# SWITCHMODE™ Soft Recovery Power Rectifier

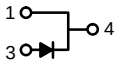
## Plastic TO–220 Package

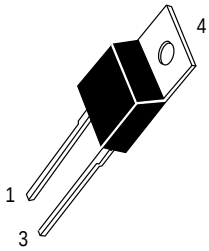
**MSR860**

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

Designed for use as free wheeling diodes in variable speed motor control applications and other average frequency switching power supplies. These state–of–the–art devices have the following 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 UL94, $V_O$ @ 1/8″
- Low Forward Voltage
- Low Leakage Current
- High Temperature Glass Passivated Junction




**CASE 221B–03, Style 1 TO–220**

**Mechanical Characteristics:**

- Case: Molded Epoxy
- 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
- Shipped in 50 Units per Plastic Tube
- Marking: MSR860

### 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 (At Rated $V_R$, $T_C$ = 125°C) | $I_O$ | 8.0 | A |
| Peak Repetitive Forward Current (At Rated $V_R$, Square Wave, 20 kHz, $T_C$ = 125°C) | $I_{FRM}$ | 16 | A |
| Non–Repetitive Peak Surge Current<br>(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

| | | | |
|---|---|---|---|
| Thermal Resistance — Junction–to–Case<br>Thermal Resistance — Junction–to–Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 1.6<br>72.8 | °C/W |

### ELECTRICAL CHARACTERISTICS

| | | | | |
|---|---|---|---|---|
| Maximum Instantaneous Forward Voltage (1) ($I_F$ = 8.0 A) | $V_F$ | **$T_J$ = 25°C** | **$T_J$ = 150°C** | V |
| *Typical* | | 1.7<br>*1.4* | 1.3<br>*1.1* | |
| Maximum Instantaneous Reverse Current ($V_R$ = 600 V) | $I_R$ | **$T_J$ = 25°C** | **$T_J$ = 150°C** | μA |
| *Typical* | | 10<br>*2.0* | 1000<br>*80* | |
| Maximum Reverse Recovery Time (2) ($V_R$ = 400 V, $I_F$ = 8.0 A, di/dt = 200 A/μs) | $t_{rr}$ | **$T_J$ = 25°C** | **$T_J$ = 125°C** | ns |
| *Typical* | | 120<br>*95* | 190<br>*125* | |
| Typical Recovery Softness Factor ($V_R$ = 400 V, $I_F$ = 8.0 A, di/dt = 200 A/μs) | s = tb/ta | *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 |

(1) Pulse Test: Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%

(2) $T_{RR}$ measured projecting from 25% of $I_{RRM}$ to zero current

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## TYPICAL ELECTRICAL CHARACTERISTICS

