DB600-A

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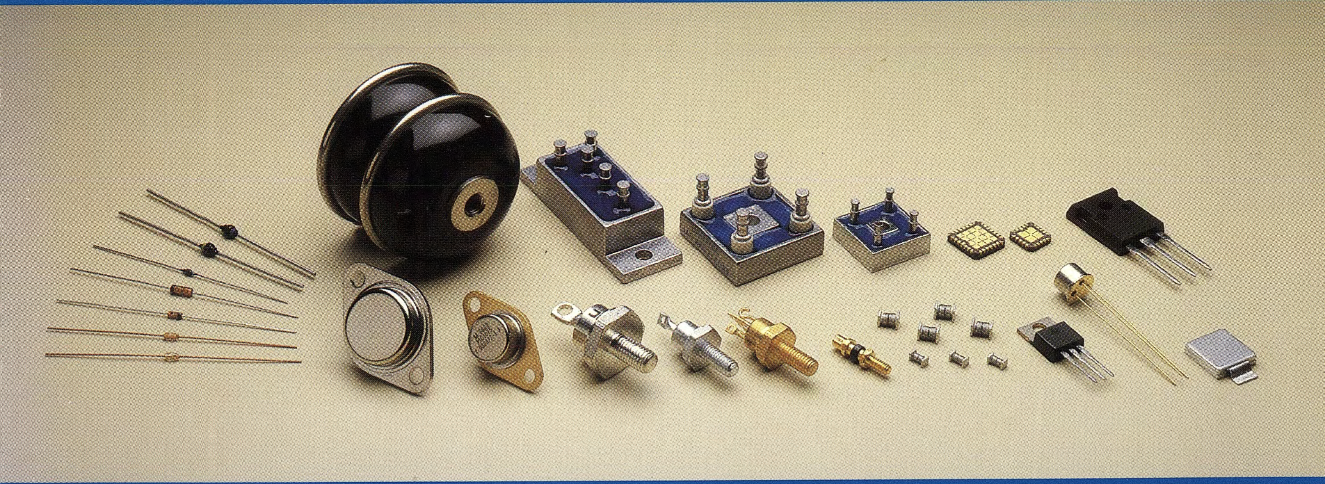
Watertown
The diode experts



Semiconductor Data Book

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ABOUT THE DATA BOOK...

This Data book contains complete data and applications information about Microsemi-Watertown's broad line of discrete semiconductors for industrial and military applications. It includes the unique new electrically and mechanically superior UNIBOND™ diode.

In July of 1992, Microsemi Corporation, headquartered in Santa Ana, California, purchased Unitrode Semiconductor Products Division (SPD), in Watertown, Massachusetts, from Unitrode Corporation. This new Microsemi division, Microsemi Corp.-Watertown (MSC-WTR), is committed to the same high standards of quality products and continuous customer service improvements that have been the foundation of Microsemi's thirty year evolution.

Due to the large breadth of product these two companies manufacture, Microsemi offers this "transitional" data book for its customers to use while the production of a new, comprehensive MSC data book is in process. We offer our apologies for any inconvience this may cause.

For more information about these products or any other Microsemi components, please call or write.

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3-24	684-4	1 ph; 10A; 400V
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3-21	696-3	3 ph; 15A; 300V
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Legend: J—JAN JTX—JANTX JTXV—JANTXV

PAGE	PART NUMBER	DESCRIPTION
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2-98	USD245CRHR2	4A; 45V; TO-39; Center-Tap
2-101	USD335C	30A; 35V; TO-3
2-101	USD335CHR2	30A; 35V; TO-3
2-101	USD345C	30A; 45V; TO-3
2-101	USD345CHR2	30A; 45V; TO-3
2-103	USD520	75A; 20V; DO-5
2-103	USD535	75A; 35V; DO-5
2-103	USD545	75A; 45V; DO-5
2-103	USD550	75A; 50V; DO-5
2-105	USD635	6A; 35V; TO-220AC
2-107	USD635C	12A; 35V; TO-220AB
2-105	USD640	6A; 40V; TO-220AC
2-107	USD640C	12A; 40V; TO-220AB
2-105	USD645	6A; 45V; TO-220AC
2-107	USD645C	12A; 45V; TO-220AB
2-105	USD650	6A; 50V; TO-220AC
2-107	USD650C	12A; 50V; TO-22AB
2-109	USD735	8A; 35V; TO-220AC
2-111	USD735C	16A; 35V; TO-220AB
2-109	USD740	8A; 40V; TO-220AC
2-111	USD740C	16A; 40V; TO-220AB
2-109	USD745	8A; 45V; TO-220AC
2-111	USD745C	16A; 45V; TO-220AB
2-109	USD750	8A; 50V; TO-220AC
2-111	USD750C	16A; 50V; TO-220AB
2-113	USD835	12A; 35V; TO-220AC
2-113	USD840	12A; 40V; TO-220AC
2-113	USD845	12A; 45V; TO-220AC
2-113	USD850	12A; 50V; TO-220AC
2-115	USD935	16A; 35V; TO-220AC
2-115	USD940	16A; 40V; TO-220AC
2-115	USD945	16A; 45V; TO-220AC
2-115	USD950	16A; 50V; TO-220AC
2-117	USD3030C	30A; 30V; TO-3P; Center-Tap
2-119	USD3030S	30A; 30V; TO-3P
2-117	USD3040C	30A; 40V; TO-3P; Center-Tap
2-119	USD3040S	30A; 40V; TO-3P
2-117	USD3045C	30A; 45V; TO-3P; Center-Tap
2-119	USD3045S	30A; 45V; TO-3P
2-121	USD4530C	45A; 30V; TO-3P; Center-Tap
2-123	USD4530S	45A; 30V; TO-3P
2-121	USD4540C	45A; 40V; TO-3P; Center-Tap
2-123	USD4540S	45A; 40V; TO-3P
2-121	USD4545C	45A; 45V; TO-3P; Center-Tap
2-123	USD4545S	45A; 45V; TO-3P
*	USD6035	60A; 35V; DO-5
*	USD6045	60A; 45V; DO-5
2-125	USD7520	75A; 20V; DO-5
2-125	USD7525	75A; 25V; DO-5
		RECTIFIER MODULE
3-57	USR12	1.2kV
3-57	USR15	1.5kV
3-57	USR20	2.0kV
3-57	USR25	2.5kV
3-57	USR30	3.0kV
3-57	USR35	3.5kV
3-57	USR40A	4.0kV
3-57	USR45A	4.5kV
3-57	USR50A	5.0kV
3-57	USR60A	6.0kV
3-57	USR70A	7.0kV
3-57	USR80A	8.0kV
3-57	USR100A	10kV
3-57	USR120A	12kV
3-57	USR150A	15kV
3-57	USR180A	18kV

PAGE	PART NUMBER	DESCRIPTION
3-51	USS5	5.0kV
3-51	USS7.5	7.5kV
3-51	USS10	10kV
3-51	USS15	15kV
		RECTIFIER
2-127	UT234	1.0A; 200V
2-127	UT235	1.0A; 400V
2-127	UT236	1.0A; 100V
2-127	UT237	1.0A; 500V
2-127	UT238	1.0A; 600V
2-127	UT242	1.25A; 200V
2-127	UT244	1.25A; 400V
2-127	UT245	1.25A; 500V
2-127	UT247	1.25A; 600V
2-127	UT249	1.25A; 100V
2-127	UT251	1.5A; 100V
2-127	UT252	1.5A; 200V
2-127	UT254	1.5A; 400V
2-127	UT255	1.5A; 500V
2-127	UT257	1.5A; 600V
2-127	UT258	1.5A; 800V
2-127	UT261	2.0A; 100V
2-127	UT262	2.0A; 200V
2-127	UT264	2.0A; 400V
2-127	UT265	2.0A; 500V
2-127	UT267	2.0A; 600V
2-127	UT268	2.0A; 800V
2-127	UT347	1.0A; 1000V
2-127	UT361	1.0A; 800V
2-127	UT362	1.2A; 800V
2-127	UT363	1.2A; 1000V
2-127	UT364	1.5A; 1000V
2-130	UT2005	2.0A; 50V
2-130	UT2010	2.0A; 100V
2-130	UT2020	2.0A; 200V
2-130	UT2040	2.0A; 400V
2-130	UT2060	2.0A; 600V
2-130	UT3005	3.0A; 50V
2-130	UT3010	3.0A; 100V
2-130	UT3020	3.0A; 200V
2-130	UT3040	3.0A; 400V
2-130	UT3060	3.0A; 600V
2-130	UT4005	4.0A; 50V
2-130	UT4010	4.0A; 100V
2-130	UT4020	4.0A; 200V
2-130	UT4040	4.0A; 400V
2-130	UT4060	4.0A; 600V
2-133	UT5105	7.5A; 50V
2-133	UT5105HR2	7.5A; 50V
2-133	UT5110	7.5A; 100V
2-133	UT5110HR2	7.5A; 100V
2-133	UT5120	7.5A; 200V
2-133	UT5120HR2	7.5A; 200V
2-133	UT5140	7.5A; 400V
2-133	UT5140HR2	7.5A; 400V
2-133	UT5160	7.5A; 600V
2-133	UT5160HR2	7.5A; 600V
2-133	UT6105	9.0A; 50V
2-133	UT6105HR2	9.0A; 50V
2-133	UT6110	9.0A; 100V
2-133	UT6110HR2	9.0A; 100V
2-133	UT6120	9.0A; 200V
2-133	UT6120HR2	9.0A; 200V
2-133	UT6140	9.0A; 400V
2-133	UT6140HR2	9.0A; 400V
2-133	UT6160	9.0A; 600V
2-133	UT6160HR2	9.0A; 600V

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PART NUMBER INDEX

PAGE	PART NUMBER	DESCRIPTION
		RECTIFIER MODULE
2-133	UT8105	12.0A; 50V
2-133	UT8105HR2	12.0A; 50V
2-133	UT8110	12.0A; 100V
2-133	UT8110HR2	12.0A; 100V
2-133	UT8120	12.0A; 200V
2-133	UT8120HR2	12.0A; 200V
2-133	UT8140	12.0A; 400V
2-133	UT8140HR2	12.0A; 400V
2-133	UT8160	12.0A; 600V
2-133	UT8160HR2	12.0A; 600V
2-136	UTR01	1.0A; 50V
2-136	UTR02	2.0A; 50V
2-136	UTR10	0.5A; 100V
2-136	UTR11	1.0A; 100V
2-136	UTR12	2.0A; 100V
2-136	UTR20	0.5A; 200V
2-136	UTR21	1.0A; 200V
2-136	UTR22	2.0A; 200V
2-136	UTR30	0.5A; 300V
2-136	UTR31	1.0A; 300V
2-136	UTR32	2.0A; 300V
2-136	UTR40	0.5A; 400V
2-136	UTR41	1.0A; 400V
2-136	UTR42	2.0A; 400V
2-136	UTR50	0.5A; 500V
2-136	UTR51	1.0A; 500V
2-136	UTR52	2.0A; 500V
2-136	UTR60	0.5A; 600V
2-136	UTR61	1.0A; 600V
2-136	UTR62	2.0A; 600V
*	UTR70	0.5A; 700V
*	UTR71	1.0A; 700V
2-139	UTR2305	2.0A; 50V
2-139	UTR2310	2.0A; 100V
2-139	UTR2320	2.0A; 200V
2-139	UTR2340	2.0A; 400V
2-139	UTR2350	2.0A; 500V
2-139	UTR2360	2.0A; 600V
2-139	UTR3305	3.0A; 50V
2-139	UTR3310	3.0A; 100V
2-139	UTR3320	3.0A; 200V
2-139	UTR3340	3.0A; 400V
2-139	UTR3350	3.0A; 500V
2-139	UTR3360	3.0A; 600V
2-139	UTR4305	4.0A; 50V
2-139	UTR4310	4.0A; 100V
2-139	UTR4320	4.0A; 200V
2-139	UTR4340	4.0A; 400V
2-139	UTR4350	4.0A; 500V
2-139	UTR4360	4.0A; 600V
2-142	UTR4405	6.0A; 50V
2-142	UTR4405HR2	6.0A; 50V
2-142	UTR4410	6.0A; 100V
2-142	UTR4410HR2	6.0A; 100V
2-142	UTR4420	6.0A; 200V
2-142	UTR4420HR2	6.0A; 200V
2-142	UTR4440	6.0A; 400V
2-142	UTR4440HR2	6.0A; 400V
2-142	UTR5405	7.5A; 50V
2-142	UTR5405HR2	7.5A; 50V
2-142	UTR5410	7.5; 100V
2-142	UTR5410HR2	7.5A; 100V
2-142	UTR5420	7.5A; 200V
2-142	UTR5420HR2	7.5A; 200V
2-142	UTR5440	7.5A; 400V
2-142	UTR5440HR2	7.5A; 400V
2-142	UTR6405	9.0A; 50V
2-142	UTR6405HR2	9.0A; 50V
2-142	UTR6410	9.0A; 100V
2-142	UTR6410HR2	9.0A; 100V
2-142	UTR6420	9.0A; 200V
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		RECTIFIER
2-142	UTR6440	9.0A; 400V
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2-145	UTX105	1.0A; 50V
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2-145	UTX115	1.0A; 150V
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2-145	UTX125	1.0A; 250V
2-145	UTX205	2.0A; 50V
2-145	UTX210	2.0A; 100V
2-145	UTX215	2.0A; 150V
2-145	UTX220	2.0A; 200V
2-145	UTX225	2.0A; 250V
2-148	UTX3105	3.0A; 50V
2-148	UTX3110	3.0A; 100V
2-148	UTX3115	3.0A; 150V
2-148	UTX3120	3.0A; 200V
2-148	UTX4105	4.0A; 50V
2-148	UTX4110	4.0A; 100V
2-148	UTX4115	4.0A; 150V
2-148	UTX4120	4.0A; 200V
		ZENER
4-24	UZ110-UZ119	3W; 5%
4-24	UZ110HR2-UZ119HR2	3W; 5%
4-24	UZ120-UZ140	3W; 5%
4-24	UZ140HR2-UZ706HR2	3W; 5%
4-24	UZ210HR2-UZ219HR2	3W; 10%
4-24	UZ220HR2-UZ240HR2	3W; 10%
4-24	UZ706HR2-UZ760HR2	3W; 5%
4-24	UZ770HR2-UZ790HR2	3W; 5%
4-24	UZ806HR2-UZ860HR2	3W; 10%
4-24	UZ870HR2-UZ890HR2	3W; 10%
4-26	UZ4110-UZ4120	5W; 5%
4-26	UZ4210-UZ4220	5W; 10%
4-26	UZ4706-UZ4791	5W; 5%
4-26	UZ4806-UZ4891	5W; 10%
4-28	UZ5110-UZ5119	5W; 5%
4-28	UZ5120-UZ5140	5W; 5%
4-28	UZ5210-UZ5240	5W; 10%
		POWER ZENER
4-28	UZ5706-UZ5760	5W; 5%
4-28	UZ5770-UZ5790	5W; 5%
4-28	UZ5806-UZ5860	5W; 10%
4-28	UZ5870-UZ5890	5W; 10%
4-30	UZ7110HR2	10W; 5%
4-30	UZ7110LHR2	6W; 5%
4-30	UZ7210HR2	10W; 10%
4-30	UZ7210LHR2	6W; 10%
4-30	UZ7706HR2-UZ7750HR2	10W; 5%
4-30	UZ7706LHR2-UZ7750LHR2	6W; 5%
4-30	UZ7756HR2-UZ7790HR2	10W; 5%
4-30	UZ7756LHR2-UZ7790LHR2	6W; 5%
4-30	UZ7806HR2-UZ7850HR2	10W; 10%
4-30	UZ7806LHR2-UZ7850LHR2	6W; 10%

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PAGE	PART NUMBER	DESCRIPTION	PAGE	PART NUMBER	DESCRIPTION
		POWER ZENER			
4-30	UZ7856HR2-UZ7890HR2	10W; 10%			
4-30	UZ7856LHR2-UZ7890LHR2	6W; 10%			
4-33	UZ8110-UZ8120	1W; 5%			
4-33	UZ8210-UZ8220	1W; 10%			
4-33	UZ8706-UZ8790	1W; 5%			
4-33	UZ8806-UZ8890	1W; 10%			

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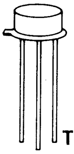
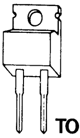
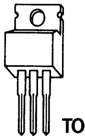
SCHOTTKY RECTIFIERS

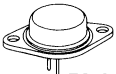
PRODUCT SELECTION GUIDE

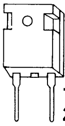

TO-39

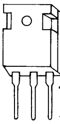

TO-220AC


TO-220AB


DO-4


TO-3


TO-3P
2 Lead

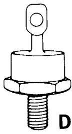

TO-3P
3 Lead

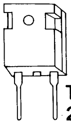
AVERAGE DC OUTPUT CURRENT		4A	6A	8A	12A[1]	12A
PEAK REVERSE VOLTAGE	PKG	TO-39 HERMETIC (3 LEAD)	TO-220 PLASTIC (2 LEAD)	TO-220 PLASTIC (2 LEAD)	TO-220 PLASTIC (3 LEAD)	TO-220 PLASTIC (2 LEAD)
30V	TYPE V_F I_{FSM}					
35V	TYPE V_F I_{FSM}		USD635 .48 @ 6A 150A	USD735 .48 @ 8A 200A	USD635C .60 @ 12A 150A	USD835 .51 @ 12A 200A
40V	TYPE V_F I_{FSM}		USD640 .48 @ 6A 150A	USD740 .48 @ 8A 200A	USD640C .60 @ 12A 150A	USD840 .45 @ 12A 200A
45V	TYPE V_F I_{FSM}	1N6492[4] USD245C .45 @ 2A 80A	USD645 .48 @ 6A 150A	USD745 .48 @ 8A 200A	USD645C .60 @ 12A 150A	USD845 .45 @ 12A 200A
50V	TYPE V_F I_{FSM}		USD650 .48 @ 6A 150A	USD750 .48 @ 8A 200A	USD650C .60 @ 12A 150A	USD850 .45 @ 12A 200A

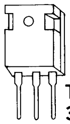
AVERAGE DC OUTPUT CURRENT		16A[2]	16A	25A	30A	30A[3]	30A[3]
PEAK REVERSE VOLTAGE	PKG	TO-220 PLASTIC (3 LEAD)	TO-220 PLASTIC (2 LEAD)	DO-4 STUD	TO-3P (2 LEAD)	TO-3P (3 LEAD)	TO-3
30V	TYPE V_F I_{FSM}				USD3030S .70 @ 30A 450A	USD3030C .71 @ 30A 400A	
35V	TYPE V_F I_{FSM}	USD735C .60 @ 16A 200A	USD935 .53 @ 16A 250A				USD335C[5] .6 @ 20A 400A
40V	TYPE V_F I_{FSM}	USD740C .60 @ 16A 200A	USD940 .53 @ 16A 250A		USD3040S .70 @ 30A 450A	USD3040C .71 @ 30A 400A	
45V	TYPE V_F I_{FSM}	USD745C .60 @ 16A 200A	USD945 .53 @ 16A 250A	1N6391[4] .68 @ 50A 600A	USD3045S .70 @ 30A 450A	USD3045C .71 @ 30A 400A	USD345C[5] SD241[5] .6 @ 20A 400A
50V	TYPE V_F I_{FSM}	USD750C .60 @ 16A 200A	USD950 .53 @ 16A 250A				

NOTES: 1. Center-tap 6A per leg.
2. Center-tap 8A per leg.
3. Center-tap 15A per leg.
4. Available as JAN, JANTX, JANTXV.
5. Available with High-Reliability (HR2) Screening.

SCHOTTKY RECTIFIERS

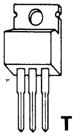

DO-5


TO-3P
2 Lead


TO-3P
3 Lead

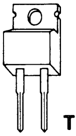
AVERAGE DC OUTPUT CURRENT		45A	45A[3]	50A	60A	75A	75A
PKG PEAK REVERSE VOLTAGE		TO-3P (2 LEAD)	TO-3P (3 LEAD)	DO-5 STUD	DO-5 STUD	DO-5 STUD	DO-5 STUD
20V	TYPE V_F I_{FSM}					USD520 .6 @ 60A 1000A	USD7520 .425 @ 60A 1000A
25V	TYPE V_F I_{FSM}						USD7525 .425 @ 60A 1000A
30V	TYPE V_F I_{FSM}	USD4530S .70 @ 45A 450A	USD4530C .70 @ 45A 450A	1N6097 .86 @ 157A 800A			
35V	TYPE V_F I_{FSM}					USD535 .6 @ 60A 1000A	
40V	TYPE V_F I_{FSM}	USD4540C .70 @ 45A 450A	USD4540C .70 @ 45A 450A	1N6098 .86 @ 157A 800A			
45V	TYPE V_F I_{FSM}	USD4545S .70 @ 45A 450A	USD4545C .70 @ 45A 450A		1N6392[2] SD51[1] .6 @ 60A 800A	USD545 .6 @ 60A 1000A	
50V	TYPE V_F I_{FSM}					USD550 .6 @ 60A 1000A	

NOTES: 1. V_{RRM} @ 25°C is 45V, V_{RRM} @ 150°C is 35V.
2. Available as JAN, JANTX, JANTXV.
3. Center-tap 23A per leg.


TO-220AB


A


B

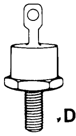

TO-220AC

ULTRA-FAST RECOVERY (t_{rr} — 25 to 50ns)

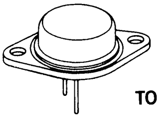
Average D.C. Output Current			1A	2A	2.5A	5A	6A	8A	16A	16A Center-Tap
Package Style			**A**	**A**	**A**	**B**	**B**	**TO-220AC**	**TO-220AC**	**TO-220AB**
Peak Inverse Voltage	50V	V_F t_{rr}	UES1001 .895 @ 1A 25ns		1N5802* UES1101 .895 @ 2A 25ns		1N5807* UES1301 .850 @ 6A 30ns	UES1401 .895 @ 8A 35ns	UES1501 .895 @ 16A 35ns	UES2401 .895 @ 8A 35ns
	75V	V_F t_{rr}			1N5803 .895 @ 1A 25ns		1N5808 .850 @ 6A 30ns			
	100V	V_F t_{rr}	UES1002 .895 @ 1A 25ns		1N5804* UES1102 .895 @ 2A 25ns		1N5809* UES1302 .850 @ 6A 30ns	UES1402 .895 @ 8A 35ns	UES1502 .895 @ 16A 35ns	UES2402 .895 @ 8A 35ns
	125V	V_F t_{rr}			1N5805 .895 @ 1A 25ns		1N5810 .850 @ 6A 30ns			
	150V	V_F t_{rr}	UES1003 .895 @ 1A 25ns		1N5806* UES1103 .895 @ 2A 25ns		1N5811* UES1303 .850 @ 6A 30ns	UES1403 .895 @ 8A 35ns	UES1503 .895 @ 16A 35ns	UES2403 .895 @ 8A 35ns
	200V	V_F t_{rr}		UES1104 1.15 @ 1A 50ns		UES1304 1.15 @ 3A 50ns		UES1404 .895 @ 8A 35ns	UES1504 .895 @ 16A 35ns	UES2404 .895 @ 8A 35ns
	300V	V_F t_{rr}		UES1105 1.15 @ 1A 50ns		UES1305 1.15 @ 3A 50ns				
	400V	V_F t_{rr}		UES1106 1.15 @ 1A 50ns		UES1306 1.15 @ 3A 50ns				

* Available as JAN, JANTX, JANTXV.

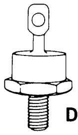
RECTIFIERS



DO-4



TO-3



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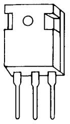


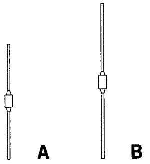
TO-3P

ULTRA-FAST RECOVERY (trr — 25 to 50ns)

Average D.C. Output Current			20A	25A	30A	30A Center-Tap	30A Center-Tap	45A	45A Center-Tap	50A	70A
Package Style			**DO-4**	**DO-4**	**TO-3P**	**TO-3P**	**TO-3**	**TO-3P**	**TO-3P**	**DO-5**	**DO-5**
Peak Inverse Voltage	50V	V_F t_{rr}		1N5812* UES701 .825 @ 25A 35ns	UES3005S .93 @ 30A 35ns	UES3005C .93 @ 30A 35ns	UES2601[1] .825 @ 15A 35ns	UES4505S .95 @ 45A 50ns	UES4505C .95 @ 45A 50ns		1N6304* UES801 .84 @ 70A 50ns
	75V	V_F t_{rr}		1N5813 .825 @ 25A 35ns							
	100V	V_F t_{rr}		1N5814* UES702 .825 @ 25A 35ns	UES3010S .93 @ 30A 35ns	UES3010C .93 @ 30A 35ns	UES2602[1] .825 @ 15A 35ns	UES4510S .95 @ 45A 35ns	UES4510C .95 @ 45A 50ns		1N6305* UES802 .84 @ 70A 50ns
	125V	V_F t_{rr}		1N5815 .825 @ 25A 35ns							
	150V	V_F t_{rr}		1N5816* UES703 .825 @ 25A 35ns	UES3015S .93 @ 30A 35ns	UES3015C .93 @ 30A 35ns	UES2603[1] .825 @ 15A 35ns	UES4515S .95 @ 45A 50ns	UES4515C .95 @ 45A 50ns		1N6306* UES803 .84 @ 70A 50ns
	200V	V_F t_{rr}	UES704[1] 1.15 @ 20A 50ns				UES2604[1] 1.15 @ 15A 50ns			UES804[1] 1.15 @ 50A 50ns	
	300V	V_F t_{rr}	UES705[1] 1.15 @ 20A 50ns				UES2605[1] 1.15 @ 15A 50ns			UES805[1] 1.15 @ 50A 50ns	
	400V	V_F t_{rr}	UES706[1] 1.15 @ 20A 50ns				UES2606[1] 1.15 @ 15A 50ns			UES806[1] 1.15 @ 50A 50ns	

* Available as JAN, JANTX, JANTXV.

1. Available with High-Reliability (HR2) Screening. See individual datasheets.

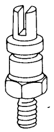


SUPER-FAST RECOVERY (trr — 75 to 100ns)

Average DC Output Current			1A	2A	3A	4A
Package Style			**A**	**A**	**B**	**B**
Peak Inverse Voltage	50V	V_F t_{rr}	UTX105 1.00 @ .5A 75ns	UTX205 1.0V @ 1A 75ns	UTX3105 1V @ 2A 100ns	UTX4105 1V @ 3A 100ns
	100V	V_F t_{rr}	UTX110 1.00 @ .5A 75ns	UTX210 1.0V @ 1A 75ns	UTX3110 1.0V @ 2A 100ns	UTX4110 1.0V @ 3A 100ns
	150V	V_F t_{rr}	UTX115 1.00 @ .5A 75ns	UTX215 1.0V @ 1A 75ns	UTX3115 1.0V @ 2A 100ns	UTX4115 1.0V @ 3A 100ns
	200V	V_F t_{rr}	UTX120 1.00 @ 1A 75ns	UTX220 1.0V @ 1A 75ns	UTX3120 1.0V @ 2A 100ns	UTX4120 1.0V @ 3A 100ns
	250V	V_F t_{rr}	UTX125 1.00 @ .5A 75ns	UTX225 1.0V @ 1A 75ns		


A


B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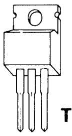
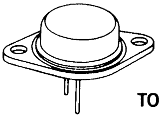

TO-220AB


TO-3

FAST RECOVERY (t_{rr} — 150 to 500ns)

Average D.C. Output Current			1A	1A	2A	3A	3A	4A	6-9A
Package Style			**A**	**A**	**A**	**B**	**B**	**B**	**C**
Peak Inverse Voltage	50V	V_F t_{rr}	UTR01 1.1V @ .5A 250ns		UTR02 1.1V @ 1A 250ns	UTR3305 1.1V @ 3A 250ns	1N5415* 1.5V @ 9A 150ns	UTR4305 1.1V @ 4A 250ns	UTR4405[1] UTR5405[1] UTR6405[1] 1.1V @ 6A 300ns
	100V	V_F t_{rr}	UTR11 1.1V @ .5A 250ns		UTR12 1.1V @ 1A 250ns	UTR3310 1.1V @ 3A 250ns	1N5416* 1N5186** 1.5V @ 9A 150ns	UTR4310 1.1V @ 4A 250ns	UTR4410[1] UTR5410[1] UTR6410[1] 1.1V @ 6A 300ns
	200V	V_F t_{rr}	UTR21 1.1V @ .5A 250ns	1N4942* 1N5615* 1.3V @ 1A 150ns	UTR22 1.1V @ 1A 250ns	UTR3320 1.1V @ 3A 250ns	1N5417* 1N5187** 1.5V @ 9A 150ns	UTR4320 1.1V @ 4A 250ns	UTR4420[1] UTR5420[1] UTR6420[1] 1.1V @ 6A 400ns
	300V	V_F t_{rr}	UTR31 1.1V @ .5A 300ns		UTR32 1.1V @ 1A 300ns				
	400V	V_F t_{rr}	UTR41 1.1V @ .5A 350ns	1N4944* 1N5617* 1.3V @ 1A 150ns	UTR42 1.1V @ 1A 350ns	UTR3340 1.1V @ 3A 300ns	1N5418* 1N5188** 1.5V @ 9A 150ns	UTR4340 1.1V @ 4A 400ns	UTR4440[1] UTR5440[1] UTR6440[1] 1.1V @ 6A 500ns
	500V	V_F t_{rr}	UTR51 1.1V @ .5A 400ns		UTR52 1.1V @ 1A 400ns	UTR3350 1.1V @ 3A 350ns	1N5419* 1.5V @ 9A 250ns	UTR4350 1.1V @ 4A 400ns	
	600V	V_F t_{rr}	UTR61 1.1V @ .5A 400ns	1N4946* 1N5619* 1.3V @ 1A 250ns	UTR62 1.1V @ 1A 400ns	UTR3360 1.1V @ 3A 400ns	1N5420* 1N5190** 1.5V @ 9A 400ns	UTR4360 1.1V @ 4A 400ns	

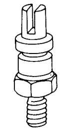
* Available as JAN, JANTX, JANTXV.

** Available as JAN, JANTX.

[1] Available with High Reliability (HR2) Screening. See individual datasheets.


A


B


C

STANDARD RECOVERY

Average DC Output Current		1A	2A	3A	4A	7.5A	9A	12A
Package Style		**A**	**A**	**B**	**B**	**C**	**C**	**C**
Peak Inverse Voltage	50V	UR105†	UR205	UT3005	UT4005	UT5105[1]	UT6105[1]	UT8105[1]
	100V	UT236 UT110†	UT261 UT210†	UT3010	UT4010	UT5110[1]	UT6110[1]	UT8110[1]
	150V	UR115†	UR215†					
	200V	UT234 UR120† 1N4245* 1N5614*	UT262 UR220† 1N3611**	UT3020	UT4020 1N5550*	UT5120[1]	UT6120[1]	UT8120[1]
	250V	UR125†	UR225†					
	400V	UT235 1N4246* 1N5616*	UT264 1N3612**	UT3040	UT4040 1N5551*	UT5140[1]	UT6140[1]	UT8140[1]
	600V	UT238 1N4247* 1N5618*	UT267 1N3613**	UT3060	UT4060 1N5552*	UT5160[1]	UT6160[1]	UT8160[1]
	800V	UT361 1N4248* 1N5620*	UT268 1N3614**		1N5553*			
	1000V	UT347 1N4249* 1N5622*	UT364					

* Available as JAN, JANTX, JANTXV.
** Available as JAN, JANTX.
† Radiation Tolerant
1. Available with High Reliability (HR) Screening. See individual datasheets

RECTIFIERS

Military Approved, 1 Amp, General Purpose

JAN & JANTX 1N3611-1N3614

FEATURES

- Qualified to MIL-S-19500/228
- Continuous Rating: 1A
- Surge Rating: 30A
- PIV: to 800V

DESCRIPTION

This series of MIL approved JAN and JANTX general purpose 1 amp rectifiers are useful in many high rel applications.

ABSOLUTE MAXIMUM RATINGS

Peak Reverse Voltage Min.	Reverse Working Voltage	Type
240V	200V	JAN & JANTX 1N3611
480V	400V	JAN & JANTX 1N3612
720V	600V	JAN & JANTX 1N3613
920V	800V	JAN & JANTX 1N3614

Maximum Average D.C. Output Current

@ $T_A = 100°C$ 1.0A

@ $T_A = 150°C$ 0.3A

Non-Repetitive Sinusoidal

Surge Current (8.3ms) 30A

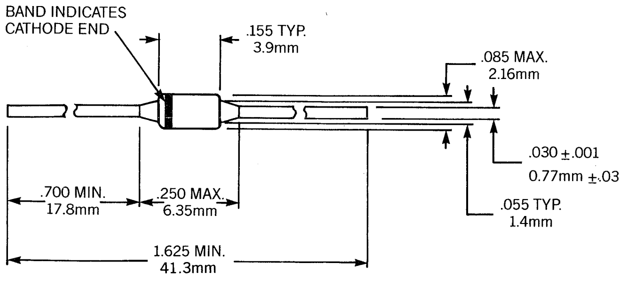
Operating Temperature Range .... —65°C to +175°C

Storage Temperature Range .... —65°C to +200°C

Thermal Resistance .... See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS

JAN & JANTX1N3611-1N3614



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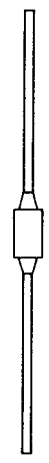


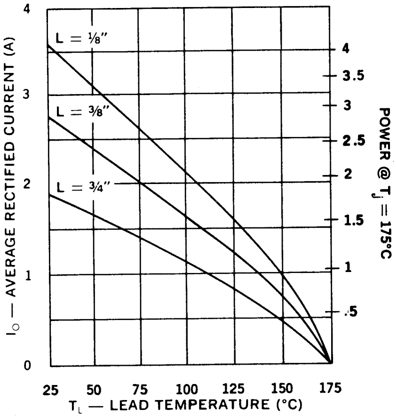
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

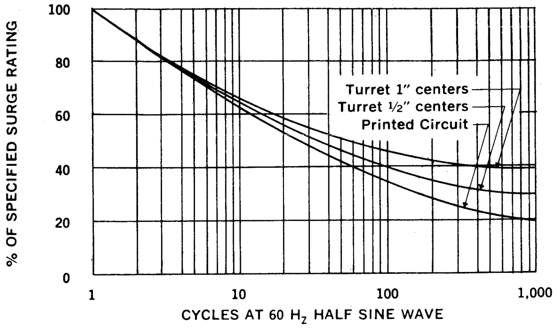
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Peak Reverse D.C. Voltage	Minimum Reverse Breakdown Voltage @ 100µA	Peak Forward Voltage		Maximum D.C. Reverse Current at D.C. Voltage	
			Min.	Max.	25°C	150°C
JAN & JANTX 1N3611	200V	240V	0.6V	1.1V(pk) @ 1.0A	1µA	300µA
JAN & JANTX 1N3612	400V	480V				
JAN & JANTX 1N3613	600V	720V				
JAN & JANTX 1N3614	800V	920V				

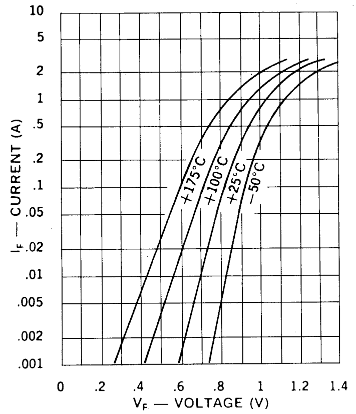
Maximum Current vs Lead Temperature



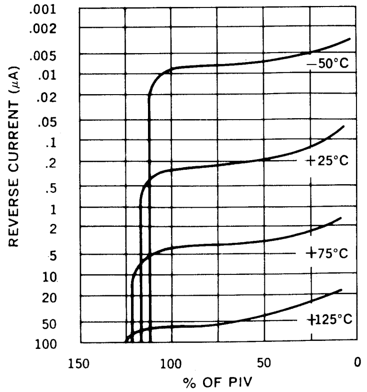
Allowable Forward Surge vs Number of Cycles



Typical Forward Current vs Forward Voltage



Typical Reverse Current vs PIV



RECTIFIERS
Military Approved, 1 Amp, General Purpose

1N4245-1N4249
JAN, JANTX & JANTXV

FEATURES
- Qualified to MIL-S-19500/286
- Surge Rating: 25A
- PIV: to 1000 V
- Controlled Avalanche
- No Plastic, Epoxy, Silicone, Oxides, Gases or Solder are used

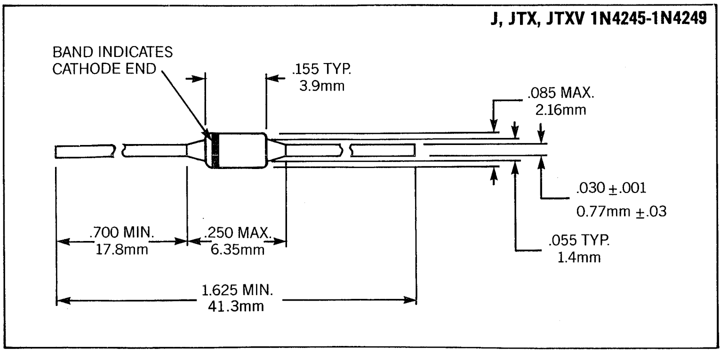
DESCRIPTION
This series of general purpose power rectifiers are available as JAN, JANTX or JANTXV for many power supply applicatons.

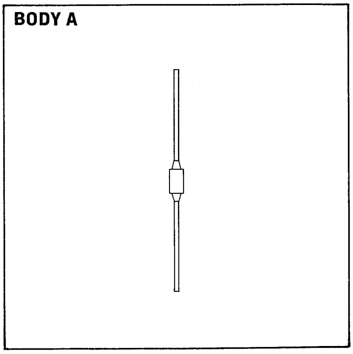
ABSOLUTE MAXIMUM RATINGS

Maximum Reverse Voltage	Type
200V	JAN, JANTX, JANTXV 1N4245
400V	JAN, JANTX, JANTXV 1N4246
600V	JAN, JANTX, JANTXV 1N4247
800V	JAN, JANTX, JANTXV 1N4248
1000V	JAN, JANTX, JANTXV 1N4249

Maximum Average D.C. Output Current	
@ $T_A = 100°C$	1.0A
@ $T_A = 150°C$	0.333A
Non-Repetitive Sinusoidal Surge Current	25A
Operating Temperature Range	—65°C to +175°C
Storage Temperature Range	—65°C to +175°C
Thermal Resistance	See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS





THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

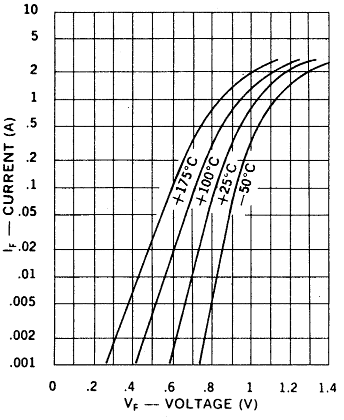
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

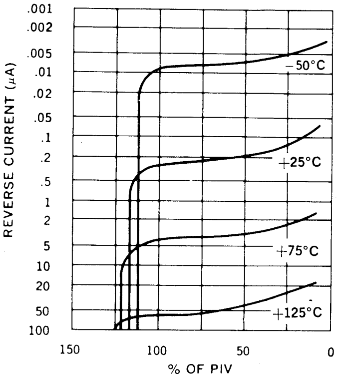
Type	PIV	Minimum Reverse Breakdown Voltage @ 100µA	Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
			Min.	Max.	25°C	150°C	
J, JTX, JTXV 1N4245	200V	240V	0.6V	1.3V(pk) @ 3.0A(pk)	1.0µA	150µA	5.0µs
J, JTX, JTXV 1N4246	400V	480V					
J, JTX, JTXV 1N4247	600V	720V					
J, JTX, JTXV 1N4248	800V	960V					
J, JTX, JTXV 1N4249	1000V	1150V					

*Measured in circuit $I_F = \frac{1}{2}A$, $I_R = 1.0A$, $I_{REC} = \frac{1}{4}A$

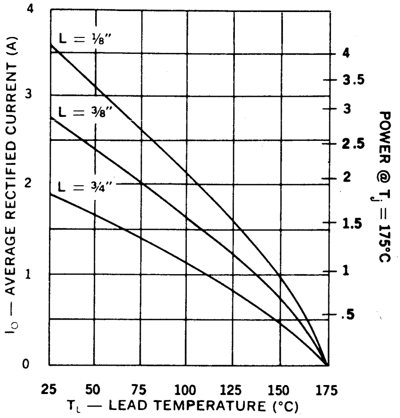
Typical Forward Current vs Forward Voltage



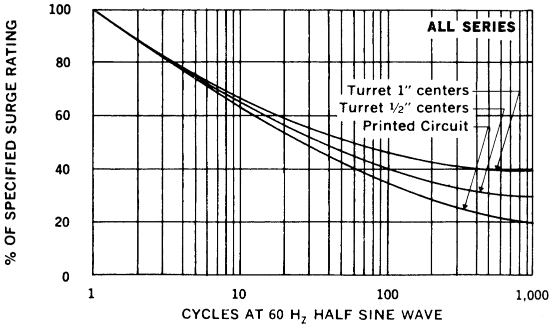
Typical Reverse Current vs PIV



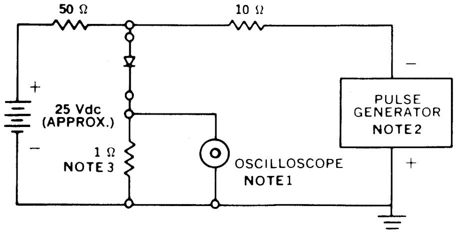
Maximum Current vs Lead Temperature



Allowable Forward Surge vs Number of Cycles



Reverse-Recovery Circuit



NOTES:
1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

Military Approved, 1 Amp, Fast Recovery

JAN, JANTX, & JANTXV 1N4942
JAN, JANTX, & JANTXV 1N4944
JAN, JANTX, & JANTXV 1N4946

FEATURES

- Qualified to MIL-S-19500/359
- Surge Rating: 15A
- PIV: to 600V
- Controlled Avalanche

DESCRIPTION

These fast recovery rectifiers are suitable for use as power devices for many applications. Devices are available as JAN, JANTX or JANTXV.

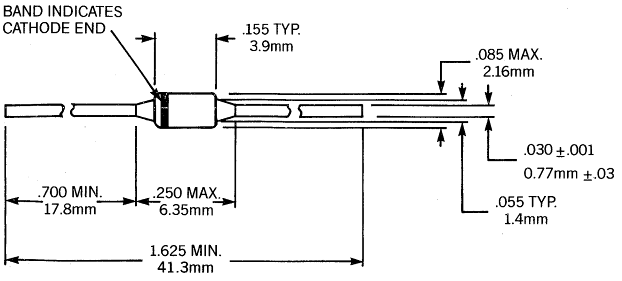
ABSOLUTE MAXIMUM RATINGS

Maximum Reverse Voltage	Type
200V	JAN, JANTX, & JANTXV 1N4942
400V	JAN, JANTX, & JANTXV 1N4944
600V	JAN, JANTX, & JANTXV 1N4946

Maximum Average D.C. Output Current	
@ $T_A = 55°C$	1.0A
@ $T_A = 100°C$	0.75A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	15A
Operating Temperature Range	—65°C to +175°C
Storage Temperature Range	—65°C to +175°C
Thermal Resistance	See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS

JAN, JANTX, & JANTXV 1N4942, 1N4944, 1N4946



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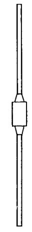


THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

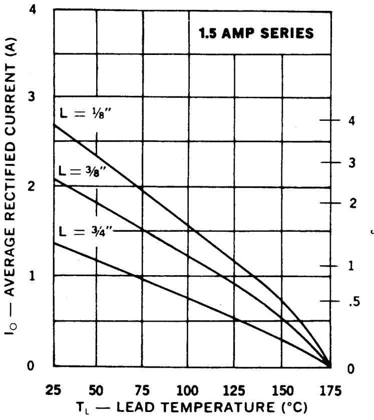
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

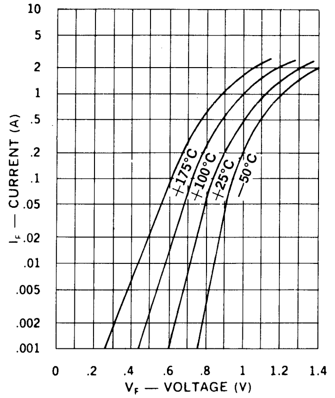
Type	Peak Inverse Voltage	Minimum Reverse Breakdown Voltage @ 50µA	Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*	Capacitance @ $V_R = 12V$ f = 1MHz
			Min.	Max.	25°C	150°C		
J, JTX, JTXV 1N4942	200V	220V	0.6V	1.3Vdc	1.0µA	200µA	150ns	45pf
J, JTX, JTXV 1N4944	400V	440V	@ 1 Adc				150ns	35pf
J, JTX, JTXV 1N4946	600V	660V					250ns	25pf

*Measured in circuit $I_F = ½A$, $I_R = 1.0A$, $I_{REC} = ¼A$

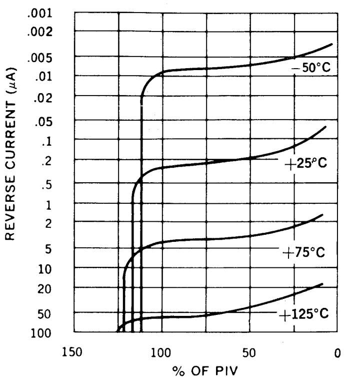
Maximum Current vs Lead Temperature



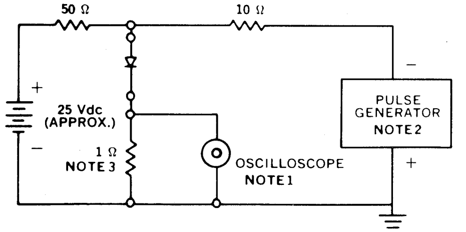
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs PIV

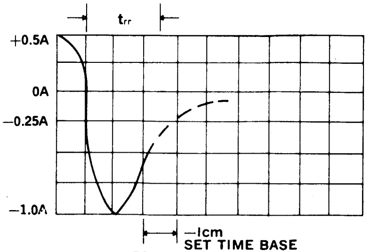


Reverse-Recovery Circuit



NOTES:
1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Characteristic Waveform.



SET TIME BASE
FOR 50 TO 100 ns/cm

RECTIFIERS

Military Approved, 3 Amp, Fast Recovery

1N5186-1N5190 JAN & JANTX

FEATURES

- Continuous Rating: 3A
- Qualified to MIL-S-19500/424
- PIV : to 600V
- Recovery Time: 150ns
- Miniature Size
- Controlled Avalanche

DESCRIPTION

These miniature fast recovery rectifiers permit operation at full power at frequencies as high as 100kHz sine wave.
They are qualified to military specification and available as JAN, JANTX

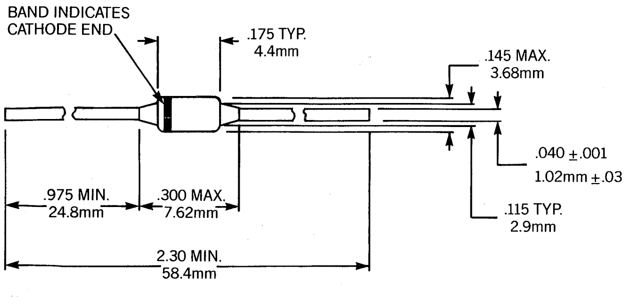
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
100V	JAN & JANTX 1N5186
200V	JAN & JANTX 1N5187
400V	JAN & JANTX 1N5188
600V	JAN & JANTX 1N5190

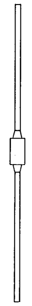
Maximum Average D.C. Output Current	
@ T_A = 25°C	3.0A
@ T_A = 150°C	0.7A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	80A
Operating Temperature Range	—65°C to +175°C
Storage Temperature Range	—65°C to +200°C
Thermal Resistance	See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS

JAN & JANTX 1N5186-1N5190



BODY B



THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

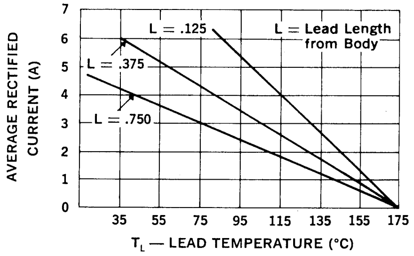
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Peak Inverse Voltage	Minimum Reverse Breakdown Voltage @ 100μA	Peak Forward Voltage		Maximum Reverse D.C. Current @ PIV	
			Min.	Max.	25°C	100°C
J, JTX 1N5186	100V	120V	0.9V	1.5V @ 9A(pk) (8.3ms)	2μA	100μA
J, JTX 1N5187	200V	240V				
J, JTX 1N5188	400V	480V				
J, JTX 1N5190	600V	660V				

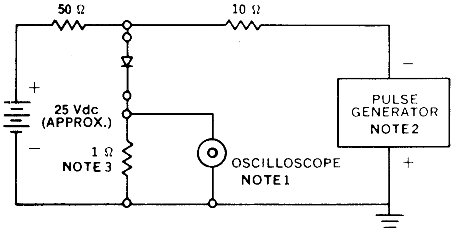
Type	Reverse Recovery Time*	Capacitance @ $V_R = 0V$ f = 1MHz	Capacitance @ $V_R = 4V$ f = 1MHz
J, JTX 1N5186	150ns	300pf	200pf
J, JTX 1N5187	200ns	300pf	170pf
J, JTX 1N5188	250ns	230pf	120pf
J, JTX 1N5190	400ns	180pf	90pf

*Recovery time measured from $I_F = 0.5A$ to $I_R = 1.0A$, $I_{REC} = 0.25A$

Maximum Current vs. Lead Temperature



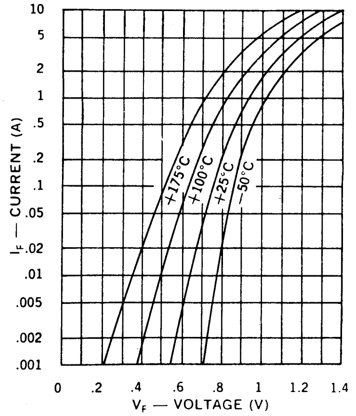
Reverse-Recovery Circuit



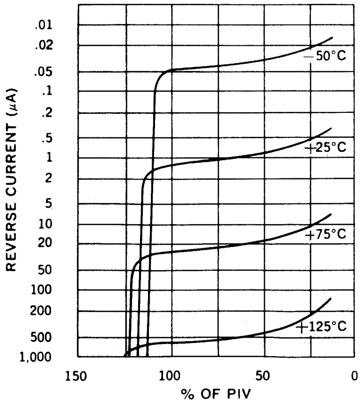
NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Typical Forward Current vs Forward Voltage



Typical Reverse Current vs PIV



RECTIFIERS

Military Approved, Fast Recovery, 3 Amp

1N5415-1N5420
JAN, JANTX & JANTXV

FEATURES

- Qualified to MIL-S-19500/411
- PIV: to 600V
- Controlled Avalanche

DESCRIPTION

This series of devices as designed to meet the need for high speed, power rectifiers in military high-rel power supplies.

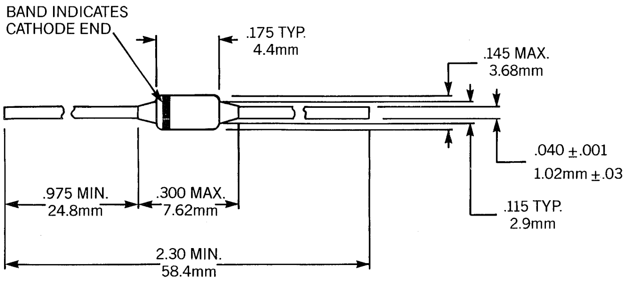
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
50V	JAN, JANTX, JANTXV 1N5415
100V	JAN, JANTX, JANTXV 1N5416
200V	JAN, JANTX, JANTXV 1N5417
400V	JAN, JANTX, JANTXV 1N5418
500V	JAN, JANTX, JANTXV 1N5419
600V	JAN, JANTX, JANTXV 1N5420

Maximum Average D.C. Output Current	
@ $T_A = 55°C$	3.0A
@ $T_A = 100°C$	2.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	80A
Operating Temperature Range	—65°C to +175°C
Storage Temperature Range	—65°C to +200°C
Thermal Resistance θ_{JL} @ L = 3/8″	20°C/W See Lead Temperature Derating Curve

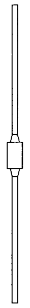
MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N5415-1N5420



Dimensions in inches.

BODY B



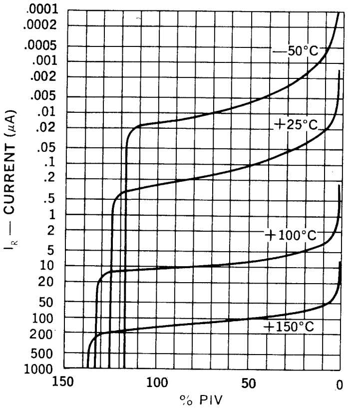
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

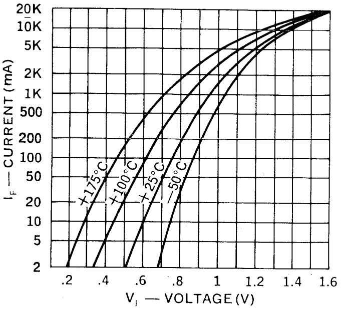
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	PIV	Minimum Reverse Breakdown Voltage @ 50μA	Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
			Min.	Max.	25°C	100°C	
J, JTX, JTXV 1N5415	50V	55V	0.6V	1.5V(pk) @ 9Adc tp = 300μs	1.0μA	20μA	150
J, JTX, JTXV 1N5416	100V	110V					150
J, JTX, JTXV 1N5417	200V	220V					150
J, JTX, JTXV 1N5418	400V	440V					150
J, JTX, JTXV 1N5419	500V	550V					250
J, JTX, JTXV 1N5420	600V	660V					400

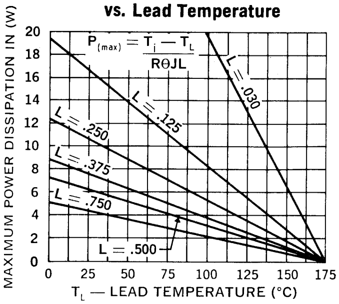
*Measured in circuit $I_F = 0.5$ A, $I_R = 1$A, $I_{REC} = 0.25$ A.



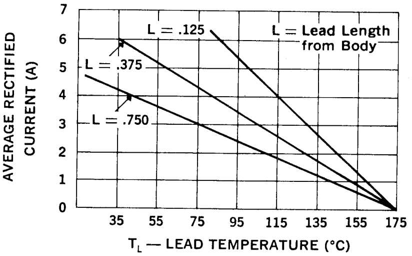
Typical Reverse Current vs. PIV



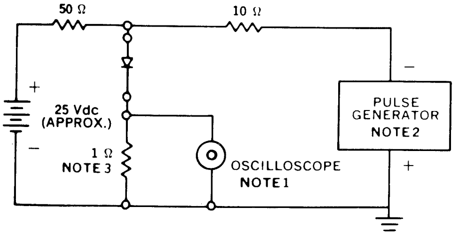
Typical Forward Current vs. Forward Voltage



Maximum Power vs. Lead Temperature



Maximum Current vs. Lead Temperature



Reverse-Recovery Circuit

NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

Military Approved, 5 Amp, General Purpose

1N5550-1N5553
JAN, JANTX & JANTXV

FEATURES

- Qualified to MIL-S-19500/420A
- Continuous Rating: 5A
- PIV: to 800V
- TX Parts 100% Screened
- Miniature Size
- Controlled Avalanche

DESCRIPTION

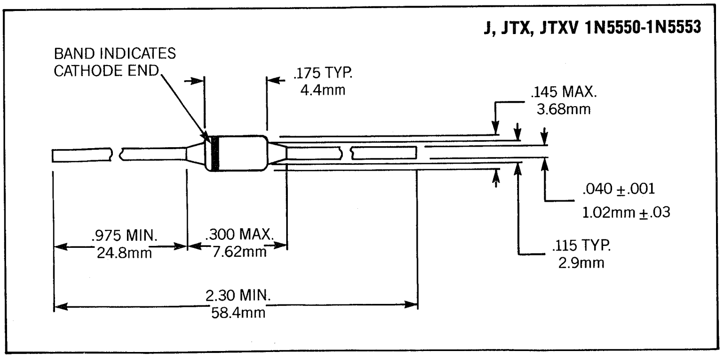
This series of military approved rectifiers is useful in many military applications. The 100% screening requirements in the "TX" version combined with the unique Unitrode construction assures the highest degree of reliability.

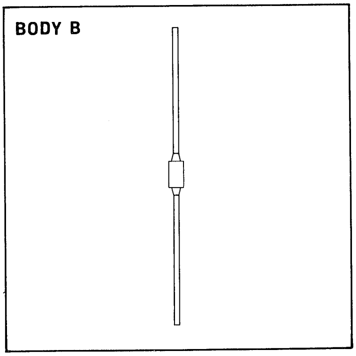
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
200V	JAN, JANTX & JANTXV 1N5550
400V	JAN, JANTX & JANTXV 1N5551
600V	JAN, JANTX & JANTXV 1N5552
800V	JAN, JANTX & JANTXV 1N5553

Maximum Average D.C. Output Current	
@ $T_A = 55°C$	3.0A
@ $T_L = 55°C$	5.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	100A
Operating Temperature Range	—65°C to +175°C
Storage Temperature Range	—65°C to +200°C
Thermal Resistance	See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS





THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

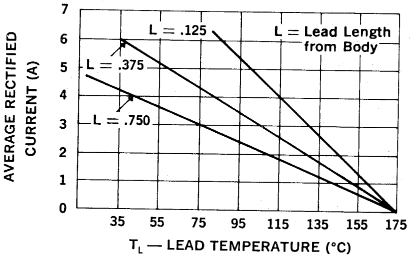
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

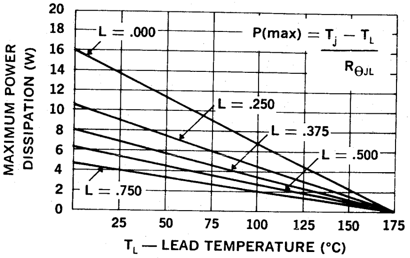
Type	Peak Inverse Voltage	Minimum Reverse Breakdown Voltage @ 50μA	Peak Forward Voltage		Maximum Leakage Current @ PIV		Maximum Reverse Recovery Time*
			Min.	Max.	25°C	100°C	
J, JTX, JTXV 1N5550	200V	240V	0.6V @ I_F = 9A(pk) (8.3ms)	1.2V	1.0μA	75μA	2.0μs
J, JTX, JTXV 1N5551	400V	460V					
J, JTX, JTXV 1N5552	600V	660V					
J, JTX, JTXV 1N5553	800V	880V		1.3V			

*Measured in a test circuit I_F =0.5A, I_R = 1.0A, I_{REC} = 0.25A

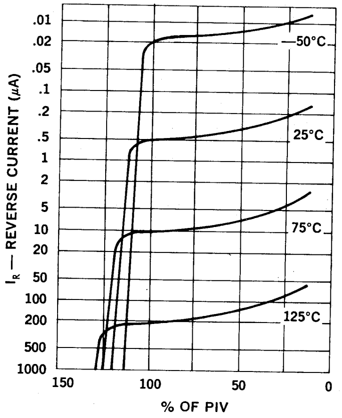
Maximum Current vs. Lead Temperature



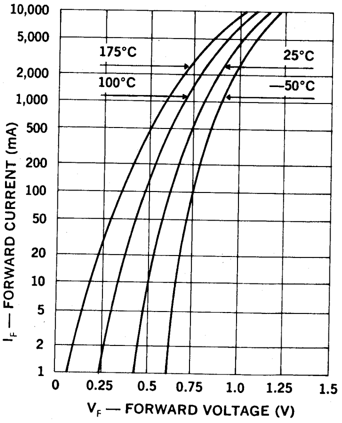
Maximum Power Dissipation vs. Lead Temperature



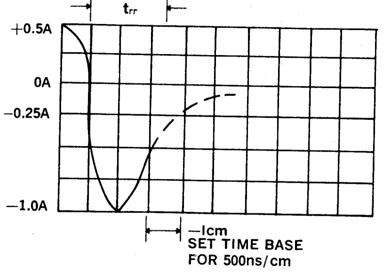
Typical Reverse Current vs. PIV



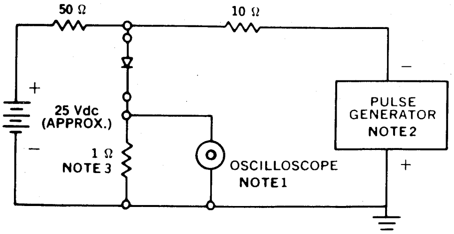
Typical Forward Current vs. Forward Voltage



Characteristic Wave Form



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

Standard Recovery, 1 Amp
Military Approved

1N5614, 1N5616, 1N5618, 1N5620, 1N5622
JAN, JANTX & JANTXV

FEATURES

- Qualified to MIL-S-19500/427
- PIV: to 1000V
- Controlled Avalanche

DESCRIPTION

This series of medium power general purpose rectifiers can be used in the most demanding military supplies. Rugged mechanical integrity and tight electrical parameters make them particularly useful.

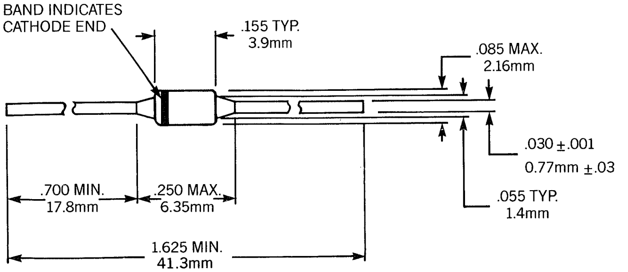
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
200V	JAN, JANTX & JANTXV 1N5614
400V	JAN, JANTX & JANTXV 1N5616
600V	JAN, JANTX & JANTXV 1N5618
800V	JAN, JANTX & JANTXV 1N5620
1000V	JAN, JANTX & JANTXV 1N5622

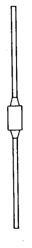
Maximum Average D.C. Output Current	
@ $T_A = 55°C$	1.0A
@ $T_A = 100°C$	0.75A
Non-Repetitive Sinusoidal	
Surge Current (8.3ms)	30A
Operating Temperature Range	−65°C to +175°C
Storage Temperature Range	−65°C to +200°C
Thermal Resistance θ_{JL} @ $L = 3/8''$	38°C/W See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N5614, 1N5616, 1N5618, 1N5620, 1N5622



BODY A



THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

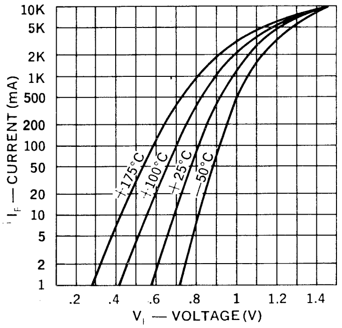
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

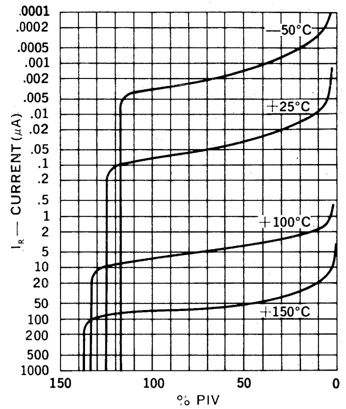
Type	PIV	Minimum Reverse Breakdown Voltage @ 50μA	Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
			Min.	Max.	25°C	100°C	
J, JTX, JTXV 1N5614	200V	220V	0.8	1.3V(pk) @3.0A tp = 300μS	0.5μA	25μA	2.0μS
J, JTX, JTXV 1N5616	400V	440V					
J, JTX, JTXV 1N5618	600V	660V					
J, JTX, JTXV 1N5620	800V	880V					
J, JTX, JTXV 1N5622	1000V	1100V					

*Measured in Circuit I_F = 1/2A, I_R =1.0A, I_{REC} = 1/4A

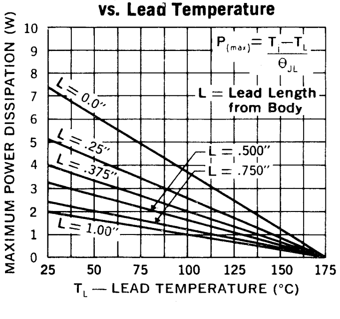
Typical Forward Voltage vs. Forward Current



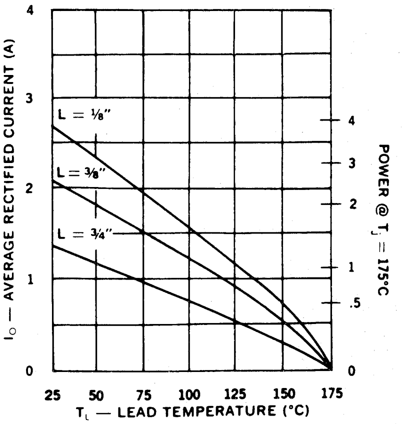
Typical Reverse Current vs. PIV



Maximum Power Dissipation vs. Lead Temperature



Maximum Current vs Lead Temperature



RECTIFIERS
Military Approved, Fast Recovery, 1 Amp

1N5615, 1N5617, 1N5619
JAN, JANTX & JANTXV

FEATURES
- Qualified to MIL-S-19500/429
- PIV: to 600V
- Controlled Avalanche

DESCRIPTION
This series of military approved rectifiers is useful in many military applications where fast recovery and medium power are required. The 100% screening requirements in the "TX" version combined with the unique Unitrode construction assures the highest degree of reliability.

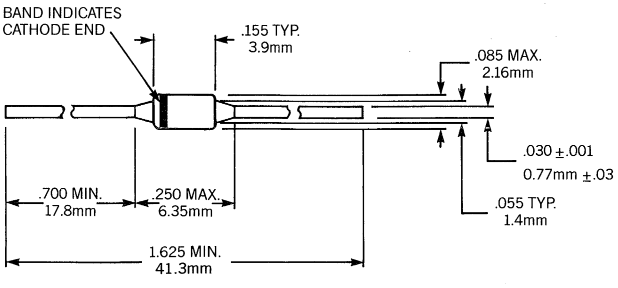
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
200V	JAN, JANTX, JANTXV 1N5615
400V	JAN, JANTX, JANTXV 1N5617
600V	JAN, JANTX, JANTXV 1N5619

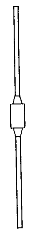
Maximum Average D.C. Output Current @ $T_A = 55°C$	1.0A
@ $T_A = 100°C$	0.75A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	25A
Operating Temperature Range	$-65°C$ to $+175°C$
Storage Temperature Range	$-65°C$ to $+200°C$
Thermal Resistance θ_{JL}	38°C/W See Lead Temperature Derating Curve

MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N5615, 1N5617, 1N5619



BODY A



THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

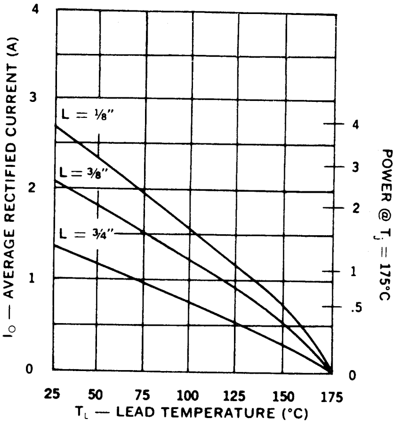
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

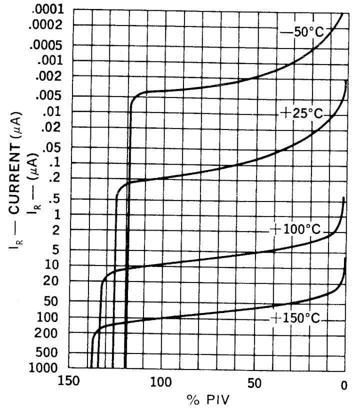
Type	PIV	Minimum Reverse Breakdown Voltage @ 50µA	Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*	Capacitance @ $V_R = 12V$ f = 1MHz
			Min.	Max.	25°C	100°C		
J, JTX, JTXV 1N5615	200V	220V	0.8V @ 3.0 Adc tp = 300µs	1.6V(pk)	0.5µA	25µA	150ns	45pf
J, JTX, JTXV 1N5617	400V	440V					150ns	35pf
J, JTX, JTXV 1N5619	600V	660V					250ns	25pf

*Measured in Circuit $I_F = ½A$, $I_R = 1A$, $I_{REC} = ¼A$

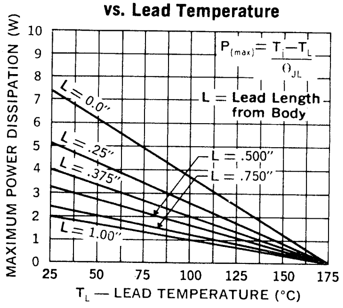
Maximum Current vs Lead Temperature



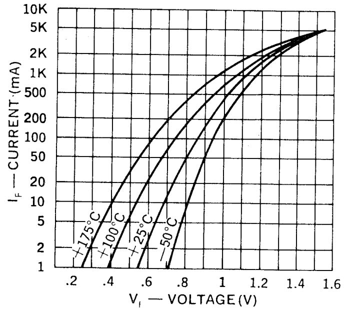
Typical Reverse Current vs. PIV



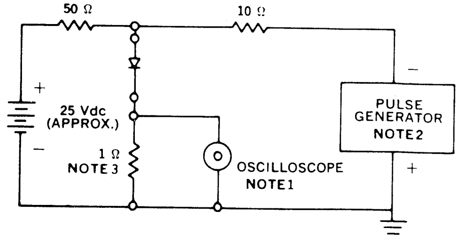
Maximum Power vs. Lead Temperature



Typical Forward Voltage vs. Forward Current



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS
High Efficiency, ESP, 2.5 Amp to 20 Amp

1N5802-1N5806
1N5807-1N5811
1N5812-1N5816

FEATURES
- Exceptional Efficiency
- Low Forward Voltage
- Extremely Fast Reverse Recovery Time
- Extremely Fast Forward Recovery Time
- High Surge
- Small Size
- Rugged, High Current Termination
- Radiation Tolerant

DESCRIPTION
This series of High Efficiency Power Rectifiers allows circuit designers to design high current, high frequency supplies to 500 kHz with very low diode losses. The high forward surge capability makes these devices useful in protective circuits.

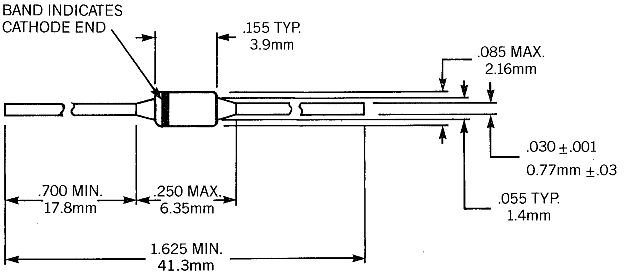
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	2.5 Amp Series	6 Amp Series	20 Amp Series
50V	1N5802	1N5807	1N5812
75V	1N5803	1N5808	1N5813
100V	1N5804	1N5809	1N5814
125V	1N5805	1N5810	1N5815
150V	1N5806	1N5811	1N5816

	2.5 AMP SERIES	6.0 AMP SERIES	20 AMP SERIES
Maximum Average D.C. Output Current			
@ $T_L = 75°C$, L = ⅜"	2.5A	6.0A	—
@ $T_C = 100°C$			20.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	35A	125A	250A
Operating and Storage Temperature Range	—65°C to +175°C		
Thermal Resistance 2.5A and 6A Series	See Lead Temperature Derating Curve		
20A Series			3.0°C/W

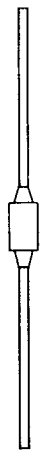
MECHANICAL SPECIFICATIONS

1N5802-1N5806

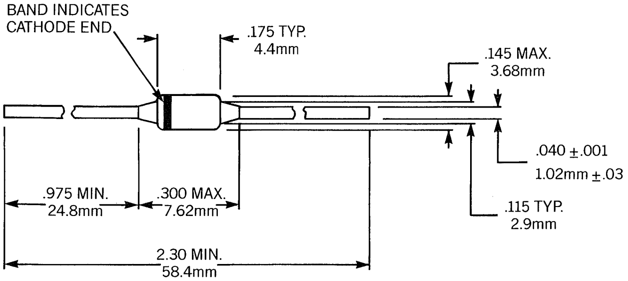


Typical Weight — 0.22 grams

BODY A

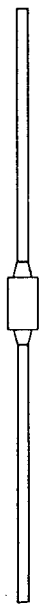


1N5807-1N5811



Typical Weight — 0.75 grams

BODY B

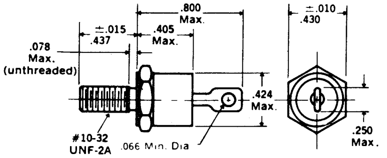


THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

MECHANICAL SPECIFICATIONS

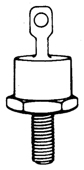
1N5812-1N5816



Part Identification: Type number printed on metal case.
Polarity: Cathode to stud end
Max. Weight: 7.0 Grams
Installation Precautions: Maximum unlubricated stud torque: 10 inch pounds
Thermal Resistance: 3.0°C/W

Dimensions in inches.

DO-4

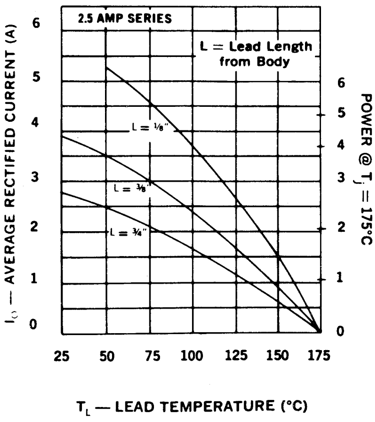


ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

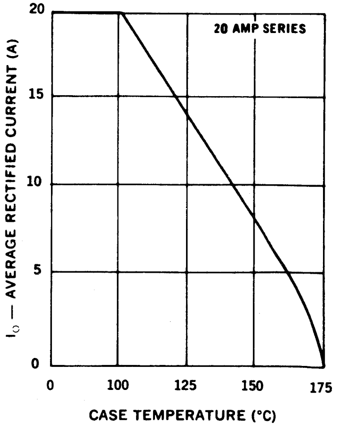
Type	PIV	Maximum Forward Voltage Drop*	Leakage Current @ PIV		Maximum Reverse Recovery Time I_F, I_R, I_{REC}	Typical Forward Recovery Time @ 1A Recover to 1V	Typical Forward Recovery Voltage @ 1A tr = 8ns	Typical Junction Capacitance @ —10V
			25°C	100°C				
1N5802	50V	.875 @ 1A	1μA	50μA	25ns, 0.5A-0.5A-0.05A	15ns	1.5V	15pf
1N5803	75V							
1N5804	100V							
1N5805	125V							
1N5806	150V							
1N5807	50V	.875 @ 4A	5μA	150μA	30ns, 1.0-1.0-0.1A	15ns	1.5V	45pf
1N5808	75V							
1N5809	100V							
1N5810	125V							
1N5811	150V							
1N5812	50V	.900 @ 10A	10μA	750μA	35ns, 1.0-1.0-0.1A	15ns	1.5V	200pf
1N5813	75V							
1N5814	100V							
1N5815	125V							
1N5816	150V							

*Pulse width = 250ms

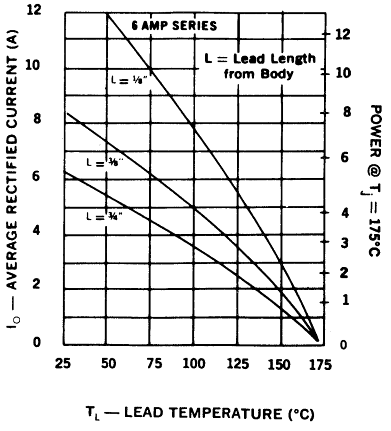
Output Current vs. Lead Temp.



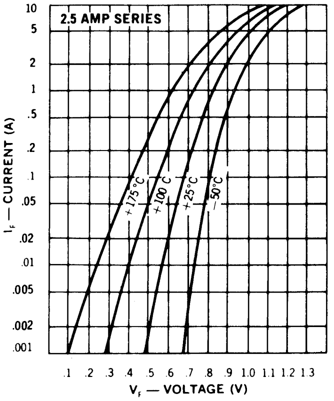
Output Current vs. Case Temp.



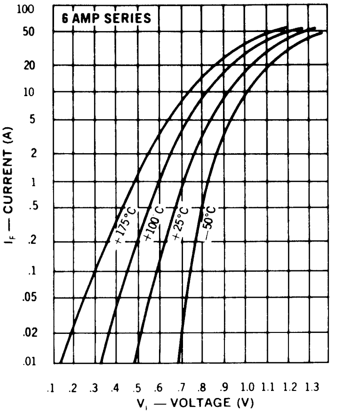
Output Current vs. Lead Temp.



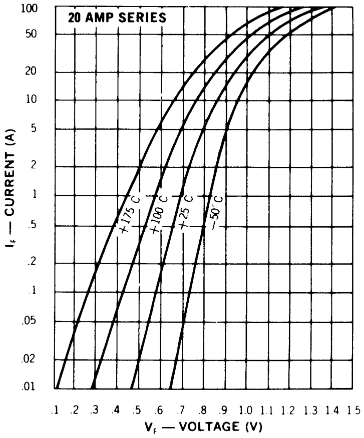
Typical Forward Current vs. Forward Voltage



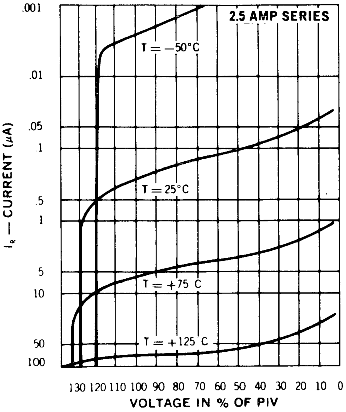
Typical Forward Current vs. Forward Voltage



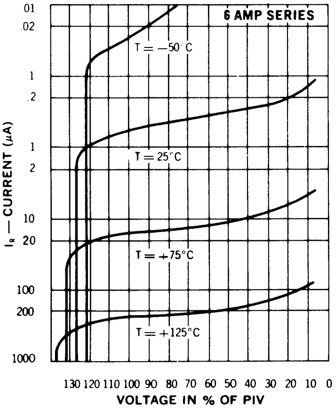
Typical Forward Current vs. Forward Voltage



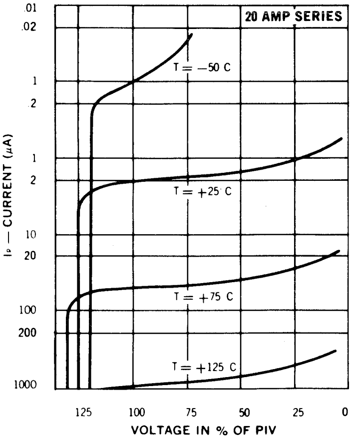
Typical Reverse Current vs. Voltage



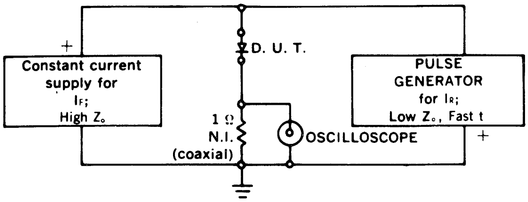
Typical Reverse Current vs. Voltage



Typical Reverse Current vs. Voltage



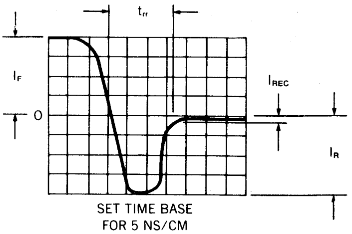
Reverse-Recovery Time Circuit



NOTES:

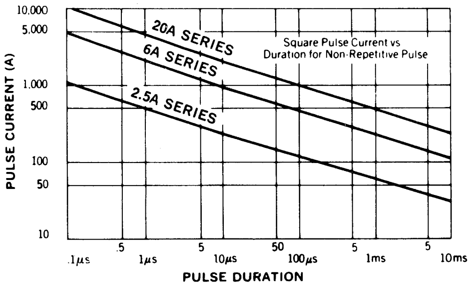
1. Oscilloscope: Rise time $\leq$ 3 ns; input impedance = 50 Ω.
2. Pulse Generator: Rise time $\leq$ 8 ns; source impedance 10 Ω.

Characteristic Waveform

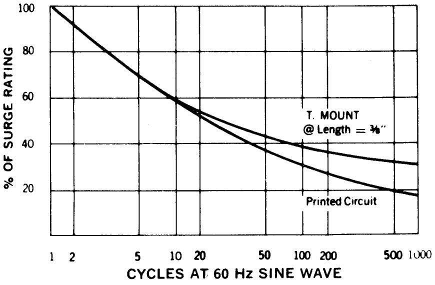


SET TIME BASE
FOR 5 NS/CM

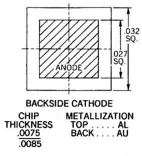
Forward Pulse Current vs. Duration



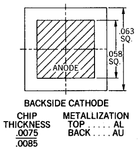
Multiple Surge Current vs. Duration



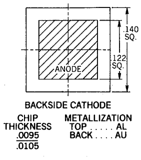
1N5804, 1N5806



1N5809, 1N5811



1N5814, 1N5816



RECTIFIERS
Military Approved, High Efficiency, 2.5 Amp and 6.0 Amp

1N5802, 1N5804, 1N5806, 1N5807, 1N5809, 1N5811 JAN, JANTX & JANTXV

FEATURES
- Qualified to MIL-S-19500/477
- PIV: to 150V
- Low Forward Voltage

DESCRIPTION
This series of high efficiency power rectifiers are particularly applicable to switching regulator power supplies where extremely fast switching and low forward losses are most important.

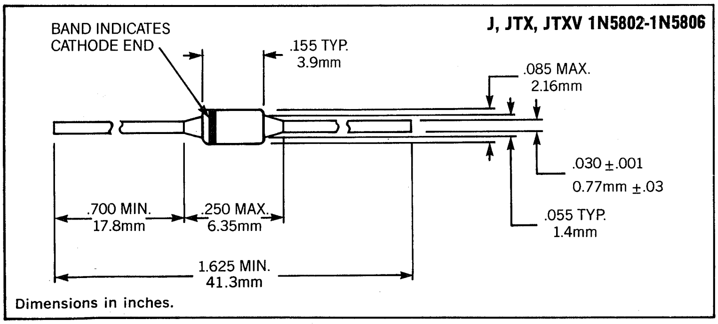
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	2.5A Series	6.A Series
50V	JAN, JANTX & JANTXV 1N5802	JAN, JANTX & JANTXV 1N5807
100V	JAN, JANTX & JANTXV 1N5804	JAN, JANTX & JANTXV 1N5809
150V	JAN, JANTX & JANTXV 1N5806	JAN, JANTX & JANTXV 1N5811

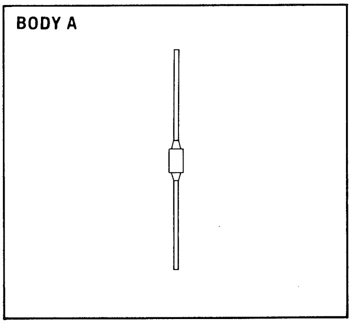
	2.5A SERIES	6A SERIES
Maximum Average D.C. Output Current		
@ $T_L = 75°C$, $L = 3/8''$	2.5A	6.0A
@ $T_A = 55°C$	1.0A	3.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	35A	125A
Operating Temperature Range	−65°C to +175°C	
Storage Temperature Range	−65°C to +200°C	
Thermal Resistance, θ_{JL} @ $L = 3/4''$	59°C/W	35.5°C/W

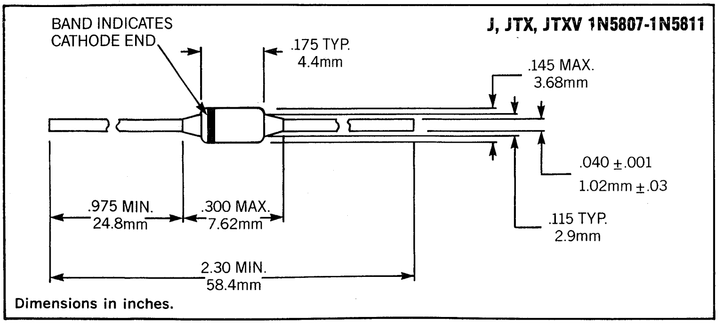
See lead temperature derating curve

MECHANICAL SPECIFICATIONS

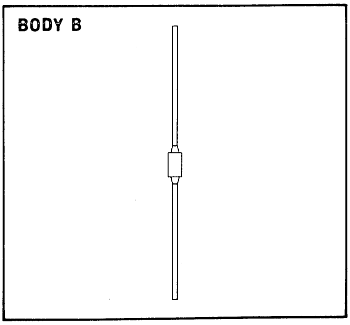


Dimensions in inches.





Dimensions in inches.



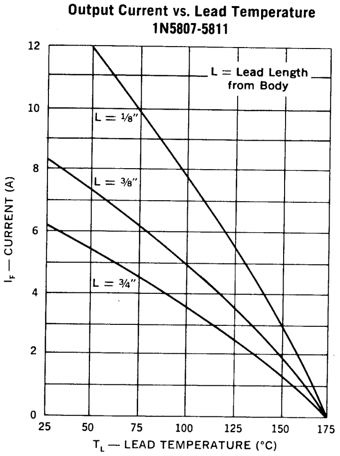
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

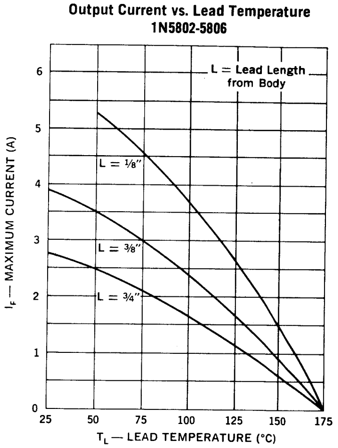
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

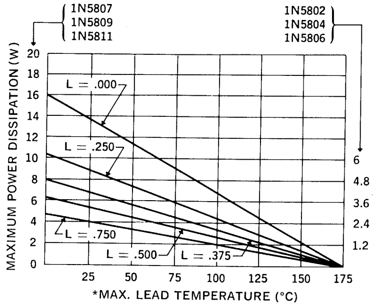
Type	PIV	Minimum Breakdown Voltage @ 100µA	Forward Voltage @ 25°C	Forward Voltage @ 100°C	Maximum Reverse Current @ PIV 25°C	Maximum Reverse Current @ PIV 100°C	Maximum Reverse Recovery Time
J, JTX, JTXV 1N5807	50V	60V	.875V Max. @ 4A (pk) .925V Max. @ 6A (pk)	.8V Max. @ 4A (pk)	5µA	150µA	30ns $I_F = I_R = 1.0A$ $I_{REC} = 0.1A$ di/dt = 100A/µs min.
J, JTX, JTXV 1N5809	100V	110V					
J, JTX, JTXV 1N5811	150V	160V					
J, JTX, JTXV 1N5802	50V	60V	.875V Max. @ 1A (pk) .975V Max. @ 2.5A (pk)	.8V Max. @ 1A (pk)	1µA	50µA	25ns $I_F = I_R = 0.5A$ $I_{REC} = 0.05A$ di/dt = 65A/µs min.
J, JTX, JTXV 1N5804	100V	110V					
J, JTX, JTXV 1N5806	150V	160V					

Output Current vs. Lead Temperature
1N5807-5811



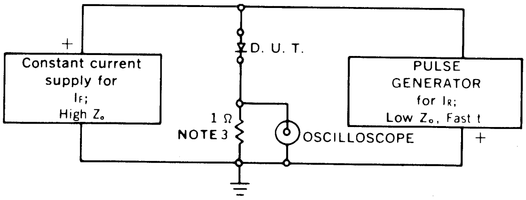
Output Current vs. Lead Temperature
1N5802-5806



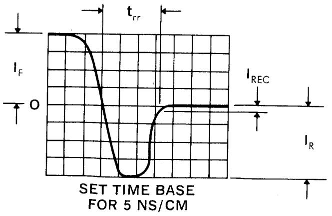


*Maximum lead temperature in °C (T_L) at point "L" from body. (For maximum operating junction temperature of 175°C with equal two-lead conditions.)

Reverse-Recovery Circuit



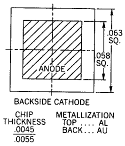
Characteristic Waveform



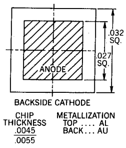
NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

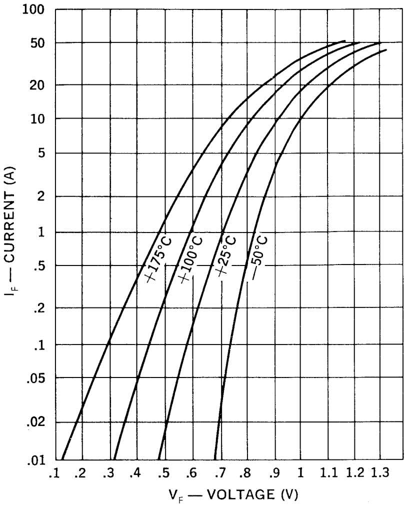
1N5809, 1N5811



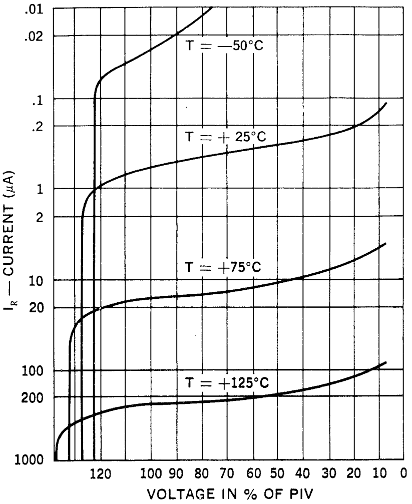
1N5804, 1N5806



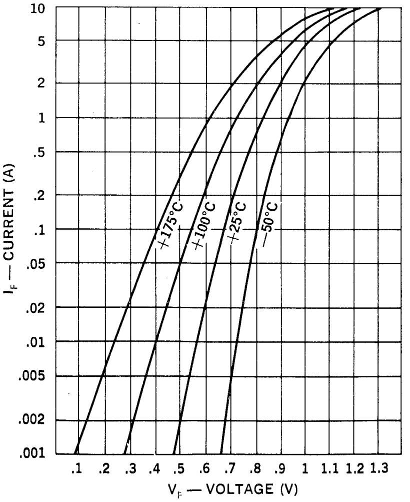
Typical Forward Current vs. Forward Voltage
JAN & JANTX 1N5807-5811



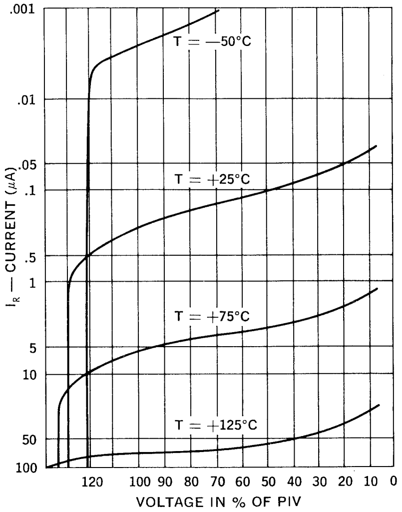
Typical Reverse Current vs. Voltage
JAN & JANTX 1N5807-5811



Typical Forward Current vs. Forward Voltage
JAN & JANTX 1N5802-5806



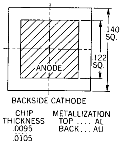
Typical Reverse Current vs. Voltage
JAN & JANTX 1N5802-5806



RECTIFIERS
Military Approved
High Efficiency, 20 Amp

1N5812, 1N5814, 1N5816
JAN, JANTX & JANTXV

FEATURES
- Qualified to MIL-S-19500/478
- Exceptional Efficiency
- Mechanically Rugged
- Low Thermal Resistance
- JAN, JANTX and JANTXV Available



DESCRIPTION
This series is suited for use as a power rectifier in switching regulator and high frequency inverter/converter and other appropriate equipment circuits where low voltage drop and fast recovery times are important.

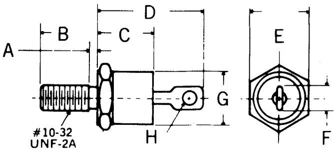
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	Type
50V	JAN, JANTX, JANTXV 1N5812
100V	JAN, JANTX, JANTXV, 1N5814
150V	JAN, JANTX, JANTXV 1N5816

Maximum Average D.C. Output Current
@ $T_C = 100°C$ 20A
@ $T_A = 55°C$ 5A
Non-Repetitive Sinusoidal
Surge Current @ 8.3mSec 400A
Thermal Resistance, Junction to Case .... 1.5°C/W
Operating Junction Temperature .... −65°C to +175°C
Storage Ambient Temperature .... −65°C to +200°C

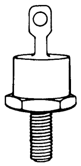
MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N5812, 1N5814, 1N5816



	ins.	mm
A	.078 MAX.	1.98 MAX.
B	.437 ± .015	11.10 ±0.38
C	.405 MAX.	10.29 MAX.
D	.800 MAX.	20.32 MAX.
E	.430 ± .010	10.92 ± 0.25
F	.250 MAX.	6.35 MAX.
G	.424 MAX.	10.77 MAX.
H	.066 MIN. DIA.	1.68 MIN. DIA.

DO-4



Notes:
1. Polarity is cathode-to-stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 15 inch pounds.
4. Angular orientation of terminal is undefined.

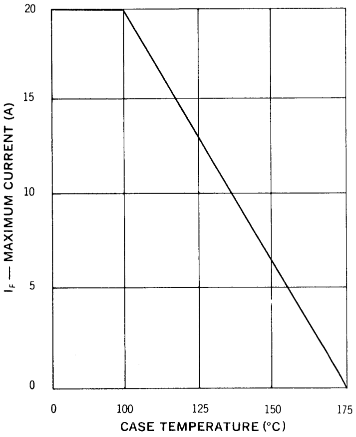
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

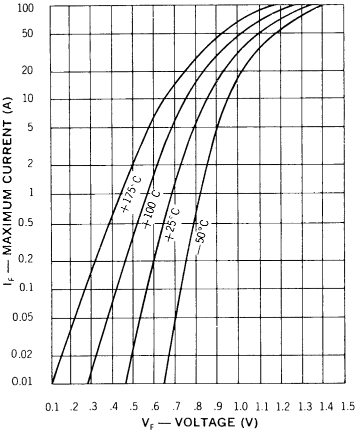
Type	Peak Inverse Voltage	Minimum Reverse Breakdown Voltage @ 100μA	Peak Forward Voltage		Maximum Leakage Current @ PIV	
			@ 10Apk	@ 20Apk	25°C	100°C
J, JTX, JTXV 1N5812	50V	60V	.86V MAX.	.95V MAX.	10μA	750μA
J, JTX, JTXV 1N5814	100V	110V				
J, JTX, JTXV 1N5816	150V	160V				

Maximum Reverse Recovery Time @ I_F, I_R, I_{REC}	Maximum Forward Recovery Time @ 1A Recovery to 1V	Maximum Forward Recovery Voltage @ 1A tr = 8nsec	Maximum Junction Capacitance @ −10V
35nsec 1.0A —1.0A —0.1A	15nsec	2.2V	300pf

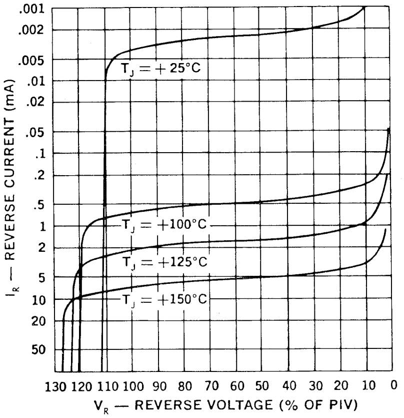
Output Current vs. Case Temperature



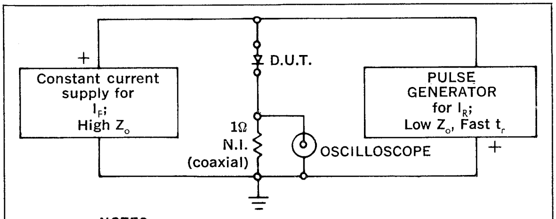
Typical Forward Current vs. Forward Voltage



Typical Reverse Current vs. Reverse Voltage



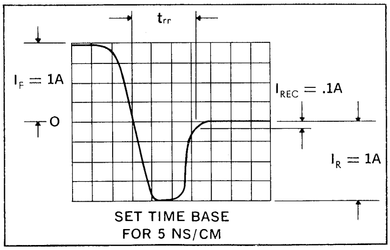
Reverse-Recovery Time Test Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3 ns; input impedance = 50 Ω.
2. Pulse Generator: Rise time ⩽ 8 ns; source impedance 10 Ω.

Characteristic Waveform



POWER SCHOTTKY RECTIFIERS

50 Amp, 30 and 40 Volts

1N6097
1N6098

FEATURES

- Very Low Forward Voltage
- Low Recovered Charge
- Rugged Package Design (DO-5)
- Low Thermal Resistance
- High Surge Current
- Reverse Energy Tested (2A pk)

DESCRIPTION

Unitrode's series of Schottky barrier power rectifiers is ideally suited for output rectifiers and catch diodes in low voltage power supplies. The Unitrode high conductivity design, using a heavy copper top post and 4 point crimp, ensures cool thermal operation and low dynamic impedance. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

ABSOLUTE MAXIMUM RATINGS

	1N6097	1N6098
Working Peak Reverse Voltage, V_{RWM}	30V	40V
DC Blocking Voltage, V_R	30V	40V
Repetitive Peak Reverse Voltage, V_{RRM}	30V	40V
Non-repetitive Peak Reverse Voltage, V_{RSM}	36V	48V
Average Rectified Forward Current, I_O	50A ($T_C = 70°C$) 20A ($T_C = 105°C$)	
Non-repetitive Peak Surge Current (8.3 mS), I_{FSM}	800A	
Storage Temperature Range, T_{stg}	−65 to + 125°C	
Peak Operating Junction Temperature, $T_{j(pk)}$	+150°C	
Thermal Resistance Junction to Case, $R_{\theta JC}$	1°C/WMax.	

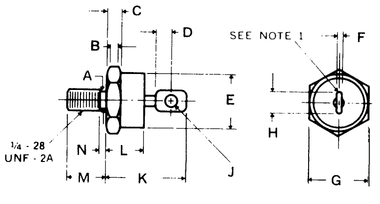
ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25°C$)

Characteristic	Symbol	Both Types	Units	Conditions
Maximum Instantaneous Reverse Current	I_{RRM}	250	mA	V_{RWM} = Rated, $T_C = 125°C$ Pulse Width = 300μs, Duty Cycle ⩽ 2 percent
Maximum Reverse Current	I_R	250	mA	V_R = Rated, T_C = 115°C
Maximum Instantaneous Forward Voltage	V_{FM}	0.86	V	I_O = 50A* T_C = 70°C
	V_{FM}	0.60	V	$I_F = 10A$ Pulse Width 300μs Duty Cycle ⩽ 2 percent
Capacitance	C_t	7000	pF	$V_R = 1.0V$

*I_{FM} = 157A

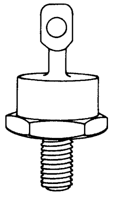
MECHANICAL SPECIFICATIONS

1N6097, 1N6098



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



Notes:

1. Cathode is stud.
2. Maximum unlubricated stud torque: 30 inch pounds.
3. Angular orientation of terminal is undefined.
4. Maximum tension (90°) anode terminal 15 pounds for 30 seconds.

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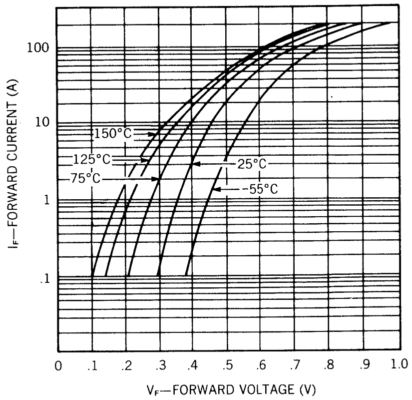
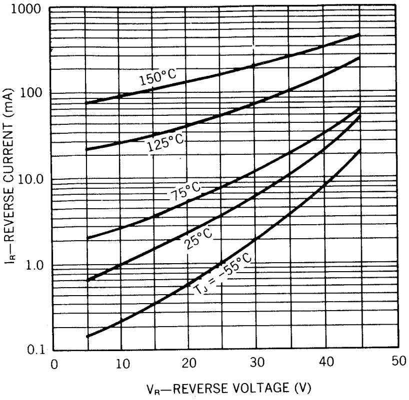
Watertown
The diode experts

Typical Forward Current vs Forward Voltage



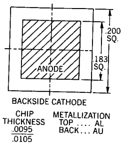
Typical Reverse Current vs Reverse Voltage



RECTIFIERS
High Efficiency, 70A

1N6304—1N6306
JAN, JANTX, JANTXV

FEATURES
- High Continuous Current Rating
- Very Low Forward Voltage
- Very Fast Switching Speeds
- High Surge Capability
- Low Thermal Resistance
- Mechanically Rugged
- Both Polarities Available
- Qualified to MIL-S-19500/550



DESCRIPTION
The 1N6304 Series is specifically designed for operation in power switching circuits operating at frequencies of at least 20KHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, 1N6304	50V
Peak Inverse Voltage, 1N6305	100V
Peak Inverse Voltage, 1N6306	150V
Maximum Average D.C. Output Current at T_C = 100°C	70A
Non-Repetitive Sinusodal Surge Current 8.3ms	800A
Thermal Resistance, Junction to Case	0.8°C/W
Operating and Storage Temperature Range	−65°C to +175°C
Operating and Storage Temperature Range (JEDEC types)	−55°C to +175°C

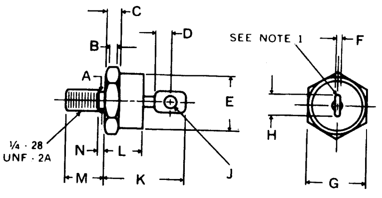
POWER CYCLING
These devices possess the unique ability to pass many thousands of cycles of a stress test designed to evaluate the integrity of the bonding systems used in the construction of power rectifiers.

In this stress test, the case of the device is not heat sunk. Full rated forward current is supplied to force a case temperature increase at least 75°C, at which time, the current is removed and the case allowed to cool. The cycle is repeated a minimum of 5,000 times to simulate equipment being turned on and off. Extended power cycling tests demonstrate a product capability in excess of 25,000 cycles.

SWITCHING CHARACTERISTICS
The switching times of these ultra-fast rectifiers increase relatively little, with temperature or at different currents. Even in severe applications, such as catch diodes for switching regulators and output rectifiers for high frequency square wave inverters, these devices switch many times faster than the fastest associated transistors. Thus, the stresses on and powers dissipated in the switching transistors are substantially less than when using other rectifiers.

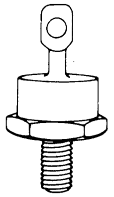
MECHANICAL SPECIFICATIONS

1N6304-1N6306



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-203AB
(DO-5)



Notes:
1. Standard polarity is cathode-to-stud.
   For reverse polarity (anode-to-stud) add suffix "R", ie. 1N6304R.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 20 inch pounds (20 kg. cm).
4. Angular orientation of terminal is undefined.

Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS

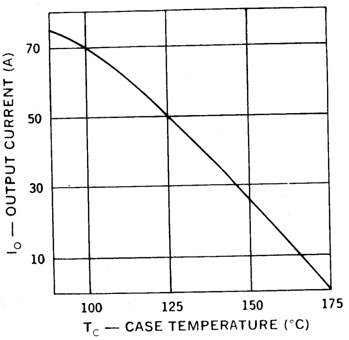
Type	V_R	Maximum Forward Voltage V_F		Maximum Reverse Current I_R		Maximum Reverse Recovery Time t_{rr}
		T_C = 25°C	T_C = 150°C	T_C = 25°C	T_C = 150°C	
1N6304 1N6305 1N6306	50V 100V 150V	.975V @ 70A t_P = 300µS	.840V @ 70A t_P = 300µS	25µA	30mA	50ns 1A-1A-0.1A
J, JTX, JTXV 1N6304 J, JTX, JTXV 1N6305 J, JTX, JTXV 1N6306	50V 100V 150V	.975V @ 70A t_P = 300µs 1.18V @ 150A t_P = 300µs	.840V @ 70A t_P = 300µs	25µA	30mA	50ns(1) 60ns(2)

(1) $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$, $di/_{dt} = 85A/\mu s$ (min.).

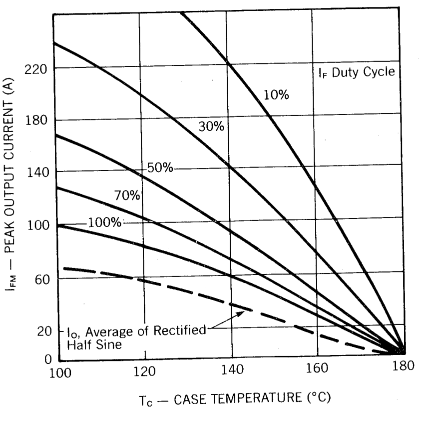
(2) $I_{FM} = 70A$, $di/_{dt} = 130A/\mu s$.

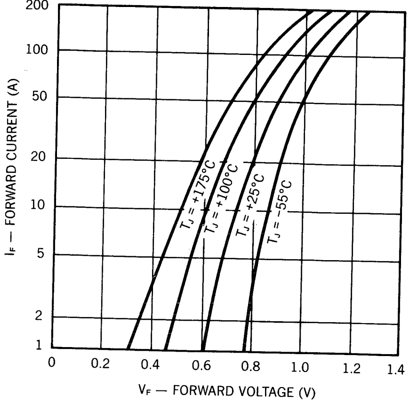
Type	V_R	Maximum Forward Recovery Time	Maximum Forward Voltage	Maximum Junction Capacitance
J, JTX, JTXV 1N6304 J, JTX, JTXV 1N6305 J, JTX, JTXV 1N6306	50V 100V 150V	15ns $I_{FM} = 1A$, $t_r = 8ns$	2.2V $I_{FM} = 1A$, $t_r = 8ns$	@ −10V 600pF

Output Current vs. Case Temperature

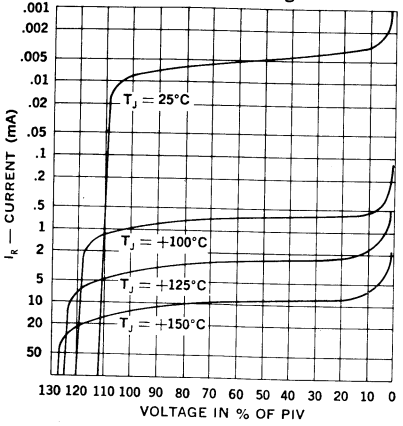


Peak Output Current vs. Case Temperature

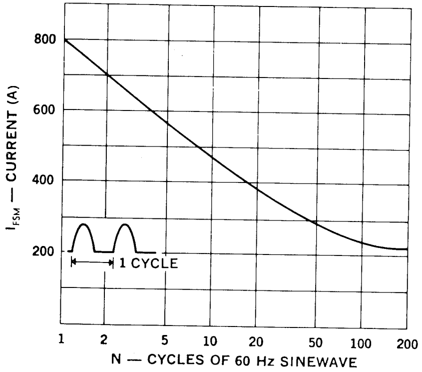




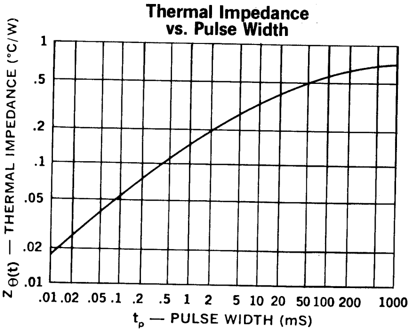
Forward Current vs. Forward Voltage



Typical Reverse Current vs. Reverse Voltage

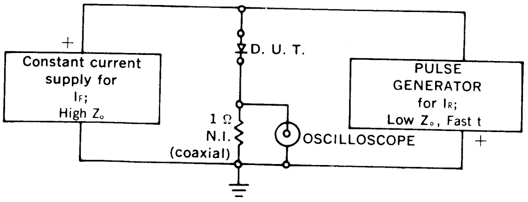


Maximum Forward Surge vs. Number of Cycles

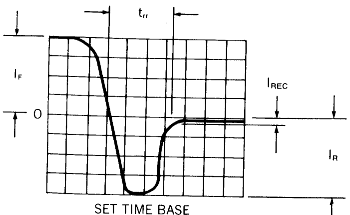


Thermal Impedance vs. Pulse Width

Reverse-Recovery Circuit



Characteristic Waveform



SET TIME BASE
FOR 5 NS/CM

NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance = 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

POWER SCHOTTKY RECTIFIERS 1N6391 JAN, JANTX, JANTXV

50A Pk, 45V

FEATURES

- Very Low Forward Voltage
- Low Recovered Charge
- Rugged Package Design (DO-4)
- High Efficiency for Low Voltage Supplies
- 45V Blocking @ Rated T_{jmax}
- 54V Repetitive Surge Voltage
- Qualified to MIL-S-19500/553

DESCRIPTION

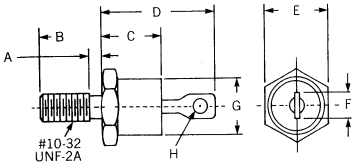
The 1N6391 has a Schottky barrier junction and is ideally suited for output rectifiers and catch diodes in low voltage power supplies. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

ABSOLUTE MAXIMUM RATINGS

Working Peak Reverse Voltage, V_{RWM}	45V
DC Blocking Voltage, V_R	45V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	54V
Average Rectified Forward Current, I_O @ T_C = 125°C	25A
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20kHz, 50% Duty Cycle), I_{FRM} @ T_C = 125°C	50A
Non-Repetitive Peak Surge Current (8.3ms), I_{FSM}	600A
Peak Reverse Transient Current, I_{RM}	2A
Operating and Storage Temperature Range	−55°C to +175°C
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.0°C/W

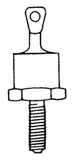
MECHANICAL SPECIFICATIONS

JAN, JANTX, JANTXV 1N6391



	INCHES	MILLIMETERS
A	.078 MAX.	1.98 MAX.
B	.437 ± .015	11.10 ± 0.38
C	.405 MAX.	10.29 MAX.
D	.800 MAX.	20.32 MAX.
E	.430 ± .010	10.92 ± 0.25
F	.250 MAX.	6.35 MAX.
G	.424 MAX.	10.77 MAX.
H	.066 MIN. DIA.	1.68 MIN. DIA.

DO-4



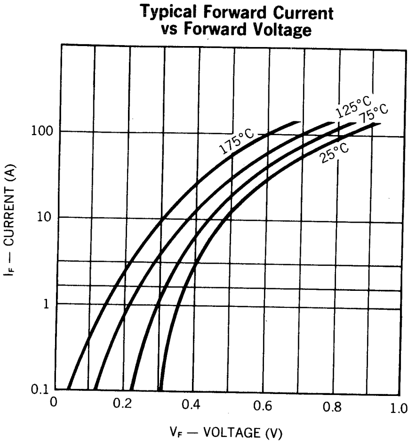
NOTES:

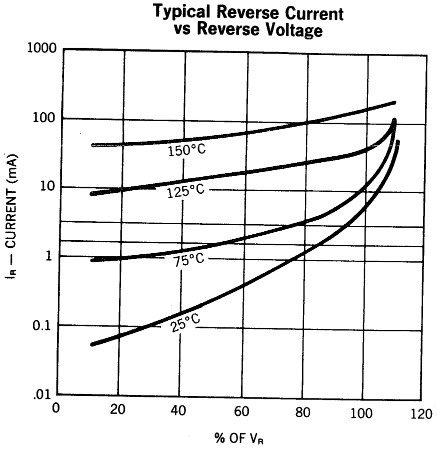
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 10 inch pounds.
4. Angular orientation of terminal is undefined.

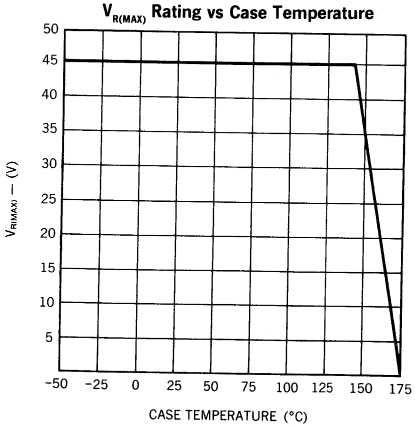
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

Characteristic	Symbol	Limit	Units	Conditions
Maximum Instantaneous Reverse Current	i_R	15 40 400	mA mA mA	T_C = 25°C, $V_R = V_{RWM}$ T_C = 125°C T_C = 175°C Pulse Width = 400μs Duty Cycle = 1%
Maximum Instantaneous Forward Voltage	V_F	0.44 0.68	V V	i_F = 5A, T_C = 25°C i_F = 50A, T_C = 25°C Pulse Width = 300μs Duty Cycle = 1%
Capacitance	C_t	2000	pF	V_R = 5.0V







POWER SCHOTTKY RECTIFIERS 120A Pk

1N6392
JAN, JANTX, JANTXV

FEATURES

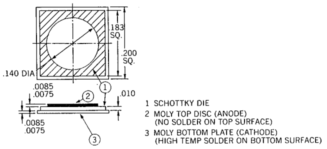
- Very Low Forward Voltage (0.6 at 60A, 125°C)
- Low Recovered Charge
- Rugged Package Design (DO-5)
- High Efficiency for Low Voltage Supplies
- Low Thermal Resistance (1.0°C/W)
- High Surge Current (800A)
- Low Reverse Current (60mA at rated V_R at 125°C)
- Qualified to MIL-S-19500/554

DESCRIPTION

The 1N6392 Schottky barrier power rectifier is ideally suited for output rectifiers and catch diodes in low voltage power supplies. The Unitrode high conductivity design, using a heavy copper top post and 4 point crimp, ensures cool thermal operation and low dynamic impedance. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

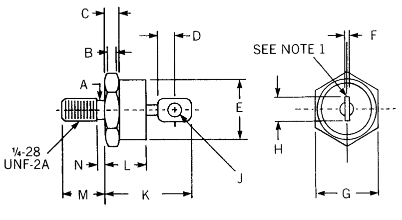
ABSOLUTE MAXIMUM RATINGS

Working Peak Reverse Voltage, V_{RWM}	45V
DC Blocking Voltage, V_R	45V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	54V
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20kHz, 50% Duty Cycle), I_{FRM}	120A (at T_C = 115°C)
Average Rectified Forward Current, $I_{F(AV)}$	60A (at T_C = 115°C)
Non-Repetitive Peak Surge Current (8.3ms), I_{FSM}	1,000A
Peak Reverse Transient Current, I_{RM}	2A
Operating and Storage Temperature Range	−55°C to +175°C
Thermal Resistance, Junction to Case, $R_{\theta JC}$	1.0°C/W



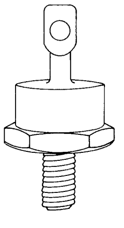
MECHANICAL SPECIFICATIONS

JAN, JANTX, JANTXV 1N6392



	INCHES	MILLIMETERS
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



NOTES:

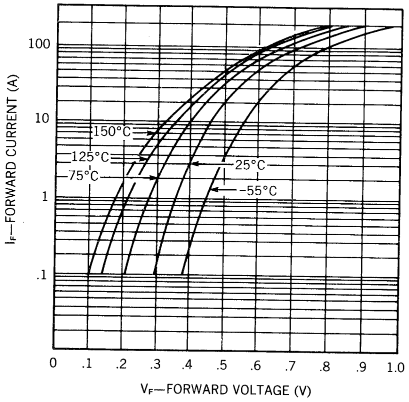
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 30 inch pounds (35 kg. cm).
4. Angular orientation of terminal is undefined.

Microsemi Corp.
Watertown
The diode experts

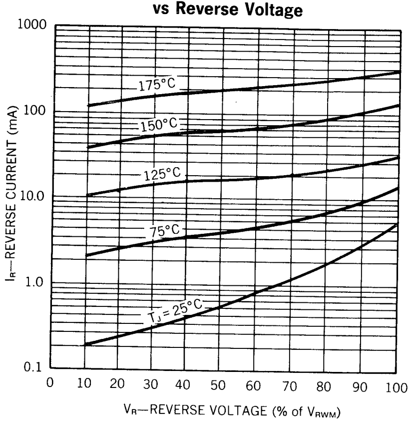
ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

Characteristic	Symbol	Limit	Units	Conditions
Maximum Instantaneous Reverse Current	i_R	20 60 600	mA mA mA	$V_R = V_{RWM}$ T_C = 125°C T_C = 175°C Pulse Width = 400μs Duty Cycle = 1%
Maximum Instantaneous Forward Voltage	V_F	0.47 0.68 0.82	V V V	i_F = 10A, T_C = 25°C i_F = 60A, T_C = 25°C i_F = 120A, T_C = 125°C Pulse Width = 300μs Duty Cycle = 1%
Maximum Capacitance	C_t	3000	pF	V_R = 5.0V

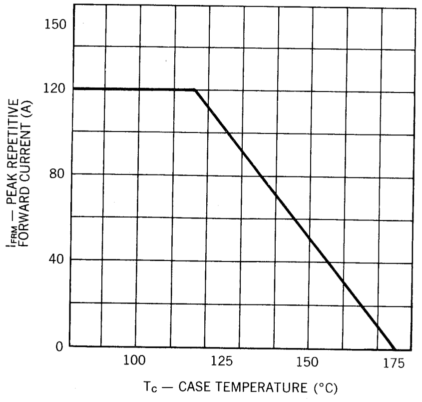
Typical Forward Current vs Forward Voltage



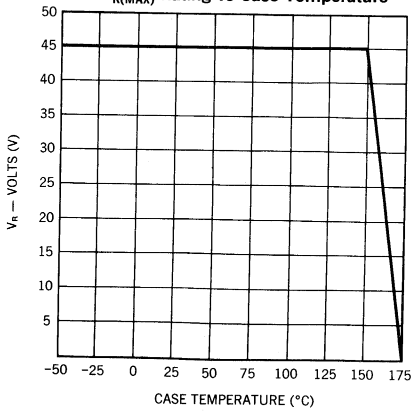
Typical Reverse Current vs Reverse Voltage



Maximum Current vs Case Temperature



$V_{R(MAX)}$ Rating vs Case Temperature



HERMETIC SCHOTTKY RECTIFIERS

4 Amp, 45 Volts

1N6492, JTX, JTXV

FEATURES

- Qualified to MIL-S-19500/567
- Extremely Low V_F and I_R
- High Surge Capability
- Low Recovered Charge
- Rugged Hermetic Package, No Pressure Contacts

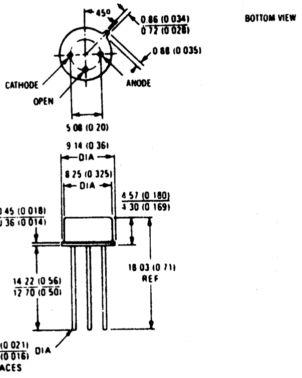
DESCRIPTION

The 1N6492 hermetic Schottky rectifier is ideally suited for output rectifiers and catch diodes in high efficiency, low voltage, high reliability switching power supplies.

ABSOLUTE MAXIMUM RATINGS

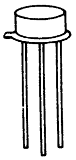
Peak Repetitive Reverse Voltage, V_{RRM}	45V
Working Peak Reverse Voltage, V_{RWM}	45V
DC Blocking Voltage, V_R	45V
Non-Repetitive Peak Reverse Voltage, V_{RSM}	54V
Average Forward Current (50% Duty Cycle), $I_{F(AV)}$, $T_A = 25°C$	1.2A
Average Forward Current (50% Duty Cycle), $I_{F(AV)}$ $T_{CASE} = 100°C$ $V_{RWM} = 45V$	4A
Non-Repetitive Peak Surge Current, I_{FSM} 8.3ms, Half Sine Wave	80A
Operating and Storage Junction Temperature Range	−65°C to +175°C
Thermal Resistance, Junction to Ambient, $R_{\theta J\text{-}A}$	175°C/W
Thermal Resistance, Junction to Case, $R_{\theta J\text{-}C}$	12°C/W

MECHANICAL SPECIFICATIONS



All Dimensions in Millimeters and Inches

TO-205AF (TO-39)



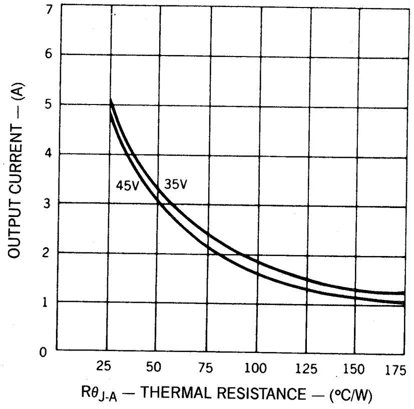
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL CHARACTERISTICS (at T_A = 25°C unless noted)

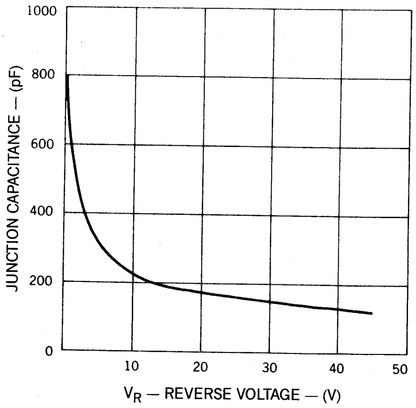
CHARACTERISTICS	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Reverse Leakage Current	I_{RM1}	2.0	mA	V_{RM} = 45V [1]
	I_{RM2}	20	mA	V_{RM} = 45V, T_A = 125°C
	I_{RM3}	200	mA	V_{RM} = 45V, T_A = 175°C
		20	mA	V_{RM} = 45V, T_A = −55°C
	I_{RM4}	2.0	A	V_{RSM} = 54V
Maximum Forward Voltage	V_{FM1}	0.92	V	I_{FM} = 8A (pk) [1, 2]
	V_{FM2}	0.68	V	I_{FM} = 4A (pk)
	V_{FM3}	0.56	V	I_{FM} = 2A (pk)
		0.63	V	I_{FM} = 2A (pk), T_A = −55°C
	V_{FM4}	0.48	V	I_{FM} = 1A (pk)
Capacitance	C_T	450	pf	V_R = 5V
Surge Current	I_{SURGE}			I_{FSM} = 80A (pk) V_{RM} = 45V (pk) I_O = 0.75A 10 surges of 8.3mSec at 1 minute intervals

[1] Pulse width = 400μSec, duty cycle = 1%

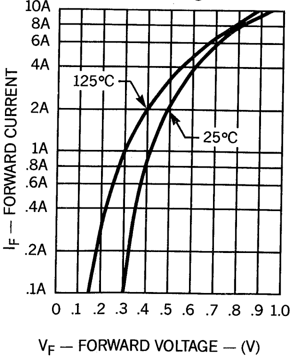
[2] Measured with anode and cathode lead length of 0.2″ from case



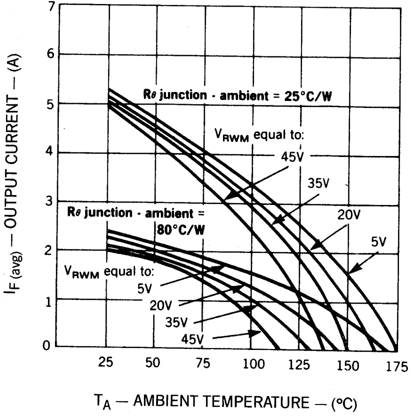
Output Current vs $R_{\theta J\text{-}A}$
$T_{ambient}$ = 25°C, 50% Duty Cycle



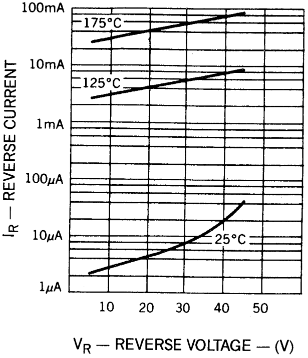
Typical Junction Capacitance vs Reverse Voltage



Typical Forward Current vs Forward Voltage



Output Current vs Ambient Temperature
50% Duty Cycle Application ($I_{F(avg)}$ and V_{RRM})



Typical Reverse Current vs Reverse Voltage

POWER SCHOTTKY RECTIFIERS

120 Amp Pk, 45V

FEATURES

- Very Low Forward Voltage
- Low Recovered Charge
- Rugged Package Design (DO-5)
- High Efficiency for Low Voltage Supplies
- Available with Flexible Top Lead

DESCRIPTION

The SD51 has a Schottky barrier junction and is ideally suited for output rectifiers and catch diodes in low voltage power supplies. The Unitrode high conductivity design, using a heavy copper top post and a 4 point crimp, ensures cool terminal operation and low dynamic impedance. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

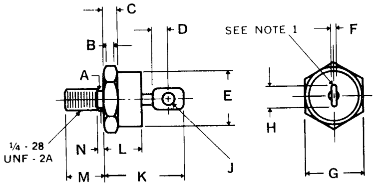
ABSOLUTE MAXIMUM RATINGS (T_{CASE} = 25°C)

Peak Repetitive Reverse Voltage, V_{RRM}	45V*
Working Peak Reverse Voltage, V_{RWM}	35V*
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 KHz, 50 percent Duty Cycle), I_{FRM}	120A
Non-repetitive Peak Surge Current (8.3 mS), I_{FSM}	800A
Peak Reverse Transient Current, I_{RM}	2A
Storage Temperature Range, T_{stg}	−55°C to +165°C
Junction Operating Temperature Range, T_j	−55°C to +150°C
Thermal Resistance, Junction-to-Case, $R_{\theta JC}$	1.0°C/W

*See curve of V_{RRM} Rating vs Case Temperature

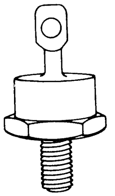
MECHANICAL SPECIFICATIONS

SD51



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



Notes:
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 30 inch pounds (35 kg. cm).
4. Angular orientation of terminal is undefined.

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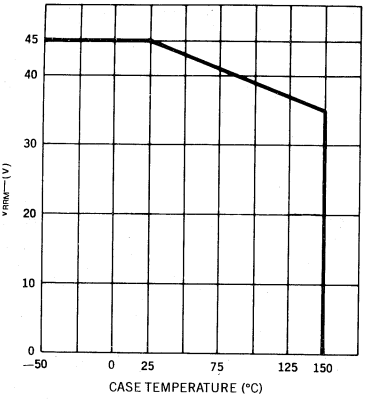
The diode experts

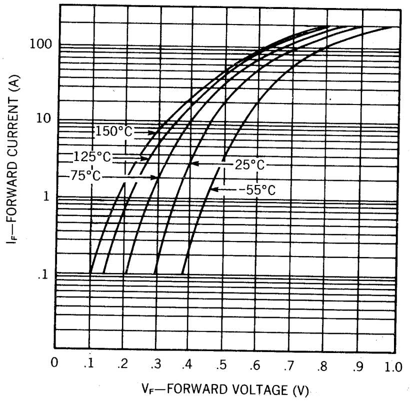
ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

Characteristic	Symbol	Limit	Units	Conditions
Maximum Instantaneous Reverse Current	i_R	50 200	mA mA	Tc = 25°C, V_R = 35V Tc = 125°C Pulse Width = 400µS Duty Cycle = 1 percent
Maximum Instantaneous Forward Voltage	V_F	0.60	V	i_F = 60A T_c = 125°C Pulse Width = 300µS Duty Cycle = 1 percent
Flexible Top Lead Option	V_F	0.65	V	
Maximum Capacitance	C_t	4000	pF	V_R = 5.0V
Maximum Voltage Rate of Change	dv/dt	700	V/µS	V_R = 35V

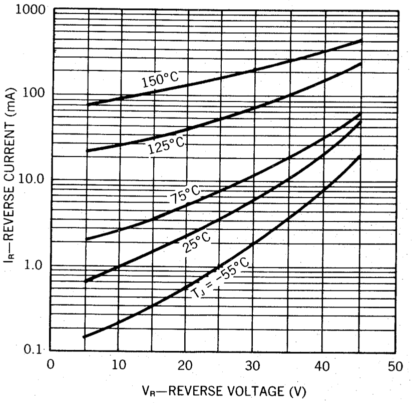
V_{RRM} Rating vs Case Temperature



Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Reverse Voltage



DUAL POWER SCHOTTKY RECTIFIERS

SD241
SD241HR2

30 Amp Pk per diode, 45V

FEATURES

- Very Low Forward Voltage
- Low Recovered Charge
- Rugged Packaged Design (TO-3)
- High Efficiency for Low Voltage Supplies
- Dual Schottky Rectifiers in a Single Package

DESCRIPTION

The SD241 has two Schottky barrier junctions arranged in a common cathode configuration and is ideally suited for output rectifiers and catch diodes in low voltage supplies.

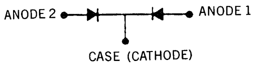
ABSOLUTE MAXIMUM RATINGS (T_{CASE} = 25°C) Per Diode

Peak Repetitive Reverse Voltage, V_{RRM}	45V*
Working Peak Reverse Voltage, V_{RWM}	35V
Average Rectified Forward Current, I_O	30A
Non-repetitive Peak Surge current (8.3 mS), I_{FSM}	400A
Peak Reverse Transient Current, I_{RM}	2A
Storage Temperature Range, T_{stg}	−55°C to +175°C
Junction Operating Temperature Range, T_j	−55°C to +150°C
Package Thermal Resistance, Junction to Case, $R_{\theta JC}$	1.4°C/W

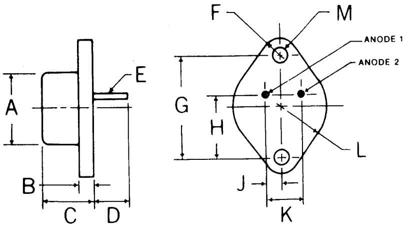
* See curve of V_{RRM} Rating vs Case Temperature.

MECHANICAL SPECIFICATIONS

NOTE:
Leads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.

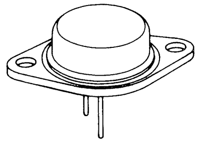


SD241
SD241HR2



	ins.	mm.
A	.875 MAX.	22.23 MAX.
B	.135 MAX.	3.43 MAX.
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.038-.043 DIA.	0.97-1.09 DIA.
F	.188 MAX. RAD.	4.78 MAX. RAD.
G	1.177-1.197	29.90-30.40
H	.655-.675	16.64-17.15
J	.205-.225	5.21-5.72
K	.420-.440	10.67-11.18
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.151-.161 DIA.	3.84-4.09 DIA.

TO-204AA (TO-3)



Notes: All metal surfaces tin plated.

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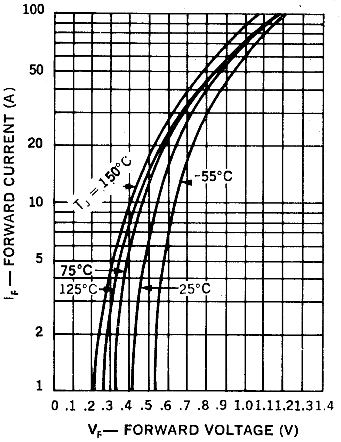
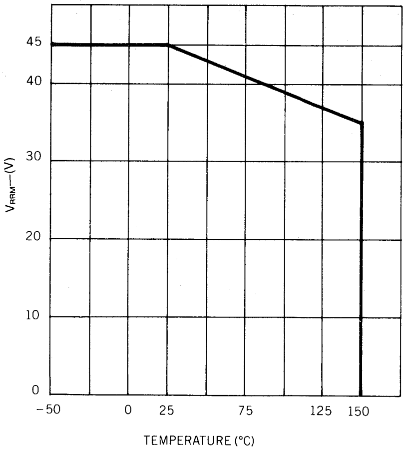
ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25°C$) Per Diode

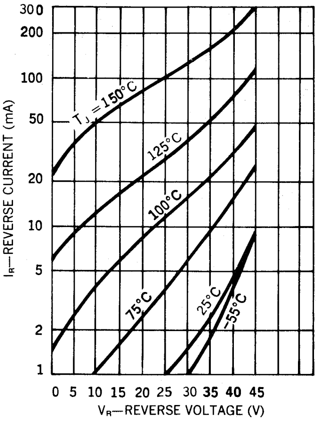
Characteristic	Symbol	Limit	Units	Conditions
Maximum Instantaneous Reverse Current	i_R	25 100	mA mA	$T_C = 25°C$, $V_R = 35V$ $T_C = 125°C$ Pulse Width = 400μS Duty Cycle = 1 percent
Maximum Instantaneous Forward Voltage	v_F	.47	V	$i_F = 10A$ Pulse Width = 300μS Duty Cycle = 1 percent $T_c = 125°C$
		.60	V	$i_F = 20A$ Pulse Width = 300μS Duty Cycle = 1 percent $T_c = 125°C$
Maximum Capacitance	C_t	2000	pF	$V_R = 5.0V$
Maximum Voltage Rate of Change	dv/dt	1000	v/μS	$v_R = 35V$



Typical Forward Current vs Forward Voltage



VRRM Rating vs Case Temperature



Typical Reverse Current vs Reverse Voltage

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified SD241HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ≥ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, VRW_M = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

RECTIFIERS
High Efficiency, 25 A

UES701 BYW31-50 BYW77-50
UES702 BYW31-100 BYW77-100
UES703 BYW31-150 BYW77-150

FEATURES
- Low Forward Voltage
- Very Fast Switching
- Low Thermal Resistance
- High Surge Capability
- Mechanically Rugged
- Both Polarities Available

DESCRIPTION
Designed to meet the efficiency demand of switching type power supplies, these devices are useful in many switching applications.
The low thermal resistance and forward voltage drop of this series allows the user to replace DO-5 size devices in many applications.

