

## Ultrasoft Recovery Rectifier Diode

### PRODUCT APPLICATIONS

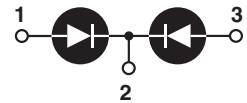
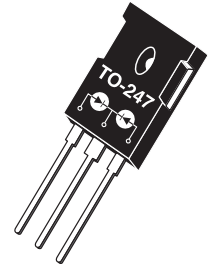
- Anti-Parallel Diode
  - Switchmode Power Supply
  - Inverters
- Applications
  - Induction Heating
- Resonant Mode Circuits
  - ZVS and ZCS Topologies
  - Phase Shifted Bridge

### PRODUCT FEATURES

- Ultrasoft Recovery Times ( $t_{rr}$ )
- Popular TO-247 Package or Surface Mount D<sup>3</sup>PAK Package
- Ultra Low Forward Voltage
- Low Leakage Current

### PRODUCT BENEFITS

- Soft Switching - High  $Q_{rr}$
- Low Noise Switching
  - Reduced Ringing
- Higher Reliability Systems
- Minimizes or eliminates snubber



- 1 - Anode 1
- 2 - Common Cathode
- Back of Case - Cathode
- 3 - Anode 2

### MAXIMUM RATINGS

 All Ratings per leg :  $T_C = 25^\circ\text{C}$  unless otherwise specified.

| Symbol         | Characteristic / Test Conditions                                                | Ratings    | Unit             |
|----------------|---------------------------------------------------------------------------------|------------|------------------|
| $V_R$          | Maximum D.C. Reverse Voltage                                                    | 600        | Volts            |
| $V_{RRM}$      | Maximum Peak Repetitive Reverse Voltage                                         |            |                  |
| $V_{RWM}$      | Maximum Working Peak Reverse Voltage                                            |            |                  |
| $I_{F(AV)}$    | Maximum Average Forward current ( $T_C = 115^\circ\text{C}$ , Duty Cycle = 0.5) | 50         | Amps             |
| $I_{F(RMS)}$   | RMS Forward Current (Square wave, 50% duty)                                     | 150        |                  |
| $I_{FSM}$      | Non-Repetitive Forward Surge Current ( $T_J = 45^\circ\text{C}$ , 8.3 ms)       | 320        |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range                                | -55 to 175 | $^\circ\text{C}$ |
| $T_L$          | Lead Temperature for 10 Seconds                                                 | 300        |                  |

### STATIC ELECTRICAL CHARACTERISTICS

| Symbol   | Characteristic / Test Conditions          | Min | Typ                                          | Max  | Unit |               |
|----------|-------------------------------------------|-----|----------------------------------------------|------|------|---------------|
| $V_F$    | Forward Voltage                           |     | $I_F = 50\text{A}$                           | 1.25 | 1.6  | Volts         |
|          |                                           |     | $I_F = 100\text{A}$                          | 2.0  |      |               |
|          |                                           |     | $I_F = 50\text{A}, T_J = 125^\circ\text{C}$  | 1.25 |      |               |
| $I_{RM}$ | Maximum Reverse Leakage Current           |     | $V_R = 600\text{V}$                          |      | 25   | $\mu\text{A}$ |
|          |                                           |     | $V_R = 600\text{V}, T_J = 125^\circ\text{C}$ |      | 250  |               |
| $C_T$    | Junction Capacitance, $V_R = 200\text{V}$ |     | 51                                           |      | pF   |               |

