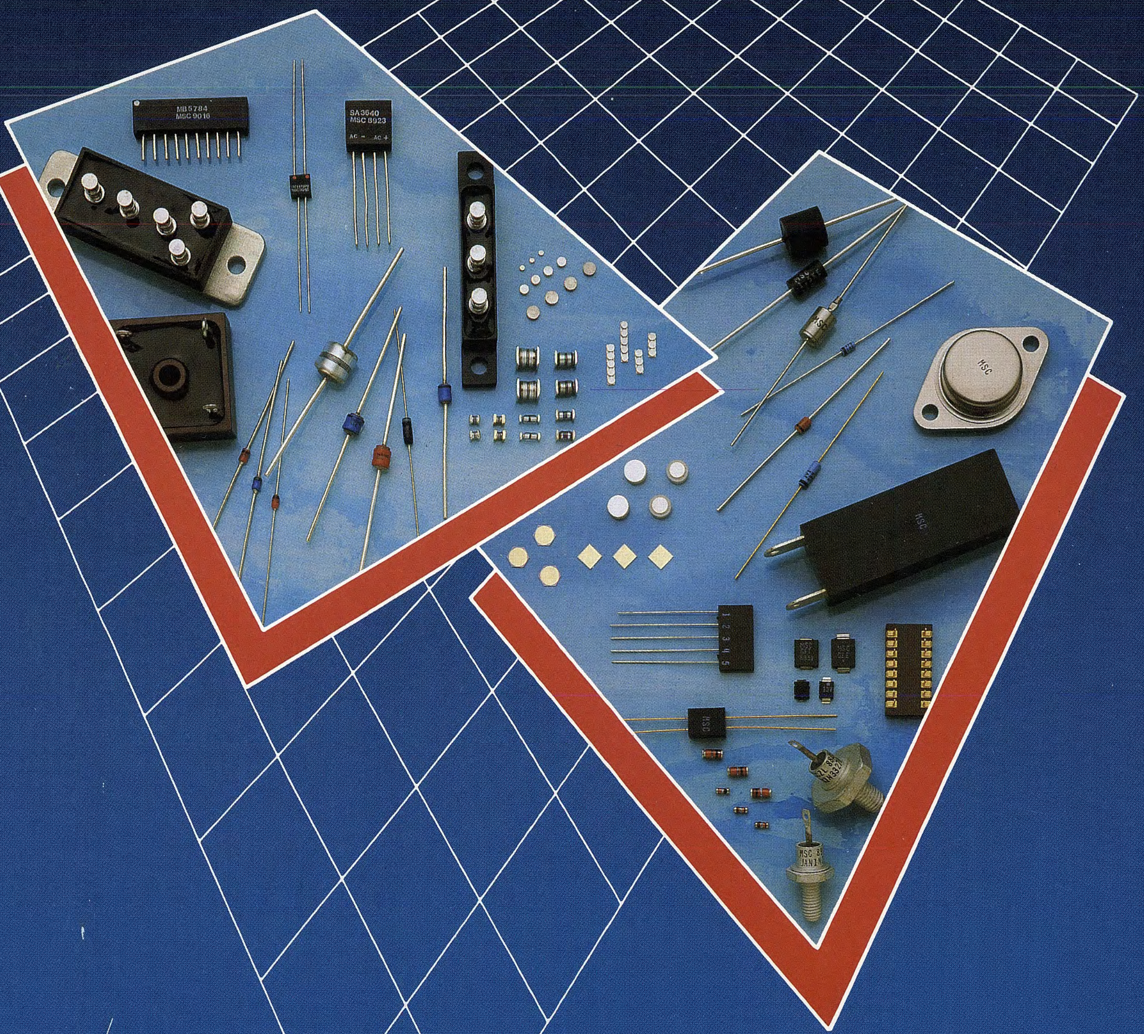
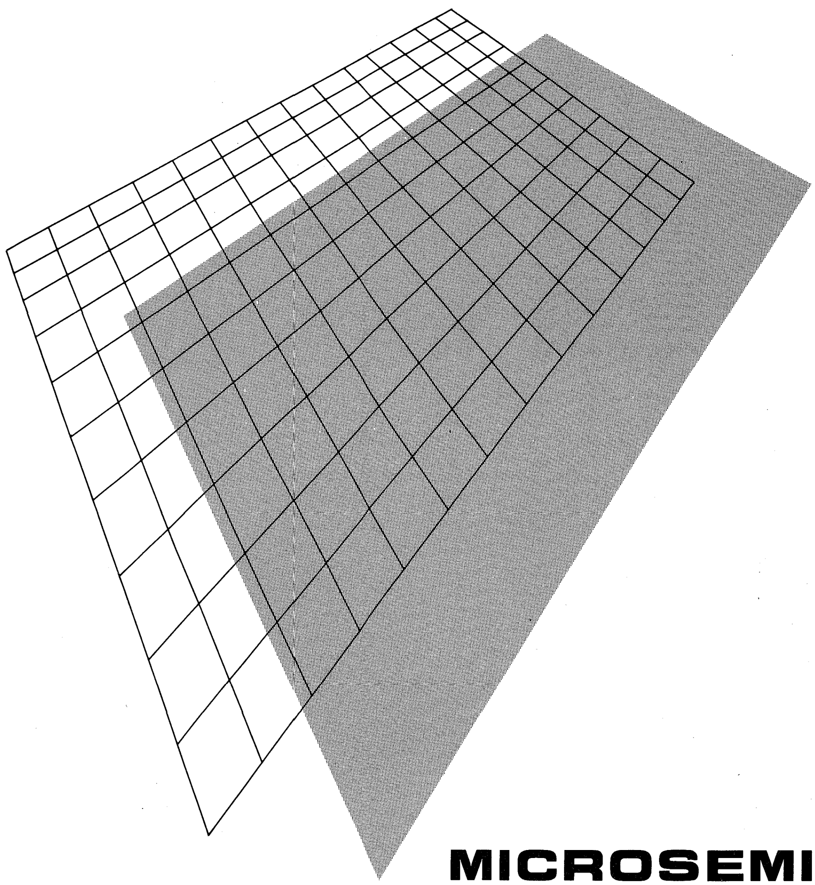
MICROSEMI DATA BOOK



Microsemi Corp.

The diode experts

- Military and Commercial Devices
- Axial Lead and Surface Mount
- Special Assemblies and Dice



MICROSEMI DATA BOOK

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MICROSEMI CORPORATION
Semiconductor Group Locations

1. Microsemi Corp. – Headquarters

2830 S. Fairview St., P.O. Box 26890, Santa Ana, CA 92799-6890
Phone: (714) 979-8220 Fax: (714) 557-5989

Principal Products: Rectifiers, Transient Suppressors, Zeners, Special Assemblies, Surface Mount Devices and Chips

2. Microsemi Corp. – Scottsdale

8700 E. Thomas Road, P.O. Box 1390, Scottsdale, AZ 85252-1390
Phone: (602) 941-6300 Fax: (602) 947-1503

Principal Products: Zener Diodes, Transient Suppressors, Zero-T.C. Reference Diodes, Special Assemblies, Surface Mount Devices and Chips

3. Microsemi Corp. – Colorado*

800 Hoyt St., Broomfield, CO 80020
Phone: (303) 469-2161 Fax: (303) 466-3775
Principal Products: Rectifiers — Schottky, Standard, Ultra Fast, and Silicon Controlled; plus, Custom Assemblies, Surface Mount Devices and Chips

4. Microsemi Corp. - Watertown*

580 Pleasant Street, Watertown, MA 02172
Phone: (617) 926-0404 Fax: (617) 924-1235
Principal Products: Rectifiers, power zeners, transient voltage suppressors, bridges, modules, surface mount devices and chips

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* Not included in this data book. Contact the factory for product information.

INTRODUCTION

DIODES

Microsemi Corporation, with the addition of the Siemens zener diode division, Coors Components, and Varo Quality Semiconductor operations, is now the leading diode supplier in the country. Total product capability in: rectifiers, zener diodes, transient suppressors and assemblies exceeds that of our major competitors. In fact, Microsemi can now provide almost 100% of the most popular silicon diode types ever made. With manufacturing plants in: Arizona, California, Colorado, and Texas; as well as off-shore operations in Hong Kong and Bombay, India, Microsemi has a combined capacity of over 500 million devices per year.

Prior to these acquisitions, Microsemi purchased complementary assembly and service businesses from Rockwell, Texas Instruments, Hamilton Avet, and several other leading semiconductor companies. The combination of these product lines and facilities has enabled Microsemi to quickly assume a dominant position in the diode field.

Product Type	Military Hi-Rel	Computer/ Industrial	Commercial/ Consumer
250mW/500mW Zeners	x	x	x
1.0 Watt Zeners	x	x	x
1.5 — 2.5 Watt Zeners	x	x	x
3 Watt Zeners	–	x	x
5 Watt Zeners	x	x	x
10 Watt Zeners	x	x	x
50 Watt Zeners	x	x	x
Zero — T.C. Zeners	x	x	x
500 Watt Transient Supp.	x	x	–
1500 Watt Transient Supp.*	x	–	–
High Voltage Diodes >1KV	x	x	–
High Voltage Fast Recovery >1KV	x	x	–
250 — 500 mW Signal Diodes	x	x	x
Computer Switch Diodes	x	x	–
Low Leakage Pico Amp	x	x	–
Multi-Junction Stabistors	x	x	–
500mA Rectifier (no recovery)	x	x	–
1.0A Rectifier (no recovery)	x	x	x
3.0A Rectifier (no recovery)	x	x	x
6.0A Rectifier (no recovery)	x	x	x
12 — 85A Rectifier DO-4/DO-5 Stud	x	x	x
125 — 300A Rectifier DO-8/DO-9 Stud	x	x	x
500mA Rectifier (fast recovery)	x	x	–
1.0A Rectifier (fast recovery)	x	x	x
3.0A Rectifier (fast recovery)	x	x	x
6.0A Rectifier (fast recovery)	x	x	x
10.0A Rectifier — DO-4 Stud	x	x	–
20.0A Rectifier — DO-5 Stud	x	x	–
1.0A Ultra Fast (20 ns) Rectifier — Glass	x	x	–
3.0A Ultra Fast (20 ns) Rectifier — Glass	x	x	–
6.0A Ultra Fast (20 ns) Rectifier — Glass	x	x	–
1.0 — 8A Ultra Fast Rectifier — Plastic	–	x	x
3.0 — 20A Ultra Fast Rectifier — TO-220	–	x	x
30A Ultra Fast Rectifier — TO-247	–	x	x
12 — 70A Ultra Fast Rectifier DO-4/DO-5	x	x	x
1.0A Schottky Rectifiers (glass or plastic)	x	x	x
3.0 — 8A Schottky Rectifiers (DO-27)	–	x	x
8 — 20A Schottky Rectifiers (TO-220)	–	x	x
30 — 50A Schottky Rectifiers (TO-247)	–	x	x
25 — 85A Schottky Rectifiers (DO-4/DO-5)	–	x	x
63 — 275 SCRs (TO-65, TO-83, TO-93, TO-94)	–	–	x
Zero — T.C. Zener Assemblies	x	x	x
Rectifier Assemblies:			
Bridges	x	x	x
Doublers	x	x	x
Dip Bridges	–	x	x
Diode Stacks ≤ 10KV	x	x	–
Rectifier Modules:			
150 — 300A Std. Recovery	–	x	x
70 — 200A Ultra Fast	–	x	x
80 — 500A Schottky	–	x	x
Industrial Power Conversion Units			
Up to 3000 KW	–	x	x

NOTE 1: Types listed are also available in surface mount. Consult SMD Section or respective factory for specifications.

* 3KW to 60KW TVS, consult factory.

Over the years, Microsemi has grown to be one of the leading suppliers of military hi-rel diodes with more part numbers on the QPL (Qualified Parts List) than any other major competitor, including small signal diodes to high-power parts. Microsemi has also expanded into the computer, commercial, and consumer markets. The front end (dice manufacture) strength of the Microsemi-Scottsdale operation has accelerated Microsemi's entry into these markets. Our overall company goal is to become the leading diode supplier in the country. Product expansion plans are already underway at each facility to add new diode products to accomplish our long term goal.

SPECIAL APPLICATION DIODES

Avalanche Diodes .... Controlled breakdown
Micro Diodes .... Ultra-small package
Tunnel Diodes .... Only manufacturer in the world
Backward Diodes .... Only manufacturer in the world
High-Temp 250°C Diodes ... Oil drilling, aircraft engine use
L.V.A. Zeners .... Replaces TRW and Motorola
Log Diodes .... Controlled conductance
High-Voltage Zeners .... >300V
P.I.N. Diodes .... Attenuators & Modulators
Schottky Diodes .... Military and Commercial
Leadless Inverted Carrier .... Use in hybrid circuits
Surface Mount Diodes(1) .... Military, medical, and commercial for hybrid & printed circuits

CHIPS

Microsemi is also the broadest chip supplier in the country and one of the only companies capable of supplying hi-rel and high quality glass passivated dice. Chips are available from each one of Microsemi's manufacturing facilities (AZ, CA, CO, and TX).

"THE DIODE EXPERTS"

Microsemi was the first diode manufacturer selected by the U.S. military services as a source to qualify product to the highest mil spec level — JANS. To help locate them quickly, the JANS level products in this data book are marked with a JANS "flag". Currently JANS qualification tests are being performed on many of our other product lines.

Microsemi has an extremely strong engineering team with a total of over 250 years of diode product and process expertise. Our engineers are constantly called upon for unique or high performance devices and work closely with customers to satisfy their special requirements. In addition, the company has also strategically placed domestic and foreign field sales engineers to assist customers with technical inquiries.

Microsemi is a company whose staff is dedicated to the highest performance and quality standards, and the ultimate satisfaction of our customers. While we are not perfect in the accomplishment of these goals, our corporate attitude of seeking constant improvements and corrective action for customer problems has earned us a respected position in the industry.

We are pleased with your interest in our company and trust that this information will enable you to make a favorable decision to join our growing customer base.

TABLE OF CONTENTS

PRODUCT LISTING

This is a numerical (followed by an alpha-numerical) listing by *JEDEC type number* of devices available from either Microsemi – Santa Ana (California), Scottsdale (Arizona), or both. Consult the respective factory for more information on series marked with an asterisk (*) or that are not shown.

*For specifications, consult factory or JEDEC registered data.

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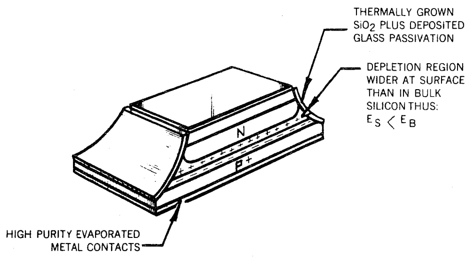
DIODE TECHNOLOGY
VOIDLESS BONDED DIODES

MICROSEMI CORP virtually eliminates all known device failure modes in silicon subminiature glass rectifiers with superior processes and new voidless glass packages.

Starting with the semiconductor die and continuing through final test and inspection, carefully evaluated processes and numerous quality control steps insure product homogeneity and ultimate reliability.

MICRO'S CHIP, a double-diffused mesa structure utilizing photo masking techniques and silicon wafers with 1-0-0 crystal alignment, provides excellent geometry and junction control with uniform contact area. The advantages of the mesa structure for high voltage rectifiers and transistors is well known. MICRO's geometry control and passivation solve the few remaining limitations of the mesa device.



ELECTRICAL INTEGRITY IN CHIP FORM

The junction design concentrates breakdown in the bulk material for maximum breakdown voltage with minimum surface fields. Under reverse bias conditions the negative charges in the P-type silicon equalize the positive charges in the N-type. The sharp slope of the etched mesa junction stretches the depletion region at the surface — significantly reducing the surface field below that of the bulk. When breakdown occurs, therefore, it is not at the surface, but in the bulk silicon. With surface effects minimized, the maximum breakdown voltage is achieved with the lowest possible starting wafer resistivity which gives the optimum combination of high breakdown voltage and high conductivity.

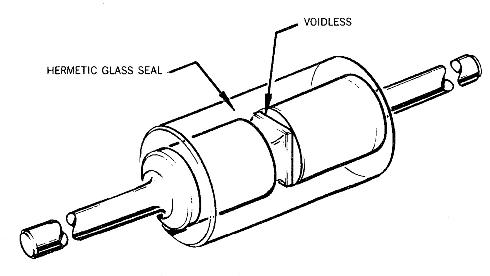
Carefully controlled junction base width insures maximum surge capability. A thermally grown oxide layer followed by a heavily deposited layer of high density alkali-free glass passivates the junction. The double passivation makes the die practically independent of outside ambients. Leakage measurements of less than ten nanoamperes at 200 V are typical and are carefully monitored to assure consistent process control. This combination of passivation and junction geometry provides stable junction breakdown voltages in excess of 1200 volts.

After passivation, high purity evaporated gold is alloyed to both the anode and cathode surfaces, followed by an additional 10KÅ of evaporated and fired silver. This results in a strong metallurgical contact to the silicon surface and provides extremely low contact resistance. The high temperature metallization system assures that subsequent processing of the dice, either as hybrid chips or in glass and epoxy assemblies, produces no degradation of surface of junction characteristics.

The rectifier final assembly is a three-stage process. The chip is first metallurgically bonded (875° C) to silver plated tungsten slugs. Metallurgical bonding insures structural integrity and the ultimate in reliability. After testing, the slug-die-slug assembly is then ready to be sealed in MICRO's voidless glass package.

MICRO'S VOIDLESS GLASS PACKAGE uses a thermal compression seal of chemically pure hard glass to the silver-plated tungsten slugs. An extremely alkaline-free glass sleeve is placed over the slug-die-slug assembly and heated to 800° C where the glass flows. During controlled cooling, the glass fills all voids and makes a strong thermal compression bond. The resultant package is a monolithic voidless structure of thermally matched material capable of withstanding virtually any environmental stress. Voltages of up to 1400 volts per single junction are sustained without any evidence of arcing.

Finally, copper or other leads as specified by the customer, are brazed to the assembled diode and the entire assembly is pressure tested at 500 PSI and inspected for absolute seal integrity.



THE TOTALLY DESIGNED RECTIFIER

GUIDE TO METALLURGICALLY-BONDED AXIAL LEAD DIODES JAN-JTX-JTXV TYPES

Military specifications require that all devices shown here be metallurgically bonded, not just "-1" parts as is generally believed. All devices listed on this chart are manufactured by Microsemi Corporation with the same hard glass voidless metallurgical constructions.

	POWER RATING — Zeners in watts/Rectifiers in I_0				
	250mW	400/500mW or 0.5A I_0	1.5W or 1.0A I_0	3A I_0	5W or 6A I_0
ZENER	Use 400mW device	1N 754-A thru 1N 759A-1 /127 1N 962B-1 thru 1N 973B-1 /117	1N 4460 thru 1N 4496 /406A	*	1N4954 thru 1N4989 /356
SMALL SIGNAL	1N5194 thru 1N5196 /118 1N3595 /241	See "RECTIFIER (NON-RECOVERY)" 1N 645-1 1N 649-1	N.A.	N.A.	N.A.
COMPUTER CORE DRIVER	1N4148-1 /116 1N4454-1 /144	1N 4150-1 /231 1N 4153-1 /337	Use 1N 5802 Series	Use 1N 5807 Series	N.A
RECTIFIER (NON-RECOVERY)	See "SMALL SIGNAL" 1N5194-6	1N645-1 thru 1N649-1 /240	1N 3611 thru 1N 3614 & 1N 3957 /228 1N 4245 thru 1N 4249 /286 1N 5614 thru 1N 5622 /427	1N5550 thru 1N5552 /420	*
RECTIFIER (FAST RECOVERY)	1N4938-1 /169	Use 1N4938-1 /169	1N 4942 thru 1N 4948 /359 1N 5615 thru 1N 5623 /429	1N 5415 thru 1N 5420 /411 1N5186 thru 1N5190 /424	*
RECTIFIER (ULTRA-FAST RECOVERY)	Use Computer Core Drive Types	*	1N 5802 thru 1N 5806 /477 1N6073 thru 1N6075 /503 (EL)	1N 5807 thru 1N 5811 /477 \\\ 1N 6076 1N6078 /503 (EL)	\\\ 1N6079 1N 6080 1N 6081 /503 (EL)

*Microsemi Corp. has metal-bonded voidless devices in these areas for non-standard parts.

\\\ Microsemi Corp. mil-qualification pending.

ZENER DIODE/RECTIFIER CROSS REFERENCE CHART

Containing all JEDEC registered Zener diodes.

This popular reference chart contains highlight information on all JEDEC registered Zener diode and rectifier types as well as Microsemi types. The following Codes are used:

Bold Face Type Only:	Indicates devices manufactured by Microsemi
Light Face Type:	Indicates devices not manufactured or offered by Microsemi. In most cases a "recommended substitute" is noted in column 8. It should be noted however that recommended substitutes are not direct replacements.

Case outlines are found on pages 37 thru 40.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N225[1]	7.5 - 10.0	0.20	—	Suffix A = 5%	150 mw	Case A[8]	
1N226[1]	9.0 - 12.0	"	—	" "	"	"	
1N227[1]	11.0 - 14.5	"	—	" "	"	"	
1N228[1]	13.5 - 18.0	"	—	" "	"	"	
1N229[1]	17.0 - 21.0	"	—	" "	"	"	
1N230[1]	20.0 - 27.0	"	—	" "	"	"	
1N231[1]	25.0 - 32.0	"	—	" "	"	"	
1N232[1]	30.0 - 39.0	"	—	" "	"	"	
1N233[1]	37.0 - 45.0	"	—	" "	"	"	
1N234[1]	43.0 - 54.0	"	—	" "	"	"	
1N235[1]	52.0 - 64.0	"	—	" "	"	"	
1N236 thru 1N239 is an obsolete 150 mW Series.							
1N429[2]	6.2 ± 5%	7.5	20.0	T.C. = .01%/°C[4]	200 mw	Case A[8]	
1N430[2]	8.4 ± 5%	10.0	15.0	T.C. = .002%/°C[4]	250 mw	Case B	
1N430A[2]	" "	"	"	T.C. = .001%/°C[4]	"	"	
1N430B[2]	" "	"	"	T.C. = .001%/°C[5]	"	"	
1N465	2.0 - 3.2	5.0	60.0[3]	Suffix A = 5%	200 mw	Case A[8]	
1N466	3.0 - 3.9	"	55.0[3]	Suffix B = 1%	"	"	
1N467	3.7 - 4.5	"	45.0[3]	" "	"	"	
1N468	4.3 - 5.4	"	35.0[3]	" "	"	"	
1N469	5.2 - 6.4	"	20.0[3]	" "	"	"	
1N470	6.2 - 8.0	"	10.0[3]	" "	"	"	
1N471[1]	3.0 - 3.9	"	65.0[3]	Suffix A = 5%	"	"	
1N472[1]	3.7 - 4.5	"	60.0[3]	" "	"	"	
1N473[1]	4.3 - 5.4	"	50.0[3]	" "	"	"	
1N474[1]	5.2 - 6.4	"	40.0[3]	" "	"	"	
1N475[1]	6.2 - 8.0	"	25.0[3]	" "	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR μA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N483B	80	.2	1.0	.025		DO7	
1N485B	200	.2	1.0	.025		DO7	
1N486B	250	.2	1.0	.025		DO7	
1N645-1	260	.4	1.0	.05		DO35	
1N647-1	480	.4	1.0	.05		DO35	
1N649-1	720	.4	1.0	.05		DO35	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N664	8.2	10.0	7.0	5%	400 mw	—	
1N665	12.0	10.0	10.0	"	"	—	
1N666	15.0	5.0	24.0	"	"	—	
1N667	18.0	"	26.0	"	"	—	
1N668	22.0	"	30.0	"	"	—	
1N669	27.0	"	35.0	"	"	—	
1N670	68.0	1.0	290.0	"	"	—	
1N671	100.0	"	350.0	"	"	—	
1N672	150.0	"	1000.0	"	"	—	
1N674	4.7	20.0	16.0	5%	400 mw	—	1N750
1N675	6.2	20.0	3.0	5%	400 mw	—	1N753
1N701	10.0	10.0	9.0	5%	400 mw	—	1N758
1N702	2.0 - 3.2	5.0	60.0[3]	Suffix A = 5%	250 mw	DO-7/DO-35	
1N703	3.0 - 3.9	"	55.0[3]	" "	"	"	
1N704	3.7 - 4.5	"	45.0[3]	" "	"	"	
1N705	4.3 - 5.4	"	35.0[3]	" "	"	"	
1N706	5.2 - 6.4	"	20.0[3]	" "	"	"	
1N707	6.2 - 8.0	"	10.0[3]	" "	"	"	
1N708	5.6	25.0	3.6	No Suffix = 10%	250 mw	"	
1N709	6.2	"	4.1	Suffix A = 5%	"	"	
1N710	6.8	"	4.7	" "	"	"	
1N711	7.5	"	5.3	" "	"	"	
1N712	8.2	"	6.0	" "	"	"	
1N713	9.1	12.0	7.0	" "	"	"	
1N714	10.0	"	8.0	" "	"	"	
1N715	11.0	"	9.0	" "	"	"	
1N716	12.0	"	10.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(3) IZT = 10mA
(4) Temperature range −55°C to +100°C
(5) Temperature range −55°C to +150°C
(8) Microsemi utilizes glass sub potted in epoxy.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N717	13.0	12.0	11.0	No Suffix = 10%	250 mw	DO-7/DO-35	
1N718	15.0	"	13.0	Suffix A = 5%	"	"	
1N719	16.0	"	15.0	" "	"	"	
1N720	18.0	"	17.0	" "	"	"	
1N721	20.0	4.0	20.0	" "	"	"	
1N722	22.0	"	24.0	" "	"	"	
1N723	24.0	"	28.0	" "	"	"	
1N724	27.0	"	35.0	" "	"	"	
1N725	30.0	"	42.0	" "	"	"	
1N726	33.0	"	50.0	" "	"	"	
1N727	36.0	"	60.0	" "	"	"	
1N728	39.0	"	70.0	" "	"	"	
1N729	43.0	"	84.0	" "	"	"	
1N730	47.0	"	98.0	" "	"	"	
1N731	51.0	"	115.0	" "	"	"	
1N732	56.0	"	140.0	" "	"	"	
1N733	62.0	2.0	170.0	No Suffix = 10%	250 mw	DO-7/DO-35	
1N734	68.0	2.0	200.0	Suffix A = 5%	"	"	
1N735	75.0	2.0	240.0	" "	"	"	
1N736	82.0	2.0	280.0	" "	"	"	
1N737	91.0	1.0	340.0	" "	"	"	
1N738	100.0	1.0	400.0	" "	"	"	
1N739	110.0	1.0	490.0	" "	"	"	
1N740	120.0	1.0	570.0	" "	"	"	
1N741	130.0	1.0	650.0	" "	"	"	
1N742	150.0	1.0	860.0	" "	"	"	
1N743	160.0	1.0	970.0	" "	"	"	
1N744	180.0	1.0	1200.0	" "	"	"	
1N745	200.0	1.0	1400.0	" "	"	"	
1N746	3.3	20.0	28.0	No Suffix = 10%	400 mw	DO-7/DO-35	
1N747	3.6	20.0	24.0	Suffix A = 5%	"	"	
1N748	3.9	20.0	23.0	" "	"	"	
1N749	4.3	20.0	22.0	" "	"	"	
1N750	4.7	20.0	19.0	" "	"	"	
1N751	5.1	20.0	17.0	" "	"	"	
1N752	5.6	20.0	11.0	" "	"	"	
1N753	6.2	20.0	7.0	" "	"	"	
1N754	6.8	20.0	5.0	" "	"	"	
1N755	7.5	20.0	6.0	" "	"	"	
1N756	8.2	20.0	8.0	" "	"	"	
1N757	9.1	20.0	10.0	" "	"	"	
1N758	10.0	20.0	17.0	" "	"	"	
1N759	12.0	20.0	30.0	" "	"	"	
1N761	4.3 - 5.4	10.0	40.0		250 mw	"	
1N762	5.2 - 6.4	"	18.0		"	"	
1N763	6.2 - 8.0	"	7.0		"	"	
1N764	7.5 - 10.0	"	12.0		"	"	
1N765	9.0 - 12.0	5.0	45.0		"	"	
1N766	11.0 - 14.5	5.0	55.0		"	"	
1N767	13.5 - 18.0	5.0	70.0		"	"	
1N768	17.0 - 21.0	5.0	100.0		"	"	
1N769	20.0 - 27.0	5.0	150.0		"	"	
1N821(2)	6.2±5%	7.5	15.0	T.C. = .01%/°C(4)	400 mw	DO-7/DO-35	
1N821A(2)	6.2±5%	"	10.0	T.C. = .01%/°C(4)	"	"	
1N822(1,2)	6.2±5%	"	15.0	T.C. = .01%/°C(4)	"	"	
1N823(2)	6.2±5%	"	15.0	T.C. = .005%/°C(4)	"	"	
1N823A(2)	6.2±5%	"	10.0	T.C. = .005%/°C(4)	"	"	
1N824(1,2)	6.2±5%	"	15.0	T.C. = .005%/°C(4)	"	"	
1N825(2)	6.2±5%	"	15.0	T.C. = .002%/°C(4)	"	"	
1N825A(2)	6.2±5%	"	10.0	T.C. = .002%/°C(4)	"	"	
1N826(2)	6.2 - 6.9	"	15.0	T.C. = .002%/°C(4)	"	"	
1N827(2)	6.2±5%	"	15.0	T.C. = .001%/°C(4)	"	"	
1N827A(2)	6.2±5%	"	10.0	T.C. = .001%/°C(4)	"	"	
1N828(2)	6.2 - 6.9	"	15.0	T.C. = .001%/°C(4)	"	"	
1N829A	6.2±5%	"	15.0	T.C. = .0005%/°C(4)	"	"	
1N935(2)	9.0±5%	7.5	20.0	T.C. = .01%/°C(7)	500 mw	DO-7	
1N936(2)	9.0±5%	"	20.0	T.C. = .005%/°C(7)	"	"	
1N937(2)	9.0±5%	"	20.0	T.C. = .002%/°C(7)	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(4) Temperature range —55°C to +100°C
(7) No suffix denotes temp. range 0°C to +75°C
Suffix A denotes temp. range —55°C to +100°C
Suffix B denotes temp. range —55°C to +150°C

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N938[2]	9.0 ± 5%	7.5	20.0	T.C. = .001%/°C[7]	"	"	
1N939[2]	9.0 ± 5%	"	20.0	T.C. = .0005%/°C[7]	"	"	
1N940[2]	9.0 ± 5%	"	20.0	T.C. = .0002%/°C[7]	"	"	
1N941[2]	11.7 ± 5%	7.5	30.0	T.C. = .01%/°C[7]	"	"	
1N942[2]	11.7 ± 5%	"	30.0	T.C. = .005%/°C[7]	"	"	
1N943[2]	11.7 ± 5%	"	30.0	T.C. = .002%/°C[7]	"	"	
1N944[2]	11.7 ± 5%	"	30.0	T.C. = .001%/°C[7]	"	"	
1N945[2]	11.7 ± 5%	"	30.0	T.C. = .0005%/°C[7]	"	"	
1N946[2]	11.7 ± 5%	"	30.0	T.C. = .0002%/°C[7]	"	"	
1N957	6.8	18.5	4.5	No Suffix = 20%	400 mw	DO-7/DO-35	
1N958	7.5	16.5	5.5	Suffix A = 10%	"	"	
1N959	8.2	15.0	6.5	Suffix B = 5%	"	"	
1N960	9.1	14.0	7.5	" "	"	"	
1N961	10.0	12.5	8.5	" "	"	"	
1N962	11.0	11.5	9.5	" "	"	"	
1N963	12.0	10.5	11.5	" "	"	"	
1N964	13.0	9.5	13.0	" "	"	"	
1N965	15.0	8.5	16.0	" "	"	"	
1N966	16.0	7.8	17.0	No Suffix = 20%	400 mw	DO-7/DO-35	
1N967	18.0	7.0	21.0	Suffix A = 10%	"	"	
1N968	20.0	6.2	25.0	Suffix B = 5%	"	"	
1N969	22.0	5.6	29.0	" "	"	"	
1N970	24.0	5.2	33.0	" "	"	"	
1N971	27.0	4.6	41.0	" "	"	"	
1N972	30.0	4.2	49.0	" "	"	"	
1N973	33.0	3.8	58.0	" "	"	"	
1N974	36.0	3.4	70.0	" "	"	"	
1N975	39.0	3.2	80.0	" "	"	"	
1N976	43.0	3.0	93.0	" "	"	"	
1N977	47.0	2.7	105.0	" "	"	"	
1N978	51.0	2.5	125.0	" "	"	"	
1N979	56.0	2.2	150.0	" "	"	"	
1N980	62.0	2.0	185.0	" "	"	"	
1N981	68.0	1.8	230.0	" "	"	"	
1N982	75.0	1.7	270.0	" "	"	"	
1N983	82.0	1.5	330.0	" "	"	"	
1N984	91.0	1.4	400.0	" "	"	"	
1N985	100.0	1.3	500.0	" "	"	"	
1N986	110.0	1.1	750.0	" "	"	"	
1N987	120.0	1.0	900.0	" "	"	"	
1N988	130.0	0.95	1100.0	" "	"	"	
1N989	150.0	0.85	1500.0	" "	"	"	
1N990	160.0	0.80	1700.0	" "	"	"	
1N991	180.0	0.68	2200.0	" "	"	"	
1N992	200.0	0.65	2500.0	" "	"	"	
1N1313	7.5 - 10.0	0.20	—	Suffix A = 5%	150 mw	Case A[8]	
1N1314	9.0 - 12.0	"	—	" "	"	"	
1N1315	11.0 - 14.5	"	—	" "	"	"	
1N1316	13.5 - 18.0	"	—	" "	"	"	
1N1317	17.0 - 21.0	"	—	" "	"	"	
1N1318	20.0 - 27.0	"	—	" "	"	"	
1N1319	25.0 - 32.0	"	—	" "	"	"	
1N1320	30.0 - 39.0	"	—	" "	"	"	
1N1321	37.0 - 45.0	"	—	" "	"	"	
1N1322	43.0 - 54.0	"	—	" "	"	"	
1N1323	52.0 - 64.0	"	—	" "	"	"	
1N1324	62.0 - 80.0	"	—		"	"	
1N1325	75.0 - 100	"	—		"	"	
1N1326	90.0 - 120	"	—		"	"	
1N1327	110 - 145	"	—		"	"	
1N1351	10.0	500.0	2.0	No Suffix = 10%	10 watt	DO-4	
1N1352	11.0	500.0	2.0	Suffix A = 5%	"	"	
1N1353	12.0	500.0	2.0	Suffix R = Rev. Polarity	"	"	
1N1354	13.0	500.0	2.0	" "	"	"	
1N1355	15.0	500.0	2.0	" "	"	"	
1N1356	16.0	500.0	3.0	" "	"	"	
1N1357	18.0	150.0	3.0	" "	"	"	
1N1358	20.0	150.0	3.0	" "	"	"	
1N1359	22.0	150.0	3.0	" "	"	"	
1N1360	24.0	150.0	3.0	" "	"	"	
1N1361	27.0	150.0	3.0	" "	"	"	
1N1362	30.0	150.0	4.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type. (8) Microsemi device utilizes glass sub potted in epoxy.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N1363	33.0	150.0	4.0	No Suffix = 10%	10 watt	DO-4	
1N1364	36.0	150.0	5.0	Suffix A = 5%	"	"	
1N1365	39.0	150.0	5.0	Suffix R = Rev. Polarity	"	"	
1N1366	43.0	150.0	6.0	" "	"	"	
1N1367	47.0	150.0	7.0	" "	"	"	
1N1368	51.0	150.0	8.0	" "	"	"	
1N1369	56.0	150.0	9.0	" "	"	"	
1N1370	62.0	50.0	12.0	" "	"	"	
1N1371	68.0	50.0	14.0	" "	"	"	
1N1372	75.0	50.0	20.0	" "	"	"	
1N1373	82.0	50.0	22.0	" "	"	"	
1N1374	91.0	50.0	35.0	" "	"	"	
1N1375	100.0	50.0	40.0	" "	"	"	
1N1416	8.2	200.0	3.0	5%	10 watt	—	1N2972
1N1417	12.0	200.0	3.5	"	"	—	1N2976
1N1418	15.0	100.0	4.0	"	"	—	1N2979
1N1419	18.0	100.0	5.0	"	"	—	1N2982
1N1420	22.0	100.0	5.0	"	"	—	1N2985
1N1421	27.0	50.0	8.0	"	"	—	1N2988
1N1422	68.0	20.0	15.0	5%	10 watt	—	**1N3001**
1N1423	100.0	20.0	30.0	"	"	—	**1N3005**
1N1424	150.0	10.0	105.0	"	"	—	**1N3011**
1N1425	8.2	20.0	5.0	5%	1 watt	—	**1N3018**
1N1426	12.0	20.0	7.0	"	"	—	**1N3022**
1N1427	15.0	10.0	17.0	"	"	—	**1N3024**
1N1428	18.0	10.0	20.0	"	"	—	**1N3026**
1N1429	22.0	10.0	23.0	"	"	—	**1N3028**
1N1430	27.0	5.0	50.0	"	"	—	**1N3030**
1N1431	68.0	2.0	150.0	"	"	—	**1N3040**
1N1432	100.0	2.0	350.0	"	"	—	**1N3044**
1N1433	150.0	1.0	1200.0	"	"	—	**1N3048**
1N1482	4.7	200.0	3.0	5%	10 watt	—	**1N3995**
1N1483	6.2	200.0	2.0	"	"	—	**1N3998**
1N1484	4.7	50.0	5.0	5%	1 watt	—	**1N3825**
1N1485	6.2	20.0	5.0	"	"	—	**1N3828**
1N1507	3.9	35.0	15.0	No Suffix = 10%	750 mw	DO-12(9)	**1N3823**
1N1508	4.7	30.0	13.0	Suffix A = 5%	"	"	**1N3825**
1N1509	5.6	26.0	11.0	" "	"	"	**1N3827**
1N1510	6.8	22.0	3.0	" "	"	"	**1N3016**
1N1511	8.2	18.0	3.0	" "	"	"	**1N3018**
1N1512	10.0	15.0	3.2	" "	"	"	**1N3020**
1N1513	12.0	12.0	6.5	" "	"	"	**1N3022**
1N1514	15.0	10.0	10.5	" "	"	"	**1N3024**
1N1515	18.0	8.0	16.0	" "	"	"	**1N3026**
1N1516	22.0	6.0	40.0	" "	"	"	**1N3028**
1N1517	27.0	5.0	82.0	" "	"	"	**1N3030**
1N1518	3.9	50.0	10.0	No Suffix = 10%	1 watt	DO-3(9)	**1N3823**
1N1519	4.7	40.0	13.0	Suffix A = 5%	"	"	**1N3825**
1N1520	5.6	35.0	10.2	" "	"	"	**1N3827**
1N1521	6.8	30.0	4.2	" "	"	"	**1N3016**
1N1522	8.2	25.0	3.0	" "	"	"	**1N3018**
1N1523	10.0	20.0	4.0	" "	"	"	**1N3020**
1N1524	12.0	15.0	6.0	" "	"	"	**1N3022**
1N1525	15.0	13.0	13.0	" "	"	"	**1N3024**
1N1526	18.0	10.0	25.0	" "	"	"	**1N3026**
1N1527	22.0	9.0	32.0	" "	"	"	**1N3028**
1N1528	27.0	7.0	45.0	" "	"	"	**1N3030**
1N1530(2)	8.4±5%	10.0	15.0	T.C. = .002%/°C(4)	250 mw	Case Q	1N3156(27)
1N1530A(2)	8.4±5%	10.0	15.0	T.C. = .001%/°C(4)	"	"	1N3157(27)
1N1588	3.9	150.0	4.5	No Suffix = 10%	3.5 watt	DO-4	
1N1589	4.7	125.0	4.0	Suffix A = 5%	"	"	
1N1590	5.6	110.0	3.0	" "	"	"	
1N1591	6.8	100.0	0.9	" "	"	"	
1N1592	8.2	80.0	1.5	" "	"	"	
1N1593	10.0	70.0	2.5	" "	"	"	
1N1594	12.0	50.0	3.0	" "	"	"	
1N1595	15.0	40.0	5.5	" "	"	"	
1N1596	18.0	35.0	9.0	" "	"	"	
1N1597	22.0	30.0	14.0	" "	"	"	
1N1598	27.0	25.0	24.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(2) Temperature compensated zener diode
(4) Temperature range —55°C to +100°C

(9) Supplied by Microsemi in DO-13 Case

(27) Supplied by Microsemi in DO-7 package.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N1599	3.9	500.0	1.5	No Suffix = 10%	10 watt	DO-4	
1N1600	4.7	400.0	0.9	Suffix A = 5%	"	"	
1N1601	5.6	350.0	0.6	" "	"	"	
1N1602	6.8	300.0	0.4	" "	"	"	
1N1603	8.2	250.0	0.6	" "	"	"	
1N1604	10.0	200.0	1.0	" "	"	"	
1N1605	12.0	170.0	2.0	" "	"	"	
1N1606	15.0	140.0	1.9	" "	"	"	
1N1607	18.0	110.0	4.0	" "	"	"	
1N1608	22.0	90.0	6.0	" "	"	"	
1N1609	27.0	70.0	10.0	" "	"	"	
1N1735(2)	6.2±5%	7.5	20.0	No Suffix, T.C. = .01%/°C(4)	200 mw	Case 1	1N821(27)
1N1736(2)	12.4±5%	"	40.0	Suffix A, T.C. = .005%/°C(4)	400 mw	Case 2	
1N1737(2)	18.6±5%	"	60.0	" "	600 mw	Case 3	
1N1738(2)	24.8±5%	"	80.0	" "	800 mw	Case 3	
1N1739(2)	31.0±5%	"	100.0	" "	1000 mw	Case 4	
1N1740(2)	37.2±5%	"	120.0	" "	1200 mw	"	
1N1741(2)	43.4±5%	"	140.0	" "	1400 mw	"	
1N1742(2)	49.6±5%	"	160.0	" "	1600 mw	"	
1N1743	10.0	200.0	3.0	5%	10 watt	—	1N2974
1N1744	10.0	20.0	6.0	5%	1 watt	—	1N3020
1N1765	5.6	100.0	1.2	No Suffix = 10%	1 watt	DO-12(9)	1N3827
1N1766	6.2	"	1.5	Suffix A = 5%	"	"	1N3828
1N1767	6.8	"	1.7	" "	"	"	1N3016
1N1768	7.5	"	2.1	" "	"	"	1N3017
1N1769	8.2	"	2.4	" "	"	"	1N3018
1N1770	9.1	50.0	3.0	" "	"	"	1N3019
1N1771	10.0	"	3.5	" "	"	"	1N3020
1N1772	11.0	"	4.2	" "	"	"	1N3021
1N1773	12.0	"	5.0	" "	"	"	1N3022
1N1774	13.0	"	5.8	" "	"	"	1N3023
1N1775	15.0	"	7.6	" "	"	"	1N3024
1N1776	16.0	"	8.6	" "	"	"	1N3025
1N1777	18.0	"	11.0	" "	"	"	1N3026
1N1778	20.0	15.0	13.0	" "	"	"	1N3027
1N1779	22.0	"	16.0	" "	"	"	1N3028
1N1780	24.0	"	18.0	" "	"	"	1N3029
1N1781	27.0	"	23.0	" "	"	"	1N3030
1N1782	30.0	"	28.0	" "	"	"	1N3031
1N1783	33.0	"	33.0	" "	"	"	1N3032
1N1784	36.0	"	39.0	" "	"	"	1N3033
1N1785	39.0	"	45.0	" "	"	"	1N3034
1N1786	43.0	"	54.0	" "	"	"	1N3035
1N1787	47.0	"	64.0	" "	"	"	1N3036
1N1788	51.0	"	74.0	" "	"	"	1N3037
1N1789	56.0	"	88.0	" "	"	"	1N3038
1N1790	62.0	5.0	105.0	" "	"	"	1N3039
1N1791	68.0	"	125.0	" "	"	"	1N3040
1N1792	75.0	"	150.0	" "	"	"	1N3041
1N1793	82.0	"	175.0	" "	"	"	1N3042
1N1794	91.0	"	220.0	" "	"	"	1N3043
1N1795	100.0	"	260.0	" "	"	"	1N3044
1N1796	110.0	"	320.0	" "	"	"	1N3045
1N1797	120.0	"	390.0	" "	"	"	1N3046
1N1798	130.0	"	450.0	" "	"	"	1N3047
1N1799	150.0	"	600.0	" "	"	"	1N3048
1N1800	160.0	"	700.0	" "	"	"	1N3049
1N1801	180.0	"	900.0	" "	"	"	1N3050
1N1802	200.0	"	1100.0	" "	"	"	1N3051
1N1803	5.6	1000.0	1.0	No Suffix = 10%	10 watt	DO-4	
1N1804	6.2	"	"	Suffix A = 5%	"	"	
1N1805	6.8	"	"	Suffix R = Rev. Polarity	"	"	
1N1806	7.5	"	"	" "	"	"	
1N1807	8.2	"	"	" "	"	"	
1N1808	9.1	500.0	"	" "	"	"	
1N1809	110.0	50.0	47.0	" "	"	"	
1N1810	120.0	"	56.0	" "	"	"	
1N1811	130.0	"	65.0	" "	"	"	
1N1812	150.0	"	82.0	" "	"	"	
1N1813	160.0	"	93.0	" "	"	"	
1N1814	180.0	"	115.0	" "	"	"	
1N1815	200.0	"	140.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(9) Supplied by Microsemi in DO-13 case.
(27) Supplied by Microsemi in DO-7 package.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N1816	13.0	500.0	2.0	No Suffix = 10%	10 watt	DO-4	
1N1817	15.0	″	″	Suffix A = 5%	″	″	
1N1818	16.0	″	3.0	Suffix C = Double Anode (10%)	″	″	
1N1819	18.0	″	″	″ ″	″	″	
1N1820	20.0	250.0	″	″ ″	″	″	
1N1821	22.0	″	″	″ ″	″	″	
1N1822	24.0	″	″	″ ″	″	″	
1N1823	27.0	″	″	″ ″	″	″	
1N1824	30.0	″	4.0	″ ″	″	″	
1N1825	33.0	150.0	″	″ ″	″	″	
1N1826	36.0	″	5.0	″ ″	″	″	
1N1827	39.0	″	″	″ ″	″	″	
1N1828	43.0	″	6.0	″ ″	″	″	
1N1829	47.0	″	7.0	″ ″	″	″	
1N1830	51.0	″	8.0	″ ″	″	″	
1N1831	56.0	″	9.0	″ ″	″	″	
1N1832	62.0	50.0	12.0	″ ″	″	″	
1N1833	68.0	″	14.0	″ ″	″	″	
1N1834	75.0	″	20.0	″ ″	″	″	
1N1835	82.0	50.0	22.0	No Suffix = 10%, Suffix A = 5%	10 watt	DO-4	
1N1836	91.0	″	35.0	Suffix C = Double Anode (10%)	″	″	
1N1875	8.2	25.0	5.0	No Suffix = 10%	1 watt	Case R [9]	1N3018
1N1876	10.0	″	6.0	Suffix A = 5%	″	″	1N3020
1N1877	12.0	″	7.0	″ ″	″	″	1N3022
1N1878	15.0	″	8.0	″ ″	″	″	1N3024
1N1879	18.0	″	9.0	″ ″	″	″	1N3026
1N1880	22.0	8.0	24.0	″ ″	″	″	1N3028
1N1881	27.0	″	27.0	″ ″	″	″	1N3030
1N1882	33.0	″	30.0	″ ″	″	″	1N3032
1N1883	39.0	″	35.0	″ ″	″	″	1N3034
1N1884	47.0	″	50.0	″ ″	″	″	1N3036
1N1885	56.0	″	75.0	″ ″	″	″	1N3038
1N1886	68.0	3.0	250.0	″ ″	″	″	1N3040
1N1887	82.0	″	325.0	″ ″	″	″	1N3042
1N1888	100.0	″	400.0	″ ″	″	″	1N3044
1N1889-1N1890 is an obsolete series							
1N1891	8.2	25.0	5.0	No Suffix = 10%	10 watt	Case K	1N2972
1N1892	10.0	″	6.0	Suffix A = 5%	″	″	1N2974
1N1893	12.0	″	7.0	″ ″	″	″	1N2976
1N1894	15.0	″	8.0	″ ″	″	″	1N2979
1N1895	18.0	″	9.0	″ ″	″	″	1N2982
1N1896	22.0	8.0	24.0	″ ″	″	″	1N2985
1N1897	27.0	″	27.0	″ ″	″	″	1N2988
1N1898	33.0	″	30.0	″ ″	″	″	1N2990
1N1899	39.0	″	35.0	″ ″	″	″	1N2992
1N1900	47.0	″	50.0	″ ″	″	″	1N2995
1N1901	56.0	″	75.0	″ ″	″	″	1N2999
1N1902	68.0	3.0	250.0	″ ″	″	″	1N3001
1N1903	82.0	″	325.0	″ ″	″	″	1N3003
1N1904	100.0	″	400.0	″ ″	″	″	1N3005
1N1927	3.9	5.0	11.0[10]	No Suffix = 10%	250 mw	Case L	1N748
1N1928	4.7	″	10.0[10]	Suffix A = 5%	″	″	1N750
1N1929	5.6	″	8.0[10]	″ ″	″	″	1N752
1N1930	6.8	″	7.0[10]	″ ″	″	″	1N754
1N1931	8.2	″	15.0[10]	″ ″	″	″	1N756
1N1932	10.0	″	22.0[10]	″ ″	″	″	1N758
1N1933	12.0	1.0	30.0[10]	″ ″	″	″	1N759
1N1934	15.0	″	50.0[10]	″ ″	″	″	1N965
1N1935	18.0	″	70.0[10]	″ ″	″	″	1N967
1N1936	22.0	″	100.0[10]	″ ″	″	″	1N969
1N1937	27.0	″	200.0[10]	″ ″	″	″	1N971
1N1938	33.0	0.2	300.0[10]	″ ″	″	″	1N973
1N1939	39.0	″	400.0[10]	″ ″	″	″	1N975
1N1940	47.0	″	500.0[10]	″ ″	″	″	1N977
1N1941	56.0	″	700.0[10]	″ ″	″	″	1N979
1N1942	68.0	″	900.0[10]	″ ″	″	″	1N981
1N1943	82.0	″	1200.0[10]	″ ″	″	″	1N983
1N1944	100.0	″	1700.0[10]	″ ″	″	″	1N985
1N1945	120.0	″	2800.0[10]	″ ″	″	″	1N987
1N1946	150.0	0.1	—	″ ″	″	″	1N989
1N1947	180.0	″	—	″ ″	″	″	1N991

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(8) Microsemi device utilizes glass subassembly potted in epoxy.

(9) Supplied by Microsemi in DO-13 Case.

(10) Typical Zener Impedance. 1N1927-32 and 1N1981-86 I_Z @ 10mA. 1N1933-36 and 1N1987-90 @ 5mA. 1N1937-39 and 1N1991-3 @ 3mA. 1N1940-41 and 1N1994-5 @ 2mA. 1N1942-45 and 1N1996-99 @ 1mA.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N1948	220.0	0.2	—	No Suffix = 10%	250 mw	Case L	
1N1949	270.0	0.1	—	Suffix A = 5%	"	"	
1N1950	330.0	"	—	" "	"	"	
1N1951	395.0	"	—	" "	"	"	
1N1952	470.0	"	—	" "	"	"	
1N1953	565.0	"	—	" "	"	"	
1N1954 thru 1N1980 is an obsolete 200 mw series							
1N1981	3.9	5.0	11.0(10)	No Suffix = 10%	150 mw	Case A(8)	
1N1982	4.7	"	10.0(10)	Suffix A = 5%	"	"	
1N1983	5.6	"	8.0(10)	" "	"	"	
1N1984	6.8	"	7.0(10)	" "	"	"	
1N1985	8.2	"	15.0(10)	" "	"	"	
1N1986	10.0	"	22.0(10)	" "	"	"	
1N1987	12.0	1.0	30.0(10)	" "	"	"	
1N1988	15.0	"	50.0(10)	" "	"	"	
1N1989	18.0	"	70.0(10)	" "	"	"	
1N1990	22.0	"	100.0(10)	" "	"	"	
1N1991	27.0	1.0	200.0(10)	No Suffix = 10%	150 mw	Case A(8)	
1N1992	33.0	0.2	300.0(10)	Suffix A = 5%	"	"	
1N1993	39.0	"	400.0(10)	" "	"	"	
1N1994	47.0	"	500.0(10)	" "	"	"	
1N1995	56.0	"	700.0(10)	" "	"	"	
1N1996	68.0	"	900.0(10)	" "	"	"	
1N1997	82.0	"	1200.0(10)	" "	"	"	
1N1998	100.0	"	1700.0(10)	" "	"	"	
1N1999	120.0	"	2800.0(10)	" "	"	"	
1N2000	145.0	0.1	—	" "	"	"	
1N2001	180.0	"	—	" "	"	"	
1N2002	220.0	"	—	" "	"	"	
1N2003	270.0	"	—	" "	"	"	
1N2004	330.0	"	—	" "	"	"	
1N2005	390.0	"	—	" "	"	"	
1N2006	470.0	"	—	" "	"	"	
1N2007	560.0	"	—	" "	"	"	
1N2008	100.0	50.0	40.0	No Suffix = 10%	10 watt	DO-4	
1N2009	110.0	"	47.0	Suffix A = 5%	"	"	
1N2010	120.0	"	56.0	Suffix R = Rev. Polarity	"	"	
1N2011	130.0	"	65.0	Suffix C = Double Anode (10%)	"	"	
1N2012	150.0	"	82.0	" "	"	"	
1N2032	4.3 - 5.4	10.0	55.0		750 mw	DO-12(9)	**1N3825**
1N2033	5.2 - 6.4	"	20.0		"	"	**1N3827**
1N2034	6.2 - 8.0	"	8.0		"	"	**1N3829**
1N2035	7.5 - 10.0	"	15.0		"	"	**1N3019**
1N2036	9.0 - 12.0	5.0	50.0		"	"	**1N3021**
1N2037	11.0 - 14.5	"	70.0		"	"	**1N3023**
1N2038	13.5 - 18.0	"	120.0		"	"	**1N3025**
1N2039	17.0 - 21.0	"	200.0		"	"	**1N3027**
1N2040	20.0 - 27.0	"	300.0		"	"	**1N3029**
1N2041	4.3 - 5.4	1000.0	0.5		10 watt	DO-4	
1N2042	5.2 - 6.4	"	0.7		"	"	
1N2043	6.2 - 8.0	"	0.8		"	"	
1N2044	7.5 - 10.0	"	0.8		"	"	
1N2045	9.0 - 12.0	500.0	1.5		"	"	
1N2046	11.0 - 14.5	"	2.0		"	"	
1N2047	13.5 - 18.0	"	3.0		"	"	
1N2048	17.0 - 21.0	"	"		"	"	
1N2049	20.0 - 27.0	150.0	8.0		"	"	
1N2163(2)	9.4 ± 5%	10.0	15.0	T.C. = .005%/°C(11)	750 mw	DO-13	1N936(27)
1N2164(2)	Suffix	"	"	" "	"	"	1N936A(27)
1N2165(2)	A = 2.0%	"	"	" "	"	"	1N936B(27)
1N2166(2)	" "	"	"	T.C. = .001%/°C(11)	"	"	1N938(27)
1N2167(2)	" "	"	"	" "	"	"	1N938A(27)
1N2168(2)	" "	"	"	" "	"	"	1N938B(27)
1N2169(2)	" "	"	"	T.C. = .0005%/°C(11)	"	"	1N939(27)
1N2170(2)	" "	"	"	" "	"	"	1N939A(27)
1N2171(2)	" "	"	"	" "	"	"	1N939B(27)
1N2214(2)	5.4 - 5.6	35.0	5.6	T.C. = .03%/°C	1 watt	DO-1 (9)	**1N3827**
1N2387 is an obsolete 1 watt device							
1N2498	10.0	500.0	2.0	No Suffix = 10%	10 watt	DO-4	
1N2499	11.0	"	"	Suffix A = 5%	"	"	
1N2500	12.0	"	"	Suffix C = Double Anode (10%)	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(9) Supplied by Microsemi in DO-13.
(27) Supplied by Microsemi in DO-7 package.
(33) Supplied by Microsemi in Case Size CC.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N2620[2]	9.3±5%	10.0	15.0	Temp. .01%/°C[7]	750mw	DO-13	1N935[27]
1N2621[2]	9.3±5%	"	"	Coeff. .005%/°C[7]	"	"	1N936[27]
1N2622[2]	9.3±5%	"	"	.002%/°C[7]	"	"	1N937[27]
1N2623[2]	9.3±5%	"	"	.001%/°C[7]	"	"	1N938[27]
1N2624[2]	9.3±5%	"	"	.0005%/°C[7]	"	"	1N939[27]
1N2625-1N2626 is an obsolete series							
1N2765[2]	6.8±5%	7.5	20.0	T.C. = .005%/°C[4]	—	Case S	1N825[27]
1N2766[2]	13.6±5%	"	40.0	Suffix A = .0025%/°C[4]	—	"	1N4058[33]
1N2767[2]	20.4±5%	"	60.0	" "	—	Case T	1N4061[33]
1N2768[2]	27.2±5%	"	80.0	" "	—	"	1N4063[33]
1N2769[2]	34.0±5%	"	100.0	" "	—	Case L	1N4065[33]
1N2770[2]	40.8±5%	"	120.0	" "	—	"	1N4067[33]
1N2783 is an obsolete device							
1N2790	8.5±5%	10.0	15.0	T.C. = .002%/°C	1 watt	—	**1N3156**
1N2804	6.8	1850.0	0.2	No Suffix = 20%	50 watt	TO-3	
1N2805	7.5	1700.0	0.3	Suffix A = 10%, Suffix B = 5%	"	"	
1N2806	8.2	1500.0	0.4	Suffix R = Rev. Polarity	"	"	
1N2807	9.1	1370.0	0.5	No Suffix = 20%	50 watt	TO-3	
1N2808	10.0	1200.0	0.6	Suffix A = 10%, Suffix B = 5%	"	"	
1N2809	11.0	1100.0	0.8	Suffix R = Rev. Polarity	"	"	
1N2810	12.0	1000.0	1.0	" "	"	"	
1N2811	13.0	960.0	1.1	" "	"	"	
1N2812	14.0	890.0	1.2	" "	"	"	
1N2813	15.0	830.0	1.4	" "	"	"	
1N2814	16.0	780.0	1.6	" "	"	"	
1N2815	17.0	740.0	1.8	" "	"	"	
1N2816	18.0	700.0	2.0	" "	"	"	
1N2817	19.0	660.0	2.2	" "	"	"	
1N2818	20.0	630.0	2.4	" "	"	"	
1N2819	22.0	570.0	2.5	" "	"	"	
1N2820	24.0	520.0	2.6	" "	"	"	
1N2821	25.0	500.0	2.7	" "	"	"	
1N2822	27.0	460.0	2.8	" "	"	"	
1N2823	30.0	420.0	3.0	" "	"	"	
1N2824	33.0	380.0	3.2	" "	"	"	
1N2825	36.0	350.0	3.5	" "	"	"	
1N2826	39.0	320.0	4.0	" "	"	"	
1N2827	43.0	290.0	4.5	" "	"	"	
1N2828	45.0	280.0	"	" "	"	"	
1N2829	47.0	270.0	5.0	" "	"	"	
1N2830	50.0	250.0	"	" "	"	"	
1N2831	51.0	245.0	5.2	" "	"	"	
1N2832	56.0	220.0	6.0	" "	"	"	
1N2833	62.0	200.0	7.0	" "	"	"	
1N2834	68.0	180.0	8.0	" "	"	"	
1N2835	75.0	170.0	9.0	" "	"	"	
1N2836	82.0	150.0	11.0	" "	"	"	
1N2837	91.0	140.0	15.0	" "	"	"	
1N2838	100.0	120.0	20.0	" "	"	"	
1N2839	105.0	"	25.0	" "	"	"	
1N2840	110.0	110.0	30.0	" "	"	"	
1N2841	120.0	100.0	40.0	" "	"	"	
1N2842	130.0	95.0	50.0	" "	"	"	
1N2843	150.0	85.0	75.0	" "	"	"	
1N2844	160.0	80.0	80.0	" "	"	"	
1N2845	180.0	68.0	90.0	" "	"	"	
1N2846	200.0	65.0	100.0	" "	"	"	
1N2865-1N2868 is an obsolete series							
1N2937	50.0	25.0	75.0	15%	10 watt	DO-4	
1N2942 thru 1N2968 is an obsolete 50 watt series							
1N2970	6.8	370.0	1.2	No Suffix = 20%	10 watt	DO-4	
1N2971	7.5	335.0	1.3	Suffix A = 10%, Suffix B = 5%	"	"	
1N2972	8.2	305.0	1.5	Suffix R = Rev. Polarity	"	"	
1N2973	9.1	275.0	2.0	" "	"	"	
1N2974	10.0	250.0	3.0	" "	"	"	
1N2975	11.0	230.0	"	" "	"	"	
1N2976	12.0	210.0	"	" "	"	"	
1N2977	13.0	190.0	"	" "	"	"	
1N2978	14.0	180.0	"	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(2) Temperature compensated zener diode
(4) Temperature range −55°C to +100°C
(7) No suffix denotes temp. range 0°C to +75°C
Suffix A denotes temp. range −55°C to +100°C
Suffix B denotes temp. range −55°C to +150°C

(9) Supplied by Microsemi in DO-13 Case
(10) See footnote (10) on page 9
(11) Temperature range 0°C to +70°C 1N2163, 66, 69
−55°C to +125°C 1N2164, 67, 70
−55°C to +185°C 1N2165, 68, 71

(27) Supplied by Microsemi in DO-7 package.
(33) Supplied by Microsemi in Case Size CC.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N2979	15.0	170.0	3.0	No Suffix = 20%	10 watt	DO-4	
1N2980	16.0	155.0	4.0	Suffix A = 10%, Suffix B = 5%	"	"	
1N2981	17.0	145.0	"	Suffix R = Rev. Polarity	"	"	
1N2982	18.0	140.0	"	" "	"	"	
1N2983	19.0	130.0	"	" "	"	"	
1N2984	20.0	125.0	"	" "	"	"	
1N2985	22.0	115.0	5.0	" "	"	"	
1N2986	24.0	105.0	"	" "	"	"	
1N2987	25.0	100.0	6.0	" "	"	"	
1N2988	27.0	95.0	7.0	" "	"	"	
1N2989	30.0	85.0	8.0	" "	"	"	
1N2990	33.0	75.0	9.0	" "	"	"	
1N2991	36.0	70.0	10.0	" "	"	"	
1N2992	39.0	65.0	11.0	" "	"	"	
1N2993	43.0	60.0	12.0	" "	"	"	
1N2994	45.0	55.0	13.0	No Suffix = 20%	10 watt	DO-4	
1N2995	47.0	"	14.0	Suffix A = 10%, Suffix B = 5%	"	"	
1N2996	50.0	50.0	15.0	Suffix R = Rev. Polarity	"	"	
1N2997	51.0	"	"	" "	"	"	
1N2998	52.0	"	"	" "	"	"	
1N2999	56.0	45.0	16.0	" "	"	"	
1N3000	62.0	40.0	17.0	" "	"	"	
1N3001	68.0	37.0	18.0	" "	"	"	
1N3002	75.0	33.0	22.0	" "	"	"	
1N3003	82.0	30.0	25.0	" "	"	"	
1N3004	91.0	28.0	35.0	" "	"	"	
1N3005	100.0	25.0	40.0	" "	"	"	
1N3006	105.0	"	45.0	" "	"	"	
1N3007	110.0	23.0	55.0	" "	"	"	
1N3008	120.0	20.0	75.0	" "	"	"	
1N3009	130.0	19.0	100.0	" "	"	"	
1N3010	140.0	18.0	125.0	" "	"	"	
1N3011	150.0	17.0	175.0	" "	"	"	
1N3012	160.0	16.0	200.0	" "	"	"	
1N3013	175.0	14.0	250.0	" "	"	"	
1N3014	180.0	"	260.0	" "	"	"	
1N3015	200.0	12.0	300.0	" "	"	"	
1N3016	6.8	37.0	3.5	No Suffix = 20%	1 watt	DO-13	
1N3017	7.5	34.0	4.0	Suffix A = 10%	"	"	
1N3018	8.2	31.0	4.5	Suffix B = 5%	"	"	
1N3019	9.1	28.0	5.0	" "	"	"	
1N3020	10.0	25.0	7.0	" "	"	"	
1N3021	11.0	23.0	8.0	" "	"	"	
1N3022	12.0	21.0	9.0	" "	"	"	
1N3023	13.0	19.0	10.0	" "	"	"	
1N3024	15.0	17.0	14.0	" "	"	"	
1N3025	16.0	15.5	16.0	" "	"	"	
1N3026	18.0	14.0	20.0	" "	"	"	
1N3027	20.0	12.5	22.0	" "	"	"	
1N3028	22.0	11.5	23.0	" "	"	"	
1N3029	24.0	10.5	25.0	" "	"	"	
1N3030	27.0	9.5	35.0	" "	"	"	
1N3031	30.0	8.5	40.0	" "	"	"	
1N3032	33.0	7.5	45.0	" "	"	"	
1N3033	36.0	7.0	50.0	" "	"	"	
1N3034	39.0	6.5	60.0	" "	"	"	
1N3035	43.0	6.0	70.0	" "	"	"	
1N3036	47.0	5.5	80.0	" "	"	"	
1N3037	51.0	5.0	95.0	" "	"	"	
1N3038	56.0	4.5	110.0	" "	"	"	
1N3039	62.0	4.0	125.0	" "	"	"	
1N3040	68.0	3.7	150.0	" "	"	"	
1N3041	75.0	3.3	175.0	" "	"	"	
1N3042	82.0	3.0	200.0	" "	"	"	
1N3043	91.0	2.8	250.0	" "	"	"	
1N3044	100.0	2.5	350.0	" "	"	"	
1N3045	110.0	2.3	450.0	" "	"	"	
1N3046	120.0	2.0	550.0	" "	"	"	
1N3047	130.0	1.9	700.0	" "	"	"	
1N3048	150.0	1.7	1000.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3049	160.0	1.6	1100.0	No Suffix = 20%	1 watt	DO-13	
1N3050	180.0	1.4	1200.0	Suffix A = 10%	"	"	
1N3051	200.0	1.2	1500.0	Suffix B = 5%	"	"	
1N3098-1N3101, 1N3102-1N3105, 1N3106-1N3109 are obsolete series							
1N3112	7.5	30.0	2.0	5%	1 watt	DO-3 (9)	**1N3017**
1N3148(2)	8.5±5%	10.0	15.0	T.C. = .005%/°C	400 mw	—	**1N3155**
1N3154(2)	8.4±5%	10.0	15.0	T.C. = .01%/°C(12)	400 mw	DO-7	
1N3155(2)	8.4±5%	"	"	T.C. = .005%/°C(12)	"	"	
1N3156(2)	8.4±5%	"	"	T.C. = .002%/°C(12)	"	"	
1N3157(2)	8.4±5%	"	"	T.C. = .001%/°C(12)	"	"	
1N3181(1)	8.2	14.0	10.0	10%	600 mw	Case Z	N/A
1N3199(2)	8.0 - 8.8	10.0	15.0	T.C. = .005%/°C(6)	270 mw	Case GG(27)	**1N3155**
1N3200(2)	8.0 - 8.8	"	"	T.C. = .003%/°C(6)	"	"	**1N3156**
1N3201(2)	8.0 - 8.8	"	"	T.C. = .002%/°C(6)	"	"	**1N3156**
1N3202(2)	8.0 - 8.8	"	"	T.C. = .001%/°C(6)	"	"	**1N3157**

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR} (n sec.)	Device Package	MICROSEMI Recommended Substitute
1N3206	100	.040	1.0	.025	4.0	H	
1N3207	60	.075	1.0	.05	6.0	H	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3305	6.8	1850.0	0.2	No Suffix = 20%	50 watt	DO-5	
1N3306	7.5	1700.0	0.3	Suffix A = 10%, Suffix B = 5%	"	"	
1N3307	8.2	1500.0	0.4	Suffix R = Rev. Polarity	"	"	
1N3308	9.1	1370.0	0.5	" "	"	"	
1N3309	10.0	1200.0	0.6	" "	"	"	
1N3310	11.0	1100.0	0.8	" "	"	"	
1N3311	12.0	1000.0	1.0	" "	"	"	
1N3312	13.0	960.0	1.1	" "	"	"	
1N3313	14.0	890.0	1.2	" "	"	"	
1N3314	15.0	830.0	1.4	" "	"	"	
1N3315	16.0	780.0	1.6	" "	"	"	
1N3316	17.0	740.0	1.8	" "	"	"	
1N3317	18.0	700.0	2.0	" "	"	"	
1N3318	19.0	660.0	2.2	" "	"	"	
1N3319	20.0	630.0	2.4	" "	"	"	
1N3320	22.0	570.0	2.5	" "	"	"	
1N3321	24.0	520.0	2.6	" "	"	"	
1N3322	25.0	500.0	2.7	" "	"	"	
1N3323	27.0	460.0	2.8	" "	"	"	
1N3324	30.0	420.0	3.0	" "	"	"	
1N3325	33.0	380.0	3.2	" "	"	"	
1N3326	36.0	350.0	3.5	" "	"	"	
1N3327	39.0	320.0	4.0	" "	"	"	
1N3328	43.0	290.0	4.5	" "	"	"	
1N3329	45.0	280.0	4.5	" "	"	"	
1N3330	47.0	270.0	5.0	" "	"	"	
1N3331	50.0	250.0	5.0	" "	"	"	
1N3332	51.0	245.0	5.2	" "	"	"	
1N3333	52.0	240.0	5.5	" "	"	"	
1N3334	56.0	220.0	6.0	" "	"	"	
1N3335	62.0	200.0	7.0	" "	"	"	
1N3336	68.0	180.0	8.0	" "	"	"	
1N3337	75.0	170.0	9.0	" "	"	"	
1N3338	82.0	150.0	11.0	" "	"	"	
1N3339	91.0	140.0	15.0	" "	"	"	
1N3340	100.0	120.0	20.0	" "	"	"	
1N3341	105.0	120.0	25.0	" "	"	"	
1N3342	110.0	110.0	30.0	" "	"	"	
1N3343	120.0	100.0	40.0	" "	"	"	
1N3344	130.0	95.0	50.0	" "	"	"	
1N3345	140.0	90.0	60.0	" "	"	"	
1N3346	150.0	85.0	75.0	" "	"	"	
1N3347	160.0	80.0	80.0	" "	"	"	
1N3348	175.0	70.0	85.0	" "	"	"	
1N3349	180.0	68.0	90.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(6) Temperature range −50°C to +100°C
(7) Temperature range 0°C to +75°C
(9) Supplied by Microsemi in DO-13 Case
(12) No suffix denotes temp. range −55°C to +100°C. Suffix A denotes −55°C to +150°C
(13) Temperature range +25°C to +100°C
(18) Certified voltage time stability
(19) Low-reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3350	200.0	65.0	100.0	" "	"	"	
1N3392 thru 1N3432 is an obsolete 500mw series							
1N3433 thru 1N3463 is an obsolete 2 watt series							
1N3477	2.2	5.0	60 @ 10mA	No Suffix = 10% Suffix A = 5%	250mw	DO-7	
1N3496[2]	5.9 - 6.5	7.5	15.0	T.C. = .005%/°C[7]	"	DO-7	
1N3497[2]	5.9 - 6.5	"	"	T.C. = .002%/°C[7]	"	"	
1N3498[2]	5.9 - 6.5	"	"	T.C. = .001%/°C[7]	"	"	
1N3499[2]	5.9 - 6.5	"	"	T.C. = .0005%/°C[7]	"	"	
1N3500[2]	5.9 - 6.5	"	"	T.C. = .01%/°C[7]	"	"	
1N3501[2,18]	6.2 - 6.5	"	12.0	T.C. = .0013%/°C[13]	250mw	DO-7	
1N3502[2,18]	6.2 - 6.5	"	"	T.C. = .0006%/°C[13]	"	"	
1N3503[2,18]	6.2 - 6.5	"	"	T.C. = .0013%/°C[13]	"	"	
1N3504[2,18]	6.2 - 6.5	"	"	T.C. = .0013%/°C[13]	"	"	
1N3506[19]	3.3	20.0	24.0	5%	400mw	DO-7/DO-35	
1N3507[19]	3.6	"	22.0	"	"	"	
1N3508[19]	3.9	"	20.0	"	"	"	
1N3509[19]	4.3	"	18.0	"	"	"	
1N3510[19]	4.7	"	16.0	"	"	"	
1N3511[19]	5.1	"	14.0	"	"	"	
1N3512[19]	5.6	"	8.0	"	"	"	
1N3513[19]	6.2	"	3.0	"	"	"	
1N3514[19]	6.8	"	"	"	"	"	
1N3515[19]	7.5	10.0	4.0	"	"	"	
1N3516[19]	8.2	"	5.0	"	"	"	
1N3517[19]	9.1	"	6.0	"	"	"	
1N3518[19]	10.0	10.0	7.0	5%	400mw	"	
1N3519[19]	11.0	"	8.0	"	"	"	
1N3520[19]	12.0	"	10.0	"	"	"	
1N3521[19]	13.0	5.0	12.0	"	"	"	
1N3522[19]	15.0	"	14.0	"	"	"	
1N3523[19]	16.0	"	16.0	"	"	"	
1N3524[19]	18.0	"	18.0	"	"	"	
1N3525[19]	20.0	"	20.0	"	"	"	
1N3526[19]	22.0	"	35.0	"	"	"	
1N3527[19]	24.0	"	38.0	"	"	"	
1N3528[19]	27.0	4.0	40.0	"	"	"	
1N3529[19]	30.0	"	48.0	"	"	"	
1N3530[19]	33.0	3.0	50.0	"	"	"	
1N3531[19]	36.0	"	75.0	"	"	"	
1N3532[19]	39.0	"	100.0	"	"	"	
1N3533[19]	43.0	2.0	130.0	"	"	"	
1N3534[19]	47.0	"	150.0	"	"	"	
1N3537[1]	11.0 - 13.0	25.0	7.0	8%	1 watt	Case R[9]	1N3022
1N3553[2]	6.3±3.2%	7.5	15.0	T.C. = .01%/°C[4]	250mw	DO-7	
1N3580 [2]	11.7±5%	"	25.0	T.C. = .01%/°C[7]	750mw	DO-13	1N941[27]
1N3581 [2]	11.7±5%	"	"	T.C. = .005%/°C[7]	"	"	1N942[27]
1N3582 [2]	11.7±5%	"	"	T.C. = .002%/°C[7]	"	"	1N943[27]
1N3583 [2]	11.7±5%	"	"	T.C. = .001%/°C[7]	"	"	1N944[27]
1N3584 [2]	11.7±5%	"	"	T.C. = .0005%/°C[7]	"	"	1N945[27]

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N3595	150	—	.83 min. 1.00 max.	1.0(nA)	(µsec.) 3.0	DO35	
		(100°C)A					
1N3611	200	1.0	1.1	1.0		A	
1N3612	400	1.0	1.1	1.0		A	
1N3613	600	1.0	1.1	1.0		A	
1N3614	800	1.0	1.1	1.0		A	
		(55°)					
1N3644	1500	.25	5.0	5		S	
1N3645	2000	.25	5.0	5		S	
1N3646	2500	.25	5.0	5		S	
1N3647	3000	.25	5.0	5		S	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3675	6.8	18.5	4.5	No Suffix = 20%	750mw	Case X [28]	
1N3676	7.5	16.5	5.5	Suffix A = 10%	"	"	
1N3677	8.2	15.0	6.5	Suffix B = 5%	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3678	9.1	14.0	7.5	No Suffix = 20%	750 mw	Case X (28)	
1N3679	10.0	12.5	8.5	Suffix A = 10%	"	"	
1N3680	11.0	11.5	9.5	Suffix B = 5%	"	"	
1N3681	12.0	10.5	11.5	" "	"	"	
1N3682	13.0	9.5	13.0	" "	"	"	
1N3683	15.0	8.5	16.0	" "	"	"	
1N3684	16.0	7.8	17.0	" "	"	"	
1N3685	18.0	7.0	21.0	" "	"	"	
1N3686	20.0	6.2	25.0	" "	"	"	
1N3687	22.0	5.6	29.0	" "	"	"	
1N3688	24.0	5.2	33.0	" "	"	"	
1N3689	27.0	4.6	41.0	" "	"	"	
1N3690	30.0	4.2	49.0	" "	"	"	
1N3691	33.0	3.8	58.0	" "	"	"	
1N3692	36.0	3.4	70.0	" "	"	"	
1N3693	39.0	3.2	80.0	" "	"	"	
1N3694	43.0	3.0	93.0	" "	"	"	
1N3695	47.0	2.7	105.0	" "	"	"	
1N3696	51.0	2.5	125.0	" "	"	"	
1N3697	56.0	2.2	150.0	" "	"	"	
1N3698	62.0	2.0	185.0	" "	"	"	
1N3699	68.0	1.8	230.0	" "	"	"	
1N3700	75.0	1.7	270.0	" "	"	"	
1N3701	82.0	1.5	330.0	" "	"	"	
1N3702	91.0	1.4	400.0	" "	"	"	
1N3703	100.0	1.3	500.0	" "	"	"	
1N3704	110.0	1.1	750.0	" "	"	"	
1N3705	120.0	1.0	900.0	" "	"	"	
1N3706	130.0	0.95	1100.0	" "	"	"	
1N3707	150.0	0.85	1500.0	" "	"	"	
1N3708	160.0	0.80	1700.0	" "	"	"	
1N3709	180.0	0.68	2200.0	" "	"	"	
1N3710	200.0	0.65	2500.0	" "	"	"	
1N3732	5.1	40.0	8.5	5%	1 watt	DO-3 (9)	
1N3763(2)	20±5%	10.0	35.0	T.C. = .002%/°C	1.5 watt	Case CC	
1N3776(1)	10.0	25.0	6.0	10%	6 watt	DO-4	
1N3779(2)	6.3 - 6.7	7.5	10.0	T.C. = .015%/°C(4)	400 mw	DO-7	
1N3780(2)	6.3 - 6.7	"	"	T.C. = .01%/°C(4)	"	"	
1N3781(2)	6.3 - 6.7	"	"	T.C. = .005%/°C(4)	"	"	
1N3782(2)	6.3 - 6.7	"	"	T.C. = .002%/°C(4)	"	"	
1N3783(2)	6.3 - 6.7	"	"	T.C. = .001%/°C(4)	"	"	
1N3784(2)	6.3 - 6.7	"	"	T.C. = .0005%/°C(4)	"	"	
1N3785	6.8	55.0	2.7	No Suffix = 20%	1.5 watt	Case AA(28)	2EZ6.8D
1N3786	7.5	50.0	3.0	Suffix A = 10%	"	"	2EZ7.5D
1N3787	8.2	46.0	3.5	Suffix B = 5%	"	"	2EZ8.2D
1N3788	9.1	41.0	4.0	No Suffix = 20%	1.5 watt	Case AA(28)	2EZ9.1D
1N3789	10.0	37.0	5.0	Suffix A = 10%	"	"	2EZ10D
1N3790	11.0	34.0	6.0	Suffix B = 5%	"	"	2EZ11D
1N3791	12.0	31.0	7.0	" "	"	"	2EZ12D
1N3792	13.0	29.0	9.0	" "	"	"	2EZ13D
1N3793	15.0	25.0	10.0	" "	"	"	2EZ15D
1N3794	16.0	23.0	11.0	" "	"	"	2EZ16D
1N3795	18.0	21.0	13.0	" "	"	"	2EZ18D
1N3796	20.0	19.0	15.0	" "	"	"	2EZ20D
1N3797	22.0	17.0	16.0	" "	"	"	2EZ22D
1N3798	24.0	16.0	17.0	" "	"	"	2EZ24D
1N3799	27.0	14.0	20.0	" "	"	"	2EZ27D
1N3800	30.0	12.0	25.0	" "	"	"	2EZ30D
1N3801	33.0	11.0	30.0	" "	"	"	2EZ33D
1N3802	36.0	10.0	35.0	" "	"	"	2EZ36D
1N3803	39.0	10.0	40.0	" "	"	"	2EZ39D
1N3804	43.0	9.0	45.0	" "	"	"	2EZ43D
1N3805	47.0	8.0	55.0	" "	"	"	2EZ47D
1N3806	51.0	7.4	65.0	" "	"	"	2EZ51D
1N3807	56.0	6.7	75.0	" "	"	"	2EZ56D
1N3808	62.0	6.0	85.0	" "	"	"	2EZ62D
1N3809	68.0	5.5	95.0	" "	"	"	2EZ68D
1N3810	75.0	5.0	110.0	" "	"	"	2EZ75D
1N3811	82.0	4.5	130.0	" "	"	"	2EZ82D
1N3812	91.0	4.1	150.0	" "	"	"	2EZ91D
1N3813	100.0	3.7	200.0	" "	"	"	2EZ100D
1N3814	110.0	3.4	300.0	" "	"	"	2EZ110D

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(4) Temperature range −55°C to +100°C
(7) No suffix denotes temp. range 0°C to +75°C
Suffix A denotes −55°C to +100°C
Suffix B denotes temp. range −55°C to +150°C
(9) Supplied by Microsemi in DO-13 Case
(14) TC=.005V/°C @ +25°C to +100°C or .025V/°C @ −55°C to +25°C
(19) Low reverse leakage diode
(28) Supplied by Microsemi in Case J (DO-41)

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3815	120.0	3.1	350.0	No Suffix = 20%	1.5 watt	Case AA(28)	2EZ120D
1N3816	130.0	2.9	400.0	Suffix A = 10%	"	"	2EZ130D
1N3817	150.0	2.5	700.0	Suffix B = 5%	"	"	2EZ150D
1N3818	160.0	2.3	750.0	" "	"	"	2EZ160D
1N3819	180.0	2.1	800.0	" "	"	"	2EZ180D
1N3820	200.0	1.9	1000.0	" "	"	"	2EZ200D
1N3821	3.3	76.0	10.0	No Suffix = 10%	1 watt	DO-13	
1N3822	3.6	69.0	10.0	Suffix A = 5%	"	"	
1N3823	3.9	64.0	9.0	" "	"	"	
1N3824	4.3	58.0	9.0	" "	"	"	
1N3825	4.7	53.0	8.0	" "	"	"	
1N3826	5.1	49.0	7.0	" "	"	"	
1N3827	5.6	45.0	5.0	" "	"	"	
1N3828	6.2	41.0	2.0	" "	"	"	
1N3829	6.8	37.0	1.5	" "	"	"	
1N3830	7.5	34.0	1.5	" "	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N3879	50	6	1.4	15	200 (n sec)	DO4	
1N3880	100	6	1.4	15	200	DO4	
1N3881	200	6	1.4	15	200	DO4	
1N3882	300	6	1.4	15	200	DO4	
1N3883	400	6	1.4	15	200	DO4	
1N3889	50	12	1.4	25	200 (n sec)	DO4	
1N3890	100	12	1.4	25	200	DO4	
1N3891	200	12	1.4	25	200	DO4	
1N3892	300	12	1.4	25	200	DO4	
1N3893	400	12	1.4	25	200	DO4	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3949	20.0	250.0	3.0	5%	10 watt	DO-4	
1N3950	20.0	19.0	15.0	5%	1.5 watt	Case AA(28)	
1N3951	25.0	15.0	18.0	"	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N3957	1150	(100°C)A 1.0	1.1	1.0		A	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N3984	5.5	1000.0	0.7	5%	10 watt	DO-4	
1N3985	6.0	1000.0	0.7	"	"	"	
1N3986	6.2	805.0	1.5	5%	10 watt	DO-4	
1N3993	3.9	640.0	2.0	No Suffix = 10%	10 watt	DO-4	
1N3994	4.3	580.0	1.5	Suffix A = 5%	"	"	
1N3995	4.7	530.0	1.2	Suffix R = Rev. Polarity	"	"	
1N3996	5.1	490.0	1.1	" "	"	"	
1N3997	5.6	445.0	1.0	" "	"	"	
1N3998	6.2	405.0	1.1	" "	"	"	
1N3999	6.8	370.0	1.2	" "	"	"	
1N4000	7.5	335.0	1.3	" "	"	"	
1N4010(2)	6.2±5%	7.5	15.0	T.C.(14)	400mw	DO-7	
1N4016	8.2	150.0	1.5	No Suffix = 20%	5 watt	DO-4	
1N4017	9.1	135.0	2.0	Suffix A = 10%	"	"	
1N4018	10.0	125.0	2.0	Suffix B = 5%	"	"	
1N4019	11.0	115.0	2.5	" "	"	"	
1N4020	12.0	105.0	2.5	" "	"	"	
1N4021	13.0	95.0	3.0	" "	"	"	
1N4022	15.0	85.0	"	" "	"	"	
1N4023	16.0	80.0	"	" "	"	"	
1N4024	18.0	70.0	4.0	" "	"	"	
1N4025	20.0	65.0	4.0	" "	"	"	
1N4026	22.0	55.0	5.0	" "	"	"	
1N4027	24.0	50.0	6.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4028	27.0	45.0	6.0	No Suffix = 20%	5 watt	Case K (32)	
1N4029	30.0	42.0	8.0	Suffix A = 10%	"	"	
1N4030	33.0	38.0	10.0	Suffix B = 5%	"	"	
1N4031	36.0	35.0	12.0	" "	"	"	
1N4032	39.0	32.0	15.0	" "	"	"	
1N4033	43.0	29.0	20.0	" "	"	"	
1N4034	47.0	27.0	20.0	" "	"	"	
1N4035	51.0	24.5	25.0	" "	"	"	
1N4036	56.0	22.0	30.0	" "	"	"	
1N4037	62.0	20.0	50.0	" "	"	"	
1N4038	68.0	18.5	75.0	" "	"	"	
1N4039	75.0	16.5	100.0	" "	"	"	
1N4040	82.0	15.0	100.0	" "	"	"	
1N4041	91.0	13.5	125.0	" "	"	"	
1N4042	100.0	12.5	150.0	" "	"	"	
1N4057(2)	12.4±5%	10.0	25.0	No Suffix T.C. = .005%/°C(4)	1.5 watt	Case CC	
1N4058(2)	14.6±5%	"	30.0	Suffix A T.C. = .002%/°C(4)	"	"	
1N4059(2)	16.8±5%	"	"	" "	"	"	
1N4060(2)	18.5±5%	"	"	" "	"	"	
1N4061(2)	21.0±5%	"	35.0	" "	"	"	
1N4062(2)	23.0±5%	"	40.0	" "	"	"	
1N4063(2)	27.0±5%	"	45.0	" "	"	"	
1N4064(2)	30.0±5%	"	50.0	" "	"	"	
1N4065(2)	33.0±5%	"	55.0	" "	"	"	
1N4066(2)	37.0±5%	7.5	80.0	" "	"	"	
1N4067(2)	43.0±5%	"	90.0	" "	"	"	
1N4068(2)	47.0±5%	"	100.0	" "	"	"	
1N4069(2)	51.0±5%	"	110.0	" "	2.0 watt	Case DD	
1N4070(2)	56.0±5%	"	120.0	" "	"	"	
1N4071(2)	62.0±5%	"	135.0	" "	"	"	
1N4072(2)	68.0±5%	5.0	230.0	" "	"	"	
1N4073(2)	75.0±5%	"	250.0	" "	"	"	
1N4074(2)	82.0±5%	"	270.0	" "	"	"	
1N4075(2)	87.0±5%	"	290.0	" "	"	"	
1N4076(2)	91.0±5%	"	310.0	" "	"	"	
1N4077(2)	100±5%	"	340.0	" "	"	"	
1N4078(2)	105±5%	2.5	700.0	" "	"	"	
1N4079(2)	110±5%	"	740.0	" "	"	"	
1N4080(2)	120±5%	"	800.0	" "	"	"	
1N4081(2)	130±5%	"	840.0	" "	2.5 watt	Case EE	
1N4082(2)	140±5%	"	960.0	" "	"	"	
1N4083(2)	150±5%	"	1020.0	" "	"	"	
1N4084(2)	175±5%	"	1150.0	" "	"	"	
1N4085(2)	200±5%	"	1350.0	" "	"	"	
1N4094 is an obsolete device							
1N4095	5.0	40.0	15.0	10%	275 mw	DO-7/DO-35	
1N4096	90.0	8.0	150.0	5%	3 watt	Case JJ (28)	
1N4097	100.0	5.0	175.0	"	"	"	
1N4098	150.0	5.0	650.0	"	"	"	
1N4099(19,20)	6.8	0.25	200.0	5%	250 mw	DO-7/DO-35	
1N4100(19,20)	7.5	"	"	"	"	"	
1N4101(19,20)	8.2	"	"	"	"	"	
1N4102(19,20)	8.7	"	"	"	"	"	
1N4103(19,20)	9.1	"	"	"	"	"	
1N4104(19,20)	10.0	"	"	"	"	"	
1N4105(19,20)	11.0	"	"	"	"	"	
1N4106(19,20)	12.0	"	"	"	"	"	
1N4107(19,20)	13.0	"	"	"	"	"	
1N4108(19,20)	14.0	"	"	"	"	"	
1N4109(19,20)	15.0	"	100.0	"	"	"	
1N4110(19,20)	16.0	"	"	"	"	"	
1N4111(19,20)	17.0	"	"	"	"	"	
1N4112(19,20)	18.0	"	"	"	"	"	
1N4113(19,20)	19.0	"	150.0	"	"	"	
1N4114(19,20)	20.0	"	"	"	"	"	
1N4115(19,20)	22.0	"	"	"	"	"	
1N4116(19,20)	24.0	"	"	"	"	"	
1N4117(19,20)	25.0	"	"	"	"	"	
1N4118(19,20)	27.0	"	"	"	"	"	
1N4119(19,20)	28.0	"	200.0	"	"	"	
1N4120(19,20)	30.0	"	"	"	"	"	
1N4121(19,20)	33.0	"	"	"	"	"	
1N4122(19,20)	36.0	"	"	"	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(2) Temperature compensated zener diode
(4) Temperature range −55°C to +100°C
(19) Low reverse leakage diode
(20) Low noise diode
(28) Supplied by Microsemi in Case J (DO-41)
(32) Supplied by Microsemi in DO-4 Case

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4123[19,20]	39.0	0.25	200.0	5%	250 mw	DO-7/DO-35	
1N4124[19,20]	43.0	"	250.0	"	"	"	
1N4125[19,20]	47.0	"	"	"	"	"	
1N4126[19,20]	51.0	"	300.0	"	"	"	
1N4127[19,20]	56.0	"	"	"	"	"	
1N4128[19,20]	60.0	"	400.0	"	"	"	
1N4129[19,20]	62.0	"	500.0	"	"	"	
1N4130[19,20]	68.0	"	700.0	"	"	"	
1N4131[19,20]	75.0	"	"	"	"	"	
1N4132[19,20]	82.0	"	800.0	"	"	"	
1N4133[19,20]	87.0	"	1000.0	"	"	"	
1N4134[19,20]	91.0	"	1200.0	"	"	"	
1N4135[19,20]	100.0	"	1500.0	"	"	"	
1N4158	6.8	37.0	3.5	No Suffix = 20%	1 watt	Case	
1N4159	7.5	34.0	4.0	Suffix A = 10%	"	DO-29[28]	
1N4160	8.2	31.0	4.5	Suffix B = 5%	"	"	
1N4161	9.1	28.0	5.0	" "	"	"	
1N4162	10.0	25.0	7.0	" "	"	"	
1N4163	11.0	23.0	8.0	" "	"	"	
1N4164	12.0	21.0	9.0	" "	"	"	
1N4165	13.0	19.0	10.0	" "	"	"	
1N4166	15.0	17.0	14.0	" "	"	"	
1N4167	16.0	15.5	16.0	" "	"	"	
1N4168	18.0	14.0	20.0	" "	"	"	
1N4169	20.0	12.5	22.0	" "	"	"	
1N4170	22.0	11.5	23.0	" "	"	"	
1N4171	24.0	10.5	25.0	" "	"	"	
1N4172	27.0	9.5	35.0	" "	"	"	
1N4173	30.0	8.5	40.0	" "	"	"	
1N4174	33.0	7.5	45.0	" "	"	"	
1N4175	36.0	7.0	50.0	" "	"	"	
1N4176	39.0	6.5	60.0	" "	"	"	
1N4177	43.0	6.0	70.0	" "	"	"	
1N4178	47.0	5.5	80.0	" "	"	"	
1N4179	51.0	5.0	95.0	" "	"	"	
1N4180	56.0	4.5	110.0	" "	"	"	
1N4181	62.0	4.0	125.0	" "	"	"	
1N4182	68.0	3.7	150.0	" "	"	"	
1N4183	75.0	3.3	175.0	" "	"	"	
1N4184	82.0	3.0	200.0	" "	"	"	
1N4185	91.0	2.8	250.0	" "	"	"	
1N4186	100.0	2.5	350.0	" "	"	"	
1N4187	110.0	2.3	450.0	" "	"	"	
1N4188	120.0	2.0	550.0	" "	"	"	
1N4189	130.0	1.9	700.0	" "	"	"	
1N4190	150.0	1.7	1000.0	" "	"	"	
1N4191	160.0	1.6	1100.0	" "	"	"	
1N4192	180.0	1.4	1200.0	" "	"	"	
1N4193	200.0	1.2	1500.0	" "	"	"	
1N4194	6.8	370.0	1.2	No Suffix = 20%	10 watt	Case HH[32]	**1N2970**
1N4195	7.5	335.0	1.3	Suffix A = 10%	"	"	**1N2971**
1N4196	8.2	305.0	1.5	Suffix B = 5%	"	"	**1N2972**
1N4197	9.1	275.0	2.0	" "	"	"	**1N2973**
1N4198	10.0	250.0	3.0	" "	"	"	**1N2974**
1N4199	11.0	230.0	"	" "	"	"	**1N2975**
1N4200	12.0	210.0	"	" "	"	"	**1N2976**
1N4201	13.0	190.0	"	" "	"	"	**1N2977**
1N4202	14.0	180.0	"	" "	"	"	**1N2978**
1N4203	15.0	170.0	"	" "	"	"	**1N2979**
1N4204	16.0	155.0	4.0	" "	"	"	**1N2980**
1N4205	17.0	145.0	"	" "	"	"	**1N2981**
1N4206	18.0	140.0	"	" "	"	"	**1N2982**
1N4207	19.0	130.0	"	" "	"	"	**1N2983**
1N4208	20.0	125.0	"	" "	"	"	**1N2984**
1N4209	22.0	115.0	5.0	" "	"	"	**1N2985**
1N4210	24.0	105.0	"	" "	"	"	**1N2986**
1N4211	25.0	100.0	6.0	" "	"	"	**1N2987**
1N4212	27.0	95.0	7.0	" "	"	"	**1N2988**
1N4213	30.0	85.0	8.0	" "	"	"	**1N2989**
1N4214	33.0	75.0	9.0	" "	"	"	**1N2990**
1N4215	36.0	70.0	10.0	" "	"	"	**1N2991**
1N4216	39.0	65.0	11.0	" "	"	"	**1N2992**
1N4217	43.0	60.0	12.0	" "	"	"	**1N2993**

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(28) Supplied by Microsemi in Case DO-29.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4218	45.0	55.0	13.0	No Suffix = 20%	10 watt	Case HH(32)	**1N2994**
1N4219	47.0	55.0	14.0	Suffix A = 10%	"	"	**1N2995**
1N4220	50.0	50.0	15.0	Suffix B = 5%	"	"	**1N2996**
1N4221	51.0	"	"	" "	"	"	**1N2997**
1N4222	52.0	"	"	" "	"	"	**1N2998**
1N4223	56.0	45.0	16.0	" "	"	"	**1N2999**
1N4224	62.0	40.0	17.0	" "	"	"	**1N3000**
1N4225	68.0	37.0	18.0	" "	"	"	**1N3001**
1N4226	75.0	33.0	22.0	" "	"	"	**1N3002**
1N4227	82.0	30.0	25.0	" "	"	"	**1N3003**
1N4228	91.0	38.0	35.0	" "	"	"	**1N3004**
1N4229	100.0	25.0	40.0	" "	"	"	**1N3005**
1N4230	105.0	25.0	45.0	" "	"	"	**1N3006**
1N4231	110.0	23.0	55.0	" "	"	"	**1N3007**
1N4232	120.0	20.0	75.0	" "	"	"	**1N3008**
1N4233	130.0	19.0	100.0	" "	"	"	**1N3009**
1N4234	140.0	18.0	125.0	" "	"	"	**1N3010**
1N4235	150.0	17.0	175.0	" "	"	"	**1N3011**
1N4236	160.0	16.0	200.0	" "	"	"	**1N3012**
1N4237	175.0	14.0	250.0	" "	"	"	**1N3013**
1N4238	180.0	14.0	260.0	" "	"	"	**1N3014**
1N4239	200.0	12.0	300.0	" "	"	"	**1N3015**
1N4240	5±.1	400.0	0.68	—	10 watt	DO-4	
1N4241	6±.1	350.0	0.50	—	"	"	

Type No.	PIV Volts	Io 25°C Amps (100°C)A	VF Volts	IR μA	T_{RR} (n sec.)	Device Package	MICROSEMI Recommended Substitute
1N4245	200	1.00	1.3	1.0	5.0	A	
1N4246	400	1.00	1.3	1.0	5.0	A	
1N4247	600	1.00	1.3	1.0	5.0	A	
1N4248	800	1.00	1.3	1.0	5.0	A	
1N4249	1000	1.00	1.3	1.0	5.0	A	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4258	6.8	370.0	1.2	No Suffix = 20%	10 watt	Case KK	1N2970
1N4259	7.5	335.0	1.3	Suffix A = 10%	"	"	1N2971
1N4260	8.2	305.0	1.5	Suffix B = 5%	"	"	1N2972
1N4261	9.1	275.0	2.0	" "	"	"	1N2973
1N4262	10.0	250.0	3.0	" "	"	"	1N2974
1N4263	11.0	230.0	"	" "	"	"	1N2975
1N4264	12.0	210.0	"	" "	"	"	1N2976
1N4265	13.0	190.0	"	" "	"	"	1N2977
1N4266	15.0	170.0	"	" "	"	"	1N2979
1N4267	16.0	155.0	4.0	" "	"	"	1N2980
1N4268	18.0	140.0	"	" "	"	"	1N2982
1N4269	20.0	125.0	"	" "	"	"	1N2984
1N4270	22.0	115.0	5.0	" "	"	"	1N2985
1N4271	24.0	105.0	"	" "	"	"	1N2986
1N4272	27.0	95.0	7.0	" "	"	"	1N2988
1N4273	30.0	85.0	8.0	" "	"	"	1N2989
1N4274	33.0	75.0	9.0	" "	"	"	1N2990
1N4275	36.0	70.0	10.0	" "	"	"	1N2991
1N4276	39.0	65.0	11.0	" "	"	"	1N2992
1N4277	43.0	60.0	12.0	" "	"	"	1N2993
1N4278	47.0	55.0	14.0	" "	"	"	1N2995
1N4279	51.0	50.0	15.0	" "	"	"	1N2997
1N4280	56.0	45.0	16.0	" "	"	"	1N2999
1N4281	62.0	40.0	17.0	" "	"	"	1N3000
1N4282	68.0	37.0	18.0	" "	"	"	1N3001
1N4283	75.0	33.0	22.0	" "	"	"	1N3002
1N4284	82.0	30.0	25.0	" "	"	"	1N3003
1N4285	91.0	28.0	35.0	" "	"	"	1N3004
1N4286	100.0	25.0	40.0	" "	"	"	1N3005
1N4287	110.0	23.0	55.0	" "	"	"	1N3007
1N4288	120.0	20.0	75.0	" "	"	"	1N3008
1N4289	130.0	19.0	100.0	" "	"	"	1N3009
1N4290	150.0	17.0	175.0	" "	"	"	1N3011

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(2) Temperature compensated zener diode
(7) No suffix denotes temp. range 0°C
Suffix A denotes temp range −55°C to +100°C
(15) T.C. = 0 to +.012%/°C.
Temp. range = −55°C to +150°C
(16) Iz (nom.) is shown. T.C. is guaranteed over current ranges: 150-250mA for 1N4297.8; 110-190 mA for 1N4299, 300; 750-1250 for 1N4301.2; 550-950 mA for 1N4303.4
(28) Can be supplied by Microsemi in Case J (DO-41)
(32) Can be supplied by Microsemi in DO-4 Case

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4291	160.0	16.0	200.0	No Suffix = 20%	10 watt	Case KK	**1N3012**
1N4292	180.0	14.0	260.0	Suffix A = 10%	"	"	**1N3014**
1N4293	200.0	12.0	300.0	Suffix B = 5%	"	"	**1N3015**
1N4295[2]	10.0	10.0	20.0	No Suf. = 2% Suf. A = 1%[15]	400 mw	DO-7	
1N4296[2]	10.0	20.0	10.0	No Suf. = 2% Suf. A = 1%[15]	1 watt	DO-13	
1N4297[2]	8.36 - 9.24	200.0[16]	1.4	T.C. = .01%/°C[7]	10 watt	DO-4	
1N4298[2]	8.36 - 9.24	200.0[16]	"	T.C. = .005%/°C[7]	"	"	
1N4299[2]	10.74 - 11.86	150.0[16]	"	T.C. = .01%/°C[7]	"	"	
1N4300[2]	10.74 - 11.86	150.0[16]	"	T.C. = .005%/°C[7]	"	"	
1N4301[2]	8.36 - 9.24	1000.0[16]	4.9	T.C. = .01%/°C[7]	50 watt	DO-5	
1N4302[2]	8.36 - 9.24	1000.0[16]	"	T.C. = .005%/°C[7]	"	"	
1N4303[2]	10.74 - 11.86	750.0[16]	3.8	T.C. = .01%/°C[7]	"	"	
1N4304[2]	10.74 - 11.86	750.0[16]	"	T.C. = .005%/°C[7]	"	"	
1N4321	50.0	15.0	50.0	10%	3 watt	Case LL	
1N4323	6.8	37.0	3.5	No Suffix = 20%	1 watt	DO-7 [28]	
1N4324	7.5	34.0	4.0	Suffix A = 10%	"	"	
1N4325	8.2	31.0	4.5	Suffix B = 5%	"	"	
1N4326	9.1	28.0	5.0	" "	"	"	
1N4327	10.0	25.0	7.0	" "	"	"	
1N4328	11.0	23.0	8.0	" "	"	"	
1N4329	12.0	21.0	9.0	" "	"	"	
1N4330	13.0	19.0	10.0	" "	"	"	
1N4331	15.0	17.0	14.0	" "	"	"	
1N4332	16.0	15.5	16.0	" "	"	"	
1N4333	18.0	14.0	20.0	" "	"	"	
1N4334	20.0	12.5	22.0	" "	"	"	
1N4335	22.0	11.5	23.0	" "	"	"	
1N4336	24.0	10.5	25.0	" "	"	"	
1N4337	27.0	9.5	35.0	" "	"	"	
1N4338	30.0	8.5	40.0	" "	"	"	
1N4339	33.0	7.5	45.0	" "	"	"	
1N4340	36.0	7.0	55.0	" "	"	"	
1N4341	39.0	6.5	60.0	" "	"	"	
1N4342	43.0	6.0	70.0	" "	"	"	
1N4343	47.0	5.5	80.0	" "	"	"	
1N4344	51.0	5.0	95.0	" "	"	"	
1N4345	56.0	4.5	110.0	" "	"	"	
1N4346	62.0	4.0	125.0	" "	"	"	
1N4347	68.0	3.7	150.0	" "	"	"	
1N4348	75.0	3.3	175.0	" "	"	"	
1N4349	82.0	3.0	200.0	" "	"	"	
1N4350	91.0	2.8	250.0	" "	"	"	
1N4351	100.0	2.5	350.0	" "	"	"	
1N4352	110.0	2.3	450.0	" "	"	"	
1N4353	120.0	2.0	550.0	" "	"	"	
1N4354	130.0	1.9	700.0	" "	"	"	
1N4355	150.0	1.7	1000.0	" "	"	"	
1N4356	160.0	1.6	1100.0	" "	"	"	
1N4357	180.0	1.4	1200.0	" "	"	"	
1N4358	200.0	1.2	1500.0	" "	"	"	
1N4360	2.4	10.0	60.0	5%	250 mw	DO-7	
1N4370	2.4	20.0	30.0	No Suffix = 10%	400 mw	DO-7	
1N4371	2.7	"	"	Suffix A = 5%	"	"	
1N4372	3.0	"	29.0	" "	"	"	
1N4400	6.8	37.0	2.0	20%	1 watt	Case NN[28]	
1N4401	7.5	34.0	2.0	"	"	"	
1N4402	8.2	31.0	2.0	"	"	"	
1N4403	9.1	28.0	2.5	"	"	"	
1N4404	10.0	25.0	3.0	"	"	"	
1N4405	11.0	23.0	3.5	"	"	"	
1N4406	12.0	21.0	4.0	"	"	"	
1N4407	13.0	19.0	5.0	"	"	"	
1N4408	15.0	17.0	6.0	"	"	"	
1N4409	16.0	15.5	8.0	"	"	"	
1N4410	18.0	14.0	10.0	"	"	"	
1N4411	20.0	12.5	11.0	"	"	"	
1N4412	22.0	11.5	12.0	"	"	"	
1N4413	24.0	10.5	13.0	"	"	"	
1N4414	27.0	9.5	14.0	"	"	"	
1N4415	30.0	8.5	15.0	"	"	"	
1N4416	33.0	7.5	17.0	"	"	"	
1N4417	36.0	7.0	19.0	"	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4418	39.0	6.5	21.0	20%	1 watt	Case NN(28)	
1N4419	43.0	6.0	23.0	"	"	"	
1N4420	47.0	5.5	26.0	"	"	"	
1N4421	51.0	5.0	30.0	"	"	"	
1N4422	56.0	4.5	33.0	"	"	"	
1N4423	62.0	4.0	40.0	"	"	"	
1N4424	68.0	3.7	44.0	"	"	"	
1N4425	75.0	3.3	60.0	"	"	"	
1N4426	82.0	3.0	85.0	"	"	"	
1N4427	91.0	2.8	115.0	20%	1 watt	Case NN(28)	
1N4428	100.0	2.5	165.0	"	"	"	
1N4429	110.0	2.3	250.0	"	"	"	
1N4430	120.0	2.0	350.0	"	"	"	
1N4431	130.0	1.9	500.0	"	"	"	
1N4432	150.0	1.7	800.0	"	"	"	
1N4433	160.0	1.6	1000.0	"	"	"	
1N4434	180.0	1.4	1100.0	"	"	"	
1N4435	200.0	1.2	1400.0	"	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR μA	TRR	Device Package	MICROSEMI Recommended Substitute
1N4449 500 mw	7.5	—	1.0	.025	4 (n sec.)	DO35	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4460	6.2	40.0	4.0	5%	1.5 watt	Case MM(28)	
1N4461	6.8	37.0	2.5	"	"	"	
1N4462	7.5	34.0	"	"	"	"	
1N4463	8.2	31.0	3.0	"	"	"	
1N4464	9.1	28.0	4.0	"	"	"	
1N4465	10.0	25.0	5.0	"	"	"	
1N4466	11.0	23.0	6.0	"	"	"	
1N4467	12.0	21.0	7.0	"	"	"	
1N4468	13.0	19.0	8.0	"	"	"	
1N4469	15.0	17.0	9.0	"	"	"	
1N4470	16.0	15.5	10.0	"	"	"	
1N4471	18.0	14.0	11.0	"	"	"	
1N4472	20.0	12.5	12.0	"	"	"	
1N4473	22.0	11.5	14.0	"	"	"	
1N4474	24.0	10.5	16.0	"	"	"	
1N4475	27.0	9.5	18.0	"	"	"	
1N4476	30.0	8.5	20.0	"	"	"	
1N4477	33.0	7.5	25.0	"	"	"	
1N4478	36.0	7.0	27.0	"	"	"	
1N4479	39.0	6.5	30.0	"	"	"	
1N4480	43.0	6.0	40.0	"	"	"	
1N4481	47.0	5.5	50.0	"	"	"	
1N4482	51.0	5.0	60.0	"	"	"	
1N4483	56.0	4.5	70.0	"	"	"	
1N4484	62.0	4.0	80.0	"	"	"	
1N4485	68.0	3.7	100.0	"	"	"	
1N4486	75.0	3.3	130.0	"	"	"	
1N4487	82.0	3.0	160.0	"	"	"	
1N4488	91.0	2.8	200.0	"	"	"	
1N4489	100.0	2.5	250.0	5%	1.5 watt	Case MM(28)	
1N4490	110.0	2.3	300.0	"	"	"	
1N4491	120.0	2.0	400.0	"	"	"	
1N4492	130.0	1.9	500.0	"	"	"	
1N4493	150.0	1.7	700.0	"	"	"	
1N4494	160.0	1.6	1000.0	"	"	"	
1N4495	180.0	1.4	1300.0	"	"	"	
1N4496	200.0	1.2	1500.0	"	"	"	
1N4499	6.2	7.5	20.0	5%	1 watt	DO-7 (28)	1N4735
1N4501 (2)	6.7-7.4	10.0	10.0	T.C. = .01%/°C(4)	210 mw	Case GG(27)	
1N4503	33.0	20.0	21.0	10%	3 watt	Case OO	
1N4504	200.0	4.0	1000.0	"	"	"	
1N4535	3.45(1)	10.0	65.0(22)	5%	500 mw	DO-7	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(6) Temperature range −55°C to +100°C
(7) No suffix denotes temp. range 0°C to +75°C
Suffix A denotes temp. range −55°C to +100°C
(19) Low reverse leakage diode
(20) Low noise diode
(22) Extended current range devices
1N4611, 1.0-3.0 mA; 1N4612, 3.0-7.0 mA;
1N4613, 7.0-15 mA
(23) Special low current series
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4549	3.9	3200	0.16	No Suffix = 20%	50 watt	DO-5	
1N4550	4.3	2900	0.16	Suffix A = 10%, Suffix B = 5%	"	"	
1N4551	4.7	2650	0.12	Suffix R = Rev. Polarity	"	"	
1N4552	5.1	2450	0.12	" "	"	"	
1N4553	5.6	2250	0.12	" "	"	"	
1N4554	6.2	2000	0.14	" "	"	"	
1N4555	6.8	1850	0.16	" "	"	"	
1N4556	7.5	1650	0.24	" "	"	"	
1N4557	3.9	3200	0.16	No Suffix = 20%	50 watt	TO-3	
1N4558	4.3	2900	0.16	Suffix A = 10%, Suffix B = 5%	"	"	
1N4559	4.7	2650	0.12	Suffix R = Rev. Polarity	"	"	
1N4560	5.1	2450	0.12	" "	"	"	
1N4561	5.6	2250	0.12	" "	"	"	
1N4562	6.2	2000	0.14	" "	"	"	
1N4563	6.8	1850	0.16	" "	"	"	
1N4564	7.5	1650	0.24	" "	"	"	
1N4565[2,23]	6.4±5%	0.5	200.0	T.C. = .01%/°C[7]	400 mw	DO-7	
1N4566[2,23]	6.4±5%	"	"	T.C. = .005%/°C[7]	"	"	
1N4567[2,23]	6.4±5%	"	"	T.C. = .002%/°C[7]	"	"	
1N4568[2,23]	6.4±5%	"	"	T.C. = .001%/°C[7]	"	"	
1N4569[2,23]	6.4±5%	"	"	T.C. = .0005%/°C[7]	"	"	
1N4570[2,23]	6.4±5%	1.0	100.0	T.C. = .01%/°C[7]	"	"	
1N4571[2,23]	6.4±5%	"	"	T.C. = .005%/°C[7]	"	"	
1N4572[2,23]	6.4±5%	"	"	T.C. = .002%/°C[7]	"	"	
1N4573[2,23]	6.4±5%	"	"	T.C. = .001%/°C[7]	"	"	
1N4574[2,23]	6.4±5%	"	"	T.C. = .0005%/°C[7]	"	"	
1N4575[2,23]	6.4±5%	2.0	50.0	T.C. = .01%/°C[7]	"	"	
1N4576[2,23]	6.4±5%	"	"	T.C. = .005%/°C[7]	"	"	
1N4577[2,23]	6.4±5%	"	"	T.C. = .002%/°C[7]	"	"	
1N4578[2,23]	6.4±5%	"	"	T.C. = .001%/°C[7]	"	"	
1N4579[2,23]	6.4±5%	"	"	T.C. = .0005%/°C[7]	"	"	
1N4580[2,23]	6.4±5%	4.0	25.0	T.C. = .01%/°C[7]	"	"	
1N4581[2,23]	6.4±5%	"	"	T.C. = .005%/°C[7]	"	"	
1N4582[2,23]	6.4±5%	"	"	T.C. = .002%/°C[7]	"	"	
1N4583[2,23]	6.4±5%	"	"	T.C. = .001%/°C[7]	"	"	
1N4584[2,23]	6.4±5%	"	"	T.C. = .0005%/°C[7]	"	"	
1N4611[2]	6.6±5%	2.0[22]	75.0	Suffix A = .002%/°C	250 mw	DO-7	
1N4612[2]	6.6±5%	5.0[22]	25.0	Suffix B = .001%/°C	"	"	
1N4613[2]	6.6±5%	10.0[22]	15.0	Suffix C = .0005%/°C	"	"	
1N4614[19,20]	1.8	250.0μA	1200.0	±5%	250 mw	DO-7/DO-35	
1N4615[19,20]	2.0	"	1250.0	"	"	"	
1N4616[19,20]	2.2	"	1300.0	"	"	"	
1N4617[19,20]	2.4	"	1400.0	"	"	"	
1N4618[19,20]	2.7	"	1500.0	"	"	"	
1N4619[19,20]	3.0	"	1600.0	"	"	"	
1N4620[19,20]	3.3	"	1650.0	"	"	"	
1N4621[19,20]	3.6	"	1700.0	"	"	"	
1N4622[19,20]	3.9	"	1650.0	"	"	"	
1N4623[19,20]	4.3	"	1600.0	"	"	"	
1N4624[19,20]	4.7	"	1550.0	"	"	"	
1N4625[19,20]	5.1	"	1500.0	"	"	"	
1N4626[19,20]	5.6	"	1400.0	"	"	"	
1N4627[19,20]	6.2	"	1200.0	"	"	"	
1N4628	6.8	18.5	4.5	No Suffix = 5%	600 mw	DO-7	
1N4629	7.5	16.5	5.5	"	"	"	
1N4630	8.2	15.0	6.5	"	"	"	
1N4631	9.1	14.0	7.5	"	"	"	
1N4632	10.0	12.5	8.5	"	"	"	
1N4633	11.0	11.5	9.5	"	"	"	
1N4634	12.0	10.5	11.5	"	"	"	
1N4635	13.0	9.5	13.0	"	"	"	
1N4636	15.0	8.5	16.0	"	"	"	
1N4637	16.0	7.8	17.0	"	"	"	
1N4638	18.0	7.0	21.0	"	"	"	
1N4639	20.0	6.2	25.0	"	"	"	
1N4640	22.0	5.6	29.0	"	"	"	
1N4641	24.0	5.2	33.0	"	"	"	
1N4642	27.0	4.6	41.0	"	"	"	
1N4643	30.0	4.2	49.0	"	"	"	
1N4644	33.0	3.8	58.0	"	"	"	
1N4645	36.0	3.4	70.0	"	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4646	39.0	3.2	80.0	No Suffix = 5%	600 mw	DO-7	
1N4647	43.0	3.0	93.0	"	"	"	
1N4648	47.0	2.7	105.0	"	"	"	
1N4649[19]	3.3	76.0	10.0	"	1 watt	Case QQ[28]	
1N4650[19]	3.6	69.0	10.0	"	"	"	
1N4651[19]	3.9	64.0	9.0	"	"	"	
1N4652[19]	4.3	58.0	9.0	"	"	"	
1N4653[19]	4.7	53.0	8.0	"	"	"	
1N4654[19]	5.1	49.0	7.0	"	"	"	
1N4655[19]	5.6	45.0	5.0	"	"	"	
1N4656[19]	6.2	41.0	2.0	"	"	"	
1N4657[19]	6.8	37.0	3.5	"	"	"	
1N4658[19]	7.5	34.0	4.0	No Suffix = 5%	1 watt	Case QQ [28]	
1N4659[19]	8.2	31.0	4.5	"	"	"	
1N4660[19]	9.1	28.0	5.0	"	"	"	
1N4661[19]	10.0	25.0	7.0	"	"	"	
1N4662[19]	11.0	23.0	8.0	"	"	"	
1N4663[19]	12.0	21.0	9.0	"	"	"	
1N4664[19]	13.0	19.0	10.0	"	"	"	
1N4665[19]	15.0	17.0	14.0	"	"	"	
1N4666[19]	16.0	15.5	16.0	"	"	"	
1N4667[19]	18.0	14.0	20.0	"	"	"	
1N4668[19]	20.0	12.5	22.0	"	"	"	
1N4669[19]	22.0	11.5	23.0	"	"	"	
1N4670[19]	24.0	10.5	25.0	"	"	"	
1N4671[19]	27.0	9.5	35.0	"	"	"	
1N4672[19]	30.0	8.5	40.0	"	"	"	
1N4673[19]	33.0	7.5	45.0	"	"	"	
1N4674[19]	36.0	7.0	50.0	"	"	"	
1N4675[19]	39.0	6.5	60.0	"	"	"	
1N4676[19]	43.0	6.0	70.0	"	"	"	
1N4677[19]	47.0	5.5	80.0	"	"	"	
1N4678[23]	1.8	0.05	(24)	No Suffix = 5%	250 mw	DO-7/DO-35	
1N4679[23]	2.0	"	"	"	"	"	
1N4680[23]	2.2	"	"	"	"	"	
1N4681[23]	2.4	"	"	"	"	"	
1N4682[23]	2.7	"	"	"	"	"	
1N4683[23]	3.0	"	"	"	"	"	
1N4684[23]	3.3	"	"	"	"	"	
1N4685[23]	3.6	"	"	"	"	"	
1N4686[23]	3.9	"	"	"	"	"	
1N4687[23]	4.3	"	"	"	"	"	
1N4688[23]	4.7	"	"	"	"	"	
1N4689[23]	5.1	"	"	"	"	"	
1N4690[23]	5.6	"	"	"	"	"	
1N4691[23]	6.2	"	"	"	"	"	
1N4692[23]	6.8	"	"	"	"	"	
1N4693[23]	7.5	"	"	"	"	"	
1N4694[23]	8.2	"	"	"	"	"	
1N4695[23]	8.7	"	"	"	"	"	
1N4696[23]	9.1	"	"	"	"	"	
1N4697[23]	10.0	"	"	"	"	"	
1N4698[23]	11.0	"	"	"	"	"	
1N4699[23]	12.0	"	"	"	"	"	
1N4700[23]	13.0	"	"	"	"	"	
1N4701[23]	14.0	"	"	"	"	"	
1N4702[23]	15.0	"	"	"	"	"	
1N4703[23]	16.0	"	"	"	"	"	
1N4704[23]	17.0	"	"	"	"	"	
1N4705[23]	18.0	"	"	"	"	"	
1N4706[23]	19.0	"	"	"	"	"	
1N4707[23]	20.0	"	"	"	"	"	
1N4708[23]	22.0	"	"	"	"	"	
1N4709[23]	24.0	"	"	"	"	"	
1N4710[23]	25.0	"	"	"	"	"	
1N4711[23]	27.0	"	"	"	"	"	
1N4712[23]	28.0	"	"	"	"	"	
1N4713[23]	30.0	"	"	"	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(7) No suffix denotes temp. range 0°C to +75°C
Suffix A denotes temp. range −55°C to +100°C
(19) Low reverse leakage diode
(23) Special low current series
(24) Zz specified in terms of voltage regulation
(28) Can be supplied by Microsemi in Case J (DO-41)

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4714[23]	33.0	0.05	(24)	No Suffix = 5%	250 mw	DO-7/DO-35	
1N4715[23]	36.0	"	"	"	"	"	
1N4716[23]	39.0	"	"	"	"	"	
1N4717[23]	43.0	"	"	"	"	"	
1N4728	3.3	76.0	10.0	No Suffix = 10%	1 watt	Case J	
1N4729	3.6	69.0	10.0	Suffix A = 5%	"	or DO-41	
1N4730	3.9	64.0	9.0	" "	"	glass	
1N4731	4.3	58.0	9.0	" "	"	"	
1N4732	4.7	53.0	8.0	" "	"	"	
1N4733	5.1	49.0	7.0	" "	"	"	
1N4734	5.6	45.0	5.0	" "	"	"	
1N4735	6.2	41.0	2.0	" "	"	"	
1N4736	6.8	37.0	3.5	" "	"	"	
1N4737	7.5	34.0	4.0	No Suffix = 10%	1 watt	Case J	
1N4738	8.2	31.0	4.5	Suffix A = 5%	"	or DO-41	
1N4739	9.1	28.0	5.0	" "	"	glass	
1N4740	10.0	25.0	7.0	" "	"	"	
1N4741	11.0	23.0	8.0	" "	"	"	
1N4742	12.0	21.0	9.0	" "	"	"	
1N4743	13.0	19.0	10.0	" "	"	"	
1N4744	15.0	17.0	14.0	" "	"	"	
1N4745	16.0	15.5	16.0	" "	"	"	
1N4746	18.0	14.0	20.0	" "	"	"	
1N4747	20.0	12.5	22.0	" "	"	"	
1N4748	22.0	11.5	23.0	" "	"	"	
1N4749	24.0	10.5	25.0	" "	"	"	
1N4750	27.0	9.5	35.0	" "	"	"	
1N4751	30.0	8.5	40.0	" "	"	"	
1N4752	33.0	7.5	45.0	" "	"	"	
1N4753	36.0	7.0	50.0	" "	"	"	
1N4754	39.0	6.5	60.0	" "	"	"	
1N4755	43.0	6.0	70.0	" "	"	"	
1N4756	47.0	5.5	80.0	" "	"	"	
1N4757	51.0	5.0	95.0	" "	"	"	
1N4758	56.0	4.5	110.0	" "	"	"	
1N4759	62.0	4.0	125.0	" "	"	"	
1N4760	68.0	3.7	150.0	" "	"	"	
1N4761	75.0	3.3	175.0	" "	"	"	
1N4762	82.0	3.0	200.0	" "	"	"	
1N4763	91.0	2.8	250.0	" "	"	"	
1N4764	100.0	2.5	350.0	" "	"	"	
1N4765[2]	9.1±5%	0.5	350.0	.01%/°C[7]	250mw	DO-7	
1N4766[2]	9.1±5%	"	"	.005%/°C[7]	"	"	
1N4767[2]	9.1±5%	"	"	.002%/°C[7]	"	"	
1N4768[2]	9.1±5%	"	"	.001%/°C[7]	"	"	
1N4769[2]	9.1±5%	"	"	.0005%/°C[7]	"	"	
1N4770[2]	9.1±5%	1.0	200.0	.01%/°C[7]	"	"	
1N4771[2]	9.1±5%	"	"	.005%/°C[7]	"	"	
1N4772[2]	9.1±5%	"	"	.002%/°C[7]	"	"	
1N4773[2]	9.1±5%	"	"	.001%/°C[7]	"	"	
1N4774[2]	9.1±5%	"	"	.0005%/°C[7]	"	"	
1N4775[2]	8.5±5%	0.5	200.0	.01%/°C[7]	250mw	DO-7	
1N4776[2]	8.5±5%	"	"	.005%/°C[7]	"	"	
1N4777[2]	8.5±5%	"	"	.002%/°C[7]	"	"	
1N4778[2]	8.5±5%	"	"	.001%/°C[7]	"	"	
1N4779[2]	8.5±5%	"	"	.0005%/°C[7]	"	"	
1N4780[2]	8.5±5%	1.0	100.0	.01%/°C[7]	"	"	
1N4781[2]	8.5±5%	"	"	.005%/°C[7]	"	"	
1N4782[2]	8.5±5%	"	"	.002%/°C[7]	"	"	
1N4783[2]	8.5±5%	"	"	.001%/°C[7]	"	"	
1N4784[2]	8.5±5%	"	"	.0005%/°C[7]	"	"	
1N4831	9.1	28.0	8.0	No Suffix = 20%	1.2watt	Case FF[28]	
1N4832	10.0	25.0	9.0	Suffix A = 10%	"	"	
1N4833	11.0	23.0	10.0	Suffix B = 5%	"	"	
1N4834	12.0	21.0	12.0	Double Anode	"	"	
1N4835	13.0	19.0	15.0	" "	"	"	
1N4836	15.0	17.0	17.0	" "	"	"	
1N4837	16.0	16.0	19.0	" "	"	"	
1N4838	18.0	14.0	20.0	" "	"	"	
1N4839	20.0	12.5	22.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4840	22.0	11.3	23.0	Double Anode	1.2 watt	Case FF[28]	
1N4841	24.0	10.5	25.0	" "	"	"	
1N4842	27.0	9.3	35.0	" "	"	"	
1N4843	30.0	8.3	40.0	" "	"	"	
1N4844	33.0	7.5	45.0	" "	"	"	
1N4845	36.0	7.0	50.0	" "	"	"	
1N4846	39.0	6.5	60.0	" "	"	"	
1N4847	43.0	5.8	70.0	" "	"	"	
1N4848	47.0	5.3	80.0	" "	"	"	
1N4849	51.0	5.0	95.0	" "	"	"	
1N4850	56.0	4.5	110.0	" "	"	"	
1N4851	62.0	4.0	125.0	No Suffix = 20%	1.2 watt	Case FF[28]	
1N4852	68.0	3.7	150.0	Suffix A = 10%	"	"	
1N4853	75.0	3.3	175.0	Suffix B = 5%	"	"	
1N4854	82.0	3.0	200.0	Double Anode	"	"	
1N4855	91.0	2.8	250.0	" "	"	"	
1N4856	100.0	2.5	350.0	" "	"	"	
1N4857	110.0	2.3	450.0	" "	"	"	
1N4858	120.0	2.1	550.0	" "	"	"	
1N4859	130.0	1.9	700.0	" "	"	"	
1N4860	150.0	1.7	100.0	" "	"	"	
1N4881	20.0	40.0	9.0	±10%	3 watt	Case LL[28]	
1N4882	36.0	20.0	21.0	±10%	"	"	
1N4883	12.0	65.0	5.0	±5%	"	"	
1N4884	20.0	40.0	9.0	±5%	"	"	
1N4889	62.0	20.0	42.5	±5%	5 watt	Case RR	1N5372
1N4890[2,18]	6.35v ± 5%	7.5 mA	10.0	.001%/°C[13,26]	400 mw	DO-7	
1N4891[2,18]	"	"	"	.0005%/°C[13,26]	"	"	
1N4892[2,18]	"	"	"	.001%/°C[13,26]	"	"	
1N4893[2,18]	"	"	"	.0005%/°C[13,26]	"	"	
1N4894[2,18]	"	"	"	.001%/°C[13,26]	"	"	
1N4895[2,18]	"	"	"	.0005%/°C[13,26]	"	"	
1N4896[2,20]	12.8v ± 5%	0.5	400.0	.01%/°C[13]	400 mw	DO-7	
1N4897[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4898[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4899[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4900[2,20]	"	1.0	200.0	.01%/°C[13]	"	"	
1N4901[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4902[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4903[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4904[2,20]	"	2.0	100.0	.01%/°C[13]	"	"	
1N4905[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4906[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4907[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4908[2,20]	"	4.0	50.0	.01%/°C[13]	"	"	
1N4909[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4910[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4911[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4912[2,20]	"	7.5	25.0	.01%/°C[13]	"	"	
1N4913[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4914[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4915[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4916[2,20]	19.2v ± 5%	0.5	600.0	.01%/°C[13]	"	"	
1N4917[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4918[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4919[2,20]	"	1.0	300.0	.01%/°C[13]	"	"	
1N4920[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4921[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4922[2,20]	"	2.0	150.0	.01%/°C[13]	"	"	
1N4923[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4924[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4925[2,20]	"	4.0	75.0	.01%/°C[13]	"	"	
1N4926[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4927[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4928[2,20]	"	"	"	.001%/°C[13]	"	"	
1N4929[2,20]	"	7.5	36.0	.01%/°C[13]	"	"	
1N4930[2,20]	"	"	"	.005%/°C[13]	"	"	
1N4931[2,20]	"	"	"	.002%/°C[13]	"	"	
1N4932[2,20]	"	"	"	.001%/°C[13]	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(1) Double anode type
(2) Temperature compensated zener diode
(13) No suffix denotes temp. range 25 to 100°C
"A" Suffix denotes temp. range −55° to +100°C
(18) Certified voltage time stability
(20) Low noise diode
(26) 1N4890 & 91 have a certified voltage time stability of 50ppm
1N4892 & 93 have a certified voltage time stability of 20ppm
1N4894 & 95 have a certified voltage time stability of 10ppm
(28) Can be supplied by Microsemi in Case J (DO-41)

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N4938-1	200	.1	1.0	.10		B	
		(55°C)A			(n sec.)		
1N4942	200	1.0	1.3	1.0	150	A	
1N4944	400	1.0	1.3	1.0	150	A	
1N4946	600	1.0	1.3	1.0	250	A	
1N4947	800	1.0	1.3	1.0	250	A	
1N4948	1000	1.0	1.3	1.0	500	A	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N4954	6.8	175.0	1.0	±5%	5 watt	Case VV	
1N4955	7.5	″	1.5	″	″	″	
1N4956	8.2	150.0	″	″	″	″	
1N4957	9.1	″	2.0	″	″	″	
1N4958	10.0	125.0	″	″	″	″	
1N4959	11.0	″	2.5	″	″	″	
1N4960	12.0	100.0	″	″	″	″	
1N4961	13.0	″	3.0	″	″	″	
1N4962	15.0	75.0	3.5	″	″	″	
1N4963	16.0	″	″	″	″	″	
1N4964	18.0	65.0	4.0	″	″	″	
1N4965	20.0	″	4.5	″	″	″	
1N4966	22.0	50.0	5.0	″	″	″	
1N4967	24.0	″	″	″	″	″	
1N4968	27.0	″	6.0	″	″	″	
1N4969	30.0	40.0	8.0	″	″	″	
1N4970	33.0	″	10.0	″	″	″	
1N4971	36.0	30.0	11.0	″	″	″	
1N4972	39.0	″	14.0	″	″	″	
1N4973	43.0	″	20.0	″	″	″	
1N4974	47.0	25.0	25.0	″	″	″	
1N4975	51.0	″	27.0	″	″	″	
1N4976	56.0	20.0	35.0	″	″	″	
1N4977	62.0	″	42.0	″	″	″	
1N4978	68.0	″	44.0	″	″	″	
1N4979	75.0	″	45.0	″	″	″	
1N4980	82.0	15.0	65.0	″	″	″	
1N4981	91.0	″	75.0	″	″	″	
1N4982	100.0	12.0	90.0	″	″	″	
1N4983	110.0	″	125.0	″	″	″	
1N4984	120.0	10.0	170.0	″	″	″	
1N4985	130.0	″	190.0	″	″	″	
1N4986	150.0	8.0	330.0	″	″	″	
1N4987	160.0	″	350.0	″	″	″	
1N4988	180.0	5.0	430.0	″	″	″	
1N4989	200.0	″	480.0	″	″	″	
1N4990	220.0	″	550.0	″	″	″	
1N4991	240.0	″	650.0	″	″	″	
1N4992	270.0	″	800.0	″	″	″	
1N4993	300.0	4.0	950.0	″	″	″	
1N4994	330.0	″	1175.0	″	″	″	
1N4995	360.0	3.0	1400.0	″	″	″	
1N4996	390.0	″	1800.0	″	″	″	
1N5008	3.3	189.0	6.0	No Suffix = 10%	2.5 watt	Case SS	
1N5009	3.6	173.0	5.5	A Suffix = 5%	″	″	
1N5010	3.9	160.0	5.0	″ ″	″	″	
1N5011	4.3	145.0	4.0	″ ″	″	″	
1N5012	4.7	133.0	3.5	″ ″	″	″	
1N5013	5.1	122.0	3.0	″ ″	″	″	
1N5014	5.6	111.0	2.5	″ ″	″	″	
1N5015	6.2	101.0	3.0	″ ″	″	″	
1N5016	6.8	92.0	1.6	″ ″	″	″	
1N5017	7.5	83.0	1.8	″ ″	″	″	
1N5018	8.2	76.0	2.1	″ ″	″	″	
1N5019	9.1	69.0	2.4	″ ″	″	″	
1N5020	10.0	62.0	3.0	″ ″	″	″	
1N5021	11.0	57.0	3.6	″ ″	″	″	
1N5022	12.0	52.0	4.2	″ ″	″	″	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5023	13.0	48.0	4.8	No Suffix = 10%	2.5 watt	Case SS	
1N5024	14.0	45.0	5.4	A Suffix = 5%	"	"	
1N5025	15.0	42.0	6.0	" "	"	"	
1N5026	16.0	39.0	6.6	" "	"	"	
1N5027	17.0	37.0	7.2	" "	"	"	
1N5028	18.0	35.0	7.8	" "	"	"	
1N5029	19.0	33.0	8.4	No Suffix = 10%	2.5 watt	Case SS	
1N5030	20.0	31.0	9.0	A Suffix = 5%	"	"	
1N5031	22.0	28.0	9.6	" "	"	"	
1N5032	24.0	26.0	10.0	" "	"	"	
1N5033	25.0	25.0	11.0	" "	"	"	
1N5034	27.0	23.0	12.0	" "	"	"	
1N5035	30.0	21.0	15.0	" "	"	"	
1N5036	33.0	19.0	18.0	" "	"	"	
1N5037	36.0	17.0	21.0	" "	"	"	
1N5038	39.0	16.0	24.0	" "	"	"	
1N5039	43.0	15.0	27.0	" "	"	"	
1N5040	45.0	14.0	30.0	" "	"	"	
1N5041	47.0	13.0	33.0	" "	"	"	
1N5042	50.0	12.0	36.0	" "	"	"	
1N5043	51.0	12.0	36.0	" "	"	"	
1N5044	52.0	12.0	39.0	" "	"	"	
1N5045	56.0	11.0	45.0	" "	"	"	
1N5046	62.0	10.0	51.0	" "	"	"	
1N5047	68.0	9.2	57.0	" "	"	"	
1N5048	75.0	8.3	66.0	" "	"	"	
1N5049	82.0	7.6	78.0	" "	"	"	
1N5050	91.0	6.9	90.0	" "	"	"	
1N5051	100.0	6.2	120.0	" "	"	"	
1N5063	6.8	75.0	2.0	±5%	3 watt	Case UU(28)	
1N5064	7.5	"	"	"	"	"	
1N5065	8.2	"	3.0	"	"	"	
1N5066	9.1	"	"	"	"	"	
1N5067	10.0	"	4.0	"	"	"	
1N5068	11.0	70.0	5.0	"	"	"	
1N5069	13.0	50.0	6.0	"	"	"	
1N5070	14.0	"	"	"	"	"	
1N5071	15.0	"	"	"	"	"	
1N5072	16.0	"	7.0	"	"	"	
1N5073	18.0	40.0	8.0	"	"	"	
1N5074	22.0	30.0	10.0	"	"	"	
1N5075	24.0	"	"	"	"	"	
1N5076	27.0	25.0	12.0	"	"	"	
1N5077	30.0	"	15.0	"	"	"	
1N5078	33.0	20.0	21.0	"	"	"	
1N5079	36.0	"	"	"	"	"	
1N5080	39.0	"	27.0	"	"	"	
1N5081	40.0	"	"	"	"	"	
1N5082	43.0	15.0	35.0	"	"	"	
1N5083	45.0	"	37.0	"	"	"	
1N5084	47.0	"	43.0	"	"	"	
1N5085	50.0	"	50.0	"	"	"	
1N5086	51.0	"	"	"	"	"	
1N5087	56.0	10.0	70.0	"	"	"	
1N5088	60.0	"	"	"	"	"	
1N5089	62.0	"	75.0	"	"	"	
1N5090	68.0	"	85.0	"	"	"	
1N5091	70.0	"	90.0	"	"	"	
1N5092	75.0	"	100.0	"	"	"	
1N5093	80.0	"	115.0	"	"	"	
1N5094	82.0	"	120.0	"	"	"	
1N5095	91.0	8.0	155.0	"	"	"	
1N5096	110.0	5.0	250.0	"	"	"	
1N5097	120.0	"	325.0	"	"	"	
1N5098	130.0	"	375.0	"	"	"	
1N5099	140.0	"	550.0	"	"	"	
1N5100	160.0	4.0	700.0	"	"	"	
1N5101	170.0	"	750.0	"	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode

(28) Supplied by Microsemi in Case J (DO-41)

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5102	180.0	4.0	850.0	±5%	3 watt	Case UU[28]	
1N5103	190.0	"	900.0	"	"	"	
1N5104	200.0	"	950.0	"	"	"	
1N5105	220.0	3.0	1100.0	±5%	3 watt	Case UU	
1N5106	240.0	"	1300.0	"	"	"	
1N5107	260.0	"	1500.0	"	"	"	
1N5108	270.0	"	1600.0	"	"	"	
1N5109	280.0	"	1700.0	"	"	"	
1N5110	300.0	"	1900.0	"	"	"	
1N5111	320.0	2.0	2100.0	"	"	"	
1N5112	330.0	"	2250.0	"	"	"	
1N5113	340.0	"	2400.0	"	"	"	
1N5114	360.0	"	2700.0	"	"	"	
1N5115	380.0	"	3000.0	"	"	"	
1N5116	390.0	"	3250.0	"	"	"	
1N5117	400.0	"	3500.0	"	"	"	
1N5118	14.0	100.0	3.0	"	5 watt	Case VV	
1N5119	40.0	30.0	14.0	"	"	"	
1N5120	45.0	"	20.0	"	"	"	
1N5121	50.0	25.0	25.0	"	"	"	
1N5122	60.0	20.0	40.0	"	"	"	
1N5123	70.0	"	45.0	"	"	"	
1N5124	80.0	15.0	60.0	"	"	"	
1N5125	90.0	"	75.0	"	"	"	
1N5126	140.0	8.0	230.0	"	"	"	
1N5127	170.0	"	380.0	"	"	"	
1N5128	190.0	5.0	450.0	"	"	"	
1N5129	260.0	"	650.0	"	"	"	
1N5130	280.0	4.0	850.0	"	"	"	
1N5131	320.0	"	1100.0	"	"	"	
1N5132	340.0	"	1200.0	"	"	"	
1N5133	380.0	3.0	1500.0	"	"	"	
1N5134	400.0	"	1800.0	"	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR μA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
1N5194	80	.2	1.0	.025		DO35	
1N5195	200	.2	1.0	.025		DO35	
1N5196	250	.2	1.0	.025		DO35	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5221 [19]	2.4	20.0	30.0	No Suffix = 20%	500mw	DO-7/DO-35	
1N5222 [19]	2.5	"	"	Suffix A = 10%	"	"	
1N5223 [19]	2.7	"	"	Suffix B = 5%	"	"	
1N5224 [19]	2.8	"	"	" "	"	"	
1N5225 [19]	3.0	"	29.0	" "	"	"	
1N5226 [19]	3.3	"	28.0	" "	"	"	
1N5227 [19]	3.6	"	24.0	" "	"	"	
1N5228 [19]	3.9	"	23.0	" "	"	"	
1N5229 [19]	4.3	"	22.0	" "	"	"	
1N5230 [19]	4.7	"	19.0	" "	"	"	
1N5231 [19]	5.1	"	17.0	" "	"	"	
1N5232 [19]	5.6	"	11.0	" "	"	"	
1N5233 [19]	6.0	"	7.0	" "	"	"	
1N5234 [19]	6.2	"	"	" "	"	"	
1N5235 [19]	6.8	"	5.0	" "	"	"	
1N5236 [19]	7.5	"	6.0	" "	"	"	
1N5237 [19]	8.2	"	8.0	" "	"	"	
1N5238 [19]	8.7	"	"	" "	"	"	
1N5239 [19]	9.1	"	10.0	" "	"	"	
1N5240 [19]	10.0	"	17.0	" "	"	"	
1N5241 [19]	11.0	"	22.0	" "	"	"	
1N5242 [19]	12.0	"	30.0	" "	"	"	
1N5243 [19]	13.0	9.5	13.0	" "	"	"	
1N5244 [19]	14.0	9.0	15.0	" "	"	"	
1N5245 [19]	15.0	8.5	16.0	" "	"	"	
1N5246 [19]	16.0	7.8	17.0	" "	"	"	
1N5247 [19]	17.0	7.4	19.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5248 [19]	18.0	7.0	21.0	No Suffix = 20%	500mw	DO-7/DO-35	
1N5249 [19]	19.0	6.6	23.0	Suffix A = 10%	"	"	
1N5250 [19]	20.0	6.2	25.0	Suffix B = 5%	"	"	
1N5251 [19]	22.0	5.6	29.0	" "	"	"	
1N5252 [19]	24.0	5.2	33.0	" "	"	"	
1N5253 [19]	25.0	5.0	35.0	" "	"	"	
1N5254 [19]	27.0	4.6	41.0	" "	"	"	
1N5255 [19]	28.0	4.5	44.0	" "	"	"	
1N5256 [19]	30.0	4.2	49.0	" "	"	"	
1N5257 [19]	33.0	3.8	58.0	No Suffix = 20%	500mw	DO-7/DO-35	
1N5258 [19]	36.0	3.4	70.0	Suffix A = 10%	"	"	
1N5259 [19]	39.0	3.2	80.0	Suffix B = 5%	"	"	
1N5260 [19]	43.0	3.0	93.0	" "	"	"	
1N5261 [19]	47.0	2.7	105.0	" "	"	"	
1N5262 [19]	51.0	2.5	125.0	" "	"	"	
1N5263 [19]	56.0	2.2	150.0	" "	"	"	
1N5264 [19]	60.0	2.1	170.0	" "	"	"	
1N5265 [19]	62.0	2.0	185.0	" "	"	"	
1N5266 [19]	68.0	1.8	230.0	" "	"	"	
1N5267 [19]	75.0	1.7	270.0	" "	"	"	
1N5268 [19]	82.0	1.5	330.0	" "	"	"	
1N5269 [19]	87.0	1.4	370.0	" "	"	"	
1N5270 [19]	91.0	"	400.0	" "	"	"	
1N5271 [19]	100.0	1.3	500.0	" "	"	"	
1N5272 [19]	110.0	1.1	750.0	" "	"	"	
1N5273 [19]	120.0	1.0	900.0	" "	"	"	
1N5274 [19]	130.0	0.95	1100.0	" "	"	"	
1N5275 [19]	140.0	0.90	1300.0	" "	"	"	
1N5276 [19]	150.0	0.85	1500.0	" "	"	"	
1N5277 [19]	160.0	0.80	1700.0	" "	"	"	
1N5278 [19]	170.0	0.74	1900.0	" "	"	"	
1N5279 [19]	180.0	0.68	2200.0	" "	"	"	
1N5280 [19]	190.0	0.66	2400.0	" "	"	"	
1N5281 [19]	200.0	0.65	2500.0	" "	"	"	
1N5333	3.3	380	3.0	No Suffix = 20%	5 watt	Alee[30] [31]	
1N5334	3.6	350	2.5	Suffix A = 10%	"	"	
1N5335	3.9	320	2.0	Suffix B = 5%	"	"	
1N5336	4.3	290	2.0	" "	"	"	
1N5337	4.7	260	2.0	" "	"	"	
1N5338	5.1	240	1.5	" "	"	"	
1N5339	5.6	220	1.0	" "	"	"	
1N5340	6.0	200	1.0	" "	"	"	
1N5341	6.2	200	1.0	" "	"	"	
1N5342	6.8	175	1.0	" "	"	"	
1N5343	7.5	175	1.5	" "	"	"	
1N5344	8.2	150	1.5	" "	"	"	
1N5345	8.7	150	2.0	" "	"	"	
1N5346	9.1	150	2.0	" "	"	"	
1N5347	10	125	2.0	" "	"	"	
1N5348	11	125	2.5	" "	"	"	
1N5349	12	100	2.5	" "	"	"	
1N5350	13	100	2.5	" "	"	"	
1N5351	14	100	2.5	" "	"	"	
1N5352	15	75	2.5	" "	"	"	
1N5353	16	75	2.5	" "	"	"	
1N5354	17	70	2.5	" "	"	"	
1N5355	18	65	2.5	" "	"	"	
1N5356	19	65	3.0	" "	"	"	
1N5357	20	65	3.0	" "	"	"	
1N5358	22	50	3.5	" "	"	"	
1N5359	24	50	3.5	" "	"	"	
1N5360	25	50	4.0	" "	"	"	
1N5361	27	50	5.0	" "	"	"	
1N5362	28	50	6.0	" "	"	"	
1N5363	30	40	8.0	" "	"	"	
1N5364	33	40	10	" "	"	"	
1N5365	36	30	11	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low leakage series.
(20) Low noise series.
(28) Supplied by Microsemi in Case J (DO-41).
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.
(31) Supplied by Microsemi in Case T-18 which is identical to Alee.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5366	39	30	14	No Suffix = 20%	5 watt	Alee[30] [31]	
1N5367	43	30	20	Suffix A = 10%	"	"	
1N5368	47	25	25	Suffix B = 5%	"	"	
1N5369	51	25	27	" "	"	"	
1N5370	56	20	35	" "	"	"	
1N5371	60	20	40	" "	"	"	
1N5372	62	20	42	No Suffix = 20%	5 watts	Alee [30] [31]	
1N5373	68	20	44	Suffix A = 10%	"	"	
1N5374	75	20	45	Suffix B = 5%	"	"	
1N5375	82	15	65	" "	"	"	
1N5376	87	15	75	" "	"	"	
1N5377	91	15	75	" "	"	"	
1N5378	100	12	90	" "	"	"	
1N5379	110	12	125	" "	"	"	
1N5380	120	10	170	" "	"	"	
1N5381	130	10	190	" "	"	"	
1N5382	140	8	230	" "	"	"	
1N5383	150	8	330	" "	"	"	
1N5384	160	8	350	" "	"	"	
1N5385	170	8	380	" "	"	"	
1N5386	180	5	430	" "	"	"	
1N5387	190	5	450	" "	"	"	
1N5388	200	5	480	" "	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR μA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
		(55°C)			(n sec.)		
1N5415	50	3.0	1.1	1.0	150	E	
1N5416	100	3.0	1.1	1.0	150	E	
1N5417	200	3.0	1.1	1.0	150	E	
1N5418	400	3.0	1.1	1.0	150	E	
1N5419	500	3.0	1.1	1.0	250	E	
1N5420	600	3.0	1.1	1.0	400	E	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5518[19] [20]	3.3	20	26	No Suffix = ± 20%	400 mw	DO-7/DO-35	
1N5519[19] [20]	3.6	20	24	A Suffix = ± 10%	"	"	
1N5520[19] [20]	3.9	20	22	B Suffix = ± 5%	"	"	
1N5521[19] [20]	4.3	20	18	C Suffix = ± 2%	"	"	
1N5522[19] [20]	4.7	10	22	D Suffix = ± 1%	"	"	
1N5523[19] [20]	5.1	5	26	" "	"	"	
1N5524[19] [20]	5.6	3	30	" "	"	"	
1N5525[19] [20]	6.2	1	30	" "	"	"	
1N5526[19] [20]	6.8	1	30	" "	"	"	
1N5527[19] [20]	7.5	1	35	" "	"	"	
1N5528[19] [20]	8.2	1	40	" "	"	"	
1N5529[19] [20]	9.1	1	45	" "	"	"	
1N5530[19] [20]	10.0	1	60	" "	"	"	
1N5531[19] [20]	11.0	1	80	" "	"	"	
1N5532[19] [20]	12.0	1	90	" "	"	"	
1N5533[19] [20]	13.0	1	90	" "	"	"	
1N5534[19] [20]	14.0	1	100	" "	"	"	
1N5535[19] [20]	15.0	1	100	" "	"	"	
1N5536[19] [20]	16.0	1	100	" "	"	"	
1N5537[19] [20]	17.0	1	100	" "	"	"	
1N5538[19] [20]	18.0	1	100	" "	"	"	
1N5539[19] [20]	19.0	1	100	" "	"	"	
1N5540[19] [20]	20.0	1	100	" "	"	"	
1N5541[19] [20]	22.0	1	100	" "	"	"	
1N5542[19] [20]	24.0	1	100	" "	"	"	
1N5543[19] [20]	25.0	1	100	" "	"	"	
1N5544[19] [20]	28.0	1	100	" "	"	"	
1N5545[19] [20]	30.0	1	100	" "	"	"	
1N5546[19] [20]	33.0	1	100	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
		(55°C)					
1N5550	200	5.0	1.0	1.0		E	
1N5551	400	5.0	1.0	1.0		E	
1N5552	600	5.0	1.0	1.0		E	
1N5553	800	5.0	1.1	1.0		E	
1N5554	1000	5.0	1.1	1.0		E	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5555	33.0	1	No Impedance	No Tolerance	1,500 watts	DO-13	
1N5556	43.7	1	Specified	Specified	for ims	"	
1N5557	54.0	1	"	"	"	"	
1N5558	191.0	1	"	"	"	"	
1N5559	6.8	37	No Impedance	No Suffix = ± 20%	1.0 watt	A196d[28] [30]	
1N5560	7.5	34	Specified	" "	"	"	
1N5561	8.2	31	"	" "	"	"	
1N5562	9.1	28	"	" "	"	"	
1N5563	10	25	"	" "	"	"	
1N5564	11	23	"	" "	"	"	
1N5565	12	21	"	" "	"	"	
1N5566	13	19	"	" "	"	"	
1N5567	15	17	"	" "	"	"	
1N5568	16	15.5	"	" "	"	"	
1N5569	18	14	"	" "	"	"	
1N5570	20	12.5	"	" "	"	"	
1N5571	22	11.5	"	" "	"	"	
1N5572	24	10.5	"	" "	"	"	
1N5573	27	9.5	"	" "	"	"	
1N5574	30	8.5	"	" "	"	"	
1N5575	33	7.5	"	" "	"	"	
1N5576	36	7.0	"	" "	"	"	
1N5577	39	6.5	"	" "	"	"	
1N5578	43	6.0	"	" "	"	"	
1N5579	47	5.5	"	" "	"	"	
1N5580	51	5.0	No Impedance	No Suffix = ± 20%	1.0 watt	A196d[28] [30]	
1N5581	56	4.5	Specified	" "	"	"	
1N5582	62	4.0	"	" "	"	"	
1N5583	68	3.7	"	" "	"	"	
1N5584	75	3.3	"	" "	"	"	
1N5585	82	3.0	"	" "	"	"	
1N5586	91	2.8	"	" "	"	"	
1N5587	100	2.5	"	" "	"	"	
1N5588	110	2.3	"	" "	"	"	
1N5589	120	2.0	"	" "	"	"	
1N5590	130	1.9	"	" "	"	"	
1N5591	150	1.7	"	" "	"	"	
1N5592	160	1.6	"	" "	"	"	
1N5593	180	1.4	"	" "	"	"	
1N5594	200	1.2	"	" "	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR}	Device Package	MICROSEMI Recommended Substitute
		(55°C)			(n sec.)		
1N5614	200	1.00		1.0	2.0	A	
1N5616	400	1.00	.8 min.	1.0	2.0	A	
1N5618	600	1.00	to	1.0	2.0	A	
1N5620	800	1.00	1.3 max.	1.0	2.0	A	
1N5622	1000	1.00		1.0	2.0	A	
1N5615	200	1.0		.5	150	A	
1N5617	400	1.0	.8 min.	.5	150	A	
1N5619	600	1.0	to	.5	250	A	
1N5621	800	1.0	1.6 max.	.5	300	A	
1N5623	1000	1.0		.5	500	A	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5629	6.8	10	No Impedance	No Suffix = 10%	1500 watts	DO-13	
1N5629A	6.8	10	Specified	Suffix A = 5%	for 1ms	"	
1N5630	7.5	10	"	" "	"	"	
1N5630A	7.5	10	"	" "	"	"	
1N5631	8.2	10	"	" "	"	"	
1N5631A	8.2	10	"	" "	"	"	
1N5632	9.1	1	"	" "	"	"	
1N5632A	9.1	1	"	" "	"	"	
1N5633	10.0	1	"	" "	"	"	
1N5633A	10.0	1	"	" "	"	"	
1N5634	11.0	1	"	" "	"	"	
1N5634A	11.0	1	"	" "	"	"	
1N5635	12.0	1	"	" "	"	"	
1N5635A	12.0	1	"	" "	"	"	
1N5636	13.0	1	"	" "	"	"	
1N5636A	13.0	1	"	" "	"	"	
1N5637	15.0	1	"	" "	"	"	
1N5637A	15.0	1	"	" "	"	"	
1N5638	16.0	1	"	" "	"	"	
1N5638A	16.0	1	"	" "	"	"	
1N5639	18.0	1	"	" "	"	"	
1N5639A	18.0	1	"	" "	"	"	
1N5640	20.0	1	"	" "	"	"	
1N5640A	20.0	1	"	" "	"	"	
1N5641	22.0	1	"	" "	"	"	
1N5641A	22.0	1	"	" "	"	"	
1N5642	24.0	1	"	" "	"	"	
1N5642A	24.0	1	"	" "	"	"	
1N5643	27.0	1	"	" "	"	"	
1N5643A	27.0	1	"	" "	"	"	
1N5644	30.0	1	"	" "	"	"	
1N5644A	30.0	1	"	" "	"	"	
1N5645	33.0	1	"	" "	"	"	
1N5645A	33.0	1	"	" "	"	"	
1N5646	36.0	1	"	" "	"	"	
1N5646A	36.0	1	"	" "	"	"	
1N5647	39.0	1	"	" "	"	"	
1N5647A	39.0	1	"	" "	"	"	
1N5648	43.0	1	"	" "	"	"	
1N5648A	43.0	1	"	" "	"	"	
1N5649	47.0	1	"	" "	"	"	
1N5649A	47.0	1	"	" "	"	"	
1N5650	51.0	1	"	" "	"	"	
1N5650A	51.0	1	"	" "	"	"	
1N5651	56.0	1	"	" "	"	"	
1N5651A	56.0	1	"	" "	"	"	
1N5652	62.0	1	"	" "	"	"	
1N5652A	62.0	1	"	" "	"	"	
1N5653	68.0	1	"	" "	"	"	
1N5653A	68.0	1	"	" "	"	"	
1N5654	75.0	1	"	" "	"	"	
1N5654A	75.0	1	"	" "	"	"	
1N5655	82.0	1	"	" "	"	"	
1N5655A	82.0	1	"	" "	"	"	
1N5656	91.0	1	"	" "	"	"	
1N5656A	91.0	1	"	" "	"	"	
1N5657	100.0	1	"	" "	"	"	
1N5657A	100.0	1	"	" "	"	"	
1N5658	110.0	1	"	" "	"	"	
1N5658A	110.0	1	"	" "	"	"	
1N5659	120.0	1	"	" "	"	"	
1N5659A	120.0	1	"	" "	"	"	
1N5660	130.0	1	"	" "	"	"	
1N5660A	130.0	1	"	" "	"	"	
1N5661	150.0	1	"	" "	"	"	
1N5661A	150.0	1	"	" "	"	"	
1N5662	160.0	1	"	" "	"	"	
1N5662A	160.0	1	"	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5663	170.0	1	No Impedance	No Suffix = 10%	1,500 watts	DO-13	
1N5663A	170.0	1	Specified	Suffix A = 5%	for 1ms	"	
1N5664	180.0	1	"	" "	"	"	
1N5664A	180.0	1	"	" "	"	"	
1N5665	200.0	1	"	" "	"	"	
1N5665A	200.0	1	"	" "	"	"	
1N5666	1.8	1	65[27]	No Suffix = ± 10%	250 mw	C29N[30]	
1N5667	2.0	1	65	" "	"	"	
1N5668	2.2	1	65	" "	"	"	
1N5669	2.4	1	65	" "	"	"	
1N5670	2.7	1	65	" "	"	"	
1N5671	3.0	1	65	" "	"	"	
1N5672	3.3	1	65	" "	"	"	
1N5673	3.6	1	65	" "	"	"	
1N5674	3.9	1	65	" "	"	"	
1N5675	4.3	1	65	" "	"	"	
1N5676	4.7	1	65	" "	"	"	
1N5677	5.1	1	65	" "	"	"	
1N5678	5.6	1	65	" "	"	"	
1N5728 (19)	4.7	10	70	B Suffix = ± 5%	400mw	DO-35	
1N5729 (19)	5.1	10	50	C Suffix = ± 2%	"	"	
1N5730 (19)	5.6	10	25	D Suffix = ± 1%	"	"	
1N5731 (19)	6.2	10	10	" "	"	"	
1N5732 (19)	6.8	10	10	B Suffix = ± 5%	400 mw	DO-35	
1N5733 (19)	7.5	10	10	C Suffix = ± 2%	"	"	
1N5734 (19)	8.2	10	15	D Suffix = ± 1%	"	"	
1N5735 (19)	9.1	10	15	" "	"	"	
1N5736 (19)	10	10	20	" "	"	"	
1N5737 (19)	11	5	20	" "	"	"	
1N5738 (19)	12	5	30	" "	"	"	
1N5739 (19)	13	5	30	" "	"	"	
1N5740 (19)	15	5	30	" "	"	"	
1N5741 (19)	16	5	40	" "	"	"	
1N5742 (19)	18	5	45	" "	"	"	
1N5743 (19)	20	5	55	" "	"	"	
1N5744 (19)	22	5	55	" "	"	"	
1N5745 (19)	24	5	70	" "	"	"	
1N5746 (19)	27	2	80	" "	"	"	
1N5747 (19)	30	2	80	" "	"	"	
1N5748 (19)	33	2	90	" "	"	"	
1N5749 (19)	36.0	2	90	" "	"	"	
1N5750 (19)	39.0	2	130	" "	"	"	
1N5751 (19)	43.0	2	150	" "	"	"	
1N5752 (19)	47.0	2	170	" "	"	"	
1N5753 (19)	51.0	2	180	" "	"	"	
1N5754 (19)	56.0	2	200	" "	"	"	
1N5755 (19)	62.0	2	215	" "	"	"	
1N5756 (19)	68.0	2	240	" "	"	"	
1N5757 (19)	75.0	2	255	" "	"	"	

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR µA	T_{RR} (n sec.)	Device Package	MICROSEMI Recommended Substitute
1N5802	50	2.5	.875	1.0	25	A	
1N5803	75	@	@	1.0	25	A	
1N5804	100	TL=75°C	1.0Adc	1.0	25	A	
1N5805	125	(L=⅜")	250 msec	1.0	25	A	
1N5806	150		pulse width	1.0	25	A	
1N5807	50	6.0	.875	5.0	30	E	
1N5808	75	@	@	5.0	30	E	
1N5809	100	TL=75°C	4Adc	5.0	30	E	
1N5810	125	(L=⅜")	250 msec	5.0	30	E	
1N5811	150		pulse width	5.0	30	E	
1N5812	50	20	.9	1.0	35	DO4	
1N5813	75	20	.9	1.0	35	DO4	
1N5814	100	20	.9	1.0	35	DO4	
1N5815	125	20	.9	1.0	35	DO4	
1N5816	150	20	.9	1.0	35	DO4	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5837	2.40	20.0	50.0	Suffix A = 10%	500 mW		**1N5221**
1N5838	2.50	20.0	50.0	Suffix B = 5%	"		**1N5222**
1N5839	2.70	20.0	50.0	" "	"		**1N5223**
1N5840	2.80	20.0	50.0	" "	"		**1N5224**
1N5841	3.00	20.0	50.0	" "	"		**1N5225**
1N5842	3.30	20.0	50.0	" "	"		**1N5226**
1N5843	3.60	20.0	48.0	" "	"		**1N5227**
1N5844	3.90	20.0	40.0	" "	"		**1N5228**
1N5845	4.30	20.0	25.0	" "	"		**1N5229**
1N5846	4.70	20.0	19.0	" "	"		**1N5230**
1N5847	5.10	20.0	17.0	" "	"		**1N5231**
1N5848	5.60	20.0	15.0	" "	"		**1N5232**
1N5849	6.00	20.0	13.0	" "	"		**1N5233**
1N5850	6.20	20.0	14.0	" "	"		**1N5234**
1N5851	6.80	20.0	17.0	" "	"		**1N5235**
1N5852	7.50	20.0	23.0	" "	"		**1N5236**
1N5853	8.20	20.0	34.0	" "	"		**1N5237**
1N5854	8.70	20.0	44.0	" "	"		**1N5238**
1N5855	9.10	20.0	50.0	" "	"		**1N5239**
1N5856	10.00	20.0	62.0	" "	"		**1N5240**
1N5857	11.00	20.0	68.0	" "	"		**1N5241**
1N5858	12.00	20.0	70.0	" "	"		**1N5242**
1N5859	13.00	9.5	70.0	" "	"		**1N5243**
1N5860	14.00	9.0	70.0	" "	"		**1N5244**
1N5861	15.0	8.5	34.0	" "	"		**1N5245**
1N5862	16.0	7.8	38.0	" "	"		**1N5246**
1N5863	17.0	7.4	42.0	" "	"		**1N5247**
1N5864	18.0	7.0	48.0	" "	"		**1N5248**
1N5865	19.0	6.6	52.0	" "	"		**1N5249**
1N5866	20.0	6.2	57.0	" "	"		**1N5250**
1N5867	22.0	5.6	68.0	" "	"		**1N5251**
1N5868	24.0	5.2	78.0	" "	"		**1N5252**
1N5869	25.0	5.0	85.0	" "	"		**1N5253**
1N5870	27.0	4.6	98.0	" "	"		**1N5254**
1N5871	28.0	4.5	105.0	" "	"		**1N5255**
1N5872	30.0	4.2	117.0	" "	"		**1N5256**
1N5873	33.0	3.8	140.0	" "	"		**1N5257**
1N5874	36.0	3.4	160.0	" "	"		**1N5258**
1N5875	39.0	3.2	190.0	" "	"		**1N5259**
1N5876	43.0	3.0	225.0	" "	"		**1N5260**
1N5877	47.0	2.7	260.0	" "	"		**1N5261**
1N5878	51.0	2.5	300.0	" "	"		**1N5262**
1N5879	56.0	2.2	360.0	" "	"		**1N5263**
1N5880	60.0	2.1	410.0	" "	"		**1N5264**
1N5881	62.0	2.0	430.0	" "	"		**1N5265**
1N5882	68.0	1.8	520.0	" "	"		**1N5266**
1N5883	75.0	1.7	600.0	" "	"		**1N5267**
1N5884	82.0	1.5	700.0	" "	"		**1N5268**
1N5913	3.3	113.6	10.0	No Suffix = 20%	1.5 Watt	Case J	
1N5914	3.6	104.2	9.0	Suffix A = 10%	"	or DO-41	
1N5915	3.9	96.1	7.5	Suffix B = 5%	"	glass	
1N5916	4.3	87.2	6.0	Suffix C = 2%	"	"	
1N5917	4.7	79.8	5.0	Suffix D = 1%	"	"	
1N5918	5.1	73.5	4.0	" "	"	"	
1N5919	5.6	66.9	2.0	" "	"	"	
1N5920	6.2	60.5	2.0	" "	"	"	
1N5921	6.8	55.1	2.5	" "	"	"	
1N5922	7.5	50.0	3.0	" "	"	"	
1N5923	8.2	45.7	3.5	" "	"	"	
1N5924	9.1	41.2	4.0	" "	"	"	
1N5925	10.0	37.5	4.5	" "	"	"	
1N5926	11.0	34.1	5.5	" "	"	"	
1N5927	12.0	31.2	6.5	" "	"	"	
1N5928	13.0	28.8	7.0	" "	"	"	
1N5929	15.0	25.0	9.0	" "	"	"	
1N5930	16.0	23.4	10.0	" "	"	"	
1N5931	18.0	20.8	12.0	" "	"	"	
1N5932	20.0	18.7	14.0	" "	"	"	
1N5933	22.0	17.0	17.5	" "	"	"	
1N5934	24.0	15.6	19.0	" "	"	"	
1N5935	27.0	13.9	23.0	" "	"	"	
1N5936	30.0	12.5	28.0	" "	"	"	
1N5937	33.0	11.4	33.0	" "	"	"	
1N5938	36.0	10.4	38.0	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N5939	39.0	9.6	45.0	No Suffix = 20%	1.5 Watt	Case J	
1N5940	43.0	8.7	53.0	Suffix A = 10%	"	or DO-41	
1N5941	47.0	8.0	67.0	Suffix B = 5%	"	glass	
1N5942	51.0	7.3	70.0	Suffix C = 2% Suffix D = 1%	"	"	
1N5943	56.0	6.7	86.0	" "	"	"	
1N5944	62.0	6.0	100.0	" "	"	"	
1N5945	68.0	5.5	120.0	" "	"	"	
1N5946	75.0	5.0	140.0	" "	"	"	
1N5947	82.0	4.6	160.0	" "	"	"	
1N5948	91.0	4.1	200.0	" "	"	"	
1N5949	100.0	3.7	250.0	" "	"	"	
1N5950	110.0	3.4	300.0	" "	"	"	
1N5951	120.0	3.1	380.0	" "	"	"	
1N5952	130.0	2.9	450.0	" "	"	"	
1N5953	150.0	2.5	600.0	" "	"	"	
1N5954	160.0	2.3	700.0	" "	"	"	
1N5955	180.0	2.1	900.0	" "	"	"	
1N5956	200.0	1.9	1200.0	" "	"	"	
1N5985	2.4	5.0	110	A Suffix = ± 10%	500mw	DO-35	
1N5986	2.7	5.0	110	B Suffix = ± 5%	"	"	
1N5987	3.0	5.0	100	" "	"	"	
1N5988	3.3	5.0	100	" "	"	"	
1N5989	3.6	5.0	95	" "	"	"	
1N5990	3.9	5.0	95	" "	"	"	
1N5991	4.3	5.0	90	" "	"	"	
1N5992	4.7	5.0	90	" "	"	"	
1N5993	5.1	5.0	88	" "	"	"	
1N5994	5.6	5.0	70	" "	"	"	
1N5995	6.2	5.0	50	" "	"	"	
1N5996	6.8	5	25	A suffix = ± 10%	500 mw	DO-35	
1N5997	7.5	5	10	B suffix = ± 5%	"	"	
1N5998	8.2	5	15	" "	"	"	
1N5999	9.1	5	18	" "	"	"	
1N6000	10	5	22	" "	"	"	
1N6001	11	5	25	" "	"	"	
1N6002	12	5	32	" "	"	"	
1N6003	13	5	36	" "	"	"	
1N6004	15	5	42	" "	"	"	
1N6005	16	5	48	" "	"	"	
1N6006	18	5	55	" "	"	"	
1N6007	20	5	62	" "	"	"	
1N6008	22	5	70	" "	"	"	
1N6009	24	5	78	" "	"	"	
1N6010	27	5	88	" "	"	"	
1N6011	30	5	95	" "	"	"	
1N6012	33	5	110	" "	"	"	
1N6013	36	5.0	130	" "	"	"	
1N6014	39	2.0	170	" "	"	"	
1N6015	43	2.0	180	" "	"	"	
1N6016	47	2.0	200	" "	"	"	
1N6017	51	2.0	225	" "	"	"	
1N6018	56	2.0	240	" "	"	"	
1N6019	62	2.0	265	" "	"	"	
1N6020	68	2.0	280	" "	"	"	
1N6021	75	2.0	300	" "	"	"	
1N6022	82	2.0	350	" "	"	"	
1N6023	91	2.0	400	" "	"	"	
1N6024	100	1.0	800	" "	"	"	
1N6025	110	1.0	950	" "	"	"	
1N6026	120	1.0	1250	" "	"	"	
1N6027	130	1.0	1400	" "	"	"	
1N6028	150	1.0	1700	" "	"	"	
1N6029	160	1.0	2000	" "	"	"	
1N6030	180	1.0	2350	" "	"	"	
1N6031	200	1.0	2700	" "	"	"	

NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(20) Low noise series

(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

Type No.	PIV Volts	Io 25°C Amps	VF Volts	IR μA	TRR (n sec.)	Device Package	MICROSEMI Recommended Substitute
1N6073	50	3.0	2.04	1.0	30	A	
1N6074	100	3.0	2.04	1.0	30	A	
1N6075	150	3.0	2.04	1.0	30	A	
1N6076	50	6.0	1.76	5.0	30	E	
1N6077	100	6.0	1.76	5.0	30	E	
1N6078	150	6.0	1.76	5.0	30	E	
1N6079	50	12.0	1.50	10.0	30	G	
1N6080	100	12.0	1.50	10.0	30	G	
1N6081	150	12.0	1.50	10.0	30	G	

Zener Type No.	Zener Voltage at I_{ZT} Volts	@ mA	Max. Zener Impedance @ I_{ZT} Ohms	Zener Voltage Tolerance	Power Rating	Device Package	MICROSEMI Recommended Substitute
1N6082(19,20)	4.3	20.0	18.0	No Suffix = 20%	400 mW	DO-7/DO-35	
1N6083(19,20)	4.7	10.0	10.0	Suffix A = 10%	"	"	
1N6084(19,20)	5.1	5.0	10.0	Suffix B = 5%	"	"	
1N6085(19,20)	5.6	1.0	40.0	Suffix C = 2%	"	"	
1N6086(19,20)	6.2	1.0	45.0	Suffix D = 1%	"	"	
1N6087(19,20)	6.8	1.0	50.0	" "	"	"	
1N6088(19,20)	7.5	1.0	50.0	" "	"	"	
1N6089(19,20)	8.2	1.0	60.0	" "	"	"	
1N6090(19,20)	9.1	1.0	60.0	" "	"	"	
1N6091(19,20)	10.0	1.0	60.0	" "	"	"	

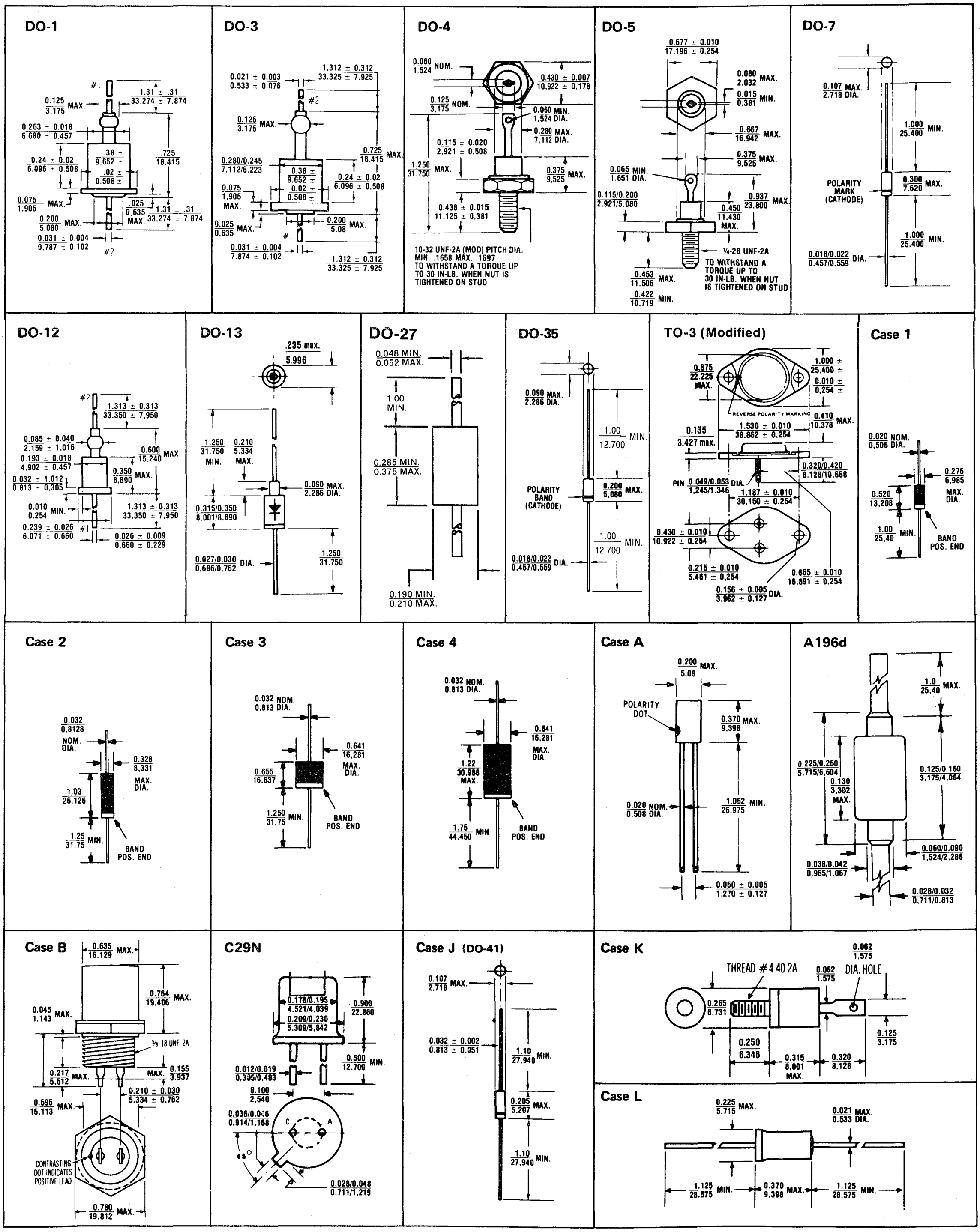
NOTE — Diode types presently available from Microsemi Corporation are shown in bold type.

