

MSR860G, MSRF860G

Switch-mode Soft Recovery Power Rectifiers

Plastic TO-220 Package

These state-of-the-art devices are designed for use as free wheeling diodes in variable speed motor control applications and switching power supplies.

Features

- Soft Recovery with Guaranteed Low Reverse Recovery Charge (Q_{RR}) and Peak Reverse Recovery Current (I_{RRM})
- 150°C Operating Junction Temperature
- Epoxy meets UL 94 V-0 @ 0.125 in
- Low Forward Voltage
- Low Leakage Current
- 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 (Rated V_R , $T_C = 125^\circ\text{C}$)	I_O	8.0	A
Peak Repetitive Forward Current (Rated V_R , Square Wave, 20 kHz, $T_C = 125^\circ\text{C}$)	I_{FRM}	16	A
Non-Repetitive Peak Surge Current (Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz)	I_{FSM}	100	A
Storage/Operating Case Temperature	T_{stg}, T_C	-65 to +150	°C
Operating Junction Temperature	T_J	-65 to +150	°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
MSR860G Thermal Resistance, Junction-to-Case Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.6 72.8	°C/W
MSRF860G Thermal Resistance, Junction-to-Case Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	4.75 75	°C/W

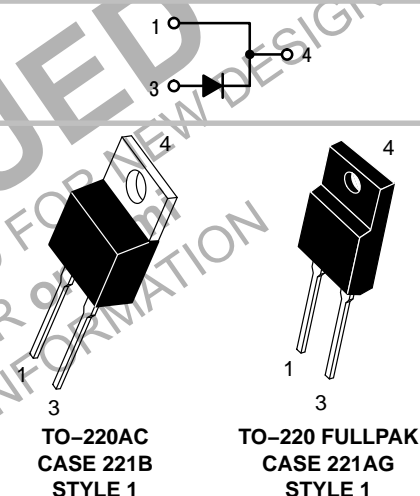
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



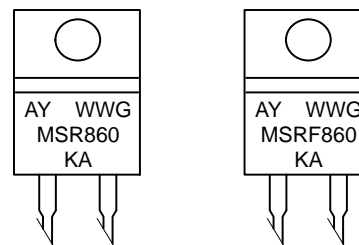
ON Semiconductor®

<http://onsemi.com>

SOFT RECOVERY POWER RECTIFIER 8.0 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
MSR860G	TO-220AC (Pb-Free)	50 Units / Rail
MSRF860G	TO-220FP (Pb-Free)	50 Units / Rail

MSR860G, MSRF860G

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Value		Unit
Maximum Instantaneous Forward Voltage ($I_F = 8.0$ A) (Note 1) Maximum Typical	V_F	$T_J = 25^\circ\text{C}$	$T_J = 150^\circ\text{C}$	V
		1.7 1.4	1.3 1.1	
Maximum Instantaneous Reverse Current ($V_R = 600$ V) Maximum Typical	I_R	$T_J = 25^\circ\text{C}$	$T_J = 150^\circ\text{C}$	μA
		10 2.0	1000 80	
Maximum Reverse Recovery Time (Note 2) ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs) Maximum Typical	t_{rr}	$T_J = 25^\circ\text{C}$	$T_J = 125^\circ\text{C}$	ns
		120 95	190 125	
Typical Recovery Softness Factor ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	$s = t_b/t_a$	2.5	3.0	
Maximum Peak Reverse Recovery Current ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	I_{RRM}	5.8	8.3	A
Maximum Reverse Recovery Charge ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	Q_{RR}	350	700	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 ≤ 380 μs , Duty Cycle $\leq 2\%$
2. T_{RR} measured projecting from 25% of I_{RRM} to zero current