ABSOLUTE MAXIMUM RATINGS

	UES701	**UES702**	**UES703**
Peak Inverse Voltage, V_R	50V	100V	150V
Repetitive Peak Inverse Voltag, V_{RRM}	50V	100V	150V
Non-Repetitive Peak Inverse Voltage, V_{RSM}	50V	100V	150V
Maximum Average D.C. Output Current I_O @ T_C	25A @ 100°C		
RMS Forward Current, $I_{F\,(RMS)}$	40A		
Non-Repetitive Sinusoidal Surge Current (8.3mS), I_{FSM}	400A		
Thermal Resistance, Junction to Case, $R_{\theta JC}$	1.5°C/W		
Storage Temperature Range, T_{STG}	−55°C to +175°C		
Maximum Operating Junction Temperature, $T_{J\,MAX}$	+175°C		

ABSOLUTE MAXIMUM RATINGS

	BYW31-50	**BYW31-100**	**BYW31-150**	**BYW77-50**	**BYW77-100**	**BYW77-150**
Peak Inverse Voltage, V_R	50V	100V	150V	50V	100V	150V
Repetitive Peak Inverse Voltage, V_{RRM}	50V	100V	150V	50V	100V	150V
Non-Repetitive Peak Inverse Voltage, V_{RSM}	50V	100V	150V	50V	100V	150V
Maximum Average D.C. Output Current, I_o @ T_C = 100°C	25A @ 100°C			30A @ 107°C		
RMS Forward Current, $I_{F\,(RMS)}$	40A			50A		
Non-Repetitive Sinusoidal Surge Current (8.3mS), I_{FSM}	320A			500A		
Thermal Resistance, Junction to Case, $R_{\theta JC}$	1.5°C/W			1.5°C/W		
Storage Temperature Range, T_{STG}	−55°C to +150°C			−55°C to +150°C		
Maximum Operating Junction Temperature, $T_{J\,MAX}$	+150°C			+150°C		

ELECTRICAL SPECIFICATIONS

Type	Maximum Reverse Voltage V_R	Maximum Forward Voltage V_F		Maximum Reverse Current I_R		Maximum Reverse Recovery Time t_{RR}
		T_C = 25°C	T_C = 125°C	T_C = 25°C	T_C = 125°C	
UES701 UES702 UES703	50V 100V 150V	0.95V @ I_F = 25A	0.825V @ I_F = 25A	20μA @ Rated V_R	4mA @ Rated V_R	35ns$^{(1)}$
		T_C = 25°C	T_C = 100°C	T_C = 25°C	T_C = 100°C	
BYW31-50 BYW31-100 BYW31-150	50V 100V 150V	1.3V @ I_F = 100A	0.85V @ I_F = 20A	20μA @ Rated V_R	2.5mA @ Rated V_R	50ns$^{(2)}$
		T_C = 25°C	T_C = 100°C	T_C = 25°C	T_C = 100°C	
BYW77-50 BYW77-100 BYW77-150	50V 100V 150V	1.1V @ I_F = 63A	V_F I_F 0.75V 10A 0.85V 20A 1.2V 100A	25μA @ Rated V_R	2.5mA @ Rated V_R	50ns$^{(2)}$

(1) Measured in circuit I_F = 0.5A, I_R = 1A, I_{REC} = 0.25A
(2) Measured in circuit I_F = 1A to V_R > 30V $dI_F/_{dt}$ = 20A/μs

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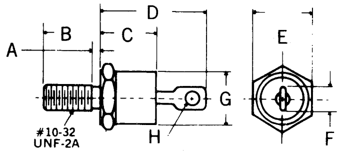
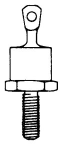
MECHANICAL SPECIFICATIONS

UES701 SERIES
BYW31 SERIES
BYW77 SERIES



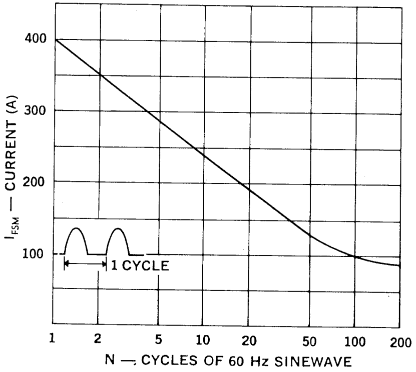
	ins.	mm
A	.078 MAX.	1.98 MAX.
B	.437 ± .015	11.10 ±0.38
C	.405 MAX.	10.29 MAX.
D	.800 MAX.	20.32 MAX.
E	.430 ± .010	10.92 ± 0.25
F	.250 MAX.	6.35 MAX.
G	.424 MAX.	10.77 MAX.
H	.066 MIN. DIA.	1.68 MIN. DIA.

DO-4

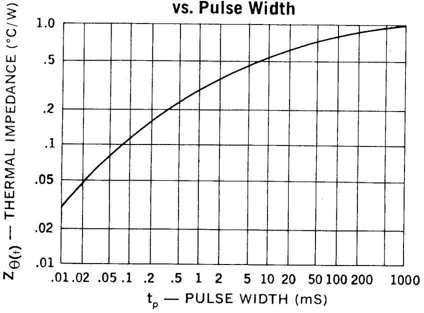


Notes:
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 10 inch pounds.
4. Angular Orientation of terminal is undefined.

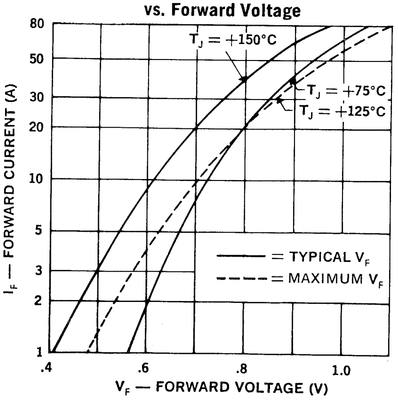
Maximum Forward Surge vs. Number of Cycles



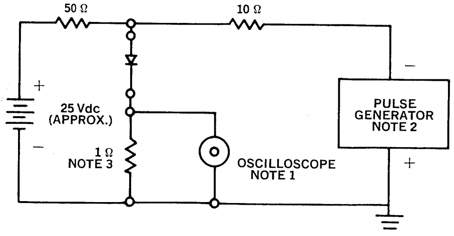
Thermal Impedance vs. Pulse Width



Forward Current vs. Forward Voltage

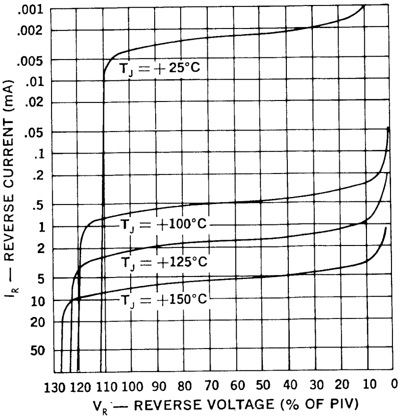


Reverse-Recovery Circuit

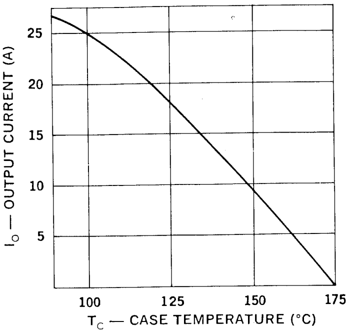


NOTES:
1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Typical Reverse Current vs. Reverse Voltage

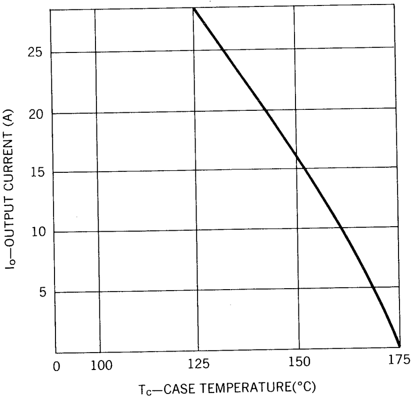


Output Current vs. Case Temperature



UES701 SERIES
BYW31 SERIES

Output Current vs Case Temperature



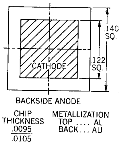
BYW77 SERIES

RECTIFIERS
High Efficiency, 20A

UES704
UES705
UES706
UES704HR2
UES705HR2
UES706HR2

FEATURES

- Very Low Forward Voltage (1.15V)
- Very Fast Recovery Times (50nSec)
- Low Thermal Resistance
- High Surge Capability
- Mechanically Rugged
- Both Polarities Available



DESCRIPTION

The UES704 series is specifically designed for operation in power switching circuits operating at frequencies of at least 20 KHz.

The low thermal resistance and forward voltage drop of this series allows the user to replace DO-5 size devices in many applications.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES704, UES704HR2	200V
Peak Inverse Voltage, UES705, UES705HR2	300V
Peak Inverse Voltage, UES706, UES706HR2	400V
Average D.C. Output Current, I_O @ T_C = 100°C	20A
Surge Current, 8.3mS	300A
Thermal Resistance, Junction to Case	1.5°C/W
Operating and Storage Temperature Range	−55°C to +150°C

POWER CYCLING

These devices possess the unique ability to pass many thousands of cycles of a stress test designed to evaluate the integrity of the bonding systems used in the construction of power rectifiers.

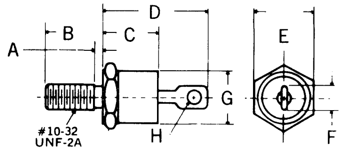
In this stress test, the case of the device is not heat sunk. Full rated forward current is supplied to force a case temperature increase at least 75°C, at which time, the current is removed and the case allowed to cool. The cycle is repeated a minimum of 5,000 times to simulate equipment being turned on and off. Extended power cycling tests demonstrate a product capability in excess of 25,000 cycles.

SWITCHING CHARACTERISTICS

The switching times of these ultra-fast rectifiers increase relatively little, with temperature or at different currents. Even in severe applications, such as catch diodes for switching regulators and output rectifiers for high frequency square wave inverters, these devices switch many times faster than the fastest associated transistors. Thus, the stresses on and powers dissipated in the switching transistors are substantially less than when using other rectifiers.

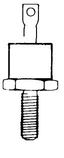
MECHANICAL SPECIFICATIONS

UES704 **UES705** **UES706**
UES704HR2 **UES705HR2** **UES706HR2**



	ins.	mm
A	.078 MAX.	1.98 MAX.
B	.437 ± .015	11.10 ±0.38
C	.405 MAX.	10.29 MAX.
D	.800 MAX.	20.32 MAX.
E	.430 ± .010	10.92 ± 0.25
F	.250 MAX.	6.35 MAX.
G	.424 MAX.	10.77 MAX.
H	.066 MIN. DIA.	1.68 MIN. DIA.

DO-4



Notes:

1. Standard polarity is cathode-to-stud.
   For reverse Polarity (anode-to-stud) add suffix "R", ie. UES704R.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 15 inch pounds.
4. Angular orientation of terminal is undefined.

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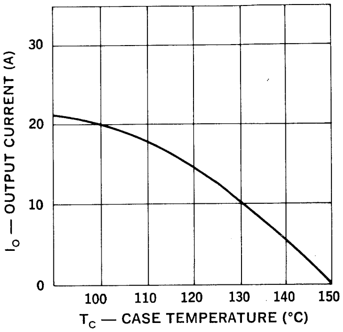
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS

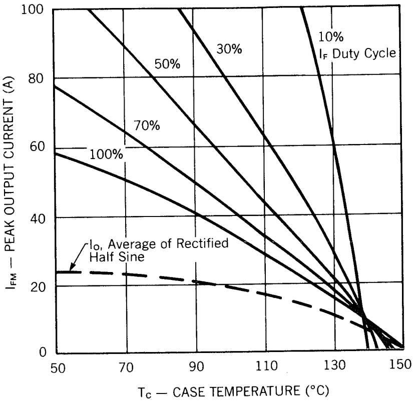
Type	PIV	Maximum Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
		$T_C = 25°C$	$T_C = 125°C$	$T_C = 25°C$	$T_C = 125°C$	
UES704/704HR2 UES705/705HR2 UES706/706HR2	200V 300V 400V	1.25V @ 20A $t_p = 300\mu S$	1.15V @ 20A $t_p = 300\mu S$	50μA	10mA	50nS

* Measured in circuit $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$

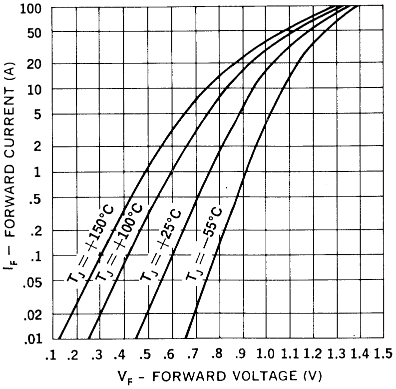
Output Current vs. Case Temperature



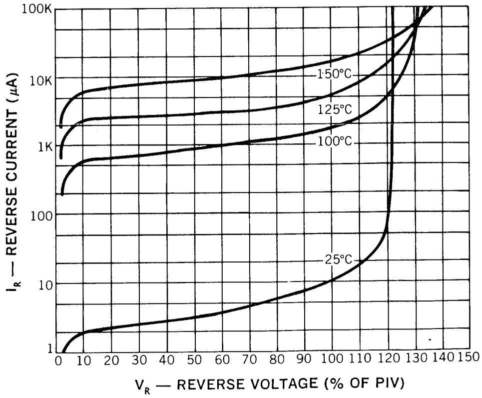
Peak Output Current vs. Case Temperature



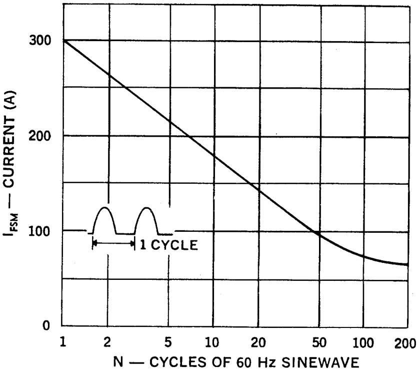
Typical Forward Current vs. Forward Voltage



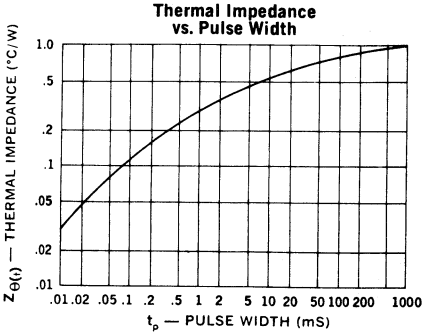
Typical Reverse Current vs. Reverse Voltage



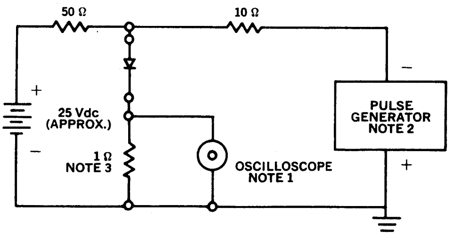
Maximum Forward Surge vs. Number of Cycles



Thermal Impedance vs. Pulse Width



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified UES704HR2, 5HR2, 6HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, $V\dot{R}W_M$ = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

RECTIFIERS
High Efficiency, 50A and 70A

UES801 BYW78-50
UES802 BYW78-100
UES803 BYW78-150

FEATURES
- High Continuous Current Rating
- Very Low Forward Voltage
- Very Fast Switching Speeds
- High Surge Capability
- Low Thermal Resistance
- Mechanically Rugged DO-5 Package

DESCRIPTION
This Series is specifically designed for operation in power switching circuits operating at frequencies of at least 20KHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

	UES801	UES802	UES803	BYW78-50	BYW78-100	BYW78-150
Peak Inverse Voltage, V_R	50V	100V	150V	50V	100V	150V
Repetitive Peak Inverse Voltage, V_{RRM}	50V	100V	150V	50V	100V	150V
Non-Repetitive Peak Inverse Voltage, V_{RSM}	50V	100V	150V	50V	100V	150V
Maximum Average D.C. Output Current, I_o @ T_C = 100°C	70A			50A		
Non-Repetitive Sinusoidal Surge Current (8.3mS), I_{FSM}	800A			1500A		
Thermal Resistance, Junction to Case, $R_{\theta JC}$	0.8°C/W					
Storage Temperature Range, T_{STG}	-55°C to +175°C					
Maximum Operating Junction Temperature, $T_{J\ MAX}$	+175°C					

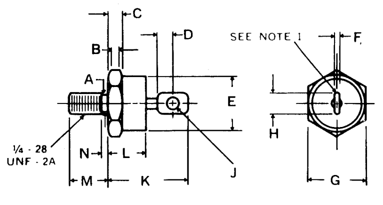
ELECTRICAL SPECIFICATIONS

Type	Maximum Reverse Voltage V_R	Maximum Forward Voltage V_F		Maximum Reverse Current I_R		Maximum Reverse Recovery Time t_{RR}
		T_C = 25°C	T_C = 150°C	T_C = 25°C	T_C = 150°C	
UES801 UES802 UES803	50V 100V 150V	0.975V @ I_F = 70A	0.84V @ I_F = 70A	25µA @ Rated V_R	30mA @ Rated V_R	50ns(1)
		T_C = 25°C	T_C = 100°C	T_C = 25°C	T_C = 100°C	
BYW78-50 BYW78-100 BYW78-150	50V 100V 150V	1.1V @ I_F = 160A	0.85V @ I_F = 50A	50µA @ Rated V_R	5mA @ Rated V_R	60ns(2)

(1) Measured in circuit I_F = 0.5A, I_R = IA, I_{REC} = 0.25A
(2) Measured in circuit I_F = 1A, V_R = 30V, $dI_F/_{dt}$ = 50A/µs

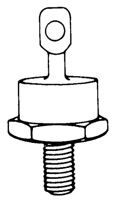
MECHANICAL SPECIFICATIONS

UES800 SERIES
BYW78 SERIES



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



Notes:
1. Standard polarity is cathode-to-stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 20 inch pounds (20 kg. cm).
4. Angular orientation of terminal is undefined.

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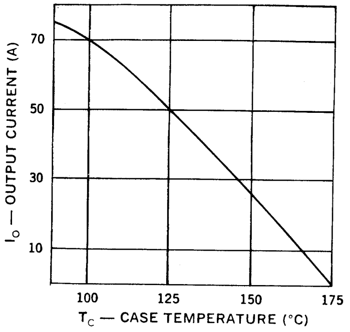
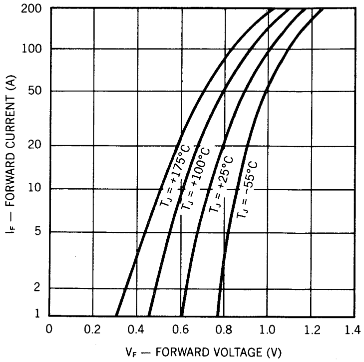
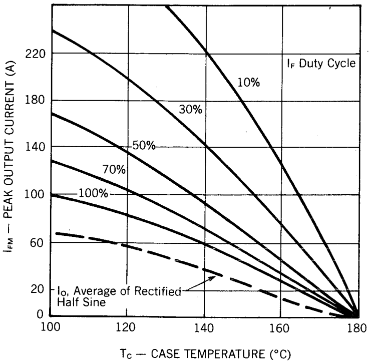


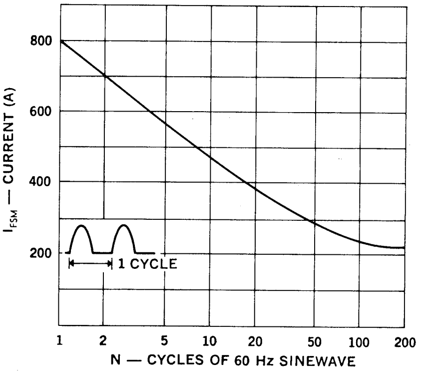
Output Current vs. Case Temperature



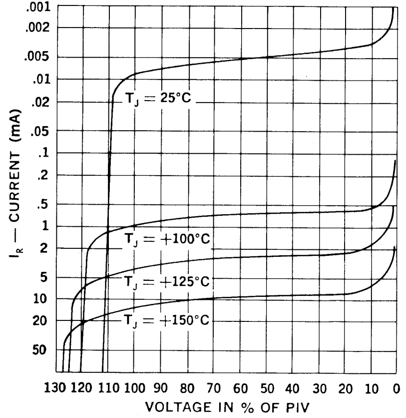
Forward Current vs. Forward Voltage



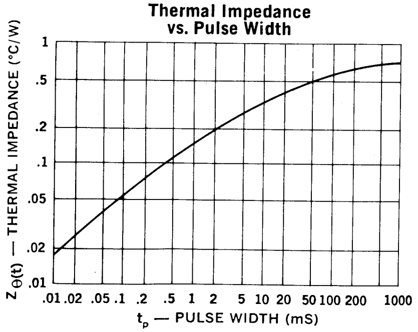
Peak Output Current vs. Case Temperature



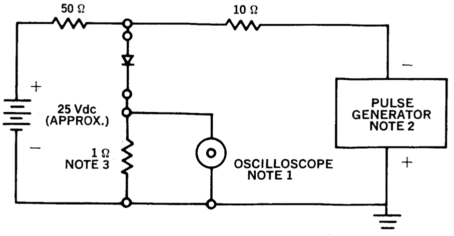
Maximum Forward Surge vs. Number of Cycles



Typical Reverse Current vs. Reverse Voltage



Thermal Impedance vs. Pulse Width



Reverse-Recovery Circuit

NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

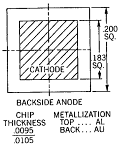
RECTIFIERS

High Efficiency, 50A

UES804
UES805
UES806
UES804HR2
UES805HR2
UES806HR2

FEATURES

- Very Low Forward Voltage (1.15V)
- Very Fast Recovery Times (50nSec)
- High Surge Capability
- Low Thermal Resistance
- Mechanically Rugged
- Both Polarities Available



DESCRIPTION

The UES804 is specifically designed for operation in power switching circuits operating at frequencies of at least 20 KHz.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES804, UES804HR2	200V
Peak Inverse Voltage, UES805, UES805HR2	300V
Peak Inverse Voltage, UES806, UES806HR2	400V
Maximum Average D.C. Output Current @ T_C = 100°C	50A
Surge Current, 8.3mS	600A
Thermal Resistance, Junction to Case	.8°C/W
Operating and Storage Temperature Range	−55°C to +150°C

POWER CYCLING

These devices possess the unique ability to pass many thousands of cycles of a stress test designed to evaluate the integrity of the bonding systems used in the construction of power rectifiers.

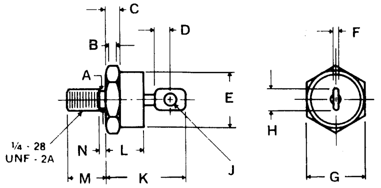
In this stress test, the case of the device is not heat sunk. Full rated forward current is supplied to force a case temperature increase at least 75°C, at which time, the current is removed and the case allowed to cool. The cycle is repeated a minimum of 5,000 times to simulate equipment being turned on and off. Extended power cycling tests demonstrate a product capability in excess of 25,000 cycles.

SWITCHING CHARACTERISTICS

The switching times of these ultra-fast rectifiers increase relatively little, with temperature or at different currents. Even in severe applications, such as catch diodes for switching regulators and output rectifiers for high frequency square wave inverters, these devices switch many times faster than the fastest associated transistors. Thus, the stresses on and powers dissipated in the switching transistors are substantially less than when using other rectifiers.

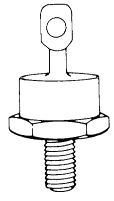
MECHANICAL SPECIFICATIONS

UES804 **UES804HR2** **UES805** **UES805HR2** **UES806** **UES806HR2**



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



Notes:

1. Standard polarity is cathode-to-stud.
   For reverse polarity (anode-to-stud) add suffix "R", ie. UES804R.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 30 inch pounds.
4. Angular orientation of terminal is undefined.

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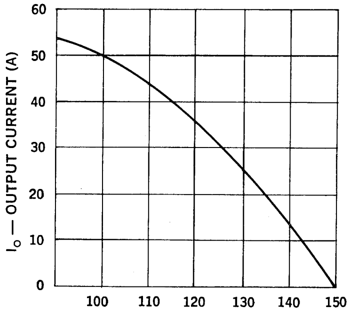
ELECTRICAL SPECIFICATIONS

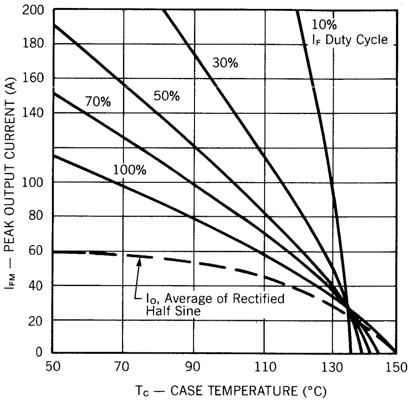
Type	PIV	Maximum Forward Voltage		Maximum Reverse Curent		Maximum Reverse Recovery Time*
		$T_C = 25°C$	$T_C = 125°C$	$T_C = 25°C$	$T_C = 125°C$	
UES804/804HR2 UES805/805HR2 UES806/806HR2	200V 300V 400V	1.25V @ $I_F = 50A$ $t_p = 300\mu S$	1.15V @ $I_F = 50A$ $t_p = 300\mu S$	$70\mu A$	30mA	50nS

* Measured in circuit $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$

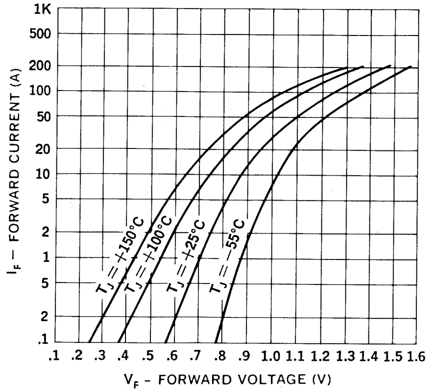
Output Current vs. Case Temperature



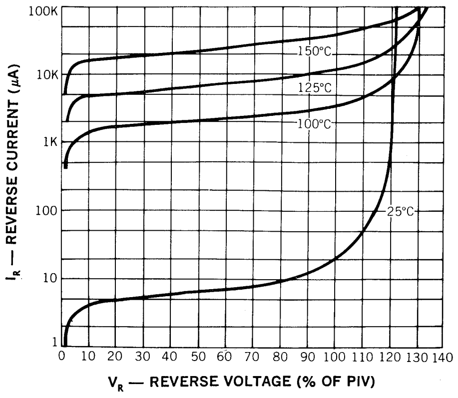
Peak Output Current vs. Case Temperature



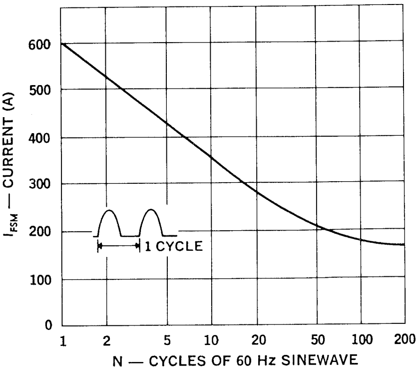
Typical Forward Current vs. Forward Voltage



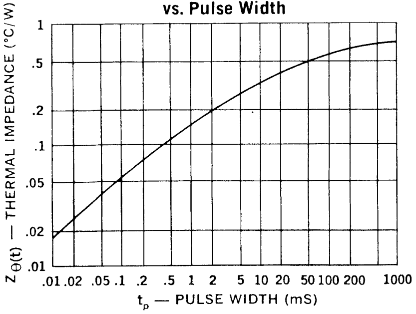
Typical Reverse Current vs. Reverse Voltage



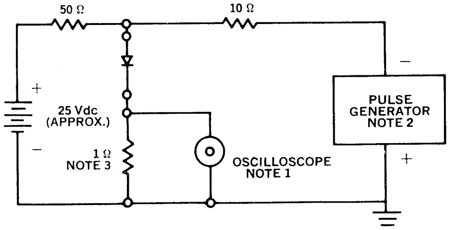
Maximum Forward Surge vs. Number of Cycles



Thermal Impedance vs. Pulse Width



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified UES804HR2, 5HR2, 6HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, VRW_M = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

RECTIFIERS

High Efficiency, 1A

UES1001-UES1003

FEATURES

- Very Fast Recovery Times
- Very Low Forward Voltage
- Small Size
- Convenient Package

DESCRIPTION

An axial leaded power rectifier useful in many switching applications. Particularly suited where very fast recovery and low forward voltage are required.

ABSOLUTE MAXIMUM RATINGS

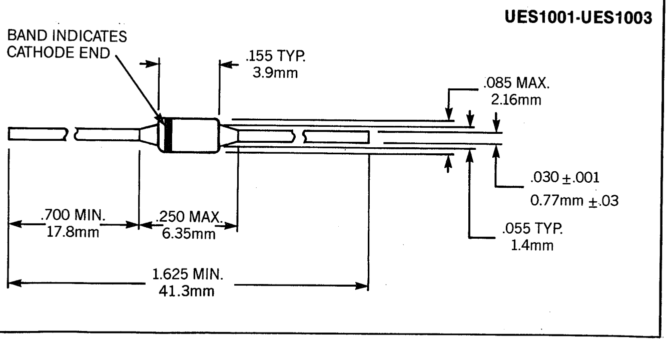
Peak Inverse Voltage, UES1001	50V
Peak Inverse Voltage, UES1002	100V
Peak Inverse Voltage, UES1003	150V
Maximum Average D.C. Output Current at T_L = 75°C, L = 3/8″	1A
Non-Repetitive Surge Current at 8.3mS	30A
Thermal Resistance at L = 3/8″	75°C/W
Operating and Storage Temperature Range	−55°C +175°C

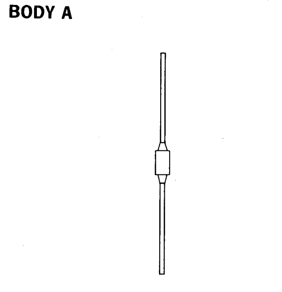
ELECTRICAL SPECIFICATIONS

Type	PIV	Maximum Forward Voltage (V_F) @		Maximum Reverse Current (I_R) @PIV		Maximum Reverse Recovery Time*
		T_J = 25°C	T_J = 100°C	@ T_J = 25°C	@ T_J = 100°C	
UES1001 UES1002 UES1003	50V 100V 150V	.975V @ 1A	.895V @ 1A	2μA	50μA	25nS

*Measured in circuit I_F = .5A, I_R = 1.0A, I_{REC} = .25A

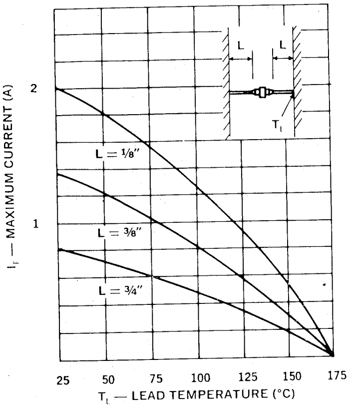
MECHANICAL SPECIFICATIONS



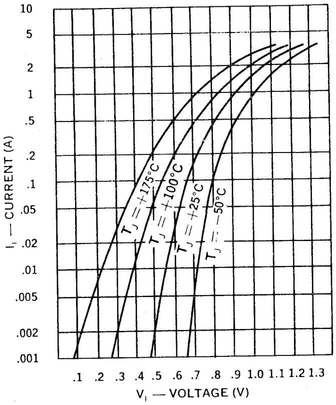


THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

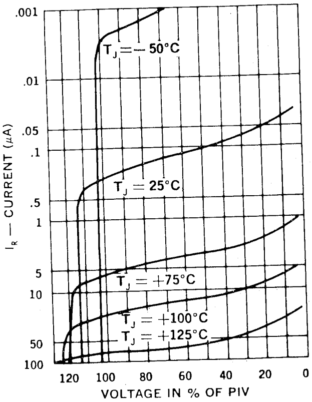
Output Current vs. Lead Temperature



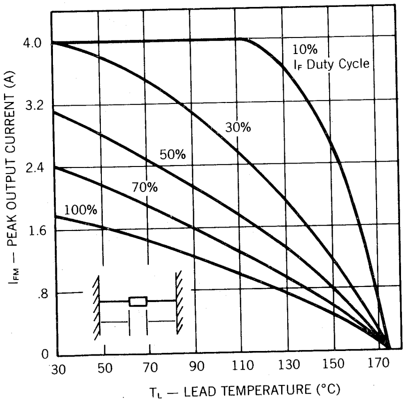
Typical Forward Current vs. Forward Voltage



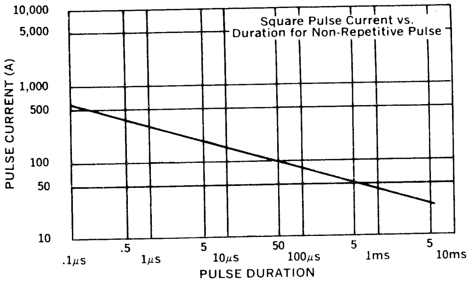
Typical Reverse Current vs. Voltage



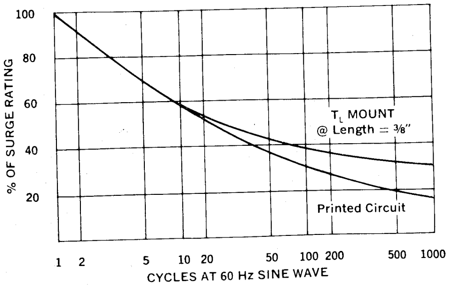
Peak Output Current vs. Lead Temperature



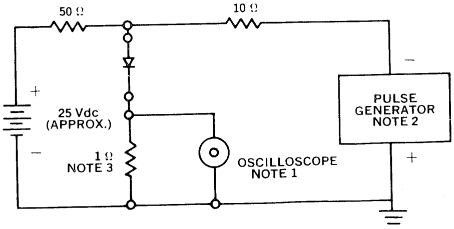
Forward Pulse Current vs. Duration



Multiple Surge Current vs. Duration



Reverse-Recovery Circuit



NOTES:
1. Oscilloscope: Rise time≤3nS; input impedance = 50Ω.
2. Pulse Generator: Rise time≤8nS; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS
High Efficiency, 2.5A

UES1101 BYV27-50
UES1102 BYV27-100
UES1103 BYV27-150

FEATURES
- Very Fast Recovery Times
- Very Low Forward Voltage
- Small Size
- Convenient Package

DESCRIPTION
An axial leaded power rectifier useful in many switching applications. Particularly suited where very fast recovery and low forward voltage are required.

ABSOLUTE MAXIMUM RATINGS

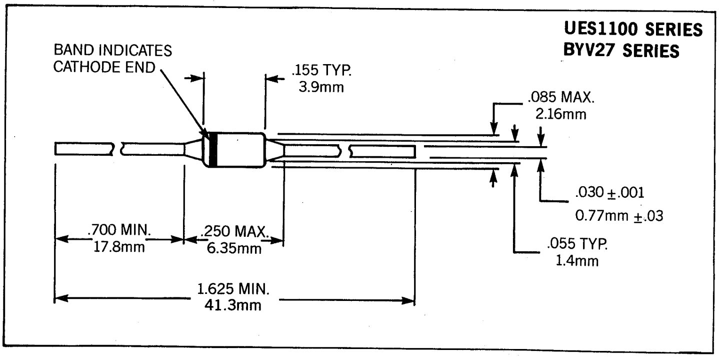
	UES1101	UES1102	UES1103	BYV27-50	BYV27-100	BYV27-150
Peak Inverse Voltage, V_R	50V	100V	150V	50V	100V	150V
Maximum Average D.C. Output at T_L = 75°C, L = 3/8", I_O	2.5A			2.0A		
Non-Repetitive Surge Current at 8.3ms, I_{FSM}	35A			50A		
Thermal Resistance at L = 3/8", $R_{\theta JC}$	38°C/W			46°C/W		
Junction Operating Temperature, T_j	175°C			165°C		
Operating and Storage Temperature Range	−55°C to +175°C					

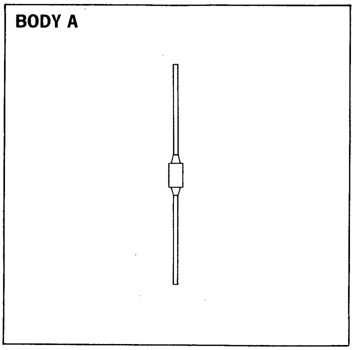
ELECTRICAL SPECIFICATIONS

Type	Maximum Reverse Voltage V_R	Maximum Forward Voltage @		Maximum Reverse Current @ Rated V_R		Maximum Reverse Recovery Time*
		T_J = 25°C	T_J = 100°C	T_J = 25° C	T_J = 100°C	
UES1101 UES1102 UES1103	50V 100V 150V	975V @ 2A	.895V @ 2A	2μA	50μA	25nS
		T_J = 25°C	T_J = 165°C	T_J = 25°C	T_J = 165°C	
BYV27-50 BYV27-100 BYV27-150	50V 100V 150V	1.25V @ 5A	.85V @ 2.5A	1μA	150μA	25nS

*Measured in circuit I_F = ½A, I_R 1.0A, I_{REC} = ¼A

MECHANICAL SPECIFICATIONS





THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

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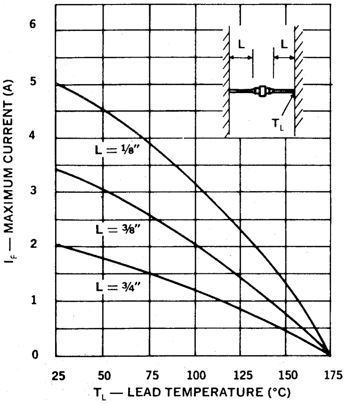
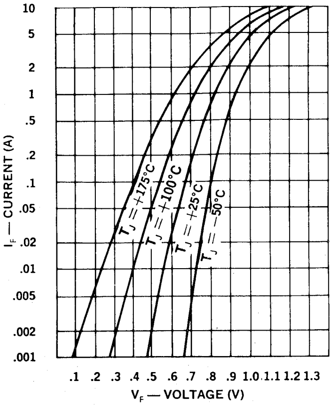
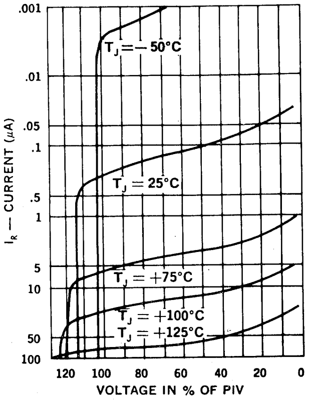
Output Current vs. Lead Temperature



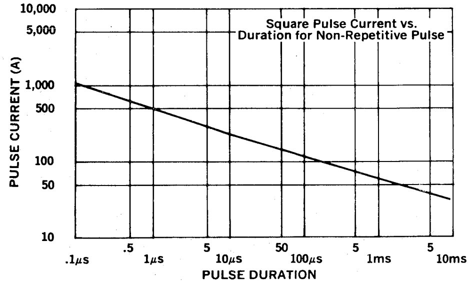
Typical Forward Current vs. Forward Voltage



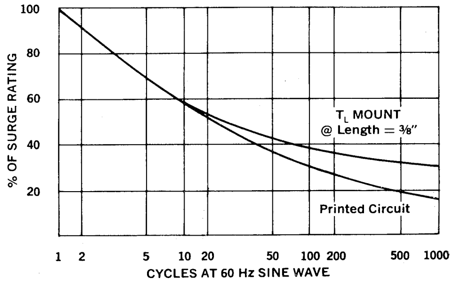
Typical Reverse Current vs. Voltage



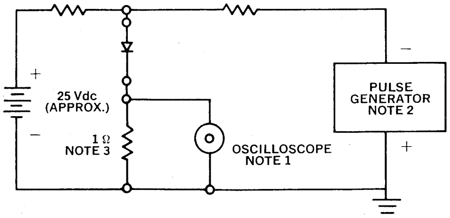
Forward Pulse Current vs. Duration



Multiple Surge Current vs. Duration



Reverse-Recovery Circuit



Notes:

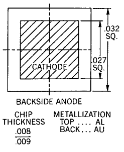
1. Oscilloscope: Rise time ≤ 3nS; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8nS; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS
High Efficiency, 2A

UES1104
UES1105
UES1106

FEATURES

- Very Low Forward Voltage (1.15V)
- Very Fast Recovery Times (50nSec)
- Small Size
- Convenient Package



DESCRIPTION

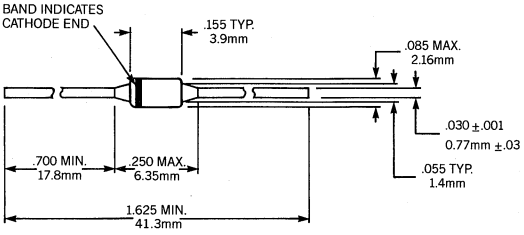
The UES1104 series is specifically designed for operation in power switching circuits operating at frequencies of at least 20 KHz.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES1104	200V
Peak Inverse Voltage, UES1105	300V
Peak Inverse Voltage, UES1106	400V
Maximum Average DC Output Current, I_O	
@ T_A = 25°C (Free Air)	1A
@ T_L = 50°C, L = ⅜″	2A
Surge Current, 8.3mSec	20A
Thermal Resistance @ L = ⅜″	38°C/W
Operating and Storage Temperature Range	−55°C to +150°C

MECHANICAL SPECIFICATIONS

UES1104 **UES1105** **UES1106**



BODY A

THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

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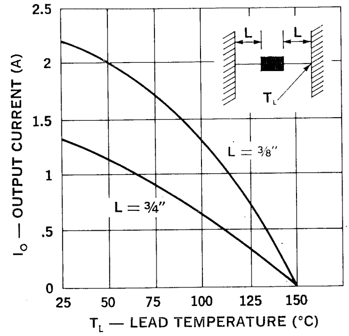
4/79 (Rev. 1)

ELECTRICAL SPECIFICATIONS

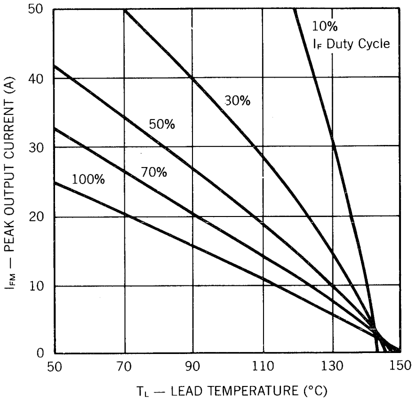
Type	PIV	Maximum Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
		$T_J = 25°C$	$T_J = 100°C$	@ PIV, $T_J = 25°C$	$T_J = 100°C$	
UES1104/1104HR UES1105/1105HR UES1106/1106HR	200V 300V 400V	1.25V @ 1A tp = 300μS	1.15V @ 1A tp = 300μS	10μA	200μA	50nS

* Measured in circuit $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$

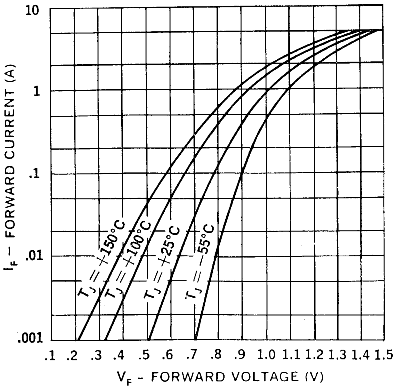
Output Current vs. Lead Temperature



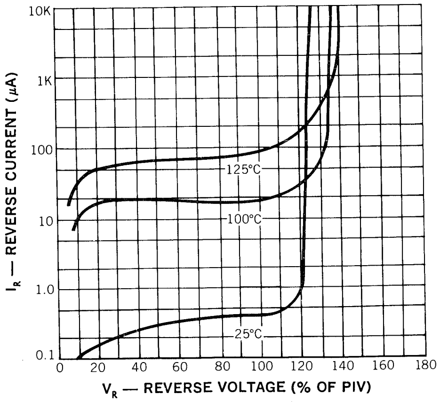
Peak Output Current vs. Lead Temperature



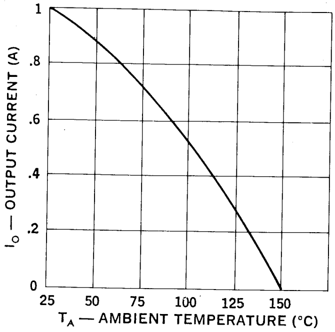
Typical Forward Current vs. Forward Voltage



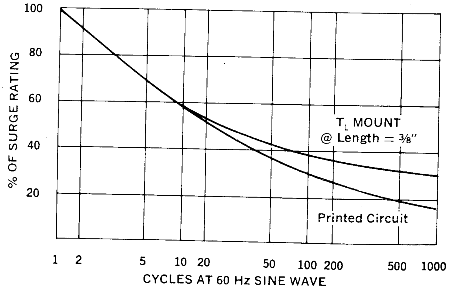
Typical Reverse Current vs. Reverse Voltage



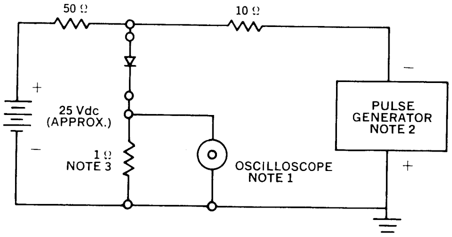
Output Current vs. Ambient Temperature.



Multiple Surge Current vs. Duration



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

• OPTIONAL HIGH RELIABILITY (HR2) SCREENING (See 1N6620-1N6625)

RECTIFIERS
High Efficiency, 3.5A

UES1301 BYV28-50
UES1302 BYV28-100
UES1303 BYV28-150

FEATURES
- Very Fast Recovery Times
- Very Low Forward Voltage
- Small Size
- Convenient Package

DESCRIPTION
An axial leaded power rectifier useful in many switching applications. Particularly suited where very fast recovery and low forward voltage are required.

ABSOLUTE MAXIMUM RATINGS

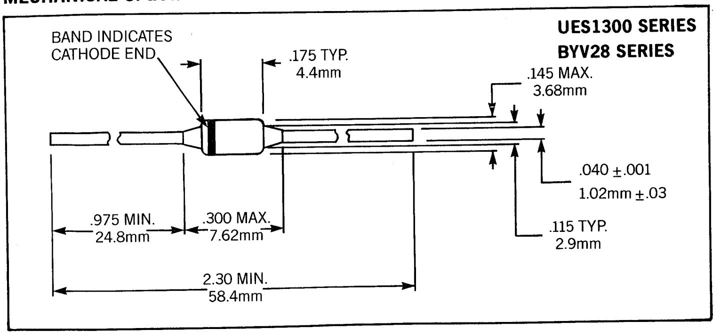
	UES1301	UES1302	UES1303	BYV28-50	BYV28-100	BYV28-150
Peak Inverse Voltage, V_R	50V	100V	150V	50V	100V	150V
Maximum Average D.C. Output at T_L = 75°C, L = 3/8" I_O		6.0A			3.5A	
Non-Repetitive Surge Current at 8.3ms, I_{FSM}		125A			80A	
Thermal Resistance at L = 3/8", $R_{\theta JC}$		20°C/W			25°C/W	
Junction Operating Temperature, T_j		175°C			165°C	
Operating and Storage Temperature Range				−55°C to +175°C		

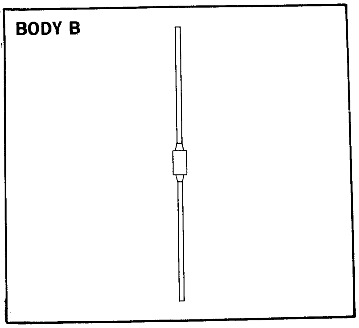
ELECTRICAL SPECIFICATIONS

Type	Maximum Reverse Voltage V_R	Maximum Forward Voltage @			Maximum Reverse Current @ Rated V_R		Maximum Reverse Recovery Time*
		T_J = 25°C	T_J = 100°C		T_J = 25°C	T_J = 100°C	
UES1301 UES1302 UES1303	50V 100V 150V	.925V @ 6A	.850V @ 6A		5μA	150μA	30ns
		T_J = 25°C	T_J = 165°C		T_J = 25°C	T_J = 100°C	
BYV28-50 BYV28-100 BYV28-150	50V 100V 150V	1.10V @ 5A	.75V @ 3A	.90V @ 5A	1μA	150μA	30ns

*Measured in circuit I_F = 0.5A, I_R = 1.0A, I_{REC} = .25A

MECHANICAL SPECIFICATIONS





THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

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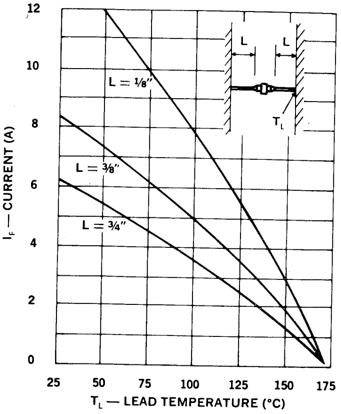
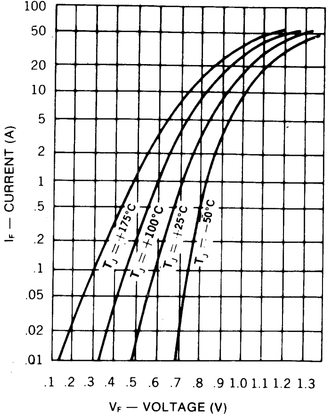
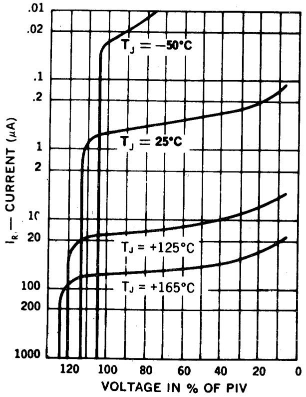
Output Current vs. Lead Temperature



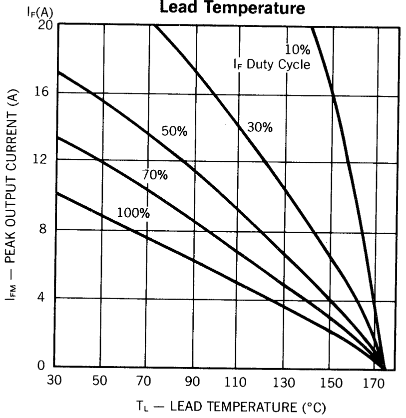
Typical Forward Current vs. Forward Voltage



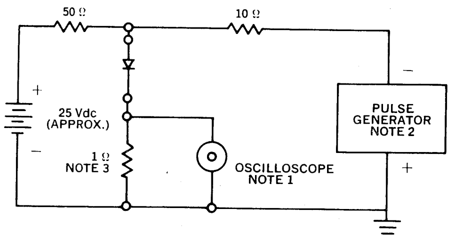
Typical Reverse Current vs. Voltage



Peak Output Current vs. Lead Temperature



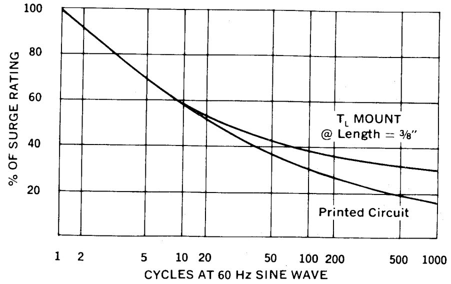
Reverse-Recovery Circuit



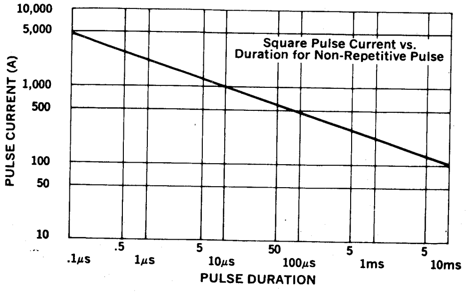
NOTES:

1. Oscilloscope: Rise time≤3nS; input impedance = 50Ω.
2. Pulse Generator: Rise time≤8nS; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Multiple Surge Current vs. Duration



Forward Pulse Current vs. Duration

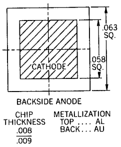


RECTIFIERS
High Efficiency, 5A

UES1304
UES1305
UES1306

FEATURES

- Very Low Forward Voltage (1.15V)
- Very Fast Recovery Times (50nSec)
- Small Size
- High Surge



DESCRIPTION

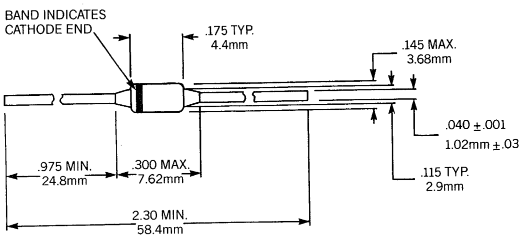
The UES1304 series is specifically designed for operation in power switching circuits operating at frequencies of at least 20 KHz.

ABSOLUTE MAXIMUM RATINGS

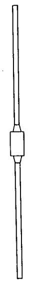
Peak Inverse Voltage, UES1304	200V
Peak Inverse Voltage, UES1305	300V
Peak Inverse Voltage, UES1306	400V
Maximum Average DC Output Current, I_O	
@ T_A = 25°C (Free Air)	3A
@ T_L = 50°C, L = ⅜″	5A
Surge Current, 8.3mSec	70A
Thermal Resistance @ L = ⅜″	20°C/W
Operating and Storage Temperature Range	−55°C to +150°C

MECHANICAL SPECIFICATIONS

UES1304 UES1305 UES1306



BODY B



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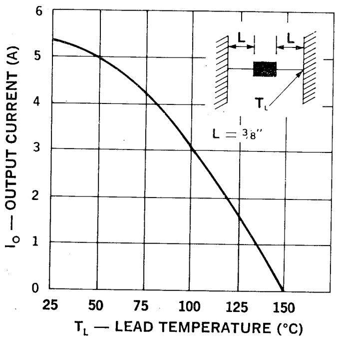
ELECTRICAL SPECIFICATIONS

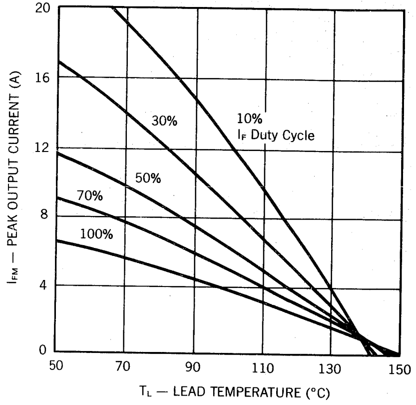
Type	PIV	Maximum Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
		$T_J = 25°C$	$T_J = 100°C$	@ PIV, $T_J = 25°C$	$T_J = 100°C$	
UES1304 UES1305 UES1306	200V 300V 400V	1.25V @ 3A tp = 300μS	1.15V @ 3A tp = 300μS	20μA	500μA	50nS

* Measured in circuit $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$

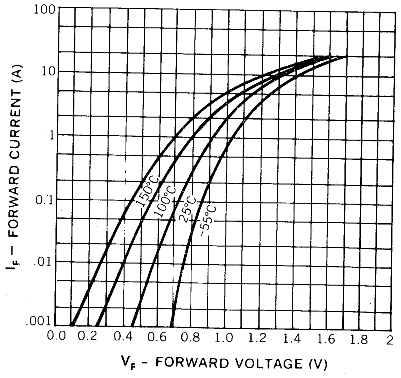
Output Current vs. Lead Temperature



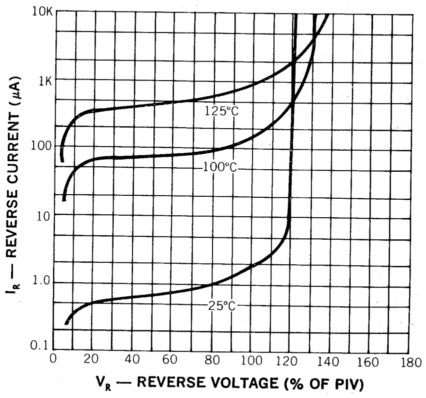
Peak Output Current vs. Lead Temperature



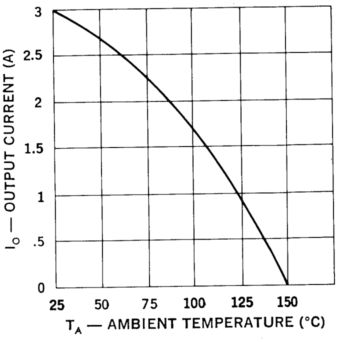
Typical Forward Current vs. Forward Voltage



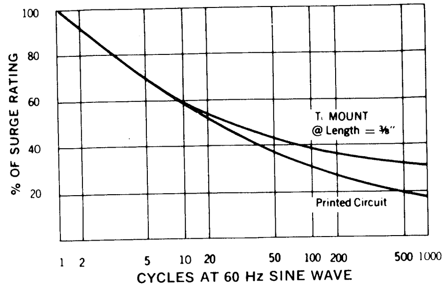
Typical Reverse Current vs. Reverse Voltage



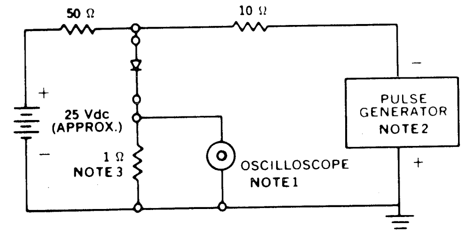
Output Current vs Ambient Temperature



Multiple Surge Current vs. Duration



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

High Efficiency, 7A and 8A

UES1401 BYW29-50 BYW80-50
UES1402 BYW29-100 BYW80-100
UES1403 BYW29-150 BYW80-150
UES1404 BYW29-200 BYW80-200

FEATURES

- Very Low Forward Voltage
- Very Fast Recovery Times
- Economical, Convenient Plastic Package
- Low Thermal Resistance
- Mechanically Rugged

DESCRIPTION

The UES1400/BYW29/BYW80 Series, in a plastic package similar to the TO-220, is specifically designed for operation in power switching circuits to frequencies in excess of 100KHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

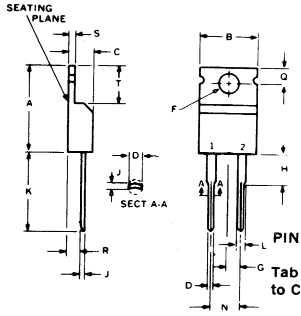
	UES1401	UES1402	UES1403	UES1404
Peak Inverse Voltage, V_R	50V	100V	150V	200V
Repetitive Peak Inverse Voltage, V_{RWM}	50V	100V	150V	200V
Non-Repetitive Peak Inverse Voltage, V_{RSM}	50V	100V	150V	200V
Maximum Average D.C. Output Current, I_O				
@ T_C = 125°C, (Note 1)	8.0A			
@ T_A = 25°C	3.0A			
@ T_A = 25°C, (Note 2)	8.0A			
Non-Repetitive Sinusoidal Surge Current at 8.3 ms, I_{FSM}	80A			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.5°C/W			
Thermal Resistance, Junction to Ambient, $R_{\theta JA}$	60°C/W			
Storage Temperature Range, T_{STG}	−55°C to +150°C			
Maximum Operating Junction Temperature, T_{jmax}	+150°C			

Note 1. Above 100°C use the tab for electrical connection.
Note 2. Using Wakefield Type 295 heatsink with convection cooling. For more definitive data refer to the Output Current vs. Temperature Curves on this datasheet.

	BYW29-50	BYW29-100	BYW29-150	BYW29-200	BYW80-50	BYW80-100	BYW80-150	BYW80-200
Peak Inverse Voltage, V_R	50V	100V	150V	200V	50V	100V	150V	200V
Repetitive Peak Inverse Voltage, V_{RWM}	50V	100V	150V	200V	50V	100V	150V	200V
Non-Repetitive Peak Inverse Voltage, V_{RSM}	50V	100V	150V	200V	50V	100V	150V	200V
Maximum Average D.C. Output Current								
@ T_C = 125°C, (Note 1)	7.0A				7.0A			
Non-Repetitive Sinusoidal Surge Current at 8.3ms,	80A				100A			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.5°C/W							
Thermal Resistance, Junction to Ambient, $R_{\theta JA}$	60°C/W							
Operating and Storage Temperature Range	−55°C to +150°C							
Maximum Operating Junction Temperature, T_{jmax}	+150°C							

Note 1. Above 100°C use the tab for electrical connection.

MECHANICAL SPECIFICATIONS

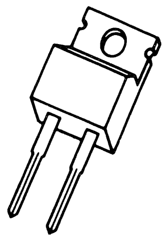


PIN 1. Cathode
2. Anode
Tab is connected to Cathode.

UES1401 SERIES
BYW29 SERIES
BYW80 SERIES

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AC



Microsemi Corp.
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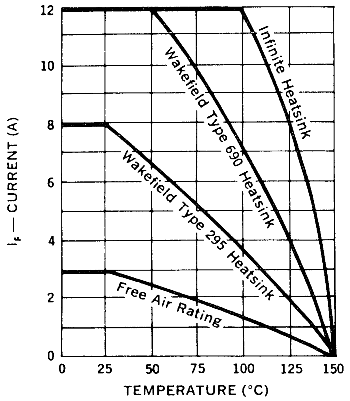
The diode experts

ELECTRICAL SPECIFICATIONS

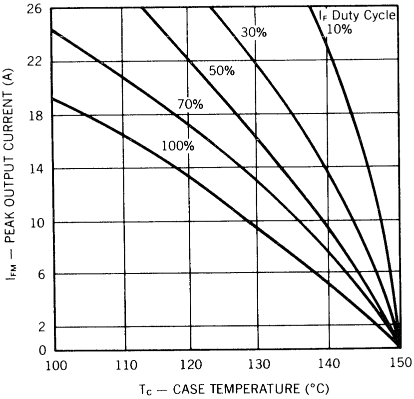
Type	Maximum Reverse Voltage V_R	Maximum Forward Voltage, V_F		Maximum Reverse Current, I_R @ rated V_R		Maximum Reverse Recovery Time	Typical Forward Recovery Voltage @ 1A	Typical Forward Recovery Charge
		T_J = 25°C	T_J = 100°C	T_J = 25°C	T_J = 100°C	T_{rr}	T_R = 8nS	Q_{RR} @ 25°
UES1401 UES1402 UES1403 UES1404	50V 100V 150V 200V	0.9V @ 4A 0.975V @ 8A tp = 300μS	0.8V @ 4A 0.895V @ 8A	5μA	150μA 150μA 150μA 500μA	35nS[1]	1.4V	—
BYW29-50 BYW29-100 BYW29-150 BYW29-200	50V 100V 150V 200V	1.300V @ 20A	0.850V @ 5A	—	600μA	35nS[2]	1.4V	—
BYW80-50 BYW80-100 BYW80-150 BYW80-200	50V 100V 150V 200V	1.25V @ 22A	0.850V @ 7A	10μA	1mA	35nS[2]	—	15nc[3]

NOTES: 1. Measured in circuit I_F = 0.5A, I_R = 1.0A, I_{REC} = 0.25A
2. Measured in circuit I_F = 1A to $V_R \geq$ 30V, dI_F/dt = 50A/μS
3. Measured in circuit I_F = 2A, $V_R \leq$ 30V, dI_F/dt = −20A/μS

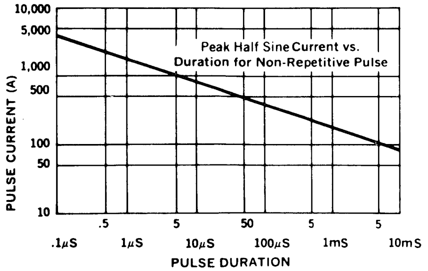
Output Current vs Temperature



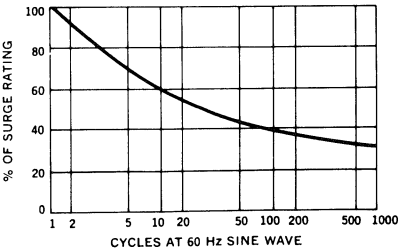
Peak Output Current vs Case Temperature



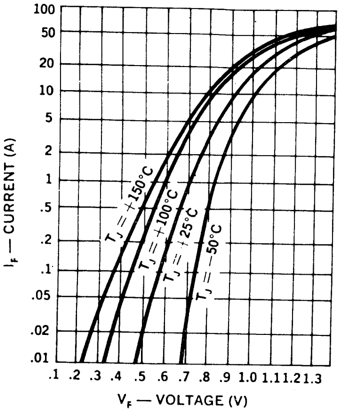
Forward Pulse Current vs. Duration



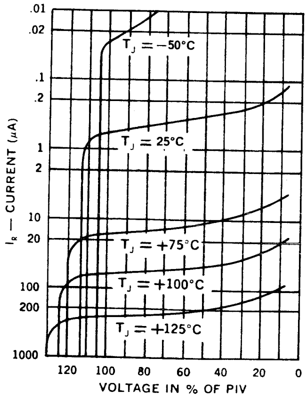
Multiple Surge Current vs. Duration



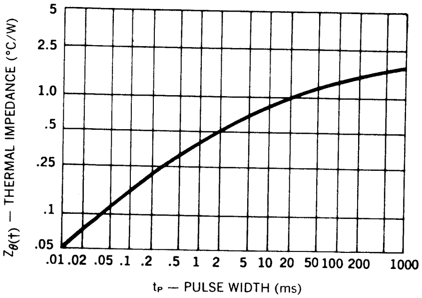
Typical Forward Current vs Forward Voltage



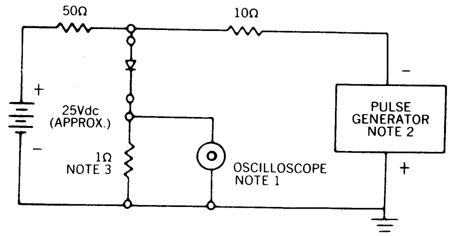
Typical Reverse Current vs Voltage



Thermal Impedance vs Pulse Width



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS
High Efficiency, 16A

UES1501
UES1502
UES1503
UES1504

FEATURES

- Very Low Forward Voltage
- Very Fast Recovery Times
- Economical, Convenient TO-220 Package
- Low Thermal Resistance
- Mechanically Rugged

DESCRIPTION

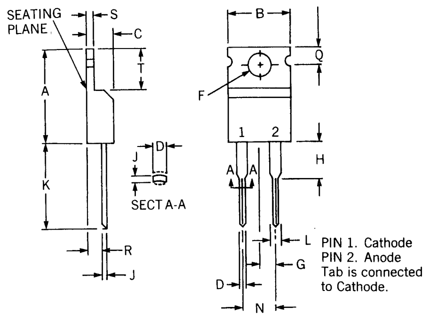
The UES1500 Series, in the economical, convenient TO-220 package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES1501	50V
Peak Inverse Voltage, UES1502	100V
Peak Inverse Voltage, UES1503	150V
Peak Inverse Voltage, UES1504	200V
Maximum Average D.C. Output Current	
@ T_C = 100°C	16A
@ T_A = 25°C	3.3A
@ T_A = 25°C (Note 1)	10.0A
Non-Repetitive Sinusoidal Surge Current, 8.3ms	300A
Thermal Resistance, Junction to Case, $\theta_{J\text{-}C}$	1.5°C/W
Thermal Resistance, Junction to Ambient, $\theta_{J\text{-}A}$	60°C/W
Operating and Storage Temperature	−55°C to +150°C

Note: 1. Using Wakefield Type 295 heatsink with convection cooling. For more definitive data refer to the Output Current vs Temperature Curve on this data sheet.

MECHANICAL SPECIFICATIONS

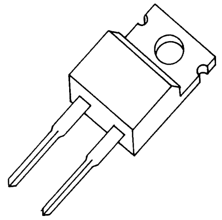


PIN 1. Cathode
PIN 2. Anode
Tab is connected to Cathode.

UES1501-UES1504

	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.560	0.625	14.23	15.87
B	0.380	0.420	9.66	10.66
C	0.140	0.190	3.56	4.82
D	0.020	0.045	0.51	1.14
F	0.139	0.147	3.531	3.733
G	0.090	0.110	2.29	2.79
H	—	0.250	—	6.35
J	0.015	0.025	0.38	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.070	1.14	1.77
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.115	2.04	2.92
S	0.045	0.055	1.14	1.39
T	0.230	0.270	5.85	6.85

TO-220AC



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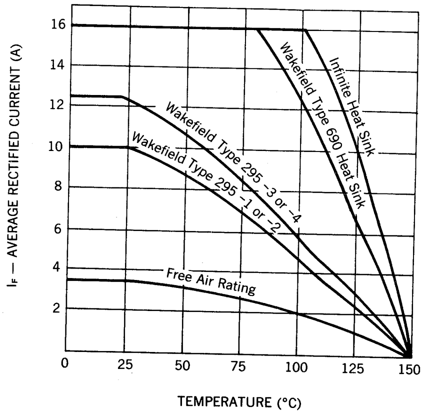
ELECTRICAL SPECIFICATIONS

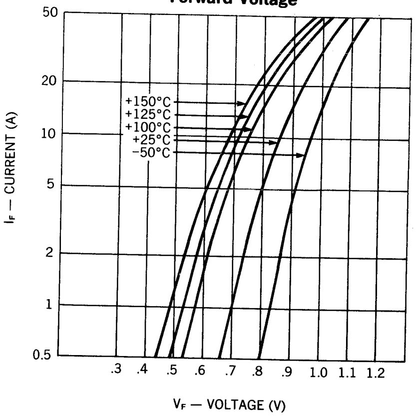
Type	PIV	Maximum Forward Voltage		Maximum Reverse Current @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A t_r = 8ns
		T_J = 25°C	T_J = 100°C	T_J = 25°C	T_J = 100°C		
UES1501 UES1502	50V 100V	.975V @ 16A	.895V @ 16A	10µA	800µA	35ns	2.0V
UES1503 UES1504	150V 200V	1.10V @ 32A	1.0V @ 32A				

* Measured in circuit $I_F = {}^1/_2$A, I_R = 1.0A, $I_{REC} = {}^1/_4$A

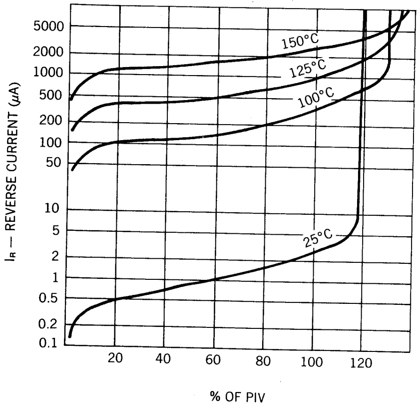
Output Current vs Temperature



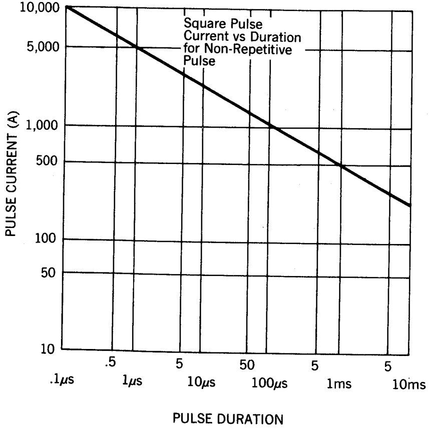
Typical Forward Current vs Forward Voltage



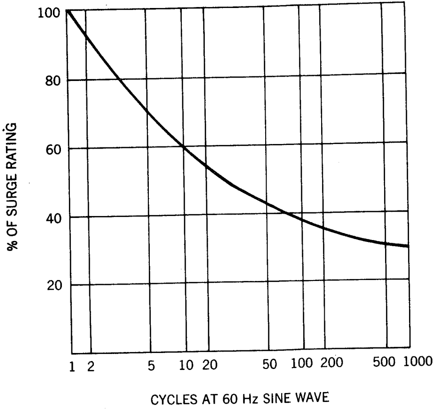
Typical Reverse Current vs Voltage



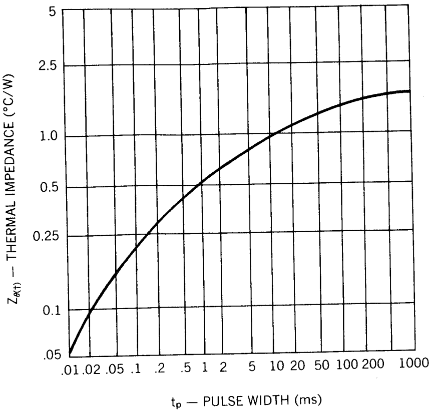
Forward Pulse Current vs Duration



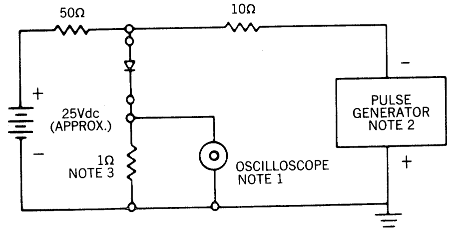
Multiple Surge Current vs Duration



Thermal Impedance vs Pulse Width



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

High Efficiency, 16A Center-Tap

UES2401-UES2404

FEATURES

- Very Low Forward Voltage
- Very Fast Recovery Times
- Economical, Convenient TO-220AB Package
- Low Thermal Resistance
- Mechanically Rugged
- PIV up to 200V

DESCRIPTION

The UES2401 Series in the economical, convenient TO-220AB package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The series combines two high efficiency devices into one package, simplifying installation, reducing heatsink requirements and the need to purchase matched components.

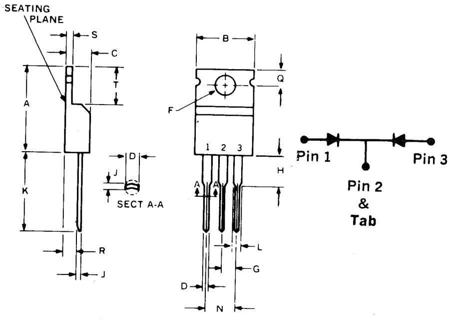
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES2401	50V
Peak Inverse Voltage, UES2402	100V
Peak Inverse Voltage, UES2403	150V
Peak Inverse Voltage, UES2404	200V
Maximum Average D.C. Output Current	
@ T_C = 125°C (Note 1)	16A
@ T_A = 25°C	3A
@ T_A = 25°C (Note 2)	10A
Non-Repetitive Sinusoidal Surge Current, 8.3ms	80A
Thermal Resistance, Junction to Case, $\theta_{J\text{-}C}$	1.75°C/W
Thermal Resistance, Junction to Ambient, $\theta_{J\text{-}A}$	60°C/W
Operating and Storage Temperature Range	−55°C to +150°C

Note 1. Above 8A use the tab for electrical connection.
Note 2. Using Wakefield Type 295 heatsink with convection cooling. For more definitive data refer to the Output Current vs. Temperature Curves on this datasheet.

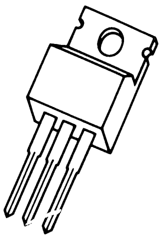
MECHANICAL SPECIFICATIONS

UES2401-2404



	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.560	0.625	14.23	15.87
B	0.380	0.420	9.66	10.66
C	0.140	0.190	3.56	4.82
D	0.020	0.045	0.51	1.14
F	0.139	0.147	3.531	3.733
G	0.090	0.110	2.29	2.79
H	—	0.250	—	6.35
J	0.015	0.025	0.38	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.070	1.14	1.77
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.115	2.04	2.92
S	0.045	0.055	1.14	1.39
T	0.230	0.270	5.85	6.85

TO-220AB

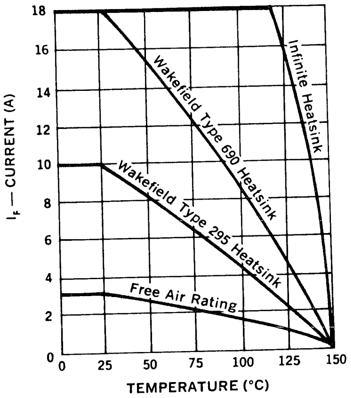


ELECTRICAL SPECIFICATIONS

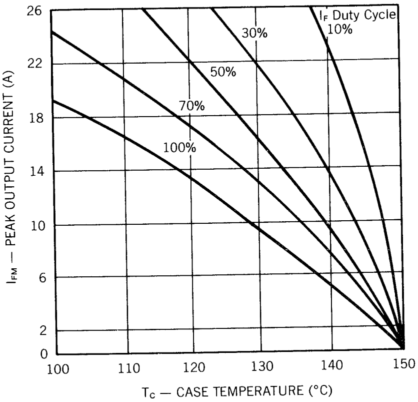
Type	PIV	Maximum Forward Voltage @		Maximum Reverse Current @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A t_r = 8ns
		T_J = 25°C	T_J = 100°C	T_J = 25°C	T_J = 100°C		
UES2401	50V	0.9V@ 4A 0.975 @ 8A tp = 300µs	0.8V @ 4A 0.895 @ 8A	5µA	150µA	35ns	1.4V
UES2402	100V				150µA		
UES2403	150V				150µA		
UES2404	200V				500µA		

*Measured in circuit I_F = 0.5A, I_R = 1.0A, I_{REC} = 0.25A

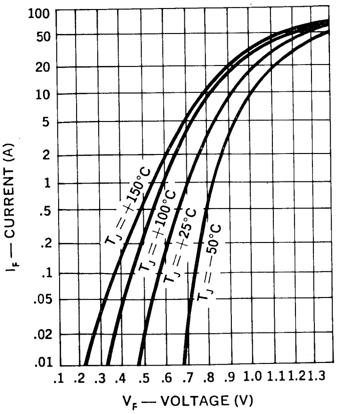
Output Current vs Temperature



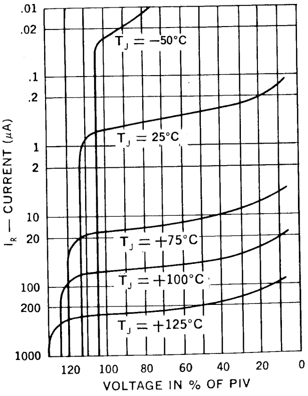
Peak Output Current vs Case Temperature



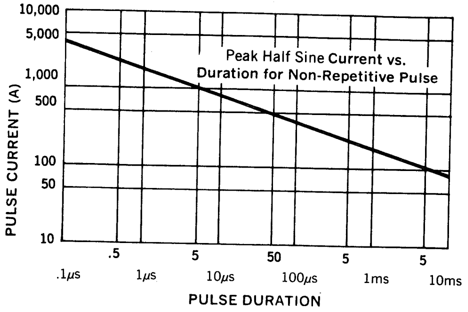
Typical Forward Current vs Forward Voltage



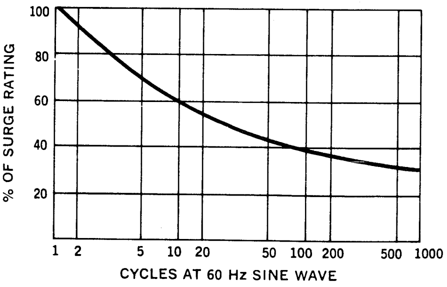
Typical Reverse Current vs Voltage



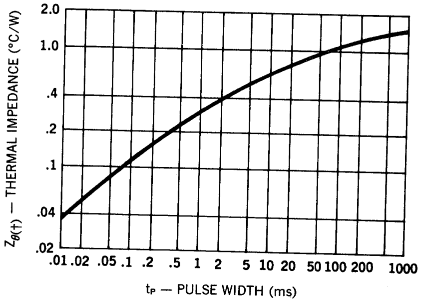
Forward Pulse Current vs Duration



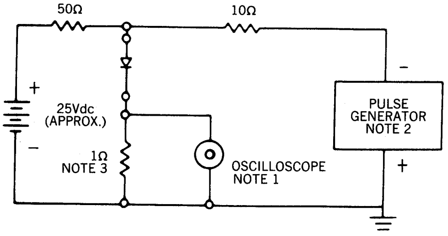
Multiple Surge Current vs Duration



Thermal Impedance vs Pulse Width



Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIERS

High Efficiency, 30A Center-Tap

UES2601
UES2602
UES2603
UES2601HR2
UES2602HR2
UES2603HR2

FEATURES

- Very Low Forward Voltage
- Very Fast Switching Speed
- Convenient Package
- High Surge
- Low Thermal Resistance
- Mechanically Rugged
- Both Polarities Available

DESCRIPTION

This series combines two high efficiency devices into one package, simplifying installation, reducing heat sink requirements and the need to purchase matched components.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES2601, UES2601HR2	50V
Peak Inverse Voltage, UES2602, UES2602HR2	100V
Peak Inverse Voltage, UES2603, UES2603HR2	150V
Maximum Average D.C. Output Current at T_C = 100°C	30A
Non-Repetitive Sinusoidal Surge Current 8.3 ms	400A
Thermal Resistance, Junction to Case	1°C/W
Operating and Storage Temperature Range	−55°C to +175°C

POWER CYCLING

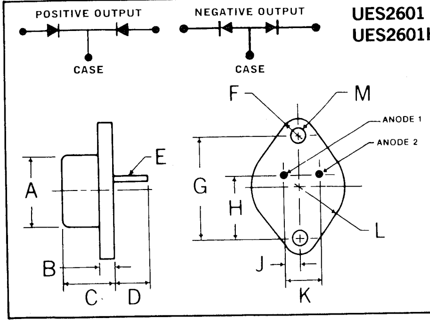
These devices possess the unique ability to pass many thousands of cycles of a stress test designed to evaluate the integrity of the bonding systems used in the construction of power rectifiers.

In this stress test, the case of the device is not heat sunk. Full rated forward current is supplied to force a case temperature increase at least 75°C, at which time, the current is removed and the case allowed to cool. The cycle is repeated a minimum of 5,000 times to simulate equipment being turned on and off. Extended power cycling tests demonstrate a product capability in excess of 25,000 cycles.

SWITCHING CHARACTERISTICS

The switching times of these ultra-fast rectifiers increase relatively little, with temperature or at different currents. Even in severe applications, such as catch diodes for switching regulators and output rectifiers for high frequency square wave inverters, these devices switch many times faster than the fastest associated transistors. Thus, the stresses on and powers dissipated in the switching transistors are substantially less than when using other rectifiers.

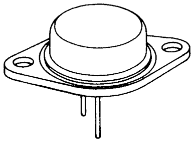
MECHANICAL SPECIFICATIONS



UES2601 UES2601HR2 UES2602 UES2602HR2 UES2603 UES2603HR2

	ins.	mm.
A	.875 MAX.	22.23 MAX.
B	.135 MAX.	3.43 MAX.
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.038-.043 DIA.	0.97-1.09 DIA.
F	.188 MAX. RAD.	4.78 MAX. RAD.
G	1.177-1.197	29.90-30.40
H	.655-.675	16.64-17.15
J	.205-.225	5.21-5.72
K	.420-.440	10.67-11.18
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.151-.161 DIA.	3.84-4.09 DIA.

TO-204AA (TO-3)



Note:
Standard polarity is positive output.
For reverse polarity (negative output) add suffix "R", ie. UES2601R.

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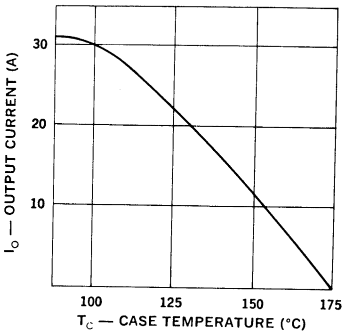
ELECTRICAL SPECIFICATIONS

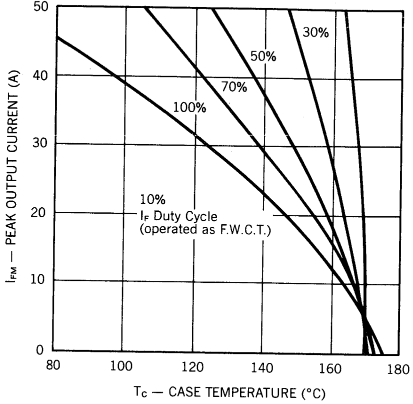
Type	PIV	Maximum Forward Voltage @		Maximum Reverse Current @		Maximum Reverse Recovery Time*
		$T_C = 25$°C	$T_C = 125$°C	$T_C = 25$°C	$T_C = 125$°C	
UES2601/2601HR2 UES2602/2602HR2 UES2603/2603HR2	50V 100V 150V	.930V @ 15A $t_P = 300\mu S$	.825V @ 15A $t_P = 300\mu S$	20μA	4mA	35nS

* Measured in circuit $I_F = 0.5A$, $I_R = 1A$, $I_{REC} = 0.25A$

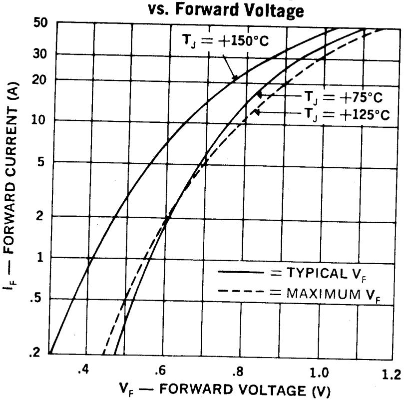
Output Current vs. Case Temperature



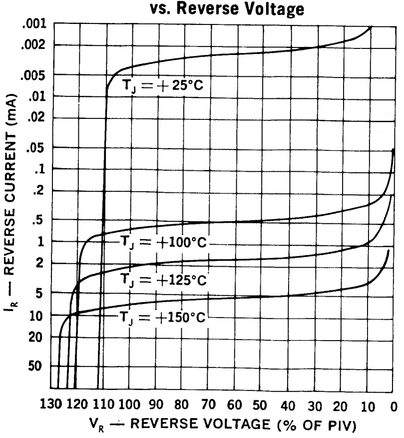
Peak Output Current vs. Case Temperature



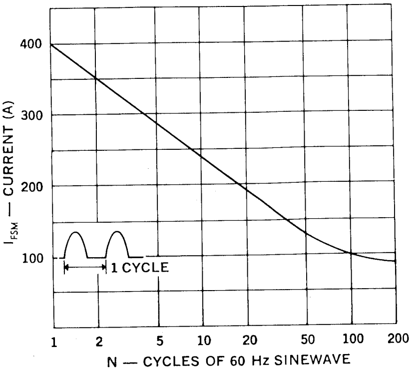
Forward Current vs. Forward Voltage



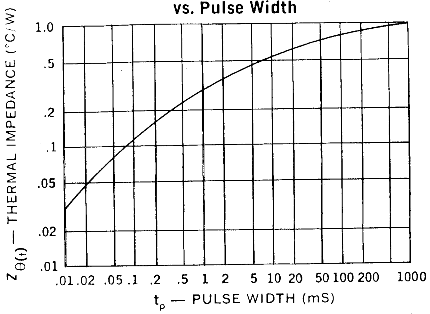
Typical Reverse Current vs. Reverse Voltage



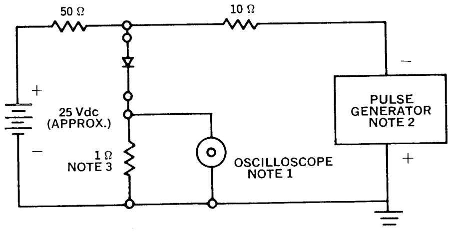
Maximum Forward Surge vs. Number of Cycles



Thermal Impedance vs. Pulse Width



Reverse-Recovery Circuit



NOTES:
1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified UES2601HR2, 2HR2, 3HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Thermal Shock (Temperature Cycling)	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. at extremes.
3. Hermetic Seal a. Fine b. Gross	1071	H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Bias (HTRB)	1038	A, 48 Hours, T_C = 125°C, V_R = 80% of rating
7. Final Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C

RECTIFIERS

High Efficiency, 30A Center-Tap

UES2604
UES2605
UES2606
UES2604HR2
UES2605HR2
UES2606HR2

FEATURES

- Very Low Forward Voltage (1.15V)
- Very Fast Recovery Times (50nSec)
- Low Profile Package
- High Surge Capability
- Low Thermal Resistance
- Mechanically Rugged
- Both Polarities Available

DESCRIPTION

The UES2604 series is specifically designed for operation in power switching circuits operating at frequencies of at least 20 KHz.

This series combines two high efficiency devices into one package, simplifying installation, reducing heat sink requirements and the need to purchase matched components.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, UES2604, UES2604HR2	200V
Peak Inverse Voltage, UES2605, UES2605HR2	300V
Peak Inverse Voltage, UES2606, UES2606HR2	400V
Maximum Average D.C. Output Current @ T_C = 100°C	30A
Surge Current, 8.3mS	300A
Thermal Resistance, Junction to Case	1°C/W
Operating and Storage Temperature Range	−55°C to +150°C

POWER CYCLING

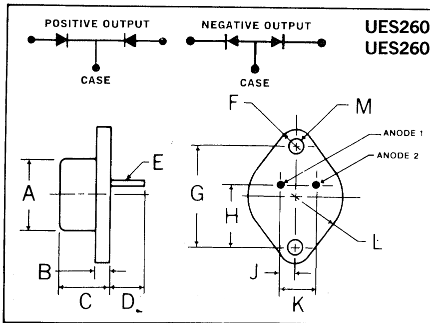
These devices possess the unique ability to pass many thousands of cycles of a stress test designed to evaluate the integrity of the bonding systems used in the construction of power rectifiers.

In this stress test, the case of the device is not heat sunk. Full rated forward current is supplied to force a case temperature increase at least 75°C, at which time, the current is removed and the case allowed to cool. The cycle is repeated a minimum of 5,000 times to simulate equipment being turned on and off. Extended power cycling tests demonstrate a product capability in excess of 25,000 cycles.

SWITCHING CHARACTERISTICS

The switching times of these ultra-fast rectifiers increase relatively little, with temperature or at different currents. Even in severe applications, such as catch diodes for switching regulators and output rectifiers for high frequency square wave inverters, these devices switch many times faster than the fastest associated transistors. Thus, the stresses on and powers dissipated in the switching transistors are substantially less than when using other rectifiers.

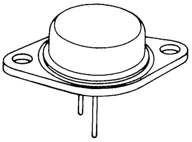
MECHANICAL SPECIFICATIONS



UES2604 **UES2605** **UES2606**
UES2604HR2 **UES2605HR2** **UES2606HR2**

	ins.	mm.
A	.875 MAX.	22.23 MAX.
B	.135 MAX.	3.43 MAX.
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.038-.043 DIA.	0.97-1.09 DIA.
F	.188 MAX. RAD.	4.78 MAX. RAD.
G	1.177-1.197	29.90-30.40
H	.655-.675	16.64-17.15
J	.205-.225	5.21-5.72
K	.420-.440	10.67-11.18
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.151-.161 DIA.	3.84-4.09 DIA.

TO-204AA (TO-3)



Note:
Standard polarity is positive output.
For reverse polarity (negative output) add suffix "R", ie. UES2604R.

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Watertown
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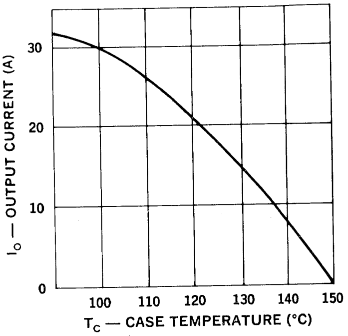
ELECTRICAL SPECIFICATIONS, PER LEG

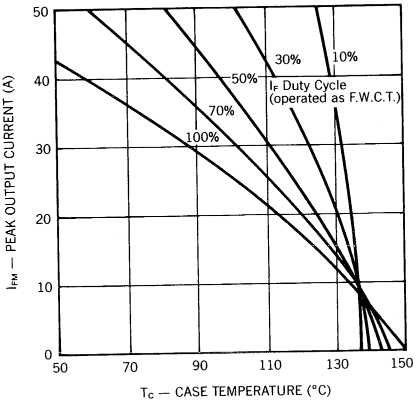
Type	PIV	Maximum Forward Voltage		Maximum Reverse Current		Maximum Reverse Recovery Time*
		$T_C = 25°C$	$T_C = 125°C$	$T_C = 25°C$	$T_C = 125°C$	
UES2604/2604HR2 UES2605/2605HR2 UES2606/2606HR2	200V 300V 400V	1.25V @ 15A $t_p = 300\mu S$	1.15V @ 15A $t_p = 300\mu S$	50μA	10mA	50nS

*Measured in circuit I_F = .5A, I_R =1A, I_{REC} = .25A

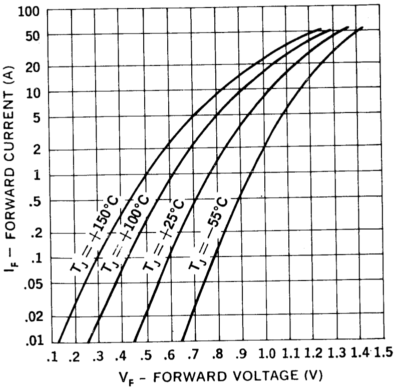
Output Current vs.
Case Temperature



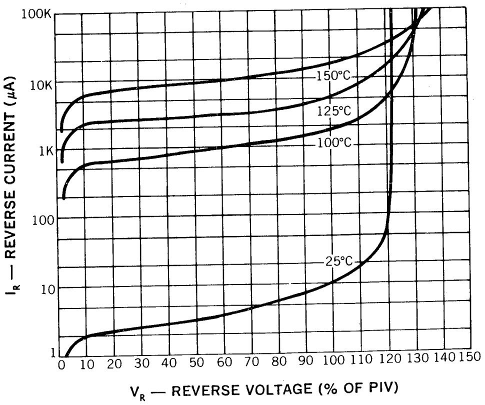
Peak Output Current vs.
Case Temperature

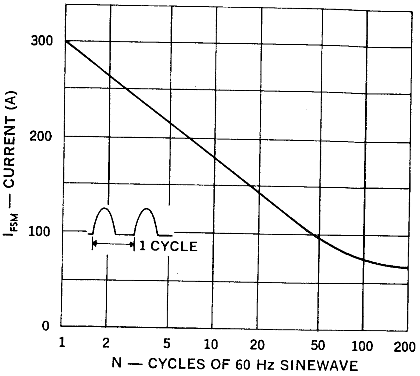


Forward Current
vs. Forward Voltage

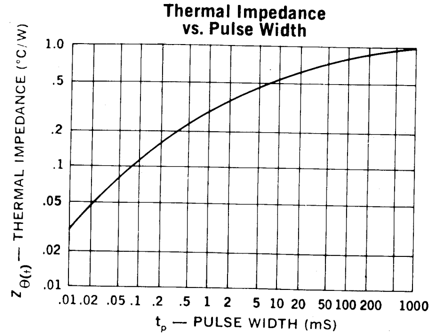


Typical Reverse Current
vs. Reverse Voltage



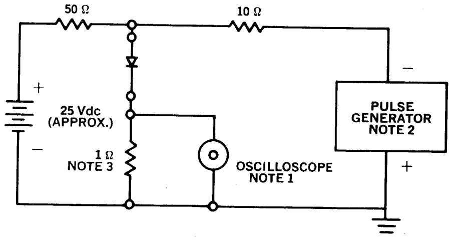


Maximum Forward Surge vs. Number of Cycles



Thermal Impedance vs. Pulse Width

Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified UES2604HR2, 5HR2, 6HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, VRW_M = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

RECTIFIERS
High Efficiency, 30A Centertap, 50-150V

UES3005C
UES3010C
UES3015C

FEATURES
- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Ultra-Fast Recovery Time
- Extremely Low V_F

DESCRIPTION
The UES3005C Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS, either leg unless noted

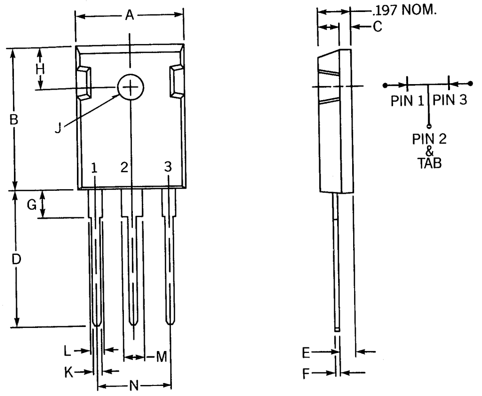
		UES3005C	UES3010C	UES3015C
Peak Inverse Voltage	V_R, V_{RWM}, V_{RRM}	50V	100V	150V
Maximum Average D.C. Output Current @ T_C = 125°C, full wave operation (see curves)	$I_{F(AV)}$	30A		
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}	300A		
Thermal Resistance Junction to Case	$R_{\theta J\text{-}C}$	1.5°C/W		
Thermal Resistance Junction to Case both legs together, full wave	$R_{\theta J\text{-}C}$	0.9°C/W		
Thermal Resistance Junction to Ambient either leg, or both legs together	$R_{\theta J\text{-}A}$	40°C/W		
Operating and Storage Temperature Range	T_{OP}, T_{STG}	−55°C to +150°C		

ELECTRICAL SPECIFICATIONS

Type	PIV	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A T_R = 14ns
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
UES3005C UES3010C UES3015C	50V 100V 150V	1.0 @ 15A 1.1 @ 30A	0.9 @ 15A 1.0 @ 30A	15μA	5mA	35ns	2.0V

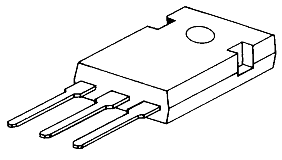
* Measured in circuit I_F = 0.50A, I_{RM} = 1.0A, I_{REC} = 0.25A.

MECHANICAL SPECIFICATIONS



DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
M	.113	.123
N	.430 Nom.	

TO-3P



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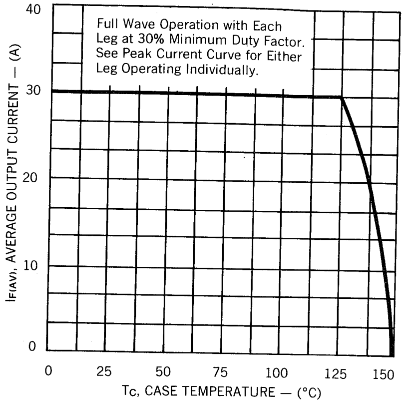
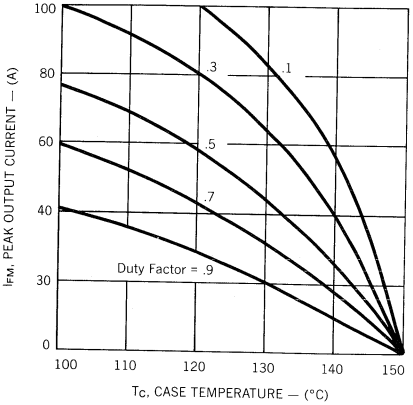
Watertown
The diode experts

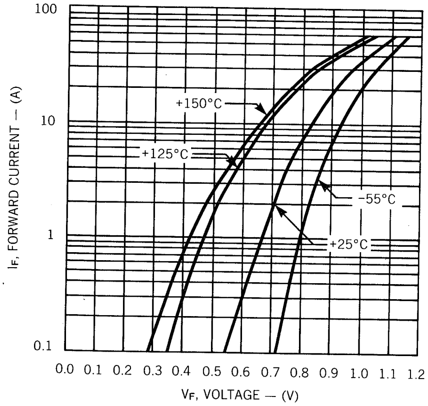
Average Output Current vs Case Temperature



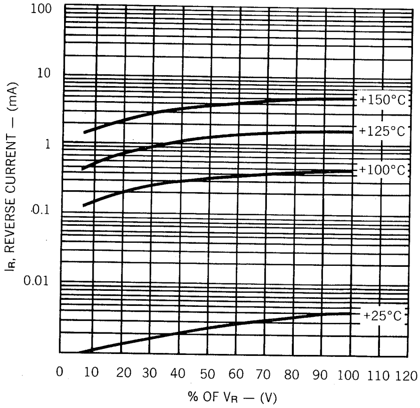
Peak Output Current vs Case Temperature (Either Leg)



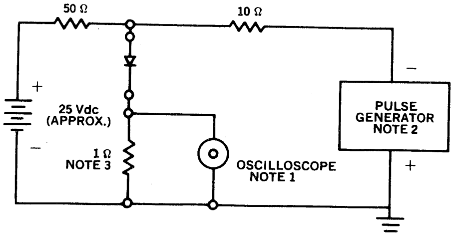
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



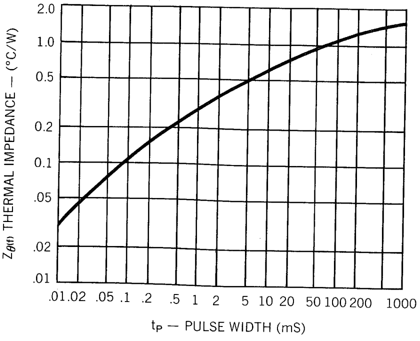
Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Thermal Impedance vs Pulse Width (Each Leg)



RECTIFIERS
High Efficiency, 30A, 50-150V

UES3005S
UES3010S
UES3015S

FEATURES

- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Ultra-Fast Recovery Time

DESCRIPTION

The UES3005S Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

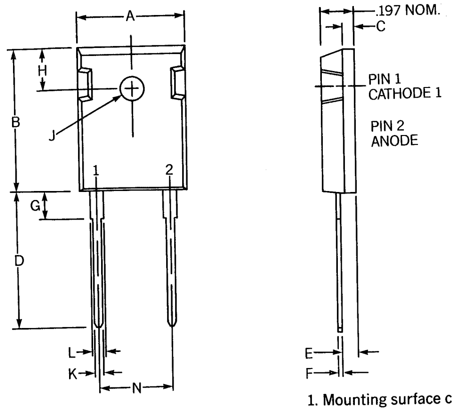
		UES3005S	**UES3010S**	**UES3015S**
Peak Inverse Voltage	V_R, V_{RWM}, V_{RRM}	50V	100V	150V
Maximum Average D.C. Output Current @ T_C = 115°C	$I_{F(AV)}$	30A		
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}	400A		
Thermal Resistance Junction to Case	$R_{\theta J\text{-}C}$	1.2°C/W		
Thermal Resistance Junction to Ambient	$R_{\theta J\text{-}A}$	40°C/W		
Operating and Storage Temperature Range	T_{OP}, T_{STG}	−55°C to +150°C		

ELECTRICAL SPECIFICATIONS

Type	PIV	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A T_R = 14ns
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
UES3005S UES3010S UES3015S	50V 100V 150V	1.1 @ 30A 1.3 @ 60A	1.0 @ 30A 1.25 @ 60A	15μA	5mA	35ns	2.0V

* Measured in circuit I_F = 0.50A, I_{RM} = 1.0A, I_{REC} = 0.25A.

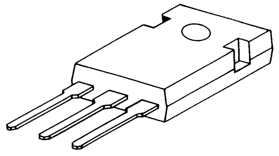
MECHANICAL SPECIFICATIONS



DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
N	.430 Nom.	

1. Mounting surface common to cathode

TO-3P



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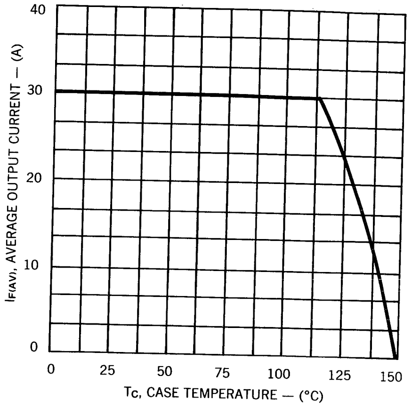
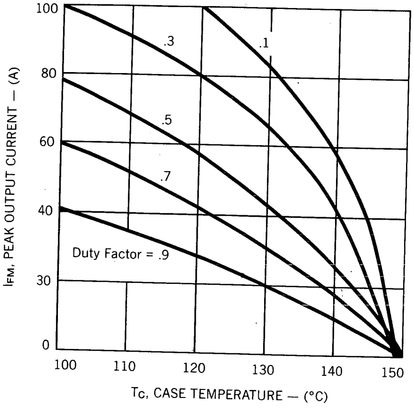
The diode experts

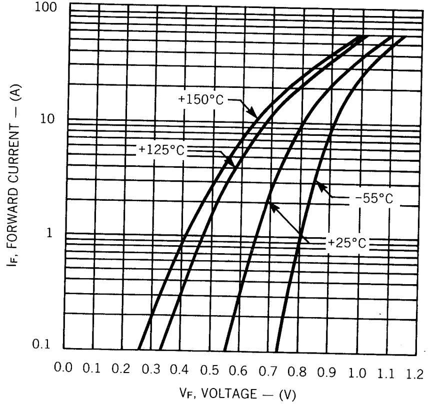
Average Output Current vs Case Temperature



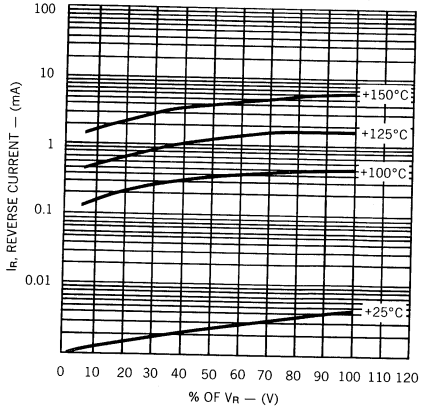
Peak Output Current vs Case Temperature



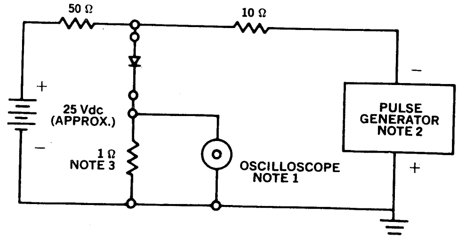
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage

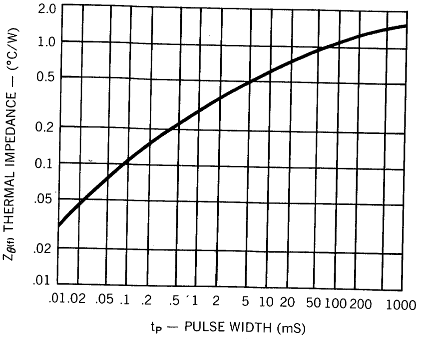


Reverse-Recovery Circuit



NOTES:
1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Thermal Impedance vs Pulse Width



RECTIFIERS
High Efficiency, 45A Centertap, 50 - 150V

UES4505C
UES4510C
UES4515C

FEATURES
- Low Forward Voltage
- Fast Recovery Times
- Economical Convenient TO-3P Package
- Low Thermal Resistance
- Mechanically Rugged
- PIV up to 150V

DESCRIPTION
The UES4505C Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

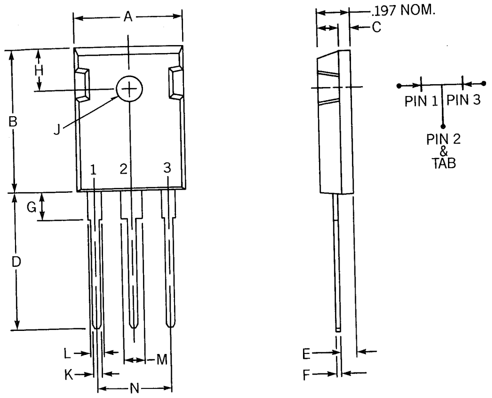
ABSOLUTE MAXIMUM RATINGS, either leg unless noted		**UES4505C**	**UES4510C**	**UES4515C**
Peak Inverse Voltage	V_R, V_{RWM}, V_{RRM}	50V	100V	150V
Maximum Average D.C. Output Current @ T_C = 125°C, full wave operation (see curves)	$I_{F(AV)}$	45A		
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}	450A		
Thermal Resistance Junction to Case	$R_{\theta J\text{-}C}$	0.8°C/W		
Thermal Resistance Junction to Case both legs together, full wave	$R_{\theta J\text{-}C}$	0.6°C/W		
Thermal Resistance Junction to Ambient either leg, or both legs together	$R_{\theta J\text{-}A}$	40°C/W		
Operating and Storage Temperature Range	T_{OP}, T_{STG}	−55°C to +150°C		

ELECTRICAL SPECIFICATIONS

Type	PIV	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A t_r = 14ns
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
UES4505C UES4510C UES4515C	50V 100V 150V	1.1 @ 45A 1.0 @ 22.5A	1.0 @ 45A .88 @ 22.5A	20μA	10mA	50ns	2.0V

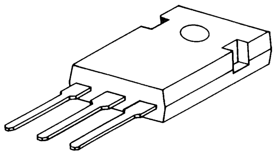
* Measured in circuit I_F = 0.50A, I_{RM} = 1.0A, I_{REC} = 0.25A.

MECHANICAL SPECIFICATIONS



DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
M	.113	.123
N	.430 Nom.	

TO-3P



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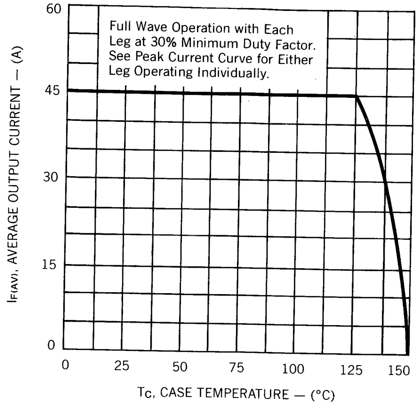
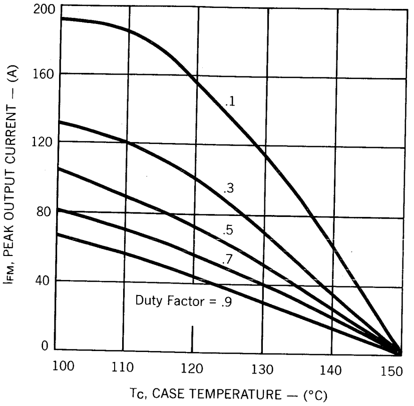
The diode experts

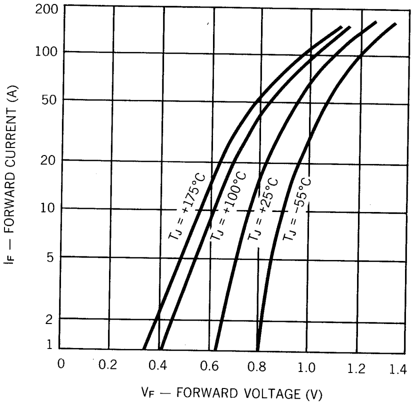
Average Output Current vs Case Temperature



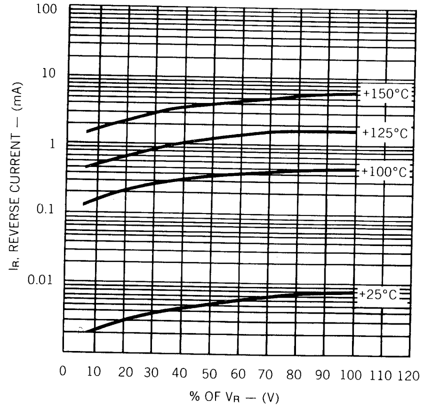
Peak Output Current vs Case Temperature (Either Leg)



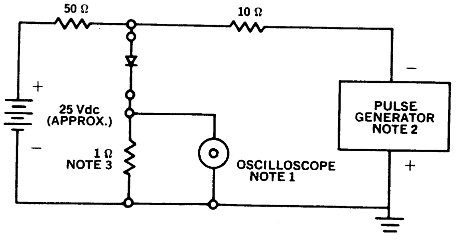
Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



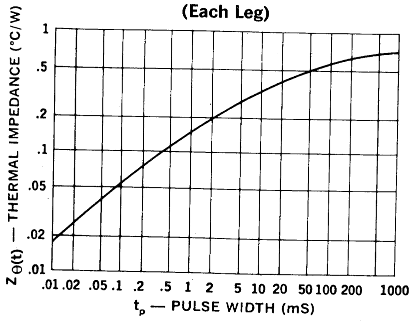
Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Thermal Impedance vs Pulse Width (Each Leg)



RECTIFIERS

High Efficiency, 45A, 50-150V

UES4505S
UES4510S
UES4515S

FEATURES

- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Ultra-Fast Recovery Time

DESCRIPTION

The UES4505S Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and very fast recovery time make them particularly suited for switching type power supplies.

ABSOLUTE MAXIMUM RATINGS

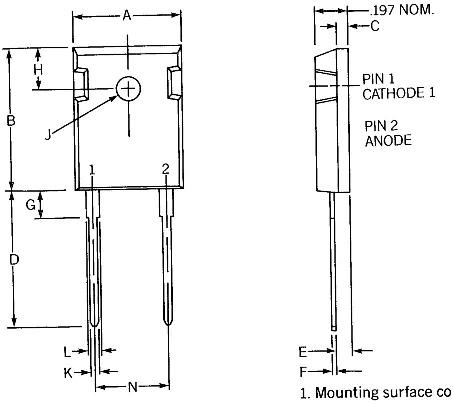
		UES4505S	UES4510S	UES4515S
Peak Inverse Voltage	V_R, V_{RWM}, V_{RRM}	50V	100V	150V
Maximum Average D.C. Output Current @ T_C = 110°C	$I_{F(AV)}$		45A	
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}		450A	
Thermal Resistance Junction to Case	$R_{\theta J-C}$		0.8°C/W	
Thermal Resistance Junction to Ambient	$R_{\theta J-A}$		40°C/W	
Operating and Storage Temperature Range	T_{OP}, T_{STG}		−55°C to +150°C	

ELECTRICAL SPECIFICATIONS

Type	PIV	Maximum Forward Volatge (V_F)		Maximum Reverse Current (I_R) @ PIV		Maximum Reverse Recovery Time*	Typical Forward Recovery Voltage @ 1A T_R = 14ns
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
UES4505S UES4510S UES4515S	50V 100V 150V	1.1 @ 45A 1.3 @ 90A	1.0 @ 45A 1.20 @ 90A	20μA	10mA	50ns	2.0V

* Measured in circuit I_F = 0.50A, I_{RM} = 1.0A, I_{REC} = 0.25A.

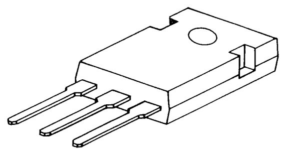
MECHANICAL SPECIFICATIONS



DIM.	INCHES MIN.	INCHES MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
N	.430 Nom.	

1. Mounting surface common to cathode

TO-3P



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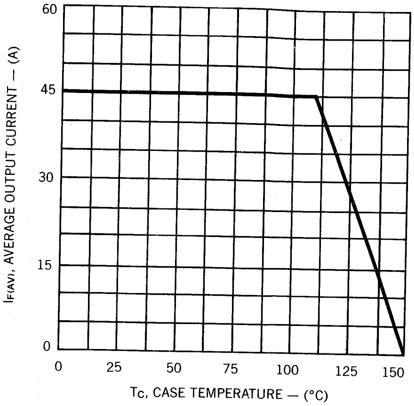
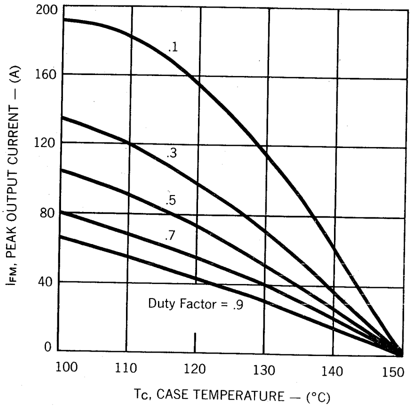
Watertown
The diode experts

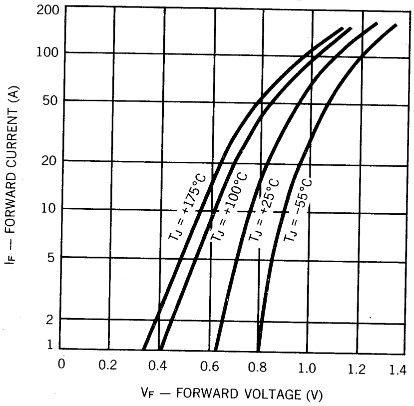
Average Output Current vs Case Temperature



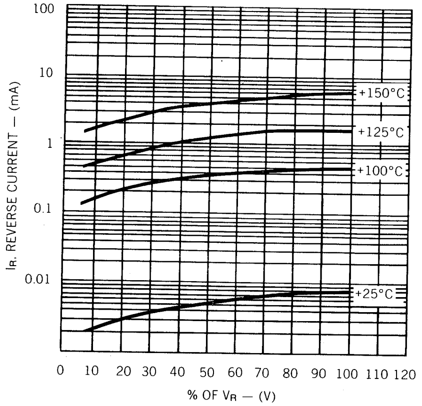
Peak Output Current vs Case Temperature



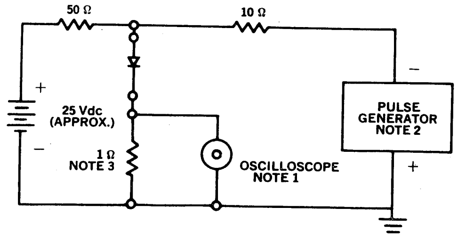
Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



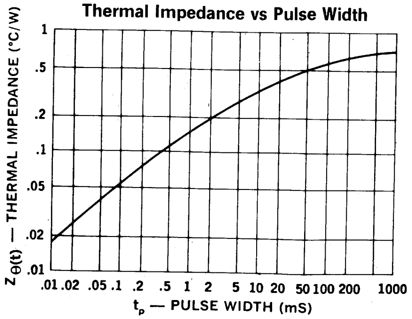
Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Thermal Impedance vs Pulse Width



RECTIFIERS
Radiation Tolerant, 1 Amp-2 Amp

UR105-UR125
UR205-UR225

FEATURES
- Radiation Tolerant: to 10^{16} NVT
- Continuous Rating: to 2A
- Controlled Avalanche
- Surge Rating: to 25A
- Miniature Package

DESCRIPTION
These devices are particularly suited to applications where radiation is present. These units have unique ability to withstand high levels of neutron, gamma and electron radiation.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	1 Amp Series	2 Amp Series
50V	UR105	UR205
100V	UR110	UR210
150V	UR115	UR215
200V	UR120	UR220
250V	UR125	UR225

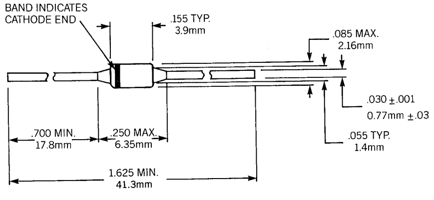
	1 AMP SERIES	2 AMP SERIES
Maximum Average D.C. Output Current		
@ $T_A = 25°C$	1A	2A
@ $T_A = 100°C$	0.5A	1A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	20A	25A
Operating Temperature Range	−195°C to +175°C	
Storage Temperature Range	−195°C to +200°C	
Thermal Resistance	See Lead Temperature Derating Curve	

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV		Maximum Radiation Tolerance
			25°C	100°C	
UR205	50V	1.0V @ 1A	3μA	50μA	10^{16} NVT
UR210	100V				10^{16}
UR215	150V				10^{15}
UR220	200V				10^{14}
UR225	250V				10^{14}
UR105	50V	1.0V @ 0.5A	3μA	50μA	10^{16}
UR110	100V				10^{16}
UR115	150V				10^{15}
UR120	200V				10^{14}
UR125	250V				10^{14}

MECHANICAL SPECIFICATIONS

UR105-UR125 UR205-UR225

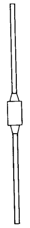


Part Identification: White band indicates "UR." Part number printed on body.

Polarity: Denoted by white band.

Weight: 0.26 grams, typical.

BODY A



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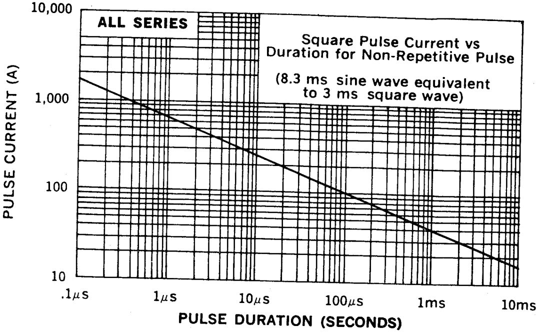
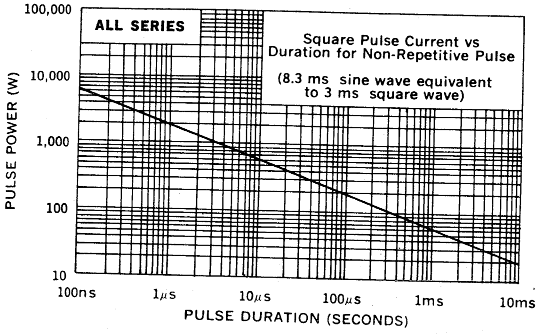
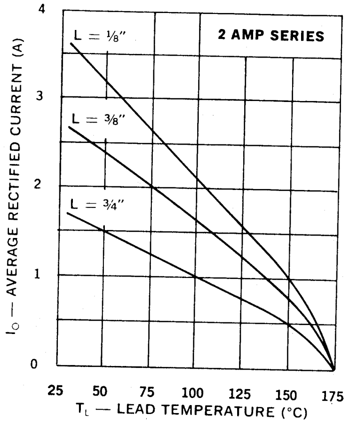


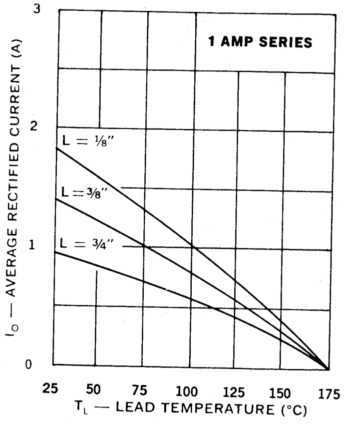
Forward Pulse Current vs Pulse Duration



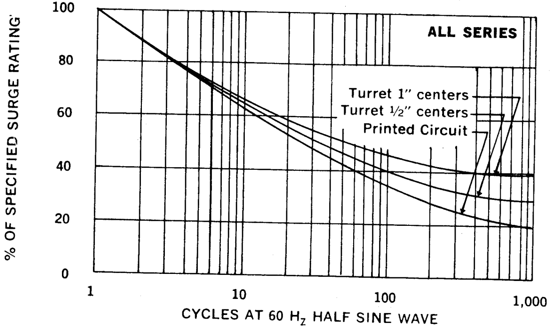
Reverse Pulse Power vs Pulse Duration



Maximum Current vs Lead Temperature



Maximum Current vs Lead Temperature



Allowable Forward Surge vs Number of Cycles

HERMETIC SCHOTTKY RECTIFIERS
6 Amp, 45 Volts

USD245C
USD245CHR2
USD245CR
USD245CRHR2

FEATURES

- MIL-S-19500 Type Screening Available
- Extremely Low V_F and I_R
- High Surge Capability
- Low Recovered Charge
- Rugged Hermetic Package, No Pressure Contacts
- Dual Rectifier in One Package
- Available in Reverse Polarity (CR)

DESCRIPTION

The USD245C series hermetic Schottky rectifier is ideally suited for output rectifiers and PWM protection in high efficiency, low voltage, high reliability switching power supplies. The series combines Schottky rectifiers in one convenient package; thus simplifying installation and reducing component parts count.

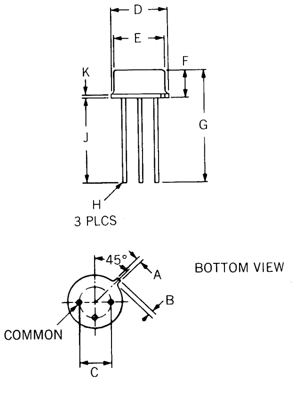
ABSOLUTE MAXIMUM RATINGS (Either leg, unless noted.)

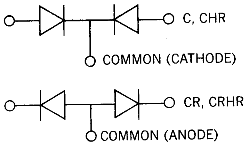
Peak Repetitive Reverse Voltage, V_{RRM} 45V
Working Peak Reverse Voltage, V_{RWM} 45V
DC Blocking Voltage, V_R 45V
Non-Repetitive Peak Reverse Voltage, V_{RSM} 54V
Average Forward Current (50% Duty Cycle), $I_{F(AV)}$, Full Wave Configuration 6A
Either Leg Alone 4A
T_{CASE} = 100°C
V_{RWM} = 45V
Average Forward Current (50% Duty Cycle), $I_{F(AV)}$ (Note 1), Either Leg Alone 2A
$R_{\theta C-A}$ = 68°C/W, T_A = 25°C
V_{RWM} = 45V
Non-Repetitive Peak Surge Current, I_{FSM} 80A
8.3ms, Half Sine Wave
Operating and Storage Junction Temperature Range, T_{OP}, T_{STA} .... −65°C to +175°C
Thermal Resistance, Junction to Ambient, $R_{\theta J-A}$ .... 175°C/W
Thermal Resistance, Junction to Case, $R_{\theta J-C}$ .... 15°C/W

Note: 1. Using Wakefield Type 205 heatsink with convection cooling.
For more definitive data refer to the Output vs Temperature curves on this data sheet.

MECHANICAL SPECIFICATIONS

USD245C SERIES

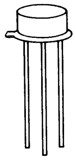




	MILLIMETERS	INCHES
A	0.72-0.86	0.028-0.034
B	0.88	0.035
C	5.08	0.20
D	9.14 DIA.	0.36 DIA.
E	8.25 DIA.	0.325 DIA.
F	4.30-4.57	0.169-0.180
G	18.03 REF.	0.71 REF.
H	0.41-0.53 DIA.	0.016-0.021 DIA.
J	12.70-14.22	0.50-0.56
K	0.36-0.45	0.014-0.018

All Dimensions in Inches and Millimeters

TO-205AF (TO-39)



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ELECTRICAL CHARACTERISTICS PER LEG (T_j = 25°C)

CHARACTERISTICS	SYMBOL	LIMIT	UNITS	CONDITIONS	
Maximum Instantaneous Reverse Current	i_R	2	mA	V_R = 45V Pulse Width = 400µs Duty Cycle = 1%	
Maximum Instantaneous Reverse Current	i_R	20	mA	V_R = 45V Pulse Width = 400µs Duty Cycle = 1% T_C = 125°C	
Maximum Instantaneous Forward Voltage (Note 1)	V_F	0.48 0.56 0.68	V	i_F = 1A i_F = 2A i_F = 4A	Pulse Width = 400µs Duty Cycle = 1%
		0.45		i_F = 2A T_j = 125°C	
Capacitance	C_T	450	pF	V_R = 5V	
Voltage Rate of Change	dv/dt	1000	V/µs	V_R = 45V	

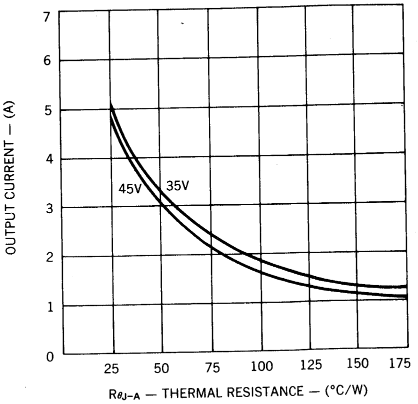
Note: 1. Measured with anode and cathode lead length of 0.2″ from case.

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

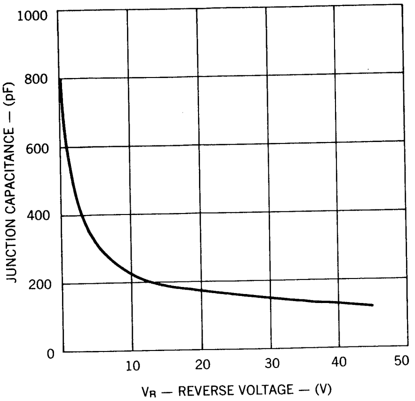
The following tests are performed on 100% of the devices specified USD245CHR2 and USD245CRHR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, VRW_M = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

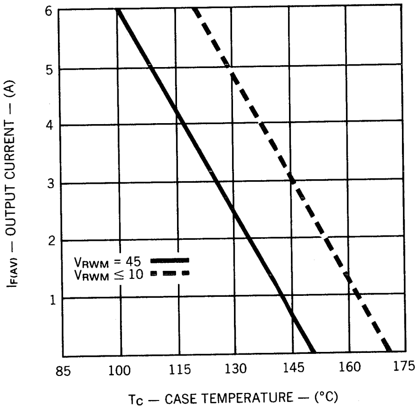
Output Current vs $R_{\theta J\text{-}A}$
$T_{ambient}$ = 25°C, 50% Duty Cycle



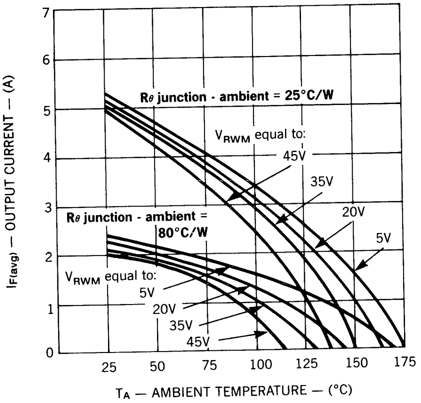
Typical Junction Capacitance vs Reverse Voltage



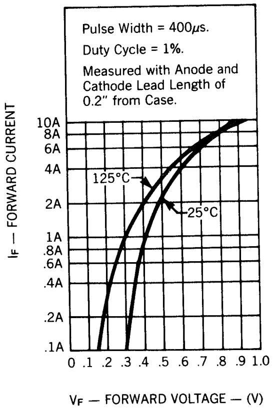
Full-Wave Output Current vs Case Temperature



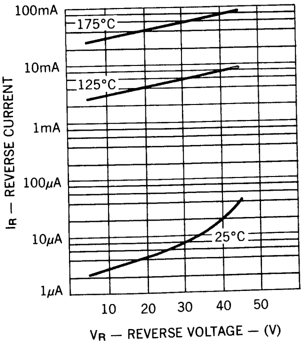
Output Current vs Ambient Temperature 50% Duty Cycle Application ($I_{F(avg)}$ and V_{RRM})



Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Reverse Voltage



NOTE: All curves, except Full-Wave Output Current, apply to either leg.

DUAL POWER SCHOTTKY RECTIFIERS

60A Pk, 45V

USD335C
USD345C
USD335CHR2
USD345CHR2

FEATURES

- Very Low Forward Voltage
- Low Recovered Charge
- Rugged Package Design (TO-3)
- High Efficiency for Low Voltage Supplies
- 45V Blocking @ Rated T_{jmax}
- 50V Repetitive Surge Voltage
- Dual Schottky Rectifier in a Single Package

DESCRIPTION

The USD320C series has two Schottky barriers arranged in a common cathode configuration and is ideally suited for a full wave output rectifier in low voltage switching power supplies.

	USD335C USD335CHR2	USD345C USD345CHR2
ABSOLUTE MAXIMUM RATINGS (Total for USD300C Series)		
Average Rectified Forward Current, I_O @ T_C = 100°C	30A	
ABSOLUTE MAXIMUM RATINGS (Per Diode)		
Working Peak Reverse Voltage V_{RWM}	35V	45V
DC Blocking Voltage, V_R	35V	45V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	54V
Average Rectified Forward Current, I_O	30A in full wave configuration*	
Non-repetitive Peak Surge current (8.3 mS), I_{FSM}	500A	
Peak Reverse Transient Current, I_{RM}	2A	
Storage Temperature Range, T_{stg}	−55°C to +200°C	
Peak Operating Junction Temperature, $T_{j\ max}$	175°C	
Thermal Resistance, Junction to Case, $R_{\theta JC}$	1.4°C/W	

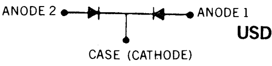
* Each Anode Pin Limited to 18A Average.
Package Capability 30A Average.

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

Characteristic	Symbol	Limit	Units	Conditions
Maximum Instantaneous Reverse Current	i_R	10 50	mA mA	T_C = 25°C, V_R = V_{RWM} T_C = 125°C Pulse Width = 400μS Duty Cycle = 1 percent
Maximum Instantaneous Forward Voltage	V_F	0.57 0.66 0.60	V V V	i_F = 10A, T_C = 25°C i_F = 20A, T_C = 25°C i_F = 20A, T_C = 125°C Pulse Width = 300μS Duty Cycle = 1 percent
Capacitance	C_t	2000	pF	V_R = 5.0V
Voltage Rate of Change	dv/dt	1000	v/μS	V_R = V_{RWM}

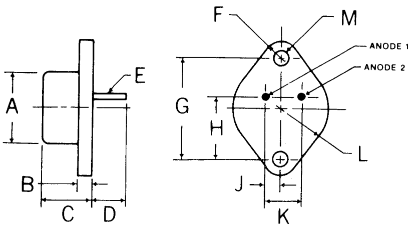
MECHANICAL SPECIFICATIONS

NOTE:
Leads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.

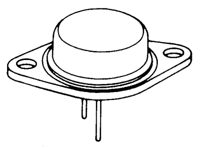


USD300C SERIES
USD300CHR2 SERIES

	ins.	mm.
A	.875 MAX.	22.23 MAX.
B	.135 MAX.	3.43 MAX.
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.038-.043 DIA.	0.97-1.09 DIA.
F	.188 MAX. RAD.	4.78 MAX. RAD.
G	1.177-1.197	29.90-30.40
H	.655-.675	16.64-17.15
J	.205-.225	5.21-5.72
K	.420-.440	10.67-11.18
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.151-.161 DIA.	3.84-4.09 DIA.



TO-204AA (TO-3)



Notes: All metal surfaces tin plated.

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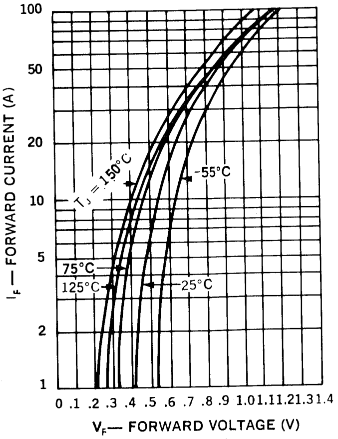
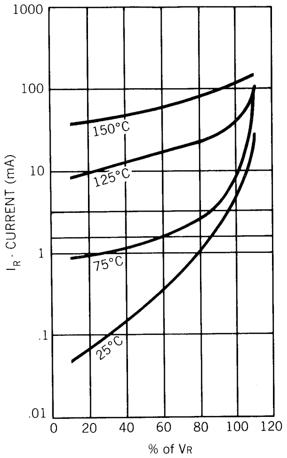
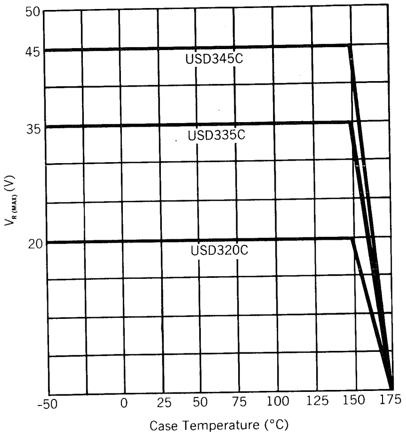
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs. Reverse Voltage



$V_{R(MAX)}$ Rating vs. Case Temperature



OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified USD335CHR2, 345CHR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 150°C
2. Temperature Cycle	1051	F, 20 Cycles, −55 to +150°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes
3. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 H, Helium C, Liquid
4. Thermal Impedance		Sage Test
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. High Temperature Reverse Blocking	Similar to Method 1040	½ Sine Reverse, t = 48 Hours, T_C = 125°C, VRW_M = rating, F = 50-60 Hz, I_O = OA
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

POWER SCHOTTKY RECTIFIERS

150 Amp Pk, Up to 50V

USD520
USD535
USD545
USD550

FEATURES

- Very Low Forward Voltage (0.6V at 60A, 125°C)
- Low Recovered Charge
- Rugged Package Design (DO-5)
- High Efficiency for Low Voltage Supplies
- Low Thermal Resistance (0.8°C/W)
- High Surge Current (1000A)
- Low Reverse Current (<50mA at rated v_R at 125°C)
- Available with Flexible Top Lead

DESCRIPTION

This series of Schottky barrier power rectifiers is ideally suited for output rectifiers and catch diodes in low voltage power supplies. The Unitrode high conductivity design, using a heavy copper top post and 4 point crimp, ensures cool thermal operation and low dynamic impedance. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

ABSOLUTE MAXIMUM RATINGS

	USD520	USD535	USD545	USD550
Working Peak Reverse Voltage, V_{RWM}	20V	35V	45V	50V
DC Blocking Voltage, V_R	20V	35V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	24V	42V	54V	60V

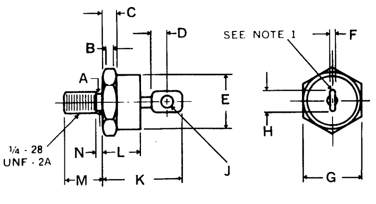
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20KHz, 50 percent Duty Cycle), I_{FRM} .... 150A (at T_c = 115°C)
Average Rectified Forward Current, $I_{F(AV)}$ .... 75A (at T_c = 115°C)
Non-repetitive Peak Surge Current (8.3mS), I_{FSM} 1000A
Peak Reverse Transient Current, I_{RM} 2A
Storage Temperature Range, T_{stg} .... −55° to +200°C
Operating Junction Temperature, T_j .... +175°C
Thermal Resistance Junction-to-Case, $R_{\theta JC}$ .... 0.8°C/W

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

Characteristic	Symbol	Limit		Units	Conditions
		USD520-545	USD550		
Maximum Instantaneous Reverse Current	i_R	20 (50)	20 (75)	mA	$V_R = V_{RWM}$ (T_C = 125°C) Pulse Width = 300μs, Duty Cycle = 1 percent
Maximum Instantaneous Forward Voltage	V_F	0.50 0.68 0.60		V V V	i_F = 10A, T_C = 25°C i_F = 60A, T_C = 25°C i_F = 60A, T_C = 125°C
Flexible Top Lead Option	V_F	(0.63)		V	i_F = 60A, (T_C = 125°C)
Maximum Capacitance	C_t	4000		pF	V_R = 5.0V
Maximum Voltage Rate of Change	dv/dt	1000		V/μS	V_R = rated

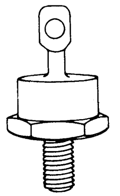
MECHANICAL SPECIFICATIONS

USD520
USD535
USD545
USD550



	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5



Notes:
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 30 inch pounds (35 kg. cm).
4. Angular orientation of terminal is undefined.