## DYNAMIC CHARACTERISTICS

APT50DL60BCT(G)

| Symbol    | Characteristic / Test Conditions                                                     | Min | Typ  | Max | Unit |
|-----------|--------------------------------------------------------------------------------------|-----|------|-----|------|
| $t_{rr}$  | Reverse Recovery Time $I_F = 1A, di_F/dt = -100A/\mu s, V_R = 30V, T_J = 25^\circ C$ |     | 52   |     | ns   |
| $t_{rr}$  | Reverse Recovery Time                                                                |     | 399  |     |      |
| $Q_{rr}$  | Reverse Recovery Charge                                                              |     | 1498 |     |      |
| $I_{RRM}$ | Maximum Reverse Recovery Current                                                     |     | 9    |     | Amps |
| $t_{rr}$  | Reverse Recovery Time                                                                |     | 449  |     | ns   |
| $Q_{rr}$  | Reverse Recovery Charge                                                              |     | 3734 |     |      |
| $I_{RRM}$ | Maximum Reverse Recovery Current                                                     |     | 15   |     |      |
| $t_{rr}$  | Reverse Recovery Time                                                                |     | 284  |     | ns   |
| $Q_{rr}$  | Reverse Recovery Charge                                                              |     | 5134 |     |      |
| $I_{RRM}$ | Maximum Reverse Recovery Current                                                     |     | 34   |     |      |

## THERMAL AND MECHANICAL CHARACTERISTICS

| Symbol          | Characteristic / Test Conditions    | Min | Typ  | Max  | Unit         |
|-----------------|-------------------------------------|-----|------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case Thermal Resistance |     |      | 0.63 | $^\circ C/W$ |
| $W_T$           | Package Weight                      |     | 0.22 |      | oz           |
|                 |                                     |     | 5.9  |      | g            |
| Torque          | Maximum Mounting Torque             |     |      | 10   | lb-in        |
|                 |                                     |     |      | 1.1  | N-m          |

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

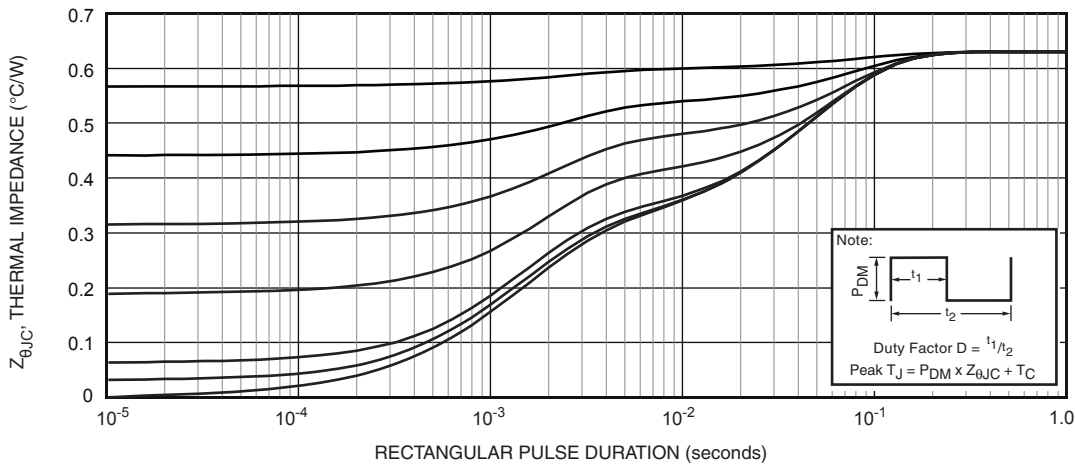


FIGURE 1a. MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs. PULSE DURATION

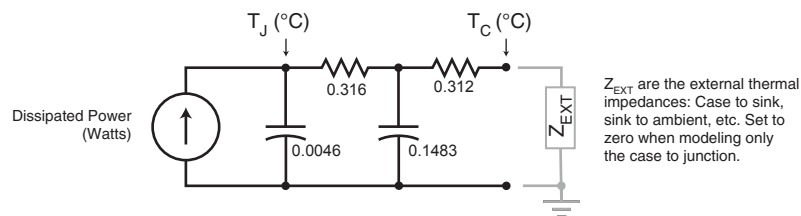


FIGURE 1b, TRANSIENT THERMAL IMPEDANCE MODEL

# TYPICAL PERFORMANCE CURVES

APT50DL60BCT(G)

