

# MSR1560G, MSRF1560G

## Switch-mode Soft Recovery Power Rectifier

These state-of-the-art devices are designed for boost converter or hard-switched converter applications, especially for Power Factor Correction application. It could also be used as a free wheeling diode in variable speed motor control applications and switching mode power supplies.

### Features

- Soft Recovery with Low Reverse Recovery Charge ( $Q_{RR}$ ) and Peak Reverse Recovery Current ( $I_{RRM}$ )
- Epoxy meets UL 94 V-0 @ 0.125 in
- Low Forward Voltage
- Low Leakage Current
- High Temperature Glass Passivated Junction
- These are Pb-Free Devices

### Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 1.9 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	$V_{RRM}$ $V_{RWM}$ $V_R$	600	V
Average Rectified Forward Current (At Rated $V_R$ , $T_C = 125^\circ\text{C}$ )	$I_O$	15	A
Peak Repetitive Forward Current (At Rated $V_R$ , Square Wave, 20 kHz, $T_C = 125^\circ\text{C}$ )	$I_{FRM}$	30	A
Non-Repetitive Peak Surge Current (Surge applied at rated load conditions, halfwave, single phase, 60 Hz)	$I_{FSM}$	100	A
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	°C

### THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
MSR1560G: Thermal Resistance Junction-to-Case Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.6 72.8	°C/W
MSRF1560G: Thermal Resistance Junction-to-Case Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	4.25 75	°C/W

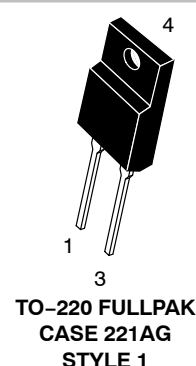
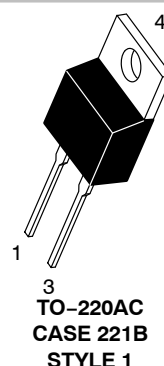
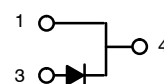
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



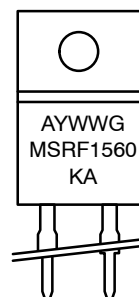
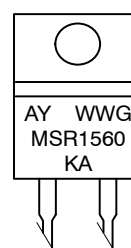
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## SOFT RECOVERY POWER RECTIFIER 15 AMPERES, 600 VOLTS



### MARKING DIAGRAMS



A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package  
KA = Diode Polarity

### ORDERING INFORMATION

Device	Package	Shipping
MSR1560G	TO-220AC (Pb-Free)	50 Units/Rail
MSRF1560G	TO-220FP (Pb-Free)	50 Units/Rail

# MSR1560G, MSRF1560G

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Value		Unit
Instantaneous Forward Voltage (Note 1) ( $I_F = 15\text{ A}$ ) Maximum Typical	$V_F$	$T_J = 25^\circ\text{C}$	$T_J = 150^\circ\text{C}$	V
		1.8 1.5	1.4 1.2	
Instantaneous Reverse Current ( $V_R = 600\text{ V}$ ) Maximum Typical	$I_R$	$T_J = 25^\circ\text{C}$	$T_J = 150^\circ\text{C}$	$\mu\text{A}$
		15 0.4	5000 100	
Reverse Recovery Time (Note 2) ( $V_R = 30\text{ V}$ , $I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ) Maximum Typical	$t_{rr}$	$T_J = 25^\circ\text{C}$	$T_J = 100^\circ\text{C}$	ns
		45 35	65 54	
Typical Recovery Softness Factor ( $V_R = 30\text{ V}$ , $I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ )	$s = t_b/t_a$	0.67	0.74	
Typical Peak Reverse Recovery Current ( $V_R = 30\text{ V}$ , $I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ )	$I_{RRM}$	2.3	3.2	A
Typical Reverse Recovery Charge ( $V_R = 30\text{ V}$ , $I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ )	$Q_{RR}$	31	78	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width  $\leq 380\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$
2.  $T_{RR}$  measured projecting from 25% of  $I_{RRM}$  to zero current

