

# Switch-mode Soft Recovery Power Rectifier

## MSR1560G, MSRF1560G

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<br>Working Peak Reverse Voltage<br>DC Blocking Voltage                       | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 600         | V    |
| Average Rectified Forward Current<br>(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<br>(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   |

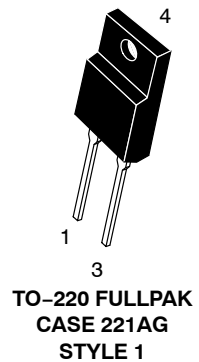
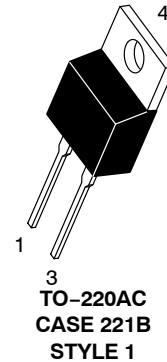
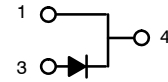
### THERMAL CHARACTERISTICS

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

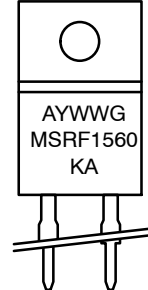
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## SOFT RECOVERY POWER RECTIFIER

### 15 AMPERES, 600 VOLTS



### MARKING DIAGRAM



- 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 |

### DISCONTINUED (Note 1)

|           |                    |                 |
|-----------|--------------------|-----------------|
| MSRF1560G | TO-220FP (Pb-Free) | 50 Units / Rail |
|-----------|--------------------|-----------------|

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](http://BRD8011/D).

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your onsemi representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

## ELECTRICAL CHARACTERISTICS

| Characteristic                                                                                                                         | Symbol        | Value                    |                           | Unit          |
|----------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|---------------------------|---------------|
| Instantaneous Forward Voltage (Note 1) ( $I_F = 15\text{ A}$ )<br>Maximum<br>Typical                                                   | $V_F$         | $T_J = 25^\circ\text{C}$ | $T_J = 150^\circ\text{C}$ | V             |
|                                                                                                                                        |               | 1.8<br>1.5               | 1.4<br>1.2                |               |
| Instantaneous Reverse Current ( $V_R = 600\text{ V}$ )<br>Maximum<br>Typical                                                           | $I_R$         | $T_J = 25^\circ\text{C}$ | $T_J = 150^\circ\text{C}$ | $\mu\text{A}$ |
|                                                                                                                                        |               | 15<br>0.4                | 5000<br>100               |               |
| Reverse Recovery Time (Note 2) ( $V_R = 30\text{ V}$ , $I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ )<br>Maximum<br>Typical | $t_{rr}$      | $T_J = 25^\circ\text{C}$ | $T_J = 100^\circ\text{C}$ | ns            |
|                                                                                                                                        |               | 45<br>35                 | 65<br>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