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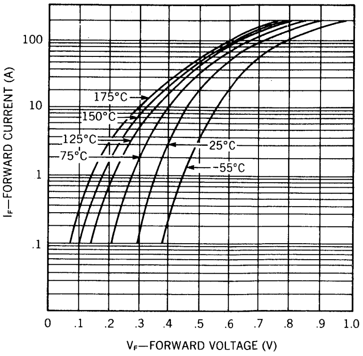
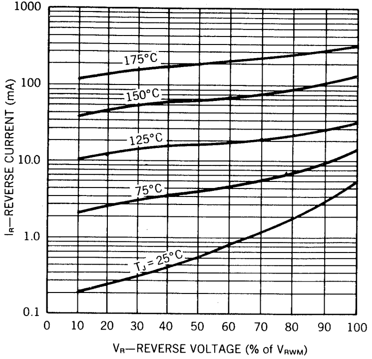
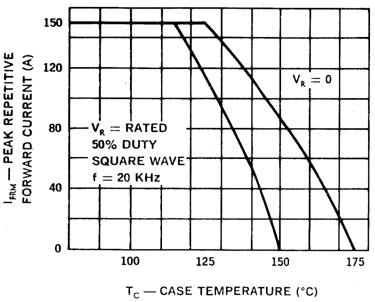
Typical Forward Current vs Forward Voltage



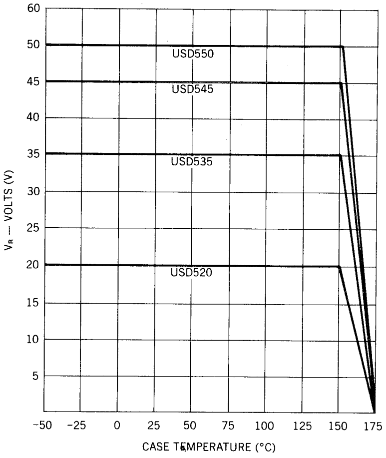
Typical Reverse Current vs Reverse Voltage



Maximum Current vs Case Temperature



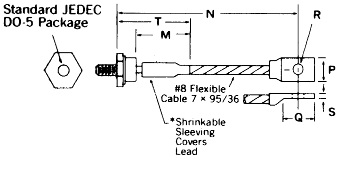
$V_{R(MAX)}$ Rating vs Case Temperature



MECHANICAL SPECIFICATIONS

FLEXIBLE TOP LEAD (OPTIONAL)
Add an "F" Suffix to Part Number.

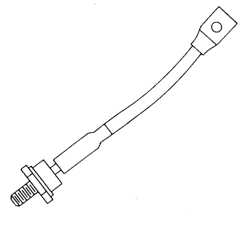
USD520F
USD535F
USD545F
USD550F



	INCHES	MILLIMETERS
M	.718 MAX.	18.24 MAX.
N	4.50 ± .250	114.3 ± 6.35
P	.525 MAX.	13.23 MAX.
Q	.675 ± .035	17.15 ± 0.89
R	.205 ± .005	5.21 ± 0.13
S	.075 ± .010	1.91 ± 0.25
T	1.125 MAX.	28.58 MAX.

*To 125°C (Ambient)

DO-5 with Flexible Lead



Note: Consult Factory for Non-standard Lead Lengths.

POWER SCHOTTKY RECTIFIERS
12A Pk, up to 50V

USD635
USD640
USD645
USD650

FEATURES

- Very Low Forward Voltage
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Working Voltage @ Rated $T_{j(max)}$

DESCRIPTION

The USD600 series of Schottky power rectifiers is ideally suited for output rectifiers and catch diodes in high frequency low voltage power supplies.

ABSOLUTE MAXIMUM RATINGS

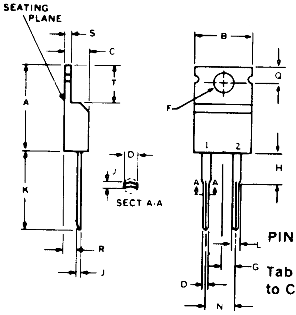
	USD635	USD640	USD645	USD650
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, $I_{F\ (AV)}$	6A			
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 KHz, 50% Duty Cycle, @ T_C = 115°C), I_{FRM}	12A			
Non-repetitive Peak Surge Current (8.3ms), I_{FSM}	150A			
Peak Reverse Transient Current, I_{RM}	1A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{Stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	3.0°C/W			

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	5	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent
Maximum Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.55 0.65	V	i_F = 6A i_F = 12A
		0.48 0.60	V	i_F = 6A i_F = 12A } T_C = 125°C
Capacitance	C_t	1000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μs	$V_R = V_{RWM}$

MECHANICAL SPECIFICATIONS

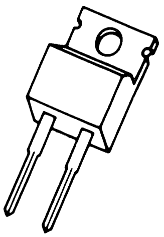
USD600 SERIES



PIN 1. Cathode
2. Anode
Tab is connected to Cathode.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AC



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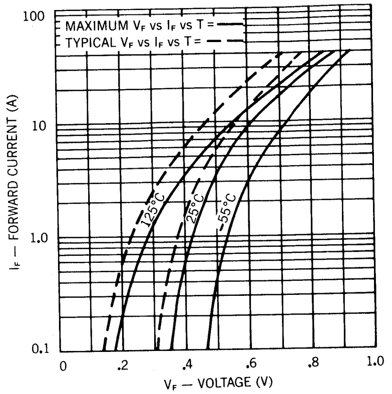
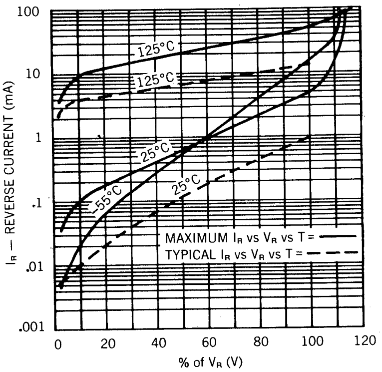
Watertown
The diode experts

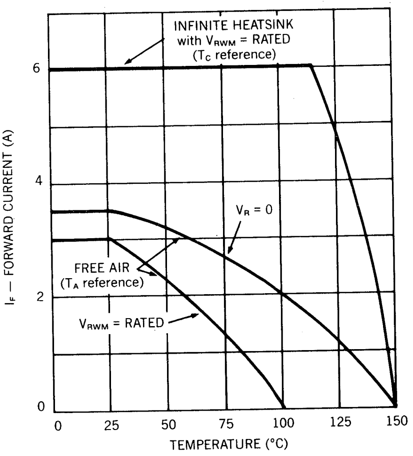
Forward Current vs. Forward Voltage



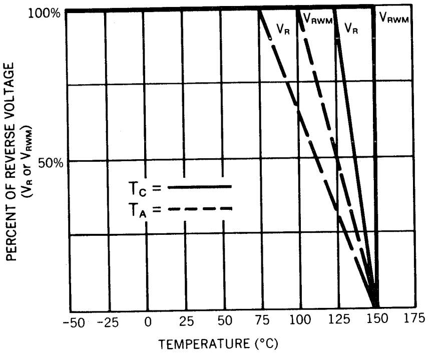
Reverse Current vs. Voltage



Average Forward Current vs. Temperature



V_R Rating vs. Temperature



DUAL POWER SCHOTTKY RECTIFIERS

12A Av, up to 50V

USD635C
USD640C
USD645C
USD650C

FEATURES

- Very Low Forward Voltage
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Working Voltage @ Rated $T_{j(max)}$

DESCRIPTION

The USD600C series of power Schottky rectifiers, in the industry standard TO-220 package, is specifically designed for operation in power switching circuits to frequencies in excess of 100 KHz. The series combines Schottky rectifiers in one convenient package; thus, simplifying installation, reducing heatsink requirements and component parts count.

ABSOLUTE MAXIMUM RATINGS (Per Diode Unless Otherwise Noted)

	USD635C	USD640C	USD645C	USD650C
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, I_O*	12A			
Non-repetitive Peak Surge Current (8.3ms), I_{FSM}	150A			
Peak Reverse Transient Current, I_{RM}	1A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	3.0°C/W			

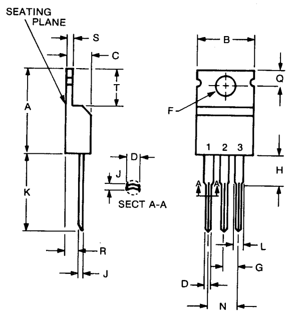
*Full Wave Center-Tap; $I_{O\ (AV)}$ 20 KHz Square Wave

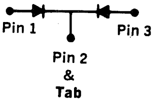
ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C) (Per Diode)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	5	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent
Maximum Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.55 0.65	V	i_F = 6A i_F = 12A
		0.48 0.60	V	i_F = 6A } T_C = 125°C i_F = 12A }
Capacitance	C_t	1000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μs	$V_R = V_{RWM}$

MECHANICAL SPECIFICATIONS

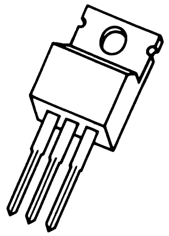
USD600C SERIES



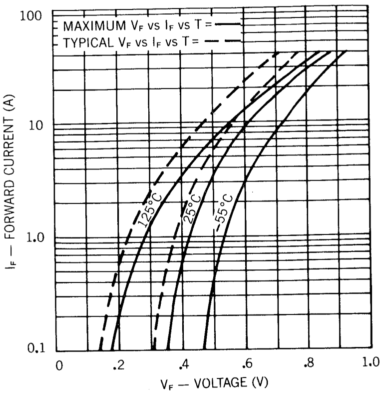


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

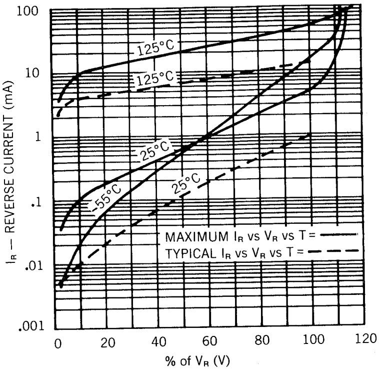
TO-220AB



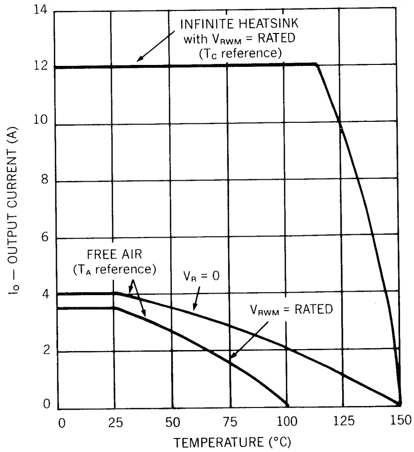
Forward Current vs. Forward Voltage



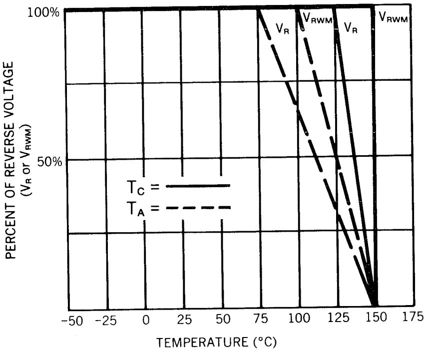
Reverse Current vs. Voltage



Average Output Current vs. Temperature



V_R Rating vs. Temperature



POWER SCHOTTKY RECTIFIERS
16A Pk, up to 50V

USD735
USD740
USD745
USD750

FEATURES
- Very Low Forward Voltage
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Working Voltage @ Rated $T_{j(max)}$

DESCRIPTION
The USD700 series of Schottky power rectifiers is ideally suited for output rectifiers and catch diodes in high frequency low voltage power supplies.

ABSOLUTE MAXIMUM RATINGS

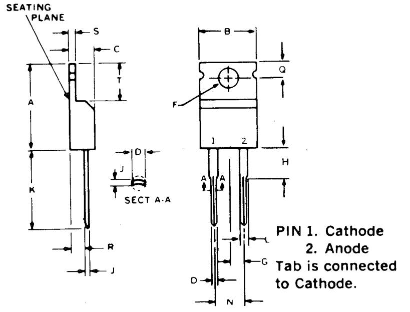
	USD735	USD740	USD745	USD750
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, $I_{F\ (AV)}$	8A			
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 KHz, 50% Duty Cycle, @ T_C = 115°C), I_{FRM}	16A			
Non-repetitive Peak Surge Current (8.3ms), I_{FSM}	200A			
Peak Reverse Transient Current, I_{RM}	1A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.8°C/W			

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	5	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent
Maximum Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.55 0.65	V	i_F = 8A i_F = 16A
		0.48 0.60	V	i_F = 8A } i_F = 16A } T_C = 125°C
Capacitance	C_t	1000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μs	$V_R = V_{RWM}$

MECHANICAL SPECIFICATIONS

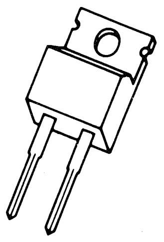
USD700 SERIES



PIN 1. Cathode
2. Anode
Tab is connected to Cathode.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AC



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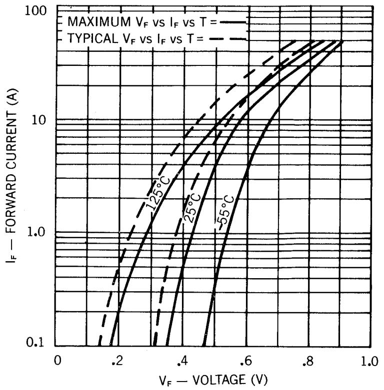
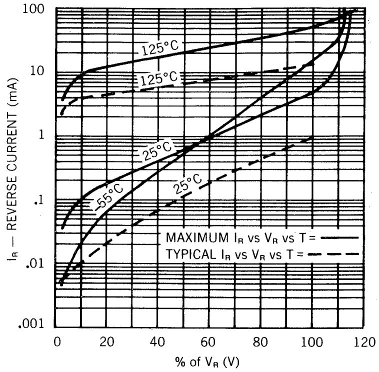
The diode experts

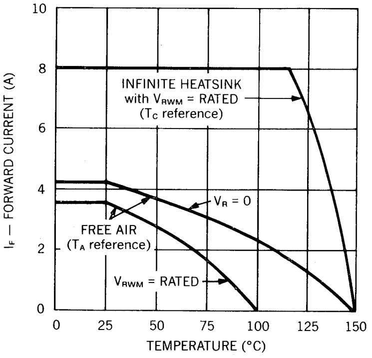
Forward Current vs. Forward Voltage



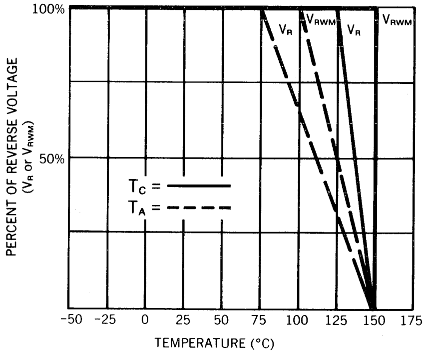
Reverse Current vs. Voltage



Average Forward Current vs. Temperature



V_R Rating vs. Temperature



DUAL POWER SCHOTTKY RECTIFIERS

16A Av, up to 50V

USD735C
USD740C
USD745C
USD750C

FEATURES

- Very Low Forward Voltage
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Working Voltage @ Rated $T_{j(max)}$

DESCRIPTION

The USD700C series of power Schottky rectifiers, in the industry standard TO-220 package, is specifically designed for operation in power switching circuits to frequencies in excess of 100 KHz. The series combines Schottky rectifiers in one convenient package; thus, simplifying installation, reducing heatsink requirements and component parts count.

ABSOLUTE MAXIMUM RATINGS (Per Diode Unless Otherwise Noted)

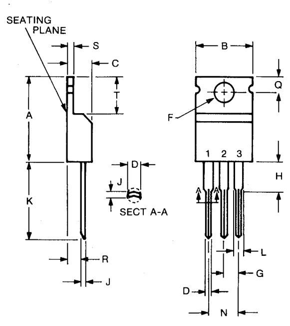
	USD735C	USD740C	USD745C	USD750C
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, I_o*	16A			
Non-repetitive Peak Surge Current (8.3ms), I_{FSM}	200A			
Peak Reverse Transient Current, I_{RM}	1A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.8°C/W			

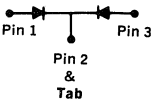
*Full Wave Center-Tap; $I_{O\ (AV)}$ 20KHz Square Wave

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C) (Per Diode)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	5	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent
Maximum Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μs Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.55 0.65	V	i_F = 8A i_F = 16A
		0.48 0.60	V	i_F = 8A i_F = 16A } T_C = 125°C
Capacitance	C_t	1000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μs	$V_R = V_{RWM}$

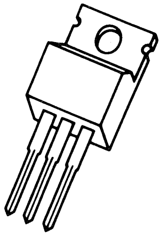
MECHANICAL SPECIFICATIONS





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AB



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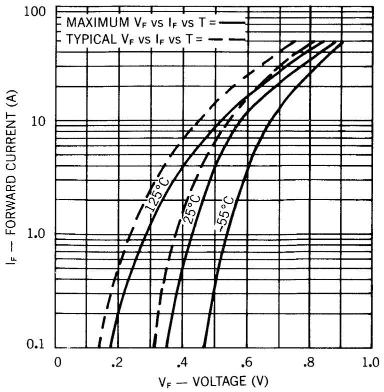
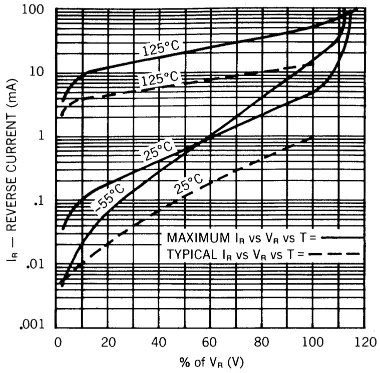
Watertown
The diode experts

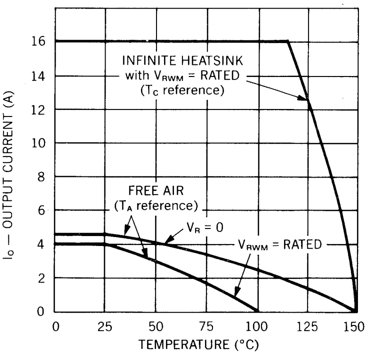
Forward Current vs. Forward Voltage



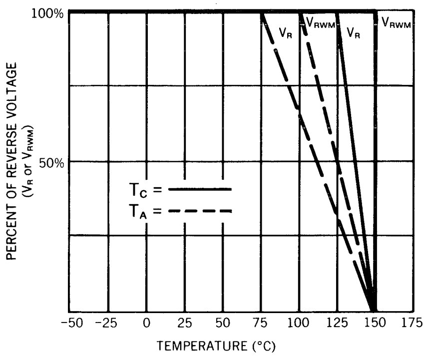
Reverse Current vs. Voltage



Average Output Current vs. Temperature



V_R Rating vs. Temperature



POWER SCHOTTKY RECTIFIERS

24A Pk, up to 50V

USD835
USD840
USD845
USD850

FEATURES

- Very Low Forward Voltage (0.45V max @ 12A)
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Blocking Voltage @ Rated T_{jmax}

DESCRIPTION

The USD800 series of Schottky barrier power rectifiers is ideally suited for output rectifiers and catch diodes in low voltage power supplies.

ABSOLUTE MAXIMUM RATINGS

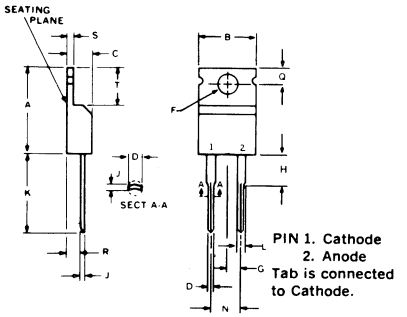
	USD835	USD840	USD845	USD850
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, I_O	12A			
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20KHz, 50% Duty Cycle, @ T_C = 115°C), I_{FRM}	24A			
Non-repetitive Peak Surge Current (8.3mS), I_{FSM}	200A			
Peak Reverse Transient Current, I_{RM}	1A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{Stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, $R_{\theta JC}$	2.4°C/W			

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	20	mA	$V_R = V_{RWM}$ Pulse Width = 400μS Duty Cycle = 1 percent
Typical Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μS Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.59	V	i_F = 12A
		0.51	V	i_F =12A T_C = 125°C
Capacitance	C_t	2000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μS	$V_R = V_{RWM}$

MECHANICAL SPECIFICATIONS

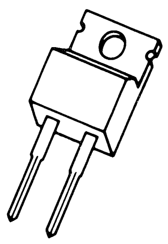
USD800 SERIES



PIN 1. Cathode
2. Anode
Tab is connected to Cathode.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AC



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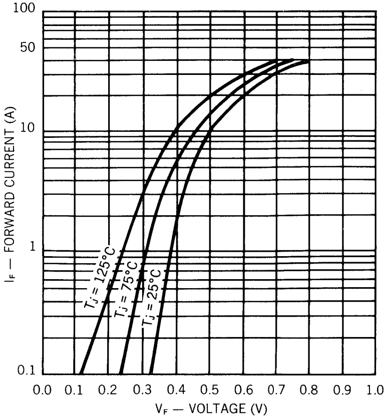
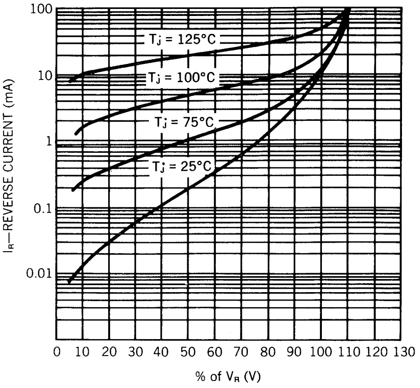
Watertown
The diode experts

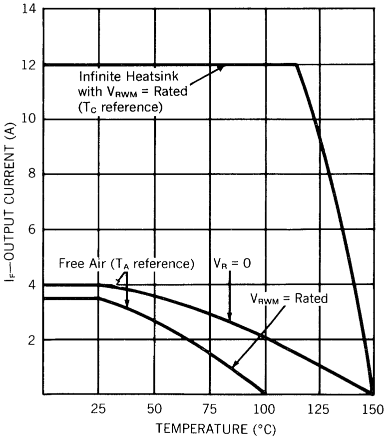
Typical Forward Current vs. Forward Voltage



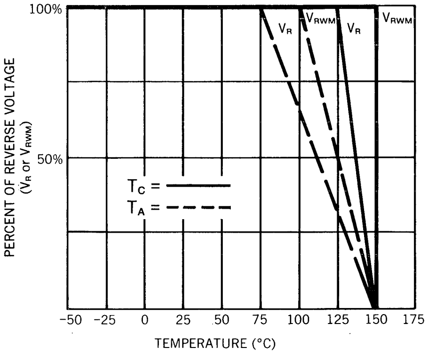
Typical Reverse Current vs. Voltage



Output Current vs. Temperature



V_R Rating vs. Temperature



POWER SCHOTTKY RECTIFIERS
32A Pk, up to 50V

USD935
USD940
USD945
USD950

FEATURES

- Very Low Forward Voltage (0.5V max @ 16A)
- Reverse Transient Capability
- Economical Convenient Plastic Package
- Mechanically Rugged
- 50V Blocking Voltage @ Rated T_{jmax}

DESCRIPTION

The USD900 series of Schottky barrier power rectifiers is ideally suited for output rectifiers and catch diodes in low voltage power supplies.

ABSOLUTE MAXIMUM RATINGS

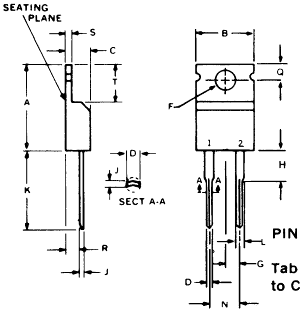
	USD935	USD940	USD945	USD950
Working Peak Reverse Voltage, V_{RWM}	35V	40V	45V	50V
DC Blocking Voltage, V_R	35V	40V	45V	50V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	42V	48V	54V	60V
Average Rectified Forward Current @ T_C = 115°C, I_O	16A			
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20KHz, 50% Duty Cycle, @ T_C = 115°C), I_{FRM}	32A			
Non-repetitive Peak Surge Current (8.3mS), I_{FSM}	250A			
Peak Reverse Transient Current, I_{RM}	2A			
Operating Junction Temperature, T_j	150°C			
Storage Temperature Range, T_{Stg}	−55°C to +150°C			
Thermal Resistance, Junction to Case, R_{JC}	2°C/W			

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C)

CHARACTERISTIC	SYMBOL	LIMIT	UNITS	CONDITIONS
Maximum Instantaneous Reverse Current	i_R	20	mA	$V_R = V_{RWM}$ Pulse Width = 400μS Duty Cycle = 1 percent
Typical Instantaneous Reverse Current	i_R	50	mA	$V_R = V_{RWM}$ Pulse Width = 400μS Duty Cycle = 1 percent T_C = 125°C
Maximum Instantaneous Forward Voltage	V_F	0.6	V	i_F = 16A
		0.53	V	i_F =16A T_C = 125°C
Capacitance	C_t	2000	pF	V_R = 5V
Voltage Rate of Change	dv/dt	1000	V/μS	$V_R = V_{RWM}$

MECHANICAL SPECIFICATIONS

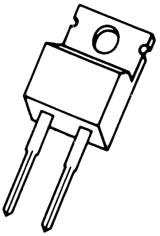
USD900 SERIES



PIN 1. Cathode
2. Anode
Tab is connected to Cathode.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.531	3.733	0.139	0.147
G	2.29	2.79	0.090	0.110
H	—	6.35	—	0.250
J	0.38	0.64	0.015	0.025
K	12.70	14.27	0.500	0.562
L	1.14	1.77	0.045	0.070
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.92	0.080	0.115
S	1.14	1.39	0.045	0.055
T	5.85	6.85	0.230	0.270

TO-220AC



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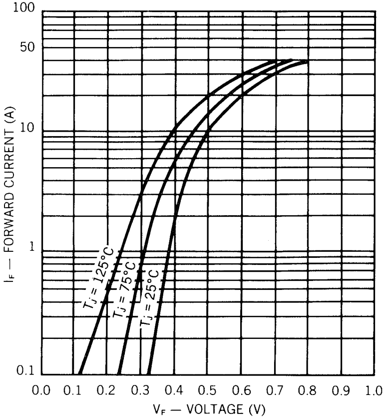
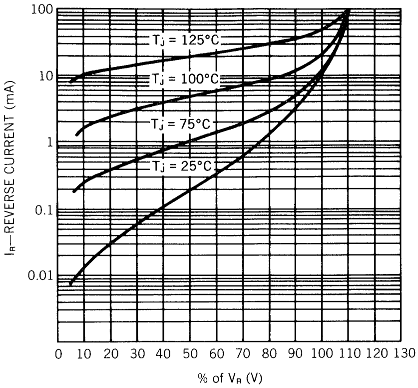
Watertown
The diode experts

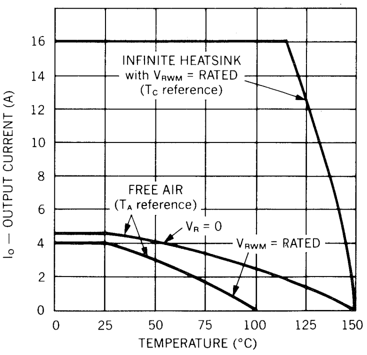
Typical Forward Current vs. Forward Voltage



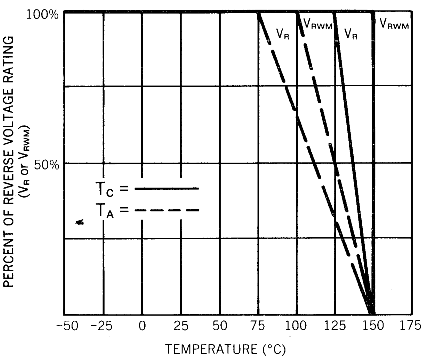
Typical Reverse Current vs. Voltage



Output Current vs. Temperature



V_R Rating vs. Temperature



POWER SCHOTTKY RECTIFIERS
30A Av, Up to 45V

USD3030C
USD3040C
USD3045C

FEATURES
- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Extremely Low V_F

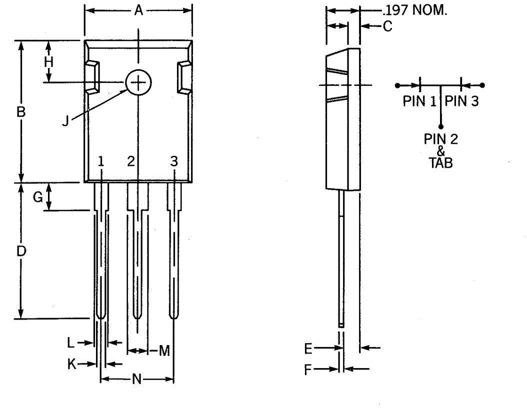
DESCRIPTION
The USD3030C Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and low recovered charge translates to extremely high efficiency making them particularly suited for low voltage switching type power supplies.

ABSOLUTE MAXIMUM RATINGS, either leg unless noted		**USD3030C**	**USD3040C**	**USD3045C**
Working Peak Inverse Voltage	V_{RWM}, V_{RRM}	30V	40V	45V
D.C. Blocking Voltage	V_R	30V	40V	45V
Peak Repetitive Surge Voltage	V_{RSM} @ I_{RM}	36V	48V	54V
Maximum Average D.C. Output Current @ T_C = 125°C, full wave operation (see curves)	$I_{F(AV)}$		30A	
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}		400A	
Peak Reverse Transient Current	I_{RM}		2A	
Thermal Resistance Junction to Case	$R_{\theta J-C}$		1.4°C/W	
Thermal Resistance Junction to Case both legs together, full wave	$R_{\theta J-C}$		0.85°C/W	
Thermal Resistance Junction to Ambient either leg, or both legs together	$R_{\theta J-A}$		40°C/W	
Operating and Storage Temperature Range	T_{OP}, T_{STG}		−55°C to +150°C	

ELECTRICAL SPECIFICATIONS

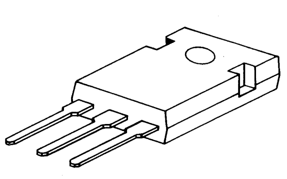
Type	V_{RWM}	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ V_{RWM}		Maximum Capacitance C_T at V_R = 5.0V	Voltage Rate of Change (dv/dt)
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
USD3030C USD3040C USD3045C	30V 40V 45V	.61 @ 15A .75 @ 30A	.55 @ 15A .71 @ 30A	20mA	50mA	2000pF	1000V/μs

MECHANICAL SPECIFICATIONS



DIM.	INCHES MIN.	INCHES MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
M	.113	.123
N	.430 Nom.	

TO-3P



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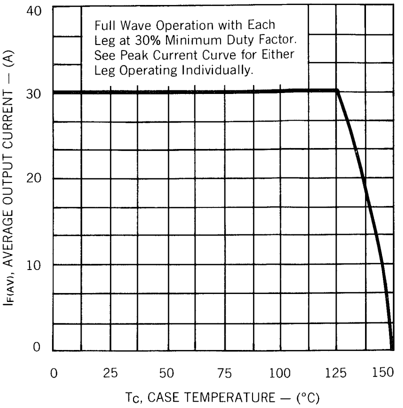
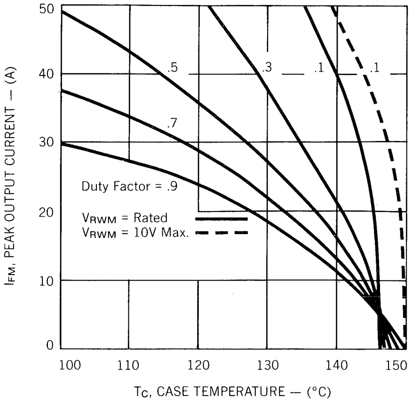
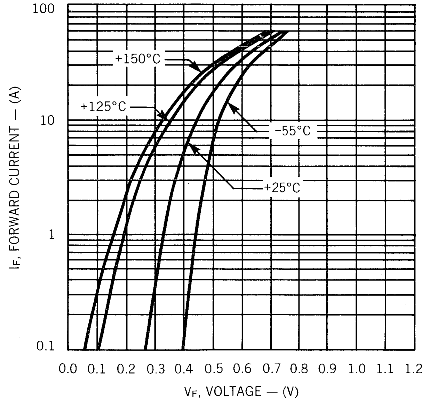
Watertown
The diode experts



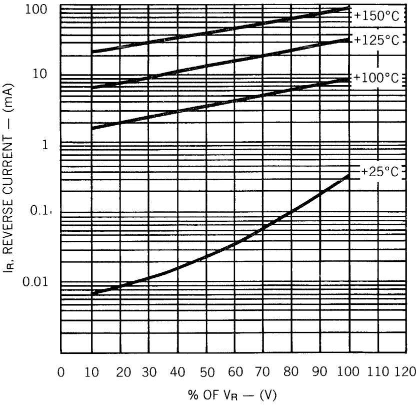
Average Output Current vs Case Temperature



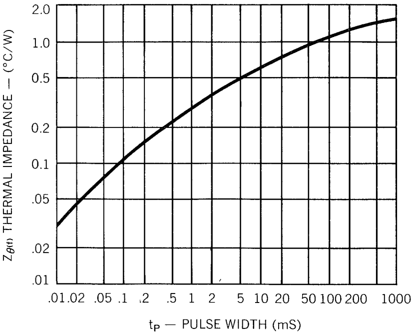
Peak Output Current vs Case Temperature (Either Leg)



Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



Thermal Impedance vs Pulse Width (Each Leg)

POWER SCHOTTKY RECTIFIERS
60A Pk, Up to 45V

USD3030S
USD3040S
USD3045S

FEATURES
- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Extremely Low V_F

DESCRIPTION
The USD3030S Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and low recovered charge translates to extremely high efficiency making them particularly suited for low voltage switching type power supplies.

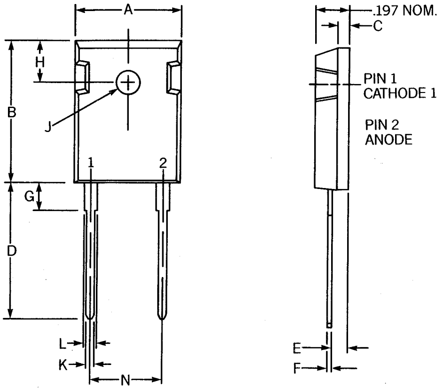
ABSOLUTE MAXIMUM RATINGS

		USD3030S	USD3040S	USD3045S
Working Peak Reverse Voltage	V_{RWM}	30V	40V	45V
D.C. Blocking Voltage	V_R	30V	40V	45V
Peak Repetitive Surge Voltage	V_{RSM} @ I_{RM}	36V	48V	54V
Maximum Average D.C. Output Current @ T_C = 115°C	$I_{F(AV)}$		30A	
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}		450A	
Peak Reverse Transient Current	I_{RM}		2A	
Thermal Resistance Junction to Case	$R_{\theta J-C}$		1.5°C/W	
Thermal Resistance Junction to Ambient	$R_{\theta J-A}$		40°C/W	
Operating and Storage Temperature Range	T_{OP}, T_{STG}		−55°C to +150°C	

ELECTRICAL SPECIFICATIONS

Type	V_{RWM}	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ V_{RWM}		Maximum Capacitance C_T at V_R = 5.0V	Voltage Rate of Change (dv/dt)
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
USD3030S USD3040S USD3045S	30V 40V 45V	.75 @ 30A .93 @ 60A	.70 @ 30A .85 @ 60A	20mA	50mA	2000pF	1000V/μs

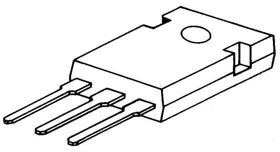
MECHANICAL SPECIFICATIONS



DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
N	.430 Nom.	

1. Mounting surface common to cathode

TO-3P



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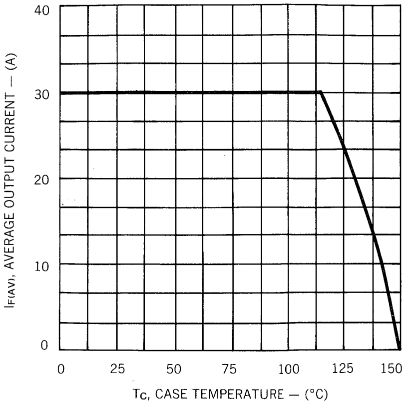
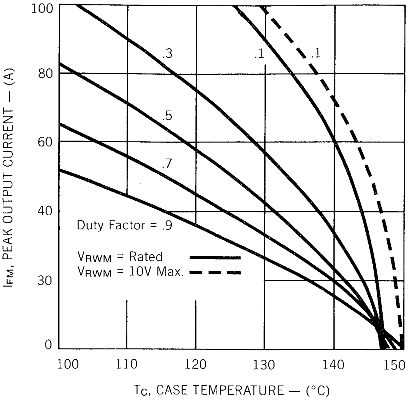
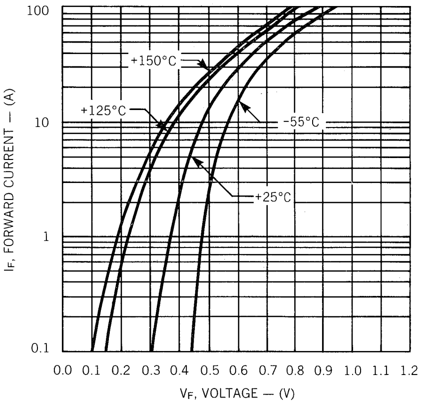
The diode experts



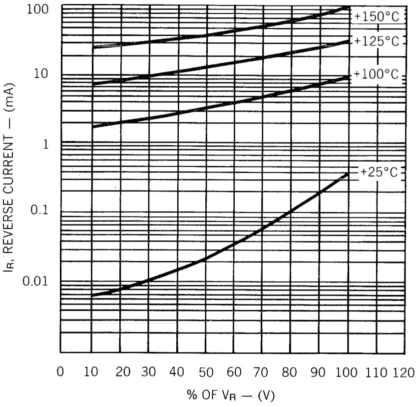
Average Output Current vs Case Temperature



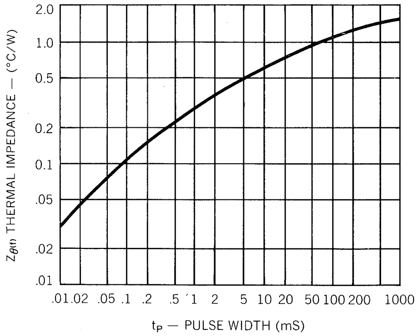
Peak Output Current vs Case Temperature



Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



Thermal Impedance vs Pulse Width

POWER SCHOTTKY RECTIFIERS

45A Av, Up to 45V

USD4530C
USD4540C
USD4545C

FEATURES

- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Extremely Low V_F

DESCRIPTION

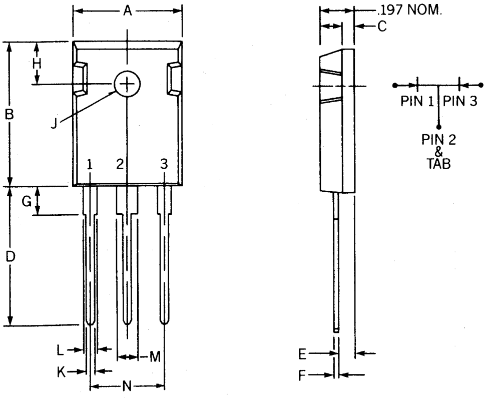
The USD4530C Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and low recovered charge translates to extremely high efficiency making them particularly suited for low voltage switching type power supplies.

ABSOLUTE MAXIMUM RATINGS, either leg unless noted		**USD4530C**	**USD4540C**	**USD4545C**
Working Peak Inverse Voltage	V_{RWM}, V_{RRM}	30V	40V	45V
D.C. Blocking Voltage	V_R	30V	40V	45V
Peak Repetitive Surge Voltage	V_{RSM} @ I_{RM}	36V	48V	54V
Maximum Average D.C. Output Current @ T_C = 125°C, full wave operation (see curves)	$I_{F(AV)}$		45A	
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}		450A	
Peak Reverse Transient Current	I_{RM}		2A	
Thermal Resistance Junction to Case	$R_{\theta J\text{-}C}$		1.0°C/W	
Thermal Resistance Junction to Case; both legs together, full wave	$R_{\theta J\text{-}C}$		0.7°C/W	
Thermal Resistance Junction to Ambient either leg, or both legs together	$R_{\theta J\text{-}A}$		40°C/W	
Operating and Storage Temperature Range	T_{OP}, T_{STG}		−55°C to +150°C	

ELECTRICAL SPECIFICATIONS

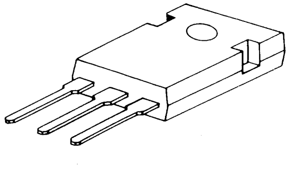
Type	V_{RWM}	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ V_{RWM}		Maximum Capacitance C_T at V_R = 5.0V	Voltage Rate of Change (dv/dt)
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
USD4530C USD4540C USD4545C	30V 40V 45V	.63 @ 23A .73 @ 45A	.60 @ 23A .70 @ 45A	20mA	75mA	4000pF	1000V/μs

MECHANICAL SPECIFICATIONS



DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222.
J	.140	.144
K	.042	.052
L	.074	.084
M	.113	.123
N	.430 Nom.	

TO-3P



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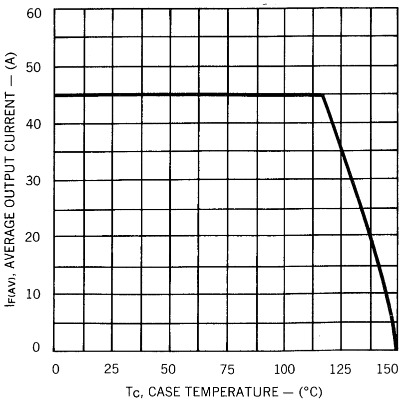
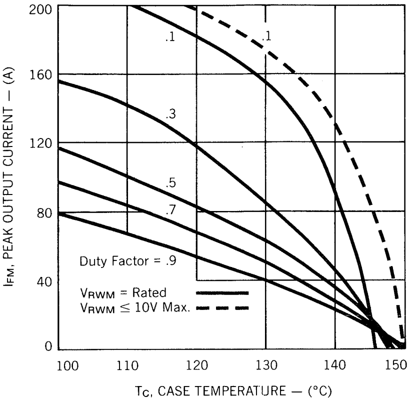
Watertown
The diode experts

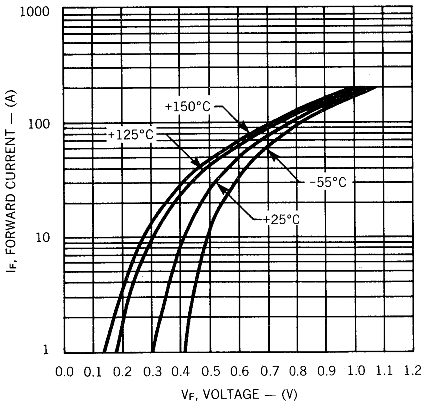
Average Output Current vs Case Temperature



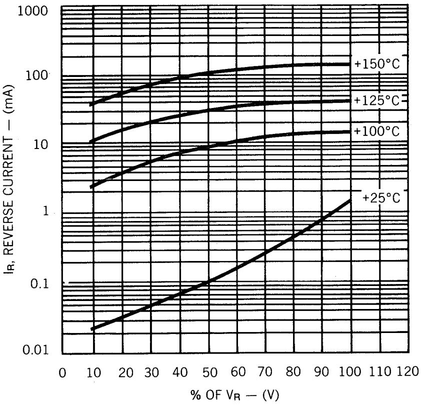
Peak Output Current vs Case Temperature



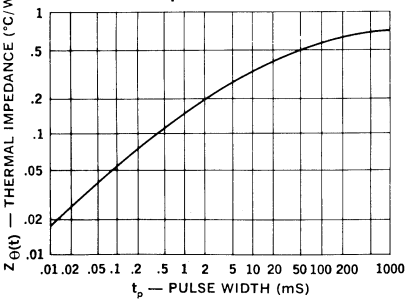
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



Thermal Impedance vs Pulse Width



POWER SCHOTTKY RECTIFIERS

90A Pk, Up to 45V

USD4530S
USD4540S
USD4545S

FEATURES

- Economical Convenient TO-3P Package
- Insulated Mounting Hole
- Can Be Clip Mounted
- Mechanically Rugged
- Low Thermal Resistance
- Extremely Low V_F

DESCRIPTION

The USD4530S Series, in the economical, convenient TO-3P package, is specifically designed for operation in power switching circuits to frequencies in excess of 100kHz. The very low forward voltage and low recovered charge translates to extremely high efficiency making them particularly suited for low voltage switching type power supplies.

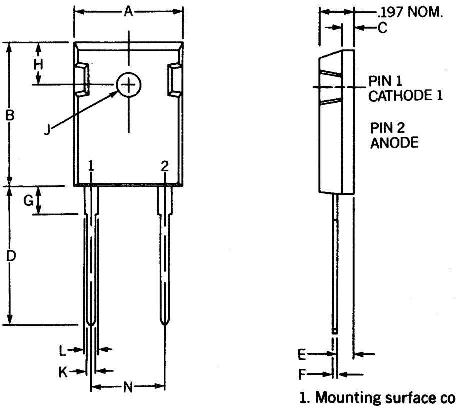
ABSOLUTE MAXIMUM RATINGS

		USD4530S	USD4540S	USD4545S
Working Peak Reverse Voltage	V_{RWM}	30V	40V	45V
D.C. Blocking Voltage	V_R	30V	40V	45V
Peak Repetitive Surge Voltage	V_{RSM} @ I_{RM}	36V	48V	54V
Maximum Average D.C. Output Current @ T_C = 115°C	$I_{F(AV)}$	45A		
Non-Repetitive Sinusoidal Surge Current, 8.3mS	I_{FSM}	450A		
Peak Reverse Transient Current	I_{RM}	2A		
Thermal Resistance Junction to Case	$R_{\theta J-C}$	.8°C/W		
Thermal Resistance Junction to Ambient	$R_{\theta J-A}$	40°C/W		
Operating and Storage Temperature Range	T_{OP}, T_{STG}	−55°C to +150°C		

ELECTRICAL SPECIFICATIONS

Type	V_{RWM}	Maximum Forward Voltage (V_F)		Maximum Reverse Current (I_R) @ V_{RWM}		Maximum Capacitance C_T at V_R = 5.0V	Voltage Rate of Change (dv/dt)
		T_J = 25°C	T_J = 125°C	T_J = 25°C	T_J = 125°C		
USD4530S USD4540S USD4545S	30V 40V 45V	.73 @ 45A 1.00 @ 90A	.70 @ 45A .95 @ 90A	20mA	75mA	4000pF	1000V/μs

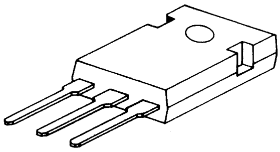
MECHANICAL SPECIFICATIONS



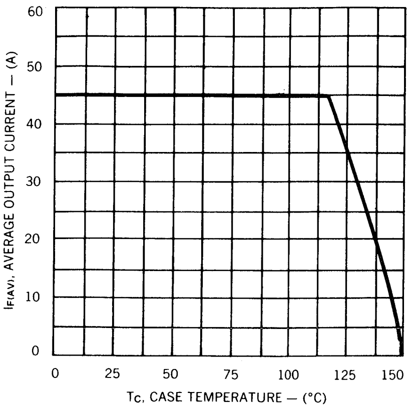
DIM.	INCHES	
	MIN.	MAX.
A	.620	.640
B	.825	.845
C	.060	.080
D	.780	.800
E	.087	.102
F	.019	.029
G	.150	.170
H	.212	.222
J	.140	.144
K	.042	.052
L	.074	.084
N	.430 Nom.	

1. Mounting surface common to cathode

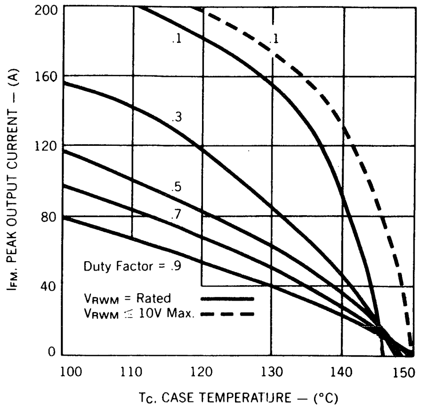
TO-3P



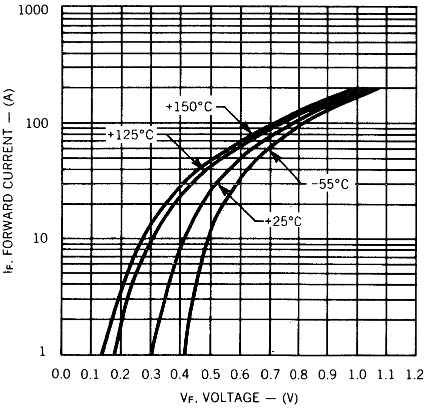
Average Output Current vs Case Temperature



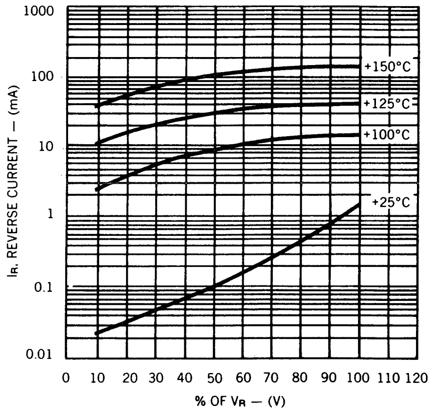
Peak Output Current vs Case Temperature



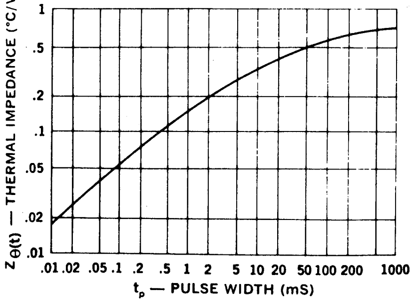
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs Voltage



Thermal Impedance vs Pulse Width



POWER SCHOTTKY RECTIFIERS

150 Amp Pk, Up to 25V

USD7520
USD7525

FEATURES

- **Extremely Low Forward Voltage (0.425V at 60A, 125°C)**
- High Efficiency for Low Voltage Supplies (3V types)
- Low Recovered Charge
- Rugged Package Design (DO-5)
- Low Thermal Resistance (0.7°C/W)
- High Surge Current (1000A)
- Low Reverse Current (150mA at Rated V_R at 125°C)

DESCRIPTION

This series of Schottky barrier power rectifiers is specifically designed to be used as output rectifiers and catch diodes for 3V power supplies. The Unitrode high conductivity design, using a heavy copper top post and 4 point crimp, ensures cool thermal operation and low dynamic impedance. Rugged design absorbs stress that can damage glass-to-metal seal during installation and use.

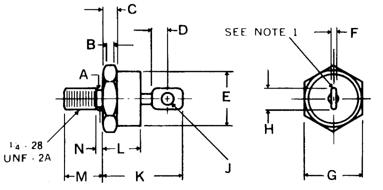
ABSOLUTE MAXIMUM RATINGS

ABSOLUTE MAXIMUM RATINGS	USD7520	USD7525
Working Peak Reverse Voltage, V_{RWM}	20V	25V
DC Blocking Voltage, V_R	20V	25V
Peak Repetitive Surge Voltage, V_{RSM} @ I_{RM}	24V	30V
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20kHz, 50% Duty Cycle), I_{FRM} (T_C = 130°C)	150A	
Average Rectified Forward Current, $I_{F(AV)}$ (T_C = 130°C)	75A	
Non-Repetitive Peak Surge Current (8.3mS), I_{FSM}	1000A	
Peak Reverse Transient Current, I_{RM}	2A	
Storage Temperature Range, T_{Stg}	−55°C to +200°C	
Operating Junction Temperature, T_J	+175°C	
Thermal Resistance Junction-to-Case, $R_{\theta JC}$	0.7°C/W	

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C unless noted.)

CHARACTERISTICS	SYMBOL	LIMIT		UNITS	CONDITIONS
		20V	25V		
Maximum Instantaneous Reverse Current	i_R	20 (100)	20 (150)	mA	$V_R = V_{RWM}$ (T_C = 125°C) Pulse Width = 300μS Duty Cycle = 1 percent
Maximum Instananeous Forward Voltage	V_F	0.425 0.450 0.550		V V V	i_F = 60A, T_C = 125°C i_F = 75A, T_C = 125°C i_F = 150A, T_C = 125°C
Maximum Capacitance	Ct	5000		pF	V_R = 5.0V
Maximum Voltage Rate of Change	dv/dt	1000		V/μS	V_R = rated

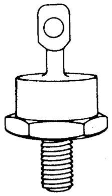
MECHANICAL SPECIFICATIONS



USD7520
USD7525

	ins.	mm
A	.225 ± .005	5.72 ± 0.13
B	.060 MIN.	1.52 MIN.
C	.156 ± .020	3.96 ± 0.51
D	.156 MIN. FLAT	3.96 MIN. FLAT
E	.667 DIA. MAX.	16.94 DIA. MAX.
F	.090 MAX.	2.29 MAX.
G	.677 ± .010	17.20 ± 0.25
H	.375 MAX.	9.53 MAX.
J	.140 MIN. DIA.	3.56 MIN. DIA.
K	1.000 MAX.	25.40 MAX.
L	.450 MAX.	11.43 MAX.
M	.438 ± .015	11.13 ± 0.38
N	.078 MAX.	1.98 MAX.

DO-5

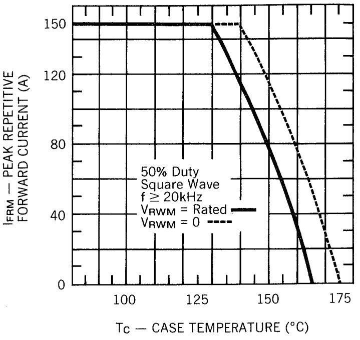


Notes:

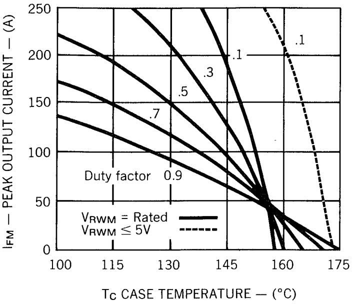
1. Cathode is stud.
2. All metal surfaces tin plated.
3. Maximum unlubricated stud torque: 30 inch pounds (35 kg. cm).
4. Angular orientation of terminal is undefined.

9/86

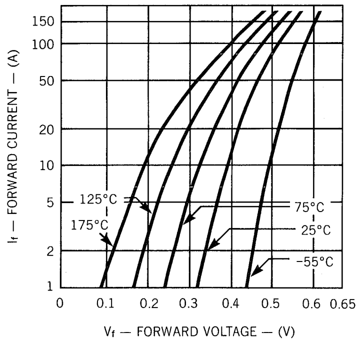
Maximum Current vs Case Temperature



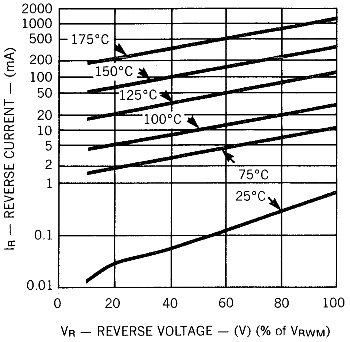
Peak Output Current vs Case Temperature



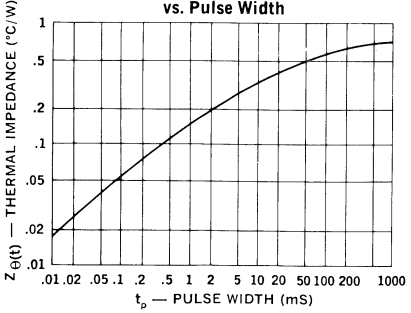
Typical Forward Current vs Forward Voltage



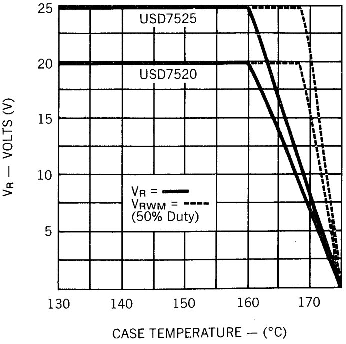
Typical Reverse Current vs Reverse Voltage



Thermal Impedance vs. Pulse Width



Maximum Reverse Voltage vs Case Temperature



RECTIFIERS
Standard Recovery, 1 Amp to 2 Amp

UT236-UT347
UT249-UT363
UT251-UT364
UT261-UT268

FEATURES
- Continuous Rating: to 2A
- Controlled Avalanche
- Surge Rating: to 30A
- PIV: to 1000V
- Miniature Package

DESCRIPTION
These miniature power rectifiers offer the user extreme reliability for high-rel military supplies.

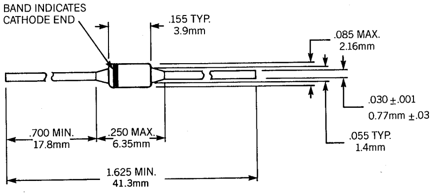
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	1 Amp Series	1.25 Amp Series	1.5 Amp Series	2 Amp Series
100V	UT236	UT249	UT251	UT261
200V	UT234	UT242	UT252	UT262
400V	UT235	UT244	UT254	UT264
500V	UT237	UT245	UT255	UT265
600V	UT238	UT247	UT257	UT267
800V	UT361	UT362	UT258	UT268
1000V	UT347	UT363	UT364	

	1 AMP SERIES	1.25 AMP SERIES	1.5 AMP SERIES	2 AMP SERIES
Maximum Average D.C. Output Current				
@ T$_A$ = 25°C	1.0A	1.25A	1.5A	2.0A
@ T$_A$ = 100°C	0.5A	0.65A	0.75A	1.0A
Non-Repetitive Sinuosoidal Surge (8.3ms)	20A	20A	25A	30A
Operating Temperature Range	—195°C to +175°C			
Storage Temperature Range	—195°C to +175°C			
Thermal Resistance	See lead temperature derating curve			

MECHANICAL SPECIFICATIONS

UT236-UT347 UT249-UT363 UT251-UT364 UT261-UT268

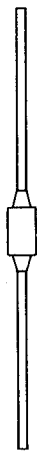


Part Identification: Orange band indicates "UT." Part number printed on body.

Polarity: Denoted by orange band.

Weight: 0.26 grams, typical.

BODY A



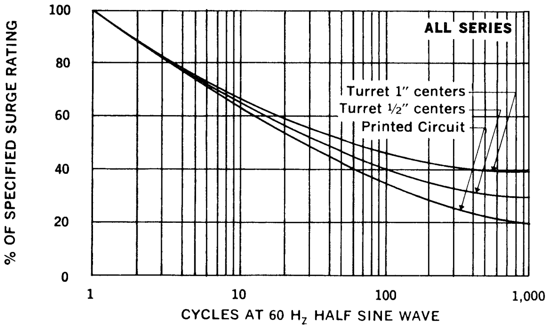
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

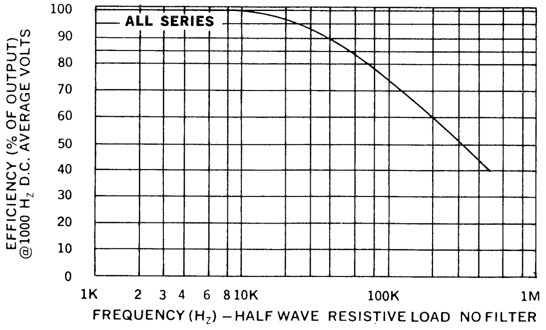
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV	
			25°C	100°C
UT261	100V	1V @ 900mA	2μA	75μA
UT262	200V			
UT264	400V			
UT265	500V			
UT267	600V			
UT268	800V			
UT251	100V	1V @ 750mA	2μA	75μA
UT252	200V			
UT254	400V			
UT255	500V			
UT257	600V			
UT258	800V			
UT364	1000V			
UT249	100V	1V @ 500mA	2μA	75μA
UT242	200V			
UT244	400V			
UT245	500V			
UT247	600V			
UT362	800V			
UT363	1000V			
UT236	100V	1V @ 400mA	2μA	75μA
UT234	200V			
UT235	400V			
UT237	500V			
UT238	600V			
UT361	800V			
UT347	1000V			

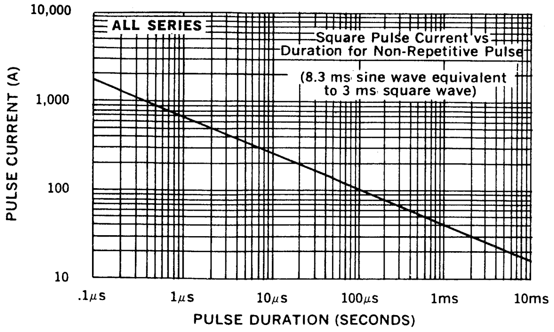
Allowable Forward Surge vs Number of Cycles



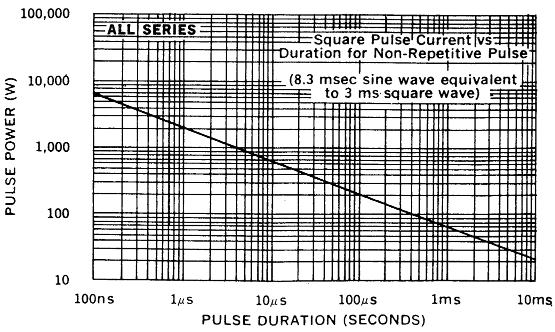
Efficiency vs Frequency at Rated Current (Sine Wave)



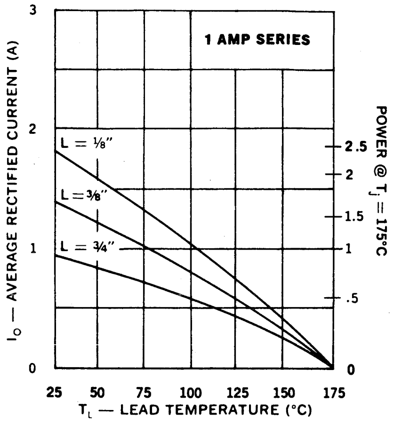
Forward Pulse Current vs Pulse Duration



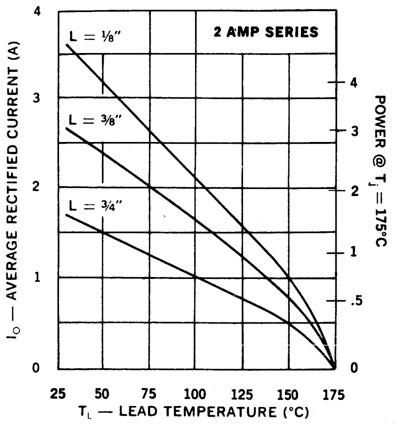
Reverse Pulse Power vs Pulse Duration



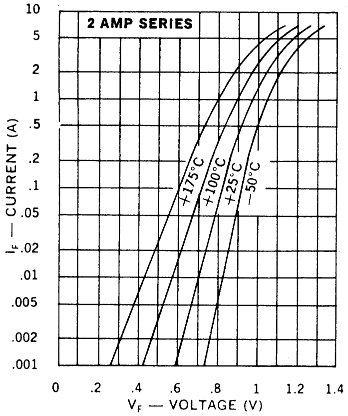
Maximum Current vs Lead Temperature



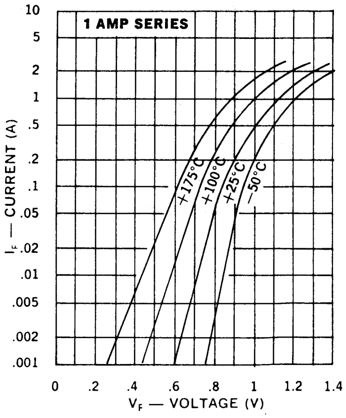
Maximum Current vs Lead Temperature



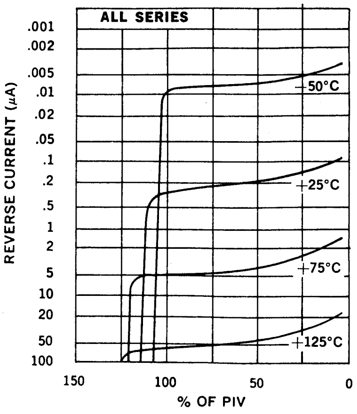
Typical Forward Current vs Forward Voltage



Typical Forward Current vs Forward Voltage



Typical Leakage Current vs. PIV



RECTIFIERS

Standard Recovery, 2 Amp to 4 Amp

UT2005-UT2060
UT3005-UT3060
UT4005-UT4060

FEATURES

- Continuous Rating: to 4A
- Controlled Avalanche
- Surge Rating: to 100A
- PIV: to 600 V
- Miniature Package

DESCRIPTION

High average power and surge capability make these series of devices attractive in many high-rel applications.

All Unitrode rectifiers have a sleeve of pure hard glass fused to the silicon junction. Since the silicon sees only this glass, electrical characteristics are permanently stable. This voidless, monolithic package is totally unaffected by the most severe moisture or temperature testing.

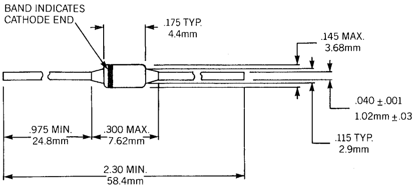
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	2 Amp Series	3 Amp Series	4 Amp Series
50V	UT2005	UT3005	UT4005
100V	UT2010	UT3010	UT4010
200V	UT2020	UT3020	UT4020
400V	UT2040	UT3040	UT4040
600V	UT2060	UT3060	UT4060

	2 AMP SERIES	3 AMP SERIES	4 AMP SERIES
Maximum Average D.C. Output Current			
@ $T_A = 25°C$	2.0A	3.0A	4.0A
@ $T_A = 100°C$	1.0A	1.5A	2.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	60A	80A	100A
Operating Temperature Range	—195°C to +175°C		
Storage Temperature Range	—195°C to +200°C		
Thermal Resistance	See lead temperature derating curve		

MECHANICAL SPECIFICATIONS

UT2005-UT2060 UT3005-UT3060 UT4005-UT4060



Part Identification: Orange band indicates "UT." Part number printed on body.

Polarity: Denoted by orange band.

Weight: 0.75 grams, typical.

BODY B

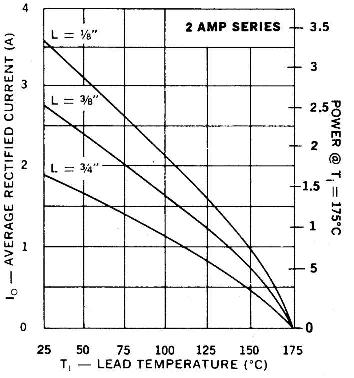
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

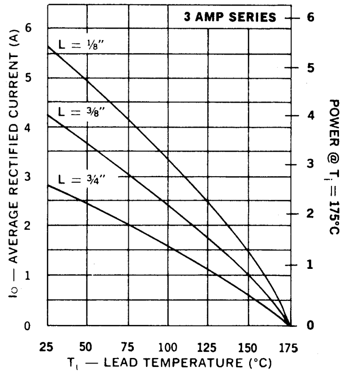
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV	
			25°C	100°C
UT4005	50V	1V @ 3A	5μA	100μA
UT4010	100V			
UT4020	200V			
UT4040	400V			
UT4060	600V			
UT3005	50V	1V @ 2A	5μA	100μA
UT3010	100V			
UT3020	200V			
UT3040	400V			
UT3060	600V			
UT2005	50V	1V @ 1A	5μA	100μA
UT2010	100V			
UT2020	200V			
UT2040	400V			
UT2060	600V			

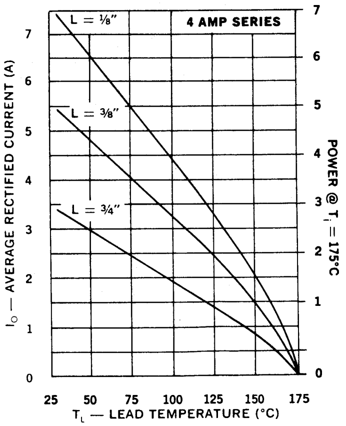
Maximum Current vs Lead Temperature



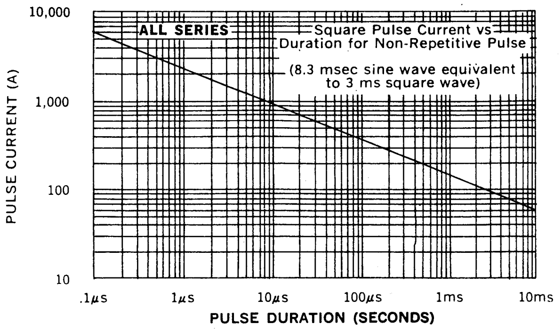
Maximum Current vs Lead Temperature



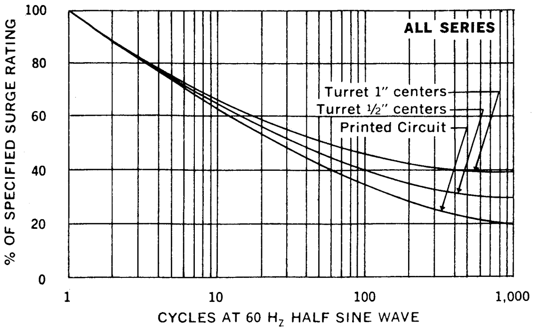
Maximum Current vs Lead Temperature



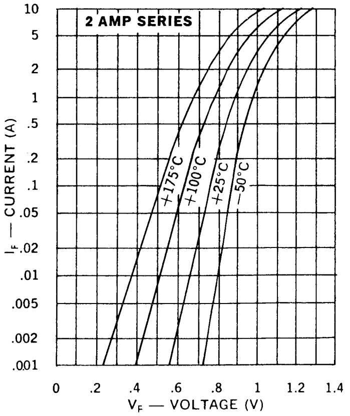
Forward Pulse Current vs Pulse Duration



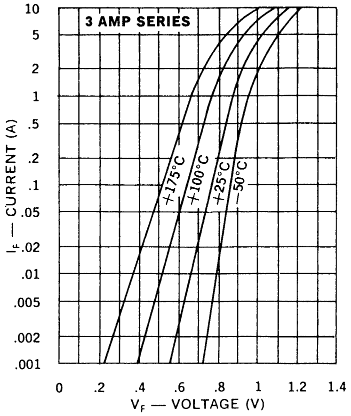
Allowable Forward Surge vs Number of Cycles



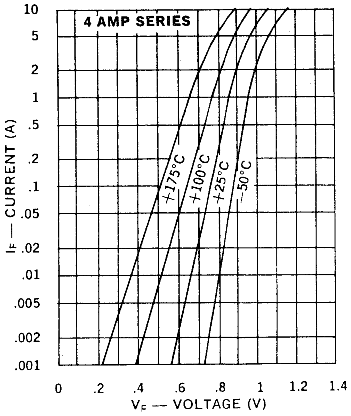
Typical Forward Current vs Forward Voltage



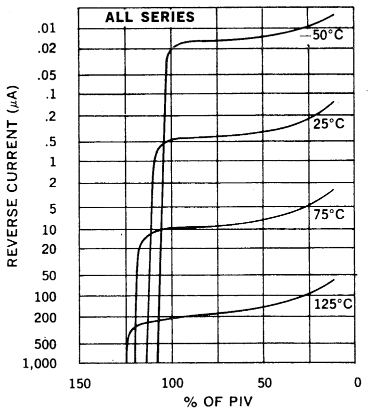
Typical Forward Current vs Forward Voltage



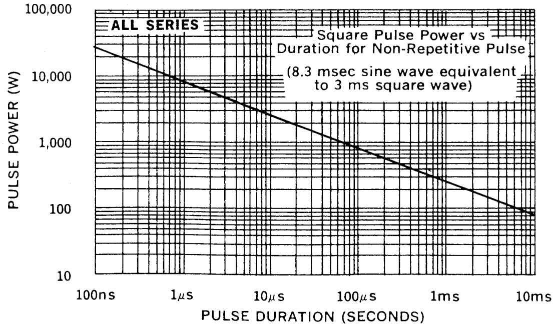
Typical Forward Current vs Forward Voltage



Typical Reverse Current vs PIV



Reverse Pulse Power vs Pulse Duration



RECTIFIERS

Standard Recovery, 7.5 Amp to 12 Amp

UT5105-UT5160
UT6105-UT6160
UT8105-UT8160
UT5105HR2-UT5160HR2
UT6105HR2-UT6160HR2
UT8105HR2-UT8160HR2

FEATURES

- Rating: 12A
- Controlled Avalanche
- Miniature Package
- Surge Rating: 200A

DESCRIPTION

These series of high current rectifiers offers opportunity for size and weight reduction in high power supplies.

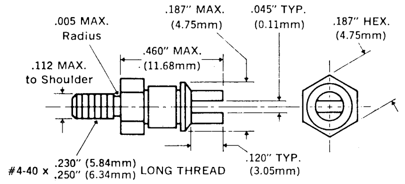
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	12 Amp Series	9 Amp Series	7.5 Amp Series
50V	UT8105/8105HR2	UT6105/6105HR2	UT5105/5105HR2
100V	UT8110/8110HR2	UT6110/6110HR2	UT5110/5110HR2
200V	UT8120/8120HR2	UT6120/6120HR2	UT5120/5120HR2
400V	UT8140/8140HR2	UT6140/6140HR2	UT5140/5140HR2
600V	UT8160/8160HR2	UT6160/6160HR2	UT5160/5160HR2

	12 AMP SERIES	9 AMP SERIES	7.5 AMP SERIES
Maximum Average D.C. Output Current @ $T_C = 100°C$	12.0A	9.0A	7.5A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	200A	175A	150A
Operating and Storage Temperature Range	—65°C to +175°C		
Thermal Resistance, Junction to Case	7.5°C/Watt		
Current Derating	See current vs. case temperature curve		

MECHANICAL SPECIFICATIONS

UT5105-UT5160 **UT6105-UT6160** **UT8105-UT8160**
UT5105HR2-UT5160HR2 **UT6105HR2-UT6160HR2** **UT8105HR2-UT8160HR2**



Part Identification: Numerals and polarity letter indicate UTR type number, e.g., UTR 4405.

Polarity: Cathode to Stud is standard. Reverse polarity denoted by "R" suffix.

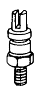
Finish: Metal parts gold plated per MIL-G-45204, Type II.

Weight: 1.5 grams, typical.

Also available with insulated stud. Reference Design Note 17.

Installation
Maximum unlubricated stud torque: 28 inch-ounces.
Mounting hardware supplied.
Do not use a screwdriver in the turret slot for installation purposes, or damage may result.

BODY C — Stud Mount

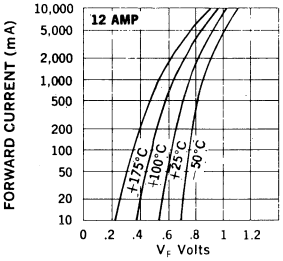


Microsemi Corp.
Watertown
The diode experts

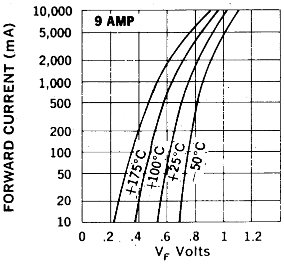
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Peak Inverse Voltage	Maximum Forward Voltage	Max. Reverse Current at PIV	
			25°C	100°C
UT8105/8105HR2	50V	1V @ 8A	10μA	300μA
UT8110/8110HR2	100V			
UT8120/8120HR2	200V			
UT8140/8140HR2	400V			
UT8160/8160HR2	600V			
UT6105/6105HR2	50V	1V @ 6A	10μA	300μA
UT6110/6110HR2	100V			
UT6120/6120HR2	200V			
UT6140/6140HR2	400V			
UT6160/6160HR2	600V			
UT5105/5105HR2	50V	1V @ 5A	10μA	300μA
UT5110/5110HR2	100V			
UT5120/5120HR2	200V			
UT5140/5140HR2	400V			
UT5160/5160HR2	600V			

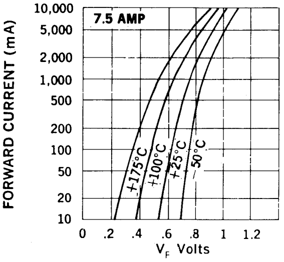
Typical Forward Voltage vs Forward Current.



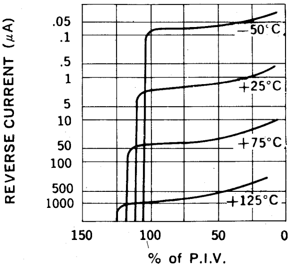
Typical Forward Voltage vs Forward Current



Typical Forward Voltage vs Forward Current



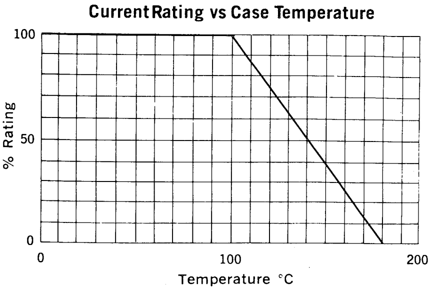
Typical P.I.V. vs Reverse Current



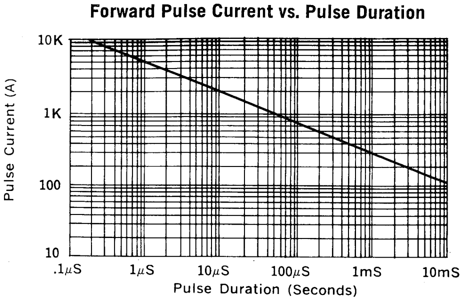
OPTIONAL HIGH RELIABILITY (HR2) SCREENING

The following tests are performed on 100% of the devices specified UT5105HR2 through UT8160HR2.

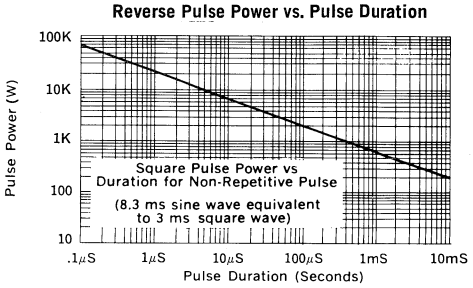
SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ 175°C
2. Temperature Cycling	1051	C, 20 Cycles, −65 to +175°C. No dwell required @ 25°C, t ⩾ 10 min. @ extremes.
3. Hermetic Seal a. Gross Leak	1071	E, ZYGLO
4. High Temperature Reverse Bias (HTRB)	1038	A, T_A = 150°C, V_R = 80% of rating, 48 hours
5. Interim Electrical Parameters	GO/NO GO	V_F and I_R @ 25°C
6. Power Burn-in	1038	B, T_A = 25°C, 96 Hours, I_O adjusted 150°C, ⩽ T_j ⩽ 175°C
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)



Current Rating vs Case Temperature

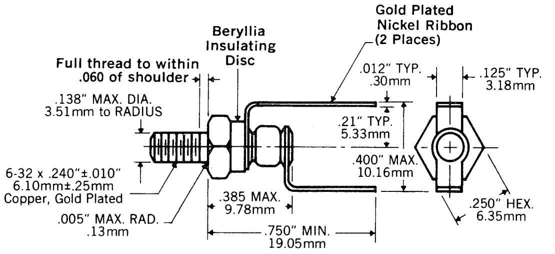


Forward Pulse Current vs. Pulse Duration



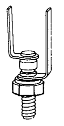
Reverse Pulse Power vs. Pulse Duration

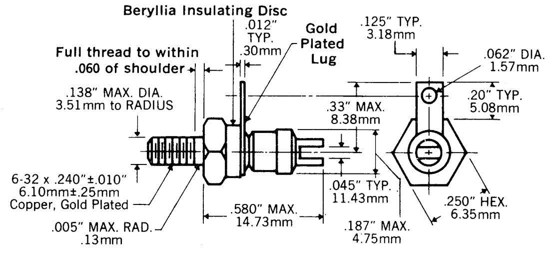
MECHANICAL SPECIFICATIONS



Dimensions in inches.

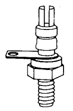
Style W





Dimensions in inches.

Style V



RECTIFIERS
Fast Recovery, 0.5 Amp to 2 Amp

UTR10-UTR60
UTR01-UTR61
UTR02-UTR62

FEATURES
- Continuous Rating: to 2A
- Controlled Avalanche
- Surge Rating: to 25A
- Fast Recovery 40kHz Operation
- PIV: to 600V
- Miniature Package

DESCRIPTION
These miniature fast recovery rectifiers permit operation at full frequencies as high as 40kHz square wave. They have the unique Unitrode Fused in Glass construction.

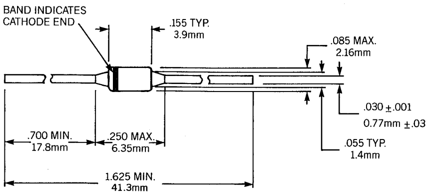
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	½ Amp Series	1 Amp Series	2 Amp Series
50V		UTR01	UTR02
100V	UTR10	UTR11	UTR12
200V	UTR20	UTR21	UTR22
300V	UTR30	UTR31	UTR32
400V	UTR40	UTR41	UTR42
500V	UTR50	UTR51	UTR52
600V	UTR60	UTR61	UTR62

	½ AMP SERIES	1 AMP SERIES	2 AMP SERIES
Maximum Average D.C. Output Current			
@ $T_A = 25°C$	0.5A	1.0A	2.0A
@ $T_A = 100°C$	0.25A	0.5A	1.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	15A	20A	25A
Operating Temperature Range	—195°C to +175°C		
Storage Temperature Range	—195°C to +200°C		
Thermal Resistance	See lead temperature derating curves		

MECHANICAL SPECIFICATIONS

UTR10-UTR60 UTR01-UTR61 UTR02-UTR62

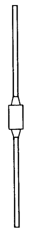


Part Identification: Green band indicates "UTR." Part number printed on body.

Polarity: Denoted by Green band.

Weight: 0.26 grams, typical.

BODY A



THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

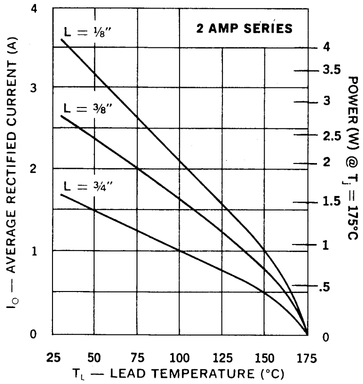
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

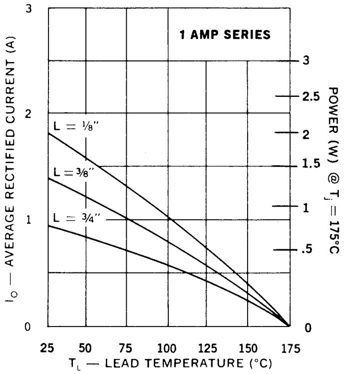
Type	PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV		Maximum Reverse Recovery Time*	Maximum Junction Capacitance @ 25°C	
			25°C	100°C		0V	—10V
UTR02	50V	1.1V @ 1000mA	3μA	100μA	250ns	150pf	60pf
UTR12	100V				250ns	100pf	40pf
UTR22	200V				250ns	80pf	32pf
UTR32	300V				300ns	70pf	28pf
UTR42	400V				350ns	60pf	24pf
UTR52	500V				400ns	50pf	20pf
UTR62	600V				400ns	40pf	16pf
UTR01	50V	1.1V @ 500mA	3μA	100μA	250ns	150pf	60pf
UTR11	100V				250ns	100pf	40pf
UTR21	200V				250ns	80pf	32pf
UTR31	300V				300ns	70pf	28pf
UTR41	400V				350ns	60pf	24pf
UTR51	500V				400ns	50pf	20pf
UTR61	600V				400ns	40pf	16pf
UTR10	100V	1.1V @ 200mA	3μA	100μA	250ns	100pf	40pf
UTR20	200V				250ns	80pf	32pf
UTR30	300V				300ns	70pf	28pf
UTR40	400V				350ns	60pf	24pf
UTR50	500V				400ns	50pf	20pf
UTR60	600V				400ns	40pf	16pf

*Recovery time is measured from 10.0mA to 10.0mA recovery to 5.0mA

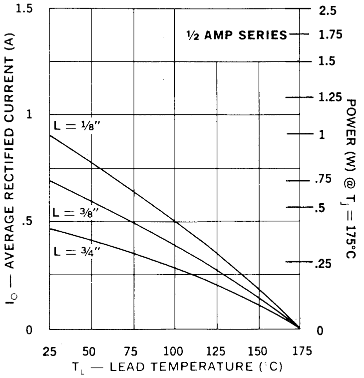
Maximum Current vs Lead Temperature



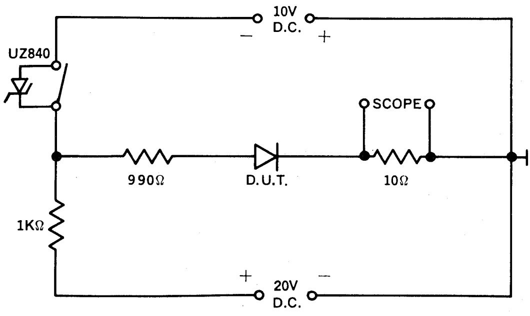
Maximum Current vs Lead Temperature



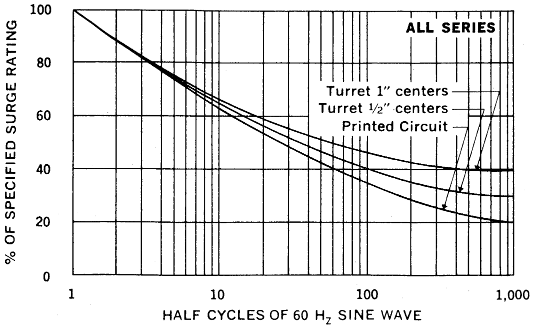
Maximum Current vs Lead Temperature



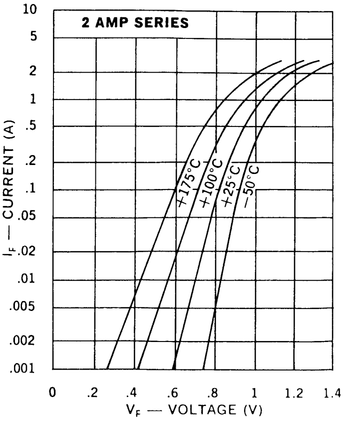
Reverse-Recovery Circuit



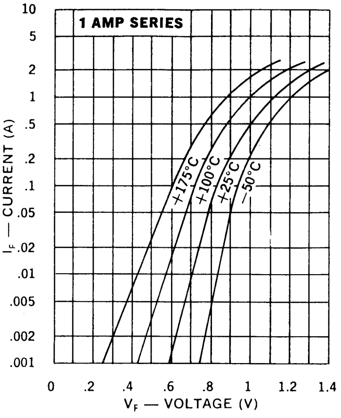
Allowable Forward Surge vs Number of Cycles



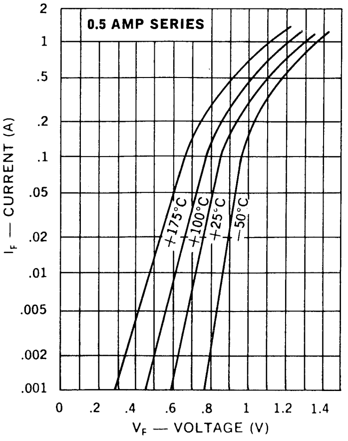
Typical Forward Current vs Forward Voltage



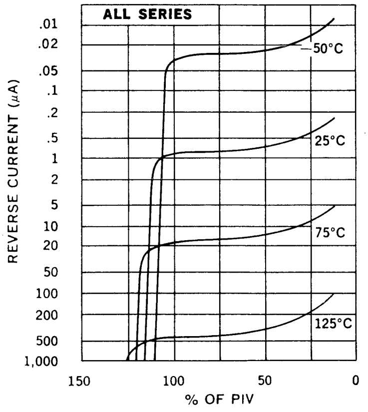
Typical Forward Current vs Forward Voltage



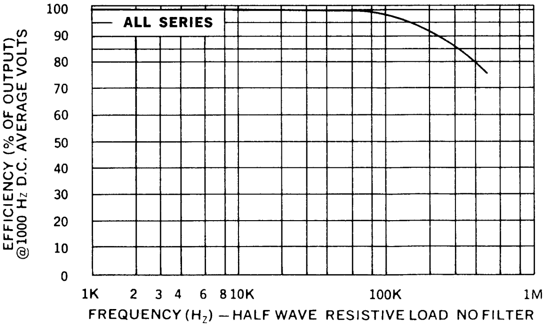
Typical Forward Current vs Forward Voltage



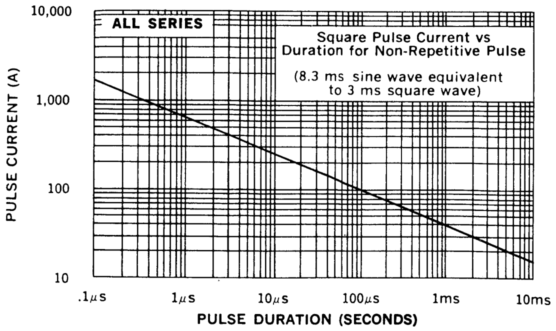
Typical Reverse Current vs PIV



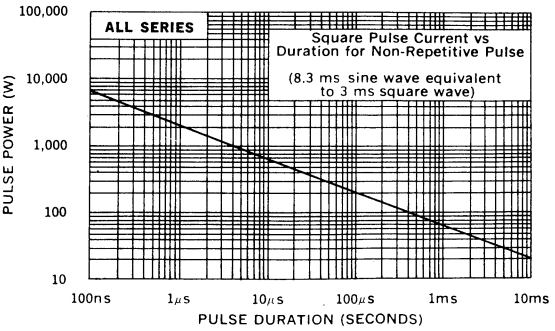
Efficiency vs Frequency at Rated Current (Sine Wave)



Forward Pulse Current vs Pulse Duration



Reverse Pulse Power vs Pulse Duration



RECTIFIERS

Fast Recovery, 2 Amp to 4 Amp

UTR2305-UTR2360
UTR3305-UTR3360
UTR4305-UTR4360

FEATURES

- Continuous Rating: to 4A
- Controlled Avalanche
- Surge Rating: to 100A
- PIV: to 600V
- Miniature Package

DESCRIPTION

Small size and high surge capability make this series of power switching rectifiers desirable for power supplies where size, weight and reliability are important.

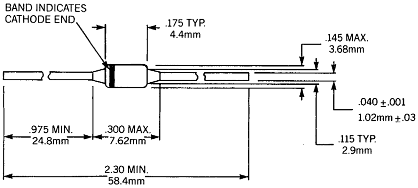
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	2 Amp Series	3 Amp Series	4 Amp Series
50V	UTR2305	UTR3305	UTR4305
100V	UTR2310	UTR3310	UTR4310
200V	UTR2320	UTR3320	UTR4320
400V	UTR2340	UTR3340	UTR4340
500V	UTR2350	UTR3350	UTR4350
600V	UTR2360	UTR3360	UTR4360

Maximum Average D.C. Output Current	2 AMP SERIES	3 AMP SERIES	4 AMP SERIES
@ $T_A = 25°C$	2.0A	3.0A	4.0A
@ $T_A = 100°C$	1.0A	1.5A	2.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	60A	80A	100A
Operating Temperature Range	−195°C to +175°C		
Storage Temperature Range	−195°C to +200°C		
Thermal Resistance	See lead temperature derating curve		

MECHANICAL SPECIFICATIONS

UTR4305-UTR4360 UTR3305-UTR3360 UTR2305-UTR2360

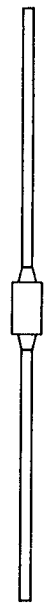


Part Identification: Green band indicates "UTR." Part number printed on body.

Polarity: Denoted by Green band.

Weight: 0.75 grams, typical.

BODY B



THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

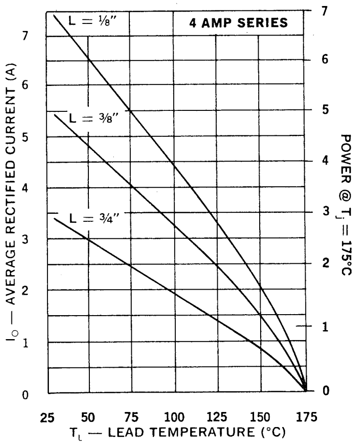
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

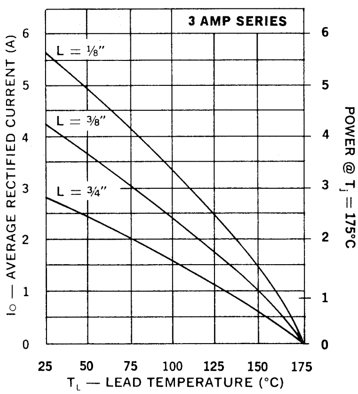
Type	PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV		Maximum Reverse Recovery Time*	Maximum Junction Capacitance @ 25°C	
			25°C	100°C		0V	—10V
UTR4305	50V	1.1V @ 4A	5μA	100μA	250ns	600pf	240pf
UTR4310	100V				250ns	400pf	160pf
UTR4320	200V				250ns	320pf	128pf
UTR4340	400V				400ns	240pf	96pf
UTR4350	500V				400ns	200pf	80pf
UTR4360	600V				400ns	160pf	64pf
UTR3305	50V	1.1V @ 3A	5μA	100μA	250ns	600pf	240pf
UTR3310	100V				250ns	400pf	160pf
UTR3320	200V				250ns	320pf	128pf
UTR3340	400V				300ns	240pf	96pf
UTR3350	500V				350ns	200pf	80pf
UTR3360	600V				400ns	160pf	64pf
UTR2305	50V	1.1V @ 2A	5μA	100μA	250ns	600pf	240pf
UTR2310	100V				250ns	400pf	160pf
UTR2320	200V				250ns	320pf	128pf
UTR2340	400V				300ns	240pf	96pf
UTR2350	500V				350ns	200pf	80pf
UTR2360	600V				400ns	160pf	64pf

*Recovery time is measured from 1A to 1A recovering to 0.5A.

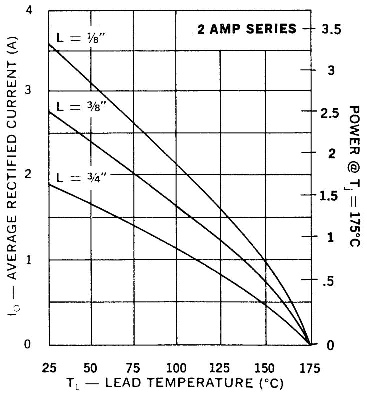
Maximum Current vs Lead Temperature



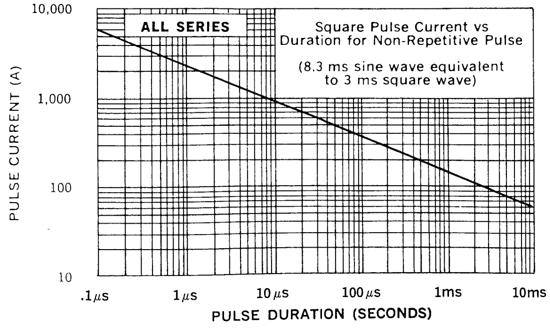
Maximum Current vs Lead Temperature



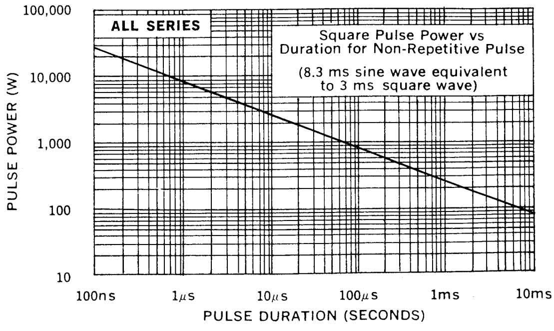
Maximum Current vs Lead Temperature



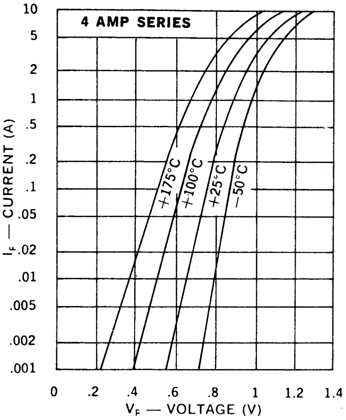
Forward Pulse Current vs Pulse Duration



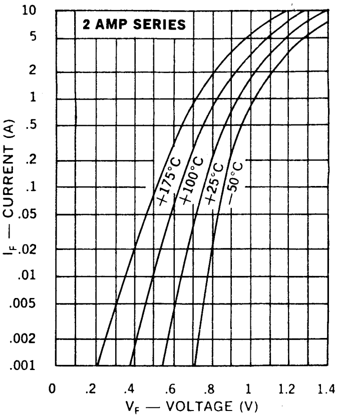
Reverse Pulse Power vs Pulse Duration



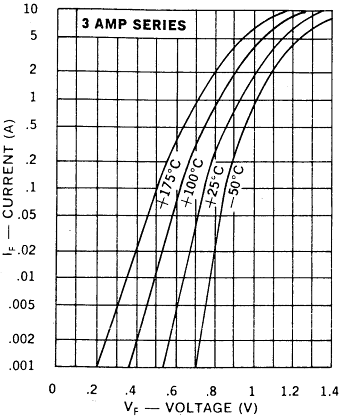
Typical Forward Current vs Forward Voltage



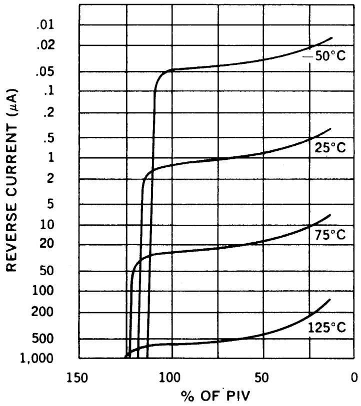
Typical Forward Current vs Forward Voltage



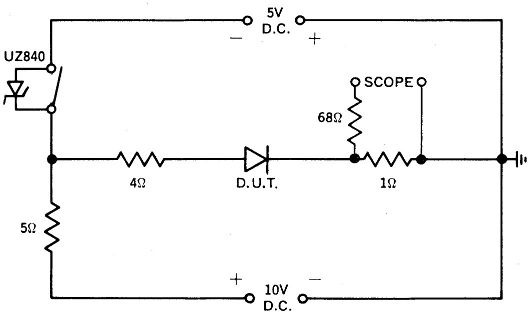
Typical Forward Current vs Forward Voltage



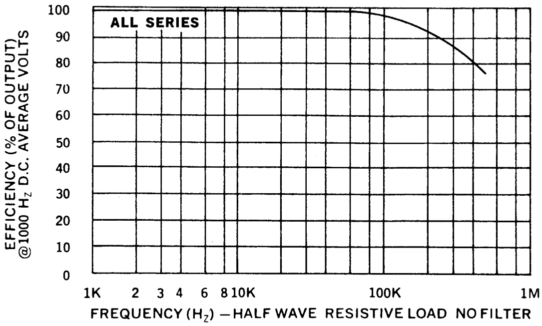
Typical Reverse Current vs PIV



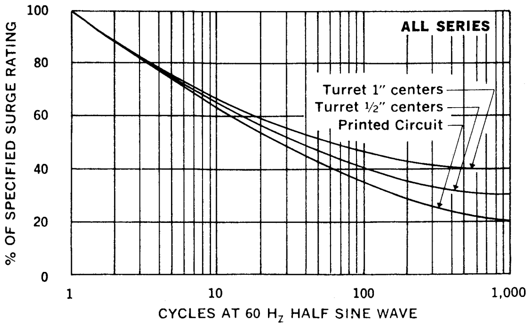
Reverse Recovery Circuit



Efficiency vs Frequency at Rated Current (Sine Wave)



Allowable Forward Surge vs Number of Cycles



RECTIFIERS
Fast Recovery, 6 Amp to 9 Amp

UTR4405-UTR4440
UTR5405-UTR5440
UTR6405-UTR6440
UTR4405HR2-UTR4440HR2
UTR5405HR2-UTR5440HR2
UTR6405HR2-UTR6440HR2

FEATURES
- Continuous Rating: to 9A
- Controlled Avalanche
- Surge Rating: to 150A
- Fast Recovery, 40kHz Operation
- PIV: to 400V
- Miniature Package

DESCRIPTION
The same basic construction as all Unitrode diodes, but using a miniature stud mounting and larger junction area, provides a 9 Amp continuous and 150 Amp surge rating in a package only one fifth the weight and one quarter the volume of conventional types.

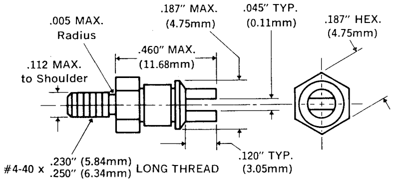
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	6 Amp Series	7.5 Amp Series	9 Amp Series
50V	UTR4405/4405HR2	UTR5405/5405HR2	UTR6405/6405HR2
100V	UTR4410/4410HR2	UTR5410/5410HR2	UTR6410/6410HR2
200V	UTR4420/4420HR2	UTR5420/5420HR2	UTR6420/6420HR2
400V	UTR4440/4440HR2	UTR5440/5440HR2	UTR6440/6440HR2

	6 Amp Series	7.5 Amp Series	9.0 Amp Series
Maximum Average D.C. Output Current @ T_C = 100°C	6.0A	7.5A	9.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	120A	135A	150A
Operating Temperature Range	−195°C to +175°C		
Storage Temperature Range	−195°C to +200°C		
Thermal Resistance	7.5°C/W		

MECHANICAL SPECIFICATIONS

UTR4405-UTR4440 **UTR5405-UTR5440** **UTR6405-UTR6440**
UTR4405HR2-UTR4440HR2 **UTR5405HR2-UTR5440HR2** **UTR6405HR2-UTR6440HR2**



Part Identification: Numerals and polarity letter indicate UTR type number, e.g., UTR 4405.

Polarity: Cathode to Stud is standard. Reverse polarity denoted by "R" suffix.

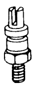
Finish: Metal parts gold plated per MIL-G-45204, Type II.

Weight: 1.5 grams, typical.

Also available with insulated stud. Reference Design Note 17.

Installation
Maximum unlubricated stud torque: 28 inch-ounces.
Mounting hardware supplied.
Do not use a screwdriver in the turret slot for installation purposes, or damage may result.

BODY C — Stud Mount



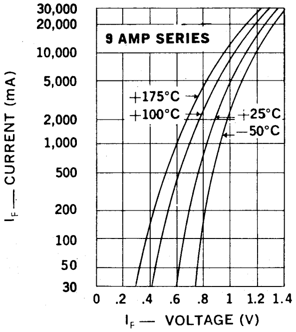
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

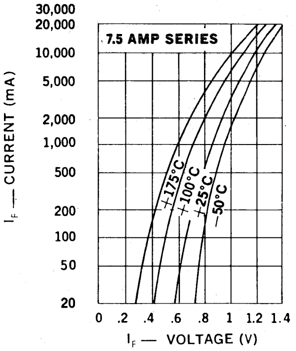
Type	PIV	Maximum Forward Voltage Drop	Maximum Reverse Current @ PIV 25°C	Maximum Reverse Current @ PIV 100°C	Maximum Reverse Recovery Time*
UTR6405/6405HR2	50V	1.1V @ 6.0A	10μA	300μA	300ns
UTR6410/6410HR2	100V				300ns
UTR6420/6420HR2	200V				400ns
UTR6440/6440HR2	400V				500ns
UTR5405/5405HR2	50V	1.1V @ 5.0A	10μA	300μA	300ns
UTR5410/5410HR2	100V				300ns
UTR5420/5420HR2	200V				400ns
UTR5440/5440HR2	400V				500ns
UTR4405/4405HR2	50V	1.1V @ 4.0A	10μA	300μA	300ns
UTR4410/4410HR2	100V				300ns
UTR4420/4420HR2	200V				400ns
UTR4440/4440HR2	400V				500ns

*Recovery time is measured from 1A to 1A, recovering to 0.5A.

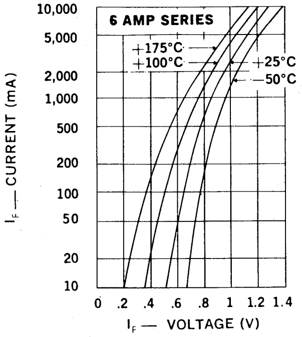
Typical Forward Voltage vs Forward Current



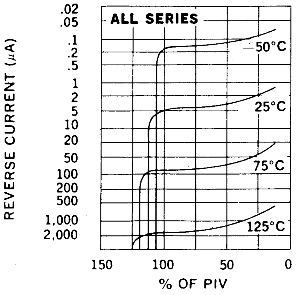
Typical Forward Voltage vs Forward Current



Typical Forward Voltage vs Forward Current



Typical Reverse Current vs PIV

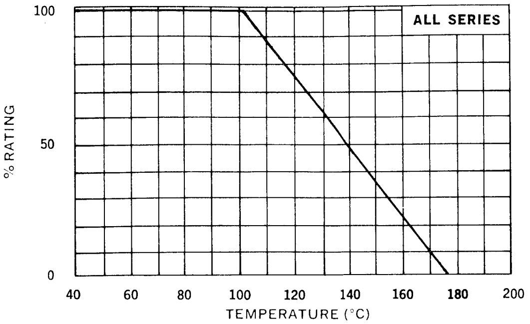


OPTIONAL HIGH RELIABILITY (HR2) SCREENING

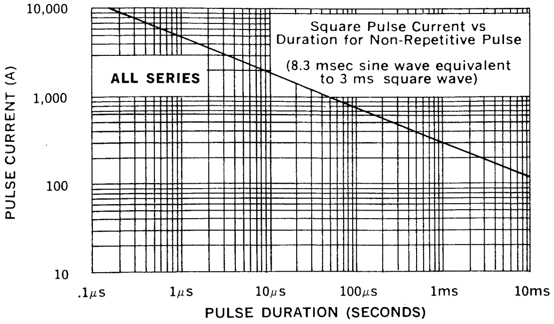
The following tests are performed on 100% of the devices specified UTR4405HR2 through UTR6440HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ 175°C
2. Temperature Cycling	1051	C, 20 Cycles, −65 to +175°C. No dwell required @ 25°C, t ⩾ min. extremes
3. Hermetic Seal a. Gross Leak	1071	E, ZYGLO
4. High Temperature Reverse Bias (HTRB)	1038	A, T_A = 150°C, V_R = 80% of rating, 48 hours
5. Interim Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C
6. Power Burn-in	1038	B, T_A = 25°C, 96 Hours, I_O adjusted 150°C, ⩽ T_j ⩽ 175°C
7. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C PDA = 10% (Final Electricals)

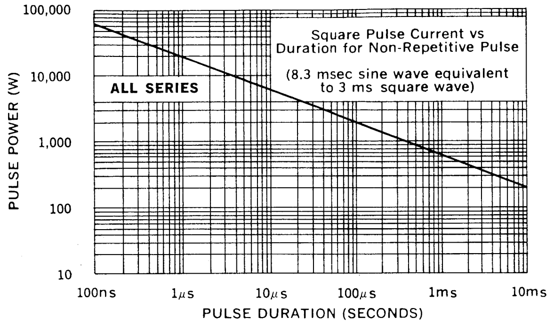
Current Rating vs Case Temperature



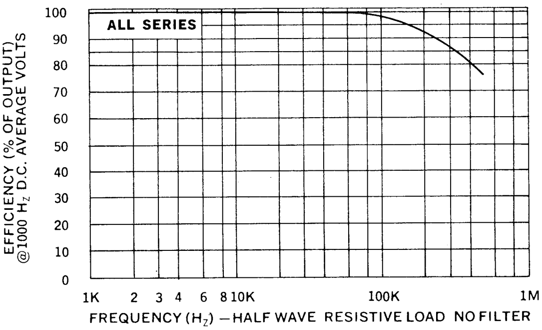
Forward Pulse Current vs Pulse Duration



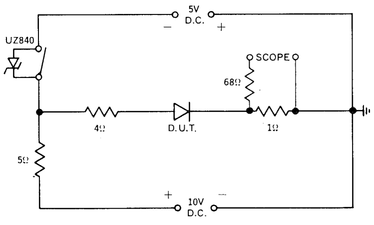
Reverse Pulse Power vs Pulse Duration



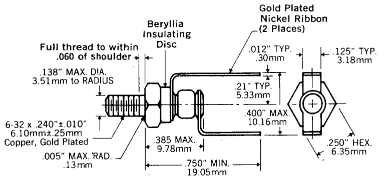
Efficiency vs Frequency at Rated Current (Sine Wave)



Reverse Recovery Circuit

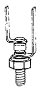


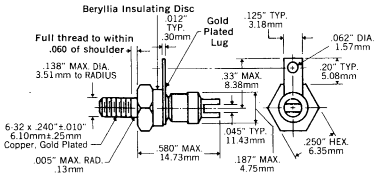
MECHANICAL SPECIFICATIONS



Dimensions in inches.

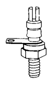
Style W





Dimensions in inches.

Style V



RECTIFIERS

Super-Fast Recovery, 1 Amp and 2 Amp

UTX105-UTX125
UTX205-UTX225

FEATURES

- Continuous Rating: to 2A
- Controlled Avalanche
- Surge: to 25A
- Recovery Time less than 75ns
- Miniature Package

DESCRIPTION

These miniature super-fast recovery rectifiers permit operation at full power at frequencies as high as 100kHz square wave. They may be used as half wave rectifiers or as legs of a bridge.

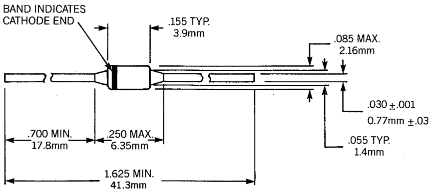
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	1 Amp Series	2 Amp Series
50V	UTX105	UTX205
100V	UTX110	UTX210
150V	UTX115	UTX215
200V	UTX120	UTX220
250V	UTX125	UTX225

	1 AMP SERIES	2 AMP SERIES
Maximum Average D.C. Output Current		
@ $T_A = 25°C$	1.0A	2.0A
@ $T_A = 100°C$	0.5A	1.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	20A	25A
Operating Temperature Range	—195°C to +175°C	
Storage Temperature Range	—195°C to +200°C	
Thermal Resistance	See Lead Temperature Derating Curve	

MECHANICAL SPECIFICATIONS

UTX105-UTX125 UTX205-UTX225

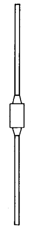


Part Identification: Green band indicates "UTX." Part number printed on body.

Polarity: Denoted by green band.

Weight: 0.26 grams, typical.

BODY A



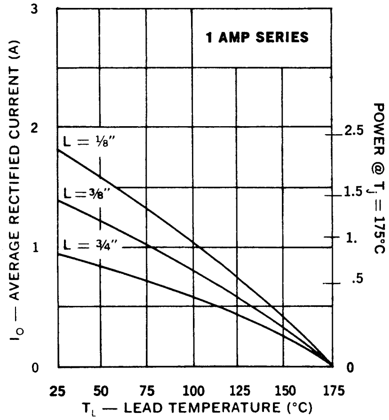
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

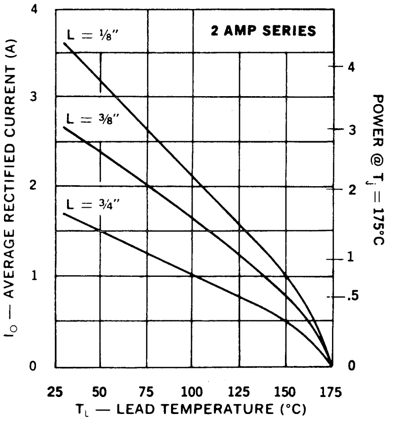
Type	PIV	Maximum Voltage Forward Drop	Leakage Current @ PIV		Max. Reverse Recovery Time*
			25°C	100°C	
UTX 205 UTX 210 UTX 215 UTX 220 UTX 225	50V 100V 150V 200V 250V	1.0V @ 1 Adc	3μA	50μA	75ns
UTX 105 UTX 110 UTX 115 UTX 120 UTX 125	50V 100V 150V 200V 250V	1.0V @ 0.5 Adc	3μA	50μA	75ns

*Recovery time is measured from 10.0mA to 10.0mA recovery to 5.0mA.

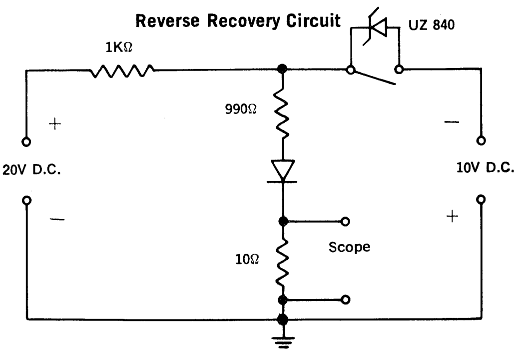
Maximum Current vs Lead Temperature



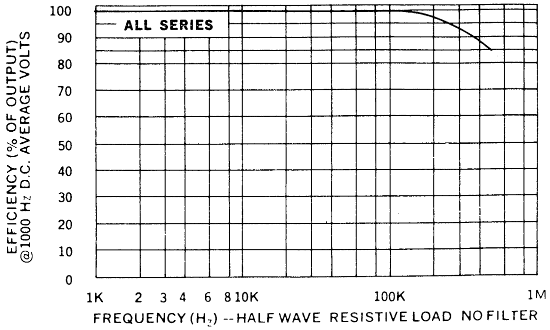
Maximum Current vs Lead Temperature



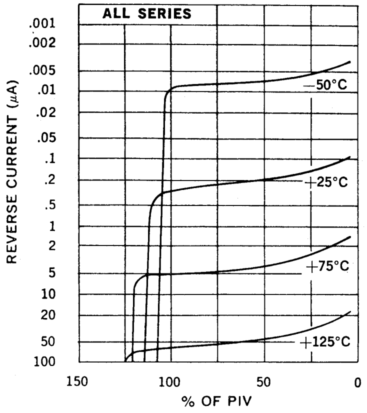
Reverse Recovery Circuit



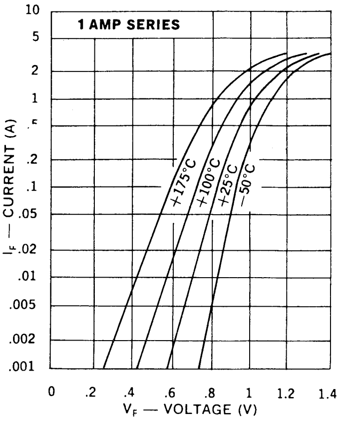
Efficiency vs Frequency at Rated Current (Sine Wave)



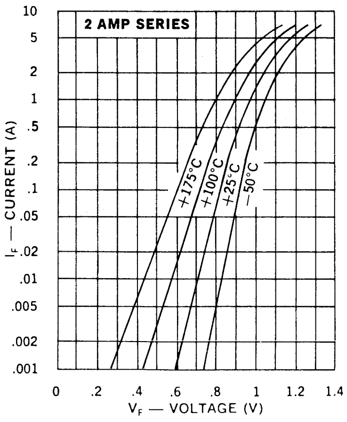
Typical Leakage Current vs. PIV



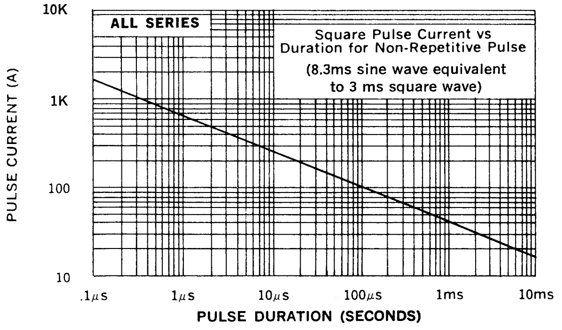
Typical Forward Current vs Forward Voltage



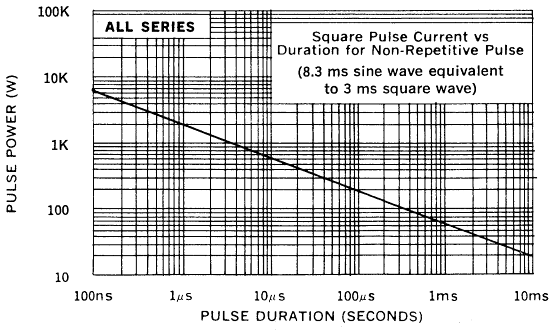
Typical Forward Current vs Forward Voltage



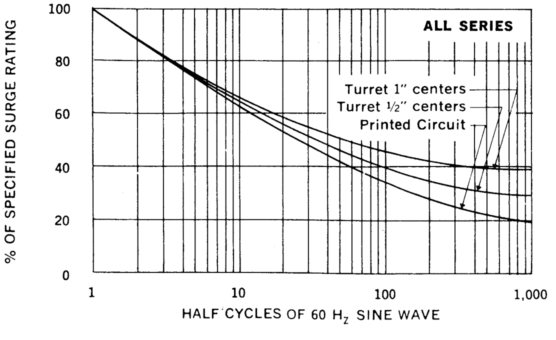
Forward Pulse Current vs Pulse Duration



Reverse Pulse Power vs Pulse Duration



Allowable Forward Surge vs Number of Cycles



RECTIFIERS
Super-Fast Recovery, 3 Amp and 4 Amp

UTX 3105-UTX 3120
UTX 4105-UTX 4120

FEATURES
- Continuous Rating: to 4A
- Controlled Avalanche
- Surge: to 80A
- Recovery Time less than 100ns
- Miniature Package

DESCRIPTION
These miniature super-fast recovery rectifiers permit operation at full power at frequencies as high as 100kHz square wave. They have the same unique Unitrode construction as the familiar 2 amp UTX series, but are scaled up in size to provide higher continuous and surge current capability.

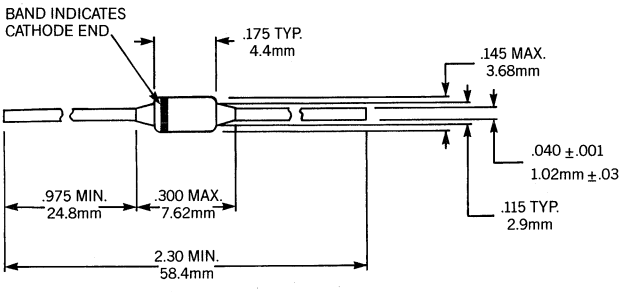
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	3 Amp Series	4 Amp Series
50V	UTX 3105	UTX 4105
100V	UTX 3110	UTX 4110
150V	UTX 3115	UTX 4115
200V	UTX 3120	UTX 4120

	3 AMP SERIES	4 AMP SERIES
Maximum Average D.C. Output Current		
@ $T_A = 25°C$	3.0A	4.0A
@ $T_A = 100°C$	1.5A	2.0A
Non-Repetitive Sinusoidal Surge Current (8.3ms)	60A	80A
Operating Temperature Range	—195°C to +175°C	
Storage Temperature Range	—195°C to +200°C	
Thermal Resistance	See Lead Temperature Derating Curve	

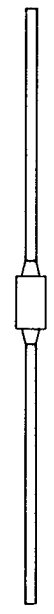
MECHANICAL SPECIFICATIONS

UTX 3105-UTX 3120 UTX 4105-UTX 4120



UTX Prefix is identified by a Green Cathode Band

BODY B



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Watertown
The diode experts

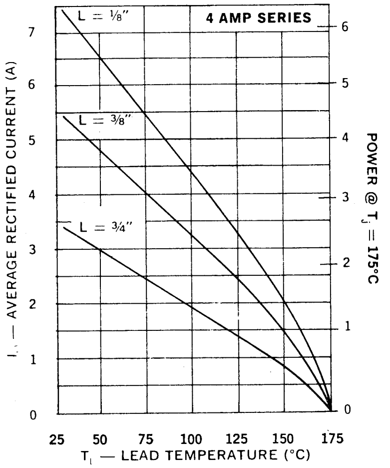
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	PIV	Maximum Forward Voltage Drop*	Maximum Leakage Current @ PIV		Maximum Reverse Recovery Time**
			25°C	100°C	
UTX 4105	50V	1V @ 3 Adc	5μA	75μA	100ns
UTX 4110	100V				
UTX 4115	150V				
UTX 4120	200V				
UTX 3105	50V	1V @ 2 Adc	5μA	75μA	100ns
UTX 3110	100V				
UTX 3115	150V				
UTX 3120	200V				

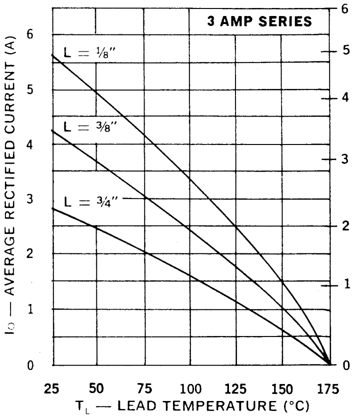
*Forward voltage is measured at least 1 second after application of current.

**Recovery time is measured from 1A to 1A recovering to 0.5A.

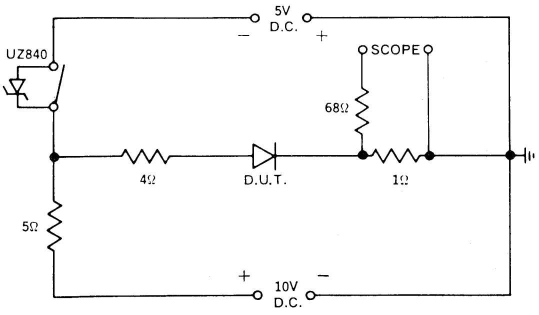
Maximum Current vs Lead Temperature



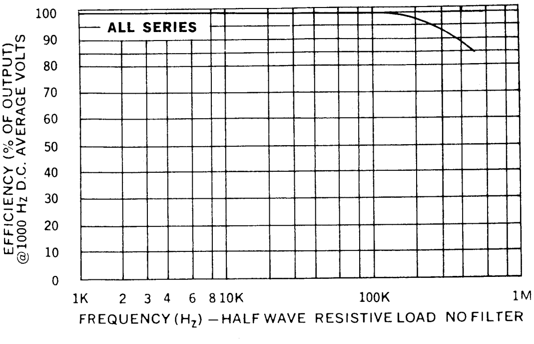
Maximum Current vs Lead Temperature

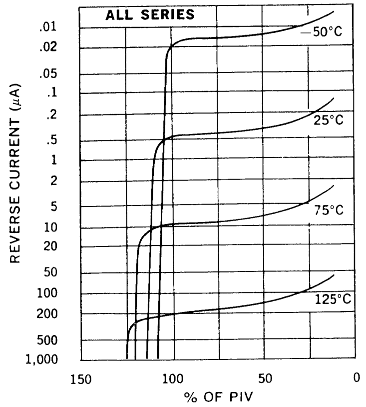


Reverse Recovery Circuit

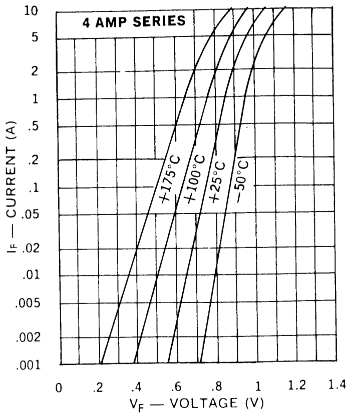


Efficiency vs Frequency at Rated Current (Sine Wave)

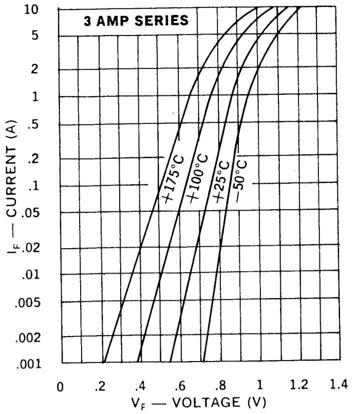




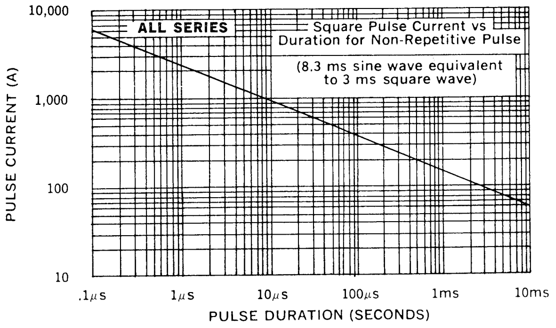
Typical Leakage Current vs PIV



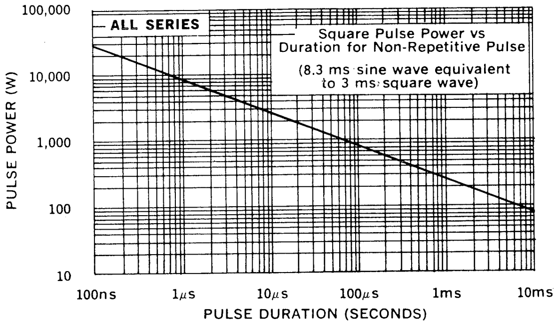
Typical Forward Current vs Forward Voltage



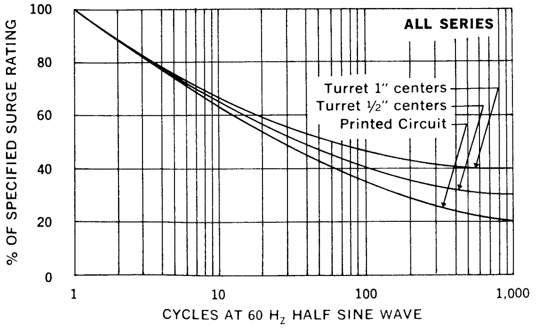
Typical Forward Current vs Forward Voltage



Forward Pulse Current vs Pulse Duration



Reverse Pulse Power vs Pulse Duration



Allowable Forward Surge vs Number of Cycles

RECTIFIER BRIDGES & MODULES

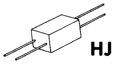
Product Selection Guides
Rectifier Bridges 3-3
Rectifier Modules 3-6
Datasheets 3-12

RECTIFIER BRIDGES

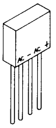
Single Phase Full-Wave Bridges

PRODUCT SELECTION GUIDE

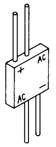
STANDARD RECOVERY



HJ, HK, HL, HM, HN, HO, HP



S



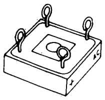
G, GA, GH

Peak Inverse Voltage Per Leg	AVERAGE D.C. OUTPUT CURRENT					
	≤.25A	.25—.75A	.75—1.5A	1.5—2.5A	4—10A	10—25A
100V			673-1 **G or S**	697-1 **GA**	680-1 **NA**	679-1 **NB** SPA25* **MC**
200V			673-2 **G or S**	697-2 **GA**	680-2 **NA** 469-1** **MD**	679-2 **NB** SPB25* **MC**
300V			673-3 **G or S**	697-3 **GA**	680-3 **NA**	679-3 **NB**
400V			673-4 **G or S**	697-4 **GA**	680-4 **NA** 469-2** **MD**	679-4 **NB** SPC25* **MC**
500V			673-5 **G or S**	697-5 **GA**	680-5 **NA**	679-5 **NB**
600V			673-6 **G or S**	697-6 **GA**	680-6 **NA** 469-3** **MD**	679-6 **NB** SPD25* **MC**
1.2kV		673-7 **GH**				
1.8kV		673-75 **HJ**				
2.4kV		673-8 **HK**				
2.5kV						
3.0kV		673-85 **HL**				
3.6kV	673-9 **HM**					
4.0kV						
4.2kV	673-10 **HN**					
4.8kV	673-11 **HO**					
5.0kV	673-12 **HO**					
7.5kV						
10kV						
15kV						

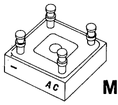
*Available as JAN
**Available as JAN, JANTX

RECTIFIER BRIDGES

Single Phase Full-Wave Bridges



NA, NB



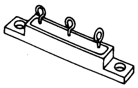
MA, MB, MC, MD

FAST RECOVERY

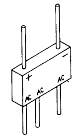
Peak Inverse Voltage Per Leg	AVERAGE D.C. OUTPUT CURRENT							
	≤.25A	.25—.75A	.75—1.5A	1.5—2.5A	4—10A	10—25A		25—35A
50V							803-1 **MB**	802-1 **MA**
100V			676-1 **G or S**	698-1 **GA**	684-1 **NA**	683-1 **NB**	803-2 **MB**	802-2 **MA**
125V							803-3 **MB**	802-3 **MA**
150V							803-4 **MB**	802-4 **MA**
200V			676-2 **G or S**	698-2 **GA**	684-2 **NA**	683-2 **NB**		
300V			676-3 **G or S**	698-3 **GA**	684-3 **NA**	683-3 **NB**		
400V			676-4 **G or S**	698-4 **GA**	684-4 **NA**	683-4 **NB**		
500V			676-5 **G or S**	698-5 **GA**	684-5 **NA**	683-5 **NB**		
600V			676-6 **G or S**	698-6 **GA**	684-6 **NA**	683-6 **NB**		
1.2kV		676-12 **HJ**						
1.8kV		676-18 **HK**						
2.4kV		676-24 **HL**						
2.5kV								
3.0kV		676-30 **HM**						
3.6kV	676-36 **HN**							
4.0kV								
4.2kV	676-42 **HO**							
4.8kV	676-48 **HP**							
5.0kV	676-50 **HP**							
7.5kV								
10kV								
15kV								
Reverse Recovery Time (max.)	500ns	500ns	500ns	500ns	500ns	500ns	50ns	50ns

RECTIFIER BRIDGES

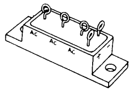
Three Phase Full-Wave Bridge



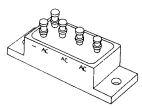
ND



F



NC



ME

STANDARD RECOVERY

Peak Inverse Voltage Per Leg	AVERAGE D.C. OUTPUT CURRENT			
	1—3A	4.5—15A	15—25A	
50V				
100V	700-1 **F**	695-1 **NC**	678-1 **NC**	
125V				
150V				
200V	700-2 **F**	695-2 **NC**	678-2 **NC**	483-1* **ME**
300V	700-3 **F**	695-3 **NC**	678-3 **NC**	
400V	700-4 **F**	695-4 **NC**	678-4 **NC**	483-2* **ME**
500V	700-5 **F**	695-5 **NC**	678-5 **NC**	
600V	700-6 **F**	695-6 **NC**	678-6 **NC**	483-3* **ME**
2.5kV				
5.0kV				
7.5kV				
10kV				

*Available as JANTX

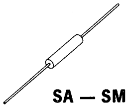
FAST RECOVERY

Peak Inverse Voltage Per Leg	AVERAGE D.C. OUTPUT CURRENT				
	1—3A	4.5—15A	15—25A		25—40A
50V				801-1 **ME**	800-1 **ME**
100V	701-1 **F**	696-1 **NC**	682-1 **NC**	801-2 **ME**	800-2 **ME**
125V				801-3 **ME**	800-3 **ME**
150V				801-4 **ME**	800-4 **ME**
200V	701-2 **F**	696-2 **NC**	682-2 **NC**		
300V	701-3 **F**	696-3 **NC**	682-3 **NC**		
400V	701-4 **F**	696-4 **NC**	682-4 **NC**		
500V	701-5 **F**	696-5 **NC**	682-5 **NC**		
600V	701-6 **F**	696-6 **NC**	682-6 **NC**		
2.5kV					
3.0kV					
4.0kV					
5.0kV					
Reverse Recovery Time (max.)	500ns	500ns	500ns	50ns	50ns

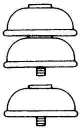
DOUBLERS & CENTER-TAP RECTIFIERS

STANDARD RECOVERY ND

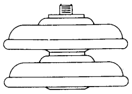
Peak Inverse Voltage Per Leg	Average D.C. Output Current
	2—15A
100V	681-1 **ND**
200V	681-2 **ND**
300V	681-3 **ND**
400V	681-4 **ND**
500V	681-5 **ND**
600V	681-6 **ND**



SA — SM



DD

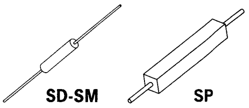


DG

STANDARD RECOVERY

Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT						
	.250-.50A	.50-.75A	.75-1A	1-1.5A	2.5-5A	5-6A	6-7A
1.0kV							
1.2kV				US12 **SA**			
1.5kV			US15 **SA**				
1.8kV		US18 **SA**					
2.0kV		US20 **SA**					
2.5kV		US25 **SB**		USB2.5 **DH**	UDB2.5 **DD**	UDE2.5 **DD**	UGE2.5 **DG**
3.0kV		US30 **SB**					
3.5kV	US35 **SC**						
4.0kV	US40 **SC**						
4.5kV	US45A **SD**						

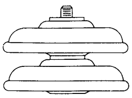
RECTIFIER MODULES



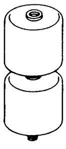
Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT										
	.100-.250A	.250-.50A	.50-.75A	.75-1A	1-1.5A	1.5-2A	2-2.5A	2.5-3A	3-4A	4-5A	5-6A
5.0kV		US50A **SD**	USB5 **DH** USS5 **DH**			UDA5 **DD** UDB5 **DD** 1N5600* **DE**				UDE5 **DG** UGB5 **DD**	UGE5 **DG** 1N5603* **DF**
6.0kV		US60A **SD**			KXS60 **SM**						
7.0kV		US70A **SD**									
7.5kV		USS7.5 **DH**	USB7.5 **DH**		UDA7.5 **DD** UDB7.5 **DD**			UGB7.5 **DG**	UGE7.5 **DG**		
8.0kV	US80A **SE**										
10kV	US100A **SE**	USB10 **DH** USS10 **DH**	688-10 **BE**	UDA10 **DD** 1N5597* **DE**			UGB10 **DG**				
12kV	US120A **SE**	688-12 **BE**									
12.5kV											

*Available as JAN

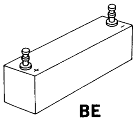
RECTIFIER MODULES



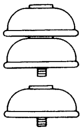
DF DG



DH



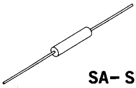
BE



DD DE

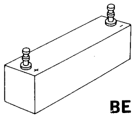
STANDARD RECOVERY

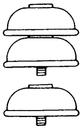
Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT		
	.100-.250A	.250-.50A	.50-.75A
15kV	US150A **SF** USS15 **DH**	688-15 **BE**	UDA15 **DD**
17.5kV			
18kV	US180A **SF**	688-18 **BE**	
20kV	US200A **SF**	688-20 **BE**	
22.5kV			
25kV	688-25 **BE**		

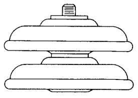


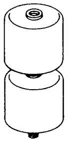
FAST RECOVERY

Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT					
	.100-.250A	.250-.50A	.50-.75A	.75-1.5A	2-2.5A	4-6A
1.0kV						
1.2kV				USR12 **SA**		
1.5kV			USR15 **SA**			
1.8kV			USR18 **SA**			
2.0kV			USR20 **SB**			
2.5kV		USR25 **SB**		UFB2.5 **DH**	UDD2.5 **DD**	UDF2.5 **DD** UGF2.5 **DG**
3.0kV		USR30 **SC**				
3.5kV		USR35 **SC**				
4.0kV		USR40A **SD**				
4.5kV	USR45A **SD**					
Reverse Recovery Time (Max.)	500ns 250ns*	500ns 250ns†	500ns 250ns*	500ns 250ns*	500ns 250ns* 150ns†	500ns



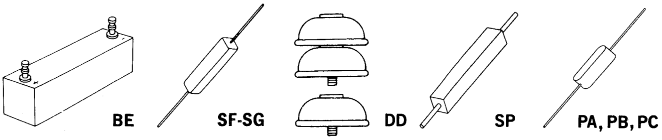






FAST RECOVERY

Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT							
	.100-.250A	.250-.50A	.50-.75A	.75 1A	1-1.5A	1.5-2A	2-2.5A	2.5-4A
5.0kV	USR50A **SD**	UFS5 **DH**	UFB5 **DH**		UDC5 **DD** UDD5 **DD**			UDF5 **DD** UGD5 **DG** UGF5 **DG**
6.0kV	USR60A **SD**							
7.0kV	USR70A **SE**							
7.5kV		UFB7.5 **DH** UFS7.5 **DH**		UDC7.5 **DD** UDD7.5 **DD**			UGD7.5 **DG** UGF7.5 **DG**	
8.0kV	USR80A **SE**							
10kV	USR100A **SE**	UFS10 **DH**	UDC10 **DD** 688-10R **BE**			UGD10 **DG**		
12kV	USR120A **SF**	688-12R **BE**						
12.5kV								
Reverse Recovery Time (Max.)	500ns	500ns	500ns	500ns	500ns	500ns	500ns	500ns



FAST RECOVERY

Peak Inverse Voltage	AVERAGE D.C. OUTPUT CURRENT	
	.100-.250A	.250-.75A
15kV	USR150A **SF**	UDC15 **DD** 688-15R **BE**
17.5kV		
18kV	USR180A **SF**	688-18R **BE**
20kV	688-20R **BE**	
22.5kV		
25kV	688-25R **BE**	
Reverse Recovery Time (Max.)	500ns	500ns 150ns

OPTIONAL HIGH RELIABILITY (HR2) SCREENING
(Consult factory for applicable part numbers)

SCREEN	MIL-STD-750 METHOD	CONDITIONS
PERFORM ON DISCRETE DIODES PRIOR TO ENCAPSULATION		
1. High Temperature Storage	1032	24 Hours @ T_A + 175°C
2. Temperature Cycling	1051	C, 10 Cycles, −65 to +175°C. No dwell required @ 25°C, t ≥ 10 min. @ extremes.
3. Hermetic Seal a. Gross	1071	E, ZYGLO
4. High Temperature Reverse Bias (HTRB)	1038	A, 48 Hours, T_A = 125°C, V_R = 80% of rating
5. Interim Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C, PDA = 10% (Final Electricals)
BRIDGE MODULE SCREENING		
1. Temperature Cycling	1051	F, 10 Cycles, −55 to +150°C. No dwell required @ 25°C, t ≥ 10 min. @ extremes.
2. Final Electrical Parameters	GO/NO GO	V_F + I_R @ 25°C
3. External Visual		

RECTIFIER ASSEMBLIES
Single Phase Bridges, 10 Amp, Military Approved

JAN & JANTX 469-1
JAN & JANTX 469-2
JAN & JANTX 469-3

FEATURES
- Qualified to MIL-S-19500/469
- Current Rating: to 10A
- PIV: from 200 to 600V
- Surge Ratings of 100A
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION
This series of military high-current single-phase bridge offer the utmost in reliability as required in military system designs. The TX series is assembled with diodes which have been subjected to 100% screening tests.