(19) Low reverse leakage diode
(20) Low noise series
(27) Supplied by Microsemi in DO-7 Case
(28) Supplied by Microsemi in Case J (DO-41)
(30) This is the package referenced in the Autumn 1972 Semiconductor Diode & SCR D.A.T.A. book.

In addition to the JEDEC registered zener devices listed previously in this section, Microsemi Corp. supplies the following Pro Electron zener device types frequently used outside of the United States. The numerical digits following "C" in each type number indicates the zener voltage. If further specific information is required on defined parameters of these device types, contact the factory.

Zener Series No.	Power Rating	Device Package
BZX83 COV8 to C51	500mW	DO-35
BZX97 COV8 to C51	500mW	DO-35
BZX98 C3V9 to C200	10W	DO-4 (metric thread)
BZY97 C3V3 to C200	1.32W	J case (plastic)
BZD10 C3V3 to C200	1.32W	DO-13
BZW22 C3V3 to C200	1.30W	DO-41 (glass)
BZV40 C3V3 to C200	5.00W	T-18 (plastic)

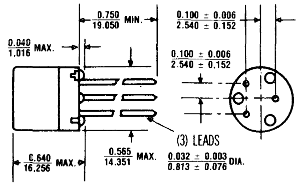
CASE CONFIGURATION CHART



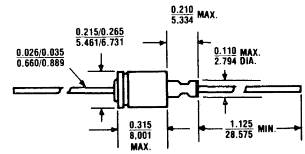
All dimensions in $\frac{\text{INCH}}{\text{m.m.}}$

CASE CONFIGURATION CHART

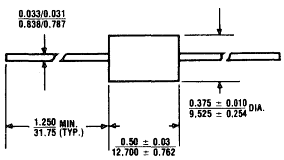
Case Q



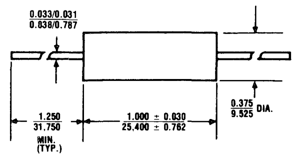
Case R



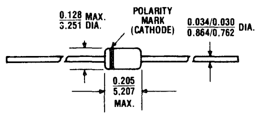
Case S



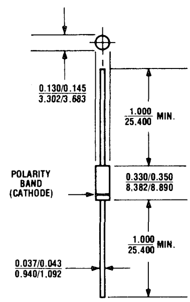
Case T



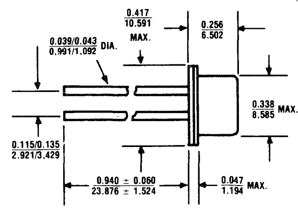
Case X



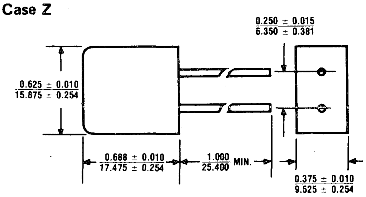
T-18



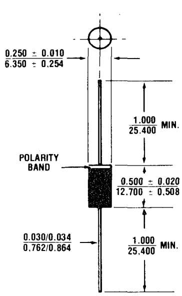
Case AA



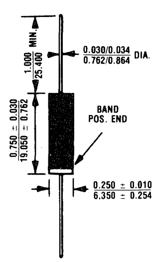
Case Z



Case CC



Case DD



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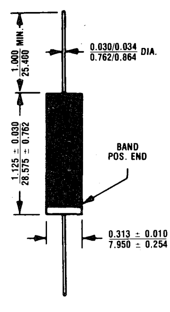
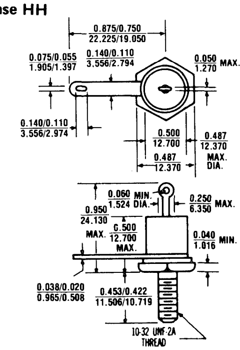
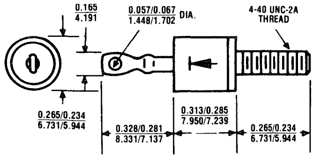


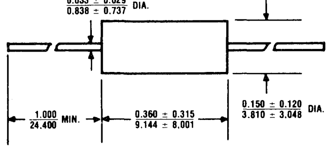
Case HH



Case FF



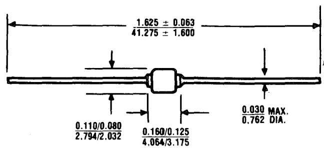
Case GG



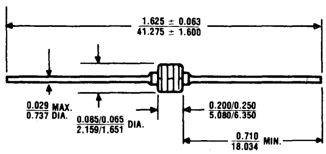
All dimensions in INCH / m.m.

CASE CONFIGURATION CHART

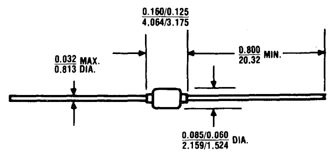
Case JJ



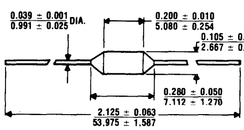
Case LL



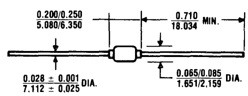
Case MM



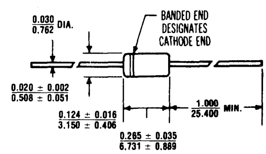
Case NN



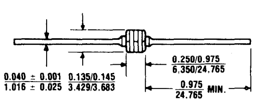
Case OO



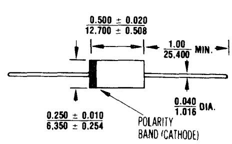
Case QQ



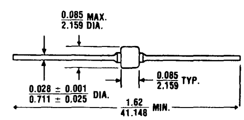
Case RR



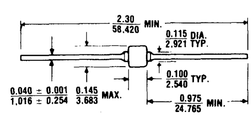
Case SS



Case UU



Case VV



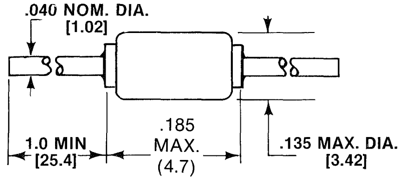
All dimensions in $\frac{\text{INCH}}{\text{m.m.}}$

CASE CONFIGURATION CHART

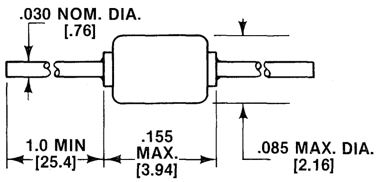
MECHANICAL CONFIGURATIONS
PHYSICAL DIMENSIONS

DIMENSIONS IN INCHES (MM)

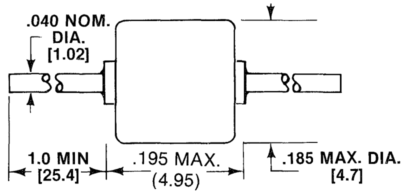
PACKAGE E



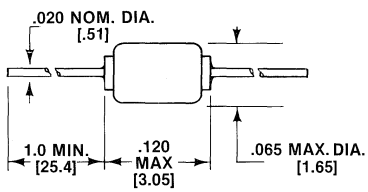
PACKAGE A



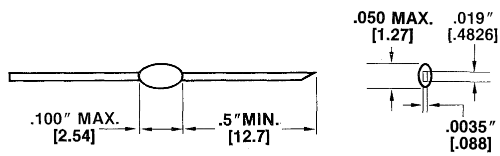
PACKAGE G



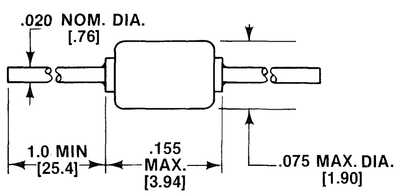
PACKAGE B [D034]



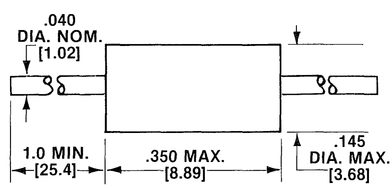
PACKAGE H



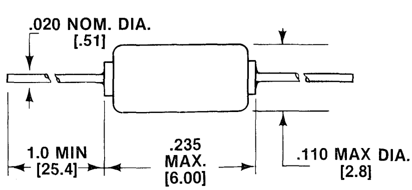
PACKAGE C



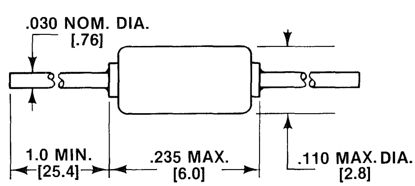
PACKAGE R



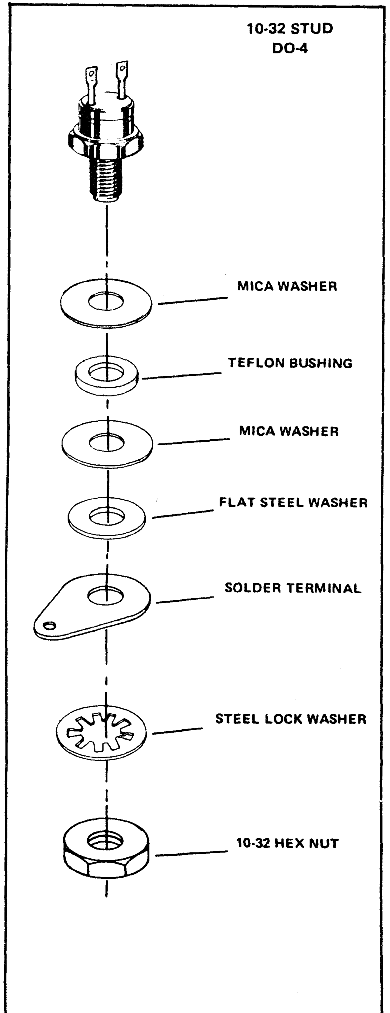
PACKAGE D

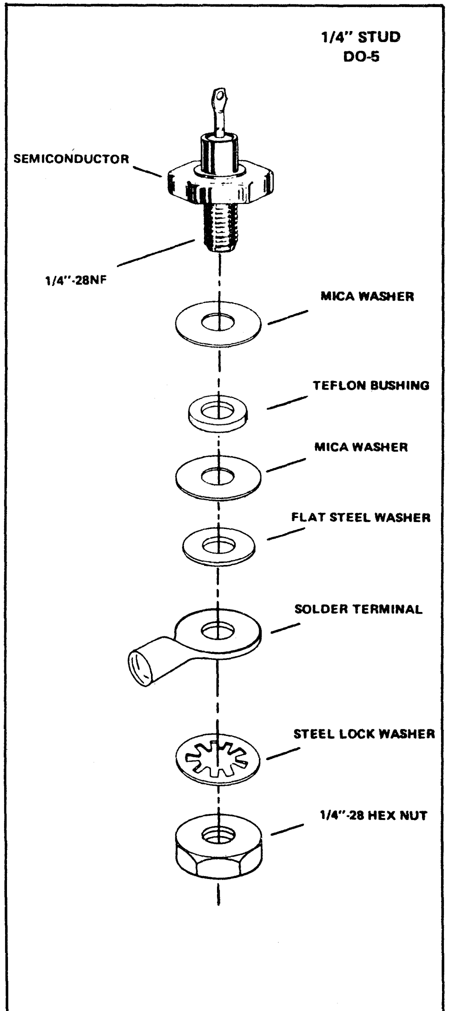


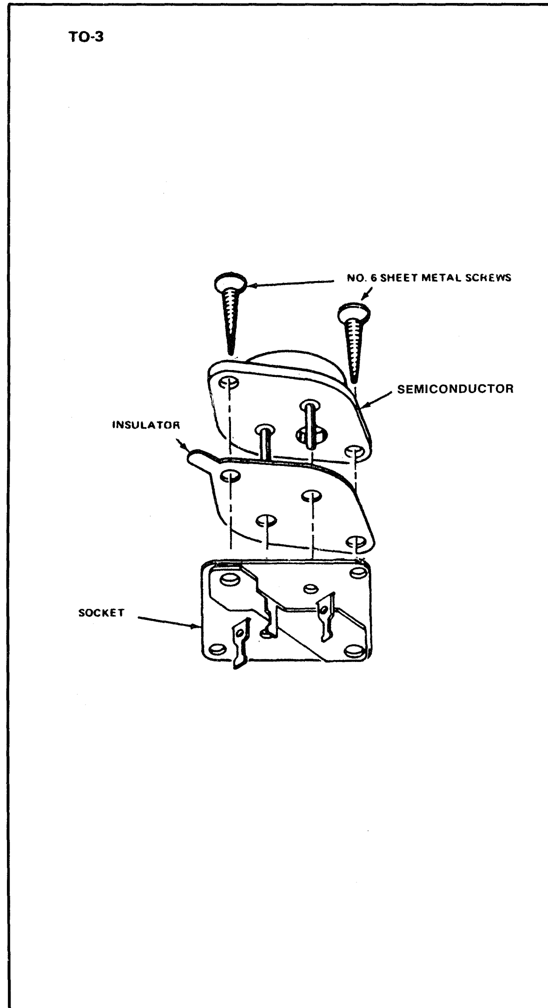
PACKAGE S



MOUNTING HARDWARE







ZENER DIODES

①

SECTION 1

GUIDE TO AVAILABLE AXIAL LEADED ZENER DIODES

	Early Industry Standard	Early Industry Standard	Low Noise Low Current Mil - Spec	Low Current (50 uA) Low Leakage	Low Noise Low Current Mil - Spec	Industry Standard Mil - Spec	Industry Standard Mil - Spec	High Performance	Low Voltage Avalanche	Low Noise Low Z Mil - Spec
Power	250 mw	250 mw	250mw	250mw	250mw	400mw	400mw	400 mw	400 mw	400 mw
	DO-35	DO-35	DO-35	DO-35	DO-35	DO-35	DO-35	DO-35	DO-7	DO-35
	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	DO-7	DO-35	DO-7
Vz Volts										
1.8				1N4678	1N4614					
2.0			[Mil-S-19500/435]	1N4679	1N4615					[Mil-S-19500/437]
2.2				1N4680	1N4616					
2.4				1N4681	1N4617	1N4370				
2.7	1N702			1N4682	1N4618	1N4371				
2.8										
3.0				1N4683	1N4619	1N4372	[Mil-S-19500/117]			
3.3				1N4684	1N4620	1N746		1N3506		1N5518
3.6	1N703			1N4685	1N4621	1N747		1N3507		1N5519
3.9				1N4686	1N4622	1N748		1N3508		1N5520
4.3	1N704			1N4687	1N4623	1N749		1N3509	1N6082	1N5521
4.7		1N761		1N4688	1N4624	1N750		1N3510	1N6083	1N5522
5.1	1N705			1N4689	1N4625	1N751		1N3511	1N6084	1N5523
5.6	1N708	1N762		1N4690	1N4626	1N752		1N3512	1N6085	1N5524
6.2	1N709			1N4691	1N4627	1N753		1N3513	1N6086	1N5525
6.8	1N710		1N4099	1N4692		1N754	1N957	1N3514	1N6087	1N5526
7.1	1N707	1N763			[Mil-S-19500/435]					
7.5	1N711		1N4100	1N4693		1N755	1N958	1N3515	1N6088	1N5527
8.2	1N712		1N4101	1N4694		1N756	1N959	1N3516	1N6089	1N5528
8.8		1N764	1N4102	1N4695						
9.1	1N713		1N4103	1N4696		1N757	1N960	1N3517	1N6090	1N5529
10	1N714		1N4104	1N4697		1N758	1N961	1N3518	1N6091	1N5530
10.5		1N765								
11	1N715		1N4105	1N4698			1N962	1N3519		1N5531
12	1N716		1N4106	1N4699		1N759	1N963	1N3520		1N5532
12.8		1N766								
13	1N717		1N4107	1N4700			1N964	1N3521		1N5533
14			1N4108	1N4701						1N5534
15	1N718		1N4109	1N4702			1N965	1N3522		1N5535
15.8		1N767								
16	1N719		1N4110	1N4703		[Mil-S-19500/127]	1N966	1N3523		1N5536
17			1N4111	1N4704						1N5537
18	1N720		1N4112	1N4705			1N967	1N3524		1N5538
19		1N768	1N4113	1N4706						1N5539
20	1N721		1N4114	1N4707			1N968	1N3525		1N5540
22	1N722		1N4115	1N4708			1N969	1N3526		1N5541
23.5		1N769								
24	1N723		1N4116	1N4709			1N970	1N3527		1N5542
25			1N4117	1N4710						1N5543
27	1N724		1N4118	1N4711			1N971	1N3528		
28			1N4119	1N4712						1N5544
30	1N725		1N4120	1N4713			1N972	1N3529		1N5545
33	1N726		1N4121	1N4714			1N973	1N3530		1N5546
36	1N727		1N4122	1N4715			1N974	1N3531		
39	1N728		1N4123	1N4716			1N975	1N3532		
40										
43	1N729		1N4124	1N4717			1N976	1N3533		
45										
47	1N730		1N4125				1N977	1N3534		
50										
51	1N731		1N4126				1N978			
52										
56	1N732		1N4127				1N979			
60			1N4128							
62	1N733		1N4129				1N980			
68	1N734		1N4130				1N981			
70										
75	1N735		1N4131				1N982			
80										
82	1N736		1N4132				1N983			
87			1N4133							
90										
91	1N737		1N4134				1N984			
100	1N738		1N4135				1N985			
110	1N739						1N986			
120	1N740						1N987			
130	1N741						1N988			
140										
150	1N742						1N989			
160	1N743						1N990			
170										
180	1N744						1N991			
190										
200	1N745						1N992			

1

GUIDE TO AVAILABLE AXIAL LEADED ZENER DIODES

	Popular Industrial Commercial	Double Slug $I_Z = 5_{MA}$	Double Slug	Replaced By 1N4728A Series	Metal Can Mil-Spec	Obsolete Use 1N4728 Series	Obsolete Use 1N4728 Series	Obsolete Use 1N4728 Series	Very Popular Industrial Commercial	1 Watt Epoxy Case J Commercial and Industrial Applications
Power	500 mw	500 mw	500mw	1 watt	1 watt	1 watt	1 watt	1 watt	1 watt	
	DO-35	DO-35	DO-35	DO-41	DO-41	DO-41	DO-41	DO-41	DO-41	
	DO-7	DO-35	DO-35	DO-41	DO-13	DO-29	DO-7	DO-14	DO-41	
Vz Volts										
1.8										
2.0										
2.2										
2.4	1N5221	1N5985								
2.7	1N5223	1N5986								
2.8	1N5224									
3.0	1N5225	1N5987								
3.3	1N5226	1N5988						1N4649	1N4728	
3.6	1N5227	1N5989			**[MIl-S-**			1N4650	1N4729	
3.9	1N5228	1N5990			**19500/115]**			1N4651	1N4730	
4.3	1N5229	1N5991						1N4652	1N4731	
4.7	1N5230	1N5992	1N5728					1N4653	1N4732	
5.1	1N5231	1N5993	1N5729					1N4654	1N4733	
5.6	1N5232	1N5994	1N5730					1N4655	1N4734	
6.2	1N5234	1N5995	1N5739					1N4656	1N4735	
6.8	1N5235	1N5996	1N5732	1N3675	1N3016	1N4158	1N4323	1N4657	1N4736	
7.1										
7.5	1N5236	1N5997	1N5733	1N3676	1N3017	1N4159	1N4324	1N4658	1N4737	
8.2	1N5237	1N5998	1N5734	1N3677	1N3018	1N4160	1N4325	1N4659	1N4738	
8.8	1N5238									
9.1	1N5239	1N5999	1N5735	1N3678	1N3019	1N4161	1N4326	1N4660	1N4739	
10	1N5240	1N6000	1N5736	1N3679	1N3020	1N4162	1N4327	1N4661	1N4740	
10.5										
11	1N5241	1N6001	1N5737	1N3680	1N3021	1N4163	1N4328	1N4662	1N4741	
12	1N5242	1N6002	1N5738	1N3681	1N3022	1N4164	1N4329	1N4663	1N4742	
12.8										
13	1N5243	1N6003	1N5739	1N3682	1N3023	1N4165	1N4330	1N4664	1N4743	
14	1N5244									
15	1N5245	1N6004	1N5740	1N3683	1N3024	1N4166	1N4331	1N4665	1N4744	
15.8										
16	1N5246	1N6005	1N5741	1N3684	1N3025	1N4167	1N4332	1N4666	1N4745	
17	1N5247									
18	1N5248	1N6006	1N5742	1N3685	1N3026	1N4168	1N4333	1N4667	1N4746	
19	1N5249									
20	1N5250	1N6007	1N5743	1N3686	1N3027	1N4169	1N4334	1N4668	1N4747	
22	1N5251	1N6008	1N5744	1N3687	1N3028	1N4170	1N4335	1N4669	1N4748	
23.5										
24	1N5252	1N6009	1N5745	1N3688	1N3029	1N4171	1N4336	1N4670	1N4749	
25	1N5253									
27	1N5254	1N6010	1N5746	1N3689	1N3030	1N4172	1N4337	1N4671	1N4750	
28	1N5255									
30	1N5256	1N6011	1N5747	1N3690	1N3031	1N4173	1N4338	1N4672	1N4751	
33	1N5257	1N6012	1N5748	1N3691	1N3032	1N4174	1N4339	1N4673	1N4752	
36	1N5258	1N6013	1N5749	1N3692	1N3033	1N4175	1N4340	1N4674	1N4753	
39	1N5259	1N6014	1N5750	1N3693	1N3034	1N4176	1N4341	1N4675	1N4754	
40										
43	1N5260	1N6015	1N5751	1N3694	1N3035	1N4177	1N4342	1N4676	1N4755	
45										
47	1N5261	1N6016	1N5752	1N3695	1N3036	1N4178	1N4343	1N4677	1N4756	
50										
51	1N5262	1N6017	1N5753	1N3696	1N3037	1N4179	1N4344		1N4757	
52										
56	1N5263	1N6018	1N5754	1N3697	1N3038	1N4180	1N4345		1N4758	
60	1N5264									
62	1N5265	1N6019	1N5755	1N3698	1N3039	1N4181	1N4346		1N4759	
68	1N5266	1N6020		1N3699	1N3040	1N4182	1N4347		1N4760	
70										
75	1N5267	1N6021	1N5757	1N3700	1N3041	1N4183	1N4348		1N4761	
80										
82	1N5268	1N6022		1N3701	1N3042	1N4184	1N4349		1N4762	
87	1N5269									
90										
91	1N5270	1N6023		1N3702	1N3043	1N4185	1N4350		1N4763	
100	1N5271	1N6024		1N3703	1N3044	1N4186	1N4351		1N4764	
110	1N5272	1N6025		1N3704	1N3045	1N4187	1N4352			1EZ110D5
120	1N5273	1N6026		1N3705	1N3046	1N4188	1N4353			1EZ120D5
130	1N5274	1N6027		1N3706	1N3047	1N4189	1N4354			1EZ130D5
140	1N5275									1EZ140D5
150	1N5276	1N6028		1N3707	1N3048	1N4190	1N4355			1EZ150D5
160	1N5277	1N6029		1N3708	1N3049	1N4191	1N4356			1EZ160D5
170	1N5278									1EZ170D5
180	1N5279	1N6030		1N3709	1N3050	1N4192	1N4357			1EZ180D5
190	1N5280									1EZ190D5
200	1N5281	1N6031		1N3710	1N3051	1N4193	1N4358			1EZ200D5

GUIDE TO AVAILABLE AXIAL LEADED ZENER DIODES

	Metal Can Mil-Spec	Double Slug Glass	Double Anode	Commercial Plastic	Mil-Std-701 Preferred Mil - Spec	2 Watt Epoxy Case J Commercial and Industrial Applications	Commercial Plastic	Industry Standard	3 Watt Epoxy Case J Commercial and Industrial Applications
Power	1 Watt	1 Watt	1.2 Watt	1.5 Watt	1.5 Watt		2.5 Watt	3.0 Watt	
	DO-41	"A"	"A"	"A"	"A"		"A"	"A"	
	DO-13	DO-41	DO-29	DO-41	"A"			"A"	
Vz Volts									
1.8									
2.0									
2.2									
2.4	[Mil-S-				[Mil-S-				
2.7	19500/115]				19500/406]				
2.8									
3.0									
3.3	1N3821			1N5913	1N6485		1N5008		
3.6	1N3822			1N5914	1N6486	2EZ3.6D5	1N5009		
3.9	1N3823			1N5915	1N6487	2EZ3.9D5	1N5010		3EZ3.9D5
4.3	1N3824			1N5916	1N6488	2EZ4.3D5	1N5011		3EZ4.3D5
4.7	1N3825			1N5917	1N6489	2EZ4.7D5	1N5012		3EZ4.7D5
5.1	1N3826			1N5918	1N6490	2EZ5.1D5	1N5013		3EZ5.1D5
5.6	1N3827			1N5919	1N6491	2EZ5.6D5	1N5014		3EZ5.6D5
6.2	1N3828			1N5920	1N4460	2EZ6.2D5	1N5015		3EZ6.2D5
6.8	1N3829	1N5559		1N5921	1N4461	2EZ6.8D5	1N5016	1N5063	3EZ6.8D5
7.1									
7.5	1N3830	1N5560		1N5922	1N4462	2EZ7.5D5	1N5017	1N5064	3EZ7.5D5
8.2		1N5561		1N5923	1N4463	2EZ8.2D5	1N5018	1N5065	3EZ8.2D5
8.8									
9.1		1N5562	1N4831	1N5924	1N4464	2EZ9.1D5	1N5019	1N5066	3EZ9.1D5
10		1N5563	1N4832	1N5925	1N4465	2EZ10D5	1N5020	1N5067	3EZ10D5
10.5									
11		1N5564	1N4833	1N5926	1N4466	2EZ11D5	1N5021	1N5068	3EZ11D5
12		1N5565	1N4834	1N5927	1N4467	2EZ12D5	1N5022	1N4883	3EZ12D5
12.8									
13		1N5566	1N4835	1N5928	1N4468	2EZ13D5	1N5023	1N5069	3EZ13D5
14						2EZ14D5	1N5024	1N5070	3EZ14D5
15		1N5567	1N4836	1N5929	1N4469	2EZ15D5	1N5025	1N5071	3EZ15D5
15.8									
16		1N5568	1N4837	1N5930	1N4470	2EZ16D5	1N5026	1N5072	3EZ16D5
17						2EZ17D5	1N5027		3EZ17D5
18		1N5569	1N4838	1N5931	1N4471	2EZ18D5	1N5028	1N5073	3EZ18D5
19						2EZ19D5	1N5029		3EZ19D5
20		1N5570	1N4839	1N5932	1N4472	2EZ20D5	1N5030	1N4884	3EZ20D5
22		1N5571	1N4840	1N5933	1N4473	2EZ22D5	1N5031	1N5074	3EZ22D5
23.5									
24		1N5572	1N4841	1N5934	1N4474	2EZ24D5	1N5032	1N5075	3EZ24D5
25							1N5033		
27		1N5573	1N4842	1N5935	1N4475	2EZ27D5	1N5034	1N5076	3EZ27D5
28									
30		1N5574	1N4843	1N5936	1N4476	2EZ30D5	1N5035	1N5077	3EZ30D5
33		1N5575	1N4844	1N5937	1N4477	2EZ33D5	1N5036	1N5078	3EZ33D5
36		1N5576	1N4845	1N5938	1N4478	2EZ36D5	1N5037	1N5079	3EZ36D5
39		1N5577	1N4846	1N5939	1N4479	2EZ39D5	1N5038	1N5080	3EZ39D5
40								1N5081	
43		1N5578	1N4847	1N5940	1N4480	2EZ43D5	1N5039	1N5082	3EZ43D5
45							1N5040	1N5083	
47		1N5579	1N4848	1N5941	1N4481	2EZ47D5	1N5041	1N5084	3EZ47D5
50							1N5042	1N5085	
51		1N5580	1N4849	1N5942	1N4482	2EZ51D5	1N5043	1N5086	3EZ51D5
52							1N5044		
56		1N5581	1N4850	1N5943	1N4483	2EZ56D5	1N5045	1N5087	3EZ56D5
60								1N5088	3EZ60D5
62		1N5582	1N4851	1N5944	1N4484	2EZ62D5	1N5046	1N5089	3EZ62D5
68		1N5583	1N4852	1N5945	1N4485	2EZ68D5	1N5047	1N5090	3EZ68D5
70								1N5091	
75		1N5584	1N4853	1N5946	1N4486	2EZ75D5	1N5048	1N5092	3EZ75D5
80								1N5093	
82		1N5585	1N4854	1N5947	1N4487	2EZ82D5	1N5049	1N5094	3EZ82D5
87									
90								1N4096	
91		1N5586	1N4855	1N5948	1N4488	2EZ91D5	1N5050	1N5095	3EZ91D5
100		1N5587	1N4856	1N5949	1N4489	2EZ100D5	1N5051	1N4097	3EZ100D5
110		1N5588	1N4857	1N5950	1N4490	2EZ110D5		1N5096	3EZ110D5
120		1N5589	1N4858	1N5951	1N4491	2EZ120D5		1N5097	3EZ120D5
130		1N5590	1N4859	1N5952	1N4492	2EZ130D5		1N5098	3EZ130D5
140						2EZ140D5		1N5099	3EZ140D5
150		1N5591	1N4860	1N5953	1N4493	2EZ150D5		1N4098	3EZ150D5
160		1N5592		1N5954	1N4494	2EZ160D5		1N5100	3EZ160D5
170						2EZ170D5		1N5101	3EZ170D5
180		1N5593		1N5955	1N4495	2EZ180D5		1N5102	3EZ180D5
190						2EZ190D5		1N5103	3EZ190D5
200		1N5594		1N5956	1N4496	2EZ200D5		1N5104	3EZ200D5

GUIDE TO AVAILABLE AXIAL LEADED ZENER DIODES

	Mil-Std-701 Preferred Mil - Spec	Popular Plastic Package	10 Watt Stud Package DO-4 Industrial & Military Applications		50 Watt Stud Package DO-5 Industrial & Military Applications		50 Watt Diamond Package TO-3 Industrial & Military Applications	
Power	5.0 Watt	5.0 Watt						
	"E"	"R"						
	"E"							
Vz Volts								
1.8								
2.0								
2.2								
2.4	**[Mil-S-**							
2.7	**19500/356]**							
2.8								
3.0								
3.3		1N5333						
3.6		1N5334						
3.9		1N5335		1N3993	1N4549		1N4557	
4.3		1N5336		1N3994	1N4550		1N4558	
4.7		1N5337		1N3995	1N4551		1N4559	
5.1		1N5338		1N3996	1N4552		1N4560	
5.6	1N5968	1N5339		1N3997	1N4553		1N4561	
6.2	1N5969	1N5341		1N3998	1N4554		1N4562	
6.8	1N4954	1N5342	1N2970	1N3999	1N4555	1N3305	1N4563	1N2804
7.1								
7.5	1N4955	1N5343	1N2971	1N4000	1N4556	1N3306	1N4564	1N2805
8.2	1N4956	1N5344	1N2972			1N3307		1N2806
8.8		1N5345						
9.1	1N4957	1N5346	1N2973			1N3308		1N2807
10	1N4958	1N5347	1N2974			1N3309		1N2808
10.5								
11	1N4959	1N5348	1N2975			1N3310		1N2809
12	1N4960	1N5349	1N2976			1N3311		1N2810
12.8								
13	1N4961	1N5350	1N2977			1N3312		1N2811
14	1N5118	1N5351	1N2978			1N3313		1N2812
15	1N4962	1N5352	1N2979			1N3314		1N2813
15.8								
16	1N4963	1N5353	1N2980			1N3315		1N2814
17		1N5354	1N2981			1N3316		1N2815
18	1N4964	1N5355	1N2982			1N3317		1N2816
19		1N5356	1N2983			1N3318		1N2817
20	1N4965	1N5357	1N2984			1N3319		1N2818
22	1N4966	1N5358	1N2985			1N3320		1N2819
23.5								
24	1N4967	1N5359	1N2986			1N3321		1N2820
25		1N5360	1N2987			1N3322		1N2821
27	1N4968	1N5361	1N2988			1N3323		1N2822
28		1N5362						
30	1N4969	1N5363	1N2989			1N3324		1N2823
33	1N4970	1N5364	1N2990			1N3325		1N2824
36	1N4971	1N5365	1N2991			1N3326		1N2825
39	1N4972	1N5366	1N2992			1N3327		1N2826
40	1N5119							
43	1N4973	1N5367	1N2993			1N3328		1N2827
43.7								
45	1N5120		1N2994			1N3329		1N2828
47	1N4974	1N5368	1N2995			1N3330		1N2829
50	1N5121		1N2996			1N3331		1N2830
51	1N4975	1N5369	1N2997			1N3332		1N2831
52			1N2998			1N3333		
54.0								
56	1N4976	1N5370	1N2999			1N3334		1N2832
60	1N5122	1N5371						
62	1N4977	1N5372	1N3000			1N3335		1N2833
68	1N4978	1N5373	1N3001			1N3336		1N2834
70	1N5123							
75	1N4979	1N5374	1N3002			1N3337		1N2835
80	1N5124							
82	1N4980	1N5375	1N3003			1N3338		1N2836
87		1N5376						
90	1N5125							
91	1N4981	1N5377	1N3004			1N3339		1N2837
100	1N4982	1N5378	1N3005			1N3340		1N2838
105			1N3006			1N3341		1N2839
110	1N4983	1N5379	1N3007			1N3342		1N2840
120	1N4984	1N5380	1N3008			1N3343		1N2841
130	1N4985	1N5381	1N3009			1N3344		1N2842
140	1N5126	1N5382	1N3010			1N3345		
150	1N4986	1N5383	1N3011			1N3346		1N2843
160	1N4987	1N5384	1N3012			1N3347		1N2844
170	1N5127	1N5385						
175			1N3013			1N3348		
180	1N4988	1N5386	1N3014			1N3349		1N2845
190	1N5128	1N5387						
200	1N4989	1N5388	1N3015			1N3350		1N2846

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1N746 thru 1N759A and 1N4370 thru 1N4372A DO-7

1% and 2% VERSIONS "C" and "D" AVAILABLE

SILICON 400 mW ZENER DIODES

1

FEATURES

- ZENER VOLTAGE 2.4V to 12.0V
- AVAILABLE IN JAN, JANTX and JANTXV QUALIFICATIONS TO MIL-S-19500/127
- 1N746A THRU 1N759A HAVE S1N QUALIFICATION

MAXIMUM RATINGS

Junction and Storage Temperatures: - 65°C to + 175°C
DC Power Dissipation: 400 mW
Power Derating: 3.2 mW/°C above 50°C
Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO. (NOTE 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (NOTE 2)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 3)	MAXIMUM REVERSE CURRENT @ V_R = 1 VOLT		MAXIMUM ZENER CURRENT I_{ZM} (NOTE 4)	TYPICAL TEMP COEFF. OF ZENER VOLTAGE α_{VZ}
				@ 25°C	@ +150°C		
	VOLTS	mA	OHMS	µA	µA	mA	%/°C
1N4370	2.4	20	30	100	200	150	−.085
1N4371	2.7	20	30	75	150	135	−.080
1N4372	3.0	20	29	50	100	120	−.075
1N746	3.3	20	28	10	30	110	−.066
1N747	3.6	20	24	10	30	100	−.058
1N748	3.9	20	23	10	30	95	−.046
1N749	4.3	20	22	2	30	85	−.033
1N750	4.7	20	19	2	30	75	−.015
1N751	5.1	20	17	1	20	70	±.010
1N752	5.6	20	11	1	20	65	+.030
1N753	6.2	20	7	.1	20	60	+.049
1N754	6.8	20	5	.1	20	55	+.053
1N755	7.5	20	6	.1	20	50	+.057
1N756	8.2	20	8	.1	20	45	+.060
1N757	9.1	20	10	.1	20	40	+.061
1N758	10.0	20	17	.1	20	35	+.062
1N759	12.0	20	30	.1	20	30	+.062

*JEDEC Registered Data

NOTE 1 Standard tolerance on JEDEC types shown is ± 10%. Suffix letter A denotes ± 5% tolerance; suffix letter C denotes ± 2%; and suffix letter D denotes ± 1% tolerance.

NOTE 2 Voltage measurements to be performed 20 sec. after application of D.C. test current.

NOTE 3 Zener impedance derived by superimposing on I_{ZT}, a 60 cps, rms ac current equal to 10% I_{ZT} (2 mA ac).

NOTE 4 Allowance has been made for the increase in V_Z due to Z_Z and for the increase in junction temperature as the unit approaches thermal equilibrium at the power dissipation of 400 mW.

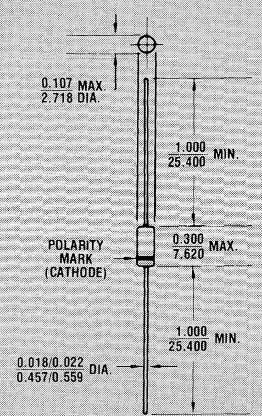

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

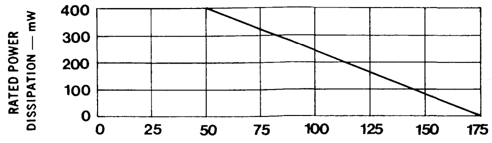

FIGURE 2 POWER DERATING CURVE

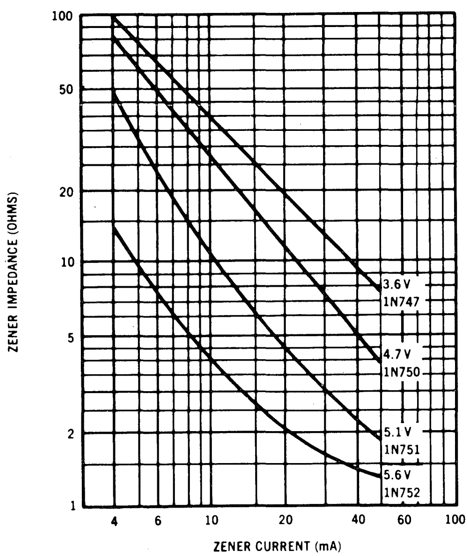

FIGURE 3

ZENER IMPEDANCE VS ZENER CURRENT (TYPICAL)

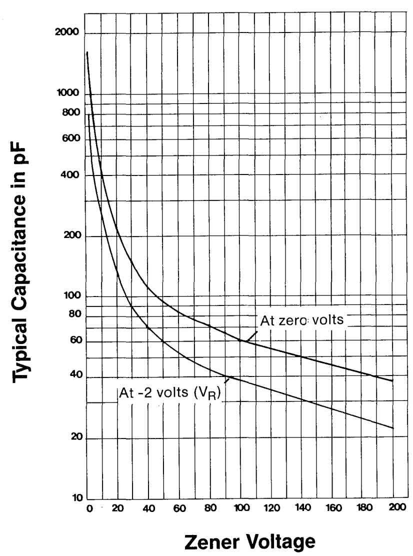

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE (TYPICAL)

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1N746 thru 1N759A and 1N4370 thru 1N4372A DO-35

1% and 2% VERSIONS
"C" and "D" AVAILABLE

SILICON 400 mW ZENER DIODES

FEATURES

- ZENER VOLTAGE 2.4 V to 12.0 V
- AVAILABLE IN JAN, JANTX AND JANTXV-1 QUALIFICATIONS TO MIL-S-19500/127
- METALLURGICALLY BONDED DEVICE TYPES

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 400 mW
Power Derating: 4.0 mW/°C above 75°C
Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO. (NOTE 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (NOTE 2)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 3)	MAXIMUM REVERSE CURRENT @ V_R = 1 VOLT		MAXIMUM ZENER CURRENT I_{ZM} (NOTE 4)	TYPICAL TEMP COEFF. OF ZENER VOLTAGE α_{VZ}
				@ 25°C	@ +150°C		
	VOLTS	mA	OHMS	μA	μA	mA	%/°C
1N4370	2.4	20	30	100	200	150	−.085
1N4371	2.7	20	30	75	150	135	−.080
1N4372	3.0	20	29	50	100	120	−.075
1N746	3.3	20	28	10	30	110	−.066
1N747	3.6	20	24	10	30	100	−.058
1N748	3.9	20	23	10	30	95	−.046
1N749	4.3	20	22	2	30	85	−.033
1N750	4.7	20	19	2	30	75	−.015
1N751	5.1	20	17	1	20	70	±.010
1N752	5.6	20	11	1	20	65	+.030
1N753	6.2	20	7	.1	20	60	+.049
1N754	6.8	20	5	.1	20	55	+.053
1N755	7.5	20	6	.1	20	50	+.057
1N756	8.2	20	8	.1	20	45	+.060
1N757	9.1	20	10	.1	20	40	+.061
1N758	10.0	20	17	.1	20	35	+.062
1N759	12.0	20	30	.1	20	30	+.062

*JEDEC Registered Data

NOTE 1 Standard tolerance on JEDEC types shown is ± 10%. Suffix letter A denotes ± 5% tolerance; suffix letter C denotes ± 2%; and suffix letter D denotes ± 1% tolerance.

NOTE 2 Voltage measurements to be performed 20 sec. after application of D.C. test current.

NOTE 3 Zener impedance derived by superimposing on I_{ZT}, a 60 cps, rms ac current equal to 10% I_{ZT} (2 mA ac).

NOTE 4 Allowance has been made for the increase in V_Z due to Z_Z and for the increase in junction temperature as the unit approaches thermal equilibrium at the power dissipation of 400 mW.

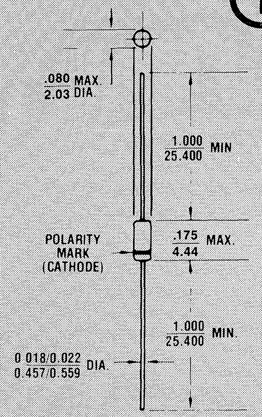

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100 °C/W at zero distance from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITIONS: Any.

1N746 thru 1N759A DO-35
1N4370 thru 1N4372A

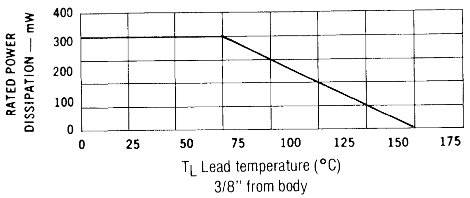

FIGURE 2 POWER DERATING CURVE

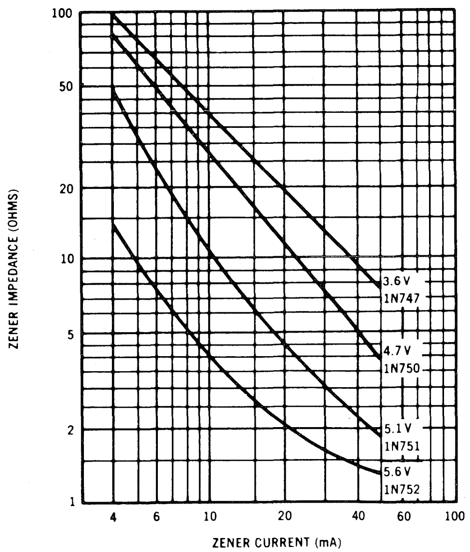

FIGURE 3

ZENER IMPEDANCE VS ZENER CURRENT
(TYPICAL)

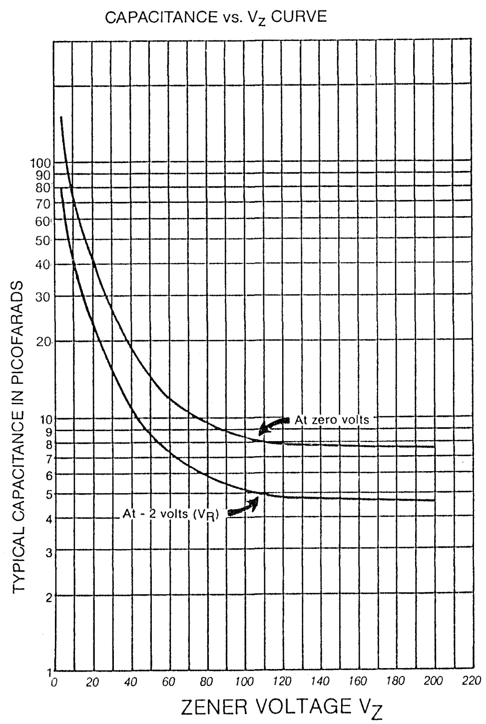

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

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SCOTTSDALE, AZ

☆JANS☆

1N754A-1 thru 1N759A-1 DO-35

SILICON 400 mW ZENER DIODES

FEATURES

- ZENER VOLTAGE 6.8 V to 12.0 V
- AVAILABLE IN JAN, JANTX, JANTXV-1 AND JANS QUALIFICATIONS TO MIL-S-19500/127
- METALLURGICALLY BONDED VOIDLESS DEVICE TYPES

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 400 mW
Power Derating: 4.0 mW/°C above 75°C
Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO. (NOTE 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (NOTE 2)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 3)	MAXIMUM REVERSE CURRENT @ V_R = 1 VOLT		MAXIMUM ZENER CURRENT I_{ZM} (NOTE 4)	TYPICAL TEMP COEFF. OF ZENER VOLTAGE α_{VZ}
				@ 25°C	@ +150°C		
	VOLTS	mA	OHMS	μA	μA	mA	%/°C
1N754A	6.8	20	5	.1	20	55	+.053
1N755A	7.5	20	6	.1	20	50	+.057
1N756A	8.2	20	8	.1	20	45	+.060
1N757A	9.1	20	10	.1	20	40	+.061
1N758A	10.0	20	17	.1	20	35	+.062
1N759A	12.0	20	30	.1	20	30	+.062

*JEDEC Registered Data

NOTE 1 Standard tolerance on JEDEC types shown is ± 5%.

NOTE 2 Voltage measurements to be performed 20 sec. after application of D.C. test current.

NOTE 3 Zener impedance derived by superimposing on I_{ZT}, a 60 cps, rms ac current equal to 10% I_{ZT} (2 mA ac).

NOTE 4 Allowance has been made for the increase in V_Z due to Z_Z and for the increase in junction temperature as the unit approaches thermal equilibrium at the power dissipation of 400 mW.

①

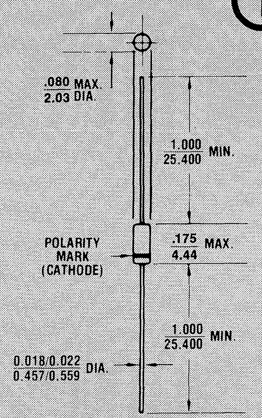

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.
FINISH: All external surfaces are corrosion resistant and leads solderable.
THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100 °C/W at zero distance from body.
POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.
WEIGHT: 0.2 grams.
MOUNTING POSITIONS: Any.

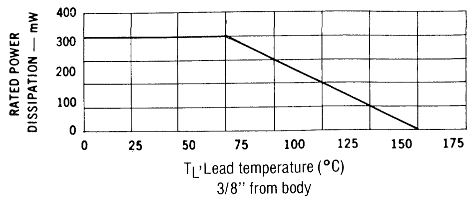

FIGURE 2 POWER DERATING CURVE

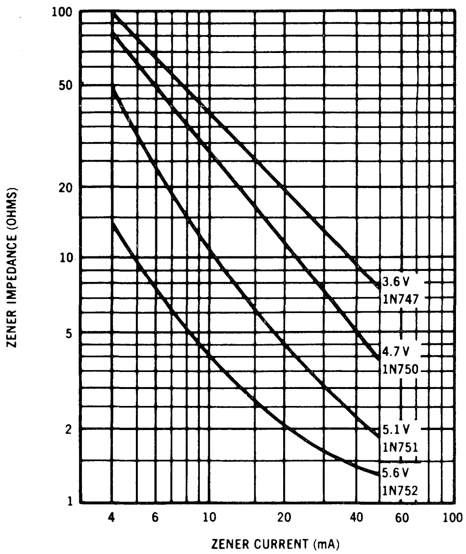

FIGURE 3

ZENER IMPEDANCE VS ZENER CURRENT
(TYPICAL)

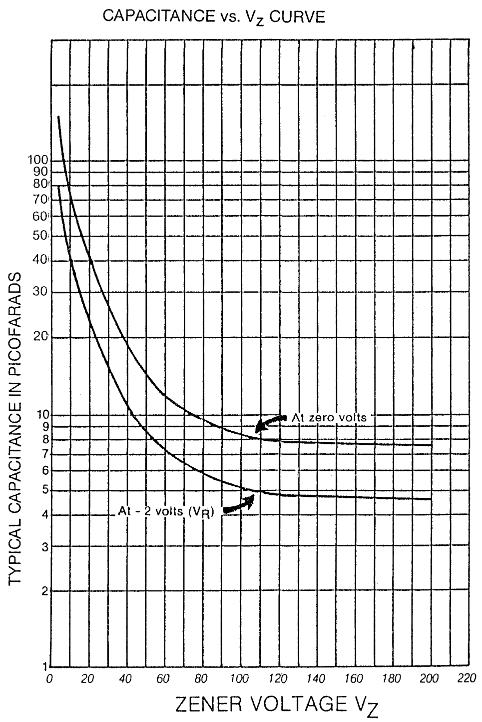

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

Microsemi Corp.
The diode experts
SANTA ANA, CA
SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N957B thru 1N992B DO-7

SILICON 400 mW ZENER DIODES

FEATURES
- 6.8 TO 200V ZENER VOLTAGE RANGE
- 1N962B THRU 1N992B HAVE JAN, JANTX AND JANTXV QUALIFICATIONS TO MIL-S-19500/117
- 1N962B THRU 1N973B HAVE S1N QUALIFICATION

MAXIMUM RATINGS
Steady State Power Dissipation: 400 mW
Operating and Storage Temperatures: - 65°C to + 175°C
Derating Factor Above 50°C: 3.2 mW/°C
Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE (Note 2) V_Z	ZENER TEST CURRENT I_{ZT}	MAX. ZENER IMPEDANCE (Note 3) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		MAX. DC ZENER CURRENT (Note 4) I_{ZM}	MAX. SURGE CURRENT (RECURRENT) (Note 5) I_Z (SURGE)	MAX. REVERSE LEAKAGE CURRENT I_R	V_R	MAX. TEMP. COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	OHMS	mA	mA	mA	µA	VOLTS	%/°C
1N957B	6.8	18.5	4.5	700	1.0	55	300	150	5.2	+0.05
1N958B	7.5	16.5	5.5	700	.5	50	275	75	5.7	+0.058
1N959B	8.2	15.0	6.5	700	.5	45	250	50	6.2	+0.065
1N960B	9.1	14.0	7.5	700	.5	41	225	25	6.9	+0.068
1N961B	10	12.5	8.5	700	.25	38	200	10	7.6	+0.075
1N962B	11	11.5	9.5	700	.25	32	175	5	8.4	+0.076
1N963B	12	10.5	11.5	700	.25	31	160	5	9.1	+0.077
1N964B	13	9.5	13.0	700	.25	28	150	5	9.9	+0.079
1N965B	15	8.5	16	700	.25	25	130	5	11.4	+0.082
1N966B	16	7.8	17	700	.25	24	120	5	12.2	+0.083
1N967B	18	7.0	21	750	.25	20	110	5	13.7	+0.085
1N968B	20	6.2	25	750	.25	18	100	5	15.2	+0.086
1N969B	22	5.6	29	750	.25	16	90	5	16.7	+0.087
1N970B	24	5.2	33	750	.25	15	80	5	18.2	+0.088
1N971B	27	4.6	41	750	.25	13	70	5	20.6	+0.090
1N972B	30	4.2	49	1000	.25	12	65	5	22.8	+0.091
1N973B	33	3.8	58	1000	.25	11	60	5	25.1	+0.092
1N974B	36	3.4	70	1000	.25	10	55	5	27.4	+0.093
1N975B	39	3.2	80	1000	.25	9.5	46	5	29.7	+0.094
1N976B	43	3.0	93	1500	.25	8.8	44	5	32.7	+0.095
1N977B	47	2.7	105	1500	.25	7.9	40	5	35.8	+0.095
1N978B	51	2.5	125	1500	.25	7.4	37	5	38.8	+0.096
1N979B	56	2.2	150	2000	.25	6.8	35	5	42.6	+0.096
1N980B	62	2.0	185	2000	.25	6.0	30	5	47.1	+0.097
1N981B	68	1.8	230	2000	.25	5.5	28	5	51.7	+0.097
1N982B	75	1.7	270	2000	.25	5.0	26	5	56.0	+0.098
1N983B	82	1.5	330	3000	.25	4.6	23	5	62.2	+0.098
1N984B	91	1.4	400	3000	.25	4.1	21	5	69.2	+0.099
1N985B	100	1.3	500	3000	.25	3.7	18	5	76.0	+0.11
1N986B	110	1.1	750	4000	.25	3.3	16	5	83.6	+0.11
1N987B	120	1.0	900	4500	.25	3.1	15	5	91.2	+0.11
1N988B	130	0.95	1100	5000	.25	2.7	13	5	98.8	+0.11
1N989B	150	0.85	1500	6000	.25	2.4	12	5	114.0	+0.11
1N990B	160	0.80	1700	6500	.25	2.2	11	5	121.6	+0.11
1N991B	180	0.68	2200	7100	.25	2.0	10	5	136.8	+0.11
1N992B	200	0.65	2500	8000	.25	1.8	9	5	152.0	+0.11

*JEDEC Registered Data

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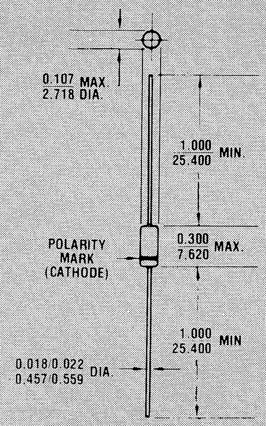

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS
CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

1N957B thru 1N992B DO-7

NOTE 1 The JEDEC type numbers shown (B suffix) have a ±5% tolerance on nominal zener voltage. The suffix A is used to identify ±10% tolerance; suffix C is used to identify ±2%; and suffix D is used to identify ±1% tolerance; no suffix indicates ±20% tolerance.

NOTE 2 Zener voltage (V_Z) is measured after the test current has been applied for 20 ±5 seconds. The device shall be suspended by its leads with the inside edge of the mounting clips between .375″ and .500″ from the body. Mounting clips shall be maintained at a temperature of 25 +8/−2°C.

NOTE 3 The zener impedance is derived from the 60 cycle A.C. voltage, which results when an A.C. current having an R.M.S. value equal to 10% of the D.C. zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units.

NOTE 4 The values of I_{ZM} are calculated for a ±5% tolerance on nominal zener voltage. Allowance has been made for the rise in zener voltage above V_{ZT} which results from zener impedance and the increase in junction temperature as power dissipation approaches 400 mW. In the case of individual diodes I_{ZM} is that value of current which results in a dissipation of 400 mW at 50°C lead temperature at 3/8″ from body.

NOTE 5 Surge is 1/2 square wave or equivalent sine wave pulse of 1/120 sec. duration.

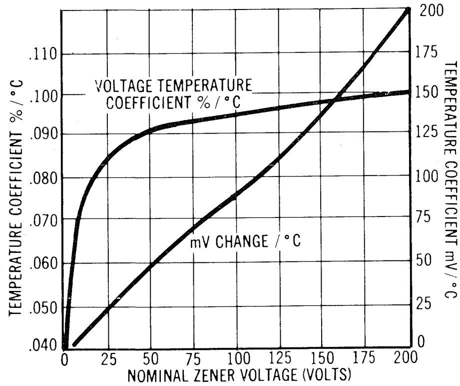

FIGURE 2

ZENER VOLTAGE TEMPERATURE COEFF. vs. ZENER VOLTAGE

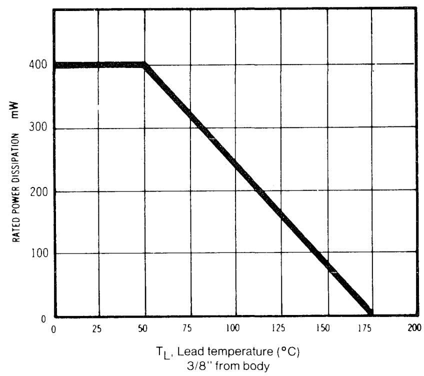

FIGURE 3

POWER DERATING CURVE

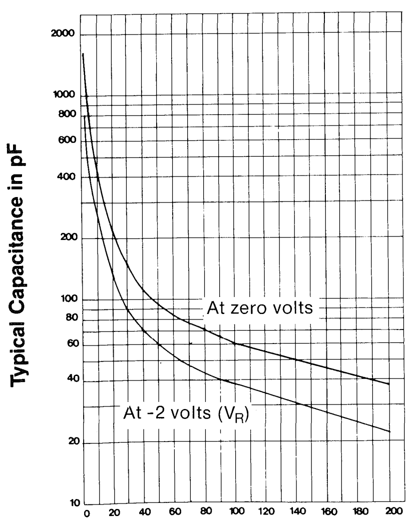

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE (TYPICAL)

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1N957B thru 1N992B DO-35

SILICON 400 mW ZENER DIODES

FEATURES

- 6.8 TO 200 V ZENER VOLTAGE RANGE
- 1N962B-1 THRU 1N992B-1 AVAILABLE IN JAN, JANTX AND JANTXV QUALIFICATIONS TO MIL-S-19500/117
- METALLURGICALLY BONDED DEVICE TYPES
- CONSULT FACTORY FOR VOLTAGES ABOVE 200 V

MAXIMUM RATINGS

Steady State Power Dissipation: 400 mW
Operating and Storage Temperature: -65°C to +175°C
Derating Factor Above 75°C: 4.0 mW/°C
Forward Voltage @ 200 mA: 1.5 Volts

* ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE (Note 2) V_Z	ZENER TEST CURRENT I_{ZT}	MAX. ZENER IMPEDANCE (Note 3) Z_{ZT} @ I_{ZT}	Z_{ZK} @	I_{ZK}	MAX. DC ZENER CURRENT (Note 4) I_{ZM}	MAX. SURGE CURRENT (RECURRENT) (Note 5) I_Z (SURGE)	MAX. REVERSE LEAKAGE CURRENT I_R	V_R	MAX. TEMP. COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	OHMS	mA	mA	mA	μA	VOLTS	%/°C
1N957B	6.8	18.5	4.5	700	1.0	55	300	150	5.2	+0.05
1N958B	7.5	16.5	5.5	700	.5	50	275	75	5.7	+0.058
1N959B	8.2	15.0	6.5	700	.5	45	250	50	6.2	+0.065
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1N967B	18	7.0	21	750	.25	20	110	5	13.7	+0.085
1N968B	20	6.2	25	750	.25	18	100	5	15.2	+0.086
1N969B	22	5.6	29	750	.25	16	90	5	16.7	+0.087
1N970B	24	5.2	33	750	.25	15	80	5	18.2	+0.088
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1N973B	33	3.8	58	1000	.25	11	60	5	25.1	+0.092
1N974B	36	3.4	70	1000	.25	10	55	5	27.4	+0.093
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1N984B	91	1.4	400	3000	.25	4.1	21	5	69.2	+0.099
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1N986B	110	1.1	750	4000	.25	3.3	16	5	83.6	+0.11
1N987B	120	1.0	900	4500	.25	3.1	15	5	91.2	+0.11
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1N992B	200	0.65	2500	8000	.25	1.8	9	5	152.0	+0.11

*JEDEC Registered Data

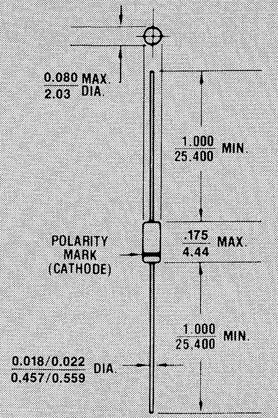

FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100°C/W at zero distance from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

1N957B thru 1N992B DO-35

NOTE 1 The JEDEC type numbers shown (B suffix) have a ±5% tolerance on nominal zener voltage. The suffix A is used to identify ± 10% tolerance; suffix C is used to identify ± 2%; and suffix D is used to identify ± 1% tolerance; no suffix indicates ± 20% tolerance.

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NOTE 3 The zener impedance is derived from the 60 cycle A.C. voltage, which results when an A.C. current having an R.M.S. value equal to 10% of the D.C. zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units.

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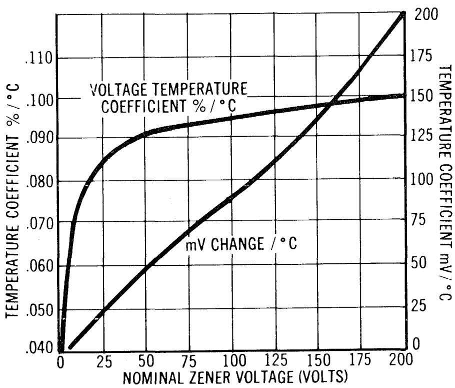

FIGURE 2

ZENER VOLTAGE TEMPERATURE COEFF. vs. ZENER VOLTAGE

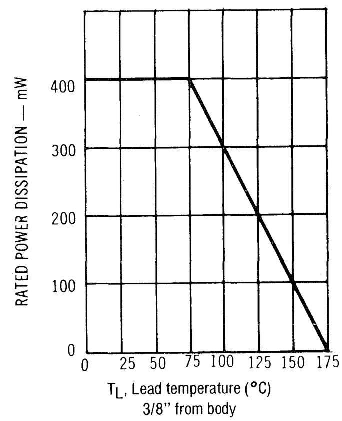

FIGURE 3

POWER DERATING CURVE

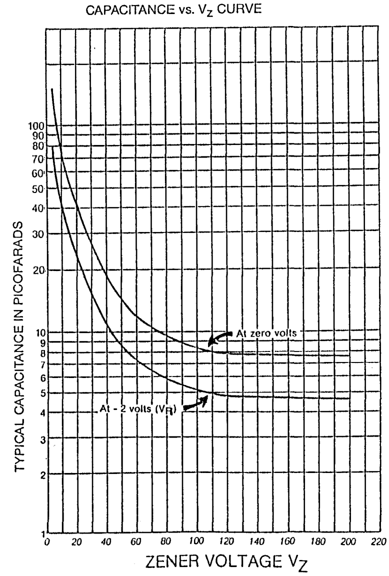

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE (TYPICAL)

Microsemi Corp.
The diode experts

SANTA ANA, CA
For more information call:
(714) 979-8220

SCOTTSDALE, AZ

1N962B thru 1N973B DO-35

☆JANS☆

SILICON 400 mW ZENER DIODES

FEATURES

- 6.8 TO 200 V ZENER VOLTAGE RANGE
- AVAILABLE IN JAN, JANTX AND JANTXV AND JANS QUALIFICATIONS TO MIL-S-19500/117
- METALLURGICALLY BONDED VOIDLESS DEVICE TYPES
- CONSULT FACTORY FOR VOLTAGES ABOVE 200 V

MAXIMUM RATINGS

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Operating and Storage Temperature: -65°C to +175°C
Derating Factor Above 75°C: 4.0 mW/°C
Forward Voltage @ 200 mA: 1.5 Volts

* ELECTRICAL CHARACTERISTICS @ 25°C

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1N966B	16	7.8	17	700	.25	24	120	5	12.2	+0.083
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*JEDEC Registered Data

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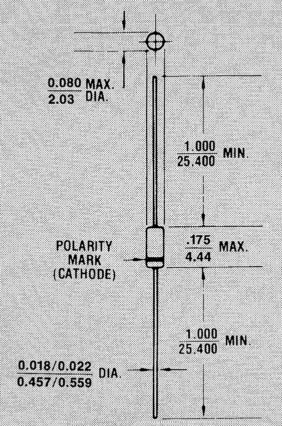

FIGURE 1

All dimensions in INCH / m.m.

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THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100°C/W at zero distance from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

1N962B thru 1N973B DO-35

NOTE 1 The JEDEC type numbers shown (B suffix) have a ±5% tolerance on nominal zener voltage. The suffix A is used to identify ±10% tolerance; suffix C is used to identify ±2%; and suffix D is used to identify ±1% tolerance; no suffix indicates ±20% tolerance.

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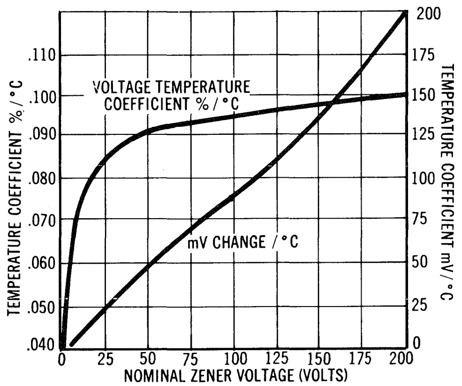


FIGURE 2
ZENER VOLTAGE TEMPERATURE COEFF. vs. ZENER VOLTAGE

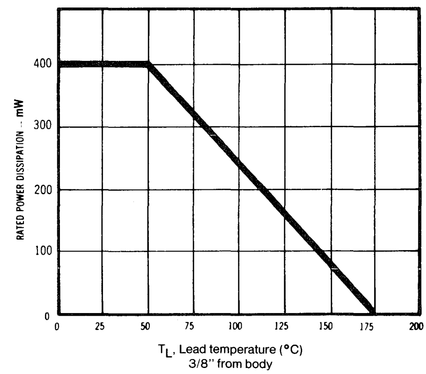
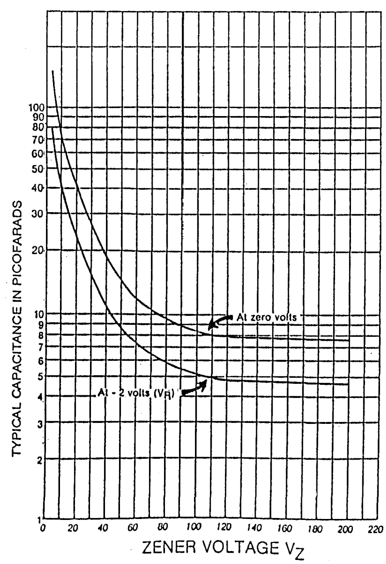


FIGURE 3
POWER DERATING CURVE



CAPACITANCE VS. ZENER VOLTAGE (TYPICAL)

FIGURE 4

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N2804 thru 1N2846B and 1N4557B thru 1N4564B

SILICON 50 WATT ZENER DIODES

1

FEATURES

- ZENER VOLTAGE 3.9V to 200V
- AVAILABLE IN TOLERANCES OF ±5%, ±10% and ±20%
- DESIGNED FOR MILITARY ENVIRONMENTS (See Below)

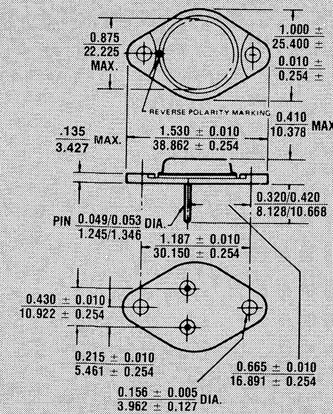
MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 50 watts
Power Derating: 0.5W/°C above 75°C
Forward Voltage @ 10 A: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO. (Note 1)	NOMINAL ZENER VOLTAGE V_z @ I_{zt} Volts (Note 2)	ZENER TEST CURRENT (I_{zt}) mA	MAX. ZENER IMPEDANCE (Note 3) Z_{zt} @ I_{zt} OHMS	Z_{zk} @ 5 mA (I_{zk}) OHMS	MAX. DC ZENER CURRENT (I_{zm}) @ 75°C Case Temp. (Note 4) mA	TYPICAL ZENER VOLTAGE Temp. Coeff. α_{vz} %/°C	MAXIMUM LEAKAGE CURRENT ** I_R µa	@ V_R V
†1N4557B	3.9	3200	0.16	400	11,900	−0.046	150	0.5
†1N4558B	4.3	2900	0.16	500	10,650	−0.033	150	0.5
†1N4559B	4.7	2650	0.12	600	9,700	−0.015	100	1
†1N4560B	5.1	2450	0.12	650	8,900	±0.010	20	1
†1N4561B	5.6	2250	0.12	900	8,100	+0.03	20	1
†1N4562B	6.2	2000	0.14	1000	7,300	+0.049	20	2
1N4563B	6.8	1850	0.16	200	6,650	+0.053	10	2
1N4564B	7.5	1650	0.24	100	6,050	+0.057	10	3
†1N2804B	6.8	1850	0.2	70	7,400	.040	150	4.5
†1N2805B	7.5	1700	0.3	70	6,600	.045	100	5
†1N2806B	8.2	1500	0.4	70	5,800	.048	50	5.4
†1N2807B	9.1	1370	0.5	70	5,300	.050	25	6.1
†1N2808B	10	1200	0.6	80	4,800	.055	25	6.7
†1N2809B	11	1100	0.8	80	4,300	.060	10	8.4
†1N2810B	12	1000	1.0	80	4,000	.065	10	9.1
†1N2811B	13	960	1.1	80	3,700	.065	10	9.9
1N2812B	14	890	1.2	80	3,400	.070	10	10.6
†1N2813B	15	830	1.4	80	3,100	.070	10	11.4
†1N2814B	16	780	1.6	80	2,950	.070	10	12.2
1N2815B	17	740	1.8	80	2,750	.075	10	13.0
†1N2816B	18	700	2.0	80	2,550	.075	10	13.7
1N2817B	19	660	2.2	80	2,450	.075	10	14.4
†1N2818B	20	630	2.4	80	2,350	.075	10	15.2
†1N2819B	22	570	2.5	80	2,100	.080	10	16.7
†1N2820B	24	520	2.6	80	1,950	.080	10	18.2
1N2821B	25	500	2.7	90	1,850	.080	10	19
†1N2822B	27	460	2.8	90	1,650	.085	10	20.6
†1N2823B	30	420	3.0	90	1,550	.085	10	22.8
†1N2824B	33	380	3.2	90	1,450	.085	10	25.1
†1N2825B	36	350	3.5	90	1,300	.085	10	27.4
†1N2826B	39	320	4.0	90	1,175	.090	10	29.7
†1N2827B	43	290	4.5	90	1,075	.090	10	32.7
1N2828B	45	280	4.5	100	1,030	.090	10	34.2
†1N2829B	47	270	5.0	100	980	.090	10	35.8
1N2830B	50	250	5.0	100	935	.090	10	38
†1N2831B	51	245	5.2	100	925	.090	10	38.8
†1N2832B	56	220	6	110	825	.090	10	42.6
†1N2833B	62	200	7	120	735	.090	10	47.1
†1N2834B	68	180	8	140	670	.090	10	51.7
†1N2835B	75	170	9	150	600	.090	10	56
†1N2836B	82	150	11	160	550	.090	10	62.2
†1N2837B	91	140	15	180	470	.090	10	69.2
†1N2838B	100	120	20	200	450	.090	10	76
1N2839B	105	120	25	210	430	.095	10	79.8
†1N2840B	110	110	30	220	410	.095	10	83.6
†1N2841B	120	100	40	240	375	.095	10	91.2
†1N2842B	130	95	50	275	345	.095	10	98.8
†1N2843B	150	85	75	400	300	.095	10	114.0
†1N2844B	160	80	80	450	285	.095	10	121.6
†1N2845B	180	68	90	525	250	.095	10	136.8
†1N2846B	200	65	100	600	220	.100	10	152.0

*JEDEC Registered Data. **Not JEDEC Data.
†Have JAN, JANTX and JANTXV Qualifications to MIL-S-19500/114.



All dimensions in INCH / m.m. **FIGURE 1**

MECHANICAL CHARACTERISTICS

CASE: Industry Standard TO-3, (modified), hermetically sealed, 0.052 inch diameter pins.

FINISH: All external surfaces are corrosion resistant and terminal solderable.

THERMAL RESISTANCE: 1.5°C/W (Typical) junction to base.

POLARITY: Standard Polarity units are connected anode to case. Reverse polarity (cathode to case is indicated by a red dot on the base plate. (Suffix R)

WEIGHT: 15 grams.

MOUNTING HARDWARE: See page 41.

NOTE 1 The JEDEC type numbers shown (B suffix) have a ±5% tolerance on nominal zener voltage. The suffix A is used to identify ±10% tolerance; no suffix indicates ±20% tolerance. If tighter tolerance is required, consult factory. Standard polarity units have the anode connected to the case. Reverse polarity (cathode-to-case) units are available and are indicated by suffixing an R to the part number.

NOTE 2 Zener Voltage (V_Z) is measured with junction in thermal equilibrium with 30°C base temperature. The test currents (I_{ZT}) have been selected so that at nominal voltages the dissipation is a constant 12.5 watts. This results in a nominal junction temperature rise of 18.75°C.

NOTE 3 The zener impedance is derived from the 60 cycle A.C. voltage, which results when an A.C. current having an R.M.S. value equal to 10% of the D.C. zener current (I_{zt} or I_{zk}) is superimposed on I_{zt} or I_{zk}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units. A curve showing the variation of zener impedance vs. zener current for six representative types is shown in Figure 3. A 100% cathode ray tube curve trace test is used to insure that each zener diode breakdown region begins at a current lower than I_{zk} and continues at nearly constant voltage to a current level in excess of I_{zm}.

NOTE 4 The values of I_{zm} are calculated for a ±5% tolerance on nominal zener voltage. Allowance has been made for the rise in zener voltage above V_{zt} which results from zener impedance and the increase in junction temperature as power dissipation approaches 50 watts. In the case of individual diodes I_{zm} is that value of current which results in a dissipation of 50 watts.

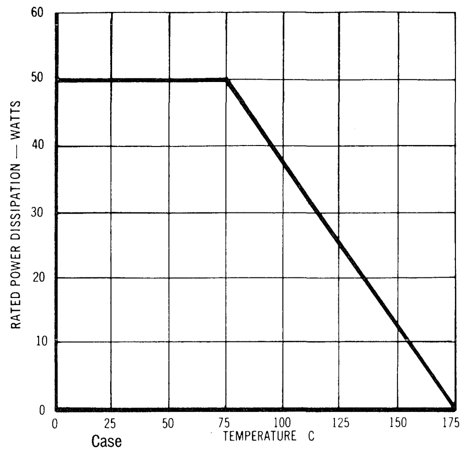
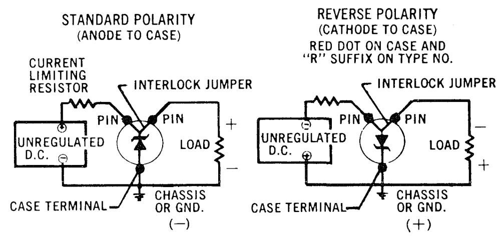


FIGURE 2

POWER DERATING CURVE



Typical circuit connections for anode-to-case and cathode-to-case polarities (standard and reverse polarities, respectively).

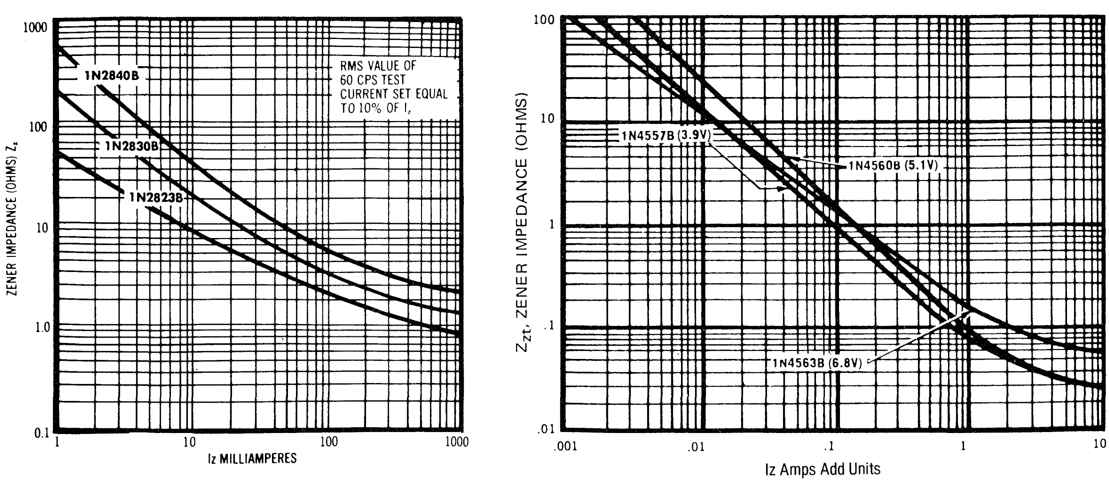


FIGURE 3

TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

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SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N2970 thru 1N3015B and 1N3993 thru 1N4000A

SILICON 10 WATT ZENER DIODES

FEATURES

- ZENER VOLTAGE 3.9 to 200V
- VOLTAGE TOLERANCES; ±5%, ±10% and ±20% (See Note 1)
- MAXIMUM RELIABILITY FOR MILITARY ENVIRONMENTS (See † Below)

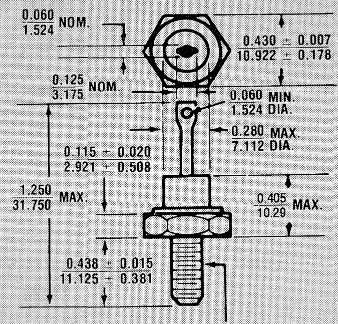
MAXIMUM RATINGS

Junction and Storage Temperatures: – 65°C to + 175°C
DC Power Dissipation: 10 Watts
Power Derating: 80 mW/°C above 50°C
Forward Voltage @ 2.0 A: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 30°C Case Temperature

JEDEC TYPE NO. (Note 1)	NOMINAL ZENER VOLTAGE $V_z@I_{zt}$ Volts (Note 2)	ZENER TEST CURRENT (I_{zt}) mA	MAX. DYNAMIC IMPEDANCE (Note 3) $Z_{zt}@I_{zt}$ OHMS	Z_{zk} @ 1mA (I_{zk}) OHMS	MAX. DC ZENER CURRENT (I_{zm})@75°C Stud Temp. (Note 4) mA	TYPICAL TEMP. COEFF. α_{VZ} % /°C	MAX** LEAKAGE CURRENT I_R µA	@ V_R Volts	POLARITY
†1N3993A	3.9	640	2.0	400	2380	–.046	100	0.5	STD. POLARITY CATHODE TO STUD
†1N3994A	4.3	580	1.5	400	2130	–.033	100	0.5	
†1N3995A	4.7	530	1.2	500	1940	–.015	50	1.0	
†1N3996A	5.1	490	1.1	550	1780	±.010	10	1.0	
†1N3997A	5.6	445	1.0	600	1620	+.030	10	1.0	
†1N3998A	6.2	405	1.1	750	1460	+.049	10	2.0	
†1N3999A	6.8	370	1.2	500	1330	+.040	10	2.0	
†1N4000A	7.5	335	1.3	250	1210	+.045	10	3.0	
††1N2970B	6.8	370	1.2	500	1,320	.040	150	5.2	STD. POLARITY ANODE TO STUD
††1N2971B	7.5	335	1.3	250	1,180	.045	100	5.7	
††1N2972B	8.2	305	1.5	250	1,040	.048	50	6.2	
††1N2973B	9.1	275	2.0	250	960	.051	25	6.9	
††1N2974B	10	250	3	250	860	.055	25	7.6	
††1N2975B	11	230	3	250	780	.060	10	8.4	
††1N2976B	12	210	3	250	720	.065	10	9.1	
††1N2977B	13	190	3	250	660	.065	10	9.9	
1N2978B	14	180	3	250	600	.070	10	10.5	
††1N2979B	15	170	3	250	560	.070	10	11.4	
††1N2980B	16	155	4	250	530	.070	10	12.2	
1N2981B	17	145	4	250	500	.075	10	13.0	
††1N2982B	18	140	4	250	460	.075	10	13.7	
1N2983B	19	130	4	250	440	.075	10	14.0	
††1N2984B	20	125	4	250	420	.075	10	15.2	
††1N2985B	22	115	5	250	380	.080	10	16.7	
††1N2986B	24	105	5	250	350	.080	10	18.2	
1N2987B	25	100	6	250	310	.080	10	18.2	
††1N2988B	27	95	7	250	300	.085	10	20.6	
††1N2989B	30	85	8	300	280	.085	10	22.8	
††1N2990B	33	75	9	300	260	.085	10	25.1	
††1N2991B	36	70	10	300	230	.085	10	27.4	
††1N2992B	39	65	11	300	210	.090	10	29.7	
††1N2993B	43	60	12	400	195	.090	10	32.7	
1N2994B	45	55	13	400	185	.090	10	33.0	
††1N2995B	47	55	14	400	175	.090	10	35.8	
1N2996B	50	50	15	500	165	.090	10	36.0	
††1N2997B	51	50	15	500	160	.090	10	38.8	
1N2998B	52	50	15	500	160	.090	10	39.0	
††1N2999B	56	45	16	500	150	.090	10	42.6	
††1N3000B	62	40	17	600	130	.090	10	47.1	
††1N3001B	68	37	18	600	120	.090	10	51.7	
††1N3002B	75	33	22	600	110	.090	10	56.0	
††1N3003B	82	30	25	700	100	.090	10	62.2	
††1N3004B	91	28	35	800	85	.090	10	69.2	
††1N3005B	100	25	40	900	80	.090	10	76.0	
1N3006B	105	25	45	1000	75	.095	10	76.0	
††1N3007B	110	23	55	1100	72	.095	10	83.6	
††1N3008B	120	20	75	1200	67	.095	10	91.2	
††1N3009B	130	19	100	1300	62	.095	10	98.8	
1N3010B	140	18	125	1400	58	.095	10	100.0	
††1N3011B	150	17	175	1500	54	.095	10	114.0	
† 1N3012B	160	16	200	1600	50	.095	10	121.6	
1N3013B	175	14	250	1750	46	.095	10	135.0	
††1N3014B	180	14	260	1850	45	.095	10	136.8	
††1N3015B	200	12	300	2000	40	.100	10	152.0	

*JEDEC Registered Data. **Not JEDEC Data.
†Have JAN and JANTX Qualifications to MIL-S-19500/272.
††Have JAN, JANTX and JANTXV Qualifications to MIL-S-19500/124.



10-32 UNF-2A (MOD) PITCH DIA. MIN. .1658 MAX. .1697 TO WITHSTAND A TORQUE UP TO 30 IN-LB. WHEN NUT IS TIGHTENED ON STUD

FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Industry Standard DO-4, (DO-203AA), 7/16" Hex. stud with 10-32 threads, welded, hermetically sealed metal and glass.
FINISH: All external surfaces are corrosion resistant and terminal solderable.
WEIGHT: 7.5 grams.
MOUNTING POSITION: Any
THERMAL RESISTANCE: 10°C/W (Typical) junction to stud.
POLARITY:
IN3993 - IN4000: Std. Polarity is cathode to sud. Reverse polarity (anode to stud) indicated by suffix "R."
IN2970 - IN3015: Std. Polarity is anode to stud. Reverse polarity indicated by suffix "R."
MOUNTING HARDWARE:
See page 41.

NOTE 1 1N3993-1N4000 series: suffix A indicates ±5% tolerance, no suffix indicates ±10% tolerance. 1N2970-1N3015 series: suffix B indicates ±5% tolerance, suffix A indicates ±10%, no suffix indicates ±20% tolerance. If tighter tolerance is required, consult factory.

NOTE 2 The electrical characteristics are measured after allowing the device to stabilize for 90 seconds with 30°C Base temperature.

NOTE 3 The zener impedance (Z_{ZT}) is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. When making zener impedance measurements at the I_{ZK} test point, it may be necessary to insert a 60 Hz band pass filter between the diode and voltmeter to avoid errors resulting from low level noise signals. A curve showing the variation of zener impedance vs. zener current for three representative types is shown in Figures 3 and 4.

NOTE 4 These values of I_{zm} may be exceeded in the case of individual diodes. The values shown are calculated for the worst case which is a unit of ±5% tolerance at the high voltage end of its tolerance range. Allowance has also been made for the rise in zener voltage above V_{zt}, which results from zener impedance and the increase in junction temperature as power dissipation approaches 10 watts.

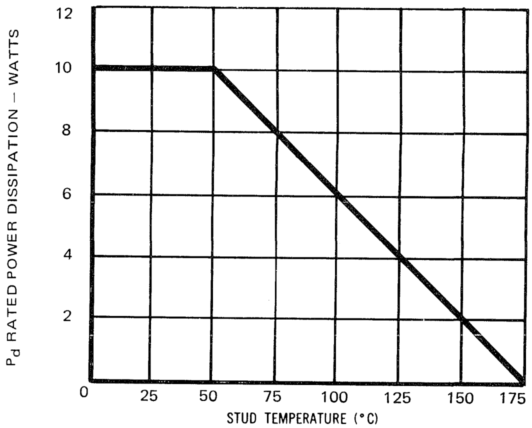


FIGURE 2
POWER DERATING CURVE

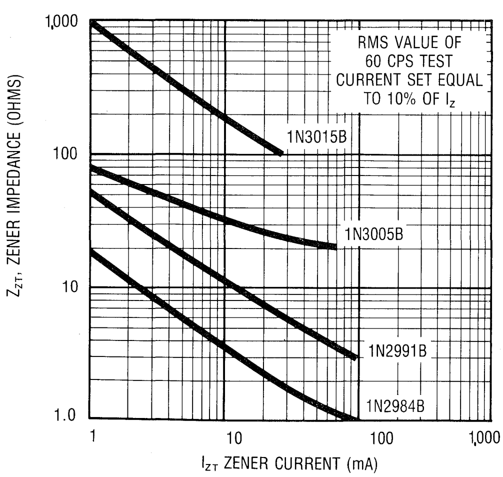


FIGURE 3
TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

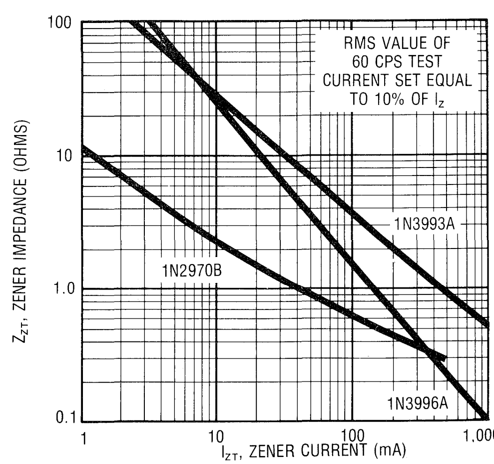


FIGURE 4
TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

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1N3016B thru 1N3051B

SILICON 1 WATT ZENER DIODES

FEATURES

- ZENER VOLTAGE RANGE: 6.8V TO 200V
- 1N3016B THROUGH 1N3051B HAVE JAN, JANTX, and JANTXV QUALIFICATIONS TO MIL-S-19500/115
- S1N3016B THROUGH S1N3051B ALSO AVAILABLE

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C

DC Power Dissipation: 1 Watt

Derating: 6.67 mW/°C above 25°C

Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 2)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 3) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		MAXIMUM ZENER CURRENT I_{ZM} (Note 4)	MAXIMUM REVERSE LEAKAGE CURRENT† I_R @	V_R	TYPICAL TEMP. COEFF. OF ZENER VOLTAGE α_{VZ}
	VOLTS	mA	OHMS	OHMS	mA	mA	µA	Volts	%/°C
1N3016B	6.8	37	3.5	700	1.0	140	150	5.2	.040
1N3017B	7.5	34	4.0	700	.5	125	100	5.7	.045
1N3018B	8.2	31	4.5	700	.5	115	50	6.2	.048
1N3019B	9.1	28	5	700	.5	105	25	6.9	.050
1N3020B	10	25	7	700	.25	95	25	7.6	.055
1N3021B	11	23	8	700	.25	85	10	8.4	.060
1N3022B	12	21	9	700	.25	80	10	9.1	.065
1N3023B	13	19	10	700	.25	74	10	9.9	.065
1N3024B	15	17	14	700	.25	63	10	11.4	.070
1N3025B	16	15.5	16	700	.25	60	10	12.2	.070
1N3026B	18	14	20	750	.25	52	10	13.7	.075
1N3027B	20	12.5	22	750	.25	47	10	15.2	.075
1N3028B	22	11.5	23	750	.25	43	10	16.7	.080
1N3029B	24	10.5	25	750	.25	40	10	18.2	.080
1N3030B	27	9.5	35	750	.25	34	10	20.6	.085
1N3031B	30	8.5	40	1000	.25	31	10	22.8	.085
1N3032B	33	7.5	45	1000	.25	28	10	25.1	.085
1N3033B	36	7.0	50	1000	.25	26	10	27.4	.085
1N3034B	39	6.5	60	1000	.25	23	10	29.7	.090
1N3035B	43	6.0	70	1500	.25	21	10	32.7	.090
1N3036B	47	5.5	80	1500	.25	19	10	35.8	.090
1N3037B	51	5.0	95	1500	.25	18	10	38.8	.090
1N3038B	56	4.5	110	2000	.25	17	10	42.6	.090
1N3039B	62	4.0	125	2000	.25	15	10	47.1	.090
1N3040B	68	3.7	150	2000	.25	14	10	51.7	.090
1N3041B	75	3.3	175	2000	.25	12	10	56.0	.090
1N3042B	82	3.0	200	3000	.25	11	10	62.2	.090
1N3043B	91	2.8	250	3000	.25	10	10	69.2	.090
1N3044B	100	2.5	350	3000	.25	9.0	10	76.0	.090
1N3045B	110	2.3	450	4000	.25	8.3	10	83.6	.095
1N3046B	120	2.0	550	4500	.25	8.0	10	91.2	.095
1N3047B	130	1.9	700	5000	.25	6.9	10	98.8	.095
1N3048B	150	1.7	1000	6000	.25	5.7	10	114.0	.095
1N3049B	160	1.6	1100	6500	.25	5.4	10	121.6	.095
1N3050B	180	1.4	1200	7000	.25	4.9	10	136.8	.095
1N3051B	200	1.2	1500	8000	.25	4.6	10	152.0	.100

*JEDEC Registered Data. †Not JEDEC Data.

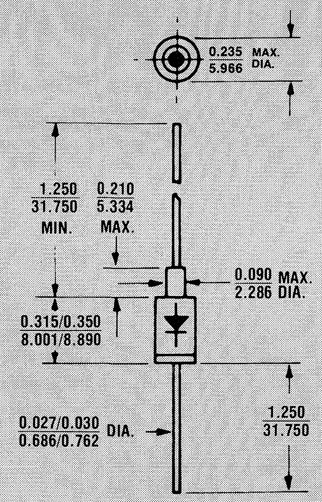

FIGURE 1

All dimensions in INCH / m.m

MECHANICAL CHARACTERISTICS

CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 50°C/W (Typical) junction to lead at 0.375-inches from body and 30°C/W at junction to case.

POLARITY: Cathode connected case.

WEIGHT: 1.4 grams.

MOUNTING POSITION: Any

NOTE 1: When using JEDEC Numbers B suffix signifies ± 5% tolerance on nominal zener voltage. The suffix A is used to identify ± 10% tolerance; no suffix indicates ± 20% tolerance. If tighter tolerance is required, consult factory.

NOTE 2: Zener Voltage (V_Z) is measured with junction in thermal equilibrium with still air at a temperature of 25°C. The test currents (I_{ZT}) at nominal voltages provide a constant 0.25 watts.

NOTE 3: The zener impedance is derived from the 60 cycle ac voltage, which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units. A curve showing the variation of zener impedance vs. zener current for six representative types is shown in Figure 2.

NOTE 4: These values of I_{ZM} may often be exceeded in the case of individual diodes. The values shown are calculated for a unit at the high voltage end of its tolerance range. Allowance has also been made for the rise in zener voltage above V_{ZT} which results from zener impedance and the increase in junction temperature as a unit approaches thermal equilibrium at a dissipation of 1 watt. The I_{ZM} values shown for ± 5% tolerance units may be used with little error for ± 10% tolerance units, but should be reduced by 7% to include a ± 20% tolerance unit near the high voltage end of its tolerance range.

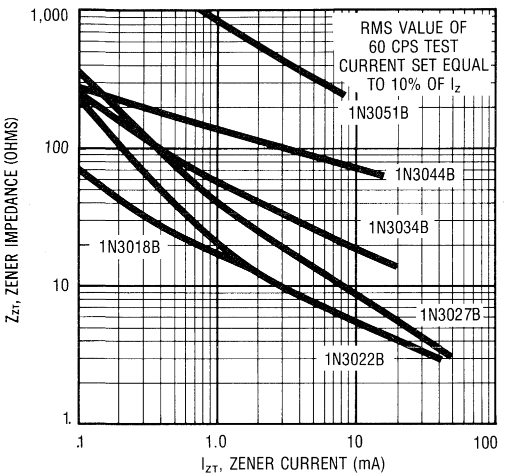

FIGURE 2

TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

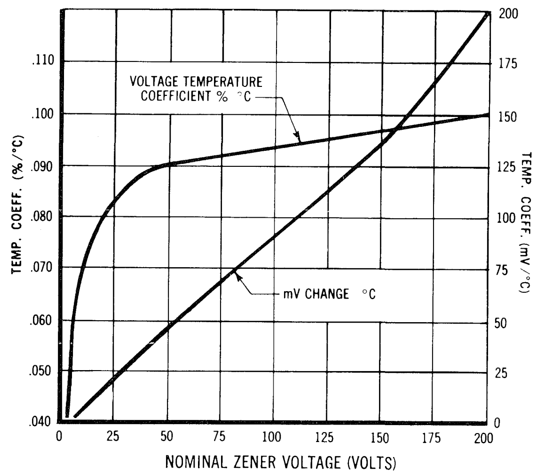

FIGURE 3

TYPICAL ZENER VOLTAGE TEMPERATURE COEFF. vs. ZENER VOLTAGE

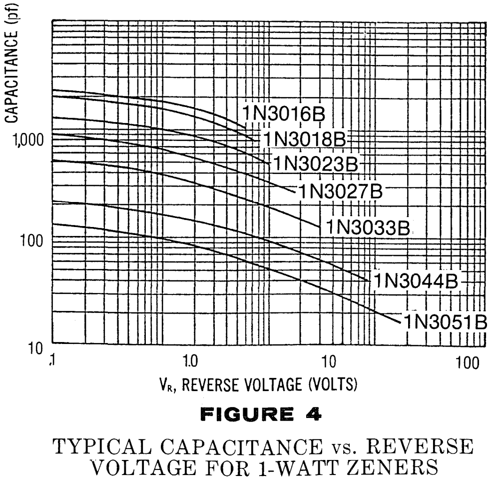

FIGURE 4

TYPICAL CAPACITANCE vs. REVERSE VOLTAGE FOR 1-WATT ZENERS

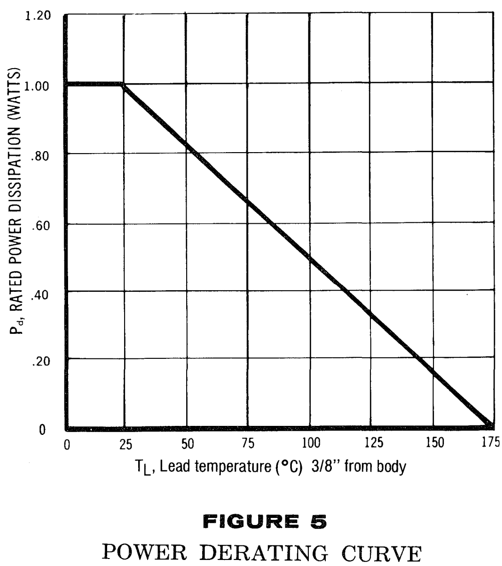

FIGURE 5

POWER DERATING CURVE

Microsemi Corp.
The diode experts

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For more information call:
(602) 941-6300

1N3305 thru 1N3350B and 1N4549B thru 1N4556B

SILICON 50 WATT ZENER DIODES

FEATURES

- ZENER VOLTAGE 3.9 TO 200V
- LOW ZENER IMPEDANCE
- HIGHLY RELIABLE AND RUGGED
- FOR MILITARY AND OTHER DEMANDING APPLICATIONS (See Below)

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 50 Watts
Power Derating: 0.5 W/° above 75°C
Forward Voltage @ 10 A: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 30°C Case Temperature

JEDEC TYPE NO. (Note 1)	NOMINAL ZENER VOLTAGE V_z @ I_{zt} Volts (Note 2) †	ZENER TEST CURRENT (I_{zt}) mA †	MAX. DYNAMIC IMPEDANCE (Note 3) † Z_{zt} @ I_{zt} OHMS	Z_{zk} @ I_{zk} = 5mA OHMS	MAX. DC ZENER CURRENT (I_{zm}) mA	MAX. REVERSE LEAKAGE** CURRENT I_R (max) @ V_R μA	VOLTS	TYPICAL TEMP. COEFF. α_{vz} %/°C
†1N4549B	3.9	3,200	0.16	400	11,900	150	0.5	−0.046
†1N4550B	4.3	2,900	0.16	500	10,650	150	0.5	−0.033
†1N4551B	4.7	2,650	0.12	600	9,700	100	1.0	−0.015
†1N4552B	5.1	2,450	0.12	650	8,900	20	1.0	±0.010
†1N4553B	5.6	2,250	0.12	900	8,100	20	1.0	+0.030
†1N4554B	6.2	2,000	0.14	1,000	7,300	20	2.0	+0.049
1N4555B	6.8	1,850	0.16	200	6,650	10	2.0	+0.053
1N4556B	7.5	1,650	0.24	100	6,050	10	3.0	+0.057
†1N3305B	6.8	1,850	0.20	70	6,600	300	4.5	0.040
†1N3306B	7.5	1,700	0.30	70	5,900	125	5.0	0.045
†1N3307B	8.2	1,500	0.40	70	5,200	50	5.4	0.048
†1N3308B	9.1	1,370	0.50	70	4,800	25	6.1	0.050
†1N3309B	10.0	1,200	0.60	80	4,300	25	6.7	0.055
†1N3310B	11.0	1,100	0.80	80	3,900	10	8.4	0.060
†1N3311B	12.0	1,000	1.00	80	3,800	10	9.1	0.065
†1N3312B	13.0	960	1.10	80	3,300	10	9.9	0.065
1N3313B	14.0	890	1.20	80	3,000	10	11.4	0.070
†1N3314B	15.0	830	1.40	80	2,800	10	11.4	0.070
†1N3315B	16.0	780	1.60	80	2,650	10	12.2	0.070
1N3316B	17.0	740	1.80	80	2,500	10	13.0	0.075
†1N3317B	18.0	700	2.00	80	2,300	10	13.7	0.075
1N3318B	19.0	660	2.20	80	2,200	10	13.7	0.075
†1N3319B	20.0	630	2.40	80	2,100	10	15.2	0.075
†1N3320B	22.0	570	2.50	80	1,900	10	16.7	0.080
†1N3321B	24.0	520	2.60	80	1,750	10	18.2	0.080
1N3322B	25.0	500	2.70	90	1,550	10	18.2	0.080
†1N3323B	27.0	460	2.80	90	1,500	10	20.6	0.085
†1N3324B	30.0	420	3.00	90	1,400	10	22.8	0.085
†1N3325B	33.0	380	3.20	90	1,300	10	25.1	0.085
†1N3326B	36.0	350	3.50	90	1,150	10	27.4	0.085
†1N3327B	39.0	320	4.00	90	1,050	10	29.7	0.090
†1N3328B	43.0	290	4.50	90	975	10	32.7	0.090
1N3329B	45.0	280	4.50	100	930	10	32.7	0.090
†1N3330B	47.0	270	5.00	100	880	10	35.8	0.090
1N3331B	50.0	250	5.00	100	830	10	38.8	0.090
†1N3332B	51.0	245	5.20	100	810	10	38.8	0.090
1N3333B	52.0	240	5.50	100	790	10	42.6	0.090
†1N3334B	56.0	220	6.00	110	740	10	42.6	0.090
†1N3335B	62.0	200	7.00	120	660	10	47.1	0.090
†1N3336B	68.0	180	8.00	140	600	10	51.7	0.090
†1N3337B	75.0	170	9.00	150	540	10	56.0	0.090
†1N3338B	82.0	150	11.00	160	490	10	62.2	0.090
†1N3339B	91.0	140	15.00	180	420	10	69.2	0.090
†1N3340B	100.0	120	20.00	200	400	10	76.0	0.090
1N3341B	105.0	120	25.00	210	380	10	83.0	0.095
†1N3342B	110.0	110	30.00	220	365	10	83.0	0.095
†1N3343B	120.0	100	40.00	240	336	10	91.2	0.095
†1N3344B	130.0	95	50.00	275	310	10	99.8	0.095
1N3345B	140.0	90	60.00	325	290	10	114.0	0.095
†1N3346B	150.0	85	75.00	400	270	10	114.0	0.095
†1N3347B	160.0	80	80.00	450	250	10	121.6	0.095
1N3348B	175.0	70	85.00	500	230	10	121.6	0.095
†1N3349B	180.0	68	90.00	525	220	10	136.8	0.095
†1N3350B	200.0	65	100.00	600	200	10	152.0	0.100

*JEDEC Registered Data. **Not JEDEC Data.

† Have JAN and JANTX and TXV Qualifications to MIL-S-19500/ 358.

(1)

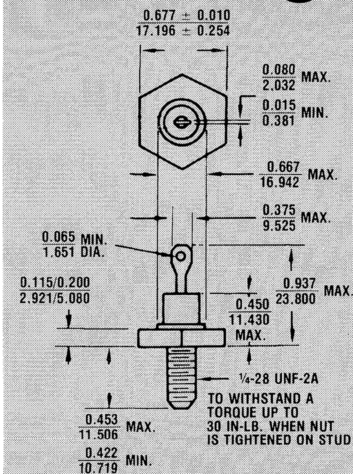

FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Industry Standard DO-5, 11/16" Hex. stud with 1/4-28 threads, welded, hermetically sealed metal and glass.

DIMENSIONS: See outline drawing Fig. 1.

FINISH: All external surfaces are corrosion resistant and terminal solderable.

THERMAL RESISTANCE: 1.5°C/W (Typical) junction to stud.

POLARITY: Standard polarity anode to case. Reverse polarity (cathode to case) indicated by suffix R .

MOUNTING HARDWARE: See page 41.

1N3305 thru 1N3350B, 1N4549B thru 1N4556B

NOTE 1

When using JEDEC numbers an R suffix should be used to signify reversed polarity. The suffixes A and B indicate tolerances of 10% and 5% respectively. No suffix or just R denotes ±20% tolerance. Example: 1N3319RB is a REVERSED polarity, 20 volt unit having a ±5% tolerance on Zener Voltage.

NOTE 2

Zener Voltage (V_Z) is measured with junction in thermal equilibrium with 30°C stud temperature.

NOTE 3

The zener impedance is derived from the 60 cycle A.C. voltage, which results when an A.C. current having an R.M.S. value equal to 10% of the D.C. zener current (I_{zt} or I_{zk}) is superimposed on I_{zt} or I_{zk}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units. A curve showing the variation of zener impedance vs. zener current for three representative types is shown in Figure 3.

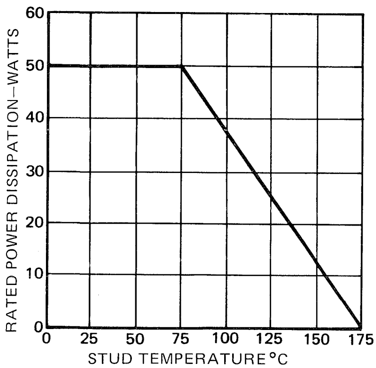

FIGURE 2

POWER DERATING CURVE

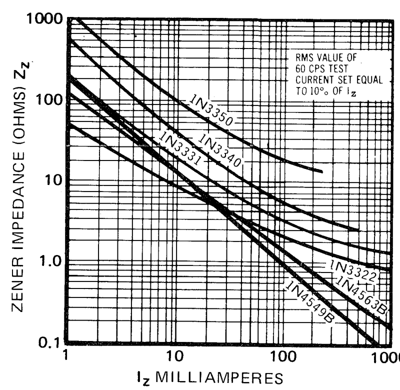

FIGURE 3

TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT

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The diode experts

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For more information call:
(602) 941-6300

1N3821 thru 1N3830A

SILICON 1 WATT ZENER DIODES

FEATURES

- **ZENER VOLTAGE RANGE: 3.3V to 7.5V**
- **1N3821A-1N3828A HAVE JAN, JANTX and JANTXV QUALIFICATIONS TO MIL-S-19500/115**

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C

DC Power Dissipation: 1 Watt

Derating: 6.67 mW/°C above 25°C

Forward Voltage @ 200 mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO.	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 1)	ZENER TEST CURRENT I_{ZT}	MAX. ZENER IMPEDANCE (Note 2)		MAXIMUM ZENER CURRENT I_{ZM} (Note 3)	MAXIMUM REVERSE CURRENT I_R @ V_R		TYPICAL TEMP. COEFF. of ZENER VOLTAGE α_{VZ}
			Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK} = 1mA				
	VOLTS	mA	OHMS	OHMS	mA	μA	VOLTS	%/°C
1N3821	3.3	76	10	400	276	100	1	−.066
1N3821A	3.3	76	10	400	276	100	1	−.066
1N3822	3.6	69	10	400	252	100	1	−.058
1N3822A	3.6	69	10	400	252	100	1	−.058
1N3823	3.9	64	9	400	238	50	1	−.046
1N3823A	3.9	64	9	400	238	50	1	−.046
1N3824	4.3	58	9	400	213	10	1	−.033
1N3824A	4.3	58	9	400	213	10	1	−.033
1N3825	4.7	53	8	500	194	10	1	−.015
1N3825A	4.7	53	8	500	194	10	1	−.015
1N3826	5.1	49	7	550	178	10	1	±.010
1N3826A	5.1	49	7	550	178	10	1	±.010
1N3827	5.6	45	5	600	162	10	2	+.030
1N3827A	5.6	45	5	600	162	10	2	+.030
1N3828	6.2	41	2	700	146	10	3	+.049
1N3828A	6.2	41	2	700	146	10	3	+.049
1N3829	6.8	37	1.5	500	133	10	3	+.053
1N3829A	6.8	37	1.5	500	133	10	3	+.053
1N3830	7.5	34	1.5	250	121	10	3	+.057
1N3830A	7.5	34	1.5	250	121	10	3	+.057

* JEDEC Registered Data

NOTE 1 The JEDEC type numbers shown with suffix A have a standard tolerance of ±5% on the nominal zener voltage. V_Z measured with device in thermal equilibrium in 25°C still air and mounted in test clips, 3/4" from unit body. If tighter tolerance on V_Z is required, consult factory.

NOTE 2 ZENER Impedance derived by superimposing on I_{ZT}-I_{ZK} a 60 cps, rms. a.c. current equal to 10% I_{ZT} or I_{ZK}.

NOTE 3 Allowance has been made for the increase in V_Z due to Z_Z and for the increase in junction temperature as the unit approaches thermal equilibrium at the power dissipation of 1 watt.

(1)

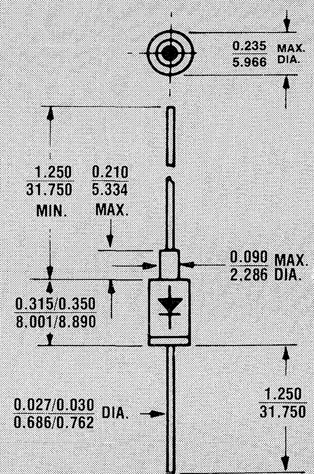

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: DO-13, welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 50° C/W (Typical) junction to lead at 0.375 inches from body and 30° C/Watt junction to case.

POLARITY: Cathode connected case.

WEIGHT: 1.4 grams.

MOUNTING POSITION: Any.

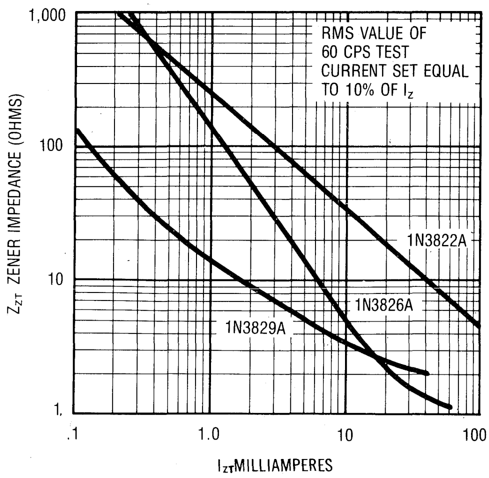

FIGURE 2
TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

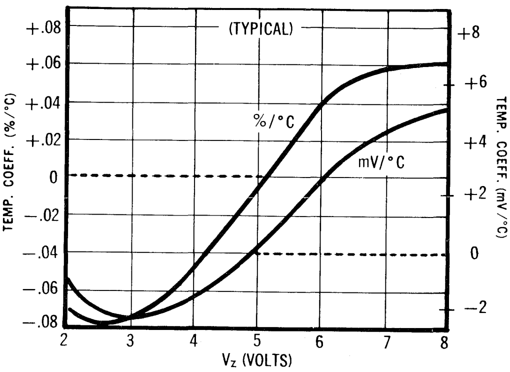

FIGURE 3
TEMP. COEFF. vs. ZENER VOLTAGE

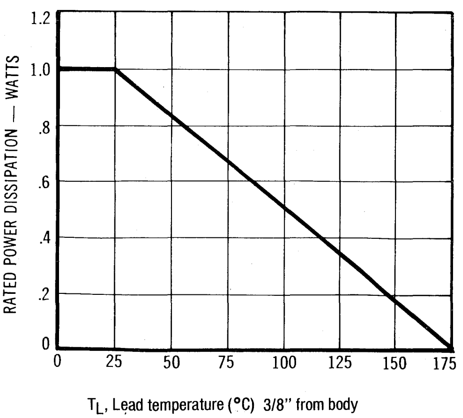

FIGURE 4
POWER DERATING CURVE

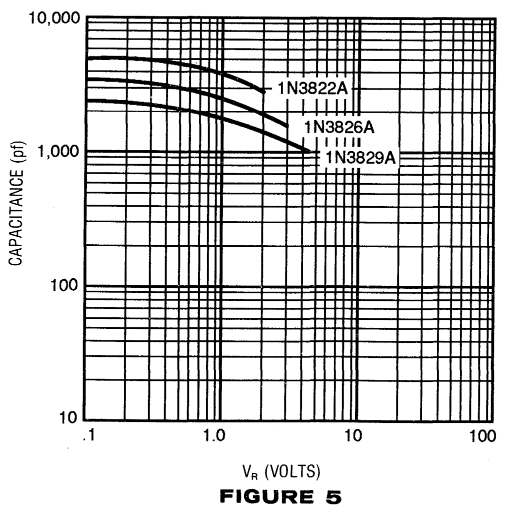

FIGURE 5
TYPICAL CAPACITANCE vs. REVERSE VOLTAGE FOR 1-WATT ZENERS

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N4099 thru 1N4135 and 1N4614 thru 1N4627 DO-7

SILICON 400 mW LOW NOISE ZENER DIODES

①

FEATURES

- ZENER VOLTAGE 1.8V to 100V
- ALL HAVE JAN, JANTX and JANTXV QUALIFICATIONS TO MIL-S-19500/435
- LOW NOISE
- LOW REVERSE LEAKAGE

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +200°C
DC Power Dissipation: 400 mW
Power Derating: 2.66 mW/°C above 50°C in DO-7
Forward Voltage @ 200 mA: 1.0 Volts 1N4099 - 1N4135
@ 100 mA: 1.0 Volts 1N4614 - 1N4627

* ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO.	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 1)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} (Note 2)	MAXIMUM REVERSE CURRENT I_Z @ V_R		MAXIMUM NOISE DENSITY N_D @ I_{ZT} (Figure 2)	MAXIMUM ZENER CURRENT I_{ZM} (Note 3)	TYPICAL TEMP. COEFF. OF ZENER VOLTAGE α_{VZ}
	VOLTS	µA	OHMS	µA	VOLTS	$\mu V/\sqrt{Hz}$	mA	%/°C
1N4614	1.8	250	1200	7.5	1	1	120	-0.075
1N4615	2.0	250	1250	5.0	1	1	110	-0.075
1N4616	2.2	250	1300	4.0	1	1	100	-0.075
1N4617	2.4	250	1400	2.0	1	1	95	-0.075
1N4618	2.7	250	1500	1.0	1	1	90	-0.075
1N4619	3.0	250	1600	0.8	1	1	87	-0.075
1N4620	3.3	250	1650	7.5	1.5	1	85	-0.075
1N4621	3.6	250	1700	7.5	2	1	83	-0.065
1N4622	3.9	250	1650	5.0	2	1	80	-0.060
1N4623	4.3	250	1600	4.0	2	1	77	-0.050
1N4624	4.7	250	1550	10.0	3	1	75	-0.040, +0.020
1N4625	5.1	250	1500	10.0	3	2	70	-0.045, +0.030
1N4626	5.6	250	1400	10.0	4	4	65	-0.020, +0.040
1N4627	6.2	250	1200	10.0	5	5	61	-0.010, +0.050
1N4099	6.8	250	200	10.0	5.17	40	56	0.040
1N4100	7.5	250	200	10.0	5.70	40	51	0.045
1N4101	8.2	250	200	1.0	6.24	40	46	0.048
1N4102	8.7	250	200	1.0	6.61	40	44	0.049
1N4103	9.1	250	200	1.0	6.92	40	42	0.050
1N4104	10	250	200	1.0	7.60	40	38	0.055
1N4105	11	250	200	.05	8.44	40	35	0.060
1N4106	12	250	200	.05	9.12	40	32	0.065
1N4107	13	250	200	.05	9.87	40	29	0.065
1N4108	14	250	200	.05	10.65	40	27	0.070
1N4109	15	250	100	.05	11.40	40	25	0.070
1N4110	16	250	100	.05	12.15	40	24	0.070
1N4111	17	250	100	.05	12.92	40	22	0.075
1N4112	18	250	100	.05	13.67	40	21	0.075
1N4113	19	250	150	.05	14.44	40	20	0.075
1N4114	20	250	150	.01	15.20	40	19	0.075
1N4115	22	250	150	.01	16.72	40	17	0.080
1N4116	24	250	150	.01	18.25	40	16	0.080
1N4117	25	250	150	.01	19.00	40	15	0.080
1N4118	27	250	150	.01	20.45	40	14	0.085
1N4119	28	250	200	.01	21.28	40	14	0.085
1N4120	30	250	200	.01	22.80	40	13	0.085
1N4121	33	250	200	.01	25.08	40	12	0.085
1N4122	36	250	200	.01	27.38	40	11	0.09
1N4123	39	250	200	.01	29.65	40	9.8	0.09
1N4124	43	250	250	.01	32.65	40	8.9	0.09
1N4125	47	250	250	.01	35.75	40	8.1	0.09
1N4126	51	250	300	.01	38.76	40	7.5	0.09
1N4127	56	250	300	.01	42.60	40	6.7	0.09
1N4128	60	250	400	.01	45.60	40	6.4	0.09
1N4129	62	250	500	.01	47.10	40	6.1	0.09
1N4130	68	250	700	.01	51.68	40	5.6	0.095
1N4131	75	250	700	.01	57.00	40	5.1	0.095
1N4132	82	250	800	.01	62.32	40	4.6	0.095
1N4133	87	250	1000	.01	66.12	40	4.4	0.095
1N4134	91	250	1200	.01	69.16	40	4.2	0.095
1N4135	100	250	1500	.01	76.00	40	3.8	0.095

*JEDEC Registered Data.

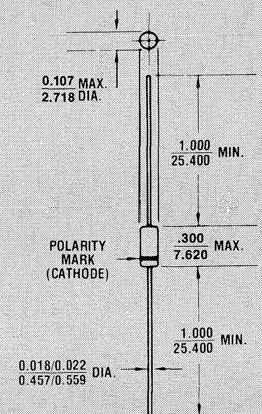

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body on DO-7.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

Noise density, (N_D) is specified in microvolts-rms per square-root-hertz. Actual measurement is performed using a 1 KHz to 3 KHz frequency bandpass filter at a constant Zener test current (I_{ZT}) at 25°C ambient temperature. N_D is calculated from the formula.

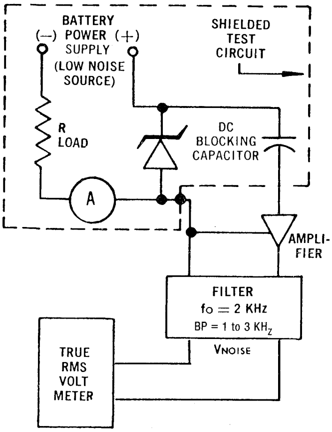

FIGURE 2 NOISE DENSITY MEASUREMENT CIRCUIT

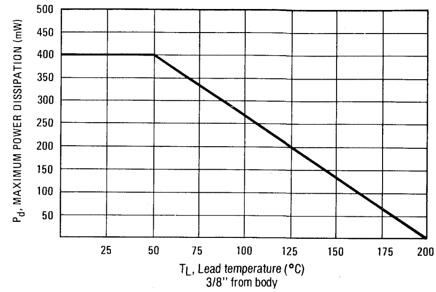

FIGURE 3 POWER DERATING CURVE

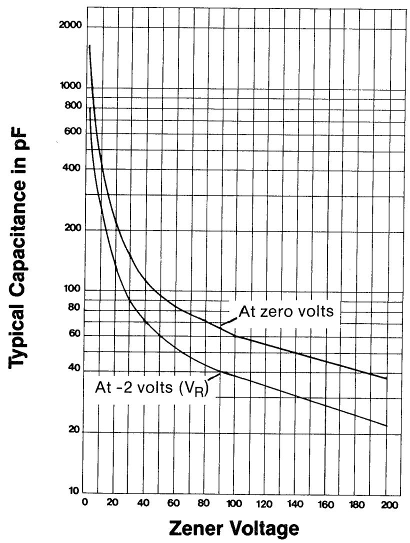

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

NOTE 1 The JEDEC type numbers shown with no suffix have a standard tolerance of ±5% on the nominal Zener voltage: suffix C is used to identify ±2%; and suffix D is used to identify ±1% tolerance. V_Z is measured with the diode in thermal equilibrium in 25°C still air.

NOTE 2 Zener impedance is derived by superimposing on I_{ZT}, a 60 Hz rms a.c. current equal to 10% of I_{ZT} (25 μA a.c.).

NOTE 3 Based upon 400 mW maximum power dissipation at 25°C ambient temperature, allowance has been made for the higher voltage associated with operation at higher currents.

1N4099 thru 1N4135 and 1N4614 thru 1N4627 DO-35

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

SILICON 400 mW LOW NOISE ZENER DIODES

①

FEATURES

- ZENER VOLTAGE 1.8 TO 100 V
- ALL HAVE JAN, JANTX AND JANTXV-1 QUALIFICATIONS TO MIL-S-19500/435
- LOW NOISE
- LOW REVERSE LEAKAGE

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +200°C
DC Power Dissipation: 400 mW
Power Derating: 3.2 mW/°C above 75°C in DO-35
Forward Voltage @ 200 mA: 1.1 Volts 1N4099 - 1N4135
@ 100 mA: 1.0 Volts 1N4614 - 1N4627

* ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NO.	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 1)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} (Note 2)	MAXIMUM REVERSE CURRENT I_Z @ V_R		MAXIMUM NOISE DENSITY N_D @ I_{ZT}	MAXIMUM ZENER CURRENT I_{ZM} (Note 3)	TYPICAL TEMP. COEFF. OF ZENER VOLTAGE α_{VZ}
	VOLTS	μA	OHMS	μA	VOLTS	$\mu V/\sqrt{Hz}$	mA	%/°C
1N4614	1.8	250	1200	7.5	1	1	120	-0.075
1N4615	2.0	250	1250	5.0	1	1	110	-0.075
1N4616	2.2	250	1300	4.0	1	1	100	-0.075
1N4617	2.4	250	1400	2.0	1	1	95	-0.075
1N4618	2.7	250	1500	1.0	1	1	90	-0.075
1N4619	3.0	250	1600	0.8	1	1	87	-0.075
1N4620	3.3	250	1650	7.5	1.5	1	85	-0.075
1N4621	3.6	250	1700	7.5	2	1	83	-0.065
1N4622	3.9	250	1650	5.0	2	1	80	-0.060
1N4623	4.3	250	1600	4.0	2	1	77	-0.050
1N4624	4.7	250	1550	10.0	3	1	75	-0.040, +0.020
1N4625	5.1	250	1500	10.0	3	2	70	-0.045, +0.030
1N4626	5.6	250	1400	10.0	4	4	65	-0.020, +0.040
1N4627	6.2	250	1200	10.0	5	5	61	-0.010, +0.050
1N4099	6.8	250	200	10.0	5.17	40	56	0.040
1N4100	7.5	250	200	10.0	5.70	40	51	0.045
1N4101	8.2	250	200	1.0	6.24	40	46	0.048
1N4102	8.7	250	200	1.0	6.61	40	44	0.049
1N4103	9.1	250	200	1.0	6.92	40	42	0.050
1N4104	10	250	200	1.0	7.60	40	38	0.055
1N4105	11	250	200	.05	8.44	40	35	0.060
1N4106	12	250	200	.05	9.12	40	32	0.065
1N4107	13	250	200	.05	9.87	40	29	0.065
1N4108	14	250	200	.05	10.65	40	27	0.070
1N4109	15	250	100	.05	11.40	40	25	0.070
1N4110	16	250	100	.05	12.15	40	24	0.070
1N4111	17	250	100	.05	12.92	40	22	0.075
1N4112	18	250	100	.05	13.67	40	21	0.075
1N4113	19	250	150	.05	14.44	40	20	0.075
1N4114	20	250	150	.01	15.20	40	19	0.075
1N4115	22	250	150	.01	16.72	40	17	0.080
1N4116	24	250	150	.01	18.25	40	16	0.080
1N4117	25	250	150	.01	19.00	40	15	0.080
1N4118	27	250	150	.01	20.45	40	14	0.085
1N4119	28	250	200	.01	21.28	40	14	0.085
1N4120	30	250	200	.01	22.80	40	13	0.085
1N4121	33	250	200	.01	25.08	40	12	0.085
1N4122	36	250	200	.01	27.38	40	11	0.09
1N4123	39	250	200	.01	29.65	40	9.8	0.09
1N4124	43	250	250	.01	32.65	40	8.9	0.09
1N4125	47	250	250	.01	35.75	40	8.1	0.09
1N4126	51	250	300	.01	38.76	40	7.5	0.09
1N4127	56	250	300	.01	42.60	40	6.7	0.09
1N4128	60	250	400	.01	45.60	40	6.4	0.09
1N4129	62	250	500	.01	47.10	40	6.1	0.09
1N4130	68	250	700	.01	51.68	40	5.6	0.095
1N4131	75	250	700	.01	57.00	40	5.1	0.095
1N4132	82	250	800	.01	62.32	40	4.6	0.095
1N4133	87	250	1000	.01	66.12	40	4.4	0.095
1N4134	91	250	1200	.01	69.16	40	4.2	0.095
1N4135	100	250	1500	.01	76.00	40	3.8	0.095

*JEDEC Registered Data.

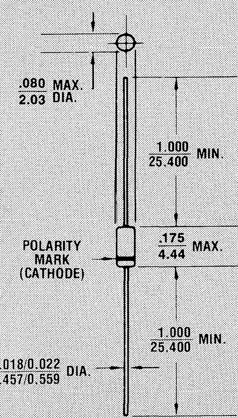

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body in DO-35. Metallurgically bonded DO-35's exhibit less than 100°C/W at zero distance from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

Noise density, (N_D) is specified in microvolts-rms per square-root-hertz. Actual measurement is performed using a 1 KHz to 3 KHz frequency bandpass filter at a constant Zener test current (I_{ZT}) at 25°C ambient temperature. N_D is calculated from the formula.

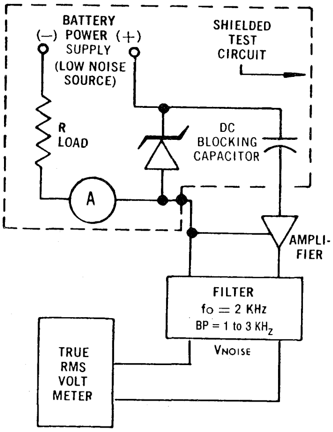

FIGURE 2 NOISE DENSITY MEASUREMENT CIRCUIT

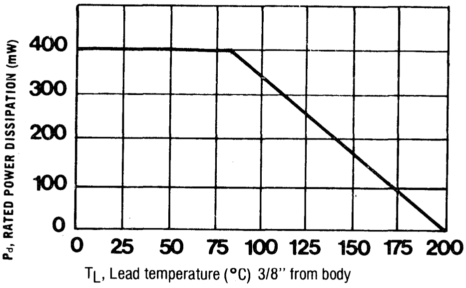

FIGURE 3 POWER DERATING CURVE

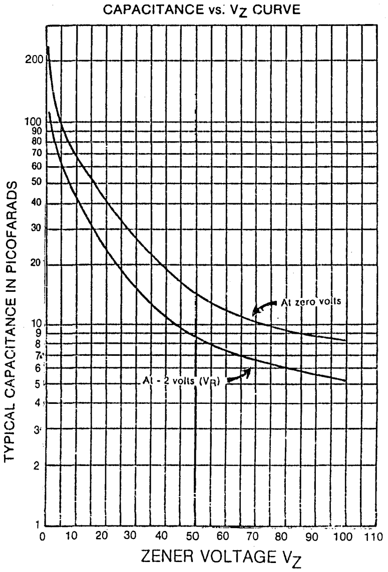

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

NOTE 1 The JEDEC type numbers shown above have a standard tolerance of ± 5% on the nominal Zener voltage. Also available in 2% and 1% tolerance, suffix C and D respectively. V_Z is measured with the diode in thermal equilibrium in 25°C still air.

NOTE 2 Zener impedance is derived by superimposing on I_{ZT}, a 60 Hz rms a.c. current equal to 10% of I_{ZT} (25μA a.c.).

NOTE 3 Based upon 400 mW maximum power dissipation at 75°C lead temperature, allowance has been made for the higher voltage associated with operation at higher currents.

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SCOTTSDALE, AZ

1N4460 thru 1N4496 and 1N6485 thru 1N6491

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1.5 WATT GLASS ZENER DIODES

①

FEATURES

- Microminiature package.
- High performance characteristics.
- Stable operation at temperatures to 200°C.
- Voidless hermetically sealed glass package.
- Triple layer passivation.
- Very low thermal impedance.
- Metallurgically bonded.
- JAN/S/TX/TXV Types available per MIL-S-19500/406.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +200°C.
Power Dissipation: 1.5 Watts @ 30°C Air Ambient.

ELECTRICAL CHARACTERISTICS

TYPE	ZENER VOLTAGE (NOM.) V_Z	TEST CURRENT I_{zt}	DYNAMIC IMPEDANCE (MAX.) Z_{zt} @ I_{zt}	KNEE IMPEDANCE (MAX.) Z_{zk} @ I_{zk}	TEST CURRENT I_{zk}	REVERSE CURRENT (MAX.) I_R @ V_R	TEST VOLTAGE V_R	MAXIMUM RATINGS MAXIMUM CONT. I_{zm}	MAXIMUM SURGE I_S	$T_A = 100°C$
	VOLTS	mA	OHMS	OHMS	mA	μA	VOLTS	mA	Amps	
1N6485	3.3	76.0	10	400	1.0	50	1.0	433	-	4.2
1N6486	3.6	69.0	10	400	1.0	50	1.0	397	-	3.9
1N6487	3.9	64.0	9	400	1.0	35	1.0	366	-	3.6
1N6488	4.3	58.0	9	400	1.0	5.0	1.0	332	-	3.3
1N6489	4.7	53.0	8	500	1.0	4.0	1.0	304	-	3.0
1N6490	5.1	49.0	7	500	1.0	1.0	1.0	280	-	2.7
1N6491	5.6	45.0	5	600	1.0	0.5	2.0	255	-	2.5
1N4460	6.2	40.0	4	200	1.0	10.0	3.72	230		2.3
1N4461	6.8	37.0	2.5	200	1.0	5.0	4.08	210	5.0	2.1
1N4462	7.5	34.0	2.5	400	.5	1.0	4.50	191	4.5	1.9
1N4463	8.2	31.0	3	400	.5	.50	4.92	174	3.9	1.7
1N4464	9.1	28.0	4	500	.5	.30	5.46	157	3.4	1.6
1N4465	10.0	25.0	5	500	.25	.30	8.00	143	3.0	1.4
1N4466	11.0	23.0	6	550	.25	.30	8.80	130	2.6	1.3
1N4467	12.0	21.0	7	550	.25	.20	9.60	119	2.4	1.2
1N4468	13.0	19.0	8	550	.25	.05	10.40	110	2.2	1.1
1N4469	15.0	17.0	9	600	.25	.05	12.00	95	1.8	.95
1N4470	16.0	15.5	10	600	.25	.05	12.80	90	1.6	.80
1N4471	18.0	14.0	11	650	.25	.05	14.40	79	1.4	.79
1N4472	20.0	12.5	12	650	.25	.05	16.00	71	1.2	.71
1N4473	22.0	11.5	14	650	.25	.05	17.60	65	1.1	.65
1N4474	24.0	10.5	16	700	.25	.05	19.20	60	.90	.60
1N4475	27.0	9.5	18	700	.25	.05	21.60	53	.80	.53
1N4476	30.0	8.5	20	750	.25	.05	24.00	48	.75	.48
1N4477	33.0	7.5	25	800	.25	.05	26.40	43	.66	.43
1N4478	36.0	7.0	27	850	.25	.05	28.80	40	.60	.40
1N4479	39.0	6.5	30	900	.25	.05	31.2	37	.54	.37
1N4480	43.0	6.0	40	950	.25	.05	34.4	33	.48	.33
1N4481	47.0	5.5	50	1000	.25	.05	37.6	30	.45	.30
1N4482	51.0	5.0	60	1100	.25	.05	40.8	28	.42	.28
1N4483	56.0	4.5	70	1300	.25	.25	44.8	26	.39	.26
1N4484	62.0	4.0	80	1500	.25	.25	49.6	23	.35	.23
1N4485	68.0	3.7	100	1700	.25	.25	54.4	21	.32	.21
1N4486	75.0	3.3	130	2000	.25	.25	60.4	19	.29	.19
1N4487	82.0	3.0	160	2500	.25	.25	65.6	17	.26	.17
1N4488	91.0	2.8	200	3000	.25	.25	72.8	16	.23	.16
1N4489	100.0	2.5	250	3100	.25	.25	80.0	14	.20	.14
1N4490	110.0	2.0	300	4000	.25	.25	88.0	13	.19	.13
1N4491	120.0	2.0	400	4500	.25	.25	96.0	12	.18	.12
1N4492	130.0	1.9	500	5000	.25	.25	104.0	11	.16	.11
1N4493	150.0	1.7	700	6000	.25	.25	120.0	9.5	.14	.095
1N4494	160.0	1.6	1000	6500	.25	.25	128.0	8.9	.12	.089
1N4495	180.0	1.4	1300	7000	.25	.25	144.0	7.9	.10	.079
1N4496	200.0	1.2	1500	8000	.25	.25	160.0	7.2	.08	.072

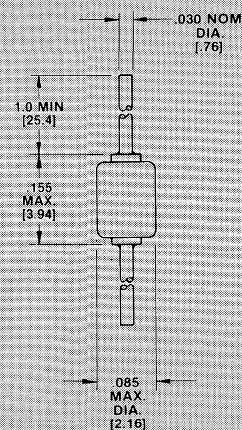

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case
Lead Material: Tinned copper.
Marking: Body painted, alpha numeric with JEDEC number.
Polarity: Cathode band.

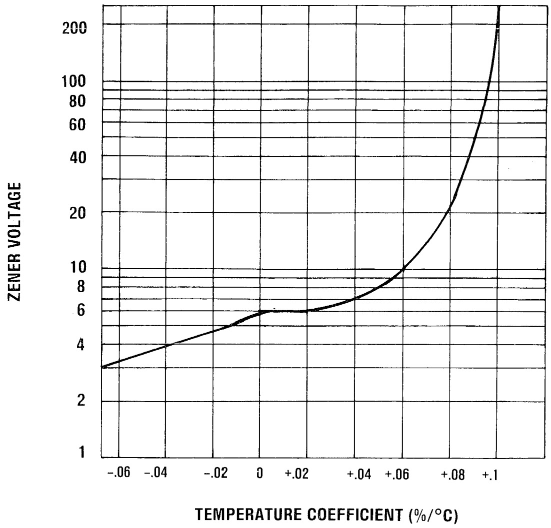

FIGURE 2
TYPICAL TEMPERATURE COEFFICIENT CHARACTERISTICS

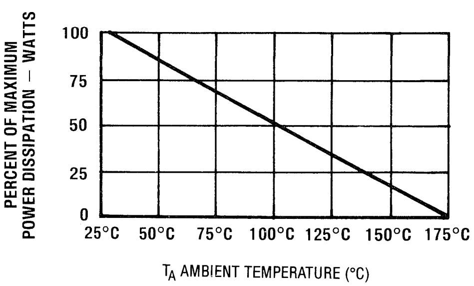

FIGURE 3
POWER TEMPERATURE DERATING CURVE

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1N4678 thru 1N4717

SILICON 250 mW ZENER DIODES

①

FEATURES

- LOW OPERATING CURRENT AT 50μA
- STANDARD ±5% VOLTAGE TOLERANCE
- GUARANTEED VOLTAGE REGULATION
- ALSO AVAILABLE IN DO-35 PACKAGE

MAXIMUM RATINGS

Junction and Storage Temperature: –65°C to +200°C
DC Power Dissipation: 250mW (Capable of 400mW in DO-7 package supplied)
Power Derating: 1.66mW/°C above 50°C Ambient (2.28mW/°C above 25°C in DO-7)
Forward Voltage @ 100mA: 1.5 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER (NOTE 1)	NOMINAL ZENER VOLTAGE (NOTE 3)	ZENER TEST CURRENT	MAXIMUM VOLTAGE REGULATION (NOTE 2 & 3)	MAXIMUM REVERSE LEAKAGE CURRENT		MAXIMUM DC ZENER CURRENT
	V_Z	I_{ZT}	ΔV_Z	I_R @	V_R	I_{ZM}
	VOLTS *	μA	VOLTS	μA	VOLTS	mA
1N4678	1.8	50	0.70	7.5	1.0	120.0
1N4679	2.0	50	0.70	5.0	1.0	110.0
1N4680	2.2	50	0.75	4.0	1.0	100.0
1N4681	2.4	50	0.80	2.0	1.0	95.0
1N4682	2.7	50	0.85	1.0	1.0	90.0
1N4683	3.0	50	0.90	0.8	1.0	85.0
1N4684	3.3	50	0.95	7.5	1.5	80.0
1N4685	3.6	50	0.95	7.5	2.0	75.0
1N4686	3.9	50	0.97	5.0	2.0	70.0
1N4687	4.3	50	0.99	4.0	2.0	65.0
1N4688	4.7	50	0.99	10.0	3.0	60.0
1N4689	5.1	50	0.97	10.0	3.0	55.0
1N4690	5.6	50	0.96	10.0	4.0	50.0
1N4691	6.2	50	0.95	10.0	5.0	45.0
1N4692	6.8	50	0.90	10.0	5.1	35.0
1N4693	7.5	50	0.75	10.0	5.7	31.8
1N4694	8.2	50	0.50	1.0	6.2	29.0
1N4695	8.7	50	0.10	1.0	6.6	27.4
1N4696	9.1	50	0.08	1.0	6.9	26.2
1N4697	10.0	50	0.10	1.0	7.6	24.8
1N4698	11.0	50	0.11	0.05	8.4	21.6
1N4699	12.0	50	0.12	0.05	9.1	20.4
1N4700	13.0	50	0.13	0.05	9.8	19.0
1N4701	14.0	50	0.14	0.05	10.6	17.5
1N4702	15.0	50	0.15	0.05	11.4	16.3
1N4703	16.0	50	0.16	0.05	12.1	15.4
1N4704	17.0	50	0.17	0.05	12.9	14.5
1N4705	18.0	50	0.18	0.05	13.6	13.2
1N4706	19.0	50	0.19	0.05	14.4	12.5
1N4707	20.0	50	0.20	0.01	15.2	11.9
1N4708	22.0	50	0.22	0.01	16.7	10.8
1N4709	24.0	50	0.24	0.01	18.2	9.9
1N4710	25.0	50	0.25	0.01	19.0	9.5
1N4711	27.0	50	0.27	0.01	20.4	8.8
1N4712	28.0	50	0.28	0.01	21.2	8.5
1N4713	30.0	50	0.30	0.01	22.8	7.9
1N4714	33.0	50	0.33	0.01	25.0	7.2
1N4715	36.0	50	0.36	0.01	27.3	6.6
1N4716	39.0	50	0.39	0.01	29.6	6.1
1N4717	43.0	50	0.43	0.01	32.6	5.5

*JEDEC Registered Data

NOTE 1 All types as shown are ± 5% tolerance. Also available in 2% and 1% tolerance, suffix C and D respectively.

NOTE 2 ΔV_Z @ 100μA minus V_Z @ 10μA.

NOTE 3 The electrical characteristics are measured after allowing the device to stabilize for 20 seconds when mounted with 3/8″ minimum lead length from the base.

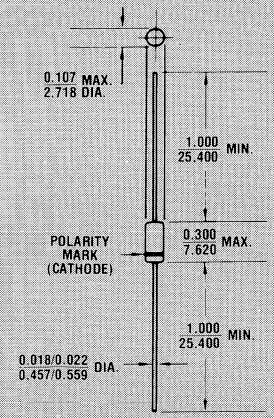

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

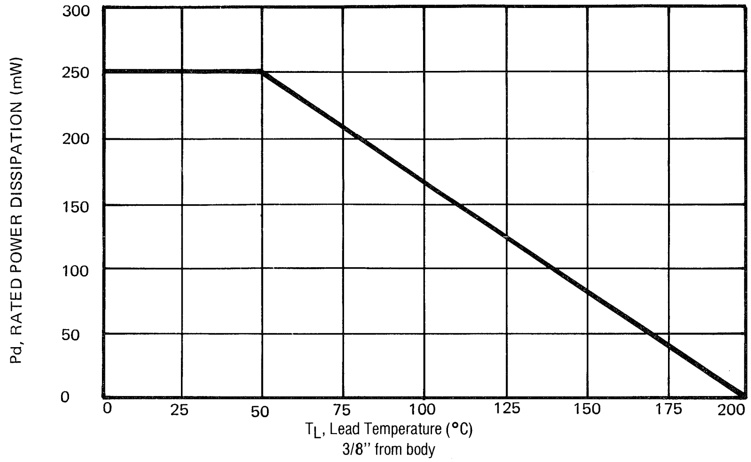

FIGURE 2 POWER DERATING CURVE FOR SUPPLIED DO-7 PACKAGE

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(602) 941-6300

1N4728A thru 1N4764A PLASTIC

SILICON 1 WATT ZENER DIODES

FEATURES

- 3.3 THRU 100 VOLT VOLTAGE RANGE
- HIGH SURGE CURRENT RATING
- HIGHER VOLTAGES AVAILABLE, SEE 1EZ SERIES

MAXIMUM RATINGS

Junction and Storage Temperature: –65°C to +200°C
DC Power Dissipation: 1 Watt
Power Derating: 10mW/°C, from 100°C
Forward Voltage @ 200 mA: 1.2 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER (Note 1)	ZENER VOLTAGE (V_Z) (NOTE 4)	TEST CURRENT (I_{ZT})	MAXIMUM DYNAMIC IMPEDANCE (Z_{ZT} @ I_{ZT}) (Note 2)	MAXIMUM REVERSE CURRENT (I_R @ V_R)	TEST VOLTAGE (V_R)	MAXIMUM REGULATOR CURRENT (I_{ZM}) $T_A = 50°C$	MAXIMUM KNEE IMPEDANCE (Z_{ZK} @ I_{ZK}) (Note 2)	TEST CURRENT (I_{ZK})	MAXIMUM (SURGE) CURRENT (I_S) (Note 3)
	VOLTS	mA	OHMS	μA	VOLTS	mA	OHMS	mA	mA
1N4728A	3.3	76	10	100	1	276	400	1.0	1380
1N4729A	3.6	69	10	100	1	252	400	1.0	1260
1N4730A	3.9	64	9	50	1	234	400	1.0	1190
1N4731A	4.3	58	9	10	1	217	400	1.0	1070
1N4732A	4.7	53	8	10	1	193	500	1.0	970
1N4733A	5.1	49	7	10	1	178	550	1.0	890
1N4734A	5.6	45	5	10	2	162	600	1.0	810
1N4735A	6.2	41	2	10	3	146	700	1.0	730
1N4736A	6.8	37	3.5	10	4	133	700	1.0	660
1N4737A	7.5	34	4.0	10	5	121	700	0.5	605
1N4738A	8.2	31	4.5	10	6	110	700	0.5	550
1N4739A	9.1	28	5.0	10	7	100	700	0.5	500
1N4740A	10	25	7	10	7.6	91	700	0.25	454
1N4741A	11	23	8	5	8.4	83	700	0.25	414
1N4742A	12	21	9	5	9.1	76	700	0.25	380
1N4743A	13	19	10	5	9.9	69	700	0.25	344
1N4744A	15	17	14	5	11.4	61	700	0.25	304
1N4745A	16	15.5	16	5	12.2	57	700	0.25	285
1N4746A	18	14	20	5	13.7	50	750	0.25	250
1N4747A	20	12.5	22	5	15.2	45	750	0.25	225
1N4748A	22	11.5	23	5	16.7	41	750	0.25	205
1N4749A	24	10.5	25	5	18.2	38	750	0.25	190
1N4750A	27	9.5	35	5	20.6	34	750	0.25	170
1N4751A	30	8.5	40	5	22.8	30	1000	0.25	150
1N4752A	33	7.5	45	5	25.1	27	1000	0.25	135
1N4753A	36	7.0	50	5	27.4	25	1000	0.25	125
1N4754A	39	6.5	60	5	29.7	23	1000	0.25	115
1N4755A	43	6.0	70	5	32.7	22	1500	0.25	110
1N4756A	47	5.5	80	5	35.8	19	1500	0.25	95
1N4757A	51	5.0	95	5	38.8	18	1500	0.25	90
1N4758A	56	4.5	110	5	42.6	16	2000	0.25	80
1N4759A	62	4.0	125	5	47.1	14	2000	0.25	70
1N4760A	68	3.7	150	5	51.7	13	2000	0.25	65
1N4761A	75	3.3	175	5	56.0	12	2000	0.25	60
1N4762A	82	3.0	200	5	62.2	11	3000	0.25	55
1N4763A	91	2.8	250	5	69.2	10	3000	0.25	50
1N4764A	100	2.5	350	5	76.0	9	3000	0.25	45

*JEDEC Registered Data

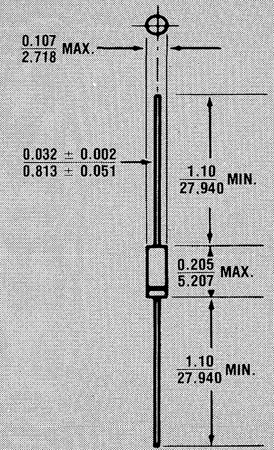

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Molded encapsulation, axial lead package (DO-41).

FINISH: Corrosion resistant. Leads are solderable.

THERMAL RESISTANCE: 45°C/Watt junction to lead at 0.375-inches from body.

POLARITY: Banded end is cathode.

WEIGHT: 0.4 grams (Typical).

NOTE 1 The JEDEC type numbers shown have a 5% tolerance on nominal zener voltage. No suffix signifies a 10% tolerance, C signifies 2%, and D signifies 1% tolerance.

NOTE 2 The Zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC Zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at two points to insure a sharp knee on the breakdown curve and eliminate unstable units.

NOTE 3 The reverse surge current is measured at 25°C ambient using a 1/2 square wave or equivalent sine wave pulse 1/120 second duration superimposed on I_{ZT}.

NOTE 4 Voltage measurements to be performed 90 seconds after application of DC current.

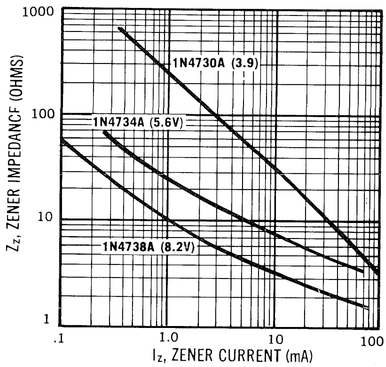

FIGURE 2
TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

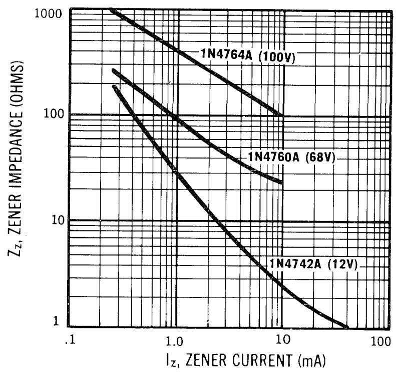

FIGURE 3
TYPICAL ZENER IMPEDANCE vs. ZENER CURRENT FOR TYPES SHOWN

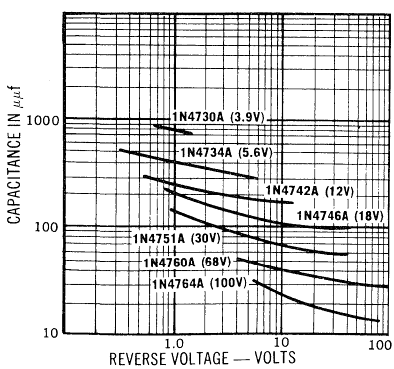

FIGURE 4
CAPACITANCE vs. VOLTAGE FOR REPRESENTATIVE TYPES

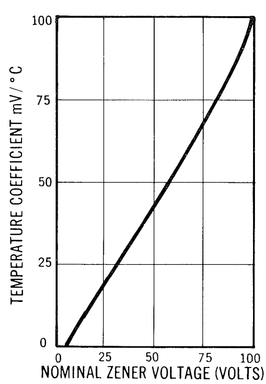

FIGURE 5
TEMP. COEFF. vs. ZENER VOLTAGE

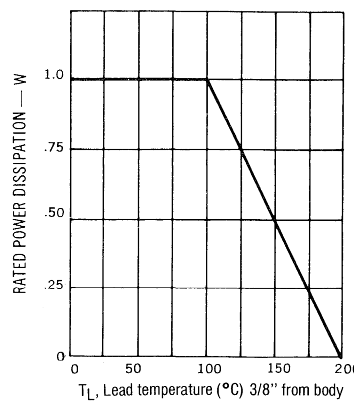

FIGURE 6
POWER DERATING CURVE

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1N4728A thru 1N4764A DO-41 GLASS

SILICON 1 WATT ZENER DIODES

①

FEATURES

- 3.3 THRU 100 VOLTS
- HERMETIC GLASS PACKAGE
- CONSULT FACTORY FOR VOLTAGES OVER 100 V

MAXIMUM RATINGS

Junction and Storage Temperature: −65°C to +200°C
Power Dissipation at T_L 100°C; 1.0 Watt
Power Derating from 100°C; 10 mW/°C
T_L = lead temperature at 3/8″ from body

*ELECTRICAL CHARACTERISTICS (at +25°C ambient.)

