MUR8100E is a Preferred Device

SWITCHMODE [™] **Power Rectifiers**

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

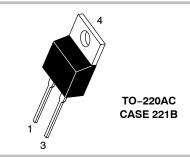


ON Semiconductor®

http://onsemi.com

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 80KA = Diode Polarity

ORDERING INFORMATION

Device	Package	Shipping
MUR8100E	TO-220	50 Units / Rail
MUR8100EG	TO-220 (Pb-Free)	50 Units / Rail
MUR880E	TO-220	50 Units / Rail
MUR880EG	TO-220 (Pb-Free)	50 Units / Rail

Preferred devices are recommended choices for future use and best overall value.

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

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage MUR880 MUR8100	- I - N	800 1000	V
Average Rectified Forward Current (Rated V _R , T _C = 150°C) Total Device	I _{F(AV)}	8.0	А
Peak Repetitive Forward Current (Rated V _R , Square Wave, 20 kHz, T _C = 150°C)	I _{FM}	16	А
Non-Repetitive Peak Surge Current (Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz)	I _{FSM}	100	Α
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-65 to +175	°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.

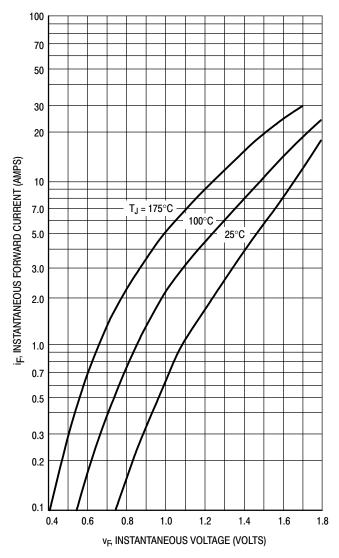
THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance, Junction-to-Case	$R_{ heta JC}$	2.0	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Maximum Instantaneous Forward Voltage (Note 1) (i _F = 8.0 A, T_C = 150°C) (i _F = 8.0 A, T_C = 25°C)	VF	1.5 1.8	V
Maximum Instantaneous Reverse Current (Note 1) (Rated DC Voltage, $T_C = 100^{\circ}C$) (Rated DC Voltage, $T_C = 25^{\circ}C$)	i _R	500 25	μΑ
Maximum Reverse Recovery Time $ \begin{aligned} (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}) \end{aligned} $	t _{rr}	100 75	ns
Controlled Avalanche Energy (See Test Circuit in Figure 6)	W _{AVAL}	20	mJ

^{1.} Pulse Test: Pulse Width = 300 μ s, Duty Cycle \leq 2.0%.



10,000 * The curves shown are typical for the highest voltage device in the voltage grouping. Typical reverse current for lower voltage selections can be 1000 estimated from these same curves if V_R is sufficiently below rated V_R I_R, REVERSE CURRENT (μA) 100 175°C 150°C 10 100°C 1.0 0.1 $T_J = 25^{\circ}C$ 0.01 0 200 400 600 800 1000 V_R, REVERSE VOLTAGE (VOLTS)

Figure 2. Typical Reverse Current*

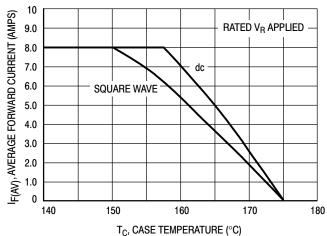


Figure 1. Typical Forward Voltage

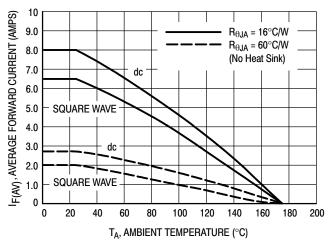


Figure 3. Current Derating, Case

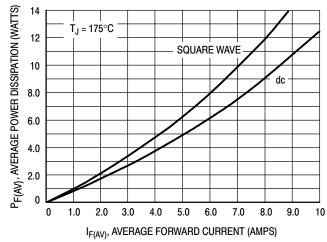
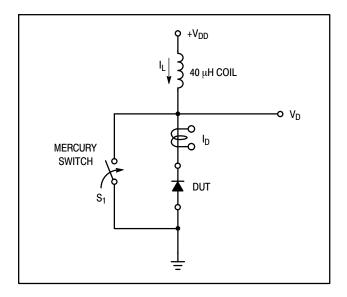


Figure 4. Current Derating, Ambient

Figure 5. Power Dissipation



BV_{DUT}

I_L

V_{DD}

t₀

t₁

t₂

t

Figure 6. Test Circuit

Figure 7. Current-Voltage Waveforms

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

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.

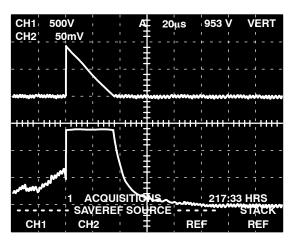
Although it is not recommended to design for this condition, the new "E" series provides added protection against those unforeseen transient viruses that can produce unexplained random failures in unfriendly environments.

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} LI_{LPK}^2 \left(\frac{BV_{DUT}}{BV_{DUT} W_{DD}} \right)$$

EQUATION (2):

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



V_{DUT}
500 VOLTS/DIV.
TIME BASE:

20 μs/DIV.

CHANNEL 1:

CHANNEL 2:

0.5 AMPS/DIV.

Figure 8. Current-Voltage Waveforms

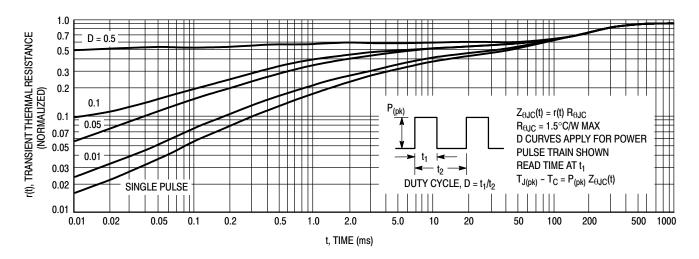


Figure 9. Thermal Response

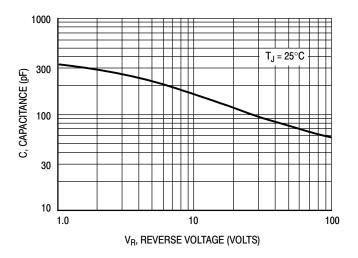


Figure 10. Typical Capacitance

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



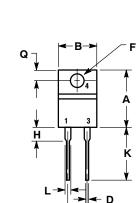


TO-220, 2-LEAD CASE 221B-04 ISSUE F

DATE 12 APR 2013

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

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	INCHES		MILLIN	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.595	0.620	15.11	15.75
В	0.380	0.405	9.65	10.29
С	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
Н	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

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

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