TYPICAL ELECTRICAL CHARACTERISTICS

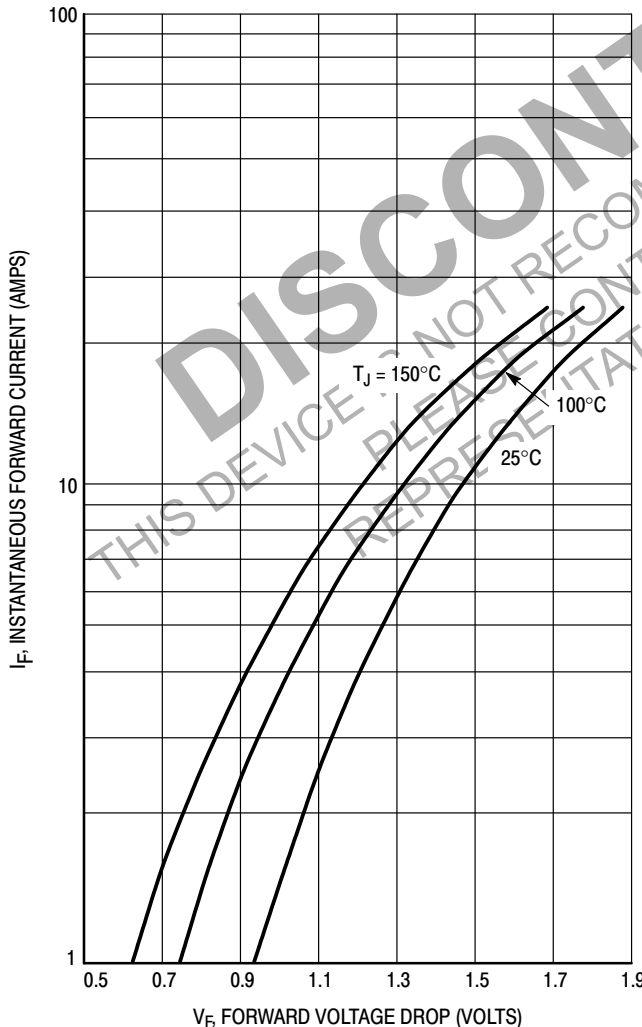


Figure 1. Typical Forward Voltage

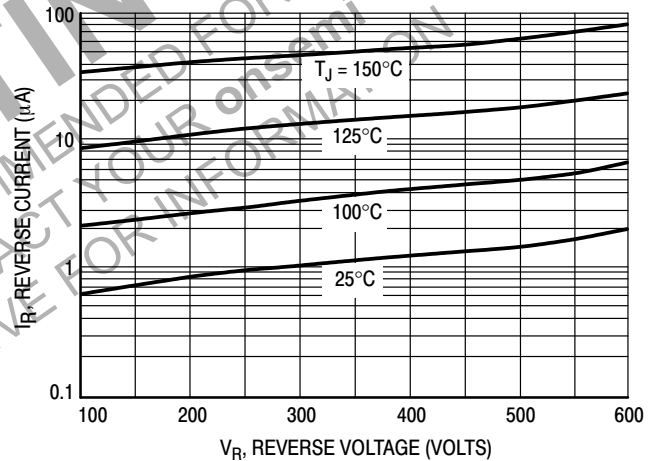


Figure 2. Typical Reverse Current

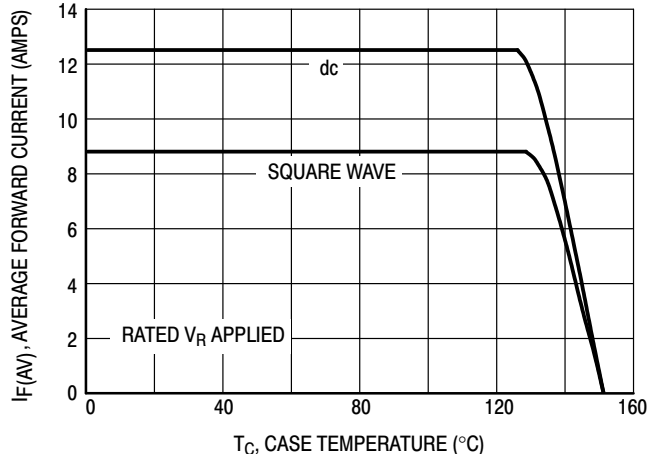


Figure 3. Current Derating, Case

MSR860G, MSRF860G