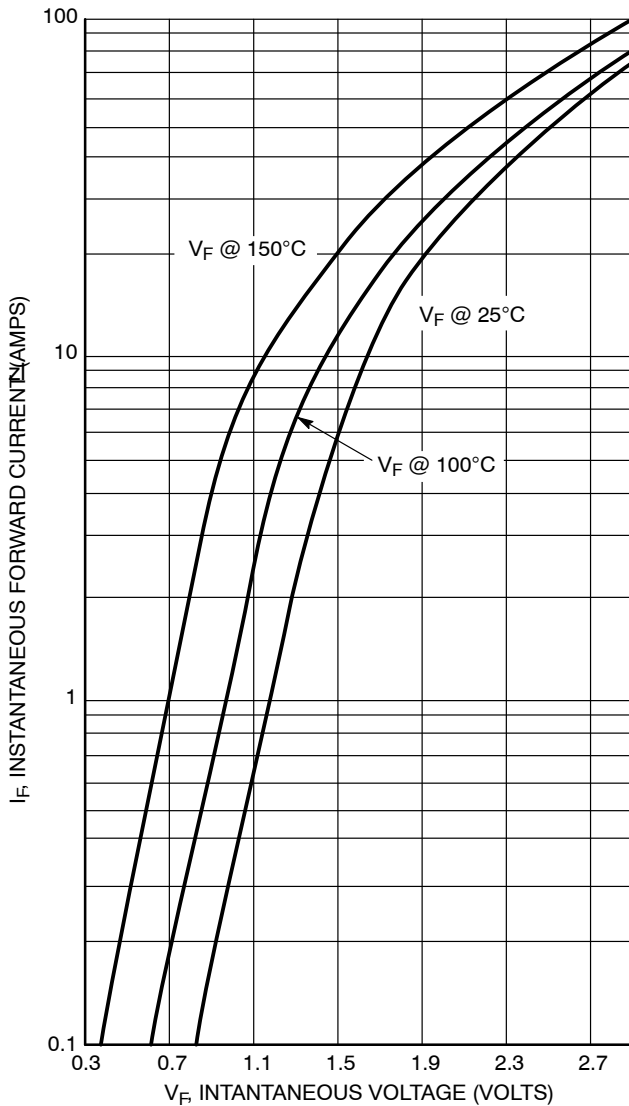


Figure 1. Maximum Forward Voltage

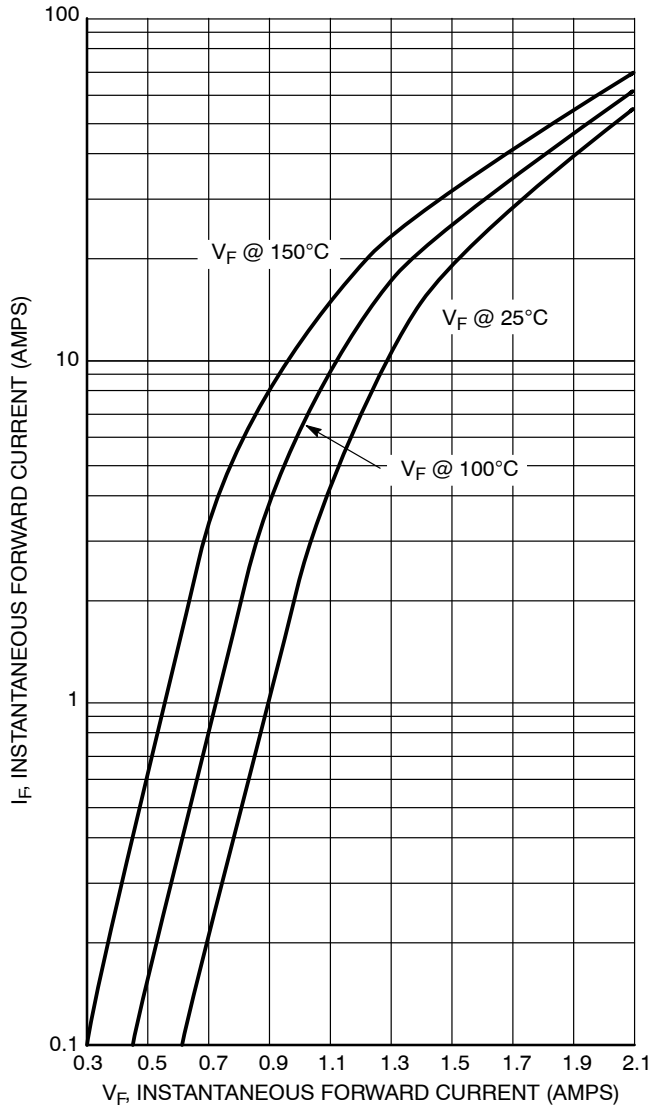
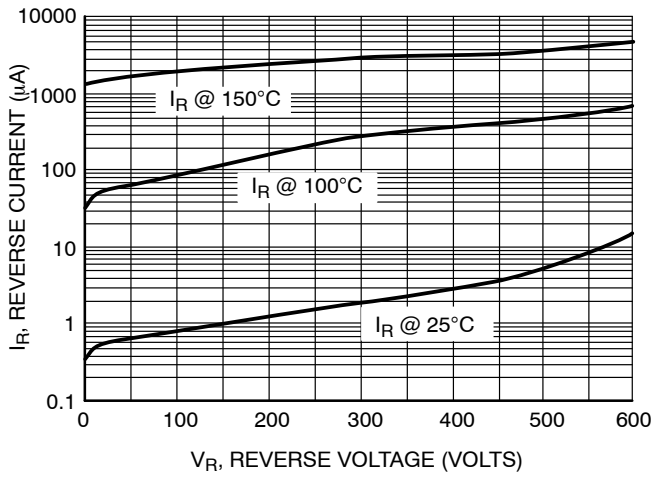
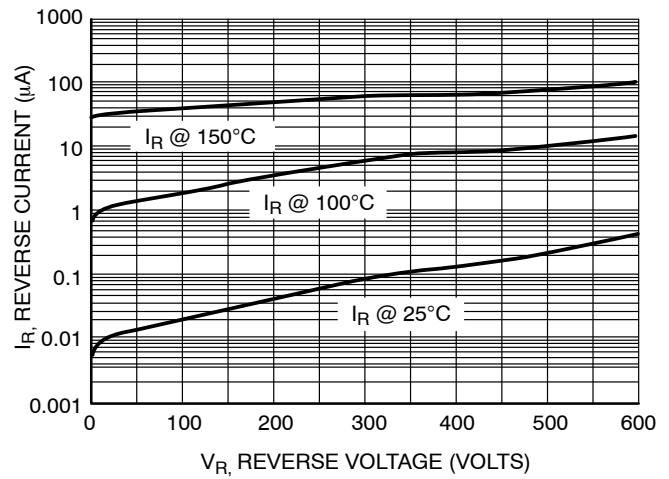


