

# MSR860

## SWITCHMODE™ Soft Recovery Power Rectifier 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
- Popular TO-220 Package
- Epoxy meets UL 94 V-0 @ 0.125 in
- Low Forward Voltage
- Low Leakage Current
- High Temperature Glass Passivated Junction
- Pb-Free Package is Available\*

### 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
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.6	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	72.8	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

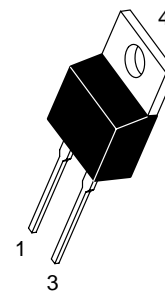
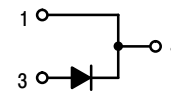
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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**SOFT RECOVERY  
POWER RECTIFIER  
8.0 AMPERES, 600 VOLTS**



TO-220AC  
CASE 221B  
STYLE 1

### MARKING DIAGRAM



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

### ORDERING INFORMATION

Device	Package	Shipping
MSR860	TO-220	50 Units/Rail
MSR860G	TO-220 (Pb-Free)	50 Units/Rail

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Value		Unit
		T <sub>J</sub> = 25°C	T <sub>J</sub> = 150°C	
Maximum Instantaneous Forward Voltage (Note 1) (I <sub>F</sub> = 8.0 A) Typical	V <sub>F</sub>	1.7 1.4	1.3 1.1	V
Maximum Instantaneous Reverse Current (V <sub>R</sub> = 600 V) Typical	I <sub>R</sub>	10 2.0	1000 80	μA
Maximum Reverse Recovery Time (Note 2) (V <sub>R</sub> = 400 V, I <sub>F</sub> = 8.0 A, di/dt = 200 A/μs) Typical	t <sub>rr</sub>	120 95	190 125	ns
Typical Recovery Softness Factor (V <sub>R</sub> = 400 V, I <sub>F</sub> = 8.0 A, di/dt = 200 A/μs)	s = t <sub>b</sub> /t <sub>a</sub>	2.5	3.0	
Maximum Peak Reverse Recovery Current (V <sub>R</sub> = 400 V, I <sub>F</sub> = 8.0 A, di/dt = 200 A/μs)	I <sub>RRM</sub>	5.8	8.3	A
Maximum Reverse Recovery Charge (V <sub>R</sub> = 400 V, I <sub>F</sub> = 8.0 A, di/dt = 200 A/μs)	Q <sub>RR</sub>	350	700	nC

1. Pulse Test: Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%
2. T<sub>RR</sub> measured projecting from 25% of I<sub>RRM</sub> to zero current