TYPICAL ELECTRICAL CHARACTERISTICS

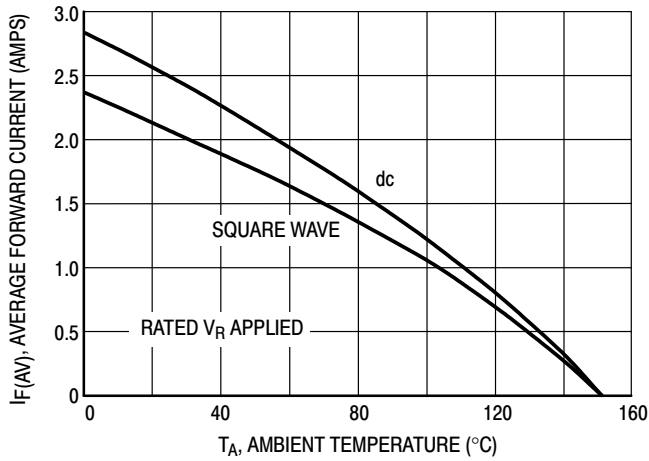


Figure 4. Current Derating, Ambient

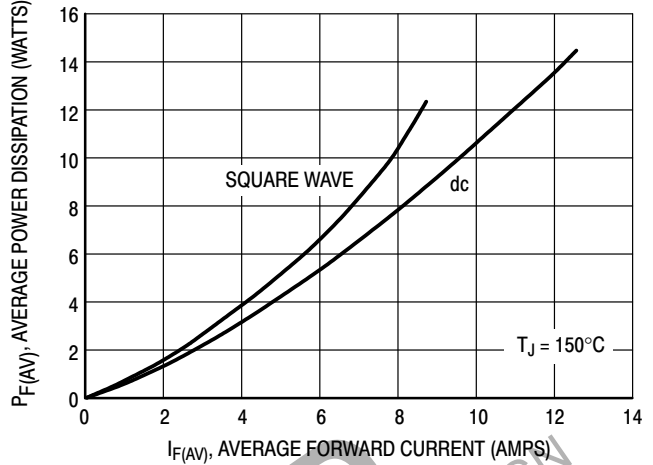


Figure 5. Power Dissipation

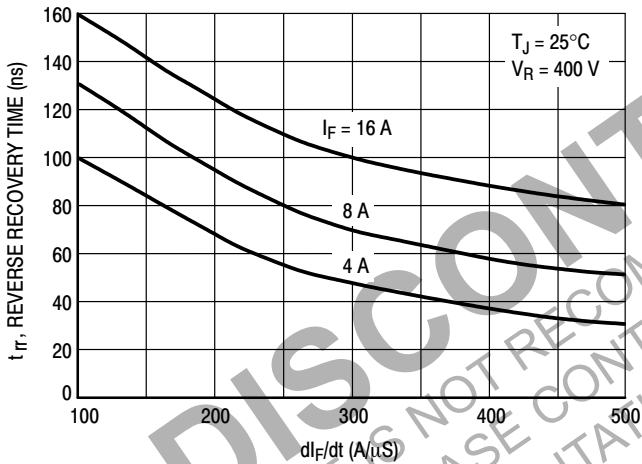


Figure 6. Typical Reverse Recovery Time

