General Instrument

Power Semiconductor Division

ISO9001 APPROVED

PRODUCT CATALOG

INTRODUCTION

General Instrument Corporation is a world leader in developing technology, systems and product solutions for the interactive delivery of video and data. GI's success results from dedication in leading-edge technology through intensive research and development, high quality, low-cost manufacturing and superior customer service and support.

The Power Semiconductor Division, (PSD) of General Instrument Corporation, is the world leader in the design, manufacture, and sale of low-to-medium power rectifiers and transient voltage suppressors in axial, bridge, surface mount, and array packages. These products are used throughout the electrical and electronics industries to condition current and voltage and to protect electrical circuits from power surges. The demand for increased electronic functions, global sourcing, and higher levels of reliability within the consumer electronics, telecommunications, electronic lighting ballast, computer, and automotive markets is helping to drive the growth of PSD's business worldwide.

The success of General Instrument PSD is the result of a remarkable group of people worldwide, all firmly committed to Total Customer Satisfaction. Although the management at General Instrument remains fully responsible for the quality of goods delivered, we strongly believe that success can only be assured by empowering our employees to meet, if not exceed, the needs and wishes of our customers.

PSD's strengths are the quality of its products, its strong worldwide sales and distribution channels, and the value added manufacturing of its worldwide operations which enables PSD to effectively compete globally in all major end markets. The Division is the market share leader in North America, Southeast Asia and Europe with 69% of its sales generated outside of North America. PSD is also the largest non-Japanese supplier of axial, surface mount and bridge rectifiers to the Japanese market.

The information contained in this data book is intended to provide the necessary technical support data to assist the design engineer. It is our policy to maintain high standards of product manufacturing. The General Instrument symbol GI, printed on every component, ensures that it reaches the highest level of quality and reliability. In the complex and competitive semiconductor industry, high standards of quality using the latest methods of statistical quality controls are of the utmost importance since they constitute for our customers, the assurance of reliable product performance. All of PSD's existing manufacturing facilities are ISO9001 approved.

Not every application problem can be solved using a standard device, in this case we often develop special products to meet the customers requirements. If in doubt, call your local Sales Office or our applications Engineering Laboratory for further information.

SYMBOLS

C_J .... Junction Capacitance
I_F .... DC Forward Current
$I_{(AV)}$ .... Average Forward Rectifier Current
I_D .... Stand-by Reverse Leakage Current
I_{FSM} .... Peak Forward Surge Current
1_O .... Mean Forward Current
I_R .... Reverse Leakage Current
I_{rr} .... Reverse Recovery Current
I_{PPM} .... Maximum Peak Impulse Current
$I_{RM(REC)}$ .... Maximum Peak Recovery Current
I_{RSM} .... Maximum Non-Repetitive Reverse Peak Current
I_T .... On-State Test Current
1^2t .... Rating for Fusing
$P_{M(AV)}$ .... Steady State Power Dissipation
P_{PM} .... Peak Pulse Power Dissipation
Q_{RR} .... Recovered Charge
$R_{\Theta JA}$ .... Thermal Resistance (Junction to Ambient)
$R_{\Theta JC}$ .... Thermal Resistance (Junction to Case)
$R_{\Theta JL}$ .... Thermal Resistance (Junction to Lead)
T_A .... Ambient Temperature
T_C ..... Case Temperature
t_d ...... Time Duration
t_f ...... Fall Time
T_J ..... Junction Temperature
T_L ..... Lead Temperature
t_r ...... Rise Time
t_{rr} ...... Reverse Recovery Time
T_{STG} ... Storage Temperature
$V_{(BR)}$ ... Reverse Breakdown Voltage
V_{FM} .... Instantaneous Forward Voltage
V_{FR} .... Forward Recovery Voltage
V_R ..... DC Reverse Voltage
V_{RM} .... Maximum Recurrent Peak Reverse Voltage
V_{RMS} ... RMS Input Voltage
V_{RRM} ... Repetitive Peak Reverse Voltage
V_{RSM} ... Maximum Non-Repetitive Peak Reverse Voltage
V_C ..... Clamping Voltage
V_{WM} .... Working Stand-off Voltage
V_Z ..... Zener Voltage
Z_Z ..... Dynamic Impedance

DRAWINGS

All dimensions are in inches and (millimeters.) Figures not to scale.

PRO ELECTRON TYPE DESIGNATION CODES

The **first letter** gives information about the material used for the active part of the device, where "B" indicates silicon.

The **second letter** indicates the primary function of the device, where "A" is for low-power signal diodes, "Y" is for rectifying diodes and "Z" for voltage reference or regulator diodes. (TVS if W follows Z).

The **serial number** follows the first two letters. It may either be a number from 100 to 999 or a letter (e.g. W after Z indicates TVS) followed by a number from 10 to 99.

A **suffix** may be added to show V_{RRM} for a rectifier or V_{WM} for a TVS (note: within the suffix a "V" is used instead of a decimal point). Examples: BZWO4-8V5, BYV32-150

JEDEC TYPE DESIGNATION CODES

The first number (which is followed by the letter "N") indicates the number of leads minus 1. This is followed by the serial number. Example 1N5817, 3N254

"All technical information mentioned in this Product Catalog is intended for representative use and application guidance and never indicates that we will guarantee or make approval of ownership right by ourselves or a third party."

NOTICE OF REVISION OF JEDEC REGISTERED CASE OUTLINES

The following case outlines have undergone a revision of outline names as shown below:

OLD OUTLINE	NEW OUTLINE
DO-15	DO-204AC
DO-41	DO-204AL
TO-3P	TO-247AD

CONTENTS

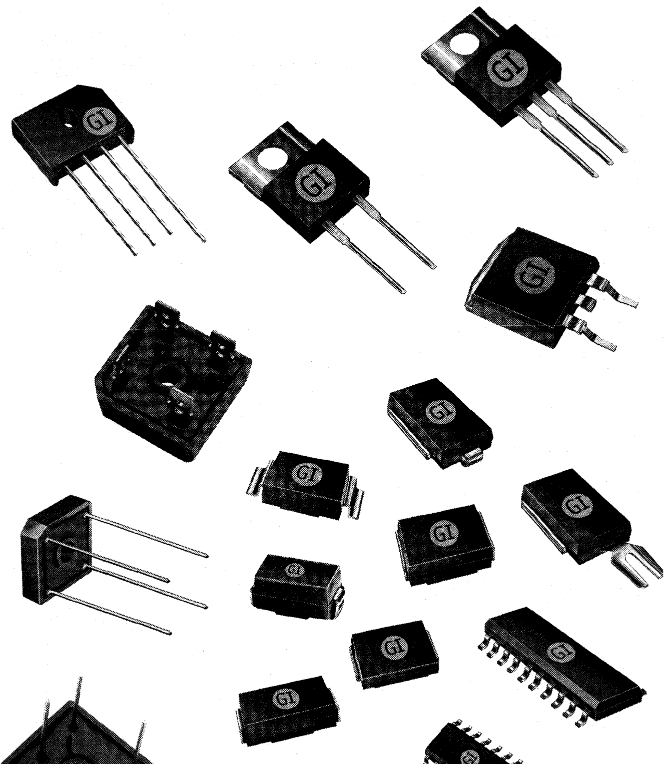
POWER SEMICONDUCTOR DIVISION

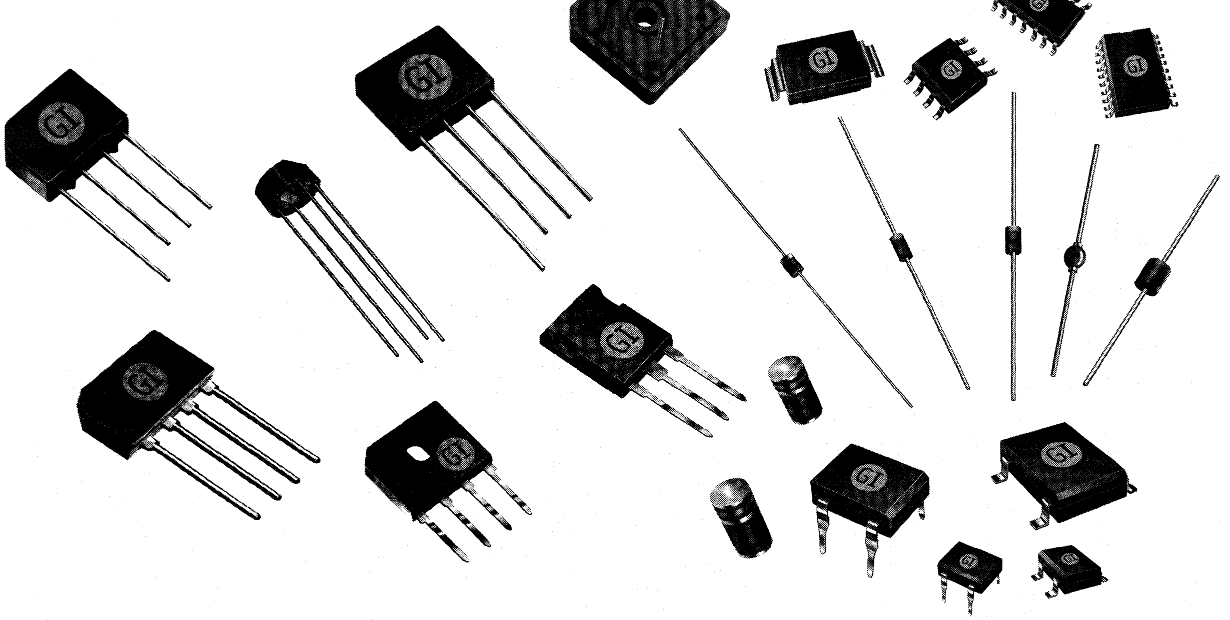
GI PRODUCT CATALOG 12^{TH} Edition GI

PRODUCT PORTFOLIO

The Power Semiconductor Division (PSD) is a leading producer of discrete rectifying devices, transient voltage suppressors (TVS), and bridge assemblies. With manufacturing facilities in the United States, Ireland, Taiwan and China (1996), General Instrument (PSD) offers a wide selection of devices employing ultrafast and Schottky silicon technologies.

All devices, including bridges and TVS components, are available in surface mount configurations (SMD's). General Instrument PSD provides components for a multitude of electronic applications worldwide.





NUMERICAL INDEX

NUMERICAL INDEX

QUALITY

It is the policy of General Instrument Corporation to design manufacture and deliver products and service which conform to specifications and satisfy customer requirements and expectations in every way. The Corporation's goal is to achieve error-free performance and zero defects in all aspects of its operations.

The General Instrument Quality Program will continue to promote both the quality and reliability of the Corporation's products and service while establishing uniformity of purpose across the entire company.

C' is a symbol of General Instrument's commitment to total customer satisfaction. It means the customer comes first... the customer is prime. And it encompasses every phase of our operation from product design through quality, reliability, delivery and service. C' is a constant reminder of our dedication to these principles.

GI General Instrument
Power Semiconductor Division

General Instrument Corporation Environmental, Health and Safety Policy

POLICY STATEMENT

It is the policy of the Company to operate worldwide in a manner which protects the environment and the health and safety of our employees and of the citizens of the communities where we have an impact. Excellence in health, safety and environmental protection is essential to our continued success and is, therefore, a shared responsibility and a common goal for all Company employees.

GUIDING PRINCIPLES

1. The Company will comply with environmental, health and safety laws and regulations and with Company standards and procedures established to protect human health and the environment.

2. On an ongoing basis, the company will assess the environmental, health and safety risks of its activities, take steps to reduce these risks, and plan for the responsible management of emergencies.

3. The Company will initiate and encourage communication that will foster responsible environmental management and prevent injury and illness in the workplace.

4. The Company will ensure that its employees have the knowledge, resources, incentive and authority to implement these guiding principles.

5. The Company supports the principles of sustainable development in its use of energy and raw materials and in the design of its products and the design and operation of its facilities.

6. The Company will measure its adherence to these guiding principles and correct any deficiencies.

7. Recognizing that conducting business in a manner protective of health, safety and the environment is an ongoing process, affected by changing scientific knowledge, laws and business and social needs, the Company will continuously evaluate and improve its policies and programs.

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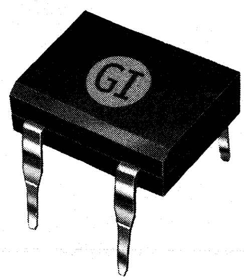
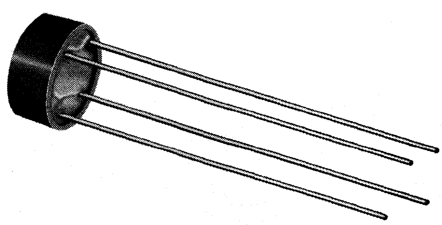
BRIDGE RECTIFIERS

0.5 AMPERE TO 35.0 AMPERES
50 VOLTS TO 1000 VOLTS





BRIDGE

INTRODUCTION TO BRIDGE RECTIFIERS

Bridge rectifiers are essential for any electronic equipment which requires full waver rectification of an AC power source. The bridge rectifier is comprised of four separate rectifier components configured into a "bridge" arrangement in a single package. This is illustrated in Fig. 1. The bridge rectifier converts alternating current (AC) into direct current (DC). General Instrument, PSD, manufactures a complete line of bridge rectifiers which can meet the power and case style requirements of almost all electronic equipment. The various case designs are shown below in Fig. 2.

Fig.1

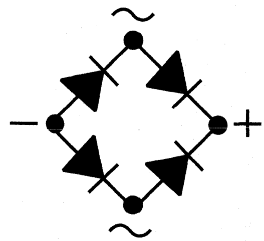
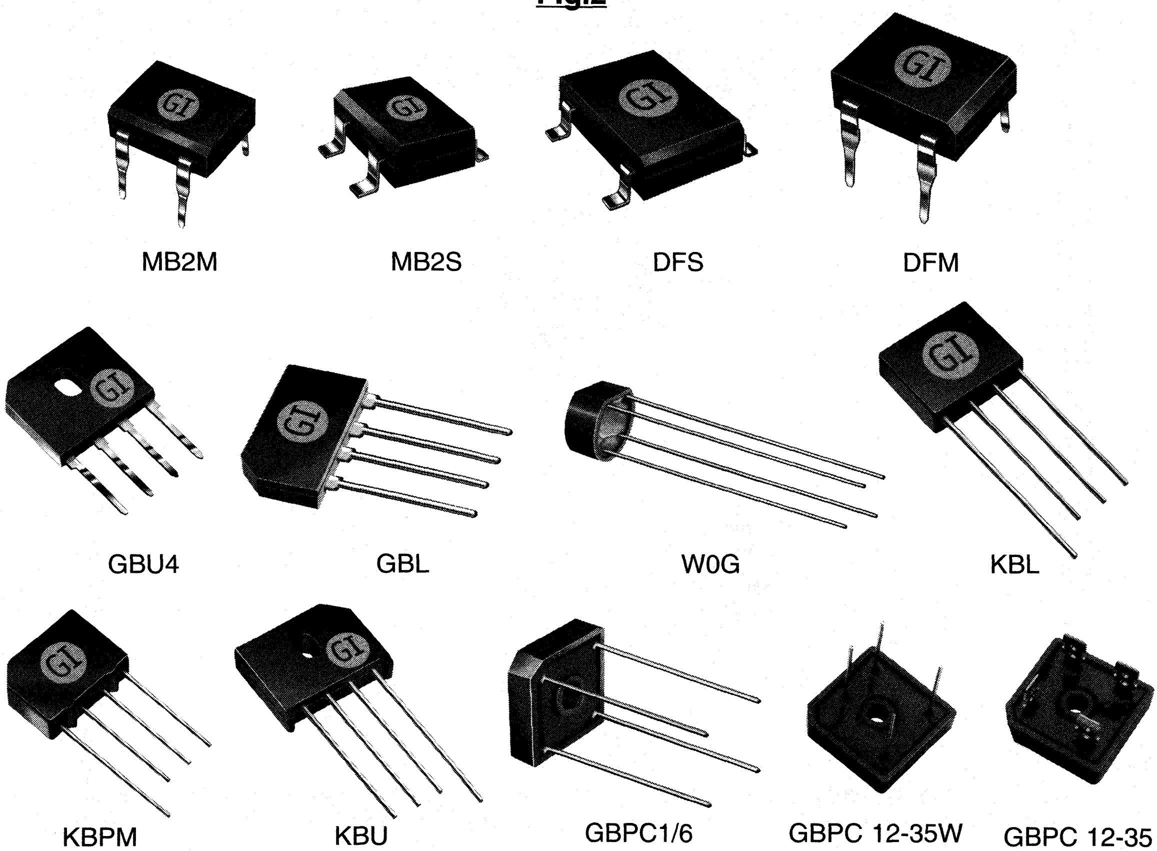


Fig.2



BRIDGE RECTIFIER

Part numbering system for all parts excluding JEDEC registered, Pro Electron and industry standard parts.

1. **MINI BRIDGE**
MBYA-ZZZZ

MB = Mini Bridge package style
Y = Reverse voltage (x100)
2 = 200V
4 = 400V
6 = 600V

A = Type Designator
M = thru-hole mount
S = Surface mount

ZZZZ = Customer specific instructions
(not shown in databook)

2. **DFM/DFS**

a) **STANDARD**
DFYYYA-ZZZZ

DF = DIP Frame package style

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

A = Type Designator
M = thru-hole mount
S = Surface mount

ZZZZ = Customer specific instructions
(not shown in databook)

b) **ENHANCED**
EDF1YA-ZZZZ

EDF = Enchanced "DF"
1 = 1 Amp

Y = Reverse Voltage

A = 50V	**C** = 150V
B = 100V	**D** = 200V

A = Type Designator
M = thru-hole mount
S = Surface mount

3. **WM**
XWYYYM-ZZZZ

X = Forward Current
"blank" = 1.5 Amp
2 = 2.0 Amp

W = "W" package style

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

M = Miniature Silastic Passivated

ZZZZ = Customer specific instructions
(not shown in databook)

4. **KBPM**
XKBPYYYM-ZZZZ

X = Forward Current
"Blank" = 1 Amp
2 = 2 Amp

KBP - Package Style
K = silicone rubber passivated chips designator
B = Bridge
P = Plastic

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

M = thru hole mount designator

ZZZZ = Customer specific instructions
(not shown in databook)

5. **GBPC**
GBPCXXYYYA-ZZZZ

GBPC = Glass passivated Bridge Plastic Case style

XX = Forward Current

1 = 3 Amp	15 = 15 Amps
6 = 6 Amps	25 = 25 Amps
12 = 12 Amps	35 = 35 Amps

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

A = Lead type designator
(for 12 Amps - 35 Amps)
W = Wire leads
"Blank" = Faston lug-terminals

ZZZZ = Customer specific instructions
(not shown in databook)

6. **GBL/KBL**
ABLYYY-ZZZZ

A = Type Designator
G = Glass passivated chip
K = silicone rubber passivated chips designator

BL - "Bridge with in-Line" mount designator

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

ZZZZ = Customer specific instructions
(not shown in databook)

7. **GBU/KBU**
ABUXY-ZZZZ

A = Type Designator
G = Glass passivated chip
K = silicone rubber passivated chips designator

BU = Bridge with Universal mounting hole package style

X = Forward Current (in Amps)

YYY = Reverse Voltage

005 = 50V	06 = 600V
01 = 100V	08 = 800V
02 = 200V	10 = 1000V
04 = 400V	

ZZZZ = Customer specific instructions
(not shown in databook)

QUICK GUIDE TO BRIDGE RECTIFIERS

I_O(A)	0.5	0.5	0.9	1.0	1.2	1.0	1.5	1.5	1.6	2.0	2.0	2.0
@T_A(C)	40	40	45	40	45	75	25	50	45	25	50	55
SURGE(C)	30	30	45	50	45	30	50	50	45	60	60	150
V_R=50(V)	-	-	B40C800G(1)	DF005M	B40C1000G	3N246	W005G	KBP005M	B40C1500	2W005G	2KBP005M	3N253
V_R=100(V)	-	-	B80C800G(1)	DF01M	B80C1000G	3N247	W01G	KBP01M	B80C1500	2W01G	2KBP01M	3N254
V_R=200(V)	MB2M	MB2S	B125C800G(1)	DF02M	B125C1000G	3N248	W02G	KBP02M	B125C1500	2W02G	2KBP02M	3N255
V_R=400(V)	MB4M	MB4S	B250C800G(1)	DF04M	B250C1000G	3N249	W04G	KBP04M	B250C1500	2W04G	2KBP04M	3N256
V_R=600(V)	MB6M	MB6S	B380C800G(1)	DF06M	B380C1000G	3N250	W06G	KBP06M	B380C1500	2W06G	2KBP06M	3N257
V_R=800(V)	-	-	-	DF08M	-	3N251	W08G	KBP08M	-	2W08G	2KBP08M	3N258
V_R=1000(V)	-	-	-	DF10M	-	3N252	W10G	KBP10M	-	2W10G	2KBP10M	3N259

QUICK GUIDE TO BRIDGE RECTIFIERS (cont'd)

I_O(A)	4.0	4.0	4.0	40	6.0	6.0	8.0	8.0
@T_A(C)	40	50	100 T_C	100 T_C	100 T_C	100 T_C	100 T_C	100 T_C
SURGE(C)	150	200	150	300	175	250	200	300
V_R=50(V)	GBL005	KBL005	GBU4A	KBU4A	GBU6A	KBU6A	GBU8A	KBU8A
V_R=100(V)	GBL01	KBL01	GBU4B	KBU4B	GBU6B	KBU6B	GBU8B	KBU8B
V_R=200(V)	GBL02	KBL02	GBU4D	KBU4D	GBU6D	KBU6D	GBU8D	KBU8D
V_R=400(V)	GBL04	KBL04	GBU4G	KBU4G	GBU6G	KBU6G	GBU8G	KBU8G
V_R=600(V)	GBL06	KBL06	GBU4J	KBU4J	GBU6J	KBU6J	GBU8J	KBU8J
V_R=800(V)	GBL08	KBL08	GBU4K	KBU4K	GBU6K	KBU6K	GBU8K	KBU8K
V_R=1000(V)	GBL10	KBL10	GBU4M	KBU4M	GBU6M	KBU6M	GBU8M	KBU8M

QUICK GUIDE TO BRIDGE RECTIFIERS (cont'd)

I_O(A)	3.0	6.0	12.0	15.0	25.0	35.0
@T_C(C)	50	100	55(2)	55(2)	55	50
SURGE(C)	60	175	200	300	300(2)	400(2)
V_R=50(V)	GBPC1005	GBPC6005	GBPC12005(2)	GBPC15005(2)	GBPC25005(2)	GBPC3550(2)
V_R=100(V)	GBPC101	GBPC601	GBPC1201(2)	GBPC1501(2)	GBPC2501(2)	GBPC3501(2)
V_R=200(V)	GBPC102	GBPC602	GBPC1202(2)	GBPC1502(2)	GBPC2505(2)	GBPC3505(2)
V_R=400(V)	GBPC104	GBPC604	GBPC1204(2)	GBPC1504(2)	GBPC2504(2)	GBPC3504(2)
V_R=600(V)	GBPC106	GBPC606	GBPC1206(2)	GBPC1506(2)	GBPC2506(2)	GBPC3506(2)
V_R=800(V)	GBPC108	GBPC608	GBPC1208(2)	GBPC1508(2)	GBPC2508(2)	GBPC3508(2)
V_R=1000(V)	GBPC110	GBPC610	GBPC1210(2)	GBPC1510(2)	GBPC2510(2)	GBPC3510(2)

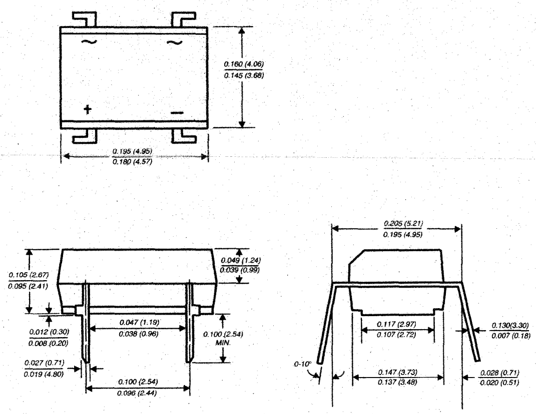
NOTES:
(1) Add "DM" suffix to indicate dual-in line package (DFM Cases Style)
(2) Add "W" suffix for wire leaded version

MB2M THRU MB6M

MINIATURE GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

Reverse Voltage *- 200 to 600 Volts* ***Forward Current*** *- 0.5 Ampere*

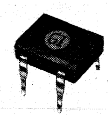
Case Style MBM



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL recognized under Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High surge overload rating: 35A peak
- ♦ Saves space on printed circuit board
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.078 ounce, 0.22 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MB2M*	*MB4M*	*MB6M*	*UNITS*
Device marking code		2	4	6	
Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	200	400	600	Volts
Maximum average forward output rectified current at T_A=30°C - on glass-epoxy P.C.B. (NOTE 1) on aluminum substrate (NOTE 2)	$I_{(AV)}$	0.5 0.8			Amp
Peak forward surge current 8.3msec. single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	35.0			Amps
Rating for fusing (t<8.3ms)	I^2t	5.0			A^2sec
Maximum instantaneous forward voltage drop per leg at 0.4A	V_F	1.0			Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C T_A=125°C	I_R	5.0 500			µA
Typical junction capacitance per leg (NOTE 3)	C_J	13.0			pF
Typical thermal resistance per leg (NOTE 1) (NOTE 1) (NOTE 2)	$R_{\Theta JL}$ $R_{\Theta JA}$ $R_{\Theta JA}$	20.0 85.0 70.0			°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150			°C

NOTES:
(1) On glass epoxy P.C.B. mounted on 0.05 x 0.05" (1.3 x 1.3mm) solder pads
(2) On aluminum substrate P.C.B. with an area of 0.8 x 0.8" (2.13 x 20mm) thick mounted on 0.05 x 0.05" (1.3 x 13mm) solder pad areas
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

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Power Semiconductor Division

FIG. 1 - DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

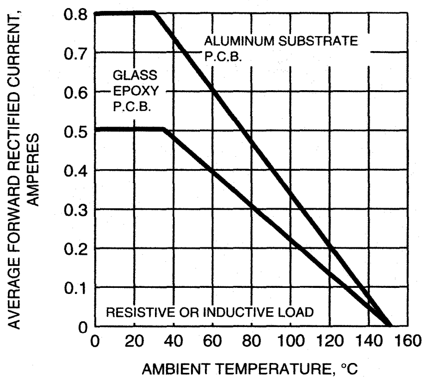


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

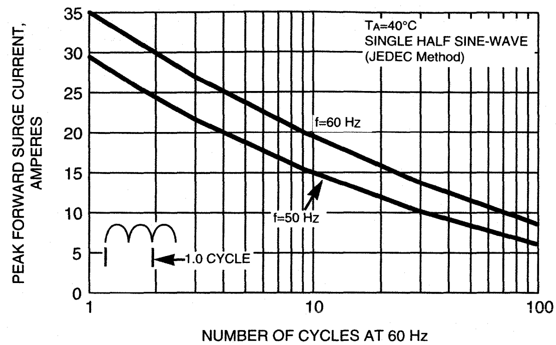


FIG. 3 - TYPICAL FORWARD VOLTAGE CHARACTERISTICS PER LEG

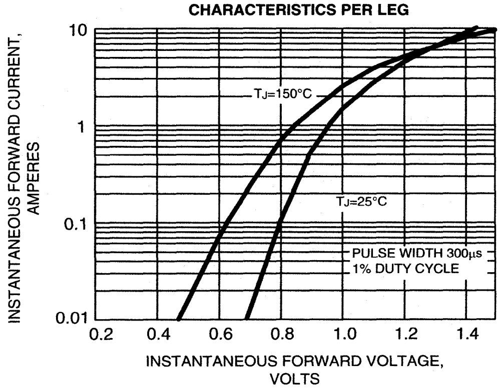


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

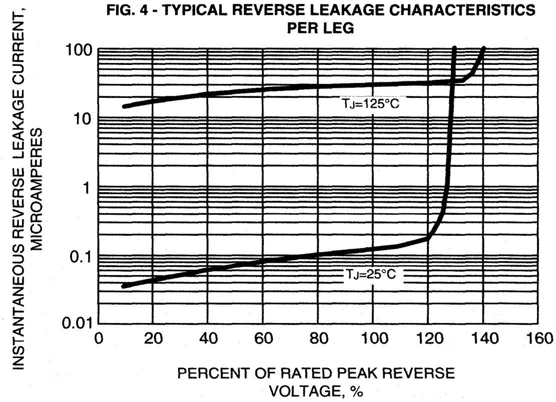
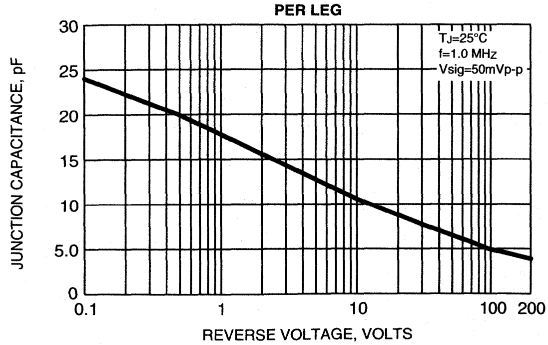


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



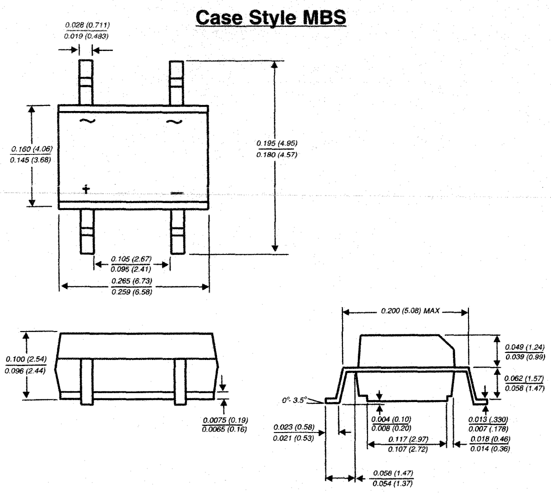
PATENT PENDING PATENT PENDING PATENT PENDING

MB2S THRU MB6S

MINIATURE GLASS PASSIVATED SINGLE-PHASE SURFACE MOUNT BRIDGE RECTIFIER

***Reverse Voltage** - 200 to 600 Volts* ***Forward Current** - 0.5 Ampere*

Case Style MBS



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL recognized under Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High surge overload rating: 35A peak
- ♦ Saves space on printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.0078 ounce, 0.22 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MB2S*	*MB4S*	*MB6S*	*UNITS*
Device marking code		2	4	6	
Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	200	400	600	Volts
Maximum average forward output rectified current at T_A=30°C - on glass-epoxy P.C.B. (NOTE 1) - on aluminum substrate (NOTE 2)	$I_{(AV)}$		0.5 0.8		Amp
Peak forward surge current 8.3msec single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}		35.0		Amps
Rating for fusing (t<8.3ms)	I^2t		5.0		A^2sec
Maximum instantaneous forward voltage drop per leg at 0.4A	V_F		1.0		Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C T_A=125°C	I_R		5.0 500		μA
Typical junction capacitance per leg (NOTE 3)	C_J		13.0		pF
Typical thermal resistance per leg (NOTE 1) (NOTE1) (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JA}$ $R_{\Theta JL}$		85.0 70.0 20.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}		-55 to +150		°C

NOTES:
(1) On glass epoxy P.C.B. mounted on 0.05 x 0.05" (1.3 x 1.3mm) pads
(2) On aluminum substrate P.C.B. with an area of 0.8 x 0.8 x 0.25" (2.0 x 2.0 x 0.64mm) mounted on 0.05 x 0.05" (1.2 x 12mm) solder pad
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

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Power Semiconductor Division

FIG. 1 - DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

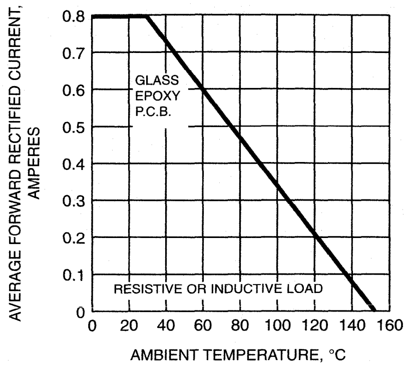


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

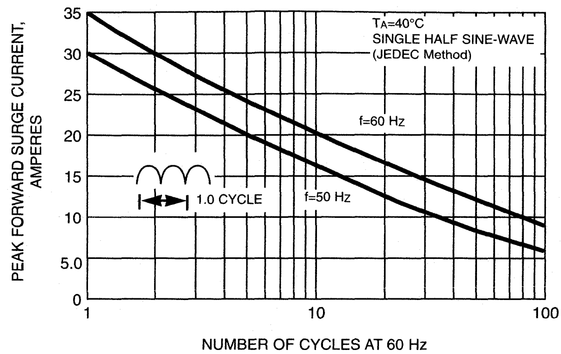


FIG. 3 - TYPICAL FORWARD VOLTAGE CHARACTERISTICS PER LEG

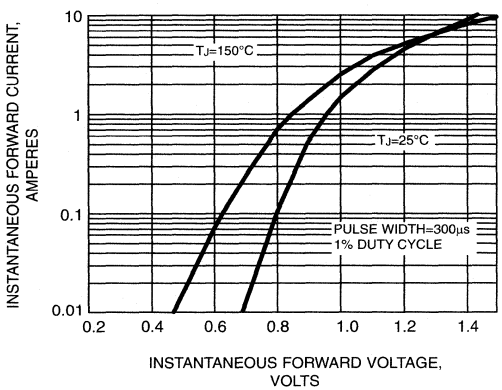


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

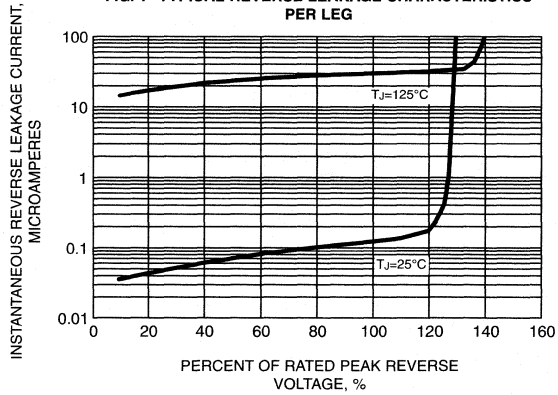
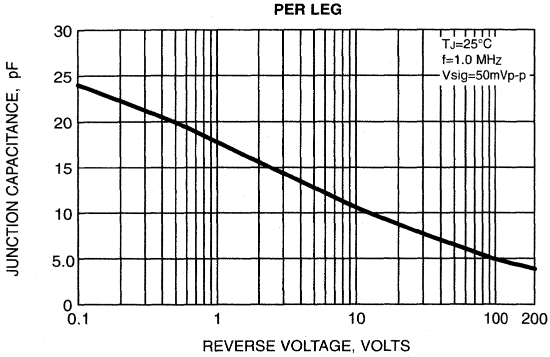


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

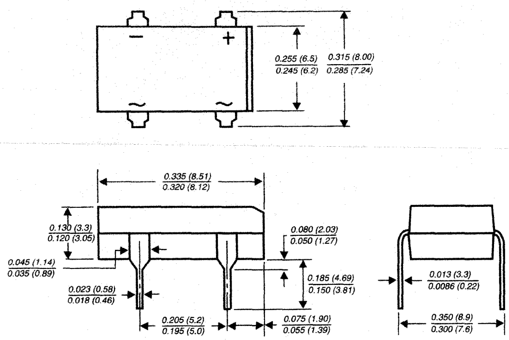


B40C800DM THRU B380C800DM

MINIATURE GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 65 to 600 Volts* ***Forward Current** - 0.9 Ampere*

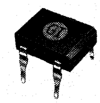
Case Style DFM



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junctions
- Surge overload rating of 45 Amperes peak
- Ideal for printed circuit boards
- High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*B40 C800DM*	*B80 C800DM*	*B125 C800DM*	*B250 C800DM*	*B380 C800DM*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS input voltage R + C-load	V_{RMS}	40	80	125	250	380	Volts
Maximum average forward output current for free air operation at T_A=45°C R + L-load C-load	$I_{(AV)}$			0.9 0.8			Amp
Maximum DC blocking voltage	V_{DC}	65	125	200	400	600	Volts
Maximum peak working voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum non-repetitive peak voltage	V_{RSM}	100	200	350	650	1000	Volts
Maximum repetitive peak forward surge current	I_{FRM}			10.0			Amps
Peak forward surge current single sine wave on rated load at T_J=125°C	I_{FSM}			45.0			Amps
Rating for fusing at T_J=125°C (t<100ms)	I^2t			10.0			A^2sec
Minimum series resistor C-load at V_{RMS} = ±10%	R_T	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum load capacitance +50% -10%	C_L	5000	2500	1000	500	200	µF
Maximum instantaneous forward voltage drop per leg at 0.9A	V_F			1.0			Volts
Maximum reverse current at rated repetitive peak voltage per leg	I_R			10.0			µA
Typical thermal resistance per leg (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$			40.0 15.0			°C/W
Operating junction temperature range	T_J			-40 to +125			°C
Storage temperature range	T_{STG}			-40 to +150			°C

NOTES:
(1) Thermal resistance from junction to ambient and from junction to lead P.C.B. mounted on 0.5 x 0.5" (13 x 13mm) copper pads

General Instrument
Power Semiconductor Division

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT FOR B40C800DM...B125C800DM

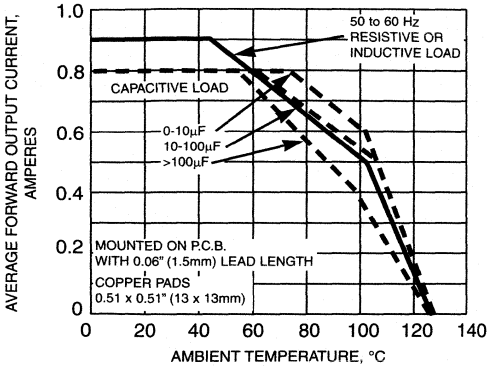


FIG. 2 - DERATING CURVE OUTPUT RECTIFIED CURRENT FOR B250C800DM...B380C800DM

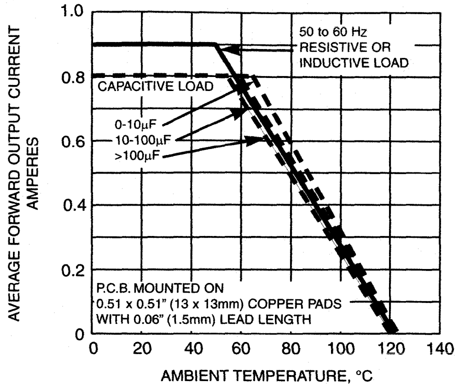


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD CURRENT PER LEG

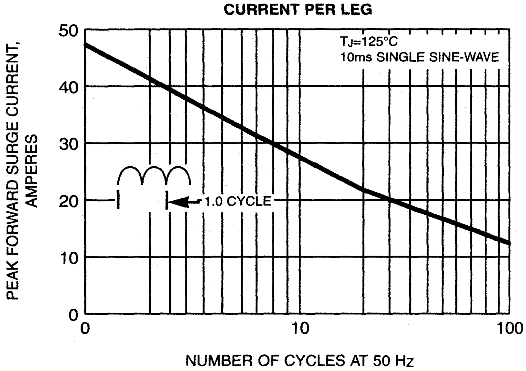


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER LEG

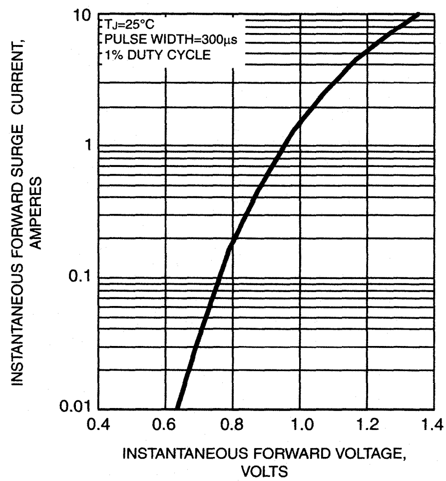


FIG. 5 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

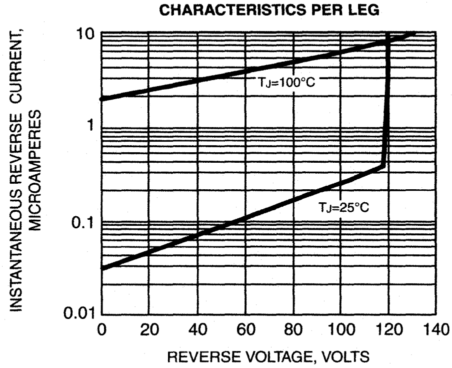
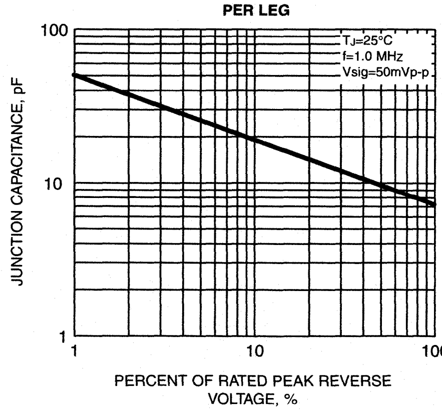


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG

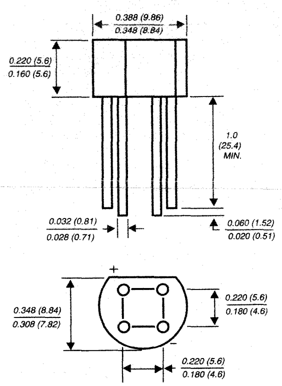


B40C800G THRU B380C800G

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

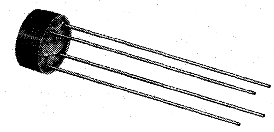
***Reverse Voltage** - 65 to 600 Volts* ***Forward Current** - 0.9 Ampere*

Case Style WOG



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical I_R less than 0.1 μ/A
- ♦ High overload surge current
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*B40 C800G*	*B80 C800G*	*B125 C800G*	*B250 C800G*	*B380 C800G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS input voltage R + C-load	V_{RMS}	40	80	125	250	380	Volts
Maximum average forward output current for free air operation at T_A=45°C R + L-load C-Load	$I_{(AV)}$			0.9 0.8			Amps
Maximum non-repetitive peak voltage	V_{RSM}	100	200	350	600	1000	Volts
Maximum DC blocking voltage	V_{DC}	65	125	200	400	600	Volts
Maximum peak working voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum repetitive peak forward surge current	I_{FRM}			10.0			Amps
Peak forward surge current single sine wave on rated load at T_J=125°C	I_{FSM}			45.0			Amps
Rating for fusing at T_J=125°C (t<100ms)	I^2t			10.0			A^2sec
Minimum series resistor C-load at V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum load capacitance +50% -10%	C_L	5000	2500	1000	500	200	μF
Maximum instantaneous forward voltage drop per leg at 0.9A	V_F			1.0			Volts
Maximum reverse current at rated repetitive peak voltage per leg T_A=25°C	I_R			10.0			μA
Typical thermal resistance per leg(NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$			 36.0			C/W
Operating junction temperature range	T_J			-40 to +125			°C
Storage temperature range	T_{STG}			-40 to +150			°C

NOTES:
(1) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. at 0.375" (9.5mm) lead lengths with 0.2 x 0.2" (5.5 x 5.5mm) copper pads

General Instrument
Power Semiconductor Division

FIG.1 - DERATING CURVES OUTPUT RECTIFIED CURRENT FOR B40C800M...B125C800M

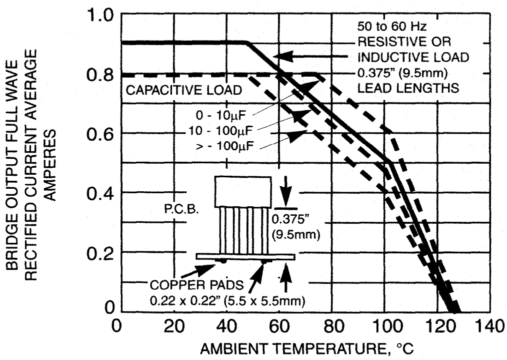


FIG. 2 - DERATING CURVES FOR OUTPUT RECTIFIED CURRENT B250C800M...B380C800M

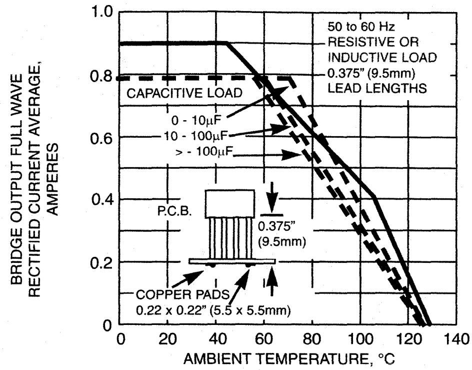


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD CURRENT PER LEG

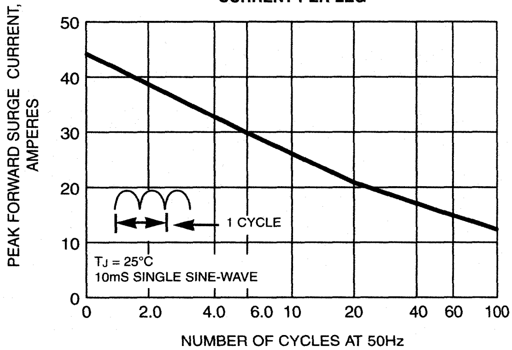


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER LEG

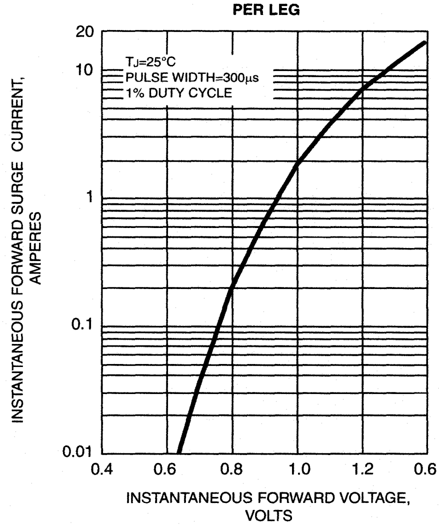


FIG.5 - TYPICAL REVERSE CHARACTERISTICS PER LEG

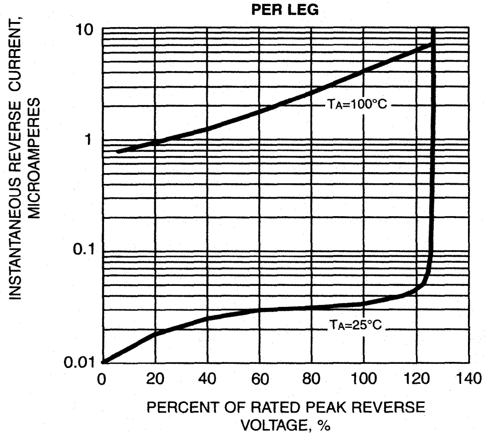
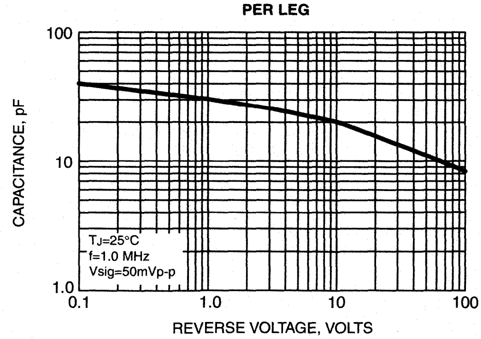


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG



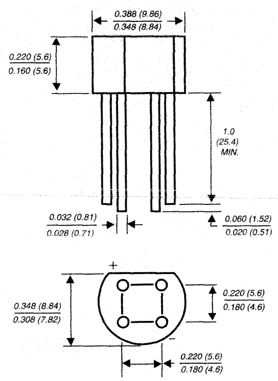
GI General Instrument
Power Semiconductor Division

B40C1000G THRU B380C1000G

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 65 to 600 Volts* ***Forward Current** -1.0 Ampere*

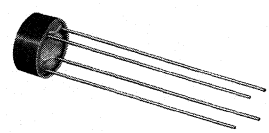
Case Style WOG



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical IR less than 0.1 µ A
- ♦ High overload surge current
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.05 ounce, 1.3 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	B40 C1000G	B80 C1000G	B125 C1000G	B250 C1000G	B380 C1000G	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS input voltage R + C-load	V_{RMS}	40	80	125	250	380	Volts
Maximum DC blocking voltage	V_{DC}	65	125	200	400	600	Volts
Maximum peak working voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum non-repetitive peak voltage	V_{RSM}	100	200	350	600	1000	Volts
Maximum repetitive peak forward surge current	I_{FRM}	10.0					Amps
Maximum average forward output current for free air operation at T_A=45°C R + L-Load C-Load	$I_{(AV)}$	1.2 1.0					Amps
Peak forward surge current single sine wave on rated load (JEDEC Method) at T_J=125°C	I_{FSM}	45.0					Amps
Rating for fusing at T_J=125°C (t<100ms)	I^2t	10.0					A^2sec
Minimum series resistor C-load at V_{RMS} = ±10%	R_T	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum load capacitance +50% -10%	C_L	5000	2500	1000	500	200	µF
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F	1.0					Volts
Maximum reverse current at rated repetitive peak voltage per leg T_A=25°C	I_R	10.0					µA
Typical thermal resistance (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$	36.0					°C/W
Operating junction temperature range	T_J	-40 to +125					°C
Storage temperature range	T_{STG}	-40 to +150					°C

NOTE:
(1) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. at 0.375" (9.5mm) lead lengths with 0.2 x 0.2" (5.5 x 5.5mm) copper pads

GI General Instrument
Power Semiconductor Division

RATINGS AND CHARACTERISTICS CURVES B40C1000G THRU B380C1000G

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT B40C1000Z...B380C1000Z

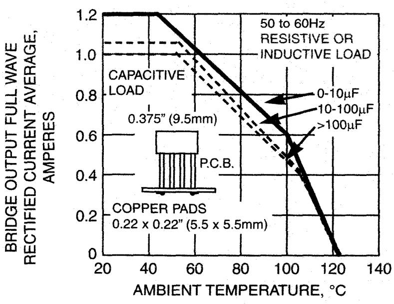


FIG. 2 - DERATING CURVES FOR OUTPUT RECTIFIED CURRENT B40C1000Z...B380C1000Z

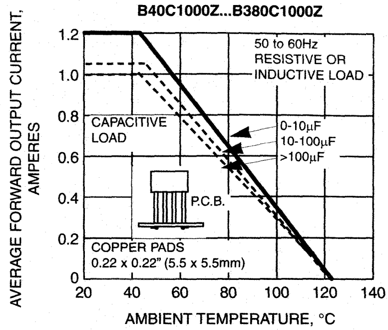


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD CURRENT PER LEG

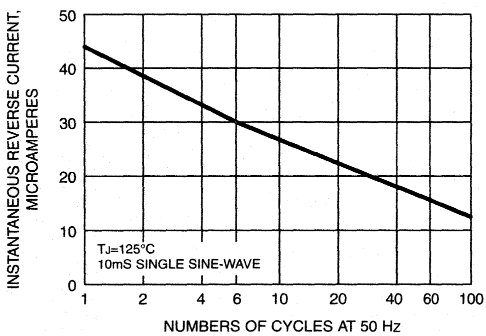


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER LEG

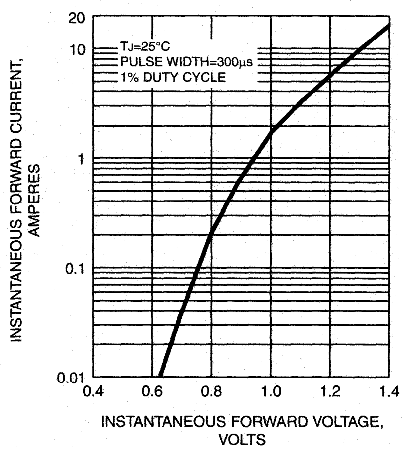


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS PER LEG

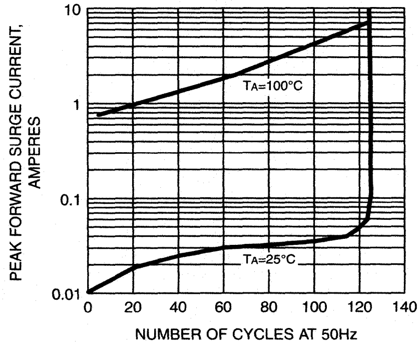
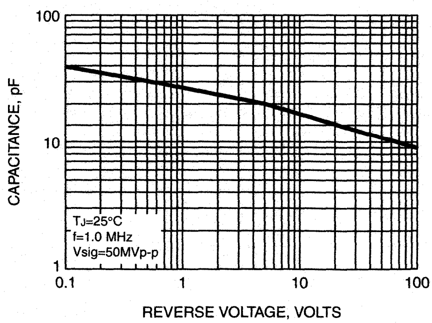


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG

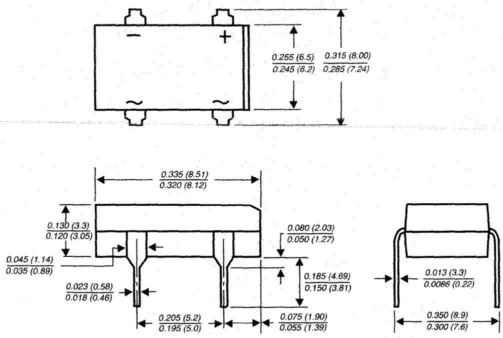


DF005M THRU DF10M

MINIATURE GLASS PASSIVATED SINGLE-PHASE-BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

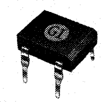
Case Style DFM



Dimensions in inches and (millimeters)

FEATURES

- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ Plastic package used has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junctions
- ♦ Surge overload rating of 50 Amperes peak
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	DF 005M	DF 01M	DF 02M	DF 04M	DF 06M	DF 08M	DF 10M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward output rectified current at T_A=40°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F	1.1							Volts
Maximum reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 / 500.0							µA
Typical junction capacitance per leg (NOTE 1)	C_J	25.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ / $R_{\Theta JL}$	40.0 / 15.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.5 x 0.5" (13 x 13mm) copper pads

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

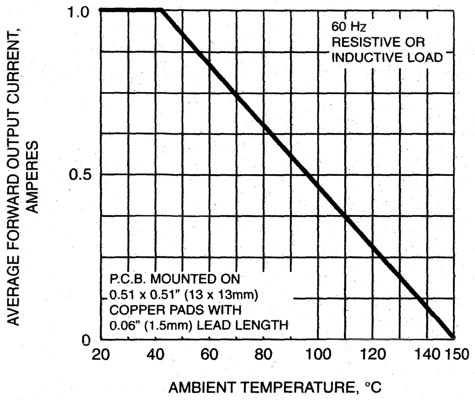


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

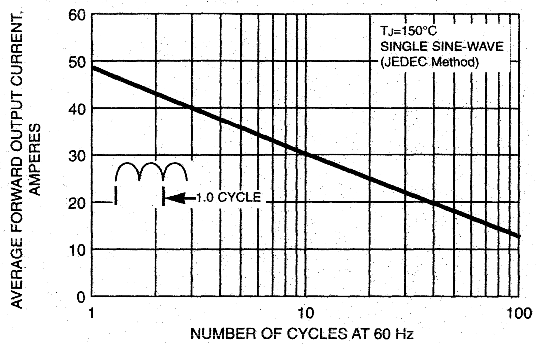


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

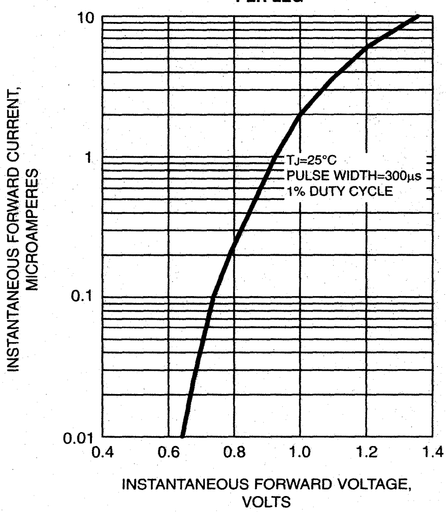


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

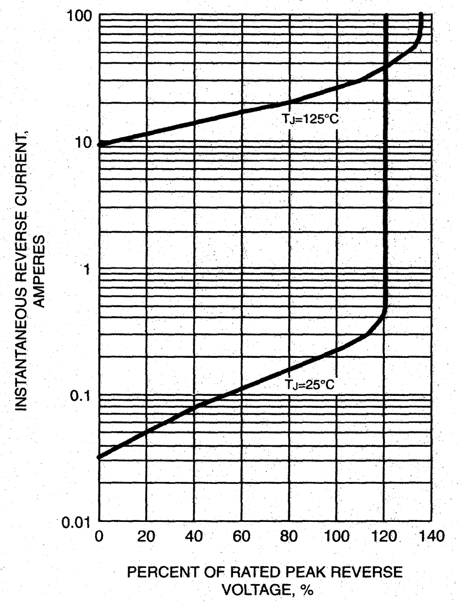
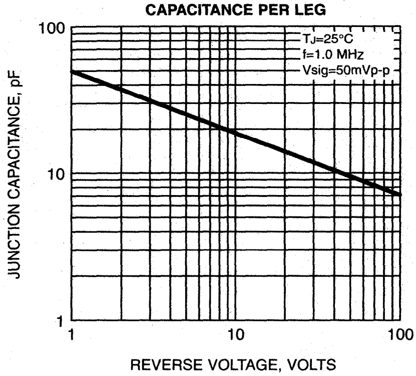


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

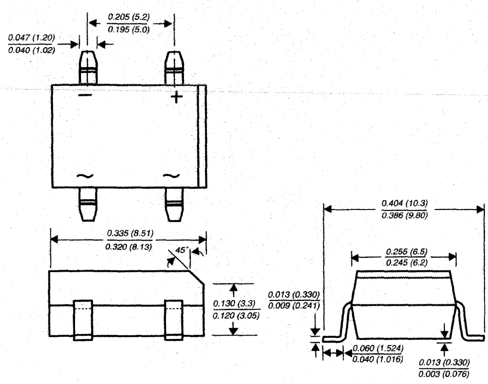


DF005S THRU DF10S

MINIATURE GLASS PASSIVATED SINGLE-PHASE SURFACE MOUNT BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

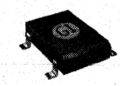
Case Style DFS



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL recognized under Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High surge overload rating-50 amperes peak
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*DF 005S*	*DF 01S*	*DF 02S*	*DF 04S*	*DF 06S*	*DF 08S*	*DF 10S*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward output rectified current at T_A=40°C (NOTE 2)	$I_{(AV)}$	1.0							Amp
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	50.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F	1.1							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage per leg T_A=125°C	I_R	5.0 500							µA
Typical junction capacitance per leg (NOTE 1)	C_J	25.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	40.0 15.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Units mounted on P.C.B. with 0.51 x 0.51" (13 x 13mm) copper pads

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

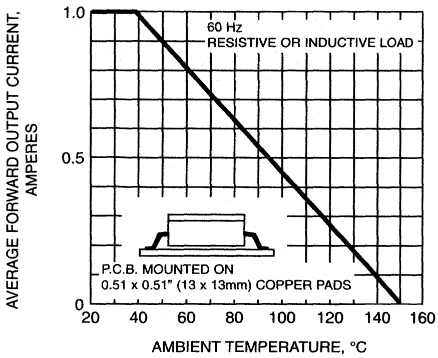


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

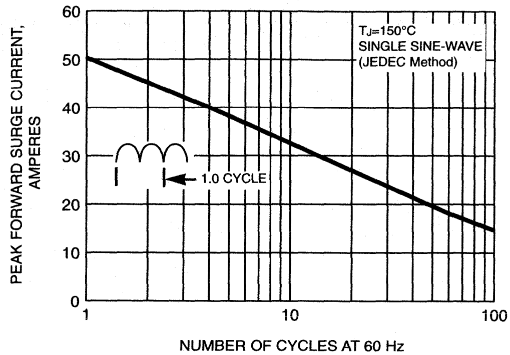


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

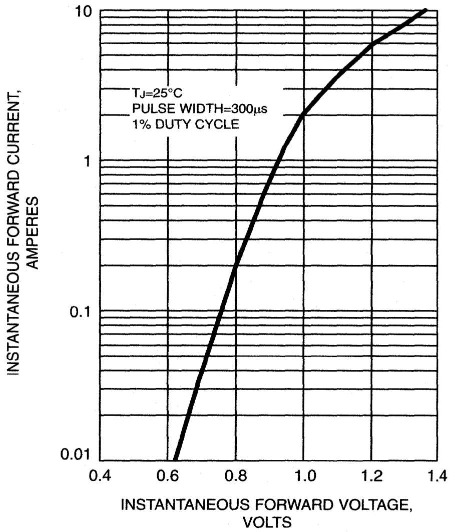


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

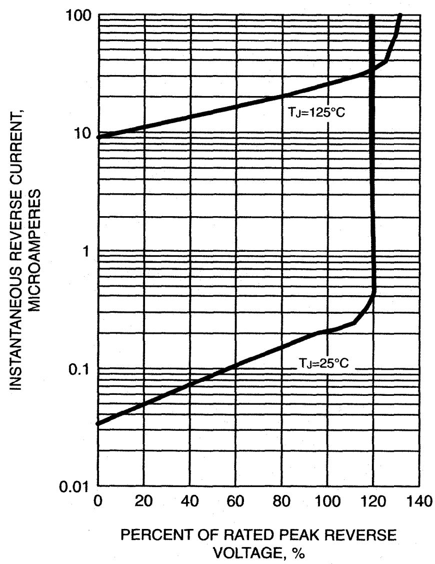
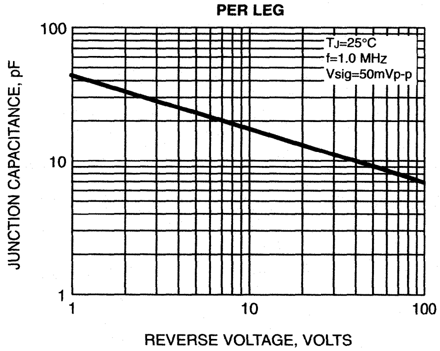


FIG. 5 -TYPICAL REVERSE CHARACTERISTICS PER LEG

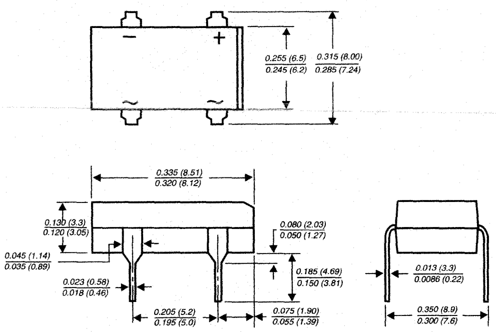


EDF1AM THRU EDF1DM

MINIATURE GLASS PASSIVATED FAST EFFICIENT BRIDGE RECTIFIER

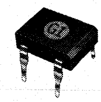
***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 1.0 Ampere*

Case Style DFM



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High forward surge current capability
- ♦ Ideal for printed circuit boards
- ♦ Superfast recovery times for high efficiency
- ♦ High temperature soldering guaranteed: 265°C/10 seconds at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*EDF1AM*	*EDF1BM*	*EDF1CM*	*EDF1DM*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	VRMS	35	70	106	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward output rectified current at T_A=40°C	$I_{(AV)}$			1.0		Amp
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}			50.0		Amps
Rating for fusing (t<8.35ms)	I^2t			10.0		A^2sec
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F			1.05		Volts
Maximum reverse current at rated DC blocking voltage T_A=25°C T_A=125°C	I_R			5.0 1.0		µA mA
Maximum reverse recovery time at (NOTE 1)	t_{rr}			50.0		ns
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$			38.0 12.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}			-55 to +150		°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.51 x 0.51" (13 x 13mm) copper pads

FIG. 1 - DERATING CURVES OUTPUT RECTIFIED CURRENT

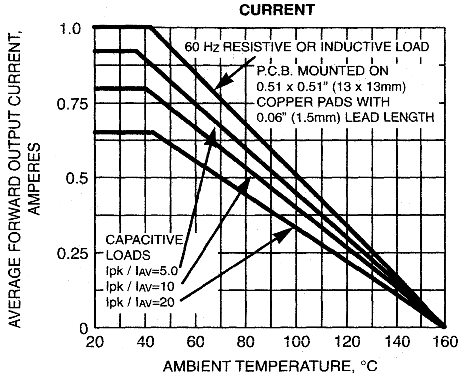


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

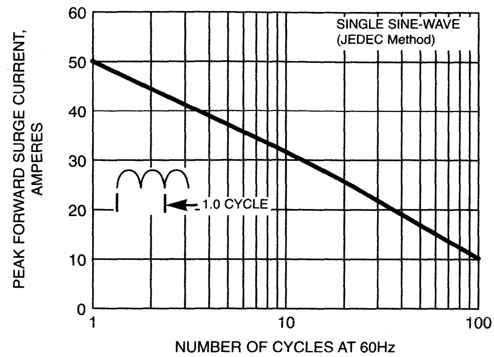


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

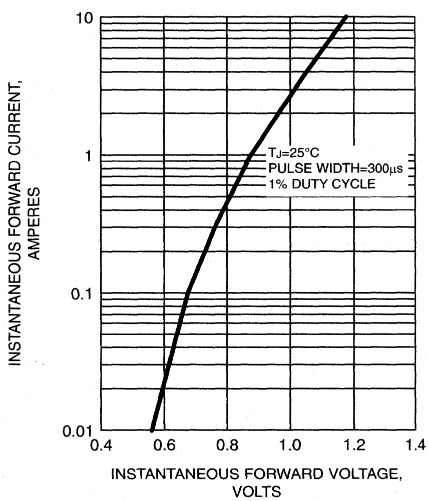


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

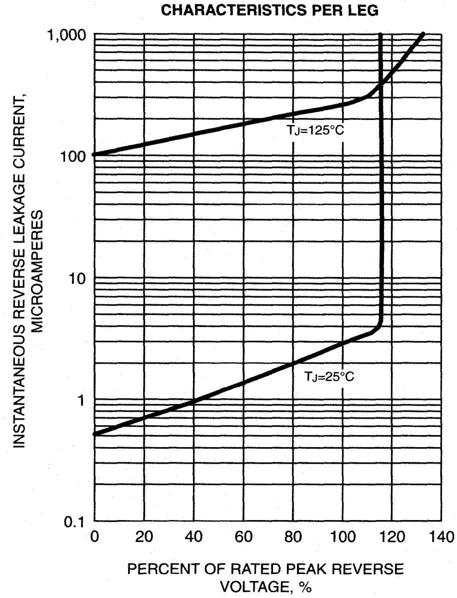
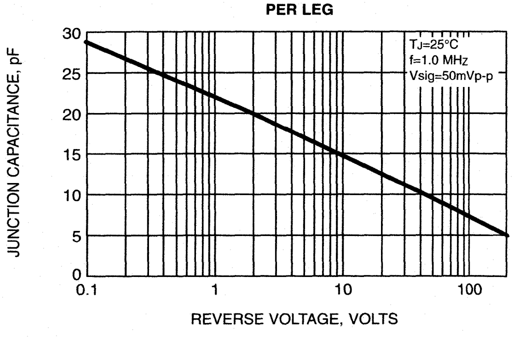


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

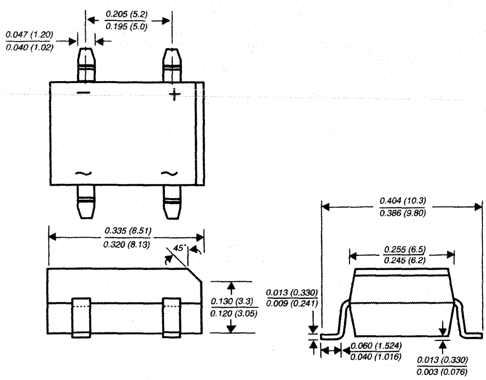


EDF1AS THRU EDF1DS

MINIATURE GLASS PASSIVATED FAST EFFICIENT SURFACE MOUNT BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 200 Volts*   ***Forward Current** - 1.0 Ampere*

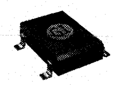
Case Style DFS



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High surge overload rating- 50 amperes peak
- ♦ Ideal for printed circuit boards
- ♦ Superfast recovery times for high efficiency
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*EDF1AS*	*EDF1BS*	*EDF1CS*	*EDF1DS*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	106	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward output rectified current at T_A=40°C (NOTE 2)	$I_{(AV)}$	1.0				Amp
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	50.0				Amps
Rating for fusing (t<8.35ms)	I^2t	10.0				A^2sec
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F	1.05				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 1.0				µA mA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0				ns
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	38.0 12.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Units mounted on P.C.B. with 0.51 x 0.51" (13 x 13mm) copper pads

General Instrument
Power Semiconductor Division

FIG. 1 - DERATING CURVES OUTPUT RECTIFIED CURRENT

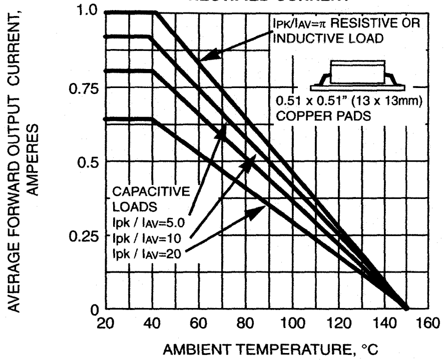


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

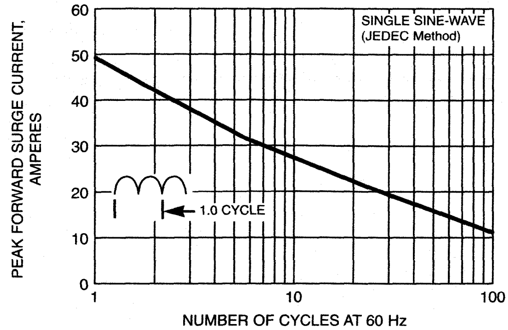


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

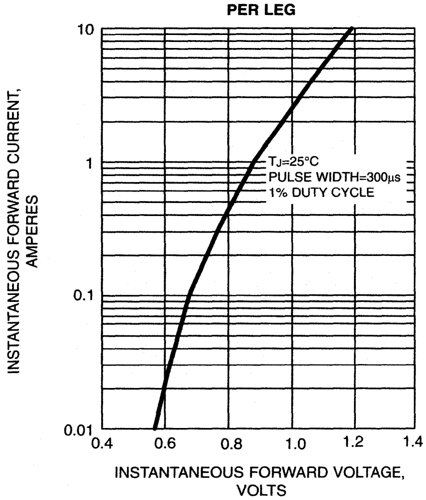


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

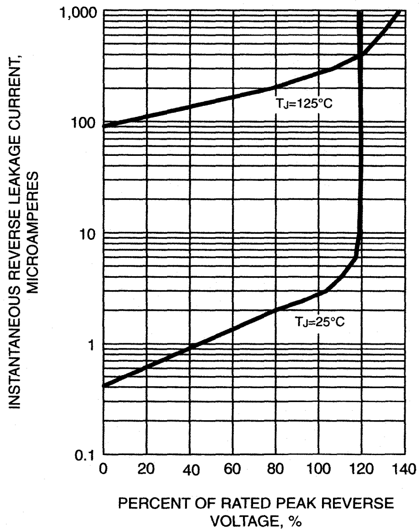
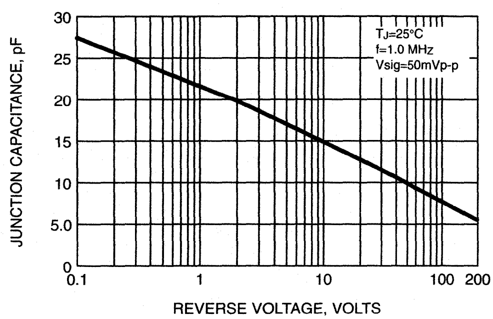


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

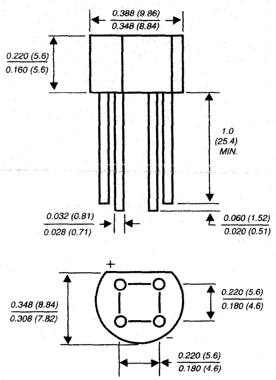


B40C1500G THRU B380C1500G

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

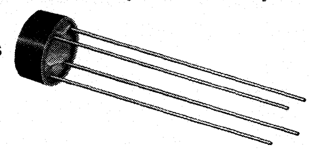
***Reverse Voltage** - 65 to 600 Volts* ***Forward Current** - 1.5 Amperes*

Case Style WOG



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical I_R less than 0.1μA
- ♦ High surge current capability
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*B40 C1500G*	*B80 C1500G*	*B125 C1500G*	*B250 C1500G*	*B380 C1500G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS input voltage R + C-load	V_{RMS}	40	80	125	250	380	Volts
Maximum DC blocking voltage	V_{DC}	65	125	200	400	600	Volts
Maximum peak working voltage	V_{RWM}	90	180	300	600	800	Volts
Maximum non-repetitive peak voltage	V_{RSM}	100	200	350	650	1000	Volts
Maximum repetitive peak forward surge current	I_{FRM}	10.0					Amps
Maximum average forward output current for free air operation at T_A=45°C R + L-load C-Load	$I_{(AV)}$	1.6 1.5					Amps
Peak forward surge current single sine wave on rated load at T_J=125°C	I_{FSM}	50.0					Amps
Rating for fusing at T_J=125°C (t<100ms)	I^2t	12.5					A^2sec
Min. series resistor C-load at V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum load capacitance +50% -10%	C_L	5000	2500	1000	500	200	μF
Maximum instantaneous forward voltage drop per leg at 1.5A	V_F	1.0					Volts
Maximum reverse current at rated repetitive peak voltage per leg T_A=25°C	I_R	10.0					μA
Typical thermal resistance per leg (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$	36.0					°C/W
Operating junction temperature range	T_J	-40 to +125					°C
Storage temperature range	T_{STG}	-40 to +150					°C

NOTES:
1. Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. at 0.375" (9.5mm) lead lengths with 0.2 x 0.2"

FIG.1 - DERATING CURVES OUTPUT RECTIFIED CURRENT FOR B40C1500G...B125C1500G

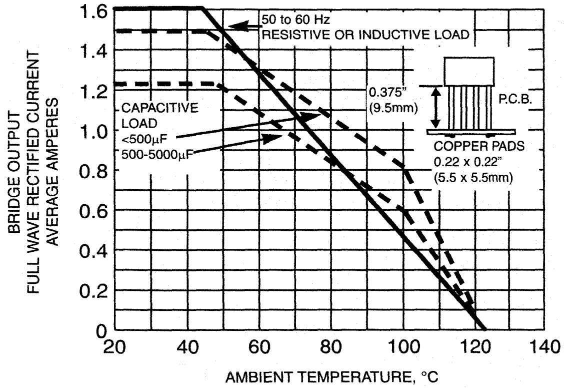


FIG.2 - DERATING CURVES OUTPUT RECTIFIED CURRENT FOR B250C1500G...B380C1500G

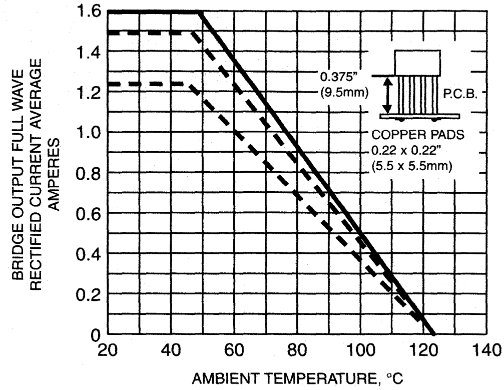


FIG.3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

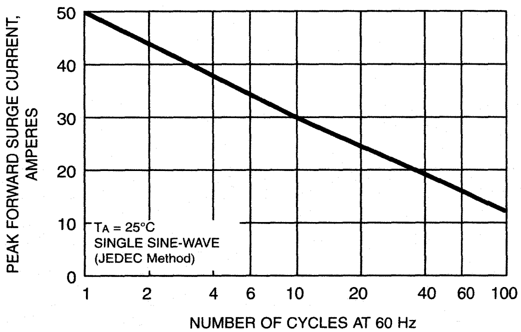


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER LEG

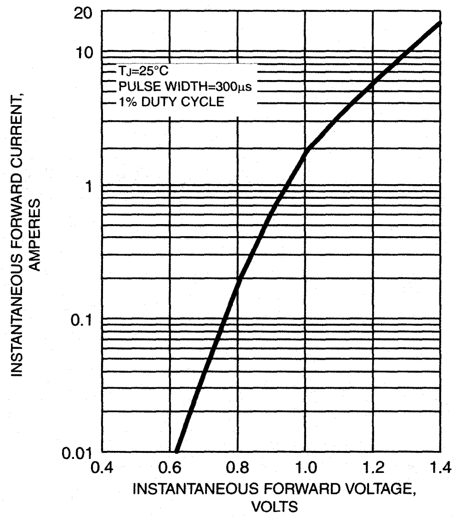


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS PER LEG

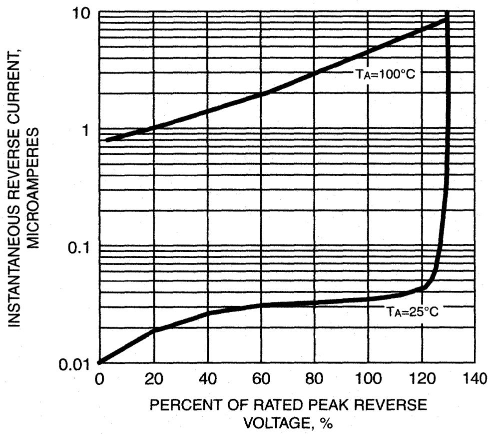
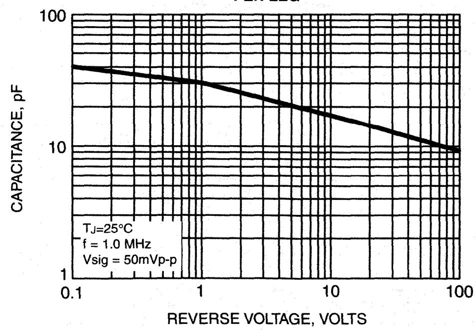


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

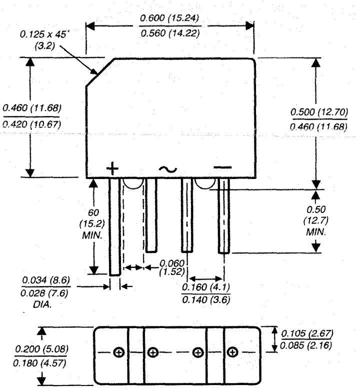


KBP005M THRU KBP10M
3N246 THRU 3N252

GLASS PASSIVATED SINGLE-PHASE RECTIFIER BRIDGE

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

Case Style KBPM

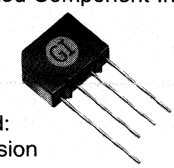


Polarity shown on front side of case: positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- This series is UL listed under Recognized Component Index, file number E54214
- Glass passivated chip junctions
- High surge current capability
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on case
Mounting position: Any
Weight: 0.06 ounce, 1.7 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*KBP 005M 3N246*	*KBP 01M 3N247*	*KBP 02M 3N248*	*KBP 04M 3N249*	*KBP 06M 3N250*	*KBP 08M 3N251*	*KBP 10M 3N252*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward output rectified current at T_A=40°C	$I_{(AV)}$	1.5							Amps
* Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	50.0 30.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
* Maximum instantaneous forward voltage drop at 1.0A per leg 1.57A per leg	V_F	1.0 1.3							Volts
* Maximum DC reverse current T_A=25°C at rated DC blocking voltage per leg T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 1)	C_J	15.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	40.0 13.0							°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with, 0.47 x 0.47" (12 x12mm) copper pads
* JEDEC registered values

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

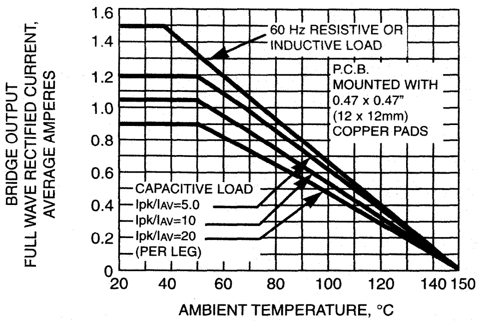


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

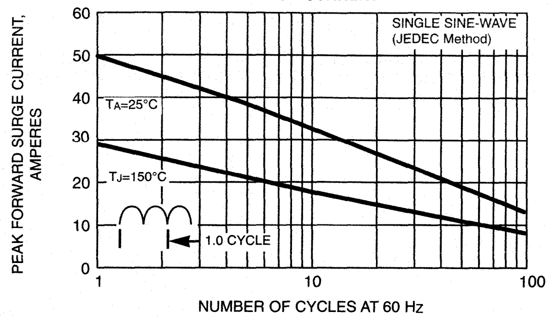


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

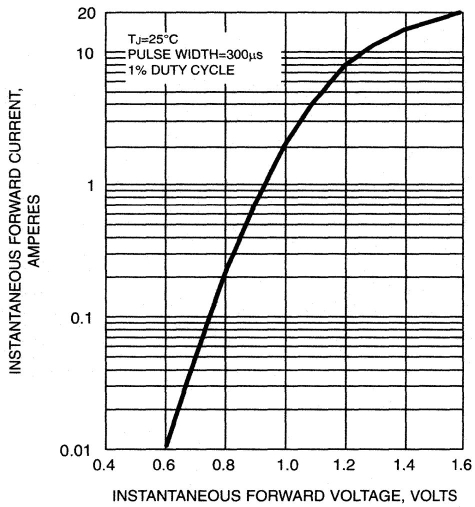


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

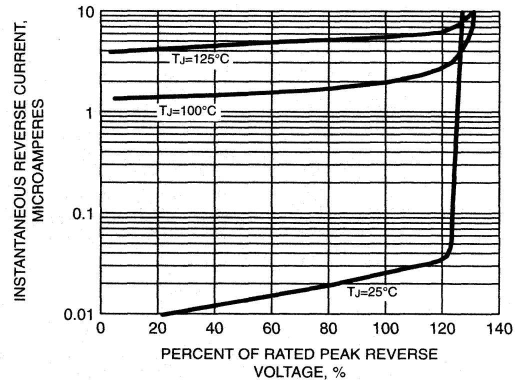
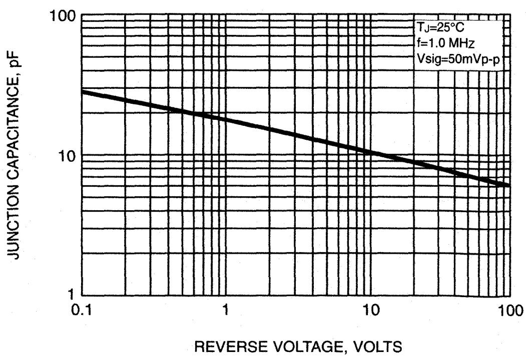


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

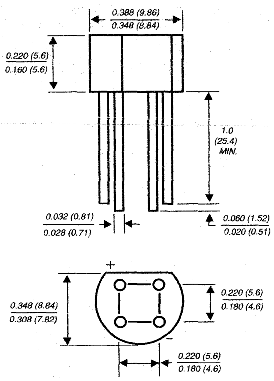


W005G THRU W10G

MINIATURE GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

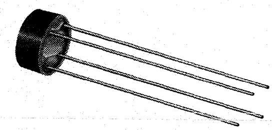
***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

Case Style WOG



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic material has Underwriters Laboratory Flammability Recognition 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical I_R less than 0.1μA
- ♦ High overload surge capability
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Any

Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*W005G*	*W01G*	*W02G*	*W04G*	*W06G*	*W08G*	*W10G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at 0.375" (9.5mm) lead length at T_A=25°C	$I_{(AV)}$	1.5							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Rating for fusing (t<8.3ms)	I^2t	10.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 1.0A	V_F	1.0							Volts
Maximum DC reverse current at rated T_A=25°C DC blocking voltage per leg T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 1)	C_J	14.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$	36.0							°C/W
Operating junction temperature range	T_J	-55 to +150							°C
Storage temperature range	T_{STG}	-55 to +150							°C

NOTES:

(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

(2) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B. mounting

FIG.1 - DERATING CURVE
OUTPUT RECTIFIED CURRENT

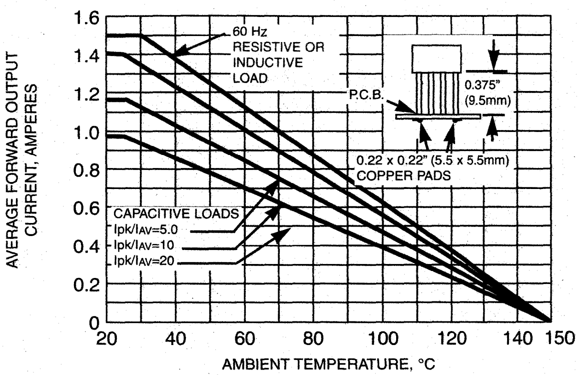


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

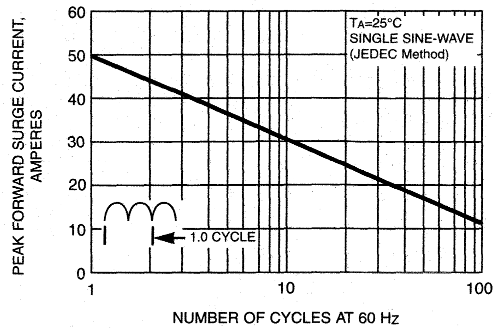


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

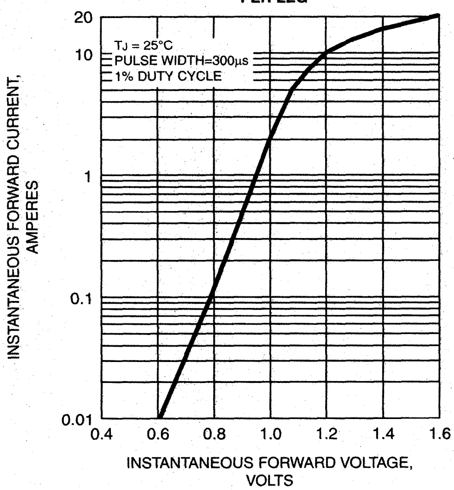


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

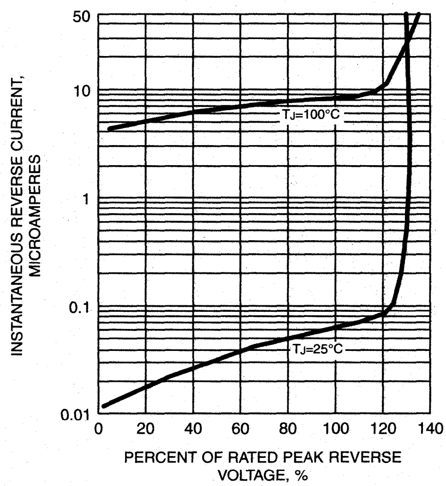


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

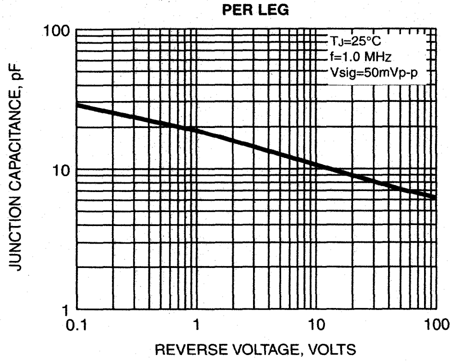
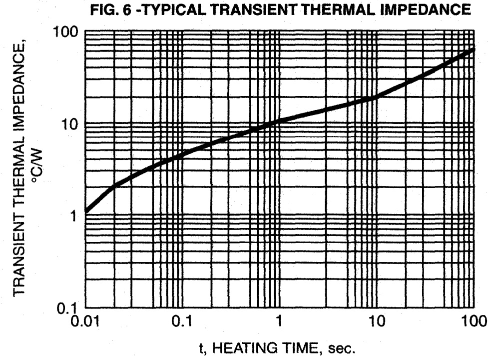


FIG. 6 -TYPICAL TRANSIENT THERMAL IMPEDANCE

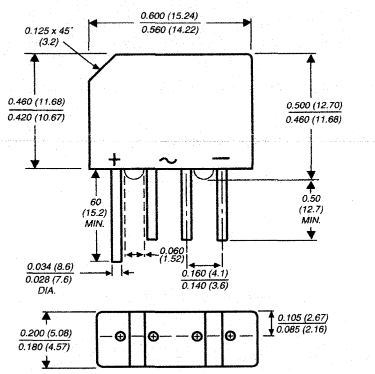


2KBP005M THRU 2KBP10M SERIES
3N253 THRU 3N259

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 2.0 Amperes*

Case Style KBPM

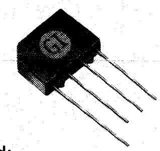


Polarity shown on front side of case: positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ Typical I_R less than 0.1μA
- ♦ High case dielectric strength
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.06 ounce, 1.7 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	2KBP 005M 3N253	2KBP 01M 3N254	2KBP 02M 3N255	2KBP 04M 3N256	2KPB 06M 3N257	2KBP 08M 3N258	2KBP 10M 3N259	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
* Maximum average forward output rectified current at T_A=55°C	$I_{(AV)}$	2.0							Amps
* Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	60.0							Amps
Rating for fusing (t<8.35ms)	I^2t	15.0							A^2sec
* Maximum instantaneous forward voltage drop per leg at 3.14A	V_F	1.1							Volts
* Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 / 500.0							μA
Typical junction capacitance per leg (NOTE 1)	C_J	25.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ / $R_{\Theta JL}$	30.0 / 11.0							°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-55 to +165							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.47 x 0.47" (12 x 12mm) copper pads
* JEDEC registered values

General Instrument
Power Semiconductor Division

RATINGS AND CHARACTERISTICS CURVES 3N253 THRU 3N259 / 2KBP005M THRU 2KBP10M

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

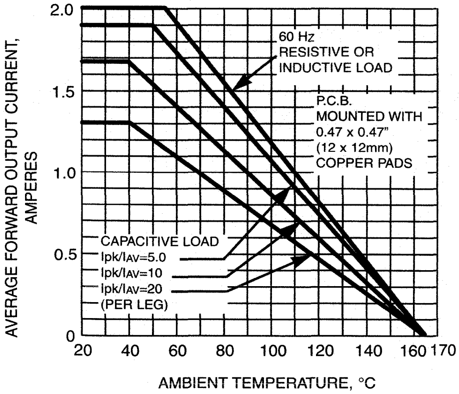


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

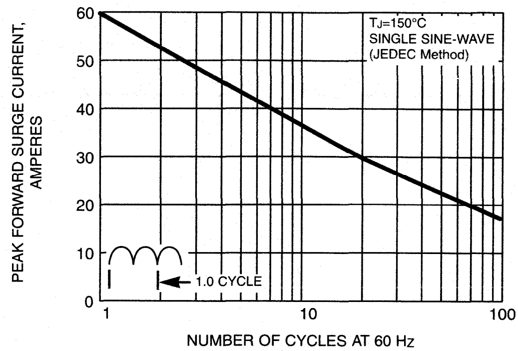


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

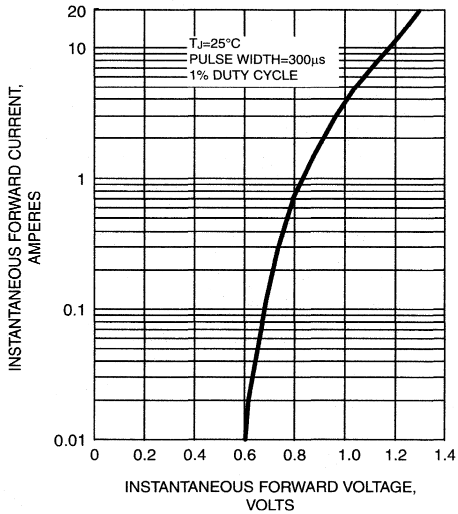


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

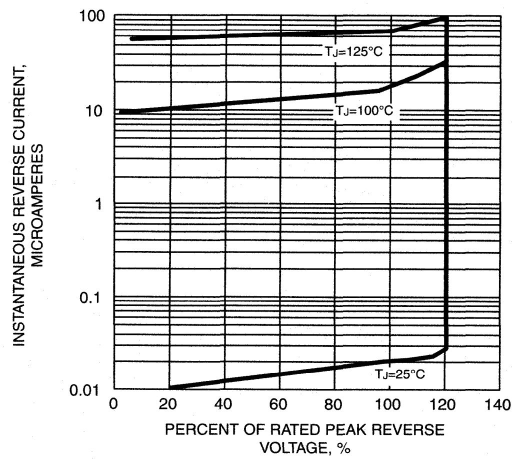
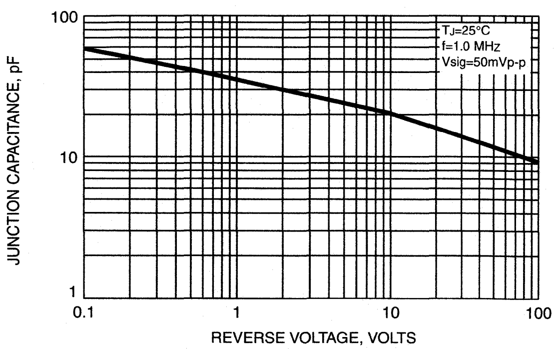


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

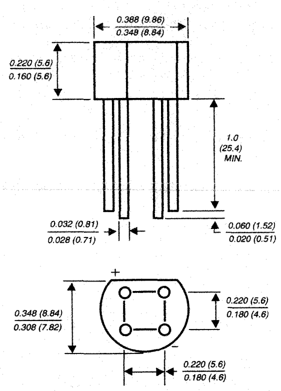


2W005G THRU 2W10G

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 2.0 Amperes*

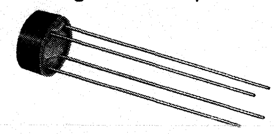
Case Style WOG



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Recognition 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical I_R less than 0.5μA
- ♦ High surge current capability
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 250°C for 10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads, solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.05 ounce, 1.3 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*2W 005G*	*2W 01G*	*2W 02G*	*2W 04G*	*2W 06G*	*2W 08G*	*2W 10G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG. 1)	$I_{(AV)}$	2.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	60.0							Amps
Rating for fusing (t<8.3ms)	I^2t	15.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 2.0 Amperes	V_F	1.1							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 / 500.0							μA
Typical junction capacitance per leg (NOTE 1)	C_J	40.0				20.0			pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ / $R_{\Theta JL}$	40.0 / 15.0							°C/W
Operating junction temperature range	T_J	-55 to + 150							°C
Storage temperature range	T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length for P.C.B. mounting

General Instrument
Power Semiconductor Division

RATINGS AND CHARACTERISTICS CURVES 2W005G THRU 2W10G

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

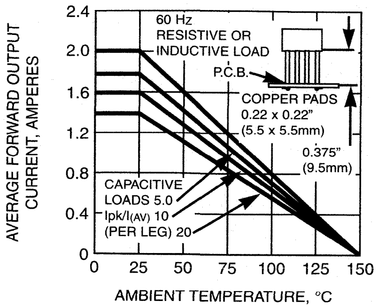


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

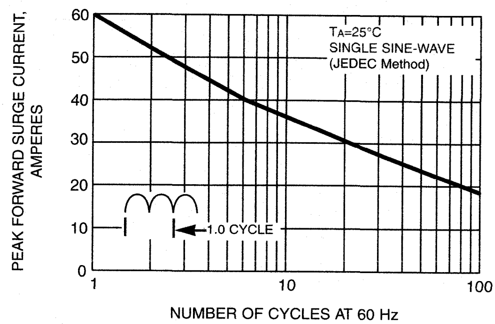


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

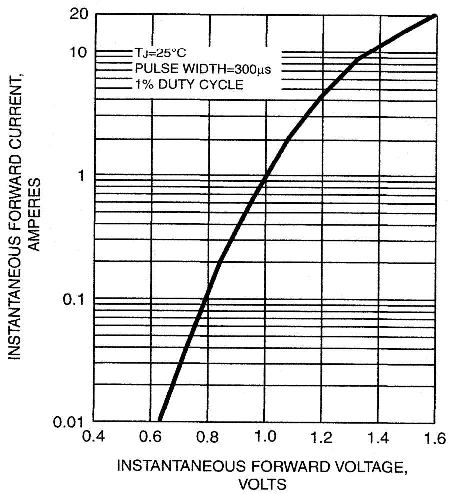


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

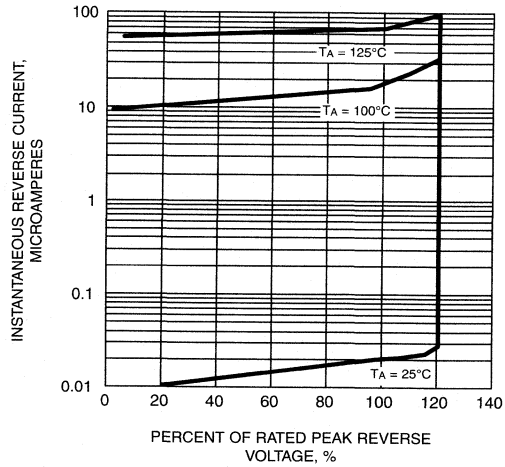


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

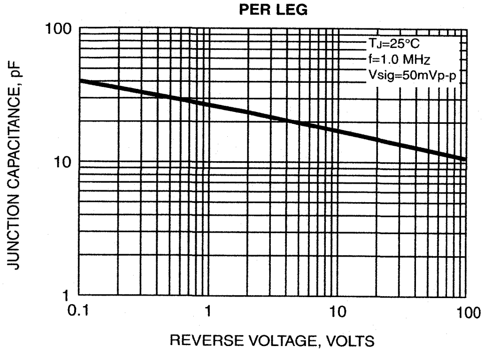
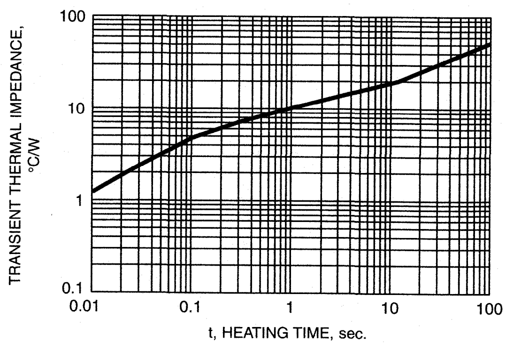


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

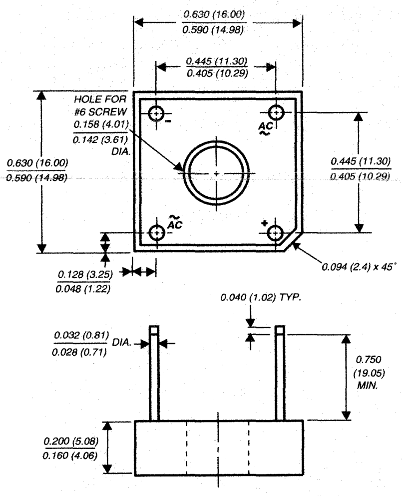


GBPC1005 THRU GBPC110

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

Case Style GBPC1

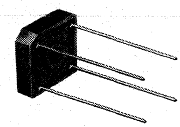


Polarity shown on side of case: Positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- This series is UL listed under Recognized Component Index, file number E54214
- Glass passivated chip junctions
- High case dielectric with standing voltage of 1500 V_{RMS}
- Typical I_R less than 0.1μA
- High surge current capability
- Ideal for printed circuit boards
- High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 1)
Mounting Torque: 5.0 in. - lb. max.
Weight: 0.1 ounce, 2.8 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GBPC 1005	GBPC 101	GPBC 102	GBPC 104	GBPC 106	GBPC 108	GBPC 110	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS bridge input voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=60°C (NOTE 2) T_A=25°C (NOTE 3)	$I_{(AV)}$	3.0 2.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method) T_C=60°C	I_{FSM}	60.0							Amps
Rating for fusing (t<8.3ms)	I^2t	15.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 1.5 Amperes	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A= 25°C T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 4)	C_J	21.0							pF
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JC}$	12.0 8.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer with #6 screw
(2) Unit mounted on 4.0 x 4.0 x 0.11" thick (10.5 x 10.5 x 0.3cm) Al. Plate
(3) Unit mounted on P.C.B. at 0.375" (9.5mm) lead length with 0.5 x 0.5" (12 x 12mm) copper pads
(4) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

RATINGS AND CHARACTERISTICS CURVES GBPC1005 THRU GBPC110

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

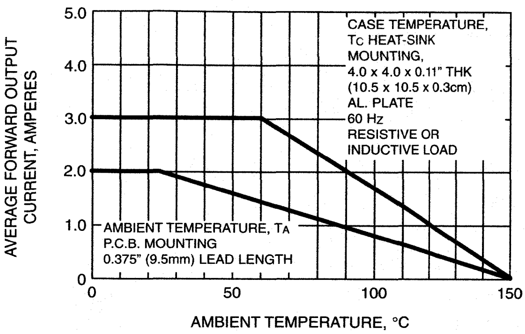


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

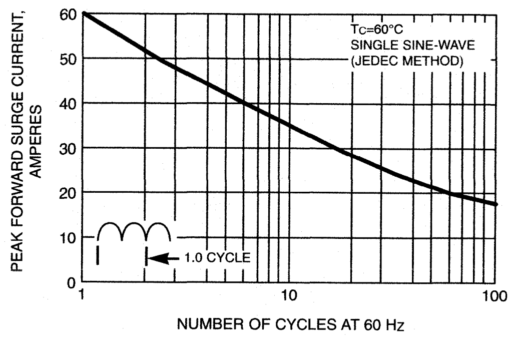


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

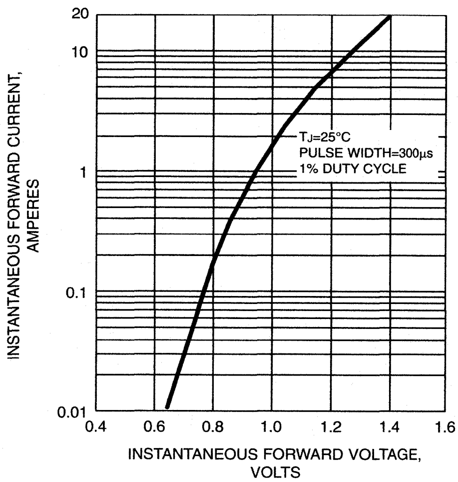


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

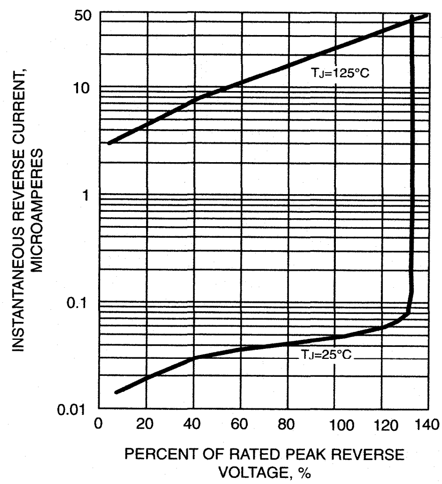


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

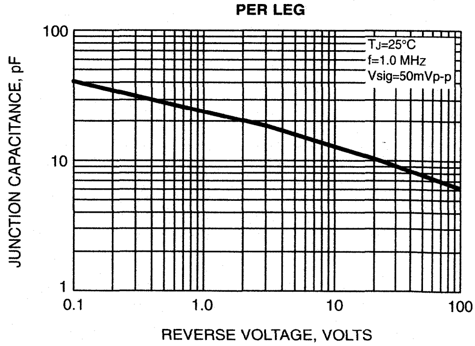
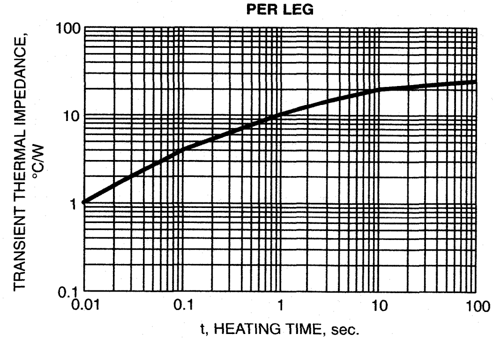


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

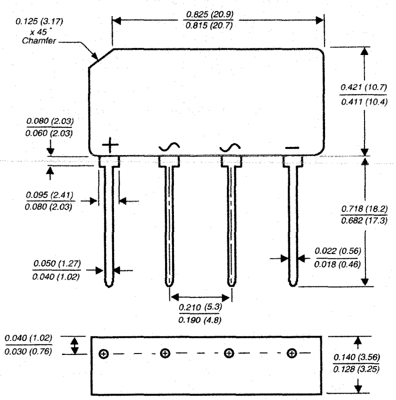


GBL005 THRU GBL10

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 4.0 Amperes*

Case Type GBL

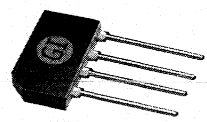


Polarity shown on front side of case: positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength
- ♦ Typical I_R less than 0.1μA
- ♦ High surge current capability
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.071 ounce, 2.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GBL 005	GBL 01	GBL 02	GBL 04	GBL 06	GBL 08	GBL 10	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_A=50°C (NOTE 1) T_A=40°C (NOTE 2)	$I_{(AV)}$	4.0 3.0							Amps
Peak forward surge current, single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	150.0							Amps
Rating for fusing (t<8.3ms)	I^2t	93.0							A^2sec
Maximum instantaneous forward drop per leg at 4.0 Amperes	V_F	1.1							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 3)	C_J	95.0				40.0			pF
Typical thermal resistance per leg (NOTE 1) (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	22.0 3.5							°C/W
Operating junction storage and temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Unit mounted on 3.0 x 3.0 x 0.11" thick (7.5 x 7.5 x 0.3cm) Al. plate
(2) Unit mounted on P.C.B. at 0.375" (9.5mm) lead length and 0.5 x 0.5" (12 x12mm) copper pads
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

FIG. 1 - DERATING CURVES OUTPUT RECTIFIED CURRENT

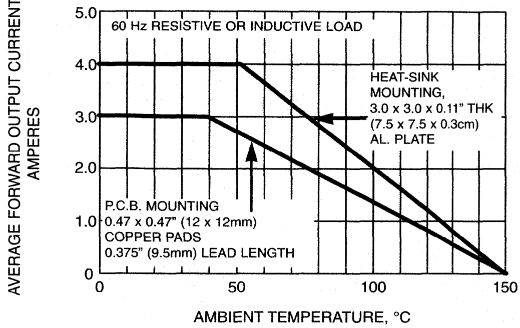


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

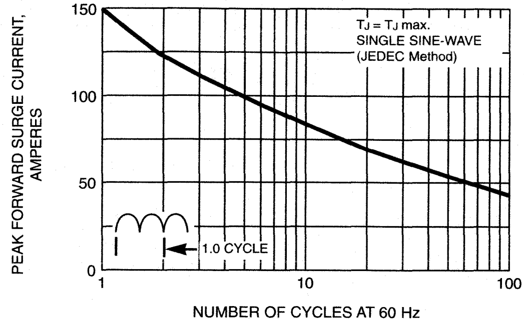


FIG. 3 - TYPICAL FORWARD VOLTAGE CHARACTERISTICS PER LEG

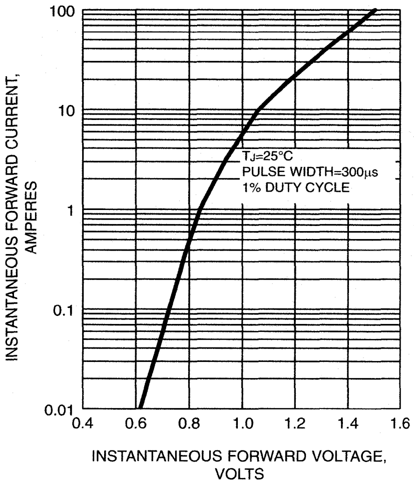


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

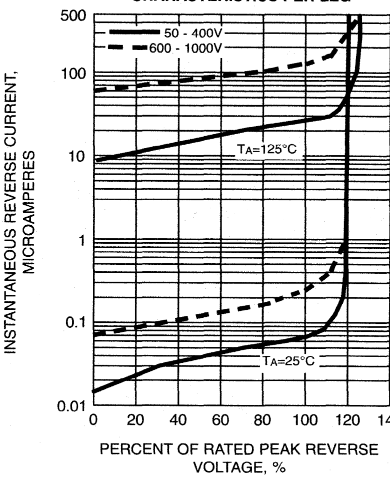


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

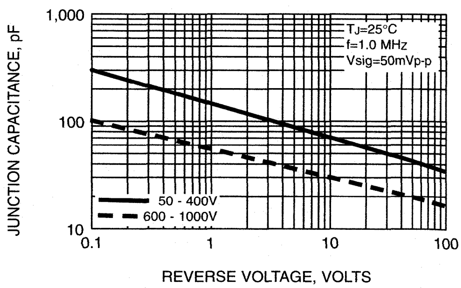
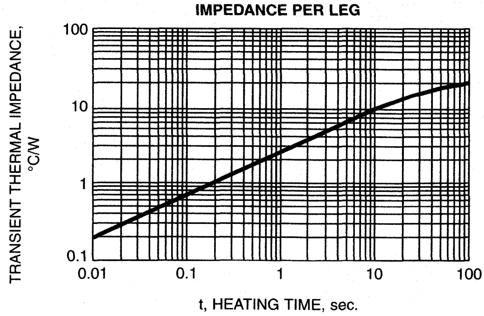


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

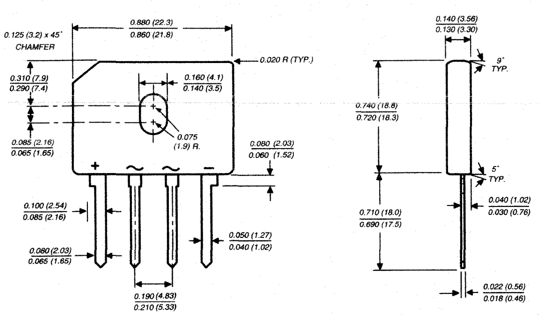


GBU4A THRU GBU4M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 4.0 Amperes*

Case Style GBU

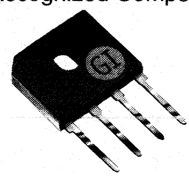


Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Ideal for printed circuit boards
- ♦ Glass passivated chip junction
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375 (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 4)
Mounting Torque: 5 in. - lb. max.
Weight: 0.015 ounce, 4.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GBU 4A*	*GBU 4B*	*GBU 4D*	*GBU 4G*	*GBU 4J*	*GBU 4K*	*GBU 4M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1) T_A=40°C (NOTE 2)	$I_{(AV)}$	4.0 3.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	150.0							Amps
Rating for fusing (t<8.3ms)	I^2t	93.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 4.0A	V_F	1.0							Volts
Maximum DC reverse current at T_J=25°C rated DC blocking voltage per leg T_J=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 3)	C_J	100.0				45.0			pF
Typical thermal resistance per leg (NOTE 2) (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JC}$	22.0 4.2							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Unit case mounted on 1.6 x 1.6 x 0.06" thick (4.0 x4.0 x 0.15cm) Al. Plate
(2) Units mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads and 0.375" (9.5mm) lead length
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6.0 screw

General Instrument
Power Semiconductor Division

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

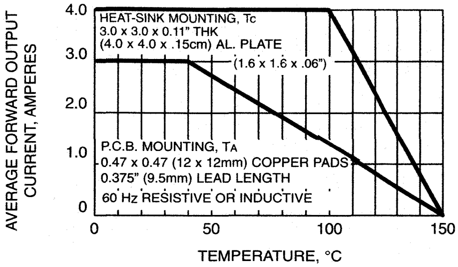


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

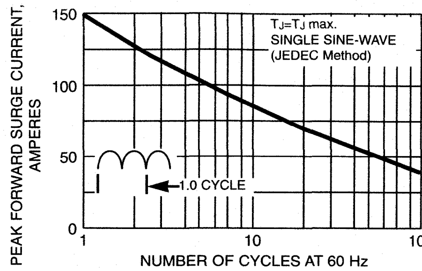


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

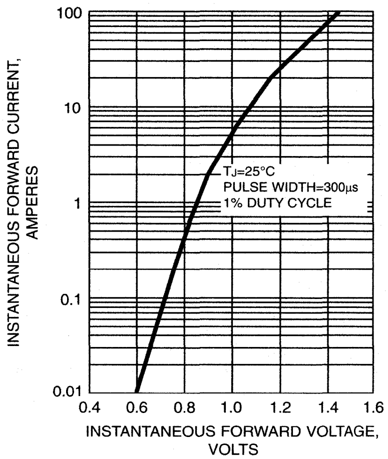


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

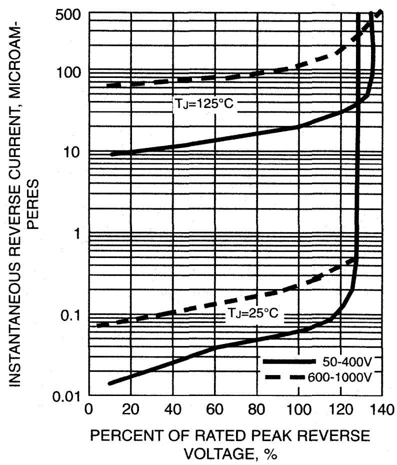


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

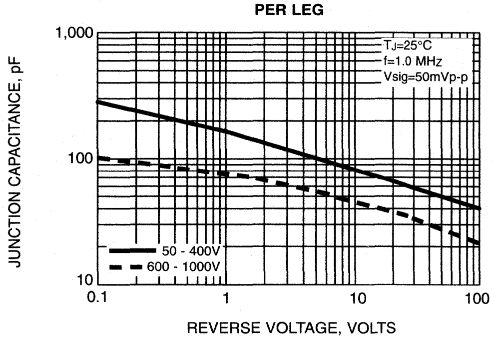
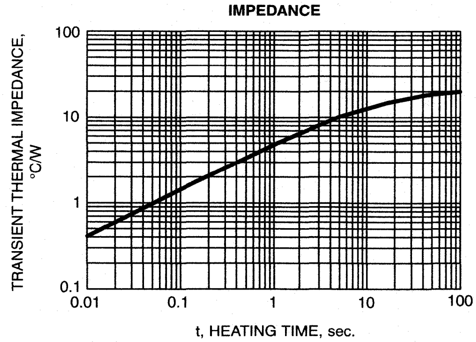


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

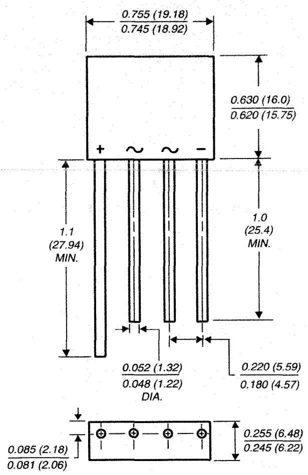


KBL005 THRU KBL10

SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 4.0 Amperes*

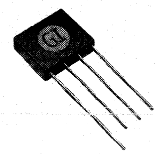
Case Style KBL



Dimensions in inches and (millimeters)

FEATURES

- Plastic material has Underwriters Laboratory Flammability Classification 94V-0
- This series is UL listed under the Recognized Component Index, file number E54214
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit boards
- High forward surge current capability
- High surge current capability
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Any

Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	KBL 005	KBL 01	KBL 02	KBL 04	KBL 06	KBL 08	KBL 10	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward output current at T_A=50°C	$I_{(AV)}$	4.0							Amps
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	200.0							Amps
Maximum instantaneous forward voltage drop per leg at 4.0A	V_F	1.1							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage per leg T_A=125°C	I_R	5.0 1.0							µA mA
Typical thermal resistance per leg (NOTE 1) (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	19.0 2.4							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:

(1) Thermal resistance from junction to ambient with units mounted on 3.0 x 3.0 x 0.11" thick (7.5 x 7.5 x 0.3cm) Al. plate

(2) Thermal resistance from junction to lead with units mounted on P.C.B. at 0.375" (9.5mm) lead length and 0.5 x 0.5" (12 x 12mm) copper pads

General Instrument
Power Semiconductor Division

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

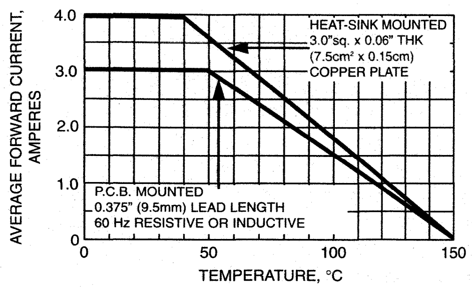


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

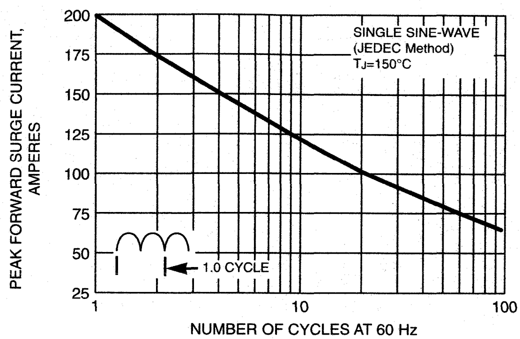


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

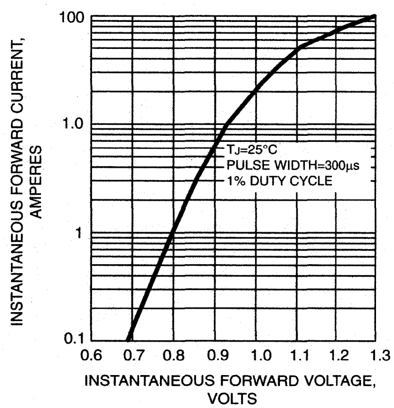


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

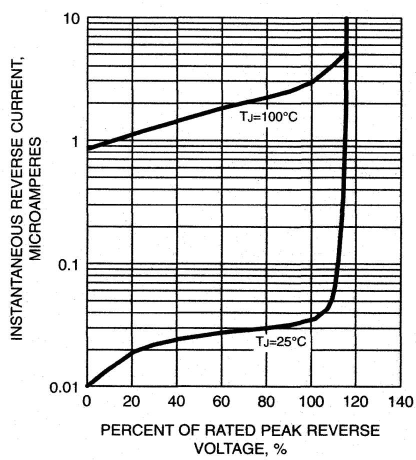
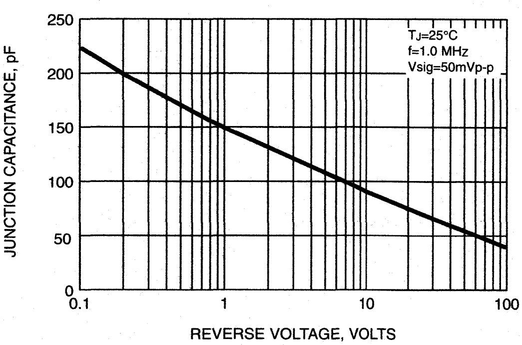


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

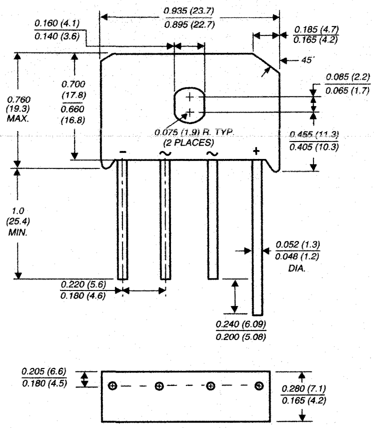


KBU4A THRU KBU4M

SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 4.0 Amperes*

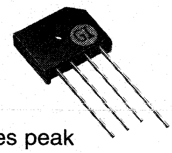
Case Style KBU



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under Recognized under Component Index, file number E54214
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Ideal for printed circuit boards
- ♦ Surge overload rating of 200 Amperes peak
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 3)
Mounting Torque: 5 in. - lb. max.
Weight: 0.3 ounce, 8.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*KBU 4A*	*KBU 4B*	*KBU 4D*	*KBU 4G*	*KBU 4J*	*KBU 4K*	*KBU 4M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1) / T_A=30°C (NOTE 2)	$I_{(AV)}$	4.0 4.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Maximum instantaneous forward voltage drop per leg at 4.0A	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 1.0							μA mA
Typical thermal resistance per leg (NOTE 2) / (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$	19.0 4.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Units mounted on a 2.0 x 1.6 x 0.3" thick (5 x 4 x 0.8cm.) Al. Plate
(2) Units mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads and 0.375" (9.5mm) lead length
(3) Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6 screw

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

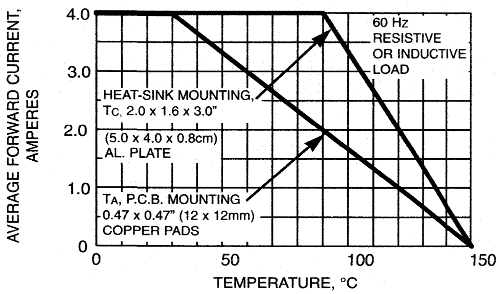


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

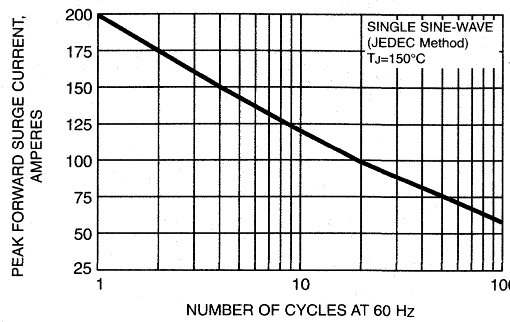


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

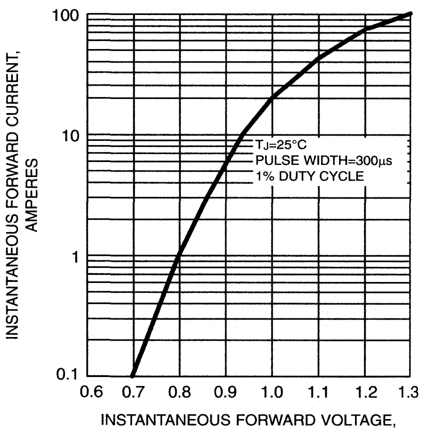


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

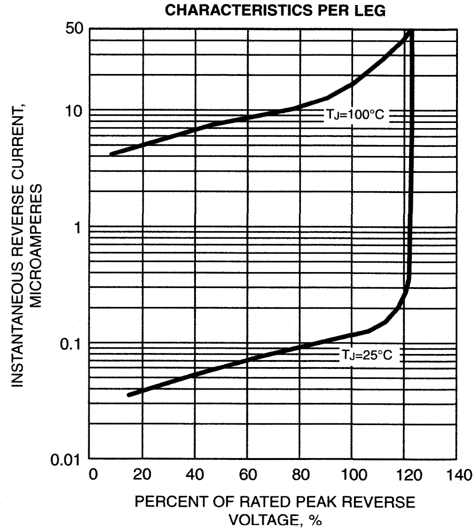
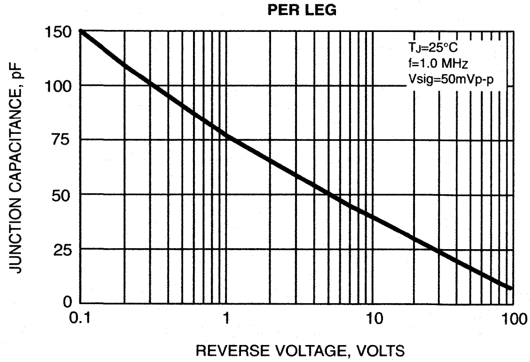


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

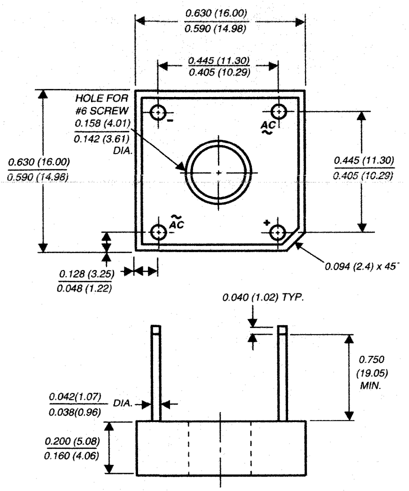


GBPC6005 THRU GBPC610

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 6.0 Amperes*

Case Style GBPC

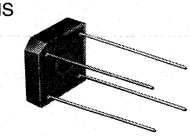


Polarity shown on side of case: Positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has carries Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under recognized under Component Index, file number E54214
- ♦ Glass passivated chip junctions
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Typical I_R less than 0.5μA
- ♦ High forward surge current capability
- ♦ Ideal for printed circuit boards
- ♦ High temperature soldering guaranteed: 260°C/10 seconds at 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junction
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 1)
Mounting Torque: 5.0 in. - lb. max.
Weight: 0.1 ounce, 2.8 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GBPC 6005*	*GBPC 601*	*GPBC 602*	*GBPC 604*	*GBPC 606*	*GBPC 608*	*GBPC 610*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS bridge input voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=50°C (NOTE1, 2) T_A=40°C (NOTE 3)	$I_{(AV)}$	6.0 3.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0							Amps
Rating for fusing (t<8.3ms)	I^2t	127.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 3.0 Amperes	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 4)	C_J	186.0				90.0			pF
Typical thermal resistance per leg (NOTE 3) (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JC}$	22.0 7.3							°C/W
Operating junction temperature range	T_J	-55 to +150							°C
Storage temperature range	T_{STG}	-55 to +150							°C

NOTES:
(1) Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer with #6 screw
(2) Unit mounted on 5.5 x 6.0 x 0.11" thick (14 x 15 x 0.3cm) Al. Plate
(3) Unit mounted on P.C.B. at 0.375" (9.5mm) lead length with 0.5 x 0.5" (12 x 12mm) copper pads
(4) Measured at 1 MHz and applied reverse voltage of 4.0 Volts

General Instrument
Power Semiconductor Division

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

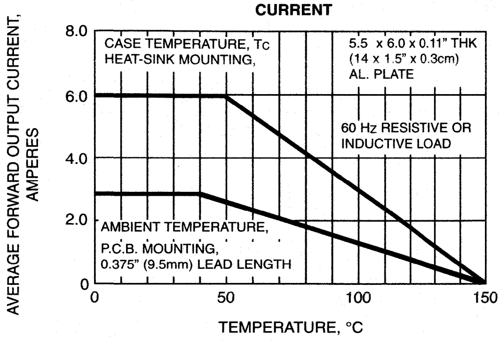


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

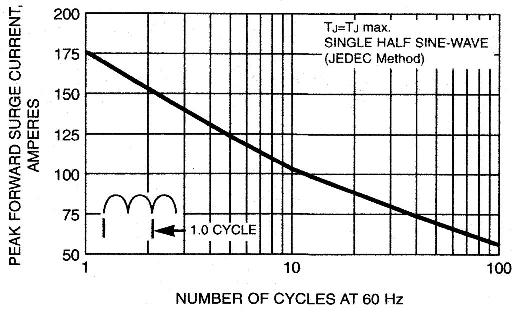


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER LEG

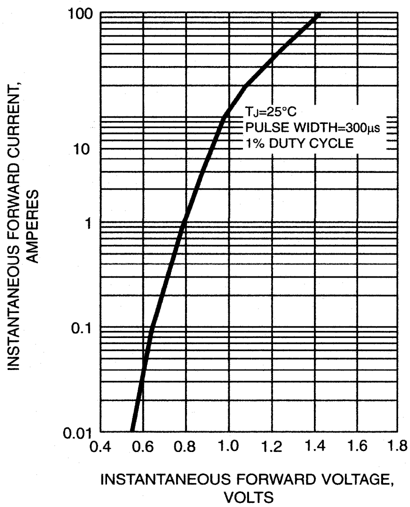


FIG. 3 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

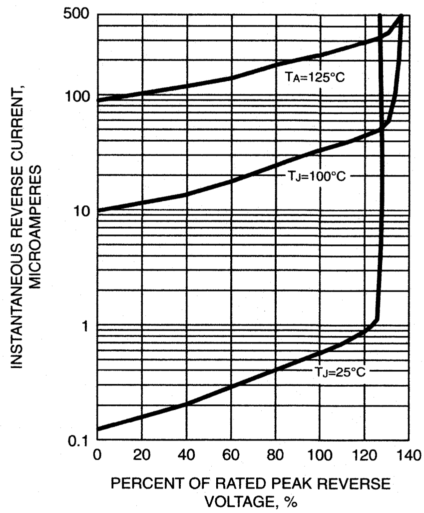


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

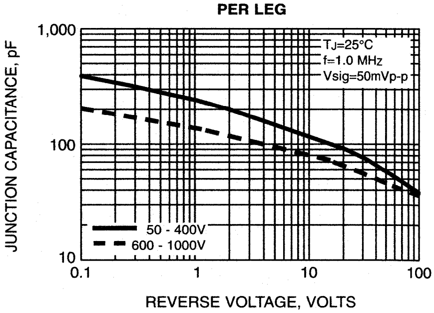
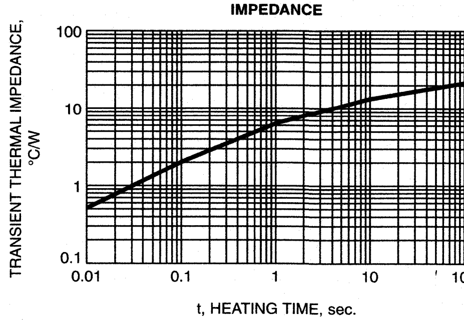


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

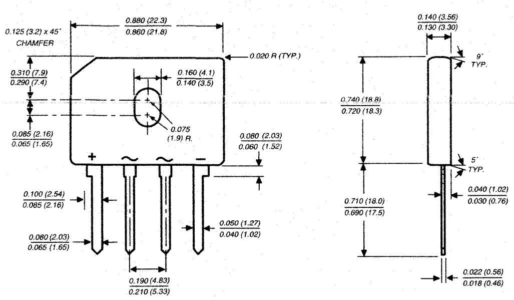


GBU6A THRU GBU6M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 6.0 Amperes*

Case Style GBU

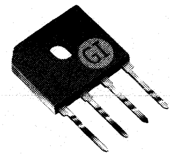


Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches
and
(millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- This series is UL listed under the Recognized Component Index, file number E54214
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit boards
- Glass passivated chip junctions
- High surge overload rating
- High temperature soldering guaranteed: 260°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated chip
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 2)
Mounting Torque: 5 in. - lb. max.
Weight: 0.15 ounce, 4.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GBU 6A	GBU 6B	GBU 6D	GBU 6G	GBU 6J	GBU 6K	GBU 6M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1, 2)	$I_{(AV)}$	6.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	175.0							Amps
Rating for fusing (t<8.3ms)	I^2t	127.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 6.0A	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 500.0							μA
Typical junction capacitance per leg (NOTE 3)	C_J	211.0				94.0			pF
Typical thermal resistance per leg (NOTE 1, 2)	$R_{\Theta JA}$ $R_{\Theta JC}$	7.4 2.2							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Units case mounted on 2.6 x 1.4 x 0.06" thick (6.5 x 3.5 x 0.15 cm) Al. Plate heatsink
(2) Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6 screws
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

General Instrument
Power Semiconductor Division

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

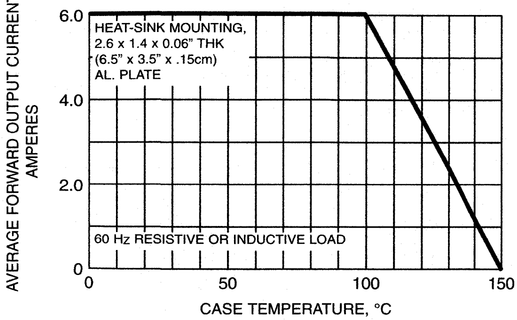


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

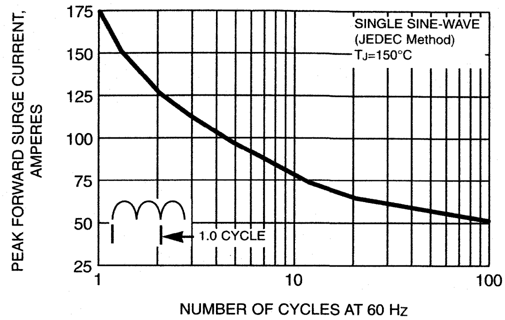


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

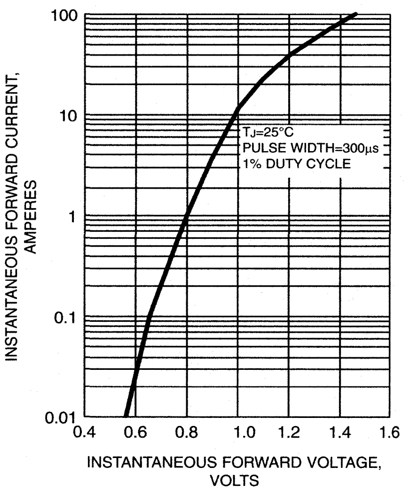


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

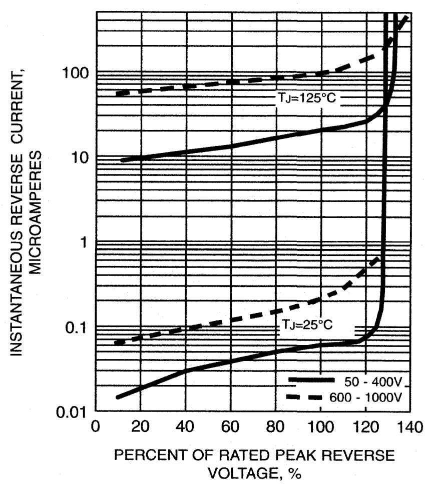


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

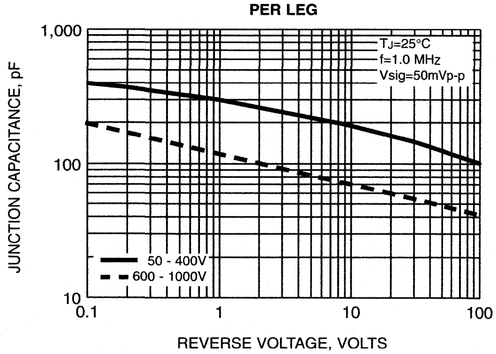
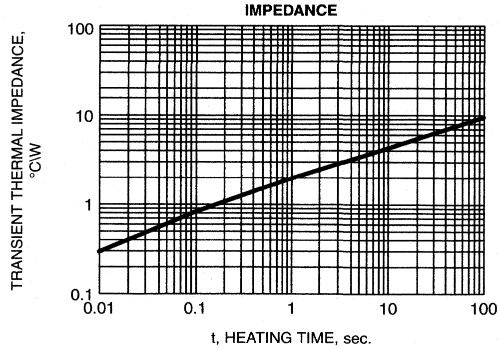


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

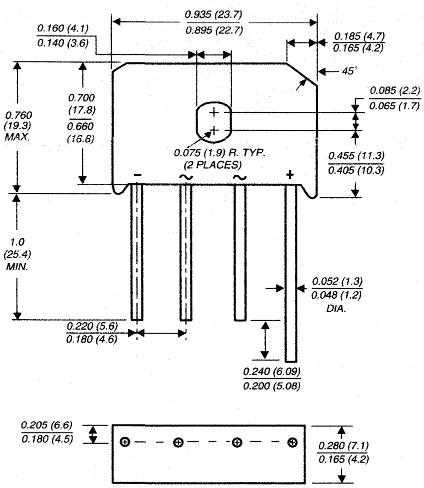


KBU6A THRU KBU6M

SINGLE-PHASE BRIDGE RECTIFIERS

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 6.0 Amperes*

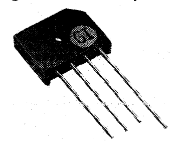
Case Style KBU



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under Recognized Component Index, file number E54214
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Ideal for printed circuit boards
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic body
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 1)
Mounting Torque: 5 in. - lb. max.
Weight: 0.3 ounce, 8.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	KBU 6A	KBU 6B	KBU 6D	KBU 6G	KBU 6J	KBU 6K	KBU 6M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1, 2) / T_A=40°C (NOTE 3)	$I_{(AV)}$	6.0 6.0							Amps
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	250.0							Amps
Maximum instantaneous forward voltage drop per leg at 6.0A	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 1.0							µA mA
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JC}$	8.6 3.1							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Recommended mounted position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6 screw
(2) Thermal resistance from junction to ambient with units in free air, P.C.B. mounted on 0.5 x 0.5" (12 x 12mm) copper pads, 0.375" (9.5mm) lead length
(3) Thermal resistance from junction to case with units mounted on a 2.6 x 1.4 x 0.06" thick (6.5 x 3.5 x.15cm) Al. Plate

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

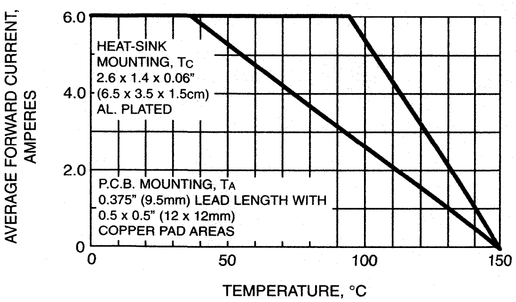


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

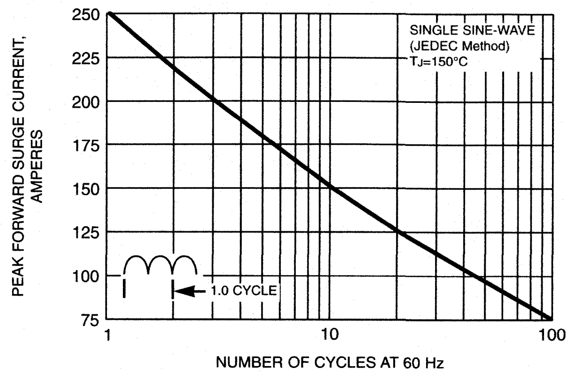


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

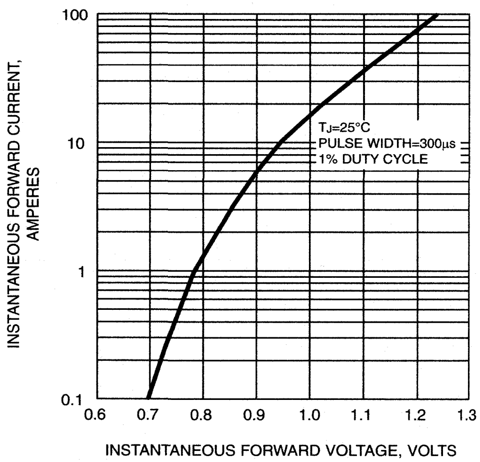


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

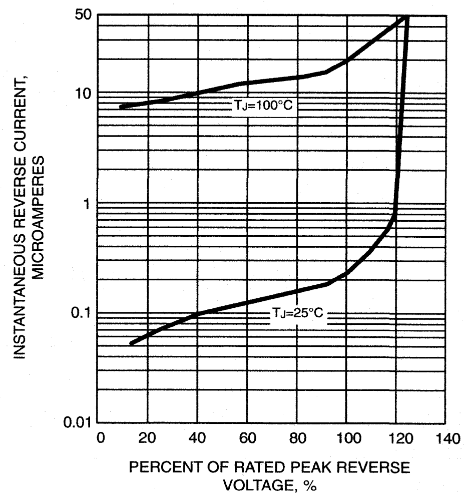
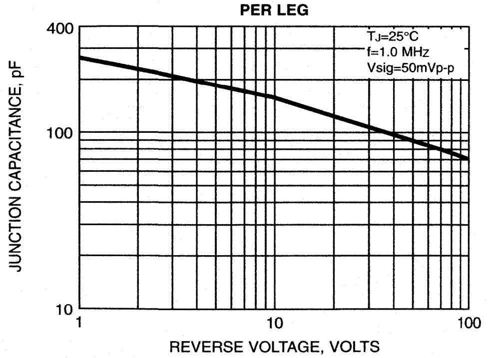


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

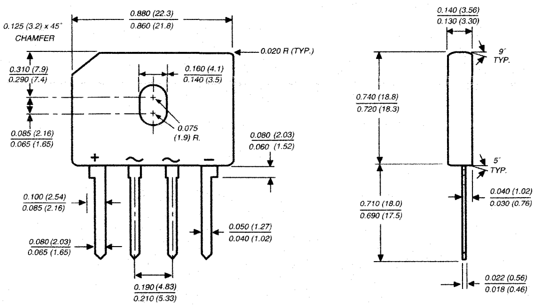


GBU8A THRU GBU8M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 8.0 Amperes*

Case Style GBU

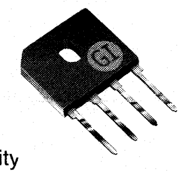


Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under the Recognized Component Index, file number E54214
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Ideal for printed circuit boards
- ♦ Glass passivated chip junction
- ♦ High forward surge current capability
- ♦ Typical I_R less than 0.5μA
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, 0.375 (9.5mm) lead length, 5lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic body over passivated junctions
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 3)
Mounting Torque: 5 in. - lbs. max.
Weight: 0.15 ounce, 4.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GBU8 8A	GBU8 8B	GBU8 8D	GBU8 8G	GBU8 8J	GBU8 8K	GBU8 8M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1)	$I_{(AV)}$	8.0							Amps
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	200.0							Amps
Rating for fusing (t<8.3ms)	I^2t	166.0							A^2sec
Maximum instantaneous forward voltage drop per leg at 8.0A	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 / 500.0							μA
Typical junction capacitance (NOTE 2)	C_J	211.0				94.0			pF
Typical thermal resistance per leg (NOTE 4) / (NOTE 1)	$R_{\Theta JA}$ / $R_{\Theta JC}$	21.0 / 2.2							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Units case mounted on 3.2 x 3.2 x 0.12" thick (8.2 x 8.2 x 0.3cm.) Al. Plate heatsink
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6 screws
(4) Units mounted in free air, no heat sink on P.C.B., 0.5 x 0.5" (12 x 12mm) copper pads, 0.375" (9.5mm) lead length

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

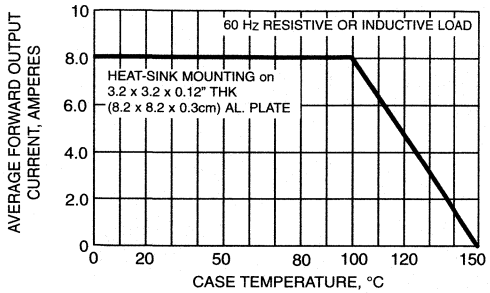


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

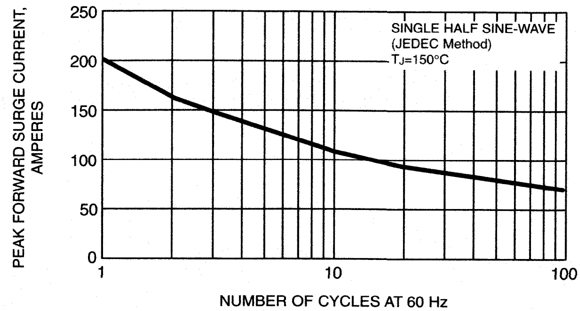


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

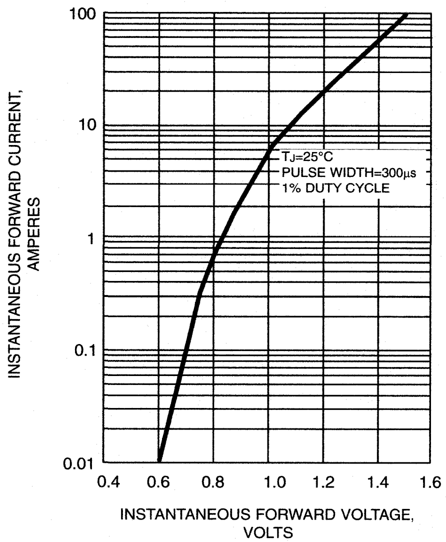


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

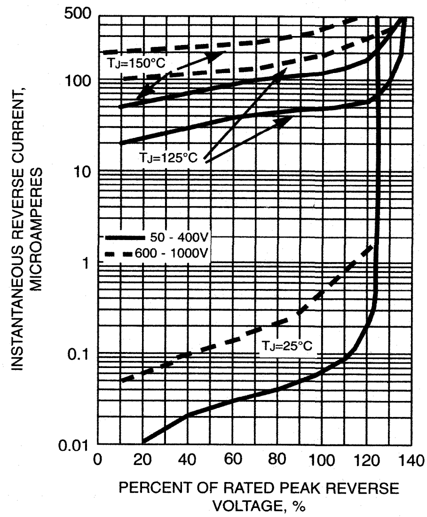


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

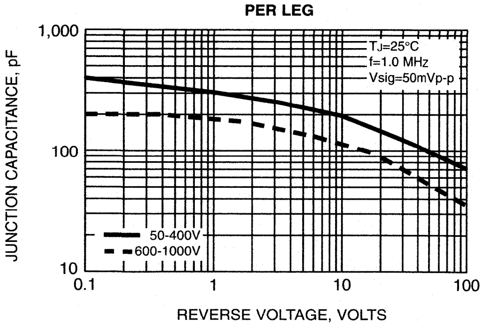
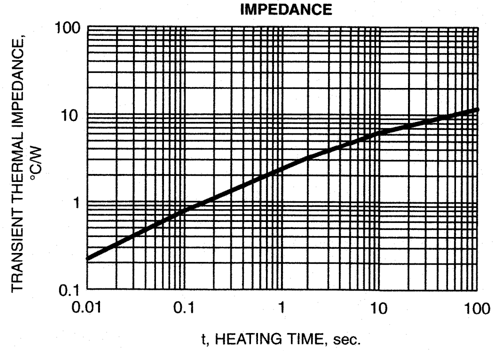


FIG.6 -TYPICAL TRANSIENT THERMAL IMPEDANCE

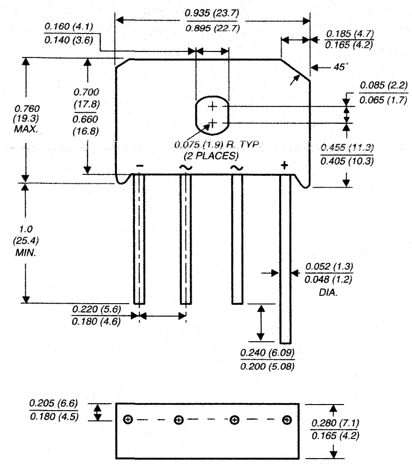


KBU8A THRU KBU8M

SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 8.0 Amperes*

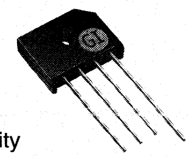
Case Style KBU



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- ♦ This series is UL listed under Recognized Component Index, file number E54214
- ♦ High case dielectric strength of 1500 V_{RMS}
- ♦ Ideal for printed circuit boards
- ♦ High forward surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic body
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 1)
Mounting Torque: 5 in.-lb. max.
Weight: 0.3 ounce, 8.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	KBU 8A	KBU 8B	KBU 8D	KBU 8G	KBU 8J	KBU 8K	KBU 8M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current at T_C=100°C (NOTE 1, 3) / T_A=45°C (NOTE 2)	$I_{(AV)}$	8.0 6.0							Amps
Peak forward surge current single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	300.0							Amps
Maximum instantaneous forward voltage drop per leg at 8.0A	V_F	1.0							Volts
Maximum DC reverse current at rated DC blocking voltage per leg T_A=25°C / T_A=125°C	I_R	10.0 1.0							µA mA
Typical thermal resistance per leg (NOTE 2) / (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JC}$	18.0 3.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with #6 screw
(2) Units mounted in free air, no heatsink, P.C.B. at 0.375" (9.5mm) lead length with 0.5 x 0.5" (12 x 12mm) copper pads
(3) Units mounted on a 3.0 x 3.0" x 0.11" thick (7.5 x 7.5 x 0.3cm) Al. Plate heatsink

FIG. 1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

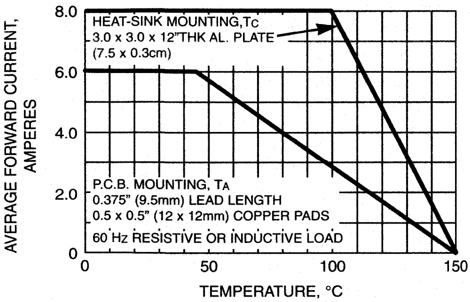


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

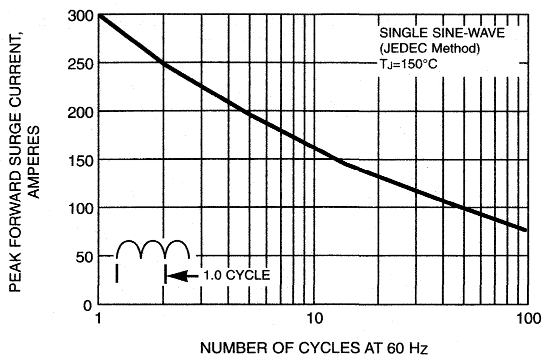


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

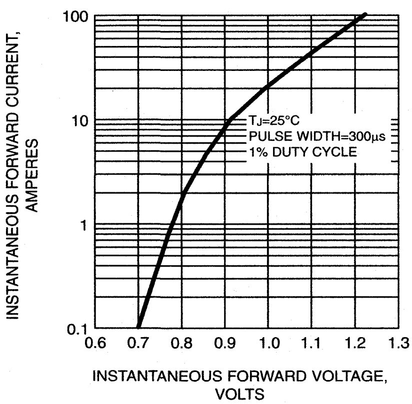


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

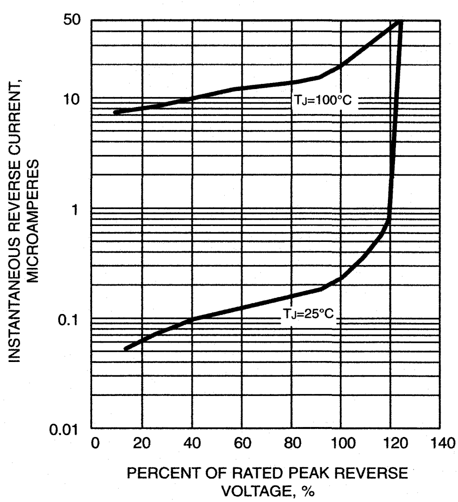
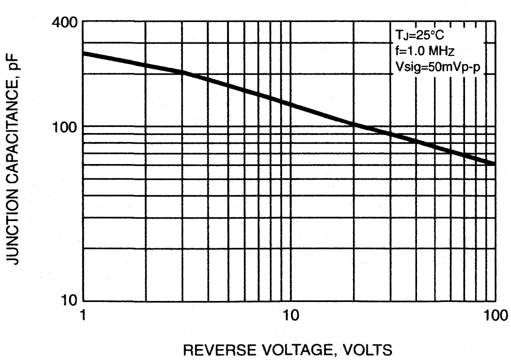


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

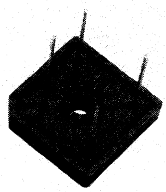


GBPC12, 15, 25 AND 35 SERIES

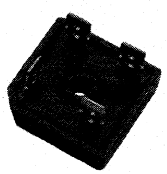
GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Current Voltage** - 12.0 to 35.0 Amperes*

GBPC - W Wire leads



GBPC - Standard



FEATURES

- The plastic package has Underwriters Laboratory Flammability Classification 94V-0
- This series is UL recognized under component index, file number E54214
- Integrally molded heatsink provide very low thermal resistance for maximum heat dissipation
- Universal 3-way terminals; snap-on, wire wrap-around, or P.C.B. mounting
- High forward surge current capabilities
- Glass passivated chip junctions
- Typical I_R less than 0.3μA
- High temperature soldering guaranteed: 260°C/10 seconds at 5lbs. (2.3 kg) tension

MECHANICAL DATA

Case: Molded plastic with heatsink integrally mounted in the bridge encapsulation
Terminals: Either plated 0.25" (6.35mm). Faston lugs or plated copper leads 0.040" (1.02mm) diameter. Suffix letter "W" added to indicate leads.(e.g. GBPC12005W)
Mounting Position: (NOTE 3)
Polarity: Polarity symbols molded on body
Mounting Torque: 20 in. - lb. max. **Weight:** 0.53 ounce, 15 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

			GBPC12, 15, 25, 35							
		SYMBOLS	*005*	*01*	*02*	*04*	*06*	*08*	*10*	*UNITS*
Maximum repetitive peak reverse voltage		V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage		V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage		V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified output current (SEE FIG.1)	GBPC12	$I_{(AV)}$				12.0				Amps
	GBPC15					15.0				
	GBPC25					25.0				
	GBPC35					35.0				
Peak forward surge current single sine-wave superimposed on rated load (JEDEC Method)	GBPC12	I_{FSM}				200.0				Amps
	GBPC15					300.0				
	GBPC25					300.0				
	GBPC35					400.0				
Rating (non-repetitive, for t greater than 1ms and less than 8.3ms) for fusing	GBPC12	I^2t				160.0				A^2 sec
	GBPC15					375.0				
	GBPC25					375.0				
	GBPC35					660.0				
Maximum instantaneous forward voltage drop per leg at	GBPC12 I_F=6.0A GBPC15 I_F=7.5A GBPC25 I_F=12.5A GBPC35 I_F=17.5A	V_F				1.1				Volts
Maximum reverse DC current at rated DC blocking voltage per leg	T_A=25°C	I_R				5.0				μA
	T_A=125°C					500.0				
RMS isolation voltage from case to leads		V_{ISO}				2500.0				Volts
Typical junction capacitance per leg (NOTE 1)		C_J				300.0				pF
Typical thermal resistance per leg (NOTE 2)	GBPC12-25	$R_{\Theta JC}$				1.9				°C/W
	GBPC35					1.4				
Operating junction storage temperature range		T_J, T_{STG}				-55 to +150				°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to case per leg
(3) Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer efficiency with #10 screw

FIG. 1 - MAXIMUM OUTPUT RECTIFIED CURRENT

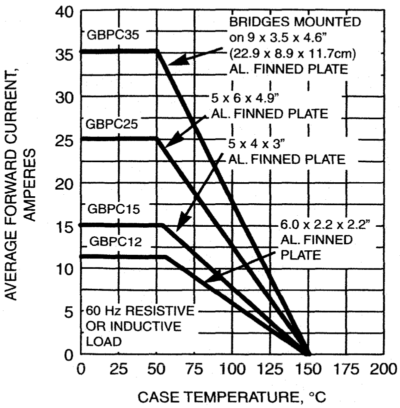


FIG. 2 - MAXIMUM OUTPUT RECTIFIED CURRENT

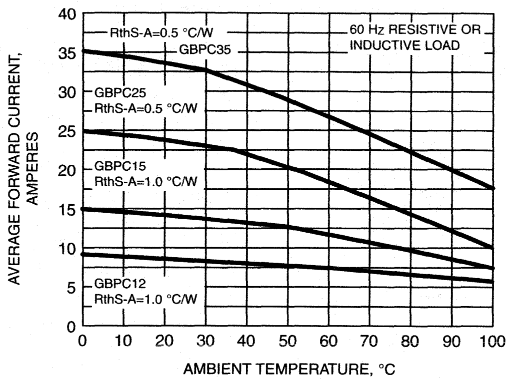


FIG. 3 - MAXIMUM POWER DESCRIPTION

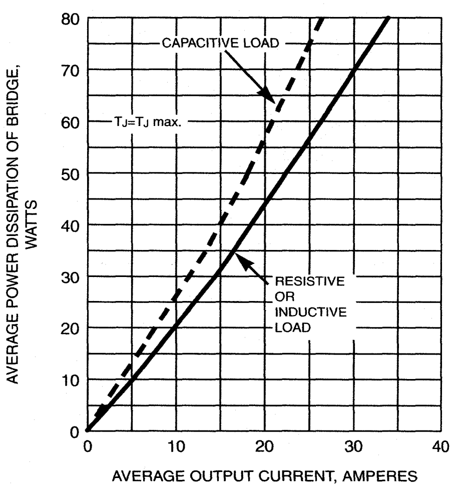


FIG. 4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

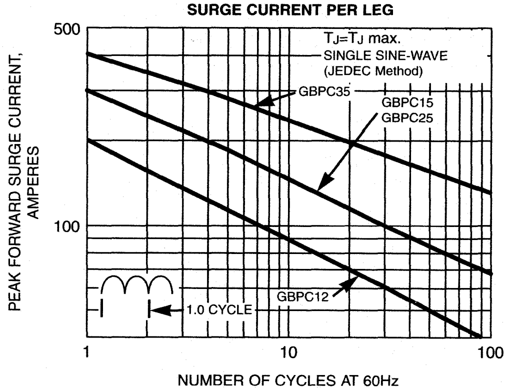


FIG. 5 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

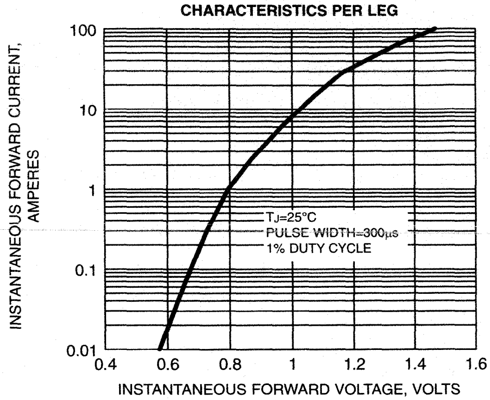


FIG. 6 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS PER LEG

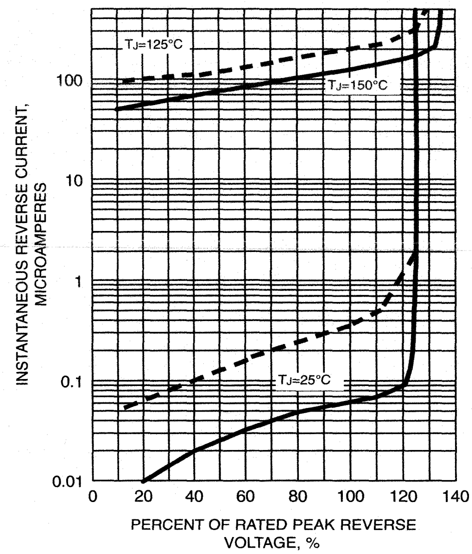


FIG. 7 - TYPICAL JUNCTION CAPACITANCE PER LEG

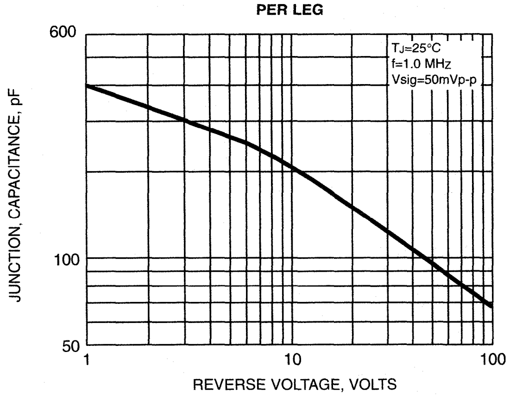
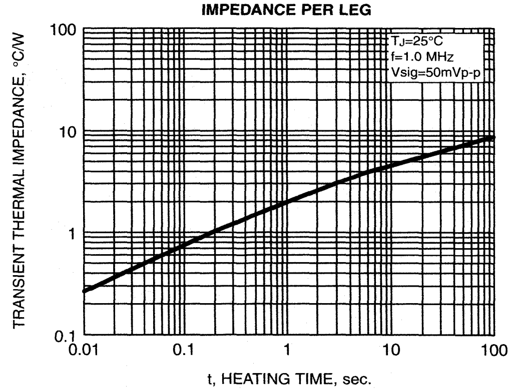


FIG. 8 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG



GBPC

FIG. 8

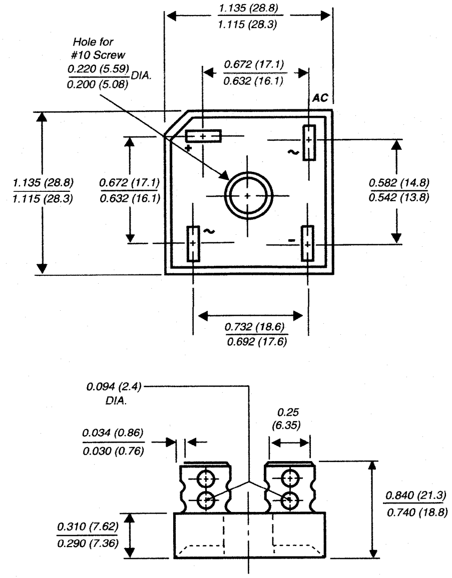
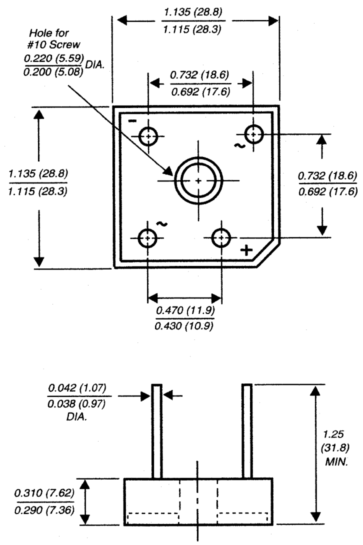


FIG. 9



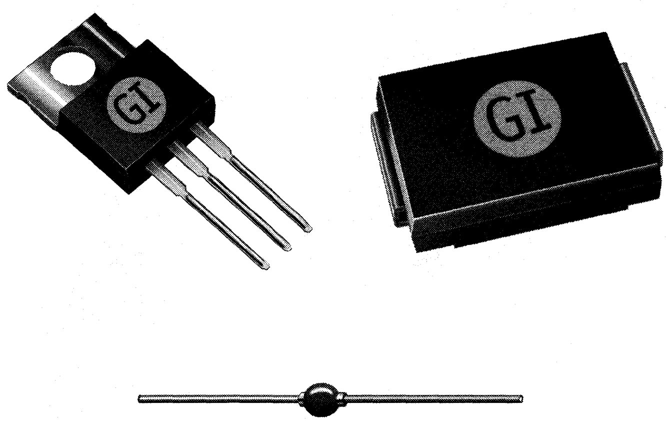
Dimensions in inches and (millimeters)

NOTES:
(1) Corrosion resistant terminals designed with 0.25" female quick connectors for wrap or snap-on
(2) A thin film of silicone thermal compound is recommended between the bridge case and mounting surface for improved thermal conduction

GI General Instrument
Power Semiconductor Division

FAST EFFICIENT RECTIFIERS

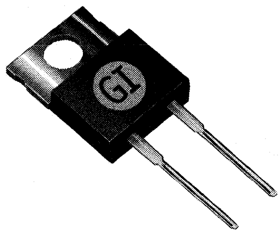
1.0 AMPERE TO 30.0 AMPERES



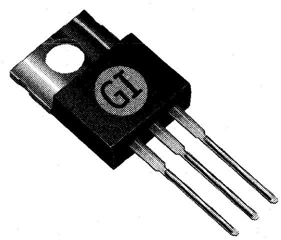
INTRODUCTION TO FAST EFFICIENT RECTIFIERS

General Instrument's Fast Efficient Rectifiers (FER) are a natural extension of our Schottky product portfolio. This is accomplished by offering very fast reverse recovery times (as low as 25 nanoseconds) and voltage levels as high as 1000 Volts and still maintain the efficiencies of a lower forward voltage loss. These are ideally suited for very high frequency switching power supplies, inverters and freewheeling diodes.

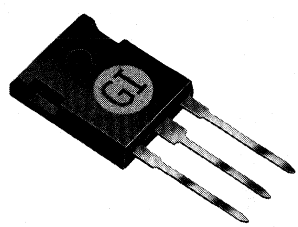
While Schottky rectifiers achieve high speed by utilizing majority carrier conduction, an FER achieves this by trapping excess minority carriers with recombination centers within the bulk of the crystal lattice. GI utilizes various assembly techniques from glass passivated chips, to the superectifer and on to the solid glass encapsulated devices (additional information on these package styles are located in their respective sections). This includes surface mount packages and high power packages such as the TO-220 and TO-3P (TO-247). The various case designs are shown below.



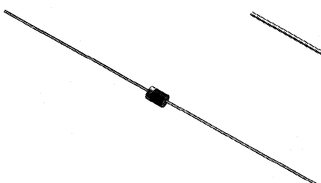
TO-220AC



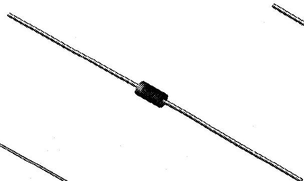
TO-220AB



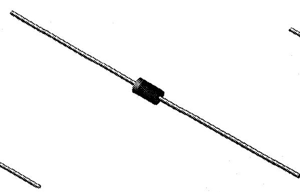
TO-247AD



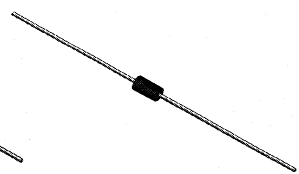
MPG06



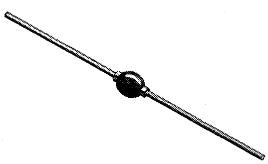
DO-204AL



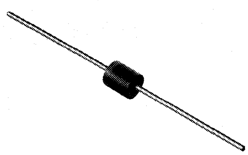
DO-204AC



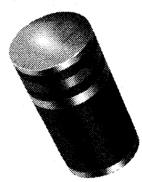
DO-201AD



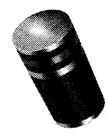
G3,G4



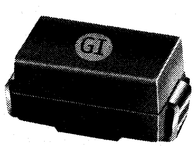
P600



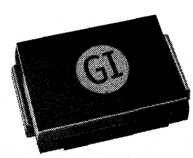
DO-213AA



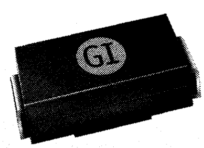
DO-213AB



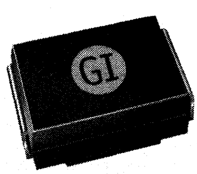
DO-214BA



DO-214AB



DO-214AC



DO-214AA

FAST EFFICEINT RECTIFIERS

Part numbering system for all parts excluding JEDEC registered, Pro Electron and industry standard parts.

