

Switch-mode Power Rectifiers

MUR8100E, MUR880E

Ultrafast “E” Series with High Reverse Energy Capability

The MUR8100 and MUR880E diodes are designed for use in switching power supplies, inverters and as free wheeling diodes.

Features

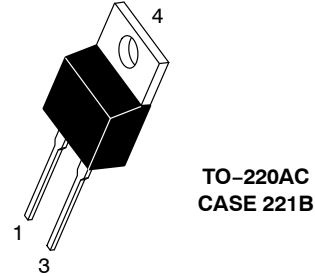
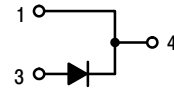
- 20 mJ Avalanche Energy Guaranteed
- Excellent Protection Against Voltage Transients in Switching Inductive Load Circuits
- Ultrafast 75 Nanosecond Recovery Time
- 175°C Operating Junction Temperature
- Popular TO-220 Package
- Epoxy Meets UL 94 V-0 @ 0.125 in.
- Low Forward Voltage
- Low Leakage Current
- High Temperature Glass Passivated Junction
- Reverse Voltage to 1000 V
- Pb-Free Packages are Available*

Mechanical Characteristics:

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

ULTRAFAST RECTIFIERS

8.0 A, 800 V – 1000 V



MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package
- U8xxxE = Device Code
xxx = 100 or 80
- KA = Diode Polarity

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|-----------|------------------|-----------------------|
| MUR8100EG | TO-220 (Pb-Free) | 50 Units/Rail |
| MUR880E | TO-220 (Pb-Free) | 50 Units/Rail |

DISCONTINUED (Note 1)

| | | |
|----------|------------------|---------------|
| MUR8100E | TO-220 (Pb-Free) | 50 Units/Rail |
| MUR880EG | TO-220 (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](#).

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.

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, [SOLDDRRM/D](#).

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MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|-------------------------------------------------------------------------------------------------------------|---------------------------------|-------------|------------------|
| Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage | V_{RRM} V_{RWM} V_R | 800 1000 | V |
| Average Rectified Forward Current (Rated V_R , $T_C = 150^\circ\text{C}$) Total Device | $I_{F(AV)}$ | 8.0 | A |
| Peak Repetitive Forward Current (Rated V_R , Square Wave, 20 kHz, $T_C = 150^\circ\text{C}$) | I_{FM} | 16 | 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 +175 | $^\circ\text{C}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Value | Unit |
|----------------------------------------------|-----------------|-------|---------------------------|
| Maximum Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.0 | $^\circ\text{C}/\text{W}$ |

ELECTRICAL CHARACTERISTICS

| Characteristic | Symbol | Value | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|---------------|
| Maximum Instantaneous Forward Voltage (Note 1) ($I_F = 8.0\text{ A}$, $T_C = 150^\circ\text{C}$) ($I_F = 8.0\text{ A}$, $T_C = 25^\circ\text{C}$) | V_F | 1.5 1.8 | V |
| Maximum Instantaneous Reverse Current (Note 1) (Rated DC Voltage, $T_C = 100^\circ\text{C}$) (Rated DC Voltage, $T_C = 25^\circ\text{C}$) | i_R | 500 25 | μA |
| Maximum Reverse Recovery Time ($I_F = 1.0\text{ A}$, $di/dt = 50\text{ A}/\mu\text{s}$) ($I_F = 0.5\text{ A}$, $i_R = 1.0\text{ A}$, $I_{REC} = 0.25\text{ A}$) | t_{rr} | 100 75 | ns |
| Controlled Avalanche Energy (See Test Circuit in Figure 6) | W_{AVAIL} | 20 | mJ |

1. Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

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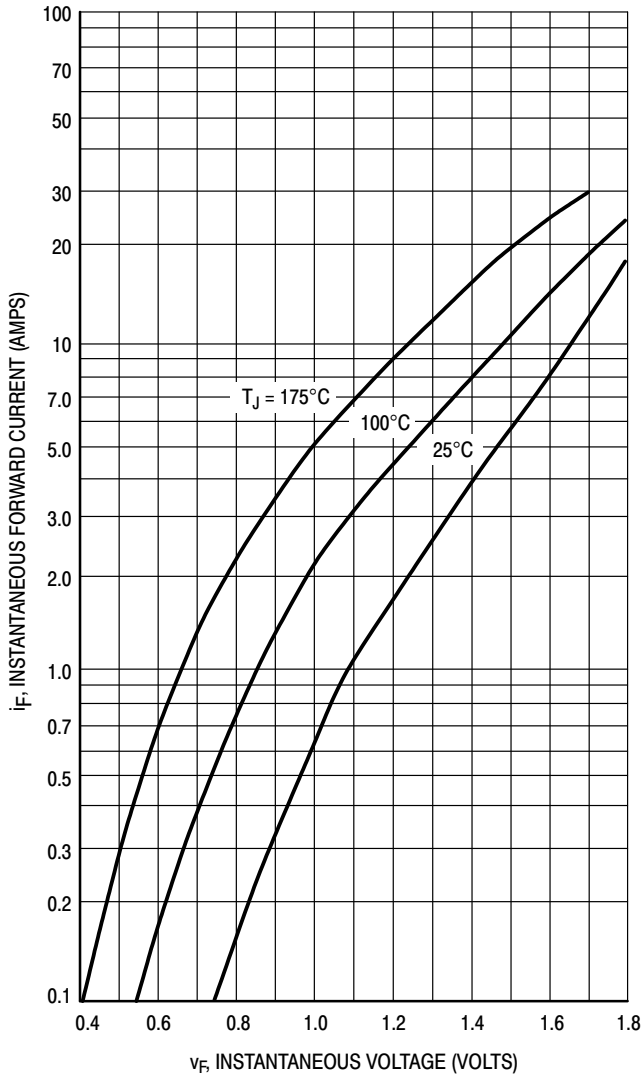