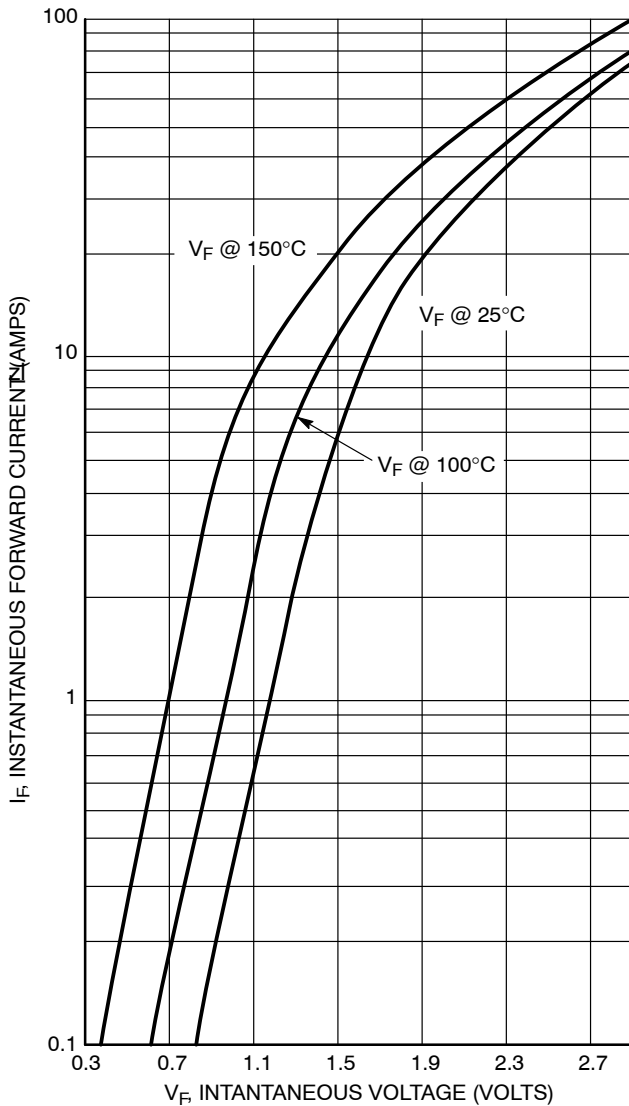


Figure 1. Maximum Forward Voltage

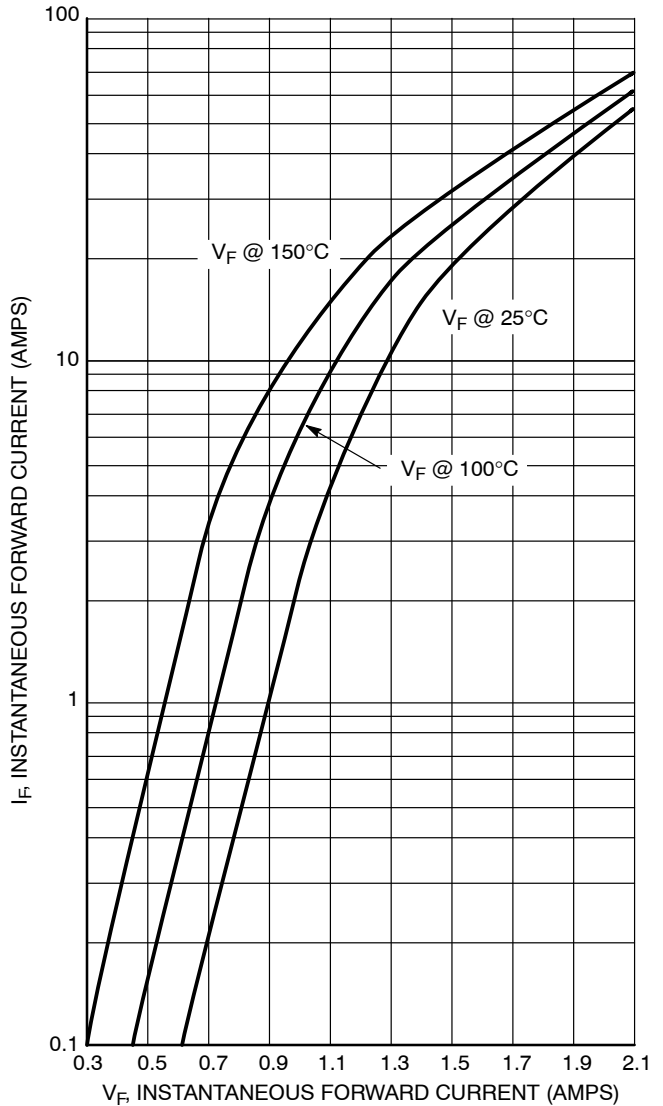


Figure 2. Typical Forward Voltage

# MSR1560G, MSRF1560G

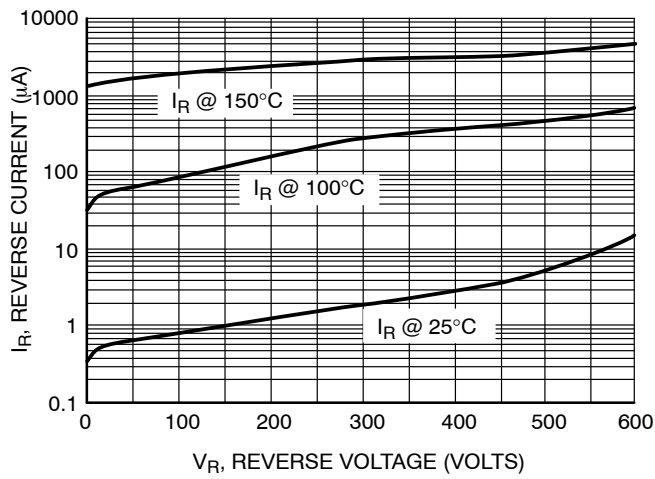