1. **SURFACE MOUNT**

a) **MELF (SUPERECTIFIER)**
EGLXXY-ZZZZ

E = "Enhanced"
GL = Glass Leadless

XX - Forward Current
34 = 0.5A (in DO-213AA mini-MELF)
41 = 1.0A (in Do-213B MELF)

Y = Reverse Voltage
A = 50V **D** = 200V
B = 100V **F** = 300V
C = 150V **G** = 400V

ZZZZ = Customer specific instructions
(not shown in databook)

b) **FLAT PACK (SUPERECTIFIER)**
EGF1Y - ZZZZ

E = Enhanced
GF = Glass Flat pack
(DO-214BA modified)

Forward Current
1 = 1.0 Amp

Y = Reverse Voltage
A = 50V
B = 100V
C = 150V
D = 200V

ZZZZ= Customer specific instructions
(not shown in databook)

1 . **SURFACE MOUNT (cont'd)**

c) **SMX**
ESXY - ZZZZ

E = "Enhanced"
S = Surface-Mount

X = Forward Current
1 = 1A (in DO-214AC = SMA)
2 = 2A (in DO-214AA = SMB)
3 = 3A (in DO-214AB = SMC)

Y = Reverse Voltage
A = 50V
B = 100V
C = 150V
D = 200V

ZZZZ = Customer specific instructions
(not shown in databook)

2. **AXIAL**
AAAXXY-ZZZZ

AAA = Type Designator
FE = Fast Efficient (Glass)
EGP = Enhanced Glass Plastic
(Superectifier)
UG = Ultra-fast Gold (Plastic)
SUF = Soft recovery Ultra Fast
(Plastic with glass passivated chip)

XX = Forward current (in Amps)
(for EGP, divide # by 10 to get current in Amps)

Y = Reverse Voltage
A = 50V **D** = 200V
B = 100V **F** = 300V
C = 150V **G** = 400V

3. **POWER PACKS**
AAABXXYPP-ZZZZ

AAA = Type Designator
FES = Fast Efficient Single
FEP = Fast Efficient Positive center tap
UG = Ultrafast Gold

B = Isolation
"Blank" = Non-isolated
F = Isolated

XX = Forward current (in Amps)
6 = 6.0A
8 = 8.0A
16 =16A
18 =18.0A
30 = 30A

Y = Reverse Voltage
A = 50V **F** = 300V
B = 100V **G** = 400V
C = 150V **H** = 500V
D = 200V **J** = 600V

PP = Package Type
T = TO-220AC for FES and UG (single),
CT = TO-220AB for UG (dual center tap)
P = TO-247AD for FEP (dual center tap)
PT = TO-247AD for UG (dual center tap)

ZZZZ = Customer specific instructions
(not shown in databook)

For JEDEC and ProElectron part numbers, please see P/N explanations on page 2

LOW TO MEDIUM CURRENT AXIAL FAST EPITAXIAL RECTIFIERS

TYPE	UG06A thru UG06D	UG1A thru UG1D	FE1A thru FE1D	GI1001 thru GI1004	BYV26D thru BYV26E	UG2A thru UG2D	FE2A thru FE2D	BYV27-50 thru BYV27-200	FE3A thru FE3D	BYV28-60 thru BYV28-200	UG4A thru UG4D	FE5A thru FE5D	FE6A thru FE6D	SUF15G thru SUF15J	SUF30G thru SUF30J
CASE STYLE	MPG06	DO-204AL	DO-204AP	DO-204AP	DO-201AP	DO-201AC	DO-201AP	DO-201AP	G4	DO-201AD	G4	G4	G4	DO-201AD	P600
I_o(A)	0.6	1.0	1.0	1.0	1.0	2.0	2.0	2.0	3.0	3.5	4.0	5.0	6.0	1.5	3.0
V_R=50(V)	UG06A	UG1A	FE1A	GI1001		UG2A	FE2A	BYV27-50	FE3A	BYV28-50	UG4A	FE5A	FE6A		
V_R=100(V)	UG06B	UG1B	FE1B	GI1002		UG2B	FE2B	BYV27-100	FE3B	BYV28-100	UG4B	FE5B	FE6B		
V_R=150(V)	UG06C	UG1C	FE1C	GI1003		UG2C	FE2C	BYV27-150	FE3C	BYV28-150	UG4C	FE5C	FE6C		
V_R=200(V)	UG06D	UG1D	FE1D	GI1004		UG2D	FE2D	BYV27-200	FE3D	BYV28-200	UG4D	FE5D	FE6D		
V_R=250(V)															
V_R=300(V)															
V_R=400(V)														SUF15G	SUFG0G
V_R=600(V)														SUF15J	SUF30J
V_R=80(V)					BYV26D										
V_R=1000(V)					BYV26E										
t_{rr}(ns)	15	15	35	25	75	15	35	25	25 /50	35	30	20	35	35	35

LOW TO MEDIUM CURRENT AXIAL FAST EFFICIENT RECTIFIERS (cont'd)

TYPE	EGL34A thru EGL34G	EGP10A thru EGP10D	EGL41A thru EGL41G	EGF1A thru EGF1D	UF4001 thru UF4007	EGP20A thru EGP20D	EGP30A thru EGP30D	UF5400 thru UF5408	EGP50A thru EGP50D
PACKAGE	**DO-213AA**	**DO-204AL**	**DO-213AB**	**DO-214BA**	**DO-204AL**	**DO-204AC**	**GP20**	**DO-201AD**	**GP20**
I_o(A)	0.5	1.0	1.0	1.0	1.0	2.0	3.0	1.0	5.0
V_R=50(V)	EGL34A	EGP10A	EGL41A	EGF1A	UF4001	EGP20A	EGP30A	UF5400	EGP50A
V_R=100(V)	EGL34B	EGP10B	EGL41B	EGF1B	UF4002	EGP20B	EGP30B	UF5401	EGP50B
V_R=150(V)	EGL34C	EGP10C	EGL41C	EGF1C		EGP20C	EGP30C		EGP50C
V_R=200(V)	EGL34D	EGP10D	EGL41D	EGF1D	UF4003	EGP20D	EGP30D	UF5402	EGP50D
V_R=300(V)	EGL34F	EGP10F	EGL41F			EGP20F	EGP30F	UF5403	EGP50F
V_R=400(V)	EGL34G	EGP10G	EGL41G		UF4004	EGP20G	EGP30G	UF5404	EGP50G
V_R=500(V)								UF5405	
V_R=600(V)					UF4005			UF5406	
V_R=800(V)					UF4006			UF5407	
V_R=1000(V)					UF4007			UF5408	
t_{rr}(ns)	50	50	50	50	50/75	50	50	50/75	50

MEDIUM TO HIGH CURRENT FAST EPITAXIAL RECTIFIERS

SINGLE RECTIFIERS

TYPE	UG8AT thru UG8DT	FES8AT thru FES8JT	GI1401 thru GI1404	BYW29-50 thru BY29-200	FES16AT thru FES16JT
PACKAGE	**TO-220AC**	**TO-220AC**	**TO-220AC**	**TO-220AC**	**TO-220AC**
I_o(A)	8.0	8.0	8.0	8.0	16.0
V_R=50(V)	UG8AT	FES8AT	GI1401	BYW29-50	FES16AT
V_R=100(V)	UG8BT	FES8BT	GI1402	BYW29-100	FES16BT
V_R=150(V)	UG8CT	FES8CT	GI1403	BYW29-150	FES16CT
V_R=200(V)	UG8DT	FES8DT	GI1404	BYW29-200	FES16DT
V_R=300(V)		FES8FT			FES16FT
V_R=400(V)		FES8GT			FES16GT
V_R=500(V)		FES8HT			FES16HT
V_R=600(V)		FES8JT			FES16JT
t_{rr}(ns)	20	35/50	35	25	35/50

MEDIUM TO HIGH CURRENT FAST EPITAXIAL RECTIFIERS DUAL RECTIFIERS

TYPE	FEP6AT thru FEP6DT	FEP16AT thru FEP16JT	GI2401 thru GI2404	UG18ACT thru UG18DCT	BYV32-50 thru BYV32-200	UG30APT thru UG30DPT	FEP30AP thru FEP30JP
PACKAGE	**TO-220AB**	**ITO-220CT**	**TO-220AB**	**TO-220AB**	**TO-220AB**	**TO-247AD**	**TO-247AD**
I_o(A)	6.0	16.0	16.0	18.0	18.0	30.0	30.0
V_R=50(V)	FEP6AT	FEP16AT	GI2401	UG18ACT	BYV32-50	UG30APT	FEP30AP
V_R=100(V)	FEP6BT	FEP16BT	GI2402	UG18BCT	BYV32-100	UG30BPT	FEP30BP
V_R=150(V)	FEP6CT	FEP16CT	GI2403	UG18CCT	BYV32-150	UG30CPT	FEP30CP
V_R=200(V)	FEP6DT	FEP16DT	GI2404	UG18DCT	BYV32-200	UG30DPT	FEP30DP
V_R=300(V)		FEP16FT					FEP30FP
V_R=400(V)		FEP16GT					FEP30GP
V_R=500(V)		FEP16HT					FEP30HP
V_R=600(V)		FEP16JT					FEP30JP
t_{rr}(ns)	35	35/50	35	20	25	20	35/50

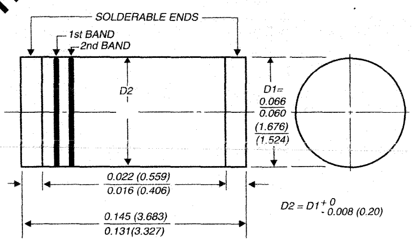
BYM07-50 THRU BYM07-400
EGL34A THRU EGL34G

SURFACE MOUNT GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 400 Volts* ***Forward Current** - 0.5 Ampere*

PATENTED*

DO-213AA



1st band denotes type and polarity
2cnd band denotes voltage type

Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation is covered by Patent No. 3,996,602 and brazed-lead assembly to Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ For surface mount applications
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-213AA molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end -1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0014 ounce, 0.036 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYM07 -50	BYM07 -100	BYM07 -150	BYM07 -200	BYM07 -300	BYM07 -400	UNITS
Fast switching time device: 1st band is Red		EGL34A	EGL34B	EGL34C	EGL34D	EGL34F	EGL34G	
Polarity color bands (2nd Band)		GRAY	RED	PINK	ORANGE	BROWN	YELLOW	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current at T_T=75°C	$I_{(AV)}$	0.5						Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0						Amps
Maximum instantaneous forward voltage at 0.5A	V_F	1.25				1.35		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0						μA
Maximum full load reverse current, full cycle average at T_A=55°C	$I_{R(AV)}$	50.0						μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0						ns
Typical junction capacitance (NOTE 2)	C_J	7.0						pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JT}$	150.0 70.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(4) Thermal resistance from junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

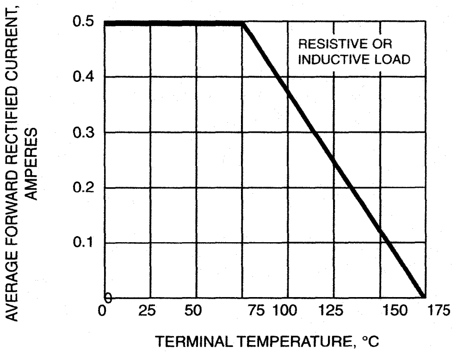


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

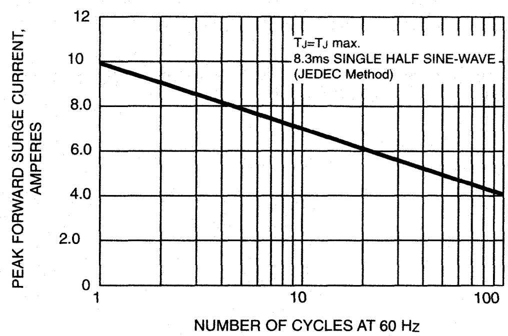


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

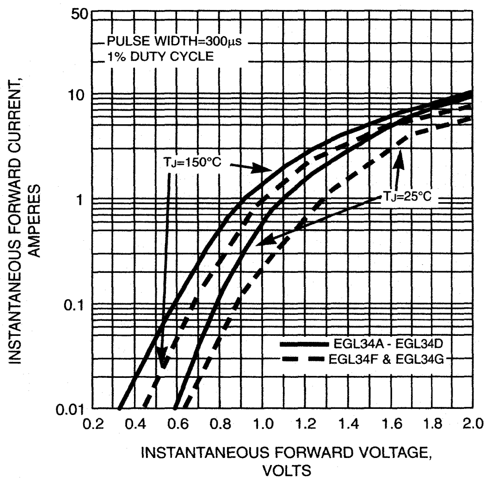


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

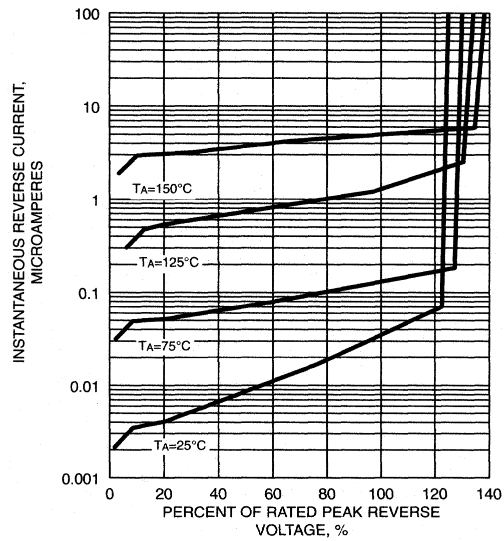


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

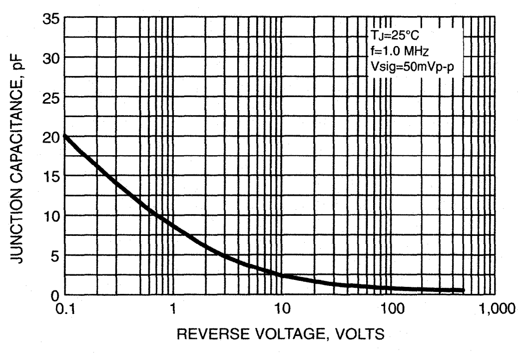
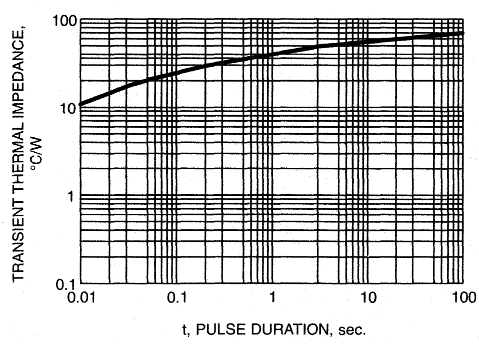


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

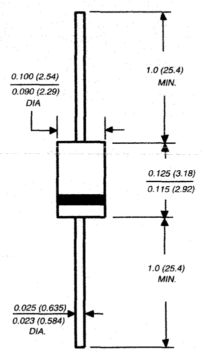


UG06A THRU UG06D

MINIATURE ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 0.6 Ampere*

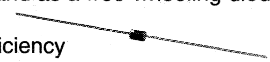
Case Style MPG06



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diode
- ♦ Ultrafast reverse recovery times for high efficiency



- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ Nitride oxide passivated junction
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Void free molded plastic body over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	UG06A	UG06B	UG06C	UG06D	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	0.6				Amp
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	40.0				Amps
Maximum instantaneous forward voltage at 0.6A	V_F	0.95				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 100.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0				ns
Maximum reverse recovery time (NOTE 2) T_J=25°C / T_J=100°C	t_{rr}	25.0 / 35.0				ns
Maximum recovered stored charge (NOTE 2) T_J=25°C / T_J=100°C	Q_{rr}	8.0 / 20.0				nC
Typical junction capacitance (NOTE 3)	C_J	9.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	97.0 / 28.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{rr} measured at I_F=0.6A: V_R=30V, di/dt=50A/μs, I_{rr}=10% I_{RM} for meaurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient and junction to lead at 0.375" (9.5mm) lead length P.C.B. mounted with 0.2 x 0.2" (5.0 x 5.0mm) copper pads

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVES

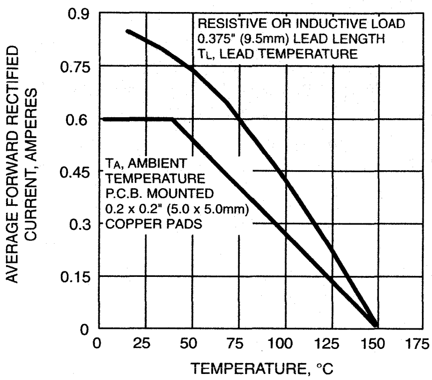


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

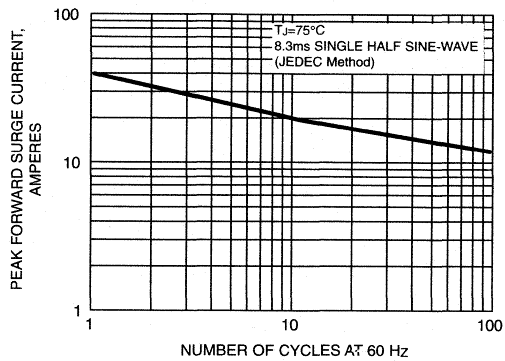


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

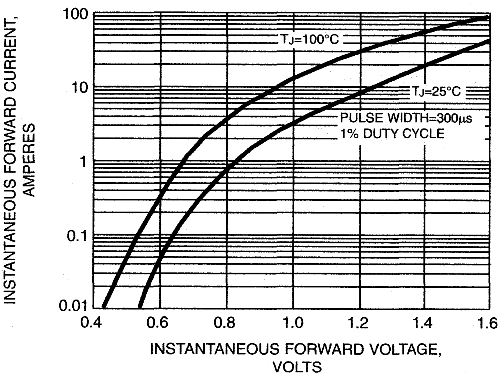


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

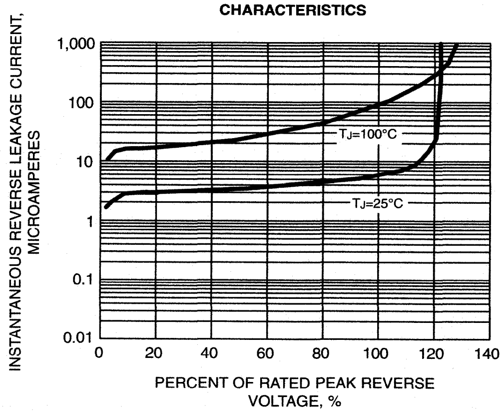


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS

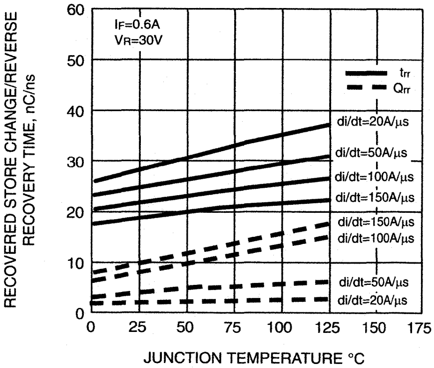
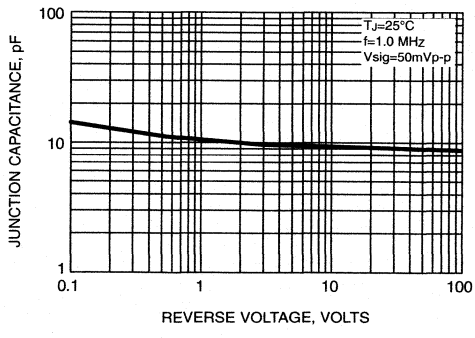


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



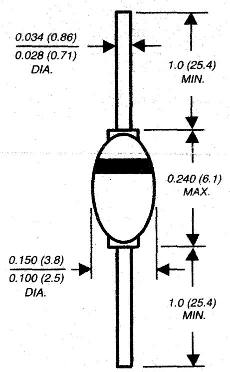
BYV26D AND BYV26E

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 800 to 1000 Volts*   ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AP

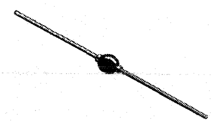


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ◆ High temperature metallurgically bonded construction
- ◆ Glass passivated cavity-free junction
- ◆ Superfast recovery times for high efficiency
- ◆ Low forward voltage, high current capability
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ Hermetically sealed package
- ◆ Low Leakage
- ◆ High surge capability
- ◆ Specified reverse surge capability
- ◆ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BVY26D*	*BYV26E*	*UNIT*
Maximum repetitive peak reverse voltage	V_{RRM}	800	1000	Volts
Maximum RMS voltage	V_{RMS}	560	700	Volts
Maximum DC blocking voltage	V_{DC}	800	1000	Volts
Minimum avalanche breakdown voltage at 100μA	V_{BR}	900	1100	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG. 1)	$I_{(AV)}$	1.0		Amp
Peak forward surge current 10ms single half sine-wave superimposed on rated load	I_{FSM}	30.0		Amps
Maximum instantaneous forward voltage at 1.0A T_A=25°C T_J=175°C	V_F	2.50 1.30		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_J=165°C	I_R	5.0 150.0		μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	75.0		ns
Non repetitive peak reverse energy (NOTE 2)	E_{RSM}	10.0		mj
Typical junction capacitance (NOTE 3)	C_J	15.0		pF
Typical thermal resistance (NOTE 4) (NOTE 5)	$R_{\Theta JA}$ $R_{\Theta JL}$	70.0 16.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175		°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Peak reverse energy measured at I_R=400mA, T_J=T_J max. on inductive load, t=20μs
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads
(5) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsink

GI General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

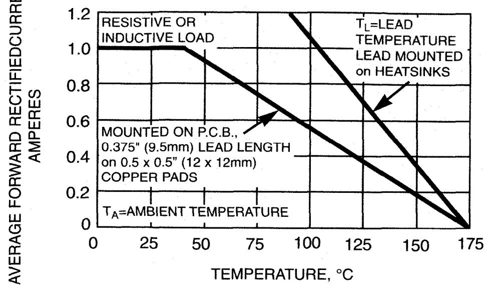


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

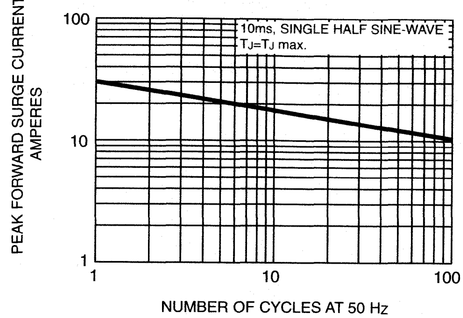


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS

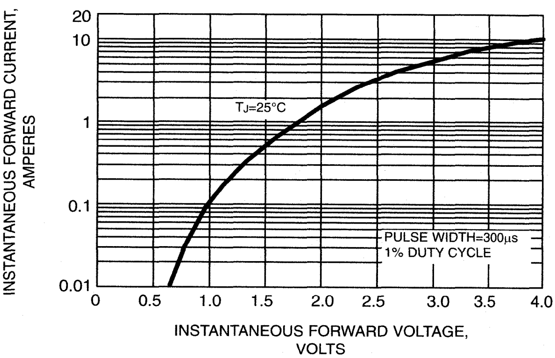


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

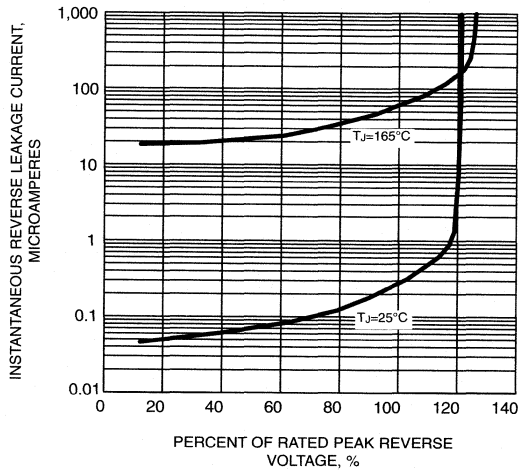


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

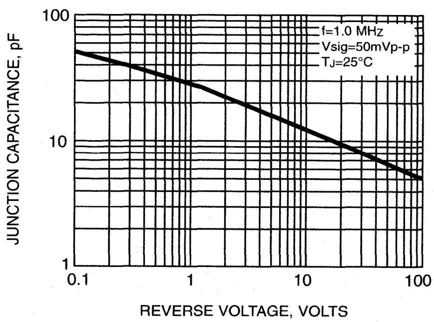
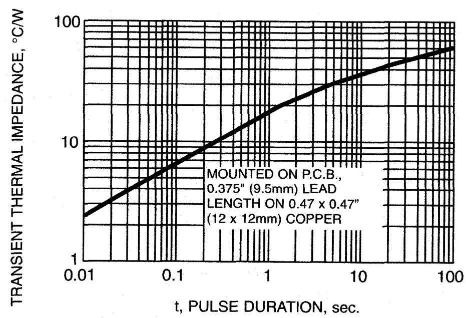


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



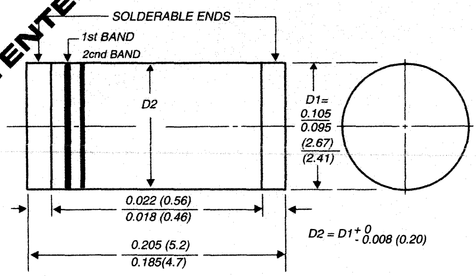
BYM12-50 THRU BYM12-400
EGL41A THRU EGL41G

SURFACE MOUNT GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 400 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-213AB



1st band denotes type and positive end (cathode)

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation is covered by Patent No. 3,996,602 and brazed-lead assembly to Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- For surface mount applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end -1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.116 ounce, 0.0046 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYM12 -50	BYM12 -100	BYM12 -150	BYM12 -200	BYM12 -300	BYM12 -400	UNITS
Fast efficient device: 1st band is green		EGL41A	EGL41B	EGL41C	EGL41D	EGL41F	EGL41G	
Polarity color bands (2cnd band)		GRAY	RED	PINK	ORANGE	BROWN	YELLOW	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current at T_T=75°C	$I_{(AV)}$	0.5						Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0						Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0				1.25		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0						μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0						ns
Typical junction capacitance (NOTE 2)	C_J	20.0				14.0		pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JT}$	60.0 30.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(4) Thermal resistance from junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

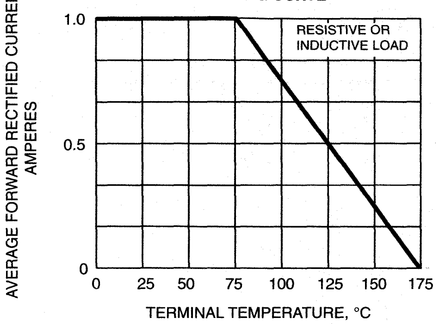


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

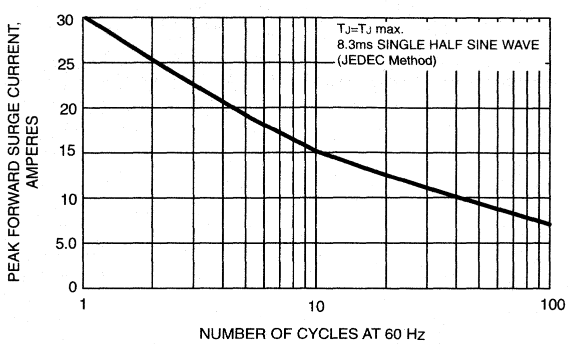


FIG. 3 -TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

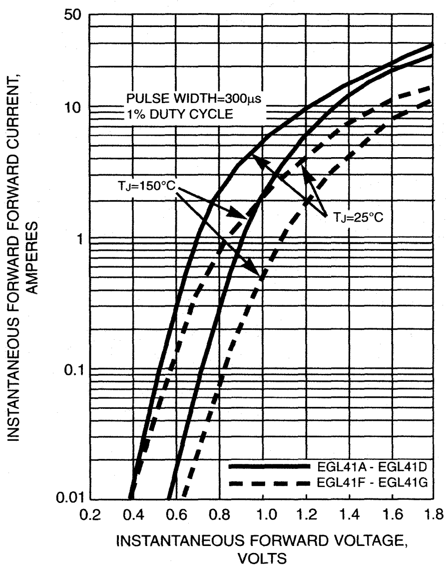


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

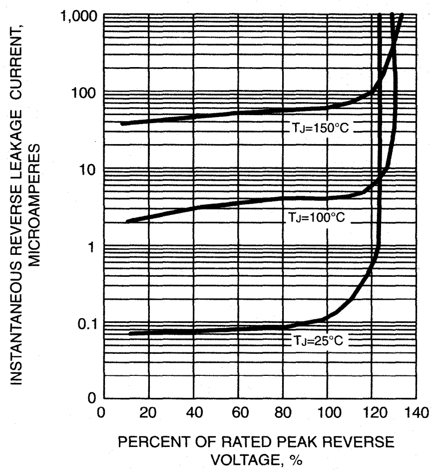


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

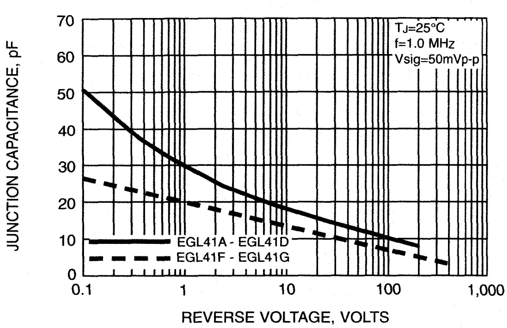
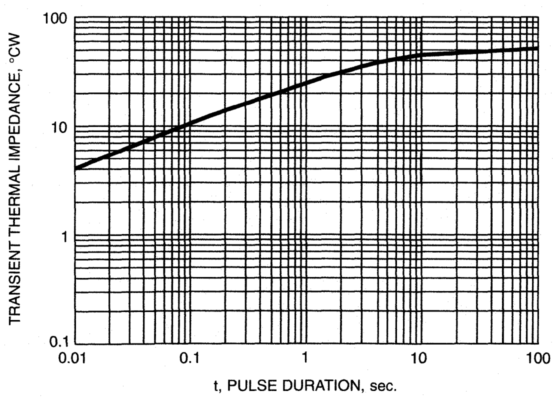


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



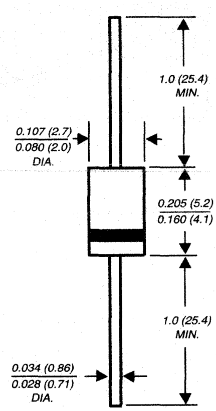
EGP10A THRU EGP10G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 400 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL

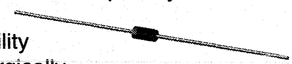


Dimensions in inches and (millimeters)

* *Glass Encapsulation technique is covered by Patent No. 3,996,602, brazed-lead assembly to Patent No. 3,930,306*

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Low leakage current
- ♦ High surge current capability
- ♦ High temperature metallurgically bonded construction
- ♦ High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*EGP 10A*	*EGP 10B*	*EGP 10C*	*EGP 10D*	*EGP 10F*	*EGP 10G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0						Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load	I_{FSM}	30.0						Amps
Maximum instantaneous forward voltage at 1.0A	V_F	0.95				1.25		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 100						μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0						ns
Typical junction capacitance (NOTE 2)	C_J	22.0				15.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	50.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

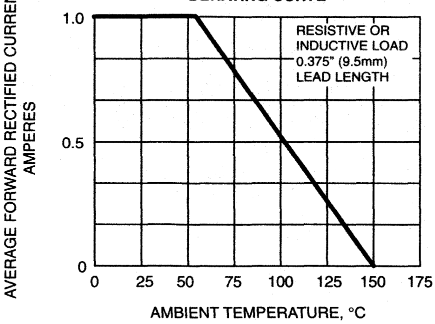


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

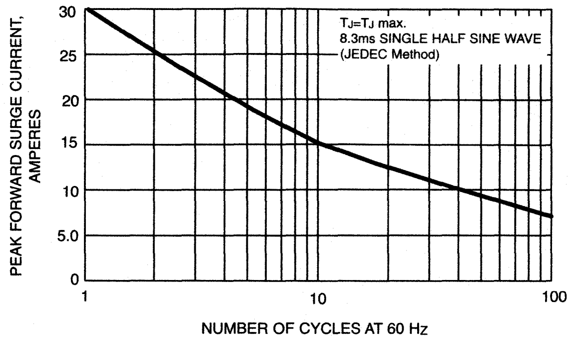


FIG. 3 -TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

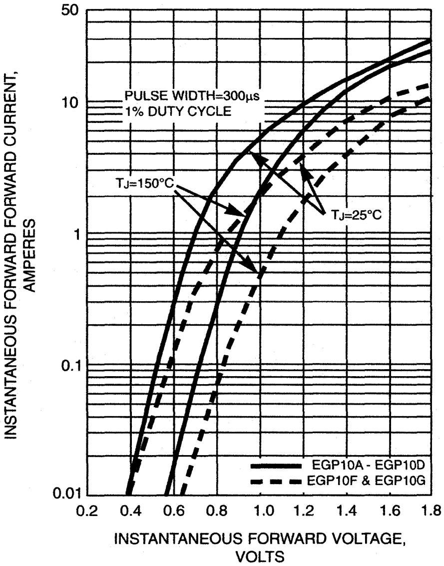


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

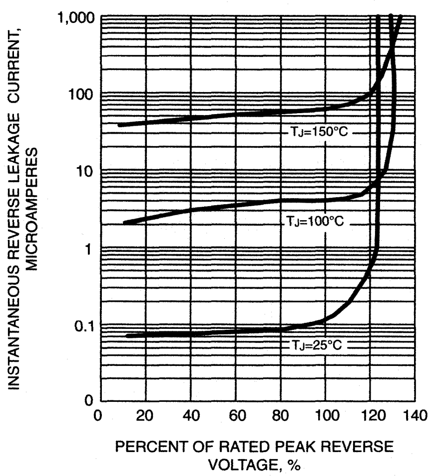


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

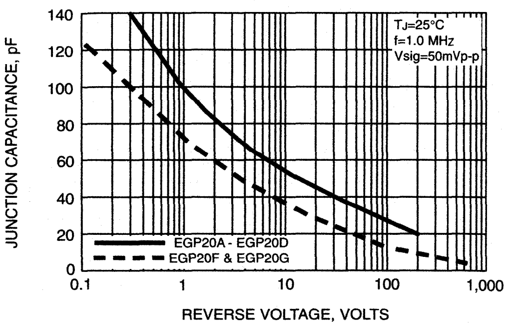
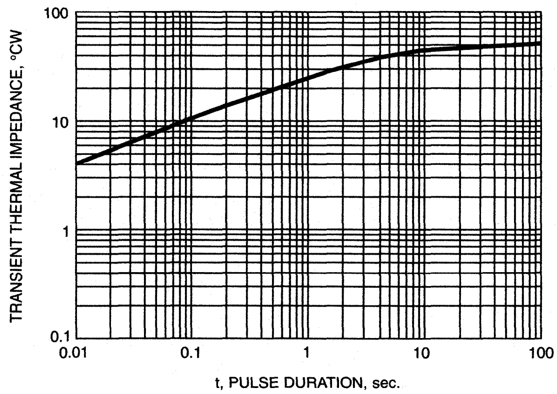


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

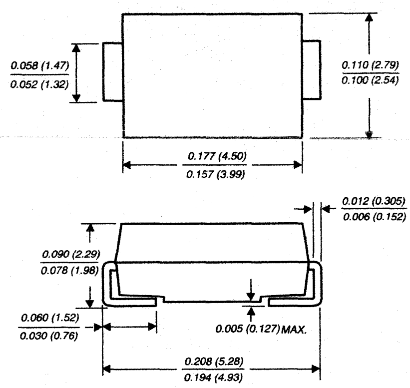


ES1A THRU ES1D

SURFACE MOUNT ULTRAFAST EFFICIENT PLASTIC RECTIFIER

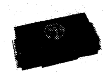
***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 1.0 Ampere*

DO-214AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- Low profile package
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- Ultrafast recovery times for high efficiency
- Low forward voltage
- Low leakage current
- Glass passivated chip junction
- High temperature soldering guaranteed: 250°C/10 seconds on terminals

MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.002 ounces, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*ES1A*	*ES1B*	*ES1C*	*ES1D*	*UNITS*
Device marking code		EA	EB	EC	ED	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_L=120°C	$I_{(AV)}$	1.0				Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0				Amps
Maximum instantaneous forward voltage at 0.6A at 1.0A	V_F	0.865 0.920				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	2.0 100				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0				ns
Maximum reverse recovery time T_A=25°C (NOTE 2) T_A=100°C	t_{rr}	25.0 35.0				ns
Maximum stored charge T_A=25°C (NOTE 2) T_A=100°C	Q_{rr}	10.0 25.0				nC
Typical junction capacitance (NOTE 3)	C_J	10.0				pF
Maximum thermal resistance (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	85.0 35.0				°C/W
Operating and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{rr} measured at: I_F=0.6A, V_R=30V, di/dt=50A/μs, I_{rr}=10% I_{RM} for measurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) P.C.B. mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pad area

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

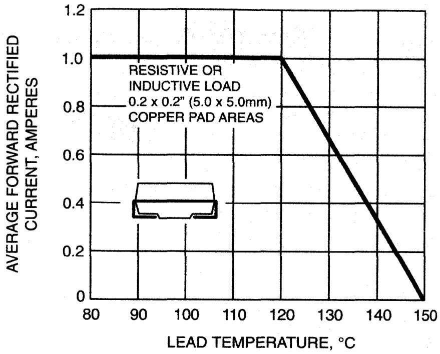


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

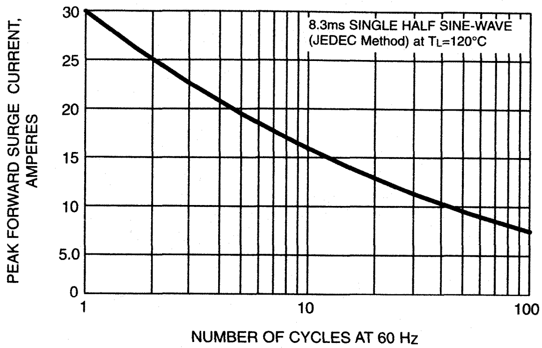


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

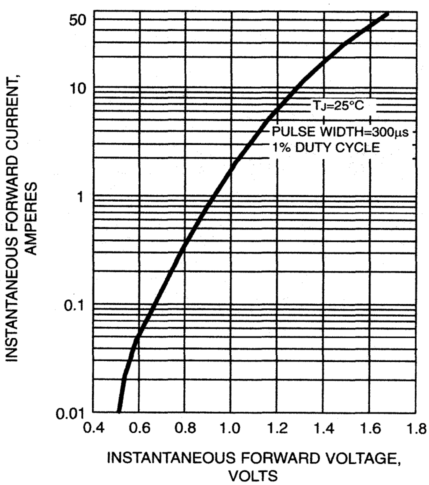


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

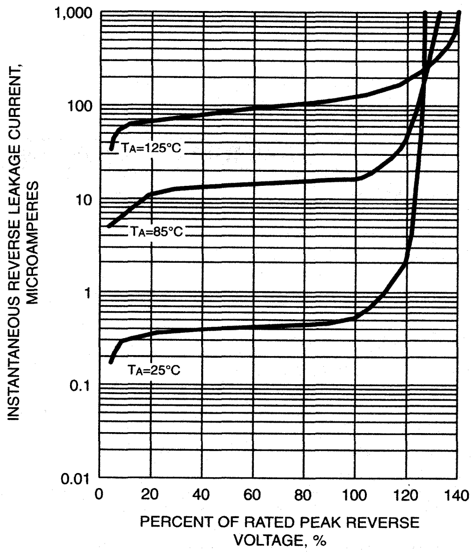
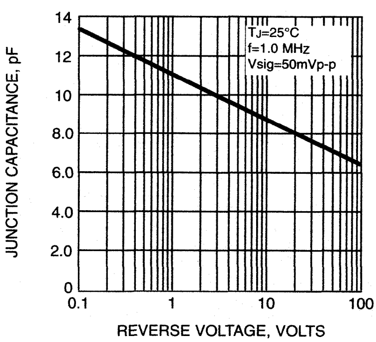


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



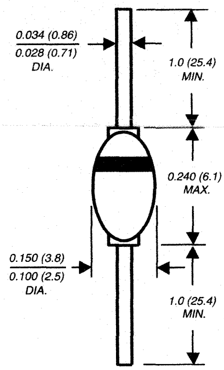
FE1A THRU FE1D

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

Reverse Voltage *- 50 to 200 Volts* ***Forward Current*** *- 1.0 Ampere*

PATENTED*

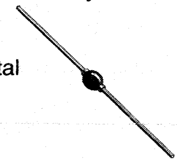
DO-204AP



Dimensions in inches and (millimeters)

* *Brazed lead assembly is covered by Patent No. 3,390,306*

FEATURES



- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Superfast recovery time for high efficiency
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed package
- Low leakage current
- High surge current capability
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case:JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FE1A*	*FE1B*	*FE1C*	*FE1D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0				Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0				Amps
Maximum instantaneous forward voltage at 1.0A	V_F	0.95				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	2.0 50.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	65.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and/or lead, 0.375" (9.5mm) lead length mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

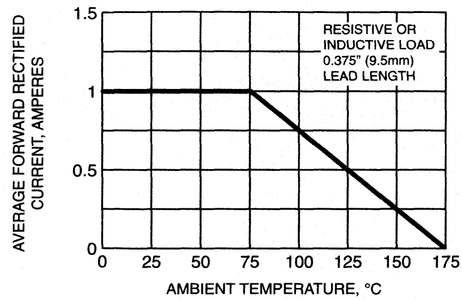


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

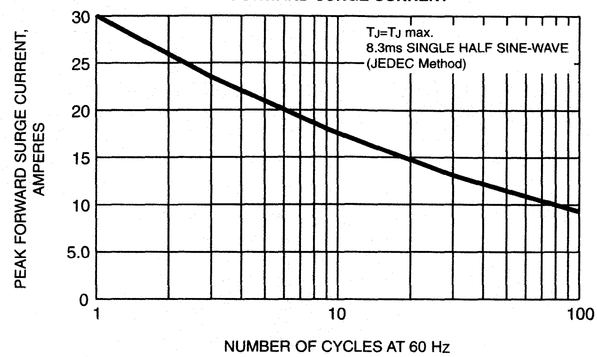


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

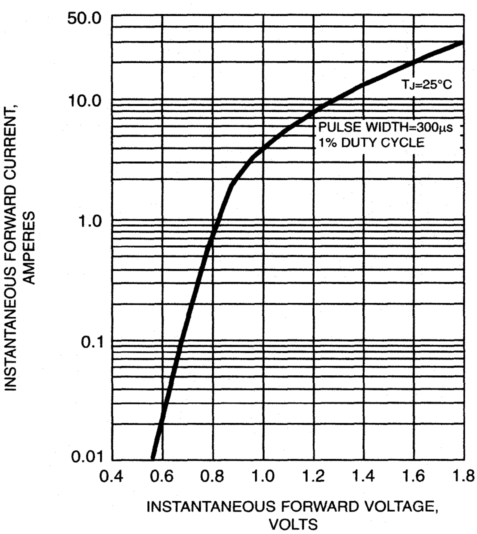


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

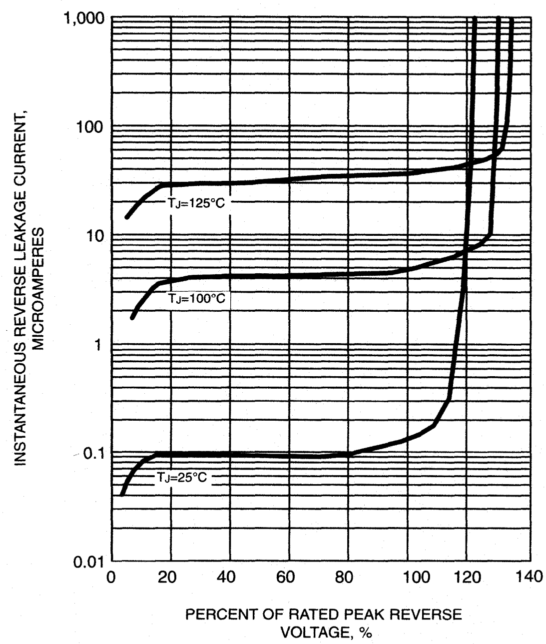
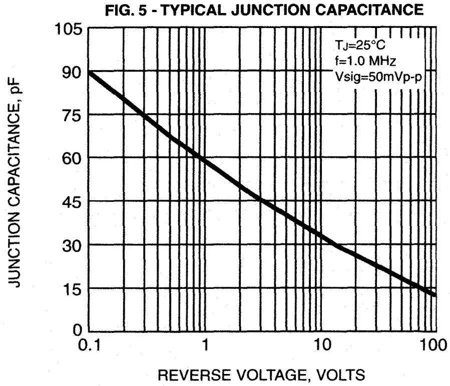


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



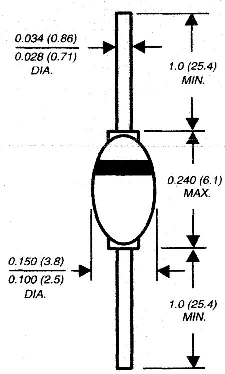
GI1001 THRU GI1004

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AP

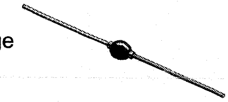


Dimensions in inches and (millimeters)

* *Brazed lead assembly is covered by Patent No. 3,930,30*

FEATURES

- ◆ High temperature metallurgically bonded construction
- ◆ Glass passivated cavity-free junction
- ◆ Superfast recovery time for high efficiency
- ◆ Low forward voltage, high current capability
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ Hermetically sealed package
- ◆ Low leakage current
- ◆ High surge capability
- ◆ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI1001*	*GI1002*	*GI1003*	*GI1004*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	1.0				Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	30.0				Amps
Maximum instantaneous forward voltage at 1.0A	V_F	0.975				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	2.0 50.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	25.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Typical thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	65.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm)
(4) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

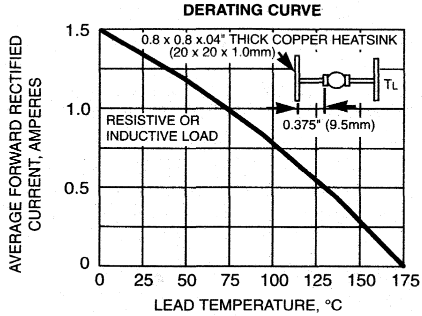


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

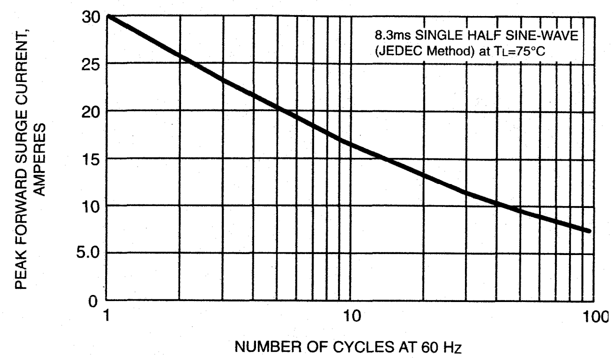


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

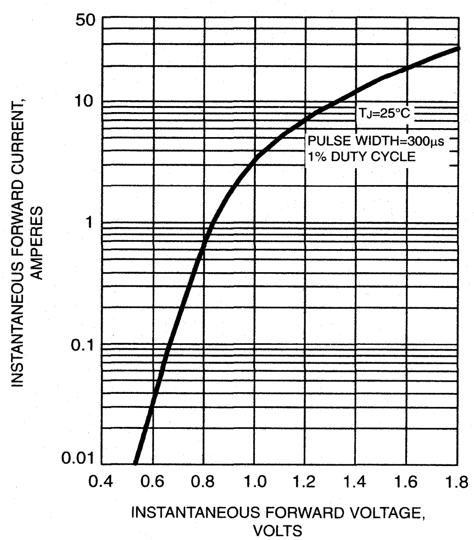


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

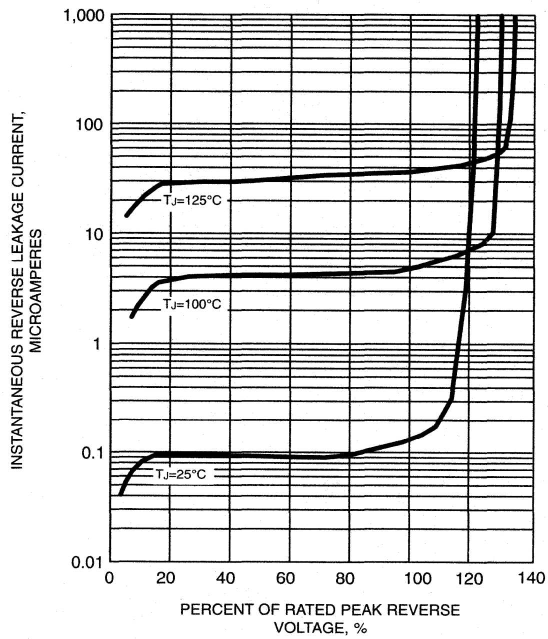
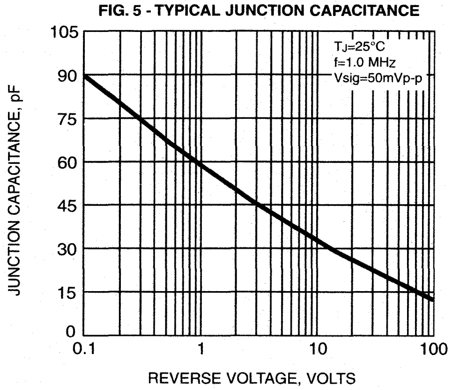


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



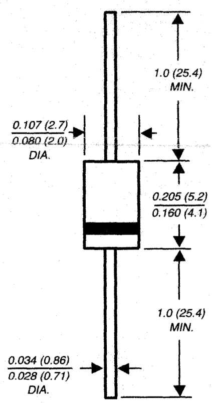
General Instrument
Power Semiconductor Division

UF4001 THRU UF4007

FAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

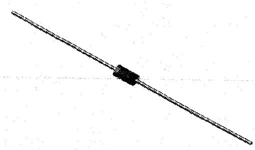
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ 1.0 ampere operation at T_A=55°C with no thermal runaway
- ♦ Glass passivated chip junction
- ♦ Low cost
- ♦ Ultrafast recovery time for high efficiency
- ♦ Low forward voltage
- ♦ Low leakage current
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UF 4001*	*UF 4002*	*UF 4003*	*UF 4004*	*UF 4005*	*UF 4006*	*UF 007*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0				1.7			Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	10.0 / 50.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0				75.0			ns
Typical junction capacitance (NOTE 2)	C_J	17.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	60.0 / 15.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead length 0.375" (9.5mm), P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

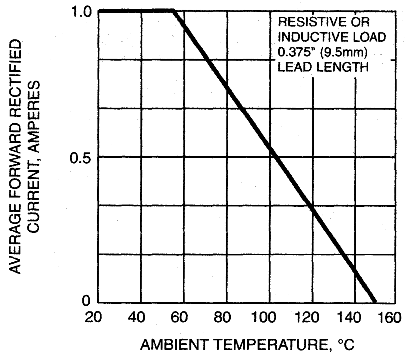


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

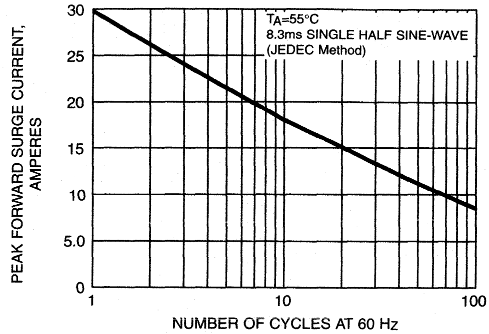


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

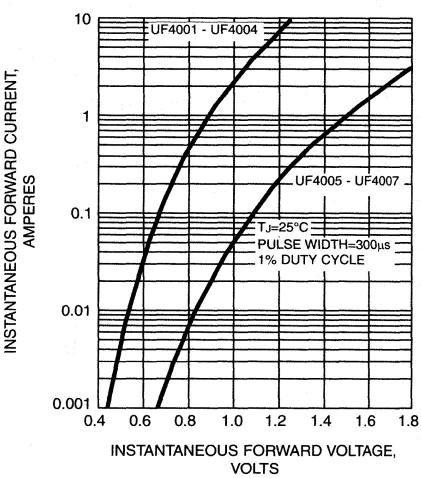


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

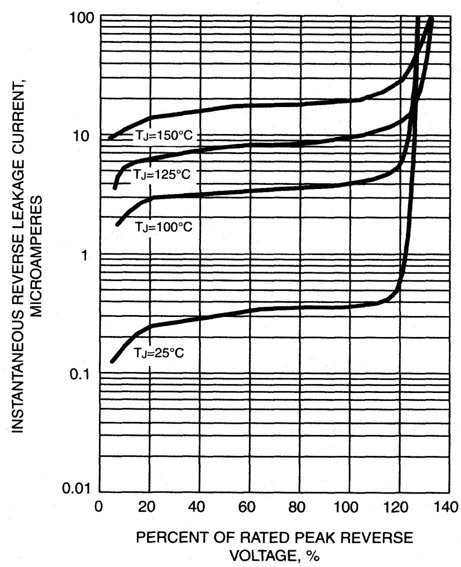
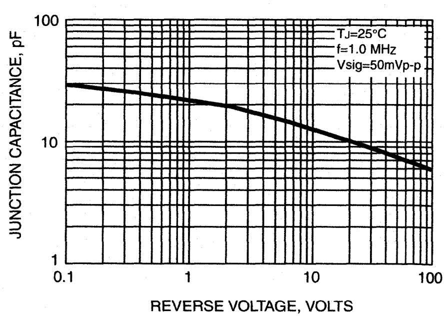


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

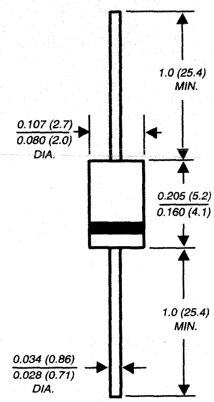


UG1A THRU UG1D

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

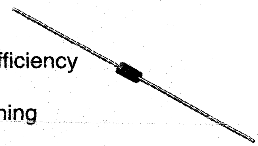
***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 1.0 Ampere*

DO-204AL



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diode
- ♦ Ultrafast recovery time for high efficiency
- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ Nitride oxide passivated junction
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic body over passivated chip
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG1A*	*UG1B*	*UG1C*	*UG1D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	1.0				Amp
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	40.0				Amps
Maximum instantaneous forward voltage at 1.0A	V_F	0.95				Volts
Maximum DC reverse current at rated DC blocking voltage T_A= 25°C / T_A=100°C	I_R	5.0 / 200.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0				ns
Maximum reverse recovery time (NOTE 2) T_J=25°C / T_J=100°C	t_{rr}	25.0 / 35.0				ns
Maximum recovered stored charge (NOTE 2) T_J=25°C / T_J=100°C	Q_{rr}	8.0 / 12.0				nC
Typical junction capacitance (NOTE 3)	C_J	7.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	60.0 / 20.0				°C/W
Operating and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R =1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{rr} measured at: I_F=1.0A V_R=30V, di/dt=50A/µs, I_{rr}=10% I_{RM} for measurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length

FIG. 1 - FORWARD CURRENT DERATING CURVES

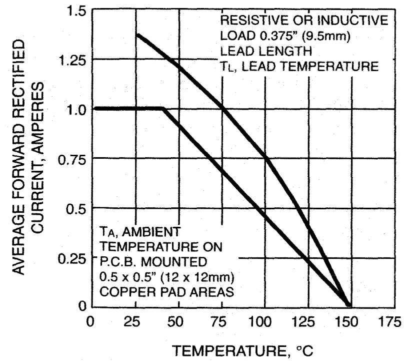


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

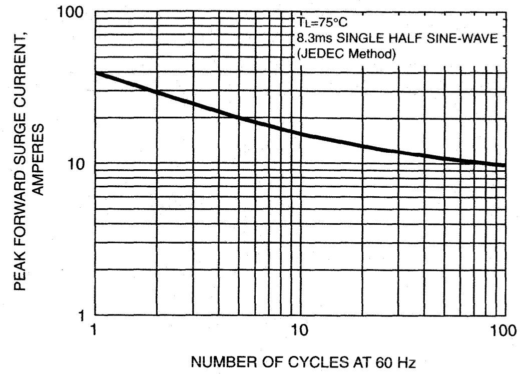


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

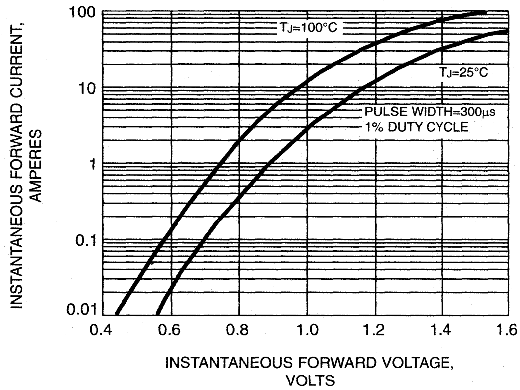


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

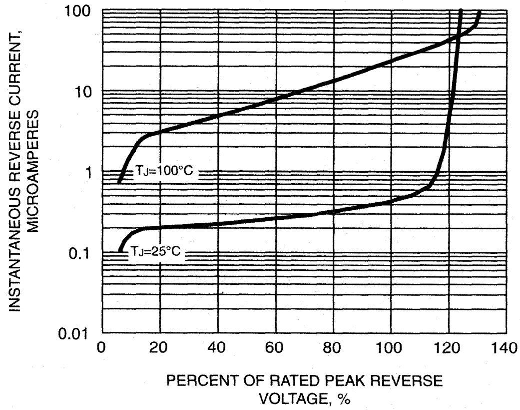


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS

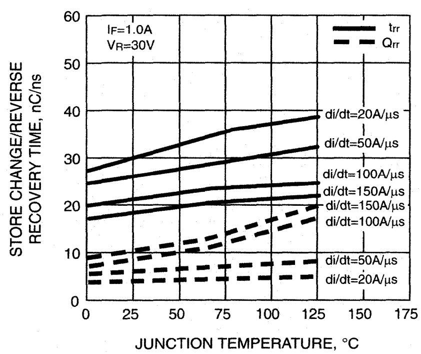
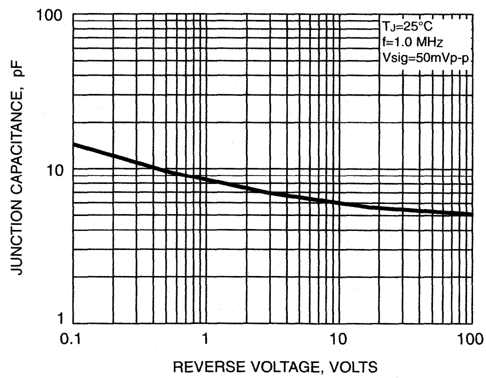


FIG. 6 - TYPICAL JUNCTION CAPACITANCE

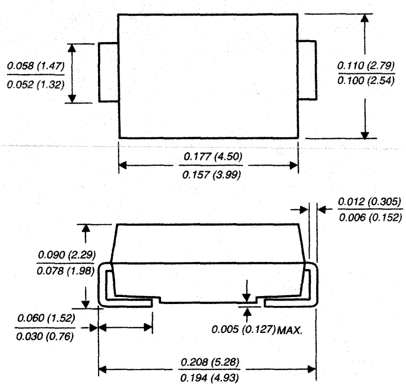


US1A THRU US1J

SURFACE MOUNT ULTRAFAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 1.0 Ampere*

DO-214AC



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mount applications
- ♦ Glass passivated chip junctions
- ♦ Low profile package
- ♦ Easy pick and place
- ♦ Ultrafast recovery times for high efficiency
- ♦ Low forward voltage, low power loss
- ♦ Built- in strain relief, ideal for automated placement
- ♦ High temperature soldering guaranteed: 250°C/10 seconds on terminals

MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.002 ounces, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*US1A*	*US1B*	*US1D*	*US1G*	*US1J*	*UNITS*
Device Marking Code		UA	UB	UD	UG	UJ	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current at T_L=110°C	$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0				1.7	Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 50.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0				75.0	ns
Typical junction capacitance (NOTE 2)	C_J	17.0				15.0	pF
Maximum thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	27.0 75.0					°C/W
Operating and storage temperature range	T_J, T_{STG}	-55 to +150					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) P.C.B. mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pad area

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

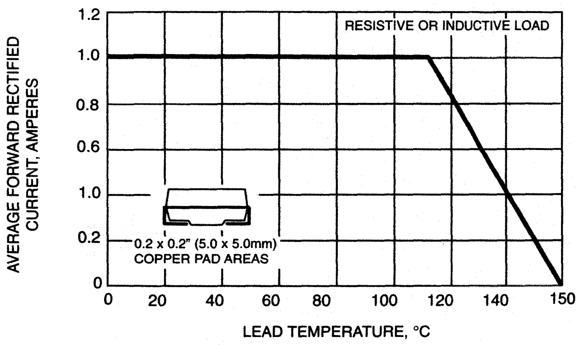


FIG. 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

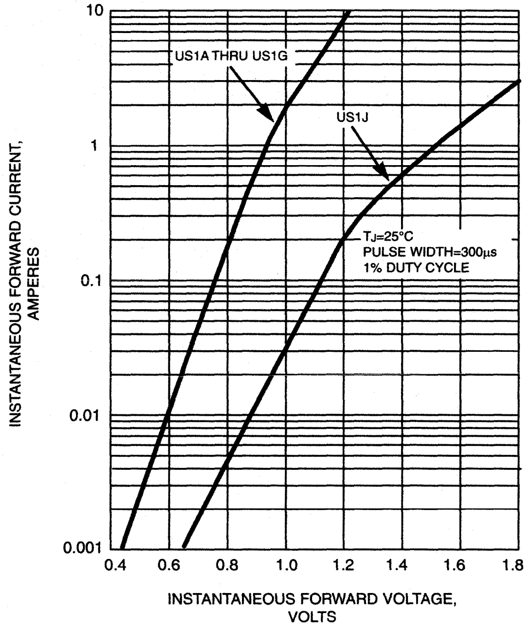


FIG. 3 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

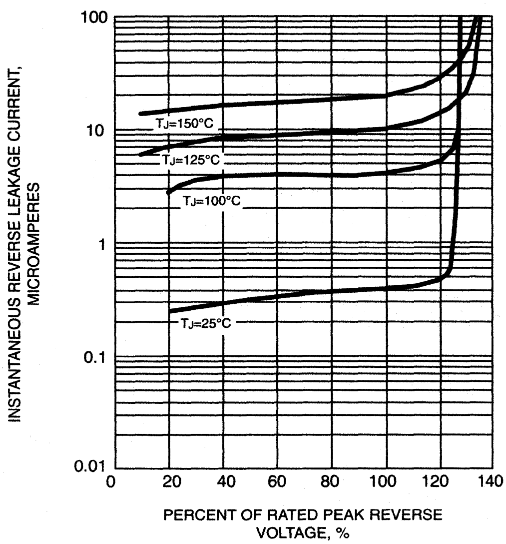


FIG.4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

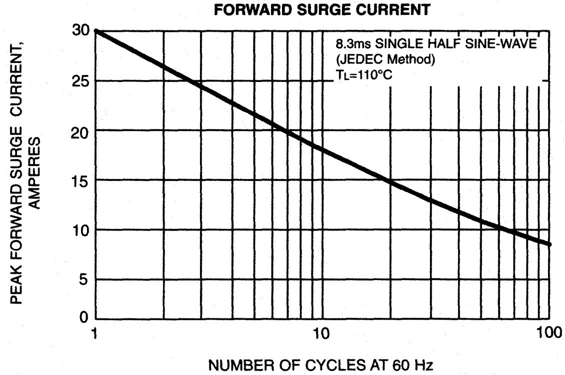
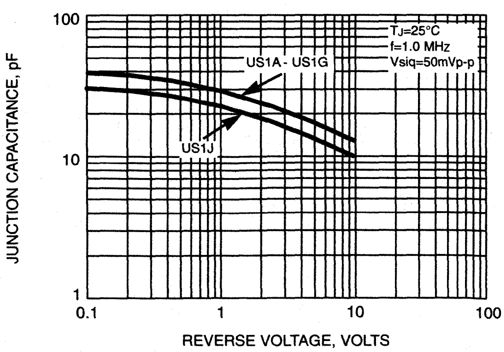


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

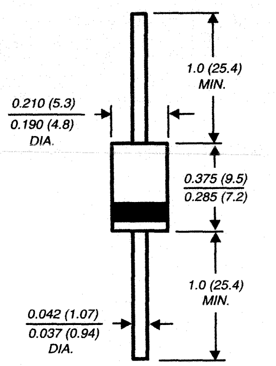


SUF15G AND SUF15J

ULTRA FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 400 and 600 Volts* ***Forward Current** - 1.5 Amperes*

Case Style GP20



Dimension in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junction
- ♦ Superfast recovery time for high efficiency
- ♦ High forward surge current capability
- ♦ Low leakage current
- ♦ Low power loss
- ♦ High temperature soldering guaranteed: 260°C/10 seconds, at 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Plastic molded body over passivated chip
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.03 ounces, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SUF15G*	*SUF15J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	400	600	Volts
Maximum RMS voltage	V_{RMS}	280	420	Volts
Maximum DC blocking voltage	V_{DC}	400	600	Volts
Maximum average forward rectified current, 0.375" (9.5mm) lead length at T_A=50°C	$I_{(AV)}$	1.5		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=50°C	I_{FSM}	50.0		Amps
Maximum instantaneous forward voltage at 1.5A	V_F	1.80		Volts
Maximum peak reverse current T_A=25°C at rated peak reverse voltage T_A=100°C	I_R	10.0 100		µA
Maximum reverse recovery time (NOTE1)	t_{rr}	35.0		ns
Typical junction capacitance (NOTE 2)	C_J	35		pF
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$	65.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150		°C

NOTES:
(1) Reverse recovery test condition: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

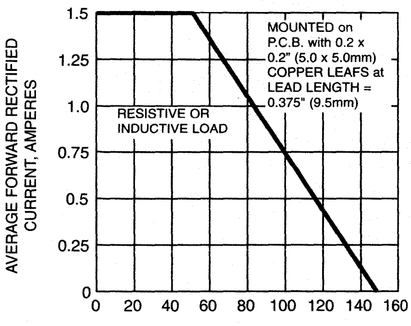


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

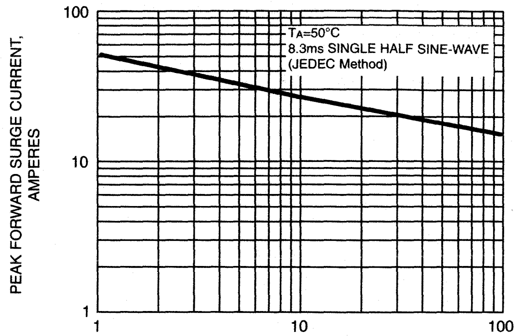


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

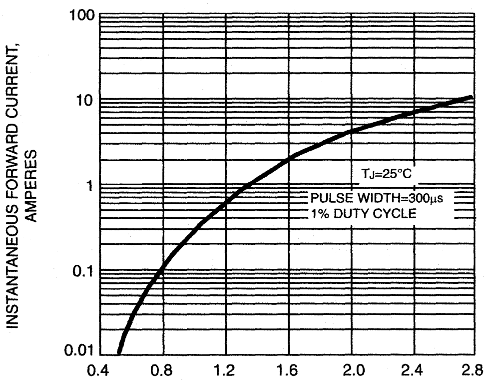


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

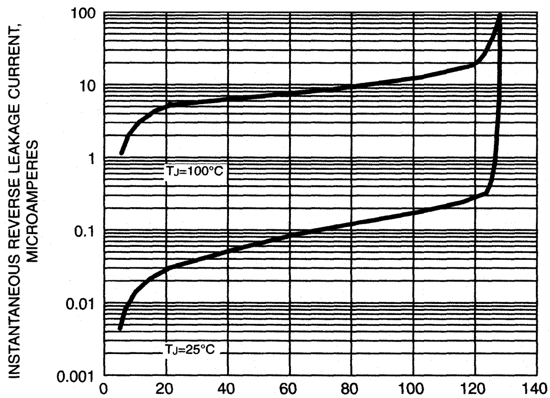


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

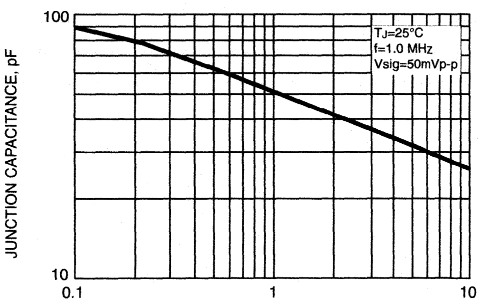
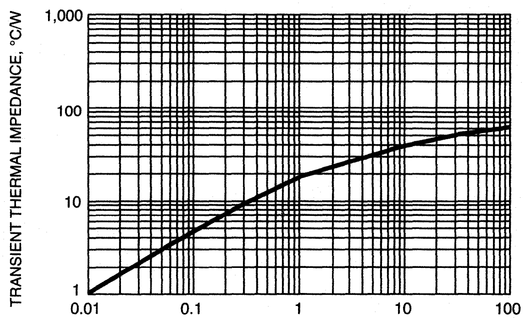


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



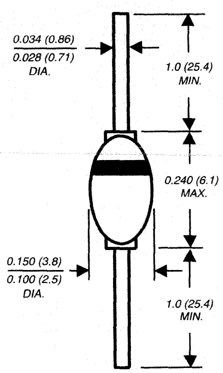
BYV27-50 THRU BYV27-200

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

DO-204AP

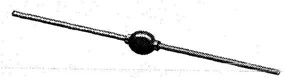


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Superfast recovery time-for high efficiency
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed package
- Low leakage current
- High surge current capability
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BYV27-50*	*BYV27-100*	*BYV27-150*	*BYV27-200*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Minimum reverse breakdown voltage at 100 µA	V_{BR}	55	110	165	220	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=85°C	$I_{(AV)}$	2.0				Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_J=175°C	I_{FSM}	50.0				Amps
Maximum instantaneous forward voltage at 3.0A T_J=25°C / T_J=175°C	V_F	1.07 / 0.88				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=165°C	I_R	1.0 / 150.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	25.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Typical thermal resistance (NOTE 3, 4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	65.0 / 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads

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Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

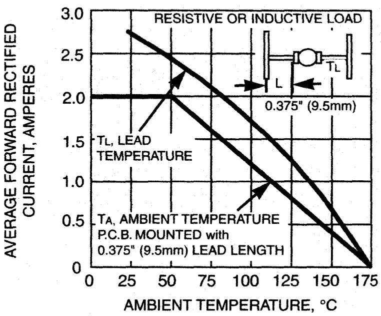


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

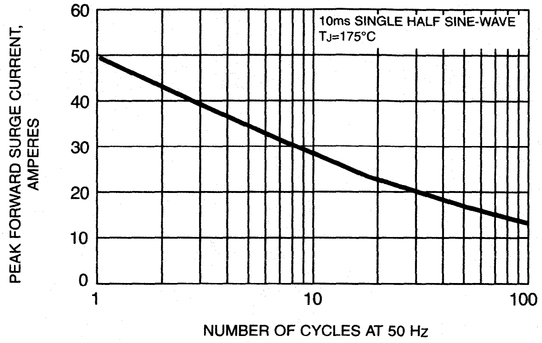


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

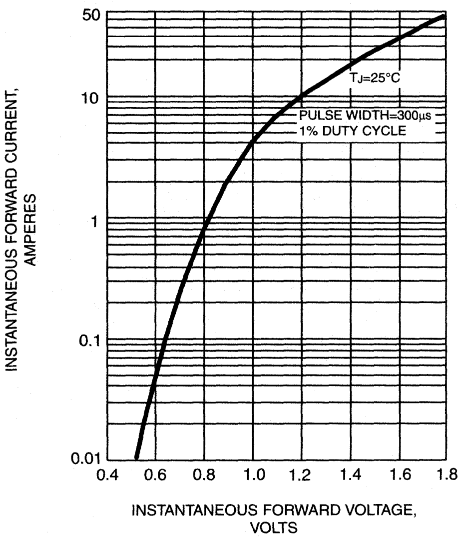


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

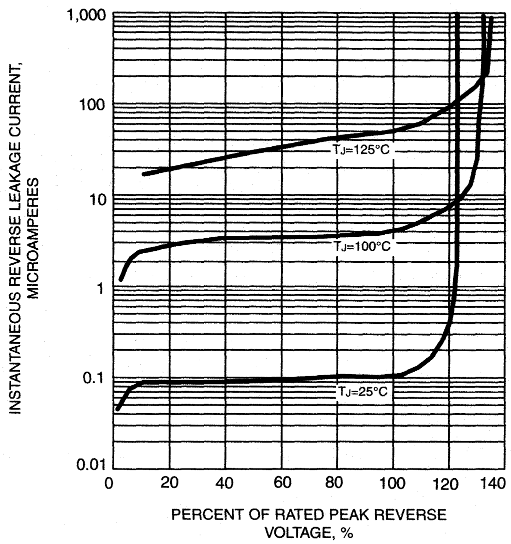
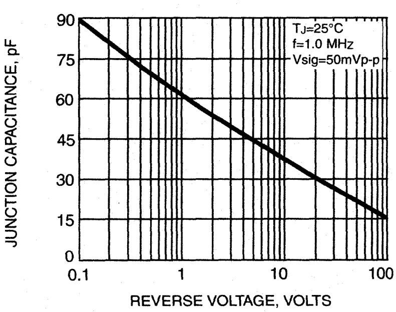


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



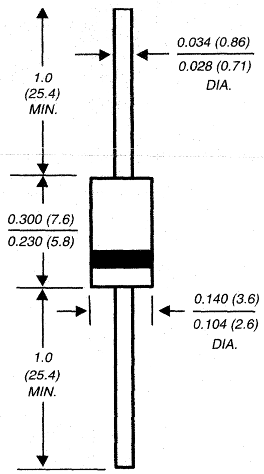
EGP20A THRU EGP20G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 400 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

DO-204AC

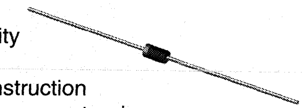


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES

- Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- Glass passivated cavity-free junction
- Superfast recovery time for high efficiency
- Low forward voltage, high current capability
- Low leakage current
- High surge current capability
- High temperature metallurgically bonded construction
- High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	EGP 20A	EGP 20B	EGP 20C	EGP 20D	EGP 20F	EGP 20G	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	2.0						Amps
Peak forward surge current, 8.3 ms single half sine-wave superimposed on rated load	I_{FSM}	75.0						Amps
Maximum instantaneous forward voltage at 2.0A	V_F	0.95				1.25		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 100.0						μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	50.0						ns
Typical junction capacitance (NOTE 2)	C_J	70.0				45.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	40.0 15.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted

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RATINGS AND CHARACTERISTIC CURVES EGP20A THRU EGP20G

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

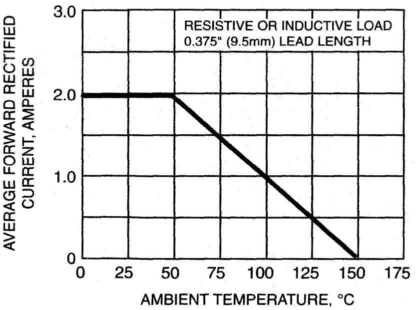


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

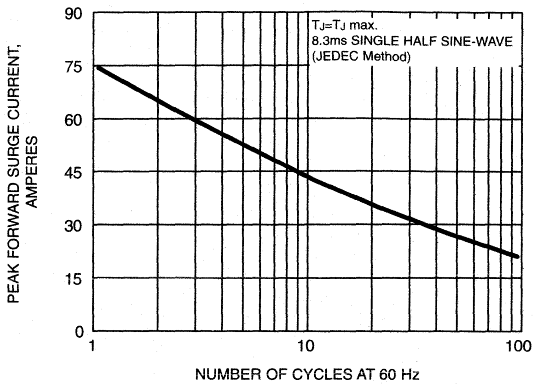


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

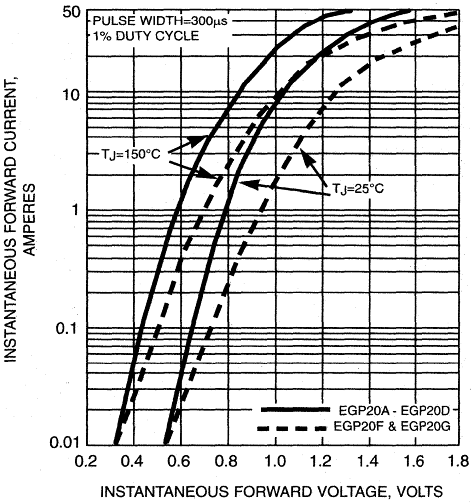


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

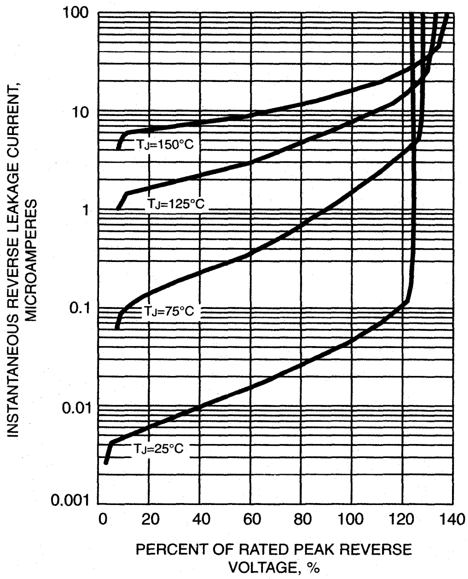


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

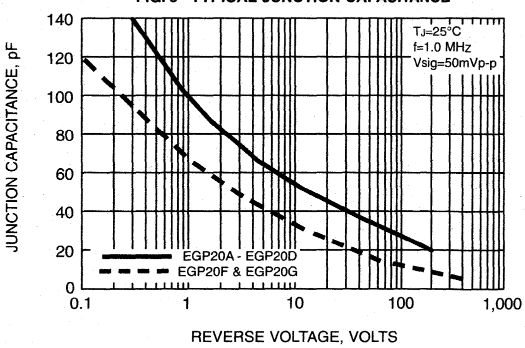
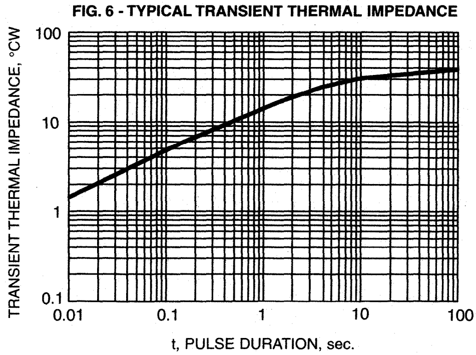


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

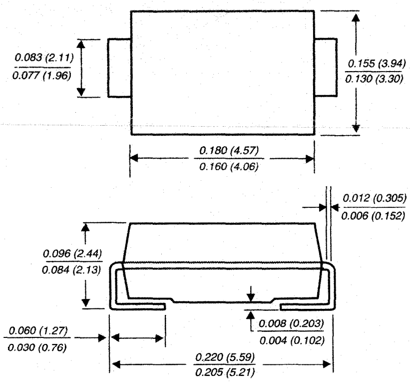


ES2A THRU ES2D

SURFACE MOUNT FAST EFFICIENT PLASTIC RECTIFIER

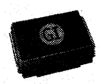
Reverse Voltage *- 50 to 200 Volts* ***Forward Current*** *- 2.0 Amperes*

DO-214AA



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- Low profile package
- Built-in strain relief, ideal for automated placement
- Easy pick and place
- Glass passivated chip junction
- Superfast recovery times for high efficiency
- Low power loss, high efficiency
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic body over passivated chip
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.003 ounces, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*ES2A*	*ES2B*	*ES2C*	*ES2D*	*UNITS*
Device marking code		EA	EB	EC	ED	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_L=110°C	$I_{(AV)}$	2.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=110°C	IFSM	50.0				Amps
Maximum instantaneous forward voltage at 2.0A	V_F	0.90				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 350				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time T_A=25°C (NOTE 2) T_A=100°C	t_{rr}	30.0 50.0				ns
Maximum stored charge T_A=25°C (NOTE 2) T_A=100°C	Q_{rr}	10.0 25.0				nC
Typical junction capacitance (NOTE 3)	C_J	25.0				pF
Maximum thermal resistance (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	75.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R= 1.0A, I_{rr}=0.25A
(2) T_{rr} and Q_{rr} measured at: I_F=2.0A, V_R=30V, di/dt=50A/μs, I_{rr}=10% I_R
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Units mounted on P.C.B. 5.0 x 5.0mm (0.013mm thick) land areas

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FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

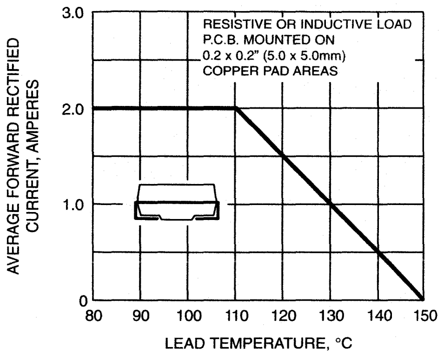


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

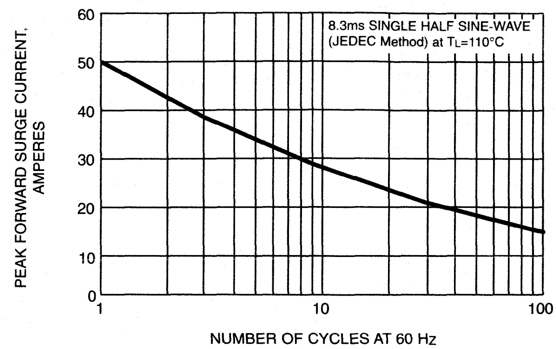


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

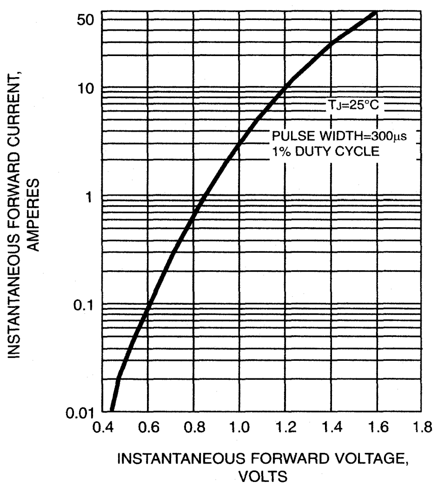


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

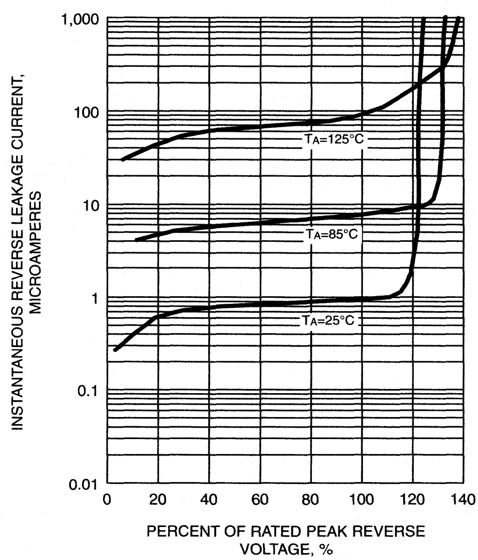
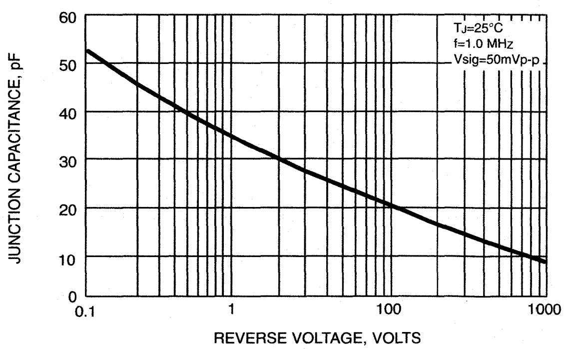


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



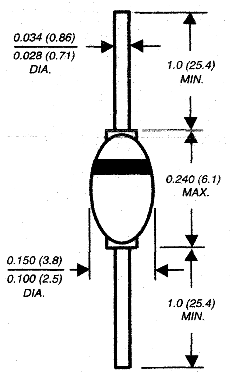
FE2A THRU FE2D

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts*   ***Forward Current** - 2.0 Amperes*

PATENTED*

DO-204AP

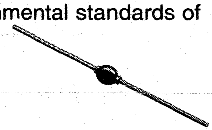


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Heretically sealed package
- ♦ Low leakage
- ♦ High surge capability
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.002 ounce, 0.56 gram

MAXIMUM RATINGS AND MECHANICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FE2A*	*FE2B*	*FE2C*	*FE2D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	2.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
Maximum instantaneous forward voltage at 2.0A	V_F	0.95				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	2.0 50.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Typical thermal resistance (NOTE 3, 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	60.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads
(4) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

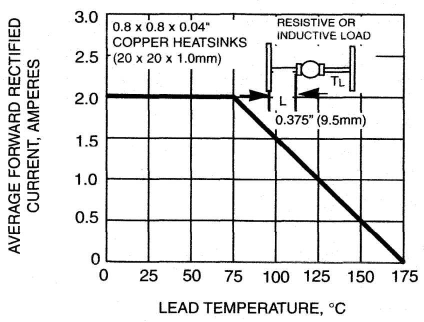


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

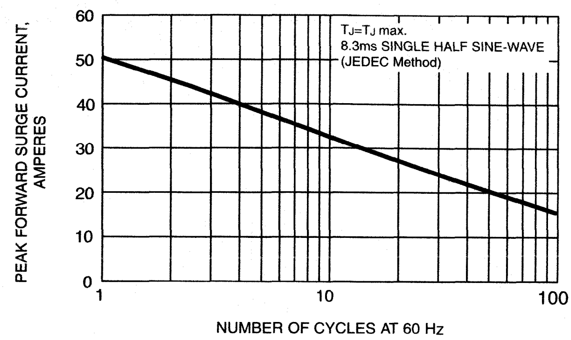


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

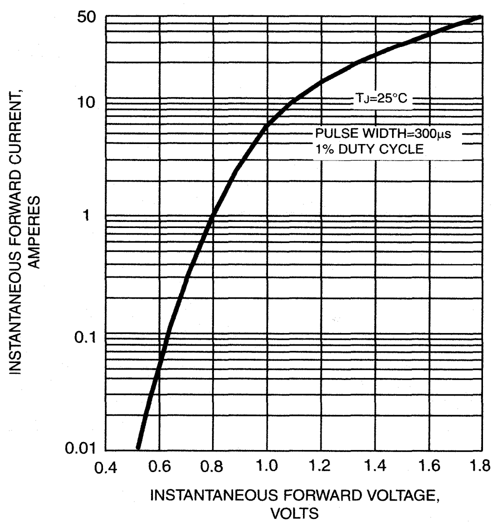


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

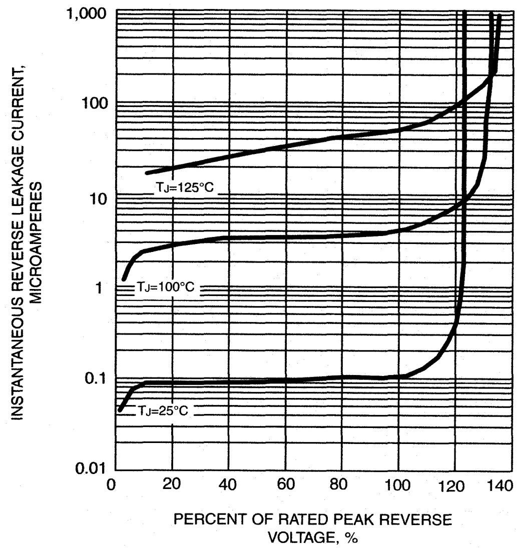
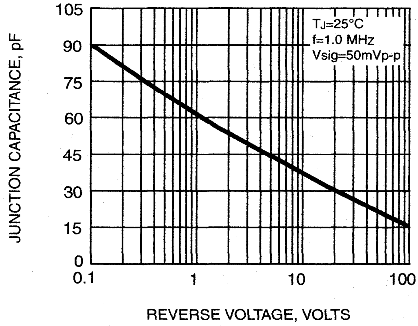


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

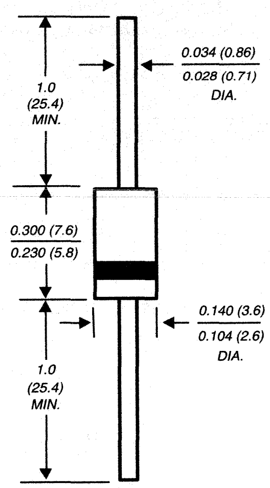


UG2A THRU UG2D

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 2.0 Amperes*

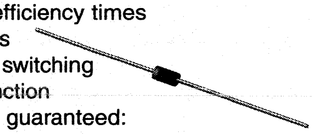
DO-204AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diode
- Ultrafast recovery for high efficiency times
- Soft recovery characteristics
- Excellent high temperature switching
- Nitride oxide passivated junction
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic body over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG2A*	*UG2B*	*UG2C*	*UG2D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	2.0				Amps
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	80.0				Amps
Maximum instantaneous forward voltage at 2.0A	V_F	0.95				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 200.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0				ns
Maximum reverse recovery time (NOTE 2) T_J=25°C / T_J=100°C	t_{rr}	25.0 / 35.0				ns
Maximum stored charge (NOTE 2) T_J=25°C / T_J=100°C	Q_{rr}	10.0 / 22.0				nC
Typical junction capacitance (NOTE 3)	C_J	15.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$	45.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{rr} at: I_F=2.0A, V_R=30V, di/dt=50A/μs, I_{rr}=10% I_{RM} for measurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVES

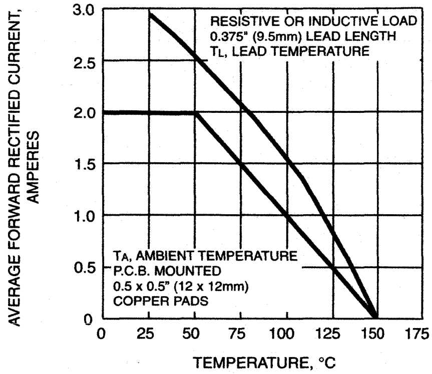


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

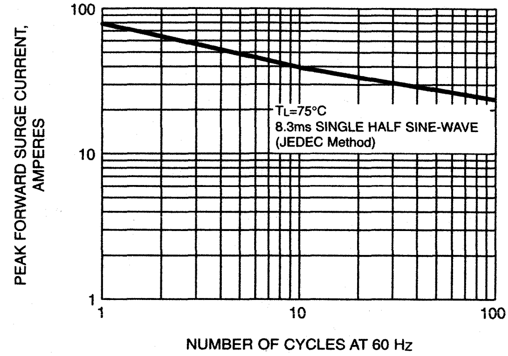


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

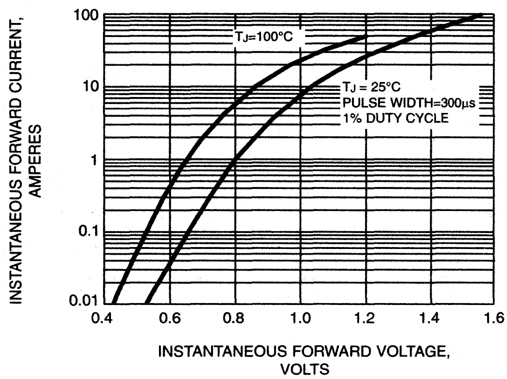


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

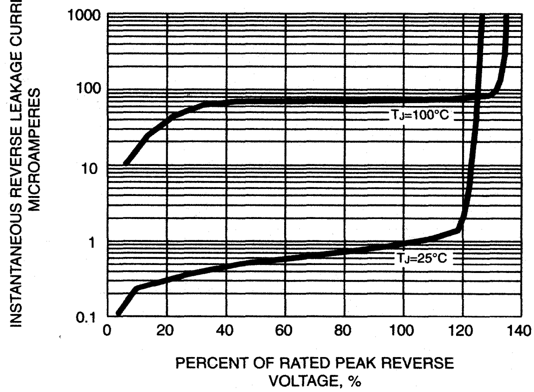


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS

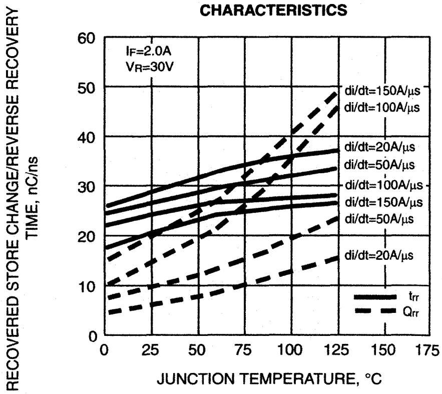
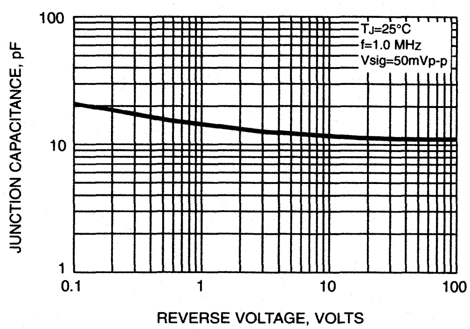


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



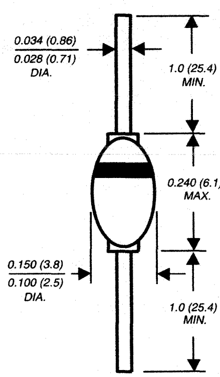
GI1101 THRU GI1104

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 2.5 Amperes*

PATENTED*

DO-204AP



Dimensions in inches and (millimeters)

* *Brazed lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Hermetically sealed package
- ♦ Low Leakage
- ♦ High surge capability
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD 750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI1101*	*GI1102*	*GI1103*	*GI1104*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG.1)	$I_{(AV)}$	2.5			2.0	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at rated T_L	I_{FSM}	50.0				Amps
Maximum instantaneous forward voltage at 2.0A	V_F	0.975			1.25 (NOTE 5)	Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	2.0 50.0			10.0 200.0	μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	25.0			50.0	ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Typical thermal resistance (NOTE 1) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	65.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175			-65 to +150	°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B. with 0.5 x 0.5" (12 x 12mm) copper pads
(4) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heat sinks
(5) Tested at I_F=1.0A

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

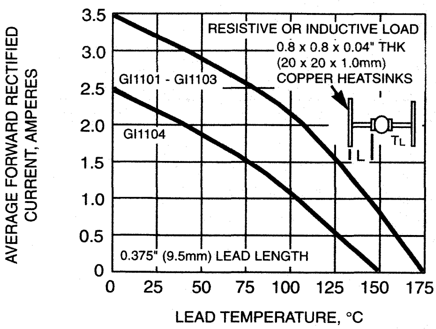


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

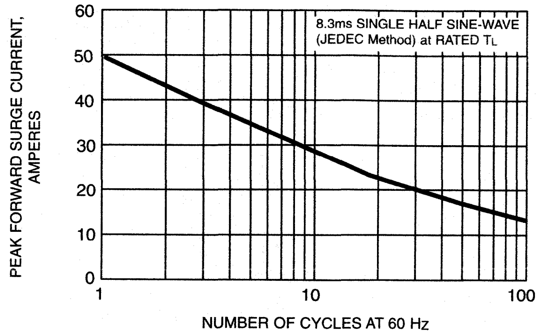


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

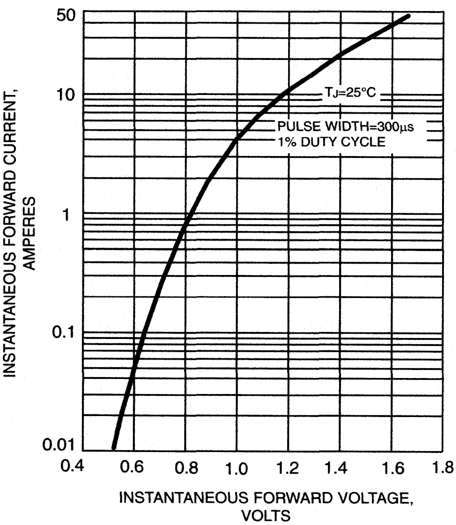


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

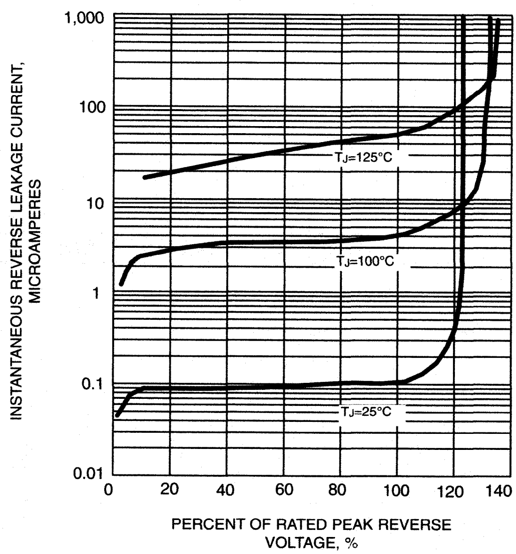
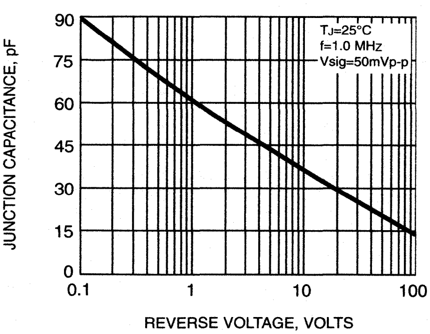


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



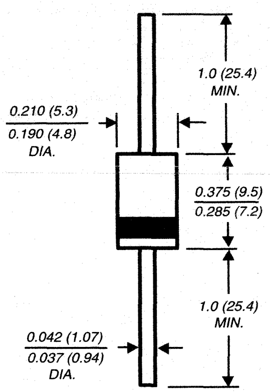
EGP30A THRU EGP30G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Forward Voltage** - 50 to 400 Volts*　　***Reverse Current** - 3.0 Amperes*

PATENTED*

Case Style GP20

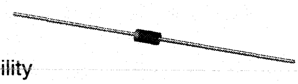


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No.3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Low leakage current
- ♦ High surge current capability
- ♦ High temperature metallurgically bonded construction
- ♦ High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*EGP 30A*	*EGP 30B*	*EGP 30C*	*EGP 30D*	*EGP 30F*	*EGP 30G*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load	I_{FSM}	125.0						Amps
Maximum instantaneous forward voltage at 3.0A	V_F	0.95				1.25		Volts
Maximum DC reverse current at rated DC blocking voltage　T_A=25°C / T_A=125°C	I_R	5.0 / 100.0						μA
Typical reverse recovery time (NOTE 1)	trr	50.0						ns
Typical junction capacitance (NOTE 2)	C_J	95.0				75.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	20.0 / 8.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, and from junction to lead 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

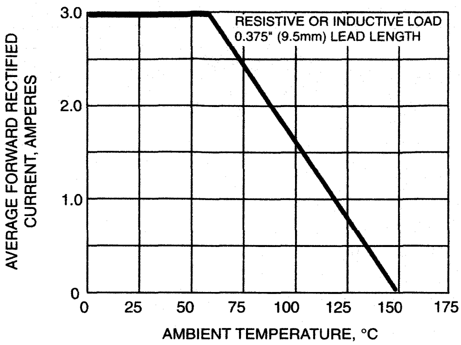


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

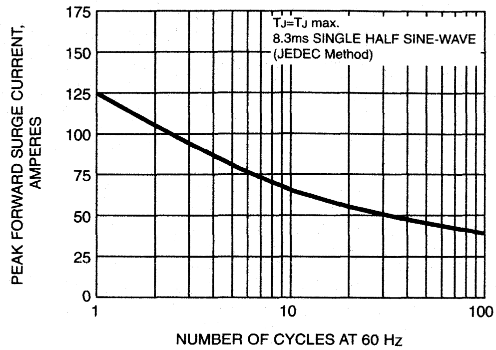


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

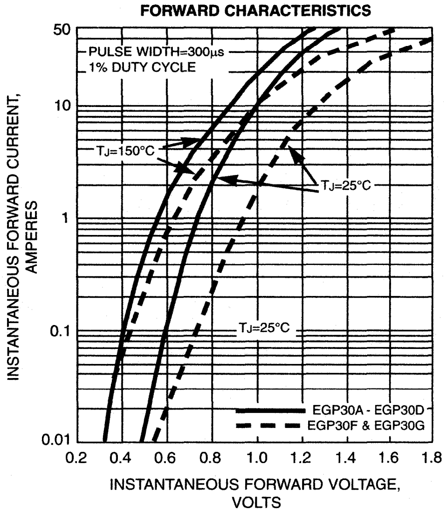


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

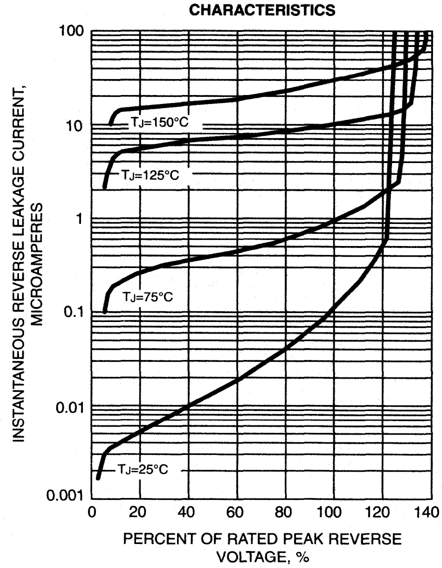


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

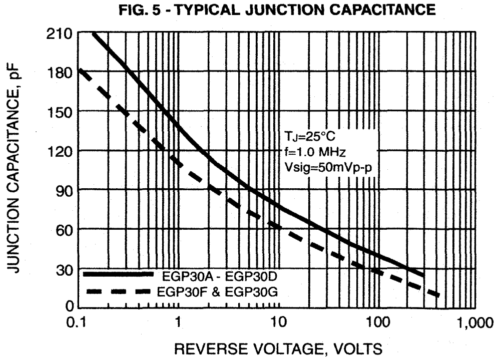
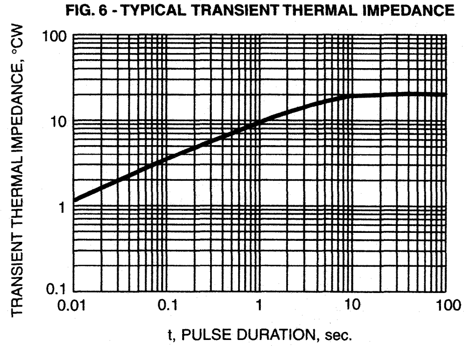


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



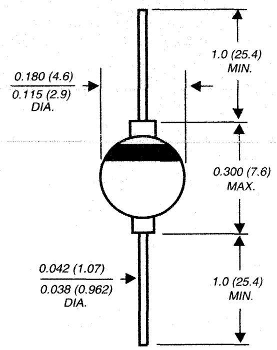
FE3A THRU FE3D

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G4

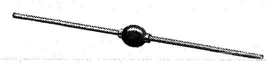


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Superfast recovery time-for high efficiency
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed package
- Low leakage current
- High surge current capability
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	FE3A	FE3B	FE3C	FE3D	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
Maximum instantaneous forward voltage at 3.0A	V_F	0.95				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 50.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	100.0				pF
Typical thermal resistance (NOTE 3,4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length mounted on P.C.B.
(4) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING

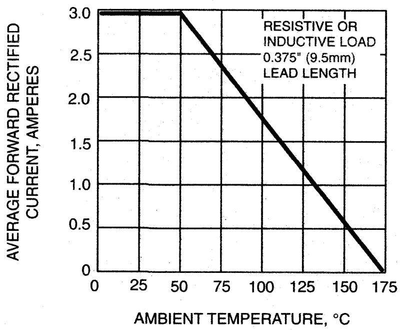


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

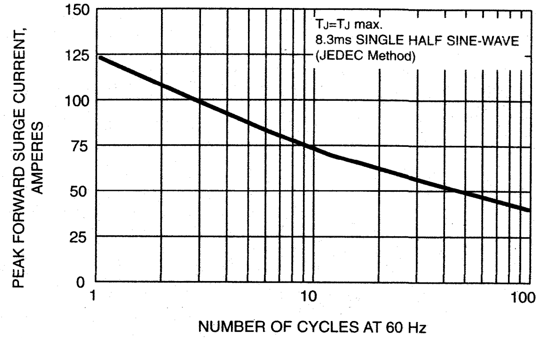


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

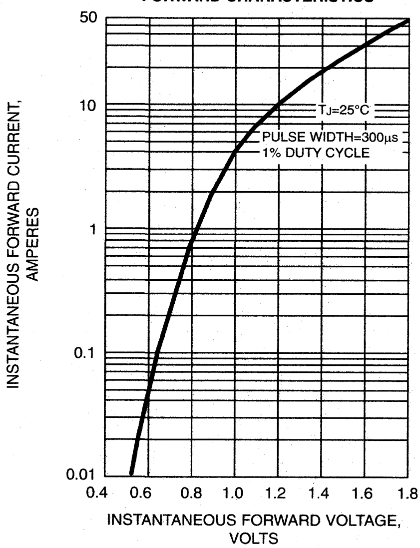


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

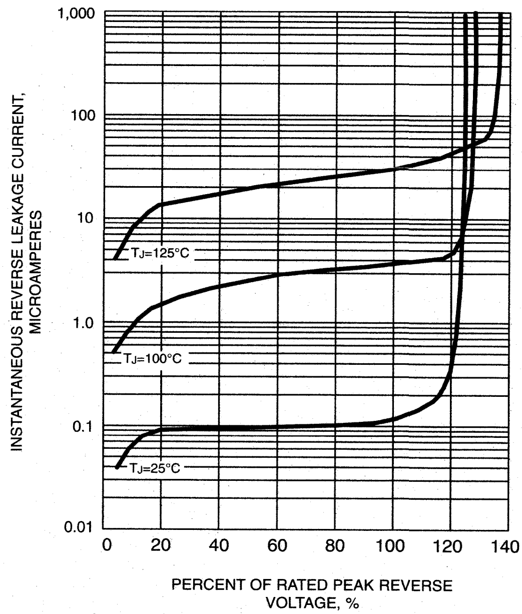
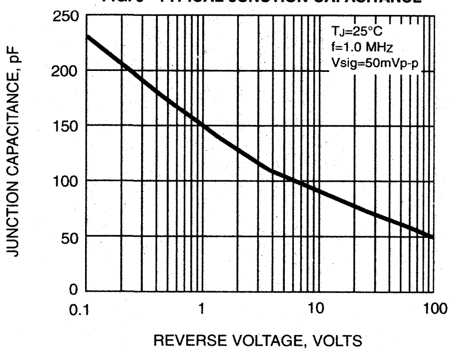


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

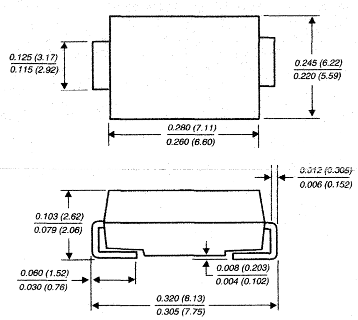


ES3A THRU ES3D

SURFACE MOUNT ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts*   ***Forward Current** - 3.0 Amperes*

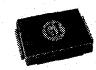
DO-214AB



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mount applications
- ♦ Low profile package
- ♦ Built-in strain relief,
- ♦ Ideal for automated placement
- ♦ Easy pick and place
- ♦ Superfast recovery time for high efficiency
- ♦ Glass passivated chip junction
- ♦ High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.007 ounces, 0.21 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*ES3A*	*ES3B*	*ES3C*	*ES3D*	*UNITS*
Device marking code		EA	EB	EC	ED	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_L=100°C	$I_{(AV)}$	3.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=100°C	I_{FSM}	100.0				Amps
Maximum instantaneous forward voltage at 3.0A	V_F	0.90				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 500.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time T_A=25°C (NOTE 2) T_A=100°C	t_{rr}	30.0 50.0				ns
Maximum stored charge T_A=25°C (NOTE 2) T_A=100°C	Q_{rr}	15.0 35.0				nC
Typical junction capacitance (NOTE 3)	C_J	45.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	47.0 12.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{rr} measured at: V_R=30V, di/dt=50A/μs, I_F=3.0A, and I_{rr}=10% I_R
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Units mounted on P.C.B. with 0.31 x 0.31" (8.0 x 8.0mm) copper pad areas

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

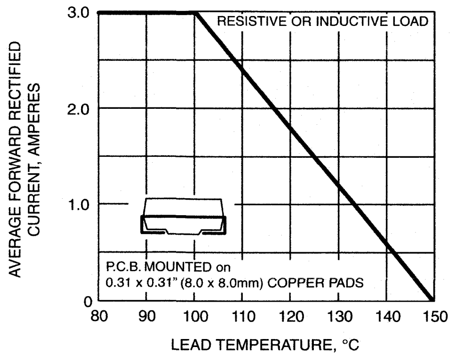


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

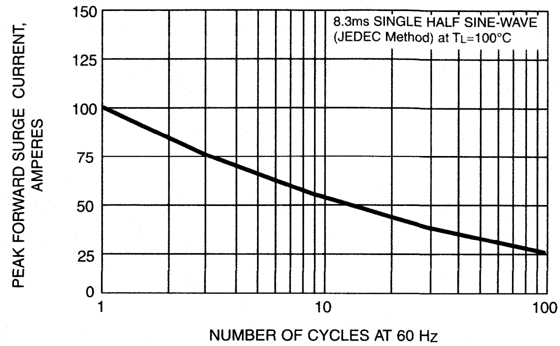


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

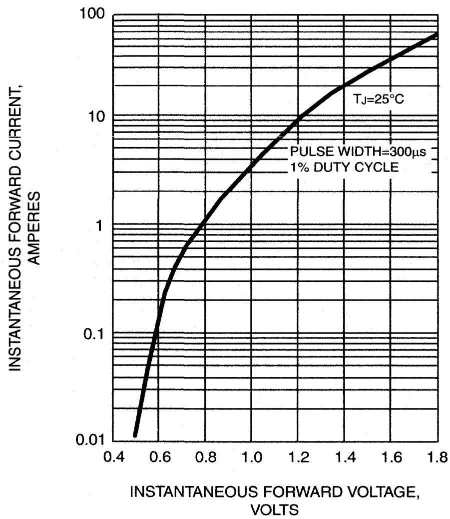


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

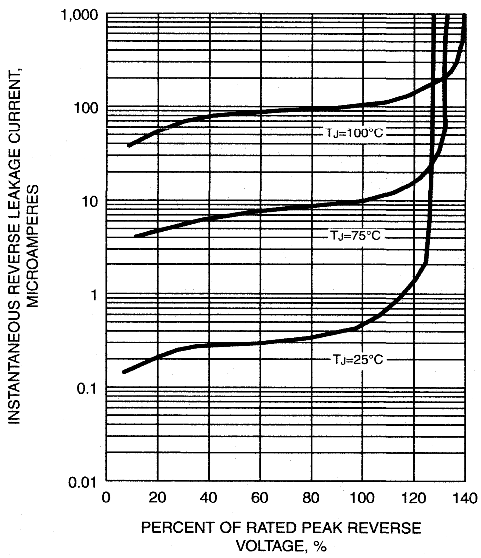
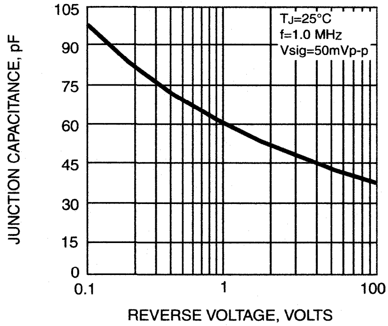


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

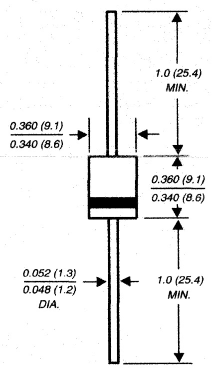


SUF30G AND SUF30J

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

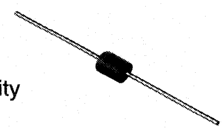
***Reverse Voltage** - 400 and 600 Volts* ***Forward Current** - 3.0 Amperes*

Case Style P600



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- Utrafast recovery times for high efficiency
- High forward surge current capability
- Low leakage current
- Low power loss
- High temperature soldering guaranteed: 260°C/10 seconds at 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded epoxy body over passivated chip
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.07 ounces, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SUF30G*	*SUF30J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	400	600	Volts
Maximum RMS voltage	V_{RMS}	280	420	Volts
Maximum DC blocking voltage	V_{DC}	400	600	Volts
Maximum average forward rectified current, 0.200" (5.0mm) lead length at T_A=60°C	$I_{(AV)}$	3.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=60°C	I_{FSM}	80.0		Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.80	2.0	Volts
Maximum peak reverse current T_A=25°C at rated peak reverse voltage T_A=100°C	I_R	10.0 100.0		µA
Maximum reverse recovery time (NOTE1)	t_{rr}	35.0		ns
Typical junction capacitance (NOTE 2)	C_J	8.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	25.0		°C/W
Operating junction and storage temperature range	T_J ,T_{STG}	-55 to +150		°C

NOTES:
(1) Reverse recovery test condition: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.200" (5.0mm) lead length with both leads attached to heat sink

RATINGS AND CHARACTERISTIC CURVES SUF30G AND SUF30J

FIG. 1 - FORWARD CURRENT DERATING CURVE

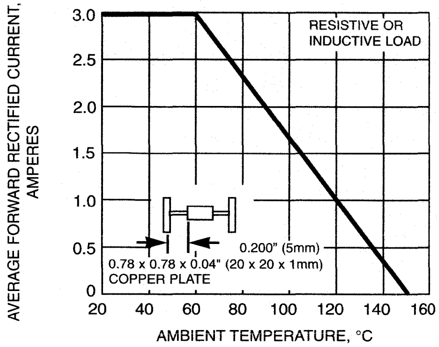


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

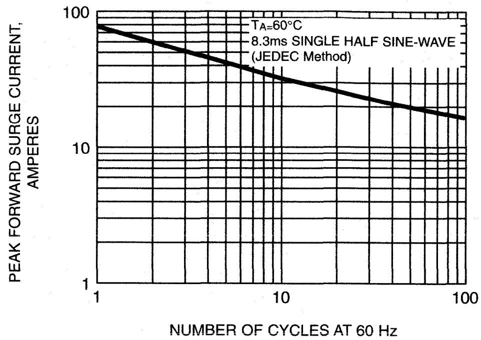


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

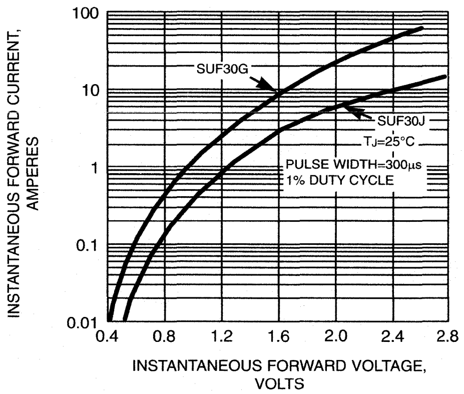


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

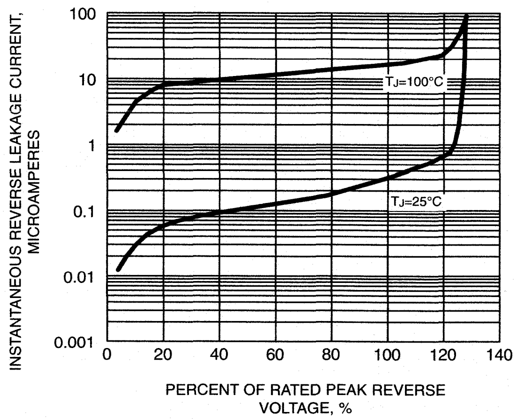


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

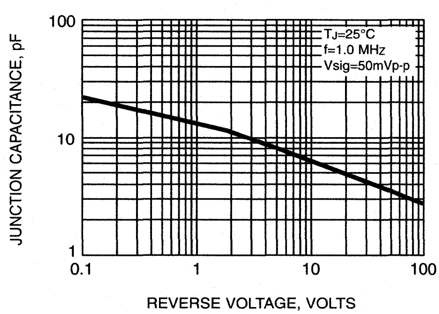
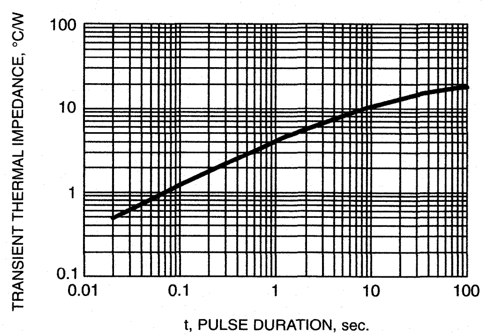


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

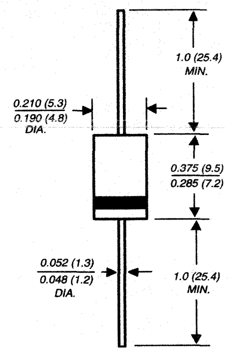


UF5400 THRU UF5408

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

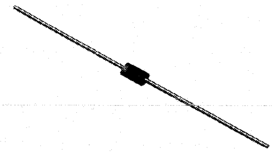
***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES



- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ Glass passivated chip junction
- ◆ Low cost
- ◆ Ultrafast recovery time for high efficiency
- ◆ Low forward voltage, high current capability
- ◆ Low leakage
- ◆ High surge capability
- ◆ High temperature soldering guaranteed: 250°C, 0.375" (9.5mm) lead length for 10 seconds, 5 lbs. (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD, molded plastic body over passivated chip
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UF5400*	*UF5401*	*UF5402*	*UF5403*	*UF5404*	*UF5405*	*UF5406*	*UF5407*	*UF5408*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
Maximum average forward rectified current, 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0									Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=55°C	I_{FSM}	150.0									Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.0					1.7				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	10.0 / 50.0									μA
Maximum reverse recovery time (NOTE 1) T_J=25°C	t_{rr}	50.0					75.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0									pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	20.0 / 8.5									°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150									°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measure at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to lead and from junction to ambient with 0.375" (9.5mm) lead length, both leads attached to heatsink

GI **General Instrument**
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

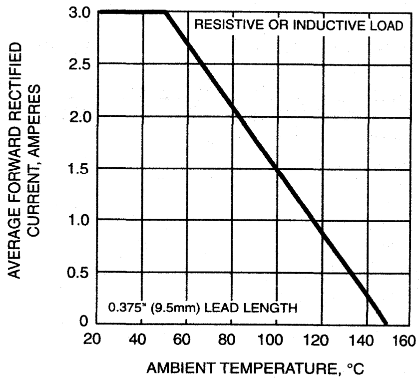


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

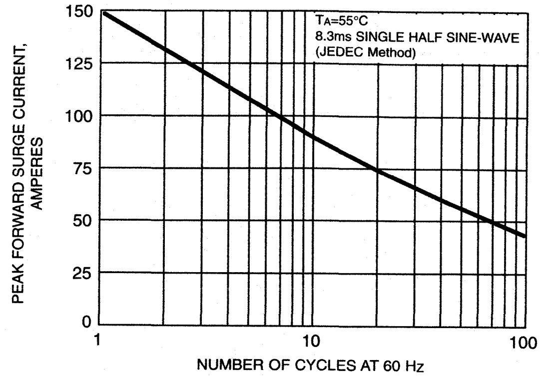


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS

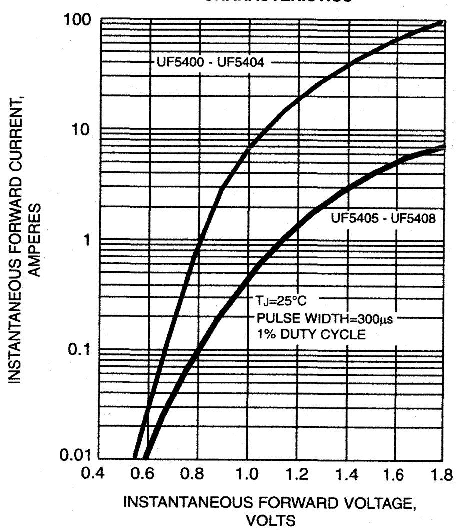


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

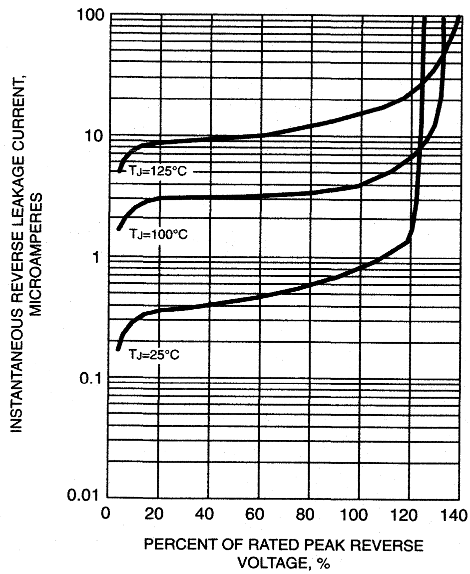
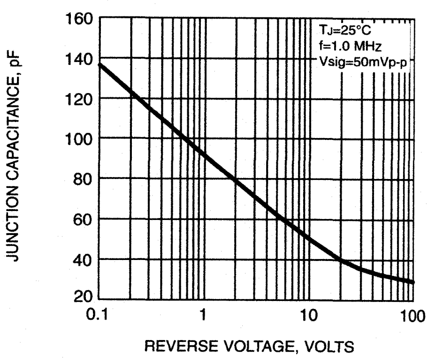


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



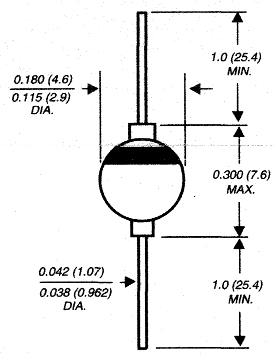
BYV28-50 THRU BYV28-200

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts*   ***Forward Current** - 3.5 Amperes*

PATENTED*

Case Style G4

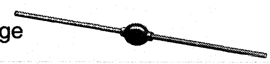


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Hermetically sealed package
- ♦ Low leakage current
- ♦ High surge capability
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYV28-50	BYV28-100	BYV28-150	BYV28-200	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Minimum reverse breakdown voltage at 100µA	$V_{(BR)}$	55	110	165	220	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=85°C	$I_{(AV)}$	3.5				Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load (JEDEC Method) at T_J=175°C	I_{FSM}	90.0				Amps
Maximum instantaneous forward voltage at 3.5A T_J=25°C / T_J=175°C	V_F	1.1 / 0.89				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=165°C	I_R	1.0 / 150.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	30.0				ns
Typical junction capacitance (NOTE 2)	C_J	100.0				pF
Typical thermal resistance (NOTE 3, 4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B.

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

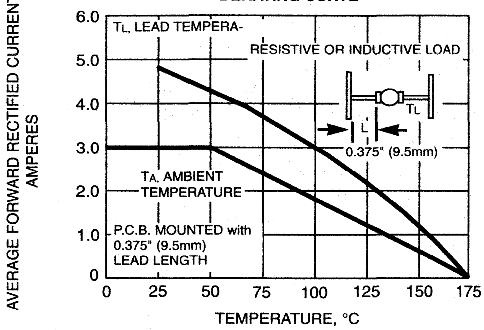


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

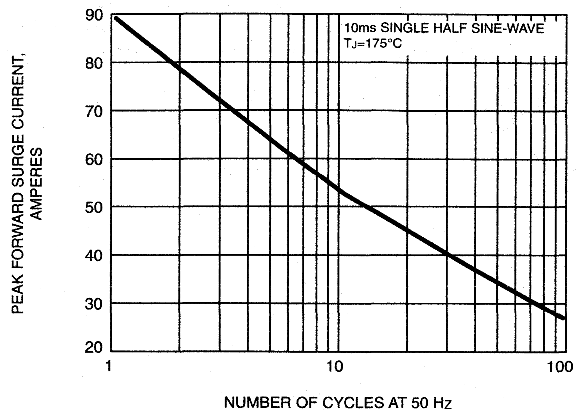


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

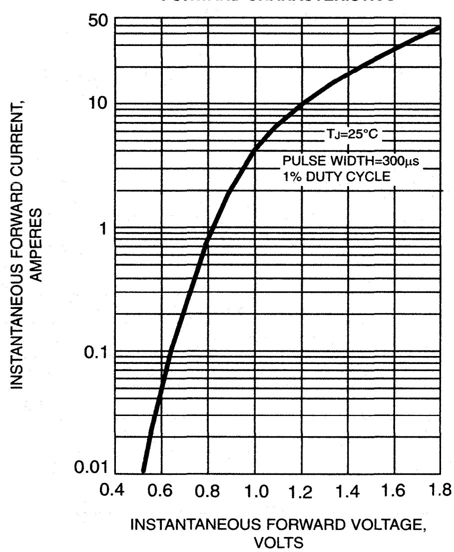


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

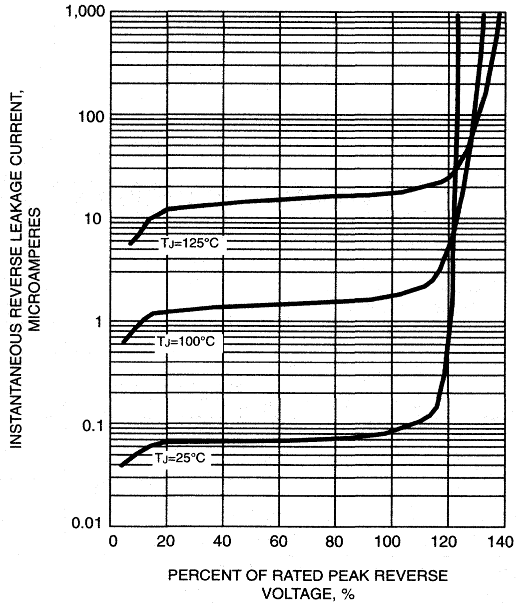
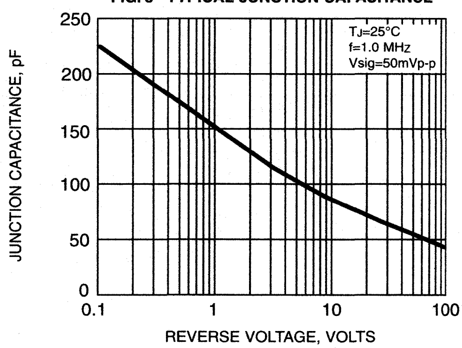


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

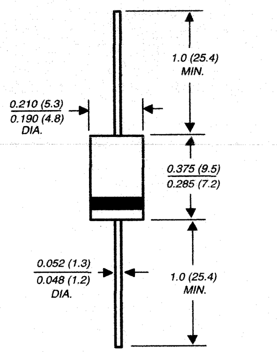


UG4A THRU UG4D

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 4.0 Amperes*

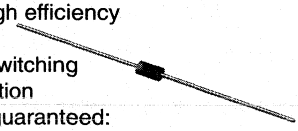
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- ♦ Ultrafast recovery time for high efficiency
- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ Nitride oxide passivated junction
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG4A*	*UG4B*	*UG4C*	*UG4D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=75°C	$I_{(AV)}$	4.0				Amps
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	150.0				Amps
Maximum instantaneous forward voltage at 4.0A	V_F	0.95				Volts
Maximum DC reverse current at rated DC blocking voltage — T_A=25°C / T_A=100°C	I_R	5.0 / 300.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time (NOTE 2) — T_J=25°C / T_J=100°C	t_{rr}	30.0 / 50.0				ns
Maximum recovered stored charge (NOTE 2) — T_J=25°C / T_J=100°C	Q_{rr}	15.0 / 30.0				nC
Typical junction capacitance (NOTE 3)	C_J	20.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$	25.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) t_{rr} and Q_{RR} measured at tester: I_F=4.0A, V_R=30V, di/dt=50A/μs, Irr=10% I_{RM} for measurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

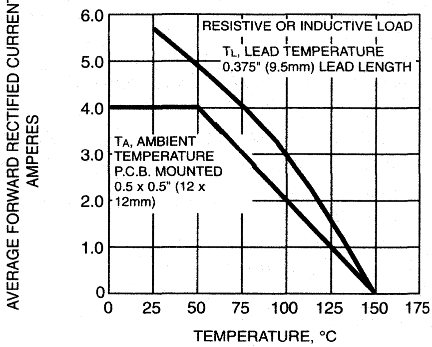


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

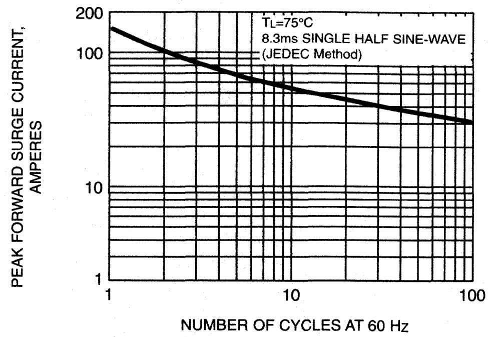


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

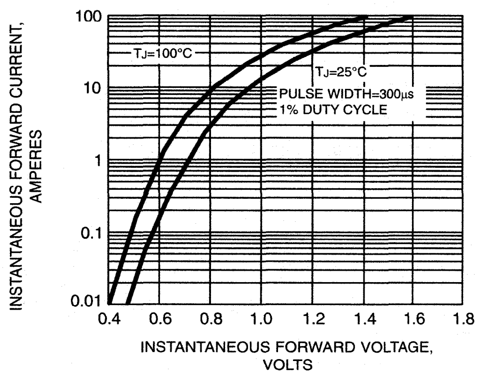


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

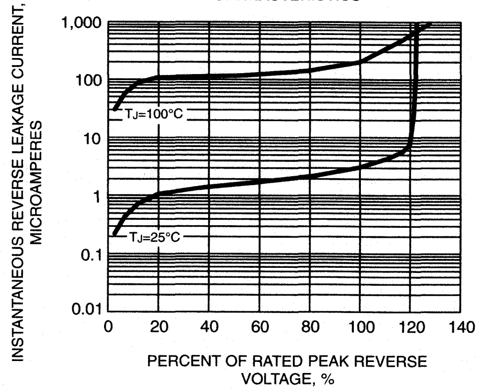


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS

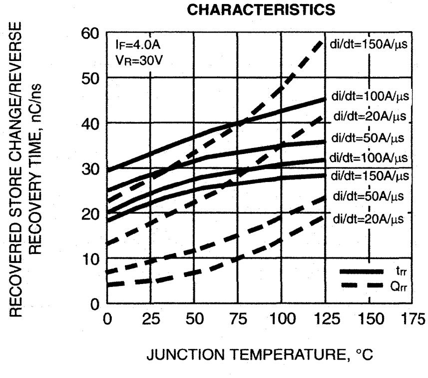
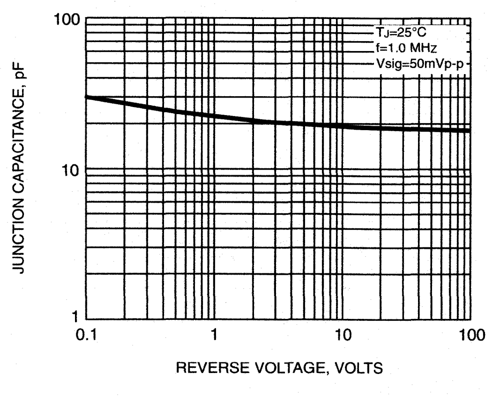


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



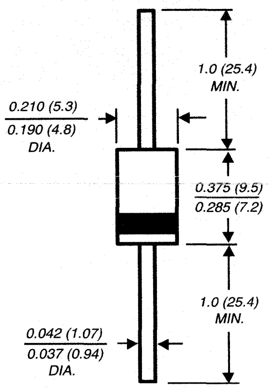
EGP50A THRU EGP50G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 400 Volts* ***Forward Current** - 5.0 Amperes*

PATENTED*

Case Style GP20

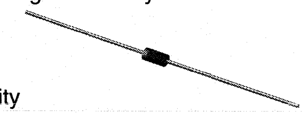


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602, brazed-lead assembly by Patent No. 3,930,306*

FEATURES

- Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- Glass passivated cavity-free junction
- Superfast recovery time for high efficiency
- Low forward voltage, high current capability
- Low leakage current
- High surge current capability
- High temperature metallurgically bonded construction
- High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over solid glass body
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	EGP 50A	EGP 50B	EGP 50C	EGP 50D	EGP 50F	EGP 50G	UNITS
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=55°C	$I_{(AV)}$	5.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load	I_{FSM}	150.0						Amps
Maximum instantaneous forward voltage at 5.0A	V_F	0.95				1.25		Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 50.0						μA
Maximum reverse recovery time (NOTE 1)	trr	50.0						ns
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	20.0 5.0						°C\W
Typical junction capacitance (NOTE 3)	C_J	95				75		pF
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Thermal resistance from junction to ambient and from junction of lead at 0.375" (9.5mm) lead length, both leads measured to heat sinks
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

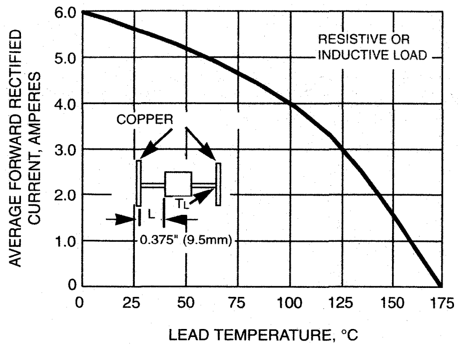


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

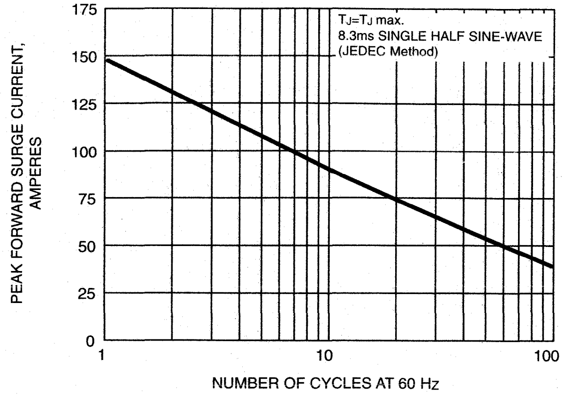


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

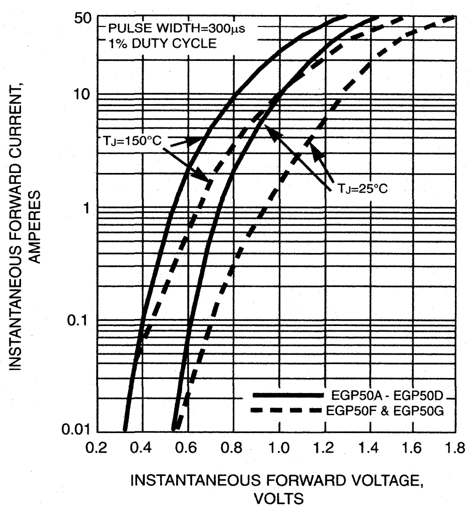


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

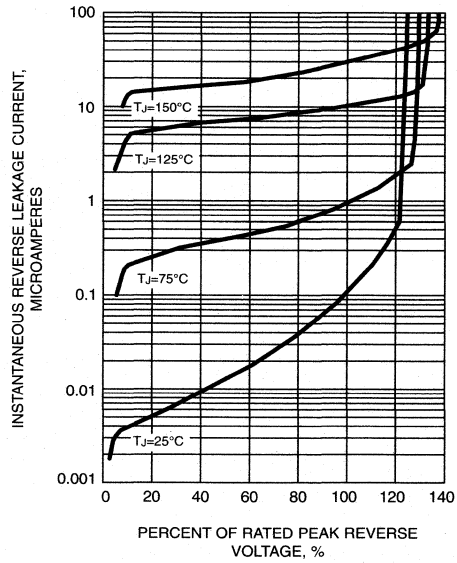


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

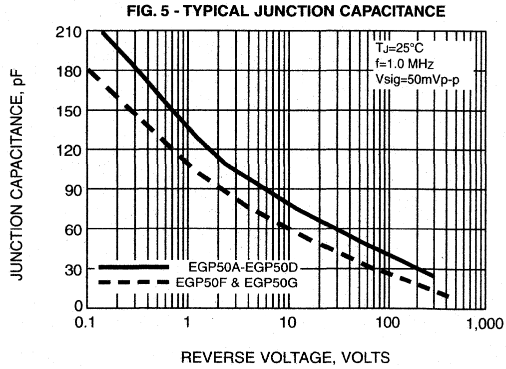
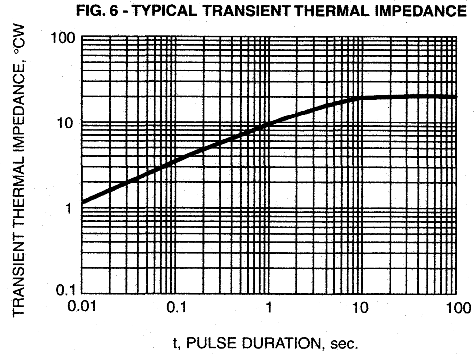


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



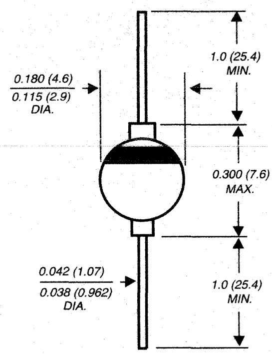
FE5A THRU FE5D

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 5.0 Amperes*

PATENTED*

Case Style G4



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Super fast recovery time for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Hermetically sealed package

- ♦ Low leakage current
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FE5A*	*FE5B*	*FE5C*	*FE5D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length T_L=55°C	$I_{(AV)}$	5.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	135.0				Amps
Maximum instantaneous forward voltage at 5.0A	V_F	0.95				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 50.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	100.0				pF
Typical thermal resistance (NOTE 3, 4)	$R_{\Theta JA}$ $R_{\Theta JL}$	55.0 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(3) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B.

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

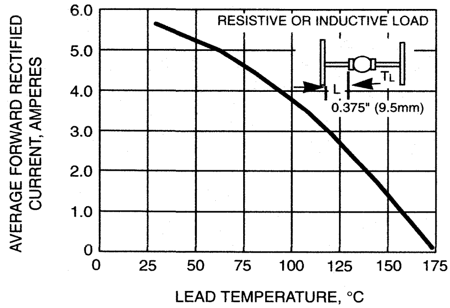


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

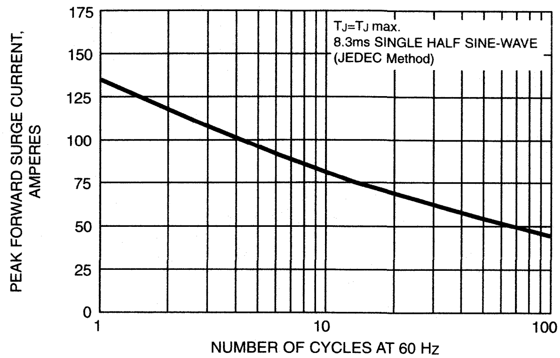


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

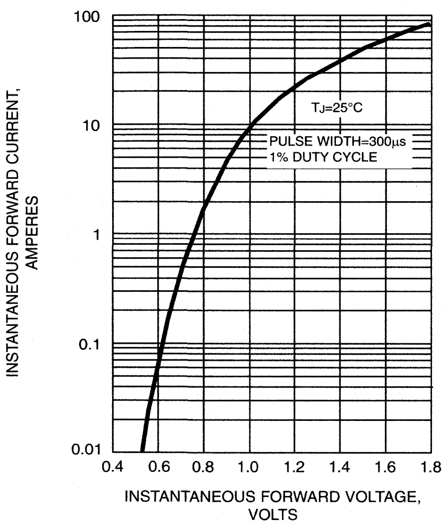


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

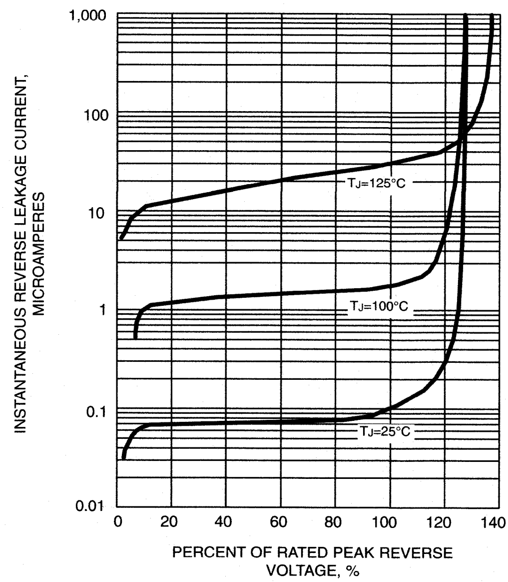
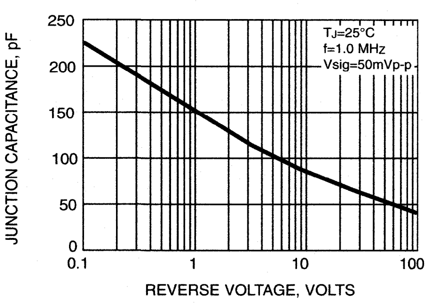


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



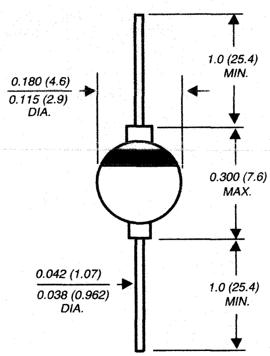
FE6A THRU FE6D

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

Reverse Voltage *- 50 to 200 Volts* ***Forward Current*** *- 6.0 Amperes*

PATENTED*

Case Style G4

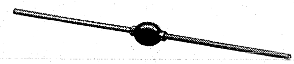


Dimensions in inches and (millimeters)

* *Brazed lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Superfast recovery time-for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Hermetically sealed package
- ♦ Low leakage current
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs, (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FE6A*	*FE6B*	*FE6C*	*FE6D*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=55°C	$I_{(AV)}$	6.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	135.0				Amps
Maximum instantaneous forward voltage at 6.0A	V_F	0.975				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 50.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	100.0				pF
Typical thermal resistance (NOTE 3, 4)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 18.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to lead at 0.375" (9.5mm) lead length with both leads attached to heatsinks
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length and mounted on P.C.B.

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FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

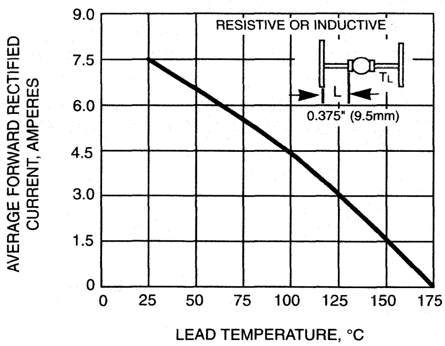


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

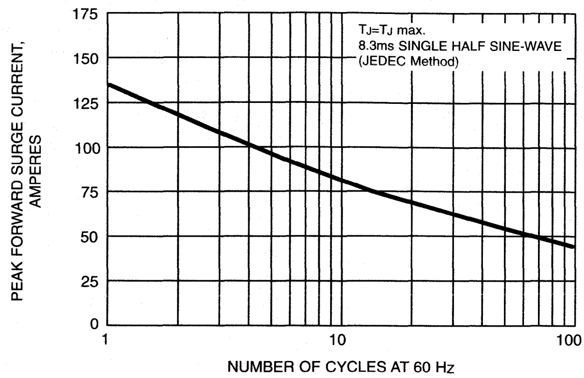


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

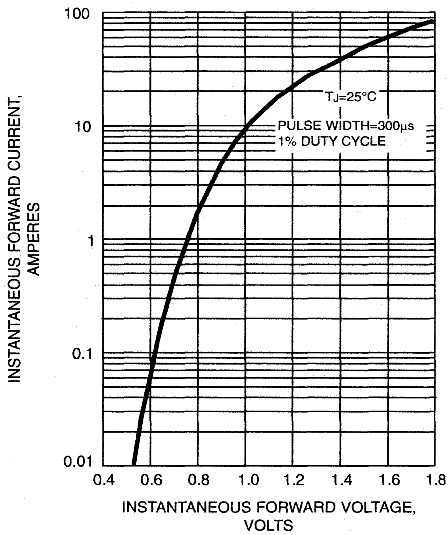


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

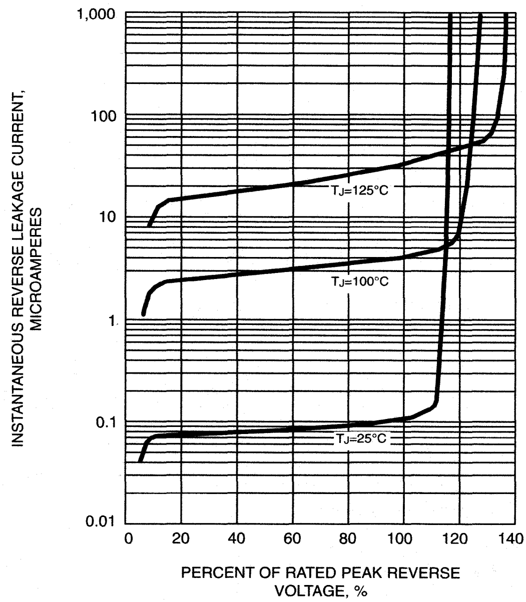
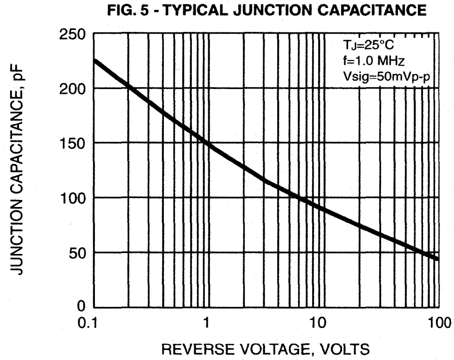


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

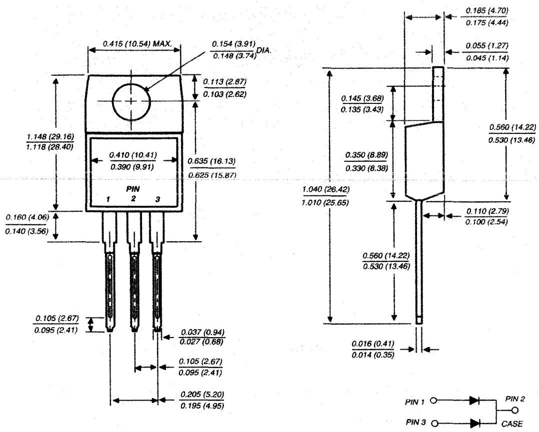


FEP6AT THRU FEP6DT

FAST EFFICIENT PLASTIC RECTIFIER

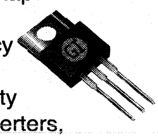
***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 6.0 Amperes*

TO-220AB



Dimensions are in inches and (millimeters)

FEATURES



- ♦ Plastic package has carries Underwriters Laboratory Flammability Classification 94V-0
- ♦ Dual rectifier construction, positive center-tap
- ♦ Glass passivated chip junctions
- ♦ Superfast recovery times for high efficiency
- ♦ Low power loss
- ♦ Low forward voltage, high current capability
- ♦ For use in low voltage, high frequency inverters, free wheeling and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chips
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lb. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FEP6AT*	*FEP6BT*	*FEP6CT*	*FEP6DT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current T_C=100°C	$I_{(AV)}$	6.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0				Amps
Maximum instantaneous forward voltage per leg at 3.0A	V_F	0.975				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 50.0				μA
Maximum reverse recovery time per leg (NOTE 1)	t_{rr}	35.0				ns
Typical thermal resistance (NOTE 2) / (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JC}$	20.0 / 3.6				°C/W
Typical junction capacitance per leg (NOTE 4)	C_J	28.0				pF
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_r=1.0A, I_{rr}=0.25A
(2) Thermal resistance from junction to ambient in free air, no heatsink
(3) Thermal resistance from junction to case per leg mounted on heatsink
(4) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts

FIG. 1 - FORWARD CURRENT DERATING CURVE

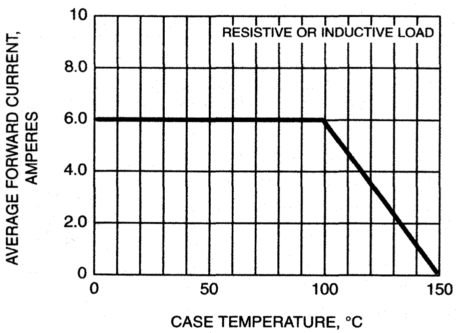


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

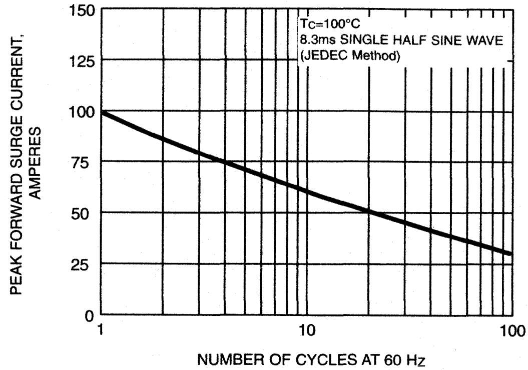


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

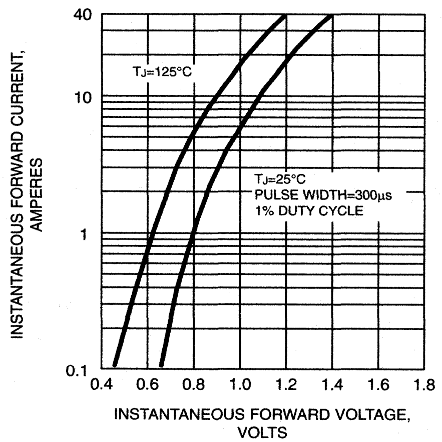


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

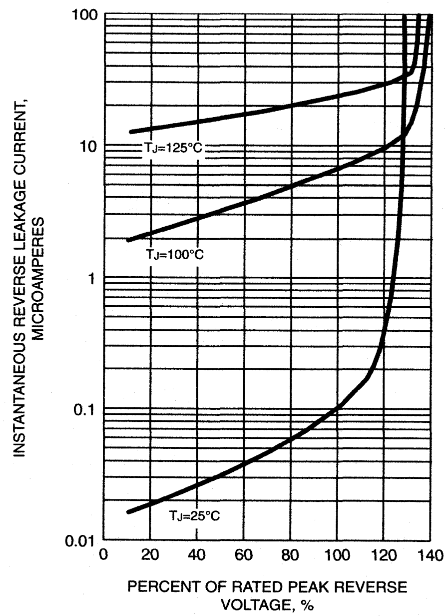
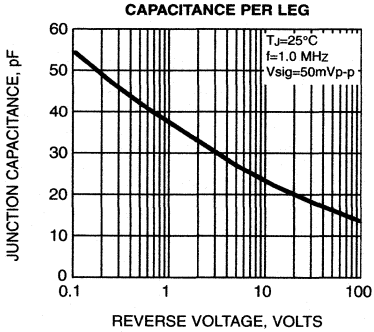


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

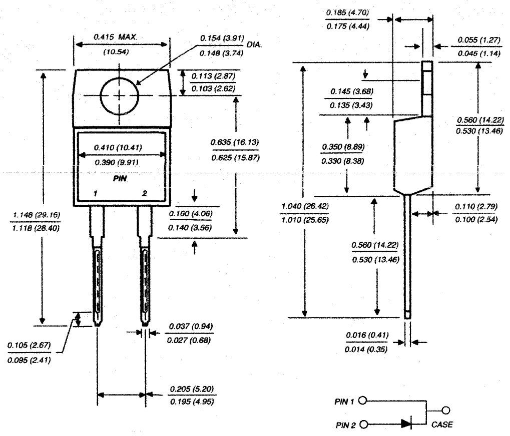


BYW29-50 THRU BYW29-200

FAST EFFICIENT PLASTIC RECTIFIER

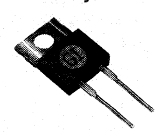
***Reverse Voltage** - 50 to 200 Volts* *__Forward Current__ - 8.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- Low power loss
- Low leakage current
- High surge current capability
- Superfast recovery time for high efficiency
- High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body over passivated chip
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BYW29-50*	*BYW29-100*	*BYW29-150*	*BYW29-200*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=125°C	$I_{(AV)}$	8.0				Amps
Peak forward surge current 10ms single half sine-wave superimposed T_J=150°C	I_{FSM}	100.0				Amps
Maximum instantaneous forward voltage at: I_F=20A, T_J=25°C I_F=8A, T_J=150°C	V_F	1.3 0.8				Volts
Maximum DC reverse current at rated DC blocking voltage T_C=25°C T_C=100°C	I_R	10.0 500.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	25.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JC}$	20.0 3.0				°C/W
Operating and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=1A, V_R=30V, di/dt=100A/μs, I_{rr}=10%, I_{RM} for measurement of t_{rr}
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient in free air; no heatsink
(4) Thermal resistance from junction to case mounted on heatsink

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

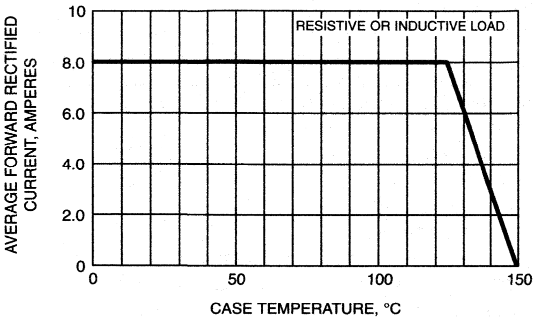


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

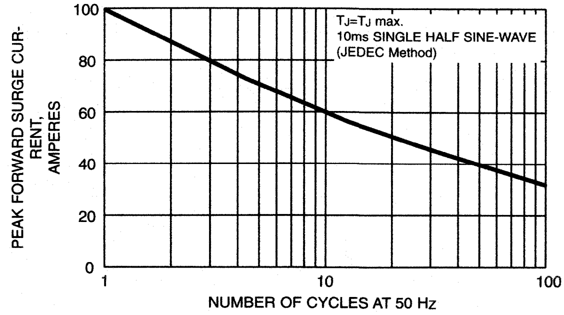


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

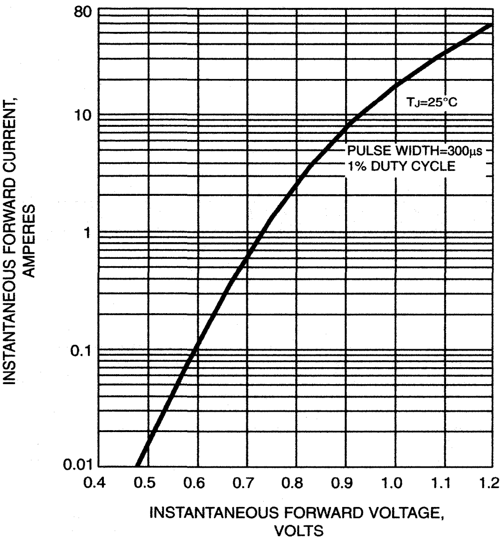


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

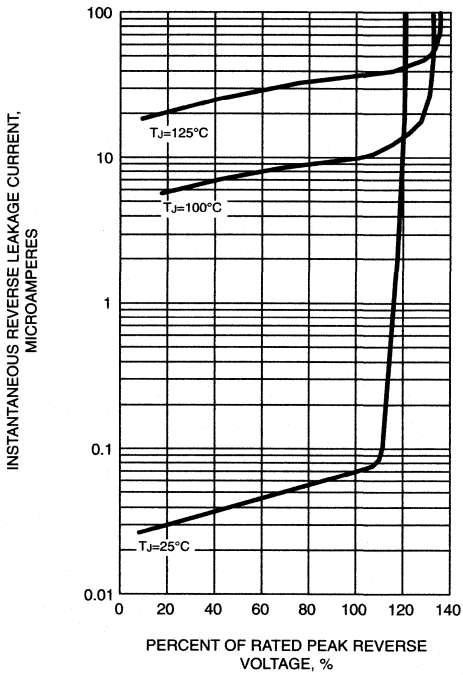
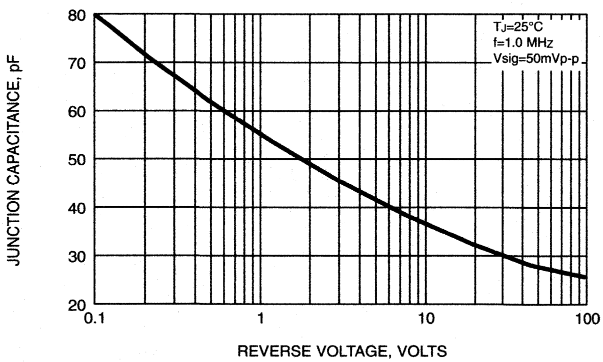


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

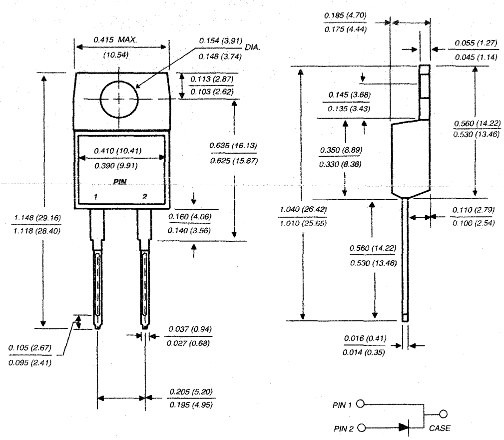


FES8AT THRU FES8JT

FAST EFFICIENT PLASTIC RECTIFIER

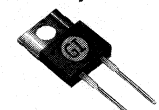
***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 8.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- Low leakage, high voltage
- High surge current capability
- Superfast recovery time, for high efficiency
- High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AC fully overmolded plastic body over passivated chip
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	FES 8AT	FES 8BT	FES 8CT	FES 8DT	FES 8FT	FES 8GT	FES 8HT	FES 8JT	UNITS
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	8.0								Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0								Amps
Maximum instantaneous forward voltage at 8.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC reverse current T_C=25°C at rated DC blocking voltage at T_C=100°C	I_R	10.0 500.0								µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				50.0				ns
Typical junction capacitance (NOTE 2)	C_J	85.0						60.0		pF
Typical thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JC}$	15.0 2.2								°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150								°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient in free air, no heatsink
(4) Thermal resistance from junction to case mounted on heatsink

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVES

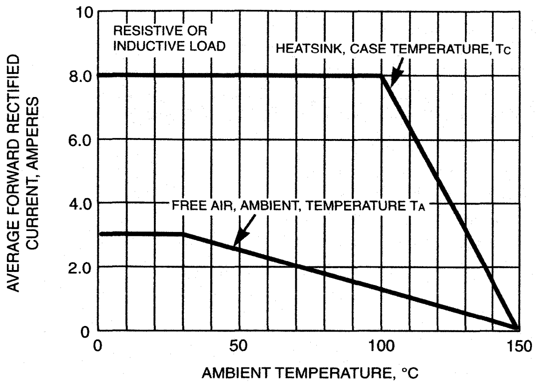


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

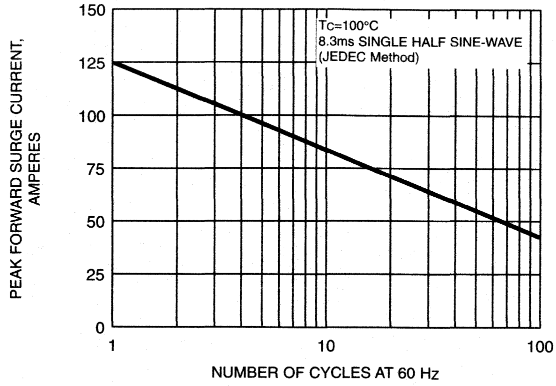


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

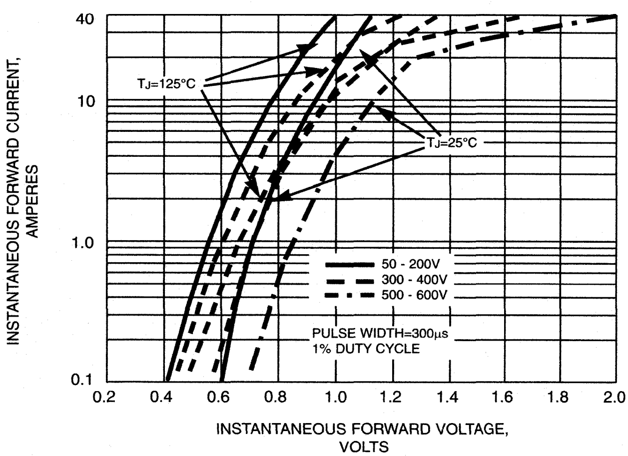


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

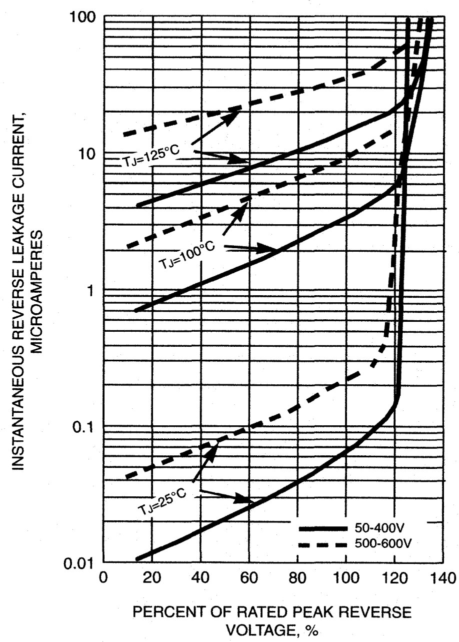
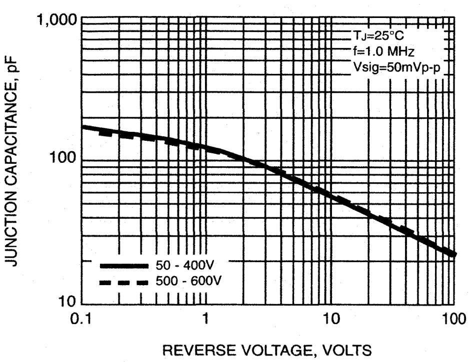


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

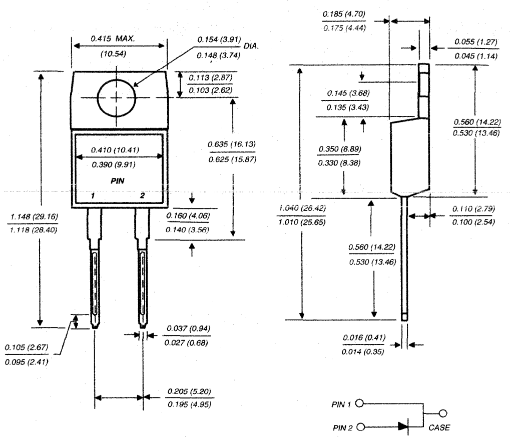


GI1401 THRU GI1404

FAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 8.0 Amperes*

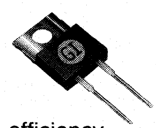
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- Low power loss
- Low leakage current
- High surge capability
- Superfast recovery time for high efficiency
- High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body over passivated chip
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI1401*	*GI1402*	*GI1403*	*GI1404*	*UNITS*
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=125°C	$I_{(AV)}$	8.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=125°C	I_{FSM}	125.0				Amps
Maximum instantaneous forward voltage at: I_F=4A, T_J=100°C I_F=8A, T_J=100°C I_F=4A, T_J=25°C I_F=8A, T_J=25°C	V_F	 0.800 0.895 0.900 0.975				Volts
Maximum DC reverse current T_C=25°C at rated DC blocking voltage T_C=100°C	I_R	5.0 150.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	35.0				ns
Typical junction capacitance (NOTE 2)	C_J	85.0				pF
Typical thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JC}$	15.0 2.25				°C/W
Operating and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient in free air, no heatsink
(4) Thermal resistance from junction to case mounted on heatsink

FIG. 1 - FORWARD CURRENT DERATING CURVES

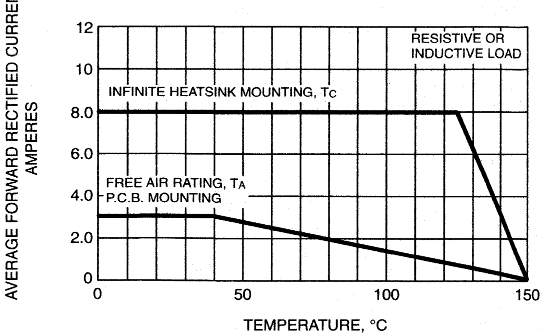


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

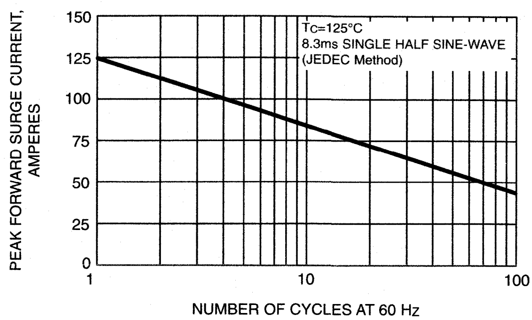


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

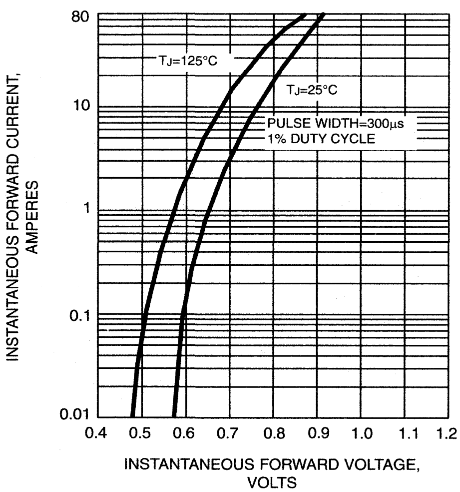


FIG. 4 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

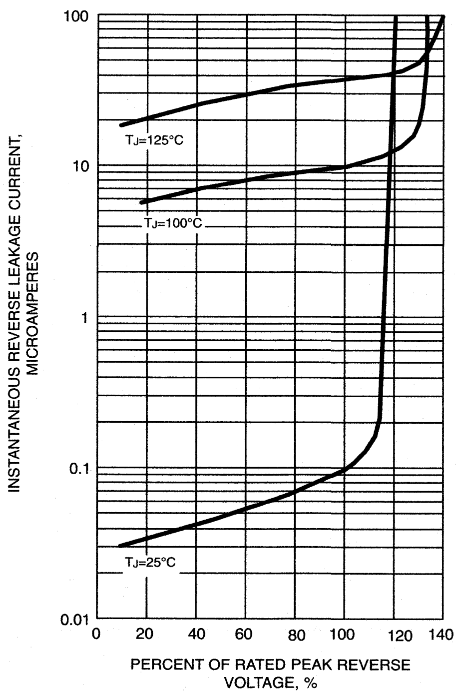
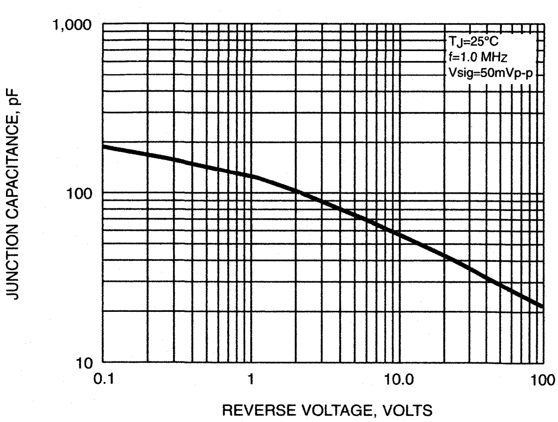


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

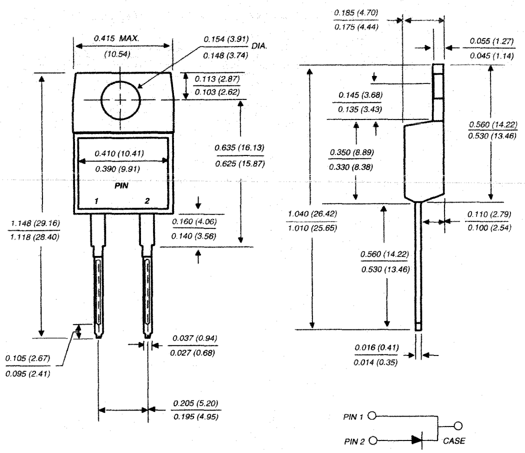


UG8AT THRU UG8DT

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 8.0 Amperes*

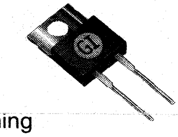
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diode
- ♦ Ultrafast reverse recovery time for high efficiency
- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ Nitride oxide passivated chip junction
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5in. - lbs. max.
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG8AT*	*UG8BT*	*UG8CT*	*UG8DT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	8.0				Amps
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=100°C	I_{FSM}	150.0				Amps
Maximum instantaneous forward voltage at 8.0 20A 5.0A, T_J=150°C	V_F	1.00 1.20 0.95				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 300.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time T_J=25°C (NOTE 2) T_J=100°C	t_{rr}	30.0 50.0				ns
Maximum recovered stored charge T_J=25°C (NOTE 2) T_J=100°C	Q_{rr}	20.0 45.0				nC
Typical junction capacitance (NOTE 3)	C_J	45.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JC}$	4.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to+150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) T_{rr} and Q_{rr} measured at I_F=8.0A, V_R=30V, di/dt=50A/μs, I_{rr}=10% I_{RM} for meaurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to case

FIG. 1 - FORWARD CURRENT DERATING CURVE

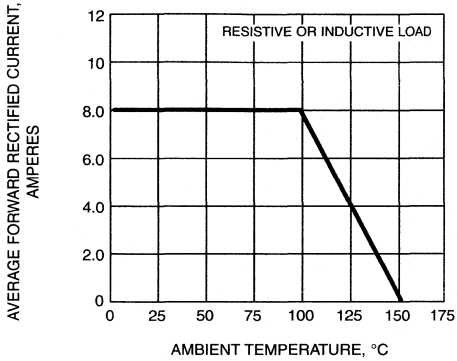


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

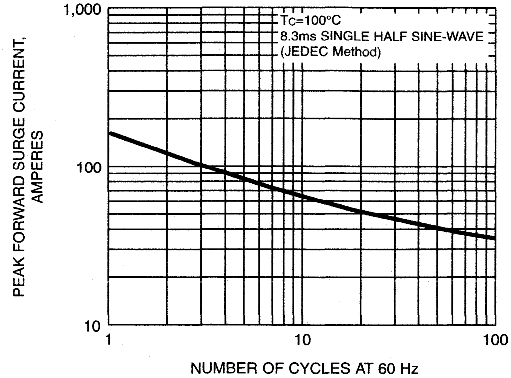


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

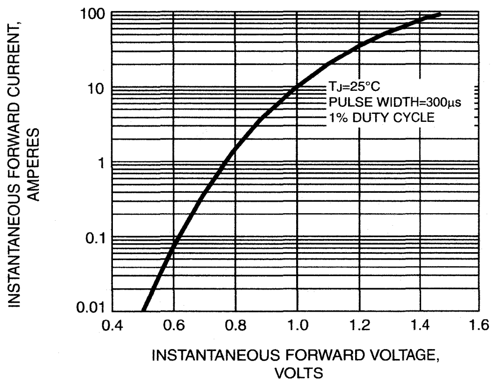


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

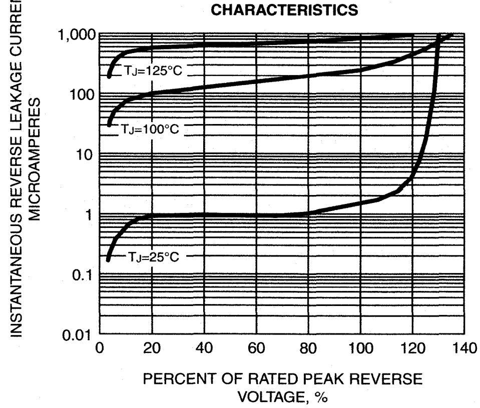


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS

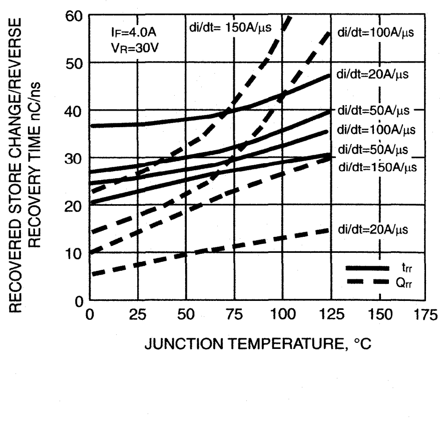
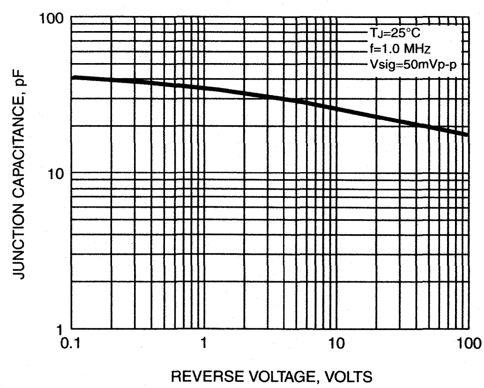


FIG. 6 - TYPICAL JUNCTION CAPACITANCE

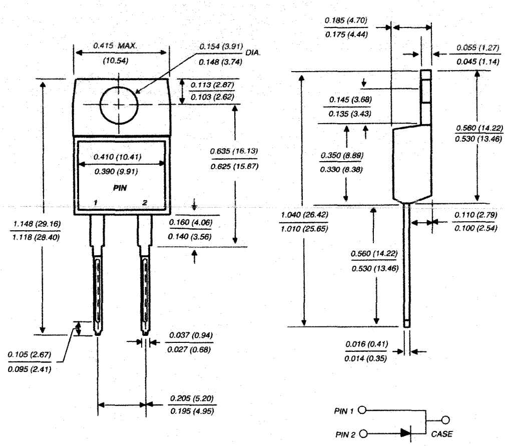


FES16AT THRU FES16JT

FAST EFFICIENT PLASTIC RECTIFIER

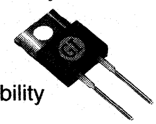
Reverse Voltage *- 50 to 600 Volts* ***Forward Current*** *- 16.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- Low power loss
- Low forward voltage, high current capability
- High surge current capability
- Superfast recovery time, for high efficiency
- High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body over passivated chips
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FES 16AT*	*FES 16BT*	*FES 16CT*	*FES 16DT*	*FES 16FT*	*FES 16GT*	*FES 16HT*	*FES 16JT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=100°C	I_{FSM}	250.0								Amps
Maximum instantaneous forward voltage at 16A	V_F	0.975				1.3		1.5		Volts
Maximum DC reverse current T_C=25°C at rated DC blocking voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum reverse recovery time (NOTE1)	t_{rr}	35.0				50.0				ns
Typical junction capacitance (NOTE 2)	C_J	175.0						145.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JC}$	16.0 1.2								°C/W
Operating and storage temperature range	T_J, T_{STG}	-65 to +150								°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to case and ambient mounted on heatsink

FIG. 1 - FORWARD CURRENT DERATING CURVE

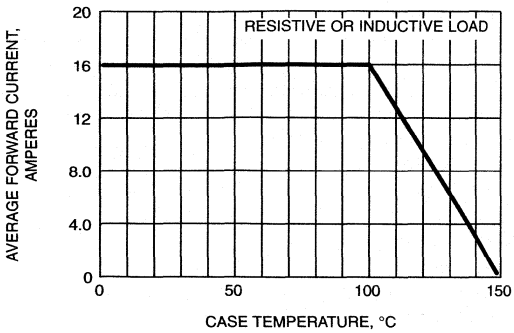


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

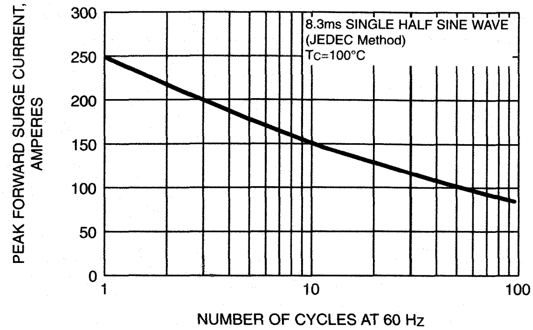


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS

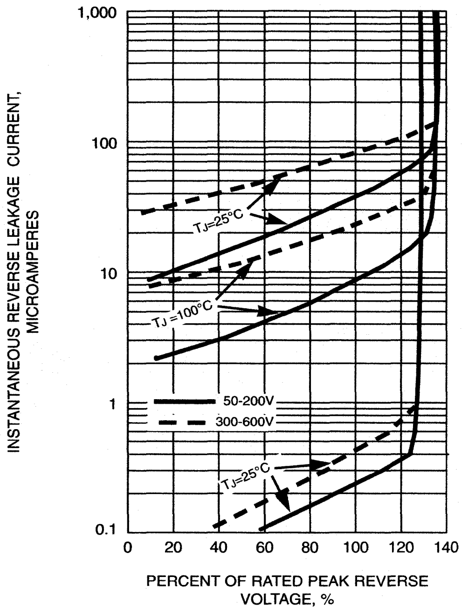


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

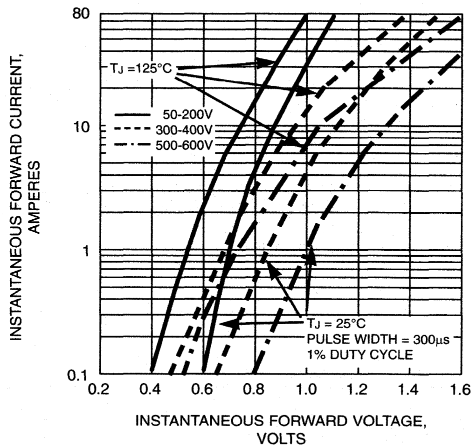
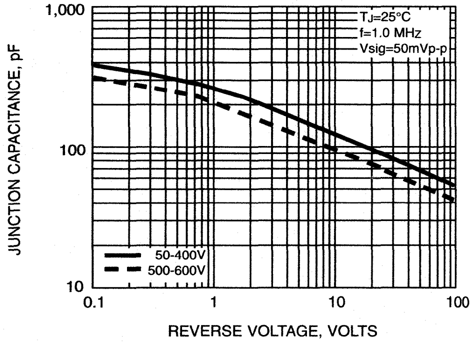


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

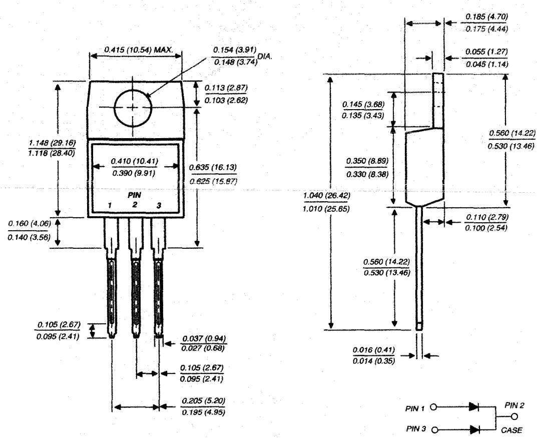


FEP16AT THRU FEP16JT

FAST EFFICIENT PLASTIC RECTIFIER

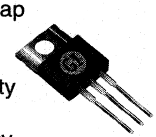
Reverse Voltage *- 50 to 600 Volts* ***Forward Current*** *- 16.0 Amperes*

TO-220AB



Dimensions are in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Dual rectifier construction, positive centertap
- ♦ Glass passivated chip junctions
- ♦ Low power loss
- ♦ Low forward voltage, high current capability
- ♦ High surge current capability
- ♦ Superfast recovery times for high efficiency
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chips
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	FEP 16AT	FEP 16BT	FEP 16CT	FEP 16DT	FEP 16FT	FEP 16GT	FEP 16HT	FEP 16JT	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=100°C	I_{FSM}	200.0								Amps
Maximum instantaneous forward voltage per leg at 8.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC reverse current T_C=25°C at rated DC blocking voltage per leg T_C=100°C	I_R	10.0 500.0								μA
Maximum reverse recovery time (NOTE 1) per leg	t_{rr}	35.0				50.0				ns
Typical junction capacitance per leg (NOTE 2)	C_J	85.0						60.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JC}$	15.0 2.2								°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150								°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to case per leg mounted on heatsink

General Instrument
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FIG. 1 - FORWARD CURRENT DERATING CURVE

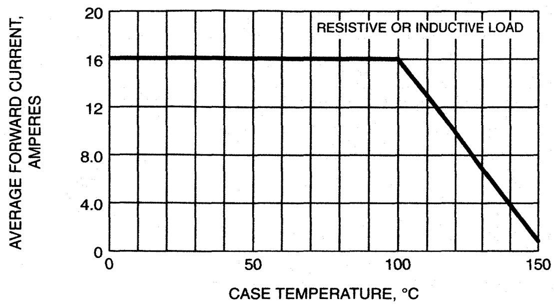


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

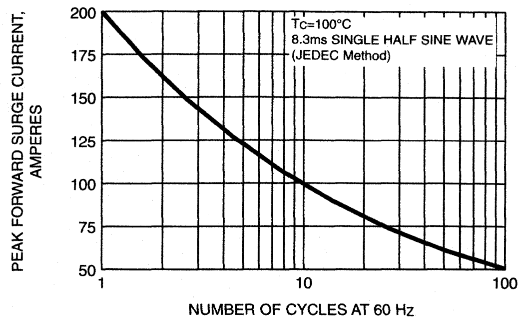


FIG. 3 -TYPICAL REVERSE CHARACTERISTICS PER LEG

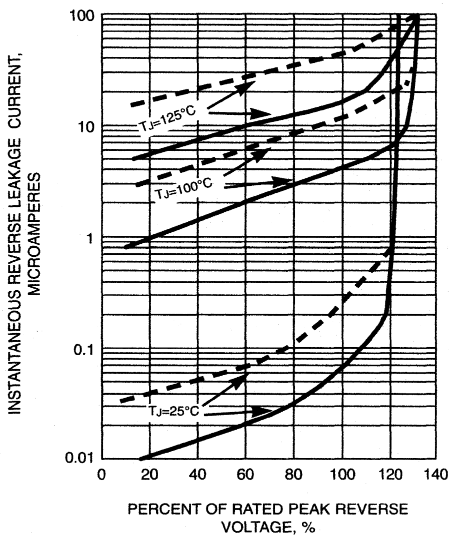


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

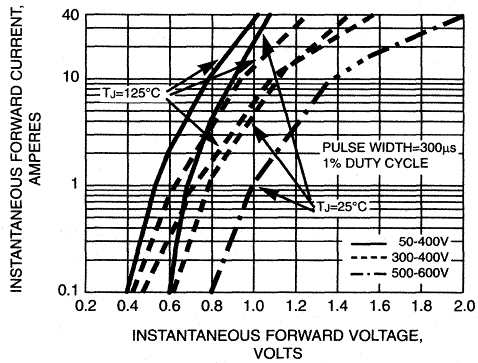
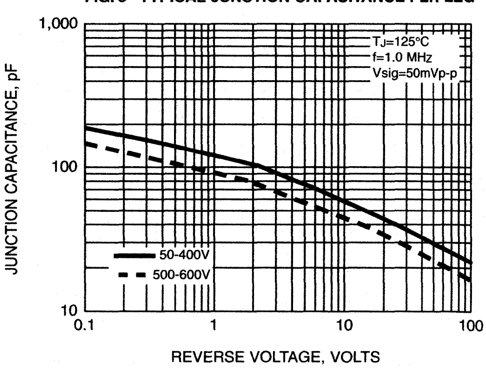


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

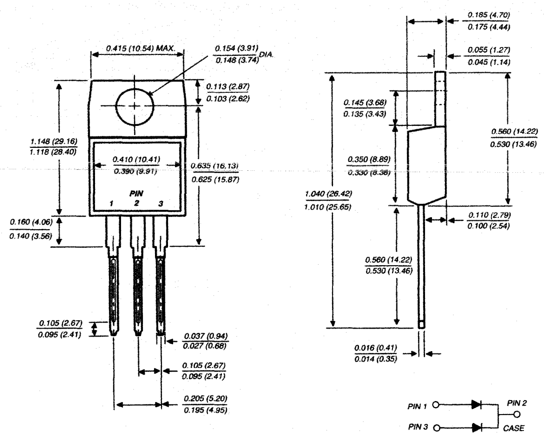


GI2401 THRU GI2404

GLASS PASSIVATED PLASTIC RECTIFIER

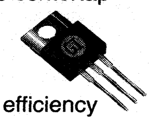
***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 16.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Dual rectifier construction, positive centertap
- ♦ Glass passivated chip junctions
- ♦ Low power loss
- ♦ High surge capability
- ♦ Superfast recovery times for high efficiency
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chips
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI2401*	*GI2402*	*GI2403*	*GI2404*	*UNITS*
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=125°C	$I_{(AV)}$	16.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=125°C	I_{FSM}	125.0				Amps
Maximum instantaneous forward voltage per leg at: I_F=4A, T_J=25°C I_F=8A, T_J=25°C I_F=4A, T_J=100°C I_F=8A, T_J=100°C	V_F	0.975 0.900 0.800 0.895				Volts
Maximum DC reverse current T_C=25°C at rated DC blocking voltage T_C=100°C	I_R	50.0 150.0			5.0 500.0	μA
Maximum reverse recovery time per leg (NOTE1)	t_{rr}	35.0				ns
Typical junction capacitance per leg (NOTE 2)	C_J	85.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JC}$	16.0 2.2				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to case and from junction to ambient per leg mounted on heatsink

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FIG. 1 -FORWARD CURRENT DERATING CURVE

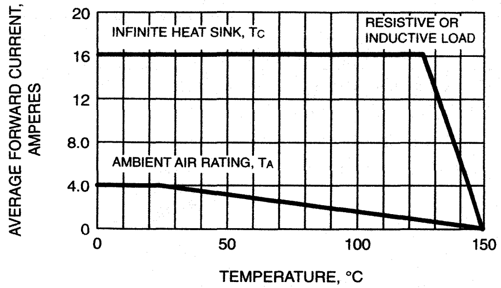


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

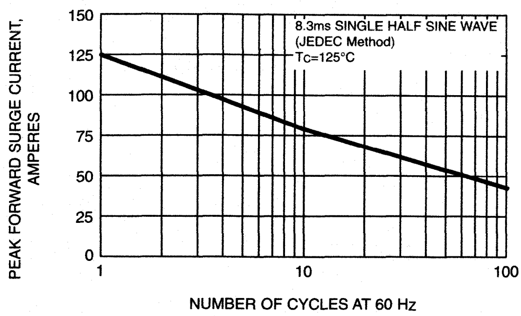


FIG.3 -TYPICAL REVERSE CHARACTERISTICS PER LEG

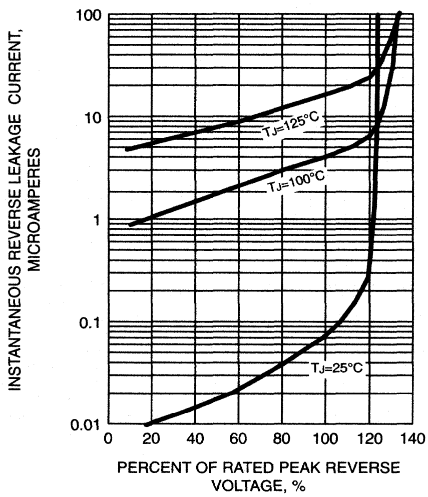


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

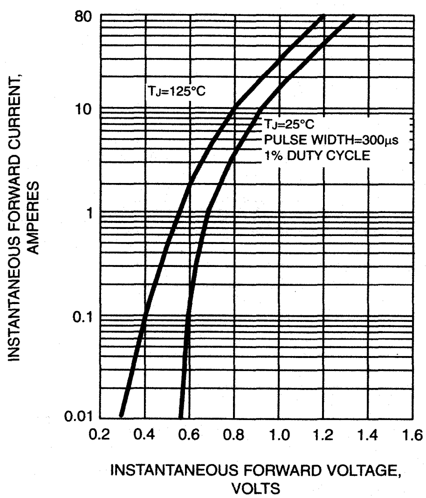
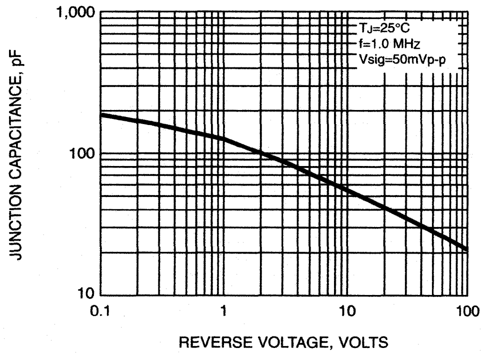


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

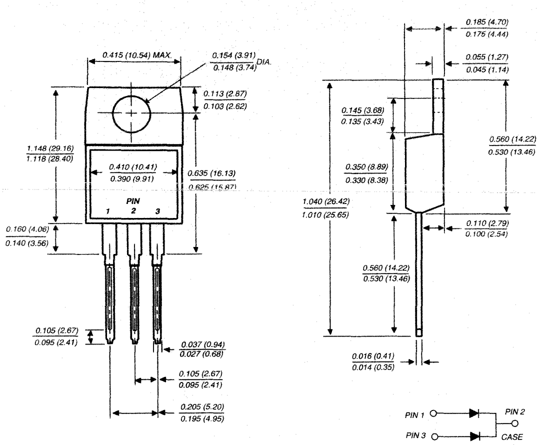


BYV32-50 THRU BYV32-200

FAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 150 Volts* ***Forward Current** - 18.0 Amperes*

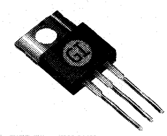
TO-220AB



Dimensions in inches and (millimeters)

FEATURES

- ♦ Dual rectifier construction, positive centertap
- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated chip junctions
- ♦ Low power loss
- ♦ Low forward voltage, high current capability
- ♦ High surge capability
- ♦ Superfast recovery time for high efficiency
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chips
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BYV32-50*	*BYV32-100*	*BYV32-150*	*BYV32-200*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=120°C	$I_{(AV)}$	18.0				Amps
Peak forward surge current 10ms single half sine-wave superimposed at at T_J=150°C	I_{FSM}	150.0				Amps
Maximum instantaneous forward voltage per leg at: I_F=20A, I_F=5.0A, T_J=100°C	V_F	1.15 0.85				Volts
Maximum DC reverse current at rated DC blocking voltage T_C=25°C T_C=100°C	I_R	10.0 600.0				μA
Maximum reverse recovery time per leg (NOTE 1)	t_{rr}	25.0				ns
Typical junction capacitance (NOTE 2)	C_J	45.0				pF
Maximum thermal resistance per leg (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JC}$	20.0 3.0				°C/W
Operating and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=1A V_R=30V, di/dt=100A/μs, Irr=10% I_{RM}
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to case per leg mounted on heatsink

General Instrument
Power Semiconductor Division

FIG.1 - FORWARD CURRENT DERATING CURVE

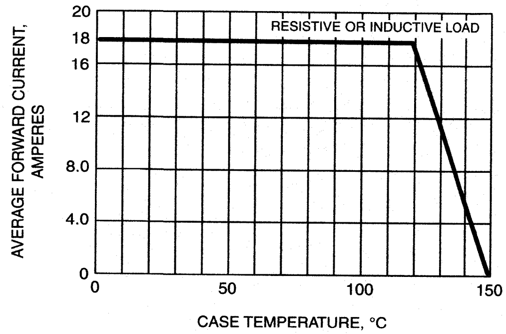


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

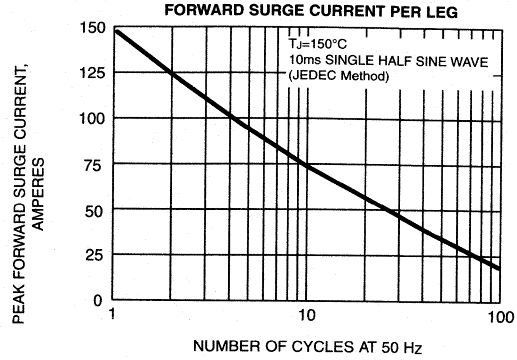


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

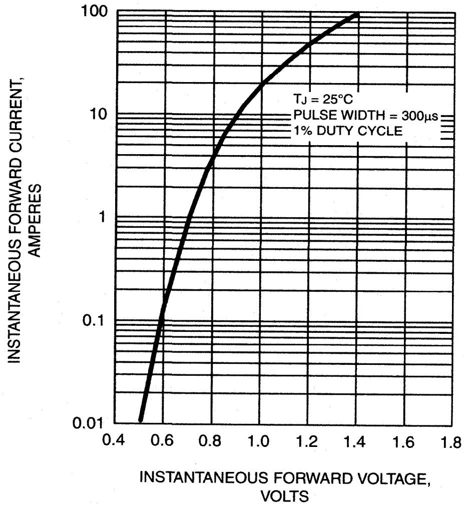


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

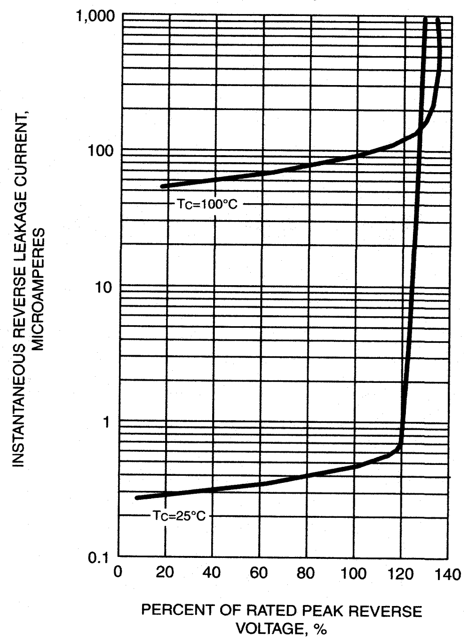
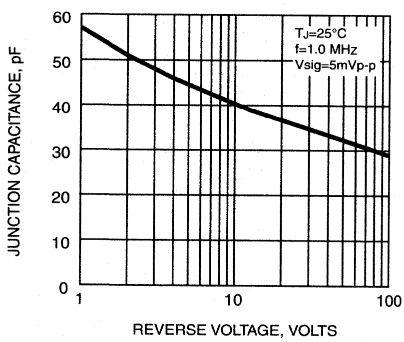


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

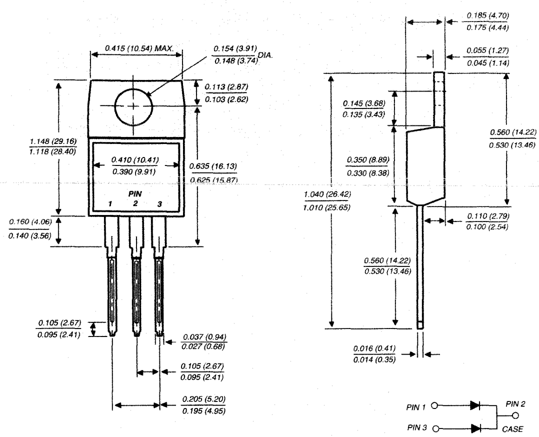


UG18ACT THRU UG18DCT

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 18.0 Amperes*

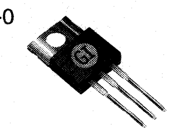
TO-220AB



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diode



- ♦ Ultrafast 25 nanosecond reverse recovery times
- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ Nitride oxide passivated junctions
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) case for 10 seconds

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chips
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG18ACT*	*UG18BCT*	*UG18CCT*	*UG18DCT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=105°C	$I_{(AV)}$	18.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) per leg at T_C=105°C	I_{FSM}	175.0				Amps
Maximum instantaneous forward voltage per leg at 9.0A 20A 5.0A, T_J=100°C	V_F	1.10 1.20 0.95				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage per leg T_A=100°C	I_R	10.0 300.0				µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time T_J=25°C (NOTE 2) T_J=100°C	t_{rr}	30.0 50.0				ns
Maximum recovered stored charge T_J=25°C (NOTE 2) T_J=100°C	Q_{rr}	20.0 45.0				nC
Typical junction capacitance (NOTE 3)	C_J	30.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JC}$	4.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) t_{rr} and Q_{rr} measured at: I_F=9.0A, V_R=30V, di/dt=50A/µs, I_{rr}=10% I_{RM}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to case per leg

FIG. 1 -FORWARD CURRENT DERATING CURVE

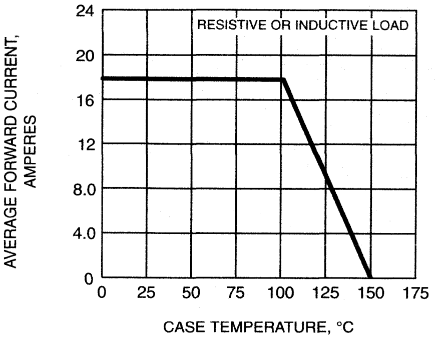


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

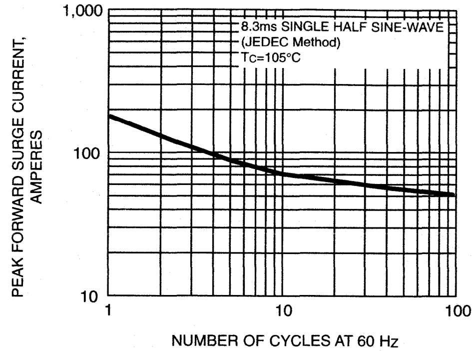


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

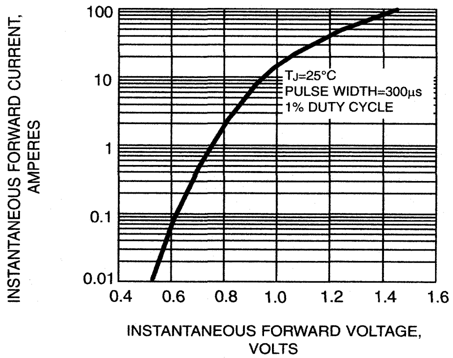


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

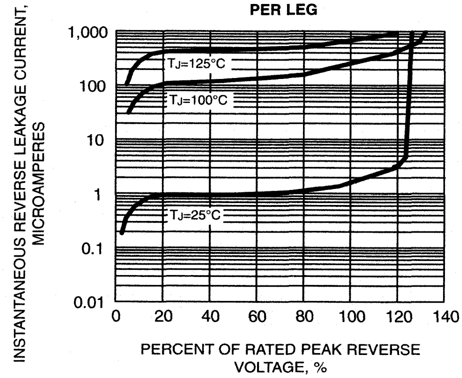


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

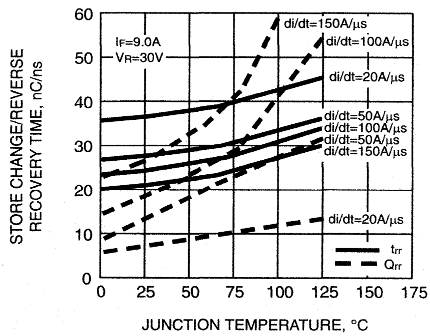
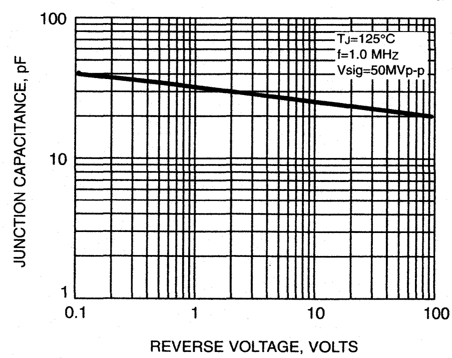


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG

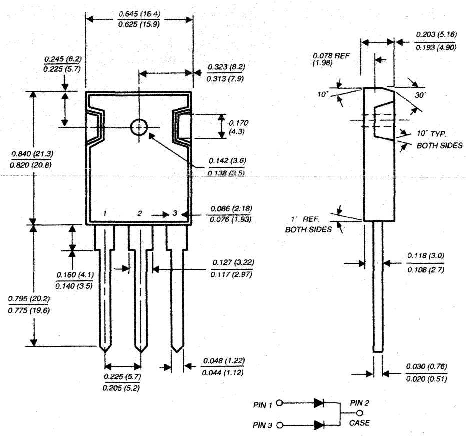


FEP30AP THRU FEP30JP

FAST EFFICIENT PLASTIC RECTIFIER

Reverse Voltage *- 50 to 600 Volts* ***Forward Current*** *- 30.0 Amperes*

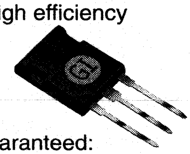
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Dual rectifier construction, positive center-tap
- ♦ Glass passivated chip junctions
- ♦ Superfast recovery times for high efficiency
- ♦ Low forward voltage, high current capability
- ♦ Low thermal resistance
- ♦ Low power loss
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body over passivated chips
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in. - lbs. max.
Weight: 0.22 ounce, 6.3 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*FEP 30AP*	*FEP 30BP*	*FEP 30CP*	*FEP 30DP*	*FEP 30FP*	*FEP 30GP*	*FEP 30HP*	*FEP 30JP*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	30.0								Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=100°C	I_{FSM}	300.0								Amps
Maximum instantaneous forward voltage per leg at 15.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC reverse current at rated DC blocking voltage T_C=25°C / T_C=100°C	I_R	10.0 / 500.0								μA
Maximum reverse recovery time time (NOTE 1) per leg	t_{rr}	35.0				50.0				ns
Typical junction capacitance per leg (NOTE 2)	C_J	175.0						145.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JC}$	1.0								°C/W
Operating storage and temperature range	T_J, T_{STG}	-55 to +150								°C

NOTES:
1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to case per leg mounted on heatsink

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

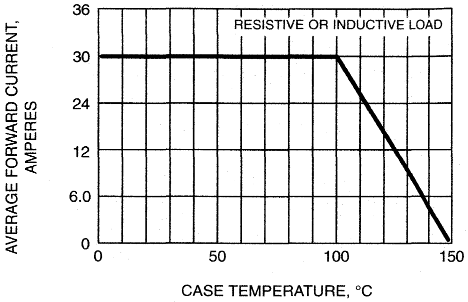


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

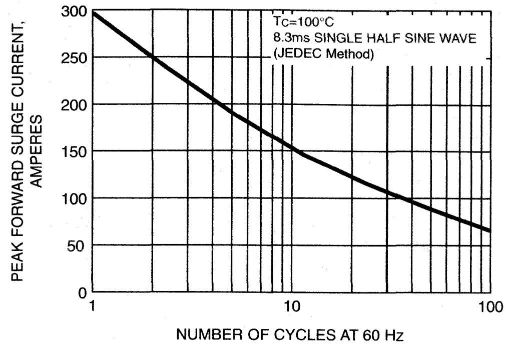


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

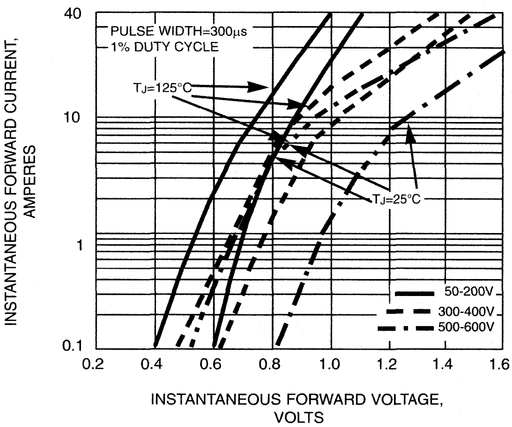


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

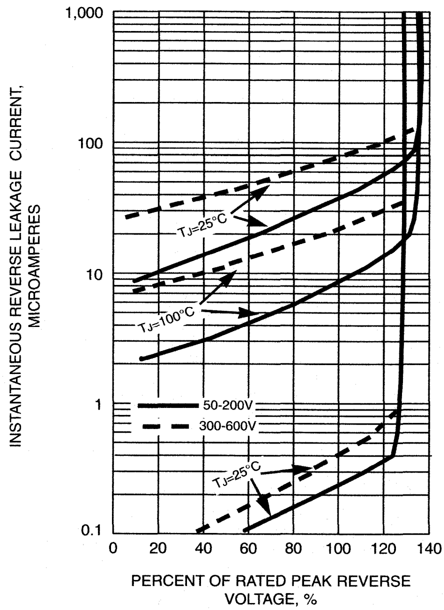
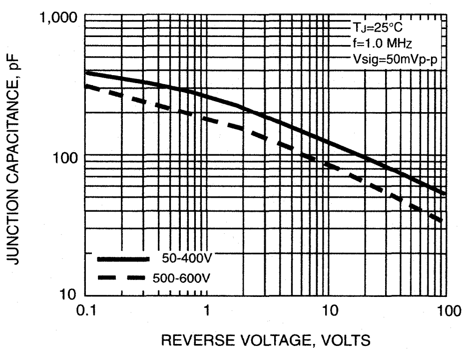


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

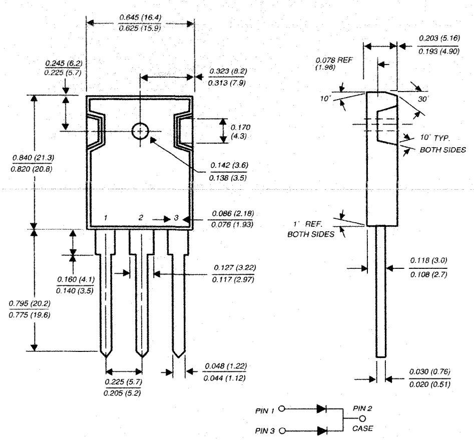


UG30APT THRU UG30DPT

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 200 Volts* ***Forward Current** - 30.0 Amperes*

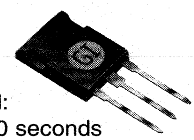
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- ♦ Ultrafast, 15 nanosecond typical recovery time
- ♦ Low leakage current
- ♦ Nitride oxide passivated chip junctions
- ♦ Soft recovery characteristics
- ♦ Excellent high temperature switching
- ♦ High temperature soldering guaranteed: 250°C, 0.16" (4.06mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body over passivated chips
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 2.2 ounces, 6.3 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*UG30APT*	*UG30BPT*	*UG30CPT*	*UG30DPT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC blocking voltage	V_{DC}	50	100	150	200	Volts
Maximum average forward rectified current at T_C=120°C	$I_{(AV)}$	30.0				Amps
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) at T_C=120°C	I_{FSM}	300.0				Amps
Maximum instantaneous forward voltage per leg at 15A 30A 10A T_J=100°C	V_F	1.0 1.15 0.85				Volts
Maximum DC reverse current at T_A =25°C rated DC blocking voltage per leg T_A =100°C	I_R	5.0 800.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0				ns
Maximum reverse recovery time T_J= 25°C (NOTE 2) T_J=100°C	t_{rr}	35.0 50.0				ns
Maximum recovered stored charge T_J=25°C (NOTE 2) T_J=100°C	Q_{rr}	22.0 50.0				nC
Typical junction capacitance (NOTE 3)	C_J	70.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JC}$	2.0				°C/W
Operating and storage temperature range	T_J, T_{STG}	-65 to +150				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R =1.0A, Irr=0.25A
(2) t_{rr} and Q_{rr} measured at: I_F=15A V_R=30V, di/dt=50 A/μs, I_{RR}=10% I_{RM} for measurement of t_{rr}
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to case per leg mounted on heatsink

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FIG. 1 - FORWARD CURRENT DERATING CURVE

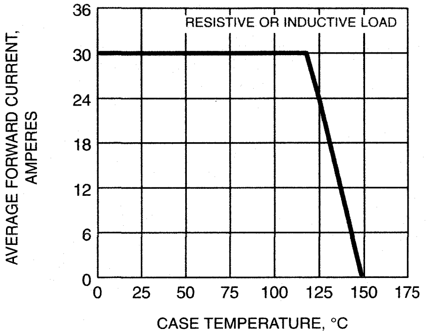


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

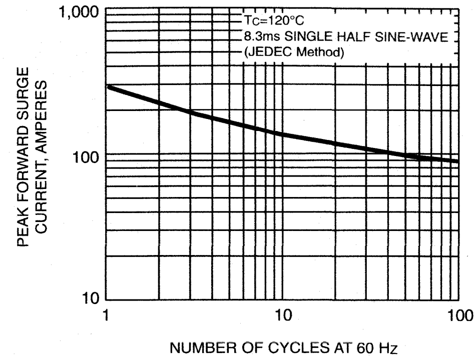


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

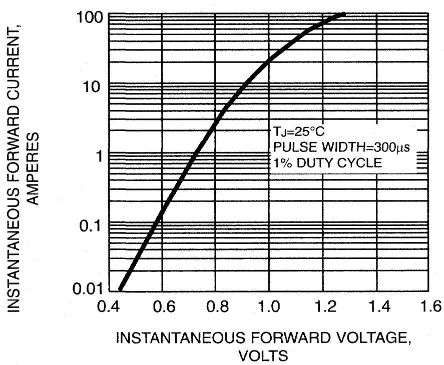


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

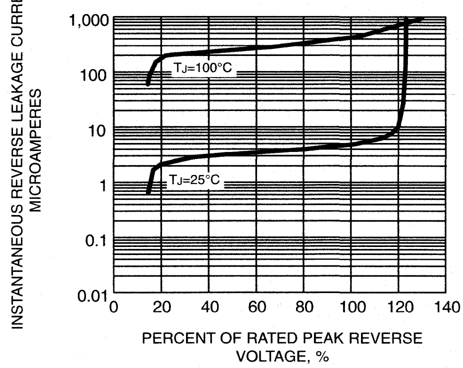


FIG. 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

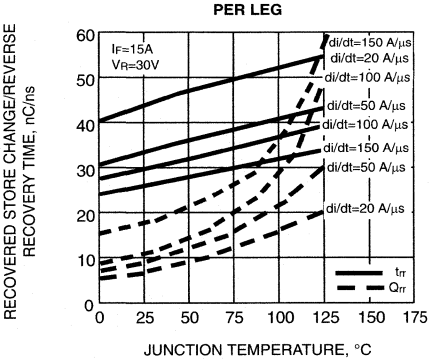
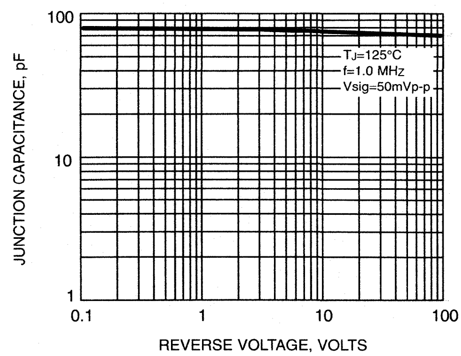


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG



General Instrument
Power Semiconductor Division

GLASS

GLASS PASSIVATED RECTIFIERS

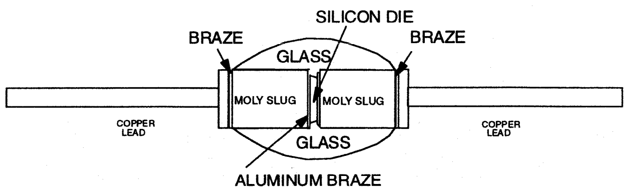
0.2 AMPERE TO 3.0 AMPERES
50 VOLTS TO 1600 VOLTS

INTRODUCTION TO GLASS RECTIFIERS

The glass passivated rectifier is a hermetically sealed, cavity free, diffused junction rectifier with unsurpassed operating and surge capabilities at high temperature. An extremely pure specially developed glass applied in direct contact with the silicon junction, creates an ideal cavity free passivating medium.