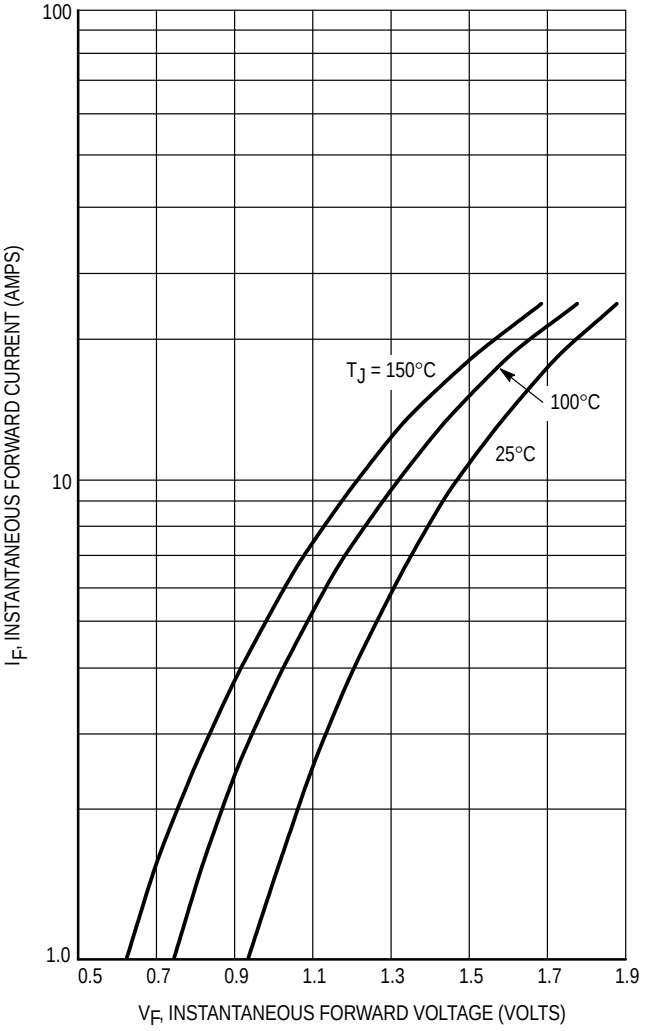



**Figure 1. Typical Forward Voltage**

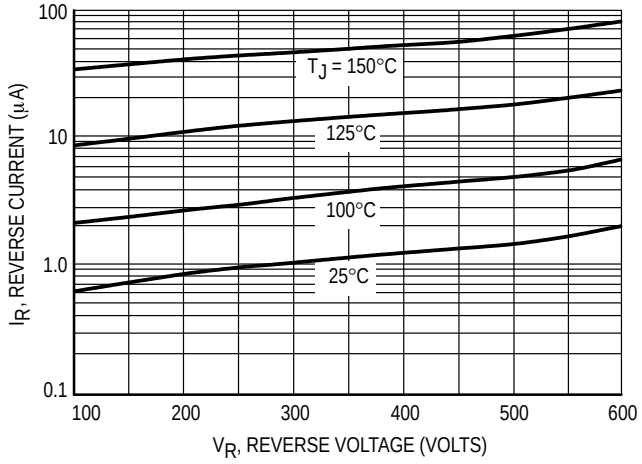



**Figure 2. Typical Reverse Current**

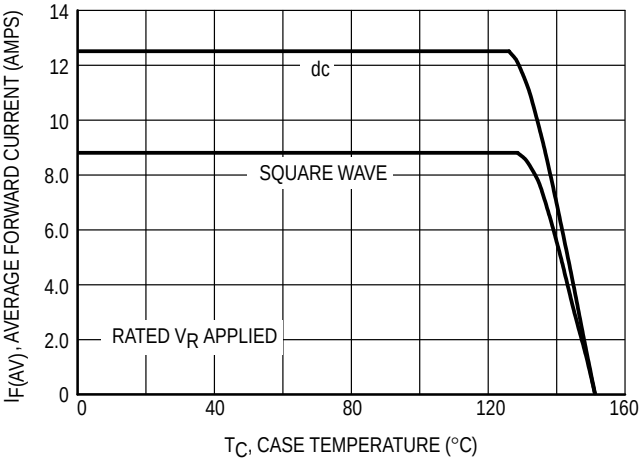



**Figure 3. Current Derating, Case**

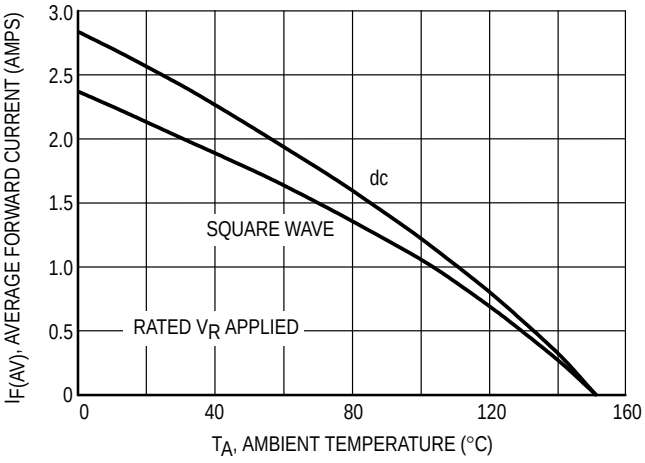



**Figure 4. Current Derating, Ambient**

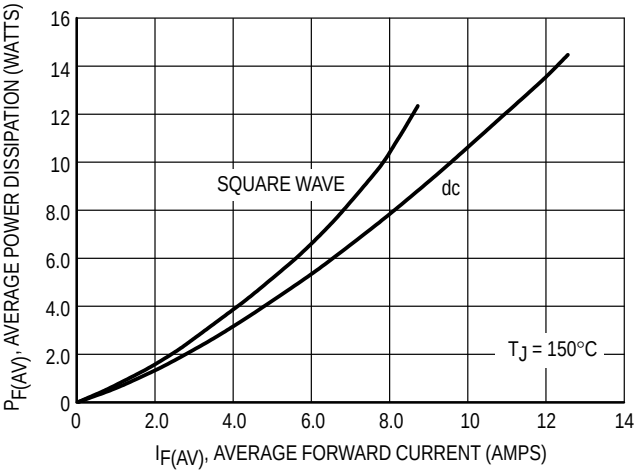