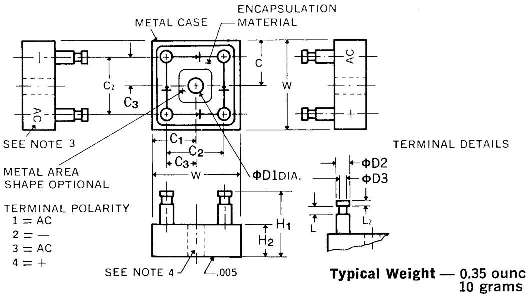
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	200 to 600V
Maximum Average D.C. Output Current	
@ $T_C = +55°C$	10A
@ $T_C = +100°C$	6A
Non-Repetitive Sinusoidal Surge (8.3ms)	
@ $T_C = +55°C$	100A
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient	25°C/W
Junction to Case	5°C/W

Dimensions				
Ltr	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
C_1	.367	.375	9.32	9.53
C_2	.350	.450	8.89	11.43
C_3	.175	.225	4.45	5.72
ϕD_1	.139	.149	3.53	3.78
ϕD_2	.091	.101	2.31	2.57
ϕD_3	.066	.076	1.68	1.93
H_1		.570		14.48
H_2		.370		9.40
L_1	.088	.098	2.24	2.49
L_2	.020	.030	.51	.76
W	.735	.750	18.67	19.05

MECHANICAL SPECIFICATIONS

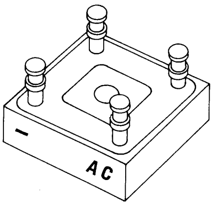
JAN & JANTX 469-1, JAN & JANTX 469-2, JAN & JANTX 469-3



Typical Weight — 0.35 ounces
10 grams

See table above

MD



NOTES:
1. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
2. Terminals shall be tinned.
3. Polarity shall be marked on the bridge body adjacent to terminals. Terminal numbers are for reference and do not have to be marked on the bridge; however, terminal (1) shall be indicated by a mechanical index such as a line, flattened corner, etc., visible from the top (terminal surface) of the device.
4. Point at which T_C is read shall be in metal part of a case as shown on drawing.

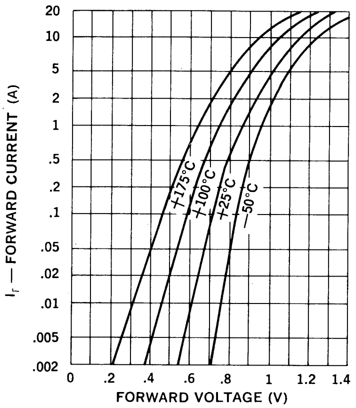
Microsemi Corp.
Watertown
The diode experts

Electrical Specification (at 25°C unless noted)

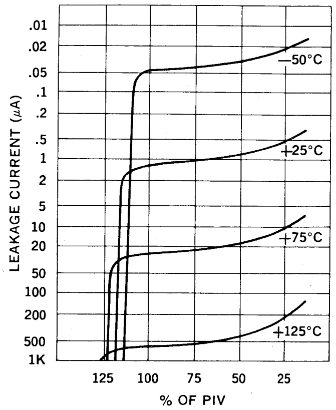
Type	PIV Per Leg	Minimum Reverse Breakdown Voltage Per Leg @ 50μA	Maximum Forward Voltage Drop Per Leg*	Maximum Reverse Recovery Time†	Maximum Leakage Current Per Leg @ PIV	
					$T_C = 25°C$	$T_C = 100°C$
	Volts	Volts		μS	μA	μA
JAN & JANTX 469-1 JAN & JANTX 469-2 JAN & JANTX 469-3	200 400 600	240 460 660	1.35V @ 15.7A(pk)	2	2	125

*Maximum forward voltage drop is measured at a pulse width of 8.3ms.
†Measured in a reverse-recovery circuit switching from 0.5A forward to 1.0A reverse current recovering to 0.25A.

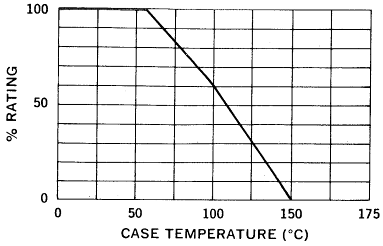
Typical Forward Voltage Per Leg vs. Forward Current

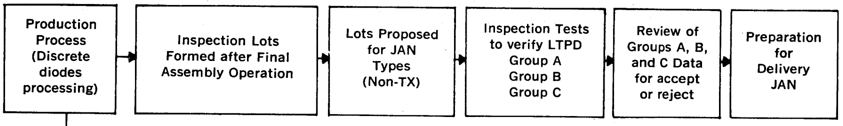


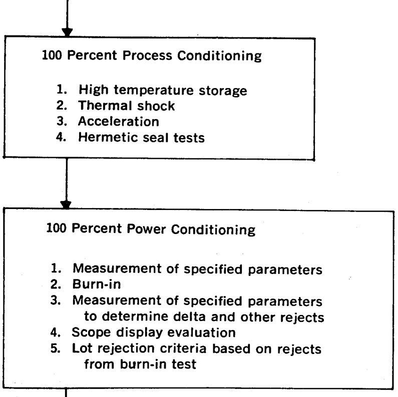
Typical Leakage Current vs. PIV

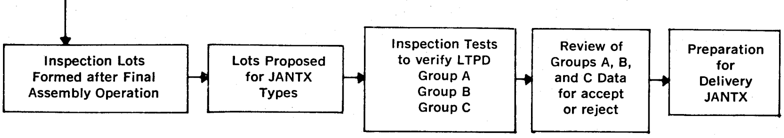


Current Derating Curve

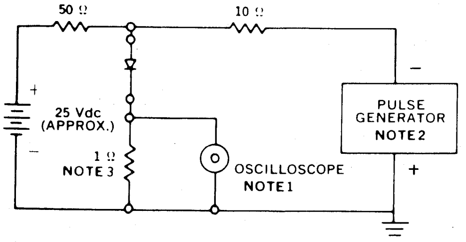








Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time < 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time < 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIER ASSEMBLIES

Three Phase Bridges, 25 Amp, Military Approved

JANTX 483-1
JANTX 483-2
JANTX 483-3

FEATURES

- Qualified to MIL-S-19500/483
- Current Rating: 25A
- PIV: from 200 to 600V
- Surge Ratings: 150A
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION

This military high-current three phase bridge series is assembled with diodes which have been subjected to TX type screening tests. This series of bridges offers the utmost in high reliability as normally required in military system design.

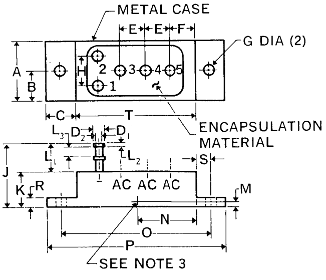
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	200 to 600V
Maximum Average D.C. Output Current	
@ $T_C = 55°C$	25A
@ $T_C = 100°C$	18.5A
Non-Repetitive Sinusoidal Surge (8.3ms)	
@ $T_C = 55°C$	150A
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient	20°C/W
Junction to Case	2.5°C/W

LTR	DIMENSIONS INCH MIN	INCH MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.730	.770	18.54	19.56
B	.355	.395	9.02	10.03
C	.355	.395	9.02	10.03
D_1	.141	.151	3.58	3.84
D_2	.108	.118	2.74	3.00
E	.355	.395	9.02	10.03
F	.230	.270	5.84	6.86
G	.149	.189	3.78	4.80
H	.355	.395	9.02	10.03
J		.82		20.83
K	.39	.51	9.91	12.95
L_1	.240	.320	6.10	8.13
L_2	.015	.030	.38	.76
L_3	.100	.125	2.54	3.18
M	.040	.060	1.02	1.52
N	.72	.78	18.29	19.81
O	1.84	1.90	46.74	48.26
P	2.22	2.28	56.39	57.91
R	.09	.15	2.29	3.81
S	.168	.208	4.27	5.28
T	1.47	1.53	37.34	38.86

MECHANICAL SPECIFICATIONS

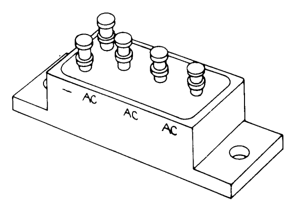
JANTX 483-1 JANTX 483-2 JANTX 483-3



See Table Above

Typical Weight — 1.0 ounces
30 grams

ME



NOTES:
1. Terminals shall be tinned.
2. Polarity shall be marked as shown on drawing.
3. Point at which T_C is read (shall be in metal part of case).

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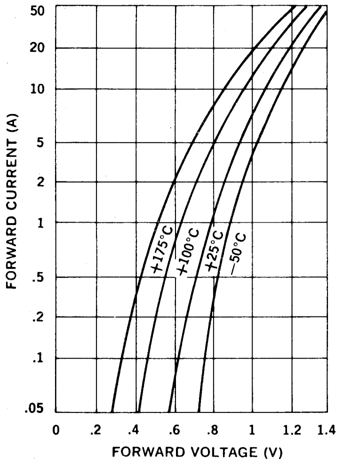
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

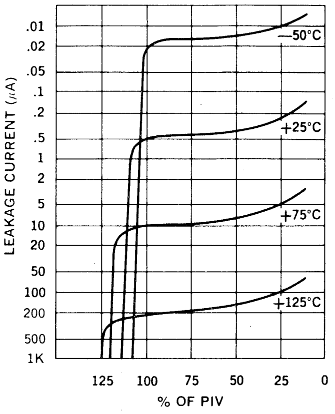
Type	PIV Per Leg	Breakdown Voltage Per Leg @ 50μA	Maximum Forward Voltage Drop Per Leg*	Maximum Leakage Current Per Leg @ PIV $T_C = 25$°C	Maximum Leakage Current Per Leg @ PIV $T_C = 100$°C
	Volts	Volts		μA	μA
JANTX 483-1	200	240	1.3V @ 39A (pk)	2	200
JANTX 483-2	400	480			
JANTX 483-3	600	660			

* Maximum forward voltage drop is measured at a pulse width of 8.3ms, duty cycle ≤2%.

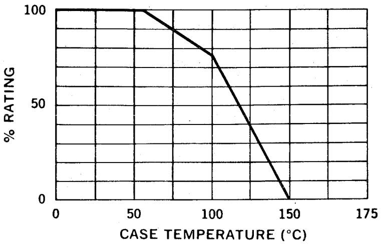
Typical Forward Voltage Per Leg vs. Forward Current

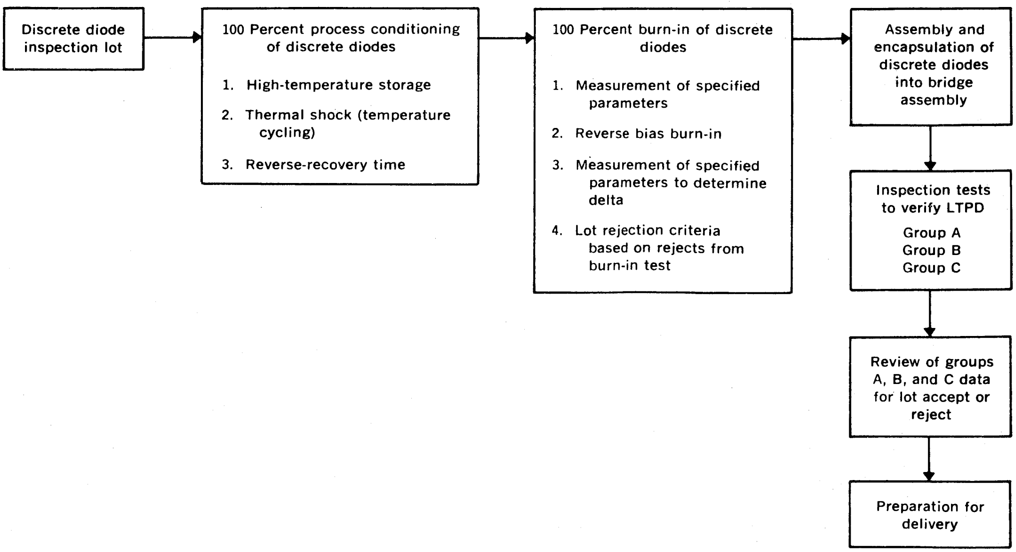


Typical Leakage Current vs. PIV



Current Derating Curve





RECTIFIER ASSEMBLIES

673, 676 SERIES

Single Phase Bridges, 1.5Amp, Standard and Fast Recovery

FEATURES

- Miniature Package
- Surge Ratings: to 25A
- PIV's: from 100 to 600V
- Recovery Times: to 500ns
- Controlled Avalanche Characteristics
- Only Fused-in-Glass Diodes Used

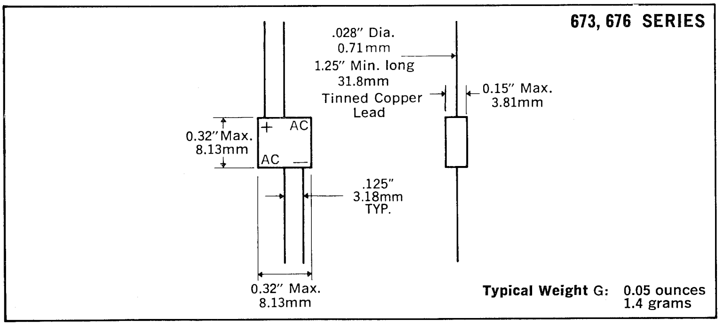
DESCRIPTION

These miniature transfer-molded single-phase power bridges are designed for universal application in power supplies. One basic bridge assembly comes in a choice of lead configurations for mounting in wired chassis or on printed boards.

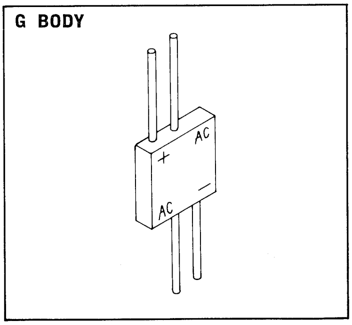
ABSOLUTE MAXIMUM RATINGS

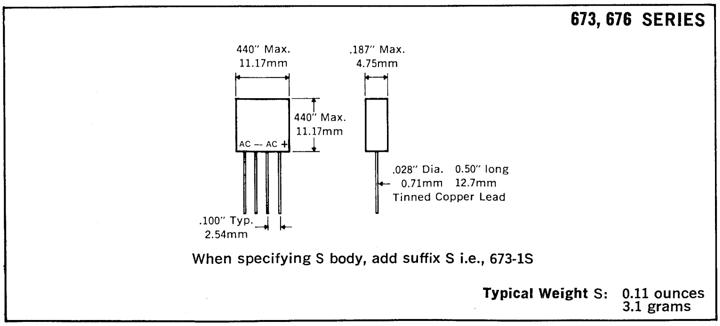
Peak Inverse Voltage	100 to 600V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3mS)	See Electrical Specifications
Operating and Storage Temperature Range	—65°C to +150°C
Thermal Resistance Junction to Ambient	50°C/W

MECHANICAL SPECIFICATIONS



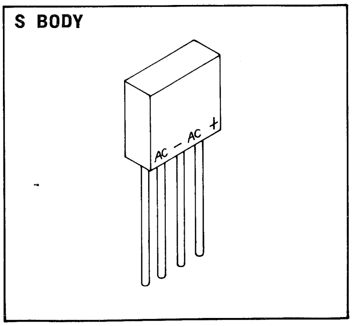
Typical Weight G: 0.05 ounces
1.4 grams





When specifying S body, add suffix S i.e., 673-1S

Typical Weight S: 0.11 ounces
3.1 grams



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

Part number is printed on the body.

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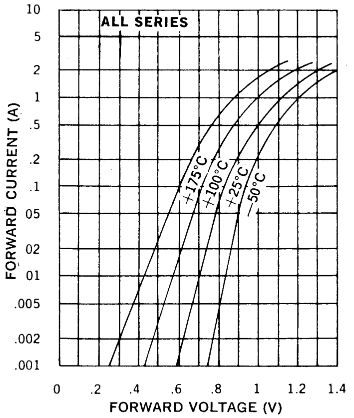
The diode experts

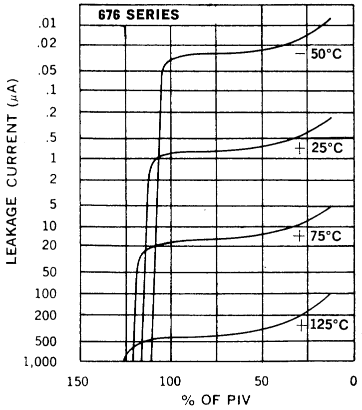
Electrical Specifications (at 25°C unless noted)							Maximum Ratings	
Type		PIV Per Leg	Maximum Forward Drop Per Leg	Leakage Current Per Leg		Maximum Reverse Recovery Time†	Maximum Average D.C. Output Current $T_A = 25°C$	Non-Repetitive Sinusoidal Surge (8.3mS)
				$T_A = 25°C$	$T_A = 100°C$			
		Volts		μA	μA	ns	Amps	Amps
Standard Recovery	673-1	100	1.1V @ 1.0A	2	100	—	1.5	25
	673-2	200						
	673-3	300						
	673-4	400						
	673-5	500						
	673-6	600						
Fast Recovery	676-1	100	1.1V @ 0.5A	3	150	500	1.0	20
	676-2	200						
	676-3	300						
	676-4	400						
	676-5	500						
	676-6	600						

†Measured in a reverse recovery circuit switching from 10mA forward to 10mA reverse current recovering to 5mA.

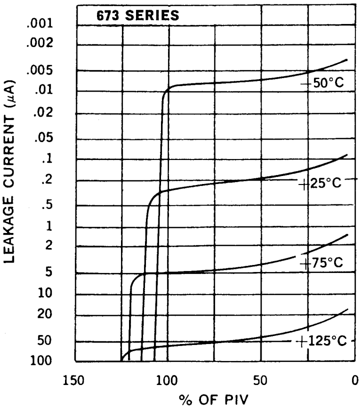
Typical Forward Voltage Per Leg vs. Forward Current



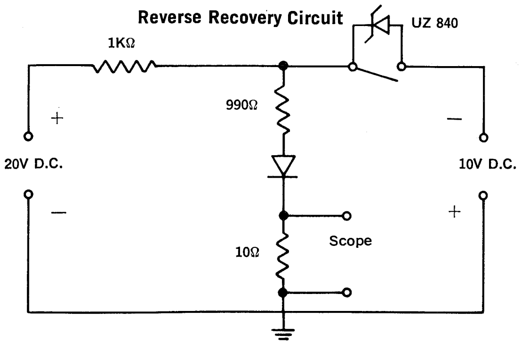
Typical Leakage Current vs. PIV



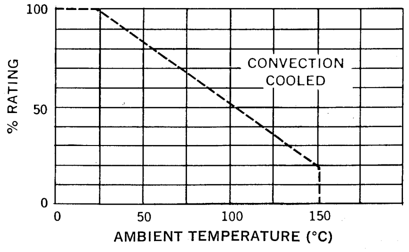
Typical Leakage Current vs. PIV



Reverse Recovery Circuit



Current Derating Curve



RECTIFIER ASSEMBLIES

Single Phase Bridges, High Voltage
0.125-0.6 Amp, Standard and Fast Recovery

673, 676 SERIES
(1200-5000V)

FEATURES

- Miniature High Voltage Bridges
- Continuous Ratings: to 0.6A
- Surge Ratings: to 15A
- PIV's: from 1200 to 5000V
- Recovery Times: to 500ns
- Controlled Avalanche Characteristics
- Only Fused in Glass Diodes Used

DESCRIPTION

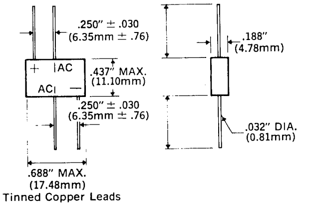
These miniature molded high-voltage single phase bridges are designed for universal application in power supplies. The miniature package is shatterproof and is capable of handling extremes in temperature, vibration and shock. These bridges, therefore are ideally suited for miniaturized, tightly packaged equipment operating in extreme environments.

ABSOLUTE MAXIMUM RATINGS

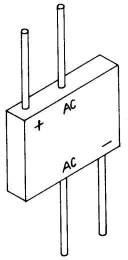
Peak Inverse Voltage	1200 to 5000V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range	−65°C to +150°C
Thermal Resistance Junction-to-Ambient	50°C/W

MECHANICAL SPECIFICATIONS

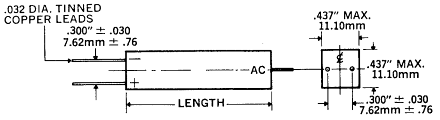
673-7



Body H



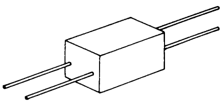
673, 676 SERIES



MAX. LENGTHS

J	K	L	M	N	O	P
.562" 14.27mm	.688" 17.48mm	.875" 22.23mm	1.125" 28.58mm	1.25" 31.75mm	1.375" 34.92mm	1.625" 41.28mm

BODY J through P



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative Output	—

Part number is printed on the body.

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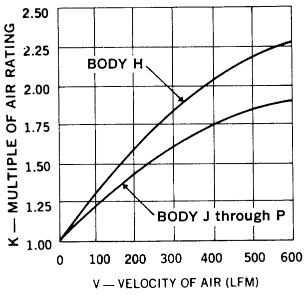
Watertown
The diode experts

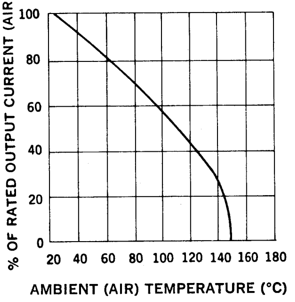
Type		Electrical Specifications at 25°C						Maximum Ratings		
		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time*	Body Size	Maximum Average D.C. Output Current		Non-repetitive Sinusoidal Surge (8.3ms)
				$T_A = 25°C$	$T_A = 100°C$			$T_A = 25°C$ Air	$T_A = 50°C$ Oil	
		Volts		μA	μA	ns		Amps	Amps	Amps
Standard Recovery	673-7	1200	2.2V @ 0.4A	2	100		H	0.6	1.5	15
	673-75	1800	3.3V @ 0.4A				J	0.5	1.25	
	673-8	2400	4.4V @ 0.4A				K	0.4	1.0	
	673-85	3000	5.5V @ 0.3A				L	0.3	0.75	
	673-9	3600	6.6V @ 0.2A				M	0.2	0.5	
	673-10	4200	7.7V @ 0.2A				N	0.18	0.45	
	673-11	4800	8.8V @ 0.15A				O	0.16	0.4	
	673-12	5000	9.0V @ 0.15A				O	0.16	0.4	
Fast Recovery	676-12	1200	3.3V @ 0.3A	5	150	500	J	0.4	1.0	10
	676-18	1800	4.4V @ 0.2A				K	0.35	0.85	
	676-24	2400	5.5V @ 0.2A				L	0.325	0.8	
	676-30	3000	7.7V @ 0.2A				M	0.25	0.625	
	676-36	3600	8.8V @ 0.15A				N	0.175	0.425	
	676-42	4200	9.9V @ 0.15A				O	0.15	0.375	
	676-48	4800	11V @ 0.15A				P	0.135	0.325	
	676-50	5000	11V @ 0.15A				P	0.125	0.3	

†Measured in a reverse recovery circuit switching from 10mA forward to 10mA reverse current recovering to 5mA.

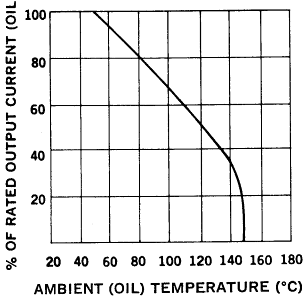
Output Current Ratio vs Velocity of Air Flow



Output Current vs Ambient (Air) Temperature

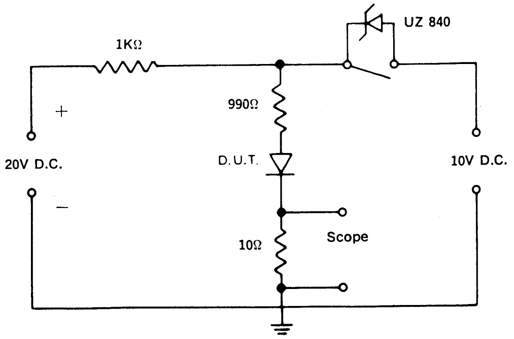


Output Current vs Ambient (Oil) Temperature

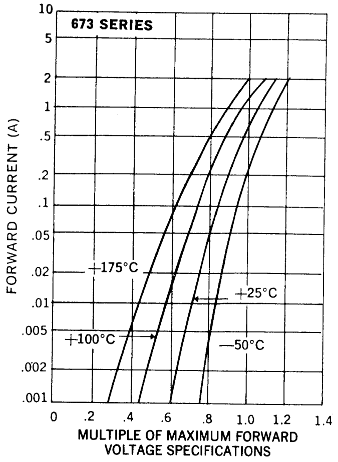


Application example: The rectifier is to be used in a cabinet at 60°C with ambient air moving at 400 LFM. The rating is reduced (Fig. 2) by a factor of 0.81 due to the elevated temperature, but is enhanced by 2.X (Fig. 1) due to the air flow. Hence the DC output current is 0.81 x 2, or 1.6 times the 25°C air rating.

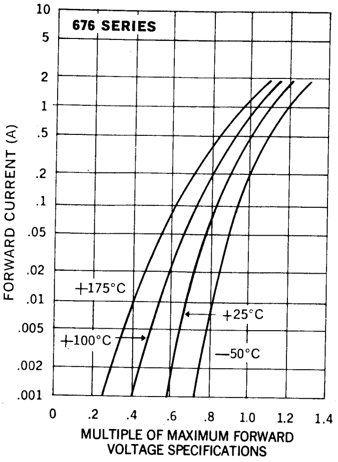
Reverse-Recovery Circuit



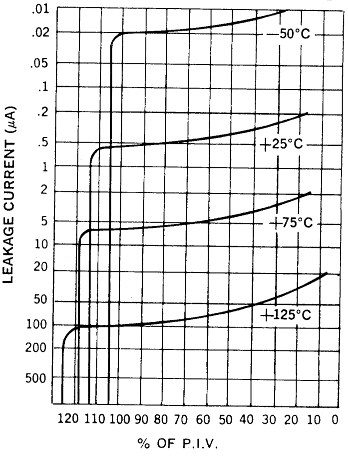
Typical Forward Voltage vs Forward Current



Typical Forward Voltage vs Forward Current



Typical Leakage Current vs. Voltage



678, 682, 695
696 SERIES

RECTIFIER ASSEMBLIES

Three Phase Bridges, 15-25 Amp, Standard and Fast Recovery Magnum®

FEATURES

- Current Rating: to 25A
- PIVs: from 100 to 600V
- Only Fused-in-Glass Diodes Used
- Recovery Times: to 500ns
- Controlled Avalanche Characteristics
- Surge Ratings: to 150A
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION

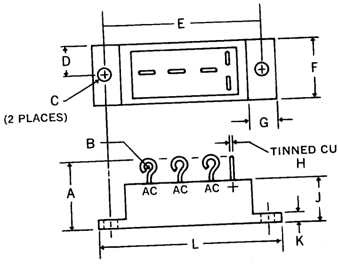
This series of three phase MAGNUM® bridges offer the ultimate in high current power supply applications. The fast recovery series allows operation at full power at high frequencies (up to 40KHz squarewave), often used in choppers, inverters and converters in aircraft, missiles, etc., equipment.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage .... 100 to 600V
Maximum Average D.C. Output Current .... See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms) .... See Electrical Specifications
Operating and Storage Temperature Range, T_C .... —65°C to +150°C
Thermal Resistance Junction to Ambient, All Series .... 20°C/W
Junction to Case, 678, 682 Series .... 1.5°C/W
Junction to Case, 695, 696 Series .... 3.0°C/W

MECHANICAL SPECIFICATIONS

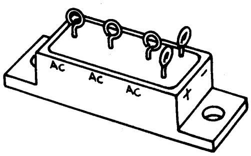
678, 682, 695, 696 SERIES



	ins.	mm.
A	.820 MAX.	20.83 MAX.
B	.09 DIA. TYP.	2.29 DIA. TYP.
C	.164-.174 DIA.	4.17-4.42 DIA.
D	.365-.385	9.27-9.78
E	1.870-1.880	47.50-47.75
F	.740-.760	18.80-19.30
G	.370-.390	9.40-9.91
H	.040 TYP.	1.02 TYP
J	.486-.506	12.34-12.85
K	.115-.135	2.92-3.43
L	2.240-2.260	56.90-57.40

Typical Weight — 30 grams

NC



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

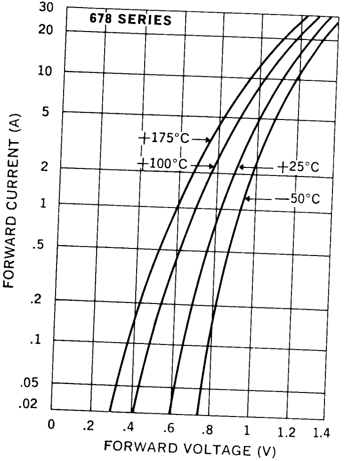
Part number is printed on the body.

Microsemi Corp.
Watertown
The diode experts

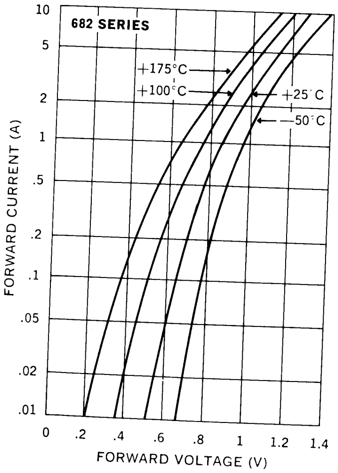
Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time*	Maximum Average D.C. Output Current		Non-Repetitive Sinusoidal Surge (8.3ms)
				$T_A = 25°C$	$T_A = 100°C$		$T_C = 55°C$	$T_C = 100°C$	$T_A = 100°C$
		Volts		µA	µA	ns	Amps	Amps	Amps
Standard Recovery	678-1	100	1.2V @ 10A	10	200	—	25	18.5	150
	678-2	200							
	678-3	300							
	678-4	400							
	678-5	500							
	678-6	600							
Standard Recovery	695-1	100	1.2V @ 2A	5	150	—	15	9	80
	695-2	200							
	695-3	300							
	695-4	400							
	695-5	500							
	695-6	600							
Fast Recovery	682-1	100	1.2V @ 6A	10	200	500	20	14	150
	682-2	200							
	682-3	300							
	682-4	400							
	682-5	500							
	682-6	600							
Fast Recovery	696-1	100	1.2V @ 2A	5	150	500	15	9	60
	696-2	200							
	696-3	300							
	696-4	400							
	696-5	500							
	696-6	600							

*Measured in a reverse recovery circuit switching from 1.0A forward to 1.0A reverse current recovering to 0.5A.

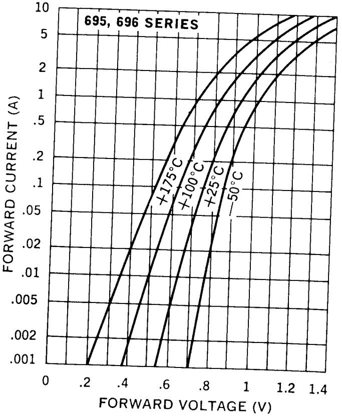
Typical Forward Voltage Per Leg vs. Forward Current



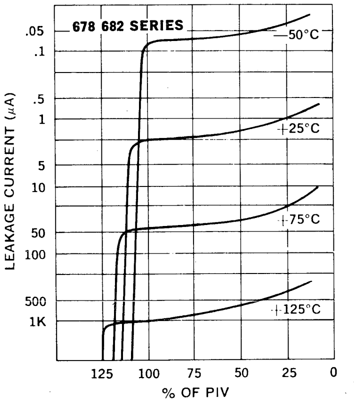
Typical Forward Voltage Per Leg vs. Forward Current



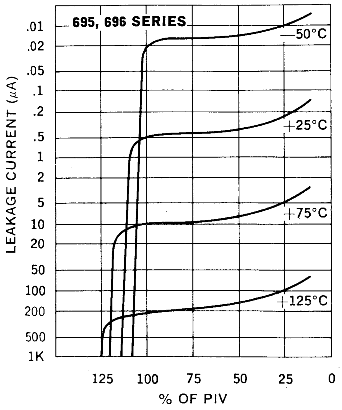
Typical Forward Voltage Per Leg vs. Forward Current



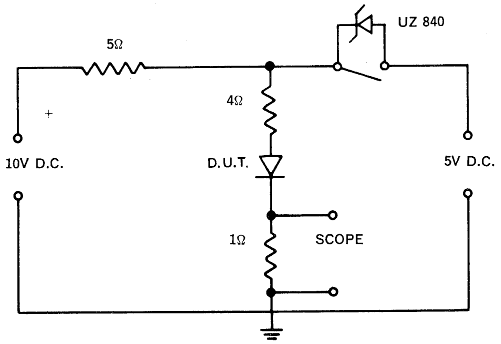
Typical Leakage Current vs. PIV



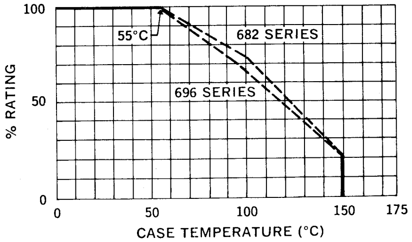
Typical Leakage Current vs. PIV



Reverse Recovery Circuit

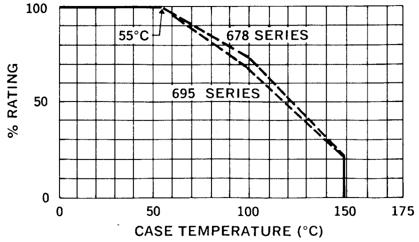


Current Derating Curve



Fast Recovery Series

Current Derating Curve



Standard Recovery Series

RECTIFIER ASSEMBLIES

679, 680, 683, 684 SERIES

Single Phase Bridges, 10-25 Amp, Standard and Fast Recovery Magnum™

FEATURES

- Current Ratings: to 25A
- Recovery Time: to 500ns
- PIVs: from 100 to 600V
- Surge Ratings: to 150A
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION

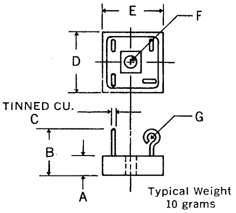
This series of single phase MAGNUM™ bridge offers the designer the ultimate in high current power supply applications. The fast recovery series allows operation at full power at high frequencies, up to 40kHz square wave, which is often used in chopper, inverters and converters in aircraft, missiles, etc., equipment.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	100 to 600V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient, 679, 683 Series	20°C/W
Junction to Ambient, 680, 684 Series	25°C/W
Junction to Case, 679, 683 Series	2.0°C/W
Junction to Case, 680, 684 Series	4.0°C/W

MECHANICAL SPECIFICATIONS

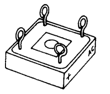
680, 684 SERIES



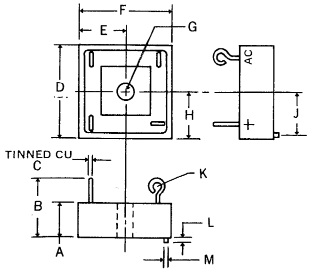
	ins.	mm.
A	.250 MAX.	6.10 MAX.
B	.57 MAX.	14.45 MAX.
C	.040 TYP.	1.02 TYP.
D	.750 MAX.	19.05 MAX.
E	.750 MAX.	19.05 MAX.
F	.140 DIA.	3.56 DIA.
G	.09 DIA. TYP.	2.29 DIA. TYP.

Typical Weight — 0.35 ounces
10 grams

NA



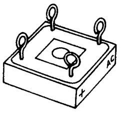
679, 683 SERIES



	ins.	mm.
A	.328 MAX.	8.33 MAX.
B	.750 MAX.	19.05 MAX.
C	.040 TYP.	1.02 TYP.
D	1.125 MAX.	28.58 MAX.
E	.562	14.27
F	1.125 MAX.	28.58 MAX.
G	.193	4.90
H	.562	14.27
J	.500	12.70
K	.09 DIA. TYP.	2.29 DIA. TYP.
L	.062	1.57
M	.062	1.57

Typical Weight — 0.7 ounces
20 grams

NB



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

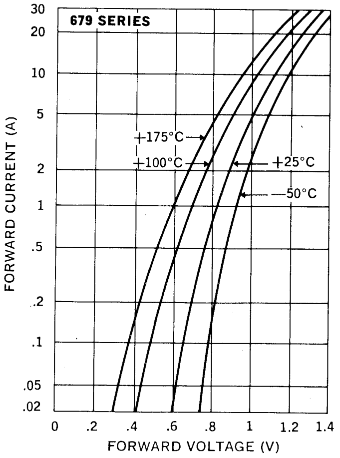
Part number is printed on the body.

Microsemi Corp.
Watertown
The diode experts

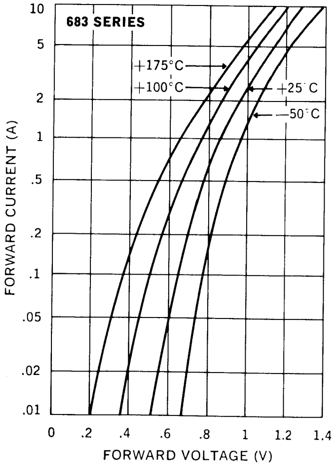
Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time*	Maximum Average D.C. Output Current		Non-Repetitive Sinusoidal Surge (8.3ms)
				$T_A = 25°C$	$T_A = 100°C$		$T_C = 55°C$	$T_C = 100°C$	$T_A = 100°C$
		Volts		µA	µA	ns	Amps	Amps	Amps
Standard Recovery	679-1	100	1.2V @ 10A	10	200	—	25	18.5	150
	679-2	200							
	679-3	300							
	679-4	400							
	679-5	500							
	679-6	600							
Standard Recovery	680-1	100	1.2V @ 2A	2	50	—	10	6	50
	680-2	200							
	680-3	300							
	680-4	400							
	680-5	500							
	680-6	600							
Fast Recovery	683-1	100	1.2V @ 6A	10	200	500	20	14	150
	683-2	200							
	683-3	300							
	683-4	400							
	683-5	500							
	683-6	600							
Fast Recovery	684-1	100	1.2V @ 2A	5	100	500	10	6	50
	684-2	200							
	684-3	300							
	684-4	400							
	684-5	500							
	684-6	600							

*Measured in a reverse recovery circuit switching from 1.0A forward to 1.0A reverse current recovering to 0.5A.

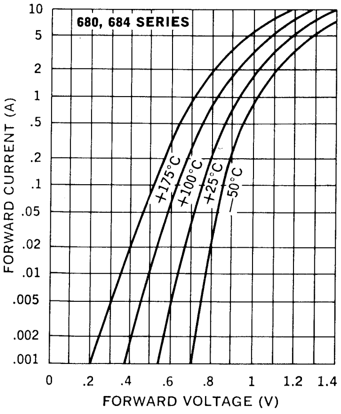
Typical Forward Voltage Per Leg vs. Forward Current



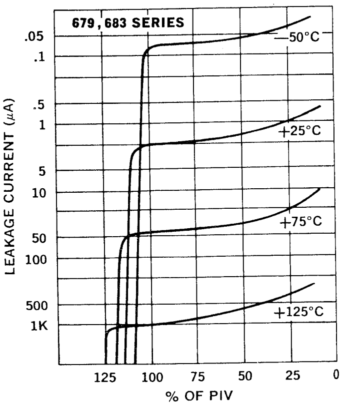
Typical Forward Voltage Per Leg vs. Forward Current



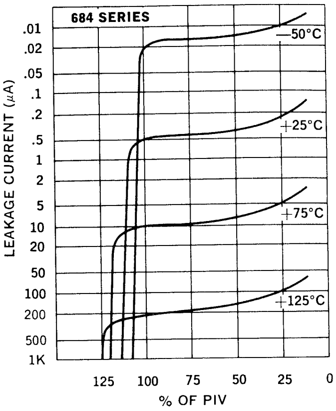
Typical Forward Voltage Per Leg vs. Forward Current



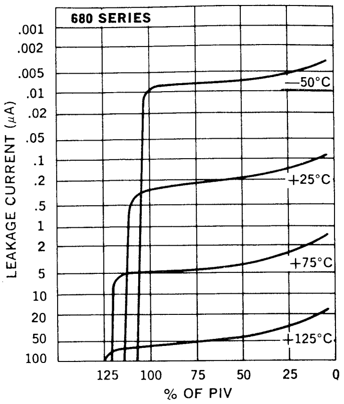
Typical Leakage Current vs. PIV



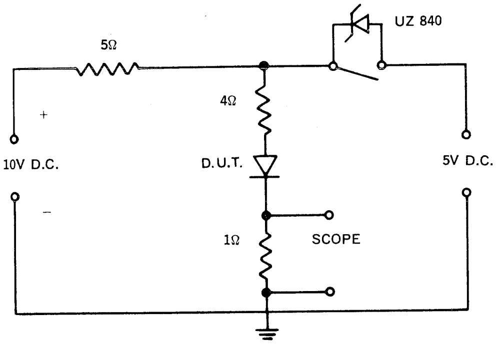
Typical Leakage Current vs. PIV



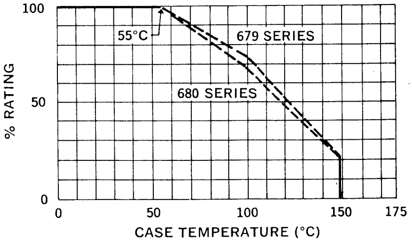
Typical Leakage Current vs. PIV



Reverse Recovery Circuit

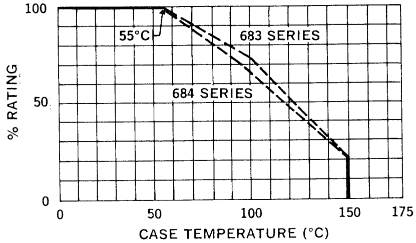


Current Derating Curve



Standard Recovery Series

Current Derating Curve



Fast Recovery Series

RECTIFIER ASSEMBLIES

Doubler and Center Tap, 15 Amp, Standard and Fast Recovery, Magnum®

681, 689 SERIES

FEATURES

- Current Ratings: to 15A
- Aluminum Heat Sink Case, Electrically Insulated
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- PIV: 100 to 600V
- Surge Ratings of 150A

DESCRIPTION

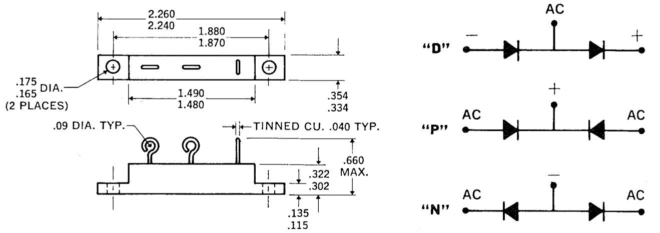
This series of MAGNUM® doublers and center tap rectifiers offers high current and high thermal conductivity needed in high current power supply applications. The MAGNUM® package is virtually indestructable and lends its use to high environmental stresses, as seen in aircraft, missile and satellite equipment.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltages	100 to 600V
Maximum Average D.C. Output Current	
@ $T_C = +55°C$	15A
@ $T_C = +100°C$	10A
Non-Repetitive Sinusoidal Surge (8.3ms)	
@ $T_A = +100°C$	150A
Operating and Storage Temperature Range, T_C	−65°C to +150°C
Thermal Resistance Junction to Ambient	20°C/W
Junction to Case	6.0°C/W

MECHANICAL SPECIFICATIONS

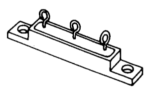
681, 689 SERIES



Orientation of terminals shown for "D". For "P" or "N" center terminal is at 90° from the AC terminals.

Typical Weight — 0.35 ounces
10 grams

ND



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

Part number is printed on the body.

† Add suffix P, N, or D for terminal configuration P, N, or D. For example, for center tap configuration, P, order 681-IP.

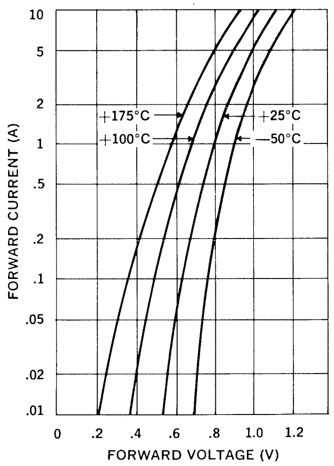
Microsemi Corp.
Watertown
The diode experts

Electrical Specifications (at 25°C unless noted)

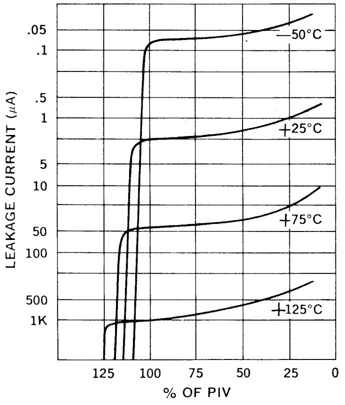
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Reverse Recovery Time*	Maximum Leakage Current Per Leg @ PIV	
					$T_A = 25°C$	$T_A = 100°C$
		Volts		nS	µA	µA
Standard Recovery	681-1	100	1.2V @ 10A		10	200
	681-2	200				
	681-3	300				
	681-4	400				
	681-5	500				
	681-6	600				
Fast Recovery	689-1	100	1.2V @ 10A	500	10	200
	689-2	200				
	689-3	300				
	689-4	400				
	689-5	500				
	689-6	600				

*Measured in a reverse recovery circuit from 1A forward to 1A reverse current recovery to 0.5A.

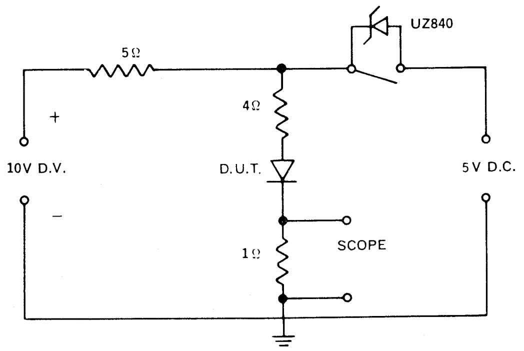
Typical Forward Voltage Per Leg vs. Forward Current



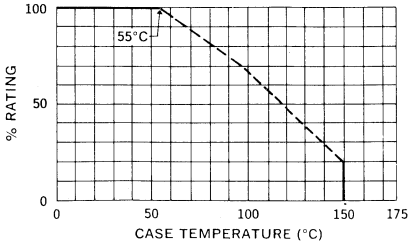
Typical Leakage Current vs. PIV



Reverse-Recovery Circuit



Current Derating Curve



RECTIFIER ASSEMBLIES
High Voltage Stacks, Standard and Fast Recovery

688 SERIES

FEATURES
- PIV: from 10kV to 25kV
- Surge Ratings of 20A
- Recovery Time Available: to 500ns
- Current Ratings: to 0.6A
- Bonded Plate for Maximum Heat Transfer
- Controlled Avalanche Characteristics
- Only Fused-in-Glass Diodes Used

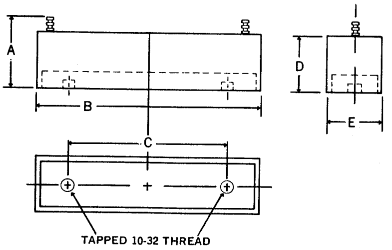
DESCRIPTION
This series of high power stacks has a unique packaging design that provides characteristics not obtainable in conventional molded epoxy packages. This series, therefore, is ideally suited for high-voltage, high-power applications.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	10kV to 25kV
Maximum Average D.C. Output Current	See Electrical Specifications
Non-repetitive Sinusoidal Surge (8.3ms)	20A
Operating and Storage Temperature Range, T_C	−65°C to +150°C
Thermal Resistance Junction to Ambient	25°C/W
Junction to Case	10°C/W

MECHANICAL SPECIFICATIONS

688 SERIES

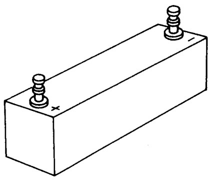


	ins.	mm.
A	1.140 MAX.	28.96 MAX.
B	2.985-3.015	75.82-76.58
C	2.110-2.140	53.59-54.36
D	.740-.770	18.80-19.56
E	.720-.750	18.29-19.05

Add suffix R to denote Fast Recovery version. For example, for recovery time, $t_{rr} = 500ns$; order 688-10R.

Typical Weight — 2.5 ounces
70 grams

BE



MARKING

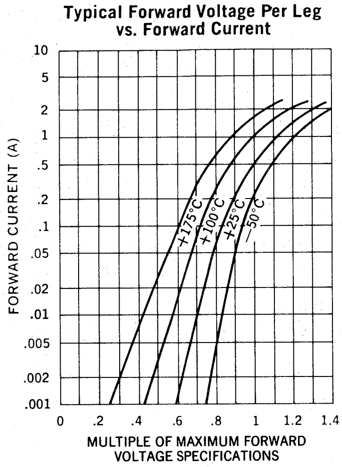
Cathode — Positive Output	+
Anode — Negative	—

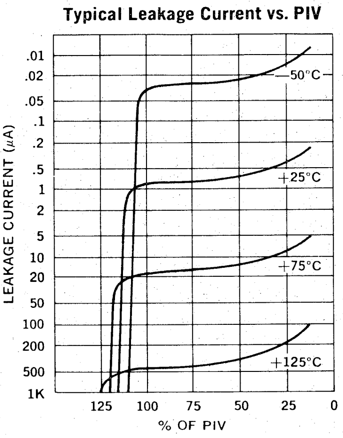
Part number is printed on the body.

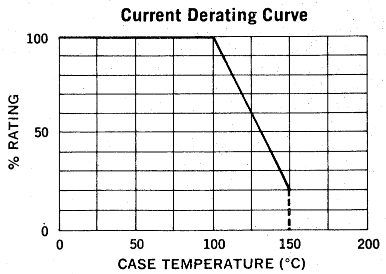
Microsemi Corp.
Watertown
The diode experts

Electrical Specifications (at 25°C unless noted)						Maximum Ratings
Type		PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV		Maximum Average D.C. Output Current
				$T_A = 25°C$	$T_A = 100°C$	$T_C = 100°C$
		kV		μA	μA	Amps
Standard And Fast Recovery*	688-10	10	17V @ 0.4A	2	100	0.60
	688-12	12	20V @ 0.4A			0.50
	688-15	15	25V @ 0.4A			0.40
	688-18	18	30V @ 0.4A			0.35
	688-20	20	34V @ 0.4A			0.30
	688-25	25	42V @ 0.4A			0.20

*Add suffix R to denote Fast Recovery version.


Typical Forward Voltage Per Leg vs. Forward Current


Typical Leakage Current vs. PIV


Current Derating Curve

RECTIFIER ASSEMBLIES

Single Phase Bridges, 7.5 Amp, Standard and Fast Recovery

697, 698 SERIES

FEATURES

- Miniature High Current Assemblies
- Continuous Ratings: to 7.5A
- Surge Ratings: to 80A
- PIV's: from 100V to 600V
- Recovery Times: to 500ns
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics

DESCRIPTION

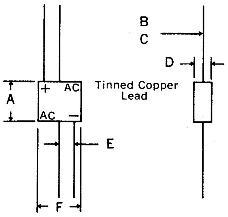
These miniature molded high-current single-phase bridges are designed for universal application in power supplies. One basic bridge fills current requirements up to 7.5A, with PIV's from 100 to 600 volts and recovery times of standard, and 500ns max.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	100 to 600V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range	—65°C to +150°C
Thermal Resistance Junction to Ambient	32°C/W
Junction to Case	10°C/W

MECHANICAL SPECIFICATIONS

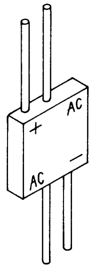
697, 698 SERIES



	ins.	mm.
A	0.50±.01	12.70±.25
B	.032 DIA.	0.81 DIA.
C	1.0 MIN.	25.4 MIN.
D	.250 MAX.	6.35 MAX.
E	.150 TYP.	3.81 TYP.
F	0.50±.01	12.70±.25

Typical Weight — 0.14 ounces
4.0 grams

GA



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

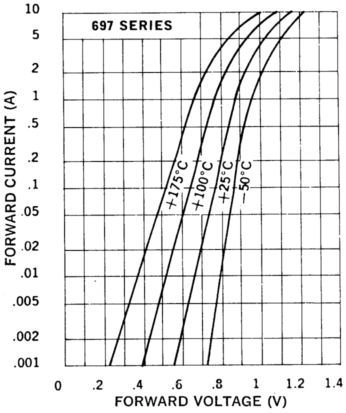
Part number is printed on the body.

Microsemi Corp.
Watertown
The diode experts

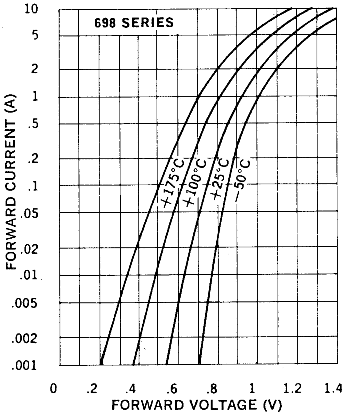
Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time†	Maximum Average D.C. Output Current		Non-Repetitive Sinusoidal Surge (8.3ms)
				T_A = 25°C	T_A = 100°C		T_A = 25°C	T_C = 55°C	
		Volts		µA	µA	ns	Amps	Amps	Amps
Standard Recovery	697-1	100	1.0V @ 2A	5	200		2.5	7.5	80
	697-2	200							
	697-3	300							
	697-4	400							
	697-5	500							
	697-6	600							
Fast Recovery	698-1	100	1.1V @ 2A	5	200	500	2.25	7.0	70
	698-2	200							
	698-3	300							
	698-4	400							
	698-5	500							
	698-6	600							

†Measured in a reverse recovery circuit switching from 1A forward to 1A reverse current recovering to .5A.

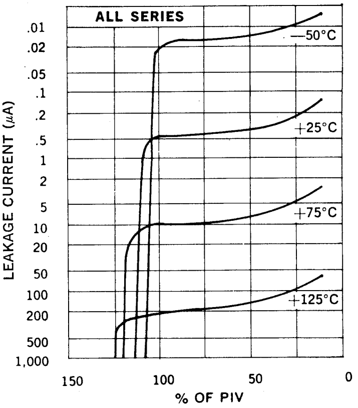
Typical Forward Voltage Per Leg vs. Forward Current



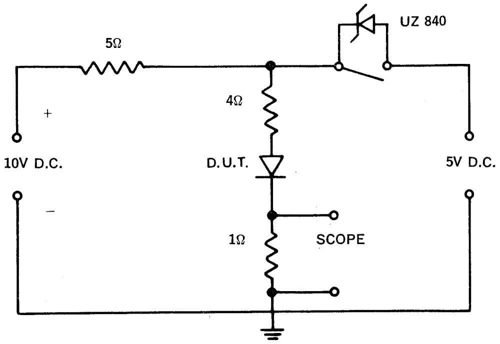
Typical Forward Voltage Per Leg vs. Forward Current



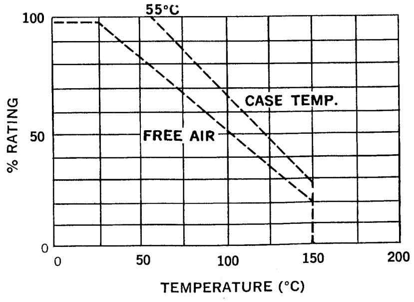
Typical Leakage Current vs. PIV



Reverse Recovery Circuit



Current Derating Curve



RECTIFIER ASSEMBLIES

700, 701 SERIES

Three Phase Bridges, 2.5 Amp, Standard and Fast Recovery

FEATURES

- Miniature Package
- Recovery Time: to 500ns
- Surge Ratings: to 25A
- PIV: from 100 to 600V
- Controlled Avalanche Characteristics
- Only Fused-in-Glass Diodes Used

DESCRIPTION

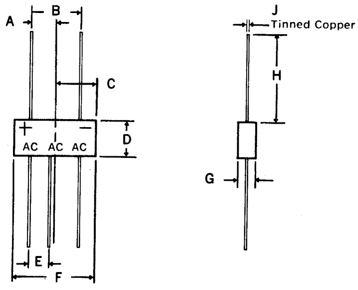
These miniature transfer-molded high-voltage three-phase power bridges are designed for universal application in power supplies. One basic bridge fills current requirements up to 2.5A, with PIV's from 100 to 600 volts and recovery times of standard and 500ns.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	100 to 600V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range	—65°C to +150°C
Thermal Resistance Junction-to-Ambient	25°C/W

MECHANICAL SPECIFICATIONS

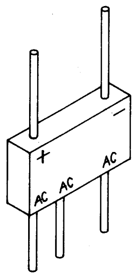
700, 701 SERIES



	ins.	mm.
A	.310	7.87
B	.621	15.77
C	.512 REF.	13.0 REF.
D	.460 MAX.	11.68 MAX.
E	.255	6.48
F	1.030 MAX.	26.16 MAX.
G	.220 MAX.	5.59 MAX.
H	.875	22.23
J	.028 DIA.	0.71 DIA.

Typical Weight — 0.12 ounces
3.5 grams

F



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

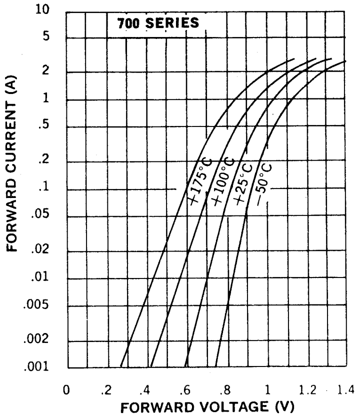
Part number is printed on the body.

Microsemi Corp.
Watertown
The diode experts

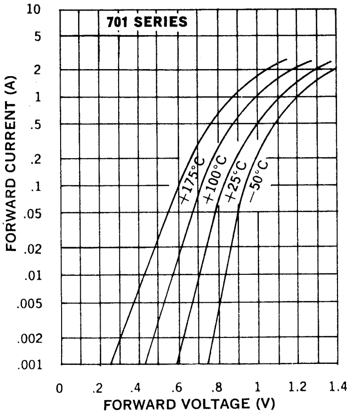
Electrical Specifications (at 25°C unless noted)							Maximum Ratings	
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time†	Maximum Average D.C. Output Current	Non-Repetitive Sinusoidal Surge (8.3ms)
				T_A = 25°C	T_A = 100°C		T_A = 55°C	
		Volts		µA	µA	ns	Amps	Amps
Standard Recovery	700-1	100	1.0V @ 0.5A	2	100		2.5	25
	700-2	200						
	700-3	300						
	700-4	400						
	700-5	500						
	700-6	600						
Fast Recovery	701-1	100	1.1V @ 0.5A	2	100	500	2.25	20
	701-2	200						
	701-3	300						
	701-4	400						
	701-5	500						
	701-6	600						

†Measured in a reverse recovery circuit switching from 10mA forward to 10mA reverse current recovering to 5mA.

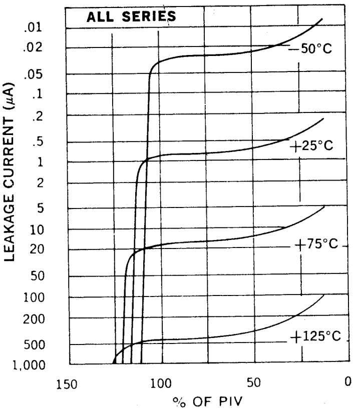
Typical Forward Voltage Per Leg vs. Forward Current



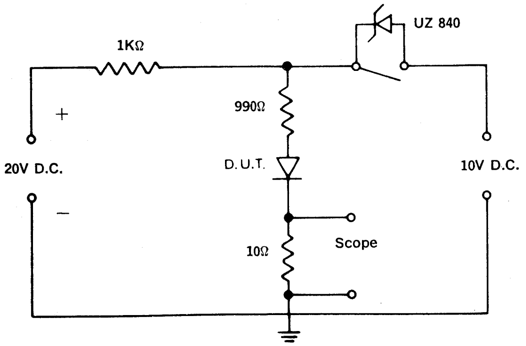
Typical Forward Voltage Per Leg vs. Forward Current



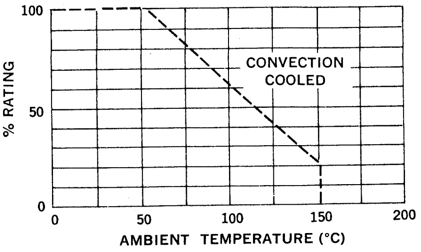
Typical Leakage Current vs. PIV



Reverse Recovery Circuit



Current Derating Curve



RECTIFIER ASSEMBLIES

Three Phase Bridges, 20-40 Amp, High Efficiency, ESP

800, 801 SERIES

FEATURES

- Current Ratings: to 40A
- Recovery Time: 50ns
- Surge Ratings: to 250A
- PIVs: from 50 to 150V
- Only Fused-in-Glass Diodes Used
- Exceptionally High Efficiency
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION

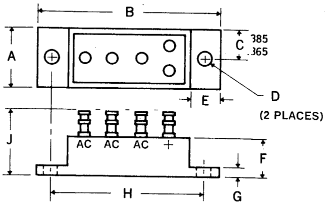
This series of three phase bridges offers the highest efficiency possible for applications where nothing else will do. The series allows operation at full power at high frequencies.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltages	50 to 150V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient, All Series	20°C/W
Junction to Case, 800 Series	1.5°C/W
Junction to Case, 801 Series	3.0°C/W

MECHANICAL SPECIFICATIONS

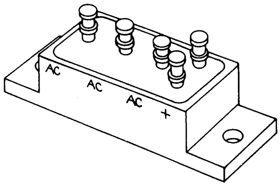
800, 801 SERIES



	ins.	mm.
A	.740-.760	18.80-19.30
B	2.240-2.260	56.90-57.40
C	.365-.385	9.27-9.78
D	.164-.174 DIA.	4.17-4.42 DIA.
E	.370-.390	9.40-9.91
F	.486-.506	12.34-12.85
G	.115-.135	2.92-3.43
H	1.870-1.880	47.50-47.75
J	.820 MAX.	20.83 MAX.

Typical Weight — 1.0 ounce
30 grams

ME



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

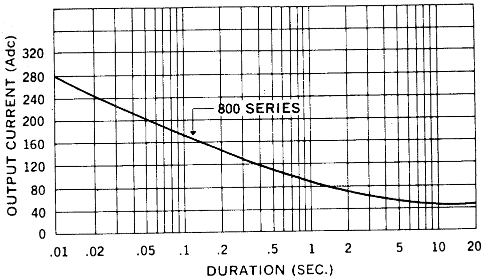
Part number is printed on the body.

Microsemi Corp.
Watertown
The diode experts

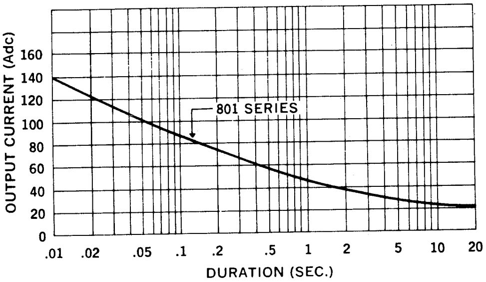
Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Reverse Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time*	Maximum Average D.C. Output Current		Non-Repetitive Sinusoidal Surge (8.3ms)
				$T_A = 25°C$	$T_A = 100°C$		$T_C = 55°C$	$T_C = 100°C$	$T_A = 100°C$
		Volts		µA	µA	ns	Amps	Amps	Amps
ESP	800-1	50	.95V @ 10A	20	1000	50	40	25	250
Recovery	800-2	100							
	800-3	125							
	800-4	150							
ESP	801-1	50	.95V @ 6A	10	300	50	20	16	125
Recovery	801-2	100							
	801-3	125							
	801-4	150							

*Measured in a reverse recovery circuit switching from 1A forward to 1A reverse current recovering to 0.5A.

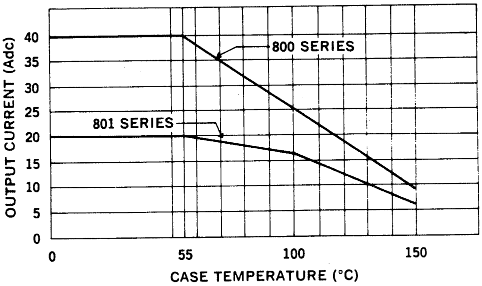
Forward Surge Current vs. Duration



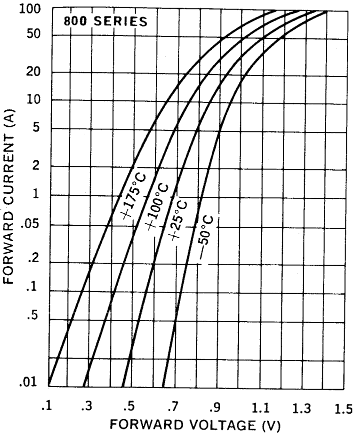
Forward Surge Current vs. Duration



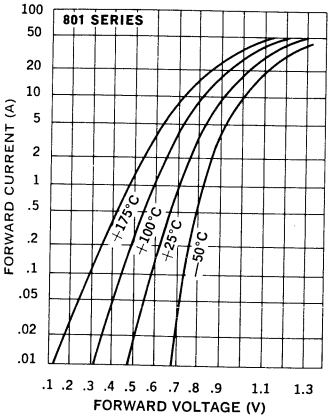
Current Derating Curve



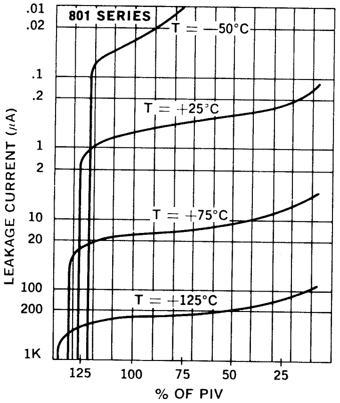
Typical Forward Voltage Per Leg vs. Forward Current



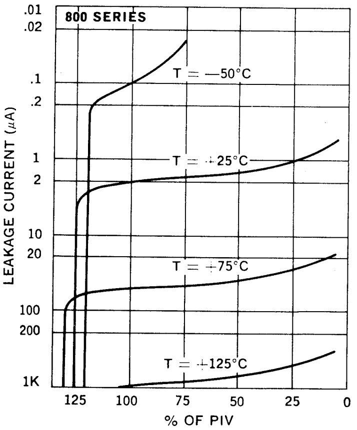
Typical Forward Voltage Per Leg vs. Forward Current



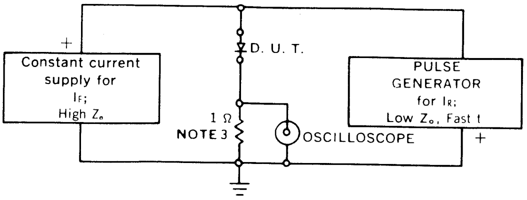
Typical Leakage Current vs. PIV



Typical Leakage Current vs. PIV



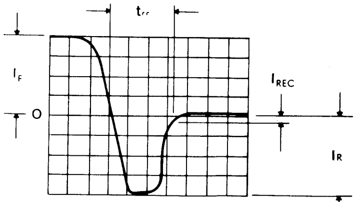
Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time $\leq$ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time $\leq$ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Characteristic Waveform



SET TIME BASE FOR 5 NS/CM

RECTIFIER ASSEMBLIES

Single Phase Bridges, 20-35 Amp, High Efficiency ESP Series

FEATURES

- Current Ratings: to 35A
- Recovery Time: 50ns
- Surge Ratings: to 250A
- PIVs: from 50 to 150V
- Only Fused-in-Glass Diodes Used
- Exceptional High Efficiency
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION

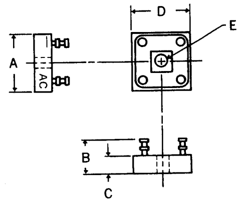
This series of single phase bridges offer the highest efficiency possible for applications where nothing else will do. The series allow operation at full power at very high frequency.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	50 to 150V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient, 802 Series	20°C/W
803 Series	25°C/W
Junction to Case, 802 Series	2.0°C/W
803 Series	4.0°C/W

MECHANICAL SPECIFICATIONS

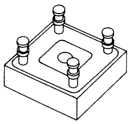
803 SERIES



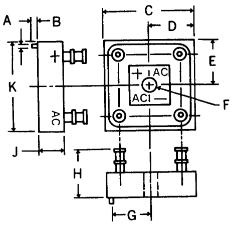
	ins.	mm.
A	.735-.755	18.67-19.18
B	.570 MAX.	14.48 MAX.
C	.250 MAX.	5.74-6.25
D	.735-.755	18.67-19.18
E	.139-.149 DIA.	3.30-3.81

Typical Weight — 0.35 ounces
10 grams

MA



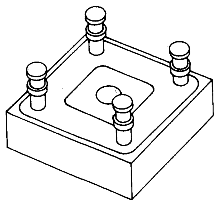
802 SERIES



	ins.	mm.
A	.056-.066	1.42-1.68
B	.052-.072	1.32-1.83
C	1.115-1.135	28.32-28.83
D	.552-.572	14.02-14.53
E	.552-.572	14.02-14.53
F	.180-.200 DIA.	4.57-5.08 DIA.
G	.490-.510	12.45-12.95
H	.750 MAX.	19.05 MAX.
J	.302-.322	7.67-8.18
K	1.115-1.135	28.32-28.83

Typical Weight — 0.70 ounces
20 grams

MB



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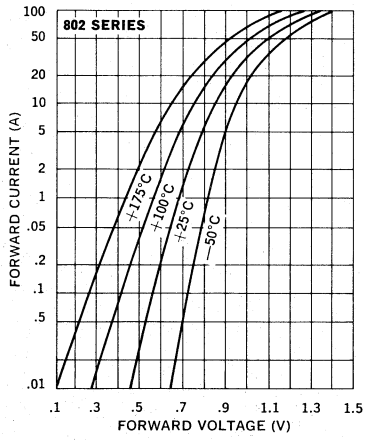
The diode experts

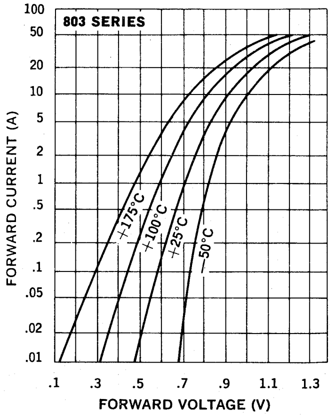
Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Reverse Leakage Current Per Leg @ PIV		Maximum Reverse Recovery Time*	Maximum Average D.C. Output Current		Non-Repetitive Sinusoidal Surge (8.3ms)
				T_A = 25°C	T_A = 100°C		T_C = 55°C	T_C = 100°C	T_A = 100°C
		Volts		µA	µA	ns	Amps	Amps	Amps
ESP Recovery	802-1	50	.95V @ 10A	20	1000	50	35	22.5	250
	802-2	100							
	802-3	125							
	802-4	150							
ESP Recovery	803-1	50	.95V @ 6A	10	300	50	20	16	125
	803-2	100							
	803-3	125							
	803-4	150							

*Measured in a reverse recovery circuit switching from 1A forward to 1A reverse current recovering to 0.5A.

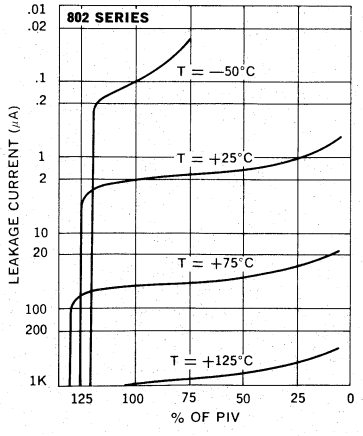
Typical Forward Voltage Per Leg vs. Forward Current



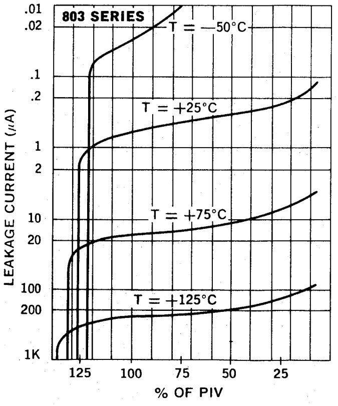
Typical Forward Voltage Per Leg vs. Forward Current



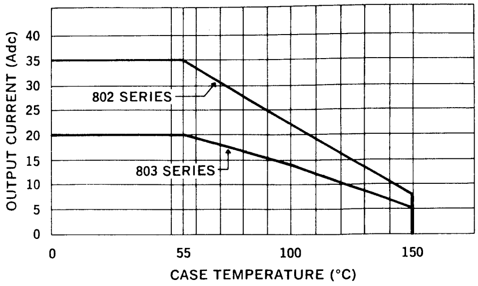
Typical Leakage Current vs. PIV



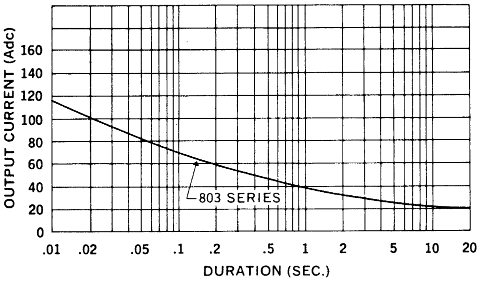
Typical Leakage Current vs. PIV



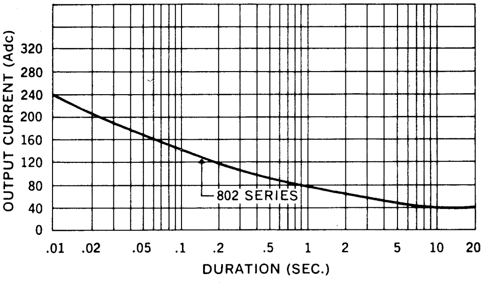
Current Derating Curve



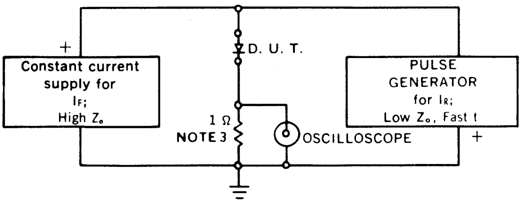
Forward Surge Current vs. Duration



Forward Surge Current vs. Duration



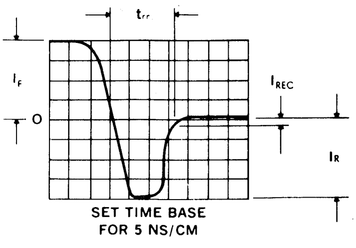
Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ≤ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ≤ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Characteristic Waveform



RECTIFIER ASSEMBLIES

804 SERIES

Doublers and Center Tap, 20 Amp, High Efficiency, ESP

FEATURES

- Current Rating: to 20A
- Aluminum Heat Sink Case, Electrically Insulated
- Recovery Time: 50ns
- Surge Ratings of 250A
- PIVs: from 50 to 150V
- Only Fused-in-Glass Diodes Used
- Exceptional High Efficiency

DESCRIPTION

This series of doublers and center tap rectifiers offer the ultimate in high efficiency application. The rectifiers are particularly suited to switching regulator supplies where very fast recovery time and low forward drop are of prime importance.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	50 to 150V
Maximum Average D.C. Output Current	
@ $T_C = +55°C$	20A
@ $T_C = +100°C$	14A
Non-Repetitive Sinusoidal Surge (8.3ms)	
@ $T_A = +100°C$	250A
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient	20°C/W
Junction to Case	6.0°C/W

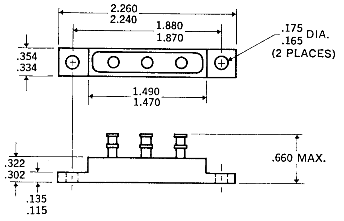
Electrical Specifications (at 25°C unless noted)

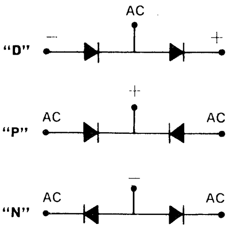
Type		PIV Per Leg	Maximum Forward Voltage Drop Per Leg	Maximum Leakage Current (μA) Per Leg @ PIV		Maximum Reverse Recovery Time*
				$T_A = 25°C$	$T_A = 100°C$	
		Volts		μA	μA	ns
ESP	804-1	50	.95V @ 10A	10	500	50
Recovery	804-2	100				
	804-3	125				
	804-4	150				

*Measured in a reverse recovery circuit switching from 1A forward to 1A reverse current recovering to 0.5A.

MECHANICAL SPECIFICATIONS

804 SERIES

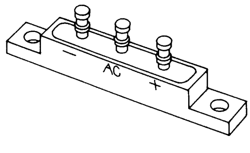




Dimensions in inches.

Typical Weight — 0.35 ounces
10 grams

MF



MARKING

Alternating Current Input	A.C.
Cathode — Positive Output	+
Anode — Negative	—

Part number is printed on the body.

† Add suffix P, N, or D for terminal configuration P, N, or D. For example, for center tap configuration, P, order 804-IP

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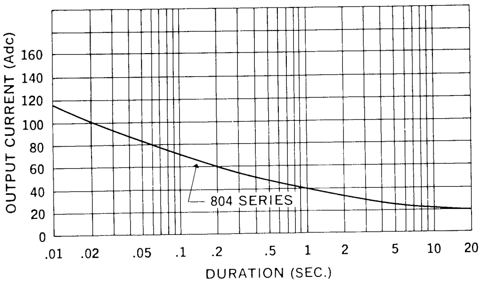
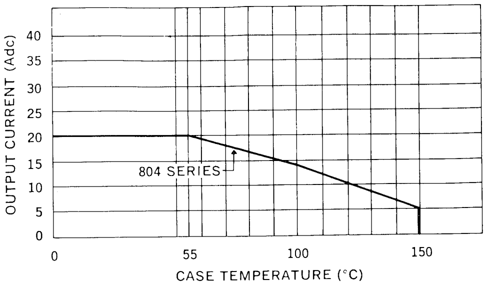
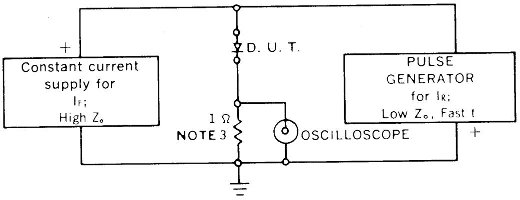
Forward Surge Current vs. Duration



Current Derating Curve



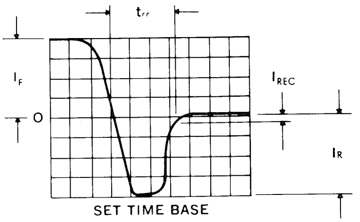
Reverse-Recovery Circuit



NOTES:

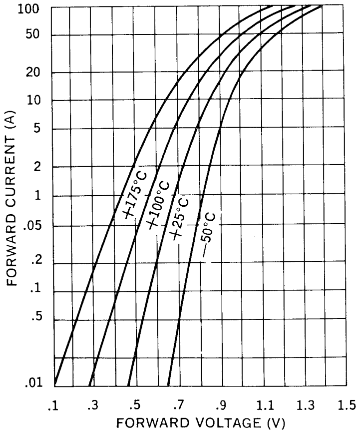
1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

Characteristic Waveform

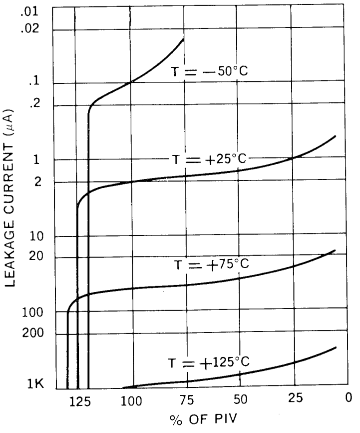


SET TIME BASE
FOR 5 NS/CM

Typical Forward Voltage Per Leg vs. Forward Current



Typical Leakage Current vs. PIV



RECTIFIER ASSEMBLIES
High Voltage Stacks, 1 Amp to 5 Amp, Military Approved

JAN 1N5597
JAN 1N5600
JAN 1N5603

FEATURES

- Qualified to MIL-S-19500/404A
- PIV: to 10kV
- Surge Ratings: to 200A
- Current Ratings: to 5A
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Modular Package For Easy Stacking

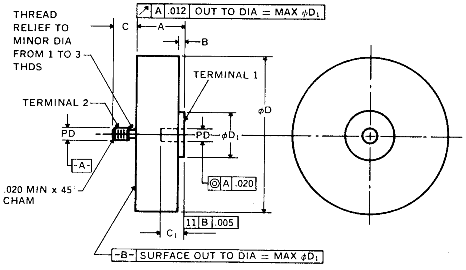
DESCRIPTION

This series of military high-voltage high-current stacks offers the utmost in reliability as required in military system designs. The rectifiers are assembled with diodes which have been subjected to TX type screening tests.

ABSOLUTE MAXIMUM RATINGS

	JAN 1N5597	JAN 1N5600	JAN 1N5603
Peak Inverse Voltage	10kV	5kV	5kV
Maximum Average D.C. Output Current @ $T_C = 75°C$	1A	2A	5A
Non-Repetitive Sinusoidal Surge (8.3ms) @ $T_C = 75°C$	30A	80A	200A
Operating and Storage Temperature Range, T_C	−65°C to +150°C		

MECHANICAL SPECIFICATIONS



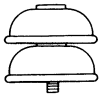
JAN 1N5597 JAN 1N5600

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses		NOTES
	Minimum	Maximum	
A	.73 (18.54)	.83 (21.08)	8
B		.080 (2.03)	
C	.240 (6.10)	.264 (6.71)	2,6
C_1	.265 (6.73)	.400 (10.16)	4
ϕD	1.85 (46.99)	1.95 (49.53)	
ϕD_1	.57 (14.48)	.67 (17.02)	

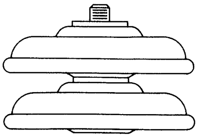
JAN 1N5603

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses		NOTES
	Minimum	Maximum	
A	.970 (24.64)	1.020 (25.91)	8
B	.050 (1.27)	.080 (2.03)	
C	.307 (7.80)	.317 (8.05)	3
C_1	.318 (8.08)	.400 (10.16)	5,7
ϕD	3.450 (87.63)	3.650 (92.71)	
ϕD_1	.95 (24.13)	1.250 (31.75)	

DE



DF



1. All marking shall be on cathode side of module.
2. Threaded stud 1/4-28UNF-2A.
3. Threaded stud 3/8-24UNF-2A.
4. Threaded insert 1/4-28UNF-2B.
5. Threaded insert 3/8-24UNF-2B.
6. Cathode connected to terminal 2.
7. Cathode connected to terminal 1.
8. Module contour within dimension A is not specified.

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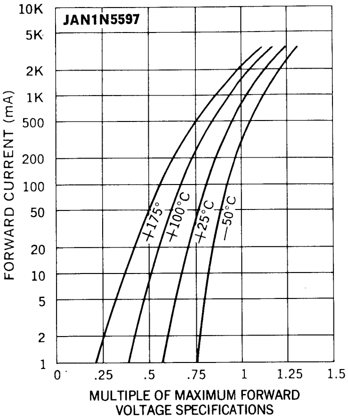
Watertown
The diode experts

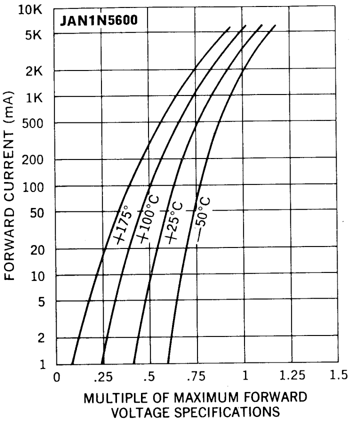
Electrical Specifications (at 25°C unless noted)

Type	PIV	Forward Voltage Drop		Maximum Leakage Current @ PIV		Capacitance @ V_R = 100V		Maximum Reverse Transient Energy Absorption
		Min.	Max.	T_A = 25°C	T_A = 100°C	Min.	Max.	
	kV			µA	µA	pf	pf	joules
JAN 1N5597	10	13V @ 1A	19V @ 1A	1	75	5	30	2
JAN 1N5600	5	6V @ 2A	10V @ 2A	5	100	7	30	6
JAN 1N5603	5	6V @ 5A	10V @ 5A	5	100	15	40	12

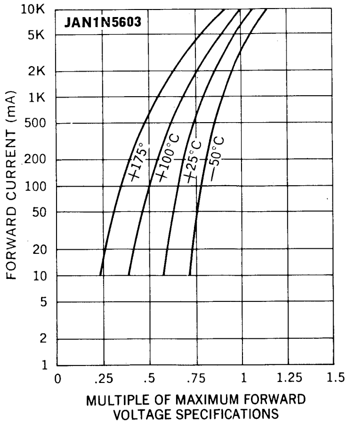
Typical Forward Voltage vs. Forward Current



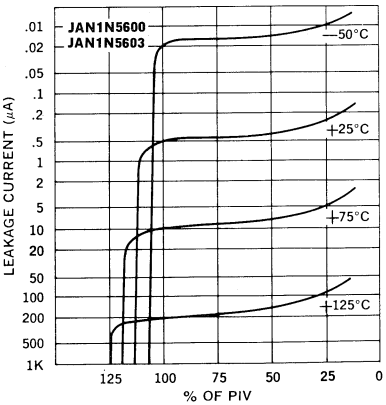
Typical Forward Voltage vs. Forward Current



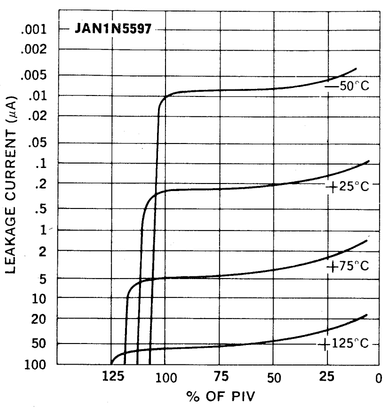
Typical Forward Voltage vs. Forward Current



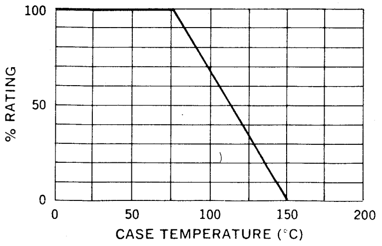
Typical Leakage Current vs. PIV

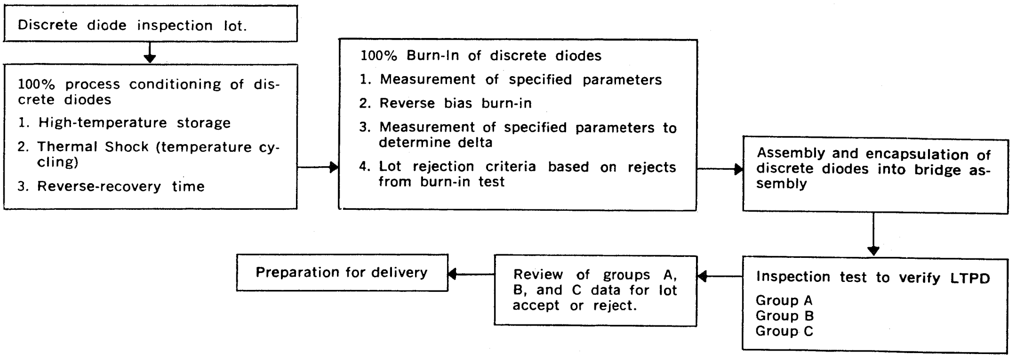


Typical Leakage Current vs. PIV



Current Derating Curve





Discrete diode inspection lot.

100% process conditioning of discrete diodes
1. High-temperature storage
2. Thermal Shock (temperature cycling)
3. Reverse-recovery time

100% Burn-In of discrete diodes
1. Measurement of specified parameters
2. Reverse bias burn-in
3. Measurement of specified parameters to determine delta
4. Lot rejection criteria based on rejects from burn-in test

Assembly and encapsulation of discrete diodes into bridge assembly

Inspection test to verify LTPD
Group A
Group B
Group C

Review of groups A, B, and C data for lot accept or reject.

Preparation for delivery

RECTIFIER ASSEMBLIES
Single Phase Bridges, 25 Amp, Military Approved

JAN SPA25
JAN SPB25
JAN SPC25
JAN SPD25

FEATURES
- Qualified to MIL-S-19500/446
- Current Rating: to 25A
- PIV: from 100 to 600V
- Surge Ratings of 150A
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Aluminum Heat Sink Case, Electrically Insulated

DESCRIPTION
This series of military high-current single-phase bridges offer the utmost in reliability as required in military system designs. This series is assembled with diodes which have been subjected to 100% screening tests.

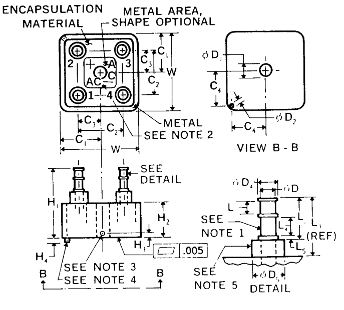
ABSOLUTE MAXIMUM RATINGS

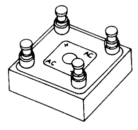
Peak Inverse Voltage	100 to 600V
Maximum Average D.C. Output Current	
@ $T_C = 55°C$	25A
@ $T_C = 100°C$	15A
Non-Repetitive Sinusoidal Surge (8.3ms)	
@ $T_C = 55°C$	150A
Operating and Storage Temperature Range, T_C	—65°C to +150°C
Thermal Resistance Junction to Ambient	20°C/W
Junction to Case	2.5°C/W

Dimensions				
Ltr	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
C_1	.552	.572	14.02	14.53
C_2	.624	.760	15.85	19.30
C_3	.312	.380	7.92	9.65
C_4	.495	.512	12.57	13.00
ϕD_1	.189	.195	4.80	4.95
ϕD_2	.057	.067	1.45	1.70
ϕD_3	.108	.118	2.74	3.00
ϕD_4	.141	.151	3.58	3.84
ϕD_5	.225	.235	5.72	5.97
H_1	.669	1.060	17.53	26.92
H_2	.300	.500	7.62	12.70
H_3	.040	.060	1.02	1.52
H_4	.042	.062	1.07	1.57
L_1	.370	.560	9.40	14.22
L_2	.307	.365	7.80	9.27
L_3	.089	.099	2.26	2.49
L_4	.132	.142	3.35	3.61
L_5	.026	.036	.66	.91
W	1.104	1.144	28.04	29.06

MECHANICAL SPECIFICATIONS

SPA25 SPB25 SPC25 SPD25





NOTES:
1. Terminals shall be hot tin dipped or silver plated.
2. Polarity shall be marked on terminal side of device.
3. Point at which Tc is read (must be in metal part of case).
4. Locating pin shall be adjacent to positive terminal.
5. Insulating sleeve shall be alumina (AL_2O_3) or equivalent.

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The diode experts

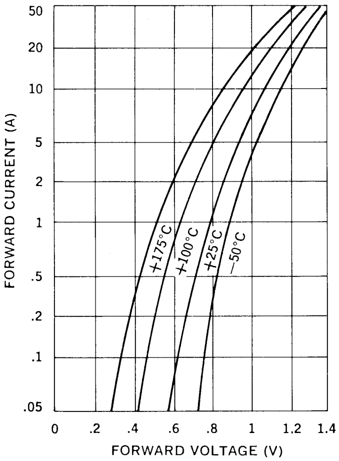
Electrical Specifications (at 25°C unless noted)

Type	PIV Per Leg	Peak Forward Voltage Drop*		Maximum Reverse Recovery Time†	Maximum Leakage Current Per Leg @ PIV	
					Tc = 25°C	Tc = 100°C
	Volts	Minimum	Maximum	µS	µA	µA
JAN SPA25	100	0.9V	1.4V	2	2	150
JAN SPB25	200	@ 39A(pk)				
JAN SPC25	400					
JAN SPD25	600					

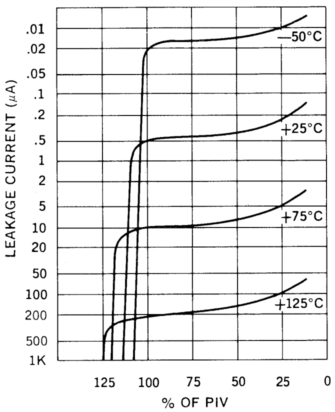
*Peak forward voltage drop is measured at a pulse width of 8.3ms.

†Measured in a reverse recovery circuit switching from 0.5A forward to 1.0A reverse current recovery to 0.5A.

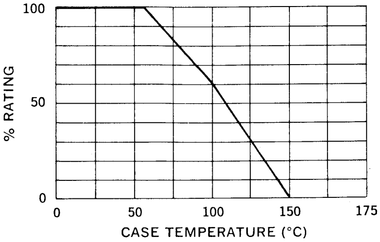
Typical Forward Voltage Per Leg vs. Forward Current

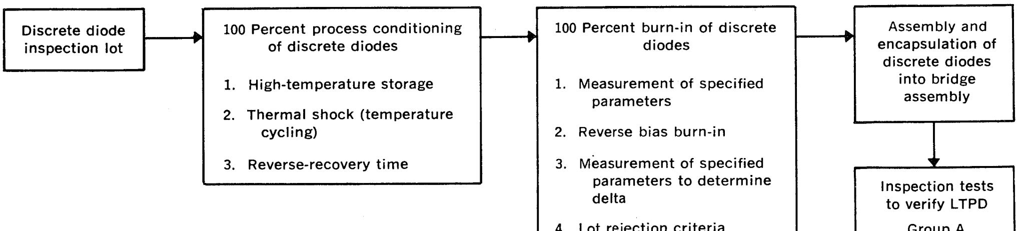


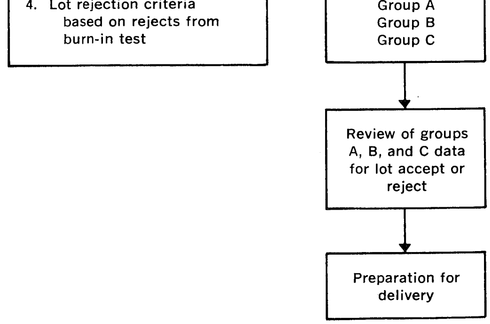
Typical Leakage Current vs. PIV



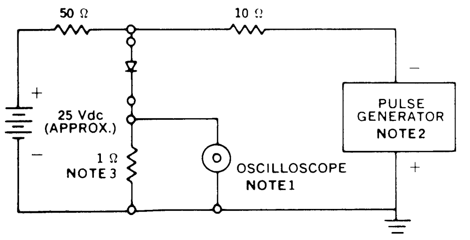
Current Derating Curve







Reverse-Recovery Circuit



NOTES:

1. Oscilloscope: Rise time ⩽ 3ns; input impedance = 50Ω.
2. Pulse Generator: Rise time ⩽ 8ns; source impedance 10Ω.
3. Current viewing resistor, non-inductive, coaxial recommended.

RECTIFIER ASSEMBLIES
High Voltage Doorbell® Modules, Standard and Fast Recovery

UDA, UDB, UDC, UDD ,
UDE, UDF SERIES

FEATURES

- PIV: from 2.5kV to 15kV
- Stackable to 600kV
- Current Ratings: to 7.7A
- Controlled Avalanche Characteristics
- Only Fused-in-Glass Diodes Used
- Recovery Time: to 500ns
- Modular Package For Easy Stacking

DESCRIPTION

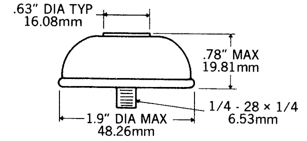
This series of high-voltage, high-current stacks that incorporate a unique modular design makes it ideally suited for high power applications such as in radar systems as charger, hold-off and clipper diodes.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	
UDA, UDC Series	5kV to 15kV
UDB, UDD Series	2.5kV to 7.5kV
UDE, UDF Series	2.5kV to 5kV
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range, T_C	—65°C to +150°C

MECHANICAL SPECIFICATIONS

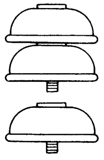
UDA, UDB, UDC, UDD, UDE, UDF SERIES



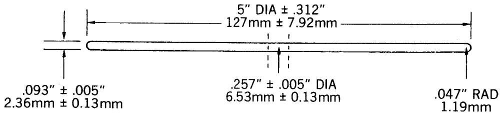
1. Polarity — Cathode connected to base.
2. Part Number — On base of unit.

Typical Weight — 2.1 ounces
60 grams

DD



EXTENDER PLATE D



Typical Weight — 2.75 ounces
78 grams

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Watertown
The diode experts

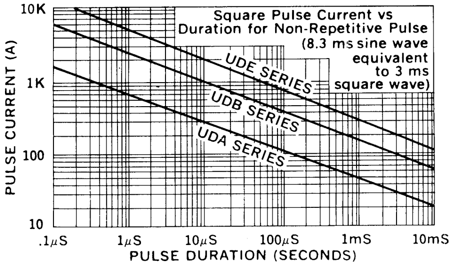
Electrical Specifications (at 25°C unless noted)						Maximum Ratings				
						Maximum Average D.C. Output Current				
Type		PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV	Maximum Reverse Recovery Time	$T_C = 75°C$ Air	$T_C = 60°C$ Air with Extender Plate**	$T_C = 50°C$ Oil	Non-Repetitive Sinusoidal Surge (8.3ms) $T_C = 100°C$	Maximum Reverse Transient Energy Absorption
		kV		μA	ns	Amps	Amps	Amps	Amps	joules
Standard Recovery	UDE-2.5	2.5	5V @ 3.00A	10	—	‡ 6.00	7.00	7.70	200	8
	UDB-2.5	2.5	4V @ 1.50A	5		3.00	3.75	4.25	100	4
	UDE-5	5	10V @ 2.20A	10		‡ 4.50	5.00	5.50	200	14
	UDB-5	5	8V @ 1.00A	5		2.00	2.50	2.75	100	8
	UDA-5	5	8V @ 0.82A	2		1.65	2.00	2.20	30	1.5
	UDB-7.5	7.5	12V @ 0.70A	5		1.33	1.65	2.00	100	12
	UDA 7.5	7.5	12V @ 0.60A	2		1.25	1.55	1.75	30	2.5
	UDA-10	10	16V @ 0.50A	2		1.00	1.25	1.40	30	3
	UDA-15	15	25V @ 0.33A	2		0.67	0.80	0.90	30	5
Fast Recovery	UDF-2.5	2.5	6V @ 2.20A	10	500* 350†	4.50	5.00	5.30	150	8
	UDD-2.5	2.5	6V @ 1.20A	5		2.25	2.80	3.30	80	4
	UDF-5	5	11V @ 1.60A	10		3.30	4.00	4.40	150	14
	UDD-5	5	11V @ 0.75A	5		1.50	1.85	2.00	80	8
	UDC-5	5	10V @ 0.70A	2		1.20	1.50	1.70	25	1.5
	UDD-7.5	7.5	17V @ 0.50A	5		1.00	1.25	1.50	80	12
	UDC-7.5	7.5	15V @ 0.50A	2		0.90	1.10	1.25	25	2.5
	UDC-10	10	20V @ 0.37A	2		0.75	0.90	1.00	25	3
	UDC-15	15	30V @ 0.25A	2		0.50	0.60	0.70	25	5

*Measured in a reverse recovery circuit switching from 1.0A forward to 1.0A reverse current recovering to 0.5A.
†Measured in a reverse recovery circuit switching from 0.5A forward to 1.0A reverse current recovering to 0.25A.

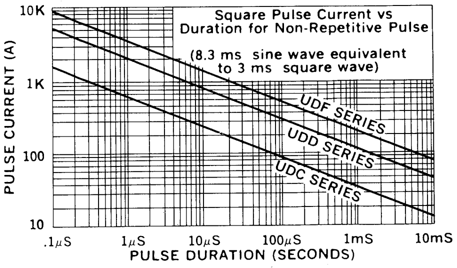
**These ratings are based on using "extender plates" that provide additional surface area to radiate heat. Because of possible corona effects caused by scratches on these plates, extreme care is necessary in their handling and they are not recommended where the working voltage exceeds 7.5KV/module. They should be carefully polished prior to installation.

‡These ratings are based on $T_C = 100°C$.

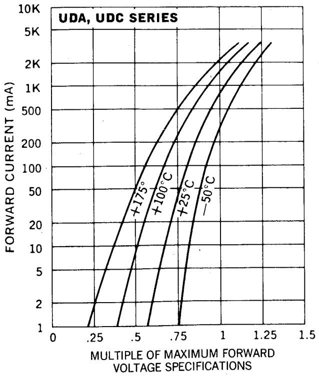
Forward Pulse Current vs. Pulse Duration



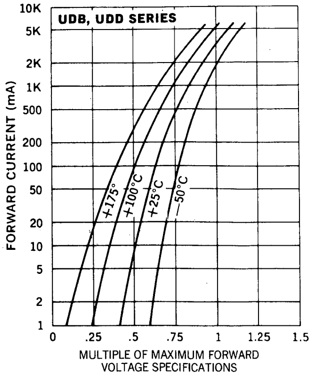
Forward Pulse Current vs. Pulse Duration



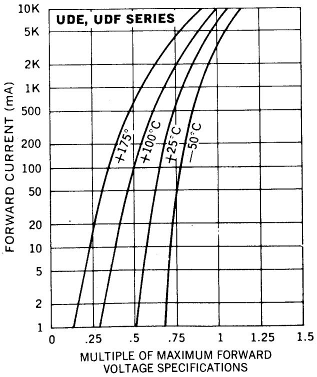
Typical Forward Voltage vs. Forward Current



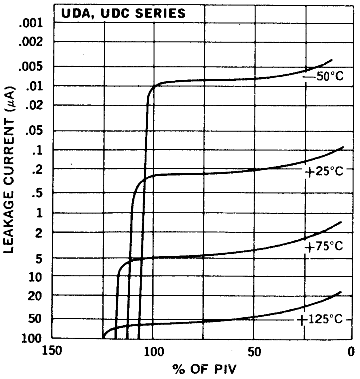
Typical Forward Voltage vs. Forward Current



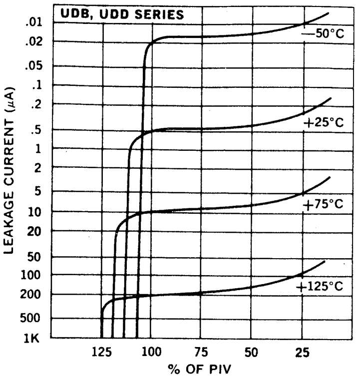
Typical Forward Voltage vs. Forward Current



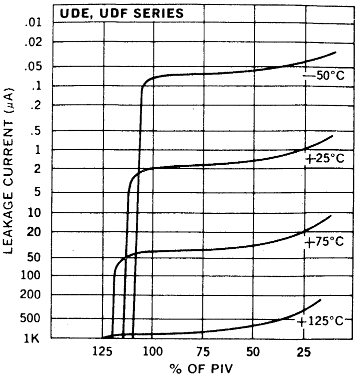
Typical Leakage Current vs. PIV



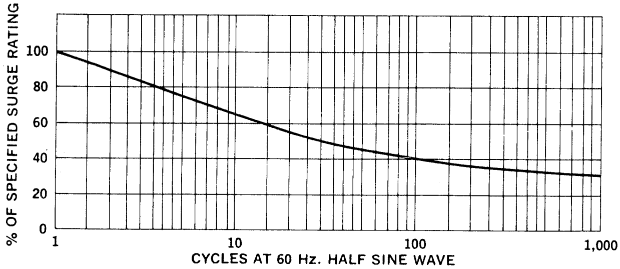
Typical Leakage Current vs. PIV



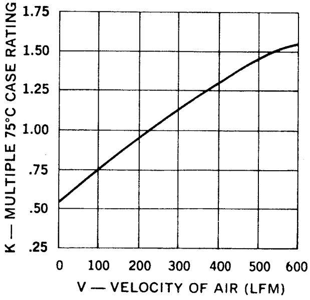
Typical Leakage Current vs. PIV



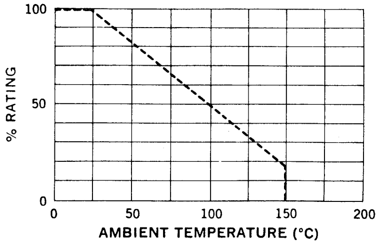
Multiple Surge Rating vs. Duration



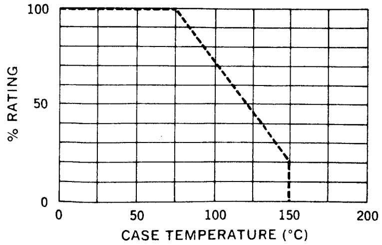
Output Current Ratio vs. Velocity of Air Flow



Current Derating Curve

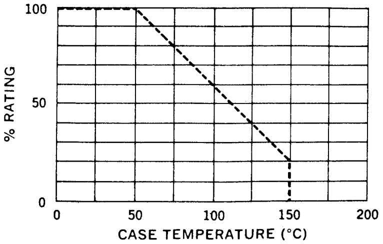


Current Derating Curve



Air Cooled

Current Derating Curve



Oil Immersed

RECTIFIER ASSEMBLIES

High Voltage Stacks, Standard and Fast Recovery

UFB, UFS, USB, USS SERIES

FEATURES

- Controlled Avalanche Characteristics
- Only Fused-in-Glass Diodes Used
- High Forward and Reverse Surge Capability
- Transfer Molded for Voidless Construction
- Modular for Easy Stacking
- PIV: from 2.5 kV to 15 kV
- Recovery Times: to 500ns
- Continuous Ratings: to 2.3A

DESCRIPTION

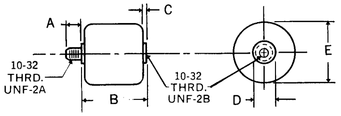
These assemblies uniquely combine a versatile stackable design with all the requirements for reliable high voltage operation. All modules are suitable for bridge or series operations.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage, USS Series	5.0 kV to 15 kV
Peak Inverse Voltage, USB Series	2.5 kV to 10 kV
Peak Inverse Voltage, UFS Series	5.0 kV to 10 kV
Peak Inverse Voltage, UFB Series	2.5 kV to 7.5 kV
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range	—65°C to +150°C

MECHANICAL SPECIFICATIONS

UFB, UFS, USB, USS SERIES

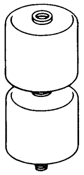


	ins.	mm.
A	.230-.235	5.84-5.97
B	.980-1.10	24.89-27.94
C	.020-.040	0.51-1.02
D	.320-.330	8.13-8.38
E	.97-1.00	24.64-25.40

Typical Weight: USS & UFS Series — 1.0 ounce
28 grams

USB & UFB Series — 1.1 ounce
31 grams

DH



MARKING

Type number marked on unit.

Polarity — Cathode connected to stud.

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Watertown
The diode experts

Electrical Specifications (at 25°C unless noted)							Maximum Ratings		
Type		PIV	Maximum Forward Voltage Drop	Leakage Current @ PIV	Maximum Reverse Recovery Time	Maximum Reverse Transient Energy Absorption	Maximum Average D.C. Output Current $T_A = 25°C$ AIR	Maximum Average D.C. Output Current $T_A = 50°C$ OIL	Non-Repetitive Sinusoidal Surge (8.3ms)
		kV		μA	ns	joules	Amps	Amps	Amps
Standard Recovery	USS 5	5.0	9V @ 0.6A	5	—	1.5	0.60	1.1	25
	USS 7.5	7.5	13V @ 0.5A			2.5	0.45	0.91	
	USS 10	10	17V @ 0.3A			3.0	0.35	0.71	
	USS 15	15	25V @ 0.2A			5.0	0.25	0.51	
Standard Recovery	USB 2.5	2.5	5V @ 1.1A	10	—	3.0	1.1	2.3	80
	USB 5	5.0	9V @ 0.7A			6.0	0.68	1.5	
	USB 7.5	7.5	13V @ 0.5A			9.0	0.53	1.2	
	USB 10	10	17V @ 0.4A			12	0.43	1.0	
Fast Recovery	UFS 5	5.0	12V @ 0.5A	5	500* 350†	1.5	0.50	0.90	20
	UFS 7.5	7.5	18V @ 0.4A			2.5	0.38	0.75	
	UFS 10	10	23V @ 0.3A			3.0	0.30	0.58	
Fast Recovery	UFB 2.5	2.5	6V @ 0.9A	10	500* 350†	3.0	0.90	2.0	70
	UFB 5	5.0	12V @ 0.6A			6.0	0.58	1.3	
	UFB 7.5	7.5	18V @ 0.4A			9.0	0.45	1.0	

*Measured in a reverse recovery circuit switching from 1A forward to 1A reverse current recovering to 0.5A.
†Measured in a reverse recovery circuit switching from .5A foward current to 1A reverse current, recovery to .25A.

Output Current Ratio vs. Velocity of Air Flow

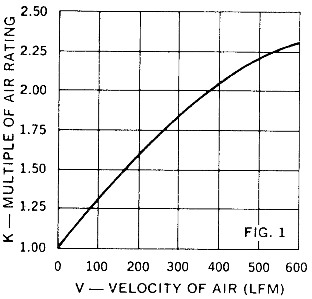


FIG. 1

Output Current vs. Ambient (Air) Temperature

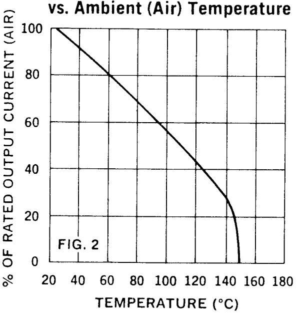


FIG. 2

Output Current vs. Ambient (Oil) Temperature

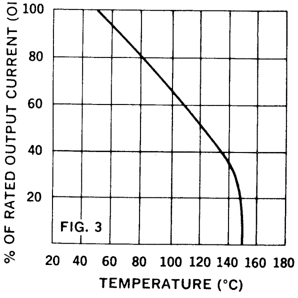
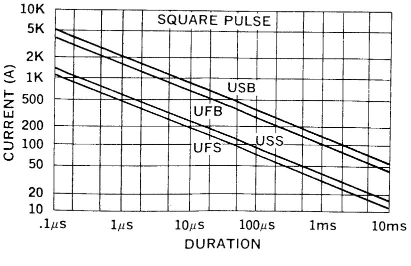


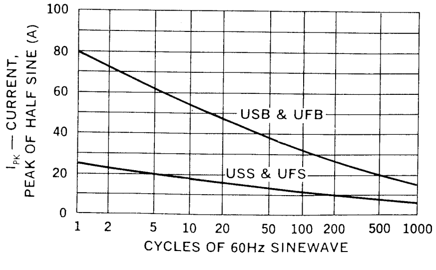
FIG. 3

Application example: The rectifier is to be used in a cabinet at 60°C with ambient air moving at 400 LFM. The rating is reduced (Fig. 2) by a factor of 0.81 due to the elevated temperature, but it is enhanced by 2X (Fig. 1) due to the air flow. Hence the DC output current is 0.81 x 2, or 1.6 times the 25°C air rating.

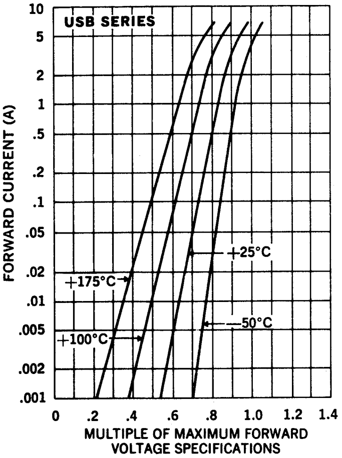
Forward Pulse Current vs. Duration



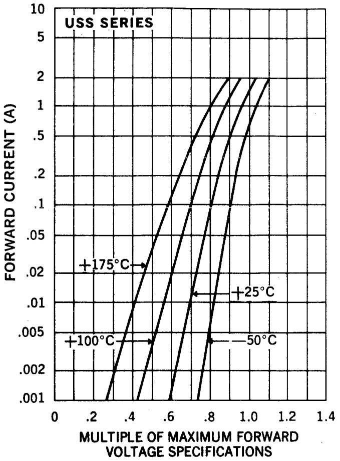
Multiple Surge Current vs. Duration



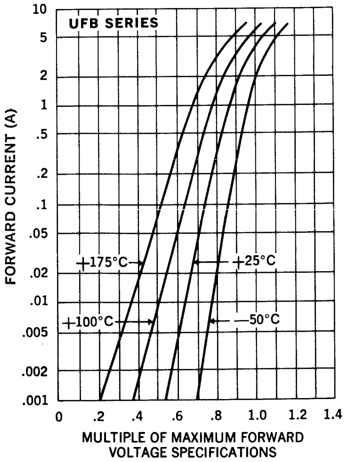
Typical Forward Voltage vs. Forward Current



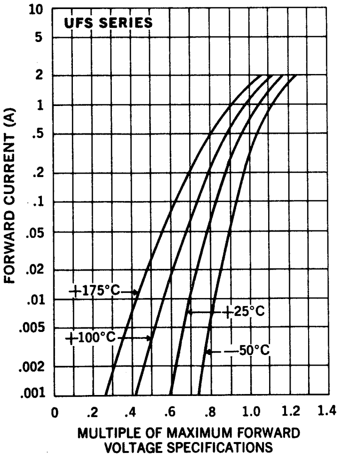
Typical Forward Voltage vs. Forward Current



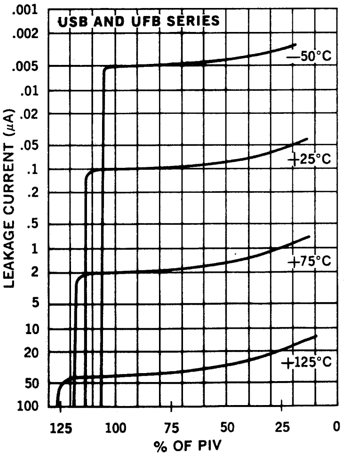
Typical Forward Voltage vs. Forward Current



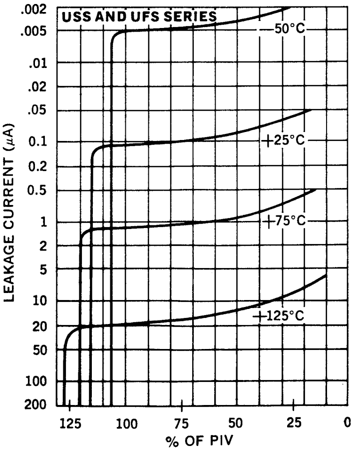
Typical Forward Voltage vs. Forward Current



Typical Leakage Current vs. PIV



Typical Leakage Current vs. PIV



RECTIFIER ASSEMBLIES

UGB, UGD, UGE, UGF SERIES

High Voltage Doorbell® Modules
Standard and Fast Recovery

FEATURES
- Current Ratings: to 10A
- PIV: 2.5 kV to 10kV
- Recovery Times: to 500ns
- Only Fused-in-Glass Diodes Used
- Controlled Avalanche Characteristics
- Stackable to 600kV
- Modular Package for Easy Stacking

DESCRIPTION

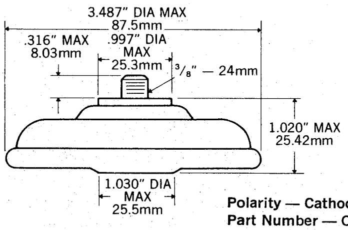
This series of high-voltage, high-current stacks that incorporate a unique modular design makes it particularly well-suited for high power applications such as in radar systems as charge, hold-off and clipper diodes.

ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	
UGB, UGD Series	5kV to 10kV
UGS, UGF Series	2.5kV to 7.5kV
Maximum Average D.C. Output Current	See Electrical Specifications
Non-repetitive Sinusoidal Surge (8.3ms)	See Electrical Specifications
Operating and Storage Temperature Range, T_C	−65°C to +150°C

MECHANICAL SPECIFICATIONS

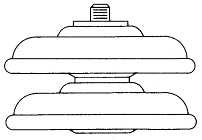
UGB, UGD, UGE, UGF SERIES



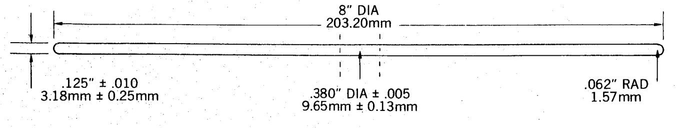
Polarity — Cathode connected to base.
Part Number — On base of unit.

Typical Weight — 7.0 ounces
200 grams

DG



EXTENDER PLATE G



Typical Weight — 9.25 ounces
265 grams

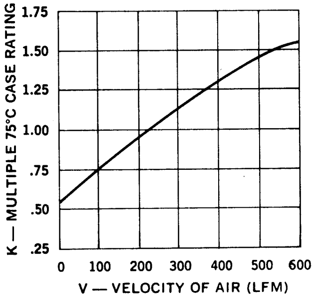
Microsemi Corp.
Watertown
The diode experts

Electrical Specifications (at 25°C unless noted)						Maximum Ratings				
						Maximum Average D.C. Output Current			Non-repetitive Sinusoidal Surge (8.3ms)	Maximum Reverse Transient Energy Absorption
Type		PIV	Maximum Forward Voltage Drop	Maximum Leakage Current @ PIV	Maximum Reverse Recovery Time	$T_C = 75°C$ Air	$T_C = 60°C$ Air with Extender Plate**	$T_C = 50°C$ Oil	$T_C = 100°C$	
		kV		μA	ns	Amps	Amps	Amps	Amps	joules
Standard	UGE-2.5	2.5	5V @ 3.30A	10		6.60	8.25	10.00	200	8
Recovery	UGE-5	5	10V @ 2.50A	15		5.00	6.25	7.50	200	14
	UGB-5	5	9V @ 2.20A	5	—	4.40	5.50	6.60	100	7
	UGE-7.5	7.5	13V @ 1.60A	10		3.30	4.10	5.00	200	20
	UGB-7.5	7.5	13V @ 1.50A	5		3.00	3.75	5.00	100	10
	UGB-10	10	17V @ 1.10A	5		2.30	2.85	3.50	100	14
Fast	UGF-2.5	2.5	6V @ 2.50A	10		5.00	6.25	8.00	150	8
Recovery	UGF-5	5	11V @ 1.80A	10		3.75	4.70	6.00	150	14
	UGD-5	5	11V @ 1.60A	5	500*	3.30	4.10	4.80	80	7
	UGF-7.5	7.5	17V @ 1.20A	10	350†	2.50	3.10	4.00	150	20
	UGD-7.5	7.5	17V @ 1.10A	5		2.25	2.80	3.50	80	10
	UGD-10	10	22V @ 0.85A	5		1.75	2.20	2.50	80	14

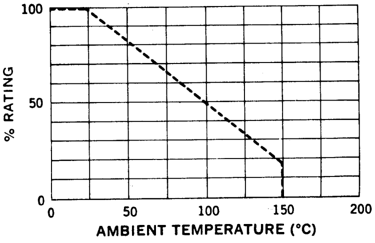
*Measured in a reverse recovery circuit switching from 1.0A forward to 1.0A reverse current recovering to 0.5A.
†Measured in a reverse recovery circuit switching from 0.5A forward to 1.0A reverse current recovering to 0.25A.

**These ratings are based on using "extender plates" that provide additional surface area to radiate heat. Because of possible corona effects caused by scratches on these plates, extreme care is necessary in their handling and they are not recommended where the working voltage exceeds 7.5KV/module. They should be carefully polished prior to installation.

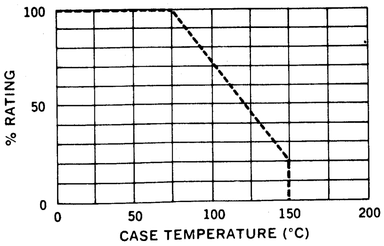
Output Current Ratio vs. Velocity of Air Flow



Current Derating Curve

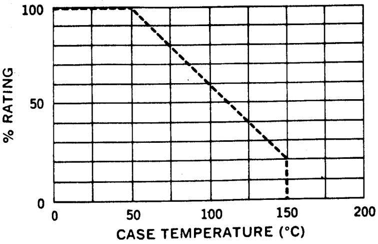


Current Derating Curve



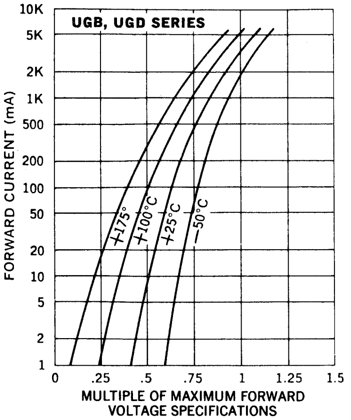
Air Cooled

Current Derating Curve

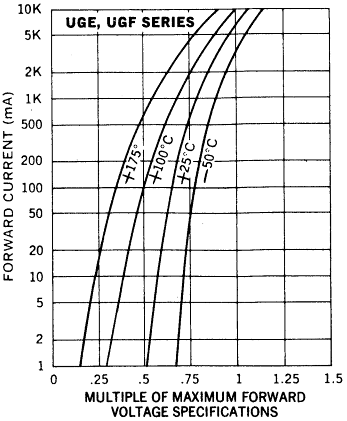


Oil Immersed

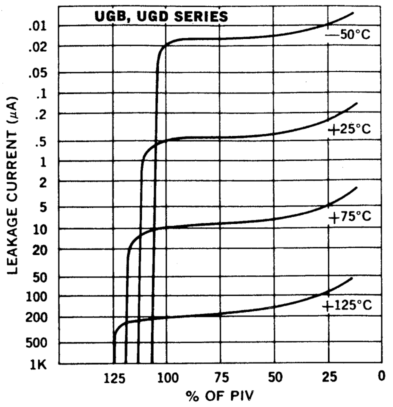
Typical Forward Voltage vs. Forward Current



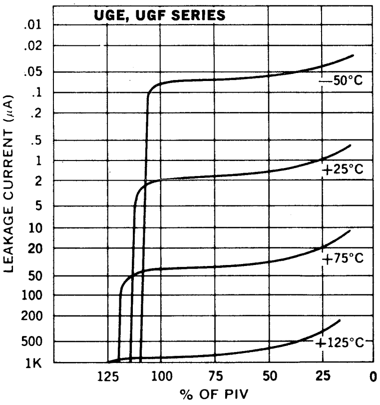
Typical Forward Voltage vs. Forward Current



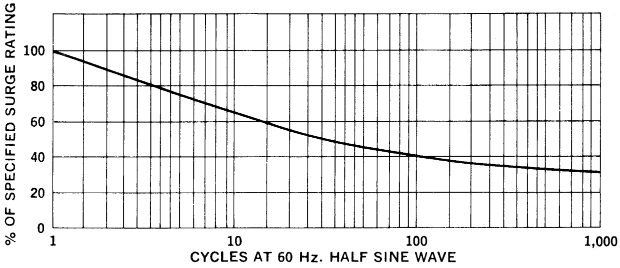
Typical Leakage Current vs. PIV



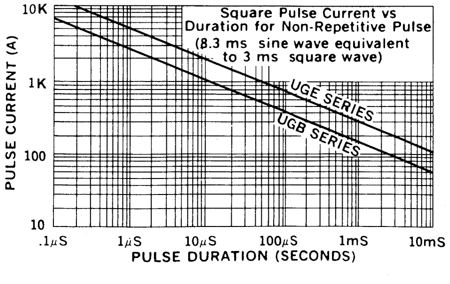
Typical Leakage Current vs. PIV



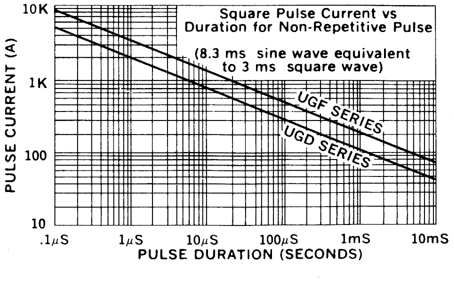
Multiple Surge Rating vs. Duration



Forward Pulse Current vs. Pulse Duration



Forward Pulse Current vs. Pulse Duration



RECTIFIER ASSEMBLIES

High Voltage Stacks, .125 Amp to 1 Amp, Standard and Fast Recovery

US12–US200A
USR12–USR180A

FEATURES

- Controlled Avalanche Characteristics
- Recovery Times: to 500ns
- Transfer Molded for Voidless Encapsulation
- High Forward and Reverse Surge Capability
- PIV: from 1200 to 20,000V
- Only Fused-in-Glass Diodes Used

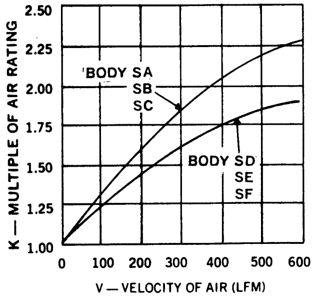
DESCRIPTION

This series of High Voltage, Medium Current Stacks are assembled from hermetically sealed, controlled avalanche individual diodes. Therefore, they offer the ultimate in reliability for such applications as clipper diodes, back swing diodes and hold-off diodes in pulse modulators.

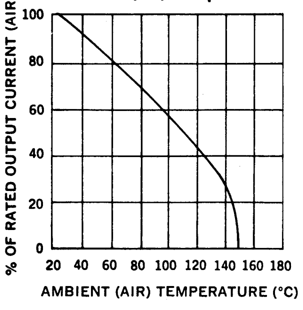
ABSOLUTE MAXIMUM RATINGS

Peak Inverse Voltage	1200 to 20,000V
Maximum Average D.C. Output Current	See Electrical Specifications
Non-Repetitive Sinusoidal Surge (8.3ms)	20A
Operating and Storage Temperature Range	−65°C to +150°C

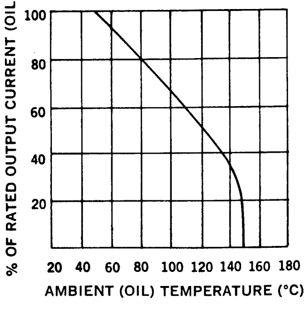
Output Current Ratio vs Velocity of Air Flow



Output Current vs Ambient (Air) Temperature



Output Current vs Ambient (Oil) Temperature

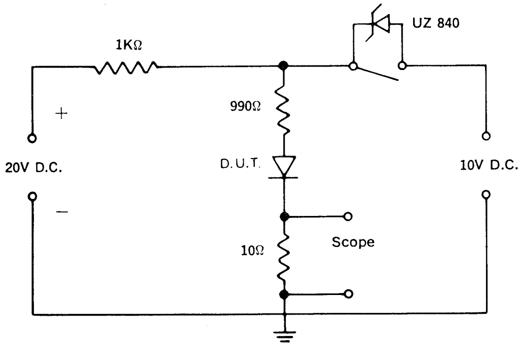


Microsemi Corp.
Watertown
The diode experts

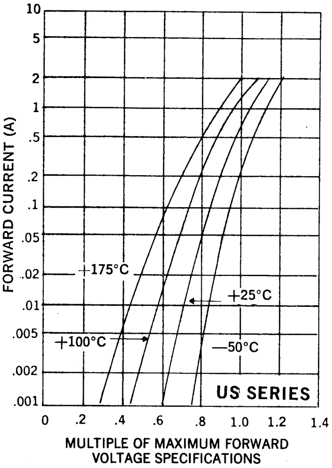
Electrical Specifications (at 25°C unless noted)							Maximum Ratings	
Type	PIV	Maximum Leakage Current at PIV		Maximum Forward Voltage Drop	Maximum Reverse Recovery Time†	Body Size	Max. Avg. D.C. Output Current	
		$T_A = 25°C$	$T_A = 100°C$				$T_A = 25°C$ (Air)	$T_A = 50°C$ (Oil)
	V	μA	μA		ns		mA	mA
Standard Recovery								
US 12	1200	2	100	2.0V @ 400mA	——	SA	1000	2500
US 15	1500	2	100	3.0V @ 400mA		SA	800	2000
US 18	1800	2	100	3.0V @ 400mA		SA	700	1750
US 20	2000	2	100	4.0V @ 400mA		SA	600	1500
US 25	2500	2	100	5.0V @ 400mA	——	SB	600	1500
US 30	3000	2	100	6.0V @ 400mA		SB	500	1250
US 35	3500	2	100	7.0V @ 200mA	——	SC	400	1000
US 40	4000	2	100	7.0V @ 200mA		SC	350	850
US 45A	4500	2	100	8.0V @ 200mA	——	SD	330	750
US 50A	5000	2	100	9.0V @ 200mA		SD	330	750
US 60A	6000	2	100	10.0V @ 200mA		SD	300	620
US 70A	7000	2	100	12.0V @ 200mA		SD	300	620
US 80A	8000	2	100	14.0V @ 100mA	——	SE	250	500
US 100A	10000	2	100	17.0V @ 100mA		SE	250	500
US 120A	12000	2	100	21.0V @ 100mA		SE	200	400
US 150A	15000	2	100	26.0V @ 100mA	——	SF	200	400
US 180A	18000	2	100	31.0V @ 100mA		SF	180	360
US 200A	20000	2	100	34.0V @ 100mA		SF	180	360
Fast Recovery								
USR 12	1200	5	150	3.3V @ 400mA	500	SA	750	1850
USR 15	1500	5	150	4.0V @ 400mA	500	SA	600	1500
USR 20	2000	5	150	5.5V @ 400mA	500	SB	500	1250
USR 25	2500	5	150	6.6V @ 400mA	500	SB	400	1000
USR 30	3000	5	150	7.7V @ 400mA	500	SC	400	1000
USR 35	3500	5	150	8.8V @ 200mA	500	SC	350	850
USR 40A	4000	5	150	9.9V @ 200mA	500	SD	300	750
USR 45A	4500	5	150	11.0V @ 100mA	500	SD	250	625
USR 50A	5000	5	150	13.0V @ 100mA	500	SD	250	625
USR 60A	6000	5	150	15.4V @ 100mA	500	SD	220	500
USR 70A	7000	5	150	17.6V @ 100mA	500	SE	220	500
USR 80A	8000	5	150	20.0V @ 100mA	500	SE	200	400
USR 100A	10000	5	150	24.0V @ 100mA	500	SE	200	400
USR 120A	12000	5	150	31.0V @ 100mA	500	SF	150	300
USR 150A	15000	5	150	33.0V @ 100mA	500	SF	150	300
USR 180A	18000	5	150	35.0V @ 100mA	500	SF	125	250

†Measured in a reverse recovery circuit switching from 10mA forward to 10mA reverse current recovering to 5mA.