Maximum forward voltage 1.2 volts at 200 mA

JEDEC TYPE NUMBER (Note 1)	ZENER VOLTAGE (V_Z) (NOTE 4)	TEST CURRENT (I_{ZT})	MAXIMUM DYNAMIC IMPEDANCE (Z_{ZT} @ I_{ZT}) (Note 2)	MAXIMUM REVERSE CURRENT (I_R @ V_R)	TEST VOLTAGE (V_R)	MAXIMUM REGULATOR CURRENT (I_{ZM}) T_A = 50°C	MAXIMUM KNEE IMPEDANCE (Z_{ZK} @ I_{ZK}) (Note 2)	TEST CURRENT (I_{ZK})	MAXIMUM (SURGE) CURRENT (I_S) (Note 3)
	VOLTS	mA	OHMS	µA	VOLTS	mA	OHMS	mA	mA
1N4728A	3.3	76	10	100	1	276	400	1.0	1380
1N4729A	3.6	69	10	100	1	252	400	1.0	1260
1N4730A	3.9	64	9	50	1	234	400	1.0	1190
1N4731A	4.3	58	9	10	1	217	400	1.0	1070
1N4732A	4.7	53	8	10	1	193	500	1.0	970
1N4733A	5.1	49	7	10	1	178	550	1.0	890
1N4734A	5.6	45	5	10	2	162	600	1.0	810
1N4735A	6.2	41	2	10	3	146	700	1.0	730
1N4736A	6.8	37	3.5	10	4	133	700	1.0	660
1N4737A	7.5	34	4.0	10	5	121	700	0.5	605
1N4738A	8.2	31	4.5	10	6	110	700	0.5	550
1N4739A	9.1	28	5.0	10	7	100	700	0.5	500
1N4740A	10	25	7	10	7.6	91	700	0.25	454
1N4741A	11	23	8	5	8.4	83	700	0.25	414
1N4742A	12	21	9	5	9.1	76	700	0.25	380
1N4743A	13	19	10	5	9.9	69	700	0.25	344
1N4744A	15	17	14	5	11.4	61	700	0.25	304
1N4745A	16	15.5	16	5	12.2	57	700	0.25	285
1N4746A	18	14	20	5	13.7	50	750	0.25	250
1N4747A	20	12.5	22	5	15.2	45	750	0.25	225
1N4748A	22	11.5	23	5	16.7	41	750	0.25	205
1N4749A	24	10.5	25	5	18.2	38	750	0.25	190
1N4750A	27	9.5	35	5	20.6	34	750	0.25	170
1N4751A	30	8.5	40	5	22.8	30	1000	0.25	150
1N4752A	33	7.5	45	5	25.1	27	1000	0.25	135
1N4753A	36	7.0	50	5	27.4	25	1000	0.25	125
1N4754A	39	6.5	60	5	29.7	23	1000	0.25	115
1N4755A	43	6.0	70	5	32.7	22	1500	0.25	110
1N4756A	47	5.5	80	5	35.8	19	1500	0.25	95
1N4757A	51	5.0	95	5	38.8	18	1500	0.25	90
1N4758A	56	4.5	110	5	42.6	16	2000	0.25	80
1N4759A	62	4.0	125	5	47.1	14	2000	0.25	70
1N4760A	68	3.7	150	5	51.7	13	2000	0.25	65
1N4761A	75	3.3	175	5	56.0	12	2000	0.25	60
1N4762A	82	3.0	200	5	62.2	11	3000	0.25	55
1N4763A	91	2.8	250	5	69.2	10	3000	0.25	50
1N4764A	100	2.5	350	5	76.0	9	3000	0.25	45

*JEDEC Registered Data

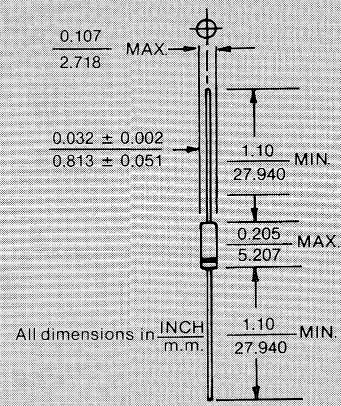

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-41.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: Less than 100°C / Watt junction to lead at 0.375-inches from body.

POLARITY: Banded end is cathode.

WEIGHT: 0.378 grams (Typical).

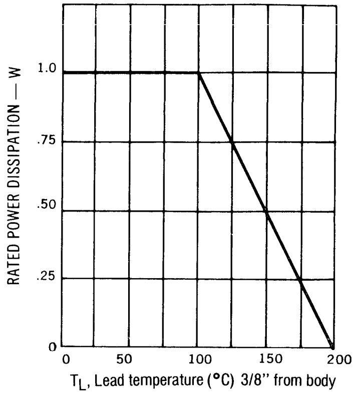

FIGURE 2. POWER DERATING CURVE

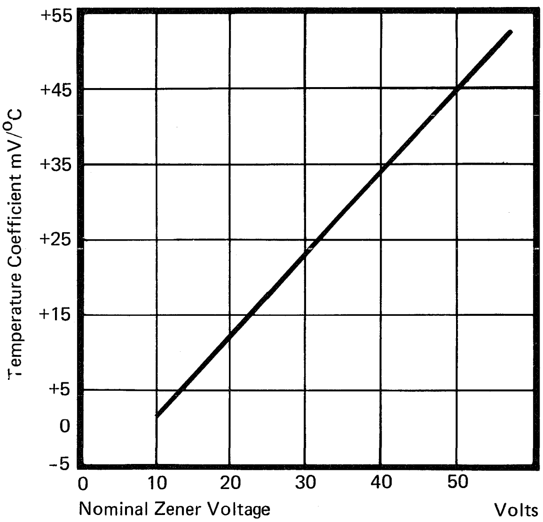

FIGURE 3. TYPICAL TEMPERATURE COEFFICIENT vs ZENER VOLTAGE

NOTE 1. The JEDEC type numbers shown with an A suffix have a 5% tolerance on nominal zener voltage. No suffix signifies a 10% tolerance, C signifies 2%, and D suffix signifies 1% tolerance.

NOTE 2. The Zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC Zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at two points to insure a sharp knee on the breakdown curve and eliminate unstable units.

NOTE 3. The reverse surge current is measured at 25°C ambient using a 1/2 square wave or equivalent sine wave pulse 1/120 second duration superimposed on I_{ZT}.

NOTE 4. Voltage measurements to be performed 90 seconds after application of DC current.

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1N4954 thru 1N4996 and 1N5968, 1N5969

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5 WATT GLASS ZENER DIODES

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- HIGH PERFORMANCE CHARACTERISTICS
- VERY LOW THERMAL IMPEDANCE
- JAN/S/TX/TXV TYPES AVAILABLE PER MIL-S-19500/356

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE*	ELECTRICAL SPECIFICATIONS AT 25°C								MAXIMUM RATINGS	
	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT}	TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_Z @ I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZK}* @ I_{ZK} = 1mA	REGULATION ΔBV ΔV_Z	MAXIMUM REVERSE LEAKAGE CURRENT I_R††	MAXIMUM REVERSE LEAKAGE CURRENT VOLTAGE V_R	MAXIMUM TEMPERATURE COEFF. T_C @ I_{ZT}	MAXIMUM CONTINUOUS CURRENT I_{ZM}	SURGE CURRENT I_{ZSM}
	VOLTS	mA	OHMS	OHMS	VOLTS	μA	VOLTS	%/°C	mA	AMPS
1N5968	5.6	220	1.0	400	0.4	5000	4.28	.04	865	20
1N5969	6.2	220	1.0	1000	0.5	1000	4.74	.04	765	20
1N4954	6.8	175	1.0	1000	0.7	150	5.2	.05	700	40
1N4955	7.5	175	1.5	800	0.7	100	5.7	.06	630	32
1N4956	8.2	150	1.5	600	0.7	50	6.2	.06	580	24
1N4957	9.1	150	2.0	400	0.7	25	6.9	.06	520	22
1N4958	10.0	125	2.0	125	0.8	25	7.6	.07	475	20
1N4959	11	125	2.5	130	0.8	10	8.4	.07	430	19
1N4960	12	100	2.5	140	0.8	10	9.1	.07	395	18
1N4961	13	100	3.0	145	0.8	10	9.9	.08	365	16
1N4962	15	75	3.5	150	1.0	5	11.4	.08	315	12
1N4963	16	75	3.5	155	1.1	5	12.2	.08	294	10
1N4964	18	65	4.0	160	1.2	5	13.7	.085	264	9.0
1N4965	20	65	4.5	165	1.5	2	15.2	.085	237	8.0
1N4966	22	50	5.0	170	1.8	2	16.7	.085	216	7.0
1N4967	24	50	5.0	175	2.0	2	18.2	.090	198	6.5
1N4968	27	50	6.0	180	2.0	2	20.6	.090	176	6.0
1N4969	30	40	8	190	2.5	2	22.8	.090	158	5.5
1N4970	33	40	10	200	2.8	2	25.1	.095	144	5.0
1N4971	36	30	11	220	3.0	2	27.4	.095	132	4.5
1N4972	39	30	14	230	3.0	2	29.7	.095	122	4.0
1N4973	43	30	20	240	3.3	2	32.7	.095	110	3.5
1N4974	47	25	25	250	3.5	2	35.8	.095	100	3.2
1N4975	51	25	27	270	4.0	2	38.8	.095	92	3.0
1N4976	56	20	35	320	4.4	2	42.6	.095	84	2.8
1N4977	62	20	42	400	5.0	2	47.1	.100	76	2.5
1N4978	68	20	50	500	5.5	2	51.7	.100	70	2.2
1N4979	75	20	55	620	6.0	2	56.0	.100	63.0	2.0
1N4980	82	15	80	720	6.6	2	62.2	.100	58.0	1.8
1N4981	91	15	90	760	7.5	2	69.2	.100	52.5	1.6
1N4982	100	12	110	800	8.0	2	76.0	.100	47.5	1.4
1N4983	110	12	125	1000	9.0	2	83.6	.100	43.0	1.2
1N4984	120	10	170	1150	10	2	91.2	.100	39.5	1.00
1N4985	130	10	190	1250	11	2	98.8	.105	36.6	0.80
1N4986	150	8	330	1500	13	2	114.0	.105	31.6	0.75
1N4987	160	8	350	1650	14	2	121.6	.105	29.4	0.70
1N4988	180	5	450	1750	16	2	136.8	.110	26.4	0.60
1N4989	200	5	500	1850	18	2	152	.110	23.6	0.50
1N4990	220	5	550	2000	19	2	167	.115	21.6	0.50
1N4991	240	5	650	2050	22	2	182	.115	19.8	0.40
1N4992	270	5	800	2100	25	2	206	.120	17.5	0.35
1N4993	300	4	950	2150	28	2	228	.120	15.6	0.30
1N4994	330	4	1175	2200	32	2	251	.120	14.4	0.25
1N4995	360	3	1400	2300	35	2	274	.120	13.0	0.22
1N4996	390	3	1800	2500	40	2	297	.120	12.0	0.20

* I_{ZK} = 5mA for 1N5968

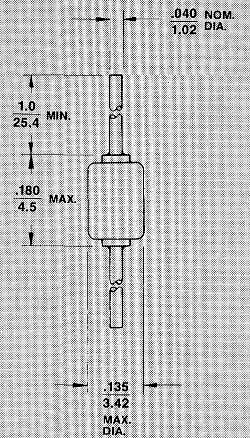

FIGURE 1
PACKAGE E

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

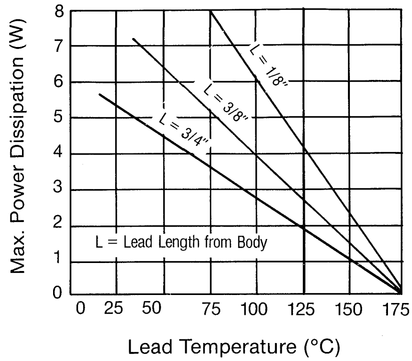

FIGURE 1
POWER DISSIPATION VS. LEAD TEMPERATURE DERATING CURVE

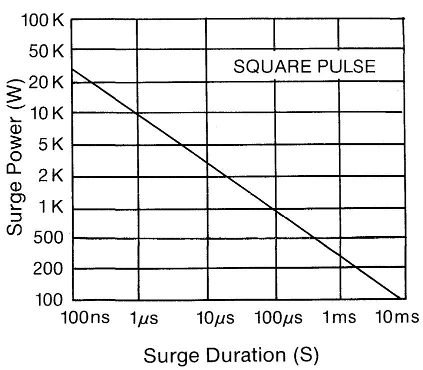

FIGURE 2
SURGE POWER VS. SURGE DURATION

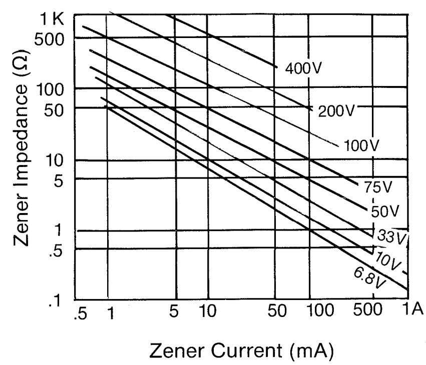

FIGURE 3
TYPICAL ZENER IMPEDANCE VS. ZENER CURRENT

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MZ806 - MZ890,
MZ 210 - MZ 240

3-WATT GLASS ZENER DIODES

FEATURES

- Microminiature package.
- Voidless hermetically sealed glass package.
- Triple layer passivation.
- Metallurgically bonded.
- High performance characteristics.
- Stable operation at temperatures to 200°C.
- Very low thermal impedance.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +200°C.

ELECTRICAL CHARACTERISTICS

TYPE (Note 1)		ELECTRICAL SPECIFICATIONS AT 25°C							MAXIMUM RATINGS	
		NOMINAL ZENER VOLTAGE $V_Z @ I_{ZT}$	TEST CURRENT I_{ZT}	MAXIMUM REVERSE LEAKAGE CURRENT $I_R @ V_R$	±5% V_R	±10% V_R	MAX. ZENER IMPEDANCE $Z_Z @ I_{ZT}$	TYP. TEMP. COEFFICIENT $T_C @ I_{ZT}$	MAXIMUM CONTINUOUS CURRENT I_{ZM}	MAXIMUM SURGE CURRENT I_S
Jedec Registration	±10% Tolerance	Volts	mA	μA	Volts	Volts	Ohms	%/°C	mA	Amps
1N5063	MZ806	6.8	75	500	5.2	4.9	2	.04	440	10.0
1N5064	MZ807	7.5	75	300	5.7	5.4	2	.04	400	8.0
1N5065	MZ808	8.2	75	200	6.2	5.9	3	.05	360	7.0
1N5066	MZ809	9.1	75	100	6.9	6.6	3	.05	330	6.0
1N5067	MZ810	10.0	75	40	7.6	7.2	4	.06	300	5.0
1N4883	MZ812	12	65	10	9.1	8.6	5	.07	250	4.0
1N5069	MZ813	13	50	10	9.9	9.3	6	.07	230	4.0
1N5070	MZ814	14	50	10	10.6	10.1	6	.07	210	4.0
1N5071	MZ815	15	50	10	11.4	10.8	6	.07	200	3.0
1N5072	MZ816	16	50	5	12.2	11.5	7	.07	185	3.0
1N5073	MZ818	18	40	5	13.7	12.9	8	.08	170	2.0
1N4884	MZ820	20	40	5	15.2	14.4	9	.08	150	2.0
1N5074	MZ822	22	30	5	16.7	15.8	10	.08	135	2.0
1N5075	MZ824	24	30	5	18.2	17.3	10	.08	125	1.5
1N5076	MZ827	27	25	1	20.6	19.4	12	.09	110	1.5
1N5077	MZ830	30	25	1	22.8	21.6	15	.090	100	1.5
1N5078	MZ833	33	20	1	25.1	23.7	21	.090	90	1.2
1N5079	MZ836	36	20	1	27.4	25.9	21	.090	85	1.0
1N5081	MZ840	40	20	1	30.4	28.8	27	.095	75	1.0
1N5083	MZ845	45	15	1	34.2	32.4	37	.095	65	0.8
1N5085	MZ850	50	15	1	38.0	36.0	50	.095	60	0.8
1N5087	MZ856	56	10	1	42.6	40.3	70	.095	55	0.7
1N5088	MZ860	60	10	1	45.7	43.2	70	.095	50	0.6
1N5091	MZ870	70	10	1	53.3	50.5	90	.095	45	0.6
1N5092	MZ875	75	10	1	56.0	54.0	100	.095	40	0.5
1N5093	MZ880	80	10	1	60.8	57.7	115	.095	35	0.4
1N4096	MZ890	90	8.0	1	68.5	64.8	150	.095	30	0.4
1N4097	MZ210	100	5.0	1	76.0	72.0	175	.100	30	0.4
1N5096	MZ211	110	5.0	1	83.6	79.2	250	.100	25	0.3
1N5097	MZ212	120	5.0	1	91.2	86.4	325	.100	25	0.2
1N5098	MZ213	130	5.0	1	98.8	93.6	375	.100	20	0.20
1N5099	MZ214	140	5.0	1	106	101	550	.100	20	0.20
1N4098	MZ215	150	5.0	1	114	108	650	.100	20	0.20
1N5100	MZ216	160	4.0	1	122	115	700	.100	20	0.15
1N5101	MZ217	170	4.0	1	129	122	750	.100	18	0.15
1N5102	MZ218	180	4.0	1	137	129	850	.100	18	0.10
1N5103	MZ219	190	4.0	1	144	137	900	.100	15	0.10
1N5104	MZ220	200	4.0	1	152	144	950	.100	15	0.10
1N5105	MZ222	220	3.0	1	167	158	1100	.100	15	0.09
1N5106	MZ224	240	3.0	1	182	173	1300	.105	12	0.09
1N5107	MZ226	260	3.0	1	198	187	1500	.105	12	0.08
1N5109	MZ228	280	3.0	1	213	202	1700	.105	10	0.08
1N5110	MZ230	300	3.0	1	228	216	1900	.105	10	0.07
1N5111	MZ232	320	2.0	1	243	230	2100	.105	9	0.07
1N5113	MZ234	340	2.0	1	258	245	2400	.110	9	0.06
1N5114	MZ236	360	2.0	1	274	259	2700	.110	8	0.06
1N5115	MZ238	380	2.0	1	289	274	3000	.110	8	0.06
1N5117	MZ240	400	2.0	1	304	288	3500	.110	7	0.06

NOTE 1: JEDEC registration applies to ± 5% tolerance zeners only.
Specify 5% voltage tolerance by changing first numeral of type number from 8 to 7.
(MZ806 becomes 706) or from 2 to 1 (MZ211 becomes MZ111).

①

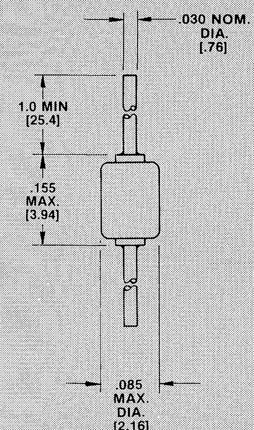

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric with JEDEC number.

POLARITY: Cathode band.

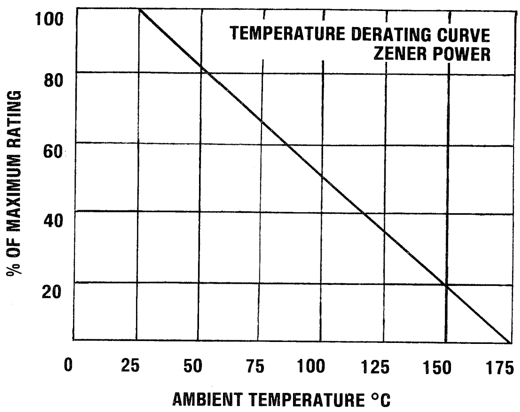

FIGURE 2

EXPLANATION OF ZENER CHARACTERISTICS

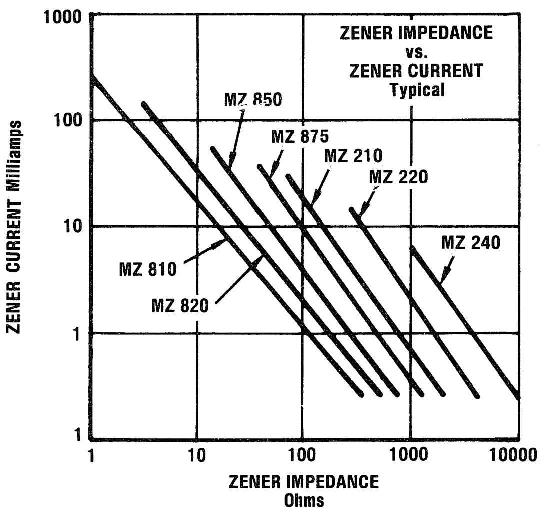

FIGURE 3

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1N5221 thru 1N5281 DO-7

SILICON 500 mW ZENER DIODES

FEATURES

- 2.4 THRU 200 VOLTS
- COMPACT PACKAGE

MAXIMUM RATINGS

Operating and Storage Temperature: −65°C to +200°C
DC Power Dissipation: 500 mW
Power Derating: 4.0 mW/°C above 75°C
Forward Voltage @ 200 mA: 1.1 Volts

ELECTRICAL CHARACTERISTICS

See following page for table of parameter values. (Fig. 3)

Table as shown on following page (Fig. 3) lists JEDEC type numbers, which indicate a tolerance of ± 20% with guaranteed limits on only V_Z, I_r, and V_f. Devices with guaranteed limits on all six parameters are indicated by suffix A for ± 10% tolerance and suffix B for ± 5% tolerance. Also available with suffix C or D which indicates 2% and 1% tolerance respectively.

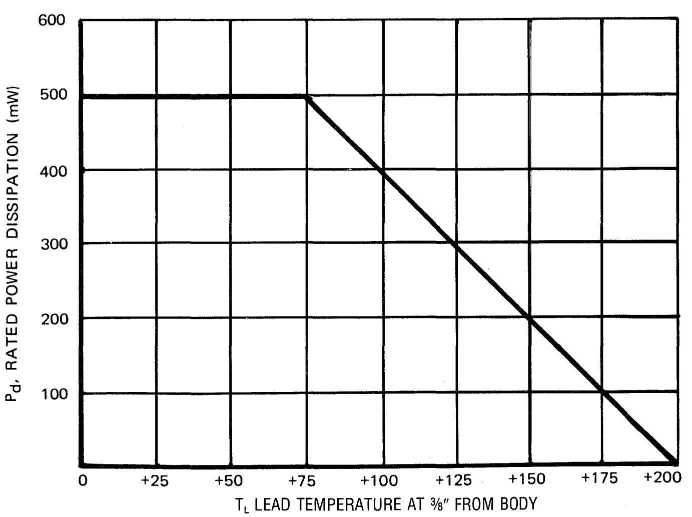

FIGURE 2
POWER DERATING CURVE

①

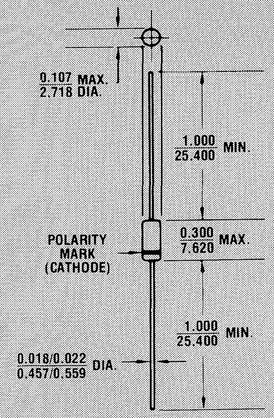

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE. Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

1N5221 thru 1N5281 DO-7

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC Type No. Note 1	Nominal Zener Voltage V_Z @ I_{ZT} Volts	Test Current I_{ZT} mA	Max Zener Impedance A & B Suffix Only Note 2		Max Reverse Leakage Current A, B, C & D Suffix Only			Non-Suffix	Max Zener Voltage Temp. Coeff. (A & B Suffix Only) α_{VZ}(%/°C) Note 3
			Z_{ZT} @ I_{ZT} Ohms	Z_{ZK} @ I_{ZK} = 0.25 mA Ohms	I_R µA	@ V_R Volts A	V_R Volts B, C & D	I_R @ V_R Used For Suffix A µA	
1N5221	2.4	20	30	1200	100	0.95	1.0	200	−0.085
1N5222	2.5	20	30	1250	100	0.95	1.0	200	−0.085
1N5223	2.7	20	30	1300	75	0.95	1.0	150	−0.080
1N5224	2.8	20	30	1400	75	0.95	1.0	150	−0.080
1N5225	3.0	20	29	1600	50	0.95	1.0	100	−0.075
1N5226	3.3	20	28	1600	25	0.95	1.0	100	−0.070
1N5227	3.6	20	24	1700	15	0.95	1.0	100	−0.065
1N5228	3.9	20	23	1900	10	0.95	1.0	75	−0.060
1N5229	4.3	20	22	2000	5.0	0.95	1.0	50	±0.055
1N5230	4.7	20	19	1900	5.0	1.9	2.0	50	±0.030
1N5231	5.1	20	17	1600	5.0	1.9	2.0	50	±0.030
1N5232	5.6	20	11	1600	5.0	2.9	3.0	50	+0.038
1N5233	6.0	20	7.0	1600	5.0	3.3	3.5	50	+0.038
1N5234	6.2	20	7.0	1000	5.0	3.8	4.0	50	+0.045
1N5235	6.8	20	5.0	750	3.0	4.8	5.0	30	+0.050
1N5236	7.5	20	6.0	500	3.0	5.7	6.0	30	+0.058
1N5237	8.2	20	8.0	500	3.0	6.2	6.5	30	+0.062
1N5238	8.7	20	8.0	600	3.0	6.2	6.5	30	+0.065
1N5239	9.1	20	10	600	3.0	6.7	7.0	30	+0.068
1N5240	10	20	17	600	3.0	7.6	8.0	30	+0.075
1N5241	11	20	22	600	2.0	8.0	8.4	30	+0.076
1N5242	12	20	30	600	1.0	8.7	9.1	10	+0.077
1N5243	13	9.5	13	600	0.5	9.4	9.9	10	+0.079
1N5244	14	9.0	15	600	0.1	9.5	10	10	+0.082
1N5245	15	8.5	16	600	0.1	10.5	11	10	+0.082
1N5246	16	7.8	17	600	0.1	11.4	12	10	+0.083
1N5247	17	7.4	19	600	0.1	12.4	13	10	+0.084
1N5248	18	7.0	21	600	0.1	13.3	14	10	+0.085
1N5249	19	6.6	23	600	0.1	13.3	14	10	+0.086
1N5250	20	6.2	25	600	0.1	14.3	15	10	+0.086
1N5251	22	5.6	29	600	0.1	16.2	17	10	+0.087
1N5252	24	5.2	33	600	0.1	17.1	18	10	+0.088
1N5253	25	5.0	35	600	0.1	18.1	19	10	+0.089
1N5254	27	4.6	41	600	0.1	20	21	10	+0.090
1N5255	28	4.5	44	600	0.1	20	21	10	+0.091
1N5256	30	4.2	49	600	0.1	22	23	10	+0.091
1N5257	33	3.8	58	700	0.1	24	25	10	+0.092
1N5258	36	3.4	70	700	0.1	26	27	10	+0.093
1N5259	39	3.2	80	800	0.1	29	30	10	+0.094
1N5260	43	3.0	93	900	0.1	31	33	10	+0.095
1N5261	47	2.7	105	1000	0.1	34	36	10	+0.095
1N5262	51	2.5	125	1100	0.1	37	39	10	+0.096
1N5263	56	2.2	150	1300	0.1	41	43	10	+0.096
1N5264	60	2.1	170	1400	0.1	44	46	10	+0.097
1N5265	62	2.0	185	1400	0.1	45	47	10	+0.097
1N5266	68	1.8	230	1600	0.1	49	52	10	+0.097
1N5267	75	1.7	270	1700	0.1	53	56	10	+0.098
1N5268	82	1.5	330	2000	0.1	59	62	10	+0.098
1N5269	87	1.4	370	2200	0.1	65	68	10	+0.099
1N5270	91	1.4	400	2300	0.1	66	69	10	+0.099
1N5271	100	1.3	500	2600	0.1	72	76	10	+0.110
1N5272	110	1.1	750	3000	0.1	80	84	10	+0.110
1N5273	120	1.0	900	4000	0.1	86	91	10	+0.110
1N5274	130	0.95	1100	4500	0.1	94	99	10	+0.110
1N5275	140	0.90	1300	4500	0.1	101	106	10	+0.110
1N5276	150	0.85	1500	5000	0.1	108	114	10	+0.110
1N5277	160	0.80	1700	5500	0.1	116	122	10	+0.110
1N5278	170	0.74	1900	5500	0.1	123	129	10	+0.110
1N5279	180	0.68	2200	6000	0.1	130	137	10	+0.110
1N5280	190	0.66	2400	6500	0.1	137	144	10	+0.110
1N5281	200	0.65	2500	7000	0.1	144	152	10	+0.110

FIGURE 3

*JEDEC registered data

NOTE 1 The electrical characteristics are measured after allowing the device to stabilize for 20 seconds when mounted with a ⅜″ minimum lead length from the case.

NOTE 2 The zener impedance is derived from the 60 HZ ac voltage, which results when an ac current having an r.m.s. value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at two points to insure a sharp knee on the breakdown curve, thereby eliminating unstable units.

NOTE 3 Temperature coefficient (α_{VZ}). Test conditions for temperature coefficient are as follows:

a. I_{ZT} = 7.5 mA, T_1 = 25°C,
T_2 = 125°C (1N5221A, B thru 1N5242A, B.)

b. I_{ZT} = Rated I_{ZT}, T_1 = 25°C,
T_2 = 125°C (1N5243A, B thru 1N5281A, B.)

Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temperature.

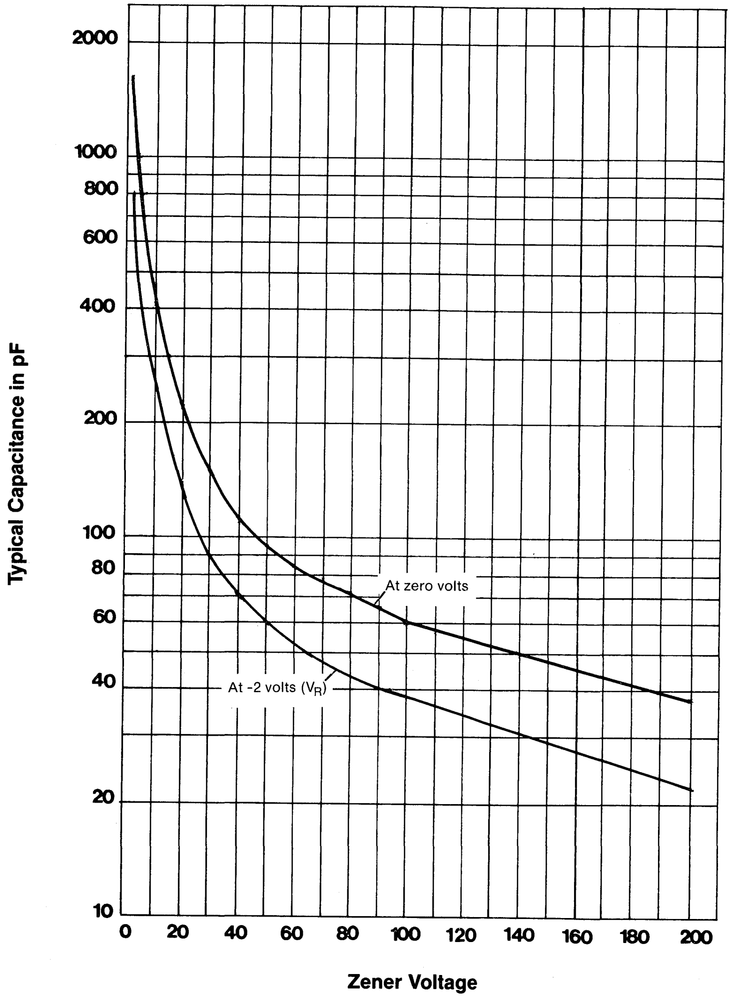

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

①

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1N5221 thru 1N5281 DO-35

SILICON 500 mW ZENER DIODES

FEATURES

- 2.4 THRU 200 VOLTS
- COMPACT PACKAGE
- CONSULT FACTORY FOR VOLTAGES ABOVE 200 V

MAXIMUM RATINGS

Operating and Storage Temperature: −65°C to +200°C
DC Power Dissipation: 500 mW
Power Derating: 4.0 mW/°C above 75°C
Forward Voltage @ 200 mA: 1.1 Volts

ELECTRICAL CHARACTERISTICS

See following page for table of parameter values. (Fig. 3)

Table as shown on following page (Fig. 3) lists JEDEC type numbers, which indicate a tolerance of ± 20% with guaranteed limits on only V_Z, I_r, and V_f. Devices with guaranteed limits on all six parameters are indicated by suffix A for ± 10% tolerance and suffix B for ± 5% tolerance. Also available with suffix C or D which indicates 2% and 1% tolerance respectively.

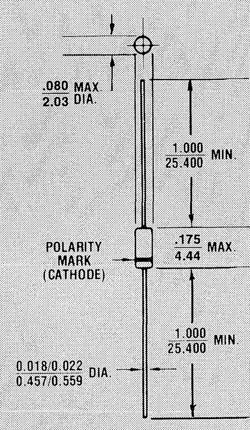

FIGURE 1

All dimensions in INCH / m.m.

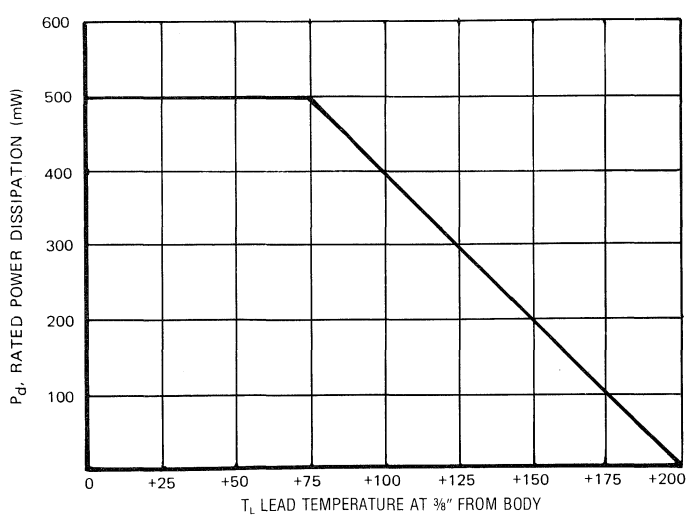

FIGURE 2

POWER DERATING CURVE

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glas case. DO-35.

FINISH: All external surfaces ar corrosion resistant and leads so derable.

THERMAL RESISTANCE: 150°C W (Typical) junction to lead a 0.375-inches from body.

POLARITY: Diode to be operate with the banded end positiv with respect to the opposite enc

1N5221 thru 1N5281 DO-35

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC Type No. Note 1	Nominal Zener Voltage V_Z @ I_{ZT} Volts	Test Current I_{ZT} mA	Max Zener Impedance A & B Suffix Only Note 2		Max Reverse Leakage Current A, B, C & D Suffix Only			Max Reverse Leakage Current Non-Suffix	Max Zener Voltage Temp. Coeff. (A & B Suffix Only) α_{VZ} (%/°C) Note 3
			Z_{ZT} @ I_{ZT} Ohms	Z_{ZK} @ I_{ZK} = 0.25 mA Ohms	I_R μA	@ V_R Volts A	@ V_R Volts B, C & D	I_R @ V_R Used For Suffix A μA	
1N5221	2.4	20	30	1200	100	0.95	1.0	200	−0.085
1N5222	2.5	20	30	1250	100	0.95	1.0	200	−0.085
1N5223	2.7	20	30	1300	75	0.95	1.0	150	−0.080
1N5224	2.8	20	30	1400	75	0.95	1.0	150	−0.080
1N5225	3.0	20	29	1600	50	0.95	1.0	100	−0.075
1N5226	3.3	20	28	1600	25	0.95	1.0	100	−0.070
1N5227	3.6	20	24	1700	15	0.95	1.0	100	−0.065
1N5228	3.9	20	23	1900	10	0.95	1.0	75	−0.060
1N5229	4.3	20	22	2000	5.0	0.95	1.0	50	±0.055
1N5230	4.7	20	19	1900	5.0	1.9	2.0	50	±0.030
1N5231	5.1	20	17	1600	5.0	1.9	2.0	50	±0.030
1N5232	5.6	20	11	1600	5.0	2.9	3.0	50	+0.038
1N5233	6.0	20	7.0	1600	5.0	3.3	3.5	50	+0.038
1N5234	6.2	20	7.0	1000	5.0	3.8	4.0	50	+0.045
1N5235	6.8	20	5.0	750	3.0	4.8	5.0	30	+0.050
1N5236	7.5	20	6.0	500	3.0	5.7	6.0	30	+0.058
1N5237	8.2	20	8.0	500	3.0	6.2	6.5	30	+0.062
1N5238	8.7	20	8.0	600	3.0	6.2	6.5	30	+0.065
1N5239	9.1	20	10	600	3.0	6.7	7.0	30	+0.068
1N5240	10	20	17	600	3.0	7.6	8.0	30	+0.075
1N5241	11	20	22	600	2.0	8.0	8.4	30	+0.076
1N5242	12	20	30	600	1.0	8.7	9.1	10	+0.077
1N5243	13	9.5	13	600	0.5	9.4	9.9	10	+0.079
1N5244	14	9.0	15	600	0.1	9.5	10	10	+0.082
1N5245	15	8.5	16	600	0.1	10.5	11	10	+0.082
1N5246	16	7.8	17	600	0.1	11.4	12	10	+0.083
1N5247	17	7.4	19	600	0.1	12.4	13	10	+0.084
1N5248	18	7.0	21	600	0.1	13.3	14	10	+0.085
1N5249	19	6.6	23	600	0.1	13.3	14	10	+0.086
1N5250	20	6.2	25	600	0.1	14.3	15	10	+0.086
1N5251	22	5.6	29	600	0.1	16.2	17	10	+0.087
1N5252	24	5.2	33	600	0.1	17.1	18	10	+0.088
1N5253	25	5.0	35	600	0.1	18.1	19	10	+0.089
1N5254	27	4.6	41	600	0.1	20	21	10	+0.090
1N5255	28	4.5	44	600	0.1	20	21	10	+0.091
1N5256	30	4.2	49	600	0.1	22	23	10	+0.091
1N5257	33	3.8	58	700	0.1	24	25	10	+0.092
1N5258	36	3.4	70	700	0.1	26	27	10	+0.093
1N5259	39	3.2	80	800	0.1	29	30	10	+0.094
1N5260	43	3.0	93	900	0.1	31	33	10	+0.095
1N5261	47	2.7	105	1000	0.1	34	36	10	+0.095
1N5262	51	2.5	125	1100	0.1	37	39	10	+0.096
1N5263	56	2.2	150	1300	0.1	41	43	10	+0.096
1N5264	60	2.1	170	1400	0.1	44	46	10	+0.097
1N5265	62	2.0	185	1400	0.1	45	47	10	+0.097
1N5266	68	1.8	230	1600	0.1	49	52	10	+0.097
1N5267	75	1.7	270	1700	0.1	53	56	10	+0.098
1N5268	82	1.5	330	2000	0.1	59	62	10	+0.098
1N5269	87	1.4	370	2200	0.1	65	68	10	+0.099
1N5270	91	1.4	400	2300	0.1	66	69	10	+0.099
1N5271	100	1.3	500	2600	0.1	72	76	10	+0.110
1N5272	110	1.1	750	3000	0.1	80	84	10	+0.110
1N5273	120	1.0	900	4000	0.1	86	91	10	+0.110
1N5274	130	0.95	1100	4500	0.1	94	99	10	+0.110
1N5275	140	0.90	1300	4500	0.1	101	106	10	+0.110
1N5276	150	0.85	1500	5000	0.1	108	114	10	+0.110
1N5277	160	0.80	1700	5500	0.1	116	122	10	+0.110
1N5278	170	0.74	1900	5500	0.1	123	129	10	+0.110
1N5279	180	0.68	2200	6000	0.1	130	137	10	+0.110
1N5280	190	0.66	2400	6500	0.1	137	144	10	+0.110
1N5281	200	0.65	2500	7000	0.1	144	152	10	+0.110

*JEDEC registered data

FIGURE 3

①

NOTE 1 The electrical characteristics are measured after allowing the device to stabilize for 20 seconds when mounted with a ⅜″ minimum lead length from the case.

NOTE 2 The zener impedance is derived from the 60 HZ ac voltage, which results when an ac current having an r.m.s. value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at two points to insure a sharp knee on the breakdown curve, thereby, eliminating unstable units.

NOTE 3 Temperature coefficient (α_{VZ}).
Test conditions for temperature coefficient are as follows:

a. I_{ZT} = 7.5 mA, T_1 = 25°C,
T_2 = 125°C (1N5221A, B thru 1N5242A, B.)

b. I_{ZT} = Rated I_{ZT}, T_1 = 25°C,
T_2 = 125°C (1N5243A, B thru 1N5281A, B.)

Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temperature.

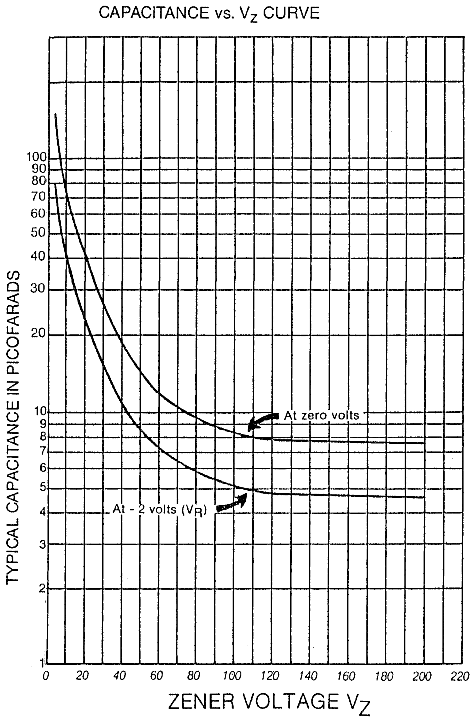

FIGURE 4

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

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1N5333B thru 1N5388B

SILICON 5 WATT ZENER DIODES

FEATURES

- ZENER VOLTAGE 3.3V to 200V
- HIGH SURGE CURRENT CAPABILITY
- FOR AVAILABLE TOLERANCES — SEE NOTE 1

MAXIMUM RATINGS

Operating Temperature: -65°C to +200°C
DC Power Dissipation: 5 Watts
Power Derating: 40 mW/°C above 75°C
Forward Voltage @ 1.0 A: 1.2 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

TYPE NUMBER	REGULATOR VOLTAGE (V_Z)	TEST CURRENT (I_Z)	MAXIMUM DYNAMIC IMPEDANCE (Z_Z) (A&B Suffix)	MAXIMUM REVERSE CURRENT (I_R)	I_R TEST VOLTAGE (V_R) (Non-Suffix & A Suffix)	I_R TEST VOLTAGE (V_R) (B,C,D Suffix)	MAXIMUM REGULATOR CURRENT (I_{ZM}) (B,C,D Suffix)	MAXIMUM DYNAMIC KNEE IMPEDANCE Z_{ZK} at 1.0 mA (A,B,C,D Suffix)	MAXIMUM SURGE CURRENT (I_{ZSM})	MAXIMUM VOLTAGE REGULATION (ΔV_Z) (A,B,C,D Suffix)
	V	mA dc	OHMS	μA	V	V	mA	OHMS	AMPS	VOLTS
1N5333B	3.3	380	3.0	300	1.0	1.0	1440	400	20	0.85
1N5334B	3.6	350	2.5	150	1.0	1.0	1320	500	18.7	0.80
1N5335B	3.9	320	2.0	50	1.0	1.0	1220	500	17.6	0.54
1N5336B	4.3	290	2.0	10	1.0	1.0	1100	500	16.4	0.49
1N5337B	4.7	260	2.0	5.0	1.0	1.0	1010	450	15.3	0.44
1N5338B	5.1	240	1.5	1.0	1.0	1.0	930	400	14.4	0.39
1N5339B	5.6	220	1.0	1.0	2.0	2.0	865	400	13.4	0.25
1N5340B	6.0	200	1.0	1.0	3.0	3.0	790	300	12.7	0.19
1N5341B	6.2	200	1.0	1.0	3.0	3.0	765	200	12.4	0.10
1N5342B	6.8	175	1.0	10	4.9	5.2	700	200	11.5	0.15
1N5343B	7.5	175	1.5	10	5.4	5.7	630	200	10.7	0.15
1N5344B	8.2	150	1.5	10	5.9	6.2	580	200	10	0.20
1N5345B	8.7	150	2.0	10	6.25	6.6	545	200	9.5	0.20
1N5346B	9.1	150	2.0	7.5	6.6	6.9	520	150	9.2	0.22
1N5347B	10	125	2.0	5.0	7.2	7.6	475	125	8.6	0.22
1N5348B	11	125	2.5	5.0	8.0	8.4	430	125	8.0	0.25
1N5349B	12	100	2.5	2.0	8.6	9.1	395	125	7.5	0.25
1N5350B	13	100	2.5	1.0	9.4	9.9	365	100	7.0	0.25
1N5351B	14	100	2.5	1.0	10.1	10.6	340	75	6.7	0.25
1N5352B	15	75	2.5	1.0	10.8	11.5	315	75	6.3	0.25
1N5353B	16	75	2.5	1.0	11.5	12.2	295	75	6.0	0.30
1N5354B	17	70	2.5	0.5	12.2	12.9	280	75	5.8	0.35
1N5355B	18	65	2.5	0.5	13	13.7	264	75	5.5	0.40
1N5356B	19	65	3.0	0.5	13.7	14.4	250	75	5.3	0.40
1N5357B	20	65	3.0	0.5	14.4	15.2	237	75	5.1	0.40
1N5358B	22	50	3.5	0.5	15.8	16.7	216	75	4.7	0.45
1N5359B	24	50	3.5	0.5	17.3	18.2	198	100	4.4	0.55
1N5360B	25	50	4.0	0.5	18	19	190	110	4.3	0.55
1N5361B	27	50	5.0	0.5	19.4	20.6	176	120	4.1	0.60
1N5362B	28	50	6.0	0.5	20.1	21.2	170	130	3.9	0.60
1N5363B	30	40	8.0	0.5	21.6	22.8	158	140	3.7	0.60
1N5364B	33	40	10	0.5	23.8	25.1	144	150	3.5	0.60
1N5365B	36	30	11	0.5	25.9	27.4	132	160	3.3	0.65
1N5366B	39	30	14	0.5	28.1	29.7	122	170	3.1	0.65
1N5367B	43	30	20	0.5	31	32.7	110	190	2.8	0.70
1N5368B	47	25	25	0.5	33.8	35.8	100	210	2.7	0.80
1N5369B	51	25	27	0.5	36.7	38.8	93	230	2.5	0.90
1N5370B	56	20	35	0.5	40.3	42.6	86	280	2.3	1.00
1N5371B	60	20	40	0.5	43	45.5	79	350	2.2	1.20
1N5372B	62	20	42	0.5	44.6	47.1	76	400	2.1	1.35
1N5373B	68	20	44	0.5	49	51.7	70	500	2.0	1.50
1N5374B	75	20	45	0.5	54	56	63	620	1.9	1.60
1N5375B	82	15	65	0.5	59	62.2	58	720	1.8	1.80
1N5376B	87	15	75	0.5	63	66	54.5	760	1.7	2.00
1N5377B	91	15	75	0.5	65.5	69.2	52.5	760	1.6	2.20
1N5378B	100	12	90	0.5	72	76	47.5	800	1.5	2.30
1N5379B	110	12	125	0.5	79.2	83.6	43	1000	1.4	2.50
1N5380B	120	10	170	0.5	86.4	91.2	39.5	1150	1.3	2.50
1N5381B	130	10	190	0.5	93.6	98.8	36.6	1250	1.2	2.50
1N5382B	140	8.0	230	0.5	101	106	34	1500	1.2	2.50
1N5383B	150	8.0	330	0.5	108	114	31.6	1500	1.1	3.00
1N5384B	160	8.0	350	0.5	115	122	29.4	1650	1.1	3.00
1N5385B	170	8.0	380	0.5	122	129	28	1750	1.0	3.00
1N5386B	180	5.0	430	0.5	130	137	26.4	1750	1.0	4.00
1N5387B	190	5.0	450	0.5	137	144	25	1850	0.9	5.00
1N5388B	200	5.0	480	0.5	144	152	23.6	1850	0.9	5.00

*JEDEC Registered Data.

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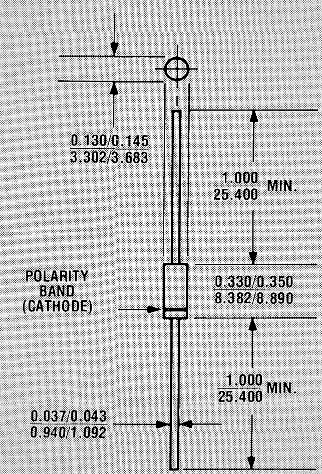

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Void free, transfer molded, thermosetting plastic (T-18).

FINISH: Corrosion resistant, readily solderable.

POLARITY: Cathode Banded.

WEIGHT: 0.7 gram (approx.).

MOUNTING POSITION: Any.

1N5333B thru 1N5388B

NOTE 1 Devices listed have a ±5% tolerance on nominal V_Z. The suffix A denotes a ± 10%, C denotes ± 2%, D denotes ± 1%, and no suffix denotes a ±20% tolerance.

NOTE 2 Nominal Zener Voltage (V_Z) is read with the device in standard test clips with 3/8 to 1/2 inch spacing between clip and case of the diode. Before reading the diode is allowed so stabilize for a period of 40 ±10 milliseconds at 25°C (+8, −2°C).

NOTE 3 The Zener Impedance (Z_{ZT} or Z_{ZK}) is derived from the 60 Hz ac voltage, which results when an ac current having a rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK} respectively.

NOTE 4 The Maximum Reverse (leakage) Current is specified for devices with ±20% and ±10% voltage tolerances on nominal V_Z in another column.

NOTE 5 The Maximum Zener Current (I_{ZM}) shown is for ±5% tolerance devices. I_{ZM} for ±10% and ±20% devices can be calculated using the formula:

$$I_{ZM} = \frac{P}{V_{ZM}}$$

where "V_{ZM}" is V_Z at the high end of the voltage tolerance specified and "P" is the rated power of the device.

NOTE 6 The Surge Current (I_{ZSM}) is specified as the maximum peak of a nonrecurrent sine wave of 8.3 milliseconds duration.

NOTE 7 Voltage Regulation (ΔV_Z) is the difference between the voltage measured at 10% and 50% of I_{ZM}.

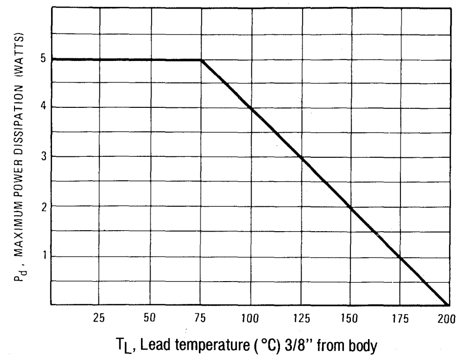

FIGURE 2 POWER DERATING CURVE

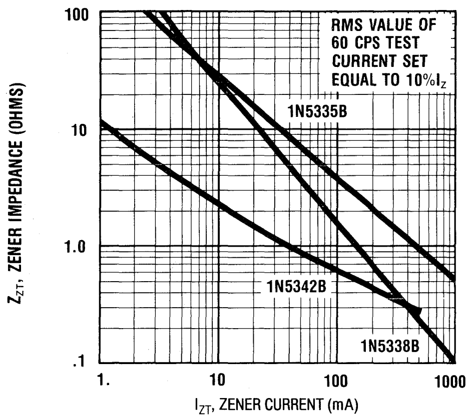

FIGURE 3
TYPICAL ZENER IMPEDANCE VS.
ZENER CURRENT FOR TYPES SHOWN

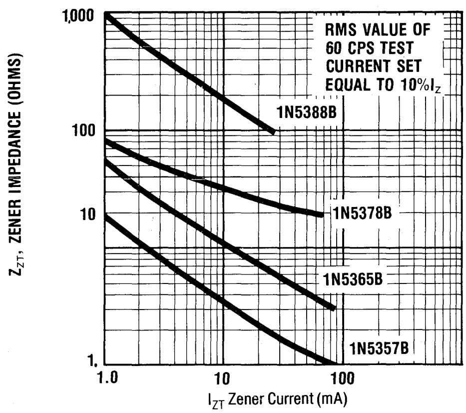

FIGURE 4
TYPICAL ZENER IMPEDANCE VS.
ZENER CURRENT FOR TYPES SHOWN

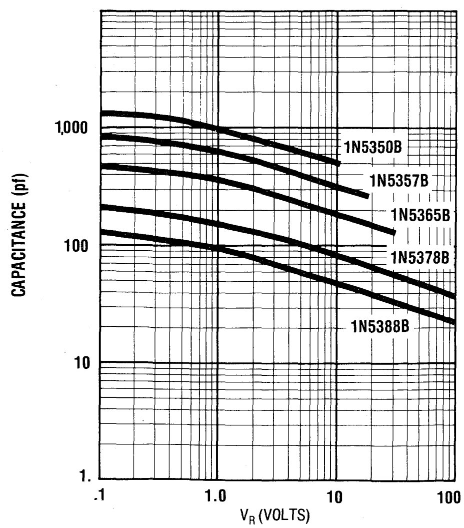

FIGURE 5
TYPICAL CAPACITANCE VS.
REVERSE VOLTAGE FOR 5 WATT ZENERS

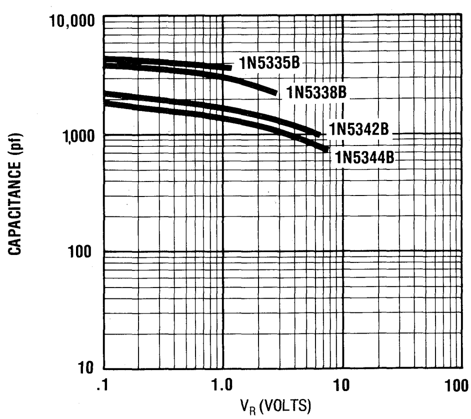

FIGURE 6
TYPICAL CAPACITANCE VS.
REVERSE VOLTAGE FOR 5 WATT ZENERS

Microsemi Corp.
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For more information call:
(602) 941-6300

1N5518 thru 1N5546

LOW VOLTAGE AVALANCHE DIODES DO-7

①

FEATURES

- LOW ZENER NOISE SPECIFIED
- LOW ZENER IMPEDANCE
- LOW LEAKAGE CURRENT
- HERMETICALLY SEALED GLASS PACKAGE
- JAN/JANTX/JANTXV AVAILABLE ON 1N5518 THROUGH 1N5546B PER MIL-S-19500/437

MAXIMUM RATINGS

Operating Temperature: - 65°C to + 200°C
Storage Temperature: - 65°C to + 200°C

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted. Based on dc measurements at thermal equilibrium; V_F = 1.1 Max @ I_F = 200 mA for all types)

JEDEC TYPE NO. (Note 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} VOLTS (Note 2)	TEST CURRENT I_{ZT} mAdc	MAX. ZENER IMPEDANCE B-C-D SUFFIX Z_{ZT} @ I_{ZT} OHMS (Note 3)	MAX. REVERSE LEAKAGE CURRENT			B-C-D SUFFIX MAXIMUM DC ZENER CURRENT I_{ZM} mAdc (Note 5)	B-C-D SUFFIX MAX. NOISE DENSITY AT I_Z = 250 µA N_D (MICRO-VOLTS PER SQUARE ROOT CYCLE)	REGULATION FACTOR ΔV_Z VOLTS (Note 6)	LOW V_Z CURRENT I_{ZL} mAdc
				I_R µAdc (Note 4)	V_R – VOLTS NON & A-SUFFIX	V_R – VOLTS B-C-D SUFFIX				
1N5518	3.3	20	26	5.0	0.90	1.0	115	0.5	0.90	2.0
1N5519	3.6	20	24	3.0	0.90	1.0	105	0.5	0.90	2.0
1N5520	3.9	20	22	1.0	0.90	1.0	98	0.5	0.85	2.0
1N5521	4.3	20	18	3.0	1.0	1.5	88	0.5	0.75	2.0
1N5522	4.7	10	22	2.0	1.5	2.0	81	0.5	0.60	1.0
1N5523	5.1	5.0	26	2.0	2.0	2.5	75	0.5	0.65	0.25
1N5524	5.6	3.0	30	2.0	3.0	3.5	68	1.0	0.30	0.25
1N5525	6.2	1.0	30	1.0	4.5	5.0	61	1.0	0.20	0.01
1N5526	6.8	1.0	30	1.0	5.5	6.2	56	1.0	0.10	0.01
1N5527	7.5	1.0	35	0.5	6.0	6.8	51	2.0	0.05	0.01
1N5528	8.2	1.0	40	0.5	6.5	7.5	46	4.0	0.05	0.01
1N5529	9.1	1.0	45	0.1	7.0	8.2	42	4.0	0.05	0.01
1N5530	10.0	1.0	60	0.05	8.0	9.1	38	4.0	0.10	0.01
1N5531	11.0	1.0	80	0.05	9.0	9.9	35	5.0	0.20	0.01
1N5532	12.0	1.0	90	0.05	9.5	10.8	32	10	0.20	0.01
1N5533	13.0	1.0	90	0.01	10.5	11.7	29	15	0.20	0.01
1N5534	14.0	1.0	100	0.01	11.5	12.6	27	20	0.20	0.01
1N5535	15.0	1.0	100	0.01	12.5	13.5	25	20	0.20	0.01
1N5536	16.0	1.0	100	0.01	13.0	14.4	24	20	0.20	0.01
1N5537	17.0	1.0	100	0.01	14.0	15.3	22	20	0.20	0.01
1N5538	18.0	1.0	100	0.01	15.0	16.2	21	20	0.20	0.01
1N5539	19.0	1.0	100	0.01	16.0	17.1	20	20	0.20	0.01
1N5540	20.0	1.0	100	0.01	17.0	18.0	19	20	0.20	0.01
1N5541	22.0	1.0	100	0.01	18.0	19.8	17	20	0.25	0.01
1N5542	24.0	1.0	100	0.01	20.0	21.6	16	20	0.30	0.01
1N5543	25.0	1.0	100	0.01	21.0	22.4	15	20	0.35	0.01
1N5544	28.0	1.0	100	0.01	23.0	25.2	14	20	0.40	0.01
1N5545	30.0	1.0	100	0.01	24.0	27.0	13	20	0.45	0.01
1N5546	33.0	1.0	100	0.01	28.0	29.7	12	20	0.50	0.01

NOTE 1 — TOLERANCE AND VOLTAGE DESIGNATION
The JEDEC type numbers shown are ±20% with guaranteed limits for only V_Z, I_R, and V_F. Units with A suffix are ±10% with guaranteed limits for V_Z, I_R, and V_F. Units with guaranteed limits for all six parameters are indicated by a B suffix for ±5.0% units, C suffix for ±2.0% and D suffix for ±1.0%.

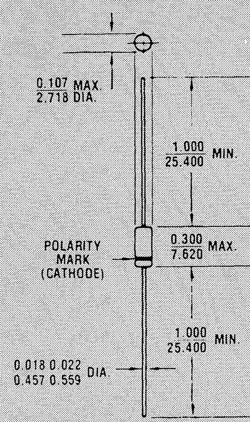
NOTE 2 — ZENER VOLTAGE (V_Z) MEASUREMENT
Nominal zener voltage is measured with the device junction in thermal equilibrium with ambient temperature of 25°C.

NOTE 3 — ZENER IMPEDANCE (Z_Z) DERIVATION
The zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 4 — REVERSE LEAKAGE CURRENT (I_R)
Reverse leakage currents are guaranteed and are measured at V_R as shown on the table.

NOTE 5 — MAXIMUM REGULATOR CURRENT (I_{ZM})
The maximum current shown is based on the maximum voltage of a 5.0% type unit, therefore, it applies only to the B suffix device. The actual I_{ZM} for any device may not exceed the value of 400 milliwatts divided by the actual V_Z of the device.

NOTE 6 — MAXIMUM REGULATION FACTOR (ΔV_Z)
ΔV_Z is the maximum difference between V_Z at I_{ZT} and V_Z at I_{ZL} measured with the device junction in thermal equilibrium.



All dimensions in INCH / m.m.

FIGURE 1
DO-7

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: Corrosion resistant. Leads are solderable.

MARKING: Body painted, alpha numeric.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

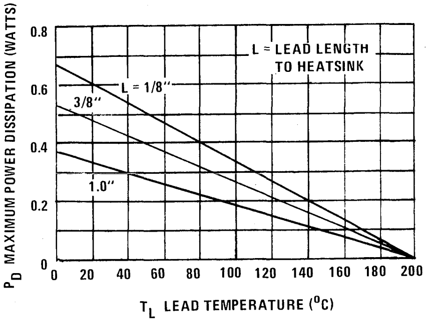


FIGURE 2
POWER-TEMPERATURE
DERATING CURVE

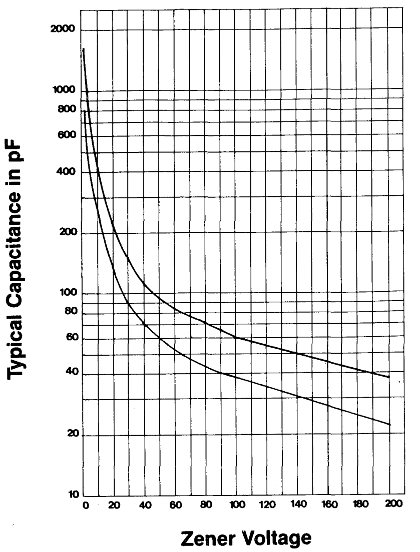


FIGURE 3

CAPACITANCE VS. ZENER VOLTAGE
(TYPICAL)

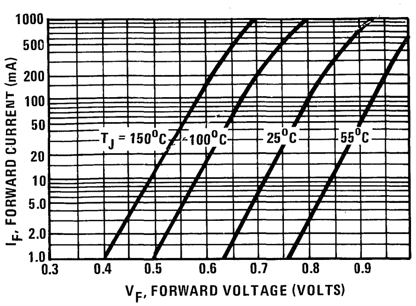


FIGURE 4
TYPICAL FORWARD
CHARACTERISTICS

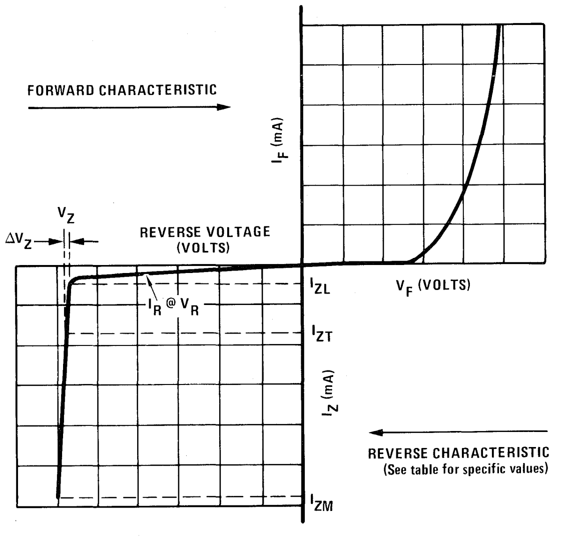


FIGURE 5
ZENER DIODE CHARACTERISTICS
AND SYMBOL IDENTIFICATION

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1N5518 thru 1N5546

LOW VOLTAGE AVALANCHE DIODES DO-35

①

FEATURES

- LOW ZENER NOISE SPECIFIED
- LOW ZENER IMPEDANCE
- LOW LEAKAGE CURRENT
- HERMETICALLY SEALED GLASS PACKAGE
- JAN/JANTX/JANTXV AVAILABLE ON 1N5518-1 THROUGH 1N5546B-1 PER MIL-S-19500/437

MAXIMUM RATINGS

Operating Temperature: −65°C to +200°C
Storage Temperature: −65°C to +200°C

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted. Based on dc measurements at thermal equilibrium; V_F = 1.1 Max @ I_F = 200 mA for all types)

JEDEC TYPE NO. (Note 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} VOLTS (Note 2)	TEST CURRENT I_{ZT} mAdc	MAX. ZENER IMPEDANCE B-C-D SUFFIX Z_{ZT} @ I_{ZT} OHMS (Note 3)	MAX. REVERSE LEAKAGE CURRENT I_R μAdc (Note 4)	V_R – VOLTS NON & A-SUFFIX	V_R – VOLTS B-C-D SUFFIX	B-C-D SUFFIX MAXIMUM DC ZENER CURRENT I_{ZM} mAdc (Note 5)	B-C-D SUFFIX MAX. NOISE DENSITY AT I_Z = 250 μA N_D (MICRO-VOLTS PER SQUARE ROOT CYCLE)	REGULATION FACTOR ΔV_Z VOLTS (Note 6)	LOW V_Z CURRENT I_{ZL} mAdc
1N5518	3.3	20	26	5.0	0.90	1.0	115	0.5	0.90	2.0
1N5519	3.6	20	24	3.0	0.90	1.0	105	0.5	0.90	2.0
1N5520	3.9	20	22	1.0	0.90	1.0	98	0.5	0.85	2.0
1N5521	4.3	20	18	3.0	1.0	1.5	88	0.5	0.75	2.0
1N5522	4.7	10	22	2.0	1.5	2.0	81	0.5	0.60	1.0
1N5523	5.1	5.0	26	2.0	2.0	2.5	75	0.5	0.65	0.25
1N5524	5.6	3.0	30	2.0	3.0	3.5	68	1.0	0.30	0.25
1N5525	6.2	1.0	30	1.0	4.5	5.0	61	1.0	0.20	0.01
1N5526	6.8	1.0	30	1.0	5.5	6.2	56	1.0	0.10	0.01
1N5527	7.5	1.0	35	0.5	6.0	6.8	51	2.0	0.05	0.01
1N5528	8.2	1.0	40	0.5	6.5	7.5	46	4.0	0.05	0.01
1N5529	9.1	1.0	45	0.1	7.0	8.2	42	4.0	0.05	0.01
1N5530	10.0	1.0	60	0.05	8.0	9.1	38	4.0	0.10	0.01
1N5531	11.0	1.0	80	0.05	9.0	9.9	35	5.0	0.20	0.01
1N5532	12.0	1.0	90	0.05	9.5	10.8	32	10	0.20	0.01
1N5533	13.0	1.0	90	0.01	10.5	11.7	29	15	0.20	0.01
1N5534	14.0	1.0	100	0.01	11.5	12.6	27	20	0.20	0.01
1N5535	15.0	1.0	100	0.01	12.5	13.5	25	20	0.20	0.01
1N5536	16.0	1.0	100	0.01	13.0	14.4	24	20	0.20	0.01
1N5537	17.0	1.0	100	0.01	14.0	15.3	22	20	0.20	0.01
1N5538	18.0	1.0	100	0.01	15.0	16.2	21	20	0.20	0.01
1N5539	19.0	1.0	100	0.01	16.0	17.1	20	20	0.20	0.01
1N5540	20.0	1.0	100	0.01	17.0	18.0	19	20	0.20	0.01
1N5541	22.0	1.0	100	0.01	18.0	19.8	17	20	0.25	0.01
1N5542	24.0	1.0	100	0.01	20.0	21.6	16	20	0.30	0.01
1N5543	25.0	1.0	100	0.01	21.0	22.4	15	20	0.35	0.01
1N5544	28.0	1.0	100	0.01	23.0	25.2	14	20	0.40	0.01
1N5545	30.0	1.0	100	0.01	24.0	27.0	13	20	0.45	0.01
1N5546	33.0	1.0	100	0.01	28.0	29.7	12	20	0.50	0.01

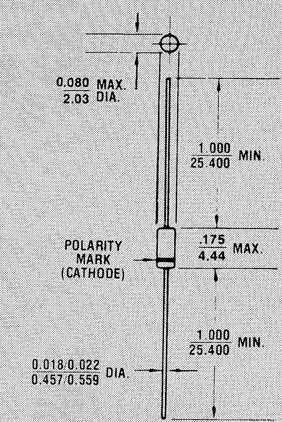


FIGURE 1

All dimensions in INCH / m.m.

NOTE 1 — TOLERANCE AND VOLTAGE DESIGNATION

The JEDEC type numbers shown are ± 20% with guaranteed limits for only V_Z, I_R, and V_F. Units with A suffix are ± 10% with guaranteed limits for only V_Z, I_R, and V_F. Units with guaranteed limits for all six parameters are indicated by a B suffix for ± 5.0% units, C suffix for ± 2.0% and D suffix for ± 1.0%.

NOTE 2 — ZENER (V_Z) VOLTAGE MEASUREMENT

Nominal zener voltage is measured with the device junction in thermal equilibrium with ambient temperature of 25°C.

NOTE 3 — ZENER IMPEDANCE (Z_Z) DERIVATION

The zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 4 — REVERSE LEAKAGE CURRENT (I_R)

Reverse leakage currents are guaranteed and are measured at V_R as shown on the table.

NOTE 5 — MAXIMUM REGULATOR CURRENT (I_{ZM})

The maximum current shown is based on the maximum voltage of a 5.0% type unit, therefore, it applies only to the B suffix device. The actual I_{ZM} for any device may not exceed the value of 400 milliwatts divided by the actual V_Z of the device.

NOTE 6 — MAXIMUM REGULATION FACTOR (ΔV_Z)

ΔV_Z is the maximum difference between V_Z at I_{ZT} and V_Z at I_{ZL} measured with the device junction in thermal equilibrium.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35s exhibit less than 100°C/Watt at zero distance from body.

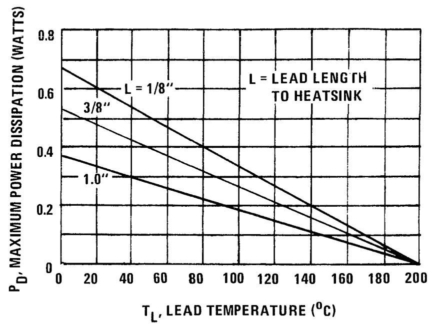


FIGURE 2
POWER-TEMPERATURE DERATING CURVE

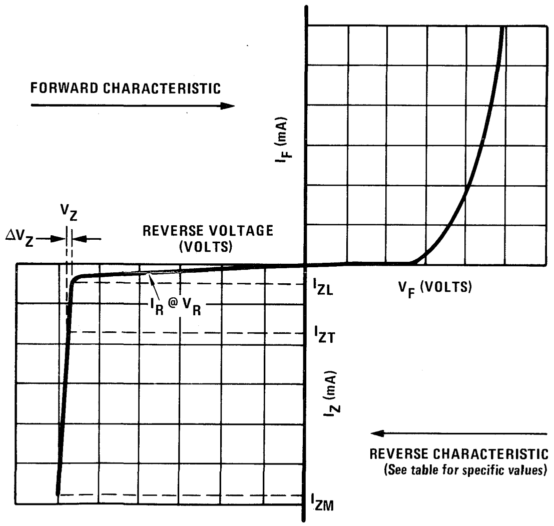
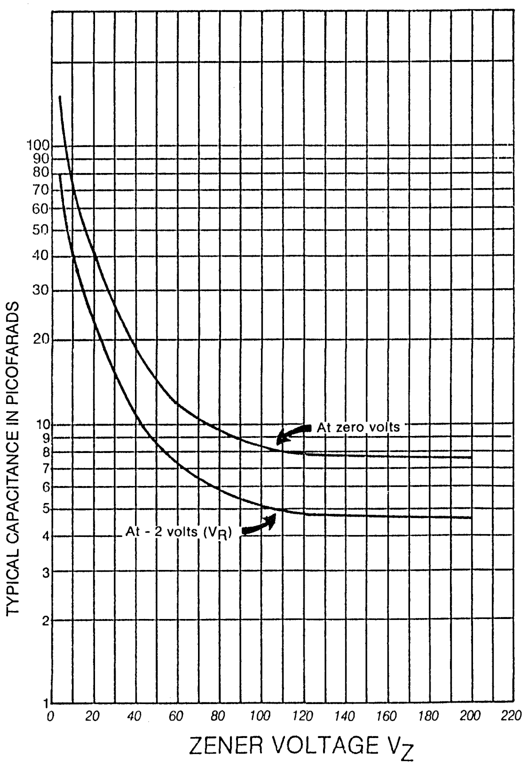


FIGURE 3

ZENER DIODE CHARACTERISTICS AND SYMBOL IDENTIFICATION

CAPACITANCE vs. V_Z CURVE



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1N5728 thru 1N5757

SILICON 400 mW ZENER DIODES

FEATURES

- ZENER VOLTAGE 4.7 TO 75 V
- SMALL RUGGED DOUBLE SLUG CONSTRUCTION DO-35
- CONSTRUCTED WITH AN OXIDE PASSIVATED ALL DIFFUSED DIE

MAXIMUM RATINGS

Operating Temperature: −65°C to +200°C
DC Power Dissipation: 400 mW
Power Derating: 2.63 mW/°C above 50°C
Forward Voltage @ 10 mA: 0.9 Volts

*ELECTRICAL CHARACTERISTICS @ 25°C

TYPE NUMBER (Note 1)	REGULATOR VOLTAGE (V_Z) VOLTS	TEST CURRENT (I_Z) MODE	DYNAMIC IMPEDANCE (Z_Z) OHMS	REVERSE CURRENT (I_R) μa	I_R TEST VOLTAGE (V_R) VOLTS	MAXIMUM REGULATOR CURRENT (I_{ZM}) mA	TEMPERATURE COEFFICIENT (α_{VZ}) mV/°C
1N5728B	4.7	10	70	3.0	2	70	−1.0
1N5729B	5.1	10	50	3.0	2	65	−0.2
1N5730B	5.6	10	25	3.0	2	60	+1.2
1N5731B	6.2	10	10	3.0	4	55	+2.3
1N5732B	6.8	10	10	3.0	4	50	+3.0
1N5733B	7.5	10	10	2.0	5	45	+4.0
1N5734B	8.2	10	15	1.0	5	40	+5.0
1N5735B	9.1	10	15	0.5	6	40	+6.0
1N5736B	10	10	20	0.2	7	35	+7.0
1N5737B	11	5	20	0.1	8	30	+8.0
1N5738B	12	5	25	0.1	8	30	+9.0
1N5739B	13	5	30	0.1	9	25	+10.5
1N5740B	15	5	30	0.1	10	25	+12.9
1N5741B	16	5	40	0.1	11	20	+13
1N5742B	18	5	45	0.1	12	20	+15
1N5743B	20	5	55	0.1	14	15	+17
1N5744B	22	5	55	0.1	15	15	+19
1N5745B	24	5	70	0.1	17	15	+21
1N5746B	27	2	80	0.1	19	10	+23.5
1N5747B	30	2	80	0.1	21	10	+26
1N5748B	33	2	90	0.1	23	10	+29
1N5749B	36	2	90	0.1	25	10	+31
1N5750B	39	2	130	0.1	27	9	+34
1N5751B	43	2	150	0.1	30	9	+37
1N5752B	47	2	170	0.1	33	8	+40
1N5753B	51	2	180	0.1	36	7	+44
1N5754B	56	2	200	0.1	39	6	+47
1N5755B	62	2	215	0.1	43	6	+51
1N5756B	68	2	240	0.1	48	5	+56
1N5757B	75	2	255	0.1	53	5	+60

*JEDEC Registered Data. The Type Number indicates 5% Tolerance. See Note 1.

1

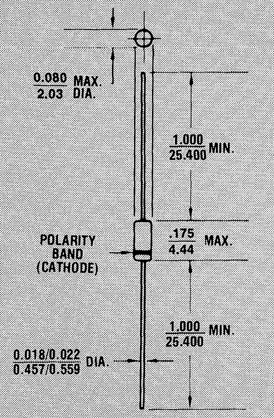

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 200°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

1N5728 thru 1N5757

NOTE 1 Devices listed have a ±5% voltage tolerance on nominal V_Z. Suffix C denotes a ±2% tolerance and suffix D denotes a ±1% tolerance.

NOTE 2 All static parameters measured under pulsed conditions, t_p = 300 μsec.

NOTE 3 Dynamic Impedance measured by superimposing 0.2 mA Iac rms at 1000 hz on I DC.

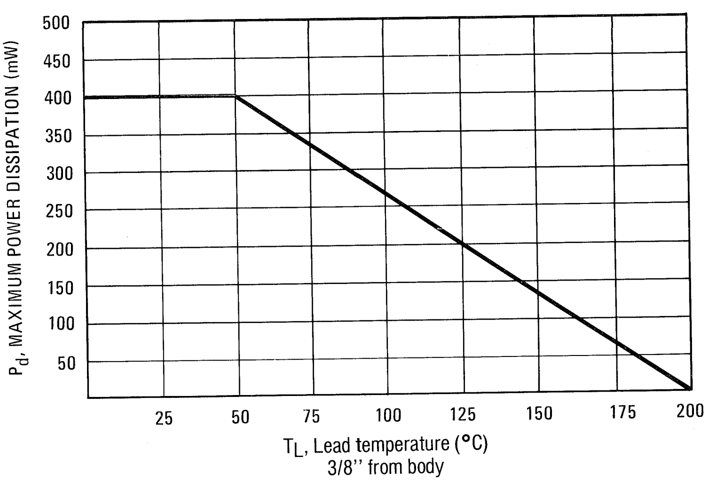

FIGURE 2 POWER DERATING CURVE

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1N5913B thru 1N5956B

SILICON 1.5 WATT ZENER DIODES

FEATURES

- ZENER VOLTAGE 3.3V TO 200V
- WITHSTANDS LARGE SURGE STRESSES
- ALSO AVAILABLE IN PLASTIC CASE. CONSULT FACTORY.

MAXIMUM RATINGS

Junction and Storage: −55 °C to +200 °C
DC Power Dissipation: 1.5 Watt
12 mW/ °C above 75 °C
Forward Voltage @ 200 mA: 1.2 Volts

ELECTRICAL CHARACTERISTICS @ T_L = 30 °C

JEDEC TYPE NUMBER	ZENER VOLTAGE V_Z Volts	TEST CURRENT I_{ZT} mA	DYNAMIC IMPEDANCE Z_{ZT} Ω	KNEE CURRENT I_{ZK} mA	KNEE IMPEDANCE Z_{ZK} Ω	REVERSE CURRENT I_R (MAX.) μ Adc	REVERSE VOLTAGE V_R Volts	MAX. DC CURRENT I_{ZM} mA
1N5913	3.3	113.6	10	1.0	500	100	1.0	454
1N5914	3.6	104.2	9.0	1.0	500	75	1.0	416
1N5915	3.9	96.1	7.5	1.0	500	25	1.0	384
1N5916	4.3	87.2	6.0	1.0	500	5.0	1.0	348
1N5917	4.7	79.8	5.0	1.0	500	5.0	1.5	319
1N5918	5.1	73.5	4.0	1.0	350	5.0	2.0	294
1N5919	5.6	66.9	2.0	1.0	250	5.0	3.0	267
1N5920	6.2	60.5	2.0	1.0	200	5.0	4.0	241
1N5921	6.8	55.1	2.5	1.0	200	5.0	5.2	220
1N5922	7.5	50	3.0	0.5	400	5.0	6.0	200
1N5923	8.2	45.7	3.5	0.5	400	5.0	6.5	182
1N5924	9.1	41.2	4.0	0.5	500	5.0	7.0	164
1N5925	10	37.5	4.5	0.25	500	5.0	8.0	150
1N5926	11	34.1	5.5	0.25	550	1.0	8.4	125
1N5927	12	31.2	6.5	0.25	550	1.0	9.1	125
1N5928	13	28.8	7.0	0.25	550	1.0	9.9	115
1N5929	15	25	9.0	0.25	600	1.0	11.4	100
1N5930	16	23.4	10	0.25	600	1.0	12.2	93
1N5931	18	20.8	12	0.25	650	1.0	13.7	83
1N5932	20	18.7	14	0.25	650	1.0	15.2	75
1N5933	22	17	17.5	0.25	650	1.0	16.7	68
1N5934	24	15.6	19	0.25	700	1.0	18.2	62
1N5935	27	13.9	23	0.25	700	1.0	20.6	55
1N5936	30	12.5	28	0.25	750	1.0	22.8	50
1N5937	33	11.4	33	0.25	800	1.0	25.1	45
1N5938	36	10.4	38	0.25	850	1.0	27.4	41
1N5939	39	9.6	45	0.25	900	1.0	29.7	38
1N5940	43	8.7	53	0.25	950	1.0	32.7	34
1N5941	47	8.0	67	0.25	1000	1.0	35.8	31
1N5942	51	7.3	70	0.25	1100	1.0	38.8	29
1N5943	56	6.7	86	0.25	1300	1.0	42.6	26
1N5944	62	6.0	100	0.25	1500	1.0	47.1	24
1N5945	68	5.5	120	0.25	1700	1.0	51.2	22
1N5946	75	5.0	140	0.25	2000	1.0	56	20
1N5947	82	4.6	160	0.25	2500	1.0	62.2	18
1N5948	91	4.1	200	0.25	3000	1.0	69.2	16
1N5949	100	3.7	250	0.25	3100	1.0	76	15
1N5950	110	3.4	300	0.25	4000	1.0	83.6	13
1N5951	120	3.1	380	0.25	4500	1.0	91.2	12
1N5952	130	2.9	450	0.25	5000	1.0	98.8	11
1N5953	150	2.5	600	0.25	6000	1.0	114	10
1N5954	160	2.3	700	0.25	6500	1.0	121.6	9.0
1N5955	180	2.1	900	0.25	7000	1.0	136.8	8.0
1N5956	200	1.9	1200	0.25	8000	1.0	152	7.0

①

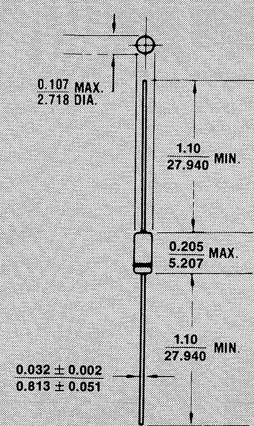


FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed, axial leaded glass package (DO-41).

FINISH: Corrosion resistant. Leads are solderable.

THERMAL RESISTANCE: 60°C/W junction to lead at 0.375-inches from body.

POLARITY: Banded end is cathode.

WEIGHT: 0.4 grams (Typical).

NOTE 1 No suffix indicates a ±20% tolerance on nominal V_Z. Suffix A denotes a ±10% tolerance, B denotes a ±5% tolerance, C denotes a ±2% tolerance, and D denotes a ±1% tolerance.

NOTE 2 Zener voltage (Vz) is measured at T_L = 30°C. Voltage measurement to be performed 90 seconds after application of DC current.

NOTE 3 The zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}.

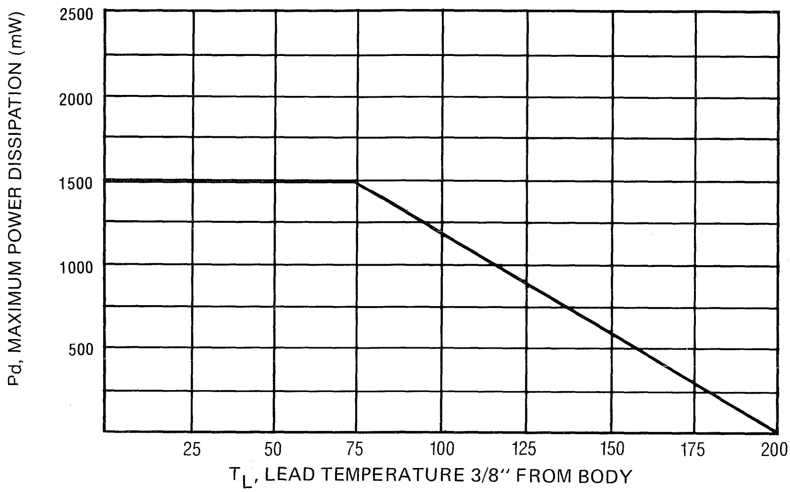


FIGURE 2. POWER DERATING CURVE

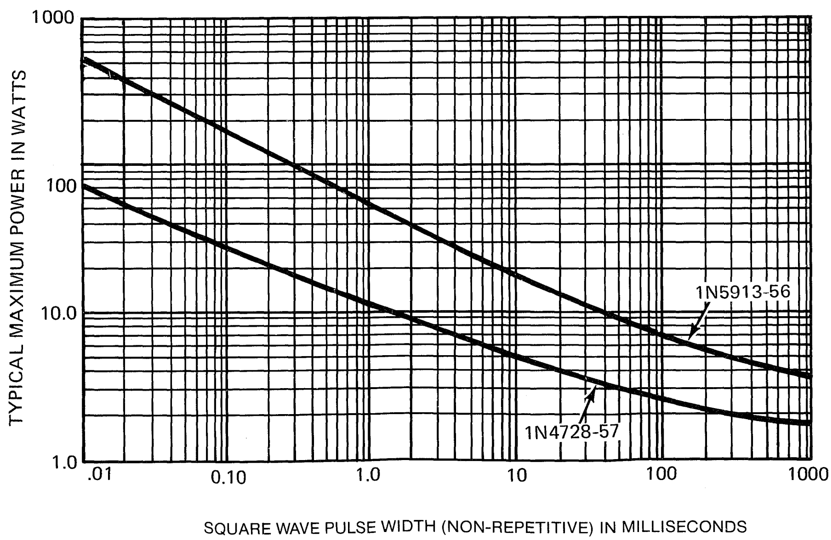
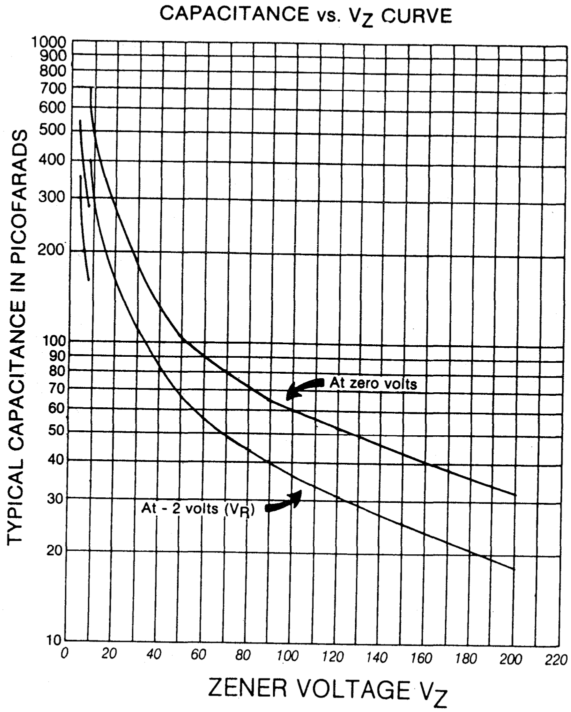


FIGURE 3. TRANSIENT SURGE CAPABILITY OF DO-41 GLASS DIODE


CAPACITANCE vs. V_Z CURVE
TYPICAL CAPACITANCE IN PICOFARADS
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
0
20
40
60
80
100
120
140
160
180
200
220
At zero volts
At - 2 volts (V_R)
ZENER VOLTAGE V_Z

①

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1N5985 thru 1N6031

SILICON 500 mW ZENER DIODES

FEATURES

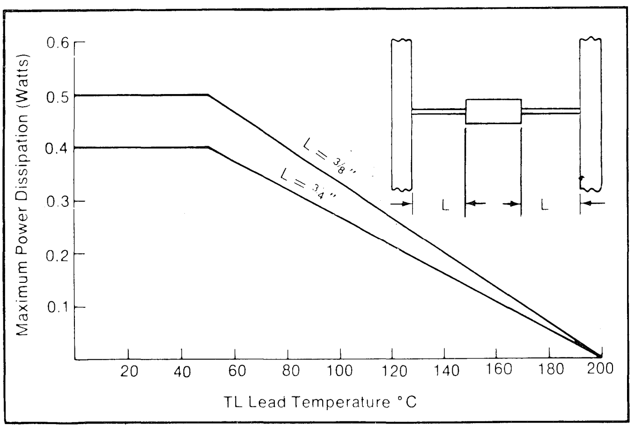
- Popular DO-35 Package—Small and Rugged
- Double Slug Construction
- Constructed with an Oxide Passivated All Diffused Die

MAXIMUM RATINGS

Operating & Storage Temp.: −65°C to +200°C
DC Power Dissipation: At Lead Temp. TL ≤50°C
Lead length 3/8": 500 mW
Derate above +50°C: 3.33mW/°C
Forward voltage @ 100mA: 1.5V
and TL = 30°C L = 3/8"

ELECTRICAL CHARACTERISTICS

See the following table:
The type number listed indicates a 20% tolerance. For 10% tolerance, add suffix A; for 5% tolerance, add suffix B; for 2% tolerance add suffix C; for 1% tolerance, add suffix D.



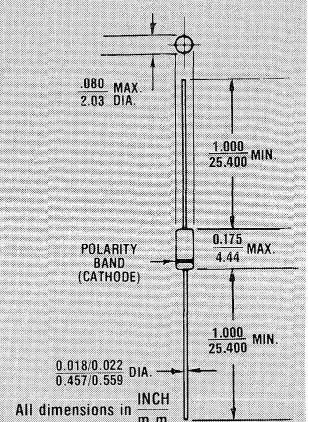


FIGURE 1

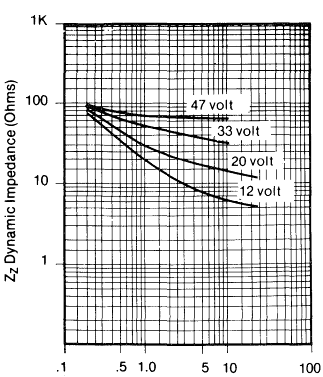
MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glas case. DO-35.

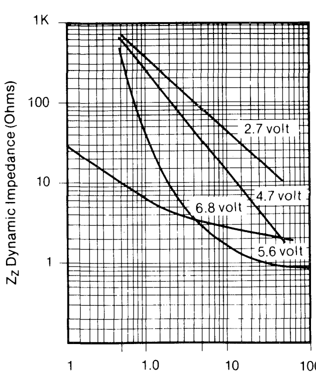
FINISH: All external surfaces ai corrosion resistant and leads so derable.

THERMAL RESISTANCE: 200°C W (Typical) junction to lead : 0.375-inches from body.

POLARITY: Diode to be operate with the banded end positive wi respect to the opposite end.



Typical Effect of Zener Current on Zener Impedance



Typical Effect of Zener Current on Zener Impedance

1N5985 thru 1N6031

*ELECTRICAL CHARACTERISTICS @ 30°C Lead Temperature. Lead Length 3/8″.

JEDEC Type Number	Nominal Zener Voltage V_Z @ I_{ZT} Volts (Note 2)	Test Current I_{ZT} mA	Max. Zener Impedance (Note 1) Z_{ZT} @ I_{ZT} Ohms		Z_{ZK} @ I_{ZK} = 0.25mA Ohms		Max. Reverse Leakage Current I_R μA		@ V_R Volts		Max. DC Zener Current I_{ZM} (Note 3)	Typical Temp. Coef. of Zener Voltage α_{VZ} %/°C
			B, C, D Suffix	A, Non-Suffix	B, C, D Suffix	A, Non-Suffix	B, C, D Suffix	A, Non-Suffix	B, C, D Suffix	A, Non-Suffix		
1N5985	2.4	5.0	100	110	1800	2000	100	100	1.0	0.5	208	−0.09
1N5986	2.7	5.0	100	110	1900	2200	75	100	1.0	0.5	185	−0.075
1N5987	3.0	5.0	95	100	2000	2300	50	100	1.0	0.5	167	−0.07
1N5988	3.3	5.0	95	100	2200	2400	25	75	1.0	0.5	152	−0.06
1N5989	3.6	5.0	90	95	2300	2500	15	50	1.0	0.5	139	−0.055
1N5990	3.9	5.0	90	95	2400	2500	10	25	1.0	1.0	128	−0.045
1N5991	4.3	5.0	88	90	2500	2500	5.0	15	1.0	1.0	116	−0.01
1N5992	4.7	5.0	70	90	2200	2500	3.0	10	1.5	1.0	106	+0.01
1N5993	5.1	5.0	50	88	2050	2500	2.0	5.0	2.0	1.0	98	+0.025
1N5994	5.6	5.0	25	70	1800	2200	2.0	3.0	3.0	1.5	89	+0.035
1N5995	6.2	5.0	10	50	1300	2050	1.0	2.0	4.0	2.0	81	+0.04
1N5996	6.8	5.0	8.0	25	750	1800	1.0	2.0	5.2	3.0	74	+0.044
1N5997	7.5	5.0	7.0	10	600	1300	0.5	1.0	6.0	4.0	67	+0.051
1N5998	8.2	5.0	7.0	15	600	750	0.5	1.0	6.5	5.2	61	+0.055
1N5999	9.1	5.0	10	18	600	600	0.1	0.5	7.0	6.0	55	+0.061
1N6000	10	5.0	15	22	600	600	0.1	0.5	8.0	6.5	50	+0.065
1N6001	11	5.0	18	25	600	600	0.1	0.1	8.4	7.0	45	+0.068
1N6002	12	5.0	22	32	600	600	0.1	0.1	9.1	8.0	42	+0.073
1N6003	13	5.0	25	36	600	600	0.1	0.1	9.9	8.4	38	+0.075
1N6004	15	5.0	32	42	600	600	0.1	0.1	11	9.1	33	+0.079
1N6005	16	5.0	36	48	600	600	0.1	0.1	12	9.9	31	+0.080
1N6006	18	5.0	42	55	600	600	0.1	0.1	14	11	28	+0.083
1N6007	20	5.0	48	62	600	600	0.1	0.1	15	12	25	+0.085
1N6008	22	5.0	55	70	600	600	0.1	0.1	17	14	23	+0.087
1N6009	24	5.0	62	78	600	600	0.1	0.1	18	15	21	+0.090
1N6010	27	5.0	70	88	600	700	0.1	0.1	21	17	19	+0.091
1N6011	30	5.0	78	95	600	700	0.1	0.1	23	18	17	+0.093
1N6012	33	5.0	88	110	700	800	0.1	0.1	25	21	15	+0.094
1N6013	36	5.0	95	130	700	900	0.1	0.1	27	23	14	+0.094
1N6014	39	2.0	130	170	800	1000	0.1	0.1	30	25	13	+0.095
1N6015	43	2.0	150	180	900	1100	0.1	0.1	33	27	12	+0.095
1N6016	47	2.0	170	200	1000	1300	0.1	0.1	36	30	11	+0.096
1N6017	51	2.0	180	225	1300	1400	0.1	0.1	39	33	9.8	+0.096
1N6018	56	2.0	200	240	1400	1600	0.1	0.1	43	36	8.9	+0.096
1N6019	62	2.0	225	265	1400	1700	0.1	0.1	47	39	8.0	+0.097
1N6020	68	2.0	240	280	1600	2000	0.1	0.1	52	43	7.4	+0.097
1N6021	75	2.0	265	300	1700	2300	0.1	0.1	56	47	6.7	+0.098
1N6022	82	2.0	280	350	2000	2600	0.1	0.1	62	52	6.1	+0.098
1N6023	91	2.0	300	400	2300	3000	0.1	0.1	69	56	5.5	+0.099
1N6024	100	1.0	500	800	2600	4000	0.1	0.1	76	62	5.0	+0.110
1N6025	110	1.0	650	950	3000	4500	0.1	0.1	84	69	4.5	+0.110
1N6026	120	1.0	800	1250	4000	5000	0.1	0.1	91	76	4.2	+0.110
1N6027	130	1.0	950	1400	4500	5500	0.1	0.1	99	84	3.8	+0.110
1N6028	150	1.0	1250	1700	5000	6000	0.1	0.1	114	91	3.3	+0.110
1N6029	160	1.0	1400	2000	5500	7000	0.1	0.1	122	99	3.1	+0.110
1N6030	180	1.0	1700	2350	6000	8000	0.1	0.1	137	114	2.8	+0.110
1N6031	200	1.0	2000	2700	7000	9000	0.1	0.1	152	122	2.5	+0.110

*Indicates JEDEC Registered Data.

NOTE 1.
Zener impedance is derived from the 1KHz AC voltage which results when an AC current having an rms value equal to 10% of DC zener current (IZT or IZK) is superimposed on IZT or IZK.

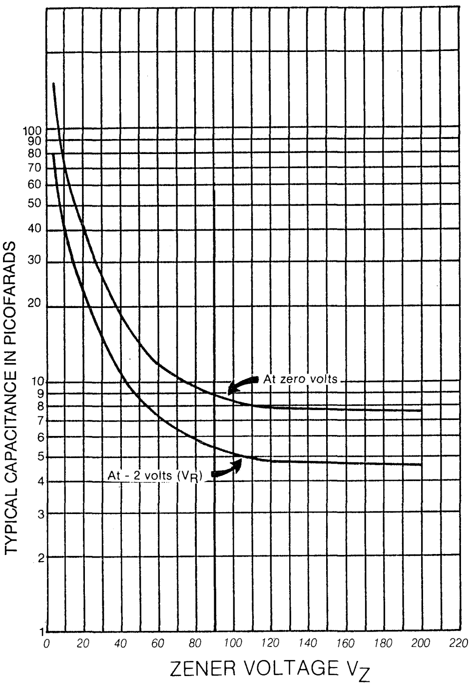
NOTE 2.
Voltage measurements to be performed 20 seconds after application of the DC test current.

NOTE 3.
The maximum zener current Izm shown is for the nominal voltages. The following formula can be used to determine the worst case current for any tolerance device.

$$Izm = \frac{P}{Vzm}$$

Where Vzm is the high end of the voltage tolerance specified and P is the rated power of the device.

CAPACITANCE vs. V_Z CURVE



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SCOTTSDALE, AZ

1N6309 thru 1N6355

500 mW Glass Zener Diodes

FEATURES

- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- MICROMINIATURE PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED (ABOVE 6.2 VOLTS)
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/533 for IN6309 to IN6336

MAXIMUM RATINGS

Operating Temperature: -65°C to +200°C
Storage Temperature: -65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE	V_{Z2} NOM. ±5% @ I_{Z2}	V_{Z1} MIN. @ I_{Z1} 250 μA	I_{Z2} TEST CURRENT	Z_Z @ I_{Z2}	Z_{ZK} @ 250 μA	I_{ZM}	$V_{Z(reg)}$ Δ VZ	I_{ZSM} SURGE	V_R	I_{R1} @ 25°C	I_{R2} @ T_A = 150°C	N_D @ 250 μA 1-3 kHz	αV_Z	C @ 0V
	VOLTS	VOLTS	mA	OHMS	OHMS	mA	VOLTS	AMPS	VOLTS	μA	μA	μV/√Hz	%/°C	pF
1N6309	2.4	1.1	20	30	1200	177	1.6	2.5	1.0	100	200	1.0	−.085	2000
1N6310	2.7	1.2	20	30	1300	157	1.6	2.2	1.0	60	150	1.0	−.080	1900
1N6311	3.0	1.3	20	29	1400	141	1.6	2.0	1.0	30	100	1.0	−.075	1800
1N6312	3.3	1.5	20	24	1400	128	1.6	1.8	1.0	5.0	20	1.0	−.065	1650
1N6313	3.6	1.8	20	22	1400	109	1.6	1.65	1.0	3.0	12	1.0	−.055 +.020	1600
1N6314	3.9	2.0	20	20	1700	118	1.6	1.5	1.0	2.0	12	1.0	−.043 +.025	1400
1N6315	4.3	2.4	20	18	1400	99	0.9	1.4	1.0	2.0	12	1.0	−.030 +.030	1350
1N6316	4.7	2.8	20	16	1500	90	0.5	1.27	1.5	5.0	12	1.0	−.028 +.032	1300
1N6317	5.1	3.3	20	14	1300	83	0.4	1.17	2.0	5.0	12	1.0	+.045	1200
1N6318	5.6	4.3	20	8.0	1200	76	0.4	1.10	2.5	5.0	10	2.0	+.050	1150
1N6319	6.2	5.2	20	3.0	800	68	0.3	0.97	3.5	5.0	10	5.0	.060	1050
1N6320	6.8	6.0	20	3.0	400	63	0.35	1.23	4.0	2.0	10	5.0	.062	1000
1N6321	7.5	6.6	20	4.0	400	57	0.4	1.16	5.0	2.0	10	5.0	.068	900
1N6322	8.2	7.5	20	5.0	400	52	0.4	1.07	6.0	1.0	10	20	.075	800
1N6323	9.1	8.4	20	6.0	500	47	0.5	0.97	7.0	1.0	10	40	.076	700
1N6324	10	9.1	20	6.0	500	43	0.5	.89	8.0	1.0	10	80	.079	600
1N6325	11	10	20	7.0	550	39	0.5	.83	8.5	1.0	10	100	.082	500
1N6326	12	11	20	7.0	550	35	0.55	.77	9.0	1.0	10	100	.083	450
1N6327	13	11.9	9.5	8.0	550	33	0.55	0.71	9.9	.05	10	100	.079	400
1N6328	15	13.8	8.5	10	600	28	.70	.62	11	.05	10	100	.082	350
1N6329	16	14.7	7.8	12	600	27	.75	.58	12	.05	10	100	.083	325
1N6330	18	16.6	7.0	14	600	24	.85	.52	14	.05	10	100	.085	300
1N6331	20	18.5	6.2	18	500	21	.95	.47	15	.05	10	100	.086	275
1N6332	22	20.4	5.6	20	500	19	1.05	.43	17	.05	10	100	.087	260
1N6333	24	22.3	5.2	24	500	18	1.15	.39	18	.05	10	100	.088	240
1N6334	27	25.2	4.6	27	500	16	1.30	.35	21	.05	10	100	+.090	220
1N6335	30	28	4.2	32	500	14	1.45	.31	23	.05	10	100	.091	200
1N6336	33	30.9	3.8	40	600	13	1.60	.28	25	.05	10	100	.092	185
1N6337	36	33.7	3.4	50	600	12	1.75	.26	27	.05	10	100	.093	175
1N6338	39	36.6	3.2	55	700	11	1.90	.24	30	.05	10	100	.094	170
1N6339	43	40.4	3.0	65	800	9.9	2.10	.22	33	.05	10	80	.095	165
1N6340	47	44.2	2.7	75	900	9.0	2.25	.20	36	.05	10	80	.095	155
1N6341	51	48	2.5	85	1000	8.3	2.50	.18	39	.05	10	80	.096	145
1N6342	56	52.7	2.2	100	1200	7.6	2.70	.17	43	.05	10	80	.097	135
1N6343	62	58.4	2.0	125	1300	6.8	2.90	.15	47	.05	10	80	.097	130
1N6344	68	64.1	1.8	155	1500	6.3	3.20	.13	52	.05	10	80	.098	120
1N6345	75	70.8	1.7	180	1600	5.7	3.40	.125	56	.05	10	80	.098	110
1N6346	82	77.4	1.5	220	1800	5.2	3.80	.115	62	.05	10	80	.099	105
1N6347	91	86	1.4	270	2100	4.7	4.20	.100	69	0.05	10	80	.099	100
1N6348	100	94.5	1.3	340	2400	4.3	4.40	.095	76	0.05	10	80	.110	95
1N6349	110	104	1.1	500	2800	3.9	4.80	.085	84	0.05	10	80	.110	90
1N6350	120	113	1.0	600	3200	3.5	5.20	.080	91	0.05	10	80	.110	70
1N6351	130	122	0.95	850	4100	3.3	5.60	.070	99	0.05	10	80	.110	70
1N6352	150	141	.85	1000	4500	2.8	7.00	.065	114	0.05	10	80	.110	65
1N6353	160	151	.80	1200	5000	2.7	7.50	.060	122	0.05	10	80	.110	65
1N6354	180	170	.68	1500	5600	2.4	9.00	.050	137	0.05	10	80	.110	60
1N6355	200	189	.65	1800	6500	2.1	12.0	.045	152	0.05	10	80	.110	55

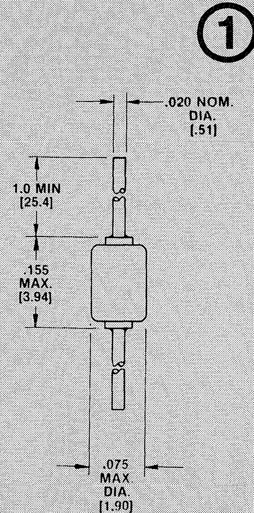

FIGURE 1
Package C

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass.

LEAD MATERIAL: Copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

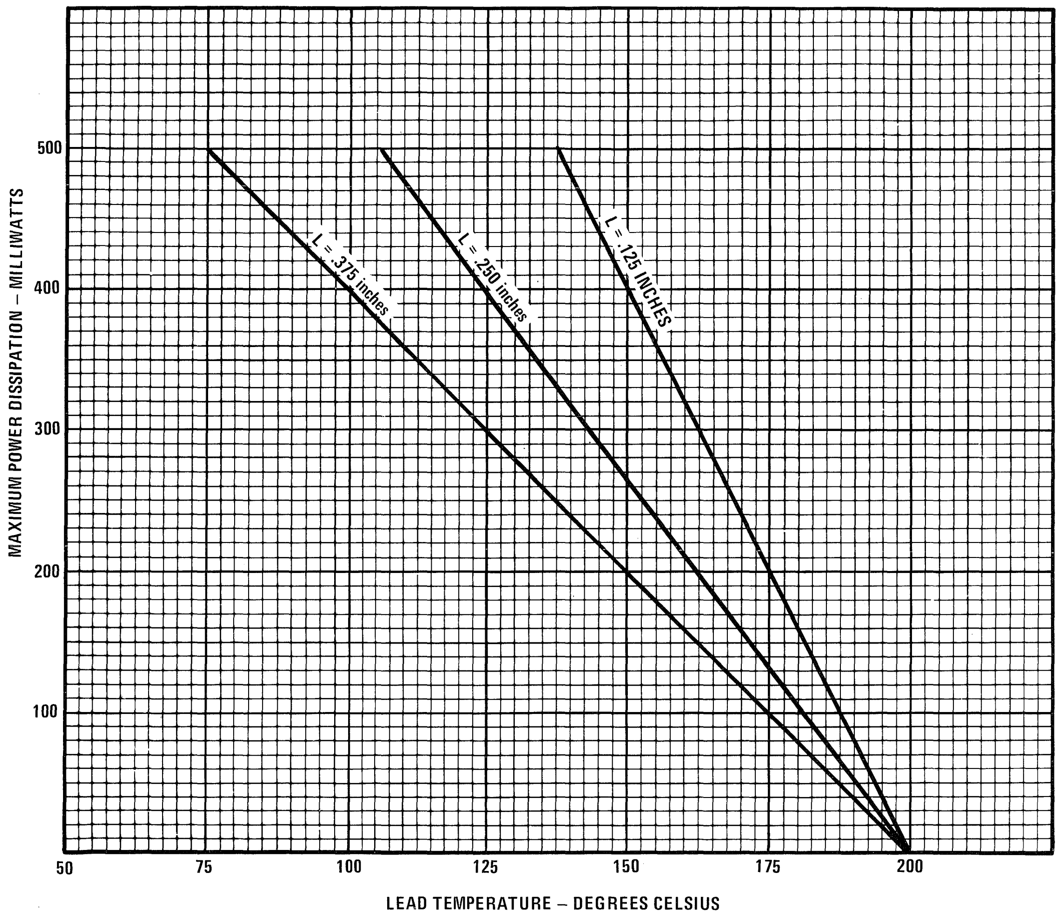

FIGURE 2. MAXIMUM POWER VS. LEAD TEMPERATURE

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1EZ110D5 thru 1EZ200D5

SILICON 1 WATT ZENER DIODE

①

FEATURES

- ZENER VOLTAGE 110 V TO 200 V
- WITHSTANDS LARGE SURGE STRESSES
- ALSO AVAILABLE IN GLASS. (See Note 6.)

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 1 Watt
Power Derating: 13.3 mW/°C above 100°C
Forward Voltage @ 200 mA: 1.2 volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICRO TYPE NUMBER Note 1	NOMINAL ZENER VOLTAGE (Note 2 & 5)		MAXIMUM ZENER IMPEDANCE Note 3			MAXIMUM RATED ZENER CURRENT @ 100°C	TYPICAL TEMP. COEF. OF ZENER VOLTAGE	MAXIMUM SURGE CURRENT I_S
	V_Z @ I_{ZT}		Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_{ZM}		
	VOLTS	mA	OHMS	OHMS	mA	mA	%/°C	A
1EZ110D5	110	2.3	570	5200	0.25	8.3	+0.095	0.15
1EZ120D5	120	2.0	710	5800	0.25	8.0	+0.095	0.14
1EZ130D5	130	1.9	910	6500	0.25	6.9	+0.095	0.13
1EZ140D5	140	1.8	1100	7000	0.25	6.5	+0.095	0.12
1EZ150D5	150	1.7	1300	7500	0.25	5.7	+0.095	0.12
1EZ160D5	160	1.6	1400	8000	0.25	5.4	+0.095	0.11
1EZ170D5	170	1.5	1450	8500	0.25	5.2	+0.095	0.10
1EZ180D5	180	1.4	1500	9000	0.25	4.9	+0.095	0.10
1EZ190D5	190	1.3	1700	9500	0.25	4.7	+0.095	0.10
1EZ200D5	200	1.2	1900	10,000	0.25	4.6	+0.100	0.10

NOTE 1 Suffix 5 indicates ± 5% tolerance. Suffix 10 indicates ± 10%, no suffix indicates ± 20%. Also, Suffix 1 indicates ± 1%, 2nd suffix 2 indicates ± 2% on V_Z tolerance.

NOTE 2 Zener Voltage (V_Z) is measured in still air at a temperature of 25°C. The test currents (I_{ZT}) have been selected so that at nominal voltages the dissipation is a constant 0.25 watts. This results in a nominal junction temperature rise of 10°C.

NOTE 3 The Zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}.

NOTE 4 Maximum Surge Current is a non recurrent maximum peak reverse surge with a pulse width of 8.3 milliseconds at T_A 25°C (+8, −2°) C.

NOTE 5 Voltage measurements to be performed 90 seconds after application of DC current.

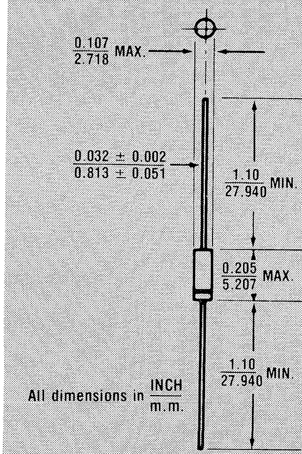


FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Molded encapsulation, axial lead package (Case J).

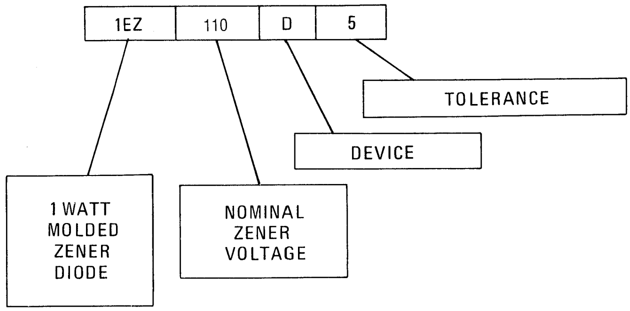
FINISH: Corrosion resistant. Leads are solderable.

THERMAL RESISTANCE: 75°C/Watt.

POLARITY: Banded end is cathode.

WEIGHT: 0.4 grams (Typical).

NOTE 6 Glass devices ordered by replacing E in the series type number with G.
Example: 1GZ110D5



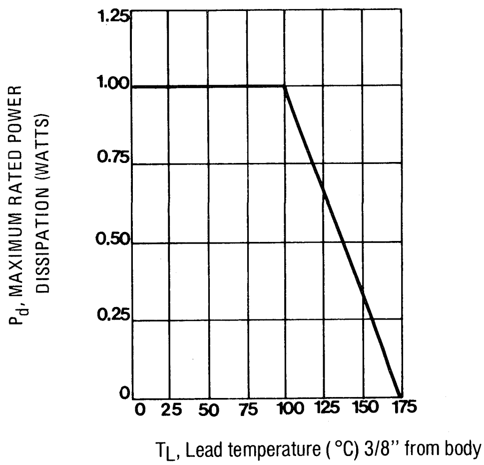


FIGURE 2 POWER DERATING CURVE

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2EZ3.6D5 THRU 2EZ200D5

SILICON 2 WATT ZENER DIODE

①

FEATURES

- **ZENER VOLTAGE 3.6 to 200V**
- **HIGH SURGE CURRENT RATING**
- **2 WATTS DISSIPATION IN A NORMALLY 1 WATT PACKAGE**

MAXIMUM RATINGS

Junction and Storage Temperature: −65°C to +175°C
DC Power Dissipation: 2 Watts
Power Derating: 20 mW/°C above 75°C
Forward Voltage @ 200 mA: 1.2 volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICRO TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE (Note 2)		MAXIMUM ZENER IMPEDANCE (Note 1)			MAXIMUM REVERSE LEAKAGE CURRENT		MAXIMUM ZENER CURRENT	MAXIMUM SURGE CURRENT (Note 4)
	V_Z	I_Z	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_R @ V_R		I_{ZM}	I_{SURGE}
	VOLTS	mA	OHMS	OHMS	mA	µA	VOLTS	mA	A
2EZ3.6D5	3.6	139	5.0	400	1.0	80	1.0	504	4.6
2EZ3.9D5	3.9	128	5.0	400	1.0	30	1.0	468	4.4
2EZ4.3D5	4.3	116	4.5	400	1.0	20	1.0	434	4.1
2EZ4.7D5	4.7	106	4.5	550	1.0	5.0	1.0	386	3.3
2EZ5.1D5	5.1	98	3.5	600	1.0	5.0	1.0	356	3.5
2EZ5.6D5	5.6	89.5	2.5	500	1.0	5.0	2.0	324	3.3
2EZ6.2D5	6.2	80.5	1.5	700	1.0	5.0	3.0	292	3.1
2EZ6.8D5	6.8	73.5	2.0	700	1.0	5.0	4.0	266	2.9
2EZ7.5D5	7.5	66.5	2.0	700	0.5	5.0	5.0	242	2.66
2EZ8.2D5	8.2	61	2.3	700	0.5	5.0	6.0	220	2.44
2EZ9.1D5	9.1	55	2.5	700	0.5	3.0	7.0	200	2.2
2EZ10D5	10	50	3.5	700	0.25	3.0	7.6	182	2.0
2EZ11D5	11	45.5	4.0	700	0.25	1.0	8.4	166	1.82
2EZ12D5	12	41.5	4.5	700	0.25	1.0	9.1	152	1.66
2EZ13D5	13	38.5	5.0	700	0.25	0.5	9.9	138	1.54
2EZ14D5	14	35.7	5.5	700	0.25	0.5	10.6	130	1.43
2EZ15D5	15	33.4	7.0	700	0.25	0.5	11.4	122	1.33
2EZ16D5	16	31.2	8.0	700	0.25	0.5	12.2	114	1.25
2EZ17D5	17	29.4	9.0	750	0.25	0.5	13.0	107	1.18
2EZ18D5	18	27.8	10	750	0.25	0.5	13.7	100	1.11
2EZ19D5	19	26.3	11	750	0.25	0.5	14.4	95	1.05
2EZ20D5	20	25	11	750	0.25	0.5	15.2	90	1.0
2EZ22D5	22	22.8	12	750	0.25	0.5	16.7	82	0.91
2EZ24D5	24	20.8	13	750	0.25	0.5	18.2	76	0.83
2EZ27D5	27	18.5	18	750	0.25	0.5	20.6	68	0.74
2EZ30D5	30	16.6	20	1000	0.25	0.5	22.5	60	0.67
2EZ33D5	33	15.1	23	1000	0.25	0.5	25.1	55	0.61
2EZ36D5	36	13.9	25	1000	0.25	0.5	27.4	50	0.56
2EZ39D5	39	12.8	30	1000	0.25	0.5	29.7	47	0.51
2EZ43D5	43	11.6	35	1500	0.25	0.5	32.7	43	0.45
2EZ47D5	47	10.6	40	1500	0.25	0.5	35.8	39	0.42
2EZ51D5	51	9.8	48	1500	0.25	0.5	38.8	36	0.39
2EZ56D5	56	9.0	55	2000	0.25	0.5	42.6	32	0.36
2EZ62D5	62	8.1	60	2000	0.25	0.5	47.1	29	0.32
2EZ68D5	68	7.4	75	2000	0.25	0.5	51.7	27	0.29
2EZ75D5	75	6.7	90	2000	0.25	0.5	56	24	0.27
2EZ82D5	82	6.1	100	3000	0.25	0.5	62.2	22	0.24
2EZ91D5	91	5.5	125	3000	0.25	0.5	69.2	20	0.22
2EZ100D5	100	5.0	175	3000	0.25	0.5	76.0	18	0.20
2EZ110D5	110	4.5	250	4000	0.25	0.5	83.6	17	0.18
2EZ120D5	120	4.2	325	4500	0.25	0.5	91.2	15	0.16
2EZ130D5	130	3.8	400	5000	0.25	0.5	98.8	14	0.15
2EZ140D5	140	3.6	500	5500	0.25	0.5	106.4	13	0.14
2EZ150D5	150	3.3	575	6000	0.25	0.5	114	12	0.13
2EZ160D5	160	3.1	650	6500	0.25	0.5	121.6	11	0.12
2EZ170D5	170	2.9	675	7000	0.25	0.5	130.4	11	0.12
2EZ180D5	180	2.8	725	7000	0.25	0.5	136.8	10	0.11
2EZ190D5	190	2.6	825	8000	0.25	0.5	144.8	10	0.10
2EZ200D5	200	2.5	900	8000	0.25	0.5	152	9	0.10

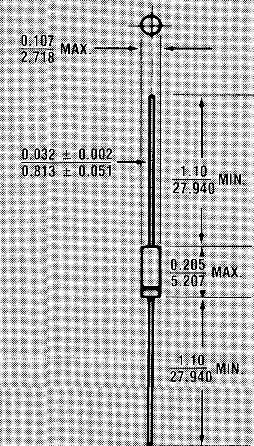


FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Molded encapsulation, axial lead package (Case J).

FINISH: Corrosion resistant. Leads are solderable.

THERMAL RESISTANCE: 45°C/Watt.

POLARITY: Banded end is cathode.

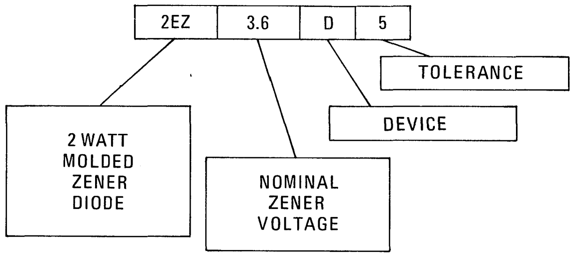
WEIGHT: 0.4 grams (Typical).

NOTE 1 Suffix 5 indicates ± 5% tolerance. Suffix 10 indicates ± 10%, no suffix indicates ± 20%. Also, Suffix 1 indicates ± 1%, 2nd suffix 2 indicates ± 2% on V_Z tolerance.

NOTE 2 V_Z measured after allowing a 90 sec. stabilization period when mounted with a ⅜″ minimum lead length from case.

NOTE 3 Dynamic Impedance, Z_Z, determined by superimposing I ac rms at 60 hz on I_{DC} where I ac rms = 10% I_{DC}.

NOTE 4 Maximum surge current is a maximum peak non-recurrent reverse surge with a maximum pulse width of 8.3 milliseconds.



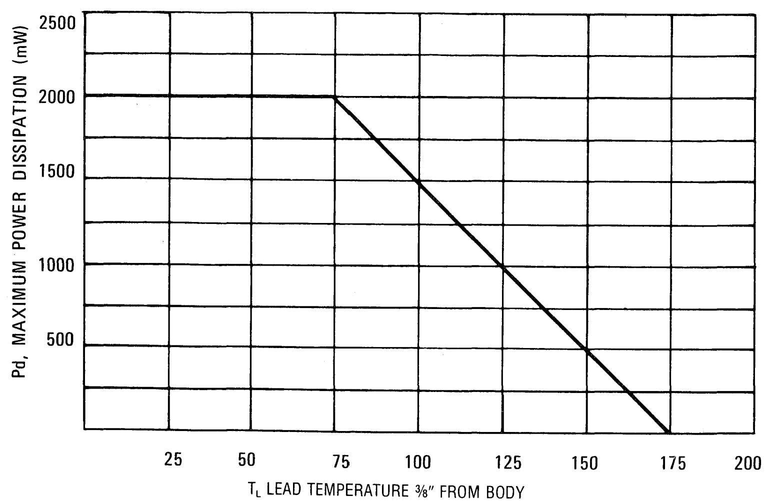


FIGURE 2 POWER DERATING CURVE

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3EZ3.9D5 thru 3EZ200D5

SILICON 3 WATT ZENER DIODE

FEATURES

- **ZENER VOLTAGE 3.9V to 200V**
- **HIGH SURGE CURRENT RATING**
- **3 WATTS DISSIPATION IN A NORMALLY 1 WATT PACKAGE**

MAXIMUM RATINGS

Junction and Storage Temperature: −65°C to +175°C
DC Power Dissipation: 3 Watts
Power Derating: 20 mW/°C above 25°C
Forward Voltage @ 200 mA: 1.2 volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICRO TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE (Note 2)		MAXIMUM ZENER IMPEDANCE (Note 3)			MAXIMUM REVERSE LEAKAGE CURRENT		MAXIMUM ZENER CURRENT	MAXIMUM SURGE CURRENT (Note 4)
	V_Z	I_Z	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_R @ V_R		I_{ZM}	I_{SURGE}
	VOLTS	mA	OHMS	OHMS	mA	µA	VOLTS	mA	A
3EZ3.9D5	3.9	192	4.5	400	1.0	80	1.0	630	4.4
3EZ4.3D5	4.3	174	4.5	400	1.0	30	1.0	590	4.1
3EZ4.7D5	4.7	160	4.0	500	1.0	20	1.0	550	3.8
3EZ5.1D5	5.1	147	3.5	550	1.0	5.0	1.0	520	3.5
3EZ5.6D5	5.6	134	2.5	600	1.0	5.0	2.0	480	3.3
3EZ6.2D5	6.2	121	1.5	700	1.0	5.0	3.0	435	3.1
3EZ6.8D5	6.8	110	2.0	700	1.0	5.0	4.0	393	2.9
3EZ7.5D5	7.5	100	2.0	700	0.5	5.0	5.0	360	2.66
3EZ8.2D5	8.2	91	2.3	700	0.5	5.0	6.0	330	2.44
3EZ9.1D5	9.1	82	2.5	700	0.5	3.0	7.0	297	2.2
3EZ10D5	10	75	3.5	700	0.25	3.0	7.6	270	2.0
3EZ11D5	11	68	4.0	700	0.25	1.0	8.4	225	1.82
3EZ12D5	12	63	4.5	700	0.25	1.0	9.1	246	1.66
3EZ13D5	13	58	4.5	700	0.25	0.5	9.9	208	1.54
3EZ14D5	14	53	5.0	700	0.25	0.5	10.6	193	1.43
3EZ15D5	15	50	5.5	700	0.25	0.5	11.4	180	1.33
3EZ16D5	16	47	5.5	700	0.25	0.5	12.2	169	1.25
3EZ17D5	17	44	6.0	750	0.25	0.5	13	150	1.18
3EZ18D5	18	42	6.0	750	0.25	0.5	13.7	159	1.11
3EZ19D5	19	40	7.0	750	0.25	0.5	14.4	142	1.05
3EZ20D5	20	37	7.0	750	0.25	0.5	15.2	135	1.0
3EZ22D5	22	34	8.0	750	0.25	0.5	16.7	123	0.91
3EZ24D5	24	31	9.0	750	0.25	0.5	18.2	112	0.83
3EZ27D5	27	28	10	750	0.25	0.5	20.6	100	0.74
3EZ28D5	28	27	12	750	0.25	0.5	21.	96	0.71
3EZ30D5	30	25	16	1000	0.25	0.5	22.5	90	0.67
3EZ33D5	33	23	20	1000	0.25	0.5	25.1	82	0.61
3EZ36D5	36	21	22	1000	0.25	0.5	27.4	75	0.56
3EZ39D5	39	19	28	1000	0.25	0.5	29.7	69	0.51
3EZ43D5	43	17	33	1500	0.25	0.5	32.7	63	0.45
3EZ47D5	47	16	38	1500	0.25	0.5	35.6	57	0.42
3EZ51D5	51	15	45	1500	0.25	0.5	38.8	53	0.39
3EZ56D5	56	13	50	2000	0.25	0.5	42.6	48	0.36
3EZ62D5	62	12	55	2000	0.25	0.5	47.1	44	0.32
3EZ68D5	68	11	70	2000	0.25	0.5	51.7	40	0.29
3EZ75D5	75	10	85	2000	0.25	0.5	56	36	0.27
3EZ82D5	82	9.1	95	3000	0.25	0.5	62.2	33	0.24
3EZ91D5	91	8.2	115	3000	0.25	0.5	69.2	30	0.22
3EZ100D5	100	7.5	160	3000	0.25	0.5	76	27	0.20
3EZ110D5	110	6.8	225	4000	0.25	0.5	83.6	25	0.18
3EZ120D5	120	6.3	300	4500	0.25	0.5	91.2	22	0.16
3EZ130D5	130	5.8	375	5000	0.25	0.5	98.8	21	0.15
3EZ140D5	140	5.3	475	5000	0.25	0.5	106.4	19	0.14
3EZ150D5	150	5.0	550	6000	0.25	0.5	114	18	0.13
3EZ160D5	160	4.7	625	6500	0.25	0.5	121.6	17	0.12
3EZ170D5	170	4.4	650	7000	0.25	0.5	130.4	16	0.12
3EZ180D5	180	4.2	700	7000	0.25	0.5	136.8	15	0.11
3EZ190D5	190	4.0	800	8000	0.25	0.5	144.8	14	0.10
3EZ200D5	200	3.7	875	8000	0.25	0.5	152	13	0.10

1

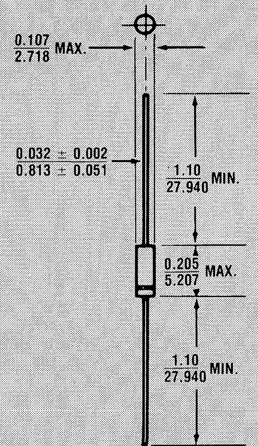


FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Molded encapsulation, axial lead package (Case J).

FINISH: Corrosion resistant. Leads are solderable.

THERMAL RESISTANCE: 45°C/Watt junction to lead at 0.375 inches from body.

POLARITY: Banded end is cathode.

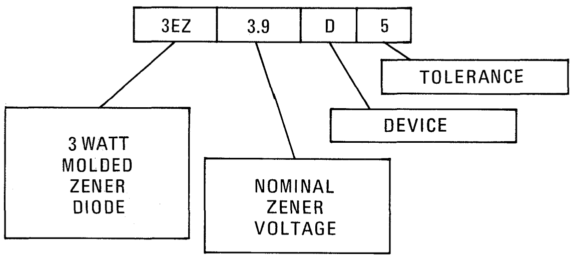
WEIGHT: 0.4 grams (Typical).

NOTE 1 Suffix 1 indicates ±1% tolerance. Suffix 2 indicates ±2% tolerance. Suffix 3 indicates ±3% tolerance. Suffix 4 indicates ±4% tolerance. Suffix 5 indicates ±5% tolerance. Suffix 10 indicates ±10%, no suffix indicates ±20%.

NOTE 2 V_Z measured by applying I_Z 40_{MS} $\pm 10_{MS}$ prior to reading. Mounting contacts are located 3/8" to 1/2" from inside edge of mounting clips. Ambient temperature, $T_A = 25°C$ (+8°C/−2°C).

NOTE 3 Dynamic Impedance, Z_Z, measured by superimposing I ac rms at 60 hz on I_{DC} where I ac rms = 10% I_{DC}.

NOTE 4 Maximum surge current is a maximum peak non-recurrent reverse surge with a maximum pulse width of 8.3 milliseconds.



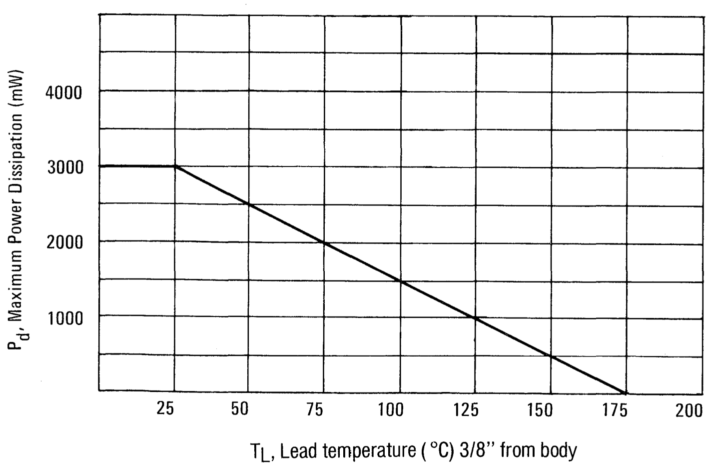


FIGURE 2 POWER DERATING CURVE

MZ5806 thru MZ5891 and MZ5210 thru MZ5240

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SCOTTSDALE, AZ

5-WATT GLASS ZENER DIODES

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- HIGH PERFORMANCE CHARACTERISTICS
- VERY LOW THERMAL IMPEDANCE

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C
Storage Temperature: −65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE	ELECTRICAL SPECIFICATIONS AT 25°C								MAXIMUM RATINGS	
	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT}	TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_Z @ I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZK} @ I_{ZK} 1mA	REGULATION ΔBV	MAXIMUM REVERSE LEAKAGE CURRENT VOLTAGE I_R	MAXIMUM REVERSE LEAKAGE CURRENT VOLTAGE V_R	MAXIMUM TEMPERATURE COEFF. T_C @ I_{ZT}	MAXIMUM CONTINUOUS CURRENT I_{ZM}	SURGE CURRENT I_S
10%	VOLTS	mA	OHMS	OHMS	VOLTS	μA	VOLTS	%/°C	mA	AMPS
MZ5806	6.8	175	1.0	1000	0.7	300	5.2	.05	700	40
MZ5807	7.5	175	1.5	800	0.7	200	5.7	.06	630	32
MZ5808	8.2	150	1.5	600	0.7	100	6.2	.06	580	24
MZ5809	9.1	150	2.0	400	0.7	50	6.9	.06	520	22
MZ5810	10.0	125	2.0	125	0.8	25	7.6	.07	475	20
MZ5811	11	125	2.5	130	0.8	15	8.4	.07	430	19
MZ5812	12	100	2.5	140	0.8	10	9.1	.07	395	18
MZ5813	13	100	3.0	145	0.8	10	9.9	.08	365	16
MZ5814	14	100	3.0	145	0.9	10	11.2	.08	320	14
MZ5815	15	75	3.5	150	1.0	5	11.4	.08	315	12
MZ5816	16	75	3.5	155	1.1	5	12.2	.08	294	10
MZ5818	18	65	4.0	160	1.2	5	13.7	.085	264	9.0
MZ5820	20	65	4.5	165	1.5	2	15.2	.085	237	8.0
MZ5822	22	50	5.0	170	1.8	2	16.7	.085	216	7.0
MZ5824	24	50	5.0	175	2.0	2	18.2	.090	198	6.5
MZ5827	27	50	6.0	180	2.0	2	20.6	.090	176	6.0
MZ5830	30	40	8	190	2.5	2	22.8	.090	158	5.5
MZ5833	33	40	10	200	2.8	2	25.1	.095	144	5.0
MZ5836	36	30	11	220	3.0	2	27.4	.095	132	4.5
MZ5839	39	30	14	230	3.0	2	29.7	.095	122	4.0
MZ5840	40	30	14	230	3.0	2	30.4	.095	116	4.0
MZ5843	43	30	20	240	3.3	2	32.7	.095	110	3.5
MZ5845	45	30	20	240	3.3	2	34.2	.095	105	3.5
MZ5847	47	25	25	250	3.5	2	35.8	.095	100	3.2
MZ5850	50	25	25	260	3.8	2	36.6	.095	96	3.0
MZ5851	51	25	27	270	4.0	2	38.8	.095	92	3.0
MZ5856	56	20	35	320	4.4	2	42.6	.095	84	2.8
MZ5860	60	20	40	360	4.8	2	45.7	.100	78	2.5
MZ5862	62	20	42	400	5.0	2	47.1	.100	76	2.5
MZ5868	68	20	50	500	5.5	2	51.7	.100	70	2.2
MZ5870	70	20	50	580	5.8	2	53.6	.100	65	2.3
MZ5875	75	20	55	620	6.0	2	56.0	.100	63.0	2.0
MZ5880	80	15	80	670	6.4	2	58.6	.100	60.5	1.8
MZ5882	82	15	80	720	6.6	2	62.2	.100	58.0	1.8
MZ5890	90	15	90	740	7.3	2	66.8	.100	54.8	1.6
MZ5891	91	15	90	760	7.5	2	69.2	.100	52.5	1.6
MZ5210	100	12	110	800	8.0	2	76.0	.100	47.5	1.4
MZ5211	110	12	125	1000	9.0	2	83.6	.100	43.0	1.2
MZ5212	120	10	170	1150	10	2	91.2	.100	39.5	1.00
MZ5213	130	10	190	1250	11	2	98.8	.105	36.6	0.80
MZ5214	140	8	230	1350	12	2	102.6	.105	33	0.80
MZ5215	150	8	330	1500	13	2	114.0	.105	31.6	0.75
MZ5216	160	8	350	1650	14	2	121.6	.105	29.4	0.70
MZ5217	170	8	380	1700	15	2	129.2	.105	27.0	0.65
MZ5218	180	5	450	1750	16	2	136.8	.110	26.4	0.60
MZ5219	190	5	470	1800	17	2	148.6	.110	24.0	0.55
MZ5220	200	5	500	1850	18	2	152	.110	23.6	0.50
MZ5222	220	5	550	2000	19	2	167	.115	21.6	0.50
MZ5224	240	5	650	2050	22	2	182	.115	19.8	0.40
MZ5226	260	5	750	2075	24	2	198	.120	18.6	0.35
MZ5227	270	5	800	2100	25	2	206	.120	17.5	0.35
MZ5228	280	4	850	2125	26	2	217	.120	16.0	0.30
MZ5230	300	4	950	2150	28	2	228	.120	15.6	0.30
MZ5232	320	4	1100	2175	30	2	242	.120	14.8	0.27
MZ5233	330	4	1175	2200	32	2	251	.120	14.4	0.25
MZ5234	340	4	1200	2250	33	2	263	.120	13.0	0.23
MZ5236	360	3	1400	2300	35	2	274	.120	13.0	0.22
MZ5238	380	3	1500	2400	38	2	286	.120	12.0	0.21
MZ5239	390	3	1800	2500	40	2	297	.120	12.0	0.20
MZ5240	400	3	1800	2600	42	2	300	.120	11.0	0.20

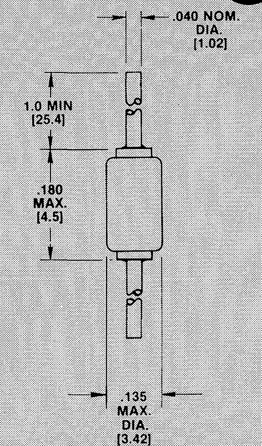

FIGURE 1
PACKAGE E

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper or tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

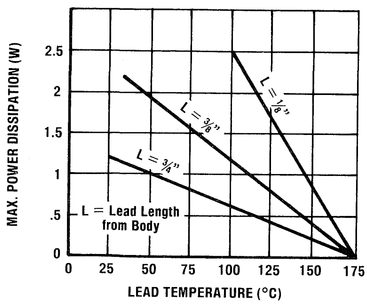

FIGURE 2
POWER DISSIPATION
vs. LEAD TEMPERATURE DERATING CURVE

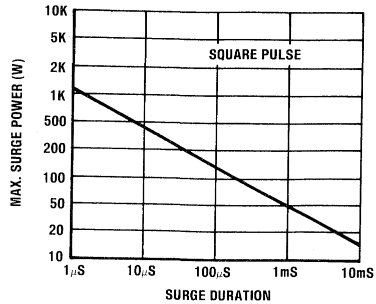

FIGURE 3
vs. SURGE DURATION

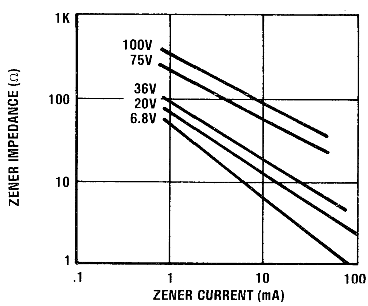

FIGURE 4
TYPICAL ZENER IMPEDANCE
vs. ZENER CURRENT

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TS04700 thru TS10000

LOW VOLTAGE AVALANCHE DIODES

1

FEATURES

- Low voltage avalanche zener diodes.
- Considerably sharper breakdown than standard 4-10 volt zeners.
- Suppressed field emission breakdown mechanism produces avalanche breakdown with sharpest knee available.
- Glass passivated planar die.
- Rugged subminiature DO-35 package.
- Reference voltages at < 1μW power consumption.
- ΔV_Z <100mV from 100μA to 1mA.

MAXIMUM RATINGS

Junction and Storage Temperature: −65°C to +200°C.
DC Power Dissipation: 500mW.
Power Derating: 4mW/°C above 75°C.
Forward Voltage at 100mA: 1V Maximum.

ELECTRICAL CHARACTERISTICS

DEVICE TYPE	NOMINAL ZENER VOLTAGE (1) @ I_Z (V)	I_Z (μA)	MAXIMUM VOLTAGE REGULATION ΔV_Z (V)	MAXIMUM REVERSE LEAKAGE CURRENT I_R (μA)	@ V_R (V)	MAXIMUM D.C. ZENER CURRENT I_{ZM} (mA)
TS04700	4.7	1000	0.25 (2)	1.0	2.0	100
TS05100	5.1	250	0.25 (3)	1.0	3.0	96
TS05600	5.6	25	0.1 (4)	1.0	4.5	80
TS0600	6.0	1	0.1 (5)	.025	4.8	75
TS06200	6.2	1	0.1 (5)	.025	5.0	72
TS06800	6.8	1	0.1 (5)	.025	5.2	66
TS07100	7.1	1	0.1 (5)	.025	5.7	64
TS07500	7.5	1	0.1 (5)	.010	6.0	60
TS08200	8.2	1	0.1 (5)	.010	6.5	58
TS08700	8.7	1	0.1 (6)	.010	7.0	54
TS09100	9.1	1	0.1 (6)	.010	7.2	52
TS10000	10.0	1	0.1 (6)	.010	8.0	47

NOTES:
(1) All voltages are ±5% tolerance.
(2) ΔV_Z @ 10mA minus V_Z @ 1mA.
(3) ΔV_Z @ 1mA minus V_Z @ 100 μA.
(4) ΔV_Z @ 1mA minus V_Z @ 25 μA.
(5) ΔV_Z @ 1mA minus V_Z @ 1 μA.
(6) ΔV_Z @ 1mA minus V_Z @ 100 nA.

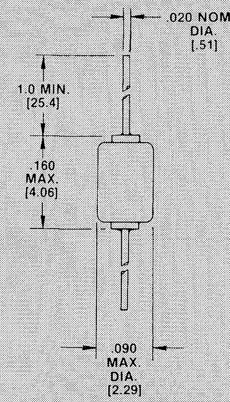

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case.
Lead Material: Tinned copper.
Marking: Body painted, alpha numeric.
Polarity: Cathode band.

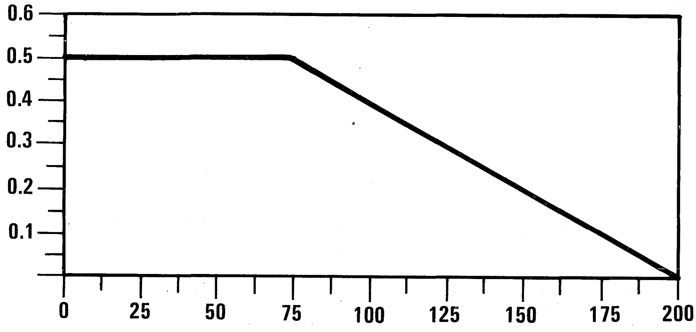

FIGURE 2. POWER DERATING CURVE

ZERO TEMPERATURE COMPENSATED REFERENCE DIODES (T.C.s) ②

SECTION 2

QUICK REFERENCE GUIDE
MICROSEMI VOLTAGE REFERENCE (TC) DIODES

Nominal Voltage Vz @ IZT	Test Current IZT mA	Case Type	Operating Temperature Range, °C	0.01%/°C Type Number	0.01%/°C Δ VZ MV	0.005%/°C Type Number	0.005%/°C Δ VZ MV	0.002%/°C Type Number	0.002%/°C Δ VZ MV	0.001%/°C Type Number	0.001%/°C Δ VZ MV	0.0005%/°C Type Number	0.0005%/°C Δ VZ MV	0.0002%/°C Type Number	0.0002%/°C Δ VZ MV	Catalog Page No.
6.2	7.5	DO-7/DO-35	−55 to +100	1N821	96	1N823	48	1N825	19	1N827	9	1N829	5			121/123
6.2	7.5	DO-7/DO-35	−55 to +100	1N821A	96	1N823A	48	1N825A	19	1N827A	9	1N829A	5			
6.3	7.5	DO-7	−55°C to +100°C									1N3553	5			
6.35	7.5	DO-7	+25°C to +100°C							1N3501	20	1N3502	5			131
										1N3503	20					
										1N3504	20					
6.4	0.5	DO-7/DO-35	0 to + 75	1N4565	48	1N4566	24	1N4567	10	1N4568	5	1N4569	2.2			137 139
	0.5		−55 to +100	1N4565A	99	1N4566A	50	1N4567A	20	1N4568A	10	1N4569A	5			
	1.0		0 to + 75	1N4570	48	1N4571	24	1N4572	10	1N4573	5	1N4574	2.2			
	1.0		−55 to +100	1N4570A	99	1N4571A	50	1N4572A	20	1N4573A	10	1N4574A	5			
	2.0		0 to + 75	1N4575	48	1N4576	24	1N4577	10	1N4578	5	1N4579	2.2			
	2.0		−55 to +100	1N4575A	99	1N4576A	50	1N4577A	20	1N4578A	10	1N4579A	5			
	4.0		0 to + 75	1N4580	99	1N4581	24	1N4582	10	1N4583	5	1N4584	2.2			
	4.0		−55 to +100	1N4580A	99	1N4581A	50	1N4582A	20	1N4583A	10	1N4584A	5			
6.5	7.5	DO-7	−55°C to +100°C	1N3779	99	1N3781	50	1N3782	20	1N3783	10	1N3784	5			
				1N3780	99											
6.6	2.0	DO-7	−55°C to +100°C			1N4611	50	1N4611A	20	1N4611B	10	1N4611C	5			
	5.0					1N4612	50	1N4612A	20	1N4612B	10	1N4612C	5			
	10.0					1N4613	50	1N4613A	20	1N4613B	10	1N4613C	5			
8.4	10	DO-7	−55 to +100	1N3154	130	1N3155	65	1N3156	26	1N3157	13					129
8.4	10	DO-7	−55 to +150	1N3154A	172	1N3155A	85	1N3156A	34	1N3157A	17					
8.5	0.5	DO-7	0 to + 75	1N4775	64	1N4776	32	1N4777	13	1N4778	6	1N4779	3.2			143
	0.5		−55 to +100	1N4775A	132	1N4776A	66	1N4777A	26	1N4778A	13	1N4779A	6.6			
	1.0		0 to + 75	1N4780	64	1N4781	32	1N4782	13	1N4783	6	1N4784	3.2			
	1.0		−55 to +100	1N4780A	132	1N4781A	66	1N4782A	26	1N4783A	13	1N4784A	6.6			
9.0	7.5	DO-7	0 to + 75	1N935	67	1N936	33	1N937	13	1N938	6	1N939	3	1N940	1.3	125
	7.5		−55 to +100	1N935A	139	1N936A	69	1N937A	27	1N938A	13	1N939A	7	1N940A	2.7	
	7.5		−55 to +150	1N935B	184	1N936B	92	1N937B	37	1N938B	18	1N939B	9	1N940B	3.7	
9.1	0.5	DO-7	0 to + 75	1N4765	68	1N4766	34	1N4767	14	1N4768	7	1N4769	3			141
	0.5		−55 to +100	1N4765A	141	1N4766A	70	1N4767A	28	1N4768A	14	1N4769A	7			
	1.0		0 to + 75	1N4770	68	1N4771	34	1N4772	14	1N4773	7	1N4774	3			
	1.0		−55 to +100	1N4770A	141	1N4771A	70	1N4772A	28	1N4773A	14	1N4774A	7			
11.7	7.5	DO-7	0 to + 75	1N941	88	1N942	44	1N943	18	1N944	9	1N945	4	1N945	1.8	127
	7.5	DO-7	−55 to +100	1N941A	181	1N942A	90	1N943A	36	1N944A	18	1N945A	9	1N946A	3.6	
	7.5	DO-7	−55 to +150	1N941B	239	1N942B	120	1N943B	47	1N944B	24	1N945B	12	1N946B	4.7	
12.8	0.5	DO-7	+25 to +100	1N4896	96	1N4897	48	1N4898	19	1N4899	10					149
	0.5		−55 to +100	1N4896A	198	1N4897A	99	1N4898A	40	1N4899A	20					
	1.0		+25 to +100	1N4900	96	1N4901	48	1N4902	19	1N4903	10					
	1.0		−55 to +100	1N4900A	198	1N4901A	99	1N4902A	40	1N4903A	20					
	2.0		+25 to +100	1N4904	96	1N4905	48	1N4906	19	1N4907	10					
	2.0		−55 to +100	1N4904A	198	1N4905A	99	1N4906A	40	1N4907A	20					
	4.0		+25 to +100	1N4908	96	1N4909	48	1N4910	19	1N4911	10					
	4.0		−55 to +100	1N4908A	198	1N4909A	99	1N4910A	40	1N4911A	20					
	7.5		+25 to +100	1N4912	96	1N4913	48	1N4914	19	1N4915	10					
	7.5		−55 to +100	1N4912A	198	1N4913A	99	1N4914A	40	1N4915A	20					
19.2	0.5	DO-7	+25 to +100	1N4916	144	1N4917	72	1N4918	29							151
	0.5		−55 to +100	1N4916A	298	1N4917A	149	1N4918A	60							
	1.0		+25 to +100	1N4919	144	1N4920	72	1N4921	29							
	1.0		−55 to +100	1N4919A	298	1N4920A	149	1N4921A	60							
	2.0		+25 to +100	1N4922	144	1N4923	72	1N4924	29							
	2.0		−55 to +100	1N4922A	298	1N4923A	149	1N4924A	60							
	4.0		+25 to +100	1N4925	144	1N4926	72	1N4927	29	1N4928	14					
	4.0		−55 to +100	1N4925A	298	1N4926A	149	1N4927A	60	1N4928A	30					
	7.5		+25 to +100	1N4929	144	1N4930	72	1N4931	29	1N4932	14					
	7.5		−55 to +100	1N4929A	298	1N4930A	149	1N4931A	60	1N4932A	30					
124 to 200	10 to 2.5	Epoxy Case CC DD & EE	−55 to +100			1N4057 to 1N4085		1N4057A to 1N4085A								135

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1N821 & A thru 1N829 & A DO-7

6.2 & 6.55 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 6.2 V AND 6.55 V
- 1N821, 823, 825, 827 AND 829 HAVE JAN, JANTX, JANTXV AND -1 QUALIFICATIONS TO MIL-S-19500/159
- S1N827A
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 5)
- ALSO AVAILABLE IN DO-35 PACKAGE
- JANS EQUIVALENT AVAILABLE VIA SCD

MAXIMUM RATINGS

Operating Temperatures: - 65°C to + 175°C
Storage Temperatures: - 65°C to + 175°C
DC Power Dissipation: 250 mW @ 25°C ambient
Derating: 1.67 mW/°C above 25°C

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	ZENER VOLTAGE (Note 1 and 4) V_Z @ I_{ZT}	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 3 and 4) Z_{ZT}	VOLTAGE TEMPERATURE STABILITY (ΔV_{ZT} MAX) −55° to +100° (Note 3 and 4)	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	mV	%/°C
1N821	5.9 - 6.5	7.5	15	96	0.01
1N821A	5.9 - 6.5	7.5	10	96	0.01
1N822†	5.9 - 6.5	7.5	15	96	0.01
1N823	5.9 - 6.5	7.5	15	48	0.005
1N823A	5.9 - 6.5	7.5	10	48	0.005
1N824†	5.9 - 6.5	7.5	15	48	0.005
1N825	5.9 - 6.5	7.5	15	19	0.002
1N825A	5.9 - 6.5	7.5	10	19	0.002
1N826	6.2 - 6.9	7.5	15	20	0.002
1N827	5.9 - 6.5	7.5	15	9	0.001
1N827A	5.9 - 6.5	7.5	10	9	0.001
1N828	6.2 - 6.9	7.5	15	10	0.001
1N829	5.9 - 6.5	7.5	15	5	0.0005
1N829A	5.9 - 6.5	7.5	10	5	0.0005

† Double Anode; Electrical Specifications Apply Under Both Bias Polarities.

*JEDEC Registered Data

NOTE 1 When ordering devices with tighter tolerances than specified, use a nominal V_Z voltage of 6.35V.

NOTE 2 Measured by superimposing 0.75 mA ac rms on 7.5 mA DC @ 25°C.

NOTE 3 The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 4 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 5 Designate Radiation Hardened devices with "RH" prefix instead of "1N", i.e., RH829A instead of 1N829A.

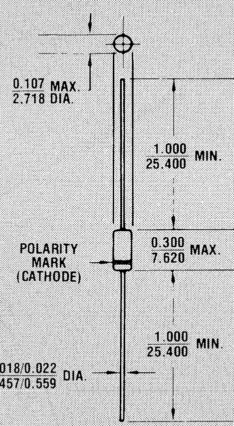

FIGURE 1

All dimensions in INCH / m.m

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7 (DO-204AA).
FINISH: All external surfaces are corrosion resistant and leads solderable.
THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.
POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.
WEIGHT: 0.2 grams.
MOUNTING POSITION: Any

The curve shown in Figure 3 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 7.5 mA.

EXAMPLE: A diode in this series is operated at a current of 7.5mA and has specified Temperature Coefficient (TC) limits of ±0.005%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 3.

At a test current of 6.0mA the change in Temperature Coefficient (TC) is approximately −0.0006%/°C. The algebraic sum of ±0.005%/°C and −0.0006%/°C gives the new estimated limits of +0.0044%/°C and −0.0056%/°C.

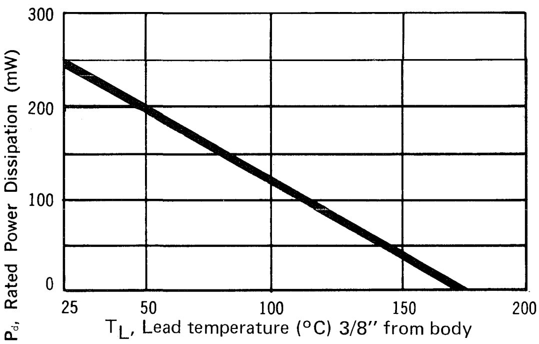

FIGURE 2
POWER DERATING CURVE

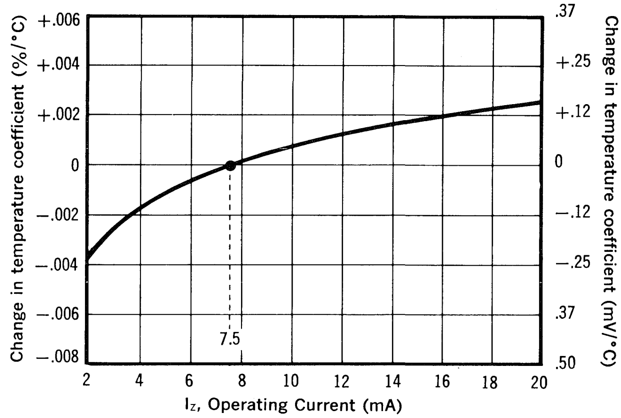

FIGURE 3
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT

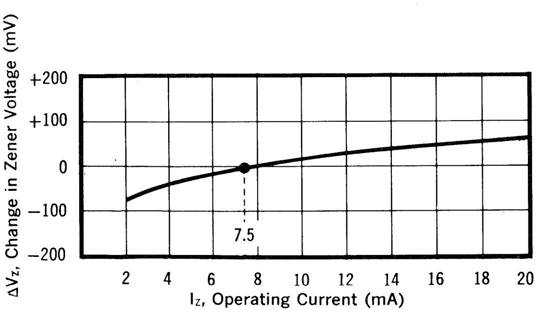

FIGURE 4

TYPICAL CHANGE OF ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT

This curve in Figure 4 illustrates the change of diode voltage arising from the effect of impedance. It is in effect an exploded view of the zener operating region of the I-V characteristic.

In conjunction with Figure 3, this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

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1N821 & A thru 1N829 & A DO-35

6.2 & 6.55 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 6.2 V AND 6.55 V
- 1N821, 823, 825, 827 AND 829 HAVE JAN, JANTX, JANTXV-1 QUALIFICATIONS TO MIL-S-19500/159
- JANS EQUIVALENT AVAILABLE VIA SCD
- ALSO AVAILABLE IN DO-7 PACKAGE

MAXIMUM RATINGS

Operating Temperatures: - 65°C to + 175°C
Storage Temperatures: - 65°C to + 175°C
DC Power Dissipation: 250 mW @ 25°C ambient
Derating: 1.67 mW/°C above 25°C

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	ZENER VOLTAGE (Note 1 and 4) V_Z @ I_{ZT}	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 3 and 4) Z_{ZT}	VOLTAGE TEMPERATURE STABILITY (ΔV_{ZT} MAX) −55° to +100° (Note 3 and 4)	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	mV	%/°C
1N821	5.9 - 6.5	7.5	15	96	0.01
1N821A	5.9 - 6.5	7.5	10	96	0.01
1N822†	5.9 - 6.5	7.5	15	96	0.01
1N823	5.9 - 6.5	7.5	15	48	0.005
1N823A	5.9 - 6.5	7.5	10	48	0.005
1N824†	5.9 - 6.5	7.5	15	48	0.005
1N825	5.9 - 6.5	7.5	15	19	0.002
1N825A	5.9 - 6.5	7.5	10	19	0.002
1N826	6.2 - 6.9	7.5	15	20	0.002
1N827	5.9 - 6.5	7.5	15	9	0.001
1N827A	5.9 - 6.5	7.5	10	9	0.001
1N828	6.2 - 6.9	7.5	15	10	0.001
1N829	5.9 - 6.5	7.5	15	5	0.0005
1N829A	5.9 - 6.5	7.5	10	5	0.0005

† Double Anode; Electrical Specifications Apply Under Both Bias Polarities.
*JEDEC Registered Data

NOTE 1 When ordering devices with tighter tolerances than specified, use a nominal V_Z voltage of 6.35 V.

NOTE 2 Measured by superimposing 0.75 mA ac rms on 7.5 mA DC @ 25°C.

NOTE 3 The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 4 Voltage measurements to be performed 15 seconds after application of DC current.

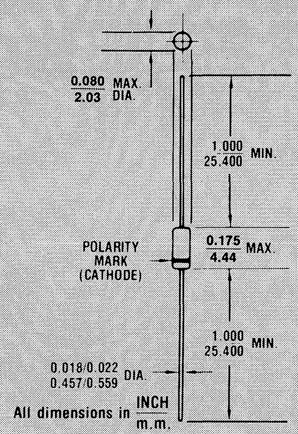

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35 (DO-204AH).
FINISH: All external surfaces are corrosion resistant and leads solderable.
THERMAL RESISTANCE: 150°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100°C/W at zero distance from body.
POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.
WEIGHT: 0.2 grams.
MOUNTING POSITION: Any

The curve shown in Figure 3 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 7.5 mA.

EXAMPLE: A diode in this series is operated at a current of 7.5mA and has specified Temperature Coefficient (TC) limits of ±0.005%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 3.

At a test current of 6.0mA the change in Temperature Coefficient (TC) is approximately −0.0006%/°C. The algebraic sum of ±0.005%/°C and −0.0006%/°C gives the new estimated limits of +0.0044%/°C and −0.0056%/°C.

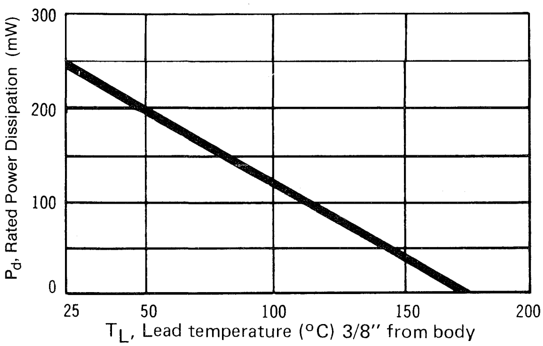

FIGURE 2
POWER DERATING CURVE

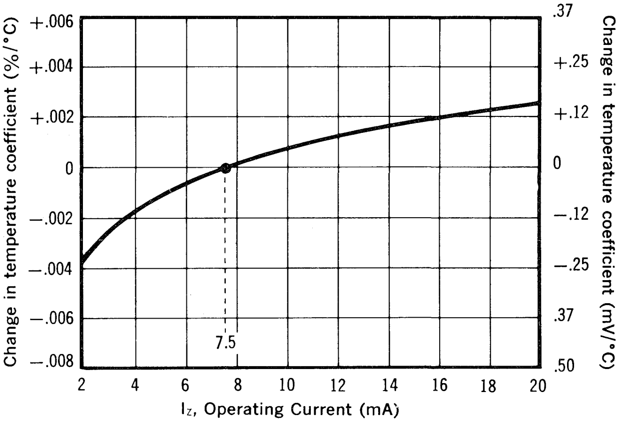

FIGURE 3
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT

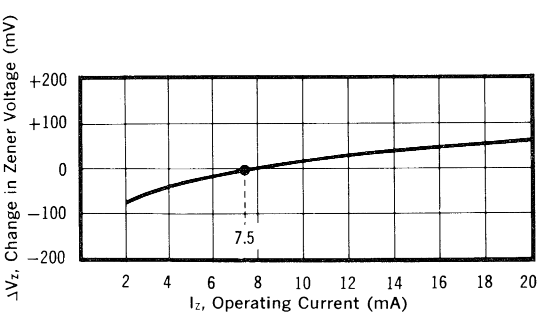

FIGURE 4
TYPICAL CHANGE OF ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT

This curve in Figure 4 illustrates the change of diode voltage arising from the effect of impedance. It is in effect an exploded view of the zener operating region of the I-V characteristic.

In conjunction with Figure 3, this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

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1N935, A & B thru 1N940, A & B

9.0 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

2

FEATURES

- ZENER VOLTAGE 9.0V ± 5% (See Note 1)
- IN935B, 937B, 938B, 939B, 940B HAVE JAN, JANTX, JANTXV, AND -1 QUALIFICATIONS TO MIL-S-19500/156
- S1N939A
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 5)
- JANS EQUIVALENT AVAILABLE VIA SCD

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C
DC Power Dissipation: 500 mW @ 25°C.
Power Derating: 3.33 mW/°C above 25°C.

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBERS	ZENER VOLTAGE V_Z @ I_{ZT} (NOTE 1 & 4)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (NOTE 2) Z_{ZT}	VOLTAGE TEMPERATURE STABILITY (NOTE 3 & 4) ΔV_{ZT} MAXIMUM	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	mV	°C	%/°C
1N935	8.55-9.45	7.5	20	67	0 to + 75	0.01
1N935A	8.55-9.45	7.5	20	139	−55 to +100	0.01
1N935B	8.55-9.45	7.5	20	184	−55 to +150	0.01
1N936	8.55-9.45	7.5	20	33	0 to + 75	0.005
1N936A	8.55-9.45	7.5	20	69	−55 to +100	0.005
1N936B	8.55-9.45	7.5	20	92	−55 to +150	0.005
1N937	8.55-9.45	7.5	20	13	0 to + 75	0.002
1N937A	8.55-9.45	7.5	20	27	−55 to +100	0.002
1N937B	8.55-9.45	7.5	20	37	−55 to +150	0.002
1N938	8.55-9.45	7.5	20	6	0 to + 75	0.001
1N938A	8.55-9.45	7.5	20	13	−55 to +100	0.001
1N938B	8.55-9.45	7.5	20	18	−55 to +150	0.001
1N939	8.55-9.45	7.5	20	3	0 to + 75	0.0005
1N939A	8.55-9.45	7.5	20	7	−55 to +100	0.0005
1N939B	8.55-9.45	7.5	20	9	−55 to +150	0.0005
1N940	8.55-9.45	7.5	20	1.3	0 to + 75	0.0002
1N940A	8.55-9.45	7.5	20	2.7	−55 to +100	0.0002
1N940B	8.55-9.45	7.5	20	3.7	−55 to +150	0.0002

*JEDEC Registered Data

NOTE 1 When ordering devices with tighter tolerances than specified, use a nominal center voltage of 9.2V.

NOTE 2 Measured by superimposing 0.75 mA ac rms on 7.5 mA DC @ 25°C.

NOTE 3 The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 4 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 5 Designate Radiation Hardened devices with "RH" prefix instead of "1N", i.e. RH938A instead of 1N938A.

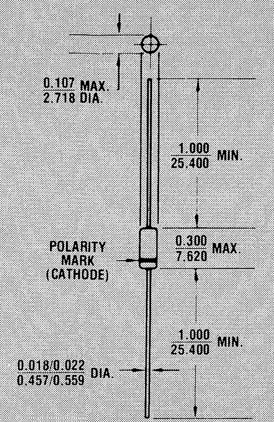

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

NOTE 5

The curve shown in Fig. 3 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 7.5 mA.

EXAMPLE: A diode in this series is operated at a current of 7.5 mA and has specified Temperature Coefficient (TC) limits of ±0.005%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0 mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 3.

At a test current of 6.0 mA the change in Temperature Coefficient (TC) is approximately −0.0009%/°C. The algebraic sum of ±0.005%/°C and −0.0009%/°C gives the new limits of +0.0041%/°C and −0.0059%/°C.

NOTE 6

The curve in Figure 4 illustrates the change of diode voltage arising from the effect of impedance. It is, in effect, an exploded view of the zener operating region of the I-V characteristic.

In conjunction with Fig. 3 this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

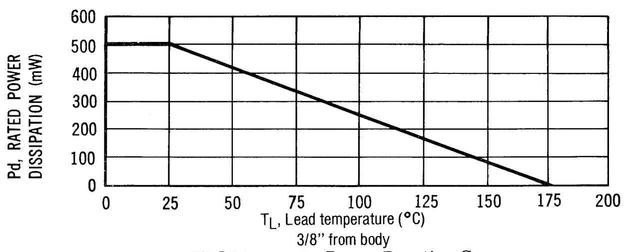

FIGURE 2 Power Derating Curve

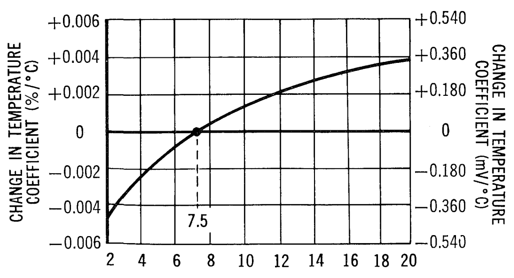

FIGURE 3 Typical change of Temperature Coefficient with Change in Operating Current.

