## MBR10H100CT

## Switch-mode Power Rectifier 100 V, 10 A

## Features and Benefits

- Low Forward Voltage: 0.61 V @ $125^{\circ} \mathrm{C}$
- Low Power Loss/High Efficiency
- High Surge Capacity
- $175^{\circ} \mathrm{C}$ Operating Junction Temperature
- 10 A Total (5.0 A Per Diode Leg)
- Guard-Ring for Stress Protection
- Pb -Free Package is Available


## Applications

- Power Supply - Output Rectification
- Power Management
- Instrumentation


## Mechanical Characteristics:

- Case: Epoxy, Molded
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Weight: 1.9 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: $260^{\circ} \mathrm{C}$ Max. for 10 Seconds
- Shipped 50 Units Per Plastic Tube


## MAXIMUM RATINGS

Please See the Table on the Following Page

[^0]
## MBR10H100CT

MAXIMUM RATINGS (Per Diode Leg)

| Rating | Symbol | Value | Unit |
| :---: | :---: | :---: | :---: |
| Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage | $V_{\text {RRM }}$ <br> $V_{\text {RWM }}$ $V_{R}$ | 100 | V |
| Average Rectified Forward Current (Rated $\mathrm{V}_{\mathrm{R}}$ ) $\mathrm{T}_{\mathrm{C}}=168^{\circ} \mathrm{C}$ | $\mathrm{I}_{\mathrm{F}(\mathrm{AV})}$ | 5.0 | A |
| Peak Repetitive Forward Current (Rated $\mathrm{V}_{\mathrm{R}}$, Square Wave, 20 kHz ) $\mathrm{T}_{\mathrm{C}}=165^{\circ} \mathrm{C}$ | IFRM | 10 | A |
| Nonrepetitive Peak Surge Current <br> (Surge applied at rated load conditions halfwave, single phase, 60 Hz ) | $\mathrm{I}_{\text {FSM }}$ | 180 | A |
| Operating Junction Temperature (Note 1) | TJ | +175 | ${ }^{\circ} \mathrm{C}$ |
| Storage Temperature | $\mathrm{T}_{\text {stg }}$ | -65 to +175 | ${ }^{\circ} \mathrm{C}$ |
| Voltage Rate of Change (Rated $\mathrm{V}_{\mathrm{R}}$ ) | dv/dt | 10,000 | V/us |
| Controlled Avalanche Energy (see test conditions in Figures 10 and 11) | $\mathrm{W}_{\text {AVAL }}$ | 100 | mJ |
| ESD Ratings: Machine Model = C <br> Human Body Model $=3 B$ |  | $\begin{gathered} >400 \\ >8000 \end{gathered}$ | V |

THERMAL CHARACTERISTICS

| Maximum Thermal Resistance - Junction-to-Case |  |  |
| ---: | ---: | :---: | :---: |
| - Junction-to-Ambient | $R_{\theta J C}$ <br> $R_{\theta J A}$ | 2.0 |
| 60 |  |  |

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

| Maximum Instantaneous Forward Voltage (Note 2) | $\mathrm{V}_{\mathrm{F}}$ |  | V |
| :--- | :--- | :--- | :---: |
| $\left(\mathrm{I}_{\mathrm{F}}=5.0 \mathrm{~A}, \mathrm{~T}_{\mathrm{C}}=25^{\circ} \mathrm{C}\right)$ |  | 0.73 |  |
| $\left(\mathrm{I}_{\mathrm{F}}=5.0 \mathrm{~A}, \mathrm{~T}_{\mathrm{C}}=125^{\circ} \mathrm{C}\right)$ |  | 0.61 |  |
| $\left(\mathrm{I}_{\mathrm{F}}=10 \mathrm{~A}, \mathrm{~T}_{\mathrm{C}}=25^{\circ} \mathrm{C}\right)$ |  | 0.85 |  |
| $\left(\mathrm{I}_{\mathrm{F}}=10 \mathrm{~A}, \mathrm{~T}_{\mathrm{C}}=125^{\circ} \mathrm{C}\right)$ |  | 0.71 |  |
| Maximum Instantaneous Reverse Current (Note 2) | $\mathrm{i}_{\mathrm{R}}$ |  | mA |
| (Rated DC Voltage, $\left.\mathrm{T}_{\mathrm{C}}=125^{\circ} \mathrm{C}\right)$ |  | 4.5 |  |
| (Rated DC Voltage, $\left.\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}\right)$ |  | 0.0035 |  |

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.