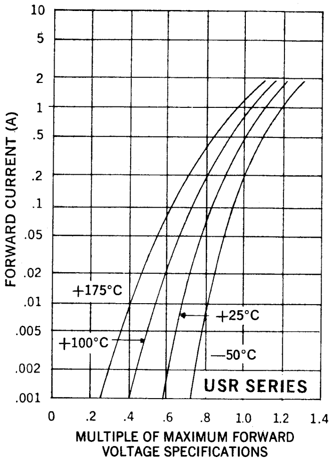
Reverse Recovery Circuit



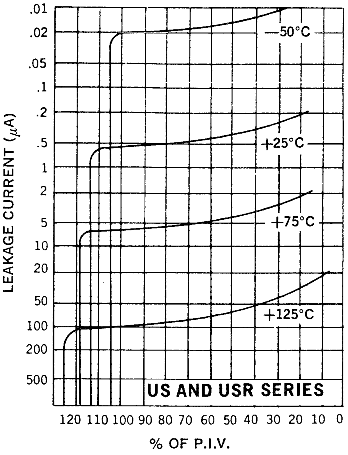
Typical Forward Current vs. Forward Voltage



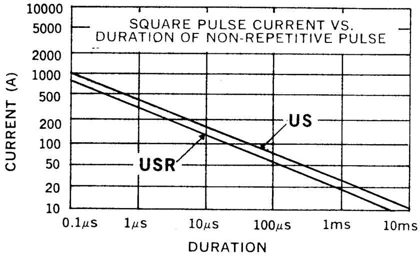
Typical Forward Current vs. Forward Voltage



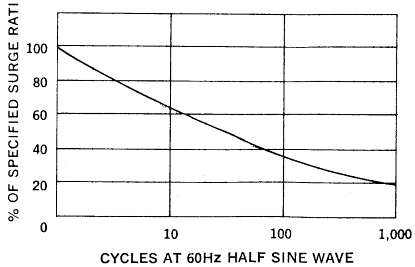
Typical Leakage Current vs. Voltage



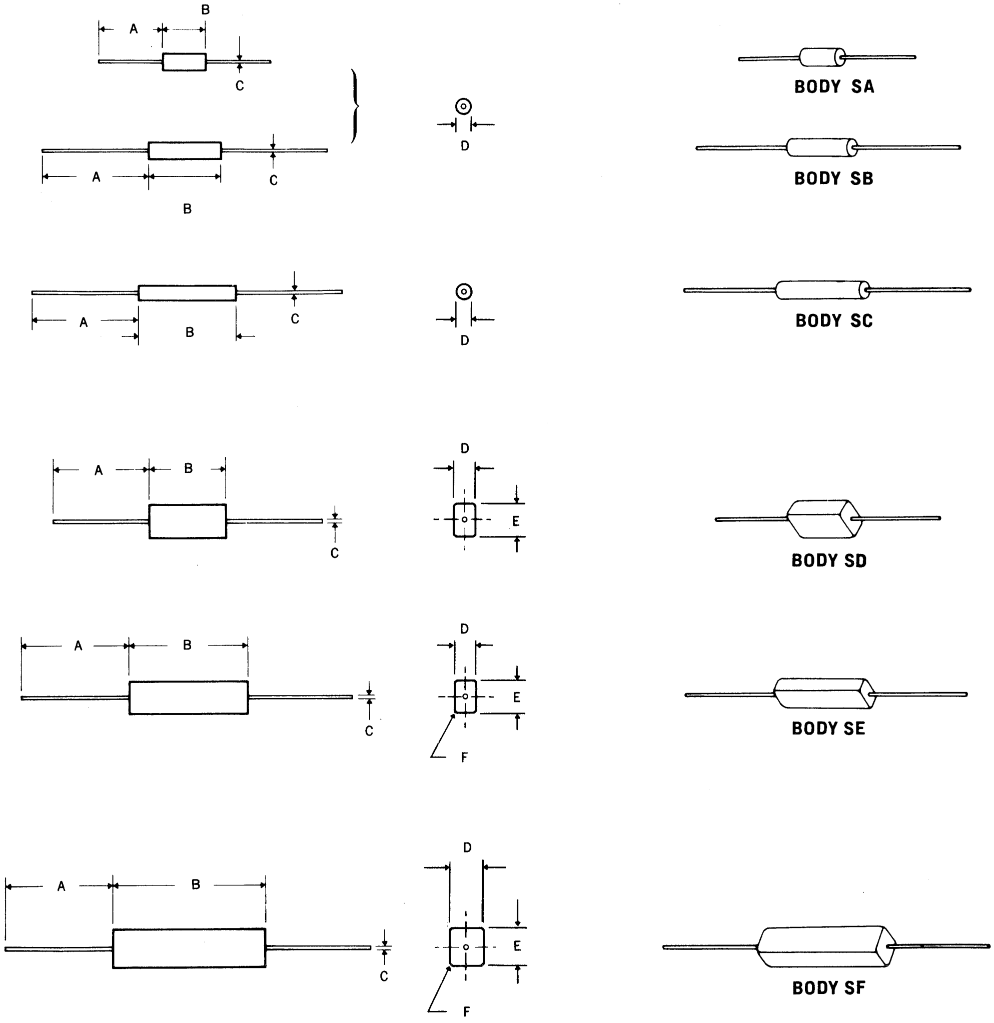
Forward Pulse Current vs Duration



Multiple Forward Surge Rating



MECHANICAL SPECIFICATIONS



	SA		SB		SC		SD		SE		SF	
	ins.	mm.	ins.	mm.	ins.	mm.	ins.	mm.	ins.	mm.	ins.	mm.
A	.75 MIN.	19.05 MIN.	1.25 MIN.	31.75 MIN.	1.25 MIN.	31.75 MIN.	1.25 MIN.	31.75 MIN.	1.25 MIN.	31.75 MIN.	1.25 MIN.	31.75 MIN.
B	.50 MAX.	12.70 MAX.	0.85 MAX.	21.59 MAX.	1.125 MAX.	28.58 MAX.	.875 MAX.	22.23 MAX.	1.375 MAX.	34.93 MAX.	1.75 MAX.	44.45 MAX.
C	.028 DIA.	.71 DIA.	.032 DIA.	.81 DIA.	.032 DIA.	.81 DIA.	.032 DIA.	.81 DIA.	.032 DIA.	.81 DIA.	.032 DIA.	.81 DIA.
D	.187 MAX.	4.75 MAX.	.187 MAX.	4.75 MAX.	.187 MAX.	4.75 MAX.	.250 MAX.	6.35 MAX.	.250 MAX.	6.35 MAX.	.400 MAX.	10.16 MAX.
E							.375 MAX.	9.53 MAX.	.375 MAX.	9.53 MAX.	.400 MAX.	10.16 MAX.
F									.078	1.98	.078	1.98

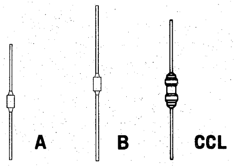
POWER ZENERS AND TRANSIENT VOLTAGE SUPPRESSORS 4

Product Selection Guides

Transient Voltage Supressors 4-3
Transient Voltage Supressors, Bidirectional 4-4
Power Zeners 4-5
Datasheets 4-7

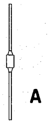
POWER ZENERS AND TRANSIENT VOLTAGE SUPPRESSORS

Transient Voltage Suppressors



Package Style		Part No.	Stand-Off Voltage V_R (V)	Min. Breakdown Voltage $BV_{(min)}$ @ 1mA (V)	Max. Peak Pulse Current I_{PP} (A)	Max. Clamping Voltage* V_C @ I_{PP} (V)	Peak Power for 1mS (W)
Package Style	A Body	TVS305	5.0	5.0	17	8.7	150
		TVS310	10.0	11.1	8.9	16.8	
		TVS312	12.0	13.8	7.1	21.0	
		TVS315	15.0	16.7	5.9	25	
		TVS318	18.0	20.4	4.9	31	
		TVS324	24.0	28.4	3.6	42	
		TVS328	28.0	30.7	3.2	46	
		TVS348	48.0	54	1.7	82	
		TVS360	60.0	67	1.4	105	
		TVS410	100.0	111	.91	160	
		TVS420	200.0	234	.42	360	
		TVS430	300.0	342	.28	520	
	B Body	TVS505	5.0	6.0	53.7	9.3	500
		TVS510	10.0	11.1	30.3	16.5	
		TVS512	12.0	13.8	23.8	21.0	
		TVS515	15.0	16.7	19.8	25.2	
		TVS518	18.0	20.4	16.3	30.5	
		TVS524	24.0	28.4	11.9	42.0	
		TVS528	28.0	30.7	10.7	46.5	
		1N6461**	5.0	5.6 @ 25mA	56	9	500
		1N6462**	6.0	6.5 @ 20mA	46	11	
		1N6463**	12.0	13.6 @ 5mA	22	22.6	
		1N6464**	15.0	16.4 @ 5mA	19	26.5	
		1N6465**	24.0	27.0 @ 2mA	12	41.4	
		1N6466**	30.5	33.0 @ 1mA	11	47.5	
		1N6467**	40.3	43.7 @ 1mA	8	63.5	
		1N6468**	51.6	54.0 @ 1mA	6	78.5	
	CCL	1N5610*		33.0	32.0	47.5	1500
		1N5611*		43.7	24.0	63.5	
		1N5612*		54.0	19.0	79.5	
		1N5613*		191.0	5.7	265.0	

Transient Voltage Suppressors Glass Axial, Bidirectional



Part No.	Stand-Off Voltage V_R (V)	Min. Breakdown Voltage $BV_{(min.)}$ @ 1mA (V)	Max. Peak Pulse Current I_{PP} (A)	Max. Clamping Voltage V_C @ I_{PP} (V)	Peak Pulse Power 8 × 20μs Waveform (W)
EPS5	5	6.0	89.4	9.5	1000
EPS8	8	8.8	62.1	13.7	1000
EPS12	12	13.8	40.3	21.6	1000
EPS15	15	16.7	33.9	26.0	1000
EPS16	17	18.7	30.8	29.2	1000
EPS24	24	28.4	22.0	41.0	1000
EPS28	28	30.7	19.2	47.8	1000
EPS33	33	36.3	16.4	56.7	1000
EPS42	48	54.0	11.2	84.3	1000

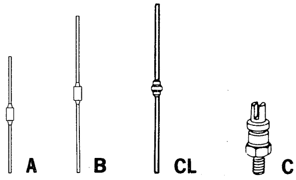
Transient Voltage Suppressors
Glass Axial, Bidirectional

Part No.	Stand-Off Voltage V_R	Min. Breakdown Voltage $BV_{(min.)}$ @ 1mA	Max. Peak Pulse Current I_{PP}	Max. Clamping Voltage V_C @ I_{PP}	Peak Pulse Power for 1ms
	(V)	(V)	(A)	(V)	(W)
1N6102A	5	6.46	47.6	10.5	500
1N6107A	8	10.45	32.0	15.6	500
1N6111A	12	15.2	22.4	22.3	500
1N6113A	15	19.0	18.0	27.7	500
1N6115A	17	22.8	15.0	33.3	500
1N6118A	24	31.4	10.9	45.7	500
1N6120A	28	37.1	9.3	53.6	500
1N6122A	33	44.7	7.7	64.6	500
1N6125A	48	64.6	5.1	97.1	500

B

POWER ZENERS AND TRANSIENT VOLTAGE SUPPRESSORS

PRODUCT SELECTION GUIDE



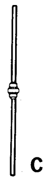
POWER ZENERS

Power		1W	1.5W	3W	3W	5W	5W	6W	10W
Package Style		**A**	**A**	**A**	**A**	**B**	**B**	**CL**	**C**
VOLTAGE V_Z (5% Tolerance)	5.6V						1N5968*		
	6.2V						1N5969*		
	6.8V	UZ8706	1N4461*	1N5063	UZ706[1]	UZ4706	1N4954*	UZ7706L[1]	UZ7706[1]
	7.5V	UZ8707	1N4462*	1N5064	UZ707[1]	UZ4707	1N4955*	UZ7707L[1]	UZ7707[1]
	8.2V	UZ8708	1N4463*	1N5065	UZ708[1]	UZ4708	1N4956*	UZ7708L[1]	UZ7708[1]
	9.1V	UZ8709	1N4464*	1N5066	UZ709[1]	UZ4709	1N4957*	UZ7709L[1]	UZ7709[1]
	10V	UZ8710	1N4465*	1N5067	UZ710[1]	UZ4710	1N4958*	UZ7710L[1]	UZ7710[1]
	11V	UZ8711	1N4466*	1N5068			1N4959*	UZ7711L[1]	UZ7711[1]
	12V	UZ8712	1N4467*	1N4883	UZ712[1]	UZ4712	1N4960*	UZ7712L[1]	UZ7712[1]
	13V	UZ8713	1N4468*	1N5069	UZ713[1]	UZ4713	1N4961*	UZ7713L[1]	UZ7713[1]
	14V	UZ8714		1N5070	UZ714[1]		1N5118	UZ7714L[1]	UZ7714[1]
	15V	UZ8715	1N4469*	1N5071	UZ715[1]	UZ4715	1N4962*	UZ7715L[1]	UZ7715[1]
	16V	UZ8716	1N4470*	1N5072	UZ716[1]	UZ4716	1N4963*	UZ7716L[1]	UZ7716[1]
	18V	UZ8718	1N4471*	1N5073	UZ718[1]	UZ4718	1N4964*	UZ7718L[1]	UZ7718[1]
	20V	UZ8720	1N4472*	1N4884	UZ720[1]	UZ4720	1N4965*	UZ7720L[1]	UZ7720[1]
	22V	UZ8722	1N4473*	1N5074	UZ722[1]	UZ4722	1N4966*	UZ7722L[1]	UZ7722[1]
	24V	UZ8724	1N4474*	1N5075	UZ724[1]	UZ4724	1N4967*	UZ7724L[1]	UZ7724[1]
	27V	UZ8727	1N4475*	1N5076	UZ727[1]	UZ4727	1N4968*	UZ7727L[1]	UZ7727[1]
	30V	UZ8730	1N4476*	1N5077	UZ730[1]	UZ4730	1N4969*	UZ7730L[1]	1N7730[1]
	33V	UZ8733	1N4477*	1N5078	UZ733[1]	UZ4733	1N4970*	UZ7733L[1]	UZ7733[1]
	36V	UZ8736	1N4478*	1N5079	UZ736[1]	UZ4736	1N4971*	UZ7736L[1]	UZ7736[1]
	39V		1N4479*	1N5080		UZ4739	1N4972*		
	40V	UZ8740		1N5081	UZ740[1]		1N5119	UZ7740L[1]	UZ7740[1]
	43V		1N4480*	1N5082		UZ4743	1N4973*		
	45V	UZ8745		1N5083	UZ745[1]		1N5120	UZ7745L[1]	UZ7745[1]
	47V		1N4481*	1N5084		UZ4747	1N4974*		
	50V	UZ8750		1N5085	UZ750[1]		1N5121	UZ7750L[1]	UZ7750[1]
	51V		1N4482*	1N5086		UZ4751	1N4975*		
	56V	UZ8756	1N4483*	1N5087	UZ756[1]	UZ4756	1N4976*	UZ7756L[1]	UZ7756[1]
	60V	UZ8760		1N5088	UZ760[1]		1N5122	UZ7760L[1]	UZ7760[1]
	62V		1N4484*	1N5089		UZ4762	1N4977*		
	68V		1N4485*	1N5090		UZ4768	1N4978*		
PULSE POWER **		100W	140W	230W	230W	720W	900W	2000W	2000W

* Available as JAN, JANTX & JANTXV

[1] Available with High Reliability (HR2) Screening. See individual datasheet.

POWER ZENERS AND TRANSIENT VOLTAGE SUPPRESSORS



CL

C

POWER ZENERS

Power		1W	1.5W	3W	3W	5W	5W	6W	10W
Package Style		**A**	**A**	**A**	**A**	**B**	**B**	**CL**	**C**
VOLTAGE V_Z (5% Tolerance)	70V	UZ8770		1N5091	UZ770[1]		1N5123	UZ7770L[1]	UZ7770[1]
	75V	UZ8775	1N4486*	1N5092	UZ775[1]	UZ4775	1N4979*	UZ7775L[1]	UZ7775[1]
	80V	UZ8780		1N5093	UZ780[1]		1N5124	UZ7780L[1]	UZ7780[1]
	82V		1N4487*	1N5094		UZ4782	1N4980*		
	90V	UZ8790		1N4096	UZ790[1]		1N5125	UZ7790L[1]	UZ7790[1]
	91V		1N4488*	1N4095		UZ4791	1N4981*		
	100V	UZ8110	1N4489*	1N4097	UZ110[1]	UZ4110	1N4982*	UZ7110L[1]	UZ7110[1]
	110V	UZ8111	1N4490*	1N5096	UZ111[1]	UZ4111	1N4983*		
	120V	UZ8112	1N4491*	1N5097	UZ112[1]	UZ4112	1N4984*		
	130V	UZ8113	1N4492*	1N5098	UZ113[1]	UZ4113	1N4985*		
	140V	UZ8114		1N5099	UZ114[1]				
	150V	UZ8115	1N4493*	1N4098	UZ115[1]	UZ4115	1N4986*		
	160V	UZ8116	1N4494*	1N5100	UZ116[1]	UZ4116	1N4987*		
	170V	UZ8117		1N5101	UZ117[1]		1N5127*		
	180V	UZ8118	1N4495*	1N5102	UZ118[1]	UZ4118	1N4988*		
	190V	UZ8119		1N5103	UZ119[1]		1N5128		
	200V	UZ8120	1N4496*	1N5104	UZ120[1]	UZ4120	1N4989*		
	220V			1N5105	UZ122[1]		1N4990*		
	240V			1N5106	UZ124[1]		1N4991*		
	260V			1N5107	UZ126[1]		1N5129		
	270V			1N5108			1N4992*		
	280V			1N5109	UZ128[1]		1N5130		
	300V			1N5110	UZ130[1]		1N4993*		
	320V			1N5111	UZ132[1]		1N5131		
	330V			1N5112			1N4994*		
	340V			1N5113	UZ134[1]		1N5132		
	360V			1N5114	UZ136[1]		1N4995*		
	380V			1N5115	UZ138[1]		1N5133		
	390V			1N5116			1N4996		
	400V			1N5117	UZ140[1]		1N5134		
PULSE POWER **		100W	140W	230W	230W	720W	900W	2000W	2000W

* Available as JAN, JANTX & JANTXV

1. Available with High Reliability (HR2) Screening. See individual datasheet.

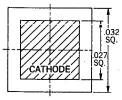
POWER ZENERS
1.5 Watt, Military

1N4461-1N4496
JAN, JANTX & JANTXV

FEATURES
- 5 Times Greater Surge Rating than JAN1N3016 Series
- Low Reverse Current: to 50nA
- ¼ Size of Conventional 1 Watt Zeners

DESCRIPTION
Fused-in-glass, metallurgically bonded 1.5 watt zeners, qualified to MIL-S-19500/406.

ABSOLUTE MAXIMUM RATINGS
Zener Voltage, V_Z	6.8 to 200V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	−65°C to +175°C



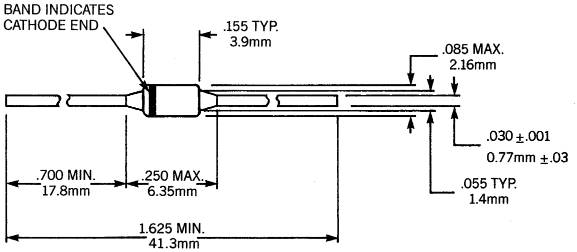
BACKSIDE ANODE

CHIP THICKNESS	
1N4461	.0054
1N4478	.0063
1N4479	.0085
1N4496	.0096

METALLIZATION
TOP ...... AL
BACK .... AU

MECHANICAL SPECIFICATIONS

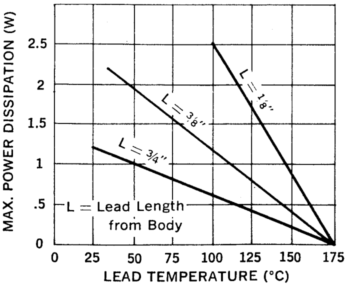
JAN, JANTX & JANTXV 1N4461-1N4496



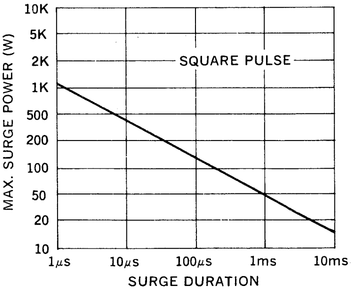
BODY A

THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

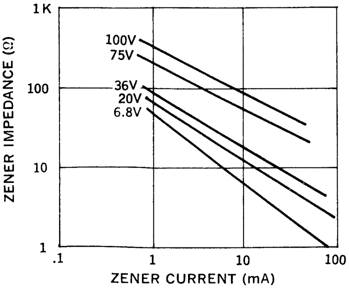
Power Dissipation vs. Lead Temperature Derating Curve



Max. Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



	Electrical Specifications at 25°C								Maximum Ratings	
			Max. Zener Impedance §				Maximum Reverse Leakage Current			
Type	Nominal Zener Voltage † V_Z @ I_{ZT}	Test Current I_{ZT}	Z_Z @ I_{ZT}	Z_{ZK} @ I_{ZK}	I_{ZK}	Voltage ** Regulation @ ΔBV Max	I_R @ V_R	V_R	Maximum Cont. Current I_{ZM}	Maximum Surge Current‡ I_S
±5% Tolerance	Volts	mA	Ohms	Ohms	mA	Volts	µA	Volts	mA	Amps
1N4461	6.8	37	2.5	200	1.0	.30	5.0	4.08	210	5.0
1N4462	7.5	34	2.5	400	.5	.35	1.0	4.50	191	4.5
1N4463	8.2	31	3.0	400	.5	.40	.50	4.92	174	3.9
1N4464	9.1	28	4.0	500	.5	.45	.30	5.46	157	3.4
1N4465	10	25	5.0	500	.25	.50	.30	8.0	143	3.0
1N4466	11	23	6.0	550	.25	.55	.30	8.8	130	2.6
1N4467	12	21	7.0	550	.25	.60	.20	9.6	119	2.4
1N4468	13	19	8.0	550	.25	.65	.10	10.4	110	2.2
1N4469	15	17	9.0	600	.25	.75	.05	12.0	95	1.8
1N4470	16	15.5	10.0	600	.25	.80	.05	12.8	90	1.6
1N4471	18	14	11.0	650	.25	.83	.05	14.4	79	1.4
1N4472	20	12.5	12.0	650	.25	.95	.05	16.0	71	1.2
1N4473	22	11.5	14	650	.25	1.0	.05	17.6	65	1.1
1N4474	24	10.5	16	700	.25	1.1	.05	19.2	60	.90
1N4475	27	9.5	18	700	.25	1.3	.05	21.6	53	.80
1N4476	30	8.5	20	750	.25	1.4	.05	24.0	48	.75
1N4477	33	7.5	25	800	.25	1.5	.05	26.4	43	.66
1N4478	36	7.0	27	850	.25	1.7	.05	28.8	40	.60
1N4479	39	6.5	30	900	.25	1.8	.05	31.2	37	.54
1N4480	43	6.0	40	950	.25	1.9	.05	34.4	33	.48
1N4481	47	5.5	50	1000	.25	2.1	.05	37.6	30	.45
1N4482	51	5.0	60	1100	.25	2.3	.05	40.8	28	.42
1N4483	56	4.5	70	1300	.25	2.5	.05	44.8	26	.39
1N4484	62	4.0	80	1500	.25	2.7	.05	49.6	23	.35
1N4485	68	3.7	100	1700	.25	3.0	.05	54.4	21	.32
1N4486	75	3.3	130	2000	.25	3.3	.05	60.0	19	.29
1N4487	82	3.0	160	2500	.25	3.6	.05	65.6	17	.26
1N4488	91	2.8	200	3000	.25	4.0	.05	72.8	16	.23
1N4489	100	2.5	250	3100	.25	4.4	.25	80.0	14	.20
1N4490	110	2.0	300	4000	.25	5.0	.25	88.0	13	.19
1N4491	120	2.0	400	4500	.25	5.5	.25	96.0	12	.18
1N4492	130	1.9	500	5000	.25	6.0	.25	104	11	.16
1N4493	150	1.7	700	6000	.25	7.0	.25	120	9.5	.14
1N4494	160	1.6	1000	6500	.25	8.0	.25	128	8.9	.12
1N4495	180	1.4	1300	7000	.25	10.0	.25	144	7.9	.10
1N4496	200	1.2	1500	8000	.25	12.0	.25	160	7.2	.08

† All Zener voltages are measured with an automated test set using a 35 millisecond test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§. Zener impedance is derived from the 60 cycle AC Voltage created when AC current with RMS value of 10% of DC Zener test current is superimposed on the test current.

** ΔBV is obtained by measuring the voltage change when the test current is changed from 10% to 50% of Iz max under DC conditions. During this measurement the leads are heat sunk .375 inch from the body and maintained at 25°C.

‡ Ratings shown are for peak sinusoidal surge current of 8.3 ms duration, non-repetitive. The 8.3 ms square pulse rating is 71% of the value shown. Rating exceeds JEDEC Registered Specification.

POWER ZENERS
5 Watt, Military

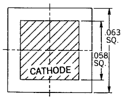
1N4954-1N4996
1N5968-1N5969
JAN, JANTX & JANTXV

FEATURES
- 2 Times Greater Surge Rating than Conventional 10 Watt Zeners
- Small Physical Size

DESCRIPTION
Fused-in-glass, metallurgically-bonded 5 watt zeners, qualified to MIL-S-19500/356.

ABSOLUTE MAXIMUM RATINGS

Zener Voltage, V_Z	5.6 to 390V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	−65°C to +175°C

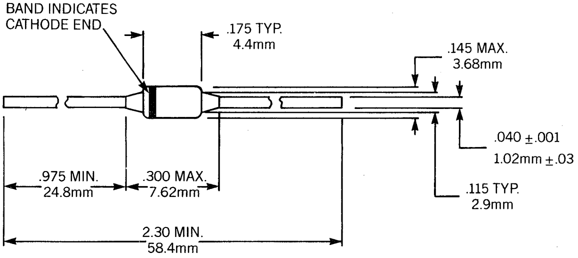


BACKSIDE ANODE

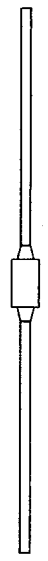
CHIP THICKNESS		METALLIZATION
1N4954 – 1N4971	.0058 / .0065	TOP ..... AL BACK .... AU
1N4972 1N4996	.0085 / .0095	

MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N4954-1N4996
J, JTX, JTXV 1N5968-1N5969

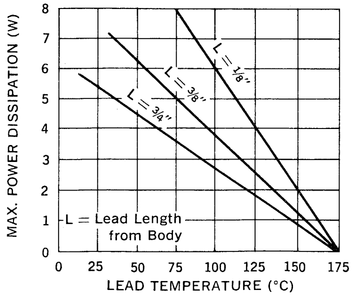


BODY B

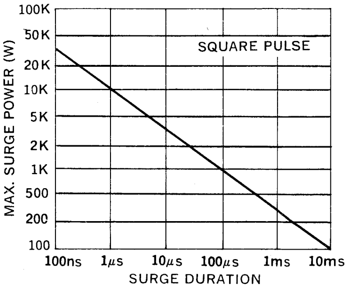


THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

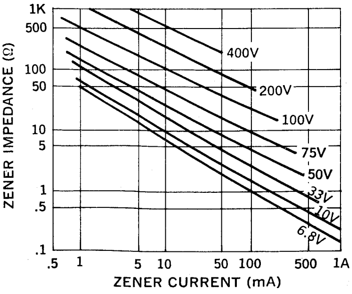
Power Dissipation vs. Lead Temperature Derating Curve



Max. Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



Microsemi Corp.
Watertown
The diode experts

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

* Available as JAN, JANTX & JANTXV.

† All zener voltages are measured with an automated test set using a 35 msec test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§ Zener impedance is derived from the 60-cycle voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

§§ ΔBV is obtained by measuring the voltage change when the test current is changed from 10% to 50% of Iz max under DC conditions. During this measurement the leads are heat sunk .375 inch from the body and maintained at 25°C.

★ Maximum current based on 5 Watt Rating. See lead temperature derating curves for proper mounting methods.

‡ Figures shown are for peak sinusoidal surge current of 8.3 msec duration, non-repetitive. The 8.3 ms square pulse rating is 71% of the value shown.

†† These specifications apply only to JAN and JANTX

POWER ZENERS

Transient Suppressor Diodes

JAN, JANTX, JANTXV 1N5610-1N5613

FEATURES

- 1500 Watts for 1ms Pulse Power Capability
- Small Physical Size
- Designed to be Used in Mil-Std-704A Applications

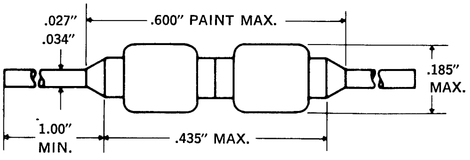
DESCRIPTION

Zener diodes with high surge capability qualified to MIL-S-19500/434.

ABSOLUTE MAXIMUM RATINGS (at 25°C except where otherwise noted)

	1N5610	1N5611	1N5612	1N5613
Zener Voltage	See Electrical Specifications			
Forward Surge Current	200A	200A	200A	200A
Zener Surge Current, at 25°C	32.0A	24.0A	19.0A	5.7A
Surge Current, at 150°C	5.5A	4.8A	3.2A	1.0A
Surge Power	See Graph			
Storage and Operating Temperature	—65°C to +175°C			

JAN, JANTX, JANTXV 1N5610-1N5613



Polarity: Cathode indicated by band.
Weight: 1.5 gram (approximate).
Mounting Position: Any. **Leads:** Tinned Copper.
Marking: Type number marked on unit.

Double C BODY

Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Min. Zener Voltage § Vz @ ImA	Max. Zener Voltage† Vz @ Is		Max. Reverse Leakage Current I_R @ V_R		Max. Forward Voltage‡ @ 100 Amps	Typical Temperature Coefficient
	Volts	Volts	Amps	μA	Volts	Volts	%/°C
1N5610*	33.0	47.5	32.0	5.0	30.5	4.8	.093
1N5611*	43.7	63.5	24.0	5.0	40.3	4.8	.094
1N5612*	54.0	78.5	19.0	5.0	49.0	4.8	.096
1N5613*	191.0	265.0	5.7	5.0	175.0	4.8	.100

Notes: * Available as JAN, JANTX and JANTXV.
§ Duration of applied current ≤ 300ms, duty cycle ≤ 2%.
† Utilizing a pulse which decays exponentially to 50% of the peak value in 1ms. See graph entitled "Pulse Waveform".
‡ Peak Sinusoidal surge current of 8.3ms duration, non-repetitive.

APPLICATIONS

Voltage transients can be suppressed with series elements, shunt elements, or a combination of both. These elements may be passive or active. For low and medium power applications, a series resistor and zener clamp offer several attractive features:

1. Simplicity of design
2. High reliability
3. Fast response time

The 1N5610 series of surge suppressors will suppress the following transients defined by *MIL-S-704A* without the use of any series limiting resistance beyond that provided by the source:

1. All 600V transients (category #1 on chart below)
2. All 80V transients except those generated by the main voltage regulator (category #2 on chart below)
3. The overvoltage transients generated by the *main voltage regulator* (category #3 on chart below) will also be suppressed by the 1N5610 series if:
   a. A 20 ohm series limiting resistor is used, or
   b. No series resistance is used but the zener is protected within 500 μs by using, for example, an SCR crowbar

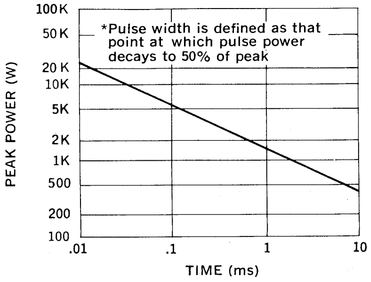
The above statements are based on the source impedances and dv/dt characteristics as given in ARINC* Specification #413. This report entitled "Guidance for Aircraft Electrical Power Utilization and Transient Protection" serves to further define *MIL-STD-704A* for large aircraft electrical systems.

Category	Source of Transient	Maximum Amplitude	Duration	Min. Source Impedance	dv/dt
1.	Inductive Switching	600 V	≤ 10 μs	50 ohms	
2.	BUS Switching	80 V	≤ 10 ms	15 ohms	
3.	Main Voltage Regulator	80 V	≥ 10 ms	0.2 ohms	50V/ms

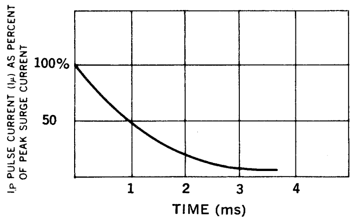
These Surge Suppressors are useful in a variety of other applications where semiconductor devices must function reliably in an environment subject to extremely high but short term surges.

* ARINC stands for Aeronautical Radio, Inc. (Annapolis, Maryland 21401)

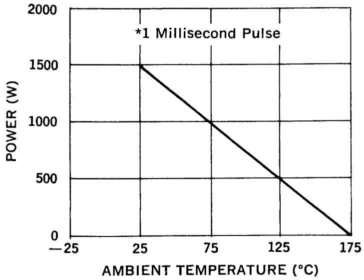
Peak Power Rating vs. Pulse Width*



Pulse Waveform



Peak Power Rating* vs. Ambient Temperature



TRANSIENT VOLTAGE SUPPRESSOR

1N6102A Series

Bidirectional, 4000 Watts Peak, Military

FEATURES

- Bidirectional
- 4000W for 8 × 20 microsec pulse
- 500W for 1 millisec pulse
- Clamping time in pico seconds
- Voidless hermetically sealed glass package
- Metallurgically bonded construction
- Designed to meet MIL-S-19500/516A

DESCRIPTION

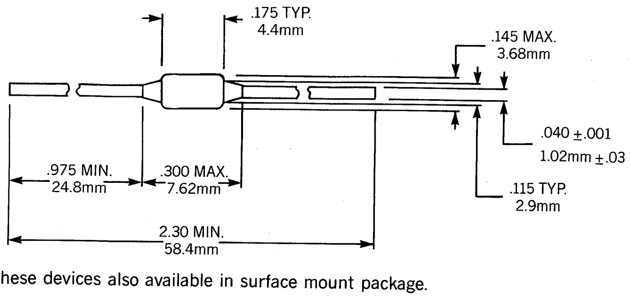
These bidirectional, high speed, voltage suppression devices are ideally suited for applications where fast response is essential. The use of passivated die metallurgically bonded on both sides asssures long term reliability. This series is especially useful in protecting microprocessor, MOS, CMOS, TTL, Schottky TTL, ECL, I²L and linear integrated circuits from spurious transient disturbances.

ABSOLUTE MAXIMUM RATINGS AT 25°C

Stand-Off Voltage . . . . 5 to 48V (See Characteristics Table)
Peak Pulse Power
(8 × 20 microsec pulse) . . . . 4000W (See Figure 1)
Peak Pulse Power (1 millisec pulse) . . . . 500W (See Figure 2)
Peak Pulse Current . . . . See Characteristics Table
Breakdown Voltage . . . . See Characteristics Table
Power Continuous
(T_L = 75°C, L = 3/8″) 3W
Storage and Operating Temperature . . . . −55°C to +175°C

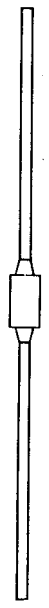
MECHANICAL SPECIFICATIONS

1N6102A Series



These devices also available in surface mount package.

B BODY

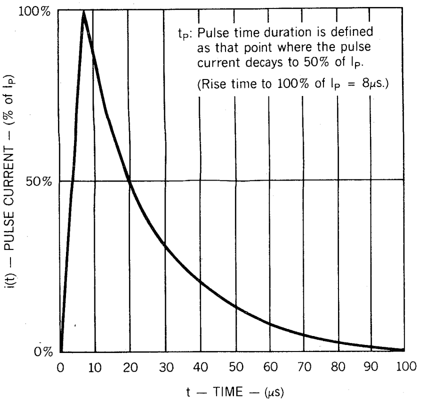


ELECTRICAL CHARACTERISTICS AT 25°C

Type	Stand-Off Voltage V_R	Breakdown Voltage BV			Test Current I_{BR}	Working Peak Voltage V_{RWM}	Maximum Leakage Current I_R @ V_R	Maximum Clamping Voltage Vcc Max. @ I_P*	Maximum Peak Current I_P	Maximum Temp. Coef. of BV
	(V)	min. (V)	nom. (V)	max. (V)	(mA)	(V)	(μA)	(V)	(A)	(%/°C)
1N6102A	5	6.46	6.8	7.14	175	5.2	100	10.5	47.6	.050
1N6107A	8	10.45	11.0	11.55	125	8.4	1	15.6	32.0	.070
1N6111A	12	15.20	16.0	16.80	75	12.2	1	22.3	22.4	.080
1N6113A	15	19.0	20.0	21.0	65	12.2	1	27.7	18.0	.085
1N6115A	17	22.8	24.0	25.2	50	18.2	1	33.3	15.0	.090
1N6118A	24	31.4	33.0	34.6	40	25.1	1	45.7	10.9	.095
1N6120A	28	37.1	39.0	40.9	30	29.7	1	53.6	9.3	.095
1N6122A	33	44.7	47.0	49.3	25	35.8	1	64.6	7.7	.095
1N6125A	48	64.6	68.0	71.4	20	51.7	1	97.1	5.1	.100

*See Figure 2.

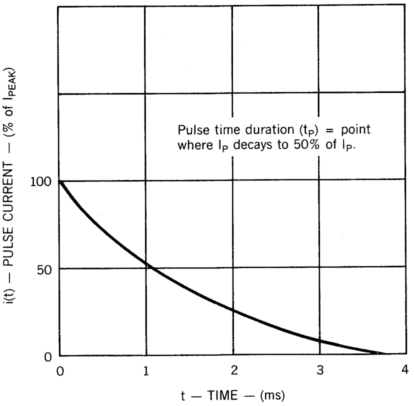
Figure 1. Current Impulse Waveform



t_P: Pulse time duration is defined as that point where the pulse current decays to 50% of I_P.

(Rise time to 100% of I_P = 8μs.)

Figure 2. Pulse Waveform



Pulse time duration (t_P) = point where I_P decays to 50% of I_P.

Figure 3. Derating Curve

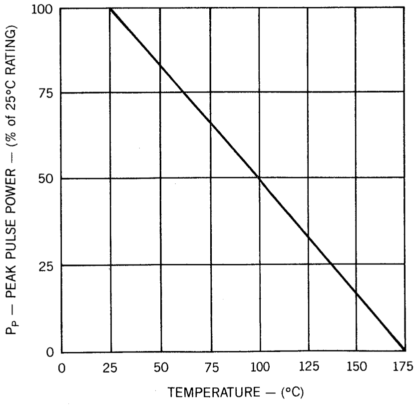
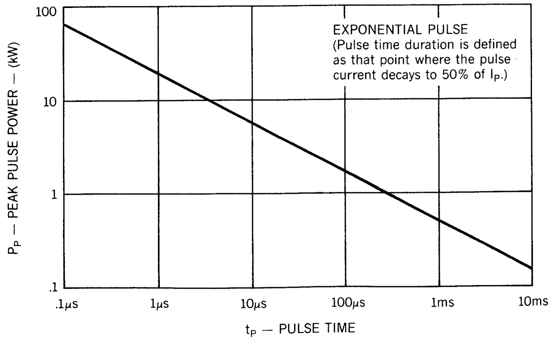
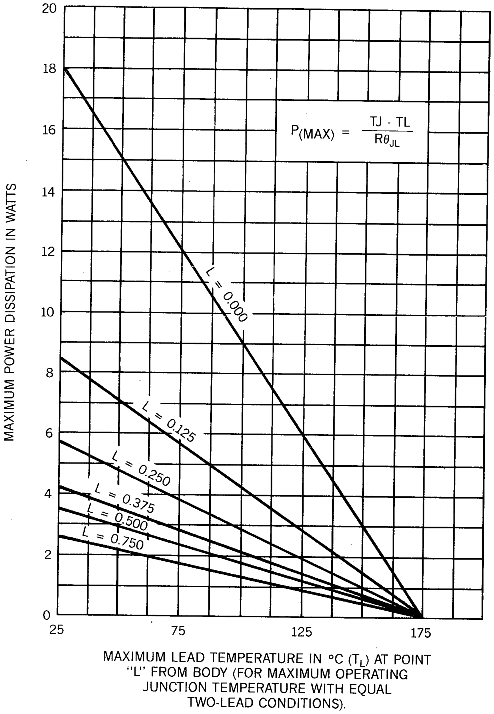


Figure 4. Peak Pulse Power vs. Pulse Duration



EXPONENTIAL PULSE
(Pulse time duration is defined as that point where the pulse current decays to 50% of I_P.)

Figure 5.
Maximum Power vs. Lead Temperature



L		$R\theta_{JL}$
INCHES	(MM)	°C/W
0.000		8.3
0.125	(3.17)	17.5
0.250	(6.35)	26.5
0.375	(9.53)	33.5
0.500	(12.70)	42.0
0.750	(19.05)	55.0

Figure 6. Steady-State Derating Curve for Free-Air Mounting

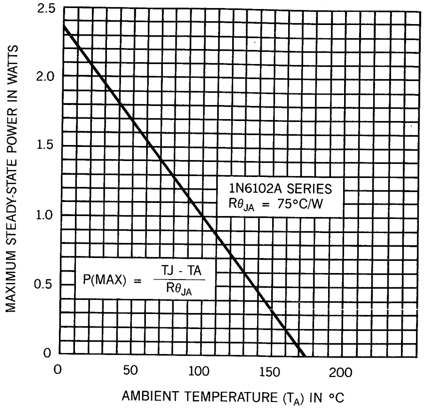
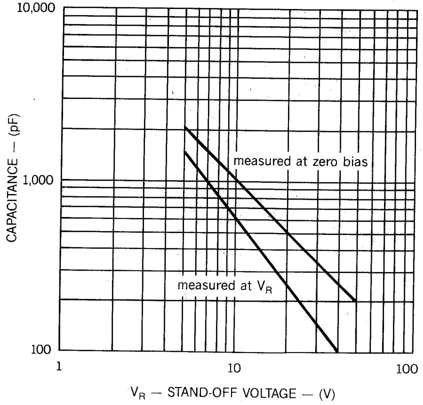


Figure 7.
Typical Capacitance vs. Stand-Off Voltage



TRANSIENT VOLTAGE SUPPRESSORS

500W, Military

1N6461-1N6468
JAN, JANTX & JANTXV

FEATURES
- 500W Power Capability for 1ms pulse
- Glass Encapsulated Device
- Clamping Time in Picoseconds

DESCRIPTION

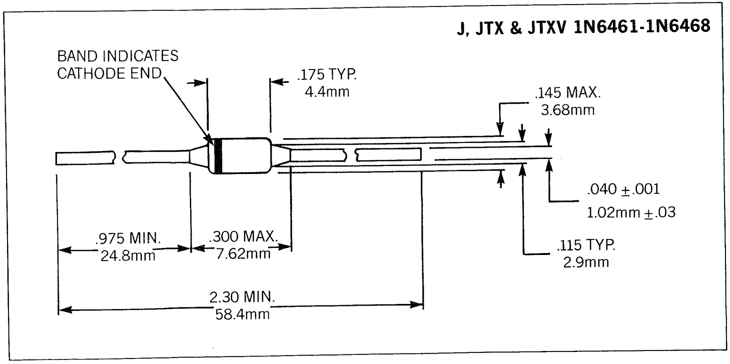
Transient voltage suppressor of noncavity design and qualified to MIL-S-19500/551. Metallurgically bonded for high reliabilty.

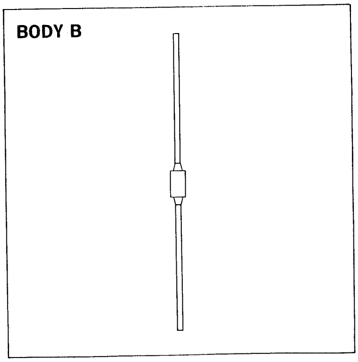
ABSOLUTE MAXIMUM RATINGS @ 25°C

Stand-off Voltage, V_R	5.0V to 51.6V
Peak Pulse Power (1ms)*, P_{PR}	500W
Forward Surge Current @ tp = 8.33ms, I_{FSM}	80A(pk)
Peak Pulse Current	see table
Breakdown Voltage	see table
Power, Continuous (Derate @ 16.7mW/°C above T_A = 25°C), P_R	2.5W
Storage Temperature	−55°C to +200°C
Operating Temperature	−55°C to +175°C

*See Figure 2 for Peak Pulse Power vs. Pulse Duration.

MECHANICAL SPECIFICATIONS





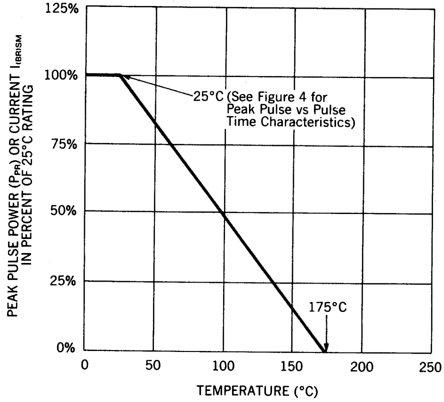
THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

Microsemi Corp.
Watertown
The diode experts

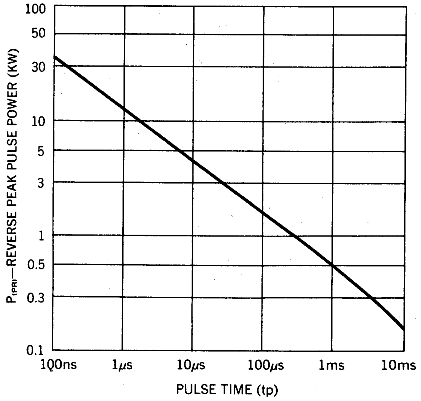
ELECTRICAL SPECIFICATIONS @ 25°C

Part No.	Stand-off Voltage V_R	Min. Breakdown Voltage @ I_{BR}	Test Current I_{BR} @ tp = 300ms Duty Cycle ≤ 2%	Max. Leakage Current I_R @ V_R	Max. Peak Pulse Current I_{pp} tp = 1ms tr = 10μs (Fig. 3)	tp = 20μs tr = 8μs (Fig. 4)	Max. Clamping Voltage ($V_{C\ MAX.}$) @ Ipp for tp = 1ms	Max. Clamping Voltage @ Ipp (tp = 1ms) Inverse Voltage $-V_{C\ Max.}$	Max. Temperature Coefficient ∝ $V_{(BR)}$
	V	V	mA	μA	A(pk)	A(pk)	V	V	%/°C
1N6461	5.0	5.6	25	3000	56	315	9.0	-3.5	0.040
1N6462	6.0	6.5	20	2500	46	258	11.0	-3.2	0.040
1N6463	12.0	13.6	5	500	22	125	22.6	-3.8	0.050
1N6464	15.0	16.4	5	500	19	107	26.5	-3.8	0.060
1N6465	24.0	27.0	2	50	12	69	41.4	-3.6	0.084
1N6466	30.5	33.0	1	3	11	63	47.5	-3.6	0.093
1N6467	40.3	43.7	1	2	8	45	63.5	-3.5	0.094
1N6468	51.6	54.0	1	2	6	35	78.5	-3.4	0.096

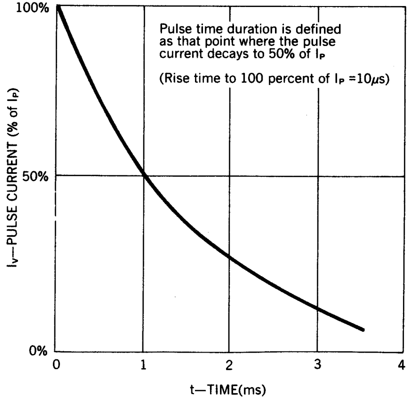
1. Derating Curve



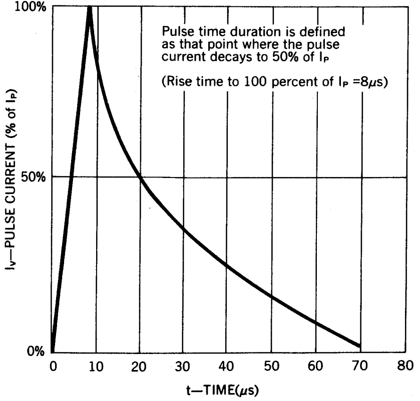
2. Peak Pulse Power vs. Pulse Duration



3. Current Impulse Waveform



4. Current Impulse Waveform



TRANSIENT VOLTAGE SUPPRESSOR

EPS5 Series

Bidirectional, 5 to 48V, 1000 Watts Peak

FEATURES

- Bidirectional
- 1000W for 8 × 20 microsec pulse
- Clamping time in pico seconds
- Extremely low leakage current
- Voidless hermetically sealed glass package
- Metallurgically bonded construction

DESCRIPTION

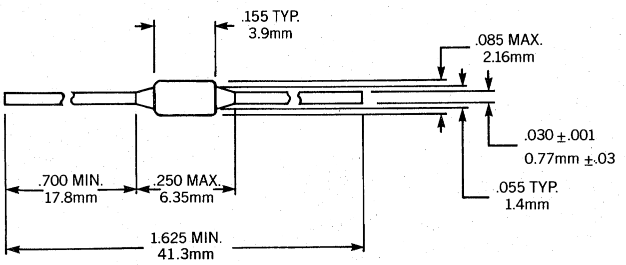
These bidirectional, high speed, voltage protection devices are ideally suited for applications where fast response is essential. The use of passivated die metallurgically bonded on both sides asssures long term reliability. This series is especially useful in protecting microprocessor, MOS, CMOS, TTL, Schottky TTL, ECL, I^2L and linear integrated circuits from spurious transient disturbances including NEMP (Nuclear Electromagnetic Pulse) and electrostatic discharge.

ABSOLUTE MAXIMUM RATINGS AT 25°C (PER LEG)

Stand-Off Voltage ....5 to 48V (See Characteristics Table)
Peak Pulse Power
(8 × 20 microsec pulse) ....1000W (See Figure 1)
Peak Pulse Power (1 millisec pulse) ....150W (See Figure 2)
Peak Pulse Current ....See Characteristics Table
Breakdown Voltage ....See Characteristics Table
Power Continuous
(T_L = 75°C, L = ⅜") 2.5W
Storage and Operating Temperature ....−65°C to +175°C

MECHANICAL SPECIFICATIONS

EPS5 Series



These devices also available in surface mount package. See Section 11

A BODY

Microsemi Corp.
Watertown
The diode experts

ELECTRICAL CHARACTERISTICS AT 25°C

Type	Stand-Off Voltage V_R	Minimum Breakdown Voltage BV(min) @ 1mA	Maximum Leakage Current I_R @ V_R	Maximum Peak Current* I_P	Maximum Clamping Voltage* V_C @ 10A	Maximum Temp. Coef. of BV
	(V)	(V)	(μA)	(A)	(V)	(%/°C)
EPS5	5	6.0	50	89.4	9.5	.030
EPS8	8	9.0	2	62.1	13.7	.040
EPS12	12	13.8	1	40.3	21.6	.050
EPS15	15	16.7	1	33.9	26.0	.055
EPS17	17	19.0	1	30.8	29.2	.060
EPS24	24	28.4	1	22.0	43.2	.070
EPS28	28	31.0	1	19.2	47.8	.075
EPS33	33	36.8	1	16.4	56.7	.080
EPS48	48	54.0	1	11.2	84.3	.090

*See Figure 1.

Figure 1. Current Impulse Waveform

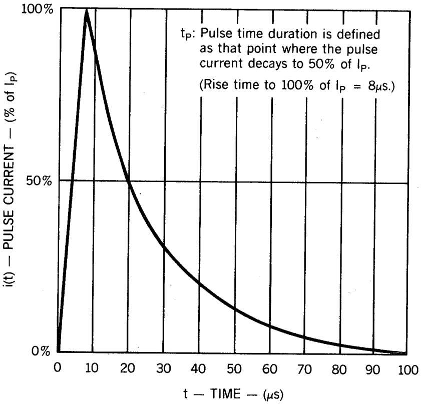


Figure 2. Peak Pulse Power vs. Pulse Duration

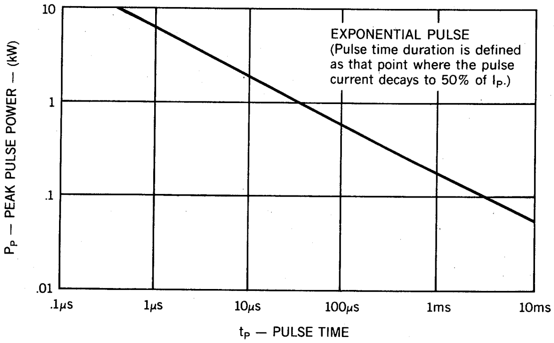


Figure 3. Derating Curve

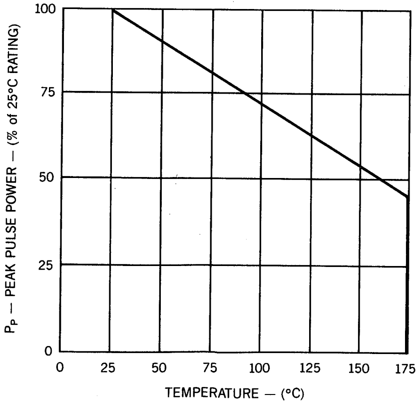
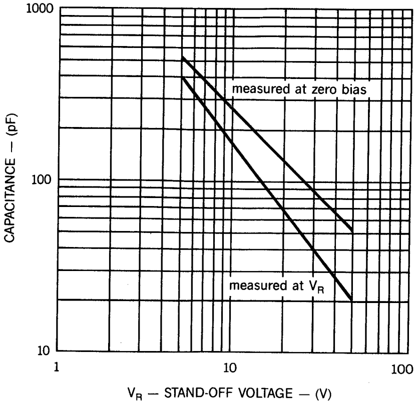


Figure 4.
Typical Capacitance vs. Stand-Off Voltage



TRANSIENT VOLTAGE SUPPRESSORS

TVS305-TVS430
TVS505-TVS528

FEATURES

- Up to 500W for 1mS Pulse Power Capability
- Clamping Time in Picoseconds
- Direct Applicability for all popular Microprocessors and IC families
- Metallurgically bonded assembly system to assure long term reliability
- Miniature glass encased hermetically sealed package

DESCRIPTION

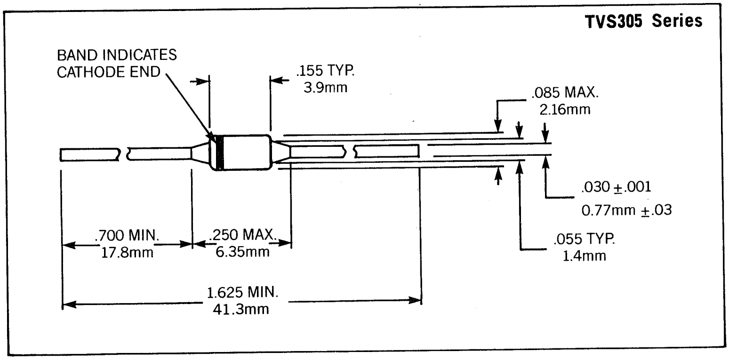
Unitrode's TVS series of transient voltage suppressors feature oxide passivated zener type chips with full-faced metallurgical bonds on both sides to achieve high surge capability and negligible electrical degradation under repeated surge conditions. The series is especially useful in protecting microprocessor, MOS, CMOS, TTL, Schottky TTL, ECL, I²L and linear integrated circuits from spurious transient disturbances.

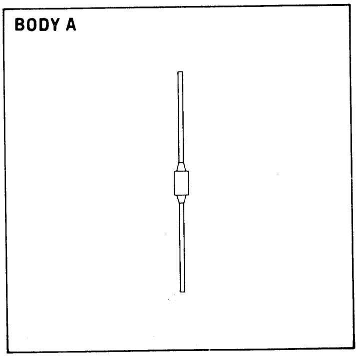
ABSOLUTE MAXIMUM RATINGS @ 25°C

	TVS305-TVS430	TVS505-TVS528
Stand-off Voltage, V_R	5 to 300V	5.0V to 28.0V
Peak Pulse Power (1mS)*	150W	500W
Forward Surge Current (8.3mS half sinewave)	15A	50A
Peak Pulse Current	See Table	See Table
Breakdown Voltage	See Table	See Table
Power, Continuous	3W	5W
Storage and Operating Temperature	−65 to +175°C	−65 to +175°C

*See Figures 3 and 4 for Peak Pulse Power vs Pulse Duration.

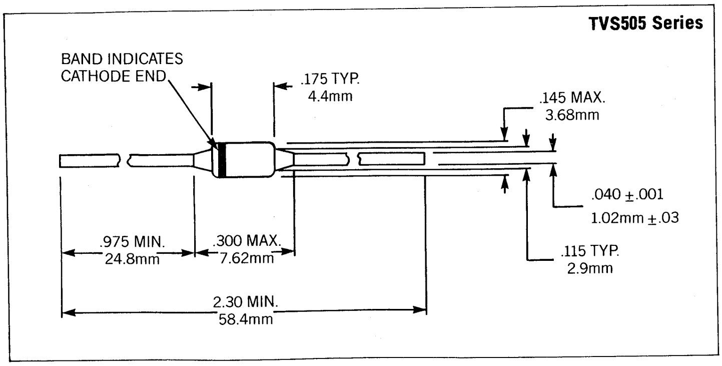
MECHANICAL SPECIFICATIONS

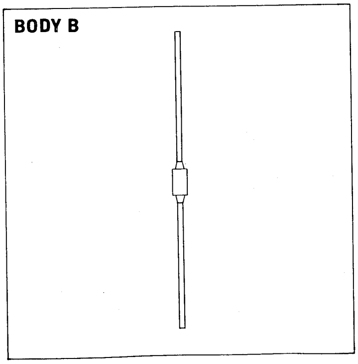




THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

MECHANICAL SPECIFICATIONS





THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE.

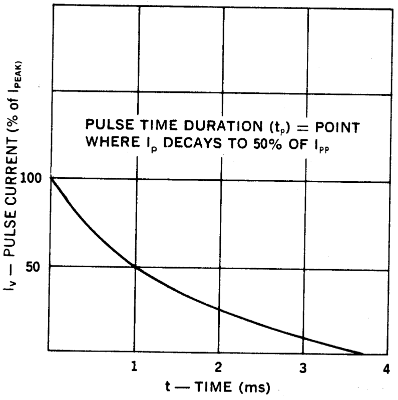
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS @ 25°C

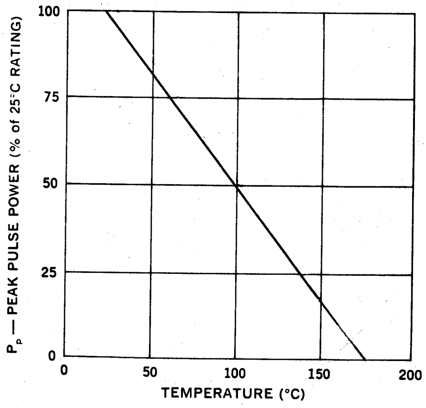
TVS Part No.	Stand -Off Voltage V_R	Min. Breakdown Voltage $BV_{(min)}$ @ 1mA	Max. Leakage Current I_R @ V_R	Max. Peak Pulse Current* I_{PP}	Max. Clamping Voltage* V_C @ I_{PP}	Max. Clamping Voltage* V_C @ 1A	Max. Clamping Voltage* V_C @	
							5A	10A
	V	V	μA	A	V	V	V	
TVS305	5.0	6.0	50	17	8.7	—	—	—
TVS310	10.0	11.1	2	8.9	16.8	—	—	—
TVS312	12	13.8	1	7.1	21.0	—	—	—
TVS315	15	16.7	1	5.9	25	—	—	—
TVS318	18	20.4	1	4.9	31	—	—	—
TVS324	24	28.4	1	3.6	42	—	—	—
TVS328	28	30.7	1	3.2	46	—	—	—
TVS348	48	54	1	1.7	82	—	—	—
TVS360	60	67	1	1.4	105	—	—	—
TVS410	100	111	1	.91	160	—	—	—
TVS420	200	234	1	.42	360	—	—	—
TVS430	300	342	1	.28	520	—	—	—
TVS505	5.0	6.0	300	53.7	9.3	7.4	—	7.9
TVS510	10.0	11.1	5	30.3	16.5	13.2	—	14.4
TVS512	12.0	13.8	5	23.8	21.0	16.5	—	18.5
TVS515	15.0	16.7	5	19.8	25.2	19.7	—	22.2
TVS518	18.0	20.4	5	16.3	30.5	23.8	26.0	—
TVS524	24.0	28.4	5	11.9	42.0	32.4	37.0	—
TVS528	28.0	30.7	5	10.7	46.5	35.9	41.0	—

*For 1mS pulse: see Figure 1.

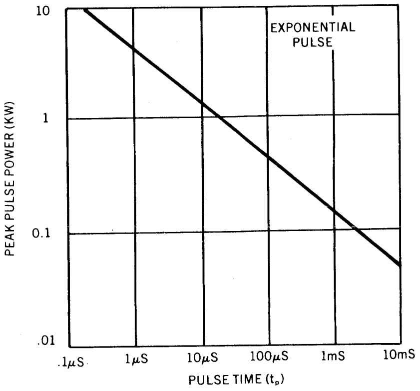
1. **Pulse Waveform**



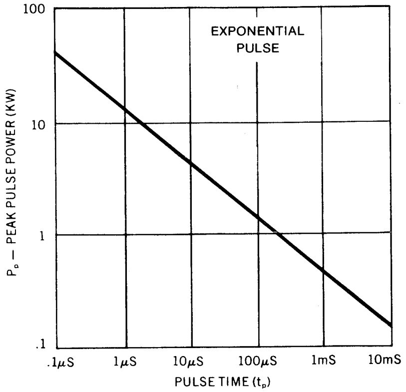
2. **Derating Curve**



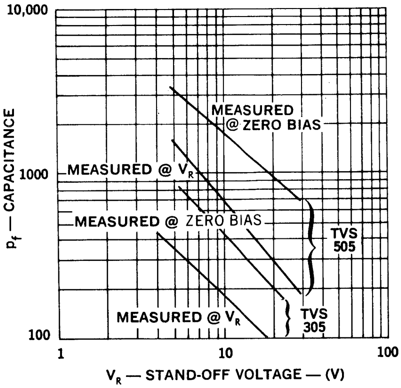
3. Peak Pulse Power vs. Pulse Duration



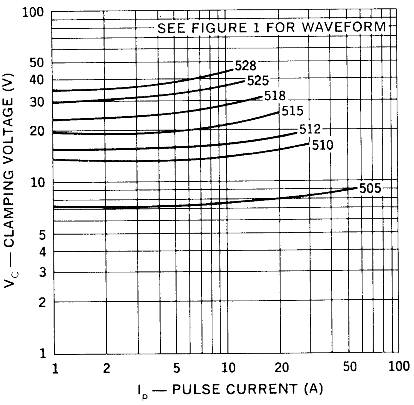
4. Peak Pulse Power vs. Pulse Duration



5. Capacitance vs. Stand-Off Voltage



6. Clamping Voltage vs. Pulse Current



CHOOSING AND SPECIFYING THE PROPER TVS

The following terms are generally used in specifying Transient Voltage Suppressors (TVS):

1. Stand-off Voltage (V_R) is the highest reverse voltage at which the TVS will be non-conducting.
2. Minimum Breakdown Voltage (BV min) is the reverse voltage at which the TVS conducts 1 milli-amp. This is the point where the TVS begins to limit the transient.
3. Maximum Clamping Voltage (V_C max) is the maximum voltage the TVS will allow during a transient "spike."

Figure 7 graphically shows all three terms.

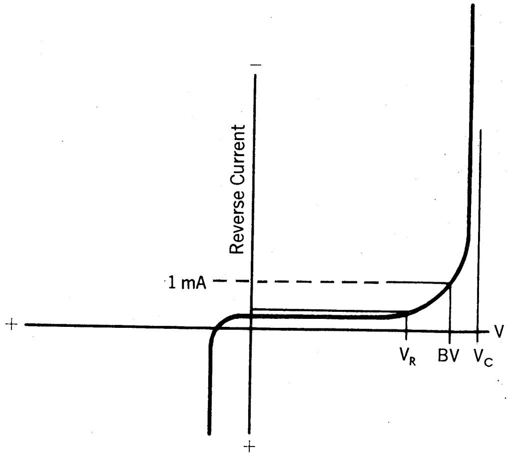


Figure 7

The three most important factors in choosing the appropriate TVS for an application in their order of importance are:

1. Pulse power (P_P) — Choose the TVS series that will handle the Transient Pulse Power. Transient Pulse Power is equal to the clamping voltage (V_C) times the peak pulse current (i_{PP}). The pulse duration vs. pulse power graph on the TVS data sheet can then be used to determine the maximum allowable pulse duration. (Figure 3 or 4).
2. Standoff voltage (V_R) — From the TVS series selected, choose the device with the stand-off voltage equal to or greater than the normal circuit operating voltage.
3. Maximum Clamping Voltage (V_{CMAX}) — Determine the clamping voltage of the device chosen for the transient given and be sure it is below the voltage that might damage any components.

POWER ZENERS
3 Watt

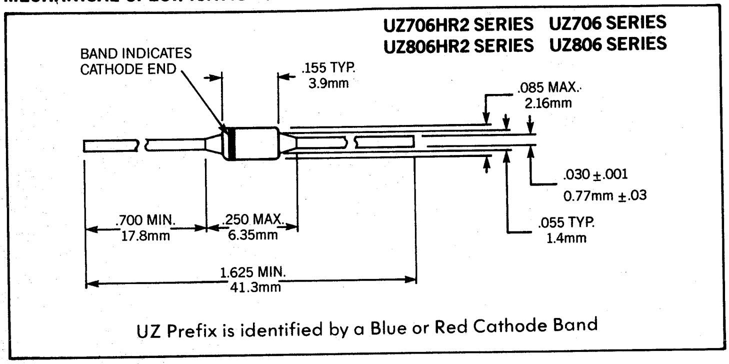
UZ706 SERIES
UZ806 SERIES
UZ706HR2 SERIES
UZ806HR2 SERIES

DESCRIPTION
Fused-in-glass metallurgically bonded 3 watt zener diodes.

FEATURES
- 10 Times Greater Surge Rating than Conventional 1 Watt Types
- Small Physical Size

ABSOLUTE MAXIMUM RATINGS
Zener Voltage, V_Z	6.8 to 400V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	—65°C to +175°C

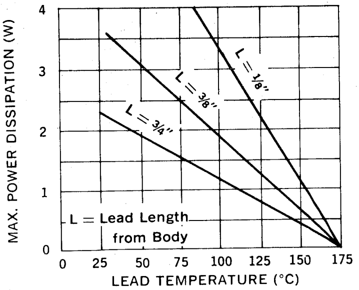
MECHANICAL SPECIFICATIONS



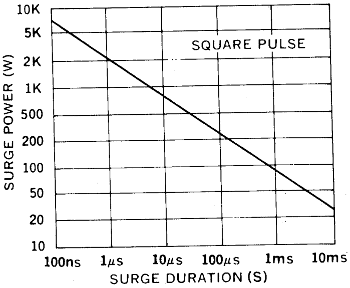
UZ Prefix is identified by a Blue or Red Cathode Band

BODY A

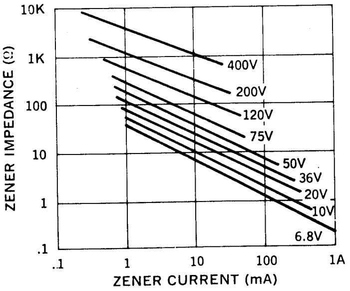
Power Dissipation vs. Lead Temperature Derating Curve



Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



OPTIONAL HIGH RELIABILITY (HR2) SCREENING
The following tests are performed on 100% of the devices specified UZ706 through UZ140HR2.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 175°C
2. Temperature Cycling	1051	C, 20 Cycles, −65 to +175°C. No dwell required @ 25°C ⩾ 10 min. at extremes
3. Hermetic Seal @ Gross Leak	1071	E, ZYGLO
4. Interim Electrical Parameters	GO/NO GO	$V_Z + I_R$ @ 25°C
5. Power Burn-in	1038	B, 96 Hours, T_A = 25°C, I_Z adjusted so that 150°C ⩽ T_j ⩽ 175°C
6. Final Electrical Parameters	GO/NO GO	$V_Z + I_R$ @ 25°C PDA = 10% (Final Electricals)

Type*		Electrical Specifications at 25°C							Maximum Ratings	
		Nominal Zener Voltage † V_Z @ I_{ZT}	Test Current I_{ZT}	Max. Zener Impedance §	Maximum Reverse Leakage Current			Typ. Temp. Coefficient T_C @ I_{ZT}	Maximum Continuous Current ★ I_{ZM}	Maximum Surge Current‡ I_S
				Z_Z @ I_{ZT}	I_R @ V_R	± 5% V_R	± 10% V_R			
±5% Tolerance	Jedec** Registration	Volts	mA	Ohms	µA	Volts	Volts	%/°C	mA	Amps
UZ706/706HR2	1N5063	6.8	75	2	500	5.2	4.9	.04	440	10.0
UZ707/707HR2	1N5064	7.5	75	2	300	5.7	5.4	.04	400	8.0
UZ708/708HR2	1N5065	8.2	75	3	200	6.2	5.9	.05	360	7.0
UZ709/709HR2	1N5066	9.1	75	3	100	6.9	6.6	.05	330	6.0
UZ710/710HR2	1N5067	10.0	75	4	40	7.6	7.2	.06	300	5.0
UZ712/712HR2	1N4883	12	65	5	10	9.1	8.6	.07	250	4.0
UZ713/713HR2	1N5069	13	50	6	10	9.9	9.3	.07	230	4.0
UZ714/714HR2	1N5070	14	50	6	10	10.6	10.1	.07	210	4.0
UZ715/715HR2	1N5071	15	50	6	10	11.4	10.8	.07	200	3.0
UZ716/716HR2	1N5072	16	50	7	5	12.2	11.5	.07	185	3.0
UZ718/718HR2	1N5073	18	40	8	5	13.7	12.9	.08	170	2.0
UZ720/720HR2	1N4884	20	40	9	5	15.2	14.4	.08	150	2.0
UZ722/722HR2	1N5074	22	30	10	5	16.7	15.8	.08	135	2.0
UZ724/724HR2	1N5075	24	30	10	5	18.2	17.3	.08	125	1.5
UZ727/727HR2	1N5076	27	25	12	1	20.6	19.4	.09	110	1.5
UZ730/730HR2	1N5077	30	25	15	1	22.8	21.6	.090	100	1.5
UZ733/733HR2	1N5078	33	20	21	1	25.1	23.7	.090	90	1.2
UZ736/736HR2	1N5079	36	20	21	1	27.4	25.9	.090	85	1.0
UZ740/740HR2	1N5081	40	20	27	1	30.4	28.8	.095	75	1.0
UZ745/745HR2	1N5083	45	15	37	1	34.2	32.4	.095	65	0.8
UZ750/750HR2	1N5085	50	15	50	1	38.0	36.0	.095	60	0.8
UZ756/756HR2	1N5087	56	10	70	1	42.6	40.3	.095	55	0.7
UZ760/760HR2	1N5088	60	10	70	1	45.7	43.2	.095	50	0.6
UZ770/770HR2	1N5091	70	10	90	1	53.3	50.5	.095	45	0.6
UZ775/775HR2	1N5092	75	10	100	1	56.0	54.0	.095	40	0.5
UZ780/780HR2	1N5093	80	10	115	1	60.8	57.7	.095	35	0.4
UZ790/790HR2	1N4096	90	8.0	150	1	68.5	64.8	.095	30	0.4
UZ110/110HR2	1N4097	100	5.0	175	1	76.0	72.0	.100	30	0.4
UZ111/111HR2	1N5096	110	5.0	250	1	83.6	79.2	.100	25	0.3
UZ112/112HR2	1N5097	120	5.0	325	1	91.2	86.4	.100	25	0.2
UZ113/113HR2	1N5098	130	5.0	375	1	98.8	93.6	.100	20	0.20
UZ114/114HR2	1N5099	140	5.0	550	1	106	101	.100	20	0.20
UZ115/115HR2	1N4098	150	5.0	650	1	114	108	.100	20	0.20
UZ116/116HR2	1N5100	160	4.0	700	1	122	115	.100	20	0.15
UZ117/117HR2	1N5101	170	4.0	750	1	129	122	.100	18	0.15
UZ118/118HR2	1N5102	180	4.0	850	1	137	129	.100	18	0.10
UZ119/119HR2	1N5103	190	4.0	900	1	144	137	.100	15	0.10
UZ120/120HR2	1N5104	200	4.0	950	1	152	144	.100	15	0.10
UZ122/122HR2	1N5105	220	3.0	1100	1	167	158	.100	15	0.09
UZ124/124HR2	1N5106	240	3.0	1300	1	182	173	.105	12	0.09
UZ126/126HR2	1N5107	260	3.0	1500	1	198	187	.105	12	0.08
UZ128/128HR2	1N5109	280	3.0	1700	1	213	202	.105	10	0.08
UZ130/130HR2	1N5110	300	3.0	1900	1	228	216	.105	10	0.07
UZ132/132HR2	1N5111	320	2.0	2100	1	243	230	.105	9	0.07
UZ134/134HR2	1N5113	340	2.0	2400	1	258	245	.110	9	0.06
UZ136/136HR2	1N5114	360	2.0	2700	1	274	259	.110	8	0.06
UZ138/138HR2	1N5115	380	2.0	3000	1	289	274	.110	8	0.06
UZ140/140HR2	1N5117	400	2.0	3500	1	304	288	.110	7	0.06

* Specify 20% voltage tolerance by changing first numeral of type number from 7 to 9. (UZ709 becomes UZ909) or from 1 to 3 (UZ111 becomes UZ311).

Specify 10% voltage tolerance by changing first numeral of type number from 7 to 8. (UZ709 becomes UZ809) or from 1 to 2 (UZ111 becomes UZ211).

** Jedec registration applies to ±5% tolerance zeners only.

† All zener voltages are measured with an automated test set using a 35 ms test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§ Zener impedance is derived from the 60-cycle AC voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

★ Maximum current based on 3 watt rating. See lead temperature derating curves for proper mounting methods.

‡ Figures shown are for a peak sinusoidal surge current of 8.3ms duration using 60 cycle AC. The 8.3ms square pulse rating is 71% of the value shown.

POWER ZENERS

5 Watt, Industrial

UZ4706 SERIES
UZ4806 SERIES

FEATURES
- 2 Times Greater Surge Rating than Plastic Types
- Small Physical Size
- Impervious to Moisture

DESCRIPTION

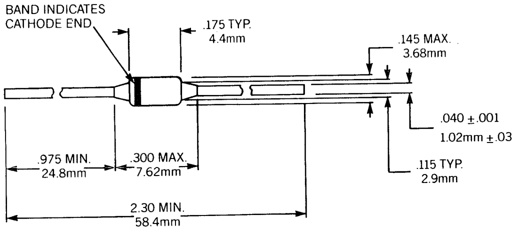
Fused-in-glass 5 watt zeners with the same electrical specs as the 1N5342-1N5388 series.

ABSOLUTE MAXIMUM RATINGS

Zener Voltage, V_Z	6.8 to 200V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	−65°C to +175°C

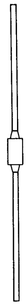
MECHANICAL SPECIFICATIONS

UZ4706 SERIES **UZ4806 SERIES**

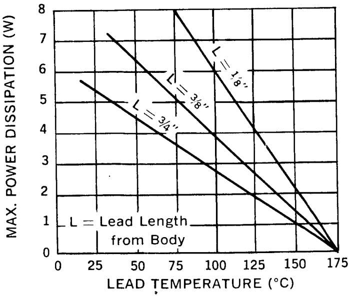


UZ Prefix is identified by a Blue or Red Cathode Band

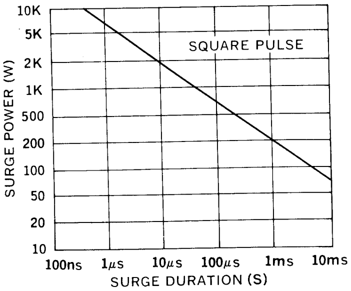
BODY B



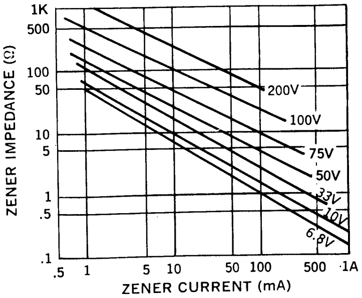
Power Dissipation vs. Lead Temperature Derating Curve



Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



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Type		Electrical Specifications at 25°C							Maximum Ratings	
		Nominal Zener Voltage † V_Z @ I_{ZT}	Test Current I_{ZT}	Max. Zener Impedance §		Reverse Voltage			Maximum Cont. Current I_{ZM}	Maximum Surge Current ‡ I_S
				Z_Z @ I_{ZT}	Z_{ZK} @ I_{ZK} = lmA	Maximum Leakage Current	@ Reverse Voltage ±10%	±5%		
±5% Tolerance	±10% Tolerance	Volts	mA	Ohms	Ohms	µA	Volts	Volts	mA	Amps
UZ4706	UZ4806	6.8	175	1	1000	500	4.9	5.2	675	32
UZ4707	UZ4807	7.5	175	1.5	800	400	5.4	5.7	620	26.5
UZ4708	UZ4808	8.2	150	1.5	600	200	5.9	6.2	570	19.2
UZ4709	UZ4809	9.1	150	2	400	100	6.6	6.9	510	17.6
UZ4710	UZ4810	10	125	2	125	75	7.2	7.6	470	16
UZ4712	UZ4812	12	100	2.5	140	50	8.6	9.1	385	14.4
UZ4713	UZ4813	13	100	3	145	25	9.3	9.9	350	12.8
UZ4715	UZ4815	15	75	3.5	150	15	10.8	11.4	300	9.6
UZ4716	UZ4816	16	75	3.5	155	10	11.5	12.2	275	8
UZ4718	UZ4818	18	65	4	160	10	12.9	13.7	255	7.2
UZ4720	UZ4820	20	65	4.5	165	10	14.4	15.2	220	6.4
UZ4722	UZ4822	22	50	5	170	10	15.8	16.7	195	5.6
UZ4724	UZ4824	24	50	5	175	10	17.3	18.2	180	5.2
UZ4727	UZ4827	27	50	6	180	10	19.4	20.6	155	4.8
UZ4730	UZ4830	30	40	8	190	10	21.6	22.8	140	4.4
UZ4733	UZ4833	33	40	10	200	5	23.7	25.1	130	4.0
UZ4736	UZ4836	36	30	11	220	5	25.9	27.4	120	3.6
UZ4739	UZ4839	39	30	14	230	5	28.1	29.7	105	3.2
UZ4743	UZ4843	43	30	20	240	5	31	32.7	100	2.8
UZ4747	UZ4847	47	25	25	250	5	33.8	35.8	96	2.6
UZ4751	UZ4851	51	25	27	270	5	36.7	38.8	85	2.4
UZ4756	UZ4856	56	20	35	320	5	40.3	42.6	81	2.2
UZ4762	UZ4862	62	20	42	400	5	44.6	47.1	73	2.0
UZ4768	UZ4868	68	20	50	500	5	49.0	51.7	61	1.8
UZ4775	UZ4875	75	20	55	620	5	54.0	56	60	1.6
UZ4782	UZ4882	82	15	80	720	5	59.0	62.2	55	1.4
UZ4791	UZ4891	91	15	90	760	5	65.5	69.2	50	1.3
UZ4110	UZ4210	100	12	100	800	5	72.0	76.0	45	1.1
UZ4111	UZ4211	110	12	125	1000	5	79.2	83.6	40	1.0
UZ4112	UZ4212	120	10	170	1150	5	86.4	91.2	38	.8
UZ4113	UZ4213	130	10	190	1250	5	93.6	98.8	35	.64
UZ4115	UZ4215	150	8	330	1500	5	108	114.0	31	.60
UZ4116	UZ4216	160	8	350	1650	5	115	121.6	30	.56
UZ4118	UZ4218	180	5	450	1750	5	129	136.8	25	.48
UZ4120	UZ4220	200	5	500	1850	5	144	152.0	22	.40

Maximum V_F @ 1.0 Amp = 1.2 Volts for all types

†All zener voltages are measured with an automated test set using a 35 ms test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§Zener impedance is derived from the 60-cycle voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

‡Figures shown are for peak sinusoidal surge current of 8.3 ms duration using 60 cycle AC. The 8.3ms square pulse rating is 71% of the value shown.

POWER ZENERS
5 Watt

UZ5706 SERIES
UZ5806 SERIES

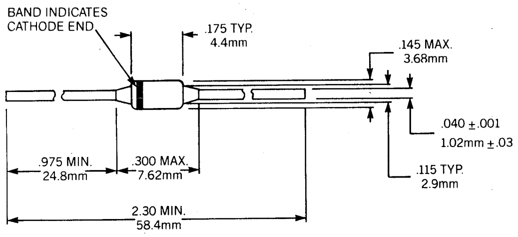
FEATURES
- 2 Times Greater Surge Rating than Conventional 10 Watt Zeners
- Small Physical Size

DESCRIPTION
Fused-in-glass, metallurgically-bonded 5 watt zeners.

ABSOLUTE MAXIMUM RATINGS
Zener Voltage, V_Z	6.8 to 400V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	—65°C to +175°C

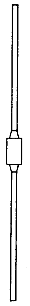
MECHANICAL SPECIFICATIONS

UZ5706 SERIES UZ5806 SERIES

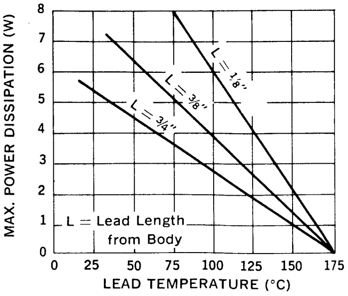


UZ Prefix is identified by a Blue or Red Cathode Band

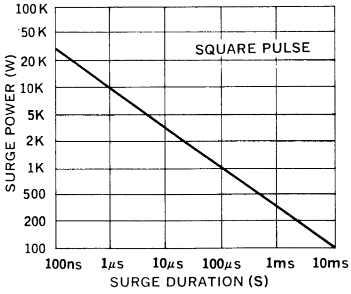
BODY B



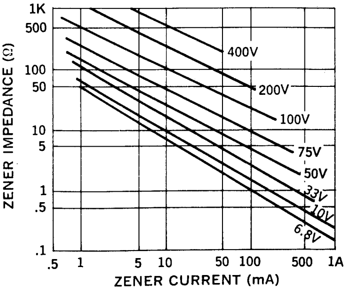
Power Dissipation vs. Lead Temperature Derating Curve



Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



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Type *		Electrical Specifications at 25°C							Maximum Ratings	
		Nominal Zener Voltage † V_Z @ I_{ZT}	Test Current I_{ZT}	Max. Zener Impedance § Z_Z @ I_{ZT}	Maximum Reverse Leakage Current			Typ. Temp. Coeff. T_C @ I_{ZT}	Maximum Continuous Current ★ I_{ZM}	Maximum Surge Current ‡ I_S
					I_R	± 5% V_R	± 10% V_R			
±5% Tolerance	±10% Tolerance	Volts	mA	Ohms	μA	Volts	Volts	%/°C	mA	Amps
UZ5706	UZ5806	6.8	175	1.0	500	5.2	4.9	.05	675	40
UZ5707	UZ5807	7.5	175	1.5	400	5.7	5.4	.06	620	32
UZ5708	UZ5808	8.2	150	1.5	200	6.2	5.9	.06	570	24
UZ5709	UZ5809	9.1	150	2.0	100	6.9	6.6	.06	510	22
UZ5710	UZ5810	10.0	125	2.0	75	7.6	7.2	.07	470	20
UZ5712	UZ5812	12	100	2.5	50	9.1	8.6	.07	385	18
UZ5713	UZ5813	13	100	3.0	25	9.9	9.3	.08	350	16
UZ5714	UZ5814	14	100	3.0	20	10.6	10.1	.08	320	14
UZ5715	UZ5815	15	75	3.5	15	11.4	10.8	.08	300	12
UZ5716	UZ5816	16	75	3.5	10	12.2	11.5	.08	275	10
UZ5718	UZ5818	18	65	4.0	10	13.7	12.9	.085	255	9.0
UZ5720	UZ5820	20	65	4.5	10	15.2	14.4	.085	220	8.0
UZ5722	UZ5822	22	50	5.0	10	16.7	15.8	.085	195	7.0
UZ5724	UZ5824	24	50	5.0	10	18.2	17.3	.090	180	6.5
UZ5727	UZ5827	27	50	6.0	10	20.6	19.4	.090	155	6.0
UZ5730	UZ5830	30	40	8	10	22.8	21.6	.09	140	5.5
UZ5733	UZ5833	33	40	10	5	25.1	23.7	.09	130	5.0
UZ5736	UZ5836	36	30	11	5	27.4	25.9	.095	120	4.5
UZ5740	UZ5840	40	30	14	5	30.4	28.8	.095	105	4.0
UZ5745	UZ5845	45	30	20	5	34.2	32.4	.095	95	3.5
UZ5750	UZ5850	50	25	25	5	38.0	36.0	.095	85	3.0
UZ5756	UZ5856	56	20	35	5	42.6	40.3	.095	80	2.8
UZ5760	UZ5860	60	20	40	5	45.7	43.2	.100	75	2.5
UZ5770	UZ5870	70	20	50	5	53.3	50.5	.100	65	2.3
UZ5775	UZ5875	75	15	55	5	56.0	54.0	.100	60	2.0
UZ5780	UZ5880	80	15	80	5	60.8	57.7	.100	55	1.8
UZ5790	UZ5890	90	15	90	5	68.5	64.8	.100	50	1.6
UZ5110	UZ5210	100	10	100	5	76.0	72.0	.100	45	1.4
UZ5111	UZ5211	110	10	125	5	83.6	79.2	.100	40	1.2
UZ5112	UZ5212	120	10	170	5	91.2	86.4	.100	38	1.0
UZ5113	UZ5213	130	10	190	5	98.8	93.6	.105	35	0.80
UZ5114	UZ5214	140	8	230	5	106.0	101.0	.105	33	0.80
UZ5115	UZ5215	150	8	330	5	114.0	108.0	.105	31	0.75
UZ5116	UZ5216	160	8	350	5	122.0	115.0	.105	30	0.70
UZ5117	UZ5217	170	8	380	5	129.0	122.0	.105	27	0.65
UZ5118	UZ5218	180	5	450	5	137	129	.110	25	0.60
UZ5119	UZ5219	190	5	470	5	144	137	.110	24	0.55
UZ5120	UZ5220	200	5	500	5	152	144	.110	22	0.50
UZ5122	UZ5222	220	5	550	5	167	158	.115	20	0.45
UZ5124	UZ5224	240	5	650	5	182	173	.115	18	0.40
UZ5126	UZ5226	260	5	750	5	198	187	.120	17	0.35
UZ5128	UZ5228	280	4	850	5	213	202	.120	16	0.30
UZ5130	UZ5230	300	4	950	5	228	216	.120	15	0.25
UZ5132	UZ5232	320	4	1100	5	243	230	.120	14	0.24
UZ5134	UZ5234	340	4	1200	5	258	245	.120	13	0.23
UZ5136	UZ5236	360	3	1400	5	274	259	.120	12	0.22
UZ5138	UZ5238	380	3	1500	5	289	274	.120	12	0.21
UZ5140	UZ5240	400	3	1800	5	304	288	.120	11	0.20

Temperature Range: Operating and Storage —65°C to +175°C.

* Specify 20% tolerance by changing the second numeral of type number from 8 to 9 (UZ5809 becomes UZ5909) or from 2 to 3 (UZ5211 becomes UZ5311).

† All zener voltages are measured with an automated test set using a 35 millisecond test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§ Zener impedance is derived from the 60-cycle AC voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

★ Maximum current based on 5 watt rating. See lead temperature derating curves for proper mounting methods.

‡ Figures shown are for a peak sinusoidal surge current of 8.3ms duration using 60 cycle AC. The 8.3ms square pulse rating is 71% of the value shown.

Several of the above types now have JEDEC 1N type numbers. The following cross-reference table lists the appropriate 1N numbers; specifications are same as above.

JEDEC #	UNITRODE TYPE	JEDEC #	UNITRODE TYPE	JEDEC #	UNITRODE TYPE
1N5118	UZ5714	1N5124	UZ5780	1N5130	UZ5128
1N5119	UZ5740	1N5125	UZ5790	1N5131	UZ5132
1N5120	UZ5745	1N5126	UZ5114	1N5132	UZ5134
1N5121	UZ5750	1N5127	UZ5117	1N5133	UZ5138
1N5122	UZ5760	1N5128	UZ5119	1N5134	UZ5140
1N5123	UZ5770	1N5129	UZ5126		

POWER ZENERS

6 Watt, Military, 10 Watt Military

UZ7706L and UZ7806L SERIES
UZ7706 and UZ7806 SERIES

FEATURES

- High Surge Rating
- Small Physical Size
- Leaded and Stud Packages Available

DESCRIPTION

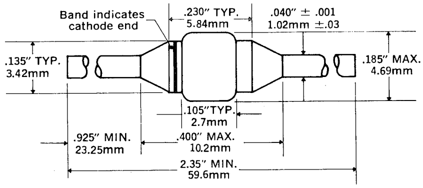
Fused-in-glass, metallurgically bonded 6 watt leaded zeners and 10 watt stud-type zeners.

ABSOLUTE MAXIMUM RATINGS

Zener Voltage, V_Z		6.8 to 100V
Continuous Current		See Table
Surge Current (8.3ms)		See Table
Surge Power		See Graph
Power	UZ7706L & UZ7806L	See Lead Temperature Derating Curve
	UZ7706 & UZ7806 @100°C Case	10W
Storage and Operating Temperature		—65°C to +175°C

MECHANICAL SPECIFICATIONS

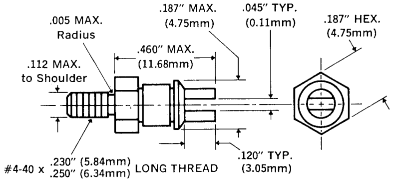
UZ7706L and UZ7806L SERIES



UZ Prefix is identified by a Blue or Red Cathode Band

BODY C —
Lead Mount

UZ7706 and UZ7806 SERIES



POLARITY: Cathode to Stud is standard. Reverse polarity denoted by "R" suffix.

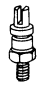
FINISH: Metal parts gold plated per MIL-G-45204, Type II.

WEIGHT: 1.5 grams (max.)

INSTALLATION PRECAUTIONS: Maximum unlubricated stud torque: 28 inch-ounces. Do not use a screwdriver in the turret slot for installation purposes, or damage may result.

Also available with insulated stud.

BODY C — Stud Mount



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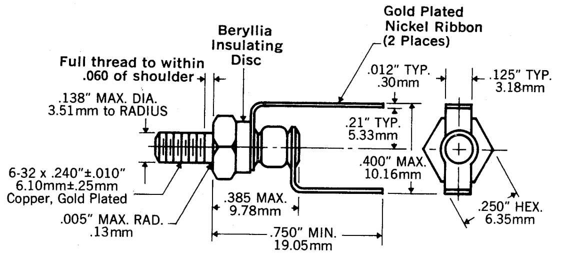
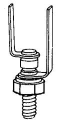
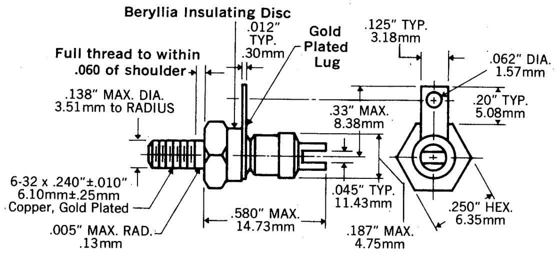
MECHANICAL SPECIFICATIONS



Dimensions in inches.

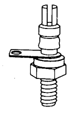
Style W



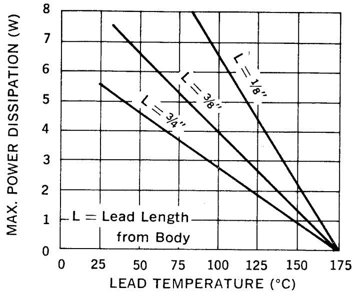


Dimensions in inches.

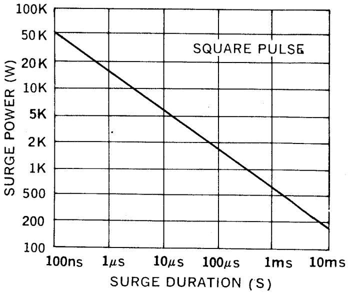
Style V



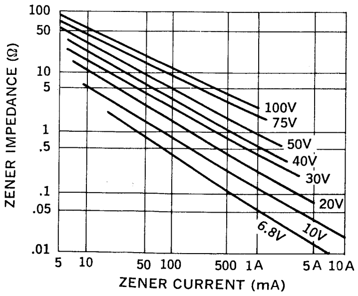
Power Dissipation vs. Lead Temperature Derating Curve



Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



Type *		Electrical Specifications at 25°C							Maximum Ratings	
		Nominal Zener Voltage † V_Z @ I_{ZT}	Test Current I_{ZT}	Max. Zener Impedance § Z_Z @ I_{ZT}	Maximum Reverse Leakage Current			Typ. Temp. Coeff. T_C @ I_{ZT}	Maximum Continuous Current ★ I_{ZM}	Maximum Surge Current ‡ I_S
					I_R @ V_R	± 5% V_R	± 10% V_R			
±5% Tolerance	±10% Tolerance	Volts	mA	Ohms	µA	Volts	Volts	%/°C	mA	Amps
UZ7706	UZ7806	6.8	350	0.6	1000	5.2	4.9	.04	1350	50
UZ7707	UZ7807	7.5	325	0.7	800	5.7	5.4	.04	1250	41
UZ7708	UZ7808	8.2	300	0.8	200	6.2	5.9	.05	1150	31
UZ7709	UZ7809	9.1	275	1.0	150	6.9	6.6	.05	1020	29
UZ7710	UZ7810	10.0	250	1.0	100	7.6	7.2	.06	950	26
UZ7712	UZ7812	12	200	1.3	75	9.1	8.6	.07	770	23
UZ7713	UZ7813	13	200	1.5	50	9.9	9.3	.07	700	21
UZ7714	UZ7814	14	175	1.5	40	10.6	10.1	.07	640	20
UZ7715	UZ7815	15	150	2.0	30	11.4	10.8	.07	600	17
UZ7716	UZ7816	16	150	2.5	20	12.2	11.5	.07	550	15
UZ7718	UZ7818	18	130	3.5	20	13.7	12.9	.08	500	13
UZ7720	UZ7820	20	120	4.0	20	15.2	14.4	.08	440	12
UZ7722	UZ7822	22	100	4.5	20	16.7	15.8	.08	390	11
UZ7724	UZ7824	24	100	5.0	20	18.2	17.3	.08	360	10
UZ7727	UZ7827	27	90	6.0	20	20.6	19.4	.09	310	9
UZ7730	UZ7830	30	80	8	20	22.8	21.6	.090	280	8.5
UZ7733	UZ7833	33	70	10	10	25.1	23.7	.090	260	7.5
UZ7736	UZ7836	36	60	12	10	27.4	25.9	.090	240	7.0
UZ7740	UZ7840	40	60	15	10	30.4	28.8	.095	210	6.4
UZ7745	UZ7845	45	50	20	10	34.2	32.4	.095	180	5.5
UZ7750	UZ7850	50	50	22	10	38.0	36.0	.095	170	4.6
UZ7756	UZ7856	56	40	30	10	42.6	40.3	.095	160	4.1
UZ7760	UZ7860	60	40	35	10	45.6	43.2	.095	150	3.7
UZ7770	UZ7870	70	35	40	10	53.2	50.4	.095	130	3.3
UZ7775	UZ7875	75	30	45	10	56.0	54.0	.095	120	3.1
UZ7780	UZ7880	80	30	60	10	60.8	57.6	.095	110	2.9
UZ7790	UZ7890	90	25	75	10	68.4	64.8	.095	100	2.6
UZ7110	UZ7210	100	20	90	10	76.0	72.0	.100	90	2.3

For optional high reliability screening, see UZ706-UZ140HR data sheet.

Power Rating: Stud Mounted: 10 Watts at 100°C Case derate linerally to zero at 175°C Case.
Lead Mounted: See lead temperature derating curve.
Temperature Range: Operating and storage −65°C to 175°C.

★ Specify 20% tolerance by changing the second numeral of type number from 8 to 9 (UZ7809 becomes UZ7909) or from 2 to 3 (UZ7210 becomes UZ7310). Specify leaded version by adding an L suffix (UZ7809 becomes UZ7809L).

† All zener voltages are measured with an automated test set using a 35 msec test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§ Zener impedance is derived from the 60-cycle voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

★ Ratings Based on 100°C Case temperature; for leaded devices multiply by 0.6.

‡ Figures shown are for a peak sinusoidal surge current of 8.3ms duration, non-repetitive. The 8.3ms square pulse rating is 71% of the value shown.

POWER ZENERS
1 Watt, Industrial

UZ8706 SERIES
UZ8806 SERIES

FEATURES

- High Surge Ratings
- A Quarter the Size of Conventional 1 Watt Zeners
- Impervious to Moisture

DESCRIPTION

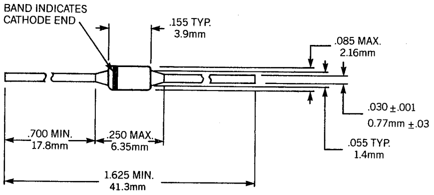
One watt zener diodes, hermetically sealed in glass.

ABSOLUTE MAXIMUM RATINGS

Zener Voltage, V_Z	6.8 to 200V
Continuous Current	See Table
Surge Current (8.3ms)	See Table
Surge Power	See Graph
Power	See Lead Temperature Derating Curve
Storage and Operating Temperature	—65°C to +175°C

MECHANICAL SPECIFICATIONS

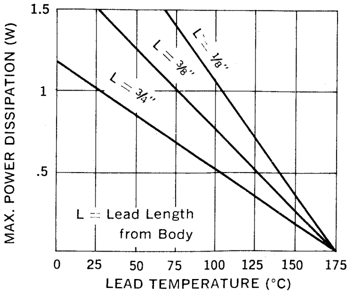
UZ8706 SERIES UZ8806 SERIES



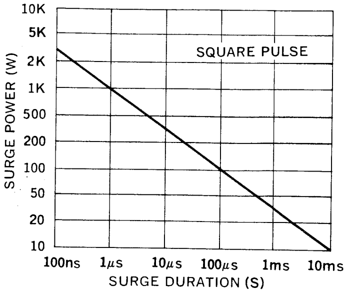
UZ Prefix is identified by a Blue or Red Cathode Band

BODY A

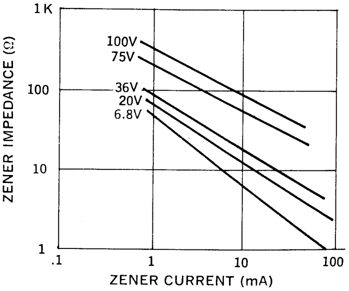
Power Dissipation vs. Lead Temperature Derating Curve



Surge Power vs. Surge Duration



Typical Zener Impedance vs. Zener Current



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Type		Electrical Specifications at 25°C							Maximum Ratings	
		Nominal Zener Voltage †	Test Current	Max. Zener Impedance §	Maximum Reverse Leakage Current			Typ. Temp. Coefficient	Maximum Continuous Current ★	Maximum Surge Current ‡
		V_Z @ I_{ZT}	I_{ZT}	Z_Z @ I_{ZT}	I_R @ V_R	± 5% V_R	± 10% V_R	T.C. @ I_{ZT}	I_{ZM}	I_S
± 5% Tolerance	± 10% Tolerance	Volts	mA	Ohms	µA	Volts	Volts	%/°C	mA	Amps
UZ 8706	UZ 8806	6.8	37	3.5	50	5.2	4.9	0.04	140	5.00
UZ 8707	UZ 8807	7.5	34	4.0	30	5.7	5.4	0.04	125	4.50
UZ 8708	UZ 8808	8.2	31	4.5	10	6.2	5.9	0.05	115	3.90
UZ 8709	UZ 8809	9.1	28	5.0	3.0	6.9	6.6	0.05	105	3.37
UZ 8710	UZ 8810	10	25	7.0	2.0	7.6	7.2	0.06	95	2.77
UZ 8712	UZ 8812	12	23	9.0	1.0	9.1	8.6	0.07	85	2.25
UZ 8713	UZ 8813	13	21	10	0.5	9.9	9.3	0.07	80	2.25
UZ 8714	UZ 8814	14	19	12	0.5	10.6	10.1	0.07	74	2.25
UZ 8715	UZ 8815	15	17	14	0.5	11.4	10.8	0.07	63	1.65
UZ 8716	UZ 8816	16	15.5	16	0.5	12.1	11.5	0.07	60	1.65
UZ 8718	UZ 8818	18	14.0	20	0.5	13.7	12.9	0.08	52	1.12
UZ 8720	UZ 8820	20	12.5	22	0.5	15.2	14.4	0.08	47	1.12
UZ 8722	UZ 8820	22	11.5	23	0.5	16.7	15.8	0.08	43	1.12
UZ 8724	UZ 8824	24	10.5	25	0.5	18.2	17.3	0.08	40	0.825
UZ 8727	UZ 8827	27	9.5	35	0.5	20.5	19.4	0.09	35	0.825
UZ 8730	UZ 8830	30	8.5	40	0.5	22.8	21.6	0.09	31	0.825
UZ 8733	UZ 8833	33	7.5	45	0.5	25.1	23.7	0.09	28	0.675
UZ 8736	UZ 8836	36	7.0	50	0.5	27.3	25.9	0.09	26	0.562
UZ 8740	UZ 8840	40	6.5	62	0.5	30.4	28.8	0.095	24	0.562
UZ 8745	UZ 8845	45	6.0	75	0.5	34.2	32.4	0.095	22	0.450
UZ 8750	UZ 8850	50	5.0	85	0.5	38.0	36.0	0.095	20	0.450
UZ 8756	UZ 8856	56	4.5	110	0.5	42.5	40.3	0.095	17	0.390
UZ 8760	UZ 8860	60	4.0	125	0.5	45.6	43.2	0.095	15	0.337
UZ 8770	UZ 8870	70	3.7	150	0.5	53.2	50.4	0.095	14	0.337
UZ 8775	UZ 8875	75	3.3	175	0.5	57.0	54.0	0.095	12	0.277
UZ 8780	UZ 8880	80	3.0	200	0.5	60.8	57.6	0.095	11	0.225
UZ 8790	UZ 8890	90	2.8	250	0.5	68.4	64.8	0.095	10	0.225
UZ 8110	UZ 8210	100	2.5	350	0.5	76.0	72.0	0.10	9.5	0.225
UZ 8111	UZ 8211	110	2.3	450	0.5	83.6	79.2	0.10	8.5	0.165
UZ 8112	UZ 8212	120	2.0	550	0.5	91.2	86.4	0.10	8.0	0.112
UZ 8113	UZ 8213	130	1.9	700	0.5	98.8	93.6	0.10	7.2	0.112
UZ 8114	UZ 8214	140	1.8	850	0.5	106	100	0.10	6.8	0.112
UZ 8115	UZ 8215	150	1.7	1000	0.5	114	108	0.10	6.3	0.112
UZ 8116	UZ 8216	160	1.6	1100	0.5	121	115	0.10	5.9	0.082
UZ 8117	UZ 8217	170	1.5	1200	0.5	129	122	0.10	5.6	0.082
UZ 8118	UZ 8218	180	1.4	1300	0.5	137	129	0.10	5.2	0.056
UZ 8119	UZ 8219	190	1.3	1400	0.5	144	137	0.10	5.0	0.056
UZ 8120	UZ 8220	200	1.2	1500	0.5	152	144	0.10	4.7	0.056

†All zener voltages are measured with an automated test set using a 35 millisecond test time. Longer or shorter test times will have a corresponding effect on the measured value due to heating effects.

§Zener impedance is derived from the 60-cycle AC voltage created when AC current with RMS value of 10% of DC zener test current is superimposed on the test current.

✱Ratings are based on free air. T_A is 25°C. For use at 1.5 watts see derating curve.

‡Figures shown are for a peak sinusoidal surge current of 8.3 ms duration using 60 cycle AC. The 8.3 ms square pulse rating is 71% of the value shown.

SWITCHING & GENERAL PURPOSE DIODES 5

Product Selection Guides
UNIBOND™ Diodes 5-3
Switching & General Purpose Diodes 5-3
Datasheets 5-4

SWITCHING, GENERAL PURPOSE DIODES

UNIBOND SWITCHING DIODES

Type	Reverse Breakdown Voltage	Average Forward Current (mA)	Forward Voltage	Reverse Recovery Time (ns)	Junction Capacitance (@ OV)
1N6638†	150V	300	1.1V @ 200 mA	4.5	2.0pf
1N6642†	100V	300	1.2V @ 100mA	5.0	5.0pf
1N6643†	75V	300	1.2V @ 100mA	6.0	5.0pf
1N4148-1†	100V	200	1.2V @ 100mA	5.0	4.0pf
1N4150-1†	75V	200	1.0V @ 200mA	4.0	2.5pf

† Available as JANTX, JANTXV.

SWITCHING

Type	Reverse Breakdown Voltage (V)	Average Forward Current (mA)	Forward Voltage (V)	Reverse Recovery Time (ns)	Junction Capacitance (pF)
1N4154	35	150	1.0 @ 30mA	2	4
1N4152	40	150	.49-.52 @ 0.1mA	2	2
1N4444	70	200	.44-.55 @ 0.1mA	7	2
1N3064**	75	75	1.0 @ 10mA	4	2
1N4532***	75	125	1.0 @ 10mA	4	2
1N4534***	75	150	.74-.88 @ 20mA	4	2
1N4151	75	150	1.0 @ 50mA	2	2
1N4153***	75	150	.49-.55 @ 0.1mA	2	2
1N4305	75	150	.5-.575 @ .25mA	2	2
1N4446	75	150	1.0 @ 20mA	4	4
1N4447	75	150	1.0 @ 20mA	4	2
1N4448	75	150	1.0 @ 100mA	4	4
1N4449	75	150	1.0 @ 30mA	4	2
1N3600***	75	200	.54-.62 @ 1mA	4	2.5
1N4149	75	200	1.0 @ 10mA	4	2
1N4454***	75	200	1.0 @ 10mA	2	2
1N914**	100	75	1.0 @ 10mA	5	4
1N4531***	100	125	1.0 @ 10mA	5	4
1N3070**	200	100	1.0 @ 100mA	50	5
1N4938**	200	150	1.0 @ 10mA	50	5

GENERAL PURPOSE

Type	Reverse Voltage (V)	Average Forward Current (mA)	Forward Voltage (V)	Reverse Recovery Time (ns)	Junction Capacitance (pF)
1N3595***	150	150	.83-1.0 @ 200mA	3μs	2.5

COMPUTER DIODE
Switching

1N643; JAN 1N643
1N662; JAN 1N662
1N663; JAN 1N663

FEATURES
- Metallurgical Bond
- Qualified to MIL-S-19500/256
- Planar Passivated Chip
- DO-7 Package

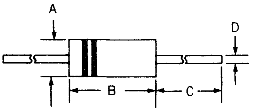
DESCRIPTION
This device is particularly suited to applications where medium speed switching is required. Moisture free stability is ensured through hermetic sealing.

ABSOLUTE MAXIMUM RATINGS, AT 25°C

	1N643 JAN 1N643	1N662 JAN 1N662	1N663	JAN 1N663
Peak Reverse Voltage	200V	100V	100V	100V
Reverse Working Voltage	175V	80V	80V	80V
Average Rectified Current	40mAdc	40mAdc	60mAdc	100mA
Surge Current, 8.3ms	500mA			
Operating Temperature Range	−65°C to +150°C			
Storage Temperature Range	−65°C to +175°C			

MECHANICAL SPECIFICATIONS

J 1N643, 1N662, 1N663



	INCHES	MILLIMETERS
A	.077 - .130	1.96 - 3.30
B	.195 - .300	4.95 - 7.62
C	1.0 - 1.5	25.4 - 38.1
D	.019 - .021	.48 - .53

DO-7
1N643
1N662
1N663

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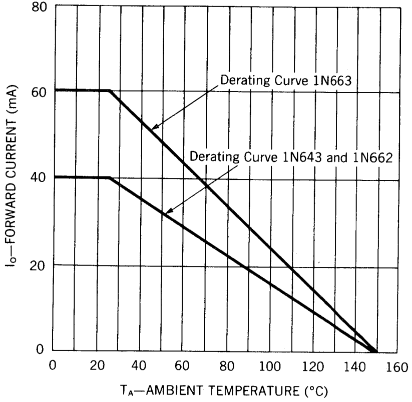
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Maximum Reverse Current @ 25°C	Maximum Reverse Current @ 25°C	Maximum Peak Reverse Current @ 25°C	Maximum Reverse Current @ 100°C
1N643	25nAdc @ V_R = 10Vdc	1μAdc @ V_R = 100Vdc	100μA_{PK} @ V_R = 200V_{PK}	15μAdc @ V_R = 100Vdc
1N662	25nAdc @ V_R = 10Vdc	5μAdc @ V_R = 50Vdc	100μA_{PK} @ V_R = 100V_{PK}	100μAdc @ V_R = 50Vdc
1N663	25nAdc @ V_R = 10Vdc	5μAdc @ V_R = 75Vdc	100μA_{PK} @ V_R = 100V_{PK}	50μAdc @ V_R = 75Vdc

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Maximum Forward Voltage @ 25°C	Capacitance	Maximum Reverse Recovery Time
1N643	1.0Vdc @ I_F = 10mAdc	3pF @ V_R = 175V	300ns @ I_F = 5mA I_R = 17.5mA I_{REC} = 0.2nA
1N662	1.0Vdc @ I_F = 10mAdc	3pF @ V_R = 80V	500ns @ I_F = 5mA I_R = 17.5mA I_{REC} = 0.4nA
1N662	1.0Vdc @ I_F = 100mAdc	3pF @ V_R = 80V	500ns @ I_F = 5mA I_R = 17.5mA I_{REC} = 0.4nA

Average Rectified Current vs. Ambient Temperature



COMPUTER DIODE

General Purpose
Switching

1N914; JAN, JANTX 1N914
1N4148; JAN, JANTX, JANTXV 1N4148
JAN, JANTX, JANTXV 1N4148-1
1N4531; JAN, JANTX, JANTXV 1N4531

FEATURES

- Metallurgical Bond
- Qualified to MIL-S-19500/116
- Planar Passivated Chip
- DO-34 or DO-35 Package
- Non-JAN Available

DESCRIPTION

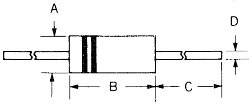
This series is very popular for general purpose switching applications in electronic equipment.

ABSOLUTE MAXIMUM RATINGS, AT 25°C

Reverse Breakdown Voltage		100V
Peak Working Voltage		75V
Average Output Current,	1N914	75mAdc
	1N4148	200mAdc
	1N4148-1	200mAdc
	1N4531	125mAdc
Surge Current, 8.3ms		500mA
Operating Temperature Range		−65°C to +175°C
Storage Temperature Range		−65°C to +200°C

MECHANICAL SPECIFICATIONS

J, JTX 1N914
J, JTX, JTXV 1N4148
J, JTX, JTXV 1N4148-1
J, JTX, JTXV 1N4531



J, JTX & JTXV 1N4531

	INCHES	MILLIMETERS
A	.050-.065	1.27-1.65
B	.080-.120	2.03-3.05
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

J, JTX 1N914

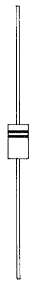
	INCHES	MILLIMETERS
A	.058-.107	1.42-2.72
B	.140-.300	3.56-7.62
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

J, JTX, JTXV 1N4148 and 1N4148-1

	INCHES	MILLIMETERS
A	.056-.075	1.42-1.91
B	.140-.180	3.56-4.57
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.10 MAX.
D	.018-.022	.46-.56

DO-34
1N4531

DO-35
1N914
1N4148



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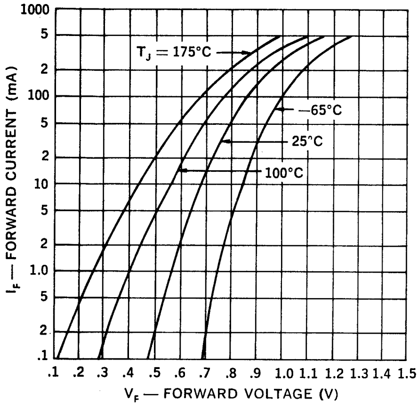
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

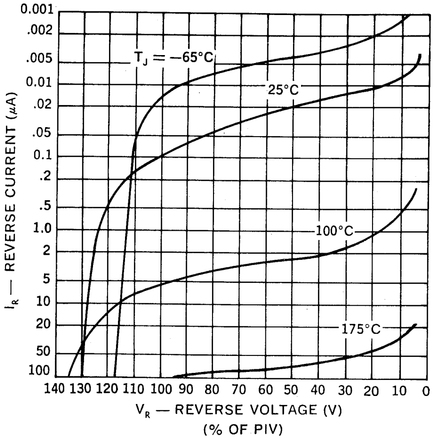
Reverse Current @ 25°C	Reverse Current @ 25°C	Peak Reverse Current @ 25°C	Reverse Current @ 150°C	Reverse Current @ 150°C
25nAdc @ $V_R = 20Vdc$	0.5μAdc @ $V_R = 75Vdc$	100μA (pk) @ $V_R = 100V$ (pk)	50μAdc @ $V_R = 20Vdc$	100μAdc @ $V_R = 75Vdc$

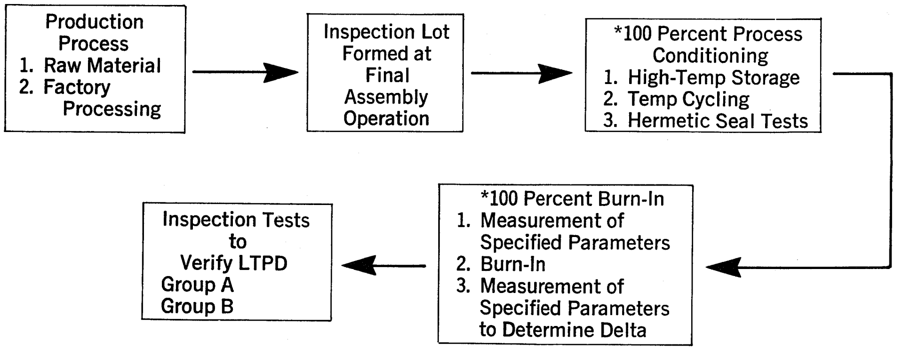
Forward Voltage	Foward Recovery Voltage	Forward Recovery Time	Reverse Recovery Time	Capacitance
1.0Vdc @ $I_F = 10mAdc$	5.0V (pk) @ $I_F = 50mAdc$	20ns @ $I_F = 50mAdc$	5ns @ $I_F = I_R = 10mA$ $R_L = 100$ ohms	4.0 pF @ $V_R = 0V, f = 1$ MHz $V_{sig} = 50mV$ (pk-pk) 2.8 pF @ $V_R = 1.5V, f = 1$ MHz $V_{sig} = 50mV$ (pk-pk)

Forward Voltage vs. Forward Current



Reverse Voltage vs. Reverse Current





*Order of the tests in the blocks shall be performed as shown.

Order of procedure diagrams for TX types only.

COMPUTER DIODE
General Purpose Switching

JAN & JANTX 1N3064
1N4454; JAN, JANTX & JANTXV 1N4454
JAN, JANTX & JANTXV 1N4454-1
1N4532; JAN, JANTX & JANTXV 1N4532

ABSOLUTE MAXIMUM RATINGS, AT 25°C

Reverse Breakdown Voltage		75V
Peak Working Voltage		50V
Average Output Current,	1N3064	75mA
	1N4454,-1	200mA
	1N4532	125mA
Surge Current, 1sec	1N3064	0.5A
	1N4454,-1	1A
	1N4532	0.5A
Operating Temperature Range		−65°C to +175°C
Storage Temperature Range		−65°C to +200°C

FEATURES

- Metallurgical Bond
- Qualified to MIL-S-19500/144
- Planar Passivated Chip
- DO-7, DO-34 or DO-35 Package

DESCRIPTION

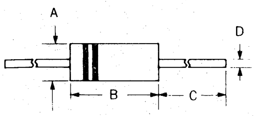
Available in DO-7, DO-34 or DO-35 packages. Unitrode offers high temperature metallurgical bond, making these devices useful in high reliability applications.

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Reverse Current @ 25°C	Reverse Current @ 150°C	Reverse Breakdown Voltage @ −65°C	Reverse Recovery Time	Capacitance	Forward Voltage	Forward Recovery Voltage	Forward Recovery Time
1N3064 1N4454 1N4454-1 1N4532	0.1μAdc @ V_R = 50V	100μAdc @ V_R = 50V	75Vdc @ I_R = 5μAdc	4ns @ $I_F = I_R$ = 10mAdc R_L = 100Ω c ≤ 3pF	2pF @ V_R = 0Vdc f = 1MHz V_{sig} = 50mV (pk to pk)	1.0Vdc @ I_F = 10mAdc	5.0V (pk) @ I_F = 100mAdc $t_r \leq$ 0.4ns	30ns I_F = 100mAdc $t_r \leq$ 0.4ns

MECHANICAL SPECIFICATIONS

J & JTX 1N3064
J, JTX & JTXV 1N4454 & 1N4454-1
J, JTX & JTXV 1N4532



J, JTX & JTXV 1N4532

	INCHES	MILLIMETERS
A	.050-.065	1.27-1.65
B	.080-.120	2.03-3.05
C	1.0 MIN.-1.5 MAX.	24.0 MIN.-38.1 MAX.
D	.018-.022	.46-.56

J & JTX 1N3064

	INCHES	MILLIMETERS
A	.078-.107	1.98-2.72
B	.195-.300	4.96-7.62
C	1.0 MIN.-1.5 MAX.	24.0 MIN.-38.1 MAX.
D	.018-.022	.46-.56

J, JTX & JTXV 1N4454,-1

	INCHES	MILLIMETERS
A	.056-.075	1.42-1.91
B	.140-.180	3.55-4.57
C	1.0 MIN.-1.5 MAX.	24.0 MIN.-38.1 MAX.
D	.018-.022	.46-.56

DO-34
1N4532

DO-35
1N4454

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The diode experts

COMPUTER DIODE
Switching

1N3070; JAN, JANTX 1N3070
1N4938; JAN, JANTX 1N4938

ABSOLUTE MAXIMUM RATINGS, AT 25°C

Reverse Breakdown Voltage 200V
Steady-State Forward Current at (or below) 25°C Free Air Temperature..........150mA
Peak Surge Current, 1sec..500mA
Peak Surge Current, 1μsec 2A
Continuous Power Dissipation at (or below) 25°C Free Air Temperature 250mW
Operating Temperature Range .... −65°C to +175°C
Storage Temperature Range .... −65°C to +200°C

FEATURES

- Double-plug Construction
- Qualified to MIL-S-19500/169
- Available in DO-7 or DO-35 package

DESCRIPTION

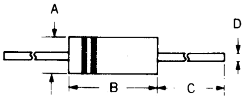
Double-plug construction affords integral positive contact by means of a thermal compression bond. Moisture free stability is ensured through hermetic sealing. The coefficients of thermal expansion of the glass case and the dumet plugs are closely matched. Hot solder dipped leads are standard.

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Maximum Reverse Current @ 25°C	Maximum Reverse Current @ 150°C	Maximum Forward Voltage	Maximum Capacitance	Maximum Reverse Recovery Time
1N3070 1N4938	0.1μAdc @ 175Vdc	100μAdc @ 175Vdc	1Vdc @ I_F = 100mAdc	5pF @ V_R = 0, f = 1MHz	50ns @ I_F = 30mA I_R = 30mA I_{REC} = 1mA

MECHANICAL SPECIFICATIONS

J, JTX, JTXV 1N3070
J, JTX, JTXV 1N4938



J, JTX 1N4938

	INCHES	MILLIMETERS
A	.056-.074	1.42-1.88
B	.140-.180	3.56-4.57
C	1.0 MIN	25.4 MIN.
D	.019-.021	.48-.53

J,JTX 1N3070

	INCHES	MILLIMETERS
A	.078-.107	1.98-2.72
B	.195-.300	4.95-7.62
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

DO-7
1N3070

DO-35
1N4938

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COMPUTER DIODE 1N3595; JAN, JANTX & JANTXV 1N3595

150 mA, Switching

ABSOLUTE MAXIMUM RATINGS, AT 25°C

Peak Reverse Voltage	125V
Reverse Breakdown Voltage	150V
Average Output Current	150mAdc
Surge Current, 1S	500mA
1μS	4A
Operating Temperature Range	−65°C to +175°C
Storage Temperature Range	−65°C to +200°C

FEATURES

- Metallurgical Bond
- Qualified to MIL-S-19500/241
- Planar Passivated Chip
- DO-7 Package

DESCRIPTION

A very useful device for medium current switching applications.

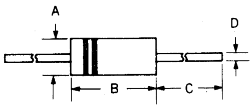
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Limits	V_{F_1} I_F = 200mAdc	V_{F_2} I_F = 100mAdc	V_{F_3} I_F = 50mAdc	V_{F_4} I_F = 10mAdc	V_{F_5} I_F = 5mAdc	V_{F_6} I_F = 1mAdc
Min	0.83Vdc	0.79Vdc	0.74Vdc	0.65Vdc	0.60Vdc	0.52Vdc
Max	1.00Vdc	0.92Vdc	0.88Vdc	0.80Vdc	0.75Vdc	0.68Vdc

Limits	I_{R_1} V_R = 125Vdc	I_{R_2} V_R = 30Vdc T_A = 125°C	I_{R_3} V_R = 125Vdc T_A = 125°C	I_{R_4} V_R = 125Vdc T_A = 150°C	C V_R = 0Vdc f = 1MHz	t_{rr} I_F = 10mAdc V_R = 35Vdc
Min	—	—	—	—	—	—
Max	1.0nAdc	0.3μAdc	0.5μAdc	3.0μAdc	8.0pF	3.0μS

MECHANICAL SPECIFICATIONS

JAN, JANTX, JANTXV 1N3595



	INCHES	MILLIMETERS
A	.092-.130	2.34-3.30
B	.130-.300	3.30-7.62
C	1.0-1.5	25.40-38.10
D	.018-.022	.46-.56

DO-7 **IN3595**

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COMPUTER DIODE

200mA
Low Power, Switching

1N3600; JAN, JANTX & JANTXV 1N3600
1N4150; JAN, JANTX & JANTXV 1N4150
JAN, JANTX & JANTXV 1N4150-1

FEATURES

- Metallurgical Bond
- Qualified to MIL-S-19500/231
- Planar Passivated Chip
- DO-7 or DO-35 Package
- Non-JAN Available

DESCRIPTION

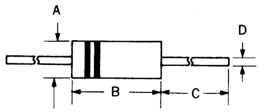
This series of switching diodes is useful in many computer switching applications, for both military and commercial systems.

ABSOLUTE MAXIMUM RATINGS, AT 25°C

Reverse Breakdown Voltage	75V
Peak Working Voltage	50V
Average Output Current	200mA
Surge Current (1sec)	0.5A
(1μsec)	4.0A
Operating Temperature Range	−65°C to +175°C
Storage Temperature Range (1N4150)	−65°C to +200°C
(1N3600)	−65°C to +175°C

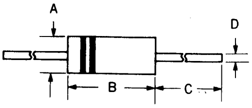
MECHANICAL SPECIFICATIONS

J, JTX & JTXV 1N3600



	INCHES	MILLIMETERS
A	.078-.107	1.98-2.72
B	.195-.300	4.96-7.62
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

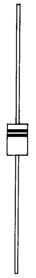
J, JTX & JTXV 1N4150, 1N4150-1



	INCHES	MILLIMETERS
A	.056-.075	1.42-1.91
B	.140-.180	3.56-4.57
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

DO-7
1N3600

DO-35
1N4150



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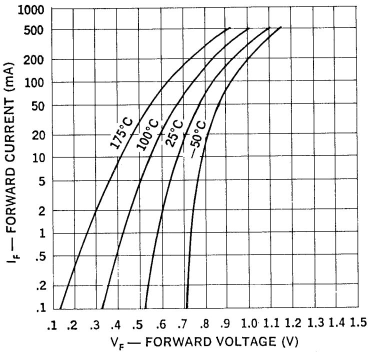
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

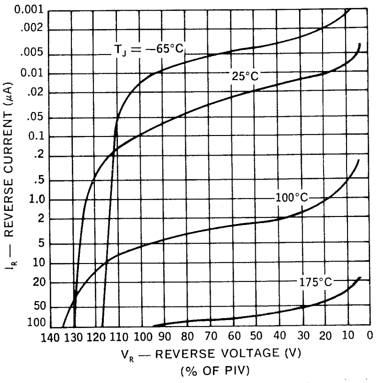
Characteristics	Forward Voltage	Forward Voltage	Forward Voltage	Forward Voltage	Forward Voltage	Reverse Breakdown Voltage
Conditions	V_{F1} $I_F = 1$ mAdc	V_{F2} $I_F = 10$ mAdc	V_{F3} $I_F = 50$ mAdc (pulse)	V_{F4} $I_F = 100$ mAdc (pulse)	V_{F5} $I_F = 200$ mAdc (pulse)	BV $I_R = 5.0$ μAdc
Minimum Maximum	0.540 Vdc 0.620 Vdc	0.660 Vdc 0.740 Vdc	0.760 Vdc 0.860 Vdc	0.820 Vdc 0.920 Vdc	0.870 Vdc 1.00 Vdc	75 Vdc —

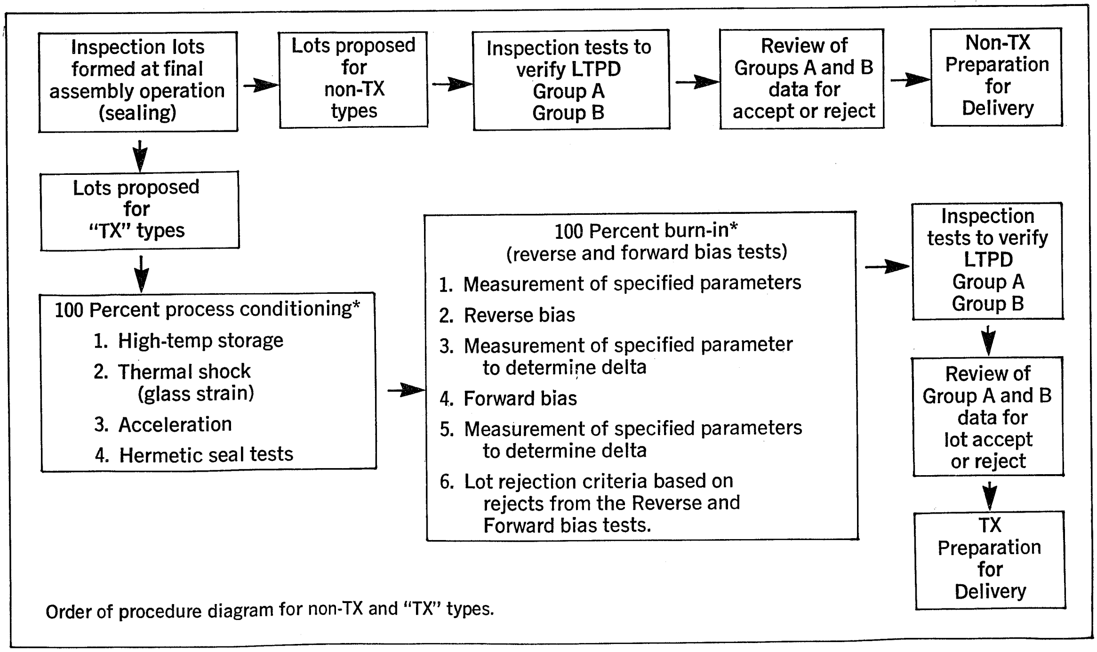
Characteristics	Reverse Current	Reverse Current	Junction Capacitance	Reverse Recovery Time	Reverse Recovery Time	Forward Recovery Time
Conditions	I_R $V_R = 50$ Vdc	I_R $V_R = 50$ Vdc $T_A = 150°C$	C $V_R = 0$ $F = 1$ MHz $V_{sig} = 50$ mv (p-p)	t_{rr1} $I_F = I_R =$ 10 to 200 mAdc; $R_L = 100$ ohms	t_{rr2} $I_F = I_R =$ 200 to 400 mAdc; $R_L = 100$ ohms	t_{fr} $I_F = 200$ mAdc; $t_p = 100$ nsec; $t_r = 0.4$ nsec
Maximum	0.1 μAdc	100 μAdc	2.5 pf	4 nsec	6 nsec	10 nsec

Typical Forward Current vs Voltage



Reverse Voltage vs. Reverse Current





Order of procedure diagram for non-TX and "TX" types.

COMPUTER DIODE
Switching

1N4149, 1N4151, 1N4154 1N4446, 1N4447, 1N4448 1N4449

FEATURES
- Metallurgical Bond
- Planar Passivated
- DO-35

DESCRIPTION
This series offers Metallurgical Bonding and is very popular for general purpose switching applications.

ABSOLUTE MAXIMUM RATINGS, AT 25°C

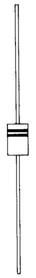
	1N4149	1N4151	1N4154	1N4446	1N4447	1N4448	1N4449
Peak Reverse Voltage	75V	75V	35V	75V	75V	75V	75V
Average Rectified Current	200mAdc						
Surge Current, 8.3 mS	500mA						
Operating Temperature Range	−65°C to +150°C						
Storage Temperature Range	−65°C to +200°C						

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Peak Inverse Voltage	Forward Voltage					Reverse Current V_R nA	Reverse Current @ 150°C V_R μA	Junction Capacitance @ 0V	Reverse Recovery Time t_{RR}
		@ 10mA	@ 20mA	@ 30mA	@ 50mA	@ 100mA				
1N4149	75	1.0	—	—	—	—	20 25	20 50	4pF	4nS
1N4151	75	—	—	—	1.0	—	50 50	50 50	4pF	2nS
1N4154	35	—	—	1.0	—	—	25 100	25 100	4pF	2nS
1N4446	75	—	1.0	—	—	—	20 25	20 50	4pF	4nS
1N4447	75	—	1.0	—	—	—	20 25	20 50	4pF	4nS
1N4448	75	—	—	—	—	1.0	20 25	20 50	4pF	4nS
1N4449	75	—	—	1.0	—	—	20 25	20 50	2pF	4nS

MECHANICAL SPECIFICATIONS

DO-35



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COMPUTER DIODE

Switching

1N4152, 1N4305, 1N4444

ABSOLUTE MAXIMUM RATINGS, AT 25°C

	1N4152	1N4305	1N4444
Peak Reverse Voltage	40V	75V	70V
Reverse Working Voltage	30V	50V	50V
Average Rectified Current		200mAdc	
Surge Current, 8.3 mS		500mA	
Operating Temperature Range		−65°C to +150°C	
Storage Temperature Range		−65°C to +200°C	

FEATURES

- Metallurgical Bond
- Planar Passivated
- DO-35 Package

DESCRIPTION

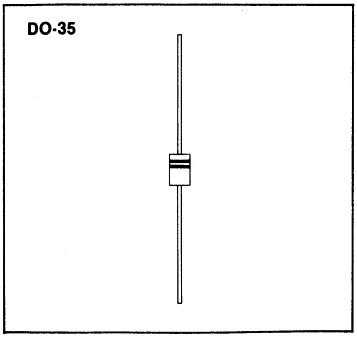
This series offers Metallurgical Bonding and is very popular for general purpose switching applications.

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type	Peak Inverse Voltage (V)	Forward Voltage @ 0.1mA		Forward Voltage @ 0.25mA		Forward Voltage @ 1.0mA		Forward Voltage @ 2.0mA		Forward Voltage @ 10mA		Forward Voltage @ 20mA		Forward Voltage @ 100mA	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
1N4152	40	0.49	0.55	0.53	0.59	0.59	0.67	0.62	0.70	0.70	0.81	0.74	0.88	—	—
1N4305	75	—	—	0.505	0.575	0.55	0.65	0.61	0.71	0.70	0.85	—	—	—	—
1N4444	70	0.44	0.55	—	—	0.56	0.68	—	—	0.69	0.82	—	—	0.85	1.0

Type	Reverse Current		Reverse Current @ 150°C		Junction Capacitance @ 0V	Reverse Recovery Time t_{rr}
	V_R	(nA)	V_R	μA		
1N4152	30	50	30	50	2pF	2nS
1N4305	50	100	50	100	2pF	2nS
1N4444	50	50	50	50	2pF	7nS

MECHANICAL SPECIFICATIONS



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COMPUTER DIODE
150mA
Switching Diode

1N4153, JAN, JANTX & JANTXV 1N4153
1N4534, JAN, JANTX & JANTXV 1N4534

FEATURES
- Metallurgical Bond
- Qualified to MIL-S-19500/337
- Planar Passivated Chip
- DO-34 or DO-35 Package

DESCRIPTION
This device is particularly suited to applications where tightly controlled forward characteristics and fast recovery time are important.

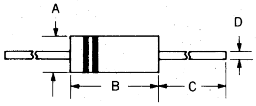
ABSOLUTE MAXIMUM RATINGS, AT 25°C

Reverse Breakdown Voltage	75V
Peak Working Voltage	50V
Average Output Current*	150mA
Surge Current, 1μs	2.0A
Operating Temperature Range	−65°C to +200°C
Storage Temperature Range	−65°C to +200°C

*Derate 0.86mAdc/°C for T_A above 25°C.