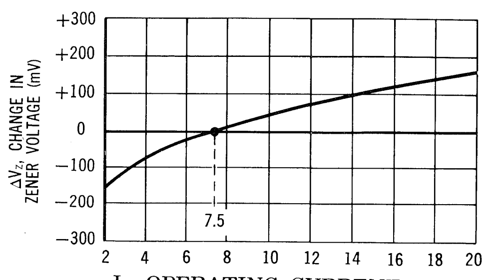

FIGURE 4 Typical change of Zener Voltage with Change in Operating Current.

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1N941 thru 1N946B

11.7 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 11.7V ± 5%
- 1N941B, 943B, 944B, 945B HAVE JAN, JANTX, JANTXV, AND -1 QUALIFICATIONS TO MIL-S-19500/157
- S1N944B
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 4)
- JANS EQUIVALENT AVAILABLE VIA SCD

MAXIMUM RATINGS

Operating Temperature: —65°C to +175°C.
Storage Temperature: —65°C to +175°C.
DC Power Dissipation: 500 mW @ 25°C
Power Derating: 3.33 mW/°C above 25°C.

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBERS	ZENER VOLTAGE V_Z @ I_{ZT} † (NOTE 3)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (NOTE 1) Z_{ZT}	VOLTAGE TEMPERATURE STABILITY (NOTE 2 & 3) ΔV_{ZT} MAXIMUM	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	mV	°C	%/°C
1N941	11.12-12.28	7.5	30	88	0 to + 75	.01
1N941A	11.12-12.28	7.5	30	181	−55 to +100	.01
1N941B	11.12-12.28	7.5	30	239	−55 to +150	.01
1N942	11.12-12.28	7.5	30	44	0 to + 75	.005
1N942A	11.12-12.28	7.5	30	90	−55 to +100	.005
1N942B	11.12-12.28	7.5	30	120	−55 to +150	.005
1N943	11.12-12.28	7.5	30	18	0 to + 75	.002
1N943A	11.12-12.28	7.5	30	36	−55 to +100	.002
1N943B	11.12-12.28	7.5	30	47	−55 to +150	.002
1N944	11.12-12.28	7.5	30	9	0 to + 75	.001
1N944A	11.12-12.28	7.5	30	18	−55 to +100	.001
1N944B	11.12-12.28	7.5	30	24	−55 to +150	.001
1N945	11.12-12.28	7.5	30	4	0 to + 75	.0005
1N945A	11.12-12.28	7.5	30	9	−55 to +100	.0005
1N945B	11.12-12.28	7.5	30	12	−55 to +150	.0005
1N946	11.12-12.28	7.5	30	1.8	0 to + 75	.0002
1N946A	11.12-12.28	7.5	30	3.6	−55 to +100	.0002
1N946B	11.12-12.28	7.5	30	4.7	−55 to +150	.0002

*JEDEC Registered Data

NOTE 1 Measured by superimposing 0.75 mA ac rms on 7.5 mA DC @ 25°C.

NOTE 2 The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 3 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 4 Designate Radiation Hardened devices with "RH" prefix instead of "1N", i.e. RH944B instead of 1N944B.

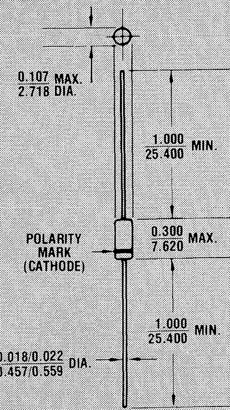

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

NOTE 4

The curve shown in Figure 3 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 7.5 mA.

EXAMPLE: A diode in this series is operated at a current of 7.5 mA and has specified Temperature Coefficient (TV) limits of ±0.002%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0 mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 3.

At a test current of 6.0 mA the change in Temperature Coefficient (TC) is approximately −0.0009%/°C. The algebraic sum of ±0.002%/°C and −0.0009%/°C gives the new limits of +0.0011%/°C and −0.0029%/°C.

NOTE 5

The curve in Figure 4 illustrates the change of diode voltage arising from the effect of impedance. It is, in effect, an exploded view of the zener operating region of the I-V characteristic.

In conjunction with Fig. 3 this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

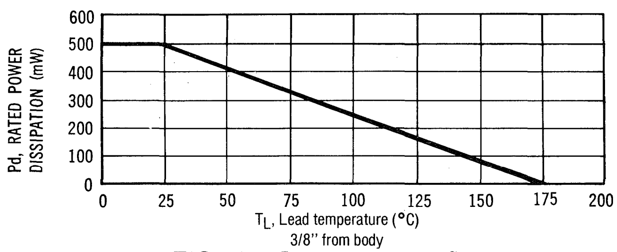

FIGURE 2 Power Derating Curve

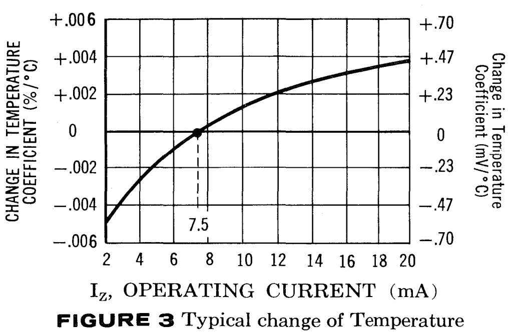

FIGURE 3 Typical change of Temperature Coefficient with Change in Operating Current.

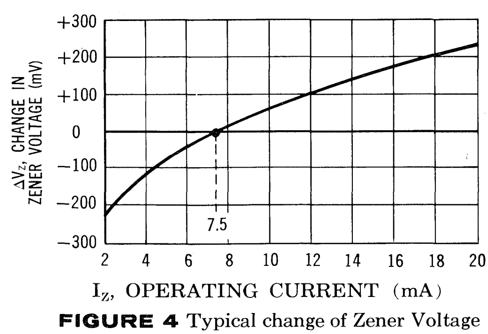

FIGURE 4 Typical change of Zener Voltage with Change in Operating Current.

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1N3154 & A thru 1N3157 & A

8.4 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 8.4V ± 5% (See Note 1)
- 1N3154 THRU 1N3157 HAVE JAN, JANTX, JANTXV, AND -1 QUALIFICATIONS TO MIL-S-19500/158
- HIGH LEVEL STABILITY WITH VIBRATION, THERMAL SHOCK & MECHANICAL SHOCK
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 5)
- JANS EQUIVALENT AVAILABLE VIA SCD

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C
Storage Temperature: −65°C to +175°C
DC Power Dissipation: 500 mW
Power Derating: 3.33 mW/°C above 25°C

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBERS	ZENER VOLTAGE V_Z @ I_{ZT} (Note 1 & 4)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (NOTE 2) Z_{ZT}	VOLTAGE TEMPERATURE STABILITY (Note 3 & 4) ΔV_{ZT} MAXIMUM	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	VOLTS	mA	OHMS	mV	°C	%/°C
1N3154	8.00-8.80	10	15	130	−55 to +100	.01
1N3154A	8.00-8.80	10	15	172	−55 to +150	.01
1N3155	8.00-8.80	10	15	65	−55 to +100	.005
1N3155A	8.00-8.80	10	15	86	−55 to +150	.005
1N3156	8.00-8.80	10	15	26	−55 to +100	.002
1N3156A	8.00-8.80	10	15	34	−55 to +150	.002
1N3157	8.00-8.80	10	15	13	−55 to +100	.001
1N3157A	8.00-8.80	10	15	17	−55 to +150	.001

*JEDEC Registered Data

NOTE 1 When ordering devices with tighter tolerance than specified, use a nominal center voltage of 8.7 volts.

NOTE 2 Measured by superimposing 1.0 mA ac rms on 10 mA DC @ 25°C.

NOTE 3 The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV at any discrete temperature between the established limits.

NOTE 4 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 5 Designate Radiation Hardened devices with "RH" prefix instead of "1N", i.e. RH3157A instead of 1N3157A.

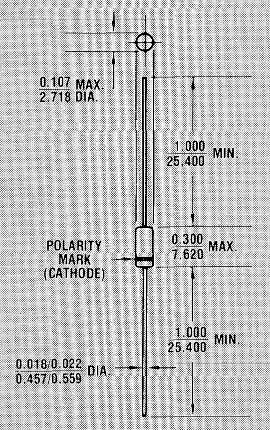

FIGURE 1
All dimensions in INCH/m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any

NOTE 5

The curve in Figure 3 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 10 mA.

EXAMPLE: A diode in this series is operated at a current of 10 mA and has specified Temperature Coefficient (TC) limits of ±0.005%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 7.5 mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 3.

At a test current of 7.5 mA the change in Temperature Coefficient (TC) is approximately −0.0012%/°C. The algebraic sum of ±0.005%/°C and −0.0012%/°C gives the new limits of +0.0038%/°C and −0.0062%/°C.

NOTE 6

The curve in Figure 4 illustrates the change of diode voltage arising from the effect of impedance. It is in effect an exploded view of the zener operating region of the I-V characteristic.

In conjunction with Fig. 3 this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

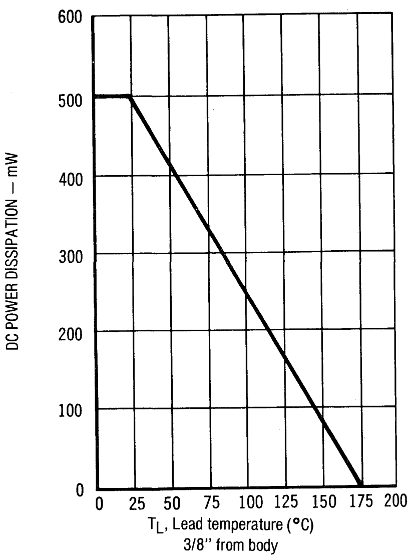

FIGURE 2 Power Derating Curve

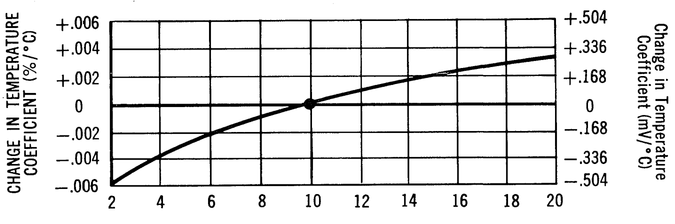

FIGURE 3 Typical change of Temperature Coefficient with Change in Operating Current.

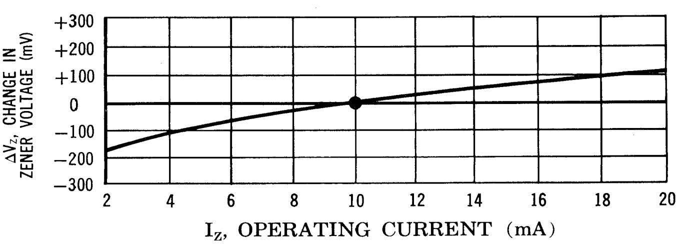

FIGURE 4 Typical change of Zener Voltage with Change in Operating Current.

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1N3501 thru 1N3504 WITH CERTIFIED ZENER VOLTAGE STABILITY

DESCRIPTION

This series of Microsemi 250mW Ultra-Stable Reference Diodes offers a CERTIFIED REFERENCE VOLTAGE STABILITY as measured over an actual operating period of 1000 hours. Standard stabilities are 20, 50, and 100 PPM/1000 hours. Units having stabilities of less than 20 PPM/1000 hours are available on special request.

Ultra-Stable Certified Reference Diodes, available in standard or radiation hardened construction, can be used in any circuit that requires a stable reference voltage that is insensitive to shock, vibration, or position. Their inherent stability allows them to be used in circuits requiring an extremely high degree of voltage time stability such as those in Digital Voltmeters, Computers, X-Y Recorders, Missile Guidance and Environmental Control Systems, and Portable Reference Standards.

All devices in this series have been subjected to Microsemi's 1000 hour Stability Test Sequence, consisting of a 1000 hour power age with reference voltage measured once every 168 hours giving a total of 7 individual test points. The stability test is performed at 80°C ±0.1°C.

A Certificate containing the following data is supplied with each diode:

1. The stability test voltage readings.
2. The voltage drift as referenced to "Zero Hour" in both μV and in PPM (Parts-Per-Million).

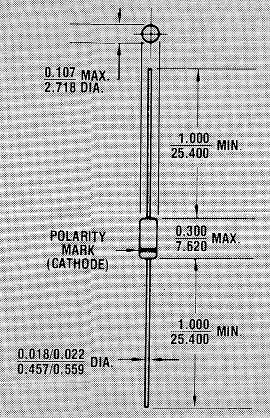
To certify these diodes to such tight stabilities as 20 PPM/1000 hours, every factor of environment, both ambient and electrical is considered and controlled to "Standards Laboratory" accuracy.

To specify radiation hardened devices, use "RH" prefix instead of "1N", i.e. RH3504 instead of 1N3504.

Consult factory for TX, TXV or JANS equivalent SCDs.

6.35 VOLT ULTRA STABLE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

2



All dimensions in INCH / m.m.

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

6.35 VOLT ULTRA-STABLE (T. C.) ZENER REFERENCE DIODES

MAXIMUM RATINGS (See Fig. 5)

Operating Temperature Range: −65° to +150°C

Maximum Lead Temperature 1/8 ±1/32 inch from case for 8 seconds: 230°C

Maximum DC Power Dissipation at or below 25°C Ambient: 250 mW

Linear Derating: 2.0 mW/°C (See Figure 5)

Maximum Steady State Current (I_{ZM}) at 125°C: 7.5 mA

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass

Dimensions: DO-7 outline

Finish: All external surfaces are corrosion resistant and leads are readily solderable

Polarity: Diode to be operated with the banded end positive

Weight: 0.2 grams (typical)

Mounting Position: Any

ELECTRICAL CHARACTERISTICS @ 25°C unless otherwise specified

JEDEC TYPE NUMBER	NOMINAL ZENER VOLTAGE ± 5% V_Z @ I_{ZT}	ZENER TEST CURRENT ±0.01 mA I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 1)	VOLTAGE TEMPERATURE STABILITY $\triangle V_{ZT}$ MAXIMUM (NOTE 2)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT	VOLTAGE TIME STABILITY @ 80°C INITIAL-TO PEAK $\triangle V_{Zt}$ MAXIMUM (NOTE 3)	EFFECTIVE VOLTAGE TIME STABILITY INITIAL-TO-PEAK
	VOLTS	mA	OHMS	mV	°C	%/°C	μV/1000 HRS.	PPM/1000 HRS.
1N3501	6.2-6.5	7.5	12	6	25 to 100	.001	635	100
1N3502	6.2-6.5	7.5	12	3	25 to 100	.0005	635	100
1N3503	6.2-6.5	7.5	12	6	25 to 100	.001	318	50
1N3504	6.2-6.5	7.5	12	6	25 to 100	.001	127	20

NOTE 1

The zener impedance is derived from the 60 Hz ac voltage which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 2

The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 3

When operated at:

$I_{ZT} = 7.5$ mA ±0.0001 mA
$T_A = 80°C \pm 0.1°C$

(See Precautions Below)

NOTES AND PRECAUTIONS FOR CERTIFIED REFERENCE DIODES

1. DIODE IDENTIFICATION: The diodes are shipped attached to their certification papers and each diode is individually packaged with the diode identification on the package. Identification includes JEDEC type number and a diode serial number consisting of 7 digits showing the lot number and diode number, which provide traceability to factory records.

2. PRECAUTIONS: The normal precautions must be taken when soldering as with any semiconductor device, such as a thermal shunt between the soldering iron and the diode body. "Mechanical" rather than solder mounting is preferred for optimum performance. Mounting the diode inside a large thermal mass such as aluminum, copper, brass, or epoxy will reduce thermally induced voltage fluctuations discernible as low frequency noise in the 0-3 Hz region of the spectrum.

Certain precautions must be taken to ensure that the diode's stability is fully utilized in the circuit. If the current through the zener is not controlled, the reference voltage will shift due to diode impedance ($\triangle V_Z = \triangle I_Z \times Z_{ZT}$). If the diode's junction temperature is allowed to change, due to a change in ambient or case temperature or due to a power level change, a shift in voltage will occur consistent with the temperature coefficient of the diode. In addition, the device must be physically mounted so as to give the diode a constant thermal resistance, junction-to-ambient. Drafts, circulating oil, and even the minute convection currents produced by a diode in a closed container can cause shifts in reference voltage greater than those that can be attributed to the diode's inherent stability.

The certified stability of a diode is achieved only under steady state, constant temperature conditions. If the diode is operated at conditions other than the certification test conditions, it is recommended that it be operated for a period of 2 to 3 weeks under circuit operating conditions to achieve rated stability.

A slight derating of voltage-time stability ($\triangle V_{Zt}$) may be experienced if the diode is operated outside the "stable-area" defined in Figure 5.

Temperature coefficients much lower than specified can be attained by operating the diode at the "O" TC crossover current (the current at which the temperature coefficient changes from positive to negative).

3. MICROSEMI TEST METHOD: Microsemi uses a potentiometric method of zener voltage measurement on certified reference diodes. The measurement facility is calibrated utilizing Primary Voltage Standards directly traceable to the National Bureau of Standards. Room ambient temperature is controlled to ±0.5°C. Zener voltage is measured to seven digits (1 microvolt resolution). Oil bath temperature is controlled to better than 0.1°C, and current is constant and repeatable to better than 0.1 μA. Test clips are designed for the four-terminal method of measurement (separate voltage and current connections) to eliminate errors caused by resistance. The diodes are thermally shielded by an aluminum thermal filter to reduce thermally created error-causing voltage fluctuations.

4. 1000 HOUR STABILITY TEST SEQUENCE: Voltage is measured seven times during the test with the last six measurements referenced to the first. The measurements are taken 168 hours apart, giving a total test time of 1008 hours.

ΔV_{zt} PLOT OF A TYPICAL 1N3501 DIODE

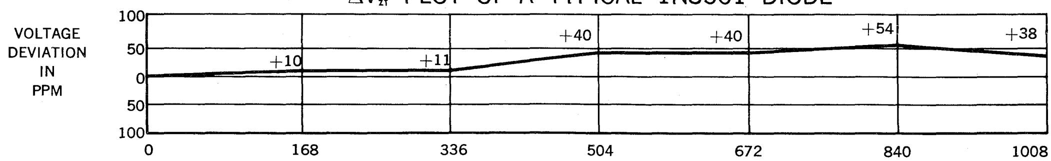


FIGURE 2 — OPERATING TEST TIME IN HOURS

ΔV_{zt} PLOT OF A TYPICAL 1N3503 DIODE

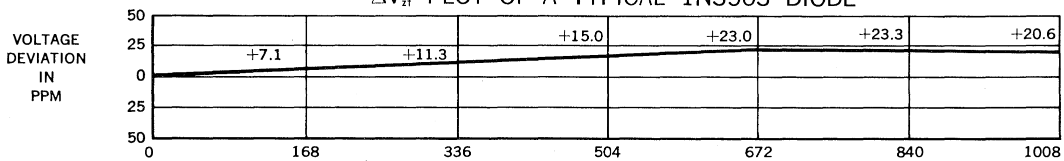


FIGURE 3 — OPERATING TEST TIME IN HOURS

ΔV_{zt} PLOT OF A TYPICAL 1N3504 DIODE

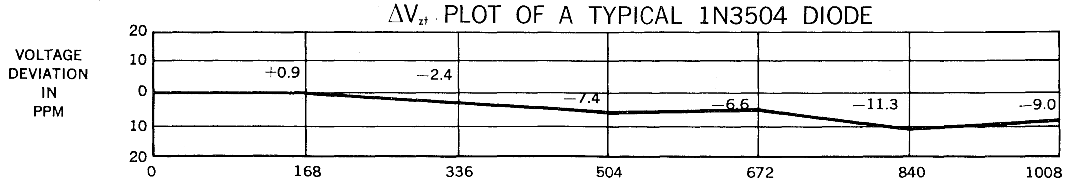


FIGURE 4 — OPERATING TEST TIME IN HOURS

DERATING CHART

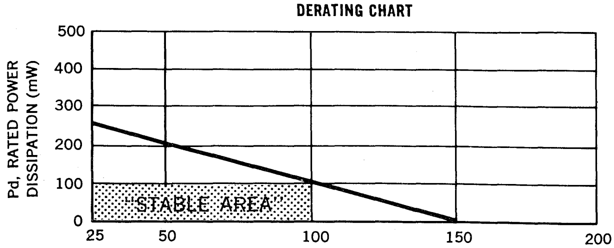


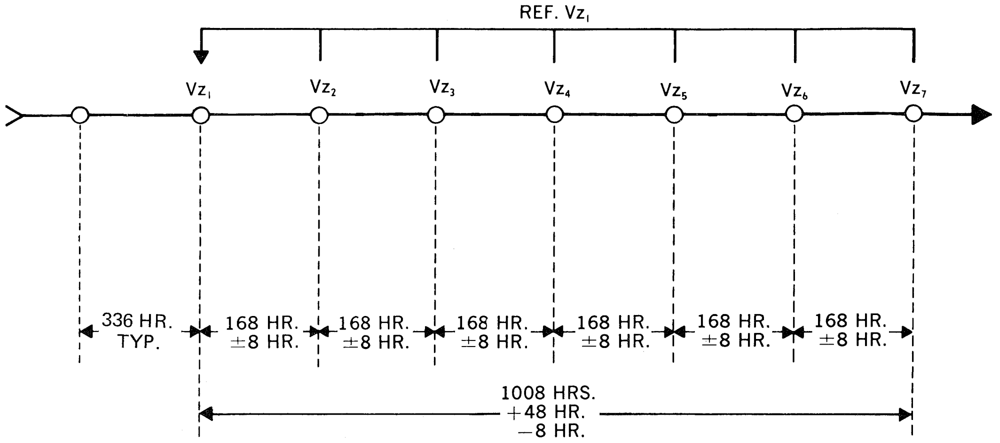
FIGURE 5 T_L, Lead temperature (°C) 3/8" from body

THE "STABLE AREA" IS DEFINED AS THE AREA IN WHICH THE MAXIMUM TIME STABILITY (ΔV_{zt}) IS ATTAINABLE.

A SLIGHT DERATING IN THE TIME STABILITY MAY BE EXPECTED IF THE DIODE IS OPERATED OUTSIDE THIS AREA.

6.35 VOLT ULTRA-STABLE (T. C.) ZENER REFERENCE DIODES

1000 HOUR STABILITY TEST SEQUENCE



Notes:

Test Temperature . . . . 80° C ±0.1° C

Test Current . . . . 7.5 mA. with a constancy and repeatability of ±0.1 microamp.

The first 336 hours of operation is a stabilization period. The stability of a diode is measured by the worst voltage difference (ΔV_Z) referenced to V_{Z1}.

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1N4057 thru 1N4085A

HIGH VOLTAGE TEMPERATURE COMPENSATED ZENER DIODES

(2)

FEATURES

- **ZENER VOLTAGE 12.4V to 200V**
- **TEMPERATURE COEFFICIENT RANGE: 0.005%/°C to 0.002%/°C**

MAXIMUM RATINGS

See Electrical Characteristics Below

DC Power Dissipation: Case CC: 1.5W

At 25°C derate Linearly to Zero at +150°C — Case DD: 2W; Case EE: 2.5W

*ELECTRICAL CHARACTERISTICS @ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	ZENER VOLTAGE V_Z @ I_{ZT} VOLTS (±5%) (See Note 1)	ZENER TEST CURRENT (I_{ZT}) MA	MAXIMUM DYNAMICS IMPEDANCE @ (I_{ZT}) OHMS	MAXIMUM TEMPERATURE COEFFICIENT (See Note 2) α_{VZ} ± %/°C	± mV/°C	TEMPERATURE RANGE °C	CASE TYPE NO.
1N4057	12.4	10.0	25	.005	.62	55 to +25 to +100	CC
1N4057A	12.4	10.0	25	.002	.25	55 to +25 to +100	CC
1N4058	14.6	10.0	30	.005	.73	55 to +25 to +100	CC
1N4058A	14.6	10.0	30	.002	.29	55 to +25 to +100	CC
1N4059	16.8	10.0	30	.005	.84	55 to +25 to +100	CC
1N4059A	16.8	10.0	30	.002	.34	55 to +25 to +100	CC
1N4060	18.5	10.0	30	.005	.92	55 to +25 to +100	CC
1N4060A	18.5	10.0	30	.002	.37	55 to +25 to +100	CC
1N4061	21	10.0	35	.005	1.05	55 to +25 to +100	CC
1N4061A	21	10.0	35	.002	.42	55 to +25 to +100	CC
1N4062	23	10.0	40	.005	1.15	55 to +25 to +100	CC
1N4062A	23	10.0	40	.002	.46	55 to +25 to +100	CC
1N4063	27	10.0	45	.005	1.35	55 to +25 to +100	CC
1N4063A	27	10.0	45	.002	.54	55 to +25 to +100	CC
1N4064	30	10.0	50	.005	1.50	55 to +25 to +100	CC
1N4064A	30	10.0	50	.002	.60	55 to +25 to +100	CC
1N4065	33	10.0	55	.005	1.65	55 to +25 to +100	CC
1N4065A	33	10.0	55	.002	.66	55 to +25 to +100	CC
1N4066	37	7.5	80	.005	1.85	55 to +25 to +100	CC
1N4066A	37	7.5	80	.002	.74	55 to +25 to +100	CC
1N4067	43	7.5	90	.005	2.15	55 to +25 to +100	CC
1N4067A	43	7.5	90	.002	.86	55 to +25 to +100	CC
1N4068	47	7.5	100	.005	2.35	55 to +25 to +100	CC
1N4068A	47	7.5	100	.002	.94	55 to +25 to +100	CC
1N4069	51	7.5	110	.005	2.55	55 to +25 to +100	DD
1N4069A	51	7.5	110	.002	1.02	55 to +25 to +100	DD
1N4070	56	7.5	120	.005	2.80	55 to +25 to +100	DD
1N4070A	56	7.5	120	.002	1.12	55 to +25 to +100	DD
1N4071	62	7.5	135	.005	3.10	55 to +25 to +100	DD
1N4071A	62	7.5	135	.002	1.24	55 to +25 to +100	DD
1N4072	68	5.0	230	.005	3.40	55 to +25 to +100	DD
1N4072A	68	5.0	230	.002	1.36	55 to +25 to +100	DD
1N4073	75	5.0	250	.005	3.75	55 to +25 to +100	DD
1N4073A	75	5.0	250	.002	1.50	55 to +25 to +100	DD
1N4074	82	5.0	270	.005	4.10	55 to +25 to +100	DD
1N4074A	82	5.0	270	.002	1.64	55 to +25 to +100	DD
1N4075	87	5.0	290	.005	4.35	55 to +25 to +100	DD
1N4075A	87	5.0	290	.002	1.74	55 to +25 to +100	DD
1N4076	91	5.0	310	.005	4.55	55 to +25 to +100	DD
1N4076A	91	5.0	310	.002	1.82	55 to +25 to +100	DD
1N4077	100	5.0	340	.005	5.00	55 to +25 to +100	DD
1N4077A	100	5.0	340	.002	2.00	55 to +25 to +100	DD
1N4078	105	2.5	700	.005	5.25	55 to +25 to +100	DD
1N4078A	105	2.5	700	.002	2.10	55 to +25 to +100	DD
1N4079	110	2.5	740	.005	5.50	55 to +25 to +100	DD
1N4079A	110	2.5	740	.002	2.20	55 to +25 to +100	DD
1N4080	120	2.5	800	.005	6.00	-55 to +25 to +100	DD
1N4080A	120	2.5	800	.002	2.40	55 to +25 to +100	DD
1N4081	130	2.5	840	.005	6.50	-55 to +25 to +100	EE
1N4081A	130	2.5	840	.002	2.60	-55 to +25 to +100	EE
1N4082	140	2.5	960	.005	7.00	55 to +25 to +100	EE
1N4082A	140	2.5	960	.002	2.80	55 to +25 to +100	EE
1N4083	150	2.5	1020	.005	7.50	-55 to +25 to +100	EE
1N4083A	150	2.5	1020	.002	3.00	55 to +25 to +100	EE
1N4084	175	2.5	1150	.005	8.75	-55 to +25 to +100	EE
1N4084A	175	2.5	1150	.002	3.50	-55 to +25 to +100	EE
1N4085	200	2.5	1350	.005	10.00	-55 to +25 to +100	EE
1N4085A	200	2.5	1350	.002	4.00	-55 to +25 to +100	EE

*JEDEC Registered Data

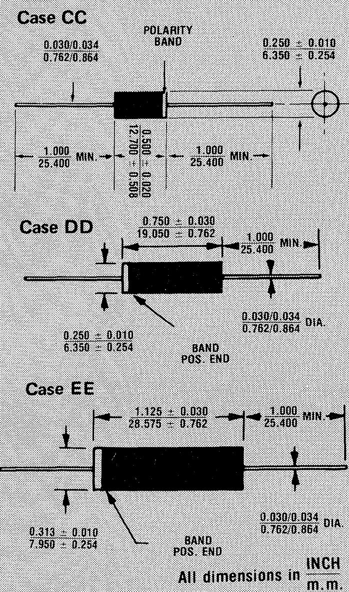

FIGURE 1

MECHANICAL CHARACTERISTICS

FINISH: All external surfaces are corrosion resistant and leads solderable.

MOUNTING POSITION: Any.

NOTE 1

Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 2

The 1N4057 through 1N4085 series is specified over the temperature range -55°C to +100°C with measurements made at -55°C, +100°C, and at the reference temperature +25°C. The maximum voltage change over the range -55°C to +25°C and +25°C to +100°C for this series is limited to the values (expressed in mV/°C) shown in the table on the reverse page. These values are computed by considering the temperature coefficient to be an average over the temperature range. For example, there is an 80°C change in temperature from -55°C to +25°C. At an average temperature coefficient of 0.005%/°C, the maximum percentage change in voltage would be: 80°C x 0.005%/°C or 0.4%. For the 1N4057, having a nominal zener voltage of 12.4 volts, the maximum allowable voltage change would be: 0.4% of 12.4 volts or 49.6 millivolts.

NOTE 3

Consult factory for TX, TXV or JANS equivalent SCDs.

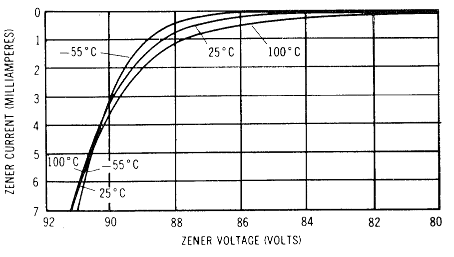

FIGURE 2

TYPICAL VOLT-AMPERE CURVE OF 1N4076A

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1N4565 & A thru 1N4584 & A DO-7

6.4 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

2

FEATURES

- 6.4 V ±5% ZENER VOLTAGE (NOTE 1) • JANS EQUIVALENT AVAILABLE VIA SCD
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C TO 0.0005%/°C
- ZENER TEST CURRENT RANGE: 500μA TO 4mA
- 1N4565A THRU 1N4574A HAVE JAN, JANTX, JANTXV QUALIFICATIONS TO MIL-S-19500/452
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 4)
- ALSO AVAILABLE IN DO-35 PACKAGE WITH JAN, JANTX, JANTXV-1 QUALIFICATIONS

MAXIMUM RATINGS

Power Dissipation: 400 mW, at 50°C ambient
(derate 3.2mw/°C above 50°C ambient)
Operating and Storage Temperature: —65 to +175°C

* ELECTRICAL CHARACTERISTICS @ 25°C, unless otherwise specified

JEDEC TYPE NO.	(NOTE 3) ZENER TEST CURRENT mA	MAXIMUM VOLTAGE TEMPERATURE COEFFICIENT α_{VZ} ±%/°C	± mV/°C	TEMP. RANGE	MAX. DYNAMIC ZENER IMPEDANCE OHMS (Note 2)
1N4565	.5	.01	.64	0 to +75°C	200
1N4565A	.5	.01	.64	−55 to +100°C	200
1N4566	.5	.005	.32	0 to +75°C	200
1N4566A	.5	.005	.32	−55 to +100°C	200
1N4567	.5	.002	.13	0 to +75°C	200
1N4567A	.5	.002	.13	−55 to +100°C	200
1N4568	.5	.001	.06	0 to +75°C	200
1N4568A	.5	.001	.06	−55 to +100°C	200
1N4569	.5	.0005	.03	0 to +75°C	200
1N4569A	.5	.0005	.03	−55 to +100°C	200
1N4570	1.0	.01	.64	0 to +75°C	100
1N4570A	1.0	.01	.64	−55 to +100°C	100
1N4571	1.0	.005	.32	0 to +75°C	100
1N4571A	1.0	.005	.32	−55 to +100°C	100
1N4572	1.0	.002	.13	0 to +75°C	100
1N4572A	1.0	.002	.13	−55 to +100°C	100
1N4573	1.0	.001	.06	0 to +75°C	100
1N4573A	1.0	.001	.06	−55 to +100°C	100
1N4574	1.0	.0005	.03	0 to +75°C	100
1N4574A	1.0	.0005	.03	−55 to +100°C	100
1N4575	2.0	.01	.64	0 to +75°C	50
1N4575A	2.0	.01	.64	−55 to +100°C	50
1N4576	2.0	.005	.32	0 to +75°C	50
1N4576A	2.0	.005	.32	−55 to +100°C	50
1N4577	2.0	.002	.13	0 to +75°C	50
1N4577A	2.0	.002	.13	−55 to +100°C	50
1N4578	2.0	.001	.06	0 to +75°C	50
1N4578A	2.0	.001	.06	−55 to +100°C	50
1N4579	2.0	.0005	.03	0 to +75°C	50
1N4579A	2.0	.0005	.03	−55 to +100°C	50
1N4580	4.0	.01	.64	0 to +75°C	25
1N4580A	4.0	.01	.64	−55 to +100°C	25
1N4581	4.0	.005	.32	0 to +75°C	25
1N4581A	4.0	.005	.32	−55 to +100°C	25
1N4582	4.0	.002	.13	0 to +75°C	25
1N4582A	4.0	.002	.13	−55 to +100°C	25
1N4583	4.0	.001	.06	0 to +75°C	25
1N4583A	4.0	.001	.06	−55 to +100°C	25
1N4584	4.0	.0005	.03	0 to +75°C	25
1N4584A	4.0	.0005	.03	−55 to +100°C	25

*JEDEC Registered Data

NOTE 1 For specific device selections above requiring tighter tolerances than ±5%, inquire with factory as to nominal zener voltage available.

NOTE 2 Measured by superimposing rms AC current equal to 10% zener test current @ 25°C. The temperature coefficient of zener impedance is approx. +0.3%/°C.

NOTE 3 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 4 Designate Radiation Hardened devices with "RH" prefix instead of "1N," i.e., RH4584A.

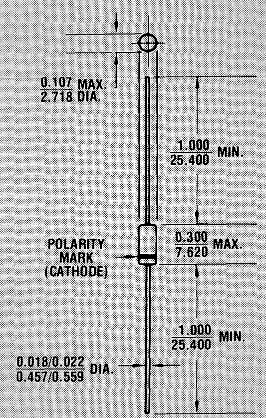


FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

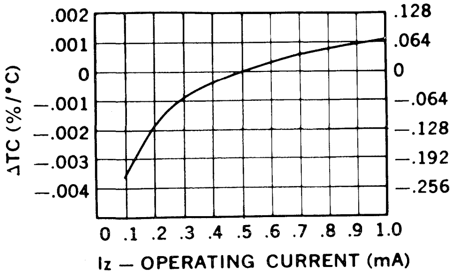
POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

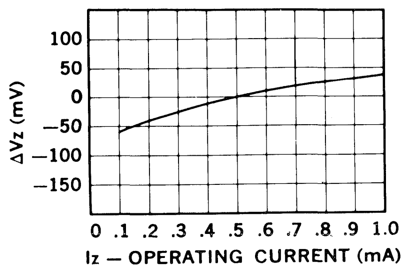
WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

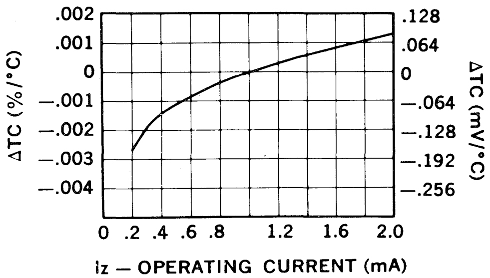
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT

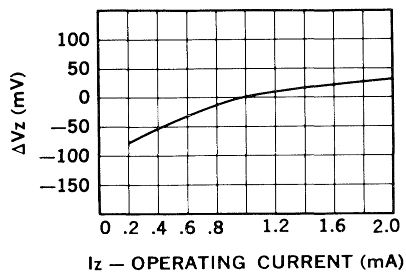
TYPICAL CHANGE IN ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT



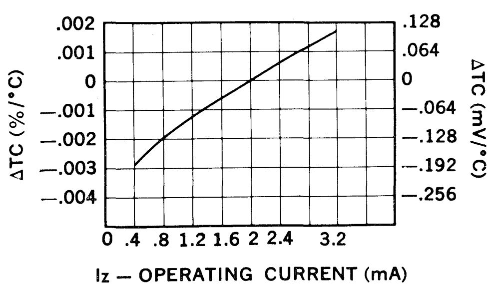


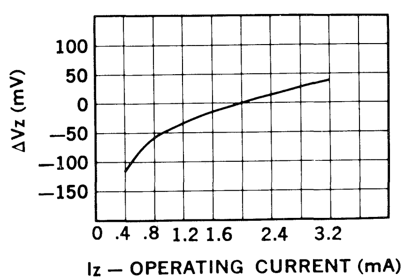
1N4565 —— 1N4569A



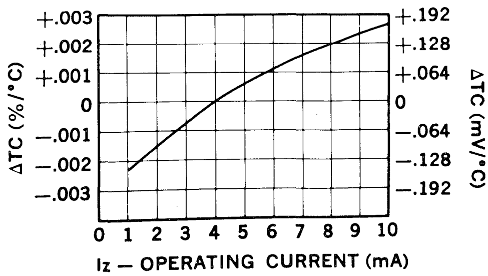


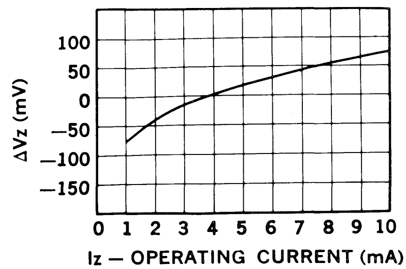
1N4570 —— 1N4574A





1N4575 —— 1N4579A





1N4580 —— 1N4584A

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For more information call:
(602) 941-6300

1N4565 & A thru 1N4584 & A DO-35

6.4 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- 6.4 V ±5% ZENER VOLTAGE (NOTE 1) • JANS EQUIVALENT AVAILABLE VIA SCD
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C TO 0.0005%/°C
- ZENER TEST CURRENT RANGE: 500μA TO 4mA
- 1N4565A THRU 1N4574A HAVE JAN, JANTX, JANTXV QUALIFICATIONS TO MIL-S-19500/452
- ALSO AVAILABLE IN DO-7 PACKAGE WITH JAN, JANTX, JANTXV-1 QUALIFICATIONS

MAXIMUM RATINGS

Power Dissipation: 400 mW, at 50°C ambient
(derate 3.2mw/°C above 50°C ambient)
Operating and Storage Temperature: −65 to +175°C

* ELECTRICAL CHARACTERISTICS @ 25°C, unless otherwise specified

JEDEC TYPE NO.	(NOTE 3) ZENER TEST CURRENT mA	MAXIMUM VOLTAGE TEMPERATURE COEFFICIENT α_{VZ} ±%/°C	± mV/°C	TEMP. RANGE	MAX. DYNAMIC ZENER IMPEDANCE OHMS (Note 2)
1N4565	.5	.01	.64	0 to +75°C	200
1N4565A	.5	.01	.64	−55 to +100°C	200
1N4566	.5	.005	.32	0 to +75°C	200
1N4566A	.5	.005	.32	−55 to +100°C	200
1N4567	.5	.002	.13	0 to +75°C	200
1N4567A	.5	.002	.13	−55 to +100°C	200
1N4568	.5	.001	.06	0 to +75°C	200
1N4568A	.5	.001	.06	−55 to +100°C	200
1N4569	.5	.0005	.03	0 to +75°C	200
1N4569A	.5	.0005	.03	−55 to +100°C	200
1N4570	1.0	.01	.64	0 to +75°C	100
1N4570A	1.0	.01	.64	−55 to +100°C	100
1N4571	1.0	.005	.32	0 to +75°C	100
1N4571A	1.0	.005	.32	−55 to +100°C	100
1N4572	1.0	.002	.13	0 to +75°C	100
1N4572A	1.0	.002	.13	−55 to +100°C	100
1N4573	1.0	.001	.06	0 to +75°C	100
1N4573A	1.0	.001	.06	−55 to +100°C	100
1N4574	1.0	.0005	.03	0 to +75°C	100
1N4574A	1.0	.0005	.03	−55 to +100°C	100
1N4575	2.0	.01	.64	0 to +75°C	50
1N4575A	2.0	.01	.64	−55 to +100°C	50
1N4576	2.0	.005	.32	0 to +75°C	50
1N4576A	2.0	.005	.32	−55 to +100°C	50
1N4577	2.0	.002	.13	0 to +75°C	50
1N4577A	2.0	.002	.13	−55 to +100°C	50
1N4578	2.0	.001	.06	0 to +75°C	50
1N4578A	2.0	.001	.06	−55 to +100°C	50
1N4579	2.0	.0005	.03	0 to +75°C	50
1N4579A	2.0	.0005	.03	−55 to +100°C	50
1N4580	4.0	.01	.64	0 to +75°C	25
1N4580A	4.0	.01	.64	−55 to +100°C	25
1N4581	4.0	.005	.32	0 to +75°C	25
1N4581A	4.0	.005	.32	−55 to +100°C	25
1N4582	4.0	.002	.13	0 to +75°C	25
1N4582A	4.0	.002	.13	−55 to +100°C	25
1N4583	4.0	.001	.06	0 to +75°C	25
1N4583A	4.0	.001	.06	−55 to +100°C	25
1N4584	4.0	.0005	.03	0 to +75°C	25
1N4584A	4.0	.0005	.03	−55 to +100°C	25

*JEDEC Registered Data

NOTE 1 For specific device selections above requiring tighter tolerances than ±5%, inquire with factory as to nominal zener voltage available.

NOTE 2 Measured by superimposing rms AC current equal to 10% zener test current @ 25°C. The temperature coefficient of zener impedance is approx. +0.3%/°C.

NOTE 3 Voltage measurements to be performed 15 seconds after application of DC current.

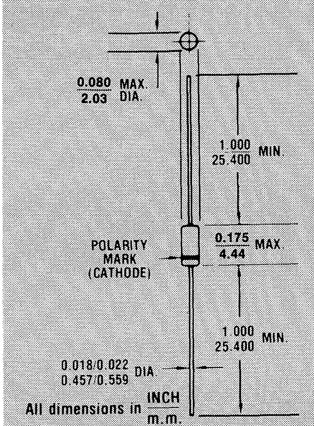


FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 150°C/W (Typical) junction to lead at 0.375-inches from body. Metallurgically bonded DO-35's exhibit less than 100°C/W at zero distance from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

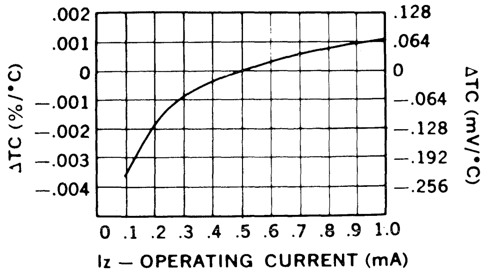
WEIGHT: 0.2 grams.

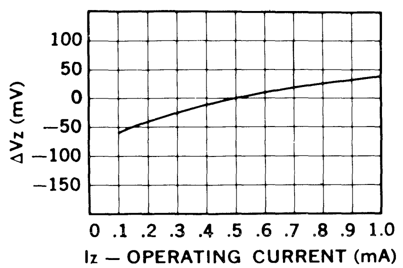
MOUNTING POSITIONS: Any.

1N4565 thru 1N4584A

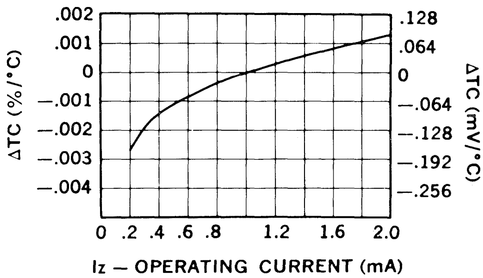
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT

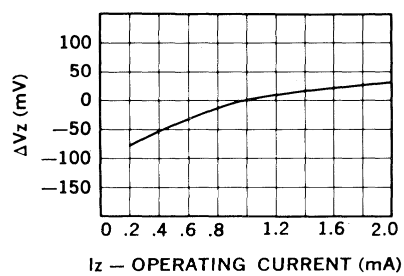
TYPICAL CHANGE IN ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT



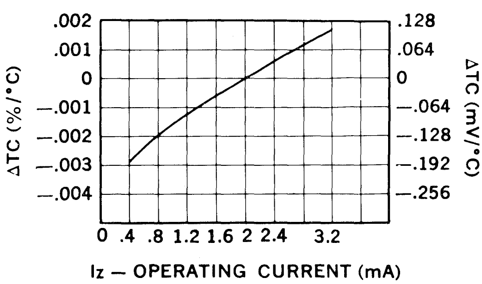


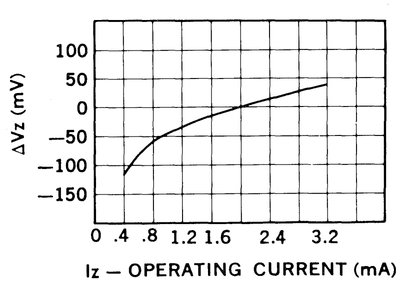
1N4565 —— 1N4569A



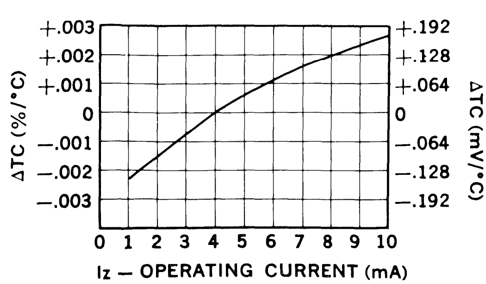


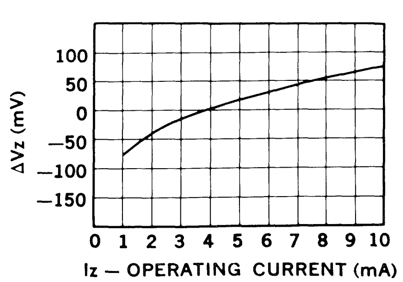
1N4570 —— 1N4574A





1N4575 —— 1N4579A





1N4580 —— 1N4584A

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1N4765 thru 1N4774A

9.1 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 9.1V ± 5%
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C TO 0.0005%/°C
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 4)

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C
DC Power Dissipation: 250 mW
Power Derating: 2 mW/°C above 50°C

*ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER	ZENER VOLTAGE (NOTE 3)	ZENER TEST CURRENT	MAXIMUM DYNAMIC IMPEDANCE (Note 1)	MAXIMUM VOLTAGE TEMPERATURE STABILITY (NOTE 2 & 3)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COMPENSATIONS
	V_Z @ I_{ZT}	I_{ZT}	Z_{ZT}	ΔV_{ZT}		α_{VZ}
	VOLTS	mA	OHMS	mV	°C	%/°C
1N4765	9.1	0.5	350	68	0 to + 75	0.01
1N4765A	9.1	0.5	350	141	−55 to +100	0.01
1N4766	9.1	0.5	350	34	0 to + 75	0.005
1N4766A	9.1	0.5	350	70	−55 to +100	0.005
1N4767	9.1	0.5	350	14	0 to + 75	0.002
1N4767A	9.1	0.5	350	28	−55 to +100	0.002
1N4768	9.1	0.5	350	7	0 to + 75	0.001
1N4768A	9.1	0.5	350	14	−55 to +100	0.001
1N4769	9.1	0.5	350	3	0 to + 75	0.0005
1N4769A	9.1	0.5	350	7	−55 to +100	0.0005
1N4770	9.1	1.0	200	68	0 to + 75	0.01
1N4770A	9.1	1.0	200	141	−55 to +100	0.01
1N4771	9.1	1.0	200	34	0 to + 75	0.005
1N4771A	9.1	1.0	200	70	−55 to +100	0.005
1N4772	9.1	1.0	200	14	0 to + 75	0.002
1N4772A	9.1	1.0	200	28	−55 to +100	0.002
1N4773	9.1	1.0	200	7	0 to + 75	0.001
1N4773A	9.1	1.0	200	14	−55 to +100	0.001
1N4774	9.1	1.0	200	3	0 to + 75	0.0005
1N4774A	9.1	1.0	200	7	−55 to +100	0.0005

*JEDEC Registered Data.

NOTE 1 Measured by superimposing I_Z ac rms on I_Z DC @ +25°C where I_Z ac rms = 10% I_Z DC.

NOTE 2 Maximum allowable change between any two discrete temperatures over the specified temperature range.

NOTE 3 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 4 Designate Radiation Hardened devices with "RH" prefix instead of "1N," i.e., RH4774A.

NOTE 5 Consult factory for TX, TXV or JANS equivalent SCDs.

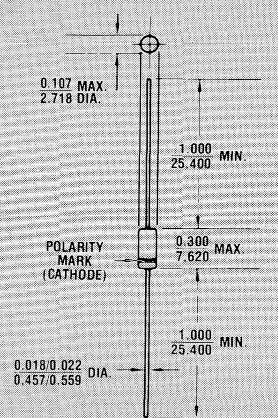

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

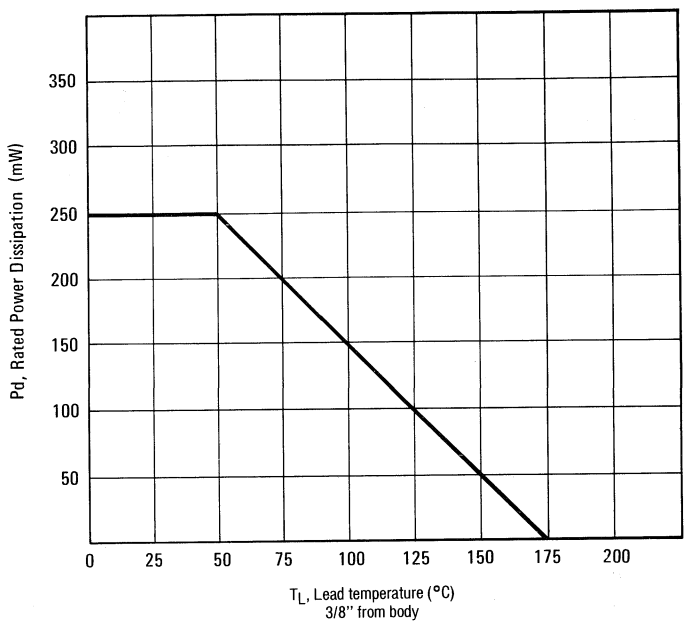

FIGURE 2 POWER DERATING CURVE

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(602) 941-6300

1N4775 thru 1N4784A

8.5 VOLT TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 8.5V ± 5% (See Note 4)
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C TO 0.0005%/°C
- RADIATION HARDENED DEVICES AVAILABLE (SEE NOTE 1)

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C
DC Power Dissipation: 250 mW
Power Derating: 2 mW/°C above 50°C

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	ZENER VOLTAGE (NOTE 5)	ZENER TEST CURRENT	MAXIMUM DYNAMIC IMPEDANCE (NOTE 2)	MAXIMUM VOLTAGE TEMPERATURE STABILITY (NOTES 3 & 5)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COMPENSATIONS α_{VZ}
	V_Z @ I_{ZT}	I_{ZT}	Z_{ZT}	ΔV_{ZT}		
	VOLTS	mA	OHMS	mV	°C	%/°C
1N4775	8.5	0.5	200	64	0 to + 75	0.01
1N4775A	8.5	0.5	200	132	−55 to +100	0.01
1N4776	8.5	0.5	200	32	0 to + 75	0.005
1N4776A	8.5	0.5	200	66	−55 to +100	0.005
1N4777	8.5	0.5	200	13	0 to + 75	0.002
1N4777A	8.5	0.5	200	26	−55 to +100	0.002
1N4778	8.5	0.5	200	6	0 to + 75	0.001
1N4778A	8.5	0.5	200	13	−55 to +100	0.001
1N4779	8.5	0.5	200	3	0 to + 75	0.0005
1N4779A	8.5	0.5	200	7	−55 to +100	0.0005
1N4780	8.5	1.0	100	64	0 to + 75	0.01
1N4780A	8.5	1.0	100	132	−55 to +100	0.01
1N4781	8.5	1.0	100	32	0 to + 75	0.005
1N4781A	8.5	1.0	100	66	−55 to +100	0.005
1N4782	8.5	1.0	100	13	0 to + 75	0.002
1N4782A	8.5	1.0	100	26	−55 to +100	0.002
1N4783	8.5	1.0	100	6	0 to + 75	0.001
1N4783A	8.5	1.0	100	13	−55 to +100	0.001
1N4784	8.5	1.0	100	3	0 to + 75	0.0005
1N4784A	8.5	1.0	100	7	−55 to +100	0.0005

*JEDEC Registered Data.

NOTE 1 Designate Radiation Hardened devices with "RH" prefix instead of "1N," i.e., RH4784A.

NOTE 2 Consult factory for TX, TXV or JANS equivalent SCDs.

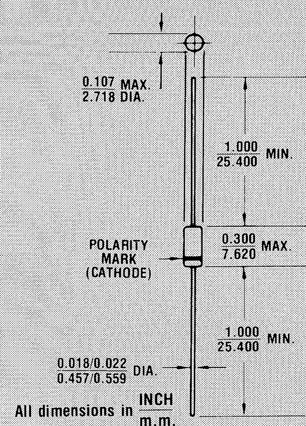

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

NOTE 2 Measured by superimposing I_Z ac rms on I_Z DC @ 25° C where I_Z ac rms = 10% I_Z DC.

NOTE 3 Maximum allowable change between any two discrete temperatures over the specified temperature change.

NOTE 4 When ordering devices with a tighter tolerance than specified, use a nominal center voltage of 8.8 volts.

NOTE 5 Voltage measurements to be performed 15 seconds after application of DC current.

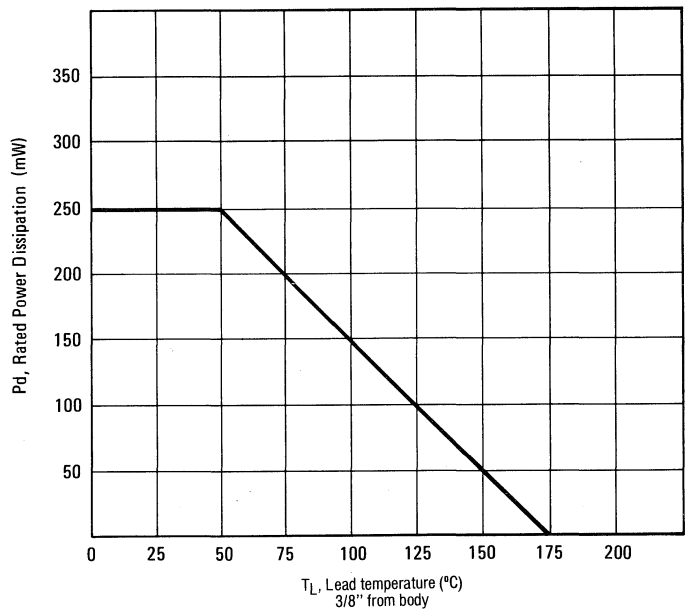

FIGURE 2 POWER DERATING CURVE

Microsemi Corp.
The diode experts

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1N4890 thru 1N4895 and 1N4890A thru 1N4895A WITH CERTIFIED ZENER VOLTAGE STABILITY

6.35 VOLT ULTRA STABLE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

(2)

DESCRIPTION

This series of Microsemi 400mW Ultra-Stable Reference Diodes offers a CERTIFIED REFERENCE VOLTAGE STABILITY as measured over an actual operating period of 1000 hours. Standard stabilities are 10, 20, and 50 PPM/1000 hours. Units having stabilities of less than 5 PPM/1000 hours are available on special request.

Ultra-Stable Certified Reference Diodes, available in standard or radiation hardened construction, can be used in any circuit that requires a stable reference voltage that is insensitive to shock, vibration, or position. Their inherent stability allows them to be used in circuits requiring an extremely high degree of voltage time stability such as those in Digital Voltmeters, Computers, X-Y Recorders, Missile Guidance and Environmental Control Systems, and Portable Reference Standards. Wherever accurate and reliable measurements are to be made, the Microsemi "Ultra-Stable" diode excels as the Standard Reference device.

All devices in this series have been subjected to Microsemi's 1000 hour Stability Test Sequence, consisting of a 1000 hour power age with reference voltage measured once every 168 hours giving a total of 7 individual test points. The stability test is performed at 80°C ±0.1°C.

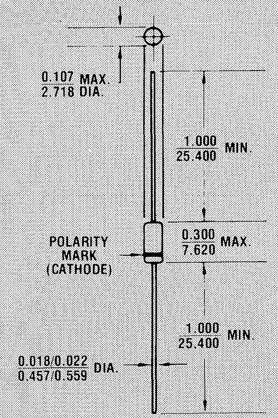
A Certificate containing the following data is supplied with each diode:

1. The stability test voltage readings.
2. The voltage drift as referenced to "Zero Hour" in both μV and in PPM (Parts-Per-Million).

To certify these diodes to such tight stabilities as 10 PPM/1000 hours, every factor of environment, both ambient and electrical is considered and controlled to "Standards Laboratory" accuracy.

To specify radiation hardened devices, use "RH" prefix instead of "1N", i.e. RH4895A instead of 1N4895A.

Consult factory for TX, TXV or JANS equivalent SCDs.



All dimensions in INCH / m.m.

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7 (DO-204AA).
FINISH: All external surfaces are corrosion resistant and leads solderable.
THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.
POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.
WEIGHT: 0.2 grams.
MOUNTING POSITION: Any

6.35 VOLT ULTRA-STABLE (T. C.) ZENER REFERENCE DIODES

MAXIMUM RATINGS (See Fig. 5)

Operating Temperature Range: —65°C to + 175°C

Maximum Lead Temperature 1/16 ± 1/32 inch from case for 10 seconds: 230°C

Maximum DC Power Dissipation at or below 50°C Ambient: 400 mW

Linear Derating: 3.2 mW/°C (See Figure 5)

Maximum Steady State Current (I_{ZM}) at 150°C: 7.5 mA

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass

Dimensions: DO-7 outline

Finish: All external surfaces are corrosion resistant and leads are readily solderable

Polarity: Diode to be operated with the banded end positive

Weight: 0.2 grams (typical)

Mounting Position: Any

*ELECTRICAL CHARACTERISTICS @ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	NOMINAL ZENER VOLTAGE ±5% V_Z @ I_{ZT}	ZENER TEST CURRENT ±0.01 mA I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 1)	VOLTAGE TEMPERATURE STABILITY ΔV_{ZT} MAXIMUM (NOTE 2)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}	VOLTAGE TIME STABILITY @ 80°C INITIAL-TO PEAK ΔV_{Zt} MAXIMUM (NOTE 3)	EFFECTIVE VOLTAGE TIME STABILITY INITIAL-TO-PEAK
	VOLTS	mA	OHMS	mV	°C	%/°C	μV/1000 HRS.	PPM/1000 HRS.
1N4890	6.35	7.5	10	5.0	25 to 100	0.001	318	50
1N4890A	6.35	7.5	10	10.0	—55 to 100	0.001	318	50
1N4891	6.35	7.5	10	2.5	25 to 100	0.0005	318	50
1N4891A	6.35	7.5	10	5.0	—55 to 100	0.0005	318	50
1N4892	6.35	7.5	10	5.0	25 to 100	0.001	127	20
1N4892A	6.35	7.5	10	10.0	—55 to 100	0.001	127	20
1N4893	6.35	7.5	10	2.5	25 to 100	0.0005	127	20
1N4893A	6.35	7.5	10	5.0	—55 to 100	0.0005	127	20
1N4894	6.35	7.5	10	5.0	25 to 100	0.001	64	10
1N4894A	6.35	7.5	10	10.0	—55 to 100	0.001	64	10
1N4895	6.35	7.5	10	2.5	25 to 100	0.0005	64	10
1N4895A	6.35	7.5	10	5.0	—55 to 100	0.0005	64	10

NOTE 1

The zener impedance is derived from the 60 Hz ac voltage which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 2

Maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 3

When operated at:

$I_{ZT} = 7.5$ mA ± 0.0001 mA

$T_A = 80°C \pm 0.1°C$

(See Note 2 Below)

NOTES AND PRECAUTIONS FOR CERTIFIED REFERENCE DIODES

1. DIODE IDENTIFICATION: The diodes are shipped attached to their certification papers and each diode is individually packaged with the diode identification on the package. Identification includes JEDEC type number and a diode serial number consisting of 7 digits showing the lot number and diode number, which provide traceability to factory records.

2. PRECAUTIONS: The normal precautions must be taken when soldering as with any semiconductor device, such as a thermal shunt between the soldering iron and the diode body. "Mechanical" rather than solder mounting is preferred for optimum performance. Mounting the diode inside a large thermal mass such as aluminum, copper, brass, or epoxy will reduce thermally induced voltage fluctuations discernible as low frequency noise in the 0-3 Hz region of the spectrum.

Certain precautions must be taken to ensure that the diode's stability is fully utilized in the circuit. If the current through the zener is not controlled, the reference voltage will shift due to diode impedance ($\Delta V_Z = \Delta I_Z \times Z_{ZT}$). If the diode's junction temperature is allowed to change, due to a change in ambient or case temperature or due to a power level change, a shift in voltage will occur consistent with the temperature coefficient of the diode. In addition, the device must be physically mounted so as to give the diode a constant thermal resistance, junction-to-ambient. Drafts, circulating oil, and even the minute convection currents produced by a diode in a closed container can cause shifts in reference voltage greater than those that can be attributed to the diode's inherent stability.

It *must* be understood that the certified stability is possible only under steady-state, constant temperature conditions. The stability of an ultra-stable zener reference diode may be upset by severe changes in junction temperature. In addition, a slight derating of voltage-time stability (ΔV_{ZT}) may be experienced if the diode is operated outside the "stable-area" defined in Figure 5. The effect of turning the diode's current off and on at a *constant* temperature is negligible (except for thermal warmup of diode). The certified stability of the diode is considered to be a worst case "inherent" junction stability, and will be realized only after 2 or 3 weeks of operation under *actual operating conditions.* This might be in the user's circuit or finished product, however, the device must have this time to reach an "equilibrium" at operating conditions. The "inherent" stability of the device is never upset unless maximum ratings are surpassed. A new "equilibrium" must be reached with each new operating condition.

Temperature coefficients much lower than specified can be attained by operating the diode at "0" TC crossover current (the point at which TC goes from positive to negative or vice-versa), however, a new "equilibrium" must be reached before full stability will be attained.

3. MICROSEMI TEST METHOD: Microsemi uses a potentiometric method of zener voltage measurement on certified reference diodes. Zener voltage is measured to seven digits (1 microvolt resolution). Voltage calibration is directly traceable to the National Bureau of Standards. Oil bath temperature is controlled to better than 0.1°C, and current is constant and repeatable to better than $\pm 0.1\,\mu A$. Test clips are designed for the four-terminal method of measurement (separate voltage and current connections) to eliminate errors caused by resistance. The diodes are thermally shielded by an aluminum thermal filter to reduce thermally created error causing voltage fluctuations.

4. 1000 HOUR STABILITY TEST SEQUENCE: Voltage is measured seven times during the test with the last six measurements referenced to the first. The measurements are taken 168 hours apart, giving a total test time of 1008 hours.

②

$\triangle V_{zt}$ PLOT OF A TYPICAL 1N4890 DIODE

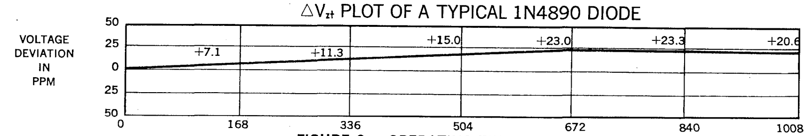


FIGURE 2 — OPERATING TEST TIME IN HOURS

$\triangle V_{zt}$ PLOT OF A TYPICAL 1N4893 DIODE

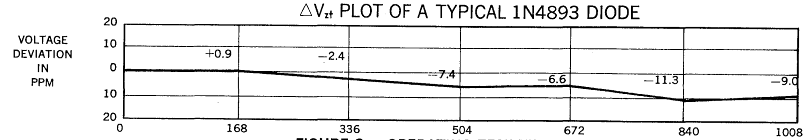


FIGURE 3 — OPERATING TEST TIME IN HOURS

$\triangle V_{zt}$ PLOT OF A TYPICAL 1N4895 DIODE

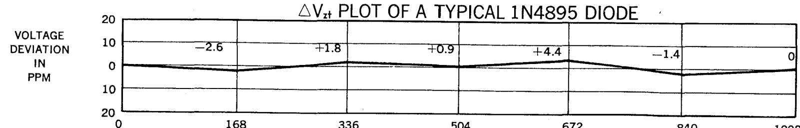


FIGURE 4 — OPERATING TEST TIME IN HOURS

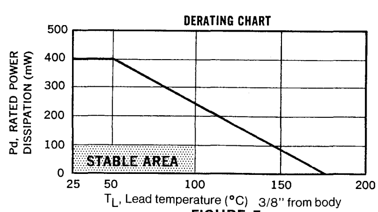
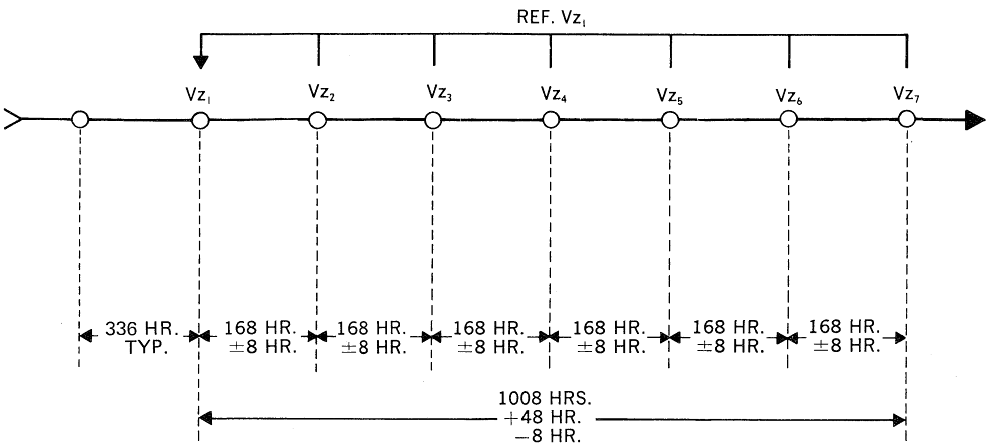


FIGURE 5

THE "STABLE AREA" IS DEFINED AS THE AREA IN WHICH THE MAXIMUM TIME STABILITY ($\triangle V_{zt}$) IS ATTAINABLE.

A SLIGHT DERATING IN THE TIME STABILITY MAY BE EXPECTED IF THE DIODE IS OPERATED OUTSIDE THIS AREA.

1000 HOUR STABILITY TEST SEQUENCE



Notes:

Test Temperature . . . . 80° C ±0.1° C

Test Current . . . . 7.5 mA. with a constancy and repeatability of ±0.1 microamp.

The first 336 hours of operation is a stabilization period. The stability of a diode is measured by the worst voltage difference (ΔV_Z) referenced to V_{Z1}.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N4896 thru 1N4915A

12.8 VOLT LOW NOISE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

2

FEATURES

- ZENER VOLTAGE 12.8V
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C to 0.001%/°C
- N_D YIELDS MAXIMUM-RMS NOISE FOR ANY BANDWIDTH

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 400 mW
Power Derating: 3.20 mW/°C above 50°C

* ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	TEST CURRENT I_{ZT} (Note 1 & 5)	MAX. VOLTAGE CHANGE WITH TEMPERATURE ΔV_{ZT} (Note 2 & 5)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ} (Note 3)	MAXIMUM DYNAMIC IMPEDANCE Z_{ZT} (Note 4)	MAXIMUM NOISE DENSITY N_D
	mA	VOLTS	°C	± %/°C	OHMS	$\mu V/\sqrt{cps}$
1N4896	0.5	0.096	+25 to +100	0.01	400	0.8
1N4896A	0.5	0.198	−55 to +100	0.01	400	0.8
1N4897	0.5	0.048	+25 to +100	0.005	400	0.8
1N4897A	0.5	0.099	−55 to +100	0.005	400	0.8
1N4898	0.5	0.019	+25 to +100	0.002	400	0.8
1N4898A	0.5	0.040	−55 to +100	0.002	400	0.8
1N4899	0.5	0.010	+25 to +100	0.001	400	0.8
1N4899A	0.5	0.020	−55 to +100	0.001	400	0.8
1N4900	1.0	0.096	+25 to +100	0.01	200	0.4
1N4900A	1.0	0.198	−55 to +100	0.01	200	0.4
1N4901	1.0	0.048	+25 to +100	0.005	200	0.4
1N4901A	1.0	0.099	−55 to +100	0.005	200	0.4
1N4902	1.0	0.019	+25 to +100	0.002	200	0.4
1N4902A	1.0	0.040	−55 to +100	0.002	200	0.4
1N4903	1.0	0.010	+25 to +100	0.001	200	0.4
1N4903A	1.0	0.020	−55 to +100	0.001	200	0.4
1N4904	2.0	0.096	+25 to +100	0.01	100	0.25
1N4904A	2.0	0.198	−55 to +100	0.01	100	0.25
1N4905	2.0	0.048	+25 to +100	0.005	100	0.25
1N4905A	2.0	0.099	−55 to +100	0.005	100	0.25
1N4906	2.0	0.019	+25 to +100	0.002	100	0.25
1N4906A	2.0	0.040	−55 to +100	0.002	100	0.25
1N4907	2.0	0.010	+25 to +100	0.001	100	0.25
1N4907A	2.0	0.020	−55 to +100	0.001	100	0.25
1N4908	4.0	0.096	+25 to +100	0.01	50	0.22
1N4908A	4.0	0.198	−55 to +100	0.01	50	0.22
1N4909	4.0	0.048	+25 to +100	0.005	50	0.22
1N4909A	4.0	0.099	−55 to +100	0.005	50	0.22
1N4910	4.0	0.019	+25 to +100	0.002	50	0.22
1N4910A	4.0	0.040	−55 to +100	0.002	50	0.22
1N4911	4.0	0.010	+25 to +100	0.001	50	0.22
1N4911A	4.0	0.020	−55 to +100	0.001	50	0.22
1N4912	7.5	0.096	+25 to +100	0.01	25	0.20
1N4912A	7.5	0.198	−55 to +100	0.01	25	0.20
1N4913	7.5	0.048	+25 to +100	0.005	25	0.20
1N4913A	7.5	0.099	−55 to +100	0.005	25	0.20
1N4914	7.5	0.019	+25 to +100	0.002	25	0.20
1N4914A	7.5	0.040	−55 to +100	0.002	25	0.20
1N4915	7.5	0.010	+25 to +100	0.001	25	0.20
1N4915A	7.5	0.020	−55 to +100	0.001	25	0.20

*JEDEC Registered Data.

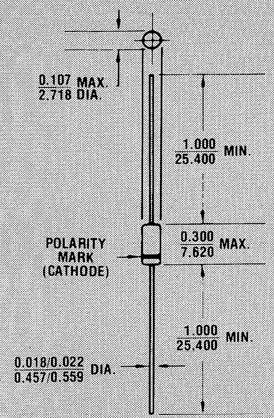


FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

NOTE 1 Nominal voltage for all types is 12.8 Volts ±5%.

NOTE 2 Referred to as the 'box' measurement method, the ΔV_{ZT} is the maximum voltage variance that will occur as the voltage is scanned thru all temperatures between the temperature range limits.

NOTE 3 The effective temperature coefficients are tabulated in %/°C primarily for information only since temperature compensated diodes inherently have a non-linear voltage-temperature characteristic.

NOTE 4 The dynamic Zener impedance Z_{ZT} is derived from the resulting a.c. voltage developed when a 60 cps, rms a.c. current equal to 10% of the D.C. Zener current I_{ZT} is superimposed on I_{ZT}

NOTE 5 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 6 To specify radiation hardened devices, use "RH" prefix instead of "IN", i.e. RH4896A instead of IN4896A.

NOTE 7 Consult factory for TX, TXV or JANS equivalent SCDs.

Noise Density (N_D) is specified in Microvolts-rms per square root cycle. Actual measurement is performed using a 1 to 3 KH_Z frequency bandpass at the Zener test current(I_{ZT}) @ 25° C ambient temperature.

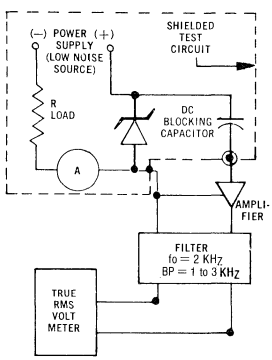


FIGURE 2 NOISE DENSITY MEASUREMENT CIRCUIT

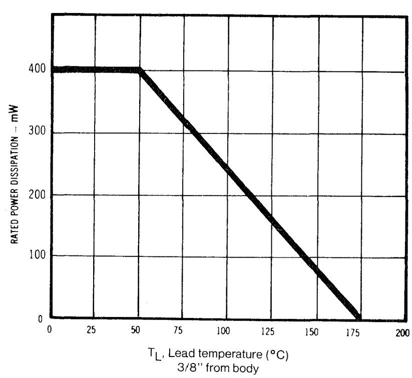


FIGURE 3 POWER DERATING CURVE

Microsemi Corp.
The diode experts
SANTA ANA, CA
SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N4916 thru 1N4932A

19.2 VOLT LOW NOISE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

FEATURES

- ZENER VOLTAGE 19.2V
- TEMPERATURE COEFFICIENT RANGE: 0.01%/°C to 0.001%/°C
- N_D YIELDS MAXIMUM-RMS NOISE FOR ANY BANDWIDTH

MAXIMUM RATINGS

Junction and Storage Temperatures: −65°C to +175°C
DC Power Dissipation: 400 mW
Power Derating: 3.20 mW/°C above 50°C

*ELECTRICAL CHARACTERISTICS

@ 25°C, unless otherwise specified

JEDEC TYPE NUMBER	TEST CURRENT I_{ZT} (Note 1 & 5)	MAX. VOLTAGE CHANGE WITH TEMPERATURE ΔV_{ZT} (Note 2 & 5)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ} (Note 3)	MAXIMUM DYNAMIC IMPEDANCE Z_{ZT} (Note 4)	MAXIMUM NOISE DENSITY N_D
	mA	VOLTS	°C	±%/°C	OHMS	µV/√ cps
1N4916	0.5	0.144	+25 to +100	0.01	600	1.0
1N4916A	0.5	0.298	−55 to +100	0.01	600	1.0
1N4917	0.5	0.072	+25 to +100	0.005	600	1.0
1N4917A	0.5	0.149	−55 to +100	0.005	600	1.0
1N4918	0.5	0.029	+25 to +100	0.002	600	1.0
1N4918A	0.5	0.060	−55 to +100	0.002	600	1.0
1N4919	1.0	0.144	+25 to +100	0.01	300	0.5
1N4919A	1.0	0.298	−55 to +100	0.01	300	0.5
1N4920	1.0	0.072	+25 to +100	0.005	300	0.5
1N4920A	1.0	0.149	−55 to +100	0.005	300	0.5
1N4921	1.0	0.029	+25 to +100	0.002	300	0.5
1N4921A	1.0	0.060	−55 to +100	0.002	300	0.5
1N4922	2.0	0.144	+25 to +100	0.01	150	0.25
1N4922A	2.0	0.298	−55 to +100	0.01	150	0.25
1N4923	2.0	0.072	+25 to +100	0.005	150	0.25
1N4923A	2.0	0.149	−55 to +100	0.005	150	0.25
1N4924	2.0	0.029	+25 to +100	0.002	150	0.25
1N4924A	2.0	0.060	−55 to +100	0.002	150	0.25
1N4925	4.0	0.144	+25 to +100	0.01	75	0.22
1N4925A	4.0	0.298	−55 to +100	0.01	75	0.22
1N4926	4.0	0.072	+25 to +100	0.005	75	0.22
1N4926A	4.0	0.149	−55 to +100	0.005	75	0.22
1N4927	4.0	0.029	+25 to +100	0.002	75	0.22
1N4927A	4.0	0.060	−55 to +100	0.002	75	0.22
1N4928	4.0	0.014	+25 to +100	0.001	75	0.22
1N4928A	4.0	0.030	−55 to +100	0.001	75	0.22
1N4929	7.5	0.144	+25 to +100	0.01	36	0.20
1N4929A	7.5	0.298	−55 to +100	0.01	36	0.20
1N4930	7.5	0.072	+25 to +100	0.005	36	0.20
1N4930A	7.5	0.149	−55 to +100	0.005	36	0.20
1N4931	7.5	0.029	+25 to +100	0.002	36	0.20
1N4931A	7.5	0.060	−55 to +100	0.002	36	0.20
1N4932	7.5	0.014	+25 to +100	0.001	36	0.20
1N4932A	7.5	0.030	−55 to +100	0.001	36	0.20

*JEDEC Registered Data.

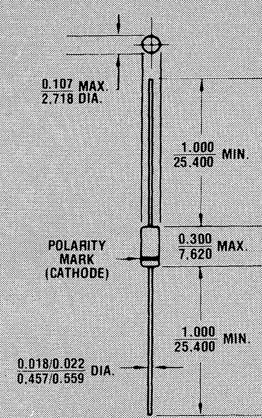


FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

NOTE 1 Nominal voltage for all types is 19.2 Volts ±5%.

NOTE 2 Referred to as the 'box' measurement method, the ΔV_{ZT} is the maximum voltage variance that will occur as the voltage is scanned thru all temperatures between the temperature range limits.

NOTE 3 The effective temperature coefficients are tabulated in %/°C primarily for information only because temperature compensated diodes inherently have a non-linear voltage-temperature relationship.

NOTE 4 The dynamic Zener impedance Z_{ZT} is derived from the resulting a.c. voltage developed when a 60 cps, rms, a.c. current equal to 10% of the D.C. Zener current I_{ZT} is superimposed on I_{ZT}.

NOTE 5 Voltage measurements to be performed 15 seconds after application of DC current.

NOTE 6 To specify radiation hardened devices, use "RH" prefix instead of "IN", i.e. RH4916A instead of IN4916A.

NOTE 7 Consult factory for TX, TXV or JANS equivalent SCDs.

Noise Density (N_D) is specified in Microvolts-rms per square root cycle. Actual measurement is performed using a 1 to 3 KH_Z frequency bandpass at the Zener test current(I_{ZT}) @ 25°C ambient temperature.

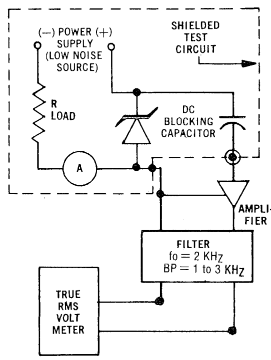


FIGURE 2
NOISE DENSITY MEASUREMENT CIRCUIT

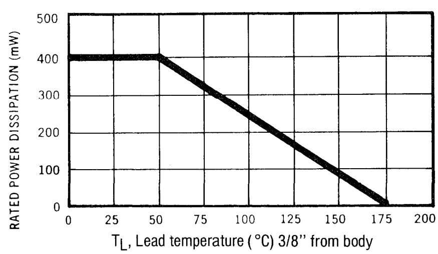


FIGURE 3
POWER DERATING CURVE

Microsemi Corp.
The diode experts
SANTA ANA, CA
SANTA ANA, CA
SCOTTSDALE, AZ
For more information call:
(602) 941-6300

USR 931 thru USR 934

WITH CERTIFIED ZENER VOLTAGE STABILITY

DESCRIPTION

This series of Microsemi 400mW Ultra-Stable Reference Diodes offers a CERTIFIED REFERENCE VOLTAGE STABILITY as measured over an actual operating period of 1000 hours. Standard stabilities are 10, 20, and 50 PPM/1000 hours. Units having stabilities of less than 5 PPM/1000 hours are available on special request.

Ultra-Stable Certified Reference Diodes, available in standard or radiation hardened construction, can be used in any circuit that requires a stable reference voltage that is insensitive to shock, vibration, or position. Their inherent stability allows them to be used in circuits requiring an extremely high degree of voltage time stability such as those in Digital Voltmeters, Computers, X-Y Recorders, Missile Guidance and Environmental Control Systems, and Portable Reference Standards. Wherever accurate and reliable measurements are to be made, the Microsemi "Ultra-Stable" diode excels as the Standard Reference device.

All devices in this series have been subjected to Microsemi's 1000 hour Stability Test Sequence, consisting of a 1000 hour power age with reference voltage measured once every 168 hours giving a total of 7 individual test points. The stability test is performed at 80°C ±0.1°C.

A Certificate containing the following data is supplied with each diode:

1. The stability test voltage readings.
2. The voltage drift as referenced to "Zero Hour" in both μV and in PPM (Parts-Per-Million).

To certify these diodes to such tight stabilities as 5PPM/1000 hours, every factor of environment, both ambient and electrical is considered and controlled to "Standards Laboratory" accuracy.

Consult factory for TX, TXV or JANS equivalent SCDs.

9.3 VOLT ULTRA STABLE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

2

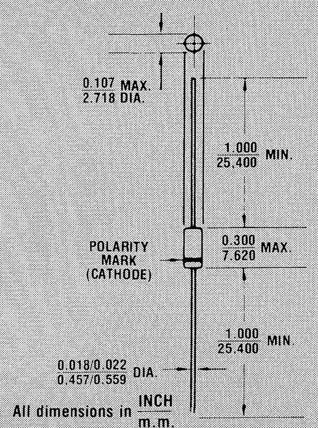


FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams

MOUNTING POSITION: Any.

9.3 VOLT ULTRA-STABLE (T.C.) ZENER REFERENCE DIODES

MAXIMUM RATINGS (See Fig. 6)

Operating Temperature Range: -65°C to +175°C

Maximum Lead Temperature 1/8 ±1/32 inch from case for 8 seconds: 230°C

Maximum DC Power Dissipation at or below 50°C Ambient

Linear Derating: 3.2 mW/°C (See Figure 6)

Maximum Steady State Current (I_{ZM}) at +150°C: 7.5 mA

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass

Dimensions: DO-7 outline

Finish: All external surfaces are corrosion resistant and leads are readily solderable

Polarity: Diode to be operated with the banded end positive

Weight: 0.2 grams (typical)

Mounting Position: Any

ELECTRICAL CHARACTERISTICS at 25°C, unless otherwise specified.

MICRO TYPE NUMBER	NOMINAL ZENER VOLTAGE ± 5% V_Z @ I_{ZT}	ZENER TEST CURRENT ±0.01 mA I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 1)	VOLTAGE TEMPERATURE STABILITY ΔV_{ZT} MAXIMUM (NOTE 2)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT	VOLTAGE TIME STABILITY @ 80°C INITIAL-TO-PEAK ΔV_{ZT} MAXIMUM (NOTE 3)	EFFECTIVE VOLTAGE TIME STABILITY INITIAL-TO-PEAK
	VOLTS	mA	OHMS	mV	°C	%/°C	μV/1000 HRS.	PPM/1000 HRS.
USR931	9.3	7.5	20	3.4	25 to 100	.0005	465	50
USR932	9.3	7.5	20	3.4	25 to 100	.0005	186	20
USR933	9.3	7.5	20	3.4	25 to 100	.0005	93	10
USR934	9.3	7.5	20	3.4	25 to 100	.0005	46	5

NOTE 1

The zener impedance is derived from the 60 Hz ac voltage which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 2

The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 3

When operated at:

$I_{ZT} = 7.5$ mA ± 0.0001 mA
$T_A = 80°C \pm 0.1°C$

(See Note 2 Below)

NOTES AND PRECAUTIONS FOR CERTIFIED REFERENCE DIODES

1. DIODE IDENTIFICATION: The diodes are shipped attached to their certification papers and each diode is individually packaged with the diode identification on the package. Identification includes MICRO type number and a diode serial number consisting of 7 digits showing the lot number and diode number, which provide traceability to factory records.

2. PRECAUTIONS: The normal precautions must be taken when soldering as with any semiconductor device, such as a thermal shunt between the soldering iron and the diode body. "Mechanical" rather than solder mounting is preferred for optimum performance. Mounting the diode inside a large thermal mass such as aluminum, copper, brass, or epoxy will reduce thermally induced voltage fluctuations discernible as low frequency noise in the 0-3 Hz region of the spectrum.

Certain precautions must be taken to ensure that the diode's stability is fully utilized in the circuit. If the current through the zener is not controlled, the reference voltage will shift due to diode impedance ($\Delta V_Z = \Delta I_Z \times Z_{ZT}$). If the diode's junction temperature is allowed to change, due to a change in ambient or case temperature or due to a power level change, a shift in voltage will occur consistent with the temperature coefficient of the diode. In addition, the device must be physically mounted so as to give the diode a constant thermal resistance, junction-to-ambient. Drafts, circulating oil, and even the minute convection currents produced by a diode in a closed container can cause shifts in reference voltage greater than those that can be attributed to the diode's inherent stability.

The certified stability of a diode is achieved only under steady state, constant temperature conditions. If the diode is operated at conditions other than the certification test conditions, it is recommended that it be operated for a period of 2 to 3 weeks under circuit operating conditions to achieve rated stability.

A slight derating of voltage-time stability (ΔV_{ZT}) may be experienced if the diode is operated outside the "stable-area" defined in Figure 6.

Temperature coefficients much lower than specified can be attained by operating the diode at "0" TC crossover current (the current at which the TC goes from positive to negative or vice-versa), however, a new "equilibrium" must be reached before full stability will be attained.

3. MICROSEMI TEST METHOD: Microsemi uses a potentiometric method of zener voltage measurement on certified reference diodes. Zener voltage is measured to seven digits (1 microvolt resolution). Voltage calibration is directly traceable to the National Bureau of Standards. Oil bath temperature is controlled to better than 0.1°C, and current is constant and repeatable to better than ±0.1 μA. Test clips are designed for the four-terminal method of measurement (separate voltage and current connections) to eliminate errors caused by resistance. The diodes are thermally shielded by an aluminum thermal filter to reduce thermally created error causing voltage fluctuations.

4. 1000 HOUR STABILITY TEST SEQUENCE: Voltage is measured seven times during the test with the last six measurements referenced to the first. The measurements are taken 168 hours apart, giving a total test time of 1008 hours.

2

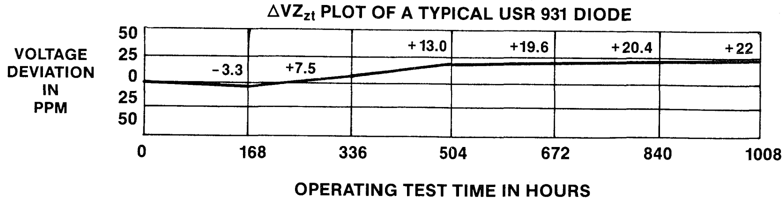


Figure 2

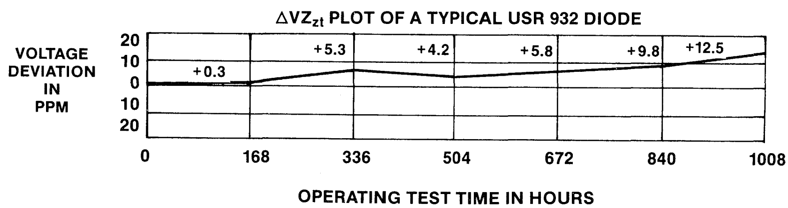


Figure 3

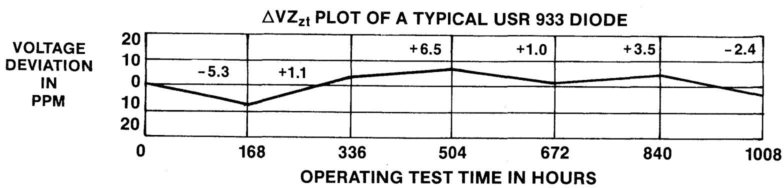


Figure 4

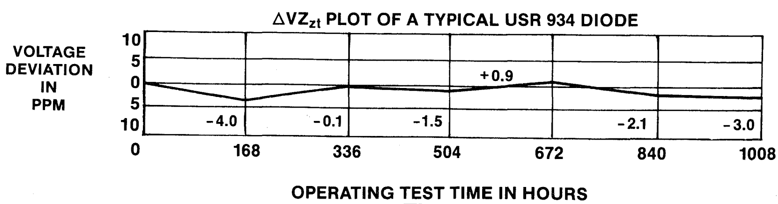
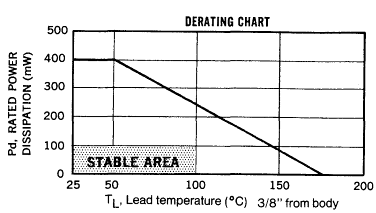


Figure 5



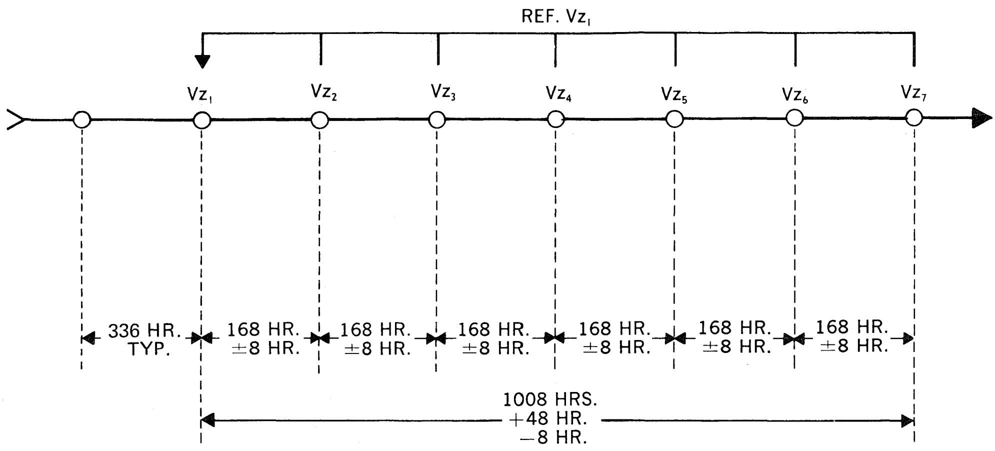
THE "STABLE AREA" IS DEFINED AS THE AREA IN WHICH THE MAXIMUM TIME STABILITY (ΔV_{zt}) IS ATTAINABLE.

A SLIGHT DERATING IN THE TIME STABILITY MAY BE EXPECTED IF THE DIODE IS OPERATED OUTSIDE THIS AREA.

Figure 6

9.3 VOLT ULTRA-STABLE (T.C.) ZENER REFERENCE DIODES

1000 HOUR STABILITY TEST SEQUENCE



Notes:

Test Temperature . . . . 80° C ±0.1° C

Test Current . . . . 7.5 mA. with a constancy and repeatability of ±0.1 microamp.

The first 336 hours of operation is a stabilization period. The stability of a diode is measured by the worst voltage difference (ΔV_Z) referenced to V_{Z1}.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

USR 1171 thru USR 1174

11.7 VOLT ULTRA STABLE TEMPERATURE COMPENSATED ZENER REFERENCE DIODES

②

DESCRIPTION

This series of Microsemi 400mW Ultra-Stable Reference Diodes offers a CERTIFIED REFERENCE VOLTAGE STABILITY as measured over an actual operating period of 1000 hours. Standard stabilities are 10, 20, and 50 PPM/1000 hours. Units having stabilities of less than 5 PPM/1000 hours are available on special request.

Ultra-Stable Certified Reference Diodes, available in standard or radiation hardened construction, can be used in any circuit that requires a stable reference voltage that is insensitive to shock, vibration, or position. Their inherent stability allows them to be used in circuits requiring an extremely high degree of voltage time stability such as those in Digital Voltmeters, Computers, X-Y Recorders, Missile Guidance and Environmental Control Systems, and Portable Reference Standards. Wherever accurate and reliable measurements are to be made, the Microsemi "Ultra-Stable" diode excels as the Standard Reference device.

All devices in this series have been subjected to Microsemi's 1000 hour Stability Test Sequence, consisting of a 1000 hour power age with reference voltage measured once every 168 hours giving a total of 7 individual test points. The stability test is performed at 80°C ±0.1°C.

A Certificate containing the following data is supplied with each diode:

1. The stability test voltage readings.
2. The voltage drift as referenced to "Zero Hour" in both μV and in PPM (Parts-Per-Million).

To certify these diodes to such tight stabilities as 5PPM/1000 hours, every factor of environment, both ambient and electrical is considered and controlled to "Standards Laboratory" accuracy.

Consult factory for TX, TXV or JANS equivalent SCDs.

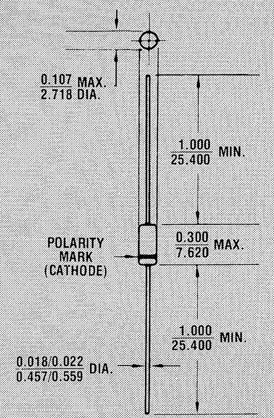


FIGURE 1

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case. DO-7.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 300°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Diode to be operated with the banded end positive with respect to the opposite end.

WEIGHT: 0.2 grams.

MOUNTING POSITION: Any.

11.7 VOLT ULTRA-STABLE (T.C.) ZENER REFERENCE DIODES

MAXIMUM RATINGS (See Fig. 6)

Operating Temperature Range: -65°C to +175°C

Maximum Lead Temperature 1/8 ±1/32 inch from case for 8 seconds: 230°C

Maximum DC Power Dissipation at or below 50°C Ambient: 400 mW

Linear Derating: 3.2 mW/°C (See Figure 6)

Maximum Steady State Current (I_{ZM}) at +150°C: 7.5 mA

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass

Dimensions: DO-7 outline

Finish: All external surfaces are corrosion resistant and leads are readily solderable

Polarity: Diode to be operated with the banded end positive

Weight: 0.2 grams (typical)

Mounting Position: Any

ELECTRICAL CHARACTERISTICS at 25°C, unless otherwise specified.

MICRO TYPE NUMBER	NOMINAL ZENER VOLTAGE ± 5% V_Z @ I_{ZT}	ZENER TEST CURRENT ±0.01 mA I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (NOTE 1)	VOLTAGE TEMPERATURE STABILITY ΔV_{ZT} MAXIMUM (NOTE 2)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT	VOLTAGE TIME STABILITY @ 80°C INITIAL-TO-PEAK ΔV_{ZT} MAXIMUM (NOTE 3)	EFFECTIVE VOLTAGE TIME STABILITY INITIAL-TO-PEAK
	VOLTS	mA	OHMS	mV	°C	%/°C	μV/1000 HRS.	PPM/1000 HRS.
USR1171	11.7	7.5	30	4.3	25 to 100	.0005	585.0	50
USR1172	11.7	7.5	30	4.3	25 to 100	.0005	234.0	20
USR1173	11.7	7.5	30	4.3	25 to 100	.0005	117.0	10
USR1174	11.7	7.5	30	4.3	25 to 100	.0005	58.5	5

NOTE 1

The zener impedance is derived from the 60 Hz ac voltage which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 2

The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.

NOTE 3

When operated at:

$I_{ZT} = 7.5$ mA ± 0.0001 mA
$T_A = 80°C \pm 0.1°C$

(See Precautions Below)

NOTES AND PRECAUTIONS FOR CERTIFIED REFERENCE DIODES

1. DIODE IDENTIFICATION: The diodes are shipped attached to their certification papers and each diode is individually packaged with the diode identification on the package. Identification includes MICRO type number and a diode serial number consisting of 7 digits showing the lot number and diode number, which provide traceability to factory records.

2. PRECAUTIONS: The normal precautions must be taken when soldering as with any semiconductor device, such as a thermal shunt between the soldering iron and the diode body. "Mechanical" rather than solder mounting is preferred for optimum performance. Mounting the diode inside a large thermal mass such as aluminum, copper, brass, or epoxy will reduce thermally induced voltage fluctuations discernible as low frequency noise in the 0-3 Hz region of the spectrum.

Certain precautions must be taken to ensure that the diode's stability is fully utilized in the circuit. If the current through the zener is not controlled, the reference voltage will shift due to diode impedance ($\Delta V_Z = \Delta I_Z \times Z_{ZT}$). If the diode's junction temperature is allowed to change, due to a change in ambient or case temperature or due to a power level change, a shift in voltage will occur consistent with the temperature coefficient of the diode. In addition, the device must be physically mounted so as to give the diode a constant thermal resistance, junction-to-ambient. Drafts, circulating oil, and even the minute convection currents produced by a diode in a closed container can cause shifts in reference voltage greater than those that can be attributed to the diode's inherent stability.

11.7 VOLT ULTRA-STABLE (T.C.) ZENER REFERENCE DIODES

Temperature coefficients much lower than specified can be attained by operating the diode at "0" TC crossover current (the current at which the TC goes from positive to negative or vice-versa), however, a new "equilibrium" must be reached before full stability will be attained.

3. MICROSEMI TEST METHOD: Microsemi uses a potentiometric method of zener voltage measurement on certified reference diodes. Zener voltage is measured to seven digits (1 microvolt resolution). Voltage calibration is directly traceable to the National Bureau of Standards. Oil bath temperature is controlled to better than 0.1°C, and current is constant and repeatable to better than $\pm 0.1\,\mu A$. Test clips are designed for the four-terminal method of measurement (separate voltage and current connections) to eliminate errors caused by resistance. The diodes are thermally shielded by an aluminum thermal filter to reduce thermally created error causing voltage fluctuations.

4. 1000 HOUR STABILITY TEST SEQUENCE: Voltage is measured seven times during the test with the last six measurements referenced to the first. The measurements are taken 336 hours apart, giving a total test time of 1008 hours.

2

ΔVZ_{zt} PLOT OF A TYPICAL USR-1171 DIODE

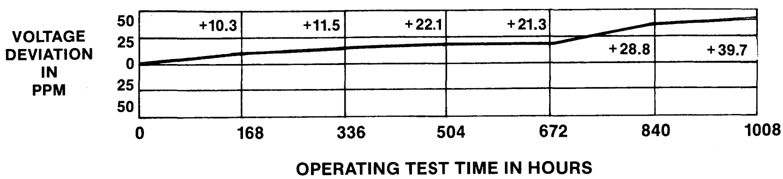


Figure 2

ΔVZ_{zt} PLOT OF A TYPICAL USR-1172 DIODE

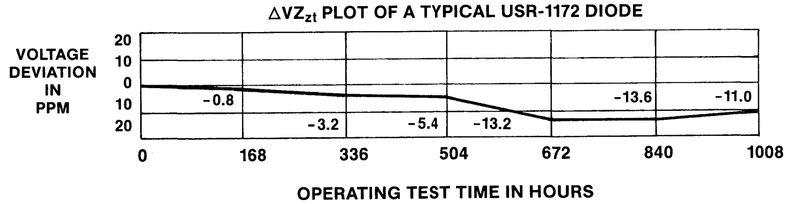


Figure 3

ΔVZ_{zt} PLOT OF A TYPICAL USR-1173 DIODE

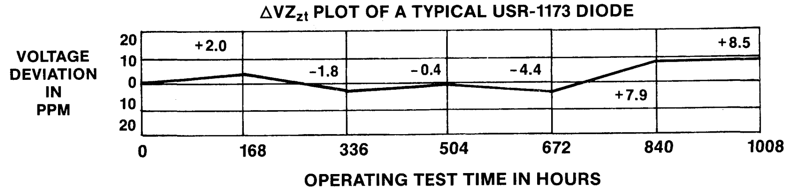


Figure 4

ΔVZ_{zt} PLOT OF A TYPICAL USR-1174 DIODE

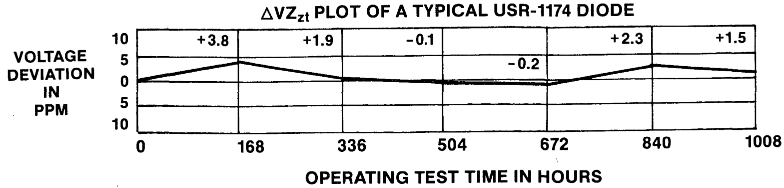
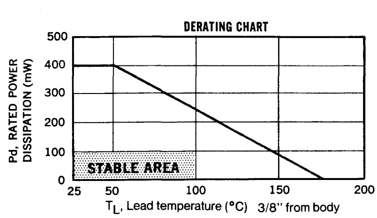


Figure 5



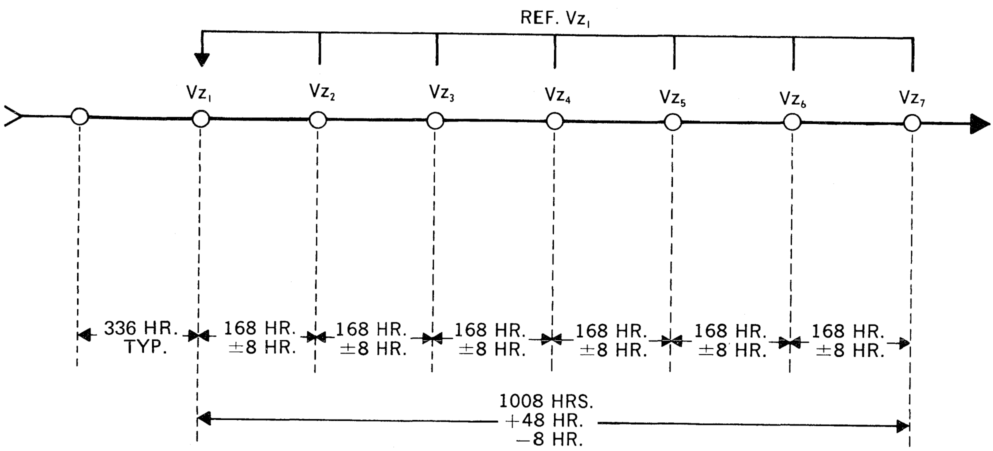
THE "STABLE AREA" IS DEFINED AS THE AREA IN WHICH THE MAXIMUM TIME STABILITY (ΔV_{zt}) IS ATTAINABLE.

A SLIGHT DERATING IN THE TIME STABILITY MAY BE EXPECTED IF THE DIODE IS OPERATED OUTSIDE THIS AREA.

Figure 6

11.7 VOLT ULTRA-STABLE (T.C.) ZENER REFERENCE DIODES

1000 HOUR STABILITY TEST SEQUENCE



Notes:

Test Temperature . . . . 80° C ±0.1° C

Test Current . . . . 7.5 mA. with a constancy and repeatability of ±0.1 microamp.

The first 336 hours of operation is a stabilization period. The stability of a diode is measured by the worst voltage difference (ΔV_Z) referenced to V_{Z1}.

RECTIFIERS AND SIGNAL DIODES

③

SECTION 3

RECTIFIER and SIGNAL SELECTION GUIDE

Avg. DC Output (A)	.5 A				1.0 A				
Package Style			A	A	A	A	A	A	A
Reverse Rec. Time	4-5 nsec	50-100 nsec	250-400 nsec	≥ 400 nsec	20 nsec	75 nsec	100-200 nsec	250-500 nsec	> 500 nsec
Peak Reverse Voltage — VOLTS 50					MB207	MB341	MB313 MB314		
75	1N4150 1N4150-1†				MB208				
100	1N914† 1N4148 1N4148-1		MB315		MB209	MB342	MB316 MB215		
125					MB210				
150					MB211	MB343			
200		1N4938* 1N4938-1†	MB318	1N645†	MB215	MB344	MB319 1N4942† 1N5615† MB216		1N3611† 1N4245†
250						MB345	MB217		
300			MB321				MB322	MB218	
400			MB324	1N647†			MB325 1N4944† 1N5617†	MB219	1N3612† 1N4246†
500		MB403 MC8936	MB327				MB328	MB220	
600			MB330	1N649			MB331	1N4946† 1N5619†	1N3613† 1N4247†
800		MB401						1N4947† 1N5621†	1N3614† 1N4248†
1000		MB402						1N4948† 1N5623†	1N3957† 1N4249†

*MIL-S-19500 Devices †Microsemi Corp. QPL

RECTIFIER and SIGNAL SELECTION GUIDE

Avg. DC Output (A)	2.0 A			3.0 A					
Package Style	A	A	A	A	A	A	A	E	
Reverse Rec. Time	20 nsec	75 nsec	250-500 nsec	25 nsec	30 nsec	50 nsec	75 nsec	100-400 nsec	>400 nsec
Peak Reverse Voltage — VOLTS 50	MB200	MB346	MB366 MB314	1N5802† MB7678 MB7681	1N6073†			1N5415† MB335 MX3105	
75	MB201			1N5803					
100	MB202	MB347	MB367 MB317	1N5804† MB7679 MB7682	1N6074†			1N5416† 1N5186 MB336 MX3110	30S1
125	MB203			1N5805					
150	MB204	MB348		1N5806† MB7680 MB7683	1N6075†			MX3115	
200	MB206	MB349	MB368 MB320		MB7748	MB7684		1N5417† 1N5187 MB337 MX3120	30S2
250		MB350							
300			MB323			MB7685			30S3
400			MB369 MB326		MB7749	MB7686		1N5418† 1N5188 MB338	30S4
500			MB370		MB7750			1N5419† 1N5189 MB339	30S5
600			MB329 MB371 MB332			MB7751 (700V) MB7752		1N5420† 1N5190 MB340	30S6
800							MB7753		30S8
1000								MB7754	30S10

*MIL-S-19500 Devices †Microsemi Corp. QPL

RECTIFIER and SIGNAL SELECTION GUIDE

4 A	5 A				6 A			6.5 A	7.5 A
	E	E	E	E	E	DO4		G	G
100-400 nsec	30 nsec	50 nsec	75 nsec	100 nsec	30-75 nsec	300 nsec	>300 nsec	300-500 nsec	300-500 nsec
MR4305A MX4105 40SL05	MV7292				1N5807† 1N6076* MES1301	1N3879	60S05	MTR4405A	MTR5405A
					1N5808				
MR4310A MX4110 40SL1	MV7293				1N5809† 1N6077* MES1302	1N3880	60S1	MTR4410A	MTR5410A
					1N5810				
MX4115	MV7294				1N5811† 1N6078* MES1303				
MR4320A MX4120 40SL2	MV7352	MV7295				1N3881	60S2	MTR4420A	MTR5420A
40SL3		MV7296				1N3882	60S3	MTR4440A	MTR5440A
MR4340A 40SL4	MV7353	MV7297				1N3883	60S4		
MR4350A 40SL5	MV7354						60S5		
MR4360A 40SL6							60S6		
40SL8	MV7355 (700V) MV7356		MV7357				60S8		
40SL10				MV7358			60S10		

*MIL-S-19500 Devices †Microsemi Corp. QPL

RECTIFIER and SIGNAL SELECTION GUIDE

Avg. DC Output (A)			9A	12A		20-25A				
Package Style			G	G	DO4	DO4				
Reverse Rec. Time			300-500 nsec	30 nsec	200 nsec	35 nsec				
Peak Reverse Voltage	VOLTS 50		MTR6405A	1N6079*	1N3889	1N5812* MES701				
	75					1N5813				
	100		MTR6410A	1N6080*	1N3890†	1N5814* MES702				
	125					1N5815				
	150			1N6081*		1N5816*				
	200		MTR6420A		1N3891†					
	250									
	300		MTR6440A		1N3892†					
	400				1N3893†					
	500									
	600									
	800									
	1000									

*MIL-S-19500 Devices †Microsemi Corp. QPL

ULTRA FAST/FAST RECOVERY RECTIFIER SELECTION GUIDE

Avg. DC Output		1.0 - 3.0 AMPERES					5.0 - 6.0 AMPERES			
PACKAGE SIZE		A					E			
	t_{rr}*	25nsec	30nsec	50nsec	75nsec	100nsec	30nsec	50nsec	75nsec	100nsec
	VOLTS									
PEAK REVERSE VOLTAGE	50	MES1001/MB7678 MES1101/MB7681 (1N5802)					MES1301/MV7292 (1N5807)			
	100	MES1002/MB7679 MES1102/MB7682 (1N5804)					MES1302/MV7293 (1N5809)			
	150	MES1003/MB7680 MES1103/MB7683 (1N5806)					MES1303/MV7294 (1N5811)			
	200		DSR3200/ MB7748	MES1104/MB7684			DSR5200/MV7352	MES1304/MV7295		
	300		DSR3300/ MB7763	MES1105/MB7685			MV7371	MES1305/MV7296		
	400		DSR3400/1N6536 MB7749	MES1106/MB7686			DSR5400/1N6543 MV7353	MES1306/MV7297		
	500		DSR3500/1N6537 MB7750				DSR5500/1N6544 MV7354			
	600			DSR3600/1N6538 MB7751				DSR5600/1N6545 MV7355		
	700			DSR3700/1N6539 MB7752				DSR5700/1N6546 MV7356		
	800				DSR3800/1N6540 MB7753				DSR5700/1N6547 MV7357	
	900					1N6541/MB7764				1N6548/MV7372
	1000					DSR31000/ 1N6542 MB7754				DSR51000 1N6549 MV7358

* = t_{rr} measured ½-1-¼ Amps

Microsemi Corp.
The diode experts

SANTA ANA, CA
For more information call:
(714) 979-8220

SCOTTSDALE, AZ

1N483B thru 1N486B and 1N5194 thru 1N5196

GENERAL PURPOSE SILICON DIODES

FEATURES

- Voidless hermetically sealed glass package (DO-35).
- Triple layer passivation.
- Metallurgically bonded.
- TX types available per MIL-S-19500/118C.

MAXIMUM RATINGS

Operating Temperature: −65°C to +200°C.
Storage Temperature: −65°C to +200°C.
Surge Current: 2A

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100 μA	AVERAGE RECTIFIED CURRENT I_0		FORWARD VOLTAGE DROP (MAX.) V_F	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) $I_{F\,surge}$	JUNCTION CAPACITANCE C @ 0V
	VOLTS	VOLTS	AMPS		VOLTS	μA		AMPS	pF
			25°C	150°C		25°C	150°C		
JAN 1N483B	70	80	.2	.05	1.0V (pk)	.025	5	2	8
JAN 1N485B	180	200	.2	.05	@	.025	5	2	8
JAN 1N486B	225	250	.2	.05	100mA pulse	.025	5	2	8
JAN 1N5194	SAME AS JAN 1N483B EXCEPT: PACKAGE D035								
JAN 1N5195	SAME AS JAN 1N485B EXCEPT: PACKAGE D035								
JAN 1N5196	SAME AS JAN 1N486B EXCEPT: PACKAGE D035								

PACKAGE: D07 for JAN 1N483B, 485B, 486B.
D035 for JAN 1N5194, JAN 1N5195, and JAN 1N5196.

NOTE 1: I_O = 200mAdc, 10 - 8.3msec surges

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case.
Lead Material: Tinned copper.
Marking: Body painted, alpha numeric.
Polarity: Cathode band.

3

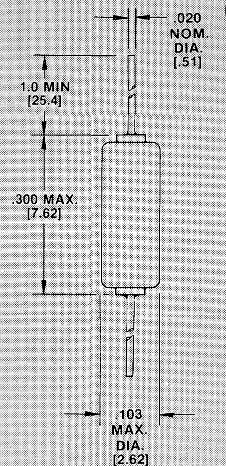


FIGURE 1A
PACKAGE D07

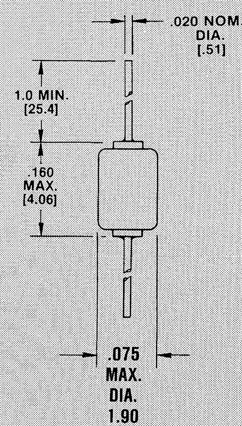


FIGURE 1B
PACKAGE DO-35

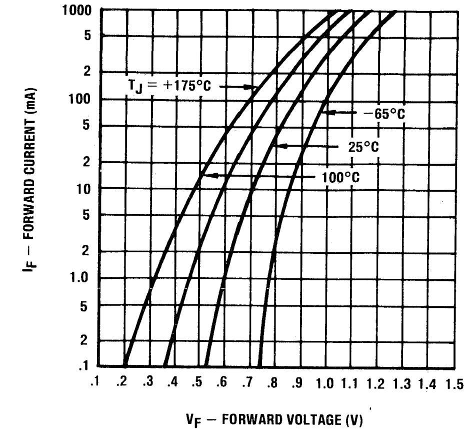


FIGURE 2
FORWARD VOLTAGE vs. FORWARD CURRENT

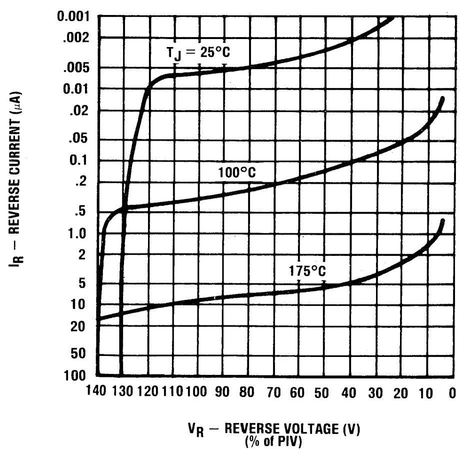


FIGURE 3
REVERSE VOLTAGE vs. REVERSE CURRENT

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SCOTTSDALE, AZ

JAN 1N645-1 thru JAN 1N649-1

☆JANS☆

MILITARY RECTIFIERS

③

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- STANDARD RECOVERY
- PIV TO 600 VOLTS
- JANS/TX/TXV TYPES AVAILABLE PER MIL-S-19500/240

MAXIMUM RATINGS

Operating Temperature: - 65°C to + 150°C
Storage Temperature: - 65°C to + 200°C
Surge Current: 5 A (8.3 msec.)

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100 µA	AVERAGE RECTIFIED CURRENT I_0		FORWARD VOLTAGE DROP (MAX.) V_F	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) I_F (surge)	JUNCTION CAPACITANCE (MAX.) C @ −4V
	VOLTS	VOLTS	AMPS		VOLTS	µA		AMPS	pF
			25°C	150°C		25°C	100°C	8.3 ms	
JAN 1N645-1	225	270	.4	.15	1.0V	.05	25	5	20
JAN 1N647-1	400	480	.4	.15	MAX. @	.05	25	5	20
JAN 1N649-1	600	720	.4	.15	400mAdc (pulsed)	.05	25	5	20

NOTE 1: T_A = 150°C, I_O = 150mAdc, 10 −8.3 msec surges.

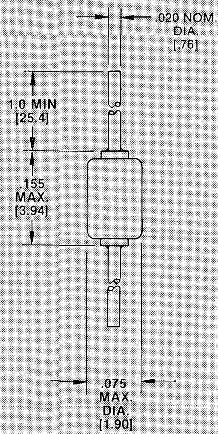

FIGURE 1
PACKAGE C

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case.
Lead Material: Tinned copper.
Marking: Body painted, alpha numeric.
Polarity: Cathode band.

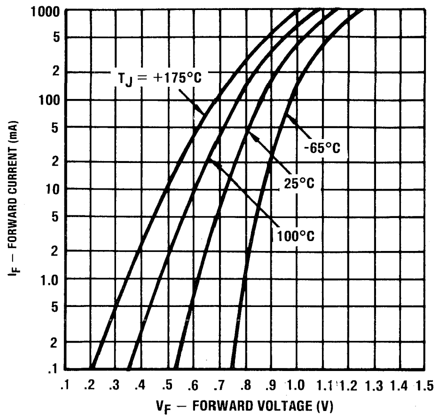

FIGURE 2
FORWARD VOLTAGE vs. FORWARD CURRENT

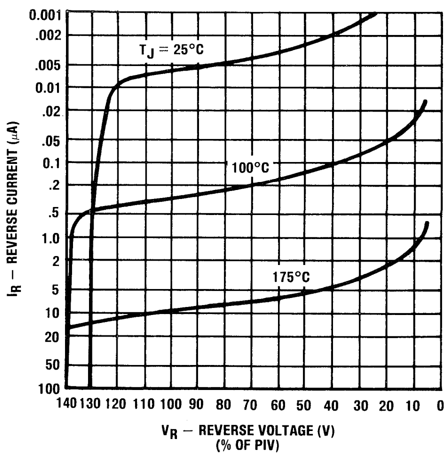

FIGURE 3
REVERSE VOLTAGE vs. REVERSE CURRENT

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SCOTTSDALE, AZ

1N897 - 1N902, 1N3064M, 1N3069M, 1N3206, 1N3207, MC914, MC914A, MC916, MC916A, MC001, MC001A, MC002

MICRO-DIODES

3

FEATURES

- Microminiature package.
- Fast recovery.
- Stable surface films integrally bonded to the device crystal.
- Meet or exceed requirements of MIL-S-19500/195 (IN 3206) and MIL-S-19500/230 (IN 3207).

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.
Power Dissipation: 300 mW @ 25°C Au plated silver leads.
250 mW @ 25°C Au plated kovar leads.

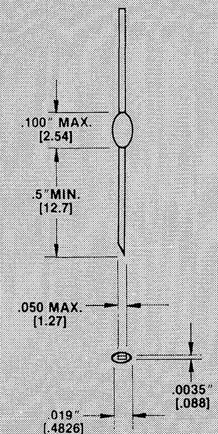

FIGURE 1
PACKAGE "H"

ELECTRICAL CHARACTERISTICS

TYPE	BREAKDOWN VOLTAGE (MIN.) @ 100 μA B_V	FORWARD CURRENT (MIN.) @ 1.0V I_F	REVERSE CURRENT (MAX.) I_R @ V_R		TEST VOLTAGE V_R	CAPACITANCE (MAX.) @ 0 V C_0	REVERSE RECOVERY (MAX.) (NOTES BELOW) t_{rr}
	VOLTS	mA	μA		VOLTS	pF	n sec.
			25°C	100°C			
1N897	50	5	0.1	20.0	−40V	—	100K Ω in .1 μsec (1)
			0.025	5.0	−10V		
1N898	50	100	5.0	20.0	−40V	—	100K Ω in .3 μsec. (1)
			0.025	5.0	−10V		
1N899	100	5	0.1	20.0	−80V	—	100K Ω in .3 μsec. (1)
			0.025	5.0	−10V		
1N900	100	50	0.1	20.0	−80V	—	100K Ω in .3 μsec. (1)
			0.025	5.0	−10V		
1N901	100	100	0.5	20.0	−80V	—	100K Ω in .3 μsec. (1)
			0.025	5.0	−10V		
1N902	200	10	1.0	15.0	−100V	—	200K Ω in .3 μsec. (1)
MC914	100	10	0.025	15.0(5)	−20V	4.0	4.0(2)
MC914A	100	20	0.025	50.0(5)	−20V	4.0	4.0(2)
MC916	100	10	0.025	50.0(5)	−20V	2.0	4.0(2)
MC916A	100	20	0.025	50.0(5)	−20V	2.0	4.0(2)
MC001	75	10	0.1	100.0(5)	−50V	2.0	2.0(2)
MC001A	75	20	0.1	100.0(5)	−50V	2.0	2.0(2)
MC002	200	100	0.1	100.0(5)	−150V	5.0	50.0(3)
1N3064M	75(@5μA)	10	0.1	100.0(5)	−50V	2.0	4.0(4)
1N3069M	65(@5μA)	50	0.1	100.0(5)	−50V	6.0	50.0(3)
1N3206	100	10	0.025	50.0(5)	−20V	4.0	4.0(2)
JAN N3206	100	10	0.025	30.0(5)	−20V	2.0	4.0(2)
			0.5		−80V		
JAN N3207	60	150	0.05	60.0(5)	−20V	15.0	6.0(2)
1N3207	60	150	0.05	10.0	−20V	6.0	6.0(2)

NOTES:
(1) JAN256 Recovery Test Circuit Conditions 5mA to −40V.
(2) Recovery to 1.0 mA reverse, switching from 10 mA forward to −6.0 Volts. R_L = 100 ohms.
(3) Recovery to 1.0 mA reverse, switching from 30 mA forward to 30 mA reverse. R_L = 150 ohms.
(4) Recovery to 1.0 mA reverse, switching from 10 mA forward to 10 mA reverse. R_L = 100 ohms.
(5) I_R measured at 150°C.

MECHANICAL CHARACTERISTICS

Case: Ultra stable epoxy encapsulation.
Lead Material: Gold plated kovar or gold plated silver.
Markings: EIA color code bands.
Polarity: Color bands on cathode lead.

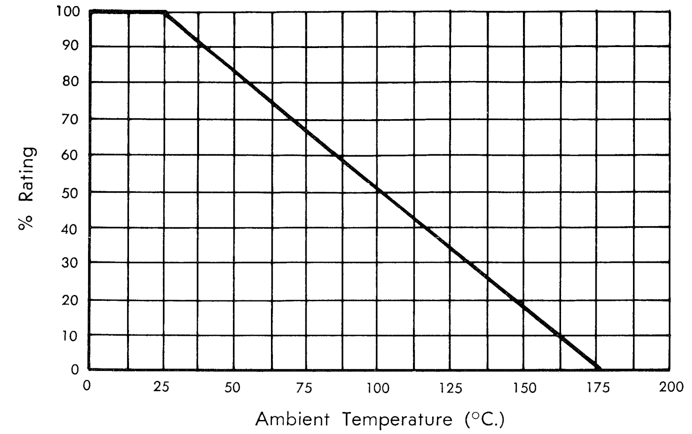

FIGURE 2
TEMPERATURE DERATING CURVE

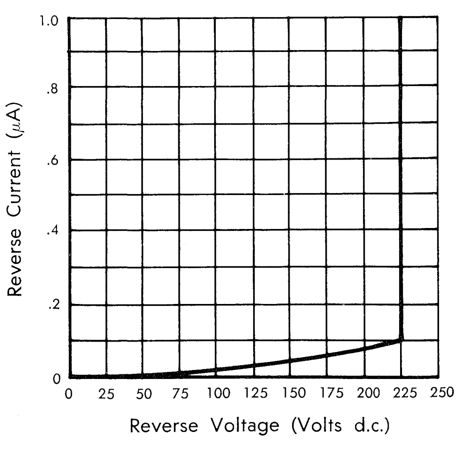

FIGURE 3
TYPICAL REVERSE
CHARACTERISTICS (25°C)

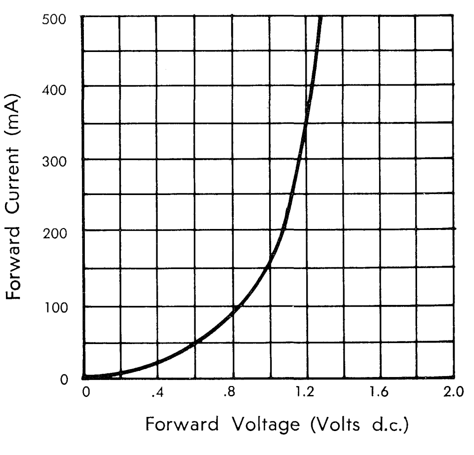

FIGURE 4
TYPICAL FORWARD CURRENT
CHARACTERISTICS (25°C)

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JAN1N914

MILITARY SWITCHING DIODES

3

FEATURES

- MICROMINIATURE PACKAGE
- HERMETICALLY SEALED
- ULTRASTABLE OPERATION
- JAN, TX, TXV DEVICES AVAILABLE PER MIL-S-19500/116

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C
Surge Current: 500 mA (8.3 msec.)

ELECTRICAL CHARACTERISTICS at 25°C unless otherwise specified.

V_{BR}	V_{RWM}	I_0	V_f @ I_F = 50mA	V_f @ I_F = 10mA	t_{rr} (Note 1)	V_{fr} (Note 2)
Volts (pk)	Volts (pk)	mA	V dc	V dc	nsec	nsec
100	75	75	1.2	1.0	5	20

I_R @ 20V dc	I_R @ 75V dc	I_R @ 20V dc T_A = 150°C	I_R @ 75V dc T_A = 150°C	CAPACITANCE (Note 3)	CAPACITANCE (Note 4)
nA	μA	μA	μA	pF	pF
25	0.5	50	100	4.0	2.8

NOTE 1: $I_F = I_R$ = 10 mA, R_L = 100 ohms.
NOTE 2: I_F = 50 mA dc.
NOTE 3: V_R = 0 V, f = 1 mHz, V_{SIG} = 50 mV (pk to pk).
NOTE 4: V_R = 1.5V dc, f = 1 mHz, V_{SIG} = 50 mV (pk to pk).

All dimensions in INCH / m.m.

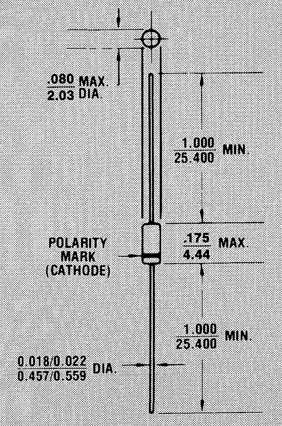

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case (DO-35).
LEAD MATERIAL: Tinned copper clad steel.
MARKING: Body painted, alpha numeric.
POLARITY: Cathode band.

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The diode experts

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SCOTTSDALE, AZ

1N2927 thru 1N2934A

SILICON TUNNEL DIODES

FEATURES

- Hermetically sealed TO-18 package.
- Weldable gold plated kovar leads.
- Temperature stability, uniformity and reliability.
- Available with 2% tolerance on Peak Point Current.
- Meets requirements of MIL-S-19500

MAXIMUM RATINGS

Operating Temperature: −65°C to +150°C.
Storage Temperature: −65°C to +200°C.
Lead Temperature (.25-inches from case for 10 seconds): +250°C.

ELECTRICAL CHARACTERISTICS

JEDEC TYPE NUMBER	STATIC CHARACTERISTICS PEAK POINT CURRENT I_P (mA) MIN.	MAX.	MAXIMUM VALLEY POINT CURRENT I_V (mA)	MAXIMUM PEAK POINT VOLTAGE V_P (mV)	MAXIMUM VALLEY POINT VOLTAGE V_V (mV)	FORWARD VOLTAGE @ APPLIED CURRENT V_F @ I_F (mV) MIN.	MAX.	(mA)	DYNAMIC CHARACTERISTICS MAX. FORWARD CURRENT I_F (MAX.) @ 25°C (mA)	DERATE I_F MAX. ABOVE 25° C (μA/°C)	MAX. REVERSE CURRENT I_R (MAX.) @ 25°C (mA)
1N2927	.09	.11	.035	75	475	600	1000	.11	0.50	3.5	1.0
1N2927A	.098	.102	.030	70	475	650	1000	.102	0.50	3.5	1.0
1N2928	.42	.52	.170	80	490	670	1000	.52	2.50	18.0	5.0
1N2928A	.46	.48	.145	74	490	710	1000		2.50	18.0	5.0
1N2929	.90	1.10	.350	80	500	700	1000	1.10	5.0	35.0	10.0
1N2929A	.98	1.02	.300	75	500	730	1000	1.02	5.0	35.0	10.0
1N2930	4.23	5.17	1.70	85	520	740	1000	5.17	15.0	100.0	30.0
1N2930A	4.61	4.79	1.45	79	520	750	1000	4.79	15.0	100.0	30.0
1N2931	9.0	11.0	3.50	85	530	740	1000	11.0	25.0	150.0	50.0
1N2931A	9.8	10.2	3.0	80	530	750	1000	10.2	25.0	150.0	50.0
1N2932	19.8	24.2	8.0	90	530	740	1000	24.2	40.0	240.0	80.0
1N2932A	21.56	22.44	6.5	82	530	750	1000	22.44	40.0	240.0	80.0
1N2933	42.3	51.7	17.0	90	530	740	1000	51.7	75.0	450.0	150.0
1N2933A	46.06	47.94	14.5	83	530	750	1000	47.94	75.0	450.0	150.0
1N2934	90.0	110.0	35.0	90	530	720	1000	110.0	150.0	900.0	300.0
1N2934A	98.0	102.0	30.0	85	530	730	1000	102.0	150.0	900.0	300.0

NOTE: All parameters tested at ⅜ inch lead length from case.

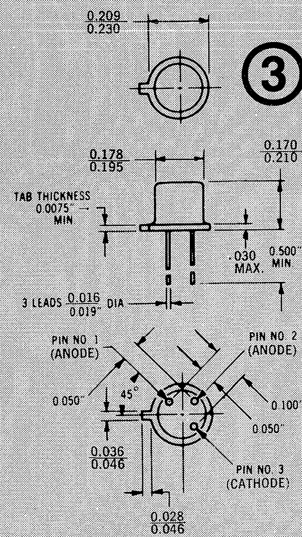

FIGURE 1
PACKAGE TO-18

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed TO-18 package.

LEAD MATERIAL: Gold plated kovar.

MARKING: Alpha numeric with JEDEC number.

POLARITY: Pins 1 and 2 (Anode) connected internally. Pin 3 (Cathode) in electrical contact with case.

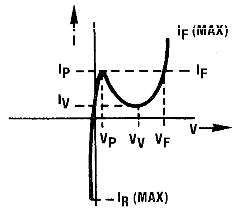

FIGURE 2
TUNNEL DIODE CHARACTERISTIC

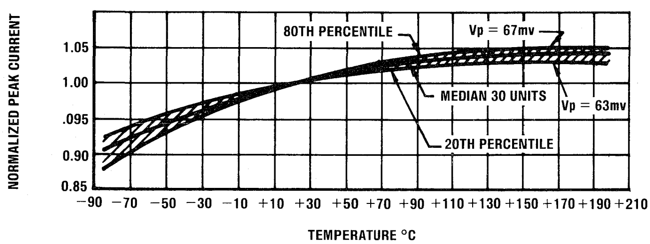

FIGURE 3
PEAK CURRENT vs. TEMPERATURE

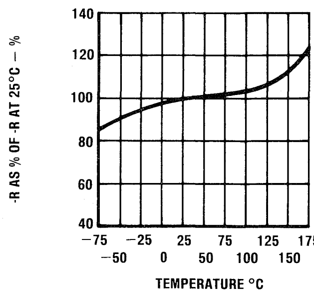

FIGURE 4
NEGATIVE RESISTANCE vs. TEMPERATURE

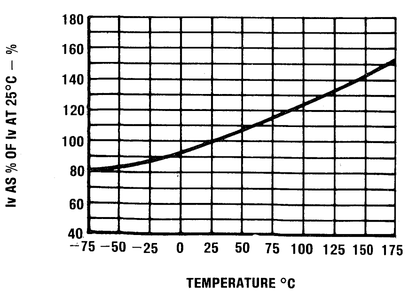

FIGURE 5
VALLEY CURRENT vs. TEMPERATURE

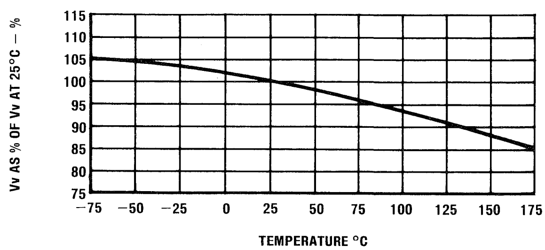

FIGURE 6
VALLEY VOLTAGE vs. TEMPERATURE

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SCOTTSDALE, AZ

1N3595

GENERAL PURPOSE DIODES

③

FEATURES

- HIGH CONDUCTANCE
- EXTREMELY LOW REVERSE CURRENT
- ULTRA-STABLE OPERATION UP TO +150°C
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/241
- METALLURGICALLY BONDED

MAXIMUM RATINGS

Operating Temperature: –65°C to +150°C
Storage Temperature: –65°C to +200°C
Surge Current: 4 Amps

ELECTRICAL CHARACTERISTICS

TYPE	FORWARD VOLTAGE DROP V_F@I_F		FORWARD CURRENT I_F	REVERSE CURRENT (MAX) I_R@ 125V		REVERSE CURRENT (MAX) I_R@ 30V	REVERSE RECOVERY (MAX) t_{rr}	JUNCTION CAPACITANCE (MAX) C @ 0V
J/JTX/ JTXV	VOLTS		mADC	nA		nA	μsec	pF
	MIN	MAX		25°C	125°C	125°C		
1N3595	.83	1.00	200	1.0	500	300	3.0	8.0
	.79	.92	100	1.0		300	3.0	8.0
	.74	.88	50	1.0		300	3.0	8.0
	.65	.80	10	1.0	3μA	300	3.0	8.0
	.60	.75	5	1.0	@	300	3.0	8.0
	.52	.68	1	1.0	150°C	300	3.0	8.0

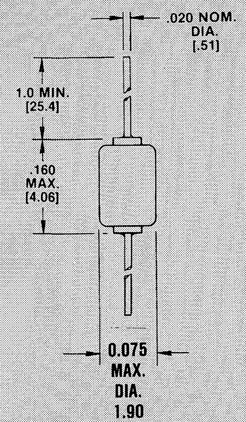

FIGURE 1
PACKAGE D035

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

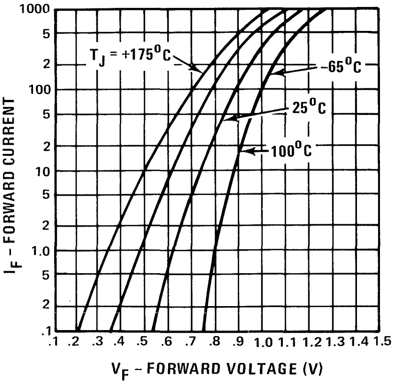

FIGURE 2
TYPICAL FORWARD VOLTAGE VS.
FORWARD CURRENT

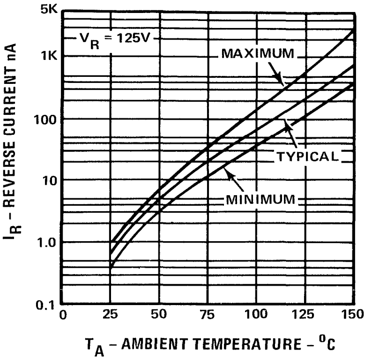

FIGURE 3
REVERSE CURRENT VS.
AMBIENT TEMPERATURE

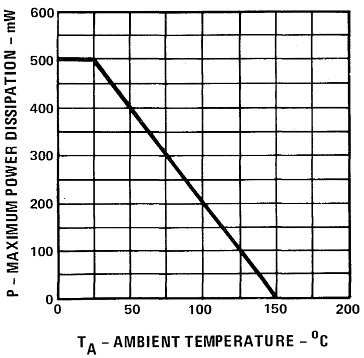

FIGURE 4
POWER DERATING CURVE

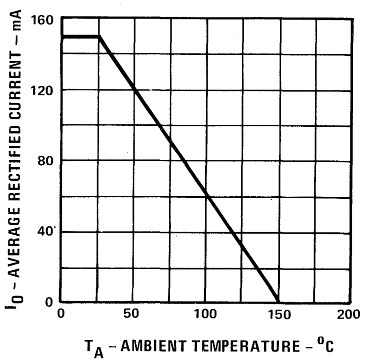

FIGURE 5
AVERAGE RECTIFIED CURRENT
VS. AMBIENT TEMPERATURE

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SCOTTSDALE, AZ

1N3611 thru 1N3614, 1N3957

MILITARY RECTIFIERS

3

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- STANDARD RECOVERY
- PIV TO 1000 VOLTS
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/228

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100μA	AVERAGE RECTIFIED CURRENT I_o		FORWARD VOLTAGE (MAX.) V_F @ 1 A	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) I_F(surge)
	VOLTS	VOLTS	AMPS		VOLTS	μA		AMPS
			100°C	150°C		25°C	150°C	
JAN 1N3611	200	240	1.0	.3	1.1	1.0	300	30
JAN 1N3612	400	480	1.0	.3	1.1	1.0	300	30
JAN 1N3613	600	720	1.0	.3	1.1	1.0	300	30
JAN 1N3614	800	920	1.0	.3	1.1	1.0	300	30
JAN 1N3957	1000	1150	1.0	.3	1.1	1.0	300	30

NOTE 1: T_A = 150°C, f = 60 Hz, I_O = 300 mA, 10-8 m sec. surges @ 1/minute.

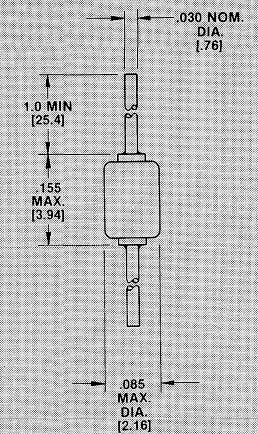

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

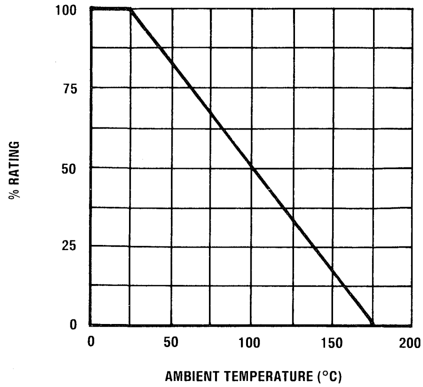

FIGURE 2
TEMPERATURE DERATING CURVE

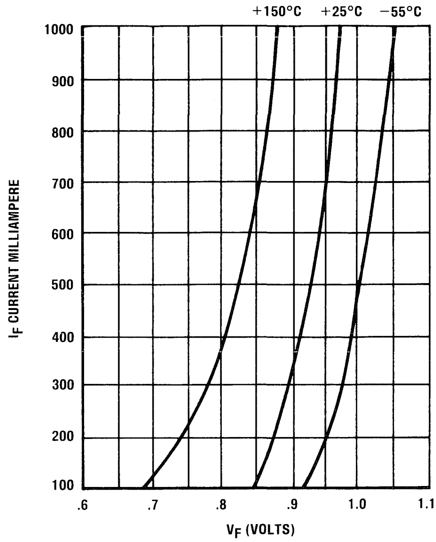

FIGURE 3
TYPICAL FORWARD CONDUCTANCE CURVE

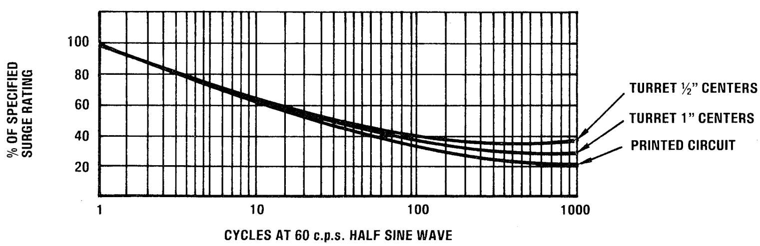

FIGURE 4
ALLOWABLE PEAK SURGE vs DURATION

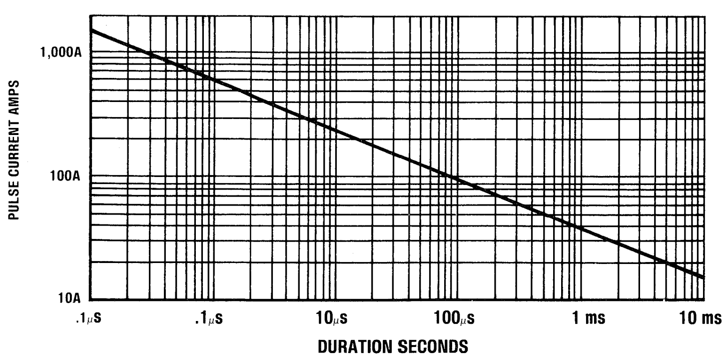

FIGURE 5
SURGE DURATION vs PULSE CURRENT
Square Pulse Current vs Duration for Non-Repetitive Pulse

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1N3643 thru 1N3647
1N5181 thru 1N5184

HIGH VOLTAGE RECTIFIERS

③

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- LOWEST REVERSE LEAKAGE AVAILABLE
- LOWEST THERMAL RESISTANCE AVAILABLE
- MAXIMUM BREAKDOWN VOLTAGE PER DIE
- ABSOLUTE HIGH VOLTAGE / HIGH TEMPERATURE STABILITY
- MEET OR EXCEED REQUIREMENTS OF MIL-S-19500/389 (IN 5181 — IN 5184).
- 1N3644 THRU 1N3647 JAN, JANTX TYPES AVAILABLE PER MIL-S-19500/279

MAXIMUM RATINGS

Operating Temperature: - 65°C to + 175°C
Storage Temperature: - 65°C to + 175°C

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	AVERAGE RECTIFIED CURRENT I_0		FORWARD VOLTAGE (MAX.) V_F (SEE NOTES)	REVERSE CURRENT (MAX.) I_R @ PIV				SURGE CURRENT (MAX.)
	VOLTS	mA		VOLTS	μA				AMPS
		55°C	100°C		25°C	55°C	125°C	175°C	
1N3643	1000	250	150	5.0(1)	5	—	—	—	14
JAN 1N3644	1500	250	150	5.0(1)	5	—	—	—	14
JAN 1N3645	2000	250	150	5.0(1)	5	—	—	—	14
JAN 1N3646	2500	250	150	5.0(1)	5	—	—	—	14
JAN 1N3647	3000	250	150	5.0(1)	5	—	—	—	14
1N4254	1500	250	150	3.5(2)	1	—	20	—	10
1N4255	2000	250	150	3.5(2)	1	—	20	—	10
1N4256	2500	250	150	3.5(2)	1	—	20	—	10
1N4257	3000	250	150	3.5(2)	1	—	20	—	10
1N5181	4000	100	60	10(2)	—	5	—	1000	4
1N5182	5000	100	60	10(2)	—	5	—	1000	4
1N5183	7500	100	60	10(2)	—	5	—	1000	4
1N5184	10,000	100	60	10(2)	—	5	—	1000	4

NOTE 1: V_F @ 250mA

NOTE 2: V_F @ 100mA

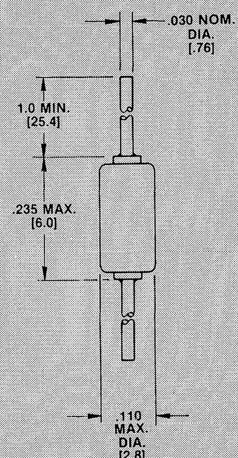

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass.
LEAD MATERIAL: Tinned copper.
MARKING: Body painted, alpha numeric.
POLARITY: Cathode band.

1N3643 thru 1N3647
1N5181 thru 1N5184

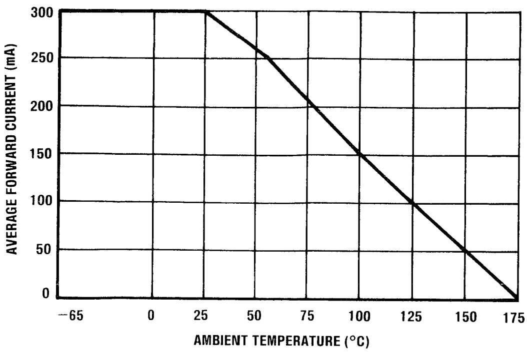

FIGURE 2
HVE/HVE 10-30/1N3643-47

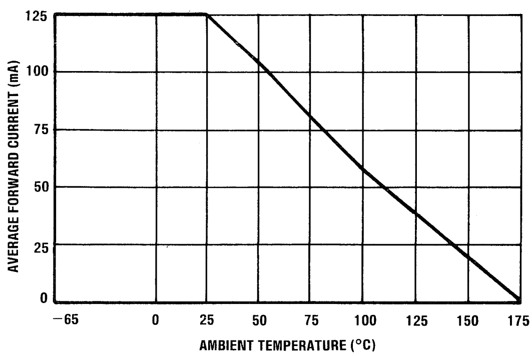

FIGURE 3
HVE/HVE 40-100/1N5181-84

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1N3879 thru 1N3883

6 AMP SILICON FAST RECOVERY RECTIFIER

③

FEATURES

- ≤ 0.3 μSEC RECOVERY TIME
- LOW OVERSHOOT CURRENT

MAXIMUM RATINGS @ 25°C unless otherwise specified

Surge Current: ½ cycle of 60 Hz @ ≤ 100°C 75A
10 cycles of 60 Hz @ ≤ 100°C 35A
Operating Temperature: —65 to 150°C
Storage Temperature: —65 to 175°C

*ELECTRICAL CHARACTERISTICS

@ 25°C unless otherwise specified

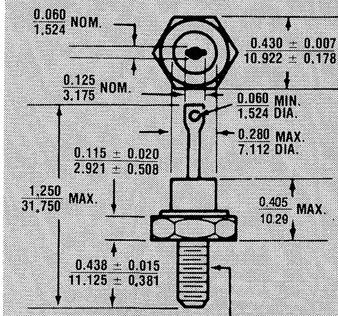
JEDEC TYPE NUMBER	RATED DC BLOCKING VOLTAGE	PEAK REVERSE VOLTAGE	AVERAGE FORWARD CURRENT	MAXIMUM FORWARD VOLTAGE		MAXIMUM REVERSE CURRENT		
						25°C	100°C	
	—65 to 100°C	—65 to 100°C	—65 to 100°C	I_F = 6A	I_O = 6A @ V_{RM} —65 to 100°C	V_R = Rated Value		@ V_{RM} I_O = 6 A f = 60Hz
	V_R	V_{RM}	I_O	V_F	V_F (PEAK)	I_R	I_R	I_R (Ave)
	VOLTS	VOLTS	AMPS	VOLTS	VOLTS	μA	mA	mA
1N3879	50	50	6	1.4	1.5	15	1.0	3.0
1N3880	100	100	6	1.4	1.5	15	1.0	3.0
1N3881	200	200	6	1.4	1.5	15	1.0	3.0
1N3882	300	300	6	1.4	1.5	15	1.0	3.0
1N3883	400	400	6	1.4	1.5	15	1.0	3.0

*SWITCHING CHARACTERISTICS

@ 25°C unless otherwise specified, and at I_F = 1.0 Amps

JEDEC TYPE NUMBER	MAXIMUM RECOVERY TIME	PEAK REVERSE RECOVERY CURRENT
	SEE FIG. 1, 2 & 3	
	t_{rr}	$I_{RM (REC)}$
	nSec	AMPS
1N3879	300	2.0
1N3880	300	2.0
1N3881	300	2.0
1N3882	300	2.0
1N3883	300	2.0

*JEDEC Registered Data



10-32 UNF-2A (MOD) PITCH DIA.
MIN. .1658 MAX. .1697
TO WITHSTAND A TORQUE UP
TO 30 IN-LB. WHEN NUT IS
TIGHTENED ON STUD

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Industry Standard DO-4, (DO-203AA), 7/16" Hex. stud with 10-32 threads, welded, hermetically sealed metal and glass.
FINISH: All external surfaces are corrosion resistant and terminal solderable.
WEIGHT: 7.5 grams.
MOUNTING POSITION: Any
POLARITY: Standard Polarity: Cathode-to-stud. Reverse Polarity: Anode-to-stud. (Suffix R.)
MOUNTING HARDWARE: See page 41.

6 AMP SILICON FAST RECOVERY RECTIFIER

NOTE 1 The relay is a make-before-break, wetted-mercury-contact type driven by a 60 Hz sine wave. Conduction time is 640 μSec and it is open approximately 7.7 mSec.

NOTE 2 Z is a 3 Ω, 25 W rheostat adjusted for a resistance of 1.4 Ω from the relay to the anode. The inductance between the same points is 38μh.

NOTE 3 Monitoring oscilloscope characteristics: $t_r \leqq 14$ nSec, $R_{in} = 9\ M\Omega$, $C_{in} \leqq 12$ pf, $L_{in} \leqq 0.5\ \mu h$.

NOTE 4 Power supply has an output impedance of 0.5 Ω from DC to 2 kHz.

TYPICAL OSCILLOSCOPE PATTERNS OF RECOVERY

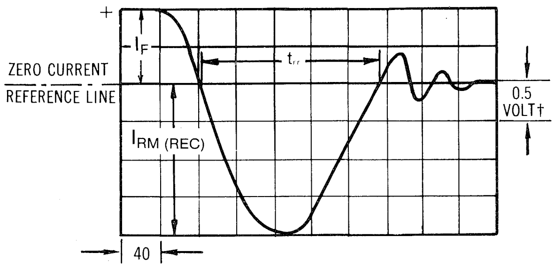


FIGURE 1

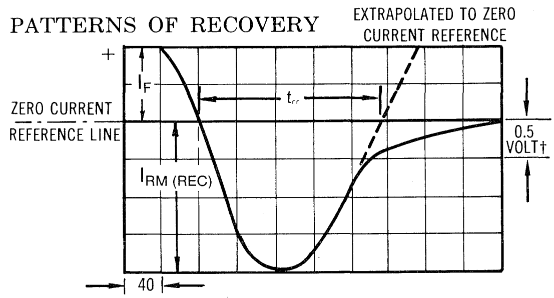
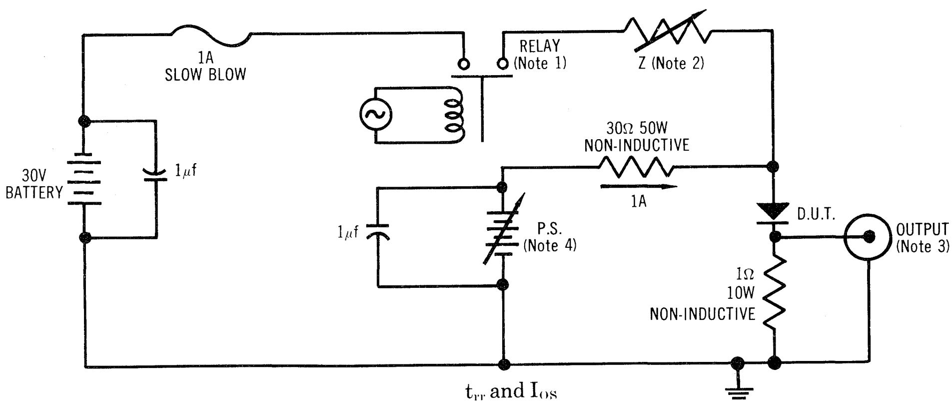
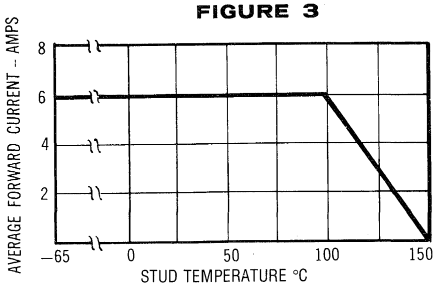


FIGURE 2

†Voltage sensed across 1-ohm resistor; each division therefore equivalent to 0.5 ampere current.



t_{rr} and I_{OS}
* TEST CIRCUIT
FIGURE 3



* DERATING CURVE
FIGURE 4

* JEDEC Registered Data

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1N3889 thru 1N3893

12 AMP SILICON FAST RECOVERY RECTIFIER

③

FEATURES

- 1N3890, 1N3891, AND 1N3893 HAVE JAN, JANTX AND JANTXV STANDARD AND REVERSE POLARITY DEVICES TO MIL-S-19500/304
- $\leq 0.2\,\mu$SEC RECOVERY TIME
- LOW OVERSHOOT CURRENT

MAXIMUM RATINGS @ 25°C unless otherwise specified

Surge Current: ½ cycle of 60 Hz @ ≦ 100°C . . . 150 A
10 cycles of 60 Hz @ ≦ 100°C . . . 70 A

Operating Temperature: −65 to 150°C

Storage Temperature: −65 to 175°C

*ELECTRICAL CHARACTERISTICS

@ 25°C unless otherwise specified

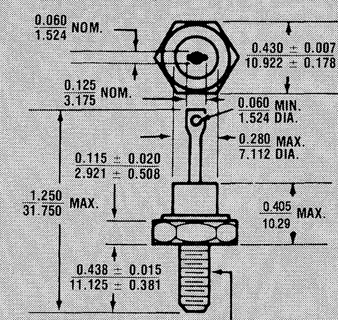
JEDEC TYPE NUMBER	RATED DC BLOCKING VOLTAGE	PEAK REVERSE VOLTAGE	AVERAGE FORWARD CURRENT	MAXIMUM FORWARD VOLTAGE		MAX. REVERSE CURRENT 25°C	MAX. REVERSE CURRENT 100°C	
	−65 to 100°C	−65 to 100°C	−65 to 100°C	$I_F = 12A$	$I_O = 12A$ @ V_{RM} −65 to 100°C	V_R = Rated Value		@ V_{RM} $I_O = 12A$ f = 60Hz
	V_R	V_{RM}	I_O	V_F	V_F (Peak)	I_R	I_R	I_R (Ave)
	Volts	Volts	Amps	Volts	Volts	μA	mA	mA
1N3889	50	50	12	1.4	1.5	25	3.0	5.0
1N3890	100	100	12	1.4	1.5	25	3.0	5.0
1N3891	200	200	12	1.4	1.5	25	3.0	5.0
1N3892	300	300	12	1.4	1.5	25	3.0	5.0
1N3893	400	400	12	1.4	1.5	25	3.0	5.0

*SWITCHING CHARACTERISTICS

@ 25°C unless otherwise specified, and at I_F = 1.0 Amps

JEDEC TYPE NUMBER	MAXIMUM RECOVERY TIME	PEAK REVERSE RECOVERY CURRENT
	SEE FIG. 1, 2 & 3	
	t_{rr}	$I_{RM\,(REC)}$
	nSec	Amps
1N3889	200	2.0
1N3890	200	2.0
1N3891	200	2.0
1N3892	200	2.0
1N3893	200	2.0

*JEDEC Registered Data



10-32 UNF-2A (MOD) PITCH DIA. MIN. .1658 MAX. .1697 TO WITHSTAND A TORQUE UP TO 30 IN-LB. WHEN NUT IS TIGHTENED ON STUD

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Industry Standard DO-4 (DO-203AA), 7/16" Hex. stud with 10-32 threads, welded, hermetically sealed metal and glass.
FINISH: All external surfaces are corrosion resistant and terminal solderable.
WEIGHT: 7.5 grams.
MOUNTING POSITION: Any
POLARITY: Standard Polarity: Cathode-to-stud. Reverse Polarity: Anode-to-stud. (Suffix R.)
MOUNTING HARDWARE: See page 41.

12 AMP SILICON FAST RECOVERY RECTIFIER

NOTE 1 The relay is a make-before-break, wetted-mercury-contact type driven by a 60 Hz sine wave. Conduction time is 640 μSec and it is open approximately 7.7 mSec.

NOTE 2 Z is a 3 Ω, 25 W rheostat adjusted for a resistance of 1.4 Ω from the relay to the anode. The inductance between the same points is 38μh.

NOTE 3 Monitoring oscilloscope characteristics: $t_r \leqq 14$ nSec, $R_{in} = 9$ MΩ, $C_{in} \leqq 12$ pf, $L_{in} \leqq 0.5$ μh.

NOTE 4 Power supply has an output impedance of 0.5 Ω from DC to 2 kHz.

TYPICAL OSCILLOSCOPE PATTERNS OF RECOVERY

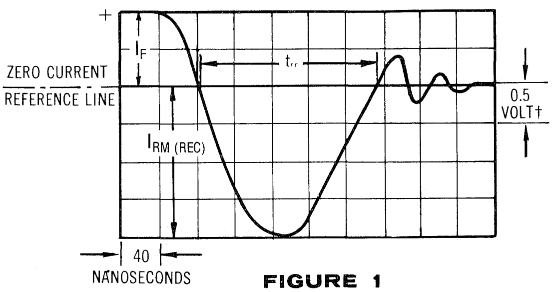


FIGURE 1

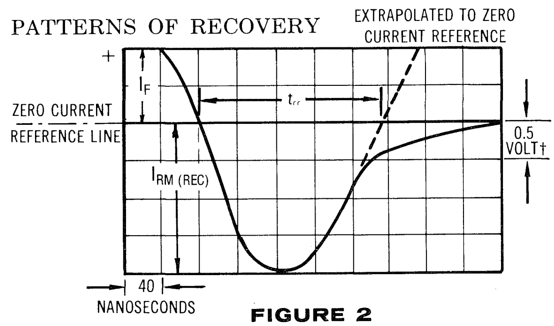
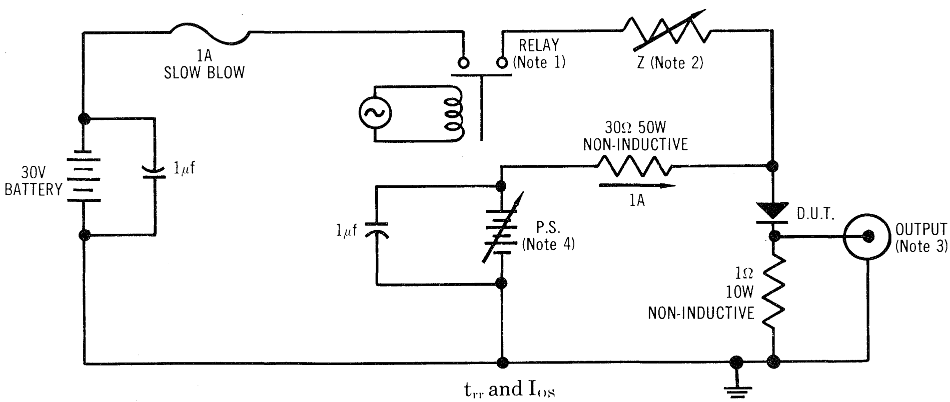


FIGURE 2

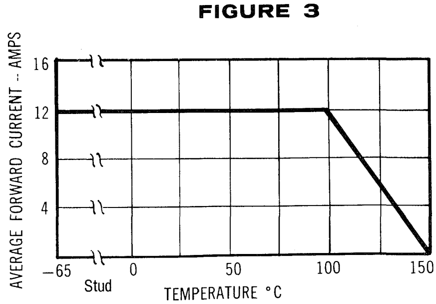
†Voltage sensed across 1-ohm resistor; each division therefore equivalent to 0.5 ampere current.



t_{rr} and I_{OS}

* TEST CIRCUIT

FIGURE 3



* DERATING CURVE

FIGURE 4

* JEDEC Registered Data

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1N4001 thru 1N4007

1A PLASTIC SILICON RECTIFIERS

③

FEATURES

- Low cost.
- High current capability.
- Low leakage.
- Low forward voltage.
- High surge capability.
- JEDEC DO-41 molded plastic case.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK REVERSE VOLTAGE	MAX. RMS VOLTAGE	MAX. DC BLOCKING VOLTAGE	MAX. AVERAGE FORWARD RECTIFIED CURRENT	PEAK FORWARD SURGE CURRENT I_F (SURGE)	MAX. FORWARD VOLTAGE @ 1A DC	MAX. DC REVERSE CURRENT @ RATED DC BLOCKING VOLTAGE	TYPICAL JUNCTION CAPACITANCE @ V_R = 4V
	V	V	V	A	A	V	μA	pF
1N4001	50	35	50	1.0	50	1.1	5.0	20
1N4002	100	70	100	1.0	50	1.1	5.0	20
1N4003	200	140	200	1.0	50	1.1	5.0	20
1N4004	400	280	400	1.0	50	1.1	5.0	20
1N4005	600	420	600	1.0	50	1.1	5.0	20
1N4006	800	560	800	1.0	50	1.1	5.0	20
1N4007	1000	700	1000	1.0	50	1.1	5.0	20

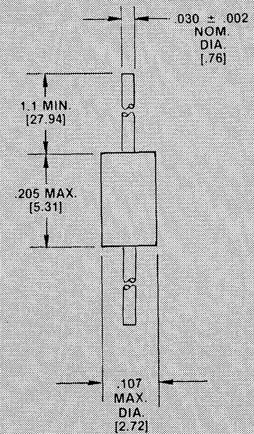

FIGURE 1

All dimensions in $\frac{\text{INCH}}{\text{m.m.}}$

MECHANICAL CHARACTERISTICS

CASE: Molded plastic (DO-41).