Figure 2. Typical Forward Voltage

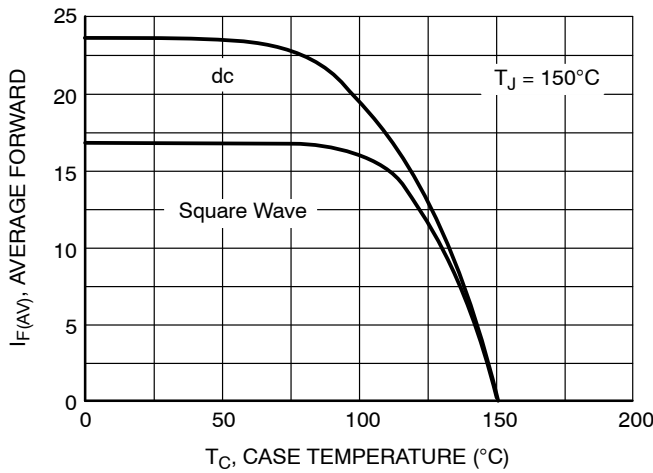
# MSR1560G, MSRF1560G



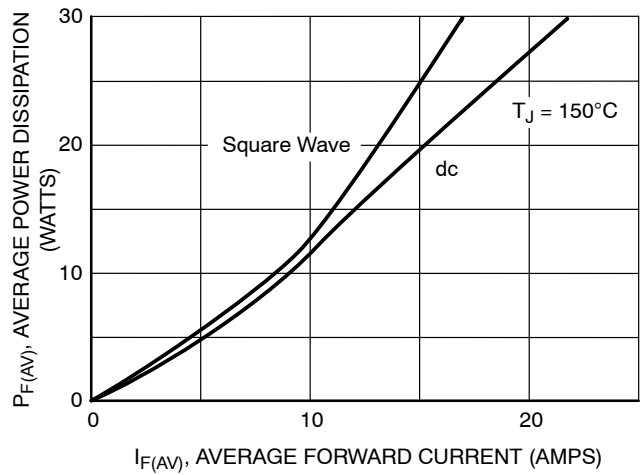
**Figure 3. Maximum Reverse Current**



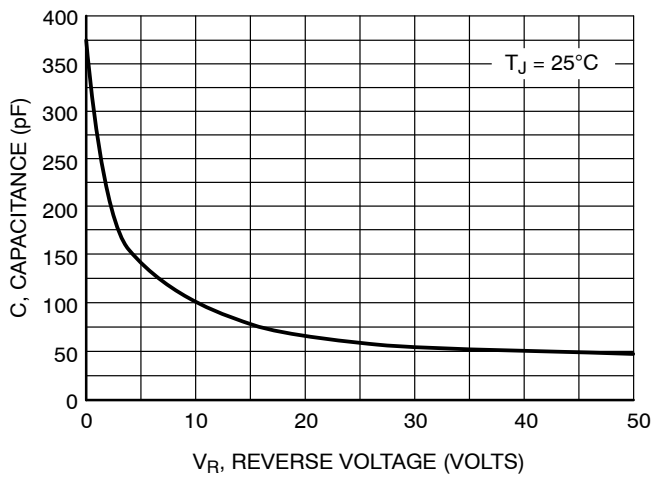
**Figure 4. Typical Reverse Current**



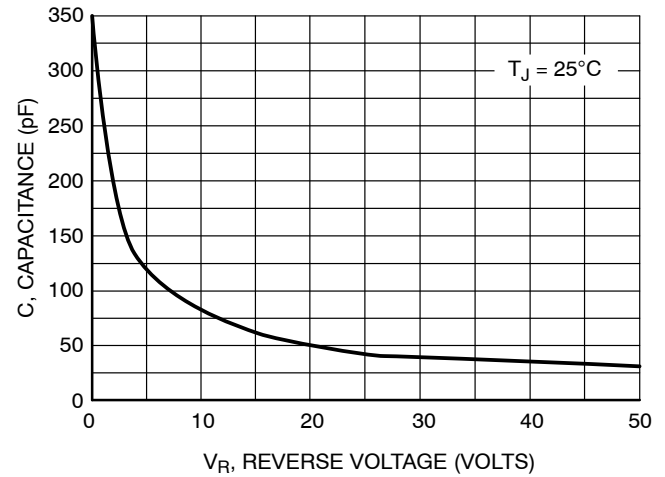