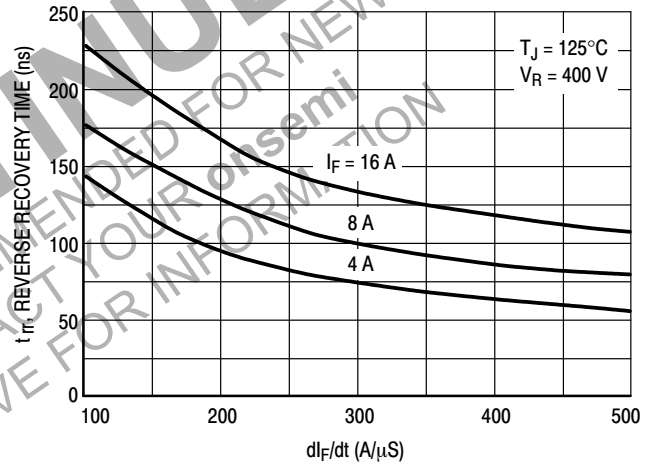


Figure 7. Typical Reverse Recovery Time

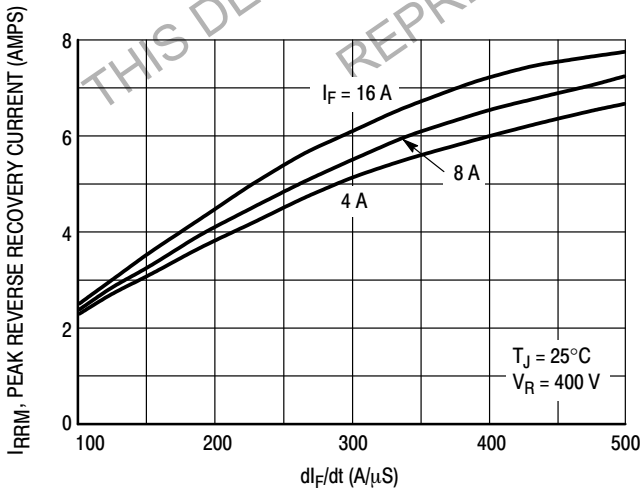


Figure 8. Typical Peak Reverse Recovery Current

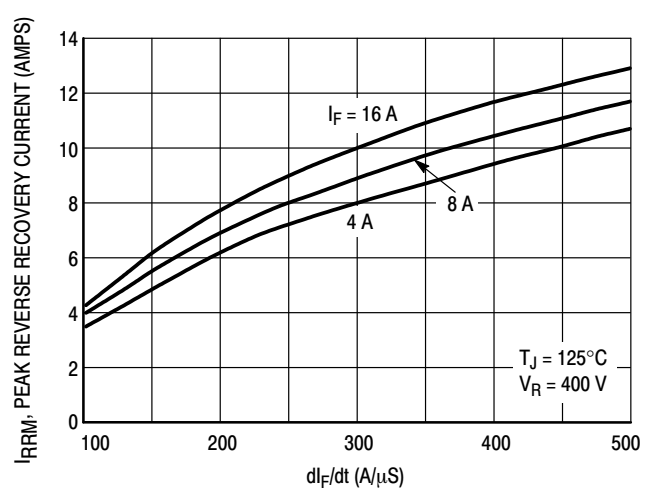


Figure 9. Typical Peak Reverse Recovery Current

MSR860G, MSRF860G

TYPICAL ELECTRICAL CHARACTERISTICS