LEAD MATERIAL: Copper, plated tin.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

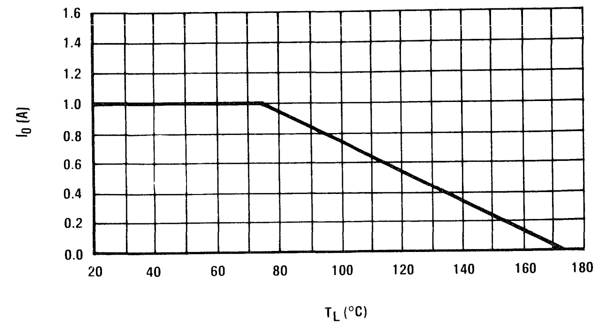

FIGURE 2

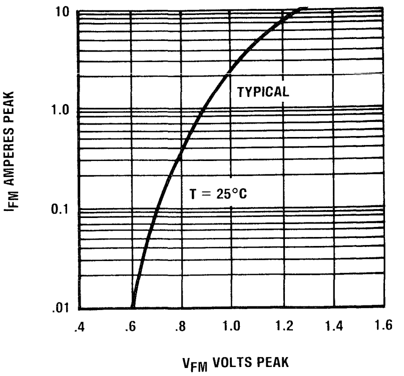

FIGURE 3
FORWARD CHARACTERISTICS

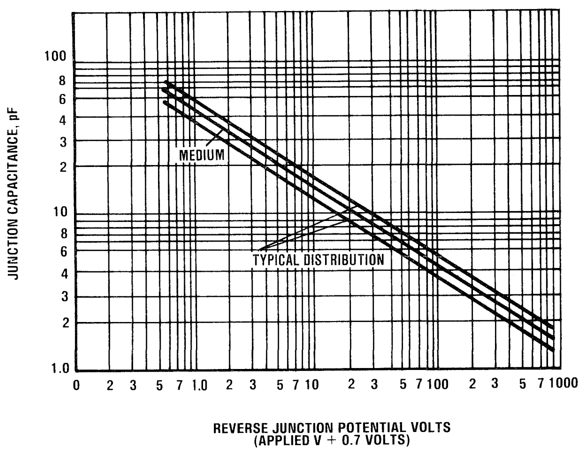

FIGURE 4
JUNCTION CAPACITANCE

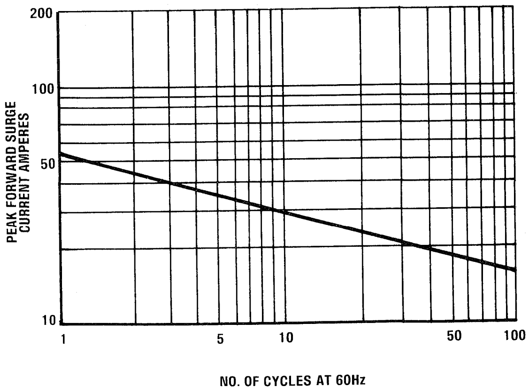

FIGURE 5
PEAK FORWARD SURGE CURRENT

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SCOTTSDALE, AZ

JAN1N4148-1

☆JANS☆

MILITARY SWITCHING DIODES

FEATURES

- MICROMINIATURE PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- HERMETICALLY SEALED GLASS PACKAGE
- JANS, TXV, AND TX TYPES AVAILABLE PER MIL-S-19500/116
- VOIDLESS CONSTRUCTION

MAXIMUM RATINGS

Operating Temperature: −65°C to +200°C
Storage Temperature: −65°C to +200°C
Surge Current: 500 mA (8.3 msec.)

ELECTRICAL CHARACTERISTICS at 25°C unless otherwise specified.

V_{BR}	V_{RWM}	I_0	V_f @ I_F = 100 mA	V_f @ I_F = 10 mA	t_{rr} (Note 1)	V_{fr} (Note 2)
Volts (pk)	Volts (pk)	mA	V dc	V dc	nsec	nsec
100	75	200	1.2	1.0	5	20

I_R @ 20 V dc	I_R @ 75 V dc	I_R @ 20 V T_A = 150°C	I_R @ 75 V dc T_A = 150°C	CAPACITANCE (Note 3)	CAPACITANCE (Note 4)
nA	μA	μA	μA	pF	pF
25	0.5	50	100	4.0	2.8

NOTE 1: $I_F = I_R = 10$ mA, $R_L = 100$ ohms.
NOTE 2: $I_F = 50$ mA dc.
NOTE 3: $V_R = 0$ V, f = 1 mHz, $V_{SIG} = 50$ mV (pk to pk).
NOTE 4: $V_R = 1.5$ V dc, f = 1 mHz, $V_{SIG} = 50$ mV (pk to pk).

③

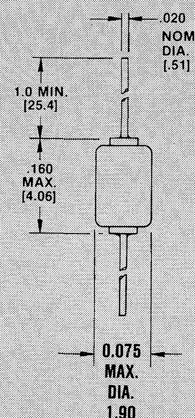

FIGURE 1
PACKAGE D035

All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

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The diode experts

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SCOTTSDALE, AZ
For more information call:
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JAN1N4148-1

MILITARY SWITCHING DIODES

FEATURES

- MICROMINIATURE PACKAGE
- TRIPLE LAYER PASSIVATION
- HERMETICALLY SEALED GLASS PACKAGE
- JANTX AND TXV TYPES AVAILABLE PER MIL-S-19500/116

MAXIMUM RATINGS

Operating Temperature: −65°C to +200°C
Storage Temperature: −65°C to +200°C
Surge Current: 500 mA (8.3 msec.)

ELECTRICAL CHARACTERISTICS at 25°C unless otherwise specified.

V_{BR}	V_{RWM}	I_0	V_f @ I_F = 100mA	V_f @ I_F = 10mA	t_{rr} (Note 1)	V_{fr} (Note 2)
Volts (pk)	Volts (pk)	mA	V dc	V dc	nsec	nsec
100	75	200	1.2	1.0	5	20

I_R @ 20V dc	I_R @ 75V dc	I_R @ 20V T_A = 150°C	I_R @ 75V dc T_A = 150°C	CAPACITANCE (Note 3)	CAPACITANCE (Note 4)
nA	μA	μA	μA	pF	pF
25	0.5	50	100	4.0	2.8

NOTE 1: $I_F = I_R$ = 10 mA, R_L = 100 ohms.
NOTE 2: I_F = 50 mA dc.
NOTE 3: V_R = 0 V, f = 1 mHz, V_{SIG} = 50 mV (pk to pk).
NOTE 4: V_R = 1.5 V dc, f = 1 mHz, V_{SIG} = 50 mV (pk to pk).

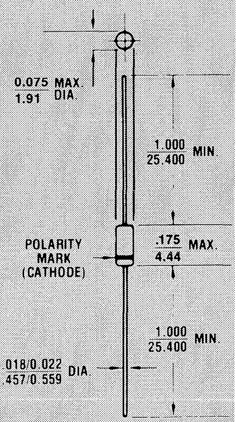

FIGURE 1
All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed gl case (DO-35).

LEAD MATERIAL: Tinned cop clad steel.

MARKING: Body painted, al numeric.

POLARITY: Cathode band.

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1N4150 and 1N4150-1

☆JANS☆

MILITARY SWITCHING DIODES

(3)

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- METALLURGICALLY BONDED
- JANS/TXV, TX TYPES AVAILABLE PER MIL-S-19500/231

MAXIMUM RATINGS

Operating Temperature: −65°C to +150°C
Storage Temperature: −65°C to +200°C
Surge Current: 4 Amps ($t_P = 1\mu s$); 0.5 A ($t_P = 1s$)

ELECTRICAL CHARACTERISTICS at 25°C unless otherwise specified.

V_{BR}	V_{RWM}	I_0	I_R @ V_R=50Vdc	I_R @ V_R=50Vdc	t_{rr} (Note 1)	t_{rr} (Note 2)
Volts	Volts (pk)	mA	μA dc	μA dc*	nsec	nsec
75	50	200	0.1	100	4	6

*T_A = 150°C

CAPACITANCE V_R = 0 Volts 1 mHz, 50 mV_{PP}	V_{f1} @ I_F = 1 mAdc	V_{f2} @ I_F = 10 mA	V_{f3} @ I_F = 50 mA (pulsed)	V_{f4} @ I_F = 100 mA (pulsed)	V_{f5} @ I_F = 200 mA (pulsed)
pF	Vdc	Vdc	Vdc	Vdc	Vdc
2.5	0.54 - 0.62	0.66 - 0.74	0.76 - 0.86	0.82 - 0.92	0.87 - 1.00

NOTE 1: $I_F = I_R$ = 10 - 200 mAdc, R_L = 100 ohms.
NOTE 2: $I_F = I_R$ = 200 - 400 mAdc, R_L = 100 ohms.

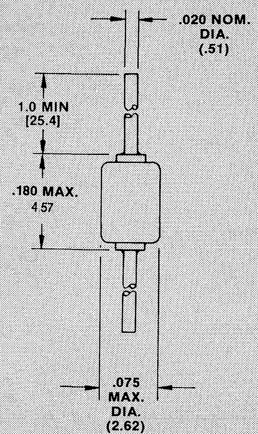

FIGURE 1

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case (DO-35).

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

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IN4156, IN4157, IN4453, IN4829, IN4830, IN5179 STABISTORS

Also, Tight Tolerance
MPD100 thru MPD400A
or
MZ2360 and MZ2361

APPLICATION

These axial lead diodes represent configurations of one to four* p-n junctions in series which may be used in any application requiring tight tolerance, low voltage levels versus current. This method of low voltage regulation is comparitively superior in dynamic impedence (voltage change versus current) than low voltage zeners where tunneling instead of avalanche current is dominant. Typical applications include use as signal limiters, level shifters in transistor logic, meter protectors, and low voltage regulators. For computer circuit applications, a controlled stored charge selection is provided as well.

In addition, these devices may be used for temperature compensation wherein each p-n junction contributes approximately -2 mV/°C each.

*Consult factory for more than four p-n junction configurations.

DESCRIPTION/FEATURES

- Hermetically Sealed Glass Packages (DO-35)
- High Reverse Breakdown and Low Leakage
- Excellent Low Voltage Regulation
- Controlled Stored Charge
- Planar Passivated Die Elements

MAXIMUM RATINGS

500 mW dc Power Rating**

Power Derating 4.0 mW/°C above 50°C

Junction and Storage Temperatures: −65°C to +175°C

**Consult factory for ratings up to 1.5W.

PACKAGE DIMENSIONS

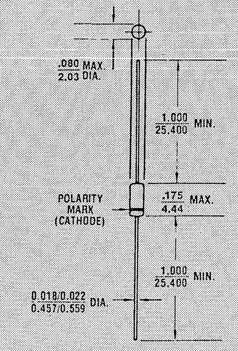

FIGURE 1
All dimensions in INCH / m.m.

DO-35

MECHANICAL CHARACTERISTICS

***Case:** Hermetically sealed glass DO-35. DO-7 and DO-41 glass are optional. Single p-n junction devices also offered in DO-41 plastic.

Finish: All external surfaces are corrosion resistant and leads solderable.

Thermal Resistance: 200° C/W typical for DO-35 at 0.375 inches from body.

Mounting Position: Any.

*Designate case size when ordering.

TYPE	MAXIMUM REVERSE CURRENT I_R			MINIMUM REVERSE BREAKDOWN VOLTAGE V_{BR} (VOLTS) AT 5μA	FORWARD VOLTAGE V_F (VOLTS) AT I_F										STORED CHARGE AT 1.00 mA Q_S (pC)		MAXIMUM CAPACITANCE C (pF) AT 0 VOLTS	NUMBER OF p-n JUNCTIONS
	25°C nA	150°C μA	@ V_R VOLTS		I_F .010 mA		I_F 0.10 mA		I_F 1.00 mA		I_F 10.0 mA		I_F 100.0 mA					
					MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
IN4156	50	50	20	30	0.740	1.090	0.970	1.220	1.210	1.410	1.380	1.580	1.540	1.840	50	500	25	2
IN4157	50	50	20	30	1.190	1.540	1.520	1.770	1.850	2.050	2.120	2.320	2.360	2.660	50	500	20	3
IN4453	50	50	20	30	—	—	0.510	0.630	0.600	0.710	0.690	0.800	0.800	0.920	50	500	30	1
IN4829	100	25@ 100°C	20	30 @ 100 μA	—	—	0.840	1.25	0.99	1.44	1.16	1.61	1.35	1.87	—	—	25	2
IN4830	100	25@ 100°C	20	30 @ 100 μA	—	—	1.35	1.80	1.63	2.08	1.90	2.35	2.15	2.69	—	—	20	3
IN5179	50	—	20	30	—	—	1.80	2.50	2.20	2.80	2.60	3.20	3.00	3.70	50	500	20	4
MPD100	30	50	30	30	0.45	0.500	0.535	0.590	0.618	0.677	0.700	0.765	0.790	0.880	75	300	30	1
MPD100A	30	50	30	30	0.45	0.500	0.535	0.590	0.618	0.677	0.700	0.765	0.790	0.880	800*	—	40	1
MPD200	30	50	30	30	0.900	1.00	1.05	1.16	1.22	1.34	1.39	1.54	1.60	1.76	75	400	30	2
MPD200A	30	50	30	30	0.900	1.00	1.05	1.16	1.22	1.34	1.39	1.54	1.60	1.76	800*	—	40	2
MPD300	30	50	30	60	1.40	1.54	1.62	1.78	1.84	2.03	2.10	2.33	2.40	2.65	75	400	30	3
MPD300A	30	50	30	60	1.40	1.54	1.62	1.78	1.84	2.03	2.10	2.33	2.40	2.65	800*	—	40	3
MPD400	30	50	30	90	1.82	2.01	2.14	2.36	2.47	2.71	2.80	3.07	3.16	3.52	60	300	30	4
MPD400A	30	50	30	90	1.82	2.01	2.14	2.36	2.47	2.71	2.80	3.07	3.16	3.52	800*	—	40	4
**MZ2360	10μA	—	5.0	—	—	—	—	—	—	—	0.63	0.71	—	—	—	—	—	1
**MZ2361	10μA	—	5.0	—	—	—	—	—	—	—	1.24	1.38	—	—	—	—	—	2

*Q_S at 10.0 mA **Optionally supplied in DO-41 glass or plastic with P_D = 1.5 W.

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1N4245 thru 1N4249

MILITARY RECTIFIERS

3

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- STANDARD RECOVERY
- PIV TO 1000 VOLTS
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/286

MAXIMUM RATINGS

Operating Temperature: - 65°C to + 175°C
Storage Temperature: - 65°C to + 200°C
Power Dissipation: (A) 3 Amp/MIL-STD-750 (See Figure 2)
(B) 1 Amp/no heat sink @ + 55°C

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100μA	AVERAGE RECTIFIED CURRENT I_0		FORWARD VOLTAGE (MAX.) V_F @ 3 A	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) $I_{F(surge)}$	REVERSE RECOVERY (MAX.) (NOTE 2) t_{rr}
	VOLTS	VOLTS	AMPS		VOLTS	μA		AMPS	μsec.
			100°C	150°C		25°C	150°C		
JAN 1N4245	200	240	1.00	.333	1.3	1.0	150	25	5.0
JAN 1N4246	400	480	1.00	.333	1.3	1.0	150	25	5.0
JAN 1N4247	600	720	1.00	.333	1.3	1.0	150	25	5.0
JAN 1N4248	800	960	1.00	.333	1.3	1.0	150	25	5.0
JAN 1N4249	1000	1150	1.00	.333	1.3	1.0	150	25	5.0

NOTE 1: T_A = 100°C, f = 60 Hz, I_O = 1A, 10-8 m sec. surges @ 1/minute.
NOTE 2: I_F = 0.5A, I_{Rm} = 1A, $i_{R(REC)}$ = .250A

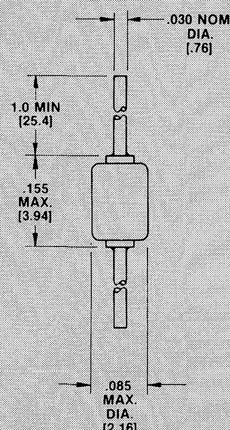


FIGURE 1
PACKAGE A

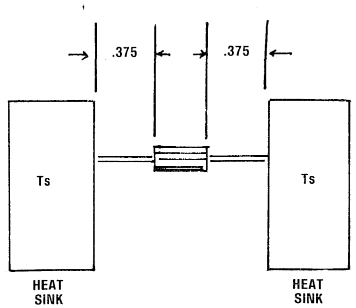
MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.



Thermal Resistance From Junction To Heat Sink θjs = 30°C/W Max.

$$P_{max} = \frac{T_j - T_s}{\theta_{js}}$$

Pmax = Max. Continuous Dissipation, Watts
Tj = Max. Junction Temp. = 175°C
Ts = Heat Sink Temp.

FIGURE 2
MIL STD 750 METHOD 1026(A)

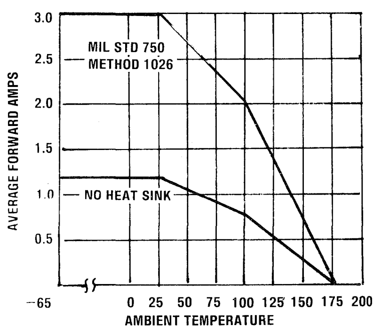


FIGURE 3
MAXIMUM FORWARD CURRENT VS AMBIENT TEMPERATURE

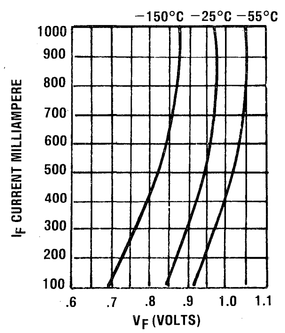


FIGURE 4
TYPICAL FORWARD CONDUCTANCE CURVE

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IN4500 and IN4500-1

MILITARY SWITCHING DIODES

(3)

FEATURES

- SILICON HIGH FORWARD CONDUCTANCE SWITCHING DIODE
- VOIDLESS* HERMETICALLY SEALED GLASS PACKAGE
- METALLURGICALLY BONDED (-1 TYPE)
- JANTX, TXV TYPES AVAILABLE PER MIL-S-19500/403

* EXCLUDES DO-35 DUMET CONSTRUCTION OPTION.

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C
Surge Current: 4 Amps (t_p = 1μs)

ELECTRICAL CHARACTERISTICS

at 25°C unless otherwise specified.

BV	V_{RM} (working)	Io (note 1)	i_f (surge) (1 sec)	i_f (surge) (1 μsec)	T_{OP}	T_{STG}
Vdc	V(pk)	mAdc	A	A	°C	°C
80	75	300	0.5	4.0	−65 to +175	-65 to +200

CAPACITANCE V_R = 0 Volts V_{sig} = 50 mVPP 100KHz≤f≤1 MHz	V_{f1} @ I_F = 250μAdc	V_{f2} @ I_F = 1.0mA	V_{f3} @ I_F = 10mA	V_{f4} @ I_F = 20mA	V_{f5} @ I_F = 300mA (pulse)	t_{rr} @ I_F = I_R² 10mAdc R_L = 100 ohms
pF	Vdc	Vdc	Vdc	Vdc	Vdc	ns
4 max.	.47 - .56	.52 - .60	.64 - .72	.67 - .77	1.1 max.	6.0 max.

OTE 1: DERATE 2.0 mAdc/°C For T_A Above 25°C.

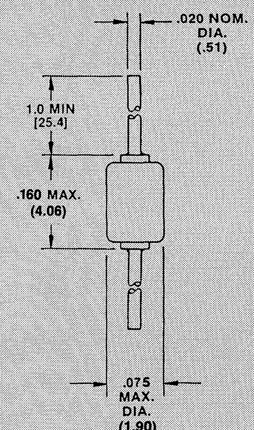

FIGURE 1
PACKAGE DO-35

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass case.

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

1N4938 and 1N4938-1

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MILITARY SWITCHING DIODES

FEATURES

- MICROMINIATURE PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- JAN, TX, TXV AVAILABLE TO REQUIREMENTS OF MIL-S-19500/169

MAXIMUM RATINGS

Operating Temperature: – 65°C to + 175°C
Storage Temperature: – 65°C to + 200°C
Surge Current: 2.0 Amps @ 1 microsecond
Forward Current: I_O = 100 mA dc, derate at 0.667 mA/°C above T_A = 25°C

ELECTRICAL CHARACTERISTICS at 25°C unless otherwise specified.

TYPE	FORWARD VOLTAGE DROP V_F @ I_F	BREAKDOWN VOLTAGE B_V	REVERSE CURRENT (max) I_R @ 175 V		REVERSE RECOVERY (max) (Note 1) t_{rr}	JUNCTION CAPACITANCE (max) C @ 0V
	Volts	V dc	nA		nsec	pF
	max		25°C	150°C		
1N4938	1.00	200	0.1	100	50.0	5.0
1N4938-1	1.00	200	0.1	100	50.0	5.0

Note 1: $I_F = I_R$ = 30 mAdc, R_L = 150 Ohms

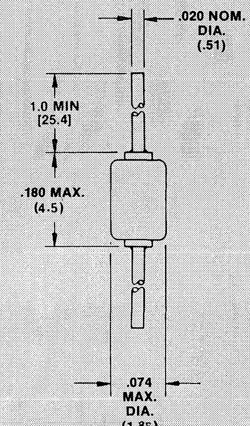

FIGURE 1
PACKAGE BLX

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass case.

LEAD MATERIAL: Tinned copper clad steel.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

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1N4942 thru 1N4948

MILITARY RECTIFIERS

③

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- FAST RECOVERY
- PIV TO 1000 VOLTS
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/359

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C
Power Dissipation: (A) 3 Amp/MIL-STD-750 (See Figure 2)
(B) 1 Amp/no heat sink @ +55°C

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MAX.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 50µA	AVERAGE RECTIFIED CURRENT I_o		FORWARD VOLTAGE (MAX.) V_F @ 1 A	REVERSE CURRENT (MAX.) I_R @ PIV		CAPACITANCE (MAX.) Co @ -12V	SURGE CURRENT (MAX.) (NOTE 1) $I_{F(surge)}$	REVERSE RECOVERY (MAX.) (NOTE 2) t_{rr}
	VOLTS	VOLTS	AMPS		VOLTS	µA		pF	AMPS	n sec.
			55°C	100°C		25°C	150°C			
JAN 1N4942	200	220	1.0	.750	1.3	1.0	200	45	15	150
JAN 1N4944	400	440	1.0	.750	1.3	1.0	200	35	15	150
JAN 1N4946	600	660	1.0	.750	1.3	1.0	200	25	15	250
JAN 1N4947	800	880	1.0	.750	1.3	1.0	200	25	15	250
JAN 1N4948	1000	1100	1.0	.750	1.3	1.0	200	15	15	500

NOTE 1: T_A = 100°C, f = 60 Hz, I_o = 750mA, 10-8 m sec. surges @ 1/minute.
NOTE 2: I_F = 0.5A, I_{Rm} = 1A, $i_{R(REC)}$ = .250A

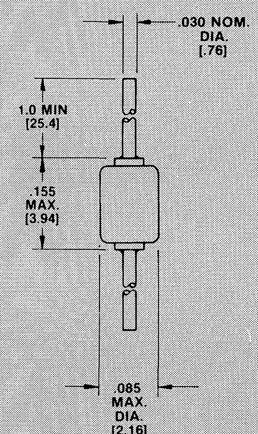

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

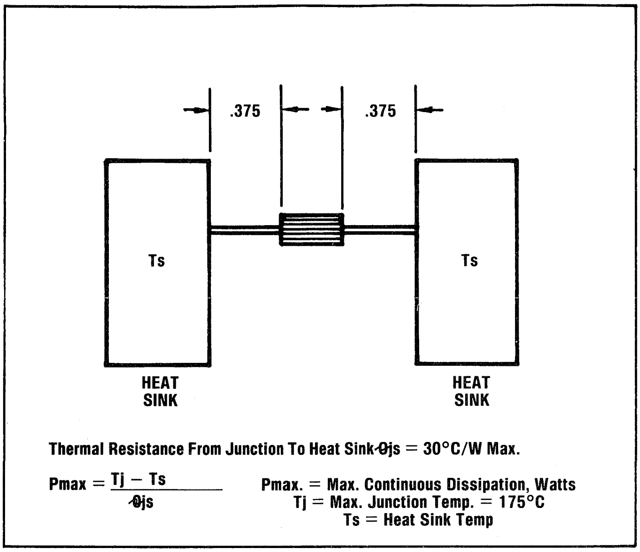

FIGURE 2
MIL STD 750 METHOD 1026 (A)

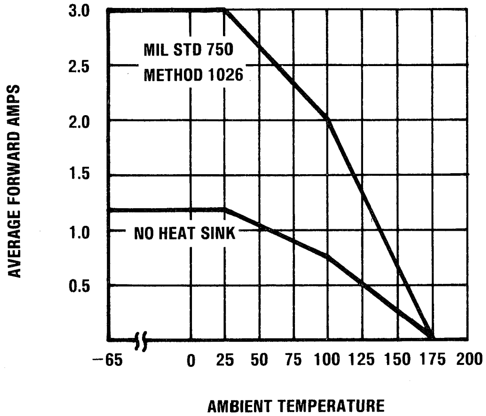

FIGURE 3
MAXIMUM FORWARD CURRENT
vs AMBIENT TEMPERATURE

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SCOTTSDALE, AZ

1N5186 thru 1N5190

FAST SWITCHING RECTIFIERS

③

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- FAST RECOVERY
- PIV TO 600 VOLTS
- MEETS REQUIREMENTS OF MIL-S-19500/424

MAXIMUM RATINGS

Operating Temperature: –65°C to +175°C
Storage Temperature: –65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE	PIV	MINIMUM REVERSE BREAKDOWN VOLTAGE @ 50μA	FORWARD VOLTAGE VF @ 9Adc		MAXIMUM REVERSE CURRENT @ PIV		MAXIMUM REVERSE RECOVERY TIME nsec
			MIN.	MAX.	25°C	100°C	
1N5186	100V	120V	0.9V (pk)	1.5V (pk)	2.0μA	100μA	150
1N5187	200V	240V					200
1N5188	400V	480V					250
1N5189	500V	550V					300
1N5190	600V	660V					400

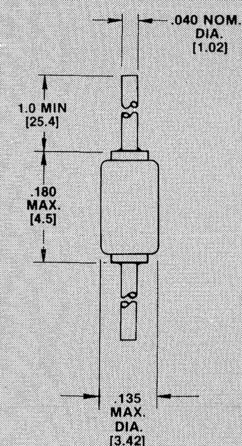

FIGURE 1
PACKAGE E

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

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1N5400 thru 1N5408

3A PLASTIC SILICON RECTIFIERS

FEATURES

- Low cost.
- High current capability.
- Low leakage.
- Low forward voltage.
- High surge capability.
- JEDEC DO-27 molded plastic case.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK REVERSE VOLTAGE	MAX. RMS VOLTAGE	MAX. DC BLOCKING VOLTAGE	MAX. AVERAGE FORWARD RECTIFIED CURRENT	PEAK FORWARD SURGE CURRENT I_F (SURGE)	MAX. FORWARD VOLTAGE @ 3A DC	MAX. DC REVERSE CURRENT @ RATED DC BLOCKING VOLTAGE	TYPICAL JUNCTION CAPACITANCE @ V_R = 4V
	V	V	V	A	A	V	µA	pF
1N5400	50	35	50	3.0	200	1.0	10	70
1N5401	100	70	100	3.0	200	1.0	10	70
1N5402	200	140	200	3.0	200	1.0	10	70
1N5403	300	210	300	3.0	200	1.0	10	70
1N5404	400	280	400	3.0	200	1.0	10	70
1N5405	500	350	500	3.0	200	1.0	10	70
1N5406	600	420	600	3.0	200	1.0	10	70
1N5407	800	560	800	3.0	200	1.0	10	70
1N5408	1000	700	1000	3.0	200	1.0	10	70

NOTE 1: Ratings at 25°C ambient temperature unless otherwise specified. Single phase, half wave, 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.
NOTE 2: Special silicon rectifiers also available.

③

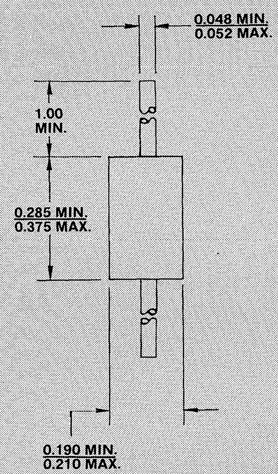

FIGURE 1
All Dimensions in INCHES

MECHANICAL CHARACTERISTICS

CASE: Molded plastic (DO-201AD)
LEAD MATERIAL: Copper, plated tin.
MARKING: Body painted, alpha numeric.
POLARITY: Cathode band.

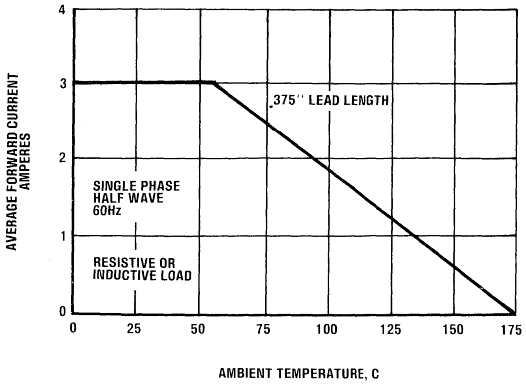

FIGURE 2
FORWARD DERATING CURVE

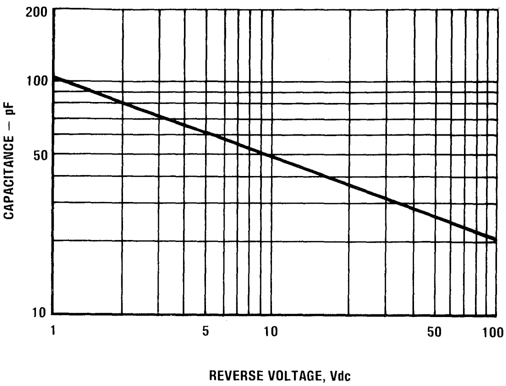

FIGURE 3
TYPICAL JUNCTION CAPACITANCE
vs. REVERSE VOLTAGE

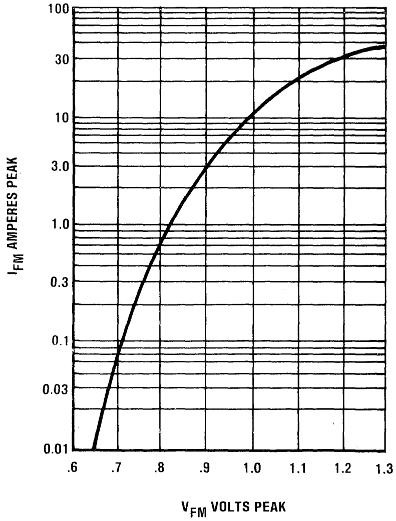

FIGURE 4
TYPICAL INSTANTANEOUS
FORWARD CHARACTERISTICS

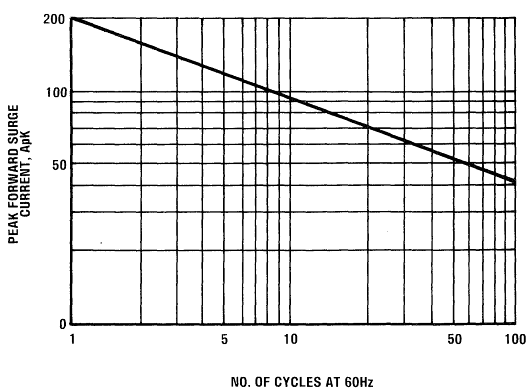

FIGURE 5
MAXIMUM NON REPETITIVE SURGE CURRENT

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1N5415 thru 1N5420

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FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- FAST RECOVERY
- PIV TO 600 VOLTS
- JAN/JANS/TX/TXV TYPES AVAILABLE PER MIL-S-19500/411

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C
Storage Temperature: -65°C to +200°C

ELECTRICAL CHARACTERISTICS

TYPE	PIV	MINIMUM REVERSE BREAKDOWN VOLTAGE @ 50μA	FORWARD VOLTAGE VF @ 9Adc		MAXIMUM REVERSE CURRENT		MAXIMUM REVERSE RECOVERY TIME nsec
			MIN.	MAX.	25°C	100°C	
J, JTX, JTXV 1N5415	50V	55V					150
J, JTX, JTXV 1N5416	100V	110V	0.6V(pk)	1.5V(pk)			150
J, JTX, JTXV 1N5417	200V	220V					150
J, JTX, JTXV 1N5418	400V	440V			1.0μA	20μA	150
J, JTX, JTXV 1N5419	500V	550V					250
J, JTX, JTXV 1N5420	600V	660V					400

FAST RECTIFIERS

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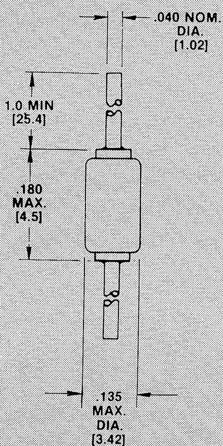

FIGURE 1
PACKAGE E

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

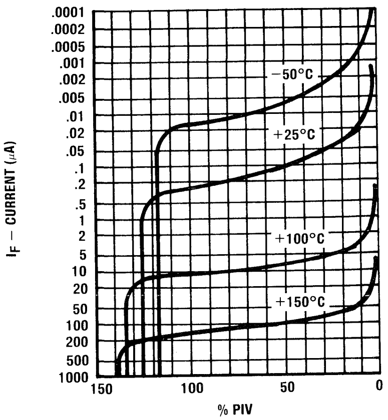

FIGURE 2
TYPICAL REVERSE CURRENT vs. PIV

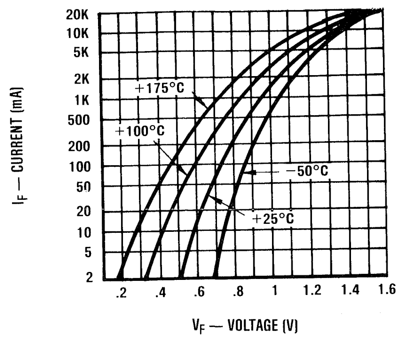

FIGURE 3
TYPICAL FORWARD CURRENT
vs. FORWARD VOLTAGE

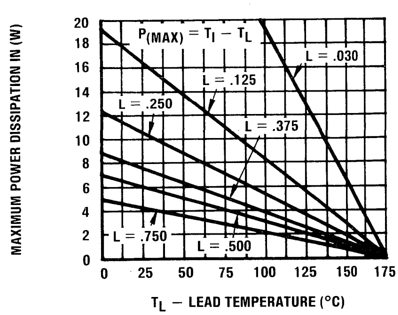

FIGURE 4
MAXIMUM POWER
vs. LEAD TEMPERATURE

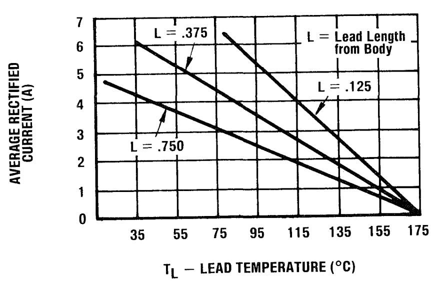

FIGURE 5
MAXIMUM CURRENT vs. LEAD TEMPERATURE

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1N5550 thru 1N5554

RECTIFIERS

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FEATURES

- Voidless hermetically sealed glass package.
- Triple layer passivation.
- Metallurgically bonded.
- JAN/TX/TXV available per MIL-S-19500/420.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.

ELECTRICAL CHARACTERISTICS

TYPE	MINIMUM REVERSE BREAKDOWN VOLTAGE @ 50μA	PEAK INVERSE VOLTAGE PIV VOLTS	AVERAGE RECTIFIED CURRENT I_O AMPS (55°C)	FORWARD VOLTAGE V_F @ 9A (pk)		REVERSE CURRENT I_R @ PIV μA	REVERSE RECOVERY t_{rr} μsec
				MIN.	MAX.		
1N5550	240	200	5.0	.6V (pk)	1.2V (pk)	1.0	2.0
1N5551	480	400	5.0	.6V (pk)	1.2V (pk)	1.0	2.0
1N5552	660	600	5.0	.6V (pk)	1.2V (pk)	1.0	2.0
1N5553	880	800	5.0	.6V (pk)	1.3V (pk)	1.0	2.0
1N5554	1100	1000	5.0	.6V (pk)	1.3V (pk)	1.0	2.0

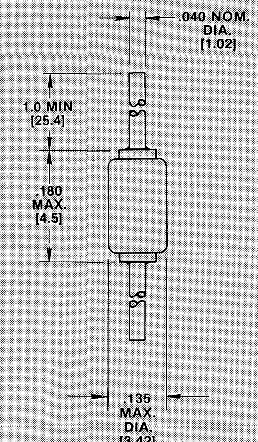


FIGURE 1
PACKAGE E

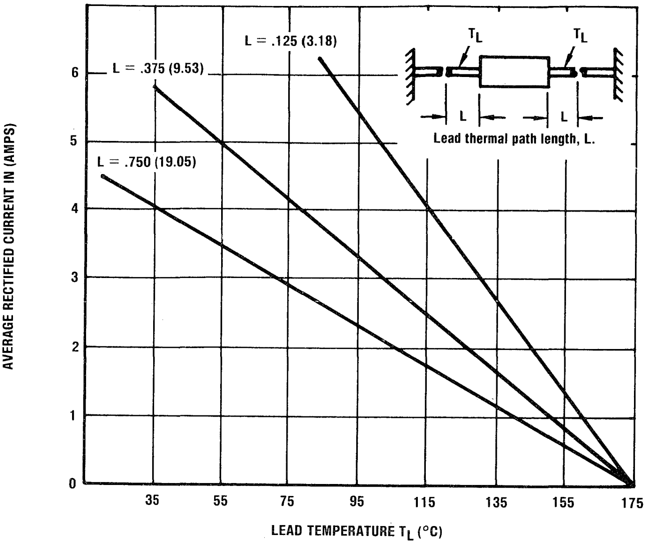
MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass.

LEAD MATERIAL: Tinned Copper.

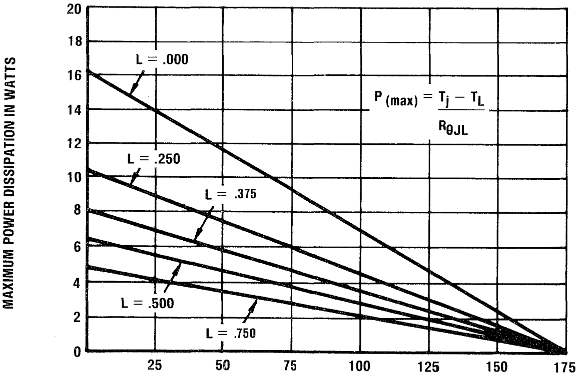
MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.



NOTES: 1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 2
MAXIMUM CURRENT vs. LEAD TEMPERATURE



L	$R_{\Theta JL}$
INCHES	°C/W
.000	11
.250 (6.35)	16.5
.375 (9.53)	22
.500 (12.70)	26
.750 (19.05)	35.5

Maximum lead temperature in °C (T_L) at point "L" from body (For maximum operating junction temperature of 175°C with equal two-lead conditions).

NOTES: 1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 3
MAXIMUM POWER IN WATTS vs. LEAD TEMPERATURE

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1N5614 thru 1N5622

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MILITARY RECTIFIERS

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FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- STANDARD RECOVERY
- PIV TO 1000 VOLTS
- JAN/S/TX/TXV TYPES AVAILABLE PER MIL-S-19500/427

MAXIMUM RATINGS

Operating Temperature: $-65°C$ to $+175°C$
Storage Temperature: $-65°C$ to $+200°C$

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 50μA	AVERAGE RECTIFIED CURRENT I_o		FORWARD VOLTAGE (MAX.) V_F @ 3 A	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) I_F (surge)	REVERSE RECOVERY (MAX.) (NOTE 2) t_{rr}
	VOLTS	VOLTS	AMPS		VOLTS	μA		AMPS	μsec.
			50°C	100°C		25°C	100°C		
JAN 1N5614	200	220	1.00	.750		1.0	25	30	2.0
JAN 1N5616	400	440	1.00	.750	.8 MIN.	1.0	25	30	2.0
JAN 1N5618	600	660	1.00	.750		1.0	25	30	2.0
JAN 1N5620	800	880	1.00	.750	1.3 MAX.	1.0	25	30	2.0
JAN 1N5622	1000	1100	1.00	.750		1.0	25	30	2.0

NOTE 1: $T_A = 100°C$, f = 60 Hz, I_o = 750mA, 10-8 m sec. surges @ 1/minute.
NOTE 2: I_F = 0.5A, I_{Rm} = 1A, $i_{R(REC)}$ = .250A

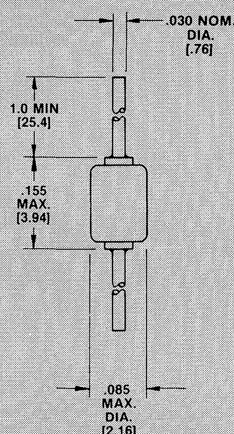

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

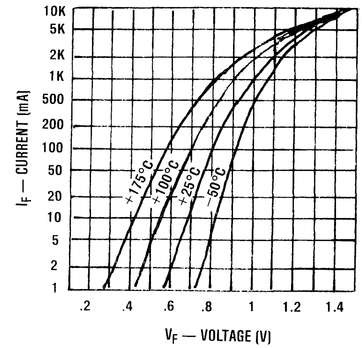

FIGURE 2
TYPICAL FORWARD VOLTAGE
vs FORWARD CURRENT

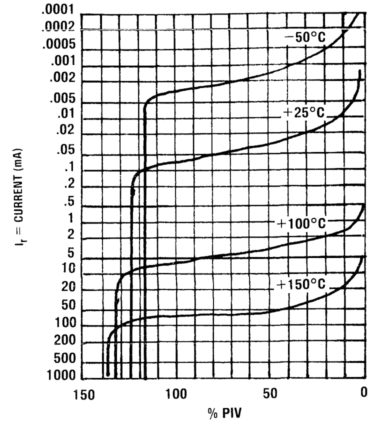

FIGURE 3
TYPICAL REVERSE CURRENT vs PIV

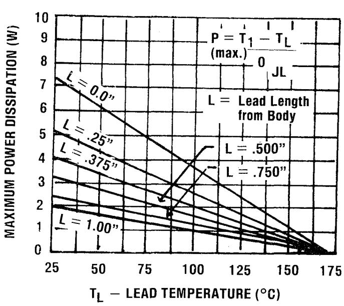

FIGURE 4
MAXIMUM POWER DISSIPATION
vs LEAD TEMPERATURE

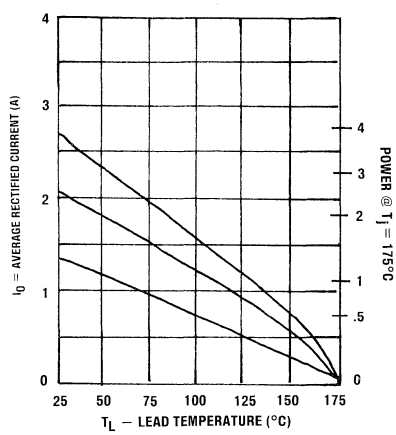

FIGURE 5
MAXIMUM CURRENT
vs LEAD TEMPERATURE

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MILITARY RECTIFIERS

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FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- FAST RECOVERY
- PIV TO 1000 VOLTS
- JANS/TX/TXV TYPES AVAILABLE PER MIL-S-19500/429

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +200°C.
Thermal Resistance: −38°C/W
Surge Current: 25A.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MAX.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 50μA	AVERAGE RECTIFIED CURRENT I_0		FORWARD VOLTAGE (MAX.) V_F @ 3A	REVERSE CURRENT (MAX.) I_R @ PIV		CAPACITANCE (MAX.) C @ -12V	SURGE CURRENT (MAX.) (NOTE 1) $I_{F(surge)}$	REVERSE RECOVERY (MAX.) (NOTE 2) t_{rr}
	VOLTS	VOLTS	AMPS		VOLTS	μA		pF	AMPS	n sec
			55°C	100°C		25°C	100°C			
JAN 1N5615	200	220	1.0	.750	.8 MIN.	.5	25	45	25	150
JAN 1N5617	400	440	1.0	.750		.5	25	35	25	150
JAN 1N5619	600	660	1.0	.750		.5	25	25	25	250
JAN 1N5621	800	880	1.0	.750	1.6 MAX.	.5	25	20	25	300
JAN 1N5623	1000	1100	1.0	.750		.5	25	15	25	500

NOTE 1: T_A = 100°C, f = 60 Hz, I_O = 750 mA, 10-8 msec surges @ 1/minute

NOTE 2: I_F = 0.5A, I_{Rm} = 1A, $i_{R(REC)}$ = .250A

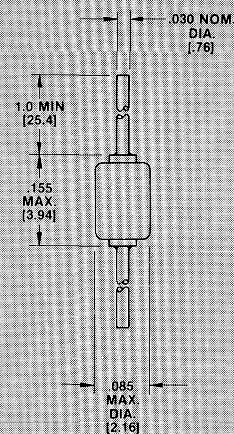

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

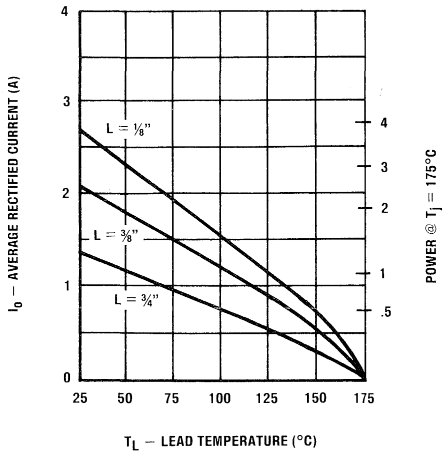

FIGURE 2
MAXIMUM CURRENT
vs LEAD TEMPERATURE

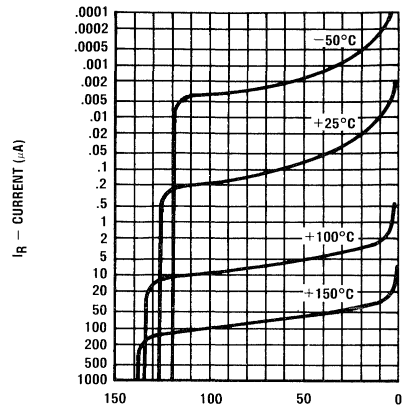

FIGURE 3
TYPICAL REVERSE CURRENT
vs. PIV

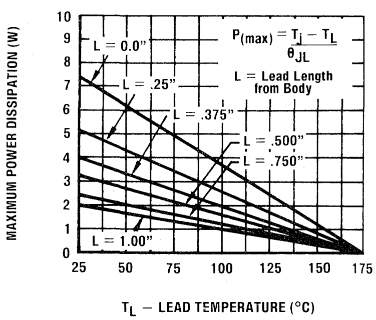

FIGURE 4
MAXIMUM POWER
vs. LEAD TEMPERATURE

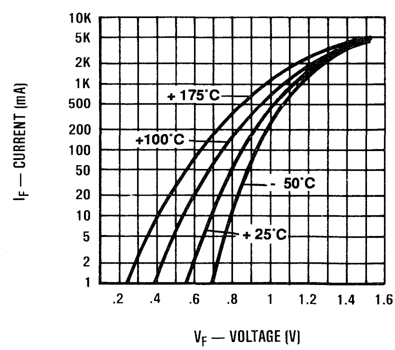

FIGURE 5
TYPICAL FORWARD VOLTAGE
vs. FORWARD CURRENT

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ULTRA FAST MILITARY RECTIFIERS

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FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- ULTRA FAST RECOVERY
- PIV TO 150 VOLTS
- JAN S/TX/TXV TYPES AVAILABLE PER MIL-S-19500/477

MAXIMUM RATINGS

Operating Temperature: −55°C to +200°C.
Storage Temperature: −55°C to +200°C.
Surge: Pulse 8.3ms, 35 A

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100μA	AVERAGE RECTIFIED CURRENT I_o	FORWARD VOLTAGE DROP (MAX.) V_F		REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) $I_{F(surge)}$	JUNCTION CAPACITANCE (MAX.) C @ −10 V	REVERSE RECOVERY TIME (MAX.) (NOTE 2)
	VOLTS	VOLTS	AMPS	VOLTS		μA		AMPS	pF	n sec
			T_A = 55°C	25°C	100°C	25°C	100°C			
1N5802	50	55	2.5	.875	.80	1.0				25
1N5803	75	80	@	@	@	1.0	50	35	20	25
1N5804	100	110	T_L=	1.0 Adc	2.5Adc	1.0	@	single		25
1N5805	125	135	75°C	250msec	@	1.0	75°C	cycle	typ.	25
1N5806	150	160	L = ⅜")	pulse width	75°C	1.0		8.3msec		25

NOTE 1: T_A = 55°C @ rated I_O, 10—8.3 msec surges

NOTE 2: I_F = 1.0A, I_R = 1.0A, recover to .1A

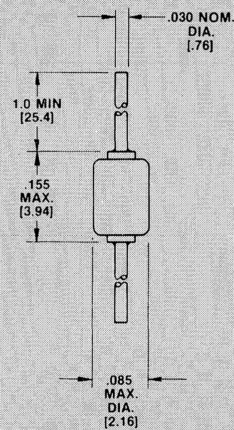

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

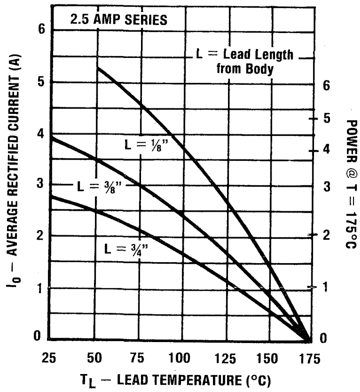

FIGURE 2
OUTPUT CURRENT vs. LEAD TEMP.

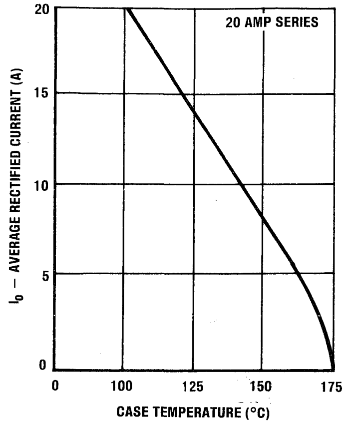

FIGURE 3
OUTPUT CURRENT vs. CASE TEMP.

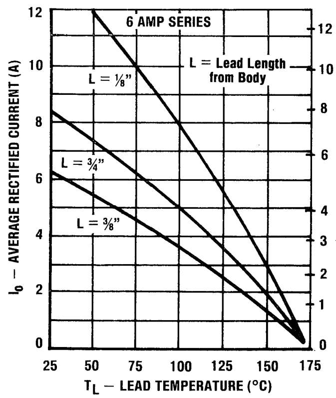

FIGURE 4
OUTPUT CURRENT vs. LEAD TEMP.

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ULTRA FAST RECTIFIERS

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FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- ULTRA FAST RECOVERY
- HIGH SURGE CAPABILITY AND EXTREMELY STABLE CHARACTERISTICS
- PIV TO 160 VOLTS
- JAN S/TX/TXV TYPES AVAILABLE PER MIL-S-19500/477

MAXIMUM RATINGS

Operating Temperature: −55°C to +200°C.
Storage Temperature: −55°C to +200°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100μA	AVERAGE RECTIFIED CURRENT I_o	FORWARD VOLTAGE DROP (MAX.) V_F		REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) $I_{F(surge)}$	JUNCTION CAPACITANCE (MAX.) C @ −10 V	REVERSE RECOVERY TIME (MAX.) (NOTE 2)
	VOLTS	VOLTS	AMPS	VOLTS		μA		AMPS	pF	nsec
			T_A55°C	25°C	100°C	25°C	100°C			
1N5807	50	55	6.0	.875	.700	5				30
1N5808	75	80	@	@	@	5	150	125		30
1N5809	100	110	T_L=	4Adc	6Adc)	5	@	Single	50	30
1N5810	125	135	75°C	250	250	5	75°C	cycle	typ.	30
1N5811	150	160	(L = ⅜")	msec	msec	5		8.3msec		30
				pulse	pulse					
				width	width					

NOTE 1: T_A = 55°C @ rated I_O and V_{RM}, 10−8.3 msec surges

NOTE 2: I_F = 1.0A, I_R = 1.0A, recover to .1A

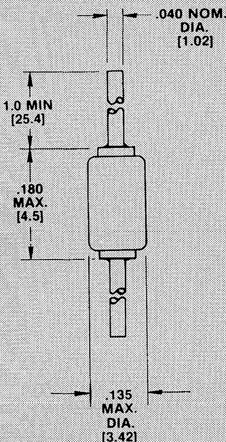


FIGURE 1
PACKAGE E

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

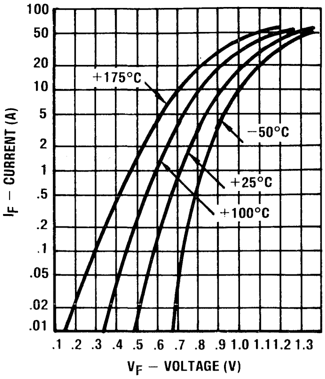


FIGURE 2
TYPICAL FORWARD CURRENT
vs. FORWARD VOLTAGE

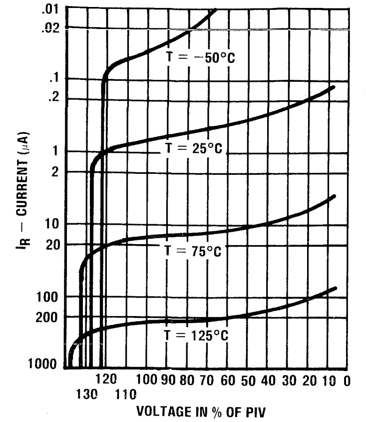


FIGURE 3
TYPICAL REVERSE CURRENT
vs. VOLTAGE

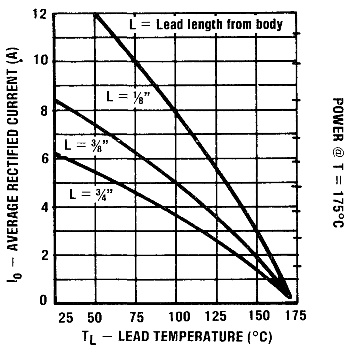


FIGURE 4
OUTPUT CURRENT vs. LEAD TEMP.

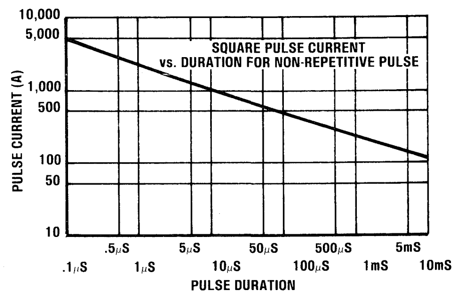
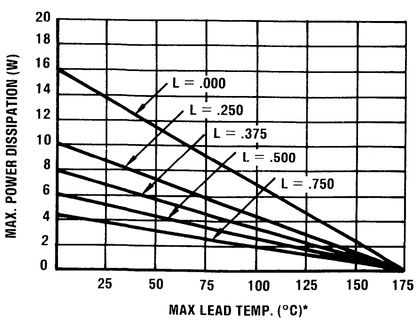


FIGURE 5
FORWARD PULSE CURRENT vs. DURATION



*Maximum lead temp. in °C (T_L) at point "L" from body. (For max. operating junction temp. of 175°C with equal two-lead conditions.)

FIGURE 6
MAXIMUM LEAD TEMP. vs P_d

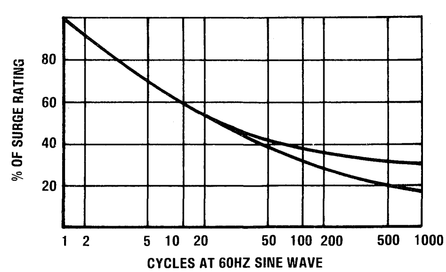


FIGURE 7
MULTIPLE SURGE CURRENT vs. DURATION

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SCOTTSDALE, AZ

1N6073 thru 1N6081

ULTRA FAST POWER RECTIFIERS

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FEATURES

- Triple layer passivation.
- Metallurgically bonded.
- Ultra fast recovery.
- Voidless hermetically sealed glass package.
- JAN/TX/TXV available for 1N6074, 1N6075 per MIL-S-19500/503.

MAXIMUM RATINGS

Operating Temperature: −65°C to +155°C.
Storage Temperature: −65°C to +155°C.

ELECTRICAL CHARACTERISTICS

(@ 25°C unless otherwise specified)

TYPE	PEAK INVERSE VOLTAGE PIV	FORWARD VOLTAGE V_f (PULSED)	AVERAGE RECTIFIED CURRENT I_0	REVERSE CURRENT @ PIV I_R	REVERSE* RECOVERY TIME t_{rr}	SURGE CURRENT I_F (SURGE)
	VOLTS	VOLTS	AMPS	μA	nsec	AMPS
1N6073	50	2.04	3.0	1.0	30	35
1N6074	100	2.04	3.0	1.0	30	35
1N6075	150	2.04	3.0	1.0	30	35
1N6076	50	1.76	6.0	5.0	30	75
1N6077	100	1.76	6.0	5.0	30	75
1N6078	150	1.76	6.0	5.0	30	75
1N6079	50	1.50	12.0	10.0	30	175
1N6080	100	1.50	12.0	10.0	30	175
1N6081	150	1.50	12.0	10.0	30	175

***NOTE:** $I_F = 0.5A$, $I_R = -1.0A$ and $I_{RR} = -0.25A$

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed hard glass.
Lead Material: 1N6073-75 — Tinned copper.
1N6076-78 — Tinned copper or silver-clad copper.
1N6079-81 — Tinned copper or silver-clad copper.
Marking: Body painted, alpha numeric.
Polarity: Cathode band.

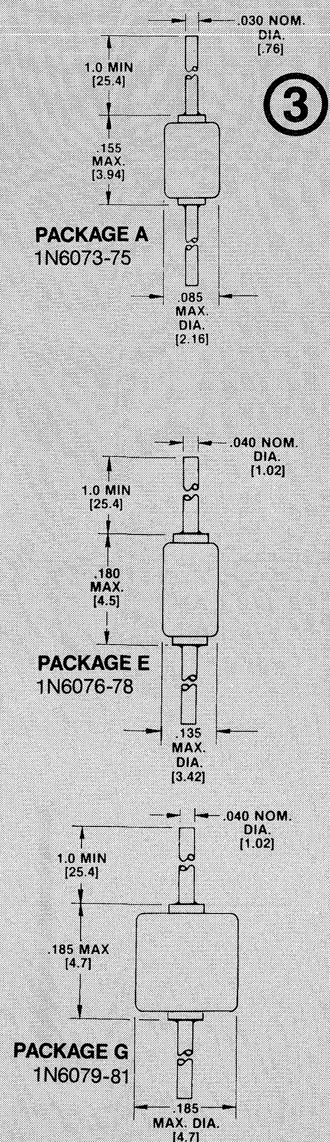
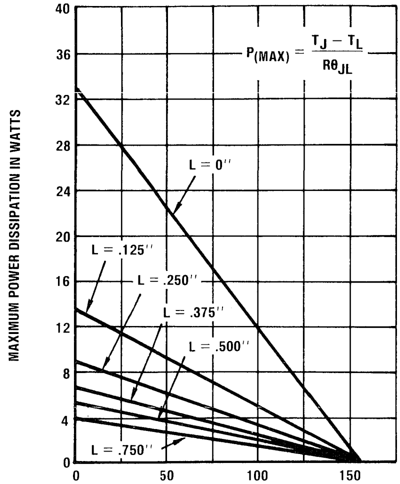


FIGURE 1

1N6073 thru 1N6081

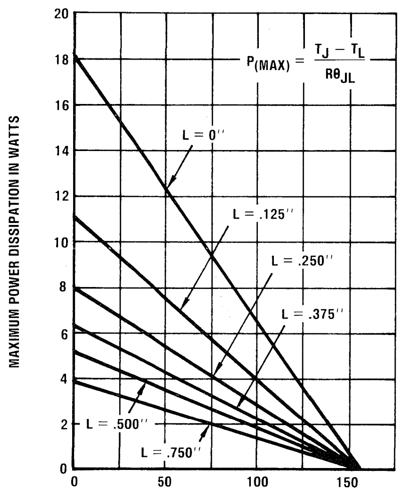


L	$R\theta_{JL}$
INCHES (mm)	°C/W
0.000	5.0
0.125 (3.17)	11.5
0.250 (6.35)	17.5
0.375 (9.53)	23.5
0.500 (12.70)	29.0
0.750 (19.05)	40.0

Maximum lead temperature in °C (T_L) at point "L" from body (for maximum operating junction temperature with equal two-lead conditions).

NOTES:
1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 2. Maximum power in watts vs lead temperature for 1N6079, 1N6080 and 1N6081

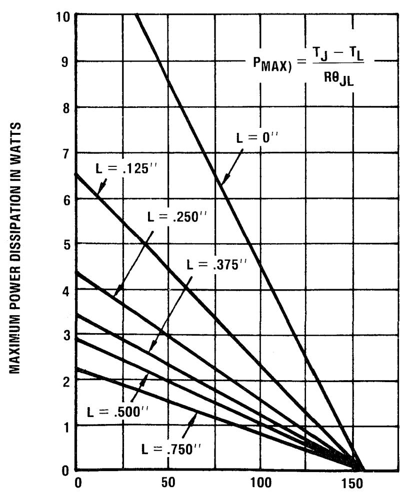


L	$R\theta_{JL}$
INCHES (mm)	°C/W
0.000	8.5
0.125 (3.17)	14.0
0.250 (6.35)	19.5
0.375 (9.53)	25.0
0.500 (12.70)	30.0
0.750 (19.05)	40.0

Maximum lead temperature in °C (T_L) at point "L" from body (for maximum operating junction temperature with equal two-lead conditions).

NOTES:
1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 3. Maximum power in watts vs lead temperature for 1N6076, 1N6077 and 1N6078



L	$R\theta_{JL}$
INCHES (mm)	°C/W
0.000	13
0.125 (3.17)	24
0.250 (6.35)	35
0.375 (9.53)	46
0.500 (12.70)	54
0.750 (19.05)	70

Maximum lead temperature in °C (T_L) at point "L" from body (for maximum operating junction temperature with equal two-lead conditions).

NOTES:
1. Dimensions are in inches.
2. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.

FIGURE 4. Maximum power in watts vs lead temperature for 1N6073, 1N6074 and 1N6075

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30S SERIES

3 AMP MEDIUM POWER SILICON RECTIFIER DIODES

③

DESCRIPTION/FEATURES

- ECONOMICAL SERIES
- HIGH SURGE, 150 AMP MAXIMUM
- UNIVERSAL REPLACEMENT FOR MANY GLASS, EPOXY, ENCAPSULATED, AND METALLIC RECTIFIERS
- PEAK REVERSE VOLTAGES THROUGH 1000 VOLTS

VOLTAGE RATINGS

	V_{RRM} – Max. Repetitive Peak Reverse Voltage (V)	V_R – Max. Direct Reverse Voltage (V)
Part Number	T_J = -65°C to 175°C	T_J = -65°C to 175°C
30S1	100	100
30S2	200	200
30S3	300	300
30S4	400	400
30S5	500	500
30S6	600	600
30S8	800	800
30S10	1000	1000

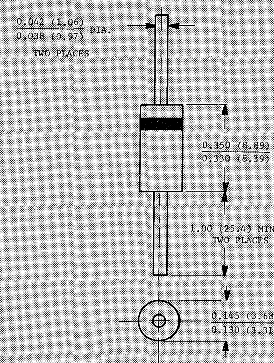
ELECTRICAL SPECIFICATIONS

			Units	Conditions	
$I_{F(AV)}$	Max. average forward current	3.0	A	1 phase operation, 180° conduction. T_L = 125°C, lead length 9.5 mm (0.375 in.)	
I_{FSM}	Max. peak one-cycle non-repetitive surge current	143	A	Half cycle 50 Hz sine wave or 6 ms rectangular pulse	Following any rated load condition and with rated V_{RRM} applied.
		150		Half cycle 60 Hz sine wave or 5 ms rectangular pulse	
		170		Half cycle 50 Hz sine wave or 6 ms rectangular pulse	Following any rated load condition and with V_{RRM} applied following surge = 0.
		178		Half cycle 60 Hz sine wave or 5 ms rectangular pulse	
I^2t	Max. I^2t for fusing	103	A^2s	t = 10 ms	With rated V_{RRM} applied following surge, initial T_J = 175°C.
		94		t = 8.3 ms	
	Max. I^2t for individual device fusing	146		t = 10 ms	ith V_{RRM} = 0 following surge, initial T_J = 175°C.
		133		t = 8.3 ms	
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual device fusing ①	1450	$A^2\sqrt{s}$	t = 0.1 to 10 ms, V_{RRM} = 0 following surge.	
V_{FM}	Max. peak forward voltage	1.0	V	$I_{F(AV)}$ = 3A (9.4A peak); T_J = 25°C.	
$I_{R(AV)}$	Max. average reverse current	0.3	mA	Max. rated $I_{F(AV)}$, V_{RRM} and T_L = 100°C. (ℓ = 9.5 mm (0.375 in.))	

① I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$.

THERMAL-MECHANICAL SPECIFICATIONS

T_J	Max. operating junction temperature range	-65 to 175	°C	
T_{stg}	Max. storage temperature range	-65 to 175	°C	
R_{thJC}	Max. internal thermal resistance, junction-to-lead	16.5	deg. C/W	DC operation, double-side cooled, measured 9.5 mm (0.375 in.) from body.
wt	Approximate weight	0.65 (0.023)	g (oz.)	



Cathode Indicated by Color Band

All Dimensions in Inches (Millimeters).

MECHANICAL CHARACTERISTICS

CASE: Molded plastic use Flame Retardant Epoxy.

TERMINALS: Axial leads, solderable per MIL-STD-202, Method 208.

POLARITY: Color band denotes cathode.

MOUNTING POSITION: Any.

RATING AND CHARACTERISTIC CURVES

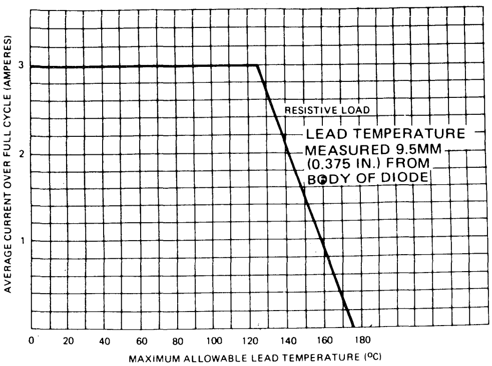


Fig. 1 — Average Forward Current Vs. Lead Temperature at Heat Sinks, ℓ = 9.5 mm (3/8 Inch) (Single Phase Operation)

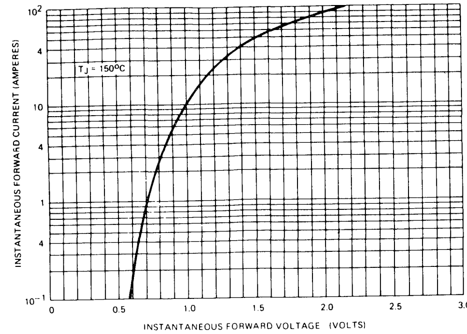


Fig. 2 — Maximum Forward Voltage Vs. Forward Current

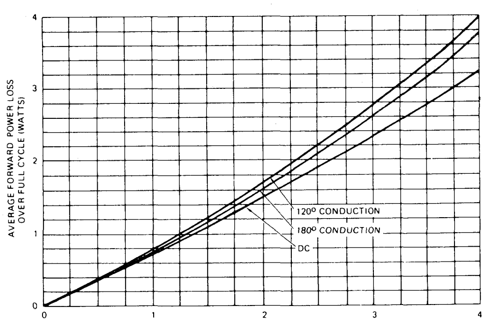


Fig. 3 — Maximum Forward Power Loss Vs. Forward Current (Sinusoidal Current Waveform)

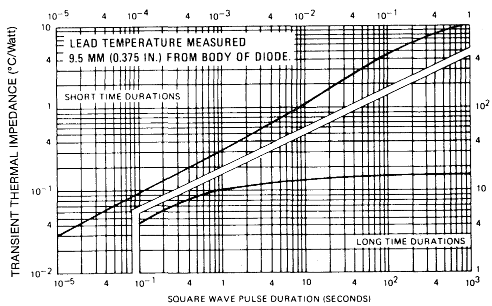


Fig. 4 — Maximum Transient Thermal Impedance, Junction-to-Lead, Vs. Pulse Duration

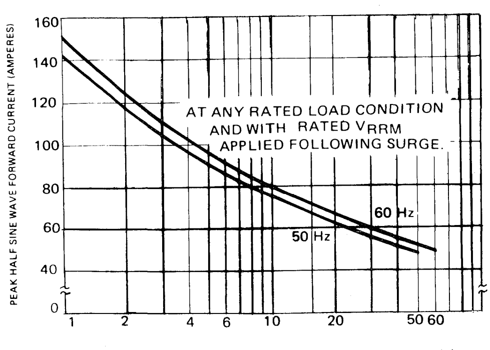


Fig. 5 — Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses

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40SL SERIES

4 AMP AXIAL-LEAD FAST RECOVERY RECTIFIER DIODES

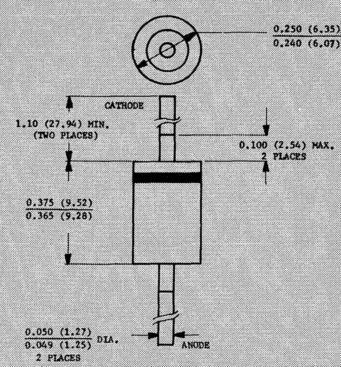
3

DESCRIPTION/FEATURES

- ECONOMICAL 4 AMP I_O MOLDED DEVICE OFFERS CAPABILITY OF STUD-MOUNTED RECTIFIERS
- 150 AMPS SURGE PROVIDES HIGH IN-RUSH CURRENT CAPABILITY
- WIDE VOLTAGE RANGE AVAILABLE: 50 TO 1000 VOLTS V_{RRM}

MAJOR RATINGS AND CHARACTERISTICS

	40 SL	
$I_{F(AV)}$	4	A
at Max. T_L	62	°C
I_{FSM} at 50Hz	143	A
I_{FSM} at 60Hz	150	A
I^2t at 50Hz	103	A^2s
I^2t at 60Hz	94	A^2s
T_J	-40 to 150	°C
V_{RRM} Range	50 - 1000	V
t_{rr}	200	ns



All Dimensions in Inches and (Millimeters)

VOLTAGE RATINGS

Part Number	V_{RRM} (V) Max. Repetitive Peak Reverse Voltage	V_R— (V) Max. Direct Reverse Voltage
	T_J = -40°C to 200°C	T_J = -40°C to 200°C
40SL05	50	50
40SL1	100	100
40SL2	200	200
40SL4	400	400
40SL5	500	500
40SL6	600	600
40SL8	800	800
40SL10	1000	1000

ELECTRICAL SPECIFICATIONS

		40SL	Units	Conditions	
$I_{F(AV)}$	Max. average forward current	4	A	1-phase operation, 180° conduction. T_L = 95°C, ℓ = 9.5 mm (0.375 in.)	
I_{FSM}	Max. peak one-cycle non-repetitive surge current	143	A	Half cycle 50Hz sine wave or 6ms rectangular pulse	Following any rated load condition and with rated V_{RRM} applied.
		150		Half cycle 60Hz sine wave or 5ms rectangular pulse	
		170		Half cycle 50Hz sine wave or 6ms rectangular pulse	Following any rated load condition and with V_{RRM} applied following surge = 0.
		178		Half cycle 60Hz sine wave or 5ms rectangular pulse	
I^2t	Max. I^2t for fusing	103	A^2s	t = 10 ms	With rated V_{RRM} applied following surge, initial T_J = 175°C.
		94		t = 8.3 ms	
	Max. I^2t for individual device fusing	145		t = 10 ms	With V_{RRM} = 0 following surge, initial T_J = 175°C.
		132		t = 8.3 ms	
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual device fusing (Note 1.)	1450	$A^2\sqrt{s}$	t = 0.1 to 10ms, V_{RRM} = 0 following surge.	
V_{FM}	Max. peak forward voltage	1.40	V	$I_{F(AV)}$ = 4A (12.6A peak), T_J = 25°C	
$I_{R(AV)}$	Max. average reverse current	5	mA	T_L = 62°C, V_{RRM} = rated V_{RRM}. $I_{F(AV)}$ = rated $I_{F(AV)}$, 1 phase operation.	
I_R	Max. dc reverse current	3	mA	T_L = 100°C	V_R = Rated V_R.
		25	μA	T_L = 25°C	
t_{rr}	Max. reverse recovery time	200	ns	T_L = 25°C, I_F = 1A, V_R = 30V	
	Typ. reverse recovery time			di/dt = 25A/μs	
$I_{RM(REC)}$	Max. peak reverse recovery current	5	A	T_L = 25°C, I_{FM} = 12.5A $t_p \approx$ 1.6μs, di/dt = 25A/μs	

THERMAL MECHANICAL SPECIFICATIONS

T_J	Max. operating junction temperature range	-40°C to 150	°C	
T_{stg}	Max. storage temperature range	-40°C to 175	°C	
R_{thJC}	Max. internal thermal resistance, junction-to-leads	--	deg C/W	(Note 2.)
ℓ	Length of leads (ℓ) (1/8") 3.2 mm	11.0	deg C/W	±10%
	Length of leads (ℓ) (3/8") 9.5 mm	14.7		
	Length of leads (ℓ) (3/4") 19 mm	20.0		
wt	Approximate weight	1.5 (0.053)	g (oz)	

Note 1. I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$
Note 2. DC operation, double side cooled, measured 9.5 mm (0.375 in.) from body.

MECHANICAL CHARACTERISTICS

CASE: Molded plastic use Flame Retardant Epoxy.

TERMINALS: Axial leads, solderable per MIL-STD-202, Method 208.

POLARITY: Color band denotes cathode.

MOUNTING POSITION: Any.

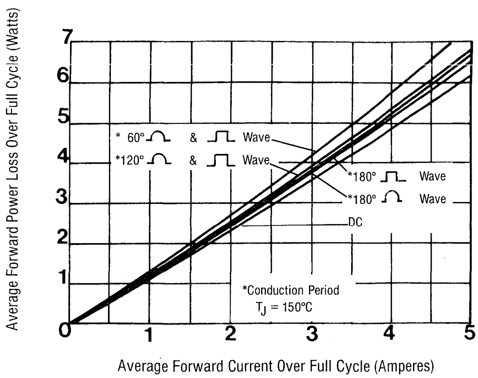


FIGURE 1
MAXIMUM LOW-LEVEL AVERAGE FORWARD POWER LOSS VS. AVERAGE FORWARD CURRENT

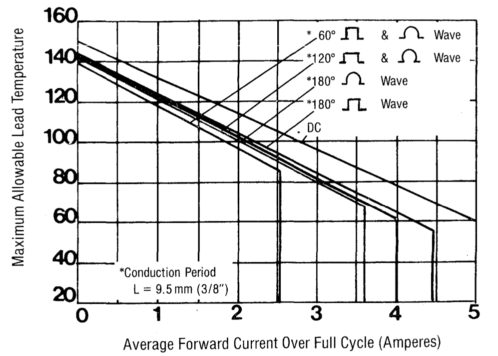


FIGURE 2
AVERAGE FORWARD CURRENT VS. LEAD TEMPERATURE

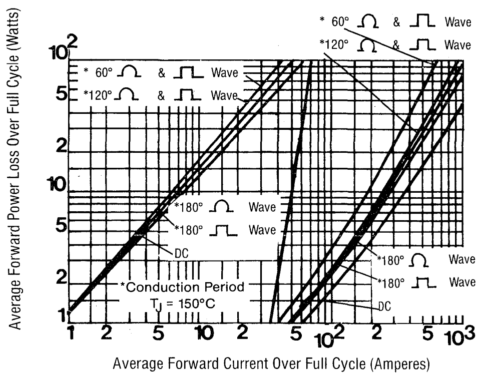


FIGURE 3
MAXIMUM HIGH-LEVEL FORWARD POWER LOSS VS. AVERAGE FORWARD CURRENT

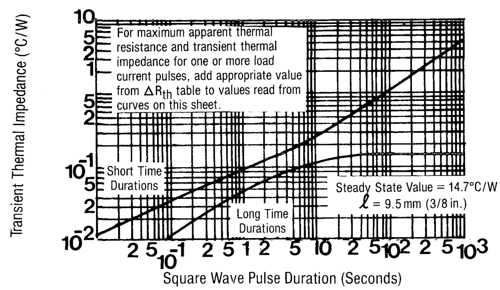


FIGURE 4
MAXIMUM TRANSIENT THERMAL IMPEDANCE JUNCTION TO LEAD VS. PULSE DURATION

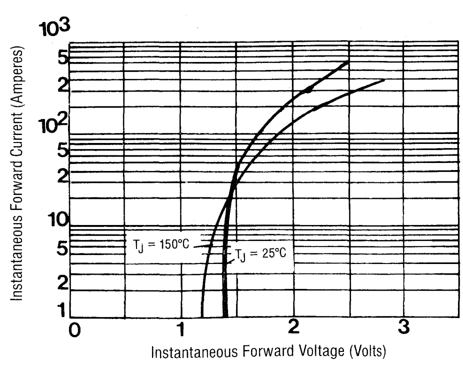


FIGURE 5
MAXIMUM FORWARD VOLTAGE VS. FORWARD CURRENT

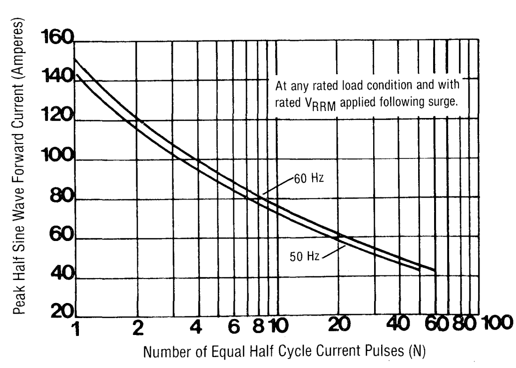


FIGURE 6
MAXIMUM NON-REPETITIVE SURGE CURRENT VS. NUMBER OF CURRENT PULSES

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60S SERIES

DESCRIPTION/FEATURES

- ECONOMICAL 6 AMP I_O MOLDED DEVICE OFFERS CAPABILITY OF STUD-MOUNTED RECTIFIERS
- 400 AMPS SURGE PROVIDES HIGH IN-RUSH CURRENT CAPABILITY
- WIDE VOLTAGE RANGE AVAILABLE: 50 TO 1000 VOLTS V_{RRM}

Major Ratings and Characteristics

	60S	
$I_{F(AV)}$	6	A
@ Max. T_L	95	°C
I_{FSM} @ 50 Hz	382	A
I_{FSM} @ 60 Hz	400	A
I^2t @ 50 Hz	712	A^2s
I^2t @ 60 Hz	650	A^2s
T_J	-40 to 175	°C
V_{RRM} Range	50-1000	V

VOLTAGE RATINGS

Part Number	V_{RRM} Max. Repetitive Peak Reverse Voltage (V) T_J = -40°C to 200°C	V_R – Max. Direct Reverse Voltage (V) T_J = -40°C to 200°C
60S05	50	50
60S1	100	100
60S2	200	200
60S4	400	400
60S5	500	500
60S6	600	600
60S8	800	800
60S10	1000	1000

ELECTRICAL SPECIFICATIONS

		60S	Units	Conditions	
$I_{F(AV)}$	Max. average forward current	6	A	1-phase operation, 180° conduction. T_L = 95°C, ℓ = 9.5 mm (0.375 in.)	
I_{FSM}	Max. peak one-cycle non-repetitive surge current	382	A	Half cycle 50 Hz sine wave or 6 ms rectangular pulse	Following any rated load condition and with rated V_{RRM} applied.
		400		Half cycle 60 Hz sine wave or 5 ms rectangular pulse	
		454		Half cycle 50 Hz sine wave or 6 ms rectangular pulse	Following any rated load condition and with V_{RRM} applied following surge = 0.
		475		Half cycle 60 Hz sine wave or 5 ms rectangular pulse	
I^2t	Max. I^2t for fusing	712	A^2s	t = 10 ms	With rated V_{RRM} applied following surge, initial T_J = 175°C
		650		t = 8.3 ms	
	Max. I^2t for individual device fusing	1006		t = 10 ms	With V_{RRM} = 0 following surge, initial T_J = 175°C
		919		t = 8.3 ms	
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual device fusing (1)	10 330	$A^2\sqrt{s}$	t = 0.1 to 10 ms, V_{RRM} = 0 following surge.	
V_{FM}	Max. peak forward voltage	1.00	V	$I_{F(AV)}$ = 6A (18.8A peak), T_J = 25°C	
$I_{R(AV)}$	Max. average reverse current		mA	Max. rated $I_{F(AV)}$ and V_{RRM}, T_C = 95°C, length of leads to the temperature measurement points (heat sinks) = 9.5 mm (0.375 in.)	
	50 - 100V	2.0			
	200V	1			
	400-500V	0.8			
	600-1000V	0.5			

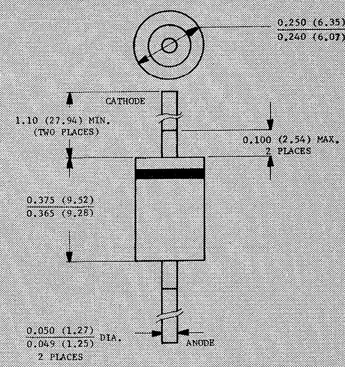
THERMAL-MECHANICAL SPECIFICATIONS

T_J	Max. operating junction temperature range	-40 to 175	°C	
T_{stg}	Max. storage temperature range	-40 to 175	°C	
R_{thJC}	Max. internal thermal resistance, junction-to-leads	–	deg C/W	DC operation, double side cooled, measured 9.5 mm (0.375 in.) from body.
ℓ	Length of leads (ℓ) (1/8") 3.2 mm	11.0		
	Length of leads (ℓ) (3/8") 9.5 mm	14.7		± 10%
	Length of leads (ℓ) (3/4") 19 mm	20.0		
wt	Approximate weight	1.5 (0.053)	g (oz)	

Note (1): I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$

6 AMP AXIAL-LEAD SILICON RECTIFIER DIODES

③



All Dimensions in Inches and (Millimeters)

MECHANICAL CHARACTERISTICS

CASE: Molded plastic use Flame Retardant Epoxy.

TERMINALS: Axial leads, solderable per MIL-STD-202, Method 208.

POLARITY: Color band denotes cathode.

MOUNTING POSITION: Any.

60S Series

RATING AND CHARACTERISTIC CURVES

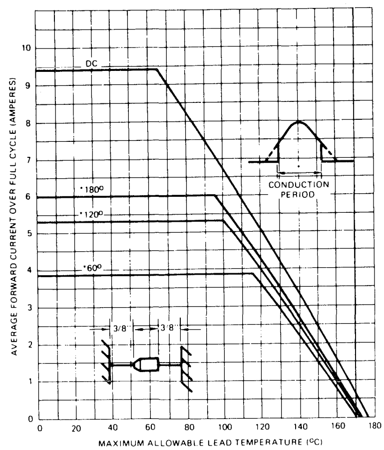


Fig. 1 — Average Forward Current Vs. Lead Temperature at Heat Sinks (ℓ = 3/8 inch)

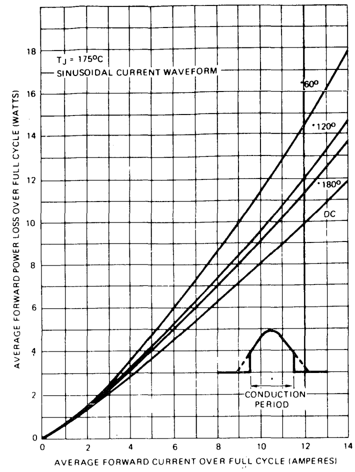


Fig. 2 — Maximum Average Forward Power Loss Vs. Low-Level Average Forward Current

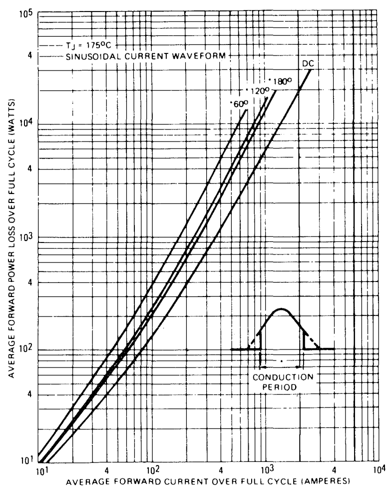


Fig. 3 — Maximum Average Forward Power Loss Vs. High-Level Forward Current

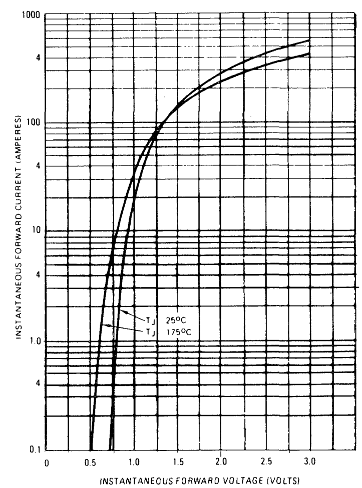


Fig. 4 — Maximum Instantaneous Forward Voltage Vs. Instantaneous Forward Current

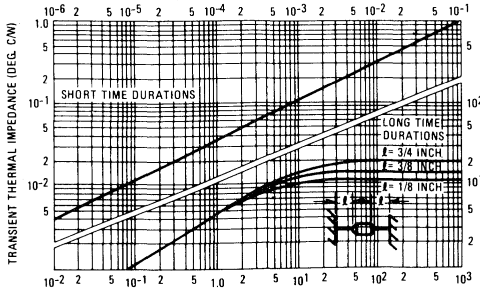


Fig. 5 — Maximum Transient Thermal Impedance, Vs. Square Wave Pulse Duration

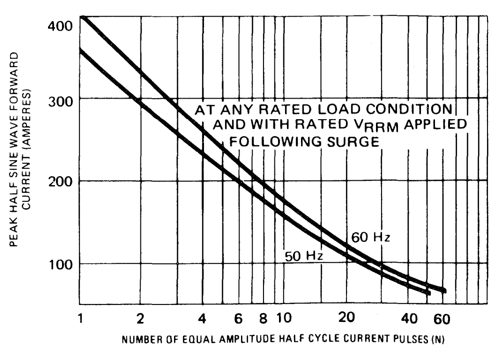


Fig. 6 — Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses

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SCOTTSDALE, AZ

MB200 thru MB206
MB207 thru MB213

RECTIFIERS

③

FEATURES

- Microminiature package.
- Voidless hermetically sealed glass package.
- Triple layer passivation.
- Metallurgically bonded.
- Ultra fast recovery.
- PIV to 215 volts.
- Meet or exceed requirements of MIL-S-19500.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +200°C.
*Power Dissipation: 2 Watts @ 25°C.

*This rating applies when diodes are mounted on turret terminals (.060" diameter x .375" minimum height) on .5" centers in free air. With fan cooling of at least 250 linear feet per minute air velocity this rating is 3.0 watts at 25°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	BREAKDOWN VOLTAGE (MIN.) B_V @ 100µA	AVERAGE RECTIFIED CURRENT I_0	FORWARD VOLTAGE DROP (MAX.) V_F	REVERSE CURRENT (MAX.) I_R @ PIV		SURGE CURRENT (MAX.) (NOTE 1) I_F(surge)	JUNCTION CAPACITANCE (MAX.) C @ V		REVERSE RECOVERY TIME (MAX.) (NOTE 2)
	VOLTS	VOLTS	AMPS	VOLTS	µA		AMPS	pF		n sec
			T_A55°C		25°C	100°C		0V	−10V	
MB200	40	55	2.0	1.0V	.5	100	25	35	20	20
MB201	65	85	2.0	@	.5	100	25	35	20	20
MB202	90	110	2.0	1.667 Adc	.5	100	25	35	20	20
MB204	135	165	2.0	(250 msec	.5	100	25	35	20	20
MB206	185	215	2.0	pulse)	1.5	200	25	35	20	20
MB207	40	55	2.0	1.0V	1.0	200	25	25	15	20
MB208	65	85	2.0	@	1.0	200	25	25	15	20
MB209	90	110	2.0	1.25 Adc	1.0	200	25	25	15	20
MB211	135	165	2.0	(250 msec	1.0	200	25	25	15	20
MB213	185	215	2.0	pulse)	3.0	400	25	25	15	20

NOTE 1: Singe cycle 8.3 msec surge
NOTE 2: I_F = 1A, I_R = 1.0A, recover to .5A

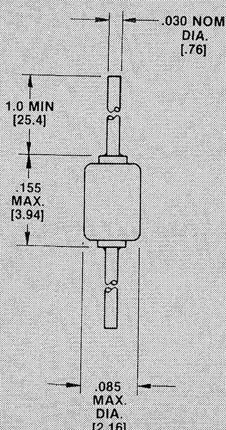

FIGURE 1
PACKAGE A

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed hard glass.

LEAD MATERIAL: Tinned copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

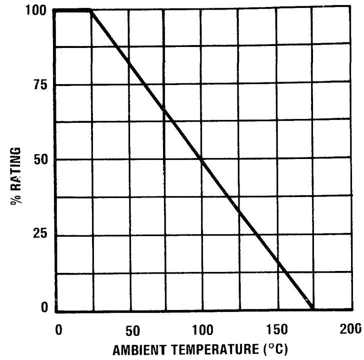

FIGURE 2
TEMPERATURE
DERATING CURVE

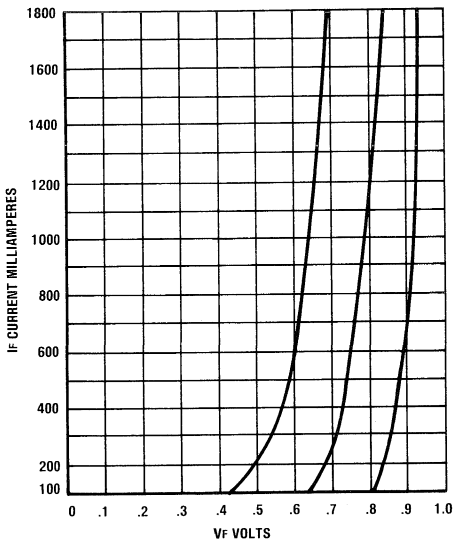

FIGURE 3
FORWARD CONDUCTANCE CURVE**

**Special band spread requirements can be supplied upon request.

MC456A - MC486B

Microsemi Corp.
The diode experts

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SCOTTSDALE, AZ

MICRO-DIODES

3

FEATURES

- Microminiature package.
- Standard recovery.
- Stable surface films integrally bonded to the device crystal.
- Meet or exceed requirements of MIL-S-19500.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: 175°C.
Power Dissipation: 300 mW @ 25°C Au plated silver leads.
250 mW @ 25°C Au plated kovar leads

ELECTRICAL CHARACTERISTICS

TYPE	BREAKDOWN VOLTAGE (MIN.) @100 μA B_V	FORWARD CURRENT (MIN.) @ 1.0 V I_F	REVERSE CURRENT (MAX.) I_R @ V_R		TEST VOLTAGE V_R	AVERAGE RECTIFIED CURRENT I_o
	VOLTS	mA	μA		VOLTS	mA
			25°C	150°C		
MC456A	30	100	0.025	5.0	−25V	150
MC457A	70	100	0.025	5.0	−60V	150
MC458A	150	100	0.025	5.0	−125V	150
MC459A	200	100	0.025	5.0	−175V	150
MC461A	30	100	0.5	30.0	−25V	150
MC462A	70	100	0.5	30.0	−60V	150
MC463A	200	100	0.5	30.0	−175V	150
MC464A	150	100	0.5	30.0	−125V	150
MC482B	40	100	0.025	5.0	−30V	150
MC483B	80	100	0.025	5.0	−60V	150
MC484B	150	100	0.025	5.0	−125V	150
MC485B	200	100	0.025	5.0	−175V	150
MC486B	250	100	0.025	5.0	−225V	150

NOTES:
- Power Dissipation: 300 mw @ 25°C.
- Operating Temperature Range: @ −65°C to +175°C.
- Storage Temperature: -65°C to +175°C

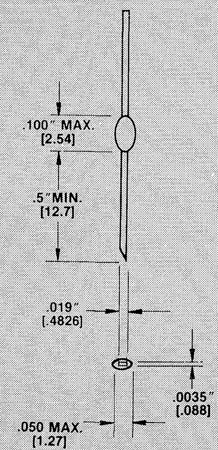

FIGURE 1
Package H

MECHANICAL CHARACTERISTICS

CASE: Ultra stable epoxy encapsulation.

LEAD MATERIAL: Gold plated kovar or gold plated silver.

MARKING: EIA color code bands.

POLARITY: Color bands on cathode leads.

Microsemi Corp.
The diode experts

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For more information call:
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SCOTTSDALE, AZ

MC5600 - MC5607

MICRO SIZE HIGH VOLTAGE SILICON RECTIFIERS

FEATURES

- METALLURGICALLY BONDED, HERMETICALLY SEALED
- MONOLITHIC VOIDLESS CONSTRUCTION
- LOWEST REVERSE LEAKAGE
- SMALL PACKAGE SIZE
- LOWEST THERMAL RESISTANCE
- MAXIMUM BREAKDOWN VOLTAGE PER DIE
- ABSOLUTE HIGH VOLTAGE / HIGH TEMPERATURE STABILITY

OPERATING TEMPERATURE

MC5600-MC5603: -65°C to +150°C
(derate I_O: 4 mA/°C above 25°C)
MC5604-MC5607: -65°C to +125°C
(derate I_O: 2.5 mA/°C above 25°C)
Storage Temperature (MC5600-MC5607):
-65°C to +175°C

ELECTRICAL CHARACTERISTICS

TYPE	PEAK INVERSE VOLTAGE (MIN.) PIV	AVERAGE RECTIFIED CURRENT I_o		FORWARD VOLTAGE (MAX.) V_F @ 100mA	REVERSE CURRENT (MAX.) I_R @ PIV	REVERSE CURRENT (MAX.) I_R @ PIV	SURGE CURRENT (MAX.)
	VOLTS	mA		VOLTS	μA	μA	AMPS
		25°C	100°C			100°C	
MC 5600	1500	500	200	2.0	1.0	20	10
MC 5601	2000	500	200	3.0	1.0	20	8
MC 5602	2500	500	200	4.0	1.0	20	6
MC 5603	3000	500	200	5.0	1.0	20	5
MC 5604	4000	250	60	6.0	1.0	20	4
MC 5605	5000	250	60	7.0	1.0	20	3.0
MC 5606	7500	250	60	9.0	1.0	20	2.7
MC 5607	10,000	250	60	10.0	1.0	20	2.5

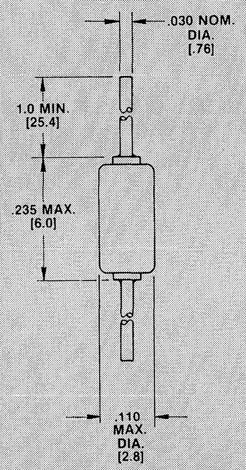

FIGURE 1
PACKAGE S

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed gla package.

LEAD MATERIAL: Tinned coppe

MARKING: Body painted, alph numeric.

POLARITY: Cathode band.

Microsemi Corp.
The diode experts

SANTA ANA, CA
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SCOTTSDALE, AZ

MC5610 thru MC5619

FAST RECOVERY HIGH POWER MICRO HIGH VOLTAGE RECTIFIERS

3

FEATURES

- Monolithic voidless construction.
- Triple layer passivation.
- Lowest reverse leakage.
- Smallest package available.
- Lowest thermal resistance.
- Maximum breakdown voltage per die.
- Absolute high voltage/high temperature stability.

DESCRIPTION

The MC5610 through MC5619 series of high power silicon rectifiers feature the smallest packages available. Metallurgically bonded and hermetically sealed, they exceed all requirements of aerospace and military specifications, including MIL-S-19500. Typical applications include transmitters, power supplies, radar equipment and X-ray machines.

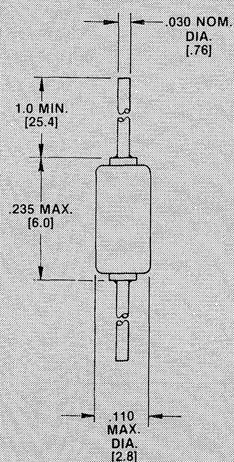

FIGURE 1

ELECTRICAL CHARACTERISTICS

TYPE NO.	PEAK INVERSE VOLTAGE	RMS VOLTAGE	DC BLOCKING VOLTAGE	NOTE 2. AVERAGE RECTIFIED CURRENT @ T_L = 55°C	100°C	Max. Static FORWARD VOLTAGE @ 100mA	Max. Static REVERSE CURRENT @ PIV 25°C	Max. Static REVERSE CURRENT @ PIV 100°C	ONE CYCLE SURGE	t_{rr} 1/
	VOLTS	VOLTS	VOLTS	mA	mA	VOLTS	μA	μA	AMPS	n SEC
MC 5610	1500	1050	1500	790	415	3.0	1.0	25	8	300
MC 5611	2000	1400	2000	630	330	4.0	1.0	25	6	300
MC 5612	2500	1750	2500	530	280	5.0	1.0	25	5	300
MC 5613	1500	1050	1500	975	515	3.0	1.0	20	8	300
MC 5614	2000	1400	2000	790	415	4.0	1.0	20	6	300
MC 5615	2500	1750	2500	665	350	5.0	1.0	20	5	300
MC 5616	3000	2100	3000	570	300	6.0	1.0	20	4	300
MC 5617	4000	2800	4000	330	120	8.0	2.5	50	3	300
MC 5618	4500	3150	4500	300	110	9.0	2.5	50	2.7	300
MC 5619	5000	3500	5000	275	100	10.0	2.5	50	2.5	300

NOTE 1: I_F = 50 mA, I_R = 100 mA, I_{RR} = 25mA
NOTE 2: Heat sink 3/8" from body

MECHANICAL CHARACTERISTICS

Tinned copper leads............................. Refer to Figure 1
Positive terminal (cathode) marked with band.
Operating temperature range:
MC5610-MC5612............................. −55°C to 150°C
MC5613-MC5616............................. −65°C to 150°C
MC5617-MC5619............................. −65°C to 125°C
Storage temperature range (MC5610-MC5619)....... −65°C to 175°C

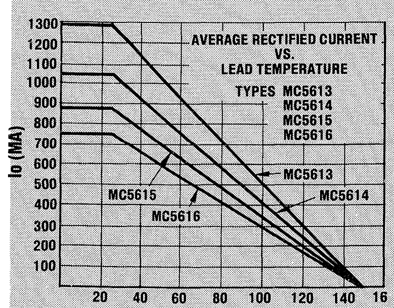

FIGURE 2
LEAD TEMPERATURE (°C)
(L = 3/8 INCH)

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The diode experts

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For more information call:
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SCOTTSDALE, AZ

MES1104
MES1105
MES1106

Ultra Fast Switching Rectifier

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- VERY LOW FORWARD VOLTAGE (1.15V)
- ULTRA FAST RECOVERY TIMES (50ns)
- HIGH SURGE
- CONSULT FACTORY FOR MES1101 THRU MES1103

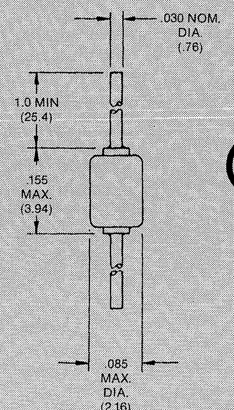

FIGURE 1
PACKAGE A

3

ABSOLUTE MAXIMUM RATINGS

Working Peak Reverse Voltage, MES1104 .... 200V
Working Peak Reverse Voltage, MES1105 .... 300V
Working Peak Reverse Voltage, MES1106 .... 400V
Maximum Average D.C. Forward Current, I_O
@TA = 25°C, (Free Air) 1A
@TL = 50°C, L=3/8" 2A
Surge Current, 8.3msec 20A
Thermal Resistance @ L=3/8" .... 38°C/W
Operating and Storage Temperature Range .... -55°C to +150°C

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

ELECTRICAL SPECIFICATIONS:

TYPE	WORKING PEAK REVERSE VOLTAGE (V_{RWM})	MAXIMUM FORWARD VOLTAGE (V_F) @ 1A, t_p = 300μs		MAXIMUM REVERSE CURRENT (I_R) @ PIV		MAXIMUM REVERSE RECOVERY TIME* (t_{rr})
		(T_J) = 25°C	(T_J) = 100°C	(T_J) = 25°C	(T_J) = 100°C	
MES1104 MES1105 MES1106	200V 300V 400V	1.25V	1.15V	10 μA	200 μA	50ns

*Measured in circuit IF = 0.5A, IR = 1A, IREC = 0.25A

Average Forward Current vs.
Ambient Temperature.

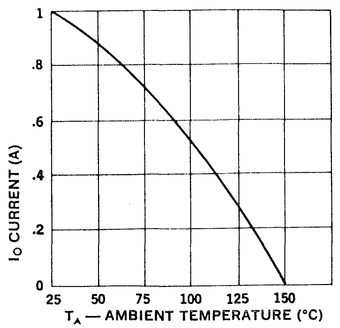

FIGURE 2

Multiple Forward Surge
Current vs. Duration

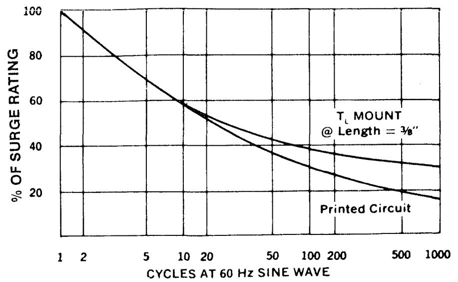

FIGURE 3

Average Forward Current vs.
Lead Temperature.

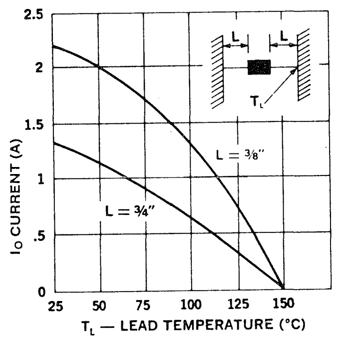

FIGURE 4

Typical Forward Current
vs. Forward Voltage

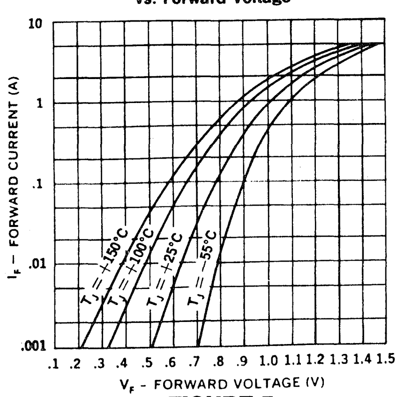

FIGURE 5

Typical Reverse Current
vs. Reverse Voltage

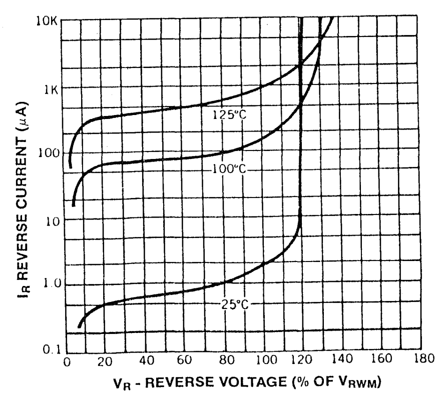

FIGURE 6

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SCOTTSDALE, AZ

MES1304
MES1305
MES1306

Ultra Fast Switching Rectifier

FEATURES

- MICROMINIATURE PACKAGE
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- TRIPLE LAYER PASSIVATION
- METALLURGICALLY BONDED
- VERY LOW FORWARD VOLTAGE (1.15V)
- ULTRA FAST RECOVERY TIMES (50ns)
- HIGH SURGE
- CONSULT FACTORY FOR MES1301 THRU MES1303

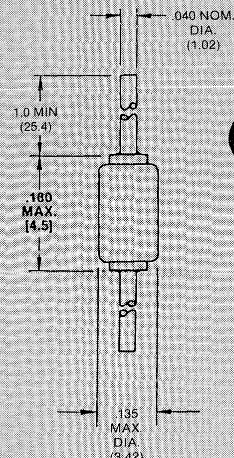

FIGURE 1
PACKAGE E

3

ABSOLUTE MAXIMUM RATINGS

Working Peak Reverse Voltage, MES1304 .... 200V
Working Peak Reverse Voltage, MES1305 .... 300V
Working Peak Reverse Voltage, MES1306 .... 400V
Maximum Average D.C. Forward Current, I_O
@TA = 25°C, (Free Air) 3A
@TL = 50°C, L=⅜″........................... 5A
Surge Current, 8.3mSec 70A
Thermal Resistance @ L=⅜″............................... 20°C/W
Operating and Storage Temperature Range ....-55°C to +150°C

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

ELECTRICAL SPECIFICATIONS:

TYPE	WORKING PEAK REVERSE VOLTAGE (V_{RWM})	MAXIMUM FORWARD VOLTAGE (V_F) @ 3A, t_p = 300μs		MAXIMUM REVERSE CURRENT (I_R) @ PIV		MAXIMUM REVERSE RECOVERY TIME* (t_{rr})
		(T_J) = 25°C	(T_J) = 100°C	(T_J) = 25°C	(T_J) = 100°C	
MES1304 MES1305 MES1306	200V 300V 400V	1.25V	1.15V	20 μA	500 μA	50ns

*Measured in circuit IF = 0.5A, IR = 1A, IREC = 0.25A

Average Forward Current vs. Ambient Temperature.

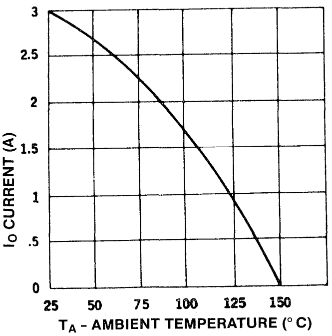

FIGURE 2

Multiple Forward Surge Current vs. Duration

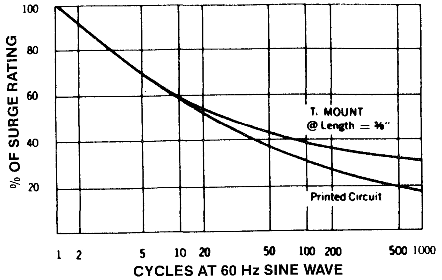

FIGURE 3

Average Forward Current vs. Lead Temperature.

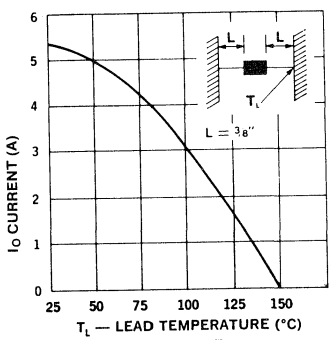

FIGURE 4

Typical Forward Current vs. Forward Voltage

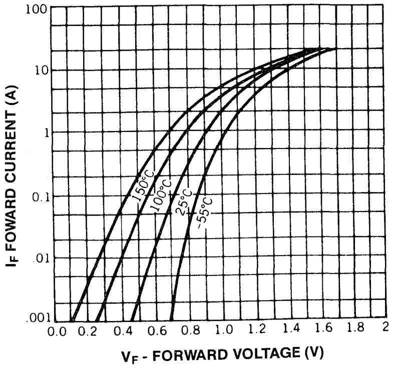

FIGURE 5

Typical Reverse Current vs. Reverse Voltage

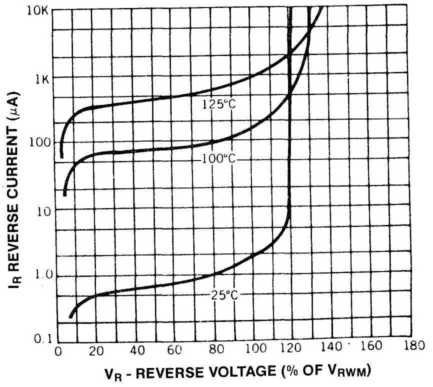

FIGURE 6

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SCOTTSDALE, AZ
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MR1001 thru MR1007

1A FAST RECOVERY RECTIFIERS

3

FEATURES

- Low cost.
- High current capability.
- Low leakage.
- Low forward voltage.
- High surge capability.
- JEDEC DO-41 molded plastic case.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK REVERSE VOLTAGE	MAX. RMS VOLTAGE	MAX. DC BLOCKING VOLTAGE	MAX. AVERAGE FORWARD RECTIFIED CURRENT	PEAK FORWARD SURGE CURRENT I_F (SURGE)	MAX. FORWARD VOLTAGE @ 1A DC	MAX. DC REVERSE CURRENT @ RATED DC BLOCKING VOLTAGE	TYPICAL JUNCTION CAPACITANCE @ V_R = 4V	MAX. REVERSE RECOVERY TIME t_{rr}
	V	V	V	A	A	V	μA	pF	ns
MR1001	50	35	50	1.0	30	1.2	5.0	15	200
MR1002	100	70	100	1.0	30	1.2	5.0	15	200
MR1003	200	140	200	1.0	30	1.2	5.0	15	200
MR1004	400	280	400	1.0	30	1.2	5.0	15	200
MR1005	600	420	600	1.0	30	1.2	5.0	15	250
MR1006	800	560	800	1.0	30	1.2	5.0	15	500
MR1007	1000	700	1000	1.0	30	1.2	5.0	15	500

NOTE 1: Ratings at 25°C ambient temperature unless otherwise specified.
NOTE 2: Special fast recovery rectifiers also available.
NOTE 3: Reverse recovery test conditions:
$I_F = 0.5A$, $I_{RM\,(REC)} = 1.0A$, and $I_{R\,(REC)} = 0.25A$

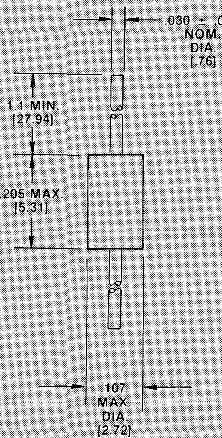

FIGURE 1

All dimensions in $\frac{\text{INCH}}{\text{m.m.}}$

MECHANICAL CHARACTERISTICS

CASE: Molded plastic (DO-41).
LEAD MATERIAL: Copper, plated tin.
MARKING: Body painted, alpha numeric.
POLARITY: Cathode band.

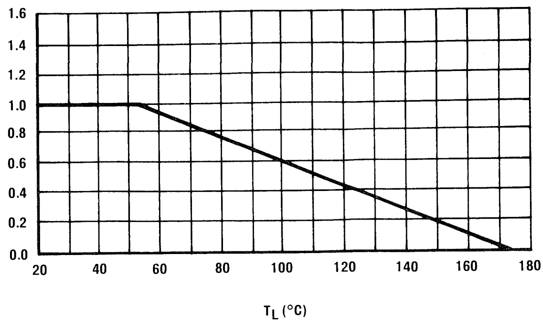

FIGURE 2
FORWARD CURRENT DERATING CURVE

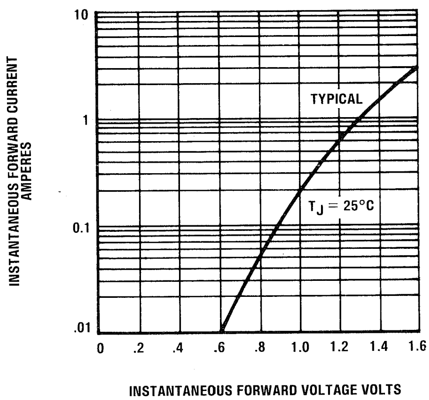

FIGURE 3
TYPICAL FORWARD VOLTAGE DROP Vs.
OUTPUT CURRENT (INSTANTANEOUS).

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MR3001 thru MR3007

3A FAST RECOVERY RECTIFIERS

FEATURES

- Low cost.
- High current capability.
- Low leakage.
- Low forward voltage.
- High surge capability.
- JEDEC DO-27 molded plastic case.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +175°C.

ELECTRICAL CHARACTERISTICS

TYPE	PEAK REVERSE VOLTAGE	MAX. RMS VOLTAGE	MAX. DC BLOCKING VOLTAGE	MAX. AVERAGE FORWARD RECTIFIED CURRENT	PEAK FORWARD SURGE CURRENT I_F (SURGE)	MAX. FORWARD VOLTAGE @ 1A DC	MAX. DC REVERSE CURRENT @ RATED DC BLOCKING VOLTAGE	TYPICAL JUNCTION CAPACITANCE @ V_R = 4V	MAX. REVERSE RECOVERY TIME t_{rr}
	V	V	V	A	A	V	μA	pF	ns
MR3001	50	35	50	3.0	200	1.2	10	60	200
MR3002	100	70	100	3.0	200	1.2	10	60	200
MR3003	200	140	200	3.0	200	1.2	10	60	200
MR3004	400	280	400	3.0	200	1.2	10	60	200
MR3005	600	420	600	3.0	200	1.2	10	60	250
MR3006	800	560	800	3.0	200	1.2	10	60	500
MR3007	1000	700	1000	3.0	200	1.2	10	60	500

NOTE 1: Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60Hz resistive or inductive load.
For capacitive load, derate current by 20%.

NOTE 2: Special fast recovery rectifiers also available.

NOTE 3: Reverse recovery test conditions:
$I_F = 0.5A$, $I_{RM\ (REC)} = 1.0A$, and $I_{R\ (REC)} = 0.25A$

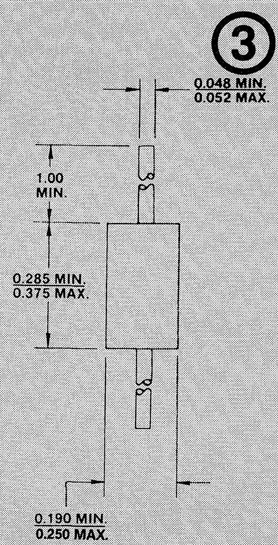

FIGURE 1

ALL DIMENSIONS IN INCHES.

MECHANICAL CHARACTERISTICS

CASE: Molded plastic.

LEAD MATERIAL: Copper, plated tin.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

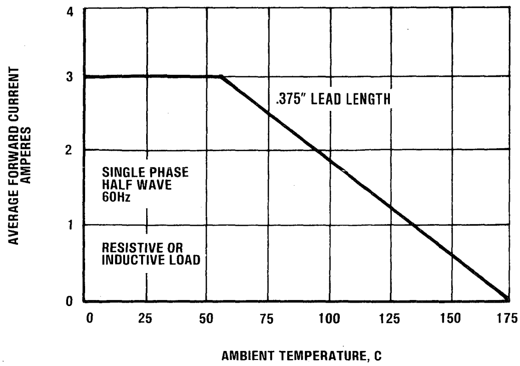

FIGURE 2
FORWARD DERATING CURVE

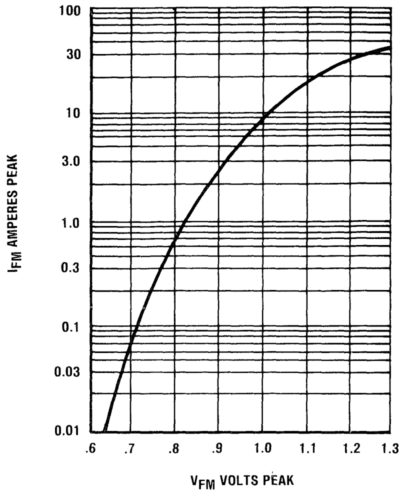

FIGURE 3
TYPICAL INSTANTANEOUS
FORWARD CHARACTERISTICS

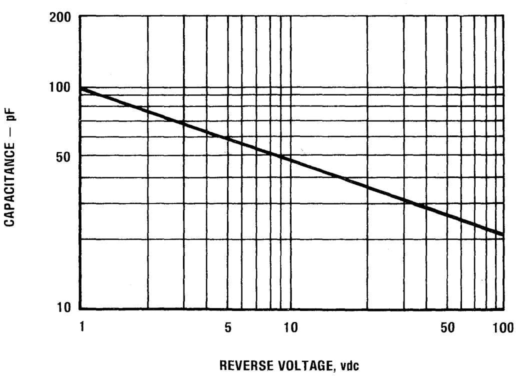

FIGURE 4
TYPICAL JUNCTION CAPACITANCE
vs REVERSE VOLTAGE

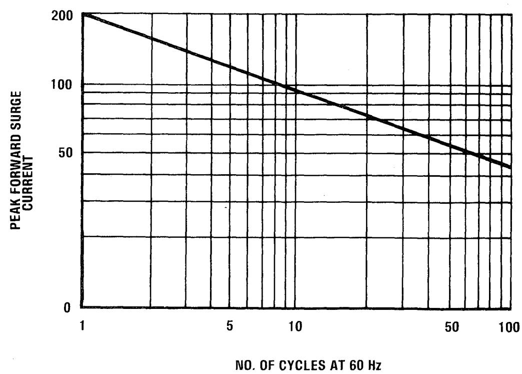

FIGURE 5
MAXIMUM NON REPETITIVE SURGE CURRENT

Microsemi Corp.
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For more information call:
(602) 941-6300

MSB05 MSB1, MSB2, MSB4, MSB6, MSB8, MSB10

DIP BRIDGE RECTIFIERS

FEATURES

- DUAL IN-LINE SUBMINIATURE PACKAGE (DIP)
- MACHINE INSERTABLE
- MOLDED EPOXY PACKAGE
- LOW COST
- UTILIZES HIGH QUALITY GLASS PASSIVATED DICE FOR IMPROVED RELIABILITY
- HIGH SURGE CAPABILITY — 50 A (SINGLE CYCLE)
- BREAKDOWN VOLTAGES TO 1000 V

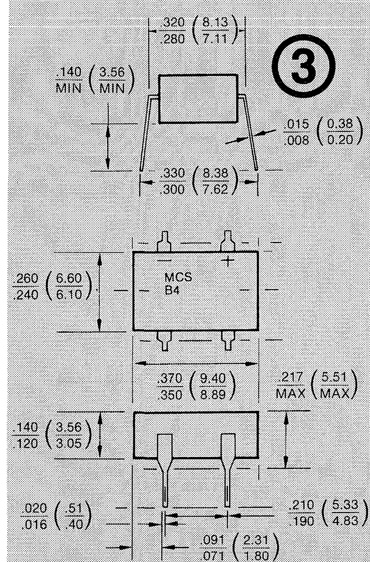
MAXIMUM RATINGS

Operating Temperature: - 55°C to + 125°C
Storage Temperature: - 55°C to + 150°C

ELECTRICAL CHARACTERISTICS

TYPE	WKG. PK. REV. VOLTS & REV. D.C. VOLTS V_{RWM} & V_R 1/	Max. RMS INPUT VOLTAGE Vrms 2/	Max. TRANSIENT RATED PK. VOLTAGE TRV 1/	AVG. OUTPUT CURRENT RES./IND. LOAD Iout//AV @ T_A = 40°C	MAX. SINGLE CYCLE SURGE CURRENT Isurge 1/	MAX. PK. FORWARD VOLTAGE V_{FM} @ T_A = 25°C & I_{FM} = 1.0A PK. 1/	MAX. D.C. REV. CURRENT I_R 1/ @ RATED V_R μAmps T_A = 25°C	T_A = 150°C
	VOLTS	VOLTS	VOLTS	AMPS	AMPS	VOLTS		
MSB05	50	35	100	1.0	50	1.1	3.0	500
MSB1	100	70	150	1.0	50	1.1	3.0	500
MSB2	200	140	300	1.0	50	1.1	3.0	500
MSB4	400	280	500	1.0	50	1.1	3.0	500
MSB6	600	420	700	1.0	50	1.1	3.0	500
MSB8	800	560	900	1.0	50	1.1	3.0	500
MSB10	1000	700	1100	1.0	50	1.1	3.0	500

NOTE: 1: Per rectifier element
2. At a power line frequency of 50/60 hertz



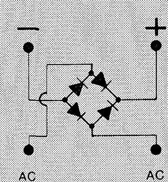


FIGURE 1

All Dimensions in INCHES and (m.m.)

MECHANICAL CHARACTERISTICS

CASE: Molded epoxy (Dual-in-line).

LEAD MATERIAL: Copper plated tin, solderable per MIL-STD-202, Method 208.

MARKING: Body painted, alpha numeric.

POLARITY: Reference mark.

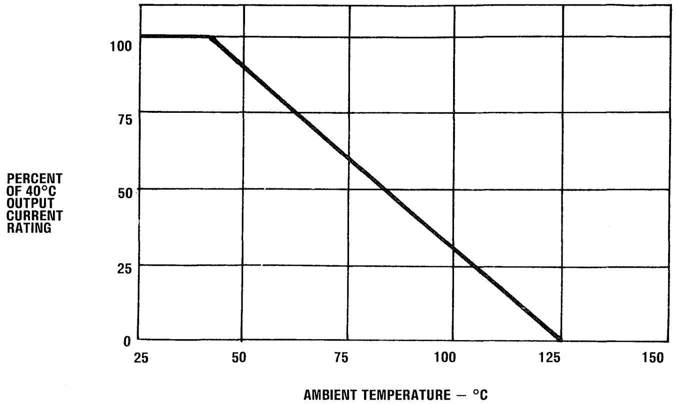


FIGURE 2
OUTPUT CURRENT DERATING SCHEDULE

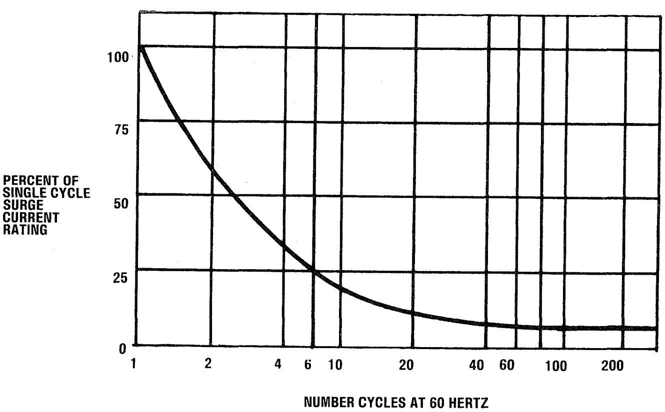


FIGURE 3
FORWARD SURGE CURRENT SCHEDULE
(PER ELEMENT; −55°C to +150°C)

Microsemi Corp.
The diode experts

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(714) 979-8220

SCOTTSDALE, AZ

MT5100-MT5103 MT5139, MT5140, MT2060, MT2060A MT2061, MT2061A

PICO AMP LOW LEAKAGE DIODES

3

FEATURES

- Exhibits leakage currents approaching the theoretical bulk characteristics of silicon.
- Oxide and glass junctions passivated for long-term stable device performance.
- Voidless hermetically sealed glass package.
- Exceeds MIL-S-19500 requirements.

MAXIMUM RATINGS

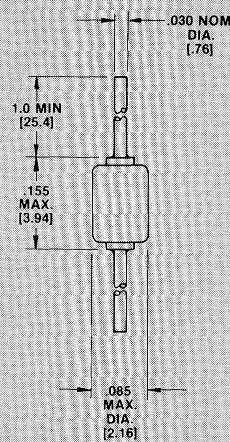
Storage Temperature: -65°C to +260°C.
Operating Temperature: -65°C to 260°C.

ELECTRICAL CHARACTERISTICS

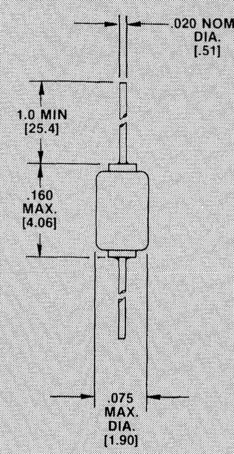
TYPE NUMBER	MIN. BV @ 100 uA @ 25°C VOLTS	Vr VOLTS	MAX. Ir @ Vr @ 25°C PICO AMPS	MAX. Ir @ Vr @ 150°C NANO AMPS	MAX. Ir @ Vr @ 200°C MICRO AMPS	If @ 1.2V MA	MAX. Cap. @ 0V PF	MAX. Cap. @ 10V PF	Pkg.
MT 5100	75	20	10	50	1	100	6	3	B
MT 5101	75	20	20	100	2	100	6	3	B
MT 5102	75	20	10	50	1	80	6	3	B
MT 5103	75	20	20	100	2	80	6	3	B
MT 5139	60	50	50	75	1	100	6	3	B
MT 5140	110	100	125	125	2	100	6	3	B
MT 2060	600	500	2000	6000	40	400	10	5	B
MT 2061	600	500	2000	6000	40	400	16	8	A
MT 2061	600	500	1000	3000	20	400	10	5	B
MT 2061A	600	500	1000	3000	20	400	16	8	A

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case.
Lead Material: Tinned copper. (A package) (Copper Clad Steel — B package)
Marking: Body painted, alpha numeric.
Polarity: Cathode band.



PACKAGE "A"



PACKAGE "B"

MT5100 - MT5103
MT5139, MT5140,
MT2060, MT2060A
MT2061, MT2061A

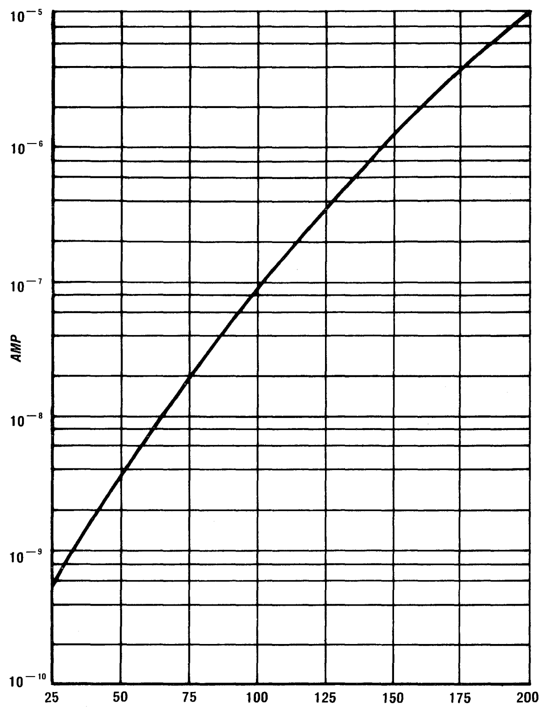


FIGURE 2
MAXIMUM Ir LIMIT @ 500V CURVE
(MT2060, MT2060A, MT2061, MT2061A)

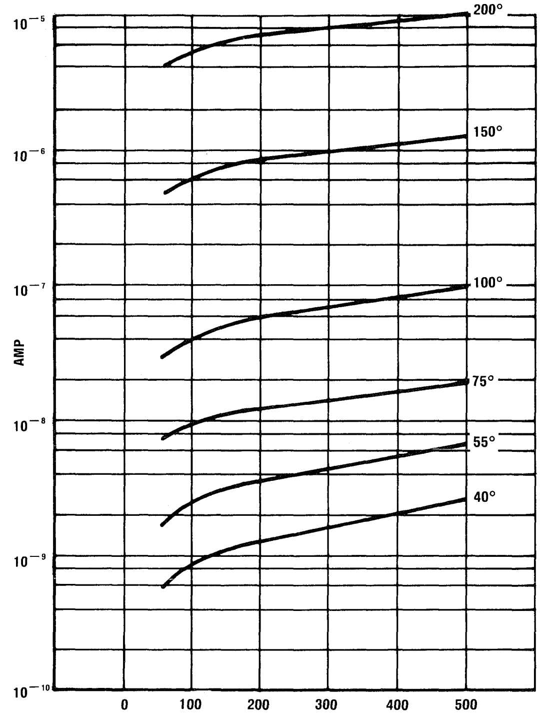


FIGURE 3
MAXIMUM Ir CURVES
(as applicable to maximum V_R)

TRANSIENT VOLTAGE SUPPRESSORS (TVS) ④
MICROSEMI'S TAZ PRODUCTS

SECTION 4

GUIDE TO SELECTING A TRANSIENT ABSORPTION ZENER BY POWER RATING

MICROSEMI PART NUMBER SERIES	LOW Ppp: 200 – 600 W, VWM: RATED STAND OFF VOLTAGE (IN VOLTS) MIN.	LOW MAX.**	LOW Ppp	MEDIUM Ppp: 700 – 1500 W, VWM: RATED STAND OFF VOLTAGE (IN VOLTS) MIN.	MEDIUM MAX.**	MEDIUM Ppp	HIGH Ppp: 1600 – 60,000 W, VWM: RATED STAND OFF VOLTAGE (IN VOLTS) MIN.	HIGH MAX.**
TS-7	5.0	5.0	230W					
P5KE5.0 thru P5KE170	5.0	170	500W					
SOV5.0 thru SOV28	5.0	28	500W					
GMP-5	5.0		500W					
DLTS-5 thru DLTS-30	5.0	30	500W					
1N6102 thru 1N6137*	5.2	152	500W					
1N6102A thru 1N6137A*	5.2	152	500W					
1N6461 thru 1N6468*	5.0	51.6	500W					
P6KE6.8 thru P6KE200A	5.0	200	600W					
SMB5.0 thru SMB170***	5.0	170	600W					
P7KE10 thru P7KE100				10	100	700W		
1.0KE5 thru 1.0KE170A				5.0	170	1000W		
1.2KE5 thru 1.2KE170A				5.0	170	1200W		
1.5KE6.8 thru 1.5KE200A				5.5	171	1500W		
1N5555 thru 1N5558*				30.5	175	1500W		
1N5629 thru 1N5665*				5.5	171	1500W		
1N5907 thru 1N5908*				5.0	5.0	1500W		
1N6036 thru 1N6072A*				5.5	185	1500W		
1N6138 thru 1N6173*				5.2	152	1500W		
1N6138A thru 1N6173A*				5.2	152	1500W		
1N6267 thru 1N6303A				5.5	171	1500W		
1N6356 thru 1N6372				5.0	45	1500W		
1N6373 thru 1N6389				5.0	4.5	1500W		
1N6469 thru 1N6476*				5.0	51.6	1500W		
ICT-5 thru ICT-45C				5.0	45	1500W		
ICTE-5 thru ICTE-45C				5.0	45	1500W		
LC6.5 thru LC170A				6.5	170	1500W		
LCE6.5 thru LCE170A				6.5	170	1500W		

HIGH: CONTINUED ON NEXT PAGE

* Available in JAN, JANTX, JANTXV PER MIL-S-19500.

**Consult factory for higher stand-off voltages.

***Surface mount devices available in either gull-wing or J-bend leads.

GUIDE TO SELECTING A TRANSIENT ABSORPTION ZENER BY POWER RATING

MICROSEMI PART NUMBER SERIES	LOW Ppp: 200 – 600 W VWM: RATED STAND OFF VOLTAGE (IN VOLTS)			MEDIUM Ppp: 700 – 1500 W VWM: RATED STAND OFF VOLTAGE (IN VOLTS)			HIGH Ppp: 1600 – 60,000 W VWM: RATED STAND OFF VOLTAGE (IN VOLTS)		
	MIN.		MAX.**	MIN.		MAX.**	MIN.		MAX.**
MPT-5 thru MPT-45C				5.0	1500W	45			
MPTE-5 thru MPTE-45				5.0	1500W	45			
SMC5.0 thru SMC170***				5.0	1500W	170			
LDTS 14 thru LDTS 30A							14	3000W	30
SML5.0 thru SML170***							5.0	3000W	170
5KP5.0 thru 5KP110A							5.0	5000W	110
PHP8.4 thru PHP30							12.0	7500W	42.5
PIP8.4 thru PIP30							12.0	7500W	42.5
PHP60 thru PHP500							85	15000W	708
PIP60 thru PIP500							85	15000W	708
704-15K36 thru 704-15K36T							31.5	15000W	31.5
60KS200C							180	60000W	180

* Available in JAN, JANTX, JANTXV PER MIL-S-19500.
**Consult factory for higher stand-off voltages.
***Surface mount devices available in either gull-wing or J-bend leads.

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Microsemi Corp.
The diode experts

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For more information call:
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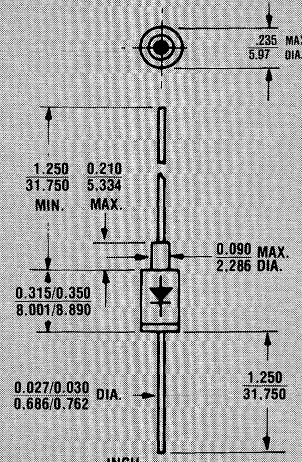
1N5555
1N5556
1N5557
1N5558

TRANSIENT ABSORPTION ZENER

(4)



All dimensions in INCH / m.m.

FEATURES

- PROTECTS CIRCUITS FROM HARMFUL TRANSIENTS
- ABSORBS TRANSIENTS UP TO 1500 WATTS FOR 1MS
- CLAMPING RESPONSE TIME OF 1 PICO SECOND
- 1 WATT CONTINUOUS POWER DISSIPATION
- WORKING VOLTAGE RANGE FROM 30.5 V TO 175 V
- HERMETIC SEALED DO-13 METAL PACKAGE
- JAN/TX/TXV AVAILABLE PER MIL-S-19500/500

DESCRIPTION

Transient Absorption Zeners are PN silicon junction zeners. Unlike the voltage regulation characteristics of a zener diode, the TAZ is designed for transient voltage suppression. Due to the TAZ's fast response time, protection level, and high discharge capability, its application area is very wide for protection against induced lighting, inductive and switching type transients, and can protect any kind of transient sensitive component/equipment, i.e., integrated circuits including secondary protection device in connection with SVP's in telecommunication applications. The use of TAZ devices in airborne avionics and electrical systems has proven to be highly effective.

MAXIMUM RATINGS

1500 Watts for 1 ms at Lead Temperature (TZ) 25°C (See Derating Curves Figs. 1-4)
Operating and Storage Temperatures: -65° to +175°C
D.C. Power Dissipation: 1 Watt at TZ = +25°C 3/8″ from body
Forward Surge Rating: 200 Amps for 8.3 ms at T_A = +25°C Duty Cycle of 4 pulses per minute maximum.

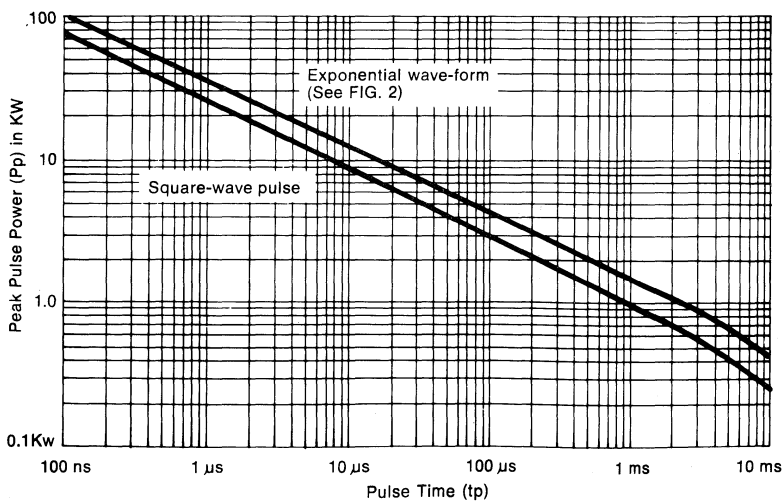


FIG. 1. Non- repetitive peak pulse power rating curve

Note: Peak power defined as peak voltage times peak current

MECHANICAL CHARACTERISTICS

CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 100°C/W (Typical) junction to ambient.

POLARITY: Cathode connected to case and marked.

WEIGHT: 1.4 grams.

MOUNTING POSITION: Any.

1N5555, 1N5556, 1N5557, 1N5558

ELECTRICAL CHARACTERISTICS

Jedec Type No.	Minimum Breakdown Voltage V_{BR} at I_T	Test Current (I_t)	Rated Standoff Voltage (V_{WM})	Maximum (RMS) Reverse Voltage V_{rwm}	Maximum Reverse Leakage Current (I_D) at V_{WM}	Maximum Peak Reverse Voltage (V_C Max.) at Ipp	Maximum Reverse Surge Current (I_{pp})	Maximum Temperature Coefficient of $V_{(BR)}$ α_{VZ} (T_A) -55°C to 100°C at 1.0 mAdc
	Vdc	mAdc	Vdc	V_{rms}	μAdc	V	A	%/°C
1N5555	33.0	1.0	30.5	21.5	5	47.5	32	+.093
1N5556	43.7	1.0	40.3	28.5	5	63.5	24	+.094
1N5557	54.0	1;0	49.3	34.5	5	78.5	19	+.096
1N5558	191.0	1.0	175.0	124.0	5	265.0	5.7	+.100

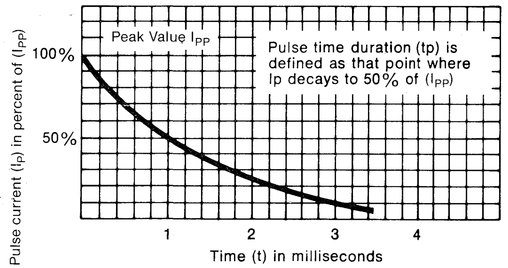


FIG. 2. Pulse wave form for exponential surge

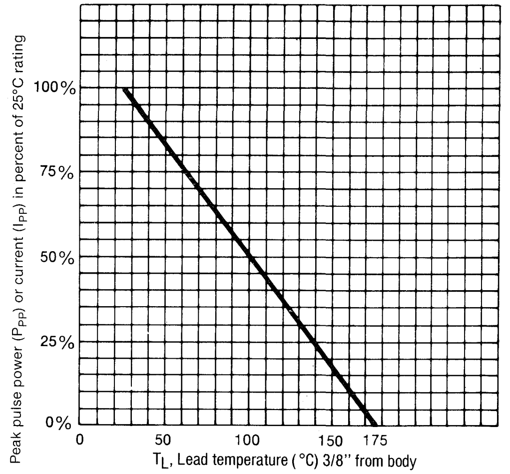


FIG. 3. Derating curve

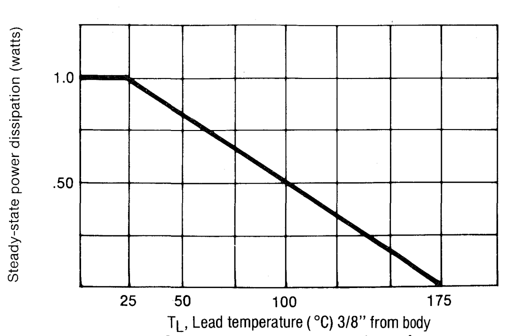


FIG. 4. Steady-state power derating curve

ABBREVIATIONS AND SYMBOLS

V_{WM} Stand Off Voltage: Applied Reverse Voltage to assure a nonconductive condition. (See Note 1.) $V_{(BR)}$ This is the minimum Breakdown Voltage the device will exhibit and is used to assure that conduction does not occur prior to this voltage level at 25°C.

V_C Maximum Clamping Voltage. The maximum peak voltage appearing across the TAZ when subjected to the peak pulse current in a one millisecond time interval. The peak pulse voltages are the combination of voltage rise due to both the series resistance and thermal rise.

I_{pp}— Peak Pulse Current—See Figure 2.

P_{pp}—Peak Pulse Power

I_D—Reverse Leakage

I_T—Current that $V_{(BR)}$ is measured at.

Note 1:
A TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

Microsemi Corp.
The diode experts

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SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N5629 thru 1N5665

TRANSIENT ABSORPTION ZENER

4

FEATURES

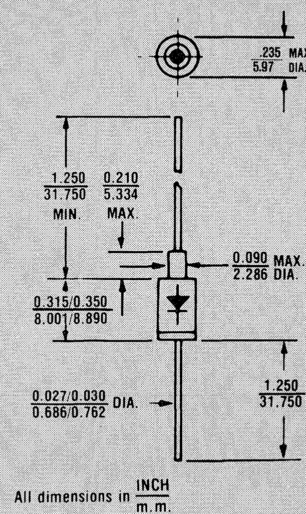
- PROTECTS CIRCUITS FROM HARMFUL TRANSIENTS
- ABSORBS 1 MS TRANSIENTS UP TO 1500 WATTS
- CLAMPS TRANSIENT IN 1 PICO SECOND
- 1 WATT CONTINUOUS POWER DISSIPATION
- WORKING VOLTAGE RANGE 5V TO 171V
- HERMETIC DO-13 METAL PACKAGE
- JAN/TX/TXV AVAILABLE PER MIL-S-19500/500

MAXIMUM RATINGS

1500 watts for 1 ms at lead temp (T_L) 25°C
See rating curves Figs. 1 thru 4
Operating and storage temp -65° to 175°C
DC power dissipation 1 watt at T_L = 25°C, 3/8″ from body.
Derate at 6.67 mW/°C
Forward surge current 200 amps for 8.3 ms at T_L = 25°C

ELECTRICAL CHARACTERISTICS

See following table
No suffix 10% tolerance
Suffix A 5% tolerance



MECHANICAL CHARACTERISTICS

CASE: DO-13, welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 50°C/W (Typical) junction to lead at 0.375-inches from body.

POLARITY: Cathode connected to case. Polarity indicated by diode symbol.

WEIGHT: 1.4 grams (Appx.)

MOUNTING POSITION: Any.

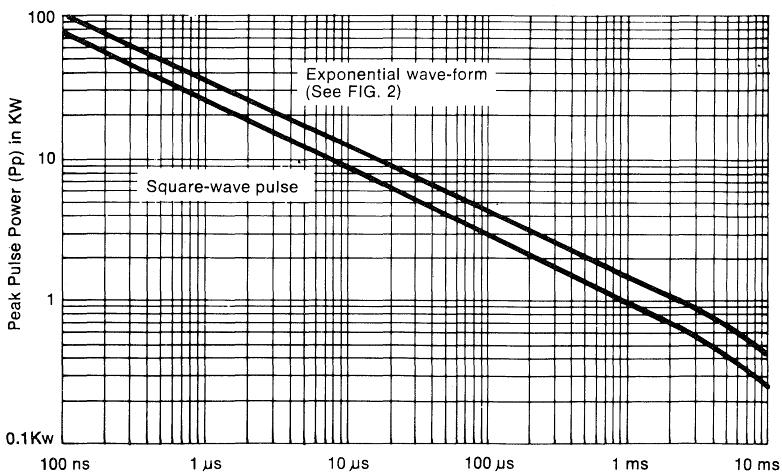


FIG. 1. Non- repetitive peak pulse power rating curve

Note: Peak power defined as peak voltage times peak current

1N5629 thru 1N5665

*ELECTRICAL CHARACTERISTICS at $T_A = 25°C$

Type No.	Breakdown Voltage (V_{BR}) Min.	Max.	Test Current (I_T)	Rated Standoff Voltage (V_{WM})	Maximum Reverse Leakage Current (I_D at V_{WM})	Maximum Peak Reverse Voltage (V_C max. at Ipp)	Maximum Peak Pulse Current (Ipp)	Maximum Temperature Coefficient of $V_{(BR)}$ α_{VZ} (T_A) -55°C to 100°C
	Vdc	Vdc	mAdc	V	μAdc	V	A	%°C
1N5629	6.12	7.48	10	5.50	1000	10.8	139	.057
1N5629A	6.45	7.14	10	5.80	1000	10.5	143	.057
1N5630	6.75	8.25	10	6.05	500	11.7	128	.061
1N5630A	7.13	7.88	10	6.40	500	11.3	132	.061
1N5631	7.38	9.02	10	6.63	200	12.5	120	.065
1N5631A	7.79	8.61	10	7.02	200	12.1	124	.065
1N5632	8.19	10.0	1	7.37	50	13.8	109	.068
1N5632A	8.65	9.55	1	7.78	50	13.4	112	.068
1N5633	9.00	11.0	1	8.10	10	15.0	100	.073
1N5633A	9.5	10.5	1	8.55	10	14.5	103	.073
1N5634	9.9	12.1	1	8.92	5	16.2	93	.075
1N5634A	10.5	11.6	1	9.40	5	15.6	96	.075
1N5635	10.8	13.2	1	9.72	5	17.3	87	.078
1N5635A	11.4	12.6	1	10.2	5	16.7	90	.078
1N5636	11.7	14.3	1	10.5	5	19.0	79	.081
1N5636A	12.4	13.7	1	11.1	5	18.2	82	.081
1N5637	13.5	16.5	1	12.1	5	22.0	68	.084
1N5637A	14.3	15.8	1	12.8	5	21.2	71	.084
1N5638	14.4	17.6	1	12.9	5	23.5	64	.086
1N5638A	15.2	16.8	1	13.6	5	22.5	67	.086
1N5639	16.2	19.8	1	14.5	5	26.5	56.5	.088
1N5639A	17.1	18.9	1	15.3	5	25.2	59.5	.088
1N5640	18.0	22.0	1	16.2	5	29.1	51.5	.090
1N5640A	19.0	21.0	1	17.1	5	27.7	54	.090
1N5641	19.8	24.2	1	17.8	5	31.9	47	.092
1N5641A	20.9	23.1	1	18.8	5	30.6	49	.092
1N5642	21.6	26.4	1	19.4	5	34.7	43	.094
1N5642A	22.8	25.2	1	20.5	5	33.2	45	.094
1N5643	24.3	29.7	1	21.8	5	39.1	38.5	.096
1N5643A	25.7	28.4	1	23.1	5	37.5	40	.096
1N5644	27.0	33.0	1	24.3	5	43.5	34.5	.097
1N5644A	28.5	31.5	1	25.6	5	41.4	36	.097
1N5645	29.7	36.3	1	26.8	5	47.7	31.5	.098
1N5645A	31.4	34.7	1	28.2	5	45.7	33	.098
1N5646	32.4	39.6	1	29.1	5	52.0	29	.099
1N5646A	34.2	37.8	1	30.8	5	49.9	30	.099
1N5647	35.1	42.9	1	31.6	5	56.4	26.5	.100
1N5647A	37.1	41.0	1	33.3	5	53.9	28	.100
1N5648	38.7	47.3	1	34.8	5	61.9	24	.101
1N5648A	40.9	45.2	1	36.8	5	59.3	25.3	.101
1N5649	42.3	51.7	1	38.1	5	67.8	22.2	.101
1N5649A	44.7	49.4	1	40.2	5	64.8	23.2	.101
1N5650	45.9	56.1	1	41.3	5	73.5	20.4	.102
1N5650A	48.5	53.6	1	43.6	5	70.1	21.4	.102
1N5651	50.4	61.6	1	45.4	5	80.5	18.6	.103
1N5651A	53.2	58.8	1	47.8	5	77.0	19.5	.103
1N5652	55.8	68.2	1	50.2	5	89.0	16.9	.104
1N5652A	58.9	65.1	1	53.0	5	85.0	17.7	.104
1N5653	61.2	74.8	1	55.1	5	98.0	15.3	.104
1N5653A	64.6	71.4	1	58.1	5	92.0	16.3	.104
1N5654	67.5	82.5	1	60.7	5	108	13.9	.105
1N5654A	71 3	78.8	1	64.1	5	103	14.6	.105
1N5655	73.8	90.2	1	66.4	5	118	12.7	.105
1N5655A	77.9	86.1	1	70.1	5	113	13.3	.105
1N5656	81.9	100.0	1	73.7	5	131	11.4	.106
1N5656A	86.5	95.5	1	77.8	5	125	12.0	.106
1N5657	90	110	1	81.0	5	144	10.4	.106
1N5657A	95	105	1	85.5	5	137	11.0	.106
1N5658	99	121	1	89.2	5	158	9.5	.107
1N5658A	105	116	1	94.0	5	152	9.9	.107
1N5659	108	132	1	97.2	5	173	8.7	.107
1N5659A	114	126	1	102	5	165	9.1	.107
1N5660	117	143	1	105	5	187	8.0	.107
1N5660A	124	137	1	111	5	179	8.4	.107
1N5661	135	165	1	121	5	215	7.0	.108
1N5661A	143	158	1	128	5	207	7.2	.108
1N5662	144	176	1	130	5	230	6.5	.108
1N5662A	152	168	1	136	5	219	6.8	.108
1N5663	153	187	1	138	5	244	6.2	.108
1N5663A	162	179	1	145	5	234	6.4	.108
1N5664	162	198	1	146	5	258	5.8	.108
1N5664A	171	189	1	154	5	246	6.1	.108
1N5665	180	220	1	162	5	287	5.2	.108
1N5665A	190	210	1	171	5	274	5.5	.108

*$V_{(BR)}$ is measured after I_T has been applied for ≤ 300 ms.
Forward voltage V_F at 100 amps peak 8.3 msec is 3.5 volts max.
Forward current I_F shall be applied for 30 secs. before V_F is measured.

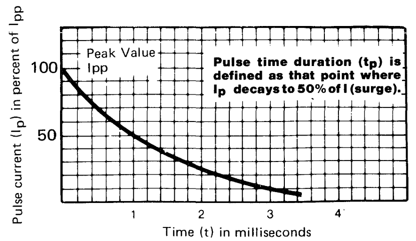


FIG. 2. Pulse wave form for exponential surge

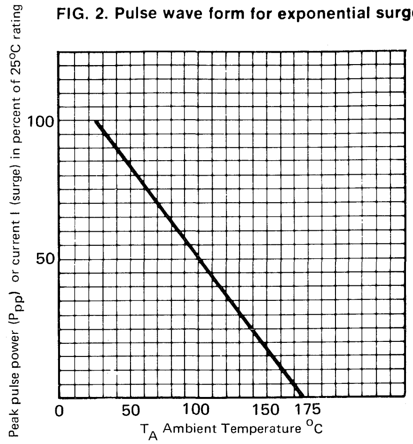


FIG. 3. Derating curve

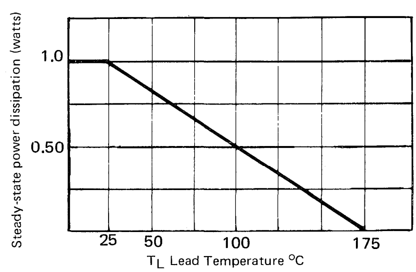


FIG. 4. Steady-state power derating curve

ABBREVIATIONS AND SYMBOLS

V_{WM} Stand Off Voltage: Applied Reverse Voltage to assure a nonconductive condition. (See Note 1.)

$V_{(BR)}$ This is the Breakdown Voltage the device will exhibit and is used to assure that conduction does not occur prior to this voltage level at 25°C.

V_C Maximum Clamping Voltage. The maximum peak voltage appearing across the Zener when subjected to the peak pulse current in a one millisecond time interval. The peak pulse voltages are the combination of voltage rise due to both the series resistance and thermal rise.

I_{pp} Peak Pulse Current—See Figure 2.

P_{pp}—Peak Pulse Power.

I_D—Reverse Leakage.

I_T—Current that $V_{(BR)}$ is measured at.

Note 1:
A TAZ is normally selected according to the rated "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

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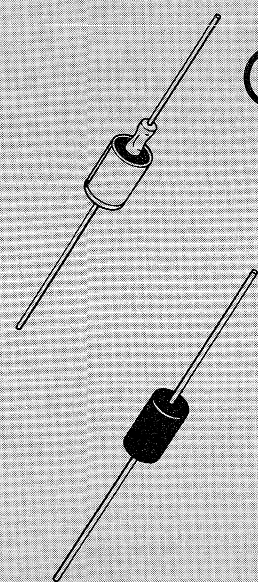
1N5907 and IN5908

TRANSIENT ABSORPTION ZENER

4



FEATURES

- 5.0 VOLTS REVERSE STAND-OFF VOLTAGE
- DESIGNED FOR T²L LOGIC PROTECTION
- 1500 WATTS PEAK PULSE POWER DISSIPATION

The 1N5907 TAZ, packaged in a hermetically sealed glass-to-metal package, is available in JAN, JANTX and JANTXV qualified to MIL-STD-19500/500. The 1N5907 and 1N5908 protect TTL, ECL, DTL, MOS and MSI integrated circuits requiring 5.0 volt or lower power supplies. These devices are rated for a peak pulse power of 1500 watts for 1 millisecond.

These devices are specified at high current pulses, such type that would be seen from inductive switching transients. They provide both protection from line transients as well as preventing transients from being injected onto the line. Both hermetic seal and molded types are available.

MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C (see derating curve)
$t_{clamping}$ (0 volts to BV min): Less than 1 x 10^{-12} second (theoretical)
Operating and Storage temperatures: -65° to +175°C
Forward surge rating: half cycle 200amps, 1/120 second at 25°C
Steady State power dissipation:
1N5907 — 1.0 watt
1N5908 — 5.0 watts at T_L = 75°C,
Lead Length = 3/8″
Repetition rate (duty cycle): 1N5907 — .01%, 1N5908 — .05%

ELECTRICAL CHARACTERISTICS @ 25°C

JEDEC TYPE NUMBER	REVERSE STAND-OFF VOLTAGE (NOTE 1) VRM VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ VOLTS	MAXIMUM REVERSE LEAKAGE V @ W_M I_D µA	MAXIMUM CLAMPING VOLTAGE @ I_{PP1} (FIG. 3) V_C VOLTS	PEAK PULSE CURRENT (FIG. 3) I_{PP1} A	MAXIMUM CLAMPING VOLTAGE @ I_{PP2} (FIG. 3) V_C VOLTS	PEAK PULSE CURRENT (FIG. 3) I_{PP2} A	MAXIMUM CLAMPING VOLTAGE @ I_{PP3} (FIG. 3) V_C VOLTS	PEAK PULSE CURRENT (FIG. 3) I_{PP3} A
*1N5907	5.0	6.0	300	7.6	30	8.0	60	8.5	120
1N5908	5.0	6.0	300	7.6	30	8.0	60	8.5	120

*Available in JAN, JTX & JTXV per MIL-S-19500/500.

Clamping Factor: 1.33 at full rated power
1.20 at 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

Capacitance: 15,000 pF at 0 Volts (typical).

MECHANICAL CHARACTERISTICS

CASE: Standard DO-13 package, metal, hermetically sealed. (IN5907)
Molded Case (IN5908)

POLARITY: Cathode connected to case. Polarity indicated by diode symbol.

WEIGHT: 1.5 grams (Appx.)

MOUNTING POSITION: Any.

1N5907 and 1N5908

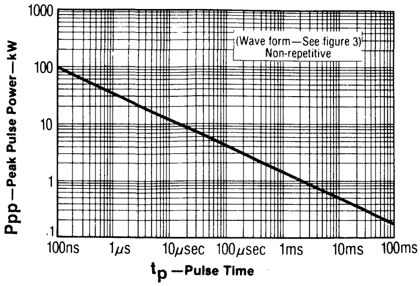


FIGURE 1
PEAK PULSE POWER
VS. PULSE TIME

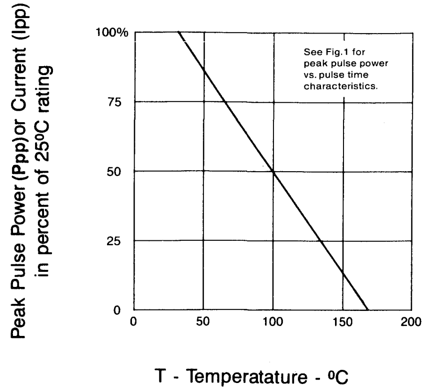


FIGURE 2
DERATING CURVE

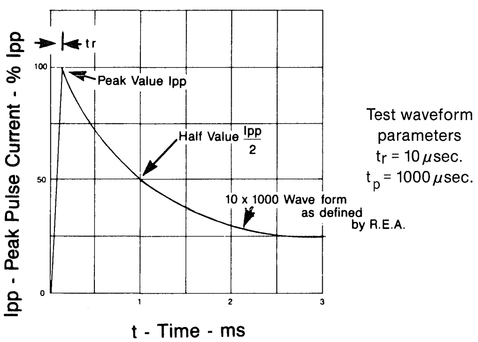


FIGURE 3
PULSE WAVEFORM

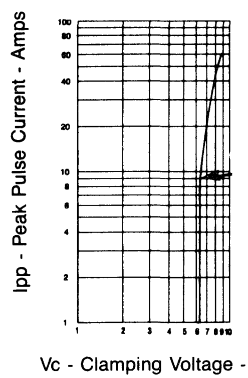
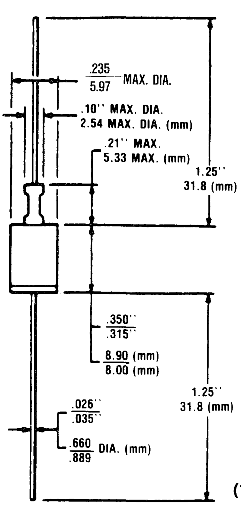


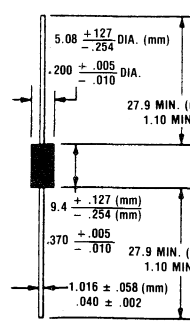
FIGURE 4
TYPICAL CLAMPING VOLTAGE (V_C)
VS. PEAK PULSE CURRENT (I_{PP})

PACKAGE DIMENSIONS

Note 1: A TAZ is normally selected according to the reverse "Stand Off Voltage" V_{RM} which should be equal to or greater than the DC or continuous peak operating voltage level.



(1N5907) CASE DO-13



(1N5908)

Microsemi Corp.
The diode experts
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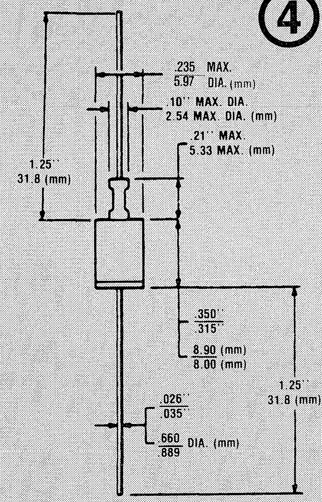
For more information call:
(602) 941-6300

1N6036 thru 1N6072A

FEATURES

- 1500 WATTS PEAK POWER DISSIPATION
- AVAILABLE IN STANDOFF VOLTAGES FROM 5.5V TO 185V
- DO-13 HERMETICALLY SEALED PACKAGE
- BIDIRECTIONAL
- UL RECOGNIZED (1N6070A)
- JAN/TX/TXV AVAILABLE PER MIL-S-19500/507

BIDIRECTIONAL TRANSIENT ABSORPTION ZENER



DESCRIPTION

These TAZ devices are a series of Bidirectional Silicon Transient Suppressors used in AC applications where large voltage transients can permanently damage voltage-sensitive components.

These devices are manufactured using two silicon PN, low voltage junction in a back to back configuration. They are characterized by their high surge capability, extremely fast response time, and low impedance, (R_{on}).

TAZ has a peak pulse power rating of 1500 watts for one millisecond and therefore can be used in applications where induced lightning on rural or remote transmission lines represents a hazard to electronic circuitry. The response time of TAZ clamping action is less than ($5x\,10^{-9}$) sec; therefore, they can protect Integrated Circuits, MOS devices, Hybrids, and other voltage-sensitive semiconductors and components.

This series of devices has been proven very effective as EMP Suppressors.

MAXIMUM RATINGS

1500 watts of peak pulse power dissipation at 25°C
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): less than 5×10^{-9} seconds
Operating and storage temperatures -65°C to + 175°C
Steady state power dissipation: 1.0 watts at T_L = 25°C, 3/8″ from body.
Repetition rate (duty cycle): .01%

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ full rated power
1.20 @ 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

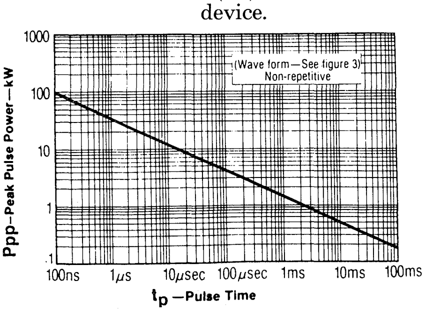


FIGURE 1
PEAK PULSE POWER VS. PULSE TIME

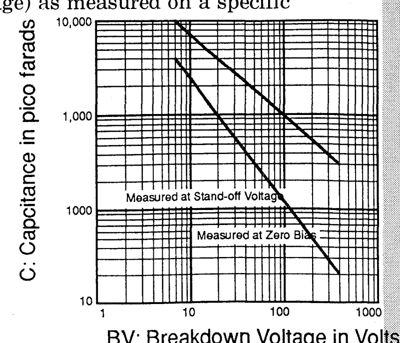


FIGURE 2 TYPICAL CAPACITANCE vs. BREAKDOWN VOLTAGE

MECHANICAL CHARACTERISTICS

Standard DO-13 package, glass and metal hermetically sealed

WEIGHT: 1.5 grams (approximate)

FINISH: All external surfaces are corrosion resistant and leads solderable.

POLARITY: Bidirectional not marked.

MOUNTING POSITION: Any.