**Figure 5. Current Derating**



**Figure 6. Power Dissipation**



**Figure 7. Maximum Capacitance**



**Figure 8. Typical Capacitance**

# MSR1560G, MSRF1560G

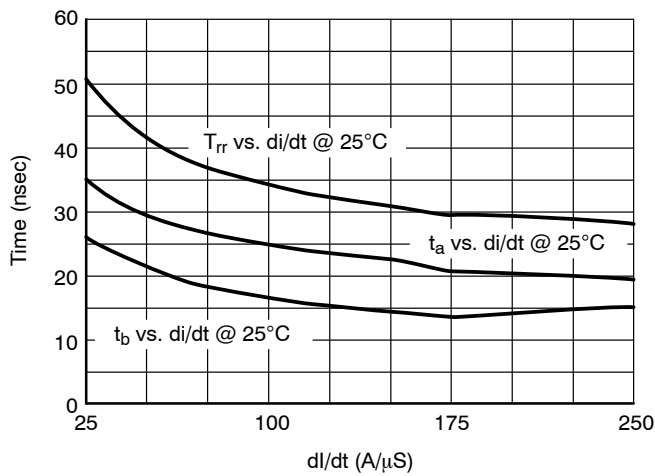


Figure 9. Typical Trr vs. di/dt

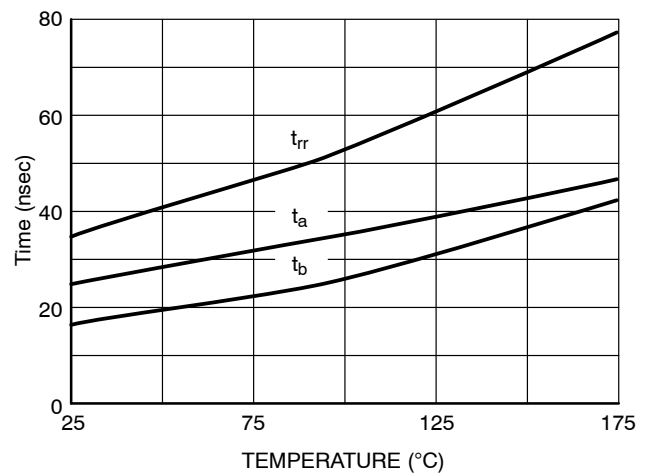


Figure 10. Typical Trr vs. Temperature