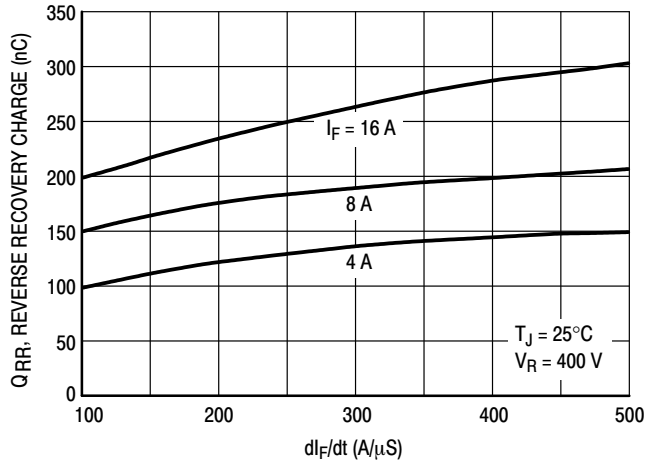


Figure 10. Typical Reverse Recovery Charge

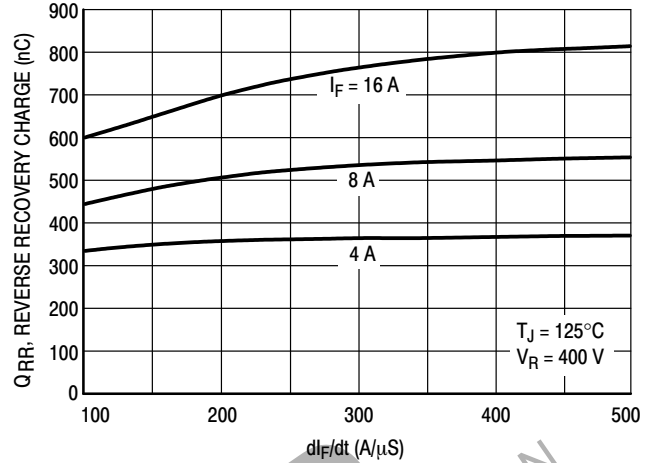


Figure 11. Typical Reverse Recovery Charge

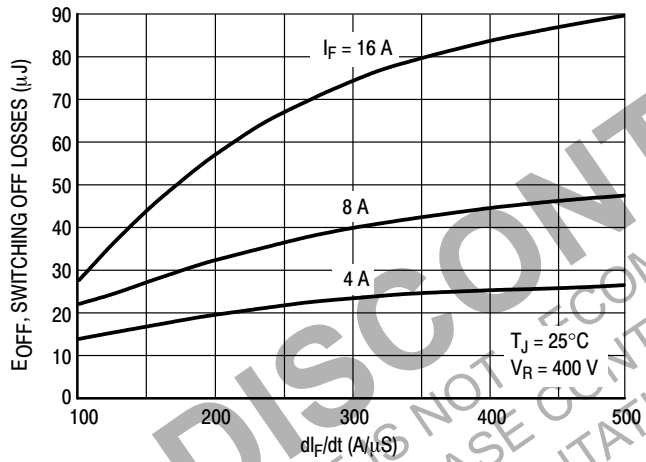


Figure 12. Typical Switching Off Losses