**Figure 5. Power Dissipation**

## TYPICAL ELECTRICAL CHARACTERISTICS

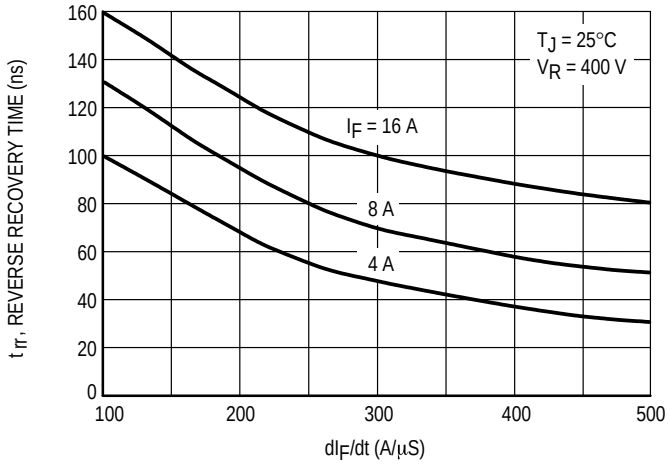



**Figure 6. Typical Reverse Recovery Time**

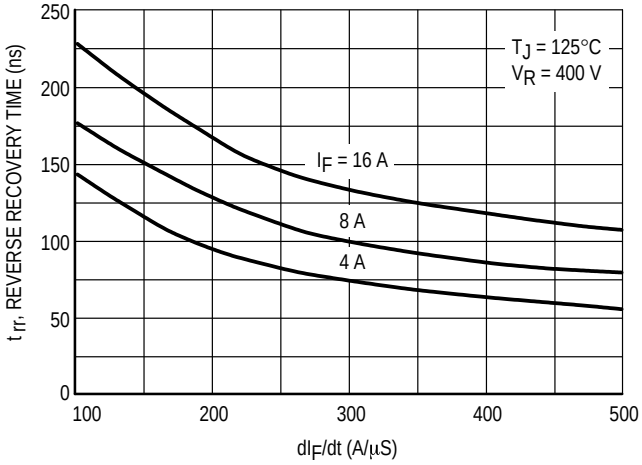



**Figure 7. Typical Reverse Recovery Time**

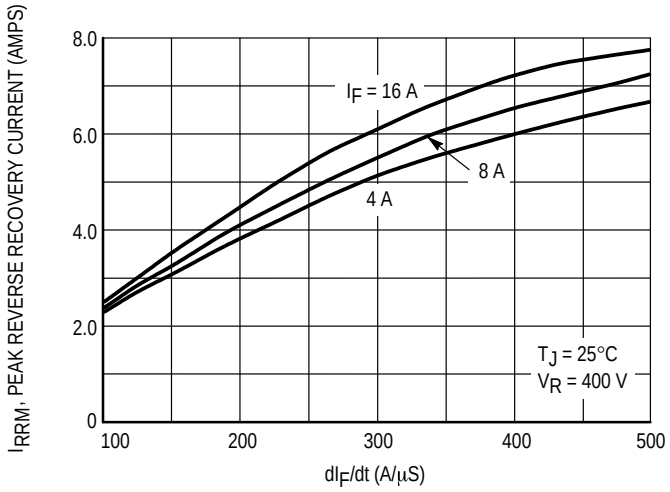



**Figure 8. Typical Peak Reverse Recovery Current**

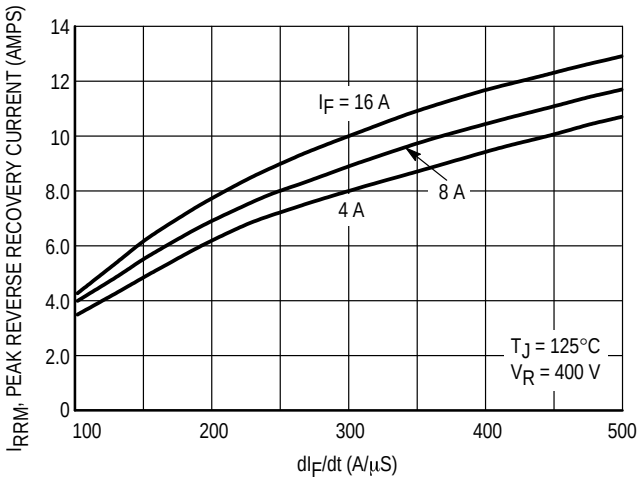