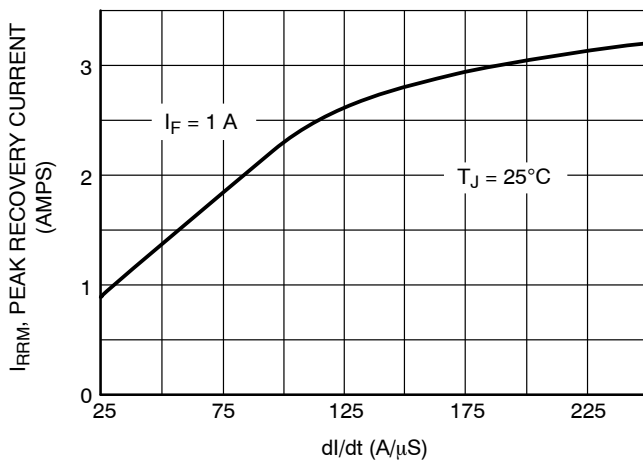


Figure 11. Typical Peak Reverse Recovery Current

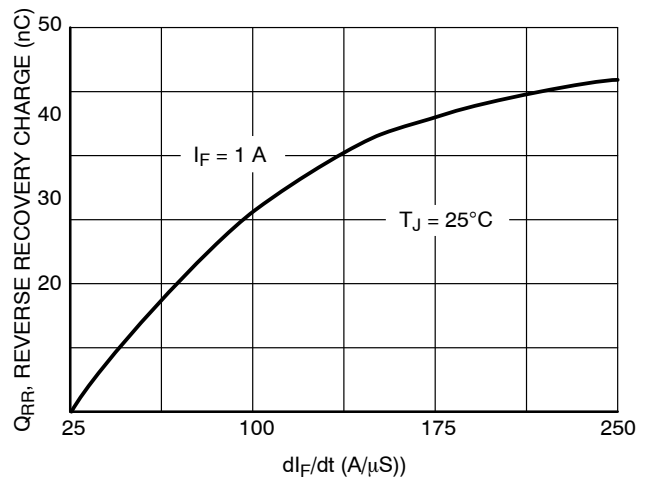


Figure 12. Typical Reverse Recovery Charge

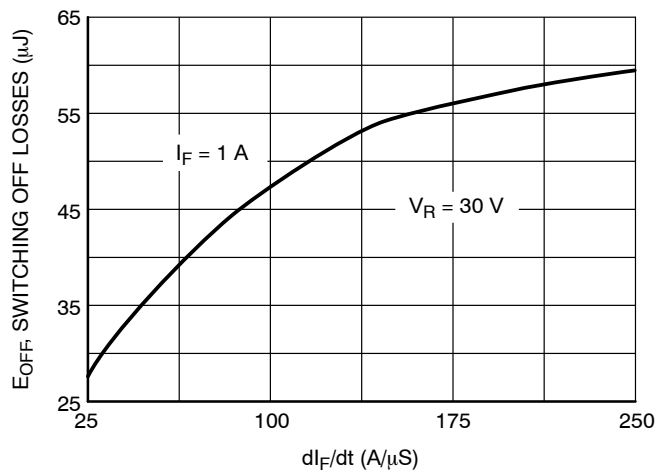


Figure 13. Typical Switching Off Losses