## TYPICAL ELECTRICAL CHARACTERISTICS

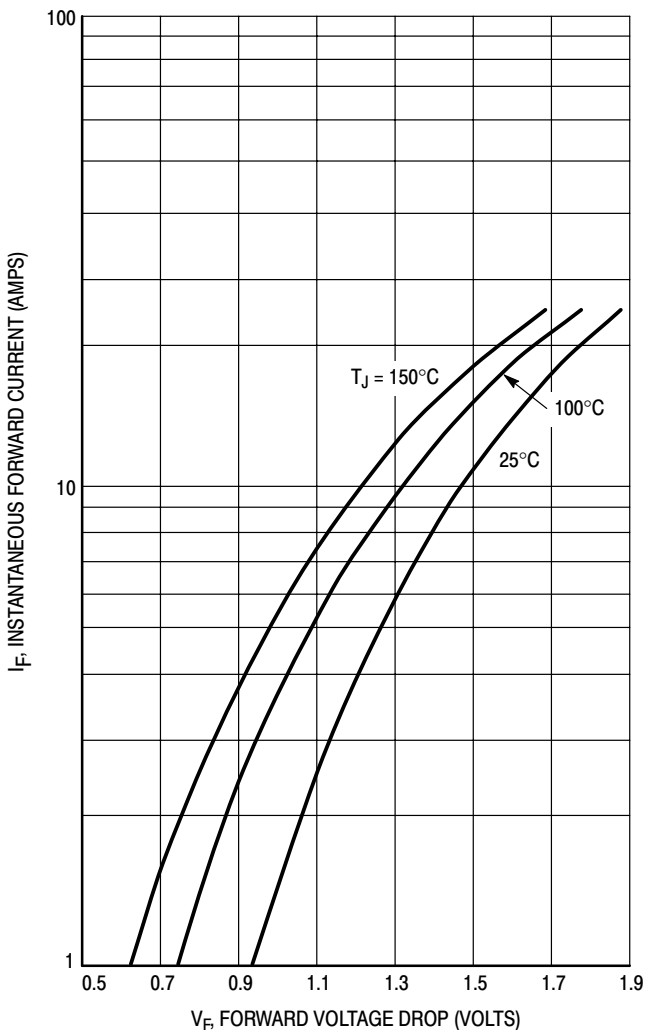


Figure 1. Typical Forward Voltage

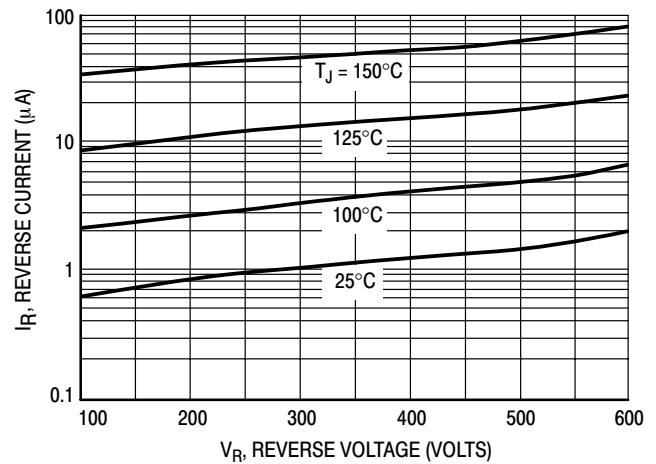


Figure 2. Typical Reverse Current

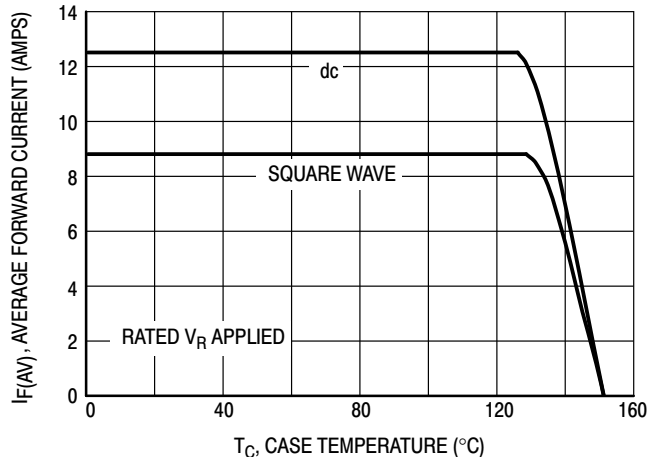


Figure 3. Current Derating, Case

TYPICAL ELECTRICAL CHARACTERISTICS

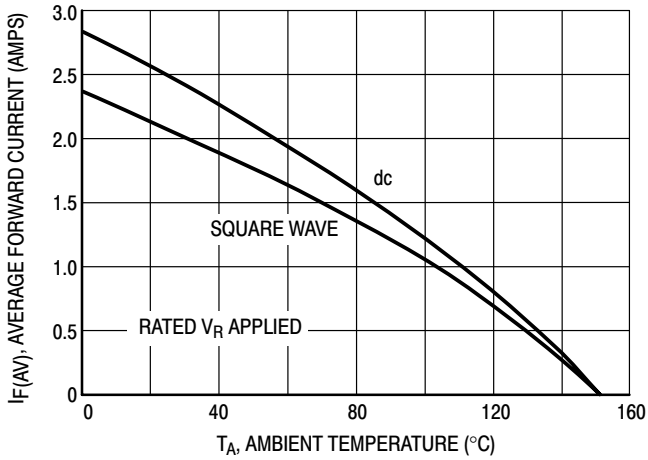


Figure 4. Current Derating, Ambient

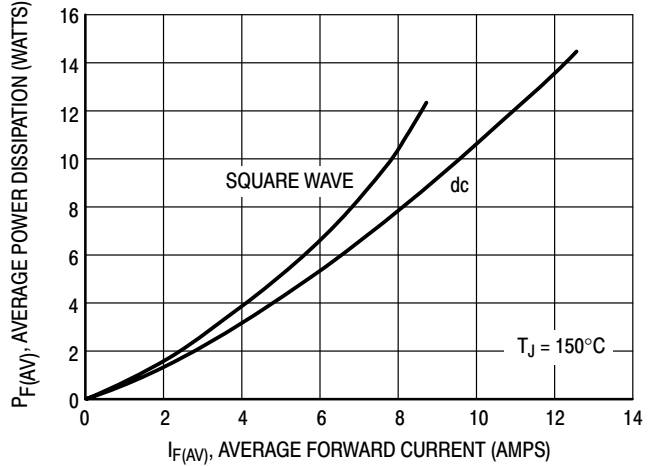


Figure 5. Power Dissipation