Figure 1. Typical Forward Voltage

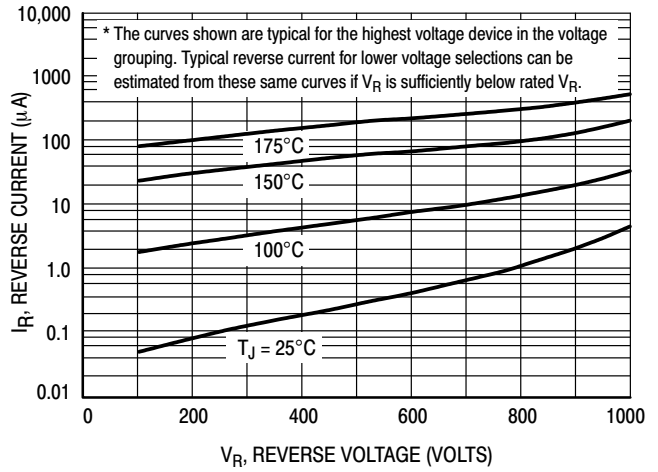


Figure 2. Typical Reverse Current*

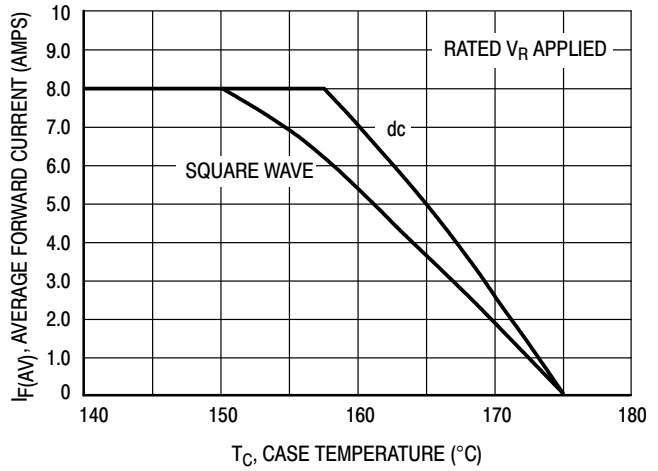


Figure 3. Current Derating, Case

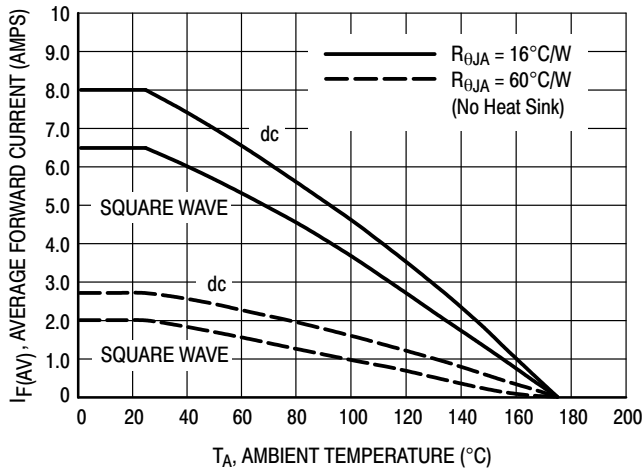


Figure 4. Current Derating, Ambient

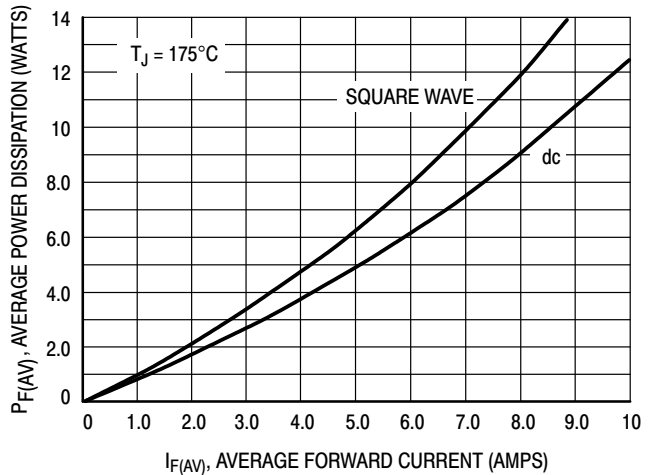


Figure 5. Power Dissipation

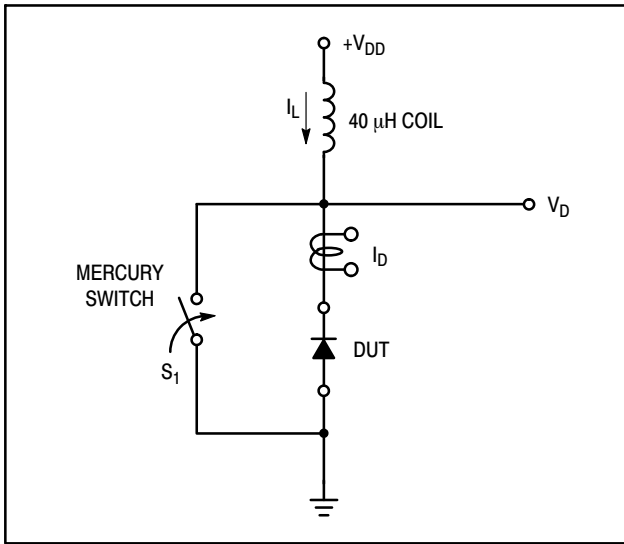


Figure 6. Test Circuit

The unclamped inductive switching circuit shown in Figure 6 was used to demonstrate the controlled avalanche capability of the new “E” series Ultrafast rectifiers. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When S_1 is closed at t_0 the current in the inductor I_L ramps up linearly; and energy is stored in the coil. At t_1 the switch is opened and the voltage across the diode under test begins to rise rapidly, due to di/dt effects, when this induced voltage reaches the breakdown voltage of the diode, it is clamped at BV_{DUT} and the diode begins to conduct the full load current which now starts to decay linearly through the diode, and goes to zero at t_2 .