MECHANICAL SPECIFICATIONS

J, JTX & JTXV 1N4153
J, JTX & JTXV 1N4534



J, JTX & JTXV 1N4534

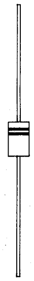
	INCHES	MILLIMETERS
A	.050-.075	1.27-1.91
B	.080-.120	2.03-3.05
C	1.0-1.5	25.4-38.1
D	.018-.022	.46-.56

J,JTX & JTXV 1N4153

	INCHES	MILLIMETERS
A	.056-.075	1.42-1.91
B	.140-.180	3.56-4.57
C	1.0 MIN.-1.5 MAX.	25.4 MIN.-38.1 MAX.
D	.018-.022	.46-.56

DO-34
1N4534

DO-35
1N4153

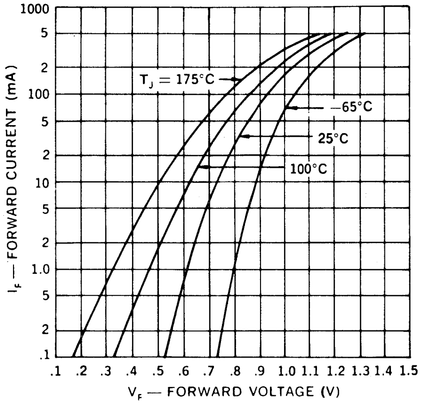


ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

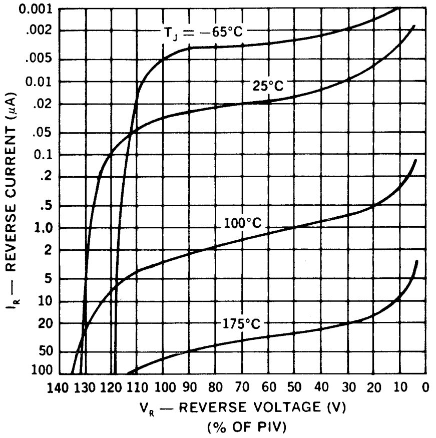
Limit	V_{F1} $I_F = 100\ \mu$Adc	V_{F2} $I_F = 250\ \mu$Adc	V_{F3} $I_F = 1$ mAdc	V_{F4} $I_F = 2$ mAdc	V_{F5} $I_F = 10$ mAdc	V_{F6} $I_F = 20$ mAdc
Min	0.490Vdc	0.530Vdc	0.590Vdc	0.620Vdc	0.700Vdc	0.740Vdc
Max	0.550Vdc	0.590Vdc	0.670Vdc	0.700Vdc	0.810Vdc	0.880Vdc

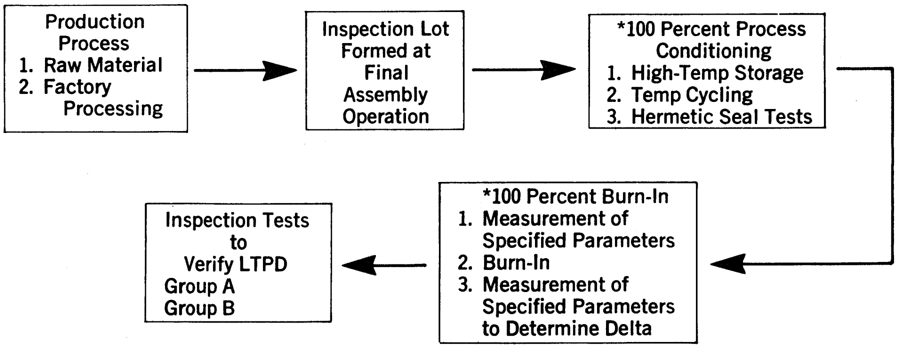
Limit	I_R $V_R = 50$V	I_{R2} $V_R = 50$V $T_A = 150$°C	C $V_R = 0$ f = 1MHz	t_{rr} $I_F = I_R = 10$mAdc $R_L = 100$ ohms	Reverse Breakdown Voltage $I_R = 5.0\mu$Adc
Min	—	—	—	—	75V
Max	0.05μAdc	50μAdc	2.0pF	4ns	—

Forward Voltage vs. Forward Current



Reverse Voltage vs. Reverse Current





*Order of the tests in the blocks shall be performed as shown.

Order of procedure diagrams for TX types only.

COMPUTER DIODE
SWITCHING, UNIBOND SERIES

1N6638, JTX, JTXV 1N6638U, JTX, JTXV
1N6642, JTX, JTXV 1N6642U, JTX, JTXV
1N6643, JTX, JTXV 1N6643U, JTX, JTXV

FEATURES

- Metallurgical Bond
- Qualified to MIL-S-19500/578
- Planar Passivated Chip
- Available in MELF Configuration
- Thermally Matched Construction
- Non-Cavity Design

DESCRIPTION

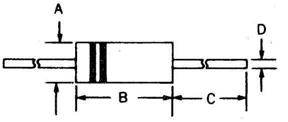
This specification details the capabilities of a superior mechanically rugged diode. Designed to replace silver button 1N4148-1 and 1N4150-1 small signal diodes used in harsh environments such as coated, potted or multilayer circuit board applications.

ABSOLUTE MAXIMUM RATINGS, AT 25°C

	1N6638	1N6642	1N6643
Peak Reverse Voltage	150V	100V	75V
Reverse Working Voltage	125V	75V	50V
Average Rectified Current	300mAdc	300mAdc	300mAdc
Surge Current, 8.3ms	2.5A	2.5A	2.5A
Operating Temperature Range		−65°C to +200°C	
Storage Temperature Range		−65°C to +200°C	
Power Dissipation @ T_A = 25°C with $R_{\theta LA}$ @ ℓ = ⅜ inches, 100°C/W			750mW
Power Derating Factor			4.25mW/°C
Thermal Resistance, Junction to Lead, ⅜ inch			120°C/W

MECHANICAL SPECIFICATIONS

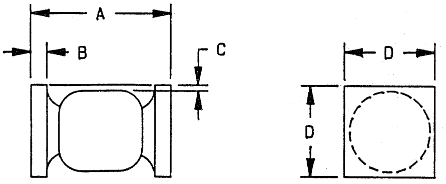
1N6638, 1N6642, 1N6643



	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.056	.075	1.42	1.91
B	.140	.180	3.56	4.57
C	1.0	1.5	25.4	38.10
D	.018	.022	.46	.56

DO-35

1N6638U, 1N6642U, 1N6643U



	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.165	.195	4.19	4.95
B	.019	.028	0.48	0.71
C	.003	—	0.08	—
D	.070	.085	1.78	2.16

Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type*	Maximum Reverse Current				Minimum Breakdown Voltage @100μA	Maximum Forward Voltage		
	@ V_R as noted		at 150°C			@ I_F (pulsed) noted		at 150°C
1N6638	25nA @ 20Vdc	0.5μA @ 125Vdc	40μA @20V	100μA @ 125Vdc	150V_{pk}	0.8Vdc @ 10mA	1.1Vdc @ 200mA	0.65Vdc @10mA
1N6642	25nA @ 20Vdc	0.5μA @ 75Vdc	50μA @ 20Vdc	100μA @ 75Vdc	100V_{pk}	1.0Vdc @ 10mA	1.2Vdc @ 100mA	0.8Vdc @ 10mA
1N6643	50nA @ 20Vdc	0.5μA @ 50Vdc	75μA @20Vdc	160μA @ 50Vdc	75V_{pk}	1.0Vdc @ 10mA	1.2Vdc @ 100mA	—

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Type*	Maximum Forward Voltage @ −55°C	Maximum Capacitance @ 1MHz with V_{sig} = 50mV (pk-pk)	Maximum Forward Recovery Voltage and Time (@ I_F = 50 with I_F = 50mA, t_r = 1ns)		Maximum Reverse Recovery Time (@ I_F = I_R = 10mA, I_{REC} = 1mA)
1N6638	1.2Vdc @ 200mA	2pf @ V_R = 0 1.4pf @ V_R = 1.4Vdc	5.0V_{pk}	20ns	4.5ns
1N6642	1.2Vdc @ 100mA	5.0pf @ V_R = 0 2.8pf @ V_R = 1.4Vdc	5.0V_{pk}	20ns	5.0ns
1N6643	1.4Vdc @ 100mA	5.0pf @ V_R = 0 2.8pf @ V_R = 1.4Vdc	5.0V_{pk}	20ns	6.0ns

*Military U-suffix (surface mount) types have the same specifications.

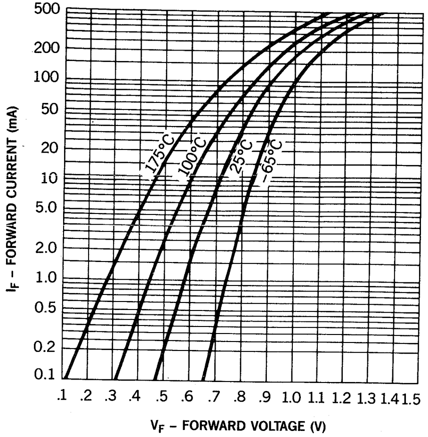
MECHANICAL INTEGRITY:

These devices have been specifically designed to eliminate intermittent opens over the entire operating temperature range which might result from thermal or mechanical stress.

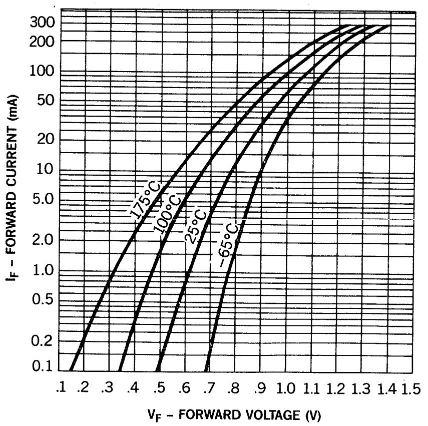
Intended to replace 1N4148-1 and 1N4150-1 types in harsh environments, these devices have a unique die and package design. The die is manufactured using a process that provides anode contact over the complete pin diameter and equal to the cathode contact area.

The terminal pins, silicon die and glass are thermally matched. The passivated die is sealed in a non-cavity glass body.

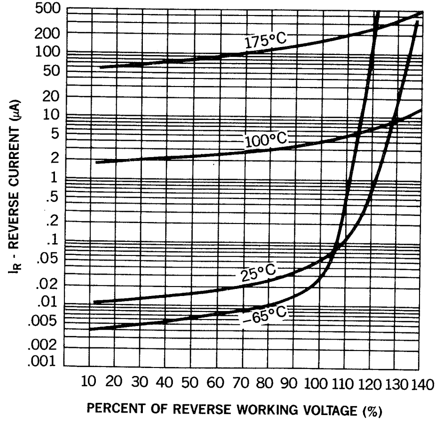
This device is capable of passing the most severe mechanical tests of MIL-STD-750 including monitored lead pull, mission profile testing and a hard potting environment.



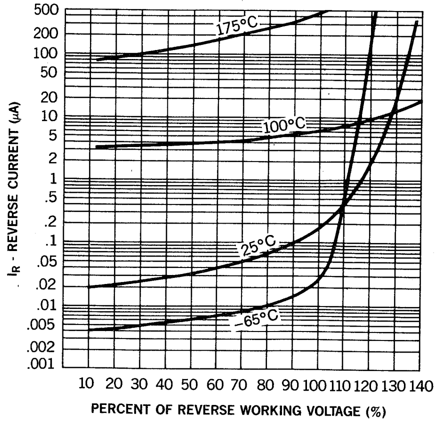
Typical Forward Current vs Forward Voltage 1N6638



Typical Forward Current vs Forward Voltage 1N6642, 1N6643



Typical Reverse Current vs Reverse Voltage 1N6638, 1N6642



Typical Reverse Current vs Reverse Voltage 1N6643

PIN DIODES 6

Product Selection Guides 6-3
  Mechanical Specifications 6-6
Datasheets 6-10

PIN DIODES

For applications information, see PIN Diode Designers' Handbook and Catalog (PD-500C)

SWITCHING PIN DIODES

Type	Voltage Rating Range	Capacitance (100V, 1MHz) C_T max.	Forward Resistance (100mA, 100MHz) R_S max.	Parallel Resistance (100V, 100MHz) R_P min.	Average Thermal Resistance θ_A max.	Average Power Dissipation P_A max.	Peak Power Dissipation P_P max.	Carrier Lifetime I_F = 10mA τ min.
	(V)	(pF)	(Ω)	(KΩ)	(°C/W)	(W)	(KW)	(μS)
UM4000	100-1000	3.0	0.5	10	6	25	100	5.0
UM4900	100-600	3.0	0.5	10	4	37	100	5.0
UM6000	100-1000	0.5	1.7	300	25	6	25	1.0
UM6200	100-400	1.1	0.4	350	25	6	10	0.6
UM6600	100-1000	0.4	2.5	300	35	4	13	1.0
UM7000	100-1000	0.9	1.0	200	15	10	60	2.5
UM7100	100-800	1.2	0.6	150	15	10	35	2.0
UM7200	100-400	2.2	0.25	70	15	10	20	1.5

HIGH POWER ATTENUATOR & MODULATOR PIN DIODES

Type	Voltage Ratings Range	Total Capacitance (0V, 100MHz) C_T max.	RF Resistance (100mA, 100MHz) R_S max.	RF Resistance (10μA, 100MHz) R_S min.	Average Thermal Resistance θ_A max.	Average Power Dissipation P_A max.	Carrier Lifetime I_F = 10mA τ min.
	(V)	(pF)	(Ω)	(Ω)	(°C/W)	(W)	(μs)
UM4300	100-1000	2.2	1.5	1000	8	18	6.0
UM7300	100-1000	0.7	3.0	3000	20	7.5	4.0

LOW CAPACITANCE SWITCH AND ATTENUATOR PIN DIODES

Type	Voltage Rating (I_R=10μA)	Total Capacitance (50V, 1MHz) C_T max.	RF Resistance (10μA, 100 MHz) R_S min.	RF Resistance (20mA, 100 MHz) R_S max.	RF Resistance (100mA, 100MHz) R_S max.	Carrier Lifetime (I_R = 10mA) τ min.
	(V)	(pF)	(Ω)	(Ω)	(Ω)	(μs)
1N5767 (5082-3080)	100	0.4	1000 3000 typ.	8 4 typ.	2.5 1.5 typ.	1

LOW DISTORTION ATTENUATOR PIN DIODES

Type	Voltage Rating I_R=10μA	Total Capacitance C_T max.	RF Resistance (100mA, 100MHz) R_S max.	RF Resistance (10μA, 100 MHz) R_S min.	Forward Current (R_S = 75Ω F = 100MHz) Typ.	Carrier Lifetime (I_F=10mA) Typ.
	(V)	(pF)	(Ω)	(Ω)	I_F (mA)	τ (μs)
1N5957	100	0.4 (50V, 1MHz)	3.5	1500	1.0	2
UM9301	75	0.8 (0V, 100MHz)	3.0	3000	1.1	4

TWO WAY RADIO ANTENNA SWITCHES

Type	Voltage Rating (I_R=10μA)	Total Capacitance (0V, 100MHz) C_T max.	RF Resistance (50mA, 100MHz) R_S max.	Transmit Harmonic Distortion f_a = 50MHz I = 20mA	Receive Third Order Distortion (Pin-10mW, 0V Bias) f_a = 50MHz f_b = 51MHZ Max.	Average Power Dissipation P_A Max.
	(V)	(pF)	(Ω)	(dB)	(dB)	(W)
UM9401 and UM9402	50	1.5	1.0	−80	−60	5.5
UM9415	50	4.0	1.0	−80	−60	10

PIN DIODES

For applications information, see PIN Diode Designers' Handbook and Catalog (PD-500C)

LOW RESISTANCE ANTENNA SWITCHING PIN DIODES

Type	Voltage Rating (I_R = 10μA)	Total Capacitance (50V, 1MHz) C_T max	RF Resistance (10mA, 100MHz) R_S max	Forward Bias Third Order I_M Distortion I = 10mA f_a = 43MHz f_b = 44MHz max	Reverse Bias Third Order I_M Distortion V = 50V f_a = 43MHz f_b = 44MHz max	Average Power Dissipation P_A max
	(V)	(pF)	(Ω)	(dB)	(dB)	(W)
UM9701	100	1.8	.8	-90	-90	2.5

MICROSTRIP PACKAGED PIN DIODES

Type	Series Resistance R_S max. (Ω)	Parallel Resistance R_P min. (KΩ)	Total Capacitance C_T max. (pF)	Carrier Lifetime τ min. (μS)	Voltage Rating (V)	Forward Voltage V_F typ. (V)
	100mA, 1GHz	0V, 1GHz	0V, 1GHz	I_F = 10mA	I_R = 10μA	I_F = 100mA
UM9601- UM9604	0.6	5	1.2	2.0	100, 400	.85
UM9605- UM9608	1.7	7	0.5	1.0	100, 400	.95

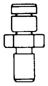
RADIATION DETECTOR

Type	Photocurrent 10^6 Rad (Si)/s, 50V Flash X-Ray, 2.5 MeV mA min.	Maximum Photocurrent	Reverse Current 50V μA max.	Capacitance f = 1 MHz, V = 50V pF max.
UM9441	4.0	3A dc, 3A^{2}s pulsed	1.0	10

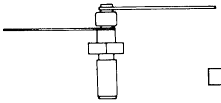
PACKAGE STYLES

A Style
Basic Diode

B Style
Round Axial Leads



***C Style**
Stud

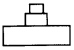


***D Style**
Insulated Stud

E Style
Ribbon Axial Leads

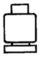
*Not available for UM6000, UM6600, UM6200.

For UM9600 Series



Cup
UM9601/2

Cup
UM9605/6



Flange
UM9603/4

Flange
UM9607/8

Drawings are not actual size.

The following series are available in surface mount packaging: UM7000, UM7200, UM7300, UM9301, UM9401, UM9415 and are also available with Round or Square End Caps.

PIN DIODES

PRODUCT SELECTION GUIDE

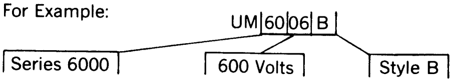
VOLTAGE RATINGS

Series	100V	200V	400V	600V	800V	1000V
UM4000	✓	✓		✓		✓
UM4300	✓	✓		✓		✓
UM4900	✓	✓		✓		
UM6000	✓	✓		✓		✓
UM6200	✓	✓	✓			
UM6600	✓	✓		✓		✓
UM7000	✓	✓		✓		✓
UM7100	✓	✓	✓		✓	
UM7200	✓	✓	✓			
UM7300	✓	✓		✓		✓

ORDERING INFORMATION

Part numbers of Switching and High Power Attenuator PIN diodes consist of the letters UM followed by four digits and one or two letters. The first two digits indicate the diode series, the next two digits specify the voltage rating in hundreds of volts. The remaining letters denote the package style. Reverse polarity is available for C, and D, style and denoted by adding second letter R.

For Example:



Generic Pin Diode Type	Typical V_{BR}	Voltage Ratings (V_R)
UM4300, UM7300	3000V	100, 200, 600, 1000 V
UM4000, UM6000, UM7000	2000V	100, 200, 600, 1000 V
UM7100	1200V	100, 200, 400, 800 V
UM6200, UM7200	600V	100, 200, 400 V

Typical PIN Diode Switching Speeds (T_{RF})

Generic Pin Diode Type	To 10 mA from 100V	To 50 mA from 100V	To 100mA from 100V
UM4000, UM6000, UM7000	5.0μs	2.5μs	1.5μs
UM7100	2.0μs	0.8μs	0.5μs
UM6200, UM7200	0.4μs	0.2μs	0.1μs

UM PIN DIODE PACKAGE MATRIX

Terminal Plug Diameter (inches)

I — Region Thickness (inches) Min.

	.030	.045	.090
.002	6200	7200, 9701	CALL FACTORY
.004	CALL FACTORY	9401, 7100, 9601	CALL FACTORY
.005	CALL FACTORY	CALL FACTORY	CALL FACTORY
.007	6000, IN5767	7000	4900, 4000, 9415
.009	IN5957	CALL FACTORY	CALL FACTORY
.013	CALL FACTORY	7300, 9301	4300

Increasing Distortion ↑ ↓ **Increasing Breakdown Voltage V_{BR}**

Decreasing C_T ←

→ **Decreasing R_S**

OPTIONAL HIGH RELIABILITY (HR2) SCREENING

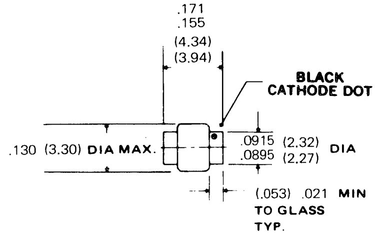
The following tests are performed on 100% of the devices specified with "UM" prefix.

SCREEN	MIL-STD-750 METHOD	CONDITIONS
1. High Temperature	1032	24 Hours @ T_A = 175°C
2. Temperature Cycling	1051	C, 20 Cycles, −65 to +175°C. No dwell required @ 25°C, t ⩾ 10 min. at extremes
3. Hermetic Seal a. Gross	1071	E, ZYGLO
4. Interim Electrical Parameters	GO/NO GO	I_R @ 25°C
5. High Temperature Reverse Bias (HTRB)	1038	A, 96 Hours. T_A = 125°C, V_R = 80% of rating (max. 200V)
6. Final Electrical Parameters	GO/NO GO	I_R @ 25°C, PDA = 10% (final electricals) Sample test C_T + RS @ L.T.P.D. = 10

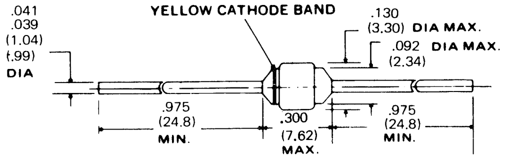
MECHANICAL SPECIFICATIONS
UM4000 SERIES
UM4300 SERIES

Dimensions — English/Metric

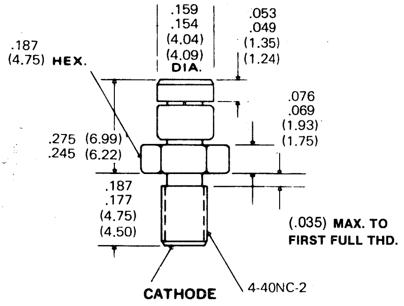
STYLE A



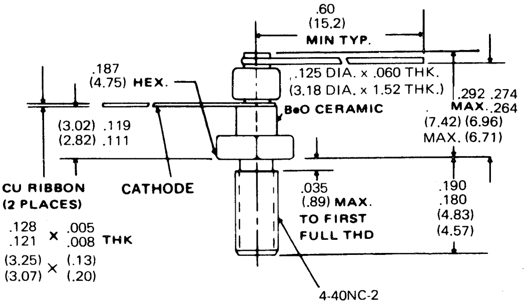
STYLE B



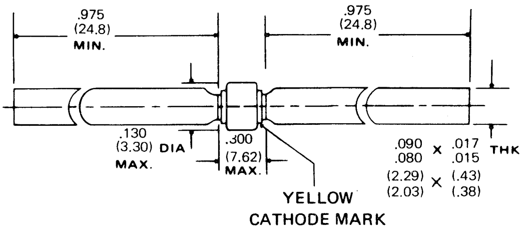
STYLE C
STUD



STYLE D
INSULATED STUD

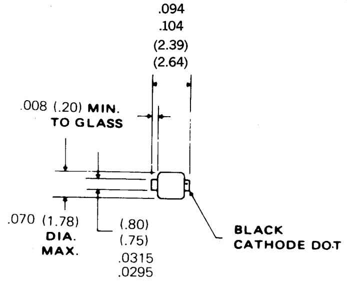


STYLE E
RIBBON LEADS

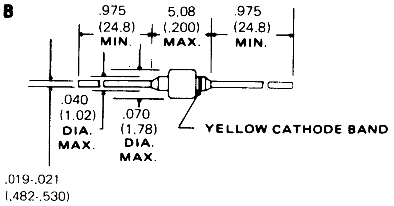


MECHANICAL SPECIFICATIONS

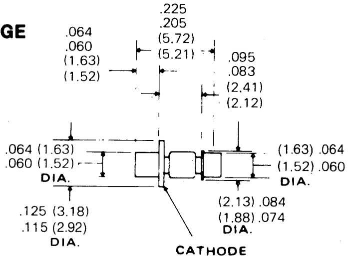
STYLE A



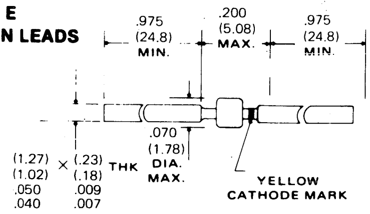
STYLE B



STYLE C
CARTRIDGE



STYLE E
RIBBON LEADS

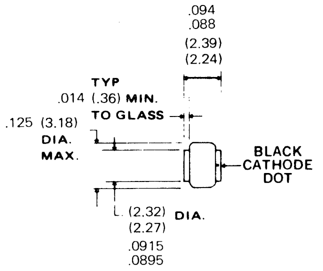


MECHANICAL SPECIFICATIONS (continued)

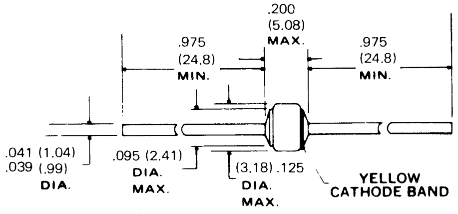
UM 4900 Series

Dimensions — English/Metric

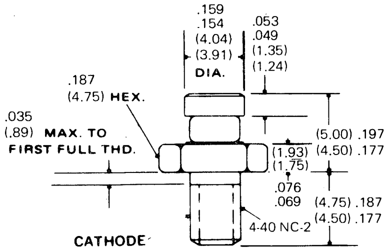
STYLE A



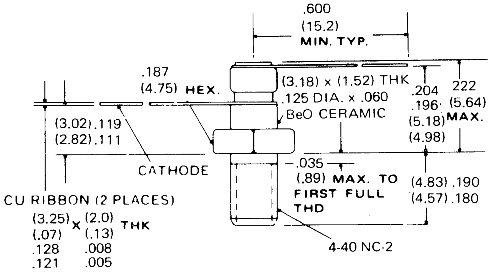
STYLE B



STYLE C
STUD



STYLE D
INSULATED STUD



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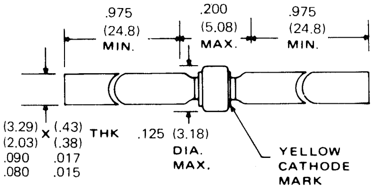
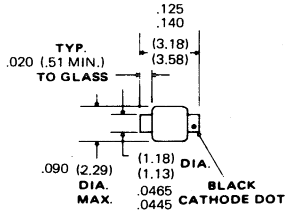
RIBBON LEADS



MECHANICAL SPECIFICATIONS (continued)
UM7000 UM7100 UM7200 SERIES
UM7300 SERIES

Dimensions — English/Metric

STYLE A



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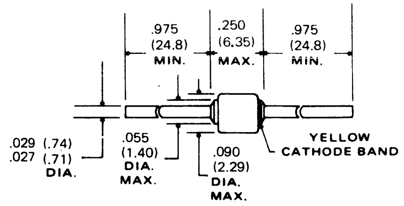

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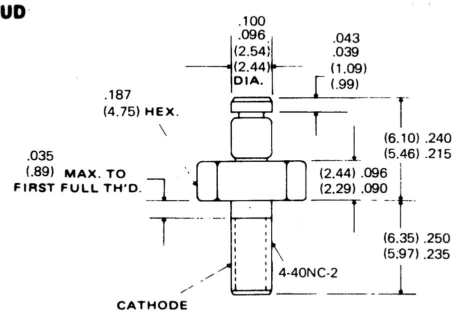
STUD



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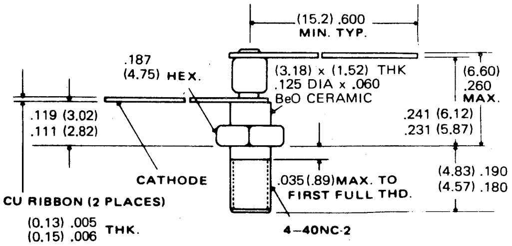
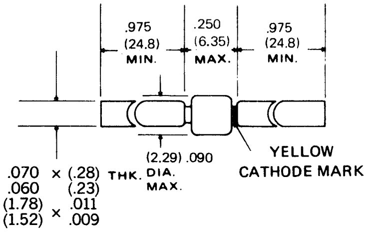
INSULATED STUD



STYLE E
RIBBON LEADS



PIN DIODE

1N5767 (5082 - 3080)SERIES
1N5957 SERIES

Features

- Useful attenuation from 1 μA to 100 mA bias.
- Capacitance below 0.4 pF.
- Low distortion in switches and attenuators.
- Rugged Unitrode construction.

Description

The 1N5767 and 1N5957 PIN diodes are based upon low capacitance PIN chips designed with long minority carrier lifetime, and thick intrinsic width. Thus operation as low as 1 MHz is possible with low distortion. Additionally, the low diode capacitance allows useful operation well into the microwave frequency range.

The 1N5767 (5082-3080) is a general purpose low power PIN diode designed for both switch and attenuator applications.

The 1N5957 is primarily used as an attenuator PIN diode and is particularly suitable wherever current controlled, wide dynamic range resistance elements are required. The 1N5957 has also been characterized for the 75Ω attenuator, commonly employed in CATV systems.

MAXIMUM RATINGS

Reverse Voltage (V_R) — Volts $(I_R = 10\ \mu A)$	100V

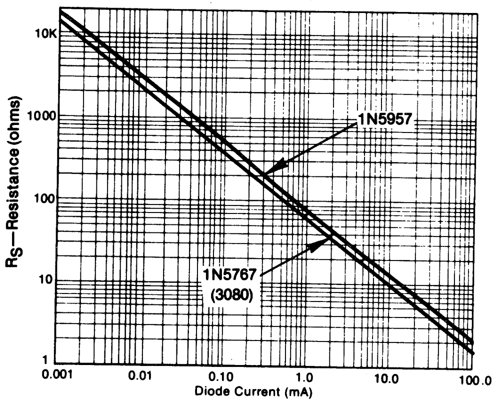
Average Power Dissipation: (25 °C) Free Air (P_A)	400 mW (Derate linearly to 175 °C)

Operating and Storage Temperature Range	−65 °C to +175 °C

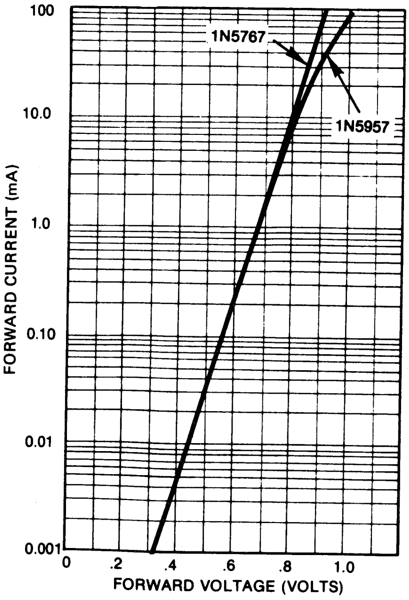
Electrical Specifications (25 °C)

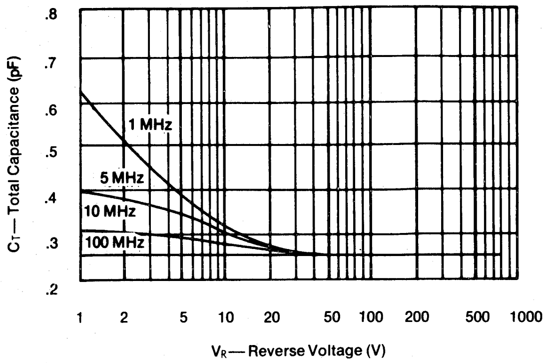
Test	Symbol	1N5767 (5082-3080)	1N5957	Conditions
Total Capacitance (Max)	C_T	0.4 pF	0.4 pF	50V, 1 MHz
Series Resistance	R_S	1000Ω(min) 2000Ω(typ)	1500Ω(min) 3000Ω(typ)	10 μA, 100 MHz
Series Resistance	R_S	8Ω(max) 4Ω(typ)	8Ω(max) 6Ω(typ)	20 mA, 100 MHz
Series Resistance	R_S	2.5Ω(max) 1.5Ω(typ)	3.5Ω(max) 2.0Ω(typ)	100 mA, 100 MHz
Carrier Lifetime (Min)	τ	1.0 μS	1.5(min) 2(typ)	I_F = 10 mA
Reverse Current (Max)	I_R	10 μA	10 μA	V_R = Rating
Current for R_S = 75Ω (typ)	I_{75}	0.7 mA	0.8 mA- 1.2 mA	R_S = 75Ω
Return Loss (typ)	—	30 dB	30 dB	Diode terminates 75Ω line
Second Order Distortion (typ)	—	−40 dB	−50 dB	Bridged tee attenuator atten. = 10 dB
Third Order Distortion (typ)	—	−60 dB	−65 dB	P_{in} = 50 dBmV f_1 = 10 MHz, f_2 = 13 MHz

RESISTANCE VS FORWARD CURRENT (TYPICAL)

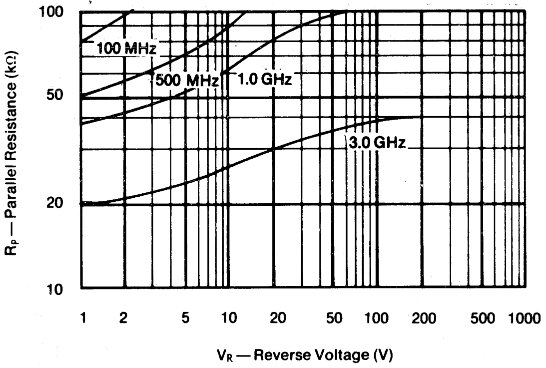


FORWARD VOLTAGE VS FORWARD CURRENT (TYPICAL)



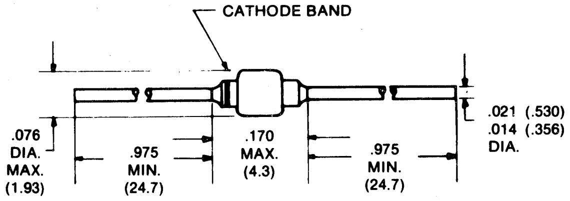


TOTAL CAPACITANCE VS REVERSE VOLTAGE



PARALLEL RESISTANCE VS REVERSE VOLTAGE

MECHANICAL SPECIFICATIONS



Dimensions: Inches (Millimeters)

PIN DIODE

UM4000 SERIES
UM4900 SERIES

Features

- Power dissipation to 37.5W
- Voltage ratings to 1000V
- Series resistance rated at 0.5Ω
- Carrier lifetime greater than 5μs

Description

The UM4000 and UM4900 series feature high power PIN diodes with long carrier lifetimes and thick I-regions. They are especially suitable for use in low distortion switches and attenuators, in the HF through S band frequencies. While both series are electrically equivalent, the UM4900 series have higher power ratings due to a shorter thermal path between chip and package. High charge storage and long carrier lifetime enable high RF levels to be controlled with relatively low bias current. Similarly, peak RF voltages can be handled well in excess of applied reverse bias voltage.

Both series have been fully qualified in high power UHF phase shifters and megawatt peak-power duplexers, accumulating thousands of hours of proven performance. Both types have been used in the design of antenna selectors and couplers, where inductive and capacitive elements are switched in and out of filter or cavity networks.

MAXIMUM RATINGS

Average Power Dissipation and Thermal Resistance Ratings

Package	Condition	UM4000		UM4900	
		P_D	θ	P_D	θ
A	25 °C Pin Temperature	25W	6 °C/W	37.5W	4 °C/W
B&E (Axial Leads)	½ in. (12.7mm) Total Length to 25 °C Contact	12W	12.5 °C/W	12W	12.5 °C/W
B&E (Axial Leads)	Free Air	2.5W	—	2.5W	—
C (Studded)	25 °C Stud Temperature	25W	6 °C/W	37.5W	4 °C/W
D (Insulated Stud)	25 °C Stud Temperature	18.75W	8 °C/W	25W	6 °C/W

Peak Power Dissipation Rating

All Packages	1 μs Pulse (Single) at 25 °C Ambient	100 KW

Operating and Storage Temperature Range: − 65 °C to + 175 °C

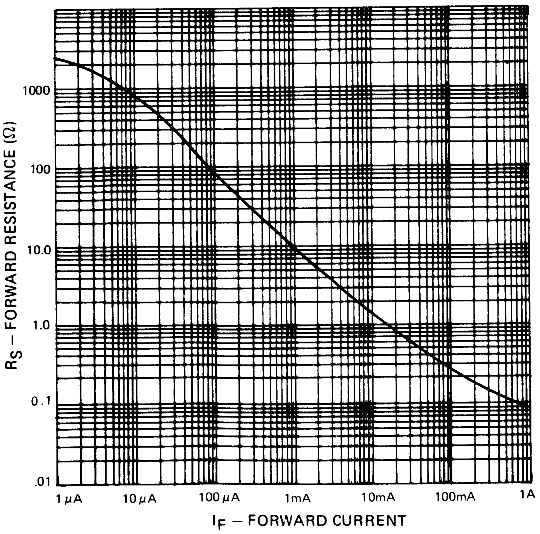
Voltage Ratings (25 °C)

Reverse Voltage (V_R) — Volts (I_R = 10 μ Amps)	Types	
100	UM4001	UM4901
200	UM4002	UM4902
400	—	—
600	UM4006	UM4906
1000	UM4010	—

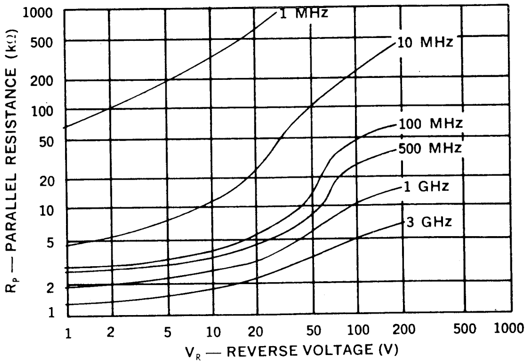
Electrical Specifications (25 °C)

Test	Symbol	UM4000 UM4900	Conditions
Total Capacitance (Max)	C_T	3 pF	100V, 1MHz
Series Resistance (Max)	R_S	0.5Ω	100mA, 100MHz
Parallel Resistance (Min)	R_P	10 KΩ	100V, 100MHz
Carrier Lifetime (Min)	τ	5μs	I_F = 10mA
Reverse Current (Max)	I_R	10μA	V_R = Rating
I-Region Width (Min)	W	150μm	—

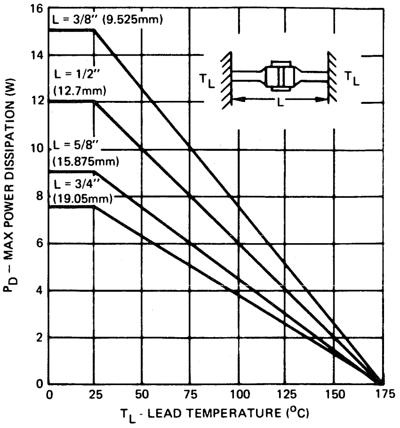
TYPICAL FORWARD RESISTANCE
VS
FORWARD CURRENT
(F = 100 MHz)



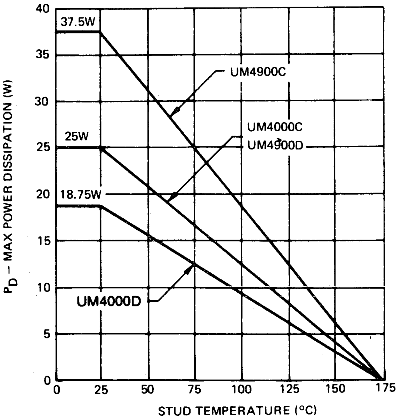
TYPICAL PARALLEL RESISTANCE CHARACTERISTIC



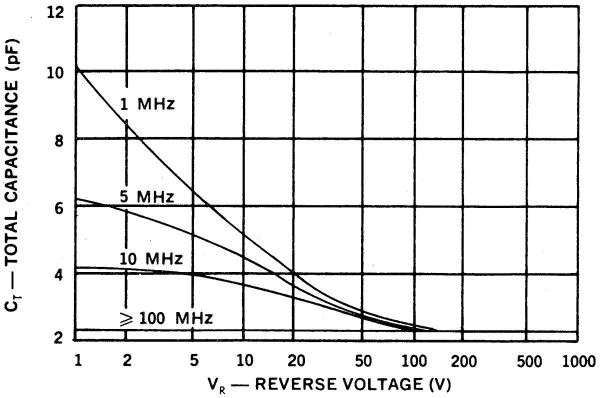
POWER RATING AXIAL LEADED DIODE



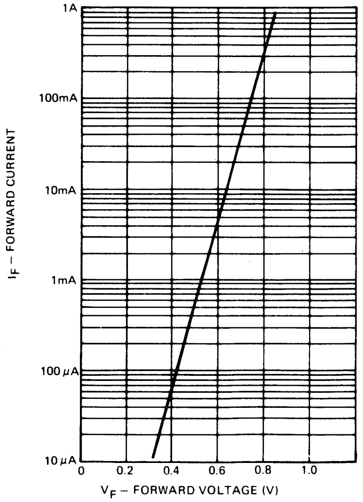
POWER RATING STUD MOUNTED DIODES



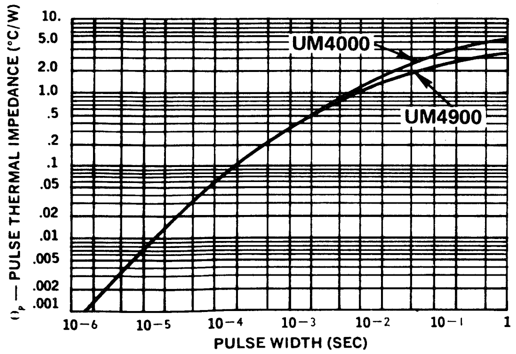
TYPICAL CAPACITANCE CHARACTERISTIC



DC CHARACTERISTICS FORWARD VOLTAGE VS FORWARD CURRENT (TYPICAL)



THERMAL IMPEDANCE



ORDERING INSTRUCTIONS

Part numbers of Unitrode PIN Diodes consist of the letters UM followed by four digits and one or two letters. The first two digits indicate the diode series, the next two digits specify the minimum breakdown voltage in hundreds of volts. The remaining letters denote the package style. Reverse polarity (anode large end cap) is available for the C style and denoted by adding second letter R.

For Example: UM|40|08|CR|

|Series 4000| |100 Volts| |Style C|Reverse Polarity|

PIN DIODE

UM4300 SERIES
UM7300 SERIES

For Attenuator Applications

Features

- Extremely low distortion performance
- Useful frequency range extends below 500 KHz
- Power dissipation to 20W (UM4300)
- Capacitance as low as 0.7 pF (UM7300)
- Voltage ratings to 1000V

Description

The UM4300 and UM7300 series combine a diode chip of extremely thick intrinsic region with a low thermal resistance construction. This results in diodes uniquely applicable to very low distortion linear attenuators and specialized switching functions. The UM4300 series, with large cross-sectional chip area offers the highest power capability, of the two series. The UM7300 series offers lower capacitance.

Both diode series are intended for use in linear attenuators operating from HF to beyond 1 GHz. Low distortion at low frequencies is a result of transit time frequencies below 5 MHz.

Operated as RF switches, either diode series can be operated at low dc reverse bias voltages, to hold off much higher RF voltage levels.

MAXIMUM RATINGS

Average Power Dissipation and Thermal Resistance Ratings

Package	Condition	UM4300		UM7300	
		P_D	θ	P_D	θ
A	25 °C Pin Temperature	20W	7.5 °C/W	7.5W	20 °C/W
B&E (Axial Leads)	½ in. (12.7mm) Total Lead Length to 25° C Contact	10W	15 °C/W	4W	37.5 °C/W
B&E (Axial Leads)	Free Air	2.5W	—	1.5W	—
C (Studded)	25 °C Stud	20W	7.5 °C/W	7.5W	20 °C/W
D (Insulated Stud)	25 °C Stud	15W	10 °C/W	6W	25 °C/W

Peak Power Dissipation Rating

All packages	1μs Pulse (Single) at 25 °C Ambient	500 KW	100 KW

Operating and Storage Temperature Range: −65 °C to +175 °C

Microsemi Corp.
Watertown
The diode experts

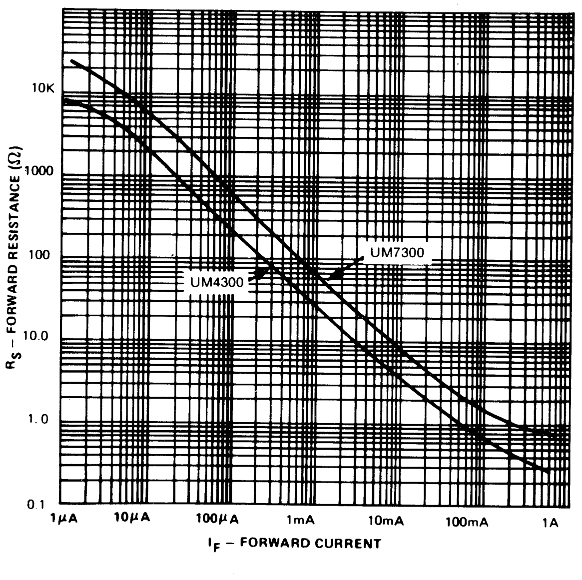
Voltage Ratings (25 °C)

Reverse Voltage (V_R) — Volts (I_R = 10 μA)	Types	
100V	UM4301	UM7301
200V	UM4302	UM7302
600V	UM4306	UM7306
1000V	UM4310	UM7310

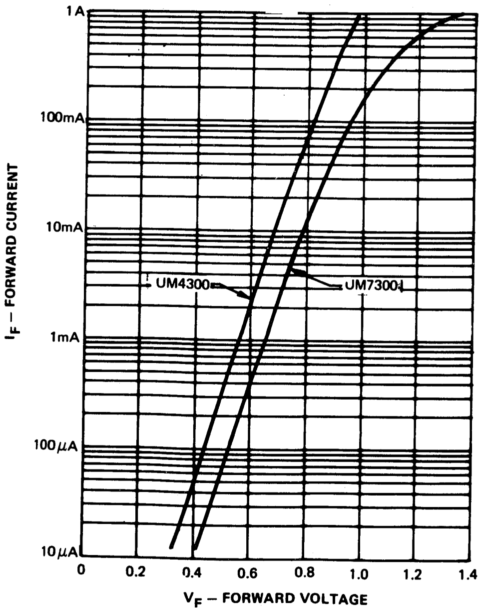
Electrical Specifications (25 °C)

Test	Symbol	UM4300	UM7300	Conditions
Total Capacitance (Max)	C_T	2.2 pF	0.7 pF	100V, 100MHz
Series Resistance (Max)	R_S	1.5Ω	3.0Ω	100mA, 100MHz
Series Resistance (Min)	R_S	1000Ω	3000Ω	10 μA, 100MHz
Carrier Lifetime (Min)	τ	6μs	4.0μS	I_F = 10mA
Leakage Current (Max)	I_R	10μA	10μA	V_R = Rating
I-Region Width (Min)	W	250μm	250μm	—

TYPICAL FORWARD RESISTANCE
VS FORWARD CURRENT (F = 100 MHz)

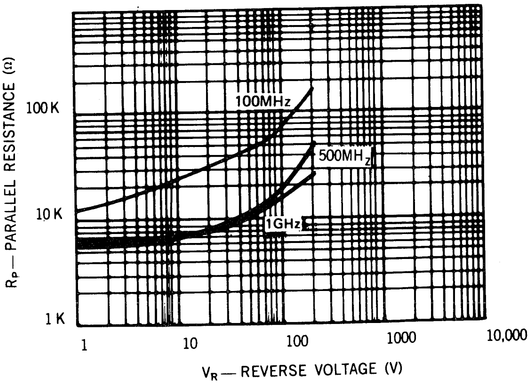


TYPICAL DC CHARACTERISTIC
FORWARD VOLTAGE
VS FORWARD CURRENT

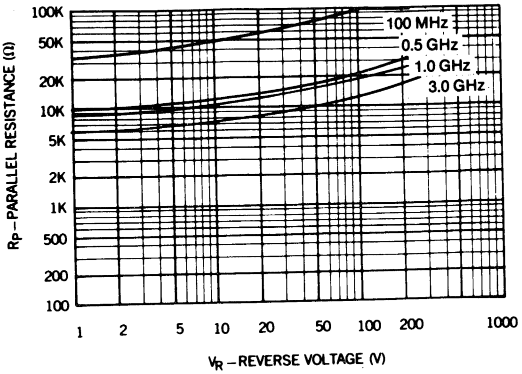


PARALLEL RESISTANCE VS REVERSE VOLTAGE

UM4300

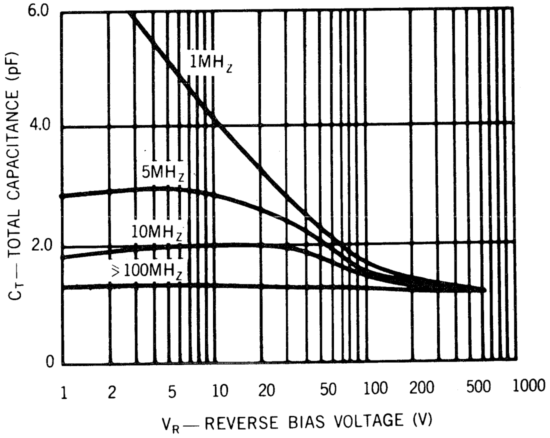


UM7300

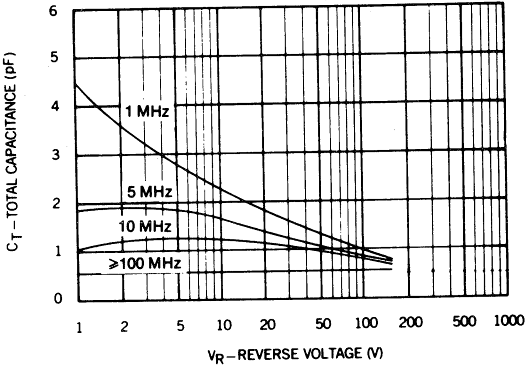


TOTAL CAPACITANCE VS REVERSE VOLTAGE

UM4300

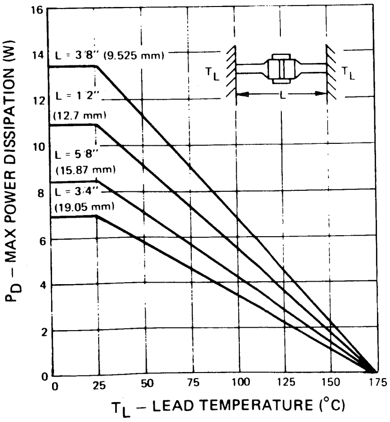


UM7300

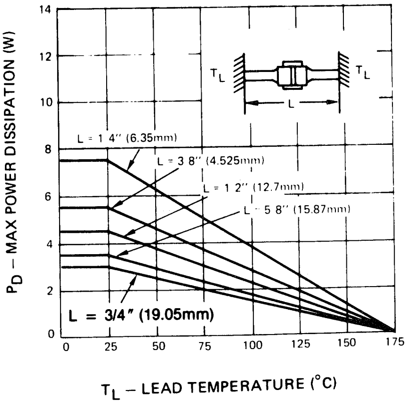


POWER RATING AXIAL LEADED DIODE

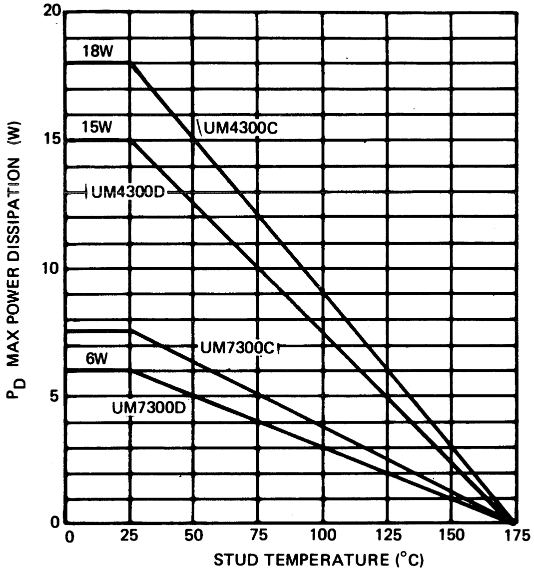
UM4300



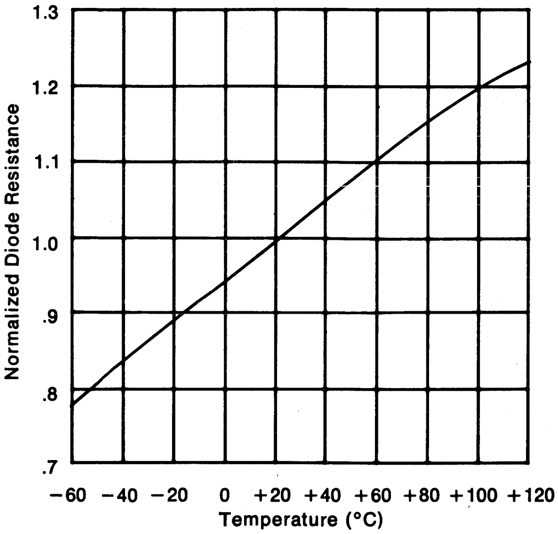
UM7300



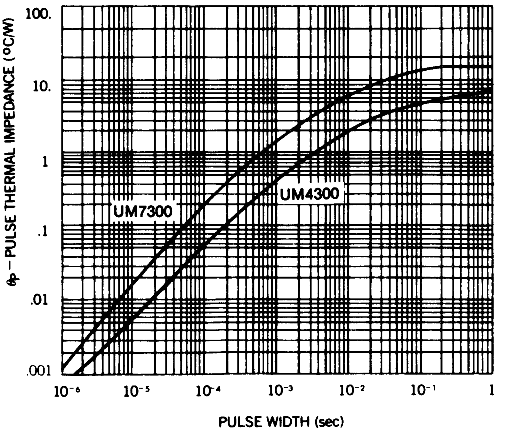
UM4300/UM7300
POWER RATING
STUD MOUNTED DIODES



NORMALIZED R_S VS TEMPERATURE



PULSE THERMAL IMPEDANCE VS PULSE WIDTH



ORDERING INSTRUCTIONS

Part numbers of Unitrode PIN Diodes consist of the letters UM followed by four digits and one or two letters. The first two digits indicate the diode series, the next two digits specify the minimum breakdown voltage in hundreds of volts. The remaining letters denote the package style. Reverse polarity (anode on stud end) is available in C or D Styles and denoted by adding second letter R.

For Example: UM|73|01|C|

Series 7300 | 100 volts | Style C

Reverse polarity available in C style. Part number designated by adding R.

PIN DIODE

UM6000 SERIES
UM6200 SERIES
UM6600 SERIES

Features

- Capacitance specified as low as 0.4 pF (UM6600)
- Resistance specified as low as 0.4Ω (UM6200)
- Voltage ratings to 1000V
- Power dissipation to 6W

Description

These series of PIN diodes are designed for applications requiring small package size and moderate average power handling capability. The low capacitance of the UM6000 and UM6600 allows them to be used as series switching elements to 1 GHz. The low resistance of the UM6200 is useful in applications where forward bias current must be minimized.

Because of its thick I-region width and long lifetime the UM6000 and UM6600 have been used in distortion sensitive and high peak power applications, including receiver protectors, TACAN, and IFF equipment. Their low capacitance allows them to be useful as attenuator diodes at frequencies greater than 1 GHz. The UM6200 has been used successfully in switches in which low insertion loss at low bias current is required.

The "A" style package for this series is the smallest Unitrode PIN diode package. It has been used successfully in many microwave applications using coaxial, microstrip, and stripline techniques at frequencies beyond X-Band. The "B" and "E" style, leaded packages offer the highest available power dissipation for a package this small. They have been used extensively as series switch elements in microstrip circuits. The "C" style package duplicates the physical outline available in conventional ceramic-metal packages but incorporates the many reliability advantages of the Unitrode construction.

MAXIMUM RATINGS

Average Power Dissipation and Thermal Resistance Ratings

Package	Condition	UM6000 UM6600		UM6200	
		P_D	θ	P_D	θ
A&C	25°C Pin Temperature	6W	25°C/W	4W	37.5°C/W
B&E (Axial Leads)	½ in. (12.7mm) Total Lead Length to 25°C Contact	2.5W	60°C/W	2.0W	75°C/W
B&E (Axial Leads)	Free Air	0.5W	—	0.5W	—

Peak Power Dissipation Rating

All Packages	1 μs Pulse (Single) at 25°C Ambient	UM6000 - 25 KW UM6200 - 10 KW	UM6600 - 13 KW

Operating and Storage Temperature Range: −65°C to +175°C

Microsemi Corp.
Watertown
The diode experts

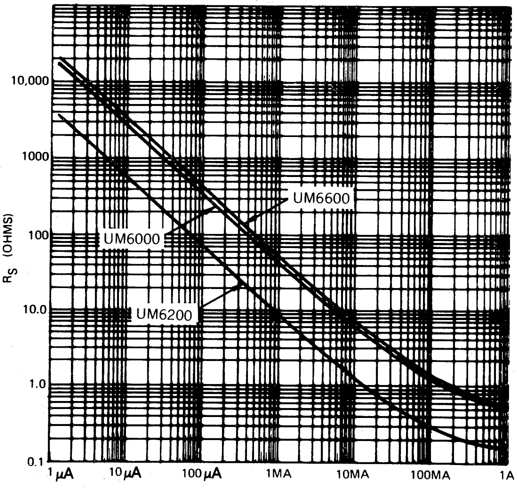
Voltage Ratings (25 °C)

Reverse Voltage (V_R) — Volts (I_R = 10 μA)	Types		
100V	UM6001	UM6201	UM6601
200V	UM6002	UM6202	UM6602
400V	—	UM6204	—
600V	UM6006	—	UM6606
1000V	UM6010	—	UM6610

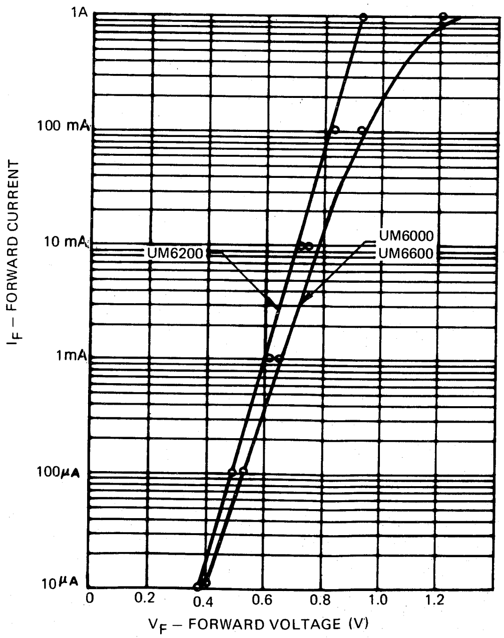
Electrical Specifications (25 °C)

Test	Symbol	UM6600	UM6000	UM6200	Conditions
Total Capacitance (Max)	C_T	0.4 pF	0.5 pF	1.1 pF	100V, 1MHz
Series Resistance (Max)	R_S	2.5Ω	1.7Ω	0.4Ω	100mA, 100MHz
Parallel Resistance (Min)	R_P	300 KΩ	300 KΩ	350 KΩ	100V, 100MHz
Carrier Lifetime (Min)	τ	1.0 μs	1.0 μs	0.6 μs	I_F = 10 mA
Reverse Current (Max)	I_R	10 μA	10 μA	10 μA	V_R = Rating
I-Region Width (Min)	W	150 μm	150 μm	40 μm	—

TYPICAL SERIES RESISTANCE
VS
FORWARD CURRENT
(F = 100MHz)

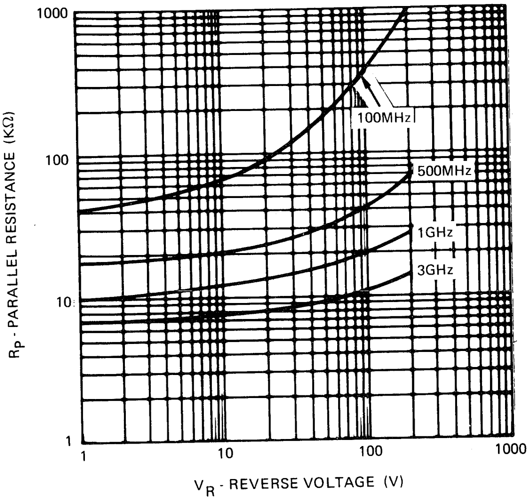


DC CHARACTERISTICS
FORWARD VOLTAGE VS CURRENT

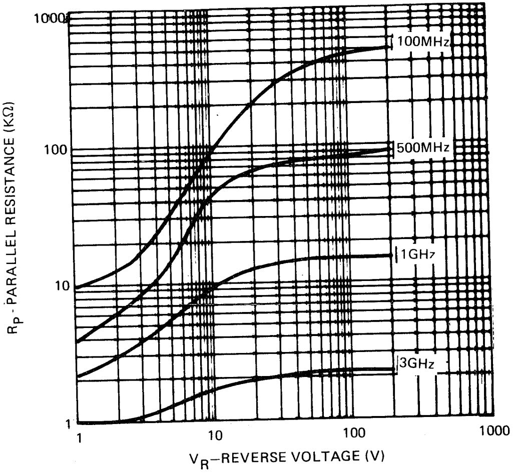


TYPICAL R_p VS VOLTAGE & FREQUENCY

UM6000/UM6600

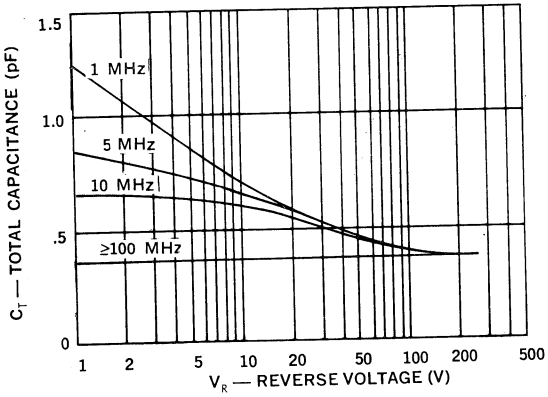


UM6200

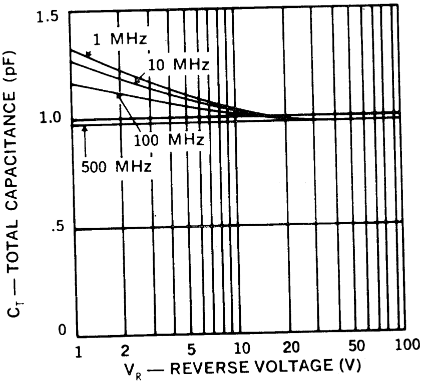


TYPICAL CAPACITANCE VS VOLTAGE AND FREQUENCY

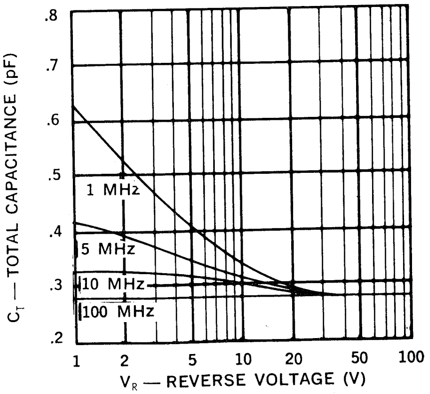
UM6000 SERIES



UM6200 SERIES



UM6600 SERIES



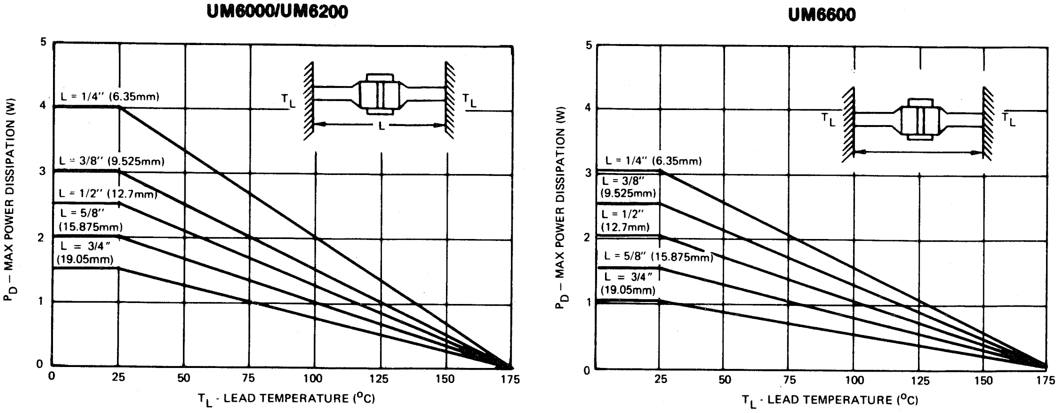
ORDERING INSTRUCTIONS

Part numbers of Unitrode PIN diodes consist of the letters UM followed by four digits and one or two letters. The first two digits indicate the diode series, the next two digits specify the minimum breakdown voltage in hundreds of volts. The remaining letters denote the package style. Reverse polarity (anode large end cap) is available for the C style and denoted by adding second letter R.

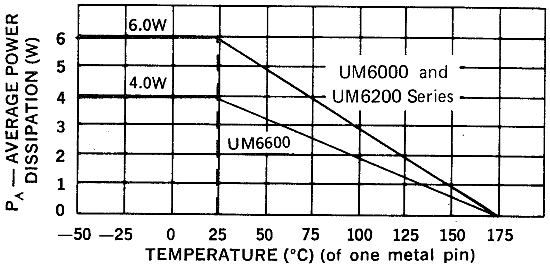
For Example: UM |60|06 |CR|

|Series 6000| |600 Volts| |Style C|Reverse Polarity|

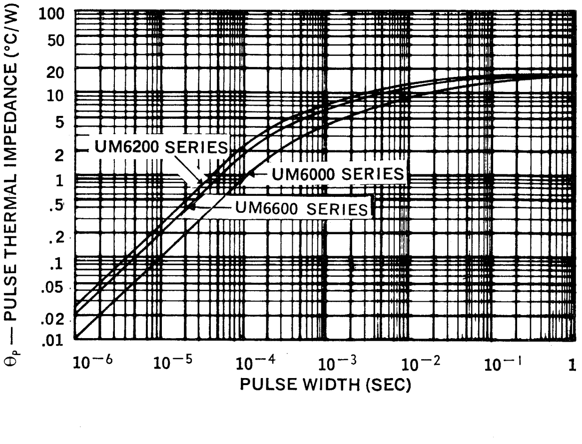
POWER RATING — AXIAL LEADED DIODE



POWER RATING



PULSE THERMAL IMPEDANCE VS PULSE WIDTH



PIN DIODE

UM7000 SERIES
UM7100 SERIES
UM7200 SERIES

Features

- Voltage ratings to 1000V (UM7000)
- Wide variety of package styles
- Rated average power dissipation to 10W
- Cost effective in volume applications

Description

The UM7000 and UM7100 series offer moderately high power handling in combination with reasonably low levels of both series resistance and capacitance. The UM7200 series offers the lowest series resistance, but the highest capacitance of the group. The differences in specified performance, for each of the series, results from different I-region thicknesses. The three series have broad applicability in many RF and microwave switch and attenuator circuits. Additionally, the UM7100 in leaded versions, is usually the most cost-effective diode choice in high volume usage.

MAXIMUM RATINGS

Average Power Dissipation and Thermal Resistance Ratings

Package	Condition	P_D	θ
A	25 °C Pin Temperature	10W	15 °C/W
B&E (Axial Leads)	½ in. (12.7mm) Total Lead Length to 25° C Contact	5.5W	27.5 °C/W
B&E (Axial Leads)	Free Air	1.5W	—
C (Studded)	25 °C Stud Temperature	10W	15 °C/W
D (Insulated Stud)	25 °C Stud Temperature	7.5W	20 °C/W

Peak Power Dissipation Rating

All Packages	1 μs Pulse (Single) at 25 °C Ambient	UM7000 - 60 KW UM7100 - 35 KW UM7200 - 20 KW

Operating and Storage Temperature Range: − 65 °C to + 175 °C

Microsemi Corp.
Watertown
The diode experts

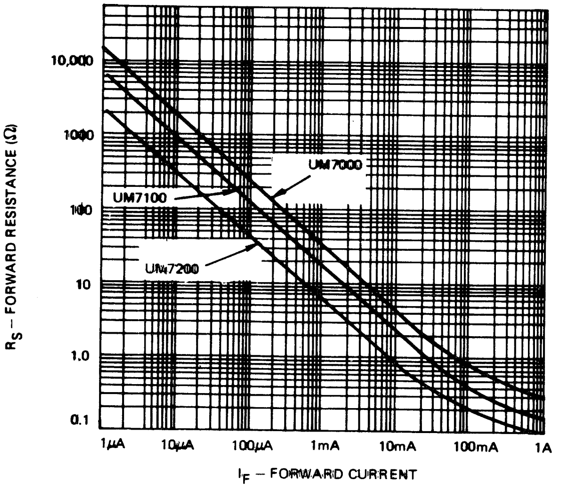
Voltage Ratings (25 °C)

Reverse Voltage (V_R) — Volts (I_R = 10 μA)	Types		
100V	UM7001	UM7101	UM7201
200V	UM7002	UM7102	UM7202
400V	—	UM7104	UM7204
600V	UM7006	—	—
800V	—	UM7108	—
1000V	UM7010	—	—

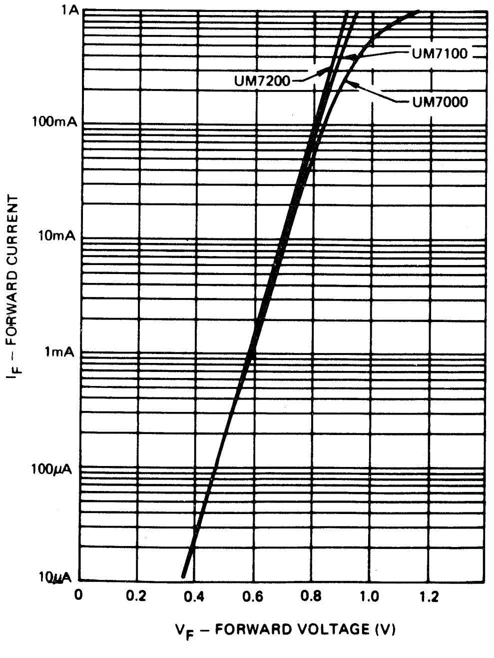
Electrical Specifications (25 °C)

Test	Symbol	UM7000	UM7100	UM7200	Conditions
Total Capacitance (Max)	C_T	0.9 pF	1.2 pF	2.2 pF	100V, 1MHz
Series Resistance (Max)	R_S	1.0Ω	0.6Ω	0.25Ω	100mA, 100MHz
Parallel Resistance (Min)	R_P	200 KΩ	150 KΩ	70 KΩ	100V, 100MHz
Carrier Lifetime (Min)	τ	2.5 μs	2.0 μs	1.5 μs	I_F = 10 mA
Reverse Current (Max)	I_R	10 μA	10 μA	10 μA	V_R = Rating
I-Region Width (Min)	W	150 μm	80 μm	40 μm	—

TYPICAL FORWARD RESISTANCE
VS FORWARD CURRENT
(F = 100 MHz)

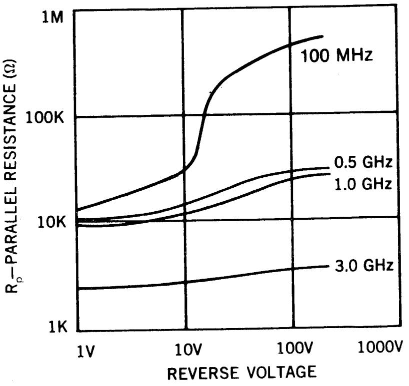


TYPICAL DC CHARACTERISTIC
FORWARD VOLTAGE
VS FORWARD CURRENT
UM7000/UM7100/UM7200

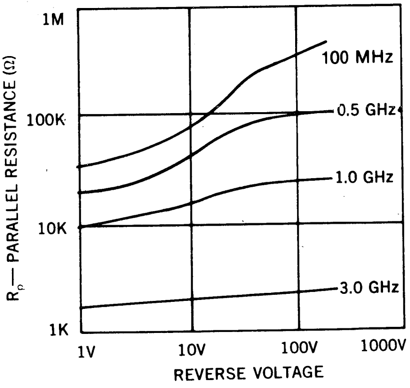


TYPICAL R_p CHARACTERISTIC

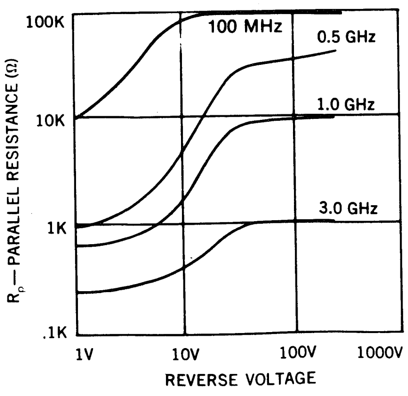
UM 7000 SERIES



UM7100 SERIES

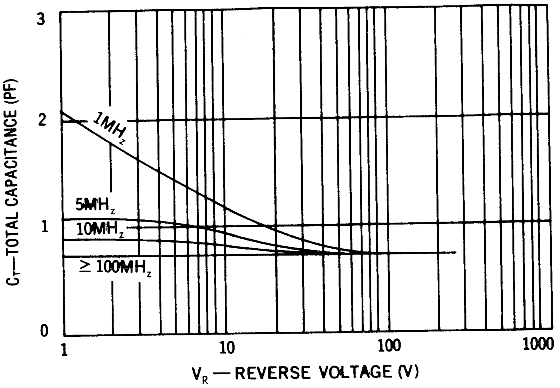


UM 7200 SERIES

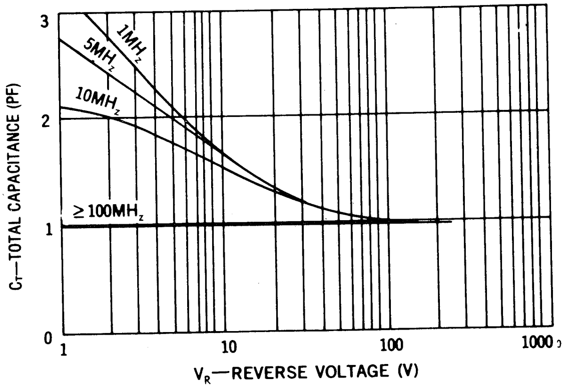


TYPICAL C_T CHARACTERISTIC

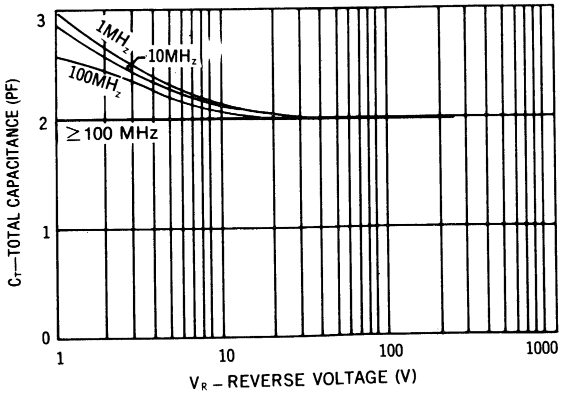
UM 7000 SERIES



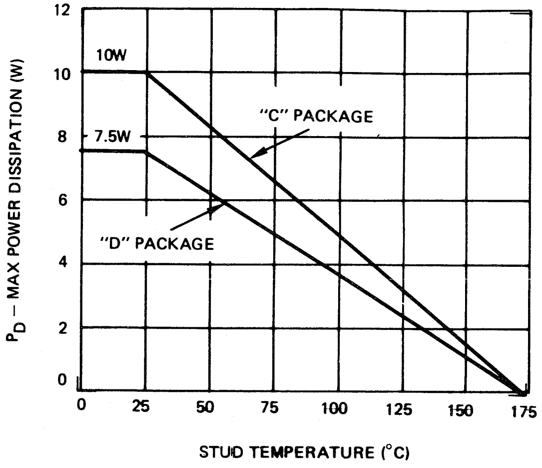
UM 7100 SERIES



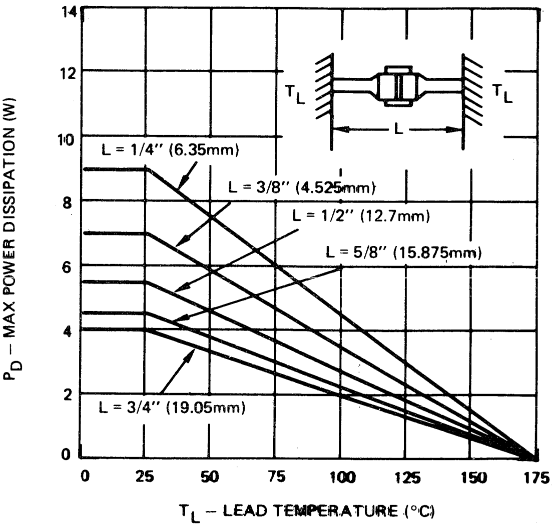
UM 7200 SERIES



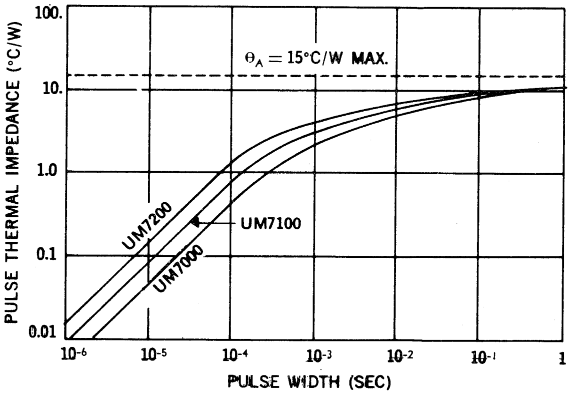
POWER RATING STUD MOUNTED DIODES



POWER RATING — AXIAL LEADED DIODES



PULSE THERMAL IMPEDANCE VS PULSE WIDTH



ORDERING INSTRUCTIONS

Part numbers of Unitrode PIN Diodes consist of the letters UM followed by four digits and one or two letters. The first two digits indicate the diode series, the next two digits specify the minimum breakdown voltage in hundreds of volts. The remaining letters denote the package style. Reverse polarity (anode on stud end) is available in C or D Styles and denoted by adding second letter R.

For Example: UM 70 01 C

Series 7000 | 100 volts | Style C

PIN DIODE

UM9301

COMMERCIAL ATTENUATOR DIODE

Features

- Specified low distortion
- Low rectification properties at low reverse bias
- Resistance specified at 3 current points
- High reliability fused-in-glass construction

Description

The UM9301 PIN Diode utilizes a special overall chip geometry with an extremely thick intrinsic "I" region, to offer unique capabilities in both RF switch and attenuator applications. Volume production also makes the diode an economical choice suitable for many commercial low power equipments.

The UM9301 has been designed for use in bridged TEE attenuator circuits commonly utilized for gain and slope control in CATV amplifiers. Low distortion and high dynamic range are characteristic of the diodes' outstanding performance.

The UM9301 is also appropriate for switch applications, when little or no bias voltage is available. Frequent applications occur in portable 12 volt-powered communications equipments, operating at frequencies as low as 2 MHz.

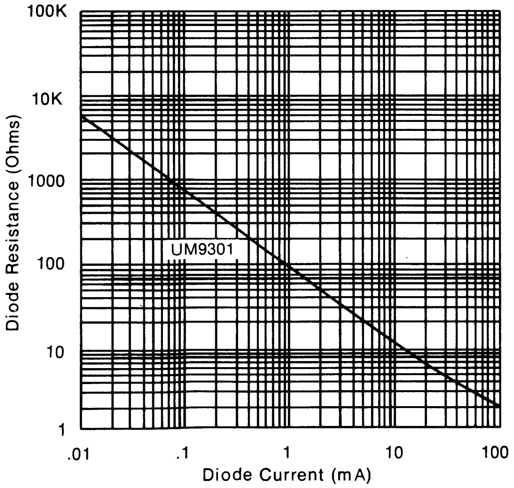
MAXIMUM RATINGS

Reverse Voltage **(V_R) — Volts** **(I_R = 10 μA)**	75V
Average Power Dissipation @ (P_A) Leads ½ in. (12.7mm) Total to 25°C Contact	1.0W (Derate linearly to 175°C)
Operating and Storage Temperature Range	−65°C to +175°C

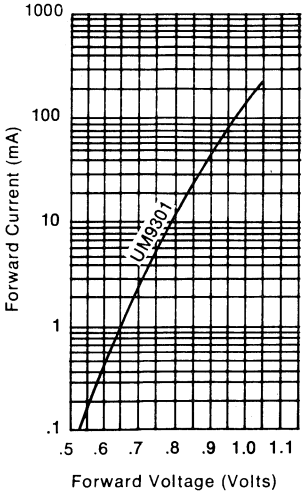
Electrical Specifications (25 °C)

Test	Min	Typ	Max	Units	Conditions
Diode Resistance R_S	 3000	1.7 80 5000	3.0 150	Ω Ω Ω	I = 100 mA, f = 100 MHz I = 1 mA, f = 100 MHz I = 0.01 mA, f = 100 MHz
Current for R_S = 75Ω I_R	0.5	1.1	2.0	mA	f = 100 MHz
Capacitance C_T			0.8	pF	V = 0V, f = 100 MHz
Return Loss	25			dB	Frequency Range: 10 - 300MHz R_S = 75Ω @ 100 MHz Diode Terminates 75Ω line
Second Order Distortion		55	50	– dB	f_1 = 10 MHz, f_2 = 13 MHz P = 50 dBmV, See Test Circuit
		70		– dB	F_1 = 67 MHz, F_2 = 77 MHz P = 50 dBmV, See Test Circuit
Third Order Distortion		75	65	– dB	F_1 = 10 MHz, F_2 = 13 MHz P = 50 dBmV, See Test Circuit
		95		– dB	Triple Beat; 205 + 67 – 77 MHz P = 50 dBmV, See Test Circuit
Cross Modulation Distortion		75		– dB	12 Channel Test P = 50 dBmV, See Test Circuit Dix Hills Test Set
Reverse Current I_R			10	μA	V = 75V
Carrier Lifetime τ	4.0			μs	I = 10 mA

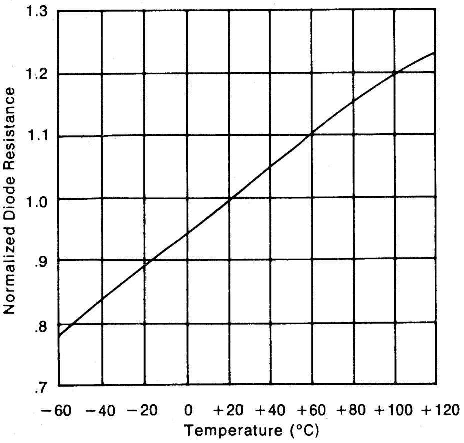
DIODE RESISTANCE
VS DIODE CURRENT
(TYPICAL)



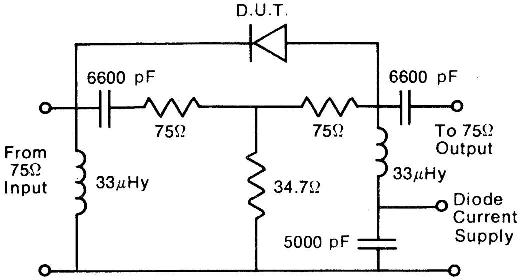
FORWARD CURRENT VS
FORWARD VOLTAGE
(TYPICAL)



NORMALIZED R_S VS TEMPERATURE



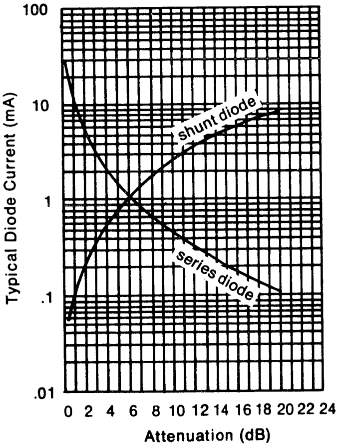
TEST CIRCUIT FOR DISTORTION MEASUREMENTS



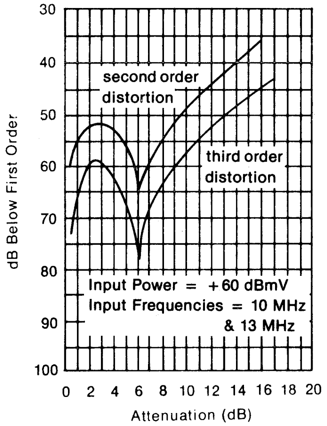
Note: Diode Current adjusted
for 10dB Attenuation

TYPICAL BRIDGED TEE ATTENUATOR PERFORMANCE

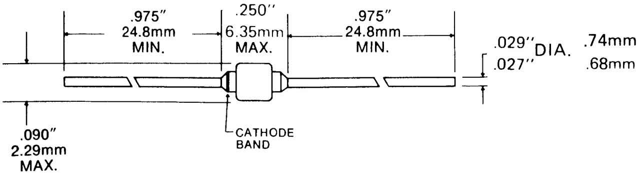
DIODE CURRENT VS ATTENUATION UM9301



DISTORTION ATTENUATION



MECHANICAL SPECIFICATIONS



PIN DIODE

UM9401
UM9402
UM9415

COMMERCIAL TWO-WAY RADIO ANTENNA SWITCH DIODES

Features

- Specified low distortion
- Unitrode ruggedness and reliability
- Low bias current requirements
- Priced for high quantity applications

Description:

Unitrode offers a series of PIN diodes specifically designed and characterized for solid state antenna switches in commercial two-way radios. Antenna switches using the UM9401 and UM9415 series PIN diodes provide high isolation, low loss and low distortion characteristics formerly possible only with electromechanical relay type switches.

The UM9401 and UM9402 diodes can handle above 100W of transmitter power, while the UM9415 will handle over 1000W. The extensive characterization of these PIN diodes in antenna switch applications has resulted in guaranteed low distortion specifications under transmit and receive conditions. These diodes also feature low forward bias resistance and high zero bias impedance which are required for low loss, high isolation and wide bandwidth antenna switch performance.

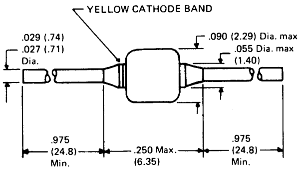
MAXIMUM RATINGS

	UM9401	UM9402	UM9415
Reverse Voltage (V_R) — Volts (I_R = 10 μA)	50V	50V	50V

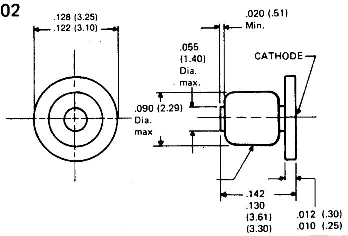
Average Power Dissipation (P_A)			
Lead Length – ½ in. (12.7mm) Total to 25°C Contacts	5.5W	—	10W
25 °C (Package Flange) Temperature	—	10W	—
Free Air	1.5W		2.5W

Operating and Storage Temperature Range	− 65 °C to + 175 °C

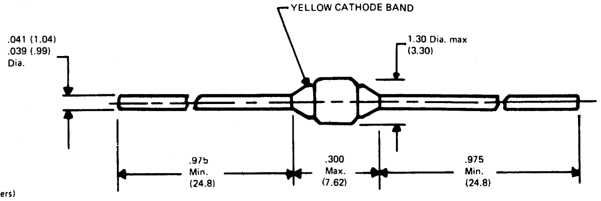
UM9401



UM9402



UM9415

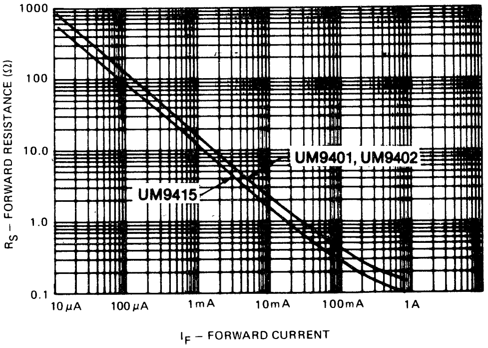


Dimensions: inches (millimeters)

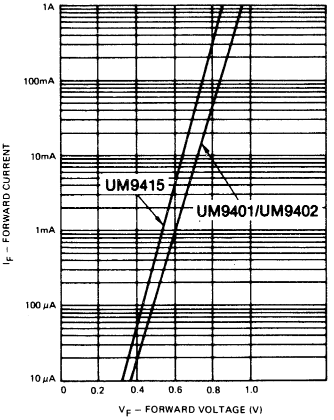
Electrical Specifications (at 25 °C)

Test	Symbol	UM9401/UM9402			UM9415			Units	Conditions
		Min	Typ	Max	Min	Typ	Max		
Series Resistance	R_S		0.75	1.0		0.75	1.0	Ω	f = 100MHz typical I = 50 mA
Diode Capacitance	C_T		1.1	1.5			4	pF	f = 100 MHz V = 0V
Parallel Resistance	R_P	5K	10K		1K	2K		Ω	f = 100 MHz V = 0V
Carrier Lifetime	τ	1.0	2.0		5			μS	I = 10 mA
Transmit Harmonic Distortion	$\frac{R_{2A}}{A}, \frac{R_{3A}}{A}$			80			80	− dB	P_{IN} = 50W f = 50 MHz, I = 50 mA
Receive Third Order Distortion	$\frac{R_{2AB}}{A}$			60			60	− dB	P_{IN} = 10 mW, 0V Bias f_A = 50 MHz, f_B = 51 MHz
Reverse Leakage Current	I_R			10			10	μA	V = 50V
Forward Voltage	V_F			1.0			1.0	V	I_F = 50 mA

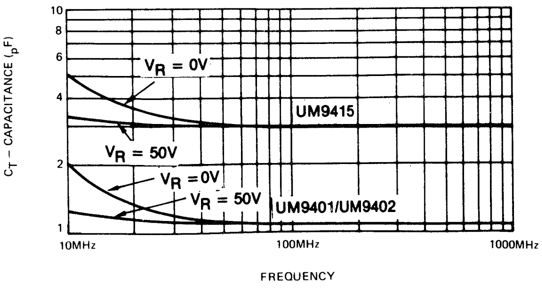
TYPICAL FORWARD RESISTANCE VS FORWARD CURRENT (F = 100 MHz)



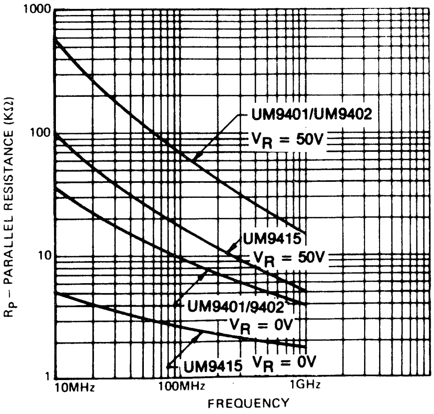
TYPICAL DC CHARACTERISTIC



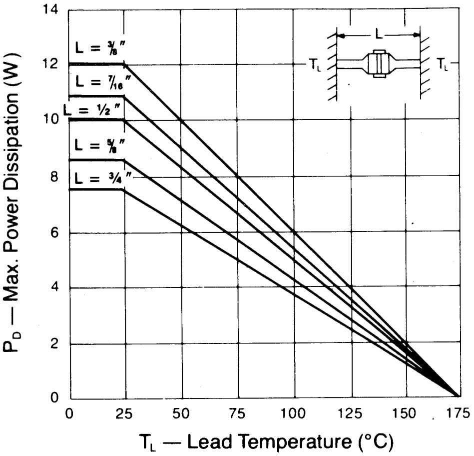
TYPICAL CAPACITANCE CHARACTERISTIC



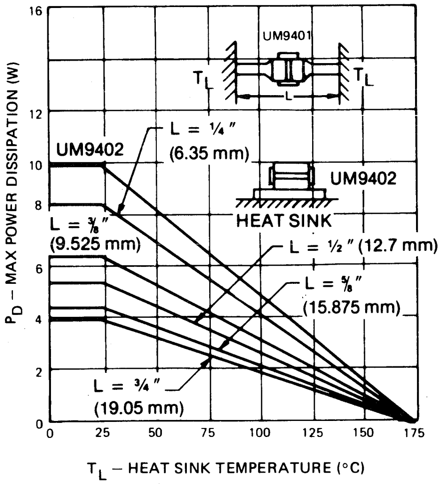
TYPICAL R_p CHARACTERISTICS



POWER RATING
UM9415

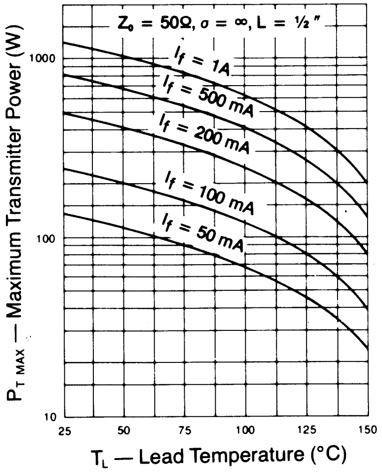


POWER RATING
UM9401/9402

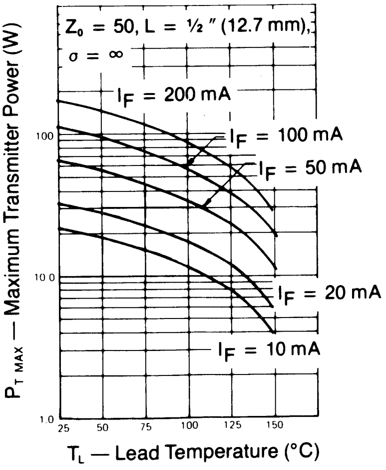


MAXIMUM TRANSMITTER POWER

UM9415



UM9401/UM9402



Maximum Transmitter Power

The maximum CW transmitter power, $P_{T(max)}$, a PIN diode antenna switch can handle depends on the diode resistance, R_S, power dissipation, P_D, antenna SWR, σ, and nominal impedance, Z_0. The expression relating these parameters is as follows:

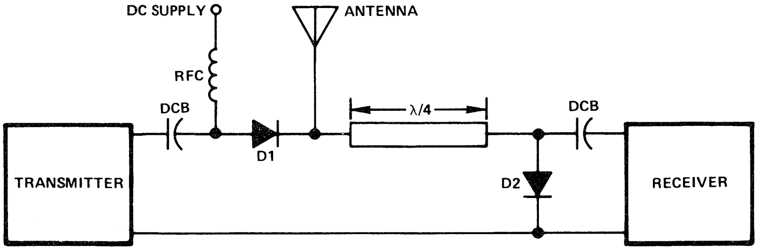
$$P_{T(max)} = \frac{P_D \times Z_0}{R_D} \left(\frac{\sigma + 1}{2\sigma}\right)^2 \text{ [Watts]}$$

Characteristic curves are shown in the data section which give both the maximum and typical diode resistance, R_S as a function of forward current. The maximum power dissipation rating of the PIN diode depends both on the length of the diode leads and the temperature of the contacts to which the leads are connected. A graph defining the maximum power dissipation at various combinations of overall lead length (L) and lead temperature (T_L) is given in the data section. From these curves and the above equation, the power handling capability of the PIN diode may be computed for a specific application.

Curves are also presented which show the maximum transmitter power that an antenna switch using UM9401s and UM9415s can safely handle for various forward currents and lead temperatures. These curves are based on a typical design condition of a ½ in. total overall lead length, 50Ω line impedance and a totally mismatched antenna ($\sigma = \infty$). For the case of a perfectly matched antenna, the maximum transmitter power can be increased by a factor of 4.

Design Information

A circuit configuration for a two-way radio antenna switch using PIN diodes consists of a diode placed in series with the transmitter and a shunt diode placed a quarter wavelength from the antenna in the direction of the receiver as shown. For low frequency operation, the quarter wave line may be simulated by lumped elements. Typical performance of antenna switches using PIN diodes forward biased at 100 mA is less than 0.2 dB insertion loss and 30 dB isolation during transmit; at zero bias the receive insertion loss is less than 0.3 dB. This performance is achievable across a ±20% bandwidth at center frequencies ranging from 10 to 500 MHz.



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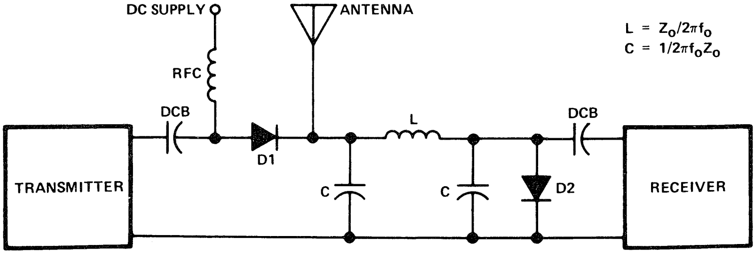


ⓑ

PIN RADIATION DETECTORS

UM9441

Features

- High Photocurrent Sensitivity
- High Reliability Construction
- Fast Rise Time
- Wide Dynamic Range
- Hardness to Neutron Bombardment
- Low Operating Voltage

Description

Silicon PIN devices are effective detectors of nuclear and electromagnetic radiation. This includes gamma radiation, electrons, and X-rays. The detectors can be used across the temperature range of −55°C to +175°C instead of being restricted to use at low temperatures.

The absorbed radiation produces electron-hole pairs in the space charge region. These charges are swept out by the applied field and result in a current flow proportional to the rate of absorbed radiation.

The Unitrode UM9441 series utilizes high resistivity material and is designed to have a uniform area mesa structure to define the active volume. The current sensitivity of these devices is proportional only to the I-region volume and is independent of temperature so long as applied voltage exceeds the saturation voltage. This structure also minimizes the effects of permanent damage caused by neutrons and other high energy radiation. Experiments on devices of the UM9441 design show no degradation in gamma sensitivity resulting from a total dose of 10^{14} neutrons/cm^2 of 1 MeV equivalent.

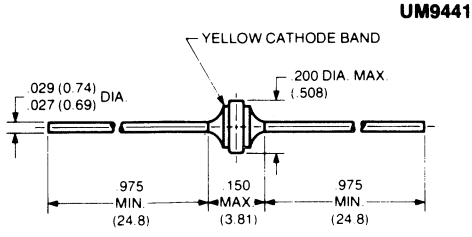
Package

The UM9441 is an axially leaded device constructed by metallurgically bonding the PIN chip in between two molybdenum refractory pins that are typically 0.125 inches in diameter and 0.050 inches long. Hyper-pure glass is then fused over this bond to form a voidless seal. Leads are then brazed to ends of molybdenum pins. This results in a high-reliability package using materials so well thermally matched that the UM9441 can withstand temperature shock or cycling from −196°C to +300°C.

ABSOLUTE MAXIMUM RATINGS

Reverse Voltage	100V
Photocurrent	3Adc, 3A^{2}s pulsed
Storage Temperature	−55°C to +200°C
Operating Temperature	−55°C to +175°C

MECHANICAL SPECIFICATIONS

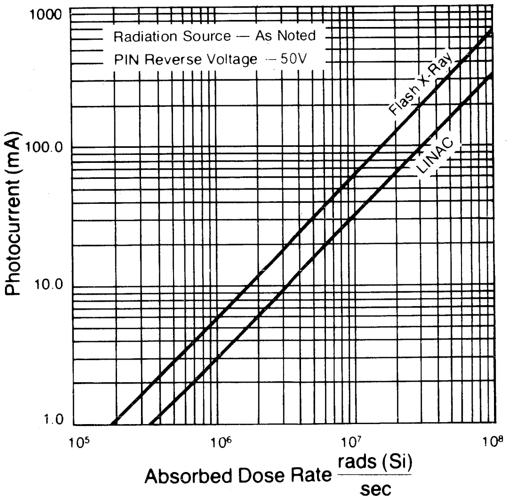


Dimensions in inches (millimeters)

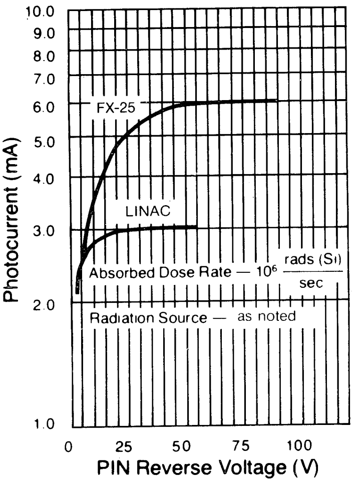
Electrical Specifications (at 25°C)

Test	Min	Typ	Max.	Units	Test Conditions
Photocurrent	4.0	6.0		mA	$V_R = 50V$ $10^6 \frac{\text{rads (Si)}}{\text{sec.}}$ 2.5 MeV Flash X-Ray Ion Physics Corp. FX-25
Capacitance			10	pF	F = 1 MHz, V = 50V
Reverse Current			1.0	μA	$V_R = 50V$
Minority Carrier Lifetime	2.0			μS	$I_f = 10mA$

TYPICAL PHOTOCURRENT SENSITIVITY



TYPICAL VOLTAGE SENSITIVITY



RELIABILITY

The UM9441 is consistent with Unitrode's reputation as a manufacturer of high reliability semiconductors. Unitrode is equipped to perform JAN type testing, base-lining and documental conformance to a wide range of reliability testing. This commitment to reliability has enabled Unitrode to be a qualified supplier of semiconductor devices to many high-reliability programs such as:

APOLLO	MINUTEMAN
DRAGON	SPRINT
HAWK	TRIDENT
MARINER	VIKING

PIN DIODE

For Microstrip 900MHz Antenna Switches and Microwave Applications

Features

- Low Inductance Shunt Mount Package
- Characterized for Microstrip
- Unitrode Ruggedness and Reliability
- High Power Handling Capability
- Low Bias Current Requirement
- Excellent Distortion Properties
- Cost Effective in High Quantity Applications

Description

The UM9601-UM9608 series of PIN diodes was developed for shunt mount applications in microstrip circuits. Good switch performance is demonstrated at frequencies from UHF to 4GHz and higher. This performance is achieved using discrete low inductance Unitrode PIN diodes assembled with special hardware to permit good electrical and mechanical compatibility with microstrip transmission lines.

Design information is presented for preparation of microstrip circuit boards to accommodate these PIN diodes. A detailed design for a 900MHz quarter-wave antenna switch is given. This switch which employs a low cost UM9401 axial leaded PIN diode in conjunction with a UM9601, performs with 30dB receiver isolation over a 100MHz bandwidth and with transmitter insertion loss of less than 0.4dB. This switch can safely handle transmitter power levels up to 100 watts at infinite antenna SWR.

The Unitrode UM9601 series PIN diodes are constructed using a fused-in-glass process which results in a highly reliable, hermetic package. The process utilizes symmetrical, full faced metallurgical bonds to both surfaces of the silicon chip. This construction greatly minimizes the normal parasitic inductance and capacitance found in conventional glass or ceramic packaged diodes which employ straps, springs or whiskers.

The use of discrete UM9601-UM9608 diodes greatly minimizes handling problems commonly associated with passivated PIN diode chips while maintaining good microwave performance. In addition the power handling capibility of the UM9601-UM9608 series is considerably higher than PIN diode chips can provide.

Environmentally, the UM9601-UM9608 series PIN diodes can withstand thermal cycling from −195°C to +300°C and exceed all military environmental specification for shock, vibration, acceleration, and moisture resistance.

Typical Microwave Performance

	UM9601-UM9604			UM9605-UM9608		
Frequency	SPST Insertion Loss 0 Bias	SPST Isolation 100mA	SPNT* Isolation 100mA	SPST Insertion Loss 0 Bias	SPST Isolation 100mA	SPNT* Isolation 100mA
GHz	dB	dB	dB	dB	dB	dB
0.5	0.20	30	36	0.20	25	31
1.0	0.25	26	32	0.20	22	28
1.5	0.35	22	28	0.20	20	26
2.0	0.50	18	24	0.25	17	22
3.0	1.00	15	21	0.25	15	21
4.0	1.50	13	19	0.40	14	20

* Performance based on SPST Measurements
In 0.025" (.635mm) Microstrip Test Circuit.

Note: All dimensions in inches and (millimeters).

Maximum Ratings

	UM9601 - UM9604		UM9605 - UM9608	
	P_D	θ	P_D	θ
Flange at 25° C	7.5W	20° C/W	4W	37.5° C/W
Free Air	1.5W	—	0.5W	—

Peak Power 1µS Single Pulse at 25° C Ambient	25KW	10KW

Operating and Storage Temperature	−65° C to +175° C

Reverse Voltage Ratings @ 10µA

100V	400V
UM9601	UM9602
UM9603	UM9604
UM9605	UM9606
UM9607	UM9608

Electrical Specifications (at 25° C)

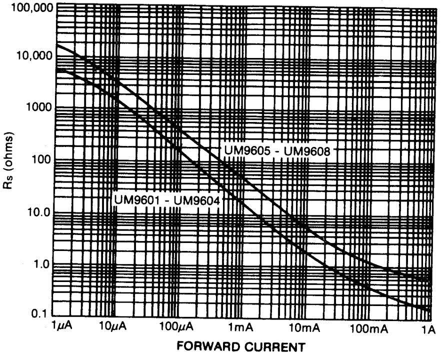
Test	Symbol	UM9601-UM9604			UM9605-UM9608			Units	Condition
		Min	Typ	Max	Min	Typ	Max		
Series Resistance	R_S	—	0.4	0.6	—	1.5	1.7	Ω	I = 100mA f = 100MHz
Parallel Resistance	R_P	100K	—	—	150K	—	—	Ω	V = 100V f = 100MHz
Total Capacitance	C_T	—	—	1.2	—	—	0.5	pF	V = 100V f = 1MHz
Carrier Lifetime	τ	2.0	—	—	1.0	—	—	µS	I_F = 10mA
Forward Voltage	V_F	—	0.85	—	—	0.95	—	V	I_F = 100mA
I-Region Width	W	80	—	—	150	—	—	µm	

Selection Guide

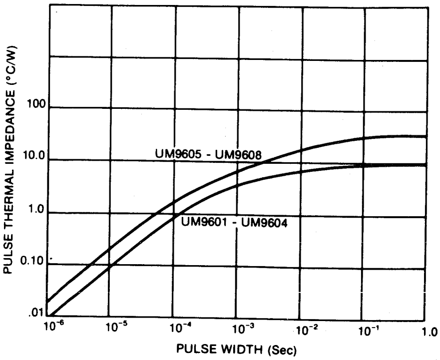
The following chart serves as a general guide for indicating the most likely diode from the series for a given application.

Applications	Recommended Types
1. High isolation switches to 2GHz at low dc drive 2. Quarter-wave antenna switches to 100 watts. 3. Priced for high volume commercial applications.	UM9601 (Affixes to microstrip ground plane.) UM9603 (Affixes to microstrip backing plate.)
High voltage rating version of UM9601 and UM9603 respectively for peak power handling to 3KW.	UM9602, UM9604
1. Low insertion loss switches to 4GHz. 2. Low distortion antenuator applications.	UM9605 (Affixes to microstrip ground plane.) UM9607 (Affixes to microstrip backing plate.)
High voltage version of UM9605 and UM9607 for peak power handling to 10KW.	UM9606, UM9608

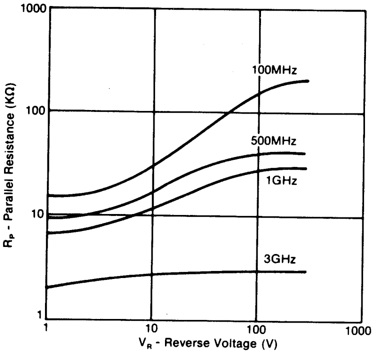
Typical Series Resistance vs Forward Current (F = 100MHz)



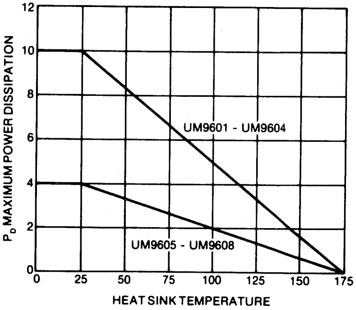
Pulse Thermal Impedance



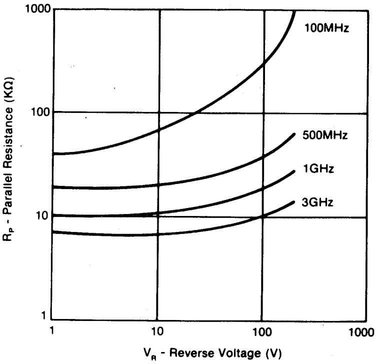
Typical R_P vs Voltage and Frequency UM9601 - UM9604



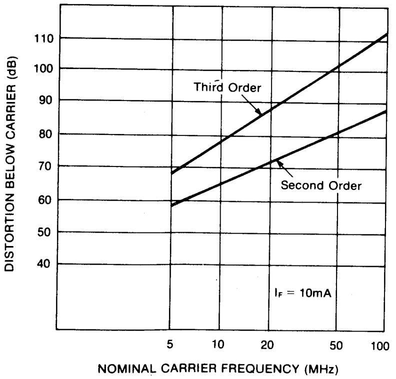
Power Rating



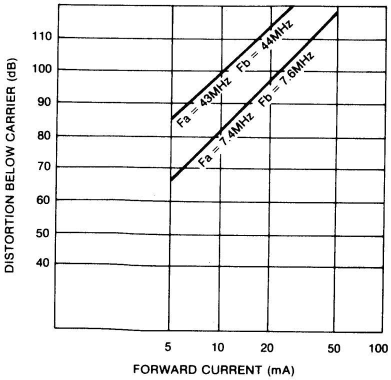
Typical R_P vs Voltage and Frequency UM9605 - UM9608



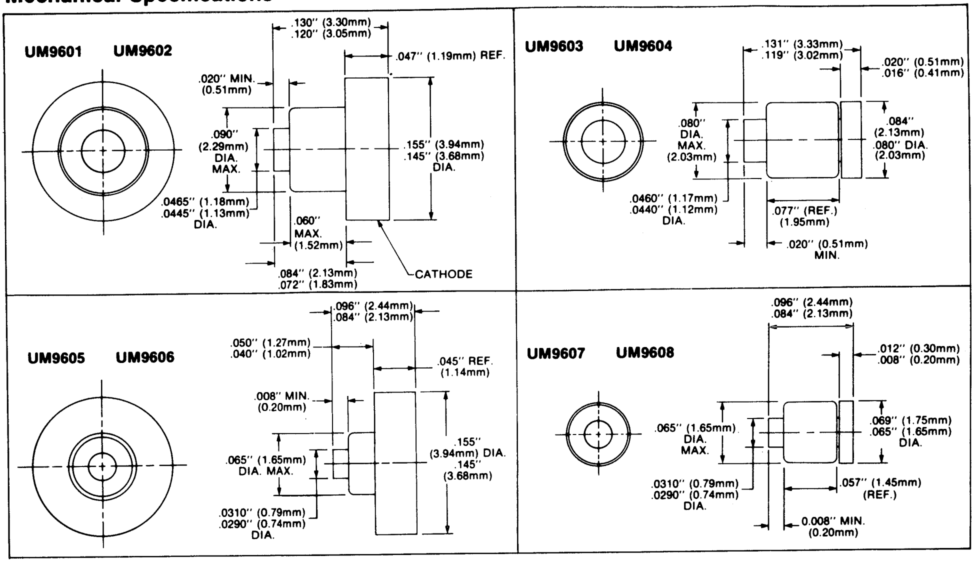
Typical Forward Bias Intermodulation Distortion vs Nominal Carrier Frequency at 20dBm per Channel



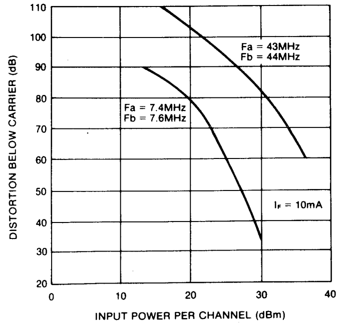
Typical Third Order Intermodulation Distortion $\left(R \frac{2ab}{a}\right)$ vs Forward Bias Current at 20dBm per Channel



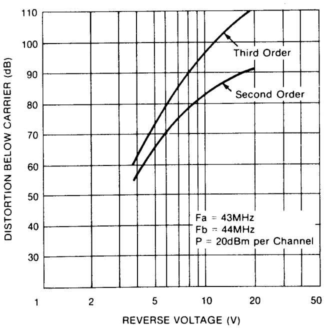
Mechanical Specifications



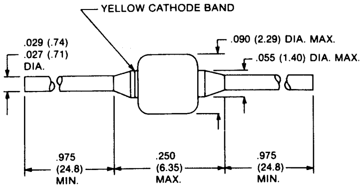
Typical Forward Bias Third Order Intermodulation Distortion $\left(R\ \frac{2ab}{a}\right)$ vs Input Power per Channel



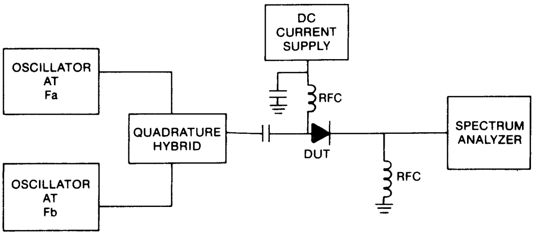
Typical Reverse Bias Intermodulation Distortion



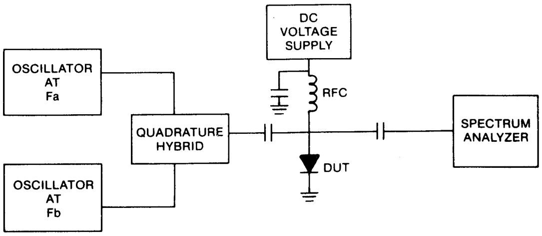
Mechanical Specifications



Forward Bias Distortion Test Set



Reverse Bias Distortion Test Set



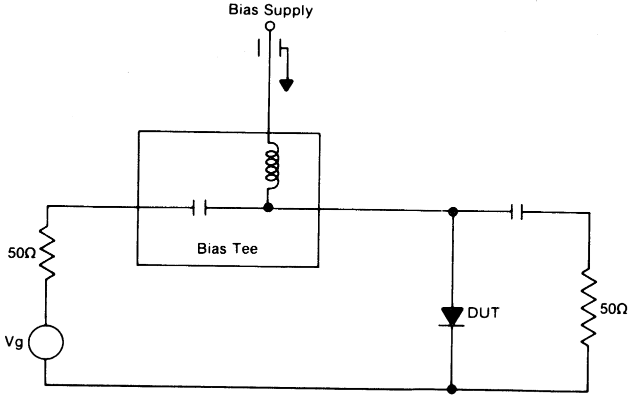
Microwave Characterization

The UM9601-UM9608 series has been designed and characterized as shunt switch elements at frequencies to 4GHz in microstrip circuits. Performance curves are given which demonstrate switch performance in 0.025″ (.635mm) alumina microstrip.

The performance data were derived by evaluating externally biased microstrip circuits in which a UM9601 diode was installed. Each circuit consisted of a 1 inch length of 50 ohm nominal impedance 0.025″ (.635mm) thick alumina microstrip and two SMA connectors. The data shown include the board and connector loss. Measurements performed using 0.050″ (1.27mm) alumina substrates show similar performance at frequencies to 1.5GHz.

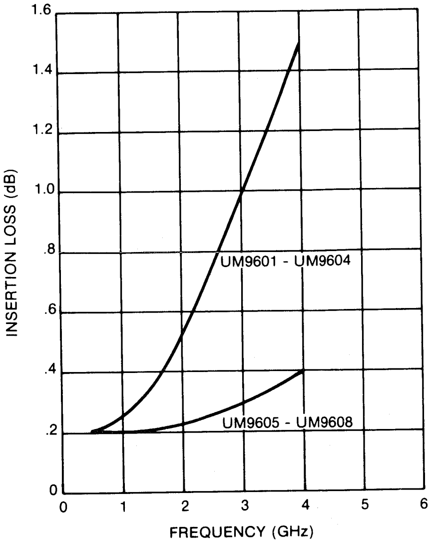
These circuits simulate simple SPST switches. Many designs require multithrow switches. It is important to recognize that a multithrow switch will have 6dB higher isolation than indicated for SPST switches. Also, a multithrow switch using shunt mounted PIN diodes require the diodes be placed a quarter-wavelength from the common port.

A further improvement in switch performance may be achieved by using 2 shunt PIN diodes in each arm spaced a quarter-wavelength from each other. In this case the isolation of each section will be twice the dB value of a SPST switch. The insertion loss due to the diodes should be less than twice the insertion loss of an SPST section due to the transforming effect of the quarter-wave line on the capacitance of a single diode.

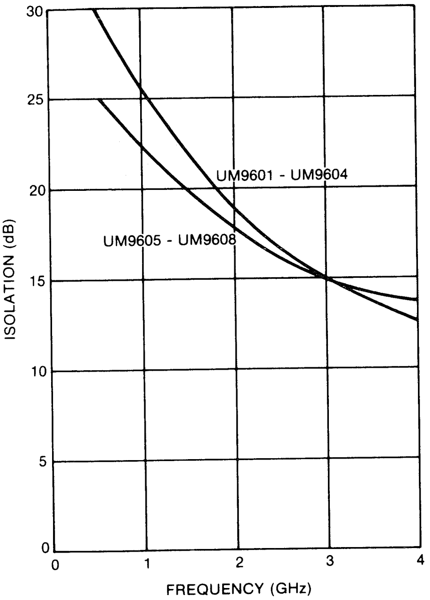


Microwave Test Circuit

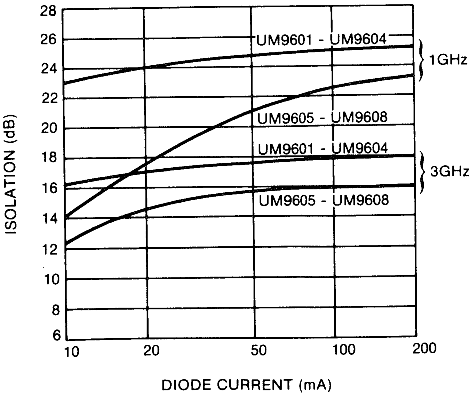
Typical Insertion Loss vs Frequency
0.025″ (0.635mm) Alumina Microstrip SPST Switch
Diode at Zero Bias



Typical Isolation vs Frequency
0.025″ (0.635mm) Alumina Microstrip SPST Switch
Diode Current = 100mA



Isolation vs Frequency and Diode Current
0.025″ (0.635mm) Alumina Microstrip SPST Switch



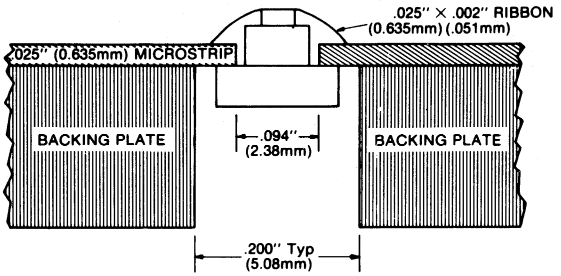
Installation in Microstrip

The cup type flange on the UM9601, UM9602, UM9605 and UM9606 is designed to be affixed to the ground plane surface of a microstrip board as shown. The UM9603, UM9604, UM9607 and UM9608 were designed to be affixed to a backing plate as shown. It was experimentally determined that at frequencies greater than 2GHz the anode of the diode should be approximately 0.010" (.254mm) above the top surface of the microstrip for lowest insertion loss.

For solder adhesion the microstrip may be heated to solder melting temperature (up to 300° C) with no damage to the diode. Conductive epoxy may also be employed. The thermal resistance of solder mounted UM9601-UM9604 in their test boards was less than 20° C/W; for the UM9605-UM9608 thermal resistance was less than 30° C/W.

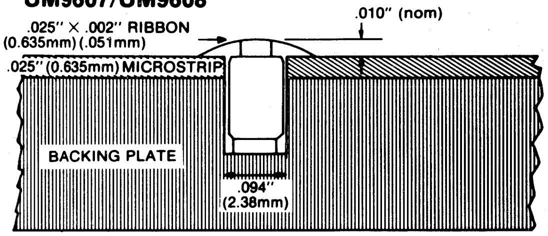
UM9601/UM9602
UM9605/UM9606

Microstrip Mount



UM9603/UM9604
UM9607/UM9608

Microstrip Mount



Design Example - 900MHz Antenna Switch

An example of a practical circuit design using a UM9601 diode is a quarter-wave antenna switch covering the frequency of 800-900MHz. The circuit design for this switch is shown and was constructed using 0.025" (0.645mm) alumina microstrip.

This antenna switch uses a series mounted diode and a shunt mounted diode. The UM9601 was selected for the shunt mounted device (SPST performance at 1GHz: 0.2dB insertion loss and 25dB isolation) and because it is the lowest cost diode in the UM9601-UM9608 series. A UM9401 axial lead diode was chosen for the series mounted device.

The performance of this switch is displayed in the graphs and in the following table. It should be noted that the loss values are actual measured numbers including losses due to the capacitors, bias networks, connectors as well as the board. In a typical radio application where the antenna switch circuit board is integrated in the same microstrip board that contains transmitter and receiver elements the connector loss is eliminated. This will result in lower overall insertion loss values than indicated here.

The CW power handling capacity is determined by the allowable power dissipation of the series mounted UM9401. Using a gap in the line of 0.190" (4.82mm) and lead soldered attached spacing of 0.250" (0.635mm) the power rating of the UM9401 is 6 watts at a 25° C ambient. This was determined by performing a thermal resistance measurement on the circuit mounted UM9401. The relationship that derives the maximum transmitter power, P_T, is:

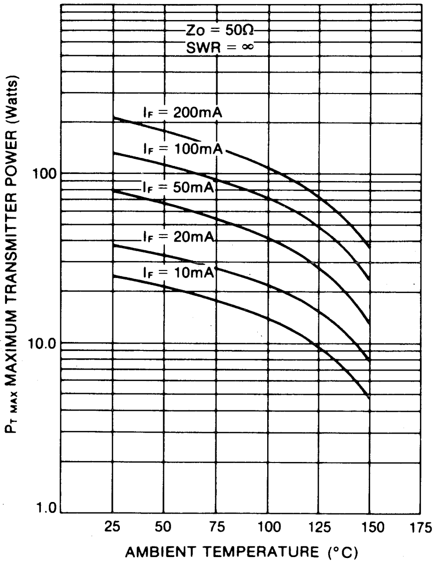
$$P_T = \frac{P_{DISS}}{R^S} \cdot Z_o \left(\frac{\sigma + 1}{2\sigma} \right)^2$$

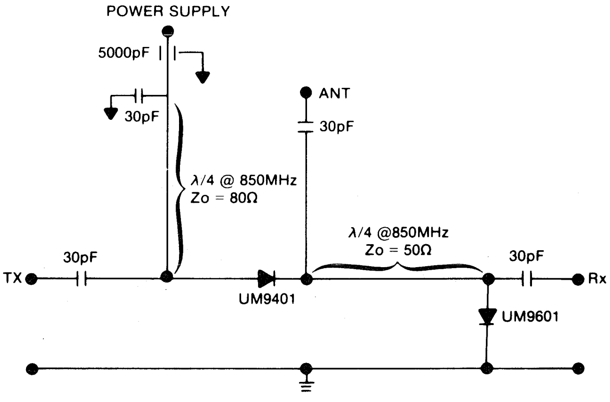
where σ = maximum antenna SWR

Using resistance values for the UM9401 and UM9601 the maximum transmitter power curve is given and shows that this circuit is able to handle 100 watts of transmitter power at 100mA forward biased and totally mismatched antenna at an ambient temperature of 60° C. For a perfectly matched antenna the power handling increases to 400 watts under the same bias and ambient temperature conditions.

Distortion is an important consideration in the selection of a PIN diode antenna switch design. The UM9401 and UM9601 PIN diodes are designed for low distortion applications. The level of distortion produced by this 900MHz antenna switch when operated in the transmit state (forward bias of 100mA) is expected to be at least 90dB below the carrier for a 50 watt transmitter level. In the receiver state (zero bias) the intermodulation distortion caused by two in-band signals at 0dBm are estimated to be at least 100dB below this level.

Maximum Transmitter Power
vs Forward Current for UM9601/UM9401
900MHz Microstrip Antenna Switch





Circuit Diagram

Antenna Switch Performance

Frequency Range 800-900MHz

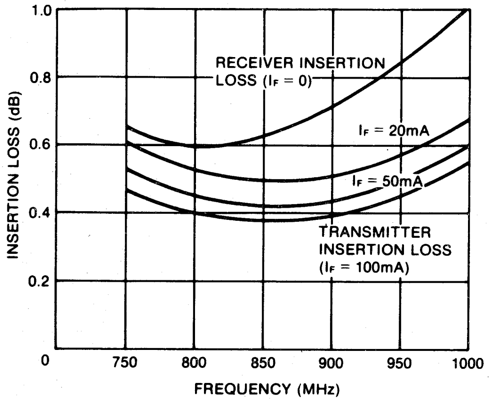
I. Transmit State
(I = 100mA, T_A = 60° C)

A. Maximum Transmitter Power - 100 watts (antenna SWR = ∞)
B. Maximum Transmitter Power - 400 watts (antenna SWR = 1)
C. Transmitter Insertion Loss - 0.4dB
D. Receiver Isolation - 31dB
E. Harmonic Distortion - −90dB (P_T = 100 watts)

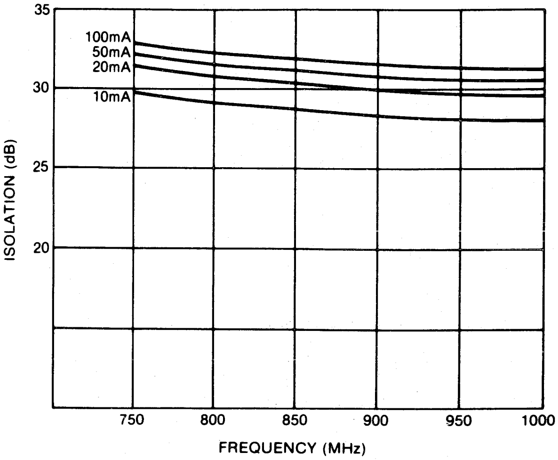
II. Receive State
(Zero Bias)

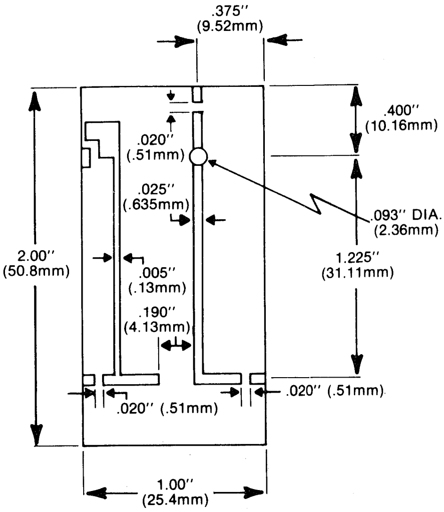
A. Receiver Insertion Loss - 0.6-0.7dB
B. Intermodulation Distortion - −100dB
P_{in} = 0dBm

Antenna Switch Insertion Loss

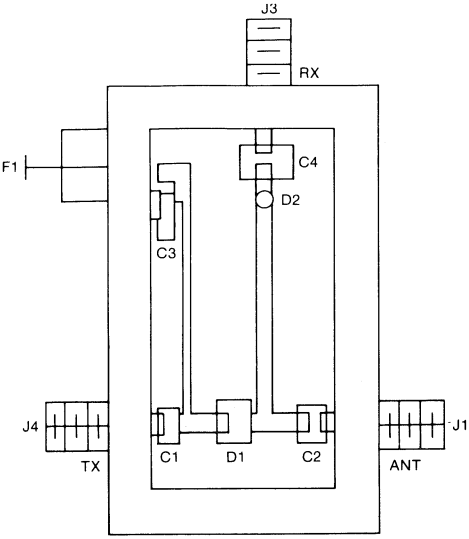


Receiver Isolation vs Frequency and Diode Current





Substrate Drawing



Assembly Drawing

Parts List

F1	5000pF Feed through Filter	Erie 1270-016
C1-C4	30pF Chip Capacitor	Vitramon VJ0805A300KF
D1	PIN Diode	Unitrode UM9401
D2	PIN Diode	Unitrode UM9601
J1-J3	SMA Connector	Cablewave 971-028
	Substrate	Vectronics Microwave 79-9081-0401

PIN DIODE

UM9701

Low Resistance, Low Distortion, RF Switching Diode

Features

- Low Forward Resistance
- High Reverse Resistance
- Specified Low Distortion
- High Voltage Capability
- Good Power Handling
- Unitrode Ruggedness and Reliability

Description

The UM9701 PIN diode was designed for low resistance at low forward bias current and low reverse bias capacitance. This unique Unitrode design results in both forward and reverse bias.

These PIN diodes are characterized for low current drain RF and microwave switch applications particularly for digital filter switch designs. The construction and geometry of these devices provide good voltage and power handling capability.

These devices are constructed using a metallurgical full face bond to both surfaces of the silicon chip. A glass enclosure houses this bond in a reliable and hermetic package. The axial leads are attached to the refractory pins and do not touch the glass enclosure.

Environmentally these, and all Unitrode PIN diodes, can withstand thermal cycling from −195° C to +300° C and exceed all military environmental specifications for shock, vibration, acceleration, and moisture resistance.

Maximum Ratings

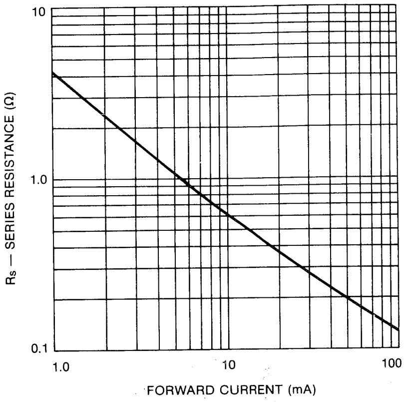
Reverse Voltage	100V
Average Power Dissipation Free Air at 25° C	500mW (Derate linearly to 175° C)
Average Power Dissipation ½" (12.7 mm) Total Lead Length to 25° C Contacts	2.5W (Derate linearly to 175° C)
Operating and Storage Temperature	−65° C to +175° C

Electrical Specifications

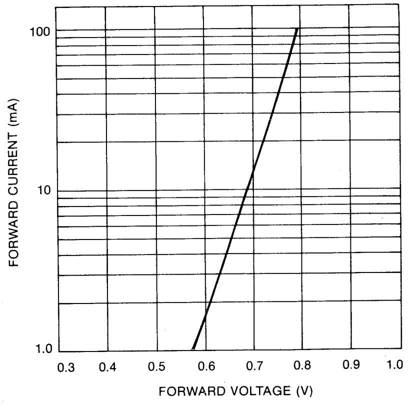
Test	Symbol	UM9701	Condition
Series Resistance (MAX)	R_S	0.8Ω	f = 100MHz, I = 10mA
Total Capacitance (MAX)	C_T	1.8pF	f = 1MHz, V = 50V
Parallel Resistance (MIN)	R_P	100kΩ	f = 100MHz, V = 50V
Carrier Lifetime (MIN)	τ	1.5μs	I = 10mA
Reverse Current (MAX)	I_R	10μA	V = 100V
Forward Voltage (MAX)	V_F	0.8V	I = 10mA
Forward Bias Third Order IM Distortion (MAX)	$R \frac{2ab}{a}$	−90dB	I = 10mA Pa = Pb = +20dBm fa = 43MHz, fb = 44MHz
Reverse Bias Third Order IM Distortion (MAX)	$R \frac{2ab}{a}$	−90dB	V = 50V Pa = Pb = +20dBm fa = 43MHz, fb = 44MHz

Microsemi Corp.
Watertown
The diode experts

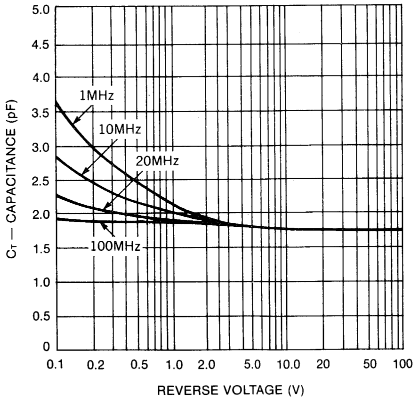
Typical Series Resistance vs Forward Current (F = 100MHz)



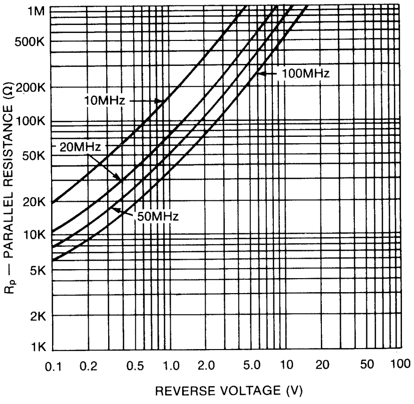
Typical DC Characteristic



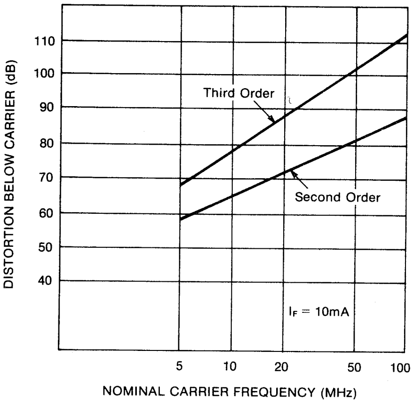
Typical Capacitance Characteristic



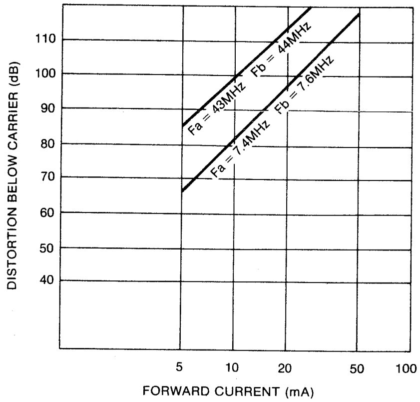
Typical Parallel Resistance Characteristic



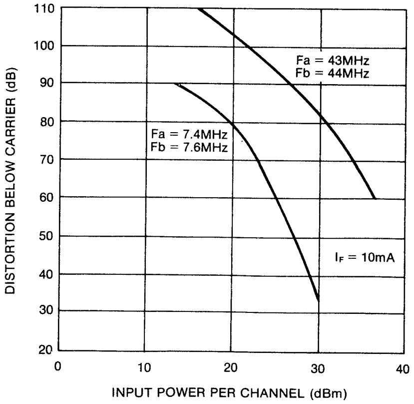
Typical Forward Bias Intermodulation Distortion vs Nominal Carrier Frequency at 20dBm per Channel



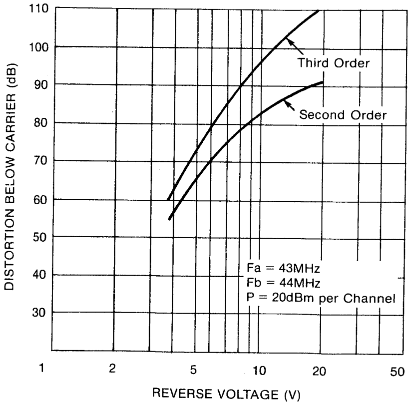
Typical Third Order Intermodulation Distortion $\left(R\ \frac{2ab}{a}\right)$ vs Forward Bias Current at 20dBm per Channel



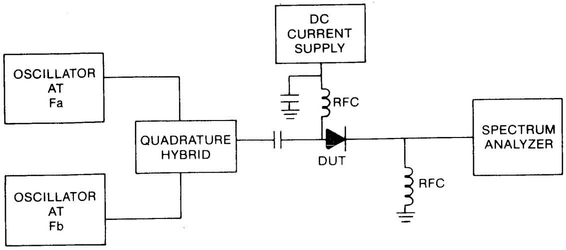
Typical Forward Bias Third Order Intermodulation Distortion $\left(R\ \frac{2ab}{a}\right)$ vs Input Power per Channel



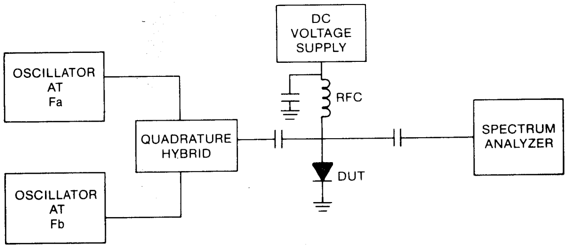
Typical Reverse Bias Intermodulation Distortion



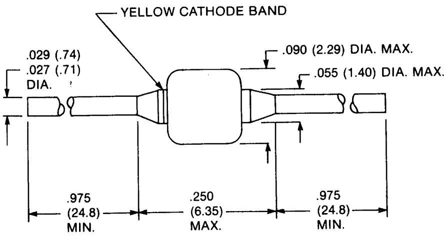
Forward Bias Distortion Test Set



Reverse Bias Distortion Test Set



Mechanical Specifications



POWER HYBRIDS 7

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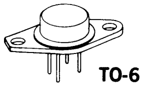
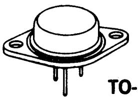
Datasheets 7-4

POWER HYBRIDS



TO-66



TO-3

Type	Output Current, Pk.	Input/Output Voltage	Polarity	Fall Time		On-State Voltage (V) @ (A)	Pkg.
				Volt. (ns)	Cur. (ns)		
PIC600 PIC601 PIC602 PIC610 PIC611 PIC612	5A	60 80 100 60 80 100	Pos. Pos. Pos. Neg. Neg. Neg.	75	150	1.5 @ 2	**4 PIN TO-66 (Isolated)**
PIC660 PIC661 PIC662 PIC670 PIC671 PIC672	10A	60 80 100 60 80 100	Pos. Pos. Pos. Neg. Neg. Neg.	150 250	250 250	1.5 @ 5	**4 PIN TO-66 (Isolated)**
PIC625 PIC626 PIC627 PIC635 PIC636 PIC637	15A	60 80 100 60 80 100	Pos. Pos. Pos. Neg. Neg. Neg.	175 300	300 300	1.5 @ 7	**4 PIN TO-66 (Isolated)**
PIC645 PIC646 PIC647 PIC655 PIC656 PIC657	20A	60 80 100 60 80 100	Pos. Pos. Pos. Neg. Neg. Neg.	150 300	300 300	1.5 @ 7	**3 PIN TO-3**

HI-REL PICS

Unitrode offers as standard parts, high reliability versions of the PIC600 series power hybrid circuit screened to Unitrode specifications UL101/102. Listed below is a part number cross reference.