The materials (glass-silicon-molybdenum) in the device were carefully developed to be thermally matched to ensure uniform expansion characteristics over a broad range of temperature extremes. Furthermore, only high temperature brazing operations and a glass fusing process performed in excess of 600°C are utilized in the construction of this device. These techniques eliminate solder construction and tremendously enhances mechanical strength and temperature cycling capability. This results in increased operating and storage temperature ranges while reducing thermal resistance.

The following cross section is an example of this type of construction.



FAMILIES OF GENERAL INSTRUMENT GLASS PASSIVATED RECTIFIERS

GLASS PASSIVATED JUNCTION RECTIFIERS 1.0 TO 3.0 AMPERES

TYPES:	FEATURES:
1N4245 thru 1N4249	♦ Glass Passivated Junction
1N5059 thru 1N5062	♦ High Mechanical Strength
1N5614 thru 1N5622	♦ Storage up to 200°C
1N5550 thru 1N5554	♦ Voidless Construction
G1A thru G1M	♦ Hermetically Sealed
G2A thru G2M	♦ Avalanche Operation
G3A thru G3M	♦ Low Leakage
G4A thru G4J	♦ High Conductance
	♦ Tin Plated Axial Leads, Solderable per MIL-STD-750, Method 2026

GLASS PASSIVATED FAST RECOVERY JUNCTION RECTIFIERS 1.0 TO 3.0 AMPERES

TYPES:	FEATURES:
1N4292 thru 1N4949	♦ Glass Passivated Junction
1N5615 thru 1N5623	♦ Fast Switching for High Rectification Efficiency to 100 kHz
1N5415 thru 1N5420	♦ High Mechanical Storage
RG1A thru RG1M	♦ Low Leakage
RG2A thru RG2M	♦ Hermetically Sealed
RG3A thru RG3M	♦ Storage up to 200°C
RG4A thru RG4M	♦ Tin Plated Axial Leads, Solderable per MIL-STD-750, Method 2026

HIGH VOLTAGE GLASS PASSIVATED JUNCTION RECTIFIERS 1.0 TO 3.0 AMPERES

TYPES:	FEATURES
CG1, DG1	♦ All Advantages of Hermetically Sealed Glass Passivated Junction
CG2, DG2	♦ Specially designed for Clamper/Damper Applications in Television/CRT circuitry
CG3, DG3	♦ Low Leakage, V_R ratings of 1400 Volts to 1600 Volts
GI1-1200 thru GI1-1600	♦ High Mechanical Strength
	♦ Tin Plated Axial Leads, Solderable per MIL-STD-750, Method 2026

GLASS PASSIVATED RECTIFIERS

Part numbering system for all parts excluding JEDEC registered, Pro Electron and industry standard parts.

AGXY - ZZZ

A = Type Designator
C = Clamper
D = Damper
R = Recovery
"Blank" = Standard

G = Glass

X = Forward Current
1 = 1 Amp
2 = 2 Amps
3 = 3 Amps
4 = 4 Amps/40 mil leads

Y = Reverse Voltage
A = 50V
B = 100V
D = 200V
G = 400V
J = 600V
K = 800V
M = 1000M

ZZZZ = Customer specific instructions
(not shown in databook)

For JEDEC and ProElectron part numbers, please see P/N explanations on page 2

QUICK GUIDE TO GLASS PASSIVATED RECTIFIERS

TYPE	1N4245 thru 1N4249	1N4942* thru 1N4948*	1N5059 thru 1N5062	1N5614 thru 1N5622	1N5615* thru 1N5623*	G1A thru G1M	RG1A* thru RG1M*
CASE	DO-204AP	DO-204AP	DO-204AP	DO-204AP	DO-204AP	DO-204AP	DO-204AP
I_o(A)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
@T_A(C)	55	55	55	55	55	100	55
V_R=50(V)						G1A	RG1A
V_R=100(V)						G1B	RG1B
V_R=200(V)	1N4245	1N4942	1N5059	1N5614	1N5615	G1D	RG1D
V_R=300(V)							
V_R=400(V)	1N4246	1N4944	1N5060	1N5616	1N5617	G1G	RG1G
V_R=500(V)							
V_R=600(V)	1N4247	1N4946	1N5061	1N5618	1N5619	G1J	RG1J
V_R=800(V)	1N4248	1N4947	1N5062	1N5620	1N5621	G1K	RG1K
V_R=1000(V)	1N4249	1N4948		1N5622	1N5623	G1M	RG1M
SURGE(A)	25	30	50	50	50	50	30
V_F(V)	1.2	1.3	1.2	1.2	1.2	1.1	1.3

*Fast Recovery

QUICK GUIDE TO GLASS PASSIVATED RECTIFIERS

TYPE	CG1 and DG1	G2A thru G2M	RG2A* and RG2M*	CG2 thru DG2	1N5624 thru 1N5627	1N5550 thru 1N5552	1N5415* thru 1N5420*	G3A thru G3M	G4A thru G4J	RG3A* thru RG3J*	RG4A thru RG4J	CG3 and DG3
CASE	DO-204P	DO-204P	DO-204P	DO-204P	G3	G4	G4	G3	G4	G3	G4	G3
I_O(A)	1.5	2.0		2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
@T_A(C)	55	70		55	50	70	55	70	70	55	50	50
V_R=50(V)		G2A	RG2A				1N5415	G3A	G4A	RG3A	RG4A	
V_R=100(V)		G2B	RG2B				1N5416	G3B	G4B	RG3B	RG4B	
V_R=200(V)		G2D	RG2D		1N5624	1N5550	1N5417	G3D	G4D	RG3D	RG4D	
V_R=300(V)												
V_R=400(V)		G2G	RG2G		1N5625	1N5551	1N5418	G3G	G4G	RG3G	RG4G	
V_R=500(V)							1N5419					
V_R=600(V)		G2J	RG2J		1N5626	1N5552	1N5420	G3J	G4J	RG3J	RG4J	
V_R=800(V)		G2K	RG2K		1N5627			G3K		RG3K		
V_R=1000(V)		G2M	RG2M					G3M		RG3M		
V_R>1000(V)	CG1/DG1			CG2/DG2								CG3/DG3
SURGE(A)	40	50	50	40	125	100	80	125	125	100	100	100
V_F(V)	1.1	1.0	1.2	1.3	1.1	1.0	1.2	1.1	1.1	1.3	1.3	1.2

*Fast Recovery

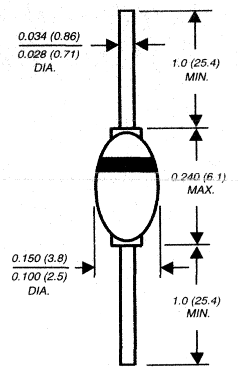
1N4245 THRU 1N4249

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

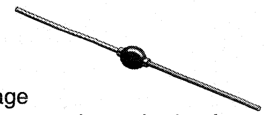
DO-204AP



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- High temperature metallurgically bonded construction
- 1.0 Ampere operation T_A=55°C with no thermal runaway
- Typical I_R less than 0.1µA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N4245*	*1N4246*	*1N4247*	*1N4248*	*1N4249*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.2					Volts
* Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	50.0					µA
* Maximum reverse current at Rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	1.0 / 25.0					µA
Typical junction capacitance (NOTE 1)	C_J	15.0					pF
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$	55.0					°C/W
* Operating junction temperature range	T_J	-65 to +160					°C
* Storage temperature range	T_{STG}	-65 to +200					°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered values

General Instrument
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FIG. 1 - FORWARD CURRENT DERATING CURVE

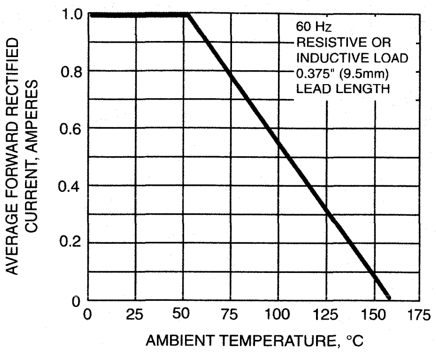


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

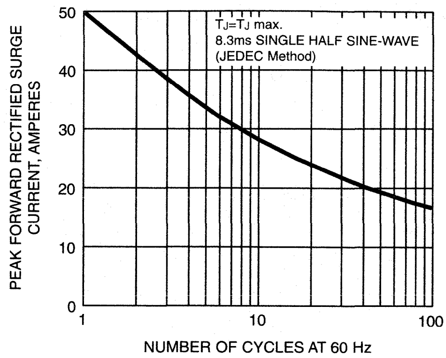


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

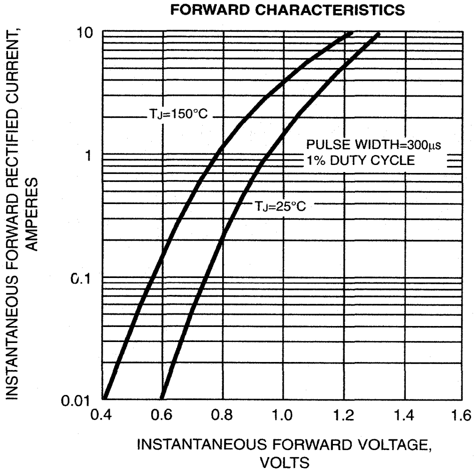


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

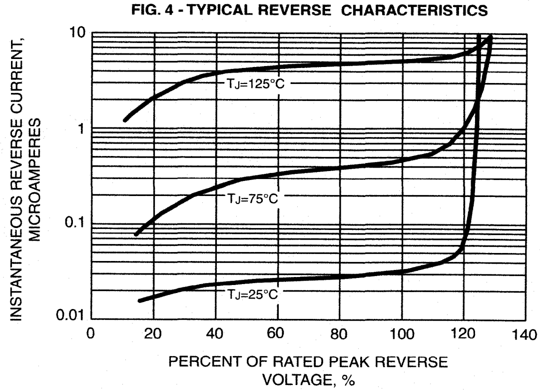
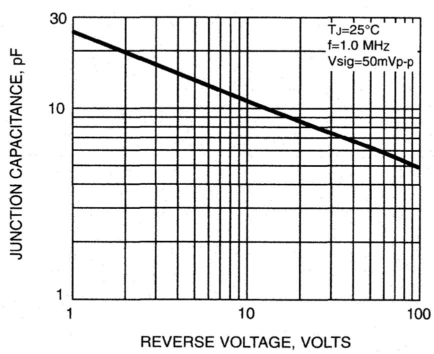


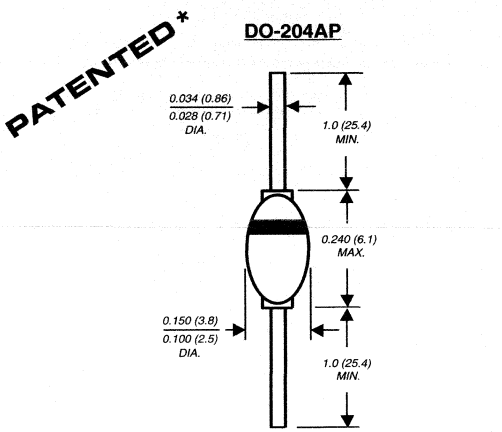
FIG. 5 - TYPICAL JUNCTION CAPACITANCE



1N4942 THRU 1N4948

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1. 0 Ampere*

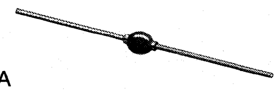


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed package
- ♦ Glass passivated cavity-free junction
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway



- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N4942*	*1N4944*	*1N4946*	*1N4947*	*1N4948*	*UNITS*
* Maximum recurrent peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Minimum reverse breakdown voltage at 50μA	$V_{(BR)}$	220	440	660	880	1100	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single halt sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	25.0					Amps
* Maximum instantaneous forward voltage at: 1.0A at 2.0A, T_A=-40°C	V_F	1.3 2.5					Volts
* Maximum DC reverse current T_A=25°C at Rated DC blocking voltage T_A=175°C	I_R	1.0 500.0					μA
* Maximum reverse recovery time (NOTE 1)	t_{rr}	150		250		500	ns
Typical junction capacitance (NOTE 2)	C_J	15.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

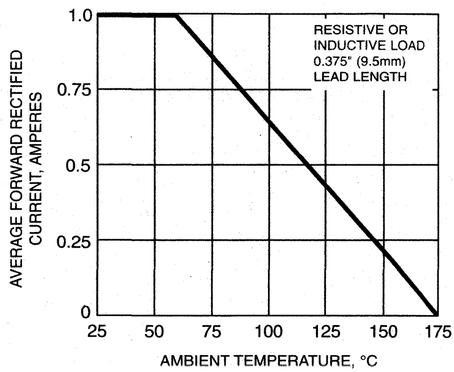


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

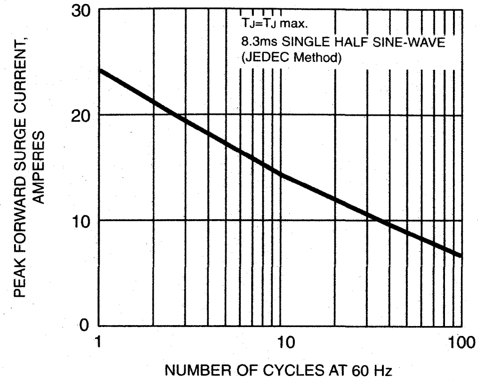


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

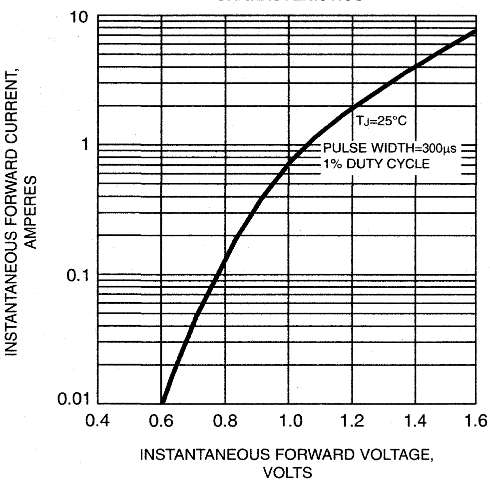


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

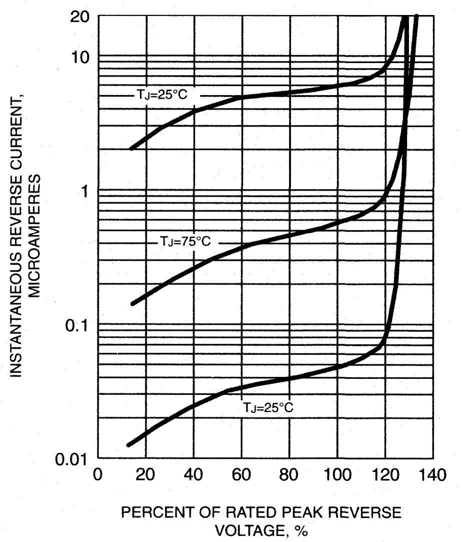
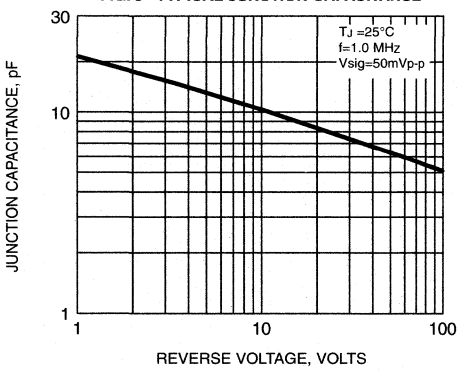


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



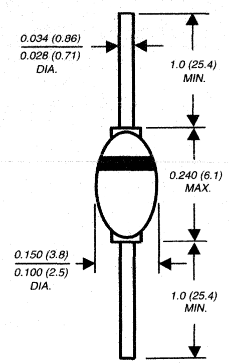
1N5059 THRU 1N5062

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 800 Volts* ***Forward Current** - 1. 0 Ampere*

PATENTED*

DO-204AP

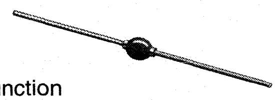


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ 1.0 Ampere operation at T_A=75°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Hermetically sealed package
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case:JEDEC DO-204AP solid glass body
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N5059*	*1N5060*	*1N5061*	*1N5062*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0				Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.2				Volts
* Maximum full Load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=25°C	$I_{R(AV)}$	5.0				μA
T_A=75°C		150		100		
* Maximum DC reverse current at rated DC blocking voltage T_A=25°C	I_R	5.0				μA
T_A=175°C		300		200		
Typical reverse recovery time (NOTE 1)	t_{rr}	1.5				μs
Typical junction capacitance (NOTE 2)	C_J	15.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0				°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B. mounted
*JEDEC registered values

FIG. 1 - FORWARD CURRENT DERATING CURVE

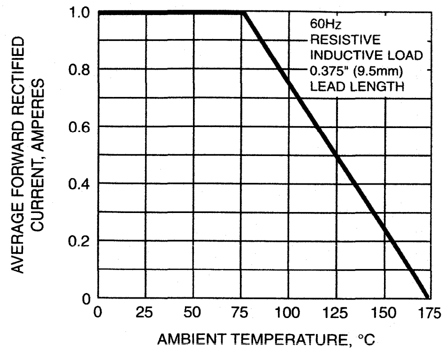


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

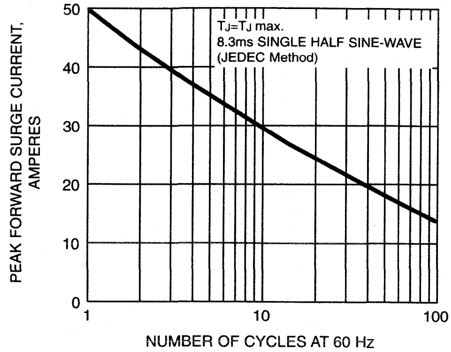


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

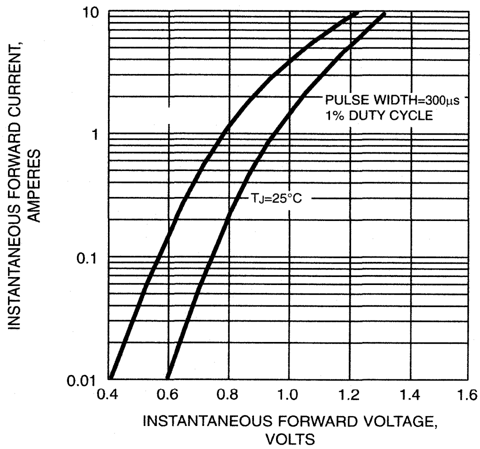


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

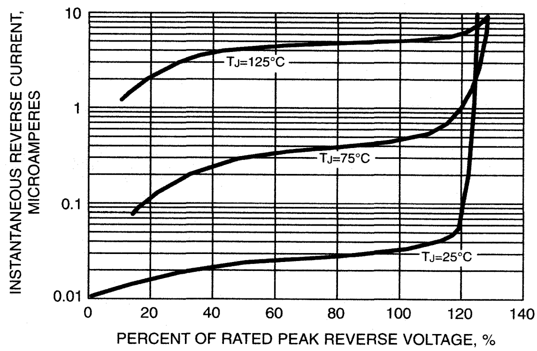


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

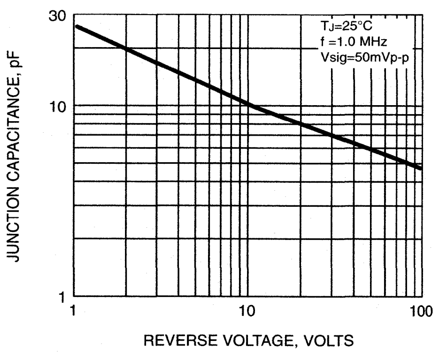
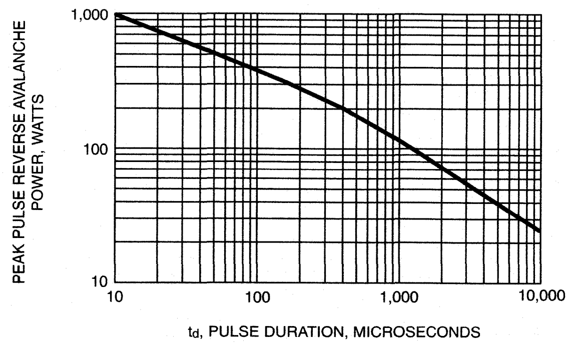


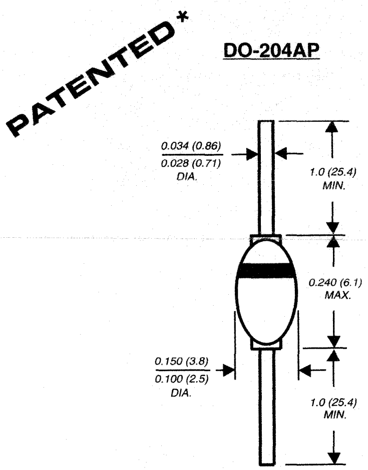
FIG. 6 - MAXIMUM NON-REPETITIVE PEAK PULSE REVERSE AVALANCHE POWER DISSIPATION



1N5614 THRU 1N5622

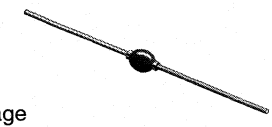
GLASS PASSIVATED MEDIUM-SWITCHING JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0. Ampere*



Dimensions in inches and (millimeters)
* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- High temperature metallurgically bonded construction
- 1.0 Ampere operation at T_A= 55°C with no thermal runaway
- Typical I_R less than 0.1μA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N5614	1N5616	1N5618	1N5620	1N5622	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Minimum reverse breakdown voltage at 50μA	V_{BR}	220	440	660	880	1100	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.2					Volts
* Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C / T_A=200°C	I_R	0.5 / 25.0 / 1500					μA
* Maximum reverse recovery time (NOTE 1)	t_{rr}	2.0					μs
Maximum junction capacitance (NOTE 2)	C_J	45	35	25	20	15	pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
* Operating junction temperature range	T_J	-65 to +175					°C
* Storage temperature range	T_{STG}	-65 to +200					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 12 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B. mounted
*JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

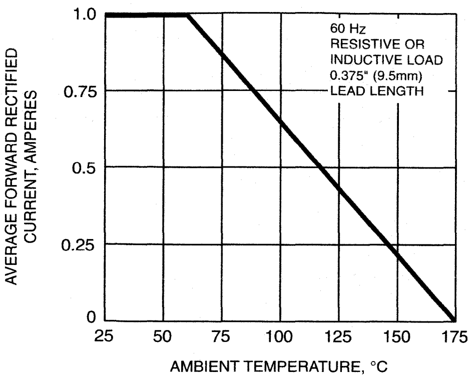


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

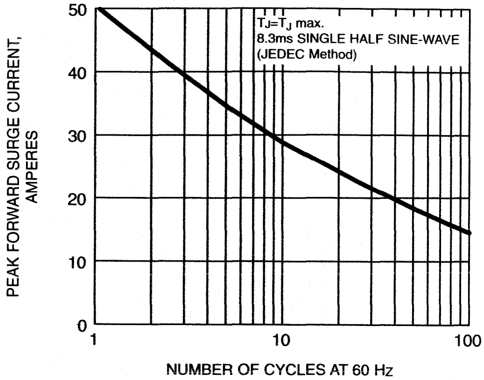


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

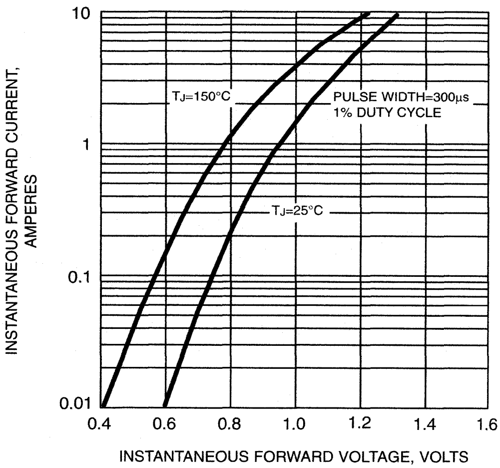


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

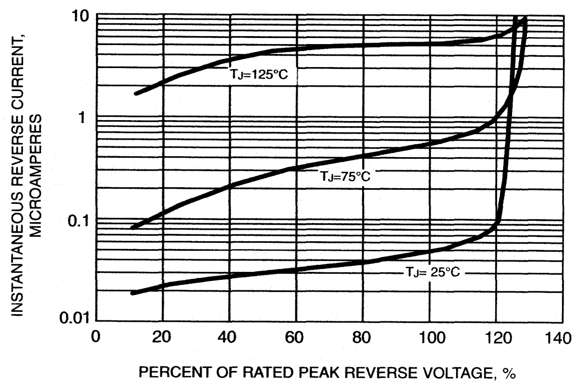
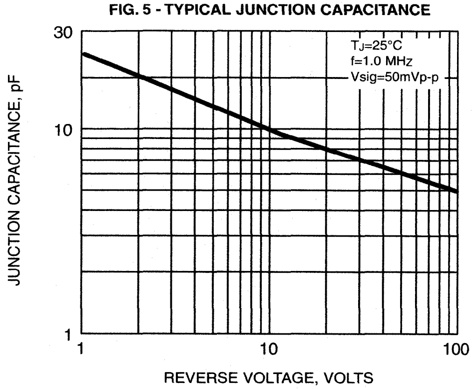


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

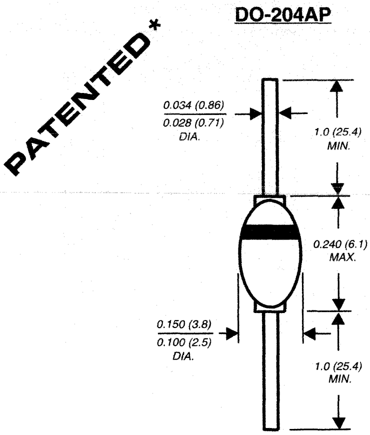


1N5615 THRU 1N5623

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

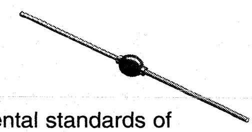
DO-204AP



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed case
- ♦ Glass passivated cavity-free junction
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N5615*	*1N5617*	*1N5619*	*1N5621*	*1N5623*	*UNITS*
*Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
*Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
*Minimum reverse breakdown voltage at 50 μA	$V_{(BR)}$	220	440	660	880	1100	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$			1.0			Amp
*Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			50.0			Amps
*Maximum instantaneous forward voltage at 1.0A	V_F			1.2			Volts
*Maximum DC reverse current at rated DC blocking voltage T_A=25°C T_A=100°C T_A=200°C	I_R			0.5 25.0 1500.0			μA
*Maximum reverse recovery time (NOTE 1)	t_{rr}	150	150	250	300	500	ns
*Maximum junction capacitance (NOTE 2)	C_J	45	35	25	20	15	pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$			55.0			°C/W
*Operating junction temperature range	T_J			-65 to +175			°C
*Storage temperature range	T_{STG}			-65 to +200			°C

NOTES:
(1) Reverse recovery test conditions I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 12 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B.mounted
*JEDEC registered values

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Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

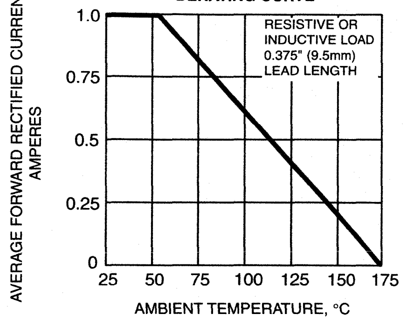


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

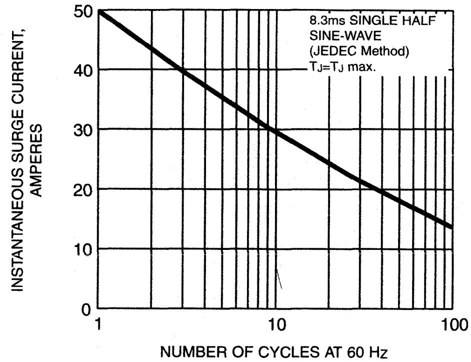


FIG. 3 -TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

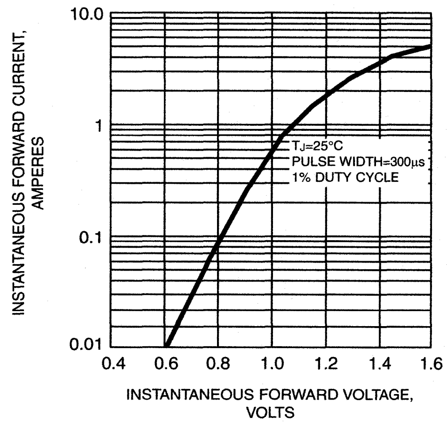


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

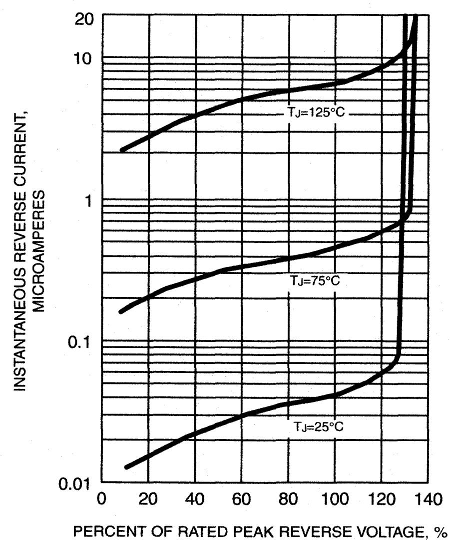
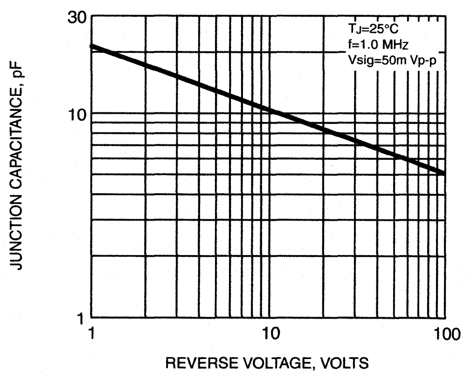


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



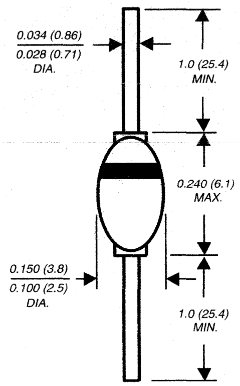
G1A THRU G1M

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AP

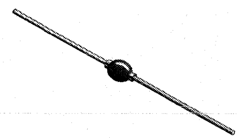


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded constructed rectifiers
- ♦ Glass passivated cavity-free junction in D0-204AP package
- ♦ Hermetically sealed package
- ♦ 1.0 ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*G1A*	*G1B*	*G1D*	*G1G*	*G1J*	*G1K*	*G1M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	70	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=100°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.2		1.1					Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=100°C	$I_{R(AV)}$	200.0							μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	2.0 / 100.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	1.5							μs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JL}$	55.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	65 to +175							°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

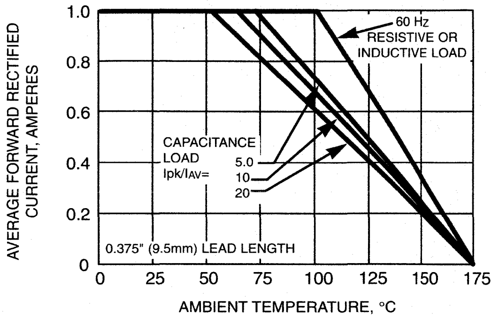


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

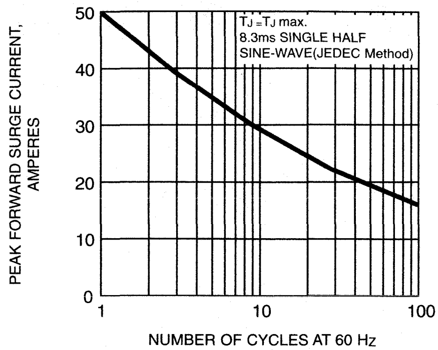


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

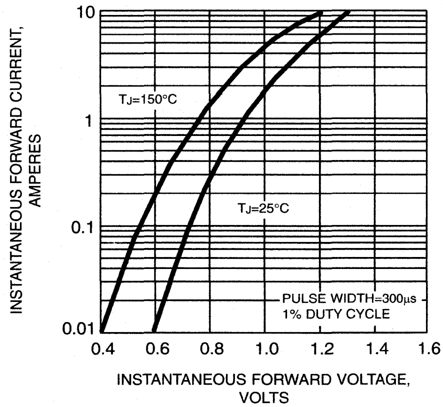


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

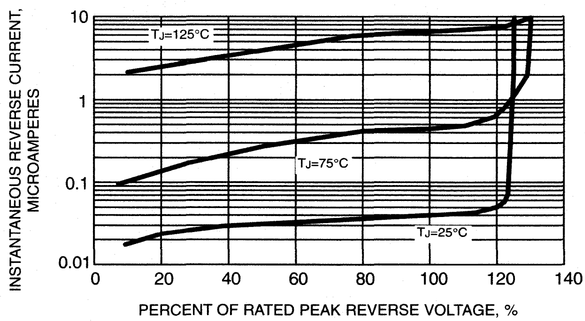
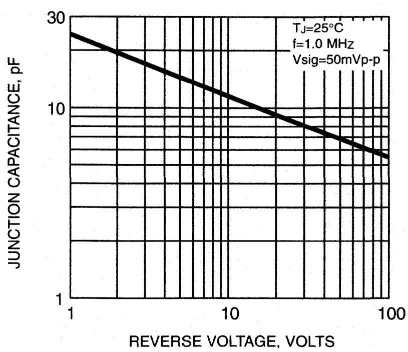


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



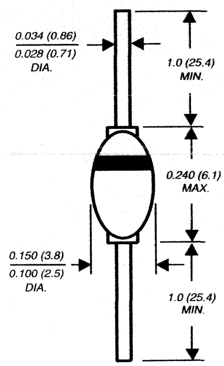
GI1-1200 THRU GI1-1600

MINIATURE HIGH VOLTAGE GLASS PASSIVATED RECTIFIER

***Reverse Voltage** - 1200 to 1600 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

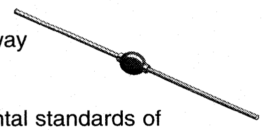
DO204AP



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction package
- ♦ 1.0 Ampere operation at T_A=75°C with no thermal runaway
- ♦ Typical I_R less than 0.1µA
- ♦ Hermetically sealed package
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GI1-1200	GI1-1400	GI1-1600	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	1200	1400	1600	Volts
Maximum RMS voltage	V_{RMS}	840	980	1120	Volts
Maximum DC blocking voltage	V_{DC}	1200	1400	1600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0			Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0			Amps
Maximum instantaneous forward voltage at 1.0A 3.14A	V_F	1.1 1.3			Volts
Maximum DC reverse current T_A= 25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 100.0			µA
Maximum reverse recovery time (NOTE 1)	t_{fr}	25.0			µs
Maximum forward recovery time (NOTE 2)	t_{rr}	1.0			µs
Typical junction capacitance (NOTE 3)	C_J	15.0			pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$	55.0			°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175			°C

NOTES:
(1) Measured on Tektronix Type "S" recovery plug-in, Tektronix 545 scope or equivalent I_{FM}=20mA, I_{RM}=2mA
(2) Measured on Tektronix Type "S" recovery plug-in, Tektronix 545 or equivalent, I_{FM}=20mA
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

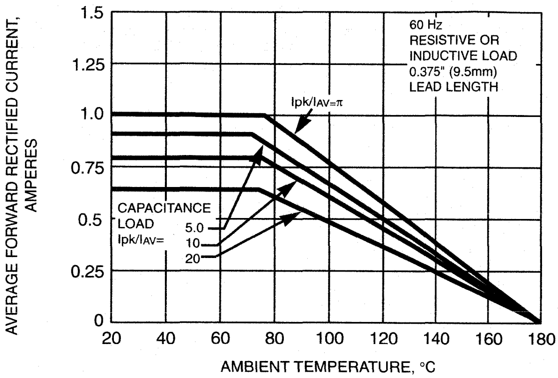


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

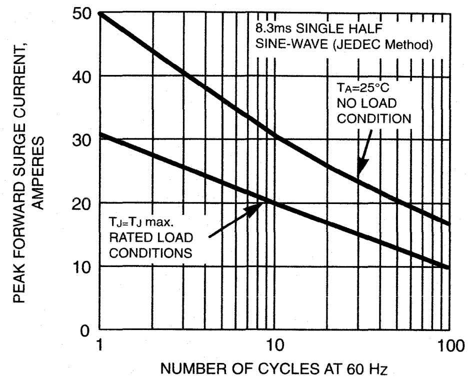


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

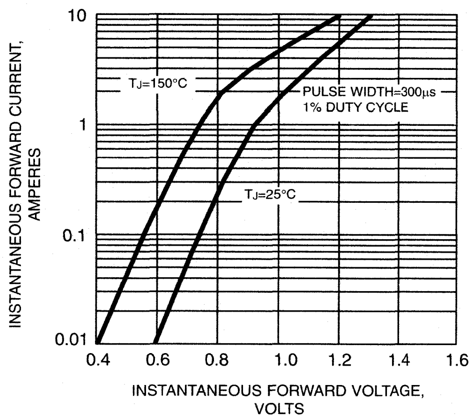


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

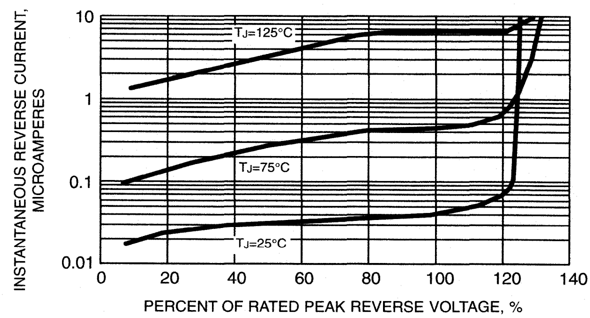
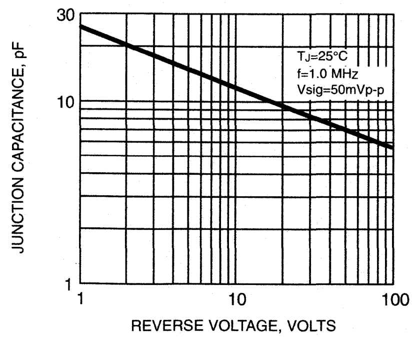


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



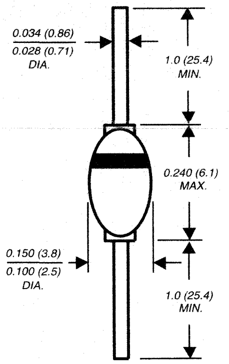
RG1A THRU RG1M

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AP

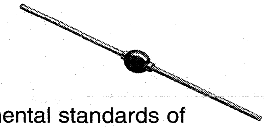


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- High temperature metallurgically bonded construction
- Hermetically sealed package
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1μA
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	RG1A	RG1B	RG1D	RG1G	RG1J	RG1K	RG1M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.3							Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=25°C / T_A=100°C	$I_{R(AV)}$	1.0 / 100.0							μA
Maximum DC reverse current at rated DC blocking voltage	I_R	2.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				200	250	500	ns
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

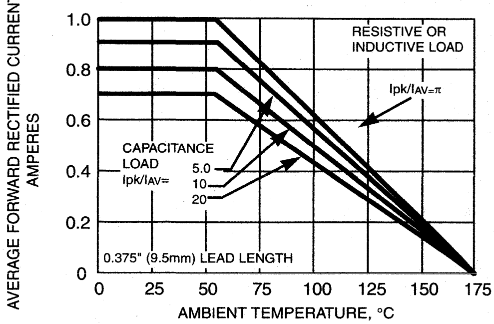


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

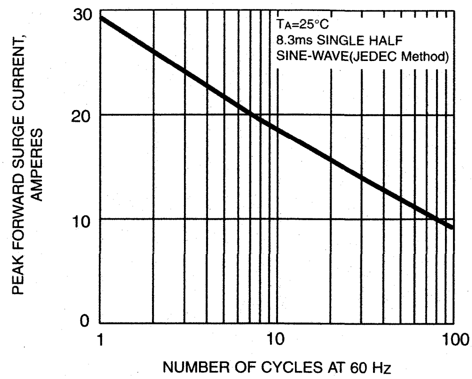


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

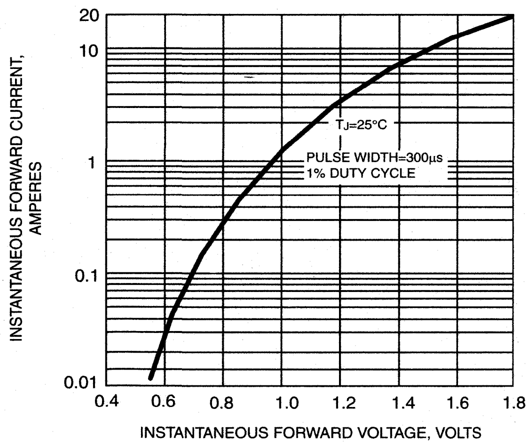


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

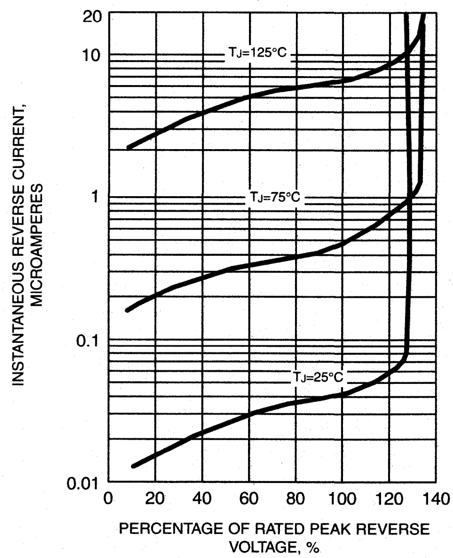
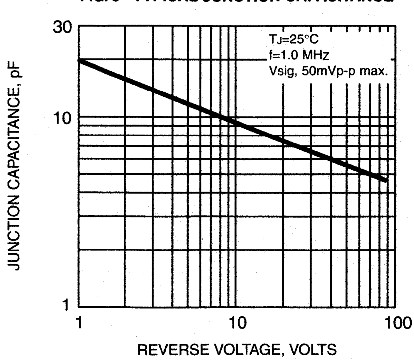


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



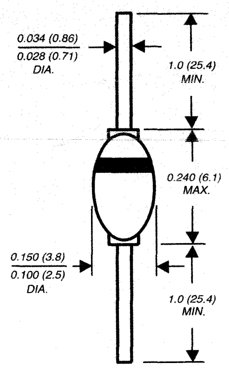
CG1 AND DG1

MINIATURE CLAMPER / DAMPER GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 1400 to 1500 Volts* ***Forward Current** - 1.5 Amperes*

PATENTED*

DO204AP

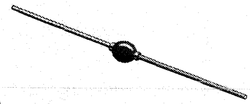


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- Specially designed for clamping circuits horizontal deflection systems and damper applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- 1.5 Ampere operation at T_A=50°C with no thermal runaway
- Typical I_R less than 0.1μA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*CG1*	*DG1*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	1400	1500	Volts
Maximum RMS voltage	V_{RMS}	980	1050	Volts
Maximum DC blocking voltage	V_{DC}	1400	1500	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=50°C	$I_{(AV)}$	1.5		Amps
Peak forward surge current 8.3ms single half sine wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0		Amps
Maximum instantaneous forward voltage at 1.5A	V_F	1.1		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 100		μA
Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_A=100°C	$I_{R(AV)}$	50.0		μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0	20.0	μs
Typical junction capacitance (NOTE 2)	C_J	15.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175		°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=50mA
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

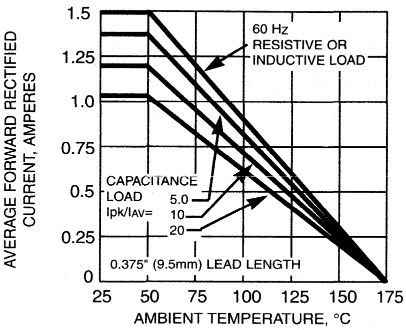


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

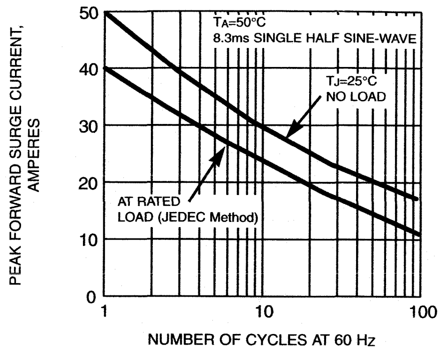


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

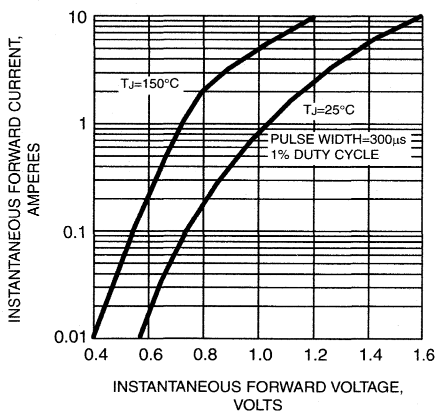


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

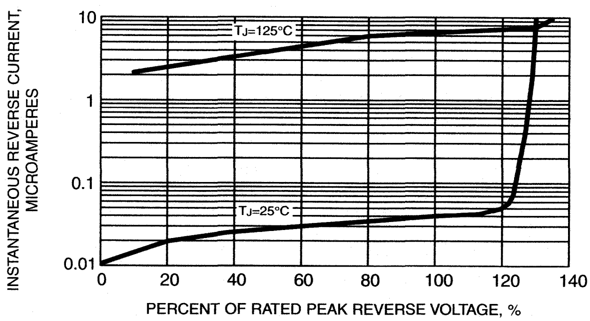
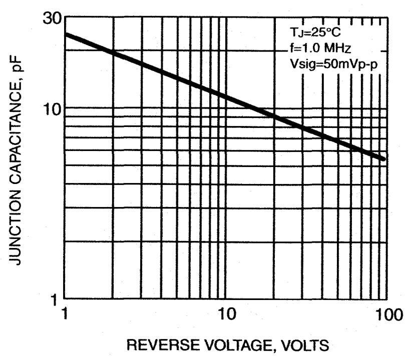


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



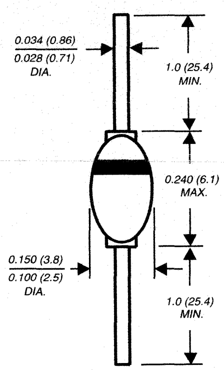
BYV95 AND BYV96 SERIES

MINIATURE GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

PATENTED*

DO-204AP

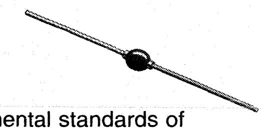


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed package
- ♦ Glass passivated cavity-free junction
- ♦ 1.5 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BYV95A*	*BYV95B*	*BYV95C*	*BYV96D*	*BYV96E*	*UNITS*
Maximum recurrent peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
Minimum avalanche breakdown voltage at 100μA	$V_{(BR)}$	300	500	700	900	1100	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.5					Amps
Peak forward surge current, 10ms single half sine-wave superimposed on rated load at T_J=165°C	I_{FSM}	35.0					Amps
Maximum instantaneous forward voltage at 1.5A T_J =25°C T_J=165°C	V_F	1.6 1.35					Volts
Maximum full load reverse current, full cycle average, 0.375", (9.5mm) lead length at T_J=25°C T_J=165°C	$I_{R(AV)}$	1.0 150.0					μA
Maximum DC reverse current at rated DC blocking voltage	I_R	2.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	250			300		ns
Typical junction capacitance (NOTE 2)	C_J	10.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
Operating junction temperature range	T_J	-65 to +175					°C
Storage temperature range	T_{STG}	-65 to +200					°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

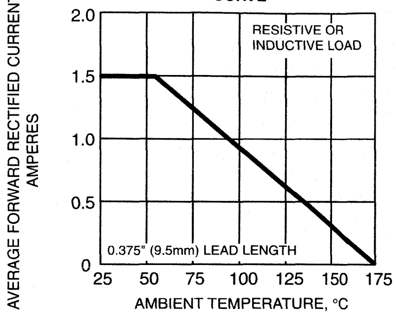


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

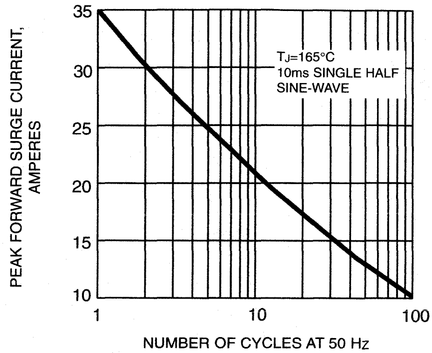


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

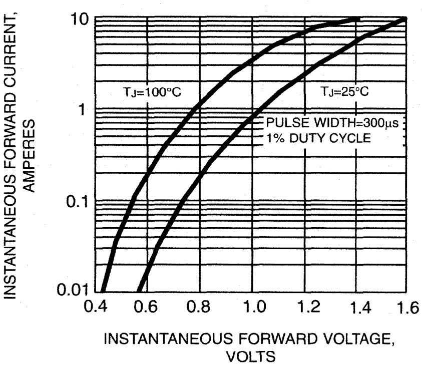


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

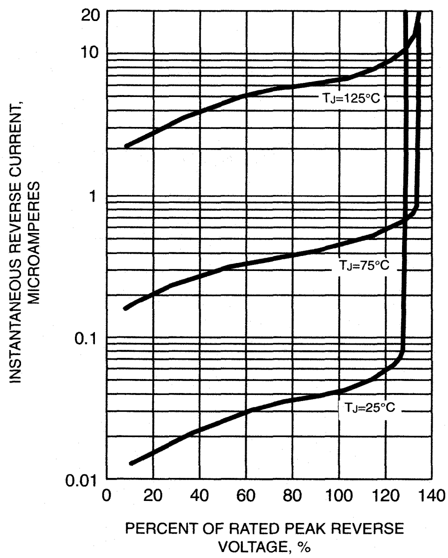
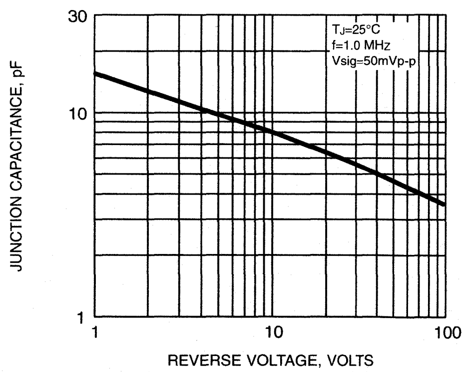


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

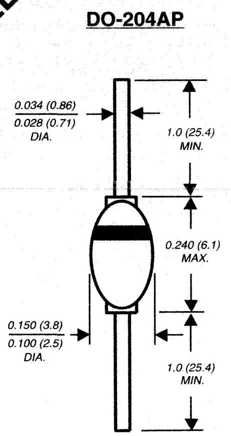


CG2 AND DG2

MINIATURE CLAMPER / DAMPER GLASS PASSIVATED RECTIFIER

***Reverse Voltage** - 1400 to 1500 Volts* ***Forward Current** - 2.0 Amperes*

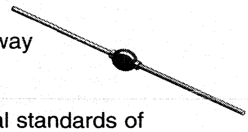
PATENTED*



Dimensions in inches and (millimeters)

* *Braised-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- ♦ Specially designed for clamping circuits in horizontal deflection systems and damper applications
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ 2.0 Ampere operation at T_A=50°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Hermetically sealed package
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*CG2*	*DG2*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	1400	1500	Volts
Maximum RMS voltage	V_{RMS}	980	1050	Volts
Maximum DC blocking voltage	V_{DC}	1400	1500	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=50°C	$I_{(AV)}$	2.0		Amps
Peak forward surge current 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0		Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.1		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 100.0		μA
Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_A=100°C	$I_{R(AV)}$	200.0		μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0	20.0	μs
Typical junction capacitance (NOTE 2)	C_J	15.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175		°C

NOTES:
(1) Measured with I_F=0.5A, I_R=50mA
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

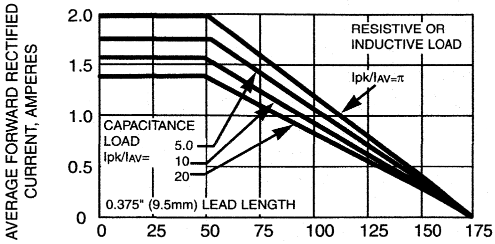


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

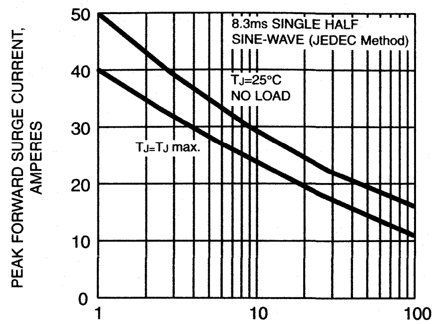


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

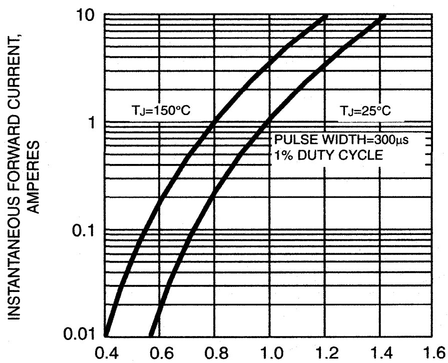


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

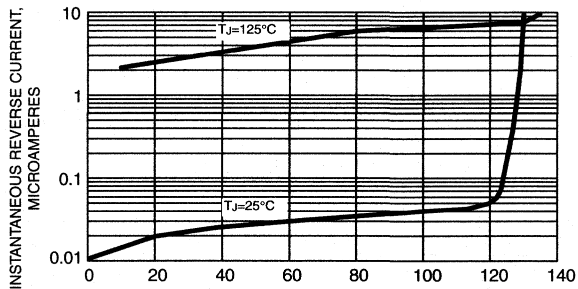
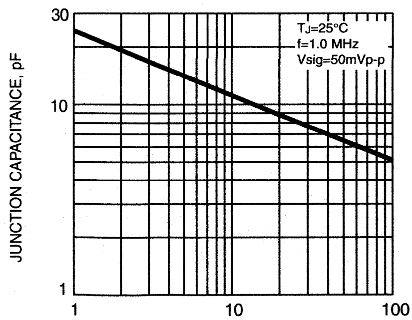


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



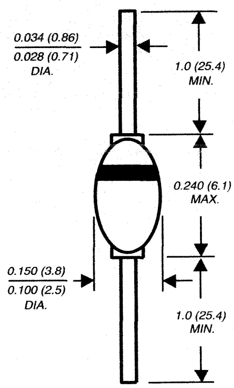
G2A THRU G2M

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

DO-204AP

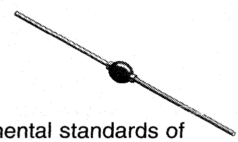


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Hermetically sealed package 2.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1µA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*G2A*	*G2B*	*G2D*	*G2G*	*G2J*	*G2K*	*G2M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	2.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.2		1.1					Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=100°C	$I_{R(AV)}$	100.0							µA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	1.0 100.0							µA
Typical reverse recovery time (NOTE 1)	t_{rr}	1.5							µs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B mounted.

FIG. 1 - FORWARD CURRENT DERATING CURVE

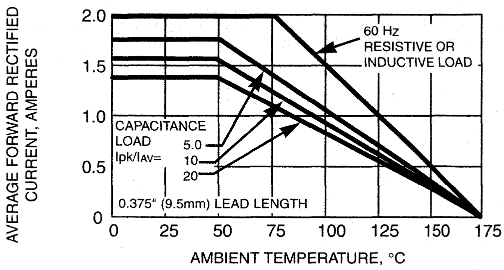


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

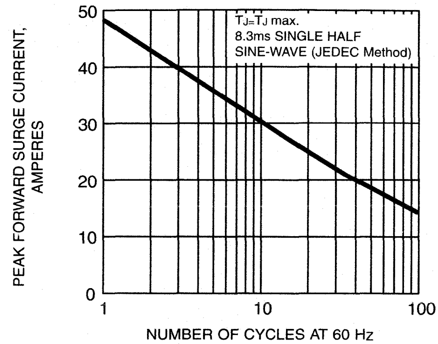


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

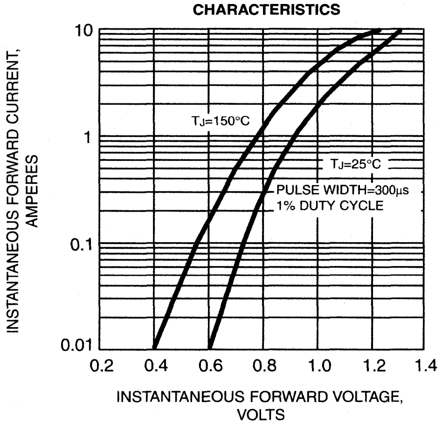


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

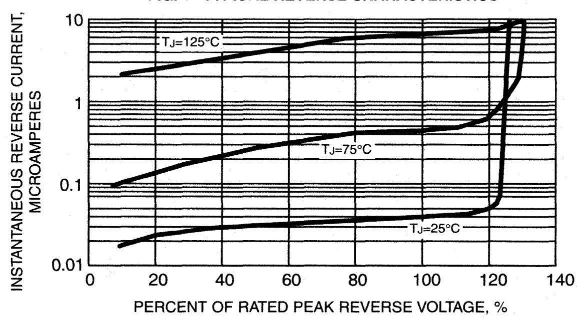
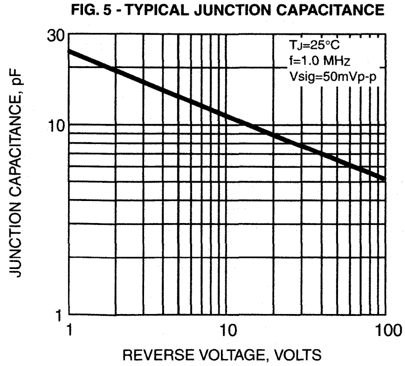


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



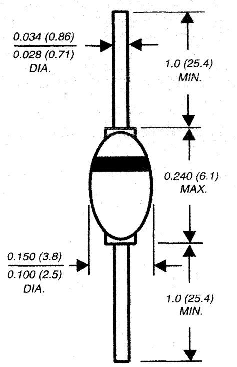
BYW32 THRU BYW36

MINIATURE GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 600 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

DO-204AP

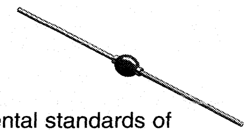


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed case
- ♦ Glass passivated cavity-free junction
- ♦ 2.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1µA
- ♦ Capable of meeting environmental standards of MIL-STD-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYW32	BYW33	BYW34	BYW35	BYW36	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	200	300	400	500	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	2.0					Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}	40.0					Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.2					Volts
Maximum DC reverse current at rated DC blocking voltage	I_R	5.0					µA
Maximum full load reverse current Full cycle average, 0.375" (9.5mm) lead length T_A=25°C / T_A=100°C	$I_{R(AV)}$	5.0 50.0					µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	200					ns
Typical junction capacitance (NOTE 2)	C_J	15.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
Operating junction temperature range	T_J	-65 to +175					°C
Storage temperature range	T_{STG}	-65 to +200					°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

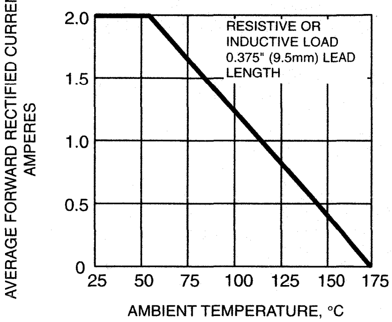


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

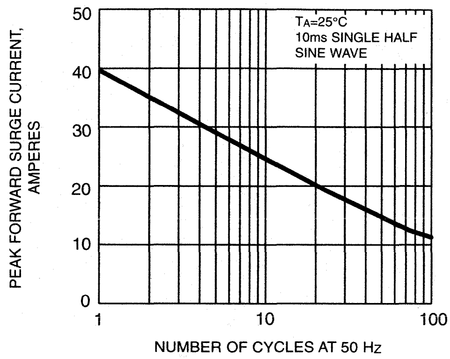


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

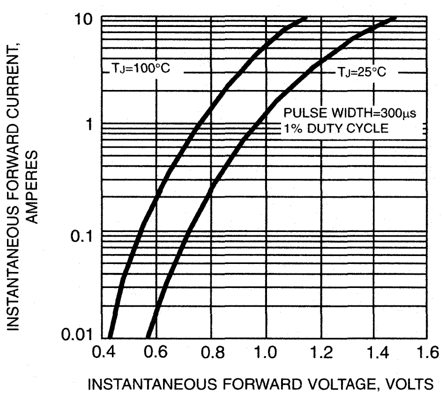


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

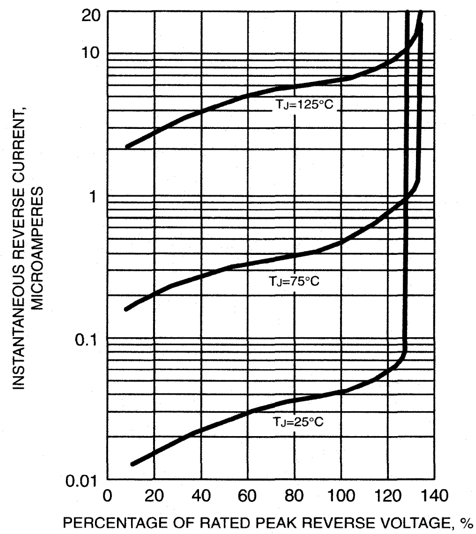


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

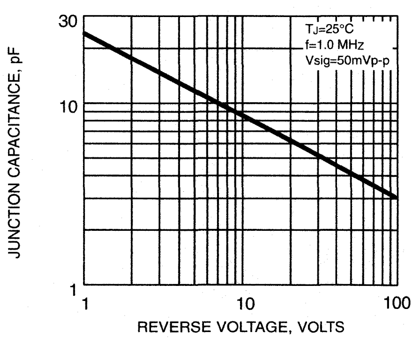
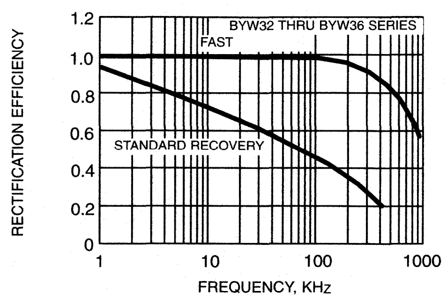


FIG. 6 - TYPICAL RECTIFICATION EFFICIENCY

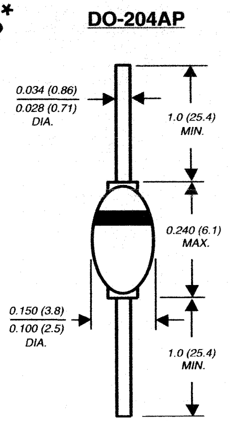


RG2A THRU RG2M

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

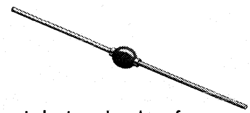


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed package
- ♦ Glass passivated cavity-free junction
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-STD-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RG2A*	*RG2B*	*RG2D*	*RG2G*	*RG2J*	*RG2K*	*RG2M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	2.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.3							Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=25°C / T_A=100°C	$I_{R(AV)}$	1.0 / 100.0							μA
Maximum DC reverse current at rated DC blocking voltage	I_R	5.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				200	250	500	ns
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

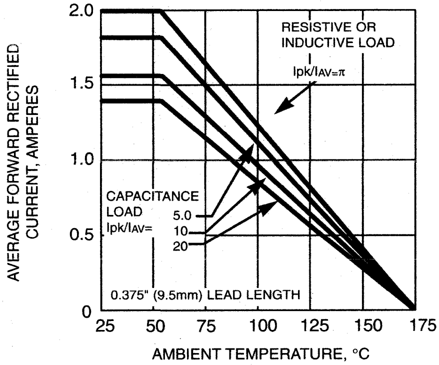


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

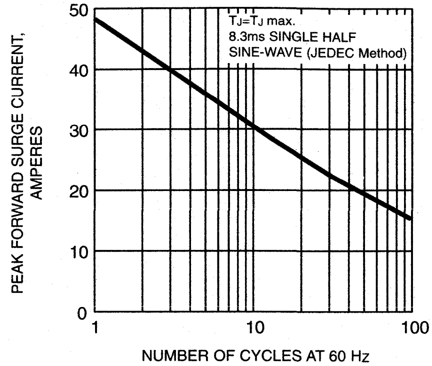


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

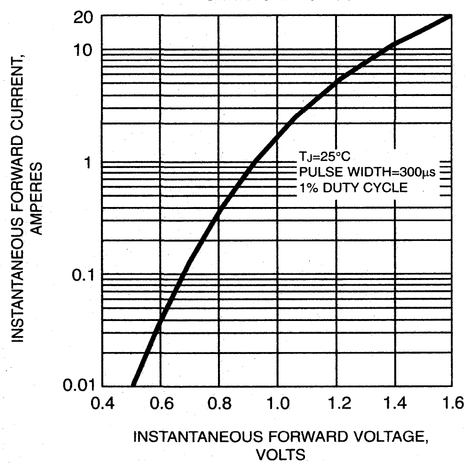


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

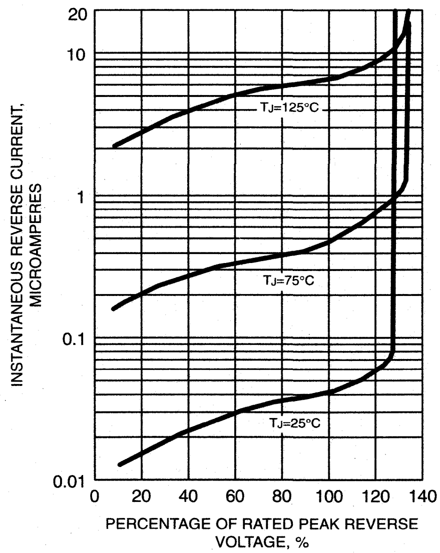
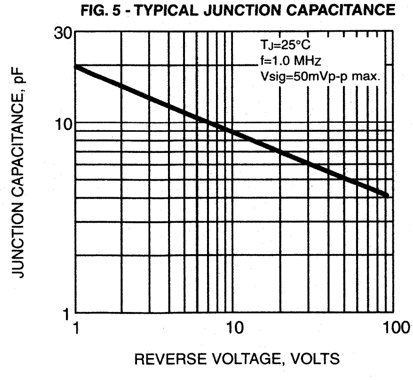


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



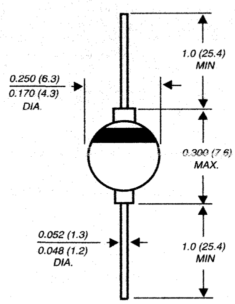
BY228 SERIES

CLAMPER / DAMPER GLASS PASSIVATED RECTIFIER

***Reverse Voltage** - 1500 Volts* ***Forward Current** - 2.5 Amperes*

PATENTED*

Case Style G3

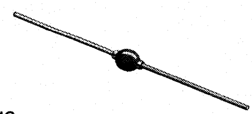


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ 2.5 ampere operation at T_A=50°C with no thermal runaway
- ♦ Typical I_R less than 0.1µA
- ♦ Hermetically sealed package
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BY228*	*UNITS*
Maximum non repetitive peak reverse voltage	V_{RSM}	1650	Volts
Maximum repetitive peak reverse voltage	V_{RRM}	1500	Volts
Maximum RMS voltage	V_{RMS}	1050	Volts
Maximum DC blocking voltage	V_{DC}	1500	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A= 50°C	$I_{(AV)}$	2.5	Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load	I_{FSM}	50.0	Amps
Maximum instantaneous forward voltage at 2.5A	V_F	1.6	Volts
Working peak forward current at T_A=75°C	I_{FWM}	5.0	Amps
Peak repetitive forward surge current at T_A=75°C	I_{FRM}	10.0	Amps
Maximum peak reverse current T_A=25°C at rated peak reverse voltage T_J=140°C	I_R	5.0 200	µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	20.0	µs
Maximum forward recovery time (NOTE 2)	t_{fr}	1.0	µs
Typical junction capacitance (NOTE 2)	C_J	40.0	pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$	20.0	°C/W
Operating junction temperature range	T_J	-65 to +150	°C
Storage temperature range	T_{STG}	-65 to +200	°C

NOTES:
(1) Measured with I_F=1.0A, I_R=50mA, di/dt=50mA/µs
(2) Measured with I_F=5.0A with tr=0.1µs
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

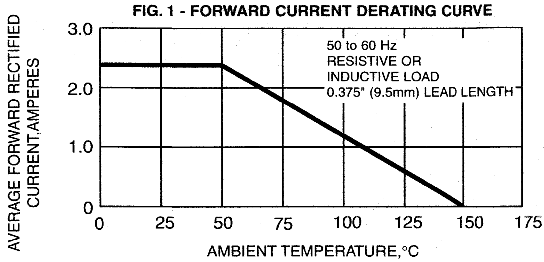


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

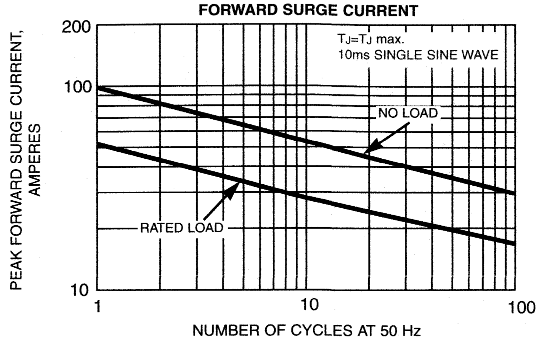


FIG. 3 - # MAXIMUM PEAK REPETITIVE FORWARD SURGE CURRENT

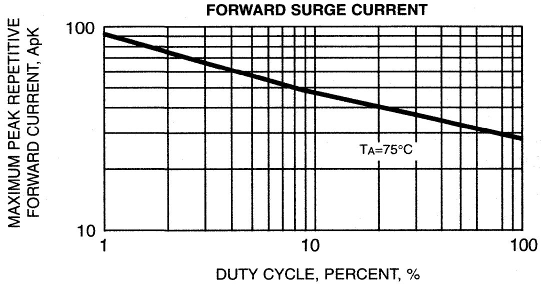


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

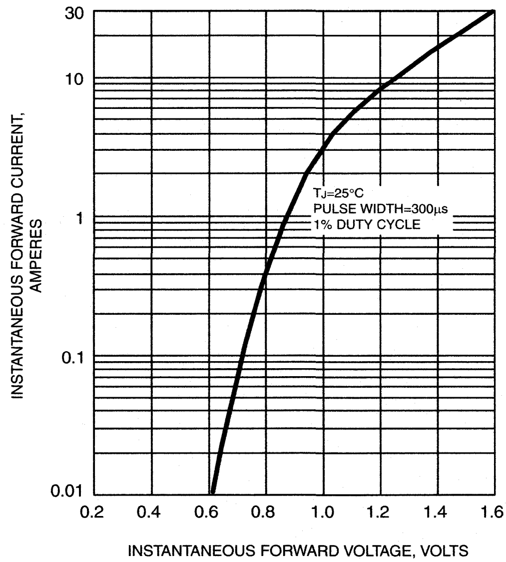


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS

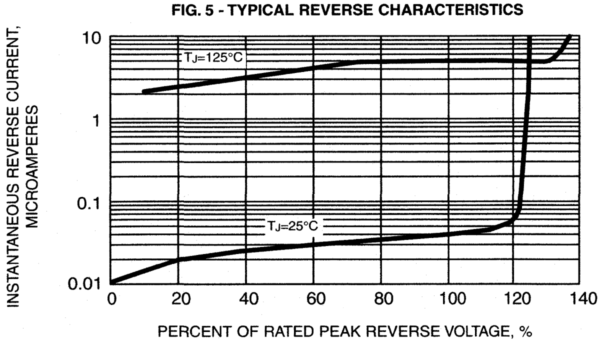
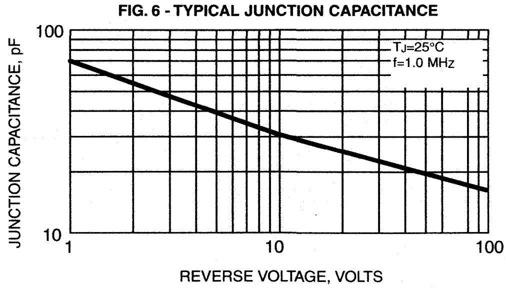


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



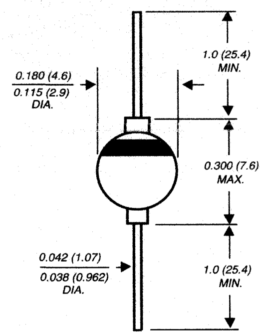
1N5415 THRU 1N5420

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G4

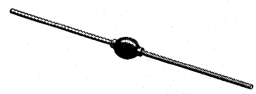


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- Glass passivated cavity-free junction
- High temperature metallurgically bonded construction
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N5415*	*1N5416*	*1N5417*	*1N5418*	*1N5419*	*1N5420*	*UNITS*
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	350	420	Volts
*Maximum DC blocking voltage	V_{DC}	50	100	200	400	500	600	Volts
*Minimum reverse breakdown voltage at 50µA	V_{BR}	55	110	220	440	550	660	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=100°C	I_{FSM}	80.0						Amps
Maximum instantaneous forward voltage at 3.0A* / 9.0A	V_F	1.10 / 1.50						Volts
Maximum DC reverse current at rated DC blocking voltage *T_A=25°C / T_A=100°C / *T_A=175°C	I_R	1.0 / 20.0 / 2.0						µA
*Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	400	ns
*Maximum junction capacitance (NOTE 2)	C_J	200	175	150	120	110	100	pF
Typical thermal resistance (NOTE3)	$R_{\Theta JA}$	22.0						°C/W
*Operating and storage temperature range	T_J, T_{STG}	-65 to +175						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R= 1.0A, Irr=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 12.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads to heat sink
*JEDEC registered values

FIG. 1 - FORWARD CURRENT DERATING CURVE

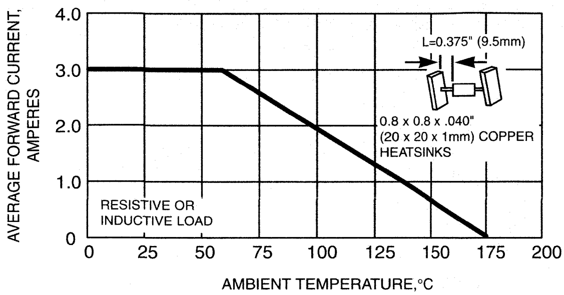


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

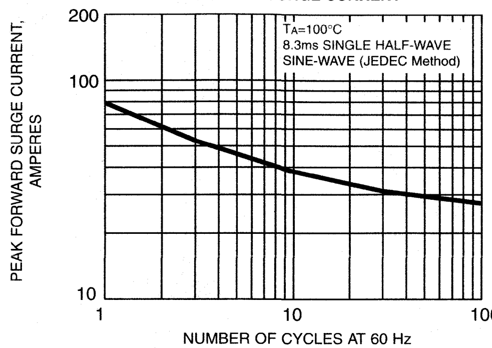


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

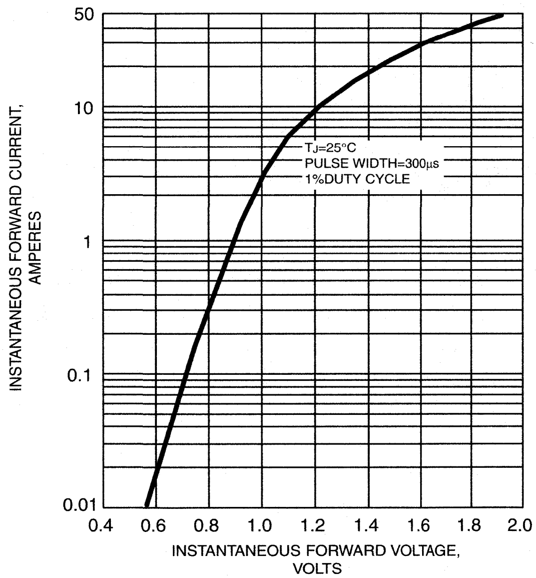


FIG. 4 -TYPICAL REVERSE CHARACTERISTICS

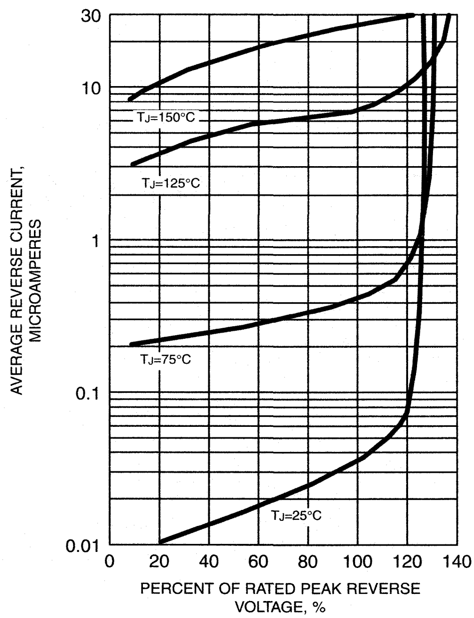
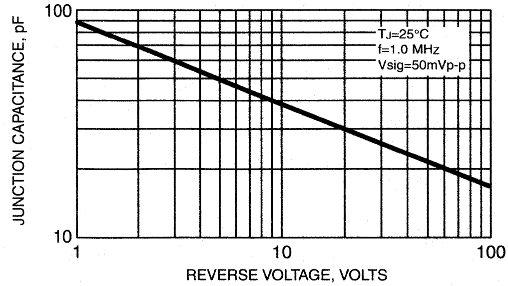


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



General Instrument
Power Semiconductor Division

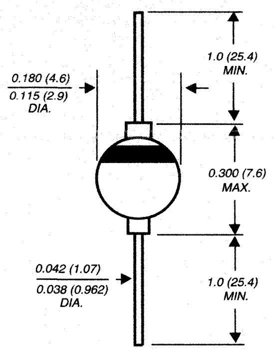
1N5550 THRU 1N5552

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G4

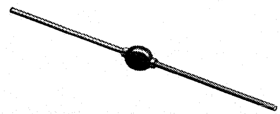


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ Glass passivated cavity-free junction
- ♦ High temperature metallurgically bonded construction
- ♦ Hermetically sealed package
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Medium switching for improved efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N5550	1N5551	1N5552	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	Volts
*Maximum DC blocking voltage	V_{DC}	200	400	600	Volts
*Minimum reverse breakdown voltage at 50μA	$V_{(BR)}$	240	460	660	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0			Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0			Amps
* Maximum instantaneous forward voltage at 3.0A	V_F	1.0			Volts
*Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C / T_A=200°C	I_R	1.0 / 25.0 / 1500.0			μA
*Maximum junction capacitance (NOTE 1)	C_J	150	120	100	pF
*Maximum reverse recovery time (NOTE 2)	t_{rr}	2.0			μs
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	22.0 / 12.0			°C/W
*Operating and storage temperature range	T_J, T_{STG}	-65 to +200			°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 12.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, with both leads mounted between heat sinks
*JEDEC registered values

GI General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

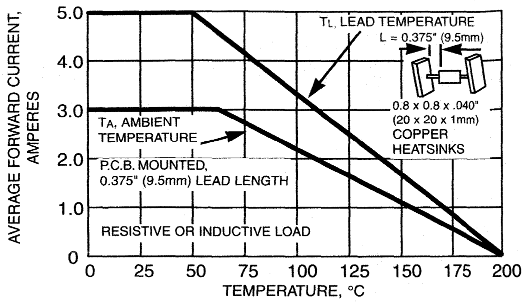


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

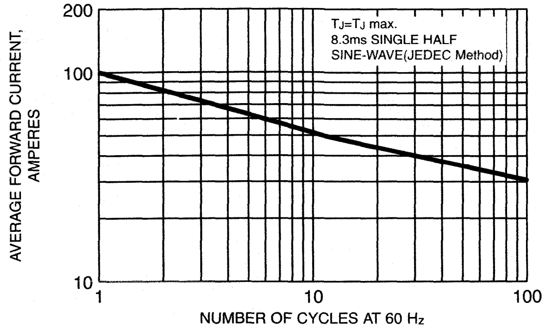


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

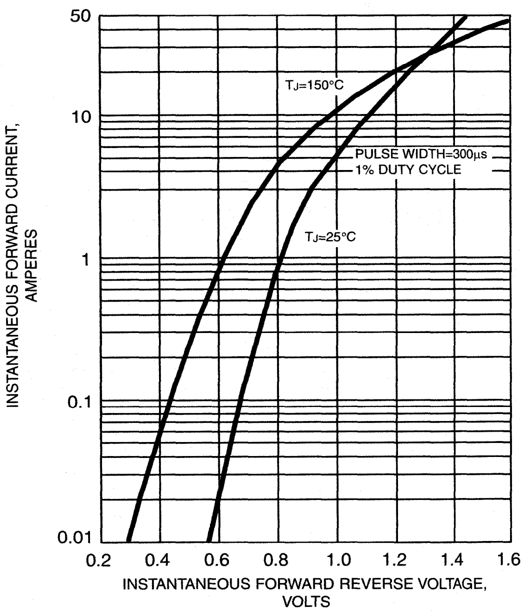


FIG. 4 -TYPICAL REVERSE CHARACTERISTICS

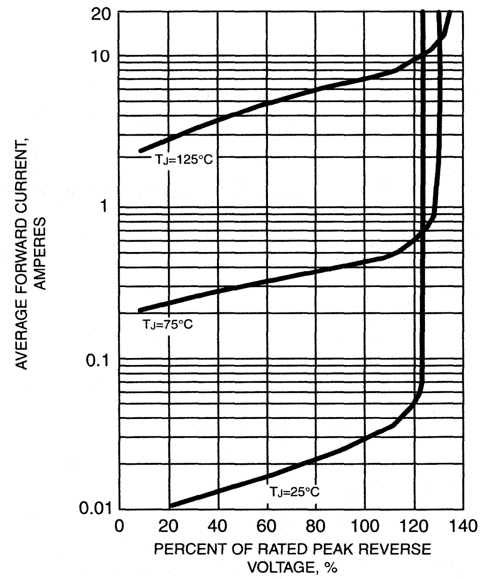
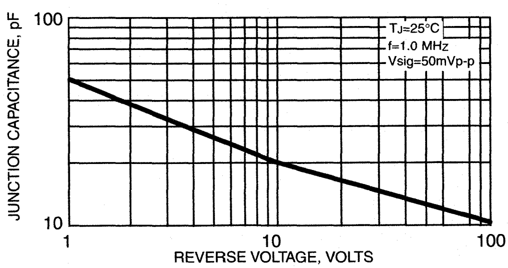


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



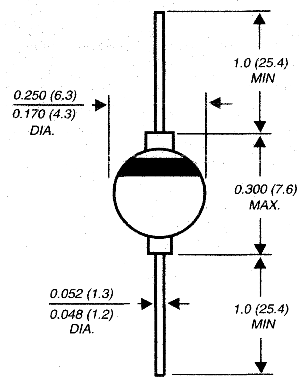
1N5624 THRU 1N5627

GLASS PASSIVATED JUNCTION RECTIFIER

Reverse Voltage *- 200 to 800 Volts* ***Forward Current*** *- 3.0 Amperes*

PATENTED*

CASE STYLE G3

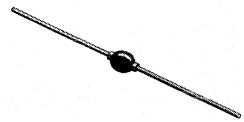


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ Glass passivated cavity-free junction
- ♦ High temperature metallurgically bonded constructed
- ♦ Hermetically sealed package
- ♦ Capable of meeting environmental standards of MIL-S-19500



- ♦ Typical I_R less than 0.1μA
- ♦ 3.0 Ampere operation at T_A=70°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N5624	1N5625	1N5626	1N5627	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	Volts
*Maximum DC blocking voltage	V_{DC}	200	400	600	800	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=70°C	$I_{(AV}$	3.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
*Maximum instantaneous forward voltage at 3.0A T_A=25°C T_A=70°C	V_F	1.0 0.95				Volts
*Maximum DC reverse current T_A=25°C	I_R	5.0				μA
at rated DC blocking voltage T_A=175°C		300.0		200.0		
*Maximum full load reverse current, full cycle average, 0.375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	150.0		100.0		μA
Typical junction capacitance (NOTE 1)	C_J	40.0				pF
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	20.0 10.0				°C/W
*Operating junction temperature range	T_J	-65 to +175				°C
*Storage temperature range	T_{STG}	-65 to +200				°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, with both leads attached between heatsinks
*JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

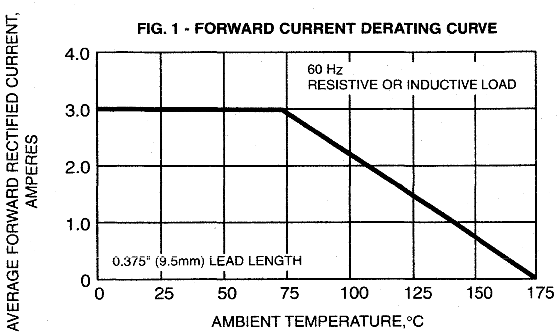


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

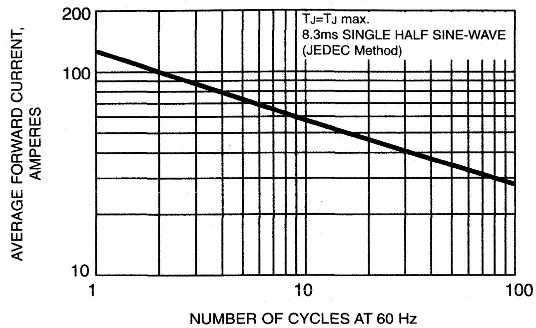


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

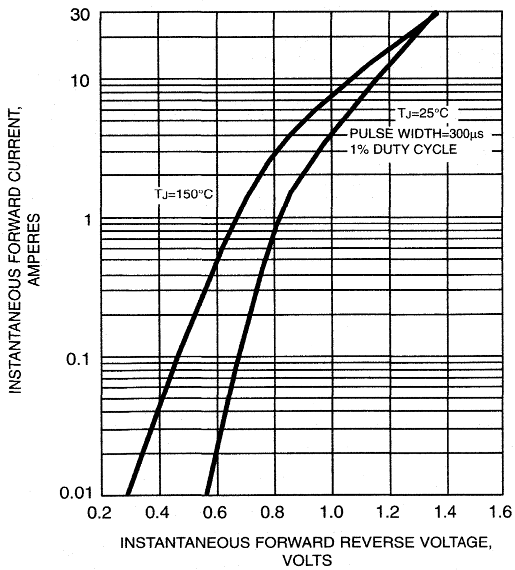


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

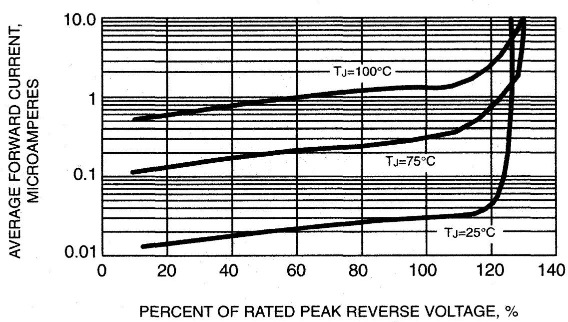
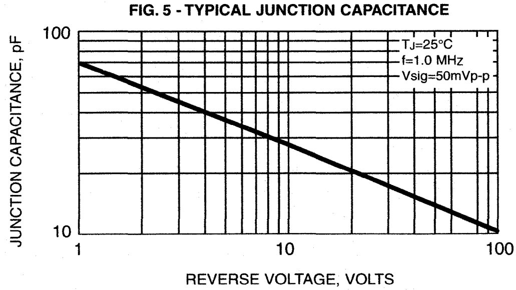


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



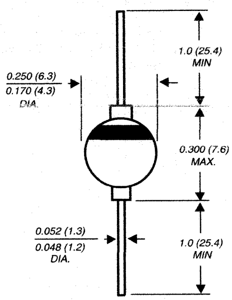
BYW72 THRU BYW76 SERIES

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 600 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G3

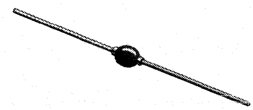


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Hermetically sealed package
- ♦ 3.0 ampere operation at T_A=45°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BYW72*	*BYW73*	*BYW74*	*BYW75*	*BYW76*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	200	300	400	500	600	Volts
Maximum RMS voltage	V_{RMS}	140	210	280	350	420	Volts
Maximum DC blocking voltage	V_{DC}	200	300	400	500	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=45°C	$I_{(AV)}$	3.0					Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_J=150°C	I_{FSM}	60.0					Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.1					Volts
Maximum average reverse current at rated peak reverse voltage at T_A=100°C	$I_{R(AV)}$	50.0					μA
Maximum DC reverse current at rated DC blocking voltage	I_R	5.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	200					ns
Typical junction capacitance (NOTE 2)	C_J	40.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0					°C/W
Operating junction temperature range	T_J	-65 to +175					°C
Storage temperature range	T_{STG}	-65 to +300					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr} = 0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads attached to heat sink

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

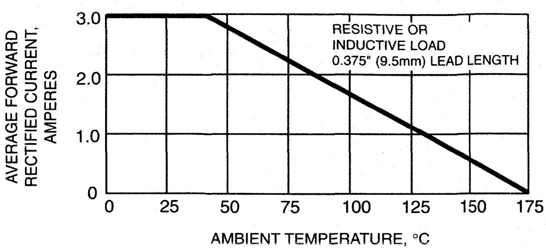


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

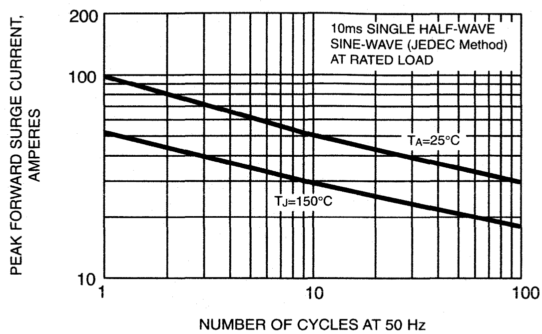


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

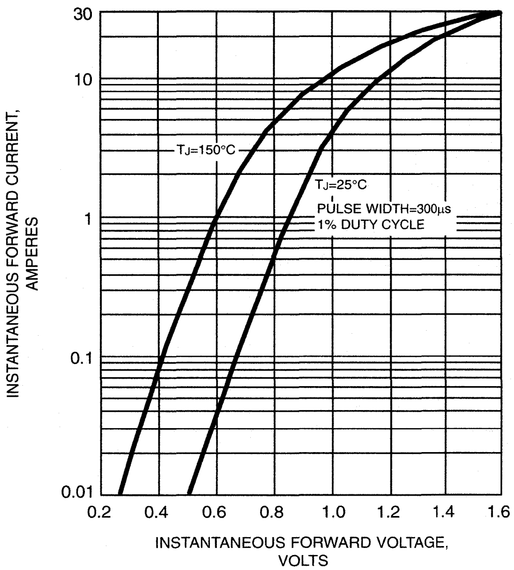


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

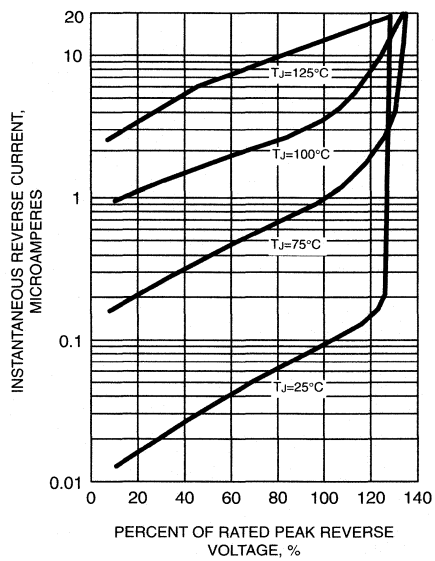
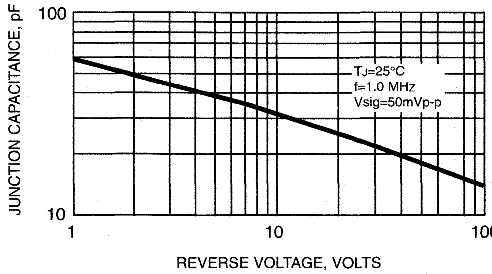


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



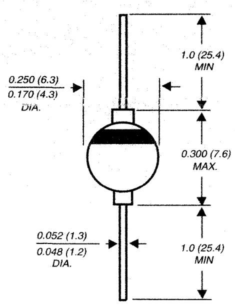
CG3 AND DG3

CLAMPER / DAMPER GLASS PASSIVATED RECTIFIER

***Reverse Voltage** - 1400 to 1500 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G3

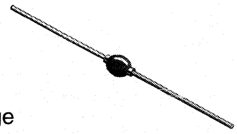


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- Specially designed for clamping circuits horizontal deflection systems and damper applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- 3.0 Ampere operation at T_A=50°C with no thermal runaway



- Typical I_R less than 0.1μA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*CG3*	*DG3*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	1400	1500	Volts
Maximum RMS voltage	V_{RMS}	980	1050	Volts
Maximum DC blocking voltage	V_{DC}	1400	1500	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=50°C	$I_{(AV)}$	3.0		Amps
Peak forward surge current 8.3ms single half sinewave superimposed on rated load (JEDEC Method) at T_A=50°C	I_{FSM}	100.0		Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.2		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 100.0		μA
Maximum full load reverse current full cycle average, 0.375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	200.0		μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	15.0	20.0	μs
Typical junction capacitance (NOTE 2)	C_J	40.0		pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	20.0		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175		°C

NOTES:
(1) Measured with I_F=0.5A, I_R=50mA
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with leads attached to heat sinks

FIG. 1 - FORWARD CURRENT DERATING CURVE

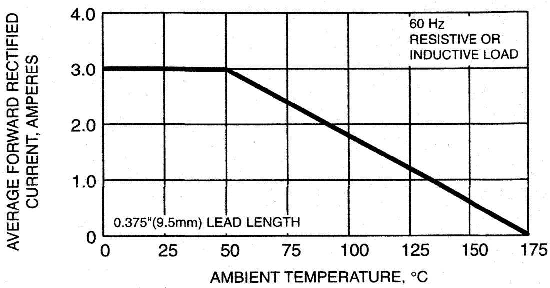


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

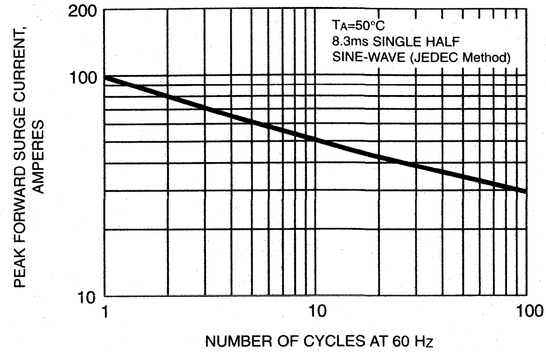


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

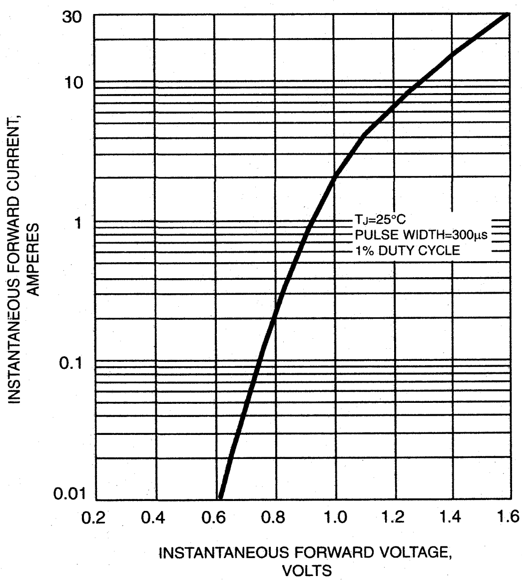


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

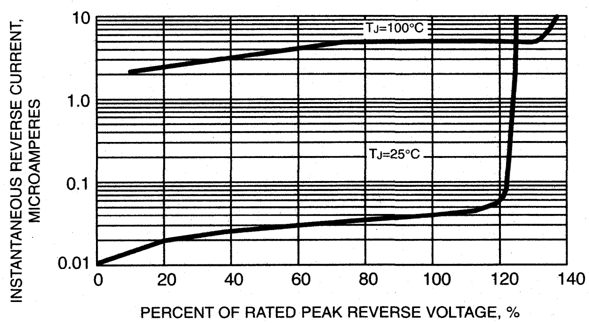
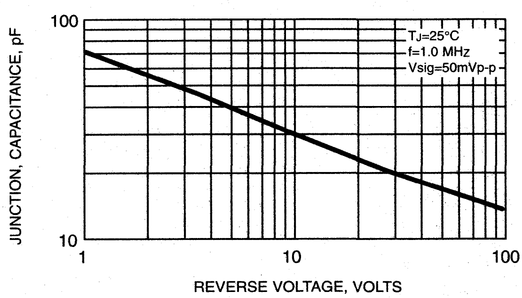


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



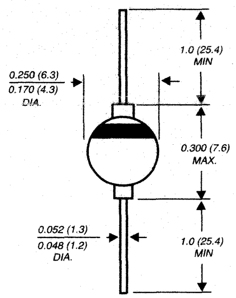
G3A THRU G3M

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

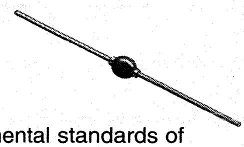
Case Style G3



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Hermetically sealed package
- 3.0 Ampere operation at T_A=70°C with no thermal runaway
- Typical I_R less than 0.1μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*G3A*	*G3B*	*G3D*	*G3G*	*G3J*	*G3K*	*G3M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=70°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0							Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.2		1.1					Volts
Maximum full load reverse current, full cycle average, 0.375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	200.0							μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	5.0 / 100.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	3.0							μs
Typical junction capacitance (NOTE 2)	C_J	40.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	20.0 / 10.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Measured with I_F=0.5A, I_R=1A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, with both leads mounted between heatsinks

FIG. 1 - FORWARD CURRENT DERATING CURVE

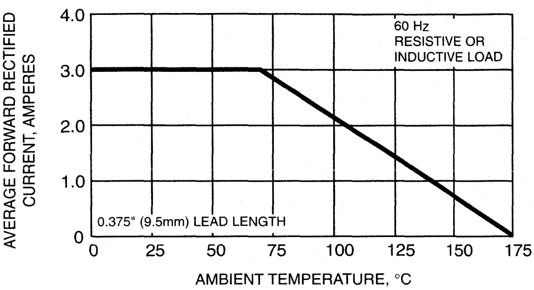


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

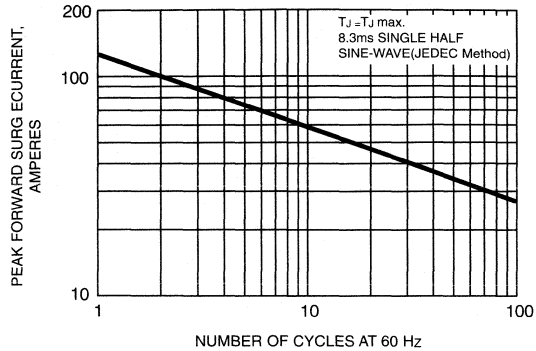


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

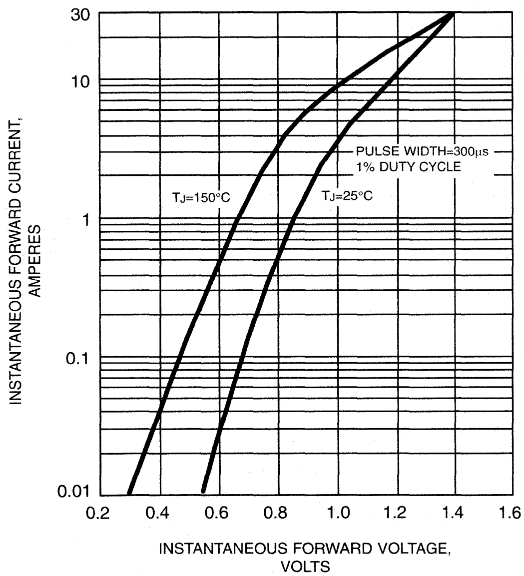


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

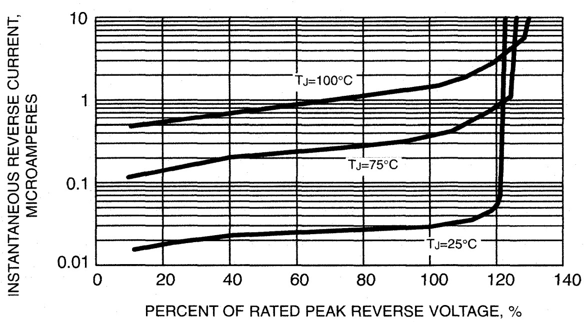
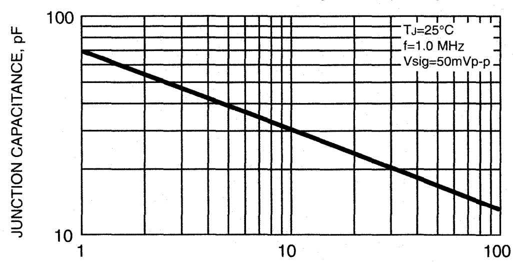


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



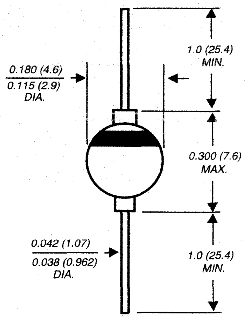
G4A THRU G4J

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

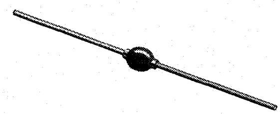
Case Style G4



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- ◆ High temperature metallurgically bonded construction
- ◆ Glass passivated cavity-free junction
- ◆ Hermetically sealed package
- ◆ 3.0 Ampere operation at T_A=75°C with no thermal runaway
- ◆ Typical I_R less than 0.1μA
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce,1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*G4A*	*G4B*	*G4D*	*G4G*	*G4J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current, 0.375" (9.5mm) lead length at T_A=70°C		$I_{(AV)}$			3.0		Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			100.0			Amps
Maximum instantaneous forward voltage at 3.0A	V_F			1.1			Volts
Maximum full load reverse current full cycle average, 0.375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$			200.0			μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C T_A=100°C	I_R			1.0 100.0			μA
Typical reverse recovery time (NOTE 1)	t_{rr}			3.0			μs
Typical junction capacitance (NOTE 2)	C_J			40.0			pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$			22.0 12.0			°C/W
Operating junction and storage temperature range	T_J, T_{STG}			-65 to +175			°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length with both leads mounted between heatsinks

FIG. 1 - FORWARD CURRENT DERATING CURVE

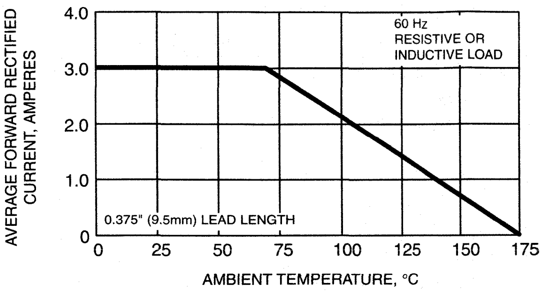


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

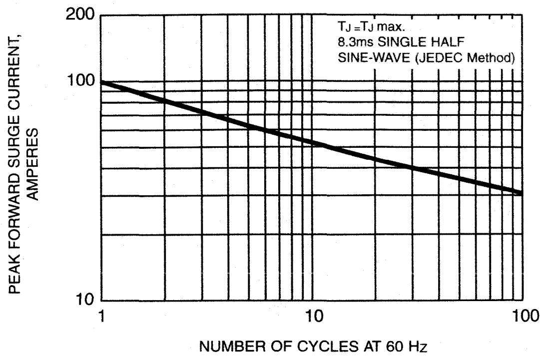


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

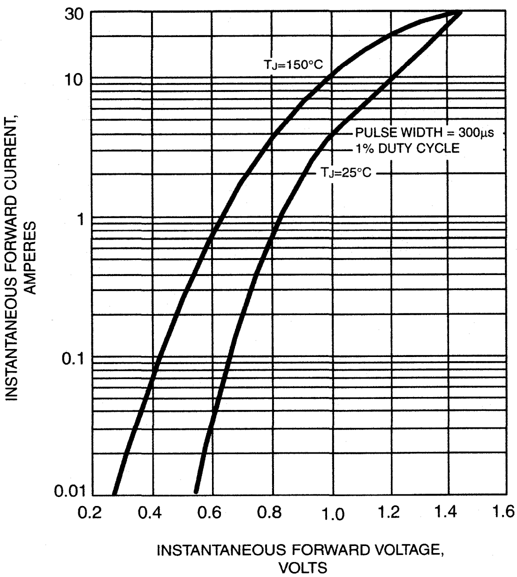


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

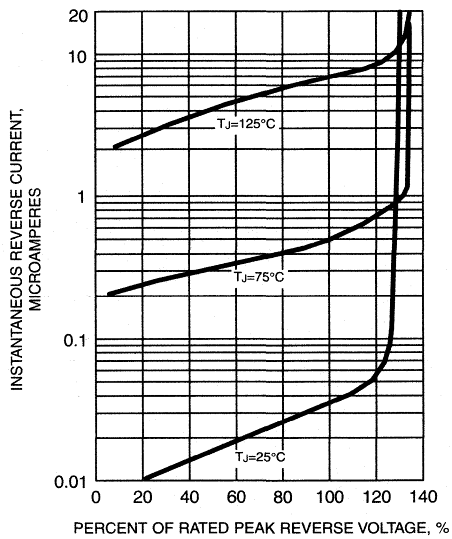
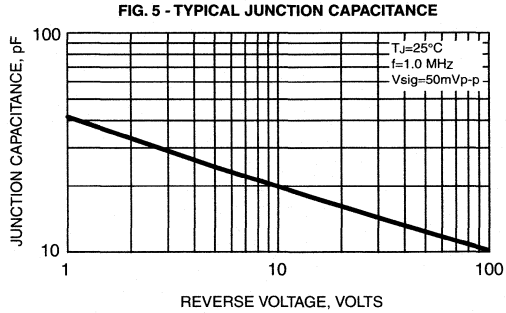


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



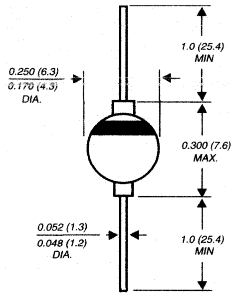
RG3A THRU RG3M

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

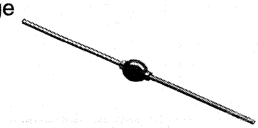
Case Style G3



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES



- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Hermetically sealed package
- ♦ 3.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RG3A*	*RG3B*	*RG3D*	*RG3G*	*RG3J*	*RG3K*	*RG3M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	220	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.3							Volts
Maximum average reverse current at rated peak reverse voltage T_A=25°C / T_A=100°C	$I_{R(AV)}$	2.0 100.0							μA
Maximum DC reverse current at rated DC blocking voltage	I_R	5.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	400	500	ns
Typical junction capacitance (NOTE 2)	C_J	40.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads attached to heat sink

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FIG. 1 - FORWARD CURRENT DERATING CURVE

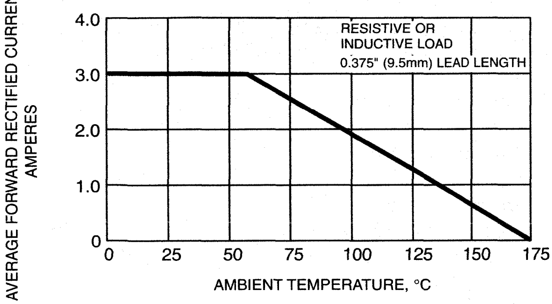


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

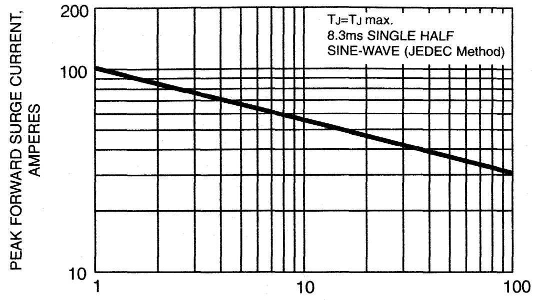


FIG.3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

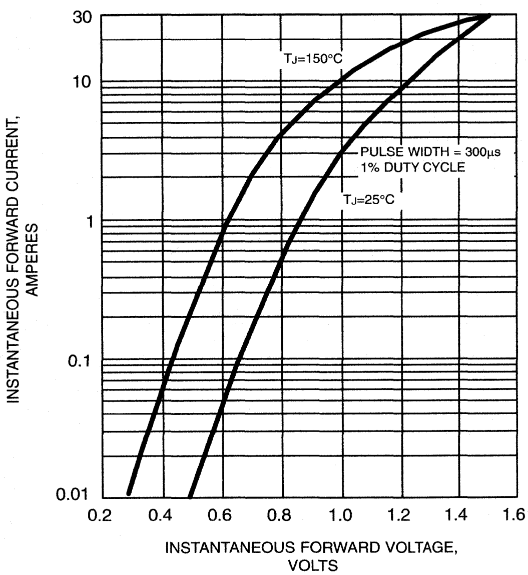


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

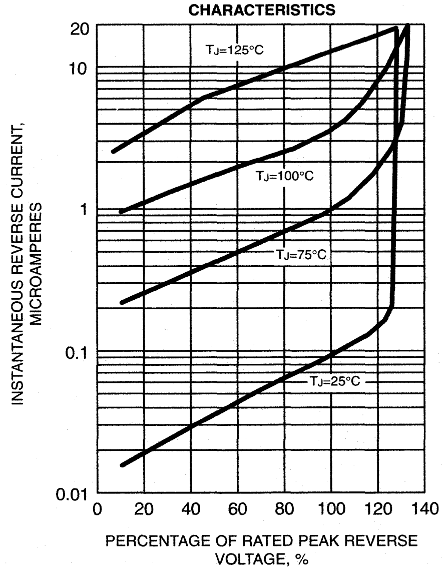
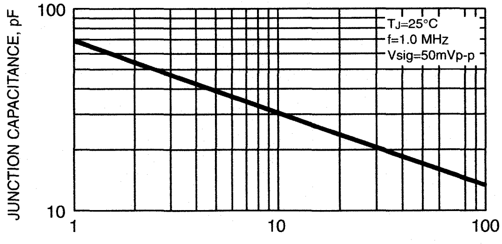


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



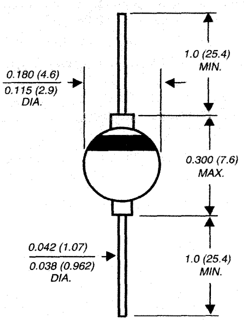
RG4A THRU RG4J

GLASS PASSIVATED FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

Case Style G4

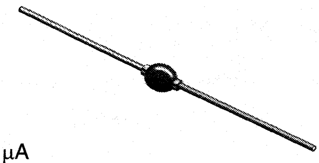


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306*

FEATURES

- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for fast efficiency
- ♦ 3.0 Ampere operation at T_A=50°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ Hermetically sealed package
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	RG4A	RG4B	RG4D	RG4G	RG4J	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	3.0					Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0					Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.3					Volts
Maximum reverse current at rated DC blocking voltage	I_R	5.0					μA
Maximum average reverse current at peak reverse voltage T_A=25°C / T_A=100°C	$I_{R(AV)}$	2.0 / 100.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	ns
Typical junction capacitance (NOTE 2)	C_J	50.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads to heat sink

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FIG. 1 - FORWARD CURRENT DERATING CURVE

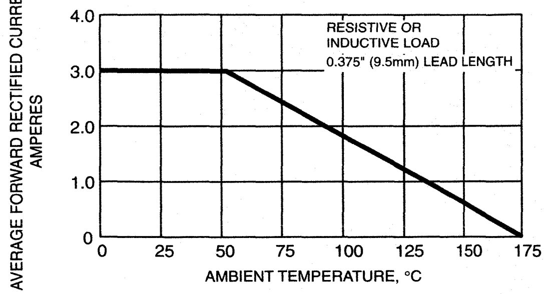


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

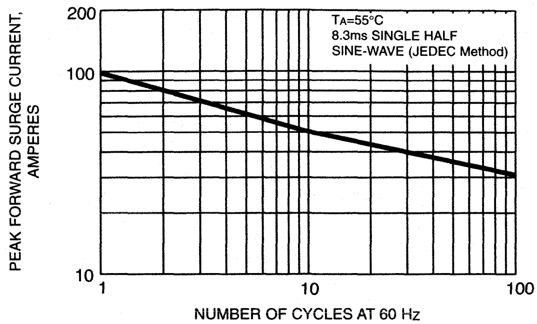


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

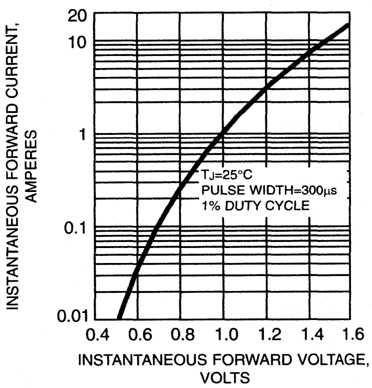


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

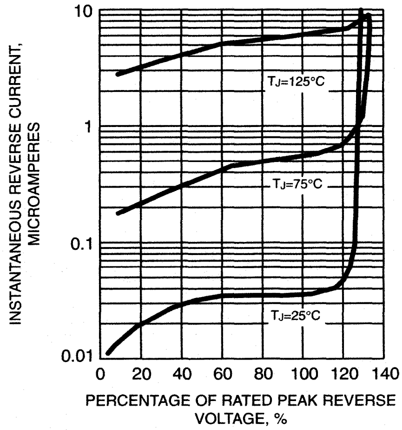
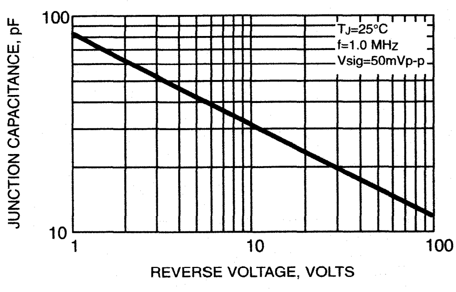


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



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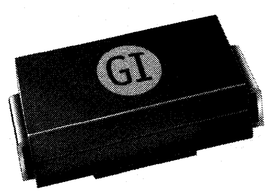
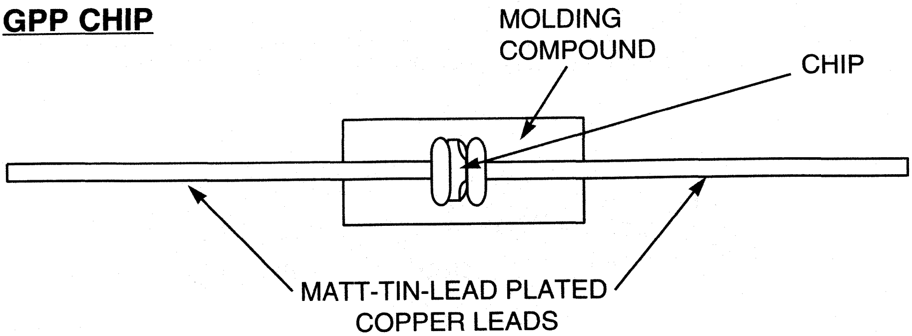
DIE LEVEL GLASS PASSIVATED RECTIFIERS

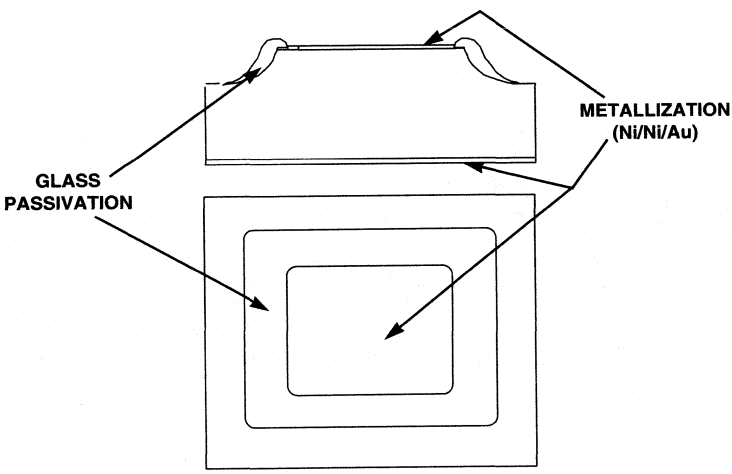
0.6 TO 3.0 AMPERES
50 VOLTS TO 1000 VOLTS



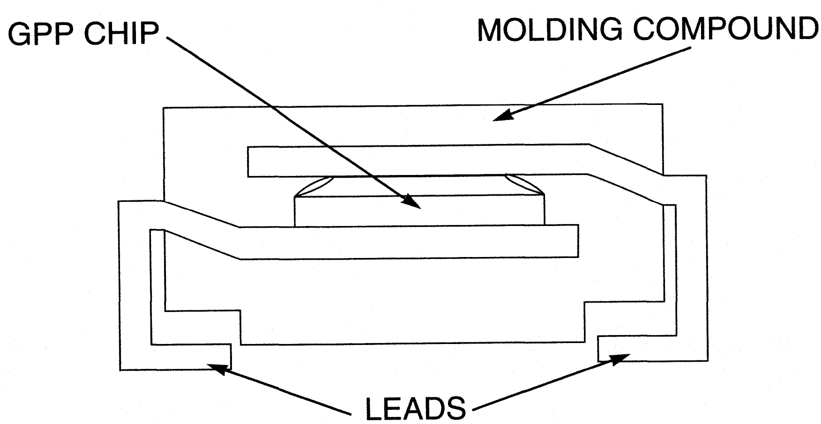
GPP CHIP



GPP DIE CONSTRUCTION



SMX CROSS SECTION



INTRODUCTION TO GLASS PASSIVATED DIE LEVEL RECTIFIERS

General Instrument GPP Type Rectifiers utilize a glass passivation on the chip level to enhance its devices performance. The difference is that the glass is applied to the wafer prior to die cutting to achieve optimum protection of the part without individual glass shurry application. This system achieves excellent reliability capabilities, while landing itself to high volume manufacturing. This technology is available in both Axial and surface mount packages.

GLASS PASSIVATED DIE LEVEL RECTIFIER PART NUMBERING SYSTEM

AMPG06X-ZZZ

A = Type Designator

R = Recovery
"Blank" = Standard

M = Miniature
P = Plastic
G = Glass
06 = 0.6 Amps Forward

B=Reverse Voltage

A = 50
B = 100
D = 200
G = 400
J = 600
K = 800
M = 1000

ZZZ=Specific Customer Information

SURFACE MOUNT
ASBC-ZZZ

A = Type Designator
R = Recovery
"Blank" = Standard

S = Surface Mount

B = Forward Current
1 = 1.0 Amp
2 = 2.0 Amp
3 = 3.0 Amp

C = Reverse Voltage
A = 50
B = 100
D = 200
G = 400
J = 600
K = 800
M = 1000

ZZZ=Customer Specific Instructions

QUICK GUIDE TO GLASS PASSIVATED DIE LEVEL RECTIFIERS

TYPE	MP606A thru MP606m	S1A thru S 1J	RMP606A thru RMP606J	RS1A thru RS1J	S2A thru S2M	RS2A thru RS2K
PACKAGE	MPG06	D0-214AC	MP606	D0-214AC	D0-214AA	D0-214AA
I_o(A)	1.0	1.0	1.0	1.0	1.5	1.5
V_R=50V	MPG06A	S1A	RMPG06A	RS1A	S2A	RS2A
V_R=100V	MPG06B	S1B	RMPG06B	RS1B	S2B	RS2B
V_R=200V	MPG06D	S1D	RMPG06D	RS1D	S2D	RS2D
V_R=400V	MPG06G	S1G	RMPG06G	RS1G	S2G	RS2G
V_R=600V	MPG06J	S1J	RMPG06J	RS1J	S2J	RS2J
V_R=800V	MPG06K				S2K	RS2K
V_R=1000V	MPG06M				S2M	
T_{rr} (ns)			150/200	150/200		150-500

QUICK GUIDE TO GLASS PASSIVATED DIE LEVEL RECTIFIERS (cont'd)

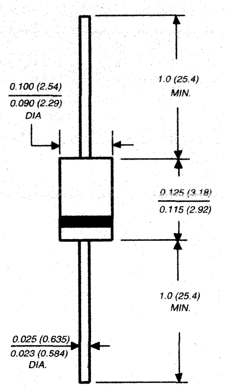
TYPE	S3A thru S3M	RS3A thru RS3K
Package	D0-214AB	D0-214AB
Io(A)	2.5	2.5
V_R=50V	S3A	RS3A
V_R=100V	S3B	RS3B
V_R=200V	S3D	RS3D
V_R=400V	S3G	RS3G
V_R=600	S3J	RS3J
V_R=800V	S3K	RS3K
V_R=1000V	S3M	
Trr (ns)		150-500

MPG06A THRU MPG06M

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

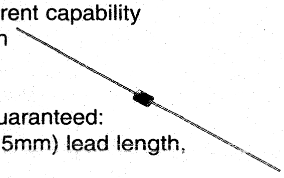
***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

Case Style MPG06



Dimensions are in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Low forward voltage, high current capability
- ♦ Glass passivated chip junction
- ♦ High surge capability
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over passivated chip
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MPG 06A*	*MPG 06B*	*MPG 06D*	*MPG 06G*	*MPG 06J*	*MPG 06K*	*MPG 06M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=25°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.1							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0							μA
Typical junction capacitance (NOTE 1)	C_J	10.0							pF
Typical reverse recovery time (NOTE 2)	t_{rr}	0.6							μs
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	67.0 30.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 0.22 x 0.22" (5.5 x 5.5mm) copper pads

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FIG. 1 - FORWARD CURRENT DERATING CURVE

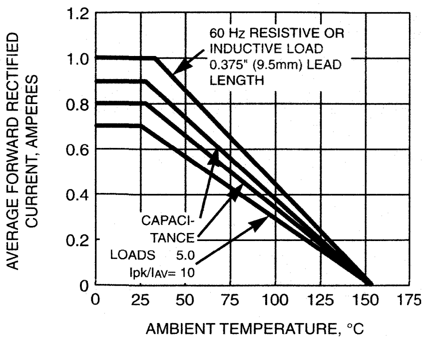


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

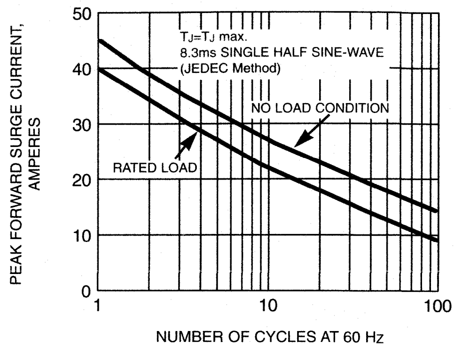


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

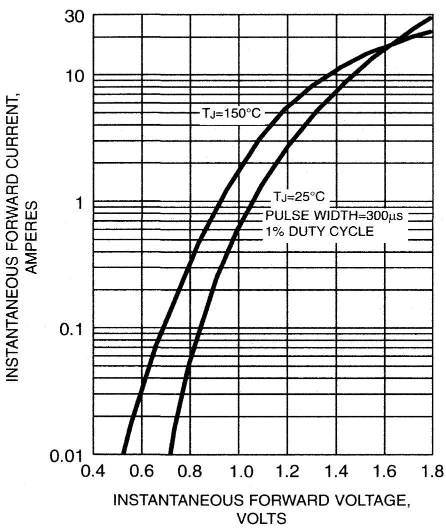


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

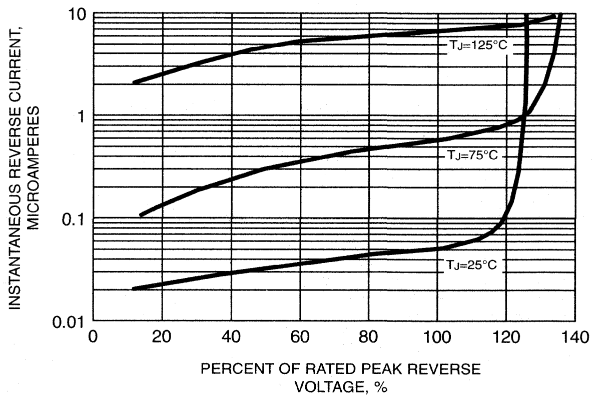
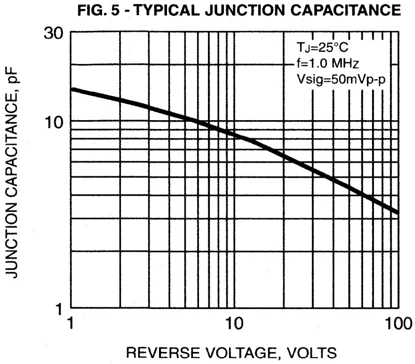


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

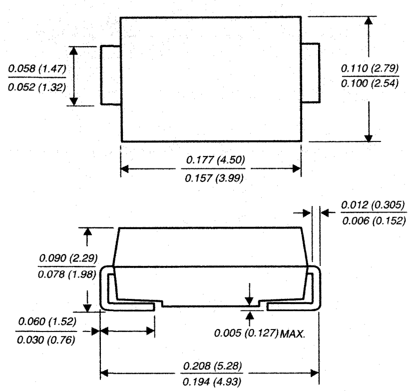


S1A THRU S1J

SURFACE MOUNT RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 1.0 Ampere*

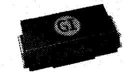
DO214AC
MODIFIED J-BEND



Dimensions are in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Low profile package
- Built-in strain relief, ideal for automated placement
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO214AC molded plastic over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.002 ounce, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*S1A*	*S1B*	*S1D*	*S1G*	*S1J*	*UNITS*
Device marking code		SA	SB	SD	SG	SJ	
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current at T_L=110°C	$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=110°C	I_{FSM}	40.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.10					Volts
Maximum DC reverse current T_A=25°C at Rated DC blocking voltage T_A=125°C	I_R	1.0 50.0					μA
Typical reverse recovery time (NOTE 1)	t_{rr}	1.8					μs
Typical junction capacitance (NOTE 2)	C_J	12.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	75.0 27.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

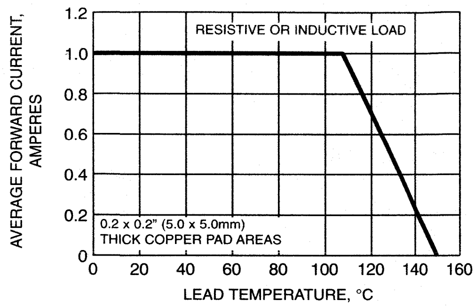


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

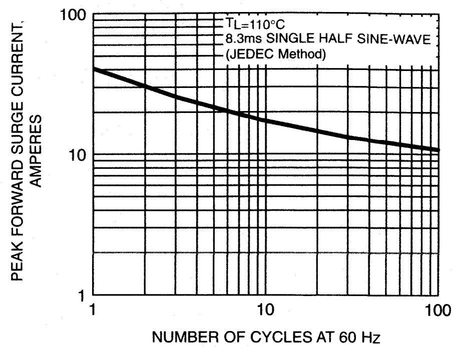


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

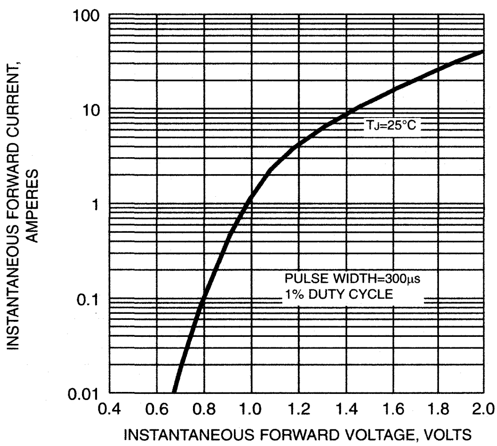


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

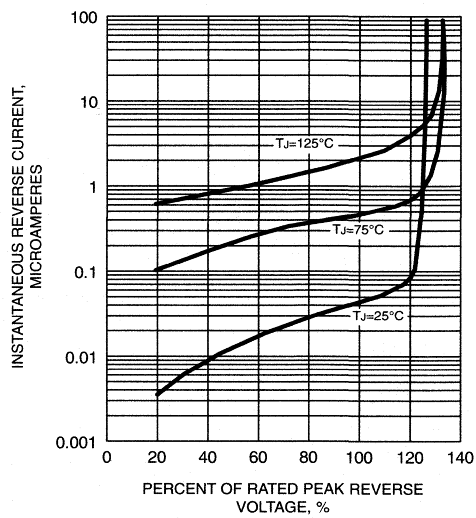


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

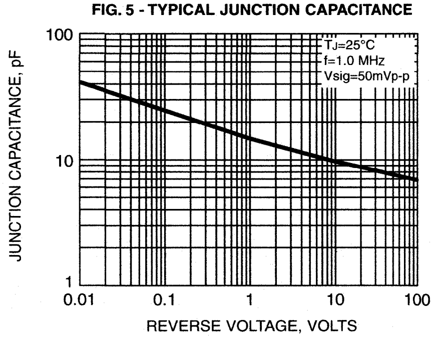
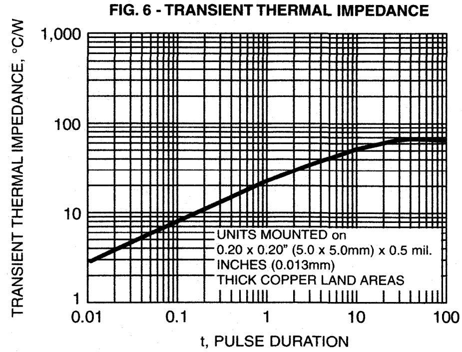


FIG. 6 - TRANSIENT THERMAL IMPEDANCE

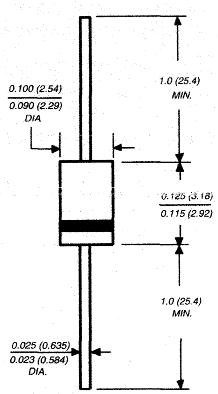


RMPG06A THRU RMPG06J

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 1.0 Ampere*

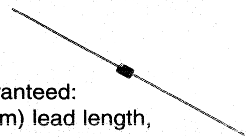
Case Style MPG06



Dimensions are in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Low forward voltage drops, high current capability
- ♦ Glass passivated chip junction
- ♦ High surge capability
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 250°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over passivated chip
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RMPG 06A*	*RMPG 06B*	*RMPG 06D*	*RMPG 06G*	*RMPG 06J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	70	200	400	600	Volts
Maximum average forward rectified current, 0.375" (9.5mm) lead length at T_A=25°C	$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.3					Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 50.0					μA
Typical junction capacitance (NOTE 1)	C_J	6.6					pF
Typical reverse recovery time (NOTE 2)	t_{rr}	150				200	ns
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	67.0 / 30.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150					°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 0.22 x 0.22" (5.5 x 5.5mm) copper pads

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FIG. 1 - FORWARD CURRENT DERATING CURVES

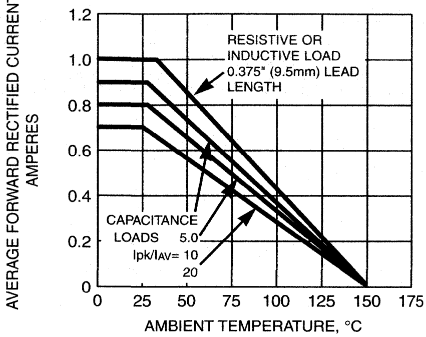


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

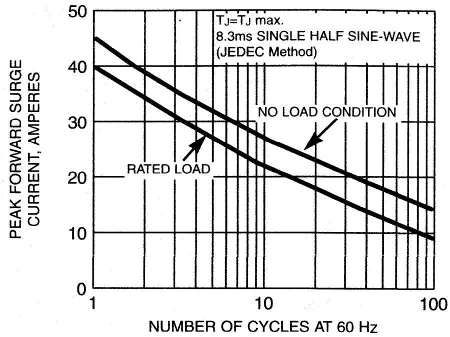


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

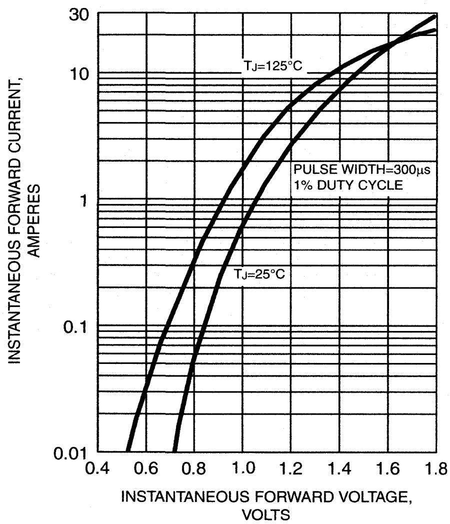


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

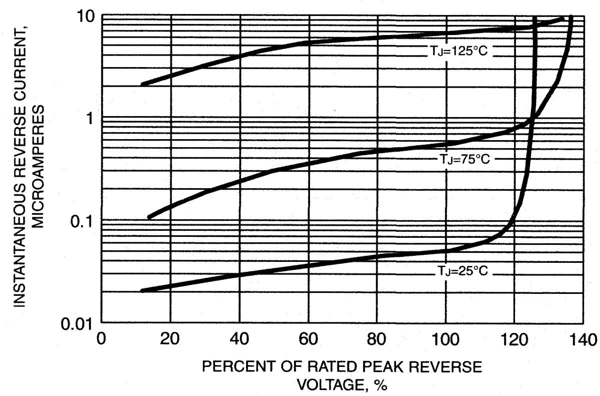
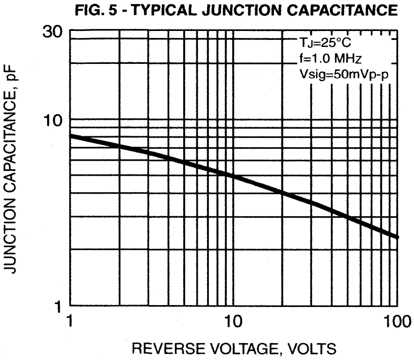


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

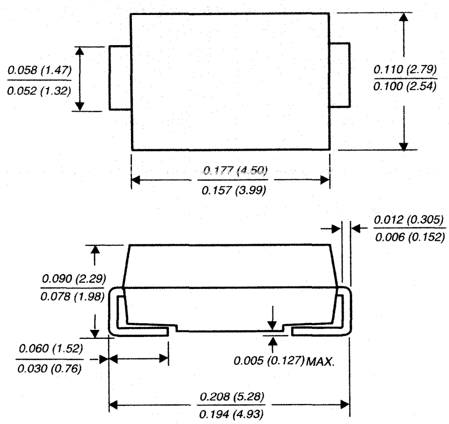


RS1A THRU RS1J

SURFACE MOUNT FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 1.0 Ampere*

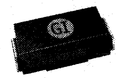
DO-214AC
MODIFIED J-BEND



Dimensions are in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mounted applications in order to optimize board space
- ♦ Low profile package
- ♦ Built-in strain relief, ideal for automated placement
- ♦ Fast switching for high efficiency
- ♦ Glass passivated chip junction
- ♦ High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.002 ounce, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

		SYMBOLS	RS1A	RS1B	RS1D	RS1G	RS1J	UNITS
Device marking code			RA	RB	RD	RG	RJ	
Maximum repetitive peak reverse voltage		V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage		V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage		V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current at T_L=90°C		$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=90°C		I_{FSM}	30.0					Amps
Maximum instantaneous forward voltage at 1.0A		V_F	1.30					Volts
Maximum DC reverse current at rated DC blocking voltage	T_A=25°C T_A=125°C	I_R	5.0 50.0					μA
Maximum reverse recovery time	(NOTE 1)	t_{rr}	150				250	ns
Typical junction capacitance	(NOTE 2)	C_J	10.0					pF
Maximum thermal resistance	(NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	105.0 32.0					°C/W
Operating junction and storage temperature range		T_J, T_{STG}	-55 to +150					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

FIG. 1 - FORWARD CURRENT DERATING CURVE

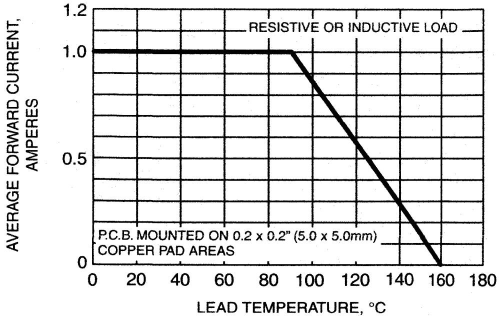


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

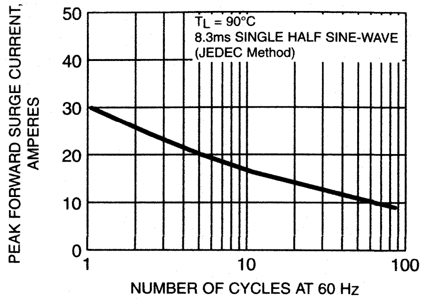


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

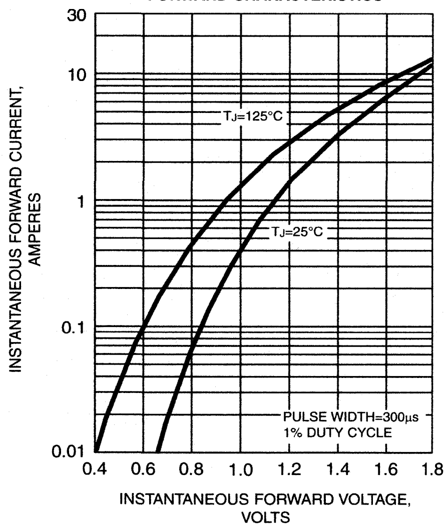


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

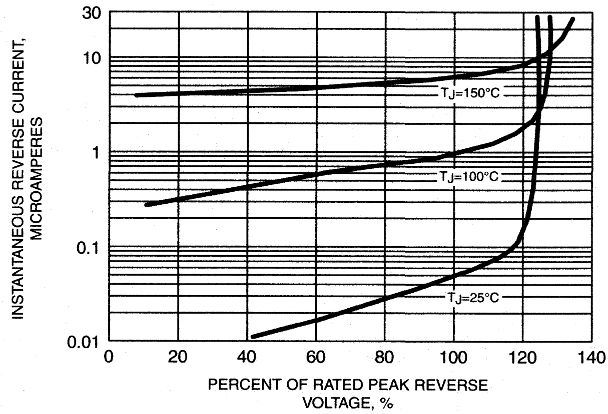
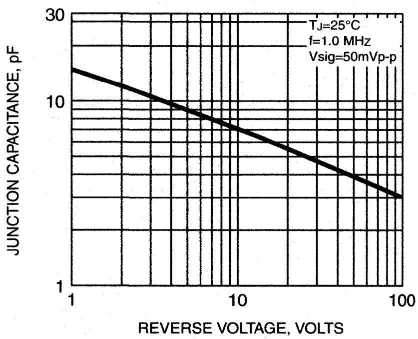


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

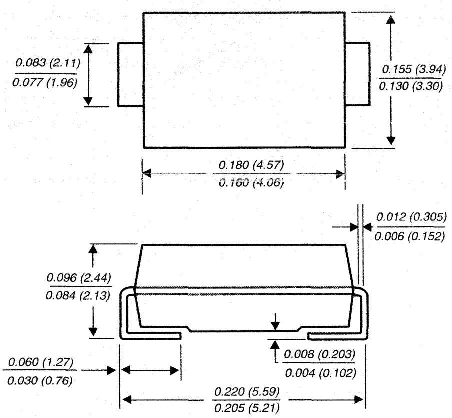


S2A THRU S2M

SURFACE MOUNT GLASS PASSIVATED SILICON RECTIFIER

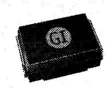
***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

DO-214AA
MODIFIED J-BEND



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Low profile package
- Built-in strain relief, ideal for automated placement
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.003 ounce, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	***S2A***	***S2B***	***S2D***	***S2G***	***S2J***	***S2K***	***S2M***	***UNITS***
Device marking code		***SA***	***SB***	***SD***	***SG***	***SJ***	***SK***	***SM***	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_L=100°C	$I_{(AV)}$	1.5							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=100°C	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 1.5 A	V_F	1.15							Volts
Maximum DC reverse current T_A=25°C at Rated DC blocking voltage T_A=125°C	I_R	1.0 125.0							µA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0							µs
Typical junction capacitance (NOTE 2)	C_J	30.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	53.0 16.0							°C/W
Operating and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and junction to lead P.C.B. mounted on 0.27 x 0.27" (7.0 x 7.0mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

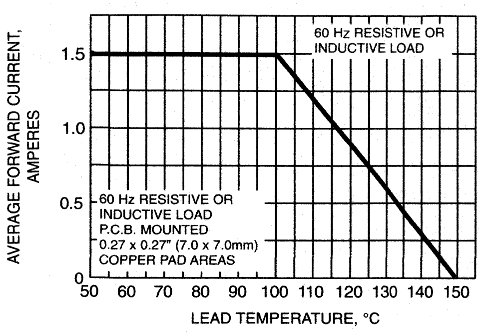


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

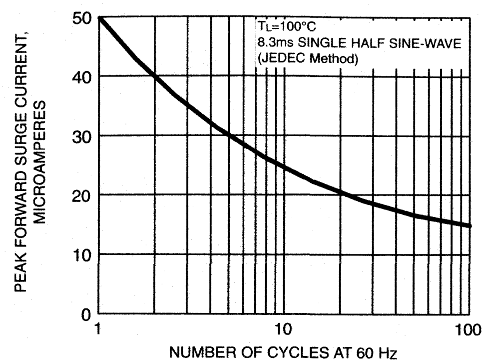


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

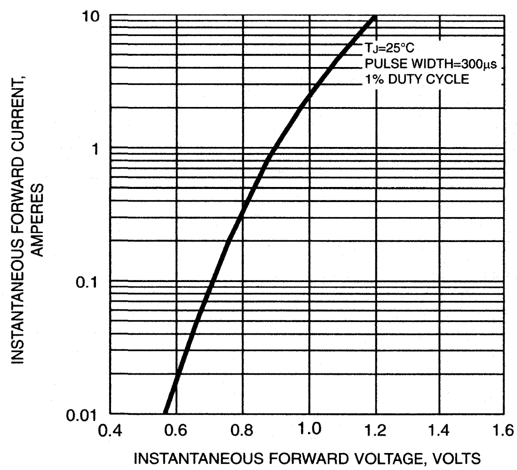


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

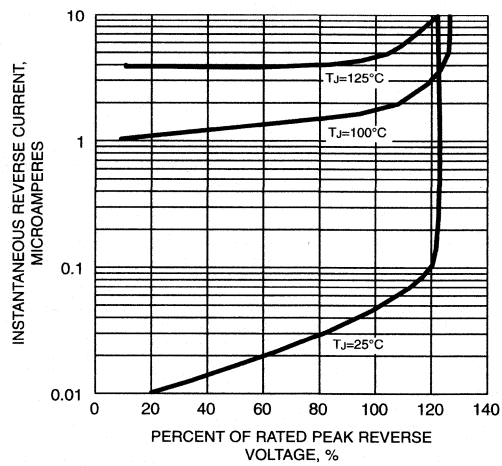
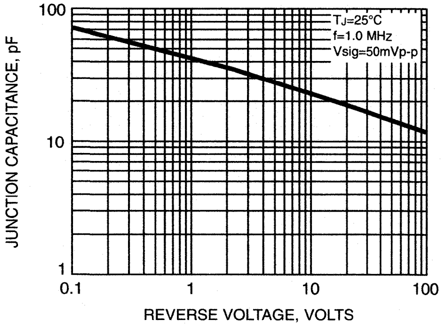


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

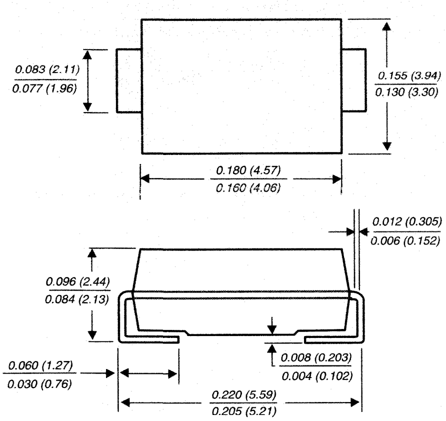


RS2A THRU RS2K

SURFACE MOUNT FAST SWITCHING RECTIFIER

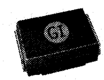
***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 1.5 Amperes*

DO-214AA
MODIFIED J-BEND



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mount applications
- ♦ Low profile package
- ♦ Built-in strain relief, ideal for automated placement
- ♦ Glass passivated chip junction
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic over passivated chip
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode band end
Weight: 0.003 ounce, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RS2A*	*RS2B*	*RS2D*	*RS2G*	*RS2J*	*RS2K*	*UNITS*
Device marking code		*RA*	*RB*	*RD*	*RG*	*RJ*	*RK*	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current at T_L=100°C	$I_{(AV)}$	1.5						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0						Amps
Maximum instantaneous forward voltage at 1.5A	V_F	1.30						Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 200.0						µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150			250		500	ns
Typical junction capacitance (NOTE 2)	C_J	50.0						pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	55.0 18.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to 150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and junction to lead P.C.B. mounted on 0.27 x 0.27" (7.0 x 7.0mm) copper pad areas

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RATINGS AND CHARACTERISTIC CURVES RS2A THRU RS2K

FIG. 1 - FORWARD CURRENT DERATING CURVE

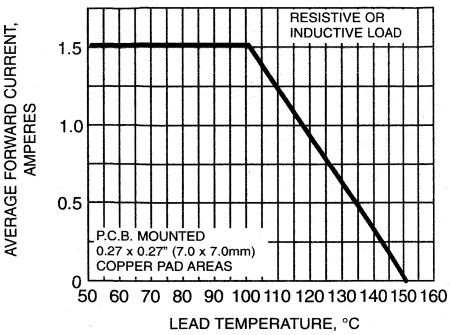


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

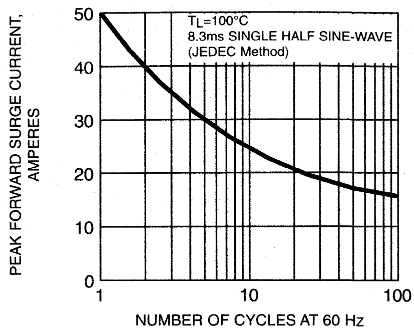


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

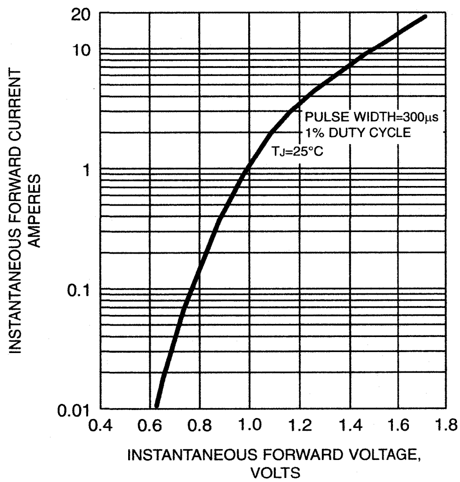


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

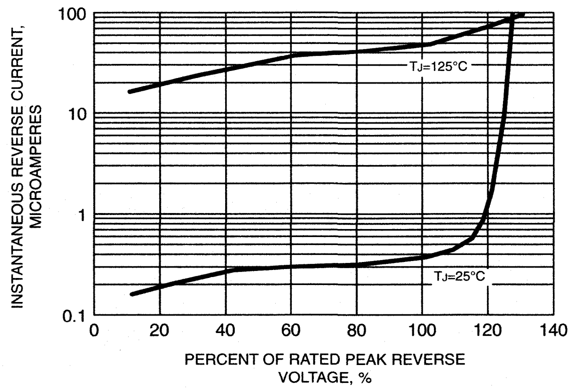
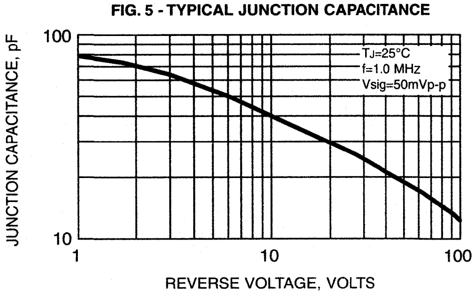


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

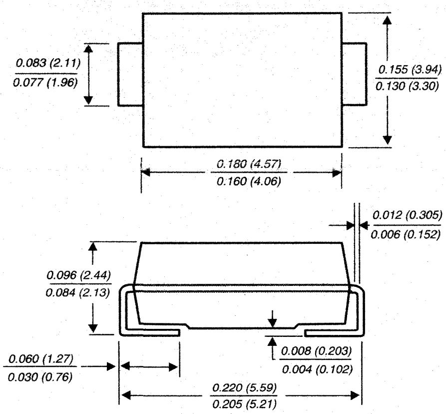


S3A THRU S3M

SURFACE MOUNT RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

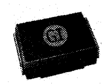
DO-214AB
MODIFIED J-BEND



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mount applications
- ♦ Low profile package
- ♦ Built-in strain relief, ideal for automated placement
- ♦ Glass passivated chip junction
- ♦ High temperature soldering: 260°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.007 ounce, 0.25 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*S3A*	*S3B*	*S3D*	*S3G*	*S3J*	*S3K*	*S3M*	*UNITS*
Device marking code		SA	SB	SD	SG	SJ	SK	SM	
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_L=75°C (NOTE 3)	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=75°C	I_{FSM}	100.0							Amps
Maximum instantaneous forward voltage at 2.5A	V_F	1.15							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	10.0 250.0							µA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.5							µs
Typical junction capacitance (NOTE 2)	C_J	60.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	47.0 13.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.3 x 0.3" (8.0 x 8.0mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

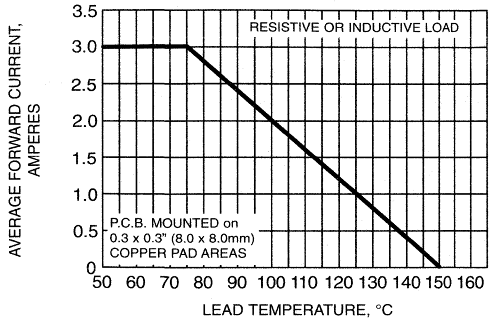


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

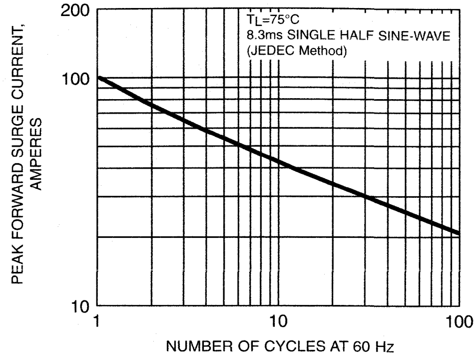


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

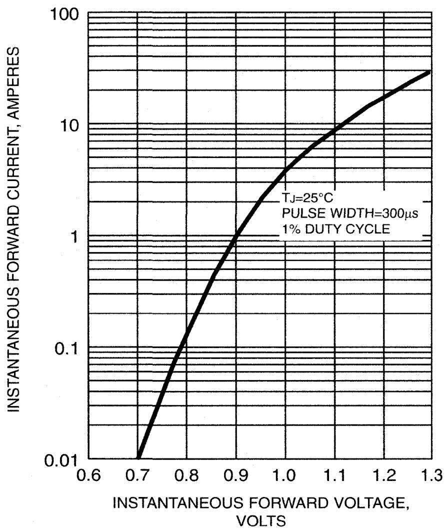


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

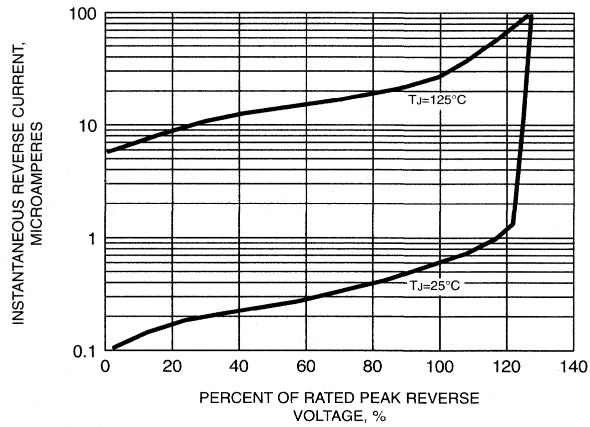
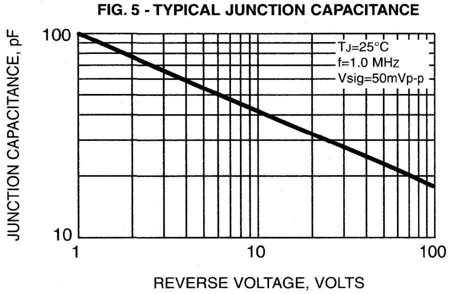


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

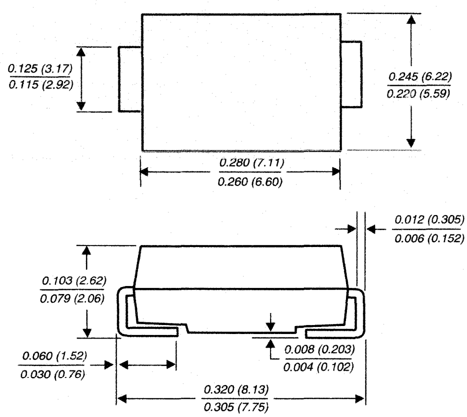


RS3A THRU RS3K

SURFACE MOUNT FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 3.0 Amperes*

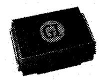
DO-214AB
MODIFIED J-BEND



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- Low profile package
- Built-in strain relief, ideal for automated placement
- Fast switching for high efficiency
- Easy pick and place
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.007 ounce, 0.25 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RS3A*	*RS3B*	*RS3D*	*RS3G*	*RS3J*	*RS3K*	*UNITS*
Device marking code		RA	RB	RD	RG	RJ	RK	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current at T_L=75°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=75°C	I_{FSM}	100.0						Amps
Maximum instantaneous forward voltage at 2.5A	V_F	1.3						Volts
Maximum DC reverse current at Rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	10.0 250						µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500	ns
Typical junction capacitance (NOTE 2)	C_J	60.0						pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	15.0 50.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied V_R=4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.3 x 0.3" (8.0 x 8.0mm) copper pad areas

FIG. 1 - FORWARD CURRENT DERATING CURVE

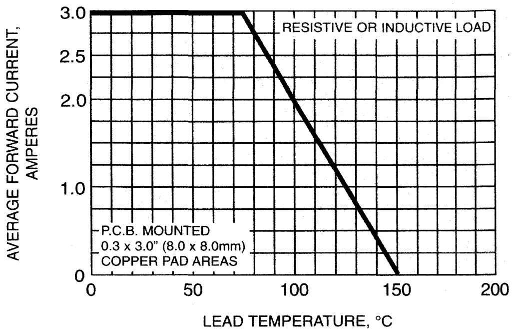


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

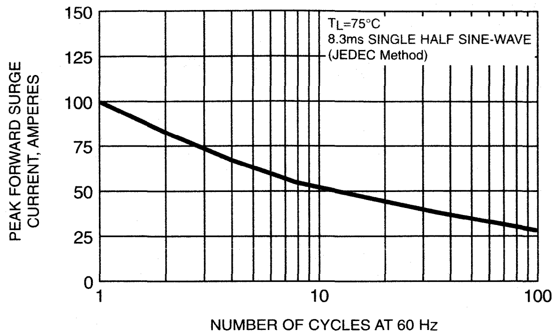


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

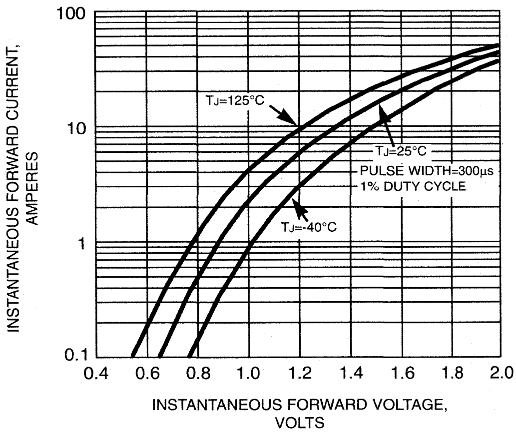
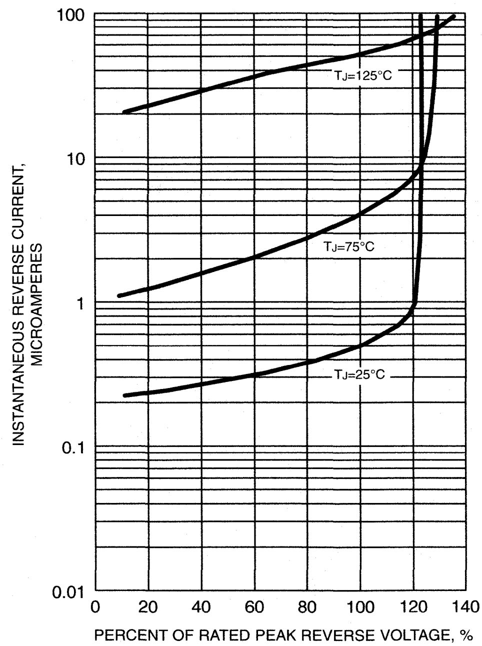


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

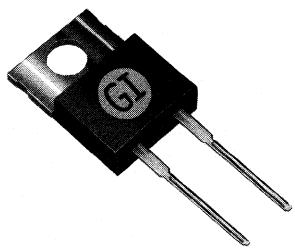


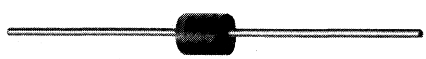
General Instrument
Power Semiconductor Division

PLASTIC

PLASTIC RECTIFIERS

1.0 AMPERE 8.0 AMPERES
50 VOLTS TO 1000 VOLTS



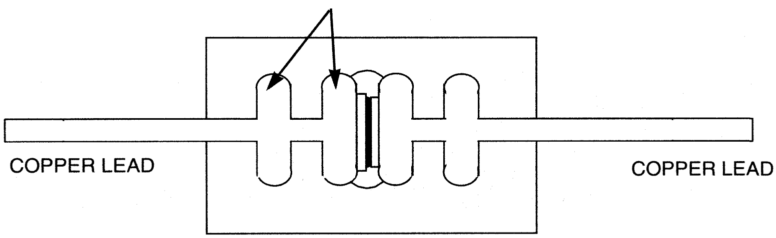


INTRODUCTION TO PLASTIC RECTIFIERS

General Instrument has produced Plastic Rectifiers successfully for many years. The key factor in the production of the Plastic Rectifiers is the double nail head construction concept. This manufacturing technique locks the nail head into the plastic to reduce stress on the chip from external forces.

PSD's proprietary manufacturing methods allow many subassemblies to be processed simultaneously in batch form. This method ensures that General Instrument produces high volumes of rectifiers economically.

The construction is shown in the following diagram.



FAMILIES OF GENERAL INSTRUMENT PLASTIC RECTIFIERS

MINIATURE PLASTIC RECTIFIERS 1.0 TO 1.5 AMPERES

TYPE:

1N4001 thru 1N4007
M100A thru M100M
1N5391 thru 1N5399

FEATURES:

- ♦ Low Cost
- ♦ Diffused Junction
- ♦ Low Leakage
- ♦ High Current Capacity
- ♦ Easily Cleaned with Freon, Alcohol, Chlorothene and similar Solvents
- ♦ Plated axial leads, solderable per MIL-STD-750, Method 2026
- ♦ Case: Jedec DO-204AL
- ♦ High Temperature Soldering Guaranteed 250°C/10 seconds/0.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension

PLASTIC POWER RECTIFIERS 3.0 TO 8.0 AMPERES

TYPES:

1N5400 thru 1N5408
P300A thru P300M
GI500 thru GI510
GI750 thru GI758
P600A thru P600M

FEATURES:

- ♦ High Surge Capability
- ♦ Void-Free Plastic Packages
- ♦ High Current Operation
- ♦ Typical I_R less than 0.1 A
- ♦ High Temperature Soldering Guaranteed 250°C/10 Seconds/0.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension

*This series uses glass passivated chip junctions.

FAST RECOVERY PLASTIC RECTIFIERS 1.0 TO 6.0 AMPERES

TYPES:

BY396P thru BY399
1N4933 thru 1N4937
BY500-100 thru BY500-800
SRP100A thru SRP100K
GI820 thru GI826
SRP300A thru SRP300K
GI850 thru GI856
GI910 thru GI917

FEATURES:

- ♦ High Surge Current Capability
- ♦ Void-Free Plastic Packages
- ♦ High Current Operation
- ♦ Typical I_R less than 1.0 A
- ♦ High Temperature Soldering Guaranteed 250 C/10 Seconds/0.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension
- ♦ Controlled Soft Recovery Guarantees on SRP100A thru SRP100K, SRP300A SRP300A thru SRP300K, SRP600A thru SRP600K, BY500-100 thru BY500-800 and SRP600A thru SRP600K series
- ♦ Plated axial leads, solderable per MIL-STD-750, Method 2026

PLASTIC RECTIFIER PART NUMBERING SYSTEM

Part numbering system for all parts excluding JEDEC registered Pro Electron and industry standard parts.