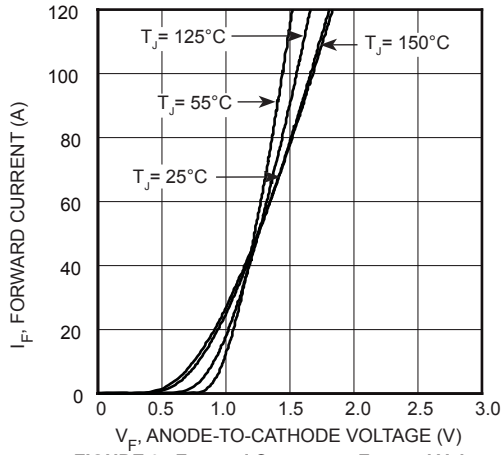


FIGURE 2, Forward Current vs. Forward Voltage

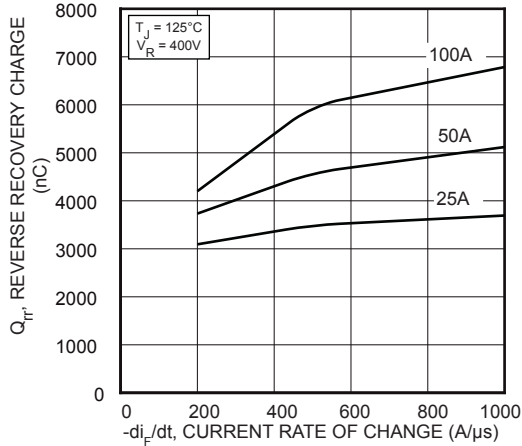


FIGURE 4, Reverse Recovery Charge vs. Current Rate of Change

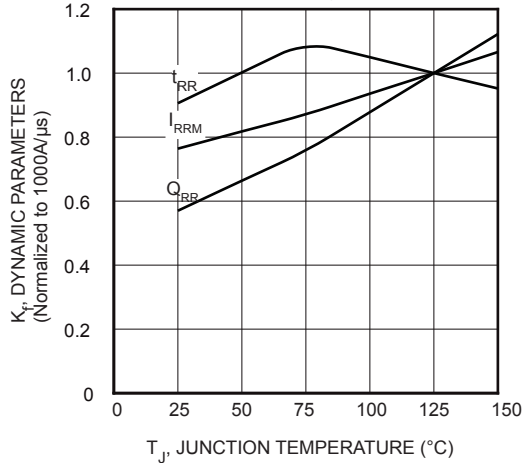


FIGURE 6, Dynamic Parameters vs. Junction Temperature

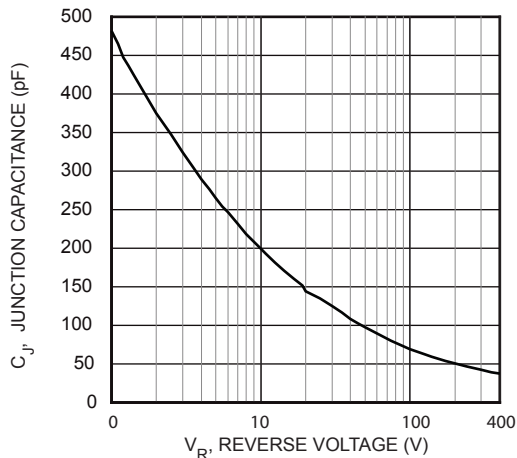


FIGURE 8, Junction Capacitance vs. Reverse Voltage

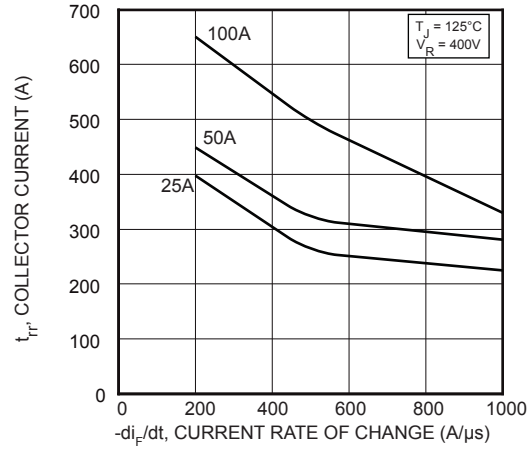


FIGURE 3, Reverse Recovery Time vs. Current Rate of Change

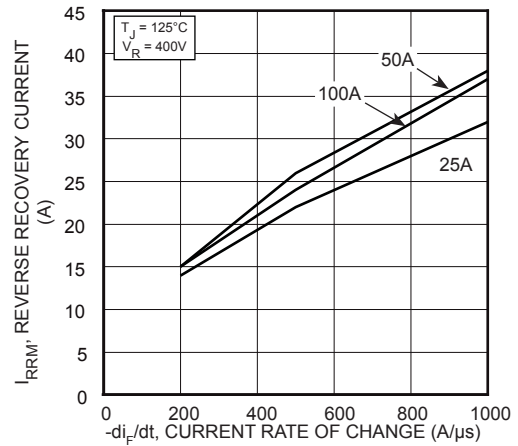


FIGURE 5, Reverse Recovery Current vs. Current Rate of Change