Figure 3. Maximum Reverse Current

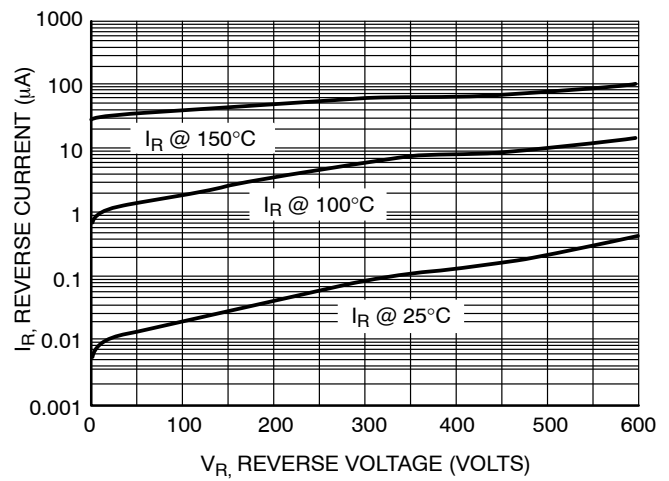


Figure 4. Typical Reverse Current

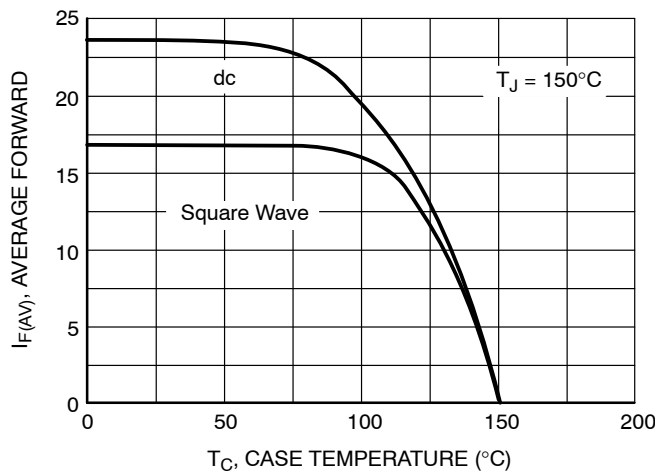


Figure 5. Current Derating

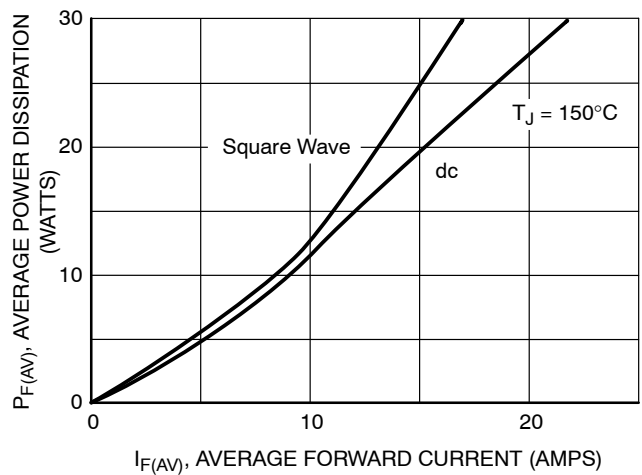


Figure 6. Power Dissipation