1. Axial

a) PX00Y - ZZZZ

A = Type Designator

"Blank" = Standard

SR = Fast **S**witching **R**ecovery

P = Plastic

X = Forward Current

1 = 1 Amp

3 = 3 Amp

6 = 6 Amp

Y = Reverse Voltage

A = 50V

B = 100V

D = 200V

G = 400V

J = 600V

K = 800V

M = 1000V

2. TO-220

NS8YT-ZZZ

NS=**N**on-**S**witching (Standard) Rectifier

8=**F**orward **C**urrent (8 Amps)

Y = Reverse Voltage

A = 50V

B = 100V

D = 200V

G = 400V

J = 600V

K = 800V

M = 1000V

T = signal TO-220 designator

ZZZZ = Customer specific instru

(not shown in databook)

For JEDEC and ProElectron part numbers, please see P/N explanations on page 2

QUICK GUIDE TO PLASTIC RECTIFIERS

TYPE	1N4001 thru 1N4007	M100A thru M100M	1N4933* thru 1N4937	SRP100A thru SRP100K	1N5391 thru 1N5399	1N5400 thru 1N5408	P300A thru P300M	GI500 thru GI510	GI910* thru GI917	GI850* thru GI858	SRP300A* thru SRP300K	BY396P* thru BY399P
CASE	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO-201AD	DO-201AD	DO-201AD	DO-201AD	DO-201AD	DO-201AD	DO-201AD
I_O(A)	1.0	1.0	1.0	1.0	1.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
@T_A(C)	75	100	75	55	75 TL	55	55	95	90	90	55	50
V_R=50(V)	1N4001	M100A	1N4933	SRP100A	1N5391	1N5400	P300A	GI500	GI910	GI850	SRP300A	
V_R=100(V)	1N4002	M100B	1N4934	SRP100B	1N5392	1N5401	P300B	GI501	GI911	GI851	SRP300B	BY396P
V_R=200(V)	1N4003	M100D	1N4935	SRP100D	1N5393	1N5402	P300D	GI502	GI912	GI852	SRP300D	BY397P
V_R=300(V)					1N5394	1N5403						
V_R=400(V)	1N4004	M100G	1N4936	SRP100G	1N5395	1N5404	P300G	GI504	GI914	GI854	SRP300G	BY398P
V_R=500(V)					1N5396	1N5405						
V_R=600(V)	1N4005	M100J	1N4937	SRP100J	1N5397	1N5406	P300J	GI506	GI916	GI856	SRP300J	
V_R=800(V)	1N4006	M100K		SRP100K	1N5398	1N5407	P300K	GI508	GI917	GI858	SRP300K	BY399P
V_R=1000(V)	1N4007	M100M			1N5399	1N5408	P300M	GI510				
SURGE(A)	30	50	30	30	50	200	200	100	100	150	100	100
V_F(V)	1.1	1.0.1.1	1.2	1.3	1.4	1.2	1.1	1.1	1.25	1.25	1.3	1.25

*Fast Recovery

QUICK GUIDE TO PLASTIC RECTIFIERS (cont'd)

TYPE	BY500-100* thru BY500-800*	GI750 thru GI758	P600A thru P600M	GI820* thru GI826*	SRP600A* thru SRP600K*	NS8AT thru NS8MT
CASE	DO-201AD	P600	P600	P600	P600	TO-220AC
I_O(A)	5.0	6.0	6.0	6.0	6.0	8.0
@T_A(C)	45	60	60	55	55	100
V_R=50(V)		GI750	P600A	GI820	SRP600A	NS8AT
V_R=100(V)	BY500-100	GI751	P600B	GI821	SRP600B	NS8BT
V_R=200(V)	BY500-200	GI752	P600D	GI822	SRP600D	NS8DT
V_R=400(V)	BY500-400	GI754	P600G	GI824	SRP600G	NS8GT
V_R=600(V)	BY500-600	GI756	P600J	GI826	SRP600J	NS8JT
V_R=800(V)	BY500-800	GI758	P600K		SRP600K	NS8KT
V_R=1000(V)			P600M			NS8MT
SURGE(A)	200	400	400	300	300	175
V_F(V)	1.35	.9/.95	.9/1.0	1.0	1.3	1.1

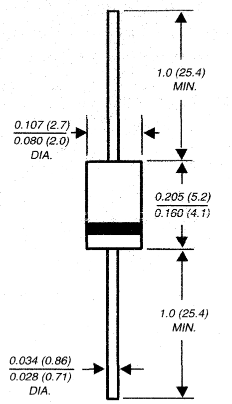
*Fast Recovery

1N4001 THRU 1N4007

GENERAL PURPOSE PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

DO-204AL

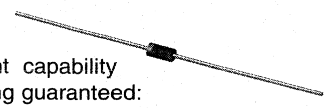


NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

FEATURES

- The plastic package carries Underwriters Laboratory Flammability Classification 94V-0
- Construction utilizes void-free molded plastic technique
- Low reverse leakage
- High forward surge current capability
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4001	1N 4002	1N 4003	1N 4004	1N 4005	1N 4006	1N 4007	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
*Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
*Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0							Amp
*Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=75°C	I_{FSM}	30.0							Amps
*Maximum instantaneous forward voltage at 1.0A	V_F	1.1							Volts
*Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_L=75°C	$I_{R(AV)}$	30.0							μA
*Maximum DC reverse current at rated DC blocking voltage T_A= 25°C / T_A=100°C	I_R	5.0 / 50.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	30.0							μs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	50.0 / 25.0							°C/W
Maximum DC blocking voltage temperature	T_A	+150							°C
*Operating junction and storage temperature range	T_J, T_{STG}	-50 to +175							°C

NOTES:
(1) Measured on Tektronix Type "S" recovery plug-in. Tektronix 545 Scope or equivalent, I_{FM}=20mA, I_{RM}=1mA
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered value

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RATINGS AND CHARACTERISTIC CURVES 1N4001 THRU 1N4007

FIG.1 - FORWARD CURRENT DERATING CURVE

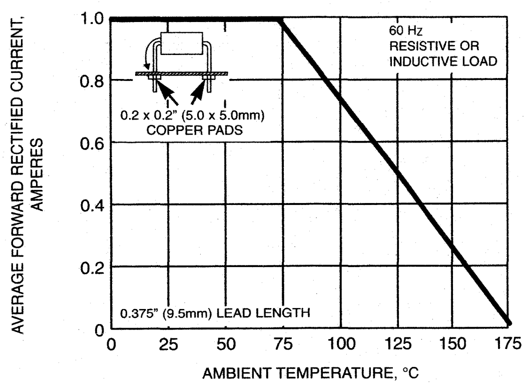


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

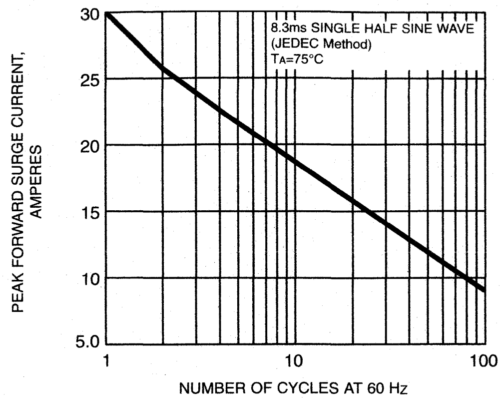


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

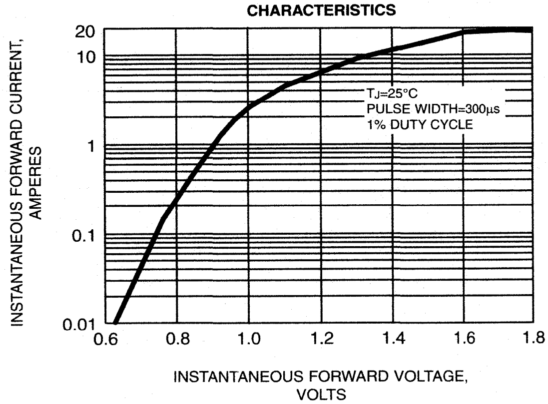


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

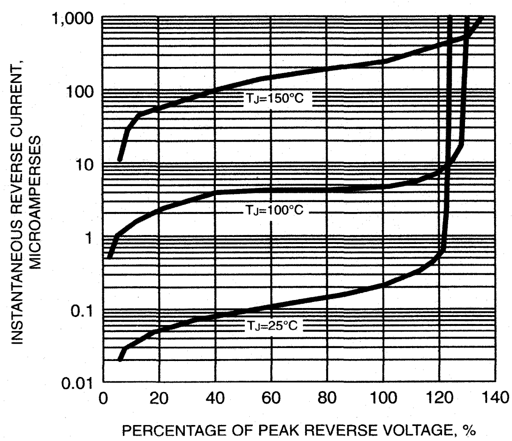


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

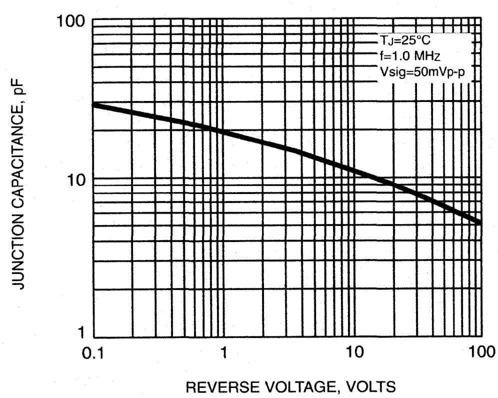
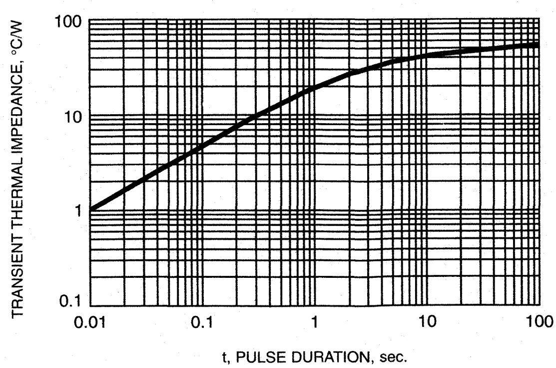


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

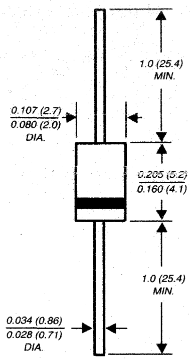


1N4933 THRU 1N4937

FAST SWITCHING PLASTIC RECTIFIER

Reverse Voltage *- 50 to 600 Volts* ***Forward Current*** *- 1.0 Ampere*

DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Fast switching for high efficiency
- ♦ Construction utilizes void-free molded plastic technique
- ♦ 1.0 Ampere operation at T_A=75°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N4933*	*1N4934*	*1N4935*	*1N4936*	*1N4937*	*UNITS*
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
*Maximum RMS voltage	V_{RMS}	35	70	145	280	420	Volts
*Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$			1.0			Amp
*Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}			30.0			Amps
*Maximum instantaneous forward voltage at 1.0A	V_F			1.2			Volts
*Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R			5.0 / 100.0			µA
*Maximum reverse recovery time (NOTE 1) T_J=25°C	t_{rr}			200.0			ns
*Maximum reverse recovery current (NOTE 1)	$I_{RM(REC)}$			2.0			Amps
Typical junction capacitance (NOTE 2)	C_J			12.0			pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$			55.0 / 25.0			°C/W
*Operating junction and storage temperature range	T_J, T_{STG}			-50 to +150			°C

NOTES:
(1) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs, and I_{rr}=10% I_{RM} for measurement of t_{rr}
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered values

FIG.1 - FORWARD CURRENT DERATING CURVE

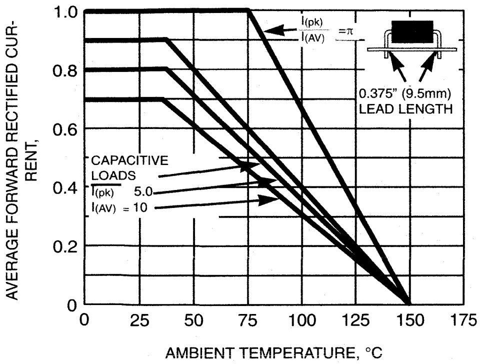


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

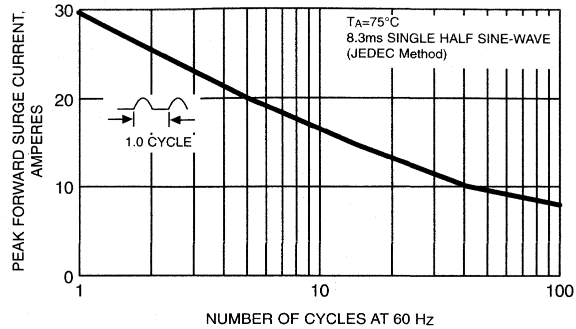


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

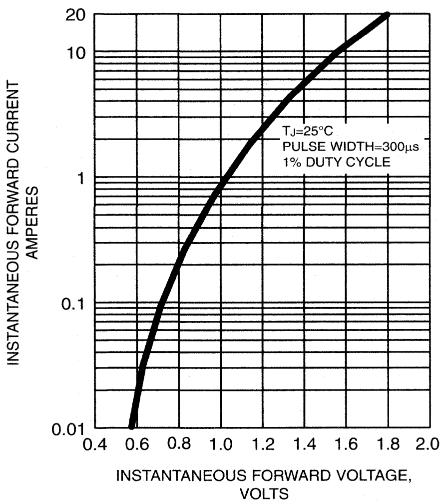


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

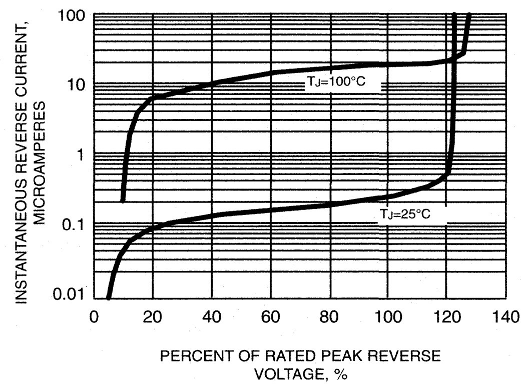


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

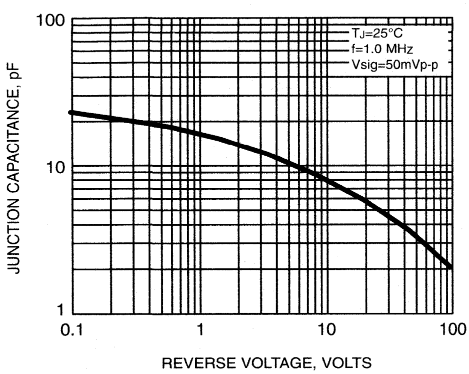
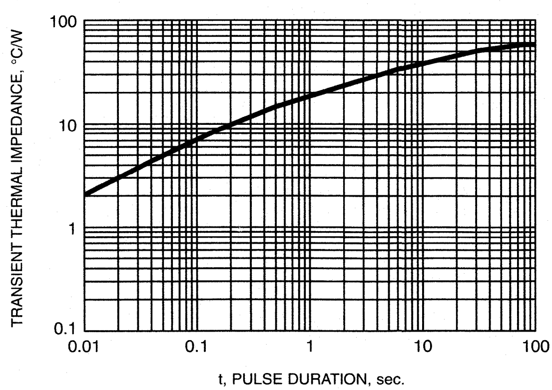


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

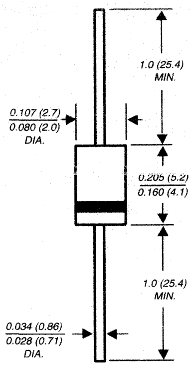


M100A THRU M100M

GENERAL PURPOSE PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts*   ***Forward Current** - 1.0 Ampere*

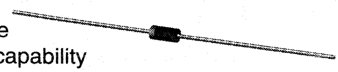
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Construction utilizes void-free molded plastic technique
- ♦ Low reverse leakage
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*M100 A*	*M100 B*	*M100 D*	*M100 G*	*M100 J*	*M100 K*	*M100 M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=100°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0					1.1		Volts
Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0							µA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	1.0 50.0							µA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0							µs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	50.0 25.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Measured with I_F=0.5A, I_R=0.1A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted

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RATINGS AND CHARACTERISTIC CURVES M100A THRU M100M

FIG. 1 - FORWARD CURRENT DERATING CURVE

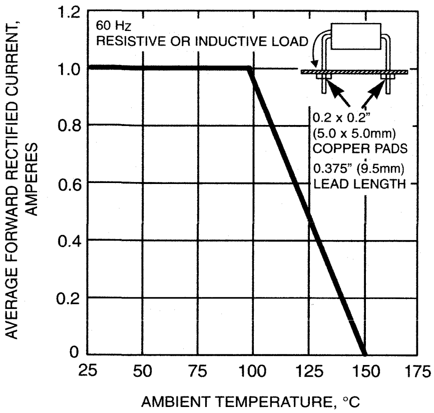


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

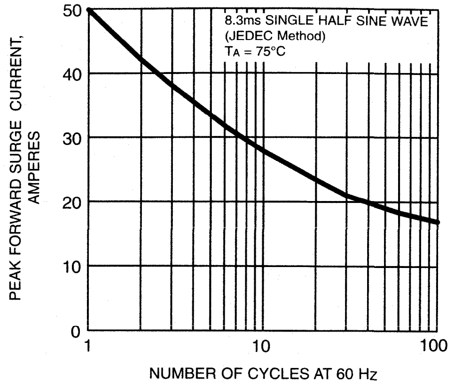


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

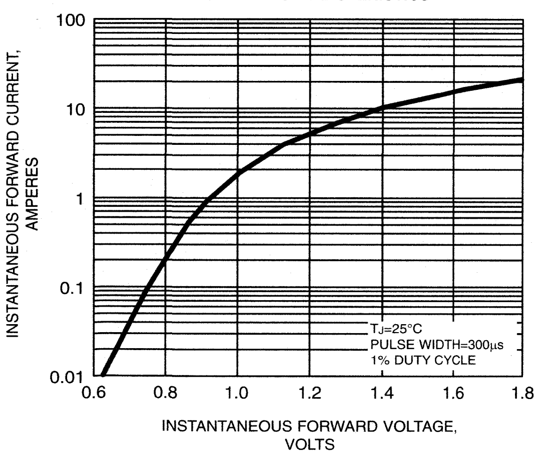


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

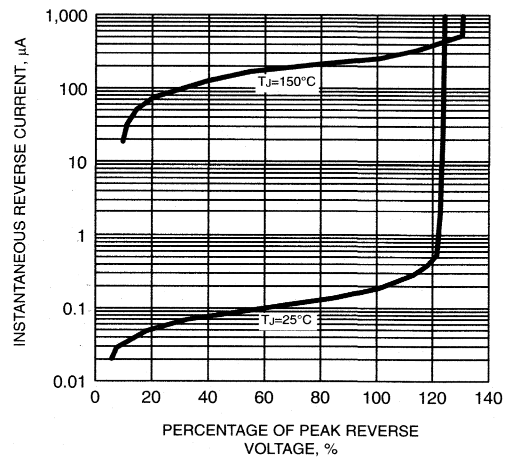


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

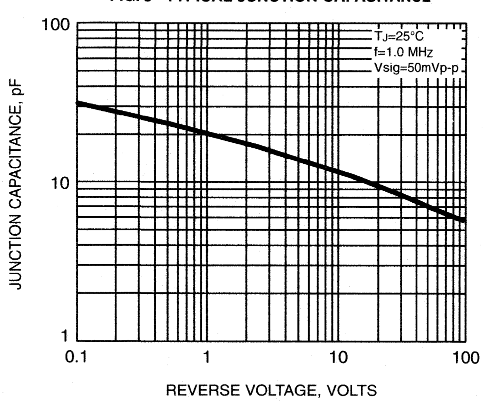
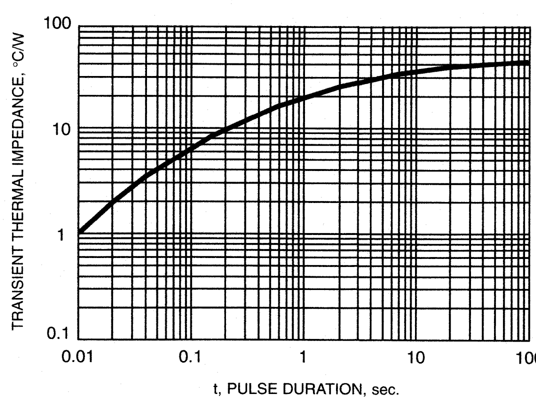


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

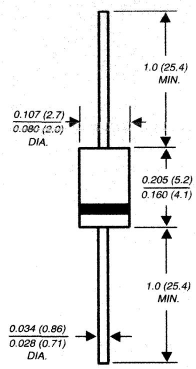


SRP100A THRU SRP100K

FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 1.0 Ampere*

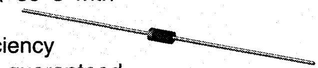
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Construction utilizes void-free molded plastic technique
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 250°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color Band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 1.3 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SRP 100A*	*SRP 100B*	*SRP 100D*	*SRP 100G*	*SRP 100J*	*SRP 100K*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0						Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}	30.0						Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.3						Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	10.0 / 200.0						μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	100				200		ns
Typical junction capacitance (NOTE 2)	C_J	12.0						pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	41.0						°C/W
Operating junction temperature range	T_J	-50 to +125						°C
Storage temperature range	T_{STG}	-50 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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RATINGS AND CHARACTERISTIC CURVES SRP100A THRU SRP100K

FIG. 1 - FORWARD CURRENT DERATING CURVE

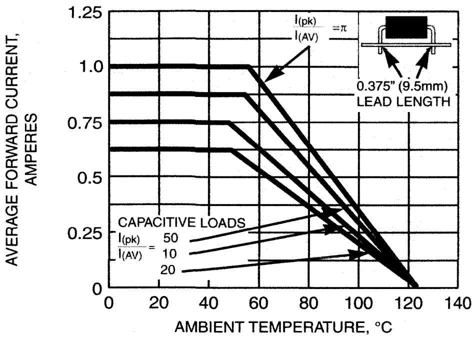


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

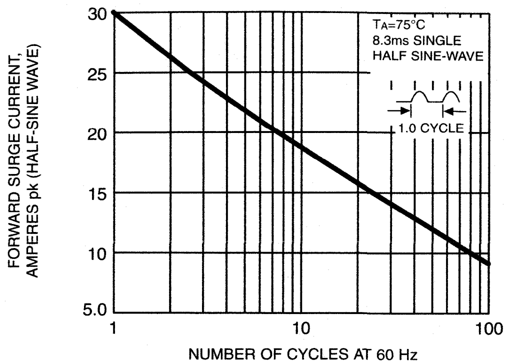


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

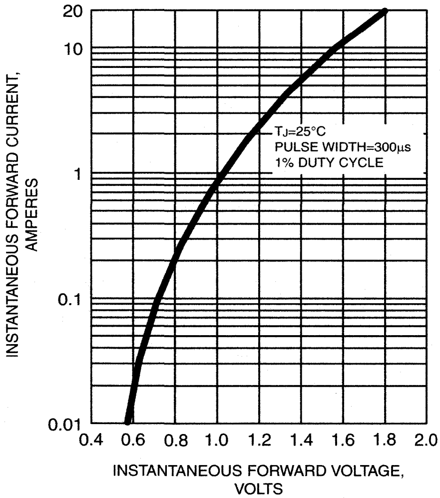


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

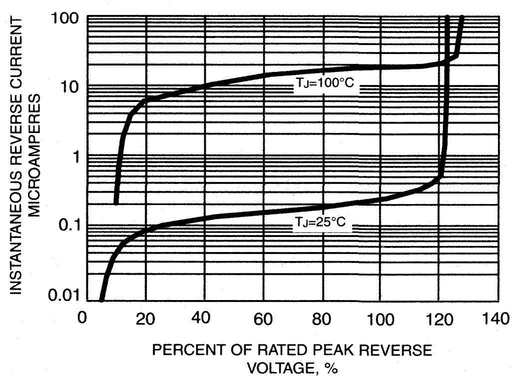


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

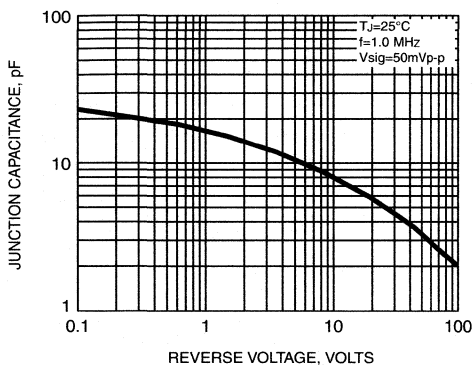
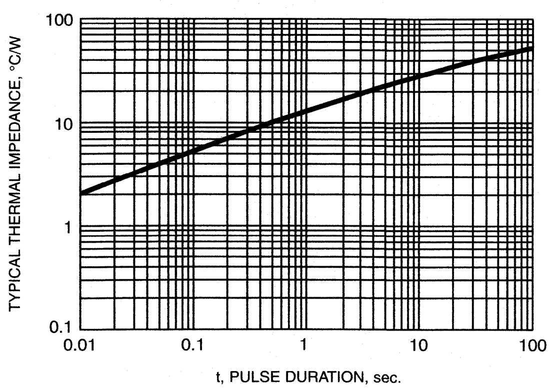


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

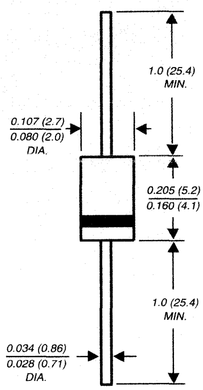


1N5391 THRU 1N5399

GENERAL PURPOSE PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

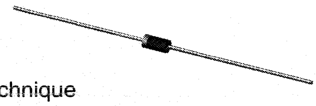
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High surge current capability
- 1.5 Ampere operation at T_L=70°C with no thermal runaway
- Low reverse leakage
- Construction utilizes void-free molded plastic technique
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 5391	1N 5392	1N 5393	1N 5394	1N 5395	1N 5396	1N 5397	1N 5398	1N 5399	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum RMS voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
*Maximum DC blocking voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum average forward rectified current 0.500" (12.7mm) lead length at T_L=70°C	$I_{(AV)}$	1.5									Amps
*Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}	50.0									Amps
*Maximum instantaneous forward voltage at 1.5A T_A=70°C	V_F	1.4									Volts
*Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=150°C	I_R	5.0 300.0									μA
*Maximum full load reverse current full cycle average, 0.375",(9.5mm) lead length at T_L=70°C	$I_{R(AV)}$	300.0									μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0									μs
Typical junction capacitance (NOTE 2)	C_J	15.0									pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	50.0 25.0									°C/W
*Maximum DC blocking voltage temperature	T_A	+150									°C
*Operating junction temperature range	T_J	-50 to + 170									°C
*Storage temperature range	T_{STG}	-50 to+175									°C

NOTES:
(1) Measured with I_F=0.5A, I_R=0.1A, I_{rr}= 0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered value

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

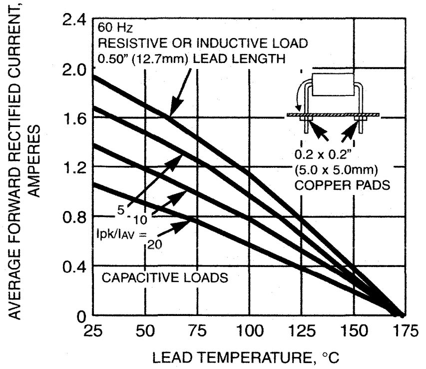


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

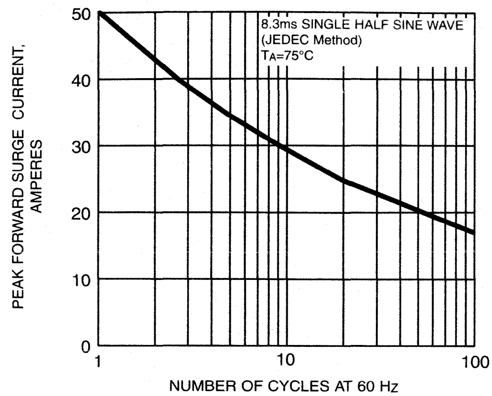


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

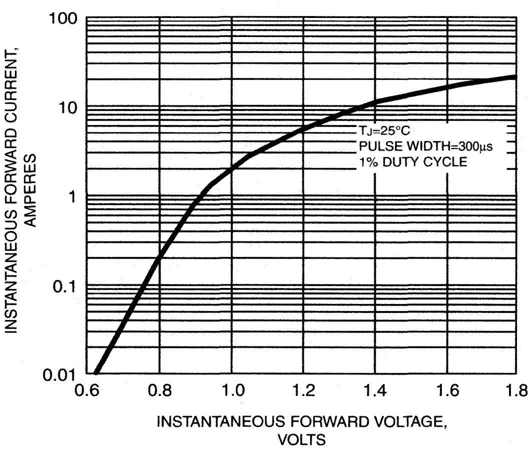


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

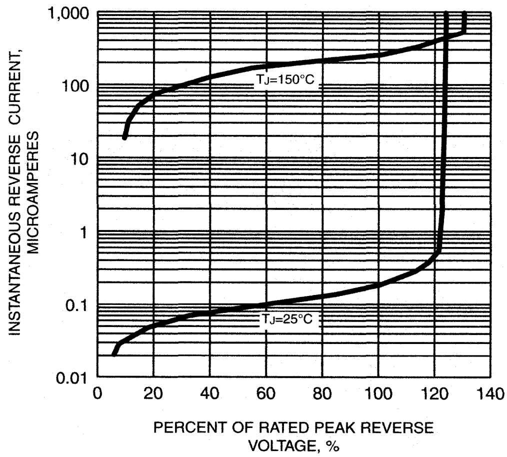


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

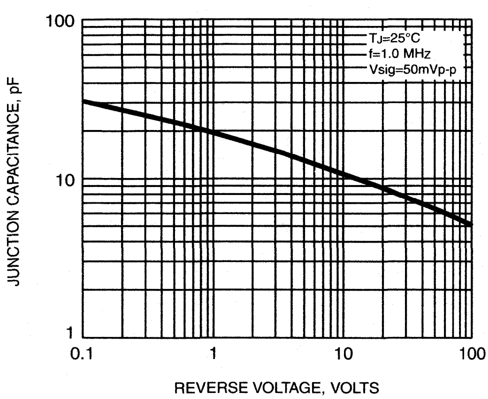
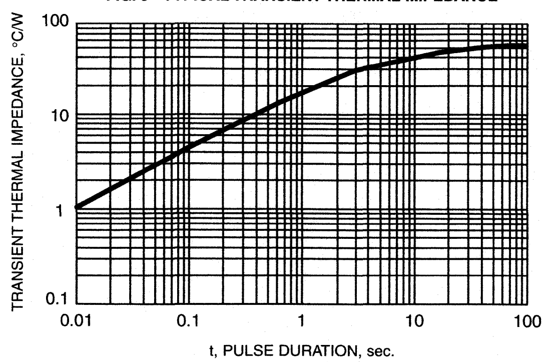


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

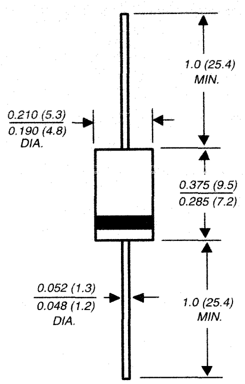


1N5400 THRU 1N5408

GENERAL PURPOSE PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

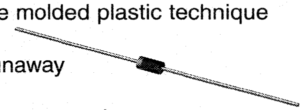
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Construction utilizes void-free molded plastic technique
- ♦ 3.0 Ampere operation at T_L=105°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 5400	1N 5401	1N 5402	1N 5403	1N 5404	1N 5405	1N 5406	1N 5407	1N 5408	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum RMS voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
*Maximum DC blocking voltage to T_A=150°C	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum average forward rectified current 0.5" (12.5mm) lead length at T_L=105°C	$I_{(AV)}$	3.0									Amps
*Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=105°C	I_{FSM}	200.0									Amps
*Maximum instantaneous forward voltage at 3.0A	V_F	1.2									Volts
*Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=150°C	I_R	10.0 500.0									μA
*Maximum full load reverse current full cycle average, 0.5" (12.5mm) lead length at T_L=105°C	$I_{R(AV)}$	500.0									μA
Typical junction capacitance (NOTE 1)	C_J	30.0									pF
*Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$	20.0									°C/W
Maximum DC blocking voltage temperature	T_A	+150									°C
*Operating junction temperature range	T_J	-50 to +170									°C
*Storage temperature range	T_{STG}	-50 to +170									°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted with 0.8 x 0.8" (20 x 20mm) copper heatsinks
*JEDEC registered value

FIG.1 - FORWARD CURRENT DERATING CURVE

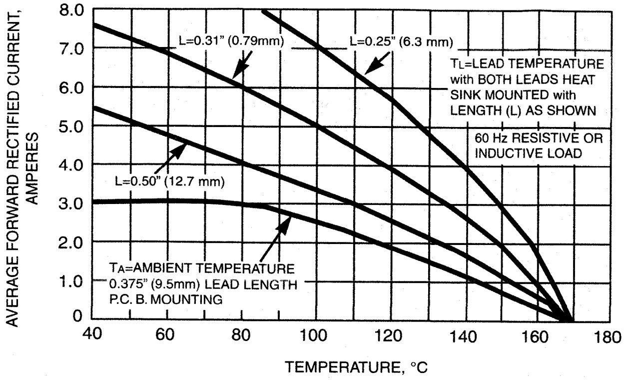


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

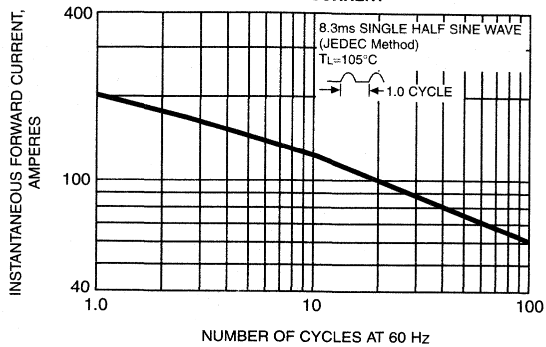


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

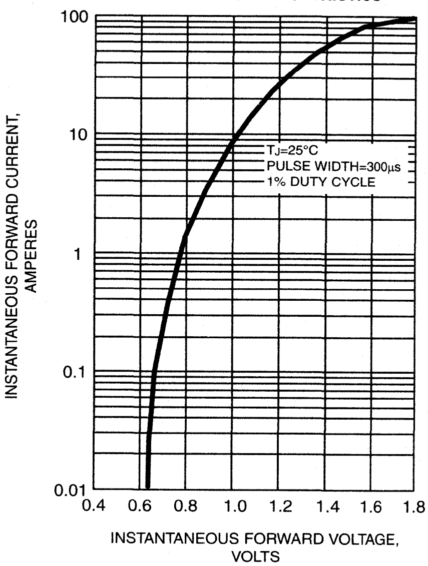


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

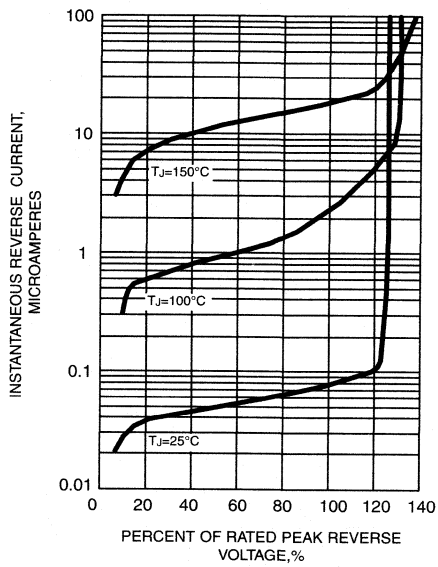


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

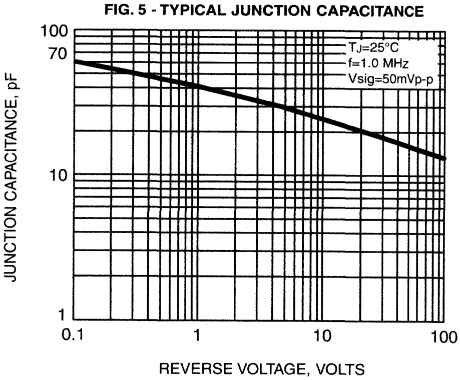
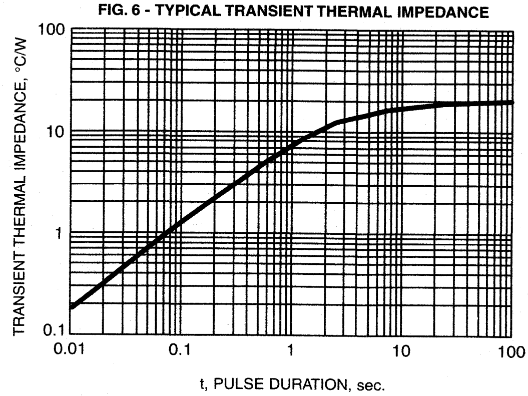


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

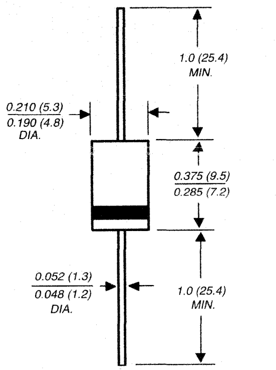


BY396P THRU BY399P

SOFT RECOVER FAST - SWITCHING PLASTIC RECTIFIER

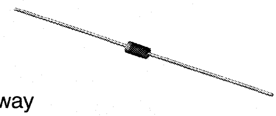
***Reverse Voltage** - 100 to 800 Volts* ***Forward Current** - 3.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package hasUnderwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Construction utilizes void-free molded plastic technique
- ♦ 3.0 Ampere operation at T_A=50°C with no thermal runaway
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BY396P*	*BY397P*	*BY398P*	*BY399P*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	100	200	400	800	Volts
Maximum RMS voltage	V_{RMS}	70	140	280	560	Volts
Maximum DC blocking voltage	V_{DC}	100	200	400	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead lengths at T_A=50°C	$I_{(AV)}$	3.0				Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_A=50°C	I_{FSM}	100.0				Amps
Maximum repetitive peak forward surge (NOTE 1)	I_{FRM}	10.0				Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.25				Volts
Maximum DC reverse current at rated DC blocking voltage T_A= 25°C / T_A=100°C	I_R	10.0 / 500.0				µA
Maximum reverse recovery time (NOTE 2)	t_{rr}	500.0				ns
Maximum forward recovery time at 100mA	t_{fr}	1.0				µs
Typical junction capacitance (NOTE 3)	C_J	28.0				pF
Typical thermal resistance (NOTE 4)	$R_{\Theta JA}$	22.0				°C/W
Operating junction temperature range	T_J	-50 to +125				°C
Storage temperature range	T_{STG}	-50 to +150				°C

NOTES:
(1) Repetitive peak forward surge current at f<15 KHz
(2) Reverse recovery test conditions: I_F=10mA, I_R=10mA, I_{rr}=1.0mA
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(4) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length with both leads to heat sink

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

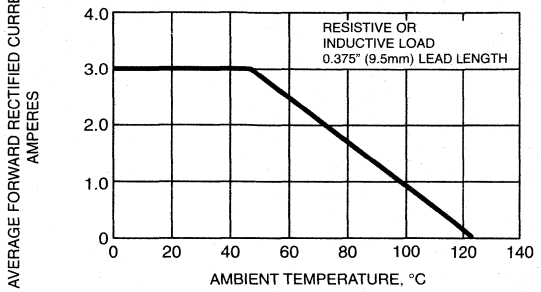


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

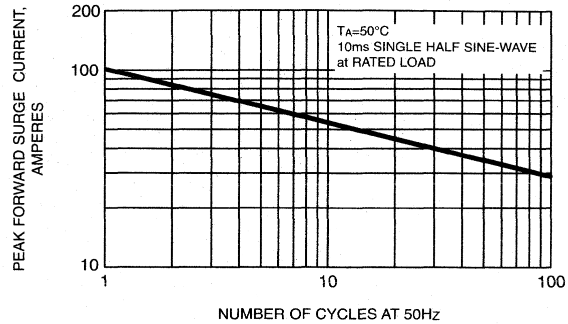


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

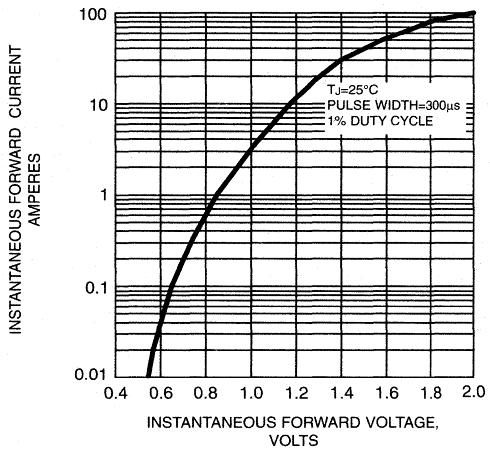


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

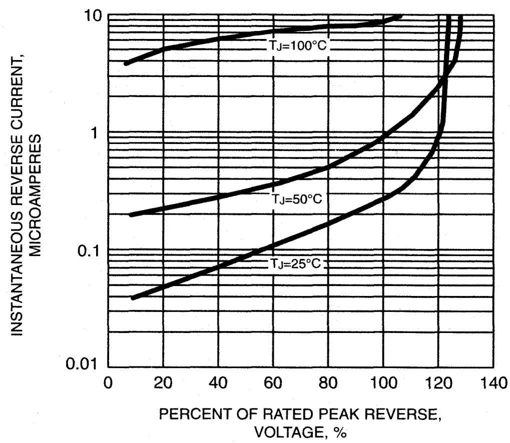
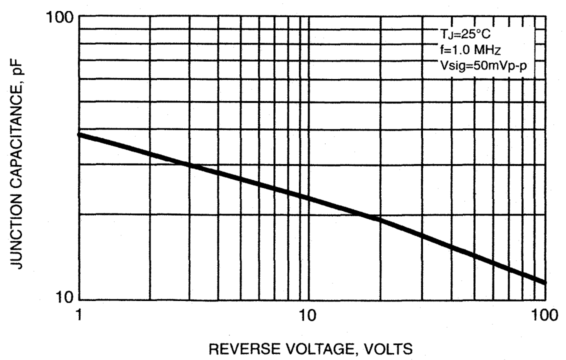


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

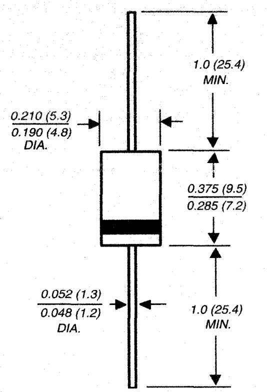


GI500 THRU GI510

GENERAL PURPOSE PLASTIC RECTIFIER

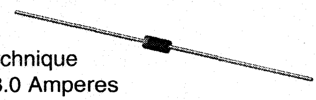
Reverse Voltage *- 50 to 1000 Volts* ***Forward Current*** *- 3.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Typical I_R less than 0.1μA
- ♦ Construction utilizes void-free molded plastic technique
- ♦ High current operation of 3.0 Amperes at T_A=95°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC D0-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	G1 500	GI 501	GI 502	GI 504	GI 506	GI 508	GI 510	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A= 95°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum instantaneous forward voltage at 9.4A T_J= 25°C / T_J=175°C	V_F	1.1 / 1.0							Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=100°C	I_R	5.0 / 50.0							μA
Typical junction capacitance (NOTE 1)	C_J	28.0							pF
Typical reverse recovery time (NOTE 2)	t_{rr}	2.0							μs
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	20.0 / 5.0							°C/W
Operating junction temperature range	T_J	-50 to +150							°C
Storage temperature range	T_{STG}	-50 to +175							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 0.8 x 0.8" (20 x 20mm) copper heatsinks

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

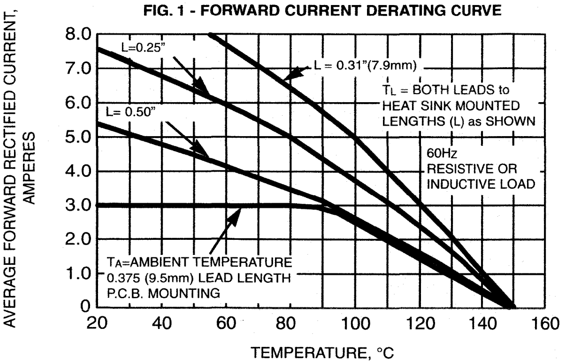


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

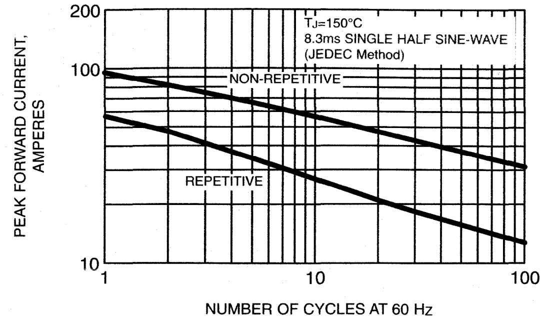


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

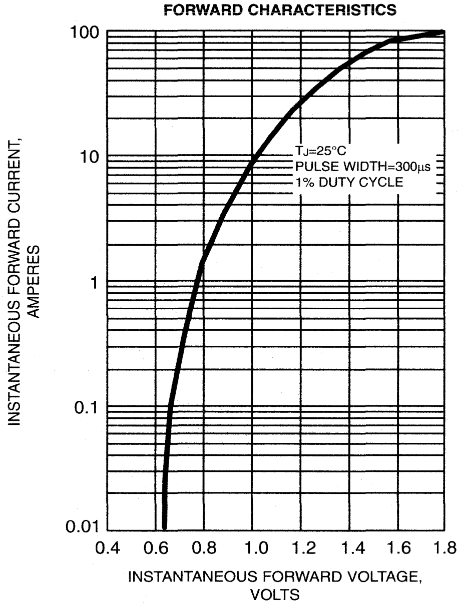


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

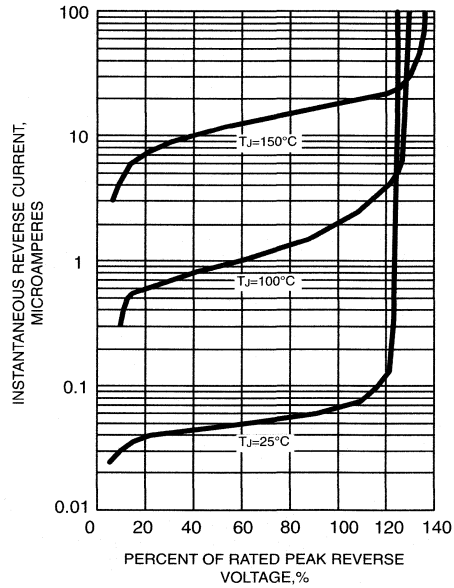


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

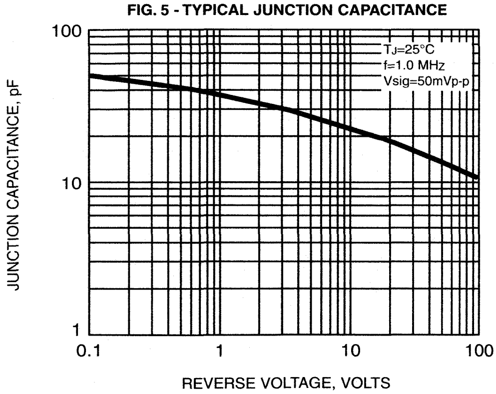
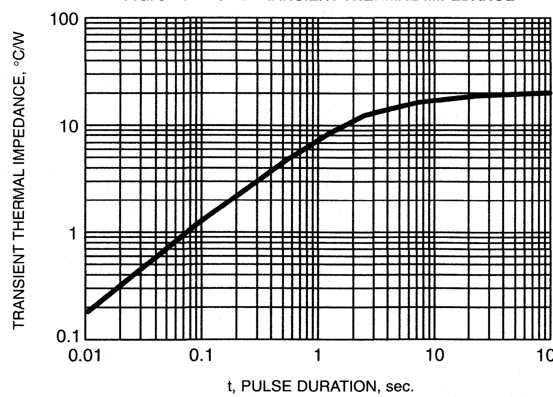


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

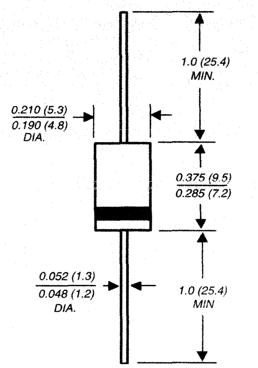


GI850 THRU GI858

FAST SWITCHING PLASTIC RECTIFIER

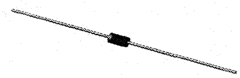
***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 3.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Fast switching for high efficiency
- ♦ Construction utilizes void-free molded plastic technique
- ♦ High forward current operation
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI850*	*GI851*	*GI852*	*GI854*	*GI856*	*GI858*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	510	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum non-repetitive peak reverse voltage	V_{RSM}	75	150	250	450	650	880	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=90°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0						Amps
Maximum instantaneous forward voltage at: 3.0A	V_F	1.25						Volts
9.4A, T_J=175°C		1.10						
Maximum DC reverse current T_A=25°C	I_R	10.0						µA
at rated DC blocking voltage T_A=100°C		150	150	200	250	300	500	
Typical junction capacitance (NOTE 1)	C_J	28.0						pF
Maximum reverse recovery time (NOTE 2)	t_{rr}	200.0						ns
Maximum reverse recovery current (NOTE 2)	$I_{RM(REC)}$	2.0						Amps
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0						°C/W
	$R_{\Theta JL}$	8.0						
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150						°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs, and I_{rr}=10% I_{RM} for measurement of t_{rr}
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, with both leads equally heat sink

General Instrument
Power Semiconductor Division

FIG.1 - FORWARD CURRENT DERATING CURVE

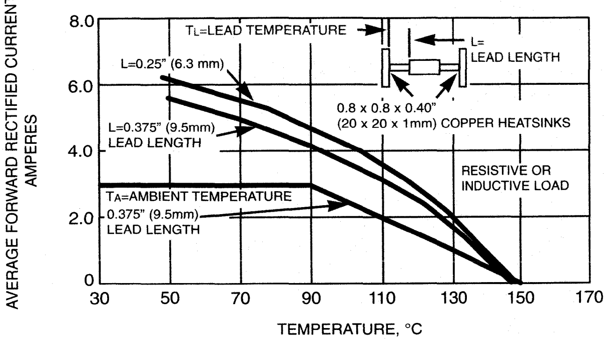


FIG. 2 - MAXIMUM PEAK FORWARD SURGE CURRENT

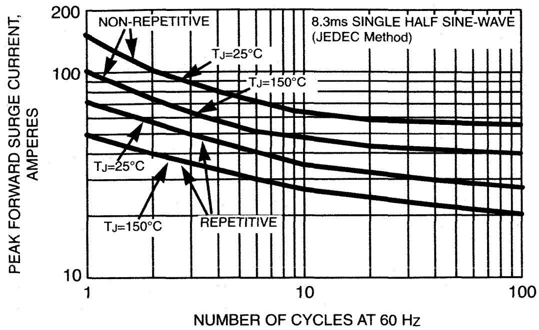


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

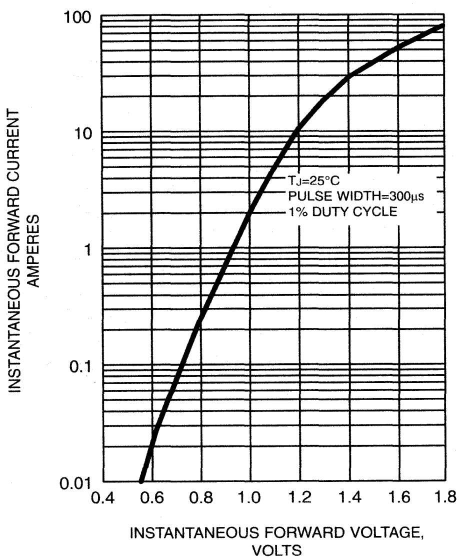


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

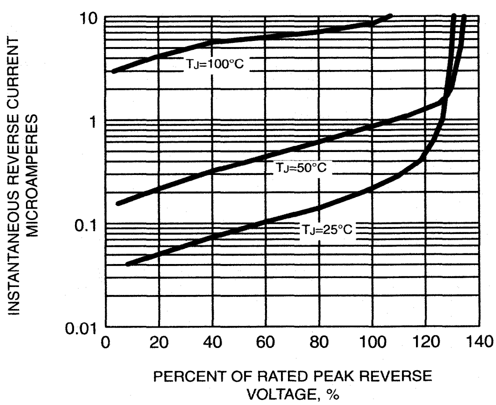
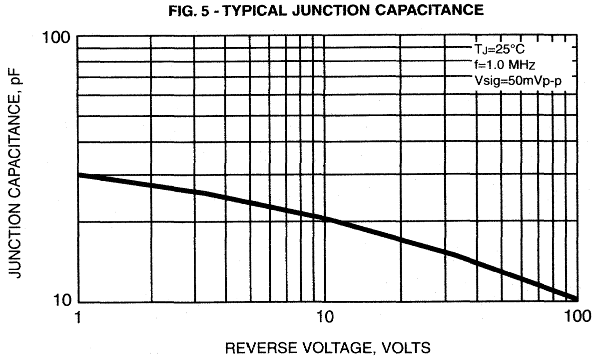


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

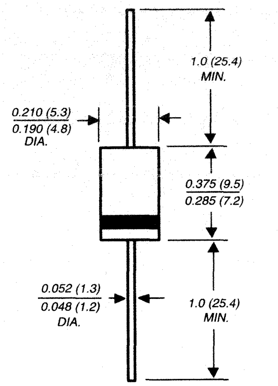


GI910 THRU GI917

MEDIUM-SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 3.0 Amperes*

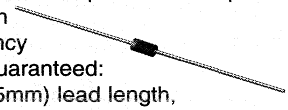
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High surge current capability
- Construction utilizes void-free molded plastic technique
- High forward current operation
- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375 (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GI910	GI911	GI912	GI914	GI916	GI917	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=90°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0						Amps
Maximum instantaneous forward voltage at: 3.0A 9.4A, T_J=175°C	V_F	1.25 1.10						Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 300.0						µA
Typical junction capacitance (NOTE 1)	C_J	28.0						pF
Maximum reverse recovery time (NOTE 2)	t_{rr}	750						ns
Maximum reverse recovery current	$I_{RM(REC)}$	2.0						Amps
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	22.0 8.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150						°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs, and I_{rr}=10% I_{RM} for measurement of t_{rr}
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, both leads equally heat sink

FIG.1 - FORWARD CURRENT DERATING CURVE

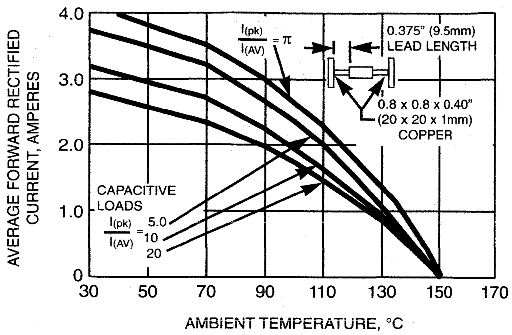


FIG. 2 - MAXIMUM PEAK FORWARD SURGE CURRENT

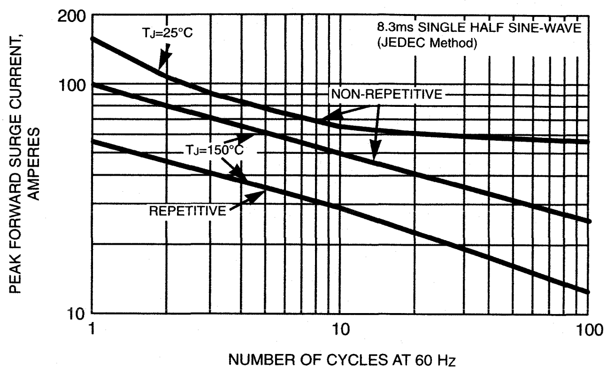


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

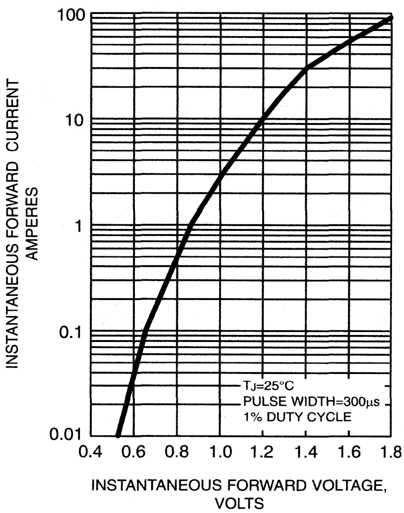


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

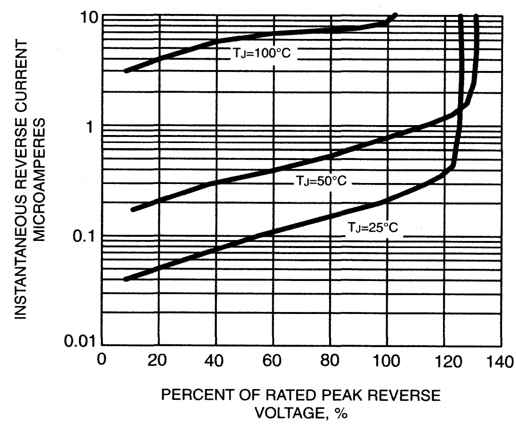
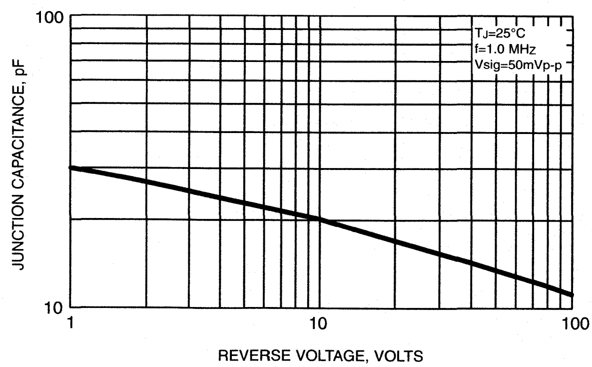


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

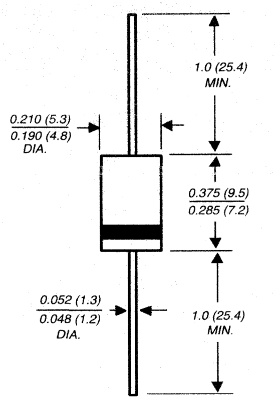


P300A THRU P300M

GENERAL PURPOSE PLASTIC RECTIFIER

Reverse Voltage *- 50 to 1000 Volts* ***Forward Current*** *- 3.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Typical I_R less than 0.1μA
- ♦ Construction utilizes void-free molded plastic technique
- ♦ 3.0 Ampere operation at T_A=90°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.4 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*P300A*	*P300B*	*P300D*	*P300G*	*P300J*	*P300K*	*P300M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.2							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 25.0							μA
Typical junction capacitance (NOTE 1)	C_J	30.0							pF
Typical reverse recovery time (NOTE 2)	t_{rr}	2.0							μs
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	20.0 5.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 0.8" x 0.8" (20 x 20mm) copper heatsinks

FIG. 1 - FORWARD CURRENT DERATING CURVE

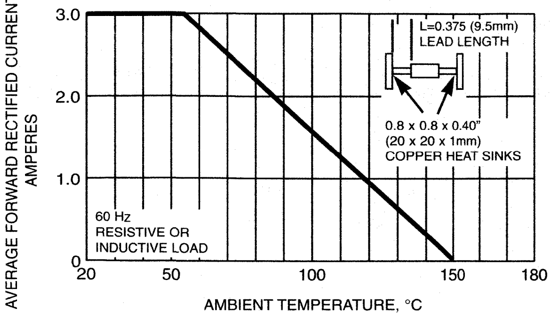


FIG. 2 - MAXIMUM PEAK FORWARD SURGE CURRENT

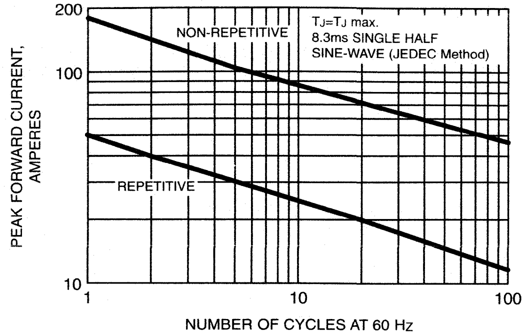


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

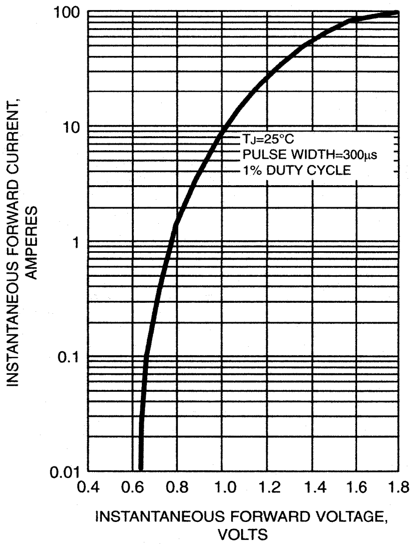


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

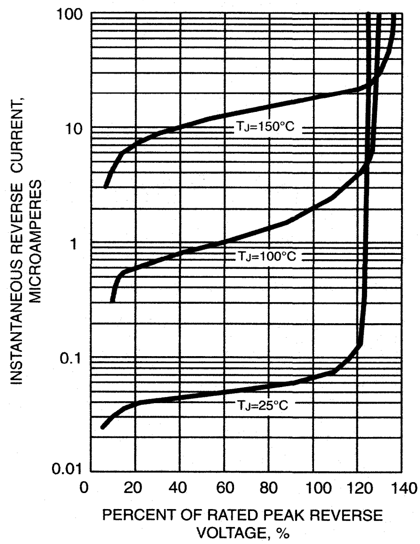


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

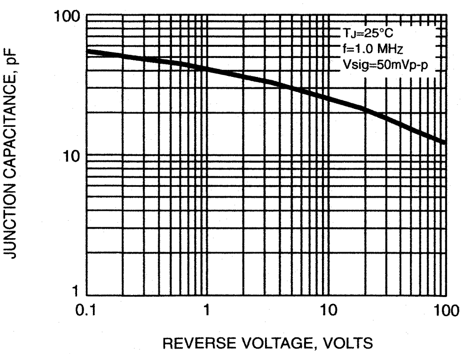
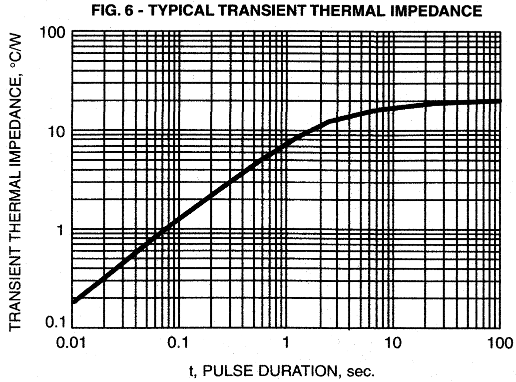


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

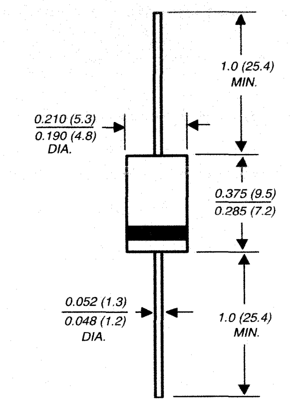


SRP300A THRU SRP300K

FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 3.0 Amperes*

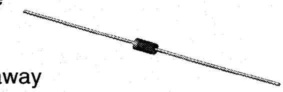
DO-201AD



Dimensions are in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Construction utilizing void-free molded plastic technique
- ♦ 3.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AD molded plastic body
Terminals: Plated axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	SRP 300A	SRP 300B	SRP 300D	SRP 300G	SRP 300J	SRP 300K	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=55°C	I_{FSM}	150.0						Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.3						Volts
Maximum DC reverse current T_A=25°C	I_R	10.0						μA
at rated DC blocking voltage T_A=100°C		200			300	400	500	
Maximum reverse recovery time (NOTE 1)	t_{rr}	100	100	150	150	200	200	ns
Typical junction capacitance (NOTE 2)	C_J	28.0						pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0						°C/W
Operating junction temperature range	T_J	-50 to +125						°C
Storage temperature range	T_{STG}	-50 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length with both leads equally heat sink

FIG. 1 - FORWARD CURRENT DERATING CURVE

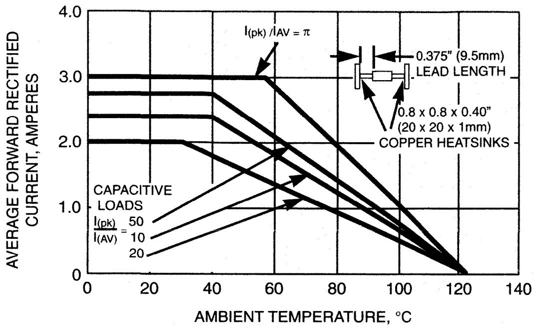


FIG. 2 - MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

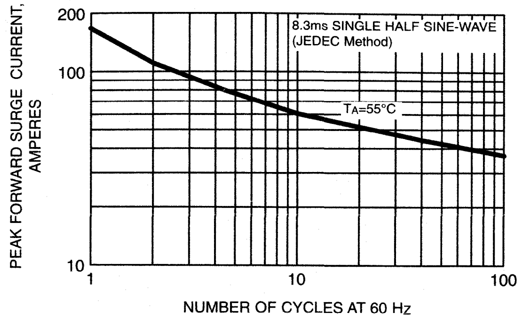


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

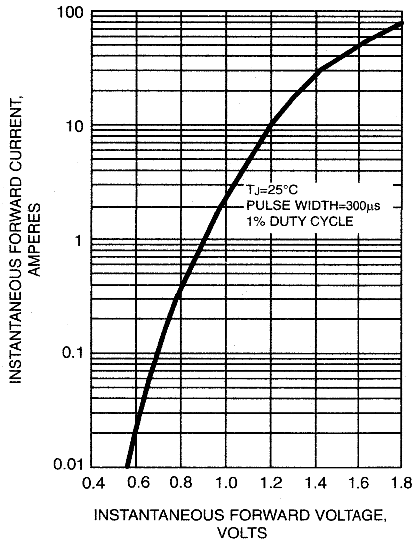


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

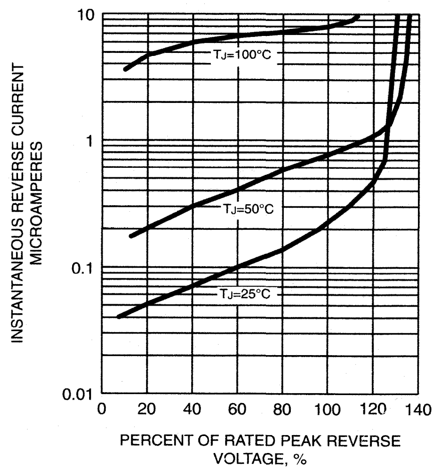
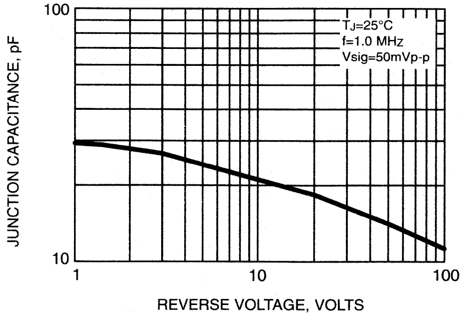


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

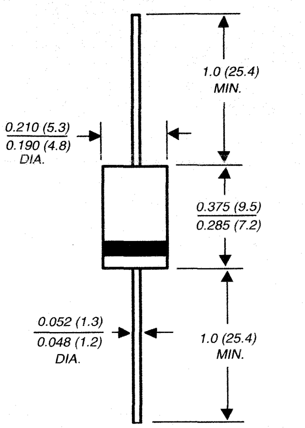


BY500-100 THRU BY500-800

SOFT RECOVERY FAST SWITCHING PLASTIC RECTIFIER

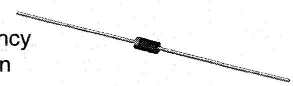
***Reverse Voltage** - 100 to 800 Volts* ***Forward Current** - 5.0 Amperes*

DO-201AD



Dimension are in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Fast switching for high efficiency
- ♦ High forward current operation at T_L=45°C
- ♦ Construction utilizes void-free molded plastic technique
- ♦ Especially designed for applications such as Switch Mode Power Supplies, Inverters, Converters, TV Scanning, Ultrasonic-Systems, Speed controlled DC Motors, Low RF Interference and Free Wheeling Diode Circuits
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BY500-100*	*BY500-200*	*BY500-400*	*BY500-600*	*BY500-800*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	100	200	400	600	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=45°C	$I_{(AV)}$	5.0					Amps
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}	200.0					Amps
Maximum repetitive peak forward surge	I_{FRM}	10.0					Amps
Maximum instantaneous forward voltage at 5.0A	V_F	1.35					Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 1.0					µA mA
Maximum reverse recovery time (NOTE 1)	t_{rr}	200.0					ns
Maximum reverse recovery current (NOTE 1)	$I_{RM(REC)}$	2.0					Amps
Typical junction capacitance (NOTE 2)	C_J	28.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0					°C/W
Operating junction temperature range	T_J	-50 to +125					°C
Storage temperature range	T_{STG}	-50 to +150					°C

NOTES:
(1) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs, I_{rr}=10%I_{RM}
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length with both leads to heat sink

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FIG.1 - FORWARD CURRENT DERATING CURVE

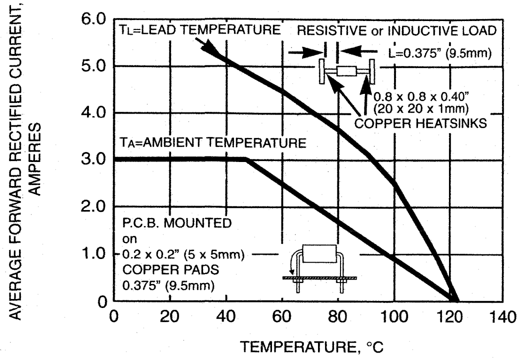


FIG. 2 - MAXIMUM PEAK FORWARD SURGE CURRENT

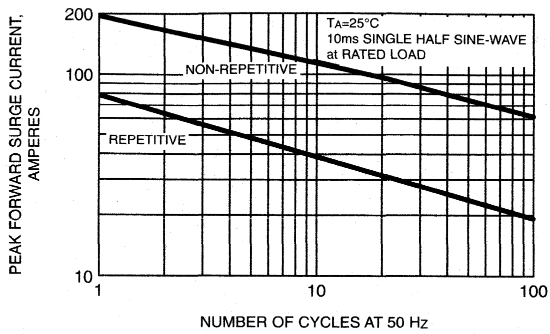


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

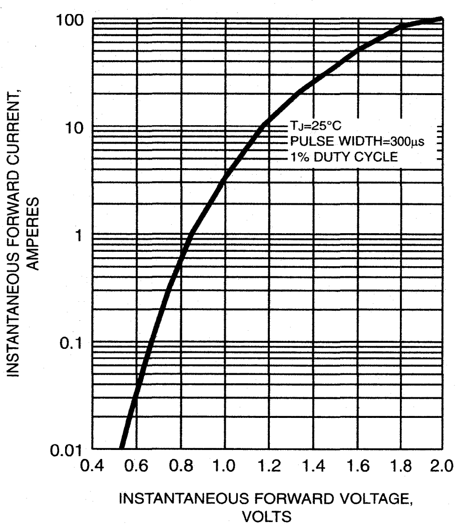


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

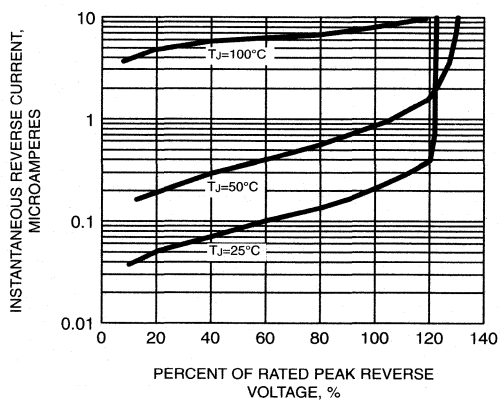
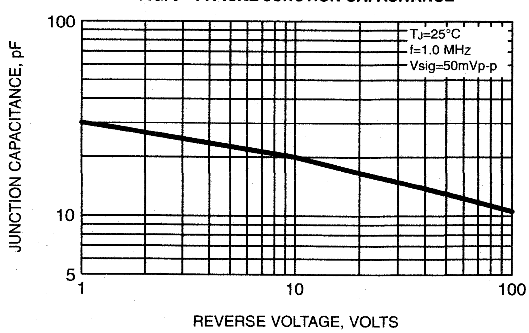


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

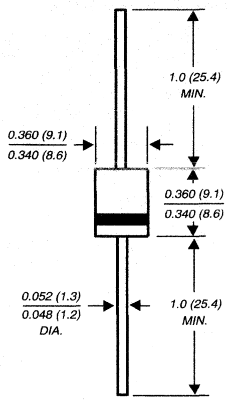


GI750 THRU GI758

HIGH CURRENT PLASTIC RECTIFIER

Reverse Voltage *- 50 to 800 Volts* ***Forward Current*** *- 6.0 Amperes*

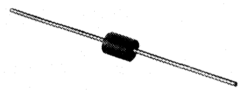
Case style P600



Dimensions are in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High forward current capability
- ♦ Diffused junction
- ♦ Construction utilizes void-free molded plastic technique
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Void-free molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.07 ounce, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GI750	GI751	GI752	GI754	GI756	GI758	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum non-repetitive peak reverse voltage	V_{RSM}	60	120	240	480	720	1200	Volts
Maximum average forward rectified current at T_A=60°C, P.C.B. mounting (FIG. 1) T_L=60°C, 0.125" (3.18mm) lead length (FIG. 2)	$I_{(AV)}$	6.0 22.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0						Amps
Maximum instantaneous forward voltage at 6.0A 100A	V_F	0.90 1.25					0.95 1.30	Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 1.0						μA mA
Typical junction capacitance (NOTE 1)	C_J	150.0						pF
Typical reverse recovery time (NOTE 2)	t_{rr}	2.5						μs
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	20.0 4.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150						°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 1.1 x 1.1" (30 x 30mm) copper pads

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FIG.1 - MAXIMUM FORWARD CURRENT DERATING CURRENT

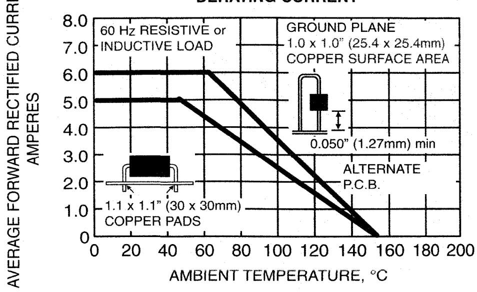


FIG. 2 - MAXIMUM FORWARD CURRENT DERATING CURVE

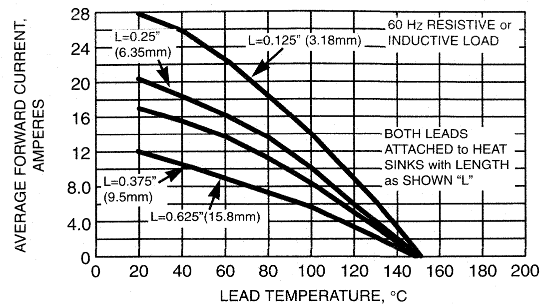


FIG. 3 - MAXIMUM PEAK FORWARD SURGE CURRENT

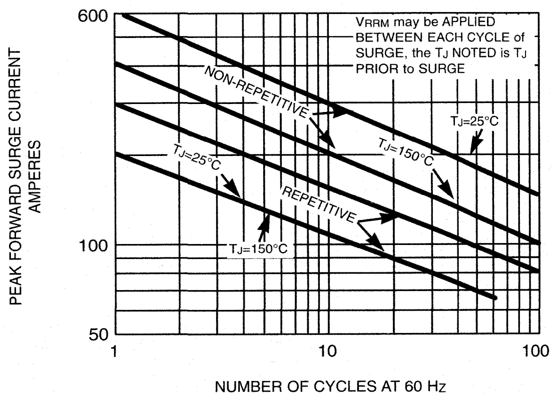


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

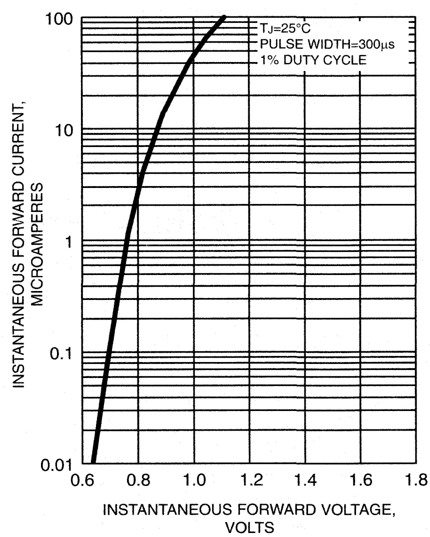


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

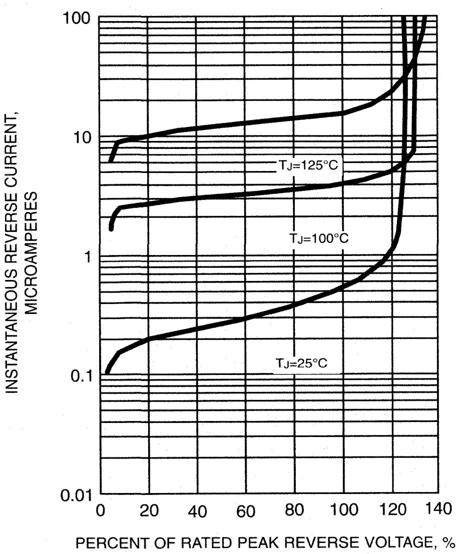
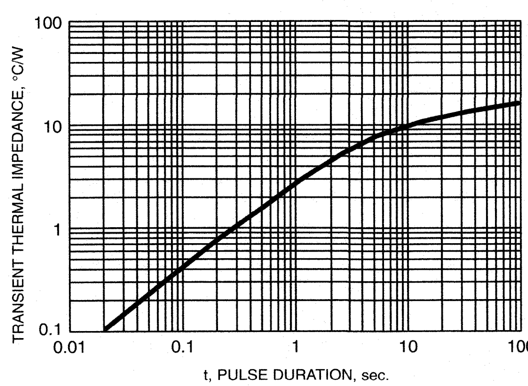


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

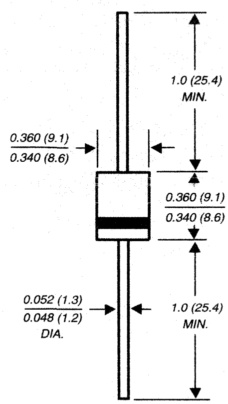


GI820 THRU GI828

FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 800 Volts* ***Forward Current** - 5.0 Amperes*

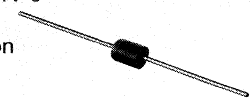
Case Style P600



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ High forward current operation
- ♦ Fast switching for high efficiency
- ♦ Construction utilizes void-free molded plastic technique
- ♦ Uniform molded body
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Void-free molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.07 ounce, 2.1grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GI820	GI821	GI822	GI824	GI826	GI828	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum non-repetitive peak reverse voltage	V_{RSM}	75	150	250	450	650	880	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	5.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0						Amps
Maximum instantaneous forward voltage at 5.0A T_J= 25°C at 15.7A T_J=150°C	V_F	1.10 1.05						Volts
Maximum reverse current T_A= 25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 1.0						μA mA
Typical junction capacitance (NOTE 1)	C_J	300.0						pF
Maximum reverse recovery time (NOTE 2)	t_{rr}	200.0						ns
Maximum reverse recovery current (NOTE 2)	$I_{RM(REC)}$	2.0						Amps
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	10.0						°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150						°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/μs, and Irr=10% I_{RM} for measurement of t_{rr}
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads equally to heat sink

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RATINGS AND CHARACTERISTIC CURVES GI820 THRU GI828

FIG.1 - FORWARD CURRENT DERATING CURVE

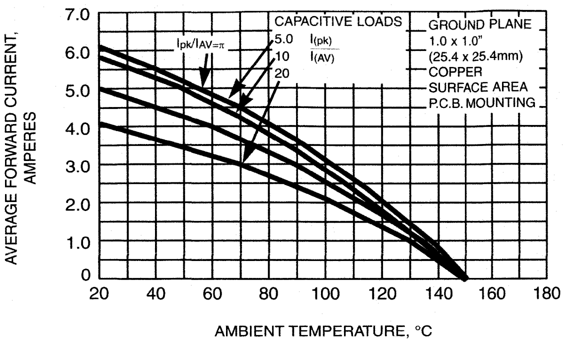


FIG. 2 - FORWARD CURRENT DERATING CURVE

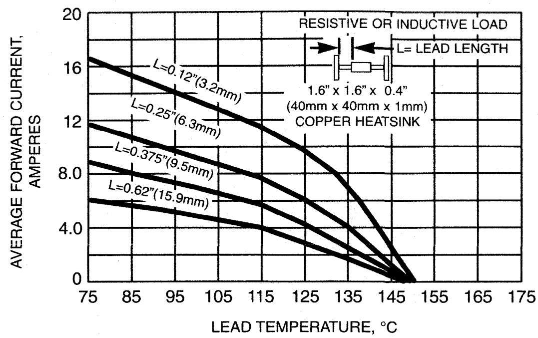


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

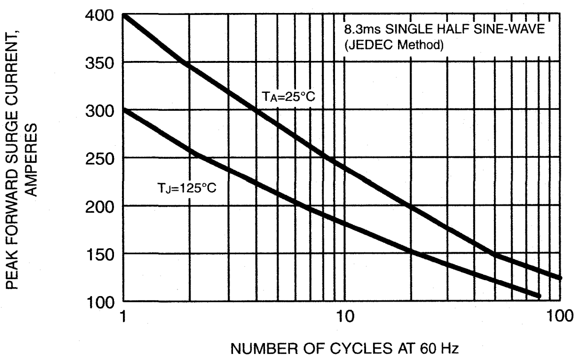


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

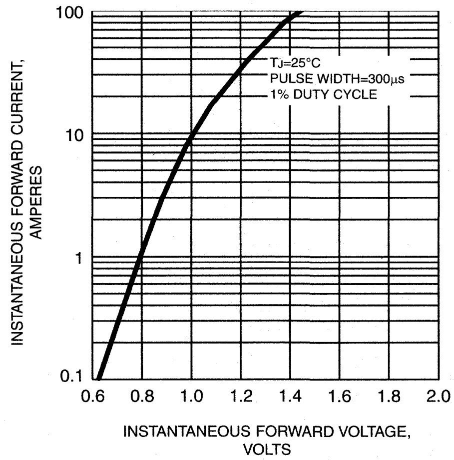


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS

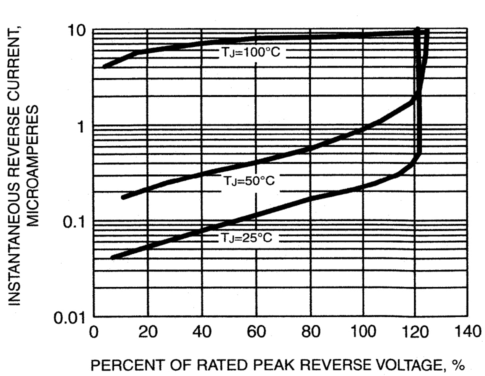
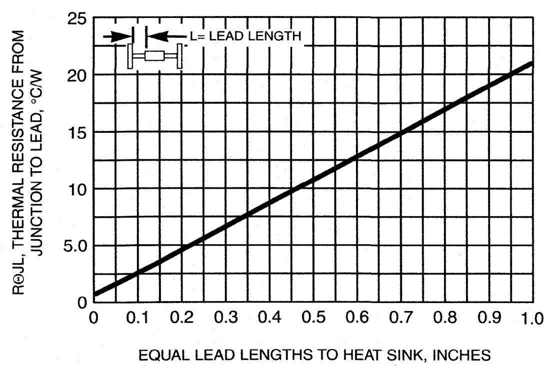


FIG. 6 - TYPICAL THERMAL RESISTANCE

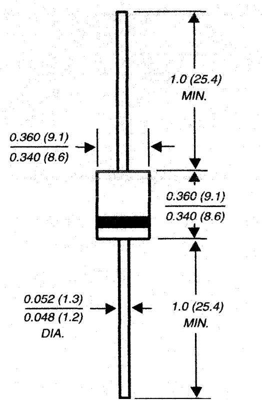


P600A THRU P600M

GENERAL PURPOSE PLASTIC RECTIFIER

Reverse Voltage *- 50 to 1000 Volts* ***Forward Current*** *- 6.0 Amperes*

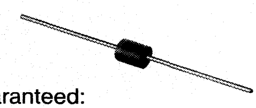
Case Style P600



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High forward current capability
- ♦ Construction utilizes void-free molded plastic technique
- ♦ High surge current capability
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: Void-free molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.07 ounce, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*P600A*	*P600B*	*P600D*	*P600G*	*P600J*	*P600K*	*P600M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_A=60°C, 0.375" (9.5mm) lead length (FIG 1) T_L=60°C, 0.125" (3.18mm) lead length (FIG 2)	$I_{(AV)}$	6.0 22.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0							Amps
Maximum instantaneous forward voltage at: 6.0A 100A	V_F	0.90 1.30						1.0 1.4	Volts
Maximum DC reverse current T_A= 25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 1.0							μA mA
Typical junction capacitance (NOTE 1)	C_J	150.0							pF
Typical reverse recovery time (NOTE 2)	t_{rr}	2.5							μS
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	20.0 4.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Reverse recovery time conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted with 1.1 x 1.1 (30 x 30mm) copper pads

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FIG.1 - MAXIMUM FORWARD CURRENT DERATING CURRENT

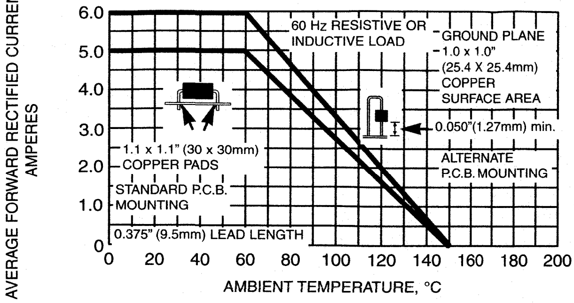


FIG. 2 - MAXIMUM FORWARD CURRENT DERATING CURVE

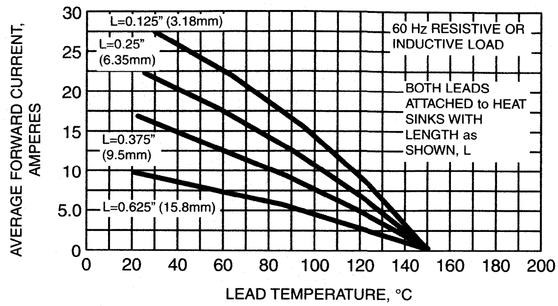


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

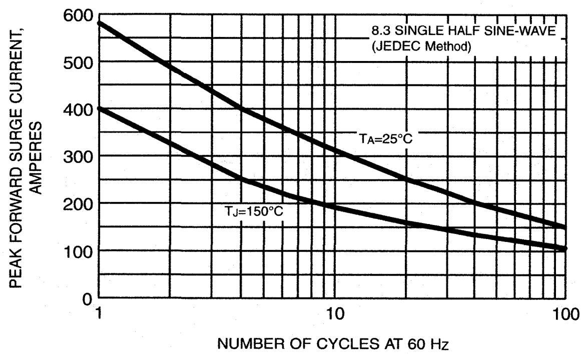


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

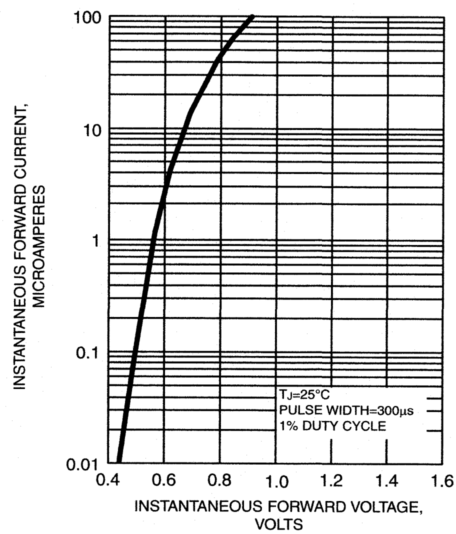


FIG. 5 - TYPICAL REVERSE CHARACTERISITIC

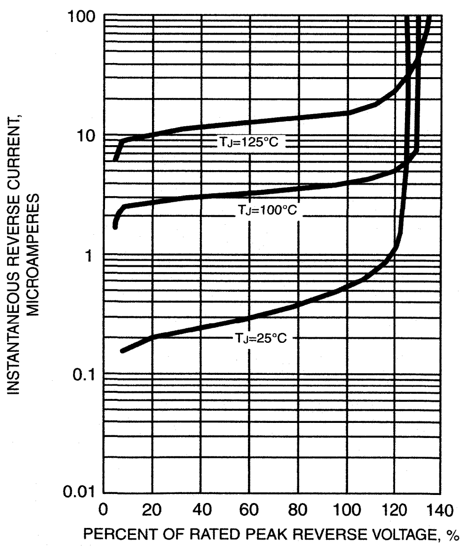
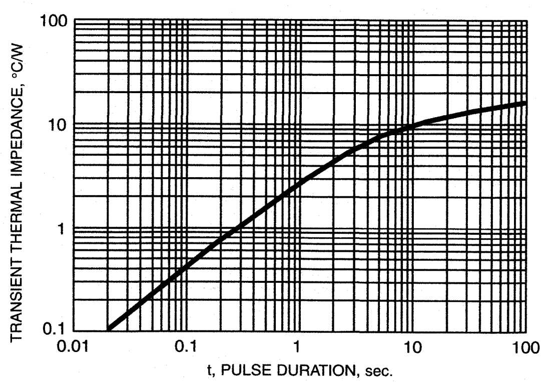


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

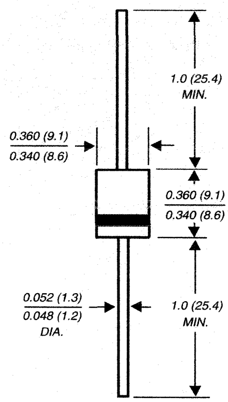


SRP600A THRU SRP600K

FAST SWITCHING PLASTIC RECTIFIER

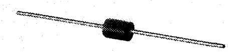
Reverse Voltage *- 50 to 800 Volts* ***Forward Current*** *- 6.0 Amperes*

Case Style P600



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High surge current capability
- ♦ Construction utilizes void-free molded plastic technique
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Void-free molded package body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.07 ounce, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	SRP 600A	SRP 600B	SRP 600D	SRP 600G	SRP 600J	SRP 600K	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	6.0						Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0						Amps
Maximum instantaneous forward voltage at 6.0A	V_F	1.3						Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 1.0						μA mA
Maximum reverse recovery time (NOTE 1)	t_{rr}	100	100	150	150	200	200	ns
Typical junction capacitance (NOTE 2)	C_J	300.0						pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	10.0						°C/W
Operating junction temperature range	T_J	-50 to +125						°C
Storage temperature range	T_{STG}	-50 to +150						°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, with both leads equally to heat sink

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FIG. 1 - FORWARD CURRENT DERATING CURVE

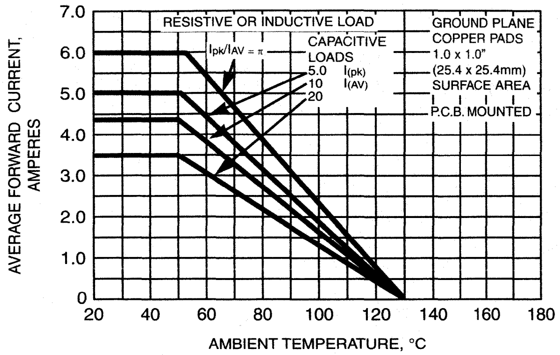


FIG. 2 - FORWARD CURRENT DERATING CURVE

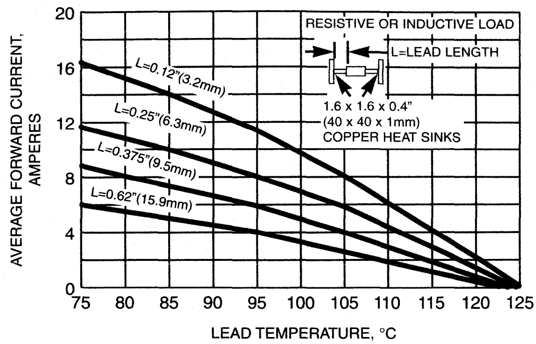


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

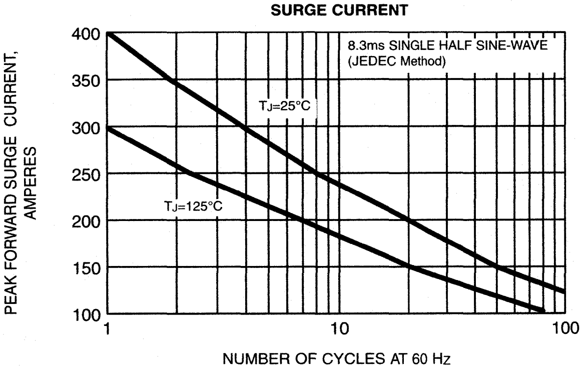


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

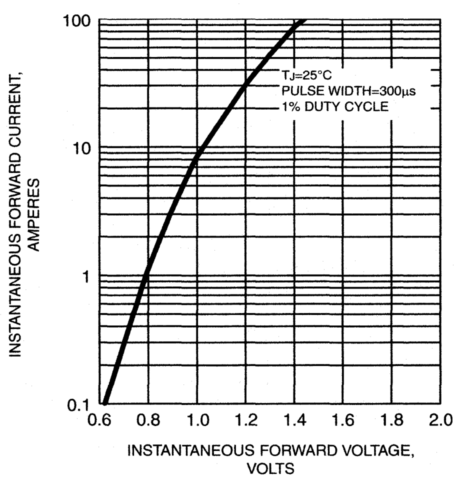


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS

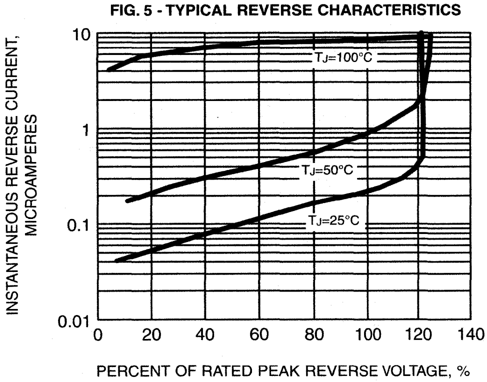
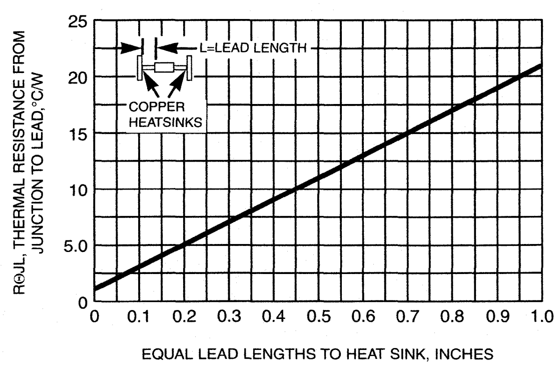


FIG. 6 - TYPICAL THERMAL RESISTANCE

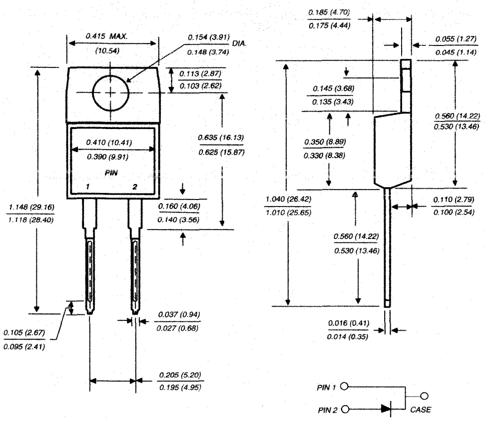


NS8AT THRU NS8MT

GLASS PASSIVATED GENERAL PURPOSE PLASTIC RECTIFIER

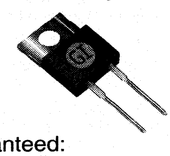
***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 8.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High forward current capability
- High surge current capability
- Low forward voltage drop
- Glass passivated chip junction
- High temperature soldering guaranteed: 260°C/10 seconds, 0.160" (4.06 mm) lead length

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body over passivated chip
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Torque: 5 in. - lbs. max.
Mounting Position: Any
Weight: 0.064 ounce, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	NS8 AT	NS8 BT	NS8 DT	NS8 GT	NS8 JT	NS8 KT	NS8 MT	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	8.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0							Amps
Maximum instantaneous forward voltage at 8.0A	V_F	1.1							Volts
Maximum DC reverse current at rated DC blocking voltage T_C=25°C / T_C=100°C	I_R	10.0 / 100.0							μA
Typical junction capacitance (NOTE 1)	C_J	55.0							pF
Typical thermal resistance (NOTE 2)	$R_{\Theta JC}$	3.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150							°C

NOTES:
(1) Measured at 1.0 MHz and applied reversed voltage of 4.0 Volts
(2) Thermal resistance from junction to case mounted on heatsink

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FIG.1 - FORWARD CURRENT DERATING CURVE

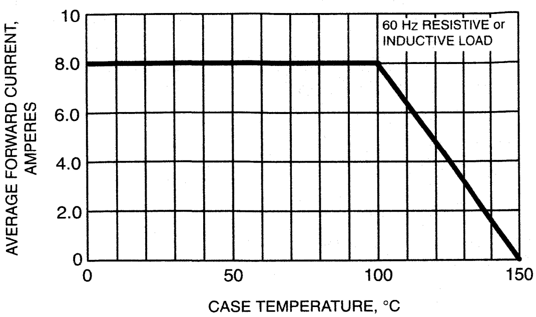


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

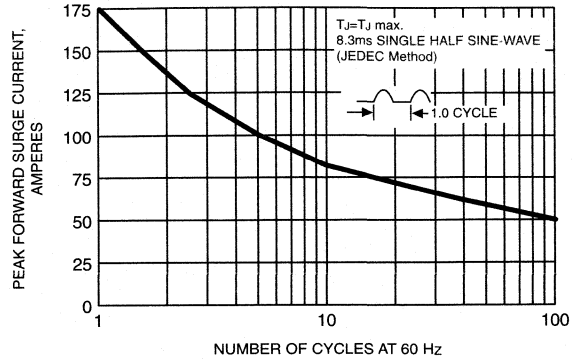


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

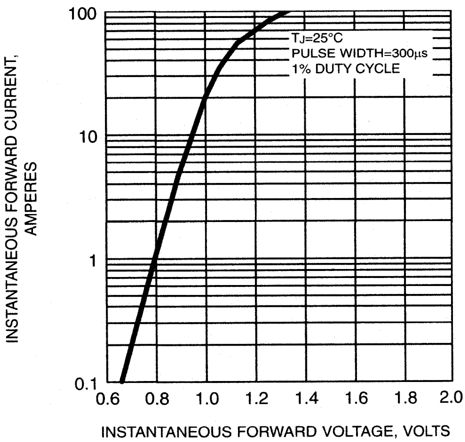


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

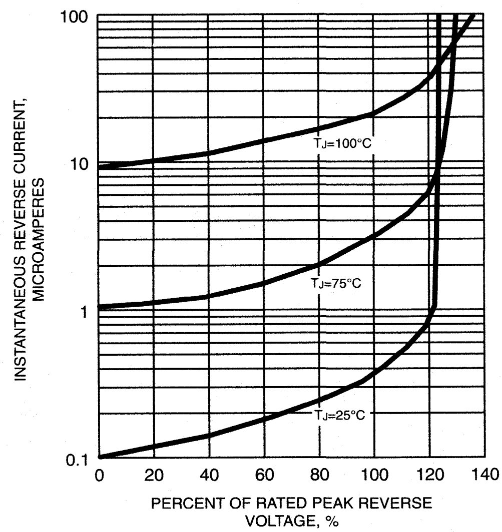
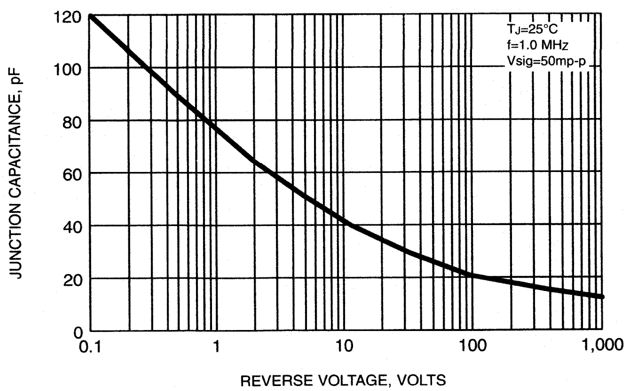


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



General Instrument
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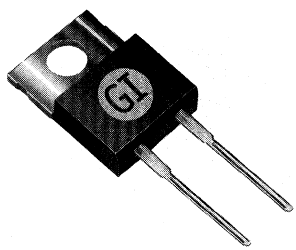
SCHOTTKY RECTIFIERS
0.6 TO 40.0 AMPERES



SCHOTTKY

INTRODUCTION TO SCHOTTKY RECTIFIERS

General Instrument's Schottky rectifier is the ideal product for high speed and low power loss applications. Their metal-silicon junctions and majority carrier condition results in extremely fast recovery times (less than 10ns) and very low forward voltage drops. General Instrument's unique sputtered metalization process and ion implanted guardring technology results in a highly reliable Schottky product. The sputtering technique provides a very uniform Schottky junction, yielding a well controlled barrier height distribution. Ion implantation provides consistency to the PN junction guardring, resulting in unsurpassed reverse energy handling capability. We offer a unique opportunity to our customers by providing flexibility of different barrier heights to best suit their end applications.

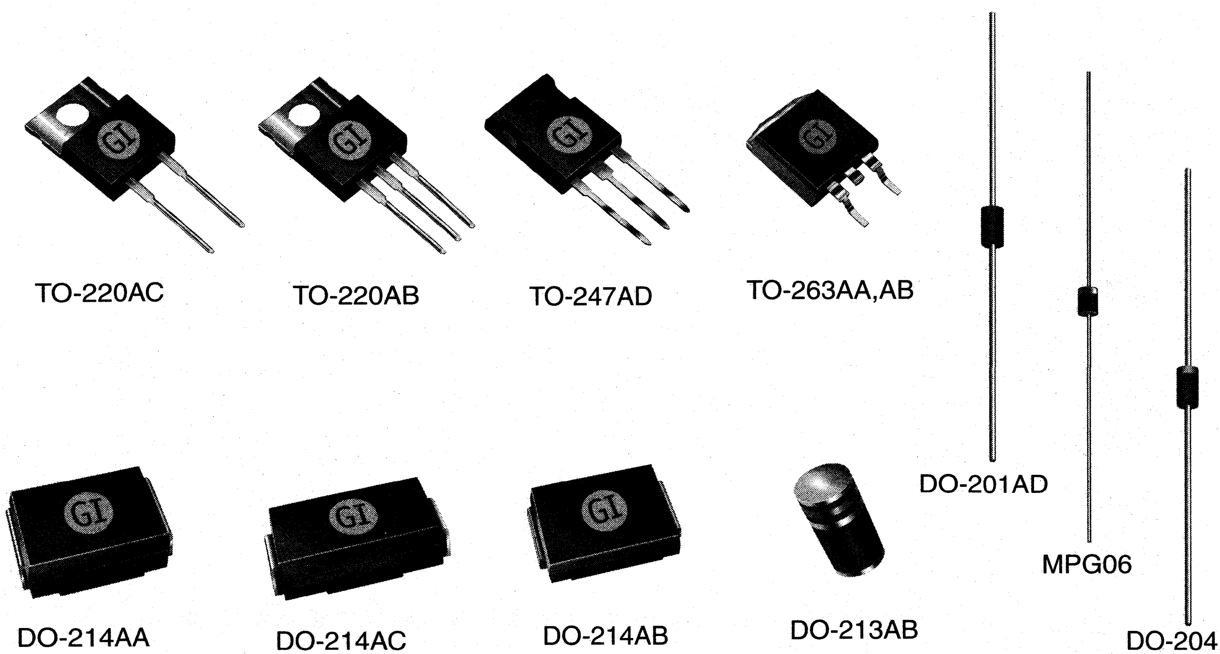
Lower barrier heights result in lower forward voltage drop and improved power dissipation. This is at the expense of high temperature leakage current due to the physics of the Schottky barrier junction. Conversely, high barrier heights result in improve high temperature leakage at the expense of higher forward voltage drop.

For additional information to choose the barrier height to best meet your particular application, please refer to the application note titled "Design Guidelines for Schottky Rectifiers," (pg. 508).

In summary, some of the features of our Schottky rectifiers are as follows:

- *Metal to silicon rectifier, majority carrier conduction*
- *Low power loss, high efficiency*
- *High current capability, low V_F*
- *Epitaxial construction*
- *Guardring for reverse transient protection*

We offer these devices in a variety of packages for your convenience.



SCHOTTKY RECTIFIERS PART NUMBERING SYSTEM

Part numbering system for all parts excluding JEDEC registered and industry standard parts.

1. **SURFACE-MOUNT**

a) SMX
SSXY - ZZZZ

SS=Surface-mount Schottky
X=Forward Current (in Amps)
1=1.0 Amp
2=2.0 Amps
3=3.0 Amps

Y=Reverse Voltage (in Volts)
2=20V
3=30V
4=40V
5=50V
6=60V

ZZZZ=Customer specific instructions (not shown in databook)

b) MELF
SSXY - ZZZZ

S=Schottky
GL=Glass Leadles
41=1 Amp
YY=Voltage

2. **AXIAL**
AGL41 - YY

SB=Schottky Barrier

X=Forward Current (in Amps)

Y=Reverse Voltage (in Volts)
20=20V
50=50V
30=30V
60=60V
40=40V

ZZZZ = Customer specific instructions (not shown in databook)

3.POWER PACKAGES
AAABXXYYPP - ZZZZ

AAA=Barrier Height Classification
SBL=Schottky Barrier Low
MBR=Medium Barrier Rectifier
B=Surface Mount TO-263
"Blank"=Non-isolated
F=Isolated

3. **POWER PACKAGES (cont'd)**
AAABXXYYPP - ZZZZ

XX=Forward Current (in Amps)
7=7.5 Amps
16=16 Amps
15=15 Amps
10=10 Amps
20=20 Amps
25=25 Amps

YY=Reverse Voltage (in Volts)
20=20V
50=50V
30=30V
60=60V
40=40V

PP=Package Type
"Blank"=single TO-220AC, TO-263AA
CT=Center Tap TO-220AB, TO-263AB
PT=Center Tap TO-247AD

ZZZZ=Customer specific instructions (not shown in databook)

For JEDEC part numbers, please see p/n explanations on page 2

LOW CURRENT SCHOTTKY RECTIFIERS

TYPE	SB020 thru SB040	SB120 thru SB160	1N5817 thru 1N5819	SS12 thru SS16	SS22 thru SS26	SB320 thru SB360	1N5820 thru 1N5822	SS32 thru SS36	SB520 thru SB560
PACKAGE	MPG06	D0204AL	DO204AL	DO214AC	DO214AA	DO201AD	DO201AD	DO214AB	DO201AD
I_O(A)	0.6	1.0	1.0	1.0	2.0	3.0	3.0	3.0	5.0
V_R=20(V)	SB020	SB120	1N6817	SS12	SS22	SB320	1N5820	SS32	SB520
V_R=30(V)	SB030	SB130	1N5818	SS13	SS23	SB330	1N5821	SS33	SB530
V_R=40(V)	SB040	SB140	1N5819	SS14	SS24	SB340	1N5822	SS34	SB540
V_R=50(V)		SB150		SS15	SS25	SB350		SS35	SB550
V_R=60(V)		SB160		SS16	SS26	SB360		SS36	SB560
SURGE(A)	20	40	25	30	50	80	80	100	150
V_F(V)	0.55	0.50	0.70	0.45	0.55	0.60	0.50/0.70	0.50/0.70	0.55/0.67

MEDIUM CURRENT SCHOTTKY SINGLE RECTIFIERS

TYPE	MBR735 thru MBR760	SBL1030 thru SBL1040	MBR1035 thru MBR1060	MBR1635 thru MBR1650
PACKAGE	TO-220AC	TO-220AC	TO-220AC	TO-220AC
BARRIER HEIGHT	HIGH	LOW	HIGH	HIGH
I_O(A)	7.5	10.0	10.0	16.0
V_R=30(V)		SBL1030		
V_R=35(V)	MBR735		MBR1035	MBR1635
V_R=40(V)		SBL1040		
V_R=45(V)	MBR745		MBR1045	MBR1645
V_R=50(V)	MBR750		MBR1050	MBR1650
V_R=60(V)	MBR760		MBR1060	MBR1660
SURGE(A)	150	250	150	150
V_F(V)	0.57/0.65	0.60	0.57/0.70*	0.63/0.75

*Tc=125 C

MEDIUM CURRENT SCHOTTKY DUAL RECTIFIERS

TYPE	SBL1030CT thru SBL1040CT	MBR1535CT thru MBR1560CT	SBL1630CT thru SBL1640CT	MBR2035CT thru MBR2060CT	MBR2535CT thru MBR2560CT
PACKAGE	TO-220AB	TO-220AB	TO-220AB	TO-220AB	TO-220AB
BARRIER HEIGHT	LOW	HIGH	LOW	HIGH	HIGH
I_O(A)	10.0	15.0	16.0	20.0	30.0
V_R=30(V)	SBL1030CT		SBL1630CT		
V_R=35(V)		MBR1535CT		MBR2035CT	MBR2535CT
V_R=40(V)	SBL1040CT		SBL1640CT		
V_R=45(V)		MBR1545CT		MBR2045CT	MBR2545CT
V_R=50(V)		MBR1550CT		MBR2050CT	MBR2550CT
V_R=60(V)		MBR1560CT		MBR2060CT	MBR2560CT
SURGE(A)	175	150	250	150	150
V_F(V)	0.55	0.57/0.65*	0.55	0.84/0.95	0.82/0.75**

*T_C-125°C
**I_F-15 Amps

MEDIUM CURRENT SCHOTTKY DUAL RECTIFIERS (cont'd)

TYPE	SBL2030PT thru SBL2040PT	SBL3030PT thru SBL3040PT	MBR3035PT thru MBR3060PT	SD241P	MBR4035PT thru MBR4060PT
PACKAGE	TO-247AD	TO-247AD	TO-247AD	TO-247AD	TO-247AD
BARRIER HEIGHT	LOW	LOW	HIGH	HIGH	HIGH
I_O(A)	20.0	30.0	30.0	30.0	40.0
V_R=30(V)	SBL2030PT	SBL3030PT			
V_R=35(V)			MBR3035PT		MBR4035PT
V_R=40(V)	SBL2040PT	SBL3040PT			
V_R=45(V)			MBR3045PT	SD241P	MBR4045PT
V_R=50(V)			MBR3050PT		MBR4050PT
V_R=60(V)			MBR3060PT		MBR4060PT
SURGE(A)	250	275	200	400	400
V_F(V)	0.55	0.55	0.60/0.65	0.60*	0.70/0.80

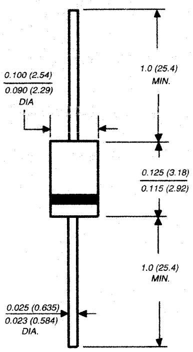
*T_C=125°C

SB020 THRU SB040

MINIATURE SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 40 Volts* ***Forward Current** - 0.6 Ampere*

Case Style MPG06



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ Guardring for overvoltage protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3 kg) tension

MECHANICAL DATA

Case: Molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	SB020	SB030	SB040	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	Volts
Maximum average forward rectified current at 0.375" (9.5mm) lead length T_L=60°C	$I_{(AV)}$		0.6		Amp
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=70°C	I_{FSM}		20.0		Amps
Maximum instantaneous forward voltage at 0.6A (NOTE 1)	V_F		0.55		Volts
Maximum instantaneous reverse current at rated DC blocking voltage T_A=25°C (NOTE 1) T_A=100°C	I_R		0.5 10.0		mA
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$		60.0 20.0		°C/W
Operating junction temperature range	T_J		-55 to +125		°C
Storage temperature range	T_{STG}		-55 to +150		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to ambient vertical P.C.B. mounted, 0.5" 1.27mm lead length with 1.5 x 1.5" (38 x 38mm) copper pad

FIG. 1 - FORWARD CURRENT DERATING CURVE

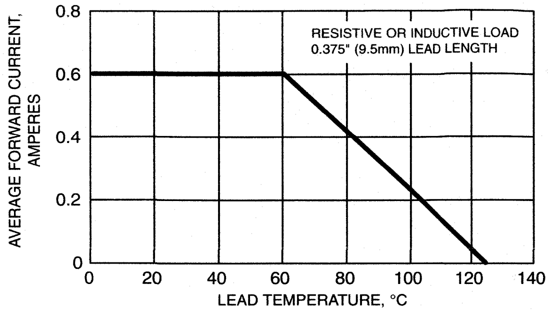


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

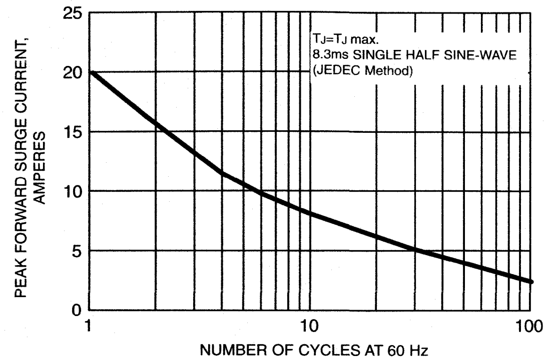


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

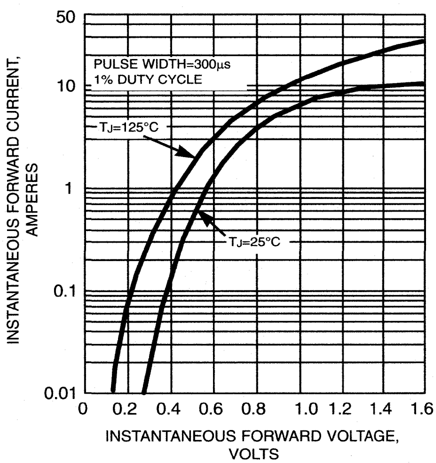


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

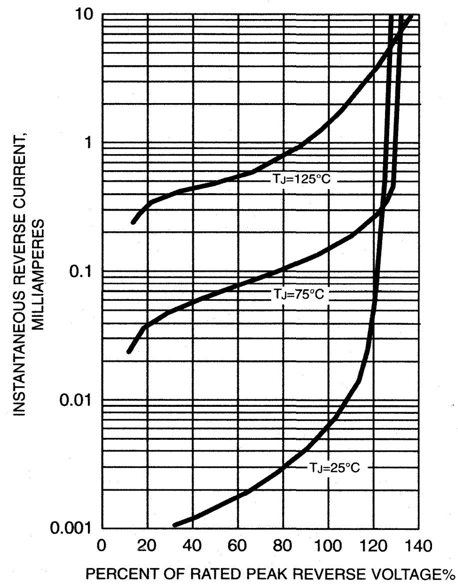


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

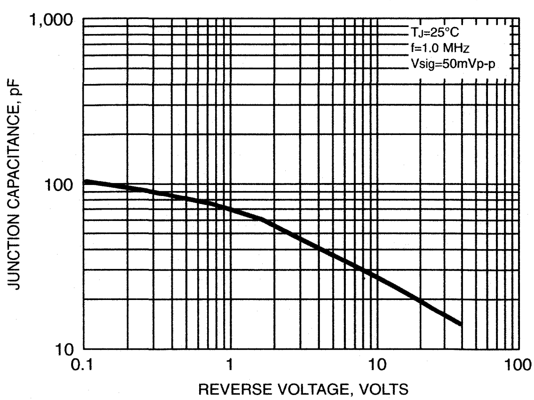
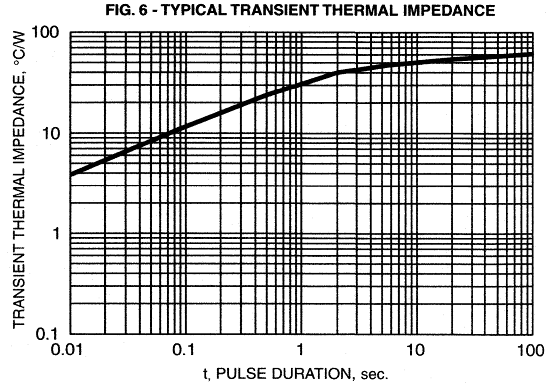


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

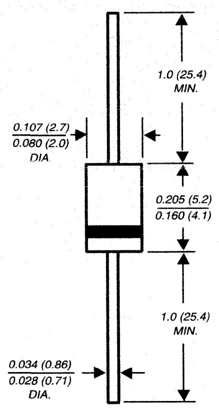


1N5817 THRU 1N5819

SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 40 Volts* ***Forward Current** - 1.0 Ampere*

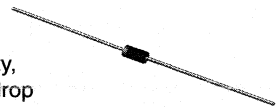
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Metal silicon junction, majority carrier conduction
- Guardring for overvoltage protection
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounces, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N5817*	*1N5818*	*1N5819*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	Volts
* Maximum DC blocking voltage	V_{DC}	20	30	40	Volts
* Maximum non-repetitive peak reverse voltage	V_{RSM}	24	36	48	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=90°C	$I_{(AV)}$		1.0		Amp
* Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=70°C	I_{FSM}		25.0		Amps
* Maximum instantaneous forward voltage at 1.0A (NOTE 1)	V_F	0.450	0.550	0.600	Volts
* Maximum instantaneous forward voltage at 3.1A (NOTE 1)	V_F	0.750	0.875	0.900	Volts
* Maximum instantaneous reverse current at rated DC reverse voltage T_A=25°C (NOTE 1) T_A=100°C	I_R		1.0 10.0		mA
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$		50.0 15.0		°C/W
Typical junction capacitance (NOTE 3)	C_J		110.0		pF
* Storage and operating junction temperature range	T_J, T_{STG}		-65 to +125		°C

*JEDEC registered values

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to lead, and/or to ambient P.C.B. mounted with 0.375" (9.5mm) lead length with 1.5 x 1.5" (38 x 38mm) copper pads
(3) Measured at 1.0 MHz and applied reverse voltage of 4.0 volts

FIG. 1 - FORWARD CURRENT DERATING CURVE

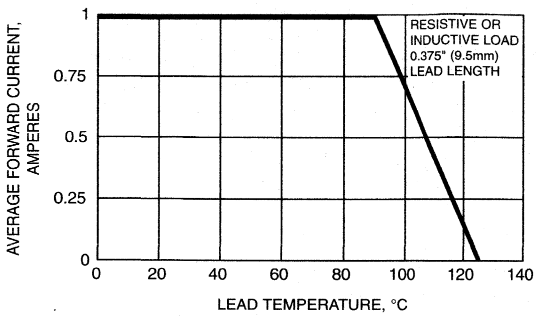


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

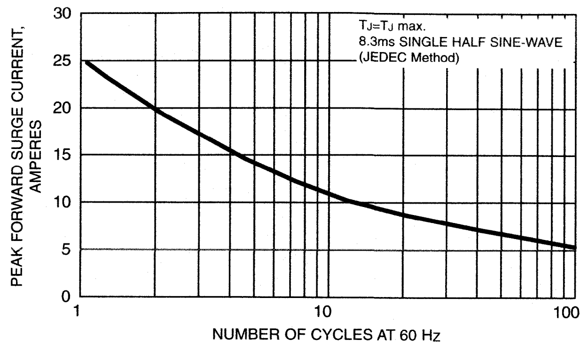


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

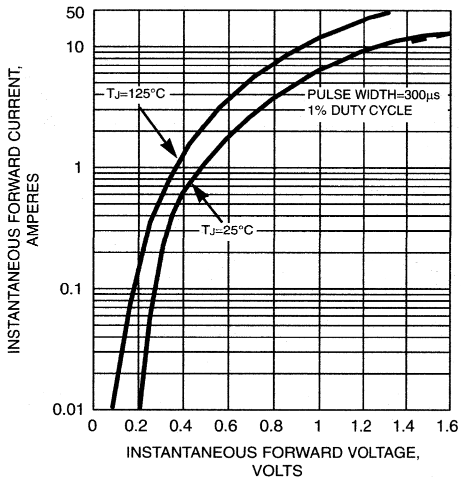


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

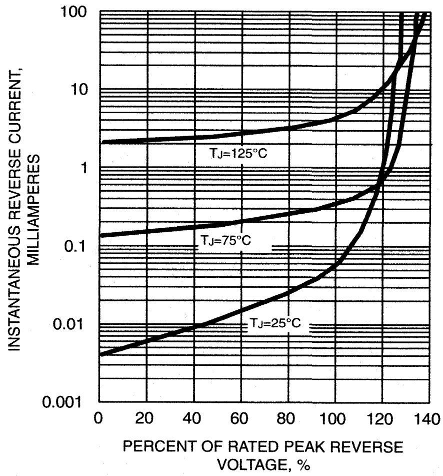


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

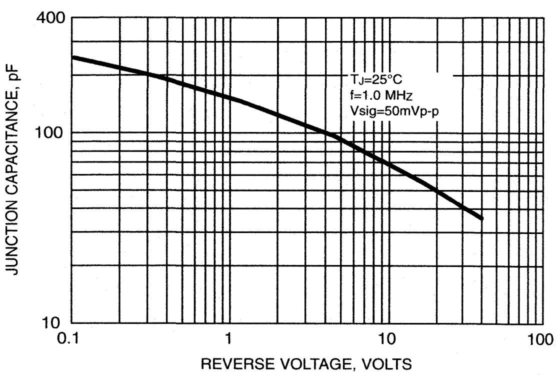
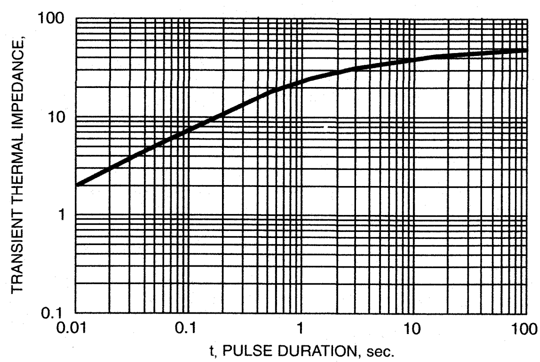


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

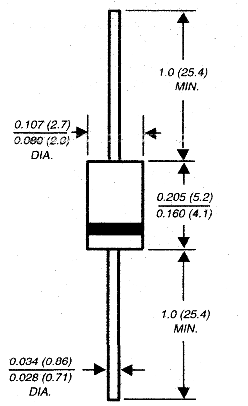


SB120 THRU SB160

SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 1.0 Ampere*

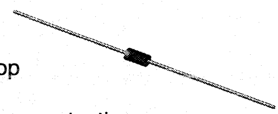
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ Guardring for overvoltage protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SB120*	*SB130*	*SB140*	*SB150*	*SB160*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG.1)	$I_{(AV)}$	1.0					Amp
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0					Amps
Maximum instantaneous forward voltage at 1.0A (NOTE 1)	V_F	0.50			0.70		Volts
Maximum instantaneous reverse current at rated DC blocking voltage T_A=25°C (NOTE 1)	I_R	0.5					mA
T_A=100°C		10.0			5.0		
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	50.0 15.0					°C/W
Operating junction temperature range	T_J	-65 to +125			-65 to +150		°C
Storage temperature range	T_{STG}	-65 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance junction to lead P.C.B. mounted 0.375" (9.5mm) lead length

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RATINGS AND CHARACTERISTIC CURVES SB120 THRU SB160

FIG. 1 - FORWARD CURRENT DERATING CURVE

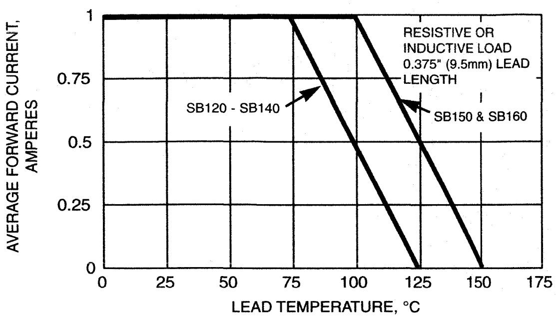


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

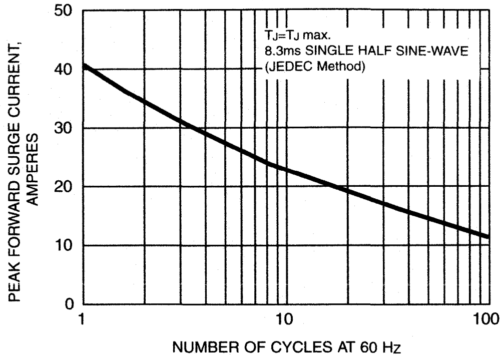


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

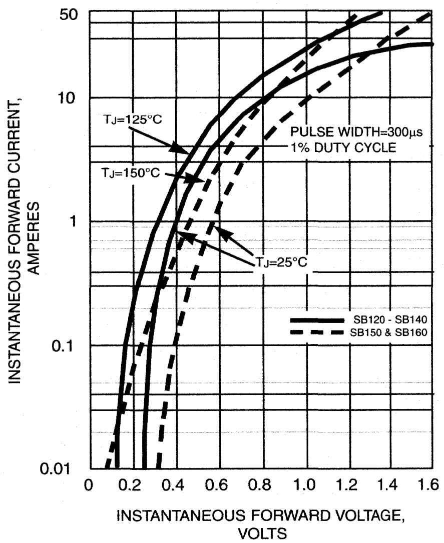


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

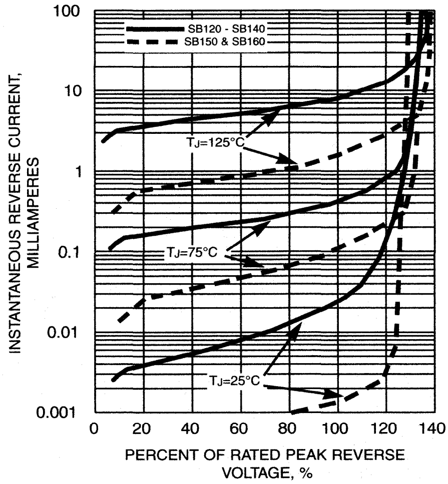


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

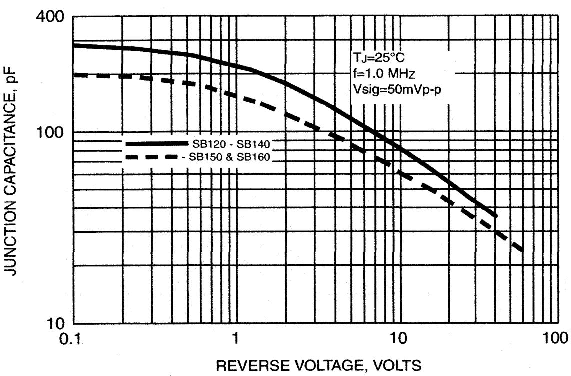
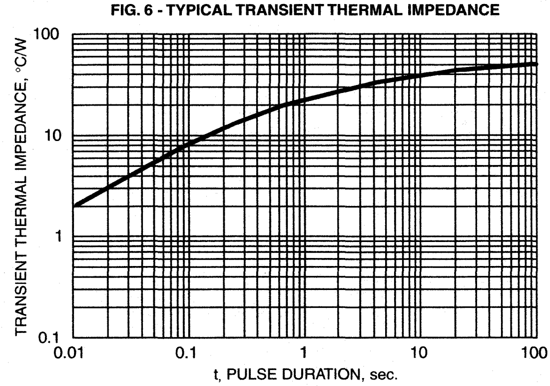


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

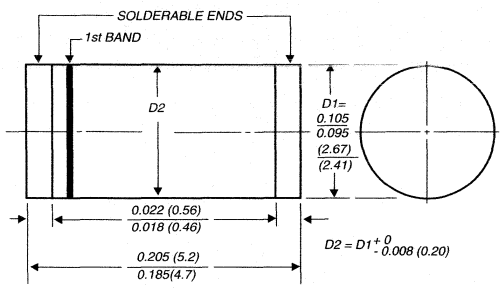


BYM13-20 THRU BYM13-60
SGL41-20 THRU SGL41-60

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 1.0 Ampere*

DO-213AB



1st band denotes type and positive end (cathode)

Dimensions in inches and (millimeters)

FEATURES

- Plastic package has carries Underwriters Laboratory Flammability Classifications 94V-0
- For surface mounted applications
- Metal silicon junction, majority carrier conduction
- High surge capability
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- For use in low voltage, high frequency inverters, free wheeling and polarity protection applications
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end 1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any
Weight: 0.116 gram, 0.0041 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYM13 -20	BYM13 -30	BYM13 -40	BYM13 -50	BYM13 -60	UNITS
Denotes Schottky devices: 1st band is orange		SGL41-20	SGL41-30	SGL41-40	SGL41-50	SGL41-60	
Polarity color bands (2nd band) voltage type		Gray	Red	Orange	Yellow	Green	
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current (SEE FIG. 1)	$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
Maximum instantaneous forward voltage at 1.0A (NOTE 1)	V_F	0.50			0.70		Volts
Maximum reverse current at rated DC blocking voltage T_J=25°C	I_R	0.5					mA
(NOTE 1) T_J=100°C		10			5.0		
Typical junction capacitance (NOTE 2)	C_J	110			80.0		pF
Maximum thermal resistance (NOTE 4)	$R_{\Theta JA}$	75.0					°C/W
(NOTE 3)	$R_{\Theta JT}$	30.0					
Operating junction temperature range	T_J	-55 to +125			-55 to +150		°C
Storage temperature range	T_{STG}	-55 to +150					°C

NOTES:
(1) Pulse test: 300µs pulse width, 1% duty cycle
(2) Measured at 1 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(4) Thermal resistance junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal

FIG. 1 - FORWARD CURRENT DERATING CURVE

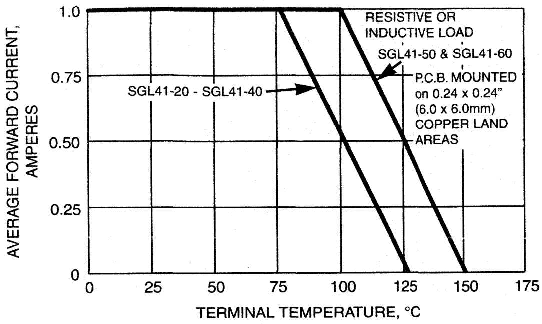


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

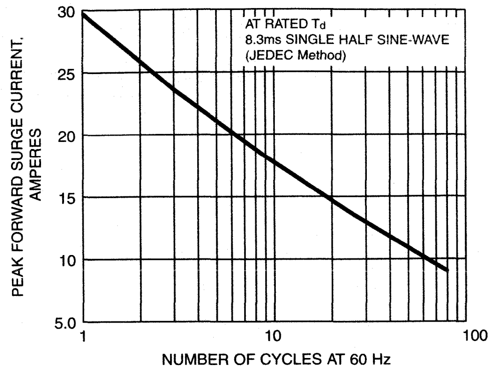


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

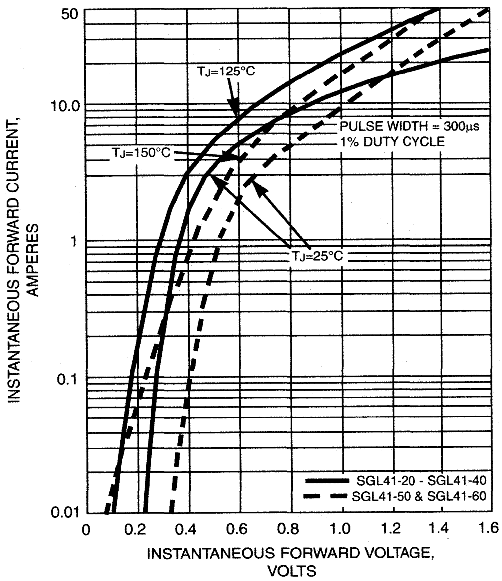


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

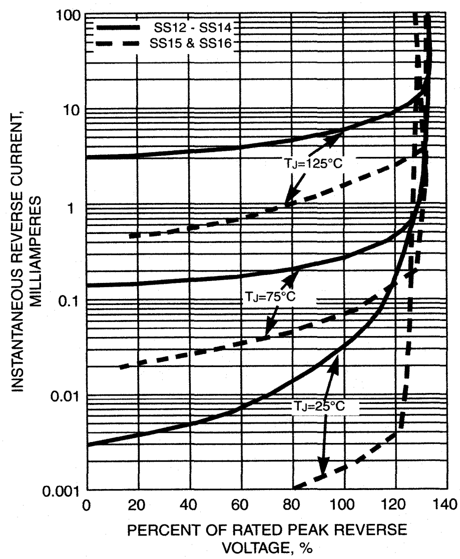
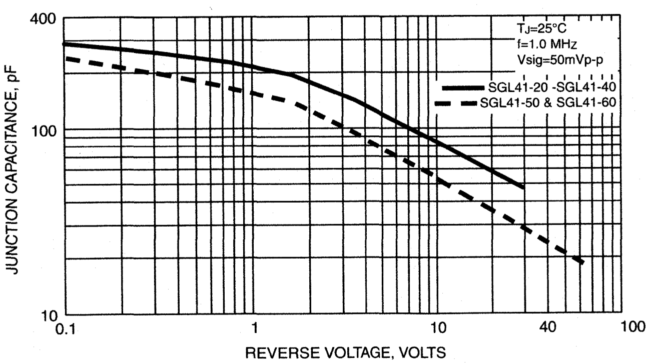


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

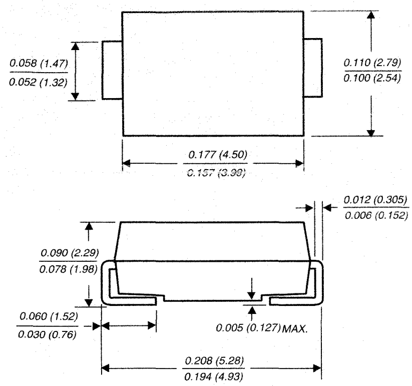


SS12 THRU SS16

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 1.0 Ampere*

DO-214AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has underwriters laboratory Flammability classification 94V-0
- For surface mount applications
- Low profile package
- Built-in strain relief
- Metal silicon junction, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage high frequency inverters, free wheeling, and polarity protection applications
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds on terminals

MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.002 ounce 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	SS12	SS13	SS14	SS15	SS16	UNITS
Device marking code		S2	S3	S4	S5	S6	
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current at T_L (SEE FIG. 1)	$I_{(AV)}$	1.0					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0					Amps
Maximum instantaneous forward voltage at 1.0A (NOTE 1)	V_F	0.50			0.75		Volts
Maximum DC reverse current (NOTE 1) T_A=25°C	I_R	0.5					mA
at rated DC blocking voltage T_A=100°C		10.0			5.0		
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$	88.0					°C/W
	$R_{\Theta JL}$	28.0					
Operating junction temperature range	T_J	-65 to +125			-65 to +150		°C
Storage temperature range	T_{STG}	-65 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) P.C.B. mounted with 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

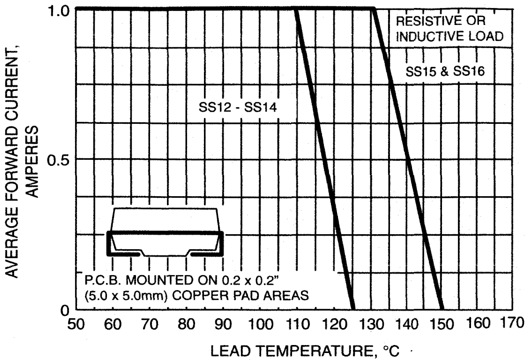


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

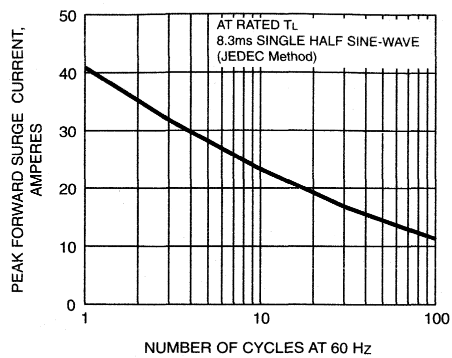


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

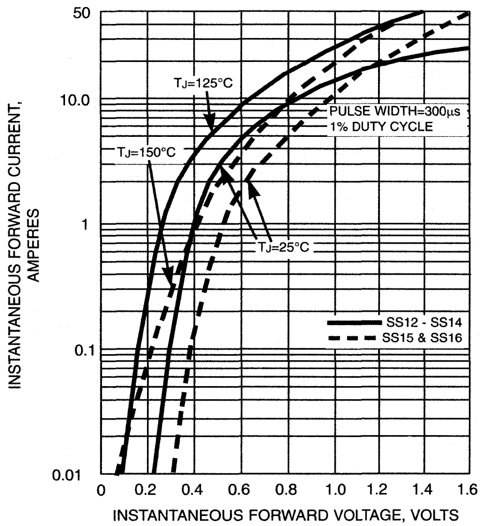


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

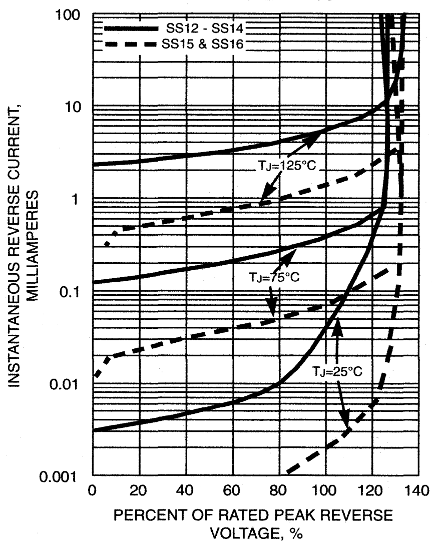
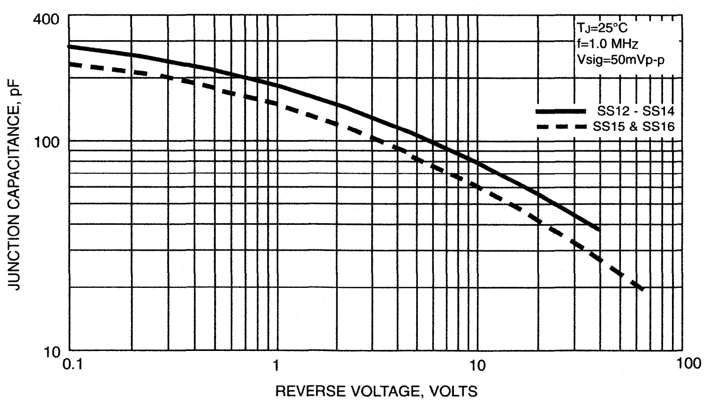


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

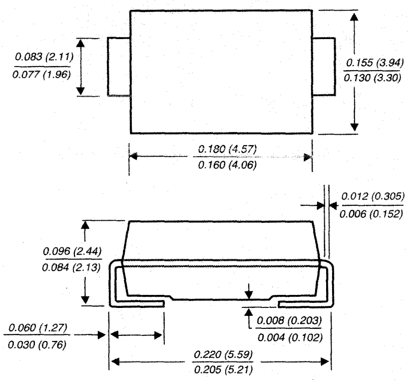


SS22 THRU SS26

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

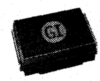
Reverse Voltage *- 20 to 60 Volts* ***Forward Current*** *- 2.0 Amperes*

DO-214AA



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mounted applications
- ♦ Low profile package
- ♦ Built-in strain relief
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.003 ounce, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SS22*	*SS23*	*SS24*	*SS25*	*SS26*	*UNITS*
Device marking code		S2	S3	S4	S5	S6	
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current at T_L (SEE FIG. 1)	$I_{(AV)}$	2.0					Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
Maximum instantaneous forward voltage at 2.0A (NOTE 1)	V_F	0.50			0.70		Volts
Maximum DC reverse current (NOTE 1) T_A=25°C	I_R	0.5					mA
at rated DC blocking voltage T_A=100°C		20.0			10.0		
Maximum thermal resistance (NOTE 2)	$R_{\Theta JA}$	75.0					°C/W
	$R_{\Theta JL}$	17.0					
Operating junction temperature range	T_J	-65 to +125			-65 to +150		°C
Storage temperature range	T_{STG}	-65 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) P.C.B. mounted with 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

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RATINGS AND CHARACTERISTIC CURVES SS22 THRU SS26

FIG. 1 - FORWARD CURRENT DERATING CURVE

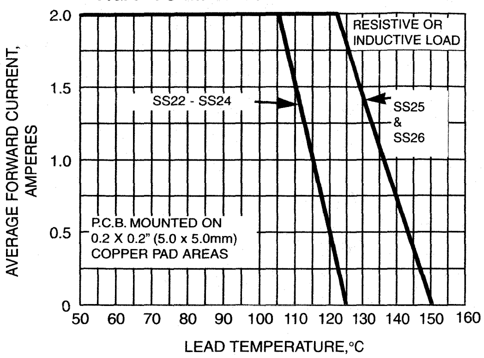


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

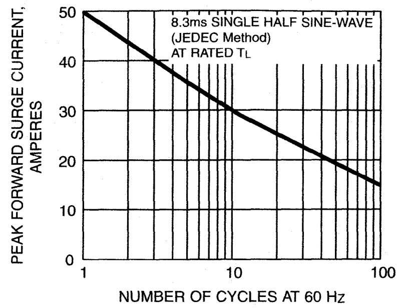


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

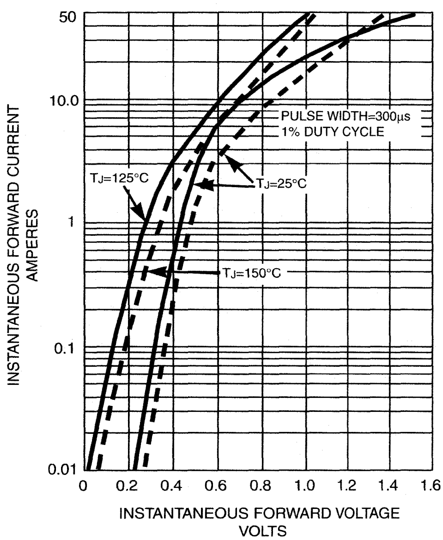


FIG. 4 - TYPICAL REVERSE CURRENT CHARACTERISTICS

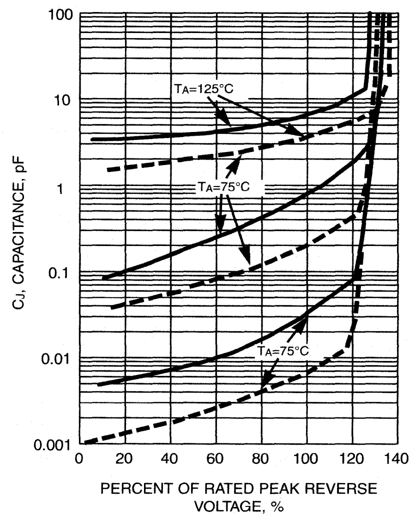
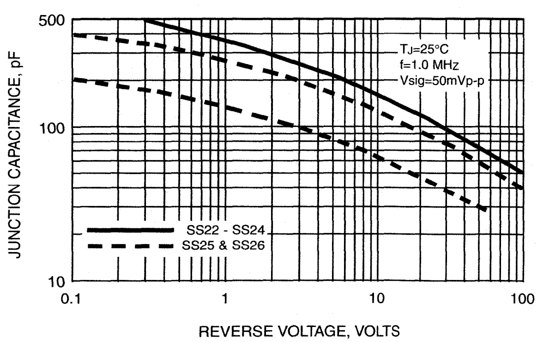


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

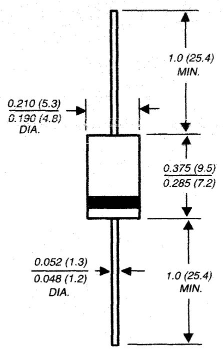


1N5820 THRU 1N5822

SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 40 Volts*   ***Forward Current** - 3.0 Amperes*

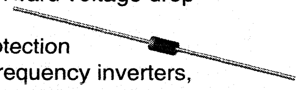
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ Guardring for overvoltage protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N5820*	*1N5821*	*1N5822*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	Volts
* Maximum DC blocking voltage	V_{DC}	20	30	40	Volts
* Non-repetitive peak reverse voltage	V_{RSM}	24	36	48	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=95°C	$I_{(AV)}$	3.0			Amps
* Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_L=75°C	I_{FSM}	80.0			Amps
* Maximum instantaneous forward voltage at 3.0 (NOTE 1)	V_F	0.475	0.500	0.525	Volts
* Maximum instantaneous forward voltage at 9.4 (NOTE 1)	V_F	0.850	0.900	0.950	Volts
* Maximum average reverse current at rated DC blocking voltage (NOTE 1) T_A=25°C T_A=100°C	I_R	2.0 20.0			mA
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	40.0 10.0			°C/W
* Storage and operating junction temperature range	T_J, T_{STG}	-65 to +125			°C

*JEDEC registered values

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to lead vertical P.C.B. mounted, 0.500" (12.7mm) lead length with 2.5 x 2.5" (63.5 x 63.5mm) copper pad

FIG. 1 - FORWARD CURRENT DERATING CURVE

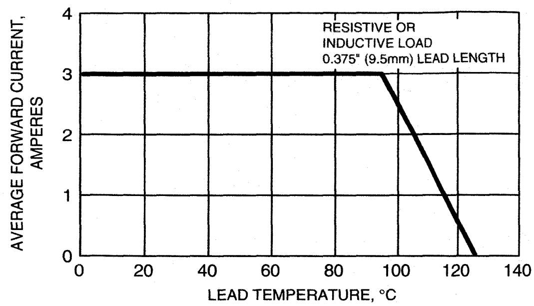


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

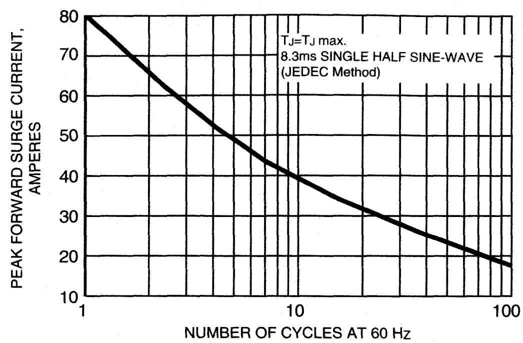


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

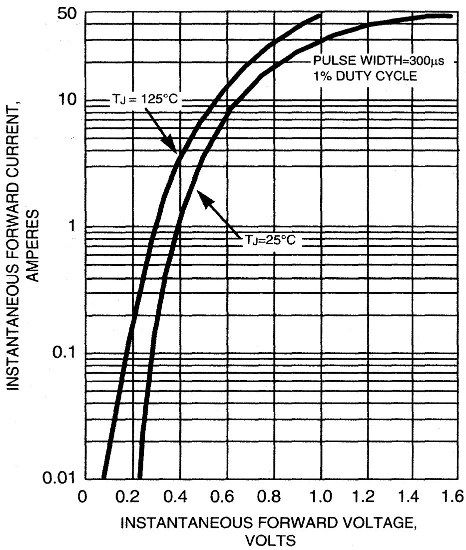


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

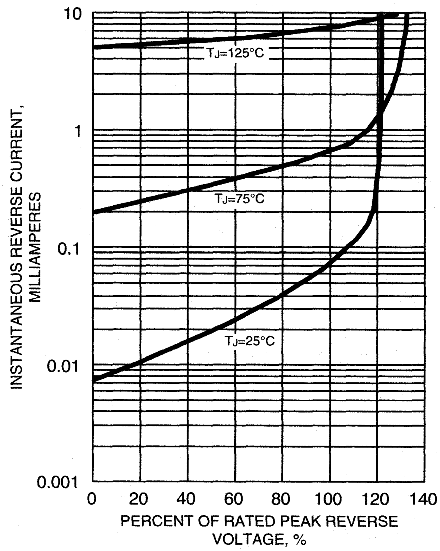


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

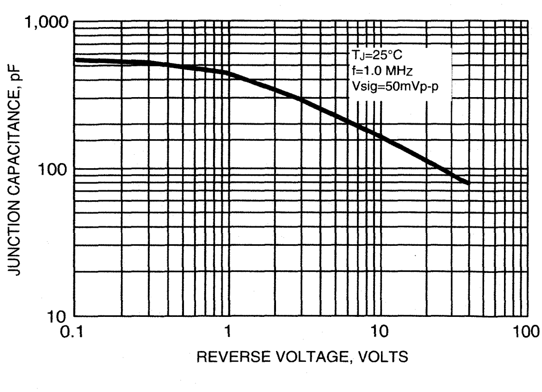
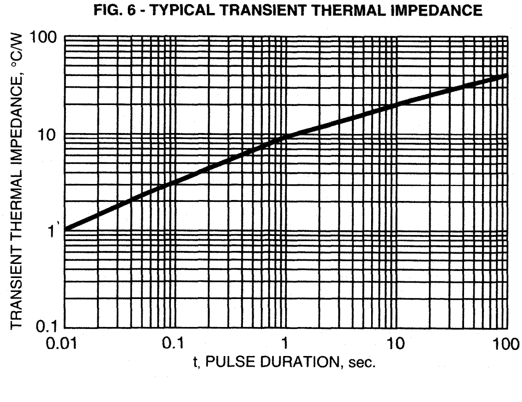


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

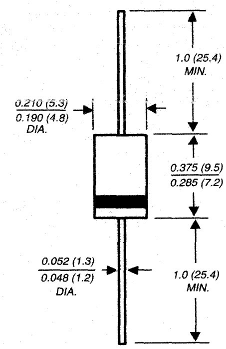


SB320 THRU SB360

MEDIUM CURRENT SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 3.0 Amperes*

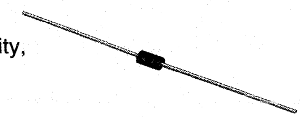
Case Style DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Metal to silicon rectifier, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low V_F
- ♦ High surge capacity
- ♦ Epitaxial construction
- ♦ Guardring for transient protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounces, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SB320*	*SB330*	*SB340*	*SB350*	*SB360*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current at 0.375" (9.5mm) lead length (SEE FIG. 1)	$I_{(AV)}$	3.0					Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0					Amps
Maximum instantaneous forward voltage at 3.0A (NOTE 1)	V_F	0.50			0.74		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 1) T_A=25°C	I_R	0.5					mA
T_A=100°C		20.0			10.0		
Typical thermal resistance (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$	40.0 10.0					°C/W
Operating junction temperature range	T_J	-65 to +125			-65 to +150		°C
Storage temperature range	T_{STG}	-65 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to lead vertical P.C.B. mounting, 0.500" (12.7mm) lead length with 2.5 x 2.5" (63.5 x 63.5mm) copper pad

FIG. 1 - FORWARD CURRENT DERATING CURVE

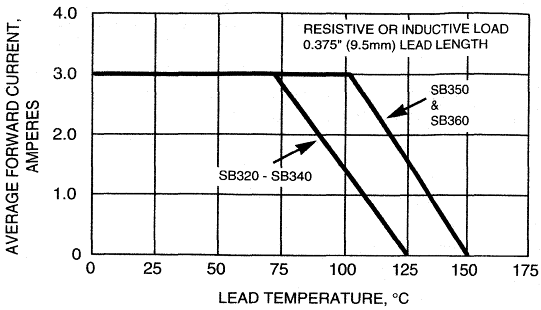


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

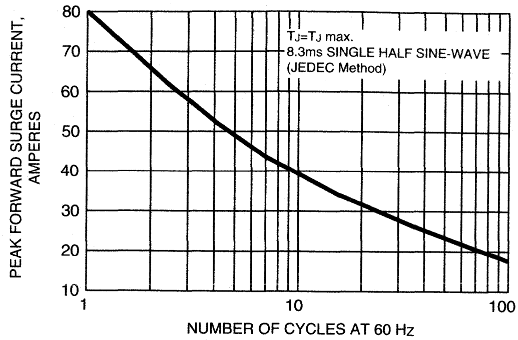


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

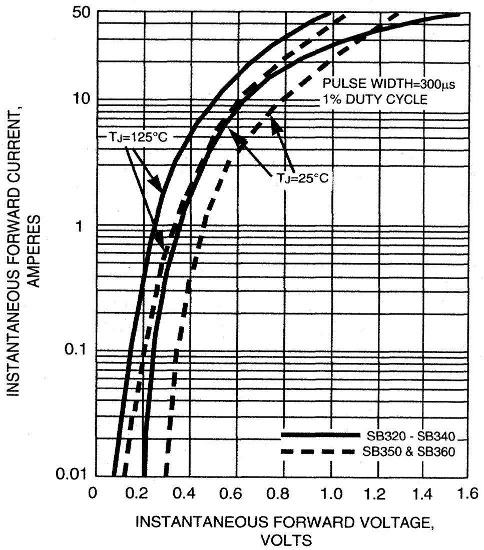


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

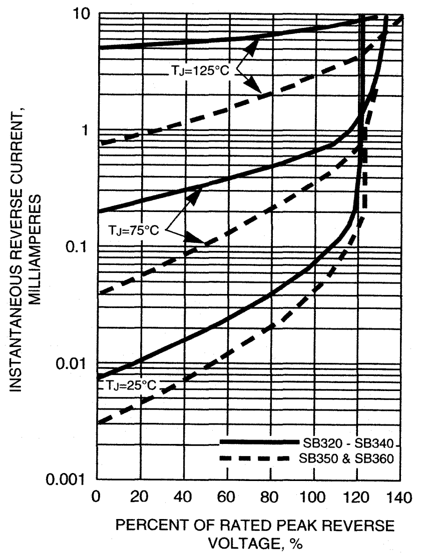


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

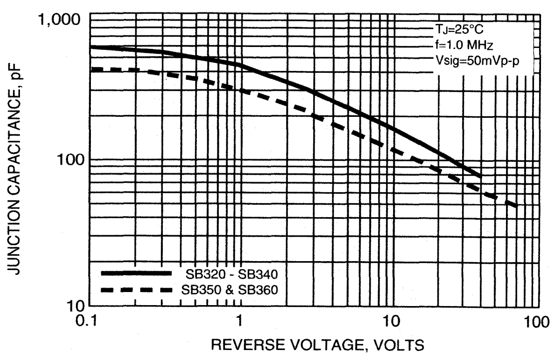
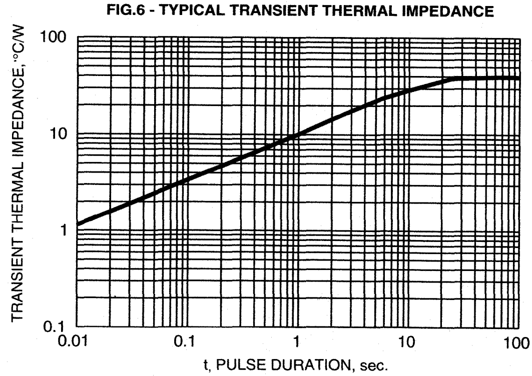


FIG.6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

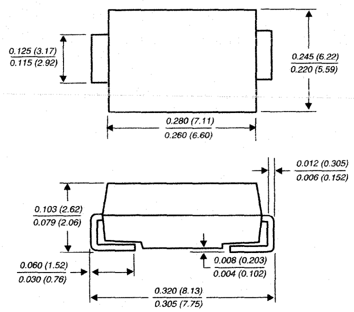


SS32 THRU SS36

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 3.0 Amperes*

DO-214AB



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ For surface mount applications
- ♦ Low profile package
- ♦ Built-in strain relief, ideal for automated placement
- ♦ Easy pick and place
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.007 ounce 0.25 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SS32*	*SS33*	*SS34*	*SS35*	*SS36*	*UNITS*
Device marking code		S2	S3	S4	S5	S6	
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current at T_L (SEE FIG. 1) (NOTE 2)	$I_{(AV)}$	3.0					Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0					Amps
Maximum instantaneous forward voltage at 3.0A (NOTE 1)	V_F	0.50			0.75		Volts
Maximum DC reverse current (NOTE 1) T_A=25°C	I_R	0.5					mA
at rated DC blocking voltage T_A=100°C		20.0			10.0		
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$	55.0					°C/W
	$R_{\Theta JL}$	17.0					
Operating junction temperature range	T_J	-55 to +125			-55 to +150		°C
Storage temperature range	T_{STG}	-55 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) P.C.B. mounted 0.55 x 0.55" (14 x 14mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

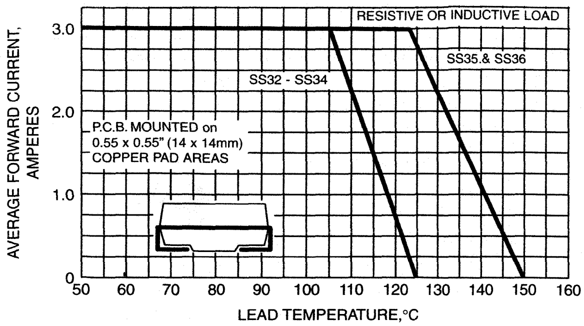


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

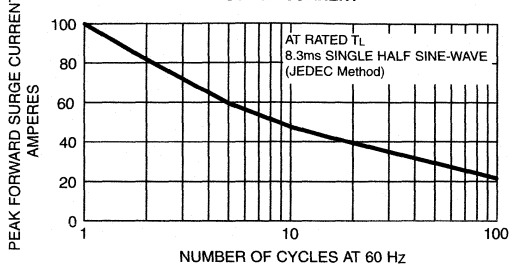


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

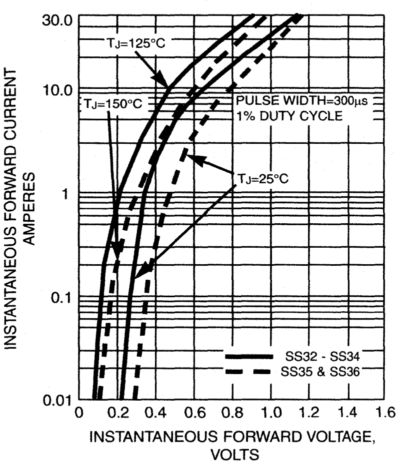


FIG. 4- TYPICAL REVERSE CURRENT CHARACTERISTICS

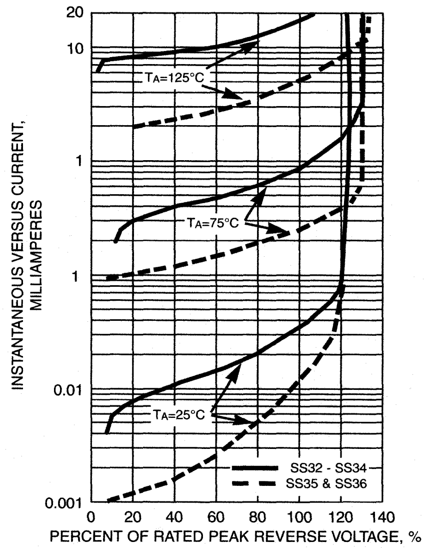


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

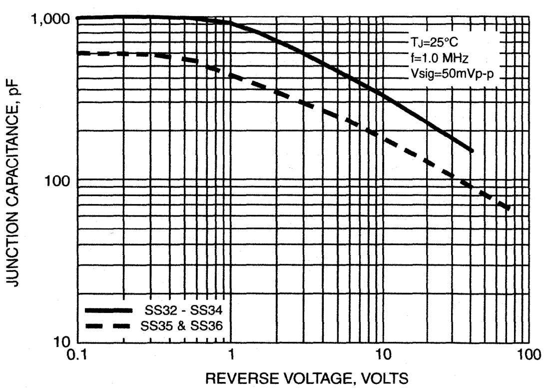
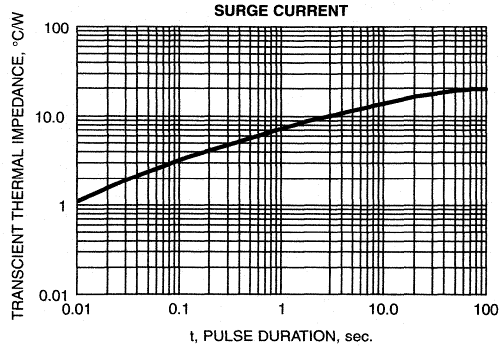


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

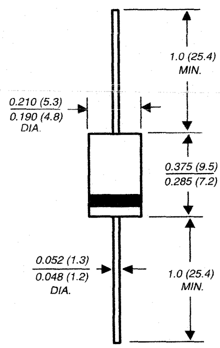


SB520 THRU SB560

SCHOTTKY BARRIER RECTIFIER

***Reverse Voltage** - 20 to 60 Volts* ***Forward Current** - 5.0 Amperes*

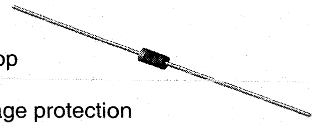
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ Guardring for overvoltage protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SB520*	*SB530*	*SB540*	*SB550*	*SB560*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC blocking voltage	V_{DC}	20	30	40	50	60	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG.1)	$I_{(AV)}$	5.0					Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at rated T_L	I_{FSM}	150.0					Amps
Maximum instantaneous forward voltage at 5.0A (NOTE 1)	V_F	0.55			0.67		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 1) T_A=25°C	I_R	0.5					mA
T_A=100°C		50.0			25.0		
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ $R_{\Theta JL}$	25.0 8.0					°C/W
Operating junction temperature range	T_J	-65 to +125			-65 to +150		°C
Storage temperature range	T_{STG}	-65 to +150					°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance junction to lead vertical P.C.B. mounted, 0.375" (9.5mm) lead length

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FIG. 1 - FORWARD CURRENT DERATING CURVE

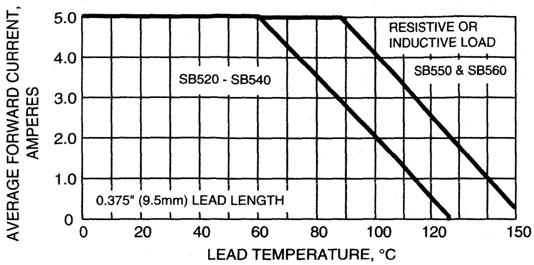


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

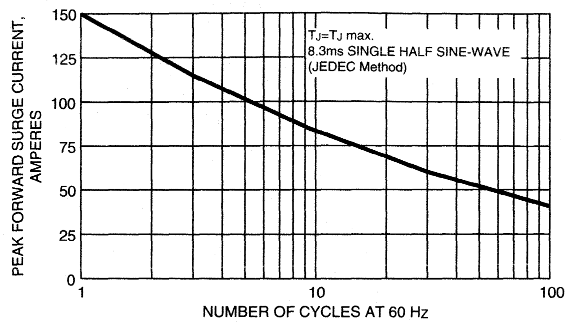


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

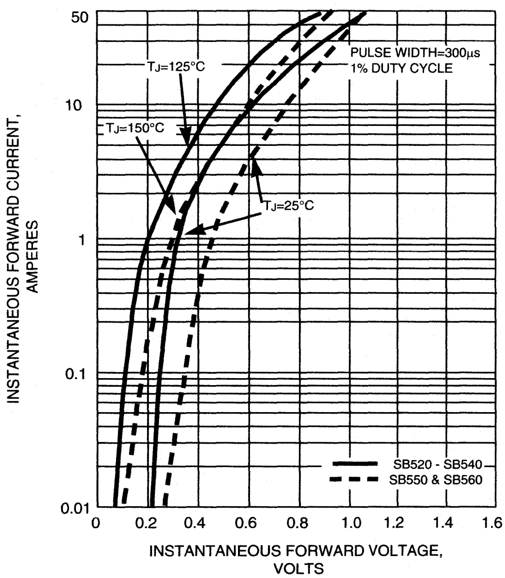


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

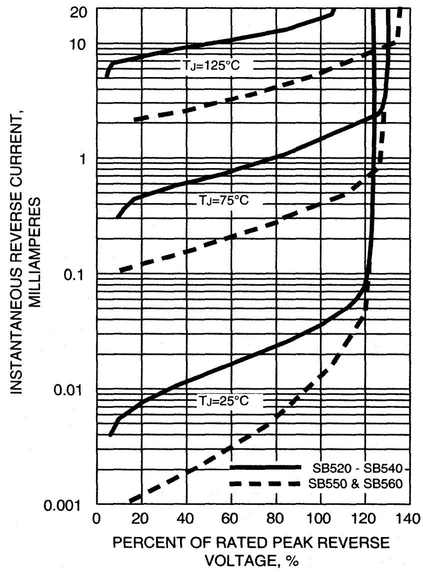


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

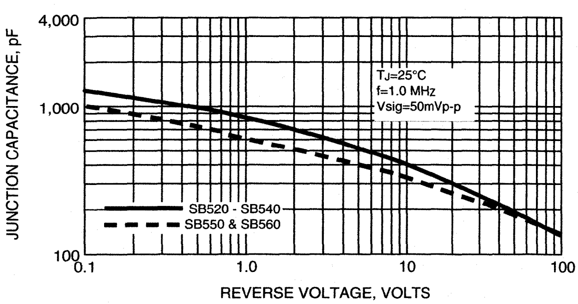
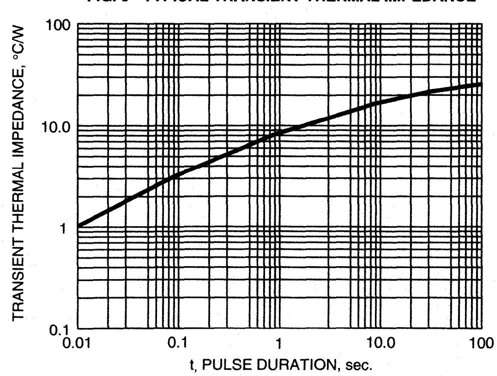


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

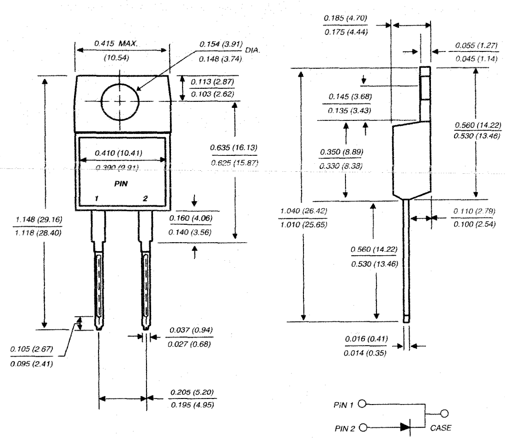


MBR735 THRU MBR760

SCHOTTKY RECTIFIER

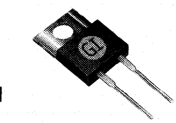
***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 7.5 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal to silicon rectifier, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounces, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MBR735*	*MBR745*	*MBR750*	*MBR760*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current (SEE FIG 1)	$I_{(AV)}$	7.5				Amps
Peak repetitive forward current (square wave, 20 KHz) at T_C=105°C	I_{FRM}	15.0				Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Maximum instantaneous forward voltage at (NOTE 2) I_F=7.5A, T_C=25°C I_F=7.5A, T_C=125°C I_F=15A, T_C=25°C I_F=15A, T_C=125°C	V_F	- 0.57 0.84 0.72		0.75 0.65 - -		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 1) T_C=25°C T_C=125°C	I_R	0.1 15.0		0.5 1000		mA
Voltage rate of change (rated V_R)	dv/dt	10,000		1000		V/µs
Maximum thermal resistance, (NOTE 3)	$R_{\Theta JC}$ $R_{\Theta JA}$	3.0 60.0				°C/W
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs, pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case and/or thermal resistance from junction to ambient

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FIG. 1 - FORWARD CURRENT DERATING CURVE

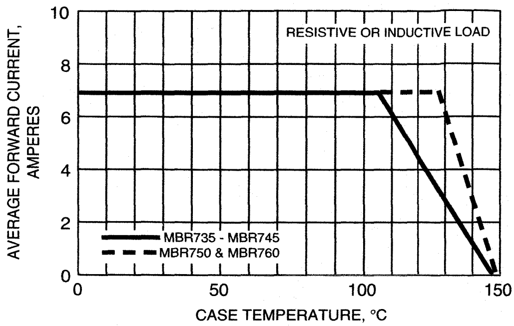


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

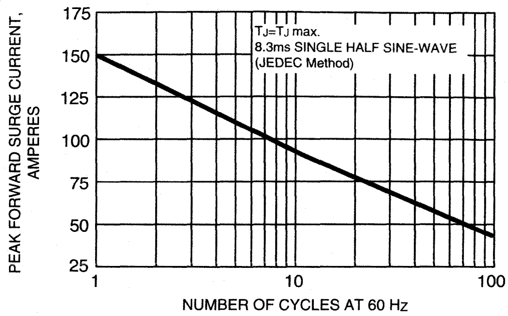


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

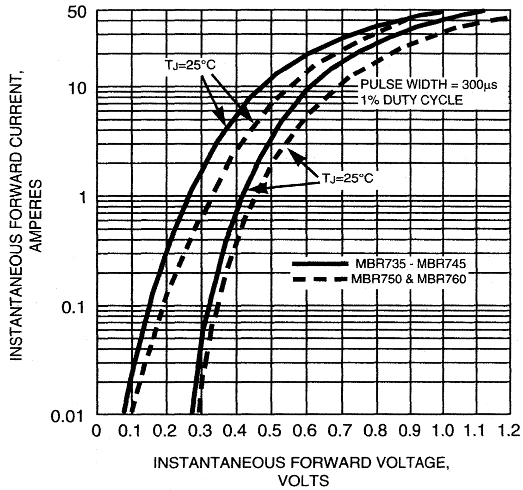


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

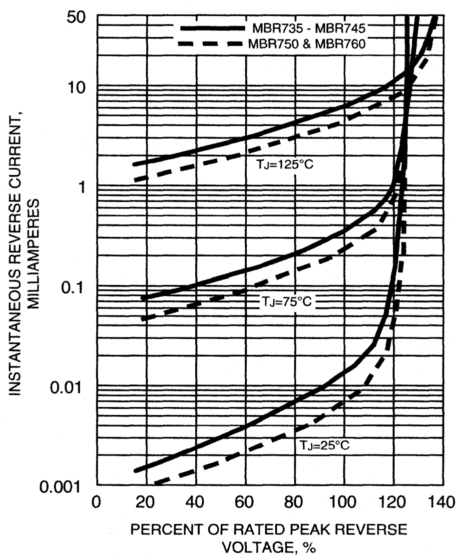


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

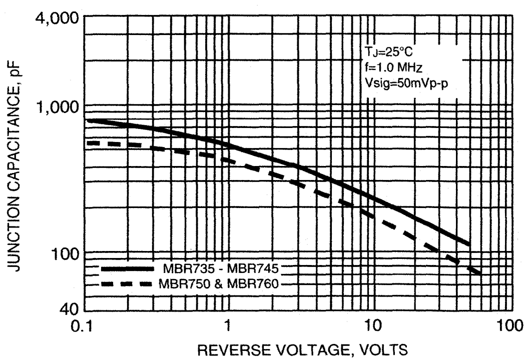
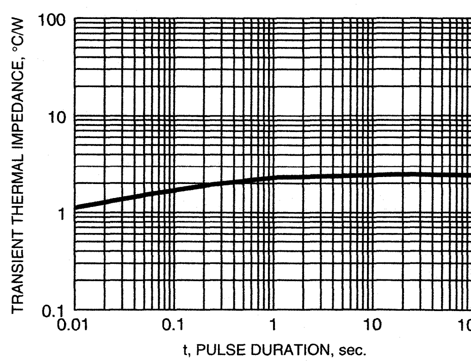


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

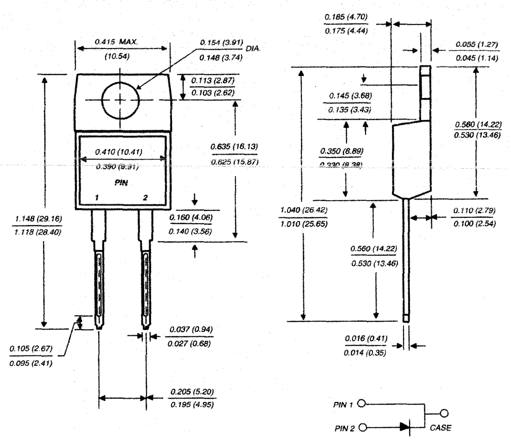


MBR1035 THRU MBR1060

SCHOTTKY RECTIFIER

***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 10.0 Amperes*

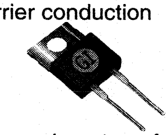
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounces, 1.81 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MBR1035*	*MBR1045*	*MBR1050*	*MBR1060*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current (SEE FIG. 1)	$I_{(AV)}$	10.0				Amps
Peak repetitive forward current at T_C=135°C (square wave 20 KHz)	I_{FRM}	20.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Voltage rate of change (rated V_R)	dv/dt	10,000				V/µs
Maximum instantaneous forward voltage at (NOTE 2) I_F=10A, T_C=25°C I_F=10A, T_C=125°C I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	- 0.57 0.84 0.72		0.80 0.70 0.95 0.85		Volts
Maximum instantaneous reverse current at rated DC blocking voltage T_C= 25°C (NOTE 2) T_C=125°C	I_R	0.10 15.0				mA
Maximum thermal resistance, junction to case	$R_{\Theta JC}$	2.0				°C/W
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

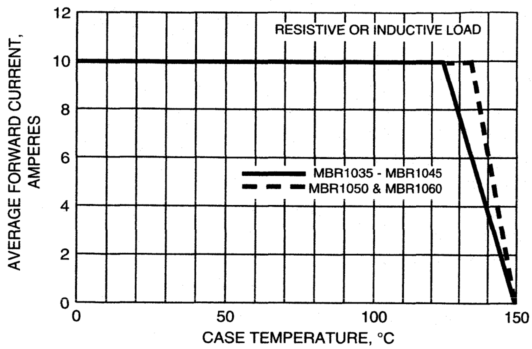


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

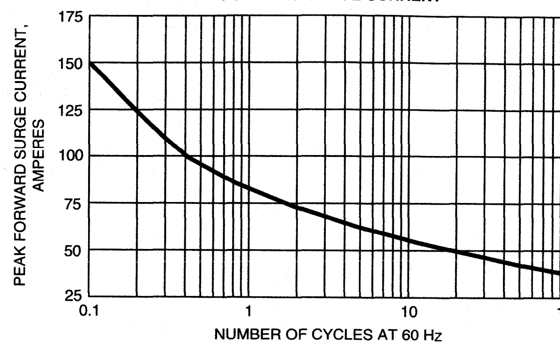


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

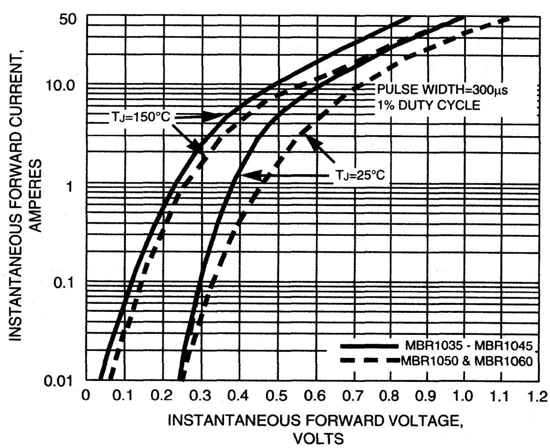


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

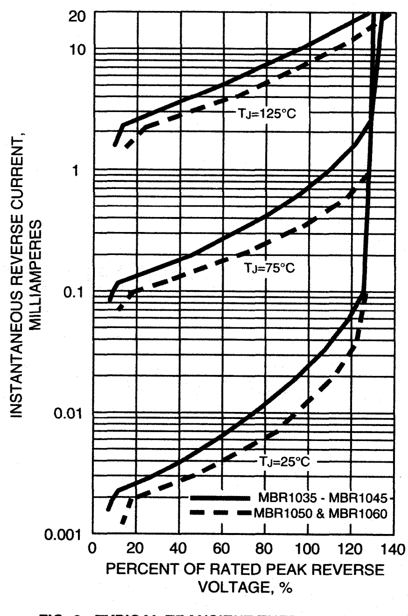


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

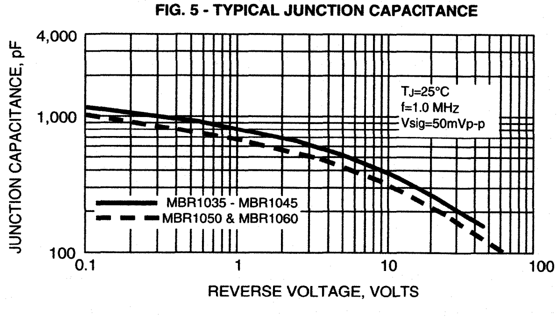
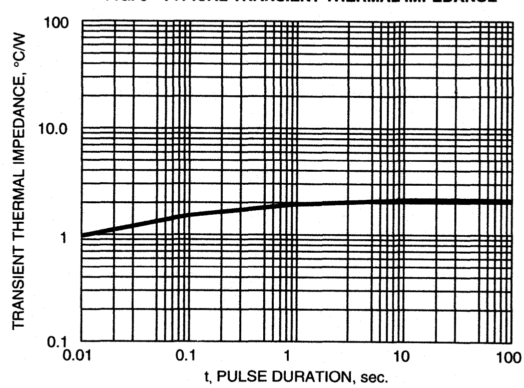


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

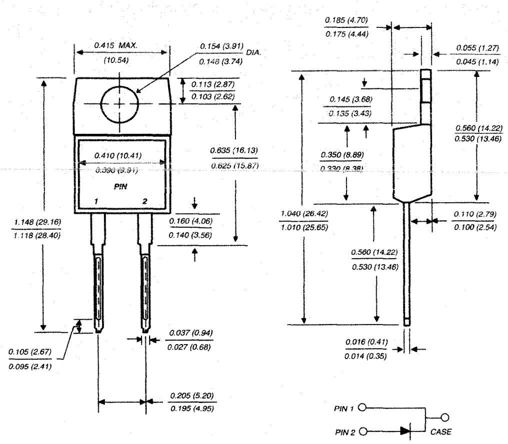


SBL1030 AND SBL1040

SCHOTTKY RECTIFIER

***Reverse Voltage** - 30 and 40 Volts* ***Forward Current** - 10.0 Amperes*

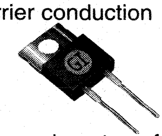
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- Metal silicon junction, majority carrier conduction
- Low power loss,high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounces, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SBL1030*	*SBL1040*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	30	40	Volts
Maximum RMS voltage	V_{RMS}	21	28	Volts
Maximum DC blocking voltage	V_{DC}	30	40	Volts
Maximum average forward rectified current at T_C=110°C	$I_{(AV)}$	10.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum instantaneous forward voltage at 10A (NOTE 1)	V_F	0.60		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 1) T_C=25°C / T_C=100°C	I_R	1.0 / 50.0		μA
Typical thermal resistance (NOTE 2)	$R_{\Theta JC}$	2.0		°C/W
Operating and storage temperature range	T_J, T_{STG}	-40 to +125		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to case per leg

FIG. 1 - FORWARD CURRENT DERATING CURVE

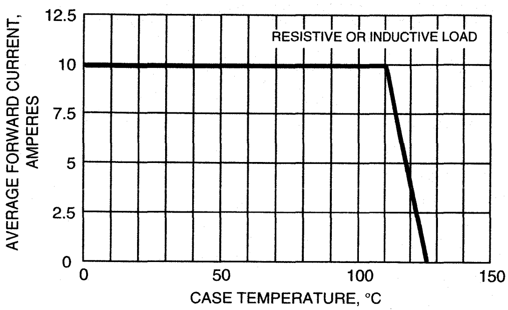


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

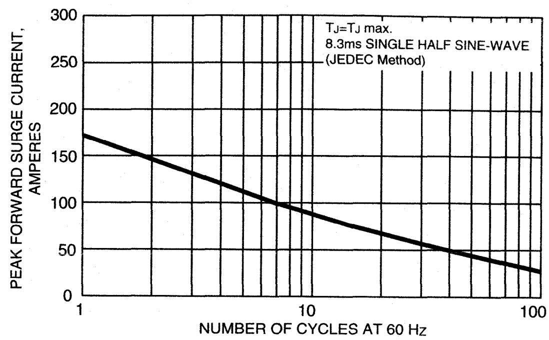


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

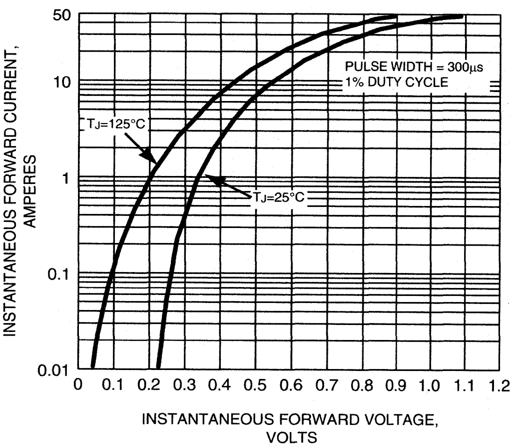


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

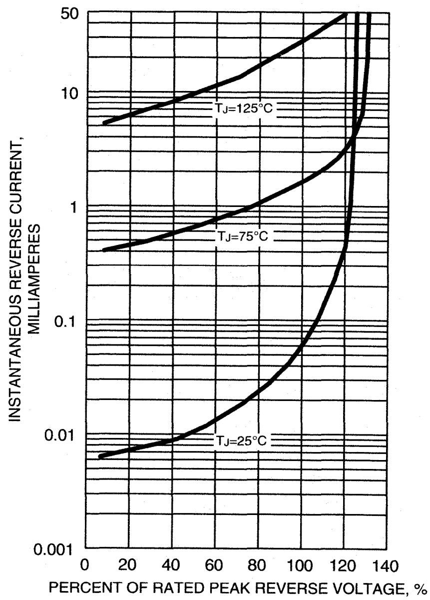


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

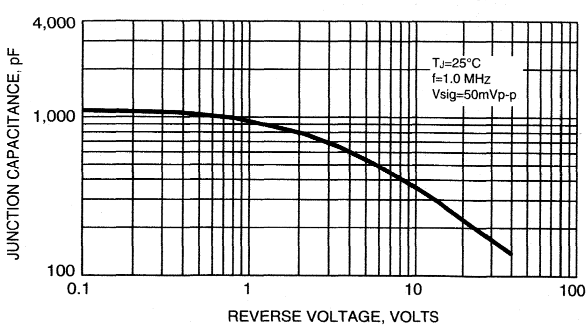
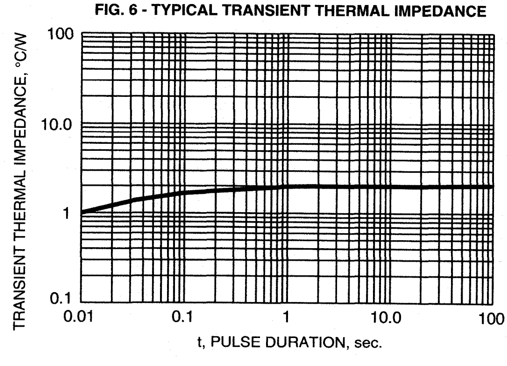


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

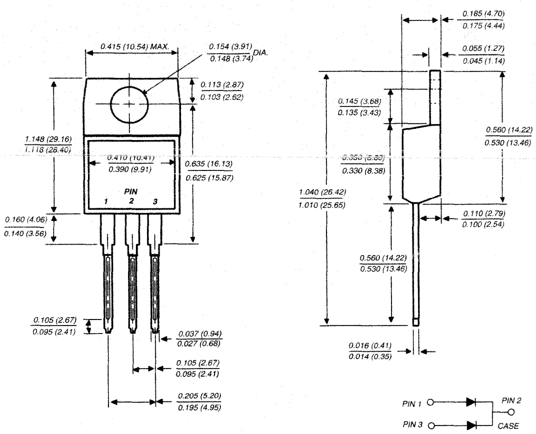


SBL1030CT AND SBL1040CT

SCHOTTKY RECTIFIER

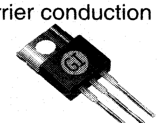
***Reverse Voltage** - 30 and 40 Volts* ***Forward Current** - 10.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss,high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capacity
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SBL1030CT*	*SBL1040CT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	30	40	Volts
Maximum RMS voltage	V_{RMS}	21	28	Volts
Maximum DC blocking voltage	V_{DC}	30	40	Volts
Maximum average forward rectified current at T_C=95°C	$I_{(AV)}$	10.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0		Amps
Maximum instantaneous forward voltage per leg at 5.0A (NOTE 1)	V_F	0.55		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 1) T_C=25°C / T_C=100°C	I_R	0.5 / 50.0		mA
Typical thermal resistance (NOTE 2)	$R_{\Theta JC}$	3.0		°C/W
Operating and storage temperature range	T_J, T_{STG}	-40 to +125		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to case per leg

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RATINGS AND CHARACTERISTIC CURVES SBL1030CT AND SBL1040CT

FIG. 1 - FORWARD CURRENT DERATING CURVE

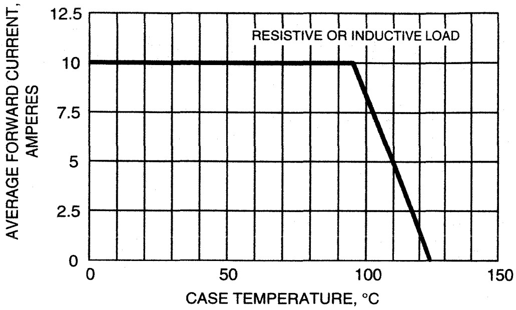


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

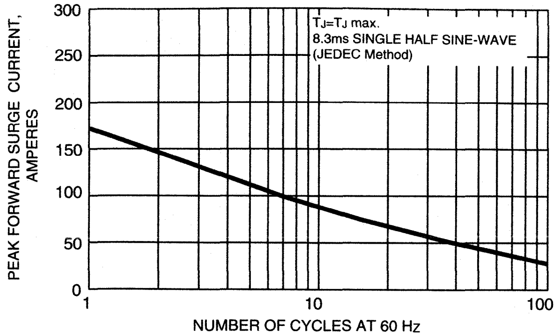


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

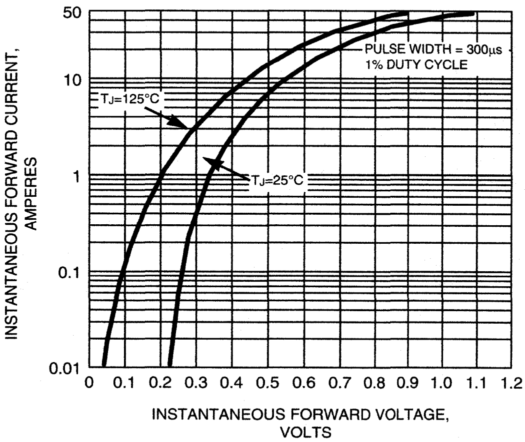


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

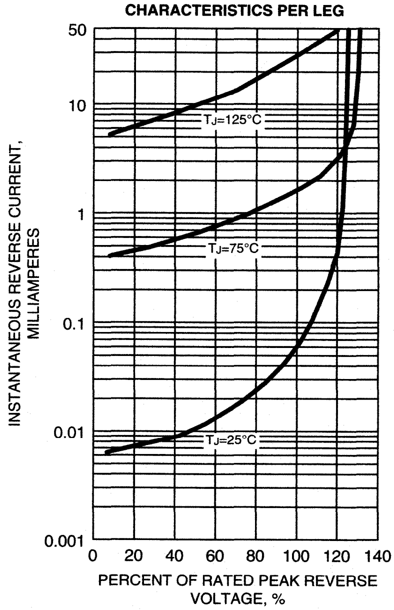


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

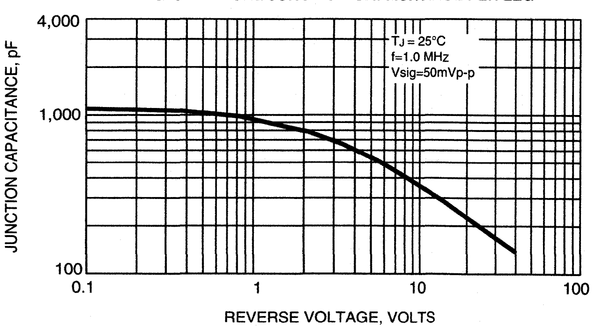
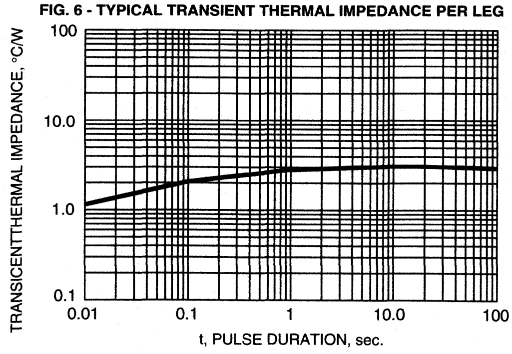


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

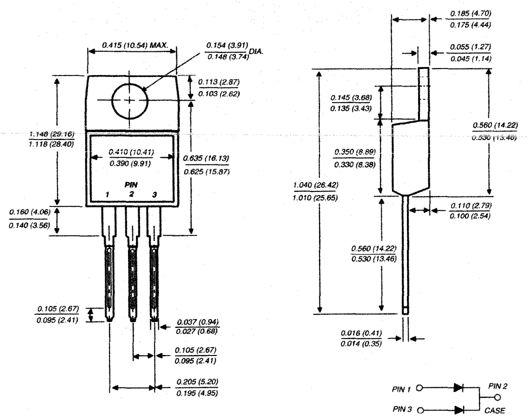


MBR1535CT THRU MBR1560CT

SCHOTTKY RECTIFIER

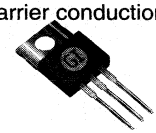
Reverse Voltage *- 35 to 60 Volts* ***Forward Current*** *- 15.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Dual rectifier construction, positive center tap
- ♦ Guardring for transient protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MBR1535CT*	*MBR1545CT*	*MBR1550CT*	*MBR1560CT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current at T_C=105°C	$I_{(AV)}$	15.0				Amps
Peak repetitive forward current at T_C=105°C per diode (rated V_R, 20KHz sq.wave)	I_{FRM}	15.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Maximum instantaneous forward voltage per leg at (NOTE 2) I_F=7.5A,T_C=25°C	V_F	–		0.75		Volts
I_F=7.5A,T_C=125°C		0.57		0.65		
I_F=15A,T_C=25°C		0.84		–		
I_F=15A,T_C=125°C		0.72		–		
Maximum instantaneous reverse current at rated DC blocking voltage per leg T_C=25°C	I_R	0.1		1.0		mA
(NOTE 2) T_C=125°C		15.0		50.0		
Voltage rate of change, (rated V_R)	dv/dt	1000				V/µs
Maximum thermal resistance per leg (NOTE 3)	$R_{\Theta JA}$	60.0				°C/W
	$R_{\Theta JC}$	3.0				
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) 300µs, pulse width, 1% duty cycle
(3) Thermal resistance from junction to case and thermal resistance from junction to ambient

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

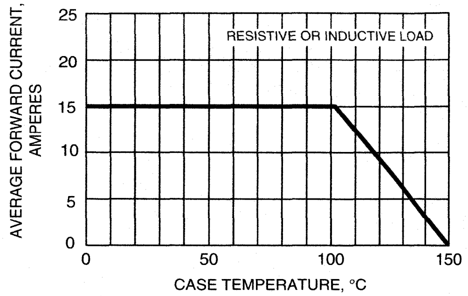


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

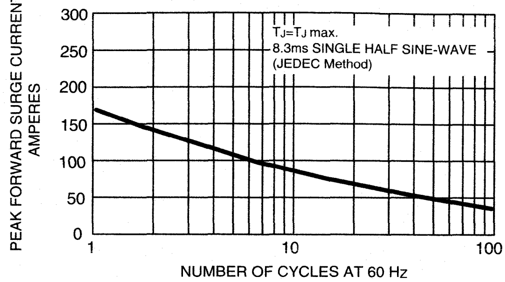


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

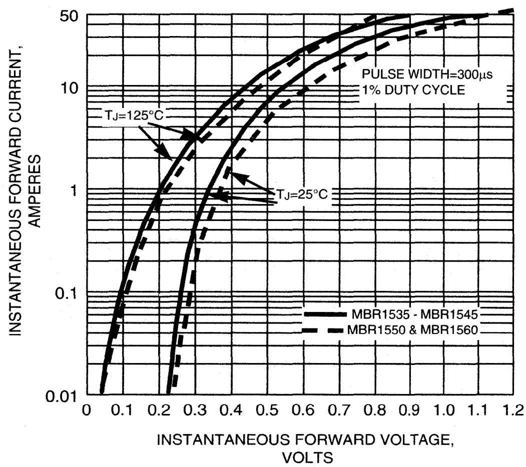


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

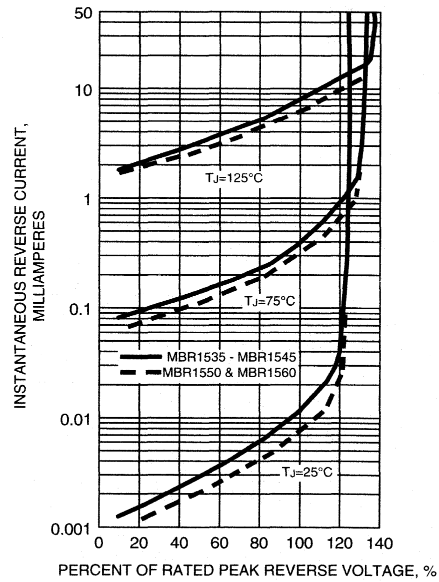


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

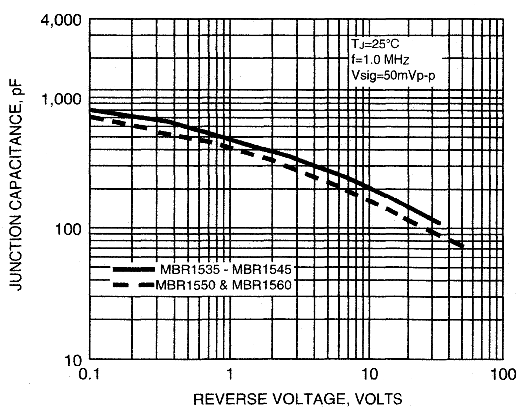
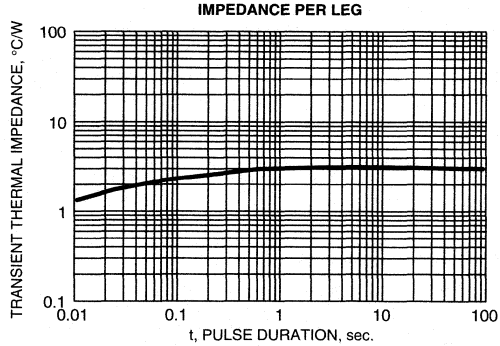


FIG.6- TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

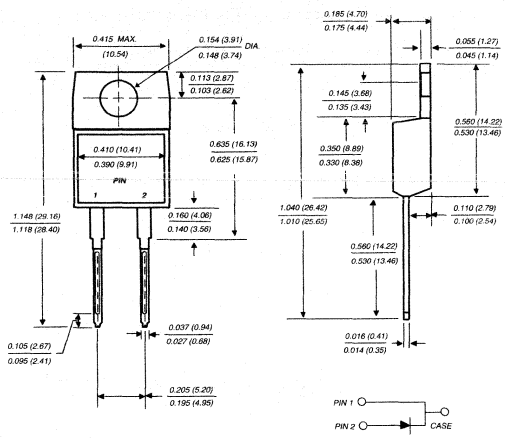


MBR1635 THRU MBR1660

SCHOTTKY RECTIFIER

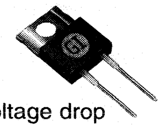
***Reverse Voltage** - 35 to 60 Volts*   ***Forward Current** - 16.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Metal silicon junction majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ Guardring for overvoltage protection
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 0.5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOLS	*MBR1635*	*MBR1645*	*MBR1650*	*MBR1660*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current at T_C=125°C	$I_{(AV)}$	16.0				Amps
Peak repetitive forward current at T_C=125°C (rated V_R, sq. wave,20 KHz)	I_{FRM}	32.0				Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Maximum instantaneous forward voltage at: (NOTE 2) I_F=16A, T_C=25°C I_F=16A, T_C=125°C	V_F	0.63 0.57		0.75 0.65		Volts
Maximum instantaneous reverse current at rated DC blocking voltage (NOTE 2) T_C= 25°C T_C=125°C	I_R	0.2 40.0		1.0 50.0		mA
Voltage rate of change (rated V_R)	dv/dt	10,000				V/µs
Maximum typical thermal resistance (NOTE 3)	$R_{\Theta JC}$	1.5				°C/W
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

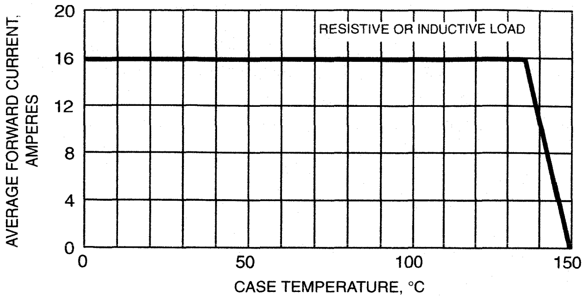


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

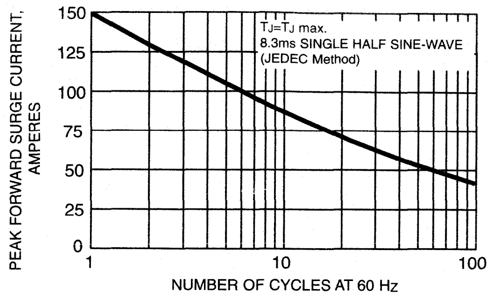


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

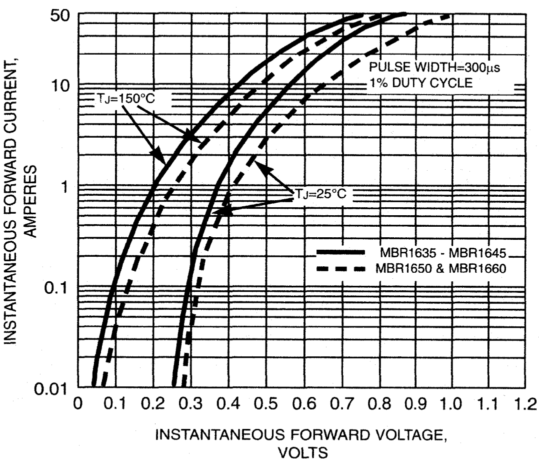


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

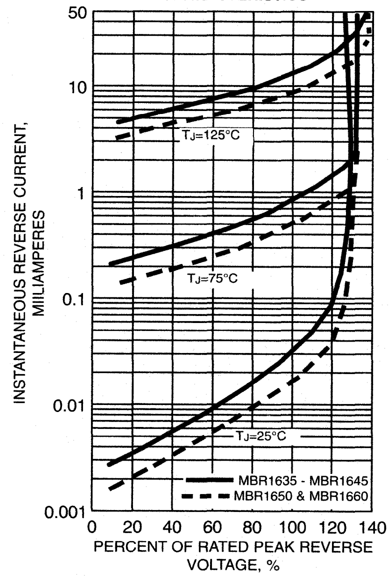


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

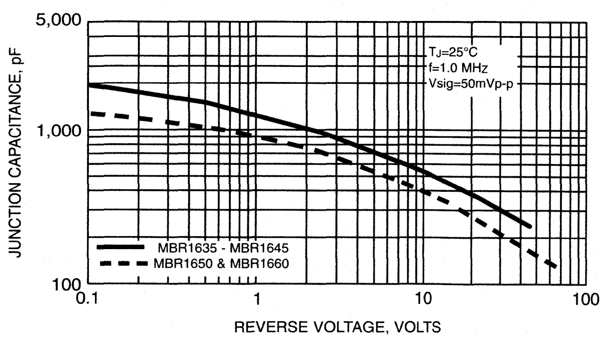
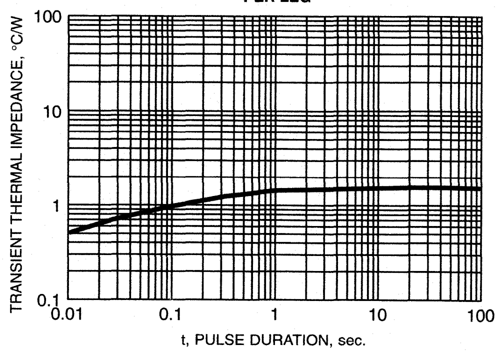


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

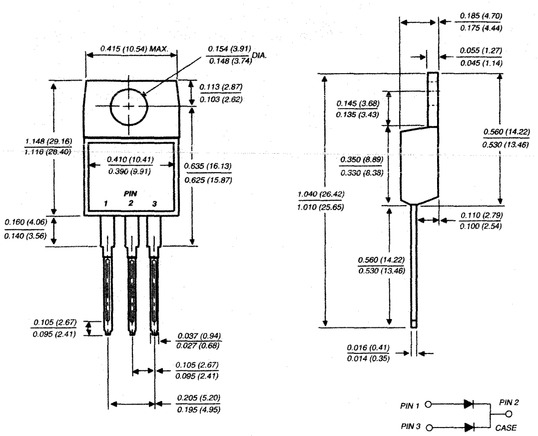


SBL1630CT AND SBL1640CT

SCHOTTKY RECTIFIER

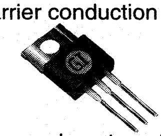
***Reverse Voltage** - 30 and 40 Volts* ***Forward Current** - 16.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- Metal silicon junction, majority carrier conduction
- Low power loss,high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Dual rectifier construction, positive center tap
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

		SYMBOLS	*SBL1630CT*	*SBL1640CT*	*UNITS*
Maximum repetitive peak reverse voltage		V_{RRM}	30	40	Volts
Maximum RMS voltage		V_{RMS}	21	28	Volts
Maximum DC blocking voltage		V_{DC}	30	40	Volts
Maximum average forward rectified current at T_C=95°C		$I_{(AV)}$	16.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)		I_{FSM}	250.0		Amps
Maximum instantaneous forward voltage per leg at 8.0A (NOTE 1)		V_F	0.55		Volts
Maximum instantaneous reverse current at rated DC blocking voltage per leg (NOTE 1)	T_C=25°C T_C=100°C	I_R	0.5 50.0		mA
Typical thermal resistance per leg (NOTE 2)		$R_{\Theta JC}$	2.0		°C/W
Operating junction and storage temperature range		T_J, T_{STG}	-40 to +125		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