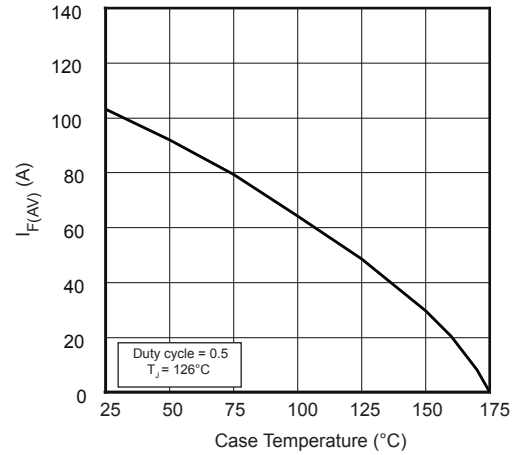


FIGURE 7, Maximum Average Forward Current vs. Case Temperature

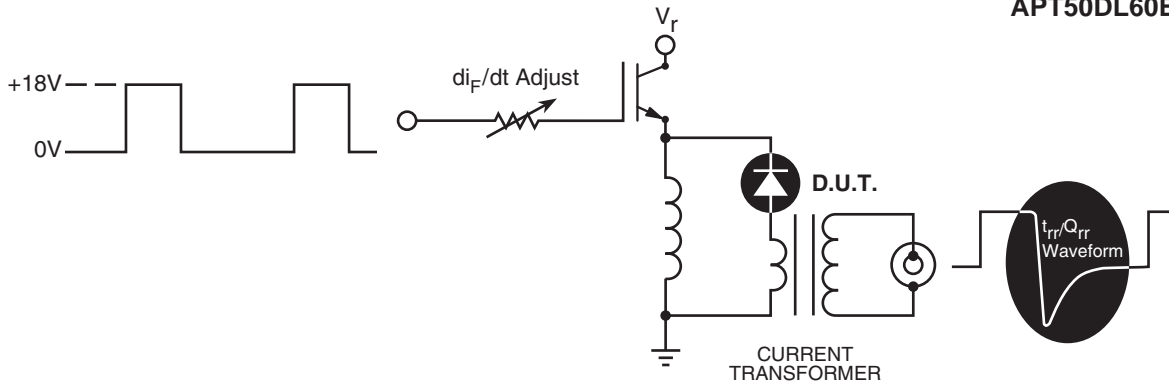


Figure 9. Diode Test Circuit

- 1  $I_F$  - Forward Conduction Current
- 2  $di_F/dt$  - Rate of Diode Current Change Through Zero Crossing.
- 3  $I_{RRM}$  - Maximum Reverse Recovery Current.
- 4  $t_{rr}$  - Reverse Recovery Time, measured from zero crossing where diode current goes from positive to negative, to the point at which the straight line through  $I_{RRM}$  and  $0.25 \cdot I_{RRM}$  passes through zero.