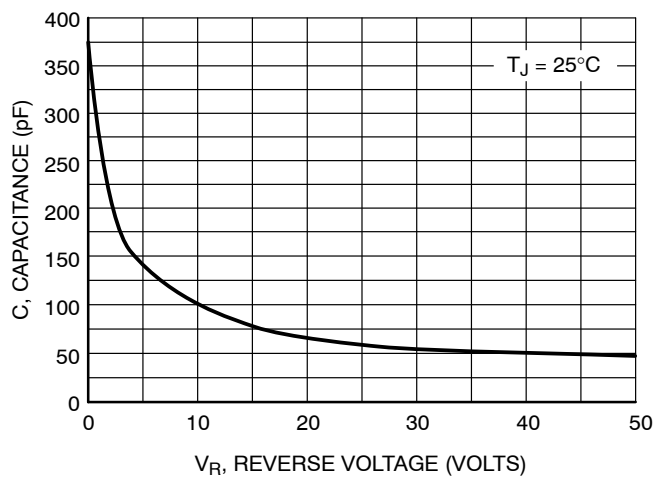


Figure 7. Maximum Capacitance

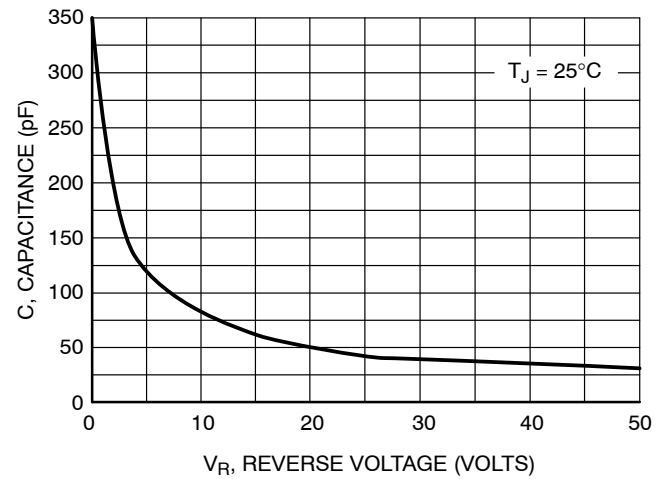


Figure 8. Typical Capacitance

# MSR1560G, MSRF1560G

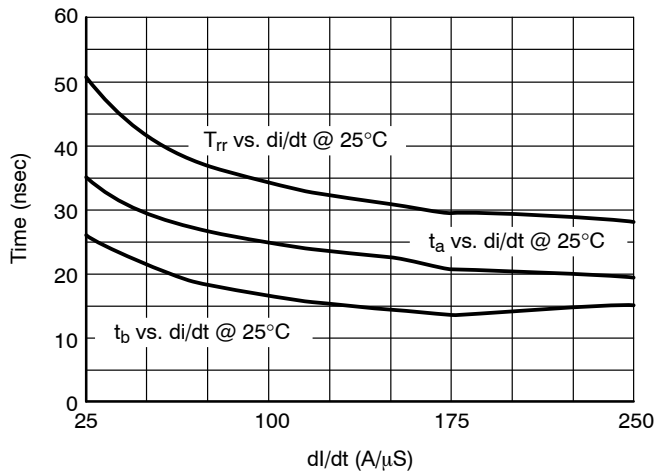