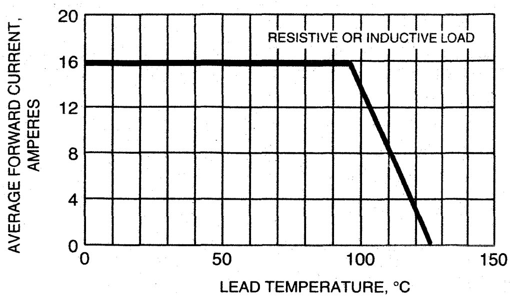


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

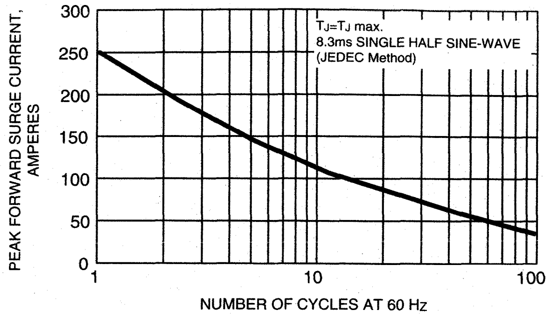


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

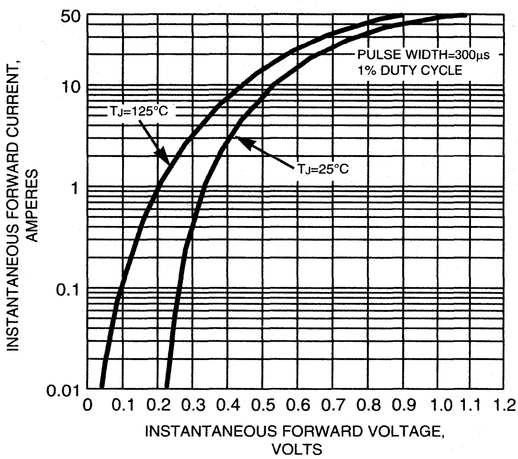


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

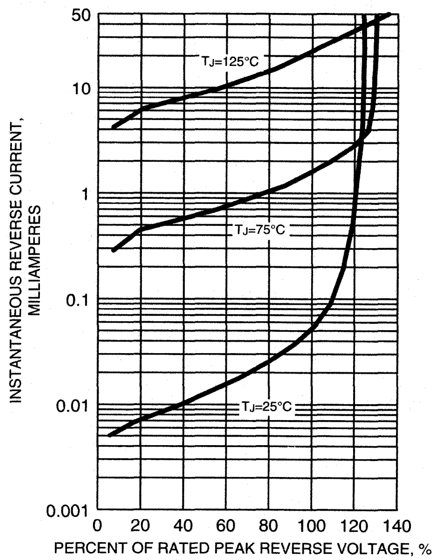


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

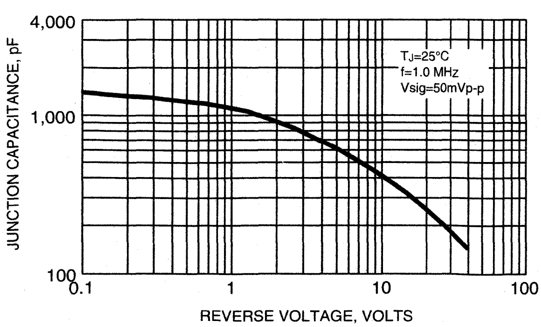
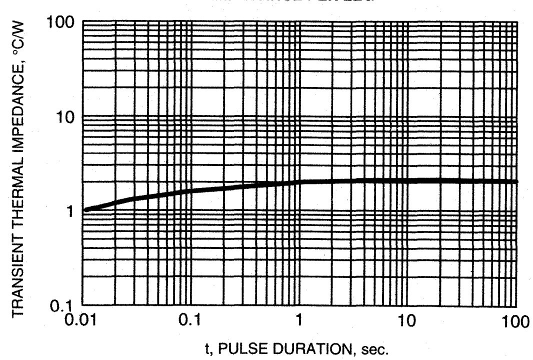


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

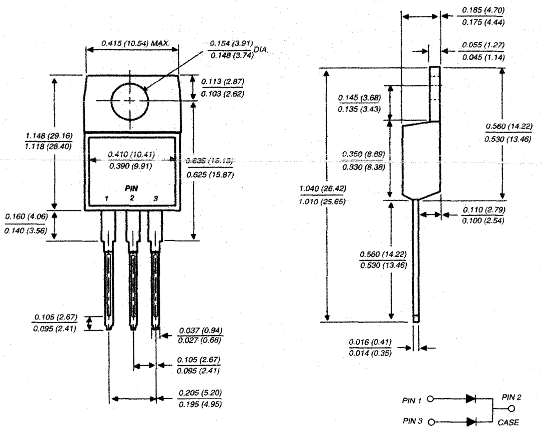


MBR2035CT THRU MBR2060CT

SCHOTTKY RECTIFIER

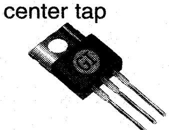
***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 20.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Dual rectifier construction, positive center tap
- Metal silicon junction, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- Guardring for overvoltage protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs.max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	MBR2035CT	MBR2045CT	MBR2050CT	MBR2060CT	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current at T_C=135°C	$I_{(AV)}$	20.0				Amps
Peak repetitive forward current per leg at T_C=135°C (rated V_R, sq. wave 2.0 KHz)	I_{FRM}	20.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Maximum instantaneous forward voltage per leg at (NOTE 2) I_F=10A, T_C=25°C I_F=10A, T_C=125°C I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	– 0.57 0.84 0.72		0.80 0.70 0.95 0.85		Volts
Maximum instantaneous reverse current at rated DC blocking voltage per leg T_C=25°C T_C=125°C	I_R	0.1 15.0		0.15 150.0		mA
Voltage rate of change, (rated V_R)	dv/dt	10,000				V/µs
Typical thermal resistance per leg (NOTE 3)	$R_{\Theta JC}$	2.0				°C/W
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

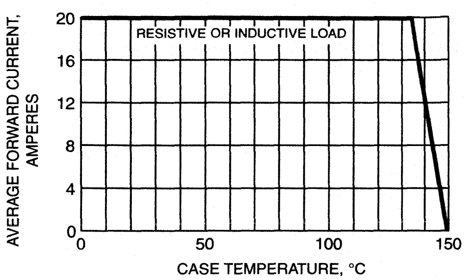


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

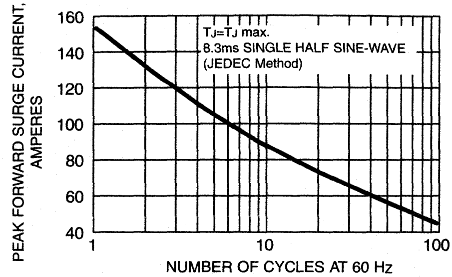


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

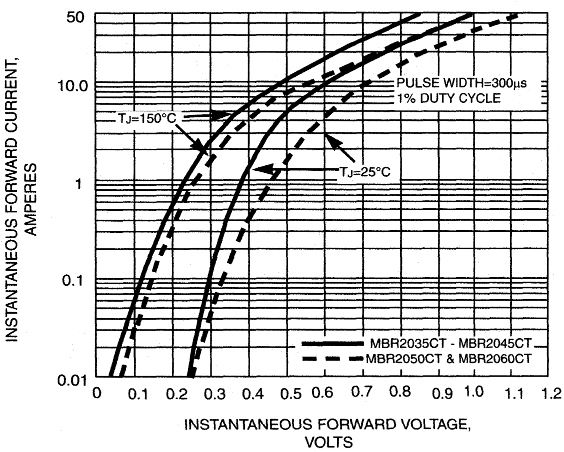


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

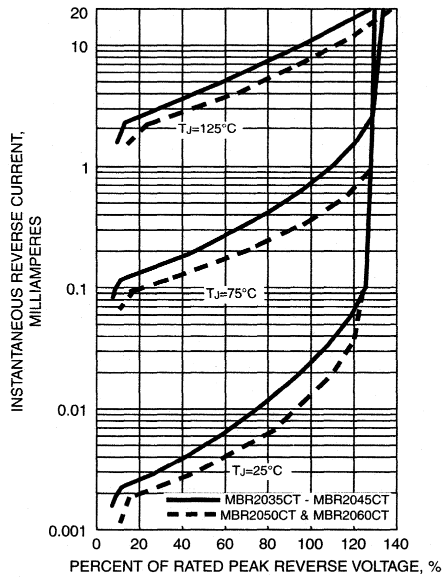


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

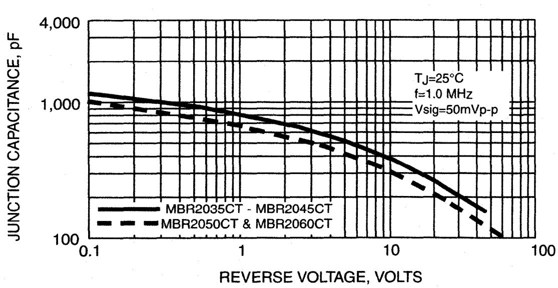
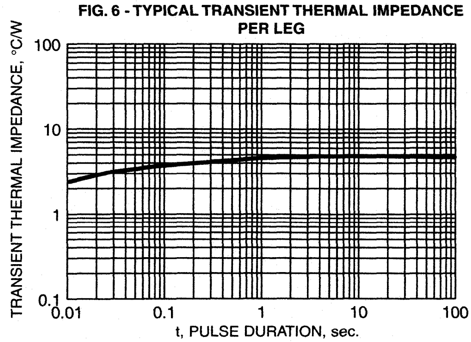


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

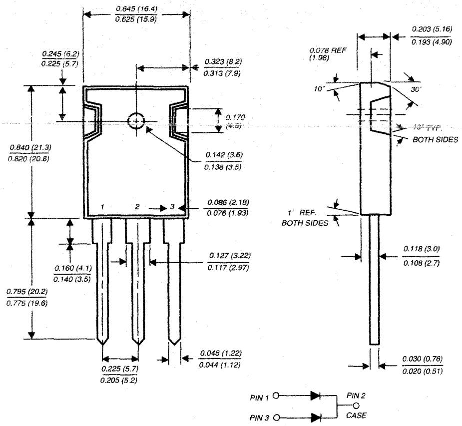


SBL2030PT AND SBL2040PT

SCHOTTKY RECTIFIER

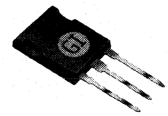
***Reverse Voltage** - 30 and 40 Volts* ***Forward Current** - 20.0 Amperes*

TO-247AD



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- Metal silicon junction, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Dual rectifier construction, positive center-tap
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds, 0.17" (4.3mm) from case

MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in. - lbs. max.
Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SBL2030PT*	*SBL2040PT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	30	40	Volts
Maximum RMS voltage	V_{RMS}	21	28	Volts
Maximum DC blocking voltage	V_{DC}	30	40	Volts
Maximum average forward rectified current at T_C=105°C	$I_{(AV)}$	20.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum instantaneous forward voltage per leg at 10.0A (NOTE 1)	V_F	0.55		Volts
Maximum instantaneous current at rated DC blocking voltage per leg (NOTE 1) T_C=25°C / T_C=100°C	I_R	1.0 / 50.0		mA
Typical thermal resistance per leg (NOTE 2)	$R_{\Theta JC}$	1.5		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-40 to +125		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cyle
(2) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

RATINGS AND CHARACTERISTIC CURVES SBL2030PT AND SBL2040PT

FIG. 1 - FORWARD CURRENT DERATING CURVE

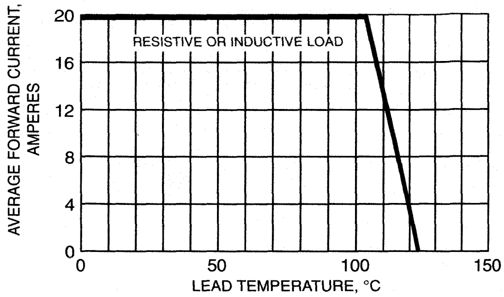


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

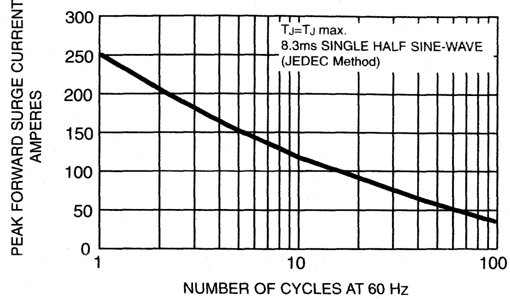


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

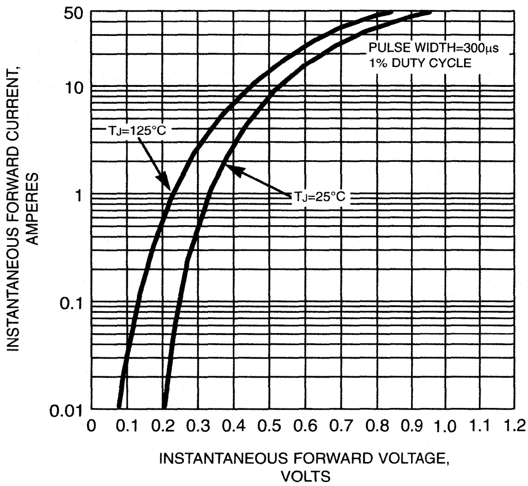


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

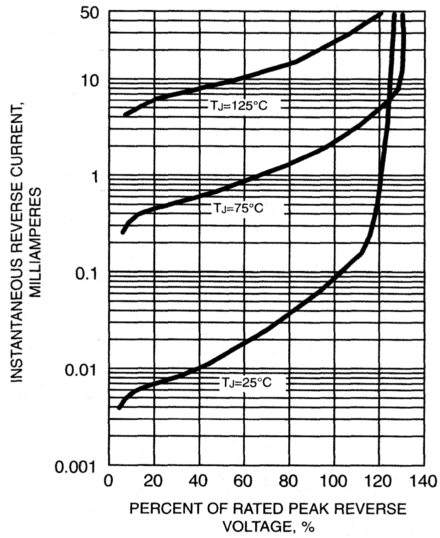


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

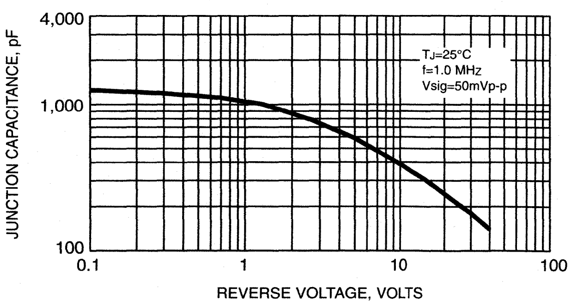
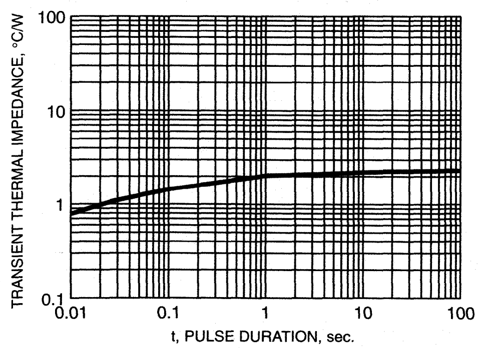


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

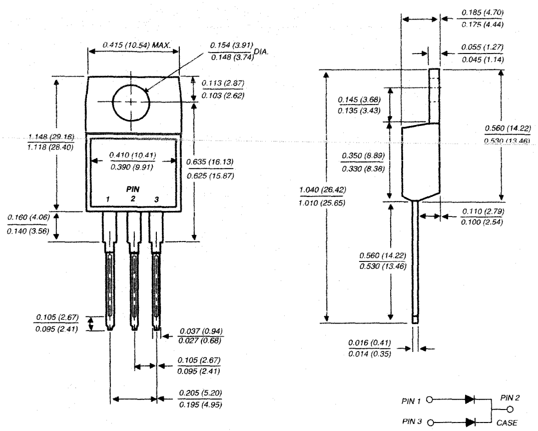


MBR2535CT THRU MBR2560CT

SCHOTTKY RECTIFIER

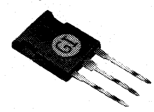
***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 30.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Dual rectifier construction, positive center-tap
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any **Mounting Torque:** 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	***MBR2535CT***	***MBR2545CT***	***MBR2550CT***	***MBR2560CT***	***UNITS***
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current at T_C=130°C	$I_{(AV)}$	30.0				Amps
Peak repetitive forward current per leg at T_C=130°C (rated V_R, square wave, 20 KHz)	I_{FRM}	30.0				Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	1.0		0.5		Amps
Maximum instantaneous forward voltage per leg at: (NOTE 2) I_F=15.0A, T_C=25°C	V_F	-		0.75		Volts
I_F=15.0A, T_C=25°C		-		0.65		
I_F= 30A, T_C=25°C		0.82		-		
I_F= 30A, T_C=125°C		0.73		-		
Maximum instantaneous reverse current at rated DC blocking voltage per leg (NOTE 2) T_C=25°C	I_R	0.2		1.0		mA
T_C=125°C		40.0		50.0		
Maximum thermal resistance (NOTE 3)	$R_{\Theta JC}$	1.5				°C/W
Voltage rate of change (rated V_R)	dv/dt	1000				V/µs
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

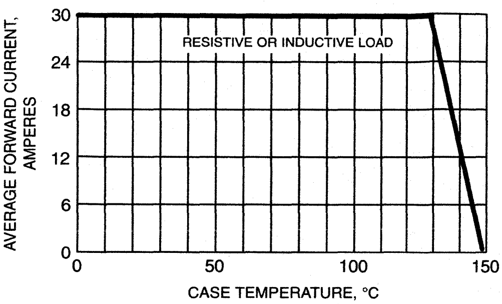


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

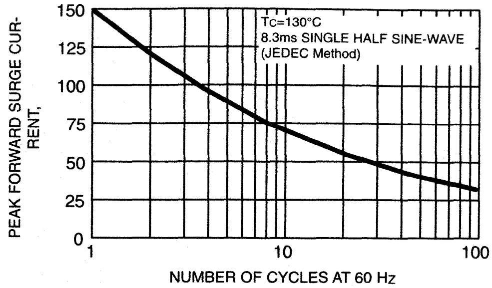


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

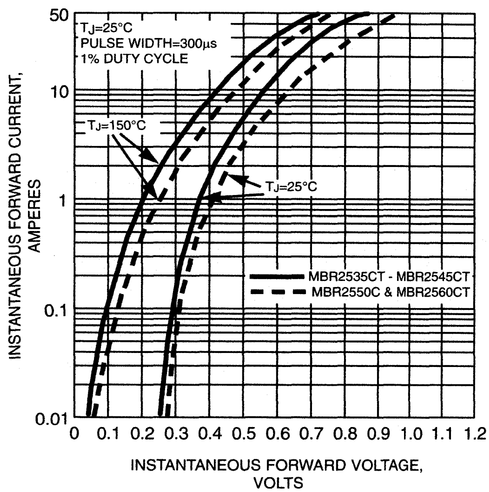


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

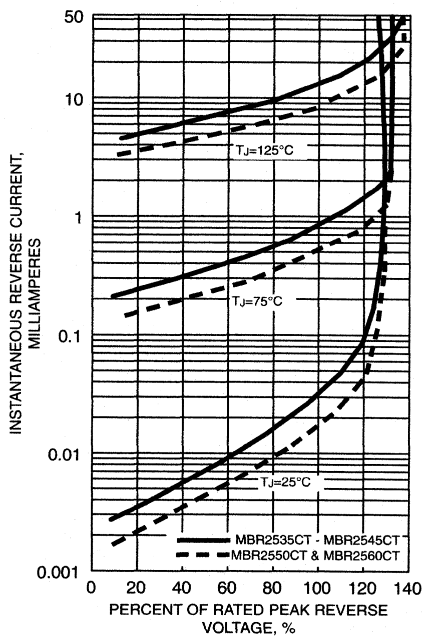


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

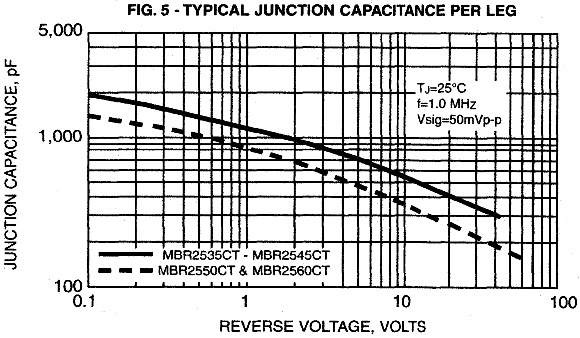
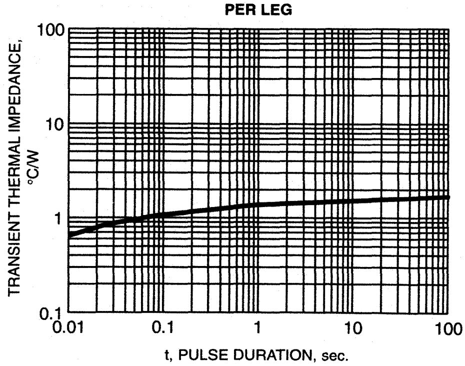


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

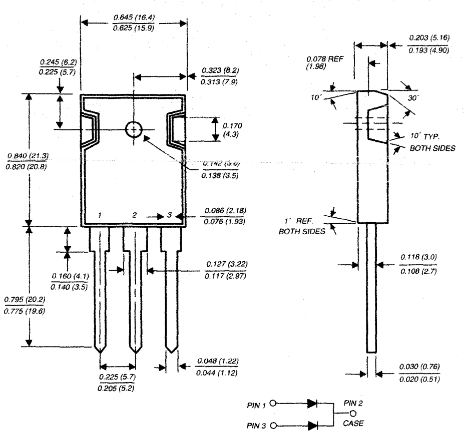


MBR3035PT THRU MBR3060PT

SCHOTTKY RECTIFIER

***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 30.0 Amperes*

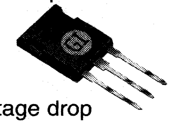
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- Dual rectifier construction, positive center-tap
- Metal silicon junction, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free-wheeling, and polarity protection applications
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds, 0.17" (4.3mm) from case



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in.- lbs. max.
Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MBR3035PT*	*MBR3045PT*	*MBR3050PT*	*MBR3060PT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RWM}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current (SEE FIG. 1)	$I_{(AV)}$	30.0				Amps
Peak repetitive forward current per leg at T_C=105°C (rated V_R, square wave, 20 KHz)	I_{FRM}	30.0				Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0				Amps
Peak repetitive reverse surge current (NOTE 2)	I_{RSM}	2.0		1.0		Amps
Maximum instantaneous forward voltage per leg at: (NOTE 1) I_F=20A, T_C=25°C I_F=20A, T_C=125°C I_F=30A, T_C=25°C I_F=30A, T_C=125°C	V_F	– 0.60 0.76 0.72		0.75 0.65 – –		Volts
Maximum instantaneous reverse current at rated DC blocking voltage per leg (NOTE 2) T_C=25°C T_C=125°C	I_R	1.0 60.0		5.0 100.0		mA
Maximum thermal resistance (NOTE 3)	$R_{\Theta JC}$	1.4				°C/W
Voltage rate of change at (rated V_R)	dv/dt	10,000		1,000		V/µs
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case per leg

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

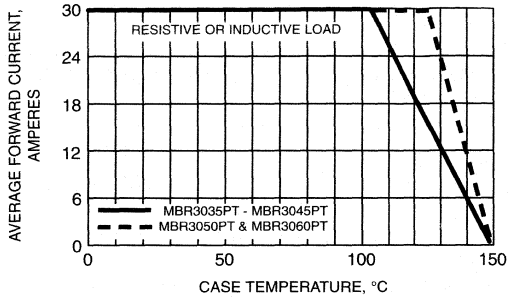


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

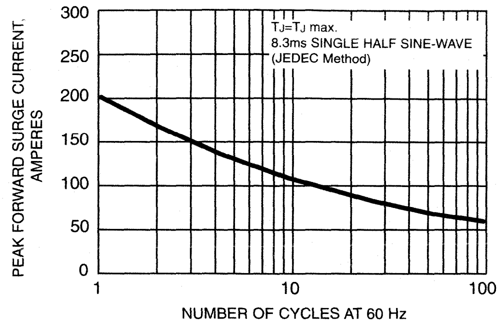


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

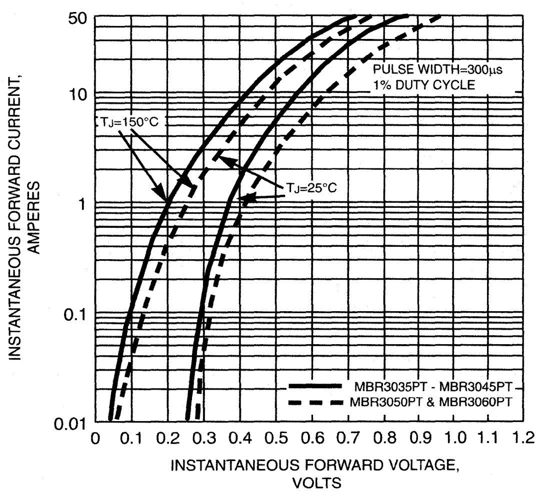


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

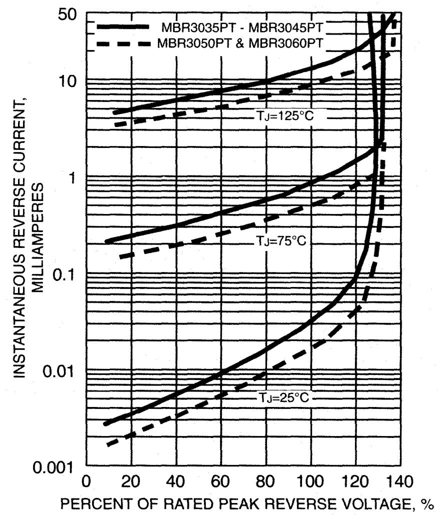


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

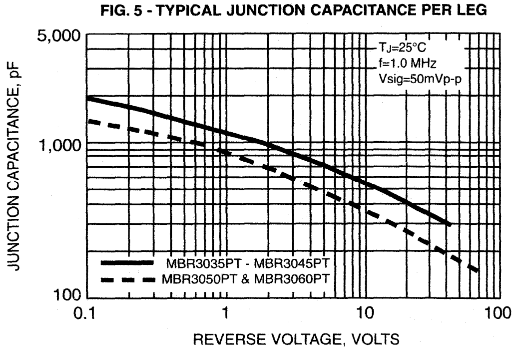
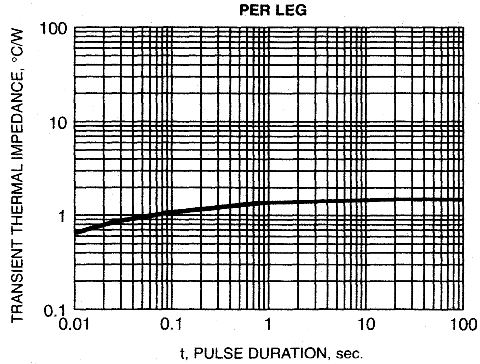


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

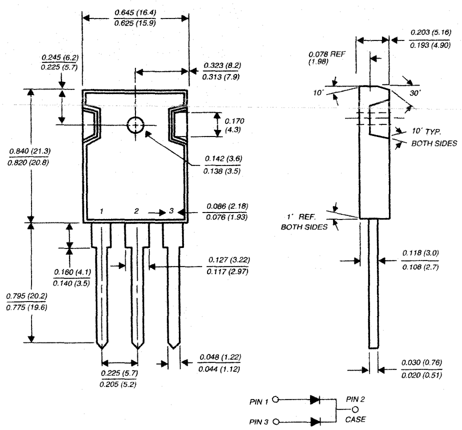


SBL3030PT AND SBL3040PT

SCHOTTKY RECTIFIER

***Reverse Voltage** - 30 and 40 Volts* ***Forward Current** - 30.0 Amperes*

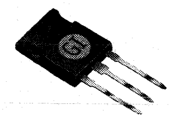
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low forward voltage drop
- High surge capability
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Dual rectifier construction, positive center-tap
- Guardring for overvoltage protection
- High temperature soldering guaranteed: 250°C/10 seconds, 0.17" (4.3mm)



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Torque: 10 in. - lbs. max.
Mounting Position: Any
Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SBL3030PT*	*SBL3040PT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	30	40	Volts
Maximum RMS voltage	V_{RMS}	21	28	Volts
Maximum DC blocking voltage	V_{DC}	30	40	Volts
Maximum average forward rectified current at T_C=100°C	$I_{(AV)}$	30.0		Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	275.0		Amps
Maximum instantaneous forward voltage per leg at 15A (NOTE 1)	V_F	0.55		Volts
Maximum instantaneous reverse current at rated DC blocking voltage per leg (NOTE 1) T_C=25°C T_C=100°C	I_R	1.0 75.0		mA
Typical thermal resistance (NOTE 2)	$R_{\Theta JC}$	1.5		°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-40 to +125		°C

NOTES:
(1) Pulse test: 300μs pulse width, 1% duty cycle
(2) Thermal resistance from junction to case per leg

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Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

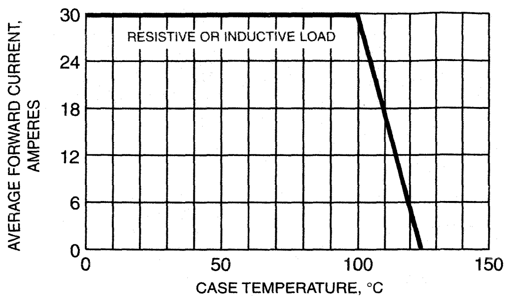


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

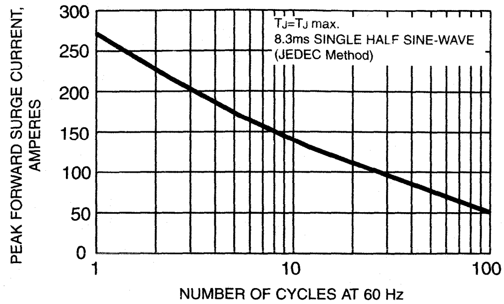


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

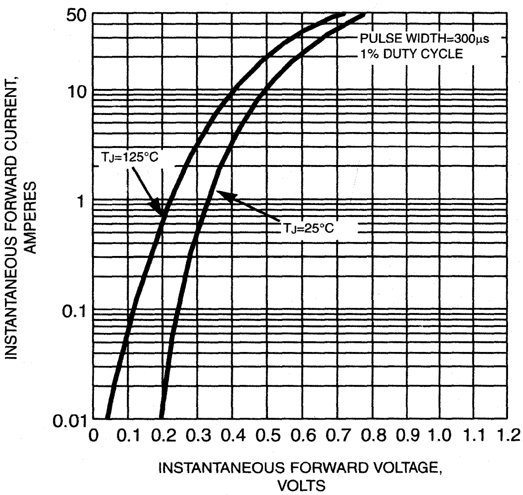


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

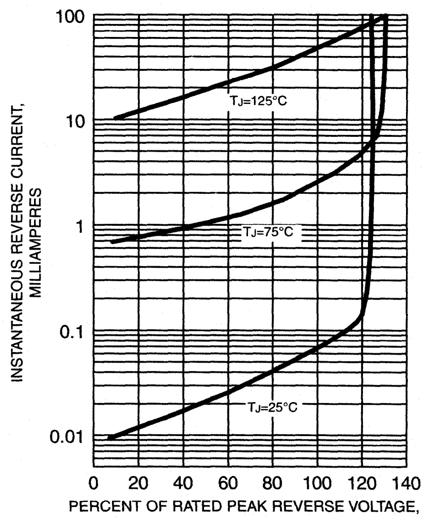


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

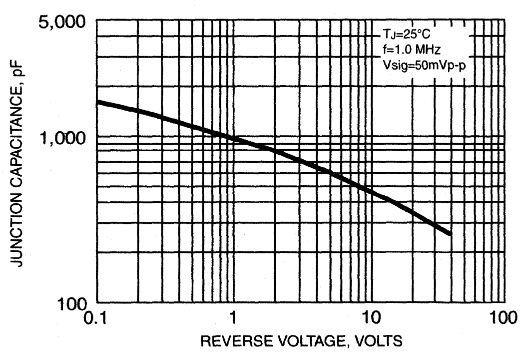
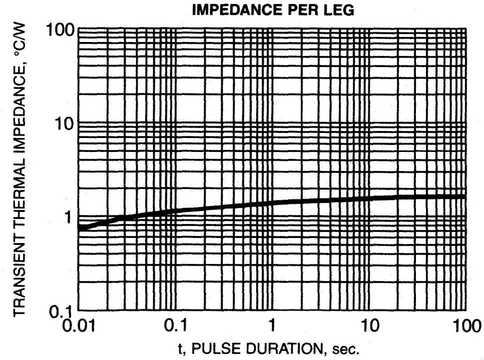


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

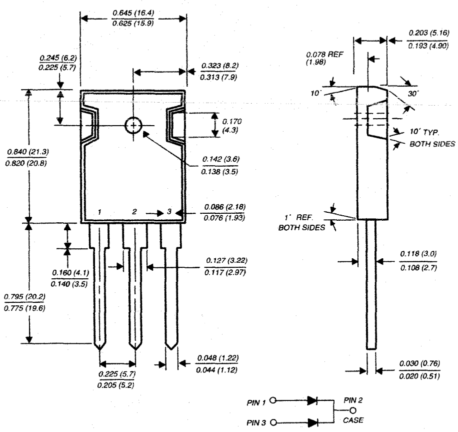


SD241P

SCHOTTKY RECTIFIER

***Reverse Voltage** - 45 Volts* ***Forward Current** - 30.0 Amperes*

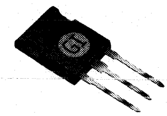
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Dual rectifier construction, positive center-tap
- ♦ Metal silicon junction, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C, 0.17" (4.3mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in. - lbs. max.
Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

		SYMBOLS	*SD241P*	*UNITS*
Maximum repetitive peak reverse voltage at T_C=25°C		V_{RRM}	45	Volts
Maximum blocking voltage at T_C=25°C		V_{DC}	45	Volts
Maximum working peak reverse voltage		V_{RWM}	35	Volts
Maximum average forward rectified current at T_C=105°C		$I_{(AV)}$	30.0	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)		I_{FSM}	400.0	Amps
Peak repetitive reverse surge current (NOTE 1)		I_{RSM}	2.0	Amps
Maximum instantaneous forward voltage per leg at (NOTE 2)	I_F=10A, T_C=125°C I_F=20A, T_C=125°C	V_F	0.47 0.60	Volts
Maximum instantaneous reverse current reverse voltage per leg at V_R=35V (NOTE 2)	T_C=25°C T_C=125°C	I_R	1.0 100.0	mA
Voltage rate of change at V_R=35V		dv/dt	10,000	V/µs
Maximum thermal resistance (NOTE 3)		$R_{\Theta JC}$	1.4	°C
Operating junction temperature range		T_J	-65 to +150	°C
Storage temperature range		T_{STG}	-65 to +175	°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction of case per leg

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Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

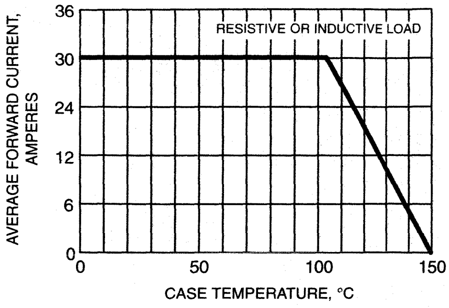


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

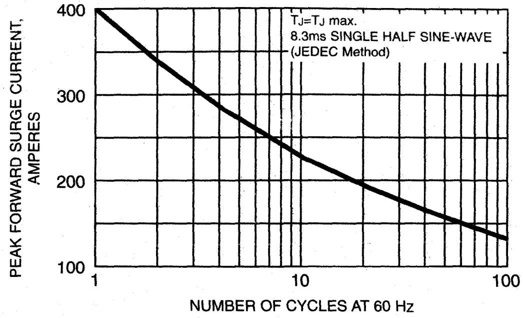


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

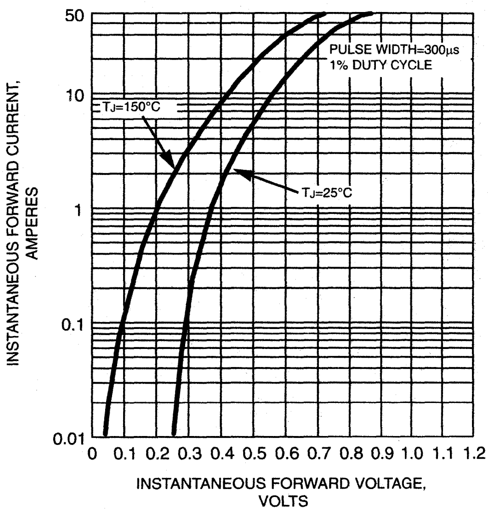


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

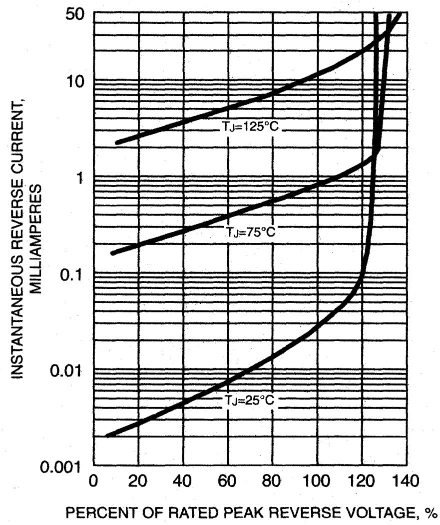


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

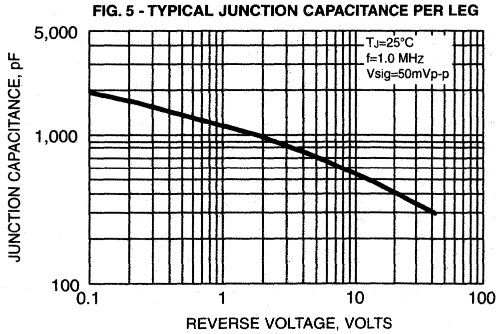
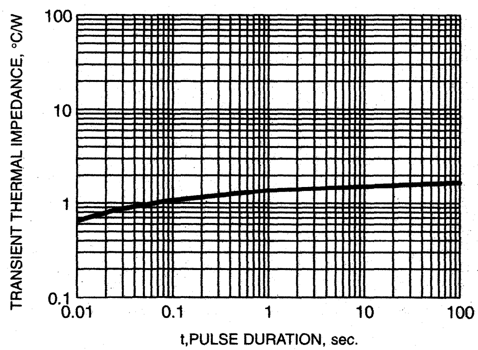


FIG.6- TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG

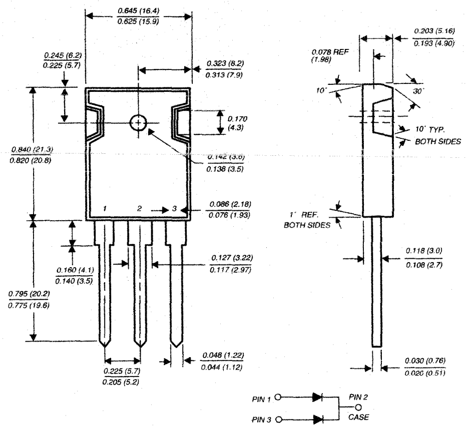


MBR4035PT THRU MBR4060PT

SCHOTTKY RECTIFIER

***Reverse Voltage** - 35 to 60 Volts* ***Forward Current** - 40.0 Amperes*

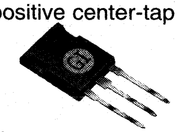
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classifications 94V-0
- ♦ Dual rectifier construction, positive center-tap
- ♦ Metal silicon rectifier, majority carrier conduction
- ♦ Low power loss, high efficiency
- ♦ High current capability, low forward voltage drop
- ♦ High surge capability
- ♦ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ♦ Guardring for overvoltage protection
- ♦ High temperature soldering guaranteed: 250°C/10 seconds, 0.17" (4.3mm) from case



MECHANICAL DATA

Case: JEDEC TO-247AD molded plastic body
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in. - lbs. max.
Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*MBR4035PT*	*MBR4045PT*	*MBR4050PT*	*MBR4060PT*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	35	45	50	60	Volts
Maximum working peak reverse voltage	V_{RMS}	35	45	50	60	Volts
Maximum DC blocking voltage	V_{DC}	35	45	50	60	Volts
Maximum average forward rectified current at T_C=125°C	$I_{(AV)}$	40.0				Amps
Peak repetitive forward current per leg at T_C=120°C (rated V_R square wave, 20 KHz)	I_{FRM}	40.0				Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0				Amps
Peak repetitive reverse surge current (NOTE 1)	I_{RRM}	2.0		1.0		Amps
Maximum instantaneous forward voltage per leg at (NOTE 2) I_F=20A, T_C=25°C	V_F	0.70		0.72		Volts
I_F=20A, T_C=125°C		0.60		0.62		
I_F=40A, T_C=25°C		0.80		–		
I_F=40A, T_C=125°C		0.75		–		
Maximum instantaneous reverse current at T_C=25°C rated DC blocking voltage per leg (NOTE 2) T_C=125°C	I_R	10.0 100.0				mA
Typical thermal resistance per leg (NOTE 3)	$R_{\Theta JC}$	1.2				°C/W
Voltage rate of change (rated V_R)	dv/dt	10,000		1,000		V/µs
Operating junction temperature range	T_J	-65 to +150				°C
Storage temperature range	T_{STG}	-65 to +175				°C

NOTES:
(1) 2.0µs pulse width, f=1.0 KHz
(2) Pulse test: 300µs pulse width, 1% duty cycle
(3) Thermal resistance from junction to case per leg

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Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

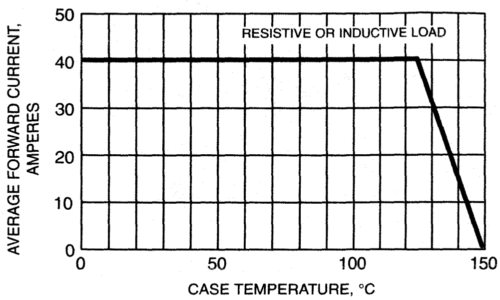


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

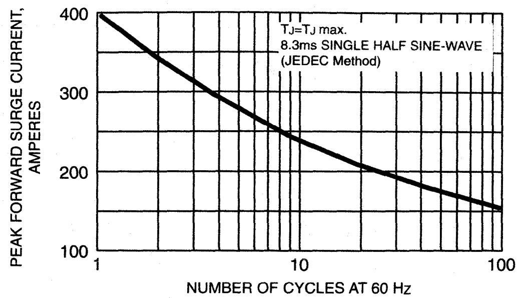


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

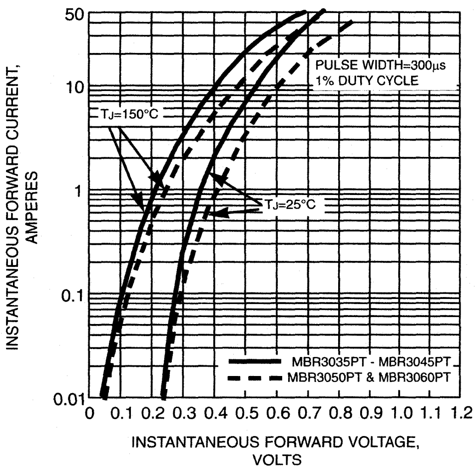


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

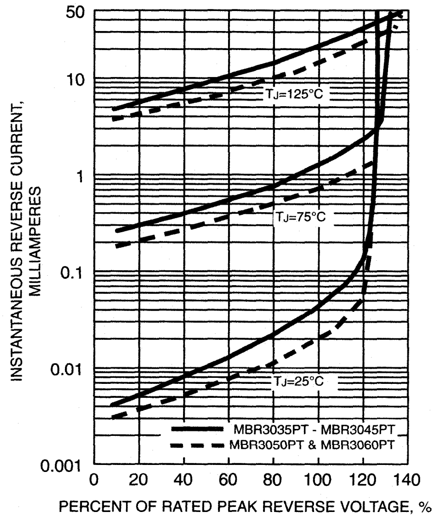


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

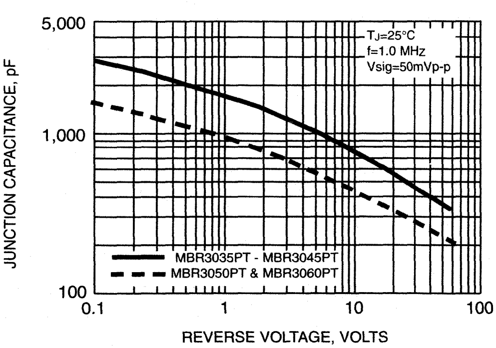
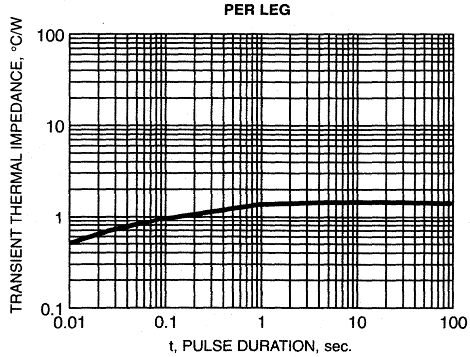


FIG . 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE PER LEG



General Instrument
Power Semiconductor Division

SUPERECTIFIERS

0.25 TO 3.0 AMPERES
50 VOLTS TO 4000 VOLTS

INTRODUCTION TO SUPERECTIFIER

General Instrument superectifier is exactly that a super rectifier. There is nothing else in the world like it. This is the most cost effective and highly reliable device on the market which is the result of the combination of Patented Technologies. No other 0.25 to 3.0 Ampere rectifiers of any kind - plastic, glass, or metal - can match (or even approach) SUPERECTIFIER'S combination of features... the result of General Instrument's unique glass-plastic construction:

- *Brazed at greater than 600°C at both leads and die; eliminates all soft solders*
- *Exclusive UL recognized flame-retardant epoxy molding compound rated 94V-0, the highest available*
- *Patented glass passivation*
- *Reliability proved equal to military requirements*
- *Hermetically sealed construction*
- *High temperature Soldering Guaranteed: 350°C/10 second/0.375", (9.5 mm) lead length at 5 lbs (2.25 kg) tension*

In cell construction, most other rectifiers rated up to 3.0 Amperes are soft soldered or are only pressure contacted and silastic passivated. SUPERECTIFIER uses a patented brazed construction and glass passivation to seal its junction hermetically. In device encapsulation, again SUPERECTIFIER is the only one that won't go in flames. It is one of the few rectifiers using an exclusive flame-RETARDANT molding compound, with UL rating of UL94V-0, the highest rating available. In summary, SUPERECTIFIER is the world's only rectifier with totally brazed construction, with a patented glass passivated junction, flame-retardant molding encapsulation and meets the most stringent reliability requirements.

The attributes of these devices lend themselves to a wide variety of end markets. Specifically its strength in durability. They can withstand the harsh environment of the automotive world, the long term reliability and specialized electrical performance requirements of the computer, consumer and telecommuniction markets.

We offer this construction in standard, fast recovery, and Ultrafast types in both axial and surface mount packages.

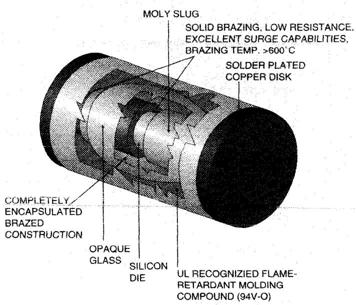
Package Design

The small size of the superectifier with its capability up to 3.0 Amperes permits packing densities in electronic assemblies and equipment, while increasing reliability. Only high temperature brazing operations are used to withstand the 600°C required to melt ant fuse the glass. The technique eliminates solder construction and tremendously enhances mechanical strength and temperature cycling capability, increasing operating and storage temperature range while reducing thermal resistance.

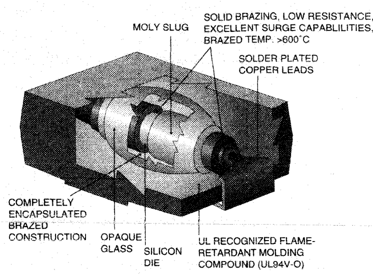
For additional information please see
the application note "Superectifier Designs Bring a New Level of Reliability," (pg. 518).

CROSS SECTIONS OF SUPERECTIFIER CONSTRUCTION

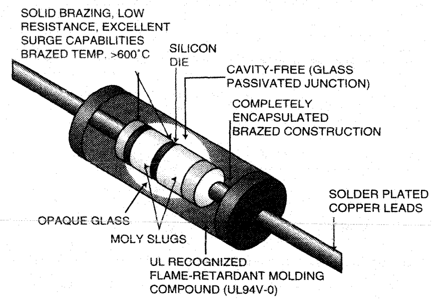
SUPERECTIFERS (GL41/RGL41/EGL41)



SUPERECTIFERS (GF1)



SUPERECTIFERS (STD/FAST REC./FER)



SUPERECTIFIER PART NUMBERING SYSTEM

All parts excluding JEDEC registered, ProElectron and industry standard parts.

1. AXIAL

<u>AGPXXY - ZZZZ</u>

<u>A = Type Designator</u>
R = Recovery
E = Enhanced recovery
"Blank" = Standard

GP= "Glass Plastic"

<u>**XX** = Forward Current</u>
02 = 0.2A
08 = 0.8A
10 = 1.0A
15 = 1.5A
30 = 3.0A

<u>Y = Reverse Voltage</u>
A = 50V
B = 100V
D = 200V
G = 400D
J = 600V
K = 800V
T = 1300V
M = 1000V

<u>AGPXXY - ZZZZ</u>

<u>Y = Reverse Voltage (cont'd)</u>

N = 1100V
Q = 1200V
V = 1400V
W = 1500V

Y = 1600V

ZZZZ = Customer specific instructions (not shown in databook)

2. SURFACE MOUNT

a) MELF (Superectifier)

<u>AGLXXY-ZZZZ</u>
A = Type Designator
R = Fast Recovery
"Blank" = Standard
GL = Glass Leadless

2. SURFACE MOUNT

a) MELF (Superectifier) (cont'd)

<u>AGLXXY-ZZZZ</u>

<u>**XX** = Foward Current</u>
34 = 0.5A
(in DO-2131AA mini-MELF)
41 = 1.0A (in DO-213B Melf)

<u>Y = Reverse Voltage</u>
A = 50V
B = 100 V
D = 200V
G = 400V
J= 600V
K= 800V
M= 1000V

ZZZZ = Customer specific instructions (not shown in databook)

For JEDEC and Pro Electron part numbers, please see p/n explanations on page 2

QUICK GUIDE TO SUPERECTIFIERS

TYPE	*RGP02 -12E thru -20E	GP02 -20 thru -40	GP250 -1 thru -4	TYPE	BA157GP* thru BY159GP	GL34A thru GL34J	RGL34A thru *RGL34J	GP08A thru GP08J	GP10A thru GP10M	1N3611GP thru 1N3614GP	1N4001GP thru 1N4007GP	1N4245GP thru 1N4249GP	*1N4933GP thru *1N4937GP
CASE	DO204AL	DO204AL	DO204AL	CASE	DO204AL	DO213AA	DO213AA	DO204AL	DO204AL	DO204AL	DO204AL	DO204AL	DO204AL
I_o(A)	0.5	0.25	0.25	I_o(A)	0.5		0.6	0.8	1.0	1.0	1.0	1.0	1.0
@T_A(°C)	55	55	75	@T_A(°C)	55	55	75	100	75	55	75	55	75
V_R=1000(V)			GI250-1	V_R=50(V)		GL34A	RGL34A	GP08A	GP10A		1N4001GP		1N4933GP
V_R=1200(V)	RG02-12E			V_R=100(V)		GL34B	RGL34B	GP08B	GP10B		1N4002GP		1N4934GP
V_R=1400(V)	RG02-14E			V_R=200(V)		GL34D	RGL34D	GP08D	GP10D	1N3611GP	1N4003GP	1N4245GP	1N4935GP
V_R=1600(V)	RG02-16E												
V_R=1800(V)	RG02-18E			V_R=400(V)	BA157GP	GL34G	RGL34G	GP08G	GP10G	1N3612GP	1N4004GP	1N4246GP	1N4936GP
V_R=2000(V)	RG02-20E	GP02-20	GI250-2										
V_R=2500(V)		GP02-25		V_R=600(V)	BA158GP	GL34J	RGL34J	GP08J	GP10J	1N3613GP	1N4005GP	1N4247GP	1N4937GP
V_R=3000(V)		GP02-30	GI250-3	V_R=800(V)	BA159GP				GP10K	1N3614GP	1N4006GP	1N4248GP	
V_R=3500(V)		GP02-35		V_R=1000(V)	BA159GP				GP10M	1N3957GP	1N4007GP	1N4249GP	
V_R=4000(V)		GP02-40	GI250-4	V_R>1000(V)					GP10N-Y				
SURGE(A)	20	15	15	SURGE(A)	20	10	10	25	30	30	30	25	30
V_F(V)	1.8	3.0	3.5	V_F(V)	1.3	1.2/1.3	1.3	1.3	1.1	1.1	1.1	1.2	1.2

*Fast Recovery

QUICK GUIDE TO SUPERECTIFIERS (cont'd)

TYPE	1N492GP thru 1N4948GP	1N4383GP thru 1N4586GP	1N5059GP thru 1N5062GP	1N6478 thru 1N6484	BYM10-50 thru BYM10-1000	BYM11-50 thru BYM11-1000	GL41A thru GL41Y	RGL41A thru RGL41M	GF1A thru GF1M	*RGF1A thru RGF1M	*RGP10A thru RGP10M
CASE	DO-204AL	DO-204AC	DO-204AC	DO-213AB	DO-213AB	DO-213AB	DO-213AB	DO-213AB	DO-214AB	DO-214AB	DO-204AL
I_o(A)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
@T_A(C)	55	55	55	75 @ T_T	75 @ T_T	55 @ T_T	75/100 @ T_T	55 75 @ T_T	125 75 @ T_T	120 75 @ T_L	55
V_R=50(V)				1N6478	BYM10-50	BYM11-50	GL41A	RGL41A	GF1A	RGF1A	RGP10A
V_R=100(V)				1N6479	BYM10-100	BYM11-100	GL41B	RGL41B	GF1B	RGF1B	RGP10B
V_R=200(V)	1N4942GP	1N4383GP	1N5059GP	1N6480	BYM10-200	BYM11-200	GL41D	RGL41D	GF1D	RGF1D	RGP10D
V_R=400(V)	1N4944GP	1N4384GP	1N5060GP	1N6481	BYM10-400	BYM11-400	GL41G	RGL41G	GF1G	RGF1G	RGP10G
V_R=600(V)	1N4946GP	1N4385GP	1N5061GP	1N6482	BYM10-600	BYM11-600	GL41J	RGL41J	GF1J	RGF1J	RGP10J
V_R=800(V)	1N4947GP	1N4585GP	1N5062GP	1N6483	BYM10-800	BYM11-800	GL41K	RGL41K	GF1K	RGF1K	RGP10K
V_R=1000(V)	1N4948GP	1N4586GP		1N6484	BYM10-1000	BYM11-1000	GL41M	RGL41M	GF1M	RGF1M	RGP10M
V_R>1000(V)							GL41T, GL41Y				
SURGE(A)	25	50	50	30	30	30	30	30	30	30	30
V_F(V)	1.3	1.0	1.2	1.1	1.1	1.3	1.1 / 1.2	1.3	1.1/1.2	1.3	1.3

*Fast Recovery

QUICK GUIDE TO SUPERECTIFIERS (cont'd)

TYPE	GP15A thru GP15M	1N5391GP thru 1N56399GP	RGP15A* thru RGFP15M	GP20A thru GP20J	RGP20A thru RGP20J	RGP25A thru RGP25M	1N5624GP thru 1N5627GP	GP30A thru GP30M	RGP30A* thru RGP30M
CASE	DO204AC	DO204AC	DO204AC	GP20	GP20	DO201AD	DO201AD	DO201AD	DO201AD
I_o(A)	1.5	1.5	1.5	2.0	2.0	2.5	3.0	3.0	3.0
@T_A(°C)	55	55	55	55	5 5	55	70	55	55
V_R=50(V)	GP15A	1N5391GP	RGP15A	GP20A	RGP20A	RGP25A		GP30A	RGP30A
V_R=100(V)	GP15B	1N5392GP	RGP15B	GP20B	RGP20B	RGP25B		GP30B	RGP30B
V_R=200(V)	GP15D	1N5393GP	RGP15D	GP20D	RGP20D	RGP25D	1N5624GP	GP30D	RGP30D
V_R=300(V)		1N5394GP							
V_R=400(V)	GP15G	1N5395GP	RGP15G	GP20G	RGP20G	RGP25G	1N5625GP	GP30G	RGP30G
V_R=500(V)		1N5396GP							
V_R=600(V)	GP15J	1N5397GP	RGP15J	GP20J	RGP20J	RGP25J	1N5626GP	GP30J	RGP30J
V_R=800(V)	GP15K	1N5398GP	RGP15K			RGP25K	1N5627GP	GP30K	RGP30K
V_R=1000(V)	GP15M	1N5399GP	RGP15M			RGP25M		GP30M	RGP30M
SURGE(A)	50	50	50	65	65	65	100	125	125
V_F(V)	1.1	1.3	1.1	1.3	1.3	1.3	1.0	1.1	1.3

*Fast Recovery

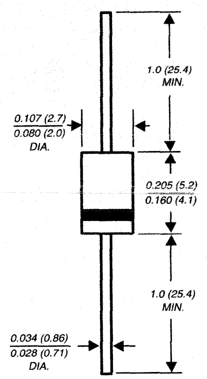
GI250-1 THRU GI250-4

HIGH VOLTAGE GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 1000 to 4000 Volts*　　***Forward Current** - 0.25 Ampere*

PATENTED*

DO-204AL

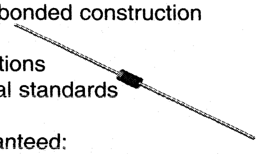


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junctions
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GI250-1	GI250-2	GI250-3	GI250-4	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	1000	2000	3000	4000	Volts
Maximum RMS voltage	V_{RMS}	700	1400	2100	2800	Volts
Maximum DC blocking voltage	V_{DC}	1000	2000	3000	4000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	0 .25				Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load at T_A=75°C (JEDEC Method)	I_{FSM}	15.0				Amps
Maximum instantaneous forward voltage at 0.25A	V_F	3.5				Volts
Maximum DC reverse current at rated DC blocking voltage　T_A =25°C T_A=100°C	I_R	5.0 50.0				μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0				μs
Typical junction capacitance (NOTE2)	C_J	3.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	130.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

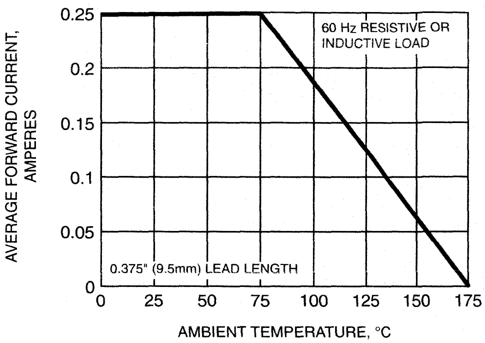


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

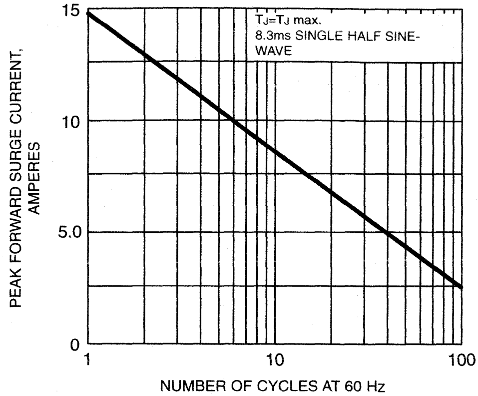


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

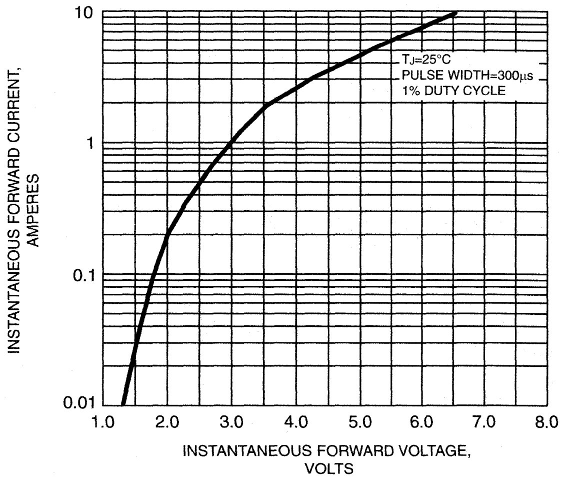


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

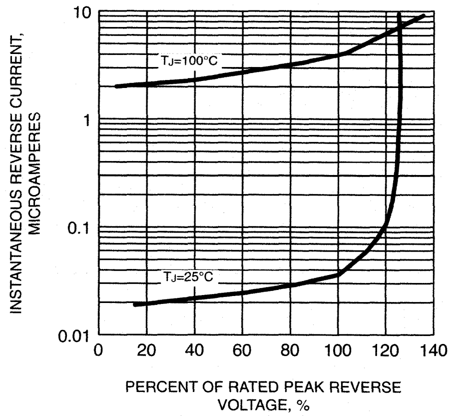
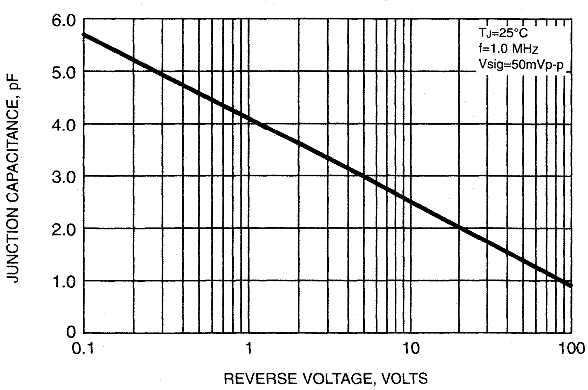


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



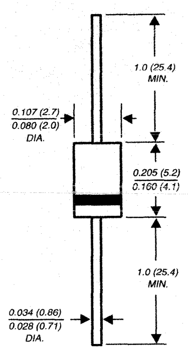
GP02-20 THRU GP02-40

HIGH VOLTAGE GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 2000 to 4000 Volts* ***Forward Current** - 0.25 Ampere*

PATENTED*

DO-204AL

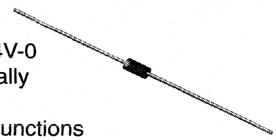


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junctions
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GP02 -20	GP02 -25	GP02 -30	GP02 -35	GP02 -40	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	2000	2500	3000	3500	4000	Volts
Maximum RMS Voltage	V_{RMS}	1400	1750	2100	2450	2800	Volts
Maximum DC blocking voltage	V_{DC}	2000	2500	3000	3500	4000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	0.25					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load at: (JEDEC Method) T_A=55°C	I_{FSM}	15.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	3.0					Volts
Maximum DC reverse current T_A= 25°C at rated DC blocking voltage T_A=100°C	I_R	5.0 50.0					μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0					μs
Typical junction capacitance (NOTE 2)	C_J	3.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	130.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead lengths, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING

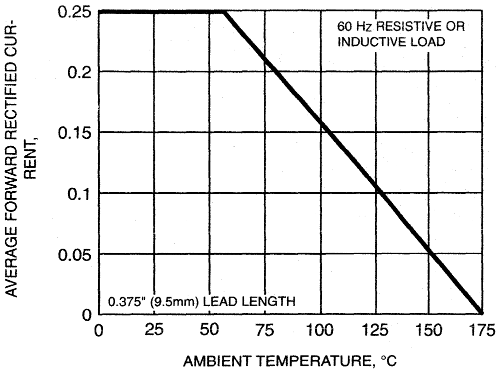


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

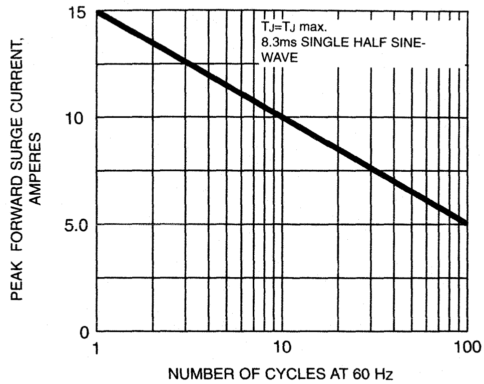


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

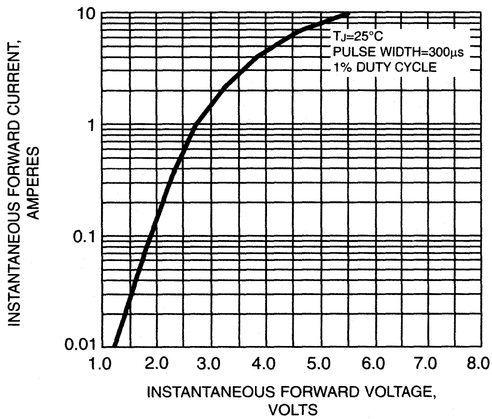


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

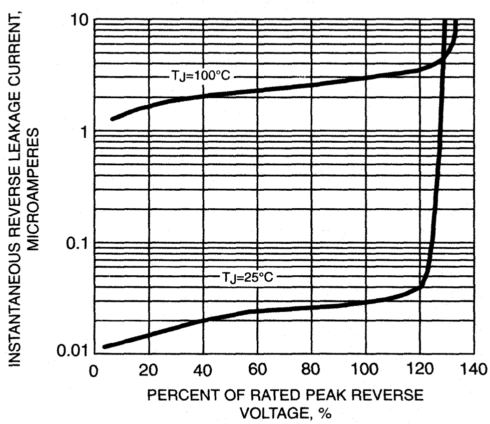
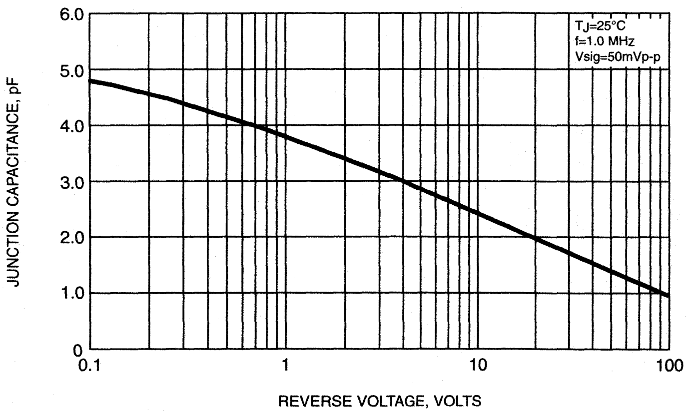


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



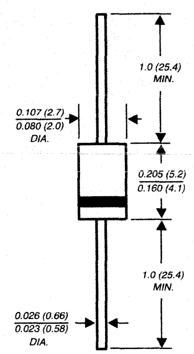
RGP02-12E THRU RGP02-20E

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 1200 to 2000 Volts* ***Forward Current** - 0.5 Ampere*

PATENTED*

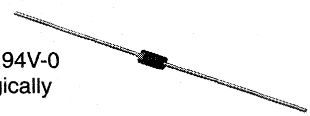
CASE STYLE GP10E



Dimensions in inches and (millimeters)
** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Capable of meeting environmental standards of MIL-S-19500
- For use in high frequency rectifier circuits
- Fast switching for high efficiency
- Glass passivated cavity-free junctions
- 0.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.2μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	RGP02 -12E	RGP02 -14E	RGP02 -16E	RGP02 -18E	RGP02 -20E	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	1200	1400	1600	1800	2000	Volts
Maximum RMS voltage	V_{RMS}	840	980	1120	1260	1400	Volts
Maximum DC blocking voltage	V_{DC}	1200	1400	1600	1800	2000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at TA=55°C	$I_{(AV)}$	0.5					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	20.0					Amps
Maximum instantaneous forward voltage at 0.1A	V_F	1.8					Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 50.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	300.0					ns
Typical junction capacitance (NOTE 2)	C_J	5.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	65.0 / 30.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

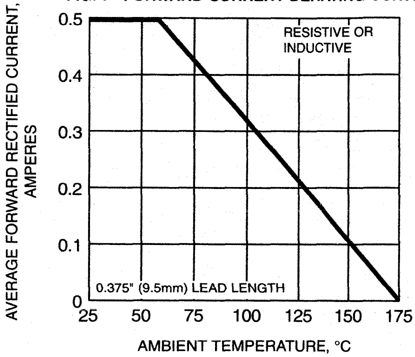


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

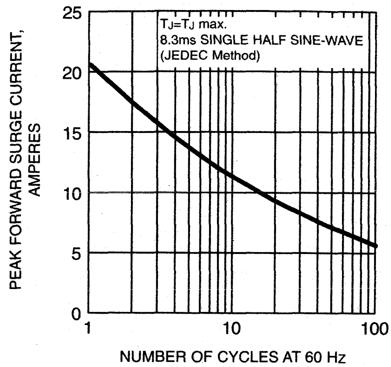


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

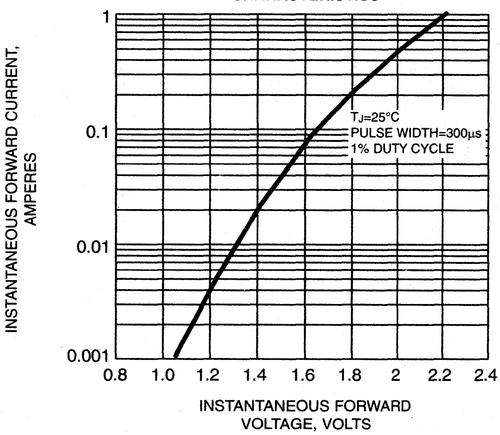


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

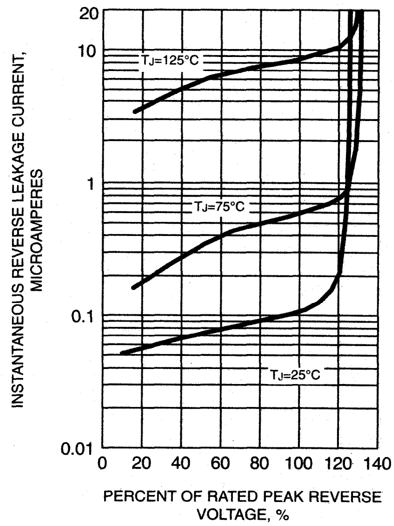
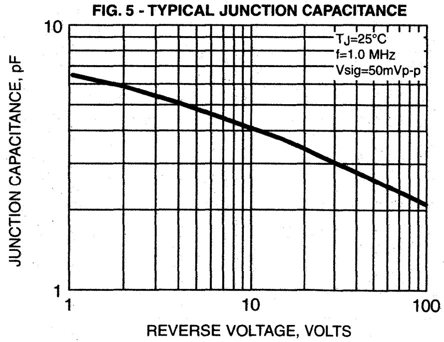


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



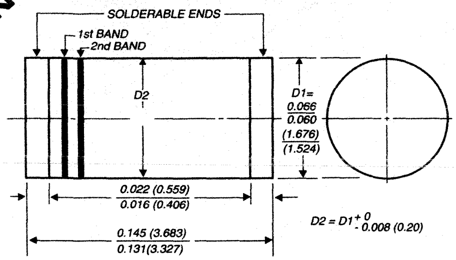
GL34A THRU GL34J

SURFACE MOUNT GLASS PASSIVATED FAST SWITCHING JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 0.5 Ampere*

PATENTED*

DO-213AA



1st band denotes type and polarity
2cnd band denotes voltage type

Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-end cap assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO213AA molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode-end - 1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0014 ounce, 0.036 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GL34A*	*GL34B*	*GL34D*	*GL34G*	*GL34J*	
Polarity color bands (2nd Band)		Gray	Red	Orange	Yellow	Green	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current at T_T=75°C	$I_{(AV)}$	0.5					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0					Amps
Maximum instantaneous forward voltage at 0.5A	V_F	1.2				1.3	Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0					µA
Maximum full load reverse current, full cycle average at T_A=55°C	$I_{R(AV)}$	30.0					µA
Typical reverse recovery time (NOTE 1)	t_{rr}	1.5					µs
Typical junction capacitance (NOTE 2)	C_J	4.0					pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JT}$	150.0 70.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal
(4) Thermal resistance from junction to terminal, 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal

FIG. 1 - FORWARD CURRENT DERATING CURVE

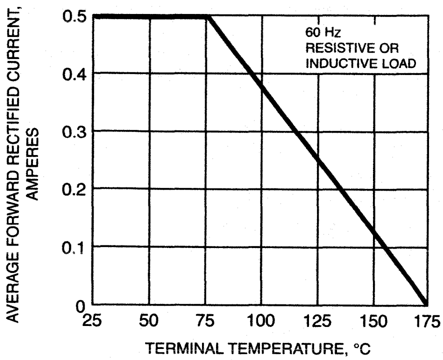


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

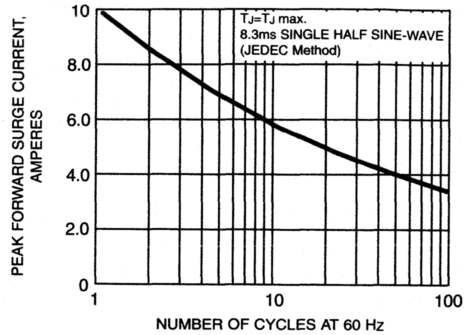


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

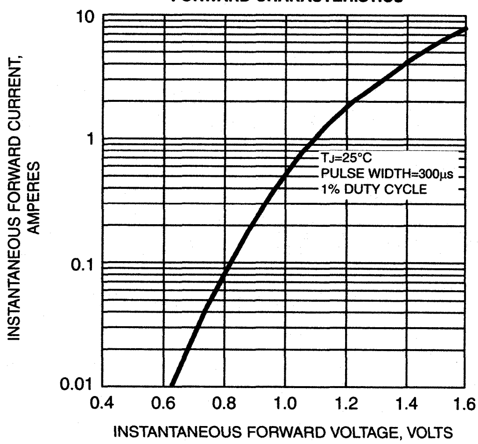


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

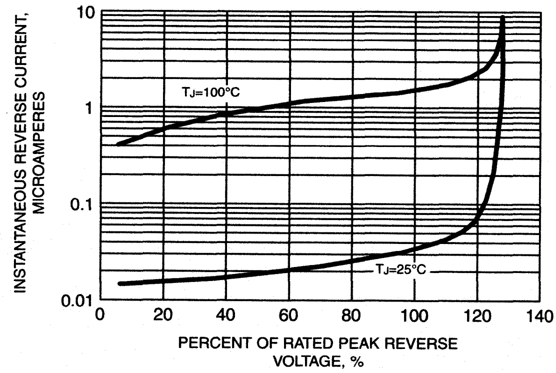
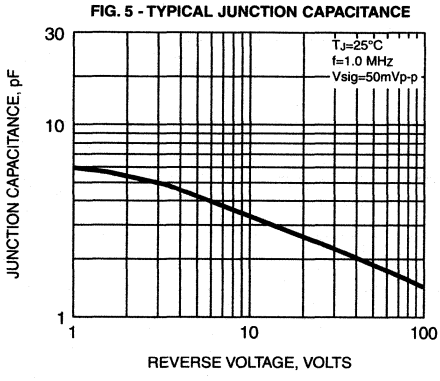


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



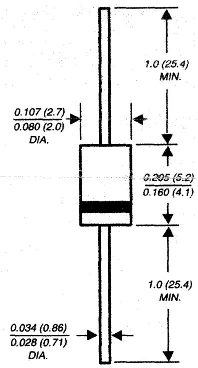
BA157GP THRU BA159GP

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 400 to 1000 Volts* ***Forward Current** - 0.5 Ampere*

PATENTED*

DO-204AL



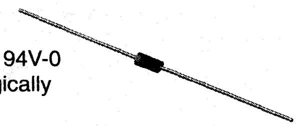
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- For use in high frequency rectifier circuits
- Fast switching for high efficiency
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 0.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce,0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*BA157GP*	*BA158GP*	*BA159DGP*	*BA159GP*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	0.5				Amp
Peak forward surge current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}	20.0				Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.5				Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C	I_R	5.0				μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150	250	500	500	ns
Typical junction capacitance (NOTE 2)	C_J	15.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

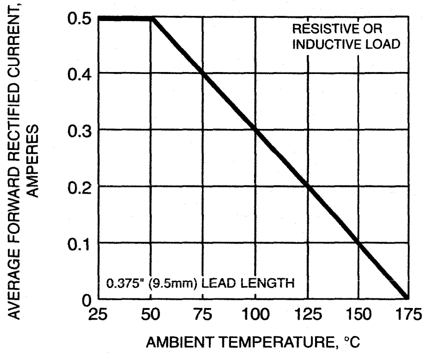


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

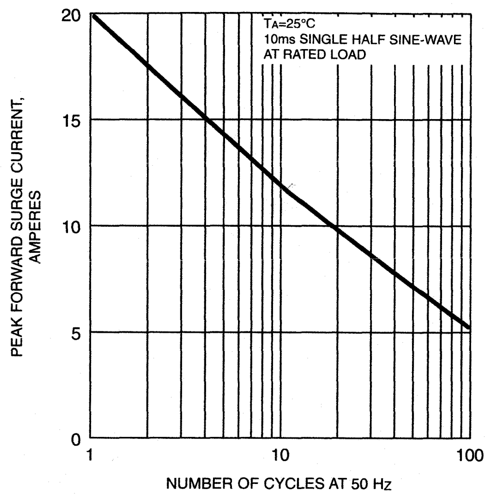


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

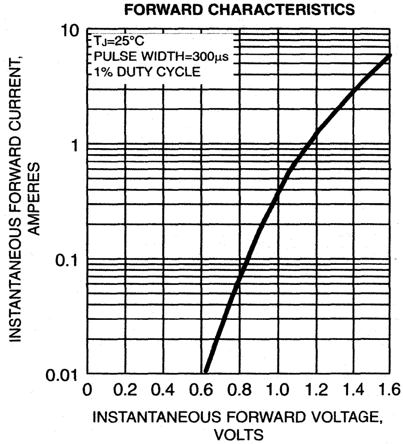
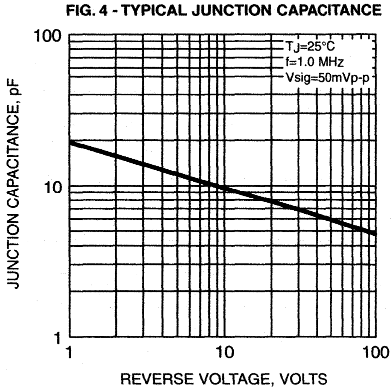


FIG. 4 - TYPICAL JUNCTION CAPACITANCE



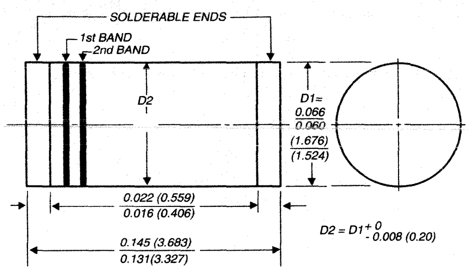
RGL34A THRU RGL34J

SURFACE MOUNT GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 0.5 Ampere*

PATENTED*

DO-213AA



1st band denotes type and polarity
2cnd band denotes voltage type

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No.3,996,602 and brazed-lead assembly by Patent No.3,930,306*

SUPERECTIFIER

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO213AA molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end - 1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0014 ounce, 0.036 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°°C ambient temperature unless otherwise specified.

Fast switching device: 1st band is Red	*SYMBOLS*	*RGL34A*	*RGL34B*	*RGL34D*	*RGL34G*	*RGL34J*	*UNITS*
Polarity color bands (2nd Band)		Gray	Red	Orange	Yellow	Green	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current at T_T=55°C	$I_{(AV)}$	0.5					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0					Amps
Maximum instantaneous forward voltage at 0.5A	V_F	1.3					Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0					µA
Maximum full load reverse current, full cycle average T_A=55°C	$I_{R(AV)}$	30.0					µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	ns
Typical junction capacitance (NOTE 2)	C_J	4.0					pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JT}$	150.0 70.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal
(4) Thermal resistance from junction to terminal, 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal

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FIG. 1 - FORWARD CURRENT DERATING CURVE

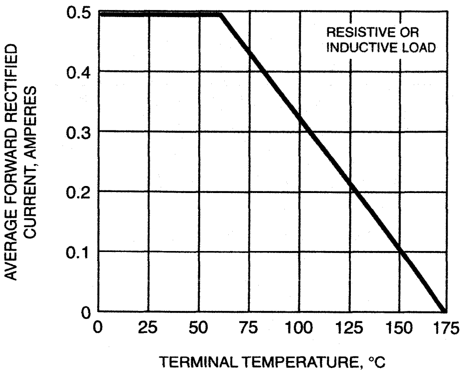


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

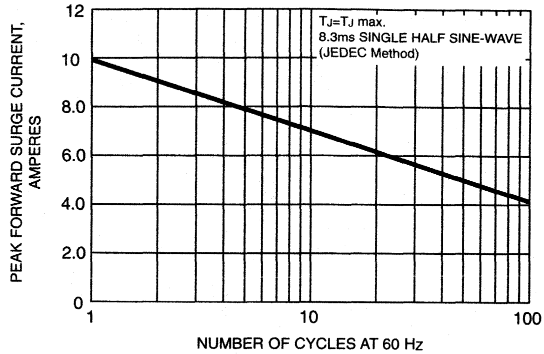


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

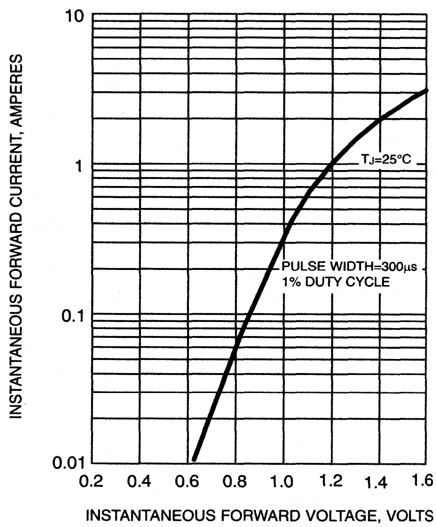


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

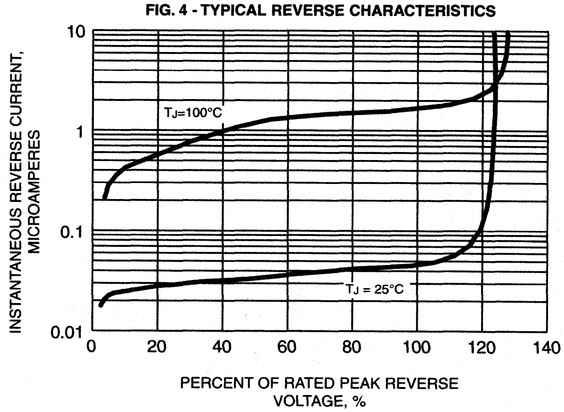
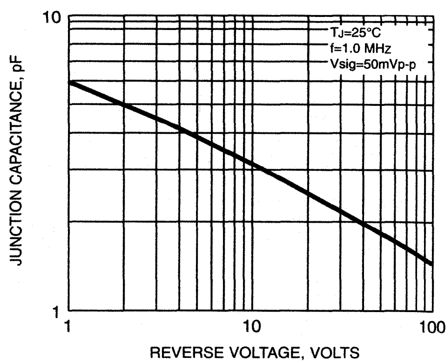


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



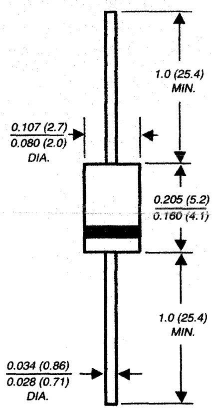
GP08A THRU GP08J

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 0.8 Ampere*

PATENTED*

DO-204AL



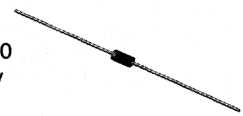
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No.3,996,602 and brazed-lead assembly by Patent No.3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 0.8 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GP08A*	*GP08B*	*GP08D*	*GP08G*	*GP08J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A =55°C	$I_{(AV)}$	0 .8					Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=55°C	I_{FSM}	25.0					Amps
Maximum instantaneous forward voltage at 0.8A	V_F	1.3					Volts
Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	30.0					μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 50.0					μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0					μs
Typical junction capacitance (NOTE 2)	C_J	8.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Measure on I_F =0.5A, I_R =1.0A, I_{rr} = 0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

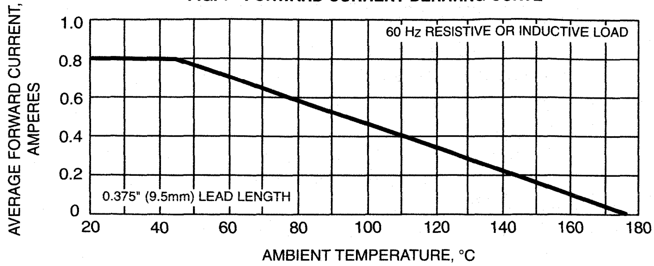


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

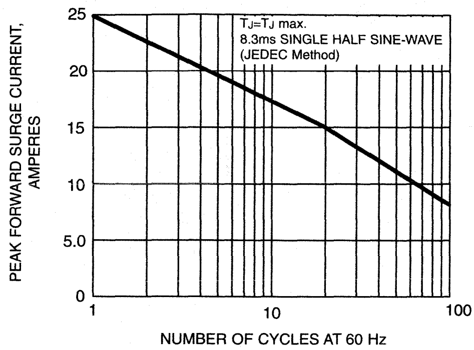


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

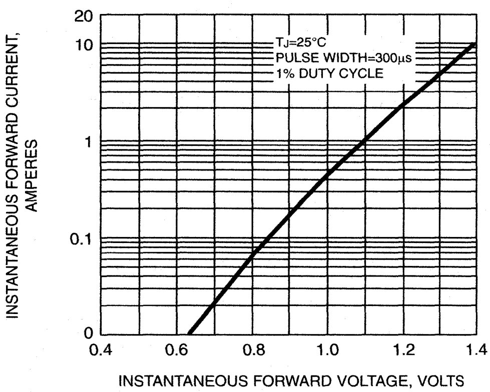


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

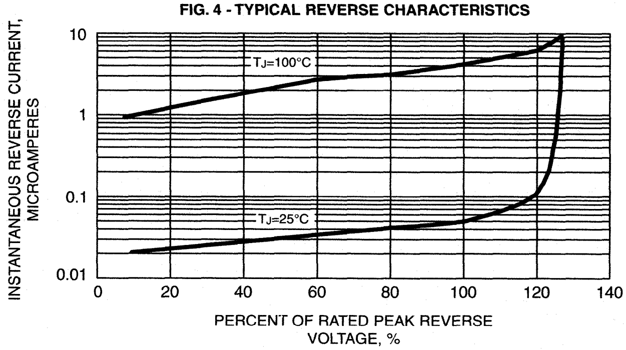
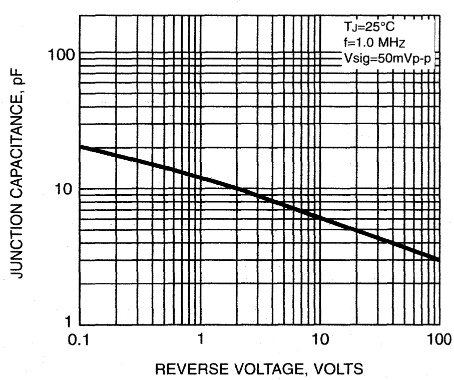


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



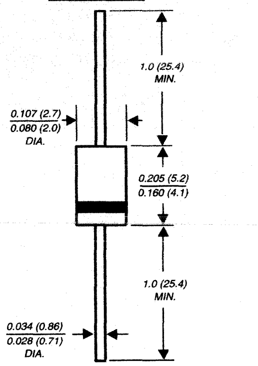
1N3611GP THRU 1N3614GP AND 1N3957GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL



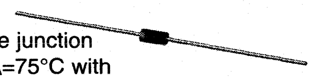
NOTE: *Lead diameter is* 0.026 (0.66) / 0.023 (0.58) *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Capable of meeting environmental standards of MIL-S-19500
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1µA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 3611GP	1N 3612GP	1N 3613GP	1N 3614GP	1N 3957GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Amps
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0					Amps
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0					Volts
* Maximum DC reverse current at rated DC blocking voltage — T_A=25°C / T_A=150°C	I_R	1.0 / 300.0					µA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0					µs
Typical junction capacitance (NOTE 2)	C_J	8.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 25.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

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FIG. 1 - MAXIMUM FORWARD CURRENT DERATING

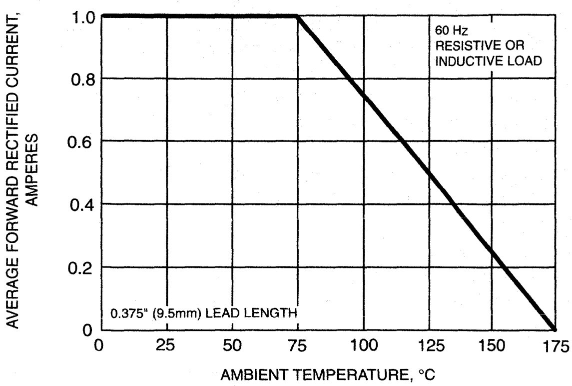


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

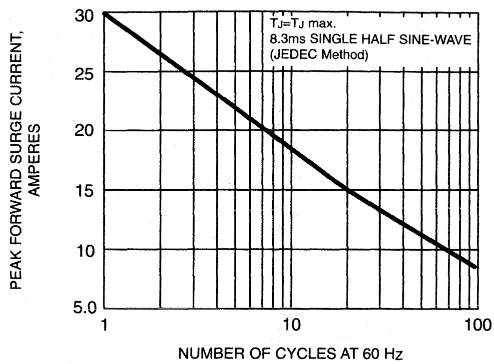


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

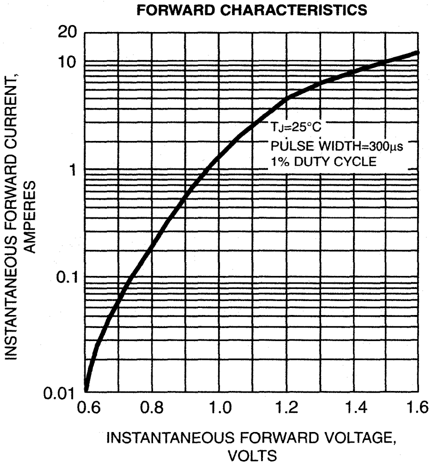


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

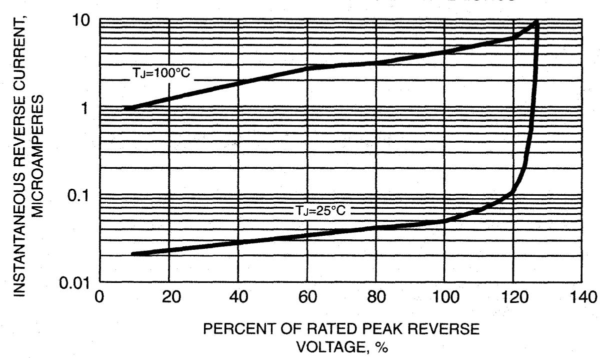
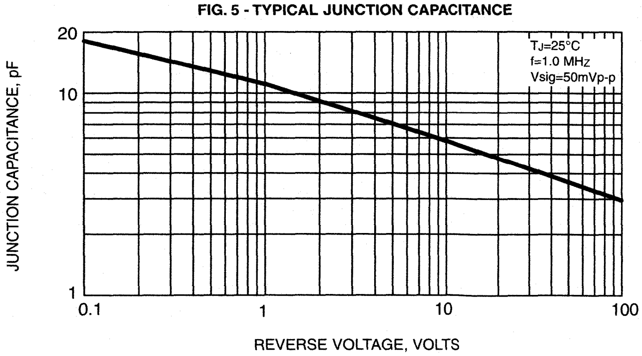


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



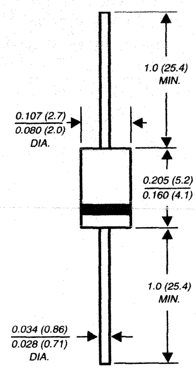
1N4001GP THRU 1N4007GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL



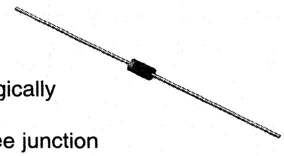
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4001GP	1N 4002GP	1N 4003GP	1N 4004GP	1N 4005GP	1N 4006GP	1N 4007GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0							Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.1							Volts
* Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length T_A= 75°C	$I_{R(AV)}$	30.0							μA
* Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 50.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0							μs
Typical junction capacitance (NOTE 2)	C_J	8.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 25.0							°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}= 0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

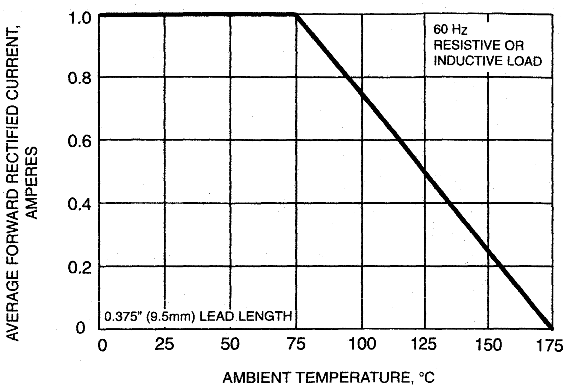


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

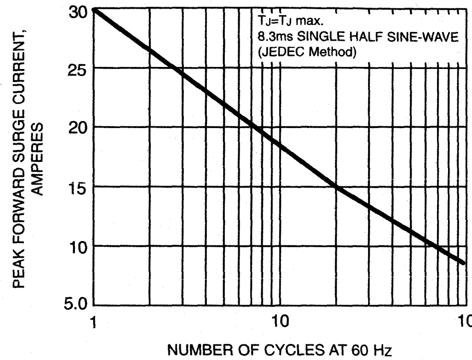


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

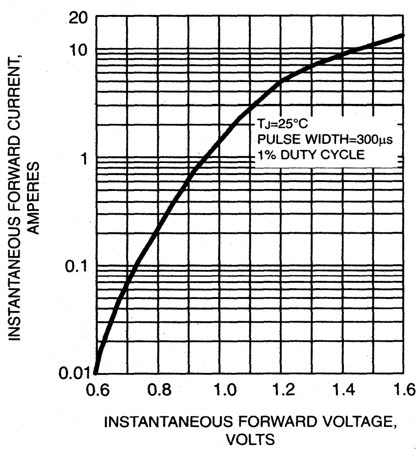


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

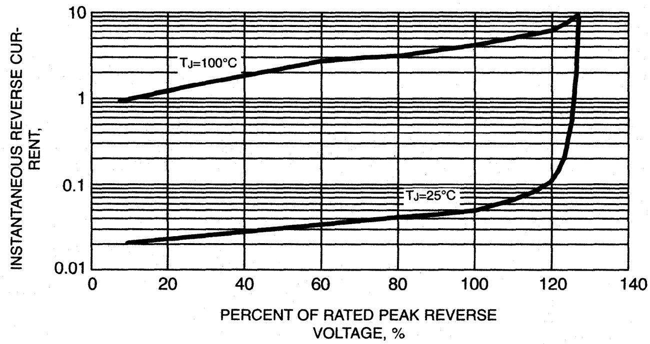
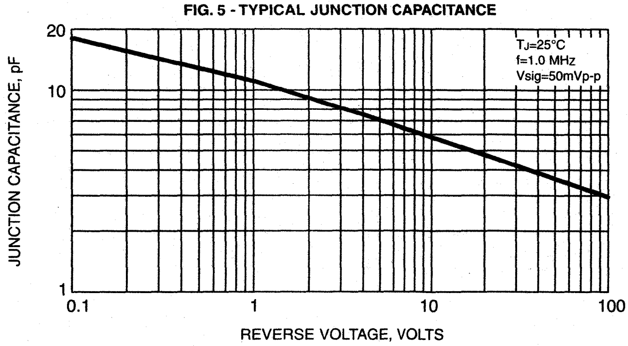


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



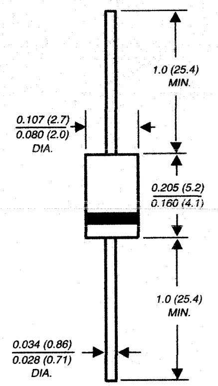
1N4245GP THRU 1N4249GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts*   ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL

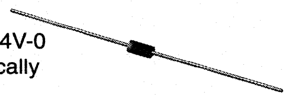


NOTE: *Lead diameter is 0.026 (0.66) / 0.023 (0.58) for suffix "E" part numbers*

Dimension in inches and (millimeters)
** Glass-plastic technique is covered by Patent No.3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4245GP	1N 4246GP	1N 4247GP	1N 4248GP	1N 4249GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	25.0					Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.2					Volts
* Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length T_A=55°C	$I_{R(AV)}$	50.0					μA
* Maximum reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	1.0 / 25.0					μA
Typical junction capacitance (NOTE 1)	C_J	8.0					pF
Typical thermal resistance (NOTE 2)	$R_{\Theta JA}$ / $R_{\Theta JL}$	55.0 / 25.0					°C/W
* Operating junction temperature range	T_J	-65 to +160					°C
* Storage temperature range	T_{STG}	-65 to +175					°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B.mounted
* JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

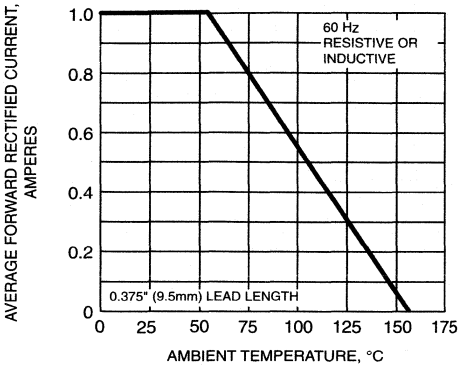


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

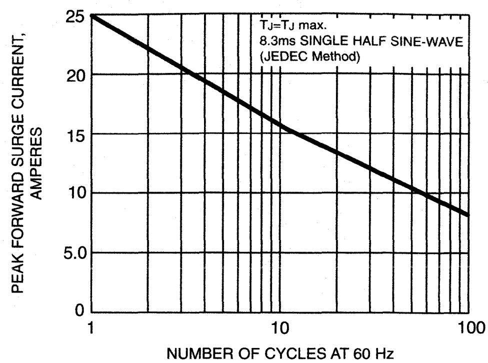


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

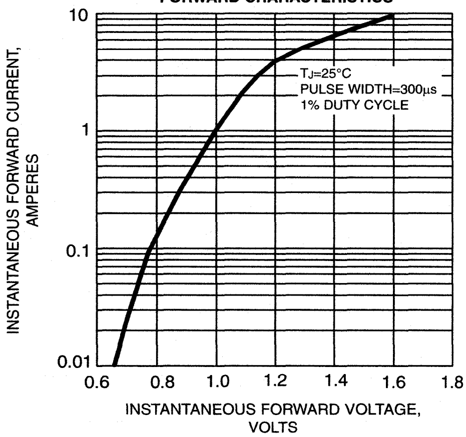


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

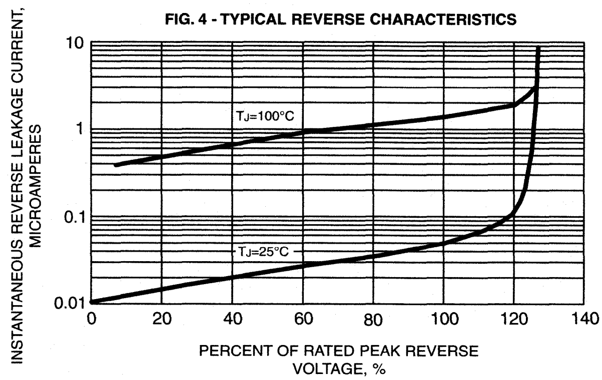
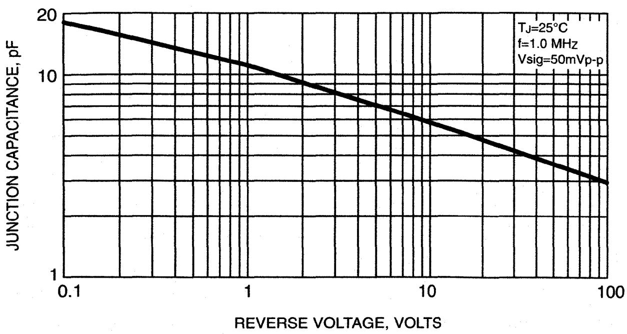


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



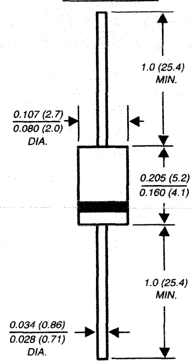
1N4933GP THRU 1N4937GP

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL



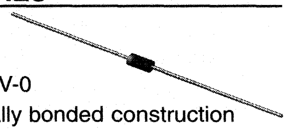
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation is covered by Patent No.3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ For use in high frequency rectifier circuits
- ♦ Fast switching for high efficiency
- ♦ Glass passivated cavity-free junction
- ♦ 1.0 Ampere operation at T_A=75°C with no thermal runaway
- ♦ Typical I_R less than 0.1µA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4933GP	1N 4934GP	1N 4935GP	1N 4936GP	1N 4937GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
* Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.2					Volts
* Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 100.0					µA
* Maximum reverse recovery time (NOTE 1)	t_{rr}	200.0					ns
Typical junction capacitance (NOTE 2)	C_J	15.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=1.0A, V_R=30 Volts
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

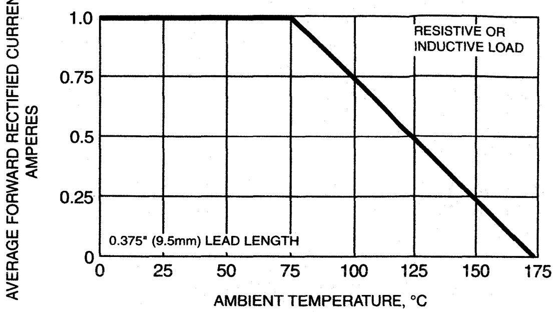


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

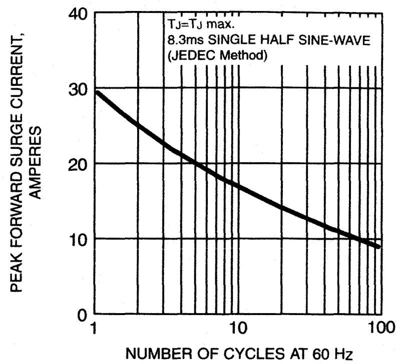


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

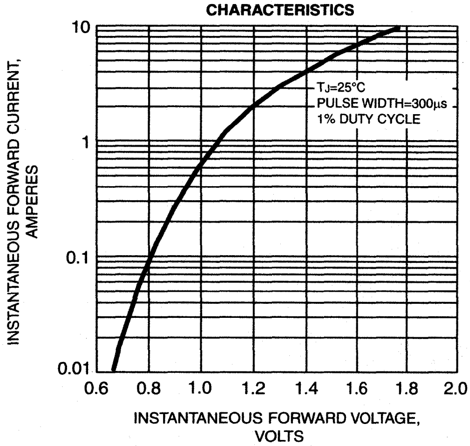


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

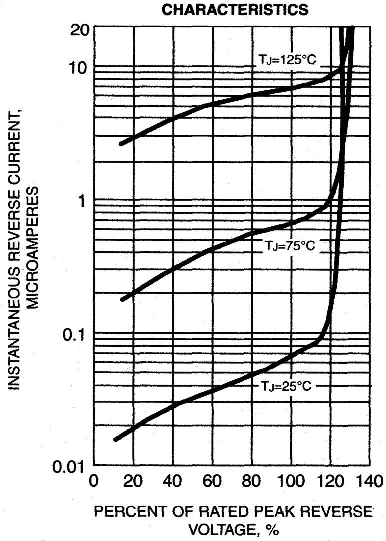
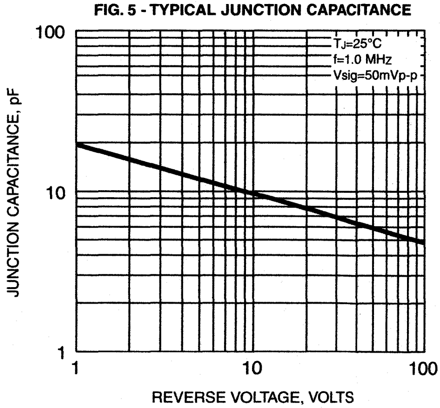


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



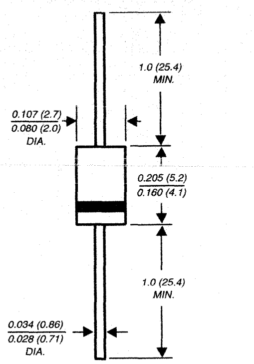
1N4942GP THRU 1N4948GP

GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL



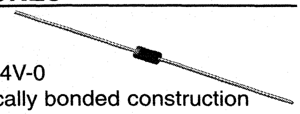
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No,3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ For use in high frequency rectifier circuits
- ♦ Fast switching for high efficiency
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4942GP	1N 4944GP	1N 4946GP	1N 4947GP	1N 4948GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	25.0					Amps
* Maximum instantaneous forward voltage at 1.0A	V_F	1.3					Volts
* Maximum DC reverse current T_A= 25°C at rated DC blocking voltage T_A=150°C	I_R	1.0 200.0					µA
* Maximum reverse recovery time (NOTE 1)	t_{rr}	150		250		500	ns
Typical junction capacitance (NOTE 2)	C_J	15.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0					°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

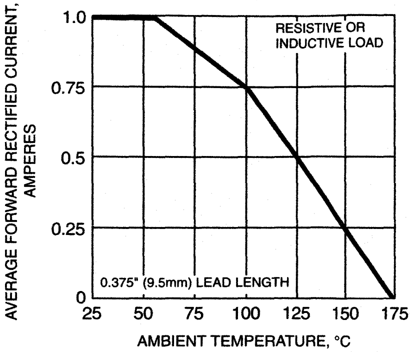


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

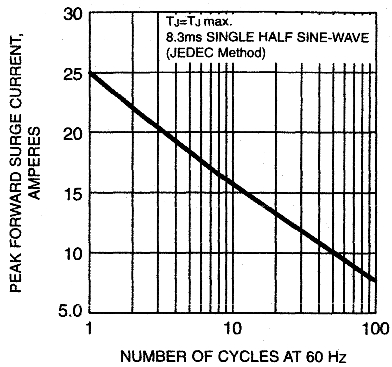


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

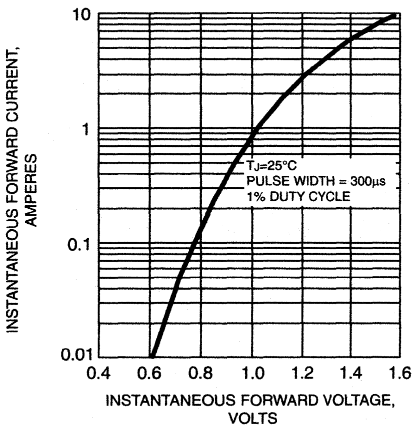


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

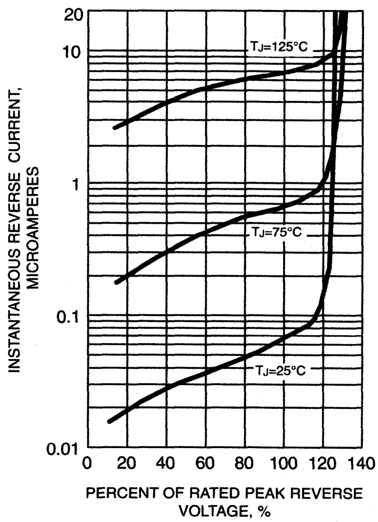
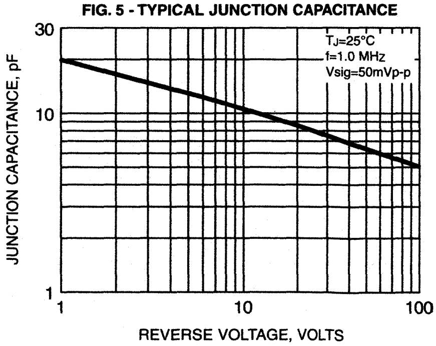


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



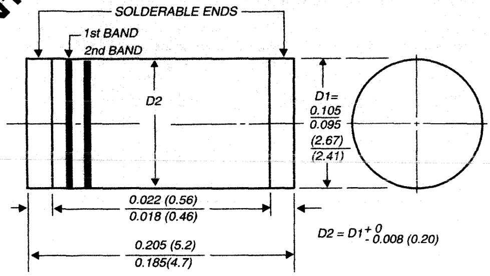
1N6478 THRU 1N6484

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-213AB



1st band denotes type and positive end (cathode)
2nd band denotes voltage type

Dimensions in inches and (millimeters)
** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mount applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end - 1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0046 ounce, 0.116 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

Standard recovery time device: 1st band is White	SYMBOLS	1N 6478	1N 6479	1N 6480	1N 6481	1N 6482	1N 6483	1N 6484	UNITS
Polarity color bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
* Maximum average forward rectified current at	$I_{(AV)}$	1.0							Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load at T_A=75°C (JEDEC Method)	I_{FSM}	30.0							Amps
* Maximum instantaneous forward voltage at 1.0A T_A=25°C / T_A=75°C	V_F	1.1 / 1.0							Volts
* Maximum DC reverse current T_A=25°C / at rated DC blocking voltage T_A=125°C	I_R	10.0 / 200.0							µA
* Maximum full load reverse current, full cycle average at T_A=75°C	$I_{R(AV)}$	100.0							µA
* Typical junction capacitance (NOTE 1)	C_J	8.0							pF
* Maximum thermal resistance (NOTE 2) / (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JT}$	50.0 / 20.0							°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(2) Thermal resistance from junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(3) Thermal resistance from junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
* JEDEC Registered Values

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

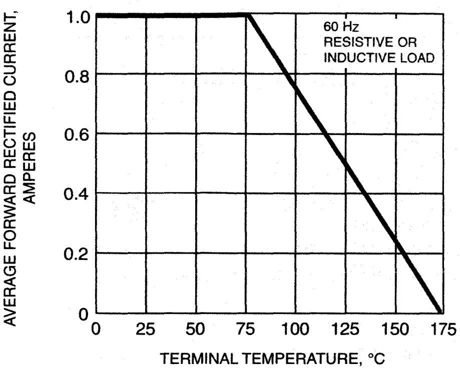


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

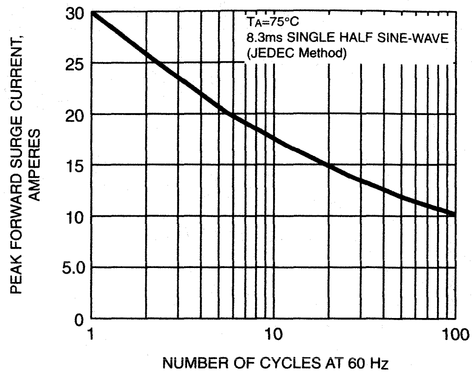


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

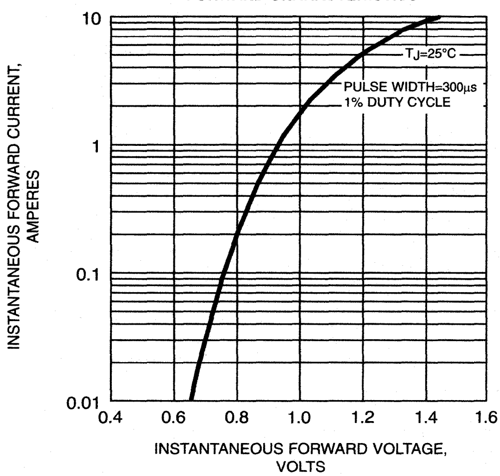


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

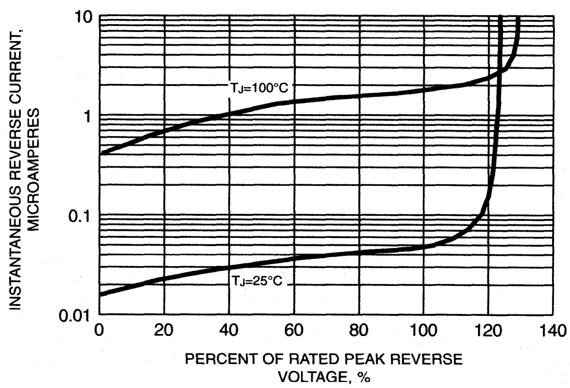
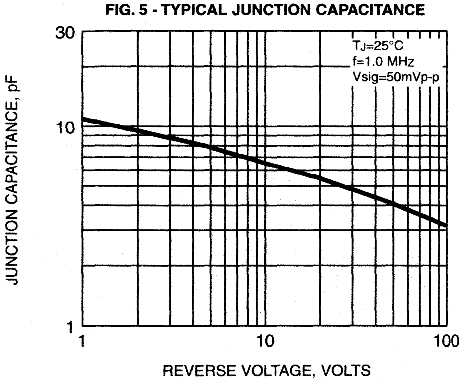


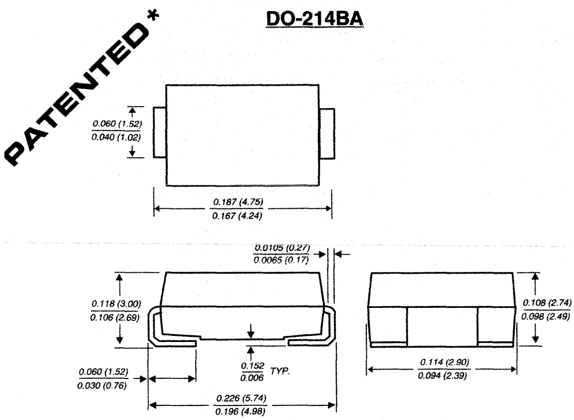
FIG. 5 - TYPICAL JUNCTION CAPACITANCE



GF1A THRU GF1M

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Ideal for surface mount automotive applications
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Built-in strain relief
- ♦ Easy pick and place
- ♦ High temperature soldering guaranteed: 450°C/5 seconds at terminals
- ♦ Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-214BA molded plastic over glass body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0048 ounces, 0.120 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GF1A*	*GF1B*	*GF1D*	*GF1G*	*GF1J*	*GF1K*	*GF1M*	*UNITS*
Device marking code		*GA*	*GB*	*GD*	*GG*	*GJ*	*GK*	*GM*	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_L=125°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.10					1.20		Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 50.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0							μs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	80.0 26.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied V_R=4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead P.C.B. mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

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RATINGS AND CHARACTERISTIC CURVES GF1A THRU GF1M

FIG. 1 - FORWARD CURRENT DERATING CURVE

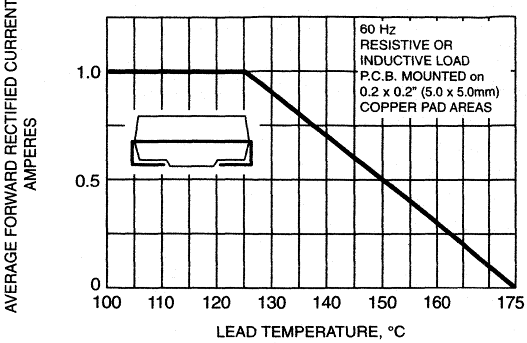


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

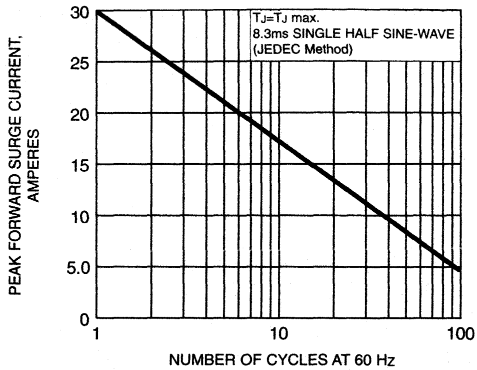


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

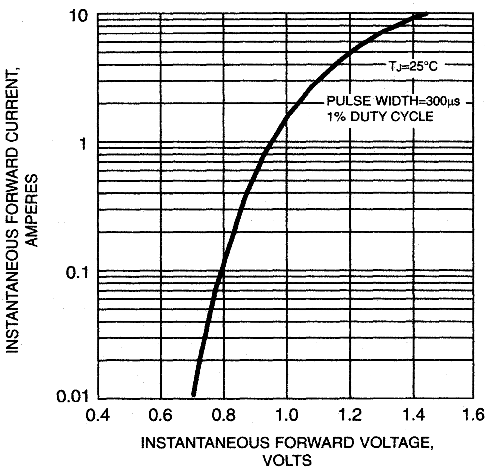


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

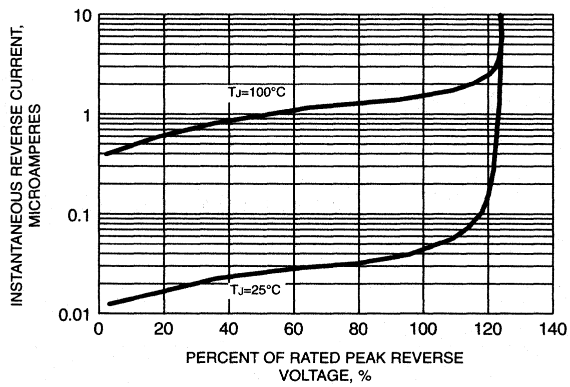
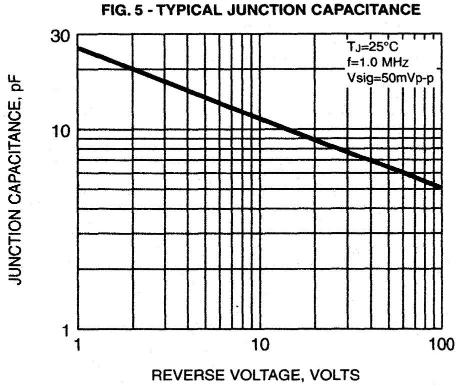


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



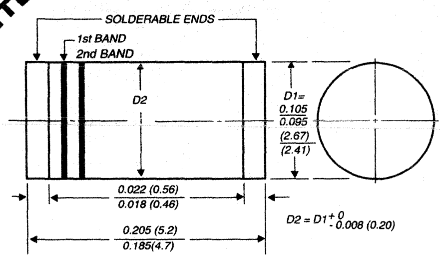
BYM10-50 THRU BYM10-1000
GL41A THRU GL41Y

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1600 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO213AB



1st band denotes type and positive end (cathode)
2nd band denotes voltage type

Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-end cap assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ For surface mount applications
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode-end -1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0046 ounce, 0.116 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

		BYM10				BYM10					
	SYMBOLS	-50	-100	-200	-400	-600	-800	-1000			UNITS
Standard recovery device: 1st band is white		GL41A	GL41B	GL41D	GL41G	GL41J	GL41K	GL41M	GL41T	GL41Y	
Polarity color bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	White	Brown	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	1300	1600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	910	1120	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	1300	1600	Volts
Maximum average forward rectified current (SEE FIG. 1)	$I_{(AV)}$	1.0									Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							25.0		Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.1					1.2				Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	10.0 50.0									µA
Maximum full load reverse current full cycle average at T_A=75°C	$I_{R(AV)}$	30.0									µA
Typical junction capacitance (NOTE 1)	C_J	8.0									pF
Typical thermal resistance (NOTE 2) (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JT}$	75.0 30.0									°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							-65 to +150		°C

NOTES:
(1) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(2) Thermal resistance from junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(3) Thermal resistance from junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal

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FIG. 1 - FORWARD CURRENT DERATING CURVE

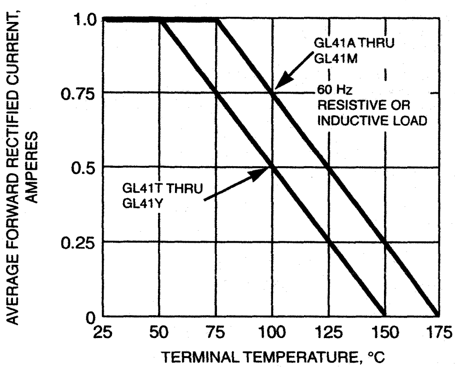


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

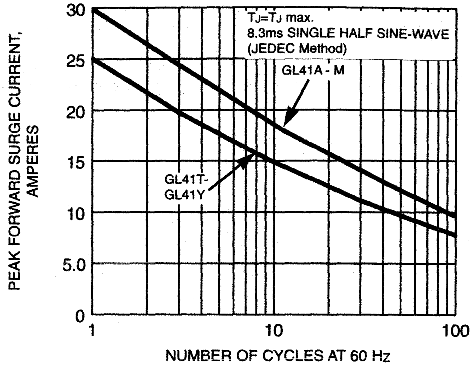


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

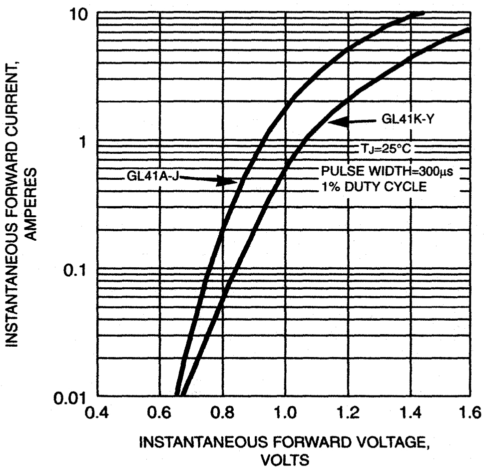


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

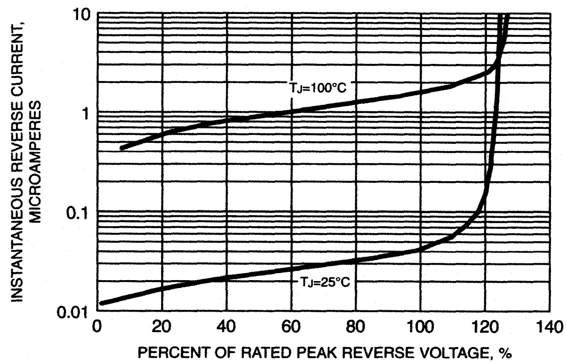
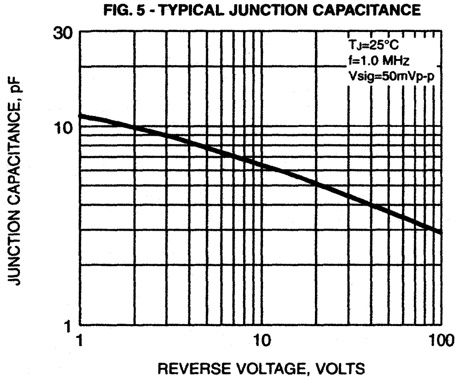


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



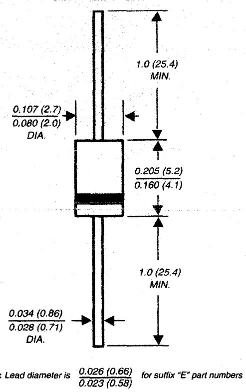
GP10A THRU GP10Y

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1600 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL

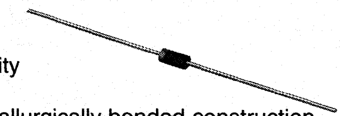


NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 1.0 Ampere operation at T_A=75°C and 55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*A*	*B*	*D*	*G*	*J*	*K*	*M*	*N*	*Q*	*T*	*V*	*W*	*Y*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50 to 1600 Volts (SEE FIG. 5)													Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length (SEE FIG. 1)	$I_{(AV)}$	1.0													Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							25.0						Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.1					1.2			1.3					Volts
Maximum full load reverse current, full cycle average, 0.375" (9.5mm) lead lengths at T_A=75°C	$I_{R(AV)}$	30.0													μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 50.0													μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0													μs
Typical junction capacitance (NOTE 2)	C_J	8.0					7.0			5.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0													°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							-65 to +150						°C

NOTES:
(1) Reverse recovery test condition: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead lengths, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

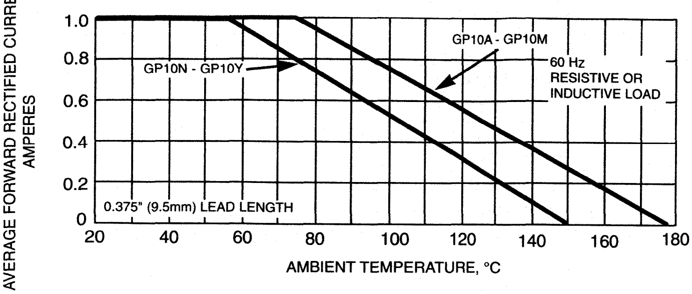


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

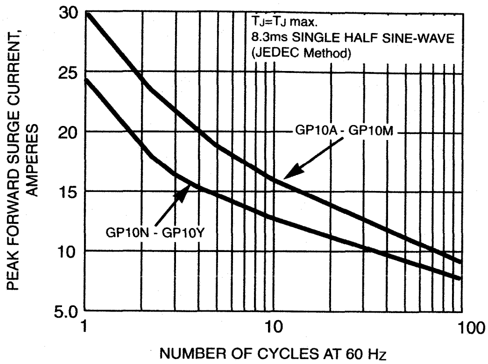


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

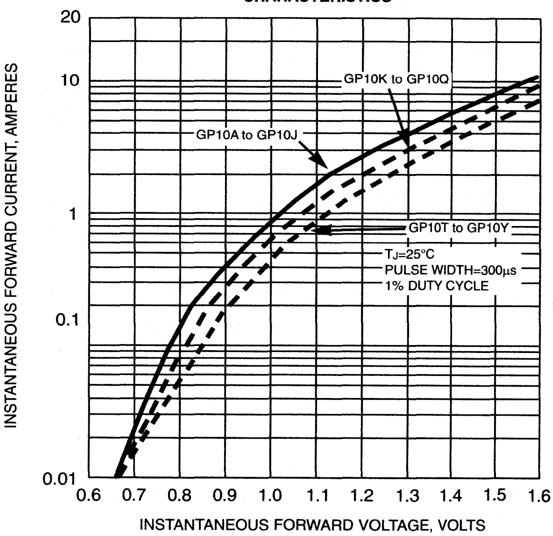


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

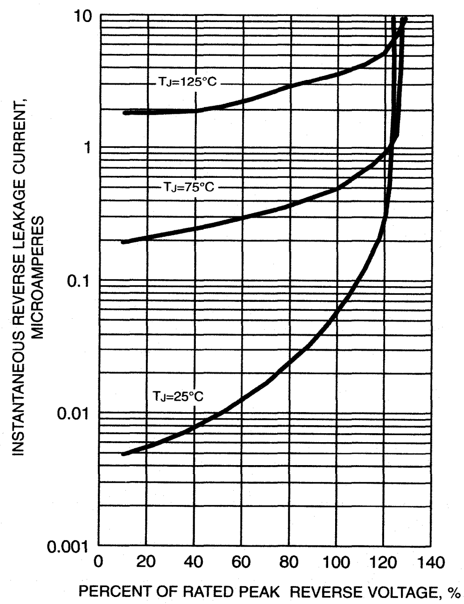
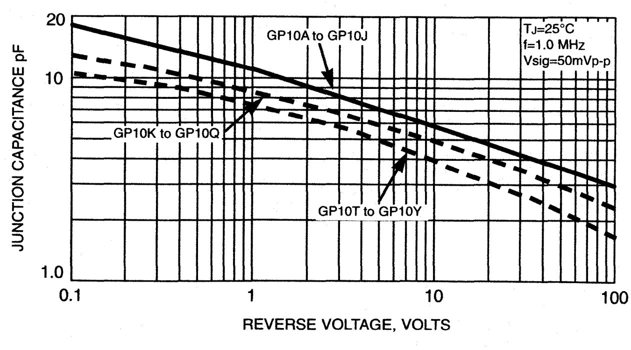


FIG. 5 - MAXIMUM REPETITIVE PEAK REVERSE CURRENT, V_{RRM}

GP10A	.50V
GP10B	.100V
GP10D	.200V
GP10G	.400V
GP10J	.600V
GP10K	.800V
GP10M	.1000V
GP10N	.1100V
GP10Q	.1200V
GP10T	.1300V
GP10V	.1400V
GP10W	.1500V
GP10Y	.1600V

FIG. 6 - TYPICAL JUNCTION CAPACITANCE



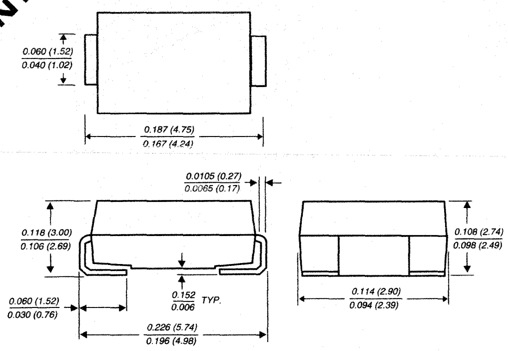
RGF1A THRU RGF1M

SURFACE MOUNT GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

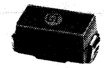
DO-214BA
MODIFIED J-BEND



Dimensions in inches and (millimeters)
** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602; brazed-lead assembly by Patent No. 3,930,306*

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Ideal for surface mount automotive applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- Built-in strain relief
- Easy pick and place
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals
- Complete device submersible temperature of 265°C for 10 seconds in solder bath



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic over glass body
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.0048 ounce, 0.120 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	RGF1A	RGF1B	RGF1D	RGF1G	RGF1J	RGF1K	RGF1M	UNITS
Device Marking Code		RA	RB	RD	RG	RJ	RK	RM	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_L=120°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.30							Volts
Maximum full load reverse current, full cycle average, T_A=55°C	$I_{R(AV)}$	50.0							µA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 100							µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	8.5							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	85.0 / 28.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied Vr=4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead P.C.B. mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pad areas

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FIG. 1 - FORWARD CURRENT DERATING CURVE

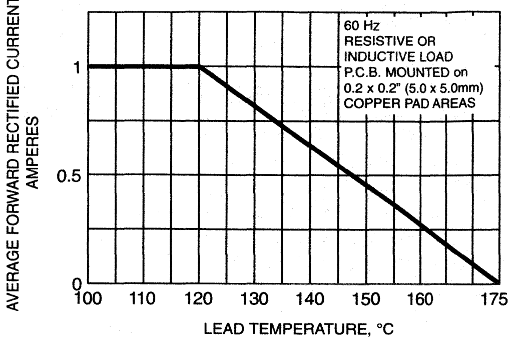


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

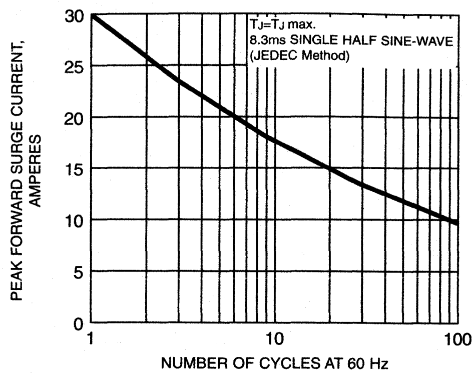


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

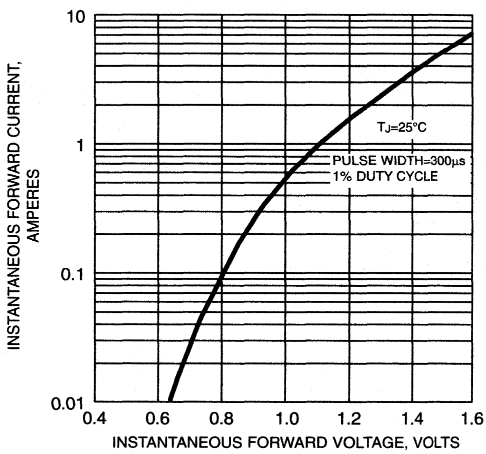


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

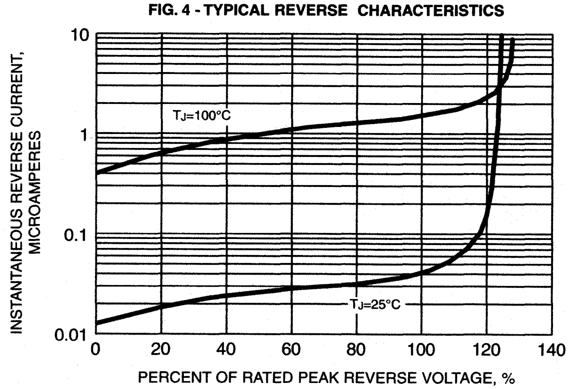
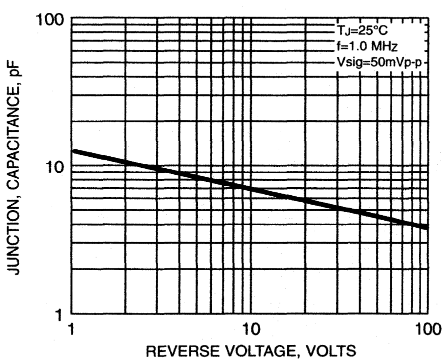


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



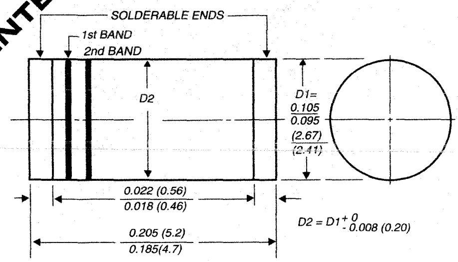
BYM11-50 THRU BYM11-1000
RGL41A THRU RGL41M

SURFACE MOUNT GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-213AB



1st band denotes type and positive end (cathode)
2nd band denotes voltage type

Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation is covered by Patent No. 3,996,602 and brazed-lead assembly to Patent No. 3,930,306*

SUPERECTIFIER

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- For surface mount applications
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic over glass body
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode end -1st band denotes device type and 2nd band denotes repetitive peak reverse voltage rating
Mounting Position: Any
Weight: 0.0046 ounce, 0.116 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	BYM11 -50	BYM11 -100	BYM11 -200	BYM11 -400	BYM11 -600	BYM11 -800	BYM11 -1000	UNITS
Fast switching time device: 1st band is Red		RGL 41A	RGL 41B	RGL 41D	RGL 41G	RGL 41J	RGL 41K	RGL 41M	
Polarity color bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current at T_T=55°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.3							Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 50.0							µA
Maximum full load reverse current, full cycle average at T_A=55°C	$I_{R(AV)}$	50.0							µA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Maximum thermal resistance (NOTE 3) (NOTE 4)	$R_{\Theta JA}$ $R_{\Theta JT}$	75.0 30.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal
(4) Thermal resistance from junction to terminal, 0.24 x 0.24" (6.0 x 6.0mm) copper pads to each terminal

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FIG. 1 - FORWARD CURRENT DERATING CURVE

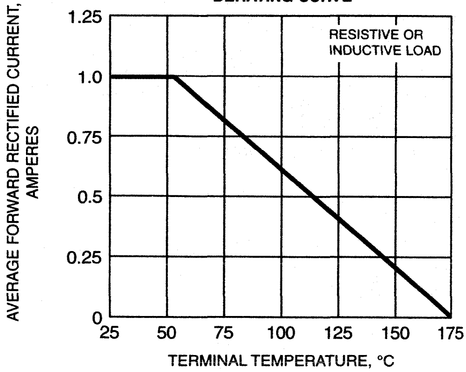


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

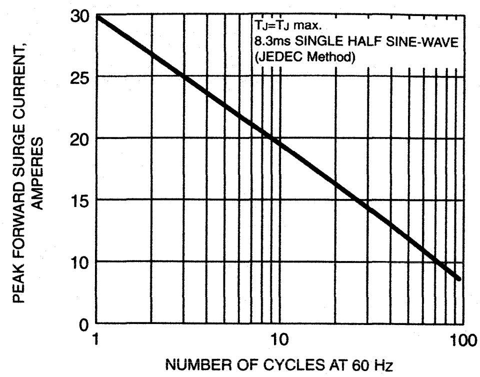


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

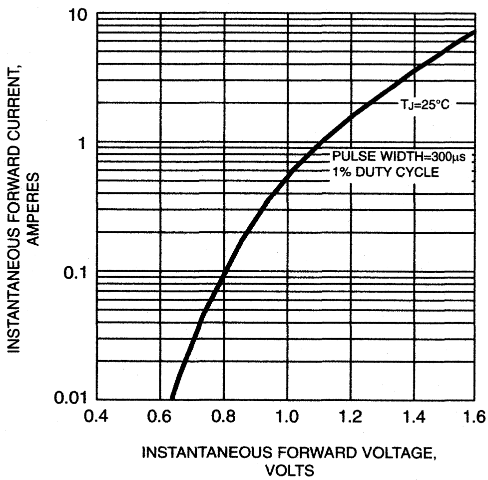


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

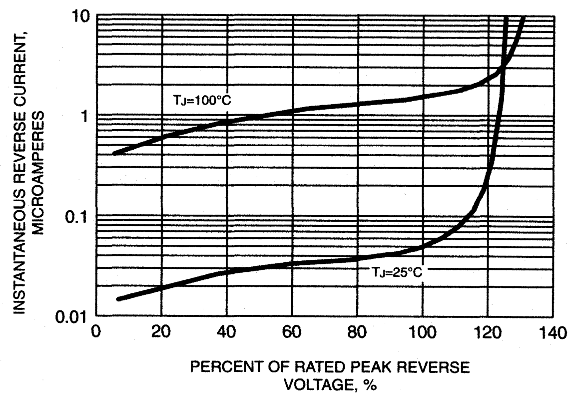
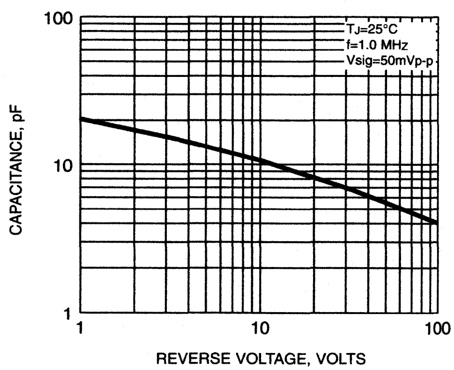


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



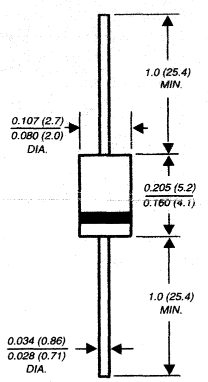
RGP10A THRU RGP10M

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AL



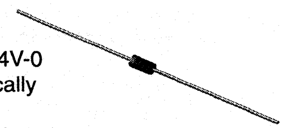
NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- For use in high frequency rectifier circuits
- Fast switching for high efficiency
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RGP 10A*	*RGP 10B*	*RGP 10D*	*RGP 10G*	*RGP 10J*	*RGP 10K*	*RGP 10M*	*UNITS*
Maximum recurrent peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	100	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.3							Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length T_A=55°C	I_R	100.0							μA
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	5.0 / 200.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	55.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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RATINGS AND CHARACTERISTIC CURVES RGP10A THRU RGP10M

FIG. 1 - FORWARD CURRENT DERATING CURVE

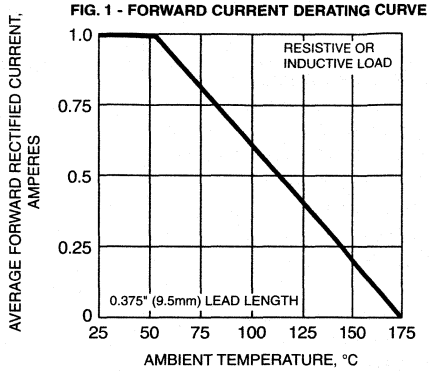


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

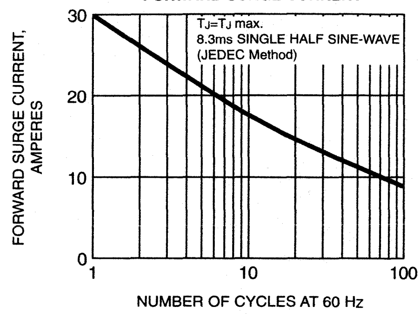


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

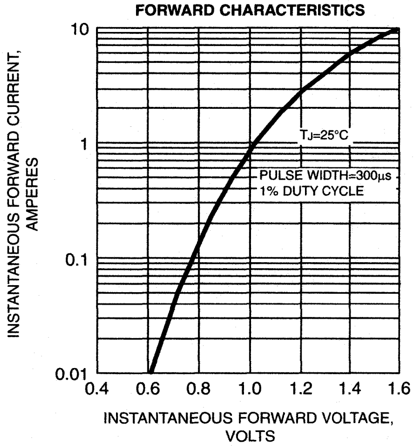


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

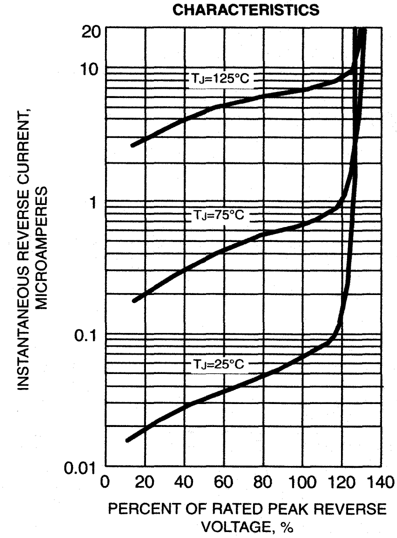
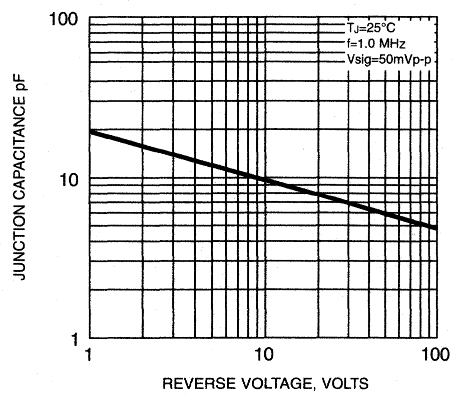


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



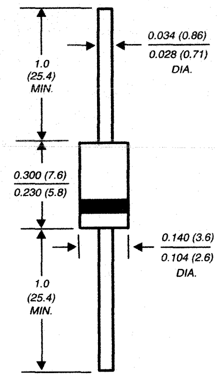
1N4383GP THRU 1N4385GP
1N4585GP AND 1N4586GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* *__Forward Current__ - 1.0 Ampere*

PATENTED*

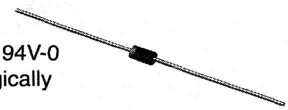
DO-204AC



Dimensions in inches and (millimeters)
** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 1.0 Ampere operation at T_A=100°C with no thermal runaway
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4383GP	1N 4384GP	1N 4385GP	1N 4585GP	1N 4586GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=100°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=100°C	I_{FSM}	50.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.0					Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=150°C	I_R	5.0 250.0					µA
* Typical reverse recovery time (NOTE 1)	t_{rr}	2.0					µs
Maximum full load reverse current full cycle average at 0.375" (9.5mm) lead length at T_A=100°C	$I_{R(AV)}$	275	250	225	200	200	µA
Typical junction capacitance (NOTE 2)	C_J	15.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	45.0					°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

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FIG. 1 - FORWARD CURRENT DERATING CURVE

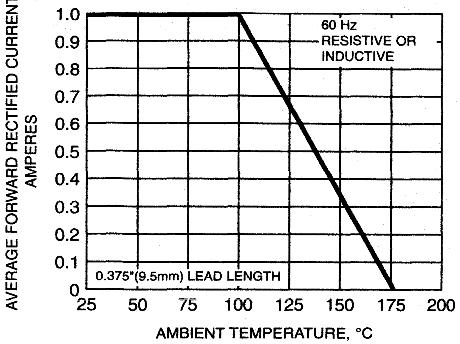


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

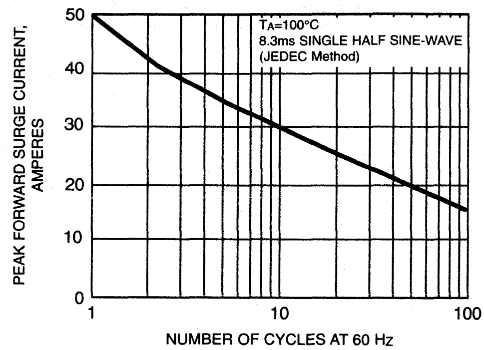


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

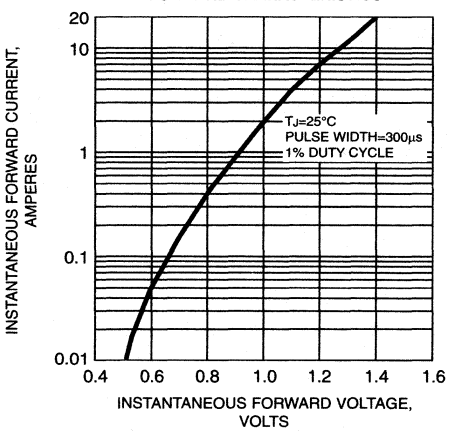


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

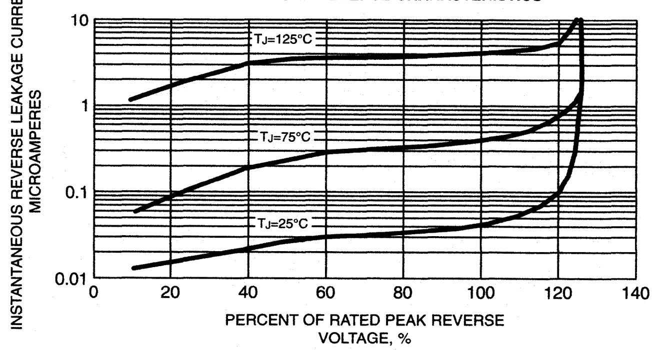
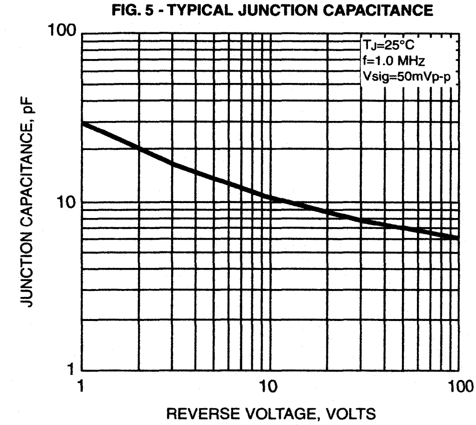


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



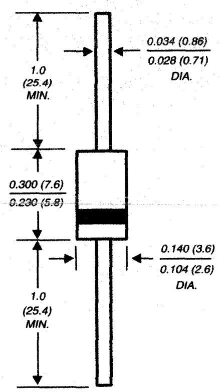
1N5059GP THRU 1N5062GP

GLASS PASSIVATED JUNCTION RECTIFIER

Reverse Voltage *- 200 to 800 Volts* ***Forward Current*** *- 1.0 Ampere*

PATENTED*

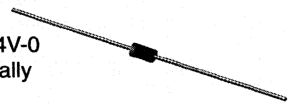
DO-204AC



Dimensions in inches and (millimeters)

* *Glass -plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N5059GP	1N5060GP	1N5061GP	1N5062GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS voltage	V_{RMS}	140	280	420	560	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0				Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
* Maximum instantaneous forward voltage at 1.0A, T_A=75°C	V_F	1.2				Volts
* Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=25°C / T_A=75°C	$I_{R(AV)}$	5.0 / 150.0				μA
* Maximum DC reverse current at rated DC blocking voltage T_A= 25°C / T_A=175°C	I_R	5.0 / 300.0				μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0				μs
Typical junction capacitance (NOTE 2)	C_J	15.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	45.0 / 20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered value

FIG. 1 - FORWARD CURRENT DERATING CURVE

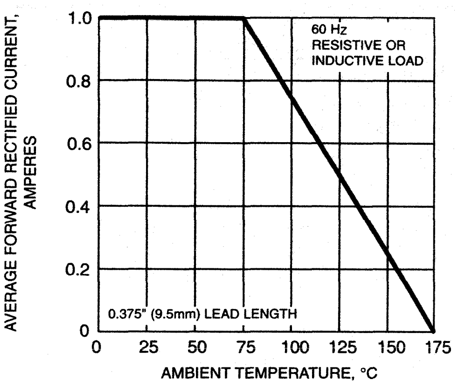


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

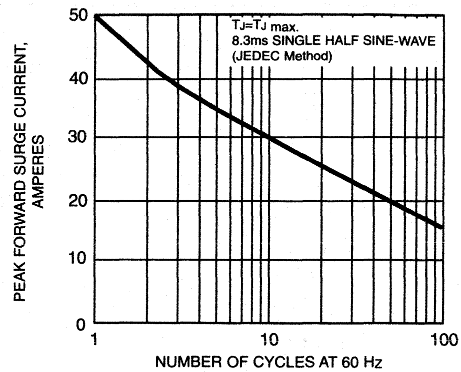


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

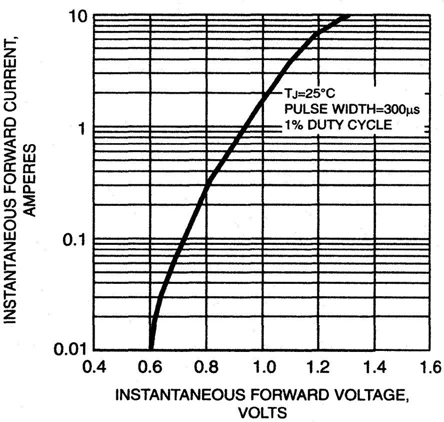


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

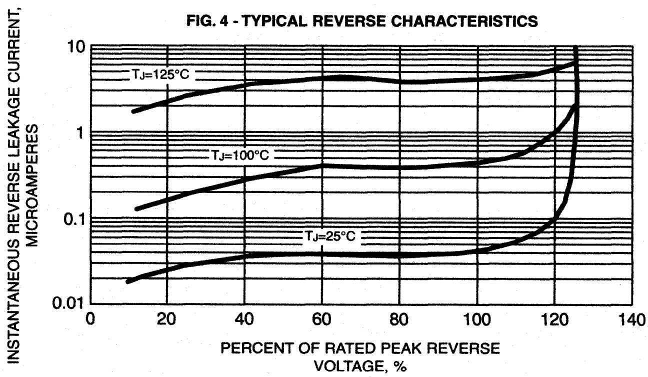
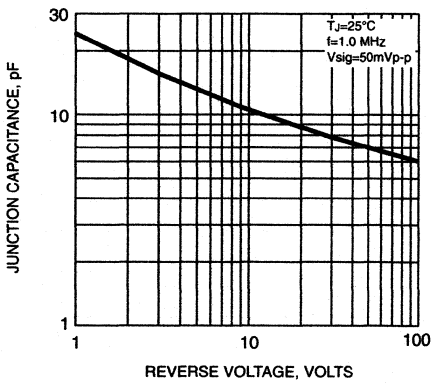


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



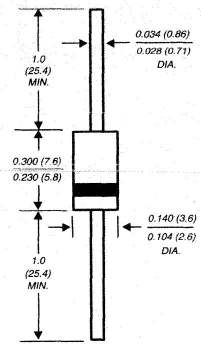
1N5615GP THRU 1N5623GP

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 200 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AC

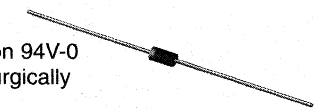


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ High temperature soldering guaranteed: 350°C/10seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*1N 5615GP*	*1N 5617GP*	*1N 5619GP*	*1N 5621GP*	*1N 5623GP*	*UNITS*
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	1000	Amps
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.0					Amp
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.2					Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	0.5 25.0					μA
*Maximum reverse recovery time (NOTE 1)	t_{rr}	150		250	300	500	ns
Typical junction capacitance (NOTE 2)	C_J	25.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	45.0					°C/W
* Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

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Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

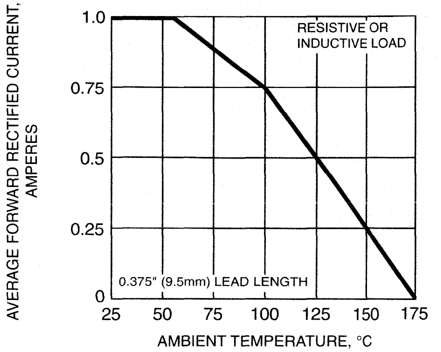


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

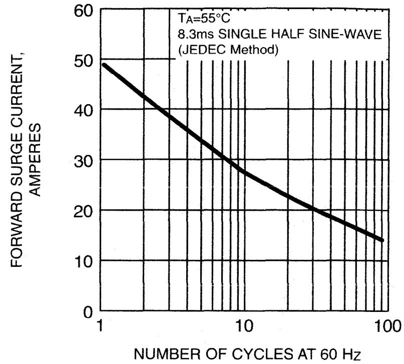


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS

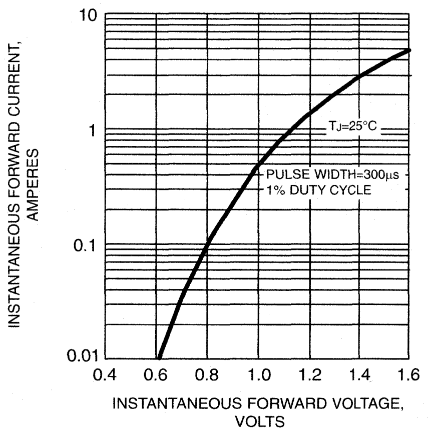


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

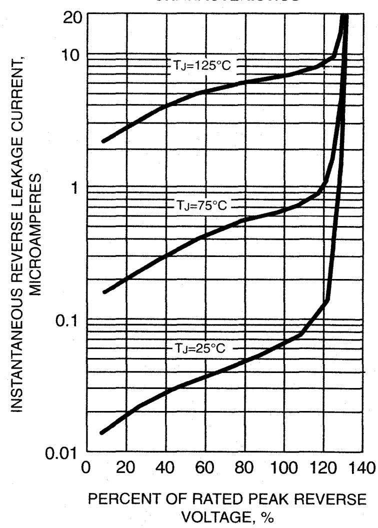
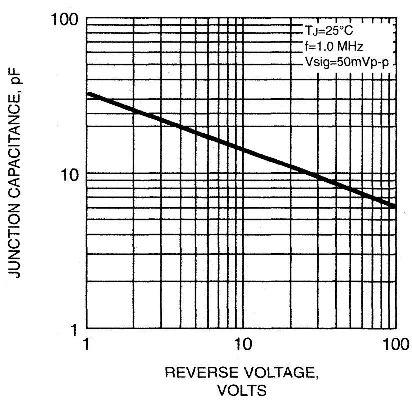


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



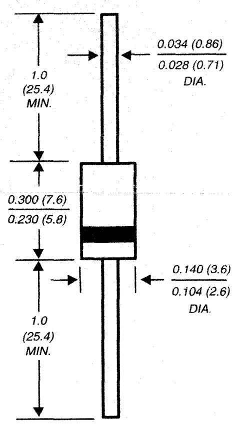
GI810 THRU GI818

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.0 Ampere*

PATENTED*

DO-204AC

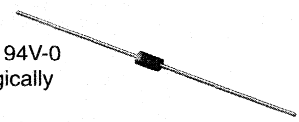


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GI 810*	*GI 811*	*GI 812*	*GI 814*	*GI 816*	*GI 817*	*GI 818*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{(AV)}$	1.0							Amp
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}	30.0							Amps
Maximum instantaneous forward voltage at 1.0A	V_F	1.2							Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=100°C	I_R	10.0 100.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	750.0							ns
Typical junction capacitance (NOTE 2)	C_J	25.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	45.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=1.0A, V_R=30V, di/dt=50A/μs
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

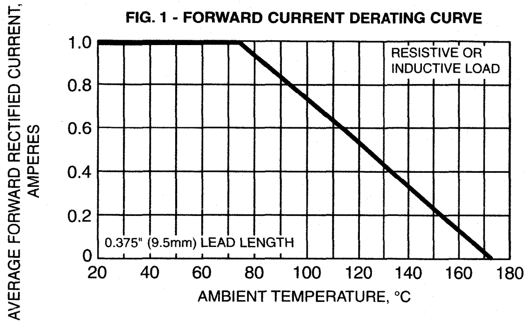


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

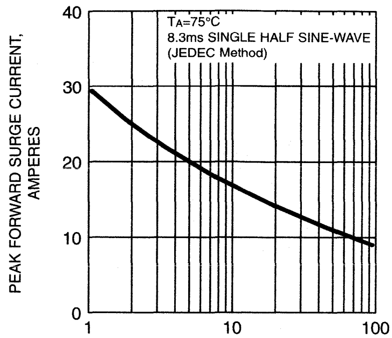


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

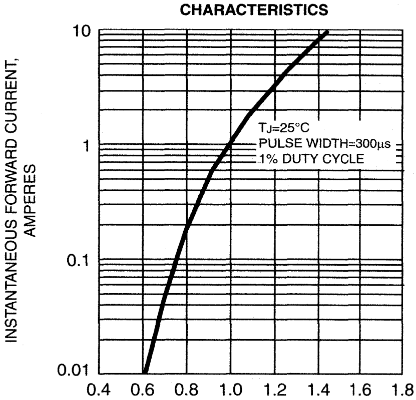


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

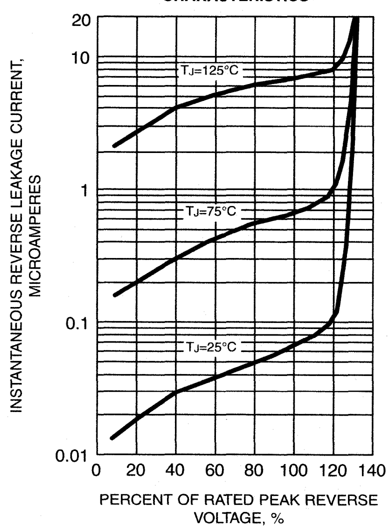
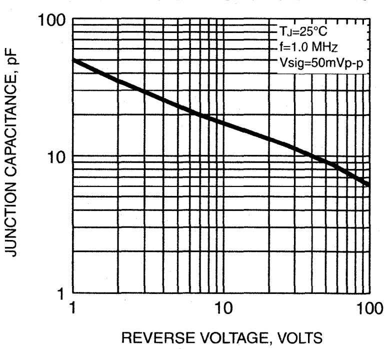


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



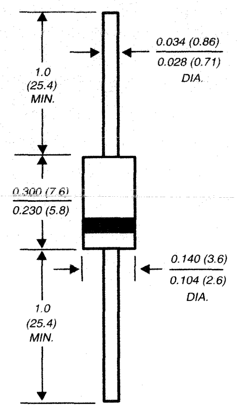
1N5391GP THRU 1N5399GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

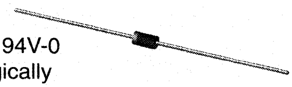
PATENTED*

DO-204AC



Dimensions in inches and (millimeters)
* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 1.5 Ampere operation at T_A=70°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N53 91GP	1N53 92GP	1N53 93GP	1N53 94GP	1N53 95GP	1N53 96GP	1N53 97GP	1N53 98GP	1N53 99GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
* Maximum RMS voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
* Maximum DC blocking voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_L=70°C	$I_{(AV)}$	1.5									Amps
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0									Amps
* Maximum instantaneous forward voltage at 1.5A, T_A=70°C	V_F	1.4									Volts
*Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	5.0 / 300.0									μA
* Maximum full load reverse current full cycle average, 0 375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	300.0									μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0									μs
Typical junction capacitance (NOTE 2)	C_J	15.0									pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	45.0									°C/W
*Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175									°C

NOTES:
(1) Reverse recovery test condition: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
* JEDEC registered values

FIG. 1 - FORWARD CURRENT DERATING CURVE

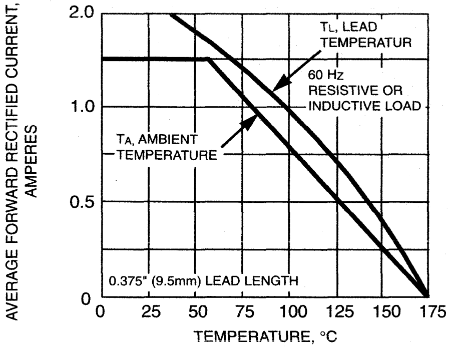


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

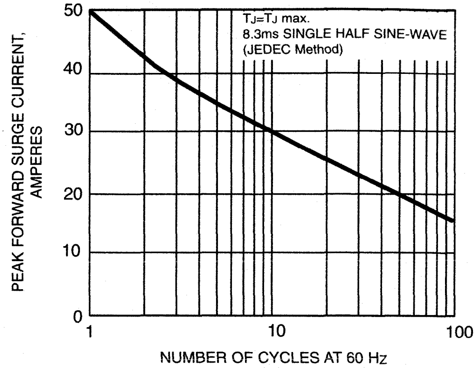


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

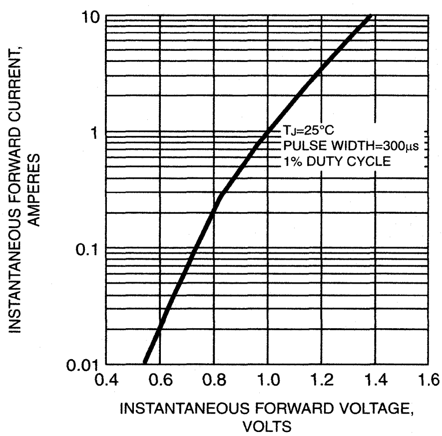


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

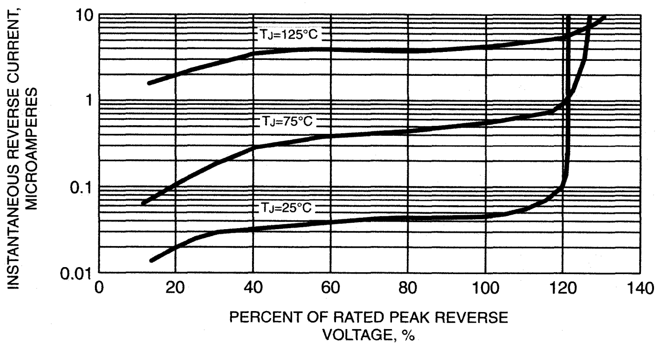
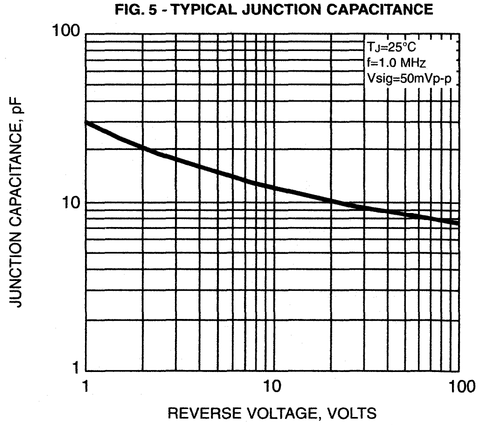


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



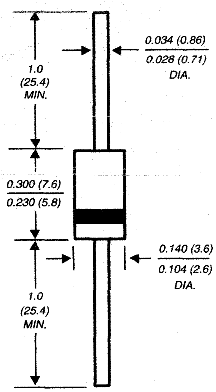
GP15A THRU GP15M

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

PATENTED*

DO-204AC

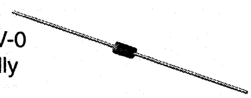


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- 1.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	GP 15A	GP 15B	GP 15D	GP 15G	GP 15J	GP 15K	GP 15M	UNITS
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.5							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 1.5A	V_F	1.1							Volts
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length atT_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum reverse current at rated DC blocking voltage T_A= 25°C / T_A=150°C	I_R	5.0 200.0							μA
Typical reverse recovery time (NOTE 1)	t_{rr}	2.0							μs
Typical junction capacitance (NOTE 2)	C_J	15.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	45.0 20.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

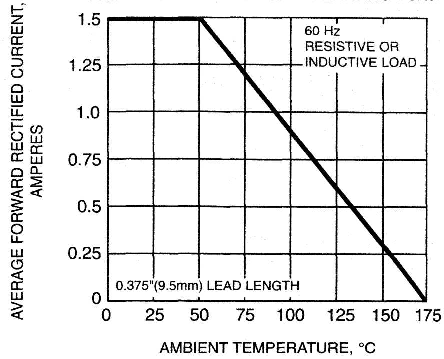


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

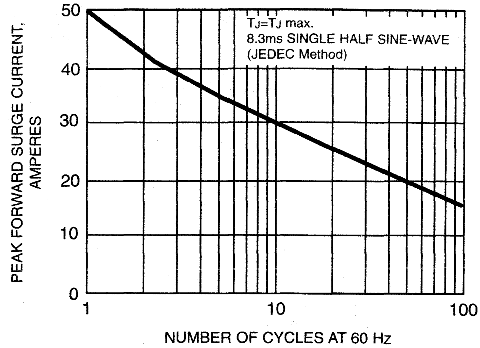


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

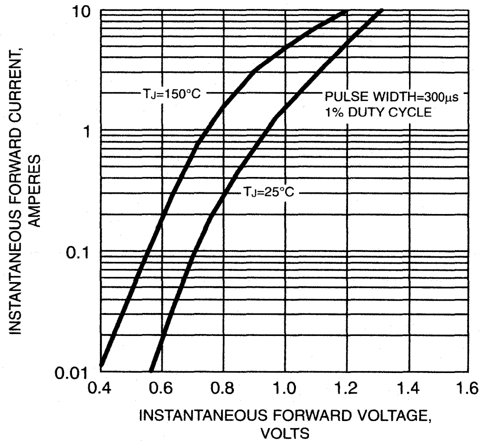


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

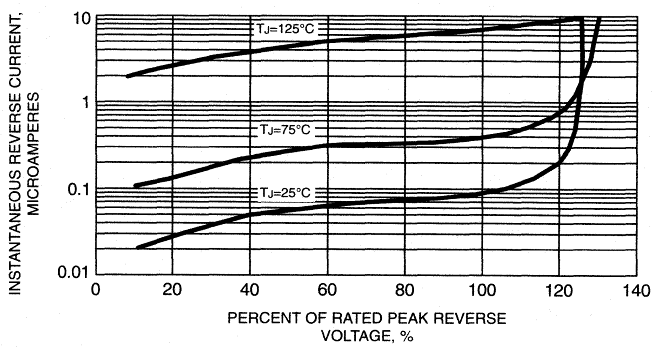
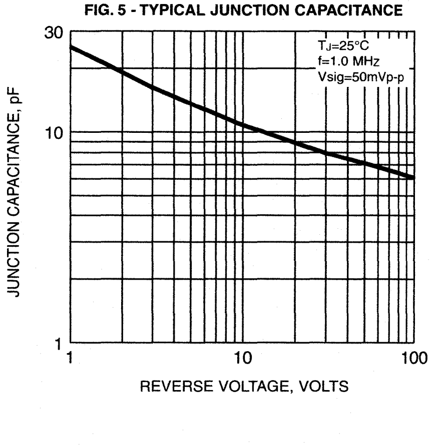


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



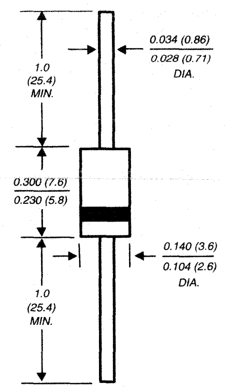
RGP15A THRU RGP15M

GLASS PASSIVATED JUNCTION
FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 1.5 Amperes*

PATENTED*

DO-204AC

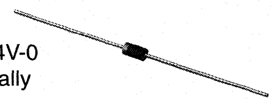


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930, 306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 1.5 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RGP 15A*	*RGP 15B*	*RGP 15D*	*RGP 15G*	*RGP 15J*	*RGP 15K*	*RGP 15M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	1.5							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum instantaneous forward voltage at 1.5A	V_F	1.3							Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	5.0 / 200.0							μA
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	25.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	45.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

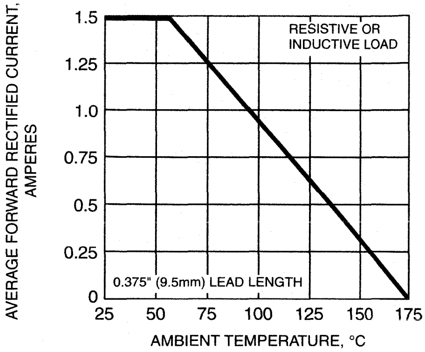


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

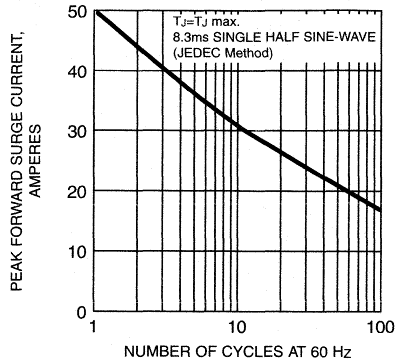


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

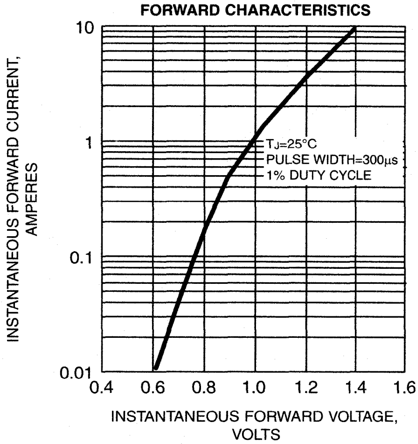


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

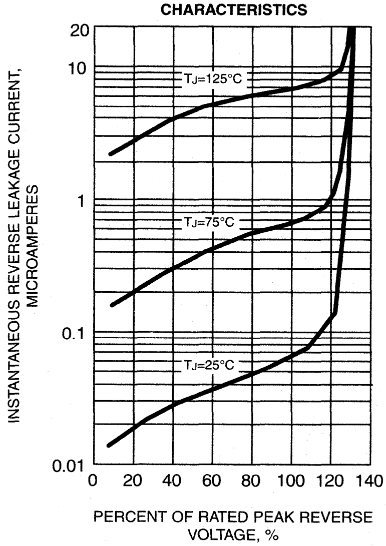
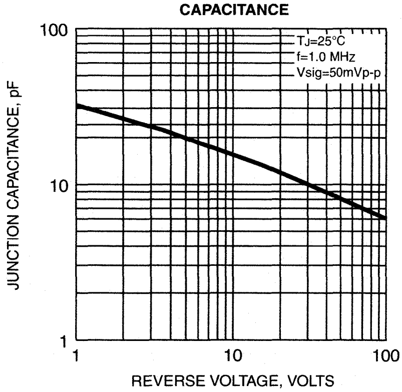


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



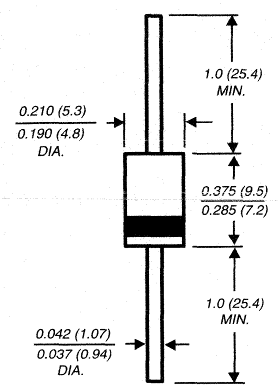
GP20A THRU GP20J

GLASS PASSIVATED JUNCTION RECTIFIER

Reverse Voltage *- 50 to 600 Volts* ***Forward Current*** *- 2.0 Amperes*

PATENTED*

Case Style GP20

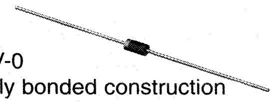


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 2.0 Ampere operation at T_A= 55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs.(2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Band denotes cathode end
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GP 20A*	*GP 20B*	*GP 20D*	*GP 20G*	*GP 20J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	2.0					Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	65.0					Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.2		1.1			Volts
Maximum reverse current at rated DC blocking voltage	I_R	5.0					μA
Maximum full load reverse current, full cycle average 0 375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0					μA
Typical reverse recovery time (NOTE 1)	trr	2.5					μs
Typical junction capacitance (NOTE 2)	C_J	40.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ $R_{\Theta JL}$	25.0 10.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

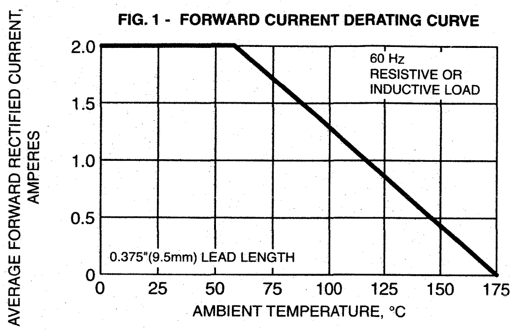


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

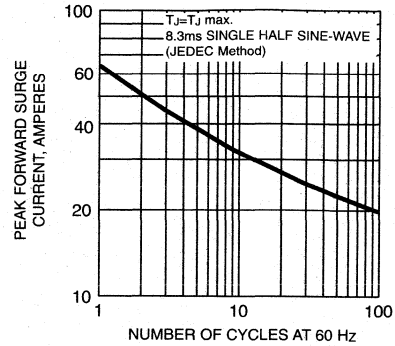


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

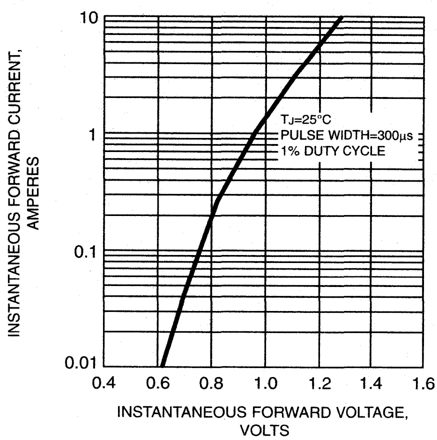


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

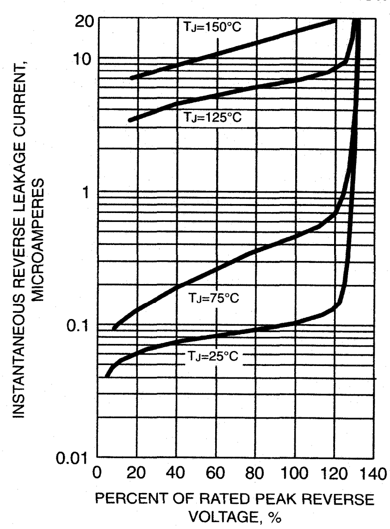
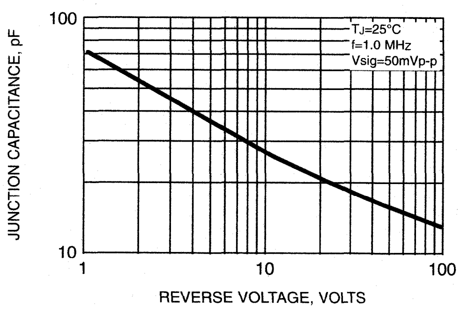


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



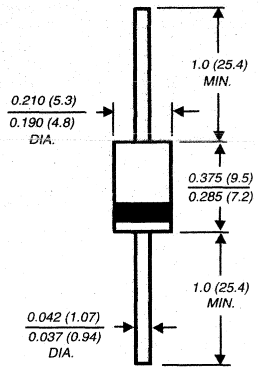
RGP20A THRU RGP20J

GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 600 Volts* ***Forward Current** - 2.0 Amperes*

PATENTED*

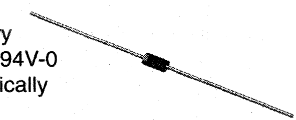
Case Style GP20



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High temperature metallurgically bonded construction
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- 2.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.2μA
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over solid glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RGP 20A*	*RGP 20B*	*RGP 20D*	*RGP 20G*	*RGP 20J*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	2.0					Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0					Amps
Maximum instantaneous forward voltage at 2.0A	V_F	1.3					Volts
Maximum DC reverse current T_A=25°C at rated DC blocking voltage T_A=125°C	I_R	5.0 100.0					μA
Maximum full load reverse current, full cycle average, 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0					μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150.0				250	ns
Typical junction capacitance (NOTE 2)	C_J	35.0					pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	22.0					°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175					°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

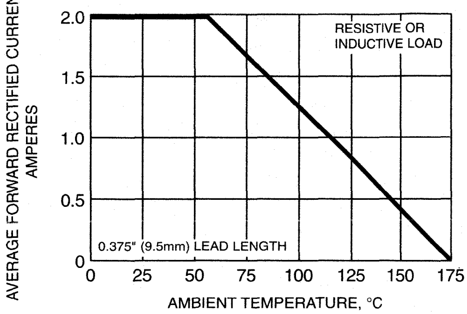


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

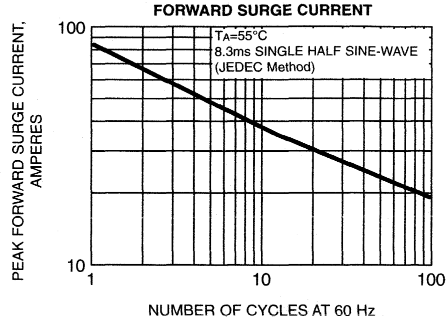


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

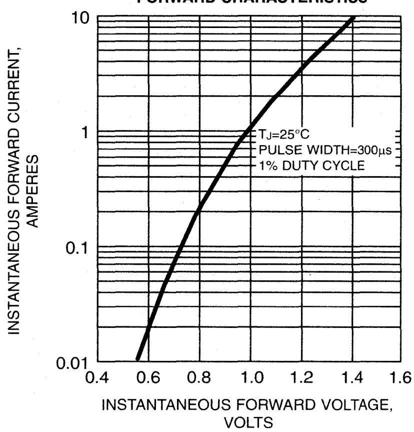


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

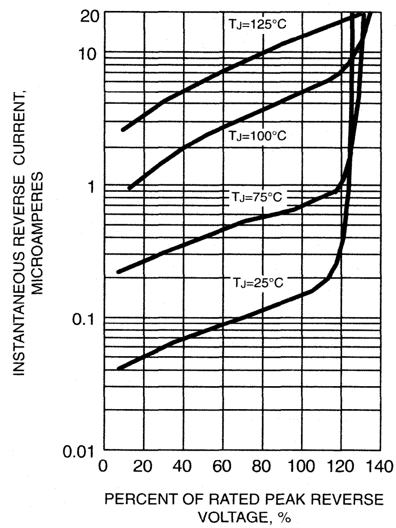
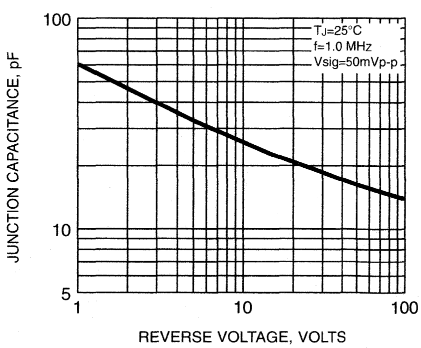


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

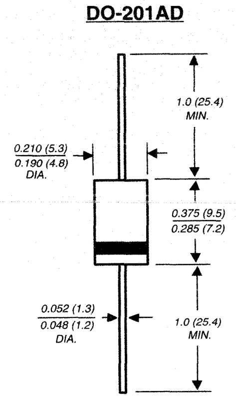


RGP25A THRU RGP25M

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 2.5 Amperes*

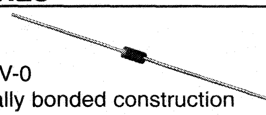
PATENTED*



Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No 3,930,306*

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ 2.5 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.2μA
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ Fast switching for high efficiency
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RGP 25A*	*RGP 25B*	*RGP 25D*	*RGP 25G*	*RGP 25J*	*RGP 25K*	*RGP 25M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	2.5							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum instantaneous forward voltage at 2.5A	V_F	1.3							Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 / 200.0							μA
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=55°C	I_R	100.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	60.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	20.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

FIG. 1 - FORWARD CURRENT DERATING CURVE

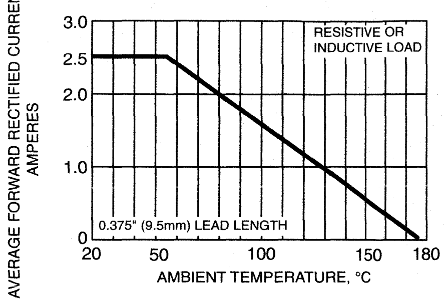


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

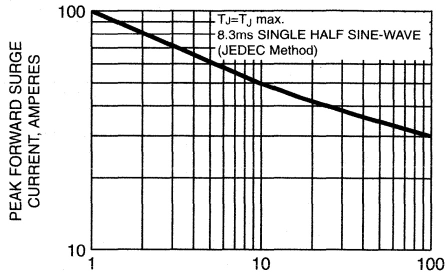


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

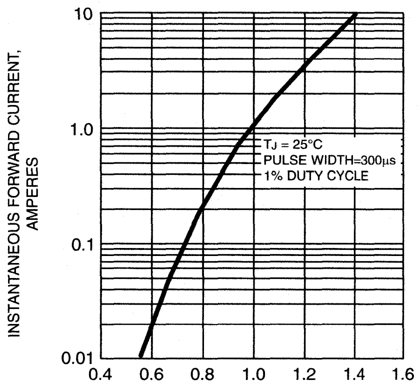


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

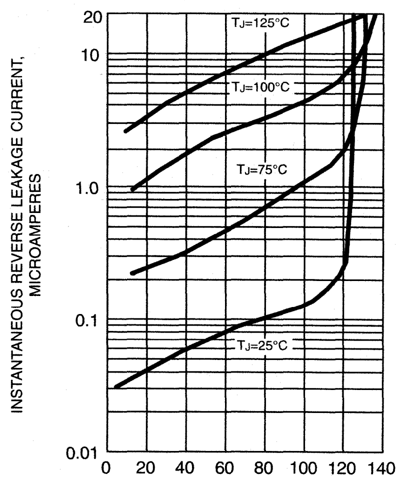
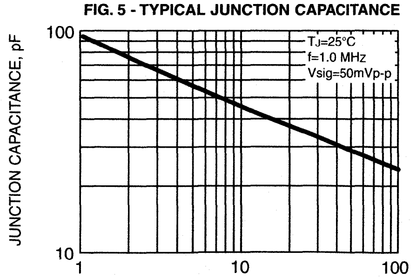


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



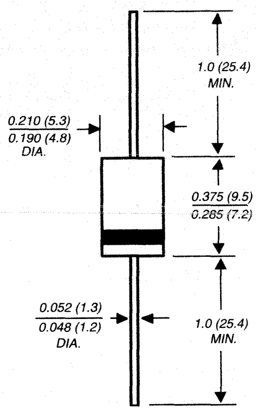
1N5624GP THRU 1N5627GP

GLASS PASSIVATED JUNCTION RECTIFIER

***Reverse Voltage** - 200 to 800 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

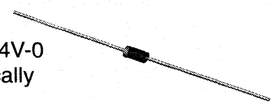
DO-201AD



Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 3.0 Ampere operation at T_A=70°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N5624GP	1N5625GP	1N5626GP	1N5627GP	UNITS
* Maximum repetitive peak reverse voltage	V_{RRM}	200	400	600	800	Volts
* Maximum DC blocking voltage	V_{DC}	200	400	600	800	Volts
* Maximum average forward rectified current 0.375" (9.5mm) lead lengths at T_A=70°C	$I_{(AV)}$	3.0				Amps
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
* Maximum instantaneous forward voltage at 3.0A T_A=25°C / T_A=70°C	V_F	1.0 / 0.95				Volts
Maximum reverse current at rated DC blocking voltage T_A=25°C	I_R	5.0				μA
Maximum reverse current at rated DC blocking voltage T_A=150°C	I_R	300.0		200.0		μA
Maximum full load reverse current, full cycle average, 0.375" (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	200.0				μA
Typical reverse recovery time (NOTE 1)	t_{rr}	3.0				μs
Typical junction capacitance (NOTE 2)	C_J	40.0				pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	20.0				°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175				°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted
*JEDEC Values

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FIG. 1 - FORWARD CURRENT DERATING CURVE

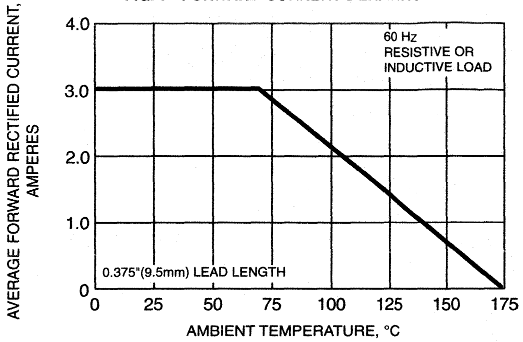


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

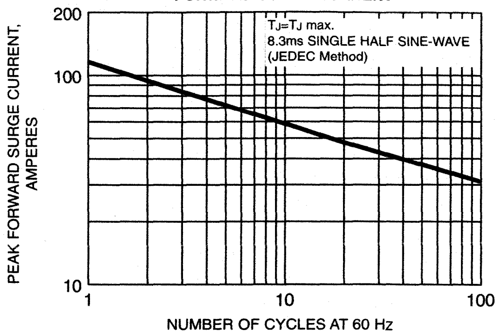


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

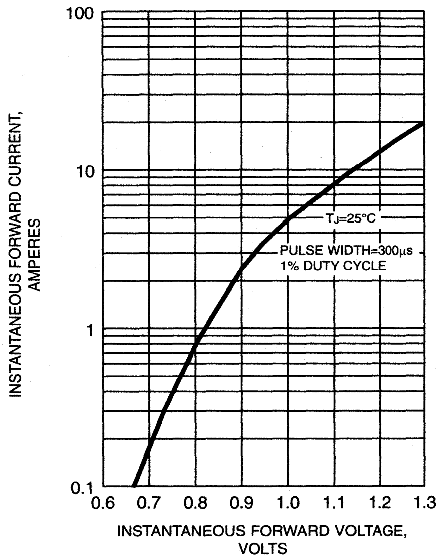


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

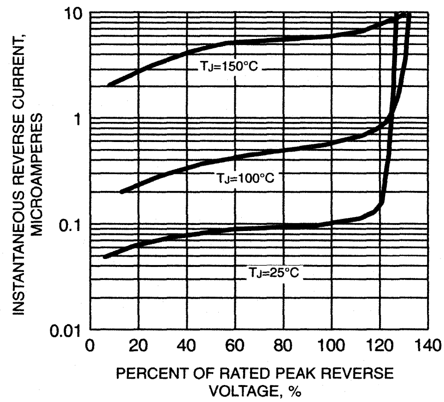
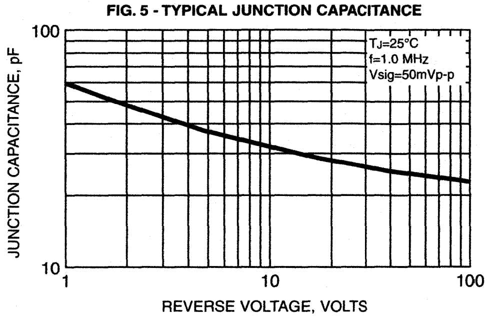


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



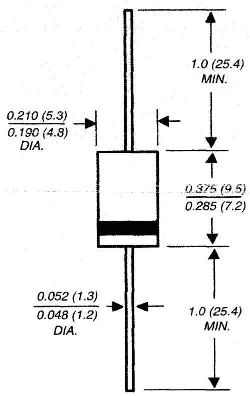
GP30A THRU GP30M

GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

DO-201AD

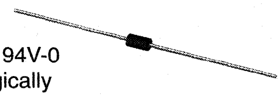


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ High temperature metallurgically bonded construction
- ♦ Glass passivated cavity-free junction
- ♦ Capable of meeting environmental standards of MIL-S-19500
- ♦ 3.0 Ampere operation at T_A=55°C with no thermal runaway
- ♦ Typical I_R less than 0.1μA
- ♦ High temperature soldering guaranteed: 350°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*GP 30A*	*GP 30B*	*GP 30D*	*GP 30G*	*GP 30J*	*GP 30K*	*GP 30M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0							Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.2		1.1					Volts
Maximum reverse current at rated DC blocking voltage T_A=25°C / T_A=150°C	I_R	5.0 / 100.0							μA
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	3.0							μs
Typical junction capacitance (NOTE 2)	C_J	40.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$ / $R_{\Theta JL}$	20.0 / 10.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted

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FIG. 1 - FORWARD CURRENT DERATING CURVE

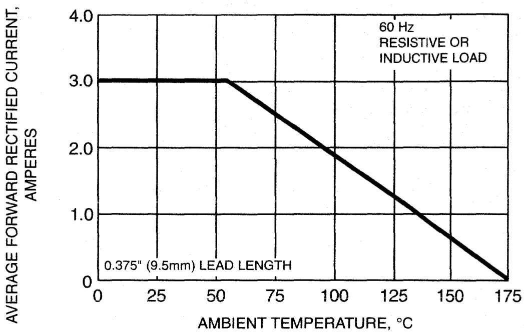


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

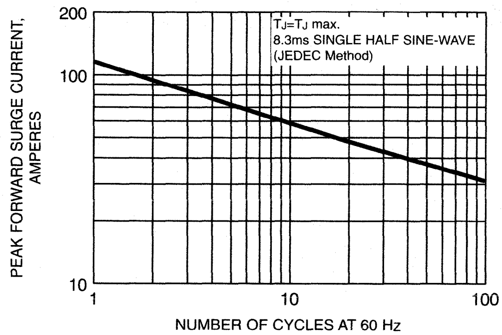


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

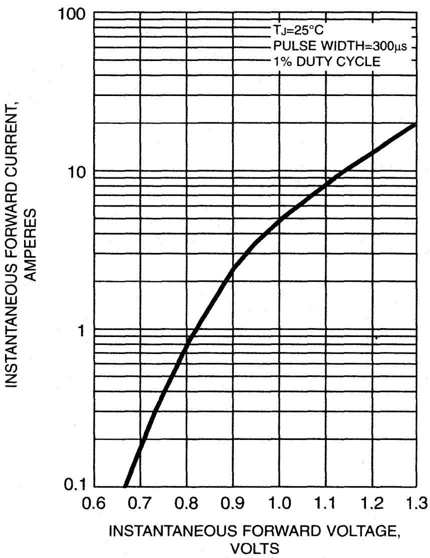


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

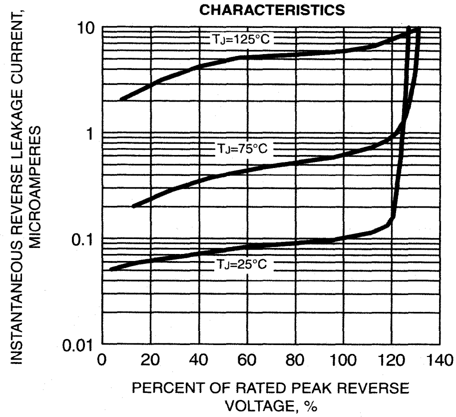
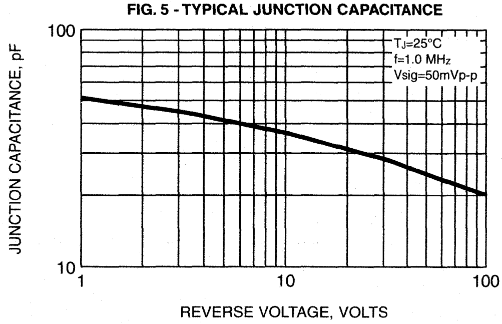


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



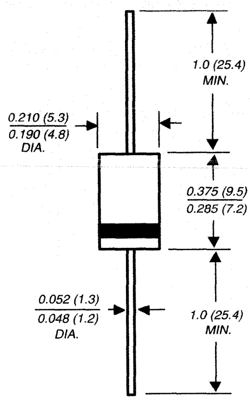
RGP30A THRU RGP30M

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Reverse Voltage** - 50 to 1000 Volts* ***Forward Current** - 3.0 Amperes*

PATENTED*

DO-201AD

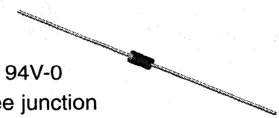


Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 and brazed-lead assembly by Patent No. 3,930,306*

SUPERECTIFIER

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- High temperature metallurgically bonded construction
- 3.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.2μA
- Fast switching for high efficiency
- High temperature soldering guaranteed 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic over glass body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.04 ounce, 1.12 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*RGP 30A*	*RGP 30B*	*RGP 30D*	*RGP 30G*	*RGP 30J*	*RGP 30K*	*RGP 30M*	*UNITS*
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0							Amps
Maximum instantaneous forward voltage at 3.0A	V_F	1.3							Volts
Maximum DC reverse current at rated DC blocking voltage T_A=25°C / T_A=125°C	I_R	5.0 100.0							μA
Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length at T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum reverse recovery time (NOTE 1)	t_{rr}	150				250	500		ns
Typical junction capacitance (NOTE 2)	C_J	60.0							pF
Typical thermal resistance (NOTE 3)	$R_{\Theta JA}$	20.0							°C/W
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175							°C

NOTES:
(1) Reverse recovery test conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A
(2) Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts
(3) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted

General Instrument
Power Semiconductor Division

FIG. 1 - FORWARD CURRENT DERATING CURVE

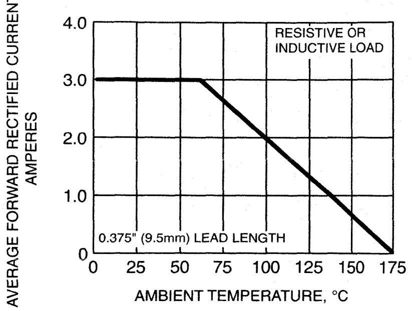


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

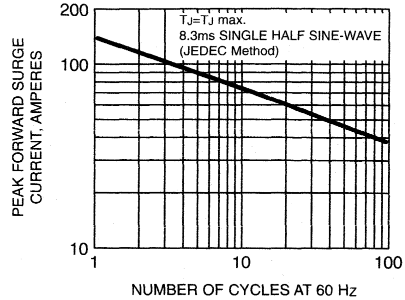


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

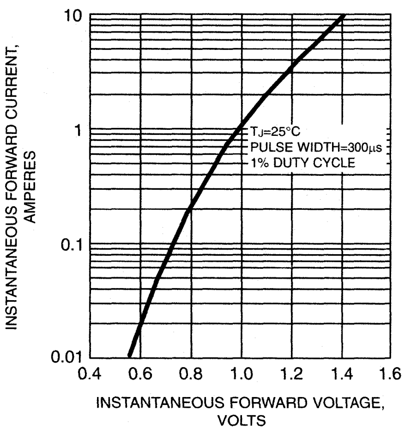


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

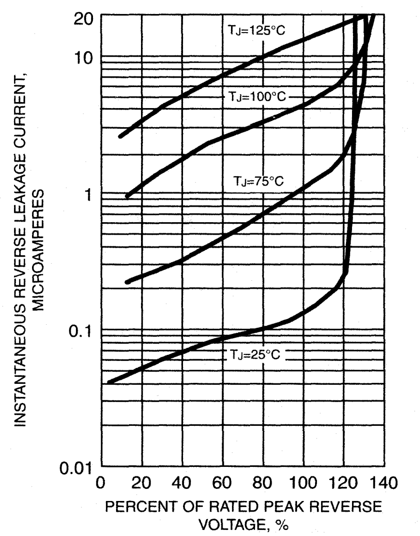
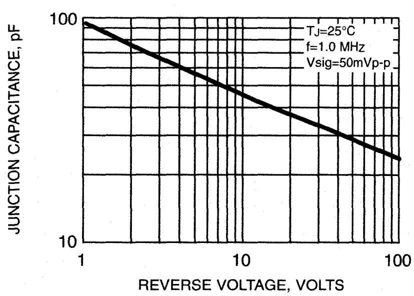


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



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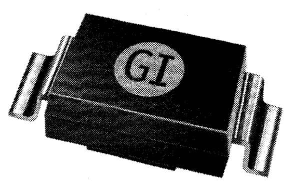
TRANSIENT VOLTAGE SUPPRESSORS

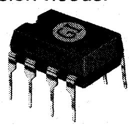
TVS



INTRODUCTION TO TRANSIENT VOLTAGE SUPPRESSORS

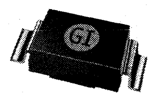
General Instrument delivers "state of the art" Transient Voltage Suppressors (TVS). Based on controlled avalanche technology, these voltage clamping devices utilize a specific soft solder construction. This physical design enables these avalanche diodes to absorb large amounts of energy for short time durations without sustaining damage. When used within each component's power handling capability, GI TVS' do not exhibit a wear out mechanism, as many MOV and similar technologies do. With sub-nanosecond turn-on times and superior clamping characteristics as compared to MOV's, GI TVS' are the preferable option for your transient suppression needs.