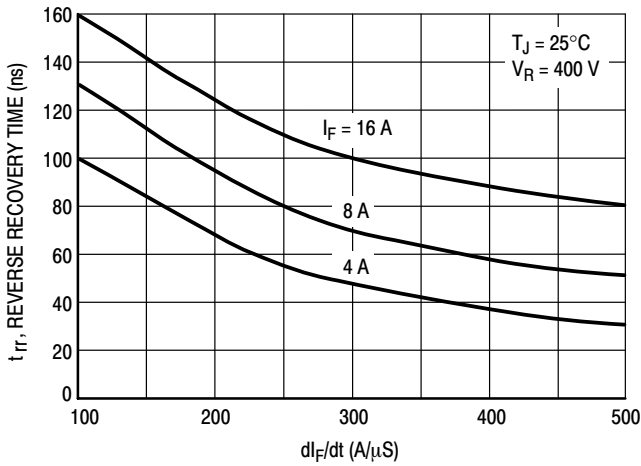


Figure 6. Typical Reverse Recovery Time

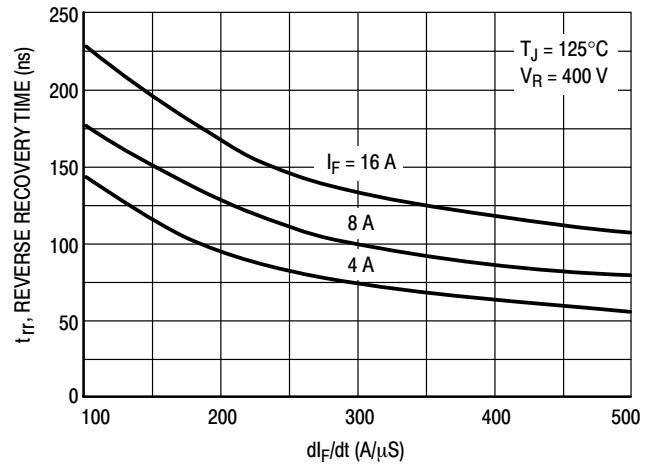


Figure 7. Typical Reverse Recovery Time

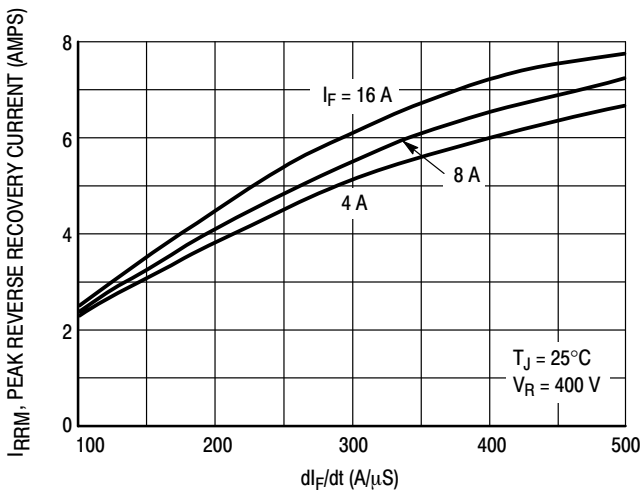


Figure 8. Typical Peak Reverse Recovery Current

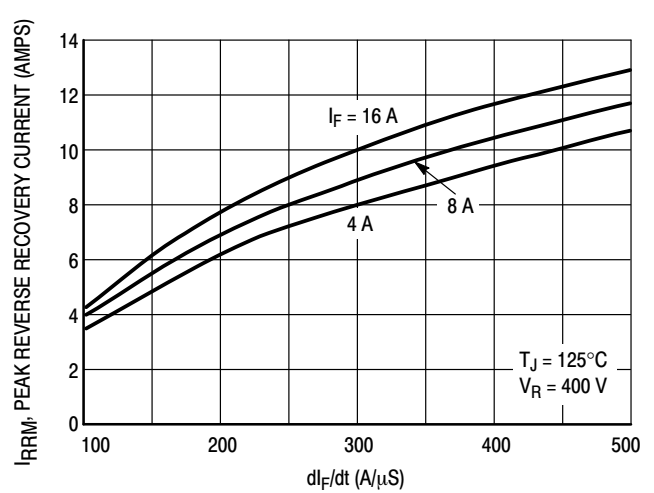


Figure 9. Typical Peak Reverse Recovery Current

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## TYPICAL ELECTRICAL CHARACTERISTICS