Basic Device	Test Specification	Test Level T1	Test Level T2
PIC600-602	UL101	PIC7501-7503	PIC7519-7521
PIC610-612	UL101	PIC7504-7506	PIC7522-7524
PIC625-627	UL101	PIC7507-7509	PIC7525-7527
PIC635-637	UL101	PIC7510-7512	PIC7528-7530
PIC645-647	UL102	PIC7513-7515	PIC7531-7533
PIC655-657	UL102	PIC7516-7518	PIC7534-7536
PIC660-661	UL101	PIC7555-7557	PIC7561-7563
PIC670-672	UL101	PIC7558-7560	PIC7564-7566

Each PIC75XX device is 100% screened to the following requirements per specification UL101/102.

UL101/102 SCREENING TABLE

1. Hermetic Seal Test — Fine Leak
2. Hermetic Seal Test — Gross Leak
3. High Temperature Storage
4. Temperature Cycling
5. Reverse Bias Clamped Inductive Test
6. High Temperature Reverse Bias
7. Power Burn-In

Test level T1 provides "attributes" data (GO/NO-GO testing after high temperature reverse bias and power burn-in) with shipment.

Test level T2 provides "variables" data (read and record data with delta criteria before and after high temperature reverse bias and power burn-in) with shipment.

A Group A sample test of mechanical, electrical and switching speed specifications is performed on each lot.

A Certificate of Compliance is provided with each shipment.

POWER INTEGRATED CIRCUIT

Switching Regulator 5 Amp Positive and Negative Power Output Stages

PIC600
PIC601
PIC602
PIC610
PIC611
PIC612

FEATURES

- Designed and characterized for switching regulator applications
- Cost saving design reduces size, improves efficiency, reduces noise and RFI (See note 4.)
- High operating frequency (to > 100kHz) results in smaller inductor-capacitor filter and improved power supply response time
- High operating efficiency: Typical 2A circuit performance —
  Rise and Fall time <75ns
  Efficiency >85%
- No reverse recovery spike generated by commutating diode (See note 4. and Fig. 2.)
- Electrically isolated, 4-Pin, TO-66 hermetic case (500V, 1μA, all leads common)

DESCRIPTION

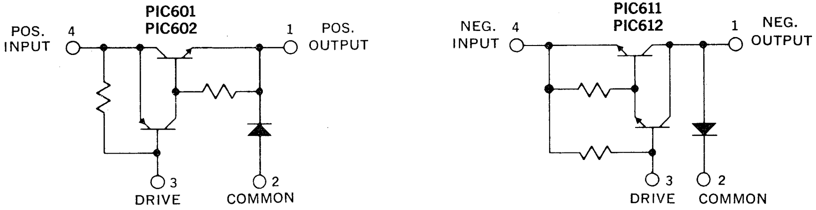
The Unitrode ESP Switching Regulator is a unique hybrid transistor circuit, specifically designed, constructed and specified for use in high current switching regulator applications. The designer is thus relieved of one of the most time consuming, tedious and critical aspects of switching regulator design: choosing the appropriate switching transistors and commutating diode, and empirically determining the optimum drive and bias conditions.

Switching regulators, when compared to conventional regulators, result in significant reductions in size, weight, and internal power losses and a major decrease in overall cost. Using the Unitrode PIC600 series, the designer can achieve further improvements in size, weight, efficiency, and costs. At the same time, because of the PIC600 series design and packaging, the designer is aided in overcoming two of the most significant drawbacks to switching regulators: noise generation and slow response time; there is, in fact, no diode reverse recovery spike (see note 4.).

The PIC600 series switching regulators are designed and characterized to be driven with standard integrated circuit voltage regulators. They are completely characterized over their entire operating range of —55°C to +125°C. The devices are enclosed in a special 4-pin TO-66 package, hermetically sealed for high reliability. The hybrid circuit construction utilizes thick film resistors on a beryllia substrate for maximum thermal conductivity and resultant low thermal impedance. All of the active elements in the hybrid are fully passivated.

Application Notes U-68 and U-76 provide a detailed description of the hybrid circuit and design guidance for specific circuit applications.

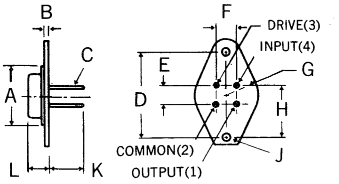
SCHEMATIC



MECHANICAL SPECIFICATIONS

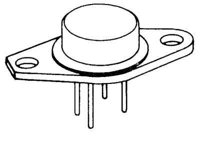
PIC600 PIC601 PIC602 PIC610 PIC611 PIC612

NOTES:
1. Case is electrically isolated.
2. Loads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.



	ins.	mm
A	.620 MAX.	15.75 MAX.
B	.050-.075	1.27-1.91
C	.028-.034	0.71-0.86
D	.958-.962	24.33-24.43
E	.190-.210	4.83-5.33
F	.190-.210	4.83-5.33
G	.350 MAX. RAD.	8.89 MAX. RAD.
H	.570-.590	14.48-14.99
J	.142-.152 DIA.	3.61-3.86 DIA.
K	.360 MIN.	9.14 MIN.
L	.250-.340	6.35-8.64

4-Pin TO-66



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ABSOLUTE MAXIMUM RATINGS

	PIC600	PIC601	PIC602	PIC610	PIC611	PIC612
Input Voltage, V_{4-2}	60V	80V	100V	—60V	—80V	—100V
Output Voltage, V_{1-2}	60V	80V	100V	—60V	—80V	—100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	—5V	—5V	—5V
Output Current, I_1	5A	5A	5A	—5A	—5A	—5A
Drive Current, I_3	—0.2A	—0.2A	—0.2A	0.2A	0.2A	0.2A

Thermal Resistance

Junction to Case, θ_{J-C}

Power Switch .... 4.0°C/W

Commutating Diode .... 4.0°C/W

Case to Ambient, θ_{C-A} .... 60.0°C/W

Operating Temperature Range, T_C .... —55°C to +125°C

Maximum Junction Temperature, T_j .... +150°C

Storage Temperature Range .... —65°C to +150°C

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	PIC600, 601, 602			PIC610, 611, 612			Units	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Current Delay Time	t_{di}	—	20	40	—	20	40	ns	V_{in} = 25V(—25V)
Current Rise Time	t_{ri}	—	50	75	—	50	75	ns	V_{out} = 5V(—5V)
Voltage Rise Time	t_{rv}	—	30	50	—	30	50	ns	I_{out} = 2A(—2A)
Voltage Storage Time	t_{sv}	—	700	—	—	700	—	ns	I_3 = —20mA(20mA) NOTE 5
Voltage Fall Time	t_{fv}	—	50	75	—	50	75	ns	See Figure 2.
Current Fall Time	t_{fi}	—	70	150	—	70	150	ns	See notes 1., 2., 4.
Efficiency (Notes 2. & 4.)	η	—	85	—	—	85	—	%	
On-State Voltage (Note 3.)	$V_{4-1(on)}$	—	1.0	1.5	—	—1.0	—1.5	V	I_4 = 2A(—2A), I_3 = —.02A(.02A) NOTE 5
On-State Voltage (Note 3.)	$V_{4-1(on)}$	—	2.5	3.5	—	—2.5	—3.5	V	I_4 = 5A(—5A), I_3 = —.02A(.02A) NOTE 5
Diode Forward Voltage (Note 3.)	$V_{2-1(on)}$	—	.8	1.0	—	—.8	—1.0	V	I_2 = 2A(—2A)
Diode Forward Voltage (Note 3.)	$V_{2-1(on)}$	—	1.0	1.5	—	—1.0	—1.5	V	I_2 = 5A(—5A)
Off-State Current	I_{4-1}	—	0.1	10	—	—0.1	—10	μA	V_4 = Rated input voltage
Off-State Current	I_{4-1}	—	10	—	—	—10	—	μA	V_4 = Rated input voltage, T_A = 100°C
Diode Reverse Current	I_{1-2}	—	1.0	10	—	—1.0	—10	μA	V_1 = Rated output voltage
Diode Reverse Current	I_{1-2}	—	500	—	—	500	—	μA	V_1 = Rated output voltage, T_A = 100°C

NOTES:

1. In switching an inductive load, the current will lead the voltage on turn on and lag the voltage on turn-off (see Figure 2.). Therefore, Voltage Delay Time (t_{DV}) $\cong t_{di} + t_{ri}$ and Current Storage Time (t_{si}) $\cong t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1., in which the efficiency is measured, is representative of typical operating conditions for the PIC600 switching regulators.
3. Pulse test: Duration = 300μs, Duty Cycle ≤ 2%.
4. As can be seen from the switching waveforms shown in Figure 2., no reverse of forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliabilty, since the power switch only carries current during turn-on.
5. To insure safe operation I_3 should be $\geq |20mA|$ during T_{ON}. Operation at $I_3 < |20mA|$ can permanently damage device.

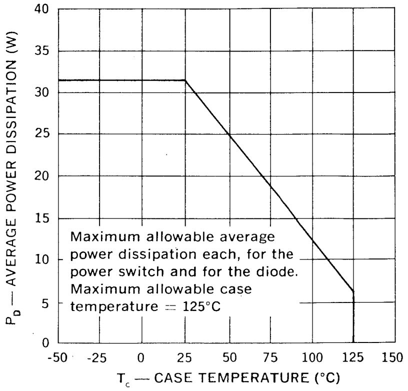
POWER DISSIPATION CONSIDERATIONS

The total power losses in the switching regulator is the sum of the switching losses, and the power switch and diode D.C. losses. Once total power dissipation has been determined, the Power Dissipation curve, or thermal resistance data may be used to determine the allowable case or ambient temperature for any operating condition.

The switching losses curve presents data for a frequency of 20KHz. To find losses at any other frequency, multiply by f/20KHz.
The D.C. losses curve presents data for a duty cycle of .2. To find D.C. losses at any other duty cycle, multiply by D/.2 for the power switch and by (1-D)/.8 for the diode.

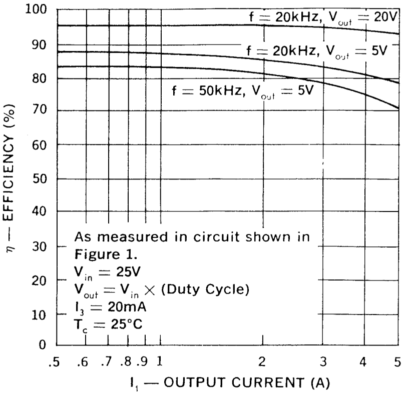
At frequencies much below 10KHz the above method for determining the allowable case or ambient temperature becomes invalid and a detailed transient thermal analysis must be performed. Please see Design Note 6 (DN-6) for further information.

Power Dissipation



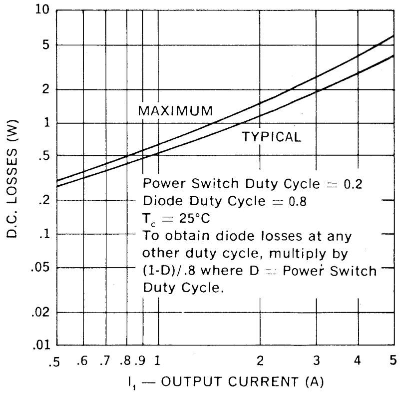
Maximum allowable average power dissipation each, for the power switch and for the diode. Maximum allowable case temperature = 125°C

Efficiency



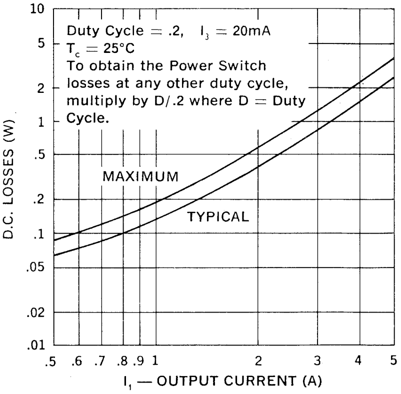
As measured in circuit shown in Figure 1.
V_{in} = 25V
$V_{out} = V_{in} \times$ (Duty Cycle)
I_3 = 20mA
T_c = 25°C

Diode D.C. Losses



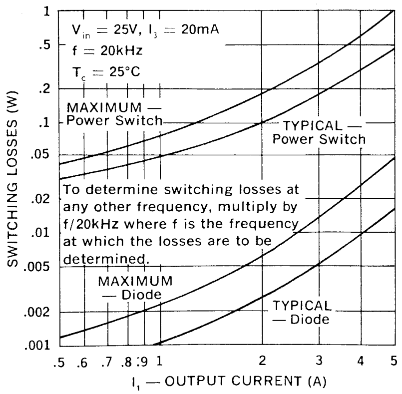
Power Switch Duty Cycle = 0.2
Diode Duty Cycle = 0.8
T_c = 25°C
To obtain diode losses at any other duty cycle, multiply by (1-D)/.8 where D = Power Switch Duty Cycle.

Power Switch D.C. Losses



Duty Cycle = .2, I_3 = 20mA
T_c = 25°C
To obtain the Power Switch losses at any other duty cycle, multiply by D/.2 where D = Duty Cycle.

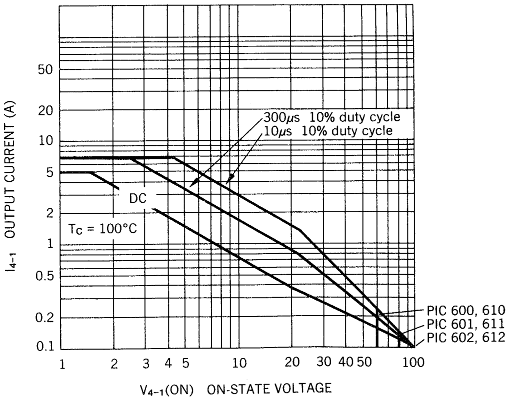
Switching Losses



V_{in} = 25V, I_3 = 20mA
f = 20kHz
T_c = 25°C

To determine switching losses at any other frequency, multiply by f/20kHz where f is the frequency at which the losses are to be determined.

Maximum Safe Operating Area
PIC 600, 601, 602-610, 611, 612



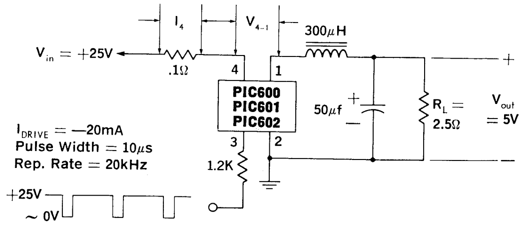


Figure 1. PIC600, 601, 602 Switching Speed Circuit

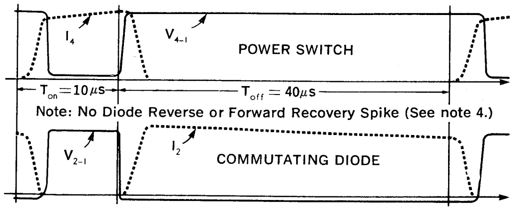
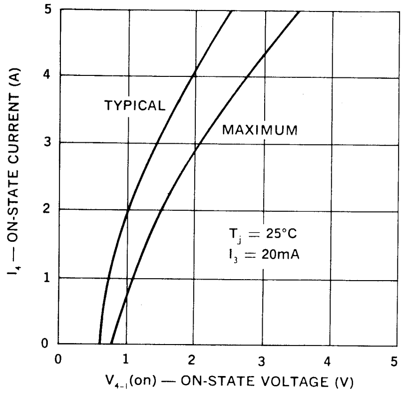


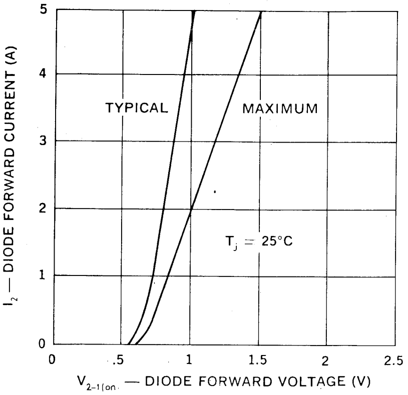
Figure 2. PIC600, PIC601, PIC602 Switching Waveforms

Note: PIC610, PIC611, PIC612 Test Circuit and waveforms are identical but of opposite polarity ($V_{in} = -25V$, $V_{out} = -5V$, $I_{DRIVE} = +20mA$).

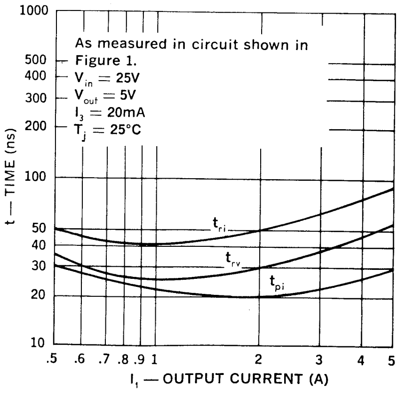
On-State Characteristics



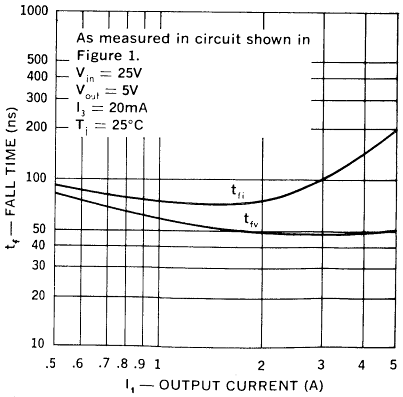
Diode Forward Characteristics



Turn-On Time



Fall Time



POWER INTEGRATED CIRCUIT

Switching Regulator 15 Amp Positive and Negative Power Output Stages

PIC625
PIC626
PIC627
PIC635
PIC636
PIC637

FEATURES

- Designed and characterized for switching regulator applications
- Cost saving design reduces size, improves efficiency, reduces noise and RFI (See note 4.)
- High operating frequency (to >100kHz) results in smaller inductor-capacitor filter and improved power supply response time
- High operating efficiency: Typical 7A circuit performance —
  Rise and Fall time <300 ns
  Efficiency >85%
- No reverse recovery spike generated by commutating diode (See note 4. and Fig. 2.)
- Electrically isolated, 4-Pin, TO66 hermetic case (500V, 1μA, all leads common)

DESCRIPTION

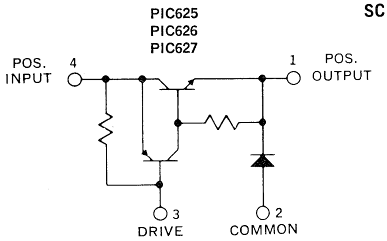
The Unitrode ESP Switching Regulator is a unique hybrid transistor circuit, specifically designed, constructed and specified for use in high current switching regulator applications. The designer is thus relieved of one of the most time consuming, tedious and critical aspects of switching regulator design: choosing the appropriate switching transistors and commutating diode, and empirically determining the optimum drive and bias conditions.

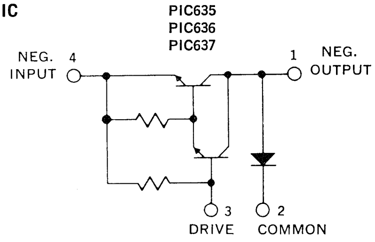
Switching regulators, when compared to conventional regulators, result in significant reductions in size, weight, and internal power losses and a major decrease in overall cost. Using the Unitrode PIC600 series the designer can achieve further improvements in size, weight, efficiency, and costs. At the same time, because of the PIC600 series design and packaging, the designer is aided in overcoming two of the most significant drawbacks to switching regulators: noise generation and slow response time; there is, in fact, no diode reverse recovery spike (See note 4.).

The PIC600 series switching regulators are designed and characterized to be driven wih standard integrated circuit voltage regulators. They are completely characterized over their entire operating range of −55°C to +125°C. The devices are enclosed in a special 4-pin TO66 package, hermetically sealed for high reliability. The hybrid circuit construction utilizes thick film resistors on a beryllia substrate for maximum thermal conductivity and resultant low thermal impedance. All of the active elements in the hybrid are fully passivated.

Application Notes U-68 and U-76 provide a detailed description of the hybrid circuit and design guidance for specific circuit applications.

SCHEMATIC

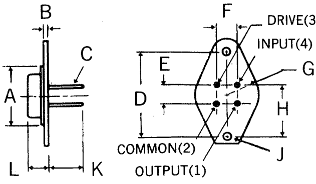




MECHANICAL SPECIFICATIONS

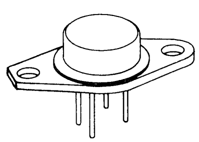
PIC625 PIC626 PIC627 PIC635 PIC636 PIC637

NOTES:
1. Case is electrically isolated.
2. Loads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.



	ins.	mm
A	.620 MAX.	15.75 MAX.
B	.050-.075	1.27-1.91
C	.028-.034	0.71-0.86
D	.958-.962	24.33-24.43
E	.190-.210	4.83-5.33
F	.190-.210	4.83-5.33
G	.350 MAX. RAD.	8.89 MAX. RAD.
H	.570-.590	14.48-14.99
J	.142-.152 DIA.	3.61-3.86 DIA.
K	.360 MIN.	9.14 MIN.
L	.250-.340	6.35-8.64

4-Pin TO-66



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ABSOLUTE MAXIMUM RATINGS

	PIC625	PIC626	PIC627	PIC635	PIC636	PIC637
Input Voltage, V_{4-2}	60V	80V	100V	—60V	—80V	—100V
Output Voltage, V_{1-2}	60V	80V	100V	—60V	—80V	—100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	—5V	—5V	—5A
Output Current, I_1	15A	15A	15A	—15A	—15A	—15A
Drive Current, I_3	—0.4A	—0.4A	—0.4A	0.4A	0.4A	0.4A

Thermal Resistance	
Junction to Case, θ_{J-C}	
Power Switch	4.0°C/W
Commutating Diode	4.0°C/W
Case to Ambient, θ_{C-A}	60.0°C/W
Operating Temperature Range, T_C	—55°C to +125°C
Maximum Junction Temperature, T_j	+150°C
Storage Temperature Range	—65°C to +150°C

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	PIC625/626/627			PIC635/636/637			Units	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Current Delay Time	t_{di}	—	35	60	—	35	60	ns	$V_{in} = 25V(—25V)$
Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	$V_{out} = 5V(—5V)$
Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	$I_{out} = 7A(—7A)$
Voltage Storage Time	t_{sv}	—	900	—	—	900	—	ns	$I_3 = —30mA(30mA)$ NOTE 5
Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 2
Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See notes 1, 2, 4
Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	1.0	1.5	—	—1.0	—1.5	V	$I_4 = 7A(—7A)$, $I_3 = —.03A(.03A)$ NOTE 5
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	2.5	3.5	—	—2.5	—3.5	V	$I_4 = 15A(—15A)$, $I_3 = —.03A(.03A)$ NOTE 5
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.85	1.25	—	—.85	—1.25	V	$I_2 = 7A(—7A)$
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.95	1.75	—	—.95	—1.75	V	$I_2 = 15A(—15A)$
Off-State Current	I_{4-1}	—	0.1	10	—	—0.1	—10	µA	V_4 = Rated input voltage
Off-State Current	I_{4-1}	—	10	—	—	—10	—	µA	V_4 = Rated input voltage, $T_A = 100°C$
Diode Reverse Current	I_{1-2}	—	1.0	10	—	—1.0	—10	µA	V_1 = Rated output voltage
Diode Reverse Current	I_{1-2}	—	500	—	—	500	—	µA	V_1 = Rated output voltage, $T_A = 100°C$

NOTES:

1. In switching an inductive load, the current will lead the voltage on turn-on and lag the voltage on turn-off (see Figure 2). Therefore, Voltage Delay Time (t_{DV}) $\cong t_{di} + t_{ri}$ and Current Storage Time (t_{si}) $\cong t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1, in which the efficiency is measured, is representative of typical operating conditions for the PIC600 series switching regulators.
3. Pulse test: Duration = 300µs, Duty Cycle ≤ 2%.
4. As can be seen from the switching waveforms shown in Figure 2, no reverse of forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliability, since the power switch only carries current during turn-on.
5. To insure safe operation I_3 should be $\geq |30mA|$ during T_{ON}. Operation at $I_3 < |30mA|$ can permanently damage device.

POWER DISSIPATION CONSIDERATIONS

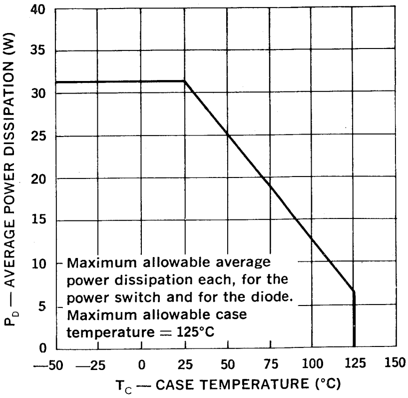
The total power losses in the switching regulator is the sum of the switching losses, and the power switch and diode D.C. losses. Once total power dissipation has been determined, the Power Dissipation curve, or thermal resistance data may be used to determine the allowable case or ambient temperature for any operating condition.

The switching losses curve presents data for a frequency of 20KHz. To find losses at any other frequency, multiply by f/20KHz.

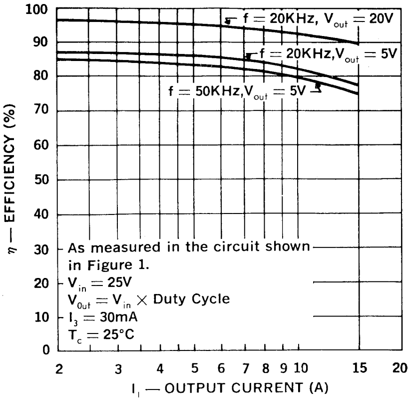
The D.C. losses curve presents data for a duty cycle of .2. To find D.C. losses at any other duty cycle, multiply by D/.2 for the power switch and by (1-D)/.8 for the diode.

At frequencies much below 10KHz the above method for determining the allowable case or ambient temperature becomes invalid and a detailed transient thermal analysis must be performed. Please see Design Note 6 (DN-6) for further information.

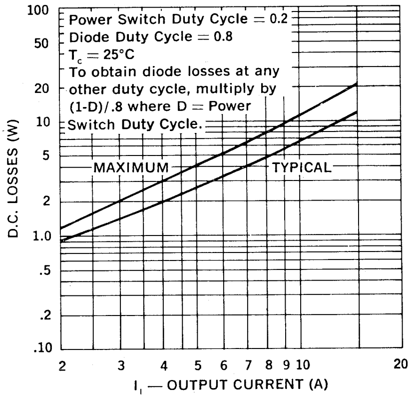
Power Dissipation



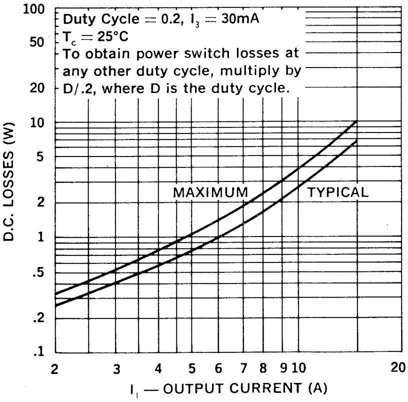
Efficiency



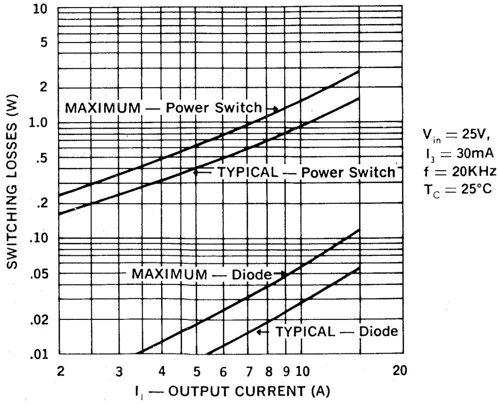
Diode D.C. Losses



Power Switch D.C. Losses

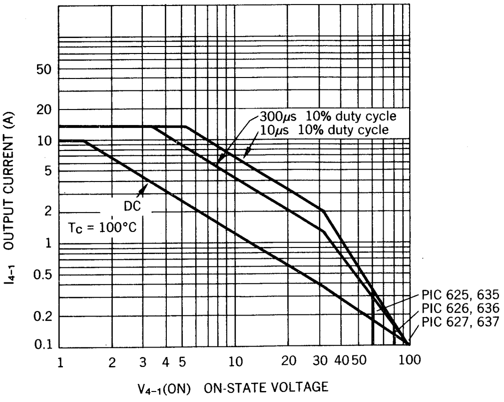


Switching Losses



To determine switching losses at any other frequency, multiply by f/20KHz where f is the frequency at which the losses are to be determined.

Maximum Safe Operating Area
PIC 625, 626, 627-635, 636, 637



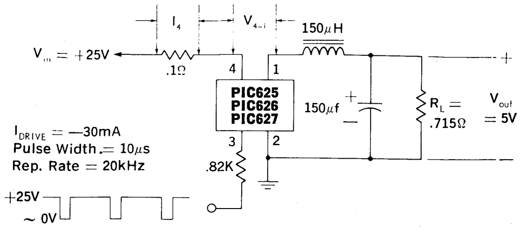


Figure 1. PIC625, 626, 627 Switching Speed Circuit

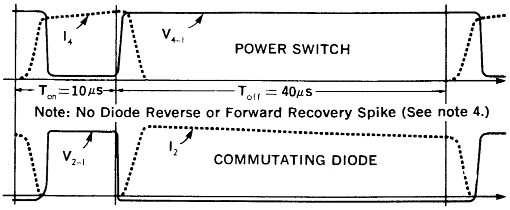
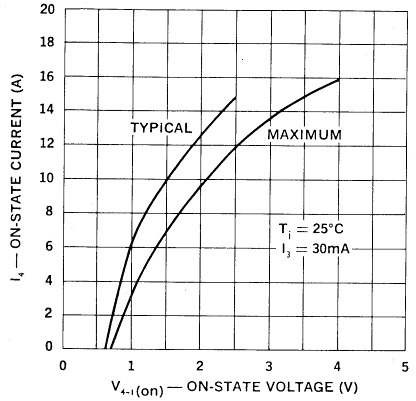


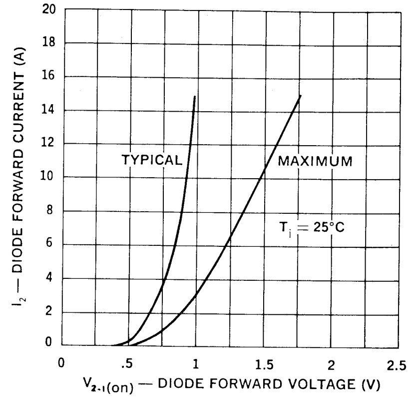
Figure 2. PIC625, 626, 627 Switching Waveforms

Note: PIC635, PIC636, PIC637 Circuit and waveforms are identical but of opposite polarity ($V_{in} = -25V$, $V_{out} = -5V$, $I_{DRIVE} = +30mA$.)

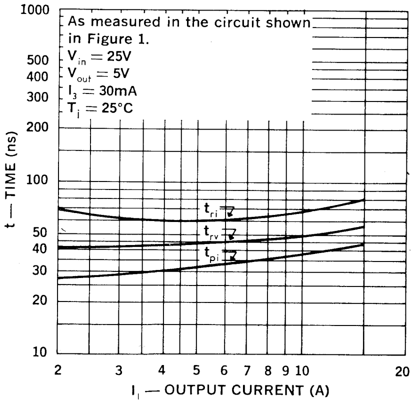
On-State Characteristics



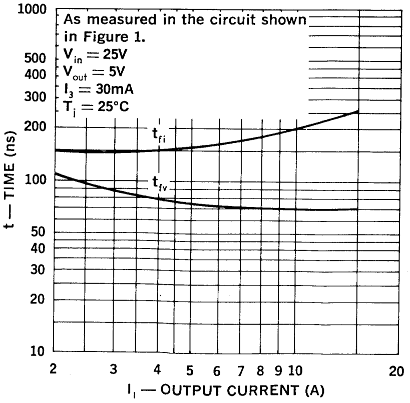
Diode Forward Characteristics



Turn-on Time



Fall Time



POWER INTEGRATED CIRCUIT

Switching Regulator 15 Amp Positive and Negative Power Output Stages

PIC645
PIC646
PIC647
PIC655
PIC656
PIC657

FEATURES

- Designed and characterized for switching regulator applications
- Cost saving design reduces size, improves efficiency, reduces noise and RFI (See note 4.)
- High operating frequency (to >100kHz) results in smaller inductor-capacitor filter and improved power supply response time
- High operating efficiency: Typical 7A circuit performance —
  Rise and Fall time <300 ns
  Efficiency >85%
- No reverse recovery spike generated by commutating diode (See note 4. and Fig. 2.)

DESCRIPTION

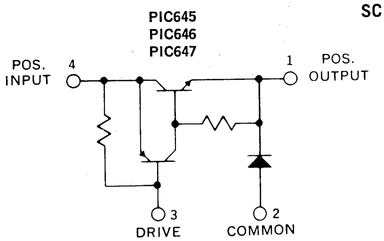
The Unitrode ESP Switching Regulator is a unique hybrid transistor circuit, specifically designed, constructed and specified for use in high current switching regulator applications. The designer is thus relieved of one of the most time consuming, tedious and critical aspects of switching regulator design: choosing the appropriate switching transistors and commutating diode, and empirically determining the optimum drive and bias conditions.

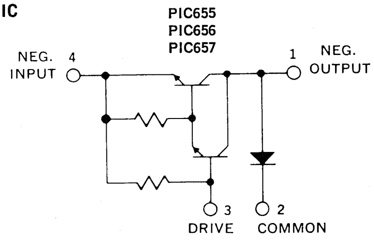
Switching regulators, when compared to conventional regulators, result in significant reductions in size, weight, and internal power losses and a major decrease in overall cost. Using the Unitrode PIC600 series the designer can achieve further improvements in size, weight, efficiency, and costs. At the same time, because of the PIC600 series design and packaging, the designer is aided in overcoming two of the most significant drawbacks to switching regulators: noise generation and slow response time; there is, in fact, no diode reverse recovery spike (See note 4.).

The PIC600 series switching regulators are designed and characterized to be driven with standard integrated circuit voltage regulators. They are completely characterized over their entire operating range of −55°C to +125°C. The devices are enclosed in a special 3 pin TO-3 package, hermetically sealed for high reliability. The hybrid circuit construction utilizes thick film resistors on a beryllia substrate for maximum thermal conductivity and resultant low thermal impedance. All of the active elements in the hybrid are fully passivated.

Application Notes U-68 and U-76 provide a detailed description of the hybrid circuit and design guidance for specific circuit applications.

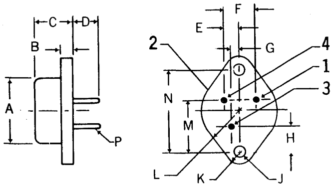
SCHEMATIC





MECHANICAL SPECIFICATIONS

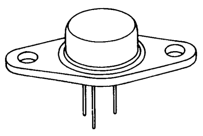
PIC645 PIC646 PIC647 PIC655 PIC656 PIC657



NOTE:
Loads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.

	ins.	mm
A	.875 MAX.	22.23 MAX.
B	.135	3.43
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.205-.225	5.21-5.72
F	.420-.440	10.67-11.18
G	.145-.165	3.68-4.19
H	.395-.405	10.03-10.29
J	.151-.161 DIA.	3.84-4.09 DIA.
K	.188 MAX. RAD.	4.78 MAX. RAD.
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.708-.728	17.98-18.49
N	1.177-1.197	29.90-30.40
P	.038-.043 DIA.	.97-1.09 DIA.

3 Pin TO-3



ABSOLUTE MAXIMUM RATINGS

	PIC645	PIC646	PIC647	PIC655	PIC656	PIC657
Input Voltage, V_{4-2}	60V	80V	100V	—60V	—80V	—100V
Output Voltage, V_{1-2}	60V	80V	100V	—60V	—80V	—100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	—5V	—5V	—5V
Continuous Output Current, I_1	15A	15A	15A	—15A	—15A	—15A
Peak Output Current	20A	20A	20A	—20A	—20A	—20A
Drive Current, I_3	—0.4A	—0.4A	—0.4A	0.4A	0.4A	0.4A

Thermal Resistance

Junction to Case, θ_{J-C}

Power Switch .... 2°C/W

Commutating Diode .... 2°C/W

Case to Ambient, θ_{C-A} .... 30.0°C/W

Operating Temperature Range, T_C .... —55°C to +125°C

Maximum Junction Temperature, T_j .... +150°C

Storage Temperature Range .... —65°C to +150°C

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	PIC645/646/647			PIC655/656/657			Units	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Current Delay Time	t_{di}	—	35	60	—	35	60	ns	$V_{in} = 25V(-25V)$
Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	$V_{out} = 5V(-5V)$
Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	$I_{out} = 7A(-7A)$
Voltage Storage Time	t_{sv}	—	900	—	—	900	—	ns	$I_3 = -30mA(30mA)$ NOTE 5
Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 2
Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See notes 1, 2, 4
Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	1.0	1.5	—	—1.0	—1.5	V	$I_4 = 7A(-7A)$, $I_3 = -.03A(.03A)$ NOTE 5
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	2.5	3.5	—	—2.5	—3.5	V	$I_4 = 15A(-15A)$, $I_3 = -.03A(.03A)$ NOTE 5
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.85	1.25	—	—.85	—1.25	V	$I_2 = 7A(-7A)$
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.95	1.75	—	—.95	—1.75	V	$I_2 = 15A(-15A)$
Off-State Current	I_{4-1}	—	0.1	10	—	—0.1	—10	µA	V_4 = Rated input voltage
Off-State Current	I_{4-1}	—	10	—	—	—10	—	µA	V_4 = Rated input voltage, $T_A = 100°C$
Diode Reverse Current	I_{1-2}	—	1.0	10	—	—1.0	—10	µA	V_1 = Rated output voltage
Diode Reverse Current	I_{1-2}	—	500	—	—	500	—	µA	V_1 = Rated output voltage, $T_A = 100°C$

NOTES:

1. In switching an inductive load, the current will lead the voltage on turn-on and lag the voltage on turn-off (see Figure 2). Therefore, Voltage Delay Time (t_{DV}) ≅ $t_{di} + t_{ri}$ and Current Storage Time (t_{si}) ≅ $t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1, in which the efficiency is measured, is representative of typical operating conditions for the PIC600 series switching regulators.
3. Pulse test: Duration = 300µs, Duty Cycle ≤ 2%.
4. As can be seen from the switching waveforms shown in Figure 2, no reverse of forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliability, since the power switch only carries current during turn-on.
5. To insure safe operation I_3 should be ≥|30mA| during T_{ON}. Operation at I_3 <|30mA| can permanently damage device.

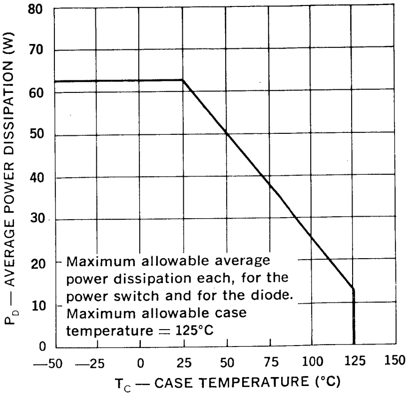
POWER DISSIPATION CONSIDERATIONS

The total power losses in the switching regulator is the sum of the switching losses, and the power switch and diode D.C. losses. Once total power dissipation has been determined, the Power Dissipation curve, or thermal resistance data may be used to determine the allowable case or ambient temperature for any operating condition.

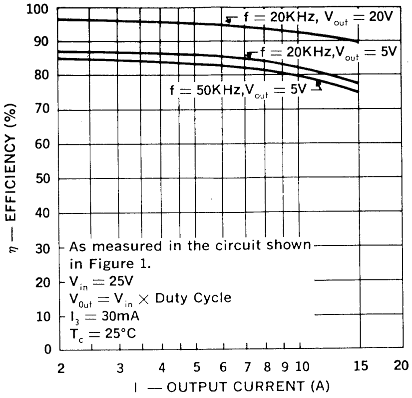
The switching losses curve presents data for a frequency of 20KHz. To find losses at any other frequency, multiply by f/20KHz.
The D.C. losses curve presents data for a duty cycle of .2. To find D.C. losses at any other duty cycle, multiply by D/.2 for the power switch and by (1-D)/.8 for the diode.

At frequencies much below 10KHz the above method for determining the allowable case or ambient temperature becomes invalid and a detailed transient thermal analysis must be performed. Please see Design Note 6 (DN-6) for further information.

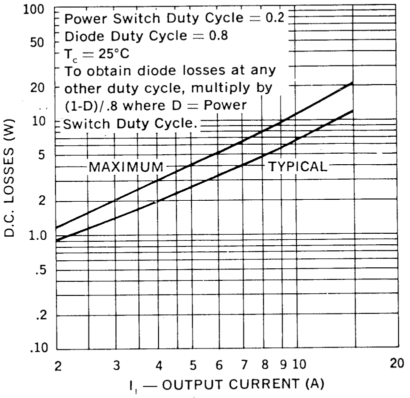
Power Dissipation



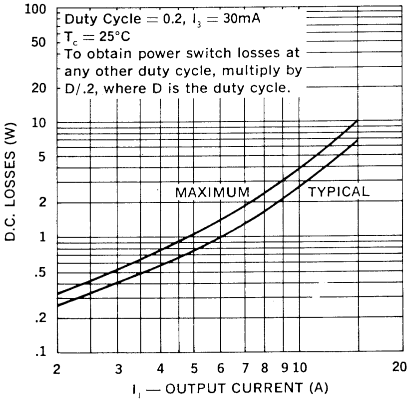
Efficiency



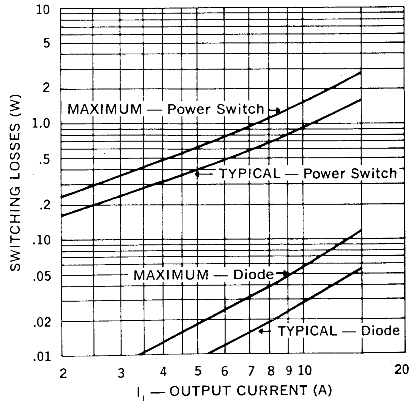
Diode D.C. Losses



Power Switch D.C. Losses



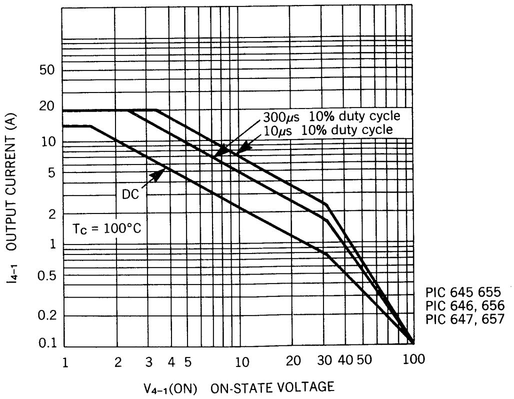
Switching Losses



V_{in} = 25V, I_3 = 30mA
f = 20KHz
T_C = 25°C

To determine switching losses at any other frequency, multiply by f/20KHz where f is the frequency at which the losses are to be determined.

Maximum Safe Operating Area
PIC 645, 646, 647-655, 656, 657



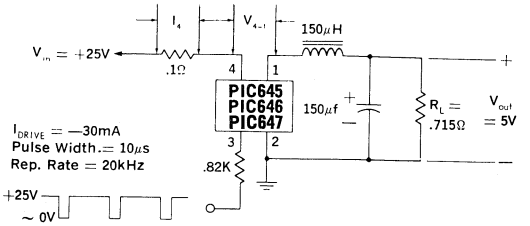


Figure 1. PIC645, 646, 647 Switching Speed Circuit

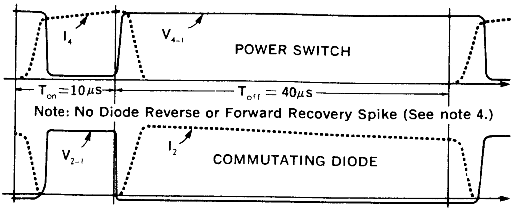
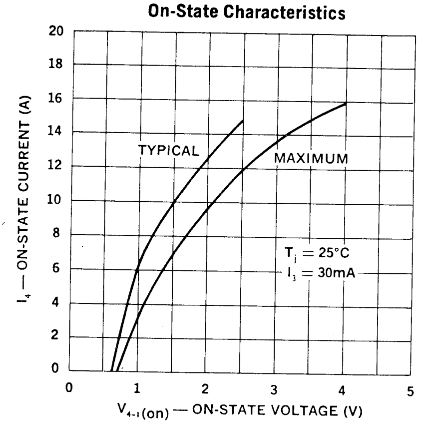
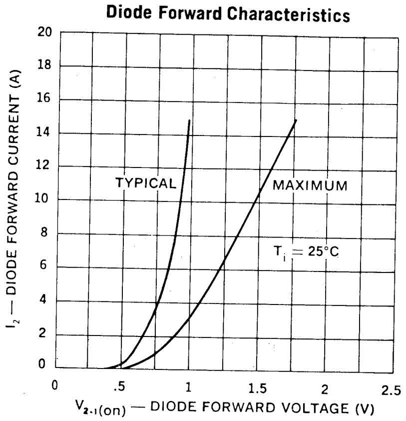
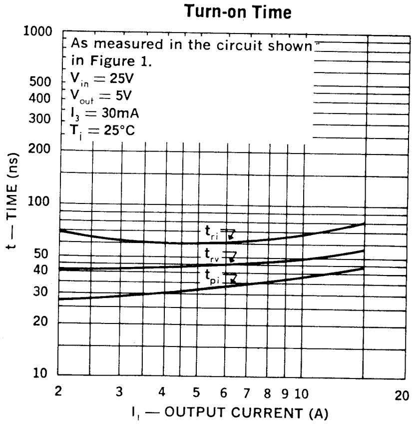


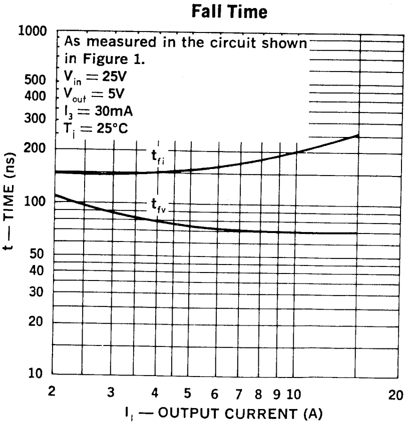
Figure 2. PIC645, 646, 647 Switching Waveforms

Note: PIC655, PIC656, PIC657 Circuit and waveforms are identical but of opposite polarity (V_{in} = −25V, V_{out} = −5V, I_{DRIVE} = +30mA.)


On-State Characteristics


Diode Forward Characteristics


Turn-on Time


Fall Time

POWER INTEGRATED CIRCUIT

Switching Regulator 10 Amp Positive and Negative Power Output Stages

PIC660
PIC661
PIC662
PIC670
PIC671
PIC672

FEATURES

- Designed and characterized for switching regulator applications
- Cost saving design reduces size, improves efficiency, reduces noise and RFI (See note 4.)
- High operating frequency (to >100kHz) results in smaller inductor-capacitor filter and improved power supply response time
- High operating efficiency: Typical 5A circuit performance —
  Rise and Fall time <300ns
  Efficiency >85%
- No reverse recovery spike generated by commutating diode (See note 4. and Fig. 2.)
- Electrically isolated, 4-Pin, TO-66 hermetic case (500V, 1μA, all leads common)

DESCRIPTION

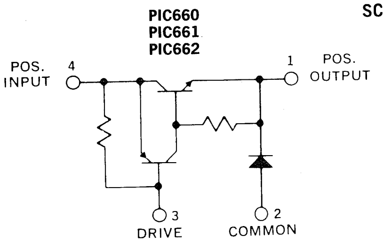
The Unitrode Switching Regulator is a unique hybrid transistor circuit, specifically designed, constructed and specified for use in high current switching regulator applications. The designer is thus relieved of one of the most time consuming, tedious and critical aspects of switching regulator design: choosing the appropriate switching transistors and commutating diode, and empirically determining the optimum drive and bias conditions.

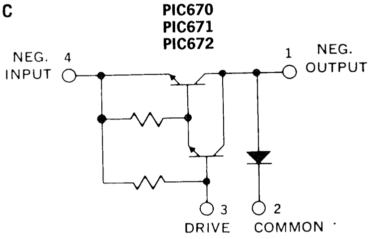
Switching regulators, when compared to conventional regulators, result in significant reductions in size, weight, and internal power losses and a major decrease in overall cost. Using the Unitrode PIC600 series the designer can achieve further improvements in size, weight, efficiency, and costs. At the same time, because of the PIC600 series design and packaging, the designer is aided in overcoming two of the most significant drawbacks to switching regulators: noise generation and slow response time; there is, in fact, no diode reverse recovery spike (See note 4.).

The PIC600 series switching regulators are designed and characterized to be driven with standard integrated circuit voltage regulators. They are completely characterized over their entire operating range of −55°C to +125°C. The devices are enclosed in a special 4-Pin TO-66 package, hermetically sealed for high reliability. The hybrid circuit construction utilizes thick film resistors on a beryllia substrate for maximum thermal conductivity and resultant low thermal impedance. All of the active elements in the hybrid are fully passivated.

Application Notes U-68 and U-76 provide a detailed description of the hybrid circuit and design guidance for specific circuit applications.

SCHEMATIC

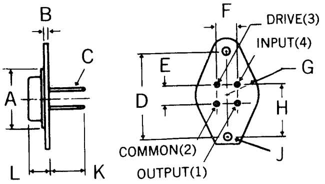




MECHANICAL SPECIFICATIONS

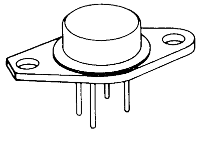
PIC660 PIC661 PIC662 PIC670 PIC671 PIC672

NOTES:
1. Case is electrically isolated.
2. Loads may be soldered to within 1/16" of base provided temperature-time exposure is less than 260°C for 10 seconds.



	ins.	mm
A	.620 MAX.	15.75 MAX.
B	.050-.075	1.27-1.91
C	.028-.034	0.71-0.86
D	.958-.962	24.33-24.43
E	.190-.210	4.83-5.33
F	.190-.210	4.83-5.33
G	.350 MAX. RAD.	8.89 MAX. RAD.
H	.570-.590	14.48-14.99
J	.142-.152 DIA.	3.61-3.86 DIA.
K	.360 MIN.	9.14 MIN.
L	.250-.340	6.35-8.64

4-Pin TO-66



Microsemi Corp.
Watertown
The diode experts

ABSOLUTE MAXIMUM RATINGS

	PIC660	PIC661	PIC662	PIC670	PIC671	PIC672
Input Voltage, V_{4-2}	60V	80V	100V	-60V	-80V	-100V
Output Voltage, V_{1-2}	60V	80V	100V	-60V	-80V	-100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	-5V	-5V	-5V
Output Current, I_1	10A	10A	10A	-10A	-10A	-10A
Drive Current, I_3	-0.4A	-0.4A	-0.4A	0.4A	0.4A	0.4A
Thermal Resistance						
Junction to Case, θ_{J-C}						
Power Switch	4.0°C/W					
Commutating Diode	4.0°C/W					
Case to Ambient, θ_{C-A}	60.0°C/W					
Operating Temperature Range, T_C	—55°C to +125°C					
Maximum Junction Temperature, T_j	+150°C					
Storage Temperature Range	—65°C to +150°C					

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	PIC660/661/662			PIC670/671/672			Units	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Current Delay Time	t_{di}	—	35	60	—	35	60	ns	$V_{in} = 25V(-25V)$
Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	$V_{out} = 5V(-5V)$
Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	$I_{out} = 5A(-5A)$
Voltage Storage Time	t_{sv}	—	900	—	—	900	—	ns	$I_3 = -30mA(30mA)$ NOTE 5
Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 2
Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See notes 1, 2, 4
Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	$I_4 = 5A(-5A)$, $I_3 = -.03A(.03A)$ NOTE 5
On-State Voltage (Note 3)	$V_{4-1(on)}$	—	2.5	3.5	—	−2.5	−3.5	V	$I_4 = 10A(-10A)$, $I_3 = -.03A(.03A)$ NOTE 5
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.85	1.25	—	−.85	−1.25	V	$I_2 = 5A(-5A)$
Diode Fwd. Voltage (Note 3)	$V_{2-1(on)}$	—	.95	1.75	—	−.95	−1.75	V	$I_2 = 10A(-10A)$
Off-State Current	I_{4-1}	—	0.1	10	—	−0.1	−10	μA	V_4 = Rated input voltage
Off-State Current	I_{4-1}	—	10	—	—	−10	—	μA	V_4 = Rated input voltage, $T_A = 100°C$
Diode Reverse Current	I_{1-2}	—	1.0	10	—	−1.0	−10	μA	V_1 = Rated output voltage
Diode Reverse Current	I_{1-2}	—	500	—	—	500	—	μA	V_1 = Rated output voltage, $T_A = 100°C$

NOTES:

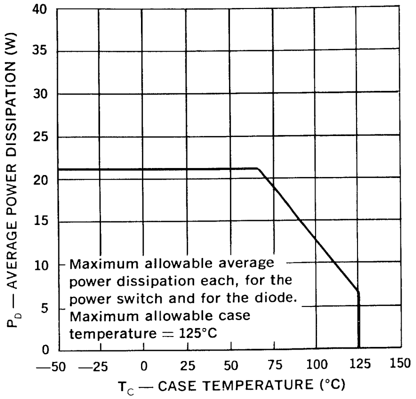
1. In switching an inductive load, the current will lead the voltage on turn-on and lag the voltage on turn-off (see Figure 2). Therefore, Voltage Delay Time (t_{DV}) ≅ $t_{di} + t_{ri}$ and Current Storage Time (t_{si}) ≅ $t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1, in which the efficiency is measured, is representative of typical operating conditions for the PIC600 series switching regulators.
3. Pulse test: Duration = 300μs, Duty Cycle ≤ 2%.
4. As can be seen from the switching waveforms shown in Figure 2, no reverse of forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliability, since the power switch only carries current during turn-on.
5. To insure safe operation I_3 should be ≥|30mA| during T_{ON}. Operation at I_3 <|30mA| can permanently damage device.

POWER DISSIPATION CONSIDERATIONS

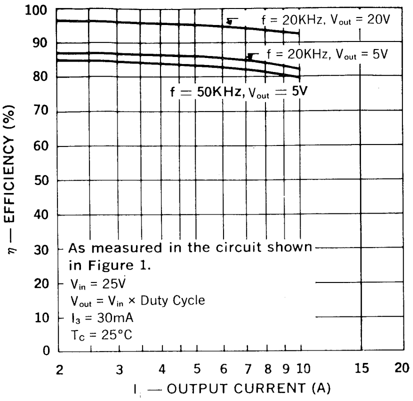
The total power losses in the switching regulator is the sum of the switching losses, and the power switch and diode D.C. losses. Once total power dissipation has been determined, the Power Dissipation curve, or thermal resistance data may be used to determine the allowable case or ambient temperature for any operating condition.

The switching losses curve presents data for a frequency of 20KHz. To find losses at any other frequency, multiply by f/20KHz.
The D.C. losses curve presents data for a duty cycle of .2. To find D.C. losses at any other duty cycle, multiply by D/.2 for the power switch and by (1-D)/.8 for the diode.

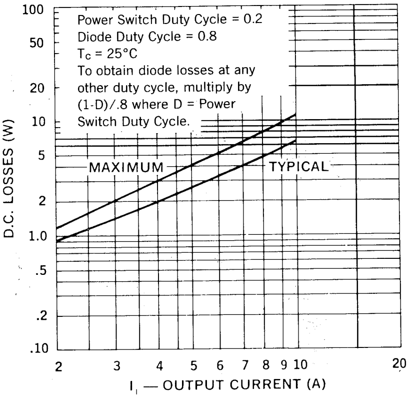
At frequencies much below 10KHz the above method for determining the allowable case or ambient temperature becomes invalid and a detailed transient thermal analysis must be performed. Please see Design Note 6 (DN-6) for further information.



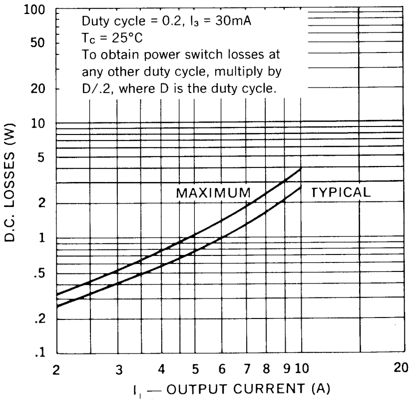
Power Dissipation



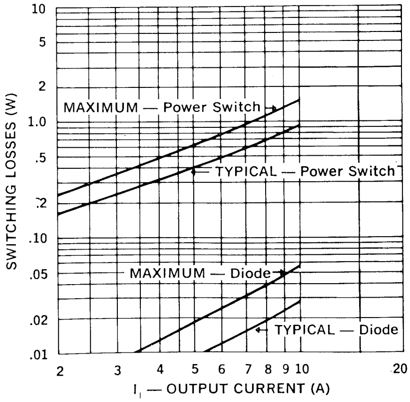
Efficiency



Diode D.C. Losses

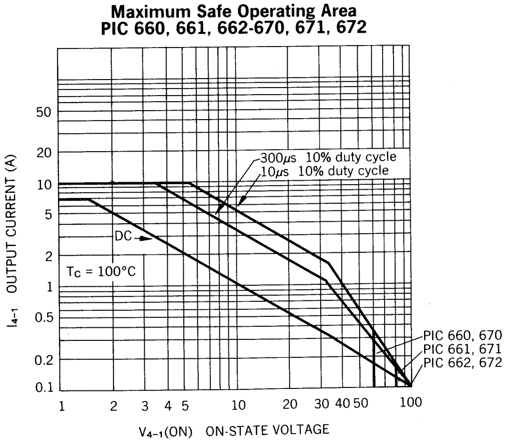


Power Switch D.C. Losses



Switching Losses

V_{in} = 25, V, I_3 = 30mA f = 20KHz T_C = 25°C	To determine switching losses at any other frequency, multiply by f/20KHz where f is the frequency at which the losses are to be determined.



Maximum Safe Operating Area
PIC 660, 661, 662-670, 671, 672

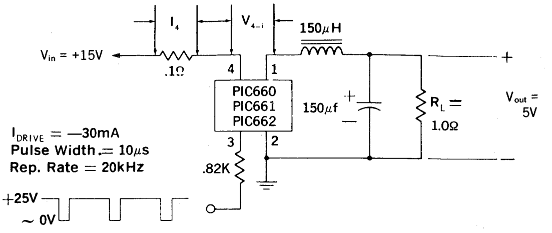


Figure 1. PIC660, 661, 662 Switching Speed Circuit

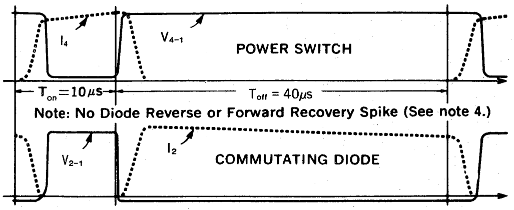
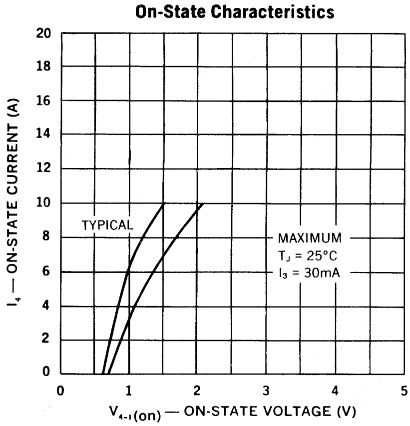
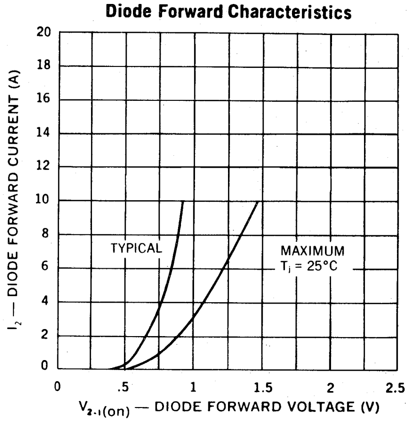
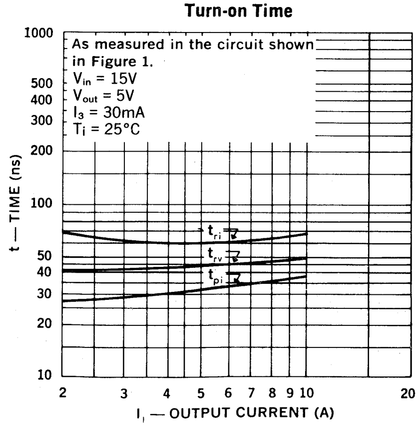


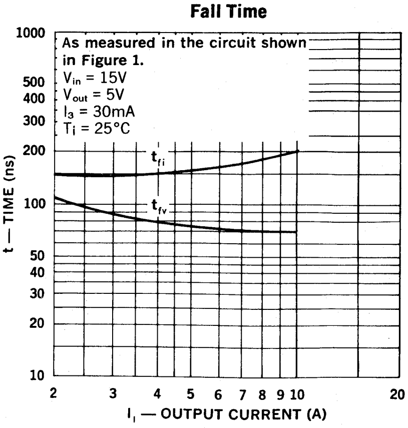
Figure 2. PIC660, 661, 662 Switching Waveforms

Note: PIC670, PIC671, PIC672 Circuit and waveforms are identical but of opposite polarity (V_{in} = −15V, V_{out} = −5V, I_{DRIVE} = +30mA.)









Semiconductor Devices, Silicon
Hybrid Switching Regulators
High Reliability Types

	Test Level T_1	**Test Level T_2**
PIC 600/601/602	PIC 7501/7502/7503	PIC 7519/7520/7521
PIC 610/611/612	PIC 7504/7505/7506	PIC 7522/7523/7524
PIC 625/626/627	PIC 7507/7508/7509	PIC 7525/7526/7527
PIC 635/636/637	PIC 7510/7511/7512	PIC 7528/7529/7530
PIC 660/661/662	PIC 7555/7556/7557	PIC 7561/7562/7563
PIC 670/671/672	PIC 7558/7559/7560	PIC 7564/7565/7566

Contents

1.0 Scope
2.0 Applications Documents
3.0 Requirements
4.0 Quality Assurance Provisions

Microsemi Corp.
Watertown
The diode experts

1.0 SCOPE

This specification defines the detail requirements for High Reliability Hybrid Switching Regulators. Very extensive 100% testing for parameter stability has been included in the Quality Assurance Provisions.

1.1a Absolute Maximum Ratings

	T_1 **PIC7501** T_2 **PIC7519** **(PIC600)**	T_1 **PIC7502** T_2 **PIC7520** **(PIC601)**	T_1 **PIC7503** T_2 **PIC7521** **(PIC602)**	T_1 **PIC7504** T_2 **PIC7522** **(PIC610)**	T_1 **PIC7505** T_2 **PIC7523** **(PIC611)**	T_1 **PIC7506** T_2 **PIC7524** **(PIC612)**
Input Voltage, V_{4-2}	60V	80V	100V	−60V	−80V	−100V
Output Voltage, V_{1-2}	60V	80V	100V	−60V	−80V	−100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	−5V	−5V	−5V
Output Current, I_1	5A	5A	5A	−5A	−5A	−5A
Drive Current, I_3	−0.2A	−0.2A	−0.2A	0.2A	0.2A	0.2A
Thermal Resistance						
Junction to Case, θ_{J-C}						
Power Switch	4.0°C/W					
Commutating Diode	4.0°C/W					
Case to Ambient, θ_{C-A}	60.0°C/W					
Operating Temperature Range, T_C	−55°C to +125°C					
Maximum Junction Temperature, T_j	+150°C					
Storage Temperature Range	−65°C to +150°C					

1.1b Absolute Maximum Ratings

	T_1 **PIC7507** T_2 **PIC7525** **(PIC625)**	T_1 **PIC7508** T_2 **PIC7526** **(PIC626)**	T_1 **PIC7509** T_2 **PIC7527** **(PIC627)**	T_1 **PIC7510** T_2 **PIC7528** **(PIC635)**	T_1 **PIC7511** T_2 **PIC7529** **(PIC636)**	T_1 **PIC7512** T_2 **PIC7530** **(PIC637)**
Input Voltage, V_{4-2}	60V	80V	100V	−60V	−80V	−100V
Output Voltage, V_{1-2}	60V	80V	100V	−60V	−80V	−100V
Drive-Input Reverse Voltage, V_{3-4}	5V	5V	5V	−5V	−5V	−5V
Output Current, I_1	15A	15A	15A	−15A	−15A	−15A
Drive Current, I_3	−0.4A	−0.4A	−0.4A	0.4A	0.4A	0.4A
Thermal Resistance						
Junction to Case, θ_{J-C}						
Power Switch	4.0°C/W					
Commutating Diode	4.0°C/W					
Case to Ambient, θ_{C-A}	60.0°C/W					
Operating Temperature Range, T_C	−55°C to +125°C					
Maximum Junction Temperature, T_j	+150°C					
Storage Temperature Range	−65°C to +150°C					

1.1c Absolute Maximum Ratings

	Positive Output			Negative Output		
	T_1	T_1	T_1	T_2	T_2	T_2
	PIC7555	**PIC7556**	**PIC7557**	**PIC7558**	**PIC7559**	**PIC7560**
	T_2	T_2	T_2	T_2	T_2	T_2
	PIC7561 (PIC660)	**PIC7562 (PIC661)**	**PIC7563 (PIC662)**	**PIC7564 (PIC670)**	**PIC7565 (PIC671)**	**PIC7566 (PIC672)**
Input Voltage, $V_{4\text{-}1}$	60V	80V	100V	−60V	−80V	−100V
Output Voltage, $V_{1\text{-}2}$	60V	80V	100V	−60V	−80V	−100V
Drive-Input Reverse Voltage, $V_{3\text{-}1}$	5V	5V	5V	−5V	−5V	−5V
Peak Output Current, I_{1pk}	10A	10A	10A	−10A	−10A	−10A
Drive Current, I_3	−0.4A	−0.4A	−0.4A	0.4A	0.4A	0.4A
Thermal Resistance						
Junction to Case, $\theta_{J\text{-}C}$						
Power Switch	4.0°C/W					
Commutating Diode	4.0°C/W					
Case to Ambient, $\theta_{C\text{-}A}$	60.0°C/W					
Operating Temperature Range, T_C	−55°C to +125°C					
Maximum Junction Temperature, T_j	+150°C					
Storage Temperature Range	−65°C to +150°C					

1.1d Electrical Specifications (at 25 °C unless noted)

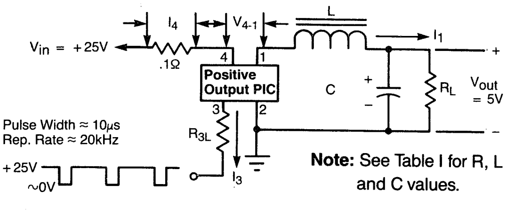
			PIC7501-3 PIC7519-21			PIC7504-6 PIC7522-24				
	Test	Symbol	Min.	Typ.	Max.	Min.	Typ.	Max.	Units	Conditions
1	Current Delay Time	t_{di}	—	20	40	—	20	40	ns	V_{in} = 25V (−25V)
2	Current Rise Time	t_{ri}	—	50	75	—	50	75	ns	V_{out} = 5V (−5V)
3	Voltage Rise Time	t_{rv}	—	30	50	—	30	50	ns	I_{out} = 2A (−2A)
4	Voltage Storage Time	t_{sv}	—	900	—	—	900	—	ns	I_3 = −20mA (20mA) (Note 5)
5	Voltage Fall Time	t_{fv}	—	50	75	—	50	75	ns	See Figure 1
6	Current Fall Time	t_{fi}	—	70	150	—	70	150	ns	See Notes 1, 2, 4
7	Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
8	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	I_4 = 2A (−2A), I_3 = −0.02A (0.02A)
9	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	2.5	3.5	—	−2.5	−3.5	V	I_4 = 5A (−5A), I_3 = −0.02A (0.02A)
10	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	0.8	1.0	—	−0.8	−1.0	V	I_2 = 2A (−2A)
11	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	I_2 = 5A (−5A)
12	Off-State Current	$I_{4\text{-}1}$	—	0.1	10	—	−0.1	−10	μA	V_4 = Rated input voltage
13	Off-State Current	$I_{4\text{-}1}$	—	0.01	1.0	—	−0.1	−1.0	mA	V_4 = Rated input voltage. T_A = 100°C
14	Diode Reverse Current	$I_{1\text{-}2}$	—	1.0	10	—	−1.0	−10	μA	V_1 = Rated output voltage
15	Diode Reverse Current	$I_{1\text{-}2}$	—	0.5	1.0	—	−0.5	−1.0	mA	V_1 = Rated output voltage. T_A = 100°C

Notes:

1. In switching an inductive load, the current will lead the voltage on turn-on and lag the voltage on turn-off (see Figure 1). Therefore, Voltage Delay Time (t_{DV}) $\cong t_{di} + t_{ri}$ and Current Storage Time (t_{si}) $\cong t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1, in which the efficiency is measured, is representative of typical operating conditions for the PIC600 series switching regulators.
3. Pulse test: Duration = $\leqslant$ 400μs. Duty Cycle $\leqslant$2%.
4. As can be seen from the switching waveforms shown in Figure 1, no reverse or forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliability, since the power switch only carries current during turn-on.
5. To insure safe operation, absolute value of I_3 should be a minimum of 20mA during $t_{(on)}$. Operation with I_3 below 20mA can permanently damage the device.
6. To insure safe operation, absolute value of I_3 should be a minimum of 30mA during $t_{(on)}$. Operation with I_3 below 30mA can permanently damage the device.

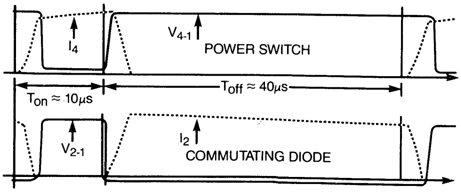
	Test	Symbol	PIC7507-9 PIC7525-27			PIC7510-12 PIC7528-30			Units	Conditions
			Min.	Typ.	Max.	Min.	Typ.	Max.		
1	Current Delay Time	t_{di}	—	35	60	—	35	60	ns	V_{in} = 25V (−25V)
2	Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	V_{out} = 5V (−5V)
3	Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	I_{out} = 7A (−7A)
4	Voltage Storage Time	t_{sv}	—	1200	—	—	1200	—	ns	I_3 = −30mA (30mA) (Note 6)
5	Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 1
6	Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See Notes 1, 2, 4
7	Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
8	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	I_4 = 7A (−7A), I_3 = −0.03A (0.03A)
9	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	2.5	3.5	—	−2.5	−3.5	V	I_4 = 15A (−15A), I_3 = −0.03A (0.03A)
10	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	0.85	1.25	—	−0.85	−1.25	V	I_2 = 7A (−7A)
11	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	0.95	1.75	—	−0.95	−1.75	V	I_2 = 15A (−15A)
12	Off-State Current	$I_{4\text{-}1}$	—	0.1	10	—	−0.1	−10	μA	V_4 = Rated input voltage
13	Off-State Current	$I_{4\text{-}1}$	—	0.01	1.0	—	−0.1	−1.0	mA	V_4 = Rated input voltage, T_A = 100°C
14	Diode Reverse Current	$I_{1\text{-}2}$	—	1.0	10	—	−1.0	−10	μA	V_1 = Rated output voltage
15	Diode Reverse Current	$I_{1\text{-}2}$	—	0.5	1.0	—	−0.5	−1.0	mA	V_1 = Rated output voltage, T_A = 100°C

	Test	Symbol	PIC7555-7 PIC7561-3			PIC7558-60 PIC7564-6			Units	Conditions
			Min.	Typ.	Max.	Min.	Typ.	Max.		
1	Current Delay Time	t_{di}	—	35	60	—	35	60	ns	V_{in} = 25V (−25V)
2	Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	V_{out} = 5V (−5V)
3	Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	I_{out} = 5A (−5A)
4	Voltage Storage Time	t_{sv}	—	1200	—	—	1200	—	ns	I_3 = 30mA (−30mA) (Note 6)
5	Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 1
6	Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See Notes 1, 2, 4
7	Efficiency	η	—	85	—	—	85	—	%	See Notes 2 and 4
8	On-State Voltage	$V_{4\text{-}1\,(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	I_4 = 5A (−5A), I_3 = −30mA (30mA), Notes 3, 5
9	On-State Voltage	$V_{4\text{-}1\,(on)}$	—	2.5	3.5	—	−2.5	−3.5	V	I_4 = 10A (−10A), I_3 = −30mA (30mA), Notes 3,5
10	Diode Fwd. Voltage	$V_{2\text{-}1\,(on)}$	—	0.85	1.25	—	−0.85	−1.25	V	I_2 = 5A (−5A)
11	Diode Fwd. Voltage	$V_{2\text{-}1\,(on)}$	—	0.95	1.75	—	−0.95	−1.75	V	I_2 = 10A (−10A)
12	Off-State Current	$I_{4\text{-}1}$	—	0.1	10	—	−0.1	−10	μA	V_4 = Rated input voltage
13	Off-State Current	$I_{4\text{-}1}$	—	.01	1	—	−.01	−1	mA	V_4 = Rated input voltage, T_A = 100°C
14	Diode Reverse Current	$I_{1\text{-}2}$	—	1.0	10	—	−1.0	−10	μA	V_1 = Rated output voltage
15	Diode Reverse Current	$I_{1\text{-}2}$	—	0.5	1.0	—	−0.5	−1.0	mA	V_1 = Rated output voltage, T_A = 100°C



Note: See Table I for R, L and C values.

Positive Output Switching Speed Circuit



Note: No Diode Reverse or Forward Recovery Spike (See note 4.).

Positive Output Switching Waveforms

Note: Negative test circuit and waveforms are identical but of opposite polarity (V_{in} = −25V, V_{out} = −5V).

Figure 1.

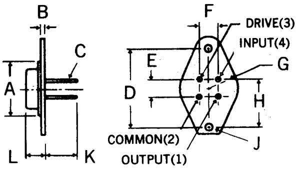
Table I.
Component Values for Switching Speed Circuit

I_3 required	R_{3L}
20mA	1.2 kohms ±5% tolerance
30mA	820 ohms ±5% tolerance

I_4 current	R_L	L	C
2A	2.5 ohms ± 1% 10 watt	300 μH	50 μF 100V electrolytic
5A	1 ohm ± 1% 50 watt	150 μH	150μF 100V electrolytic
7A	0.714 ohms ± 1% 35 watt	150 μH	150μF 100V electrolytic

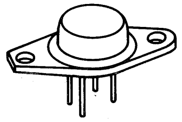
MECHANICAL SPECIFICATIONS

Notes:
1. Case is electrically isolated.
2. Loads may be soldered to within 1/16″ of base provided temperature-time exposure is less than 260°C for 10 seconds.

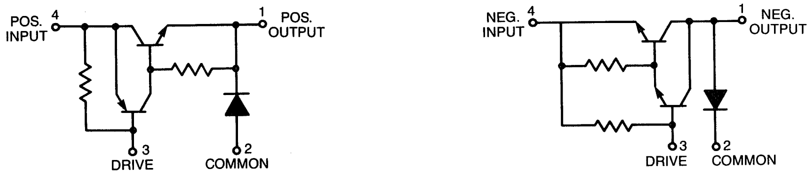


	ins.	mm
A	.620 MAX.	15.75 MAX.
B	.050-.075	1.27-1.91
C	.028-.034	0.71-0.86
D	.958-.962	24.33-24.43
E	.190-.210	4.83-5.33
F	.190-.210	4.83-5.33
G	.350 MAX. RAD.	8.89 MAX. RAD.
H	.570-.590	14.48-14.99
J	.142-.152 DIA.	3.61-3.86 DIA.
K	.360 MIN.	9.14 MIN.
L	.250-.340	6.35-8.64

4-Pin TO-66



SCHEMATIC



PIC7501-3, PIC7519-21
PIC7507-9, PIC7525-27
PIC7555-57, PIC7561-65

PIC7504-6, PIC7522-24
PIC7510-12, PIC7528-30
PIC7558-60, PIC7564-66

Figure 2. Physical Dimensions and Biasing Diagrams

2.0 APPLICABLE DOCUMENTS

The following documents of the issue in effect on the date of invitations for bids, form a part of this specification to the extent specified herein.

MIL-S-19500 — General Specifications for Semiconductor Devices

MIL-S-19491 — Preparation for Delivery of Semiconductor Devices

3.0 REQUIREMENTS

3.1 Design and Construction

The Hybrid devices supplied under this specification shall have a design and construction such that they will meet all of the requirements specified herein. The dimensions and physical characteristics shall be as specified in Figure 2.

3.2 Performance Characteristics

The performance characteristics of the Hybrid device supplied under this specification shall be as specified in Group A inspection defined in Table III.

3.3 Quality Assurance

The Quality Assurance Provisions shall be as defined in paragraph 4.0.

3.4 Test Methods

Test methods shall be as specified herein.

3.5 Marking

The markings on the devices supplied shall be permanent and legible and shall include the Manufacturer's name or trademark, a Manufacturing Date Code in accordance with MIL-S-19500 and the specific device type number.

3.6 Preparation for Delivery

The Hybrid devices supplied under this specification shall be prepared for delivery in accordance with level C of MIL-S-19491 unless otherwise directed in the specific contract or purchase order.

3.7 Ordering Data

Procurement documents should specify the following:

a. Specific item type number
b. Number and date of this specification
c. Quality Assurance Test level required
d. Any special packaging if required

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General Provisions

4.1.1 Inspection Responsibility — The supplier is responsible for the performance of all inspection requirements and acceptability of results as specified herein for the Test Level identified in the contract or purchase order.

4.1.2 Controlled Manufacture — The devices supplied under this specification shall be manufactured under controlled conditions using formally defined quality assurance methods and systems.

4.1.3 Manufacturing Traceability — Each device supplied under this specification shall be traceable to a specific process group, to permit tracing of its full manufacturing history. Process group records shall indicate the exact date that each manufacturing operation was performed and identify materials and process procedures which were used. The manufacturer shall keep these records on file for at least five years.

4.1.4 Definitions

4.1.4.1 Inspection Lot — An "inspection lot" is a collection of devices from which a sample is withdrawn and inspected to determine compliance with the acceptibility criterion. It shall consist of one or more "inspection sublots" of the device types defined in this specification. The maximum inspection lot size shall be 5000 units.

4.1.4.2 Inspection Sublot — An "inspection sublot" shall consist of a collection of devices of a single type which have been manufactured under the same conditions and with the same materials.

4.1.4.3 Shipment Lot — A "shipment lot" shall consist of devices taken from an accepted inspection lot for the purpose of shipment on a specific contract or order.

4.1.4.4 Group A Inspection — Group A inspection shall consist of the examinations and tests specified in Table I, and shall be performed on a sublot basis.

4.1.4.5 Controlled Inventory — The controlled inventory shall consist of lots which have successfully passed the acceptance inspection and are being held in storage prior to actual shipment. A controlled inventory shall have adequate safeguards to insure that no defective or untested devices can be included in it. It shall be accessible only to those individuals who are formally identified as authorized personnel.

4.2 Acceptance Inspection

The acceptance inspection requirements shall be as defined by the applicable test level. The procedures of MIL-S-19500 shall apply to Group A inspection. Inspection lots which have been inspected and accepted shall be kept in a controlled inventory. Shipment lots shall be formed using devices taken from accepted inspection lots.

4.2.1 Test Level T2 Requirements — Test level T2 shall consist of the following requirements.

4.2.1.1 The supplier shall perform the Parameter Stability Testing defined in paragraph 4.3 on each device to be supplied. Prior to starting the Blocking Stability test defined in paragraph 4.3.6, each device shall be serialized for individual identity. Variables test data for the controlled electrical parameters shall be recorded before and after stressing. The same procedure shall apply for the Power Stress stability test defined in paragraph 4.3.8.

4.2.1.2 The supplier shall perform the Group A inspections in accordance with the defined LTPD requirements on each inspection sublot. Electrical parameter testing as specified shall be performed by variables with test data recorded.

4.2.1.3 With each shipment lot, the supplier shall provide a Certificate of Compliance to test level T2 of this specification.

4.2.2 Test Level T1 Requirements — Test level T1 shall consist of the following requirements.

4.2.2.1 The supplier shall perform the Parameter Stability Testing defined in paragraph 4.3 on each device to be supplied. Electrical parameter testing as specified shall be performed by attributes.

4.2.2.2 The supplier shall perform the Group A inspections in accordance with the defined LTPD requirements on each inspection sublot. Electrical parameter testing as specified shall be performed by attributes with test data recorded.

4.2.2.3. With each shipment lot, the supplier shall provide a Certification of Compliance to test level T1 of this specification.

4.3 Parameter Stability Tests

Each hybrid device to be supplied under this specification shall receive the following tests in addition to other standard testing performed by the manufacturer.

4.3.1 Temperature Storage — Each Hybrid device shall be subjected, in a non-operating state, to a temperature of 150°C for a minimum period of 48 hours.

4.3.2 Temperature Cycling — Each Hybrid device shall be temperature cycled from −55°C to 150°C for a minimum of 10 cycles. Each cycle shall consist of at least 15 minutes at each temperature extreme with a maximum transition time of 5 minutes between each temperature extreme.

4.3.3 Hermetic Seal Test — Fine Leak — Each Hybrid device shall be tested for a case leakage rate of 1×10^{-8} cc/sec or smaller using a helium mass spectrometer or equivalent method. Devices with a case leakage rate greater than specified shall be removed from the lot.

4.3.4 Hermetic Seal Test — Gross Leak — Each Hybrid device shall be tested for gross leaks using fluorocarbon gross leak test or equivalent method. Devices with any indication of case leakage shall be removed from the lot.

4.3.5 Reverse Bias Clamp Inductive Test —

$V_{4\text{-}2}$ = Rated Input Voltage
f ≈ 25kHz, E_{out} = 5V
T_C = 25°C, see Figure 4
I_{out} — See Table II
t = 1 sec max

4.3.6 High Temperature Reverse Bias — Each Hybrid device will be high temperature reversed biased in the circuit shown in Figure 3. The conditions of this test are as follows:

T_A = +125°C
Time = 16 hours $^{+8}_{-0}$ hours
Circuit and voltages as shown in Figure 3.

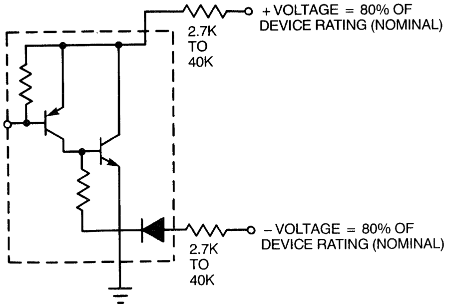
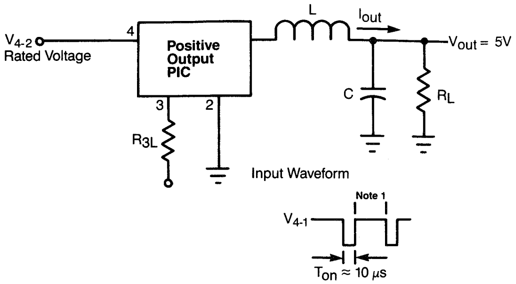


Figure 3. High Temperature Reverse Bias Circuit

4.3.7 The following measurements will be made before and after the high temperature reverse bias test. The unit measurements shall be recorded or the devices will be celled in order to compare and guarantee the delta (△) requirements depending on the test level to which the lot is being prepared.

Part Type	Test 1.1.D	Maximum Readings Initial & Final	Delta Change	Symbol
PIC7501/7502/7503/7519/7520/7521	8	1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7507/7508/7509/7525/7526/7527	8	1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7555/7556/7557/7561/7562/7563	8	1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7504/7505/7506/7522/7523/7524	8	−1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7507/7508/7509/7528/7529/7530	8	−1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7558/7559/7560/7564/7565/7655	8	−1.5V	±0.3V	$V_{4\text{-}1\ (on)}$
PIC7501/7502/7503/7519/7520/7521	10	1.0V	±0.25V	$V_{2\text{-}1\ (on)}$
PIC7507/7508/7509/7525/7526/7527	10	1.25V	±0.3V	$V_{2\text{-}1\ (on)}$
PIC7555/7556/7557/7561/7562/7563	10	1.25V	±0.3V	$V_{2\text{-}1\ (on)}$
PIC7504/7505/7506/7522/7523/7524	10	−1.0V	±0.25V	$V_{2\text{-}1\ (on)}$
PIC7507/7508/7509/7528/7529/7530	10	−1.25V	±0.3V	$V_{2\text{-}1\ (on)}$
PIC7558/7559/7560/7564/7565/7655	10	−1.25V	±0.3V	$V_{2\text{-}1\ (on)}$
PIC7501/7502/7503/7519/7520/7521	12	10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7507/7508/7509/7525/7526/7527	12	10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7555/7556/7557/7561/7562/7563	12	10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7504/7505/7506/7522/7523/7524	12	−10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7507/7508/7509/7528/7529/7530	12	−10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7558/7559/7560/7564/7565/7655	12	−10μA	±1.0 or ±100%*	$I_{4\text{-}1}$
PIC7501/7502/7503/7519/7520/7521	14	10μA	±2.0 or ±100%*	$I_{2\text{-}1}$
PIC7507/7508/7509/7525/7526/7527	14	10μA	±2.0 or ±100%*	$I_{2\text{-}1}$
PIC7555/7556/7557/7561/7562/7563	14	10μA	±2.0 or ±100%*	$I_{2\text{-}1}$
PIC7504/7505/7506/7522/7523/7524	14	−10μA	±2.0 or ±100%*	$I_{2\text{-}1}$
PIC7507/7508/7509/7528/7529/7530	14	−10μA	±2.0 or ±100%*	$I_{2\text{-}1}$
PIC7558/7559/7560/7564/7565/7655	14	−10μA	±2.0 or ±100%*	$I_{2\text{-}1}$

* Whichever is greater.



Note 1: Adjust T_{off} to obtain specified I_{out}.

Note 2: Negative output test circuits and waveforms are identical but of opposite polarity.

Note 3: See Table II for component values.

Figure 4. Reverse Bias Clamp Inductive Test Circuit

4.3.8 Power Stress — Each Hybrid device shall be burned-in using the circuit shown in Figure 5. The conditions are as follows:

T_A = +25°C

Time = 40 hours minimum

Circuit and conditions as shown in Figure 5.

4.3.9 The readings before and after burn-in shall be as specified in paragraph 4.3.7 above.

Table II.
Component Values for Clamped Inductive Test
(Refer to Figure 4)

Device Type	R_{3L}	L/C	R_L	I_{OUT}
PIC 7501, 7504 PIC 7519, 7522	3K	300/100	2.5	2
PIC 7502, 7505 PIC 7520, 7523	4K	300/100	2.5	2
PIC 7503, 7506 PIC 7521, 7524	5K	300/100	2.5	2
PIC 7507, 7525 PIC 7510, 7528 PIC 7555, 7561 PIC 7558, 7564	2K	150/100	1	5
PIC 7508, 7526 PIC 7511, 7529 PIC 7556, 7562 PIC 7559, 7565	2.7K	150/100	1	5
PIC 7509, 7527 PIC 7512, 7530 PIC 7557, 7563 PIC 7560, 7566	3.3K	150/100	1	5

Table III. Group A Inspection

Examination or Test	Symbol	Electrical Spec Test Number	Sample Size (LTPD)	Max. Acc. No.
Subgroup 1				
Visual and Mechanical	—	—	22 (10)	0
Subgroup 2 25°C Tests				
On-State Voltage	$V_{4\text{-}1\ on}$	8	45	0
On-State Voltage	$V_{4\text{-}1\ on}$	9	(5)	
Diode Forward Voltage	$V_{2\text{-}1\ on}$	10		
Diode Forward Voltage	$V_{2\text{-}1\ on}$	11		
Off-State Current	$I_{4\text{-}1}$	12		
Diode Reverse Current	$I_{1\text{-}2}$	14		
Subgroup 3 T_A = +100°C Tests				
Off-State Current	$I_{4\text{-}1}$	13	45	0
Off-State Current	$I_{1\text{-}2}$	15	(5)	
Subgroup 4 25°C Tests				
Current Delay Time	t_{dl}	1		
Current Rise Time	t_{rl}	2		
Voltage Rise Time	t_{rv}	3	45	0
Voltage Fall Time	t_{fv}	5	(5)	
Current Fall Time	t_{fi}	6		

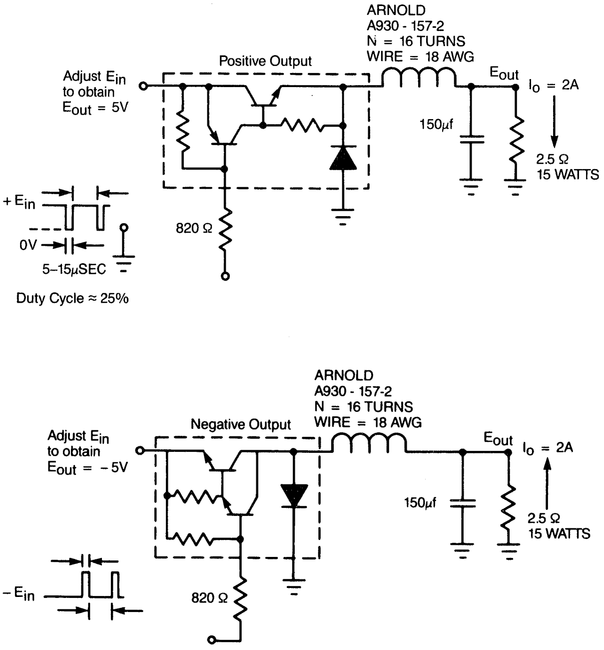


Figure 5. Burn-in Circuits

Semiconductor Devices, Silicon
Hybrid Switching Regulators
High Reliability Types

	Test Level T_1	Test Level T_2
PIC 645/646/647	PIC 7513/7514/7515	PIC 7531/7532/7533
PIC 655/656/657	PIC 7516/7517/7518	PIC 7534/7535/7536

Contents

1.0 Scope
2.0 Applications Documents
3.0 Requirements
4.0 Quality Assurance Provisions

1.0 SCOPE

This specification defines the detail requirements for High Reliability Hybrid Switching regulators. Very extensive 100% testing for parameter stability has been included in the Quality Assurance Provisions.

1.1a Absolute Maximum Ratings

	T_1 PIC7513 T_2 PIC7531 (PIC645)	T_1 PIC7514 T_2 PIC7532 (PIC646)	T_1 PIC7515 T_2 PIC7533 (PIC647)	T_1 PIC7516 T_2 PIC7534 (PIC655)	T_1 PIC7517 T_2 PIC7535 (PIC656)	T_1 PIC7518 T_2 PIC7536 (PIC657)
Input Voltage, $V_{4\text{-}2}$	60V	80V	100V	−60V	−80V	−100V
Output Voltage, $V_{1\text{-}2}$	60V	80V	100V	−60V	−80V	−100V
Drive-Input Reverse Voltage, $V_{3\text{-}4}$	5V	5V	5V	−5V	−5V	−5V
Continuous Output Current, I_1	15A	15A	15A	−15A	−15A	−15A
Peak Output Current	20A	20A	20A	−20A	−20A	−20A
Drive Current, I_3	−0.4A	−0.4A	−0.4A	0.4A	0.4A	0.4A
Thermal Resistance						
Junction to Case, $\theta_{J\text{-}C}$						
Power Switch	2°C/W					
Commutating Diode	2°C/W					
Case to Ambient, $\theta_{C\text{-}A}$	30.0°C/W					
Operating Temperature Range, T_C	−55°C to +125°C					
Maximum Junction Temperature, T_j	+150°C					
Storage Temperature Range	−65°C to +150°C					

			PIC7513/14/15 PIC7531/32/33			PIC7516/17/18 PIC7534/35/36				
	Test	Symbol	Min.	Typ.	Max.	Min.	Typ.	Max.	Units	Conditions
1	Current Delay Time	t_{di}	—	35	60	—	35	60	ns	V_{in} = 25V (−25V)
2	Current Rise Time	t_{ri}	—	65	150	—	65	175	ns	V_{out} = 5V (−5V)
3	Voltage Rise Time	t_{rv}	—	40	60	—	40	60	ns	I_{out} = 7A (−7A)
4	Voltage Storage Time	t_{sv}	—	1200	—	—	1200	—	ns	I_3 = −30mA (30mA) (Note 5)
5	Voltage Fall Time	t_{fv}	—	70	175	—	100	300	ns	See Figure 1
6	Current Fall Time	t_{fi}	—	175	300	—	175	300	ns	See Notes 1, 2, 4
7	Efficiency (Notes 2 and 4)	η	—	85	—	—	85	—	%	
8	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	1.0	1.5	—	−1.0	−1.5	V	I_4 = 7A (−7A), I_3 = −0.03A (0.03A)
9	On-State Voltage (Note 3)	$V_{4\text{-}1\,(on)}$	—	2.5	3.5	—	−2.5	−3.5	V	I_4 = 15A (−15A), I_3 = −0.03A (0.03A)
10	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	0.85	1.25	—	−0.85	−1.25	V	I_2 = 7A (−7A)
11	Diode Fwd. Voltage (Note 3)	$V_{2\text{-}1\,(on)}$	—	0.95	1.75	—	−0.95	−1.75	V	I_2 = 15A (−15A)
12	Off-State Current	$I_{4\text{-}1}$	—	0.1	10	—	−0.1	−10	μA	V_4 = Rated input voltage
13	Off-State Current	$I_{4\text{-}1}$	—	10	1000	—	−10	1000	μA	V_4 = Rated input voltage, T_A = 100°C
14	Diode Reverse Current	$I_{1\text{-}2}$	—	1.0	10	—	−1.0	−10	μA	V_1 = Rated output voltage
15	Diode Reverse Current	$I_{1\text{-}2}$	—	500	1000	—	−500	−1000	μA	V_1 = Rated output voltage, T_A = 100°C

Notes:

1. In switching an inductive load, the current will lead the voltage on turn-on and lag the voltage on turn-off (see Figure 1). Therefore, Voltage Delay Time $(t_{DV}) \cong t_{di} + t_{ri}$ and Current Storage Time $(t_{si}) \cong t_{sv} + t_{fv}$.
2. The efficiency is a measure of internal power losses and is equal to Output Power divided by Input Power. The switching speed circuit of Figure 1, in which the efficiency is measured, is representative of typical operating conditions for the PIC600 series switching regulators.
3. Pulse test: Duration = ⩽ 400 μsec.
4. As can be seen from the switching waveforms shown in Figure 1, no reverse or forward recovery spike is generated by the commutating diode during switching! This reduces self-generated noise, since no current spike is fed through the switching regulator. It also improves efficiency and reliability, since the power switch only carries current during turn-on.
5. To insure safe operation, the absolute value of I_3 should be a minimum of 30 mA during $t_{(on)}$. Operation with I_3 below 30 mA can permanently damage the device.

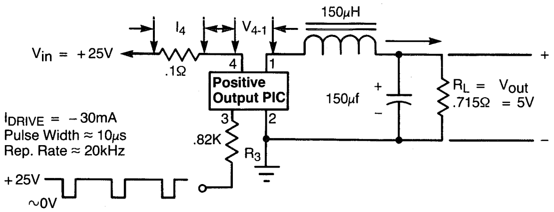
Power Dissipation Considerations

The total power losses in the switching regulator is the sum of the switching losses, and the power switch and diode D.C. losses. Once total power dissipation has been determined, the Power Dissipation curve, or thermal resistance data may be used to determine the allowable case or ambient temperature for any operating condition.

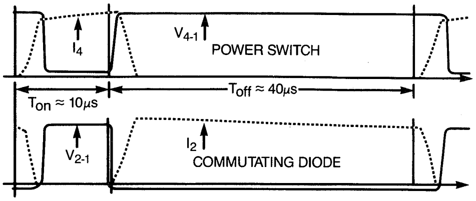
The switching losses curve presents data for a frequency of 20 kHz. To find losses at any other frequency, multiply by f/20 kHz.

The D.C. losses curves present data for a duty cycle of 0.2. To find D.C. losses at any other duty cycle, multiply by D/0.2 for the power switch and by (1-D)/0.8 for the diode.

At frequencies much below 10 kHz the above method for determining the allowable case or ambient temperature becomes invalid and a detailed transient thermal analysis must be performed. Unitrode will supply transient thermal impedance information on request.



Positive Output Switching Speed Circuit



Note: No Diode Reverse or Forward Recovery Spike (See note 4.)!

Positive Output Switching Waveforms

Note: Negative output circuit and waveforms are identical but of opposite polarity (V_{in} = −25V, V_{out} = −5V, I_{DRIVE} = +30mA).

Figure 1.

2.0 APPLICABLE DOCUMENTS

The following documents of the issue in effect on the date of invitations for bids, form a part of this specification to the extent specified herein.

MIL-S-19500 —	General Specification for Semiconductor Devices
MIL-S-19491 —	Preparation for Delivery of Semiconductor Devices

3.0 REQUIREMENTS

3.1 Design and Construction

The Hybrid devices supplied under this specification shall have a design and construction such that they will meet all of the requirements specified herein. The dimensions and physical characteristics shall be as specified in Figure 2.

3.2 Performance Characteristics

The performance characteristics of the Hybrid device supplied under this specification shall be as specified in Group A inspection defined in Table I.

3.3 Quality Assurance

The Quality Assurance Provisions shall be defined in paragraph 4.0.

3.4 Test Methods

Test methods shall be as specified herein.

3.5 Marking

The markings on the devices supplied shall be permanent and legible and shall include the Manufacturer's name or trademark, a Manufacturing Date Code in accordance with MIL-S-19500 and the specific device type number.

3.6 Preparation for Delivery

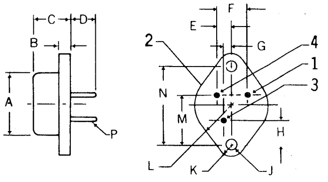
The Hybrid devices supplied under this specification shall be prepared for delivery in accordance with level C of MIL-S-19491 unless otherwise directed in the specific contract or purchase order.

3.7 Ordering Data

Procurement document should specify the following:

a. Specific item type number
b. Number and date of this specification
c. Quality Assurance Test level required
d. Any special packaging if required

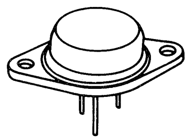
MECHANICAL SPECIFICATIONS



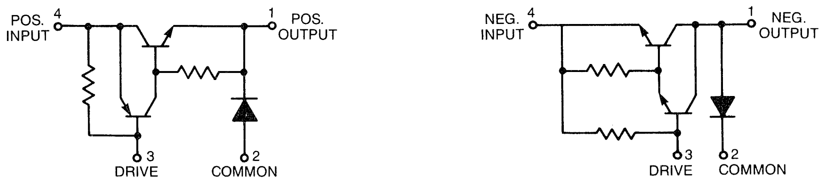
Note: Loads may be soldered to within 1/16″ of base provided temperature-time exposure is less than 260°C for 10 seconds.

	ins.	mm
A	.875 MAX.	22.23 MAX.
B	.135	3.43
C	.250-.450	6.35-11.43
D	.312 MIN.	7.92 MIN.
E	.205-.225	5.21-5.72
F	.420-.440	10.67-11.18
G	.145-.165	3.68-4.19
H	.395-.405	10.03-10.29
J	.151-.161 DIA.	3.84-4.09 DIA.
K	.188 MAX. RAD.	4.78 MAX. RAD.
L	.525 MAX. RAD.	13.34 MAX. RAD.
M	.708-.728	17.98-18.49
N	1.177-1.197	29.90-30.40
P	.038-.043 DIA.	.97-1.09 DIA.

3 Pin TO-3



SCHEMATIC



PIC7513/14/15
PIC7531/32/33

PIC7516/17/18
PIC7534/35/36

Figure 2. Physical Dimensions and Biasing Diagrams

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General Provisions

4.1.1 Inspection Responsibility — The supplier is responsible for the performance of all inspection requirements and acceptability of results as specified herein for the Test Level identified in the contract or purchase order.

4.1.2 Controlled Manufacture — The devices supplied under this specification shall be manufactured under controlled conditions using formally defined quality assurance methods and systems.

4.1.3 Manufacturing Traceability — Each device supplied under this specification shall be traceable to a specific process group, to permit tracing of its full manufacturing history. Process group records shall indicate the exact date that each manufacturing operation was performed and identify materials and process procedures which were used. The manufacturer shall keep these records on file for at least five years.

4.1.4 Definitions

4.1.4.1 Inspection Lot — An "inspection lot" is a collection of devices from which a sample is withdrawn and inspected to determine compliance with the acceptability criterion. It shall consist of one or more "inspection sublots" of the device types defined in this specification. The maximum inspection lot size shall be 5000 units.

4.1.4.2 Inspection Sublot — An "inspection sublot" shall consist of a collection of devices of a single type which have been manufactured under the same conditions and with the same materials.

4.1.4.3 Shipment Lot — A "shipment lot" shall consist of devices taken from an accepted inspection lot for the purpose of shipment on a specific contract or order.

4.1.4.4 Group A Inspection — Group A inspection shall consist of the examinations and tests specified in Table I, and shall be performed on a sublot basis.

4.1.4.5 Controlled Inventory — The controlled inventory shall consist of lots which have successfully passed the acceptance inspection and are being held in storage prior to actual shipment. A controlled inventory shall have adequate safeguards to insure that no defective or untested devices can be included in it. It shall be accessible only to those individuals who are formally identified as authorized personnel.

4.2 Acceptance Inspection

The acceptance inspection requirements shall be as defined by the applicable test level. The procedures of MIL-S-19500 shall apply to Group A inspection. Inspection lots which have been inspected and accepted shall be kept in a controlled inventory. Shipment lots shall be formed using devices taken from accepted inspection lots.

4.2.1 Test Level T2 Requirements — Test level T2 shall consist of the following requirements.

4.2.1.1 The supplier shall perform the Parameter Stability Testing defined in paragraph 4.3 on each device to be supplied. Prior to starting the Blocking Stability test defined in paragraph 4.3.6, each device shall be serialized for individual identity. Variables test data for the controlled electrical parameters shall be recorded before and after stressing. The same procedure shall apply for the Power Stress stability test defined in paragraph 4.3.8.

4.2.1.2 The supplier shall perform the Group A inspections in accordance with the defined LTPD requirements on each inspection sublot. Electrical parameter testing as specified shall be performed by variables with test data recorded.

4.2.1.3 With each shipment lot, the supplier shall provide a Certificate of Compliance to test level T2 of this specification.

4.2.2 Test Level T1 Requirements — Test level T1 shall consist of the following requirements.

4.2.2.1 The supplier shall perform the Parameter Stability Testing defined in paragraph 4.3 on each device to be supplied. Electrical parameter testing as specified shall be performed by attributes.

4.2.2.2 The supplier shall perform the Group A inspections in accordance with the defined LTPD requirements on each inspection sublot. Electrical parameter testing as specified shall be performed by attributes with test data recorded.

4.2.2.3 The supplier shall provide a Certificate of Compliance to test level T1 of this specification with each shipment lot.

4.3 Parameter Stability Tests

Each Hybrid device is to be supplied under this specification and shall receive the following tests in addition to other standard testing performed by the manufacturer.

4.3.1 Temperature Storage — Each Hybrid device shall be subjected, in a non-operating state, to a temperature of 150°C for a minimum period of 48 hours.

4.3.2 Temperature Cycling — Each Hybrid device shall be temperature cycled from −55°C to 150°C for a minimum of 10 cycles. Each cycle shall consist of at least 15 minutes at each temperature extreme with a maximum transition time of 5 minutes between each temperature extreme.

4.3.3 Hermetic Seal Test — Fine Leak — Each Hybrid device shall be tested for a case leakage rate of 1×10^{-8} cc/sec or smaller using a helium mass spectrometer or equivalent method. Devices with a case leakage rate greater than specified shall be removed from the lot.

4.3.4 Hermetic Seal Test — Gross Leak — Each Hybrid device shall be tested for gross leaks using fluorocarbon gross leak test or equivalent method. Devices with any indication of case leakage shall be removed from the lot.

4.3.5 Reverse Bias Clamp Inductive Test —

V_{4-2} = Rated Input Voltage

I_4 = 5A., f = 25 kHz, E_{out} = 5V

T_C = 25°C, see Figure 4

4.3.6 High Temperature Reverse Bias — Each Hybrid device will be high temperature reversed biased in the circuit shown in Figure 3. The conditions of this test are as follows:

T_A = +125°C

Time = 16 hours $^{+8}_{-0}$ hours

Circuit and voltages as shown in Figure 3 for the appropriate device.

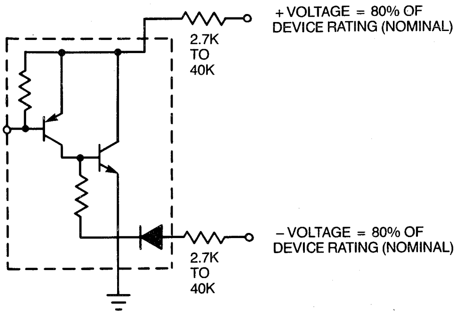
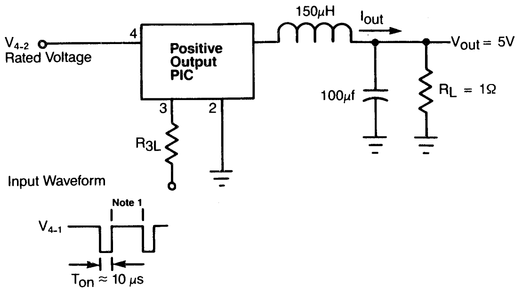


Figure 3. High Temperature Reverse Bias Circuit



Note 1: Adjust T_{off} to obtain specified I_{out}.

Note 2: Negative output test circuits and waveforms are identical but of opposite polarity.

Note 3: R_{3L} = 2KΩ for the PIC 7513/16/31/34
R_{3L} = 2.7KΩ for the PIC 7514/17/32/35
R_{3L} = 3.3KΩ for the PIC 7515/18/33/36

Figure 4. Reverse Bias Clamp Inductive Test Circuit

4.3.7 The following measurements will be made before and after the high temperature reverse bias test. The unit measurements shall be recorded or the devices will be celled in order to compare and guarantee the delta (Δ) requirements depending on the test level the lot is being prepared to.

Type Number	Test 1.1a	Maximum Readings Initial & Final	Delta Change	Symbol
PIC7513/14/15/31/32/33	8	1.5V	±0.3V	$V_{4-1\,(on)}$
PIC7516/17/18/34/35/36	8	−1.5V	±0.3V	$V_{4-1\,(on)}$
PIC7513/14/15/31/32/33	10	1.25V	±0.3V	$V_{2-1\,(on)}$
PIC7516/17/18/34/35/36	10	−1.25V	±0.3V	$V_{2-1\,(on)}$
PIC7513/14/15/31/32/33	12	10µA	±1.0 or ±100%[1]	I_{4-1}
PIC7516/17/18/34/35/36	12	−10µA	±1.0 or ±100%[1]	I_{4-1}
PIC7513/14/15/31/32/33	14	10µA	±2.0 or ±100%[1]	I_{1-2}
PIC7516/17/18/34/35/36	14	−10µA	±2.0 or ±100%[1]	I_{1-2}

[1] Whichever is greater.

4.3.8 Power Stress — Each Hybrid device shall be burned-in using the circuit shown in Figure 5. The conditions are as follows:

T_A = +25°C
Time = 40 hours minimum
Circuit and conditions as shown in Figure 5.

4.3.9 The readings before and after burn-in shall be as specified in paragraph 4.3.7.

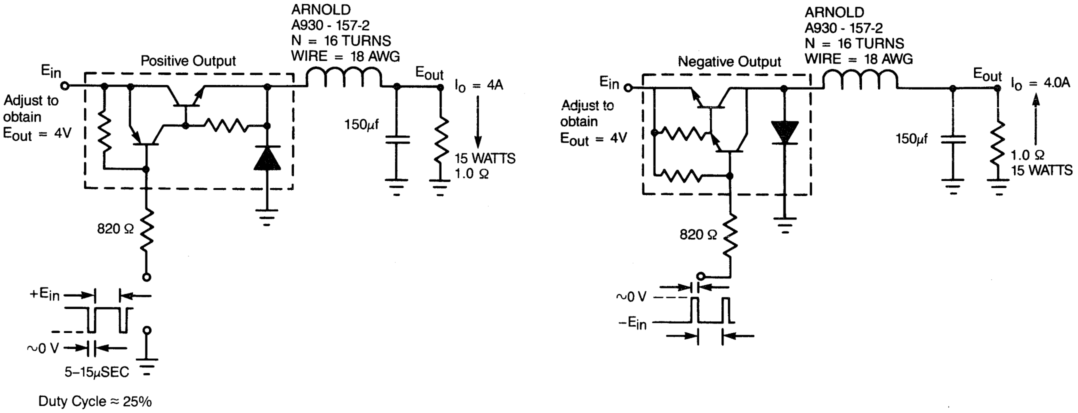


Figure 5. Burn-in Circuits

Table I. Group A Inspection

Examination or Test	Symbol	Electrical Spec Test Number	Sample Size (LTPD)	Max. Acc. No.
Subgroup 1				
Visual and Mechanical	—	—	22 (10)	0
Subgroup 2 25°C Tests				
On-State Voltage	$V_{4\text{-}1\ on}$	8	45	0
On-State Voltage	$V_{4\text{-}1\ on}$	9	(5)	
Diode Forward Voltage	$V_{2\text{-}1\ on}$	10		
Diode Forward Voltage	$V_{2\text{-}1\ on}$	11		
Off-State Current	$I_{4\text{-}1}$	12		
Diode Reverse Current	$I_{1\text{-}2}$	14		
Subgroup 3 T_A = +100°C Tests				
Off-State Current	$I_{4\text{-}1}$	13	45	0
Off-State Current	$I_{1\text{-}2}$	15	(5)	
Subgroup 4 25°C Tests				
Current Delay Time	t_{dI}	1		
Current Rise Time	t_{rI}	2		
Voltage Rise Time	t_{rv}	3	45	0
Voltage Fall Time	t_{fv}	5	(5)	
Current Fall Time	t_{fi}	6		

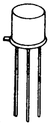
SCRs & THYRISTORS 8

Product Selection Guides
  Thyristors 8-3
  Ultra-Fast Switching 8-4
  Radiation Hardened SCRs 8-4
  PUTs 8-4
Datasheets 8-5

THYRISTORS (SCRs & PUTs)

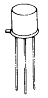
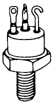
			$I_{T(RMS)}$	.5A			
 TO-18	SCR	V_{DRM} (V)	30		2N3027*	2N3030*	ID100
			60	AA114	2N3028*	2N3031*	ID101
			100		2N3029*	2N3032*	ID102
			150				ID103
			200	AA116			ID104
			300	AA110			ID105
			400	AA111			ID106
			I_{GT}	200μA	200μA	20μA	200μA
			I_H	2mA	5mA	4mA	5mA

			$I_{T(RMS)}$	1.25A	
 TO-9	SCR	V_{DRM} (V)	30	2N1876	2N1870A**
			60	2N1877	2N1871A**
			100	2N1878	2N1872A**
			150	2N1879	2N1873A
			200	2N1880	2N1874A**
			I_{GT}	20μA	200μA
			I_H	3mA	5mA

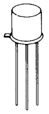
			$I_{T(RMS)}$	1.6A				
 TO-39	SCR	V_{DRM} (V)	30				2N2322	
			60	AD100	2N5724	2N2323A***	2N2323***	1D200
			100	AD101	2N5725	2N2324A***	2N2324***	ID201
			150			2N2325A	2N2325	ID202
			200	AD102	2N5726	2N2326A***	2N2326***	ID203
			300	AD103	2N5727	2N2328A***	2N2328***	ID300
			400	AD104	2N5728		2N2329***	ID301
			I_{GT}	2μA	20μA	20μA	200μA	200μA
			I_H	2mA	2mA	2mA	2mA	3mA

*Available as JAN and JANTX types.
**Available as JAN type.
***Available as JAN, JANTX, JANTXV types.

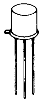
ULTRAFAST SWITCHING

 TO-18	SCR	V_{DRM} (V)	$I_{T(RMS)}$	4A	
			60V	GA200 GA300	GA200A GA300A
			100V	GA201 GA301	GA201A GA301A
			t_{on}	20ns (TYP.)	20nS (TYP.)
			t_q	2.0μS	.5μS
 TO-59	SCR	V_{DRM} (V)	$I_{T(RMS)}$	6A	
			60V	GB200 GB300	GB200A GB300A
			100V	GB201 GB301	GB201A GB301A
			t_{on}	20ns (TYP.)	20nS (TYP.)
			t_q	2.0μS	.5μS

RADIATION HARDENED SCRs

 TO-18	On-State Current $I_{T(RMS)}$		0.4A
	Package Style		TO-18
	REPETITIVE PEAK OFF-STATE VOLTAGE, V_{DRM} and REVERSE VOLTAGE, V_{RRM}	30V	GA100
		60V	GA101
		80V	GA102
	Key Parameters		I_{GT} (Post $3X10^{14}$ NVT) 20mA
			I_H (Post $3X10^{14}$ NVT) 30mA

PUTs — PROGRAMMABLE UNIJUNCTION TRANSISTORS

 TO-18	Peak Recurrent Forward Current		8A	
	Package Style		TO-18	
	MIN. VALLEY CURRENT, I_V MAX. PEAK POINT CURRENT, I_P	$I_V = 25\mu A$ @ $R_G = 10K$ $I_P = .15\mu A$ @ $R_G = 1Meg$	U13T2	CONSULT FACTORY
		$I_V = 70\mu A$ @ $R_G = 10K$ $I_P = 2\mu A$ @ $R_G = 1Meg$	U13T1	
		$I_V = 1mA$ @ $R_G = 200\Omega$ $I_P = .15\mu A$ @ $R_G = 1Meg$	2N6120	
		$I_V = 1.5mA$ @ $R_G = 200\Omega$ $I_P = 2\mu A$ @ $R_G = 1Meg$	2N6119 2N6137*	
	Forward and Reverse Voltage; V_{AK}, V_{AKR}		40V	100V

* Available as JAN and JANTX types.

SCRs
1.25 Amp, Planar

2N1870A-2N1874A, J

FEATURES
- Available as Either "JAN" or Standard Types
- Operating D.C. Current Range: 5 to 1250mA
- Pulse Currents: to 30A
- Voltage Ratings: to 200V
- Maximum Trigger Current: 0.2mA
- Maximum Trigger Voltage: 0.8V
- All Leads Isolated from Case
- Maximum θ_{J-C}: 20°C/W

DESCRIPTION
These are premium PNPN controlled switches intended for use in applications requiring a high degree of reliability assurance. The JAN types are specified under MIL-S-19500/198, and are included in MIL-STD-701 as recommended types for military usage.

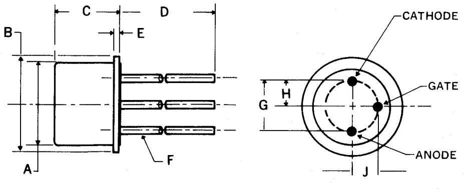
This series is useful in a wide variety of applications including: safety, arming and detonating circuits; timing and programming circuits; protective and warning circuits; driving relays; driving indicator lamps, encoding and decoding circuits; replacing relays, thyratrons, and magamps; servo motor control; pulse generation; plus many others.

ABSOLUTE MAXIMUM RATINGS

	2N1870A **JAN2N1870A**	**2N1871A** **JAN2N1871A**	**2N1872A** **JAN2N1872A**	**2N1873A** **—**	**2N1874A** **JAN2N1874A**
Repetitive Peak Off-State Voltage, V_{DRM}	30V	60V	100V	150V	200V
Repetitive Peak Reverse Voltage, V_{RRM}	30V	60V	100V	150V	200V
D.C. On-State Current, I_T					
100°C Ambient	250mA				
100°C Case	1.25A				
Repetitive Peak On-State Current, I_{TRM}	up to 30A				
Peak One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}	15A				
Peak Gate Current, I_{GM}	250mA				
Average Gate Current, $I_{G(AV)}$	25mA				
Reverse Gate Voltage, V_{GR}	5V				
Thermal Resistance, Junction to Case, $R\theta_{J-C}$	20°C/W				
Operating and Storage Temperature Range	—65°C to +150°C				

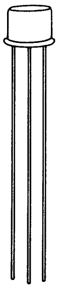
MECHANICAL SPECIFICATIONS

2N1870A-2N1874A



	ins.	mm.
A	.275-.335	6.99-7.75
B	..290-.370	7.37-9.40
C	.200-.260	5.08-6.60
D	1.5 MIN.	38.10 MIN.
E	.010-.030	.25-.76
F	$.017 \pm {}^{.002}_{.001}$	$.432 \pm {}^{.051}_{.025}$
G	.200	5.08
H	.100	2.54
J	.100	2.54

TO-9



Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)†

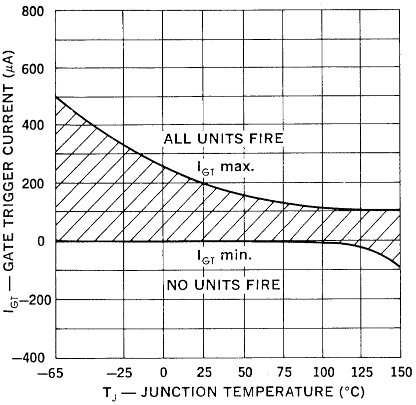
Test	Symbol	Min.	Typical	Max.	Units	Test Conditions
Subgroup 1 (Visual and Mechanical)						
Subgroup 2 (25°C Tests)						
Off-State Current	I_{DRM}	—	0.5	10	µA	$R_{GK} = 1K$, $V_{DRM} = +$ Rating
Reverse Current	I_{RRM}	—	0.5	10	µA	$R_{GK} = 1K$, $V_{RRM} = -$ Rating
Gate Trigger Voltage	V_{GT}	0.4	0.55	0.8	V	$R_{GS} = 100$ ohms, $V_D = 5V$
Gate Trigger Current	I_{GT}	—	30	200	µA	$R_{GS} > 10K$ ohms, $V_D = 5V$
On-State Voltage	V_{TM}	—	1.8	2.5	V	$I_{TM} = 2A$ (pulse test)
Off-State Voltage — Critical of Rise	dv_c/dt	100	—	—	V/µs	Specified test circuit
Reverse Gate Current	I_{GR}	—	0.5	10	µA	$V_{GRM} = 5V$, anode open
Holding Current	I_H	0.3	—	5.0	mA	$I_G = -150\mu A$, $V_D = 5V$
Subgroup 3 (125°C Tests)						
High Temp. Off-State Current	I_{DRM}	—	15	100	µA	$R_{GK} = 1K$, $V_{DRM} = +$ Rating
High Temp. Reverse Current	I_{RRM}	—	15	100	µA	$R_{GK} = 1K$, $V_{RRM} = -$ Rating
High Temp. Gate Non-Trigger Voltage	V_{GD}	0.2	—	—	V	$R_{GS} = 100$ ohms, $V_D = 5V$
High Temp. Holding Current	I_H	0.2	—	—	mA	$I_G = -150\mu A$, $V_D = 5V$
Subgroup 4 (—65°C Tests)						
Low Temp. Gate Trigger Voltage	V_{GT}	—	—	1.0	V	$R_{GK} = 100$ ohms, $V_D = 5V$
Low Temp. Gate Trigger Current	I_{GT}	—	—	500	µA	$R_{GK} > 10K$ ohms, $V_D = 5V$
Low Temp. Holding Current	I_H	—	—	15	mA	$I_G = -150\mu A$, $V_{AA} = 5V$

†All values in this table are JEDEC registered.

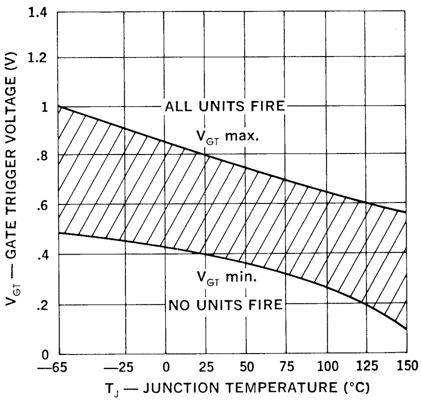
Note: Voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1 K or smaller, or other adequate gate bias is used.

Triggering and Bias Stabilization

1. **Gate Trigger Current**

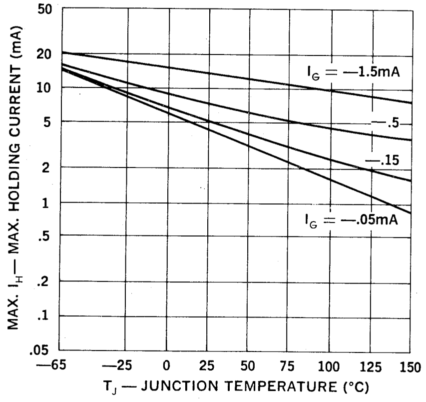


2. **Gate Trigger Voltage**

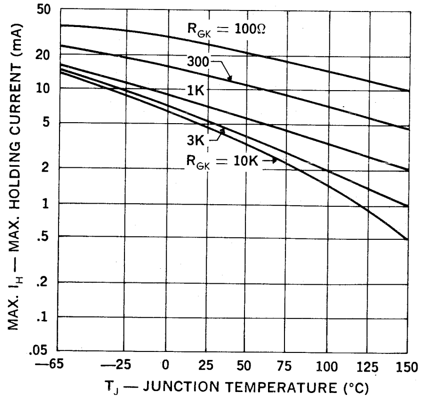


Holding Current

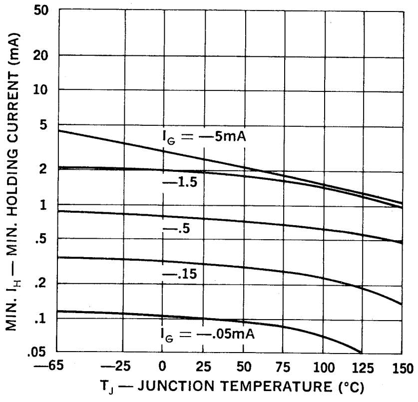
1. Max. Holding Current (Current Bias)



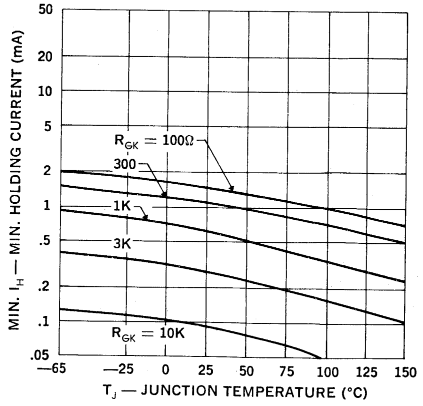
2. Max. Holding Current (Resistor Bias)



3. Min. Holding Current (Current Bias)

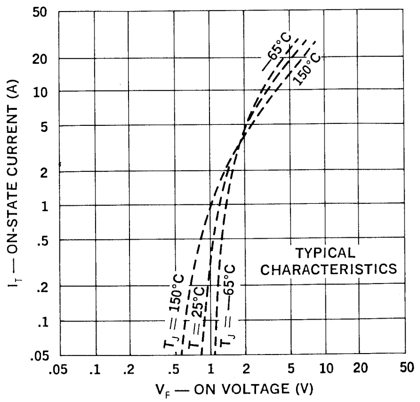


4. Min. Holding Current (Resistor Bias)

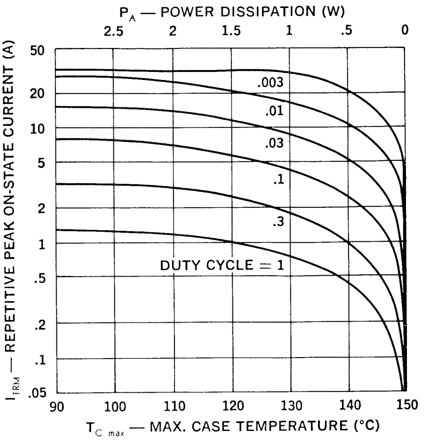


Current Ratings — Thermal Design

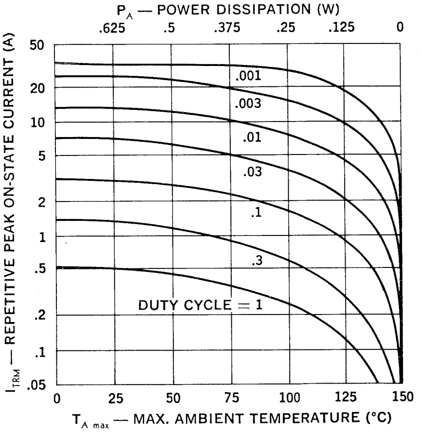
1. On-State Current vs. Voltage



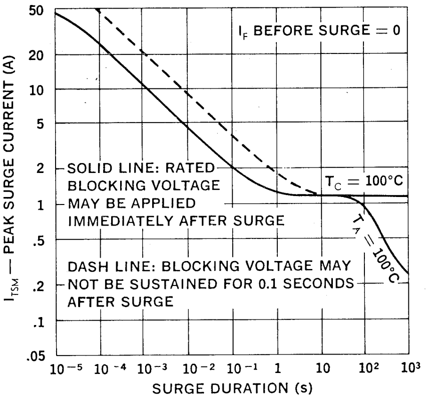
2. Peak Current vs. Case Temperature



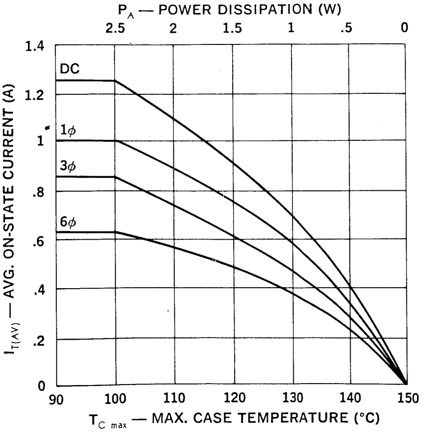
3. Peak Current vs. Ambient Temperature



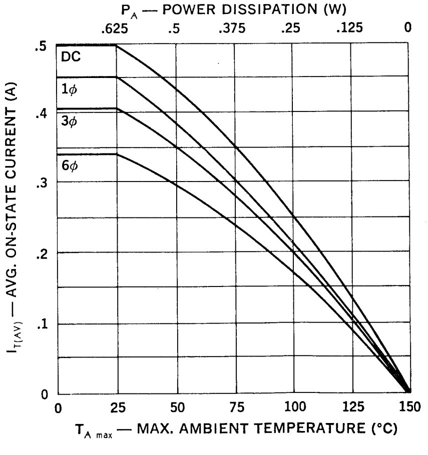
4. Surge Current vs. Time



5. Average Current vs. Case Temperature



6. Average Current vs. Ambient Temperature



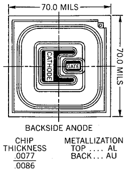
SCRs

1.6 Amp, Planar

2N2323-2N2329, J, JTX, JTXV
2N2323A-2N2328A, J, JTX, JTXV
2N2323S-2N2329S, J, JTX, JTXV
2N2323AS-2N2328AS, J, JTX, JTXV

FEATURES

- Available as JAN, JANTX, & JANTXV Types
- JAN Types Available in TO-5
- 1.6A D.C. Current
- Peak Currents: to 30A
- Voltage Ratings: to 400V
- 20μA Max. Trigger Current ("A" types)
- 0.6V Max. Trigger Voltage ("A" types)



DESCRIPTION

These are premium thyristor switches intended for use in high performance industrial, military and space applications requiring a high degree of reliability assurance. This series is useful in a wide variety of applications including timing and programming circuits, protective and warning circuits, driving relays, driving indicator lamps, encoding and decoding circuits, replacing relays, thyratrons, and magamps, servo motor control, pulse generation, plus many others. The high surge current rating (15A - 1 cycle) makes this series particularly useful for squib firing.

The following JAN, JANTX and JANTXV types are specified under Mil-S-19500/276A and are included in Mil-STD-701 as recommended types for military usage:

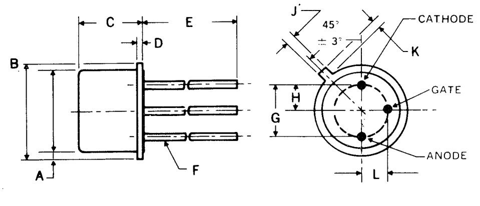
ABSOLUTE MAXIMUM RATINGS

	2N2323 JAN2N2323S JANTX2N2323S JANTXV2N2323S 2N2323A JAN2N2323AS JANTX2N2323AS JANTXV2N2323AS	2N2324 JAN2N2324S JANTX2N2324S JANTXV2N2324S 2N2324A JAN2N2324AS JANTX2N2324AS JANTXV2N2324AS	2N2325 2N2325A	2N2326 JAN2N2326S JANTX2N2326S JANTXV2N2326S 2N2326A JAN2N2326AS JANTX2N2326AS JANTXV2N2326AS	2N2327 2N2327A	2N2328 JAN2N2328S JANTX2N2328S JANTXV2N2328S 2N2328A JAN2N2328AS JANTX2N2328AS JANTXV2N2328AS	2N2329 JAN2N2329S JANTX2N2329S JANTXV2N2329S
Repetitive Peak Off-State Voltage, V_{DRM}	50V	100V	150V	200V	250V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	50V	100V	150V	200V	250V	300V	400V
Non-Repetitive Peak Reverse Voltage, V_{RSM} (< 5ms)	75V	150V	225V	300V	350V	400V	500V

D.C. On-State Current, I_T	
80°C Ambient	300mA
85°C Case	1.6A
One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}	15A
Repetitive Peak On-State Current, I_{TM}	30A
Gate Power Dissipation, P_{GM}	0.1W
Gate Power Dissipation, $P_{GM(AV)}$	0.01W
Peak Gate Current, I_{GM}	100mA
Reverse Gate Voltage	6V
Reverse Gate Current, I_{GR}	3mA
Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−65°C to +125°C

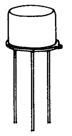
MECHANICAL SPECIFICATIONS

2N2323-2N2329, J, JTX, JTXV 2N2323S-2N2328S, J, JTX, JTXV
2N2323A-2N2328A, J, JTX, JTXV 2N2323AS-2N2328AS, J, JTX, JTXV



	INCHES	MILLIMETERS
A	.315-.335	8.00-8.51
B	.350-.370	8.89-9.39
C	.240-.260	6.35-6.60
D	.010-.030	0.25-0.76
E	.5 MIN	12.70 MIN
F	.016-.019	.406-.483
G	.190-.210	4.83-5.33
H	.085-.105	2.16-2.67
J	.028-.034	.711-.864
K	.029-.045	.737-1.14
L	.100	2.54

TO-205AD (TO-39)



ELECTRICAL SPECIFICATIONS

Test	Symbol	Min.	Typical	Max.	Units	Test Conditions
Visual and Mechanical						MIL-STD-750, Method 2071
25°C						
Off-State Current	I_{DRM}	—	0.1	10	μA	V_{DRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Reverse Current	I_{RRM}	—	0.1	10	μA	V_{RRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Gate Trigger Current	I_{GT}					
"A" Types		—	2	20	μA	V_D = 6V, R_L = 100Ω
non-"A" Types		—	50	200	μA	V_D = 6V, R_L = 100Ω
Gate Trigger Voltage	V_{GT}					
"A" Types		0.35	0.52	0.60	V	V_D = 6V, R_{GK} = 2K, R_L = 100Ω
non-"A" Types		0.35	0.55	0.80	V	V_D = 6V, R_{GK} = 1K, R_L = 100Ω
On-State Voltage	V_{TM}	—	2.0	2.2	V	I_{TM} = 4A (pulse test)
Holding Current	I_H	—	0.3	2.0	mA	V_D = 6V, R_{GK} = 1K (2K for "A" Types)
Reverse Gate Current	I_{GR}	—	1	200*	μA	V_{GR} = 6V
Delay Time	t_d	—	0.6	—	μs	I_G = 10mA, I_T = 1A, V_D = 30V
Rise Time	t_r	—	0.4	—	μs	I_G = 10mA, I_T = 1A, V_D = 30V
Circuit Commutated Turn-Off Time	t_q	—	20	—	μs	I_T = 1A, I_R = 1A, R_{GK} = 1K
125°C						
Off-State Current	I_{DRM}	—	1	100	μA	V_{DRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Reverse Current	I_{RRM}	—	1	100	μA	V_{RRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Gate Trigger Voltage	V_{GT}	0.1	0.3	—	V	V_D = Rated V_D, R_{GK} = 1K (2K for "A" Types)
Holding Current	I_H					
"A" Types		0.1†	—	—	mA	V_D = 6V, R_{GK} = 2K
non-"A" Types		0.15†	—	—	mA	V_D = 6V, R_{GK} = 1K
Off-State Voltage — Critical Rate of Rise	dv/dt					
"A" Types		0.7*			V/μs	V_D = Rating, R_{GK} = 2K
non-"A" Types		1.8*			V/μs	V_D = Rating, R_{GK} = 1K
—65°C						
Off-State Current	I_{DRM}	—	.05	5.0*	μA	V_{DRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Reverse Current	I_{RRM}	—	.05	5.0*	μA	V_{RRM} = Rating, R_{GK} = 1K (2K for "A" Types)
Gate Trigger Current	I_{GT}					
"A" Types		—	50	75	μA	V_D = 6V, R_L = 100Ω
non-"A" Types		—	100	350	μA	V_D = 6V, R_L = 100Ω
Gate Trigger Voltage	V_{GT}					
"A" Types		—	0.7	0.8*	V	V_D = 6V, R_{GK} = 2K, R_L = 100Ω
				0.9†	V	V_D = 6V, R_{GK} = 2K, R_L = 100Ω
non-"A" Types		—	0.75	1.0	V	V_D = 6V, R_{GK} = 1K, R_L = 100Ω
Holding Current	I_H	—	—	3.0†	mA	V_D = 6V, R_{GK} = 1K (2K for "A" Types)

* JAN and JANTX Types only.
† Industrial Types only.