DO-204AC


ARRAY


DO-204AL


P600


SMX


MELF

TRANSIENT VOLTAGE SUPPRESSOR

Part numbering system for all parts excluding JEDEC registered, Pro Electron and industry standard parts

1. AXIAL

a) MINI 400W AUTOMOTIVE TVS
TMPG06 - YYD - ZZZZ

T = TVS

MPG06 = Mini-Plastic Glass "06" package style

YY = Nominal Breakdown Voltage (in volts)

D = Breakdown Voltage Tolerance
"Blank" = ±10%
A = ±5%

ZZZZ = Customer specific instructions (not shown in databook)

b) TVS SPECIFIED BY NOMINAL BREAKDOWN VOLTAGE
XXKBYYYD-ZZZZ

XXK = Power Ratings
P4K = 0.4KW (ie, 400 Watts)
P6K = 0.6KW (ie, 600 Watts)
1.5K = 1.5KW (ie, 1500 Watts)
5K = 5KW (ie, 5000 Watts) (unidirectional only)

B = Type Designator
A = Automotive (unidirectional only)
E = non-Automotive: 400W-1.5KW (original meaning: epoxy package)
P = non-Automotive: 5KW only (original meaning: high Power)

YYY = Nominal Breakdown Voltage (in volts)

D = Breakdown Voltage Tolerance/Polarity
"Blank" = ±10%/unidirectional
A = ±5%/unidirectional
C = ±10%/bidirectional
CA = ±5%/bidirectional

ZZZZ = Customer specific instructions (not shown in databook)

1. AXIAL (cont'd)

c) TVS SPECIFIED BY STAND-OFF VOLTAGE

(1) 500W
SABYYYD-ZZZZ

SA = Surge Arrestor

B = Type Designator
"Blank" = standard
C = Low Capacitance (unidirectional only)

YYY = stand-off voltage (in volts)

D = Breakdown Voltage Tolerance/Polarity
"Blank" = ±10%/unidirectional
A = ±5%/unidirectional
C = ±10%/bidirectional
CA = ±5%/bidirectional

ZZZZ = Customer specific instructions (not shown in databook)

(2) 1500W
AAAAYYD-ZZZZ

AAAA = Application Designator
ICTE = Integrated Circuit TVS (±1V Tolerance)
LCE = Low Capacitance TVS (unidirectional only)

YY = Stand-off Voltage (in volts)

D = Breakdown Voltage Tolerance/Polarity
"Blank" = standard
A = ±5% ("LCE" only)
C = bidirectional ("ICTE" only)

ZZZZ = Customer specific instructions (not shown in databook)

TRANSIENT VOLTAGE SUPPRESSOR (CONT'D)

(1) **AXIL** <u>(cont'd)</u>

(3) **6000W AUTOMOTIVE LOAD DUMP TVS**
6KA24 - ZZZZ

6K = 6000 Watts
A = Automotive
24 = 24V stand-off voltage

ZZZZ = Customer specific instructions (not shown in databook)

2. **Surface Mount**

a) **MELF**
TGL41-YYD-ZZZZ

T = TVS

G = Glass passivated

L41 = Leadless "41" package (MELF/DO-213AB): 300W

YY = Nominal Breakdown Voltage (in volts)

D = Breakdown Voltage Tolerance/Polarity
"Blank" = ±10%/unidirectional
A = ±5%/unidirectional
C = ±10%/bidirectional
CA = ±5%/bidirectional

ZZZZ = Customer specific instructions (not shown in databook)

(2) **SURFACE MOUNT** <u>(cont'd)</u>
b) **SMX**
(1) **NON-AUTOMOTIVE**
SMXBYYYD-ZZZZ

SMX = Surface Mount Package style
SMA = DO-214AC (J-Bend): 300W
SMB = DO-214AA (J-Bend) or DO-215AA **(gull-wing):** 600W
SMC = DO-214AB (J-Bend) or DO-215AB **(gull-wing):** 1500W

B = lead form
J = J-bend
G = gull-wing
YYY = Stand-off voltage (in Volts)

D = Breakdown Voltage Tolerance/Polarity
"Blank" = ±10%/unidirectional
A = ±5%/unidirectional
C = ±10%/bidirectional
CA = ±5%/bidirectional
ZZZZ = Customer specific instructions (not shown in databook)

(2) **Automotive**
TPSMXYYD-ZZZZ

T = TVS
P = Automotive designator

SMX = Surface Mount Package style
SMA = DO-214AC (J-Bend): 400W
SMB = DO-214AA (J-Bend): 600W
SMC = DO-214AB (J-Bend): 1500W

YY = nominal breakdown voltage (in Volts)

D = Breakdown Voltage Tolerance
"Blank" = ±10%
A = ±5%
ZZZZ = Customer specific instructions (not shown in databook)

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

P_{PPM}(W)		400		600		1500		6000
CASE TYPE	D0204AL	MPG06	DO24AC	D020AAC	D0214AA	1.5KA	D0214AB	P600
BREAKDOWN VOLTAGE $V_{(BR)}$ V NOM (1)								
6.8	P4KA6.8	TMPG06-6.8	TPSMA6.8	P6KA6.8	TPSMB6.8	1.5KA6.8	TPSMC6.8	
7.5	P4KA7.5	TMPG06-6.8	TPSMA7.5	P6KA7.5	TPSMB7.5	1.5KA7.5	TPSMC7.5	
8.2	P4KA8.2	TMPG06-8.2	TPSMA8.2	P6KA8.2	TPSMB8.2	1.5KA8.2	TPSMC8.2	
9.1	P4KA9.1	TMPG06-9.1	TPSMA9.1	P6KA9.1	TPSMB9.1	1.5KA9.1	TPSMC9.1	
10.0	P4KA10	TMPG06-10	TPSMA10	P6KA10	TPSMB10	1.5KA10	TPSMC10	
11.0	P4KA11	TMPG06-11	TPSMA11	P6KA11	TPSMB11	1.5KA11	TPSMC11	
12.0	P4KA12	TMPG06-12	TPSMA12	P6KA12	TPSMB12	1.5KA12	TPSMC12	
13.0	P4KA13	TMPG06-13	TPSMA13	P6KA13	TPSMB13	1.5KA13	TPSMC13	
15.0	P4KA15	TMPG06-15	TPSMA15	P6KA15	TPSMB15	1.5KA15	TPSMC15	
16.0	P4KA16	TMPG06-16	TPSMA16	P6KA16	TPSMB16	1.5KA16	TPSMC16	
18.0	P4KA18	TMPG06-18	TPSMA18	P6KA18	TPSMB18	1.5KA18	TPSMC18	
20.0	P4KA20	TMPG06-20	TPSMA20	P6KA20	TPSMB20	1.5KA20	TPSMC20	
22.0	P4KA22	TMPG06-22	TPSMA22	P6KA22	TPSMB22	1.5KA22	TPSMC22	
24.0	P4KA24	TMPG06-24	TPSMA24	P6KA24	TPSMB24	1.5KA24	TPSMC24	
27.0	P4KA27	TMPG06-27	TPSMA27	P6KA27	TPSMB27	1.5KA27	TPSMC27	6KA24
30.0	P4KA30	TMPG06-30	TPSMA30	P6KA30	TPSMB30	1.5KA30	TPSMC30	
33.0	P4KA33	TMPG06-33	TPSMA33	P6KA33	TPSMB33	1.5KA33	TPSMC33	
36.0	P4KA36	TMPG06-36	TPSMA36	P6KA36	TPSMB36	1.5KA36	TPSMC36	
39.0	P4KA39	TMPG06-39	TPSMA39	P6KA39	TPSMB39	1.5KA39	TPSMC39	
43.0	P4KA43	TMPG06-43	TPSMA43	P6KA43	TPSMB43	1.5KA43	TPSMC43	

NOTES:
(1) Standard device is ± 10% tolerance add "A" suffix to part number of ± 5% tolerance (2) Peak pulse power waveform: 10/1000us at T_A=25°C

TRANSIENT VOLTAGE SUPPRESSOR

P_{PPM} (W)	175		200	300				400		500	
CASE TYPE	MS012AA	MS013AC	DO-214AC	DO-214AC	MS-012AA	MS-012AB	DO-213AB	DO-204AL		DO-204AC	
BREAKDOWN V $V_{(BR)}$ V NOM. (1)											
6.8	SMDA05-6	SMDA05-18	SMAJ05.0C	SMAJ5.0	SMDA05C-4	SMDA05C-8	TGL41-6.8	BZW04P5VB	P4KE6.8	SA5.0	SAC5.0
7.5				SMAJ6.0			TGL41-7.5	BZW04P6V4	P4KE7.5	SA6.0	SAC6.0
8.0				SMAJ6.5						SA6.5	
8.2							TGL41-8.2		P4KE8.2		
8.6				SMAJ7.0						SA7.0	SAC7.0
9.1							TGL419.1	BZW04P7V0	P4KE9.1		
9.2			SMAJ7.5C	SMAJ7.5				BZW04P7VB		SA7.5	
9.9				SMAJ8.0						SA8.0	SAC8.0
10.0							TGL41-10		P4KE10		
10.5				SMAJ8.5				BZW04PBV5		SA8.5	SAC8.5
11				SMAJ9.0			TGL41-11	BZW04P9V4	P4KE11	SA9.0	
12							TGL41-12		P4KE12		
12.3			SMAJ10C	SMAJ10				BZW04P10		SA10	SAC10
13							TGL41-13		P4KE13		
13.5				SMAJ11				BZW04P11		SA11	
14.8				SMAJ12	SMDA12C-4	SMDA12C-8				SA12	SAC12
15							TGL41-15		P4KE15		
16				SMAJ13			TGL41-16	BZW04P13	P4KE16	SA13	
17.3				SMAJ14				BZW04P14		SA14	
18							TGL41-18		P4KE18		
18.5			SMAJ15C	SMAJ15	SMDA15C-4	SMDA15C-8		BZW04P15		SA15	SAC15
19.8				SMAJ16						SA16	
20									P4KE20		
21				SMAJ17				BZW04P17		SA17	
22							TGL41-22	BZW04P19	P4KE22		
22.2				SMAJ18						SA18	SAC18
24							TGL41-24		P4KE24		
24.6				SMAJ20				BZW04P20		SA20	
27				SMAJ22			TGL41-27		P4KE27	SA22	SAC22
29.6			SMAJ24C	SMAJ24	SMDA24C-4	SMDA24C-8		BZW04P23		SA24	
30							TGL41-30		P4KE30		
32.1				SMAJ26				BZW04P26		SA26	SAC26
33							TGL41-33		P4KE33		
34.5				SMAJ28						SA28	
36							TGL41-36	BZW04P28	P4KE36		
37				SMAJ30				BZW04P31		SA30	SAC30
39							TGL41-39		P4KE39		
40.8				SMAJ33				BZW04P33		SA33	
43							TGL41-43		P4KE43		
44.4				SMAJ36				BZW04P37		SA36	SAC36
47							TGL41-47		P4KE47		
49.3				SMAJ40				BZW04P40		SA40	
51							TGL41-51	BZW04P44	P4KE51		
53.1				SMAJ43						SA43	
55.5				SMAJ45						SA45	SAC45
56							TGL41-56		P4KE56		
59.2				SMAJ48				BZW04P48		SA48	
62							TGL41-62		P4KE62		SAC50
63				SMAJ51				BZW04P53		SA51	
66.6				SMAJ54							
68							TGL41-68		P4KE68		
71.5				SMAJ58				BZW04P58		SA58	
74.1				SMAJ60						SA60	
75							TGL41-75		P4KE75		
79				SMAJ64				BZW04P64		SA64	
82							TGL41-82		P4KE82		
86.4				SMAJ70				BZW04P70		SA70	
91							TGL41-91		P4KE91		
92.6				SMAJ75						SA75	
96.3				SMAJ78				BZW04P78		SA78	
100							TGL41-100		P4KE100		
104.7				SMAJ85				BZW04P85		SA85	
110							TGL41-110		P4KE110		
111.0				SMAJ90				BZW04P94		SA90	
120							TGL41-120		P4KE120		
123.5				SMAJ100						SA100	
130							TGL41-130	BZW04P102	P4KE130		
135.5				SMAJ110				BZW04P110		SA110	
148.0				SMAJ120						SA120	
150							TGL41-150	BZW04P128	P4KE150		
160				SMAJ130			TGL41-160	BZW04P171	P4KE160	SA130	
164								BZW04P136			
170							TGL41-170		P4KE170		
174								BZW04P145			
180							TGL41-180		P4KE180		
185.5				SMAJ150				BZW04P154		SA150	
198.0				SMAJ160						SA160	
200							TGL41-200		P4KE200	SA170	
210.0				SMAJ170	SA170	220		BZW04P188	P4KE220		
250								BZW04P213	P4KE250		
287								BZW04P239			
300								BZW04P256	P4KE300		
328								BZW04P273			
350								BZW04P299	P4KE350		
400								BZW04P342	P4KE400		
440								BZW04P376		P4KE440	

NOTES:

(1) Standarrd device is ± 10% tolerance, add "A" suffix to part number for 5% tolerance

(2) Peak pulse power wsaveform: 10/1000μs at T_A=25°C

TRANSIENT VOLTAGE SUPPRESSOR

P_{PPM} (W)	600		1500						5000
CASE TYPE	DO-240AC	DO-214/215AA	1.5KE					DO-214/215AB	P6000
BREAKDOWN (V) $V_{(BR)}$ V NOM.(1)									
6.8	P6KE6.8	SMBGJ5.0	IN6267	1.5KE6.8	IN6373	ICTE-5*		SMCGJ5.0	5KP5.0
7.5	P6KE7.5	SMBGJ6.0	IN6268	1.5KE7.5				SMCGJ6.0	5KP6.0
8.0		SMBGJ6.5					LCE6.5	SMCGJ6.5	5KP6.5
8.2	P6KE8.2		1N6269	1.5KE8.2					
8.6		SMBGJ7.0					LCE7.0	SMCGJ7.0	5KP7.0
9.1	P6KE9.1		IN6270	1.5KE9.1					
9.2		SMBGJ7.5					LCE7.5	SMCGJ7.5	5KP7.5
9.9		SMBGJ8.0	IN6374/IN6383			ICTE-8/ICTE-8C	LCE8.0	SMCGJ8.0	5KP8.0
10.0	P6KE10		IN6271	1.5KE10					
10.5		SMBGJ8.5					LCE8.5	SMCGJ8.5	5KP8.5
11	P6KE11	SMBGJ9.0	IN6272	1.5KE11			LCE9.0	SMCGJ9.0	5KP9.0
12	P6KE12		IN6273	1.5KE12					
12.3		SMBGJ10	IN6375/IN6383			ICTE-10/ICTE-10C	LCE10	SMCGJ10	5KP10
13	P6KE13		IN6274	1.5KE13					
13.5		SMBGJ11					LCE11	SMCGJ11	5KP11
14.8		SMBGJ12	IN6376/IN6384			ICTE-12/ICTE12C	LCE12	SMCGJ12	5KP12
15	P6KE15		IN6275	1.5KE15					
16	P6KE16	SMBGJ13	IN6276	1.5KE16			LCE13	SMCGJ13	5KP13
17.3		SMBGJ14					LCE14	SMCGJ14	5KP14
18	P6KE18		IN6277	1.5KE18					
18.5		SMBGJ15	IN6377/IN6385			ICTE-15/ICTE-15C	LCE15	SMCGJ15	5KP15
19.8		SMBGJ16					LCE16	SMCGJ16	5KP16
20	P6KE20		IN6278	1.5KE20					
21		SMBGJ7					LCE17	SMCGJ17	5KP17
22	P6KE22		IN6279	1.5KE22					
22.2		SMBGJ18					LCE18	SMCGJ18	5KP18
24	P6KE24		1N6280	1.5KE24					
24.6		SMBGJ20					LCE20	SMCGJ20	5KP20
27	P6KE27	SMBGJ22	IN6281	1.5KE27			LCE22	SMCGJ22	5KP22
29.6		SMBGJ24					LCE24	SMCGJ24	5KP24
30	P6KE30		IN6282	1.5KE30					
32.1		SMBGJ26					LCE26	SMCGJ26	5KP26
33	P6KE33		IN6283	1.5KE33					
34.5		SMBGJ28					LCE28	SMCGJ28	5KP28
36	P6KE36		IN6284	1.5KE36					
37.0		SMBGJ30						SMCGJ30	5KP30
39.0	P6KE39		IN6285	1.5KE39					
40.8		SMBGJ33						SMCGJ,33	5KP33
43	P6KE43		IN6286	1.5KE43					
44.4		SMBGJ36						SMCGJ36	5KP36
47	P6KE47		IN6287	1.5KE47					
49.3		SMBGJ40						SMCGJ40	5KP40
51	P6KE51		IN6288	1.5KE51					
53.1		SMBGJ43						SMCGJ43	5KP43
55.5		SMBGJ45						SMCGJ45	5KP45
56	P6KE56		IN6289	1.5KE56					
59.2		SMBGJ48						SMCGJ48	5KP48
62	P6KE62		IN6290	1.5KE62					
63		SMBGJ51						SMCGJ51	5KP51
66.6		SMBGJ54						SMCGJ54	5KP56
68	P6KE68		IN6291	1.5KE68					
71.5		SMBGJ58						SMCGJ58	5KP58
74.1		SMBGJ60						SMCGJ60	5KP60
75	P6KE75		IN6292	1.5KE75					
79		SMBGJ64						SMCGJ64	5KP64
82	P6KE82		IN6293	1.5KE82					

continued on next page

TRANSIENT VOLTAGE SUPPRESSOR (cont'd)

P_{PPM} (W)	600		1500						5000
CASE TYPE	DO-240AC	DO-214/215AA	1.5KE					D0-214/215A	P6000
BREAKDOWN (V) $V_{(BR)}$ V NOM. (1)									
86.4		SMBGJ,70						SMCGJ,70	5KP70
91	P6KE91		IN6294	1.5KE91					
92.6		SMBGJ,75						SMCGJ,75	5KP75
96.3		SMBGJ,78						SMCGJ,78	5KP78
100	P6KE100		IN6295	1.5KE100					
104		SMBGJ,85						SMCGJ,85	5KP85
110	P6KE110		IN6296	1.5KE110					
111.0		SMBGJ,90						SMCGJ,90	5KP90
120	P6KE120		IN6297	1.5KE120					
123		SMBGJ,100						SMCGJ,100	5KP100
130	P6KE130		IN6298	1.5KE130					
135.5		SMBGJ,110						SMCGJ,110	5KP110
148.0		SMBGJ,120						SMCGJ,120	5KP120
150	P6KE150		IN6299	1.5KE150					
160	P6KE160	SMBGJ,130	IN6300	1.5KE160				SMCGJ,130	
170	P6KE170		IN6301	1.5KE170					
180	P6KE180		IN6302	1.5KE180					
185.5		SMBGJ,150						SMCGJ,150	
198.0		SMBGJ,160						SMCGJ,160	
200	P6KE200		IN6303	1.5KE200					
210.0		SMBGJ,170						SMCGJ,170	
220	P6KE220			1.5KE220					
250	P6KE250			1.5KE250					
300	P6KE300			1.5KE300					
350	P6KE350			1.5KE350					
400	P6KE400			1.5KE400					
440	P6KE440			1.5KE440					

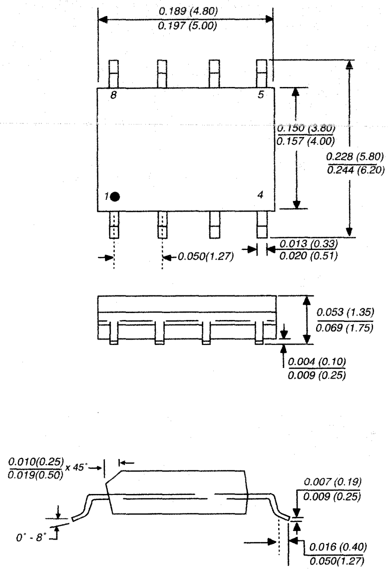
NOTES:
(1) Standard device is 10% tolerance, add "A": suffix to par number for 5 % tolerance
(2) Peak pulse power waveform : 10/1000μs at T_A=25°C

SMDA05-6

SURFACE MOUNT DIODE ARRAY TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 Volts* ***Peak Pulse Power** - 175 Watts*

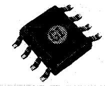
SO-8/MS-012-AA



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Offers ESD protection in accordance with IEC1000-4-2 (IEC801-2)



- ♦ Monolithic TVS junctions
- ♦ 175W peak pulse power surge capability
- ♦ Excellent clamping capability
- ♦ Protection of up to six data lines
- ♦ Fast response time: typically less than 1.0ns from 0 volts to $V_{(BR)}$
- ♦ High temperature soldering guaranteed: 265°C for 5 seconds at terminals

MECHANICAL DATA

Case: JEDEC MS-012-AA molded plastic over passivated junctions

Terminal: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: Unidirectional as marked

Mounting Position: Any

Weight: 0.04 ounce, 1.00 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak power dissipation with a 8.0/20μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 175	Watts
Peak power pulse current with a 8.0/20μs waveform (NOTE 1)	I_{PPM}	13.3	Amps
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +125	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad areas of 0.045 x 0.030" (1.14 x 0.076mm) per leg

UNIDIRECTIONAL APPLICATIONS

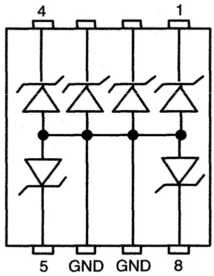
ELECTRICAL CHARACTERISTICS at 25°C

PART NUMBER	DEVICE MARKING CODE	STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE at I_T=10mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1A	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 5A	MAXIMUM FORWARD VOLTAGE DROP at I_F= 200 mA	MAXIMUM REVERSE LEAKAGE CURRENT at V_{WM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
UNIDIRECTIONAL		V_{WM} Volts	$V_{(BR)}$ Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	V_F Volts	I_D µA	C_J pF
SMDA05-6	QEB	5.0	6.0	9.8	11.0	1.25	20.0	120

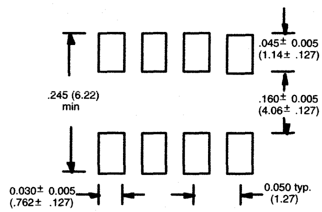
NOTES:
(1) $V_{(BR)}$ measured at pulse width of 300µs sq. wave or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) Junction capacitance measured between I/O pin and ground at 1.0 MHz and applied V_R=0 volts

*Application note: Due to the topology of the SMDA array, the V_{RWM} and $V_{(BR)}$ specifications also apply to the differential voltage between any two data line pins. Hence the SMDA05-6 is designed to "see" a maximum voltage excursion of ± 2.5 volts between any two data lines.

CIRCUIT DIAGRAM - top view



SOLDER PAD GEOMETRY



Dimensions in inches and (millimeters)

RATINGS AND CHARACTERISTIC CURVES FOR SMDA05-6

FIG. 1 - PEAK PULSE POWER RATING CURVE

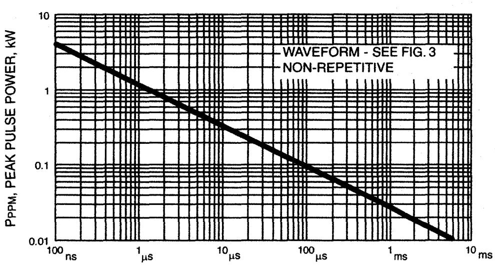


FIG. 2 - PULSE DERATING CURVE

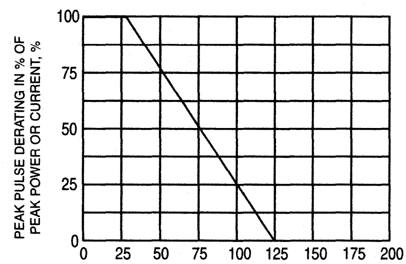


FIG. 3 - PULSE WAVEFORM

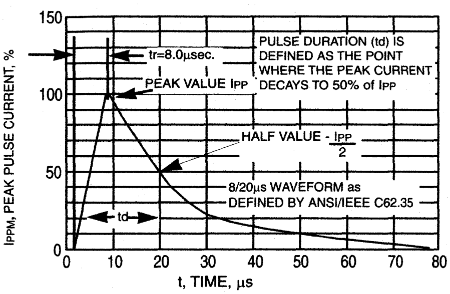
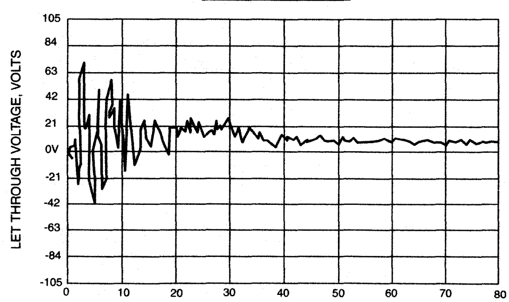


FIG. 4 - TYPICAL RESPONSE TO 8KV POSITIVE GOING ESD PULSE

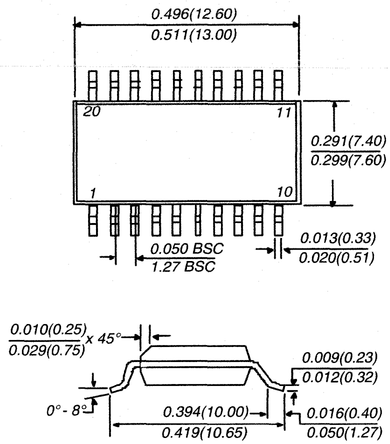


SMDA05-18

SURFACE MOUNT ESD PROTECTION ARRAY

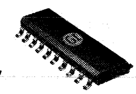
Stand-off Voltage *- 5.0 Volts* ***Peak Pulse Power*** *- 175 Watts*

SO-20/MS-013-AC



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Offers ESD protection in accordance with IEC1000-4-2 (IEC801-2)
- ♦ Monolithic TVS junctions in a wide body package
- ♦ 175W peak pulses power surge capability
- ♦ Excellent clamping capability
- ♦ Protection of up to eighteen data lines
- ♦ Ideal for Centronix Port protection
- ♦ Fast response time: typically less than 1.0ns from 0 volts to $V_{(BR)}$
- ♦ High temperature soldering guaranteed: 265°C for 5 seconds at terminals

MECHANICAL DATA

Case: JEDEC MS-013-AC molded plastic over passivated junctions
Terminal: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Unidirectional, as marked
Mounting Position: Any
Weight: 0.10 ounce, 2.50 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak power dissipation with a 8.0/20µs waveform (NOTE 1, FIG 1)	P_{PPM}	Minimum 175	Watts
Peak power pulse current with a 8.0/20µs waveform (NOTE 1)	I_{PPM}	13.3	Amps
Operating junction and storage temperature range	T_J, T_{STG}	-50 to +125	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad areas of 0.045 x 0.030" (1.14 x 0.076 mm) per leg

UNIDIRECTIONAL APPLICATIONS

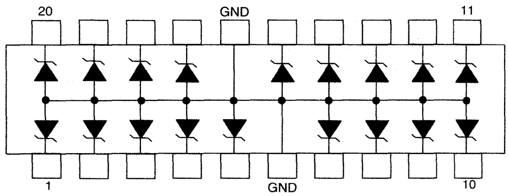
ELECTRICAL CHARACTERISTICS at 25°C

PART NUMBER	DEVICE MARKING CODE	STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE at I_T=10mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1A	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 5A	MAXIMUM FORWARD VOLTAGE DROP at I_F=200 mA	MAXIMUM REVERSE LEAKAGE CURRENT at V_{WM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
UNIDIRECTIONAL		V_{WM} Volts	$V_{(BR)}$ Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	V_F Volts	I_D µA	C_J pF
SMDA05-18	VEB	5.0	6.0	9.8	11.0	1.25	20.0	120

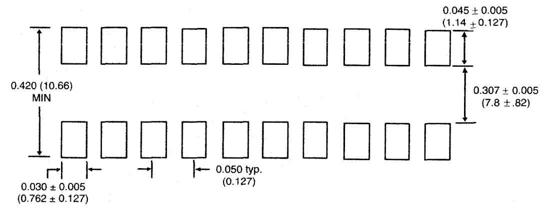
NOTES:
(1) $V_{(BR)}$ measured at pulse width of 300µs sq. wave or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) Junction capacitance measured between I/O pin and ground at 1.0 MHz and applied V_R=0 volts

*Application note: Due to the topology of the SMDA array, the V_{RWM} and $V_{(BR)}$ specifications also apply to the differential voltage between any two data line pins. Hence the SMDA05-18 is designed to "see" a maximum voltage excursion of ± 2.5 volts between any two data lines.

CIRCUIT DIAGRAM



SOLDER PAD GEOMETRY



RATINGS AND CHARACTERISTIC CURVES FOR SMDA05-18

FIG. 1 - PEAK PULSE POWER RATING CURVE

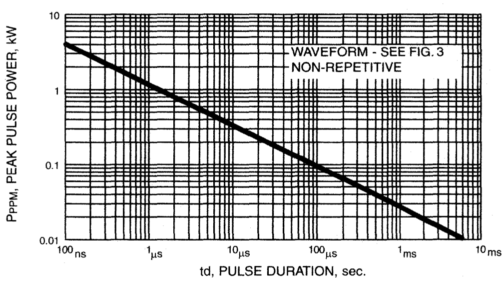


FIG. 2 - PULSE DERATING CURVE

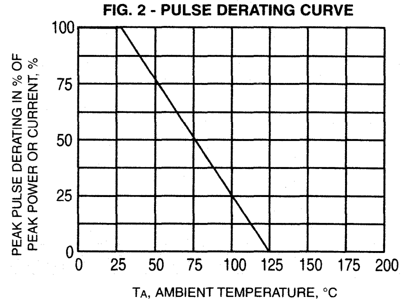


FIG. 3 - PULSE WAVEFORM

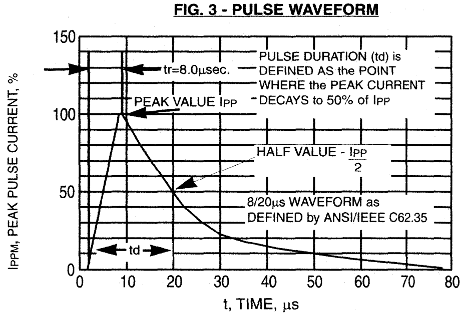
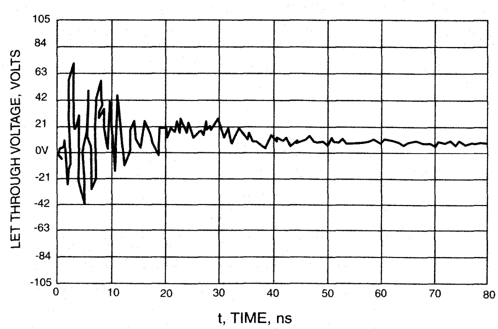


FIG. 4 - TYPICAL RESPONSE TO 8KV POSITIVE GOING ESD PULSE

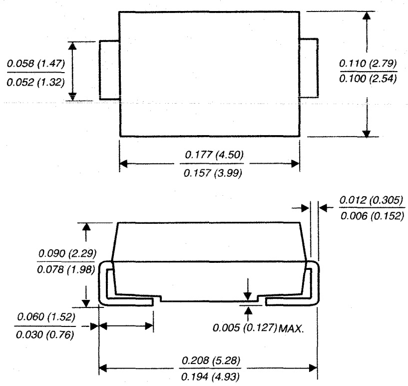


SMAJ5.0C THRU SMAJ24C SERIES

BIDIRECTIONAL SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 24.0 Volts* ***Peak Pulse Power** - 200 Watts*

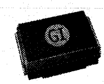
DO-214AC
Modified J-Bend



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Optimized for LAN protection applications
- Ideal for ESD protection of single lines in accordance with IEC1000-4-2 (IEC801-2)
- 200W peak pulse power capability with a 10/1000μs wave form repetition rate (duty cycle): 0.01%
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low incremental surge resistance
- Excellent clamping capability
- Fast response time: typically less than 1ns
- For devices with $V_{(BR)} \geq 10V$ are typically I_D are less than 1μA
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic body over passivated chips
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.002 ounce, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Electrical characteristics apply in both directions. Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTES 1,2, FIG.1)	P_{PPM}	Minimum 200	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG.3)	I_{PPM}	SEE TABLE 1	Amps
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 0.2"sq. x 0.5 mil. inches thick (5.0mm² x 0.013 mil.) copper pad areas
(3) Minimum breakdown voltage tested at 10mA

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

DEVICE	DEVICE MARKING CODE	WORKING STAND-OFF VOLTAGE V_{WM} (VOLTS)	MINIMUM BREAKDOWN VOLTAGE at 1.0mA $V_{(BR)}$ (VOLTS)	MAXIMUM CLAMPING VOLTAGE at I_{PPM} V_C (VOLTS)	MAXIMUM PEAK IMPULSE SURGE CURRENT I_{PPM} (AMPS)	MAXIMUM REVERSE LEAKAGE at V_{WM} I_D (μA)	MAXIMUM CAPACITANCE at 0V C_J (pF)	MAXIMUM CAPACITANCE at V_{WM} C_J (pF)
SMAJ5.0C	AA	5.0	6.4(3)	9.6	21.0	240.0	2000	1200
SMAJ7.5C	AB	7.5	8.3	14.3	14.0	10.0	1340	820
SMAJ10C	AC	10.0	11.1	18.8	10.7	1.0	680	440
SMAJ12C	AI	12.0	13.3	22.0	9.1	1.0	500	300
SMAJ15C	AJ	15.0	16.7	26.9	7.5	1.0	380	215
SMAJ24C	AQ	24.0	26.7	43.0	4.7	1.0	275	125

General Instrument
Power Semiconductor Division

FIG. 1 - PEAK PULSE POWER RATING CURVE

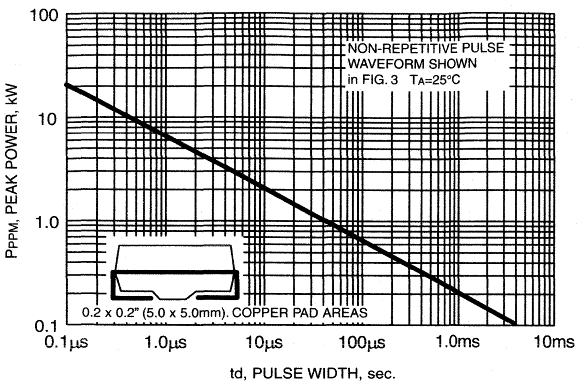


FIG. 2 - PULSE RATING CURVE

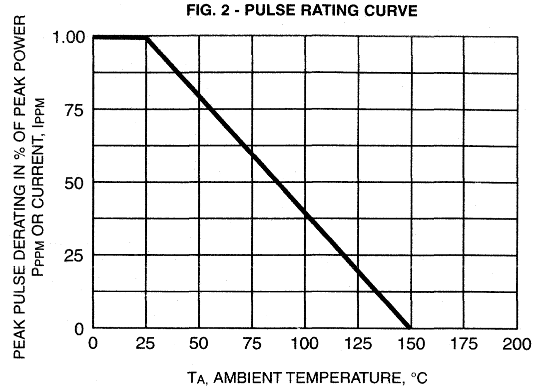


FIG. 3 - PULSE WAVEFORM

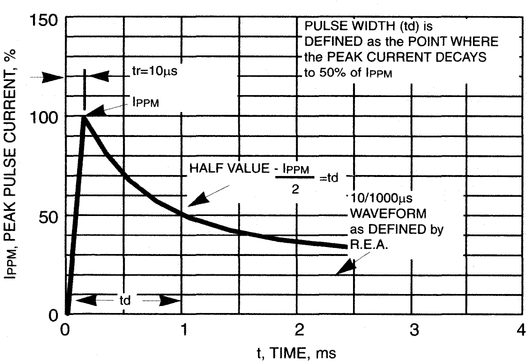


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

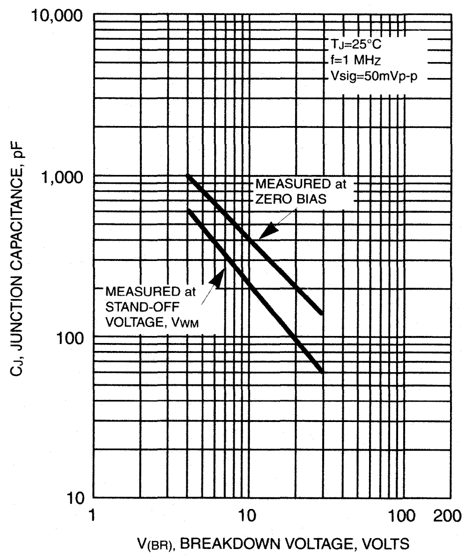
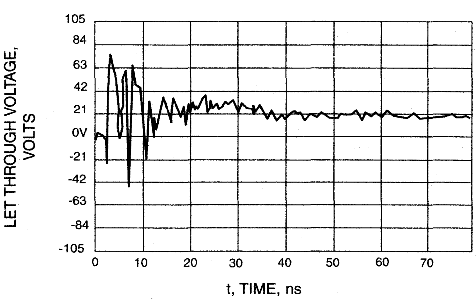


FIG. 5 - TYPICAL LET THROUGH VOLTAGE FOR AN 8KV ESD PULSE AS PER IECI000-4-2

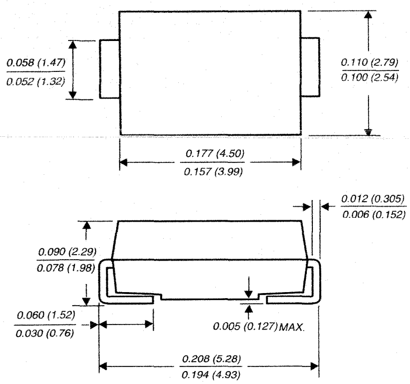


SMAJ5.0 THRU SMAJ170A

SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

Stand-off Voltage *- 5.0 to 170 Volts* ***Peak Pulse Power*** *- 300 Watts*

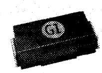
DO-214AC



Dimensions in inches and (millimeters)

Available in unidirectional only

FEATURES



- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ For surface mounted applications
- ◆ Low profile package
- ◆ Built-in strain relief
- ◆ Glass passivated junction
- ◆ Excellent clamping capability
- ◆ Low incremental surge resistance
- ◆ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ min.
- ◆ 300W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ◆ For devices with $V_{(BR)} \geq 10V$ I_D is typically less than 1μA
- ◆ High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214 AC molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.002 ounces, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1,2,5, FIG.1)	P_{PM}	Minimum 300	Watts
Peak forward surge current per FIG. 5 (NOTE 3)	I_{FSM}	40.0	Amps
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG 2)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation (NOTE 3)	$P_{M(AV)}$	1.0	Watts
Maximum instantaneous forward voltage at 25A (NOTE 4)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 5.0mm² copper pads to each terminal
(3) Lead temperature at 75°C=T_L
(4) Measured on 8.3ms single half sine-wave duty cycle=4 pulses per minutes maximum
(5) Peak pulse power waveform is 10/1000μs

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Device	Device Marking Code	Working Peak Reverse Voltage V_{WM} (Volts)	Breakdown Voltage $V_{(BR)}$ (Volts) at I_T Min.	Max.	Test Current I_T (mA)	Maximum Clamping Voltage at I_{PPM} Vc (Volts) (NOTE5)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 5) (Amps)	Maximum Reverse Leakage a V_{WM} I_D (μA)
SMAJ5.0	AD	5.0	6.40	7.30	10	9.6	32.0	800.0
SMAJ5.0A	AE	5.0	6.40	7.00	10	9.2	34.0	800.0
SMAJ6.0	AF	6.0	6.67	8.15	10	11.4	27.6	800.0
SMAJ6.0A	AG	6.0	6.67	7.37	10	10.3	30.5	800.0
SMAJ6.5	AH	6.5	7.22	8.82	10	12.3	25.6	500.0
SMAJ6.5A	AK	6.5	7.22	7.98	10	11.2	28.0	500.0
SMAJ7.0	AL	7.0	7.78	9.51	10	13.3	23.6	200.0
SMAJ7.0A	AM	7.0	7.78	8.60	10	12.0	26.0	200.0
SMAJ7.5	AN	7.5	8.33	10.3	1.0	14.3	22.0	100.0
SMAJ7.5A	AP	7.5	8.33	9.21	1.0	12.9	24.4	100.0
SMAJ8.0	AQ	8.0	8.89	10.9	1.0	15.0	21.0	50.0
SMAJ8.0A	AR	8.0	8.89	9.83	1.0	13.6	23.0	50.0
SMAJ8.5	AS	8.5	9.44	11.5	1.0	15.9	19.8	10.0
SMAJ8.5A	AT	8.5	9.44	10.4	1.0	14.4	21.8	10.0
SMAJ9.0	AU	9.0	10.0	12.2	1.0	16.9	18.6	5.0
SMA J9.0A	AV	9.0	10.0	11.1	1.0	15.4	20.4	5.0
SMAJ10	AW	10.0	11.1	13.6	1.0	18.8	16.7	5.0
SMAJ10A	AX	10.0	11.1	12.3	1.0	17.0	18.5	5.0
SMAJ11	AY	11.0	12.2	14.9	1.0	20.1	15.6	5.0
SMAJ11A	AZ	11.0	12.2	13.5	1.0	18.2	17.3	5.0
SMAJ12	BD	12.0	13.3	16.3	1.0	22.0	14.3	5.0
SMAJ12A	BE	12.0	13.3	14.7	1.0	19.9	15.8	5.0
SMAJ13	BF	13.0	14.4	17.6	1.0	23.8	13.0	5.0
SMAJ13A	BG	13.0	14.4	15.9	1.0	21.5	14.6	5.0
SMAJ14	BH	14.0	15.6	19.1	1.0	25.8	12.2	5.0
SMAJ14A	BK	14.0	15.6	17.2	1.0	23.2	13.5	5.0
SMAJ15	BL	15.0	16.7	20.4	1.0	26.9	11.7	5.0
SMAJ15A	BM	15.0	16.7	18.5	1.0	24.4	12.9	5.0
SMAJ16	BN	16.0	17.8	21.8	1.0	28.8	10.9	5.0
SMAJ16A	BP	16.0	17.8	19.7	1.0	26.0	12.0	5.0
SMAJ17	BQ	17.0	18.9	23.1	1.0	30.5	10.3	5.0
SMAJ17A	SR	17.0	18.9	20.9	1.0	27.6	11.4	5.0
SMAJ18	RS	18.0	20.0	24.4	1.0	32.2	9.7	5.0
SMAJ18A	BT	18.0	20.0	22.1	1.0	29.2	10.7	5.0
SMAJ20	BU	20.0	22.2	27.1	1.0	35.8	8.7	5.0
SMAJ20A	BV	20.0	22.2	24.5	1.0	32.4	9.7	5.0
SMAJ22	BW	22.0	24.4	29.8	1.0	39.4	8.0	5.0
SMAJ22A	BX	22.0	24.4	26.9	1.0	35.5	8.8	5.0
SMAJ24	BY	24.0	26.7	32.6	1.0	43.0	7.3	5.0
SMAJ24A	BZ	24.0	26.7	29.5	1.0	38.9	8.0	5.0
SMAJ26	CD	26.0	28.9	35.3	1.0	46.6	6.7	5.0
SMAJ26A	CE	26.0	28.9	31.9	1.0	42.1	7.4	5.0
SMAJ28	CF	28.0	31.1	38.0	1.0	50.0	6.3	5.0
SMAJ28A	CG	28.0	31.1	34.4	1.0	45.4	6.9	5.0
SMAJ30	CH	30.0	33.3	40.7	1.0	53.5	5.8	5.0
SMAJ30A	CK	30.0	33.3	36.8	1.0	48.4	6.5	5.0
SMAJ33	CL	33.0	36.7	44.9	1.0	59.0	5.3	5.0
SMAJ33A	CM	33.0	36.7	40.6	1.0	53.3	5.9	5.0
SMAJ36	CN	36.0	40.0	48.9	1.0	64.3	4.8	5.0
SMAJ36A	CP	36.0	40.0	44.2	1.0	58.1	5.4	5.0
SMAJ40	CQ	40.0	44.4	54.3	1.0	71.4	4.4	5.0
SMAJ40A	CR	40.0	44.4	49.1	1.0	64.5	4.8	5.0
SMAJ43	CS	43.0	47.8	58.4	1.0	76.7	4.1	5.0
SMAJ43A	CT	43.0	47.8	52.8	1.0	69.4	4.5	5.0
SMAJ45	CU	45.0	50.0	61.1	1.0	80.3	3.9	5.0

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

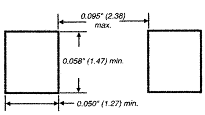
Device	Device Marking Code	Working Peak Reverse Voltage V_{WM} (Volts)	Breakdown Voltage $V_{(BR)}$ (Volts) at I_T Min.	Max.	Test Current I_T I_T mA	Maximum Clamping Voltage at I_{PPM} Vc (Volts) (NOTE5)	Maximum Peak pulse Surge Current I_{PPM} (NOTE 5) (Amps)	Maximum Reverse Leakage at V_{WM} I_D (μA)
SMAJ45A	CV	45	50.0	55.3	1.0	72.7	4.3	5.0
SMAJ48	CW	48	53.3	65.1	1.0	85.5	3.6	5.0
SMAJ48A	CX	48	53.3	58.9	1.0	77.4	4.0	5.0
SMAJ51	CY	51	56.7	69.3	1.0	91.1	3.4	5.0
SMAJ51A	CZ	51	56.7	62.7	1.0	82.4	3.8	5.0
SMAJ54	RD	54	60.0	73.3	1.0	96.3	3.2	5.0
SMAJ54A	RE	54	60.0	66.3	1.0	87.1	3.6	5.0
SMAJ58	RF	58	64.4	78.7	1.0	103.0	3.0	5.0
SMAJ58A	RG	58	64.4	71.2	1.0	93.6	3.3	5.0
SMAJ60	RH	60	66.7	81.5	1.0	107.0	2.9	5.0
SMAJ60A	RK	60	66.7	73.7	1.0	96.8	3.2	5.0
SMAJ64	RL	64	71.1	86.4	1.0	114.0	2.7	5.0
SMAJ64A	RM	64	71.1	78.6	1.0	103.0	3.0	5.0
SMAJ70	RN	70	77.8	95.1	1.0	125	2.5	5.0
SMAJ70A	RP	70	77.8	86.0	1.0	113	2.7	5.0
SMAJ75	RQ	75	83.3	102	1.0	134	2.3	5.0
SMAJ75A	RR	75	83.3	92.1	1.0	121	2.6	5.0
SMAJ78	RS	78	86.7	106	1.0	139	2.2	5.0
SMAJ78A	RT	78	86.7	95.8	1.0	126	2.5	5.0
SMAJ85	RU	85	94.4	115	1.0	151	2.0	5.0
SMAJ85A	RV	85	94.4	104	1.0	137	2.2	5.0
SMAJ90	RW	90	100	122	1.0	160	1.9	5.0
SMAJ90A	RX	90	100	111	1.0	146	2.1	5.0
SMAJ100	RY	100	111	136	1.0	179	1.7	5.0
SMAJ100A	RZ	100	111	123	1.0	162	1.9	5.0
SMAJ110	SD	110	122	149	1.0	196	1.6	5.0
SMAJ110A	SE	110	122	135	1.0	177	1.7	5.0
SMAJ120	SF	120	133	163	1.0	214	1.4	5.0
SMAJ120A	SG	120	133	147	1.0	193	1.6	5.0
SMAJ130	SH	130	144	176	1.0	231	1.3	5.0
SMAJ130A	SK	130	144	159	1.0	209	1.5	5.0
SMAJ150	SL	150	167	204	1.0	266	1.1	5.0
SMAJ150A	SM	150	167	185	1.0	243	1.3	5.0
SMAJ160	SN	160	178	218	1.0	287	1.0	5.0
SMAJ160A	SP	160	178	197	1.0	259	1.2	5.0
SMAJ170	SQ	170	189	231	1.0	304	1.0	5.0
SMAJ170A	SR	170	189	209	1.0	275	1.1	5.0

APPLICATION NOTES

RECOMMENDED PAD LAYOUT

The pad dimensions should be 0.010" (2.5mm) longer than the contact size in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

MODIFIED J-BEND



Dimensions in inches and (millimeters)

This device is designed specifically for transient voltage suppression from threats generated by ESD for board level load switching components.

The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground.

This series is designed to optimize board space and for use with surface mount technology automated assembly equipment.

They can be easily mounted on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

FIG. 1 - PEAK PULSE POWER RATING CURVE

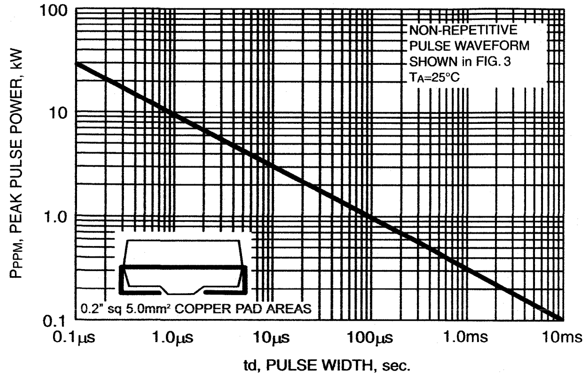


FIG. 2 - PULSE DERATING CURVE

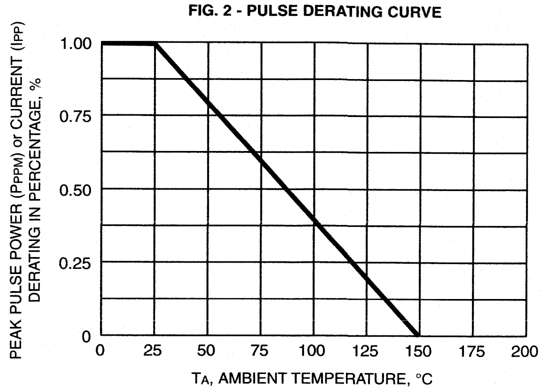


FIG. 3 - PULSE WAVEFORM

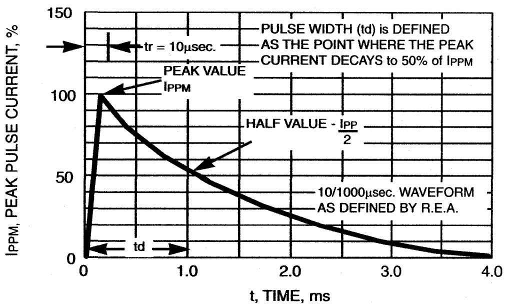


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

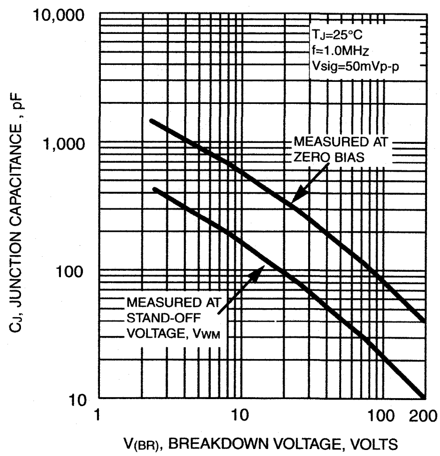
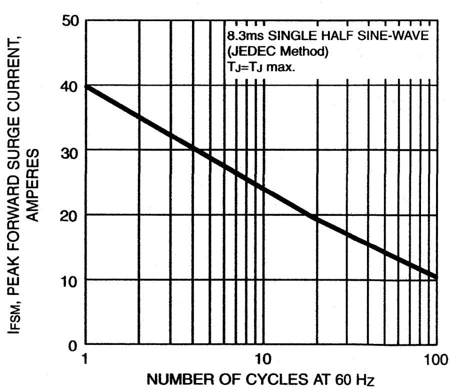


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

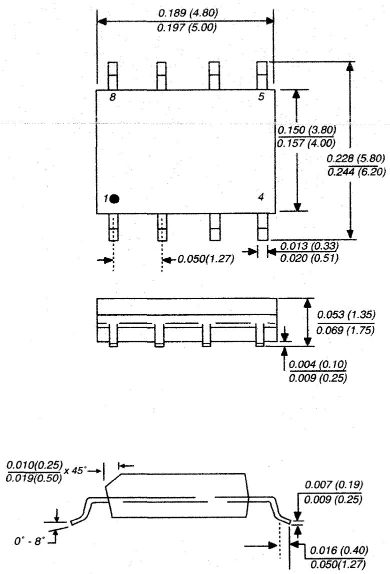


SMDA05C-4 THRU SMDA24C-4

SURFACE MOUNT DIODE ARRAY TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 24 Volts* ***Peak Pulse Power** - 300 Watts*

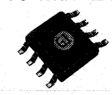
SO-8/MS-012-AA



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Offers ESD protection in accordance with IEC1000-4-2 (IEC801-2)



- ♦ Monolithic TVS junctions
- ♦ 300W peak pulse power reverse surge capability
- ♦ Excellent clamping capability
- ♦ Protection of up to four data lines
- ♦ Fast response time: typically less than 5.0ns from 0 volts to $V_{(BR)}$
- ♦ High temperature soldering guaranteed: 265°C for 5 seconds at terminals

MECHANICAL DATA

Case: JEDEC MS-012-AA molded plastic, over passivated Junctions

Terminal: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: Bidirectional as marked

Mounting Position: Any

Weight: 0.04 ounce, 1.00 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING		*SYMBOL*	*VALUE*	*UNITS*
Peak power dissipation with a 8.0/20μs waveform		P_{PPM}	Minimum 300	Watts
Peak power pulse current with a 8.0/20μs waveform	SMDA05C-4	I_{PPM}	20.0	Amps
	SMDA12C-4		15.0	
	SMDA15C-4		12.0	
	SMDA24C-4		7.5	
Operating junction and storage temperature range		T_J, T_{STG}	-50 to +125	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad areas of 0.045 x 0.030" (1.14 x 0.076mm) per leg

BIDIRECTIONAL APPLICATIONS

All electrical characteristics apply in both direction

General Instrument
Power Semiconductor Division

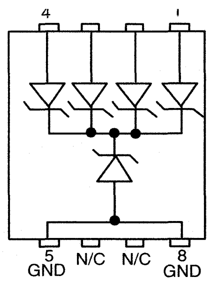
ELECTRICAL CHARACTERISTICS at 25°C

PART NUMBER	DEVICE MARKING CODE	STANDOFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE at I_T=1.0mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1A	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 5A	MAXIMUM REVERSE LEAKAGE CURRENT at V_{WM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
BIDIRECTIONAL		V_{WM} Volts	$V_{(BR)}$ Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	I_D µA	C_J pF
SMDA05C-4	REB	5.0	*6.0	9.8	11.0	100.0	350
SMDA12C-4	RED	12.0	13.4	19.0	24.0	1.0	150
SMDA15C-4	REF	15.0	16.7	24.0	30.0	1.0	120
SMDA24C-4	REH	24.0	26.7	43.0	55.0	1.0	100

NOTES:
(1) $V_{(BR)}$ measured at pulse width of 300µs sq. wave or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) Junction capacitance measured at 1.0 MHz and applied V_R=0 volts
*$V_{(BR)}$ test current is (I_T) is 10 mA

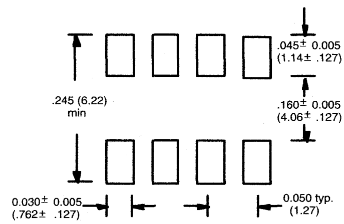
*Application note: Due to the topology of the SMDA array, the V_{RWM} and $V_{(BR)}$ specifications also apply to the differential voltage between any two data line pins. Hence the SMDA12C-4 is designed to "see" a maximum voltage excursion of ± 6 volts between any two data lines.

CIRCUIT DIAGRAM* - top view



*SMDA05C-4 is common anode configuration

SOLDER PAD GEOMETRY



Dimensions in inches and (millimeters)

RATING AND CHARACTERISTIC CURVES FOR SMDA05C-4 THRU SMDA24C-4

FIG. 1 - PEAK PULSE POWER RATING CURVE

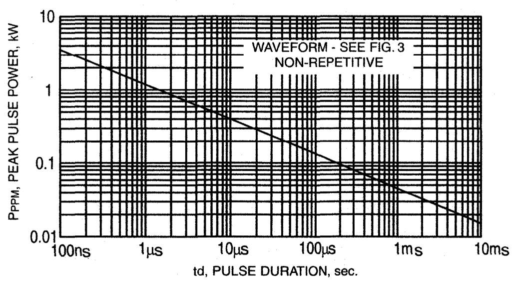


FIG. 2 - PULSE DERATING CURVE

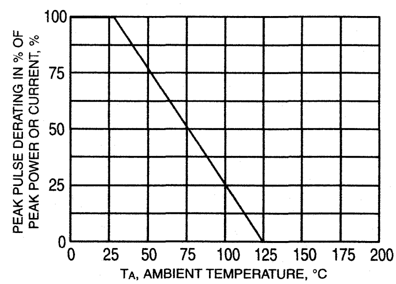
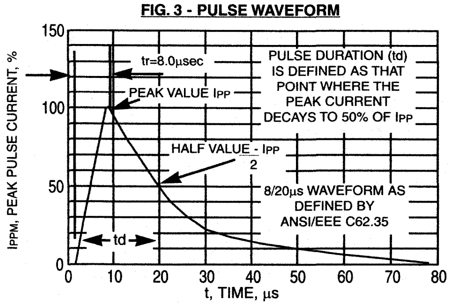


FIG. 3 - PULSE WAVEFORM



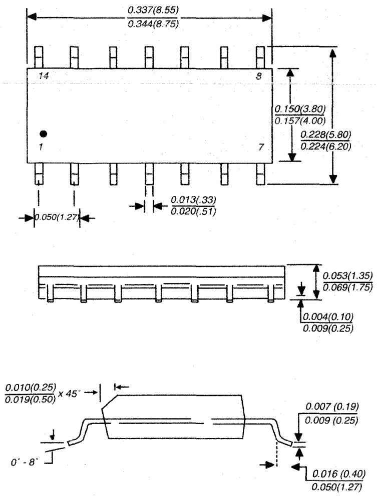
General Instrument
Power Semiconductor Division

SMDA05C-8 THRU SMDA24C-8

SURFACE MOUNT DIODE ARRAY TRANSIENT VOLTAGE SUPPRESSOR

Stand-off Voltage *- 5.0 to 24 Volts* ***Peak Pulse Power*** *- 300 Watts*

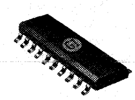
SO-14/MS-012-AB



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Offers ESD protection in accordance with IEC1000-4-2 (IEC801-2)
- ♦ Monolithic TVS junctions
- ♦ 300W peak pulse power surge capability
- ♦ Excellent clamping capability
- ♦ Protection of up to eight data lines
- ♦ Fast response time: typically less than 5.0ns from 0 volts to $V_{(BR)}$
- ♦ High temperature soldering guaranteed: 265°C for 5 seconds at terminals



MECHANICAL DATA

Case: JEDEC MS-012-AB molded plastic, over passivated Junctions

Terminal: Plated, solderable per MIL-STD-750, Method 2026

Polarity: Bidirectional as marked

Mounting Position: Any

Weight: 0.07 ounce, 1.75 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING		*SYMBOL*	*VALUE*	*UNITS*
Peak power dissipation with a 8.0/20μs waveform (NOTE 1, FIG 1)		P_{PPM}	Minimum 300	Watts
Peak power pulse current with a	SMDA05C-8		20.0	
8.0/20μs waveform (NOTE 1)	SMDA12C-8	I_{PPM}	15.0	Amps
	SMDA15C-8		12.0	
	SMDA24C-8		7.5	
Operating junction and storage temperature range		T_J, T_{STG}	-50 to +125	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad areas of 0.045 x 0.030" (1.14 x 0.076mm) per leg

BIDIRECTIONAL APPLICATIONS

All electrical characteristics apply in both directions

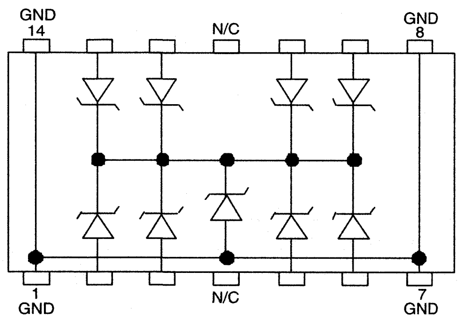
ELECTRICAL CHARACTERISTICS at 25°C

PART NUMBER	DEVICE MARKING CODE	STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE at I_T=1.0mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1A	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 5A	MAXIMUM REVERSE LEAKAGE CURRENT at V_{WM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
BIDIRECTIONAL		V_{WM} Volts	$V_{(BR)}$ Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	I_D µA	C_J pF
SMDA05C-8	SEB	5.0	6.0*	9.8	11.0	100.0	350
SMDA12C-8	SED	12.0	13.4	19.0	24.0	1.0	150
SMDA15C-8	SEF	15.0	16.7	24.0	30.0	1.0	120
SMDA24C-8	SEH	24.0	26.7	43.0	55.0	1.0	100

NOTES:
(1) $V_{(BR)}$ measured at pulse width of 300µs sq. wave or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) Junction capacitance measured at 1.0 MHz and applied V_R=0 volts
* $V_{(BR)}$ test current (I_T) is 10 mA

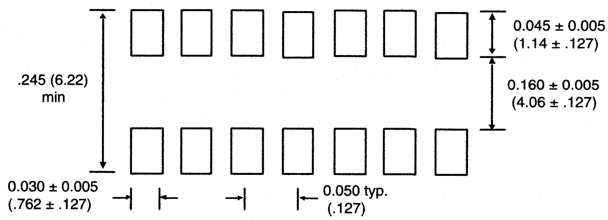
*Application note: Due to the topology of the SMDA array the V_{RWM} and $V_{(BR)}$ specifications also apply to the differential voltage between any two data line pins. Hence the SMDA12C-8 is designed to "see" a maximum voltage excursion of ± 6 volts between any two data lines.

CIRCUIT DIAGRAM* - top view



*SMDA05C-8 is common anode configuration

SOLDER PAD GEOMETRY



Dimensions in inches and (millimeters)

RATING AND CHARACTERISTIC CURVES FOR SMDA05C-8 THRU SMDA24C-8

FIG. 1 - PEAK PULSE POWER RATING CURVE

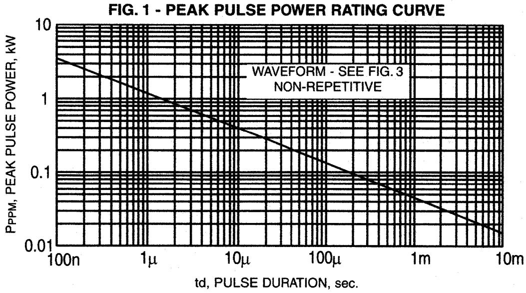


FIG. 2 - PULSE DERATING CURVE

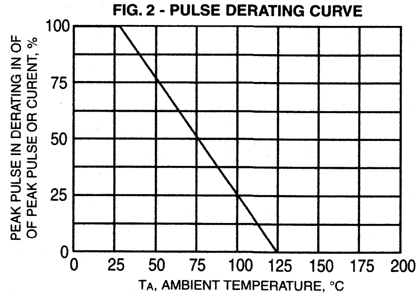
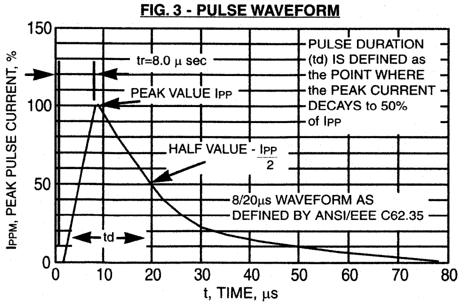


FIG. 3 - PULSE WAVEFORM



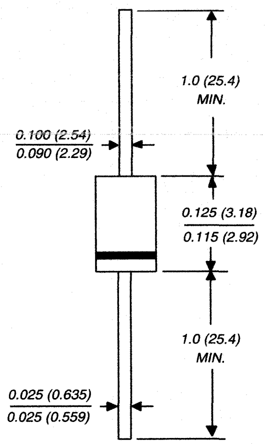
TMPG06-6.8 THRU TMPG06-43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43 Volts* ***Peak Pulse Power** - 400 Watts*

PATENTED*

Case Style TMPG-06



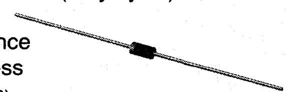
Dimensions in inches and (millimeters)

* *Patent #'s 4,980,315*
5,166,769
5,278,094

Available in unidirectional only

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Designed for the hood applications
- Available in unidirectional only
- Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- 400W peak pulse power capability on 10/1000μs waveform, repetition rate (duty cycle): 1.0%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- High temperature soldering guaranteed: 300°C/10 seconds 0.375 (9.5mm) lead length, 5lbs (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	*VALUE*	*UNITS*
Peak power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak pulse power current with a 10/1000μs waveform (NOTE1,2, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.25" (6.33mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pads area of 1.6 x 1.6" (40 x 40mm)
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage Vwm (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Reverse Leakage at V_{WM} T_J=150°C I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
TMPG06-6.8	6.12	7.48	10.0	5.50	300	1000	29.2	10.8	0.057
TMPG06-6.8A	6.45	7.14	10.0	5.80	300	1000	36.0	10.5	0.057
TMPG06-7.5	6.75	8.25	10.0	6.05	150	500	26.9	11.7	0.060
TMPG06-7.5A	7.13	7.88	10.0	6.40	150	500	27.9	11.3	0.061
TMPG06-8.2	7.38	9.02	10.0	6.63	50.0	200	25.2	12.5	0.065
TMPG06-8.2A	7.79	8.61	10.0	7.02	50.0	200	26.0	12.1	0.065
TMPG06-9.1	8.19	10.0	1.0	7.37	10.0	50.0	22.8	13.8	0.068
TMPG06-9.1A	8.65	9.55	1.0	7.78	10.0	50.0	23.5	13.4	0.068
TMPG06-10	9.00	11.0	1.0	8.10	5.0	20.0	28.0	15.0	0.073
TMPG06-10A	9.50	10.5	1.0	8.55	5.0	20.0	28.9	14.5	0.073
TMPG06-11	9.90	12.1	1.0	8.92	2.0	10.0	25.9	16.2	0.075
TMPG06-11A	10.5	11.6	1.0	9.40	2.0	10.0	26.3	15.6	0.075
TMPG06-12	10.8	13.2	1.0	9.72	1.0	5.0	24.9	17.3	0.076
TMPG06-12A	11.4	12.6	1.0	10.2	1.0	5.0	25.1	16.7	0.078
TMPG06-13	11.7	14.3	1.0	10.5	1.0	5.0	22.1	19.0	0.081
TMPG06-13A	12.4	13.7	1.0	11.1	1.0	5.0	23.1	18.2	0.081
TMPG06-15	13.5	16.3	1.0	12.1	1.0	5.0	19.1	22.0	0.084
TMPG06-15A	14.3	15.8	1.0	12.8	1.0	5.0	19.8	21.2	0.084
TMPG06-16	14.4	17.6	1.0	12.9	1.0	5.0	17.8	23.5	0.086
TMPG06-16A	15.2	16.8	1.0	13.6	1.0	5.0	19.6	22.5	0.086
TMPG06-18	16.2	19.8	1.0	14.5	1.0	5.0	15.8	26.5	0.088
TMPG06-18A	17.1	18.9	1.0	15.3	1.0	5.0	16.5	25.5	0.088
TMPG06-20	18.0	22.0	1.0	16.2	1.0	5.0	14.4	29.1	0.090
TMPG06-20A	19.0	21.0	1.0	17.0	1.0	5.0	15.1	27.7	0.090

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Reverse Leakage at V_{WM} T_J=150°C I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
TMPG06-22	19.8	24.2	1.0	17.8	1.0	5.0	13.2	31.9	0.092
TMPG06-22A	20.9	23.1	1.0	18.8	1.0	5.0	13.7	30.6	0.092
TMPG06-24	21.6	26.4	1.0	19.4	1.0	5.0	12.3	34.2	0.094
TMPG06-24A	22.8	25.2	1.0	20.5	1.0	5.0	12.6	33.2	0.094
TMPG06-27	24.3	29.7	1.0	21.8	1.0	5.0	10.7	39.1	0.096
TMPG06-27A	25.7	28.4	1.0	23.1	1.0	5.0	11.2	37.5	0.096
TMPG06-30	27.0	33.0	1.0	24.3	1.0	5.0	9.6	43.5	0.097
TMPG06-30A	28.5	31.5	1.0	25.6	1.0	5.0	10.1	41.4	0.097
TMPG06-33	29.7	36.3	1.0	26.8	1.0	5.0	8.8	47.7	0.098
TMPG06-33A	31.4	34.7	1.0	28.2	1.0	5.0	9.2	45.7	0.098
TMPG06-36	32.4	39.6	1.0	29.1	1.0	5.0	8.0	52.0	0.099
TMPG06-36A	34.2	37.8	1.0	30.8	1.0	5.0	8.4	49.9	0.099
TMPG06-39	35.1	42.9	1.0	31.6	1.0	5.0	7.4	56.4	0.100
TMPG06-39A	37.1	41.0	1.0	33.3	1.0	5.0	7.8	53.9	0.100
TMPG06-43	38.7	47.3	1.0	34.8	1.0	5.0	6.8	61.9	0.101
TMPG06-43A	40.9	45.2	1.0	36.8	1.0	5.0	7.1	59.3	0.101

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derated per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

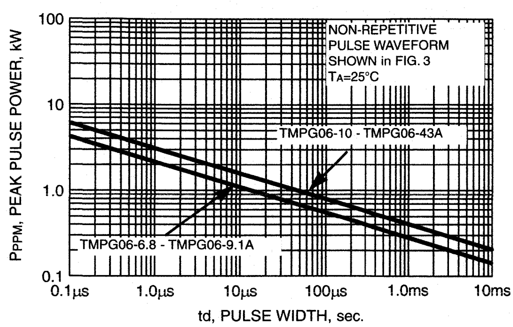


FIG. 2 - PULSE DERATING CURVE

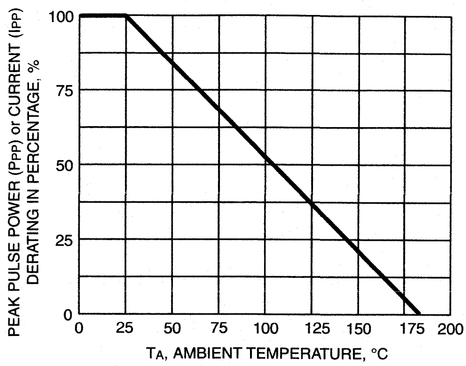


FIG. 3 - PULSE WAVEFORM

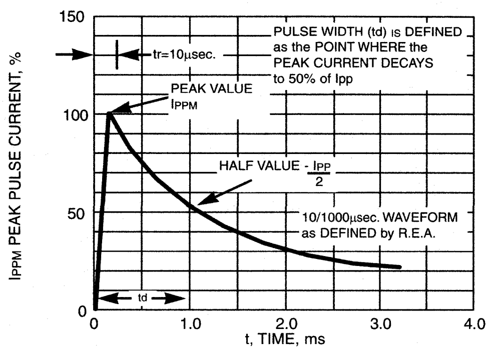


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

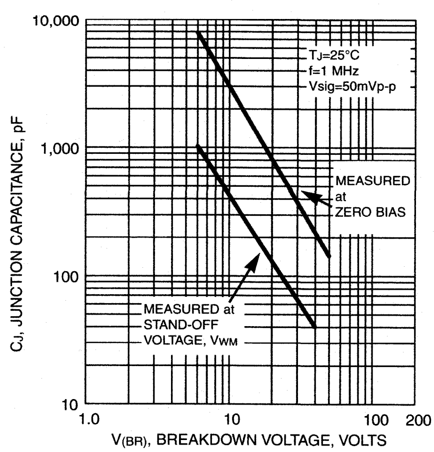


FIG. 5 - STEADY STATE POWER DERATING CURVE

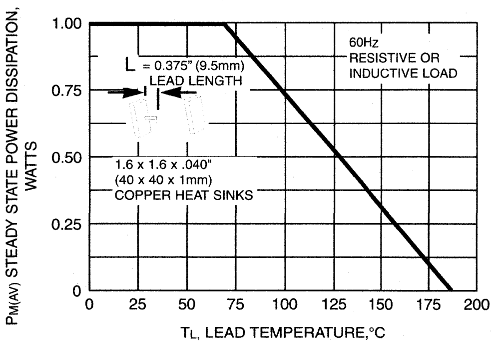
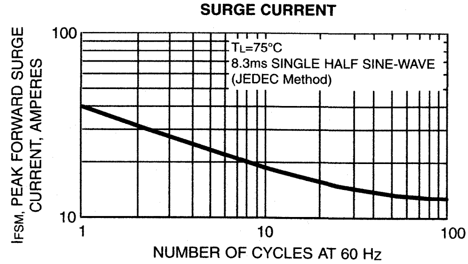


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

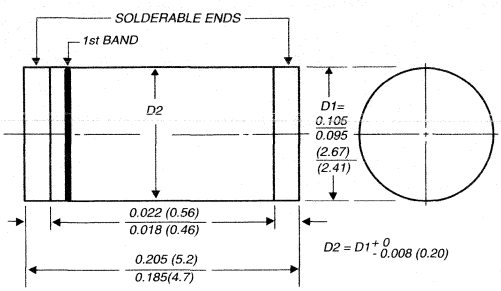


TGL41-6.8 THRU TGL41-200CA

SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 200 Volts* ***Peak Pulse Power** - 400 Watts*

DO-213AB



1st band denotes type and positive end (cathode)

Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Glass passivated junction
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- 400W peak pulse capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic body over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Blue bands denotes positive end (cathode) for unidirectional and a yellow band in the middle for bidirectional types
Mounting Position: Any
Weight: 0.116 gram, 0.0046 ounce

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional applications use suffix letters C or CA for types TGL41-6.8 thru TGL41-200A (e.g. TGL41-6.8C, TGL41-200CA). Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATINGS	*SYMBOL*	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Steady state power dissipation at T_T=75°C (NOTE 2)	$P_{M(AV)}$	1.0	Watt
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load for unidirectional only (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A (NOTE 3) for unidirectional only	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pads to each terminal of 0.31 in² (8.0 mm²) per Fig. 5
(3) Measured at 8.3ms single half sine-wave or equivalent square wave duty cycle=4 pulses per minute maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (NOTE 4) (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA) (NOTE 4)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
	MIN	MAX						
TGL41-6.8	6.12	7.48	10.0	5.50	1000.0	38.7	10.8	0.060
TGL41-6.8A	6.45	7.14	10.0	5.80	1000.0	40.0	10.5	0.060
TGL41-7.5	6.75	8.25	10.0	6.05	500.0	36.0	11.7	0.064
TGL41-7.5A	7.13	7.88	10.0	6.40	500.0	37.1	11.3	0.064
TGL41-8.2	7.38	9.02	10.0	6.63	200.0	33.6	12.5	0.068
TGL41-8.2A	7.79	8.61	10.0	7.02	200.0	34.7	12.1	0.068
TGL41-9.1	8.19	10.0	1.0	7.37	50.0	30.4	13.8	0.071
TGL41-9.1A	8.65	9.55	1.0	7.78	50.0	31.3	13.4	0.071
TGL41 -10	9.00	11.0	1.0	8.10	10.0	28.0	15.0	0.076
TGL41 -10A	9.50	10.5	1.0	8.55	10.0	28.9	14.5	0.076
TGL41 -11	9.90	12.1	1.0	8.92	5.0	25.9	16.2	0.078
TGL41 -11A	10.5	11.6	1.0	9.40	5.0	26.9	15.6	0.078
TGL41-12	10.8	13.2	1.0	9.72	5.0	24.2	17.3	0.081
TGL41-12A	11.4	12.6	1.0	10.2	5.0	25.1	16.7	0.081
TGL41-13	11.7	14.3	1.0	10.5	5.0	22.1	19.0	0.084
TGL41-13A	12.4	13.7	1.0	11.1	5.0	23.0	18.2	0.084
TGL41-15	13.5	16.5	1.0	12.1	5.0	19.0	22.0	0.087
TGL41-15A	14.3	15.8	1.0	12.8	5.0	19.8	21.2	0.087
TGL41-16	14.4	17.6	1.0	12.9	5.0	17.8	23.5	0.089
TGL41-16A	15.2	16.8	1.0	13.6	5.0	18.6	22.5	0.089
TGL41-18	16.2	19.8	1.0	14.5	5.0	15.8	26.5	0.091
TGL41-18A	17.1	18.9	1.0	15.3	5.0	16.6	25.2	0.091
TGL41-20	18.0	22.0	1.0	16.2	5.0	14.4	29.1	0.093
TGL41-20A	19.0	21.0	1.0	17.1	5.0	15.1	27.7	0.093
TGL41-22	19.8	24.2	1.0	17.8	5.0	13.1	31.9	0.095
TGL41-22A	20.9	23.1	1.0	18.8	5.0	13.7	30.6	0.095
TGL41-24	21.6	26.4	1.0	19.4	5.0	12.1	34.7	0.097
TGL41-24A	22.8	25.2	1.0	20.5	5.0	12.6	33.2	0.097
TGL41-27	24.3	29.7	1.0	21.8	5.0	10.7	39.1	0.099
TGL41-27A	25.7	28.4	1.0	23.1	5.0	11.2	37.5	0.099
TGL41-30	27.0	33.0	1.0	24.3	5.0	9.8	43.5	0.100
TGL41-30A	28.5	31.5	1.0	25.6	5.0	10.1	41.4	0.100
TGL41-33	29.7	36.3	1.0	26.8	5.0	8.8	47.7	0.101
TGL41-33A	31.4	34.7	1.0	28.2	5.0	9.1	45.7	0.101
TGL41-36	32.4	39.6	1.0	29.1	5.0	8.0	52.0	0.102
TGL41-36A	34.2	37.8	1.0	30.8	5.0	8.4	49.9	0.102
TGL41-39	35.1	42.9	1.0	31.6	5.0	7.4	56.4	0.103
TGL41-39A	37.1	41.0	1.0	33.3	5.0	7.7	53.9	0.103
TGL41-43	38.7	47.3	1.0	34.8	5.0	6.7	61.9	0.104
TGL41-43A	40.9	45.2	1.0	36.8	5.0	7.0	59.3	0.104
TGL41-47	42.3	51.7	1.0	38.1	5.0	10.6	67.8	0.104

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
TGL41-47A	44.7	49.4	1.0	40.2	5.0	6.4	64.8	0.104
TGL41-51	45.9	56.1	1.0	41.3	5.0	5.7	73.5	0.105
TGL41-51A	48.5	53.6	1.0	43.6	5.0	5.9	70.1	0.105
TGL41-56	50.4	61.6	1.0	45.4	5.0	5.2	80.5	0.106
TGL41-56A	53.2	58.8	1.0	47.8	5.0	5.4	77.0	0.106
TGL41-62	55.8	68.2	1.0	50.2	5.0	4.7	89.0	0.107
TGL41-62A	58.9	65.1	1.0	53.0	5.0	4.9	85.0	0.107
TGL41-68	61.2	74.8	1.0	55.1	5.0	4.2	98.0	0.107
TGL41-68A	64.6	71.4	1.0	58.1	5.0	4.5	92.0	0.107
TGL41-75	67.5	82.5	1.0	60.7	5.0	3.8	108.0	0.108
TGL41-75A	71.3	78.8	1.0	64.1	5.0	4.0	103.0	0.108
TGL41-82	73.8	90.2	1.0	66.4	5.0	3.5	118.0	0.108
TGL41-82A	77.9	86.1	1.0	70.1	5.0	3.7	113.0	0.108
TGL41-91	81.9	100.0	1.0	73.7	5.0	3.2	131.8	0.109
TGL41-91A	86.5	95.50	1.0	77.8	5.0	3.3	125.0	0.109
TGL41-100	90.0	110.0	1.0	81.0	5.0	1.46	144.0	0.109
TGL41-100A	95.0	105.0	1.0	85.5	5.0	1.53	137.0	0.109
TGL41-110	99.0	121.0	1.0	89.2	5.0	1.33	158.0	0.110
TGL41-110A	105.0	116.0	1.0	94.0	5.0	1.38	152.0	0.110
TGL41-120	108.0	132.0	1.0	97.2	5.0	1.21	173.0	0.110
TGL41-120A	114.0	126.0	1.0	102.0	5.0	1.27	165.0	0.110
TGL41-130	117.0	143.0	1.0	105.0	5.0	1.12	187.0	0.110
TGL41-130A	124.0	137.0	1.0	111.0	5.0	1.17	179.0	0.110
TGL41-150	135.0	165.0	1.0	121.0	5.0	0.98	215.0	0.111
TGL41-150A	143.0	158.0	1.0	128.0	5.0	1.01	207.0	0.111
TGL41-160	144.0	176.0	1.0	130.0	5.0	0.91	230.0	0.111
TGL41-160A	152.0	168.0	1.0	136.0	5.0	0.96	219.0	0.111
TGL41-170	153.0	187.0	1.0	138.0	5.0	0.86	244.0	0.111
TGL41-170A	162.0	179.0	1.0	145.0	5.0	0.90	234.0	0.111
TGL41-180	162.0	198.0	1.0	146.0	5.0	0.81	258.0	0.111
TGL41-180A	171.0	189.0	1.0	154.0	5.0	0.85	246.0	0.111
TGL41-200	180.0	220.0	1.0	162.0	5.0	0.73	287.0	0.111
TGL41-200A	190.0	210.0	1.0	171.0	5.0	0.77	274.0	0.111

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300µs I_T=square wave pulse or equivalent
(2) Surge current waveform per Figure 3 and derate per Fig.2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35
(4) For bidirectional types having V_{WM} of 10 Volts and less, the I_D limit is doubled

FIG. 1 - PEAK PULSE POWER RATING CURVE

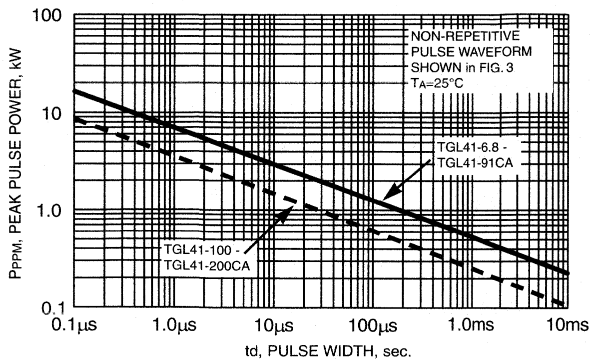


FIG. 2 - PULSE DERATING CURVE

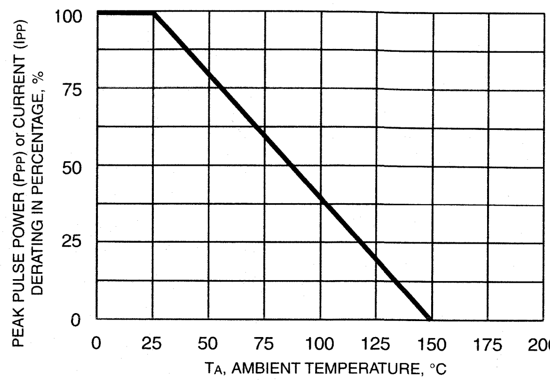


FIG. 3 - PULSE WAVEFORM

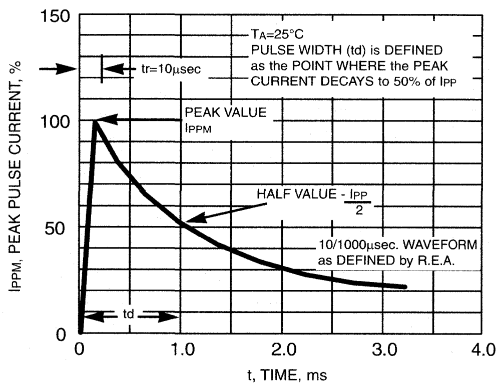


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

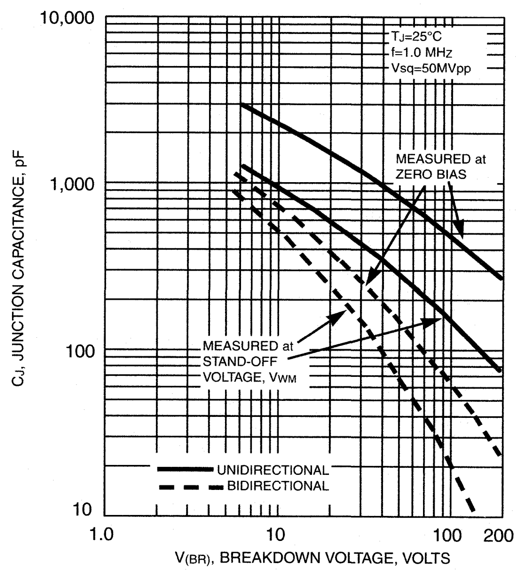


FIG. 5 - STEADY STATE POWER DERATING CURVE

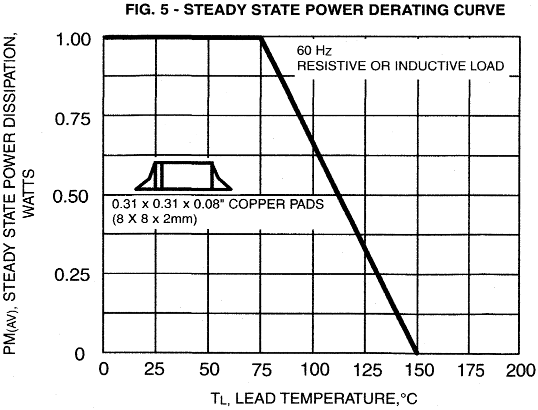
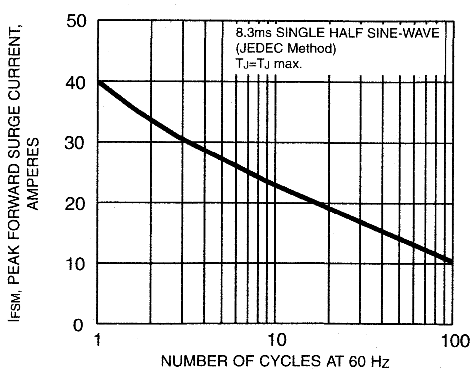


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

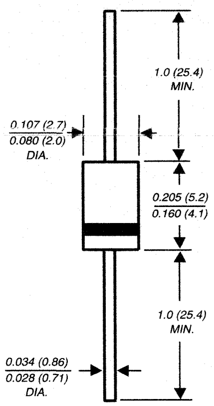


BZW04P-5V8 THRU BZW04-376

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

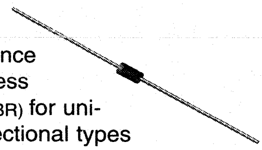
***Stand-off Voltage** - 5.8 to 376 Volts* ***Peak Pulse Power** - 400 Watts*

DO204AL



Dimensions are in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junction
- 400W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 Volts to $V_{(BR)}$ for uni-directional and 5.0ns for bidirectional types
- Typical I_D less than 1μA above 10V rating
- High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over passivated junction
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except for bidirectional types
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use add suffix Letter "B" (e.g. BZW04P-6V4B).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 3)	P_{PPM}	Minimum 400	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady pulse state power dissipation at T_L=75°C lead lengths, 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half Sine-wave superimposed on rated load (JEDEC Method) (NOTE 3) unidirectional only	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A (NOTE 4) unidirectional only	V_F	3.0/6.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum
(4) V_F=3.0V max. for devices of $V_{(BR)}\leq$200V and V_F 6.5 Volt max. for devices of $V_{(BR)}$>200V

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ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA) (NOTE4)	Maximum Peak Pulse Current I_{PPM} (Amps) (NOTE 2)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / C)
*BZW04P5V8	6.45	7.48	10.0	5.80	1000	38.0	10.5	0.057
*BZW04-5V8	6.45	7.14	10.0	5.80	1000	38.0	10.5	0.057
BZW04P6V4	7.13	8.25	10.0	6.40	500	35.4	11.3	0.061
BZW04-6V4	7.13	7.88	10.0	6.40	500	35.4	11.3	0.061
BZW04P7V0	7.79	9.02	10.0	7.02	200	33.0	12.1	0.065
BZW04-7V0	7.79	8.61	10.0	7.02	200	33.0	12.1	0.065
BZW04P7V8	8.65	10.0	1.0	7.78	50.0	30.0	13.4	0.068
BZW04-7V8	8.65	9.55	1.0	7.78	50.0	30.0	13.4	0.073
BZW04P8V5	9.50	11.0	1.0	8.55	10.0	27.6	14.5	0.073
BZW04-8V5	9.50	10.5	1.0	8.55	10.0	27.6	14.5	0.075
BZW04P9V4	10.5	12.1	1.0	9.4	5.0	25.7	15.6	0.075
BZW04-9V4	10.5	11.6	1.0	9.4	5.0	25.7	15.6	0.075
BZW0P10	11.4	13.2	1.0	10.2	5.0	24.0	16.7	0.078
BZW04-10	11.4	12.6	1.0	10.2	5.0	24.0	16.7	0.078
BZW04P11	12.4	14.3	1.0	11.1	5.0	22.0	18.2	0.081
BZW04-11	12.4	13.7	1.0	11.1	5.0	22.0	18.2	0.081
BZW04P13	14.3	16.5	1.0	12.8	5.0	19.0	21.2	0.084
BZW04-13	14.3	15.8	1.0	12.8	5.0	19.0	21.2	0.084
BZW04P14	15.2	17.6	1.0	13.6	5.0	17.8	22.5	0.086
BZW04-14	15.2	16.8	1.0	13.6	5.0	17.8	22.5	0.086
BZW04P15	17.1	19.8	1.0	15.3	5.0	16.0	25.2	0.088
BZW04-15	17.1	18.9	1.0	15.3	5.0	16.0	25.2	0.088
BZW04P17	19.0	22.0	1.0	17.1	5.0	14.5	27.7	0.090
BZW04-17	19.0	21.0	1.0	17.1	5.0	14.5	27.7	0.090
BZW04P19	20.9	24.2	1.0	18.8	5.0	13.0	30.6	0.092
BZW04-19	20.9	23.1	1.0	18.8	5.0	13.0	30.6	0.092
BZW04P20	22.8	26.4	1.0	20.5	5.0	12.0	33.2	0.094
BZW04-20	22.8	25.2	1.0	20.5	5.0	12.0	33.2	0.094
BZW04P23	25.7	29.7	1.0	23.1	5.0	10.7	37.5	0.096
BZW04-23	25.7	28.4	1.0	23.1	5.0	10.7	37.5	0.096
BZW04P26	28.5	33.0	1.0	25.6	5.0	9.60	41.5	0.097
BZW04-26	28.5	31.5	1.0	25.6	5.0	9.60	41.5	0.097
BZW04P28	31.4	36.3	1.0	28.2	5.0	8.80	45.7	0.098
BZW04-28	31.4	34.7	1.0	28.2	5.0	8.80	45.7	0.098
BZW04P31	34.2	39.6	1.0	30.8	5.0	8.00	49.9	0.099
BZW04-31	34.2	37.8	1.0	30.8	5.0	8.00	49.9	0.099
BZW04P33	37.1	42.9	1.0	33.3	5.0	7.40	53.9	0.100
BZW04-33	37.1	41.0	1.0	33.3	5.0	7.40	53.9	0.100
BZW04P37	40.9	47.3	1.0	36.8	5.0	6.70	59.3	0.101
BZW04-37	40.9	45.2	1.0	36.8	5.0	6.70	59.3	0.101
BZW04P40	44.7	51.7	1.0	40.2	5.0	6.20	64.8	0.101
BZW04-40	44.7	49.4	1.0	40.2	5.0	6.20	64.8	0.101
BZW04P44	48.5	56.1	1.0	43.6	5.0	5.70	70.1	0.102
BZW04-44	48.5	53.6	1.0	43.6	5.0	5.70	70.1	0.102
BZW04P48	53.2	61.6	1.0	47.8	5.0	5.20	77.0	0.103
BZW04-48	53.2	58.8	1.0	47.8	5.0	5.20	77.0	0.103

*Not available as bidirectional devices

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA) (NOTE4)	Maximum Peak Pulse Current I_{PPM} (Amps) (NOTE 2)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / C)
BZW04P53	58.9	68.2	1.0	53.0	5.0	4.70	85.0	0.104
BZW04-53	58.9	65.1	1.0	53.0	5.0	4.70	85.0	0.104
BZW04P58	64.6	74.8	1.0	58.1	5.0	4.30	92.0	0.104
BZW04-58	64.6	71.4	1.0	58.1	5.0	4.30	92.0	0.104
BZW04P64	71.3	82.5	1.0	64.1	5.0	3.90	103	0.105
BZW04-64	71.3	78.8	1.0	64.1	5.0	3.90	103	0.105
BZW04P70	77.9	90.2	1.0	70.1	5.0	3.50	113	0.105
BZW04-70	77.9	86.1	1.0	70.1	5.0	3.50	113	0.105
BZW04P78	86.5	100	1.0	78.0	5.0	3.20	125	0.105
BZW04-78	86.5	95.5	1.0	78.0	5.0	3.20	125	0.105
BZW04P85	95.0	110	1.0	85.5	5.0	2.90	137	0.106
BZW04-85	95.0	105	1.0	85.5	5.0	2.90	137	0.106
BZW04P94	105	121	1.0	94.0	5.0	2.60	152	0.107
BZW04-94	105	116	1.0	94.0	5.0	2.60	152	0.107
BZW04P102	114	132	1.0	102.0	5.0	2.40	165	0.107
BZW04-102	114	126	1.0	102.0	5.0	2.40	165	0.107
BZW04P110	124	143	1.0	118.0	5.0	2.20	179	0.107
BZW04-110	124	137	1.0	111.0	5.0	2.20	179	0.107
BZW04P128	143	165	1.0	128.0	5.0	2.00	207	0.108
BZW04-128	143	158	1.0	128.0	5.0	2.00	207	0.108
BZW04P136	152	176	1.0	136.0	5.0	1.80	219	0.108
BZW404-136	152	168	1.0	136.0	5.0	1.80	219	0.108
BZW04P145	161	187	1.0	145.0	5.0	1.70	234	0.108
BZW04-145	161	179	1.0	145.0	5.0	1.70	234	0.108
BZW04P154	171	198	1.0	154.0	5.0	1.60	246	0.108
BZW04-154	171	189	1.0	154.0	5.0	1.60	246	0.108
BZW04P171	190	220	1.0	171.0	5.0	1.50	274	0.108
BZW04-171	190	210	1.0	171.0	5.0	1.50	274	0.108
BZW04P188	209	242	1.0	188.0	5.0	1.40	301	0.108
BZW04-188	209	231	1.0	188.0	5.0	1.40	301	0.108
BZW04P213	237	275	1.0	213.0	5.0	1.50	344	0.110
BZW04-213	237	263	1.0	213.0	5.0	1.50	344	0.110
BZW04P239	266	308	1.0	239.0	5.0	1.50	384	0.110
BZW04-239	266	294	1.0	239.0	5.0	1.50	384	0.110
BZW04P256	285	330	1.0	256.0	5.0	1.20	414	0.110
BZW04-256	285	315	1.0	256.0	5.0	1.20	414	0.110
BZW04P273	304	352	1.0	273.0	5.0	1.20	438	0.110
BZW04-273	304	336	1.0	273.0	5.0	1.20	438	0.110
BZW04P299	332	385	1.0	299.0	5.0	0.90	482	0.110
BZW04-299	332	368	1.0	299.0	5.0	0.90	482	0.110
BZW04P342	380	440	1.0	342.0	5.0	0.90	548	0.110
BZW04-342	380	420	1.0	342.0	5.0	0.90	548	0.110
BZW04P376	418	484	1.0	376.0	5.0	0.80	603	0.110
BZW04-376	418	462	1.0	376.0	5.0	0.80	603	0.110

NOTES:

(1) $V_{(BR)}$ measured after I_T applied for 300μs I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derated per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35
(4) For bidirectional devices with V_{WM} of 10 Volts and less, the I_D limit is doubled

FIG. 1 - PEAK PULSE POWER RATING CURVE

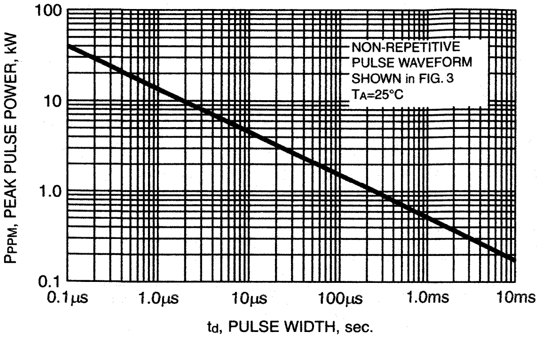


FIG. 2 - PULSE DERATING CURVE

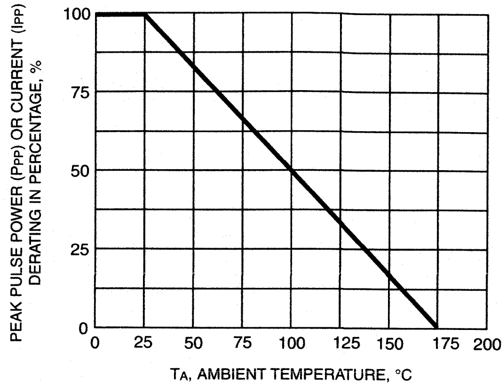


FIG. 3 - PULSE WAVEFORM

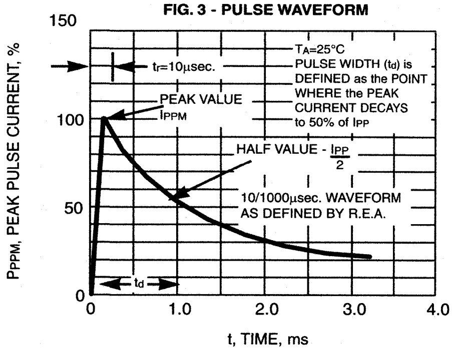


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

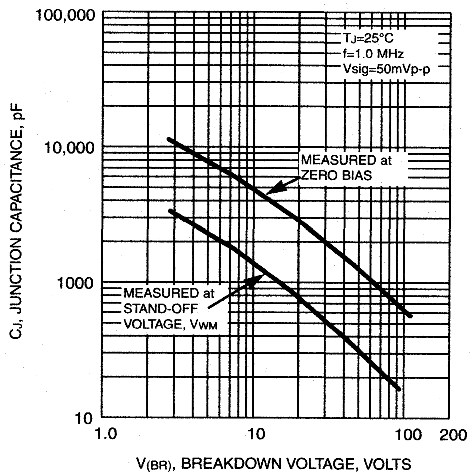


FIG. 5 - STEADY STATE POWER DERATING CURVE

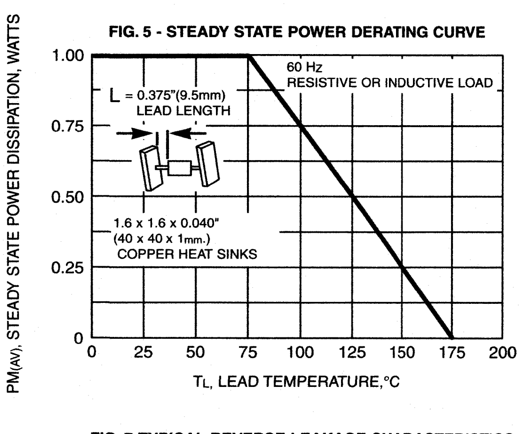


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL

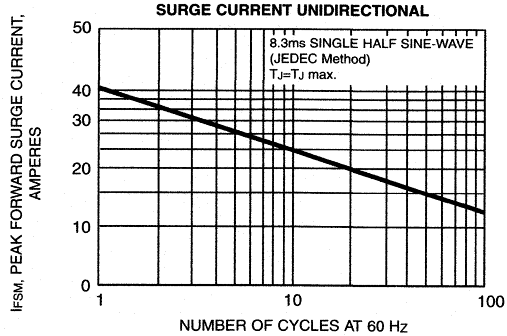
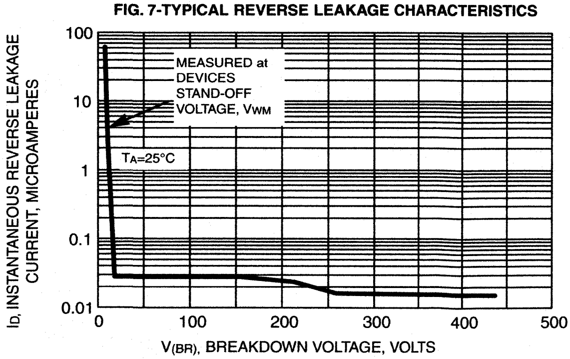


FIG. 7-TYPICAL REVERSE LEAKAGE CHARACTERISTICS



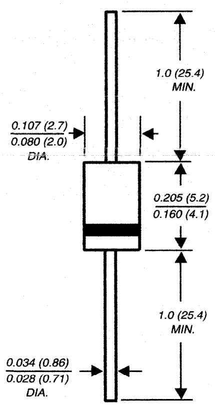
P4KA6.8 THRU P4KA43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43 Volts* ***Peak Pulse Power** - 400 Watts*

PATENTED*

DO-204AL

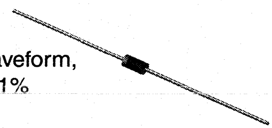


Dimensions in inches and (millimeters)
★ Patent #'s 4,980,315
5,166,769
5,278,094

Available in unidirectional only

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Designed for under the hood applications
- Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- 400W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body over passivated junction
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5

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ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Reverse Leakage at V_{WM}, T_J=150°C I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
	MIN	MAX							
P4KA6.8	6.12	7.48	10.0	5.50	300	1000	38.0	10.8	0.057
P4KA6.8A	6.45	7.14	10.0	5.80	300	1000	40.0	10.5	0.057
P4KA7.5	6.75	8.25	10.0	6.05	150	500	36.0	11.7	0.060
P4KA7.5A	7.13	7.88	10.0	6.40	150	500	37.0	11.3	0.061
P4KA8.2	7.38	9.02	10.0	6.63	50.0	200	33.0	12.5	0.065
P4KA8.2A	7.79	8.61	10.0	7.02	50.0	200	34.0	12.1	0.065
P4KA9.1	8.19	10.0	1.0	7.37	10.0	50.0	30.0	13.8	0.068
P4KA9.1 A	8.65	9.55	1.0	7.78	10.0	50.0	31.0	13.4	0.068
P4KA10	9.00	11.0	1.0	8.10	5.0	20.0	28.0	15.0	0.073
P4KA10A	9.50	10.5	1.0	8.55	5.0	20.0	28.9	14.5	0.073
P4KA11	9.90	12.1	1.0	8.92	2.0	10.0	25.0	16.2	0.075
P4KA11A	10.5	11.6	1.0	9.40	2.0	10.0	26.0	15.6	0.075
P4KA12	10.8	13.2	1.0	9.72	1.0	10.0	24.0	17.3	0.076
P4KA12A	11.4	12.6	1.0	10.2	1.0	10.0	25.0	16.7	0.078
P4KA13	11.7	14.3	1.0	10.5	1.0	10.0	22.0	19.0	0.081
P4KA13A	12.4	13.7	1.0	11.1	1.0	10.0	23.6	18.2	0.081
P4KA15	13.5	16.3	1.0	12.1	1.0	10.0	19.0	22.0	0.084
P4KA15A	14.3	15.8	1.0	12.8	1.0	10.0	19.8	21.2	0.084
P4KA16	14.4	17.6	1.0	12.9	1.0	10.0	17.8	23.5	0.086
P4KA16A	15.2	16.8	1.0	13.6	1.0	10.0	18.0	22.5	0.086
P4KA18	16.2	19.8	1.0	14.5	1.0	10.0	15.8	26.5	0.088
P4KA18A	17.1	18.9	1.0	15.3	1.0	10.0	16.4	25.5	0.088
P4KA20	18.0	22.0	1.0	16.2	1.0	10.0	14.4	29.1	0.090
P4KA20A	19.0	21.0	1.0	17.0	1.0	10.0	15.0	27.7	0.0903

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Reverse Leakage at V_{WM}, T_C=150°C I_D (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
P4KA22	19.8	24.2	1.0	17.8	1.0	10.0	13.0	31.9	0.092
P4KA22A	20.9	23.1	1.0	18.8	1.0	10.0	13.7	30.6	0.092
P4KA24	21.6	26.4	1.0	19.4	1.0	10.0	12.0	34.2	0.094
P4KA24A	22.8	25.2	1.0	20.5	1.0	10.0	12.6	33.2	0.094
P4KA27	24.3	29.7	1.0	21.8	1.0	10.0	10.7	39.1	0.096
P4KA27A	25.7	28.4	1.0	23.1	1.0	10.0	11.0	37.5	0.096
P4KA30	27.0	33.0	1.0	24.3	1.0	10.0	9.6	43.5	0.097
P4KA30A	28.5	31.5	1.0	25.6	1.0	10.0	10.0	41.4	0.097
P4KA33	29.7	36.3	1.0	26.8	1.0	10.0	8.8	47.7	0.098
P4KA33A	31.4	34.7	1.0	28.2	1.0	10.0	9.0	45.7	0.098
P4KA36	32.4	39.6	1.0	29.1	1.0	10.0	8.0	52.0	0.099
P4KA36A	34.2	37.8	1.0	30.8	1.0	10.0	8.4	49.9	0.099
P4KA39	35.1	42.9	1.0	31.6	1.0	10.0	7.4	56.4	0.100
P4KA39A	37.1	41.0	1.0	33.3	1.0	10.0	7.7	53.9	0.100
P4KA43	38.7	47.3	1.0	34.8	1.0	10.0	6.7	61.9	0.101
P4KA43A	40.9	45.2	1.0	36.8	1.0	10.0	7.0	59.3	0.101

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300µs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derated per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

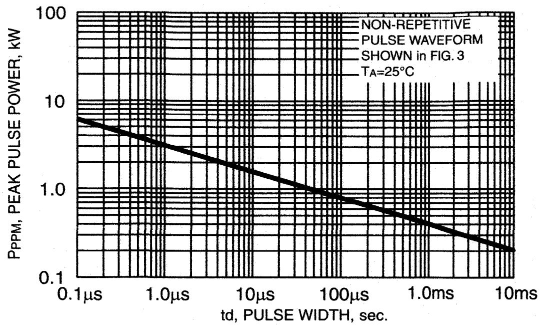


FIG. 2 - PULSE DERATING CURVE

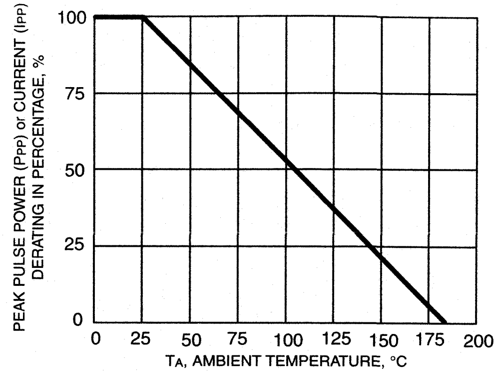


FIG. 3 - PULSE WAVEFORM

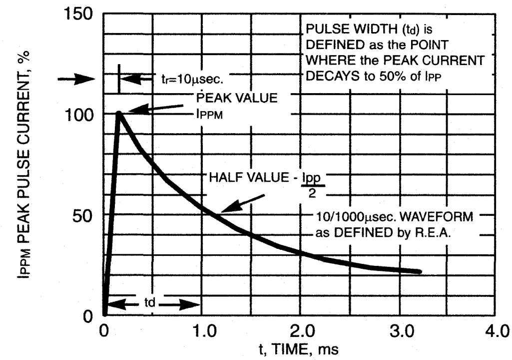


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

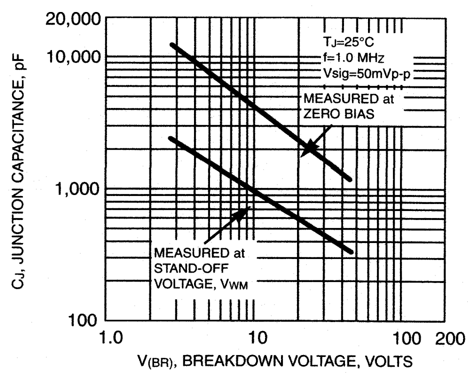


FIG. 5 - STEADY STATE POWER DERATING CURVE

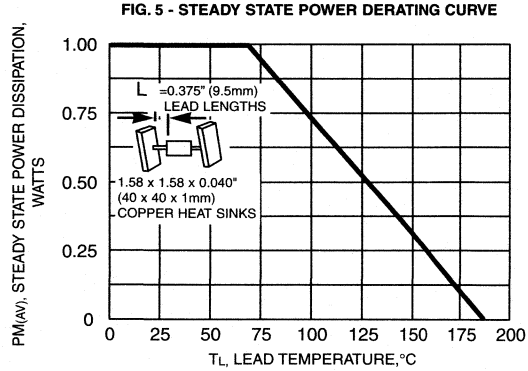
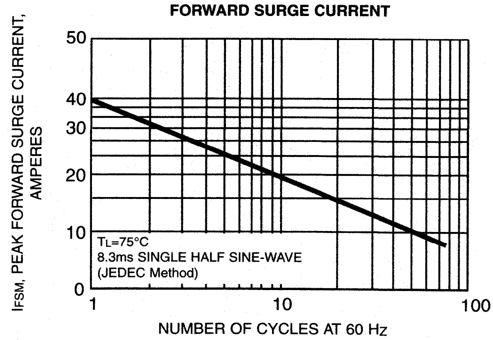


FIG. 6 - MAXIMUM NON-REPETITIVE\PEAK FORWARD SURGE CURRENT

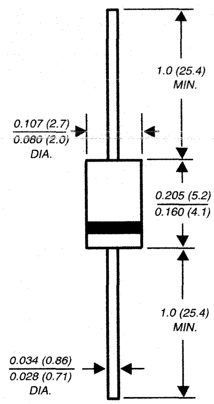


P4KE6.8 THRU P4KE440CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 440 Volts* ***Peak Pulse Power** - 400 Watts*

DO-204AL

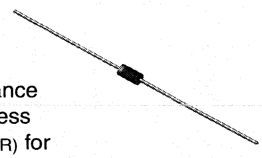


NOTE: *Lead diameter is* $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ *for suffix "E" part numbers*

Dimensions are in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ 400W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- ♦ Devices with $V_{(BR)} \geq 10V$ I_D are typically I_D less than 1.0μA
- ♦ High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic body over passivated junction
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except for bidirectional types
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use C or CA suffix for types P4KE7.5 thru types P4KE440 (e.g. P4KE7.5CA, P4KE440CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	*VALUE*	*UNITS*
Peak power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A for unidirectional only (NOTE 4)	V_F	3.5/6.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 6
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum
(4) V_F=3.0 Volt max. for devices of $V_{(BR)} \leq 200V$, and V_F=6.5 Volt max. for devices of $V_{(BR)} > 200V$

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
*P4KE6.8	6.12	7.48	10.0	5.50	1000.0	38.0	10.8	0.057
*P4KE6.8A	6.45	7.14	10.0	5.80	1000.0	40.0	10.5	0.057
P4KE7.5	6.75	8.25	10.0	6.05	500.0	35.0	11.7	0.061
P4KE7.5A	7.13	7.88	10.0	6.40	500.0	37.0	11.3	0.061
P4KE8.2	7.38	9.02	10.0	6.63	200.0	33.0	12.5	0.065
P4KE8.2A	7.79	8.61	10.0	7.02	200.0	34.0	12.1	0.065
P4KE9.1	8.19	10.0	10.0	7.37	50.0	30.0	13.8	0.068
P4KE9.1A	8.65	9.55	1.0	7.78	50.0	31.0	13.4	0.068
P4KE10	9.00	11.0	1.0	8.10	10.0	28.0	15.0	0.073
P4KE10A	9.50	10.5	1.0	8.55	10.0	29.0	14.5	0.073
P4KE11	9.90	12.1	1.0	8.92	5.0	26.0	16.2	0.075
P4KE11A	10.5	11.6	1.0	9.40	5.0	27.0	15.6	0.075
P4KE12	10.8	13.2	1.0	9.72	5.0	24.0	17.3	0.076
P4KE12A	11.4	12.6	1.0	10.2	5.0	25.0	16.7	0.078
P4KE13	11.7	14.3	1.0	10.5	5.0	22.0	19.0	0.081
P4KE13A	12.4	13.7	1.0	11.1	5.0	23.0	18.2	0.081
P4KE15	13.5	16.5	1.0	12.1	5.0	19.0	22.0	0.084
P4KE15A	14.3	15.8	1.0	12.8	5.0	20.0	21.2	0.084
P4KE16	14.4	17.6	1.0	12.9	5.0	17.8	23.5	0.086
P4KE16A	15.2	16.8	1.0	13.6	5.0	18.6	22.5	0.086
P4KE18	16.2	19.8	1.0	14.5	5.0	16.0	26.5	0.088
P4KE18A	17.1	18.9	1.0	15.3	5.0	16.5	25.5	0.088
P4KE20	18.0	22.0	1.0	16.2	5.0	14.0	29.1	0.090
P4KE20A	19.0	21.0	1.0	17.1	5.0	15.0	27.7	0.090
P4KE22	19.8	24.2	1.0	17.8	5.0	13.0	31.9	0.092
P4KE22A	20.9	23.1	1.0	18.8	5.0	13.7	30.6	0.092
P4KE24	21.6	26.4	1.0	19.4	5.0	12.0	34.7	0.094
P4KE24A	22.8	25.2	1.0	20.5	5.0	12.6	33.2	0.094
P4KE27	24.3	29.7	1.0	21.8	5.0	10.7	39.1	0.096
P4KE27A	25.7	28.4	1.0	23.1	5.0	11.0	37.5	0.096
P4KE30	27.0	33.0	1.0	24.3	5.0	9.6	43.5	0.097
P4KE30A	28.5	31.5	1.0	25.6	5.0	10.0	41.4	0.097
P4KE33	29.7	36.3	1.0	26.8	5.0	8.8	47.7	0.098
P4KE33A	31.4	34.7	1.0	28.2	5.0	9.0	45.7	0.098
P4KE36	32.4	39.6	1.0	29.1	5.0	8.0	52.0	0.099
P4KE36A	34.2	37.8	1.0	30.8	5.0	8.4	49.9	0.099
P4KE39	35.1	42.9	1.0	31.6	5.0	7.4	56.4	0.100
P4KE39A	37.1	41.0	1.0	33.3	5.0	7.7	53.9	0.100
P4KE43	38.7	47.3	1.0	34.8	5.0	6.7	61.9	0.101
P4KE43A	40.9	45.2	1.0	36.8	5.0	7.0	59.3	0.101
P4KE47	42.3	51.7	1.0	38.1	5.0	6.2	67.8	0.101
P4KE47A	44.7	49.4	1.0	40.2	5.0	6.4	64.8	0.101
P4KE51	45.9	56.1	1.0	41.3	5.0	5.7	73.5	0.102
P4KE51A	48.5	53.6	1.0	43.6	5.0	6.0	70.1	0.102
P4KE56	50.4	61.6	1.0	45.4	5.0	5.2	80.5	0.103
P4KE56A	53.2	58.8	1.0	47.8	5.0	5.4	77.0	0.103

* Not available as bidirectional devices

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
P4KE62	55.8	68.8	1.0	50.2	5.0	4.7	89.0	0.104
P4KE62A	58.9	65.1	1.0	53.0	5.0	5.0	85.0	0.104
P4KE68	61.2	74.8	1.0	55.1	5.0	4.2	98.0	0.104
P4KE68A	64.6	71.4	1.0	58.1	5.0	4.5	92.0	0.104
P4KE75	67.5	82.5	1.0	60.7	5.0	3.8	108.0	0.105
P4KE75A	71.3	78.8	1.0	64.1	5.0	4.0	103.0	0.105
P4KE82	73.8	90.2	1.0	66.4	5.0	3.5	118.0	0.105
P4KE82A	77.9	86.1	1.0	70.1	5.0	3.7	113.0	0.105
P4KE91	81.9	100	1.0	73.7	5.0	3.2	131.0	0.106
P4KE91A	86.5	95.5	1.0	77.8	5.0	3.3	125.0	0.106
P4KE100	90.0	110	1.0	81.0	5.0	2.9	144.0	0.106
P4KE100A	95.0	105	10	85.5	5.0	3.0	137.0	0.106
P4KE110	99.0	121	1.0	89.2	5.0	2.6	158.0	0.107
P4KE110A	105	116	1.0	94.0	5.0	2.7	152.0	0.107
P4KE120	108	132	1.0	97.2	5.0	2.4	173.0	0.107
P4KE120A	114	126	1.0	102	5.0	2.5	165.0	0.107
P4KE130	117	143	1.0	105	5.0	2.2	187.0	0.107
P4KE130A	124	137	1.0	111	5.0	2.3	179.0	0.107
P4KE150	1'35	165	t.0	121	5.0	1.9	215.0	0.108
P4KE150A	143	158	1.0	128	5.0	2.0	207.0	0.108
P4KE160	144	176	1.0	130	5.0	1.8	230.0	0.108
P4KE160A	152	168	1.0	136	5.0	1.9	219.0	0.108
P4KE170	153	187	1.0	138	5.0	1.7	244.0	0.108
P4KE170A	162	179	1.0	145	5.0	1.8	234.0	0.108
P4KE180	162	198	1.0	146	5.0	1.6	258.0	0.108
P4KE180A	171	189	1.0	154	5.0	1.7	246.0	0.108
P4KE200	180	220	1.0	162	5.0	1.4	287.0	0.108
P4KE200A	190	210	1.0	171	5.0	1.51	274.0	0.108
P4KE220	198	242	1.0	175	5.0	1.2	344.0	0.108
P4KE220A	209	231	1.0	185	5.0	1.3	328.0	0.108
P4KE250	225	275	1.0	202	5.0	1.1	360.0	0.110
P4KE250A	237	267	1.0	214	5.0	1.2	344.0	0.110
P4KE300	270	330	1.0	243	5.0	0.97	430.0	0.110
P4KE300A	285	315	1.0	256	5.0	1.0	414.0	0.110
P4KE350	315	385	1.0	284	5.0	0.83	504.0	0.110
P4KE350A	332	368	1.0	300	5.0	0.87	482.0	0.110
P4KE400	360	440	1.0	324	5.0	0.73	574.0	0.110
P4KE400A	380	420	1.0	342	5.0	0.76	548.0	0.110
P4KE440	396	484	1.0	356	5.0	0.66	631.0	0.110
P4KE440A	418	462	1.0	376	5.0	0.69	602.0	0.110

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derated per Fig. 2
(3) For bidirectional types having V_{WM} of 10 volts and less, the I_D limit is doubled
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

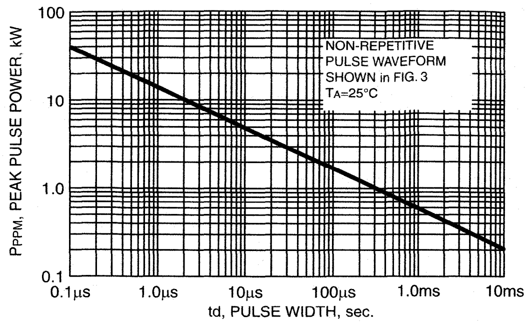


FIG. 2 - PULSE DERATING CURVE

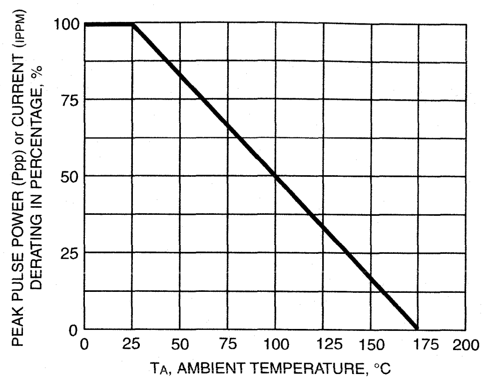


FIG. 3 - PULSE WAVEFORM

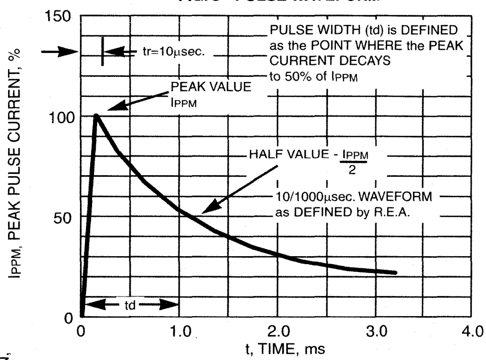


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

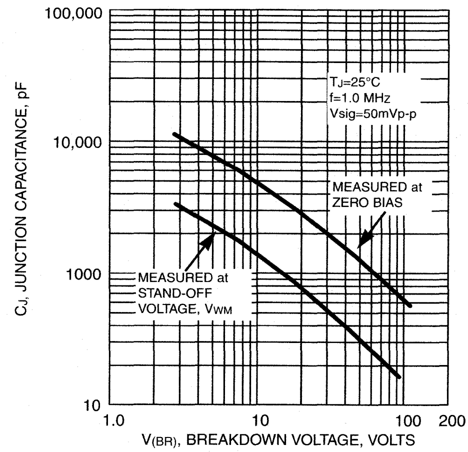


FIG. 5 - STEADY STATE POWER DERATING CURVE

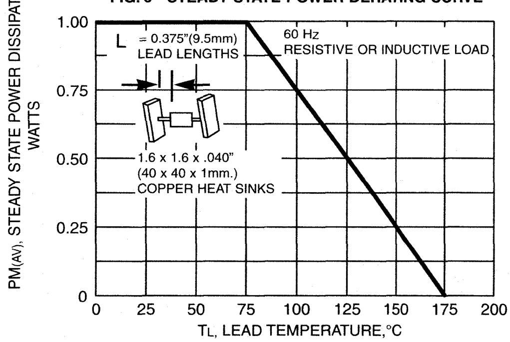


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

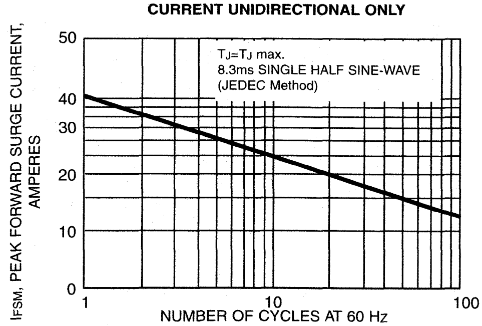
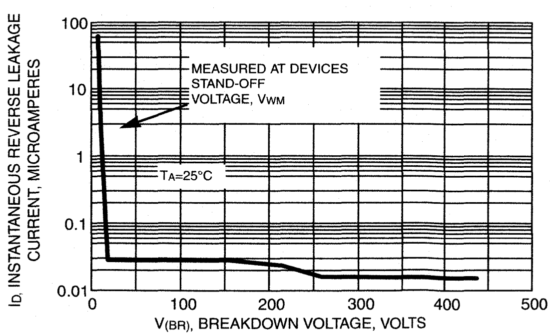


FIG. 7 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS



General Instrument
Power Semiconductor Division

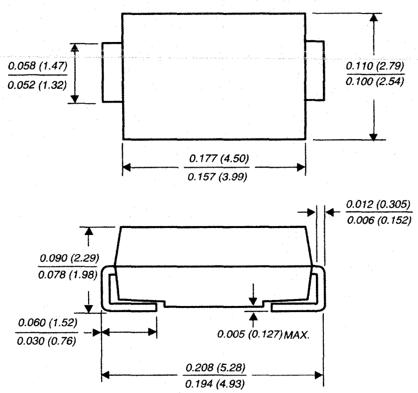
TPSMA6.8 THRU TPSMA43A

SURFACE MOUNT AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43.0 Volts* ***Peak Pulse Power** - 400 Watts*

PATENTED

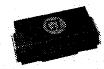
DO-214AC
MODIFIED J-BEND



Dimensions in inches and (millimeters)

Available in unidirectional only

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Ideal for automated placement
- ♦ Low profile package
- ♦ Built-in strain relief
- ♦ Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- ♦ 400W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ min.
- ♦ For devices with $V_{(BR)} \geq 10V$ I_D are typically less than 1.0μA at T_A=150°C
- ♦ Designed for under the hood surface mount applications
- ♦ High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic body over passivated chip
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.002 ounces, 0.064 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATINGS	*SYMBOLS*	*VALUE*	*UNITS*
Peak power dissipation with a 10/1000μs waveform, (NOTES 1, 2 FIG. 3)	P_{PPM}	Minimum 400	Watts
Peak power pulse current with a 10/1000μs waveform (NOTE 1, FIG. 1)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum instantaneous forward voltage at 25A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on P.C.B. with 0.2 x 0.2" (5.0 x 0.5mm) copper pads attached to each terminal
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN.	MAX.	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_R (μA)	Maximum Reverse Leakage at V_{WM}, T_A=150°C I_D (μA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)
TPSMA6.8	ADP	6.12	7.48	10.0	5.50	300.0	1000.0	38.0	10.8
TPSMA6.8A	AEP	6.45	7.14	10.0	5.80	300.0	1000.0	40.0	10.5
TPSMA7.5	AFP	6.75	8.25	10.0	6.05	150.0	500.0	36.0	11.7
TPSMA7.5A	AGP	7.13	7.88	10.0	6.40	150.0	500.0	37.0	11.3
TPSMA8.2	AHP	7.38	9.02	10.0	6.63	50.0	200.0	33.0	12.5
TPSMA8.2A	AKP	7.79	8.61	10.0	7.02	50.0	200.0	34.0	12.1
TPSMA9.1	ALP	8.19	10.00	1.0	7.37	10.0	50.0	30.0	13.8
TPSMA9.1A	AMP	8.65	9.55	1.0	7.78	10.0	50.0	31.0	13.4
TPSMA10	ANP	9.00	11.00	1.0	8.10	5.0	20.0	28.0	15.0
TPSMA10A	APP	9.50	10.50	1.0	8.65	5.0	20.0	28.9	14.5
TPSMA11	AQP	9.90	12.10	1.0	8.92	1.0	5.0	25.0	16.2
TPSMA11A	ARP	10.50	11.60	1.0	9.40	1.0	5.0	26.0	15.6
TPSMA12	ASP	10.80	13.20	1.0	9.72	1.0	5.0	24.0	17.3
TPSMA12A	ATP	11.40	12.60	1.0	10.20	1.0	5.0	25.0	16.7
TPSMA13	AUP	11.70	14.30	1.0	10.50	1.0	5.0	22.0	19.0
TPSMA13A	AVP	12.40	13.70	1.0	11.10	1.0	5.0	23.0	18.2
TPSMA15	AWP	13.50	16.30	1.0	12.10	1.0	5.0	19.0	22.0
TPSMA15A	AXP	14.30	15.80	1.0	12.80	1.0	5.0	19.8	21.2
TPSMA16	AYP	14.40	17.60	1.0	12.90	1.0	5.0	17.8	23.5
TPSMA16A	AZP	15.20	16.80	1.0	13.60	1.0	5.0	18.0	22.5
TPSMA18	BDP	16.20	19.80	1.0	14.50	1.0	5.0	15.8	26.5
TPSMA18A	BEP	17.10	18.90	1.0	15.30	1.0	5.0	16.4	25.5
TPSMA20	BFP	18.00	22.00	1.0	16.20	1.0	5.0	14.4	29.1
TPSMA20A	BGP	19.00	21.00	1.0	17.10	1.0	5.0	15.0	27.7
TPSMA22	BHP	19.80	24.20	1.0	17.80	1.0	5.0	13.0	31.9
TPSMA22A	BKP	20.90	23.10	1.0	18.80	1.0	5.0	13.7	30.6
TPSMA24	BLP	21.60	26.40	1.0	19.40	1.0	5.0	12.0	34.7
TPSMA24A	BMP	22.80	25.20	1.0	20.50	1.0	5.0	12.6	33.2
TPSMA27	BNP	24.30	29.70	1.0	21.80	1.0	5.0	10.7	39.1
TPSMA27A	BPP	25.70	28.40	1.0	23.10	1.0	5.0	11.0	37.5
TPSMA30	BOP	27.00	33.00	1.0	24.30	1.0	5.0	9.6	43.5
TPSMA30A	BRP	28.50	31.50	1.0	25.60	1.0	5.0	10.0	41.4
TPSMA33	BSP	29.70	36.30	1.0	26.80	1.0	5.0	8.8	47.7
TPSMA33A	BTP	31.40	34.70	1.0	28.20	1.0	5.0	9.0	45.7
TPSMA36	BUP	32.40	39.60	1.0	29.10	1.0	5.0	8.0	52.0
TPSMA36A	BVP	34.20	37.80	1.0	30.80	1.0	5.0	8.4	49.9
TPSMA39	BWP	35.10	42.90	1.0	31.60	1.0	5.0	7.4	56.4
TPSMA39A	BXP	37.10	41.00	1.0	33.30	1.0	5.0	7.7	53.9
TPSMA43	BYP	38.70	47.30	1.0	34.80	1.0	5.0	6.7	61.9
TPSMA43A	BZP	40.90	45.20	1.0	36.80	1.0	5.0	7.0	59.3

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

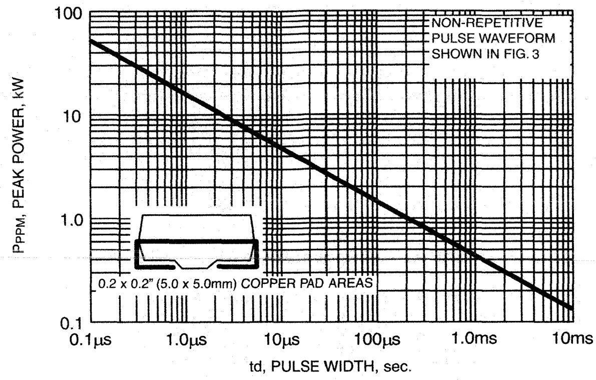


FIG. 2 - PULSE DERATING CURVE

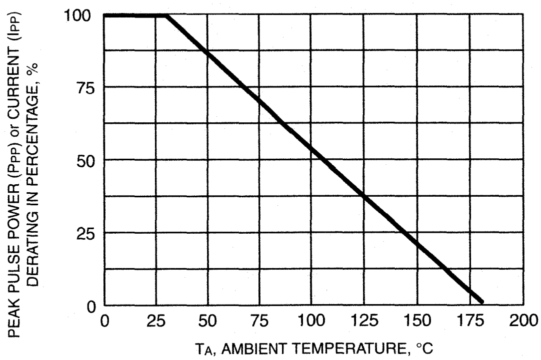


FIG. 3 - PULSE WAVEFORM

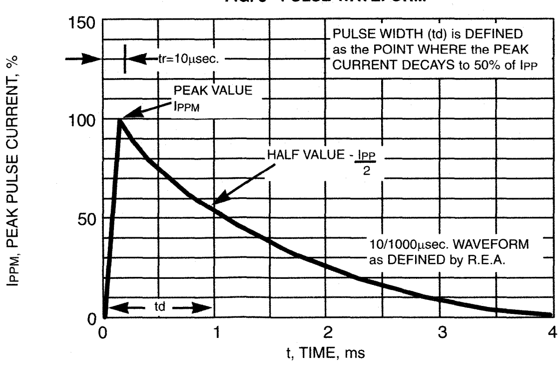


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

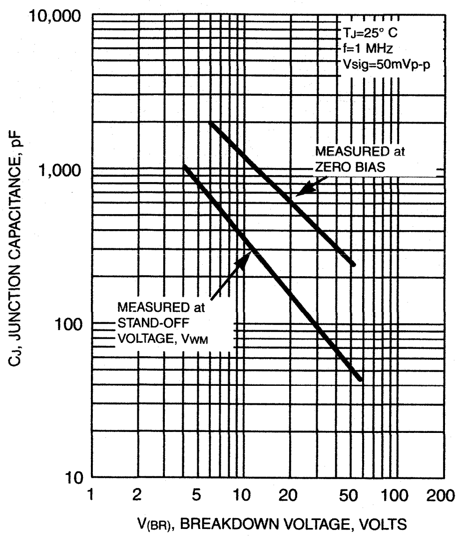
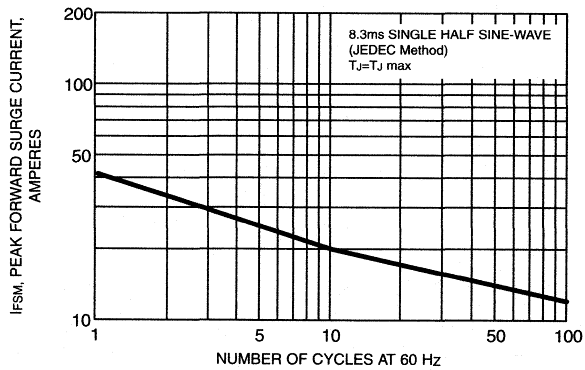


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

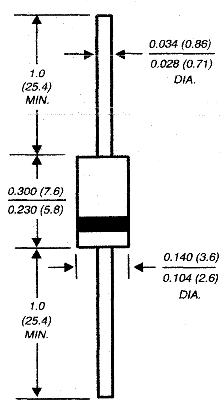


SA5.0 THRU SA170CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 170 Volts* ***Peak Pulse Power** - 500 Watts*

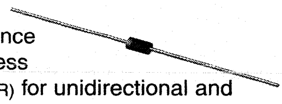
DO-204AC



Dimensions in inches and (millimeters)

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ 500W peak pulse power surge capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- ♦ For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- ♦ High temperature soldering guaranteed: 265°C/10 seconds 0.375" (9.5mm) lead length, 5lbs (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic body over passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectionals
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use C or CA Suffix for types SA6.5 thru types SA170 (e.g. SA6.5C, SA170CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

	SYMBOL	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 500	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, unidirectional only (JEDEC Method) (NOTE 3)	I_{FSM}	70	Amps
Maximum instantaneous forward voltage at 35A for unidirectional only (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (mV / °C)
	MIN	MAX						
SA5.0*	6.40	7.30	10	5.0	600	54.0	9.6	5.0
SA5.0A*	6.40	7.00	10	5.0	600	57.0	9.2	5.0
SA6.0*	6.67	8.15	10	6.0	600	46.0	11.4	5.0
SA6.0A*	6.67	7.37	10	6.0	600	50.0	10.3	5.0
SA6.5	7.22	8.82	10	6.5	400	42.0	12.3	5.0
SA6.5A	7.22	7.98	10	6.5	400	46.0	11.2	5.0
SA7.0	7.78	9.51	10	7.0	150	39.0	13.3	6.0
SA7.0A	7.78	8.60	10	7.0	150	43.0	12.0	6.0
SA7.5	8.33	10.2	1.0	7.5	50	36.0	14.3	7.0
SA7.5A	8.33	9.21	1.0	7.5	50	40.0	12.9	7.0
SA8.0	8.89	10.9	1.0	8.0	25	35.0	15.0	7.0
SA8.0A	8.89	9.83	1.0	8.0	25	38.0	13.6	7.0
SA8.5	9.44	11.5	1.0	8.5	10	33.0	15.9	8.0
SA8.5A	9.44	10.4	1.0	8.5	10	36.0	14.4	8.0
SA9.0	10.0	12.2	1.0	9.0	5.0	31.0	16.9	9.0
SA9.0A	10.0	11.1	1.0	9.0	5.0	34.0	15.4	9.0
SA10	11.1	13.6	1.0	10.0	1.0	27.0	18.8	10.0
SA10A	11.1	12.3	1.0	10.0	1.0	30.0	17.0	10.0
SA11	12.2	14.9	1.0	11.0	1.0	26.0	20.1	11.0
SA11A	12.2	13.5	1.0	11.0	1.0	28.0	18.2	11.0
SA12	13.3	16.3	1.0	12.0	1.0	23.0	22.0	12.0
SA12A	13.3	14.7	1.0	12.0	1.0	26.3	19.9	12.0
SA13	14.4	17.6	1.0	13.0	1.0	22.0	23.8	13.0
SA13A	14.4	15.9	1.0	13.0	1.0	24.0	21.5	13.0
SA14	15.6	19.1	1.0	14.0	1.0	20.3	25.8	14.0
SA14A	15.6	17.2	1.0	14.0	1.0	22.6	23.2	14.0
SA15	16.7	20.4	1.0	15.0	1.0	19.5	26.9	16.0
SA15A	16.7	18.5	1.0	15.0	1.0	21.0	24.4	16.0
SA16	17.8	21.8	1.0	16.0	1.0	18.0	28.8	19.0
SA16A	17.8	19.7	1.0	16.0	1.0	20.0	26.0	17.0
SA17	18.9	23.1	1.0	17.0	1.0	17.0	30.5	20.0
SA17A	18.9	20.9	1.0	17.0	1.0	19.0	27.6	19.0
SA18	20.0	24.4	1.0	18.0	1.0	16.3	32.2	21.0
SA18A	20.0	22.1	1.0	18.0	1.0	17.9	29.2	20.0
SA20	22.2	27.1	1.0	20.0	1.0	14.0	35.8	25.0
SA20A	22.2	24.5	1.0	20.0	1.0	16.0	32.4	23.0
SA22	24.4	29.8	1.0	22.0	1.0	13.0	39.4	28.0
SA22A	24.4	26.9	1.0	22.0	1.0	14.7	35.5	25.0
SA24	26.7	32.6	1.0	24.0	1.0	12.0	43.0	31.0
SA24A	26.7	29.5	1.0	24.0	1.0	13.4	38.9	28.0
SA26	28.9	35.3	1.0	26.0	1.0	11.0	46.6	31.0
SA26A	28.9	31.9	1.0	26.0	1.0	12.4	42.1	30.0
SA28	31.1	38.0	1.0	28.0	1.0	10.0	50.1	35.0
SA28A	31.1	34.4	1.0	28.0	1.0	11.5	45.4	31.0
SA30	33.3	40.7	1.0	30.0	1.0	9.8	53.5	39.0
SA30A	33.3	36.8	1.0	30.0	1.0	10.8	48.4	36.0
SA33	36.7	44.9	1.0	33.0	1.0	8.8	59.0	42.0
SA33A	36.7	40.6	1.0	33.0	1.0	9.8	53.3	39.0
SA36	40.0	48.9	1.0	36.0	1.0	8.1	64.3	46.0
SA36A	40.0	44.2	1.0	36.0	1.0	9.0	58.1	41.0
SA40	44.4	54.3	1.0	40.0	1.0	7.3	71.4	51.0
SA40A	44.4	49.1	1.0	40.0	1.0	8.1	64.5	46.0
SA43	47.8	58.4	1.0	43.0	1.0	6.8	76.7	55.0
SA43A	147.8	52.8	1.0	43.0	1.0	7.5	69.4	50.0

**Not available as bidirectional devices*

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (mV / °C)
SA45	50.0	61.1	1.0	45.0	1.0	6.5	80.3	58.0
SA45A	50.0	55.3	1.0	45.0	1.0	7.2	72.7	52.0
SA48	53.3	65.2	1.0	48.0	1.0	6.1	85.5	63.0
SA48A	53.3	58.9	1.0	48.0	1.0	6.7	77.4	56.0
SA51	56.7	69.3	1.0	51.0	1.0	5.7	91.1	66.0
SA51A	56.7	62.7	1.0	51.0	1.0	6.3	82.4	61.0
SA54	60.0	73.3	1.0	54.0	1.0	5.4	96.3	71.0
SA54A	60.0	66.3	1.0	54.0	1.0	6.0	87.1	65.0
SA58	64.4	78.7	1.0	58.0	1.0	5.0	103	78.0
SA58A	64.4	71.2	1.0	58.0	1.0	5.6	93.6	70.0
SA60	66.7	81.5	1.0	60.0	1.0	4.9	107	80.0
SA60A	66.7	73.7	1.0	60.0	1.0	5.4	96.8	71.0
SA64	71.1	86.9	1.0	64.0	1.0	4.6	114	86.0
SA64A	71.1	78.6	1.0	64.0	1.0	5.0	103	76.0
SA70	77.8	95.1	1.0	70.0	1.0	4.2	125	94.0
SA70A	77.8	86.0	1.0	70.0	1.0	4.6	113	85.0
SA75	83.3	102	1.0	75.0	1.0	3.9	134	101
SA75A	83.3	92.1	1.0	75.0	1.0	4.3	121	91.0
SA78	86.7	106	1.0	78.0	1.0	3.7	139	105
SA78A	86.7	95.8	1.0	78.0	1.0	4.1	126	95.0
SA85	94.4	115	1.0	85.0	1.0	3.4	151	114
SA85A	94.4	104	1.0	85.0	1.0	3.8	137	103
SA90	100	122	1.0	90.0	1.0	3.2	160	121
SA90A	100	111	1.0	90.0	1.0	3.5	146	110
SA100	111	136	1.0	100	1.0	2.9	179	135
SA100A	111	123	1.0	100	1.0	3.2	162	123
SA110	122	149	1.0	110	1.0	2.6	196	148
SA110A	122	135	1.0	110	1.0	2.9	177	133
SA120	133	163	1.0	120	1.0	2.4	214	162
SA120A	133	147	1.0	120	1.0	2.7	193	146
SA130	144	176	1.0	130	1.0	2.2	230	175
SA130A	144	159	1.0	130	1.0	2.5	209	158
SA150	167	204	1.0	150	1.0	1.9	268	203
SA150A	167	185	1.0	150	1.0	2.1	243	184
SA160	178	218	1.0	160	1.0	2.0	257	217
SA160A	178	197	1.0	160	1.0	2.0	259	196
SA170	189	231	1.0	170	1.0	1.7	304	230
SA170A	I189	1209	1.0	170	1.0	1.9	275	208

NOTES
(1) $V_{(BR)}$ measured after I_T applied for 300μs. I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bidirectional types with V_{WM} of 10 Volts and less, the I_D limit is doubled.
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

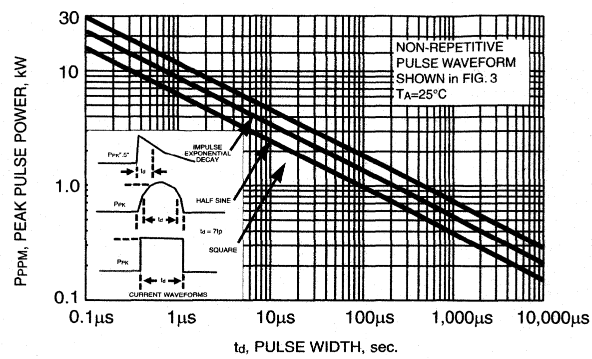


FIG. 2 - PULSE DERATING CURVE

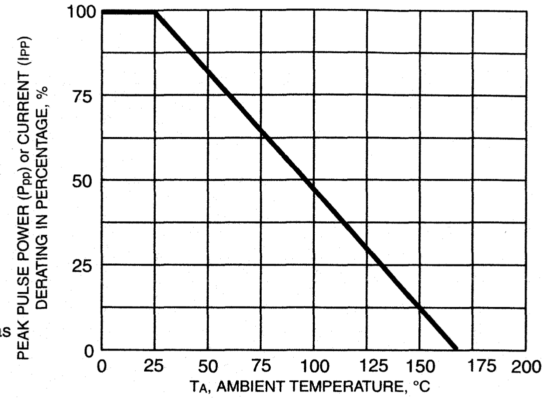


FIG. 3 - PULSE WAVEFORM

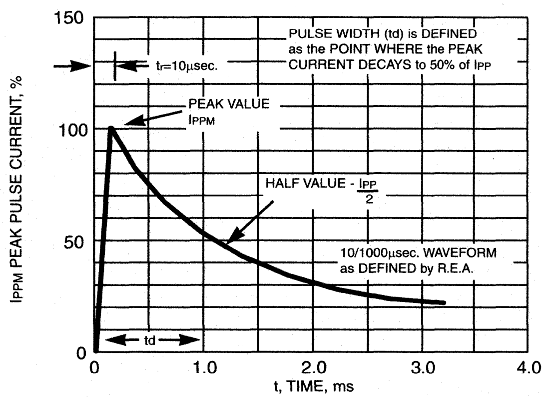


FIG. 4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

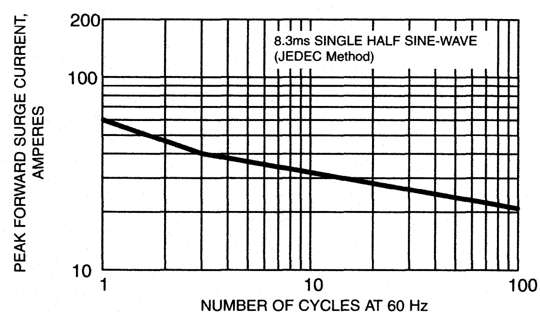


FIG. 5 - STEADY STATE POWER DERATING CURVE

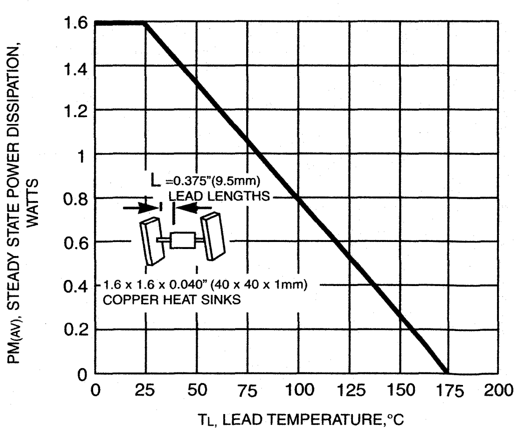


FIG. 6 - INCREMENTAL CLAMPING VOLTAGE CURVE UNIDIRECTIONAL

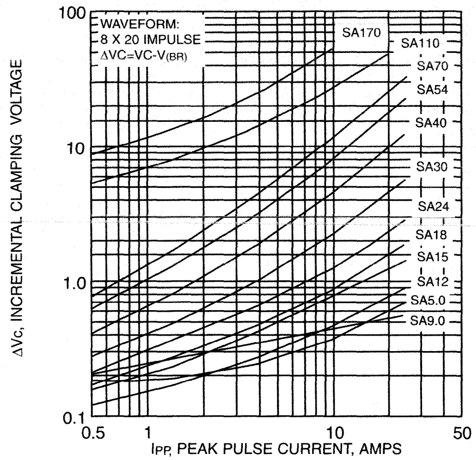


FIG. 7 - INCREMENTAL CLAMPING VOLTAGE CURVE UNIDIRECTIONAL

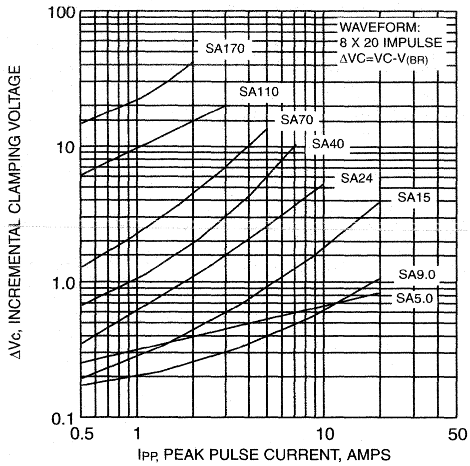


FIG. 8 - INCREMENTAL CLAMPING VOLTAGE CURVE BIDIRECTIONAL

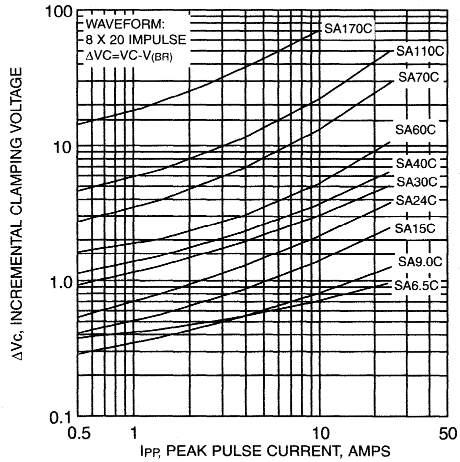


FIG. 9 - INCREMENTAL CLAMPING VOLTAGE CURVE BIDIRECTIONAL

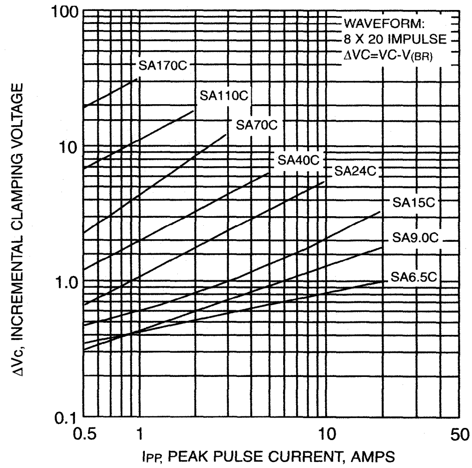


FIG. 10 - TYPICAL INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS CURVE

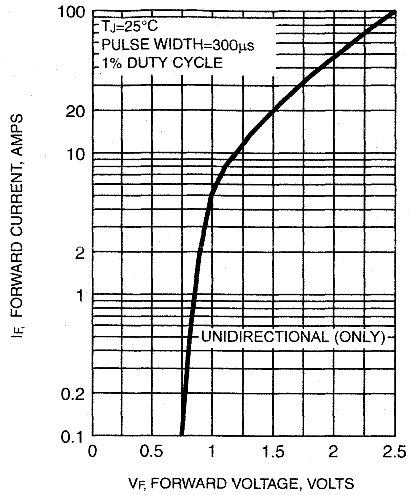
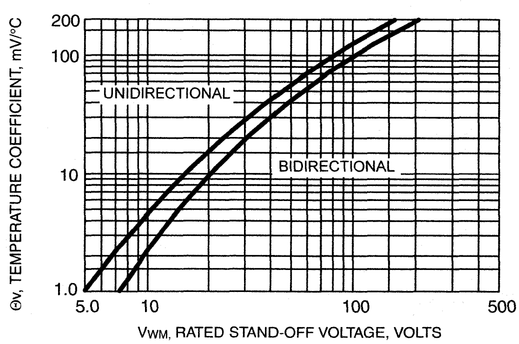


FIG. 11 - BREAKDOWN VOLTAGE TEMPERATURE COEFFICIENT CURVE



APPLICATIONS

This TVS series is a low cost, 500 watt commercial and industrial product for use in applications where space is a premium and where large voltage transients can permanently damage voltage-sensitive components.

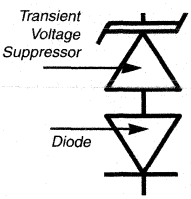
The response time of TVS clamping action is 1.0ns second for unidirectional and 5.0ns for bidirectional; therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage-sensitive semiconductor components.

SAC5.0 THRU SAC26 SERIES

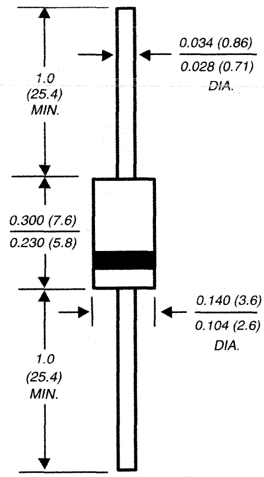
LOW CAPACITANCE TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 50 Volts* ***Peak Pulse Power** - 500 Watts*

Schematic



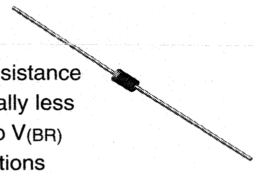
DO-204AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated junctions
- 500W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ns from 0 Volts to $V_{(BR)}$
- Ideal for data line applications
- High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over a passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1)	P_{PPM}	Minimum 500	Watts
Steady state power dissipation at T_L=75°C with lead lengths or 0.375" (9.5mm)	$P_{M(AV)}$	1.0	Watts
Peak pulse power surge current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Part Number	Stand-off Voltage (NOTE 1) V_{WM} (VOLTS)	Minimum Breakdown Voltage at I_T = 1.0mA $V_{(BR)}$ (VOLTS)	Maximum Reverse Leakage at V_{WM} I_D (uA)	Maximum Clamping Voltage at I_{PP}=5.OA V_C (VOLTS)	Maximum Peak Pulse Current per FIG. 3 I_{PP} (AMPS)	Maximum Junction Capacitance at 0 VOLTS (pF)	Working Inverse Blocking Voltage V_{WIB} (VOLTS)	Inverse Blocking Leakage Current at V_{WIB} I_{IB} (mA)	Peak Inverse Blocking Voltage V_{PIB} (VOLTS)
SAC5.0	5.0	7.60	300	10.0	44	50	75	1.0	100
SAC6.0	6.0	7.90	300	11.2	41	50	75	1.0	100
SAC7.0	7.0	8.33	300	12.6	38	50	75	1.0	100
SAC8.0	8.0	8.89	100	13.4	36	50	75	1.0	100
SAC8.5	8.5	9.44	50	14.0	34	50	75	1.0	100
SAC10	10	11.10	5.0	16.3	29	50	75	1.0	100
SAC12	12	13.30	5.0	19.0	25	50	75	1.0	100
SAC15	5	16.70	5.0	23.6	20	50	75	1.0	100
SAC18	18	20.00	5.0	28.8	15	50	75	1.0	100
SAC22	22	24.40	5.0	35.4	14	50	75	1.0	100
SAC26	26	28.90	5.0	42.3	11.1	50	75	1.0	100

RATINGS AND CHARACTERISTIC CURVES SAC5.0 THRU SAC26 SERIES

FIG. 1 - PEAK PULSE POWER RATING CURVE

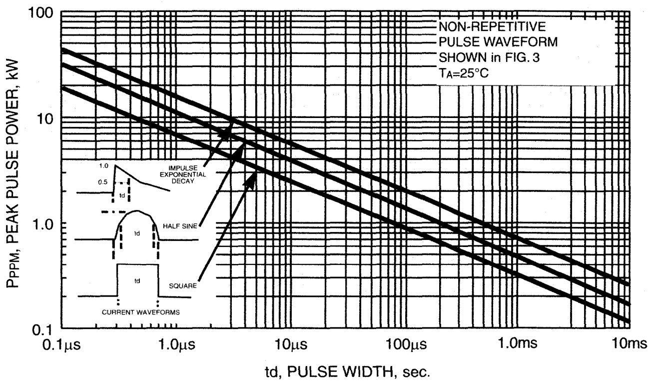


FIG. 2 - POWER DERATING CURVE

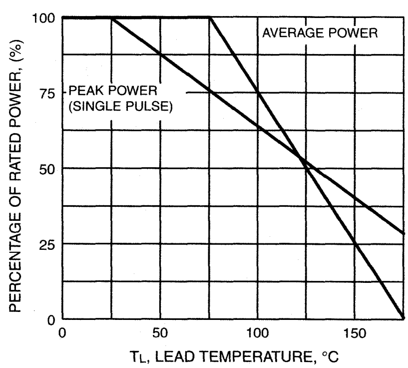


FIG. 3 - PULSE WAVEFORM

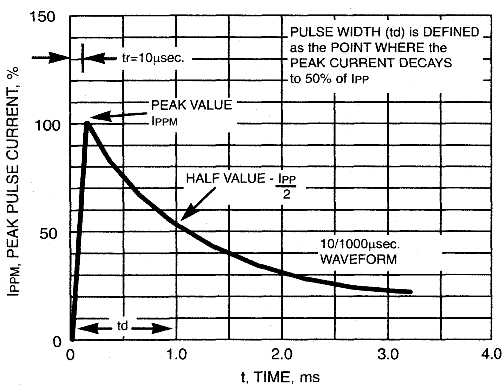
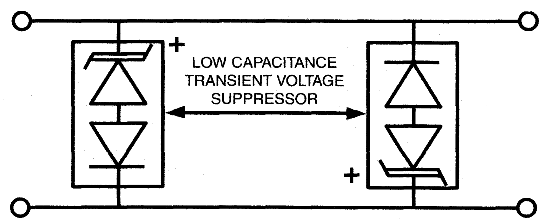


FIG. 4 - AC LINE PROTECTION APPLICATION



APPLICATION NOTE: Device must be used with two units in parallel, opposite in polarity as shown in circuit for AC signal line protection

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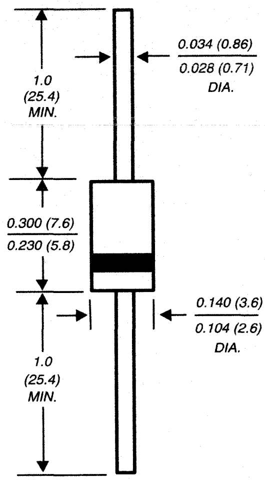
P6KA6.8 THRU P6KA43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43 Volts* ***Peak Pulse Power** - 600 Watts*

PATENTED*

DO-204AC



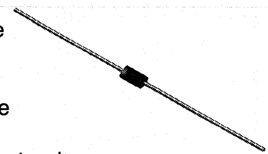
Dimensions in inches and (millimeters)

* *Patent #'s 4,980,315*
5,166,769
5,278,094

Available in unidirectional only

FEATURES

- Designed for under the hood applications
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) construction
- 600W peak pulse power surge capability with a 10/1000μs waveform repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic body over passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs (NOTE 1, FIG. 1)	P_{PPM}	Minimum 600	Watts
Pulse pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	70.0	Amps
Maximum instantaneous forward voltage at 50A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) Measured on 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS RATINGS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1)		Test Current at I_T (Amps)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Reverse Leakage at V_{WM} T_J=150°C I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
	MIN	MAX							
P6KA6.8	6.12	7.48	10	5.50	500.0	1000	58.0	10.8	0.057
P6KA6.8A	6.45	7.14	10	5.80	500.0	1000	60.0	10.5	0.057
P6KA7.5	6.75	8.25	10	6.05	250.0	500	53.0	11.7	0.061
P6KA7.5A	7.13	7.88	10	6.40	250.0	500	55.0	11.3	0.061
P6KA8.2	7.38	9.02	10	6.63	100.0	200	50.0	12.5	0.065
P6KA8.2A	7.79	8.61	10	7.02	100.0	200	52.0	12.1	0.065
P6KA9.1	8.19	10.0	1.0	7.37	25.0	100	45.0	13.8	0.068
P6KA9.1A	8.65	9.55	1.0	7.78	25.0	100	47.0	13.4	0.068
P6KA10	9.00	11.0	1.0	8.10	10.0	50	42.0	15.0	0.073
P6KA10A	9.50	10.5	1.0	8.55	10.0	50	43.0	14.5	0.073
P6KA11	9.90	12.1	1.0	8.92	5.0	20.0	38.0	16.2	0.075
P6KA11A	10.5	11.6	1.0	9.40	5.0	20.0	40.0	15.6	0.076
P6KA12	10.8	13.2	1.0	9.72	2.0	10.0	36.0	17.3	0.076
P6KA12A	11.4	12.6	1.0	10.2	2.0	10.0	37.0	16.7	0.078
P6KA13	11.7	14.3	1.0	10.5	2.0	10.0	33.0	19.0	0.081
P6KA13A	12.4	13.7	1.0	11.1	2.0	10.0	34.0	18.2	0.081
P6KA15	13.5	16.3	1.0	12.1	2.0	10.0	28.0	22.0	0.084
P6KA15A	14.3	15.8	1.0	12.8	2.0	10.0	29.0	21.2	0.084
P6KA16	14.4	17.6	1.0	12.9	2.0	10.0	26.0	23.5	0.086
P6KA16A	15.2	16.8	1.0	13.6	2.0	10.0	28.0	22.5	0.086
P6KA18	16.2	19.8	1.0	14.5	2.0	10.0	23.0	26.5	0.088
P6KA18A	17.1	18.9	1.0	15.3	2.0	10.0	25.0	25.2	0.088

ELECTRICAL CHARACTERISTIC RATINGS ($T_A = 25°C$ unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Tc=150°C Maximum Reverse Leakage at V_{WM} I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
	MIN	MAX							
P6KA20	18.0	22.0	1.0	16.2	2.0	10.0	21.0	29.1	0.090
P6KA20A	19.0	21.0	1.0	17.1	2,0	10.0	22.0	27.7	0.090
P6KA22	19.8	24.2	1.0	17.8	2.0	10.0	19.0	31.9	0.092
P6KA22A	20.9	23.1	1.0	18.8	2.0	10.0	20.0	30.6	0.092
P6KA24	21.6	26.4	1.0	19.4	2.0	10.0	18.0	34.7	0.094
P6KA24A	22.8	25.2	1.0	20.5	2.0	10.0	19.0	33.6	0.094
P6KA27	24.3	29.7	1.0	21.8	2.0	10.0	16.0	39.1	0.096
P6KA27A	25.7	28.4	1.0	23.1	2.0	10.0	16.8	37.5	0.096
P6KA30	27.0	33.0	1.0	24.3	2.0	10.0	14.0	43.5	0.097
P6KA30A	28.5	31.5	1.0	25.6	2.0	10.0	15.0	41.4	0.097
P6KA33	29.7	36.3	1.0	26.8	2.0	10.0	13.0	47.7	0.098
P6KA33A	31.4	34.7	1.0	28.2	2.0	10.0	13.8	45.7	0.098
P6KA36	32.4	39.6	1.0	29.1	2.0	10.0	12.0	52.0	0.099
P6KA36A	34.2	37.8	1.0	30.8	2.0	10.0	12.6	49.9	0.099
P6KA39	35.1	42.9	1.0	31.6	2.0	10.0	11.1	56.4	0.100
P6KA39A	37.1	41.0	1.0	33.3	2.0	10.0	11.6	53.9	0.100
P6KA43	38.7	47.3	1.0	34.8	2.0	10.0	10.0	61.9	0.101
P6KA43A	40.9	45.2	1.0	36.8	2.0	10.0	10.6	59.3	0.101

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs. I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

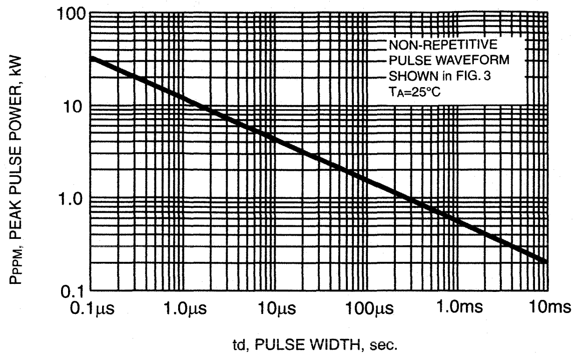


FIG. 2 - PULSE DERATING CURVE

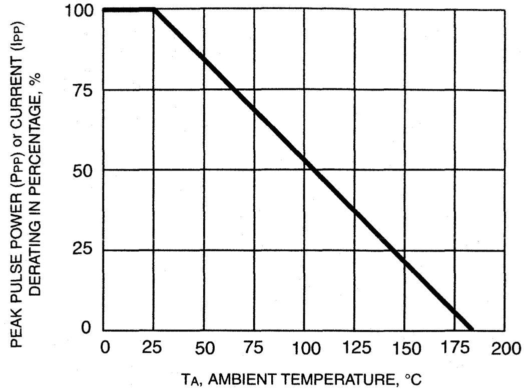


FIG. 3 - PULSE WAVEFORM

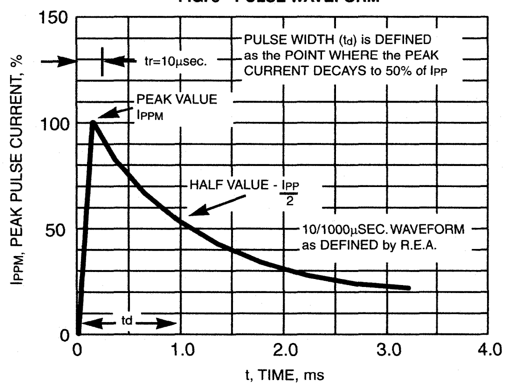


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

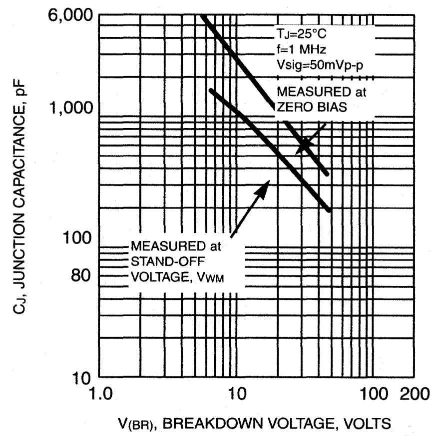


FIG. 5 - STEADY STATE POWER DERATING CURVE

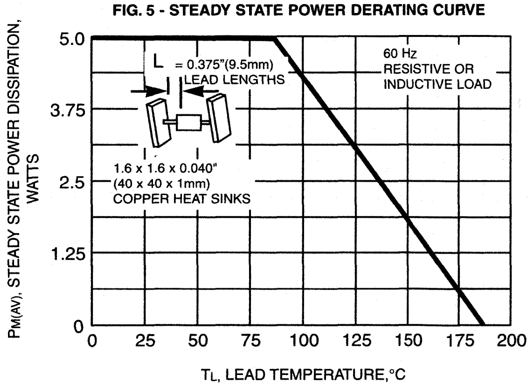
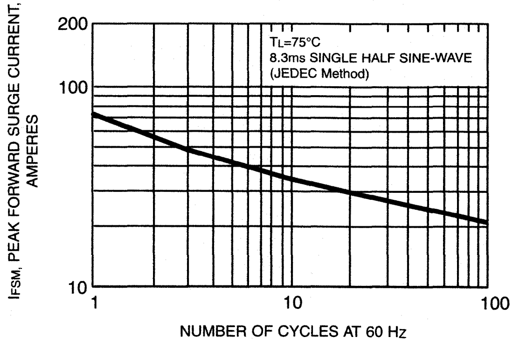


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

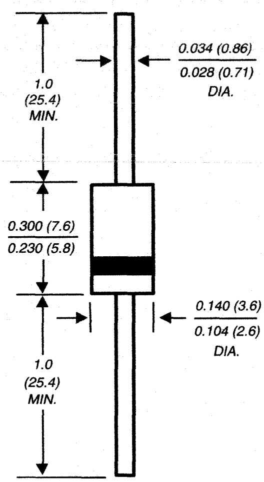


P6KE6.8 THRU P6KE440CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

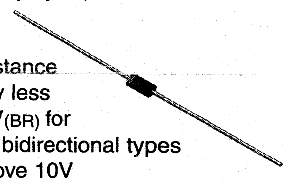
***Breakdown Voltage** - 6.8 to 440 Volts* ***Peak Pulse Power-** 600 Watts*

DO-204AC



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ 600W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- ♦ Typical I_D less than 1μA above 10V
- ♦ High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic body over passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectional
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use C or CA Suffix for types P6KE6.8 thru types P6KE440 (e.g. P6KE6.8C, P6KE440CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 600	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths, 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) unidirectional only (NOTE 3)	I_{FSM}	100.0	Amps
Maximum instantaneous forward voltage at 50.0A for unidirectional only (NOTE 4)	V_F	3.5/5.0	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 1.6 x 1.6" (40 x 40mm) per Fig. 5
(3) Measured on 8.3ms single half sine-wave or equivalent square wave duty cycle=4 pulses per minute maximum
(4) V_F=3.0 Volt max. for devices of $V_{(BR)} \leq$200V, and V_F=5.0V for devices of $V_{(BR)}$>200V

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA) (NOTE3)	Maximum Peak Pulse Current I_{PPM} (Amps) (NOTE 2)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / C)
+P6KE6.8	6.12	7.48	10	5.50	1000	58.0	10.8	0.057
+P6KE6.8A	6.45	7.14	10	5.80	1000	60.0	10.5	0.057
+P6KE7.5	6.75	8.25	1.0	6.05	500	53.0	11.7	0.061
+P6KE7.5A	7.13	7.88	1.0	6.40	500	55.0	11.3	0.061
+P6KE8.2	7.38	9.02	1.0	6.63	200	50.0	12.5	0.065
+P6KE8.2A	7.79	8.61	1.0	7.02	200	52.0	12.1	0.065
+P6KE9.1	8.19	10.0	1.0	7.37	50	45.0	13.8	0.068
+P6KE9.1A	8.65	9.55	1.0	7.78	50	47.0	13.4	0.068
+P6KE10	9.00	11.0	1.0	8.10	10	42.0	15.0	0.073
+P6KE10A	9.50	10.5	1.0	8.55	10	43.0	14.5	0.073
+P6KE11	9.90	12.1	1.0	8.92	5.0	38.0	16.2	0.075
+P6KE11 A	10.5	11.6	1.0	9.40	5.0	40.0	15.6	0.075
+P6KE12	10.8	13.2	1.0	9.72	5.0	36.0	17.3	0.078
+P6KE12A	11.4	12.6	1.0	10.2	5.0	37.0	16.7	0.078
+P6KE13	11.7	14.3	1.0	10.5	5.0	33.0	19.0	0.061
+P6KE13A	12.4	13.7	1.0	11.1	5.0	34.0	18.2	0.081
+P6KE15	13.5	16.5	1.0	12.1	5.0	28.0	22.0	0.084
+P6KE15A	14.3	15.8	1.0	12.8	5.0	29.0	21.2	0.084
+P6KE16	14.4	17.6	1.0	12.9	5.0	26.0	23.5	0.086
+P6KE16A	15.2	16.8	1.0	13.6	5.0	28.0	22.5	0.086
+P6KE18	16.2	19.8	1.0	14.5	5.0	23.0	26.5	0.088
+P6KE18A	17.1	18.9	1.0	15.3	5.0	25.0	25.2	0.088
+P6KE20	18.0	22.0	1.0	16.2	5.0	21.0	29.1	0.090
+P6KE20A	19.0	21.0	1.0	17.1	5.0	22.0	27.7	0.090
+P6KE22	19.8	24.2	1.0	17.8	5.0	19.0	31.9	0.092
+P6KE22A	20.9	23.1	1.0	18.8	5.0	20.0	30.6	0.092
+P6KE24	21.6	26.4	1.0	19.4	5.0	18.0	34.7	0.094
+P6KE24A	22.8	25.2	1.0	20.5	5.0	19.0	33.2	0.094
+P6KE27	24.3	29.7	1.0	21.8	5.0	16.0	39.1	0.096
+P6KE27A	25.7	28.4	1.0	23.1	5.0	16.8	37.5	0.096
+P6KE30	27.0	33.0	1.0	24.3	5.0	14.0	43.5	0.097
+P6KE30A	28.5	31.5	1.0	25.6	5.0	15.0	41.4	0.097
+P6KE33	29.7	36.3	1.0	26.8	5.0	13.0	47.7	0.098
+P6KE33A	31.4	34.7	1.0	28.2	5.0	13.8	45.7	0.098
+P6KE36	32.4	39.6	1.0	29.1	5.0	12.0	52.0	0.099
+P6KE36A	34.2	37.8	1.0	30.8	5.0	12.6	49.9	0.099
+P6KE39	35.1	42.9	1.0	31.6	5.0	11.1	56.4	0.100
+P6KE39A	37.1	41.0	1.0	33.3	5.0	11.6	53.9	0.100
+P6KE43	38.7	47.3	1.0	34.8	5.0	10.0	61.9	0.101
+P6KE43A	40.9	45.2	1.0	36.8	5.0	10.6	59.3	0.101
+P6KE47	42.3	51.7	1.0	38.1	5.0	9.2	67.8	0.101
+P6KE47A	44.7	49.4	1.0	40.2	5.0	9.7	64.8	0.101
P6KE51	45.9	56.1	1.0	41.3	5.0	8.5	73.5	0.102
P6KE51A	48.5	53.6	1.0	43.6	5.0	8.9	70.1	0.102
P6KE56	50.4	61.6	1.0	45.4	5.0	7.8	80.5	0.103
P6KE56A	53.2	58.8	1.0	47.8	5.0	8.1	77.0	0.103
P6KE62	55.8	68.2	1.0	50.2	5.0	7.0	89.0	0.104
P6KE62A	58.9	65.1	1.0	53.0	5.0	7.4	85.0	0.104
P6KE68	61.2	74.8	1.0	55.1	5.0	6.4	98.0	0.104
P6KE68A	64.6	71.4	1.0	58.1	5.0	6.8	92.0	0.104
P6KE75	67.5	82.5	1.0	60.7	5.0	5.8	108	0.105
P6KE75A	71.3	78.8	1.0	64.1	5.0	6.1	103	0.105
P6KE82	73.8	90.2	1.0	66.4	5.0	5.3	118	0.105
P6KE82A	77.9	86.1	1.0	70.1	5.0	5.5	113	0.105
P6KE91	81.9	100	1.0	73.7	5.0	4.8	131	0.106

+UL listed for Telecom application protection 497B, file number E136766 for both unidirectional and bidirectional devices

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA) (NOTE3)	Maximum Peak Pulse Current I_{PPM} (Amps) (NOTE 2)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / C)
	MIN	MAX						
P6KE91A	86.5	95.5	1.0	77.8	5.0	5.0	125	0.106
P6KE100	90.0	110	1.0	81.0	5.0	4.3	144	0.106
P6KE100A	95.0	105	1.0	85.5	5.0	4.5	137	0.106
P6KE110	99.0	121	1.0	89.2	5.0	3.9	158	0.107
P6KE110A	105	116	1.0	94.0	5.0	4.1	152	0.107
P6KE120	108	132	1.0	97.2	5.0	3.6	173	0.107
P6KE120A	114	126	1.0	102	5.0	3.8	165	0.107
P6KE130	117	143	1.0	105	5.0	3.3	187	0.107
P6KE130A	124	137	1.0	111	5.0	3.5	179	0.107
P6KE150	135	165	1.0	121	5.0	2.9	215	0.108
P6KE150A	143	158	1.0	128	5.0	3.0	207	0.108
P6KE160	144	176	1.0	130	5.0	2.7	230	0.108
P6KE160A	152	168	1.0	136	5.0	2.8	219	0.108
P6KE170	153	187	1.0	138	5.0	2.5	244	0.108
P6KE170A	162	179	1.0	145	5.0	2.6	234	0.108
P6KE180	162	198	1.0	146	5.0	2.4	258	0.108
P6KE180A	171	189	1.0	154	5.0	2.5	246	0.108
P6KE200	180	220	1.0	162	5.0	2.1	287	0.108
P6KE200A	190	210	1.0	171	5.0	2.2	274	0.108
P6KE220	198	242	1.0	175	5.0	1.8	344	0.108
P6KE220A	209	231	1.0	185	5.0	1.9	328	0.108
P6KE250	225	275	1.0	202	5.0	1.7	360	0.110
P6KE250A	237	263	1.0	214	5.0	1.8	344	0.110
P6KE300	270	330	1.0	243	5.0	1.4	430	0.110
P6KE300A	285	315	1.0	256	5.0	1.5	414	0.110
P6KE350	315	385	1.0	284	5.0	1.2	504	0.110
P6KE350A	332	368	1.0	300	5.0	1.3	482	0.110
P6KE400	360	440	1.0	324	5.0	1.9	574	0.110
P6KE400A	380	420	1.0	342	5.0	1.10	548	0.110
P6KE440	396	484	1.0	356	5.0	0.99	631	0.110
P6KE440A	418	462	1.0	376	5.0	1.04	602	0.110

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300µs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bidirectional types with V_{WM} of 10 volts and less, the I_D limit is doubled
(4) All terms and symbols are consistent with ANSI/IEEE C62.35
+UL listed for Telecom application protection 497B, file number E136766 for both unidirectional and bidirectional devices

DESCRIPTION

This P6KE TVS series is a low cost commercial product for use in applications where large voltage transients can permanently damage voltage-sensitive components.

The P6KE series device types are designed in a small package size where power and space is a consideration. They are characterized by their high surge capability, extremely fast response time, and low impedance, (R_{on}). Because of the unpredictable nature of transients, and the variation of the impedance with respect to these transients, impedance, per se, is not specified as a parametric value. However, a minimum voltage at low current conditions (BV) and a maximum clamping voltage (Vc) at a maximum peak pulse current is specified.

In some instances, the thermal effect (see Vc Clamping Voltage) may be responsible for 50% to 70%. of the observed voltage differential when subjected to high current pulses for several duty cycles, thus making a maximum impedance specification insignificant.
In case of a severe current overload or abnormal transient beyond the maximum ratings, the Transient Voltage Suppressor will initially fail 'short' thus tripping the system's circuit breaker or fuse while protecting the entire circuit. Curves depicting clamping voltage vs. various current pulses are available from the factory. Extended power curves vs. pulse time are also available.