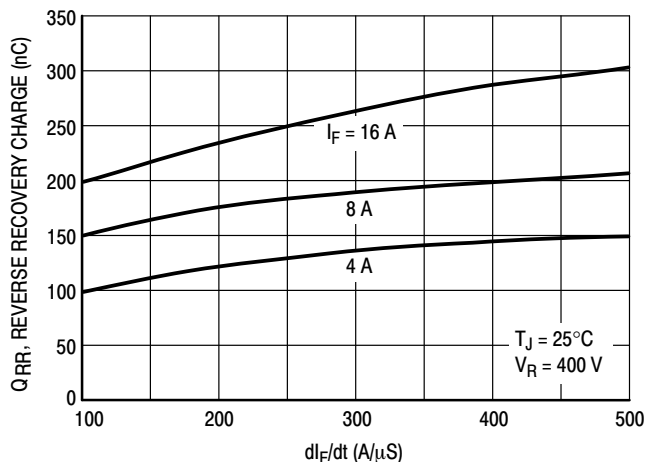


Figure 10. Typical Reverse Recovery Charge

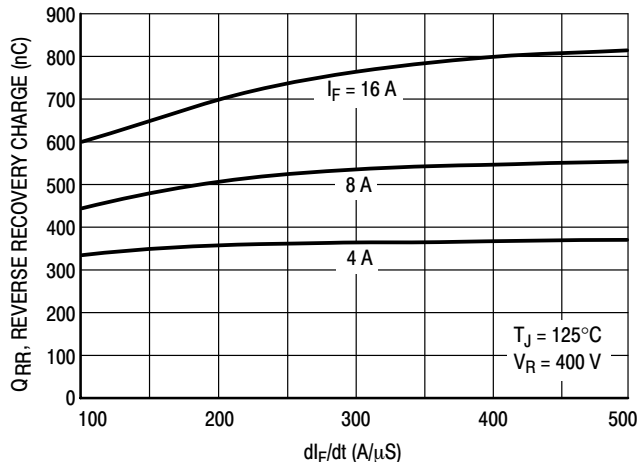


Figure 11. Typical Reverse Recovery Charge

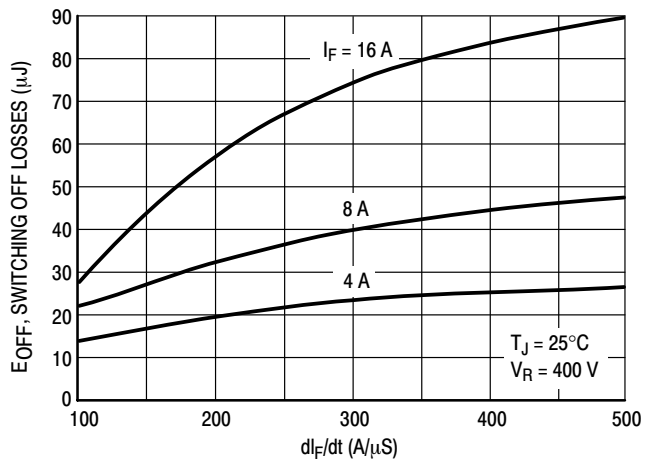


Figure 12. Typical Switching Off Losses

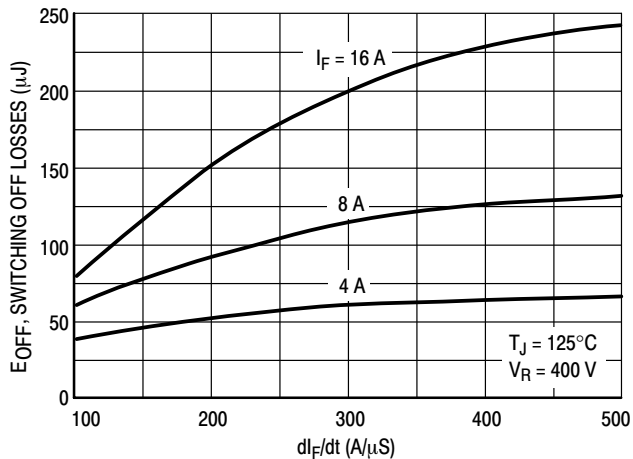


Figure 13. Typical Switching Off Losses

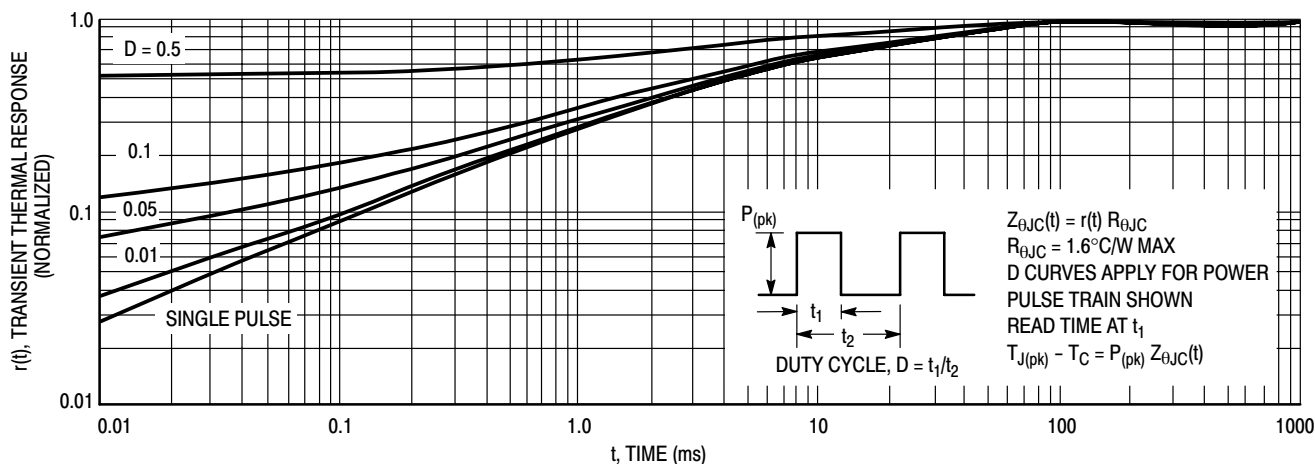
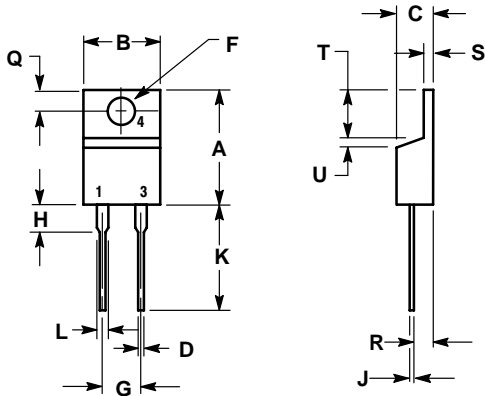


Figure 14. Thermal Response

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## PACKAGE DIMENSIONS

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



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	0.035	0.64	0.89
F	0.142	0.147	3.61	3.73
G	0.190	0.210	4.83	5.33
H	0.110	0.130	2.79	3.30
J	0.018	0.025	0.46	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:

1. CATHODE
2. N/A
3. ANODE
4. CATHODE

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