# MSR1560G, MSRF1560G

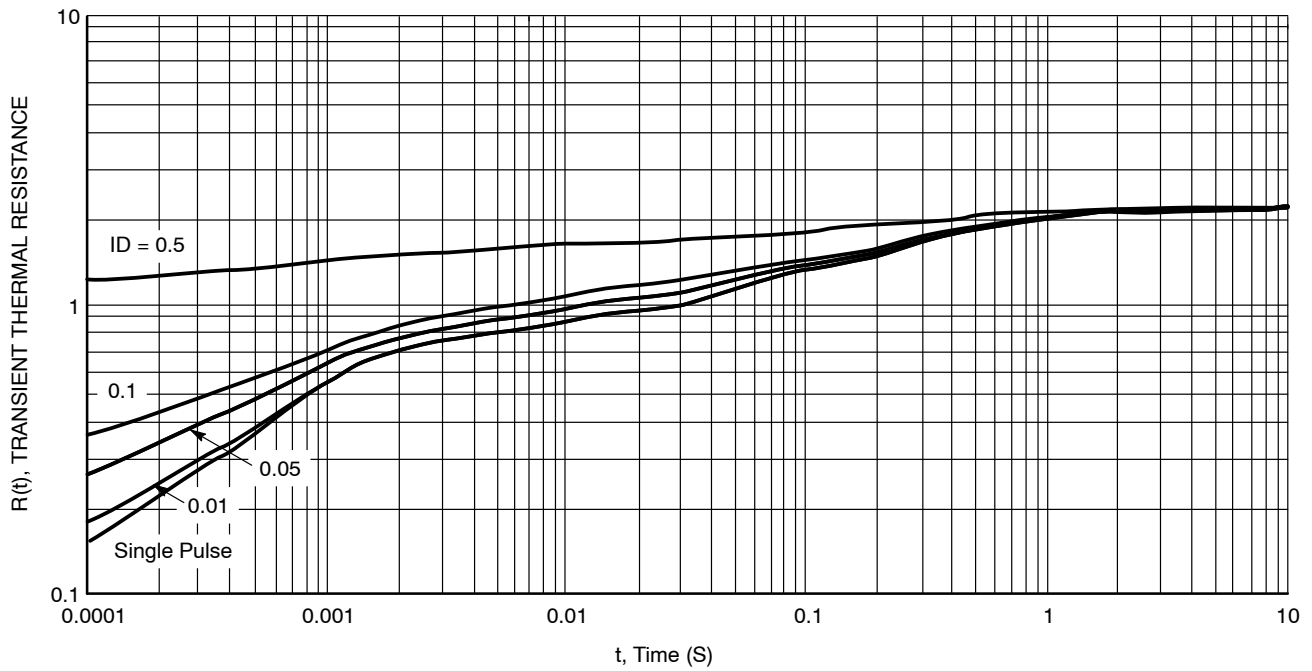


Figure 14. Transient Thermal Response

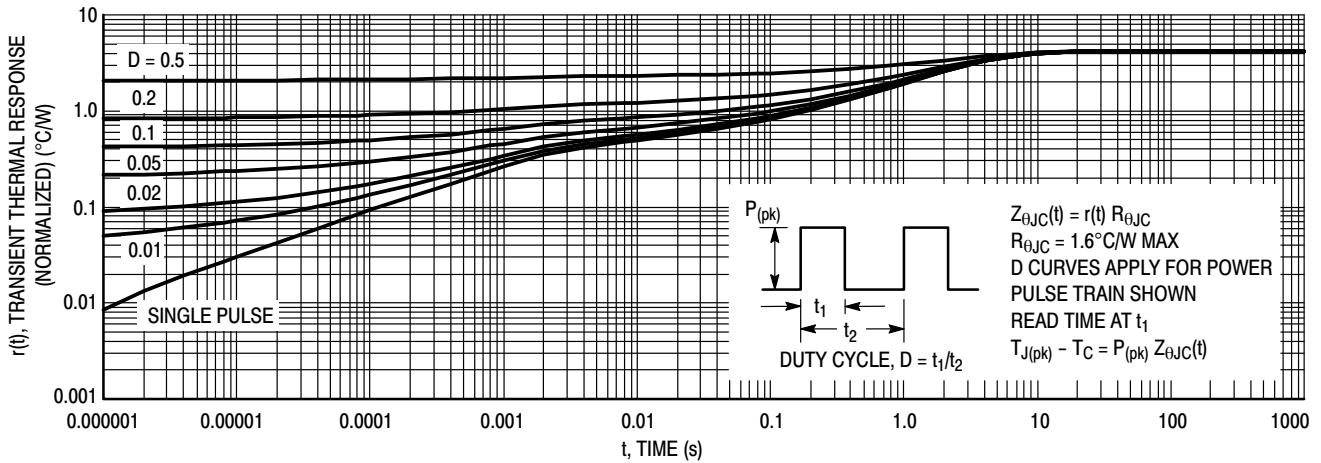


Figure 15. Thermal Response, (MSRF1560) Junction-to-Case ( $R_{\theta JC}$ )

# MSR1560G, MSRF1560G

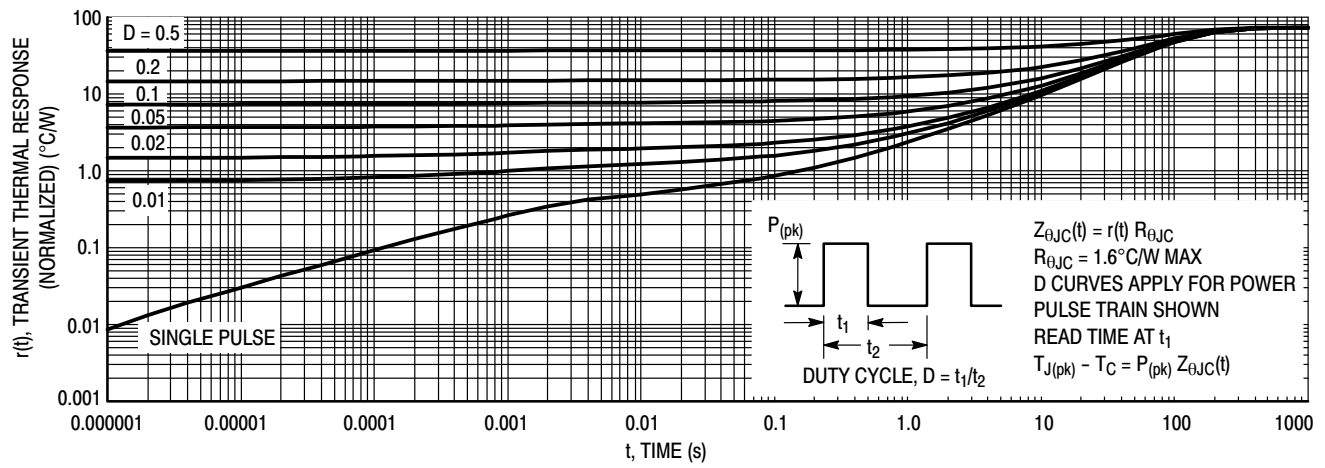
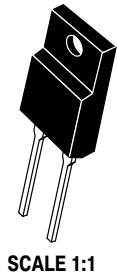