FIG. 1 - PEAK PULSE POWER RATING CURVE

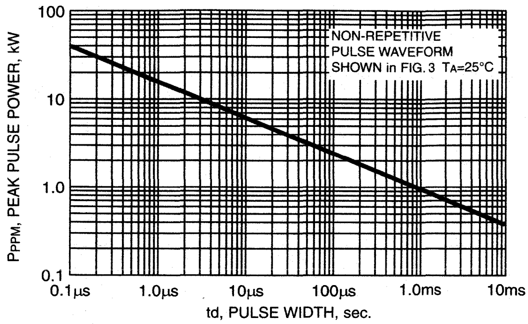


FIG. 2 - PULSE DERATING CURVE

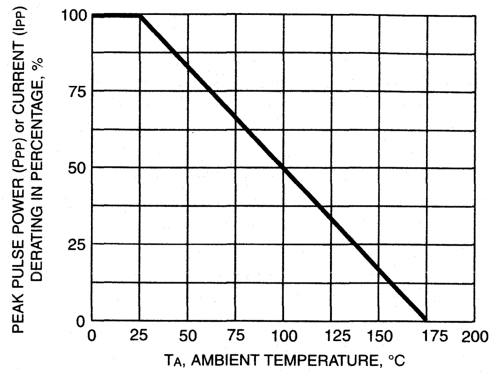


FIG. 3 - PULSE WAVEFORM

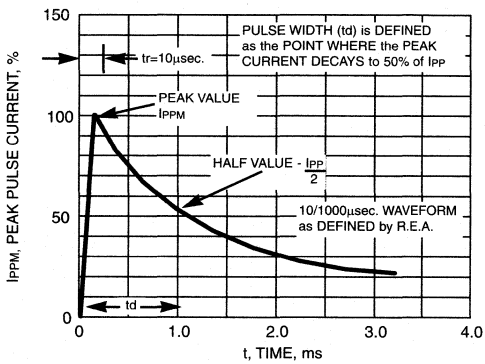


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

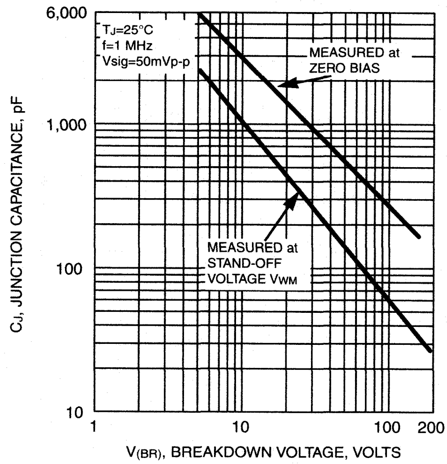


FIG. 5 - STEADY STATE POWER DERATING CURVE

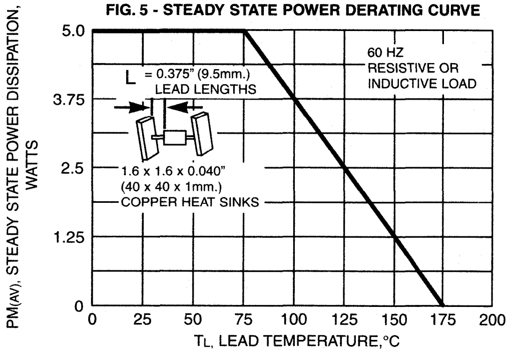


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL

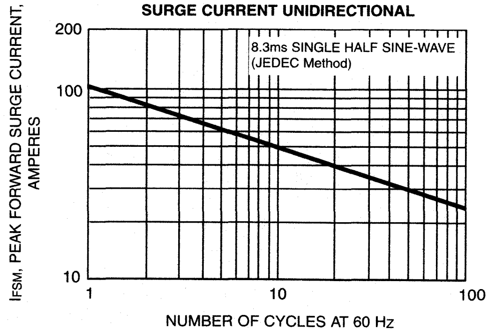
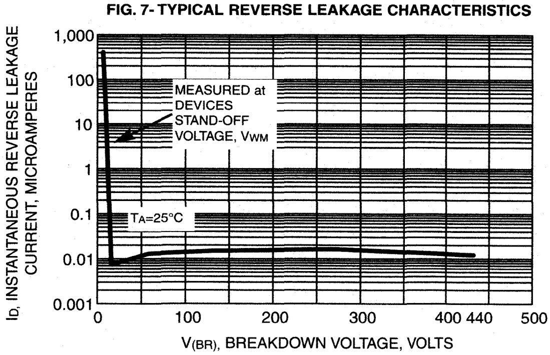


FIG. 7- TYPICAL REVERSE LEAKAGE CHARACTERISTICS

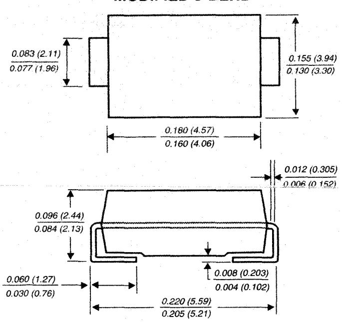


SMBG AND SMBJ5.0 THRU 170CA SERIES

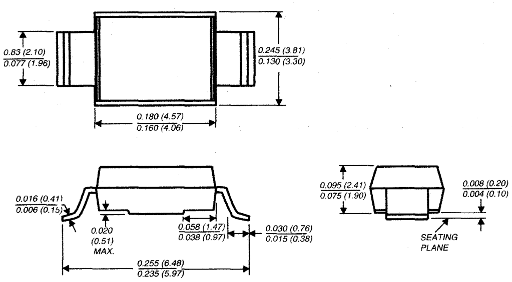
SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to170 Volts* ***Peak Pulse Power** - 600 Watts*

DO-214AA
MODIFIED J-BEND



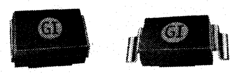
DO-215AA
GULL WING



Dimensions in inches and (millimeters)

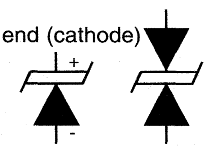
FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low incremental surge resistance
- 600W peak pulse power capability with a 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Fast response time: typically less than 1.0ps from 0 volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0µA
- High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO214AA / DO215AA molded plastic body over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectional
Mounting Position: Any
Weight: 0.003 ounces, 0.093 gram



Unidirectional Bidirectional

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use suffix C or CA for types SMB-5.0 thru SMB-170 (eg. SMBG5.0C, SMBJ170CA).
Electrical characteristics apply in both directions

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000µs waveform (NOTES 1, 2, FIG. 1)	P_{PPM}	Minimum 600	Watts
Peak pulse current with a 10/1000µs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3) - unidirectional only	I_{FSM}	100.0	Amps
Maximum instantaneous forward voltage at 50A (NOTE 3, 4) unidirectional only	V_F	SEE NOTE 4	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum
(4) V_F=3.5V on SMB-5.0 thru SMB-90 devices and V_F=5.0V on SMB-100 thru SMB-170 devices

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Device Type Gull Wing Lead	Device Type Modified "J" Bend Lead	Device Marking Code UNI	BI	Breakdown Voltage $V_{(BR)}$(Volts) (NOTE 1) (MIN /MAX)	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage I_D at V_{WM} (μA) (NOTE 3)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMBG5.0	SMBJ5.0	KD	KD	6.40 / 7.3	10	5.0	800.0	65.0	9.6
SMBG5.0A	SMBJ5.0A	KE	KE	6.40 / 7.0	10	5.0	500.0	68.0.	9.2
SMBG6.0	SMBJ6.0	KF	KF	6.67 / 8.15	10	6.0	800.0	55.0	11.4
SMBG6.0A	SMGJ6.0A	KG	KG	6.67 / 7.37	10	6.0	800.0	61.0	10.3
SMBG6.5	SMBJ6.5	KH	AH	7.22 / 8.82	10	6.5	500.0	51.0	12.3
SMBG6.5A	SMBJ6.5A	KK	AK	7.22 / 7.98	10	6.5	500.0	56.0	11.2
SMBG7.0	SMBJ7.0	KL	KL	7.78 / 9.51	10	7.0	200.0	47.0	13.3
SMBG7.0A	SMBJ7.0A	KM	KM	7.78 / 8.60	10	7.0	200.0	52.0	12.0
SMBG7.5	SMBJ7.5	KN	AN	8.33 / 10.3	1.0	7.5	100.0	44.0	14.3
SMBG7.5A	SMBJ7.5A	KP	AP	8.33 / 9.21	1.0	7.5	100.0	48.0	12.9
SMBG8.0	SMBJ8.0	KQ	AQ	8.89 / 10.9	1.0	8.0	50.0	42.0	15.0
SMBG8.0A	SMBJ8.0A	KR	AR	8.89 / 9.83	1.0	8.0	50.0	46.0	13.6
SMBG8.5	SMBJ8.5	KS	AS	9.44 / 11.5	1.0	8.5	20.0	39.0	15.9
SMBG8.5A	SMBJ8.5A	KT	AT	9.44 / 10.4	1.0	8.5	20.0	43.0	14.4
SMBG9.0	SMBJ9.0	KU	AU	10.0 / 12.2	1.0	9.0	10.0	37.0	16.9
SMBG9.0A	SMBJ9.0A	KV	AV	10.0 / 11.1	1.0	9.0	10.0	40.0	15.4
SMBG10	SMBJ10	KW	AW	11.1 / 13.6	1.0	10	5.0	33.0	18.8
SMBG10A	SMBJ10A	KX	AX	11.1 / 12.3	1.0	10	5.0	37.0	17.0
SMBG11	SMBJ11	KY	KY	12.2 / 14.9	1.0	11	5.0	31.0	20.1
SMBG11A	SMBJ11A	KZ	KZ	12.2 / 13.5	1'0	11	5.0	34.0	18.2
SMBG12	SMBJ12	LD	BD	13.3 / 16.3	1.0	12	5.0	28.0	22.0
SMBG12A	SMBJ12A	LE	BE	13.3 / 14.7	1.0	12	5.0	31.0	19.9
SMBG13	SMBJ13	LF	LF	14.4 / 17,6	1.0	13	5.0	26.0	23.8
SMBG13A	SMBJ13A	LG	LG	14.4 / 15.9	1.0	13	5.0	29.0	21.5
SMBG14	SMBJ14	LH	BH	15,6 / 19.1	1.0	14	5.0	24.4	25.8
SMBG14A	SMBJ14A	LK	BK	15.6 / 17.2	1.0	14	5.0	27.0	23.2
SMBG15	SMBJ15	LL	BL	16.7 / 20.4	1.0	15	5.0	23.1	26.9
SMBG15A	SMBJ15A	LM	BM	16.7 / 18.5	1.0	15	5.0	25.1	24.4
SMBG16	SMBJ16	LN	LN	178 / 21.8	1.0	16	5.0	21.8	28.8
SMBG16A	SMBJ16A	LP	LM	178 / 19.7	1.0	16	5.0	24.2	26.0
SMBG17	SMBJ17	LQ	LQ	18.9 / 23.1	1.0	17	5.0	20.0	30.5
SMBG17A	SMBJ17A	LR	LR	18.9 / 20.9	1.0	17	5.0	22.8	27.6
SMBG18	SMBJ18	LS	BS	20.0 / 24.4	1.0	18	5.0	19.5	32.2
SMBG18A	SMBJ18A	LT	BT	20.0 / 22.1	1.0	18	5.0	21.5	29.2
SMBG20	SMBJ20	LU	LU	22.2 / 27.1	1.0	20	5.0	17.6	35.8
SMBG20A	SMBJ20A	LV	LV	22.2 / 24.5	1.0	20	5.0	19.4	32.4
SMBG22	SMBJ22	LW	BW	24.4 / 29.8	1.0	22	5.0	15.0	39.4
SMBG22A	SMBJ22A	LX	BX	24.4 / 26.9	1.0	22	5.0	17.7	35.5
SMBG24	SMBJ24	LY	BY	26.7 / 32.6	1.0	24	5.0	14.6	43.0
SMBG24A	SMBJ24A	LZ	BZ	26.7 / 29.5	1.0	24	5.0	16.0	38.9
SMBG26	SMBJ26	MD	CD	28.9 / 35.3	1.0	26	5.0	13.5	46.6
SMBG26A	SMBJ26A	ME	CE	28.9 / 31.9	1.0	26	5.0	14.9	42.1
SMBG28	SMBJ28	MF	MF	31.1 / 38.0	1.0	28	5.0	12.6	50.0
SMBG28A	SMBJ28A	MG	MG	31.1 / 34.4	1.0	28	5.0	13.8	45.4
SMBG30	SMBJ30	MH	CH	33.3 / 40.7	1.0	30	5.0	11.7	53.5
SMBG30A	SMBJ30A	MK	CK	33.1 / 36,8	1.0	30	5.0	13.0	48.4
SMBG33	SMBJ33	ML	CL	36.7 / 44.9	1.0	33	5.0	10.6	59.0
SMBG33A	SMBJ33A	MM	CM	36.7 / 40.6	1.0	33	5.0	11.8	53.3
SMBG36	SMBJ36	MN	CN	40.0 / 48.9	1.0	36	5.0	9.8	64.3
SMBG36A	SMBJ36A	MP	CP	40.0 / 44.2	1.0	36	5.0	10.8	58.1
SMBG40	SMBJ40	MQ	CQ	44.4 / 54.3	1.0	40	5.0	8.8	71.4
SMBG40A	SMBJ40A	MR	CR	44.4 / 49.1	1.0	40	5.0	9.7	64.5
SMBG43	SMBJ43	MS	CS	47.8 / 58.4	1.0	43	5.0	8.2	76.7
SMBG43A	SMBJ43A	MT	CT	47.8 / 52.8	1.0	43	5.0	9.0	69.4
SMBG45	SMBJ45	MU	MU	50.0 / 61.1	1.0	45	5.0	7.8	80.3
SMBG45A	SMBJ45A	MV	MV	50.0 / 55.3	1.0	45	5.0	8.6	72.7
SMBG48	SMBJ48	MW	MW	53.3 / 65.1	1.0	48	5.0	7.3	85.5
SMBG48A	SMBJ48A	MX	MX	53.3 / 58.9	1.0	48	5.0	8.1	77.4
SMBG51	SMBJ51	MY	MY	56.7 / 69-3	1.0	51	5.0	6.9	91.1
SMBG51A	SMBJ51A	MZ	MZ	56.7 / 62.7	1.0	51	5.0	7.6	82.4

ELECTRICAL CHARACTERISTICS ($T_A = 25°C$ unless otherwise noted)

Device Type Gull Wing Lead	Device Type Modified "J" Bend Lead	Device Marking Code UNI	BI	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) (Min /Max)	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage I_D at V_{WM} (μA)(NOTE 3)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMBG54	SMBJ54	ND	ND	60.0 / 73.3	1.0	54	5.0	6.5	96.3
SMBG54A	SMBJ54A	NE	NE	60.0 / 66.3	1.0	54	5.0	7.2	87.1
SMBG58	SMBJ58	NF	NF	64.4 / 78.7	1.0	58	5.0	6.1	103.0
SMBG58A	SMBJ58A	NG	NG	64.4 / 71.2	1.0	58	5.0	6.7	93.6
SMBG60	SMBJ60	NH	NH	66.7 / 81.5	1.0	60	5.0	5.8	107.0
SMBG60A	SMBJ60A	NK	NK	66.7 / 73.7	1.0	60	5.0	6.5	96.8
SMBG64	SMBJ64	NL	NL	71.1 / 86.9	1.0	64	5.0	5.5	114.0
SMBG64A	SMBJ64A	NM	NM	71.1 / 78.6	1.0	64	5.0	6.1	103.0
SMBG70	SMBJ70	NN	NN	77.8 / 95.1	1.0	70	5.0	5.0	125.0
SMBG70A	SMBJ70A	NP	NP	77.8 / 86.0	1.0	70	5.0	5.5	113.0
SMBG75	SMBJ75	NQ	NQ	83.3 / 102	1.0	75	5.0	4.7	134.0
SMBG75A	SMBJ75A	NR	NR	83.3 / 92.1	1.0	75	5.0	5.2	121.0
SMBG78	SMBJ78	NS	NS	86.7 / 106	1.0	78	5.0	4.5	139.0
SMBG78A	SMBJ78A	NT	NT	86.7 / 95.8	1.0	78	5.0	5.0	126.0
SMBG85	SMBJ85	NU	NU	94.4 / 115	1.0	85	5.0	4.1	151.0
SMBGBSA	SMBJ85A	NV	NV	94.4 / 104	1.0	85	5.0	4.6	137.0
SMBG90	SMBJ90	NW	NW	100 / 122	1.0	90	5.0	3.9	160.0
SMBG90A	SMBJ90A	NX	NX	100 / 111	1.0	90	6.0	4.3	146.0
SMBG100	SMBJ100	NY	NY	111 / 136	1.0	100	5.0	3.5	179.0
SMBG100A	SMBJ100A	NZ	NZ	111 / 123	1.0	100	5.0	3.8	162.0
SMBG110	SMBJ110	PD	PD	122 / 149	1.0	110	5.0	3.2	196.0
SMBG110A	SMBJ110A	PE	PE	122 / 135	1.0	110	5.0	3.5	177.0
SMBG120	SMBJ120	PF	PF	133 / 163	1.0	120	5.0	2.9	214.0
SMBG120A	SMBJ120A	PG	PG	133 / 147	1.0	120	5.0	3.2	193.0
SMBG130	SMBJ130	PH	PH	144 / 176	1.0	130	5.0	2.7	231.0
SMBG130A	SMBJ130A	PK	PK	144 / 159	1.0	130	5.0	3.0	209.0
SMBG150	SMBJ150	PL	PL	167 / 204	1.0	150	5.0	2.3	268.0
SMBG150A	SMBJ150A	PM	PM	167 / 185	1.0	150	5.0	2.5	243.0
SMBG160	SMBJ160	PN	PN	178 / 218	1.0	160	5.0	2.2	287.0
SMBG160A	SMBJ160A	PP	PP	178 / 197	1.0	160	5.0	2.4	259.0
SMBG170	SMBJ170	PQ	PQ	189 / 231	1.0	170	5.0	2.0	304.0
SMBG170A	SMBJ170A	PR	PR	189 / 209	1.0	170	5.0	2.2	275.0

NOTES:
(1) $V_{(BR)}$ measured after I_T applied f0r 300μs I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bidirectional types having V_{WM} of 10 Volts and less, the I_D limit is doubled
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

APPLICATION N0TES

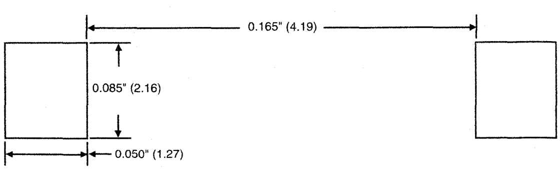
These surface mountable packages are designed specifically for transient voltage suppression. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

A 600W (SMB) device is normally selected when the threat of transients is from lightening-induced transients conducted via external leads or 1/0 lines. It is also used to protect against switching transients induced by large coils or industrial motors.
System impedance at component level in a system is usually high enough to limit the current to within the peak pulse current (I_{PP}) rating of this series.

RECOMMENDED PAD SIZES

The pad dimensions should be 0.010" (0.25mm) longer than the contact size, in the lead axis.
This allows a solder fillet to form, see Fig. below. Contact factory for soldering methods.

GULL- WING



MODIFIED J-BEND

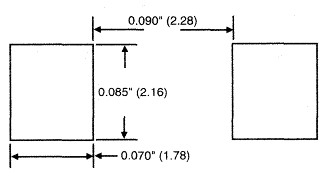


FIG. 1 - PEAK PULSE POWER RATING CURVE

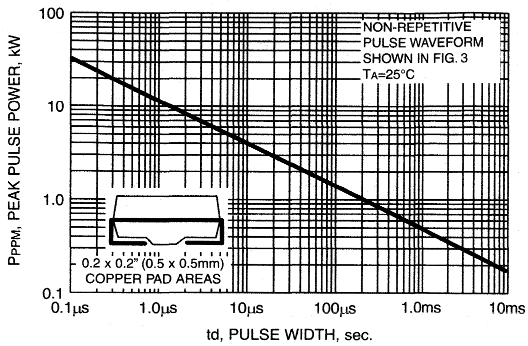


FIG. 2 - PULSE DERATING CURVE

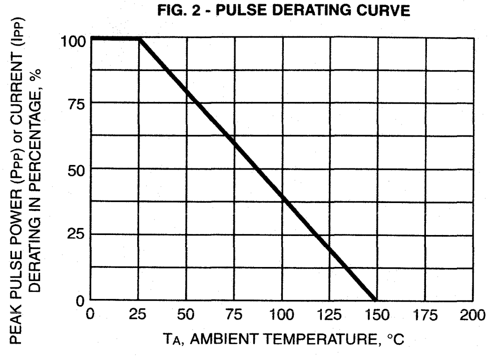


FIG. 3 - PULSE WAVEFORM

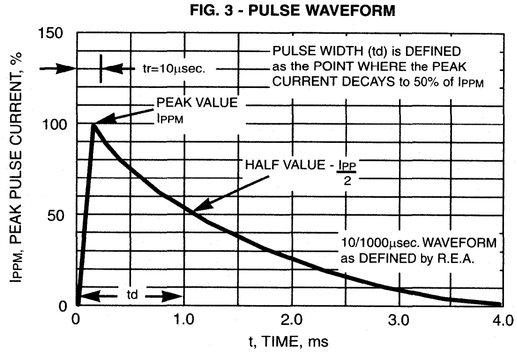


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

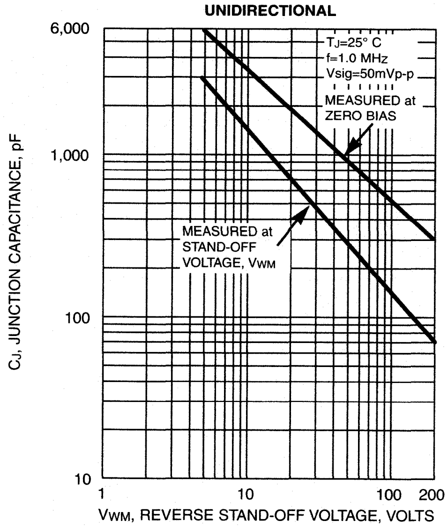


FIG. 5 - TYPICAL JUNCTION CAPACITANCE BIDIRECTIONAL

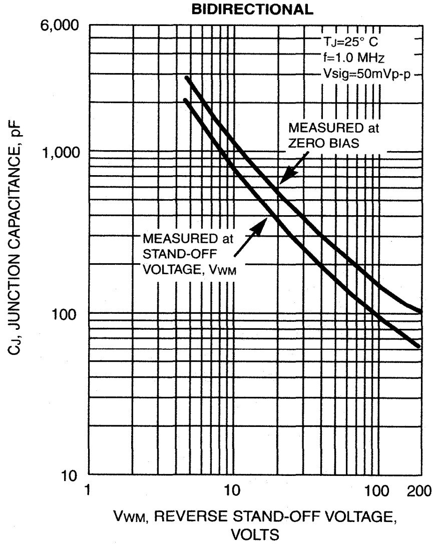
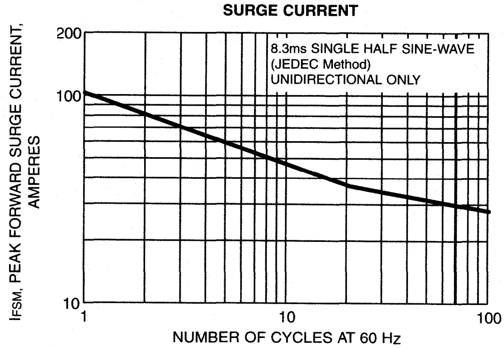


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



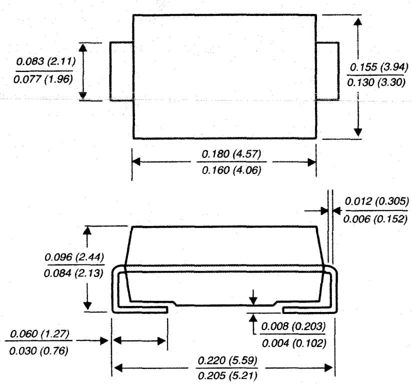
TPSMB6.8 THRU TPSMB43A

SURFACE MOUNT AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 - 43 Volts* ***Peak Pulse Power** - 600 Watts*

PATENTED

DO-214AA
Modified J-Bend

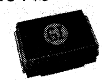


Dimensions in inches and (millimeters)

Available in unidirectional only

FEATURES

- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Easy pick and place
- ♦ Low profile package
- ♦ Built-in strain relief ideal for automated placement
- ♦ Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- ♦ 600W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- ♦ For devices with $V_{(BR)} \geq 10V$ I_D is typically less than 2.0μA at T_A=150°C
- ♦ Designed for under the hood surface mount applications
- ♦ High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic body over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.003 ounces, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTES 1,2, FIG. 1)	P_{PPM}	Minimum 600	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3)	I_{FSM}	70.0	Amps
Instantaneous forward voltage at 50A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 0.2 x 0.2" (5.0 x 5.0mm) land areas per figure
(3) Mounted on 8.3ms single half sine-wave duty cycle=4 pulses per minute maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min.	Max.	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Reverse Leakage at V_{WM},T_J =150°C I_D (μA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)
TPSMB6.8	KDP	6.12	7.48	10.0	5.50	500	1000.0	58.0	10.8
TPSMB6.8A	KEP	6.45	7.14	10.0	5.80	500	1000.0	60.0	10.5
TPSMB7.5	KFP	6.75	8.25	10.0	6.05	250	500.0	53.0	11.7
TPSMB7.5A	KGP	7.13	7.88	10.0	6.40	250	500.0	55.0	11.3
TPSMB8.2	KHP	7.38	9.02	10.0	6.63	100	200.0	50.0	12.5
TPSMB8.2A	KKP	7.79	8.61	10.0	7.02	100	200.0	52.0	12.1
TPSMB9.1	KLP	8.19	10.0	1.0	7.37	25	50.0	45.0	13.8
TPSMB9.1A	KMP	8.65	9.55	1.0	7.78	25	50.0	47.0	13.4
TPSMB10	KNP	9.00	11.0	1.0	8.10	5.0	20.0	42.0	15.0
TPSMB10A	KPP	9.50	10.5	1.0	8.55	5.0	20.0	43.0	14.5
TPSMB11	KQP	9.90	12.1	1.0	8.92	2.0	5.0	38.0	16.2
TPSMB11A	KRP	10.5	11.6	1.0	9.40	2.0	5.0	40.0	15.6
TPSMB12	KSP	10.8	13.2	1.0	9.72	2.0	5.0	36.0	17.3
TPSMB12A	KTP	11.4	12.6	1.0	10.2	2.0	5.0	37.0	16.7
TPSMB13	KUP	11.7	14.3	1.0	10.5	2.0	5.0	33.0	19.0
TPSMB13A	KVP	12.4	13.7	1.0	11.1	2.0	5.0	34.0	18.2
TPSMB15	KWP	13.5	16.5	1.0	12.1	2.0	5.0	28.0	22.0
TPSMB15A	KXP	14.3	15.8	1.0	12.8	2.0	5.0	29.0	21.2
TPSMB16	KYP	14.4	17.6	1.0	12.9	2.0	5.0	26.0	23.5
TPSMB16A	KZP	15.2	16.8	1.0	13.6	2.0	5.0	28.0	22.5
TPSMB18	LDP	16.2	19.8	1.0	14.5	2.0	5.0	23.0	26.5
TPSMB18A	LEP	17.1	18.9	1.0	15.3	2.0	5.0	25.0	25.2
TPSMB20	LFP	18.0	22.0	1.0	16.2	2.0	5.0	21.0	29.1
TPSMB20A	LGP	19.0	21.0	1.0	17.1	2.0	5.0	22.0	27.7
TPSMB22	LHP	19.8	24.2	1.0	17.8	2.0	5.0	19.0	31.9
TPSMB22A	LKP	20.9	23.1	1.0	18.8	2.0	5.0	20.0	30.6
TPSMB24	LLP	21.6	26.4	1.0	19.4	2.0	5.0	18.0	34.7
TPSMB24A	LMP	22.8	25.2	1.0	20.5	2.0	5.0	19.0	33.2
TPSMB27	LNP	24.3	29.7	1.0	21.8	2.0	5.0	16.0	39.1
TPSMB27A	LPP	25.7	28.4	1.0	23.1	2.0	5.0	16.8	37.5
TPSMB30	LQP	27.0	33.0	1.0	24.3	2.0	5.0	14.0	43.5
TPSMB30A	LRP	28.5	31.5	1.0	25.6	2.0	5.0	15.0	41.4
TPSMB33	LSP	29.7	36.3	1.0	26.8	2.0	5.0	13.0	47.7
TPSMB33A	LTP	31.4	34.7	1.0	28.2	2.0	5.0	13.8	45.7
TPSMB36	LUP	32.4	39.6	1.0	29.1	2.0	5.0	12.0	52.0
TPSMB36A	LVP	34.2	37.8	1.0	30.8	2.0	5.0	12.6	49.9
TPSMB39	LWP	35.1	42.9	1.0	31.6	2.0	5.0	11.1	56.4
TPSMB39A	LXP	37.1	41.0	1.0	33.3	2.0	5.0	11.6	53.9
TPSMB43	LYP	38.7	47.3	1.0	34.8	2.0	5.0	10.0	61.9
TPSMB43A	LZP	40.9	45.2	1.0	36.8	2.0	5.0	10.6	59.3

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

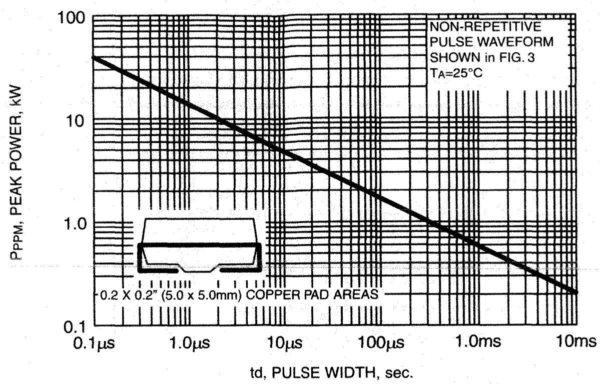


FIG. 2 - PULSE DERATING CURVE

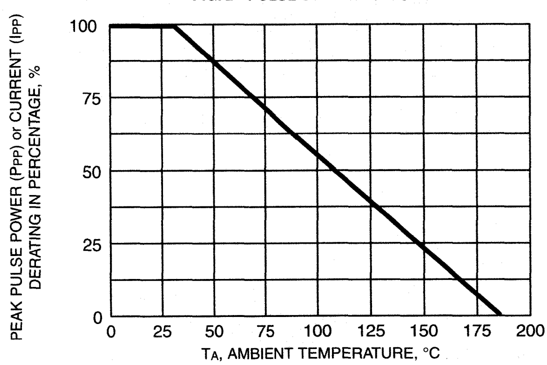


FIG. 3 - PULSE WAVEFORM

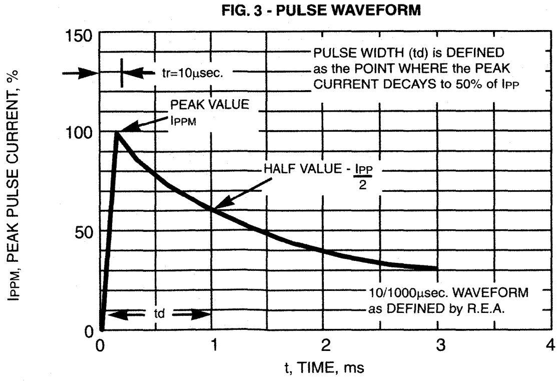


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

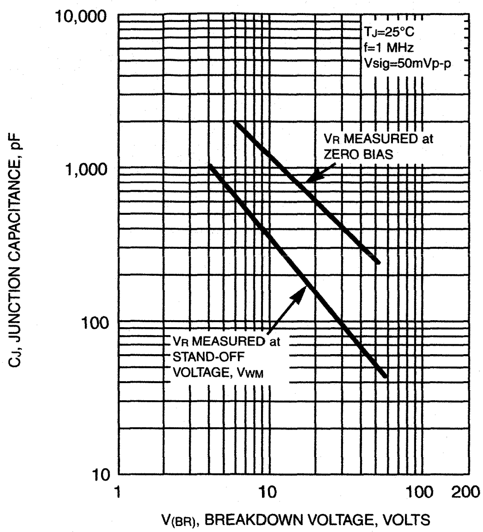
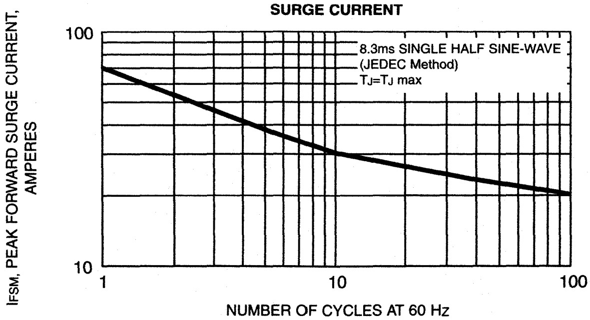


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



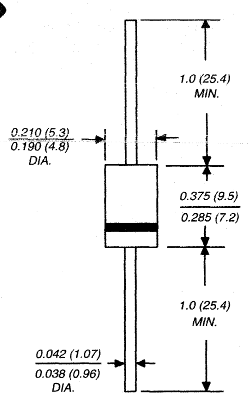
1.5KA6.8 THRU 1.5KA43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43 Volts* ***Peak Pulse Power** - 1500 Watts*

Case Style 1.5KA

PATENTED*



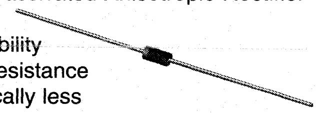
Dimensions in inches and (millimeters)

* *Patent #'s 4,980,315*
5,166,769
5,278,094

Available in unidirectional only

FEATURES

- ♦ Designed for under the hood applications
- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ 1500W peak pulse power surge capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0 ps from 0 Volts to $V_{(BR)}$ for unidirectional
- ♦ For devices with $V_{(BR)} \geq 10V$ I_D are typically less than 1.0μA at T_A=150°C
- ♦ High temperature soldering guaranteed: 300°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 1500	Watts
Peak pulse current at T_A=25°C with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half Sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	200	Amps
Maximum instantaneous forward voltage at 100A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 0.8 x 0.8" (20 x 20mm) per Fig. 5
(3) 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	T_J=150°C Maximum Reverse Leakage at V_{WM} I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
1.5KA6.8	6.12	7.48	10	5.50	500	2000	145.0	10.8	0.057
1.5KA6.8A	6.45	7.14	10	5.80	500	2000	150.0	10.5	0.057
1.5KA7.5	6.75	8.25	10	6.05	250	1000	134.0	11.7	0.061
1.5KA7.5A	7.13	7.88	10	6.40	250	1000	139.0	11.3	0.061
1.5KA8.2	7.38	9.02	10	6.63	100	400	126.0	12.5	0.065
1.5KA8.2A	7.79	8.61	10	7.02	100	400	130.0	12.1	0.065
1.5KA9.1	8.19	10.0	1.0	7.37	25.0	100	114.0	13.8	0.068
1.5KA9.1A	8.65	9.55	1.0	7.78	25.0	100	117.0	13.4	0.068
1.5KA10	9.00	11.0	1.0	8.10	10.0	50.0	105.0	15.0	0.073
1.5KA10A	9.50	10.5	1.0	8.55	10.0	50.0	108.0	14.5	0.073
1.5KA11	9.90	12.1	1.0	8.92	5.0	20.0	97.0	16.2	0.075
1.5KA11A	10.5	11.6	1.0	9.40	5.0	20.0	100.0	15.6	0.076
1.5KA12	10.8	13.2	1.0	9.72	2.0	10.0	91.0	17.3	0.076
1.5KA12A	11.4	12.6	1.0	10.2	2.0	10.0	94.0	19.0	0.078
1.5KA13	11.7	14.3	1.0	10.5	2.0	10.0	82.0	18.2	0.081
1.5KA13A	12.4	13.7	1.0	11.1	2.0	10.0	86.0	22.0	0.081
1.5KA15	13.5	16.3	1.0	12.1	2.0	10.0	71.0	21.2	0.084
1.5KA15A	14.3	15.8	1.0	12.8	2.0	10.0	74.0	23.5	0.084
1.5KA16	14.4	17.6	1.0	12.9	2.0	10.0	67.0	23.5	0.086
1.5KA16A	15.2	16.8	1.0	13.6	2.0	10.0	70.0	22.5	0.086
1.5KA18	16.2	19.8	1.0	14.5	2.0	10.0	59.0	26.5	0.088

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	T_J=150°C Maximum Reverse Leakage at V_{WM} I_D (μA)	Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
1.5KA18A	17.1	18.9	1.0	15.3	2.0	10.0	60.0	25.2	0.088
1.5KA20	18.0	22.0	1.0	16.2	2.0	10.0	54.0	29.1	0.090
1.5KA20A	19.0	21.0	1.0	17.1	2.0	10.0	50.0	27.7	0.090
1.5KA22	19.8	24.2	1.0	17.8	2.0	10.0	49.0	31.9	0.092
1.5KA22A	20.9	23.1	1.0	18.8	2.0	10.0	51.0	30.6	0.092
1.5KA24	21.6	26.4	1.0	19.4	2.0	10.0	45.0	34.7	0.094
1.5KA24A	22.8	25.2	1.0	20.5	2.0	10.0	47.0	33.2	0.094
1.5KA27	24.3	29.7	1.0	21.8	2.0	10.0	40.0	39.1	0.096
1.5KA27A	25.7	28.4	1.0	23.1	2.0	10.0	42.0	37.5	0.096
1.5KA30	27.0	33.0	1.0	24.3	2.0	10.0	36.0	43.5	0.097
1.5KA30A	28.5	31.5	1.0	25.6	2.0	10.0	38.0	41.4	0.097
1.5KA33	29.7	36.3	1.0	26.8	2.0	10.0	33.0	47.7	0.098
1.5KA33A	31.4	34.7	1.0	28.2	2.0	10.0	34.0	45.7	0.098
1.5KA36	32.4	39.6	1.0	29.1	2.0	10.0	30.0	52.0	0.099
1.5KA36A	34.2	37.8	1.0	30.8	2.0	10.0	31.0	49.9	0.099
1.5KA39	35.1	42.9	1.0	31.6	2.0	10.0	27.0	56.4	0.100
1.5KA39A	37.1	41.0	1.0	33.3	2.0	10.0	29.0	53.9	0.100
1.5KA43	38.7	47.3	1.0	34.8	2.0	10.0	25.0	61.9	0.101
1.5KA43A	40.9	45.2	1.0	36.8	2.0	10.0	26.0	59.3	0.101

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs = square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE C62.35

FIG. 1 - PEAK PULSE POWER RATING CURVE

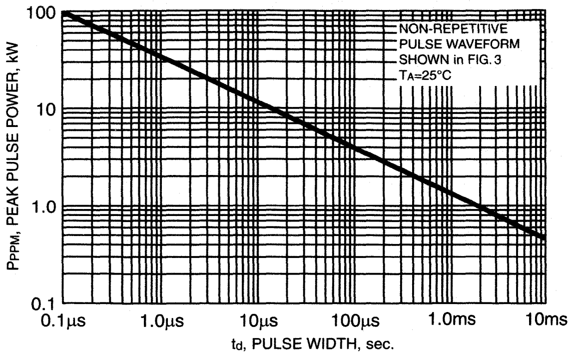


FIG. 2 - PULSE DERATING CURVE

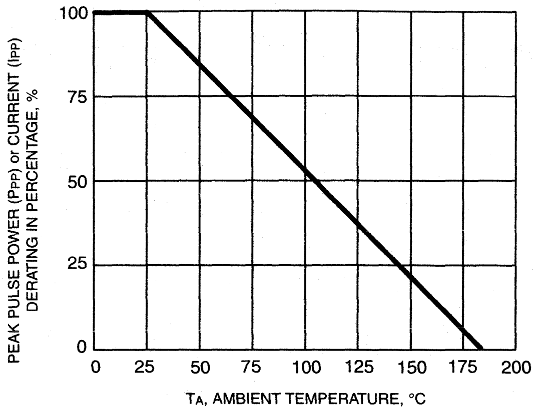


FIG. 3 - PULSE WAVEFORM

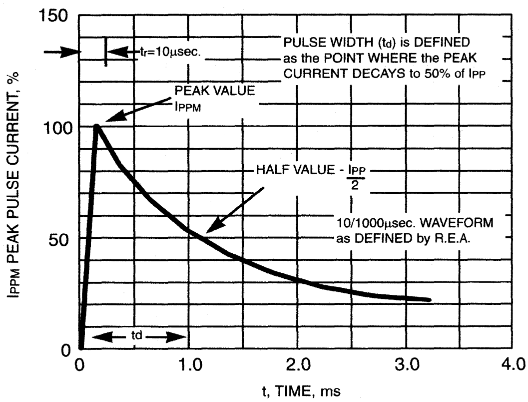


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

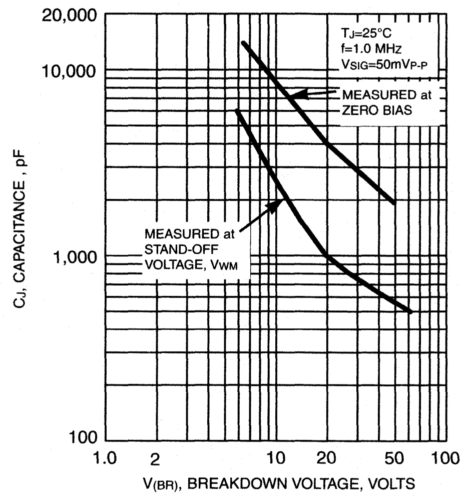


FIG. 5 - STEADY STATE POWER DERATING CURVE

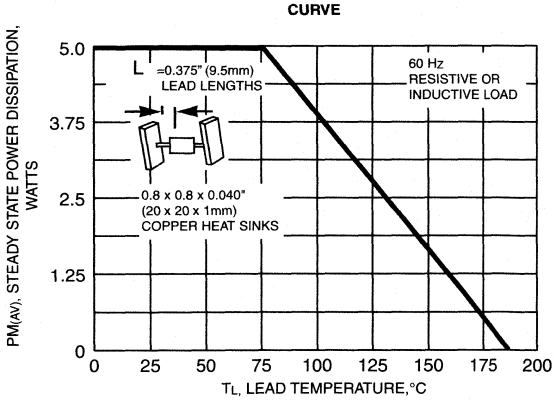
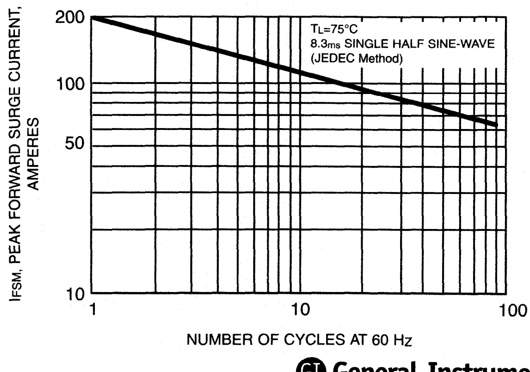


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

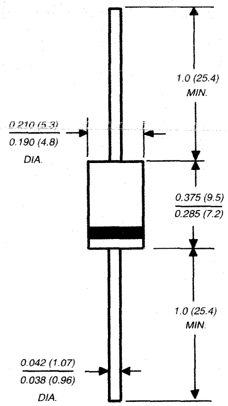


1.5KE6.8 THRU 1.5KE440CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

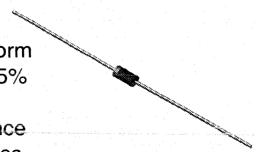
***Breakdown Voltage** - 6.8 to 440 Volts* ***Peak Pulse Power** - 1500 Watts*

Case Style 1.5KE



Dimensions in inches and (millimeters)

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ 1500W peak pulse power capability on 10/1000μs waveform repetition rate (duty cycle): 0.05%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- ♦ For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0μA
- ♦ High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension

MECHANICAL DATA

Case: Molded plastic body over passivated junction
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except for bidirectional
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use C or CA suffix for types 1.5KE6.8 thru types 1.5KE440A (e.g. 1.5KE6.8C, 1.5KE440CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1)	P_{PPM}	Minimum 1500	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 1)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths, 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) unidirectional only	I_{FSM}	200	Amps
Maximum instantaneous forward current at 50.0A for unidirectional only (NOTE 3)	V_F	3.5/5.0	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 0.8 x 0.8" (20 x 20mm) per Fig. 5
(3) V_F=3.5V for devices of $V_{(BR)} \leq 200V$ and V_F=5.0 Volt max. for devices of $V_{(BR)} > 200V$

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

JEDEC TYPE NUMBER	GENERAL PART NUMBER	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min	Max	Test Current at (mA) I_T	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 4) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) Amps	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
1N6267	+1.5KE6.8	6.12	7.48	10.0	5.50	1000	145.0	10.8	0.057
1N6267A	+1.5KE6.8A	6.45	7.14	10.0	5.80	1000	150.0	10.5	0.057
1N6268	+1.5KE7.5	6.75	8.25	10.0	6.05	500	134.0	11.7	0.061
1N6268A	+1.5KE7.5A	7.13	7.88	10.0	6.40	500	139.0	11.3	0.061
1N6269	+1.5KE8.2	7.38	9.02	10.0	6.63	200	126.0	12.5	0.065
1N6269A	+1.5KE8.2A	7.79	8.61	10.0	7.02	200	130.0	12.1	0.065
1N6270	+1.5KE9.1	8.19	10.0	1.0	7.37	50	114.0	13.8	0.068
1N6270A	+1.5KE9.1A	8.65	9.55	1.0	7.78	50	117.0	13.4	0.068
1N6271	+1.5KE10	9.00	11.0	1.0	8.10	1.0	105.0	15.0	0.073
1N6271A	+1.5KE10A	9.50	10.5	1.0	8.55	1.0	108.0	14.5	0.073
1N6272	+1.5KE11	9.90	12.1	1.0	8.92	5.0	97.0	16.2	0.075
1N6272A	+1.5KE11A	10.5	11.6	1.0	9.40	5.0	100.0	15.6	0.075
1N6273	+1.5KE12	10.8	13.2	1.0	9.72	5.0	91.0	17.3	0.076
1N6273A	+1.5KE12A	11.4	12.6	1.0	10.2	5.0	94.0	16.7	0.078
1N6274	+1.5KE13	11.7	14.3	1.0	10.5	5.0	82.0	19.0	0.081
1N6274A	+1.5KE13A	12.4	13.7	1.0	11.1	5.0	86.0	18.2	0.061
1N6275	+1.5KE15	13.5	16.5	1.0	12.1	5.0	71.0	22.0	0.084
1N6275A	+1.5KE15A	14.3	15.8	1.0	12.8	5.0	74.0	21.2	0.084
1N6276	+1.5KE16	14.4	17.6	1.0	12.9	5.0	67.0	23.5	0.066
1N6276A	+1.5KE16A	15.2	16.8	1.0	13.6	5.0	70.0	22.5	0.066
1N6277	+1.5KE18	16.2	19.8	1.0	14.5	5.0	59.0	26.5	0.068
1N6277A	+1.5KE18A	17.1	18.9	1.0	15.3	5.0	60.0	26.2	0.089
1N6278	+1.5KE20	18.0	22.0	1.0	16.2	5.0	54.0	29.1	0.090
1N6278A	+1.5KE20A	19.0	21.0	1.0	17.1	5.0	56.0	27.7	0.090
1N6279	+1.5KE22	19.8	24.2	1.0	17.8	5.0	49.0	31.9	0.092
1N6279A	+1.5KE22A	20.9	23.1	1.0	18.8	5.0	51.0	30.6	0.092
1N6280	+1.5KE24	21.6	26.4	1.0	19.4	5.0	45.0	34.7	0.094
1N6280A	+1.5KE24A	22.8	25.2	1.0	20.5	5.0	47.0	33.2	0.094
1N6281	+1.5KE27	24.3	29.7	1.0	21.8	5.0	40.0	39.1	0.096
1N6281A	+1.5KE27A	25.7	28.4	1.0	23.1	5.0	42.0	37.5	0.096
1N6282	+1.5KE30	27.0	33.0	1.0	24.3	5.0	36.0	43.5	0.097
1N6282A	+1.5KE30A	28.5	31.5	1.0	25.6	5.0	38.0	41.4	0.097
1N6283	+1.5KE33	29.7	36.3	1.0	26.8	5.0	33.0	47.7	0.098
1N6283A	+1.5KE33A	31.4	34.7	1.0	28.2	5.0	34.0	45.7	0.098
1N6284	+1.5KE36	32.4	39.6	1.0	29.1	5.0	30.0	52.0	0.099
1N6284A	+1.5KE36A	34.2	37.8	1.0	30.8	5.0	31.0	49.9	0.099
1N6285	+1.5KE39	35.1	42.9	1.0	31.6	5.0	27.0	56.4	0.100
1N6285A	+1.5KE39A	37.1	41.0	1.0	33.3	5.0	29.0	53.9	0.100
1N6286	+1.5KE43	38.7	47.3	1.0	34.8	5.0	25.0	61.9	0.101
1N6286A	+1.5KE43A	40.9	45.2	1.0	36.8	5.0	26.0	59.3	0.101
1N6287	+1.5KE47	42.3	51.7	1.0	36.1	5.0	23.0	67.8	0.101
1N6287A	+1.5KE47A	44.7	49.4	1.0	40.2	5.0	24.0	64.8	0.101
1N6288	1.5KE51	45.9	56.1	1.0	41.3	5.0	21.0	73.5	0.102
1N6288A	1.5KE51A	48.5	53.6	1.0	43.6	5.0	22.0	70.1	0.102
1N6289	1.5KE56	50.4	61.8	1.0	45.4	5.0	19.0	80.5	0.103
1N6289A	1.5KE56A	53.2	58.8	1.0	47.8	5.0	20.0	77.0	0.103
1N6290	1.5KE62	55.8	68.2	1.0	50.2	5.0	17.0	89.0	0.104
1N6290A	1.5KE62A	58.9	65.1	1.0	53.0	5.0	18.0	85.0	0.104
1N6291	1.5KE68	61.2	74.8	1.0	55.1	5.0	16.0	98.0	0.104

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

JEDEC TYPE NUMBER	GENERAL PART NUMBER	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min	Max	Test Current at (mA) I_T	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 4) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) Amps	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
1N6291A	1.5KE68A	64.6	71.4	1.0	58.1	5.0	17.0	92.0	0.104
1N6292	1.5KE75	67.5	82.5	1.0	60.7	5.0	14.0	109	0.105
1N6292A	1.5KE75A	71.3	78.8	1.0	64.1	5.0	15.0	104	0.105
1N6293	1.5KE82	73.8	90.2	1.0	66.4	5.0	13.0	118	0.105
1N6293A	1.5KE82A	77.9	86.1	1.0	70.1	5.0	13.9	113	0.105
1N6294	1.5KE91	81.9	100.0	1.0	73.7	5.0	12.0	131	0.106
1N6294A	1.5KE91A	86.5	95.5	1.0	77.8	5.0	12.6	125	0.106
1N6295	1.5KE100	90.0	110	1.0	81.0	5.0	10.9	144	0.106
1N6295A	1.5KE100A	95.0	105	1.0	85.5	5.0	11.4	137	0.106
1N6296	1.5KE110	99.0	121	1.0	89.2	5.0	9.9	158	0.107
1N6296A	1.5KE 110A	106	116	1.0	94.0	5.0	10.3	152	0.107
1N6297	1.5KE120	108	132	1.0	97.2	5.0	9.1	173	0.107
1N6297A	1.5KE120A	114	126	1.0	102	5.0	9.5	165	0.107
1N6298	1.5KE130	117	143	1.0	106	5.0	8.4	187	0.107
1N6298A	1.5KE130A	124	137	1.0	111	5.0	8.7	179	0.107
1N6299	1.5KE150	136	165	1.0	121	5.0	7.3	215	0.108
1N6299A	1.5KE150A	143	158	1.0	128	5.0	7.6	207	0.106
1N6300	1.5KE160	144	176	1.0	130	5.0	6.8	230	0.106
1N6300A	1.5KE160A	152	168	1.0	136	5.0	7.1	219	0.108
1N6301	1.5KE170	153	167	1.0	138	5.0	6.4	244	0.108
1N6301A	1.5KE170A	162	179.	1.0	145	5.0	6.7	234	0.108
1N6302	1.5KE180	162	198	1.0	146	5.0	6.1	258	0.108
1N6302A	1.5KE180A	171	189	1.0	154	5.0	6.4	246	0.108
1N6303	1.5KE200	180	220	1.0	162	5.0	5.4	287	0.108
1N6303A	1.5KE200A*	190	210	1.0	171	5.0	5.7	274	0.108
	1.5KE220	196	242	1.0	175	5.0	4.5	344	0.108
	1.5KE220A*	209	231	1.0	185	5.0	4.8	328	0.108
	1.5KE250	225	275	1.0	202	5.0	4.3	360	0.110
	1.5KE250A	237	263	1.0	214	5.0	4.5	344	0.110
	1.5KE300	270	330	1.0	243	5.0	3.6	430	0.110
	1.5KE300A	285	315	1.0	256	5.0	3.8	414	0.110
	1.5KE350	315	385	1.0	284	5.0	3.1	504	0.110
	1.5KE350A	333	368	1.0	300	5.0	3.2	482	0.110
	1.5KE400	360	440	1.0	324	5.0	2.7	574	0.110
	1.5KE400A	380	420	1.0	342	5.0	2.8	548	0.110
	1.5KE440	396	484	1.0	356	5.0	2.4	631	0.110
	1.5KE440A	418	462	1.0	376	5.0	2.6	602	0.110

NOTES:

(1) $V_{(BR)}$ measured after I_T applied for 300μs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All terms and symbols are consistent with ANSI/IEEE CA62.35
(4) For bidirectional types with V_R 10 volts and less the I_D limit is doubled
* Bidirectional versions are UL approved under component across the line protection, ULV1414 file number E108274 (1.5KE200CA, 1.5KE220CA)
+ UL listed for Telecom applications protection, 497B, file number E133766 for both unidirectional and bidirectional devices

APPLICATION

This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.

The TVS diode can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).

This Transient Voltage Suppressor diode has a pulse power rating of 1500 watts for one millisecond. The response time of TVS diode clamping action is effectively instantaneous (1×10^{-9} seconds bidirectional); therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage sensitive semiconductors and components. TVS diodes can also be used in series or parallel to increase the peak power ratings.

FIG. 1 - PEAK PULSE POWER RATING CURVE

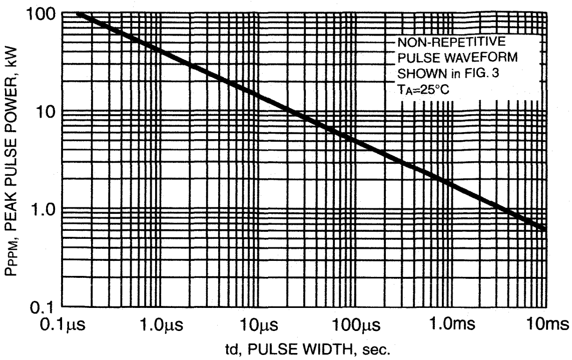


FIG. 2 - PULSE DERATING CURVE

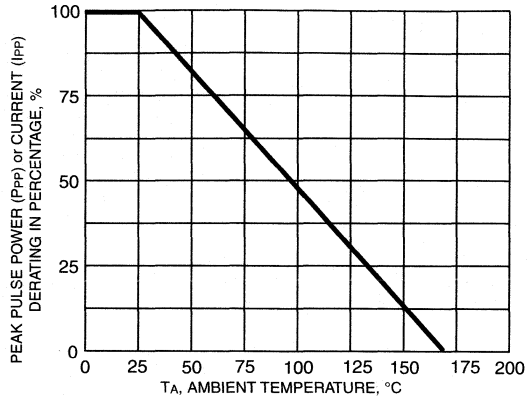


FIG. 3 - PULSE WAVEFORM

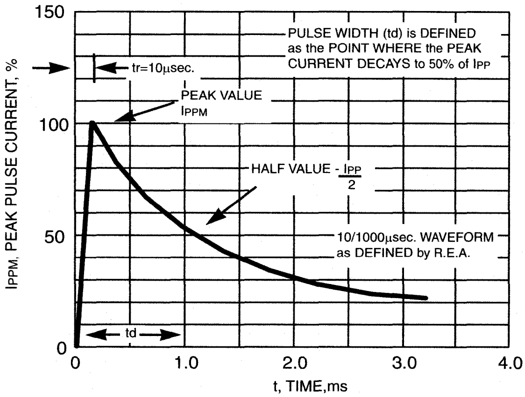


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

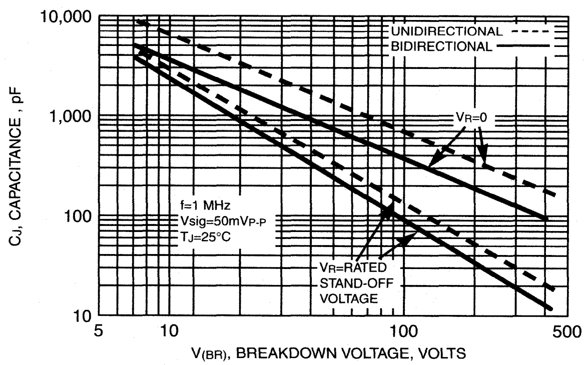


FIG. 5 - STEADY STATE POWER DERATING CURVE

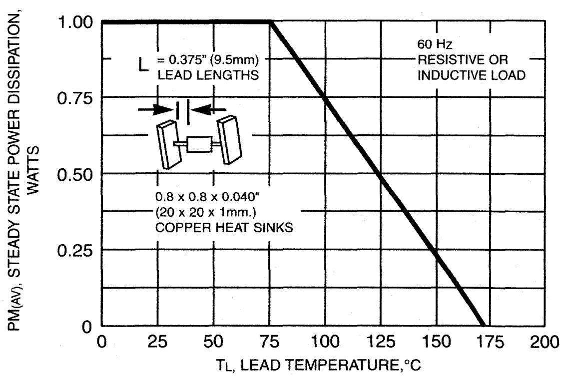


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

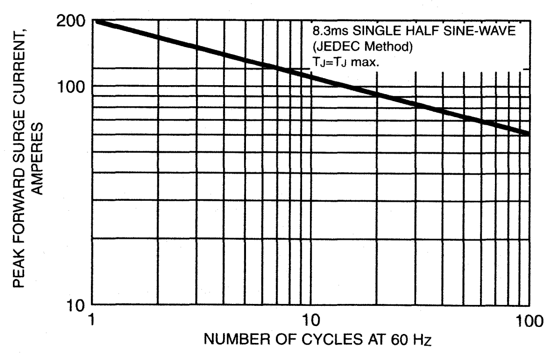


FIG. 7 - INCREMENTAL CLAMPING VOLTAGE CURVE
UNIDIRECTIONAL

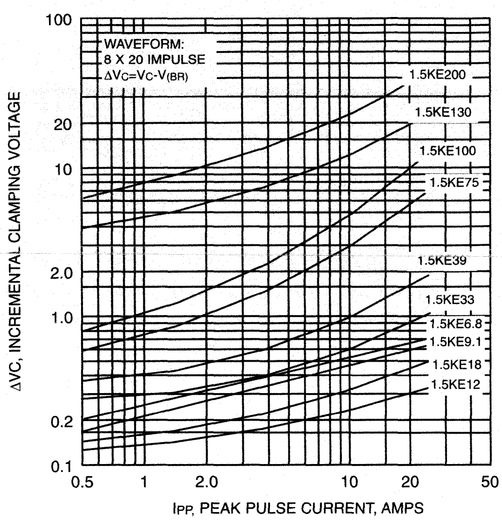


FIG. 8 - INCREMENTAL CLAMPING VOLTAGE CURVE
UNIDIRECTIONAL

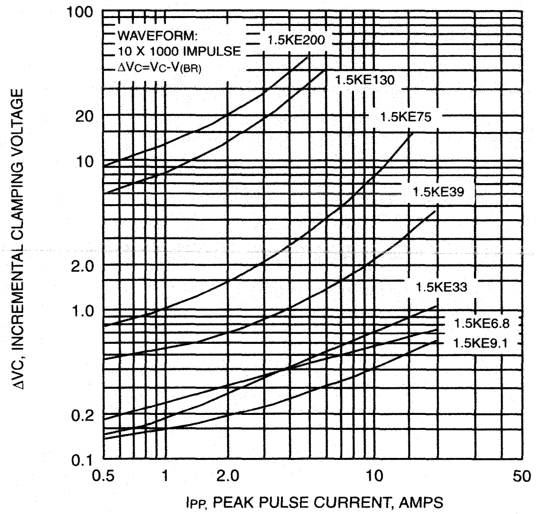


FIG. 9 - INCREMENTAL CLAMPING VOLTAGE CURVE
BIDIRECTIONAL

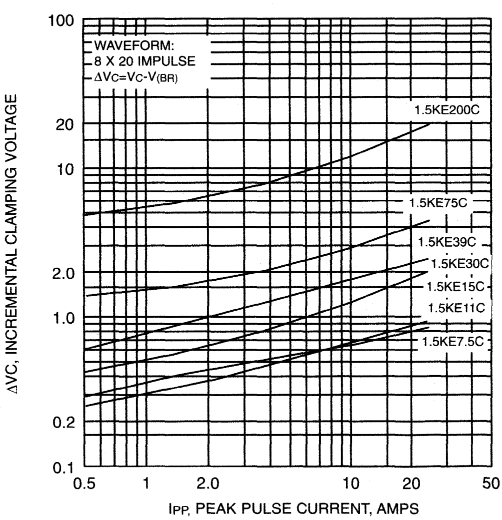
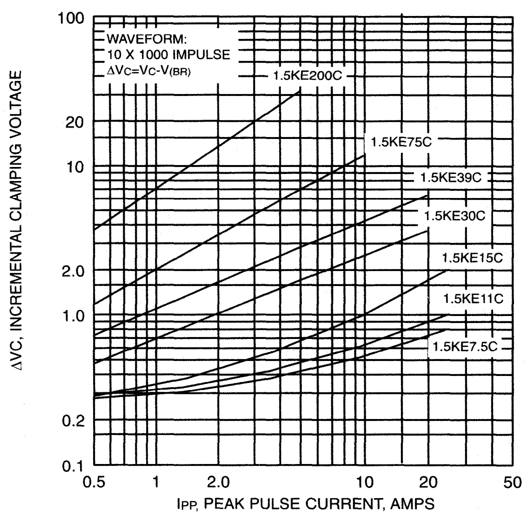


FIG. 10 - INCREMENTAL CLAMPING VOLTAGE CURVE
BIDIRECTIONAL



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Power Semiconductor Division

FIG. 11 - INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS CURVE

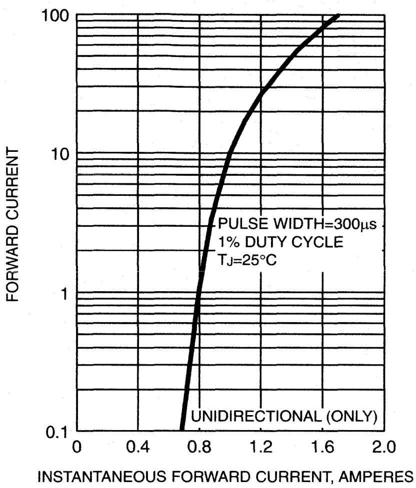
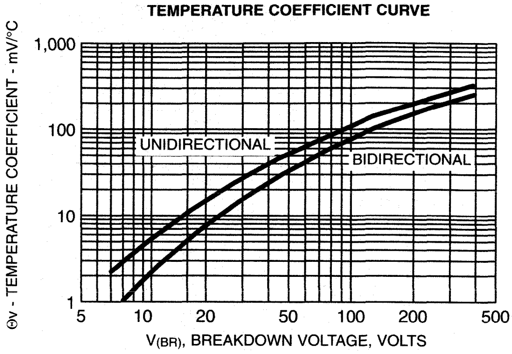


FIG. 12 - BREAKDOWN VOLTAGE TEMPERATURE COEFFICIENT CURVE

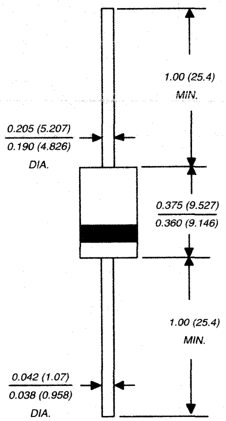


ICTE5.0 THRU ICTE15C SERIES

TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 15 Volts* ***Peak Pulse Power** - 1500 Watts*

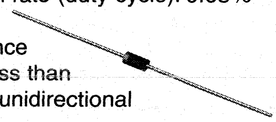
Case Style 1.5KE



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated junction
- 1500W Peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.05%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional
- Ideal for data and bus line applications
- High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except for bidirectional types
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 1500	Watts
Steady state power dissipation, T_L= 75°C at lead lengths 0.375" (9.5mm)	$P_{M(AV)}$	5.0	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load for unidirectional only (JEDEC Method) (NOTE 2)	I_{FSM}	200.0	Amps
Maximum instantaneous forward voltage at 100A for unidirectional only (NOTE 2)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2
(2) 8.3ms single half sine-wave, duty cycle=4 pulses per minute maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at 25°C (JEDEC REGISTERED DATA)

JEDEC TYPE NUMBER	GENERAL INSTRUMENT PART NUMBER	STAND-OFF VOLTAGE V_{WM} (VOLTS)	MINIMUM BREAKDOWN VOLTAGE at 1mA. $V_{(BR)}$ (VOLTS)	MAXIMUM REVERSE LEAKAGE at V_{WM} I_D (μA)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1.0A V_C (VOLTS)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 10A V_C (VOLTS)	MAXIMUM PEAK PULSE CURRENT I_{PP} (Amps)
1N6373	ICTE-5	5.0	6.0	300.0	7.1	7.5	160
1N6374	ICTE-8	8.0	9.4	25.0	11.3	11.5	100
1N6375	ICTE-10	10.0	11.7	2.0	13.7	14.1	90
1N6376	ICTE-12	12.0	14.1	2.0	16.1	16.5	70
1N6377	ICTE-15	15.0	17.6	2.0	20.1	20.6	60

$V_{(BR)}$ *Test current (I_T) 12 10mA

ELECTRICAL CHARACTERISTICS AT 25°C (JEDEC REGISTERED DATA)

JEDEC TYPE NUMBER	GENERAL INSTRUMENT PART NUMBER	STAND-OFF VOLTAGE V_{WM} (VOLTS)	MINIMUM** BREAKDOWN VOLTAGE at 1.0mA. $V_{(BR)}$ (VOLTS)	MAXIMUM REVERSE LEAKAGE at V_{WM} I_D (μA)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 1A V_C (VOLTS)	MAXIMUM CLAMPING VOLTAGE at I_{PP} = 10A V_C (VOLTS)	MAXIMUM PEAK PULSE CURRENT I_{PP} (Amps)
1N6382	ICTE-8C*	8.0	9.4	50.0	11.4	11.6	100
1N6383	ICTE-10C	10.0	11.7	2.0	14.1	14.5	90
1N6384	ICTE-12C	12.0	14.1	2.0	16.7	17.1	70
1N6385	ICTE-15C	15.0	17.6	2.0	20.8	21.4	60

NOTES:

(1) " C " Suffix indicates bidirectional

(2) ICTE-5 and 1N6373 are not available as bidirectional

(3) The minimum breakdown voltage as shown takes into consideration the =1 Volt tolerance normally specified for power supply regulation on most integrated circuit manufacturers data sheets. Please consult factory for devices that require reduced clamping voltages where tighter regulated power supply voltages are employed.

(4) Clamping Factor: 1.33 at full Io rated power; 1.20 at 50% rated power; Clamping Factor: the ratio of the actual Vc (Clamping Voltage) to the $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

FIG. 1 - PEAK PULSE POWER RATING CURVE

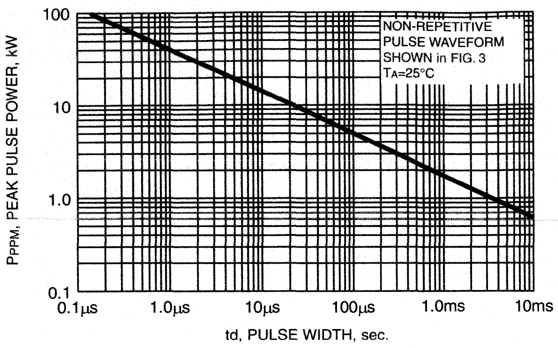


FIG. 2 - PULSE DERATING CURVE

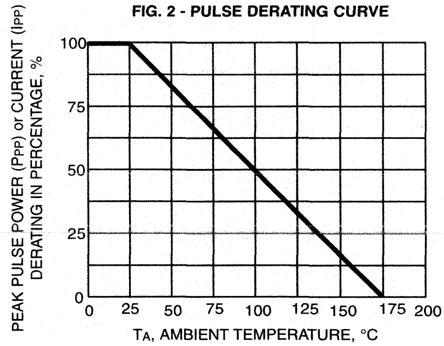


FIG. 3 - PULSE WAVEFORM

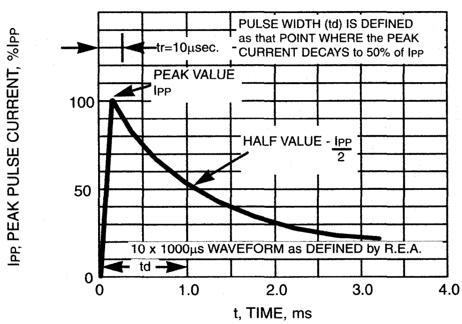


FIG. 4 - TYPICAL JUNCTION CAPACITANCE UNI-DIRECTIONAL TYPE

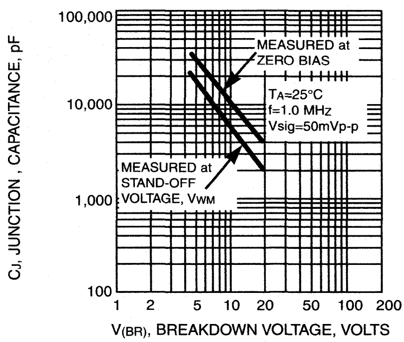


FIG. 5 - TYPICAL JUNCTION CAPACITANCE BIDIRECTIONAL TYPE

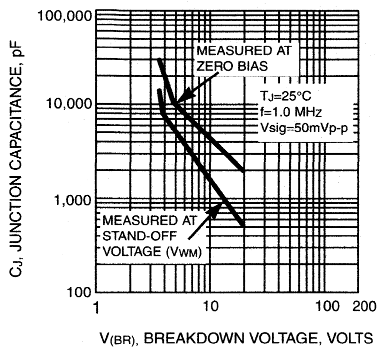


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

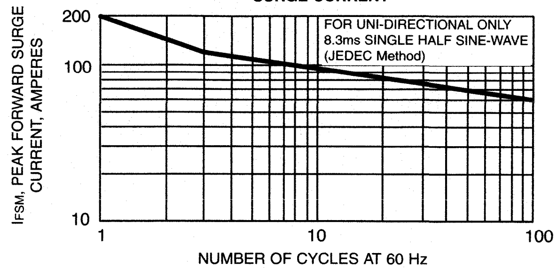
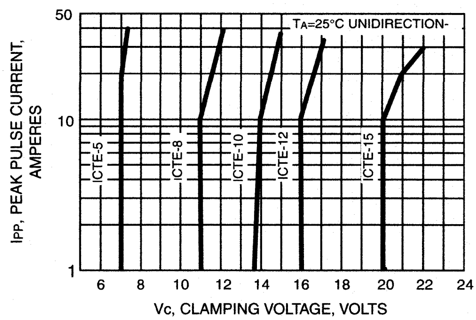


FIG. 7 - TYPICAL CHARACTERISTIC CLAMPING VOLTAGE

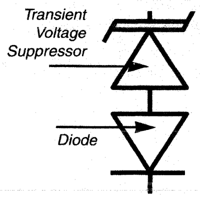


LCE6.5 THRU LCE28A SERIES

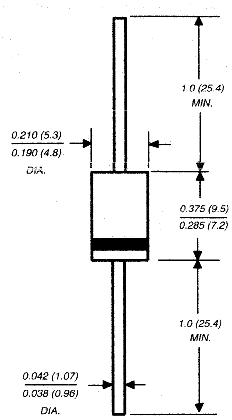
LOW CAPACITANCE TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 6.5 to 28 Volts* ***Peak Pulse Power** - 1500 Watts*

Schematic



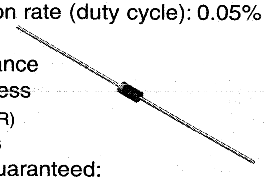
Case Style 1.5KE



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated junction
- 1500W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.05%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 5.0ns from 0 volts to $V_{(BR)}$
- Ideal for data line applications
- High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic body over a passivated junction
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 1500	Watts
Steady state power dissipation, T_L=75°C with at lead lengths 0.375" (9.5mm)	$P_{M(AV)}$	5.0	Watts
Peak power pulse surge current with a 10/1000μs waveform (FIG. 3, NOTE 1)	I_{PPM}	SEE TABLE 1	Amps
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +175	°C

NOTE:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2

ELECTRICAL CHARACTERISTICS at (T_A=25°C UNLESS OTHERWISE NOTED)

PART NUMBER	STAND-OFF VOLTAGE V_{WM} (VOLTS)	BREAKDOWN VOLTAGE $V_{(BR)}$ (VOLTS) MIN / MAX	TEST CURRENT at I_T mA	MAXIMUM REVERSE LEAKAGE AT V_{WM} I_D (mA)	MAXIMUM CLAMPING VOLTAGE AT I_{PP} V_C (VOLTS)	MAXIMUM PEAK PULSE CURRENT FIG.2 I_{PPM} (AMPS)	MAXIMUM JUNCTION CAPACITANCE AT 0 VOLTS (pF)	WORKING INVERSE BLOCKING VOLTAGE V_{WIB} (VOLTS)	MAXIMUM INVERSE BLOCKING LEAKAGE CURRENT AT V_{WIB} I_D (mA)	MINIMUM PEAK INVERSE BLOCKING VOLTAGE V_{PIB} (VOLTS)
+LCE6.5	6.5	7.22-8.82	10.0	1000	12.3	100	100	75	1.0	100
+LCE6.5A	6.5	7.22-7.98	10.0	1000	11.2	100	100	75	1.0	100
+LCE7.0	7.0	7.78-9.51	10.0	500	13.3	100	100	75	1.0	100
+LCE7.0A	7.0	7.78-8.60	10.0	500	12.0	100	100	75	1.0	100
+LCE7.5	7.5	8.33-10.2	10.0	250	14.3	100	100	75	1.0	100
+LCE7.5A	7.5	8.33-9.21	10.0	100	12.9	100	100	75	1.0	100+
+LCE8.0	8.0	8.89-10.9	1.0	100	15.0	100	100	75	1.0	100
+LCE8.0A	8.0	8.89-9.83	1.0	100	13.6	100	100	75	1.0	100
+LCE8.5	8.5	9.44-11.5	1.0	50.0	15.9	94	100	75	1.0	100
+LCE8.5A	8.5	9.44-10.4	1.0	50.0	14.4	100	100	75	1.0	100
+LCE9.0	9.0	10.0-12.2	1.0	10.0	16.9	89	100	75	1.0	100

ELECTRICAL CHARACTERISTICS at (T_A=25°C UNLESS OTHERWISE NOTED)

PART NUMBER	STAND-OFF VOLTAGE V_{WM} (VOLTS)	BREAKDOWN VOLTAGE $V_{(BR)}$ (VOLTS) MIN/MAX	TEST CURRENT at I_T (mA)	MAXIMUM REVERSE LEAKAGE AT V_{WM} I_D (mA)	MAXIMUM CLAMPING VOLTAGE AT I_{PP} V_C (VOLTS)	MAXIMUM PEAK PULSE CURRENT FIG.2 I_{PPM} (AMPS)	MAXIMUM JUNCTION CAPACITANCE AT 0 VOLTS (pF)	WORKING INVERSE BLOCKING VOLTAGE V_{WIB} (VOLTS)	MAXIMUM INVERSE BLOCKING LEAKAGE CURRENT AT V_{WIB} I_D (mA)	MINIMUM PEAK INVERSE BLOCKING VOLTAGE V_{PIB} (VOLTS)
+LCE9.0A	9.0	10.0-11.1	1.0	10.0	15.4	97	100	75	1.0	100
+LCE10	10	11.1-13.6	1.0	5.0	18.8	80	100	75	1.0	100
+LCE10A	10	11.1-12.3	1.0	5.0	17.0	88	100	75	1.0	100
+LCE11	11	12.2-14.9	1.0	5.0	20.1	74	100	75	1.0	100
+LCE11A	11	12.2-13.5	1.0	5.0	18.2	82	100	75	1.0	100
+LCE12	12	13.3-16.3	1.0	5.0	22.0	68	100	75	1.0	100
+LCE12A	12	13.3-14.7	1.0	5.0	19.9	75	100	75	1.0	100
+LCE13	13	14.4-17.6	1.0	5.0	23.8	63	100	75	1.0	100
+LCE13A	13	14.4-15.9	1.0	5.0	21.5	70	100	75	1.0	100
+LCE14	14	15.6-19.1	1.0	5.0	25.8	58	100	75	1.0	100
+LCE14A	14	15.6-17.2	1.0	5.0	23.2	65	100	75	1.0	100
+LCE15	15	1 6.7-20.4	1.0	5.0	26.9	56	100	75	1.0	100
+LCE15A	15	16.7-18.5	1.0	5.0	24.4	61	100	75	1.0	100
+LCE16	16	17.8-21.8	1.0	5.0	28.8	52	100	75	1.0	100
+LCE16A	16	17.8-19.7	1.0	5.0	26.0	57	100	75	1.0	100
+LCE17	17	18.9-23.1	1.0	5.0	30.5	49	100	75	1.0	100
+LCE17A	17	18.9-20.9	1.0	5.0	27.6	54	100	75	1.0	100
+LCE18	18	20.0-24.4	1.0	5.0	32.2	46	100	75	1.0	100
+LCE18A	18	20.0-22.1	1.0	5.0	29.2	51	100	75	1.0	100
+LCE20	20	22.2-27.1	1.0	5.0	35.8	42	100	75	1.0	100
+LCE20A	20	22.2-24.5	1.0	5.0	32.4	46	100	75	1.0	100
+LCE22	22	24.4-29.8	1.0	5.0	39.4	38	100	75	1.0	100
+LCE22A	22	24.4-26.9	1.0	5.0	35.5	42	100	75	1.0	100
+LCE24	24	26.7-32.6	1.0	5.0	43.0	35	100	75	1.0	100
+LCE24A	24	26.7-29.5	1.0	5.0	38.9	39	100	75	1.0	100
+LCE26	26	28.9-35.3	1.0	5.0	46.6	32	100	75	1.0	100
+LCE26A	26	28.9-31.9	1.0	5.0	42.1	36	100	75	1.0	100
+LCE28	28	31.1-38.0	1.0	5.0	50.1	30	100	75	1.0	100
+LCE28A	28	31.1-34.4	1.0	5.0	45.5	33	100	75	1.0	100

+ UL listed for Telecom application protection 497B, file number E136766

RATINGS AND CHARACTERISTIC CURVES LCE6.5 THRU LCE28A SERIES

FIG. 1 - PEAK PULSE POWER RATING CURVE

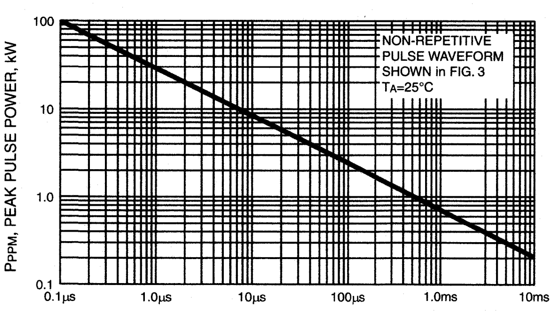


FIG. 2 - POWER DERATING CURVE

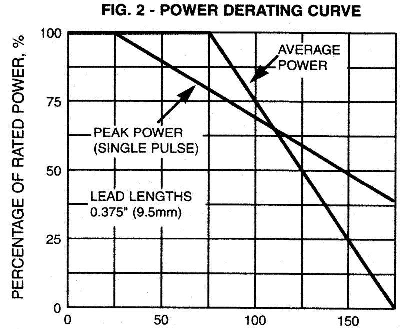


FIG. 3 - PULSE WAVEFORM

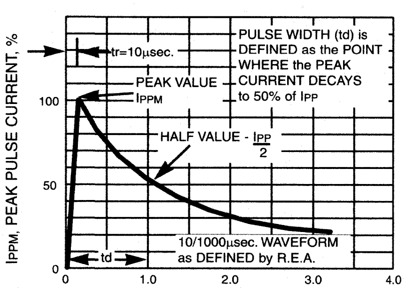
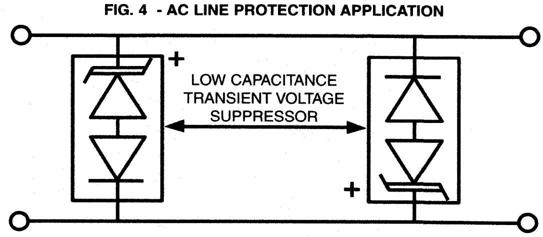


FIG. 4 - AC LINE PROTECTION APPLICATION



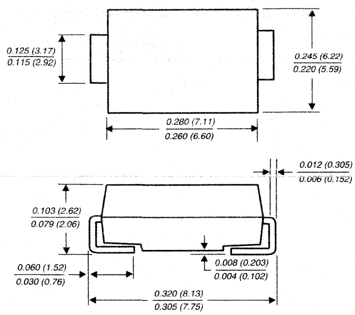
APPLICATION NOTE: Device must be used with two units in parallel, opposite in polarity as shown in circuit for AC signal Line protection

SMCG AND SMCJ5.0 THRU 170, CA SERIES

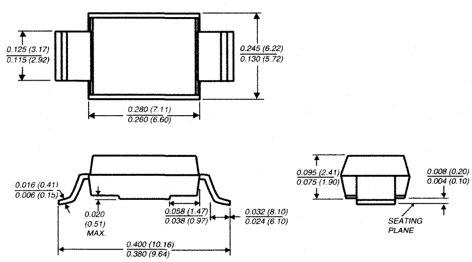
SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 - 170 Volts*   ***Peak Pulse Power** - 1500 Watts*

DO-214AB
MODIFIED J-BEND



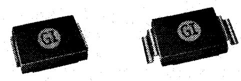
DO-215AB
GULL WING



Dimensions in inches and (millimeters)

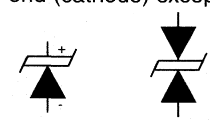
FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- 1500W peak pulse power capability with a 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$ for unidirectional and 5.0ns for bidirectional types
- For devices with $V_{(BR)} \geq 10V$, I_D are typically less than 1.0µA
- High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO214AB / DO215AB molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectional
Mounting Position: Any
Weight: 0.007 ounces, 0.21 gram



Unidirectional   Bidirectional

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional use add suffix C or CA for types SMC-5.0 thru SMC-170 (e.g. SMCG5.0C, SMCJ170CA).
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000µs waveform (NOTES 1, 2, FIG. 1)	P_{PPM}	Minimum 1500	Watts
Peak pulse current with a 10/1000µs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3) - unidirectional only	I_{FSM}	100.0	Amps
Maximum instantaneous forward voltage at 100A - unidirectional only	V_F	SEE NOTE 3, 4	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 0.31 x 0.31" (8.0 x 8.0mm) copper pads to each terminal
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle 4 pulses per minute maximum
(4) V_F=3.5V on SMC5.0 thru SMC-90 devices and V_F=5.0V on SMC-100 thru SMC-170 devices

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted) TABLE 1

Device Type Gull Wing Lead	Device Type Modified "J" Bend Lead	Device Marking Code UNI	Device Marking Code BI	Breakdown Voltage $V_{(BR)}$(Volts) (NOTE 1) (MIN / MAX)	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} (NOTE 3) I_D (μA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMCG5.0	SMCJ5.0	GDD	GDD	6.40 / 7.3	10.0	5.0	1000	164.0	9.6
SMCG5.0A	SMCJ5.0	GDE	GDE	6.40 / 7.0	10.0	5.0	1000	171.0	9.2
SMCG6.0	SMCJ6.0	GDF	GDF	6.67 / 8.15	10.0	5.0	1000	138.0	11.4
SMCG6.0A	SMCJ6.0A	GDG	GDG	6.67 / 7.37	10.0	6.0	1000	152.0	10.3
SMCG6.5	SMCJ6.5	GDH	BDH	7.22 / 8.82	10.0	6.5	500	128.0	12.3
SMCG6.0A	SMCJ6.5A	GDK	BDK	7.22 / 7.98	10.0	6.5	500	140.0	11.2
SMCG7.0	SMCJ7.0	GDL	GDL	7.78 / 8.51	10.0	7.0	200	118.0	13.3
SMCG7.0A	SMCJ7.0A	GDM	GDM	7.78 / 8.60	10.0	7.0	200	131.0	12.0
SMCG7.5	SMCJ7.5	GDN	BDN	8.33 / 10.3	1.0	7.5	100	110.0	14.3
SMCG7.5A	SMCJ7.5A	GDP	BDP	8.33 / 9.21	1.0	7.5	100	122.0	12.9
SMCG8.0	SMCJ8.0	GDQ	BDG	8.89 / 10.9	1.0	8.0	50	105.0	15.0
SMCG8.0A	SMCJ8.0A	GDR	BDR	8.89 / 9.83	1.0	8.0	50	115.0	13.6
SMCG8.5	SMCJ8.5	GDS	DBS	9.44 / 11.5	1.0	8.5	25	99.0	15.9
SMCG8.5A	SMCJ8.5A	GDT	BDT	9.44 / 10.4	1.0	8.5	20	109.0	14.4
SMCG9.0	SMCJ9.0	GDU	BDU	10.0 / 12.2	1.0	9.0	10	93.0	16.9
SMCG9.0A	SMCJ9.0A	GDV	BDV	10.0 / 11.1	1.0	9.0	10	102.0	15.4
SMCG10	SMCJ10	GDW	BDW	11.1 / 13.6	1.0	10.0	5.0	83.0	18.8
SMCG10A	SMCJ10A	GDX	BDX	11.1 / 12.3	1.0	10.0	5.0	92.0	17.0
SMCG11	SMCJ11	GDY	GDY	12.2 / 14.9	1.0	11.0	5.0	78.0	20.1
SMCG11A	SMCJ11A	GDZ	GDZ	12.2 / 13.5	1.0	11.0	5.0	86.0	18.2
SMCG12	SMCJ12	GED	BED	13.3 / 16.3	1.0	12.0	5.0	71.0	22.0
SMCG12A	SMCJ12A	GEE	BEE	13.3 / 14.7	1.0	12.0	5.0	79.0	19.9
SMCG13	SMCJ13	GEF	GEF	14.4 / 17.6	1.0	13.0	5.0	66.0	23.8
SMCG13A	SMCJ13A	GEG	GEG	14.4 / 15.9	1.0	13.0	5.0	73.0	21.5
SMCG14	SMCJ14	GEH	BEH	15.6 / 19.1	1.0	14.0	5.0	61.0	25.8
SMCG14A	SMCJ14A	GEK	BEK	15.6 / 17.2	1.0	14.0	5.0	67.0	23.2
SMCG15	SNCJ15	GEL	BEL	16.7 / 20.4	1.0	15.0	5.0	58.0	26.9
SMCG15A	SNCJ15A	GEM	BEM	16.7 / 18.5	1.0	15.0	5.0	64.0	24.4
SMCG16	SMCJ16	GEN	GEN	17.8 / 21.8	1.0	16.0	5.0	54.0	28.8
SMCG16A	SMCJ16A	GEP	GEP	17.8 / 19.7	1.0	16.0	5.0	60.0	26.0
SMCG17	SMCJ17	GEQ	GEQ	18.9 / 23.1	1.0	17.0	5.0	51.0	30.5
SMCG17A	SMCJ17A	GER	GER	18.9 / 20.9	1.0	17.0	5.0	57.0	27.6
SMCGI8	SMCJ18	GES	BES	20.0 / 24.4	1.0	18.0	5-0	48.0	32.2
SMCG18A	SMCJ18A	GET	BEW	20.0 / 22.1	1.0	18.0	5.0	53.0	29.2
SMCG20	SMCJ20	GEU	BEU	22.2 / 27.7	1.0	20.0	5.0	43.0	35.8
SMCG20A	SMCJ20A	GEV	BEV	22.2 / 24.5	1.0	20.0	5.0	48.0	32.4
SMCG22	SMCJ22	GEW	BEW	24.4 / 29.8	1.0	22.0	5.0	39.0	39.4
SMCG22A	SMCJ22A	GEX	BEX	24,4 / 26.9	1.0	22.0	5.0	44.0	35.5
SMCG24	SMCJ24	GEY	BEY	26.7 / 32.6	1.0	24.0	5.0	36.0	43.0
SMCG24A	SMCJ24A	GEZ	BEZ	26.7 / 29.5	1.0	24.0	5.0	40.0	38.9
SMCG26	SMCJ26	GFD	BFD	28.9 / 35.3	1.0	26.0	5.0	33.0	46.6
SMCG26A	SMCJ26A	GFE	BFE	28.9 / 31.9	1.0	26.0	5.0	37.0	42.1
SMCG28	SMCJ28	GFF	BFF	31.1 / 38.0	1.0	28.0	5.0	31.0	50.0
SMCG28A	SMCJ28A	GFG	BFG	31.1 / 34.4	1.0	28.0	5.0	34.0	45.4
SMCG30	SMCJ30	GFH	BFH	33.3 / 40.7	1.0	30.0	5.0	29.0	53.5
SMCG30A	SMCJ30A	GFK	BFK	33.3 / 36.8	1.0	30.0	5.0	32.0	48.4
SMCG33	SMCJ33	GFL	BFL	36.7 / 44.9	1.0	33.0	5.0	26.0	59.0
SMCG33A	SMCJ33A	GFM	BFM	36.7 / 40.6	1.0	33.0	5.0	29.0	53.3
SMCG36	SMCJ36	GFN	BFN	40.0 / 48.9	1.0	36.0	5.0	24.0	64.3
SMCG36A	SMCJ36A	GFP	BFP	40.0 / 44.2	1.0	36.0	5.0	27.0	58.1
SMCG40	SMCJ40	GFQ	BFQ	44.4 / 54.3	1.0	40.0	5.0	22.0	71.4
SMCG40A	SMCJ40A	GFR	BFR	44.4 / 49.1	1.0	40.0	5.0	24.0	64.5
SMCG43	SMCJ43	GFS	BFS	47.8 / 58.4	1.0	43.0	5.0	20.0	76.7
SMCG43A	SMCJ43A	GFT	BFT	47.8 / 52.8	1.0	43.0	5.0	22.0	69.4
SMCG45	SMCJ45	GFU	GFU	50.0 / 61.1	1.0	45.0	5.0	19.0	80.3
SMCG45A	SMCJ45A	GFV	GFV	50.0 / 55-3	1.0	45.0	5.0	21.0	72.7
SMCG48	SMCJ48	GFW	GFW	53.3 / 65.1	1.0	48.0	5.0	18.0	85.5
SMCG48A	SMCJ48A	GFX	GFX	53.3 / 58.9	1.0	48.0	5-0	20.0	77.4
SMCG51	SMCJ51	GFY	GFY	56.7 / 69.3	1.0	51.0	5.0	17.0	91.1
SMCG51A	SMCJ51A	GFZ	GFZ	56.7 / 62.7	1.0	51.0	5.0	19.0	82.4
SMCG54	SMCJ54	GGD	GDD	60.0 / 73.3	1.0	54.0	5-0	16.0	96.3
SMCG54A	SMCJ54A	GGE	GGE	60.0 / 66.3	1.0	54.0	5.0	18.0	87.1

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type Gull Wing Lead	Device Type Modified "J" Bend Lead	Device Marking Code UNI	Device Marking Code BI	Breakdown Voltage $V_{(BR)}$(Volts) (NOTE 1) (MIN / MAX)	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} (NOTE 3) I_D (μA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMCG58	SMCJ58	GGF	GGF	64.4 / 78.7	1.0	58	5.0	15.0	103.0
SMCG58A	SMCJ58A	GGG	GGG	6.4.4 / 71.2	1.0	58	5.0	16.0	93.6
SMCG60	SMCJ60	GGH	GGH	66.7 / 81.5	1.0	60	5.0	14.0	107.0
SMCG60A	SMCJ60A	GGK	GGK	66.7 / 73.7	1.0	60	5.0	16.0	96.8
SMCG64	SMCJ64	GGL	GGL	71.1 / 86.9	1.0	64	5.0	13.8	114.0
SMCG64A	SMCJ64A	GGM	GGM	71.1 / 78.6	1.0	64	5.0	15.0	103.0
SMCG70	SMCJ70	GGN	GGN	77.8 / 95.1	1.0	70	5.0	12.6	125.0
SMCG70A	SMCJ70A	GGP	GGP	77.8 / 86.0	1.0	70	5.0	13.9	113.0
SMCG75	SMCJ75	GGQ	GGQ	83.3 / 102	1.0	75	5.0	11.7	134.0
SMCG75A	SMCJ75A	GGR	GGR	83.3 / 92.1	1.0	75	5.0	13.0	121.0
SMCG78	SMCJ78	GGS	GGS	86.7 / 106	1.0	78	5.0	11.3	139.0
SMCG78A	SMCJ78A	GGT	GGT	86.7 / 95.8	1.0	78	5.0	12.5	126.0
SMCG85	SMCJ85	GGU	GGU	94.4 / 115	1.0	85	5.0	10.4	151.0
SMCG85A	SMCJ85A	GGV	GGV	94.4 / 104	1.0	85	5.0	11.5	137.0
SMCG90	SMCJ90	GGW	GGW	100 / 122	1.0	90	5.0	9.8	160.0
SMCG90A	SMCJ90A	GGX	GGX	100 / 111	1.0	90	5.0	10.7	146.0
SMCG100	SMCJ100	GGY	GGY	111 / 136	1.0	100	5.0	8.8	179.0
SMCG100A	SMCJ100A	GGZ	GGZ	111 / 123	1.0	100	5.0	9.7	162.0
SMCG110	SMCJ110	GHD	GHD	122 / 149	1.0	110	5.0	8.0	196.0
SMCG110A	SMCJ110A	GHE	GHE	122 / 135	1.0	110	5.0	8.9	177.0
SMCG120	SMCJ120	GHF	GHF	133 / 163	1.0	120	5.0	7.3	214.0
SMCG120A	SMCJ120A	GHG	GHG	133 / 147	1.0	120	5.0	8.1	193.0
SMCG130	SMCJ130	GHH	GHH	144 / 176	1.0	130	5.0	6.8	231.0
SMCG130A	SMCJ130A	GHK	GHK	144 / 159	1.0	130	5.0	7.5	209.0
SMCG150	SMCJ150	GHL	GHL	16.7 / 204	1.0	150	5.0	5.8	268.0
SMCG150A	SMCJ150A	GHM	GHM	167 / 185	1.0	150	5.0	6.4	243.0
SMCG160	SMCJ160	GHN	GHN	178 / 218	1.0	160	5.0	5.4	287.0
SMCG160A	SMCJ160A	GHP	GHP	178 / 197	1.0	160	5.0	6.0	259.0
SMCG170	SMCJ170	GHQ	GHQ	189 / 231	1.0	170	5.0	5.1	304.0
SMCG170A	SMCJ170A	GHR	GHR	189 / 209	1.0	170	5.0	5.7	275.0

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) For bidirectional types having V_{WM} of 10 Volts and less, the I_D limit is doubled
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

APPLICATION NOTES

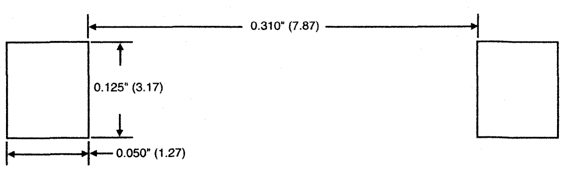
These surface mountable packages are designed specifically for transient voltage suppression. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

A 1500W (SMC) device is normally selected when the threat of transients is from lightning-induced transients conducted via external leads or I/0 lines. It is also used to protect against switching transients induced by large coils or industrial motors.
System impedance at component level in a system is usually high enough to limit the current to within the peak pulse current (I_{PP}) rating of this series.

RECOMMENDED PAD SIZES

The pad dimensions should be 0.010" (0.25mm) longer than the contact size, in the lead axis.
This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

GULL- WING



MODIFIED J-BEND

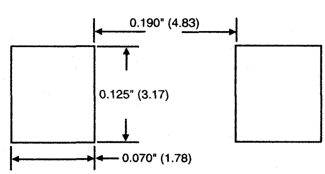


FIG. 1 - PEAK PULSE POWER RATING CURVE

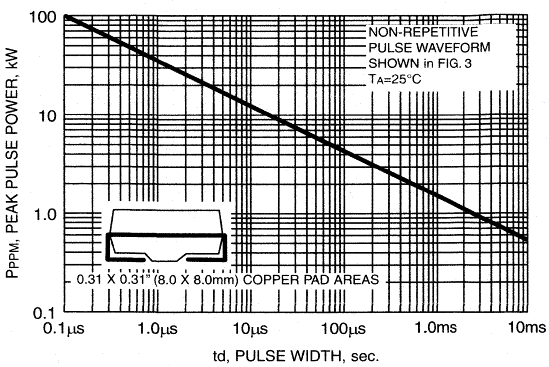


FIG. 2 - PULSE DERATING CURVE

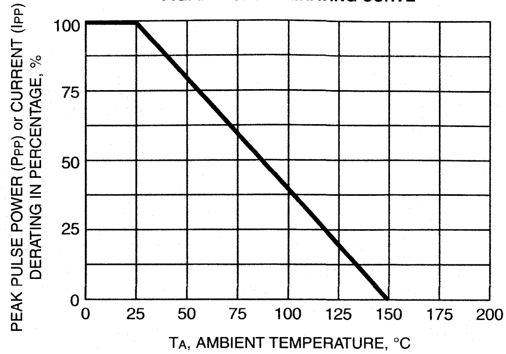


FIG. 3 - PULSE WAVEFORM

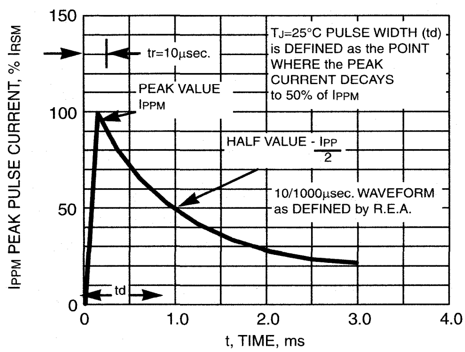


FIG. 4 - TYPICAL JUNCTION CAPACITANCE
UNIDIRECTIONAL

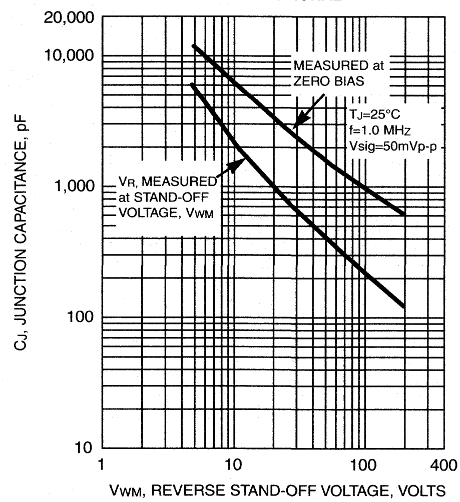


FIG. 5 - TYPICAL JUNCTION CAPACITANCE
BIDIRECTIONAL

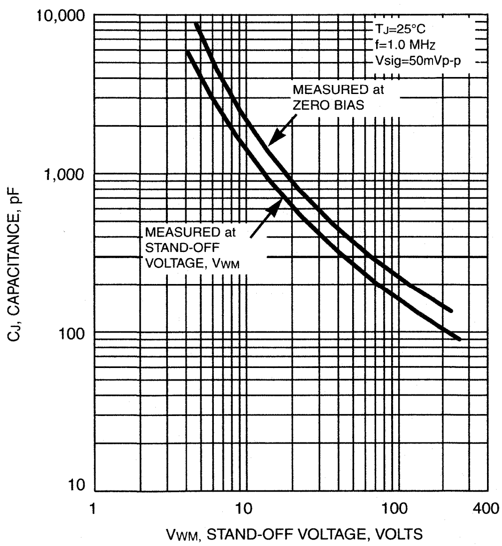
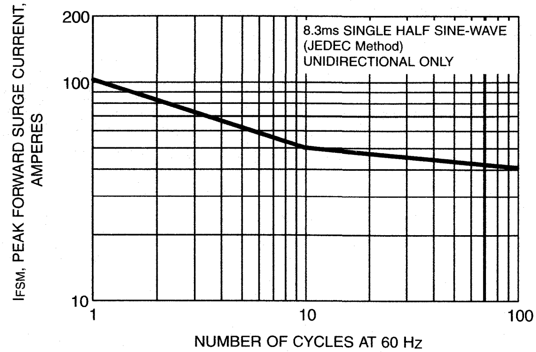


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD
SURGE CURRENT



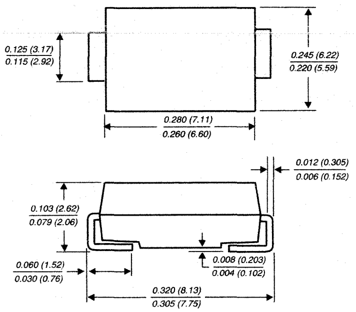
TPSMC6.8 THRU TPSMC43A

AUTOMOTIVE SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***Breakdown Voltage** - 6.8 to 43 Volts* ***Peak Pulse Power** - 1500 Watts*

PATENTED

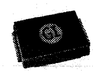
DO-214AB
Modified J-Bend



Dimensions in inches and (millimeters)

Available in unidirectional only

FEATURES



- Designed for under the hood surface mount applications
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Easy pick and place
- Low profile package
- Built-in strain relief
- Ideal for automated placement
- Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) chip construction
- 1500W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- For devices with $V_{(BR)} \geq 10V$ I_D are typically less than 1.0μA at T_A=150°C
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic body over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.007 ounces, 0.2 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	VALUE	UNITS
Peak pulse power dissipation with a 10/1000μs waveform (NOTES 1, 2, FIG. 3)	P_{PPM}	Minimum 1500	Watts
Peak power pulse current with a 10/1000μs waveform (NOTE 1, FIG. 1)	I_{PPM}	SEE TABLE 1	Amps
Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3)	I_{FSM}	200.0	Amps
Maximum instantaneous forward voltage at 100A (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2
(2) Mounted on 0.31 X 0.31" (8.0 X 8.0mm) copper pads to each terminal
(3) Measured on 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minute maximum

General Instrument
Power Semiconductor Division

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min.	Max.	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_R (µA)	Maximum Reverse Leakage at V_{WM}, T_J =150°C I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)
TPSMC6.8	DDP	6.12	7.48	10.0	5.50	500.0	1000.0	145.0	10.8
TPSMC6.8A	DEP	6.45	7.14	10.0	5.80	500.0	1000.0	150.0	10.5
TPSMC7.5	DFP	6.75	8.25	10.0	6.05	250.0	500.0	134.0	11.7
TPSMC7.5A	DGP	7.13	7.88	10.0	6.40	250.0	500.0	139.0	11.3
TPSMC8.2	DHP	7.38	9.02	10.0	6.63	100.0	200.0	126.0	12.5
TPSMC8.2A	DKP	7.79	8.61	10.0	7.02	100.0	200.0	130.0	12.1
TPSMC9.1	DLP	8.19	10.0	1.0	7.37	25.0	50.0	114.0	13.8
TPSMC9.1A	DMP	8.65	9.55	1.0	7.78	25.0	50.0	117.0	13.4
TPSMC10	DNP	9.00	11.0	1.0	8.10	10.0	25.0	105.0	15.0
TPSMC10A	DPP	9.50	10.5	1.0	8.55	10.0	25.0	108.0	14.5
TPSMC11	DOP	9.90	12.1	1.0	8.92	2.0	10.0	97.0	16.2
TPSMC11A	DRP	10.5	11.6	1.0	9.40	2.0	10.0	100.0	15.6
TPSMC12	DSP	10.8	13.2	1.0	9.72	2.0	10.0	91.0	17.3
TPSMC12A	DTP	11.4	12.6	1.0	10.2	2.0	10.0	94.0	16.7
TPSMC13	DUP	11.7	14.3	1.0	10.5	2.0	10.0	82.0	19.0
TPSMC13A	DVP	12.4	13.7	1.0	11.1	2.0	10.0	86.0	18.2
TPSMC15	DWP	13.5	16.5	1.0	12.1	2.0	10.0	71.0	22.0
TPSMC15A	DXP	14.3	15.8	1.0	12.8	2.0	10.0	74.0	21.2
TPSMC16	DYP	14.4	17.6	1.0	12.9	2.0	10.0	67.0	23.5
TPSMC16A	DZP	15.2	16.8	1.0	13.6	2.0	10.0	70.0	22.5
TPSMC18	EDP	16.2	19.8	1.0	14.5	2.0	10.0	59.0	26.5
TPSMC18A	EEP	17.1	18.9	1.0	15.3	2.0	10.0	60.0	25.2
TPSMC20	EFP	18.0	22.0	1.0	16.2	2.0	10.0	54.0	29.1
TPSMC20A	EGP	19.0	21.0	1.0	17.1	2.0	10.0	56.0	27.7
TPSMC22	EHP	19.8	24.2	1.0	17.8	2.0	10.0	49.0	31.9
TPSMC22A	EKP	20.9	23.1	1.0	18.8	2.0	10.0	51.0	30.6
TPSMC24	ELP	21.6	26.4	1.0	19.4	2.0	10.0	45.0	34.7
TPSMC24A	EMP	22.8	25.2	1.0	20.5	2.0	10.0	47.0	33.2
TPSMC27	ENP	24.3	29.7	1.0	21.8	2.0	10.0	40.0	39.1
TPSMC27A	EPP	25.7	28.4	1.0	23.1	2.0	10.0	42.0	37.5
TPSMC30	EQP	27.0	33.0	1.0	24.3	2.0	10.0	36.0	43.5
TPSMC30A	ERP	28.5	31.5	1.0	25.6	2.0	10.0	38.0	41.4
TPSMC33	ESP	29.7	36.3	1.0	26.8	2.0	10.0	33.0	47.7
TPSMC33A	ETP	31.4	34.7	1.0	28.2	2.0	10.0	34.0	45.7
TPSMC36	EUP	32.4	39.6	1.0	29.1	2.0	10.0	30.0	52.0
TPSMC36A	EVP	34.2	37.8	1.0	30.8	2.0	10.0	31.0	49.9
TPSMC39	EWP	35.1	42.9	1.0	31.6	2.0	10.0	27.0	56.4
TPMC39A	EXP	37.1	41.0	1.0	33.3	2.0	10.0	29.0	53.9
TPSMC43	EYP	38.7	47.3	1.0	34.8	2.0	10.0	25.0	61.9
TPSMC43A	EZP	40.9	45.2	1.0	36.8	2.0	10.0	26.0	59.3

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300µs, I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2

FIG. 1 - PEAK PULSE POWER RATING CURVE

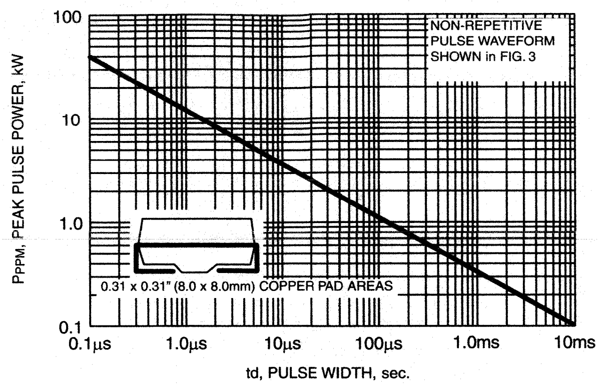


FIG. 2 - PULSE DERATING CURVE

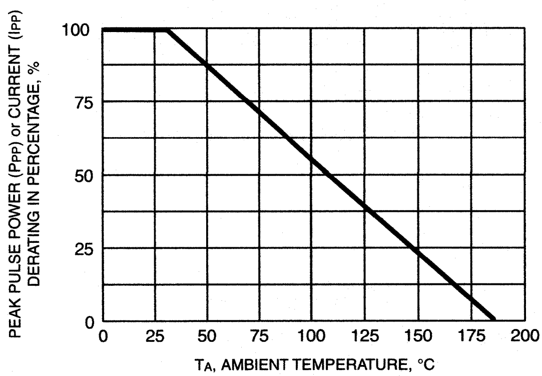


FIG. 3 - PULSE WAVEFORM

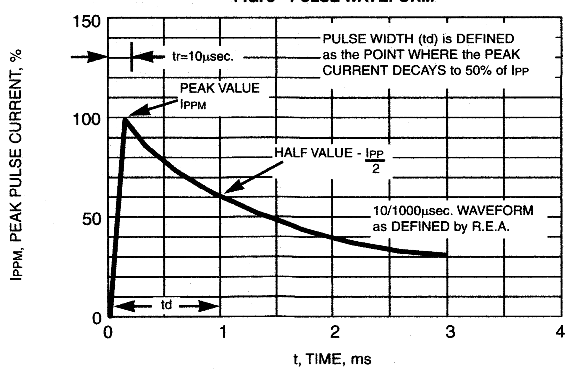


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

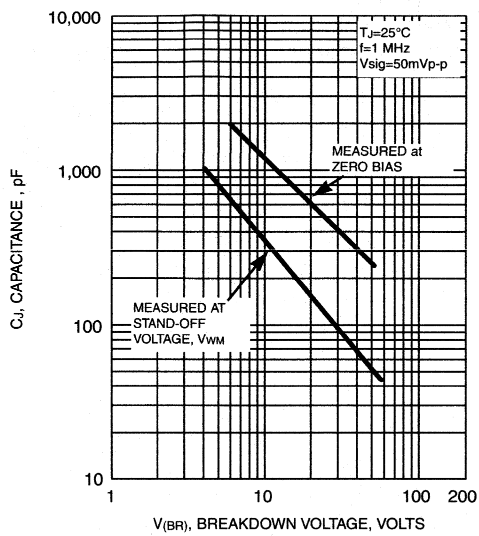
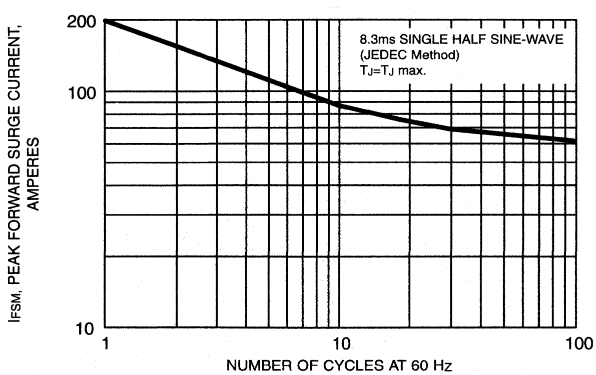


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

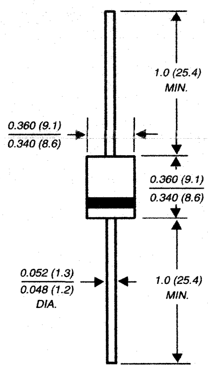


5KP5.0 THRU 5KP110A

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 5.0 to 110 Volts* ***Peak Pulse Power** - 5000 Watts*

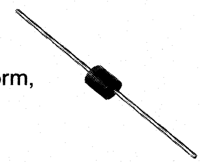
Case Style P600



Dimensions in inches and (millimeters)

Available in unidirectional only

FEATURES



- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ 5000W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.05%
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to $V_{(BR)}$
- ♦ Devices with $V_{(BR)}$>10V I_D are typically I_D less than 1.0μA
- ♦ High temperature soldering guaranteed: 265°C/10 seconds, 0.375" (9.5mm) lead length, 5lbs. (2.3 kg) tension

MECHANICAL DATA

Case: Molded plastic body over glass passivated junction
Terminals: Solder plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.07 ounce, 2.1 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOL	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 5000	Watts
Peak pulse current with a 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady state power dissipation at T_L=75°C lead lengths 0.375" (9.5mm) (NOTE 2)	$P_{M(AV)}$	8.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	400	Amps
Instantaneous forward voltage at 100A, (NOTE 3)	V_F	3.5	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	°C

NOTES:
(1) Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2
(2) Mounted on copper pad area of 0.8 x 0.8" (20 x 20mm) per Fig. 5
(3) Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum

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ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1)		Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
	MIN	MAX						
5KP5.0	6.40	7.30	50	5.0	2000	546	9.6	0.057
5KP5.0A	6.40	7.00	50	5.0	2000	570	9.2	0.057
5KP6.0	6.67	8.15	50	6.0	5000	460	11.4	0.061
5KP6.0A	6.67	7.37	50	6.0	5000	509	10.3	0.061
5KP6.5	7.22	8.82	50	6.5	2000	426	12.3	0.065
5KP6.5A	7.22	7.98	50	6.5	2000	468	11.2	0.065
5KP7.0	7.78	9.51	50	7.0	1000	394	13.3	0.068
5KP7.0A	7.78	8.60	50	7.0	1000	437	12.0	0.068
5KP7.5	8.33	10.2	5.0	7.5	250	367	14.3	0.073
5KP7.5A	8.33	9.21	5.0	7.5	250	406	12.9	0.073
5KP8.0	8.89	10.9	5.0	8.0	150	350	15.0	0.075
5KP8.0A	8.89	9.83	5.0	8.0	150	386	13.6	0.075
5KP8.5	9.44	11.5	5.0	8.5	50.0	330	15.9	0.078
5KP8.5A	9.44	10.4	5.0	8.5	50.0	364	14.4	0.078
5KP9.0	10.0	12.2	5.0	9.0	20.0	310	16.9	0.081
5KP9.0A	10.0	11.1	5.0	9.0	20.0	340	15.4	0.081
5KP10	11.1	13.6	5.0	10.0	15.0	279	18.8	0.084
5KP10A	11.1	12.3	5.0	10.0	15.0	308	17.0	0.084
5KP11	12.2	14.9	5.0	11.0	10.0	261	20.1	0.086
5KP11A	12.2	13.5	5.0	11.0	10.0	288	18.2	0.086
5KP12	13.3	16.3	5.0	12.0	10.0	238	22.0	0.088
5KP12A	13.3	14.7	5.0	12.0	10.0	263	19.9	0.088
5KP13	14.4	17.6	5.0	13.0	10.0	220	23.8	0.090
5KP13A	14.4	15.9	5.0	13.0	10.0	244	21.5	0.090
5KP14	15.6	19.1	5.0	14.0	10.0	203	25.8	0.092
5KP14A	15.6	17.2	5.0	14.0	10.0	226	23.2	0.092
5KP15	16.7	20.4	5.0	15.0	10.0	195	26.9	0.094
5KP15A	16.7	18.5	5.0	15.0	10.0	215	24.4	0.094
5KP16	17.8	21.8	5.0	16.0	10.0	182	28.8	0.096
5KP16A	17.8	19.7	5.0	16.0	10.0	201	26.0	0.096
5KP17	18.9	23.1	5.0	17.0	10.0	172	30.5	0.097
5KP17A	18.9	20.9	5.0	17.0	10.0	190	27.6	0.097
5KP18	20.0	24.4	5.0	18.0	10.0	163	32.2	0.098
5KP18A	20.0	22.1	5.0	18.0	10.0	179	29.2	0.098
5KP20	22.2	27.1	5.0	20.0	10.0	146	35.8	0.099
5KP20A	22.2	24.5	5.0	20.0	10.0	162	32.4	0.099
5KP22	24.4	29.8	5.0	22.0	10.0	133	39.4	0.100
5KP22A	24.4	26.9	5.0	22.0	10.0	147	35.5	0.100
5KP24	26.7	32.6	5.0	24.0	10.0	122	43.0	0.101
5KP24A	26.7	29.5	5.0	24.0	10.0	134	38.9	0.101
5KP26	28.9	35.3	5.0	26.0	10.0	112	46.6	0.101
5KP26A	28.9	31.9	5.0	26.0	10.0	124	42.1	0.101
5KP28	31.1	38.0	5.0	28.0	10.0	104	50.1	0.102
5KP28A	31.1	34.4	5.0	28.0	10.0	115	45.4	0.102
5KP30	33.3	40.7	5.0	30.0	10.0	98.0	53.5	0.103
5KP30A	33.3	36.8	5.0	30.0	10.0	108	48.4	0.103
5KP33	36.7	44.9	5.0	33.0	10.0	88	59.0	0.104

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MIN	MAX	Test Current at I_T (mA)	Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
5KP33A	36.7	40.6	5.0	33.0	10.0	98.0	53.3	0.104
5KP36	40.0	48.9	5.0	36.0	10.0	81.0	64.3	0.104
5KP36A	40.0	44.2	5.0	36.0	10.0	90.0	58.1	0.104
5KP40	44.4	54.3	5.0	40.0	10.0	73.0	71.4	0.105
5KP40A	44.4	49.1	5.0	40.0	10.0	81.0	64.5	0.105
5KP43	47.8	58.4	5.0	43.0	10.0	68.0	76.7	0.105
5KP43A	47.8	52.8	5.0	43.0	10.0	75.0	69.4	0.105
5KP45	50.0	61.1	5.0	45.0	10.0	65.0	80.3	0.106
5KP45A	50.0	55.3	5.0	45.0	10.0	72.0	72.7	0.106
5KP48	53.3	65.2	5.0	48.0	10.0	61.0	85.5	0.106
5KP48A	53.3	58.9	5.0	48.0	10.0	67.0	77.4	0.106
5KP51	56.1	69.3	5.0	51.0	10.0	57.0	91.1	0.107
5KP51A	56.7	62.7	5.0	51.0	10.0	63.0	82.4	0.107
5KP54	60.0	73.3	5.0	54.0	10.0	54.0	96.3	0.107
5KP54A	60.0	66.3	5.0	54.0	10.0	60.0	87.1	0.107
5KP58	64.4	78.7	5.0	58.0	10.0	50.0	103	0.107
5KP58A	64.4	71.2	5.0	58.0	10.0	55.0	94	0.107
5KP60	66.7	81.5	5.0	60.0	10.0	49.0	107	0.108
5KP60A	66.7	73.7	5.0	60.0	10.0	54.0	97	0.108
5KP64	71.1	96.9	5.0	64.0	10.0	46.0	114	0.108
5KP64A	71.1	78.6	5.0	64.0	10.0	50.0	103	0.108
5KP70	77.6	95.1	5.0	70.0	10.0	42.0	125	0.108
5KP70A	77.8	86.0	5.0	70.0	10.0	46.0	113	0.108
5KP75	83.3	102	5.0	75.0	10.0	39.0	134	0.108
5KP75A	83.3	92.1	5.0	75.0	10.0	43.0	121	0.108
5KP78	86.7	106.0	5.0	78.0	10.0	37.0	139	0.108
5KP78A	86.7	95.8	5.0	78.0	10.0	41.0	126	0.108
5KP85	94.4	115	5.0	85.0	10.0	34.0	151	0.108
5KP85A	94.4	104	5.0	85.0	10.0	38.0	137	0.110
5KP90	100	122	5.0	90.0	10.0	32.0	160	0.110
5KP90A	100	111	5.0	90.0	10.0	35.0	146	0.110
5KP100	111	136	5.0	100	10.0	29.0	179	0.110
5KP100A	111	123	5.0	100	10.0	32.0	162	0.110
5KP110	122	149	5.0	110	10.0	26.0	196	0.112
5KP110A	122	135	5.0	110	10.0	9.0	177	0.112

NOTES:
(1) $V_{(BR)}$ measured after I_T applied for 300μs I_T=square wave pulse or equivalent
(2) Surge current waveform per Fig. 3 and derate per Fig. 2
(3) All items and symbols are consistent with ANSI/IEEE C62.35

APPLICATION

The 5KP series of high power transient voltage suppressors were designed to be used on the output of switching power supplies. These devices may be used to replace crowbar circuits. Both the 5 and 10 percent voltage tolerances are referenced to the power supply output voltage level.

They are able to withstand high levels of peak current while allowing a circuit breaker to trip or a fuse blow before shorting. This will enable the user to reset the breaker or replace the fuse and continue operation. For this type operation, it is recommended that a sufficient mounting surface be used for dissipating the heat generated by the Transient Voltage Suppressor during the transient or over-voltage condition.

Transient Voltage Suppressors are Silicon PN Junction devices designed for absorption of high voltage transients associated with power disturbances, switching and induced lighting effects. This series is available from 5.0 volts thru 110 volts.

FIG. 1 - PEAK PULSE POWER RATING CURVE

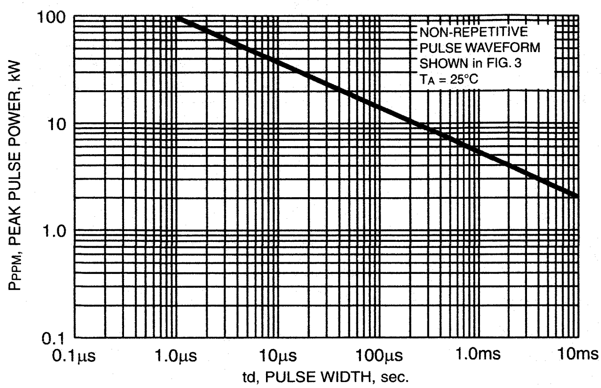


FIG. 2 - PULSE DERATING CURVE

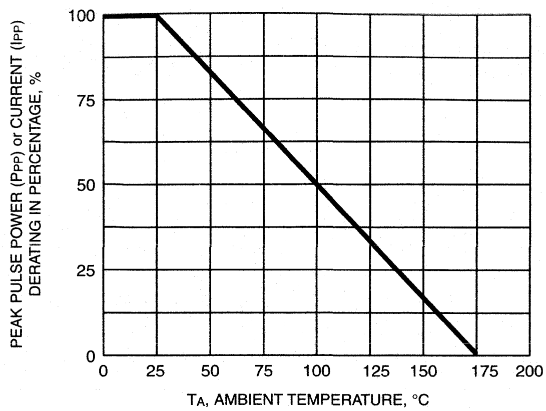


FIG. 3 - PULSE WAVEFORM

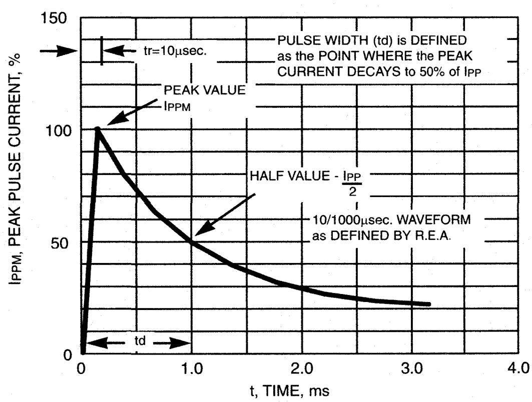


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

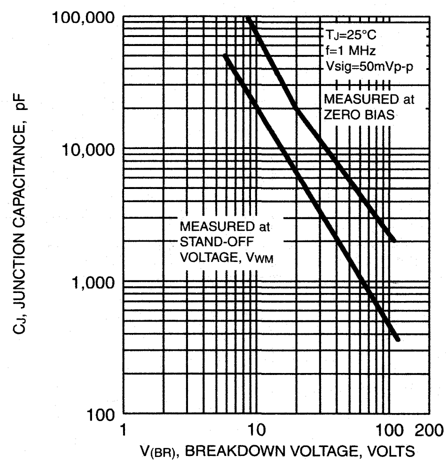


FIG. 5 - STEADY STATE POWER DERATING CURVE

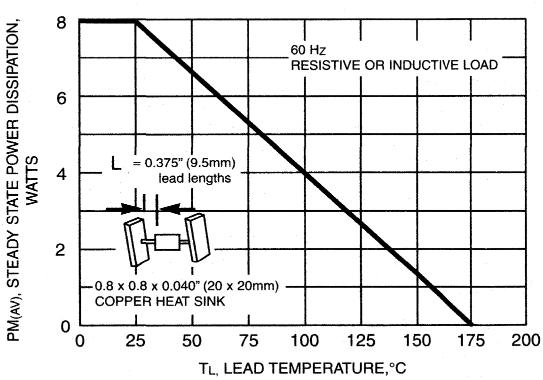
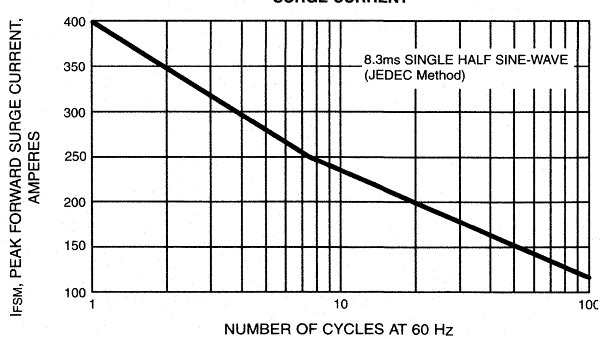


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT



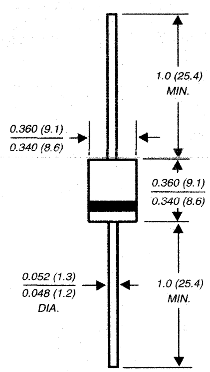
6KA24 TRANSIENT SUPPRESSOR

PREMIUM AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***Stand-off Voltage** - 24 Volts* ***Peak Pulse Power** - 6000 Watts*

PATENTED*

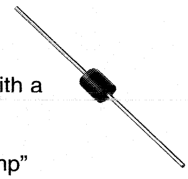
Case Style P600



Dimensions in inches and (millimeters)

* *Patent #'s 4,980,315*
5,166,769
5,278,094

FEATURES



- ♦ Designed for under the hood applications
- ♦ Plastic package has Underwriters Laboratories Flammability classification 94V-0
- ♦ Exclusive G.I. patented Passivated Anisotropic Rectifier (PAR) construction
- ♦ 6000W peak pulse power capability with a 10/1000μs waveform
- ♦ 2000W peak pulse power capability with a 10μs/50ms waveform
- ♦ Low incremental surge resistance
- ♦ Ideally suited for automotive "load dump" applications
- ♦ High temperature soldering guaranteed: 300°C/10 seconds 0.375" (9.5mm) lead lengths, 5lbs (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic body over nitride passivated die
Terminals: Axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.07 ounce, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°ambient temperature unless otherwise specified.

RATINGS	*SYMBOL*	*VALUE*	*UNITS*
Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1)	P_{PPM}	6000	Watts
Peak pulse power dissipation with a 10μs/50ms waveform (NOTE 2)	P_{PPM}	2000	Watts
Steady state power dissipation, (NOTE 6) lead lengths 0.375" (9.5mm), T_L=85°C	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half sine-wave on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	400	Amps
Maximum DC reverse leakage current at V_{WM}=24V T_A=25°C T_A=150°C	I_D	1.0 50.0	μA
Reverse Breakdown Voltage at 100mA T_A=25°C minimum T_A=25°C maximum T_A=150°C minimum T_A=150°C maximum	$V_{(BR)}$	26.7 32.6 29.7 36.7	Volts
Maximum clamping voltage at I_{PPM}=90A (NOTE 4) T_A=25°C T_A=150°C	V_C	40.0 45.0	Volts
Maximum instantaneous forward voltage at 100A (NOTE 5)	V_F	1.8	Volts
Operating junction and storage temperature range	T_J, T_{STG}	-65 to +185	°C

NOTES:
(1) Non repetitive current pulse, per Fig. 2, with a 10/1000μs waveform
(2) Non repetitive current pulse, per Fig. 5, with a 10μs/50ms waveform
(3) Measured on 8.3ms half sine-wave, or equivalent square wave, duty cycle=4 pulses maximum
(4) Measured on 80μs square pulse width
(5) Measured on 300μs second square pulse width
(6) Mounted on copper pad area of 0.8 x 8.0" (20 x 20mm) per Fig. 5

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FIG. 1 - PEAK PULSE POWER RATING CURVE

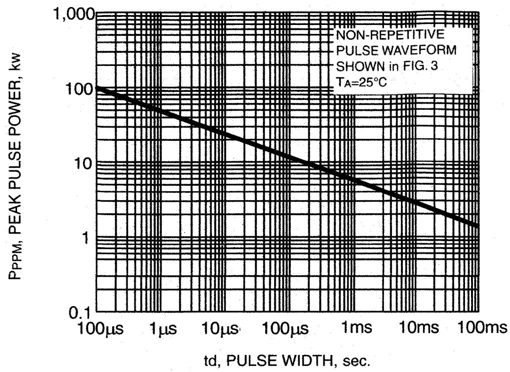


FIG. 2 - PULSE WAVEFORM

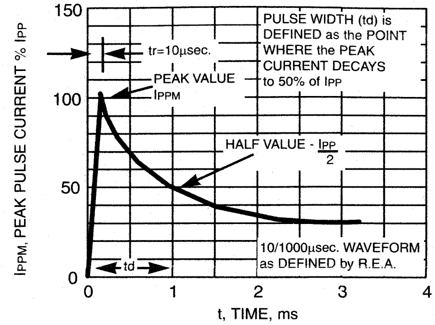


FIG. 3 - PULSE DERATING CURVE

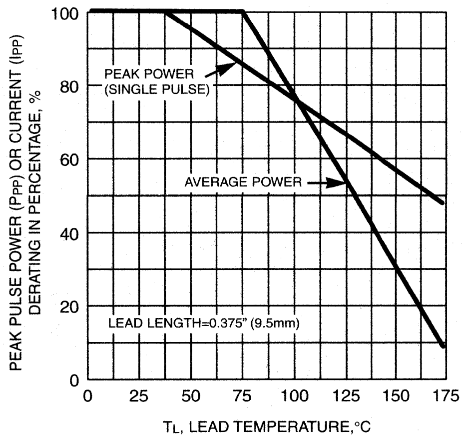


FIG. 4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

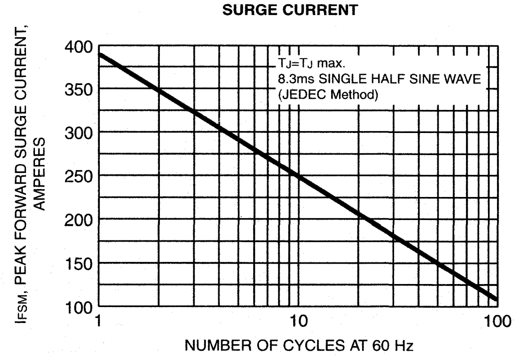
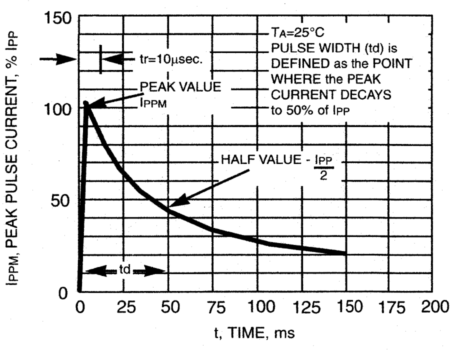


FIG. 5 - PULSE WAVEFORM



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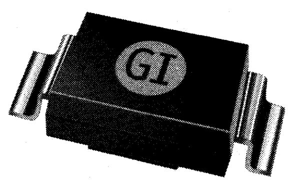
ZENER DIODES

6.2 VOLTS TO 200 VOLTS
1.0 WATT TO 1.5 WATTS

ZENER



INTRODUCTION TO ZENER

General Instrument zener diodes utilize controlled avalanche technology to provide stable voltage references for electronic circuits. Available in various power ratings, packages, with voltage tolerances as tight as +/-5%, PSD provides equipment designers with an excellent zener diode selection to meet most voltage reference needs.

ZENER PART NUMBERING SYSTEM

1. Surface Mount

a) MELF

1) JEDEC

GLL-XXXX(6.2-91V)

GLL-Glass Leadless (MELF)
XXXX=Jedec Designated Numbers

SML=XXXX
SML=Surface Mount Leadless (SMA)
XXXX=Jedec Designated Numbers

2. Non-JEDEC type

ZGL41-XXX (100-200V)
Z=Zener
GL41=Glass Leadless Package (D0-213AD)
XXX=Mean Zener Voltage

b) SMX

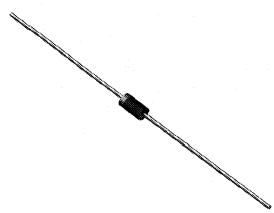
SMZB-XXXX
SM=Surface Mount

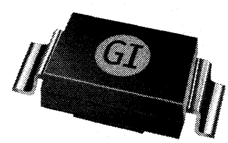
B=Lead Designators
G=Gullwing
J-JBend

XXXX=Jedec Designated Numbers

3. Axial

Z4KE-XXX (100-200V)
Z=Zener Axial
4KE=1 Watt D0204AL CASE
XXX=Mean Zener Voltage





QUICK GUIDE TO ZENER DIODES

TYPE	Z4KE100 thru Z4KE200, A	GLL4735 thru ZGL41-200, A	SML4735 thru SML4763, A	SMZG, J3789 thru SMZG, J3809, A
PACKAGE	D0-204AL	D0-213AB	D0-214AC	D0-214/215AA
Pd(W)	1.0	1.0	1.0	1.5
Vz=6.2V		GLL4735, A	SML4735, A	
Vz=6.8V		GLL4736, A	SML4736, A	
Vz=7.5V		GLL4737, A	SML4737, A	
Vz=8.2V		GLL4738, A	SML4738, A	
Vz=9.1V		GLL4739, A	SML4739, A	
Vz=10V		GLL4740, A	SML4740, A	SMZJ3789, A, B
Vz=11V		GLL4741, A	SML4741, A	SMZJ3790, A, B
Vz=12V		GLL4742, A	SML4742, A	SMZJ3791, A, B
Vz=13V		GLL4743, A	SML4743, A	SMZJ3792, A, B
Vz=15V		GLL4744, A	SML4744, A	SMZJ3793, A, B
Vz=16V		GLL4745, A	SML4745, A	SMZJ3794, A, B
Vz=18V		GLL4746, A	SML4746, A	SMZJ3795, A, B
Vz=20V		GLL4747, A	SML4747, A	SMZJ3796, A, B
Vz=22V		GLL4748, A	SML4748, A	SMZJ3797, A, B
Vz=24V		GLL4749, A	SML4749, A	SMJZ3798, A, B
Vz=27V		GLL4750, A	SML4750, A	SMJZ3799, A, B
Vz=30V		GLL4751.A	SML4751, A	SMJZ3800, A, B
Vz=33V		GLL4752, A	SML4752, A	SMJZ3801, A, B
Vz=36V		GLL4753, A	SML4753, A	SMJZ3802, A, B
Vz=39V		GLL4754, A	SML4754, A	SMJZ3803, A, B
Vz=43V		GLL4755, A	SML4755, A	SMJZ3804, A, B
Vz=47V		GLL4756, A	SML4756, A	SMJZ3805, A, B

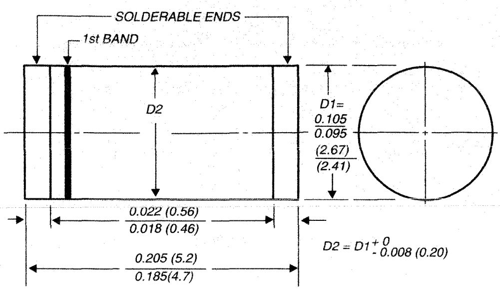
TYPE PACKAGE	Z4KE100 thru Z4KE200, A D0-204AL	GLL4735 thru ZGL41-200, A D0-213AB	SML4735 thru SML4763, A D0-214AC	SMZG, J3789 thru SMZG, J3809, A D0-214/215AA
$P_{d(W)}$	1.0	1.0	1.0	1.5
V_Z=51V		GLL4757, A	SML4757, A	SMJZ3806, A, B
V_Z=56V		GLL4758, A	SML4758, A	SMJZ3807, A, B
V_Z=62V		GLL4759, A	SML4759, A	SMJZ3808, A, B
V_Z=68V		GLL4760, A	SML4760, A	SMJZ3809v, A, B
V_Z=75V		GLL4761, A	SML4761, A	
V_Z=82V		GLL4762, A	SML4762, A	
V_Z=91V		GLL4763, A	SML4763, A	
V_Z=100V	Z4KE100, A		ZGL41-100, A	
V_Z=110V	Z4KE110, A		ZGL41-110, A	
V_Z=120V	Z4KE120, A		ZGL41-120, A	
V_Z=130V	Z4KE130, A		ZGL41-130, A	
V_Z=140V	Z4KE140, A		ZGL41-140, A	
V_Z=150V	Z4KE150, A		ZGL41-150, A	
V_Z=160V	Z4KE160, A		ZGL41-160, A	
V_Z=170V	Z4KE170, A		ZGL41-170, A	
V_Z=180V	Z4KE180, A		ZGL41-180, A	
V_Z=190V	Z4KE190, A		ZGL41-190, A	
V_Z=200V	Z4KE200, A		ZGL41-200, A	

GLL4735 THRU GLL4763A

SURFACE MOUNT GLASS PASSIVATED ZENER

***Zener Voltage** - 6.2 to 91.0 Volts*   ***Steady State Power** - 1.0 Watt*

DO-213AB



1st band denotes type and positive end (cathode)

Dimensions are in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Glass passivated chip junction
- Low zener impedance
- Low regulation factor
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Red band denotes zener diode and positive end (cathode)
Mounting Position: Any
Weight: 0.0046 ounce, 0.116 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: T_J, T_{STG}: -55°C to +150°C

TYPE	NOMINAL ZENER VOLTAGE AT I_{ZT} (NOTE 1) V_Z (Volts)	TEST CURRENT I_{ZT} (mA)	MAXIMUM DYNAMIC IMPEDANCE			MAXIMUM DC REVERSE LEAKAGE CURRENT		MAXIMUM ZENER CURRENT (NOTE 2) I_{ZM} (mApk)	MAXIMUM FORWARD VOLTAGE at 200mA V_F (Volts)
			Z_{ZT} at I_{ZT} (Ohms)	Z_{ZK} at I_{ZK} (Ohms)	I_{ZK} (mA)	I_R (µA)	V_R (Volts)		
GLL4735	6.2	41.0	2.0	700	1.0	10.0	3.0	730.0	1.2
GLL4736	6.8	37.0	3.5	700	1.0	10.0	4.0	660.0	1.2
GLL4737	7.5	34.0	4.0	700	0.5	10.0	5.0	605.0	1.2
GLL4738	8.2	31.0	4.5	700	0.5	10.0	6.0	550.0	1.2
GLL4739	9.1	28.0	5.0	700	0.5	10.0	7.0	500.0	1.2
GLL4740	10	25.0	7.0	700	0.25	10.0	7.6	454.0	1.2
GLL4741	11	23.0	8.0	700	0.25	5.0	8.4	414.0	1.2
GLL4742	12	21.0	9.0	700	0.25	5.0	9.1	380.0	1.2
GLL4743	13	19.0	10.0	700	0.25	5.0	9.9	344.0	1.2
GLL4744	15	17.0	14.0	700	0.25	5.0	11.4	305.0	1.2
GLL4745	16	15.5	16.0	700	0.25	5.0	12.2	285.0	1.2
GLL4746	18	14.0	20.0	750	0.25	5.0	13.7	250.0	1.2
GLL4747	20	12.5	22.0	750	0.25	5.0	15.2	225.0	1.2
GLL4748	22	11.5	23.0	750	0.25	5.0	16.7	205.0	1.2
GLL4749	24	10.5	25.0	750	0.25	5.0	18.2	190.0	1.2
GLL4750	27	9.5	35.0	750	0.25	5.0	20.6	170.0	1.2
GLL4751	30	8.5	40.0	1000	0.25	5.0	22.8	150.0	1.2
GLL4752	33	7.5	45.0	1000	0.25	5.0	25.1	135.0	1.2
GLL4753	36	7.0	50.0	1000	0.25	5.0	27.4	125.0	1.2
GLL4754	39	6.5	60.0	1000	0.25	5.0	29.7	115.0	1.2
GLL4755	43	6.0	70.0	1500	0.25	5.0	32.7	110.0	1.2
GLL4756	47	5.5	80.0	1500	0.25	5.0	35.8	95.0	1.2
GLL4757	51	5.0	95.0	1500	0.25	5.0	38.8	90.0	1.2
GLL4758	56	4.5	110.0	2000	0.25	5.0	42.6	80.0	1.2
GLL4759	62	4.0	125.0	2000	0.25	5.0	47.1	70.0	1.2
GLL4760	68	3.7	150.0	2000	0.25	5.0	51.7	65.0	1.2
GLL4761	75	3.3	175.0	2000	0.25	5.0	56.0	60.0	1.2
GLL4762	82	3.0	200.0	3000	0.25	5.0	62.2	55.0	1.2
GLL4763	91	2.0	250.0	3000	0.25	5.0	69.2	50.0	1.2

NOTES:
(1) Standard voltage tolerance is ±10%, Suffix A = ±5%
(2) Surge current is a non-repetitive, 8.3ms pulse width square wave or equivalent sine-wave superimposed on I_{ZT} per JEDEC Method
(3) Maximum steady state power dissipation is 1.0 watt at T_T=75°C

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM CONTINUOUS POWER DISSIPATION

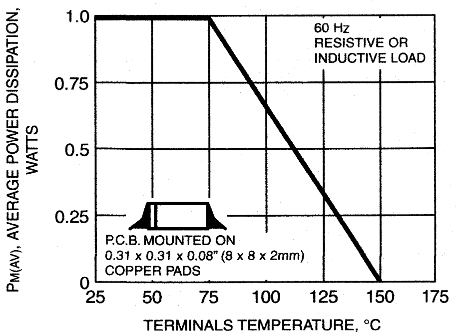


FIG. 2 - TYPICAL ZENER IMPEDANCE

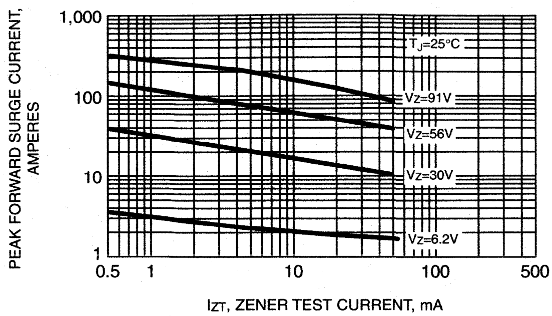


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS FOR GLL4763

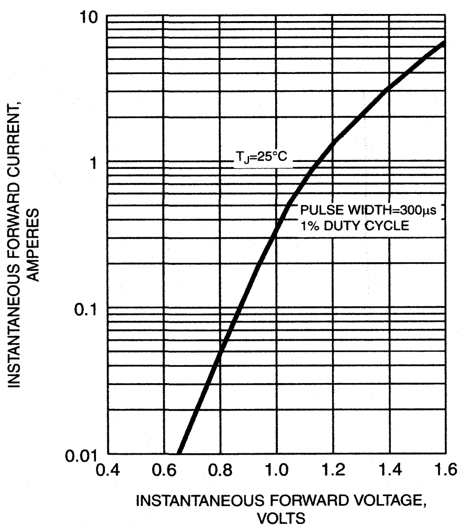


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

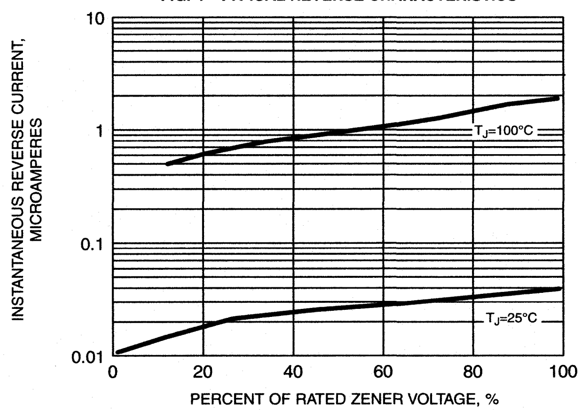
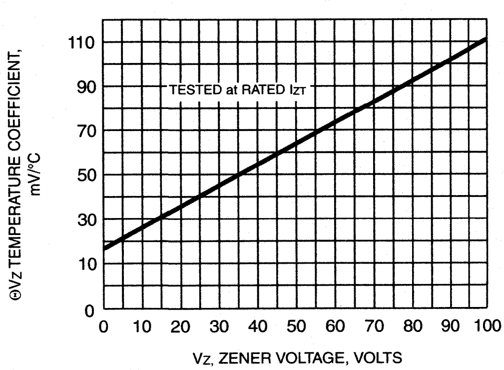


FIG. 5 - TYPICAL TEMPERATURE COEFFICIENTS

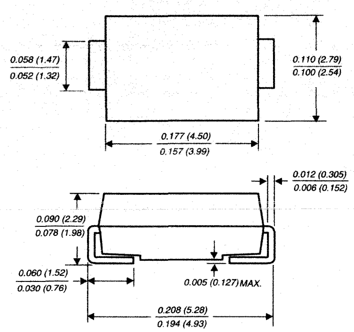


SML4735 THRU SML4763A

SURFACE MOUNT GLASS PASSIVATED ZENER

***Zener Voltage** - 6.2 to 91.0 Volts* ***Steady State Power** - 1.0 Watt*

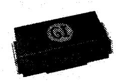
DO-214AC



Dimensions are in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Glass passivated chip junction
- Low zener impedance
- Low regulation factor
- High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.002 ounce, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: T_J, T_{STG}: -55°C to +150°C

TYPE	NOMINAL ZENER VOLTAGE at I_{ZT} V_Z (NOTE 1) (Volts)	TEST CURRENT I_{ZT} (mA)	MAXIMUM DYNAMIC IMPEDANCE			MAXIMUM DC REVERSE LEAKAGE CURRENT		MAXIMUM SURGE CURRENT (NOTE 2) I_{RM} (mApk)	MAXIMUM FORWARD VOLTAGE at 200mA V_F (Volts)
			Z_{ZT} at I_{ZT} (Ohms)	Z_{ZK} at (Ohms)	(NOTE 1) I_{ZK} (mA)	I_R (µA)	V_R (Volts)		
SML4735	6.2	41.0	2.0	700	1.0	10.0	3.0	730.0	1.2
SML4736	6.8	37.0	3.5	700	1.0	10.0	4.0	660.0	1.2
SML4737	7.5	34.0	4.0	700	0.5	10.0	5.0	605.0	1.2
SML4738	8.2	31.0	4.5	700	0.5	10.0	6.0	550.0	1.2
SML4739	9.1	28.0	5.0	700	0.5	10.0	7.0	500.0	1.2
SML4740	10	25.0	7.0	700	0.25	10.0	7.6	454.0	1.2
SML4741	11	23.0	8.0	700	0.25	5.0	8.4	414.0	1.2
SML4742	12	21.0	9.0	700	0.25	5.0	9.1	380.0	1.2
SML4743	13	19.0	10.0	700	0.25	5.0	9.9	344.0	1.2
SML4744	15	17.0	14.0	700	0.25	5.0	11.4	305.0	1.2
SML4745	16	15.5	16.0	700	0.25	5.0	12.2	285.0	1.2
SML4746	18	14.0	20.0	750	0.25	5.0	13.7	250.0	1.2
SML4747	20	12.5	22.0	750	0.25	5.0	15.2	225.0	1.2
SML4748	22	11.5	23.0	750	0.25	5.0	16.7	205.0	1.2
SML4749	24	10.5	25.0	750	0.25	5.0	18.2	190.0	1.2
SML4750	27	9.5	35.0	750	0.25	5.0	20.6	170.0	1.2
SML4751	30	8.5	40.0	1000	0.25	5.0	22.8	150.0	1.2
SML4752	33	7.5	45.0	1000	0.25	5.0	25.1	135.0	1.2
SML4753	36	7.0	50.0	1000	0.25	5.0	27.4	125.0	1.2
SML4754	39	6.5	60.0	1000	0.25	5.0	29.7	115.0	1.2
SML4755	43	6.0	70.0	1500	0.25	5.0	32.7	110.0	1.2
SML4756	47	5.5	80.0	1500	0.25	5.0	35.8	95.0	1.2
SML4757	51	5.0	95.0	1500	0.25	5.0	38.8	90.0	1.2
SML4758	56	4.5	110.0	2000	0.25	5.0	42.6	80.0	1.2
SML4759	62	4.0	125.0	2000	0.25	5.0	47.1	70.0	1.2
SML4760	68	3.7	150.0	2000	0.25	5.0	51.7	65.0	1.2
SML4761	75	3.3	175.0	2000	0.25	5.0	56.0	60.0	1.2
SML4762	82	3.0	200.0	3000	0.25	5.0	62.2	55.0	1.2
SML4763	91	2.0	250.0	3000	0.25	5.0	69.2	50.0	1.2

NOTES:
(1) Standard voltage tolerance is 10%, Suffix A ± 5%
(2) Surge current is a non-repetitive, 8.3ms pulse width square wave or equivalent sine-wave superimposed on I_{ZT} per JEDEC Method
(3) Maximum steady state power dissipation is 1.0 watt at T_T=75°C

FIG. 1 - MAXIMUM CONTINUOUS POWER DISSIPATION

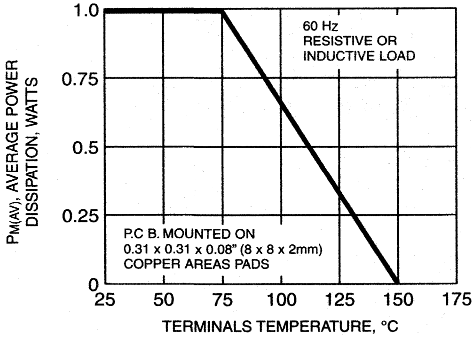


FIG. 2 - TYPICAL ZENER IMPEDANCE

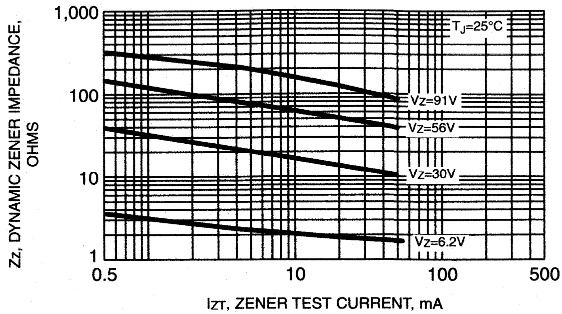


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS FOR SML4763

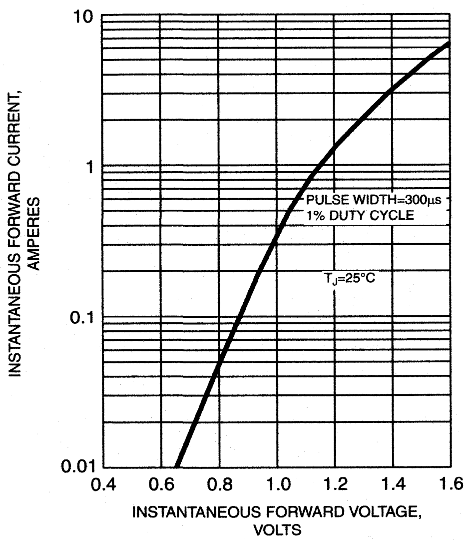


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

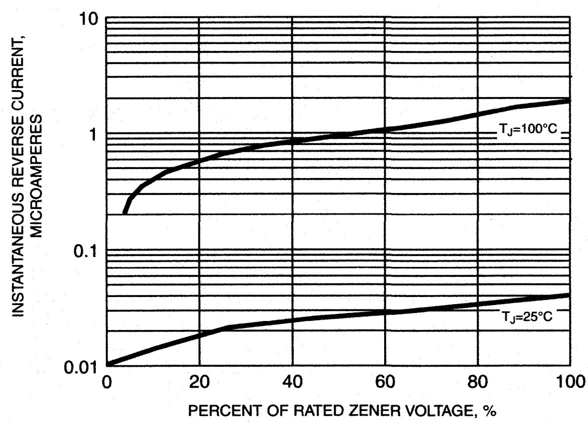
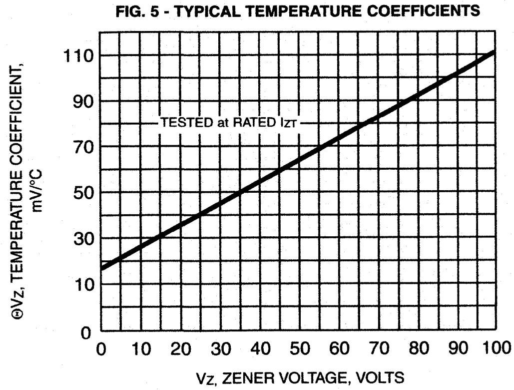


FIG. 5 - TYPICAL TEMPERATURE COEFFICIENTS

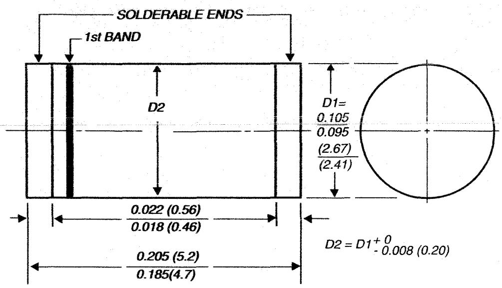


ZGL41-100 THRU ZGL41-200A

SURFACE MOUNT GLASS PASSIVATED ZENER

Zener Voltage *- 100 to 200 Volts* ***Steady State Power*** *- 1.0 Watt*

DO-213AB



1st band denotes type and positive end (cathode)

Dimensions in inches and (millimeters)

FEATURES

- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ For surface mounted applications
- ◆ Glass passivated junction
- ◆ Low zener impedance
- ◆ Low regulation factor
- ◆ High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic body over passivated Junction

Terminals: Solder plated solderable per MIL-STD-750, Method 2026

Polarity: Red band denotes zener diode and positive end (cathode)

Mounting Position: Any

Weight: 0.0046 ounce, 0.116 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: T_J, T_{STG}: -55°C to +150°C

TYPE	NOMINAL ZENER VOLTAGE at I_{ZT} (NOTE 1) (V_Z)	TEST CURRENT (I_{ZT})	MAXIMUM ZENER DYNAMIC IMPEDANCE Z_{ZT} at I_{ZT}	Z_{ZK} at	I_{ZK}	MAXIMUM DC REVERSE LEAKAGE CURRENT at V_R (I_R)	(V_R)	MAXIMUM SURGE CURRENT (NOTE 2) (I_{RM})	MAXIMUM INSTANTANEOUS FORWARD VOLTAGE at 200mA (V_F)
	(Volts)	(mA)	(Ohms)	(Ohms)	(mA)	(µA)	(Volts)	(mAdc)	(VOLTS)
ZGL41-100	100	3.7	250	3100	0.25	1.0	76.0	10.0	1.5
ZGL41-110	110	3.4	300	4000	0.25	1.0	83.6	9.1	1.5
ZGL41-120	120	3.1	380	4500	0.25	1.0	91.2	8.3	1.5
ZGL41-130	130	2.9	450	5000	0.25	1.0	98.8	7.7	1.5
ZGL41-140	140	2.7	525	5500	0.25	1.0	106.4	7.1	1.5
ZGL41-150	150	2.5	600	6000	0.25	1.0	114.0	6.7	1.5
ZGL41-160	160	2.3	700	6500	0.25	1.0	121.6	6.3	1.5
ZGL41-170	170	2.2	800	6750	0.25	1.0	129.2	5.9	1.5
ZGL41-180	180	2.1	900	7000	0.25	1.0	136.9	5.6	1.5
ZGL41-190	190	2.0	1050	7500	0.25	1.0	144.4	5.3	1.5
ZGL41-200	200	1.9	1200	8000	0.25	1.0	152.0	5.0	1.5

NOTES:
(1) Standard voltage tolerance is ± 10%, Suffix A = ± 5%
(2) Surge current is a non-repetitive, 8.3ms pulse width square wave or equivalent sine-wave superimposed on I_{ZT} per JEDEC Method
(3) Maximum steady state power dissipation is 1.0 watt at T_T=75°C

FIG. 1 - MAXIMUM CONTINUOUS POWER DISSIPATION

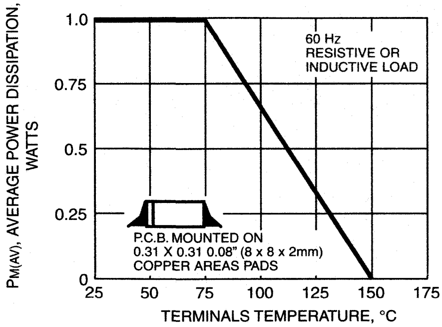


FIG. 2 - TYPICAL ZENER IMPEDANCE

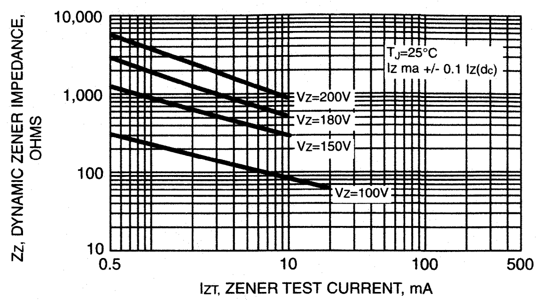


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

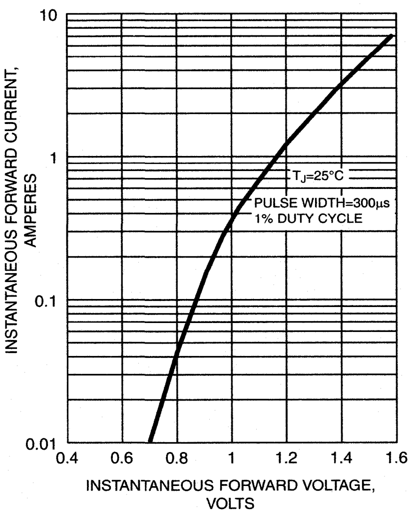


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

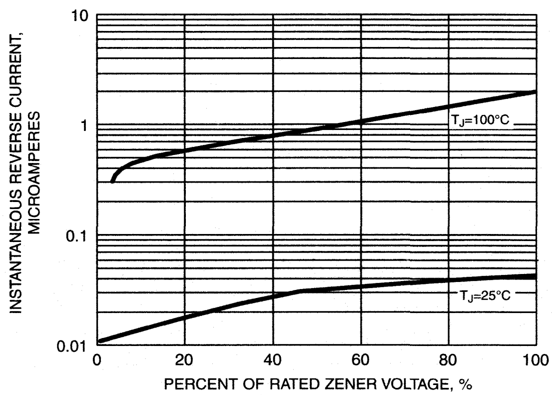


FIG. 5 - TYPICAL TEMPERATURE COEFFICIENTS

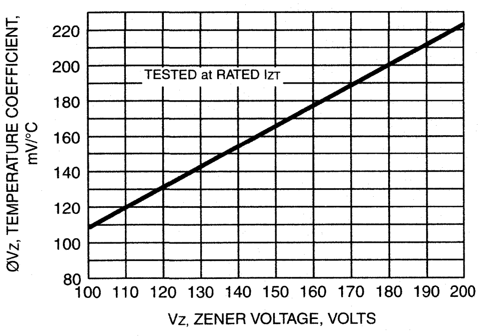
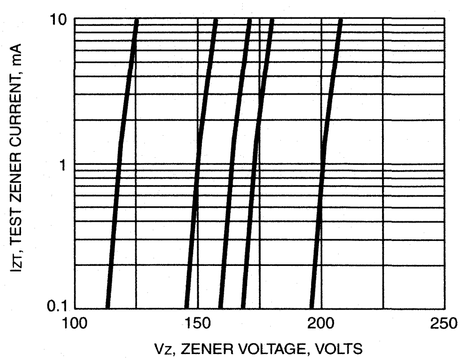


FIG. 6 - TYPICAL ZENER VOLTAGE

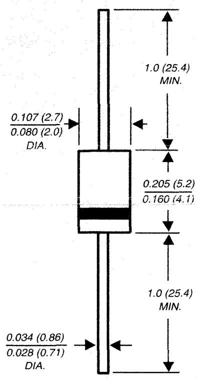


Z4KE100 THRU Z4KE200A

GLASS PASSIVATED ZENER

***Zener Voltage** - 100 to 200 Volts* ***Steady State Power** - 1.5 Watts*

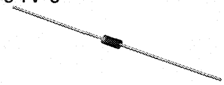
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ Low zener impedance
- ◆ Low regulation factor
- ◆ Glass passivated junction
- ◆ High temperature soldering guaranteed: 260°C/10 seconds 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over passivated Junction
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: T_J, T_{STG}: -55°C to +150°C

TYPE	ZENER VOLTAGE at 5.0mA		MAXIMUM ZENER DYNAMIC IMPEDANCE				MAXIMUM DC REVERSE LEAKAGE CURRENT AT V_R			MAXIMUM INSTANTANEOUS FORWARD VOLTAGE at 0.50A	MAXIMUM CONTINUOUS REGULATOR CURRENT (1)
	V_Z (Volts)		I_{ZT} (mA)	Z_{ZT} (Ohms)	I_{ZK} (mA)	Z_{ZK} (Ohms)	V_R (Volts)	I_R @ 25°C (μA)	I_R 100°C (μA)	V_{FM} (Volts)	I_{ZM} (μA)
	MIN	MAX									
Z4KE100	90	110	5.0	500	0.25	5000	72.0	0.5	100.0	1.0	15.0
Z4KE100A	95	105	5.0	500	0.25	5000	76.0	0.5	100.0	1.0	15.0
Z4KE110	99	121	5.0	600	0.25	5000	79.2	0.5	100.0	1.0	13.0
Z4KE110A	104	116	5.0	600	0.25	5000	83.2	0.5	100.0	1.0	13.0
Z4KE120	108	132	5.0	700	0.25	5000	86.4	0.5	100.0	1.0	12.0
Z4KE120A	114	126	5.0	700	0.25	5000	91.2	0.5	100.0	1.0	12.0
Z4KE130	117	143	5.0	800	0.25	5000	93.6	0.5	100.0	1.0	11.0
Z4KE130A	124	137	5.0	800	0.25	5000	99.2	0.5	100.0	1.0	11.0
Z4KE140	126	154	5.0	900	0.25	5000	100	0.5	100.0	1.0	10.7
Z4KE140A	133	147	5.0	900	0.25	5500	106.4	0.5	100.0	1.0	10.7
Z4KE150	135	165	5.0	1000	0.25	6000	108.0	0.5	100.0	1.0	10.0
Z4KE150A	142	158	5.0	1000	0.25	6000	113.6	0.5	100.0	1.0	10.0
Z4KE160	144	176	5.0	1100	0.25	6500	115.2	0.5	100.0	1.0	9.0
Z4KE160A	152	168	5.0	1100	0.25	6500	121.6	0.5	100.0	1.0	9.0
Z4KE170	153	187	5.0	1200	0.25	7000	122.4	0.5	100.0	1.0	8.8
Z4KE170A	162	179	5.0	1200	0.25	7000	129.6	0.5	100.0	1.0	8.0
Z4KE180	162	198	5.0	1300	0.25	7000	129.6	0.5	100.0	1.0	8.0
Z4KE180A	171	189	5.0	1300	0.25	7000	136.8	0.5	100.0	1.0	8.0
Z4KE190	171	209	5.0	1400	0.25	7500	136.8	0.5	100.0	1.0	7.9
Z4KE190A	180	200	5.0	1400	0.25	7500	144.0	0.5	100.0	1.0	7.9
Z4KE200	180	220	5.0	1500	0.25	8000	144.0	0.5	100.0	1.0	7.0
Z4KE200A	190	210	5.0	1500	0.25	8000	152.0	0.5	100.0	1.0	7.0

NOTES:
(1) Standard voltage tolerance is ±10%, suffix "A" is ± 5%
(2) Temperature rating at specified regulator current is T_L=30°C
(3) Maximum steady state power dissipation is 1.5 watts at T_L=75°C with lead length 0.375" (9.5mm)

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FIG.1 - MAXIMUM CONTINUOUS POWER DISSIPATION

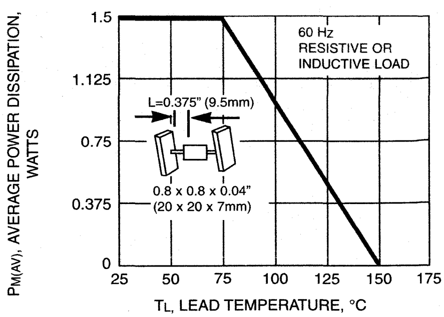


FIG. 2 - TYPICAL ZENER IMPEDANCE

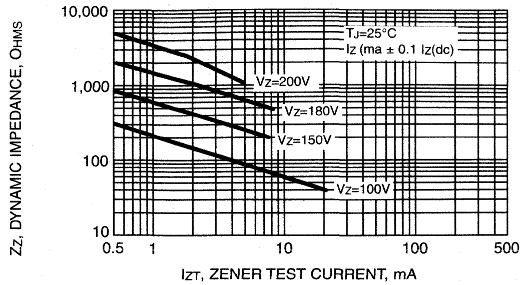


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

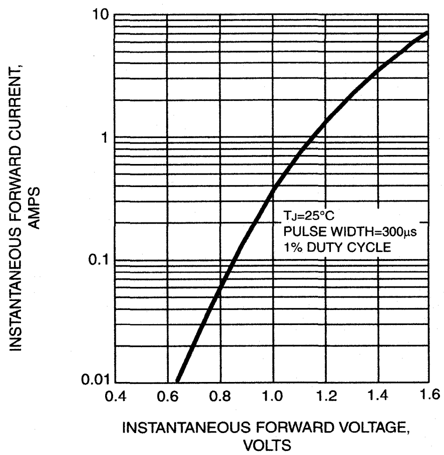


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

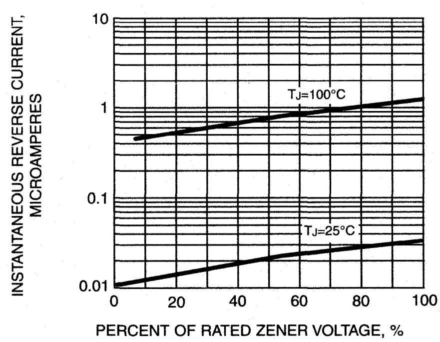


FIG. 5 - TYPICAL TEMPERATURE COEFFICIENTS

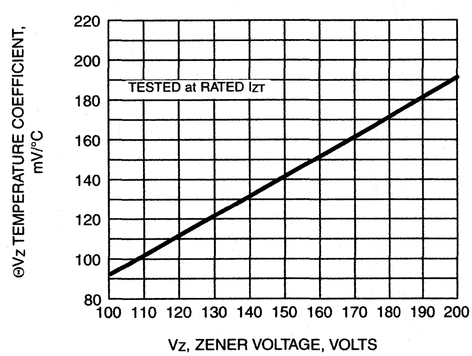
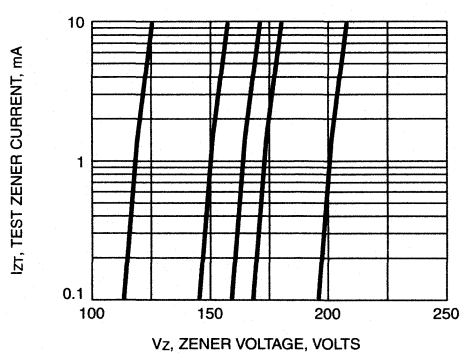
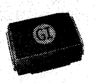


FIG. 6 - TYPICAL ZENER VOLTAGE



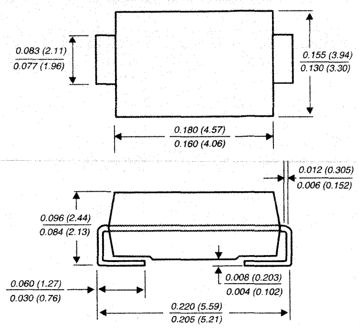


SMZG AND SMZJ 3789 THRU 3809B

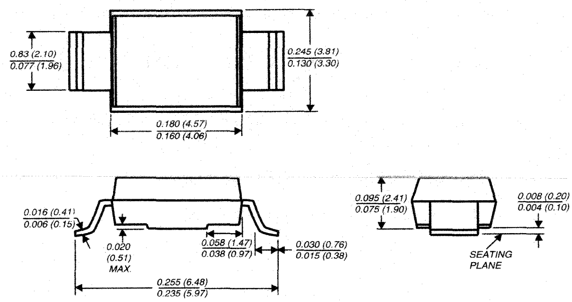
SURFACE MOUNT ZENER DIODE

***Zener Voltage** -10 to 68 Volts* ***Steady State Power** - 1.5 Watts*

DO-214AA MODIFIED J-BEND



DO-215AA



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- For surface mounted applications
- Glass passivated chip junction
- Low zener impedance
- Low regulation factor
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214/DO215AA molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.003 ounce , 0.093 gram

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: T_J, T_{STG}: -55°C to +150°C

MAXIMUM ELECTRICAL CHARACTERISTICS

PART NUMBER		DEVICE MARKING CODE	NOMINAL ZENER VOLTAGE V_Z at I_{ZT}	TEST CURRENT I_{ZT}	MAX. ZENER IMPEDANCE			MAX. REVERSE LEAKAGE CURRENT I_R at V_R		MAX. ZENER CURRENT I_{ZM}
GULL-WING	MODIFIED J-BEND				Z_{ZT} at I_{ZT}	Z_{ZK} at I_{ZK}				
			(Volts)	(mA)	(Ohms)	(Ohms)	(mA)	(µA)	(Volts)	(mA)
SMZG3789A,B	SMZJ3789A,B	WA,B	10.0	37.5	5.0	1000	0.25	50.0	7.6	125
SMZG3790A,B	SMZJ3790A.B	WC,D	11.0	34.1	6.0	650	0.25	10.0	8.4	115
SMZG3791A,B	SMZJ3791A,B	WE,F	12.0	31.2	7.0	550	0.25	5.0	9.1	105
SMZG3792A,B	SMZJ3792A,B	WG,H	13.0	28.8	7.5	550	0.25	5.0	9.9	98
SMZG3793A,B	SMZJ3793A,B	WI,J	15.0	25.0	9.0	600	0.25	5.0	11.4	85
SMZG3794A,B	SMZJ3794A,B	WK,L	16.0	23.4	10.0	600	0.25	5.0	12.2	80
SMZG3795A,B	SMZJ3795A,B	XA,B	18.0	20.8	12.0	650	0.25	5.0	13.7	70
SMZG3796A,B	SMZJ3796A,B	XC,D	20.0	18.7	14.0	650	0.25	5.0	15.2	62
SMZG3797A,B	SMZJ3797A,B	XE,F	22.0	17.0	17.5	650	0.25	5.0	16.7	56
SMZG3798A,B	SMZJ3798A,B	XG,H	15.6	19.0	700	0.25	5.0	18.2	51	
SMZG3799A,B	SMZJ3799A,B	XI,J	13.9	23.0	700	0.25	5.0	20.6	46	
SMZG3800A,B	SMZJ3800A,B	XK,L	30.0	12.5	26.0	750	0.25	5.0	22.8	41
SMZG3801A,B	SMZJ3801A,B	YA,B	33.0	11.4	33.0	800	0.25	5.0	25.1	38
SMZG3802A,B	SMZJ3802A,B	YC,D	36.0	10.4	38.0	850	0.25	5.0	27.4	35
SMZG3803A,B	SMZJ3803A,B	YE,F	39.0	9.6	45.0	900	0.25	5.0	29.7	31
SMZG3804A,B	SMZJ3804A,B	YG,H	43.0	8.7	53.0	950	0.25	5.0	32.7	28
SMZG3805A.B	SMZJ3805A,B	YI,J	8.0	67.0	1000	0.25	5.0	35.8	26	
SMZG3806A,B	SMZJ3806A,B	YK,L	51.0	7.3	70.0	1100	0.25	5.0	38.8	24
SMZG3807A,B	SMZJ3807A,B	ZA,B	56.0	6.7	86.0	1300	0.25	5.0	42.6	22
SMZG3808A,B	SMZJ3808A,B	ZC,D	62.0	6.0	100.0	1500	0.25	5.0	47.1	20
SMZG3809A,B	SMZJ3809A,B	ZE,F	68.0	5.5	120.0	1700	0.25	5.0	51.7	18

NOTES:
(1) Standard voltage tolerance is ±20%, suffix "A" denotes ±10% and suffix "B" denotes ±5%
(2) Maximum steady state power dissipation is 1.5 watts at T_L=75°C (SEE FIG. 1)

General Instrument
Power Semiconductor Division

FIG. 1 - MAXIMUM CONTINUOUS POWER DISSIPATION

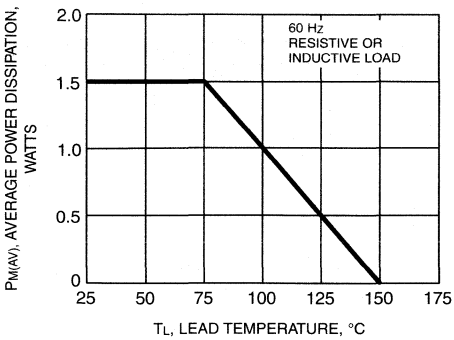


FIG. 2 - TYPICAL ZENER IMPEDANCE

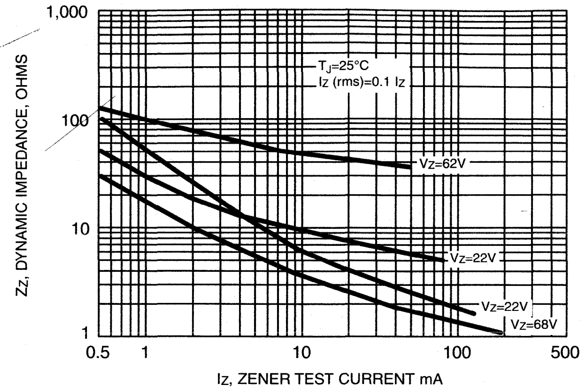


FIG. 3 - TYPICAL ZENER IMPEDANCE

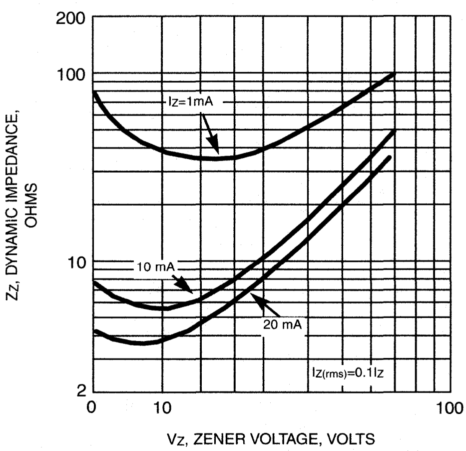
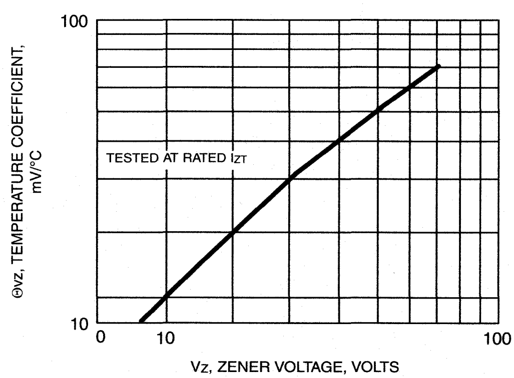


FIG. 4 - TYPICAL TEMPERATURE COEFFICIENTS



General Instrument
Power Semiconductor Division

PACKAGING, ASSEMBLY RECOMMENDATIONS AND PAD LAYOUTS

PACKAGING CODES

STANDARD PACKAGE CODE	ANTI-STATIC PACKAGE CODES	PACKAGING DESCRIPTION
1	51	Bulk
2	52	DO-214/215AA (SMB), 12mm Tape, 7" Diameter Plastic Reel
3	53	26mm Horizontal Taping and Ammo Box Packing
4	54	52.4mm Horizontal Tape, 13" Diameter Paper Reel Class I
4A		Euroform, Reel Cathode First Off Reel Non Lead Coated
4B		Euroform, Ammo Pack, Cathode First Out of Box Non Lead Coated
4C		Euroform, Reel Cathode Last Off Reel Non Lead Coated
4D		Euroform, Ammo Pack, Cathode Last Out of Box, Non Lead Coated
5	55	DO-214/215AA (SMB), 12mm Tape, 13" Diameter Paper Reel
	5A	DO-214AC (SMA), 12mm Tape, 13" Diameter Plastic Reel, Electro-static Packing
	5B	DO-214/215AA (SMB) 12mm Tape, 13" Diameter Plastic Reel, Electro-static Packing
5C		SO8/MS-012AA, 12mm Tape,13" Diameter Reinforced Hub Paper Reels
6	56	Avisert, Cathode Up, Cathode First Off Reel
7	57	DO-214/215AB (SMC), 16mm Tape, 7" Diameter Plastic Reel
8	58	Avisert, Cathode Up, Cathode First Out of Ammo Pack
9	59	DO-214/215AB (SMC), 16mm Tape, 13" Diameter Paper Reel
	9A	DO-214/215AB (SMC), 16mm Tape, 13" Diameter Plastic Reel, Electro-static Packing
10	60	Avisert, Cathode Down, Anode First Off Reel
11	61	DO-214AC (SMA), 12mm Tape, 7" Diameter Plastic Reel
12	62	Avisert, Cathode Down, Anode First Out of Ammo Pack
13	63	DO-214AC (SMA), 12mm Tape, 13" Diameter Paper Reel
14	64	Panasert, Cathode Up, Cathode First Off Reel
15	65	Panasert, Cathode Up, Anode First Out of Ammo Pack
16	66	Panasert, Cathode Up, Cathode First Out of Ammo Pack
17	67	DO-214BA (GF1), 12mm Tape, 7" Diameter Plastic Reel
18	68	Panasert, Cathode Down, Anode First Off Reel
19	69	DO-214BA (GF1), 12mm Tape, 13" Diameter Paper Reel
20	70	Panasert, Cathode Down, Anode First Out of Ammo Pack
21	71	Panasert, Cathode Up, Cathode First Off Reel, Lead Coat
22	72	Bulk Pack for Special Axial-Leaded Formed Devices
23	73	52.4mm Horizontal Tape and Ammo Box Packing, Class I
24	74	Panasert, Cathode Up, Cathode First out of Ammo Pack, Lead Coat
26	76	DO-213AB (GL41) 12mm Tape, 13" Diameter Paper Reel
27	77	DFS Bridge,16mm Tape, 13" Diameter Paper Reel
28	78	Special Carton Packing method for Tube Packaging Products
29	79	SO14/MS-012BA 16mm Tape, 13" Diameter Reinforced Hub Paper Reels
30	80	MB-S (0.5A) Bridge, 12mm Tape, 13" Diameter Paper Reel
31	81	SO20/MS-013AC, TO-263AA,AB 24mm Tape, 13" Diameter Reinforced Hub Paper Reel
32	82	DO-213AA (GL34), 8mm Tape, 7" Diameter Paper Reel
39	89	Miscellaneous Non-Standard T&R Packaging
40	90	Euroform, Reel, Cathode First Off Reel, Lead Coated
41	91	Euroform, Ammo Pack, Cathode First Out of Ammo Pack, Lead Coated
42	92	Euroform, Reel, Cathode Last Off Reel, Lead Coated
43	93	Euroform, Ammo Pack, Cathode Last Out of Ammo Pack, Lead Coated
44	94	52.4mm Horizontal Tape, 13" Diameter Paper Reel, 5mm Component Spacing for 1.5KA devices only.
45	45	Anti-Static Tube Packaging for ITO220, TO247AD, DFM, and Arrays
46	96	DO-213AB (GL41) 12mm Tape, 7" Diameter Plastic Reels
48	98	DO-213AA (GL34) 8mm Tape, 7" Diameter Plastic Reels
50	100	MPG06 Pseudo Radial Tape, Cathode First Out of Ammo Pack

Also available for all packaging Electro-Static-Protection by adding the number "50" to the existing codes. For example, "51" would be Bulk, Electro-Static Packaging. "54" would be T/R, Electro-Static Packaging.

GI TAIWAN BULK PACKAGING

TABLE 1

CASE TYPES:	PACKAGING	BOX SIZE INCHES	BOX SIZE CM	QUANTITY EA.	GROSS WEIGHT LBS.	GROSS WEIGHT KG
DO-213AA (GL34)	SURFACE MOUNT PAPER BOX	8.0 x 3.5 x 1.0	20.3 x 8.8 x 2.54	8000	0.55	0.25
DO-213AB (GL41)	SURFACE MOUNT PAPER BOX	8.0 x 3.5 x 1.0	20.3 x 8.8 x 2.54	4000	1.03	0.47
DO-214BA (GF1)	SURFACE MOUNT PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.76	1.67
DO-214AC (SMA)	SURFACE MOUNT PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.77	1.69
DO-214AA (SMB)	SURFACE MOUNT PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.77	1.69
DO-214AB (SMC)	SURFACE MOUNT PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	1000	0.87	1.92
DO-204AC	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	4000	3.85	1.75
DO-201AD	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	1500	4.41	2.0
DO-204AP	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	4000	3.75	1.7
DO-204AL/MPG06	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	5000	2.38/2.20	1.08/1.0
G4/G3	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	3000/2000	5.07/5.29	2.3/2.4
GP20/1.5KA	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	1500	3.75	1.7
P600	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	750	3.72	1.69
DF-M/DF-S	ANTI-STATIC PLASTIC TUBES	19.0 LENGTH	48.2 LENGTH	50	0.12	0.05
TO-220AB,AC	ANTI-STATIC PLASTIC TUBES	20.5 LENGTH	52.0 LENGTH	50	0.306	0.14
TO-247AD	ANTI-STATIC PLASTIC TUBES	20.5 LENGTH	52.0 LENGTH	30	0.572	0.26
TO-263AA,AB	ANTI-STATIC PLASTIC TUBES	20.5 LENGTH	52.0 LENGTH	50	0.306	0.14
KBPM/2KBPM	ANTI-STATIC PVC TRAY	12.5 x 6.5 x 1.25	31.7 x 16.5 x 3.17	120	0.53	0.24
GBU4,6,8	ANTI-STATIC PVC TRAY	12.5 x 6.1 x 1.0	30.9 x 15.5 x 2.5	250	2.42	1.1
GBL	ANTI-STATIC PVC TRAY	12.5 x 6.1 x 1.0	30.9 x 15.5 x 2.5	400	2.20	1.0
GBPC12-35W	PAPER BOX	12.5 x 12.5x 1.7	31.7 x 31.7 x 4.3	100	3.20	2.1
GBPC1,GBPC6	PAPER BOX	7.5 x 7.5 x 1.43	19.0 x 19.0 x 3.6	100	1.26/1.48	0.57/0.67
KBL	ANTI-STATIC PVC TRAY	12.2 x 6.1 x 1.5	30.9 x 15.5 x 3.8	300	4.19	1.9
GBPC12-35	PAPER BOX	12.5 x 12.5 x 1.7	31.7 x 31.7 x 4.3	100	4.85-	2.2
KBU4,6,8	ANTI-STATIC PVC TRAY	12.2 x 6.1 x 1.5	30.9 x 15.5 x 3.8	250	3.53	2.1
WOG/2WOG	PLASTIC BAG			100	0.37	0.17

GI IRELAND BULK PACKAGING

CASE TYPES:	PACKAGING	BOX SIZE INCHES	BOX SIZE CM	QUANTITY EA.	GROSS WEIGHT LBS.	GROSS WEIGHT KG
1.5KE	PAPER BOX	9.8 x 4.7 x 3.1	25.0 x 12.0 x 8.0	1000	2.17	0.98
DO-204AL	PAPER BOX	8.8 x 3.1 x 1.8	22.5 x 8.0 x 4.5	1000	1.16	0.53
DO-204AC	PAPER BOX	8.8 x 3.1 x 1.8	22.5 x 8.0 x 4.5	1000	0.91	0.41
MS-012AA (SO-8)	ANTI-STATIC PLASTIC TUBES	19.7 x .31	50 x .78	98	0.032	0.014
MS-012AB (SO-14)	ANTI-STATIC PLASTIC TUBES	19.7 x .62	50 x 1.6	50	0.101	0.046
MS-013AC (SO-20)	ANTI-STATIC PLASTIC TUBES	19.7 x .62	50 x 1.6	25	0.104	0.047
DO-214AA/DO-215AA	PAPER BOX	10 x 3.25 x 4.75	25.4 x 10.6 x 12.1	2000	0.55	0.250
DO-214AB/DO-215AB	PAPER BOX	10 x 3.25 x 4.75	25.4 x 10.6 x 12.1	1000	0.63	0.286
MB-M (0.5A BRIDGE)	ANTI STATIC TUBES	20.3 x .41	51.5 x 1.04	100	0.079	0.036
MB-S (0.5A SM BRIDGE)	ANTI-STATIC TUBES	20.3 x .41	51.5 x 1.04	100	0.073	0.033

AMMO PACK PACKAGING

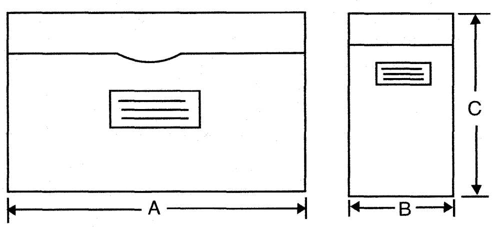


TABLE 2

Packaging	Available Product Outlines	Packaging Codes	Dimension "A"	Dimension "B"	Dimension "C"	Quantity Box
26mm Horizontal Tape, Ammo Pack	DO-204AL,MPG06 DO204AP, DO-204AC	Pkg 3	9.7" (247mm)	1.7 (44mm)	"3.7" (95mm)	3.0K 1.5K
52mm Horizontal Tape, Ammo Pack	DO204AP, DO-204AL, MPG06, DO-204AC DO201AD, G3,G4,GP20 P600	Pkg 23	10.0" (255mm)	3.15" (80mm)	4.53" (115mm)	3.0K 2.0K 1.0K 0.3K
*Radial (Avisert, Panasert, Euroform) Tape, Ammo Pack	GP10-E, RGP10-E DO-204AL	Pkg 8,15, 41	13.4" (340mm)	1.8" (47mm)	7.9" (200mm)	2.5K
*Pseudo /Radial Tape, Ammo Pack	MPG06	Pkg 50	13.4" (340mm)	1.8" (47mm)	7.9" (200mm)	2.5k

*Only available on Taiwan manufactured components

GI TAIWAN / REEL PACKAGING

TABLE 3

COMPONENT CASE TYPE	UNITS PER REEL	COMPONENT SPACING "A" FIG. 1		TAPE SPACING "B" FIG. 1		REEL DIMENSION "D" FIG.2		MAX. OFF ALIGNMENT "E"FIG. 1		GROSS WEIGHT PER REEL	
	ea.	in.	mm	in	mm	in.	mm	in.	mm	lbs.	kg.
1.5KA (PAR)	2000	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	7.1	3.2
DO-204AC	4000	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	5.0	2.29
DO-201AD	1400	0.395	10.0	2.06	52.4	13.0	330	0.047	1.2	4.9	2.22
DO-204AP	4500	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	5.4	2.44
DO-204MB	5000	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	4.6	2.07
DO-204AL	5500	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	5.5	2.51
DFS Surface Mount	1500	0.472	12.0	-	-	13.0	330	See Fig. 11		1.95	0.885
G3/G4	1600/2000	0.395	10.0	2.06	52.4	13.0	330	0.047	1.2	5.2/4.4	2.36/2.02
DO-214BA (GF1)	1500/6500	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.31/1.39	0.14/0.63
DO-213AA (GL34)	2500	0.157	4.0	-	-	7.0	178	See Fig. 11		0.471	0.214
DO-213AB (GL41)	1500/5000	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.62/1.49	0.281/0.68
GP10E Radial	2500	0.500	12.7	-	-	13.0	330	0.079	2.0	3.0	1.34
GP10E	5500	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	4.4	1.99
GP20	1400	0.395	10.0	2.06	52.4	13.0	330	0.047	1.2	4.9	2.22
MPG06	5500	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	3.8	1.71
MPG06 Radial	2500	0.500	12.7	-	-	-	-	0.080	2.0	3.0	1.34
P600	800	0.395	10.0	2.06	52.4	13.0	330	0.047	1.2	5.3	2.39
DO-214AC (SMA)	1800/7500	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.24/0.99	0.11/0.45
DO-214AA (SMB)	750/3200	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.24/0.99	0.11/0.45
DO-214AB (SMC)	850/3500	0.472	12.0	-	-	7.0/13.0	178/330	See Fig. 11		0.44/1.39	0.20/0.63
TO-263AA, AB	800	0.630	16.0	-	-	13.0	330	See Fig. 11		2.4	1.1

GI IRELAND HORIZONTAL TAPE / REEL PACKAGING

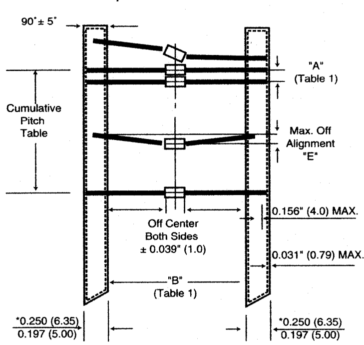
COMPONENT CASE TYPE	UNITS PER REEL	COMPONENT SPACING "A" FIG. 1		TAPE SPACING "B" FIG. 1		REEL DIMENSION "D" FIG.2		MAX. OFF ALIGNMENT "E"FIG. 1		GROSS WEIGHT PER REEL	
	ea.	in.	mm	in	mm	in.	mm	in.	mm	lbs.	kg.
1.5KE	1400	0.395	10	2.06	52.4	13.0	330	0.047	1.2	3.80	1.76
DO-204AL	5500	0.200	5.0	2.06	52.4	13.0	330	0.047	1.2	4.92	2.23
DO-204AC	4000	0.200	5.0	2.06	52.4	7.0/13.0	178/330	0.047	1.2	4.32	1.96
DO214AC (SMA)	1800/7500	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.24/0.99	0.11/0.45
DO214AA/215AA (SMB)	1000/3200	0.157	4.0	-	-	7.0/13.0	178/330	See Fig. 11		0.44/1.43	0.20/.65
DO214AB/215AB (SMC)	900/3000	0.472	12.0	-	-	7.0/13.0	178/330	See Fig. 11		0.68/2.27	0.31/1.03
MS-012AA (S08)	2500	0.315	8.0	-	-	7.0/13.0	178/330	See Fig. 11		1.21	0.55
MS-012AB(S014)	2500	0.472	12.0	-	-	13.0	330	See Fig. 11		2.00	0.91
MS-013AC(S020)	1500	0.472	12.0	-	-	13.0	330	See Fig. 11		2.64	1.22
MB-S Surface Mount	3000	0.315	8.0	-	-	13.0	330	See Fig. 11		1.43	0.65

COMPONENT AND INSIDE TAPE SPACING

TABLE 4

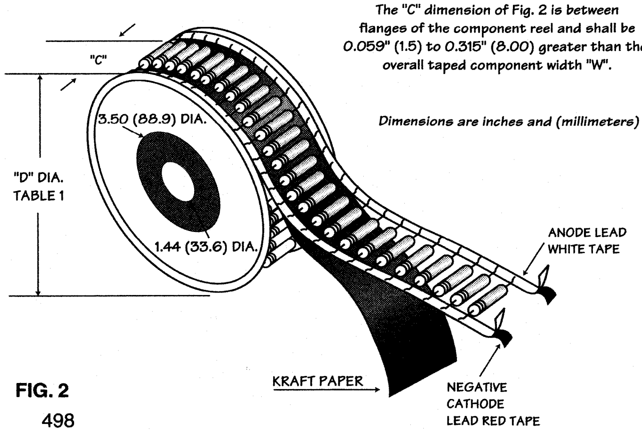
Component Body Diameter	Components Spacing "A"(Lead to Lead)	Inside Tape Spacing "B"	Cumulative Pitch Tolerance
0mm to 5mm (0.0" to 0.197")	5.0mm ± 0.5mm (0.197" ± 0.020")	26mm+0.75mm (1.024" ± 0.030")	Not to Exceed 1.5mm (0.059") over 6 Consecutive Components
0mm to 5mm (0.0" to 0.197")	5.0mm + 0.5mm (0.197" ± 0.020")	52.4mm+1.5mm (2.062" ± 0.059")	
5.01mm to 10mm (0.197" to 0.394")	10mm ± 0.5mm (0.394" ± 0.020")	52.4mm ± 1.5mm (2.062" ± 0.059")	

All Axial leaded devices are packed in accordance with EIA Standard RS-296-E and the diagrams given below which refer to these specifications.