1N6036 thru 1N6072A

ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)

JEDEC Type Number	Rated Stand-off Voltage (Note I) V_{RM} Volts	Breakdown Voltage $V_{(BR)}$ Volts	@ I_T mA	Maximum Clamping Voltage @ I_{PP} (1 mSEC) V_C Volts	Maximum Reverse Leakage @ V_{RM} I_{RM} µA	Maximum Peak Pulse Current (Fig. 2) I_{PP} A	Maximum Temperature Coefficient of $V_{(BR)}$ αV_Z %/°C
1N6036	5.5	6.75 - 8.25	10	11.7	1000	128	.061
*1N6036A	6.0	7.13 - 7.88	10	11.3	1000	132	.061
1N6037	6.5	7.38 - 9.02	10	12.5	500	120	.065
*1N6037A	7.0	7.79 - 8.61	10	12.1	500	124	.065
1N6038	7.0	8.19 - 10.00	10	13.8	200	109	.068
*1N6038A	7.5	8.65 - 9.55	10	13.4	200	112	.068
1N6039	8.0	9.0 - 11.0	1	15.0	50	100	.073
*1N6039A	8.5	9.5 - 10.5	1	14.5	50	103	.073
1N6040	8.5	9.9 - 12.1	1	16.2	10	93	.075
*1N6040A	9.0	10.5 - 11.6	1	15.6	10	96	.075
1N6041	9.0	10.8 - 13.2	1	17.3	5	87	.078
*1N6041A	10.0	11.4 - 12.6	1	16.7	5	90	.078
1N6042	10.0	11.7 - 14.3	1	19.0	5	79	.081
*1N6042A	11.0	12.4 - 13.7	1	18.2	5	82	.081
1N6043	11.0	13.5 - 16.5	1	22.0	5	68	.084
*1N6043A	12.0	14.3 - 15.8	1	21.2	5	71	.084
1N6044	12.0	14.4 - 17.5	1	23.5	5	64	.086
*1N6044A	13.0	15.2 - 16.8	1	22.5	5	67	.068
1N6045	14.0	16.2 - 19.8	1	26.5	5	56.5	.088
*1N6045A	15.0	17.1 - 18.9	1	25.2	5	59.5	.088
1N6046	16.0	18.0 - 22.0	1	29.1	5	51.5	.090
*1N6046A	17.0	19.0 - 21.0	1	27.7	5	54	.090
1N6047	17.0	19.8 - 24.2	1	31.9	5	47	.092
*1N6047A	18.0	20.9 - 23.1	1	30.6	5	49	.092
1N6048	19.0	21.6 - 26.4	1	34.7	5	43	.094
*1N6048A	20.0	22.8 - 25.2	1	33.2	5	45	.094
1N6049	21.0	24.3 - 29.7	1	39.1	5	38.5	.095
*1N6049A	22.0	25.7 - 28.4	1	37.5	5	40	.096
1N6050	24.0	27.0 - 33.0	1	43.5	5	34.5	.097
*1N6050A	25.0	28.5 - 31.5	1	41.4	5	36	.097
1N6051	26.0	29.7 - 36.3	1	47.7	5	31.5	.098
*1N6051A	28.0	31.4 - 34.7	1	45.7	5	33	.098
1N6052	29.0	32.4 - 39.6	1	52.0	5	29	.099
*1N6052A	30.0	34.2 - 37.8	1	49.9	5	30	.099
1N6053	31.0	35.1 - 42.9	1	56.4	5	26.5	.100
*1N6053A	33.0	37.1 - 41.0	1	53.9	5	28	.100
1N6054	34.0	38.7 - 47.3	1	61.9	5	24	.101
*1N6054A	36.0	40.9 - 45.2	1	59.3	5	25.3	.101
1N6055	38.0	42.3 - 51.7	1	67.8	5	22.2	.101
*1N6055A	40.0	44.7 - 49.4	1	64.8	5	23.2	.101
1N6056	41.0	45.9 - 56.1	1	73.5	5	20.4	.102
*1N6056A	43.0	48.5 - 53.6	1	70.1	5	21.4	.102
1N6057	45.0	50.4 - 61.6	1	80.5	5	18.6	.103
*1N6057A	47.0	53.2 - 58.8	1	77.0	5	19.5	.103
1N6058	48.0	55.8 - 68.2	1	89.0	5	16.9	.104
*1N6058A	53.0	58.9 - 65.1	1	85.0	5	17.7	.104
1N6059	55.0	61.2 - 74.8	1	98.0	5	15.3	.104
*1N6059A	58.0	64.6 - 71.4	1	92.0	5	16.3	.104
1N6060	60.0	67.5 - 82.5	1	108.0	5	13.9	.105
*1N6060A	64.0	71.3 - 78.8	1	103.0	5	14.6	.105
1N6061	66.0	73.8 - 90.2	1	118.0	5	12.7	.105
*1N6061A	70.0	77.9 - 86.1	1	113.0	5	13.3	.105
1N6062	73.0	81.9 - 100.0	1	131.0	5	11.4	.106
*1N6062A	75.0	86.5 - 95.5	1	125.0	5	12.0	.106
1N6063	81.0	90.0 - 110.0	1	144.0	5	10.4	.106
*1N6063A	82.0	95.0 - 105.0	1	137.0	5	11.0	.106
1N6064	90.0	99.0 - 121.0	1	158.0	5	9.5	.107
*1N6064A	94.0	105.0 - 116.0	1	152.0	5	9.9	.107
1N6065	95.0	108.0 - 132.0	1	176.0	5	8.5	.107
*1N6065A	100.0	114.0 - 126.0	1	168.0	5	8.9	.107
1N6066	105.0	117.0 - 143.0	1	191.0	5	7.8	.107
*1N6066A	110.0	124.0 - 137.0	1	182.0	5	8.2	.107
1N6067	121.0	135.0 - 165.0	1	223.0	5	6.7	.108
*1N6067A	128.0	143.0 - 158.0	1	213.0	5	7.0	.108
1N6068	137.0	153.0 - 187.0	1	258.0	5	5.8	.108
*1N6068A	145.0	162.0 - 179.0	1	245.0	5	6.1	.108
1N6069	145.0	162.0 - 198.0	1	274.0	5	5.5	.108
*1N6069A	150.0	171.0 - 189.0	1	261.0	5	5.7	.108
1N6070	155.0	171.0 - 210.0	1	292.0	5	5.1	.108
*1N6070A	160.0	181.0 - 200.0	1	278.0	5	5.4	.108
1N6071	165.0	180.0 - 220.0	1	308.0	5	4.9	.108
*1N6071A	170.0	190.0 - 210.0	1	294.0	5	5.1	.108
1N6072	175.0	198.0 - 242.0	1	344.0	5	4.3	.108
*1N6072A	185.0	209.0 - 231.0	1	328.0	5	4.6	.108

*Available in JAN, JANTX, JANTXV

NOTE 1: A TAZ is normally selected according to the rated "Stand Off Voltage" V_{RM} which should be equal to or greater than the DC or continuous peak operating voltage level.

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1N6103-1N6137
1N6139-1N6173
1N6103A-1N6137A
1N6139A-1N6173A

BIDIRECTIONAL TRANSIENT SUPPRESSORS

FEATURES

- HIGH SURGE CAPACITY PROVIDES TRANSIENT PROTECTION FOR MOST CRITICAL CIRCUITS.
- TRIPLE LAYER PASSIVATION.
- SUBMINIATURE.
- METALLURGICALLY BONDED.
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE
- DYNAMIC IMPEDANCE AND REVERSE LEAKAGE LOWEST AVAILABLE.
- JAN/S/TX/TXV TYPES AVAILABLE PER MIL-S-19500/516.

MAXIMUM RATINGS

Operating Temperature: −65°C to +175°C.
Storage Temperature: −65°C to +200°C.
Surge Power 500W & 1500W
Power @ TL = 75°C (3/8) 3.0W 500W Type
Power @ TL = 50°C (3/8) 5.0W 1500W Type

ELECTRICAL CHARACTERISTICS

SERIES TYPE		BREAKDOWN VOLTAGE $V_{(BR)}$ MIN.	TEST CURRENT I_T	WORKING PEAK VOLTAGE V_{RWM}	MAX LEAKAGE CURRENT I_D		MAX CLAMPING VOLTAGE V_C (MAX)	MAX PEAK PULSE CURRENT I_P		MAX. TEMP. COEF. OF $V_{(BR)}$
500W	1500W	Vdc	mAdc	Vdc	μAdc	μAdc	V(pk)	A(pk)	A(pk)	%/°C
1N6103A	1N6139A	7.13	175	5.7	50	300	11.2	44.6	133.9	.06
1N6104A	1N6140A	7.79	150	6.2	10	100	12.1	41.3	124.0	.06
1N6105A	1N6141A	8.65	150	6.9	10	100	13.4	37.3	111.9	.06
1N6106A	1N6142A	9.50	125	7.6	10	100	14.5	34.5	103.4	.07
1N6107A	1N6143A	10.45	125	8.4	1	10	15.6	32.0	96.2	.07
1N6108A	1N6144A	11.40	100	9.1	1	10	16.9	29.6	88.8	.07
1N6109A	1N6145A	12.35	100	9.9	1	10	18.2	27.5	82.4	.08
1N6110A	1N6146A	14.25	75	11.4	1	10	21.0	23.8	71.4	.08
1N6111A	1N6147A	15.20	75	12.2	1	10	22.3	22.4	67.3	.08
1N6112A	1N6148A	17.10	65	13.7	1	10	25.1	19.9	59.8	.085
1N6113A	1N6149A	19.0	65	15.2	1	5	27.7	18.0	54.2	.085
1N6114A	1N6150A	20.9	50	16.7	1	5	30.5	16.4	49.2	.085
1N6115A	1N6151A	22.8	50	18.2	1	5	33.3	15.0	45.0	.09
1N6116A	1N6152A	25.7	50	20.6	1	5	37.4	13.4	40.1	.09
1N6117A	1N6153A	28.5	40	22.8	1	5	41.6	12.0	36.0	.09
1N6118A	1N6154A	31.4	40	25.1	1	5	45.7	10.9	32.8	.095
1N6119A	1N6155A	34.2	30	27.4	1	5	49.9	10.0	30.1	.095
1N6120A	1N6156A	37.1	30	29.7	1	5	53.6	9.3	28.0	.095
1N6121A	1N6157A	40.9	30	32.7	1	5	59.1	8.5	25.4	.095
1N6122A	1N6158A	44.7	25	35.8	1	5	64.6	7.7	23.2	.095
1N6123A	1N6159A	48.5	25	38.8	1	5	70.1	7.1	21.4	.095
1N6124A	1N6160A	53.2	20	42.6	1	5	77.0	6.5	19.5	.095
1N6125A	1N6161A	58.9	20	47.1	1	5	85.3	5.9	17.6	.100
1N6126A	1N6162A	64.6	20	51.7	1	5	97.1	5.1	15.4	.100
1N6127A	1N6163A	71.3	20	56.0	1	5	103.1	4.8	14.5	.100
1N6128A	1N6164A	77.9	15	62.2	1	5	112.8	4.4	13.3	.100
1N6129A	1N6165A	86.5	15	69.2	1	5	125.1	4.0	12.0	.100
1N6130A	1N6166A	95.0	12	76.0	1	5	137.6	3.6	10.9	.100
1N6131A	1N6167A	104.5	12	86.6	1	5	151.3	3.3	9.9	.100
1N6132A	1N6168A	114.0	10	91.2	1	5	165.1	3.0	9.1	.100
1N6133A	1N6169A	123.5	10	98.8	1	5	178.8	2.8	8.4	.105
1N6134A	1N6170A	142.5	8	114.0	1	5	206.3	2.4	7.3	.105
1N6135A	1N6171A	152.0	8	121.6	1	5	218.4	2.3	6.9	.105
1N6136A	1N6172A	171.0	5	136.8	1	5	245.7	2.0	6.1	.110
1N6137A	1N6173A	190.0	5	152.0	1	5	273.0	1.8	5.5	.110
Note: 4		1	1	1	2	3	1	2	3	1

NOTES: **1.** Applies to both 500W and 1500W series.
2. Applies to only 500W series.
3. Applies to only 1500W series.
4. Non --A part has 5% higher max surge voltage, 5% lower $V_{(BR)}$ min., I_{SM}.

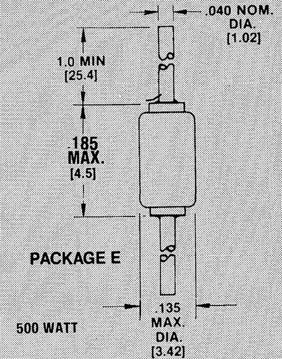


FIGURE 1
(NOTE 2)

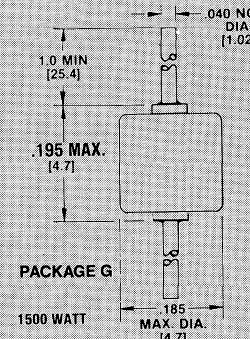


FIGURE 1A
(NOTE 3)

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass case.
Lead Material: Tinned copper or silver clad copper.
Marking: Body painted, alpha numeric.
Polarity: No marking with bi directional devices.

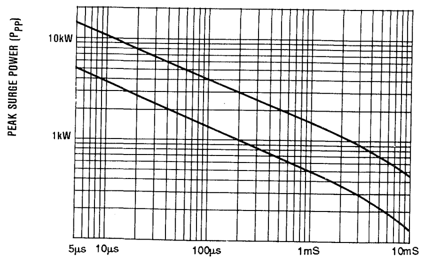


FIGURE 2
PEAK SURGE POWER vs. PULSE TIME

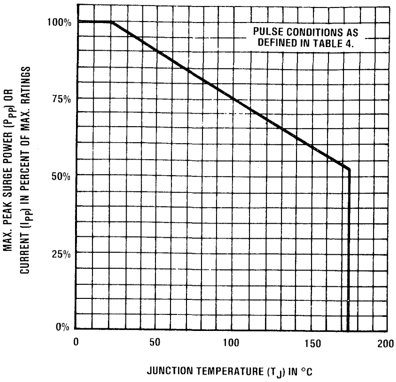


FIGURE 3
PULSE DERATING CURVE

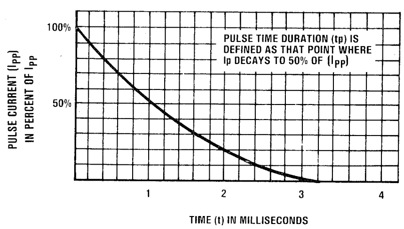


FIGURE 4
PULSE WAVE FORM

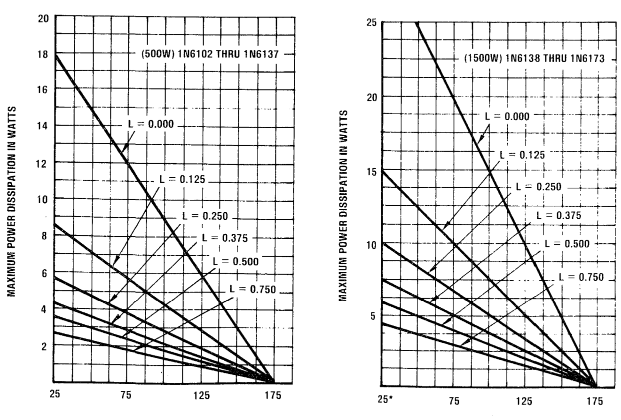


FIGURE 5
MAXIMUM POWER vs. LEAD TEMPERATURE

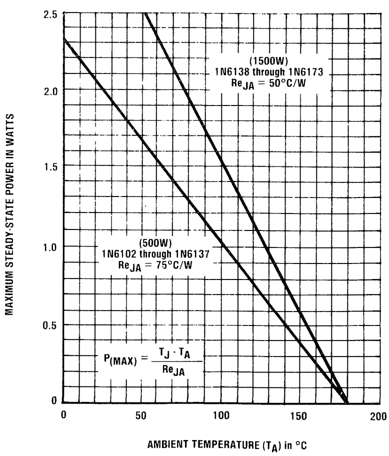


FIGURE 6
STEADY STATE DERATING CURVE
FOR FREE AIR MOUNTING

Maximum lead temperature in °C (T_L) at point "L" from body
(for maximum operating junction temperature with equal two-lead conditions).

Microsemi Corp.

The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N6267 thru 1N6303A and 1.5KE6.8 thru 1.5KE400A

TRANSIENT ABSORPTION ZENER

UNIDIRECTIONAL AND BIDIRECTIONAL

4

FEATURES

- ECONOMICAL
- 1500 WATTS PEAK PULSE POWER DISSIPATION
- STAND OFF VOLTAGES FROM 5.5V – 171V
- UNIPOLAR OR BIPOLAR
- AVAILABLE IN CHIP FORM FOR HYBRID APPLICATION —
- MULTI-CHIP BIDIRECTIONAL CELLS AVAILABLE

DESCRIPTION

This defines a series of silicon Transient Suppressors designed to protect voltage sensitive components from high energy voltage transients. TAZ devices have become very important as a consequence of their high surge capability, extremely fast response time, and low incremental surge resistance (Rs).

To characterize TAZ, a minimum voltage at low current conditions (V_{BR}), and a maximum clamping voltage (V_C), at a maximum peak pulse current are specified. In addition, a maximum clamping ratio is indicated. The maximum leakage current at the rated stand-off voltage is also provided to assure low power consumption under normal conditions.

APPLICATION

This TAZ series has a peak pulse power rating of 1500 watts for one millisecond. It can protect integrated circuits, hybrids, CMOS, MOS, and other voltage sensitive components in a broad range of applications such as telecommunications, power supplies, computers, automotive, industrial, and medical equipment.

MAXIMUM RATINGS

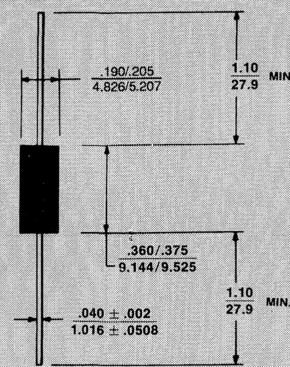
1500 Watts of Peak Pulse Power Dissipation at 25°C.

$t_{clamping}$ (0 Volts to BV Min.):
Unidirectional $< 1 \times 10^{-12}$ Seconds; Bidirectional $< 5 \times 10^{-9}$ Seconds.
Operating and Storage Temperature -65°C to +175°C.
Forward Surge Rating 200 Amps, 1/20 Second at 25°C.
Steady State Power Dissipation 5.0 W @ T1 = 75°C.
(Not Applicable in Chip Form).

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ full rated power
1.20 @ 50% rated power

The Clamping Factor is defined as: The ratio of the actual V_C (Clamping Voltage) to the actual BV (Breakdown Voltage) as measured on a specific device.



All dimensions in INCH / m.m.

MECHANICAL CHARACTERISTICS

CASE: Molded
WEIGHT: 1.5 Grams (Approx.)
POLARITY: Positive Terminal Marked with Band

1N6267 thru 1N6303A and 1.5KE6.8 thru 1.5KE400A
ELECTRICAL CHARACTERISTICS @ 25°C

Industry Type Number	JEDEC Type Number	Rated Stand-off Voltage V_{WM} VOLTS	Breakdown Voltage $V_{(BR)}$ VOLTS MIN	MAX	@ I_T mA	Maximum Clamping Voltage @ Ipp (1 mSEC) V_C VOLTS	Maximum Reverse Leakage @ V_{WM} I_D μA	Rated Maximum Peak Pulse Current Ipp A	Maximum Temperature Coefficient α VZ of $V_{(BR)}$ %/°C
—	1N5908	5.0	6.0	—	1	7.6	300	30.	.057
1.5KE6.8	1N6267	5.50	6.12	7.48	10	10.8	1000	139.0	.057
1.5KE6.8A	1N6267A	5.80	6.45	7.14	10	10.5	1000	143.0	.057
1.5KE7.5	1N6268	6.05	6.75	8.25	10	11.7	500	128.0	.061
1.5KE7.5A	1N6268A	6.40	7.13	7.88	10	11.3	500	132.0	.061
1.5KE8.2	1N6269	6.63	7.38	9.02	10	12.5	200	120.0	.065
1.5KE8.2A	1N6269A	7.02	7.79	8.61	10	12.1	200	124.0	.065
1.5KE9.1	1N6270	7.37	8.19	10.00	1	13.8	50	109.0	.068
1.5KE9.1A	1N6270A	7.78	8.65	9.55	1	13.4	50	112.0	.068
1.5KE10	1N6271	8.10	9.00	11.00	1	15.0	10	100.0	.073
1.5KE10A	1N6271A	8.55	9.50	10.50	1	14.5	10	103.0	.073
1.5KE11	1N6272	8.92	9.90	12.10	1	16.2	5	93.0	.075
1.5KE11A	1N6272A	9.40	10.50	11.60	1	15.6	5	96.0	.075
1.5KE12	1N6273	9.72	10.80	13.20	1	17.3	5	87.0	.078
1.5KE12A	1N6273A	10.20	11.40	12.60	1	16.7	5	90.0	.078
1.5KE13	1N6274	10.50	11.70	14.30	1	19.0	5	79.0	.081
1.5KE13A	1N6274A	11.10	12.40	13.70	1	18.2	5	82.0	.081
1.5KE15	1N6275	12.10	13.50	16.50	1	22.0	5	68.0	.084
1.5KE15A	1N6275A	12.80	14.30	15.80	1	21.2	5	71.0	.084
1.5KE16	1N6276	12.90	14.40	17.60	1	23.5	5	64.0	.086
1.5KE16A	1N6276A	13.60	15.20	16.80	1	22.5	5	67.0	.086
1.5KE18	1N6277	14.50	16.20	19.80	1	26.5	5	56.5	.088
1.5KE18A	1N6277A	15.30	17.10	18.90	1	25.2	5	59.5	.088
1.5KE20	1N6278	16.20	18.00	22.00	1	29.1	5	51.5	.090
1.5KE20A	1N6278A	17.10	19.00	21.00	1	27.7	5	54.0	.090
1.5KE22	1N6279	17.80	19.80	24.20	1	31.9	5	47.0	.092
1.5KE22A	1N6279A	18.80	20.90	23.10	1	30.6	5	49.0	.092
1.5KE24	1N6280	19.40	21.60	26.40	1	34.7	5	43.0	.094
1.5KE24A	1N6280A	20.50	22.80	25.20	1	33.2	5	45.0	.094
1.5KE27	1N6281	21.80	24.30	29.70	1	39.1	5	38.5	.096
1.5KE27A	1N6281A	23.10	25.70	28.40	1	37.5	5	40.0	.096
1.5KE30	1N6282	24.30	27.00	33.00	1	43.5	5	34.5	.097
1.5KE30A	1N6282A	25.60	28.50	31.50	1	41.4	5	36.0	.097
1.5KE33	1N6283	26.80	29.70	36.30	1	47.7	5	31.5	.098
1.5KE33A	1N6283A	28.20	31.40	34.70	1	45.7	5	33.0	.098
1.5KE36	1N6284	29.10	32.40	39.60	1	52.0	5	29.0	.099
1.5KE36A	1N6284A	30.80	34.20	37.80	1	49.9	5	30.0	.099
1.5KE39	1N6285	31.60	35.10	42.90	1	56.4	5	26.5	.100
1.5KE39A	1N6285A	33.30	37.10	41.00	1	53.9	5	28.0	.100
1.5KE43	1N6286	34.80	38.70	47.30	1	61.9	5	24.0	.101
1.5KE43A	1N6286A	36.80	40.90	45.20	1	59.3	5	25.3	.101
1.5KE47	1N6287	38.10	42.30	51.70	1	67.8	5	22.2	.101
1.5KE47A	1N6287A	40.20	44.70	49.40	1	64.8	5	23.2	.101
1.5KE51	1N6288	41.30	45.90	56.10	1	73.5	5	20.4	.102
1.5KE51A	1N6288A	43.60	48.50	53.60	1	70.1	5	21.4	.102
1.5KE56	1N6289	45.40	50.40	61.60	1	80.5	5	18.6	.103
1.5KE56A	1N6289A	47.80	53.20	58.80	1	77.0	5	19.5	.103
1.5KE62	1N6290	50.20	55.80	68.20	1	89.0	5	16.9	.104
1.5KE62A	1N6290A	53.00	58.90	65.10	1	85.0	5	17.7	.104
1.5KE68	1N6291	55.10	61.20	74.80	1	98.0	5	15.3	.104
1.5KE68A	1N6291A	58.10	64.60	71.40	1	92.0	5	16.3	.104
1.5KE75	1N6292	60.70	67.50	82.50	1	108.0	5	13.9	.105
1.5KE75A	1N6292A	64.10	71.30	78.80	1	103.0	5	14.6	.105
1.5KE82	1N6293	66.40	73.80	90.20	1	118.0	5	12.7	.105
1.5KE82A	1N6293A	70.10	77.90	86.10	1	113.0	5	13.3	.105
1.5KE91	1N6294	73.70	81.90	100.00	1	131.0	5	11.4	.106
1.5KE91A	1N6294A	77.80	86.50	95.50	1	125.0	5	12.0	.106
1.5KE100	1N6295	81.00	90.00	110.00	1	144.0	5	10.4	.106
1.5KE100A	1N6295A	85.50	95.00	105.00	1	137.0	5	11.0	.106
1.5KE110	1N6296	89.20	99.00	121.00	1	158.0	5	9.5	.107
1.5KE110A	1N6296A	94.00	105.00	116.00	1	152.0	5	9.9	.107
1.5KE120	1N6297	97.20	108.00	132.00	1	173.0	5	8.7	.107
1.5KE120A	1N6297A	102.00	114.00	126.00	1	165.0	5	9.1	.107
1.5KE130	1N6298	105.00	117.00	143.00	1	187.0	5	8.0	.107
1.5KE130A	1N6298A	111.00	124.00	137.00	1	179.0	5	8.4	.107
1.5KE150	1N6299	121.00	135.00	165.00	1	215.0	5	7.0	.108
1.5KE150A	1N6299A	128.00	143.00	158.00	1	207.0	5	7.2	.108
1.5KE160	1N6300	130.00	144.00	176.00	1	230.0	5	6.5	.108
1.5KE160A	1N6300A	136.00	152.00	168.00	1	219.0	5	6.8	.108
1.5KE170	1N6301	138.00	153.00	187.00	1	244.0	5	6.2	.108
1.5KE170A	1N6301A	145.00	162.00	179.00	1	234.0	5	6.4	.108
1.5KE180	1N6302	146.00	162.00	198.00	1	258.0	5	5.8	.108
1.5KE180A	1N6302A	154.00	171.00	189.00	1	246.0	5	6.1	.108
1.5KE200	1N6303	162.00	180.00	220.00	1	287.0	5	5.2	.108
1.5KE200A	1N6303A	171.00	190.00	210.00	1	274.0	5	5.5	.108
1.5KE220		175.00	198.00	242.00	1	344.0	5	4.3	0.110
1.5KE220A		185.00	209.00	231.00	1	328.0	5	4.6	0.110
1.5KE250		202.00	225.00	275.00	1	360.0	5	5.0	0.110
1.5KE250A		214.00	237.00	263.00	1	344.0	5	5.0	0.110
1.5KE300		243.00	270.00	330.00	1	430.0	5	5.0	0.111
1.5KE300A		256.00	285.00	315.00	1	414.0	5	5.0	0.111
1.5KE350		284.00	315.00	385.00	1	504.0	5	4.0	0.111
1.5KE350A		300.00	332.00	368.00	1	482.0	5	4.0	0.111
1.5KE400		324.00	360.00	440.00	1	574.0	5	4.0	0.111
1.5KE400A		342.00	380.00	420.00	1	548.0	5	4.0	0.111

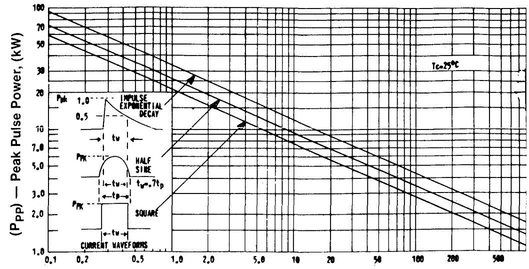


FIGURE 1

PEAK PULSE POWER VS. PULSE TIME (T w) IN |

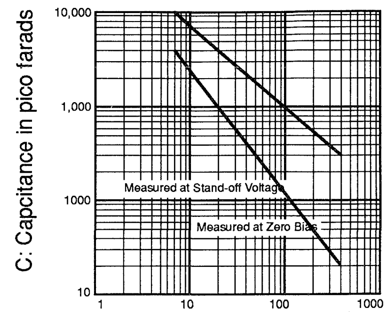


FIGURE 2

TYPICAL CAPACITANCE VS. BREAKDOWN VOLTAGE

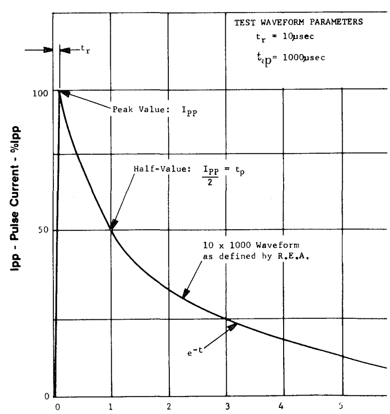


FIGURE 3 PULSE WAVE FORM

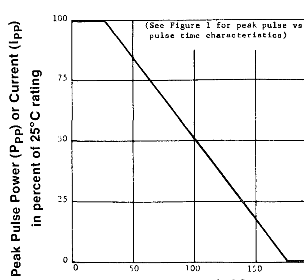


FIGURE 4 DERATING CURV

V_f at 100 amps peak. 8.3 ms sine wave equals 3.5 volts max. (unidirectional only). For Bidirectional part number add C or CA as suffix (e.e., 1.5KE33C or 1.5KE33CA). For Bidirectional types having V_{WM} of 8 volts and under, the I_D leakage current is doubled. 1N62XX or 1N5908 not available as bidirectional. For bipolar capacitance will be .5 that shown in Fig. 2 for zero bias.

SYMBOLS AND ABBREVIATIONS

- V_{WM} = Rated Stand-off Voltage
- $V_{(BR)}$ = Breakdown Voltage
- I_{PP} = Peak Pulse Current
- I_T = Test Current
- P_{PP} = Peak Pulse Power
- I_D = Reverse Leakage
- $V_{C(MAX)}$ = Maximum Clamping Voltage

NOTE 1: Normal selection criteria for TAZ devices is by rated stand-off voltage (V_{WM}) and should be equal or greater than DC or continuous peak operating voltage.
NOTE 2: TAZ devices are tested to maximum peak pulse current (I_{PP}) with clamping voltage monitored. This surge capability is one of the most significant electrical characteristics of the device and should be considered as part of customer quality inspections.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1N6356 thru 1N6372 and MPT-5 thru MPT-45C

TRANSIENT ABSORPTION ZENER

FEATURES

- DESIGNED TO PROTECT BIPOLAR AND MOS MICROPROCESSOR BASED SYSTEMS.
- VOLTAGE RANGE OF 5.0 TO 45 VOLTS
- LOW CLAMPING RATIO

MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C

$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Unidirectional — Less than 1 x 10^{-12} seconds
Bidirectional — Less than 5 x 10^{-9} seconds

Operating and Storage temperatures: -65° to +175°C

Forward surge rating: 200 amps, 1/120 second at 25°C
(Applies to Unipolar or single direction only)

Steady State power dissipation: 1.0 watt

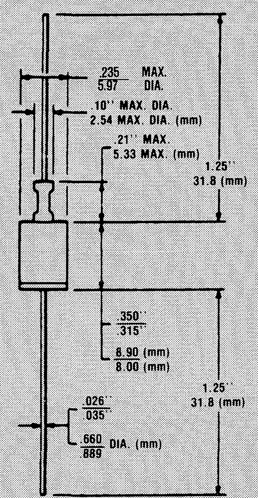
Repetition rate (duty cycle): .01%

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ Full rated power
1.20 @ 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

4



MECHANICAL CHARACTERISTICS

CASE: DO-13 welded, hermetically sealed, metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

POLARITY: Cathode connected to case and marked. Bidirectional not marked.

WEIGHT: 1.4 grams (Appx.)

MOUNTING POSITION: Any.

1N6356 thru 1N6372 and MPT-5 thru MPT-45C

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM* BREAKDOWN VOLTAGE @ mA $V_{(BR)}$ (min) VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) I_{PP1} = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP2} = 10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT I_{PP3} A
IN6356 MPT-5	5.0	300	6.0	7.1	7.5	160
IN6357 MPT-8	8.0	25	9.4	11.3	11.5	100
IN6358 MPT-10	10.0	2	11.7	13.7	14.1	90
IN6359 MPT-12	12.0	2	14.1	16.1	16.5	70
IN6360 MPT-15	15.0	2	17.6	20.1	20.6	60
IN6361 MPT-18	18.0	2	21.2	24.2	25.2	50
IN6362 MPT-22	22.0	2	25.9	29.8	32.0	40
IN6363 MPT-36	36.0	2	42.4	50.6	54.3	23
IN6364 MPT-45	45.0	2	52.9	63.3	70.0	19

V_f at 100 amps peak, 8.3 msec sine wave equals 3.5 volts maximum

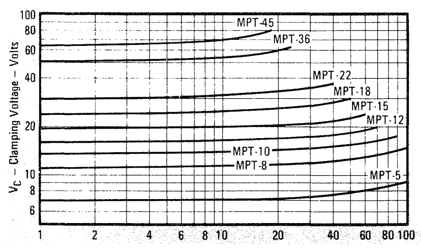
ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)

IN6365 MPT-8C	8.0	25	9.4	11.4	11.6	100
IN6366 MPT-10C	10.0	2	11.7	14.1	14.5	90
IN6367 MPT-12C	12.0	2	14.1	16.7	17.1	70
IN6368 MPT-15C	15.0	2	17.6	20.8	21.4	60
IN6369 MPT-18C	18.0	2	21.2	24.8	25.5	50
IN6370 MPT-22C	22.0	2	25.9	30.8	32.0	40
IN6371 MPT-36C	36.0	2	42.4	50.6	54.3	23
IN6372 MPT-45C	45.0	2	52.9	63.3	70.0	19

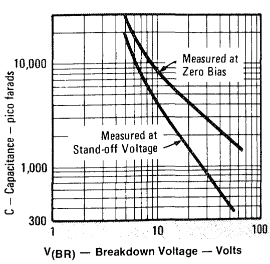
C Suffix indicates Bidirectional

NOTE 1 TAZ are normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

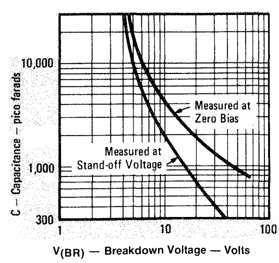
*The minimum breakdown voltage as shown takes into consideration the ±1 volt tolerance normally specified for power supply regulation on most integrated circuit manufacturers data sheets. Similar devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.



Typical Characteristic Clamping Voltage vs. Peak Pulse Current



Typical Capacitance vs. Breakdown Voltage (Unidirectional Types)



Typical Capacitance vs. Breakdown Voltage (Bidirectional Types)

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
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IN6373 thru IN6389 and MPTE-5 thru MPTE-45C

TRANSIENT ABSORPTION ZENER

FEATURES

- DESIGNED TO PROTECT BIPOLAR AND MOS MICROPROCESSOR BASED SYSTEMS FROM ELECTRICAL DISTURBANCES.
- TRANSIENT PROTECTION FOR CMOS, MOS, AND BIPOLAR MICROPROCESSORS
- VOLTAGE RANGE OF 5.0 TO 45 VOLTS
- LOW CLAMPING RATIO

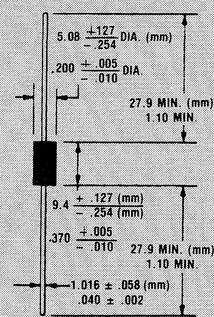
MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Unidirectional—Less than 1 x 10^{-12} seconds
Bidirectional—Less than 5 x 10^{-9} seconds
Operating and Storage temperatures: -65° to +175°C
Forward surge rating: 200 amps, 1/120 second at 25°C
(Applies to Unidirectional or single direction only)
Steady State power dissipation: 5.0 watts @ T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .05%

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ Full rated power
1.20 @ 50% rated power
Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual BV (Breakdown Voltage) as measured on a specific device.

4



MECHANICAL CHARACTERISTICS

CASE: Void free transfer molded thermosetting plastic

FINISH: Silver plated copper readily solderable

POLARITY: Cathode marked with band. No marking on bidirectional types.

WEIGHT: 1.5 grams (Appx.)

MOUNTING POSITION: Any

1N6373 - 1N6389 and MPTE - 5 thru MPTE - 45C

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	STAND-OFF VOLTAGE (Note 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM* BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ (min.) VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP1} = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP2} = 10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT I_{PP3} A
IN6373 MPTE-5	5.0	300	6.0	7.1	7.5	160
IN6374 MPTE-8	8.0	25	9.4	11.3	11.5	100
IN6375 MPTE-10	10.0	2	11.7	13.7	14.1	90
IN6376 MPTE-12	12.0	2	14.1	16.1	16.5	70
IN6377MPTE-15	15.0	2	17.6	20.1	20.6	60
IN6378 MPTE-18	18.0	2	21.2	24.2	25.2	50
IN6379 MPTE-22	22.0	2	25.9	29.8	32.0	40
IN6380 MPTE-36	36.0	2	42.4	50.6	54.3	23
IN6381 MPTE-45	45.0	2	52.9	63.3	70.0	19

V_f at 100 amps peak, 8.3 msec sine wave equals 3.5 volts maximum

ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)

MPTE-5C	5.0	300	6.0	7.1	7.5	160
IN6382 MPTE-8C	8.0	25	9.4	11.4	11.6	100
IN6383 MPTE-10C	10.0	2	11.7	14.1	14.5	90
IN6384 MPTE-12C	12.0	2	14.1	16.7	17.1	70
IN6385 MPTE-15C	15.0	2	17.6	20.8	21.4	60
IN6386 MPTE-18C	18.0	2	21.2	24.8	25.5	50
IN6387 MPTE-22C	22.0	2	25.9	30.8	32.0	40
IN6388 MPTE-36C	36.0	2	42.4	50.6	54.3	23
IN6389 MPTE-45C	45.0	2	52.9	63.3	70.0	19

C Suffix indicates Bidirectional

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

*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. Similar devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.

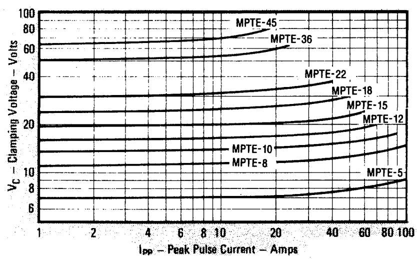


FIGURE 2
TYPICAL CHARACTERISTIC CLAMPING VOLTAGE VS PEAK PULSE CURRENT

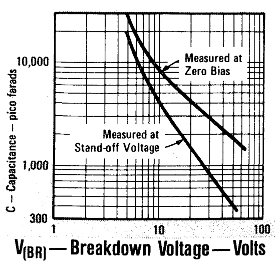


FIGURE 3
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (UNIDIRECTIONAL TYPES)

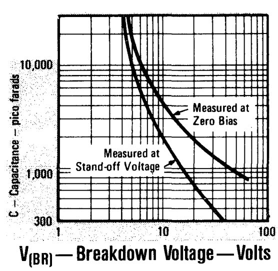


FIGURE 4
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (BIDIRECTIONAL TYPES)

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The diode experts
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For more information call:
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SCOTTSDALE, AZ

IN6461 thru IN6468 and IN6469 thru IN6476

TRANSIENT SUPPRESSORS

FEATURES

- HIGH SURGE CAPACITY PROVIDES TRANSIENT PROTECTION FOR MOST CRITICAL CIRCUITS.
- TRIPLE LAYER PASSIVATION.
- SUBMINIATURE.
- METALLURGICALLY BONDED.
- VOIDLESS HERMETICALLY SEALED GLASS PACKAGE.
- DYNAMIC IMPEDANCE AND REVERSE LEAKAGE LOWEST AVAILABLE.
- JAN/TX/TXV TYPES AVAILABLE PER MIL-S-19500/551, 552.

MAXIMUM RATINGS

Operating Temperature: -65°C to +175°C.
Storage Temperature: -65°C to +200°C.
Surge Power 500W & 1500W
Power @ TA = 25°C (3/8) 2.5W 500W Type
Power @ TL = 50°C (3/8) 5.0W 1500W Type

ELECTRICAL CHARACTERISTICS

SERIES TYPE		BREAK DOWN VOLTAGE $V_{(BR)}$ MIN.	TEST CURRENT I_T		WORKING PEAK VOLTAGE V_{WM}	MAX LEAKAGE CURRENT I_D		MAX CLAMPING VOLTAGE V_C	MAX PEAK PULSE CURRENT (I_{PP})		MAX. TEMP. COEF. OF $V_{(BR)}$
500W	1500W	Vdc	mAdc		Vdc	µAdc	µAdc	V(pk)	A(pk)	A(pk)	%/°C
IN6461	IN6469	5.6	25	50	5	3000	5000	9.0	56	167	0.04
IN6462	IN6470	6.5	20	50	6	2500	5000	11.0	46	137	0.04
IN6463	IN6471	13.0	5	10	12	500	1000	22.6	22	66	0.05
IN6464	IN6472	16.4	5	10	15	500	1000	26.5	19	57	0.06
IN6465	IN6473	27.0	2	5	24	50	100	41.4	12	36.5	.084
IN6466	IN6474	33.0	1	1	30.5	3	5	47.5	11	32	.093
IN6467	IN6475	43.7	1	1	40.3	2	5	63.5	8	24	.094
IN6468	IN6476	54.0	1	1	51.6	2	5	78.5	6	19	.096
NOTES		1	2	3	1	2	3	1	2	3	1

NOTE 1: Applies to both 500W and 1500W series.

NOTE 2: Applies to only 500W series.

NOTE 3: Applies to only 1500W series.

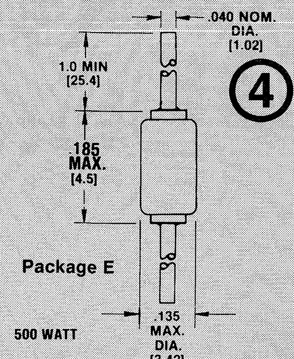

FIGURE 1
(NOTE 2)

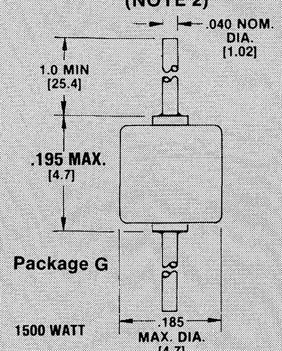

FIGURE 1A
(NOTE 3)

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass case.

LEAD MATERIAL: Tinned copper or silver clad copper.

MARKING: Body painted, alpha numeric.

POLARITY: Cathode band.

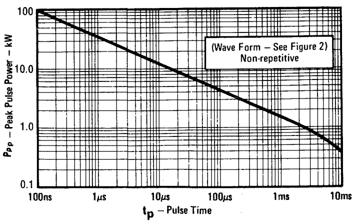

Figure 1. Pulse Time
1N6469 Series

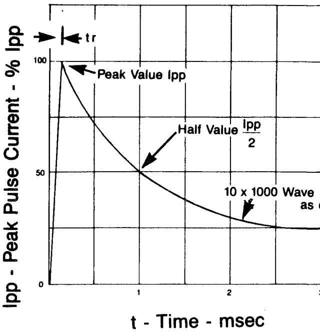

Figure 2. Current Impulse Waveform

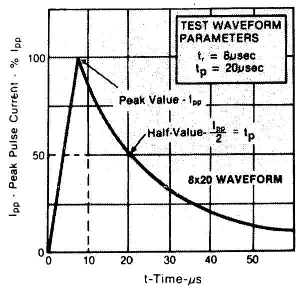

Figure 3. Current Impulse Waveform

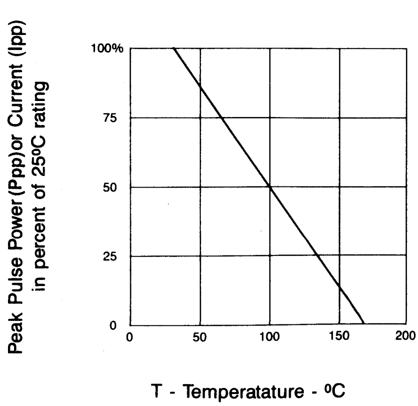

Figure 4. Derating Curve

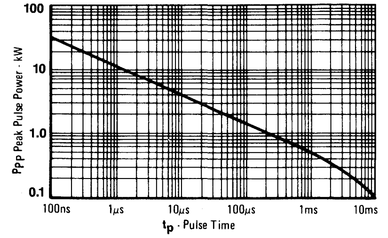

Figure 5. Pulse Waveform
1N6461 Series

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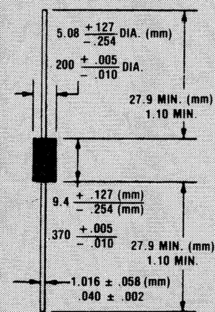
1.0 KE5 thru 1.0 KE170A

TRANSIENT ABSORPTION ZENER

4



FEATURES

- AVAILABLE IN RANGES FROM 5.0 TO 170 VOLTS
- AVAILABLE IN BIDIRECTIONAL FOR AC APPLICATIONS
- LOW CLAMPING RATIO
- SMALL PACKAGE SIZE

As a low cost, 1,000 watt commercial and industrial component, this TAZ series is used in applications where space is a premium and where large voltage transients can permanently damage voltage-sensitive components.

This TAZ has a peak pulse power rating of 1,000 watts for one millisecond. The response time of TAZ clamping action is theoretically instantaneous (1 x 10^{-12} sec); therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage-sensitive semiconductors and components. TAZ can also be used in series or parallel to increase the peak power ratings.

MAXIMUM RATINGS

1000 Watts of Peak Pulse Power dissipation at 25°C (see derating curve)
$t_{clamping}$ (0 Volts to BV Min.):
Unidirectional < 1x10^{-12} Seconds; Bidirectional < 5 x 10^{-9} Seconds (theoretical).
Operating and Storage temperatures: -55° to +175°C
Forward surge rating: 133 amps, 8.3 msec at 25°C (except Bidirectional)
Steady State power dissipation: 5.0 watt T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .05%

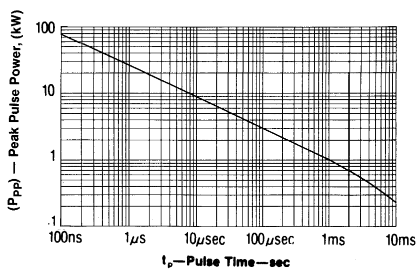


FIGURE 1 PEAK PULSE POWER VS PULSE TIME

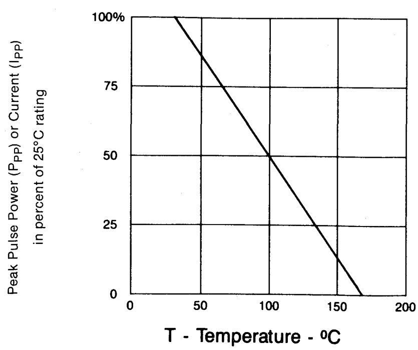


FIGURE 2 DERATING CURVE

MECHANICAL CHARACTERISTICS

CASE: Molded case

FINISH: Silver-plated copper, readily solderable

POLARITY: Cathode terminal marked with band (except bi-directional)

WEIGHT: 1.5 grams (Appx.)

MOUNTING POSITION: Any

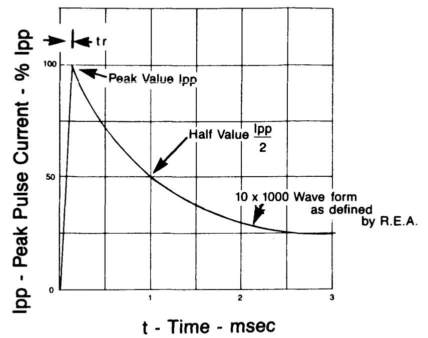
1.0KE5 thru 1.0KE170A

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ VOLTS @ MIN.		MAX.	I_D mA	MAXIMUM REVERSE LEAKAGE V_{WM} (NOTE 2) I_R μA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} (FIG. 3) V_C VOLTS	MAXIMUM PEAK PULSE CURRENT (FIG. 3) I_{PP} A	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF $V_{(BR)}$ mV/°C
1.0KE5.0	5.0	6.40	-	7.3	10	1000	9.6	104.0	5.0
1.0KE5.0A	5.0	6.40	-	7.00	10	1000	9.2	109.0	5.0
1.0KE6.0	6.0	6.67	-	8.15	10	1000	11.4	87.7	5.0
1.0KE6.0A	6.0	6.67	-	7.37	10	1000	10.3	97.0	5.0
1.0KE6.5	6.5	7.22	-	8.82	10	500	12.3	81.3	5.0
1.0KE6.5A	6.5	7.22	-	7.96	10	500	11.2	89.3	5.0
1.0KE7.0	7.0	7.78	-	9.51	10	200	13.3	75.2	6.0
1.0KE7.0A	7.0	7.78	-	8.60	10	200	12.0	83.3	6.0
1.0KE7.5	7.5	8.33	-	10.2	1	100	14.3	69.9	7.0
1.0KE7.5A	7.5	8.33	-	9.21	1	100	12.9	77.5	7.0
1.0KE8.0	8.0	8.89	-	10.9	1	50	15.0	66.3	7.0
1.0KE8.0A	8.0	8.89	-	9.83	1	50	13.6	73.5	7.0
1.0KE8.5	8.5	9.44	-	11.5	1	25	15.9	62.9	8.0
1.0KE8.5A	8.5	9.44	-	10.4	1	25	14.4	69.4	8.0
1.0KE9.0	9.0	10.0	-	12.2	1	10	16.9	59.2	9.0
1.0KE9.0A	9.0	10.0	-	11.1	1	10	15.4	64.9	9.0
1.0KE10	10	11.1	-	13.6	1	5	18.8	53.3	10
1.0KE10A	10	11.1	-	12.3	1	5	17.0	58.8	10
1.0KE11	11	12.2	-	14.9	1	5	20.1	49.8	11
1.0KE11A	11	12.2	-	13.5	1	5	18.2	54.9	11
1.0KE12	12	13.3	-	16.3	1	5	22.0	45.5	12
1.0KE12A	12	13.3	-	14.7	1	5	19.9	50.3	12
1.0KE13	13	14.4	-	17.6	1	5	23.8	42.0	13
1.0KE13A	13	14.4	-	15.9	1	5	21.5	46.5	13
1.0KE14	14	15.6	-	19.1	1	5	25.8	38.8	14
1.0KE14A	14	15.6	-	17.2	1	5	23.2	43.1	14
1.0KE15	15	16.7	-	20.4	1	5	26.9	37.2	16
1.0KE15A	15	16.7	-	18.5	1	5	24.4	41.0	16
1.0KE16	16	17.8	-	21.8	1	5	28.8	34.7	19
1.0KE16A	16	17.8	-	19.7	1	5	26.0	38.5	17
1.0KE17	17	18.9	-	23.1	1	5	30.5	32.8	20
1.0KE17A	17	18.9	-	20.9	1	5	27.6	36.2	19
1.0KE18	18	20.0	-	24.4	1	5	32.2	31.1	21
1.0KE18A	18	20.0	-	22.1	1	5	29.2	34.2	20
1.0KE20	20	22.2	-	27.1	1	5	35.8	27.9	25
1.0KE20A	20	22.2	-	24.5	1	5	32.4	30.9	23
1.0KE22	22	24.4	-	29.8	1	5	39.4	25.4	28
1.0KE22A	22	24.4	-	26.9	1	5	35.5	28.2	25
1.0KE24	24	26.7	-	32.6	1	5	43.0	23.3	31
1.0KE24A	24	26.7	-	29.5	1	5	38.9	25.7	28
1.0KE26	26	28.9	-	35.3	1	5	46.6	21.5	31
1.0KE26A	26	28.9	-	31.9	1	5	42.1	23.8	30
1.0KE28	28	31.1	-	38.0	1	5	50.0	20.0	35
1.0KE28A	28	31.1	-	34.4	1	5	45.4	22.0	31
1.0KE30	30	33.3	-	40.7	1	5	53.5	18.7	39
1.0KE30A	30	33.3	-	36.8	1	5	48.4	20.6	36
1.0KE33	33	36.7	-	44.9	1	5	59.0	17.0	45
1.0KE33A	33	36.7	-	40.6	1	5	53.3	18.8	41
1.0KE36	36	40.0	-	48.9	1	5	64.3	15.6	49
1.0KE36A	36	40.0	-	44.2	1	5	58.1	17.2	45
1.0KE40	40	44.4	-	54.3	1	5	71.4	14.0	55
1.0KE40A	40	44.4	-	49.1	1	5	64.5	15.5	50
1.0KE43	43	47.8	-	58.4	1	5	76.7	13.0	60
1.0KE43A	43	47.8	-	52.8	1	5	69.4	14.4	54
1.0KE45	45	50.0	-	61.1	1	5	80.3	12.5	63
1.0KE45A	45	50.0	-	55.3	1	5	72.7	13.8	57
1.0KE48	48	53.3	-	65.1	1	5	85.5	11.7	68
1.0KE48A	48	53.3	-	58.9	1	5	77.4	12.9	61
1.0KE51	51	56.7	-	69.3	1	5	91.1	11.0	72
1.0KE51A	51	56.7	-	62.7	1	5	82.4	12.1	65
1.0KE54	54	60.0	-	73.3	1	5	96.3	10.4	76
1.0KE54A	54	60.0	-	66.3	1	5	87.1	11.5	69
1.0KE58	58	64.4	-	78.7	1	5	103.0	9.7	83
1.0KE58A	58	64.4	-	71.2	1	5	93.6	10.7	74
1.0KE60	60	66.7	-	81.5	1	5	107.0	9.3	86
1.0KE60A	60	66.7	-	73.7	1	5	96.8	10.3	77
1.0KE64	64	71.1	-	86.9	1	5	114.0	8.8	91
1.0KE64A	64	71.1	-	78.6	1	5	103.0	9.7	82
1.0KE70	70	77.8	-	95.1	1	5	125	8.0	100
1.0KE70A	70	77.8	-	86.0	1	5	113	8.8	90
1.0KE75	75	83.3	-	102.0	1	5	134	7.5	108
1.0KE75A	75	83.3	-	92.1	1	5	121	8.3	97
1.0KE78	78	86.7	-	106.0	1	5	139	7.2	112
1.0KE78A	78	86.7	-	95.8	1	5	126	7.9	102
1.0KE85	85	94.4	-	115.0	1	5	151	6.6	123
1.0KE85A	85	94.4	-	104.0	1	5	137	7.3	110
1.0KE90	90	100	-	122	1	6	160	6.3	130
1.0KE90A	90	100	-	111	1	5	146	6.8	118
1.0KE100	100	111	-	136	1	5	179	5.6	145
1.0KE100A	100	111	-	123	1	5	162	6.2	132
1.0KE110	110	122	-	149	1	5	196	5.1	159
1.0KE110A	110	122	-	135	1	5	177	5.7	144
1.0KE120	120	133	-	163	1	5	214	4.7	176
1.0KE120A	120	133	-	147	1	5	193	5.2	157
1.0KE130	130	144	-	176	1	5	231	4.3	190
1.0KE130A	130	144	-	159	1	5	209	4.8	172
1.0KE150	150	167	-	204	1	5	268	3.7	220
1.0KE150A	150	167	-	185	1	5	243	4.1	200
1.0KE160	160	178	-	218	1	5	287	3.5	235
1.0KE160A	160	178	-	197	1	5	259	3.9	213
1.0KE170	170	189	-	231	1	5	304	3.3	254
1.0KE170A	170	189	-	209	1	5	275	3.6	226

V_f at 65 amps peak, 8.5 ms sine wave equals 3.5 volts maximum (except bidirectional).
For Bidirectional Applications — use C or CA suffix for types 1.0KE6.5 through 1.0KE170.

NOTE 1: A TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.



Test wave form parameters
t_r = 10 μ
t_p = 1000 μ

FIGURE 3
PULSE WAVEFORM

Microsemi Corp.
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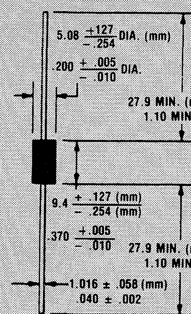
1.2KE5 thru 1.2KE170A

TRANSIENT ABSORPTION ZENER

④



FEATURES

- AVAILABLE IN RANGES FROM 5.0 TO 170 VOLTS
- AVAILABLE IN BIDIRECTIONAL FOR AC APPLICATIONS
- LOW CLAMPING RATIO
- SMALL PACKAGE SIZE

As a low cost, 1,200 watt commercial and industrial device, this TAZ is used in applications where space is at a premium and where large voltage transients can permanently damage voltage-sensitive components.

This TAZ has a peak pulse power rating of 1,200 watts for one millisecond. The response time of TAZ clamping action is theoretically instantaneous (1×10^{-12} sec); therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage-sensitive semiconductors and components. TAZ can also be used in series or parallel to increase the peak power ratings.

MAXIMUM RATINGS

1,200 Watts of Peak Pulse Power dissipation at 25°C (see derating curve)
$t_{clamping}$ (0 Volts to BV Min.):
Unidirectional $< 1 \times 10^{-12}$ Seconds; Bidirectional $< 5 \times 10^{-9}$ Seconds.
Operating and Storage temperatures: -55° to +175°C
Forward surge rating: 160 amps, 8.3 msec at 25°C (except Bipolar)
Steady State power dissipation: 5.0 watt T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .05%

MECHANICAL CHARACTERISTICS

CASE: Molded case.
FINISH: Silverplated copper, readily solderable.
POLARITY: Cathode terminal marked with a band (except bidirectional types).
WEIGHT: 1.5 grams (Appx.).
MOUNTING POSITION: Any.

1.2KE5 thru 1.2KE170A

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ VOLTS @ MIN.	MAX.	I_D mA	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_R µA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} (FIG. 3) V_C VOLTS	MAXIMUM PEAK PULSE CURRENT (FIG. 3) I_{PP} A	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF $V_{(BR)}$ mV/°C
1.2KE5.0	5.0	6.40	7.30	10	1000	9.6	125.0	5.0
1.2KE5.0A	5.0	6.40	7.00	10	1000	9.2	130.0	5.0
1.2KE6.0	6.0	6.67	8.15	10	1000	11.4	105.0	5.0
1.2KE6.0A	6.0	6.67	7.37	10	1000	10.3	117.0	5.0
1.2KE6.5	6.5	7.22	8.82	10	500	12.3	97.6	5.0
1.2KE6.5A	6.5	7.22	7.96	10	500	11.2	107.0	5.0
1.2KE7.0	7.0	7.78	9.51	10	200	13.3	90.2	6.0
1.2KE7.0A	7.0	7.78	8.60	10	200	12.0	100.0	6.0
1.2KE7.5	7.5	8.33	10.2	1	100	14.3	53.9	7.0
1.2KE7.5A	7.5	8.33	9.21	1	100	12.9	93.0	7.0
1.2KE8.0	8.0	8.89	10.9	1	50	15.0	80.0	7.0
1.2KE8.0A	8.0	8.89	9.83	1	50	13.6	88.2	7.0
1.2KE8.5	8.5	9.44	11.5	1	25	15.9	75.5	8.0
1.2KE8.5A	8.5	9.44	10.4	1	25	14.4	83.3	8.0
1.2KE9.0	9.0	10.0	12.2	1	10	16.9	71.0	9.0
1.2KE9.0A	9.0	10.0	11.1	1	10	15.4	78.0	9.0
1.2KE10	10	11.1	13.6	1	5	18.8	63.8	10
1.2KE10A	10	11.1	12.3	1	5	17.0	70.6	10
1.2KE11	11	12.2	14.9	1	5	20.1	59.7	11
1.2KE11A	11	12.2	13.5	1	5	18.2	65.9	11
1.2KE12	12	13.3	16.3	1	5	22.0	54.5	12
1.2KE12A	12	13.3	14.7	1	5	19.9	60.3	12
1.2KE13	13	14.4	17.6	1	5	23.8	50.4	13
1.2KE13A	13	14.4	15.9	1	5	21.5	55.8	13
1.2KE14	14	15.6	19.1	1	5	25.8	46.5	14
1.2KE14A	14	15.6	17.2	1	5	23.2	51.7	14
1.2KE15	15	16.7	20.4	1	5	26.9	44.6	16
1.2KE15A	15	16.7	18.5	1	5	24.4	49.2	16
1.2KE16	16	17.8	21.8	1	5	28.8	41.7	19
1.2KE16A	16	17.8	19.7	1	5	26.0	46.2	17
1.2KE17	17	18.9	23.1	1	5	30.5	39.3	20
1.2KE17A	17	18.9	20.9	1	5	27.6	43.5	19
1.2KE18	18	20.0	24.4	1	5	32.2	37.3	21
1.2KE18A	18	20.0	22.1	1	5	29.2	41.1	20
1.2KE20	20	22.2	27.1	1	5	35.8	33.5	25
1.2KE20A	20	22.2	24.5	1		32.4	37.0	23
1.2KE22	22	24.4	29.8	1	5	39.4	30.5	28
1.2KE22A	22	24.4	26.9	1	5	35.5	33.8	25
1.2KE24	24	26.7	32.6	1	5	43.0	27.9	31
1.2KE24A	24	26.7	29.5	1	5	38.9	30.8	28
1.2KE26	26	26.9	35.3	1	5	46.6	25.8	31
1.2KE26A	26	26.9	31.9	1	5	42.1	28.5	30
1.2KE28	28	31.1	38.0	1	5	50.0	24.0	35
1.2KE28A	28	31.1	34.4	1	5	45.4	26.4	31
1.2KE30	30	33.3	40.7	1	5	53.5	22.4	39
1.2KE30A	30	33.3	36.8	1	5	48.4	24.6	36
1.2KE33	33	36.7	44.9	1	5	59.0	20.3	45
1.2KE33A	33	36.7	40.6	1	5	53.3	22.5	41
1.2KE36	36	40.0	48.9	1	5	64.3	18.7	49
1.2KE36A	36	40.0	44.2	1	5	58.1	20.7	45
1.2KE40	40	44.4	54.3	1	5	71.4	16.8	55
1.2KE40A	40	44.4	49.1	1	5	64.5	18.6	50
1.2KE43	43	47.8	58.4	1	5	76.7	15.6	60
1.2KE43A	43	47.8	52.8	1	5	69.4	17.3	54
1.2KE45	45	50.0	61.1	1	5	80.3	14.9	63
1.2KE45A	45	50.0	55.3	1	5	72.7	16.5	57
1.2KE48	48	53.3	65.1	1	5	85.5	14.0	68
1.2KE48A	48	53.3	58.9	1	5	77.4	15.5	61
1.2KE51	51	56.7	69.3	1	5	91.1	13.2	72
1.2KE51A	51	56.7	62.7	1	5	82.4	14.6	65
1.2KE54	54	60.0	73.3	1	5	96.3	12.5	76
1.2KE54A	54	60.0	66.3	1	5	87.1	13.8	69
1.2KE58	58	64.4	78.7	1	5	103.0	11.7	83
1.2KE58A	58	64.4	71.2	1	5	93.6	12.8	74
1.2KE60	60	66.7	81.5	1	5	107.0	11.2	86
1.2KE60A	60	66.7	73.7	1	5	96.8	12.4	77
1.2KE64	64	71.1	86.9	1	5	114.0	10.5	91
1.2KE64A	64	71.1	78.6	1	5	103.0	11.6	82
1.2KE70	70	77.8	95.1	1	5	125	9.6	100
1.2KE70A	70	77.8	86.0	1	5	113	10.6	90
1.2KE75	75	83.3	102.0	1	5	134	8.9	108
1.2KE75A	75	83.3	92.1	1	5	121	9.9	97
1.2KE78	78	86.7	106.0	1	5	139	8.6	112
1.2KE78A	78	86.7	95.8	1	5	126	9.5	102
1.2KE85	85	94.4	115.0	1	5	151	7.9	123
1.2KE85A	85	94.4	104.0	1	5	137	8.8	110
1.2KE90	90	100	122	1	6	160	7.5	130
1.2KE90A	90	100	111	1	5	146	8.2	118
1.2KE100	100	111	136	1	5	179	6.7	145
1.2KE100A	100	111	123	1	5	162	7.4	132
1.2KE110	110	122	149	1	5	196	6.1	159
1.2KE110A	110	122	135	1	5	177	6.8	144
1.2KE120	120	133	163	1	5	214	5.6	176
1.2KE120A	120	133	147	1	5	193	6.2	157
1.2KE130	130	144	176	1	5	231	5.2	190
1.2KE130A	130	144	159	1	5	209	5.7	172
1.2KE150	150	167	204	1	5	268	4.5	220
1.2KE150A	150	167	185	1	5	243	4.95	200
1.2KE160	160	178	218	1	5	287	4.2	235
1.2KE160A	160	178	197	1	5	259	4.6	213
1.2KE170	170	189	231	1	5	304	3.9	254
1.2KE170A	170	189	209	1	5	275	4.4	226

V_f at 80 amps peak, 8.3 ms sine wave equals 3.5 volts maximum (except bidirectional). For Bidirectional Applications—use C or CA suffix for types 1.2KE6.5 through 1.2KE170.

NOTE 1: A TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

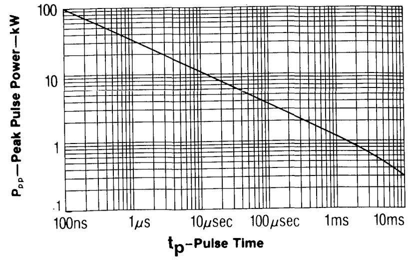


FIGURE 1

Peak Pulse Power vs. Pulse Time

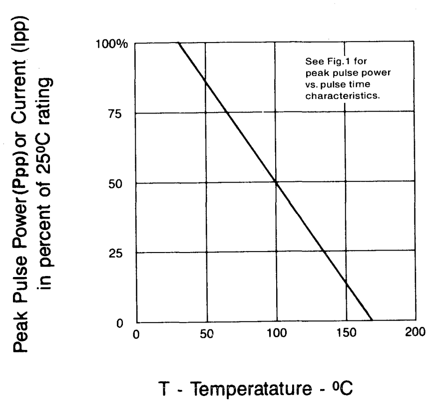


FIGURE 2

Derating Curve

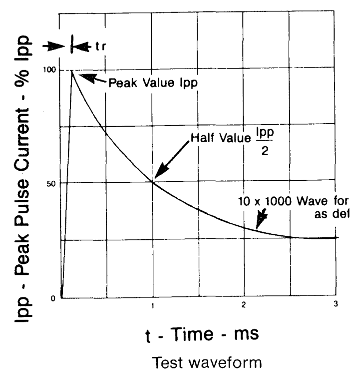


FIGURE 3

PULSE WAVEFORM

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1.4KESD5.0 thru 1.4KESD170A

AXIAL LEAD

Features

1. Protects Sensitive Circuits From Short Duration Fast Rise Time Transients such as Electro-Static-Discharge (ESD) or Electrical Fast Transients (EFT).
2. Excellent Protection in Clamping Direct ESD Level Transients* in Excess of 15,000 Volts.
3. Absorbs ESD Level Transients* of 1400 Watts or One Microsecond Transients** up to 400 Watts. See Figure #1 For Overall Transient Peak Pulse Power.
4. Clamps Transients in 1 Pico Second.
5. 0.5 Watt Continuous Power Dissipation.
6. Working (Stand-off) Voltage Range of 5V to 170V.
7. Hermetic DO-35 Package. Also Available in Surface Mount DO-213AA (MELF).
8. Low Inherent Capacitance for High Frequency Application (See Figure #4).

These devices feature the ability to clamp dangerous high voltage short term transients such as produced by directed or radiated electro-static-discharge phenomena before entering sensitive component regions of a circuit design. They are small economical transient voltage suppressors targeted primarily for short term transients below a few microseconds while still achieving significant peak-pulse-power capability as seen in Figure #1.

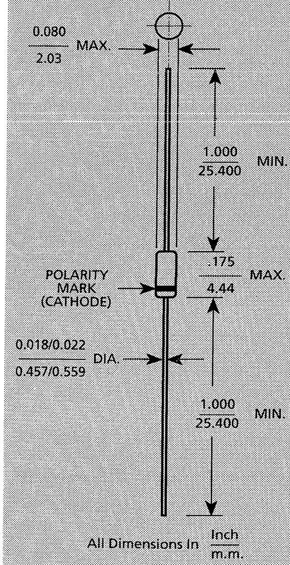
Maximum Ratings

1. 400 Watts for One Microsecond Square Wave or 1400 Watts Per ESD Wave Form of MIL-STD-750, Method 1020.
2. See Surge Rating Curve in Figures #1, 2 and 3.
3. Operating and Storage Temperature -65° to 200°C
4. DC Power Dissipation 500 mW at T_L = 75° C, .375" From Body.
5. Derate at 2.3 W / °C Above 25°C For P_{PP} (1µs) and at 5 mW / °C Above 100°C for dc Power.
6. Forward Surge Current 50 amps for 1 µs at T_L = 25°C (rise time ≥ 100 ns).

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	µA	VOLTS	AMPS
1.4KESD5.0	5.0	6.40	10	600	13.7	29.20
1.4KESD5.0A	5.0	6.40	10	600	13.9	29.85
1.4KESD6.0	6.0	6.67	10	600	14.8	27.00
1.4KESD6.0A	6.0	6.67	10	600	14.0	28.50
1.4KESD6.5	6.5	7.22	10	400	16.0	24.94
1.4KESD6.5A	6.5	7.22	10	400	15.2	26.32
1.4KESD7.0	7.0	7.78	10	150	17.3	23.12
1.4KESD7.0A	7.0	7.78	10	150	16.4	24.42
1.4KESD7.5	7.5	8.33	1.0	50	18.5	21.57
1.4KESD7.5A	7.5	8.33	1.0	50	17.5	22.81
1.4KESD8.0	8.0	8.89	1.0	25	19.8	20.20
1.4KESD8.0A	8.0	8.89	1.0	25	18.7	21.37
1.4KESD8.5	8.5	9.44	1.0	5	20.9	19.10
1.4KESD8.5A	8.5	9.44	1.0	5	19.8	20.16
1.4KESD9.0	9.0	10.0	1.0	1.0	22.2	18.02

**At 400 watts 1 µs square wave rating (See Figures 1 and 2).
* Pulse wave form of MIL-STD-750, Method 1020. (Approximately 150 ns exponential wave.) See derating for V_S on Fig. 3



DO-35

Mechanical Characteristics

CASE: Hermetically sealed glass case DO-35.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: 200°C / Watt typical for DO-35 at 0.375 inches from body.

POLARITY: Banded end is cathode.

WEIGHT: 0.2 grams (typical).

1.4KESD5.0 thru 1.4KESD170A

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	μA	VOLTS	AMPS
1.4KESD9.0A	9.0	10.0	1.0	1.0	21.1	18.96
1.4KESD10	10	11.1	1.0	1.0	24.7	16.19
1.4KESD10A	10	11.1	1.0	1.0	23.4	17.09
1.4KESD11	11	12.2	1.0	1.0	27.1	14.76
1.4KESD11A	11	12.2	1.0	1.0	25.7	15.56
1.4KESD12	12	13.3	1.0	1.0	29.6	13.51
1.4KESD12A	12	13.3	1.0	1.0	28.0	14.29
1.4KESD13	13	14.4	1.0	1.0	32.0	12.50
1.4KESD13A	13	14.4	1.0	1.0	30.3	13.20
1.4KESD14	14	15.6	1.0	1.0	31.2	12.81
1.4KESD14A	14	15.6	1.0	1.0	29.5	13.60
1.4KESD15	15	16.7	1.0	1.0	33.4	11.98
1.4KESD15A	15	16.7	1.0	1.0	31.7	12.63
1.4KESD16	16	17.8	1.0	1.0	35.6	11.22
1.4KESD16A	16	17.8	1.0	1.0	33.8	11.85
1.4KESD17	17	18.9	1.0	1.0	37.8	10.58
1.4KESD17A	17	18.9	1.0	1.0	35.8	11.17
1.4KESD18	18	20.0	1.0	1.0	40.0	10.00
1.4KESD18A	18	20.0	1.0	1.0	37.9	10.56
1.4KESD20	20	22.2	1.0	1.0	44.4	9.02
1.4KESD20A	20	22.2	1.0	1.0	42.0	9.52
1.4KESD22	22	24.4	1.0	1.0	48.8	8.20
1.4KESD22A	22	24.4	1.0	1.0	46.2	8.66
1.4KESD24	24	26.7	1.0	1.0	53.4	7.49
1.4KESD24A	24	26.7	1.0	1.0	50.6	7.91
1.4KESD26	26	28.9	1.0	1.0	57.8	6.93
1.4KESD26A	26	28.9	1.0	1.0	54.7	7.31
1.4KESD28	28	31.1	1.0	1.0	62.2	6.43
1.4KESD28A	28	31.1	1.0	1.0	59.0	6.79
1.4KESD30	30	33.3	1.0	1.0	66.6	6.01
1.4KESD30A	30	33.3	1.0	1.0	63.1	6.34
1.4KESD33	33	36.7	1.0	1.0	73.4	5.45
1.4KESD33A	33	36.7	1.0	1.0	69.6	5.75
1.4KESD36	36	40.0	1.0	1.0	80.0	5.00
1.4KESD36A	36	40.0	1.0	1.0	75.8	5.28
1.4KESD40	40	44.4	1.0	1.0	88.8	4.50
1.4KESD40A	40	44.4	1.0	1.0	84.2	4.75
1.4KESD43	43	47.8	1.0	1.0	95.6	4.18
1.4KESD43A	43	47.8	1.0	1.0	90.5	4.42
1.4KESD45	45	50.0	1.0	1.0	100.0	4.00
1.4KESD45A	45	50.0	1.0	1.0	94.8	4.22
1.4KESD48	48	53.3	1.0	1.0	106.6	3.75
1.4KESD48A	48	53.3	1.0	1.0	101.0	3.96
1.4KESD51	51	56.7	1.0	1.0	113.4	3.53
1.4KESD51A	51	56.7	1.0	1.0	107.5	3.72
1.4KESD54	54	60.0	1.0	1.0	120.0	3.33
1.4KESD54A	54	60.0	1.0	1.0	113.7	3.52
1.4KESD58	58	64.4	1.0	1.0	128.9	3.10
1.4KESD58A	58	64.4	1.0	1.0	122.0	3.28
1.4KESD60	60	66.7	1.0	1.0	133.4	3.00
1.4KESD60A	60	66.7	1.0	1.0	126.4	3.17
1.4KESD64	64	71.1	1.0	1.0	142.2	2.81
1.4KESD64A	64	71.1	1.0	1.0	134.7	2.97
1.4KESD70	70	77.8	1.0	1.0	155.6	2.57
1.4KESD70A	70	77.8	1.0	1.0	147.4	2.71
1.4KESD75	75	83.3	1.0	1.0	166.8	2.40
1.4KESD75A	75	83.3	1.0	1.0	158.0	2.53
1.4KESD78	78	86.7	1.0	1.0	173.4	2.31
1.4KESD78A	78	86.7	1.0	1.0	164.3	2.44
1.4KESD85	85	94.4	1.0	1.0	188.5	2.12
1.4KESD85A	85	94.4	1.0	1.0	178.6	2.24
1.4KESD90	90	100.0	1.0	1.0	199.8	2.00
1.4KESD90A	90	100.0	1.0	1.0	189.9	2.11
1.4KESD100	100	111.0	1.0	1.0	222.3	1.80
1.4KESD100A	100	111.0	1.0	1.0	210.6	1.90
1.4KESD110	110	122.0	1.0	1.0	243.9	1.64
1.4KESD110A	110	122.0	1.0	1.0	213.3	1.73
1.4KESD120	120	133.0	1.0	1.0	266.4	1.50
1.4KESD120A	120	133.0	1.0	1.0	252.0	1.59
1.4KESD130	130	144.0	1.0	1.0	288.0	1.39
1.4KESD130A	130	144.0	1.0	1.0	273.0	1.47
1.4KESD150	150	167.0	1.0	1.0	333.9	1.20
1.4KESD150A	150	167.0	1.0	1.0	316.8	1.26
1.4KESD160	160	178.0	1.0	1.0	356.4	1.12
1.4KESD160A	160	178.0	1.0	1.0	337.5	1.19
1.4KESD170	170	189.0	1.0	1.0	378.0	1.06
1.4KESD170A	170	189.0	1.0	1.0	358.2	1.12

**At 400 watts 1 μs square wave rating (See Figures 1 and 2).

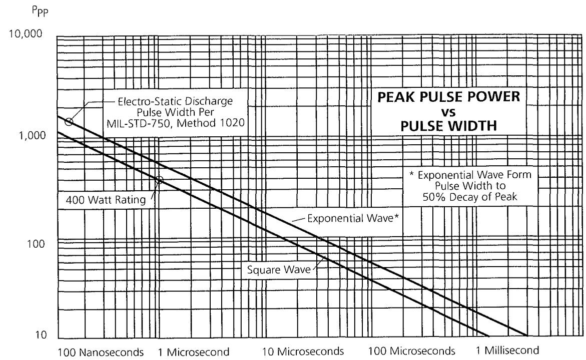


Figure 1

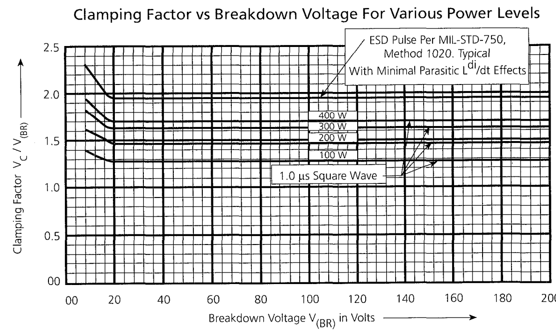


Figure 2

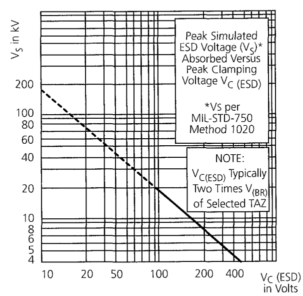


Figure 3

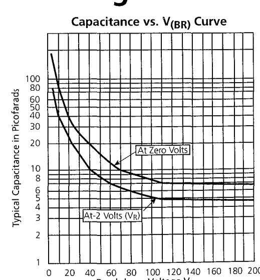


Figure 4

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5KP5.0 thru 5KP110A

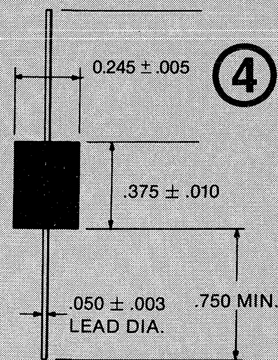
TRANSIENT ABSORPTION ZENER

FEATURES

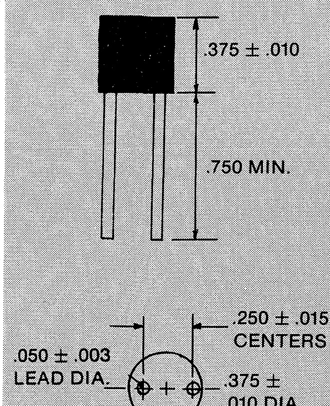
Designed for use on the output of switching power supplies, voltage tolerances are referenced to the power supply output voltage level.

MAXIMUM RATINGS

5000 Watts of Peak Pulse Power dissipation at 25°C for 10 x 1000μsec pulse
Clamping time (0 volts to $V_{(BR)}$ min): Less than 1 x 10^{-12} seconds
Operating and Storage temperature: -55° to +150°C
Steady State power dissipation: 5.0 watts @ T_L = 25°C
Repetition rate (duty cycle): .05%



CASE 5A



CASE 5R

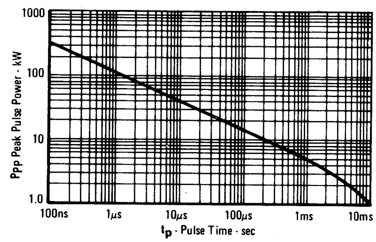


FIGURE 1
PEAK PULSE POWER VS. PULSE TIME TO 50% OF EXPONENTIALLY DECAYING PULSE

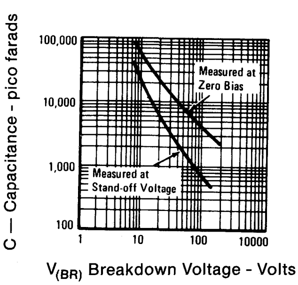


FIGURE 2
TYPICAL CAPACITANCE VS. BREAKDOWN VOLTAGE

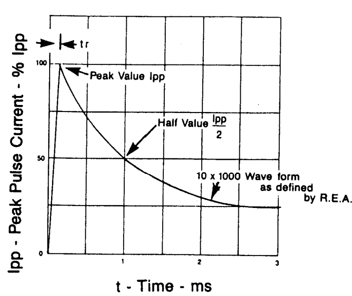


FIGURE 3
PULSE WAVEFORM

MECHANICAL CHARACTERISTIC

CASE: Void free molded thermo-setting plastic.
FINISH: Silver plated copper readily solderable.
POLARITY: Band/dot denotes cathode. Bidirectional not marked.
WEIGHT: 0.2 grams.
MOUNTING POSITION: Any.

5KP5.0 thru 5KP110A

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE (Note 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE @ $V_{(BR)}$ VOLTS	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} (1 mSEC) V_C VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MAXIMUM PEAK PULSE CURRENT (FIG. 3) I_{PP} A	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF $V_{(BR)}$ mV/°C
5KP5.0	5.0	6.40 - 7.30	50	9.6	2000	520	4.0
5KP5.0A	5.0	6.40 - 7.00	50	9.2	2000	543	4.0
5KP6.0	6.0	6.67 - 8.15	50	11.4	5000	439	4.0
5KP6.0A	6.0	6.67 - 7.37	50	10.3	5000	485	4.0
5KP6.5	6.5	7.22 - 8.82	50	12.3	2000	407	4.0
5KP6.5A	6.5	7.22 - 7.98	50	11.2	2000	447	4.0
5KP7.0	7.0	7.78 - 9.51	50	13.3	1000	378	5.0
5KP7.0A	7.0	7.78 - 8.60	50	12.0	1000	417	5.0
5KP7.5	7.5	8.33 - 10.2	5	14.3	250	350	6.0
5KP7.5A	7.5	8.33 - 9.21	5	12.9	250	388	6.0
5KP8.0	8.0	8.89 - 10.9	5	15.0	150	333	6.0
5KP8.0A	8.0	8.89 - 9.83	5	13.6	150	367	6.0
5KP8.5	8.5	9.44 - 11.5	5	15.9	50	314	7.0
5KP8.5A	8.5	9.44 - 10.4	5	14.4	50	347	7.0
5KP9.0	9.0	10.0 - 12.2	5	16.9	20	295	8.0
5KP9.0A	9.0	10.0 - 11.1	5	15.4	20	325	8.0
5KP10	10	11.1 - 13.6	5	18.8	15	266	9.0
5KP10A	10	11.1 - 12.3	5	17.0	15	294	9.0
5KP11	11	12.2 - 14.9	5	20.1	10	249	10
5KP11A	11	12.2 - 13.5	5	18.2	10	274	10
5KP12	12	13.3 - 16.3	5	22.0	10	227	11
5KP12A	12	13.3 - 14.7	5	19.9	10	251	11
5KP13	13	14.4 - 17.6	5	23.8	10	210	12
5KP13A	13	14.4 - 15.9	5	21.5	10	232	12
5KP14	14	15.6 - 19.1	5	25.8	10	194	13
5KP14A	14	15.6 - 17.2	5	23.2	10	215	13
5KP15	15	16.7 - 20.4	5	26.9	10	188	15
5KP15A	15	16.7 - 18.5	5	24.4	10	206	15
5KP16	16	17.8 - 21.8	5	28.8	10	176	18
5KP16A	16	17.8 - 19.7	5	26.0	10	192	16
5KP17	17	18.9 - 23.1	5	30.5	10	164	19
5KP17A	17	18.9 - 20.9	5	27.6	10	181	18
5KP18	18	20.0 - 24.4	5	32.2	10	155	20
5KP18A	18	20.0 - 22.1	5	29.2	10	172	19
5KP20	20	22.2 - 27.1	5	35.8	10	139	24
5KP20A	20	22.2 - 24.5	5	32.4	10	154	22
5KP22	22	24.4 - 29.8	5	39.4	10	127	27
5KP22A	22	24.4 - 26.9	5	35.5	10	141	24
5KP24	24	26.7 - 32.6	5	43.0	10	116	30
5KP24A	24	26.7 - 29.5	5	38.9	10	128	27
5KP26	26	28.9 - 35.3	5	46.6	10	107	33
5KP26A	26	28.9 - 31.9	5	42.1	10	119	29
5KP28	28	31.1 - 38.0	5	50.1	10	99	34
5KP28A	28	31.1 - 34.4	5	45.5	10	110	30
5KP30	30	33.3 - 40.7	5	53.5	10	93	38
5KP30A	30	33.3 - 36.8	5	48.4	10	103	35
5KP33	33	36.7 - 44.9	5	59.0	10	85	41
5KP33A	33	36.7 - 40.6	5	53.3	10	94	38
5KP36	36	40.0 - 48.9	5	64.3	10	78	45
5KP36A	36	40.0 - 44.2	5	58.1	10	86	40
5KP40	40	44.4 - 54.3	5	71.4	10	70	50
5KP40A	40	44.4 - 49.1	5	64.5	10	78	45
5KP43	43	47.8 - 58.4	5	76.7	10	65	54
5KP43A	43	47.8 - 52.8	5	69.4	10	72	49
5KP45	45	50.0 - 61.1	5	80.3	10	62	57
5KP45A	45	50.0 - 55.3	5	72.7	10	69	51
5KP48	48	53.3 - 65.1	5	85.5	10	58	62
5KP48A	48	53.3 - 58.9	5	77.4	10	65	55
5KP51	51	56.7 - 69.3	5	91.1	10	55	65
5KP51A	51	56.7 - 62.7	5	82.4	10	61	60
5KP54	54	60.0 - 73.3	5	96.3	10	52	70
5KP54A	54	60.0 - 66.3	5	87.1	10	57	64
5KP58	58	64.4 - 78.7	5	103.0	10	49	77
5KP58A	58	64.4 - 71.2	5	93.6	10	53	69
5KP60	60	66.7 - 81.5	5	107.0	10	47	79
5KP60A	60	66.7 - 73.7	5	96.8	10	52	70
5KP64	64	71.1 - 86.9	5	114.0	10	44	85
5KP64A	64	71.1 - 78.6	5	103.0	10	49	75
5KP70	70	77.8 - 95.1	5	125	10	40	93
5KP70A	70	77.8 - 86.0	5	113	10	44	84
5KP75	75	83.3 - 102.0	5	134	10	37	100
5KP75A	75	83.3 - 92.1	5	121	10	41	90
5KP78	78	86.7 - 106.0	5	139	10	36	104
5KP78A	78	86.7 - 95.8	5	126	10	40	94
5KP85	85	94.4 - 115.0	5	151	10	33	113
5KP85A	85	94.4 - 104.0	5	137	10	36	102
5KP90	90	100 - 122	5	160	10	31	120
5KP90A	90	100 - 111	5	146	10	34	109
5KP100	100	111 - 136	5	179	10	28	134
5KP100A	100	111 - 123	5	162	10	31	122
5KP110	110	122 - 149	5	196	10	26	147
5KP110A	110	122 - 135	5	177	10	28	132

V_f at 100 amps peak, 8.3 ms sine wave equals 3.5 volts maximum.

Note 1: TAZ are normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

Note 2: For bidirectional construction, indicate a C or CA suffix after the part number.

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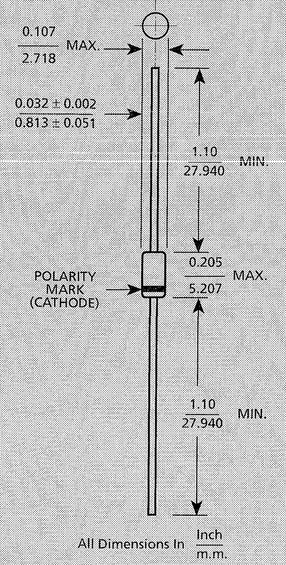
14KESD5.0 thru 14KESD170A
AXIAL LEAD



DO-41

Features

1. Protects Sensitive Circuits From Short Duration Fast Rise Time Transients such as Electro-Static-Discharge (ESD) or Electrical Fast Transients (EFT).
2. Excellent Protection in Clamping Direct ESD Level Transients* in Excess of 40,000 Volts.
3. Absorbs ESD Level Transients* of 14,000 Watts or One Microsecond Transients** up to 4000 Watts. See Figure #1 For Overall Transient Peak Pulse Power.
4. Clamps Transients in 1 Pico Second.
5. 1.5 Watt Continuous Power Dissipation.
6. Working (Stand-off) Voltage Range of 5V to 170V.
7. Hermetic DO-41 Package. Also Available in Surface Mount DO-213AB (MELF).
8. Low Inherent Capacitance for High Frequency Application (See Figure #3).

These devices feature the ability to clamp dangerous high voltage short term transients such as produced by directed or radiated electro-static-discharge phenomena before entering sensitive component regions of a circuit design. They are small economical transient voltage suppressors targeted primarily for short term transients below a few microseconds while still achieving significant peak-pulse-power capability as seen in Figure #1.

Maximum Ratings

1. 4000 Watts for One Microsecond Square Wave or 14,000 Watts Per ESD Wave Form of MIL-STD-750, Method 1020.
2. See Surge Rating Curve in Figures #1 and 2.
3. Operating and Storage Temperature -65° to 200°C.
4. DC Power Dissipation 1500 mW at T_L = 75° C, .375" From Body.
5. Derate at 22.8 W / °C Above 25°C For P_{PP} (1μs) and at 12 mW / °C Above 75°C for dc Power.
6. Forward Surge Current 500 amp for 1 μs at T_L = 25°C (rise time ≥ 100 ns).

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	μA	VOLTS	AMPS
14KESD5.0	5.0	6.40	10	600	17.1	233.6
14KESD5.0A	5.0	6.40	10	600	16.8	238.8
14KESD6.0	6.0	6.67	10	600	18.5	215.9
14KESD6.0A	6.0	6.67	10	600	17.6	227.9
14KESD6.5	6.5	7.22	10	400	20.1	199.5
14KESD6.5A	6.5	7.22	10	400	19.0	210.5
14KESD7.0	7.0	7.78	10	150	21.6	185.0
14KESD7.0A	7.0	7.78	10	150	20.5	195.4
14KESD7.5	7.5	8.33	1.0	50	23.2	172.6
14KESD7.5A	7.5	8.33	1.0	50	21.9	182.4
14KESD8.0	8.0	8.89	1.0	25	24.8	161.6
14KESD8.0A	8.0	8.89	1.0	25	23.4	170.9
14KESD8.5	8.5	9.44	1.0	5	26.2	152.8
14KESD8.5A	8.5	9.44	1.0	5	24.8	161.3
14KESD9.0	9.0	10.0	1.0	1.0	27.8	144.1

* Pulse wave form of MIL-STD-750, Method 1020. (Approximately 150 ns exponential wave.)
**At 4000 watts 1 μs square wave rating (See Figures 1 and 2).

Mechanical Characteristics

CASE: Hermetically sealed glass case DO-41.

FINISH: All external surfaces are corrosion resistant and leads solderable.

THERMAL RESISTANCE: Less than 83°C / Watt junction to lead at 0.375 inches from body.

POLARITY: Banded end is cathode.

WEIGHT: 0.378 grams (typical).

14KESD5.0 thru 14KESD170A

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	µA	VOLTS	AMPS
14KESD9.0A	9.0	10.0	1.0	1.0	26.4	151.7
14KESD10	10	11.1	1.0	1.0	30.9	129.5
14KESD10A	10	11.1	1.0	1.0	29.3	136.8
14KESD11	11	12.2	1.0	1.0	33.9	118.0
14KESD11A	11	12.2	1.0	1.0	32.1	124.5
14KESD12	12	13.3	1.0	1.0	37.0	108.1
14KESD12A	12	13.3	1.0	1.0	35.0	114.3
14KESD13	13	14.4	1.0	1.0	40.0	100.0
14KESD13A	13	14.4	1.0	1.0	37.9	105.6
14KESD14	14	15.6	1.0	1.0	43.4	92.2
14KESD14A	14	15.6	1.0	1.0	41.0	97.6
14KESD15	15	16.7	1.0	1.0	46.4	86.2
14KESD15A	15	16.7	1.0	1.0	42.2	94.7
14KESD16	16	17.8	1.0	1.0	45.5	87.8
14KESD16A	16	17.8	1.0	1.0	41.3	97.0
14KESD17	17	18.9	1.0	1.0	41.8	95.7
14KESD17A	17	18.9	1.0	1.0	39.8	100.5
14KESD18	18	20.0	1.0	1.0	42.2	94.8
14KESD18A	18	20.0	1.0	1.0	37.9	105.6
14KESD20	20	22.2	1.0	1.0	41.9	95.4
14KESD20A	20	22.2	1.0	1.0	37.4	107.1
14KESD22	22	24.4	1.0	1.0	40.7	98.4
14KESD22A	22	24.4	1.0	1.0	38.5	103.9
14KESD24	24	26.7	1.0	1.0	44.5	89.9
14KESD24A	24	26.7	1.0	1.0	42.2	94.9
14KESD26	26	28.9	1.0	1.0	48.2	83.1
14KESD26A	26	28.9	1.0	1.0	45.6	87.7
14KESD28	28	31.1	1.0	1.0	51.8	77.2
14KESD28A	28	31.1	1.0	1.0	49.1	81.4
14KESD30	30	33.3	1.0	1.0	55.5	72.1
14KESD30A	30	33.3	1.0	1.0	52.6	76.1
14KESD33	33	36.7	1.0	1.0	61.2	65.4
14KESD33A	33	36.7	1.0	1.0	58.0	69.0
14KESD36	36	40.0	1.0	1.0	66.7	60.0
14KESD36A	36	40.0	1.0	1.0	63.2	63.3
14KESD40	40	44.4	1.0	1.0	74.0	54.0
14KESD40A	40	44.4	1.0	1.0	70.1	57.0
14KESD43	43	47.8	1.0	1.0	79.7	50.2
14KESD43A	43	47.8	1.0	1.0	75.5	53.0
14KESD45	45	50.0	1.0	1.0	83.3	48.0
14KESD45A	45	50.0	1.0	1.0	79.0	50.6
14KESD48	48	53.3	1.0	1.0	88.8	45.0
14KESD48A	48	53.3	1.0	1.0	84.2	47.5
14KESD51	51	56.7	1.0	1.0	94.5	42.3
14KESD51A	51	56.7	1.0	1.0	89.6	44.6
14KESD54	54	60.0	1.0	1.0	100.0	40.0
14KESD54A	54	60.0	1.0	1.0	94.7	42.2
14KESD58	58	64.4	1.0	1.0	107.4	37.2
14KESD58A	58	64.4	1.0	1.0	101.7	39.3
14KESD60	60	66.7	1.0	1.0	111.2	36.0
14KESD60A	60	66.7	1.0	1.0	105.3	38.0
14KESD64	64	71.1	1.0	1.0	118.5	33.7
14KESD64A	64	71.1	1.0	1.0	112.3	35.6
14KESD70	70	77.8	1.0	1.0	129.7	30.8
14KESD70A	70	77.8	1.0	1.0	122.9	32.5
14KESD75	75	83.3	1.0	1.0	139.0	28.8
14KESD75A	75	83.3	1.0	1.0	131.5	30.4
14KESD78	78	86.7	1.0	1.0	144.5	27.7
14KESD78A	78	86.7	1.0	1.0	136.9	29.2
14KESD85	85	94.4	1.0	1.0	157.1	25.4
14KESD85A	85	94.4	1.0	1.0	148.8	26.9
14KESD90	90	100.0	1.0	1.0	166.5	24.0
14KESD90A	90	100.0	1.0	1.0	158.3	25.3
14KESD100	100	111.0	1.0	1.0	185.3	21.6
14KESD100A	100	111.0	1.0	1.0	175.5	22.8
14KESD110	110	122.0	1.0	1.0	203.3	19.7
14KESD110A	110	122.0	1.0	1.0	192.8	20.7
14KESD120	120	133.0	1.0	1.0	222.0	18.0
14KESD120A	120	133.0	1.0	1.0	210.0	19.0
14KESD130	130	144.0	1.0	1.0	240.0	16.7
14KESD130A	130	144.0	1.0	1.0	227.3	17.6
14KESD150	150	167.0	1.0	1.0	278.3	14.4
14KESD150A	150	167.0	1.0	1.0	264.0	15.2
14KESD160	160	178.0	1.0	1.0	297.0	13.5
14KESD160A	160	178.0	1.0	1.0	281.2	14.2
14KESD170	170	189.0	1.0	1.0	315.0	12.7
14KESD170A	170	189.0	1.0	1.0	298.5	13.4

**At 4000 watts 1 µs square wave rating (See Figures 1 and 2).

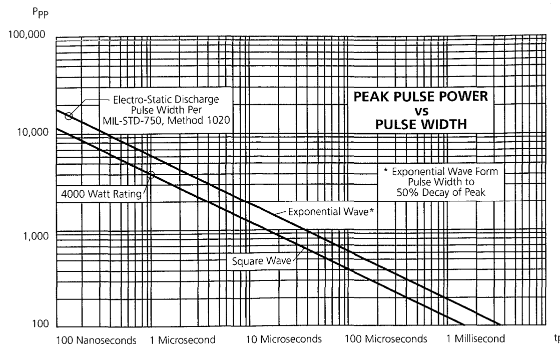


Figure 1

Clamping Factor vs Breakdown Voltage For Various Power Levels

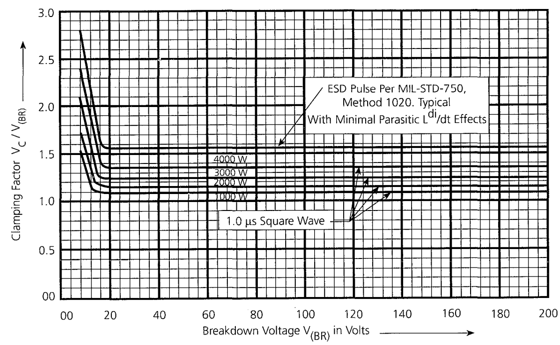


Figure 2

Capacitance vs. $V_{(BR)}$ Curve

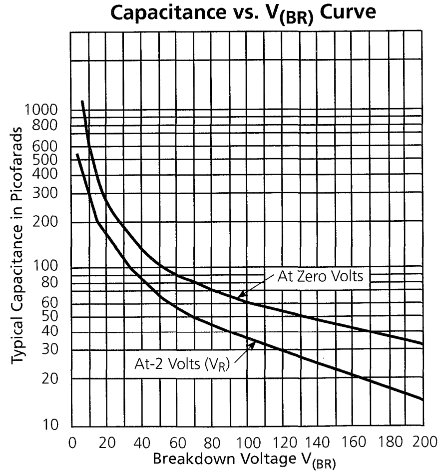


Figure 3

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15KP17 thru 15KP280A

TRANSIENT ABSORPTION ZENER

FEATURES

These TAZ devices are high power, medium voltage Transient Suppressors designed for protecting precision industrial electronic equipment. They are available from 17 volts through 280 volts. Special voltages are available upon request to the factory.

MAXIMUM RATINGS

15,000 Watts of Peak Pulse Power dissipation at 25°C for 10 x 1000μsec pulse
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Less than 1 x 10^{-12} seconds
Operating and Storage temperature: -55°C to +150°C
Steady State power dissipation: 7.0 watts @ T_A = 25°C
Repetition rate (duty cycle): .05%

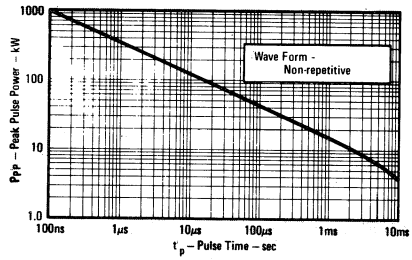
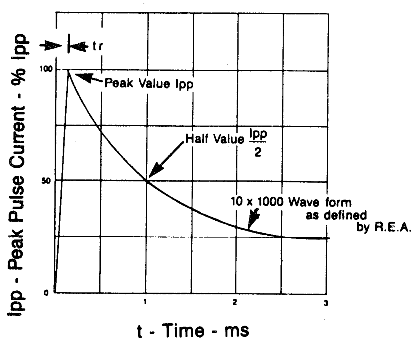
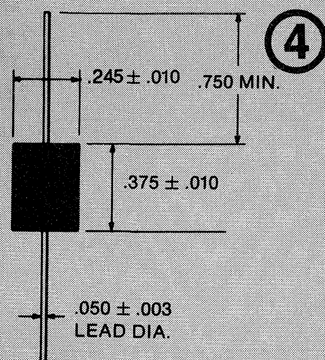


FIGURE 1
PEAK PULSE POWER VS. PULSE TIME TO 50% OF EXPONENTIALLY DECAYING PULSE

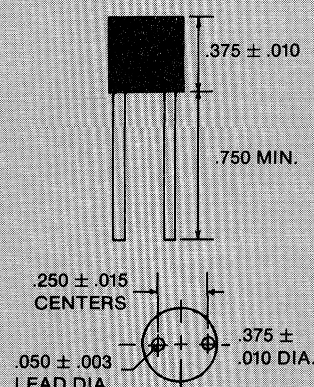


Test waveform parameters
t_r = 10μsec.
t_p = 1000μsec.

FIGURE 2
PULSE WAVEFORM



CASE 5A



CASE 5R

MECHANICAL CHARACTERISTICS

CASE: Void free molded thermosetting plastic.
FINISH: Silver plated copper Readily solderable.
POLARITY: Positive terminal marked with a dot.
WEIGHT: 13 grams (Appx.).
MOUNTING POSITION: Any.

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE (Note 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ VOLTS	@ I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} (1 mSEC) V_C VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D µA	MAXIMUM PEAK PULSE CURRENT (FIG. 2) I_{PP} A	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF $V_{(BR)}$ mV/°C
15KP17	17	18.9- 23.1	50	32.3	5000	464	19
15KP17A	17	18.9- 20.9	50	29.3	5000	512	17
15KP18	18	20.0- 24.4	50	34.2	5000	439	20
15KP18A	18	20.0- 22.1	50	30.9	5000	485	18
15KP20	20	22.2- 27.1	20	37.9	1500	396	24
15KP20A	20	22.2- 24.5	20	34.3	1500	437	21
15KP22	22	24.4- 29.8	10	41.1	500	365	27
15KP22A	22	24.4- 26.9	10	37.1	500	404	24
15KP24	24	26.7- 32.6	5	45.0	150	333	30
15KP24A	24	26.7- 29.5	5	40.7	150	369	27
15KP26	26	28.9- 35.3	5	48.7	50	308	32
15KP26A	26	28.9- 31.9	5	44.0	50	341	29
15KP28	28	31.1- 38.0	5	52.4	25	286	35
15KP28A	28	31.1- 34.4	5	47.5	25	316	31
15KP30	30	33.3- 40.7	5	56.2	15	267	27
15KP30A	30	33.3- 36.8	5	50.7	15	296	34
15KP33	33	36.7- 44.9	5	60.6	10	248	42
15KP33A	33	36.7- 40.6	5	54.8	10	274	38
15KP36	36	40.0- 48.9	5	66.0	10	227	46
15KP36A	36	40.0- 44.2	5	59.7	10	251	41
15KP40	40	44.4- 54.3	5	72.8	10	206	51
15KP40A	40	44.4- 49.1	5	65.8	10	228	46
15KP43	43	47.8- 58.4	5	77.1	10	195	55
15KP43A	43	47.8- 52.8	5	69.7	10	215	50
15KP45	45	50.0- 61.1	5	80.7	10	186	57
15KP45A	45	50.0- 55.3	5	73.0	10	205	52
15KP48	48	53.3- 65.1	5	85.9	10	175	62
15KP48A	48	53.3- 58.9	5	77.7	10	193	56
15KP51	51	56.7- 69.3	5	91.5	10	164	66
15KP51A	51	56.7- 62.7	5	82.8	10	181	60
15KP54	54	60.0- 73.3	5	96.8	10	155	70
15KP54A	54	60.0- 66.3	5	87.5	10	171	63
15KP58	58	64.4- 78.7	5	104.0	10	144	76
15KP58A	58	64.4- 71.2	5	94.0	10	160	68
15KP60	60	66.7- 81.5	5	107.0	10	140	78
15KP60A	60	66.7- 73.7	5	97.3	10	154	71
15KP64	64	71.1- 86.9	5	115	10	130	84
15KP64A	64	71.1- 78.6	5	104	10	144	76
15KP70	70	77.8- 95.1	5	126	10	119	92
15KP70A	70	77.8- 86.0	5	114	10	132	83
15KP75	75	83.3-102.0	5	135	10	111	100
15KP75A	75	83.3- 92.1	5	122	10	123	89
15KP78	78	86.7-106.0	5	140	10	107	104
15KP78A	78	86.7- 95.8	5	126	10	119	93
15KP85	85	94.4-115	5	152	10	99	113
15KP85A	85	94.4-104	5	137	10	109	102
15KP90	90	100.0-122	5	160	10	94	120
15KP90A	90	100.0-111	5	146	10	103	109
15KP100	100	111 -136	5	179	10	84	134
15KP100A	100	111 -123	5	162	10	93	121
15KP110	110	122 -149	5	196	10	77	147
15KP110A	110	122 -135	5	178	10	84	133
15KP120	120	133 -163	5	214	10	70	161
15KP120A	120	133 -147	5	193	10	78	145
15KP130	130	144 -176	5	231	10	65	174
15KP130A	130	144 -159	5	209	10	72	157
15KP150	150	167 -204	5	268	10	56	202
15KP150A	150	167 -185	5	243	10	62	183
15KP160	160	178 -218	5	287	10	52	216
15KP160A	160	178 -197	5	259	10	58	195
15KP170	170	189 -231	5	304	10	49	229
15KP170A	170	189 -209	5	275	10	55	207
15KP180	180	200 -244	5	321	10	47	242
15KP180A	180	200 -221	5	291	10	52	219
15KP200	200	222 -271	5	356	10	42	269
15KP200A	200	222 -245	5	322	10	47	243
15KP220	220	245 -299	5	393	10	38	297
15KP220A	220	245 -271	5	356	10	42	269
15KP240	240	267 -326	5	428	10	35	324
15KP240A	240	267 -295	5	388	10	39	293
15KP260	260	289 -353	5	464	10	32	352
15KP260A	260	289 -319	5	419	10	36	317
15KP280	280	311 -380	5	500	10	30	378
15KP280A	280	311 -344	5	452	10	33	342

V_f = 7.5 V @ 200 A, 8.3 ms (1/2 sine wave).

Note 1: TAZ are normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

Note 2: For bidirectional construction, indicate a C or CA suffix after the part number.

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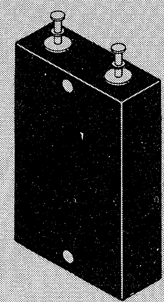
60KS200C BIDIRECTIONAL TRANSIENT VOLTAGE SUPPRESSOR

TRANSIENT ABSORPTION ZENER

4



FEATURES

- 200 VOLT BIDIRECTIONAL
- EXCEEDS MIL-STD-1399 REQUIREMENTS
- CAN BE SUPPLIED WITH JAN/JANTX PARTS

This device is a bidirectional Transient Suppressor for shipboard equipment and power servicing equipment where large voltage transients endanger voltage sensitive components. It meets all applicable environmental requirements of MIL-S-19500 and is consistent with MIL-E-16400. Designed with MIL-STD-1399 Section 300 (Interface standard for shipboard systems, Electrical power, alternating current) as the controlling specification.

MAXIMUM RATINGS

60,000 watts Peak Pulse Power dissipation at 25°C
Steady State power dissipation: 10 watts
Operating and Storage temperatures: -65° to +150°C
$t_{clamping}$ (0 volts to $V_{(BR)}$): Less than 1 x 10^{-8} seconds

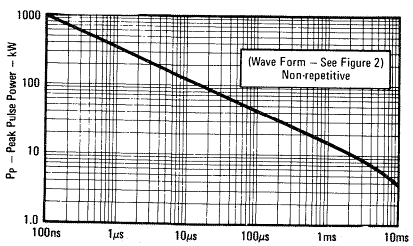
CAPACITANCE

170 pF @ 0 Volts (Typical)

ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)*

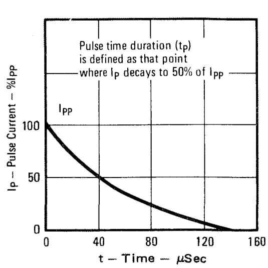
MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ VOLTS Min.	BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ VOLTS Max.	MAXIMUM CLAMPING VOLTAGE @ I_{pp} V_C VOLTS	MAXIMUM PEAK PULSE CURRENT (Pulse Wave Form) I_{pp} A
60KS200C	180	10	200	225	335	180

*Consult factory for other available voltages.



Peak Pulse Power vs Pulse Time

FIGURE 1



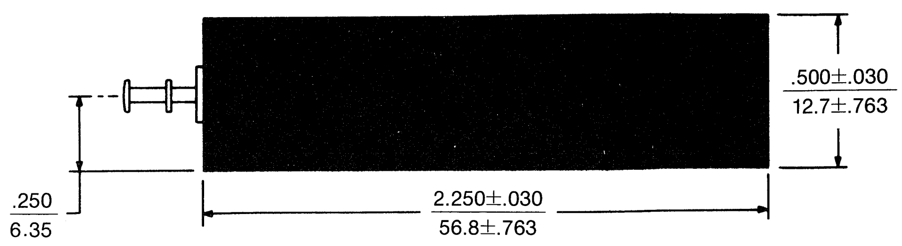
Pulse Wave Form
(1.5 x 40 μs)

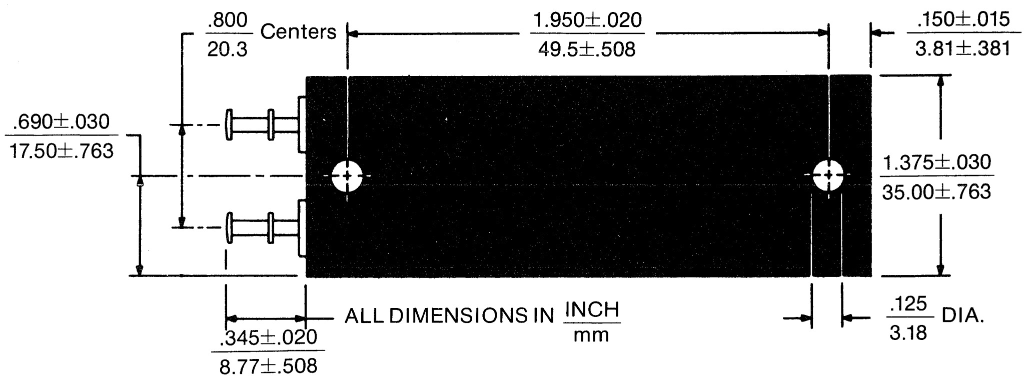
FIGURE 2

MECHANICAL CHARACTERISTICS

CASE: Molded case.
TERMINAL: Silver-plated brass.
POLARITY: Bidirectional.
WEIGHT: 50 grams (Appx.).
MOUNTING POSITION: Any.

60KS200C BIDIRECTIONAL TRANSIENT VOLTAGE SUPPRESSOR





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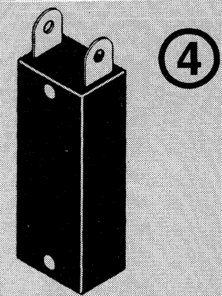
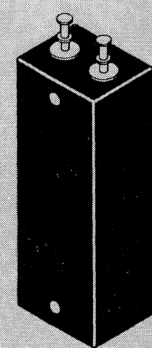
704-15K36 and 704-15K36T TRANSIENT VOLTAGE SUPPRESSOR

TRANSIENT ABSORPTION ZENER



(Flat Terminal)



(Turret Terminal)

FEATURES

- DESIGNED FOR MIL-STD-704
- 28 VOLT POWER SUPPLY PROTECTION
- CAN BE SUPPLIED WITH JAN/JANTX PARTS

This series is primarily for use in avionics equipment. It meets all applicable environmental requirements of MIL-S-19500. The controlling specification for these devices is MIL-STD-704 (Characteristics and Utilization of Aircraft Electric Power). These 15kW assemblies are designed typically to operate with a minimum source impedance of .25 Ohms for transients.

MAXIMUM RATINGS

Peak Pulse Power dissipation at 25°C: 15,000 watts at 1 ms (See Fig. 2)
Steady State power dissipation: 10 watts
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Less than 1 x 10^{-12} seconds
Operating and Storage temperatures: -65° to +150°C
Forward surge rating: 300 amps, 1/120 second at 25°C
Duty cycle: .01%

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE (Note 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM BREAKDOWN VOLTAGE @ 10 mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE @ I_{pp} V_C VOLTS	MAXIMUM PEAK PULSE CURRENT (Fig. 2) I_{pp} A	MAXIMUM FORWARD VOLTAGE V_F @ ~ 8.3 msec. 100 A VOLTS DC
704-15K36	31.5	100	36	51	300	3.0
704-15K36T	31.5	500	36	51	300	3.0

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the dc or continuous peak operating voltage level. Bipolar also available. Consult factory.

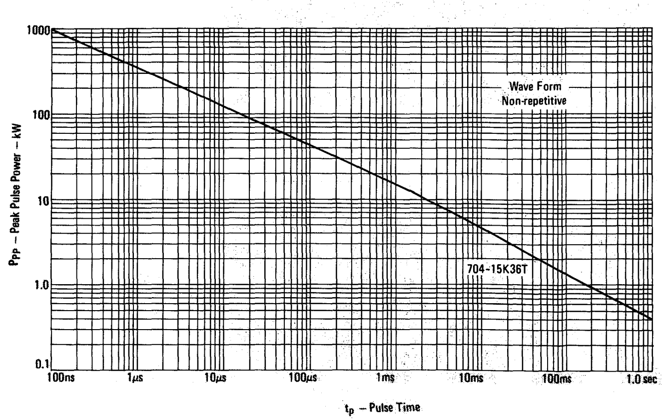


FIGURE 1
PEAK PULSE POWER
VS. PULSE TIME

MECHANICAL CHARACTERISTICS

CASE: Molded case.
TERMINAL: Silver Plated Brass
POLARITY: Cathode terminal marked with a dot.
WEIGHT: 704-15K36 = 38 grams
704-15K36T = 65 grams
MOUNTING POSITION: Any.

704-15K36 and 704-15K36T

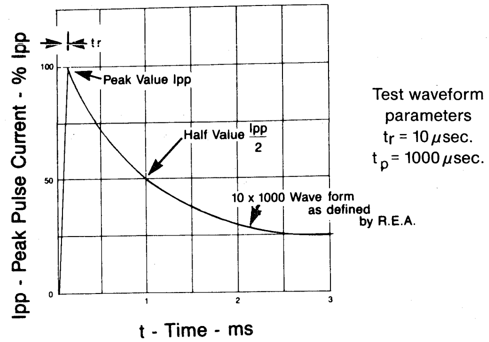
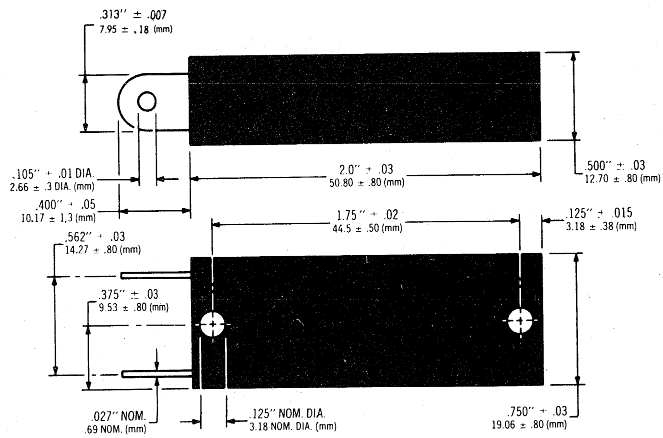


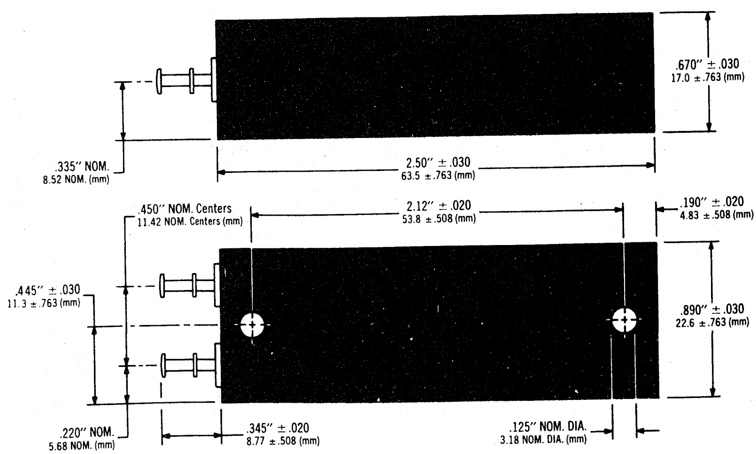
FIGURE 2

PULSE WAVEFORM

PACKAGE DIMENSIONS



CASE 8



CASE 9

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For more information call:
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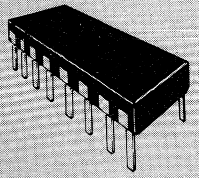
DLTS-5 thru DLTS-30

DATA LINE TRANSIENT SUPPRESSOR

FEATURES

This series of TAZ devices is packaged in a ceramic, dual-in-line, hermetically sealed package. These components offer 15 protective devices; unidirectional or bidirectional, common buss connections, per package. The dual-in-line is designed specifically for data line protection, at the P.C. board level. TTL and MOS voltages are available for protection of input/output data circuits.

- UNIDIRECTIONAL OR BIDIRECTIONAL
- MULTIPLE TAZ ARRAY
- DUAL-IN-LINE, 16 PIN HERMETIC PACKAGE
- LOW CAPACITANCE
- μP/mP COMPATIBLE PACKAGE
- VOLTAGE RANGE OF 5V TO 100V AVAILABLE
- COMMON BUSS CONFIGURATION
- MILITARY ENVIRONMENT CAPABILITY



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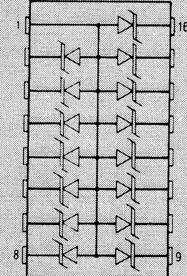
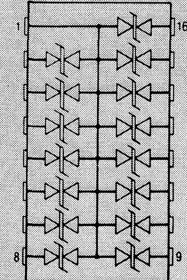


TYPICAL UNIDIRECTIONAL SCHEMATIC



TYPICAL BIDIRECTIONAL SCHEMATIC

MAXIMUM RATINGS

500 Watts Peak Pulse Power/Position (@ 25°C) (8 x 20μs)
$t_{clamping}$ (0 volts to BV min.) Less than 1 x 10^{-12} seconds (theoretical) (unidirectional) 5 x 10^{-9} seconds (bidirectional) (theoretical)
Operating and Storage Temperatures: -55°C to +150°C
Forward Surge Rating: 10 Amps, 1/120 sec. @ 25°C (unidirectional)
Repetition Rate (duty cycle): .01%

AVAILABLE DEVICE TYPES

UNIDIRECTIONAL	BIDIRECTIONAL
DLTS-5, A	DLTS-8C, CA
DLTS-12, A	DLTS-13C, CA
DLTS-17, A	DLTS-19C, CA
DLTS-24, A	DLTS-30C, CA
DLTS-30, A	

MECHANICAL CHARACTERISTICS

CASE: Ceramic, 16 pin dual-in-line (.300″ row spacing)

POLARITY: Pin No. 1 marked with a flag on lead and a dot on top of package. Body marked with type number.

WEIGHT: 3.5 grams (Appx.)

DLTS thru DLTS - 30

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE @ I_{PP2} = 1A (8 x 20 μs) V_{C1} VOLTS	MAXIMUM CLAMPING VOLTAGE @ I_{PP2} = 10A (8 x 20 μs) V_{C2} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MAXIMUM CAPACITANCE @ 0V 1MHz C pF	MAXIMUM VOLTAGE TEMPERATURE VARIATION OF $V_{(BR)}$ MV/C
Unidirectional							
DLTS-5	5	6.0	10.2	12.5	200	880	5
DLTS-5A	5	6.0	9.5	10.6	200	880	5
DLTS-12	12	13.3	21.1	26.0	2	440	18
DLTS-12A	12	13.3	19.1	23.5	2	440	18
DLTS-17	17	19.2	30.4	37.4	2	330	20
DLTS-17A	17	19.2	27.5	33.9	2	330	20
DLTS-24	24	26.7	42.3	52.1	2	275	31
DLTS-24A	24	26.7	38.3	47.2	2	275	31
DLTS-30	30	33.3	52.8	65.0	2	220	39
DLTS-30A	30	33.3	47.8	58.8	2	220	39
Bidirectional							
DLTS-8C	8	8.5	13.4	16.6	10	440	9
DLTS-8CA	8	8.5	12.2	15.0	10	440	9
DLTS-13C	13	14.4	22.8	28.1	4	385	18
DLTS-13CA	13	14.4	20.6	25.4	4	385	18
DLTS-19C	19	21.6	34.2	42.1	4	275	24
DLTS-19CA	19	21.6	31.0	38.1	4	275	24
DLTS-30C	30	33.3	52.8	65.0	4	165	39
DLTS-30CA	30	33.3	47.8	58.8	4	165	39

"A", "CA", suffix denotes selected clamping voltage.

NOTE 1: A TAZ is normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

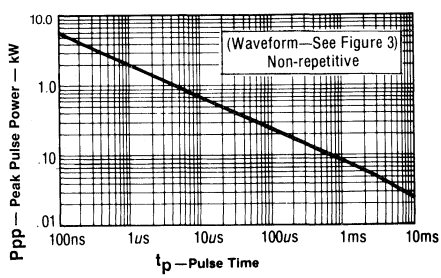


FIGURE 1
PEAK PULSE POWER VS PULSE TIME (PER POSITION)

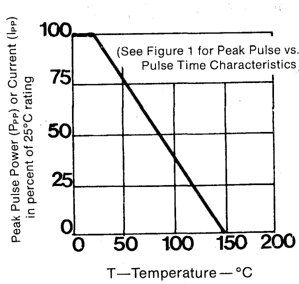


FIGURE 2
DERATING CURVE

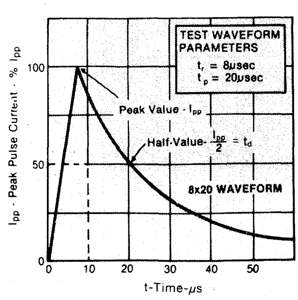
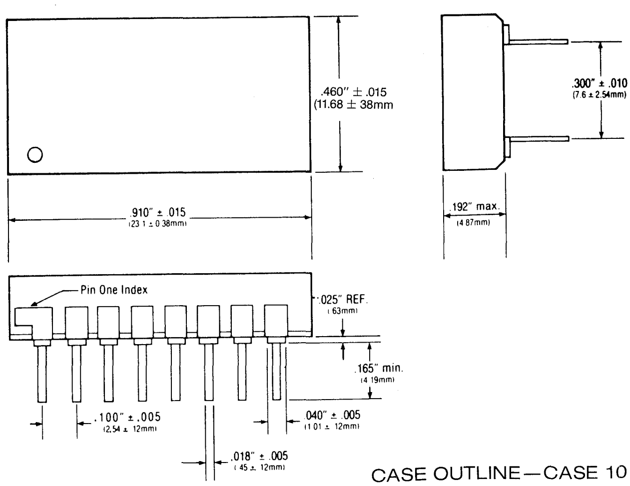


FIGURE 3
PULSE WAVEFORM



CASE OUTLINE—CASE 10

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The diode experts

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SCOTTSDALE, AZ
For more information call:
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GMP-5 SERIES

TRANSIENT ABSORPTION ZENER

APPLICATION

The GMP-5 is a low voltage transient suppressor designed for the protection of integrated circuits. Characterized by a very low clamping voltage together with a low standoff voltage, GMP-5's afford a high degree of protection to: TTL, ECL, DTL, MOS, CMOS, VMOS, HMOS, NMOS and static memory circuits susceptible to 5-volt line transients.

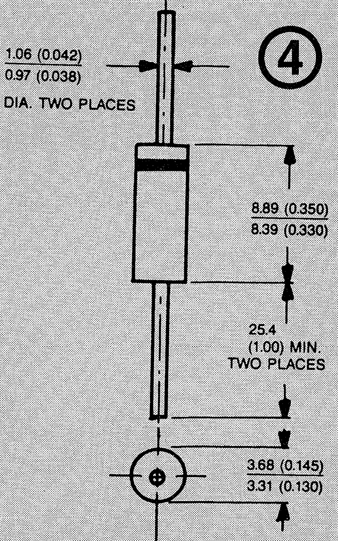
DESCRIPTION/FEATURES

Transient Absorption Zeners (TAZ) are PN silicon junction zeners designed for transient voltage suppression. Due to the TAZ's fast response time, protection level and high discharge capability, they are extremely effective in providing protection against pulses generated by: voltage reversals, capacitive or inductive load switching, electromechanical switching, electrostatic discharge and electromagnetic coupling. Since integrated circuits are more susceptible to damage from these pulses, TAZ devices offer effective protection.

- 500 WATTS PEAK PULSE POWER DISSIPATION
- WORKING VOLTAGE OF 5 VOLTS
- PROTECTS TTL, ECL, DTL, MOS, CMOS, AND MSI INTEGRATED CIRCUITS
- LOW CLAMPING FACTOR

MAXIMUM RATINGS

500 Watts of Peak Pulse Power dissipation at 25°C
$t_{clamping}$ (0 volts to BV min.): Less than 1 x 10^{-12} seconds (theoretical)
Operating and Storage Temperatures: -65°C to +175°C
Forward surge rating: 50 amps 1/120 second at 25°C
Steady State power dissipation: 5.0 W @ T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .05%



Cathode Indicated by Band
All Dimensions in Millimeters (Inches)

MECHANICAL CHARACTERISTICS

CASE: Void free transfer molded thermosetting plastic
FINISH: Silver plated copper, readily solderable
POLARITY: Band denotes cathode
WEIGHT: 0.7 gram (Appx.)
MOUNTING POSITION: Any

GMP-5

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI CORP. PART NUMBER	STAND OFF VOLTAGE Note 1 V_{WM} Volts	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM BREAKDOWN VOLTAGE @ 1mA V (min) V (BR) Volts	MAXIMUM CLAMPING VOLTAGE @Ipp1 =1A (Fig 2) V_C Volts	MAXIMUM CLAMPING VOLTAGE @Ipp2 =10A (Fig 2) V_C Volts	MAXIMUM PEAK PULSE CURRENT (Fig 2) Ipp3 Amps	MAXIMUM PEAK PULSE CURRENT (1.2x50 μsec) Amps
GMP — 5	5.0	300	5.3	6.7	6.9	70	215
GMP — 5A	5.0	100	5.5	6.7	6.9	70	215
GMP — 5B	5.0	300	5.3	6.4	6.6	70	215

Note 1: A TAZ is usually selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

Vf at 50 amps peak, 8.3 msec sine wave = 3.5 volts maximum

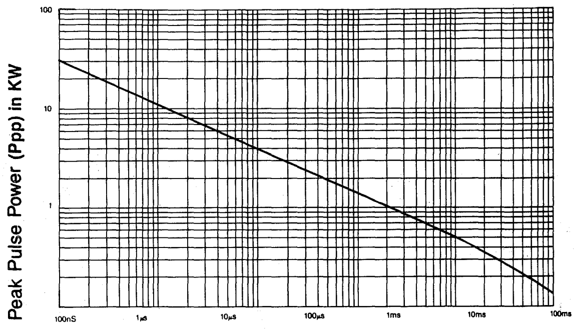


FIGURE 1
PEAK PULSE POWER VS PULSE TIME

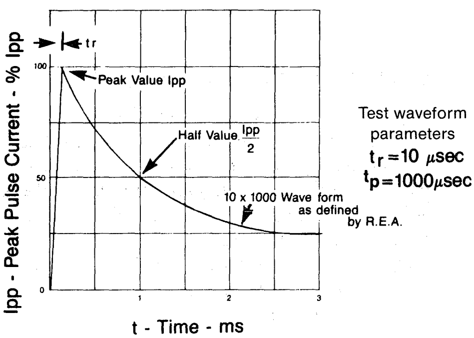


FIGURE 2
PULSE WAVE FORM

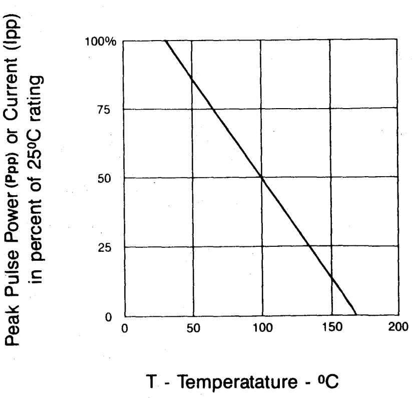


FIGURE 3
DERATING CURVE

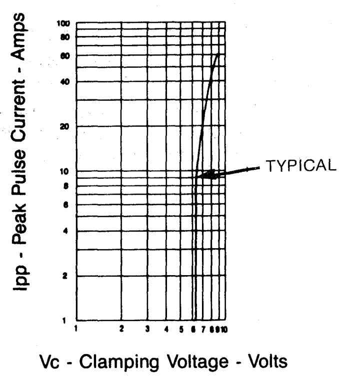


FIGURE 4
TYPICAL CHARACTERISTIC CLAMPING VOLTAGE (V_C) VS PEAK PULSE CURRENT (I_{pp})

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

ICT-5 thru ICT-45C

TRANSIENT ABSORPTION ZENER

④

FEATURES

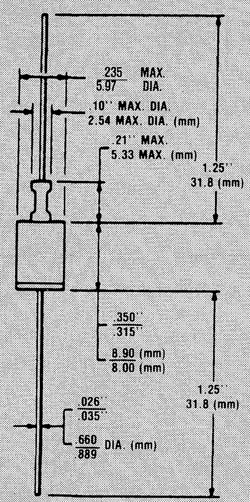
- THIS SERIES OF TAZ DEVICES IS DESIGNED TO PROTECT BIPOLAR, MOS AND SCHOTTKY IMPROVED INTEGRATED CIRCUITS.
- TRANSIENT PROTECTION FOR CMOS, MOS, BIPOLAR, ICS (TTL, ECL, DTL, RTL AND LINEAR FUNCTIONS)
- 5.0 TO 45 VOLTS
- LOW CLAMPING RATIO

MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C and 10 x 1000μs
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Unidirectional—Less than 1 x 10^{-12} seconds
Bidirectional—Less than 5 x 10^{-9} seconds
Operating and Storage temperatures: -65° to +175°C
Forward surge rating: 200 amps, 1/120 second at 25°C
(Applies to Unidirectional or single direction only)
Steady State power dissipation: 1.0 watt
Repetition rate (duty cycle): .01%

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ Full rated power
1.20 @ 50% rated power
Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.



MECHANICAL CHARACTERISTICS

CASE: DO-13 welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

POLARITY: Cathode connected to case and marked. Bidirectional not marked.

WEIGHT: 1.4 grams (Appx.)

MOUNTING POSITION: Any

ICT-5 thru ICT-45C

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM* BREAKDOWN VOLTAGE @ 1 mA $B_{(VR)}$ (min.) VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP1} = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP2} = 10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT @ 10 x 1000 μs I_{PP3} A
ICT-5	5.0	300	6.0	7.1	7.5	160
ICT-8	8.0	25	9.4	11.3	11.5	100
ICT-10	10.0	2	11.7	13.7	14.1	90
ICT-12	12.0	2	14.1	16.1	16.5	70
ICT-15	15.0	2	17.6	20.1	20.6	60
ICT-18	18.0	2	21.2	24.2	25.2	50
ICT-22	22.0	2	25.9	29.8	32.0	40
ICT-36	36.0	2	42.4	50.6	54.3	23
ICT-45	45.0	2	52.9	63.3	70.0	19

V_f at 100 amps peak, 8.3 ms sine wave equals 3.5 volts maximum

ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)

ICT-5C	5.0	300	6.0	7.1	7.5	160
ICT-8C	8.0	25	9.4	11.4	11.6	100
ICT-10C	10.0	2	11.7	14.1	14.5	90
ICT-12C	12.0	2	14.1	16.7	17.1	70
ICT-15C	15.0	2	17.6	20.8	21.4	60
ICT-18C	18.0	2	21.2	24.8	25.5	50
ICT-22C	22.0	2	25.9	30.8	32.0	40
ICT-36C	36.0	2	42.4	50.6	54.3	23
ICT-45C	45.0	2	52.9	63.3	70.0	19

C Suffix indicates Bidirectional

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or repetitive peak operation voltage level.

*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. Similar devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.

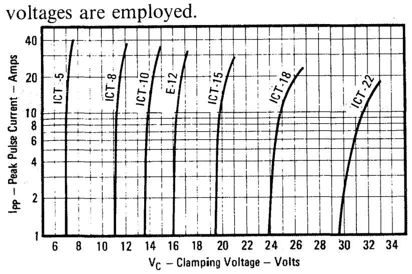


FIGURE 2
TYPICAL CHARACTERISTIC CLAMPING VOLTAGE VS PEAK PULSE CURRENT

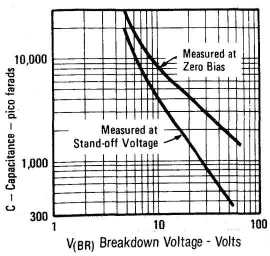


FIGURE 3
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (UNIDIRECTIONAL TYPES)

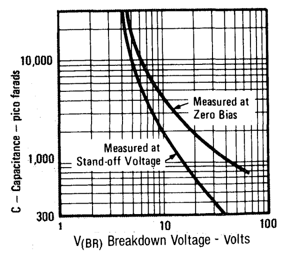


FIGURE 4
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (BIDIRECTIONAL TYPES)

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

ICTE-5 thru ICTE-45C

TRANSIENT ABSORPTION ZENER

4

FEATURES

- DESIGNED TO PROTECT BIPOLAR, MOS, AND SCHOTTKY IMPROVED INTEGRATED CIRCUITS FROM ELECTRICAL DISTURBANCES.
- TRANSIENT PROTECTION FOR CMOS, MOS, BIPOLAR, ICs, (TTL, ECL, DTL, RTL AND LINEAR FUNCTIONS)
- VOLTAGE RANGE OF 5.0 to 45 VOLTS
- LOW CLAMPING RATIO

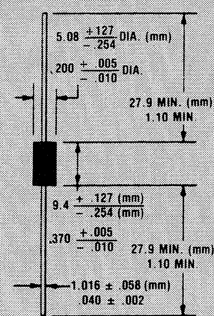
MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C and 10 x 1000μs
$t_{clamping}$ (0 volts to $V_{(BR)}$ min.): Unidirectional—Less than 1 x 10^{-12} seconds
Bidirectional—Less than 5 x 10^{-9} seconds
Operating and Storage Temperatures: -65° to +175°C
Forward Surge Rating: 200 amps, 1/120 second at 25°C
(Applies to Unidirectional or single direction only)
Steady State power dissipation: 5.0 watts @ T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .05%

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 @ Full rated power
1.20 @ 50% rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.



MECHANICAL CHARACTERISTICS

CASE: Void free, molded thermal-setting plastic
FINISH: Silver plated copper readily solderable
POLARITY: Band denotes cathode
WEIGHT: 1.5 grams (Appx.)
MOUNTING POSITION: Any

ICTE - 5 thru ICTE - 45C

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	STAND-OFF VOLTAGE (Note 1) V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MINIMUM* BREAKDOWN VOLTAGE @ 1 mA $V_{(BR)}$ (min.) VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP1} = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ I_{PP2} = 10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT @ 10 x 1000 μs I_{PP3} A
ICTE-5	5.0	300	6.0	7.1	7.5	160
ICTE-8	8.0	25	9.4	11.3	11.5	100
ICTE-10	10.0	2	11.7	13.7	14.1	90
ICTE-12	12.0	2	14.1	16.1	16.5	70
ICTE-15	15.0	2	17.6	20.1	20.6	60
ICTE-18	18.0	2	21.2	24.2	25.2	50
ICTE-22	22.0	2	25.9	29.8	32.0	40
ICTE-36	36.0	2	42.4	50.6	54.3	23
ICTE-45	45.0	2	52.9	63.3	70.0	19

V_f at 100 amps peak, 8.3 msec sine wave equals 3.5 volts maximum

ELECTRICAL CHARACTERISTICS @ 25°C (Test Both Polarities)

ICTE-5C	5.0	300	6.0	7.1	7.5	160
ICTE-8C	8.0	25	9.4	11.4	11.6	100
ICTE-10C	10.0	2	11.7	14.1	14.5	90
ICTE-12C	12.0	2	14.1	16.7	17.1	70
ICTE-15C	15.0	2	17.6	20.8	21.4	60
ICTE-18C	18.0	2	21.2	24.8	25.5	50
ICTE-22C	22.0	2	25.9	30.8	32.0	40
ICTE-36C	36.0	2	42.4	50.6	54.3	23
ICTE-45C	45.0	2	52.9	63.3	70.0	19

C Suffix indicates Bidirectional

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

*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. Similar devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.

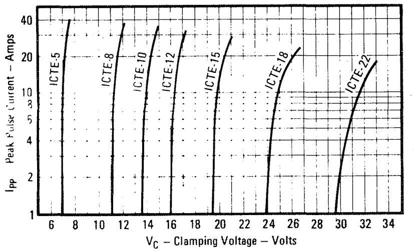


FIGURE 2
TYPICAL CHARACTERISTIC CLAMPING VOLTAGE VS PEAK PULSE CURRENT

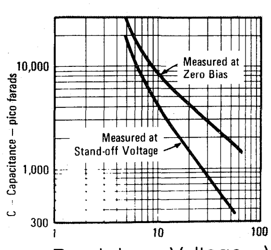


FIGURE 3
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (UNIDIRECTIONAL TYPES)

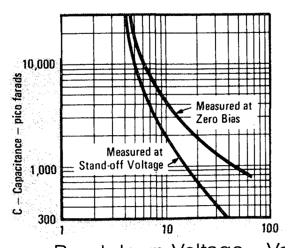


FIGURE 4
TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE (BIDIRECTIONAL TYPES)

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

LC6.5 thru LC170A LOW CAPACITANCE

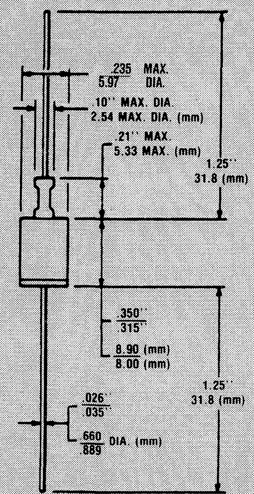
TRANSIENT ABSORPTION ZENER

4

FEATURES

This series employs a standard TAZ in series with a rectifier with the same transient capabilities as the TAZ. The rectifier is used to reduce the effective capacitance up thru 100 MHz with a minimum amount of signal loss or deformation. The low capacitance TAZ may be applied directly across the signal line to prevent induced transients from lightning, power interruptions, or static discharge. If bipolar transient capability is required, two low-capacitance TAZ must be used in parallel, opposite in polarity for complete AC protection.

- 1500 WATTS OF PEAK PULSE POWER DISSIPATION AT 25°C AND 10 x 1000 μs
- AVAILABLE IN RANGES FROM 6.5-200V
- LOW CAPACITANCE AC SIGNAL PROTECTION



MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Less than 5 x 10^{-9} seconds
Operating and Storage temperatures: −65° to +175°C
Steady State power dissipation: 1.0 W
Repetition Rate (duty cycle): .01%

ELECTRICAL CHARACTERISTICS

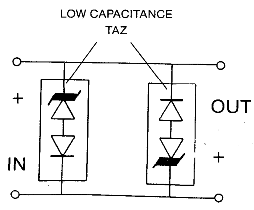
Clamping Factor: 1.4 @ Full Rated power
1.30 @ 50% Rated power

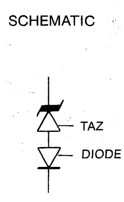
Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

NOTE: When pulse testing, test in Avalanche direction. DO NOT pulse in forward direction.

APPLICATION

Devices must be used with two units in parallel, opposite in polarity, as shown in circuit for AC Signal Line protection:





MECHANICAL CHARACTERISTICS

CASE: DO-13, welded, hermetically sealed metal and glass.

FINISH: All external surfaces are corrosion resistant and leads solderable.

POLARITY: Cathode connected to case and marked.

WEIGHT: 1.4 grams (Appx.)

MOUNTING POSITION: Any

LC6.5 thru LC170A

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ VOLTS Min.	Max.	@ I_T mA	MAXIMUM REVERSE LEAKAGE V_{WM} I_D μA	MAXIMUM CLAMPING VOLTAGE I_{PP} V_C VOLTS	MAXIMUM PEAK PULSE CURRENT 10 x 1000 AMPS	CAPACI-TANCE @ 0 VOLTS pF	V_{WIB} WORKING INVERSE BLOCKING VOLTAGE VOLTS	I_{IB} INVERSE BLOCKING LEAKAGE CURRENT μA	V_{PIB} PEAK INVERSE BLOCKING VOLTAGE VOLTS
LC6.5	6.5	7.22	8.82	10	1000	12.3	100	100	75	1	100
LC6.5A	6.5	7.22	7.98	10	1000	11.2	100	100	75	1	100
LC7.0	7.0	7.78	9.51	10	500	13.3	100	100	75	1	100
LC7.0A	7.0	7.78	8.60	10	500	12.0	100	100	75	1	100
LC7.5	7.5	8.33	10.2	10	250	14.3	100	100	75	1	100
LC7.5A	7.5	8.33	9.21	10	250	12.9	100	100	75	1	100
LC8.0	8.0	8.89	10.9	1	100	15.0	100	100	75	1	100
LC8.0A	8.0	8.89	9.83	1	100	13.6	100	100	75	1	100
LC8.5	8.5	9.44	11.5	1	50	15.9	94	100	75	1	100
LC8.5A	8.5	9.44	10.4	1	50	14.4	100	100	75	1	100
LC9.0	9.0	10.0	12.2	1	10	16.9	89	100	75	1	100
LC9.0A	9.0	10.0	11.1	1	10	15.4	97	100	75	1	100
LC10	10	11.1	13.6	1	5	18.8	80	100	75	1	100
LC10A	10	11.1	12.3	1	5	17.0	88	100	75	1	100
LC11	11	12.2	14.9	1	5	20.1	74	100	75	1	100
LC11A	11	12.2	13.5	1	5	18.2	82	100	75	1	100
LC12	12	13.3	16.3	1	5	22.0	68	100	75	1	100
LC12A	12	13.3	14.7	1	5	19.9	75	100	75	1	100
LC13	13	14.4	17.6	1	5	23.8	63	100	75	1	100
LC13A	13	14.4	15.9	1	5	21.5	70	100	75	1	100
LC14	14	15.6	19.1	1	5	25.8	58	100	75	1	100
LC14A	14	15.6	17.2	1	5	23.2	65	100	75	1	100
LC15	15	16.7	20.4	1	5	26.9	56	100	75	1	100
LC15A	15	16.7	18.5	1	5	24.4	61	100	75	1	100
LC16	16	17.8	21.8	1	5	28.8	52	100	75	1	100
LC16A	16	17.8	19.7	1	5	26.0	57	100	75	1	100
LC17	17	18.9	23.1	1	5	30.5	49	100	75	1	100
LC17A	17	18.9	20.9	1	5	27.6	54	100	75	1	100
LC18	18	20.0	24.4	1	5	32.2	46	100	75	1	100
LC18A	18	20.0	22.1	1	5	[illegible]	51	100	75	1	100
LC20	20	22.2	27.1	1	5	35.8	42	100	75	1	100
LC20A	20	22.2	24.5	1	5	32.4	46	100	75	1	100
LC22	22	24.4	29.8	1	5	39.4	38	100	75	1	100
LC22A	22	24.4	26.9	1	5	35.5	42	100	75	1	100
LC24	24	26.7	32.6	1	5	43.0	35	100	75	1	100
LC24A	24	26.7	29.5	1	5	38.9	39	100	75	1	100
LC26	26	28.9	35.3	1	5	46.6	32	100	75	1	100
LC26A	26	28.9	31.9	1	5	42.1	36	100	75	1	100
LC28	28	31.1	38.0	1	5	50.1	30	100	75	1	100
LC28A	28	31.1	34.4	1	5	45.4	33	100	75	1	100
LC30	30	33.3	40.7	1	5	53.5	28	100	75	1	100
LC30A	30	33.3	36.8	1	5	48.4	31	100	75	1	100
LC33	33	36.7	44.9	1	5	58.0	25.4	100	75	1	100
LC33A	33	36.7	40.6	1	5	53.3	28.1	100	75	1	100
LC36	36	40.0	48.9	1	5	64.3	23.3	100	75	1	100
LC36A	36	40.0	44.2	1	5	58.1	25.8	100	75	1	100
LC40	40	44.4	54.3	1	5	71.4	21.0	100	75	1	100
LC40A	40	44.4	49.1	1	5	64.5	23.3	100	75	1	100
LC43	43	47.8	58.4	1	5	76.7	19.5	100	150	1	200
LC43A	43	47.8	52.8	1	5	69.4	21.6	100	150	1	200
LC45	45	50.0	61.1	1	5	80.3	18.7	100	150	1	200
LC45A	45	50.0	55.3	1	5	72.7	20.6	100	150	1	200
LC48	48	53.3	65.1	1	5	85.5	17.5	100	150	1	200
LC48A	48	53.3	58.9	1	5	77.4	19.4	100	150	1	200
LC51	51	56.7	69.3	1	5	91.1	16.5	100	150	1	200
LC51A	51	56.7	62.7	1	5	82.4	18.2	100	150	1	200
LC54	54	60.0	73.3	1	5	96.3	15.6	100	150	1	200
LC54A	54	60.0	66.3	1	5	87.1	17.2	100	150	1	200
LC58	58	64.4	78.7	1	5	103.0	14.6	100	150	1	200
LC58A	58	64.4	71.2	1	5	93.6	16.0	100	150	1	200
LC60	60	66.7	81.5	1	5	107.0	14.0	90	150	1	200
LC60A	60	66.7	73.7	1	5	96.8	15.5	90	150	1	200
LC64	64	71.1	86.9	1	5	114.0	13.2	90	150	1	200
LC64A	64	71.1	78.6	1	5	103.0	14.6	90	150	1	200
LC70	70	77.8	95.1	1	5	125	12.0	90	150	1	200
LC70A	70	77.8	86.0	1	5	113	13.3	90	150	1	200
LC75	75	83.3	102.0	1	5	134	11.2	90	150	1	200
LC75A	75	83.3	92.1	1	5	121	12.4	90	150	1	200
LC80	80	88.7	108	1	5	142	10.6	90	150	1	200
LC80A	80	88.7	98.0	1	5	129	11.6	90	150	1	200
LC90	90	100	122	1	5	160	9.4	90	300	1	200
LC90A	90	100	111	1	5	146	10.3	90	300	1	200
LC100	100	111	136	1	5	179	8.4	90	300	1	200
LC100A	100	111	123	1	5	162	9.3	90	300	1	200
LC110	110	122	149	1	5	196	7.7	90	300	1	400
LC110A	110	122	135	1	5	178	8.4	90	300	1	400
LC120	120	133	163	1	5	214	7.0	90	300	1	400
LC120A	120	133	147	1	5	193	7.8	90	300	1	400
LC130	130	144	176	1	5	231	6.5	90	300	1	400
LC130A	130	144	159	1	5	209	7.2	90	300	1	400
LC150	150	167	204	1	5	268	5.6	90	300	1	400
LC150A	150	167	185	1	5	243	6.2	90	300	1	400
LC160	160	178	218	1	5	287	5.2	90	300	1	400
LC160A	160	178	197	1	5	259	5.8	90	300	1	400
LC170	170	189	231	1	5	304	4.9	90	300	1	400
LC170A	170	189	209	1	5	275	5.4	90	300	1	400

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

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LCE6.5 thru LCE170A LOW CAPACITANCE

TRANSIENT ABSORPTION ZENER

4

FEATURES

This series employs a standard TAZ in series with a rectifier with the same transient capabilities as the TAZ. The rectifier is also used to reduce the effective capacitance up thru 100 MHz with a minimum amount of signal loss or deformation. The low-capacitance TAZ may be applied directly across the signal line to prevent induced transients from lightning, power interruptions, or static discharge. If bipolar transient capability is required, two low-capacitance TAZ must be used in parallel, opposite in polarity for complete AC protection.

- **1500 WATTS OF PEAK PULSE POWER DISSIPATION AT 25°C AND 10 x 1000 μs**
- **AVAILABLE IN RANGES FROM 6.5—200V**
- **LOW CAPACITANCE AC SIGNAL PROTECTION**

MAXIMUM RATINGS

1500 Watts of Peak Pulse Power dissipation at 25°C
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): Less than 5 x 10^{-9} seconds
Operating and Storage temperatures: -65° to +175°C
Steady State power dissipation: 5.0W @ T_L = 75°C
Lead Length = 3/8″
Repetition Rate (duty cycle): .05%

ELECTRICAL CHARACTERISTICS

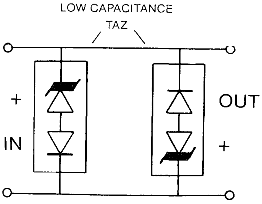
Clamping Factor: 1.4 @ Full Rated power
1.30 @ 50% Rated power

Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the actual $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

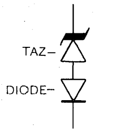
NOTE: When pulse testing, test in TAZ Avalanche direction. DO NOT pulse in forward direction.

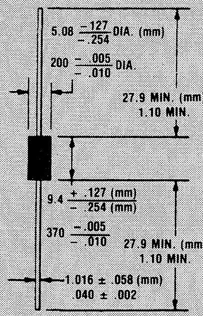
APPLICATION

Devices must be used with two units in parallel, opposite in polarity, as shown in circuit for AC Signal Line protection:



SCHEMATIC





MECHANICAL CHARACTERISTICS

CASE: Void free transfer molded thermosetting plastic.

FINISH: Silver plated copper readily solderable.

POLARITY: Cathode marked with band.

WEIGHT: 1.5 grams (Appx.).

MOUNTING POSITION: Any.

LCE6.5 thru LCE170A

ELECTRICAL CHARACTERISTICS @ 25°C

MICRO-SEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ VOLTS Min.	Max.	@ I_T mA	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA	MAXIMUM CLAMPING VOLTAGE I_{PP} V_C VOLTS	MAXIMUM PEAK PULSE CURRENT 10 x 1000 AMPS	CAPACI-TANCE @ 0 VOLTS pF	V_{WIB} WORKING INVERSE BLOCKING VOLTAGE VOLTS	I_{IB} INVERSE BLOCKING LEAKAGE CURRENT μA	V_{PIB} PEAK INVERSE BLOCKING VOLTAGE VOLTS
LCE6.5	6.5	7.22	8.82	10	1000	12.3	100	100	75	1	100
LCE6.5A	6.5	7.22	7.98	10	1000	11.2	100	100	75	1	100
LCE7.0	7.0	7.78	9.51	10	500	13.3	100	100	75	1	100
LCE7.0A	7.0	7.78	8.60	10	500	12.0	100	100	75	1	100
LCE7.5	7.5	8.33	10.2	10	250	14.3	100	100	75	1	100
LCE7.5A	7.5	8.33	9.21	10	250	12.9	100	100	75	1	100
LCE8.0	8.0	8.89	10.9	1	100	15.0	100	100	75	1	100
LCE8.0A	8.0	8.89	9.83	1	100	13.6	100	100	75	1	100
LCE8.5	8.5	9.44	11.5	1	50	15.9	94	100	75	1	100
LCE8.5A	8.5	9.44	10.4	1	50	14.4	100	100	75	1	100
LCE9.0	9.0	10.0	12.2	1	10	16.9	89	100	75	1	100
LCE9.0A	9.0	10.0	11.1	1	10	15.4	97	100	75	1	100
LCE10	10	11.1	13.6	1	5	18.8	80	100	75	1	100
LCE10A	10	11.1	12.3	1	5	17.0	88	100	75	1	100
LCE11	11	12.2	14.9	1	5	20.1	74	100	75	1	100
LCE11A	11	12.2	13.5	1	5	18.2	82	100	75	1	100
LCE12	12	13.3	16.3	1	5	22.0	68	100	75	1	100
LCE12A	12	13.3	14.7	1	5	19.9	75	100	75	1	100
LCE13	13	14.4	17.6	1	5	23.8	63	100	75	1	100
LCE13A	13	14.4	15.9	1	5	21.5	70	100	75	1	100
LCE14	14	15.6	19.1	1	5	25.8	58	100	75	1	100
LCE14A	14	15.6	17.2	1	5	23.2	65	100	75	1	100
LCE15	15	16.7	20.4	1	5	26.9	56	100	75	1	100
LCE15A	15	16.7	18.5	1	5	24.4	61	100	75	1	100
LCE16	16	17.8	21.8	1	5	28.8	52	100	75	1	100
LCE16A	16	17.8	19.7	1	5	26.0	57	100	75	1	100
LCE17	17	18.9	23.1	1	5	30.5	49	100	75	1	100
LCE17A	17	18.9	20.9	1	5	27.6	54	100	75	1	100
LCE18	18	20.0	24.4	1	5	32.2	46	100	75	1	100
LCE18A	18	20.0	22.1	1	5	29.2	51	100	75	1	100
LCE20	20	22.2	27.1	1	5	35.8	42	100	75	1	100
LCE20A	20	22.2	24.5	1	5	32.4	46	100	75	1	100
LCE22	22	24.4	29.8	1	5	39.4	38	100	75	1	100
LCE22A	22	24.4	26.9	1	5	35.5	42	100	75	1	100
LCE24	24	26.7	32.6	1	5	43.0	35	100	75	1	100
LCE24A	24	26.7	29.5	1	5	38.9	39	100	75	1	100
LCE26	26	28.9	35.3	1	5	46.6	32	100	75	1	100
LCE26A	26	28.9	31.9	1	5	42.1	36	100	75	1	100
LCE28	28	31.1	38.0	1	5	50.1	30	100	75	1	100
LCE28A	28	31.1	34.4	1	5	45.5	33	100	75	1	100
LCE30	30	33.3	40.7	1	5	53.5	28	100	75	1	100
LCE30A	30	33.3	36.8	1	5	48.4	31	100	75	1	100
LCE33	33	36.7	44.9	1	5	59.0	25.4	100	75	1	100
LCE33A	33	36.7	40.6	1	5	53.3	28.1	100	75	1	100
LCE36	36	40.0	48.9	1	5	64.3	23.3	100	75	1	100
LCE36A	36	40.0	44.2	1	5	58.1	25.8	100	75	1	100
LCE40	40	44.4	54.3	1	5	71.4	21.0	100	75	1	100
LCE40A	40	44.4	49.1	1	5	64.5	23.3	100	75	1	100
LCE43	43	47.8	58.4	1	5	76.7	19.5	100	150	1	200
LCE43A	43	47.8	52.8	1	5	69.4	21.6	100	150	1	200
LCE45	45	50.0	61.1	1	5	80.3	18.7	100	150	1	200
LCE45A	45	50.0	55.3	1	5	72.7	20.6	100	150	1	200
LCE48	48	53.3	65.1	1	5	85.5	17.5	100	150	1	200
LCE48A	48	53.3	58.9	1	5	77.4	19.4	100	150	1	200
LCE51	51	56.7	69.3	1	5	91.1	16.5	100	150	1	200
LCE51A	51	56.7	62.7	1	5	82.4	18.2	100	150	1	200
LCE54	54	60.0	73.3	1	5	96.3	15.6	100	150	1	200
LCE54A	54	60.0	66.3	1	5	87.1	17.2	100	150	1	200
LCE58	58	64.4	78.7	1	5	103.0	14.6	100	150	1	200
LCE58A	58	64.4	71.2	1	5	93.6	16.0	100	150	1	200
LCE60	60	66.7	81.5	1	5	107.0	14.0	90	150	1	200
LCE60A	60	66.7	73.7	1	5	96.8	15.5	90	150	1	200
LCE64	64	71.1	86.9	1	5	114.0	13.2	90	150	1	200
LCE64A	64	71.1	78.6	1	5	103.0	14.6	90	150	1	200
LCE70	70	77.8	95.1	1	5	125	12.0	90	150	1	200
LCE70A	70	77.8	86.0	1	5	113	13.3	90	150	1	200
LCE75	75	83.3	102.0	1	5	134	11.2	90	150	1	200
LCE75A	75	83.3	92.1	1	5	121	12.4	90	150	1	200
LCE80	80	88.7	108	1	5	142	10.6	90	150	1	200
LCE80A	80	88.7	98.0	1	5	129	11.6	90	150	1	200
LCE90	90	100	122	1	5	160	9.4	90	300	1	200
LCE90A	90	100	111	1	5	146	10.3	90	300	1	200
LCE100	100	111	136	1	5	179	8.4	90	300	1	200
LCE100A	100	111	123	1	5	162	9.3	90	300	1	200
LCE110	110	122	149	1	5	196	7.7	90	300	1	400
LCE110A	110	122	135	1	5	178	8.4	90	300	1	400
LCE120	120	133	163	1	5	214	7.0	90	300	1	400
LCE120A	120	133	147	1	5	193	7.8	90	300	1	400
LCE130	130	144	176	1	5	231	6.5	90	300	1	400
LCE130A	130	144	159	1	5	209	7.2	90	300	1	400
LCE150	150	167	204	1	5	268	5.6	90	300	1	400
LCE150A	150	167	185	1	5	243	6.2	90	300	1	400
LCE160	160	178	218	1	5	287	5.2	90	300	1	400
LCE160A	160	178	197	1	5	259	5.8	90	300	1	400
LCE170	170	189	231	1	5	304	4.9	90	300	1	400
LCE170A	170	189	209	1	5	275	5.4	90	300	1	400

NOTE 1: TAZ are normally selected according to the reverse "Stand Off Voltage (V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

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For more information call:
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LDTS 14 thru LDTS48A

TRANSIENT ABSORPTION ZENER

FEATURES

This series is used in automotive and vehicular applications where load-dump and field decay transients occur. The LDTS protects across-the-line dc power systems from Load Dump and Field Decay Voltage Transient Susceptibility on Power Leads.

- DESIGNED FOR DC POWER APPLICATIONS
- LOW CLAMPING RATIO

MAXIMUM RATINGS

3000 Watts of Peak Pulse Power dissipation at 50ms (see Figure 1)
$t_{clamping}$ (0 volts to $V_{(BR)}$ min.): Less than 1 x 10^{-12} seconds (theoretical)
Storage temperature: -50°C to +200°C
Operating temperature: -50° to +175°C (Figure 3)
Forward surge rating: 200 amps, 8.3ms at 25°C
Steady state power dissipation: 50 watts, T_C = 25°C
Repetition Rate (duty cycle): 0.1%

LDTS 14 Series - Designed for a standard 12 volt power system.

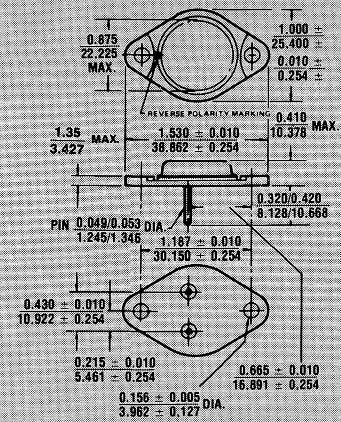
LDTS 24 Series - Designed for a standard 12 volt power system capable of sustaining a 24 volt (double voltage) jump start.

LDTS 30 Series - Designed for a standard 24 volt power system.

LDTS 48 Series - Designed for a standard 24 volt power system capable of sustaining a 48 volt (double voltage) jump start.

ELECTRICAL CHARACTERISTICS

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE $V_{(BR)}$ @ 20mA VOLTS	MAXIMUM CLAMPING VOLTAGE @I_{pp} V_C VOLTS	MAXIMUM SURGE CURRENT (FIG.2) @I_{pp} AMPS	MAXIMUM REVERSE LEAKAGE V_{WM} ID μAMPS	MAXIMUM VOLTAGE TEMP. Variation V_{BR} mV/C
LDTS 14	14.0	16.0	26.0	115.5	100.0	19.0
LDTS 14A	14.0	16.0	23.5	128.0	100.0	17.0
LDTS 24	24.0	26.5	43.0	70.0	100.0	31.0
LDTS 24A	24.0	26.5	39.0	77.0	100.0	29.0
LDTS 30	30.0	33.0	54.0	56.0	100.0	39.0
LDTS 30A	30.0	33.0	48.5	62.0	100.0	36.0
LDTS 48	48.0	53.0	86.0	34.0	100.0	55.0
LDTS 48A	48.0	53.0	78.0	38.0	100.0	50.0



All dimensions in INCH/m.m. **FIGURE 1**

MECHANICAL CHARACTERISTICS

CASE: Industry standard TO-3 hermetically sealed, .052 inch diameter pins.

FINISH: All external surfaces are corrosion resistant and terminals solderable.

POLARITY: Standard polarity anode to case.

WEIGHT: 15 grams (Appx.).

MOUNTING HARDWARE: See page 41.