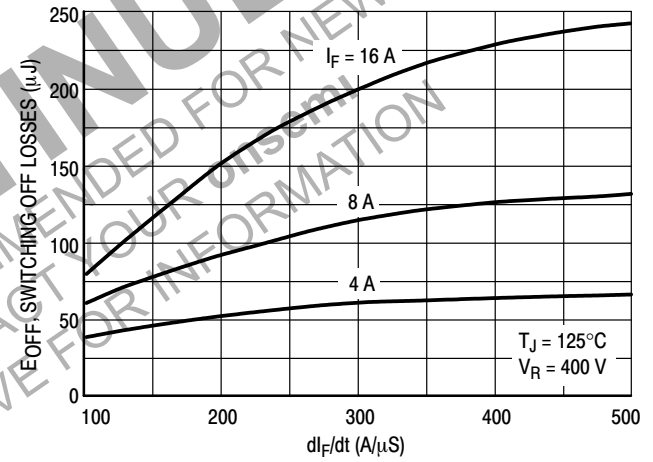


Figure 13. Typical Switching Off Losses

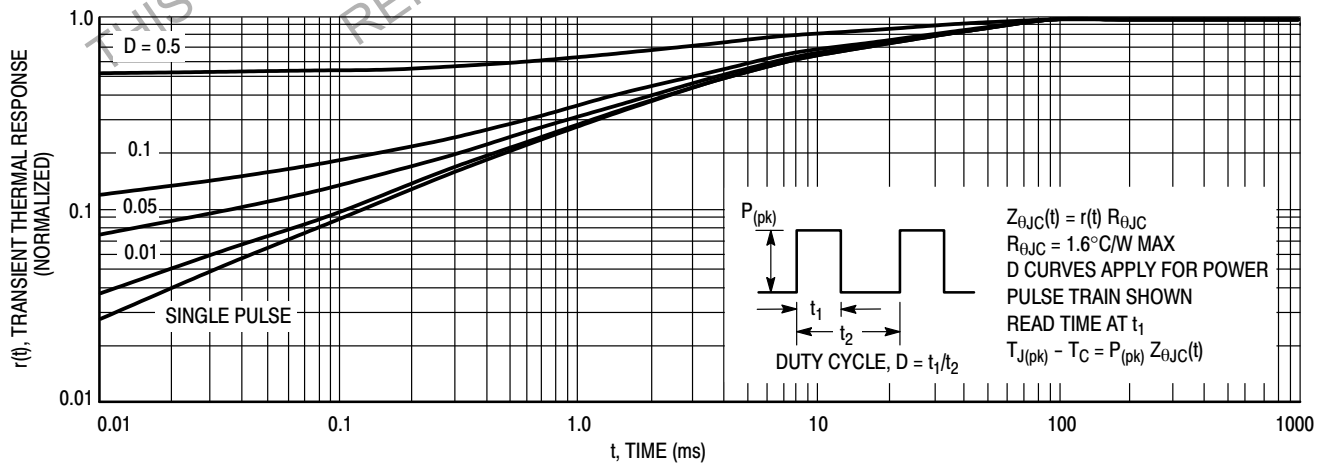


Figure 14. Thermal Response (MSR860)

MSR860G, MSRF860G

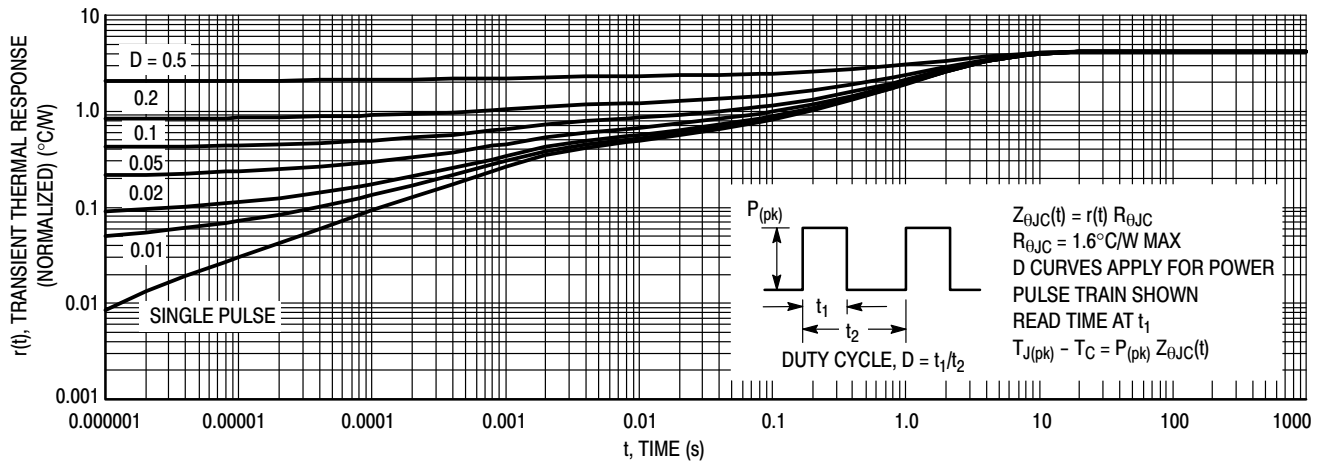


Figure 15. Thermal Response, (MSRF860) Junction-to-Case ($R_{\theta JC}$)