*These are mounted values and have a ± 0.0157" (0.40) tolerance range at each value

FIG. 1



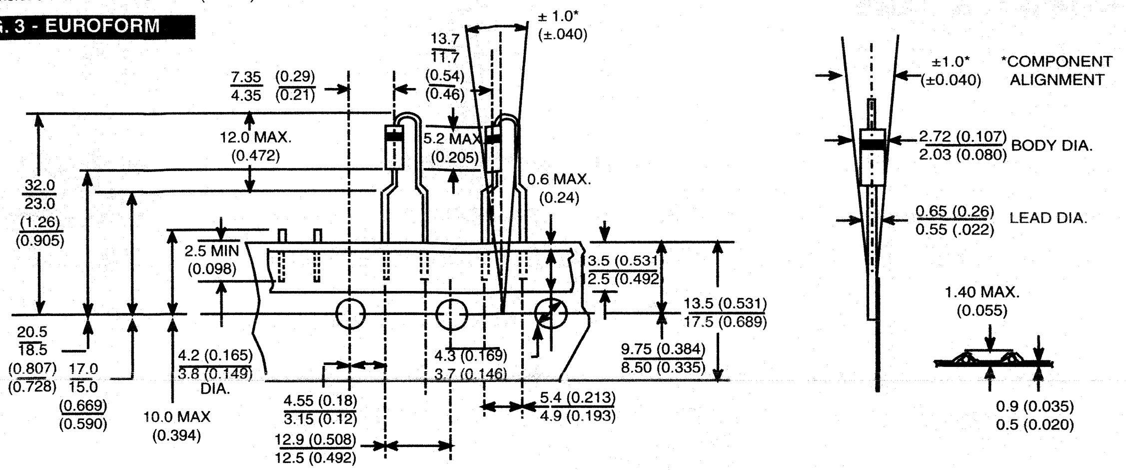
The "C" dimension of Fig. 2 is between flanges of the component reel and shall be 0.059" (1.5) to 0.315" (8.00) greater than the overall taped component width "W".

Dimensions are inches and (millimeters)

FIG. 2

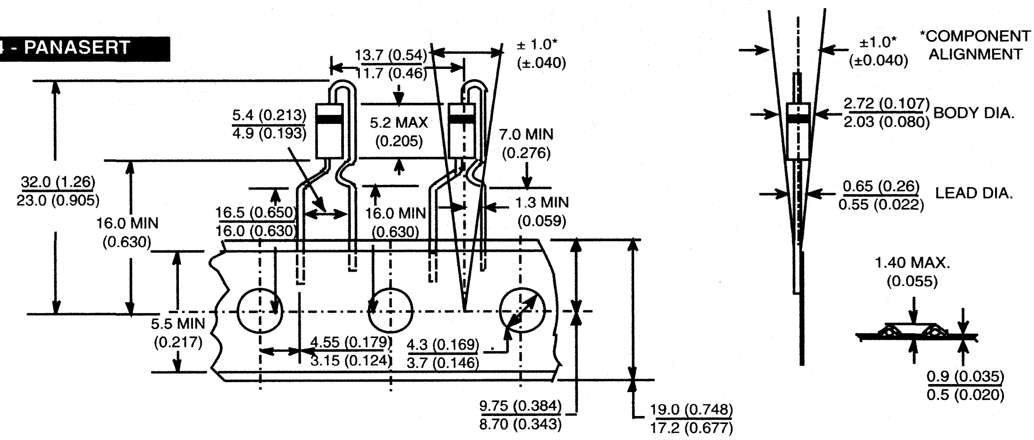
All dimensions are in millimeters and (inches)

FIG. 3 - EUROFORM



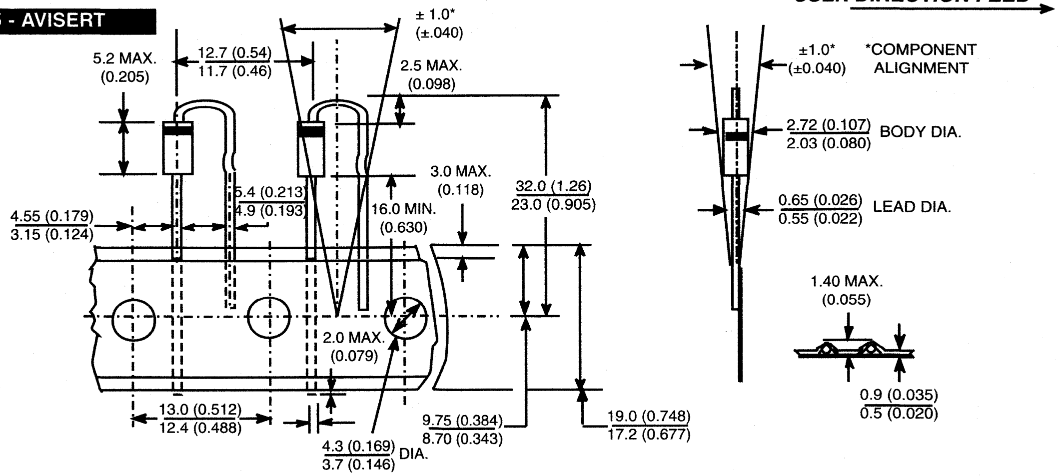
Available for GP10 products only utilizing 0.65mm (0.025") diameter leads for Euroform Tape and Reeling by adding suffix "E" (GP10GE, 1N4004GPE). Lead coating is standard

FIG. 4 - PANASERT



USER DIRECTION FEED

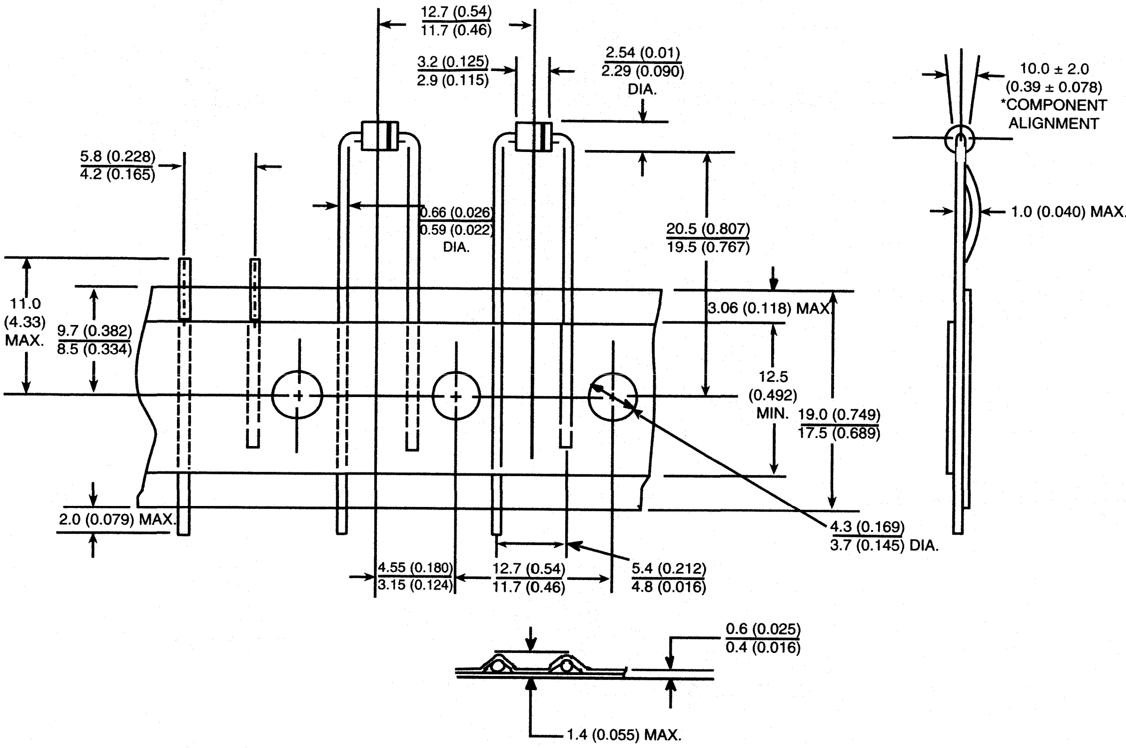
FIG. 5 - AVISERT



Available only for DO-204AL (DO-41) style products utilizing 0.65mm (0.025") or 0.76mm (0.030") diameter leads for Panasert and Avisert Tape and Reeling. Lead coating is not available.

Standard polarity cathode oriented away from sprocket holes (Optional polarity cathode oriented toward sprocket holes)

FIG. 6 - PSEUDO RADIAL



Available only for MPG06 product in Ammo Pack utilizing 0.61mm (0.024") diameter leads.
Maximum cumulative pitch tolerance: 1.0mm (0.039") /20 pitch.

All dimensions are in millimeters and (inches)

PACKAGING FOR RADIAL TAPING

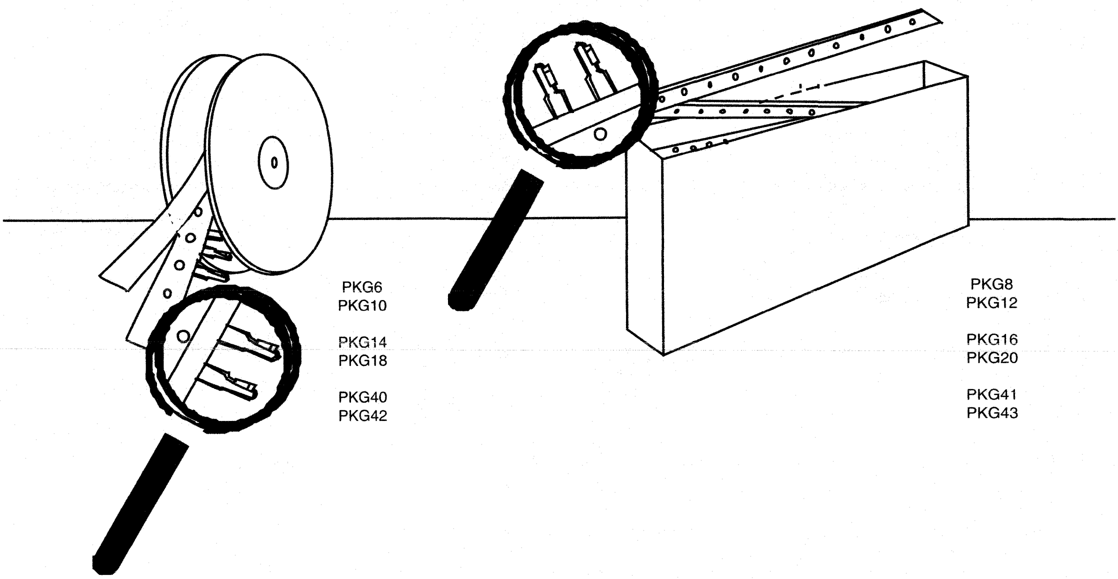


FIG. 7 & 8 - REEL AND AMMO BOX PACKAGING

AVISERT	PANASERT	EUROFORM
PKG6	PKG14	PKG40
PKG8	PKG16	PKG41
PKG10	PKG18	PKG42
PKG12	PKG20	PKG43

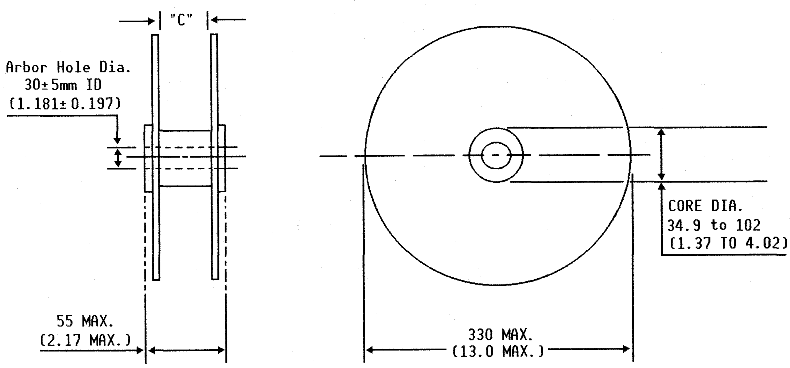


FIG. 9 - REEL DIMENSIONS

"C" Dimension between the reel flanges shall be governed by the overall width of the taped components and shall be 1.5mm (0.057) to 8.0mm (0.315") greater than the overall width

All leaded devices are packaged in accordance with EIA Standard RS-468-A specification and are available on either reels, or fan fold box (ammo pack.)
All dimensions are in millimeters and (inches)
The above packaging is only available from Taiwan.

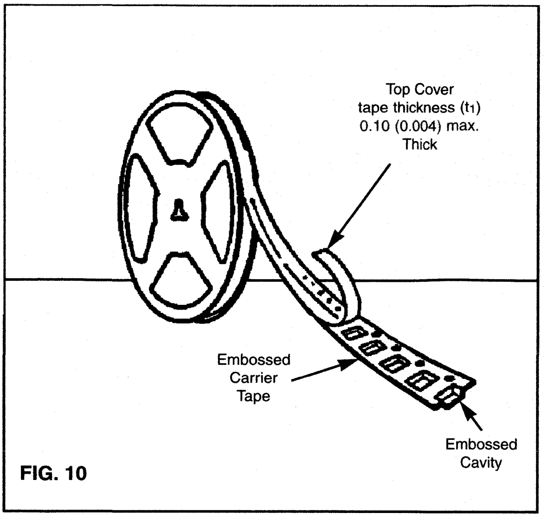


FIG. 10

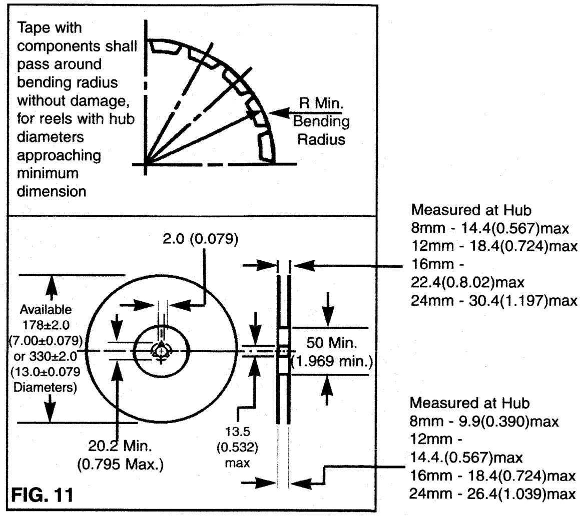


FIG. 11

TABLE 5

All Dimensions in Millimeters and (Inches)

	Tape Size	D	E	Po	Tmax	Ao, Bo, Ko	P_2	Constant Dimensions	
	8, 12, 16, 24mm	1.5±0.1 (0.059±0.004)	1.75 ± 0.1 (0.069 ± 0.004)	4.0 ± 0.1 (0.157 ±0.004)	0.600 (0.024)	See Note 1	2.0±0.05 (0.79±0.002)		
Case Type	**Tape Size**	**Max. B_1**	**Min. D_1**	**F**	**Max. T_2**	**Min. R**	**W**	**P**	
DO-214AA (GL34)	8mm (0.315)	4.2 (0.165)	1.0 (0.39)	3.5 ± 0.051 (0.138 ± 0.002)	2.4 (0.094)	25 (0.984)	8.0±0.30 (0.315 ±0.012)		
DO-214AB (GL41)					4.5 (0.177)		12.0 ± 0.30 (0.472 ± 0.012)	4.0 ± 0.10 (0.157± 0.004)	
DO-214BA (GF1)	12mm (0.472)	8.2 (0.323)		5.5 ± 0.051 (0.217± 0.12)	3.15 ± 0.10 (0.124 ± 0.004)				Variable Dimensions
DO-214AC (SMA)			1.5 (0.059)		2.54 ± 0.10 (0.100 ± 0.004)	30 (1.181)	12.0 ± 0.008) (0.472 ± 0.008)		
DO214/215 (SMB) MB-S MS-012AA (SMDA)					2.67 ± 0.10 (0.105 ± 0.004)			8.0 ± 0.10 (0.315± 0.004)	
DO-214/215AB (SMC)	16mm (0.630)	12.1 (0.476)		7.5 ± 0.051 (0.295 ±0.002)	2.5 ± 0.10 (0.100 ± 0.004)		16.0 ± 0.2 (0.630 ± 0.008)		
DFS MS-012AB									
MS-013AC								12.0 ± 0.10 (0.472 ± 0.004)	
TO-263AA, AB	24mm (0.945)	20.1 (0.791)		11.5 ± 0.1 (0.453 ± 0.004)	3.8 ± 0.07 (0.150 ±0.003)		24.0 ± 0.2 (0.945 ± 0.008)	16.0 ± 0.10 (0.630 ± 0.004)	

NOTE: 1. Ao, Bo, and Ko are determined by the maximum dimensions of the component size. The clearance between the component and the cavity must be within 0.05 mm (0.002") min. to 0.5 mm (0.02")max. for 8mm tape and 12mm tape, 0.15mm (0.066") min. to 0.90mm (0.035") max. for 16mm tape and 0.15mm(0.006) min. to 1.0mm (0.59") max 24mm tape. 2. All surface mount components are packed in accordance with EIA standard 481-1 and 481-2

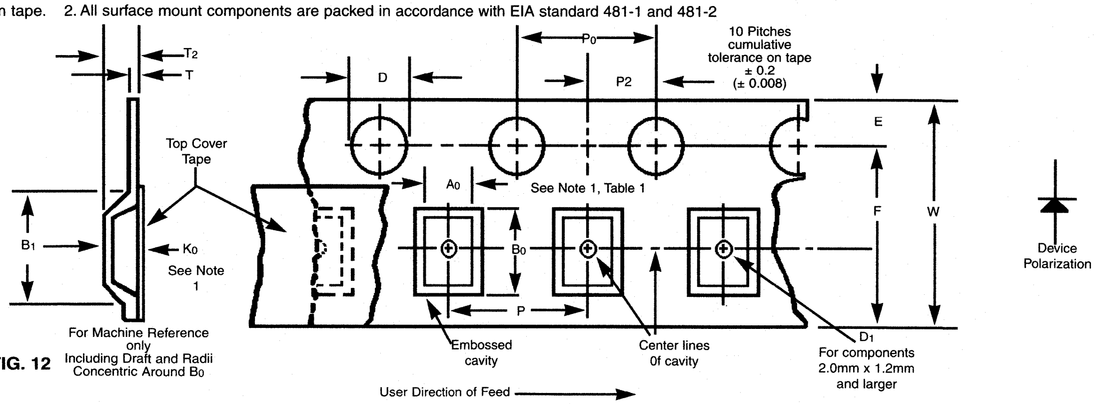
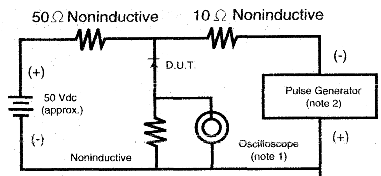


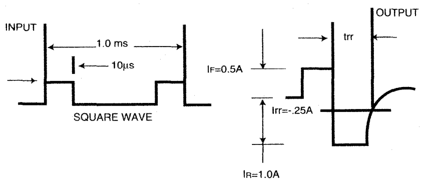
FIG. 12

CIRCUITS: trr, Reverse Recovery Time Characteristics and Test Diagrams

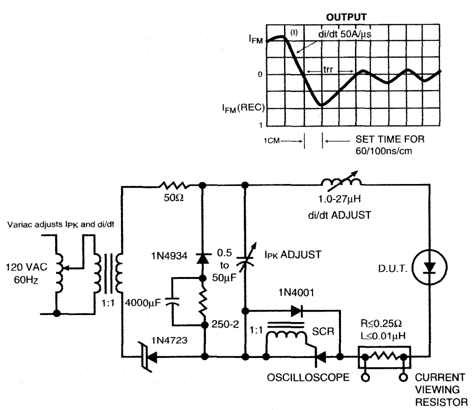
1



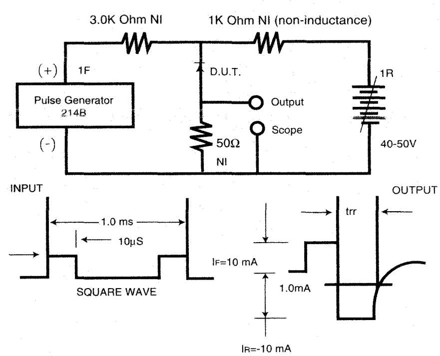
NOTES: 1. Rise Time - 7ns max. Input Impedance - 1 megaohm 22pf.
2. Rise Time - 10ns max. Source Impedance - 50 ohms.



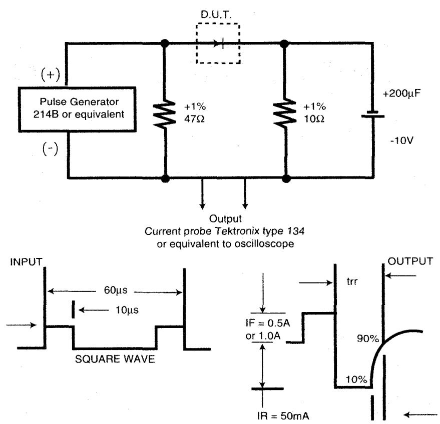
2



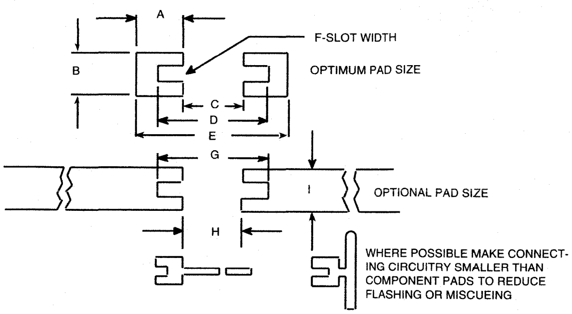
3



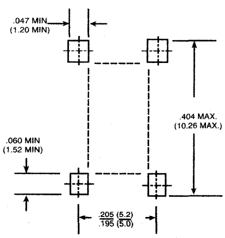
4



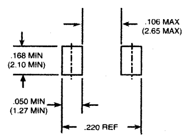
GI RECOMMENDED MINIMUM MOUNTING PAD LAYOUT SIZES FOR THE SURFACE MOUNT RECTIFIERS



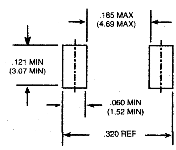
DIMENSION	GL34 DO-213AA	GL41 DO-213AB
A	.069 (1.75)	.100 (2.54)
B	.063 (1.60)	.100 (2.54)
C	.069 (1.75)	.100 (2.54)
D	.138 (3.50)	.200 (5.08)
E	.207 (5.26)	.300 (7.62)
F	.016 (.406)	.025 (.635)
G	.138 (3.50)	.200 (5.08)
H	.035 to .080 (.89 to 2.03)	.050 to .125 (1.27 to 3.17)
I	.048 (1.22) min	.075 (1.90) min



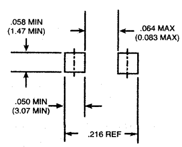
DFS BRIDGE



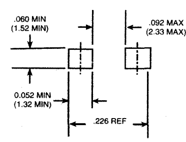
DO214AA



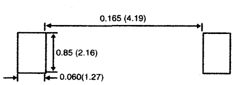
DO-214AB



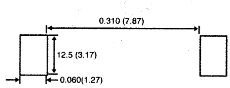
DO-214AC



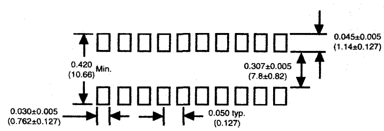
DO-214BA



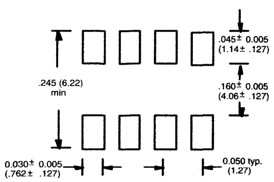
DO-215AA



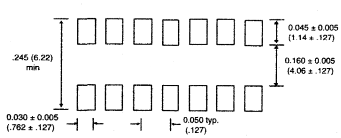
DO-215AB



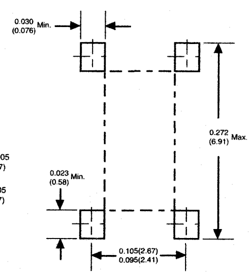
MB-S Bridge



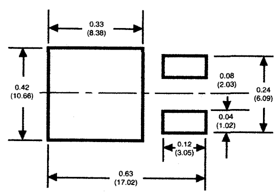
MS-012AA



MS-012BA



MS-013AC



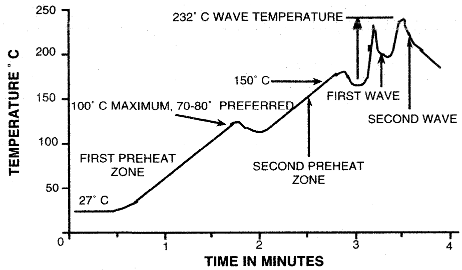
TO-263AA,AB

All Dimensions in inches and (millimeters)

GI RECOMMENDED SOLDERING PROCESSING FOR SURFACE MOUNT AND AXIAL-LEADED COMPONENTS

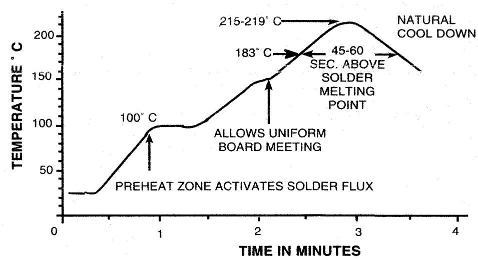
WAVE SOLDERING

Wave soldering has the highest solder temperature and heat transfer rates that are imposed by small resin molded parts like transistors, integrated circuits and surface mount components. The profile has short dwell time in the solder pot and high preheat to minimize thermal shock in ceramic components and temperature problems with resin molded parts.



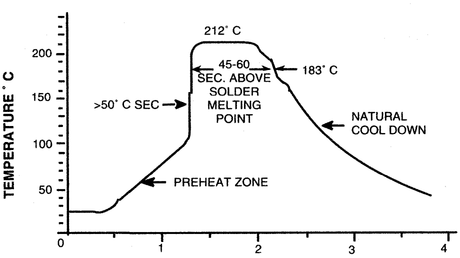
INFRARED REFLOW SOLDERING (IR)

Soldering with IR has the highest yields due to controlled heating rates and solder liquidus times. Only the dwell time and peak temperature limitations of resin molded components need to be considered.



VAPOR PHASE REFLOW SOLDERING

Vapor phase soldering has the second highest heat transfer rate so care must be used. Preheating the assembly and minimizing the dwell time above the solder liquidus temperature is needed for minimum defects



General Instrument Power Semiconductor Division (PSD) has dedicated itself to provide the electronics industry with the highest levels of quality, service, and technology. GI PSD is a world leader in the design, manufacture, and sale of power rectifying and transient voltage suppression components. In reaffirming our dedication to quality worldwide, all our existing manufacturing facilities have achieved the ISO9001 approval . GI PSD believes that its strength lies within the quality of its products, and its strong worldwide sales and distribution channels.

In further pursuit of our commitment to continuous quality and excellence, PSD has implemented the **C 'Program**, designed to generate new and more innovative ideas. **C'** encompasses every phase of GI PSD's operation from product design through quality, reliability, delivery, service, and insures total customer satisfaction.

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General Instrument
Power Semiconductor Division

APPLICATION NOTES

DESIGN GUIDELINES FOR SCHOTTKY RECTIFIERS

Known limitations of Schottky rectifiers—including limited high temperature operation, high leakage and limited voltage range—can be measured and controlled, allowing wide application on switch mode power supplies.

Jon R. Schleisner
Senior Marketing Engineer

Schottky rectifiers have been used in the power supply industry for approximately 15 years. During this time, significant fiction as well as fact has been associated with this type of rectifier. The primary assets of Schottky devices are switching speeds approaching zero-time and very low forward voltage drop (V_F). This combination makes Schottky barrier rectifiers ideal for the output stages of switching power supplies. On the negative side, Schottky devices are also known for limited high-temperature operation, high leakage and limited voltage range $B(V_R)$. Though these limitations exist, they are quantifiable and controllable, allowing wide application of these devices in switch mode power supplies.

High leakage, when associated with standard P-N junction rectifiers, usually indicates "badness," implying poor reliability. In a Schottky device, leakage at high temperature (75°C and greater) is often on the order to several milliamps, depending on chip size. In the case of Schottky barrier rectifiers, high-temperature leakage and forward voltage drop are controlled by two primary factors: the size of the chip's active area and the barrier height (ϕ B).

Design of a Schottky rectifier can be viewed as a tradeoff. A high barrier height device exhibits low leakage at high temperature, however, the forward voltage drop increases. These parameters are also controlled by the die size and resistivity of the starting material. A larger die will lower the V_F but raise the leakage if all other parameters are held constant. The resistivity of the starting material must be chosen in a range where the breakdown voltage (B_{VR}) is not degraded at the low end and the forward end of the resistivity range. Since a larger chip size is obviously more expensive, this is not the primary method for controlling these parameters. Chip size is usually set to a dimension where the current density through the die is kept at a safe level.

Barrier Height (ϕ B), A Factor

General Instrument produces two product lines of Schottky barrier rectifiers. One line is referred to as the "MBR" series, a high-temperature, low-leakage, relatively high V_F type of Schottky device with a high barrier height (ϕ B). The second line is the "SBL" series, designed to operate at lower temperature (125°C or less); however, while leakage current is higher, forward voltage drop (V_F) is significantly lower and they are designed with a low-ϕB barrier height. The low-ϕB-line SBL series uses a nichrome barrier metal with a barrier height of ϕB=0.64 eV. The high-ϕB MBR series uses a nichrome-platinum barrier metal to achieve barrier height (ϕB=0.71 eV). Both series are guard-ring protected against excessive transient voltages.

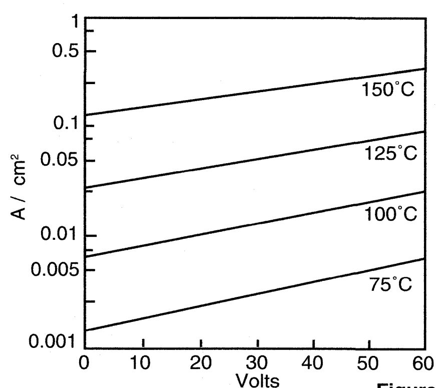


Figure 1

Voltage versus die area leakage barrier height = 0.71 Volts

Both the low- and high-barrier-height Schottky devices are valuable in a variety of applications.

When the true operating temperature of the Schottky rectifier exceeds 125°C, the high-barrier-height series must be used to avoid thermal runaway. This occurs when excessive self-heating of the rectifier causes large leakage currents, resulting in additional self-heating. The process becomes a form of positive thermal feedback and may lead to damage in the rectifier or inappropriate functioning of the circuit utilizing the device.

Using a high-barrier-height (MBR) component prevents this anomaly, but sacrifices higher forward voltage. Operating the low barrier height (SBL) series at a junction temperature of 125°C, a decision on the use of a low- or high-barrier-height Schottky device must be made.

The following procedure has been developed to provide an analytical method of selecting the most efficient Schottky barrier device for a given application.

Calculating The Barrier Height (ϕ B) of Schottky Rectifiers

Calculating the barrier height of a Schottky rectifier where ϕB is not given is a straightforward process. The following two equations will yield an excellent engineering approximation of the barrier height, ϕB:

$$\phi B = (-KT/q)\, LN\, (J / R^*T) \qquad (1)$$

$J_o = I_o$ /ACTIVE AREA (cm^2)
ϕB = barrier height (eV)
K = Boltsman's constant = 8.62 x 105 eV/°K
T = ambient temperature in degrees Kelvin
J_o = current density at zero Volts
R^* = Richardon's constant = $112/cm^2k^2$
I_o = forward current at zero Volts

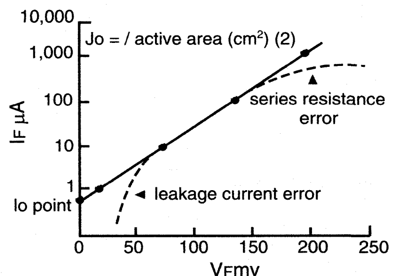
To solve Equation One, the current density J_o (Equation Two) must be found first:

$$J_o = I_o / ACTIVE\ AREA\ (cm^2) \qquad (2)$$

General Instrument provides the active area of its Schottky die in its product literature. If a manufacturer does not supply this information, decapsulating the device under question and measuring it with a precision caliper can provide an approximation of the active Schottky area, assuming 90% of the total chip area is active.

$$Total\ die\ area \times 0.9 = active\ area \qquad (3\_)$$

The calculation of I_o is done graphically (Graph 1). A minimum of three low-current room-temperature forward voltage drop V_F measurements are needed. This data is graphed on semi-log paper (Graph 1) where the vertical axis (log scales) is the current and the horizontal axis (linear scale) is the measured V_F When these points are graphed, the result should be a true straight line. If the graph curves downward (see the dotted line on the left side of Graph 1), it indicates that the lowest measurement current is being affected by the rectifier's room temperature leakage. In this case, the current level at which the V_F measurements are taken should be increased to "swamp" out the contribution of low level leakage on the measurement. If the current levels are raised excessively, the series resistance of the device in question will influence the measurements. This causes a downward curve as represented by the dotted line on the right side of Graph 1. Again, the results should yield a true straight line.



Graph 1

Calculation of J_o (current density at zero Volts)

The point where the line intercepts the vertical axis is the current at zero Volts (I_o). J_o is then calculated:

$$J_o = I_o / ACTIVE\ AREA\ (cm^2) \qquad (2)$$

This result is then placed into the first equation:

$$\phi B = (-KT/q) LN\, (J_o / R^*T^2) \qquad (1)$$

The results of the calculation are usually in the range of 0.6 eV to 0.8 eV. Results well outside this range indicated either a defective rectifier, measurement, or calculation error.

Selecting Efficient Schottky Devices

Normalized graphs of the low (SBL) and high (MBR) barrier height processes are provided. The vertical axis on all graphs is in amperes per square centimeter (A/cm^2). The horizontal axis provides forward voltage drop for the low and high barrier parts. Two additional graphs have the horizontal axis labeled for reverse voltage (V_R) for both the low and high barrier series. The graphs for the low barrier (SBL) series parts have curves for operation at 75°C, 100°C and 125°C.

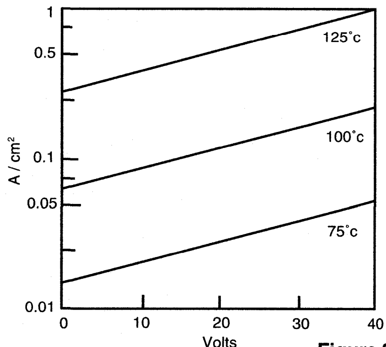


Figure 2

Voltage versus die area leakage barrier height = 0.64 Volts

These curves may be used in two ways. If the die size, barrier height, temperature and forward current (I_F) are known, V_F can be graphically calculated. Using the leakage curves, and knowing the reverse voltage (V_R) to which the device will be subjected, it is possible to find the leakage current. Conversely, if the circuit parameters are set, the curves will provide the die size in A/cm^2 equations, making it possible to analytically select either a low or high-barrier-height rectifier for maximum circuit efficiency. Most Schottky rectifiers are used in switch mode power supplies.

To select a Schottky rectifier that yields maximum efficiency, it is necessary to determine the "duty cycle equilibrium point," or the duty cycle point at which both a low- and high-barrier-height part will dissipate precisely the same amount of power:

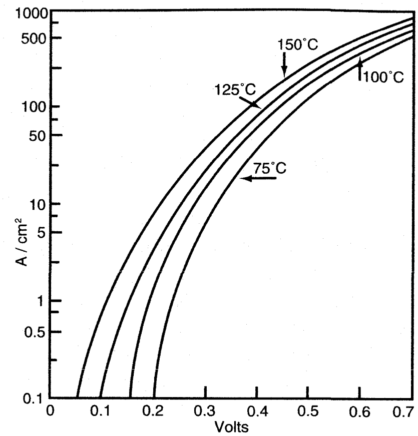


Figure 3

Die area current versus forward voltage drop barrier height = 0.71

$$D\,(P_{df\phi BL}) + (1\text{-}D)(P_{dr\phi BL}) + =$$

$$D(P_{dr\phi BH} + (1\text{-}D)(D_{dr\phi BH}) \qquad (1)$$

$$P_{dt} = P_{df} + P_{dr} \qquad (2)$$

$$P_{df} = I_F \times V_F \qquad (3)$$

$$P_{dr} = I_R \times V_R \qquad (4)$$

D = duty cycle forward conduction

$1\text{-}D$ = duty cycle reverse blocking

I_F = forward current

I_R = reverse current

P_{df} = power dissipation in forward

P_{dr} = power dissipation in reverse

P_{dt} = total power dissipation

V_F = forward voltage drop

V_R - reverse voltage

$\phi\, BL$ = low barrier height

$\phi\, BH$ = high barrier height

The following is an example of the use of this equation:

Given the need for a 30-Volt Schottky capable of operating at 10 amperes, the choice is between a SBL1040 (ϕBL = 0.64) or a MBR1045 (ϕBH = 0.71). These two devices were chosen for convenience in this example because of their equal die size (0.0477cm^2 active area).

The equilibrium point must be calculated for 75°C, 100°C and 125°C. For demonstration purposes, only the 75°C equilibrium point will be calculated in the same manner. The reverse leakage (I_R) and forward voltage drop (V_F) are derived from Graphs 1 through 4 using the temperature, die size and ϕ B given above.

For the low-barrier-height SBL1040:

$P_{dr} = V_R \times I_R = \text{Watts}$ (4)

$30\ V \times (1.9 \times 10^{-3} A) = 0.057\ W$

$P_{dr} = I_F \times V_F = \text{Watts}$ (3)

$10\ A \times 0.46V = 4.6W$

For the high-barrier-height MBR1045:

$P_{dr} = V_R \times I_R = \text{Watts}$ (4)--30

$V \times (1.43 \times 10^{-4} A) = 4.29 \times 10^{-3}\ W$

$P_{df} = I_F \times V_F = \text{Watts}$

$10\ A \times 0.565V = 5.65W$

Solving for the equilibrium point at 75°C:

LOW BARRIER HIGH BARRIER

$(D \times P_{df}\phi BL) + [(1-D) \times P_{dr}\phi BL] =$

$(D \times P_{df}\phi BH) + [(1-D)\ x_{dr}\phi BH]$

$(D \times 4.6W) + [(1-D)\ 0.057W] =$

$(D \times 5.65W) + [(1-D)\ 0.00429W]$

$0.05271 = 1.1027D$

$D = 0.0478$

$D\% = 0.0478 \times 100$

duty cycle equilibrium point, D - 4.78%

Switching loss is assumed to be equal on both sides of the equation and thus ignored. This procedure is then repeated for 100°C and 125°C. After calculating the equilibrium point for 100°C and 125°C, the results are :

TEMP	*DUTY CYCLE EQUILIBRIUM POINT %*
75°C	*4.78%*
100°C	*15.93%*
125°C	*52.42%*

The results of these calculations are graphed in Figure 5. To the left of the equilibrium curve, the high-barrier-height MBR1045 is most efficient; to the right of the equilibrium curve, the low barrier-height SBL1040 is more efficient. This is easy to understand because the high-barrier-height part exhibits lower reverse power loss and at a low duty cycle more time is spent in the reverse mode.

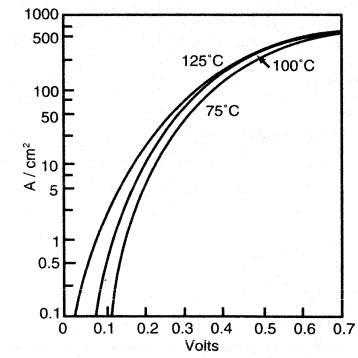


Figure 4

Die area current versus forward voltage drop barrier height = 0.64

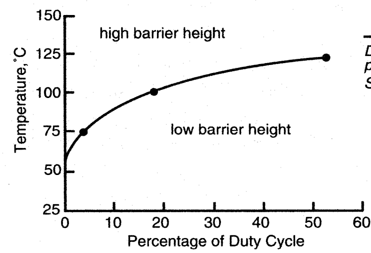


Figure 5

Duty cycle equilibrium point MBR1045 versus SBL1040

With the duty cycle higher than the equilibrium point, the part spends a larger percentage of time in the forward mode, and the low-barrier-height type part has a lower V_F and the forward power losses are reduced.

With knowledge of the application, including expected duty cycle and temperature, it is possible to choose the most efficient Schottky barrier rectifier, constructing a graph similar to Figure 1.

It is thus easy to graph the duty cycle versus temperature, as in Figure 5, and by knowing the application (expected duty cycle and temperature), make the intelligent choice of the most efficient Schottky rectifier for the application in question.

This analysis technique enables the design engineer to make an efficient and cost-effective choice of Schottky rectifier in duty-cycle-based systems. In addition, light has hopefully been shed on the difference in design philosophies between the low- and high- ϕB style of Schottky rectifiers.

SELECTING THE OPTIMUM VOLTAGE TRANSIENT SUPPRESSOR

Although the published data for several transient suppressors may appear similar enough to make the devices seem interchangeable, careful analysis can rule out nearly identical parts whose use could prove disastrous.

Jon R. Schleisner,
Senior Marketing Engineer

Transient Voltage Suppressors (TVS) are specialized zener diodes intended to clamp the voltage appearing across a line, thereby preventing transient spikes from damaging sensitive components. They accomplish this conducting when the voltage across the line exceeds the zener-avalanche rating. Because transient voltages can be quite high, suppressors must be able to handle large avalanche currents. This means that care must be taken in the construction of the package and assembly process to ensure that the suppressor can tolerate high energy levels for short periods.

Typical Transient Voltage Suppressors carry peak ratings of 400, 600, 1500 or 5000 Watts. These wattages translate to 0.55, 0.80, 2.10 or 7.00 joules of energy during a 1-millisecond period. Avalanche ratings generally range from a few volts to several hundred Volts. Key operating parameters include:

♦ ***Breakdown voltage ($V_{(BR)}$),*** the voltage at which a given device breaks down in its avalanche mode. This voltage is usually characterized at a test current (I_t) of 1 milliamp and is often specified as a range with minimum ($V_{(BR)}$ min.) and maximum ($V_{(BR)}$ max.) voltages listed.

♦ ***Working stand-off reverse voltage $V_{(BR)}$,*** the voltage at which the device's leakage current is measured. This voltage is always at least 10 percent lower than the minimum breakdown voltage. Suppressors with a breakdown-voltage rating of less than 10 volts can exhibit leakage currents as high as 1 milliamp, but suppressors with higher breakdown ratings typically exhibit leakage currents of 5 microamps or less.

♦ ***Maximum peak pulse surge current (I_{PPM}),*** the maximum current that the suppressor is guaranteed to withstand without incurring damage. This parameter is usually characterized with a 1 millisecond exponential waveform.

Maximum clamping voltage (V_C), the maximum voltage that can appear across the suppressor when the maximum rated surge current is flowing through it.

Maximum breakdown-voltage temperature coefficient (%$V_{(BR)}$/°C), the maximum allowable change in the breakdown voltage as a function of the temperature.

Design Criteria

The best way to demonstrate the selection process is through a hypothetical example. In this example, the device to be protected is an integrated circuit, IC_X, which is designed to operate on a nominal rail voltage of 15 Volts, and which has an absolute maximum voltage rating of 22 Volts. The first step in the selection process is to determine the energy (joules) or power (Watts) contained in the surge against which the device is to be protected, and the duration of that surge.

Transients are by definition nonrepetitive, with energy levels that are difficult to ascertain. Moreover, they generally result from an unexpected failure elsewhere in the system or from natural phenomenon such as lightning. Because of this, determining energy content and duration of the surge is the most difficult step in the transient-suppressor selection process.

Some surges, however, are predictable. The surge produced by solenoid driver is a good example. If the inductance of the coil is known and the load on the solenoid is defined, it is possible to calculate or measure the duration and magnitude of the surge. Whenever possible, a "hands on" measurement of the worst-case transient condition should be made. For the

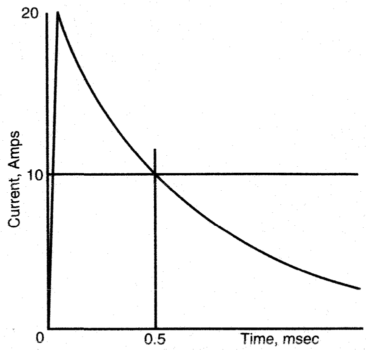
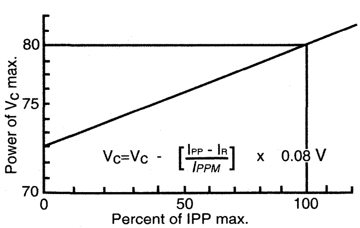


Figure 1

Waveform of an exponential-decay transient pulse with a peak current and a 0.5-millisecond pulse width at the half-peak-current point

sake of discussion, assume that the transient being presented to IC_X has a peak current of 20 Amps with a classic exponential decay, as shown in Figure 1, and a duration of 0.5 milliseconds, measured at 50 percent of the peak current.

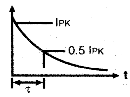
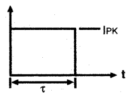
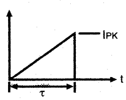
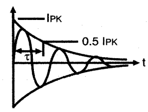
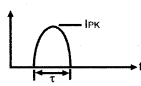
With this data in hand, the next step is to examine manufacturer's data sheets to find a transient suppressor able to handle the anticipated surge. The breakdown voltage and maximum reverse surge current ratings published in the data sheets are key selection criteria. Since IC_X has a nominal 15-Volt operating voltage, the minimum breakdown voltage must be greater than 15 Volts. However, since it carries a 22-Volt absolute maximum voltage rating, the suppressor's maximum breakdown voltage must be less than 22 Volts. The foregoing assumes a relatively stable ambient temperature, such as that usually experienced in an office environment. If the product in which IC_x is used is expected to see wider temperature fluctuations, the minimum breakdown voltage would have to be based on the lowest expected temperature. The resulting voltage would be determined by multiplying the difference between the expected temperature and room temperature by the temperature coefficient.



$$V_C = V_C - \left[\frac{I_{PP} - I_R}{I_{PPM}}\right] \times 0.08\ V$$

Figure 2

The clamping characteristic of a typical transient suppressor

WAVESHAPE	EQUATION	K-FACTOR
	$I_{PK}\, e^{-t/1.44\tau}$	1.4
	I_{PK}	1.0
	$I_{PK}(t/\tau)$	0.5
	$I_{PK} \sin(\pi\, t)\, e^{-t/\tau}$	0.86
	$I_{PK} \sin([\pi /]\, t)$	0.637

$$\text{Energy} = \int_0^{\tau} V_C(t)\, I(t)\, \Delta t = K\, V_C\, I\, \tau$$

Figure 3

The energy contained in a transient pulse depends on its wave shape

With the minimum and maximum permissible breakdown voltages in hand, examine the clamping-voltage ratings published in the manufacturer's data sheets to identify suppressors falling within the required range. It is possible that there is no device that falls well within the upper and lower limits. If the device with the closest voltage rating falls about the upper voltage limit, a very close examination of its parameters must be made. Most reputable semiconductor manufacturers apply a one-percent guardband around voltage ratings as a safety margin. In this example, the guardband raises the absolute maximum rail voltage from 22 Volts to 22.22 Volts. This small increase may not seem like much, but can make the difference in selecting a transient suppressor.

Selecting the Best Transient Suppressor

Consider a situation in which the only suppressor that comes close to meeting the protection need of IC carries a maximum clamping voltage rating of 22.5 Volts. The actual voltage at which the suppressor will clamp depends on the actual current flowing through it, as shown in Figure 2, and can be predicted using the following equation:

$$V_C\ [\ (\ I_{PPM}\ I_R)\ /\ (I_{PPM})\ ]\ x\ (0.08)V = V_C$$

For the sake of discussion, consider the General Instrument type P6KE16A transient suppressor, which carries a 22.5-Volt maximum clamping-voltage rating.

$$22.5 - [27 - 20)/27]\ x\ 0.08\ (22.5) = 22.03\ Volts$$

Although the resulting clamping voltage is still greater than the 22-Volt absolute maximum voltage rating carried by ICx, it is well within the 22.22-Volt rating provided by the one-percent guardband. Thus, although carrying a maximum clamping-voltage rating 0.5 Volt higher than the maximum voltage rating carried by ICx, this suppressor can be safely used in this application.

The same, however, cannot be said of all 22.5-Volt suppressors. Another device in the same family, the P4KE16A, has slightly different current ratings and yields considerably different results:

$$22.5 - [(19 - 20)/19]\ x\ 0.08\ (22.5) = 2.59\ Volts$$

Clearly, with a 22.59-Volt clamping voltage, this device cannot be used because it exceeds the maximum clamping-voltage rating plus guardband of ICx. The next step in the selection process is to verify the transient suppressor's power rating. There are two approaches that can be taken:

1. Since the waveform of the transient is a classic exponential decay with a 0.5-millisecond duration at the half-peak current point, a graphic plot of peak power versus time can be used. This graph is often published in manufacturer's data sheets and if it is available for the device under consideration, one need only compare the anticipated current against the current shown in the graph. Using the peak-power versus time graph published for the P6KE series suppressors, it can be seen that with a 0.5-millisecond time-constant decay, a P6KE device can handle a peak power of 792 Watts. Using Ohm's law and a 22-Volt clamping voltage, this translates to:

$$I = P/V = 792/22 - 36\ Amps$$

Since the anticipated peak reverse current with a 0.5-millisecond time constant is 20 Amps, it is clear that a P6KE device can easily withstand the anticipated peak power of the surge.

2. Calculate the energy in joules contained in the transient and compare it to the maximum energy rating of the transient suppressor. The energy in the transient, of course, depends on its wave shape, as shown in Figure 3. The amount of energy a given transient suppressor can handle, on the other hand, depends on its energy rating and the duration of the pulse, as shown in Figure 4. In this example, the waveform has an exponential shape with a 20-Amp peak current and a 0.5 millisecond half-peak-power point. Using these data, the energy calculations are as follows:

$$E = V_C(t)\ x\ I(t)\ x\ A(t) - KV_C\ x\ I\ x\ \tau$$

where, in this example,

$$V_C = 2V$$
$$I = 20A$$
$$\tau = 0.5\ msec$$
$$K = 1.4\ (from\ \textbf{Figure 3})$$

$$Thus\ E = 1.4\ x\ 22\ x\ 20\ x\ (0.5\ x\ 10^{-3}) = 0.308J$$

The maximum single-pulse energy rating for a P6KE series is 0.83 joules for a pulse of 1 millisecond duration. Referring to Equation 4, the energy rating for a 0.5 millisecond pulse becomes 0.7 x 0.83 J, or 0.581 joules. Clearly, then, a P6KE device can easily handle the 0.308-joule energy contained in the anticipated transient pulse.

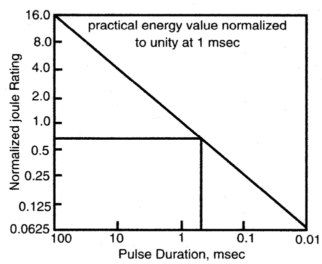


Figure 4

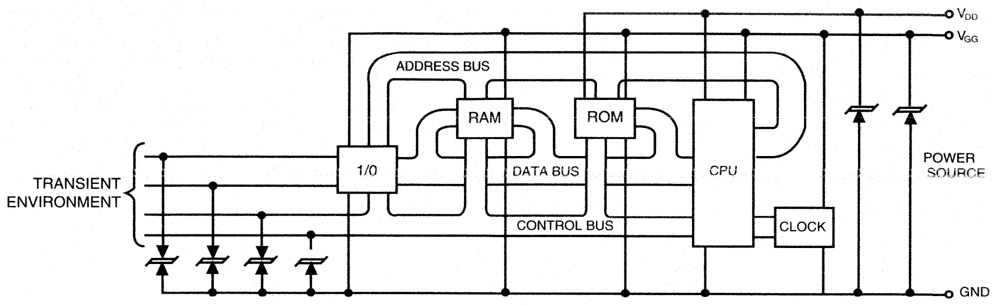
Energy-handling capacity of a transient voltage suppressor as a function of the transient's duration

Conclusion

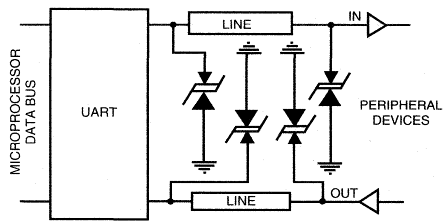
The above example assumes a nonrepetitive transient, or, if repetitive, each pulse is separated from the others by an interval of at least 20 seconds. Under these conditions, however, the procedures outlined provide a straightforward and reliable method of selecting the best Transient Voltage Suppressor for a given application.

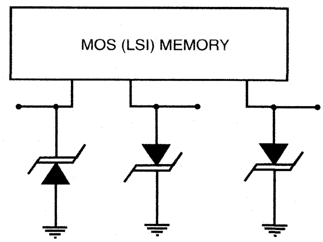
APPLICATION NOTES

Transient Voltage Suppressors are characterized by the reverse stand-off voltage (V_{MW}). They are synonymous with the integrated or micro circuit power supply voltage. The breakdown voltage [$V_{(BR)}$] is that point at which the Transient Voltage Suppressor is in avalanche breakdown. This is temperature coefficient. Allowance has been made in establishing the minimum breakdown voltage at 25°C to provide a safe operation over the full temperature range of -65°C to +150°C.



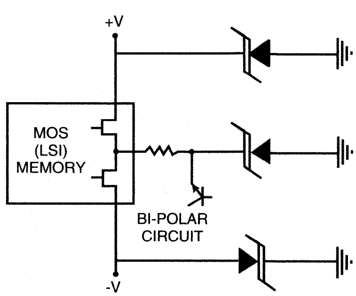
The Transient Voltage Suppressor on the signal and input poser lines prevent microprocessor system failures caused by transients (electrostatic charges), AC power surges, or during switching of the power supply to ON or OFF. A static discharge can exceed 10,000V for 10 microseconds with a 60 Amp current potential. 10V applied to a typical T²L circuit for 30 nanoseconds will cause destruction. Placing Transient Voltage Suppressors across the signal lines to ground will keep unwanted transients out of the Data and Control Buses. Transient Voltage Suppressors which are shunted across the power lines maintain a continuous operating voltage during AC line surges and switching transients.





Transients generated on the line can vary from a few microseconds to several milliseconds duration and up to 10,000 Volts. This threat of potential energy has given rise to high noise immunity integrated circuits. High immunity and super high immunity circuits are prone to damage by noise transients as a result of the power being dissipated by the substrate input diode. Excess current passing through the input diode can cause an open circuit condition or slow degradation of the circuit performance. Transient Voltage Suppressors located on the signal line can absorb this excess energy. For some circuit applications a low capacitance unit may be required, which is available upon request.

The Transient Voltage Suppressors protect the internal MOSFET from transients introduced on the power supply line. When interfaced with bipolar TTL circuits, the same power supply is often used. A common practice is to place a series protection diode from source to gate, but this does not offer protection from source to ground and is usually limited on peak power dissipation. A Transient Voltage Suppressor is required on each voltage supply line to the integrated circuit.

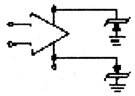


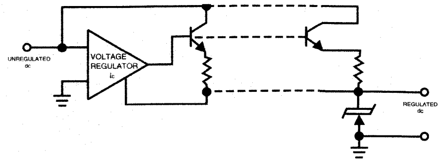
Totem pole output circuits often generate current spikes requiring decoupling capacitors. While maintaining circuit continuity, the Transient Voltage Suppressor is capable of absorbing the energy pulse as well as eliminating noise spikes due to such things as cross-talk, etc. A clamp diode in the IC substrate is limited in conduction current, <100mA, providing a minimum protection.

APPLICATION NOTES

DC LINE APPLICATIONS

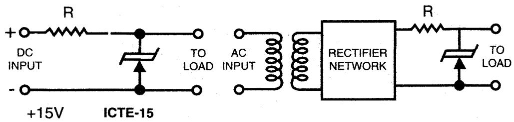
The Transient Voltage Suppressor on the power line prevents IC failures caused by transients (electrostatic discharge), power supply reversals or during switching of the power supply to on or off.



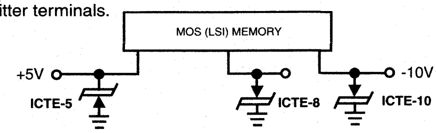


The Transient Voltage Suppressor placed in the output of a voltage regulator can often replace many components associated with a protection circuit such as a crowbar circuit. It may also be required to protect the bypass transistor from voltage spikes across the collector to emitter terminals.

Typical power sources employing the Transient Voltage Suppressor for transient protection.

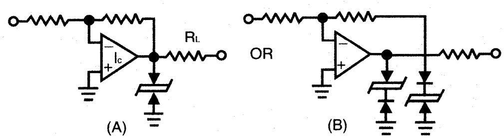


The Transient Voltage Suppressor is chosen in which the reverse stand-off voltage is equal to or greater than the DC output voltage. For certain applications it may be more desirable to replace the series resistor (R) with an inductor. In most applications, a fuse in the line is desirable. Elimination of a transformer will require an LC filter on the line for most industrial applications, when the Transient Voltage Suppressor is placed on the input to the power supply and with an input voltage greater than 40 Volts.

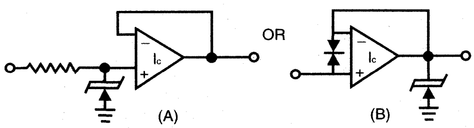


The Transient Voltage Suppressors protect the internal MOSFET from transients introduced on the power supply line. When interfaced with bipolar TTL circuits, the same power supply is often used. A common practice is to place a series protection diode from source to gate, but this does not offer protection from source to ground and is usually limited on peak power dissipation. A Transient Voltage Suppressor is required on each voltage supply line to the integrated circuit.

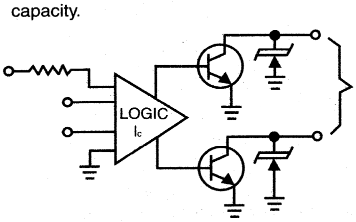
SINGLE LINE APPLICATIONS



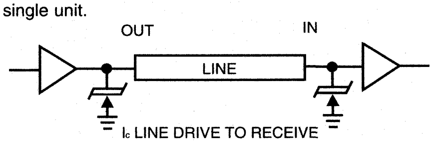
A Transient Voltage Suppressor on the output of an Op-amp will prevent a voltage transient, due to a short circuit or an inductive load, from being transmitted into the output stage. Fig. A is for linear circuits whereas Fig. B may be required for reducing effective capacity at the output. The Transient Voltage Suppressor and a blocking diode is available as a single unit.



Input states are vulnerable to low energy, high voltage static discharges or crosstalk transmitted on the signal wires. Limited protection is provided by the clamp diode or an input network within the IC substrate. The diodes, however, must have a breakdown voltage greater than the supply voltage (Vcc) and are limited in current capacity.



Very high transient voltages are generated when an inductive load is disconnected, such as motors, relay coils and solenoids. The Transient Voltage Suppressor provides protections for the output transistor as well as the IC, eliminating a resistor/capacitor network. The ICTE series Transient Voltage Suppressor is capable of dissipating the full load current for short duration pulses (<8.3 msec). For longer pulses, the Transient Voltage Suppressor is available in stud or press fit package.



Transients generated on the line can vary from a few microseconds to several milliseconds duration and up to 10,000 volts. This threat of potential energy has given rise to high noise immunity integrated circuits. An independent study* has found that high immunity and super high immunity circuits are prone to damage by noise transients as a result of the power being dissipated by the substrate input diode. Excess current passing through the input diode can cause an open circuit condition or a slow degradation of the circuit performance. Transient Voltage Suppressors located on the signal line can absorb this excess energy.

*The Radio & Electronic Engineer, Vol. 43, No. 4, April 1973.

Transient Voltage Suppressors can be used in series or parallel to increase their power handling capability. No precautions are required when using Transient Voltage Suppressors in a series string since power dissipation for two or more devices of the same type is equally shared. When using Transient Voltage Suppressors in parallel it is necessary for the units to be closely matched (approx. 0.1 Volt of each other) in order for equal sharing to take place. Matched sets can be ordered from the factory for an additional charge.

TYPICAL TVS APPLICATIONS

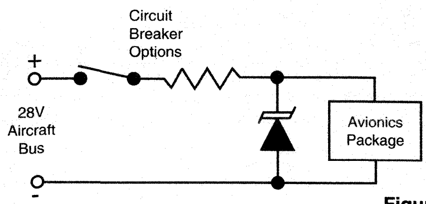


Figure 1

28V D.C. Supply Protection

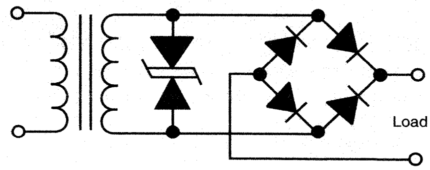


Figure 2

A.C. Supply Protection

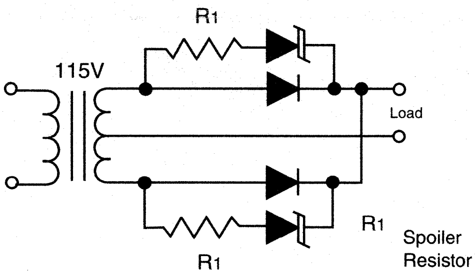


Figure 3

Breakdown Voltage Rectifier Protection

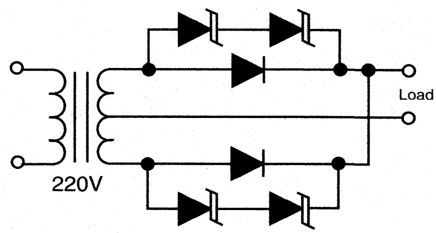


Figure 4

Breakdown Voltage Rectifier Protection

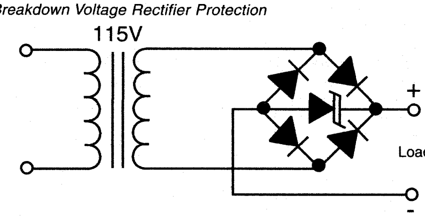


Figure 5

115V A.C. Supply Protection

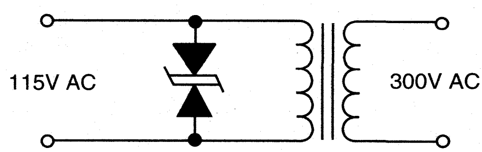


Figure 6

Circuit Protection from Overvoltage Supply Power

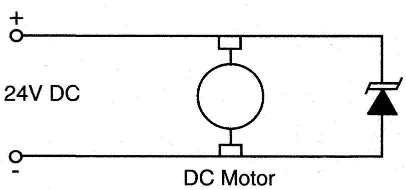


Figure 7

EMI Limiting

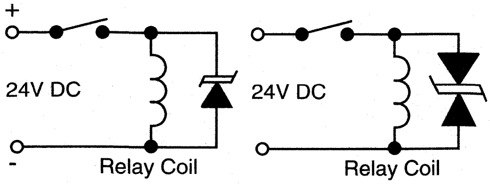


Figure 8

Relay and Contactor Transient Limiting

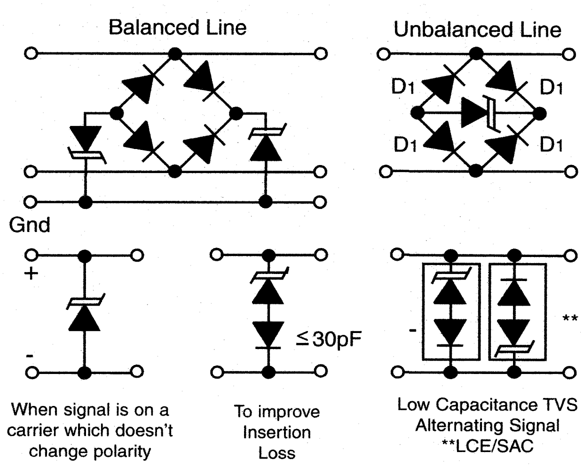


Figure 9

R.F. Coupling

SUPERECTIFIER DESIGN BRINGS NEW LEVEL OF RELIABILITY TO SURFACE MOUNT COMPONENTS

Joseph M. Beck,
Senior Applications Engineer

Surface Mount technology is here to stay. After years of plodding through cautious experimentation, many manufactures now have fully automated production lines in place. These production lines place circuit components at speeds that until recently would have been unthinkable. Finally being realized are the benefits of what was once considered a "Voo Doo" manufacturing technology. Component manufacturers have learned a great deal over the past several years as well. Initially most surface mount components were nothing more than retrofit, lead formed versions of their conventional leaded, through-hole counterparts. For most manufacturers this was the quickest and least costly method of "developing" a line of surface mountable components.

It was soon discovered, however, that this approach to component assembly would be unacceptable. Surface mount technology placed new demands upon circuit components. Electrically, the same power was being required from smaller and smaller packages. Package geometries and dimensions became critical in relation to pick and place equipment and circuit board mounting. In addition, the construction of these devices needed to be such that they would suffer no ill effects when subjected to the rigors of the new assembly environment that surface mount technology presented. Encountered in this environment was extremely high-speed pick and place equipment, component adhesive attachment, immersion in molten solder and rapid temperature changes associated with reflow soldering processes. All this meant that component manufacturers would have to re-think their approach to device fabrication. Yes, components needed to be smaller; but they also needed to be more reliable.

At General Instrument, the development of new surface mount components is not something that is taken lightly. It is realized that in order to produce a truly reliable surface mount product one must first consider all relevant aspects of the technology. Only when this process has been completed can a product be developed which is surface mountable, and inherently reliable.

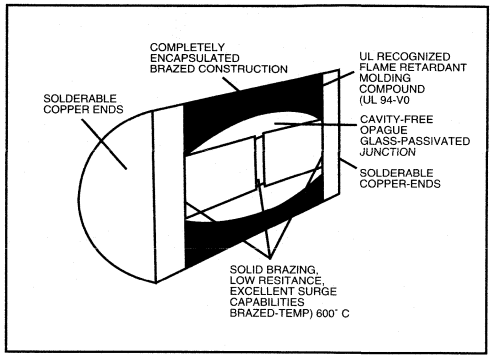


Figure 1

SUPERECTIFIER construction

Surface Mount Superectifier®

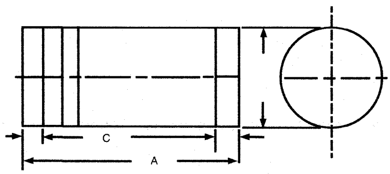
General Instrument manufactures surface mount rectifiers in the popular MELF (metalized electroface) package style. These devices, denoted as SUPERECTIFIERS, are available with a wide variety of electrical characteristics. The main difference, however, between these rectifiers and other MELF style devices lies in the area of device construction. Figure 1 shows the unique construction employed in the manufacture of the SUPERECTIFIER.

The construction of the SUPERECTIFIER does not internally utilize any soft solders. All interconnects are accomplished by the use of a high temperature brazing process (600°C). Hence, any chances of solder void occurrence or internal solder reflow during circuit board processing are eliminated. In addition, the silicon rectifier junction is completely encapsulated by a cavity-free glass. This glass encapsulation ensures that the rectifier junction is hermetically isolated from humidity and other harmful environmental intrusions.

The resultant sub-assembly could be considered to be a fully functional surface mount rectifier. In fact, many component manufacturers offer MELF devices which have this appearance; namely, an oblong glass bead with two protruding metal end terminations. However, in order that the device have a uniform shape, the General Instrument sub-assembly is over molded with epoxy. The result is a smooth, perfectly cylindrical package.

Two Sizes

Two different size SUPERECTIFIER MELF packages are available. General Instrument designation GL34 and GL41 are for 0.5 Ampere and 1.0 Ampere rectifier types, respectively. JEDEC mechanical specifications DO-213AA and DO-213AB detail the dimensions of the GL34 and GL41, respectively. Figure 2 gives these package dimensions.



	GL34 DO-213AA		GL41 DO-213AB	
DIM.	MIN	MAX	MIN	MAX
A	.130	.146	.189	.205
B	.063	.067	.094	.105
C	.016	.022	.016	.022

NOTE: ALL DIMENSIONS IN INCHES

Figure 2

Dimensional outline

MANUFACTURING CONSIDERATIONS

Pick and Place-Surface mount SUPERECTIFIERS are supplied on tape and reel in accordance with JEDEC standard RS-481A. Removal of the devices from the embossed carrier tape is easily accomplished by all vacuum pick-up mechanisms which utilize a compliant tip. The compliant tip will form a tight seal around the cylindrical MELF design once contact with the device has been made. This is not always the case, however, when MELF devices with a non-uniform package outline are used. Figure 3 shows two such MELF outlines. Figure 3A is a device with a concave package outline. This type of package is difficult to consistently remove from the carrier tape as the exact position of pick-up on the component body is critical. Figure 3B is that of the most common form of MELF packaging. This type of construction utilizes a non-transparent glass body which is often characterized by pitting and surface irregularities. The irregularities make it difficult for a vacuum pick-up to form a tight seal around the device body. The result is that components are often dropped onto the production room floor instead of being placed on the targeted circuit board. General Instrument solves these problems with a smooth surface and perfectly cylindrical package outline.

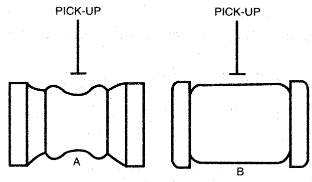


Figure 3

Non-uniform MELF outlines

Bonding Pads - The geometries and dimensions of bonding pads are critical to the proper mounting, soldering and overall performance of all surface mount components. Figure 4 gives the recommended pad layouts for GL34 and GL41 MELF outlines. Use of these pad layouts will be primary assistance in the following three areas:

♦ Surface mount technology by nature dictates that smaller component packages dissipate the same power as their larger through-hole counterparts. Hence, adequate bonding pad land area is required in order to aid the component package in the dissipation of this power. The recommended pad layouts provide the needed land area for GL34 and GL41 devices to operate safely at their maximum ratings.

♦ Component adhesive attachment allows the package to shift slightly from its original placement position prior to adhesive curing. In addition, most adhesives tend to spread during the curing process which also may allow package misalignment. The geometry of the recommended pad layouts will tend to minimize such movements. This assumes, of course, that the package was originally positioned correctly.

♦ During reflow soldering, solder surface tension can have a significant effect on the movement and final position of components in relations to their bonding pads. The recommended pad layouts will actually make use of the solder surface tensions to bring MELF devices into alignment with the two bonding pad land areas. This means

that MELF devices which are initially placed in slight misalignment on their bonding pads will reposition themselves during solder reflow until a position of alignment is reached.

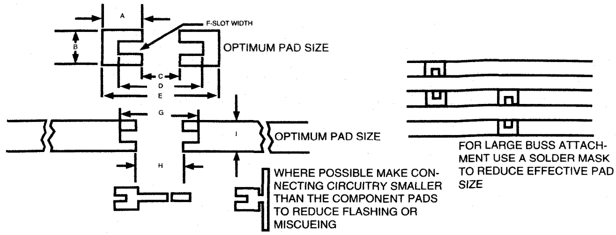
Soldering - Surface mount SUPERECTIFIERS are capable of withstanding all present forms of wave and reflow soldering. The following guidelines should be followed, however, in order to ensure overall package integrity:

◆ GL34-Maximum temperature at device and terminations not to exceed 400°C for 5 seconds. Complete device submersible temperature not to exceed 260°C for 10 seconds in solder bath.

◆ GL41-Maximum temperature at device end terminations not to exceed 450°C for 5 seconds. Complete device submersible temperature not to exceed 265°C for 10 seconds in solder bath.

General Instrument's surface mount SUPERECTIFIERS combine superb electrical performance with unmatched levels of reliability. The construction of the SUPERECTIFIER virtually eliminates all problems associated with high-speed pick and place of MELF components. In addition, SUPERECTIFIER construction ensures that performance and reliability are never compromised when the device is subjected to the demands of surface mount assembly techniques or when other seemingly harmful environments are encountered. Quite simply, no other surface mount rectifier comes close to offering all the advantages of the SUPERECTIFIER MELF.

All surface mount components are small and save space. However, performance and reliability should never be considered necessary trade-offs in order to utilize surface mount technology. Use of General Instrument surface mount SUPERECTIFIERs requires no such sacrifices; no trade-offs.



DIMENSION	GL34	GL41
A	.069	.100
B	.063	.100
C	.069	.100
D	.138	.200
E	.207	.300
F	.016	.025
G	.138	.200
H	.035 to .80	.050 to .125
I	.048 min	.075 min

NOTE: ALL DIMENSIONS IN INCHES

Figure 4

Recommended pad layout

PART NUMBER	CURRENT(A)	VOLTAGE(V)	TRR(ns)	PACKAGE
GENERAL PURPOSE				
GL34-J	0.5	50-600	-	GL34
1N6478-84	1.0	50-1000	-	GL41
GL41A-Y	1.0	50-1600	-	GL41
FAST RECOVERY				
RGL34A-J	0.5	50-600	150-250	GL34
RGL41A-M	1.0	50-1000	150-500	GL41
ULTRA FAST RECOVERY				
EGL41A-G	1.0	50-400	50.0	GL41
EGL34A-G	0.5	50-400	50.0	GL34

FAILURE MODES AND FUSING OF TVS DEVICES

by David W. Hutchins

Introduction

Transient Voltage Suppressors (TVS) will fail if they are subjected to conditions beyond their designed limits. It is, therefore, important to understand the types of failure modes of TVS devices before designing them into a circuit application. There are three basic types of failure modes: shorts, open and degraded (outside of the specification limits). Although the silicon avalanche junction Transient Voltage Suppressor (SAJTVS) will first fail short in most applications, there is always one transient event that will cause it to open initially. In this case, the transient energy is large and of short duration that the silicon chip itself explodes.

When a TVS device does short, follow-on operating current may cause the device to open. Fusing of the line is recommended in all applications. Shorted devices will start to conduct current away from the circuit or system affecting its performance. Open devices are transparent to the circuit/system and will not usually distribute circuit functions. In either case, it is difficult to determine if the TVS device is still functioning while in the circuit. Degraded TVS devices are most difficult to detect in the circuit. These can be devices with high leakage currents which may not adversely affect circuit performance, except under elevated operating temperatures. All three types of failure modes are discussed in this applications note along with the design practices for fusing the line when a device does fail.

With the thought that a TVS device can fail, there are some additional terms that designers would like to impose on the protector to ease this problem. One such term is a "Fail Safe" condition. The term "Fail Safe" implies some level of safety which cannot be used in connection with the TVS device. Due to the very nature of the unknown transient threat, there are no 100% guarantees. "Fail Safe" is one of the most misunderstood terms regarding transient protection. It is important to define the term and discuss why it should not be used in reference to a TVS device.

Words have different meanings to different people which is the case with the term "Fail Safe". A TVS device cannot assure a fail safe environment. By nature, a TVS device will fail when subjected to a transient beyond its designed capability. If the circuit or system is not properly fused, a shorted TVS device can become a safety hazard conducting operating currents through the return path. Even with the proper design-in and adherence to good engineering practices, this term should not be used in describing the function of the protection network. Quite often, the unknown transient threat along with some of the guess work regarding the sizing (Peak Pulse Power Rating) of the TVS device will suggest some level of risk in the overall protection system. The risk, in this case, is the trial and error method used to guarantee proper TVS device selection versus its location. This type of selection process may take some time to accomplish when the transient threat cannot be fully defined. "Fail Safe" may be used in conjunction with a complete systems approach, but not with a component such as a TVS device.

Failure Modes

TVS devices will fail in one of three modes. These are shorts, opens and degraded devices. In most applications, the preferred method of failure is a short. A short is defined when the TVS device has a resistance value of less than 1 ohm at a dc voltage of 0.1 volts (ref. ANSI/IEEE C62.35). In the more practical world, a shorted device will start to conduct a significant amount of operating current to ground, Figure 1.

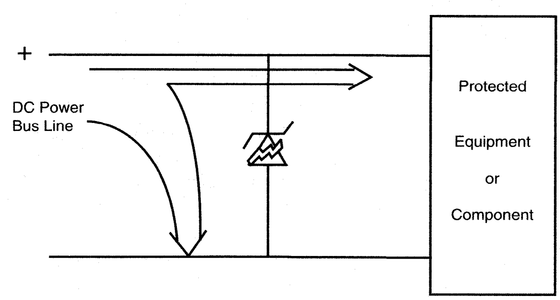


Figure 1

Current Path for Shorted Surge Protector

The actual current shunted to ground will depend upon the resistance in the line ahead of the TVS device. For the power line, this could mean a significant amount of current depending upon the available current from the power supply or source. With data lines, this can be somewhat limited but will depend upon the operating current of the circuit. Data lines operating in the milliampere range are more difficult to fuse. In either case, it is important to provide some type of fusing in the line to open up the circuit when a TVS device does short, Figure 2.

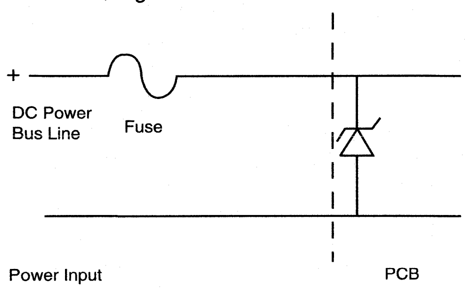


Figure 2

Fuse Location Relative to TVS Device

The fusing element must take into consideration two possibilities. First is the ability to handle the required transient current without interrupting the circuit functions. Second, it has to be able to open the line when the TVS device does short.

An open TVS device is defined as a diode that has a breakdown voltage $V_{(BR)}$ greater than 150% of the pretested value at an applied test current (I_P) (ref. ANSI/IEEE C62.35). For this test, the unit must be taken out of the circuit for verification. An open device in the circuit will not exhibit any of the standard electrical characteristics such as leakage current or clamping voltage. Once out of the circuit, the TVS device can be tested on a curve tracer for verification of the open condition.

In an improperly fused circuit, a device that has been shorted can become open after an applied operating current is allowed to conduct through the device for a period of time. Figure 3 shows the fusing currents and time durations for each of the major axial lead type packages. When this occurs, there is usually some visible evidence in the form of a burn mark on or within the device indicating an open unit.

Devices that degrade are more difficult to detect. These types of failed devices will exhibit an increase in the reverse leakage current under

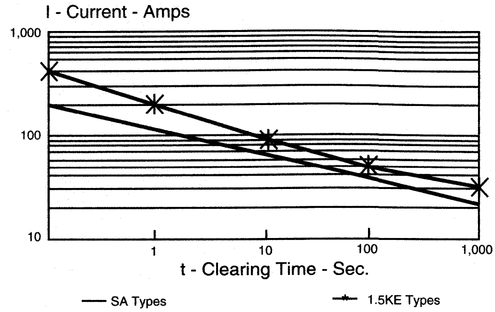


Figure 3

Clearing Time for Transient Voltage Suppressor Device - Fail Opened Condition

normal operating voltages (equivalent to the stand-off voltage). According to ANSI/IEEE C62.35, a degraded failure mode has occurred when the avalanche junction surge suppressor has a stand-by current greater than the maximum specified. On the power bus line, this level of current reaches the upper limit of the power supply current or when the unit shorts from the increased current conduction. For data lines, this value may be much less due to the fact that there can be loss of data transmission of information. A device will act as a low impedance shunt path to ground.

As discussed earlier, "Fail Safe" is discouraged in the description of a failure mode for TVS devices. For some, the term can be a desirable characteristic in that the unit will protect up to a specific level. To others it can mean that the device should provide protection because of the fail short or open condition. While both may be true, the TVS device should not be described as a fail safe product due to the fact that no one can guarantee a specific type of device failure mode. The transient threat and the location of the Transient Voltage Suppressor in the equipment will also have a major influence on the type of failure mode. In some applications, the transient currents and impulse waveform cannot be completely defined. As a result, the correct TVS device may not be designed in. In this case, the TVS device application is a trial and error method as suggested earlier. A TVS device is designed to withstand a specific level (power) of transient threat as defined by a peak pulse power rating versus pulse width curve, Figure 4.

Most manufacturers will provide a peak pulse power versus time curve on their individual product data sheets. This will provide the designer with the maximum power limit within a product family or series of devices. It is up to the circuit or system designer to translate this product

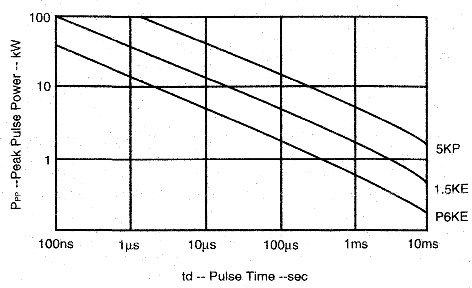


Figure 4

Peak Pulse Power vs. Pulse Time

information into the appropriate threat level. Threat levels should always be defined in terms of the peak current amplitude and impulse waveform rather than calculate the energy of the TVS device from the power curve. Energy is not a key parameter here due to the fact that the energy contained within the transient event is not the energy deposited in the TVS device. Equating the transient current threat to the peak pulse current rating of the TVS will ensure proper device selection and the continuous operation of the protector in the application. There will, however, be those applications in which the actual transient current cannot be defined. At best, the identification of the source of the threat is necessary; that is, lightning, switching, ESD or NEMP. From this information, the manufacturer can provide the direction for initial product selection.

Product selection begins by equating the circuit operating voltage to the stand-off voltage of the TVS device, Table I.

Table I
Avalanche Junction Selection Process

DEVICE PARAMETERS		CONDITIONS
1) Stand-Off Voltage	>	Operating Voltage
2) Peak Pulse Current	>	Transient Current
3) Clamping Voltage	<	Voltage Protection

Next, as discussed above, it is necessary to equate the transient current to the peak pulse current of the TVS device. The transient current must always be less than the peak pulse current of the TVS for continuous operation. It is the transient current that will cause the TVS device to fail in a shorted mode. Device shorts can occur at the semiconductor chip junction surface interface or within the bulk material. This type of short will appear as a burn spot on the junction surface or as a dark spot on the top/bottom of the silicon chip. The bulk type of device short will be a function of the amount of transient current that was passed through the silicon chip. The burn spot can be as small as a pin hole in the die and as large as a funnel hole of a few millimeters in diameter. In both cases there is evidence of remelted semiconductor material. Its size will usually depend upon the current amplitude of the transient and any additional follow-up current that is present over a short period of time. Longer pulses will usually remelt the solder material which can bridge the silicon chip causing the shorted condition. In this case, removing the solder bridge will allow the TVS device to recover and appear as a good device.

Follow-on current after a TVS device has failed short can become a safety or circuit performance problem. For these reasons, it is suggested that a fuse or fusible link be inserted in the line ahead of the TVS device on both the power and data line applications. Selections well as location of a fusing element is important. From Figure 3, it is possible to determine the I^2t value necessary to select the fuse for any follow-on current. As this data is defined as the clearing time for a TVS device to open up for a continuous applied current, it is necessary to select a fuse with an I^2t characteristic below the device capability. Location of the fuse is best closest to the TVS device in the series line for board level protection, Figure 2. For equipment and high level systems protection, the fusing element can be a circuit breaker located at the point of power entry. At this location, the power and transient currents are terminated at the point of power entry input to the equipment preventing any additional problems such as safety hazard, data errors, or component damage.

One of the most difficult problems is the identification and, sometimes location of the failure. Inline tests are often used as the checkout procedure for the system/circuit's performance. With a Transient Voltage Suppressor, this may not be the best solution. The first step is the identification of problem area; that is, power bus or data line. The second step is to perform a visual inspection to locate the failed device or see evidence of a burn spot on a component. The third step is to apply power to the circuit for performance testing and test for any loss of data. If there are any major problems, tripping of a circuit breaker (CB) or a blown fuse will indicate some type of line problem. Trace the line to the problem area. When a CB or fuse does function, it's best not to reset the CB or replace the fuse but to locate the source of the problem. With data lines, this can be somewhat difficult if the fusing link does not function due to improper sizing.

EFFECT OF LEAD WIRE LENGTHS ON PROTECTOR CLAMPING VOLTAGES

by O. Melville Clark and Joseph J. Pizzicaroli

Originally presented at the Federal Aviation Administration-Florida Institute of Technology Workshop on Grounding and Lightning Technology
March, 1979 - Melbourne, Florida

Abstract

Under high current pulse conditions, excessive lead lengths on suppressor components can be responsible for destruction of the protected circuit. This is caused by voltage build-up across the small but finite amount of inductance in the interconnecting leads of the protector. Some suppressor devices have been tested and observed to have more than twice the specified clamping voltage which was subsequently shown to be caused by inductive effects. Problems and corrective measures are illustrated and discussed in this paper.

Semiconductor Failure Thresholds

MOS and small area geometry semiconductors are particularly vulnerable to the effects of transient voltages. Unfortunately there has been very little information published on this subject. The work reported by Van Keuren[1] illustrates how fragile CMOS and TTL devices can be. Minimum failure pulse voltage thresholds are shown in Table 1.

Electrostatic Discharge (ESD) failures of MOS microcircuits have been measured by Gallace and Pujol[2]. Comparisons among several suppliers indicate that failure levels can be a function of manufacturing technique. Repeated step stressing of a sample of 25 CD4011AF type devices shows that at a given stress level devices would eventually fail, as shown in Figure 1.

TABLE1
Minimum Failure Thresholds of CMOS and TTL

Device Type	Pulse Width					
	20µsec	2µsec	1µsec	.02µsec	.01µsec	.025µsec
55107	22V	16V		22V		
55109	36V	38V		60V		
5404			30V		50V	120V
54L30			20V		50V	90V

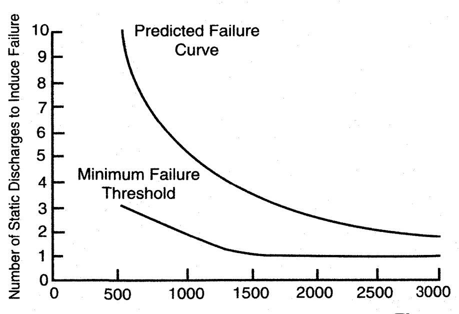


Figure 1

Pulse Voltage (Volts) Stress Failure of CD4011F

Equivalent Circuit of Protector

The equivalent circuit of a silicon transient suppressor, such as the Transient Voltage Suppressor, is shown in Figure 2. All parameter values are fixed by manufacturing processes and device construction except L_1, the inductance resulting from the lead wires connecting the protector across the circuit for which protection is intended. Normal wiring practice results in lead lengths of the order of centimeters. In some power installations this has been observed to be of the order of feet.

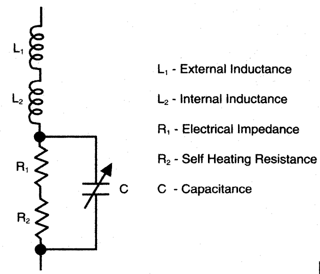


Figure 2

Equivalent Circuit of Protector

The inductance within an axial leaded part, as represented by L_2, is of the order of 10^{-8} henrys while the inductance within a modular assembly can be one to two orders of magnitude greater, depending on the design and the number of subcomponents. The capacitance of a silicon avalanche suppressor can vary over an order of magnitude, depending on the degree of reverse biasing.

Transient Voltage Rise-Times

A. **EMP**: Voltage rise-times of EMP (Electromagnetic Pulse) transients, as generated by high altitude nuclear detonations, are 5kV/nsec. The presence of even a small amount of inductance in the protector circuit can have very profound results on the effectiveness of a protector device. This is illustrated with the oscillographs in Figures 3 and 4.

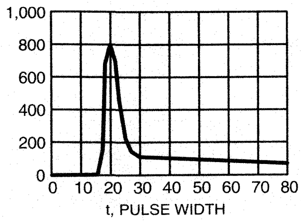


Figure 3

7.5 cm Lead Wires

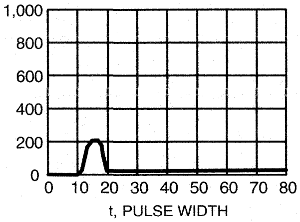


Figure 4

Zero Length Lead Wires

In Figure 3, a 30V Transient Voltage Suppressor in the DO-13 package was pulsed with a 100A 4kV/nsec rise-time transient. With 7.5 cm leads on each end, at which current was injected and voltage measured, the overshoot voltage is slightly greater than 800V. The energy under this curve is calculated to be 70μjoules, sufficient energy to destroy most types of MOS and some TTL devices. By reducing the lead length to zero and repeating the pulsing, the overshoot voltage is reduced to about 200V. The energy under this curve is less than 1μjoule, below the destruct threshold of MOS and TTL devices.

B. **Lightning and Inductive Switching:** From measurements made on 120V ac power systems, Martzloff[3] has proposed a waveform with a frequency of 100kH. The lightning stroke, which is usually reported with current rise-times ranging from 1 to 3μsec has been more recently measured by Llewellyn[4] to be as low as 500nsec. Transients on shipboard ac power systems have been defined by MIL-STD-1339 as having transient rise-times of 1.5μsec.

Normal wiring practices are usually considered adequate for protection of electronic circuitry. "Normal" and "adequate" are relative terms and usually prevail under conditions in which equipment performance is acceptable. What is normal and adequate protection for vacuum tubes is not the same for power semiconductor devices. Protection for microcircuits is also quite different from power semiconductors. With increased usage of microprocessors and other small area geometry semiconductors, equipment is becoming more vulnerable to transient voltages, under both single pulse and repetitive pulse conditions.

Inductive Effects in Component Leads

A. **Calculation:** The inductance in a straight wire appears, at first glance, to be very small and insignificant. Assuming a value of IμH/m for a straight wire, most lead wires have inductance values in the nanohenry region. The voltage drop developed across an inductor under pulse conditions is expressed as:

$$V_{(t)} = L\,\frac{di}{dt}$$

where L is inductance in henrys

$\frac{di}{dt}$ is the rate change of current

For the fast rise-times of EMP as shown above, the associated problems are obvious; however, for the slower rise-time of switching and induced lightning the degree of exposure and protection required can be defined only after carefully studying all boundary conditions.

B. **Case Study:** In the following application, a silicon transient suppressor is being used to both regulate the voltage to power a telecommunications repeater and also provide transient suppression. The schematic is shown in Figure 5. This is one of two repeaters powered and protected by the same component.

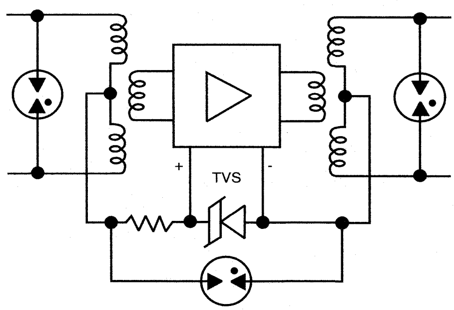


Figure 5

Telecom Repeater With Protection

The microcircuitry used in this equipment has some well defined failure levels; 20V in the positive direction and 6.5V in the negative direction. The suppressor has a well defined clamping voltage in the avalanche direction under a specified rise-time. The forward polarity measurements are specified at 100A with an 8.4 msec, ½ sine wave pulse. To determine higher current capability, pulse tests were made with a 1.2 x 50μsec waveform. During the process of taking data, small differences in lead length in the protection circuit were observed to have profound effect on the suppression capability of the device. Measurements extended over the range from 100A to 500A with lead lengths from the body of the device of zero, 1.0 cm and 2.0 cm. Tests were made on a molded 1.5kW Transient Voltage Suppressor. The peak clamping voltage was plotted against pulse current as shown in Figure 6.

After tests were made with 0.0, 1.0 cm and 2.0 cm lead lengths, the plastic body was carefully cut away leaving only the cell containing the junction and the leads. Voltage measurements were then made across the cell, virtually eliminating inductance within the package. A lead length of 2 cm has a peak clamping voltage of 4V at 100A and 13.5V at 500A. By contrast, the cell only has a peak clamping voltage of 1.3V at 100A and 3V at 500A. Voltage probe placement for taking measurements is shown in Figure 7.

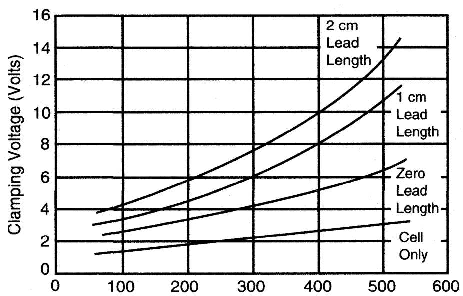


Figure 6

Clamping Voltage vs Pulse Current

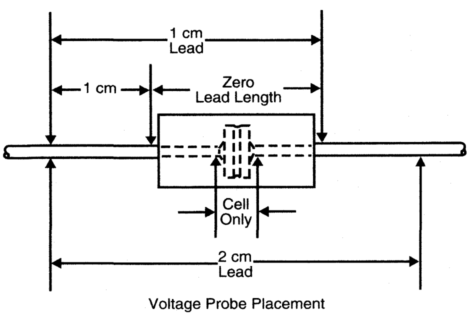


Figure 7

Voltage Probe Placement

Voltage drops across the lead wires contributing to peak clamping voltage can be attributed to both resistive and inductive components. Calculations were made for both resistive and inductive voltage drops for a 1.0 cm .040 in dia. copper wire at pulse current levels from 100A to 500A. Rise-time is 1.2µsec. This data is shown in Table II.

Note that the calculated inductive voltage drop compares favorably with the measured voltage drop while the resistive component contributes less than 10% of the total.

TABLE II
Pulse Current Level and Voltage Drop

Pulse Current (Amps)	Measured Voltage Drop (Volts)	Calculated Resistive Voltage Drop (Volts)	Calculated Inductive Voltage Drop (Volts)
100	0.75	0.019	0.83
200	1.3	0.038	1.66
350	2.3	0.066	2.91
500	3.3	0.095	4.16

Clamping Voltage Of AC Protector

In power systems, it is quite easy to place a modular assembly protector in a convenient mounting location rather than the most effective one, especially in retrofit applications. These components are sometimes bulky and do not always conveniently fit the desired location. To illustrate reduced effectiveness in an ac power transient suppressor, a module was measured for peak clamping voltage having lead lengths of 24 in., 48 in., and 72 in. Pulse currents were 100A, 200A, 300A and 400A with a wave form of 1.2 x 50µsec. Lead length vs additive peak clamping voltage plotted here, is that value above the normal clamping voltage with zero lead length.

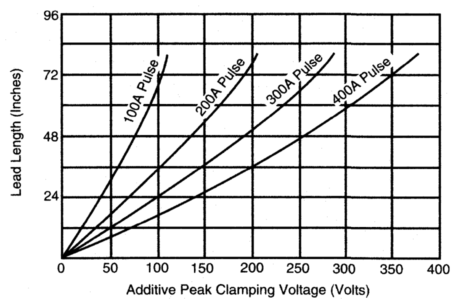


Figure 8

Lead Length vs Clamping Voltage

Note that the additive clamping voltage can be down in the range of 35V at 100A for 24 in. leads extending up to 350V at 400A for 72 in. leads. An oscillograph depicting optimum protection at 100A and 400A is shown in Figure 9. The 100A pulse is being clamped at about 215V and 400A pulse at 265V. The peak clamping voltage is substantially increased by the inductive effects of 72 in. leads as shown in Figure 10. In this oscillograph, the 100A pulse produced a peak of about 320V and 400A pulse produced a peak of about 615V. The inductive overshoot illustrated in Figure 10 is quite profound by comparison with Figure 9.

FIGURE 9

AC Protector, Optimum Protection

Vert: 100V/div.
Horiz: 2µsec/div.

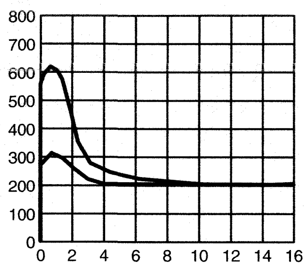


FIGURE 10

AC Protector, 72 in Leads

Vert: 100V/div.
Horiz: 2µsec/div.

Clamping Voltage of Microcircuit Protector

An ICT-5 type Transient Voltage Suppressor, designed for protecting low voltage logic circuits, was pulsed at levels of 100A, 200A, 300A, 400A and 500A with a 1.2 x 50µsec waveform. Voltage drop was measured across the leads at distances of 0.0, 1.0 cm and 2.0 cm from the body of the package, adding a total of 4.0 cm 0.030 dia. straight wire contributing to inductance and subsequently adding to the peak clamping voltage. A graph plotting total lead length vs. peak clamping voltage is shown in Figure 11.

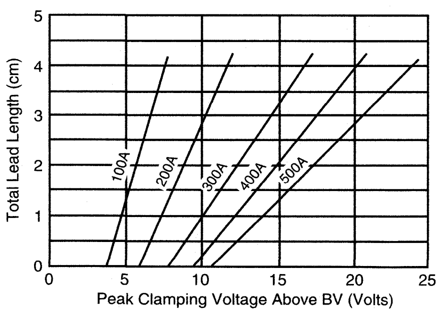


Figure 11

Lead Length vs. Peak Clamping Voltage

These curves are plotted as additive above the breakdown voltage (BV) at lmA, which was 6.3V for the device tested. The clamping voltages increase with pulse current using zero lead length due both to the electrical impedance and thermal self-heating effect on the silicon pn junction. Observe that the clamping voltage covers a very broad range, from 3.6V above BV to 24V above BV depending on peak current and insertion method.

Reducing Inductive Effects

The most obvious method of reducing inductive effects and thus optimizing protector capability is to reduce lead wire lengths in the protector circuit. If it is not possible to reduce the conductor length, other options are available. Inductance in a given length of conductor can be reduced by replacing a small diameter wire with a wide strip conductor. On circuit boards, a ground plane on one or both sides of the board has been used by the author as a method for optimizing protector clamping.

Since voltage drop across the lead length is a function of the transient rise-time, it may be feasible to add series inductance between the transient source and the protector to reduce the risetime and subsequently the peak clamping voltage. A Transient Voltage Suppressor used for 5V logic protection was tested with a 300A pulse having a 1.2 x 50µsec waveform with voltage measurements made at 2.0 cm from each end of the body of the device. This is shown in Figure 12, peaking at 24V. Placing a 12µH choke ahead of the suppressor to reduce the rise-time, reduced the peak to l9V and using 24µH reduced the peak to 17V. These curves are also shown in Figure 12.

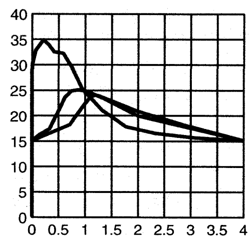


FIGURE 12

AC Protector, 72 in. Leads

Vert: 100V/div.
Horiz: 2µsec/div.

Conclusion

Inductive effects can be, and often are, a source of abnormally high peak clamping voltages compared to the inherent capability of a Transient Voltage Suppressor. These high clamping voltages can cause failure of vulnerable electronic components; thus a suppressor capable of providing adequate protection can be rendered useless due to poor insertion methods. So it behooves the design engineers working on both mechanical layout and circuit design to be acutely aware of inductive effects and the problems which they can cause along with corrective measures in order to optimize transient voltage protector components.

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HARDENING POWER SUPPLIES TO LINE VOLTAGE TRANSIENTS

Originally presented at the Power Electronics Design Conference, October, 1985, Anaheim, California
Also published in Power Conversion & Intelligent Motion, June, 1986

Abstract

The power line transient environment is described. Transient voltages on the DC output of off-line rectifier/filter designs are shown. Protection schemes are discussed. An integrated rectifier/transient suppressor circuit is suggested as a cost-effective means of rendering the DC bus virtually immune to line transients.

Introduction

Unexpected line voltage transients are finally being recognized as a significant factor in the failure of Switching Mode Power Supplies (SMPS). As stated in a recent Navy publication1: "The most predominant power supply failure modes are caused by peak in instantaneous transients and subtle factors within and external to the power supply . . . The following is a list of key points to consider when designing and evaluating a switching-mode power supply design: (1) Put voltage transient protection on the input power line."

Until the publication if IEEE Standard 587-1980[2], now ANSI-IEEE C62.41, the designer of off-line SMPS was unsure of the ac line transient environment. Now switching power supplies can be designed to meet this standard and pulse generators are available which produce the waveform specified. The standard specifies that low impedances across the line in commercial and industrial environments should handle an 8/20 current waveshape (double exponential, 8μs rise time, 20μs decay to half of peak) having a peak amplitude of 3000A.

It should be understood that lightning induced transients propagate through a system as a current source looking for a low impedance path to ground. It is unlikely that most designers make provision for the rectifier and filter system to handle pulse currents up to 3000A, but a conservation design philosophy indicates that this should be done. The task is not easy, because component manufacturers do not generally consider this problem either.

A rectifier diode has a single-cycle 60Hz surge current rating exceeding 300A and would most probably handle toe 300A. 8/20μs impulse specified in the standard, but the capability of rectifiers with lower ratings is questionable and needs to be verified. Rectifier diode surge capability will not be further addressed in this paper but clearly the rectifier must handle surge currents; the amount depends upon the protection scheme used.

In most off-line SMPS, the element which prevents excessive transient voltages from appearing across the DC bus and also bears the brunt of carrying the line to neutral transient pulse current is the filter capacitor. However, the charge delivered by the input transient and the voltage drop across the capacitor's ESL and ESR combine to develop a large overshot voltage. This overshoot usually shorts the power switches connected to the DC output from the rectifier system.

Providing a network to limit voltage to a predetermined maximum rather than using higher voltage power switches offers a number of advantages to the power supply designer, independent of the choice of switching transistor (i.e., bipolar or FET). For a bipolar transistor of a given die area, lowering breakdown voltage raises current gain and reduces all switching times. Reducing the breakdown voltage of a FET chip causes a marked decrease in onstate voltage-the principle determinant of power loss-because of the relationship $r_{DS(on)}$ of $V_B^{2.5}$. Alternately, a smaller size power switch chip could be used to achieve the same performance while realizing a significant cost savings[3].

Conditions In An Unprotected System

Most SMPS have an input network as shown in Figure 1. The impedance is used to limit start-up inrush current without causing excessive power loss. The series impedance may be excessive power loss. The series impedance may be a thermistor or a resistor which is often shunted by a triac to reduce power loss after start-up.

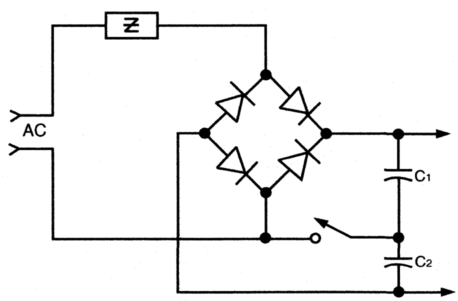

Figure 1

Basic line rectifier & filter for SMPS operating from 120/240V lines

It is not unusual to allow for a 20% tolerance on a 120/240V ac power line which puts the voltage crest at about 400 Volts. Added to the dc level is the overshoot caused by the 3000A impulse. The usual switching power supply which operates from 120/240V inputs has two capacitors as part of the voltage double arrangement. The capacitors are con-

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nected in series when used on 240V. Thus, the total dc bus voltage spikes up to twice the individual capacitor transients when used on 240V.

The voltage waveform of Figure 2 reveals the presence of three components of overshoot: 1) a fast rising step caused the di/dt of the wave flowing through the capacitors ESL, 2) an in-phase component caused by the current flow through capacitor ESL, and 3) a charge placed on the capacitor. Obviously, the transient voltage can be reduced by using a large valued capacitor having low ESL and ESR. The relationship is given in Equation 1.

$$V_C = \frac{I}{C}\ idt + iR_S + L_S\frac{di}{dt} \qquad (1)$$

where

C = input filter capacitance

i = pulse current

R_S = capacitor equivalent series resistance (ESR)

L = capacitor equivalent series inductance (ES)

di/dt = rate of rise of transient current

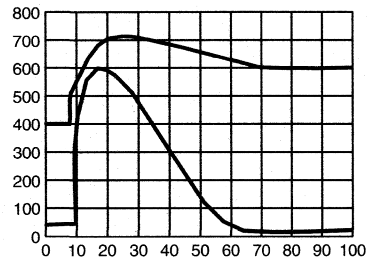

Figure 2

Capacitor waveform showing spike caused by current, and charge placed on capacitor

($C_1 = C_2 = 60\mu F$; Upper: 10V/div; Lower: 100A/div; Time: 10µ/div)

Measured voltage transients for some different capacitors when pulsed with 500A in the circuit of Figure 1 are shown in Table 1. With a 3000A pulse, overshoots of 6 times the values shown would occur. In all cases of 240V input, the transient voltage exceeds the typical 250V surge rating of a 200 volt capacitor. Even worse, the DC bus - possibly at about 400 volts because of high line, low load condition - is now up to at least 560 volts! No wonder power switch failures occur in seemingly well designed systems.

C_1, C_2	Type	Input	Peak Transient Voltage	Charge Voltage
540µF	Mepco/Electra 319DA541T250AMA1	120V	39V	30V
		240V	75V	58V
650µF	Mepco/Electra 3120EA651T200BHA1	120V	33V	23V
		240V	65V	46V
2100µF	General Electric 44A417052M21	120V	12V	7V
		240V	27V	16V

TABLE 1 – Transient performance of the circuit of Figure 1
(Peak Pulse Current = 500A)

The spike could be clipped by a suitable TVS device but the charge voltage persists for too long and is not easily eliminated. The best solution is to minimize the amount of transient current being fed to the capacitor.

Transient Protection Techniques

General principles of powerline transient protection have been described in a paper by Jacobus[4]. Almost concurrently, a specific module designed using these same principles, which meets the 3000A specification of ANSI-IEEE C62.41, was described by Roehr and Clark[5]. Both papers deal with providing transient protection downstream from susceptible equipment. However, in a power supply, components which must be present for rectification and filtering may be used as part of the transient suppression network.

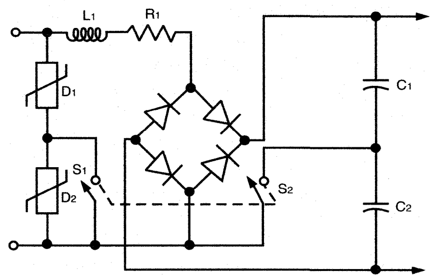

Figure 3

Basic circuit with MOV protection

When transient protection is used in a SMPS, it most often is nothing more than a single MOV across the line as shown in Figure 3. Table 2 shows test results taken in the circuit of Figure 3. Note that the worst transients occur in the 240V position when both switches are open. However, unless the MOV voltage is adjusted to fit the lower line voltage when used on 120V ac, (i.e., S_1 is closed), a very large capacitor current flows. For example, with only .5 ohm impedance the 77 volt spike appears across only one capacitor; with 3000A of input current the spike would increase to 115V which could exceed the surge voltage rating of the capacitor. The 106 volt transient increases to about 150 volts when 3000A is applied, bringing the bus voltage to 550 Volts.

$R_1 = L_1$	Input	S_1	Peak Transient Voltage	Charge Voltage	Peak Capacitor Current
0.5Ω - 0µH	120V	Open	77V	54V	1080A
		Closed	24V	21V	440A
	240V	Open	106V	78V	780A
0.5Ω - 100µH	120V	Closed	18V	10V	190A
	240V	Open	74V	47V	440A
1.0Ω - 100µH	120V	Closed	12V	7V	130A
	240V	Open	53V	34V	300A

TABLE 2 – Transient performance of the circuit of Figure 3
(R_1 = .05Ω, $C_1 = C_2$ = 540µF, Peak Pulse Current = 2000A)

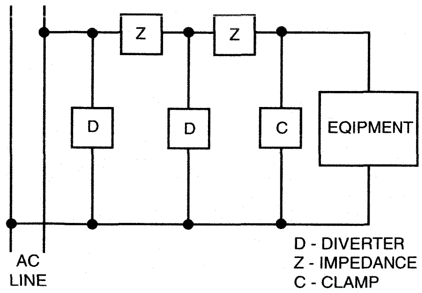

Figure 4

General topology for a protection network

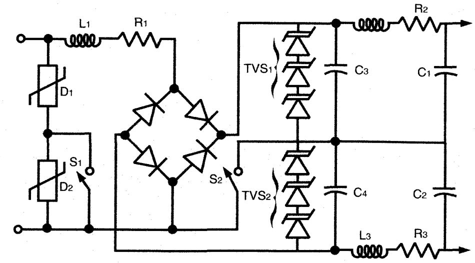

Figure 5

Curcuit providing a high level of protection

To improve the transient suppression, the capacitor and/or the series impedance must be larger. The data in Table 2 taken with higher series impedances shows some improvement in lowering the transient levels, but the transients are still higher than desired. For very low power supplies, the circuit of Figure 3 would be satisfactory, if an appropriate series impedance and capacitor were chosen. For example, the data of Table 1 shows that the 2100µF capacitor allowed only 27V of overshoot with a 500A pulse. This capacitor would be satisfactory if used in Figure 3 with the 0.5 ohm-100µH input network.

A general topology for transient protection is shown in Figure 4 using the notations of Jacobus. The diverter devices handle high currents but do not offer a precise control of voltage; gas tubes and metal oxide varistors (MOVs) are typical elements. The clamp devices have lower impedance than the diverters but have lower energy handling capabilities. A Transient Voltage Suppressor Diode is a typical clamping device. The series impedances shown semi-isolate the various diverter and clamp stages by causing a voltage drop between them. To meet the requirements of ANSI-IEEE C62.41, Category B, and provide low output voltage clamping, the topology of Figure 4 has proven to be quite effective.

An Integrated Rectifier/Suppressor Circuit

After some experimentation, the network of Figure 4 has been found to work quite well when the first diverter is a MOV, the first impedance is composed of the inrush current limiting resistance and an indicator, the second diverter is a silicon Transient Voltage Suppressor and capacitor network. The second impedance is a series R-L circuit, the clamping devices is the filter capacitor.

Figure 5 (patent pending) shows a practical implementation of the circuit of Figure 4, which is virtually immune to transients. The resulting T filter network also attenuates high frequency noise in both directions, thus easing EMI filter requirements. Performance is shown in Table 3 when pulsed with 2500A. The resulting 25V peak transient appearing at the output is low enough to allow the use of 450V rated transistors in the power switching section.

Input	Peak Transient Voltage	Charge Voltage	Peak Capacitor Current
120V	9V	5V	103A
240V	25V	16V	163A

TABLE 3 – *Transient performance of the circuit of Figure 5 (Pulse Current * 2500A, $L_1 = L_2 = L_3 = 100mH$, $R_1 = R_2 = R_3 = 0.5\Omega$ TVS Stack; 5KP60)*

Conclusion

Only by ensuring a clean dc bus can a switching power supply be a reliable piece of equipment. Attention must be given to the lowly line rectifier and filter system to dramatically reduce line voltage transients. The circuit of Figure 5 provides a satisfactory clean dc level.

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Using Rectifiers In Voltage Multiplier Circuits

By Joseph M. Beck
Senior Applications Engineer

Systems designs frequently call for a high voltage, low current power source that needs only minimal regulation. A few familiar examples are CRT circuits, electrostatic copiers, and photoflash applications. Required voltages typically range from 10 to 30kV and the current demand rarely exceeds 5 milliamperes.

When your design requires this type of power source, you may want to consider a voltage multiplier circuit. They are inexpensive, easy to design, versatile, and can provide virtually any output voltage that is an odd or even multiple of the input voltage.

This article explores the basic operation of multiplier circuits and discusses guidelines for electronic component selection. Since General Instrument corporation is the industry's leading manufacturer of rectifier products, we will place special emphasis on selecting rectifier diodes for multiplier circuits.

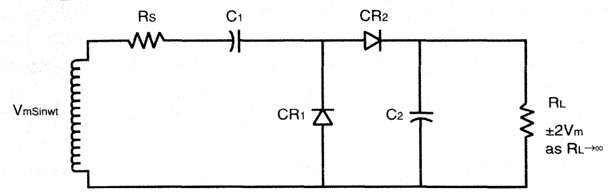


Figure 1A

Basic multiplier circuits. Half-wave Voltage Doubler

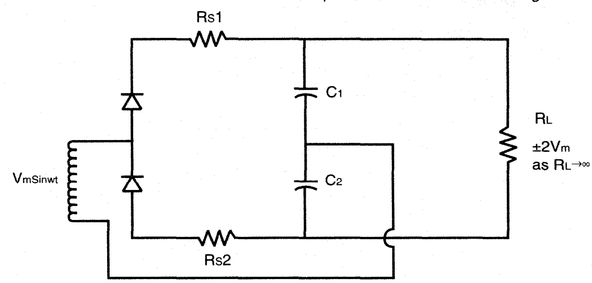


Figure 1B

Basic multiplier circuits. Full-wave Voltage Doubler

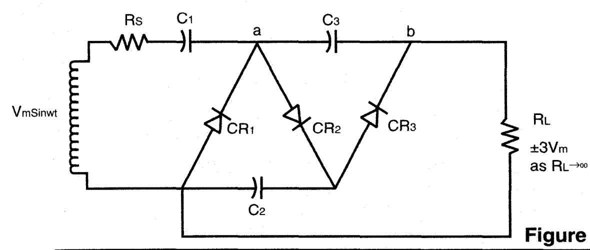


Figure 1C

Basic multiplier circuits. Half-wave Voltage Tripler

BASIC OPERATING PRINCIPLES

Most voltage multiplier circuits, regardless of their topology, consist chiefly of rectifiers and capacitors. Figure 1 shows three basic multiplier circuits.

The operating principle of all three circuits is essentially the same. Capacitors connected in series are charged and discharged on alternate half-cycles of the supply voltage. Rectifiers and additional capacitors are used to force equal voltage increments across each of these series capacitors. The multiplier circuit's output voltage is simply the sum of these series capacitor voltages.

A wide variety of alternating signal inputs are used with multiplier circuits. The most popular are sine and square wave inputs. For simplicity, this discussion will be limited to sine wave inputs; the calculations become somewhat more involved with asymmetrical signals.

Voltage Doublers - Figure 1A shows a half-wave voltage doubler circuit. It functions as follows. On the negative half-cycle of the input voltage, capacitor C1 charges, through rectifier CR1, to a voltage of Vm. On the positive half-cycle, the input voltage, in series with the voltage of C1 (Vc1=Vm), charges capacitor C2 through rectifier CR2 to the desired output voltage of 2Vm. Capacitor C1, which aides in the charging of a

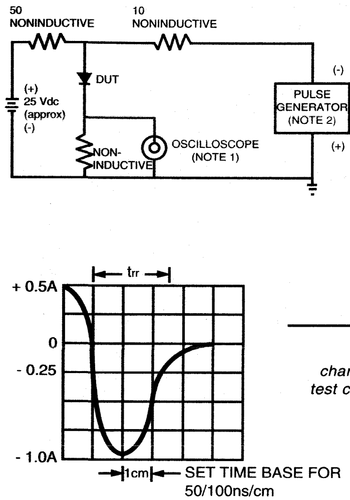


Figure 2

Reverse recovery time characteristic and test circuit diagram

capacitor C2, sees alternating current ("AC Cap") while C2 sees only direct current ("DC Cap"). In this circuit, the output voltage and the input signal have the same ripple frequency.

The same operating principle extends to the full-wave voltage doubler circuit of Figure 1B. On the negative half-cycle of the input voltage, capacitor C2 is charged through rectifier CR2 to a voltage of Vm. On the positive half-cycle, capacitor C1 is also charged to a voltage of Vm, through rectifier CR1. The series voltages of capacitors C1 and C2 (VC1=Vc2=Vm) yield the desired output voltage: 2Vm. In this case, capacitors C1 and C2 are "DC capacitors"; they see no alternating current. The output ripple frequency of the full-wave doubler is twice that of the input signal.

Voltage Tripler - Higher output voltages are possible through the use of a half-wave voltage tripler circuit, shown in Figure 1C. This circuit operates as follows. On the negative half-cycle of the input voltage, capacitor C1 charges through rectifier CR1 to a voltage of Vm. On the positive half-cycle, the input voltage, in series with the stored voltage on C1 (Vc1=Vm), charges capacitor C2 through rectifier CR2 to a voltage of 2Vm. On the next negative half-cycle, the charge on C1 is replenished. At the same time, the input voltage, in series with the stored voltage on C2 (Vc2=2Vm), charges capacitor C3 through CR3 to a voltage of 2Vm (Vc3=Vb-Va =(Vm+Vc2)-Vc1=2Vm). Vc1 and Vc3, in series, provide the output voltage of 3Vm. In this case, the output ripple frequency is equal to that of the input signal.

Although half-wave and full-wave multiplier circuits can provide equivalent output voltages, there are some fundamental differences that should be considered. First, the full-wave circuit has the advantage of higher output ripple frequency (twice that of the half-wave circuit). In addition, the full-wave circuit provides better voltage regulation than the half-wave circuit, since the latter relies upon one capacitor (C1 in Figure 1A) to provide the charging energy to a single DC load capacitor (C2 in Figure 1A). The full-wave circuit, however, requires that the secondary side of the transformer be capable of withstanding high voltages (approximately 1/2 of the output voltage). For this reason, the half-wave multiplier is usually the preferred circuit when high voltage outputs (Vo=kilovolts) are required.

DESIGN GUIDELINES

Capacitor selection - The size of capacitors used in multiplier circuits is directly proportional to the frequency of the input signal. Capacitors used in off-line, 60Hz applications are usually in the range of 1.0 to 200µF while those used in higher frequency applications, say 10kHz, are typically in the range of .02 to .06µF. In practice, it is usually easier, and less costly, to use the same large capacitance value for all capacitors, both "AC" and "DC" type. The overall capacitive reactance of the circuit must be considered, however, to determine the largest permissible value.

The voltage rating of capacitors is determined solely by the type of multiplier circuit. In the half-wave doubler circuit of Figure 1A, C4 must be capable of withstanding a maximum voltage of Vm, while C2 must withstand a voltage of 2Vm. In the full-wave doubler circuit of Figure 1B, both C1 and C2 must withstand voltages of Vm. The half-wave voltage tripler of Figure 1C requires C1 to withstand a voltage of Vm, and both C2 and C3 to withstand voltages of 2Vm. A good rule of thumb is to select capacitors whose voltage rating is approximately twice that of the actual peak applied voltage. For example, a capacitor which will see a peak voltage of 2Vm should have a voltage rating of approximately 4Vm.

RECTIFIER DIODE SELECTION

Several basic device parameters should be considered:

Repetitive Peak Reverse Voltage (V_{RRM}) - Repetitive peak reverse voltage is the maximum allowable instantaneous value of reverse voltage across the rectifier diode. Applied reverse voltages below this maximum value will produce only negligible leakage currents through the device. Voltages in excess of this maximum value, however, can cause circuit malfunction —and even permanent component damage — because significant reverse currents will flow through the device. For example, General Instrument's GP02-40 rectifier diode has a peak reverse voltage rating (V_{RRM}) of 4,000 Volts, maximum. Applied reverse voltages of 4kV or less will produce a maximum reverse leakage current, I_R, of 5 microamperes through the device when operated at room temperature (25°C). In most cases, this leakage current is considered negligible, and the device is said to be completely blocking ($I_R=0$).

In the case of the three circuits of Figure 1, the maximum reverse voltage seen by each rectifier diode is 2Vm. So devices must be selected with reverse voltage (V_{RRM}) ratings of at least 2Vm.

Reverse Recovery Time (t_{rr}) - In general terms, reverse recovery time is a measure of the time needed for a rectifier diode to reach a state of complete blocking ($I_R=0$) upon the application of a reverse bias. Ideally, this time should be zero. In reality, however, there's a finite period of time in which a stored charge at the diode junction must be "swept away" before the device can enter its blocking mode. This stored charge is directly related to the amount of forward current flowing through the device just prior to the application of the reverse bias. Fortunately, since operating currents are very low in multiplier circuits, reverse recovery times are kept to a minimum. Nevertheless, trr plays an important role in multiplier design.

When selecting rectifier diodes, the frequency of the input signal to the multiplier network must be considered. For symmetrical signal inputs, the device chosen must be capable of switching at speeds faster than the rise and fall times of the input. If the reverse recovery time of the rectifier is too long, the efficiency and regulation of the circuit will suffer. In the worst case, insufficient recovery speeds will result in excessive device heating, as reverse power losses in the rectifier become significant. Continued operation in this mode usually results in permanent damage to the device.

The reverse recover time (t_{rr}) specification is very dependent upon the circuit and the conditions being used to make the measurement. Several industry standard trr test circuits exist (Figure 2 is the test circuit used for the GP02-40). Therefore, it's very important to note which test circuit is being referenced, as the same device may measure differently on different test circuits. Furthermore, the trr specification should be used for qualitative, not quantitative purposes, since conditions specified for trr measurement rarely reflect those found in actual "real life" circuit operation. The trr specification is most valuable when comparing two or more devices that are measured on the same circuit, under the same conditions.

Figure 3 shows the relationship between forward current and trr in the GPO2-40. As you can see, decreasing current flow in the multiplier circuit makes it possible to use higher input frequencies. An increase in current flow has the opposite effect. Ideally, the multiplier network load should draw no current.

Peak forward Surge Current (I_{FSM}) - A peak forward surge current rating is given for most rectifier diodes. Most often, this rating corresponds to the maximum peak value of a single half- sine wave (50 or 60Hz) which, when superimposed upon the devices rated load current (JEDEC method), can be conducted, without damage by the rectifier. This rating becomes important when considering the large capacitance associated with multiplier circuitry.

Surge currents can develop in multiplier circuits, due to capacitive loading effects. The large step-up turns ratio between primary and secondary of most high voltage transformers causes the first multiplier capacitor (C1, secondary side) to be reflected as a much larger capacitance into the primary. For example, a transformer with a turns ratio of 25 will cause a 1.0μF capacitance to be reflected into the primary circuitry as a capacitance of (1.0)(25)μF, or 625μF. At circuit turn-on, large currents will be developed in the primary side as this effective capacitance begins charging.

On the secondary side, significant surge currents can flow through the rectifiers during initial

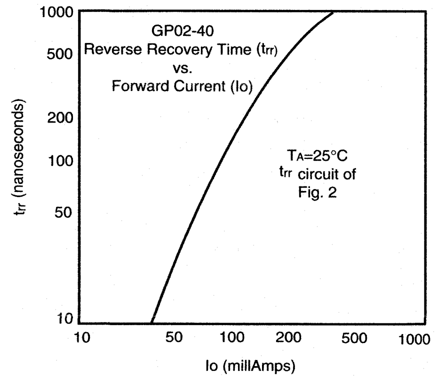


Figure 3

T_{rr} as a function of forward current

capacitor charging at turn-on. The addition of a series resistance (Rs in Figure 1) can greatly reduce these current surges, as well as those in the primary circuitry. For example, the GPO2-40 has a forward surge rating, I_{FSM}, of 15 amperes. Considering a maximum secondary voltage of 260 V_{RMS}, 60Hz, the calculation of Rs is as follows:

$$RS \square\, Vpeak/Ifsm \quad eq.1$$
$$RS \square\, (1.41)(260)/15$$
$$RS \square\, 24.4\ ohm$$

Other Parameters - Of lesser significance are the forward current rating, I_O, and maximum forward voltage, V_F.

Forward current, Io - As stated earlier, in the ideal multiplier configuration the load will draw no current. Ideally, the only significant current flow through the rectifiers occurs during capacitor charging. Therefore, devices with very low current ratings (hundreds of milliamperes) can be used. It must be noted, however, that the forward current and forward surge current ratings are related, since both are a function of silicon die area. Generally speaking, devices with a high surge current rating, I_{FSM}, will also have a high forward current, I_O, rating, and vice versa.

Forward Voltage, V_F - In practice, the forward voltage drop, V_F, of the rectifiers does not have a significant effect on the multiplier network's overall efficiency. For instance, the GP02-40 has a typical forward drop of 2.0 Volts when measured at a current of 100 milliamperes. A half-wave doubler with an 8kV output will have less than 0.05 percent (2 x 2V/8kV) loss in efficiency due to the forward voltage drops.

HIGHER ORDER CASCADE MULTIPLIER

Still higher voltages are possible by using the cascade multiplier circuit shown in Figure 4. The output voltage is calculated as:

$$Vo = (n)(Vm),\ as\ IL \text{ -- } 0 \qquad eq.2$$

where n=number of capacitors, or diodes, assuming equal value capacitors, ideal diodes and symmetrical signal input.

In theory, one can obtain any incremental output voltage increasing the value of n. In practice, however, voltage regulation and efficiency become increasingly poor as n increases. The potential for voltage arcing must also be considered as the value of n increases, and when higher output voltages are required. Careful mechanical design can minimize arcing, to a large extent.

From a pure circuits standpoint, voltage multipliers are relatively easy to design. The selection of circuit components, however, is one facet of the "overall design" that should not be taken for granted or trivialized. Careful consideration of all component parameters is the only way to ensure both reliable and predictable circuit performance. Put another way, ideal circuits require ideal circuit components.

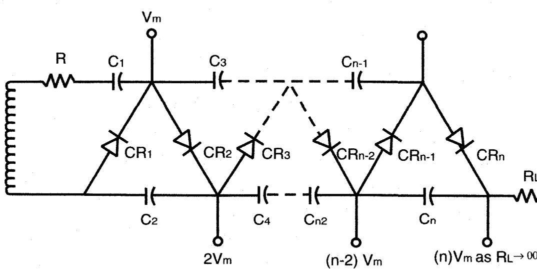


Figure 4

Cascade multiplier

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

Premium Automotive Overvoltage Protection

Jon Schleisner, Senior Applications Engineer

General Instrument PSD has developed a TVS style transient voltage suppressor specifically for automotive applications. As we approach the twenty first century, automotive electrical systems are becoming;

-More complex
-Increasingly vital to vehicle operation
-A larger percentage of manufacturing and replacement cost.

To protect this principle automotive system General Instrument PSD has developed the 6KA24 "load dump" rectifier.

The 6KA component offers superior performance compared to the standard 5KP series and the leaded button rectifier several manufactures supply for this application. The features include:

- Enhanced power handling capability. With a 10x1000µs power rating of 6500 watts and 2000 watt rating on a 50ms. to 1/2 Ipp surge the 6KA24 is among the most rugged automotive TVS devices.

- Superior clamping performance, Fig.1 displays the very low impedance and resultant tight clamping characteristics. This implies more protection of the dollar invested.

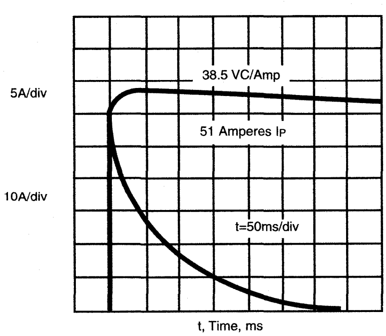


Figure 1

- Excellent high temperature reverse leakage characteristics (see Fig. 2). This TVS component has a 180°C upper temperature limit.

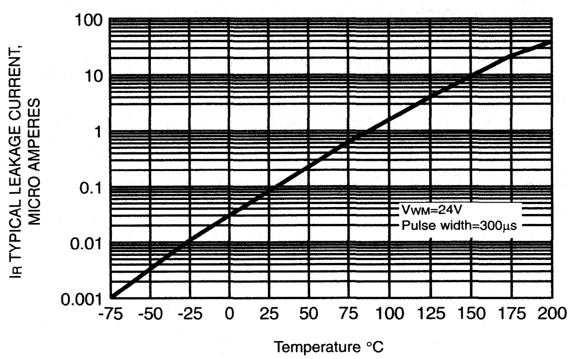


Figure 2

- Specified to withstand "double battery" and "load dump" conditions.

- Exclusive PAR chip design for Superior Reliability performance.

The PAR (Passivated Anisotropric etched Rectifier) has two physical characteristics that help realize superior " under the hood" performance.

1. The junction allows for very uniform current density across the surface area of the die. This results in minimum "hot spots" across the chip. Uniform surface area temperature results in efficient use of the available die area.

(cont.)

2. The passivation is a grown oxide. This oxide has thermal properties similar to silicon. The benefit here is excellent thermal cycling characteristics. Figure 3 is composite reliability summary of the 6KA24.

LIFE AND ENVIRONMENT TEST SUMMARY

6KA24 TVS	QUALIFICATION DATA	
LIFE TESTS	**F/T**	**N**
(1000 HRS) **STORAGE: 200°C**	0/45	0/45
(1000 HRS) **HTRB: 175°C Tj/RATED BIAS**	0/45	0/45
(1000 HRS) **HUMIDITY: 85°CC/85% R.H.**		
121°C, 15 PSI **AUTOCLAVE: 24 HOURS**		0/45
SOLDER DIP: 260°C/10 SEC.		0/45
(JEDEC SPEC) **FORWARD SURGE: 400 AMPS**		0/45
TEMP CYCLE: 1000 CYCLES -55°C to +200°C/30 MIN.		0/45

F/T=Number of fails per thousand device hours.
N=Number of units tested.

The 6KA TVS is an ideal product to protect automotive electrical systems from automotive "load dump" transients and other unexpected surges within the electrical system. A typical applications circuit including a GP30 for reverse battery protection is shown in Figure 4.

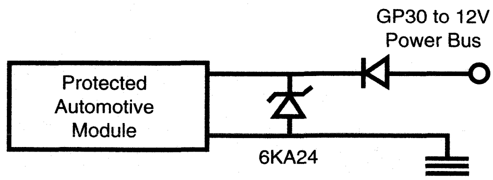


Figure 4

Typical application circuit

HIGH SPEED DATA LINE PROTECTION

Low Current Bridges Rectifiers Lend Themselves to Data Line Protection

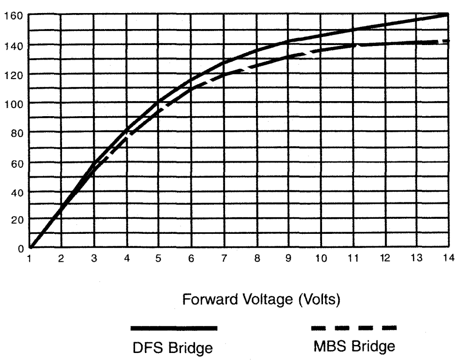
Jon Schleisner, Senior Applications Engineer

Local Area Network (LAN) data lines require protection against direct and induced transient over voltages on the lines. Protecting these lines and the associated network is not a trivial task. The power range is somewhere between static discharge (very low power) and lightening protection which is at the other end of the spectrum (high power).

Power handling capability is only one aspect of the design. The designer must take care not to "load down" the line with a highly capacitive TVS or R/C network. As data rates go beyond 50mb. it is not possible to use a TVS unit with capacitance above 100-200 pf. Most standard TVS devices have zero Volt capacitance values greater that 500pf. To make matters worse, the lower voltage TVS units have higher capacitance values than their higher voltage counterparts. Enter the steering diode bridge.

PSD offers two surface mount bridge rectifiers. These components are ideal for use in protection circuits where power handling, capacitive loading and cost are all design considerations. These are the 1 amp. bridge (DF01S) the smaller 1/2 amp (MB1S) SMD bridge rectifiers. Each diode within the 1 amp part has a zero volt capacitance of 50 pf. the 1/2 bridge has a junction capacitance of about 30 pf. These components can be configured with TVS components (such as an SMBJ12) to form a high performance, low capacitance network capable of outstanding data line protection in LAN and other

Forward Current vs Forward Voltage



similar applications where data lines are exposed to transient surges beyond the scope of static discharge. Since each bridge contains for diodes each component can protect 2 independent lines.

Graph #1 shows the forward voltage drop of the 1 and 1/2 amp bridge when configured as shown in Fig.1. The surge can be applied in either polarity and to either input individually or simutaneously.

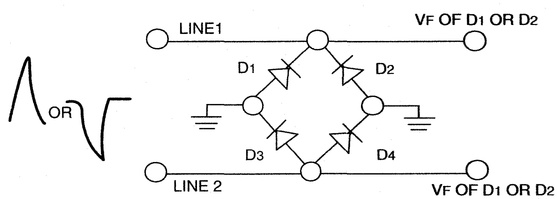


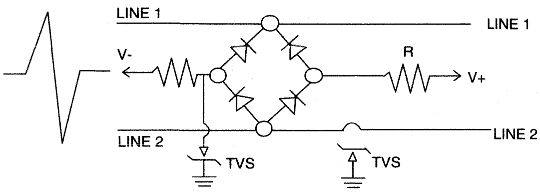
Figure 1

These small components are capable of handling 120 (MBS) and 160 (DFS) amps. on the industry standard 10*1000 current waveform. This is the same waveform that is used to test the axial and surface mount TVS components as seen in the PSD data book. For the MB1S the maximum Vf encountered at 120 amps is 7 Volts hence, it is possible to use the 100 volt version of either bridge in this application without fear of reliability issues caused by reverse breakdown of the diodes within the bridge during surge events.

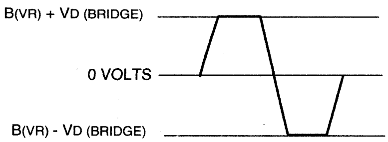
The different Steering diode / TVS configurations are illustrated in fig. 2 through 6.

Figure 2 shows the classic symmetrical bidirectional protector. TVS units are utilized to provide clamping protection for both positive and negative going transients. The "turn on threshold" of the network is specified by the BVR of the TVS unit selected plus the forward voltage drop of the rectifier diode junction within the bridge being utilized. Because the currents encountered can vary between below 1 ampere and higher than 100 amps. the forward voltage drop of the bridge may vary between.6 volts and 7 volts.

Incoming Transient



Protection Action



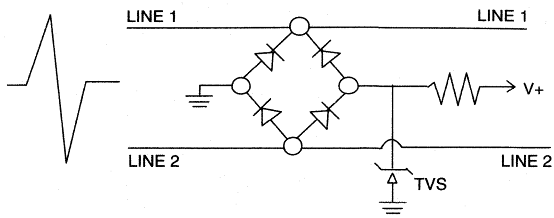
THE SURGE CAN BE APPLIED TO EITHER LINE OR BOTH. +B(VR) AND -B(VR) ARE ADJUSTED VIA TVS PARTS SELECTION.

Figure 2

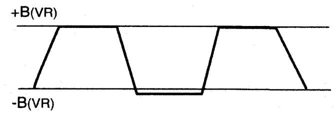
Fig. 3 is a configuration designed to provide a-symmetrical bi-polar protection, that is, the diode drop of 1 volt is observed for negative going transients and the Bvr of the selected TVS provides the turn on characteristic for a positive going surge. This is a common configuration when protecting the input stages of transceiver IC's that are powered by ground and B+ and no negative power rail is utilized. The configuration can be reversed to provide the same style of surge suppression with a negative power source.

Both Fig 2 and 3 have a resistor designated "R" going to either V+ or V-. These resistors can be any low power chip resistor in the 50 K or above range. They are optional. The purpose of these resistors is to provide a low current forcing the TVS into the avalanche mode causing the impedance at this node to be low. This reduces crosstalk and maintains a reasonable voltage across the steering diodes minimizing the diode junction capacitance and assuring minimum circuit loading.

Incoming Transient



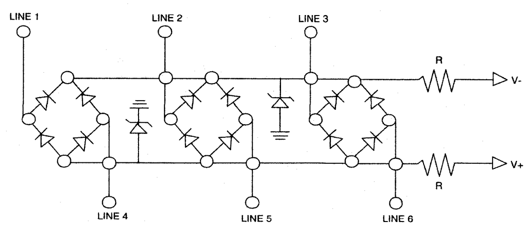
Protection Action



THE CLAMPING VOLTAGE BECOMES:
B(VR) (TVS) + 2 VF (BRIDGE) = VC

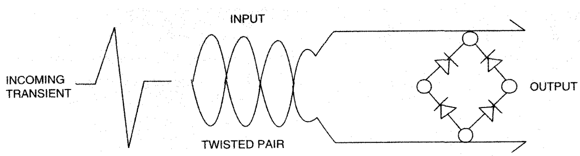
Figure 3

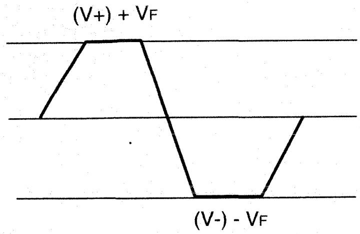
Fig. 4 graphically shows how multiple SMD bridge rectifiers can be used in conjunction with one or two TVS units in order to protect multiple line applications. Note that the cost of the TVS units then becomes amortized over the number of lines tied into it. In significant volumes it is possible to protect multiple data lines to a legitimate 600 watt (on the 10*1000 waveform) level at a cost far less than an individual TVS per line. And all the while the data lines are being loaded with less than 50 pf. capacitance.



Multiple line protection can be implemented by tying several bridges into one set of TVS's. For single supply systems, one TVS can be eliminated and that node connected to ground.

Figure 4

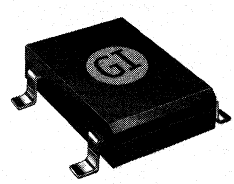




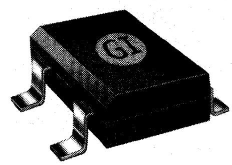
CLAMPING OCCURS AT
V+ (OR V-) +/- VF (BRIDGE)

Figure 5

Fig. 5 shows an alternate method of using a SMD bridge to provide effective low loss protection for "twisted pair" arrangements.



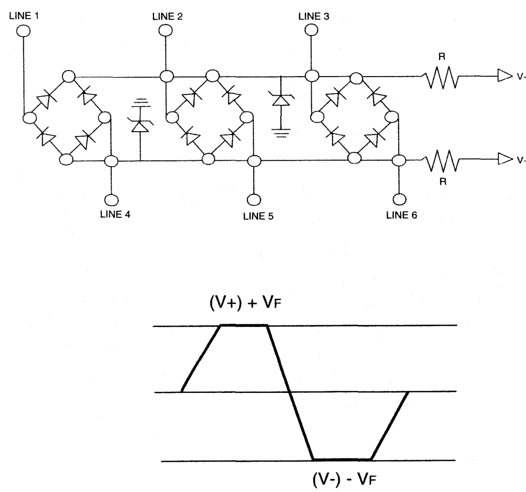
DFS



MBS

Fig. 6 demonstrates a method of using the bridge rectifier arrangement to protect transceiver I/O ports by "steering" the transient overvoltages to either power supply rail or a single rail and ground. It is important to remember good "house keeping" when employing this topology ie; low inductance capacitors should bypass the power supply rails close to the circuitry being protected. If these rules are not followed the leading edge of any steep rise time transient will not be absorbed by the power supply. This will result in higher "let through" voltages and less effective protection.

The resultant performance of any of these circuits is severely influenced by parasitic elements in the circuit. Robust low impedance ground planes and simple PCB traces are essential. Series inductance in the PCB traces or grounding scheme will cause higher than expected let though voltage on fast rising transients. How fast is fast? and how much let through voltage is excessive? That will depend on the components you are protecting.



CLAMPING OCCURS AT
V+ (OR V-) +/- VF (BRIDGE)

Figure 6

ESD PROTECTION IN THE NINETIES

I/O PORT DESIGNERS LOOK TO PROTECT AGAINST ESD THREATS

By Jon Schleisner, Senior Applications Engineer

As we approach the year 2000, reliability has become an essential component of any communication and data management system. In some regions of the global marketplace these reliability standards are government imposed. This is particularly true in Europe where the IEC (International Electrotechnical Commission) is very influential. North America has Canadian Standards Association and Underwriters Laboratories. However, from the standpoint of stringency, Europe leads the way. Most of the time, system reliability is demanded by the consumer. Communication and data management systems are the backbone of modern business and down time costs money.

Whether government imposed or customer demanded, reliability (and perceived quality) are here to stay. Enter the ESD protection of data ports. P.C.'s, printers and LAN's all have one thing in common. Each one must interface with other existing hardware in order to perform their required tasks. The designers of P.C.'s, printers, LAN hubs, data entry terminals and "black box interfaces" all face a common problem; ESD surge events at the interface from the outside world. These surges must be dealt with in an efficient and cost effective manner.

General Instrument, Power Semiconductor Division offers several TVS Array solutions. The traditional method of protecting data ports against ESD is to use RC filters or individual Zener diode clamps to limit the voltage excursions at the data port to safe levels. These are levels that will not damage the transceiver chips or cause latch up and require system restart to recover the data port. Filters and zener clamps are effective solutions, but often prove expensive from both a cost and board real estate point of view. By contrast, the TVS Array solution is an extremely cost effective solution and the footprint of the device (in SOIC form) is extremely compact. This package style is small enough to fit comfortably on the rear of a printed circuit board between the input connector shell and the associated transceiver circuit.

Measuring the performance of ESD protection devices is an arduous task. Due to the extremely fast rise time (on the order of 10kv/ns) recording these events requires sophisticated (and expensive) test equipment. In this case, the test pulse was applied with the KeyTek minizap model MZ15/EC with TPC-2 tip. The events were recorded with a Tektronics SCD1000 transient waveform recorder.
This scope has the capability of performing ultra high speed differential measurements and storing the information. The difficult part of the measurement is developing a test fixture that will support the SMD component and allow a reasonably clean, high speed measurement.

The test fixture breaks with tradition as it mounts directly on the front panel inputs of the scope. The internal 50 ohm impedance of the scope is used in conjunction with 1ΩK low inductance carbon resistors to form wide band attenuators between the scope and the test fixture interface. The attenuation factor is 21:1.

Figure 1 shows the test fixture. The attenuators are mounted directly on the double sided printed circuit board which supports the DUT. 1KΩ resistors (hand matched to .25% of each other) are mounted directly on the chassis mount male BNC connectors. The other end of the resistors have small copper alligator clips attached to provide measurement points. Schematic 1 shows the measurement circuit. The purpose of the differential measurement technique is to provide noise cancellation across the ground plane.

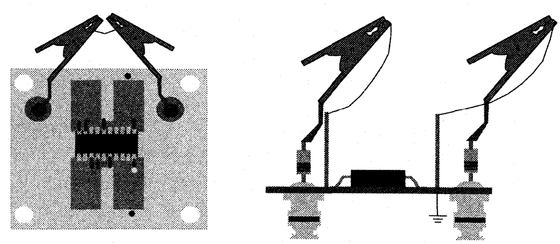
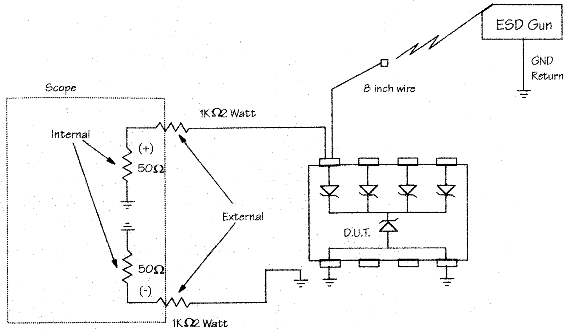
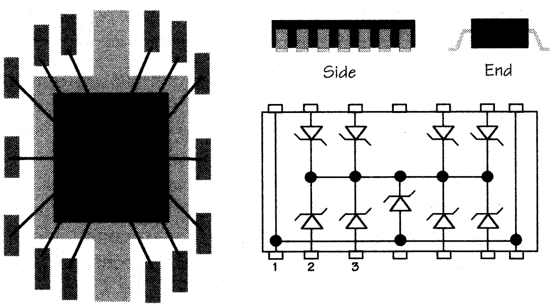


Figure 1



Schematic 1

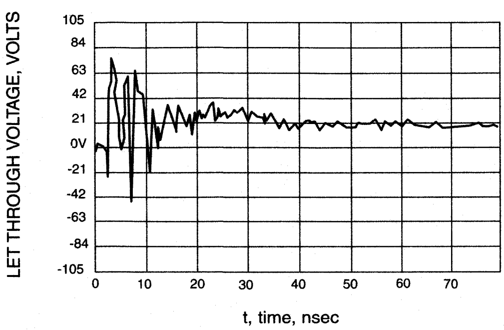


Schematic 2

The ESD pulse is supplied via the KeyTek minizap gun with direct application via an 8 inch jumper wire. The wire is necessary to reduce the residual noise level around the scope and prevent false triggering. This is a symmetrical bi-directional array (SMDA15C-8) utilizing the circuit shown in Schematic 2. Figure 2 shows the response of the array with an 8kV spike allied to pin 2. Figure 3 shows the response to an 8 kV spike in the negative direction.

SMDA 15C-8

Typical Response to 8KV Positive Going ESD Pulse



The initial leading edge of the pulse shows the "let thru" voltage due to the inductance in the circuit board and internal wire bonds in the package. This settles out after roughly 20 ns and the array can be seen to clamp at 18 Volts. The measured "let thru" voltage is less than 100 Volts in either direction. In a perfect world, the voltage peak would not exceed the 18 volt clamping level but circuit board and packaging limitations cause the initial "let thru" voltages. The energy level during the "let thru" period of the waveform is very low and delivers minimal stress to the protected port. It is possible to design a protector with almost zero "let thru". However this would require "kelvin" (or 4 point) connections to each signal line node. This would mean that an eight line package could protect only 2 lines. This would result in a very expensive solution that few engineers could afford to design in.

SMDA 15C-8

Typical Response to 8KV Negative Going ESD Pulse

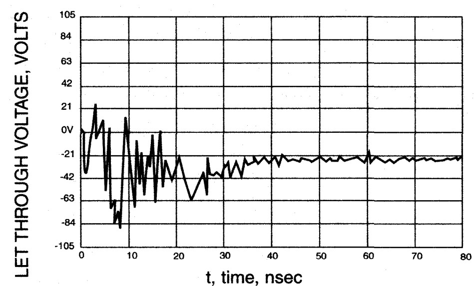
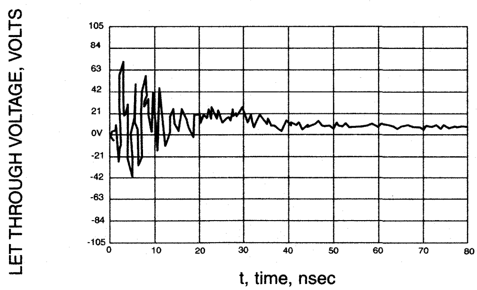


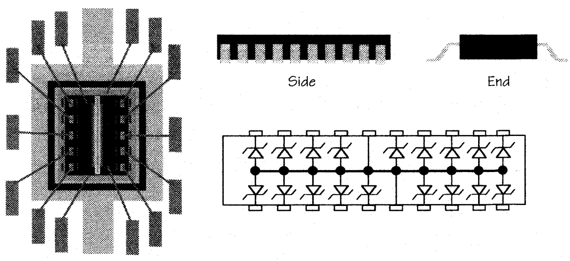
Figure 3

Figure 4 shows the response of the SMDA05-18 array. This is an asymmetrical bi-directional array (the circuit is seen in Schematic 3). The part can be seen to clamp at 9 volts on the positive going ESD pulse. Figure 5 shows the response to a negative going 8kV ESD pulse. The part can be seen clamping at approximately negative 1 Volt.

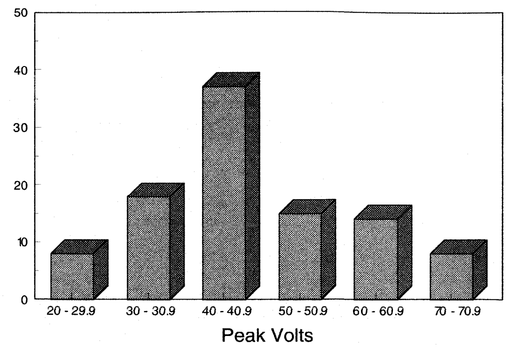
SMDA 05-18

Typical Response to 8KV Positive Going ESD Pulse





Schematic 3



Graph 1

SMDA 05-18
Typical Response to 8KV Negative Going ESD Pulse

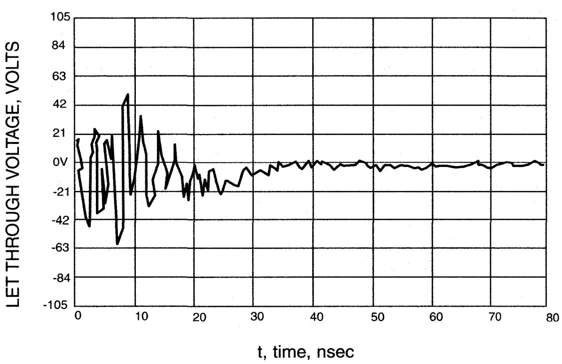
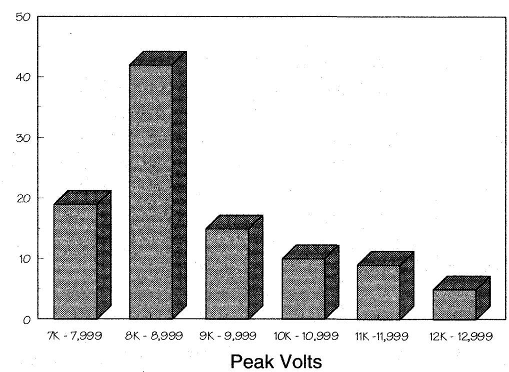


Figure 5

While these pictures are interesting, they deliver only implied proof that TVS Array devices provide protection against ESD pulses. For a more conclusive demonstration it is necessary to use the array devices in a circuit protecting an ESD sensitive component. At General Instrument's Power Semiconductor Division, we have access to a substantial store of small geometry power MOSFETs in TO-92 cases. The part number of this MOSFET was PM802L, this is an 80 volt part with 3 ohms "on resistance" and a low gate turn-on threshold. These MOS devices proved to be an ideal candidate for an ESD "stress to failure" test. All ESD test pulses were delivered by the KeyTek minizap gun. Graph 1 provides data on a 100 piece sample. The voltages indicated are the voltages the devices <u>last survived</u>. This first group of 100 pieces were tested without any protection devices in place. They were soldered onto printed circuit board ground planes with the source and drain tied to ground and the gate floating. It can be seen in Graph 1, that the devices all failed below 100V. This made these particular MOSFETS an ideal candidate to test the functional effectiveness of the TVS Array.

The second set of 100 pieces were soldered onto test boards with the source and drain connected to the ground plane and the gate attached to one input line on the SMDA12C-8. The same procedure was used stepping 20 volts at a time. At the 100V level, it was observed that all 100 devices had survived. The incremental level was then increased in 500V steps. The results appear on Graph 2, which show MOSFETs gate rupture at a minimum of 7.5 kV and a maximum of 12.0 kV. This is outstanding ESD immunity.



Graph 2

Certainly the TVS Array product provides greatly enhanced ESD performances verses the unprotected FETs. One of the critical parameters influencing the effectiveness of TVS Arrays, or other protection technologies, is placement. Inductance on the ground return circuit will dramatically decrease the TVS performance against ESD. The extremely fast rise times observed during ESD events make proper suppressor placement a necessity not an elegant option. Please see QuikNote Series No. 105 for more details on array placement.

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QUIKNOTES™

WHAT IS A SILICON TRANSIENT VOLTAGE SUPPRESSOR? AND HOW DOES IT WORK?

by Bruce Hartwig, Senior Automotive Applications Engineer

Transient Voltage Suppressors (TVS's) are devices used to protect vulnerable circuits from electrical overstress such as that caused by electrostatic discharge, inductive load switching and induced lightning. Within the TVS, damaging voltage spikes are limited by clamping or avalanche action of a rugged silicon pn junction which reduces the amplitude of the transient to a nondestructive level.

In a circuit, the TVS should be "invisible" until a transient appears. Electrical parameters such as breakdown voltage ($V_{(BR)}$), standby (leakage) current (I_D), and capacitance should have no effect on normal circuit performance.

The TVS breakdown voltage is usually 10% above the reverse standoff voltage (V_R), which approximates the circuit operating voltage to limit standby current and to allow for variations in $V_{(BR)}$ caused by the temperature coefficient of the TVS. When a transient occurs, the TVS clamps instantly to limit the spike voltage to a safe level, called the clamping voltage (V_C), while conducting potentially damaging current away from the protected component.

Fig. 1

Transients of several thousand Volts can be 'clamped' to a safe level by the TVS

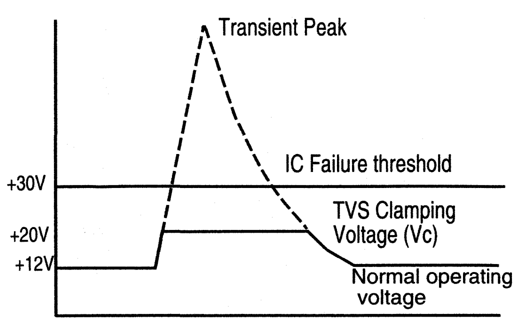
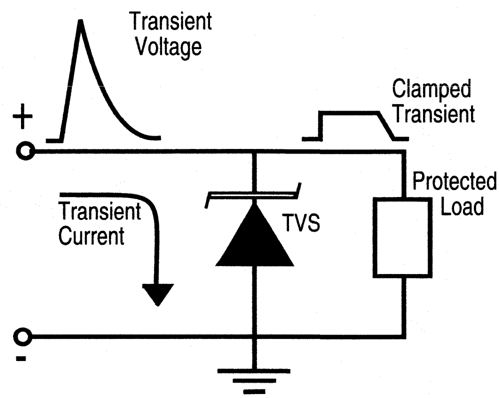


Fig. 2

Transient current is diverted to ground through TVS; the voltage seen by the protected load is limited to the clamping voltage level of the TVS



TVS's are designed, specified and tested for transient voltage protection, while a zener diode is designed and specified for voltage regulation. For transient protection, the designer's choice is a TVS.

The surge power and surge current capability of the TVS are proportional to its junction area. Surge ratings for silicon TVS families are normally specified in kilowatts of peak pulse power (P_{PP}) during a given waveform. Early devices were specified with a 10/1000µs waveform (10µs rise to peak and 1000µs exponential decay to one half peak), while more recent product introductions are rated for an 8/20µs test waveform. Power ratings range from 5KW for 10/1000µs, down to 400W for 8/20µs. This power is derived from the product of the peak voltage across the TVS and the peak current conducted through the device.

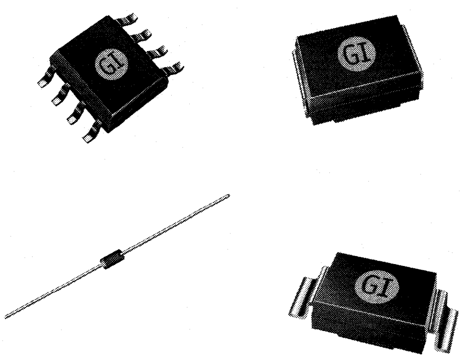
(continued)

WHAT IS A SILICON TRANSIENT VOLTAGE SUPPRESSOR? AND HOW DOES IT WORK? (cont'd)

Packaging covers a broad spectrum according the need. Discrete axial leaded components are available in peak pulse power ratings of 400W, 500W, 600W, 1.5KW and 5KW. The higher power devices are most frequently used across power buses.

Fig. 3

Transient Voltage Suppressors are offered in axial, surface mount and array packages



For lower power, high density applications, suppressor arrays are available in both DIP and small outline surface mount configurations. Arrays are normally used across data lines for protecting I/O ports from static discharge. Specialized low capacitance TVSs are available for use in high data rate circuits to prevent signal attenuation.

TVSs have circuit operating voltages available in increments from 5V up through 376V for some types. Because of the broad range of voltages and power ratings available, (as well as the universal presence of transient voltages) TVSs are used in a remarkably wide variety of circuits and applications.

Integrated circuits normally feature on-chip protection which is usually provided by internal resistor- diode networks or SCR's. There is insufficient space on a microchip to provide more than minimal protection, so the higher power, external protection of a TVS should be added in those applications where damaging transient voltage threats exist.

The loss to U.S. industry due to transient voltages exceeds $10 billion per year. TVS devices are an important part of the solution.

DETERMINING CLAMPING VOLTAGE LEVELS FOR A BROAD RANGE OF PULSE CURRENTS

Bruce Hartwig, Senior Automotive Applications Engineer

In Transient Voltage Suppressor (TVS) data sheets, all clamping voltage (V_C) levels are specified at maximum rated peak pulse current (I_{PP}). How do you interpolate the V_C levels for transient currents (I_P) other than the rated maximum?

This figure is easily calculated using the parameters on the data sheet with the formula:

$$V_C = (I_P/I_{PP})(V_C \text{ max.} - V_{(BR)} \text{ max.}) + V_{(BR)} \text{ max.}$$

Where: I_P = *test pulse current*
I_{PP} = *max rated pulse current*
V_C *max.* = *maximum specified clamping voltage*
$V_{(BR)}$ *max.* = *upper limit of breakdown voltage*

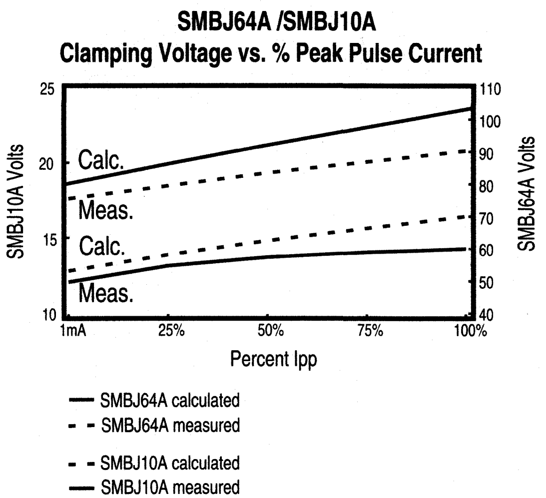
This calculation assumes a linear increase in V_C between $V_{(BR)}$ and V_C max, which is realistic. Figure 1 illustrates the ΔV_C vs ΔI_P relationship for two voltage levels, 10V and 64V, in the SMB 600W series between $V_{(BR)}$ and V_C as determined by this formula. Results are linear as expected. $V_{(BR)}$ max is used in this calculation as it is the upper limit of specified breakdown voltage.

In those instances where $V_{(BR)}$ max is not given on the data sheet, it can be closely approximated. For "A" suffix parts, multiply the minimum $V_{(BR)}$ by 1.11 and for non-suffix parts, multiply by 1.22 to obtain the maximum $V_{(BR)}$.

The curves derived from measured data are compared with calculated values in Fig. 1. Surge tests were performed for a 30 piece sample at 25°C ambient with a 10/1000μs waveform.

Note that the curves based on actual surge data have a more shallow slope than those from the calculation, indicating that the devices are conservatively rated and that the formula shown provides a sufficient level of confidence for worst- case design.

Fig 1.
V_C vs I_{PP} for SMBJ10A and SMBJ64A Calculated and Measured



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USING THE POWER VS TIME CURVE

Bruce Hartwig, Senior Automotive Applications Engineer

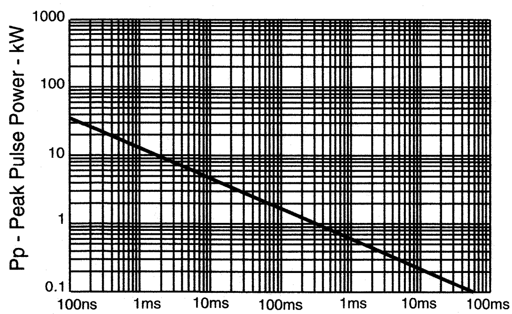
How can the maximum transient power and current capability for silicon Transient Voltage Suppressors (TVS) be derived for conditions other than the 10/1000µs pulse specified on data sheets?

Most Transient Voltage Suppressors are rated for 10/1000µs non-repetitive pulse waveforms (10µs being the front time and 1000µs being the time from start to decay to one- half of the peak value), which is an early telecom transient waveform. Real world transients will have varying pulse widths depending on the source. Various standards describe other waveforms to reflect these origins. For example, IEC 801- 5 describes a lightning threat to data lines approximating 1.2/50µs.

The graph in Fig. 1 relates peak pulse power with time for 600W suppressors; similar curves exist for TVS's rated at other power levels. At 1000µs

Fig 1.

Peak Pulse Power vs Pulse Time



the maximum pulse power (P_P) is 600W, the rating condition of the device. The graph illustrates that at 50µs, the rating is 2100W and at 10,000µs (10ms), P_P rating is down to approximately 200W. This applies to all devices in the 600W series regardless of their operating voltage.

Under shorter pulse widths a TVS will sustain higher pulse currents (I_P). For a width of 50µs, for example, a TVS will sustain 3.5 times its rated I_P at 1000µs, 600W. Thus the peak I_P of an SMBJ12A would increase from 30.2A at 10/1000µs to 105.7A at 1.2/50µs. The current rating of an SMBJ64A would increase from 5.8A to 20.3A.

Increasing the pulse width to 10,000µs will reduce the I_P rating by a factor of 0.33 since the P_P is reduced to 200W. An SMBJ12A with an I_P of 30.2A at 1000µs would be reduced to an I_P of 9.9A for a 10,000µs duration.

This method can be applied to derive the P_P and the I_P of a TVS from any other series (such as 400W, 500W, 1.5KW, 5KW,) using its published power vs pulse time curve.

Most Transient Voltage Suppressors, including the examples shown here, are rated for 10/1000µs double exponential waveforms. For one-half sine wave pulses, derate to 75% of the exponential waveform value and for square wave pulses, derate to 66%.

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PROTECTING LOW CURRENT LOADS IN HARSH ELECTRICAL ENVIRONMENTS

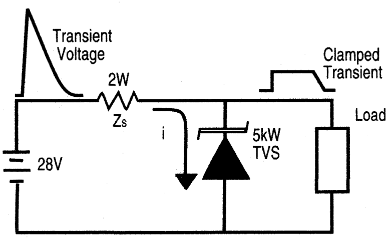
Bruce Hartwig, Senior Automotive Applications Engineer

Today's sophisticated electronic systems feature sensors, transducers and microcontrollers which are often placed in harsh environments having exposure to lightning, heavy load switching and other damaging transients.

To protect these vulnerable circuit elements from electrical overstress, high power silicon transient voltage suppressors (TVSs) are usually the first choice as illustrated in Fig. 1.

Fig. 1

A 5kW TVS is required to handle the high surge current



Consider as an example, a pressure transducer which operates at 28V, placed in an environment in which it encounters a transient voltage of 140V peak, having a source impedance of 2 ohms and a duration of 10/1000µs. The failure threshold of the transducer is 40V, therefore the TVS must clamp at 40V or less. The current delivered by this transient is:

$$I = (140V - 40V)/2\Omega = 50A$$

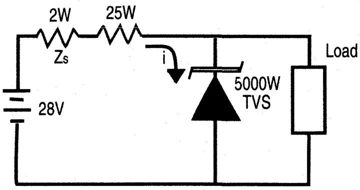
Note that the voltage clamping action of the TVS results in a voltage divider whereby the open circuit level of the transient appears across the combination of the source impedance and the TVS device. Thus the TVS clamping voltage is subtracted from the transient voltage leaving a net source voltage of 100V. When the clamping voltage is high compared to the transient peak voltage, the surge current is significantly reduced.

This circuit can be protected with a 5KW- rated suppression device such as the 5KP28A TVS which will easily sustain the surge current.

An alternate and more economical approach is to add a series resistor to effectively increase the source impedance thus limiting surge current as illustrated in fig 2 Since the current drawn by the transducer under normal operation is small (<20mA typical), performance is not adversely affected by reduction in supply current.

Fig. 2

Series resistor reduces transient current allowing a much smaller TVS to be used



For a small load current, 10mA, the voltage drop across the added resistance is minimal, about 0.25V for a 0.25 Ohm resistor. Adding this resistor reduces the surge current to:

$$I = (140V - 40V)/(2\Omega + 25\Omega) = 3.7A$$

This is less than one-tenth the surge current without the resistor. A TVS with lower power rating is able to handle the resulting current. In this case a 500W suppressor, such as the SA28A TVS, replaces the 5KW device, saving board space and cost.

An SA28A was chosen in this example since its current rating for a 10/1000µs pulse is 11A, easily withstanding the 3.7A surge calculated above. Although the maximum clamping voltage for the SA28A is given on the data sheet as 45.4V, the reduced surge current is 33% of the suppressor's peak capability, hence the clamping voltage would be approximately 38V, within our stated limit. (Reference QuikNote™ No.101)

Carbon composition resistors are recommended for this application, as they have sufficient energy capability for the pulse condition. Steady state power dissipated by the resistor (E x I) is 0.25W requiring a 0.5W rated resistor for adequate margin. The examples given are for 25°C ambient. For elevated temperatures, derate accordingly. Protected circuits derived within these guidelines should be fully evaluated under operating and threat conditions before use.

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PROTECTING FOR REPETITIVE TRANSIENT VOLTAGES

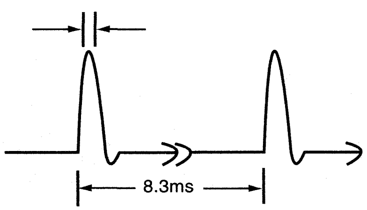
Bruce Hartwig, Senior Automotive Applications Engineer

While lightning may not strike twice in the same place, in circuits which involve power switching, relays, or motor control, components may be continually subjected to very short transient voltages occurring at regular intervals. Transient Voltage Suppressor (TVS) will effectively limit the transient voltage to a safe level, but some guidelines are needed for selecting the TVS which must handle this repetitive stress.

The average steady state power which the TVS will dissipate can be calculated for recurring short pulse widths. This average power must be within the steady state power rating of the TVS selected for the application. For example, in a motor drive circuit, the switching of current through the inductance of the motor winding continuously generates a pulse which has a 4μs duration and a 25A peak current at a frequency of 120 Hz.

Fig. 1

Repetitive transient generated by motor winding inductance



In this application a surface mount TVS, part number SMBJ6.5A, is initially selected to protect the control inputs of the motor drive circuitry because it will clamp the single-pulse voltage to a maximum level of 11.2 volts. But will this suppressor survive the continuous (120 times per second) application of this transient?

Pulse interval, the inverse of the frequency, is:

$$1/120 \text{ pulse/sec.} = 0.0083 \text{ sec.}$$

Peak pulse power is the clamping voltage multiplied by the pulse current:

$$P_{PP} = 11.2V \times 25A = 280W$$

Average power can be closely estimated by multiplying the peak power times the ratio of the pulse width to its interval:

$$P \text{ avg.} = 280W \times (0.000004 / 0.0083 \text{ sec.}) = 0.134W$$

The SMBJ6.5A will dissipate at least one watt steady state on a typical printed circuit board. Thus the calculation shows that the suppressor safely dissipates the average power generated in the motor drive, and clamps the transient voltage to a safe level. The SMAJ6.8A device is another option for this application.

Circuit board layout and engineering practices which provide adequate heat sinking for the suppressor should be observed. Higher power dissipation can be achieved by sizing mounting pads proportionately. Where this is not practical, or if calculation results in average dissipation greater than can be safely handled, a transient suppressor with a higher steady state power rating should be selected.

Derating must be observed for operation at elevated temperatures since all electrical ratings are normally specified at 25°C. For the described electrical conditions an ambient temperature of 75°C will provide 60% of the rated steady state capability.

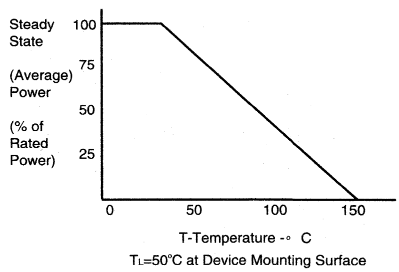


Fig. 2

Temperature derating for steady-state power dissipation

The average power calculation shown here is generally valid for pulses up to 10μs in duration, occurring at intervals in the range of 100 to 1000μs. Longer pulse durations approaching 1ms or more may be sustained only if the interval increases correspondingly.

It may not be possible to determine the exact conditions (current amplitude, pulse width, etc.) in repetitive pulse environments, so some experimentation may be required to optimize the suppressor selection.

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TVS PLACEMENT
THE CRITICAL PATH TO THE LEADING EDGE

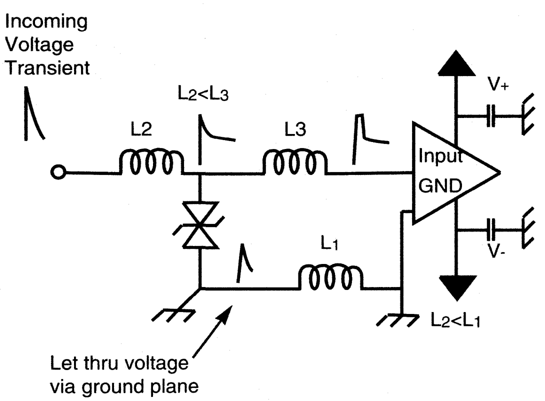
Jon Schleisner, Senior Applications Engineer

Reverse avalanche transient suppressors have excellent turn on characteristics. Typically these devices turn on in sub- nano second time frames. When protecting small geometry integrated circuits it is important to "catch" the leading edge of transient surges with very steep rise times.

Parasitic inductance in the circuit configuration and component layout inhibit the suppressor's ability to catch the leading edge of an ESD surge or other very fast pulses;

The suppressor should be as physically close to the vulnerable components ground return as possible (see fig. 1). The lower the parasitic inductance between the ground plane of the component to be protected and the TVS, the more effective the suppressor will be.

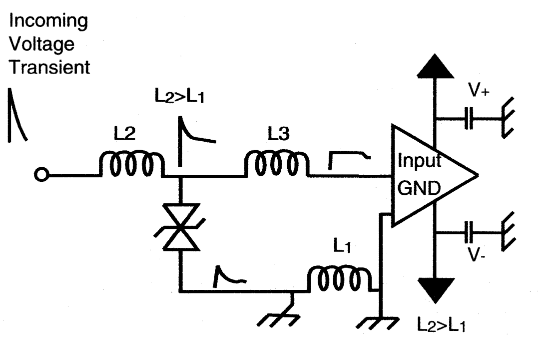
Fig. 1



ESD can have rise times as steep as 64KV/µs or 30KA/µs. Though the total energy is minimal, the peak is easily capable of rupturing the gate oxide at the input stage of a data transceiver chip. Fortunately it is possible to use the parasitic inductance of the P.C.B. to your advantage.

In Fig. 2 it is shown that the inductance inherent in the P.C.B. conductive traces can be used to slow down the leading edge of an incoming transient, thereby reducing the importance of the inductance between the TVS diode element and the critical ground path.

Fig. 2



For both Fig. 1 and Fig. 2:

L_1 = inductance of ground plane

L_2 = inductance of P.C.B. trace from input to TVS

L_3 = inductance of P.C.B. trace from TVS to tranciever into pin

SERIES STACKING OF TVS FOR HIGHER VOLTAGES AND POWER

A. Karl, Applications Engineer

Higher Voltages

In normal operation, a transient voltage suppressor should be invisible to the protected circuit. This is guaranteed by a very low leakage current at reverse stand-off voltage. As long as this voltage is not exceeded, the above mentioned feature is applicable. Some TVS-applications require a very high stand-off voltage, which is beyond the highest available value for a certain TVS series. In the past TVS voltages up to 440V were available in axial parts. This was achieved by stacking chips inside the axial package.

In surface mount packages, this is no longer possible and the maximum available voltage is 170V (working voltage). Applications requiring a working voltage that is higher than 170V can be solved by putting TVS diodes in series.

When putting TVS diodes in series to obtain higher stand-off voltages, then the sum of the stand-off voltages of the single diodes should be equal to the desired value.

This sounds like a simple solution of the whole problem but also current rating must be taken into account. Preferably one uses devices with the same V_R rating for series stacking. Thus the I_{PP} rating is the same for each part. I_{PP} is the peak pulse current that can be reached with a corresponding clamping voltage VCL, where I_{PP}*VCL is the peak pulse power that the TVS device is capable of. If TVS diodes with different V_R ratings are used to get the desired voltage by series stacking, the I_{PP} for the combination is determined by the device with the lowest I_{PP} capability. V_F is something to observe at series stacking of TVS, as it will be multiplied by the number of devices.

Higher Power

In applications with a fixed working and clamping voltage, a designer can increase the surge rating of his design by putting several lower voltage parts in series. Power handling capability is increased because lower voltage types tends to be limited, e.g. for a 1.5KE200 it is 5.2A. The 5KP series is only available up to V_R-110V. Some transients, however, have higher pulse currents.

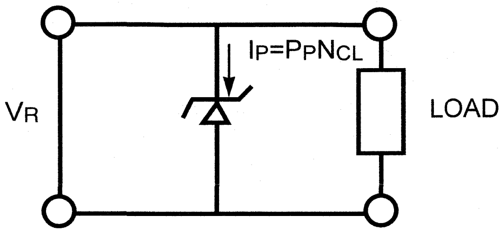
To keep the advantages of AJTVS, several TVS diodes can be put in series.

The designer needs to pay attention to the fact that the voltages need to be split equally. If all working voltages of the TVS devices put in series are equal, also the peak currents and power dissipated is equal.

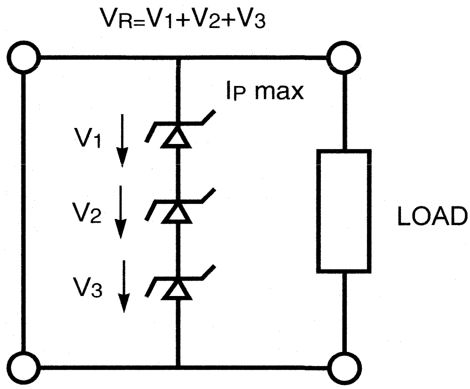
In this case, the total power capability of the TVS diodes put in series is equal to the sum of each TVS diode.

continued

SERIES STACKING OF TVS FOR HIGHER VOLTAGES AND POWER (cont'd)



Where:
- P_P = power rating of used TVS
- V_R = reverse working voltage
- I_P = peak pulse current
- V_R 1/2/3 = reverse working voltages for single TVS
- I_P max = lowest I_P of the TVS diodes put in series



Availability and Pricing

Another reason to consider series stacking of TVS diodes is availability and price of different types of TVS. If you have an application with a high working voltage and the total power is just over the wattage in GI's range(400, 500, 600, 1500, 5000W), it might be worth it to contact your GI representative to discuss price and availability for a solution where diodes are put into a series.

PARALLELING TRANSIENT VOLTAGE SUPPRESSORS FOR HIGHER POWER CAPABILITY

Bruce Hartwig, Senior Automotive Applications Engineer

Silicon avalanche transient voltage suppressors (TVSs) offer a great deal of flexibility in circuit protection these devices are available in voltages ranging from 5 through 400 Volts, and in power ratings from 300 through 6000 Watts.

In addition, they have been successfully used in higher voltage and power combinations, by configuring multiple TVSs in series (see QuikNote™ No.106, "Series Stacking of TVS for Higher Voltages and Power"), or in parallel.

Paralleling for Higher Power - The Basics

Power ratings for individual TVSs are expressed in Watts, based on an industry standard pulse waveform, which has a 10μs rise time, and an exponential decay to 1/2 its peak at 1000 microseconds. They can be derated for other pulse waveshapes in accordance with the power vs time graphs on datasheets (see QuikNote™ No.101, "Using the Power vs Time Curve").

For an application in which known transient power exceeds these limits, it is possible (with appropriate cautions) to configure two or more TVSs in parallel. In this configuration, they will provide the same voltage response (reverse stand-off voltage and breakdown voltage) as a single unit. Leakage current will increase in proportion to the number of units paralleled. The primary advantage in paralleling TVSs in this manner is increased current and power handling capability.

The basic requirement is that they be matched in terms of clamping voltage, in order to share transient current equally.

Current Sharing

As a first approximation, Fig. 1 shows an example in which a 300V transient of 150A total current is divided among three TVSs (p/n 1.5KE15) in parallel. 150A is greater than the rated capability of a single such TVS. However, by sharing the current equally, each TVS shunts 1/3 of the current or 50A to ground. This value is within its rated capability, and the transient is safely clamped to 20V, protecting the load from damage.

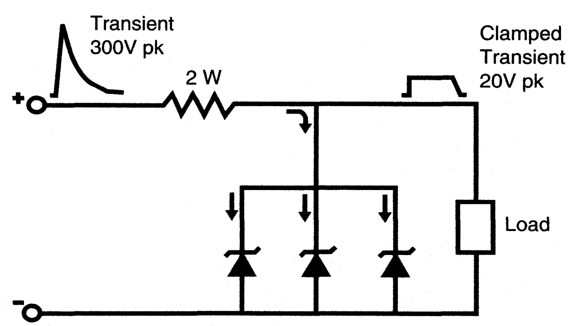
Matching

While all three TVSs in this example are of the same part number, each individual unit has its own value of breakdown voltage, reverse leakage and clamping voltage. These shifts are due to minor differences in dynamic impedance; all within the allowable specification. If close attention is not paid to matching these units, the device with the lowest breakdown voltage will typically conduct first and will be required to handle a disproportionate share of the transient current.

Matching of devices on the basis of clamping voltage under pulse conditions at a moderate current level is recommended. Rather than measuring low-current breakdown voltage only, this method provides accurate voltage matching by taking into account the dynamic effects under higher current. Each device is subjected to a known pulse level, such as a 1A, 1ms rectangular pulse. Clamping voltage is then monitored by a storage oscilloscope or peak reading voltmeter with sufficiently fast response. Units can then be sorted into groups of 1% tolerance for best current sharing performance. In board layout, keep lead lengths and circuit board traces in the shunt path as short as possible.

Through proper selection and configuration, an effective transient suppressor combination can be achieved for almost any protection need.

Fig. 1



HIGH SPEED RECTIFIER APPLICATIONS IN HIGH END AUDIO

Jon Schleisner, Senior Applications Engineer

High end audio is one of the few subjective areas of electronic design. In almost all fields of hardware development a system either works or it does not. In high end audio component design it is entirely possible to have a piece of equipment that works (meets all paper specifications) and sounds horrible.

Component selection in areas that would appear to be insignificant to the success of a design, can effect the ultimate sound quality of a component in a negative way. One of the areas that is overlooked is the input rectifier that lives off the secondary of the power transformer Fig. 1. Traditionally these rectifier sockets have been filled with standard recovery diodes. On the surface this would appear to be a good selection, since the fundamental frequency of the line current is 60 Hz (50 Hz in Europe).

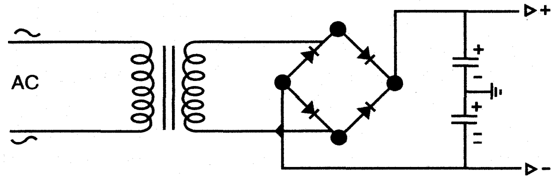


Fig. 1

Critical listening tests have demonstrated that the recovery time (Fig. 2) and type (soft or snappy) has an effect on the "subjective quietness" of a high end audio product. This is not "quietness" from the standpoint of signal to noise ratio traditionally measured in decibels. This is a subjective sense of silence between notes in a musical passage. To investigate further, this phenomenon can be measured with a spectrum analyzer. This was demonstrated in an article by Rick Miller with pictures and data in the "Audio Amateur" of Jan '94. The higher order harmonics generated by the recovery time of the standard speed rectifier can be clearly viewed on the spectrum analyzer. These upper harmonics are absent (or at least below the noise floor of the instrumentation). Audiophiles spend lots of money on AC line conditioners to eliminate line noise from the power supply inputs to their equipment, which is certainly counter productive to generating this noise internally. This component substitution is easy to accomplish.

With regards to Schottky rectifiers concerning low voltage applications, many solid state designs can utilized schottky rectifiers. Schottky rectifiers have switching speeds in the single nanosecond times and below. They are available to 60 Volt $B_{(VR)}$ maximum. These are ideal for almost all solid state preamplifiers, CD players, digital processors, tuners, high end surround sound, low voltage class "A" power amps and tube filament supplies.

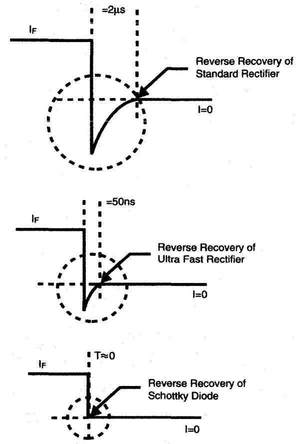


Fig. 2

Tubes (also known as valves) are still widely used in high end audio circuitry. These components require much higher operating voltages than solid state designs. The SUF15 and SUF30 diodes are ideal 1.5 and 3.0 ampere diodes with a B_{VR} of 600 Volts (J class). The SUF15J is ideal for tube preamplifiers for new designs or as a retrofit. The SUF30J is a 3.0 Ampere 600 Volt rectifier ideal for valve power amplifiers.

Power amplifiers typically use a bridge rectifier after the power transformer. Unfortunately, G.I. does not make high power fast recovery bridges. It is necessary to build the bridge assembly out of components utilizing the TO-220, TO-3P or paralleling discrete 4.0 ampere diodes. Based on the facts that the UG series is very fast, exhibits a "soft" recovery waveform, and is available in up to 200 volts B_{VR} makes it ideal for this application. These are very effective in the standard modern solid state power amplifier ie; B&K, Adcom, Hafler, Bryston and all their spinoffs.

Attention to the front end of the power supply in high grade audio gear is essential, if a design is going to deliver the best possible sound quality. In addition, it is possible to design "AC line conditioning" into the AC front end of the power supply, minimizing the need for external power conditioning equipment. If all this is done, the DC rails of properly designed equipment should be unbelievably quiet.

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