JAN and JANTX Acceptance Tests

100% Screening TX-Types

High Temperature Storage
Temperature Cycling
Constant Acceleration
Fine & Gross Hermetic Seal
Electrical Test
Burn-in
Electrical Test

Group B Tests

Subgroup 1 — Reverse Gate Current
Surge Current
Non-Repetitive Reverse Voltage

Subgroup 2 — Low Temp. Reverse Blocking Current
Low Temp. Forward Blocking Current
Low Temp. Gate Trigger Voltage
Low Temp. Gate Trigger Current

Subgroup 3 — Temperature Cycling
Thermal Shock
Moisture Resistance
Solderability

Subgroup 4 — Blocking Life Test

Group C Tests

Subgroup 1 — Physical Dimensions

Subgroup 2 — Shock
Constant Acceleration
Vibration, Variable Frequency

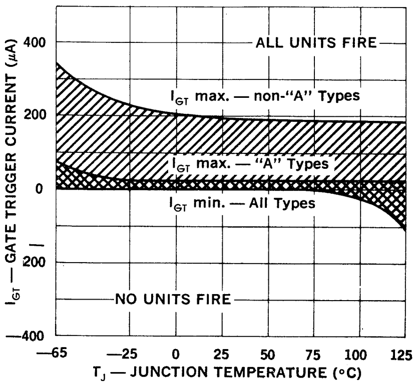
Subgroup 3 — Barometric Pressure, Reduced

Subgroup 4 — Salt Atmosphere

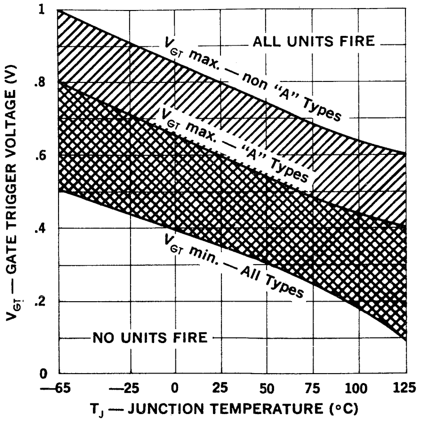
Subgroup 5 — Terminal Strength

Subgroup 6 — Intermittent Operating Life Test

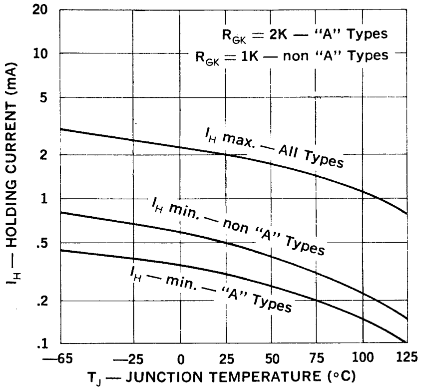
Gate Trigger Current



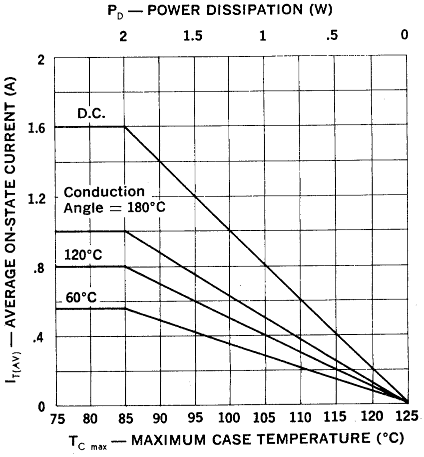
Gate Trigger Voltage



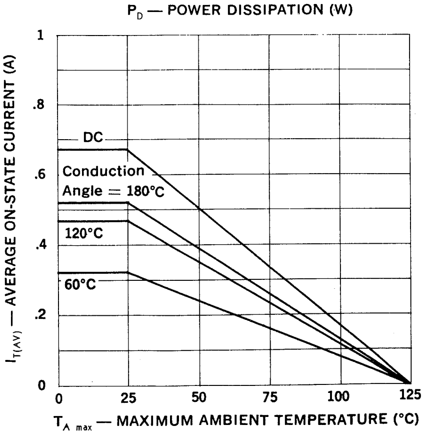
Holding Current



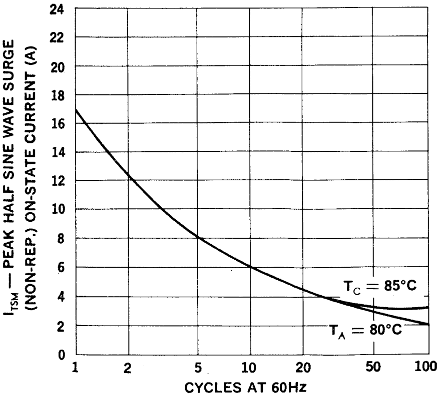
Average Current vs. Case Temperature



Average Current vs. Ambient Temperature

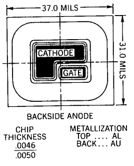


Surge Current



SCRs
0.5 Amp, Planar

JAN & JANTX 2N3027-2N3032



FEATURES
- JAN and JANTX Types Available
- Fully Characterized for "Worst Case" Design
- Passivated Planar Construction for Maximum Reliability and Parameter Uniformity
- Low On-State Voltage and Fast Switching at High Current Levels
- Typical Turn-On Time: 0.12μs
- Typical Recovery Time: 0.7μs
- Pulse Currents: to 30A

DESCRIPTION
The 2N3027 series of planar SCRs (controlled switches) are intended for use in military and space applications requiring a high degree of reliability. They offer a unique combination of extremely fast switching, precise triggering, high pulse power, small size, intrinsic parameter stability, and high radiation tolerance.

The JAN and JANTX types are specified under MIL-S-19500/419, and are included in MIL-STD-701 as recommended types for military usage.

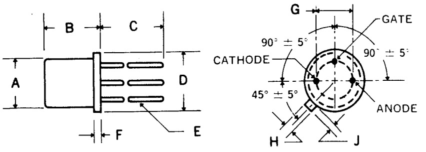
ABSOLUTE MAXIMUM RATINGS

	JAN & JANTX 2N3027 **JAN & JANTX 2N3030**	**JAN & JANTX 2N3028** **JAN & JANTX 2N3031**	**JAN & JANTX 2N3029** **JAN & JANTX 2N3032**
Repetitive Peak Off-State Voltage, V_{DRM}	30V	60V	100V
Repetitive Peak Reverse Voltage, V_{RRM}	30V	60V	100V
D.C. On-State Current, I_T			
100°C Case	500mA		
75°C Ambient	250mA		
Repetitive Peak On-State Current, I_{TRM}	30A		
Surge (Non-Rep.) On-State Current, I_{TSM}			
50ms	5A		
8ms	8A		
Peak Gate Current, I_{GM}	250mA		
Average Gate Current, $I_{G(AV)}$	25mA		
Reverse Gate Voltage	5V		
Reverse Gate Current	3mA		
Storage Temperature Range	−65°C to +200°C		
Operating Temperature Range	−65°C to +150°C		

Note: Blocking voltage ratings apply over the operating temperature range, provided the gate is connected to the cathode through an appropriate resistor, or adequate gate bias is used. (See section on bias stabilization.)

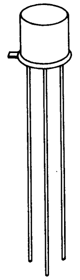
MECHANICAL SPECIFICATIONS

JAN & JANTX 2N3027-2N3032



	INCHES	MILLIMETERS
A	.178-.195 DIA.	4.52-4.95 DIA.
B	.170-.210	4.31-5.33
C	.5 MIN.	12.70 MIN.
D	.209-.230 DIA.	5.31-5.84 DIA.
E	.017 ± .002 DIA. .001 DIA.	.432 ± .051 .025
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028-.048	.711-1.22

TO-18



Micro/semi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted) 2N3027 — 2N3028 — 2N3029

Parameter	Symbol	Min.	Typical	Max.	Units	Test Conditions
SUBGROUP 1						MIL-STD-750
Visual and Mechanical	—	—	—	—	—	Method 2071
SUBGROUP 2 (25°C Tests)						
Off-State Current	I_{DRM}	—	.002	0.1	µA	R_{GK} = 1K, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	.002	0.1	µA	R_{GK} = 1K, V_{RRM} = Rating
Reverse Gate Voltage	V_{GR}	5	8	—	V	I_{GR} = 0.1mA
Gate Trigger Current	I_{GT}	−5	8	200	µA	R_{GS} = 10K, V_D = 5V
Gate Trigger Voltage	V_{GT}	.40	.55	.80	V	R_{GS} = 100Ω, V_D = 5V
On-State Voltage	V_T	0.8	1.2	1.5	V	I_T = 1A (pulse test)
Holding Current	I_H	0.3	0.7	5.0	mA	R_{GK} = 1K, V_D = 5V
SUBGROUP 3 (25°C Tests)						
		30	60	—		R_{GK} = 1K, V_D = 30V (2N3027)
Off-State Voltage — Critical Rate of Rise	dv_c/dt	15	30	—	V/µs	R_{GK} = 1K, V_D = 60V (2N3028)
		10	25	—		R_{GK} = 1K, V_D = 100V (2N3029)
Gate Trigger-on Pulse Width	$t_{pg\,(on)}$	—	.07	0.2	µs	I_G = 10mA, I_T = 1A, V_{DM} = 30V
Delay Time	t_d	—	.08	—	µs	I_G = 10mA, I_T = 1A, V_D = 30V
Rise Time	t_r	—	.04	—	µs	I_G = 10mA, I_T = 1A, V_D = 30V
Circuit Commutated Turn-off Time	t_g	—	0.7	2.0	µs	I_T = 1A, I_R = 1A, R_{GK} = 1K
SUBGROUP 4 (150°C Tests)						
High Temp. Off-State Current	I_{DRM}	—	2	20	µA	R_{GK} = 1K, V_{DRM} = Rating
High Temp. Reverse Current	I_{RRM}	—	20	50	µA	R_{GK} = 1K, V_{RRM} = Rating
High Temp. Gate Trigger Voltage	V_{GT}	.10	.15	0.6	V	R_{GS} = 100Ω, V_D = 5V
High Temp. Holding Current	I_H	.05	.20	1.0	mA	R_{GK} = 1K, V_D = 5V
SUBGROUP 5 (−65°C Tests)						
Low Temp. Gate Trigger Voltage	V_{GT}	0.6	0.75	1.1	V	R_{GS} = 100Ω, V_D = 5V
Low Temp. Gate Trigger Current	I_{GT}	0	150	1.2	mA	R_{GS} = 10K, V_D = 5V
Low Temp. Holding Current	I_H	0.5	3.5	10	mA	R_{GK} = 1K, V_D = 5V

ELECTRICAL SPECIFICATIONS (at 25°C unless noted) 2N3030 — 2N3031 — 2N3032

Parameter	Symbol	Min.	Typical	Max.	Units	Test Conditions
SUBGROUP 1						MIL-STD-750
Visual and Mechanical	—	—	—	—	—	Method 2071
SUBGROUP 2 (25°C Tests)						
Off-State Current	I_{DRM}	—	.002	0.1	µA	R_{GK} = 1K, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	.002	0.1	µA	R_{GK} = 1K, V_{RRM} = Rating
Reverse Gate Voltage	V_{GR}	5	8	—	V	I_{GR} = 0.1mA
Gate Trigger Current	I_{GT}	−5		20	µA	R_{GS} = 10K, V_D = 5V
Gate Trigger Voltage	V_{GT}	0.44		0.6	V	R_{GS} = 100Ω, V_D = 5V
On-State Voltage	V_T	0.8	1.2	1.5	V	I_T = 1A (pulse test)
Holding Current	I_H	0.3	1.0	4.0	mA	R_{GK} = 1K, V_D = 5V
SUBGROUP 3 (25°C Tests)						
		30	60	—		R_{GK} = 1K, V_D = 30V (2N3030)
Off-State Voltage — Critical Rate of Rise	dv_c/dt	15	30	—	V/µs	R_{GK} = 1K, V_D = 60V (2N3031)
		10	25	—		R_{GK} = 1K, V_D = 100V (2N3032)
Gate Trigger-on Pulse Width	$t_{pg\,(on)}$	—	.05	0.1	µs	I_G = 10mA, I_T = 1A, V_D = 30V
Delay Time	t_d	—	0.1	—	µs	I_G = 10mA, I_T = 1A, V_D = 30V
Rise Time	t_r	—	.05	—	µs	I_G = 10mA, I_T = 1A, V_D = 30V
Circuit Commutated Turn-off Time	t_g	—	0.7	2.0	µs	I_T = 1A, I_R = 1A, R_{GK} = 1K
SUBGROUP 4 (150°C Tests)						
High Temp. Off-State Current	I_{DRM}	—	2	20	µA	R_{GK} = 1K, V_{DRM} = Rating
High Temp. Reverse Current	I_{RRM}	—	20	50	µA	R_{GK} = 1K, V_{RRM} = Rating
High Temp. Gate Trigger Voltage	V_{GT}	.10	.15	0.4	V	R_{GS} = 100Ω, V_D = 5V
High Temp. Holding Current	I_H	.05	.30	2.0	mA	R_{GK} = 1K, V_D = 5V
SUBGROUP 5 (−65°C Tests)						
Low Temp. Gate Trigger Voltage	V_{GT}	0.44	0.8	0.95	V	R_{GS} = 100Ω, V_D = 5V
Low Temp. Gate Trigger Current	I_{GT}	0	0.4	0.5	mA	R_{GS} = 10K, V_D = 5V
Low Temp. Holding Current	I_H	0.5	5.0	8	mA	R_{GK} = 1K, V_D = 5V

High Reliability Processing

The 2N3027-2N3032 series provides a complete range of high reliability processing from the standard devices that undergo extensive electrical testing, through JAN and JANTX levels. 100% processing, Group B, and Group C tests for JAN and JANTX devices is shown below. For further details, see MIL-S-19500/419(EL).

100% Screening TX-Types

High Temperature Storage
Temperature Cycling
Constant Acceleration
Fine & Gross Hermetic Seal
Electrical Test
Burn-in
Electrical Test

Group B Tests

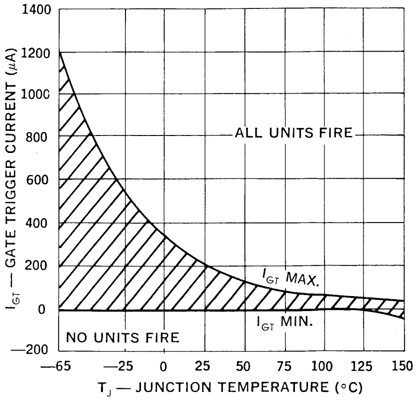
Subgroup 1 — Physical Dimensions
Subgroup 2 — Solderability
Temperature Cycling
Thermal Shock
Constant Acceleration
Moisture Resistance
Subgroup 3 — Surge Current
Subgroup 4 — Blocking Life Test
Subgroup 5 — Storage Life Test
Subgroup 6 — Operating Life Test

Group C Tests

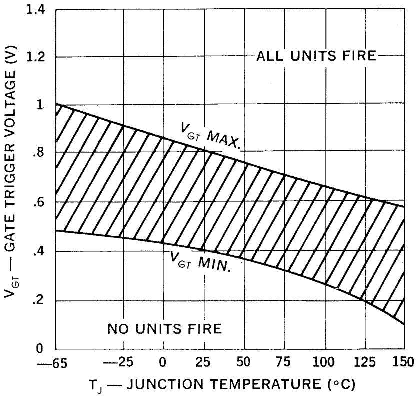
Subgroup 1 — Shock
Vibration, Variable Frequency
Subgroup 2 — Salt Atmosphere
Subgroup 3 — Terminal Strength
Subgroup 4 — High Temp. Anode Voltage — Critical rate or rise
Subgroup 5 — Storage Life Test
Subgroup 6 — Operating Life Test

TYPICAL CHARACTERISTICS
2N3027 — 2N3028 — 2N3029

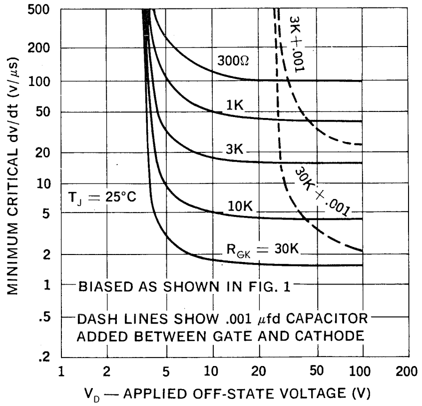
1 Gate Trigger Current



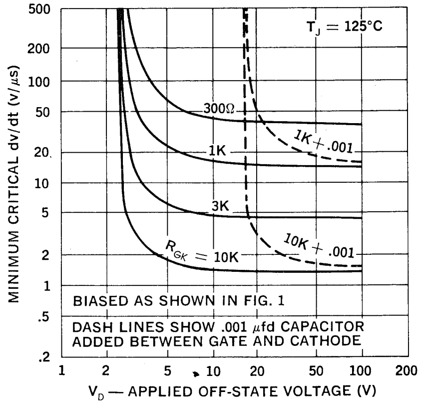
2 Gate Trigger Voltage



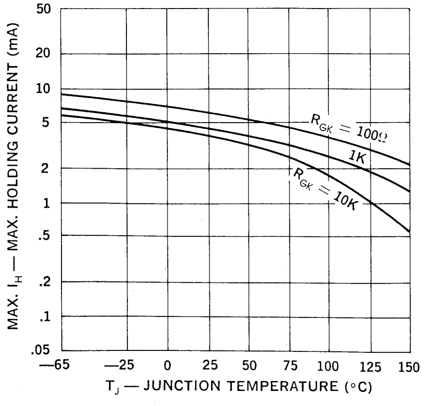
3 Min. Critical dv/dt (25°C — R Bias)



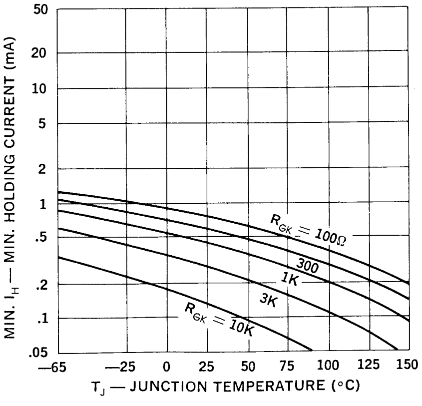
4 Min. Critical dv/dt (125°C — R Bias)



5 Max. Holding Current (Resistor Bias)

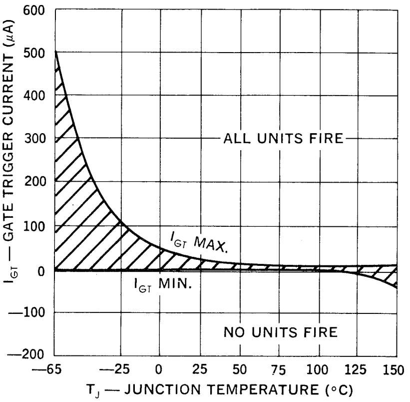


6 Min. Holding Current (Resistor Bias)

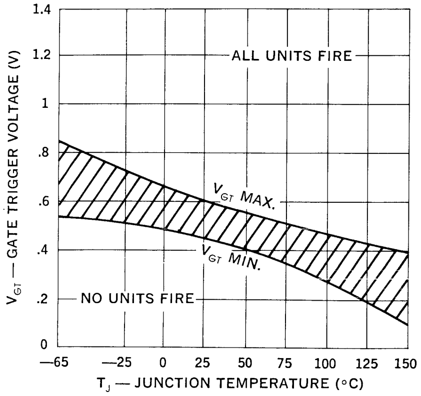


TYPICAL CHARACTERISTICS
2N3030 — 2N3031 — 2N3032

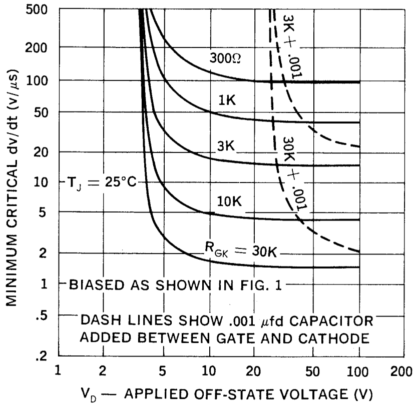
1 Gate Trigger Current



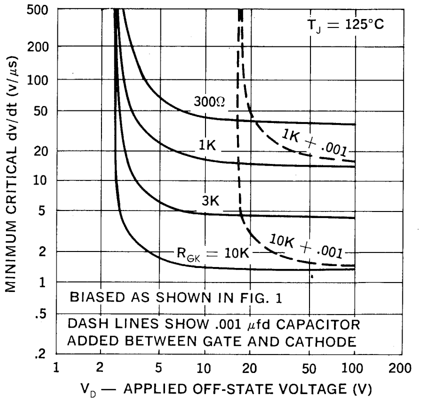
2 Gate Trigger Voltage



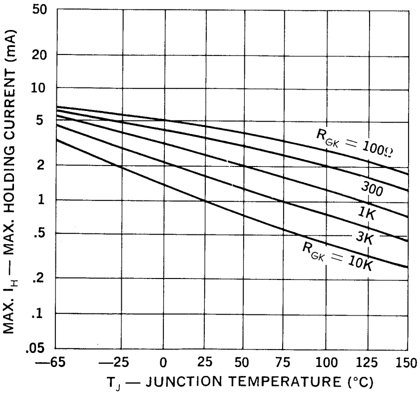
3 Min. Critical dv/dt (25°C — R Bias)



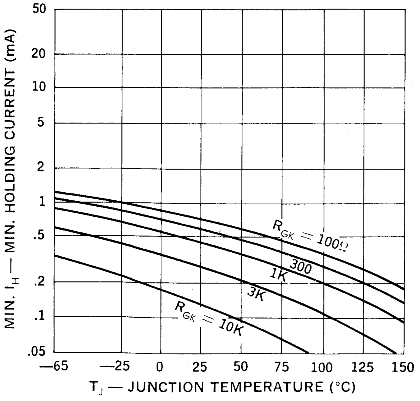
4 Min. Critical dv/dt (125°C — R Bias)



5 Max. Holding Current (Resistor Bias)

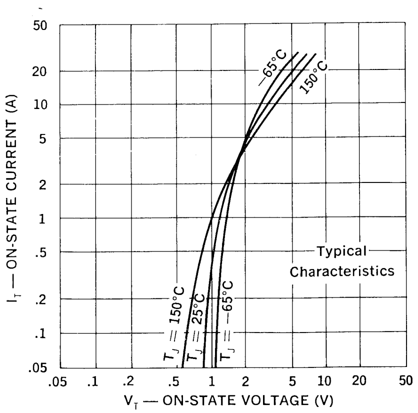


6 Min. Holding Current (Resistor Bias)

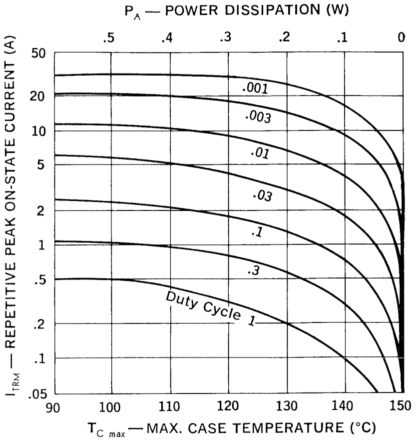


CURRENT RATINGS

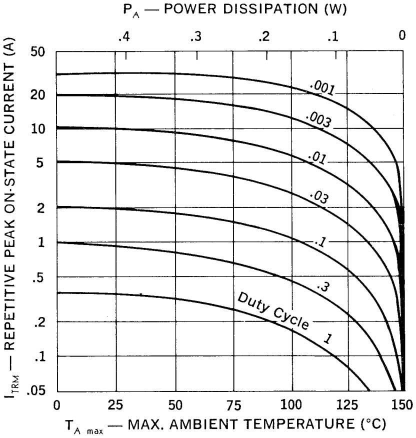
C1 Forward on Current vs. Voltage



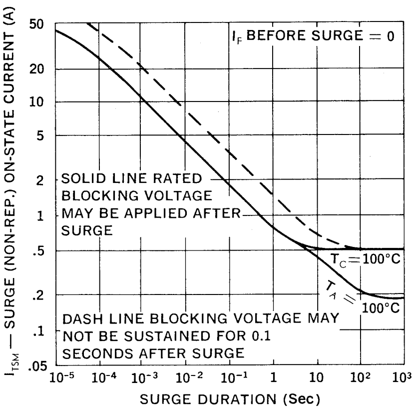
C2 Peak Current vs. Case Temperature



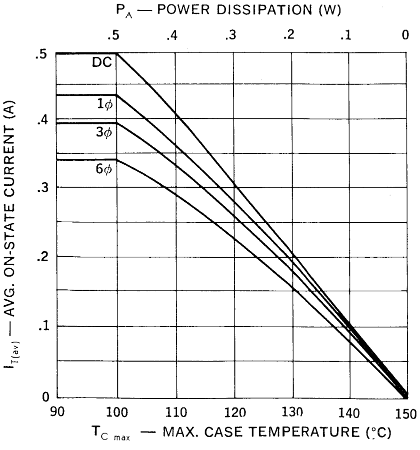
C3 Peak Current vs. Ambient Temperature TO-18 Ratings (see note)



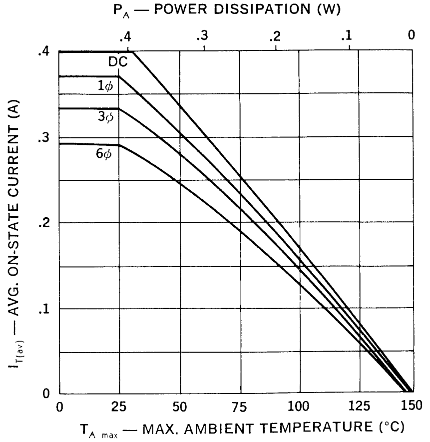
C4 Surge Current vs. Time



C5 Average Current vs. Case Temperature

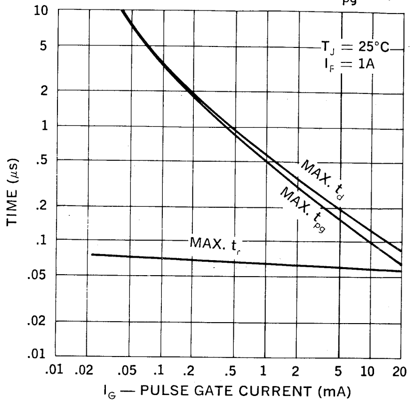


C6 Average Current vs. Ambient Temperature TO-18 Ratings (see note)

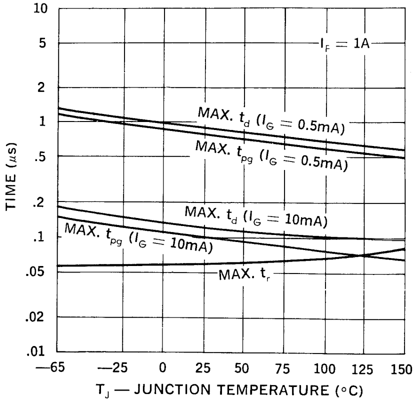


SWITCHING SPEEDS

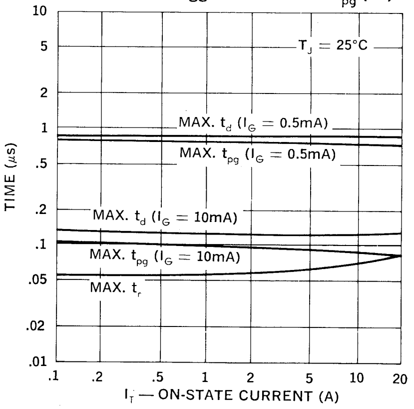
S1 Maximum Delay Time t_d, Rise Time t_r, and Gate Trigger Pulse Width t_{pg} (on)



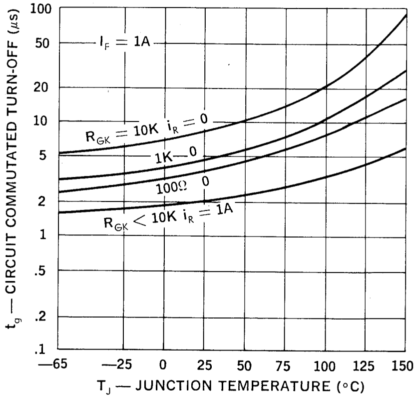
S2 Maximum Delay Time t_d, Rise Time t_r, and Gate Trigger Pulse Width t_{pg} (on)



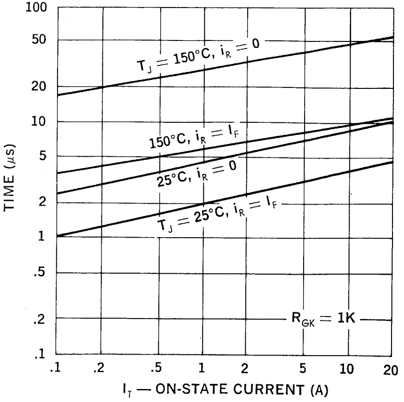
S3 Maximum Delay Time t_d, Rise Time t_r, and Gate Trigger Pulse Width t_{pg} (on)



S4 Maximum Circuit Commutated Turn-off Time t_q



S5 Maximum Circuit Commutated Turn-off Time t_q



SCRs

1.6 Amp, Planar

2N5724-2N5728

FEATURES

- Maximum Gate Trigger Current: 20μA
- Closely Controlled Gate Trigger Voltage: .44 to .6V
- Operating Current Range: 2mA to 1.6A
- Voltage Ratings: to 400V
- Low On-State Voltage
- Specified for dv/dt and Switching Time

DESCRIPTION

These devices are intended for general purpose usage in Military/aerospace or severe industrial environments. Major design parameters are specified at the temperature extremes, thus permitting worst case design on the basis of guaranteed values. These devices undergo 100% preconditioning, which includes high temperature storage and temperature cycling followed by a fine leak test as a regular part of the manufacturing procedure.

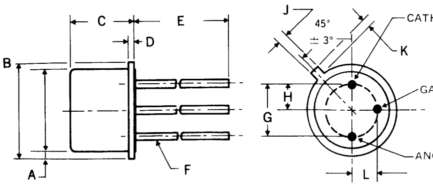
The high voltage types of the 2N5724 series are especially useful as pulse modulator switches in low to medium power pulse modulator applications. Specific parameters such as rise time, delay time, holding current, and recovery time can be selected for optimum performance in a pulse modulator circuit.

ABSOLUTE MAXIMUM RATINGS

	2N5724	2N5725	2N5726	2N5727	2N5728
Repetitive Peak Off-State Voltage, V_{DRM}	60V	100V	200V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	60V	100V	200V	300V	400V
Non-Repetitive Peak Off-State Voltage, V_{DSM}			500V		
D.C. On-State Current, I_T					
75°C Ambient			450mA		
85°C Case			1.6A		
Repetitive Peak On-State Current, I_{TRM}			up to 30A		
Peak One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}			15A		
Peak Gate Current, I_{GM}			250mA		
Average Gate Current, $I_{G(AV)}$			25mA		
Reverse Gate Current, I_{GR}			3mA		
Reverse Gate Voltage, V_{GR}			6V		
Operating and Storage Temperature Range			—65°C to +150°C		

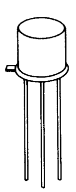
MECHANICAL SPECIFICATIONS

2N5724-2N5728



	ins.	mm.
A	.305-.335	7.75-8.51
B	.335-.370	8.51-9.40
C	.240-.260	6.35-6.60
D	.010-.030	.25-.76
E	.5 MIN.	12.70 MIN.
F	$.017 \pm {}^{.002}_{.001}$	$.432 \pm {}^{.051}_{.025}$
G	.200	5.08
H	.100	2.54
J	.031±.003	.79±.08
K	.029-.045	.74-1.14
L	.100	2.54

TO-205AD (TO-39)



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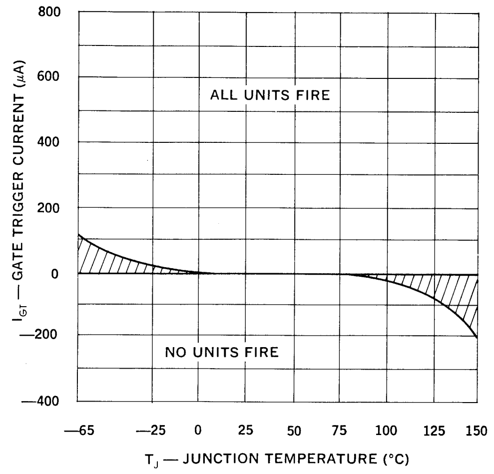
ELECTRICAL SPECIFICATIONS

Test	Symbol	Min.	Typical	Max.	Units	Test Conditions
SUBGROUP 1 Visual and Mechanical	—	—	—	—	—	
SUBGROUP 2 (25°C TESTS)						
Off-State Current	I_{DRM}	—	.05	0.1	μA	$R_{GK} = 1K$, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	.05	0.1	μA	$R_{GK} = 1K$, V_{RRM} = Rating
Reverse Gate Voltage	V_{GR}	5	8	—	V	$I_{GR} = 0.1mA$
Gate Trigger Current	I_{GT}	—	2	20	μA	$R_{GS} = 10K$, $V_D = 5V$
Gate Trigger Voltage	V_{GT}	0.44	0.5	0.6	V	$R_{GS} = 100\Omega$, $V_D = 5V$
On-State Voltage	V_T	—	2.3	2.5	V	$I_T = 5A$ (pulse test)
Holding Current	I_H	0.3	0.8	2.0	mA	$R_{GK} = 1K$, $V_D = 5V$
SUBGROUP 3 (25°C TESTS)						
Off-State Voltage — Critical Rate of Rise	dv/dt	100	150	—	v/μs	$R_{GK} = 1K$, $V_D = 30V$
Gate Trigger — on Pulse Width	t_{pg} (on)	—	0.1	0.5	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Delay Time	t_d	—	0.1	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Rise Time	t_r	—	0.3	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Circuit Commutated Turn-off Time						
2N5724, 2N5725, 2N5726,	t_q	—	15	30	μs	$I_T = 1A$, $i_R = 1A$, $R_{GK} = 1K$
2N5727, 2N5728		—	30	50	μs	
SUBGROUP 4 (150°C TESTS)						
High Temp. Off-State Current	I_{DRM}	—	50	200	μA	$R_{GK} = 1K$, V_{DRM} = Rating
High Temp. Reverse Current	I_{RRM}	—	80	200	μA	$R_{GK} = 1K$, V_{RRM} = Rating
High Temp. Gate Trigger Voltage	V_{GT}	0.10	0.15	—	V	$R_{GS} = 100\Omega$, $V_D = 5V$
High Temp. Holding Current	I_H	0.10	0.15	—	mA	$R_{GK} = 1K$, $V_D = 5V$
SUBGROUP 5 (—65°C TESTS)						
Low Temp. Gate Trigger Voltage	V_{GT}	—	0.7	0.9	V	$R_{GS} = 100\Omega$, $V_D = 5V$
Low Temp. Gate Trigger Current	I_{GT}	—	50	125	μA	$R_{GS} = 10K$, $V_D = 5V$
Low Temp. Holding Current	I_H	—	1.2	3.0	mA	$R_{GK} = 1K$, $V_D = 5V$

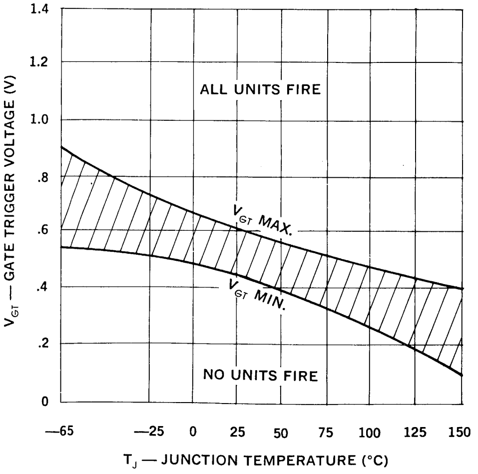
Note 1 See rating curves for full rating information.

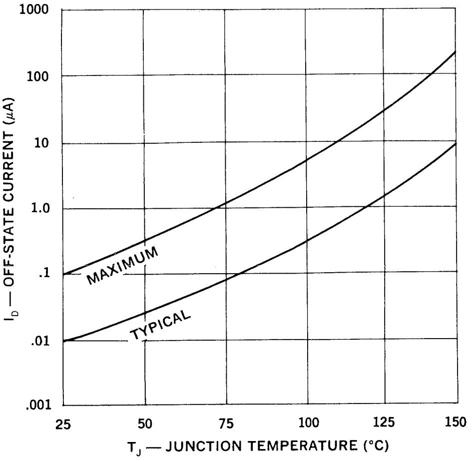
Note 2 Blocking voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1K or smaller, or other adequate gate bias is used.

Gate Trigger Current

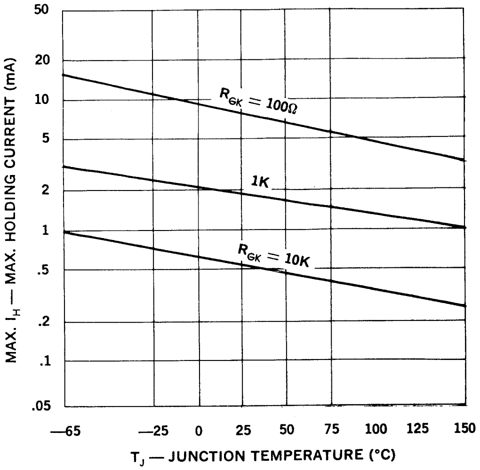


Gate Trigger Voltage

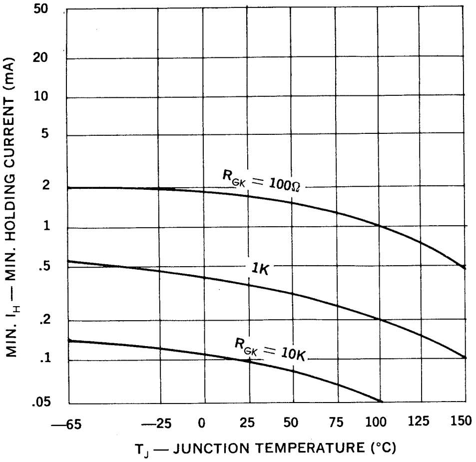




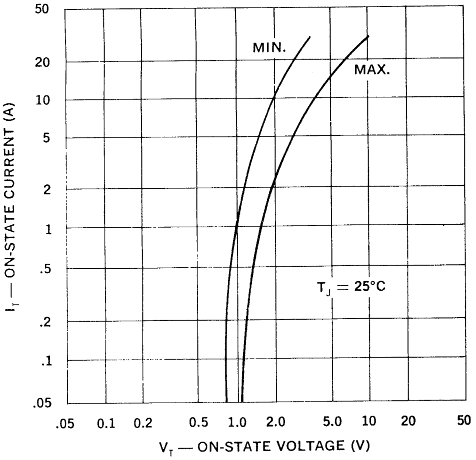
Off-State Current



Max. Holding Current

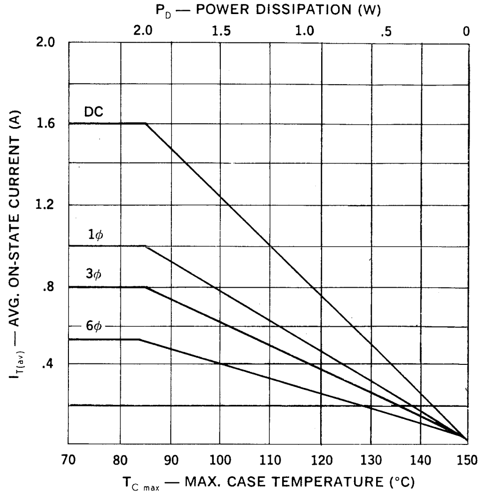


Min. Holding Current

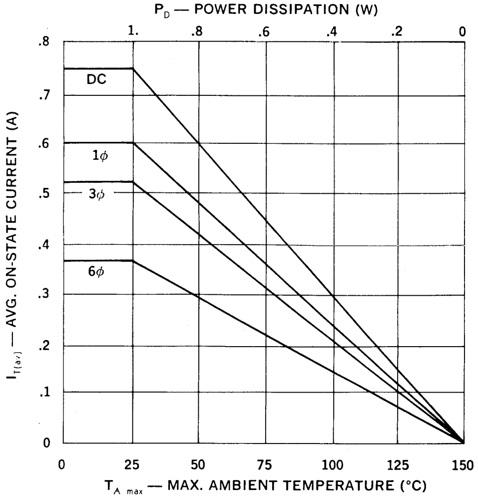


On-State Current vs. Voltage

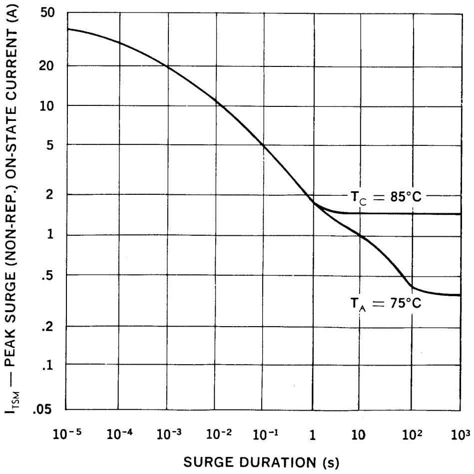
Avg. Current vs. Case Temperature



Avg. Current vs. Ambient Temperature



Surge Current



SCRs

.5A, Planar

AA100-AA104
AA107-AA111
AA114-AA118

FEATURES

- Maximum Gate Trigger Current: 2, 20 or 200μA
- Tight Gate Trigger Voltage Range: .44 to .6V
- Voltage Ratings: to 400V
- Specified for dv/dt and Switching Time

DESCRIPTION

This data sheet describes Unitrode's AA Series 0.5A SCRs designed for low-current sensing applications. Units are available in a complete range of blocking voltages from 60 to 400 volts.

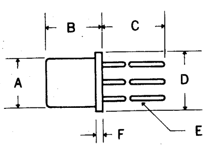
The AA100 series offers a maximum gate trigger current of 2.0 microamps making it the most sensitive device of its type. The AA107 series has a maximum I_{GT} of 20μA while this parameter is specified at 200μA for the AA114 series.

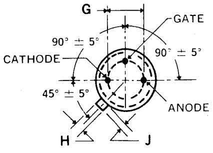
ABSOLUTE MAXIMUM RATINGS

	AA100 **AA107** **AA114**	**AA101** **AA108** **AA115**	**AA102** **AA109** **AA116**	**AA103** **AA110** **AA117**	**AA104** **AA111** **AA118**
Repetitive Peak Off-State Voltage, V_{DRM}	60V	100V	200V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	60V	100V	200V	300V	400V
Non-Repetitive Peak Reverse Voltage, V_{RSM}	80V	150V	300V	400V	500V
Non-Repetitive Peak Off-State Voltage, V_{DSM}	500V				
D.C. On-State Current, I_T					
75°C Ambient	250mA				
100°C Case	500mA				
Repetitive Peak On-State Current, I_{TRM}	up to 30A				
Peak One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}	5A				
Peak Gate Current, I_{GM}	250mA				
Average Gate Current, $I_{G(AV)}$	25mA				
Reverse Gate Voltage V_{GR}	6V				
Operating and Storage Temperature Range	−65°C to +150°C				

MECHANICAL SPECIFICATIONS

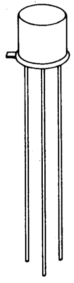
AA100-AA104 AA107-AA111 AA114-AA118





	INCHES	MILLIMETERS
A	.178-.195 DIA.	4.52-4.95 DIA.
B	.170-.210	4.31-5.33
C	.5 MIN.	12.70 MIN.
D	.209-.230 DIA.	5.31-5.84 DIA.
E	$.017 \pm ^{.002\text{ DIA.}}_{.001\text{ DIA.}}$	$.432 \pm ^{.051}_{.025}$
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028-.048	.711-1.22

TO-18



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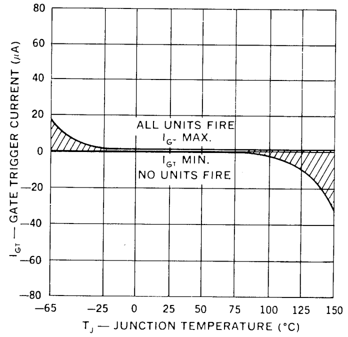
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

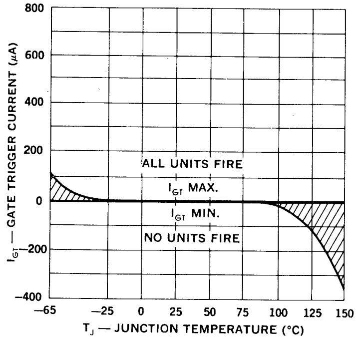
Parameter	Symbol	Min.	Typical	Max.	Units	Test Conditions
SUBGROUP 1 Visual & Mechanical	—	—	—	—	—	—
SUBGROUP 2 (25°C TESTS)						
Off-State Current	I_{DRM}	—	.01	0.1	μA	$R_{GK} = 1K$, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	.01	0.1	μA	$R_{GK} = 1K$, V_{RRM} = Rating
Reverse Gate Current	I_{GR}	—	0.1	0.2	μA	$V_{GR} = 2V$
Gate Trigger Current	I_{GT}					$R_{GS} = 10K$, $V_D = 5V$
AA100-104		—	0.2	2.0	μA	
AA107-111		—	2.0	20	μA	
AA114-118		—	20	200	μA	
Gate Trigger Voltage	V_{GT}	0.44	0.52	0.60	V	$R_{GS} = 100\Omega$, $V_D = 5V$
On-State Voltage	V_T	—	1.1	1.5	V	$I_T = 1.0$ A (pulse)
Holding Current	I_H	0.3	0.5	2.0	mA	$R_{GK} = 1K$
SUBGROUP 3 (25°C TESTS)						
Off-State Voltage — Critical Rate of Rise	dv/dt	50	100	—	V/μs	$R_{GK} = 1K$, $V_D = 30V$
Gate Trigger — on Pulse Width	t_{pg} (on)	—	0.5	2.0	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Delay Time	t_d	—	0.6	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Rise Time	t_r	—	0.4	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Circuit Commutated Turn-off Time	t_q	—	20	50	μs	$I_T = 1A$, $I_R = 1A$, $R_{GK} = 1K$
SUBGROUP 4 (125°C TESTS)						
Off-State Current	I_{DRM}	—	10	20	μA	$R_{GK} = 1K$, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	30	100	μA	$R_{GK} = 1K$, V_{RRM} = Rating
Gate Trigger Voltage	V_{GT}	0.15	0.2	—	V	$R_{GS} = 100\Omega$, $V_D = 5V$
Holding Current	I_H	0.2	0.4	1.5	mA	$R_{GK} = 1K$

Note: Blocking voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1000 ohms or smaller, or other adequate bias is used.

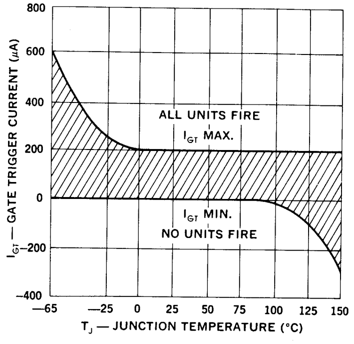
Gate Trigger Current
AA100 Series



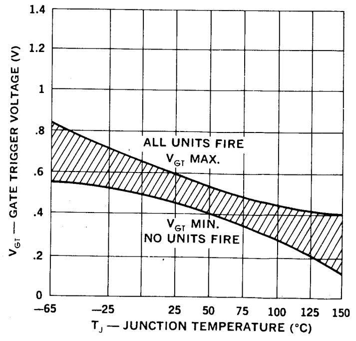
Gate Trigger Current
AA107 Series

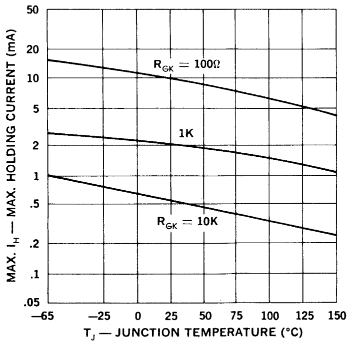


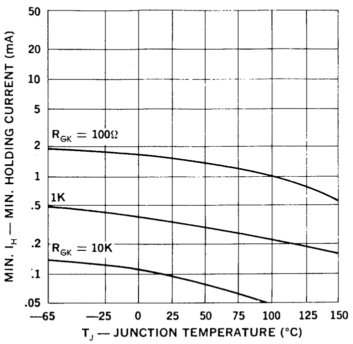
Gate Trigger Current
AA114 Series

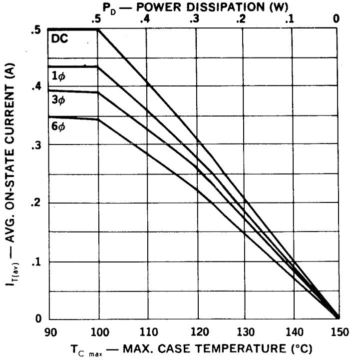


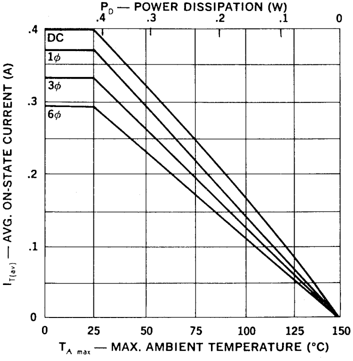
Gate Trigger Voltage

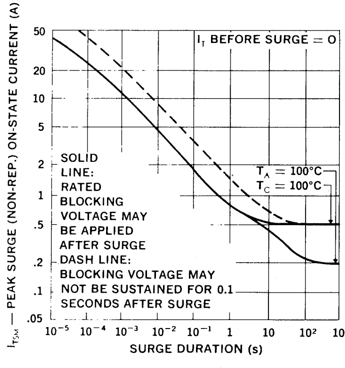



Max. Holding Current


Min. Holding Current


Avg. Current vs. Case Temperature


Avg. Current vs. Ambient Temperature


Surge Current

SCRs
1.6 Amp, Planar

AD100-AD104
AD107-AD111
AD114-AD118

FEATURES

- Maximum Gate Trigger Current: 2, 20 or 200μA
- Tight Gate Trigger Voltage Range: .44 to .6V
- Voltage Ratings: to 400V
- Specified for dv/dt and Switching Time

DESCRIPTION

This data sheet describes Unitrode's AD Series 1.6A SCRs designed for medium-current control and sensing applications. Units are available in a complete range of blocking voltages from 60 to 400 volts.

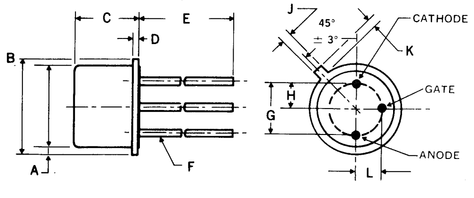
The AD100 series offers a maximum gate trigger current of 2.0 microamps making it the most sensitive device of its type. The AD107 series has a maximum I_{GT} of 20μA while this parameter is specified at 200μA for the AD114 series.

ABSOLUTE MAXIMUM RATINGS

	AD100 **AD107** **AD114**	**AD101** **AD108** **AD115**	**AD102** **AD109** **AD116**	**AD103** **AD110** **AD117**	**AD104** **AD111** **AD118**
Repetitive Peak Off-State Voltage, V_{DRM}	60V	100V	200V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	60V	100V	200V	300V	400V
Non-Repetitive Peak Reverse Voltage, V_{RSM}	80V	150V	300V	400V	500V
Non-Repetitive Peak Off-State Voltage, V_{DSM}	500V				
D.C. On-State Current, I_T					
75°C Ambient	450mA				
85°C Case	1.6A				
Repetitive Peak On-State Current, I_{TRM}	up to 30A				
Peak One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}	15A				
Peak Gate Current, I_{GM}	250mA				
Average Gate Current, $I_{G(AV)}$	25mA				
Reverse Gate Voltage, V_{GR}	6V				
Operating and Storage Temperature Range	−65°C to +150°C				

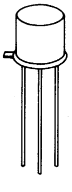
MECHANICAL SPECIFICATIONS

AD100-AD104 AD107-AD111 AD114-AD118



	ins.	mm.
A	.305-.335	7.75-8.51
B	.335-.370	8.51-9.40
C	.240-.260	6.35-6.60
D	.010-.030	.25-.76
E	.5 MIN.	12.70 MIN.
F	$.017 \pm {.002 \atop .001}$	$.432 \pm {.051 \atop .025}$
G	.200	5.08
H	.100	2.54
J	.031±.003	.79±.08
K	.029-.045	.74-1.14
L	.100	2.54

TO-205AD (TO-39)



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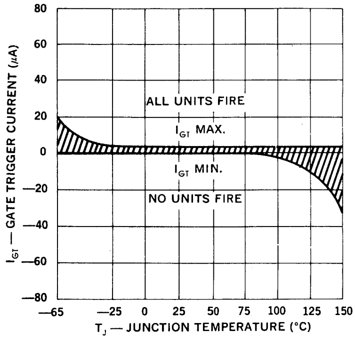
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

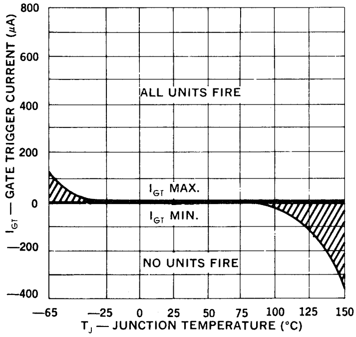
Parameter	Symbol	Min.	Typical	Max.	Units	Test Conditions
SUBGROUP 1						
Visual & Mechanical	—	—	—	—	—	
SUBGROUP 2 (25°C TESTS)						
Off-State Current	I_{DRM}	—	.01	0.1	μA	$R_{GK} = 1K$, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	.01	0.1	μA	$R_{GK} = 1K$, V_{RRM} = Rating
Reverse Gate Current	I_{GR}	—	0.1	0.2	μA	$V_{GR} = 2V$
Gate Trigger Current	I_{GT}					$R_{GS} = 10K$, $V_D = 5V$
AD100-104		—	0.2	2.0	μA	
AD107-111		—	2.0	20	μA	
AD114-118		—	20	200	μA	
Gate Trigger Voltage	V_{GT}	0.44	0.52	0.60	V	$R_{GS} = 100\Omega$, $V_D = 5V$
On-State Voltage	V_T	—	1.1	1.5	V	$I_T = 1.0$ Amp (pulse)
Holding Current	I_H	0.3	0.5	2.0	mA	$R_{GK} = 1K$
SUBGROUP 3 (25°C TESTS)						
On-State Voltage-Critical Rate of Rise	dv/dt	50	100	—	V/μs	$R_{GK} = 1K$, $V_D = 30V$
Gate Trigger-on Pulse Width	t_{pg} (on)	—	0.5	2.0	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Delay Time	t_d	—	0.6	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Rise Time	t_r	—	0.4	—	μs	$I_G = 10mA$, $I_T = 1A$, $V_D = 30V$
Circuit Commutated Turn-off Time	t_g	—	20	50	μs	$I_T = 1A$, $I_R = 1A$, $R_{GK} = 1K$
SUBGROUP 4 (125°C TESTS)						
Off-State Current	I_{DRM}	—	10	100	μA	$R_{GK} = 1K$, V_{DRM} = Rating
Reverse Current	I_{RRM}	—	30	100	μA	$R_{GK} = 1K$, V_{RRM} = Rating
Gate Trigger Voltage	V_{GT}	0.15	0.2	—	V	$R_{GS} = 100\Omega$, $V_D = 5V$
Holding Current	I_H	0.2	0.4	1.5	mA	$R_{GK} = 1K$

Note: Blocking voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1000 ohms or smaller, or other adequate bias is used.

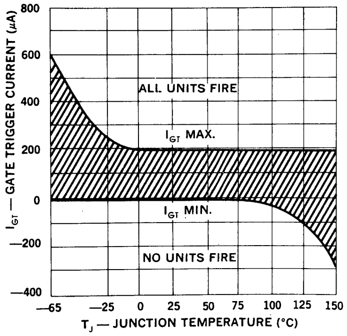
Gate Trigger Current
AD100 Series



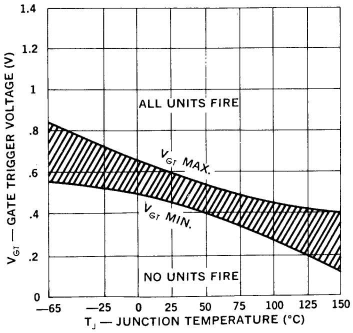
Gate Trigger Current
AD107 Series

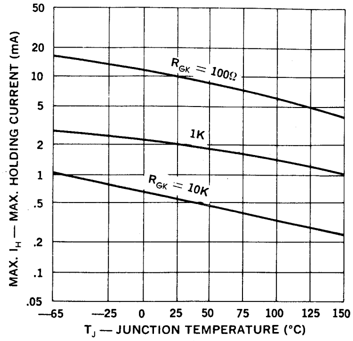


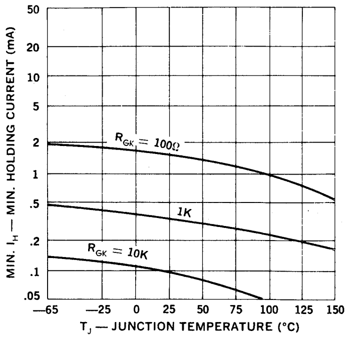
Gate Trigger Current
AD114 Series



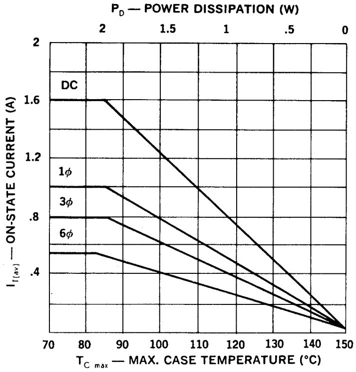
Gate Trigger Voltage

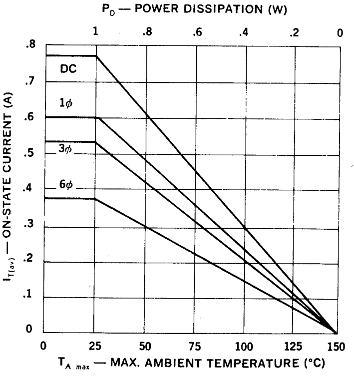


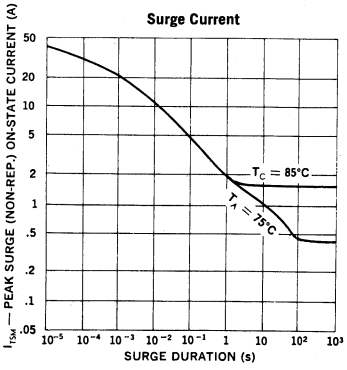

Max. Holding Current


Min. Holding Current

8


Avg. Current vs. Case Temperature


Avg. Current vs. Ambient Temperature


Surge Current

SCRs
Nuclear Radiation Resistant, Planar

GA100
GA101
GA102

FEATURES

- Optimized for Radiation Resistance
- Fully Characterized for "Worst Case" Design
- Post Radiation Design Limits Specified
- Passivated Planar Construction for Maximum Reliability and Parameter Uniformity
- Pulse Currents: to 30A
- Max. Trigger Current 20mA after 3 X 10^{14} NVT
- Max. Holding Current 30mA after 3 X 10^{14} NVT

DESCRIPTION

The GA100 Series of Radiation Hard SCRs have been designed to provide significantly greater radiation tolerance than conventional SCRs or Transistors with the same current handling ability. This Series is capable of operation after exposure to 10^{15} NVT.

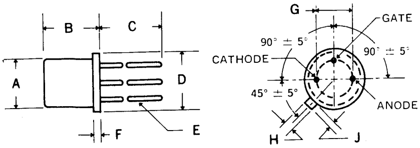
The radiation resistant characteristics of the GA100 series devices make them particularly desirable for use under radiation environments in squib firing circuits; inverters and converters; pulse generators; relay drivers; and modulator discharge switches.

ABSOLUTE MAXIMUM RATINGS

	GA100	GA101	GA102
Repetitive Peak Off-State Voltage, V_{DRM}	30V	60V	80V
D.C. On-State Current, I_T			
75°C Ambient		200mA	
100°C Case		400mA	
Repetitive Peak On-State Current, I_{TRM}		up to 30A	
Surge (non-rep.) On-State Current, I_{TSM} (Sq. Pulse-50ms)		5A	
Peak Gate Current, I_{GM}		250mA	
Average Gate Current, $I_{G(AV)}$		25mA	
Reverse Gate Voltage, V_{GR}		5V	
Reverse Gate Current, I_{GR}		3mA	
Storage Temperature Range		−65°C to +200°C	
Operating Temperature Range		−65°C to +150°C	

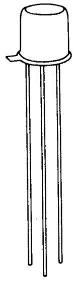
MECHANICAL SPECIFICATIONS

GA100 GA101 GA102



	INCHES	MILLIMETERS
A	.178–.195 DIA.	4.52–4.95 DIA.
B	.170–.210	4.31–5.33
C	.5 MIN.	12.70 MIN.
D	.209–.230 DIA.	5.31–5.84 DIA.
E	.017 ± $^{.002}_{.001}$ DIA.	.432 ± $^{.051}_{.025}$
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028–.048	.711–1.22

TO-18



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ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	Preradiation Limits			Post 3 x 10^{14} NVT Design Limits		Units	Test Conditions
		Min.	Typ.	Max.	Min.	Max.		
SUBGROUP 1 Visual and Mechanical	—	—	—	—	—	—	—	MIL-STD-750 Method 2071
SUBGROUP 2 (25°C Tests)								
Off-State Current	I_{DRM}	—	.005	0.1	—	1.0	μA	$R_{GK} = 220\Omega$, V_{DRM} = Rating
Reverse Gate Current	I_{GR}	—	.01	0.1	—	1.0	μA	$V_{GR} = 2V$
Input Trigger Current (Note 2)	I_{ST}	1.8	2.3	3.5	—	20	mA	$R_{GK} = 220\Omega$, $V_D = 5V$
Gate Trigger Voltage	V_{GT}	0.4	0.5	0.7	—	1.5	V	$R_{GK} = 220\Omega$, $V_D = 5V$
On-State Voltage	V_T	0.8	1.1	1.5	—	3.0	V	$i_T = 1A$ (pulse test)
Holding Current	I_H	0.3	0.7	10	—	30	mA	$R_{GK} = 220\Omega$
SUBGROUP 3 (25°C Tests)								
Off-State Voltage-Critical Rate of Rise	dv_c/dt	20	40	—	—	—	v/μs	$R_{GK} = 220\Omega$, $V_D = 30V$
Gate Trigger-on Pulse Width	t_{pg} (on)	—	.02	.05	—	0.1	μs	$I_G = 25mA$, $I_T = 1A$, $V_D = 30V$
Delay Time	t_d	—	.02	—	—	—	μs	$I_G = 25mA$, $I_T = 1A$, $V_D = 30V$
Rise Time	t_r	—	.05	—	—	—	μs	$I_G = 25mA$, $I_T = 1A$, $V_D = 30V$
Circuit Commutated Turn-off Time	t_q	—	1.5	2.5	—	1.0	μs	$I_T = 1A$, $i_R = 1A$, $R_{GK} = 220\Omega$
SUBGROUP 4 (125°C Tests)								
High Temp Off-State Current	I_{DRM}	—	10	100	—	100	μA	$R_{GK} = 220\Omega$, V_{DRM} = Rating
High Temp Gate Trigger Voltage	V_{GT}	0.1	.17	—	0.1	—	V	$R_{GK} = 220\Omega$, $V_D = 5V$

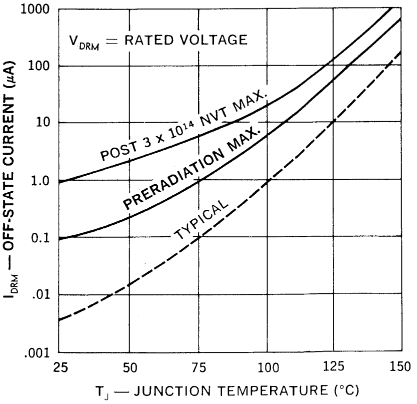
Notes: 1. Off-State voltage ratings apply over the operating temperature range provided the gate is connected to the cathode through an appropriate resistor, or other adequate bias is used.

2. Total Input Trigger Current, including current required by 220Ω gate bias resistance.

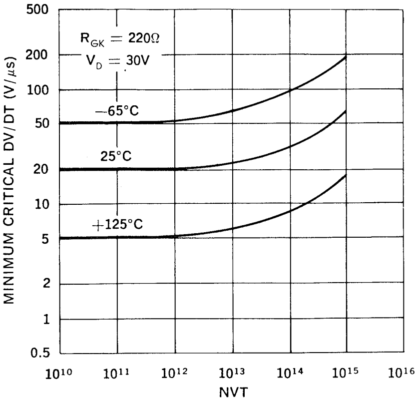
DESIGN CONSIDERATIONS

1. Curve 1 shows the off-state current, I_{DRM} of the SCR as a function of temperature. I_{DRM} is increased by radiation damage, but is not a design consideration at the recommended gate bias levels.
   In order to optimize for radiation tolerance, reverse blocking capability has not been retained as a design feature. Devices with reverse blocking capability can be provided.
2. Minimum critical dv/dt levels are defined in Curve 2. The dv/dt capability is improved after radiation because of reduced triggering sensitivity. dv/dt is therefore a design consideration only prior to radiation.
3. Curves 3 and 4 show the limits of Gate Trigger Voltage and Total Input Trigger Current prior to radiation. Maximum design limits after a total radiation dosage of 3 x 10^{14} NVT is also shown. Curves 5 and 6 show the maximum limits of Gate Trigger Voltage and Total Input Trigger Currents as a junction of neutron dosage. The minimum level of Trigger current prior to radiation is established by the shunting effect of a 220 ohm resistor between gate and cathode. After radiation the device is less sensitive and Total Trigger Current will increase to a level relatively independent of the bias resistance. The 220 ohm resistor is recommended since it raises the minimum preradiation trigger current to a level that is closer to the past radiation limit and minimizes the percentage change in this parameter.
4. Current ratings shown in Curves 10, 11, and 12 apply after the device has been subjected to 3 x 10^{14} NVT. Current ratings prior to radiation are greater than the values indicated.
5. Gamma radiation produces a reversible ionization (leakage) current within the device which is directly proportional to the Gamma flux level. When the Gamma flux level is in the range of 10 to 100 Roentgens per microsecond for burst durations greater than 1 microsecond, the device will self trigger ON. For the radiation bursts associated with nuclear explosions, the Gamma flux level will invariably cause device triggering at radiation levels significantly below the levels that would produce detectable permanent device damage due to cumulative neutron dosage. In applications where the burst effect triggering cannot be tolerated, it is necessary to reset the device after the radiation burst. Special circuit approaches such as additional SCRs to crowbar or otherwise cancel the output function may be used.

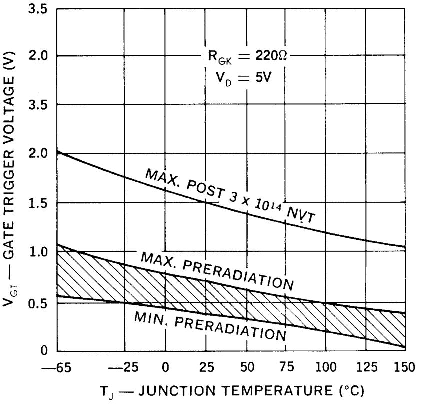
1. Off-State Current



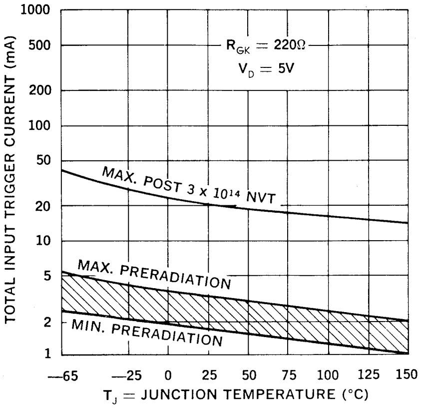
2. Minimum Critical DV/DT vs. Neutron Dosage



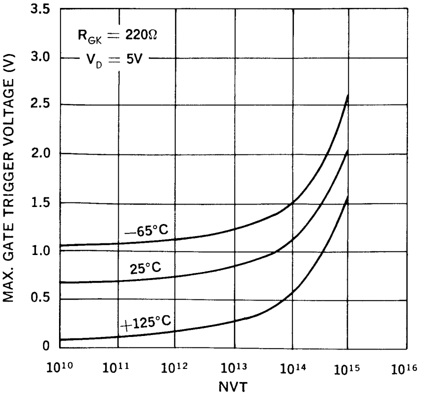
3. Gate Trigger Voltage



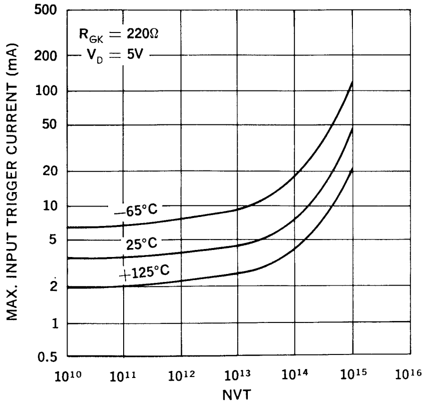
4. Input Trigger Current



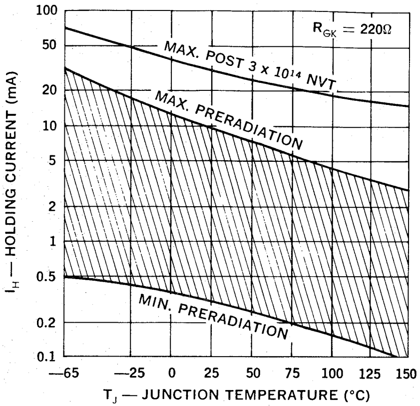
5. Max. Gate Trigger Voltage vs. Neutron Dosage



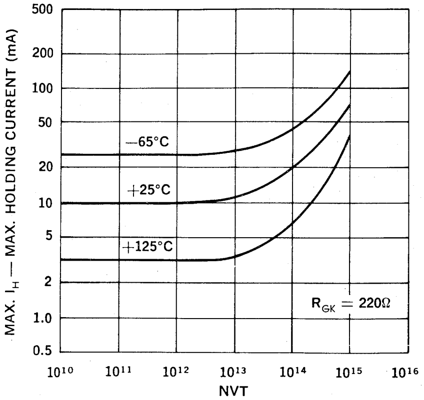
6. Max. Input Trigger Current vs. Neutron Dosage



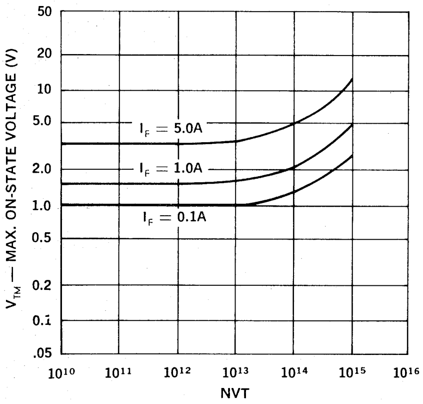
7. Holding Current



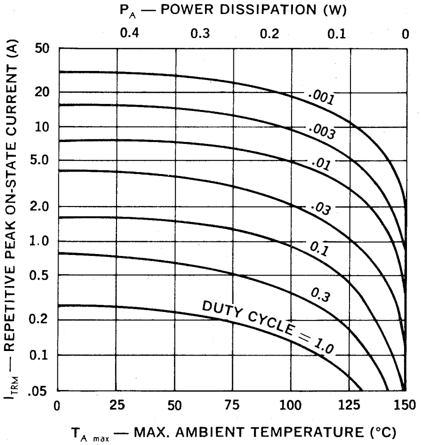
8. Max. Holding Current vs. Neutron Dosage



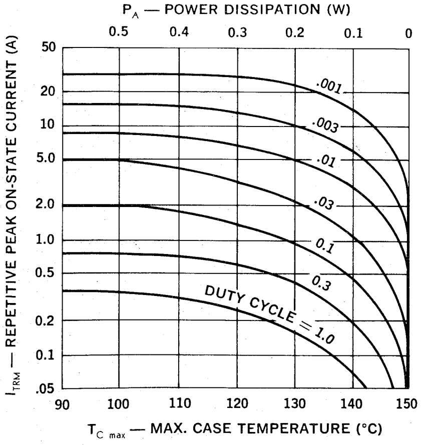
9. Max. On-State Voltage vs. Neutron Dosage



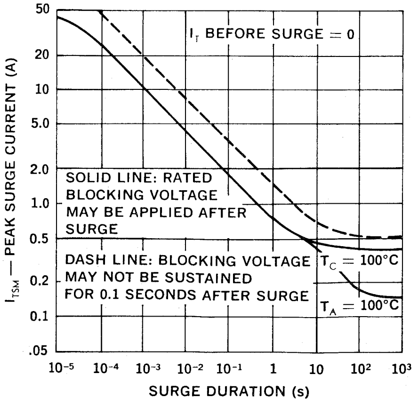
10. Peak Current vs. Ambient Temperature



11. Peak Current vs. Case Temperature



12. Surge Current vs. Time



SCRs

Nanosecond Switching, Planar

GA200 GB200
GA200A GB200A
GA201 GB201
GA201A GB201A

FEATURES

- Rise Time: 10ns
- Delay Time: 10ns
- Recovery Time: 0.5 μs
- Pulse Current: to 100A
- Turn-on with 20ns, 10 mA Gate Pulse

DESCRIPTION

The Unitrode Nanosecond Thyristor Switch combines the turn-on speed of logic level transistors with the high current switching capability inherent in SCRs. With this device engineers can now design circuits capable of switching pulse currents of 1A in less than 10ns or up to 30A in less than 20ns.

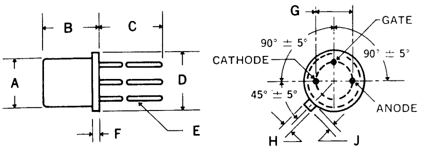
The GA/GB200 series is specifically designed for use as switching elements in high speed, low-to-medium power radar pulse modulators. Other applications include switching elements for phased array radars, laser pulse drivers, harmonic wave-form generators, line drivers and high current replacements for avalanche transistors. For applications requiring higher voltage levels, Unitrode has developed several "series string" circuits which allow the series connection of virtually an unlimited number of devices for voltages as high as 2000V with no significant decrease in speed. These circuits are described in Unitrode's Design Note #14.

ABSOLUTE MAXIMUM RATINGS

	GA200 GA200A	GA201 GA201A	GB200 GB200A	GB201 GB201A
Repetitive Peak Off-State Voltage, V_{DRM}	60V	100V	60V	100V
Repetitive Peak On-State Current, I_{TRM}	up to 100A		up to 100A	
D.C. On-State Current, I_T				
70°C Ambient	200mA		—	
70°C Case	400mA		6A	
Peak Gate Current, I_{GM}	250mA		250mA	
Average Gate Current, $I_{G(AV)}$	25mA		50mA	
Reverse Gate Current, I_{GR}	3mA		3mA	
Reverse Gate Voltage, V_{GR}	5V		5V	
Thermal Resistance, $R_{\theta\ CA}$	300°C/W			
Storage Temperature Range	−65°C to +200°C			
Operating Temperature Range	−65°C to +150°C			

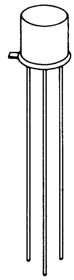
MECHANICAL SPECIFICATIONS

GA200 GA200A GA201 GA201A

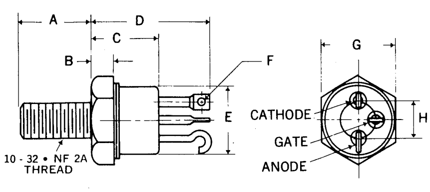


	INCHES	MILLIMETERS
A	.178-.195 DIA.	4.52-4.95 DIA.
B	.170-.210	4.31-5.33
C	.5 MIN.	12.70 MIN.
D	.209-.230 DIA.	5.31-5.84 DIA.
E	.017 ± .002 DIA. .001 DIA.	.432 ± .051 .025
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028-.048	.711-1.22

TO-18



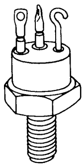
GB200 GB200A GB201 GB201A



	INCHES	MILLIMETERS
A	.400-.455	10.16-11.56
B	.090-.150	2.28-3.81
C	.320-.468	8.13-11.88
D	.570-.763	14.48-19.38
E	.318-.380	8.07-9.65
F	.055 ± .010 .015	1.40 ± .254 .381
G	.424-.437	10.77-11.10
H	.185-.215	4.70-5.46

NOTE: Anode connected to case.

TO-59



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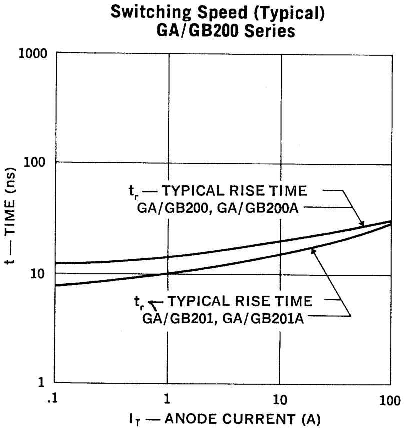
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Delay Time	t_d	— —	20 10	30 —	ns ns	$I_G = 20mA, I_T = 1A$ $I_G = 30mA, I_T = 1A$
Rise Time GA200, 200A, GB200, 200A	t_r	— —	15 25	25 —	ns ns	$V_D = 60V, I_T = 1A$ (1) $V_D = 60V, I_T = 30A$ (1)
Rise Time GA201, 201A, GB201, 201A	t_r	— —	10 20	20 —	ns ns	$V_D = 100V, I_T = 1A$ (1) $V_D = 100V, I_T = 30A$ (1)
Gate Trigger on Pulse Width	$t_{pg(on)}$	—	.02	.05	μs	$I_G = 10mA, I_T = 1A$
Circuit Commutated Turn-off Time GA200, 201, GB200, 201	t_q	—	0.8	2.0	μs	$I_T = 1A, I_R = 1A, R_{GK} = 1K$
GA200A, 201A, GB200A, 201A	t_q	—	0.3	0.5	μs	
Off-State Current	I_{DRM}	—	.01	0.1	μA	V_{DRM} = Rating, $R_{GK} = 1K$
		—	20	100	μA	V_{DRM} = Rating, $R_{GK} = 1K$, 150°C
Reverse Current	I_{RRM}	—	1.0	10	mA	$V_{RRM} = 30V, R_{GK} = 1K$ (2)
Reverse Gate Current	I_{GR}	—	.01	0.1	mA	$V_{GRM} = 5V$
Gate Trigger Current	I_{GT}	—	10	200	μA	$V_D = 5V, R_{GS} = 10K$
Gate Trigger Voltage	V_{GT}	0.4	.6	0.75	V	$V_D = 5V, R_{GS} = 100\Omega, T = 25°C$
		0.10	0.2	—	V	$T = +150°C$
On-State Voltage	V_T	—	1.1	1.5	V	$I_T = 2A$
Holding Current	I_H	0.3	2.0	5.0	mA	$V_D = 5V, R_{GK} = 1K, T = 25°C$
		0.05	0.2	—	mA	$T = +150°C$
Off-State Voltage-Critical Rate of Rise	dv/dt	20	40	—	V/μs	$V_D = 30V, R_{GK} = 1K$

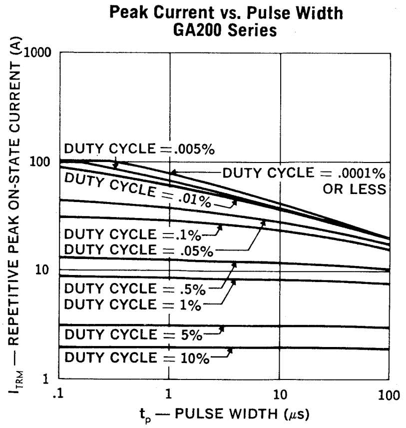
Notes: 1. $I_G = 10mA$; Pulse Test, Duty Cycle <1%.

2. Pulse test intended to guarantee reverse anode voltage capability for pulse commutation. Device should not be operated in the Reverse blocking mode on a continuous basis.



Switching Speed (Typical) GA/GB200 Series

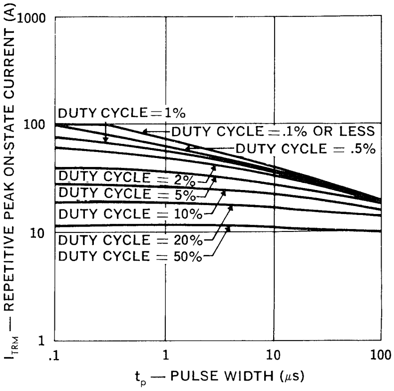
NOTES: 1. V_D = Rated V_{DRM}
2. $T_A = 25°C$
3. $I_G = 20mA$
4. t_d = 20ns TYPICALLY FOR ALL TYPES INDEPENDENT OF ANODE CURRENT



Peak Current vs. Pulse Width GA200 Series

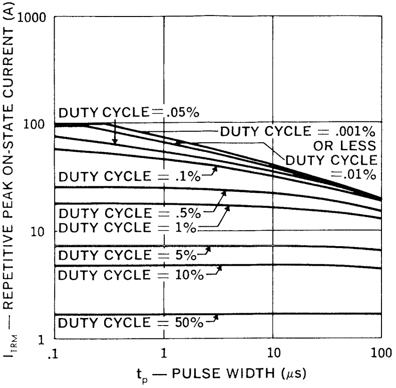
NOTES: 1. DATA BASED ON ON-STATE VOLTAGE GRAPH AT $T_j = 150°C$. BLOCKING VOLTAGE MAY BE APPLIED IMMEDIATELY AFTER TERMINATION OF CURRENT PULSE.
2. $T_A = 75°C$

Peak Current vs. Pulse Width
GB200 Series



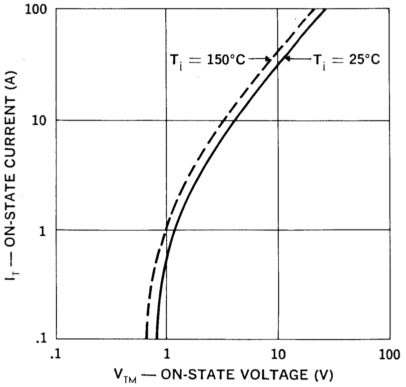
NOTES: 1. DATA BASED ON ON-STATE VOLTAGE GRAPH AT $T_j = 150°C$. BLOCKING VOLTAGE MAY BE APPLIED IMMEDIATELY AFTER TERMINATION OF CURRENT PULSE.
2. $T_C = 75°C$

Peak Current vs. Pulse Width
GB200 Series

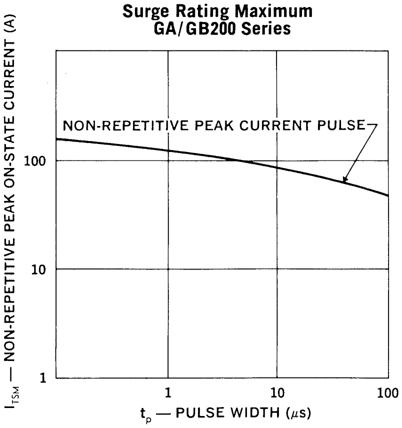


NOTES: 1. DATA BASED ON ON-STATE VOLTAGE GRAPH AT $T_j = 150°C$. BLOCKING VOLTAGE MAY BE APPLIED IMMEDIATELY AFTER TERMINATION OF CURRENT PULSE.
2. $T_A = 75°C$

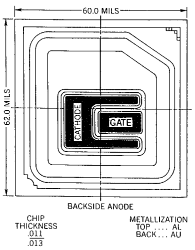
On-State Current vs. Voltage
GA/GB200 Series



Surge Rating Maximum
GA/GB200 Series



NOTES: 1. BLOCKING VOLTAGE MAY NOT BE APPLIED FOR .001 SEC. AFTER TERMINATION OF SURGE PULSE AS JUNCTION TEMPERATURE WILL EXCEED 150°C.
2. $T_C = 75°C$



SCRs
Commercial Nanosecond Switching Planar

GA300 GB300
GA300A GB300A
GA301 GB301
GA301A GB301A

FEATURES

- Rise Time: 10ns
- Delay Time: 10ns
- Recovery Time: 0.5µs
- Pulse Current: to 100A
- Turn-on with 20ns, 10mA gate pulse

DESCRIPTION

Unitrode's Nanosecond Thyristor Switch combines the turn-on speed of logic level transistors with the high current switching capability inherent in SCRs. With this device, engineers can now design circuits capable of switching pulse currents of 1A in less than 10ns or up to 30A in less than 20ns.

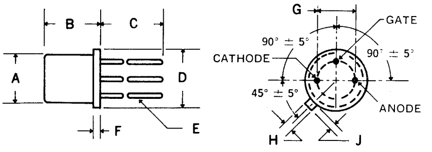
The GA300, GB300 Series is specifically designed for use as the switching element in high speed laser diode pulse drivers. Other applications include electronic crowbars, harmonic wave-form generators, line drivers and general purpose replacements for avalanche transistors. For applications requiring higher voltage levels, Unitrode has developed several "series string" circuits which allow the series connection of an unlimited number of devices for voltages as high as 2000V with no significant decrease in speed. These circuits are described in Unitrode's Design Note #14.

ABSOLUTE MAXIMUM RATINGS

	GA300 GA300A	GA301 GA301A	GB300 GB300A	GB301 GB301A
Repetitive Peak Off-State Voltage, V_{DRM}	60V	100V	60V	100V
Repetitive Peak On-State Current, I_{TRM}	up to 100A		up to 100A	
Peak Gate Current, I_{GM}	250mA		250mA	
Average Gate Current, $I_{G(AV)}$	25mA		50mA	
Reverse Gate Current, I_{GR}	3mA		3mA	
Reverse Gate Voltage, V_{GR}	5V		5V	
Storage Temperature Range	−65°C to +150°C			
Operating Temperature Range	0°C to +125°C			

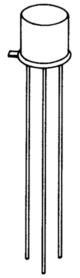
MECHANICAL SPECIFICATIONS

GA300 GA300A GA301 GA301A

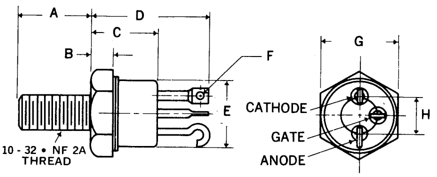


	INCHES	MILLIMETERS
A	.178–.195 DIA.	4.52–4.95 DIA.
B	.170–.210	4.31–5.33
C	.5 MIN.	12.70 MIN.
D	.209–.230 DIA.	5.31–5.84 DIA.
E	.017 ± .002 DIA. .001 DIA.	.432 ± .051 .025
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028–.048	.711–1.22

TO-18



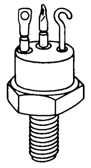
GB300 GB300A GB301 GB301A



	INCHES	MILLIMETERS
A	.400–.455	10.16–11.56
B	.090–.150	2.28–3.81
C	.320–.468	8.13–11.88
D	.570–.763	14.48–19.38
E	.318–.380	8.07–9.65
F	.055 ± .010 .015	1.40 ± .254 .381
G	.424–.437	10.77–11.10
H	.185–.215	4.70–5.46

NOTE: Anode connected to case.

TO-59



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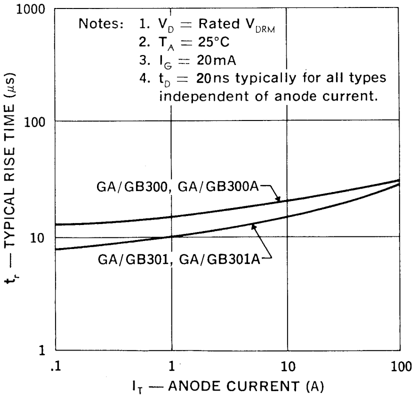
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

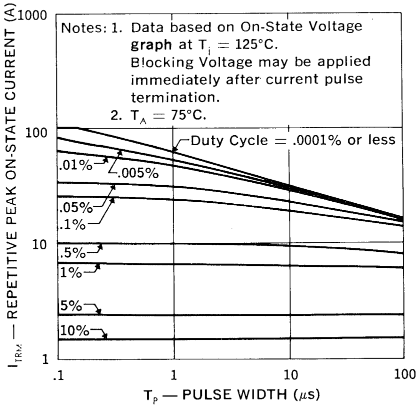
Test	Symbol	Min.	Typical	Max.	Units	Test Conditions
Delay Time	t_d	—	20 10	30 —	ns	$I_G = 20mA, I_T = 1A$ $I_G = 30mA, I_T = 1A$
Rise Time (Note 1) GA300, 300A, GB300, 300A	t_r	—	15 25	25 —	ns	$V_D = 60V, I_T = 1A$ $V_D = 60V, I_T = 30A$ (Note 1)
Rise Time (Note 1) GA301, 301A, GB301, 301A	t_r	—	10 20	20 —	ns	$V_D = 100V, I_T = 1A$ $V_D = 100V, I_T = 30A$ (Note 1)
Circuit Commutated Turn-off Time GA300, 301, GB300, 301	t_q	—	0.8	2.0	μs	$I_T = 1A, I_R = 1A, R_{GK} = 1K$
GA300A, 301A, GB300A, 301A			0.3	0.5	μs	$I_T = 1A, I_R = 1A, R_{GK} = 1K$
Gate Trigger-on Pulse Width	$t_{pg\ (on)}$	—	0.02	0.05	μs	$I_G = 10mA, I_T = 1A$
Off-state Current	I_{DRM}	— —	0.01 20	0.1 100	μA μA	V_{DRM} = Rating, $R_{GK} = 1K, T = 25°C$ V_{DRM} = Rating, $R_{GK} = 1K, T = 125°C$
Reverse Current (Note 2)	I_{RRM}	—	1.0	10	mA	$V_{RRM} = 30V, R_{GK} = 1K$ (Note 2)
Gate Trigger Voltage	V_{GT}	0.4 0.10	0.6 0.2	0.75 —	V V	$V_D = 5V, R_{GS} = 100\Omega, T = 25°C$ $V_D = 5V, R_{GS} = 100\Omega, T = 125°C$
Gate Trigger Current	I_{GT}	—	10	200	μA	$V_D = 5V, R_{GS} = 10K$
On-state Voltage	V_T	—	1.1	1.5	V	$I_T = 2A$
Off-state Voltage — Critical Rate of Rise	dv/dt	15	30	—	V/μs	$V_D = 30V, R_{GK} = 1K$
Reverse Gate Current	I_{GR}	—	0.01	0.1	mA	$V_{GR} = 5V$
Holding Current	I_H	0.3 0.05	2.0 0.4	5.0 —	mA mA	$V_D = 5V, R_{GK} = 1K, T = 25°C$ $V_D = 5V, R_{GK} = 1K, T = 125°C$

Notes: 1. $I_G = 10mA$; Pulse Test, Duty Cycle < 1%.
2. Pulse test intended to guarantee reverse anode voltage capability for pulse commutation. Device should not be operated in the reverse blocking mode on a continuous basis.

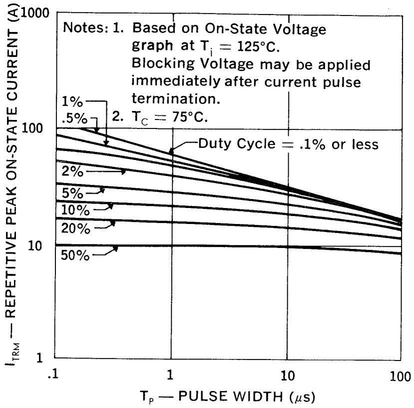
Switching Speed vs. Current
GA/GB300 Series



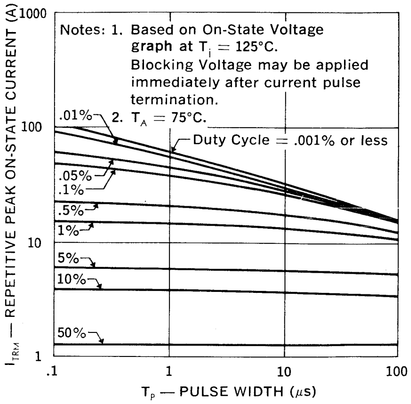
Peak Current vs. Pulse Width
GA300 Series



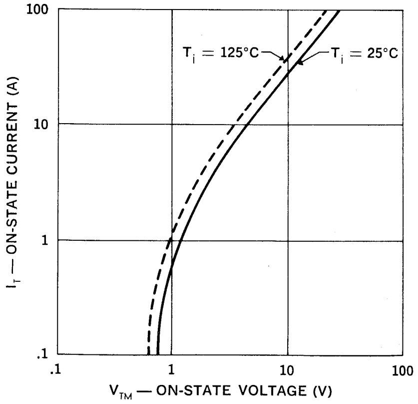
Peak Current vs. Pulse Width
GB300 Series



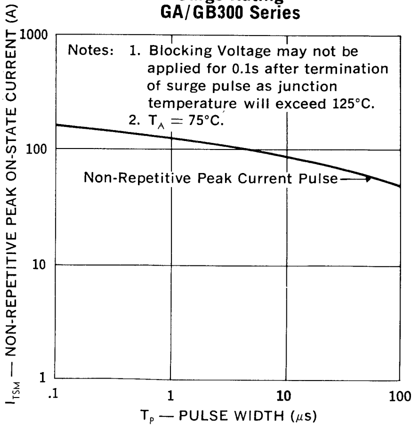
Peak Current vs. Pulse Width
GB300 Series



On-State Voltage vs. Current
GA/GB300 Series



Surge Rating
GA/GB300 Series



ID100-ID106

SCRs

.5 Amp, Planar

FEATURES

- Voltage Ratings: to 400V
- Maximum Gate Trigger Current: 200μA
- Hermetically Sealed TO-18 Metal Can
- Planar Passivated Construction

DESCRIPTION

This Data Sheet describes Unitrode's line of hermetically sealed industrial SCRs designed for low-voltage, low-current sensing application. The ID100 Series is packaged in a TO-18 metal case with Unitrode's unique oxide passivated junctions, offering the highest degree of reliability and parameter stability for any device in its price range.

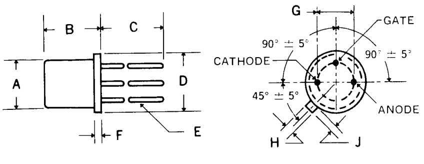
Typical applications include lamp driving, relay driving, sensor, pulse-generating and timing circuits.

ABSOLUTE MAXIMUM RATINGS

	ID100	ID101	ID102	ID103	ID104	ID105	ID106
Repetitive Peak Off-State Voltage, V_{DRM}	30V	60V	100V	150V	200V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	30V	60V	100V	150V	200V	300V	400V
On-State Current, I_T							
75°C Ambient	250mA						
100°C Case	0.5A						
Repetitive Peak On-State Current, I_{TRM}	6A						
Peak One Cycle Surge (Non-Rep.) On-State Current, I_{TSM}	up to 30A						
Peak Gate Current, I_{GM}	250mA						
Average Gate Current, $I_{G(AV)}$	25mA						
Reverse Gate Voltage, V_{GR}	6V						
Storage Temperature Range	−65°C to +150°C						
Operating Temperature Range	−65°C to +125°C						

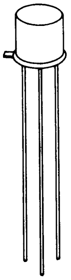
MECHANICAL SPECIFICATIONS

ID100-ID106



	INCHES	MILLIMETERS
A	.178-.195 DIA.	4.52-4.95 DIA.
B	.170-.210	4.31-5.33
C	.5 MIN.	12.70 MIN.
D	.209-.230 DIA.	5.31-5.84 DIA.
E	.017 ± .002 DIA. .001 DIA.	.432 ± .051 .025
F	.020 MAX.	.508 MAX.
G	.100±.010 DIA.	2.54±.254 DIA.
H	.041±.005	1.04±.127
J	.028-.048	.711-1.22

TO-18



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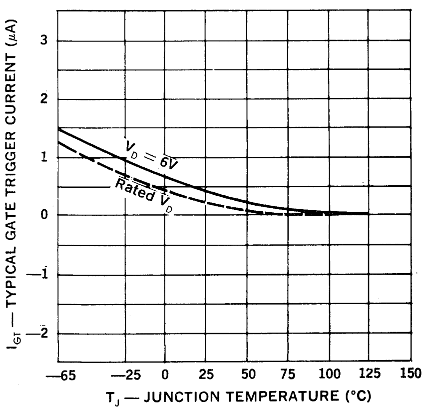
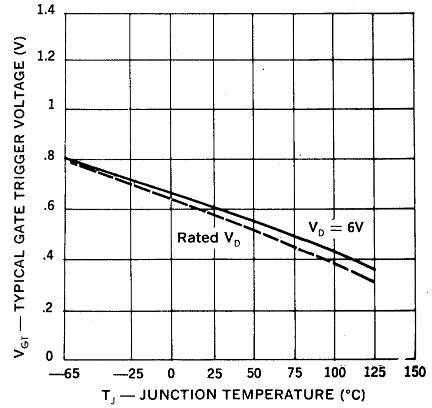
ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	Min.	Typical	Max.	Units	Test Conditions
Off-State Current	I_{DRM}	— —	5.0 10.0	50 100	μA μA	V_{DRM} = Rating, R_{GK} = 1K, T = 125°C, ID100-ID104 V_{DRM} = Rating, R_{GK} = 1K, T = 125°C, ID105-ID106
Reversing Current	I_{RRM}	— —	10 15	50 100	μA μA	V_{RRM} = Rating, R_{GK} = 1K, T = 125°C, ID100-ID104 V_{RRM} = Rating, R_{GK} = 1K, T = 125°C, ID105-ID106
Gate Trigger Current	I_{GT}	— —	5.0 —	200 500	μA μA	V_D = 5V, R_{GS} = 10K V_D = 5V, R_{GS} = 10K, T = —40°C
Gate Trigger Voltage	V_{GT}	0.4 — 0.10	0.55 — —	0.8 1.0 —	V V V	V_D = 5V, R_{GS} = 100Ω V_D = 5V, R_{GS} = 100Ω, T = —40°C V_D = 5V, R_{GS} = 100Ω, T = 125°C
Peak On-State Voltage	V_{TM}	—	—	1.7	V	I_{TM} = 1 Amp Pulse
Holding Current	I_H	— —	1.0 —	5.0 10.0	mA mA	R_{GK} = 1K R_{GK} = 1K, T = —40°C
Turn-on Time	t_{on}	—	0.5	—	μs	I_G = 10mA, I_T = 1A, V_D = 30V
Circuit Commutated Turn-off Time	t_q	— —	8.0 15.0	— —	μs μs	I_T = I_R = 1A, R_{GK} = 1K, ID100-ID104 I_T = I_R = 1A, R_{GK} = 1K, ID105-ID106

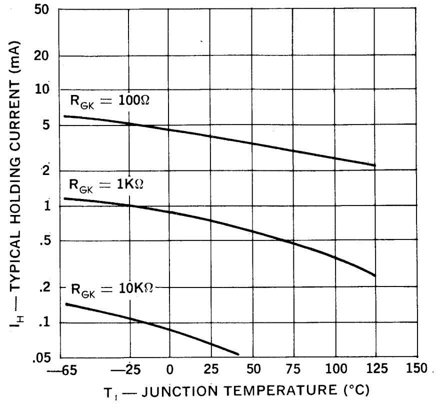
Note: Blocking voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1000 ohms or smaller, or other adequate bias is used.



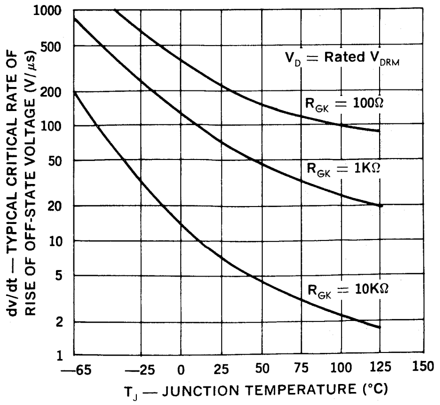
Gate Trigger Current vs. Junction Temp.



Gate Trigger Voltage vs. Junction Temp.

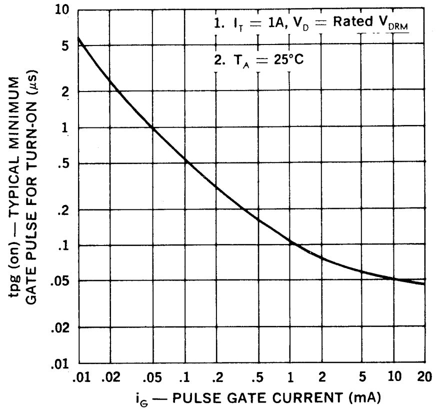


Holding Current vs. Junction Temp.

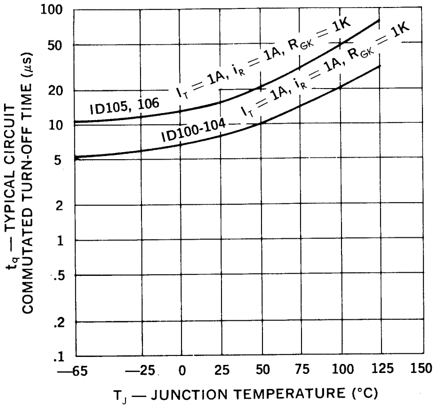


dv/dt vs. Junction Temp.

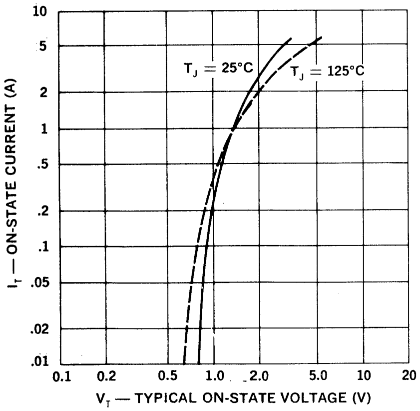
Gate Pulse for Turn-On vs. Pulse Gate Current



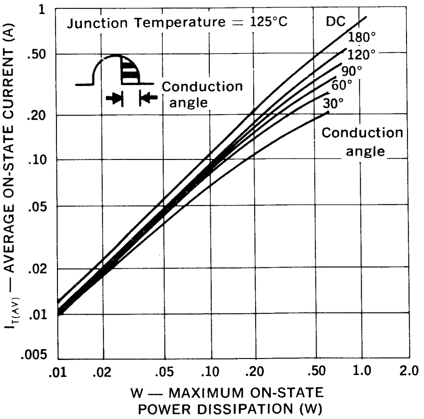
Circuit Commutated Turn-Off Time vs. Junction Temp.



Current vs. On State Voltage



Current vs. Power Dissipation



SCRs

1.6 Amp, Planar

ID200-ID203
ID300-ID301

FEATURES

- Voltage Rating: to 200V
- Max. Gate Trigger Current: 200μA
- Hermetically Sealed Metal Can
- Planar Passivated Construction

DESCRIPTION

This Data Sheet describes Unitrode's line of hermetically sealed industrial SCRs designed for high-voltage, medium-current control applications. The Series is packaged in a TO-39 metal case with Unitrode's unique oxide passivated junctions to ensure reliability and parameter stability.

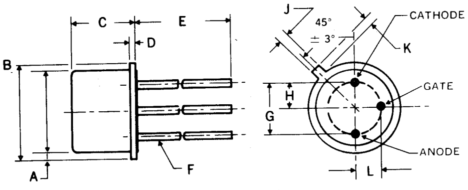
Typical applications include relay equipment, motor controls, process controllers and pulse generators.

ABSOLUTE MAXIMUM RATINGS

	ID200	ID201	ID202	ID203	ID300	ID301
Repetitive Peak Off-State Voltage, V_{DRM}	50V	100V	150V	200V	300V	400V
Repetitive Peak Reverse Voltage, V_{RRM}	50V	100V	150V	200V	300V	400V
Non-Repetitive Peak Reverse Voltage, V_{RSM} (<5ms)	75V	150V	225V	300V	400V	500V
On-State Current, $I_{T(RMS)}$						
70°C Case	1.6A					
75°C Ambient	450mA					
Peak One Cycle Surge (Non-Repetitive) On-State Current, I_{TSM}	15A					
Repetitive Peak On-State Current, I_{TRM}	up to 30A					
Rate of Rise of On-State Current, di/dt	100A/μs					
I^2t (for times > 1.5 ms)	0.83A^2s					
Peak Gate Current, I_{GM}	250mA					
Average Gate Current, $I_{G(AV)}$	25mA					
Reverse Gate Voltage, V_{GR}	6V					
Storage Temperature Range	—65°C to +150°C					
Operating Temperature Range	—40°C to +110°C					

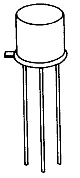
MECHANICAL SPECIFICATIONS

ID200-ID203 ID300-ID301



	ins.	mm.
A	.305-.335	7.75-8.51
B	.335-.370	8.51-9.40
C	.240-.260	6.35-6.60
D	.010-.030	.25-.76
E	.5 MIN.	12.70 MIN.
F	$.017 \pm ^{.002}_{.001}$	$.432 \pm ^{.051}_{.025}$
G	.200	5.08
H	.100	2.54
J	.031±.003	.79±.08
K	.029-.045	.74-1.14
L	.100	2.54

TO-205AD (TO-39)



Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)

Test	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Off-State Current	I_{DRM}	— —	— 5	10 100	μA μA	V_{DRM} = Rating, R_{GK} = 1K, T = 25°C V_{DRM} = Rating, R_{GK} = 1K, T = 110°C
Reverse Current	I_{RRM}	— —	— 10	10 100	μA μA	V_{RRM} = Rating, R_{GK} = 1K, T = 25°C V_{RRM} = Rating, R_{GK} = 1K, T = 110°C
Gate Trigger Current	I_{GT}	— —	— —	200 500	μA μA	V_D = 5V, R_{GS} = 10K, T = 25°C V_D = 5V, R_{GS} = 10K, T = −40°C
On-State Voltage	V_{GT}	0.4 0.5 0.2	0.52 0.7 —	0.8 1.0 —	V V V	V_D = 5V, R_{GS} = 100Ω, T = 25°C V_D = 5V, R_{GS} = 100Ω, T = −40°C V_D = 5V, R_{GS} = 100Ω, T = 110°C
Peak On — Voltage	V_{TM}	—	—	2.2	V	I_T = 4 Amp Pulse, T = 25°C
Holding Current	I_H	0.3 0.4 0.2	0.7 — —	3.0 6.0 —	mA mA mA	R_{GK} = 1K, T = 25°C R_{GK} = 1K, T = −40°C R_{GK} = 1K, T = 110°C
Off-State Voltage — Critical Rate of Rise	dv/dt	—	20	—	V/μs	V_{DRM} = Rated, R_{GK} = 1K, T = 110°C
Turn-on Time	t_{on}	—	1.0	—	μs	I_G = 10mA, I_T = I_A, V_D = 30V, T = 25°C
Circuit Commutated Turn-off Time	t_q	—	—	40	μs	I_T = i_R = 1A, R_{GK} = 1K, T = 25°C

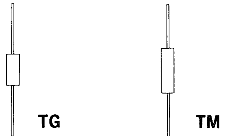
Note: Blocking voltage ratings apply over the full operating temperature range, provided the gate is connected to the cathode through a resistor, 1000 ohms or smaller, or other adequate bias is used.

SENSISTORS® 9

Product Selection Guides 9-3
Datasheets 9-4

SENSISTORS®

PRODUCT SELECTION GUIDE



Type	Resistance Range (Ω)	Resistance Range (R25°C/R125°C)	Tolerance	Package
TG1/8-J	10-10K	0.55±15%	5%	TG
TG1/8-K	10-10K	0.55±15%	10%	TG
TM1/8-J	10-39K	0.55±15%	5%	TM
TM1/8-K	10-39K	0.55±15%	10%	TM
TM1/4-J	10-10K	0.55±15%	5%	TM
TM1/4-K	10-10K	0.55±15%	10%	TM
RTH22 ES-J	10-10K	0.55±15%	5%	TM
RTH22 ES-K	10-10K	0.55±15%	10%	TM
RTH42 ES-J	10-2.7K	0.55±15%	5%	TG
RTH42 ES-K	10-2.7K	0.55±15%	10%	TG

TYPE NUMBER DESIGNATION **TM1/8272K**

TM 1/8 272 K

STYLE	WATTAGE	RESISTANCE VALUE CODE	TOLERANCE
TM	1/8	270 = 27Ω	J = 5%
TG		271 = 270Ω	K = 10%
RTH22 ES		272 = 2,700Ω	
RTH42 ES		273 = 27,000Ω	

SENSISTORS®
Positive – Temperature – Coefficient Silicon Thermistors

TG1/8
TM1/8
RTH42
RTH22
TM1/4

FEATURES

- Qualified to MIL-T-23648A
- TG1/8 – Similar to RTH42 (MIL-T-23648A/19)
- TM1/8 – Similar to RTH22 (MIL-T-23648A/9)
- Large Positive Temperature Coefficient ≏ 0.7%/°C
- Wide Resistance Value Ranges Available in 5% or 10% Tolerances

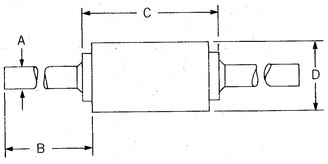
DESCRIPTION

The TG1/8 thermistor is encapsulated in a glass, hermetically sealed package. The TM1/8 and TM1/4 thermistors are encapsulated in a molded package. Both have hot solder-dipped leads and are used in temperature sensing and compensation circuits. They meet or exceed all of the requirements of MIL-T-23648A.

ABSOLUTE MAXIMUM RATINGS	TG1/8 RTH42	TM1/8 RTH22	TM1/4
Power Dissipation at (or below) 25°C Free-Air Temperature (See Figure 1)	300mW	500mW	500mW
Power Dissipation at (or below) 100°C Free Air Temperature (See Figure 1)	125mW		250mW
Operating Free-Air Temperature Range	−55°C to +125°C		−55°C to +125°C
Storage Temperature Range	−65°C to +150°C		−65°C to +150°C

MECHANICAL SPECIFICATIONS

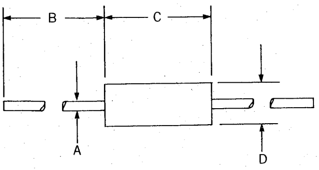
TM1/4 TG1/8 RTH42



	INCHES	MILLIMETERS
A	.020 ± .002	.508 ± .051
B	1.0 MIN.	25.4 MIN.
C	.285 ± .015	7.239 ± .381
D	.095 ± .01	2.413 ± .254

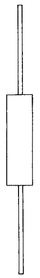
TG

TM1/4 TM1/8 RTH22



	INCHES	MILLIMETERS
A	.025 ± .003	.635 ± .076
B	1.0 MIN.	25.4 MIN.
C	.405 ± .015	10.287 ± .381
D	.14 ± .015	3.556 ± .381

TM



Microsemi Corp.
Watertown
The diode experts

ELECTRICAL AND THERMAL CHARACTERISTICS

	TG1/8 RTH42	TM1/8 RTH22	TM1/4
Zero Power Resistance Ratio ($R_{25°C}/R_{125°C}$)	0.55 ± 15%		
Thermal Time Constant – Typical	35s		
Thermal Time Constant – Maximum	60s		

NOMINAL RESISTANCE AT VARIOUS TEMPERATURES

Standard Zero Power Resistance Value (Ω) at 25°C Free-Air Temperature	Type No.					Resistance (Ω) of Sensistor® at Temperature other than 25°C						
						-55°	-15°C	0°C	50°C	75°	100°C	125°C
10	TG1/8	RTH42	TM1/8	RTH22	TM1/4	6.15	7.9	8.63	11.6	13.5	15.45	17.5
12	TG1/8	RTH42	TM1/8	RTH22	TM1/4	7.38	9.48	10.356	13.92	16.2	18.54	21
15	TG1/8	RTH42	TM1/8	RTH22	TM1/4	9.225	11.85	12.945	17.4	20.25	23.175	26.25
18	TG1/8	RTH42	TM1/8	RTH22	TM1/4	11.07	14.22	15.534	20.88	24.3	27.81	31.5
22	TG1/8	RTH42	TM1/8	RTH22	TM1/4	13.53	17.38	18.986	25.52	29.7	33.99	38.5
27	TG1/8	RTH42	TM1/8	RTH22	TM1/4	16.605	21.33	23.301	31.32	36.45	41.715	47.25
33	TG1/8	RTH42	TM1/8	RTH22	TM1/4	20.295	26.07	28.479	38.28	44.55	50.985	57.75
39	TG1/8	RTH42	TM1/8	RTH22	TM1/4	23.985	30.81	33.657	45.24	52.65	60.255	68.25
47	TG1/8	RTH42	TM1/8	RTH22	TM1/4	28.905	37.13	40.561	54.52	63.45	72.615	82.25
50	TG1/8	RTH42	TM1/8	RTH22	TM1/4	30.75	39.5	43.15	58	67.5	77.25	87.5
56	TG1/8	RTH42	TM1/8	RTH22	TM1/4	34.44	44.24	48.328	64.96	75.6	86.52	98
68	TG1/8	RTH42	TM1/8	RTH22	TM1/4	41.82	53.72	58.684	78.88	91.8	105.06	119
82	TG1/8	RTH42	TM1/8	RTH22	TM1/4	47.724	63.14	69.454	95.94	112.34	129.888	147.6
100	TG1/8	RTH42	TM1/8	RTH22	TM1/4	58.2	77	84.7	117	137	158.4	180
120	TG1/8	RTH42	TM1/8	RTH22	TM1/4	69.84	92.4	101.64	140.4	164.4	190.08	216
150	TG1/8	RTH42	TM1/8	RTH22	TM1/4	87.3	115.5	127.05	175.5	205.5	237.6	270
180	TG1/8	RTH42	TM1/8	RTH22	TM1/4	100.8	135.9	150.84	212.4	252	292.14	334.8
220	TG1/8	RTH42	TM1/8	RTH22	TM1/4	123.2	166.1	184.36	259.6	308	357.06	409.2
270	TG1/8	RTH42	TM1/8	RTH22	TM1/4	151.2	203.85	226.26	318.6	378	438.21	502.2
330	TG1/8	RTH42	TM1/8	RTH22	TM1/4	184.8	249.15	276.54	389.4	462	535.59	613.8
390	TG1/8	RTH42	TM1/8	RTH22	TM1/4	218.4	294.45	326.82	460.2	546	632.97	725.4
470	TG1/8	RTH42	TM1/8	RTH22	TM1/4	263.2	354.85	393.86	554.2	658	762.81	874.2
500	TG1/8	RTH42	TM1/8	RTH22	TM1/4	280	377.5	419	590	700	811.5	930
560	TG1/8	RTH42	TM1/8	RTH22	TM1/4	308	414.4	467.6	672	795.2	927.36	1,075.2
680	TG1/8	RTH42	TM1/8	RTH22	TM1/4	374	503.2	567.8	816	965.6	1,126.08	1,305.6

NOMINAL RESISTANCE AT VARIOUS TEMPERATURES

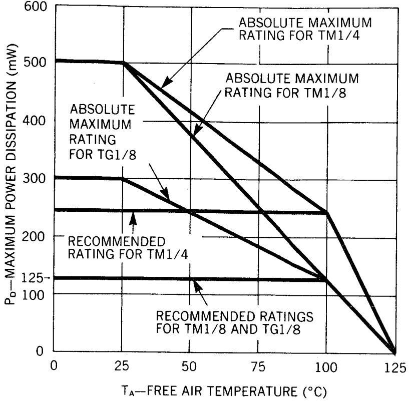
Standard Zero Power Resistance Value (Ω) at 25°C Free-Air Temperature	Type No.					Resistance (Ω) of Sensistor® at Temperature other than 25°C						
						-55°	-15°C	0°C	50°C	75°	100°C	125°C
820	TG1/8	RTH42	TM1/8	RTH22	TM1/4	451	606.8	684.7	984	1,164.4	1,357.92	1,574.4
1,000	TG1/8	RTH42	TM1/8	RTH22	TM1/4	550	740	835	1,200	1,420	1,656	1,920
1,200	TG1/8	RTH42	TM1/8	RTH22	TM1/4	660	888	1,002	1,440	1,704	1,987.2	2,304
1,500	TG1/8	RTH42	—	—	TM1/4	772.5	1,095	1,237.5	1,845	2,175	2,505	2,940
	—	—	TM1/8	RTH22	TM1/4	825	1,110	1,252.5	1,800	2,130	2,484	2,880
1,800	TG1/8	RTH42	TM1/8	RTH22	TM1/4	927	1,314	1,485	2,214	2,610	3,006	3,528
2,200	TG1/8	RTH42	TM1/8	RTH22	TM1/4	1,133	1,606	1,815	2,706	3,190	3,674	4,312
2,700	TG1/8	RTH42	TM1/8	RTH22	TM1/4	1,390.5	1,971	2,27.5	3,321	3,915	4,509	5,292
3,300	TG1/8	—	TM1/8	RTH22	TM1/4	1,699.5	2,409	2,722.5	4,059	4,785	5,511	6,468
3,900	TG1/8	—	TM1/8	RTH22	TM1/4	2,008.5	2,847	3,217.5	4,797	5,655	6,513	7,644
4,700	TG1/8	—	TM1/8	RTH22	TM1/4	2,420.5	3,431	3,877.5	5,781	6,815	7,849	9,212
5,000	TG1/8	—	TM1/8	RTH22	TM1/4	2,575	3,650	4,125	6,150	7,250	8,350	9,800
5,600	TG1/8	—	TM1/8	RTH22	TM1/4	2,884	4,088	4,620	6,888	8,120	9,352	10,976
6,800	TG1/8	—	—	—	TM1/4	3,468	4,964	5,610	8,092	9,520	10,948	12,444
	—	—	TM1/8	RTH22	TM1/4	3,502	4,964	5,610	8,364	9,860	11,356	13,328
8,200	TG1/8	—	TM1/8	RTH22	TM1/4	4,182	5,986	6,765	9,758	11,480	13,202	15,006
	—	—	TM1/8	RTH22	TM1/4	4,223	5,986	6,765	10,086	11,890	13,694	16,072
10,000	TG1/8	—	TM1/8	RTH22	TM1/4	5,100	7,300	8,250	11,900	14,000	16,100	18,300
	—	—	TM1/8	RTH22	TM1/4	5,150	7,300	8,250	12,300	14,500	16,700	19,600
12,000	—	—	TM1/8	—	—	6,180	8,760	9,900	14,760	17,400	20,040	23,520
15,000	—	—	TM1/8	—	—	7,215	10,680	12,210	18,150	21,450	20,050	28,500
18,000	—	—	TM1/8	—	—	8,658	12,816	14,652	21,780	25,740	30,060	34,200
22,000	—	—	TM1/8	—	—	10,582	15,664	17,908	26,620	31,460	36,740	41,800
27,000	—	—	TM1/8	—	—	12,987	19,224	21,978	32,670	38,610	45,090	51,300
33,000	—	—	TM1/8	—	—	15,873	23,496	26,862	39,930	47,190	55,110	62,700
39,000	—	—	TM1/8	—	—	18,759	27,768	31,746	47,190	55,770	65,130	74,100

DEVICE TOLERANCE

The actual resistance of the thermistor at T/°C may vary from the calculated value by an amount not exceeding the tolerances tabulated below.

Temperature	±5%	±10%
(°C)	(J)	(K)
-55	±15%	±20%
-15	±9%	±14%
0	±7%	±12%
25	±5%	±10%
50	±7%	±12%
75	±9%	±14%
100	±12%	±17%
125	±15%	±20%

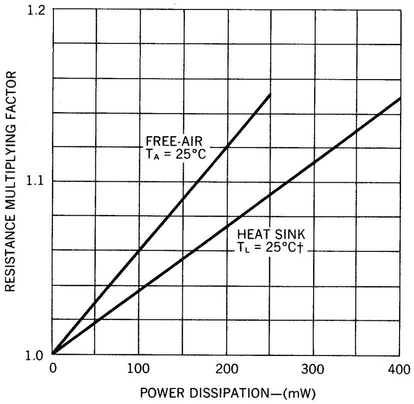
1. Dissipation Derating Curves



TYPICAL CHARACTERISTICS WITH POWER APPLIED

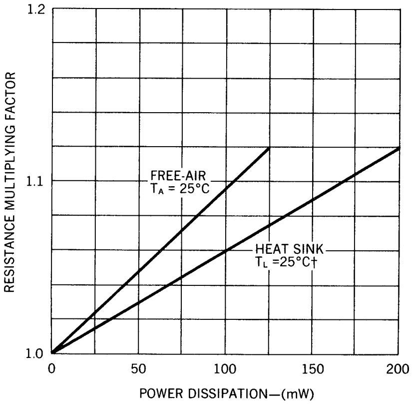
To determine resistance value with power applied, obtain a multiplying factor from the applicable curve below. The free-air curve is for the condition of heat removal by free-air convection only. The heat sink curve is for the maximum cooling rate condition of a heat sink strap, with leads attached to an infinite heat sink. Actual conditions encountered will be between these two extremes. After selecting an applicable multiplying factor from figure 2 or 3, multiply this by the 25°C zero power resistance. This product is then corrected for the actual ambient temperature by use of the appropriate temperature column in the Nominal Resistance at Various Temperatures table.

2. Percent Resistance Change vs Power Dissipation TM1/8 / RTH22 / TM1/4



†TL is lead temperature measured 1/16 inch from the body.

3. Percent Resistance Change vs Power Dissipation TM1/8 / RTH42 / TM1/4



†TL is lead temperature measured 1/16 inch from the body.

PART NUMBER DESIGNATION (EXAMPLE)

TM1/8272K

TM 1/8 272 K

STYLE	WATTAGE	RESISTANCE VALUE CODE	TOLERANCE
TM	1/8	270 = 27Ω	J = 5%
TG	1/4	271 = 270Ω	K = 10%
RTH42 ES		272 = 2,700Ω	
RTH22 ES		273 = 27,000Ω	

SURFACE MOUNT DEVICES 10

Introduction 10-3
Product Selection Guides 10-5

SURFACE MOUNTABLE POWER SEMICONDUCTORS

DESCRIPTION

The technology generally known as "surface mount" provides an opportunity to achieve several important benefits in many applications. Unitrode's traditional miniature, high power, metallurgically bonded, glass to metal, non-cavity, hermetically sealed axial devices are available as surface mount (MELF) products. Unitrode offers MELF versions of our rectifiers, small signal diodes, zener diodes, transient voltage suppressors and PIN diodes in 3 standard sizes with various ratings.

Unitrode offers bipolar and MOSFET transistors, and PN junction and Schottky rectifiers in ceramic leadless chip carriers. These capabilities are described in detail in the Unitrode Custom Packaging brochure.

A major advantage of this technology over other discrete component assembly methods, and even over some hybrid circuits, is reduction in size of the complete circuit. It is not unusual to achieve a four times reduction in area over a "compactly designed" conventional printed circuit (PC) board, — greater reductions are possible when compared with typical PC, hand wired or brass board designs. Another significant advantage, that of lower assembly cost, and often lower hardware cost, can be achieved with automation in high volume production for the industrial market.

Other benefits result from the inherently small size. Shorter "runs" between components achieve reduced parasitic inductance, resulting in "cleaner" high frequency circuits and switching circuits freer of spurious oscillations and/or voltage transients. Simple, uniform ground planes are readily utilized to decrease radiated electromagnetic interference (EMI) and providing better protection against outside EMI sources.

These improvements do not necessarily come at the cost of thermal properties, in fact, Unitrode's MELF devices have *lower* thermal resistance, junction to case, than equivalent axial types. Hence the current or power rating is enhanced. The conventionally mounted axial device requires heat flow through the leads to reach the mounting surface, thus adding thermal resistance. In the MELF package, low-resistance square end caps are used instead of leads, allowing the heat to reach the "outside world" with minimal resistance. R_θ is shown on the individual data sheets.

In hybrid circuits, the use of a packaged surface mount device (SMD) allows the purchase of a 100% tested component with all parameters guaranteed. This cannot be done for chip components. The advantages of higher hybrid yields and lower overall costs are obvious.

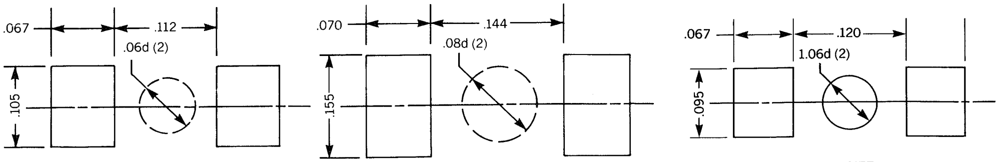
Mounting Considerations

To achieve the benefits noted above it is important to mount the devices in a manner to maintain the inherent reliability. This involves the proper choice of mounting boards or substrates and a suitable assembly process. The axial (glass MELF type) have low expansion coefficients, similar to ceramic leadless chip carriers (CLCC). Plastic chip carriers (PLCC) usually require flexible leads (J or gull-wing) when used on the same circuit board with the other types.

Selection of circuit board material should generally be governed by consideration of thermal-mismatch and power requirements. For Military temperature ranges or applications requiring many thousands of temperature cycles an alumina substrate is advised. A suitable material with even better thermal conductivity is Copper-Invar-Copper triplate with a thin bonded coating of insulating material such as polyimide and printed copper wiring on the component-mounting surface. This material, however, is heavier and more expensive than the alumina. High-reliability industrial or commercial users will find aluminum, coated with similar insulating and conductive wiring, suitable. The cost is considerably less than the triplate material and the ruggedness considerably greater than alumina. Where cost is the primary consideration a low expansion PC board material, such as epoxy-glass, is satisfactory for environments where the temperature range is limited. The trade off here is thermal; thermal resistance is higher than the other materials mentioned so allowable power dissipation is less.

Assembly may be accomplished with wave soldering, vapor phase reflow or infra red reflow assembly techniques. In high power, low thermal resistance (mounting surface to ambient) application the solder joint must be relatively void-free.

SUGGESTED FOOTPRINTS FOR MOUNTING UNITRODE MELF DEVICES (1)



A-SIZE
(standard small
square end cap outline)

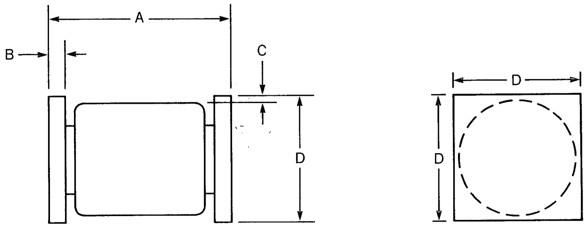
B-SIZE
(standard large
square end cap outline)

D-SIZE
(extra small
square end cap outline)

NOTES:

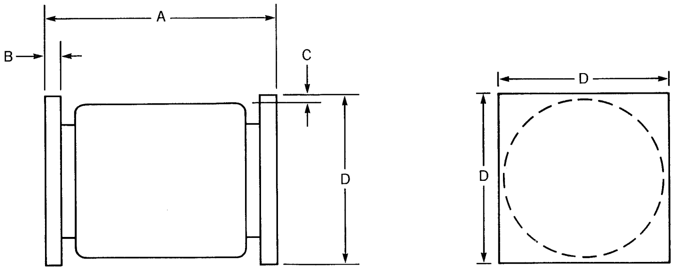
1. These dimensions will match the terminals and provide for additional solder fillets at the outboard ends at least as wide as the terminals themselves, assuming accuracy of device placement within .005 inches.
2. If the mounting method chosen requires use of an adhesive separate from the solder compound, a round (or square) spot of cement as shown should be centrally located.
3. Dimensions shown are in inches.

MELF A



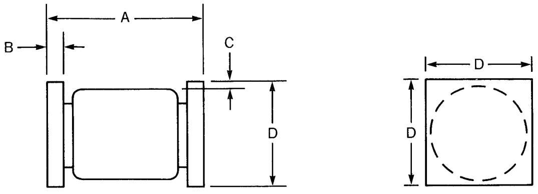
	"A" BODY	
DIM.	MIN.	MAX.
A	.168	.200
B	.019	.028
C	.003	—
D	.091	.103

MELF B



	"B" BODY	
DIM.	MIN.	MAX.
A	.200	.225
B	.019	.028
C	.003	—
D	.137	.148

MELF D

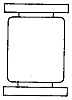


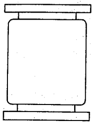
	INCHES		MM	
DIM.	MIN.	MAX.	MIN.	MAX.
A	.165	.195	4.19	4.95
B	.019	.028	0.48	0.71
C	.003	—	0.08	—
D	.070	.085	1.78	2.16

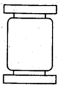
SURFACE MOUNT PACKAGES

PRODUCT SELECTION GUIDE

Ultra-Fast & Standard Recovery Rectifiers







UNIBOND SWITCHING DIODES

Average DC Output Current	300mA @ TEC = 110°C
Package Style	**Melf D**
150V	1N6638U
100V	1N6642U
75V	1N6643U

These also available as JTX, JTXV.

ULTRA-FAST RECTIFIERS

Average DC Output Current			2A	3A	4A	7A	8A
Package Style			**Melf A**	**Melf A**	**Melf A**	**Melf B**	**Melf B**
Peak Inverse Voltage	50V		UES1001SM		UES1101SM SM5802		UES1301SM SM5807
		t_{rr}	25ns		25ns		30ns
	100V		UES1002SM		UES1102SM SM5804		UES1302SM SM5809
		t_{rr}	25ns		25ns		30ns
	150V		UES1003SM		UES1103SM SM5806		UES1303SM SM5811
		t_{rr}	25ns		25ns		30ns

STANDARD RECOVERY RECTIFIERS

Average DC Output Current		2A	4A	8A
Package Style		**Melf A**	**Melf A**	**Melf B**
Peak Inverse Voltage	200V	SM3611 SM4245	**SM5614 SM5615**	**SM5550 SM5417**
	400V	SM3612 SM4246	**SM5616 SM5617**	**SM5551 SM5418**
	600V	SM3613 SM4247	**SM5618 SM5619**	**SM5552 SM5419**
	800V	SM3614 SM4248	SM5620	SM5553
	1000V	SM4249		

HV PLUS RECTIFIERS

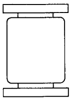
Average DC Output Current			2.25A	3.0A	4.5A	6.0A
Package Style			**Melf A**	**Melf A**	**Melf B**	**Melf B**
Peak Inverse Voltage	200V	V_F t_{rr}		SM6620 UHVP202SM 1.6V @ 2A 30 nSec		SM6626 UHVP402SM 1.5V @ 4A 30 nSec
	400V	V_F t_{rr}		SM6621 UHVP204SM 1.6V @ 2A 30 nSec		SM6627 UHVP404SM 1.5V @ 4A 30 nSec
	600V	V_F t_{rr}		SM6622 UHVP206SM 1.6V @ 2A 30 nSec		SM6628 UHVP406SM 1.5V @ 4A 30 nSec
	800V	V_F t_{rr}	SM6623 UHVP208SM 1.8V @ 1.5A 50 nSec		SM6629 UHVP408SM 1.7V @ 3A 50 nSec	

Contact factory for Rectifiers, Zeners, TVSs, and PINs not displayed in this section.

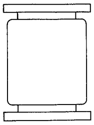
SURFACE MOUNT PACKAGES

PRODUCT SELECTION GUIDE

Power Zeners & Transient Voltage Suppressors



MELF A



MELF B

POWER ZENERS

Power		3W	10W	6W
Package Style		**Melf A**	**Melf B**	**Melf A**
Voltage V_Z (5% Tolerance)	5.6V		SM5968	
	6.2V		SM5969	
	6.8V	SM4461	SM4954	UZ706SM
	7.5V	SM4462	SM4955	UZ707SM
	8.2V	SM4463	SM4956	UZ708SM
	9.1V	SM4464	SM4957	UZ709SM
	10V	SM4465	SM4958	UZ710SM
	11V	SM4466	SM4959	
	12V	SM4467	SM4960	UZ712SM
	13V	SM4468	SM4961	UZ713SM
	14V			UZ714SM
	15V	SM4469	SM4962	UZ715SM
	16V	SM4470	SM4963	UZ716SM
	18V	SM4471	SM4964	UZ718SM
	20V	SM4472	SM4965	UZ720SM
	22V	SM4473	SM4966	UZ722SM
	24V	SM4474	SM4967	UZ724SM
	27V	SM4475	SM4968	UZ727SM
	30V	SM4476	SM4969	UZ730SM
	33V	SM4477	SM4970	UZ733SM
	36V	SM4478	SM4971	UZ736SM
	39V	SM4479	SM4972	
	40V			UZ740SM
	43V	SM4480	SM4973	
	45V			UZ745SM
	47V	SM4481	SM4974	
	50V			UZ750SM
	51V	SM4482	SM4975	
	56V	SM4483	SM4976	UZ756SM
	60V			UZ760SM
	62V	SM4484	SM4977	

POWER ZENERS

Power		3W	10W	6W
Package Style		**Melf A**	**Melf B**	**Melf A**
Voltage V_Z (5% Tolerance)	68V	SM4485	SM4978	
	70V			UZ770SM
	75V	SM4486	SM4979	UZ775SM
	80V			UZ780SM
	82V	SM4487	SM4980	
	90V			UZ790SM
	91V	SM4488	SM4981	
	100V	SM4489	SM4982	UZ110SM
	110V	SM4490	SM4983	UZ111SM
	120V	SM4491	SM4984	UZ112SM
	130V	SM4492	SM4985	UZ113SM
	140V			UZ114SM
	150V	SM4493	SM4986	UZ115SM
	160V	SM4494	SM4987	UZ116SM
	170V			UZ117SM
	180V	SM4495	SM4988	UZ118SM
	190V			UZ119SM
	200V	SM4496	SM4989	UZ120SM
	220V		SM4990	UZ122SM
	240V		SM4991	UZ124SM
	260V			UZ126SM
	270V		SM4992	
	280V			UZ128SM
	300V		SM4993	UZ130SM
	320V			UZ132SM
	330V		SM4994	
	340V			UZ134SM
	360V		SM4995	UZ136SM
	380V			UZ138SM
	390V		SM4996	
	400V			UZ140SM

TRANSIENT VOLTAGE SUPPRESSORS

Part No.			Stand-Off Voltage V_R	Min. Breakdown Voltage $BV_{(min)}$ @ 1mA	Max. Peak Pulse Current I_{PP}	Max. Clamping Voltage V_C @ I_{PP}	Peak Power for ImS
			(V)	(V)	(A)	(V)	(W)
Package Style	**Melf B**	SM6461	5.0	5.6 @ 25mA	56	9	500
		SM6462	6.0	6.5 @ 20mA	46	11	
		SM6463	12.0	13.6 @ 5mA	22	22.6	
		SM6464	15.0	16.4 @ 5mA	19	26.5	
		SM6465	24.0	27.0 @ 2mA	12	41.4	
		SM6466	30.5	33.0 @ 1mA	11	47.5	
		SM6467	40.3	43.7 @ 1mA	8	63.5	
		SM6468	51.6	54.0 @ 1mA	6	78.5	

Contact factory for Rectifiers, Zeners, TVSs, and PINs not displayed in this section.

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