By solving the loop equation at the point in time when S_1 is opened; and calculating the energy that is transferred to the diode it can be shown that the total energy transferred is equal to the energy stored in the inductor plus a finite amount of energy from the V_{DD} power supply while the diode is in

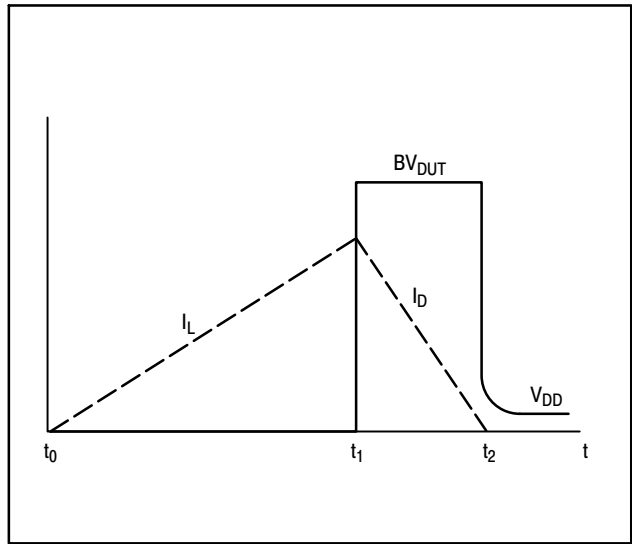


Figure 7. Current–Voltage Waveforms

breakdown (from t_1 to t_2) minus any losses due to finite component resistances. Assuming the component resistive elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the V_{DD} voltage is low compared to the breakdown voltage of the device, the amount of energy contributed by the supply during breakdown is small and the total energy can be assumed to be nearly equal to the energy stored in the coil during the time when S_1 was closed, Equation (2).

The oscilloscope picture in Figure 8, shows the MUR8100E in this test circuit conducting a peak current of one ampere at a breakdown voltage of 1300 V, and using Equation (2) the energy absorbed by the MUR8100E is approximately 20 mjoules.

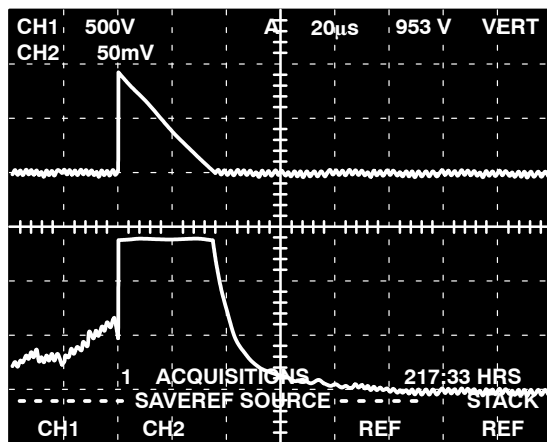
Although it is not recommended to design for this condition, the new “E” series provides added protection against those unforeseen transient viruses that can produce unexplained random failures in unfriendly environments.

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2 \left(\frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

EQUATION (2):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2$$



CHANNEL 2:
 I_L
0.5 AMPS/DIV.

CHANNEL 1:
 V_{DUT}
500 VOLTS/DIV.

TIME BASE:
20 μ s/DIV.