Figure 9. Typical Trr vs. di/dt

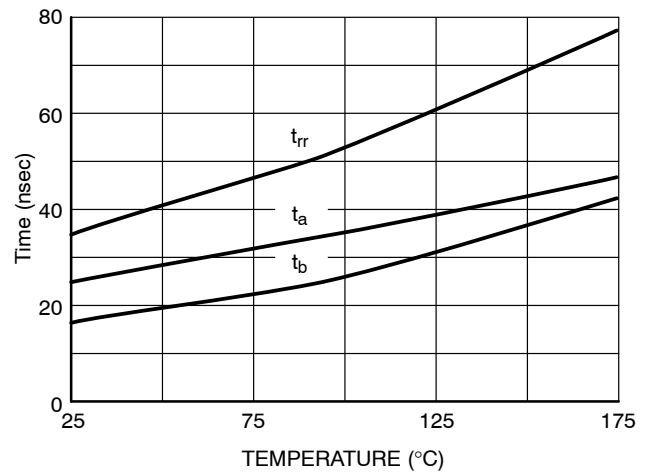


Figure 10. Typical Trr vs. Temperature

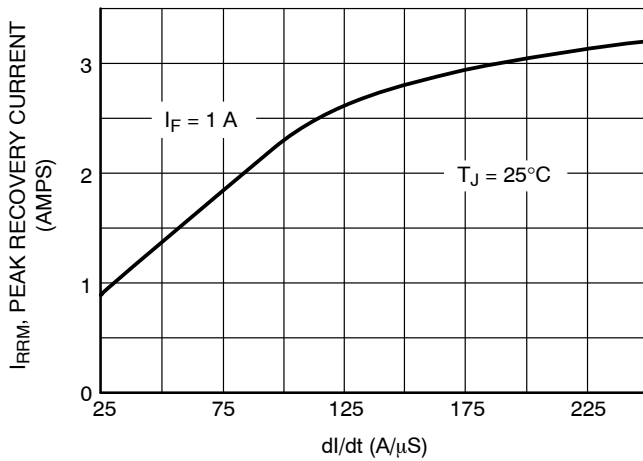


Figure 11. Typical Peak Reverse Recovery Current

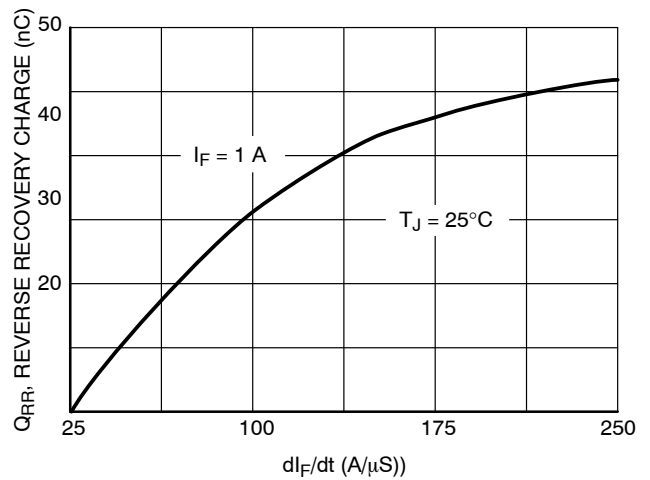