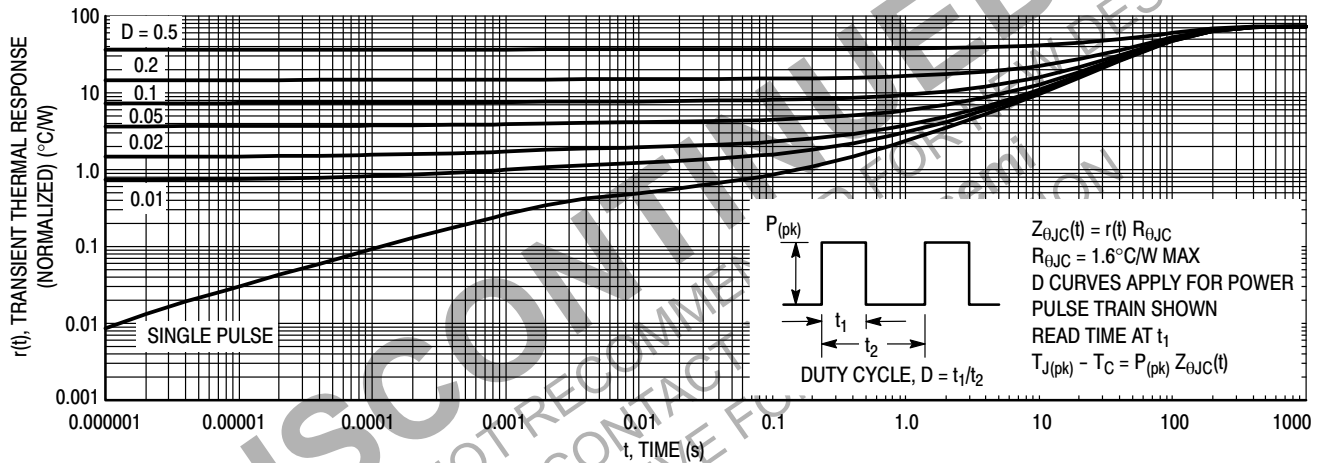
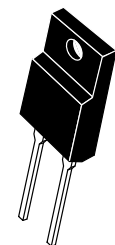


Figure 16. Thermal Response, (MSRF860) Junction-to-Ambient ($R_{\theta JA}$)

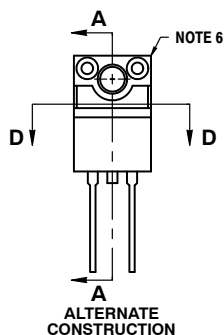
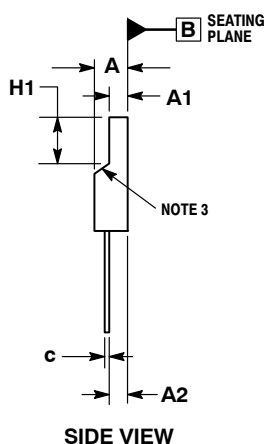
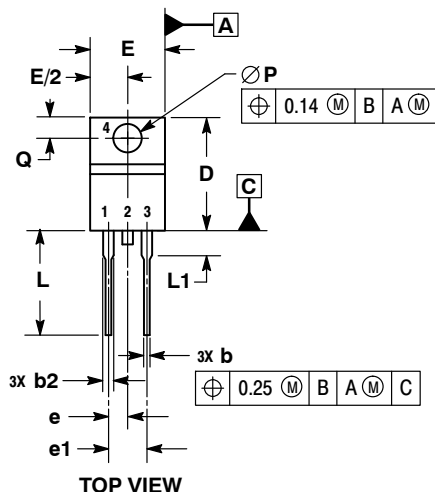
MSR860/D

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

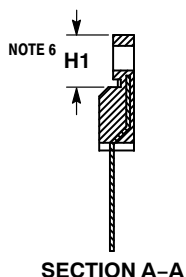
DATE 27 AUG 2015



SCALE 1:1



SECTION D-D

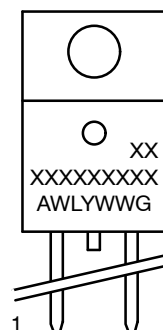


NOTES:

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*

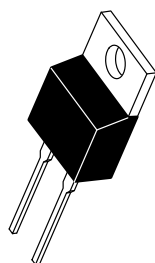


A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

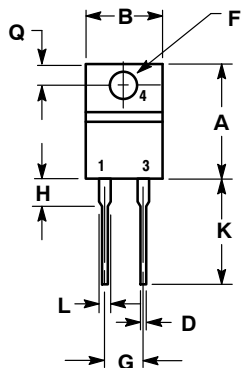
*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

DOCUMENT NUMBER:	98AON52563E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TO-220 FULLPACK, 2-LEAD	PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.



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

Electronic versions are uncontrolled except when accessed directly from the Document Repository.
Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.

DESCRIPTION: TO-220, 2-LEAD

PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[onsemi:](#)

[MSR860](#) [MSR860G](#) [MSRF860G](#)