1. The heat generated must be less than the thermal conductivity from Junction-to-Ambient: $d_{D} / d T_{J}<1 / R_{\theta J A}$.
2. Pulse Test: Pulse Width $=300 \mu \mathrm{~s}$, Duty Cycle $\leq 2.0 \%$.

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Figure 1. Typical Forward Voltage

$\mathrm{V}_{\mathrm{F}}$, INSTANTANEOUS FORWARD VOLTAGE (VOLTS)
Figure 2. Maximum Forward Voltage


Figure 3. Typical Reverse Current


Figure 4. Maximum Reverse Current


Figure 5. Current Derating


Figure 6. Forward Power Dissipation


Figure 7. Capacitance


Figure 8. Thermal Response Junction-to-Ambient


Figure 9. Thermal Response Junction-to-Case

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Figure 10. Test Circuit
The unclamped inductive switching circuit shown in Figure 10 was used to demonstrate the controlled avalanche capability of this device. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When $\mathrm{S}_{1}$ is closed at $\mathrm{t}_{0}$ the current in the inductor $\mathrm{I}_{\mathrm{L}}$ 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 $\mathrm{BV}_{\text {DUT }}$ 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 $\mathrm{S}_{1}$ 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 $\mathrm{V}_{\mathrm{DD}}$ power supply while the diode is in breakdown (from $\mathrm{t}_{1}$ to $\mathrm{t}_{2}$ ) minus any losses due to finite component resistances. Assuming the component resistive


Figure 11. Current-Voltage Waveforms
elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the $\mathrm{V}_{\mathrm{DD}}$ 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 $\mathrm{S}_{1}$ was closed, Equation (2).

EQUATION (1):

$$
\mathrm{W}_{\mathrm{AVAL}} \approx \frac{1}{2} \mathrm{LI}_{\mathrm{LPK}}^{2}\left(\frac{\mathrm{BV}_{\mathrm{DUT}}}{\mathrm{BV}_{\mathrm{DUT}}{ }^{\mathrm{E}} \mathrm{DD}}\right)
$$

## EQUATION (2):

$\mathrm{W}_{\mathrm{AVAL}} \approx \frac{1}{2} \mathrm{LI}_{\mathrm{LPK}}^{2}$


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE $=1.35 \mathrm{MM}$

| DIM | INCHES |  | MILLIMETERS |  |
| :---: | :---: | :---: | :---: | :---: |
|  | MIN. | MAX. | MIN. | MAX. |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.415 | 9.66 | 10.53 |
| C | 0.160 | 0.190 | 4.07 | 4.83 |
| D | 0.025 | 0.038 | 0.64 | 0.96 |
| F | 0.142 | 0.161 | 3.60 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.161 | 2.80 | 4.10 |
| J | 0.014 | 0.024 | 0.36 | 0.61 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.41 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | ---- | 1.15 | --- |
| Z | ---- | 0.080 | --- | 2.04 |


| STYLE 1: |  |
| ---: | :--- |
| PIN 1. | BASE |
| 2. | COLLECTOR |
| 3. | EMITTER |
| 4. | COLLECTOR |
|  |  |
| STYLE 5: |  |
| PIN 1. | GATE |
| 2. | DRAIN |
| 3. | SOURCE |
| 4. | DRAIN |
|  |  |
| STYLE 9: |  |
| PIN 1. | GATE |
| 2. | COLLECTOR |
| 3. | EMITTER |
| 4. | COLLECTOR |


| STYLE 2: |  |
| ---: | :--- |
| PIN 1. | BASE |
| 2. | EMITTER |
| 3. | COLLECTOR |
| 4. | EMITTER |
|  |  |
| STYLE 6: |  |
| PIN 1. | ANODE |
| 2. | CATHODE |
| 3. | ANODE |
| 4. | CATHODE |
| STYLE 10: |  |
| PIN 1. | GATE |
| 2. | SOURCE |
| 3. | DRAIN |
| 4. | SOURCE |


| STYLE 3: |  |
| ---: | :--- |
| PIN 1. | CATHODE |
| 2. | ANODE |
| 3. | GATE |
| 4. | ANODE |
|  |  |
| STYLE 7: |  |
| PIN 1. | CATHODE |
| 2. | ANODE |
| 3. | CATHODE |
| 4. | ANODE |
|  |  |
| STYLE 11: |  |
| PIN 1. | DRAIN |
| 2. | SOURCE |
| 3. | GATE |
| 4. | SOURCE |

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE $8:$
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
3. GATE 4. NOT CONNECTED

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