Figure 12. Typical Reverse Recovery Charge

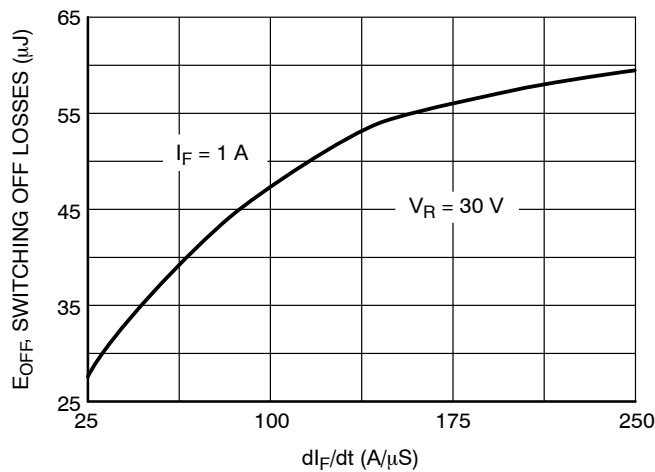


Figure 13. Typical Switching Off Losses

# MSR1560G, MSRF1560G

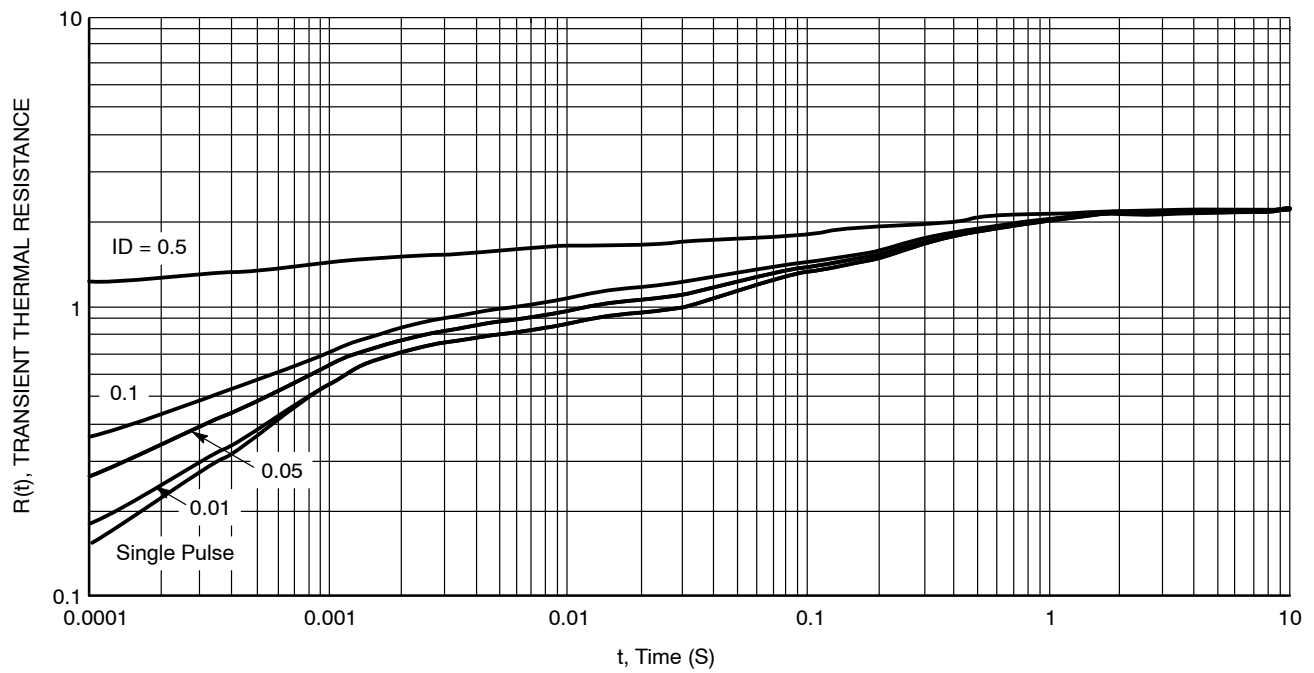


Figure 14. Transient Thermal Response