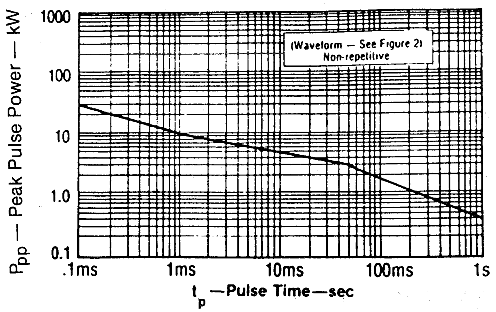
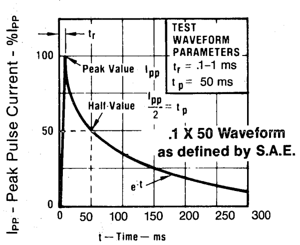


FIGURE 1
PEAK PULSE POWER
VS. PULSE TIME @ 25°C



Pulse Wave Form (.1 X 50)

FIGURE 2
SURGE WAVEFORM

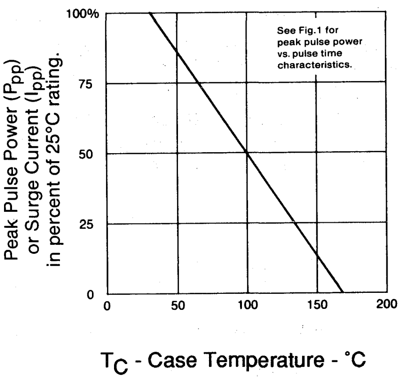
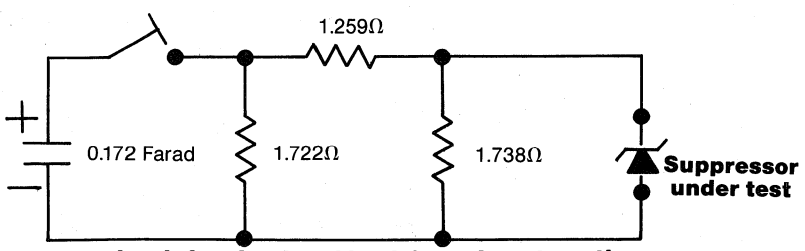


FIGURE 3
DERATING CURVE



Test circuit for simulated load dump in automotive and similar electrical applications.

FIGURE 4

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BIDIRECTIONAL VARISTOR MSV SERIES

FEATURES

The MSV series consists of a matched set of silicon junctions configurated for bidirectional application. They can be used in telephone equipment, replacing: copper oxide varistors, fractional voltage regulators, negative temperature coefficient resistors, signal limiters and expanders. They are ideally suited for: meter/galvanometer protection, wave shaping, threshold limiters and zener diode compensation. Non-standard voltages are also available.

The MSV varistor is a PN junction device configurated with two parallel-connected, matched, bidirectional, highly reliable silicon diodes. It is a two-electrode device with a voltage-dependent nonlinear resistance that drops markedly as the applied voltage is increased.

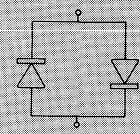
MSV devices are designed for controlled protection at various current levels and are rated at 70 amps peak pulse current.

These varistors are supplied in Microsemi's exclusive, cost-effective, highly reliable, molded axial leaded package.

MAXIMUM RATINGS

Steady State Power: 1.0 Watt at 50°C
Operating and Storage Temperatures: -65° to +175°C
Surge: 30 Amps, 8.4 ms @ 25°C
70 Amps, 1.0 ms @ 25°C
$t_{clamping}$ (0 volts to BV min.): less than $1x10^{-8}$ seconds (theoretical)

SCHEMATIC



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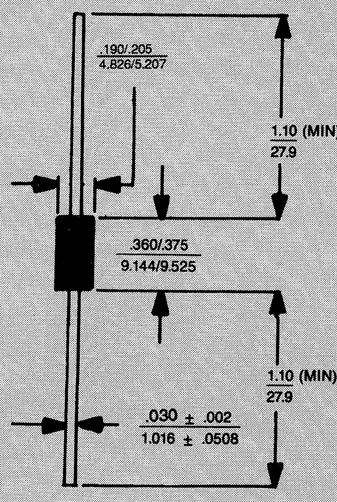


dimensions: inches / mm

MECHANICAL CHARACTERISTICS

CASE: Void free molded thermosetting plastic. (DO-201AA)

FINISH: Silver plated CCFE readily solderable.

POLARITY: Bidirectional.

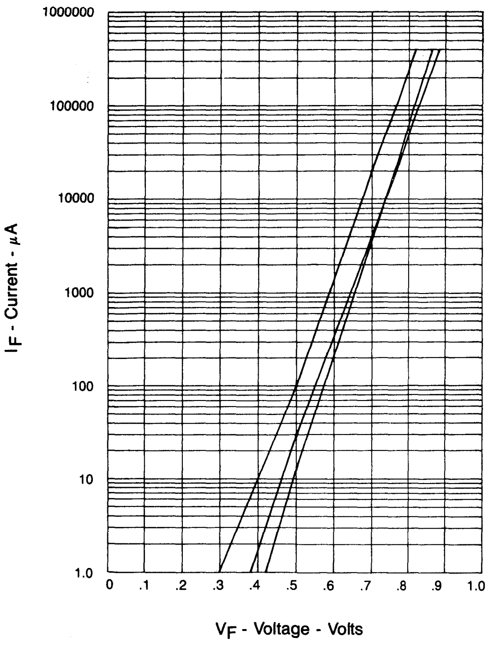
WEIGHT: 1.5 grams. (Appx.).

MOUNTING POSITION: Any.

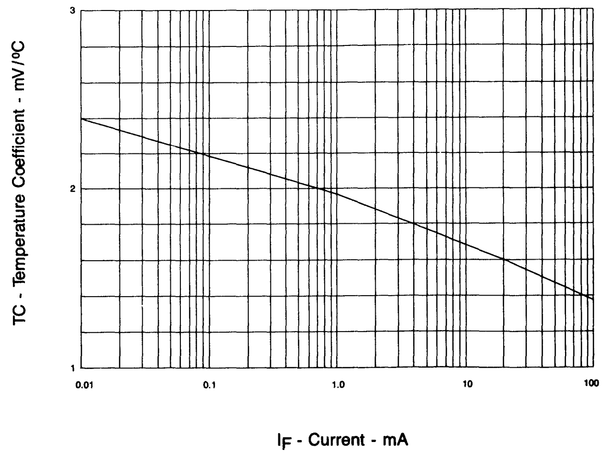
MSV SERIES

ELECTRICAL CHARACTERISTICS at 25°C (Test Both Polarities).

MICROSEMI PART NUMBER	SYMBOL	CONDITIONS	LIMITS Minimum	LIMITS Maximum	UNITS
MSV 101	V_F	10.0μA	.35	.50	Vdc
	V_F	100.0mA	.74	.85	Vdc
MSV 102	V_F	100.0mA	.74	.85	Vdc
	I_F	0.2V		.10	μA
MSV 103	V_F	1.0μA	.30	.45	Vdc
	V_F	10.0μA	.40	.50	Vdc
	V_F	100.0μA	.48	.58	Vdc
	V_F	1.0mA	.56	.66	Vdc
	V_F	10.0mA	.65	.74	Vdc
	V_F	100.0mA	.75	.82	Vdc
MSV 201	V_F	20μA	.70	1.00	Vdc
	V_F	100.0mA	1.48	1.70	Vdc



Range Curve
Current - Voltage for MSV Varistor
(Typical Curves for the MSV 103)



Ambient Temperature Coefficient
Of Voltage vs. Varistor Current

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MSV101A thru MSV101G and MSV201A thru MSV701A

BIDIRECTIONAL VARISTORS

Features

The MSV series consists of a matched set of silicon junctions configured for bidirectional application. They can be used in telephone equipment, replacing: copper oxide varistors, fractional voltage regulators, negative temperature coefficient resistors, signal limiters and expanders. They are ideally suited for: meter/galvanometer protection, wave shaping, threshold limiters and zener diode compensation.

The MSV varistor uses two anti-parallel, matched, silicon diodes in a two-electrode device configuration with a voltage-dependent nonlinear resistance that drops markedly as the applied voltage is increased.

MSV devices are designed for controlled protection at various current levels and are rated at various peak pulse currents.

These varistors are supplied in Microsemi's cost-effective, highly reliable, molded axial leaded package. Non-standard voltages are available. Devices in this series with V_{C2} clamping are rated to U.L.497B requirements. (See table.)

Maximum Ratings

Steady State Power: 1.0 Watt at 50°C
Operating and Storage Temperatures: -65°C to +175°C
Surge: 30 Amps, 8.4 ms @ 25°C
Pulse: 1.0 ms @ 25°C for V_{C1} clamping*
$t_{clamping}$ (0 volts to V_{BR} min.): less than 1×10^{-8} seconds (theoretical)

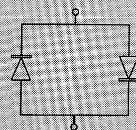
Electrical Characteristics at 25°C (Test Both Polarities)

MICROSEMI PART NUMBER	V_{BR} at I_{BR} Vdc / µA Minimum	V_{BR} at I_{BR} Vdc / mAdc Maximum	V_{CI} at I_{PP}* V / A Maximum	C_J at zero volts f = 1 MHz pF Maximum	V_{C2} ** V Maximum
MSV101A	.05 / 10 .14 / 100	- .51 / 1,000	- -	200	-
MSV101B	.05 / 10 .14 / 100	- .66 / 1,000	- -	200	-
MSV101C	.05 / 10 .14 / 100	- .50 / 1,000	- -	200	-
MSV101D	.43 / 100 .56 / 1,000	.72 / 10 -	1.5 / 50	1500	3.8
MSV101E	.43 / 100 .56 / 1,000	.90 / 100 -	1.5 / 50	1500	3.8
MSV101F	.02 / 10 .56 / 1,000	.90 / 100 -	1.5 / 50	1500	3.8
MSV101G	.20 / 10 .56 / 1,000	.90 / 100 -	1.5 / 50	1500	3.8
MSV201A	.86 / 100 1.10 / 1,000	1.48 / 10 -	3.0 / 45	750	4.4
MSV301A	1.60 / 1,000	2.40 / 50	4.5 / 40	500	5.4
MSV401A	1.72 / 100 2.20 / 1,000	2.92 / 10 -	4.5 / 35	400	6.4
MSV401B	1.30 / 10 2.20 / 1,000	2.92 / 10 -	5.5 / 35	400	6.4
MSV401C	2.20 / 1,000	3.10 / 50	5.5 / 35	400	6.4
MSV501A	1.70 / 10 2.80 / 1,000	5.00 / 100 -	6.5 / 30	300	7.4
MSV601A	3.00 / 100 3.40 / 1,000	4.60 / 100 -	8.0 / 30	250	8.4
MSV701A	3.70 / 100 3.90 / 1,000	5.00 / 5.0 -	9.0 / 30	220	9.4

* Conditions: Pulse is 10 x 1000 µs waveshape
- 10 µs rise, 1000 µs triangle fall to 1/2 amplitude.
- Voltage limits measured at I_{PP} peak pulse current.

** Per U.L.497B with 100v / µs rise time.

SCHEMATIC



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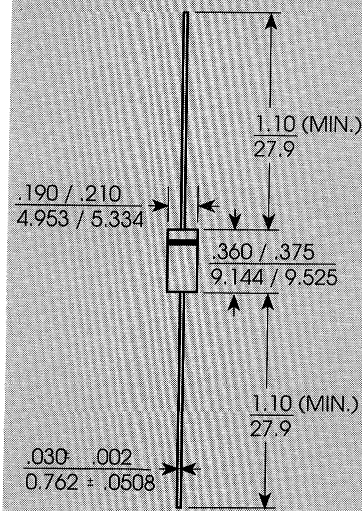
PACKAGE DIMENSIONS



Dimensions: inches / mm

Mechanical Characteristics

CASE: Void free molded thermosetting plastic.

FINISH: Plated CCFE readily solderable.

POLARITY: Bidirectional.

WEIGHT: 1.5 gram (Appx.)

MOUNTING POSITION: Any.

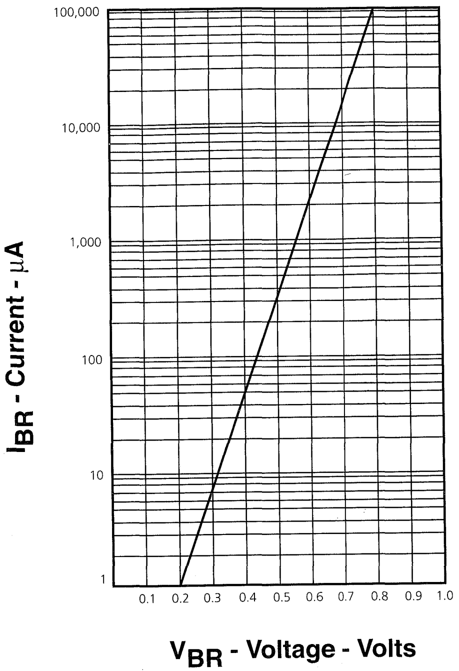


FIGURE 1

Typical Current versus Voltage †

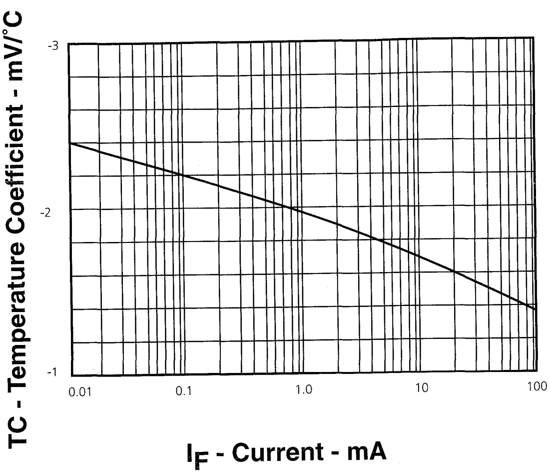


FIGURE 2

Temperature Coefficient of Voltage vs. Current †

(NOTE: TC is a negative value.)

† NOTE: Multiply applicable V_{BR} voltage or TC by 2 for MSV201, by 3 for MSV301, by 4 for MSV401, by 5 for MSV501, by 6 for MSV601, and by 7 for MSV701.

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PHP8.4 thru PHP500 and PIP8.4 thru PIP500

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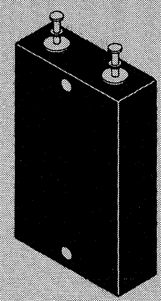


Case 11

FEATURES

- 7,500 AND 15,000 WATTS PEAK PULSE POWER DISSIPATION
- AVAILABLE IN RANGES FROM 8.4 TO 500 VOLTS
- EACH DEVICE IS 100% TESTED
- DESIGNED FOR MILITARY (PHP SERIES) AND COMMERCIAL (PIP SERIES)

PHP/PIP is designed for applications requiring "across the line" AC power protection. These TAZ modules are used in applications where extreme voltage transients can permanently damage voltage sensitive systems or components. These devices are most often used when discrete TAZ do not have high enough power requirements to suppress large power surges.

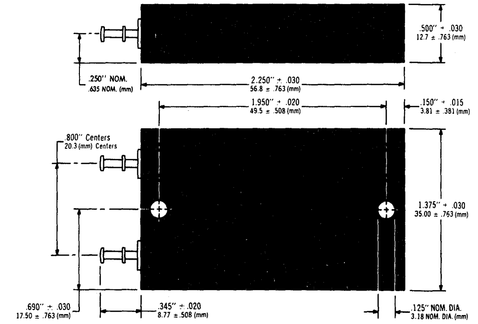
TAZ modules can be used to protect equipment from induced lightning, power surges and transients originating from inductive switching or power interrupt. The modules used for both commercial and military applications, including telecommunications, central office switching and PABX, CATV distribution, aircraft, shipboard, computers, distributed data processing and power supplies.

For military applications, the PHP module sub-assemblies are packaged in a hermetically sealed glass-to-metal package. Also available screened in accordance with MIL-S-19500/507. The PHP series modules can have design consistency with the following military requirements as controlling specifications:

- MIL-STD-1399, Section 300
- MIL-STD-704
- MIL-E-16400
- MIL-S-19500/507

MAXIMUM RATINGS

7,500 and 15,000 watts Peak Pulse power dissipation at the 1 msec pulse and 25°C (see derating curve)
Operating and Storage temperatures: -65° to +150°C
Average Steady State power dissipation at 50°C: 7.5 watts
$t_{clamping}$ (0 volts to BV): Less than 1×10^{-8} seconds



Case 11

MECHANICAL CHARACTERISTICS

CASE: Molded case.
TERMINAL: Silver plated brass.
POLARITY: Bidirectional.
WEIGHT: 50 grams (Appx.).
MOUNTING POSITION: Any.

MILITARY APPLICATIONS: PHP series sub-assemblies are packaged in a hermetically sealed glass-to-metal package, available with design consistency to MIL-S-19500/507.

COMMERCIAL APPLICATIONS: PIP series sub-assemblies are packaged in a molded epoxy case.

PHP8.4 thru PIP500

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	AVERAGE RMS VOLTAGE VOLTS AC	REVERSE STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS DC	MINIMUM BREAKDOWN VOLTAGE $V_{(BR)}$ @ It VOLTS	mA	MAXIMUM REVERSE LEAKAGE I_D @ V_{WM} MICRO AMPERES	MAXIMUM CLAMPING VOLTAGE V_C @ I_{PP} VOLTS DC	MAXIMUM PEAK PULSE CURRENT (FIG. 3) I_{PP} A	MAXIMUM PEAK PULSE POWER (I MSEC) P_p KILOWATTS
PHP8.4	8.4	12.0	14	10	250	22	341	7.5
PHP24	24.0	34.0	40	10	250	67	112	7.5
PHP 30	30.0	42.5	50	1.0	250	84	90	7.5
PHP 60	60.0	85.0	100	1.0	250	167	90	15.0
PHP 120*	120.0	170.0	200	1.0	250	319	47	15.0
PHP 208	208.0	295.0	347	1.0	250	536	28	15.0
PHP250*	250.0	354.0	418	1.0	250	652	23	15.0
PHP 440	440.0	623.0	735	1.0	250	1138	13.2	15.0
PHP 500*	500.0	708.0	835	1.0	250	1292	11.6	15.0

PIP 8.4	8.4	12.0	14	10	250	22	341	7.5
PIP 24	24.0	34.0	40	10	250	67	112	7.5
PIP 30	30.0	42.5	50	1.0	250	84	90	7.5
PIP 60	60.0	85.0	100	1.0	250	167	90	
PIP 120*	120.0	170.0	200	1.0	250	319	47	15.0
PIP 208	208.0	295.0	347	1.0	250	536	28	15.0
PIP 250*	250.0	354.0	418	1.0	250	652	23	15.0
PIP 440	440.0	623.0	735	1.0	250	1138	13.2	15.0
PIP 500*	500.0	708.0	835	1.0	250	1292	11.6	15.0

Special Voltages available from factory. *Recommended for marine applications.

NOTE 1: A TAZ is normally selected according to the reverse "Stand Off Voltage" (V_R) which should be equal to or greater than the DC or continuous peak operating voltage level.

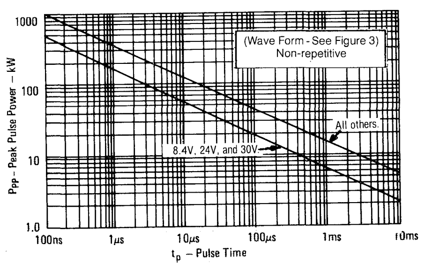


FIGURE 1
PEAK PULSE POWER
VS. PULSE TIME

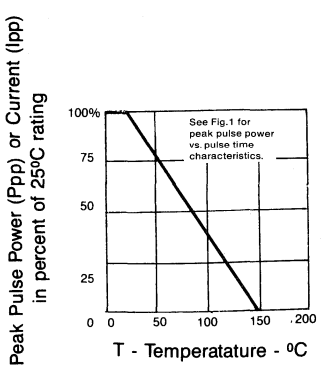
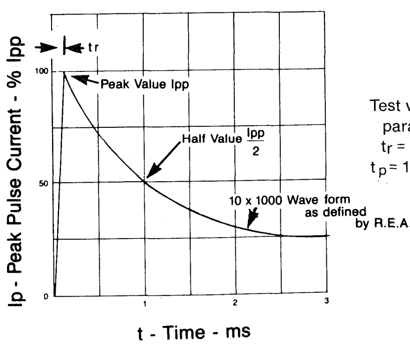


FIGURE 2
PULSE WAVEFORM

DERATING CURVE



Test waveform parameters
t_r = 10 μs
t_p = 1000 μs

FIGURE 3
PULSE WAVEFORM

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P4KE6.8 thru P4KE400

TRANSIENT ABSORPTION ZENER

Features

- ECONOMICAL SERIES
- AVAILABLE IN BOTH UNIDIRECTIONAL AND BIDIRECTIONAL CONSTRUCTION
- 6.8 TO 400 VOLTS AVAILABLE
- 400 WATTS PEAK PULSE POWER DISSIPATION
- QUICK RESPONSE

Maximum Ratings

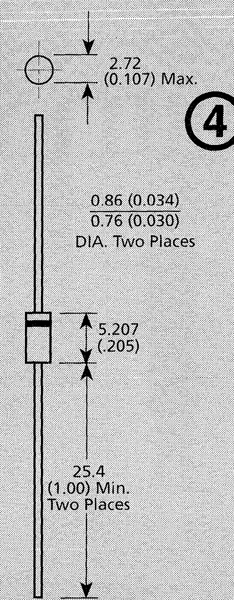
Peak Pulse Power Dissipation at 25°C: 400 Watts
Steady State Power Dissipation: 1.0 Watt at T_L = +75°C at 3/8" Lead Length
$t_{clamping}$ (0 volts to $V_{(BR)}$ Min.): Unidirectional < 1 x 10^{-12} seconds;
Bidirectional < 5 x 10^{-9} seconds.
Operating and Storage Temperature: -65° to +175°C

Application

This TAZ is an economical molded product frequently used for automotive applications to protect voltage sensitive components from destruction or partial degradation. The response time for unipolar clamping action is virtually instantaneous (1 x 10^{-12} seconds). They have a peak pulse power rating of 400 watts for 1 ms as depicted in Figures 1 and 2. Microsemi also offers various other TAZ devices to meet higher and lower power demands and special applications.

Electrical Characteristics at 25°C

TYPE NUMBER	RATED STAND-OFF VOLTAGE V_{WM}	BREAKDOWN VOLTAGE $V_{(BR)}$ MIN.	MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE V_C MAX. @I_{PP}	MAXIMUM REVERSE LEAKAGE CURRENT I_D @ V_{WM}	MAXIMUM PEAK PULSE CURRENT I_{PP}	MAXIMUM TEMPERATURE COEFFICIENT OF ∝ $V_{(BR)}$
	V	V_{DC}	V_{DC}		V	μADC	A	% / °C
P4KE6.8	5.50	6.12	7.48	10	10.8	500	37	.057
P4KE6.8A	5.80	6.45	7.14	10	10.5	500	38	.057
P4KE7.5	6.05	6.75	8.25	10	11.7	200	34	.061
P4KE7.5A	6.40	7.13	7.88	10	11.3	200	35	.061
P4KE8.2	6.63	7.38	9.02	10	12.5	100	32	.065
P4KE8.2A	7.02	7.79	8.61	10	12.1	100	33	.065
P4KE9.1	7.37	8.19	10.0	1	13.8	20	29	.068
P4KE9.1A	7.78	8.65	9.55	1	13.4	20	30	.068
P4KE10	8.10	9.00	11.0	1	15.0	20	27	.073
P4KE10A	8.55	9.50	10.5	1	14.5	5	28	.073
P4KE11	8.92	9.90	12.1	1	16.2	2	25	.075
P4KE11A	9.40	10.5	11.6	1	15.6	2	26	.075
P4KE12	9.72	10.8	13.2	1	17.3	2	23	.078
P4KE12A	10.2	11.4	12.6	1	16.7	2	24	.078
P4KE13	10.5	11.7	14.3	1	19.0	2	21	.081
P4KE13A	11.1	12.4	13.7	1	18.2	2	22	.081
P4KE15	12.1	13.5	16.5	1	22.0	2	18	.084
P4KE15A	12.8	14.3	15.8	1	21.2	2	19	.084
P4KE16	12.9	14.4	17.6	1	23.5	2	17	.086
P4KE16A	13.6	15.2	16.8	1	22.5	2	18	.086
P4KE18	14.5	16.2	19.8	1	26.5	2	15	.088
P4KE18A	15.3	17.1	18.0	1	25.2	2	16	.088
P4KE20	16.2	18.0	22.0	1	29.1	2	14	.090
P4KE20A	17.1	19.0	21.0	1	27.7	2	14.5	.090
P4KE22	17.8	19.8	24.2	1	31.9	2	12.5	.092
P4KE22A	18.8	20.9	23.1	1	30.6	2	13	.092
P4KE24	19.4	21.6	26.4	1	34.7	2	11.5	.094
P4KE24A	20.5	22.8	25.2	1	33.2	2	12	.094
P4KE27	21.8	24.3	29.7	1	39.1	2	10	.096
P4KE27A	23.1	25.7	28.4	1	37.5	2	11	.096
P4KE30	24.3	27.0	33.0	1	43.5	2	9.0	.097
P4KE30A	25.6	28.5	31.5	1	41.4	2	9.5	.097
P4KE33	26.8	29.7	36.3	1	47.7	2	8.5	.098
P4KE33A	28.2	31.4	34.7	1	45.7	2	9.0	.098
P4KE36	29.1	32.4	39.6	1	52.0	2	7.5	.099
P4KE36A	30.8	34.2	37.8	1	49.9	2	8.0	.099



NOTE: Cathode indicated by band.
All dimensions in millimeters (inches)

Mechanical Characteristics

CASE: Void Free Transfer Molded Thermosetting Plastic.

FINISH: Plated Copper Readily Solderable.

POLARITY: Band Denotes Cathode. Bidirectional Not Marked.

WEIGHT: 0.7 Gram (Appx.).

MOUNTING POSITION: Any.

P4KE6.8 thru P4KE400

Electrical Characteristics at 25°C

TYPE NUMBER	RATED STAND-OFF VOLTAGE V_{WM}	BREAKDOWN VOLTAGE $V_{(BR)}$ MIN.	BREAKDOWN VOLTAGE $V_{(BR)}$ MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE V_C MAX. @I_{PP}	MAXIMUM REVERSE LEAKAGE CURRENT I_D @ V_{WM}	MAXIMUM PEAK PULSE CURRENT I_{PP}	MAXIMUM TEMPERATURE COEFFICIENT OF ∝ $V_{(BR)}$
	V	V_{DC}	V_{DC}		V	µADC	A	% / °C
P4KE39	31.6	35.1	42.9	1	56.4	2	7.0	.100
P4KE39A	33.3	37.1	41.0	1	53.9	2	7.5	,100
P4KE43	34.8	38.7	47.3	1	61.9	2	6.5	.101
P4KE43A	36.8	40.9	45.2	1	59.3	2	7.0	.101
P4KE47	38.1	42.3	51.7	1	67.8	2	5.9	.101
P4KE47A	40.2	44.7	49.4	1	64.8	2	6.2	.101
P4KE51	41.3	45.9	56.1	1	73.5	2	5.4	.102
P4KE51A	43.6	48.5	53.6	1	70.1	2	5.7	.102
P4KE56	45.4	50.4	61.6	1	80.5	2	5.0	.103
P4KE56A	47.8	53.2	58.8	1	77.0	2	5.2	.103
P4KE62	50.2	55.8	68.2	1	89.0	2	4.5	.104
P4KE62A	53.0	58.9	65.1	1	85.0	2	4.7	.104
P4KE68	55.1	61.2	74.8	1	98.0	2	4.1	.104
P4KE68A	58.1	64.6	71.4	1	92.0	2	4.4	.104
P4KE75	60.7	67.5	82.5	1	108.0	2	3.7	.105
P4KE75A	64.1	71.3	78.8	1	103.0	2	3.9	.105
P4KE82	66.4	73.8	90.2	1	118.0	2	3.4	.105
P4KE82A	70.1	77.9	86.1	1	113.0	2	3.5	.105
P4KE91	73.7	81.9	100.0	1	131.0	2	3.1	.106
P4KE91A	77.8	86.5	95.5	1	125.0	2	3.2	.106
P4KE100	81.0	90.0	110.0	1	144.0	2	2.8	.106
P4KE100A	85.5	95.0	105.0	1	137.0	2	2.9	.106
P4KE110	89.2	99.0	121.0	1	158.0	2	2.5	.107
P4KE110A	94.0	105.0	116.0	1	152.0	2	2.6	.107
P4KE120	97.2	108.0	132.0	1	173.0	2	2.3	.107
P4KE120A	102.0	114.0	126.0	1	165.0	2	2.4	.107
P4KE130	105.0	117.0	143.0	1	187.0	2	2.1	.107
P4KE130A	111.0	124.0	137.0	1	179.0	2	2.2	.107
P4KE150	121.0	135.0	165.0	1	215.0	2	1.9	.108
P4KE150A	128.0	143.0	158.0	1	207.0	2	1.95	.108
P4KE160	130.0	144.0	176.0	1	230.0	2	1.7	.108
P4KE160A	136.0	152.0	168.0	1	219.0	2	1.8	.108
P4KE170	138.0	153.0	187.0	1	244.0	2	1.6	.108
P4KE170A	145.0	162.0	179.0	1	234.0	2	1.7	.108
P4KE180	146.0	162.0	198.0	1	258.0	2	1.5	.108
P4KE180A	154.0	171.0	189.0	1	246.0	2	1.6	.108
P4KE200	162.0	180.0	220.0	1	287.0	2	1.4	.108
P4KE200A	171.0	190.0	210.0	1	274.0	2	1.5	.108
P4KE220	175.0	198.0	242.0	1	344.0	2	1.0	.110
P4KE220A	185.0	209.0	231.0	1	328.0	2	1.0	.110
P4KE250	202.0	225.0	275.0	1	360.0	2	1.0	.110
P4KE250A	214.0	237.0	263.0	1	344.0	2	1.0	.110
P4KE300	243.0	270.0	330.0	1	430.0	2	1.0	.110
P4KE300A	256.0	285.0	315.0	1	414.0	2	1.0	.110
P4KE350	284.0	315.0	385.0	1	504.0	2	1.0	.110
P4KE350A	300.0	333.0	368.0	1	482.0	2	1.0	.110
P4KE400	324.0	360.0	440.0	1	574.0	2	1.0	.110
P4KE400A	342.0	380.0	420.0	1	548.0	2	1.0	.110

Forward Voltage (V_f) @ 30 amps peak, 8.3 ms sine wave equal to 3.5 volts maximum for P4KE6.8 to 200. (Excluding Bidirectional)
For bidirectional construction, indicate a C or CA suffix after part number, i.e. P4KE170CA.

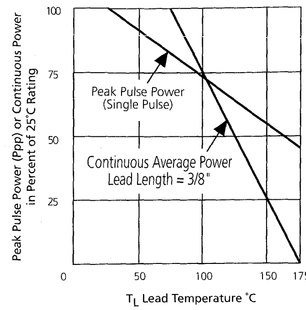


FIGURE 1
Derating Curve

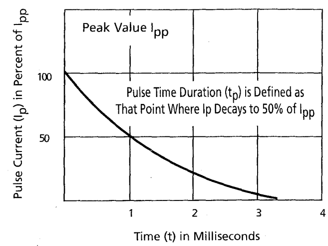


FIGURE 2
Pulse Waveform For Exponential Surge

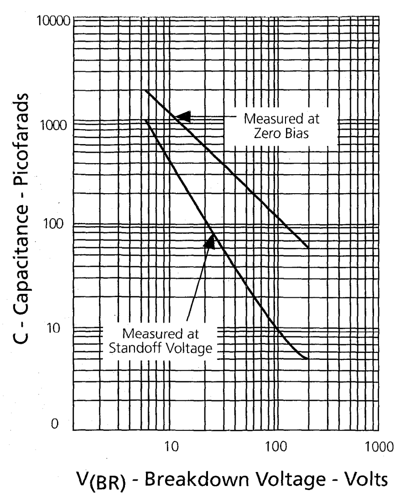


FIGURE 3
P4KE Typical Capacitance vs Breakdown Voltage (Unipolar)

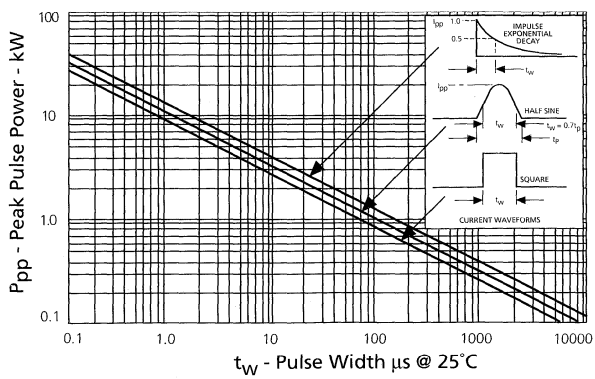


FIGURE 4
Peak Pulse Power vs Pulse Time

Symbols and Abbreviations

V_{WM} = Rated Stand-Off Voltage
P_{PP} = Peak Pulse Power
$V_{(BR)}$ = Breakdown Voltage
I_D = Reverse Leakage
I_{PP} = Peak Pulse Current
$V_{C\,(MAX)}$ = Maximum Clamping Voltage
I_T = Test Current

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P5KE5.0 thru P5KE170

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FEATURES

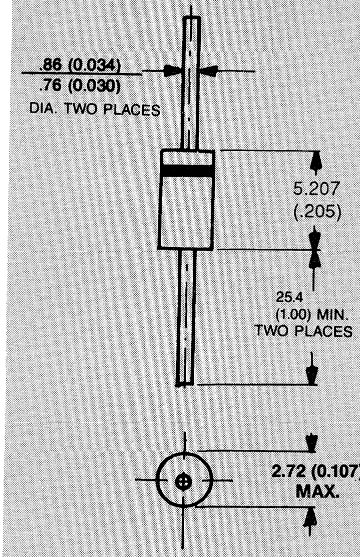
- ECONOMICAL SERIES
- AVAILABLE IN BOTH UNIDIRECTIONAL AND BIDIRECTIONAL CONSTRUCTION
- 5.0 TO 170 STAND-OFF VOLTS AVAILABLE
- 500 WATTS PEAK PULSE POWER DISSIPATION
- QUICK RESPONSE

MAXIMUM RATINGS

Peak Pulse Power Dissipation at 25°C: 500 Watts
Steady State Power Dissipation: 2.5 Watts at T_L = +75°C
3/8″ Lead Length
$t_{clamping}$ (0 Volts to BV Min.):
Unidirectional < $1x10^{-12}$ Seconds; Bidirectional < $5x10^{-9}$ Seconds.
Operating and Storage Temperature: -65° to +175°C

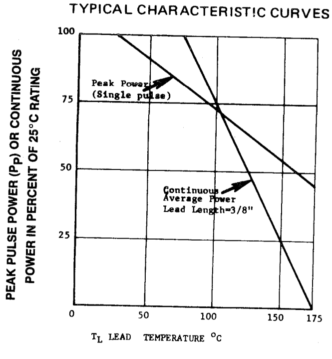
APPLICATION

This TAZ is an economical, molded, commercial product used to protect voltage-sensitive components from destruction or partial degradation. The response time of their clamping action is virtually instantaneous (1 x 10^{-12} seconds) and they have a peak pulse power rating of 500 watts for 1 ms as depicted in Figure 1 and 2. Microsemi also offers various varieties of TAZ to meet higher and lower power demands and special applications.



Cathode Indicated by Band
All Dimensions in Millimeters (Inches)

TYPICAL CHARACTERISTIC CURVES



DERATING CURVE

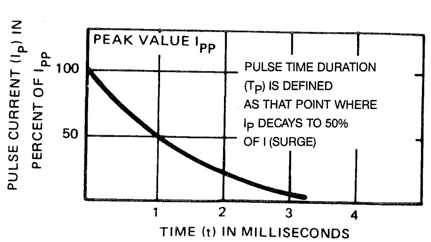


FIGURE 1
PULSE WAVEFORM FOR EXPONENTIAL SURGE

MECHANICAL CHARACTERISTICS

CASE: Void free transfer molded thermosetting plastic.
FINISH: Silver plated copper readily solderable.
POLARITY: Band denotes cathode. Bidirectional not marked.
WEIGHT: 0.7 gram (Appx.).
MOUNTING POSITION: Any.

P5KE5.0 thru P5KE170

ELECTRICAL CHARACTERISTICS at 25°C

PART NUMBER	BREAKDOWN VOLTAGE $V_{(BR)}$ MIN.	BREAKDOWN VOLTAGE $V_{(BR)}$ MAX.	TEST CURRENT I_T	RATED STAND OFF VOLTAGE V_{WM}	MAX. REVERSE LEAKAGE CURRENT I_D @ V_{WM}	MAX. PEAK REVERSE VOLTAGE V_C MAX. @ I_{PP}	MAX. PEAK PULSE CURRENT I_{PP}	MAX. TEMP. COEFFICIENT OF $V_{(BR)}$ (TA) -55°C TO 100°C α $V_{(BR)}$
	V_{DC}	V_{DC}	mADC	V	µADC	V	A	% / °C
P5KE5.0	6.4	7.3	10	5.0	600	9.6	52	.057
P5KE5.0A	6.4	7.0	10	5.0	600	9.2	54.3	.057
P5KE6.0	6.67	8.15	10	6.0	600	11.4	43.9	.059
P5KE6.0A	6.67	7.37	10	6.0	600	10.3	48.5	.059
P5KE6.5	7.22	8.82	10	6.5	400	12.3	40.7	.061
P5KE6.5A	7.22	7.98	10	6.5	400	11.2	44.7	.061
P5KE7.0	7.78	9.51	10	7.0	150	13.3	37.8	.065
P5KE7.0A	7.78	8.60	10	7.0	150	12.0	41.7	.065
P5KE7.5	8.33	10.2	1	7.5	50	14.3	35.0	.067
P5KE7.5A	8.33	9.21	1	7.5	50	12.9	38.8	.067
P5KE8.0	8.89	10.9	1	8.0	25	15.0	33.3	.070
P5KE8.0A	8.89	9.83	1	8.0	25	13.6	36.7	.070
P5KE8.5	9.44	11.5	1	8.5	5	15.9	31.4	.073
P5KE8.5A	9.44	10.4	1	8.5	5	14.4	34.7	.073
P5KE9.0	10.0	12.2	1	9.0	1	16.9	29.5	.076
P5KE9.0A	10.0	11.1	1	9.0	1	15.4	32.5	.076
P5KE10	11.1	13.6	1	10	1	18.8	26.6	.078
P5KE10A	11.1	12.3	1	10	1	17.0	29.4	.078
P5KE11	12.2	14.9	1	11	1	20.1	24.9	.081
P5KE11A	12.2	13.5	1	11	1	18.2	27.4	.081
P5KE12	13.3	16.3	1	12	1	22.0	22.7	.082
P5KE12A	13.3	14.7	1	12	1	19.9	25.1	.082
P5KE13	14.4	17.6	1	13	1	23.8	21.0	.084
P5KE13A	14.4	15.9	1	13	1	21.5	23.2	.084
P5KE14	15.6	19.1	1	14	1	25.8	19.4	.086
P5KE14A	15.6	17.2	1	14	1	23.2	21.5	.086
P5KE15	16.7	20.4	1	15	1	26.9	18.8	.087
P5KE15A	16.7	18.5	1	15	1	24.4	20.6	.087
P5KE16	17.8	21.8	1	16	1	28.8	17.6	.088
P5KE16A	17.8	19.7	1	16	1	26.0	19.2	.088
P5KE17	18.9	23.1	1	17	1	30.5	16.4	.090
P5KE17A	18.9	20.9	1	17	1	27.6	18.1	.090
P5KE18	20.0	24.4	1	18	1	32.2	15.5	.092
P5KE18A	20.0	22.1	1	18	1	29.2	17.2	.092
P5KE20	22.2	27.1	1	20	1	35.8	13.9	.093
P5KE20A	22.2	24.5	1	20	1	32.4	15.4	.093
P5KE22	24.4	29.8	1	22	1	39.4	12.7	.094
P5KE22A	24.4	26.9	1	22	1	35.5	14.1	.094
P5KE24	26.7	32.6	1	24	1	43.0	11.6	.096
P5KE24A	26.7	29.5	1	24	1	38.9	12.8	.096
P5KE26	28.9	35.3	1	26	1	46.6	10.7	.097
P5KE26A	28.9	31.9	1	26	1	42.1	11.9	.097
P5KE28	31.1	38.0	1	28	1	50.0	9.9	.098
P5KE28A	31.1	34.4	1	28	1	45.4	11.0	.098
P5KE30	33.3	40.7	1	30	1	53.5	9.3	.099
P5KE30A	33.3	36.8	1	30	1	48.4	10.3	.099
P5KE33	36.7	44.9	1	33	1	59.0	8.5	.100
P5KE33A	36.7	40.6	1	33	1	53.3	9.4	.100
P5KE36	40.0	48.9	1	36	1	64.3	7.8	.101
P5KE36A	40.0	44.2	1	36	1	58.1	8.6	.101
P5KE40	44.4	54.3	1	40	1	71.4	7.0	.101
P5KE40A	44.4	49.1	1	40	1	64.5	7.8	.101
P5KE43	47.8	58.4	1	43	1	76.7	6.5	.102
P5KE43A	47.8	52.8	1	43	1	69.4	7.2	.102
P5KE45	50.0	61.1	1	45	1	80.3	6.2	.102
P5KE45A	50.0	55.3	1	45	1	72.7	6.9	.102
P5KE48	53.3	65.1	1	48	1	85.5	5.8	.103
P5KE48A	53.3	58.9	1	48	1	77.4	6.5	.103
P5KE51	56.7	69.3	1	51	1	91.1	5.5	.103
P5KE51A	56.7	62.7	1	51	1	82.4	6.1	.103
P5KE54	60.0	73.3	1	54	1	96.3	5.2	.104
P5KE54A	60.0	66.3	1	54	1	87.1	5.7	.104
P5KE58	64.4	78.7	1	58	1	103.0	4.9	.104
P5KE58A	64.4	71.2	1	58	1	93.6	5.3	.104
P5KE60	66.7	81.5	1	60	1	107.0	4.7	.104
P5KE60A	66.7	73.7	1	60	1	96.8	5.2	.104
P5KE64	71.1	86.9	1	64	1	114.0	4.4	.105
P5KE64A	71.1	78.6	1	64	1	103.0	4.9	.105
P5KE70	77.8	95.1	1	70	1	125.0	4.0	.105
P5KE70A	77.8	86.0	1	70	1	113.0	4.4	.105
P5KE75	83.3	102.0	1	75	1	134.0	3.7	.105
P5KE75A	83.3	92.1	1	75	1	121.0	4.1	.105
P5KE78	86.7	106.0	1	78	1	139.0	3.6	.106
P5KE78A	86.7	95.8	1	78	1	126.0	4.0	.106
P5KE85	94.4	115.0	1	85	1	151.0	3.3	.106
P5KE85A	94.4	104.0	1	85	1	137.0	3.6	.106
P5KE90	100.0	122.0	1	90	1	160.0	3.1	.107
P5KE90A	100.0	111.0	1	90	1	146.0	3.4	.107
P5KE100	111.0	136.0	1	100	1	179.0	2.8	.107
P5KE100A	111.0	123.0	1	100	1	162.0	3.1	.107
P5KE110	122.0	149.0	1	110	1	196.0	2.6	.107
P5KE110A	122.0	135.0	1	110	1	177.0	2.8	.107
P5KE120	133.0	163.0	1	120	1	214.0	2.3	.107
P5KE120A	133.0	147.0	1	120	1	193.0	2.0	.107
P5KE130	144.0	176.0	1	130	1	231.0	2.2	.108
P5KE130A	144.0	159.0	1	130	1	209.0	2.4	.108
P5KE150	167.0	204.0	1	150	1	268.0	1.9	.108
P5KE150A	167.0	185.0	1	150	1	243.0	2.1	.108
P5KE160	178.0	218.0	1	160	1	287.0	1.7	.108
P5KE160A	178.0	197.0	1	160	1	259.0	1.9	.108
P5KE170	189.0	231.0	1	170	1	304.0	1.6	.108
P5KE170A	189.0	209.0	1	170	1	275.0	1.8	.108

SYMBOLS AND ABBREVIATIONS

V_{WM} = Rated Stand-Off Voltage
I_{PP} = Peak Pulse Current
P_{PP} = Peak Pulse Power
$V_{C\,(MAX)}$ = Maximum Clamping Voltage
$V_{(BR)}$ = Breakdown Voltage
I_T = Test Current
I_D = Reverse Leakage

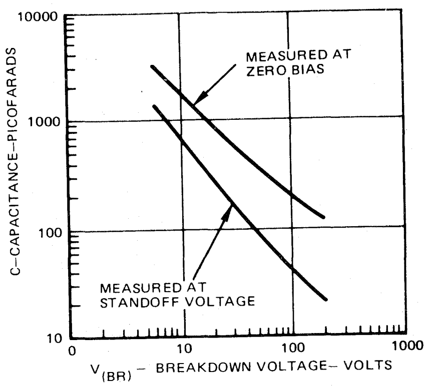


FIGURE 3
P5KE TYPICAL CAPACITANCE VS BREAKDOWN VOLTAGE

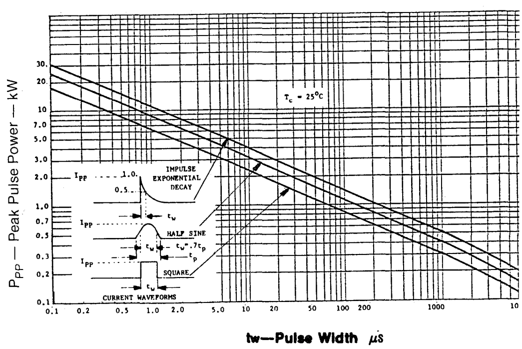


FIGURE 4
PEAK PULSE POWER VS PULSE TIME

Forward Voltage (V_f) @ 35 amps peak, 8.3 ms sine wave equal to 3.5 volts max. (Excluding Bidirectional)

For Bidirectional Construction, indicate a C or CA suffix after part number i.e. P5KE170CA.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

P6KE6.8 thru P6KE200A

TRANSIENT ABSORPTION ZENER

4

FEATURES

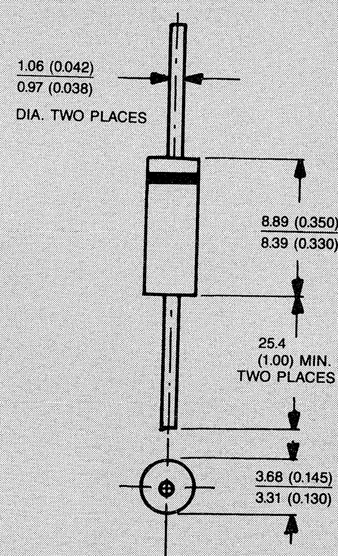
- ECONOMICAL SERIES
- AVAILABLE IN BOTH UNIDIRECTIONAL AND BIDIRECTIONAL CONSTRUCTION
- 6.8 TO 200 VOLTS AVAILABLE
- 600 WATTS PEAK PULSE POWER DISSIPATION

MAXIMUM RATINGS

Peak Pulse Power Dissipation at 25°C: 600 Watts
Steady State Power Dissipation: 5 Watts at T_L = +75°C, 3/8″ Lead Length
$t_{clamping}$ (0 Volts to BV Min.):
Unidirectional $< 1 x 10^{-12}$ Seconds; Bidirectional $< 5 x 10^{-9}$ Seconds.
Operating and Storage Temperature: -65° to 200°C

APPLICATION

TAZ is an economical, molded, commercial product used to protect voltage-sensitive components from destruction or partial degradation. The response time of their clamping action is virtually instantaneous (1 x 10^{-12} seconds) and they have a peak pulse power rating of 600 watts for 1 msec as depicted in Figure 1 and 2. Microsemi also offers various varieties of TAZ to meet higher and lower power demands and special applications.



Cathode Indicated by Band
All Dimensions in Millimeters (Inches)

MECHANICAL CHARACTERISTICS

CASE: Void free transfer molded thermosetting plastic (T-18).

FINISH: Silver plated copper readily solderable.

POLARITY: Band denotes cathode. Bidirectional not marked.

WEIGHT: 0.7 gram (Appx.).

MOUNTING POSITION: Any.

P6KE6.8 thru P6KE200A

ELECTRICAL CHARACTERISTICS $T_A = 25°C$

MICROSEMI PART NUMBER	BREAKDOWN VOLTAGE $V_{(BR)}$ MIN.	NOM.	MAX.	TEST CURRENT I_T	RATED STAND-OFF VOLTAGE V_{WM}	MAX. REVERSE LEAKAGE CURRENT I_D @ V_{WM}	MAX. CLAMPING VOLTAGE V_C @ I_{PP}	MAX. PEAK PULSE CURRENT I_{PP}	MAX. TEMP. COEFFICIENT OF V_{BR} ∝ $V_{(BR)}$ (TA) -55°C To 100°C
	V_{DC}	V_{DC}	V_{DC}	mADC	V	μADC	V	A	%/°C
P6KE6.8	6.12	6.8	7.48	10	5.5	1000	10.8	56	.057
P6KE6.8A	6.45	6.8	7.14	10	5.8	1000	10.5	57	.057
P6KE7.5	6.75	7.5	8.25	10	6.05	500	11.7	51	.061
P6KE7.5A	7.13	7.5	7.88	10	6.4	500	11.3	53	.061
P6KE8.2	7.38	8.2	9.02	10	6.63	200	12.5	48	.065
P6KE8.2A	7.79	8.2	8.61	10	7.02	200	12.1	50	.065
P6KE9.1	8.19	9.1	10	1	7.37	50	13.8	44	.068
P6KE9.1A	8.65	9.1	9.55	1	7.78	50	13.4	45	.068
P6KE10	9.0	10	11	1	8.1	10	15	40	.073
P6KE10A	9.5	10	10.5	1	8.55	10	14.5	41	.073
P6KE11	9.9	11	12.1	1	8.92	5	16.2	37	.075
P6KE11A	10.5	11	11.6	1	9.4	5	15.6	38	.075
P6KE12	10.8	12	13.2	1	9.72	5	17.3	35	.078
P6KE12A	11.4	12	12.6	1	10.2	5	16.7	36	.078
P6KE13	11.7	13	14.3	1	10.5	5	19	32	.081
P6KE13A	12.4	13	13.7	1	11.1	5	18.2	33	.081
P6KE15	13.5	15	16.5	1	12.1	5	22	27	.084
P6KE15A	14.3	15	15.8	1	12.8	5	21.2	28	.084
P6KE16	14.4	16	17.6	1	12.9	5	23.5	26	.086
P6KE16A	15.2	16	16.8	1	13.6	5	22.5	27	.086
P6KE18	16.2	18	19.8	1	14.5	5	26.5	23	.088
P6KE18A	17.1	18	18.9	1	15.3	5	25.2	24	.088
P6KE20	18	20	22	1	16.2	5	29.1	21	.090
P6KE20A	19	20	21	1	17.1	5	27.7	22	.090
P6KE22	19.8	22	24.2	1	17.8	5	31.9	19	.092
P6KE22A	20.9	22	23.1	1	18.8	5	30.6	20	.092
P6KE24	21.6	24	26.4	1	19.4	5	34.7	17	.094
P6KE24A	22.8	24	25.2	1	20.5	5	33.2	18	.094
P6KE27	24.3	27	29.7	1	21.8	5	39.1	15	.096
P6KE27A	25.7	27	28.4	1	23.1	5	37.5	16	.096
P6KE30	27	30	33	1	24.3	5	43.5	14	.097
P6KE30A	28.5	30	31.5	1	25.6	5	41.4	14.4	.097
P6KE33	29.7	33	36.3	1	26.8	5	47.7	12.6	.098
P6KE33A	31.4	33	34.7	1	28.2	5	45.7	13.2	.098
P6KE36	32.4	36	39.6	1	29.1	5	52	11.6	.099
P6KE36A	34.2	36	37.8	1	30.8	5	49.9	12	.099
P6KE39	35.1	39	42.9	1	31.6	5	56.4	10.6	.100
P6KE39A	37.1	39	41	1	33.3	5	53.9	11.2	.100
P6KE43	38.7	43	47.3	1	34.8	5	61.9	9.6	.101
P6KE43A	40.9	43	45.2	1	36.8	5	59.3	10.1	.101
P6KE47	42.3	47	51.7	1	38.1	5	67.8	8.8	.101
P6KE47A	44.7	47	49.4	1	40.2	5	64.8	9.3	.101
P6KE51	45.9	51	56.1	1	41.3	5	73.5	8.2	.102
P6KE51A	48.5	51	53.6	1	43.6	5	70.1	8.6	.102
P6KE56	50.4	56	61.6	1	45.4	5	80.5	7.4	.103
P6KE56A	53.2	56	58.8	1	47.8	5	77	7.8	.103
P6KE62	55.8	62	68.2	1	50.2	5	89	6.8	.104
P6KE62A	58.9	62	65.1	1	53	5	85	7.1	.104
P6KE68	61.2	68	74.8	1	55.1	5	98	6.1	.104
P6KE68A	64.6	68	71.4	1	58.1	5	92	6.5	.104
P6KE75	67.5	75	82.5	1	60.7	5	108	5.5	.105
P6KE75A	71.3	75	78.8	1	64.1	5	103	5.8	.105
P6KE82	73.8	82	90.2	1	66.4	5	118	5.1	.105
P6KE82A	77.9	82	86.1	1	70.1	5	113	5.3	.105
P6KE91	81.9	91	100	1	73.7	5	131	4.5	.106
P6KE91A	86.5	91	95.5	1	77.8	5	125	4.8	.106
P6KE100	90	100	110	1	81	5	144	4.2	.106
P6KE100A	95	100	105	1	85.5	5	137	4.4	.106
P6KE110	99	110	121	1	89.2	5	158	3.8	.107
P6KE110A	105	110	116	1	94	5	152	3.4	.107
P6KE120	108	120	132	1	97.2	5	173	3.5	.107
P6KE120A	114	120	126	1	102	5	165	3.6	.107
P6KE130	117	130	143	1	105	5	187	3.2	.107
P6KE130A	124	130	137	1	111	5	179	3.3	.107
P6KE150	135	150	165	1	121	5	215	2.8	.108
P6KE150A	143	150	158	1	128	5	207	2.9	.108
P6KE160	144	160	176	1	130	5	230	2.6	.108
P6KE160A	152	160	168	1	136	5	219	2.7	.108
P6KE170	153	170	187	1	138	5	244	2.5	.108
P6KE170A	161	170	179	1	145	5	234	2.6	.108
P6KE180	162	180	198	1	146	5	258	2.3	.108
P6KE180A	171	180	189	1	154	5	246	2.4	.108
P6KE200	180	200	220	1	162	5	287	2.1	.108
P6KE200A	190	200	210	1	171	5	274	2.2	.108

Consult factory for higher voltages.

Forward Voltage (V_F) @ 50 amps peak, 8.3 msec sine wave equal to 3.5 volts max. (For unidirectional only.)

For Bidirectional Construction, indicate C or CA suffix after part number i.e. P6KE200CA. Capacitance will be 1/2 that shown in Figure 3.

SYMBOLS AND ABBREVIATIONS

V_{WM} = Rated Stand-Off Voltage
I_{PP} = Peak Pulse Current
P_P = Peak Pulse Power
V_C = Clamping Voltage
$V_{(BR)}$ = Breakdown Voltage
I_T = Test Current
I_D = Reverse Leakage

TYPICAL CHARACTERISTIC CURVES

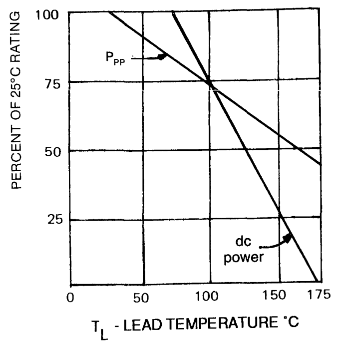


FIGURE 1

POWER DERATING CURVE

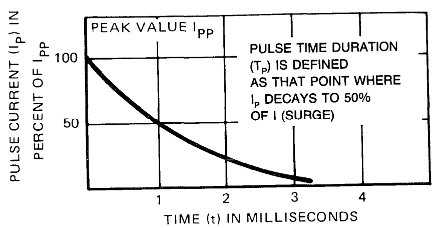


FIGURE 2

PULSE WAVEFORM FOR EXPONENTIAL SURGE

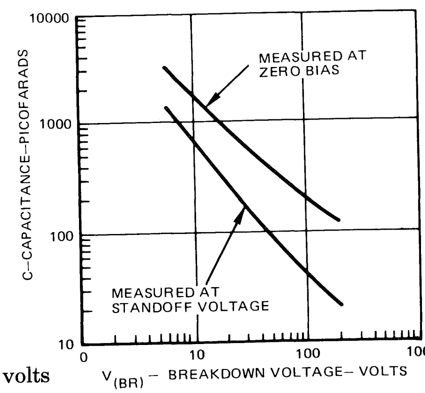


FIGURE 3

P6KE TYPICAL CAPACITANC

VS BREAKDOWN VOLTAGE

Microsemi Corp.
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P7KE10 thru P7KE100C

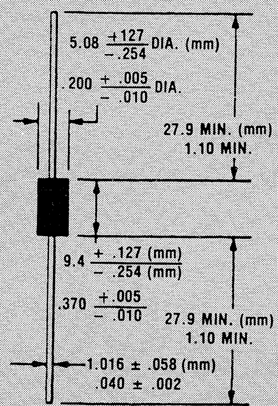
UNIDIRECTIONAL & BIDIRECTIONAL TRANSIENT ABSORPTION ZENER

4

FEATURES

- VOLTAGES FROM 10.0 TO 100V STAND-OFF (V_{WM})
- UNIDIRECTIONAL OR BIDIRECTIONAL
- LOW COST

The P7KE10 thru P7KE100C TAZ is a low cost silicon transient suppressor series designed to protect applications in telephone switching where large voltage transients can permanently damage voltage-sensitive components. TAZ has a peak pulse power rating of 700 watts for 1 millisecond. The response time of the TAZ clamping action is less than (1 x 10^{-12} seconds) and therefore can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry. They can also be used to protect integrated circuits, MOS devices, hybrids and other voltage-sensitive semiconductors and components.



MAXIMUM RATINGS

700 Watts of Peak Pulse Power dissipation at 25°C (see derating curve)
$t_{clamping}$ (0 volts to BV min): Less than 1 x 10^{-9} seconds (Bidirectional), 1 x 10^{-12} seconds (Unidirectional)
Operating and Storage temperatures: -55° to +175°C
Forward surge rating: 133 amps, (Except Bidirectional)

MICROSEMI PART NUMBER Unidirectional	Bidirectional	REVERSE STAND-OFF VOLTAGE (NOTE 1) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_D = 5mA VOLTS MIN.	MAX.	MAXIMUM CLAMPING VOLTAGE (Fig. 2) V_C @ I_{PP} VOLTS	MAXIMUM REVERSE LEAKAGE CURRENT I_D @ V_{WM} μA	MAXIMUM PEAK PULSE CURRENT (Fig. 2) I_{PP} AMPS	MAXIMUM TEMP. COEFFICIENT $V_{(BR)}$ OF $V_{(BR)}$ %/°C
P7KE10	P7KE10C	10	13.0	20.0	25	5.0	30	.10
P7KE25	P7KE25C	25	29.6	43.5	53	5.0	13	.11
P7KE43	P7KE43C	43	50.0	75.0	90	5.0	8	.12
P7KE100	P7KE100C	100	130.0	200.0	235	5.0	3	.12

NOTE 1: A TAZ is normally selected according to the reverse "Stand-Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

MECHANICAL CHARACTERISTICS

CASE: Molded case.
FINISH: Silver plated copper, readily solderable.
POLARITY: Cathode terminal marked (except bidirectional).
WEIGHT: 1.5 grams (Appx.).
MOUNTING POSITION: Any.

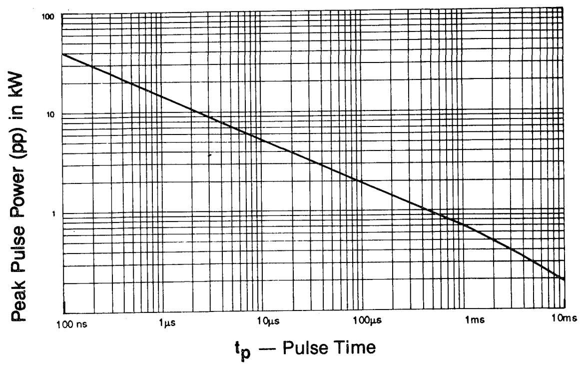


FIGURE 1 PEAK PULSE POWER VS. PULSE TIME

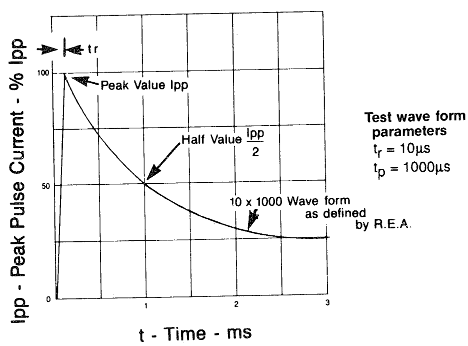


FIGURE 2 DERATING CURVE

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

SOV5.0 thru SOV28

FEATURES

- VOLTAGES FROM 5.0 TO 28V STAND-OFF (V_{WM})
- LOW CLAMPING RATIO
- SMALL PACKAGE SIZE

The SOV series is an inexpensive, 500 watt transient absorbtion zener designed for board level protection of bipolar and MOS memories from ESD (Electrostatic Discharge) and other transient voltages. In addition, TAZ, because of their low clamping factor, provide a high degree of protection to VMOS, HMOS, and CMOS circuits susceptible to line transients.

MAXIMUM RATINGS

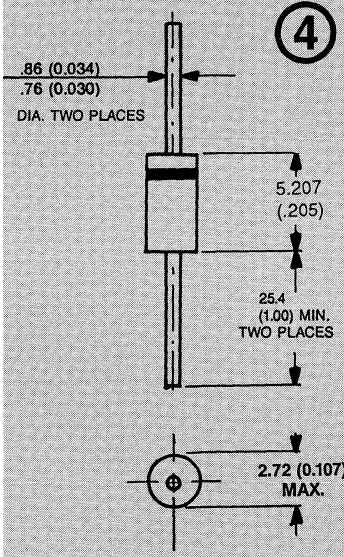
500 Watts of Peak Pulse Power dissipation at 25°C (see derating curve)
$t_{clamping}$ (0 volts to BV min): Less than 1 x 10^{-12} seconds (theoretical)
Operating and Storage temperatures: -65° to +175°C
Forward surge rating: 70 amps, 1/120 second at 25°C
Steady State power dissipation: 1.0 watt T_L = 75°C, Lead Length = 3/8″
Repetition rate (duty cycle): .01%

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MAXIMUM REVERSE LEAKAGE CURRENT I_D @ V_{WM} μA	MINIMUM BREAKDOWN VOLTAGE $V_{(BR)}$ (MIN) @ 1 mA VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) V_C @ 1A VOLTS	TYPICAL CLAMPING VOLTAGE V_C VOLTS @ 5A	TYPICAL CLAMPING VOLTAGE V_C VOLTS @ 10A	MAXIMUM CLAMPING VOLTAGE (Fig. 2) V_C @ I_{PP} VOLTS	MAXIMUM PEAK PULSE CURRENT (Fig. 2) I_{PP} AMPS
SOV 5.0	5.0	300	6.0	7.4		7.9	9.3	53.7
SOV10	10.0	2	11.1	13.2		14.4	16.5	30.3
SOV12	12.0	2	13.8	16.5		18.5	21.0	23.8
SOV15	15.0	2	16.7	19.7		22.2	25.2	19.8
SOV18	18.0	2	20.4	23.8	26.0		30.5	16.3
SOV24	24.0	2	28.4	32.4	37.0		42.0	11.9
SOV28	28.0	2	30.7	35.9	41.0		46.5	10.7

NOTE 1: A TAZ is normally selected according to the reverse "Stand-Off Voltage" V_{WM} which should be equal to or greater than the DC or continuous peak operating voltage level.

TRANSIENT ABSORPTION ZENER



Cathode Indicated by Band
All Dimensions in Millimeters (Inches)

MECHANICAL CHARACTERISTICS

CASE: Molded case.

FINISH: Silver plated copper, readily solderable.

POLARITY: Band denotes cathode.

WEIGHT: 0.4 grams (Appx.).

MOUNTING POSITION: Any.

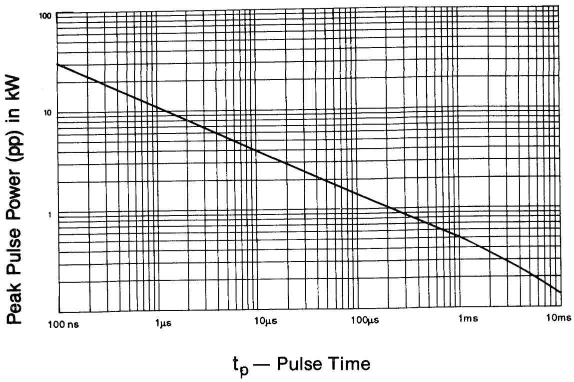


FIGURE 1
PEAK PULSE POWER
VS. PULSE TIME

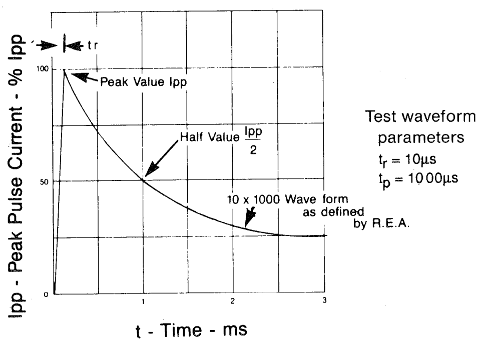


FIGURE 2
PULSE WAVEFORM

DIODE ARRAYS

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

Features

These products are designed for data line protection at the P.C. board level as well as for other applications including: cameras, smart cards, etc. which require multiple protection with limited board space.

- 300 to 600 watts peak pulse power
- Data and bus line applications
- Conventional thru-hole or surface mountable pin configurations
- Low capacitance available
- 8 pin to 28 pin versatile packages
- Common ground or independent diode positions available
- Unidirectional or bidirectional capabilities
- Voltage range of 5 volts to 200 volts available

Maximum Ratings

- Peak pulse power 8/20 µs = up to 600 watts
- Operating and storage temperature range = -55°C to +150°C
- Repetion rate (duty cycle) = 0.01%

Mechanical Characteristics

CASE: Molded or ceramic options.

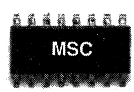
TERMINAL: Lead/tin plated or solder dipped.

MARKING: Body marked with dot on top for pin no.1 location.

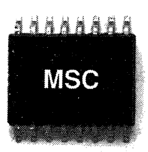
PACKAGE DIMENSIONS: Per industry standard PDIPs, CERDIPs, SOICs, and PLCCs. Consult factory for further details.

The illustrations below demonstrate SOIC surface mount options.
Note: P_{pp} @ 8 x 20 µs.

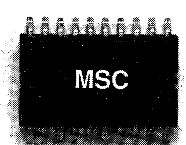
8 Lead, up to 300 Watt (Ppp)



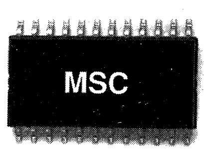
16 Lead, up to 300 Watt (Ppp)



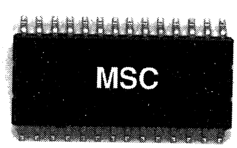
16 Lead, up to 600 Watt (Ppp)



20 Lead, up to 600 Watt (Ppp)



24 Lead, up to 600 Watt (Ppp)



28 Lead, up to 600 Watt (Ppp)

WORKSHEET: Transient Voltage Suppressor Modules
CUSTOM ASSEMBLY DESIGN INFORMATION

(FILL IN ONLY THE INFORMATION WHICH IS KNOWN OR APPLICABLE)

MICROSEMI USE ONLY

REPRESENTATIVE (FIRM & INDIVIDUAL)	LOCATION	DATE

CUSTOMER	ENGINEER	DEPT. / MS.

STREET	CITY	STATE	ZIP

TELEPHONE NUMBER	AREA CODE	EXTENSION	WHAT TYPE OF EQUIPMENT?

DETAIL YOUR APPLICATION HERE

Either a circuit drawing or complete description. For additional space use reverse side.

Module Specifications:

Stand-off Voltage (V_{RWM})______Volts Max. [specified as maximum continuous (DC) or repetitive peak reverse voltage (PIV)]

Clamping Voltage (V_C)________Volts Max. [max. peak voltage a circuit can withstand during transient time period]

Breakdown Voltage (V_{BR})_____Volts Min. @ 1 mA Avalanche Condition [unless otherwise specified]

Temperature Range (T)_______° C to _______° C [max. operating and storage temperature]

Source Impedance (R_S)_______ Ohms [source or line impedance (min. series impedance)] ☐ Inductive ☐ Resistive

Leakage Current Rating (I_D) _______ µA (Max.) [leakage current specified at max. stand-off voltage during normal circuit operation]

Application

☐ A. C. ☐ D.C.
☐ Power Line
☐ Signal Line
Frequency ________ Hz
☐ Analog ☐ Digital
☐ Industrial ☐ Military
☐ Other ________________

Surge or Transient Source

☐ Induced Lightning
☐ ESD (Electrostatic Discharge)
☐ EMP (Electromagnetic Pulse)
☐ Switching (Relays, Switches Motors, Inductive)
☐ Momentary Overvoltage
☐ Other ________________

Maximum Module Dimensions:

Special Comments

☐ Our anticipated annual usage is ________________
☐ Budgeted cost objective per module is ________________
☐ Our first anticipated delivery is ________________
☐ Other ________________

Series Protection [primary protection before module assembly]

☐ Fuse
☐ Circuit Breaker
☐ "Crow-Bar"
☐ Other ________________

Transient Characteristics

☐ MIL-STD-704 (Aircraft)
☐ MIL-STD-1275 (Vehicles)
☐ MIL-STD-1399 (Shipboard)
☐ REA–PE60 (Trunk Carrier Equipment)
☐ IEEE–Std 472 (Surge Withstand Capability)
☐ FCC–Part 68 (Telecommunications)
☐ Other ________________

Wave Shape ☐ Impulse
☐ Sinusoidal
☐ Square Wave

Peak Pulse Voltage (V_{PP}) ________________ V
Peak Pulse Current (I_{PP}) ________________ A
Pulse Width (t) ________________ (Secs)
Repetition Rate ________________ Pulses/Sec.

Microsemi Corp. - Scottsdale 8700 E. Thomas Road, P.O. Box 1390, Scottsdale, Arizona 85252
(602) 941-6300 FAX (602) 947-1503

5

SPECIAL ASSEMBLIES AND SURFACE MOUNT DEVICES (SMD)

SECTION 5

SURFACE MOUNT TECHNOLOGY

Surface Mount Technology is rapidly becoming the state-of-the-art in PC board design and construction.

Insertion technology has imposed restrictions and limitations on thru-hole PC board technology. With utilization of Surface Mount Technology these restrictions and limitations may be overcome, permitting a continued advance in the state-of-the-art design of PC boards.

Surface Mount Packages can offer a much lower profile than conventional packages. This allows for more boards to be utilized in a given amount of space. Surface Mount Packages may be stacked closer together utilizing less total volume than insertion packages.

The reduction of the number of board layers required and the elimination or reduction of the number of plated through holes significantly lowers PC board prices.

Surface Mount components are sent directly to the assembly line, eliminating the intermediate preparation step required for insertion technology components.

Surface Mount Component design and recent assembly equipment development has provided for the placement of devices at the rate of five thousand per hour to hundreds of thousands of devices per hour.

Surface Mount Packages with their unique construction allow for superior device performance. With the smaller configuration, the limitations placed on chip performance by internal lead length, parasitic capacitance, and inductance has been greatly reduced.

The cost effectiveness of Surface Mount Technology allows the manufacturer to produce smaller units and offer increased functions with the same size product.

SURFACE MOUNT PACKAGE ADVANTAGES

• **Small Size–** The amount of space required for a circuit is reduced by 25% to 50% over conventional diode components.

• **Complete Pretest Capability–** Unlike unencapsulated die, which can only be partially tested by probing or sorting, surface mount products are 100% electrically tested after encapsulation, providing performance equivalent to their largest discrete counterparts.

• **Handling and Assembly Ease–** Surface Mount standard package outline permits the placement of components onto the substrates using automated handling equipment.

• **Mounting Considerations–** To maintain the inherent reliability of the Microsemi products, proper selection of printed circuit board and hybrid substrates are important. The square-end cap axial surface mount equivalents have low expansion coefficients similar to ceramic leadless chip carriers. For military temperature range applications requiring many temperature cycles, an alumina substrate should be considered. For low cost commercial applications subject to reasonable environments with limited temperature ranges, a low expansion PC board material like epoxy glass, can be considered. Since the PC material has inherent higher thermal resistance than alumina substrate, the SMD maximum dissipation will involve the usual design/cost/performance trade off.

• **Pre-Formed Leads–** Surface Mount packages are ready for placement onto the substrates, with no intermediate lead forming steps required.

• **Reliability–** All chips used in Surface Mount packages are oxide passivated or glassivated, and are epoxy or glass encapsulated for superior mechanical strength and moisture resistance.

• **Availability–** A wide variety of discrete diode and rectifier components from Microsemi's repertoire of reliability-proven semiconductor processes and geometries are available in surface mount packages. Please consult the factory for availability of specific devices not listed in the data book.

Special Packages and Assemblies

Microsemi Corporation offers a multiplicity of packages for many applications. These include: potted modules, flat packs, leadless chip carriers, dual inline, single inline, chip on channel and disc-die-disc assemblies.

Since the aforementioned assemblies can use high reliability die and Microsemi diode construction packaging techniques, they possess all of the axial diode high performance characteristics. For example, almost all Microsemi diode products listed in this data book can be manufactured in disc-die-disc construction.

Figures 1 through 7 illustrate a small sample of several disc-die-disc special rectifiers, transient suppressors, 3 ϕ rectifiers, and diode arrays suitable for hybrid and other subminiature applications.

Consult the respective Microsemi factory for more information on the company's capabilities to meet customer requirements on special packages and assemblies.

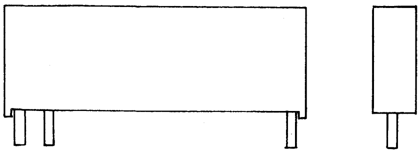


FIGURE 1
DIODE NETWORK

FIGURE 2
DISC-DIE-DISC ASSEMBLY

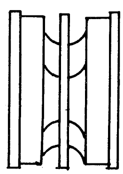


FIGURE 3
PELLET, BIDIRECTIONAL
TRANSIENT SUPPRESSOR

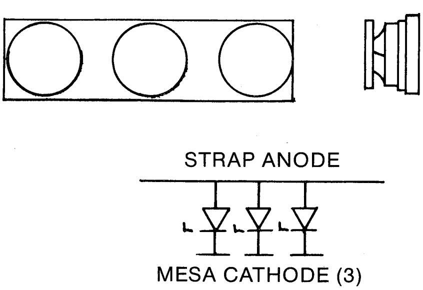


FIGURE 4
DIODE ARRAY (3)

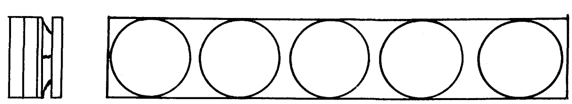


FIGURE 5
DIODE ARRAY (5)

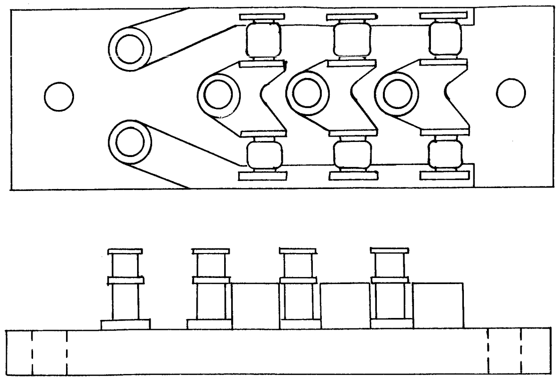


FIGURE 6
3ϕ F.W. RECTIFIER
ASSEMBLY

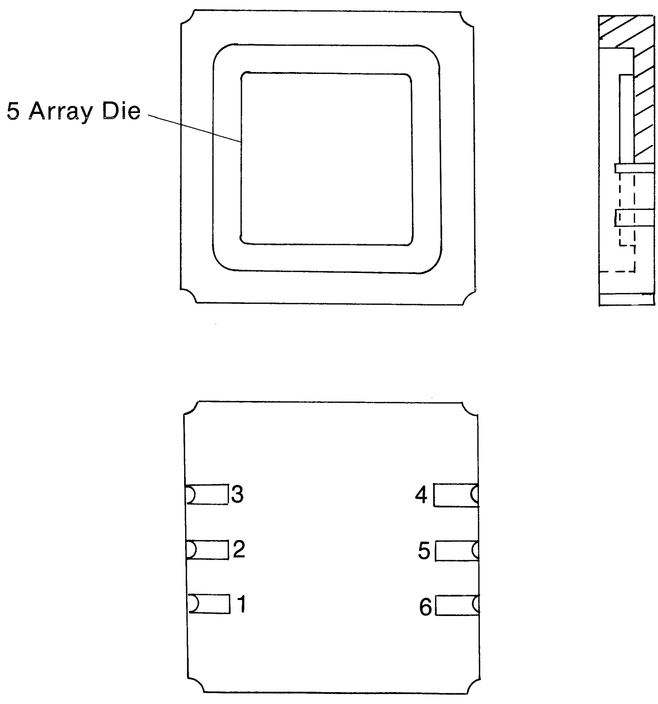


FIGURE 7
LEADLESS CHIP CARRIER

SURFACE MOUNT DEVICES

Offered by Microsemi Corp. — Santa Ana, CA

DESCRIPTION

In addition to being "the Diode Experts," Microsemi Corporation manufactures diodes using Surface Mount Technology (SMT) which provides small size, low cost assemblies for many customer applications, without sacrificing power rating or hi-rel JAN, TX, TXV, and JANS quality. Mesa surface mount diodes can be supplied from the Santa Ana facility using miniature, metallurgically bonded, hard glass to metal, non-cavity, square end cap packages for high power applications.

Microsemi Santa Ana facility initial offerings include: four basic power ratings of rectifiers, hi-rel rectifier stacks, zener diodes, transient voltage suppressors, and PIN diodes. The capability exists to supply JAN, TX, TXV, and JANS equivalents on all of Santa Ana's products.

FEATURES FOR SURFACE MOUNT DEVICES (SMD)

- VOIDLESS, HERMETICALLY SEALED GLASS PACKAGE
- METALLURGICALLY BONDED
- SQUARE END CAPS
- JAN, TX, TXV, AND JANS EQUIVALENTS AVAILABLE
- CUSTOM TYPES SUPPLIED TO CUSTOMER DRAWINGS
- MIL-S-1900 PENDING

MECHANICAL CHARACTERISTICS

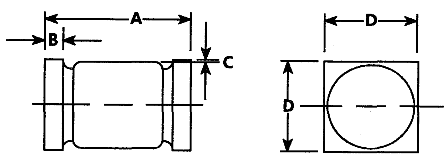
Case: Hermetically sealed glass
Polarity: Cathode dot
Finish Material: Silver

5

MAXIMUM RATINGS

Operating Temperature: - 65°C to + 200°C
Storage Temperature: - 65°C to + 200°C

Package Dimensions (in inches)



PACKAGE TYPE

DIMENSION SYMBOL	A MIN.	A MAX.	E MIN.	E MAX.	B MIN.	B MAX.	G MIN.	G MAX.	D MIN.	D MAX.	X MIN.	X MAX.	W MIN.	W MAX.	P MIN.	P MAX.
A	.185	.200	.205	.225	.165	.185	.225	.245	Consult Factory		.390	.430	.275	.315	.100	.120
B	.019	.028	.019	.028	.019	.028	.019	.028	.019	.028	.045	.055	.045	.055	.025	.030
C	.003	-	.003	-	.003	-	.003	-	.003	-	.010	-	.010	-	Consult Factory	
D	.097	.103	.137	.142	.070	.075	.187	.193	.091	.103	.365	.385	.300	.320	.087	.092

* Consult MSC-Santa Ana for details on new "X" package with high current ratings.

CROSS REFERENCE SELECTION GUIDE

Rectifiers and Stacks*

JEDEC TYPE NUMBER	SMD TYPE NUMBER	PACKAGE TYPE	PEAK REV. VOLTAGE	AVG. DC CURRENT (I_O) in AMPS
1N3595	3595 SM	B	125	0.5
1N4938	4938 SM	A	200	0.5
1N4942 thru 1N4948	4942 SM thru 4948 SM	A	200 thru 1000	1.0
1N5615 thru 1N5623	5615 SM thru 5623 SM	A	200 thru 1000	1.0
1N4148-1	4148-1 SM	B	75	0.5
1N4150-1	4150-1 SM	B	50	0.5
1N5802 thru 1N5806	5802 SM thru 5806 SM	A	50 thru 150	2.5
1N6073 thru 1N6075	6073 SM thru 6075 SM	A	50 thru 150	3.0
1N5415 thru 1N5420	5415 SM thru 5420 SM	E	50 thru 600	3.0
1N5186 thru 1N5190	5186 SM thru 5190 SM	E	100 thru 600	3.0
1N5807 thru 1N5811	5807 SM thru 5811 SM	E	50 thru 150	6.0
1N6079 thru 1N6081	6079 SM thru 6081 SM	G	50 thru 150	12.0
**1N3643 thru 1N3647	3643 SM thru 3647 SM	D	1000 thru 3000	0.2
**1N4254 thru 1N4257	4254 SM thru 4257 SM	D	1500 thru 3000	0.2
**1N5181 thru 1N5184	5181 SM thru 5184 SM	D	4000 thru 10,000	0.06

Zener Diodes*

(and T.C. Zeners, Unidirectional and Bidirectional Transient Suppressors)

JEDEC TYPE NUMBER	SMD TYPE NUMBER	PACKAGE TYPE	WATTAGE (mW)	PEAK PULSE POWER (Watts)
1N821 thru 1N829	821 SM thru 829 SM	A	250	-
1N6309 thru 1N6355	6309 SM thru 6355 SM	B	500	-
1N6485 thru 1N6491	6485 SM thru 6491 SM	A	1500	-
1N4460 thru 1N4496	4460 SM thru 4496 SM	A	1500	-
1N5063 thru 1N5117	5063 SM thru 5117 SM	A	3000	-
1N4954 thru 1N4986	4954 SM thru 4986 SM	E	5000	-
†1N6102 A thru 1N6137	6102 SM thru 6137 SM	E	-	500
†1N6138 A thru 1N6173	6138 SM thru 6173 SM	G	-	1500

*Consult factory for additional types not listed.
**High Voltage Stacks.
†Bidirectional Transient Suppressors.

Note: Unidirectional transient suppressor versions of this SMD package are available at 250 through 1500 watts peak pulse power. Consult factory for the package size applicable for specific applications.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

1.5KCD6.8 thru 1.5KCD200A, CD5908 and CD6267 thru CD6303A
Transient Suppressor
CELLULAR DIE PACKAGE

APPLICATION

This TAZ* series has a peak pulse power rating of 1500 watts for one millisecond. It can protect integrated circuits, hybrids, CMOS, MOS and other voltage sensitive components that are used in a broad range of applications including: telecommunications, power supplies, computers, automotive, industrial and medical equipment. TAZ* devices have become very important as a consequence of their high surge capability, extremely fast response time and low clamping voltage.

The cellular die (CD) package is ideal for use in hybrid applications and for solder mounting. The cellular design in hybrids assures ample bonding with immediate heat sinking to provide the required transient peak pulse power of 1500 watts.

FEATURES

- Economical
- 1500 Watts peak pulse power dissipation
- Stand-Off voltages from 5.0V to 171V
- Uses thermally passivated die design
- Additional silicone protective coating over die for rugged environments
- Stringent process norm screening
- Low leakage current at rated stand-off voltage
- Exposed metal surfaces are readily solderable
- 100% lot traceability
- Manufactured in the U.S.A.
- Meets JEDEC IN6267 - IN6303A electrically equivalent specifications
- Available in bipolar configuration
- Additional transient suppressor ratings and sizes are available as well as zener, rectifier and reference diode configurations. Consult factory for special requirements.

MAXIMUM RATINGS

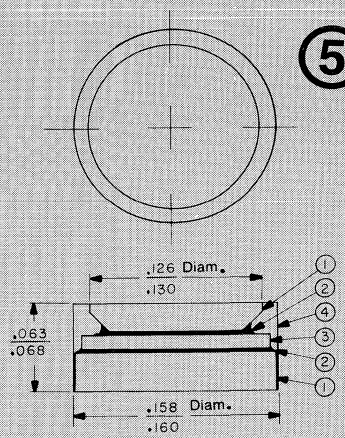
1500 Watts of Peak Pulse Power Dissipation at 25°C**
$t_{clamping}$ (0 Volts to BV Min.):
unidirectional $< 1x10^{-12}$ seconds;
bidirectional $< 5x10^{-9}$ seconds;
Operating and Storage Temperature: -65°C to +175°C
Forward Surge Rating: 200 Amps, 1/120 second at 25°C
Steady State Power Dissipation is heat sink dependent.

Transient Absorption Zener

***Wire contact or tab geometry for interconnects should be selected with adequate cross-sectional size to prevent fusing relative to peak pulse current rating (Ipp).*

PACKAGE DIMENSIONS

5



Item Number	Description
1	Nickel and Silver Plated Copper Discs
2	Solder Bond
3	Silicon Die
4	Conformal coating

Illustration Represents Unipolar Only

MECHANICAL CHARACTERISTICS

Case: Nickel and Silver plated copper discs with conformal coating.

Finish: Both external surfaces are corrosion resistant, readily solderable.

Polarity: Large contact side is cathode

Mounting Position: Any

1.5KCD6.8 thru 1.5KCD200A, CD5908 and CD6267 thru CD6303A CELLULAR DIE PACKAGE

ELECTRICAL CHARACTERISTICS @ 25°C

Industry Type Number	JEDEC Type Number Elect. Eqvlt.	Rated Stand-off Voltage V_{WM} VOLTS	Breakdown Voltage $V_{(BR)}$ VOLTS MIN	MAX	@ I_T mA	Maximum Clamping Voltage @ I_{PP} (1 mSEC) V_C VOLTS	Maximum Reverse Leakage @ V_{WM} I_D μA	Rated Maximum Peak Pulse Current I_{PP} A	Maximum Temperature Coefficient ∝ VZ of $V_{(BR)}$ % / °C
——	CD5908	5.00	6.0	——	1	7.6	300	30.0	.057
1.5KCD6.8	CD6267	5.50	6.12	7.48	10	10.8	1000	139.0	.057
1.5KCD6.8A	CD6267A	5.80	6.45	7.14	10	10.5	1000	143.0	.057
1.5KCD7.5	CD6268	6.05	6.75	8.25	10	11.7	500	128.0	.061
1.5KCD7.5A	CD6268A	6.40	7.13	7.88	10	11.3	500	132.0	.061
1.5KCD8.2	CD6269	6.63	7.38	9.02	10	12.5	200	120.0	.065
1.5KCD8.2A	CD6269A	7.02	7.79	8.61	10	12.1	200	124.0	.065
1.5KCD9.1	CD6270	7.37	8.19	10.00	1	13.8	50	109.0	.068
1.5KCD9.1A	CD6270A	7.78	8.65	9.55	1	13.4	50	112.0	.068
1.5KCD10	CD6271	8.10	9.00	11.00	1	15.0	10	100.0	.073
1.5KCD10A	CD6271A	8.55	9.50	10.50	1	14.5	10	103.0	.073
1.5KCD11	CD6272	8.92	9.90	12.10	1	16.2	5	93.0	.075
1.5KCD11A	CD6272A	9.40	10.50	11.60	.1	15.6	5	96.0	.075
1.5KCD12	CD6273	9.72	10.80	13.20	1	17.3	5	87.0	.078
1.5KCD12A	CD6273A	10.20	11.40	12.60	1	16.7	5	90.0	.078
1.5KCD13	CD6274	10.50	11.70	14.30	1	19.0	5	79.0	.081
1.5KCD13A	CD6274A	11.10	12.40	13.70	1	18.2	5	82.0	.081
1.5KCD15	CD6275	12.10	13.50	16.50	1	22.0	5	68.0	.084
1.5KCD15A	CD6275A	12.80	14.30	15.80	1	21.2	5	71.0	.084
1.5KCD16	CD6276	12.90	14.40	17.60	1	23.5	5	64.0	.086
1.5KCD16A	CD6276A	13.60	15.20	16.80	1	22.5	5	67.0	.086
1.5KCD18	CD6277	14.50	16.20	19.80	1	26.5	5	56.5	.088
1.5KCD18A	CD6277A	15.30	17.10	18.90	1	25.2	5	59.5	.088
1.5KCD20	CD6278	16.20	18.00	22.00	1	29.1	5	51.5	.090
1.5KCD20A	CD6278A	17.10	19.00	21.00	1	27.7	5	54.0	.090
1.5KCD22	CD6279	17.80	19.80	24.20	1	31.9	5	47.0	.092
1.5KCD22A	CD6279A	18.80	20.90	23.10	1	30.6	5	49.0	.092
1.5KCD24	CD6280	19.40	21.60	26.40	1	34.7	5	43.0	.094
1.5KCD24A	CD6280A	20.50	22.80	25.20	1	33.2	5	45.0	.094
1.5KCD27	CD6281	21.80	24.30	29.70	1	39.1	5	38.5	.096
1.5KCD27A	CD6281A	23.10	25.70	28.40	1	37.5	5	40.0	.096
1.5KCD30	CD6282	24.30	27.00	33.00	1	43.5	5	34.5	.097
1.5KCD30A	CD6282A	25.60	28.50	31.50	1	41.4	5	36.0	.097
1.5KCD33	CD6283	26.80	29.70	36.30	1	47.7	5	31.5	.098
1.5KCD33A	CD6283A	28.20	31.40	34.70	1	45.7	5	33.0	.098
1.5KCD36	CD6284	29.10	32.40	39.60	1	52.0	5	29.0	.099
1.5KCD36A	CD6284A	30.80	34.20	37.80	1	49.9	5	30.0	.099
1.5KCD39	CD6285	31.60	35.10	42.90	1	56.4	5	26.5	.100
1.5KCD39A	CD6285A	33.30	37.10	41.00	1	53.9	5	28.0	.100
1.5KCD43	CD6286	34.80	38.70	47.30	1	61.9	5	24.0	.101
1.5KCD43A	CD6286A	36.80	40.90	45.20	1	59.3	5	25.3	.101
1.5KCD47	CD6287	38.10	42.30	51.70	1	67.8	5	22.2	.101
1.5KCD47A	CD6287A	40.20	44.70	49.40	1	64.8	5	23.2	.101
1.5KCD51	CD6288	41.30	45.90	56.10	1	73.5	5	20.4	.102
1.5KCD51A	CD6288A	43.60	48.50	53.60	1	70.1	5	21.4	.102
1.5KCD56	CD6289	45.40	50.40	61.60	1	80.5	5	18.6	.103
1.5KCD56A	CD6289A	47.80	53.20	58.80	1	77.0	5	19.5	.103
1.5KCD62	CD6290	50.20	55.80	68.20	1	89.0	5	16.9	.104
1.5KCD62A	CD6290A	53.00	58.90	65.10	1	85.0	5	17.7	.104
1.5KCD68	CD6291	55.10	61.20	74.80	1	98.0	5	15.3	.104
1.5KCD68A	CD6291A	58.10	64.60	71.40	1	92.0	5	16.3	.104
1.5KCD75	CD6292	60.70	67.50	82.50	1	108.0	5	13.9	.105
1.5KCD75A	CD6292A	64.10	71.30	78.80	1	103.0	5	14.6	.105
1.5KCD82	CD6293	66.40	73.80	90.20	1	118.0	5	12.7	.105
1.5KCD82A	CD6293A	70.10	77.90	86.10	1	113.0	5	13.3	.105
1.5KCD91	CD6294	73.70	81.90	100.00	1	131.0	5	11.4	.106
1.5KCD91A	CD6294A	77.80	86.50	95.50	1	125.0	5	12.0	.106
1.5KCD100	CD6295	81.00	90.00	110.00	1	144.0	5	10.4	.106
1.5KCD100A	CD6295A	85.50	95.00	105.00	1	137.0	5	11.0	.106
1.5KCD110	CD6296	89.20	99.00	121.00	1	158.0	5	9.5	.107
1.5KCD110A	CD6296A	94.00	105.00	116.00	1	152.0	5	9.9	.107
1.5KCD120	CD6297	97.20	108.00	132.00	1	173.0	5	8.7	.107
1.5KCD120A	CD6297A	102.00	114.00	126.00	1	165.0	5	9.1	.107
1.5KCD130	CD6298	105.00	117.00	143.00	1	187.0	5	8.0	.107
1.5KCD130A	CD6298A	111.00	124.00	137.00	1	179.0	5	8.4	.107
1.5KCD150	CD6299	121.00	135.00	165.00	1	215.0	5	7.0	.108
1.5KCD150A	CD6299A	128.00	143.00	158.00	1	207.0	5	7.2	.108
1.5KCD160	CD6300	130.00	144.00	176.00	1	230.0	5	6.5	.108
1.5KCD160A	CD6300A	136.00	152.00	168.00	1	219.0	5	6.8	.108
1.5KCD170	CD6301	138.00	153.00	187.00	1	244.0	5	6.2	.108
1.5KCD170A	CD6301A	145.00	162.00	179.00	1	234.0	5	6.4	.108
1.5KCD180	CD6302	146.00	162.00	198.00	1	258.0	5	5.8	.108
1.5KCD180A	CD6302A	154.00	171.00	189.00	1	246.0	5	6.1	.108
1.5KCD200	CD6303	162.00	180.00	220.00	1	287.0	5	5.2	.108
1.5KCD200A	CD6303A	171.00	190.00	210.00	1	274.0	5	5.5	.108

Vf at 100 amps peak. 8.3 ms sine wave equals 3.5 volts maximum. For bidirectional part number add C or CA as suffix (ie: 1.5KCD33C or 1.5KCD33CA; or CD6283C or CD6283CA).
Note that for bidirectional types having V_{WM} of 8 volts and under, the I_D leakage current is doubled.

SYMBOLS AND ABBREVIATIONS

V_{WM} = RATED STAND-OFF VOLTAGE

I_{PP} = PEAK PULSE CURRENT

$V_{C\,(MAX)}$ = MAXIMUM CLAMPING VOLTAGE

$V_{(BR)}$ = BREAKDOWN VOLTAGE

I_T = TEST CURRENT

I_D = REVERSE LEAKAGE

NOTE 1 Normal selection criteria for TAZ* devices is by rated stand-off voltage (V_{WM}) and should be equal or greater than DC or continuous peak operating voltage.

NOTE 2 TAZ* devices are tested to maximum peak pulse current (I_{PP}) with clamping voltage monitored. This surge capability is one of the most significant electrical characteristics of the device and should be considered as part of customer quality inspections.

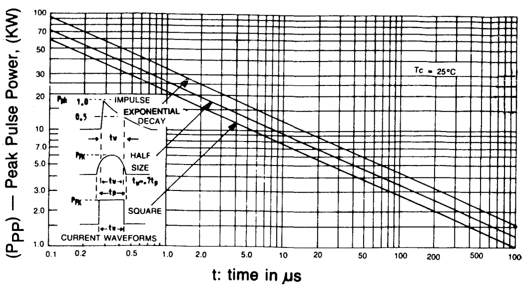


FIGURE 1
Peak Pulse Power vs Pulse Time

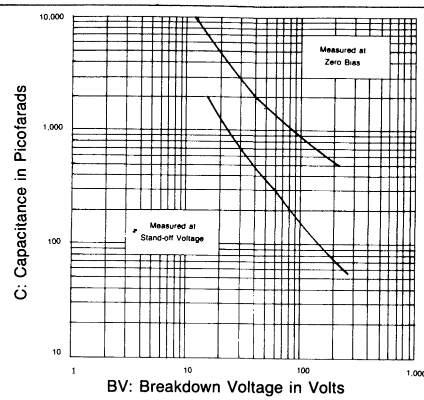


FIGURE 2
Typical Capacitance vs Breakdown Voltage

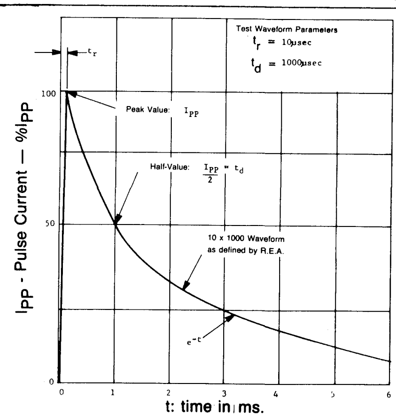


FIGURE 3
Pulse Wave Form

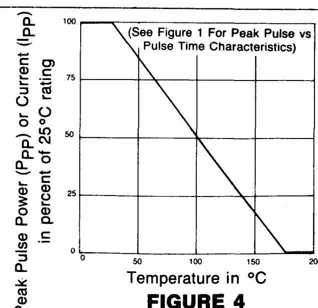


FIGURE 4
Derating Curve

Microsemi Corp.
The diode experts

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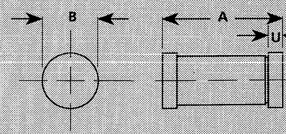
MLL3016B thru MLL3051B

LEADLESS GLASS ZENER DIODES



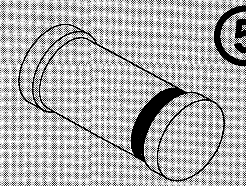


Figure 1

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.80	5.20	.189	.205
B	2.39	2.66	.094	.105
U	0.41	0.55	.016	.022

DO-213AB

Description / Features

- LEADLESS PACKAGE FOR SURFACE MOUNT EQUIVALENT TO IN3016 THRU IN3051
- IDEAL FOR HIGH DENSITY MOUNTING
- VOLTAGE RANGE: 6.8 TO 200 VOLTS
- HERMETICALLY SEALED, DOUBLE-SLUG GLASS CONSTRUCTION
- METALLURGICALLY ENHANCED CONTACT CONSTRUCTION
- AVAILABLE IN JANTX OR JANTXV EQUIVALENTS TO MIL-S-19500/115 WITH MLX OR MLXV PREFIX.

Maximum Ratings

1.50 Watts DC Power Rating (See Power Derating Curve)
-65°C to +200°C Operating and Storage Junction Temperature.
Power Derating 10.0 mW/°C above 50°C.
Forward Voltage @ 200 mA is less than 1.50 Volts.

Application

This surface mountable zener diode series is similar to the IN3016 thru IN3051 registration in the DO-13 package except that it meets the new JEDEC surface mount outline DO-213AB. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it is also suited for high reliability applications. This can be acquired by a source control drawing (SCD), or simply by ordering device types with a MLX or MLXV prefix for equivalent screening to JANTX or JANTXV.

*Electrical Characteristics @ 25° C

** TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 1)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 2) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}=ImA		MAXIMUM ZENER CURRENT I_{ZM} (Note 3)	MAXIMUM REVERSE LEAKAGE CURRENT I_R @ V_R		TYPICAL TEMP. COEFF. OF ZENER VOLTAGE $\propto_{VZ}$
	VOLTS	mA	OHMS	OHMS	mA	mA	µA	Volts	%/°C
MLL3016B	6.8	37	3.5	750	1.0	140	150	5.2	.040
MLL3017B	7.5	34	4	750	.5	125	100	5.7	.045
MLL3018B	8.2	31	4.5	750	.5	115	50	6.2	.048
MLL3019B	9.1	28	5	750	.5	105	25	6.9	.050
MLL3020B	10	25	7	750	.25	95	25	7.6	.055
MLL3021B	11	23	8	750	.25	85	10	8.4	.060
MLL3022B	12	21	9	750	.25	80	10	9.1	.065
MLL3023B	13	19	10	1000	.25	74	10	9.9	.065
MLL3024B	15	17	14	750	.25	63	10	44.4	.070
MLL3025B	16	15.5	16	750	.25	60	10	12.2	.070
MLL3026B	18	14	20	750	.25	52	10	13.7	.075
MLL3027B	20	12.5	22	1000	.25	47	10	15.2	.075
MLL3028B	22	11.5	23	750	.25	43	10	16.7	.080
MLL3029B	24	10.5	25	750	.25	40	10	18.2	.080
MLL3030B	27	9.5	35	750	.25	34	10	20.6	.085
MLL3031B	30	8.5	40	1000	.25	31	10	22.8	.085
MLL3032B	33	7.5	45	750	.25	28	10	25.1	.085
MLL3033B	36	7.0	50	750	.25	26	10	27.4	.085
MLL3034B	39	6.5	60	750	.25	23	10	29.7	.090
MLL3035B	40	6.0	70	1000	.25	21	10	32.7	.090
MLL3036B	47	5.5	80	1500	.25	19	10	35.8	.090
MLL3037B	51	5.0	95	1500	.25	18	10	38.8	.090
MLL3038B	56	4.5	110	2000	.25	17	10	42.6	.090
MLL3039B	62	4.0	125	2000	.25	15	10	47.1	.090
MLL3040B	68	3.7	150	2000	.25	14	10	51.7	.090
MLL3041B	75	3.3	175	2000	.25	12	10	56.0	.090
MLL3042B	82	3.0	200	3000	.25	11	10	62.2	.090
MLL3043B	91	2.8	250	3000	.25	10	10	69.2	.090
MLL3044B	100	2.5	350	3000	.25	9.0	10	76.0	.090
MLL3045B	110	2.3	450	4000	.25	8.3	10	83.6	.095
MLL3046B	120	2.0	550	4500	.25	8.0	10	91.2	.095
MLL3047B	130	1.9	700	5000	.25	6.9	10	98.8	.095
MLL3048B	150	1.7	1000	6000	.25	5.7	10	114.0	.095
MLL3049B	160	1.6	1100	6500	.25	5.4	10	121.6	.095
MLL3050B	180	1.4	1200	7000	.25	4.9	10	136.8	.095
MLL3051B	200	1.2	1500	8000	.25	4.6	10	152.0	.100

* JEDEC Registered Data for 1N3821 thru 3830A equivalents..
** When applicable, replace MLL prefix with MLX or MLXV for 3821A to 3828A. † Not JEDEC Data.

Mechanical Characteristics

CASE: Hermetically sealed glass with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

POLARITY:
Banded end is cathode

THERMAL RESISTANCE:
50°C/ Watt typical junction to end caps. (See Power Derating Curve).

MOUNTING POSITION:
Any.

1N3016B thru 1N3051B

NOTE 1:
Suffix A signifies a ±5% tolerance on nominal zener voltage. If tighter tolerance is required, consult factory. Zener Voltage (V_Z) is measured with junction in thermal equilibrium with still air at a temperature of 25°C. The test currents (I_{ZT}) at nominal voltages provide a constant 0.25 watts for this device series.

NOTE 2:
The zener impedance is derived when a 60 cycle ac current having an rms value equal to 10% of the dc zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units. A curve showing the variation of zener impedance vs. zener current for four representative types is shown in Figure 2.

NOTE 3:
These JEDEC values of I_{ZM} may be exceeded by 50% fo the surface mount package shown. Further power capability exists by heatsinking for end cap temperature control (T_{EC}) as shown in Figure 5.

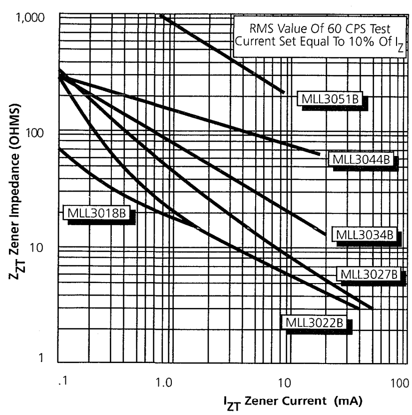


FIGURE 2 Typical Zener Impedance vs. Zener Current For Types Shown

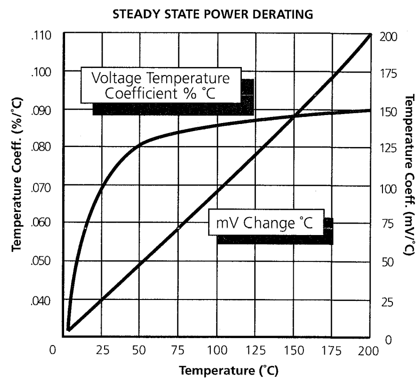


FIGURE 3 Typical Zener Voltage Temperature Coeff. vs. Zener Voltage

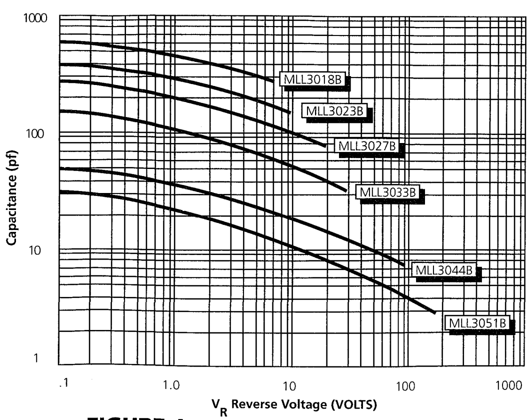


FIGURE 4 Typical Capacitance vs. Reverse Voltage

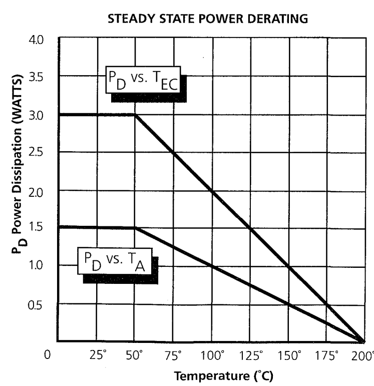


FIGURE 5 Power Derating Curve Where T_A is Ambient Temperature And T_{EC} is End Cap Temperature

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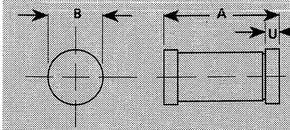
MLL3821 thru MLL3830A

LEADLESS GLASS ZENER DIODES



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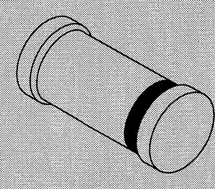

Figure 1

DIM.	MILLIMETERS MIN.	MILLIMETERS MAX.	INCHES MIN.	INCHES MAX.
A	4.80	5.20	.189	.205
B	2.39	2.66	.094	.105
U	0.41	0.55	.016	.022

DO-213AB

Description / Features

- LEADLESS PACKAGE FOR SURFACE MOUNT EQUIVALENT TO IN3821 THRU IN3830A
- IDEAL FOR HIGH DENSITY MOUNTING
- VOLTAGE RANGE: 3.3 TO 7.5 VOLTS
- HERMETICALLY SEALED, DOUBLE-SLUG GLASS CONSTRUCTION
- METALLURGICALLY BONDED CONSTRUCTION
- AVAILABLE IN JANTX OR JANTXV EQUIVALENTS TO MIL-S-19500/115 FOR 3821A THRU 3828A WITH MLX OR MLXV PREFIX.

Maximum Ratings

1.50 Watts DC Power Rating (See Power Derating Curve)
-65°C to +200°C Operating and Storage Junction Temperature
Power Derating 10.0 mW/°C above 50°C
Forward Voltage @ 200 mA is less than 1.50 Volts

Application

This surface mountable zener diode series is similar to the IN3821 thru IN3830 registration in the DO-13 package except that it meets the new JEDEC surface mount outline DO-213AB. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it is also suited for high reliability applications. This can be acquired by a source control drawing (SCD), or simply by ordering device types with a MLX or MLXV prefix for equivalent screening to JANTX or JANTXV.

*Electrical Characteristics @ 25° C

** TYPE NUMBER (Note 1)	NOMINAL ZENER VOLTAGE V_Z @ I_{ZT} (Note 1)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 2) Z_{ZT} @ I_{ZT}	MAXIMUM ZENER IMPEDANCE (Note 2) Z_{ZK} @ I_{ZK}=1mA	MAXIMUM ZENER CURRENT I_{ZM} (Note 3)	MAXIMUM REVERSE LEAKAGE CURRENT I_R	@ V_R	TYPICAL TEMP. COEFF. OF ZENER VOLTAGE $\propto_{VZ}$
	VOLTS	mA	OHMS	OHMS	mA	µA	Volts	%/°C
MLL3821	3.3	76	10	400	276	100	1	-.066
MLL3821A	3.3	76	10	400	276	100	1	-.066
MLL3822	3.6	69	10	400	252	100	1	-.058
MLL3822A	3.6	69	10	400	252	100	1	-.058
MLL3823	3.9	64	9	400	238	50	1	-.046
MLL3823A	3.9	64	9	400	238	50	1	-.046
MLL3824	4.3	58	9	400	213	10	1	-.033
MLL3824A	4.3	58	9	400	213	10	1	-.033
MLL3825	4.7	53	8	500	194	10	1	-.015
MLL3825A	4.7	53	8	500	194	10	1	-.015
MLL3826	5.1	49	7	550	178	10	1	±.010
MLL3826A	5.1	49	7	550	178	10	1	±.010
MLL3827	5.6	45	5	600	162	10	2	+.030
MLL3827A	5.6	45	5	600	162	10	2	+.030
MLL3828	6.2	41	2	700	146	10	3	+.049
MLL3828A	6.2	41	2	700	146	10	3	+.049
MLL3829	6.8	37	1.5	500	133	10	3	+.053
MLL3829A	6.8	37	1.5	500	133	10	3	+.053
MLL3830	7.5	34	1.5	250	121	10	3	+.057
MLL3830A	7.5	34	1.5	250	121	10	3	+.057

* JEDEC Registered Data for 1N3821 thru 3830A equivalents.
** When applicable, replace MLL prefix with MLX or MLXV for 3821A to 3828A.

Mechanical Characteristics

CASE: Hermetically sealed glass with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

POLARITY: Banded end is cathode.

THERMAL RESISTANCE: 50°C/ Watt typical junction to end caps. (See Power Derating Curve.)

MOUNTING POSITION: Any.

NOTE 1:
Suffix A signifies a ±5% tolerance on nominal zener voltage. If tighter tolerance is required, consult factory. Zener Voltage (V_Z) is measured with junction in thermal equilibrium with still air at a temperature of 25°C. The test currents (I_{ZT}) at nominal voltages provide a constant 0.25 watts for this device series.

NOTE 2:
The zener impedance is derived when a 60 cycle ac current having an rms value equal to 10% of the dc zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at 2 points to insure a sharp knee on the breakdown curve and to eliminate unstable units. A curve showing the variation of zener impedance vs. zener current for four representative types is shown in Figure 2.

NOTE 3:
These JEDEC values of I_{ZM} may be exceeded by 50% for the surface mount package shown. Further power capability exists by heatsinking for end cap temperature control (T_{EC}) as shown in Figure 5.

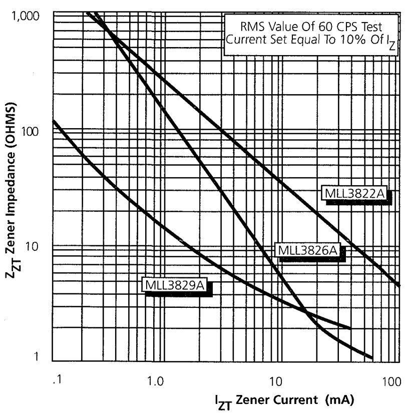

FIGURE 2 Typical Zener Impedance vs. Zener Current For Types Shown

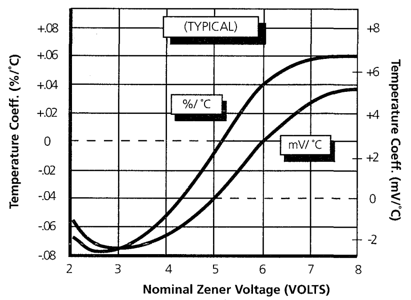

FIGURE 3 Typical Zener Voltage Temperature Coeff. vs. Zener Voltage

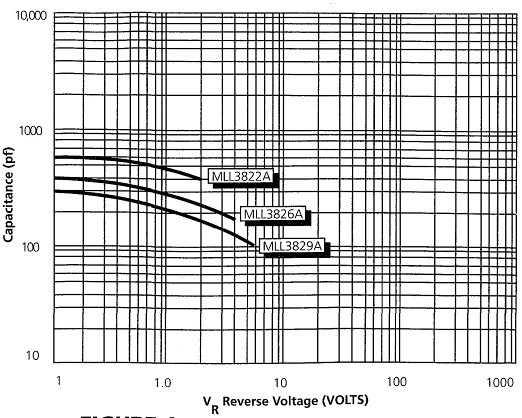

FIGURE 4 Typical Capacitance vs. Reverse Voltage

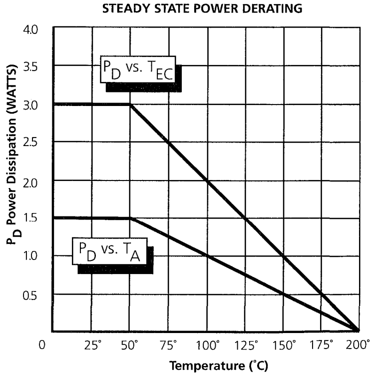

FIGURE 5 Power Derating Curve Where T_A is Ambient Temperature And T_{EC} is End Cap Temperature

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MLL4001 thru
MLL4004
(MELF)

APPLICATION

This surface mountable rectifier series is similar to the 1N4001 thru 1N4004 registration in the DO-41 equivalent package except that it meets the new JEDEC surface mount outline DO-213AB. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it may also be considered for high reliability applications when required by a source control drawing (SCD).

FEATURES

- Low cost
- High current capability
- Low leakage
- Low forward voltage
- High surge capability
- Hermetically sealed, double-slug glass construction
- Leadless package for surface mount technology
- Ideal for high density mounting
- Available on tape and reel (12mm tape*)

MAXIMUM RATINGS

-65°C to +175°C Operating Temperature Range.
-65°C to +200°C Storage Temperature Range.
Current Derating 10.0mA/°C above 75°C.

ELECTRICAL CHARACTERISTICS

Type	Peak Reverse Voltage	Max. RMS Voltage	Max. DC Blocking Voltage	Max. Average Forward Rectified Current	Peak Forward Surge Current I_F (Surge)	Max. Forward Voltage @ 1A DC	Max. DC Reverse Current @ Rated DC Blocking Voltage	Typical Junction Capacitance @V_R=4V
	V	V	V	A	A	V	uA	pF
MLL4001	50	35	50	1.0	30	1.1	5.0	15
MLL4002	100	70	100	1.0	30	1.1	5.0	15
MLL4003	200	140	200	1.0	30	1.1	5.0	15
MLL4004	400	280	400	1.0	30	1.1	5.0	15

**The carrier tape consists of a plastic tape with "nests" having a size corresponding to the component's requirements. The sprocket holes are on one side of the tape. The blister tapes are sealed with a cover tape. The cathode side of the components in MELF and minicases are adjacent to the sprocket holes. Other orientation can be supplied on request.*

1 AMPERE LEADLESS GLASS RECTIFIERS

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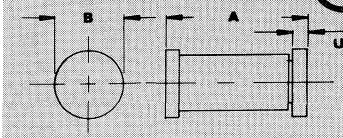

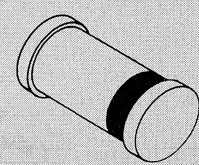

DIM.	MILLIMETERS MIN.	MILLIMETERS MAX.	INCHES MIN.	INCHES MAX.
A	4.80	5.20	.189	.205
B	2.39	2.66	.094	.102
U	.41	.55	.016	.022

DO-213AB

MECHANICAL CHARACTERISTICS

Case: Hermetically sealed glass with solder contact tabs at each end.

Finish: All external surfaces are corrosion resistant, readily solderable.

Polarity: Banded end is cathode.

Mounting Position: Any

MLL4001 thru MLL4004 (MELF)

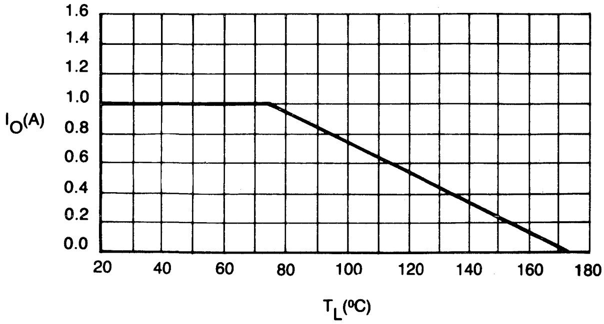

FIGURE 1
FORWARD DERATING CURVE

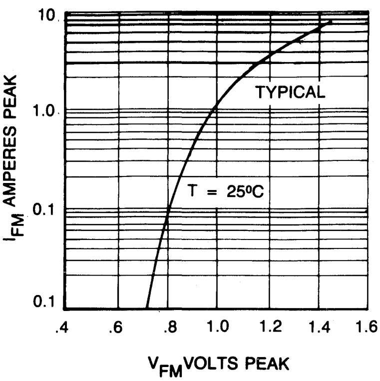

FIGURE 2
FORWARD CHARACTERISTICS

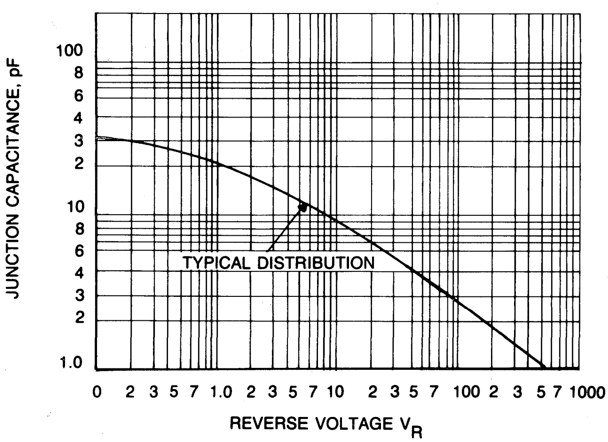

FIGURE 3
JUNCTION CAPACITANCE

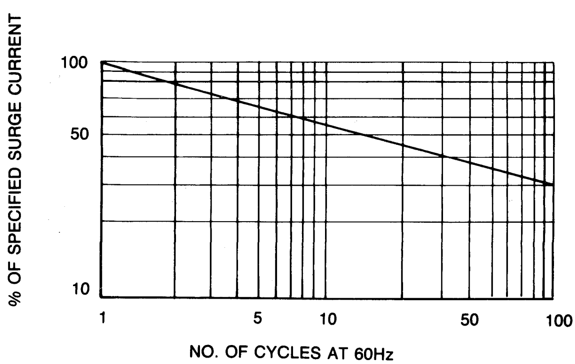

FIGURE 4
PEAK FORWARD SURGE CURRENT

Microsemi Corp.
The diode experts

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SCOTTSDALE, AZ
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(602) 941-6300

MLL4728 thru MLL4764

LEADLESS GLASS ZENER DIODES

5

DESCRIPTION/FEATURES

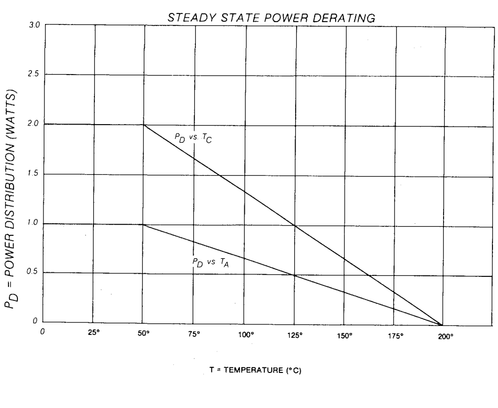
- LEADLESS PACKAGE FOR SURFACE MOUNT TECHNOLOGY
- IDEAL FOR HIGH DENSITY MOUNTING
- VOLTAGE RANGE—3.3 TO 100 VOLTS
- HERMETICALLY SEALED, DOUBLE-SLUG GLASS CONSTRUCTION

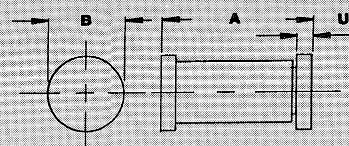
MAXIMUM RATINGS

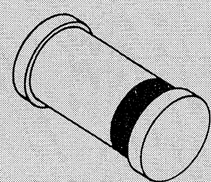
1.00 Watt DC Power Rating (See Power Derating Curve)
-65°C to +200°C Operating and Storage Junction Temperature
Power Derating 10.0 mW/°C above 50°C
Forward Voltage @ 200 mA: 1.2 Volts

APPLICATION

This surface mountable zener diode series is similar to the 1N4728 thru 1N4764 registration in the DO-41 equivalent package except that it meets the new JEDEC surface mount outline DO-213AB. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it may also be considered for high reliability applications when required by a source control drawing (SCD).







DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.80	5.20	.189	.205
B	2.39	2.66	.094	.105
U	.41	.55	.016	.022

DO-213AB

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

POLARITY: Banded end is cathode.

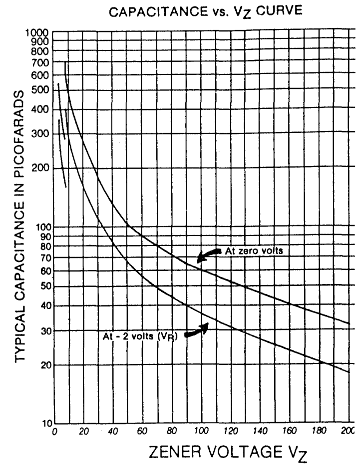
THERMAL RESISTANCE: 75°C/Watt typical junction to contact (case) tabs. (See Power Derating Curve)

MOUNTING POSITION: Any.

MLL4728 thru MLL4764

ELECTRICAL CHARACTERISTICS @ $T_C = 30°C$

TYPE NUMBER (Note 1)	ZENER VOLTAGE (V_Z) (NOTE 4)	TEST CURRENT (I_{ZT})	MAXIMUM DYNAMIC IMPEDANCE (Z_{ZT} @ I_{ZT}) (Note 2)	MAXIMUM REVERSE CURRENT (I_R @ V_R)	TEST VOLTAGE (V_R)	MAXIMUM REGULATOR CURRENT (I_{ZM}) $T_A = 50°C$	MAXIMUM KNEE IMPEDANCE (Z_{ZK} @ I_{ZK}) (Note 2)	TEST CURRENT (I_{ZK})	MAXIMUM (SURGE) CURRENT (I_S) (Note 3)
	VOLTS	mA	OHMS	μA	VOLTS	mA	OHMS	mA	mA
MLL4728A	3.3	76	10	100	1	276	400	1.0	1380
MLL4729A	3.6	69	10	100	1	252	400	1.0	1260
MLL4730A	3.9	64	9	50	1	234	400	1.0	1190
MLL4731A	4.3	58	9	10	1	217	400	1.0	1070
MLL4732A	4.7	53	8	10	1	193	500	1.0	970
MLL4733A	5.1	49	7	10	1	178	550	1.0	890
MLL4734A	5.6	45	5	10	2	162	600	1.0	810
MLL4735A	6.2	41	2	10	3	146	700	1.0	730
MLL4736A	6.8	37	3.5	10	4	133	700	1.0	660
MLL4737A	7.5	34	4.0	10	5	121	700	0.5	605
MLL4738A	8.2	31	4.5	10	6	110	700	0.5	550
MLL4739A	9.1	28	5.0	10	7	100	700	0.5	500
MLL4740A	10	25	7	10	7.6	91	700	0.25	454
MLL4741A	11	23	8	5	8.4	83	700	0.25	414
MLL4742A	12	21	9	5	9.1	76	700	0.25	380
MLL4743A	13	19	10	5	9.9	69	700	0.25	344
MLL4744A	15	17	14	5	11.4	61	700	0.25	304
MLL4745A	16	15.5	16	5	12.2	57	700	0.25	285
MLL4746A	18	14	20	5	13.7	50	750	0.25	250
MLL4747A	20	12.5	22	5	15.2	45	750	0.25	225
MLL4748A	22	11.5	23	5	16.7	41	750	0.25	205
MLL4749A	24	10.5	25	5	18.2	38	750	0.25	190
MLL4750A	27	9.5	35	5	20.6	34	750	0.25	170
MLL4751A	30	8.5	40	5	22.8	30	1000	0.25	150
MLL4752A	33	7.5	45	5	25.1	27	1000	0.25	135
MLL4753A	36	7.0	50	5	27.4	25	1000	0.25	125
MLL4754A	39	6.5	60	5	29.7	23	1000	0.25	115
MLL4755A	43	6.0	70	5	32.7	22	1500	0.25	110
MLL4756A	47	5.5	80	5	35.8	19	1500	0.25	95
MLL4757A	51	5.0	95	5	38.8	18	1500	0.25	90
MLL4758A	56	4.5	110	5	42.6	16	2000	0.25	80
MLL4759A	62	4.0	125	5	47.1	14	2000	0.25	70
MLL4760A	68	3.7	150	5	51.7	13	2000	0.25	65
MLL4761A	75	3.3	175	5	56.0	12	2000	0.25	60
MLL4762A	82	3.0	200	5	62.2	11	3000	0.25	55
MLL4763A	91	2.8	250	5	69.2	10	3000	0.25	50
MLL4764A	100	2.5	350	5	76.0	9	3000	0.25	45



NOTE 1: The type numbers shown with an "A" suffix have a ±5% tolerance on the nominal Zener voltage. Also available with suffix "C" for ±2%, and "D" for ±1%, while the absence of a suffix letter denotes ±10% tolerance.

NOTE 2: The Zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC Zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}. Zener impedance is measured at two points to insure a sharp knee on the breakdown curve and eliminate unstable units.

NOTE 3: The reverse surge current is measured at 25°C ambient using a 1/2 square wave or equivalent sine wave pulse 1/120 second duration superimposed on I_{ZT}.

NOTE 4: Voltage measurements to be performed 90 seconds after application of DC current.

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SCOTTSDALE, AZ
For more information call:
(602) 941-6300

MLL5221 thru MLL5281

LEADLESS GLASS ZENER DIODES

DESCRIPTION/FEATURES

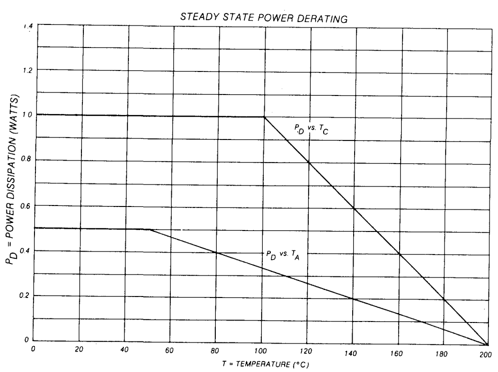
- LEADLESS PACKAGE FOR SURFACE MOUNT TECHNOLOGY
- IDEAL FOR HIGH DENSITY MOUNTING
- VOLTAGE RANGE—2.4 TO 200 VOLTS
- HERMETICALLY SEALED, DOUBLE-SLUG GLASS CONSTRUCTION
- METALLURGICALLY BONDED CONSTRUCTION AVAILABLE AS DASH ONE.

MAXIMUM RATINGS

500 mW DC Power Rating (See Power Derating Curve)
-65°C to +200°C Operating and Storage Junction Temperature
Power Derating 3.33 mW/°C above 50°C

APPLICATION

This surface mountable zener diode series is similar to the 1N5221 thru 1N5281 registration in the DO-35 equivalent package except that it meets the new JEDEC surface mount outline DO-213AA. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it may also be considered for high reliability applications when required by a source control drawing (SCD).



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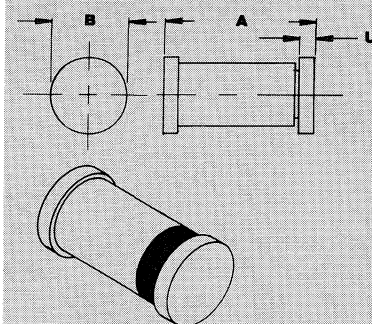


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	3.30	3.70	0.130	0.146
B	1.60	1.70	0.063	0.067
U	.41	.55	0.016	0.022

DO-213AA

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

POLARITY: Banded end is cathode.

THERMAL RESISTANCE: 100°C/Watt typical junction to contact (case) tabs.

MOUNTING POSITION: Any.

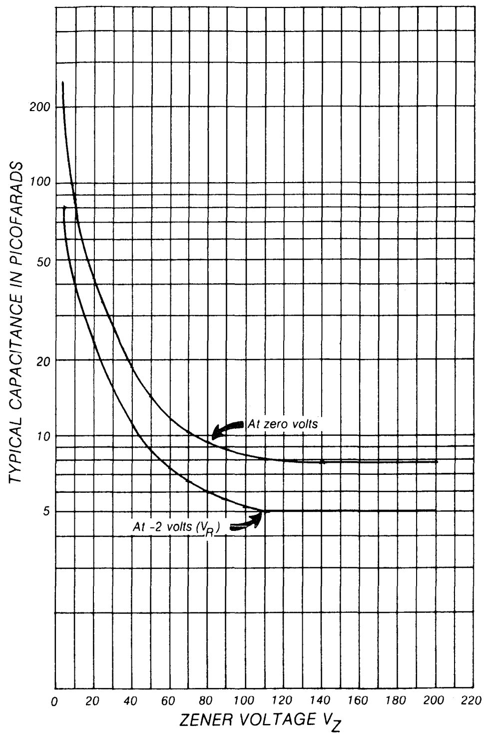
MLL5221 thru MLL 5281

ELECTRICAL CHARACTERISTICS

($T_A = 25°C$ unless otherwise noted. Based on dc measurements at thermal equilibrium; case temperature maintained at 30 ± 2°C. $V_F = 1.1V$ max @ $I_F = 200$ mA for all types.)

Type No. (Note 1)	Nominal Zener Voltage V_Z @ I_{ZT} Volts (Note 2)	Test Current I_{ZT} mA	Max Zener Impedance A and B Suffix only: Z_{ZT} @ I_{ZT} Ohms	Z_{ZK} @ I_{ZK} = 0.25 mA Ohms	Max Reverse Leakage Current A and B Suffix only: I_R µA	@ V_R Volts A	V_R Volts B	Non-Suffix: I_R @ V_R Used for Suffix A µA	Max Zener Voltage Temperature Coeff. (A and B Suffix only) α_{VZ} (%/°C) (Note 3)
MLL5221	2.4	20	30	1200	100	0.95	1.0	200	-0.085
MLL5222	2.5	20	30	1250	100	0.95	1.0	200	-0.085
MLL5223	2.7	20	30	1300	75	0.95	1.0	150	-0.080
MLL5224	2.8	20	30	1400	75	0.95	1.0	150	-0.080
MLL5225	3.0	20	29	1600	50	0.95	1.0	100	-0.075
MLL5226	3.3	20	28	1600	25	0.95	1.0	100	-0.070
MLL5227	3.6	20	24	1700	15	0.95	1.0	100	-0.065
MLL5228	3.9	20	23	1900	10	0.95	1.0	75	-0.060
MLL5229	4.3	20	22	2000	5.0	0.95	1.0	50	±0.055
MLL5230	4.7	20	19	1900	5.0	1.9	2.0	50	±0.030
MLL5231	5.1	20	17	1600	5.0	1.9	2.0	50	±0.030
MLL5232	5.6	20	11	1600	5.0	2.9	3.0	50	+0.038
MLL5233	6.0	20	7.0	1600	5.0	3.3	3.5	50	+0.038
MLL5234	6.2	20	7.0	1000	5.0	3.8	4.0	50	+0.045
MLL5235	6.8	20	5.0	750	3.0	4.8	5.0	30	+0.050
MLL5236	7.5	20	6.0	500	3.0	5.7	6.0	30	+0.058
MLL5237	8.2	20	8.0	500	3.0	6.2	6.5	30	+0.062
MLL5238	8.7	20	8.0	600	3.0	6.2	6.5	30	+0.065
MLL5239	9.1	20	10	600	3.0	6.7	7.0	30	+0.068
MLL5240	10	20	17	600	3.0	7.6	8.0	30	+0.075
MLL5241	11	20	22	600	2.0	8.0	8.4	30	+0.076
MLL5242	12	20	30	600	1.0	8.7	9.1	10	+0.077
MLL5243	13	9.5	13	600	0.5	9.4	9.9	10	+0.079
MLL5244	14	9.0	15	600	0.1	9.5	10	10	+0.082
MLL5245	15	8.5	16	600	0.1	10.5	11	10	+0.082
MLL5246	16	7.8	17	600	0.1	11.4	12	10	+0.083
MLL5247	17	7.4	19	600	0.1	12.4	13	10	+0.084
MLL5248	18	7.0	21	600	0.1	13.3	14	10	+0.085
MLL5249	19	6.6	23	600	0.1	13.3	14	10	+0.086
MLL5250	20	6.2	25	600	0.1	14.3	15	10	+0.086
MLL5251	22	5.6	29	600	0.1	16.2	17	10	+0.087
MLL5252	24	5.2	33	600	0.1	17.1	18	10	+0.088
MLL5253	25	5.0	35	600	0.1	18.1	19	10	+0.089
MLL5254	27	4.6	41	600	0.1	20	21	10	+0.090
MLL5255	28	4.5	44	600	0.1	20	21	10	+0.091
MLL5256	30	4.2	49	600	0.1	22	23	10	+0.091
MLL5257	33	3.8	58	700	0.1	24	25	10	+0.092
MLL5258	36	3.4	70	700	0.1	26	27	10	+0.093
MLL5259	39	3.2	80	800	0.1	29	30	10	+0.094
MLL5260	43	3.0	93	900	0.1	31	33	10	+0.095
MLL5261	47	2.7	105	1000	0.1	34	36	10	+0.095
MLL5262	51	2.5	125	1100	0.1	37	39	10	+0.096
MLL5263	56	2.2	150	1300	0.1	41	43	10	+0.096
MLL5264	60	2.1	170	1400	0.1	44	46	10	+0.097
MLL5265	62	2.0	185	1400	0.1	45	47	10	+0.097
MLL5266	68	1.8	230	1600	0.1	49	52	10	+0.097
MLL5267	75	1.7	270	1700	0.1	53	56	10	+0.098
MLL5268	82	1.5	330	2000	0.1	59	62	10	+0.098
MLL5269	87	1.4	370	2200	0.1	65	68	10	+0.099
MLL5270	91	1.4	400	2300	0.1	66	69	10	+0.099
MLL5271	100	1.3	500	2600	0.1	72	76	10	+0.110
MLL5272	110	1.1	750	3000	0.1	80	84	10	+0.110
MLL5273	120	1.0	900	4000	0.1	86	91	10	+0.110
MLL5274	130	0.95	1100	4500	0.1	94	99	10	+0.110
MLL5275	140	0.90	1300	4500	0.1	101	106	10	+0.110
MLL5276	150	0.85	1500	5000	0.1	108	114	10	+0.110
MLL5277	160	0.80	1700	5500	0.1	116	122	10	+0.110
MLL5278	170	0.74	1900	5500	0.1	123	129	10	+0.110
MLL5279	180	0.68	2200	6000	0.1	130	137	10	+0.110
MLL5280	190	0.66	2400	6500	0.1	137	144	10	+0.110
MLL5281	200	0.65	2500	7000	0.1	144	152	10	+0.110

CAPACITANCE vs. V_Z CURVE



NOTE 1: Table as shown lists type numbers, which indicate a tolerance of ±20% with guaranteed limits on only V_Z, I_R, and V_F. Devices with guaranteed limits on all six parameters are indicated by suffix "A" for ±10%, "B" for ±5%, "C" for ±2%, and "D" for ±1% tolerance.

NOTE 2: The electrical characteristics are measured after allowing the device to stabilize for 20 seconds.

NOTE 3: Temperature coefficient (α_{VZ}). Test conditions for temperature coefficient are as follows:

a. I_{ZT} = 7.5 mA, T_1 = 25°C,
   T_2 = 125°C (MLL5221A, B thru MLL5242A, B.)

b. I_{ZT} = Rated I_{ZT}, T_1 = 25°C,
   T_2 = 125°C (MLL5243A, B thru MLL5281A, B.)

Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temperature.

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

MLL5913 thru MLL5956

LEADLESS GLASS ZENER DIODES

5

DESCRIPTION/FEATURES

- LEADLESS PACKAGE FOR SURFACE MOUNT TECHNOLOGY
- IDEAL FOR HIGH DENSITY MOUNTING
- VOLTAGE RANGE—3.3 TO 200 VOLTS
- HERMETICALLY SEALED, DOUBLE-SLUG GLASS CONSTRUCTION
- METALLURGICALLY ENHANCED CONTACT CONSTRUCTION

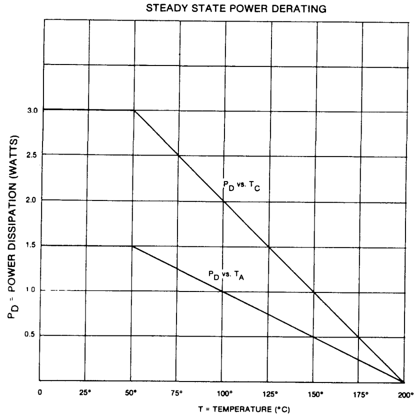
MAXIMUM RATINGS

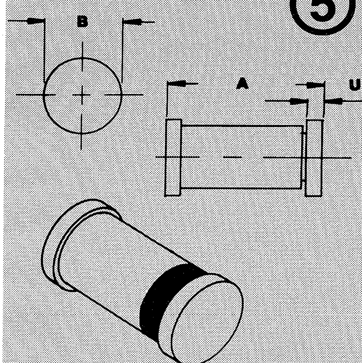
1.50 Watts DC Power Rating (See Power Derating Curve)
-65°C to +200°C Operating and Storage Junction Temperature
Power Derating 10.0 mW/°C above 50°C

APPLICATION

This surface mountable zener diode series is similar to the 1N5913 thru 1N5956 registration in the DO-41 equivalent package except that it meets the new JEDEC surface mount outline DO-213AB. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic qualities, it may also be considered for high reliability applications when required by a source control drawing (SCD).

STEADY STATE POWER DERATING





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.20	.189	.205
B	2.39	2.66	.094	.105
U	.41	.55	.016	.022

DO-213AB

MECHANICAL CHARACTERISTICS

CASE: Hermetically sealed glass with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

POLARITY: Banded end is cathode.

THERMAL RESISTANCE: 50°C/Watt typical junction to contact (case) tabs. (See Power Derating Curve)

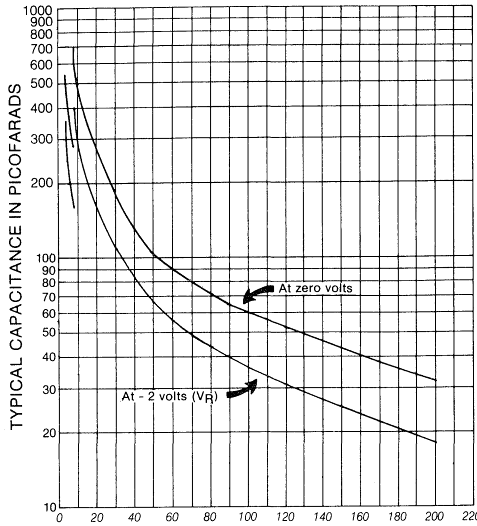
MOUNTING POSITION: Any.

MLL5913 thru MLL5956

ELECTRICAL CHARACTERISTICS @ T_C = 30°C

JEDEC TYPE NUMBER (Note 1)	ZENER VOLTAGE V_Z (Note 2) Volts	TEST CURRENT I_{ZT} mA	DYNAMIC IMPEDANCE Z_{ZT} (Note 3) Ω	KNEE CURRENT I_{ZK} mA	KNEE IMPEDANCE Z_{ZK} (Note 3) Ω	REVERSE CURRENT I_R μAdc	REVERSE VOLTAGE V_R Volts	MAX. DC CURRENT I_{ZM} mA
MLL5913	3.3	113.6	10	1.0	500	100	1.0	454
MLL5914	3.6	104.2	9.0	1.0	500	75	1.0	416
MLL5915	3.9	96.1	7.5	1.0	500	25	1.0	384
MLL5916	4.3	87.2	6.0	1.0	500	5.0	1.0	348
MLL5917	4.7	79.8	5.0	1.0	500	5.0	1.5	319
MLL5918	5.1	73.5	4.0	1.0	350	5.0	2.0	294
MLL5919	5.6	66.9	2.0	1.0	250	5.0	3.0	267
MLL5920	6.2	60.5	2.0	1.0	200	5.0	4.0	241
MLL5921	6.8	55.1	2.5	1.0	200	5.0	5.2	220
MLL5922	7.5	50	3.0	0.5	400	5.0	6.0	200
MLL5923	8.2	45.7	3.5	0.5	400	5.0	6.5	182
MLL5924	9.1	41.2	4.0	0.5	500	5.0	7.0	164
MLL5925	10	37.5	4.5	0.25	500	5.0	8.0	150
MLL5926	11	34.1	5.5	0.25	550	1.0	8.4	125
MLL5927	12	31.2	6.5	0.25	550	1.0	9.1	125
MLL5928	13	28.8	7.0	0.25	550	1.0	9.9	115
MLL5929	15	25	9.0	0.25	600	1.0	11.4	100
MLL5930	16	23.4	10	0.25	600	1.0	12.2	93
MLL5931	18	20.8	12	0.25	650	1.0	13.7	83
MLL5932	20	18.7	14	0.25	650	1.0	15.2	75
MLL5933	22	17	17.5	0.25	650	1.0	16.7	68
MLL5934	24	15.6	19	0.25	700	1.0	18.2	62
MLL5935	27	13.9	23	0.25	700	1.0	20.6	55
MLL5936	30	12.5	28	0.25	750	1.0	22.8	50
MLL5937	33	11.4	33	0.25	800	1.0	25.1	45
MLL5938	36	10.4	38	0.25	850	1.0	27.4	41
MLL5939	39	9.6	45	0.25	900	1.0	29.7	38
MLL5940	43	8.7	53	0.25	950	1.0	32.7	34
MLL5941	47	8.0	67	0.25	1000	1.0	35.8	31
MLL5942	51	7.3	70	0.25	1100	1.0	38.8	29
MLL5943	56	6.7	86	0.25	1300	1.0	42.6	26
MLL5944	62	6.0	100	0.25	1500	1.0	47.1	24
MLL5945	68	5.5	120	0.25	1700	1.0	51.2	22
MLL5946	75	5.0	140	0.25	2000	1.0	56	20
MLL5947	82	4.6	160	0.25	2500	1.0	62.2	18
MLL5948	91	4.1	200	0.25	3000	1.0	69.2	16
MLL5949	100	3.7	250	0.25	3100	1.0	76	15
MLL5950	110	3.4	300	0.25	4000	1.0	83.6	13
MLL5951	120	3.1	380	0.25	4500	1.0	91.2	12
MLL5952	130	2.9	450	0.25	5000	1.0	98.9	11
MLL5953	150	2.5	600	0.25	6000	1.0	114	10
MLL5954	160	2.3	700	0.25	6500	1.0	121.6	9.0
MLL5955	180	2.1	900	0.25	7000	1.0	136.8	8.0
MLL5956	200	1.9	1200	0.25	8000	1.0	152	7.0

CAPACITANCE vs. V_Z CURVE



ZENER VOLTAGE V_Z

T_C Maintained at 30°C, V_F = 1.2 V max @ I_F = 200 mA (all types)

NOTE 1: No suffix indicates a ±20% tolerance on nominal V_Z. The suffix A denotes ±10%, B denotes ±5%, C denotes ±2%, and D denotes ±1% tolerance.

NOTE 2: Zener voltage (V_Z) is measured at T_C = 30°C. Voltage measurement to be performed 90 seconds after application of DC current.

NOTE 3: The zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}.

Microsemi Corp.
The diode experts

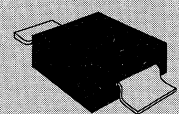
SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

SMBG5913 thru SMBG5956B and SMBJ5913 thru SMBJ5956B

SILICON
1.5 WATT
ZENER DIODES
SURFACE MOUNT

DO-215AA



(5)

DO-214AA

NOTE: All SMB series are equivalent to prior SMS package identifications.

Features

- SURFACE MOUNT EQUIVALENT TO 1N5913 THRU 1N5956B
- IDEAL FOR HIGH DENSITY, LOW PROFILE MOUNTING
- ZENER VOLTAGE 3.3V TO 200V
- WITHSTANDS LARGE SURGE STRESSES

Maximum Ratings

Junction and Storage: -55°C to +200°C
DC Power Dissipation: 1.5 Watt
12mW/°C above 75°C
Forward Voltage @ 200 mA: 1.2 Volts

Electrical Characteristics @ T_L = 30° C

MICROSEMI PART NUMBER		ZENER VOLTAGE V_Z	TEST CURRENT I_{ZT}	DYNAMIC IMPEDANCE Z_{ZT}	KNEE CURRENT I_{ZK}	KNEE IMPEDANCE Z_{ZK}	REVERSE CURRENT I_R	REVERSE VOLTAGE V_R	MAX. DC CURRENT I_{ZM}
Gull-Wing Lead	C-Bend (Mod.-J)	Volts	mA	Ω	mA	Ω	µ Adc	Volts	mA
SMBG5913	SMBJ5913	3.3	113.6	10.0	1.0	500	100.0	1.0	454
SMBG5914	SMBJ5914	3.6	104.2	9.0	1.0	500	75.0	1.0	416
SMBG5915	SMBJ5915	3.9	96.1	7.5	1.0	500	25.0	1.0	384
SMBG5916	SMBJ5916	4.3	87.2	6.0	1.0	500	5.0	1.0	348
SMBG5917	SMBJ5917	4.7	79.8	5.0	1.0	500	5.0	1.5	319
SMBG5918	SMBJ5918	5.1	73.5	4.0	1.0	350	5.0	2.0	294
SMBG5919	SMBJ5919	5.6	66.9	2.0	1.0	250	5.0	3.0	267
SMBG5920	SMBJ5920	6.2	60.5	2.0	1.0	200	5.0	4.0	241
SMBG5921	SMBJ5921	6.8	55.1	2.5	1.0	200	5.0	5.2	220
SMBG5922	SMBJ5922	7.5	50.0	3.0	0.5	400	5.0	6.0	200
SMBG5923	SMBJ5923	8.2	45.7	3.5	0.5	400	5.0	6.5	182
SMBG5924	SMBJ5924	9.1	41.2	4.0	0.5	500	5.0	7.0	164
SMBG5925	SMBJ5925	10	37.5	4.5	0.25	500	5.0	8.0	150
SMBG5926	SMBJ5926	11	34.1	5.5	0.25	550	1.0	8.4	125
SMBG5927	SMBJ5927	12	31.2	6.5	0.25	550	1.0	9.1	125
SMBG5928	SMBJ5928	13	28.8	7.0	0.25	550	1.0	9.9	115
SMBG5929	SMBJ5929	15	25.0	9.0	0.25	600	1.0	11.4	100
SMBG5930	SMBJ5930	16	23.4	10.0	0.25	600	1.0	12.2	93
SMBG5931	SMBJ5931	18	20.8	12.0	0.25	650	1.0	13.7	83
SMBG5932	SMBJ5932	20	18.7	14.0	0.25	650	1.0	15.2	75
SMBG5933	SMBJ5933	22	17.0	17.5	0.25	650	1.0	16.7	68
SMBG5934	SMBJ5934	24	15.6	19.0	0.25	700	1.0	18.2	62
SMBG5935	SMBJ5935	27	13.9	23.0	0.25	700	1.0	20.6	55
SMBG5936	SMBJ5936	30	12.5	28.0	0.25	750	1.0	22.8	50
SMBG5937	SMBJ5937	33	11.4	33.0	0.25	800	1.0	25.1	45
SMBG5938	SMBJ5938	36	10.4	38.0	0.25	850	1.0	27.4	41
SMBG5939	SMBJ5939	39	9.6	45.0	0.25	900	1.0	29.7	38
SMBG5940	SMBJ5940	43	8.7	53.0	0.25	950	1.0	32.7	34
SMBG5941	SMBJ5941	47	8.0	67.0	0.25	1000	1.0	35.8	31
SMBG5942	SMBJ5942	51	7.3	70.0	0.25	1100	1.0	38.8	29
SMBG5943	SMBJ5943	56	6.7	86.0	0.25	1300	1.0	42.6	26
SMBG5944	SMBJ5944	62	6.0	100.0	0.25	1500	1.0	47.1	24
SMBG5945	SMBJ5945	68	5.5	120.0	0.25	1700	1.0	51.2	22
SMBG5946	SMBJ5946	75	5.0	140.0	0.25	2000	1.0	56.0	20
SMBG5947	SMBJ5947	82	4.6	160.0	0.25	2500	1.0	62.2	18
SMBG5948	SMBJ5948	91	4.1	200.0	0.25	3000	1.0	69.2	16
SMBG5949	SMBJ5949	100	3.7	250.0	0.25	3100	1.0	76.0	15
SMBG5950	SMBJ5950	110	3.4	300.0	0.25	4000	1.0	83.6	13
SMBG5951	SMBJ5951	120	3.1	380.0	0.25	4500	1.0	91.2	12
SMBG5952	SMBJ5952	130	2.9	450.0	0.25	5000	1.0	98.8	11
SMBG5953	SMBJ5953	150	2.5	600.0	0.25	6000	1.0	114.0	10
SMBG5954	SMBJ5954	160	2.3	700.0	0.25	6500	1.0	121.6	9
SMBG5955	SMBJ5955	180	2.1	900.0	0.25	7000	1.0	136.8	8
SMBG5956	SMBJ5956	200	1.9	1200.0	0.25	8000	1.0	152.0	7

Mechanical Characteristics

CASE: Molded Surface Mountable.

TERMINALS: Gull-wing or C-bend (modified J-bend) leads, tin lead plated.

POLARITY: Cathode indicated by band.

PACKAGING: Standard 12mm tape (see EIA Std. RS-481).

THERMAL RESISTANCE: 25°C/ Watt (typical) junction to lead (tab) at mounting plane.

SMB (G or J) 5913 thru SMB (G or J) 5956B

NOTE 1 No suffix indicates a ± 20% tolerance on nominal V_Z. Suffix A denotes a ± 10% tolerance, B denotes a ± 5% tolerance, C denotes a ± 2% tolerance, and D denotes a ± 1% tolerance.

NOTE 2 Zener voltage (Vz) is measured at T_L = 30°C. Voltage measurement to be performed 90 seconds after application of dc current.

NOTE 3 The zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}.

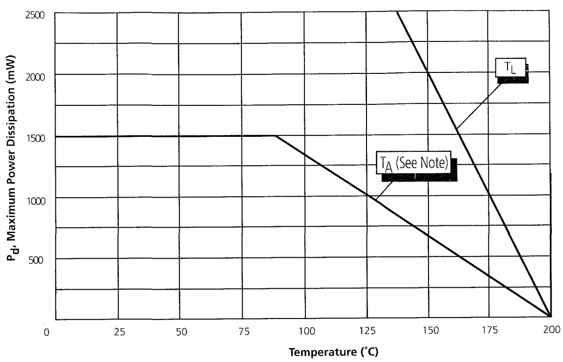


FIGURE 2 Power Derating Curve
Note: Lead temperature (T_L) at mounting plane for typical pc board thermal resistance design of 50°C/w will result in 75°C lead temperatures above ambient (T_A), if operating at the full rated 1.5 watts.

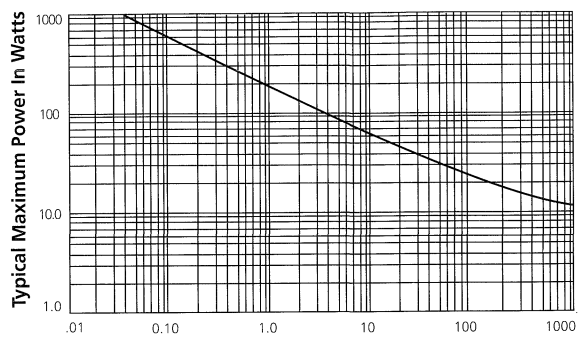


FIGURE 3 Transient Surge Capability Square Wave Pulse Width (Non-Repetitive) In Milliseconds

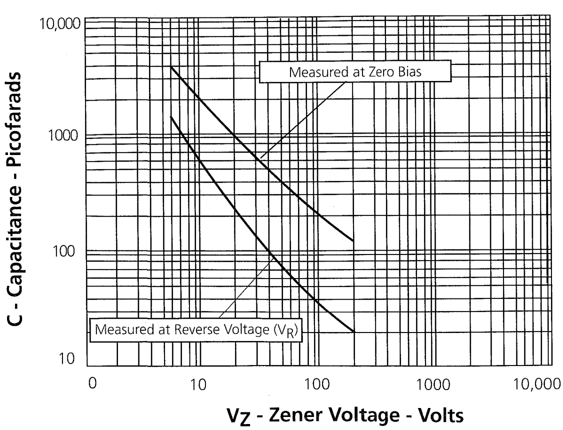
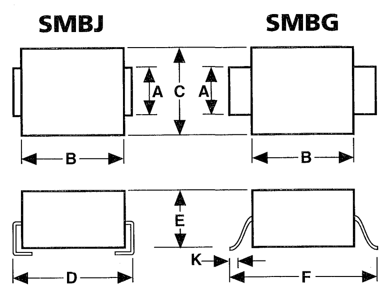


FIGURE 4 Typical Capacitance Vs. Zener Voltage

PACKAGE DIMENSIONS



DIMENSIONS IN INCHES	A	B	C	D	E	F	K	L
MIN.	.077	.160	.130	.205	.075	.235	.015	.030
MAX.	.083	.180	.155	.220	.095	.255	.030	.060
DIMENSIONS IN MILLIMETERS								
MIN.	1.96	4.06	3.30	5.21	1.90	5.97	0.381	0.760
MAX.	2.10	4.57	3.94	5.59	2.41	6.48	0.762	1.520

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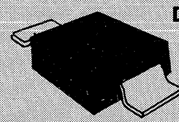
SMB* SERIES 5.0 thru 170.0 Volts 600 WATTS

UNI- and BI-DIRECTIONAL SURFACE MOUNT

DO-215AA



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DO-214AA

FEATURES

- LOW PROFILE PACKAGE FOR SURFACE MOUNTING
- VOLTAGE RANGE: 5.0 TO 170 VOLTS
- 600 WATTS PEAK POWER
- UNIDIRECTIONAL AND BIDIRECTIONAL
- LOW INDUCTANCE

This series of TAZ (transient absorption zeners), available in small outline surface mountable packages, is designed to optimize board space. Packaged for use with surface mount technology automated assembly equipment, these parts can be placed on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

The SMB series, rated for 600 watts, during a one millisecond pulse, can be used to protect sensitive circuits against transients induced by lightning and inductive load switching. With a response time of 1×10^{-12} seconds (theoretical) they are also effective against electrostatic discharge and NEMP.

MAXIMUM RATINGS

600 watts of Peak Power dissipation (10 x 1000μs)
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): less than 1×10^{-12} seconds (theoretical)
Forward surge rating: 50 Amps, 1/120 sec @ 25°C (Excluding Bidirectional)
Operating and Storage Temperature: -65° to +175°C

NOTE: A TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{RM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

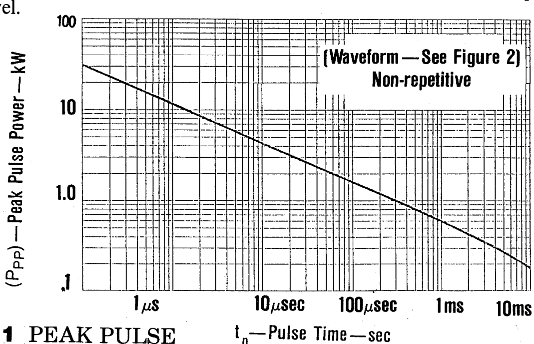


FIGURE 1 PEAK PULSE POWER VS PULSE TIME

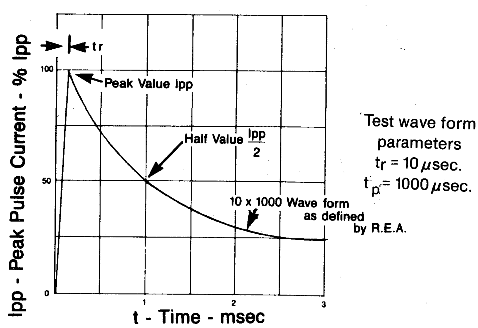


FIGURE 2
PULSE WAVEFORM

* **NOTE:** All SMB series are equivalent to prior SMS package identifications.

MECHANICAL CHARACTERISTICS

CASE: Molded Surface Mountable.

TERMINALS: Gull-wing or C-bend (modified J-bend) leads, tin lead plated.

POLARITY: Cathode indicated by dot. No marking on bidirectional devices.

PACKAGING: Standard 12 mm tape (see EIA Std. RS-481).

THERMAL RESISTANCE: 25°C/W (typical) junction to lead (tab) at mounting plane.

SMB 5.0 thru 170 Volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MICROSEMI CORP. PART NUMBER MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN.	MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA
SMBG5.0	SMBJ5.0	5.0	6.40	7.30	10	9.6	62.5	800
SMBG5.0A	SMBJ5.0A	5.0	6.40	7.00	10	9.2	65.2	800
SMBG6.0	SMBJ6.0	6.0	6.67	8.15	10	11.4	52.6	800
SMBG6.0A	SMBJ6.0A	6.0	6.67	7.37	10	10.3	58.3	800
SMBG6.5	SMBJ6.5	6.5	7.22	8.82	10	12.3	48.7	500
SMBG6.5A	SMBJ6.5A	6.5	7.22	7.98	10	11.2	53.6	500
SMBG7.0	SMBJ7.0	7.0	7.78	9.51	10	13.3	45.1	200
SMBG7.0A	SMBJ7.0A	7.0	7.78	8.60	10	12.0	50.0	200
SMBG7.5	SMBJ7.5	7.5	8.33	10.2	1	14.3	42.0	100
SMBG7.5A	SMBJ7.5A	7.5	8.33	9.21	1	12.9	46.5	100
SMBG8.0	SMBJ8.0	8.0	8.89	10.9	1	15.0	40.0	50
SMBG8.0A	SMBJ8.0A	8.0	8.89	9.83	1	13.6	44.1	50
SMBG8.5	SMBJ8.5	8.5	9.44	11.5	1	15.9	37.7	10
SMBG8.5A	SMBJ8.5A	8.5	9.44	10.4	1	14.4	41.7	10
SMBG9.0	SMBJ9.0	9.0	10.0	12.2	1	16.9	35.5	5
SMBG9.0A	SMBJ9.0A	9.0	10.0	11.1	1	15.4	39.0	5
SMBG10	SMBJ10	10	11.1	13.6	1	18.8	31.9	5
SMBG10A	SMBJ10A	10	11.1	12.3	1	17.0	35.3	5
SMBG11	SMBJ11	11	12.2	14.9	1	20.1	29.9	5
SMBG11A	SMBJ11A	11	12.2	13.5	1	18.2	33.0	5
SMBG12	SMBJ12	12	13.3	16.3	1	22.0	27.3	5
SMBG12A	SMBJ12A	12	13.3	14.7	1	19.9	30.2	5
SMBG13	SMBJ13	13	14.4	17.6	1	23.8	25.2	5
SMBG13A	SMBJ13A	13	14.4	15.9	1	21.5	27.9	5
SMBG14	SMBJ14	14	15.6	19.1	1	25.8	23.3	5
SMBG14A	SMBJ14A	14	15.6	17.2	1	23.2	25.8	5
SMBG15	SMBJ15	15	16.7	20.4	1	26.9	22.3	5
SMBG15A	SMBJ15A	15	16.7	18.5	1	24.4	24.0	5
SMBG16	SMBJ16	16	17.8	21.8	1	28.8	20.8	5
SMBG16A	SMBJ16A	16	17.8	19.7	1	26.0	23.1	5
SMBG17	SMBJ17	17	18.9	23.1	1	30.5	19.7	5
SMBG17A	SMBJ17A	17	18.9	20.9	1	27.6	21.7	5
SMBG18	SMBJ18	18	20.0	24.4	1	32.2	18.6	5
SMBG18A	SMBJ18A	18	20.0	22.1	1	29.2	20.5	5
SMBG20	SMBJ20	20	22.2	27.1	1	35.8	16.7	5
SMBG20A	SMBJ20A	20	22.2	24.5	1	32.4	18.5	5
SMBG22	SMBJ22	22	24.4	29.8	1	39.4	15.2	5
SMBG22A	SMBJ22A	22	24.4	26.9	1	35.5	16.9	5
SMBG24	SMBJ24	24	26.7	32.6	1	43.0	14.0	5
SMBG24A	SMBJ24A	24	26.7	29.5	1	38.9	15.4	5
SMBG26	SMBJ26	26	28.9	35.3	1	46.6	12.4	5
SMBG26A	SMBJ26A	26	28.9	31.9	1	42.1	14.2	5
SMBG28	SMBJ28	28	31.1	38.0	1	50.0	12.0	5
SMBG28A	SMBJ28A	28	31.1	34.4	1	45.4	13.2	5
SMBG30	SMBJ30	30	33.3	40.7	1	53.5	11.2	5
SMBG30A	SMBJ30A	30	33.3	36.8	1	48.4	12.4	5
SMBG33	SMBJ33	33	36.7	44.9	1	59.0	10.2	5
SMBG33A	SMBJ33A	33	36.7	40.6	1	53.3	11.3	5
SMBG36	SMBJ36	36	40.0	48.9	1	64.3	9.3	5
SMBG36A	SMBJ36A	36	40.0	44.2	1	58.1	10.3	5
SMBG40	SMBJ40	40	44.4	54.3	1	71.4	8.4	5
SMBG40A	SMBJ40A	40	44.4	49.1	1	64.5	9.3	5
SMBG43	SMBJ43	43	47.8	58.4	1	76.7	7.8	5
SMBG43A	SMBJ43A	43	47.8	52.8	1	69.4	8.6	5
SMBG45	SMBJ45	45	50.0	61.1	1	80.3	7.5	5
SMBG45A	SMBJ45A	45	50.0	55.3	1	72.7	8.3	5
SMBG48	SMBJ48	48	53.3	65.1	1	85.5	7.0	5
SMBG48A	SMBJ48A	48	53.3	58.9	1	77.4	7.7	5
SMBG51	SMBJ51	51	56.7	69.3	1	91.1	6.6	5
SMBG51A	SMBJ51A	51	56.7	62.7	1	82.4	7.3	5
SMBG54	SMBJ54	54	60.0	73.3	1	96.3	6.2	5
SMBG54A	SMBJ54A	54	60.0	66.3	1	87.1	6.9	5
SMBG58	SMBJ58	58	64.4	78.7	1	103.0	5.8	5
SMBG58A	SMBJ58A	58	64.4	71.2	1	93.6	6.4	5
SMBG60	SMBJ60	60	66.7	81.5	1	107.0	5.6	5
SMBG60A	SMBJ60A	60	66.7	73.7	1	96.8	6.2	5
SMBG64	SMBJ64	64	71.1	86.9	1	114.0	5.3	5
SMBG64A	SMBJ64A	64	71.1	78.6	1	103.0	5.8	5

SMB 5.0 thru 170 Volts

ELECTRICAL CHARACTERISTICS @ 25°C

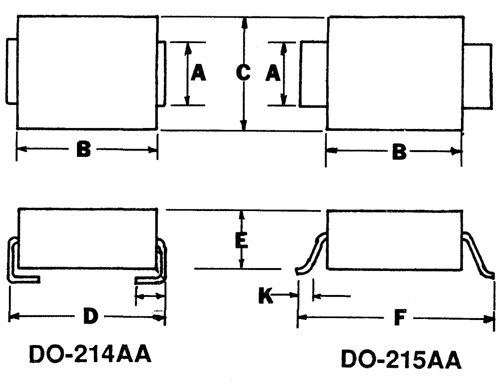
MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MICROSEMI CORP. PART NUMBER MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN. MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA
SMBG70	SMBJ70	70	77.8- 95.1	1	125	4.8	5
SMBG70A	SMBJ70A	70	77.8- 86.0	1	113	5.3	5
SMBG75	SMBJ75	75	83.3-102.0	1	134	4.5	5
SMBG75A	SMBJ75A	75	83.3- 92.1	1	121	4.9	5
SMBG78	SMBJ78	78	86.7-106.0	1	139	4.3	5
SMBG78A	SMBJ78A	78	86.7- 95.8	1	126	4.7	5
SMBG85	SMBJ85	85	94.4-115.0	1	151	3.9	5
SMBG85A	SMBJ85A	85	94.4-104.0	1	137	4.4	5
SMBG90	SMBJ90	90	100 -122	1	160	3.8	5
SMBG90A	SMBJ90A	90	100 -111	1	146	4.1	5
SMBG100	SMBJ100	100	111 -136	1	179	3.4	5
SMBG100A	SMBJ100A	100	111 -123	1	162	3.7	5
SMBG110	SMBJ110	110	122 -149	1	196	3.0	5
SMBG110A	SMBJ110A	110	122 -135	1	177	3.4	5
SMBG120	SMBJ120	120	133 -163	1	214	2.8	5
SMBG120A	SMBJ120A	120	133 -147	1	193	3.1	5
SMBG130	SMBJ130	130	144 -176	1	231	2.6	5
SMBG130A	SMBJ130A	130	144 -159	1	209	2.9	5
SMBG150	SMBJ150	150	167 -204	1	268	2.2	5
SMBG150A	SMBJ150A	150	167 -185	1	243	2.5	5
SMBG160	SMBJ160	160	178 -218	1	287	2.1	5
SMBG160A	SMBJ160A	160	178 -197	1	259	2.3	5
SMBG170	SMBJ170	170	189 -231	1	304	2.0	5
SMBG170A	SMBJ170A	170	189 -209	1	275	2.2	5

⑤

For Bidirectional indicate a C or CA suffix after the part number. (i.e.: SMBG170CA or SMBJ170C)

Microsemi Corp.'s SMB Series (600W) 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.