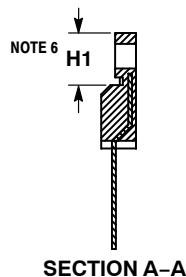
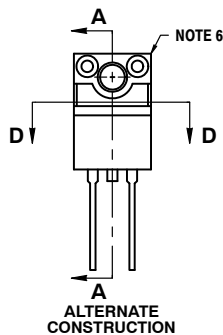
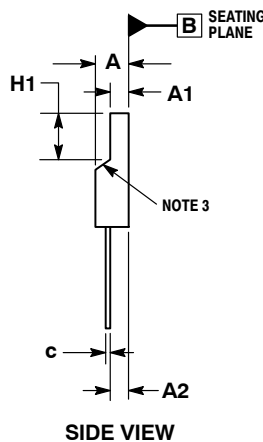
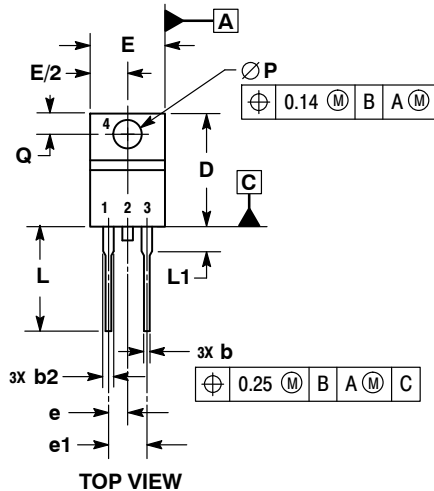
Figure 16. Thermal Response, (MSRF1560) Junction-to-Ambient ( $R_{\theta JA}$ )

TO-220 FULLPACK, 2-LEAD  
CASE 221AG  
ISSUE B

DATE 27 AUG 2015



SCALE 1:1

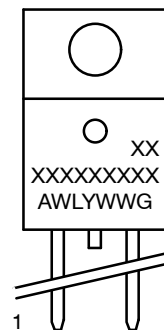


NOTES:

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.

| MILLIMETERS |          |       |
|-------------|----------|-------|
| DIM         | 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          | 6.40     | 6.90  |
| L           | 12.70    | 14.73 |
| L1          | ---      | 2.80  |
| P           | 3.00     | 3.40  |
| Q           | 2.80     | 3.20  |

GENERIC  
MARKING DIAGRAM\*

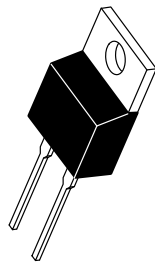


A = Assembly Location  
WL = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

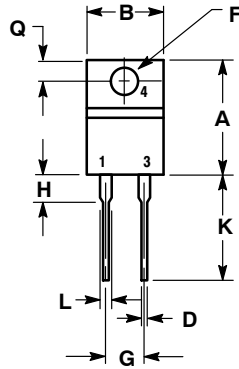
\*This information is generic. Please refer to device data sheet for actual part marking.  
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

|                  |                         |                                                                                                                                                                                  |
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SCALE 1:1



TO-220, 2-LEAD  
CASE 221B-04  
ISSUE F

DATE 12 APR 2013

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

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

DOCUMENT NUMBER: 98ASB42149B

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