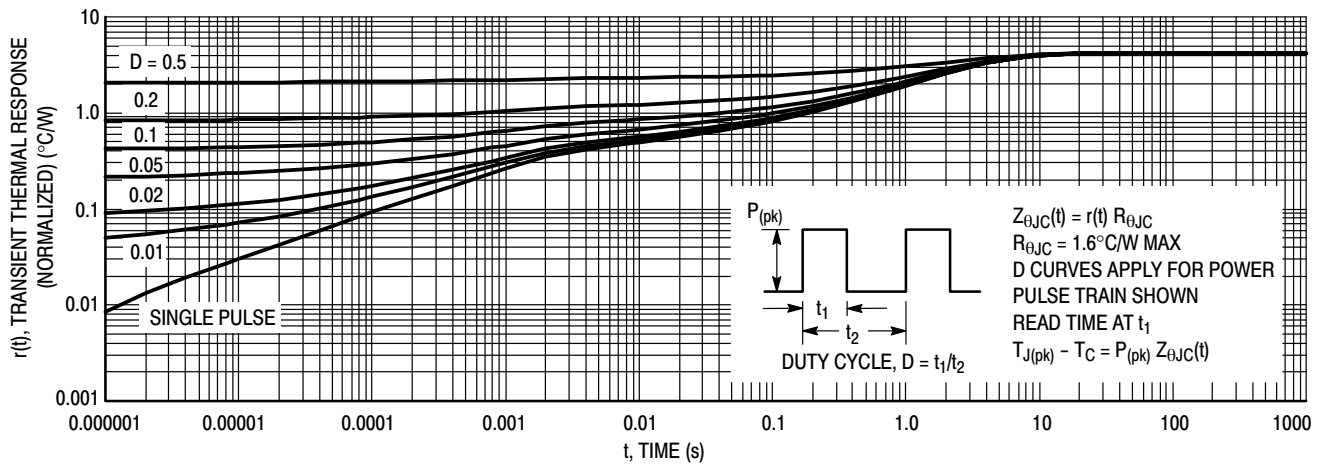


Figure 15. Thermal Response, (MSRF1560) Junction-to-Case ( $R_{\theta JC}$ )

# MSR1560G, MSRF1560G

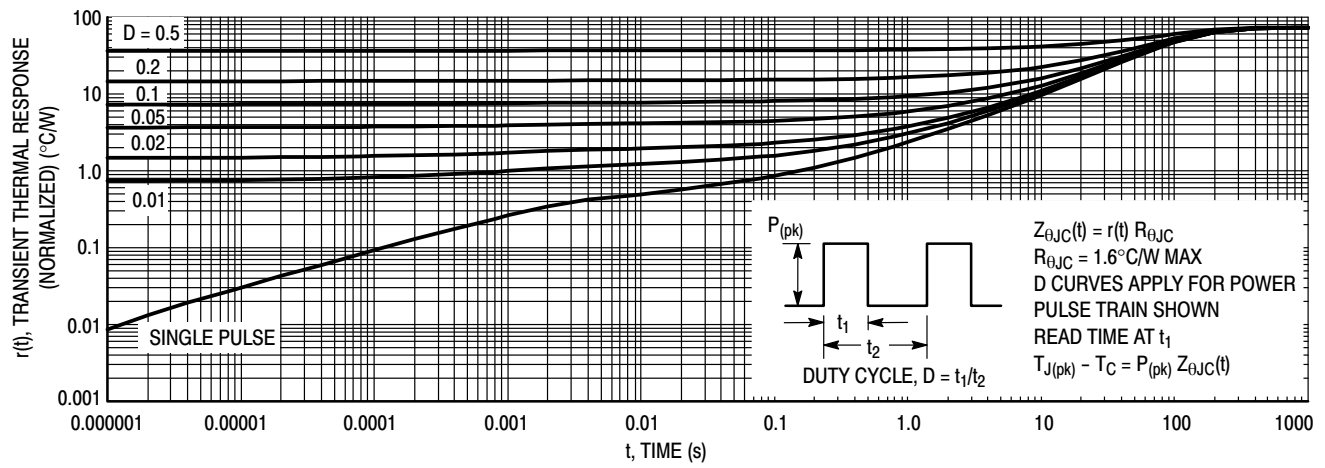
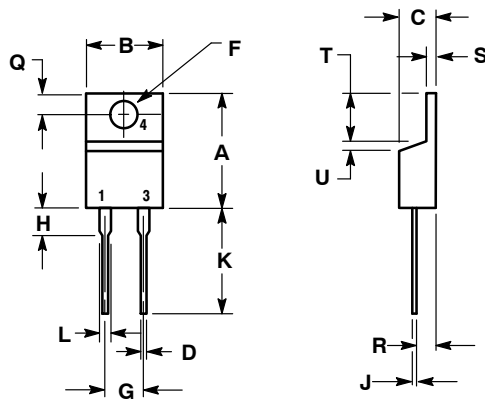