PACKAGE DIMENSIONS



DIMENSIONS IN INCHES	A	B	C	D	E	F	K	L
MIN.	.077	.160	.130	.205	.075	.235	.015	.030
MAX.	.083	.180	.155	.220	.095	.255	.030	.060
DIMENSIONS IN MILLIMETERS								
MIN.	1.96	4.06	3.30	5.21	1.90	5.97	0.381	0.760
MAX.	2.10	4.57	3.94	5.59	2.41	6.48	0.762	1.520

Typical Standoff Height: 0.004"-0.008" (0.1mm-0.2mm)

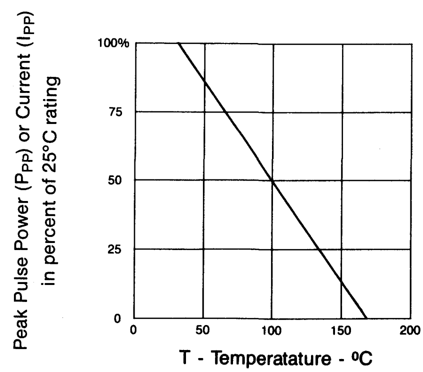


FIGURE 3 DERATING CURVE

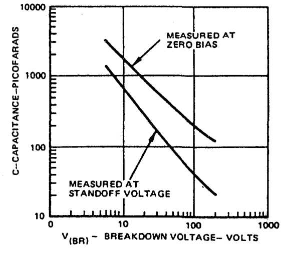


FIGURE 4
TYPICAL CAPACITANCE VS. BREAKDOWN VOLTAGE

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For more information call:
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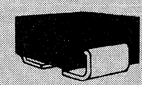
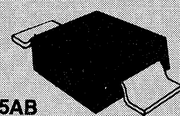
SMC* SERIES
5.0 thru 170.0 Volts
1500 WATTS

UNIDIRECTIONAL AND BIDIRECTIONAL SURFACE MOUNT

DO-214AB



5



DO-215AB

FEATURES

- UNIDIRECTIONAL AND BIDIRECTIONAL
- 1500 WATTS PEAK POWER
- VOLTAGE RANGE: 5.0 TO 170 VOLTS
- LOW INDUCTANCE
- LOW PROFILE PACKAGE FOR SURFACE MOUNTING

This series of TAZ (transient absorption zeners), available in small outline surface mountable packages, is designed to optimize board space. Packaged for use with surface mount technology automated assembly equipment, these parts can be placed on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

The SMC series, rated for 1500 watts during a one millisecond pulse, can be used to protect sensitive circuits against transients induced by lightning and inductive load switching. With a response time of 1 x 10^{-12} seconds (theoretical) they are also effective against electrostatic discharge and NEMP.

MAXIMUM RATINGS

1500 watts of Peak Power dissipation (10 x 1000μs)
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): less than 1 x 10^{-12} seconds (theoretical)
Forward surge rating: 200 Amps, 1/120 sec @ 25°C (Excluding Bidirectional)
Operating and Storage Temperature: -65° to +175°C

NOTE: TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{RM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

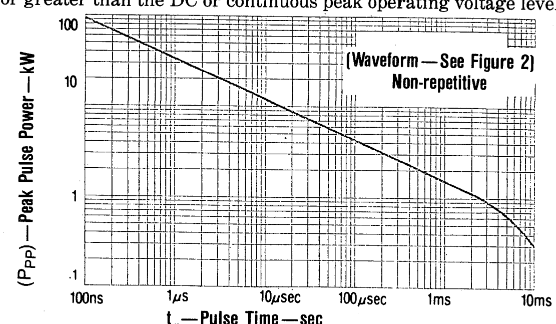


FIGURE 1 PEAK PULSE POWER VS PULSE TIME

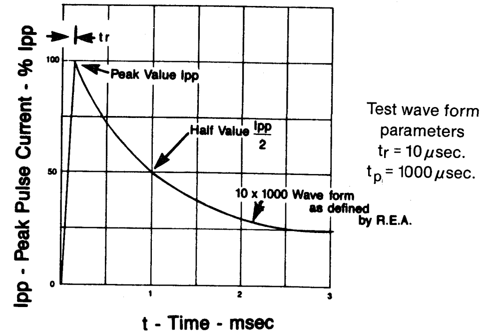


FIGURE 2 PULSE WAVEFORM

* **NOTE:** All SMC series are equivalent to prior SMM package identifications.

MECHANICAL CHARACTERISTICS

CASE: Molded, surface mountable.

TERMINALS: Gull-wing or C-bend (modified J-bend) leads, tin lead plated.

POLARITY: Cathode indicated by dot. No marking on bidirectional devices.

PACKAGING: 16mm tape. (See EIA Std. RS-481.)

THERMAL RESISTANCE: 20°C/W (typical) junction to lead (tab) at mounting plane.

SMC 5.0 thru 170 Volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MICROSEMI CORP. PART NUMBER MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN. - MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA
SMCG5.0	SMCJ5.0	5.0	6.40 - 7.30	10	9.6	156.2	1000
SMCG5.0A	SMCJ5.0A	5.0	6.40 - 7.00	10	9.2	163.0	1000
SMCG6.0	SMCJ6.0	6.0	6.67 - 8.15	10	11.4	131.6	1000
SMCG6.0A	SMCJ6.0A	6.0	6.67 - 7.37	10	10.3	145.6	1000
SMCG6.5	SMCJ6.5	6.5	7.22 - 8.82	10	12.3	122.0	500
SMCG6.5A	SMCJ6.5A	6.5	7.22 - 7.98	10	11.2	133.9	500
SMCG7.0	SMCJ7.0	7.0	7.78 - 9.51	10	13.3	112.8	200
SMCG7.0A	SMCJ7.0A	7.0	7.78 - 8.60	10	12.0	125.0	200
SMCG7.5	SMCJ7.5	7.5	8.33 - 10.2	1	14.3	104.9	100
SMCG7.5A	SMCJ7.5A	7.5	8.33 - 9.21	1	12.9	116.3	100
SMCG8.0	SMCJ8.0	8.0	8.89 - 10.9	1	15.0	100.0	50
SMCG8.0A	SMCJ8.0A	8.0	8.89 - 9.83	1	13.6	110.3	50
SMCG8.5	SMCJ8.5	8.5	9.44 - 11.5	1	15.9	94.3	25
SMCG8.5A	SMCJ8.5A	8.5	9.44 - 10.4	1	14.4	104.2	25
SMCG9.0	SMCJ9.0	9.0	10.0 - 12.2	1	16.9	88.7	10
SMCG9.0A	SMCJ9.0A	9.0	10.0 - 11.1	1	15.4	97.4	10
SMCG10	SMCJ10	10	11.1 - 13.6	1	18.8	79.8	5
SMCG10A	SMCJ10A	10	11.1 - 12.3	1	17.0	88.2	5
SMCG11	SMCJ11	11	12.2 - 14.9	1	20.1	74.6	5
SMCG11A	SMCJ11A	11	12.2 - 13.5	1	18.2	82.4	5
SMCG12	SMCJ12	12	13.3 - 16.3	1	22.0	68.2	5
SMCG12A	SMCJ12A	12	13.3 - 14.7	1	19.9	75.3	5
SMCG13	SMCJ13	13	14.4 - 17.6	1	23.8	63.0	5
SMCG13A	SMCJ13A	13	14.4 - 15.9	1	21.5	69.7	5
SMCG14	SMCJ14	14	15.6 - 19.1	1	25.8	58.1	5
SMCG14A	SMCJ14A	14	15.6 - 17.2	1	23.2	64.7	5
SMCG15	SMCJ15	15	16.7 - 20.4	1	26.9	55.8	5
SMCG15A	SMCJ15A	15	16.7 - 18.5	1	24.4	61.5	5
SMCG16	SMCJ16	16	17.8 - 21.8	1	28.8	52.1	5
SMCG16A	SMCJ16A	16	17.8 - 19.7	1	26.0	57.7	5
SMCG17	SMCJ17	17	18.9 - 23.1	1	30.5	49.2	5
SMCG17A	SMCJ17A	17	18.9 - 20.9	1	27.6	53.3	5
SMCG18	SMCJ18	18	20.0 - 24.4	1	32.2	46.6	5
SMCG18A	SMCJ18A	18	20.0 - 22.1	1	29.2	51.4	5
SMCG20	SMCJ20	20	22.2 - 27.1	1	35.8	41.9	5
SMCG20A	SMCJ20A	20	22.2 - 24.5	1	32.4	46.3	5
SMCG22	SMCJ22	22	24.4 - 29.8	1	39.4	38.1	5
SMCG22A	SMCJ22A	22	24.4 - 26.9	1	35.5	42.2	5
SMCG24	SMCJ24	24	26.7 - 32.6	1	43.0	34.9	5
SMCG24A	SMCJ24A	24	26.7 - 29.5	1	38.9	38.6	5
SMCG26	SMCJ26	26	28.9 - 35.3	1	46.6	32.2	5
SMCG26A	SMCJ26A	26	28.9 - 31.9	1	42.1	35.6	5
SMCG28	SMCJ28	28	31.1 - 38.0	1	50.0	30.0	5
SMCG28A	SMCJ28A	28	31.1 - 34.4	1	45.4	33.0	5
SMCG30	SMCJ30	30	33.3 - 40.7	1	53.5	28.0	5
SMCG30A	SMCJ30A	30	33.3 - 36.8	1	48.4	31.0	5
SMCG33	SMCJ33	33	36.7 - 44.9	1	59.0	25.2	5
SMCG33A	SMCJ33A	33	36.7 - 40.6	1	53.3	28.1	5
SMCG36	SMCJ36	36	40.0 - 48.9	1	64.3	23.3	5
SMCG36A	SMCJ36A	36	40.0 - 44.2	1	58.1	25.8	5
SMCG40	SMCJ40	40	44.4 - 54.3	1	71.4	21.0	5
SMCG40A	SMCJ40A	40	44.4 - 49.1	1	64.5	23.2	5
SMCG43	SMCJ43	43	47.8 - 58.4	1	76.7	19.6	5
SMCG43A	SMCJ43A	43	47.8 - 52.8	1	69.4	21.6	5
SMCG45	SMCJ45	45	50.0 - 61.1	1	80.3	18.7	5
SMCG45A	SMCJ45A	45	50.0 - 55.3	1	72.7	20.6	5
SMCG48	SMCJ48	48	53.3 - 65.1	1	85.5	17.5	5
SMCG48A	SMCJ48A	48	53.3 - 58.9	1	77.4	19.4	5
SMCG51	SMCJ51	51	56.7 - 69.3	1	91.1	18.5	5
SMCG51A	SMCJ51A	51	56.7 - 62.7	1	82.4	18.2	5
SMCG54	SMCJ54	54	60.0 - 73.3	1	96.3	15.6	5
SMCG54A	SMCJ54A	54	60.0 - 66.3	1	87.1	17.2	5
SMCG58	SMCJ58	58	64.4 - 78.7	1	103.0	14.6	5
SMCG58A	SMCJ58A	58	64.4 - 71.2	1	93.6	16.0	5
SMCG60	SMCJ60	60	66.7 - 81.5	1	107.0	14.0	5
SMCG60A	SMCJ60A	60	66.7 - 73.7	1	96.8	15.5	5
SMCG64	SMCJ64	64	71.1 - 86.9	1	114.0	13.2	5
SMCG64A	SMCJ64A	64	71.1 - 78.6	1	103.0	14.6	5

SMC 5.0 thru 170 Volts

ELECTRICAL CHARACTERISTICS @ 25°C

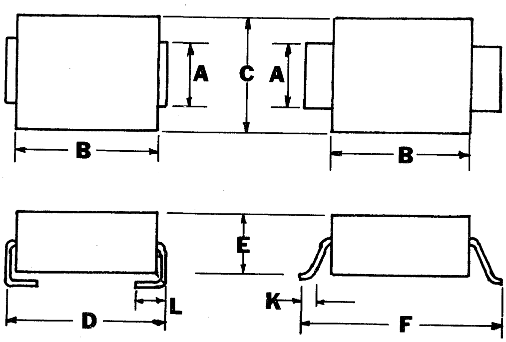
MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MICROSEMI CORP. PART NUMBER MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN. MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA
SMCG70	SMCJ70	70	77.8- 95.1	1	125	12.0	5
SMCG70A	SMCJ70A	70	77.8- 86.0	1	113	13.3	5
SMCG75	SMCJ75	75	83.3-102.0	1	134	11.2	5
SMCG75A	SMCJ75A	75	83.3- 92.1	1	121	12.4	5
SMCG78	SMCJ78	78	86.7-106.0	1	139	10.8	5
SMCG78A	SMCJ78A	78	86.7- 95.8	1	126	11.4	5
SMCG85	SMCJ85	85	94.4-115.0	1	151	9.9	5
SMCG85A	SMCJ85A	85	94.4-104.0	1	137	10.4	5
SMCG90	SMCJ90	90	100 -122	1	160	9.4	5
SMCG90A	SMCJ90A	90	100 -111	1	146	10.3	5
SMCG100	SMCJ100	100	111 -136	1	179	8.4	5
SMCG100A	SMCJ100A	100	111 -123	1	162	9.3	5
SMCG110	SMCJ110	110	122 -149	1	196	7.7	5
SMCG110A	SMCJ110A	110	122 -135	1	177	8.4	5
SMCG120	SMCJ120	120	133 -163	1	214	7.0	5
SMCG120A	SMCJ120A	120	133 -147	1	193	7.8	5
SMCG130	SMCJ130	130	144 -176	1	231	6.5	5
SMCG130A	SMCJ130A	130	144 -159	1	209	7.2	5
SMCG150	SMCJ150	150	167 -204	1	268	5.6	5
SMCG150A	SMCJ150A	150	167 -185	1	243	6.2	5
SMCG160	SMCJ160	160	178 -218	1	287	5.2	5
SMCG160A	SMCJ160A	160	178 -197	1	259	5.8	5
SMCG170	SMCJ170	170	189 -231	1	304	4.9	5
SMCG170A	SMCJ170A	170	189 -209	1	275	5.5	5

⑤

For Bidirectional indicate a C or CA suffix after the part number. (i.e.: SMC G170CA or SMC J170C)

Microsemi Corp.'s SMC Series (1500W) 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.

PACKAGE DIMENSIONS



DO-214AB DO-215AB

	A	B	C	D	E	F	K	L
DIMENSIONS IN INCHES								
MIN.	.115	.260	.220	.305	.075	.380	.025	.030
MAX.	.121	.280	.245	.320	.095	.400	.040	.060
DIMENSIONS IN MILLIMETERS								
MIN.	2.92	6.60	5.59	7.75	1.90	9.65	0.635	0.760
MAX.	3.07	7.11	6.22	8.13	2.41	10.16	1.016	1.520

Typical Standoff Height: 0.004"-0.008" (0.1mm-0.2mm)

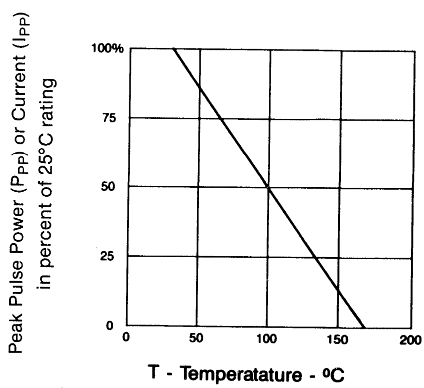


FIGURE 3 DERATING CURVE

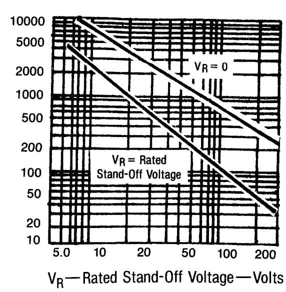


FIGURE 4 TYPICAL CAPACITANCE VS STAND-OFF VOLTAGE

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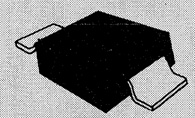
SML SERIES
5.0 thru 170.0 Volts
3000 WATTS

**UNIDIRECTIONAL AN
BIDIRECTIONAL
SURFACE MOUNT**



DO-215.

DO-214AB

FEATURES

- UNIDIRECTIONAL AND BIDIRECTIONAL
- 3000 WATTS PEAK POWER
- VOLTAGE RANGE: 5.0 TO 170 VOLTS
- LOW INDUCTANCE
- LOW PROFILE PACKAGE FOR SURFACE MOUNTING

This series of TAZ (transient absorption zeners), available in small outline surface mountable packages, is designed to optimize board space. Packaged for use with surface mount technology automated assembly equipment, these parts can be placed on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

The SML series, rated for 3000 watts, during a one millisecond pulse, can be used to protect sensitive circuits against transients induced by lightning and inductive load switching. With a response time of 1 x 10^{-12} seconds (theoretical) they are also effective against electrostatic discharge and NEMP.

MAXIMUM RATINGS

3000 watts of Peak Power dissipation (10 x 1000μs)
$t_{clamping}$ (0 volts to $V_{(BR)}$ min): less than 1 x 10^{-12} seconds (theoretical)
Forward surge rating: 200 Amps, 1/120 sec @ 25°C (Excluding Bidirectional)
Operating and Storage Temperature: -65° to +175°C

NOTE: TAZ is normally selected according to the reverse "Stand Off Voltage" (V_{RM}) which should be equal to or greater than the DC or continuous peak operating voltage level.

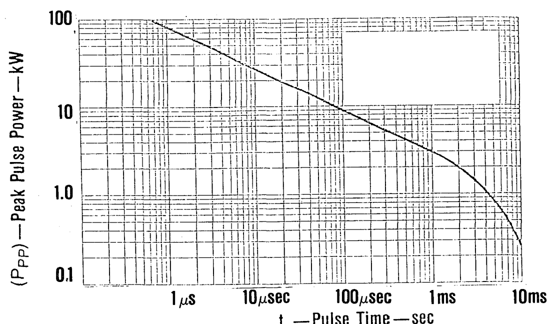
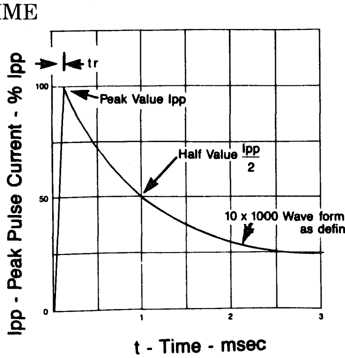


FIGURE 1 PEAK PULSE POWER VS PULSE TIME



Test wave form parameters
t_r = 10μsec.
t_p = 1000μsec.

FIGURE 2 PULSE WAVEFORM

MECHANICAL CHARACTERISTICS

CASE: Molded, surface mountab

TERMINALS: Gull-wing or C-
(modified J-bend) leads, tin lea

POLARITY: Cathode end in
cated by dot. No marking on
directional devices.

PACKAGING: 16mm tape. (
EIA Std. RS-481.)

THERMAL RESISTANC
20°C/W (typical) junction
lead (tab) at mounting plane

SML 5.0 thru 170.0 Volts

ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN. MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D μA
SMLG5.0	SMLJ5.0	5.0	6.40 - 7.30	10	9.6	312.5	1000
SMLG5.0A	SMLJ5.0A	5.0	6.40 - 7.00	10	9.2	326.0	1000
SMLG6.0	SMLJ6.0	6.0	6.67 - 8.15	10	11.4	263.2	1000
SMLG6.0A	SMLJ6.0A	6.0	6.67 - 7.37	10	10.3	291.3	1000
SMLG6.5	SMLJ6.5	6.5	7.22 - 8.82	10	12.3	243.9	500
SMLG6.5A	SMLJ6.5A	6.5	7.22 - 7.98	10	11.2	267.9	500
SMLG7.0	SMLJ7.0	7.0	7.78 - 9.51	10	13.3	225.6	200
SMLG7.0A	SMLJ7.0A	7.0	7.78 - 8.60	10	12.0	250.0	200
SMLG7.5	SMLJ7.5	7.5	8.33-10.2	1	14.3	209.8	100
SMLG7.5A	SMLJ7.5A	7.5	8.33- 9.21	1	12.9	232.6	100
SMLG8.0	SMLJ8.0	8.0	8.89-10.9	1	15.0	200.0	50
SMLG8.0A	SMLJ8.0A	8.0	8.89- 9.83	1	13.6	220.6	50
SMLG8.5	SMLJ8.5	8.5	9.44-11.5	1	15.9	188.6	25
SMLG8.5A	SMLJ8.5A	8.5	9.44-10.4	1	14.4	208.4	25
SMLG9.0	SMLJ9.0	9.0	10.0 - 12.2	1	16.9	177.4	10
SMLG9.0A	SMLJ9.0A	9.0	10.0 - 11.1	1	15.4	194.8	10
SMLG10	SMLJ10	10	11.1 - 13.6	1	18.8	159.6	5
SMLG10A	SMLJ10A	10	11.1 - 12.3	1	17.0	176.4	5
SMLG11	SMLJ11	11	12.2 - 14.9	1	20.1	149.2	5
SMLG11A	SMLJ11A	11	12.2 - 13.5	1	18.2	164.8	5
SMLG12	SMLJ12	12	13.3 - 16.3	1	22.0	136.4	5
SMLG12A	SMLJ12A	12	13.3 - 14.7	1	19.9	150.6	5
SMLG13	SMLJ13	13	14.4 - 17.6	1	23.8	126.0	5
SMLG13A	SMLJ13A	13	14.4 - 15.9	1	21.5	139.4	5
SMLG14	SMLJ14	14	15.6 - 19.1	1	25.8	116.2	5
SMLG14A	SMLJ14A	14	15.6 - 17.2	1	23.2	129.4	5
SMLG15	SMLJ15	15	16.7 - 20.4	1	26.9	111.6	5
SMLG15A	SMLJ15A	15	16.7 - 18.5	1	24.4	123.0	5
SMLG16	SMLJ16	16	17.8 - 21.8	1	28.8	104.2	5
SMLG16A	SMLJ16A	16	17.8 - 19.7	1	26.0	115.4	5
SMLG17	SMLJ17	17	18.9 - 23.1	1	30.5	98.4	5
SMLG17A	SMLJ17A	17	18.9 - 20.9	1	27.6	106.6	5
SMLG18	SMLJ18	18	20.0 - 24.4	1	32.2	93.2	5
SMLG18A	SMLJ18A	18	20.0 - 22.1	1	29.2	102.8	5
SMLG20	SMLJ20	20	22.2 - 27.1	1	35.8	83.8	5
SMLG20A	SMLJ20A	20	22.2 - 24.5	1	32.4	92.6	5
SMLG22	SMLJ22	22	24.4 - 29.8	1	39.4	76.2	5
SMLG22A	SMLJ22A	22	24.4 - 26.9	1	35.5	84.4	5
SMLG24	SMLJ24	24	26.7 - 32.6	1	43.0	69.8	5
SMLG24A	SMLJ24A	24	26.7 - 29.5	1	38.9	77.2	5
SMLG26	SMLJ26	26	28.9 - 35.3	1	46.6	64.4	5
SMLG26A	SMLJ26A	26	28.9 - 31.9	1	42.1	71.2	5
SMLG28	SMLJ28	28	31.1 - 38.0	1	50.0	60.0	5
SMLG28A	SMLJ28A	28	31.1 - 34.4	1	45.4	66.0	5
SMLG30	SMLJ30	30	33.3 - 40.7	1	53.5	56.0	5
SMLG30A	SMLJ30A	30	33.3 - 36.8	1	48.4	62.0	5
SMLG33	SMLJ33	33	36.7 - 44.9	1	59.0	50.4	5
SMLG33A	SMLJ33A	33	36.7 - 40.6	1	53.3	56.2	5
SMLG36	SMLJ36	36	40.0 - 48.9	1	64.3	46.6	5
SMLG36A	SMLJ36A	36	40.0 - 44.2	1	58.1	51.6	5
SMLG40	SMLJ40	40	44.4 - 54.3	1	71.4	42.0	5
SMLG40A	SMLJ40A	40	44.4 - 49.1	1	64.5	46.4	5
SMLG43	SMLJ43	43	47.8 - 58.4	1	76.7	39.2	5
SMLG43A	SMLJ43A	43	47.8 - 52.8	1	69.4	43.2	5
SMLG45	SMLJ45	45	50.0 - 61.1	1	80.3	37.4	5
SMLG45A	SMLJ45A	45	50.0 - 55.3	1	72.7	41.2	5
SMLG48	SMLJ48	48	53.3 - 65.1	1	85.5	35.0	5
SMLG48A	SMLJ48A	48	53.3 - 58.9	1	77.4	38.8	5
SMLG51	SMLJ51	51	56.7 - 69.3	1	91.1	37.0	5
SMLG51A	SMLJ51A	51	56.7 - 62.7	1	82.4	36.4	5
SMLG54	SMLJ54	54	60.0 - 73.3	1	96.3	31.2	5
SMLG54A	SMLJ54A	54	60.0 - 66.3	1	87.1	34.4	5
SMLG58	SMLJ58	58	64.4 - 78.7	1	103.0	39.2	5
SMLG58A	SMLJ58A	58	64.4 - 71.2	1	93.6	32.0	5
SMLG60	SMLJ60	60	66.7 - 81.5	1	107.0	28.0	5
SMLG60A	SMLJ60A	60	66.7 - 73.7	1	96.8	31.0	5
SMLG64	SMLJ64	64	71.1 - 86.9	1	114.0	26.4	5
SMLG64A	SMLJ64A	64	71.1 - 78.6	1	103.0	29.2	5

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SML 5.0 thru 170 Volts

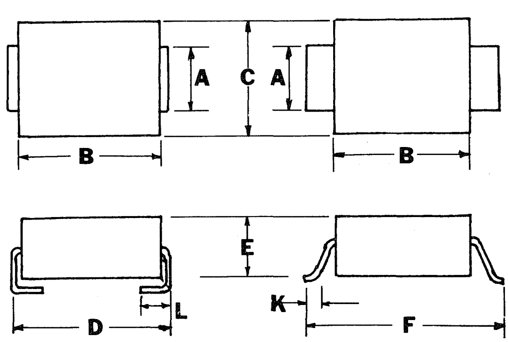
ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI CORP. PART NUMBER GULL-WING LEAD	MICROSEMI CORP. PART NUMBER MODIFIED "J" BEND LEAD	REVERSE STAND-OFF VOLTAGE (See Note) V_{WM} VOLTS	BREAKDOWN VOLTAGE $V_{(BR)}$ @ I_T VOLTS MIN. MAX.	I_T mA	MAXIMUM CLAMPING VOLTAGE @ I_{PP} VOLTS	PEAK PULSE CURRENT (See Fig. 2) I_{PP} AMPS	MAXIMUM REVERSE LEAKAGE @ V_{WM} I_D µA
SMLG70	SMLJ70	70	77.8- 95.1	1	125	24.0	5
SMLG70A	SMLJ70A	70	77.8- 86.0	1	113	26.6	5
SMLG75	SMLJ75	75	83.3-102.0	1	134	22.4	5
SMLG75A	SMLJ75A	75	83.3- 92.1	1	121	24.8	5
SMLG78	SMLJ78	78	86.7-106.0	1	139	21.6	5
SMLG78A	SMLJ78A	78	86.7- 95.8	1	126	22.8	5
SMLG85	SMLJ85	85	94.4-115.0	1	151	19.8	5
SMLG85A	SMLJ85A	85	94.4-104.0	1	137	20.8	5
SMLG90	SMLJ90	90	100 -122	1	160	18.8	5
SMLG90A	SMLJ90A	90	100 -111	1	146	20.6	5
SMLG100	SMLJ100	100	111 -136	1	179	16.8	5
SMLG100A	SMLJ100A	100	111 -123	1	162	18.6	5
SMLG110	SMLJ110	110	122 -149	1	196	15.4	5
SMLG110A	SMLJ110A	110	122 -135	1	177	16.8	5
SMLG120	SMLJ120	120	133 -163	1	214	14.0	5
SMLG120A	SMLJ120A	120	133 -147	1	193	15.6	5
SMLG130	SMLJ130	130	144 -176	1	231	13.0	5
SMLG130A	SMLJ130A	130	144 -159	1	209	14.4	5
SMLG150	SMLJ150	150	167 -204	1	268	11.2	5
SMLG150A	SMLJ150A	150	167 -185	1	243	12.4	5
SMLG160	SMLJ160	160	178 -218	1	287	10.4	5
SMLG160A	SMLJ160A	160	178 -197	1	259	11.6	5
SMLG170	SMLJ170	170	189 -231	1	304	9.8	5
SMLG170A	SMLJ170A	170	189 -209	1	275	11.0	5

For Bidirectional indicate a C or CA suffix after the part number. (i.e.: SMLG170CA or SMLJ170C)

Microsemi Corp.'s SML Series (3000W) 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.

PACKAGE DIMENSIONS



DO-214AB DO-215AB

	A	B	C	D	E	F	K	L
	DIMENSIONS IN INCHES							
MIN.	.115	.260	.220	.305	.075	.380	.025	.030
MAX.	.121	.280	.245	.320	.095	.400	.040	.060
	DIMENSIONS IN MILLIMETERS							
MIN.	2.92	6.60	5.59	7.75	1.90	9.65	0.635	0.760
MAX.	3.07	7.11	6.22	8.13	2.41	10.16	1.016	1.520

Typical Standoff Height: 0.004"-0.008" (0.1mm-0.2mm)

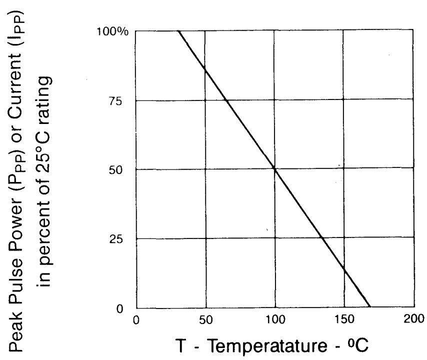


FIGURE 3 DERATING CURVE

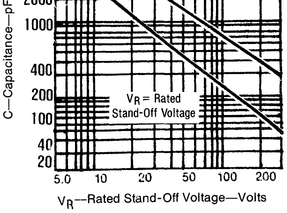


FIGURE 4
TYPICAL CAPACITANCE VS STAND-OFF VOLTAGE

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

SM1.4KESD5.0 thru SM1.4KESD170A
SURFACE MOUNT

Features

1. Protects Sensitive Circuits From Short Duration Fast Rise Time Transients such as Electro-Static-Discharge (ESD) or Electrical Fast Transients (EFT).
2. Excellent Protection in Clamping Direct ESD Level Transients* in Excess of 15,000 Volts.
3. Absorbs ESD Level Transients* of 1400 Watts or One Microsecond Transients** up to 400 Watts. See Figure #1 For Overall Transient Peak Pulse Power.
4. Clamps Transients in 1 Pico Second.
5. 1.0 Watt Continuous Power Dissipation.
6. Working (Stand-off) Voltage Range of 5V to 170V.
7. Hermetic Surface Mount DO-213AA (MELF) Package. Also Available in Axial Lead DO-35.
8. Low Inherent Capacitance for High Frequency Application (See Figure #4).

These devices feature the ability to clamp dangerous high voltage short term transients such as produced by directed or radiated electro-static-discharge phenomena before entering sensitive component regions of a circuit design. They are small economical transient voltage suppressors targeted primarily for short term transients below a few microseconds while still achieving significant peak-pulse-power capability as seen in Figure #1.

Maximum Ratings

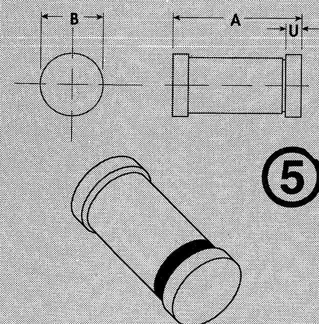
1. 400 Watts for One Microsecond Square Wave or 1400 Watts Per ESD Wave Form of MIL-STD-750, Method 1020.
2. See Surge Rating Curve in Figures #1, 2 and 3.
3. Operating and Storage Temperature -65° to 200°C
4. DC Power Dissipation 1000 mW at T_C = 100° C.
5. Derate at 2.3 W / °C Above 25°C For P_{PP} (1μs) and at 10 mW / °C Above 100°C For dc Power.
6. Forward Surge Current 50 amps for 1 μs at T_C = 25°C (rise time ≥ 100 ns).

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	μA	VOLTS	AMPS
SM1.4KESD5.0	5.0	6.40	10	600	13.7	29.20
SM1.4KESD5.0A	5.0	6.40	10	600	13.9	29.85
SM1.4KESD6.0	6.0	6.67	10	600	14.8	27.00
SM1.4KESD6.0A	6.0	6.67	10	600	14.0	28.50
SM1.4KESD6.5	6.5	7.22	10	400	16.0	24.94
SM1.4KESD6.5A	6.5	7.22	10	400	15.2	26.32
SM1.4KESD7.0	7.0	7.78	10	150	17.3	23.12
SM1.4KESD7.0A	7.0	7.78	10	150	16.4	24.42
SM1.4KESD7.5	7.5	8.33	1.0	50	18.5	21.57
SM1.4KESD7.5A	7.5	8.33	1.0	50	17.5	22.81
SM1.4KESD8.0	8.0	8.89	1.0	25	19.8	20.20
SM1.4KESD8.0A	8.0	8.89	1.0	25	18.7	21.37
SM1.4KESD8.5	8.5	9.44	1.0	5	20.9	19.10
SM1.4KESD8.5A	8.5	9.44	1.0	5	19.8	20.16
SM1.4KESD9.0	9.0	10.0	1.0	1.0	22.2	18.02

* Pulse wave form of MIL-STD-750, Method 1020. (Approximately 150 ns exponential wave.) See derating for V_S on Fig. 3
**At 400 watts 1 μs square wave rating (See Figures 1 and 2).

Package Dimensions



DO-213AA

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	3.30	3.70	0.130	0.146
B	1.60	1.70	0.063	0.067
U	0.41	0.55	0.016	0.022

Mechanical Characteristics

CASE: Hermetically sealed glass MELF (DO-213AA) with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

THERMAL RESISTANCE: 100°C / Watt typical junction to contact (case) tabs.

POLARITY: Banded end is cathode.

MOUNTING POSITION: Any

SM1.4KESD5.0 thru SM1.4KESD170A
Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	μA	VOLTS	AMPS
SM1.4KESD9.0A	9.0	10.0	1.0	1.0	21.1	18.96
SM1.4KESD10	10	11.1	1.0	1.0	24.7	16.19
SM1.4KESD10A	10	11.1	1.0	1.0	23.4	17.09
SM1.4KESD11	11	12.2	1.0	1.0	27.1	14.76
SM1.4KESD11A	11	12.2	1.0	1.0	25.7	15.56
SM1.4KESD12	12	13.3	1.0	1.0	29.6	13.51
SM1.4KESD12A	12	13.3	1.0	1.0	28.0	14.29
SM1.4KESD13	13	14.4	1.0	1.0	32.0	12.50
SM1.4KESD13A	13	14.4	1.0	1.0	30.3	13.20
SM1.4KESD14	14	15.6	1.0	1.0	31.2	12.81
SM1.4KESD14A	14	15.6	1.0	1.0	29.5	13.60
SM1.4KESD15	15	16.7	1.0	1.0	33.4	11.98
SM1.4KESD15A	15	16.7	1.0	1.0	31.7	12.63
SM1.4KESD16	16	17.8	1.0	1.0	35.6	11.22
SM1.4KESD16A	16	17.8	1.0	1.0	33.8	11.85
SM1.4KESD17	17	18.9	1.0	1.0	37.8	10.58
SM1.4KESD17A	17	18.9	1.0	1.0	35.8	11.17
SM1.4KESD18	18	20.0	1.0	1.0	40.0	10.00
SM1.4KESD18A	18	20.0	1.0	1.0	37.9	10.56
SM1.4KESD20	20	22.2	1.0	1.0	44.4	9.02
SM1.4KESD20A	20	22.2	1.0	1.0	42.0	9.52
SM1.4KESD22	22	24.4	1.0	1.0	48.8	8.20
SM1.4KESD22A	22	24.4	1.0	1.0	46.2	8.66
SM1.4KESD24	24	26.7	1.0	1.0	53.4	7.49
SM1.4KESD24A	24	26.7	1.0	1.0	50.6	7.91
SM1.4KESD26	26	28.9	1.0	1.0	57.8	6.93
SM1.4KESD26A	26	28.9	1.0	1.0	54.7	7.31
SM1.4KESD28	28	31.1	1.0	1.0	62.2	6.43
SM1.4KESD28A	28	31.1	1.0	1.0	59.0	6.79
SM1.4KESD30	30	33.3	1.0	1.0	66.6	6.01
SM1.4KESD30A	30	33.3	1.0	1.0	63.1	6.34
SM1.4KESD33	33	36.7	1.0	1.0	73.4	5.45
SM1.4KESD33A	33	36.7	1.0	1.0	69.6	5.75
SM1.4KESD36	36	40.0	1.0	1.0	80.0	5.00
SM1.4KESD36A	36	40.0	1.0	1.0	75.8	5.28
SM1.4KESD40	40	44.4	1.0	1.0	88.8	4.50
SM1.4KESD40A	40	44.4	1.0	1.0	84.2	4.75
SM1.4KESD43	43	47.8	1.0	1.0	95.6	4.18
SM1.4KESD43A	43	47.8	1.0	1.0	90.5	4.42
SM1.4KESD45	45	50.0	1.0	1.0	100.0	4.00
SM1.4KESD45A	45	50.0	1.0	1.0	94.8	4.22
SM1.4KESD48	48	53.3	1.0	1.0	106.6	3.75
SM1.4KESD48A	48	53.3	1.0	1.0	101.0	3.96
SM1.4KESD51	51	56.7	1.0	1.0	113.4	3.53
SM1.4KESD51A	51	56.7	1.0	1.0	107.5	3.72
SM1.4KESD54	54	60.0	1.0	1.0	120.0	3.33
SM1.4KESD54A	54	60.0	1.0	1.0	113.7	3.52
SM1.4KESD58	58	64.4	1.0	1.0	128.9	3.10
SM1.4KESD58A	58	64.4	1.0	1.0	122.0	3.28
SM1.4KESD60	60	66.7	1.0	1.0	133.4	3.00
SM1.4KESD60A	60	66.7	1.0	1.0	126.4	3.17
SM1.4KESD64	64	71.1	1.0	1.0	142.2	2.81
SM1.4KESD64A	64	71.1	1.0	1.0	134.7	2.97
SM1.4KESD70	70	77.8	1.0	1.0	155.6	2.57
SM1.4KESD70A	70	77.8	1.0	1.0	147.4	2.71
SM1.4KESD75	75	83.3	1.0	1.0	166.8	2.40
SM1.4KESD75A	75	83.3	1.0	1.0	158.0	2.53
SM1.4KESD78	78	86.7	1.0	1.0	173.4	2.31
SM1.4KESD78A	78	86.7	1.0	1.0	164.3	2.44
SM1.4KESD85	85	94.4	1.0	1.0	188.5	2.12
SM1.4KESD85A	85	94.4	1.0	1.0	178.6	2.24
SM1.4KESD90	90	100.0	1.0	1.0	199.8	2.00
SM1.4KESD90A	90	100.0	1.0	1.0	189.9	2.11
SM1.4KESD100	100	111.0	1.0	1.0	222.3	1.80
SM1.4KESD100A	100	111.0	1.0	1.0	210.6	1.90
SM1.4KESD110	110	122.0	1.0	1.0	243.9	1.64
SM1.4KESD110A	110	122.0	1.0	1.0	213.3	1.73
SM1.4KESD120	120	133.0	1.0	1.0	266.4	1.50
SM1.4KESD120A	120	133.0	1.0	1.0	252.0	1.59
SM1.4KESD130	130	144.0	1.0	1.0	288.0	1.39
SM1.4KESD130A	130	144.0	1.0	1.0	273.0	1.47
SM1.4KESD150	150	167.0	1.0	1.0	333.9	1.20
SM1.4KESD150A	150	167.0	1.0	1.0	316.8	1.26
SM1.4KESD160	160	178.0	1.0	1.0	356.4	1.12
SM1.4KESD160A	160	178.0	1.0	1.0	337.5	1.19
SM1.4KESD170	170	189.0	1.0	1.0	378.0	1.06
SM1.4KESD170A	170	189.0	1.0	1.0	358.2	1.12

**At 400 watts 1 μs square wave rating (See Figures 1 and 2).

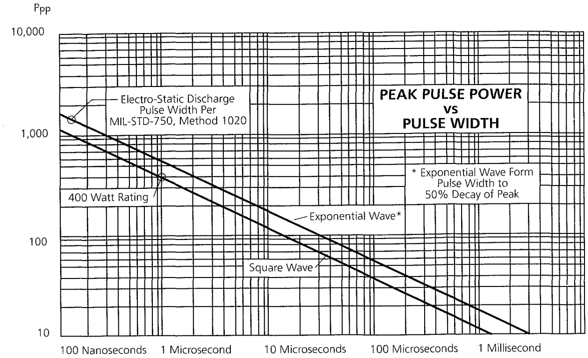


Figure 1

Clamping Factor vs Breakdown Voltage For Various Power Levels

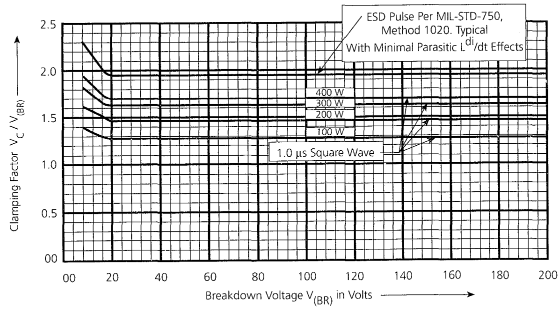


Figure 2

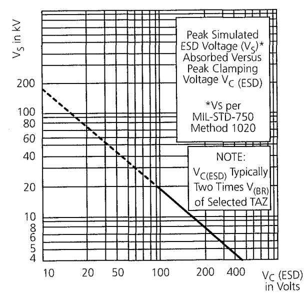


Figure 3

Capacitance vs. $V_{(BR)}$ Curve

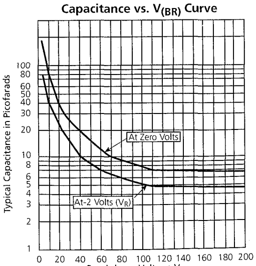


Figure 4

Microsemi Corp.
The diode experts

SANTA ANA, CA

SCOTTSDALE, AZ
For more information call:
(602) 941-6300

SM14KESD5.0 thru SM14KESD170A
SURFACE MOUNT

Features

1. Protects Sensitive Circuits From Short Duration Fast Rise Time Transients such as Electro-Static-Discharge (ESD) or Electrical Fast Transients (EFT).
2. Excellent Protection in Clamping Direct ESD Level Transients* in Excess of 40,000 Volts.
3. Absorbs ESD Level Transients* of 14,000 Watts or One Microsecond Transients** up to 4000 Watts. See Figure #1 For Overall Transient Peak Pulse Power.
4. Clamps Transients in 1 Pico Second.
5. 2.5 Watt Continuous Power Dissipation.
6. Working (Stand-off) Voltage Range of 5V to 170V.
7. Hermetic Surface Mount DO-213AB (MELF) Package. Also Available in Axial Lead DO-41.
8. Low Inherent Capacitance for High Frequency Application (See Figure #3).

These devices feature the ability to clamp dangerous high voltage short term transients such as produced by directed or radiated electro-static-discharge phenomena before entering sensitive component regions of a circuit design. They are small economical transient voltage suppressors targeted primarily for short term transients below a few microseconds while still achieving significant peak-pulse-power capability as seen in Figure #1.

Maximum Ratings

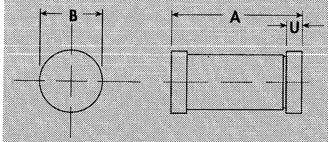
1. 4000 Watts for One Microsecond Square Wave or 14,000 Watts Per ESD Wave Form of MIL-STD-750, Method 1020.
2. See Surge Rating Curve in Figures #1 and 2.
3. Operating and Storage Temperature -65° to 200°C
4. DC Power Dissipation 2500 mW at T_C = 75° C.
5. Derate at 22.8 W / °C Above 25°C For P_{PP} (1μs) and at 20 mW / °C Above 75°C For dc Power.
6. Forward Surge Current 500 amp for 1 μs at T_C = 25°C (rise time ≥ 100 ns).

Electrical Characteristics

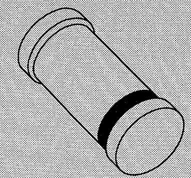
TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	μA	VOLTS	AMPS
SM14KESD5.0	5.0	6.40	10	600	17.1	233.6
SM14KESD5.0A	5.0	6.40	10	600	16.8	238.8
SM14KESD6.0	6.0	6.67	10	600	18.5	215.9
SM14KESD6.0A	6.0	6.67	10	600	17.6	227.9
SM14KESD6.5	6.5	7.22	10	400	20.1	199.5
SM14KESD6.5A	6.5	7.22	10	400	19.0	210.5
SM14KESD7.0	7.0	7.78	10	150	21.6	185.0
SM14KESD7.0A	7.0	7.78	10	150	20.5	195.4
SM14KESD7.5	7.5	8.33	1.0	50	23.2	172.6
SM14KESD7.5A	7.5	8.33	1.0	50	21.9	182.4
SM14KESD8.0	8.0	8.89	1.0	25	24.8	161.6
SM14KESD8.0A	8.0	8.89	1.0	25	23.4	170.9
SM14KESD8.5	8.5	9.44	1.0	5	26.2	152.8
SM14KESD8.5A	8.5	9.44	1.0	5	24.8	161.3
SM14KESD9.0	9.0	10.0	1.0	1.0	27.8	144.1

* Pulse wave form of MIL-STD-750, Method 1020. (Approximately 150 ns exponential wave.)

Package Dimensions



5



DO-213AB

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.80	5.20	0.189	0.205
B	2.39	2.66	0.094	0.102
U	0.41	0.55	0.016	0.022

Mechanical Characteristics

CASE: Hermetically sealed glass MELF (DO-213AB) with solder contact tabs at each end.

FINISH: All external surfaces are corrosion resistant, readily solderable.

THERMAL RESISTANCE: 50°C / Watt typical junction to contact (case) tabs.

POLARITY: Banded end is cathode.

MOUNTING POSITION: Any

SM14KESD5.0 thru SM14KESD170A

Electrical Characteristics

TYPE NUMBER	REVERSE STAND-OFF VOLTAGE	BREAK DOWN VOLTAGE VBR MINIMUM	TEST CURRENT	MAXIMUM REVERSE LEAKAGE	MAXIMUM CLAMPING VOLTAGE	PEAK PULSE CURRENT
	V_{wm}	$V_{(BR)}$	I_T	I_R @ V_{wm}	V_C @ I_{PP}	I_{PP}**
	VOLTS	VOLTS	mA	µA	VOLTS	AMPS
SM14KESD9.0A	9.0	10.0	1.0	1.0	26.4	151.7
SM14KESD10	10	11.1	1.0	1.0	30.9	129.5
SM14KESD10A	10	11.1	1.0	1.0	29.3	136.8
SM14KESD11	11	12.2	1.0	1.0	33.9	118.0
SM14KESD11A	11	12.2	1.0	1.0	32.1	124.5
SM14KESD12	12	13.3	1.0	1.0	37.0	108.1
SM14KESD12A	12	13.3	1.0	1.0	35.0	114.3
SM14KESD13	13	14.4	1.0	1.0	40.0	100.0
SM14KESD13A	13	14.4	1.0	1.0	37.9	105.6
SM14KESD14	14	15.6	1.0	1.0	43.4	92.2
SM14KESD14A	14	15.6	1.0	1.0	41.0	97.6
SM14KESD15	15	16.7	1.0	1.0	46.4	86.2
SM14KESD15A	15	16.7	1.0	1.0	42.2	94.7
SM14KESD16	16	17.8	1.0	1.0	45.5	87.8
SM14KESD16A	16	17.8	1.0	1.0	41.3	97.0
SM14KESD17	17	18.9	1.0	1.0	41.8	95.7
SM14KESD17A	17	18.9	1.0	1.0	39.8	100.5
SM14KESD18	18	20.0	1.0	1.0	42.2	94.8
SM14KESD18A	18	20.0	1.0	1.0	37.9	105.6
SM14KESD20	20	22.2	1.0	1.0	41.9	95.4
SM14KESD20A	20	22.2	1.0	1.0	37.4	107.1
SM14KESD22	22	24.4	1.0	1.0	40.7	98.4
SM14KESD22A	22	24.4	1.0	1.0	38.5	103.9
SM14KESD24	24	26.7	1.0	1.0	44.5	89.9
SM14KESD24A	24	26.7	1.0	1.0	42.2	94.9
SM14KESD26	26	28.9	1.0	1.0	48.2	83.1
SM14KESD26A	26	28.9	1.0	1.0	45.6	87.7
SM14KESD28	28	31.1	1.0	1.0	51.8	77.2
SM14KESD28A	28	31.1	1.0	1.0	49.1	81.4
SM14KESD30	30	33.3	1.0	1.0	55.5	72.1
SM14KESD30A	30	33.3	1.0	1.0	52.6	76.1
SM14KESD33	33	36.7	1.0	1.0	61.2	65.4
SM14KESD33A	33	36.7	1.0	1.0	58.0	69.0
SM14KESD36	36	40.0	1.0	1.0	66.7	60.0
SM14KESD36A	36	40.0	1.0	1.0	63.2	63.3
SM14KESD40	40	44.4	1.0	1.0	74.0	54.0
SM14KESD40A	40	44.4	1.0	1.0	70.1	57.0
SM14KESD43	43	47.8	1.0	1.0	79.7	50.2
SM14KESD43A	43	47.8	1.0	1.0	75.5	53.0
SM14KESD45	45	50.0	1.0	1.0	83.3	48.0
SM14KESD45A	45	50.0	1.0	1.0	79.0	50.6
SM14KESD48	48	53.3	1.0	1.0	88.8	45.0
SM14KESD48A	48	53.3	1.0	1.0	84.2	47.5
SM14KESD51	51	56.7	1.0	1.0	94.5	42.3
SM14KESD51A	51	56.7	1.0	1.0	89.6	44.6
SM14KESD54	54	60.0	1.0	1.0	100.0	40.0
SM14KESD54A	54	60.0	1.0	1.0	94.7	42.2
SM14KESD58	58	64.4	1.0	1.0	107.4	37.2
SM14KESD58A	58	64.4	1.0	1.0	101.7	39.3
SM14KESD60	60	66.7	1.0	1.0	111.2	36.0
SM14KESD60A	60	66.7	1.0	1.0	105.3	38.0
SM14KESD64	64	71.1	1.0	1.0	118.5	33.7
SM14KESD64A	64	71.1	1.0	1.0	112.3	35.6
SM14KESD70	70	77.8	1.0	1.0	129.7	30.8
SM14KESD70A	70	77.8	1.0	1.0	122.9	32.5
SM14KESD75	75	83.3	1.0	1.0	139.0	28.8
SM14KESD75A	75	83.3	1.0	1.0	131.5	30.4
SM14KESD78	78	86.7	1.0	1.0	144.5	27.7
SM14KESD78A	78	86.7	1.0	1.0	136.9	29.2
SM14KESD85	85	94.4	1.0	1.0	157.1	25.4
SM14KESD85A	85	94.4	1.0	1.0	148.8	26.9
SM14KESD90	90	100.0	1.0	1.0	166.5	24.0
SM14KESD90A	90	100.0	1.0	1.0	158.3	25.3
SM14KESD100	100	111.0	1.0	1.0	185.3	21.6
SM14KESD100A	100	111.0	1.0	1.0	175.5	22.8
SM14KESD110	110	122.0	1.0	1.0	203.3	19.7
SM14KESD110A	110	122.0	1.0	1.0	192.8	20.7
SM14KESD120	120	133.0	1.0	1.0	222.0	18.0
SM14KESD120A	120	133.0	1.0	1.0	210.0	19.0
SM14KESD130	130	144.0	1.0	1.0	240.0	16.7
SM14KESD130A	130	144.0	1.0	1.0	227.3	17.6
SM14KESD150	150	167.0	1.0	1.0	278.3	14.4
SM14KESD150A	150	167.0	1.0	1.0	264.0	15.2
SM14KESD160	160	178.0	1.0	1.0	297.0	13.5
SM14KESD160A	160	178.0	1.0	1.0	281.2	14.2
SM14KESD170	170	189.0	1.0	1.0	315.0	12.7
SM14KESD170A	170	189.0	1.0	1.0	298.5	13.4

**At 4000 watts 1 µs square wave rating (See Figures 1 and 2).

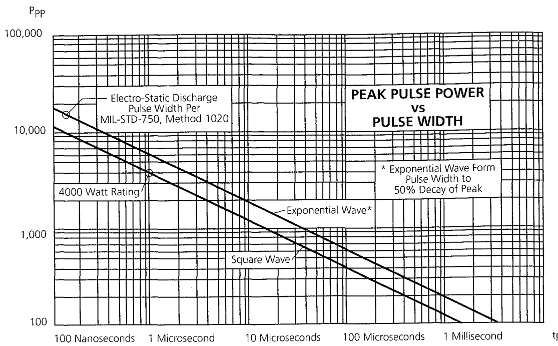


Figure 1

Clamping Factor vs Breakdown Voltage For Various Power Levels

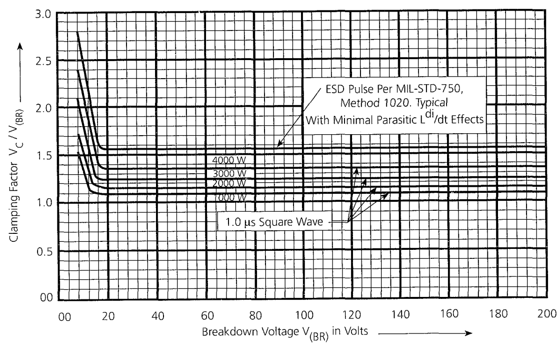


Figure 2

Capacitance vs. $V_{(BR)}$ Curve

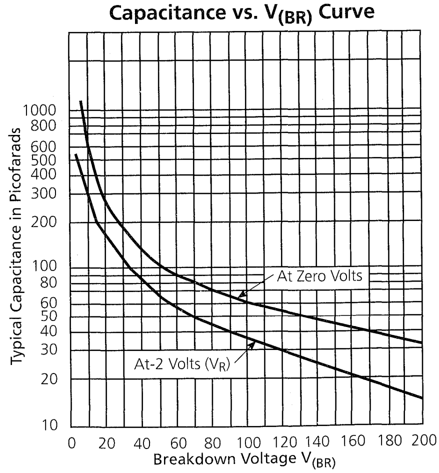


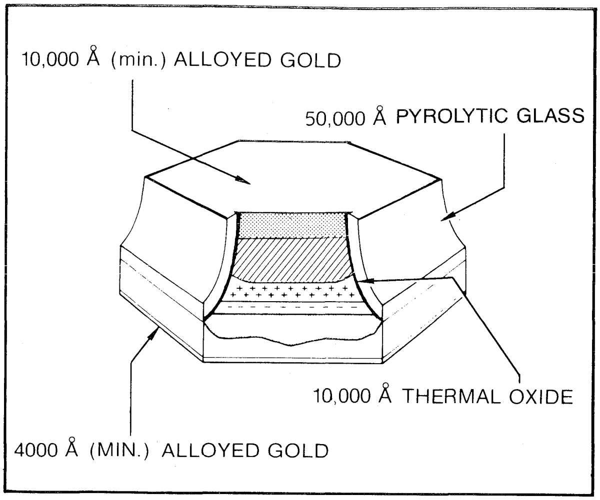
Figure 3

CHIPS FOR HYBRID APPLICATIONS ⑥

SECTION 6

MICROSEMI CORP. - SANTA ANA

MESA CHIPS FOR HYBRID APPLICATIONS



TYPICAL DIE CROSS
SECTION FOR MESA DIE

Microsemi's new families of rectifier, computer diode and zener dice are passivated both with thermal oxide and pyrolytic glass for improved electrical stability after high temperature assembly operations. Rugged mesa construction and controlled junction geometry give high surge capability with minimized surface electric fields.

The rectifier family consists of 0.5A, 1A, 3A, and 12A devices; computer and general purpose diodes, range from 250mW to 3A; and zener chips are available in 0.5W, 1.5W and 5W configurations. Micro also has single chip T.C. zeners of series 1N821-829 and 1N821A-829A.

Devices are available as dice or, for more convenient handling, they may be ordered lid, channel or tab mounted. Specify any variation of gold, silver, aluminum or nickel metallization, as well as moly, tungsten and kovar tabs. Hard or soft solder can be applied to metallization of tabs.

Dice may be shipped in freon to avoid contamination and mechanical shock. For use, the freon is poured off and the dice are clean and ready for assembly. Dice may also be packaged in waffle packs or bulk packing in vials.

FEATURES

- Any Zener or Rectifier in the Microsemi Data Book Can be Supplied in Dice.
- Lot Traceability.
- All Dice are Visually Inspected.
- Hi-Rel Screening and Product Assurance Testing is Available.
- All Mesa Dice are Oxide and Glass Passivated.
- Rectifier Polarity: Mesa Cathode. Anode Mesa is Available for Dice less than 200 Volts.
- Zener Polarity: 6.8-39 Volt, 91-400 Volt Cathode Mesa; 43-82 Volt Anode Mesa.
- Standard Metallization for Mesa Dice is 10,000 Å Minimum Gold on the Mesa; 4,000 Å Gold Minimum on the Base. Special Metallization is Available.
- Dice Available to MIL-STD-883C, Method 5008. (B Level and S Level).
- Dice may be Packaged in Waffle Packs, Bulk Packing Vials or Bulk Pack in Vials With Freon.

SANTA ANA, CA
For more information call:
(714) 979-8220

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GENERAL PARAMETER RESTRICTIONS FOR 100% DICE TEST:

Unmounted dice do not have the power ratings of packaged devices, therefore test conditions as well as ratings may need to be reduced or sampled in packaged form as described below:

V_F = 200 mA maximum. Accuracy variable above 50 mA, highly contact dependent.*

I_R = Testing in dark required. Normal handling to 10 nA. Special handling, cables and contacts required to 1 nA.

B_V = Normal care 300 Volts maximum. Special care for dice >600 Volts — Requires hand test, special test box and environment. Dice are to be tested and maintained in an inert atmosphere to insure stability and eliminate arcing.

V_Z = 300 Volts maximum. V_Z tests requiring I_Z of over 200 mA not reliable.*

Z_{zt} = 1 Ohm minimum. Z_{zt} tests requiring I_Z of over 200 mA not reliable.*

Z_{ZK} = Not very reliable test due to AC pick up in probe and contact leads.

A.C. Tests such as t_{rr}, junction capacitance, V_f peak, t_{fr}, r_e, are not performed as 100% tests.

⑥

***High Current Tests** such as V_f or V_Z at current levels over 200 mA cannot be reliably performed on dice, but must be die attached and bonded or sealed in a proper test vehicle package.

A.C. OR HIGH CURRENT PARAMETER TESTING:

A.C. parameters (or high current parameters when required) are lot guaranteed, not 100% tested. Samples sufficient to guarantee an LTPD of 5, or an equivalent AQL, are assembled from the inspection lot and all required parameters tested. These samples must meet the specified quality level or the lot is rejected.

Tighter AQL's are available by special lot selection or special controlled lot processing.

ZENER REGULATORS

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART#	POWER/ CURRENT RATING	DIE SIZE MESA PAD	DIE SIZE BASE	DIE THICKNESS	DIE GEOMETRY (FIGURE#)	METALLIZATION TOP	METALLIZATION BASE	PACKAGING WAFFLE	PACKAGING F. VIAL	NOTE
1N957B- 1N992B	MD957B- MD992B	400 mW	.011″	.022″	.009″	#6	10KÅ Au	4KÅ Au	★	★	1, 2
1N4461- 1N4496	MD4461- MD4496	1.5 Watt	.019″	.033″	.009″	#6	10KÅ Au	4KÅ Au	★	★	1, 2
1N4954- 1N4996	MD4954- MD4996	5 Watt	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	1, 2
1N5063- 1N5117	MD5063- MD5117	3 Watt	.030″	.048″	.009″	#7	10KÅ Au	4KÅ Au	★	★	1, 2
1N6309- 1N6319	MD6309- MD6319	500 mW	See Note 3		.008″	#3	Al	Au	★	★	1, 2
1N6320- 1N6355	MD6320- MD6355	500 mW	.019″	.024″	.009″	#6	10KÅ Au	4KÅ Au	★	★	1, 2

RECTIFIERS

1N482B, 1N485B- 1N486B	MD482B, MD485B- MD486B	General Purpose .2 A @ 25°C	.011″	.022″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2, 6
1N645- 1N649	MD645- MD649	General Purpose .2 A @ 25°C	.017″	.026″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2

SANTA ANA, CA
For more information call:
(714) 979-8220

RECTIFIERS (cont'd)

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART#	POWER/ CURRENT RATING	DIE SIZE MESA PAD	DIE SIZE BASE	DIE THICKNESS	DIE GEOMETRY (FIGURE#)	METALLIZATION TOP	METALLIZATION BASE	PACKAGING WAFFLE	PACKAGING F. VIAL	NOTE
1N3595	MD3595	General Purpose .2 A @ 25°C	.009″	.015″	.008″	#3	Al	Au	★	★	5
1N3600	MD3600	Switching .2A @ 25°C	.007″	.015″	.008″	#3	Al	Au	★	★	4
1N3611,	MD3611,	General	.019″	.033″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N3612,	MD3612,	Purpose	.030″	.048″		#7	10KÅ Au	4KÅ Au	★	★	2
1N3613,	MD3613,	1 Amp	.030″	.048″		#7	10KÅ Au	4KÅ Au	★	★	2
1N3614,	MD3614,	@	.035″	.050″		#7	10KÅ Au	4KÅ Au	★	★	2
1N3957	MD3957	100°C	.035″	.050″		#7	10KÅ Au	4KÅ Au	★	★	2
1N4001,	MD4001,	General	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2, 6
1N4004,	MD4004,	Purpose	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2, 6
1N4005,	MD4005,	1 Amp	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N4007	MD4007	(Max.)	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N4148,	MD4148,	Switching	.0055″	.015″	.008″	#3	Al	Au	★	★	4
1N4150	MD4150	.2 A (Max.)	.007″	.015″	.008″	#3	Al	Au	★	★	4
1N4245-	MD4245-	General	.019″	.033″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N4246	MD4246	Purpose 1 Amp	.019″	.033″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N4247-	MD4247-	@	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N4249	MD4249	100°C	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N4942- 1N4944	MD4942- MD4944	Fast Recovery	.019″	.033″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N4946- 1N4948	MD4946- MD4948	1 Amp @ 55°C	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5415- 1N5420	MD5415- MD5420	Fast Recovery 3 Amp	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2, 6
1N5614, 1N5616,	MD5614, MD5616,	General Purpose	.030″	.048″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5618 1N5620, 1N5622	MD5618 MD5620, MD5622	1 Amp @ 50°C	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5550- 1N5553,	MD5550- MD5553,	General Purpose	.049″	.0615″	.009″	#6	10KÅ Au	4KÅ Au	★	★	2
1N5554	MD5554	5 Amps @ 55°C	.074″	.088″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5615, 1N5617,	MD5615, MD5617,	General Purpose	.030″	.048″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5619 1N5621, 1N5623	MD5619 MD5621, MD5623	1 Amp @ 55°C	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2
1N5802- 1N5806	MD5802- MD5806	Ultra-Fast Recovery 1 Amp @ 55°C	.035″	.050″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2, 6
1N5807- 1N5811	MD5807- MD5811	Ultra-Fast Recovery 3 Amps @ 55°C	.074″	.088″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2, 6

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RECTIFIERS (cont'd)

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART#	POWER/ CURRENT RATING	DIE SIZE MESA PAD	DIE SIZE BASE	DIE THICKNESS	DIE GEOMETRY (FIGURE#)	METALLIZATION TOP	METALLIZATION BASE	PACKAGING WAFFLE	PACKAGING F. VIAL	NOTE
1N6073- 1N6075	MD6073- MD6075	Ultra-Fast Recovery 3 Amp (Average)	.030″	.048″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2, 6
1N6076- 1N6078	MD6076- MD6078	6 Amp (Average)	.074″	.088″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2, 6
1N6079- 1N6081	MD6079- MD6081	12 Amp (Average)	.115″	.129″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2, 6
1N6626- 1N6627	MD6626- MD6627	Ultra-Fast Recovery 5-6 Amp (Average)	.074″	.090″	.009″	#7	10KÅ Au	4KÅ Au	★	★	2

Note 1: 6.8-39 Volts; 91-200 Volts Cathode Mesa, 43-82 Volts Anode Mesa.
Note 2: Special metallization is available.
Note 3: Planar die .021 square, bonding pad anode up.
Note 4: Planar die also available in .021 square.
Note 5: Figure #2 when ordering .021 square die.
Note 6: Anode mesa available less than 200 Volts.

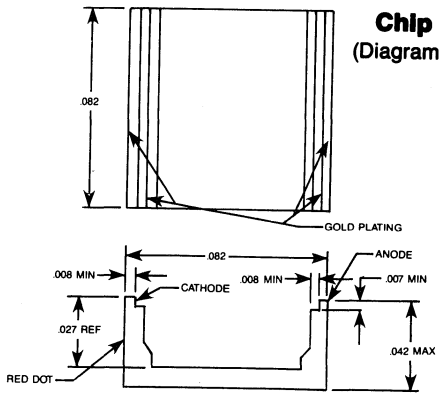
6

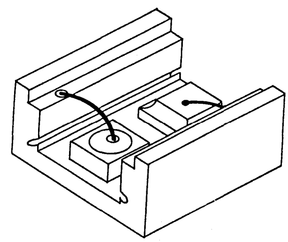
ZERO TEMPERATURE COMPENSATED REFERENCE DIODES

INDUSTRY STANDARD PART#	MSC PART#
1N821- 1N829	CZ821- CZ829
1N935- 1N939	CZ935- CZ939
1N941- 1N945-	CZ941- CZ945

(Packaged in Waffle Packs)

Chip on Channel
(Diagram and Dimensions)

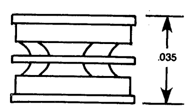




BI-DIRECTIONAL TRANSIENT VOLTAGE SUPPRESSORS

INDUSTRY STANDARD PART#	MSC PART#	Diameter	Thickness	Metallization
1N6103- 1N6137	DD6103- DD6137	.090	.035	Ag
1N6139- 1N6173	DD6139- DD6173	.130	.035	Ag

(Packaged in Waffle Packs)



(PELLET)

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MICROSEMI CORP. - SCOTTSDALE

PASSIVATED CHIPS FOR HYBRID APPLICATIONS

Microsemi's family of zener and transient suppressor planar dice are passivated with thermal oxide construction utilizing unique epitaxial techniques to provide both controlled junction geometry with minimized surface electric fields as well as minimal clamping voltages for transient suppressors. Additional geometries are available for single chip zero temperature coefficient reference diodes and bipolar transient suppressors.

Microsemi Corporation offers a complete line of zener, transient suppressor, rectifier and zero temperature compensated reference voltage chips most commonly used in hybrid circuit design. All chips have a high temperature glass SiO_2 passivation protecting the p-n junction regions for subsequent handling. Metallizations available are compatible with ultrasonic and thermocompression scrub and eutectic die bonding and wire bonding techniques. Also, our own special metallization is available for solder bonding techniques as required.

All chips are subjected to visual inspection which exceed the criteria detailed in MIL-STD-750, Method 2073. All chips are also 100% electrically pulse tested and guaranteed to meet the specified parameters to a 0.65% AQL.

Microsemi hybrid applications requiring zener diodes have historically selected electrical properties identical to earlier identified JEDEC registrations in the "1N" series devices. The majority of these are rated at 500mW or less. However, higher power selections are also available if adequate heat sinking is provided by the hybrid manufacturers in the mounting techniques.

Microsemi offers several chip sizes for various applications. A 25 mil square die is primarily for applications up to 500mW. For power levels exceeding this up to 3 watts, we recommend our 37 mil square. Above 3 watts, 60 mil square die or larger are available. Please specify die size when ordering if requirements deviate from this guideline as determined by customer heat-sinking and mounting conditions.

The popular zero temperature compensated reference voltage chips provided by Microsemi - Scottsdale are available in 37 mil or 25 mil double pad square die. On request, Microsemi will provide correlation samples assembled in solderless DO-7 package.

Some of the electrical equivalent types offered by Microsemi are listed in the accompanying pages. As may be seen, the "1N" prefix has been replaced by a "CH" to specify CHip when ordering. Other JEDEC registration chip equivalents may be ordered similarly if not listed herein in "CH" prefix. Consult factory for other special requirements not JEDEC registered.

HIGH RELIABILITY FEATURES

- Available to JAN, JANTX, JANTXV and JANS Equivalent Screening
- Visual Per MIL-STD-750 Method 2073, MIL-STD-883 Method 2010 or Custom Specifications
- Mounting in Device Packages for Lot Acceptance Testing or Special Screening as Required by Customer Specifications

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ADDITIONAL FEATURES

- Planar Configuration
- Glass Passivated
- Glass Passivated Mesa Including Bipolar Configuration
- Saw Cut to Eliminate Cracks and Chipping
- Available for HI-REL Applications
- Numerous Metallization Schemes Available
- Traceability to Starting Silicon Wafer Lot and Individual Diffusion Run
- 100% Tested
- Many Standard Types Available off the Shelf

Microsemi's diode chips are available in numerous metallization schemes including aluminum top (anode) and gold back (cathode), chrome-silver-gold or others as specified by customer requirements. Microsemi chips are compatible with all wire bonding and die attach techniques.

Microsemi chips are available in both polarities, Anode-Top and Cathode-bottom being standard and Anode-bottom and Cathode-Top optional.

Virtually all encapsulated devices available from Microsemi can be supplied in dice form.

Engineering support is available for any special requirements.

SPECIFICATIONS

- Zener Diode Chips.
- Zero Temperature Compensated Reference Voltage Chips.*
- Transient Absorption Zeners (TAZ)
- Rectifiers
- All Junctions Passivated with Silicon Dioxide.
- Electrically Similar to JEDEC Registrations with appropriate Bonding and Heat Sinking.
- Compatible with All Wire Bonding and Die Attach Techniques.

*Also radiation hard chip stacks available

Metallization: Anode wire bond pad is aluminum 50KÅ thick. Cathode (backside) is gold 6000 Å thick and alloyed. Other metallizations available for solder bonding such as chrome-silver-gold as specified.

Operation: For zener or reference voltage zero-TC operation, back side cathode must be operated positive with respect to anode.

Shipment: Chips are packaged in "waffle pack" containers or glass vials.

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ZERO TEMPERATURE COMPENSATED REFERENCE DIODES
(Single Chip and Chip Stacks)

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART # (Note 1)	POWER RATING*	DIE SIZE (Note 1)	DIE THICKNESS	DIE GEOMETRY (Figure)	BOND PAD SIZE ANODE	BOND PAD SIZE CATHODE (Note 2)	METALLIZATION TOP	METALLIZATION BACK (Note 2)	METALLIZATION OPTIONS	PACKAGING WAFFLE	PACKAGING F. VIAL
1N821, A- 1N829, A	CH821, A- CH829, A	250 mW	.037"x .037" .025" x .025"	.013"	#1 #4, #9	.029" (Double Pad)	.037"	Al	Au	CrAgAu	★	★
1N4565, A- 1N4584, A	CH4565, A- CH4584, A	400 mW	.037" x .037" .025" x .025"	.013" .010"	#1 #4, #9	.029" (Double Pad)	.037"	Al	Au	CrAgAu	★	★
1N935, A,B- 1N940, A, B	CH935, A, B- CH940, A, B	500mW	.057"diam.	.045"	#10	.037"	.027"	CrAgAu	NiAu		★	★
1N941, A,B- 1N945, A, B	CH941, A,B- CH945, A, B	500mW	.057" diam.	.062"	# 11	.037"	.027"	CrAgAu	NiAu		★	★
1N3154, A- 1N3157, A	CH3154, A- CH3157, A	500mW	.057"diam.	.045"	# 10	.029"	.037"	CrAgAu	NiAu		★	★

TRANSIENT VOLTAGE SUPPRESSORS

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART # (Note 1)	POWER RATING*	DIE SIZE (Note 1)	DIE THICKNESS	DIE GEOMETRY (Figure)	BOND PAD SIZE ANODE	BOND PAD SIZE CATHODE (Note 2)	METALLIZATION TOP	METALLIZATION BACK (Note 2)	METALLIZATION OPTIONS	PACKAGING WAFFLE	PACKAGING F. VIAL
1N5555- 1N5558	CH5555- CH5558	1500 Watt	.123" x .123"	.013"	#5	.115"	.123"	CrAgAu	CrAgAu	Al/Au	★	★
1N5629, A- 1N5665, A	CH5629, A- CH5665, A	1500 Watt	.123" x .123"	.013"	#5	.115"	.123"	CrAgAu	CrAgAu	Al/Au	★	★
1N5907- 1N5908	CH5907- CH5908	1500 Watt	.123" x .123"	.013"	#5	.115"	.123"	CrAgAu	CrAgAu	Al/Au	★	★
1N6036, A- 1N6072, A	CH6036, A- CH6072, A	1500 Watt	.123" x .123"	.020"	#8	.115" (Double Anode)	.115"	CrAgAu	CrAgAu		★	★
1N6267, A- 1N6303, A (1.5 KE Series)	CH6267, A- CH6303, A (CH1.5KE6.8, A- CH1.5KE200, A)	1500 Watt	.123" x .123"	.013"	#5	.115"	.123"	CrAgAu	CrAgAu	Al/Au	★	★
P6KE6.8, A- P6KE200, A	CHP6KE6.8, A- CH6KE200, A	600 Watt	.060" x .060"	.013"	#1	.052"	.060"	CrAgAu	CrAgAu	Al/Au	★	★
5KP5.0, A- 5KP110, A	CH5KP, A- CH110, A	5000 Watt	.180" x .180"	.013"	#1	.156"	.180"	CrAgAu	CrAgAu	Al/Au	★	★
15KP17, A- 15KP280, A	CH15KP17, A- CH15KP280, A	15000 Watt	.320" x .320"	.013"	#1	.296"	.320"	CrAgAu	CrAgAu	Al/Au	★	★

NOTE 1: For ordering 20 mil size die add suffix "—20", for 25 mil die add "—25", or for 37 mil die add "—37" to type number.

NOTE 2: Chips are available in both polarities. Standard is anode-top, cathode-bottom except for 1N935 and 1N941 which are anode-bottom, cathode-top.

NOTE 3: Zero TC chip stacks are also available with radiation hardened construction. When ordering, use "RCH" prefix instead of "CH".

NOTE 4: Chips also offered in cellular die package similar to that shown in Fig. 12. This option is ideally suited for larger geometry die to assure proper heatsinking and bonding particularly for transient suppressor devices. When ordering, use "CD" suffix instead of "CH". For 1.5KE, 5KP, etc., use 1.5KCD, 15KCD, etc. as identification.

*Power Rating = Peak Pulse Power (TAZ devices only)

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ZENER REGULATORS

INDUSTRY STANDARD PART#	MICROSEMI CHIP PART # (Note 1)	POWER RATING*	DIE SIZE (Note 1)	DIE THICKNESS	DIE GEOMETRY (Figure)	BOND PAD SIZE ANODE	CATHODE (Note 2)	METALLIZATION TOP	BACK	OPTIONS	PACKAGING WAFFLE	F. VIAL
1N746, A- 1N759, A	CH746, A- CH759, A	400 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N4370, A- 1N4372, A	CH4370, A- CH4372, A	400 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N957, A, B- 1N992, A, B	CH957, A, B- CH992, A, B	400 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N2970, A, B- 1N3015, A, B	CH2970, A, B- CH3015, A, B	10 Watt	.060″ x .060″	.013″	#1	.052″	.060″	Al	Au	CrAgAu	★	★
1N3993, A- 1N4000, A	CH3993, A- CH4000, A	10 Watt	.060″ x .060″	.013″	#1	.052″	.060″	Al	Au	CrAgAu	★	★
1N3016, A, B- 1N3051, A, B	CH3016, A, B- CH3051, A, B	1 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
1N3821, A- 1N3830, A	CH3821, A- CH3830, A	1 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
1N4099- 1N4135	CH4099- CH4135	400 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N4614- 1N4627	CH4614- CH4627	400 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N4678- 1N4717	CH4678- CH4717	250 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N4728, A- 1N4764, A	CH4728, A- CH4764, A	1 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
1N5221, A, B- 1N5281, A, B	CH5221, A, B- CH5281, A, B	500 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N5333, A, B- 1N5388, A, B	CH5333, A, B- CH5388, A, B	5 Watt	.060″ x .060″	013″	#1	.052″	.060″	Al	Au	CrAgAu	★	★
1N5518, A, B- 1N5546, A, B	CH5518, A, B- CH5546, A, B	250 mW	.020″ x .020″ .025″ x .025″ .037″ x .037″	.010″ .010″ .013″	#1	.013″ .020″ .029″	.020″ .025″ .037″	Al	Au	CrAgAu	★	★
1N5728, A, B- 1N5757, A, B	CH5728, A, B- CH5757, A, B	400 mW	.020″ x .020″	.010″	#1	.013″	.020″	Al	Au	CrAgAu	★	★
1N5913, A, B- 1N5956, A, B	CH5913, A, B- CH5956, A, B	1.5 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
1N5985- 1N6031	CH5985- CH6031	500 mW	.020″ x .020″	.010″	#1	.013″	.020″	Al	Au	CrAgAu	★	★
1EZ110D5- 1EZ200D5	CH1EZ110D5- CH1EZ200D5	1 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
2EZ3.6D5- 2EZ200D5	CH2EZ3.6D5- CH2EZ200D5	2 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★
3EZ3.9D5- 3EZ200D5	CH3EZ3.9D5- CH3EZ200D5	3 Watt	.037″ x .037″	.013″	#1	.029″	.037″	Al	Au	CrAgAu	★	★

MICROSEMI DIE GEOMETRIES

PLANAR

FIGURE 1

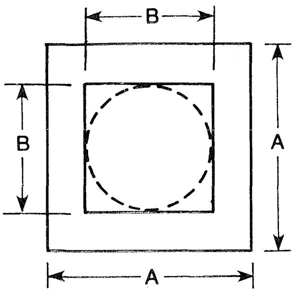
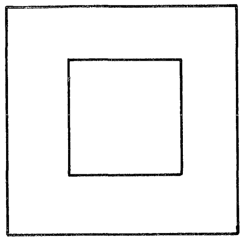
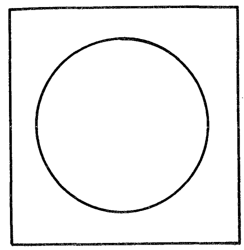


FIGURE 2



(Top View)

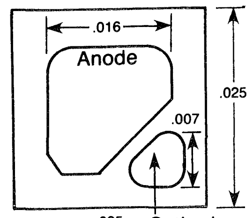
FIGURE 3



(Top View)

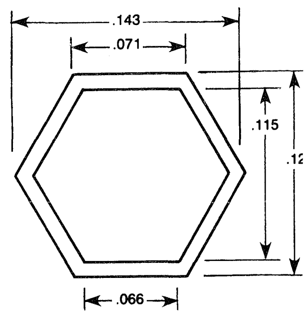
Square (Anode Top Contact)

FIGURE 4
Double Pad



(Top View)

FIGURE 5
Hexagonal



(Top View)

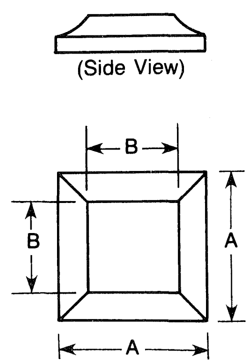
PLANAR SQUARE

DIE SIZE	.020	.025	.037	.060	.120	.180	.225	.320
A	.020	.025	.037	.060	.120	.180	.225	.320
B	.013	.020	.029	.052	.112	.169	.212	.308
Thickness	.010	.010	.013	.013	.013	.013	.013	.013

Table for Figures 1, 2 and 3. *All dimensions are in inches.*

MESA

FIGURE 6
Square



(Side View)

(Top View)

MESA SQUARE

DIE SIZE	.020	.022	.025	.026	.033	.037	.040	.060	.0615	.066	.072	.080	.090	.110
A	.020	.022	.025	.026	.033	.037	.040	.060	.0615	.066	.072	.080	.090	.110
B	.013	.011	.020	.017	.019	.029	.034	.052	.049	.045	.052	.055	.074	.094
Thickness	.010	.009	.010	.009	.009	.013	.011	.013	.009	.011	.011	.011	.013	.011

Table for Figure 6. *All dimensions are in inches.*

MESA SQUARE

DIE SIZE	.120	.133	.150	.165	.180	.180	.196	.225	.248	.275	.320	.330	.444	.450
A	.120	.133	.150	.165	.180	.180	.196	.225	.248	.275	.320	.330	.444	.450
B	.112	.113	.119	.147	.144	.156	.178	.199	.217	.237	.296	.292	.406	.400
Thickness	.013	.011	.011	.011	.013	.013	.011	.013	.011	.011	.013	.011	.011	.011

Table for Figure 6. *All dimensions are in inches.*

MICROSEMI DIE GEOMETRIES

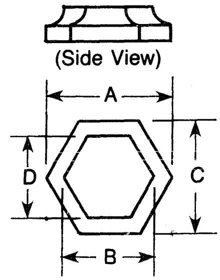
Mesa (cont'd)

MESA HEXAGONAL

DIE SIZE	.048	.050	.088	.129	.143	.455	.775
A	.048	.050	.088	.129	.143	.455	.775
B	.030	.035	.074	.115	.132	.411	.732
C	.041	.043	.076	.112	.123	.394	.672
D	.026	.030	.064	.100	.114	.356	.634
Thickness	.009	.009	.009	.009	.013	.011	.011

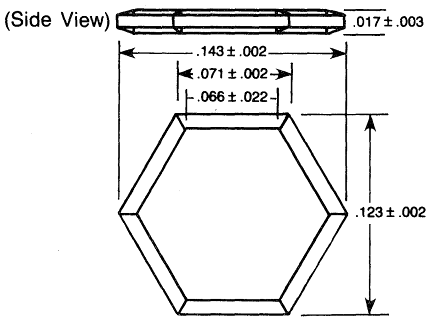
Table for Figure 7. All dimensions are in inches.

FIGURE 7
Hexagonal



⑥

FIGURE 8
Hexagonal Bipolar



Zero TC Chip Stacks

(Radiation Hardened Configurations also Available.)

FIGURE 9*

*(For RH821-RH829A and RH4565-RH4584A Only.)

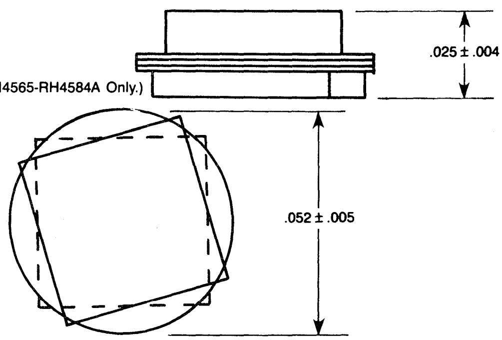
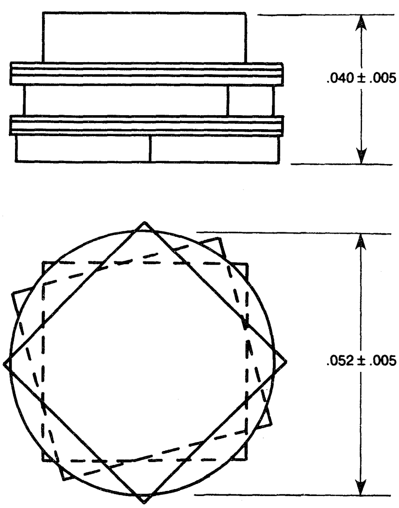
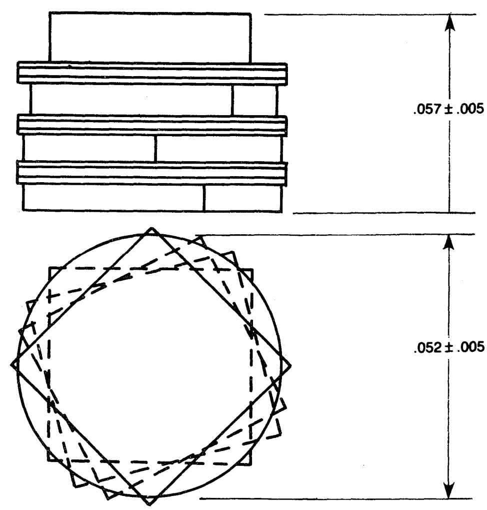


FIGURE 10



(For 1N935-1N940B and 1N3154-1N3157A Equivalent)

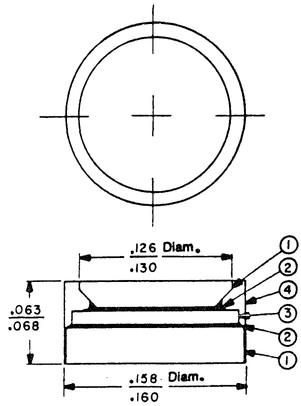
FIGURE 11



(For 1N941-1N946B Equivalent.)

Cellular Die Package

FIGURE 12*



Item Number	Description
1	Nickel and Silver Plated Copper Discs
2	Solder Bond
3	Silicon Die
4	Conformal Coating

*(Example shown is for CD5629-CD5665 or 1.5KCD6.8-1.5KCD200 Series. Consult Factory for Other Cellular Geometry Sizes.)

DESIGNERS' APPLICATION GUIDES ⑦

SECTION 7

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SILICON VOLTAGE REGULATOR DIODES (ZENERS)

INTRODUCTION

The Silicon Voltage Regulator Diode is a two terminal semiconductor, commonly referred to as a "zener diode". It is designed to provide a near constant voltage when operated in the reverse breakdown mode (anode negative). When operated with a forward bias (anode positive) the Regulator Diode behaves similarly to any forward biased rectifier junction.

PARAMETER LETTER SYMBOLS AND THEIR DEFINITIONS

The Voltage Regulator Diode is defined by a number of static and dynamic parameters. The most important are on the data sheet as shown in the Microsemi catalog. These symbols and definitions have been compiled previously for this catalog. It is suggested that the reader familiarize himself with these definitions before continuing on with the test material.

VOLT-AMPERE CHARACTERISTICS

Figure 1 is a curve illustrating the Volt-Ampere characteristics of the Regulator Diode. The standard circuit symbol is also shown.

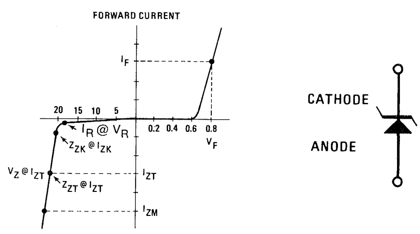


FIGURE 1

The Volt-Ampere characteristics show that the Regulator Diode conducts current in both directions. The reverse breakdown voltage (V_Z) is determined by the manufacturing process, the resistivity of the material used, and the test current. Because of the low dynamic impedance beyond the knee of the curve, the current must be limited by some external means. The steady state DC current is not to exceed I_{ZM} or the device may be destroyed due to internal heating. The forward characteristics, as illustrated in the curve, are similar to those associated with any forward biased silicon junction. There is little change in forward current until V_F exceeds approximately 0.6 volts. As in the case of reverse breakdown or "zener" mode, the forward current must be limited by external means or the device can be destroyed. The allowable current under forward biased conditions is much greater than under reverse biased conditions. Most data sheets today specify a maximum forward voltage (V_F) at a selected forward current (I_F).

Because the Voltage Regulator Diode's primary function is to provide a constant voltage output, it is important that the dynamic impedance (Z_Z) along the operating portion of the V-I curve be as low as possible. The lower the impedance the less change in zener voltage due to changes in operating current. The dynamic impedance usually is specified at two points on the curve, namely at the manufacturer's specified operating point (Z_{ZT}), and at the "knee" where the device is just starting to regulate (Z_{ZK}). The sharpness of the "knee" is a good indication of the regulation qualities of the device. The dynamic impedance decreases with increasing current up to a point, however good regulation usually can be obtained by operating at any point beyond the "knee".

Ideally there should be no current flow through the regulator until breakdown occurs. However, due to the intrinsic properties of a semiconductor there is a minute current flow prior to breakdown. This reverse leakage current (I_R) is usually specified at 75% to 90% of the nominal zener breakdown voltage (V_Z). I_R will change with temperature and must be considered for high temperature operation. For junction temperature changes of 25°C to +150°C, I_R will increase approximately 100 times.

The Silicon Voltage Regulating Diode is commonly used to clamp or suppress extraneous surge currents within a system. Under surge conditions the Voltage Regulator Diode can withstand currents in excess of the specified steady state maximum current I_{ZM}. The maximum reverse surge current, I_{ZSM} (surge), usually is specified for a pulse duration of 8.3ms (1/2 cycle of 60 Hz). However, due to the increased number of digital applications pulse widths as low as 100μsec are now being specified. These characteristics are further defined under section "Transient Suppression Characteristics."

TEMPERATURE EFFECTS

All semiconductors are susceptible to parameter changes with temperature. Of primary concern with Voltage Regulator Diodes is the change in the reverse breakdown voltage (V_Z). As is commonly known, a forward biased junction exhibits a negative temperature coefficient (TC) between −1.6MV/°C and −2.2MV/°C depending on the methods and material used in fabrication. The temperature dependency of the Voltage Regulator Diode operated in the reverse breakdown "zener" mode is quite different. Figure 2 is a curve illustrating the change in V_Z with temperature changes.

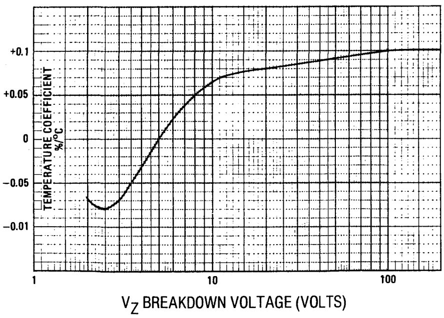


FIGURE 2

Note that for specified breakdown voltages less than 5.1 volts, the TC is negative. For breakdown voltages above approximately 5.1 volts the temperature coefficients become increasingly positive. Beyond 25 or 30 volts the temperature coefficient change is not quite as drastic as at the lower voltages. There is a region of V_Z around 5 to 6 volts where the Voltage Regulator has a theoretical zero TC. The exact voltage where zero TC occurs is greatly dependent on the operating current.

Silicon junctions can withstand junction temperatures in excess of 200°C. Usually the limiting factor for the maximum operating temperature is in the method of construction. Most specifications call for 200°C storage and 175°C maximum operating temperature.

JUNCTION FABRICATION

The initial stage of Voltage Regulator fabrication is commonly referred to as the "crystal growing process". Ultra pure polycrystalline silicon, mixed with a specific amount of impurities is brought to a molten state in an induction furnace. A monocrystalline seed, selected for the desired lattice structure, orientation and impurity concentration, is lowered into a crucible and allowed to come in contact with the molten silicon. As the seed begins to melt it is slowly withdrawn from the crucible. The rate of withdrawal is such that a crystal is grown which exhibits the properties of the seed. The crystal, or ingot as it is sometimes called, is sliced into wafers of approximately 15 mil thickness. The wafers are then of approximately 15-20 mil thickness. The wafers are then lapped and polished to obtain surface uniformity.

The junctions are formed by employing one of two basic techniques while in wafer form – diffused or alloy diffused. The diffused method is accomplished by diffusing N or P type material into P or N type material respectively. Alloy diffused junctions are formed by alloying an aluminum deposition into N type material. The alloy diffused devices exhibit superior breakdown characteristics at the lower voltages (2V-10V). The diffused method is used to manufacture devices with breakdown voltages above 10 volts or so. After diffusion the wafer is metalized and then etched or scribed into individual chips.

Although specific processes vary from one manufacturer to another, basic fabrication techniques are quite similar throughout the industry.

Figure 3 illustrates the chip cross sectional view of the diffused and alloy diffused junctions. Figure 3a shows a simple diffused junction. This method has some serious drawbacks in that the edge of the junction is exposed to contamination by the elements. Figure 3b shows an improved method whereby a silicon dioxide (S_iO_2) passivation is used to protect the junction. This method greatly improves the long term performance of the device.

Figures 3c and 3d show the alloy diffused methods. The passivated process has established itself as a reliable method of forming all types of semiconductor junctions.

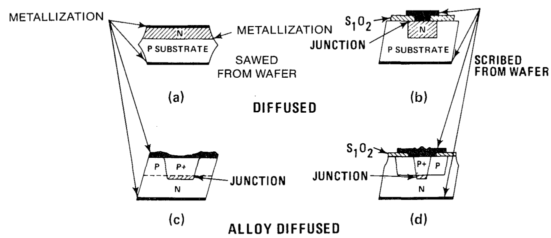
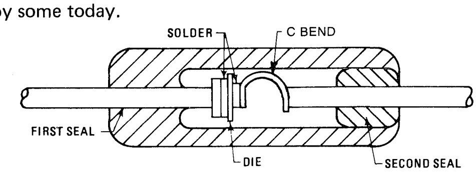


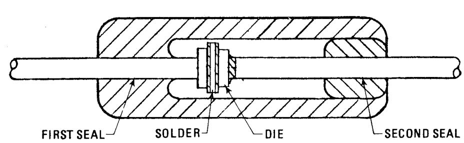
FIGURE 3

CONSTRUCTION METHODS

There are two basic methods for constructing glass diodes. Figure 4a illustrates the use of a "C" bend to make contact with one side of the die. This is used only on stacked die zero TC devices. The opposite side of the die is soldered directly to the die stack first seal post. This method has been used at one time or another by most manufacturers and is still being used by some today.



(a)



(b)

FIGURE 4

The construction as shown in Figure 4b eliminates the "C" bend by using a straight through post. This method has the advantage of simplifying construction techniques and increasing surge and power capabilities and is used on all of our Zener diodes and some TC's.

The epoxy package which utilizes top planar die construction is shown in Figure 5. The leads utilized are of a double nail-head type with a flat to prevent a torque for breaking the solder bond. Each device is conformal coated to protect the die. The double nail-head lead in conjunction with the conformal coating result in a device with excellent moisture resistance.

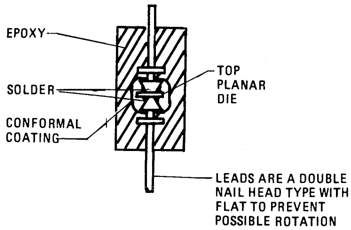


FIGURE 5

Double slug DO-35 diodes are assembled in the manner shown in Figure 6. A diffused and passivated die with an electrolytically deposited silver "bump" for a front contact is sealed between Dumet slugs in a hermetically sealed glass sleeve. A metallurgically bonded version of the DO-35 or DO-41 is also available with an additional high temperature braze preform inserted on both sides of the die.

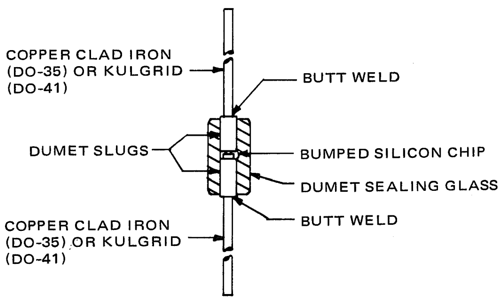


FIGURE 6

THERMAL CHARACTERISTICS

The Silicon Voltage Regulator has inherent thermal properties that must be taken into consideration when operating at elevated temperatures. As mentioned earlier in the text, there is a maximum allowable junction temperature after which reliable operation may be impaired. Figure 7 is a typical power derating curve for a 400mW glass device.

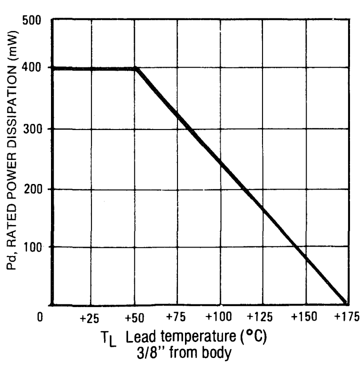


FIGURE 7

Note that the curve decreases linearly to zero power at the maximum specified operating temperature. This curve is only valid under specified conditions, i.e. the leads are clamped to an infinite heat sink 3/8" from the body of the device. An infinite heat sink is defined as a method by which the leads of the device are maintained at the ambient temperature under maximum power conditions. If the lead temperature is allowed to increase above the ambient, the junction temperature also will increase by an equivalent amount. This temperature increase limits the maximum power dissipation. The reciprocal of the power curve's slope approximates the thermal resistance of the device ($R_{\theta JL}$). For the curve in Figure 7 the thermal resistance junction to lead can be calculated to be

$$R_{\theta JL} = \frac{125°C}{400mW} = 310°C/Watt.$$

For case mounted devices, $R_{\theta JC}$ (thermal resistance junction to case) is given on the data sheet.

In actual applications, an infinite heat sink is not practical such that there is a finite thermal resistance value which exists in series with the device with reference to ambient temperature. For example, printed circuit board mountings for axial leaded devices may easily exceed 30°C/watt which can be significant, particularly for devices which are rated above one watt and exhibit a thermal resistance junction to lead below 100°C/watt. It is therefore important to include these considerations when determining what the **junction to ambient** thermal resistance is, i.e.

$$R_{\theta JA} = R_{\theta JL} + R_{\theta HS}$$

where $R_{\theta HS}$ is the thermal resistance of the heat sink to ambient provided by the application mounting.

The thermal resistance of the heat sink will dictate the clamp location lead temperature (T_L) rise above ambient illustrated in Fig. 7 by the following relation:

$$T_L = T_A + PR_{\theta HS}$$

where P is the power dissipated by the diode and T_A is the ambient temperature. For case mounted diode, the value of case temperature T_C can be determined by similar means.

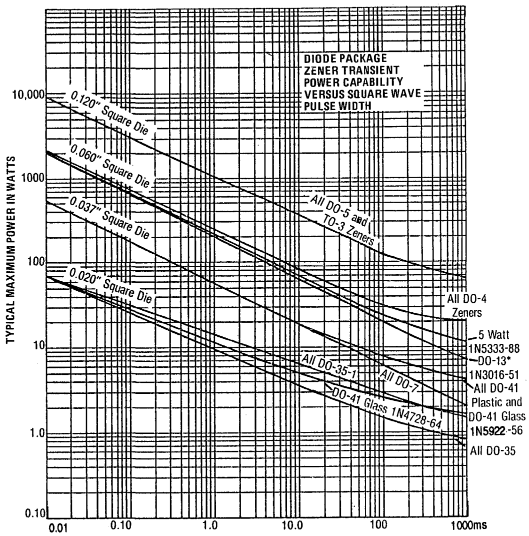
TRANSIENT SUPPRESSION CHARACTERISTICS

The relative large p-n junction geometries that are inherently designed into zener diodes provide the silicon voltage regulator with very good transient suppression qualities. The specific extent of energy or power versus time (pulse width) which zener devices can safely absorb is dependent primarily on uniform silicon p-n junction area as well as the internal package heat sinking immediately in contact with this active region.

The transient surge capability of discrete zener diodes is also what inherently classifies zener diodes as being **insensitive** to ElectroStatic Discharges (ESD) per DOD-HDBK-263, 5.4.2.1.3.

For applications requiring both voltage regulation and transient suppression (including ESD), discrete forms of zener diodes have been used extensively with considerable success. Protection diodes designed into IC chips or as part of MOS chips are generally not suitable for transient protection or prevention of ESD damage primarily as a consequence of the limited size protection junctions and heat sinking due to cost and performance trade offs of such device designs.

In Figure 8 is a composite illustration of the transient surge capability of the major discrete package configurations of zener diodes provided by Microsemi Corp. This depicts the power capability versus transient square wave pulse width.



SQUARE WAVE PULSE WIDTH IN MILLISECONDS
(NON REPETITIVE)
FIGURE 8

*See 1N5629 TAZ Series for large die surge characteristics in DO-13.

USER GUIDE

The Silicon Voltage Regulator Diode can be mounted in any position without affecting operation. However, as mentioned under thermal properties, mounting is important when considering power dissipation.

Regulator Diodes are not often connected in parallel. The only useful application for parallel operation is to clamp the voltage during excessive surge conditions where a single device would not be effective. Usually, the breakdown voltage $V_{(BR)}$ of each device connected in parallel is matched as near as possible otherwise the surge power will not be equally distributed.

Series operation is quite common. In fact, most manufacturers stack die in series of high voltage applications. The breakdown voltage of the stack then becomes the sum of the individual zeners.

There are clipping applications where two regulators are connected in series with their anodes or cathodes common as shown in Figure 9.

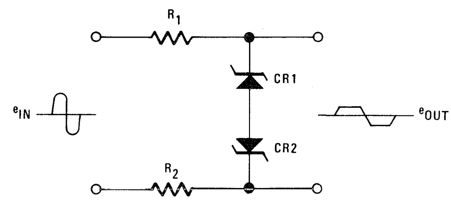


FIGURE 9

In this illustration, when the input signal goes positive CR_1 operates in the normal zener or reverse breakdown mode. CR_2 is forward biased and offers a low impedance, low voltage drop return to the supply. When the signal goes negative the reverse is true, i.e. CR_2 is operated in the reverse breakdown mode and CR_1 is forward biased. The result is the squaring of the input sine wave.

Devices of this type, when manufactured specifically for this application are called "Double Anode" or "Clipper" Diodes. Voltage Regulator Diodes are also used for signal level shifting, threshold or bias control, and limiting.

TEMPERATURE COMPENSATED VOLTAGE REFERENCE DIODES

INTRODUCTION

The Temperature Compensated Voltage Reference Diode is a 2 terminal multi-junction semiconductor commonly referred to as a "TC zener diode". It is designed to provide a constant breakdown voltage with time and temperature. Voltage temperature stability is achieved by matching the equal and opposite temperature coefficients of a Voltage Regulator Diode (zener) and a forward-biased junction.

PARAMETER LETTER SYMBOLS AND THEIR DEFINITIONS

The Temperature Compensated Voltage Reference Diode is defined by a number of static and dynamic parameters which are the same, or similar, to those of a Voltage Regulator Diode.

THEORY OF OPERATION

The TC Voltage Reference Diode (TC zener) is a combination of a Voltage Regulator Diode with one or more rectifying junctions connected in series.[1] The positive temperature coefficient of the Voltage Regulator Diode is equal and opposite to the negative temperature coefficient of the forward-biased junction(s). Figure 1 schematically illustrates how the regulator and forward-biased junction(s) are connected for 2 of the more popular reference voltages.

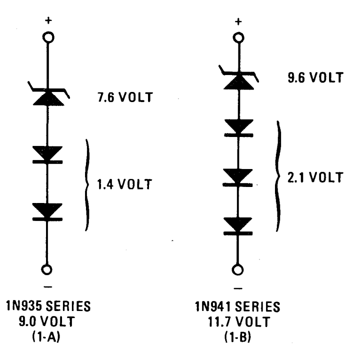


FIGURE 1

The number of forward-biased junctions required per device type is a function of the Voltage Regulator breakdown voltage. As shown in Figure 1, two forward junctions are used for the 9 Volt reference and three forward junctions are used for the 11.7 Volt reference. Multiple "forwards" are required for 9 Volt and 11.7 Volt references because the temperature coefficient of the Voltage Regulator becomes increasingly positive with breakdown voltage, therefore requires a larger negative coefficient to cancel its effects. Other reference voltages are possible by combining one or more of those shown in Figure 1 or by other combinations of Voltage Regulator Diodes and forward-biased junctions that have compatible coefficients and linearity.

The forward-biased junctions have a voltage drop of approximately 0.7 volts at 7.5 mA and exhibit a negative temperature coefficient between −1.6 and −2.2mV/°C. The exact coefficient is a function of material and the process used. As mentioned previously, the temperature coefficient of the Voltage Regulator Diode becomes increasingly positive for voltages greater than approximately 5 Volts (see Application Note on Voltage Regulator Diodes). For a 7.8 Volt regulator diode, the temperature coefficient is approximately +0.05%/°C or +4.2mV/°C. By combining this with two forward junctions of −2.1mV/°C each, compensation for temperature changes can be achieved. Also, it is important that the temperature coefficients of both the Voltage Regulator Diode and forward biased junctions be as linear as possible so there will be tracking over the complete temperature range. This is not always possible and, consequently, some device types are specified over a limited temperature range.

VOLT-AMPERE CHARACTERISTICS

The volt-ampere characteristics of the temperature compensated reference diodes are similar to the volt-ampere characteristics of Voltage Regulating Diodes (zener) with the exception that they have a very high breakdown voltage in the forward-biased mode. See Figure 2.

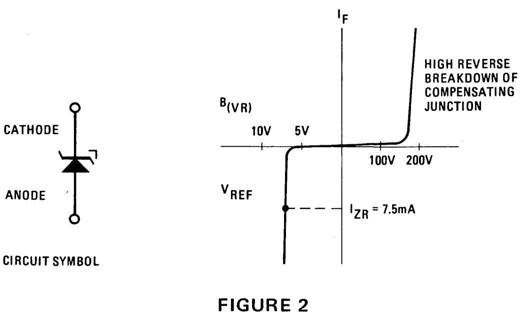


FIGURE 2

This is due to the high reverse breakdown characteristics of the forward compensating junctions. The two parameters that set it apart from a Voltage Regulator Diode are temperature coefficient and time stability. Otherwise, Voltage Reference Diodes can be analyzed as a very low TC Voltage Regulating Diode.

NOTE 1:
These compensating junctions are sometimes referred to as stabistors.

EFFECTS OF VARYING CURRENT

The temperature coefficient of temperature compensated Voltage Reference Diodes is extremely dependent on the operating current. Figure 3 illustrates the effective change in temperature coefficient vs operating current for the device type shown in Figure 1(a).

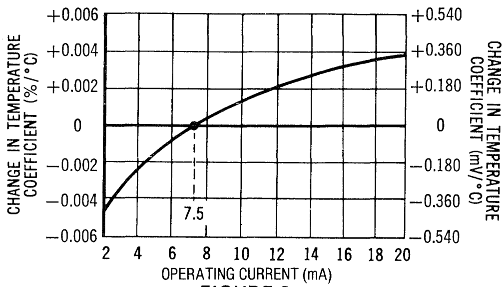


FIGURE 3

It's possible to improve the temperature coefficient of individual devices by slight adjustments of operating current. For example: If the device has an initial positive coefficient at the specified test current; reducing the current slightly will have the effect of making the temperature coefficient less positive.

METHODS OF DEFINING TEMPERATURE COEFFICIENT

Early registrations of Temperature Compensated Voltage Reference diodes defined the temperature coefficient in %/°C i.e., a maximum % change in reference (or breakdown) voltage with each degree change in ambient temperature. Common values specified are ± 0.01%/°C, ± 0.005%/°C, ± 0.002%/°C, ± 0.001%/°C, ± 0.0005%/°C and ± 0.0002%/°C. These values also are specified in PPM/°C. For example: A 0.001%/°C device can be identified as a 10 PPM/°C or 10 μV/V°C. This method implies that the TC characteristics are linear and predictable over the temperature extremes. In reality, the combined coefficients of the Voltage Regulator and forward junctions are not always linear, especially for the low values of TC.

This led to the "Hour-glass" measurement technique as illustrated in Figure 4 whereby, while not guaranteeing a linear relationship, it was hoped the TC characteristics would stay within the confines of the shaded area. This approach had the disadvantage in that it required a large number of test points to guarantee operation within the "Hour-glass".

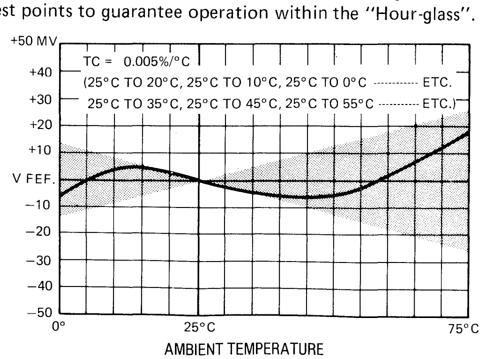


FIGURE 4

A later, and more widely accepted concept was the so-called "Box Method" where a max. mV change over the temperature extremes is specified. See Figure 5.

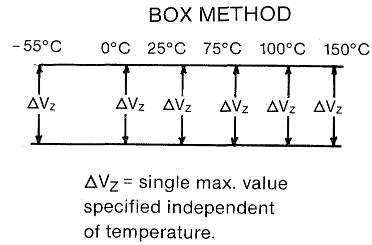


FIGURE 5

This method of defining temperature coefficient is more practical from both the manufacturer's and Design Engineer's point of view. The manufacturer does not have to concern himself so much with linearity so long as he does not exceed the maximum mV deviation between the temperature extremes. The Design Engineer finds this more useful because he does not have to go through computations to find out what his worst case reference change will be. Both the Military and JEDEC format now require that the device be specified by the "Box Method" with a minimum of 5 test points.

Some manufacturers, rather than perform 5 tests at different temperatures, continuously monitor ΔB_V as the device is subjected to the two temperature extremes. This is still basically a Box Method with the advantage of increased productivity and an infinite number of test points.

TIME STABILITY

Specifying a device with a low TC does not necessarily imply that the reference voltage will remain stable over long periods of time. To control this parameter, manufacturers have established a test procedure and screening process whereby TC devices can be specified with guaranteed stability for 1,000 or more hours of operating life. These Ultra Stable Temperature Compensated Voltage Reference Diodes, as they are sometimes referred to, are manufactured with guaranteed stability as low as 5 PPM/1,000 hours. This guarantee is only valid if the device is operated at a specific temperature and current per the manufacturer's data sheet. Figure 6 is a typical plot of time stability.

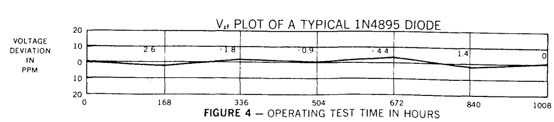
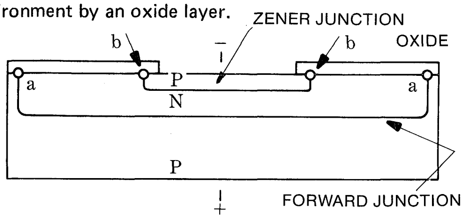


FIGURE 6

JUNCTION FABRICATION

Since the TC Voltage Reference Diode is basically a Voltage Regulator Diode, with forward-biased junctions connected in series, the methods of fabrication are the same, and are covered in the section on "Voltage Regulator Diodes". There is one possible exception, however. The 6.2 Volt references utilize a single chip construction i.e., the Voltage Regulator junction and the forward-biased compensating junction are diffused on a single chip in a single process. Figure 7 illustrates this fabrication technique. This technique also has the advantage of a simplified manufacturing process by elimination of a solder process. NOTE: The regions where the junctions reach the surface (A and B) are fully protected (passivated) from the environment by an oxide layer.



SINGLE CHIP CONSTRUCTION

FIGURE 7

CONSTRUCTION METHODS

Voltage Reference Diodes are packaged in glass and epoxy with the 400 mW glass being, by far, the most popular. Figure 8 illustrates typical construction techniques for these type devices.

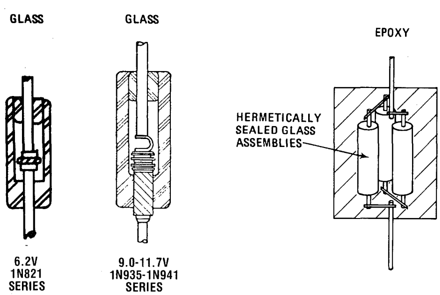


FIGURE 8

USER GUIDE

MOUNTING CONSIDERATIONS

The temperature compensated Voltage Reference Diodes can be mounted in any position without adversely affecting operation.

THERMAL CONSIDERATIONS

The Voltage Reference Diode is designed to operate at the maximum specified operating temperature without derating, providing the test current is as specified. Actually, there is no need for a derating curve because normal operation will insure that the max. junction temperature will not be exceeded. However, for Ultra Stable applications, mounting techniques can affect the absolute value of the reference. The difference between an infinite heat sink and no sink at all could cause a 15°C difference in junction temperature and, therefore, a change in reference voltage depending on the TC of the device. When correlation of readings is required, the method of measurement has to be completely defined.

ELECTRICAL CONSIDERATIONS

There are no useful applications for operating reference devices in parallel, however, series operation is quite common. When operating in series, the user should select device types that have a common test current. Otherwise, the junction operating temperature may be adversely affected. Also, rated parameters at I_{ZT} may be substantially changed.

Reference devices require that the operating current be maintained at a high degree of accuracy to ensure performance as published by the manufacturer. Figure 9 is a schematic representation of two circuits that can provide a constant current. Figure 9a requires an extremely stable power supply to maintain I_{ZT} at its proper current. While the circuit, as shown in Figure 9b, can provide a constant current independent of power supply variations.

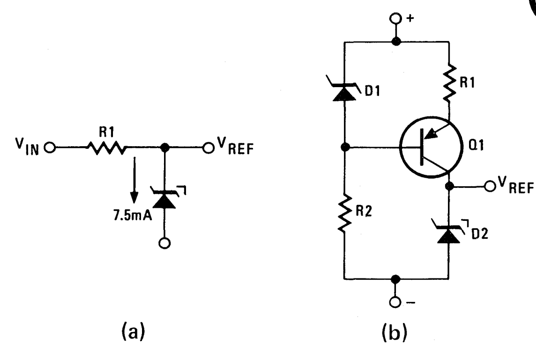


FIGURE 9

APPLICATIONS

Many of the Electronic Systems today require a voltage reference to insure system accuracy. Stability with time and temperature is only as good as the reference selected, therefore careful consideration must be given to the design and choice of reference. The Standard Cell, due to its size, fragility, and susceptibility to environments is not suitable for most applications. Consequently, the Silicon Temperature Compensated Voltage Reference Diode (TC Zener) has found acceptance as a small, reliable, and rugged replacement for Standard Cell applications.

Shown below are a few illustrations where a Reference Diode is used as a stable reference for critical circuit applications. For most optimum performance, a minimal current should be drawn from the device.

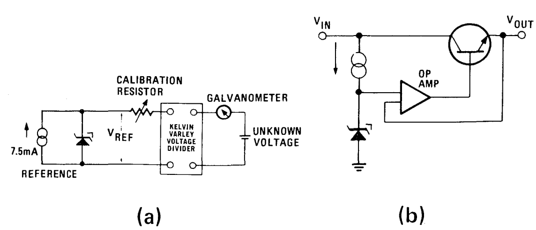


FIGURE 10

PROCESS NORM SCREENING
WHY ARE MICROSEMI DIODES BETTER?

Over the past 20 years, Microsemi has been noted for high quality zener diodes. As the semiconductor state-of-the art advanced, Microsemi has expanded its technology to offer the highest quality, most reliable, yet reasonably priced zener diodes on the market. This is accomplished by the following methods:

I. DIE

A. Thermal oxide passivated planar junctions are utilized for sharper breakdown and longer life.
B. The largest junctions possible were designed for lower operating temperatures and high surge capabilities.
C. VZ, ZZT, ZZK, and IR are 100% tested on all die. (except DO-35)

II. PACKAGES & ASSEMBLY

A. All the device packages are designed for the lowest thermal properties and the highest structural stability.

III. TESTING

A. All devices are 100% tested for VZ, ZZT, ZZK, IR and VF regardless of individual specifications.
B. All devices are tested to MICROSEMI **PROCESS NORM SCREENING.**

Microsemi has incorporated many device preconditioning and test methods to insure that the quality of our devices is far superior to the industry standard.

GLASS PACKAGES (DO-7, DO-35, DO-13 and DO-41)	**METAL PACKAGES (DO-4, DO-5 and TO-3)**	**EPOXY PACKAGES (Case J and T-18)**
1. 48 hours storage at 200°C after final seal.	1. 48 hours storage at 200°C following final weld.	1. 30 minute storage at 150°C following encapsulation.
2. Temperature cycling -50°C to +150°C, 5 cycles minimum.	2. Temperature cycling -50°C to +150°C, 5 cycles minimum.	2. Temperature cycling -50°C to +150°C, 5 cycles minimum.
3. All electrical parameters tested (VZ, ZZT, ZZK, IR and VF) regardless of individual specifications.	3. All electrical parameters tested (VZ, ZZT, ZZK, IR and VF).	3. All electrical parameters tested (VZ, ZZT, ZZK, IR and VF) regardless of individual specifications.
4. Process norm IR.	4. Power square wave surge (TO-3, DO-5: 100ms; DO-4: 50ms).	4. Process norm IR.
5. Process norm VF.	5. Thermal response test.	5. Process norm VF.
	6. Process norm IR.	
	7. Process norm VF.	

CHART 1

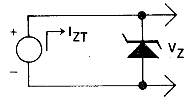
PROCESS NORM SCREENING

100% PRECONDITIONING AND TESTS BY PACKAGE TYPE FOR ALL VOLTAGE REGULATOR DIODES.

Probably the most important characteristic of a semiconductor device to your customer is its infant mortality rate. This is a term used to describe the devices that fail within the first few hours of operation. Although this is most important, it is very difficult to identify infant mortalities by conventional test methods. One method of eliminating these failures that is expensive but relatively common is to subject a production lot to environmental and life testing. In an attempt to give the customer a more reliable part without prohibitive costs, Microsemi has devised sophisticated screening procedures to insure a high quality level in our **commercial product**. A summary by package type of these procedures is shown in Chart I.

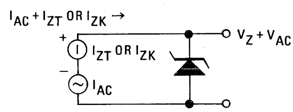
VOLTAGE REGULATOR and VOLTAGE REFERENCE
LETTER SYMBOLS and DEFINITIONS

V_Z	Breakdown voltage when the regulator is biased in the reverse direction.
I_{ZT}	Test current applied to define V_Z.



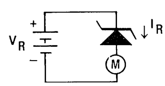
V_Z TEST CIRCUIT

Z_{ZT}	Voltage regulator impedance with I_{ZT} applied. See Note 3 on the 1N5333B data sheet for complete test conditions.
Z_{ZK}	Voltage regulator impedance at a test current (I_{ZK}). This defines the "Knee" of the curve or that point where the regulator has just started in the breakdown mode.
I_{ZK}	The test current used to define Z_{ZK}. See Note 3 on the 1N5333B data sheet for complete test conditions.



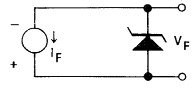
Z_{ZT} OR Z_{ZK} TEST CIRCUIT

I_R	Reverse leakage current. The amount of current flow when a voltage is applied (V_R) such that the diode is biased at some voltage less than that which causes breakdown.
V_R	The voltage applied to measure leakage current.



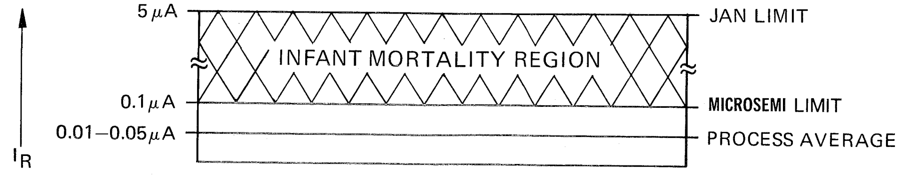
I_R TEST CONDITIONS

I_{ZM}	Maximum current that can be applied to the regulator to maintain operation within its specified power rating. See Note 5 on the 1N5333B data sheet for complete test conditions.
I_{ZSM}	Maximum surge current that the devices can withstand for a specified period of time. See Note 6 on the 1N5333B data sheet for complete test conditions. (This is specified as I_{PP} for transient suppressors.)
V_F	Forward voltage drop of the regulator when biased in the forward direction.
I_F	Forward current used to define V_F

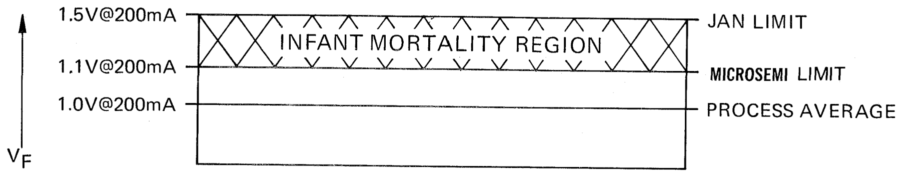


V_F TEST CIRCUIT

α_{VZ}	Temperature coefficient of the breakdown voltage V_Z. The maximum change in V_Z expressed as a percent per degree centigrade change in temperature. This is a method of defining the TC of a Voltage Regulator. For convenience, $\pm$mV/°C is sometimes used. It is not the preferred method of reference voltage TC measurement.
$\Delta V_{Z\,(temp.)}$	Voltage temperature stability. This is the change in breakdown voltage (V_Z) for a given set of conditions. This is the MIL and JEDEC preferred definition of Voltage Reference temperature coefficients.



PROCESS NORM I_R LIMITS



PROCESS NORM V_F LIMITS

CHART II
PROCESS NORM LIMITS
EXAMPLE: JAN1N962B SERIES

7

OUR PROCEDURES ARE AS FOLLOWS:

1. NORM LIMIT TESTING:

Due to Microsemi die processing methods, many of our critical measurement parameters are orders of magnitude tighter than standard JAN or JEDEC requirements. These tighter parameters are utilized to provide a very effective reliability screen. In lieu of the JEDEC or JAN limits, Microsemi utilizes tighter limits that conform to their product norms. An example of this is the IR limit for the JAN1N962B series. The JAN limit is 5μA and Microsemi in-house limit is 0.1μA. It has been found through extensive evaluation that devices with a leakage exceeding 0.1μA but less than 5μA, exhibit a very high failure rate. Chart II depicts norm I_R, norm V_F, and norm transient thermal response limits.

2. SURGE STRESSES:

All our devices are then subjected to a high current surge pulse which is used to detect devices with junction abnormalities (except DO-35).

3. PARAMETERS TESTED FOR:

VZ, ZZT, ZZK, IR and VF are all tested on all devices although individual test requirements may not specify all these parameters.

To insure junction cleanliness, Microsemi subjects all devices to an elevated temperature IR with a norm limit (except DO-35).

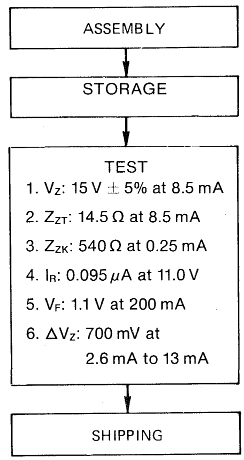
4. NORM LIMIT VF:

To detect solder and/or die plating deficiencies, we subject all devices to a norm limit VF test.

5. THERMAL RESPONSE (Thermal impedance per defined unit of time): (DO-7 & DO-13 only)

To assure high quality, high power Microsemi zeners are subjected to thermal response (or thermal impedance) testing on a 100% basis. Thermal response is similar to thermal resistance (0J) in that you measure a junction temperature rise for a predetermined power dissipation. The main difference with thermal respose is that you use a very high power pulse for a short time duration (50-100 msec). This increases the sensitivity to solder voids and potential intermittent devices over that of standard thermal resistance tests. This is accomplished by confining the heat dissipation to the die/solder area and disregarding the package thermal properties.

MICROSEMI METHODS



TYPICAL TEST

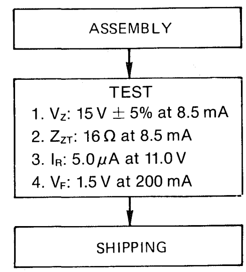


CHART III

COMPARISON OF **MICROSEMI** TEST METHODS TO THOSE OF OTHER MANUFACTURERS FOR A 1N965B UTILIZING STRAIGHT-THRU CONSTRUCTION (DO-7).

Chart III compares test methods with typical methods used by other manufacturers. By employing unique test methods such as these, Microsemi is able to supply commercial products with failure rates well below 1%/1000 hours. Thus, in nearly all instances, potential infant mortality devices are removed before product is shipped.

WHAT ARE JAN COMPONENTS?

JAN components are standard "1N" type devices, MIL qualified and subjected to environmental and life sample tests to assure quality conformance. The JAN devices are 100% tested, lot traceable, and are subjected to other tests as described in the comparison chart. JAN devices are the most economical of the Hi-Rel devices and are often used in commercial applications requiring better potential life cycle performance than can be guaranteed with standard "1N" components.

WHAT ARE TX AND TXV COMPONENTS?

JANTX and JANTXV semiconductors are JAN devices subjected to extra testing as outlined in MIL-S-19500. These screening procedures are designed to eliminate the possibility of infant failures that might occur in the early stages of component system use. The devices are subjected to environmental as well as electrical test.

To assure continuous quality and reliability, PDA (percent defects allowable) requirements are applied to every lot. This effectively restricts the probability of shipping defective lots which are not characteristic of the TX product. The selection of TX and TXV components assures (1) maximum component reliability and (2) standardized reliability testing procedures.

1. Reliability
The Department of Defense has had extremely favorable reliability with electronic systems which have incorporated TX and TXV requirements. These complicated systems include ICBM's, anti missile missiles, and other advanced military defense systems.

2. Standardization
Military specifications, incorporating TX and TXV requirements, cover large families of devices and provide a broad range of specific device types capable of fulfilling the majority of electrical requirements. Quite often special device types can be selected from this group and still meet the basic military specifications by belonging to the generic MIL-spec family.

WHAT ARE DO35-1 COMPONENTS?

The DO35-1 devices represent one of the newest military approved product lines within the zener diode industry Microsemi has had QPL approval to supply these devices since June 1, 1979.
Basically, the -1 signifies a metallurgically bonded device which provides a substantial reduction of thermal impedance and eliminates any possibility of poor contact due to thermal excursions during subsequent application.

Microsemi approval of the DO35-1 device consists of JAN, JANTX, JANTXV, and JANS.

WHAT ARE JAN S COMPONENTS?

JAN S components meet industry requirements for "Space Reliability Parts". JAN S is the highest reliability level in military specifications and requires additional testing above the levels of JANTX and JANTXV. NASA standard parts are now covered by JAN S military parts.

Microsemi is the first manufacturer to qualify its diodes to JAN S and has a large selection of types under qualification. All JAN S diodes meet these requirements:

(7)

- All parts are traceable from starting wafer to shipped product.
- Serialization of individual parts are identified within lots.
- Critical process steps are baselined and change controlled.
- Production and Q.C. operators are qualified and certified.
- Radiographic examination is performed on each device by a certified X-ray facility.
- Lot conformance testing is performed on each device lot.
- All diodes have an additional 144 hours of burn-in beyond the 96 hours required for JANTX and JANTXV.
- Failure analysis is performed on all catastrophic screening failures.
- Construction of all parts is accomplished on certified lines under exacting GSI surveillance from the start of wafer processing through shipment.

ADVANTAGES OF MICROSEMI HIGH-REL COMPONENTS

Why should you choose Microsemi Hi-Rel diodes? Just look at these facts and the answer will be clear.

■ Proven Reliability

Microsemi diodes are capable of "witnessing" failure* rates as low as 0.067 parts per million hours. Microsemi's Hi-Rel diodes have proven their reliability in virtually every major military contract from the F-4 fighter to the Intelsat Satellite.

**Definition: units which deviate from the initial parameter limits, with the exception of reverse leakage, which normally is allowed to double.*

■ Broad Qualification

Microsemi offers the broadest selection of zener and temperature compensated diodes in the industry, from 1.8 volts to 200 volts, from 250 mw to 50 watts and from metallurgically bonded DO-35 package to TO-3 package. No matter what the numbers, Microsemi has the combination.

■ Weldable leads

Microsemi Hi-Rel diodes (TX and TXV) have leads which are compatible with the majority of weld and solder requirements.

■ Separate packaging and shipping area

As with the Hi-Rel testing area, the packaging and shipping area is segregated from our normal commercial product areas to specially handle virtually any packaging requirement.

■ Constant QC monitor
Specially trained QC personnel are assigned to the Hi-Rel area to constantly monitor processes from Hi-Rel entry to final data preparation and shipment from a common area.

■ Stock availability
Our continuous qualifications and testing procedures allow Microsemi to carry a large factory inventory of JAN and JANTXV devices from the common 400 mw version to the more sophisticated high voltage T.C. devices.

■ Continuous Engineering for Quality
To meet the current and future demands of the industry and production processes, Microsemi has established Engineering departments to improve semiconductor manufacturing.

A. Sustaining Engineering works in the production phase of manufacturing to improve device capabilities of product which is currently being produced.
B. Development Engineering is continually developing new products which can be added to our current product lines enabling Microsemi to meet the product demands of our customers.

HIGH RELIABILITY SCREENING SEQUENCE

Microscopic Inspection — 100% microscopic inspection is performed on all TXV devices.

Serialization — As required, a serial number is used to provide traceability throughout the entire screening process.

Traceability — Traceability is maintained per the applicable specification and MIL-S-19500.

100% Electrical Test — Complete electrical test per applicable specification.

High Temperature Storage (Non-operating). Devices are stored in high temperatures ranging from 150°C to 200°C to screen out failures.

Temperature Cycling — Devices are cycled for temperatures ranging from −65°C to +175°C to weed out structural weakness, i.e. solder joints, welds, glass to metal seals and molecular lattice structure.

100% Electrical Tests — Devices are subjected to electrical tests to the critical functional parameters and delta calculations determined.

Shock — When specified devices are subjected to a mechanical shock test.

Acceleration — When specified devices are subjected to centrifuge.

100% Electrical Test — Devices are subjected to electrical test to the critical parameters and delta calculations determined.

Forward Instability Shock Test — When specified devices receive a monitored shock test in the forward direction.

Backward Instability Vibration — When specified devices are subjected to a monitored vibration test in the reverse direction.

Seal Leak (Fine) — Devices are tested with a helium mass spectrometer to locate any leaks down to $1x10^{-8}$ CC's per second leak rate.

Seal Leak (Gross). — Devices are checked for leaks too large for detection by tracer gases.

Powerage (Burn-in) — Devices are subjected to up to 240 hours of burn-in to the conditions in the applicable specification.

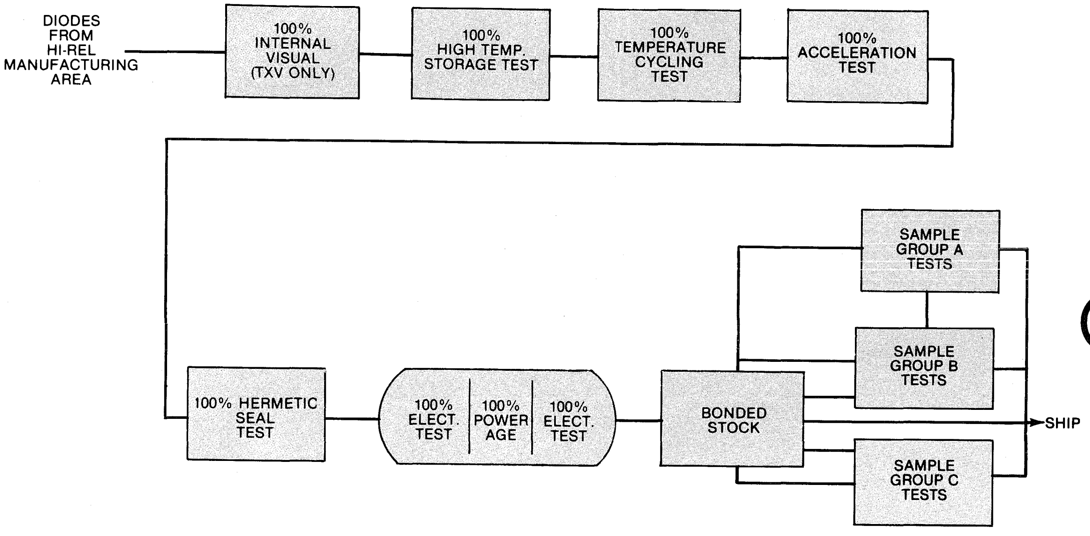
100% Electrical Test — Devices are subjected to all parameters of the applicable specification and delta calculations are determined and those devices not meeting the requirements are rejected.

HIGH-RELIABILITY COMPARISON CHART

	JAN	TX	TXV	S
Microscopic Inspection (Internal Visual)	No	No	Yes	Yes
Serialization	No	No	No	Yes
Traceability (Diffusion)	Yes (1)	Yes (1)	Yes(1)	Yes
Traceability (Lot)	Yes (1)	Yes (1)	Yes (1)	Yes
100% Electrical Test	Yes	Yes	Yes	Yes
High Temp. Storage (Non-Operating)	Yes	Yes	Yes	Yes
Temperature Cycling	No	Yes	Yes	Yes
Electrical Test (#1 with Drift Screen Limits)	No	No	No	Yes
Monitored Shock	No	No	No	Yes
Monitored Vibration	No	No	No	Yes
Centrifuge	No	Yes (2)	Yes (2)	Yes
Seal Leak (Fine)	No	Yes	Yes	Yes
Seal Leak (Gross)	No	Yes	Yes	Yes
Electrical Test (#2 with Drift Screen Limits)	No	Yes	Yes	Yes
Power Age (Burn-In)	No	Yes	Yes	Yes
Electrical Test (#3 with Drift Screen Limits)	No	Yes	Yes	Yes
X-Ray	No	No	No	Yes
Microscopic (External Visual)	No	No	No	Yes
Group A Inspection per MIL-S-19500	Yes	Yes	Yes	Yes
Group B Inspection per MIL-S-19500	Yes	Yes	Yes	Yes
Group C Inspection per MIL-S-19500	Yes	Yes	Yes	Yes
PDA (Max, Pct. Def. Allow. thru Screening)	No	Yes	Yes	Yes

1. Within lot accumulation rules established in MIL-S-19500.
2. When Required by MIL-S-19500.
Any combination of the above tests and many additional tests will be performed if the customer requires further reliability testing. These would require special Purchase Order requirements which are particularly well handled at Microsemi.

Testing-Sequence



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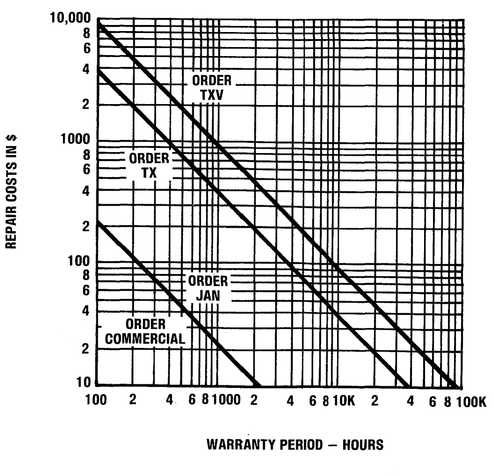
The chart below is designed to help you select the level of reliability that you need. It compares cost of equipment and repair costs during warranty and is offered only as a rule of thumb. Obviously, other factors such as your image in your marketplace, and initial equipment costs, must also be factored into your component buying decision.

Once you decide on a reliability level for your components then you must select a vendor. Like you, our quality stems from our people and from the materials we use in production.



SELECTING TRANSIENT VOLTAGE SUPPRESSORS

APPLICATION NOTES

5

System voltage and current transients are a major cause of component failure in semiconductors.

These transients may be by either internal system disturbances, such as the normal switching operations of power supplies and electro mechanical devices or from external system disturbances such as electrostatic discharges.

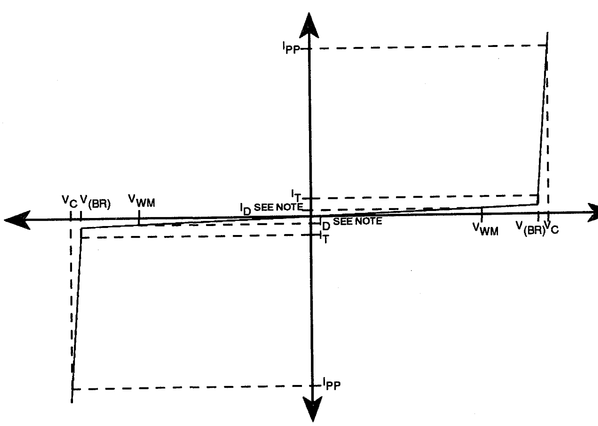
Microsemi Corp's series of transient suppressors provide significant protection against these high voltage spikes and due to their subminiature size can be installed directly onto the p.c. board offering maximum protection to sensitive components.

The following information is offered as a guide for choosing the correct device for your applications:

Certain parameters form the basis for selection: (See Figure 1)

Figure 1

TYPICAL CHARACTERISTIC CURVE FOR BI-DIRECTIONAL TRANSIENT SUPPRESSOR SHOWING ALL THE SIGNIFICANT PARAMETERS.



1. Breakdown Voltage [V(BR)] is the nominal zener breakdown voltage, suffix A 5% tolerance, no suffix 10% tolerance.
2. Test current (I_T) is the zener current at which nominal breakdown voltage is measured.
3. Maximum Leakage Current (I_D) is the current leakage measured at the max D.C. working voltage (V_{WM}).
4. Working Peak Voltage (V_{WM}) is the maximum permissible D.C. working voltage.
5. Maximum Peak Surge Voltage (V_C) is the maximum clamping voltage at I_{PP}.
6. Maximum Peak Pulse Current (I_{PP}) is the maximum permissible surge current for waveform of Figure 3. The product of V_C and I_{PP} give the power rating for the device, e.g. for 1N6138A, $I_{PP} \times V_C$ is 142.8 x 10.5 = 1500 Watts.

Using the above parameters, first choose which series of suppressors will handle the surge from Figure 2, Peak Surge Power vs. Pulse Time. Examples given in this figure are for bidirectional TAZ; however, unidirectional are also available.

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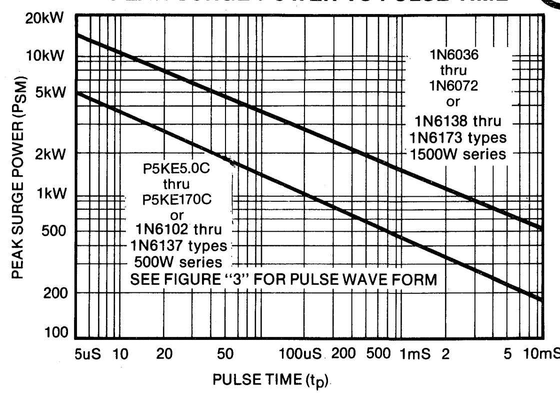
FIGURE 2
PEAK SURGE POWER VS PULSE TIME

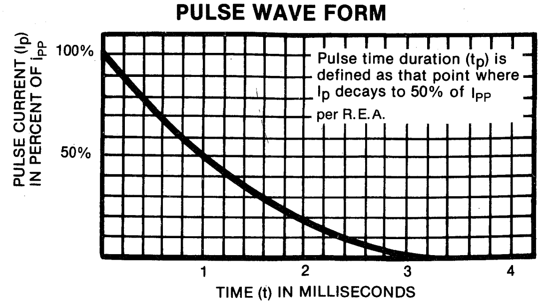


Then from the appropriate data page, determine the device with the standoff voltage equal to or greater than the normal circuit operating voltage. Making sure the clamping voltage from V_C is below the voltage that could cause damage to any component in your circuit.

Should the clamping voltage not be low enough for your application please contact the factory for other specialized devices available.

These devices are also available in encapsulated assemblies of parallel and/or series combinations to provide higher current or higher power capabilities. Please contact the factory for further information.

FIGURE 3
PULSE WAVE FORM



TAZ GENERAL DESCRIPTION

TAZ are PN silicon transient voltage suppressors characterized by exceptional surge handling capabilities, extremely fast response time (1 picosecond) and low series resistance. TAZ are designed, manufactured, specified and tested for transient suppression.

TAZ are available in a number of axial leaded package configurations:

- Metal DO-13 package.
- Hard Glass Axial Lead
- Plastic economical commercial package.
- Multiple device assemblies.
- Modules for special applications.
- High reliability and commercial applications.

TAZ are also available in chip form for hybrid applications in ratings from 500 watts to 1500 watts peak pulse power.

Standard geometrics of .060 inches square for up to 600 watts; .142 inch hexagonal for 1500 watt devices. Both .013 inches max thickness.

Standard metallization is chrome/silver/gold.

Aluminum/gold is also available.

Typical general applications for TAZ include protection from:

- Induced lightning effects on transmission lines.
- Inductive and switching transients.
- Electrostatic Discharge (ESD)
- Electromagnetic Pulse (EMP)

Microsemi specializes in custom design of devices for special applications.

TRANSIENTS

A voltage transient is generated by a sudden release of stored energy causing an unpredictable change in voltage. This energy can be stored and released from within the circuit by means of inductive switching or arcing, or can be induced from outside the circuit by uncontrollable sources such as switching transients on an AC power line, lightning induced transients, electrostatic discharge, or by electromagnetic pulse sources including nuclear NEMP.

TAZ

TAZ (Transient Absorption Zeners) offer a low cost and effective solution to this problem. TAZ are bi-axial leaded devices composed of large area, silicon P-N junctions.

TAZ are capable of absorbing the energy present within the transient, thereby maintaining circuit conditions and protecting voltage sensitive components.

Since integrated circuits are becoming smaller and more complex, it has become increasingly more important that transient suppression be implemented in the early design stages. The design of the circuit protection will help prevent costly field failures and future installation or retrofitting.

The major electrical characteristics of TAZ are:

1. Fast response time — theoretically 1 x 10 −12 seconds.
2. Wide voltage range: 5.0V-400V available in axial leaded devices. (Higher voltages available in modular devices.)
3. High transient power dissipation:
   - Up to 5000 watts in axial leaded devices.
   - Up to 60,000 watts or more available in modular packages.
4. Available in high reliability metal cases, glass and cost effective plastic.

MODULAR ASSEMBLIES

For applications where an axial leaded TAZ cannot handle the amount of transient energy detected, Microsemi offers custom modules utilizing other component combinations to meet individual requirements. Microsemi offers a complete line of standard commercial and military grade modular assemblies such as the 60KS200C, 704-15K36/704-15K36T, and the PIP/PHP series. For more information or special requirements, consult the factory.

TAZ CHIPS FOR HYBRID APPLICATIONS

TAZ are also offered in chip form for hybrid applications. TAZ chips are available in various geometry and metallizations. Please consult the factory for further information.

TAZ
TERMS, DEFINITIONS AND SYMBOLS

This section provides the reader an overview of terminology and its definition as it relates to the device parameters shown on the data sheets and JEDEC Standard No. 77.

SYMBOL	TERM	DEFINITION
V_{WM}	Rated working peak voltage also (rated stand-off voltage).	The peak voltage excluding all transient voltages.
I_D	Standby current.	The DC current through a surge suppressor at rated standoff voltage V_{WM}.
I_S	Surge peak transient current.	The peak current for a single pulse.
$V_{(BR)}$	Breakdown voltage.	The value of voltage at which breakdown occurs.
V_C	Clamping voltage.	The voltage in a region of low differential resistance that serves to limit the voltage across the device terminals.
I_{PP}	Peak impulse current.	The peak current for a series of essentially identical pulses.
I_{PPM}	Rated peak impulse current.	
V_W	Working peak voltage. Note: This term is also called "standoff voltage."	The peak voltage excluding all transient voltages.
I_{SM}	Rated surge peak transient current.	
P_{PP}	Repetitive peak pulse power dissipation.	The peak power dissipation resulting from the peak impulse current I_{PP}.
P_{PPM}	Rated repetitive peak pulse power dissipation.	
CF	Clamping factor.	The ratio of clamping voltage to breakdown voltage.
VC/V_{WM}	Voltage clamping ratio.	The ratio of clamping voltage to rated working peak voltage.

HOW TO SELECT TAZ

In selecting the right TAZ for an application, there are four key parameters to consider:

1. V_{WM} Rated working peak voltage or reverse stand-off voltage.
2. P_{PPM} Rated peak pulse power dissipation.
3. I_{PPM} Rated peak pulse current.
4. V_C Clamping voltage.

1. V_{WM} Select a TAZ with a V_{wm} equal to or greater than the peak operating voltage at the point of protection. It is important that the operating voltage does not exceed this V_{wm} parameter in normal operating conditions or the device could go into the avalanche or breakdown mode which may disrupt normal operations or dissipate power needlessly across the TAZ.

2. P_{PPM} To select TAZ for the correct peak pulse power capability, one must first define the transient conditions. This can be determined by the placement or location of the device within the system.

There are basically three categories or levels of protection. These are primary, secondary and board level.

The primary level of protection is the most severe transient environment. This level usually has a very low source impedance as well as a low series resistance; e.g., transmission lines which are exposed to the highest degree of voltage transients such as power switching or lightning strikes. Due to the intensity and magnitude of these transients, a single TAZ may not provide adequate protection. For applications of this nature, Microsemi offers a series of custom modules to fit individual needs. For more information, consult the factory.

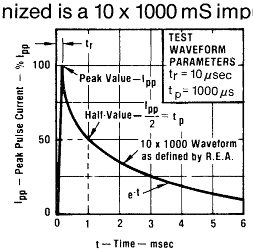
The secondary protection level would normally be preceded by a transformer or a circuit with a given series resistance and inductance. Higher source impedance can result in a higher voltage transient, but may not contain the energy level generated on low impedance lines. A 1500 watt TAZ will be sufficient for most secondary protection installations, however, engineering judgement should be used to determine individual requirements for each application.

Board level protection has higher impedance and may result in higher voltage spikes, but usually is lower in transient energy due to the greater current limiting factor. Applications at this level will generally require a lower power TAZ such as a 500 watt (P5KE) or 600 watt (P6KE). Since there are no set industry standards on source impedance at various levels, it is suggested that discretion be used when selecting for a specific application.

3. I_{PP} In order to select for the peak pulse current capability of a TAZ, the transient voltage and circuit impedance must be determined. The peak current can be calculated by dividing the peak transient voltage by the series impedance. A TAZ is then selected with a greater I_{PP} than that expected in a transient condition.

4. V_C In selecting TAZ it is important that the clamping voltage rating does not exceed the instantaneous voltage level acceptable to maintain safe operating conditions for the components being protected. Board level applications are usually more sensitive in this respect than primary or secondary applications. The clamping is the maximum allowable voltage at the output of the device when subjected to its peak pulse current.

This parameter is determined using a specified pulse waveform. The waveform most widely recognized is a 10 x 1000 mS impulse Figure 1.

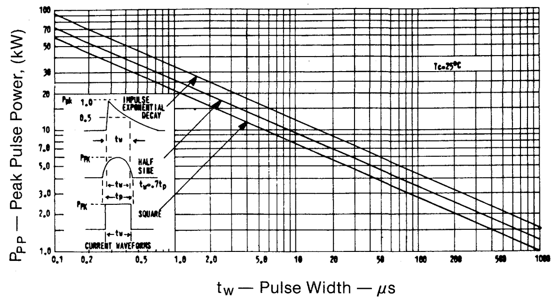


Pulse Wave Form (10 x 1000)

FIGURE 1

Other waveforms are used for some devices geared for specific applications or environments such as the LDTS series for load dump. Here a 50 mS pulse is used to simulate the conditions found in an automotive application.

Although the 10 x 1000 mS waveform is used as a reference for the majority of TAZ available, they can also be upgraded for higher transient levels for shorter duration pulses. Also different transient waveforms may be used as shown in Figure 2 as exemplified for the TAZ devices rated for 1500 watts peak pulse power for the waveform in Figure 1.



PEAK PULSE POWER vs. PULSE TIME

FIGURE 2

TAZ APPLICATIONS

AC AND DC APPLICATIONS

TAZ are typically used in parallel to the load or circuit being protected. When the transient voltage exceeds the rated stand-off voltage, the TAZ will go into the avalanche or breakdown mode. It will then act as a shunt so that the destructive energy within the transient bypasses the load as shown in Figure 3.

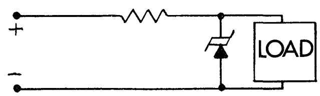
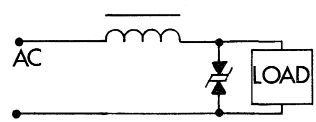


FIGURE 3
DC POWER

Bidirectional TAZ is also available for AC applications as shown in Figure 4.



TAZ is used to protect sensitive components in a DC power supply from AC line transients. Figure 5 shows the TAZ placed across the rectifier bridge. With this method a unipolar TAZ can be used, but the surge capability of the rectifier diodes must be compatible with that of the TAZ.

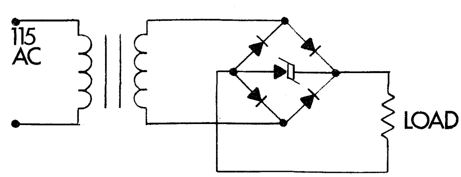


FIGURE 5
AC LINE PROTECTION USING UNIPOLAR TAZ

Figure 6 shows how a bipolar TAZ can be used for the same application, but to protect against line transients that can overstress the rectified diodes used in the bridge.

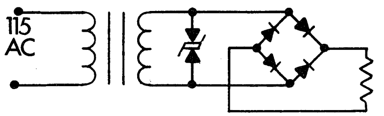


FIGURE 6
AC LINE PROTECTION USING BIDIRECTIONAL TAZ

TRANSIENT SUPPRESSION FOR ENERGIZING AND DE-ENERGIZING OF TRANSFORMER PRIMARY

Figure 7 shows how bipolar or double anode TAZ can be used to suppress transients caused by the energizing and de-energizing of a transformer primary. When energized, transients can occur when the peak voltage couples the stray capacitance and inductance of the secondary winding causing an oscillating voltage transient.

When de-energizing, large voltage transients occur when the primary circuit is opened while the transformer is driving a high impedance load. Transients can be coupled into the secondary winding when this interruption occurs. TAZ provides a low impedance discharge path to protect sensitive components.

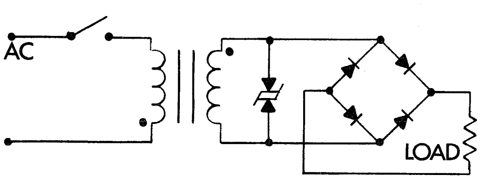


FIGURE 7

TRANSISTOR PROTECTION FOR INDUCTIVE LOAD SWITCHING

TAZ can be used to protect transistors against damaging transients generated by an inductive load when disconnected. Figure 8 shows a TAZ connected collector to emitter to absorb the stored energy released from the load when the transistor turns off. This will reduce the demands upon the safe operating area of the transistor.

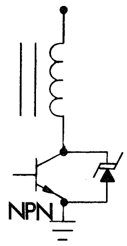


FIGURE 8

MICROPROCESSOR AND MEMORY PROTECTION

Memories and microprocessors along with logic and linear integrated circuits are extremely susceptible to voltage transients. It is very important that protection is provided to prevent costly field failures and down time.

MOS memory protection.

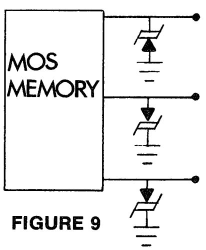


FIGURE 9

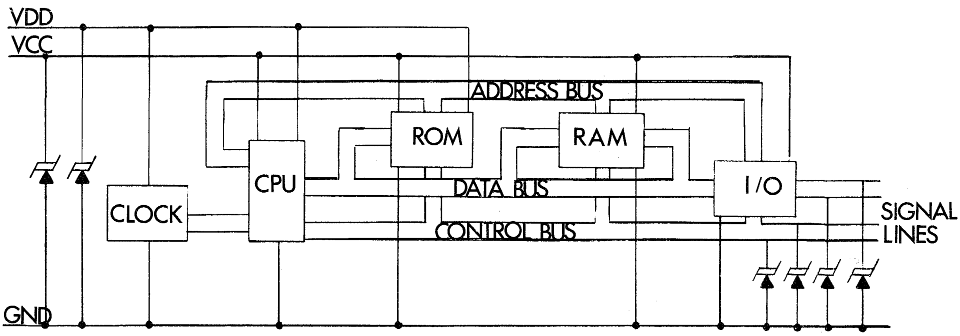


FIGURE 10

7

TAZ are used on each voltage supply line to the integrated circuit to protect against transients induced on to the power supply line. Placing the TAZ from line to ground will optimize the TAZ peak power dissipation capability.

MICROPROCESSOR SYSTEM PROTECTION

Figure 10 shows TAZ used to protect microprocessor systems from AC line transients and switching transients from the power supply. Also shown are TAZ used to prevent transients induced on to the signal lines from entering the data and control buses. If the microprocessor is operating in a hazardous environment, such as controlling operating functions of machine tools, protection should be provided on both the power supply lines and signal lines.

HIGH VOLTAGE OR CURRENT APPLICATIONS

TAZ can be used in parallel or in series to accommodate applications requiring a higher voltage or surge current rating than offered in single axial leaded device. For higher voltage applications, TAZ can be used in series as shown in Figure 11.

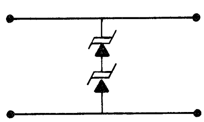


FIGURE 11

When used in this configuration, the total voltage capability equals the sum of the voltages of each additional TAZ in series. The surge current capability remains the same as that of the TAZ with the lowest surge current rating. This, in turn will increase the total peak pulse power dissipation rating.

For higher surge current capabilities, TAZ can be used in parallel as shown in Figure 12.

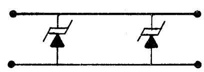


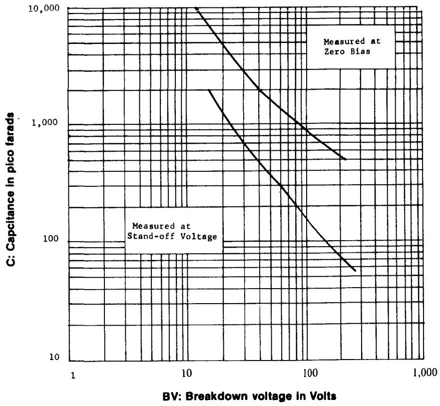
FIGURE 12

When used in parallel, it is very important that the TAZ be closely matched by voltage to assure that one of the devices does not go into the breakdown mode absorbing all of the current. In parallel, the voltage will remain the same as one TAZ, but the current is increased by the surge current rating of each additional TAZ used. This also increases the peak pulse power dissipation rating. Due to the critical aspect of the screening required for parallel combinations, it is recommended that this be handled by the manufacturer.

TAZ CAPACITANCE

For many applications, the TAZ is viewed as a device that does not introduce extraneous noise into the system. It is assumed to react instantaneously and does not create an insertion loss. The low leakage currents do give a low insertion loss, but in fast switching circuits or RF applications the TAZ capacitance becomes an important factor.

Due to the peak pulse power dissipation level required of the TAZ, it is constructed using a large P-N junction which in turn means a higher capacitance. Capacitance is also affected by the avalanche voltage of the device. The greater the breakdown voltage, the lower the capacitance. The lower the breakdown voltage, the greater the capacitance as depicted in the curve for the 1.5KW TAZ series in Figure 13. Note that the capacitance is reduced as the reverse bias voltage is applied.



TYPICAL CAPACITANCE vs.BREAKDOWN VOLTAGE
FOR 1.5 KW SERIES

FIGURE 13

When the capacitance level of the device is too high for a particular application, it may be reduced by one of the methods shown in Figures 14 and 15.

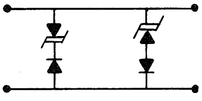


FIGURE 14

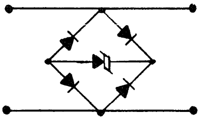


FIGURE 15

In order to reduce the effective capacitance, low capacitance diodes may be used in series. Both methods shown are bi-directional and will require proper selection of the low capacitance diodes used for a particular application. There are four major requirements that are of concern when making this selection:

1. The reverse breakdown of the diode must exceed the TAZ maximum clamping voltage.
2. The forward surge current rating must exceed the expected current level that the TAZ is exposed to under transient conditions.
3. The forward voltage at expected pulse levels must not exceed the allowable voltage level of the protected circuit when added to the other TAZ clamping voltage and other voltage drops in series.
4. The capacitance of the diode must be compatible with the operating frequency of the circuit.

Microsemi offers a line of low capacitance TAZ, the LCE series (epoxy package) for commercial applications and the LC series (DO-13 package) which is hermetically sealed and can be screened to military specifications. For applications requiring a lower capacitance or special assemblies, consult the factory.

Notes

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- † 1N941B-1, 1N943B-1, 1N944B-1, 1N945B-1 ..... /157
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- † 1N4099 thru 1N4135 ..... /435
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- † 1N4549B & RB thru 1N4554B & RB ..... /358
- † 1N4557B & RB thru 1N4562B & RB ..... /114
- † 1N4565A thru 1N4574A ..... /452
- † 1N4565A-1 thru 1N4574A-1 ..... /452
- † 1N4614 thru 1N4627 ..... /435
- † 1N4614-1 thru 1N4627-1 ..... /435
- ★ 1N4938, 1N4938-1 ..... /169
- ★ 1N4942, 1N4944, 1N4946, 1N4948 ..... /359
- ★ 1N4954 thru 1N4996 ..... /356
- ★ 1N5186 thru 1N5190 ..... /424
- ★ 1N5194 thru 1N5196 ..... /118
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