**Figure 9. Typical Peak Reverse Recovery Current**

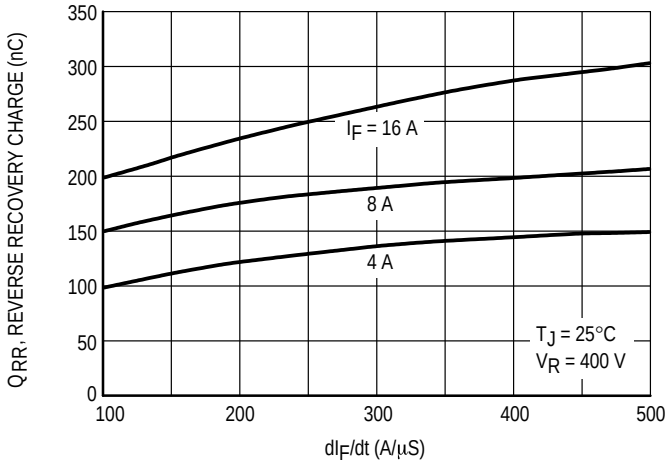



**Figure 10. Typical Reverse Recovery Charge**

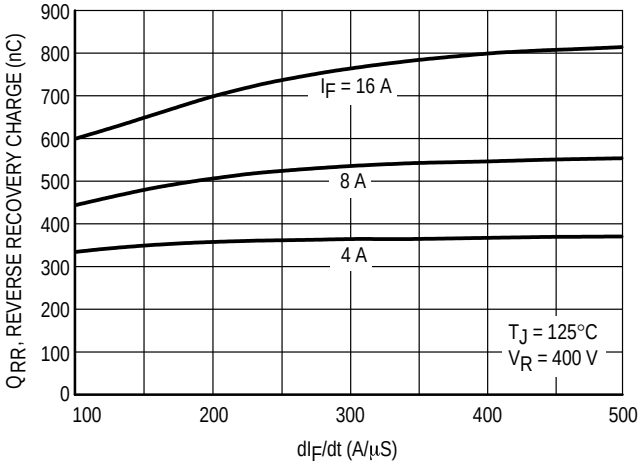



**Figure 11. Typical Reverse Recovery Charge**

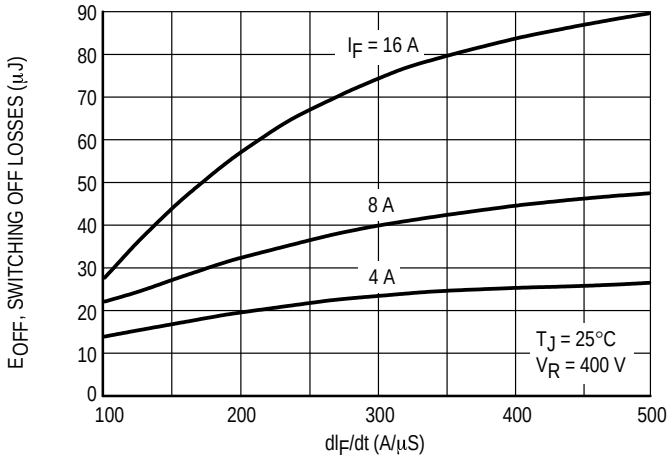



**Figure 12. Typical Switching Off Losses**

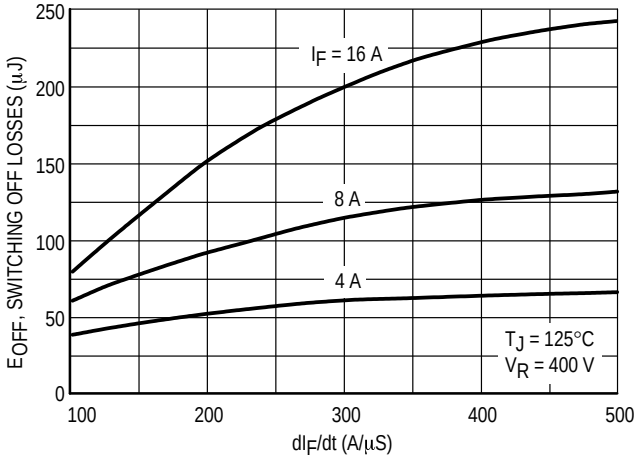



**Figure 13. Typical Switching Off Losses**

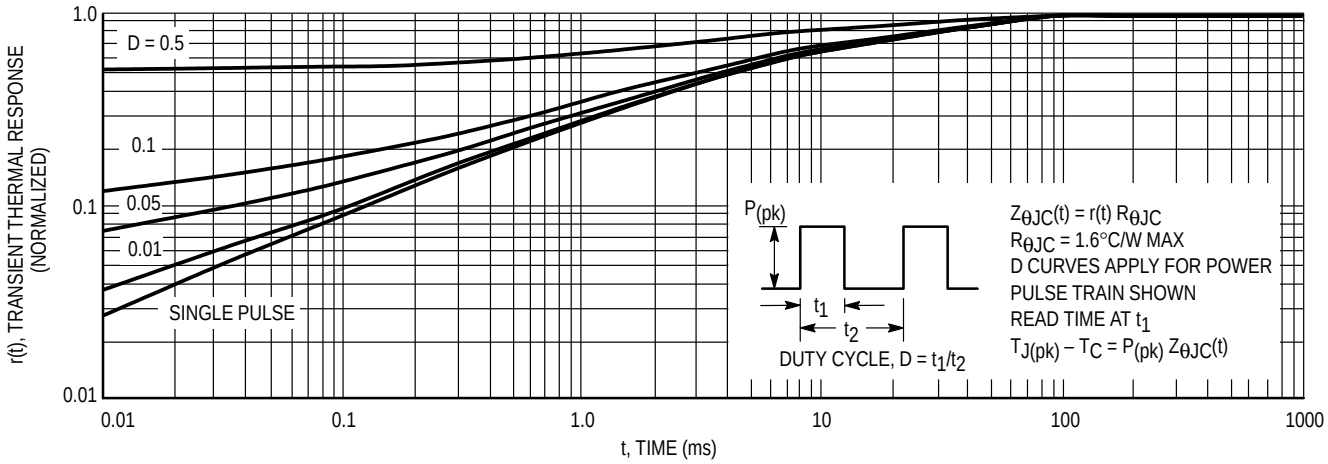
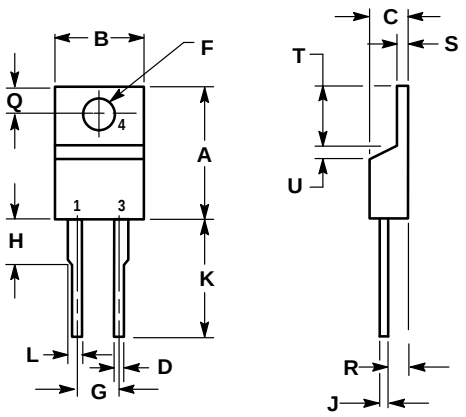



**Figure 14. Thermal Response**

## PACKAGE DIMENSIONS




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

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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:
PIN 1. CATHODE
2. N/A
3. ANODE
4. CATHODE

**CASE 221B–03**
**ISSUE B**

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