- 5  $Q_{rr}$  - Area Under the Curve Defined by  $I_{RRM}$  and  $t_{rr}$ .
- 6  $di_M/dt$  - Maximum Rate of Current Increase During the Trailing Portion of  $t_{rr}$ .

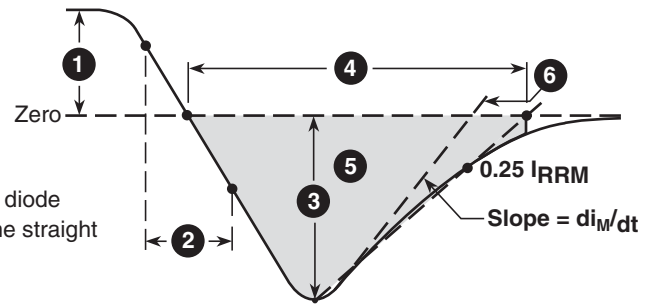
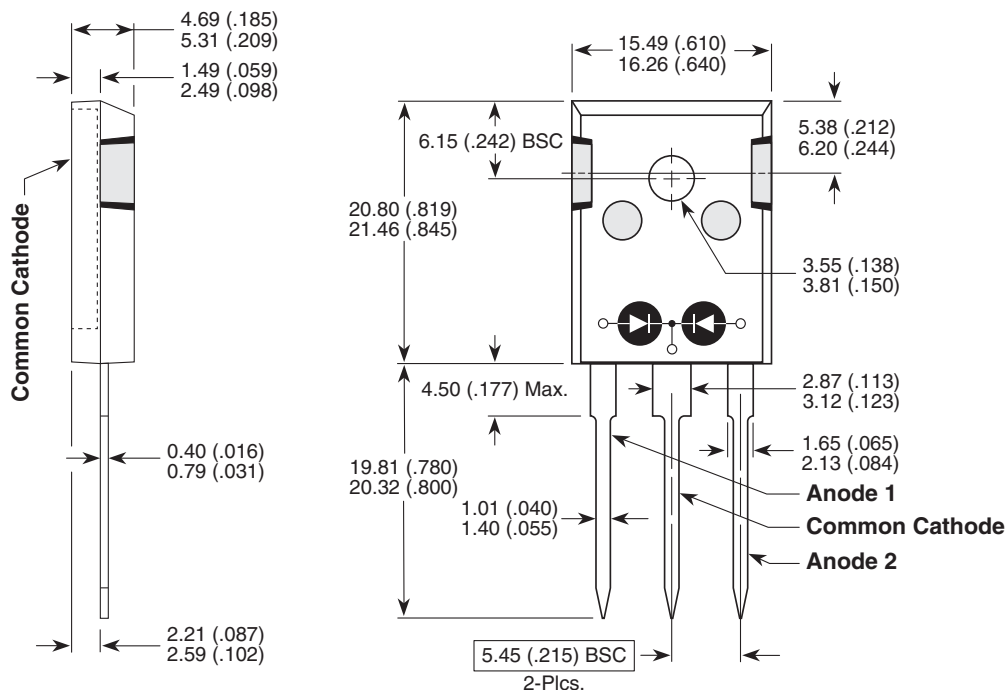


Figure 10, Diode Reverse Recovery Waveform and Definitions

TO-247 (BCT) Package Outline



Dimensions in Millimeters and (Inches)

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743, 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. US and Foreign patents pending. All Rights Reserved.