Figure 8. Current–Voltage Waveforms

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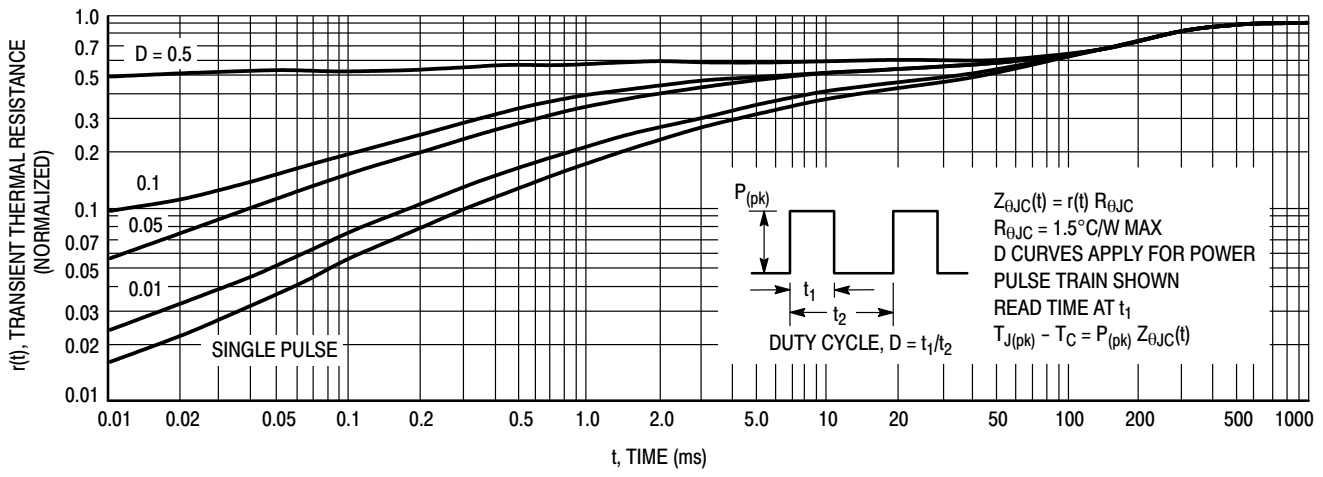


Figure 9. Thermal Response

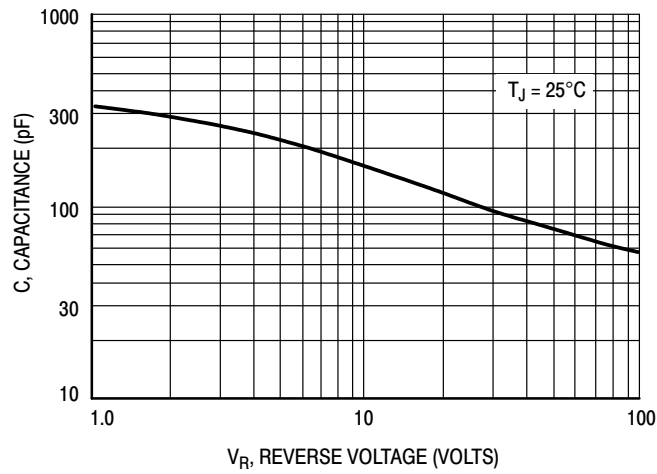
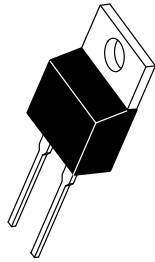


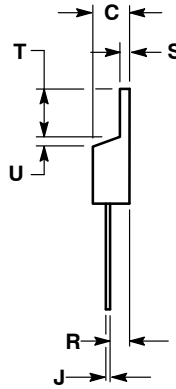
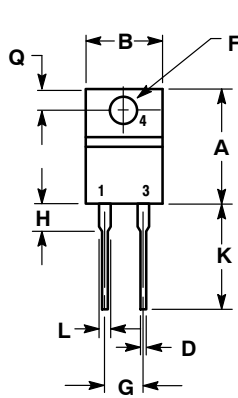
Figure 10. Typical Capacitance

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

DATE 12 APR 2013



SCALE 1:1



- 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

| | | |
|------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION: | TO-220, 2-LEAD | PAGE 1 OF 1 |

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