Figure 16. Thermal Response, (MSRF1560) Junction-to-Ambient ( $R_{\theta JA}$ )

# MSR1560G, MSRF1560G

## PACKAGE DIMENSIONS

### TO-220 TWO-LEAD CASE 221B-04 ISSUE F

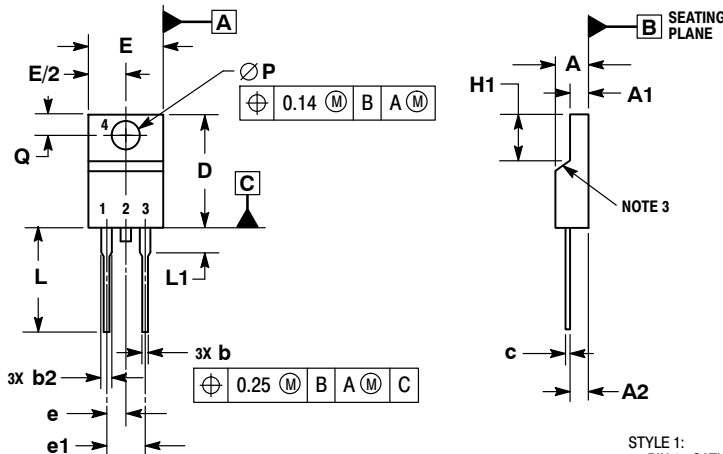


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.595	0.620	15.11	15.75
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.82
D	0.025	0.039	0.64	1.00
F	0.142	0.161	3.61	4.09
G	0.190	0.210	4.83	5.33
H	0.110	0.130	2.79	3.30
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.14	1.39
T	0.235	0.255	5.97	6.48
U	0.000	0.050	0.000	1.27

- STYLE 1:  
PIN 1. CATHODE  
2. N/A  
3. ANODE  
4. CATHODE

### TO-220 FULLPAK, 2-LEAD CASE 221AG ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. CONTOUR UNCONTROLLED IN THIS AREA.
  4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH AND GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT OUTERMOST EXTREME OF THE PLASTIC BODY.
  5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.00.

DIM	MILLIMETERS	
	MIN	MAX
A	4.30	4.70
A1	2.50	2.90
A2	2.50	2.90
b	0.54	0.84
b2	1.10	1.40
c	0.49	0.79
D	14.22	15.88
E	9.65	10.67
e	2.54 BSC	
e1	5.08 BSC	
H1	5.97	6.48
L	12.70	14.73
L1	---	2.80
P	3.00	3.40
Q	2.80	3.20

- STYLE 1:  
PIN 1. CATHODE  
2. N/A  
3. ANODE

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