

T-23-07

**Features**

- Ultrafast with Soft Recovery Characteristic ( $t_{rr} < 55\text{ns}$ )
- +175°C Rated Junction Temperature
- Reverse Voltage Up to 600V
- Avalanche Energy Rated

**Applications**

- Switching Power Supply
- Power Switching Circuits
- General Purpose

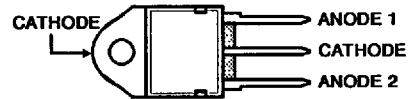
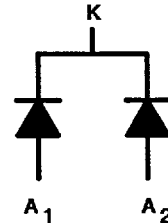
**Description**

MUR3040PT, MUR3050PT, MUR3060PT and RURD1540, RURD1550, RURD1560 are ultrafast dual diodes ( $t_{rr} < 55\text{ns}$ ) with soft recovery characteristics ( $t_a/t_b \approx 1$ ). They have a low forward voltage drop and are of planar, silicon nitride passivated, ion-implanted, epitaxial construction.

These devices are intended for use as energy steering/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristics minimizes ringing and electrical noise in many power switching circuits thus reducing power loss in the switching transistor.

All are supplied in TO-218AC packages.

**Package**

 TO-218AC  
 TOP VIEW

**Symbol**

**Absolute Maximum Ratings ( $T_C = +25^\circ\text{C}$ )**

|  | MUR3040PT<br>RURD1540 | MUR3050PT<br>RURD1550 | MUR3060PT<br>RURD1560 |
|--|-----------------------|-----------------------|-----------------------|
| Peak Repetitive Reverse Voltage..... $V_{RRM}$   | 400V                  | 500V                  | 600V                  |
| Working Peak Reverse Voltage..... $V_{RWM}$  | 400V                  | 500V                  | 600V                  |
| DC Blocking Voltage..... $V_R$   | 400V                  | 500V                  | 600V                  |
| Average Rectified Forward Current..... $I_{F(AV)}$<br>(Total device forward current at rated $V_F$ and $T_C = 150^\circ\text{C}$ ) | 15A                   | 15A                   | 15A                   |
| Peak Forward Repetitive Current..... $I_{FRM}$<br>(Rated $V_F$ , square wave 20kHz)  | 30A                   | 30A                   | 30A                   |
| Nonrepetitive Peak Surge Current..... $I_{FSM}$<br>(Surge applied at rated load condition halfwave 1 phase 60Hz)                   | 200A                  | 200A                  | 200A                  |
| Operating and Storage Temperature..... $T_{STG}, T_J$  | -55°C to +175°C       | -55°C to +175°C       | -55°C to +175°C       |

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| SYMBOL                                      | TEST CONDITION                                  | LIMITS              |     |      |                     |     |      |                     |     |      | UNITS |
|---|---|---------------------|-----|------|---------------------|-----|------|---------------------|-----|------|-------|
|   |   | MUR3040PT, RURD1540 |     |      | MUR3050PT, RURD1550 |     |      | MUR3060PT, RURD1560 |     |      |       |
|   |   | MIN                 | TYP | MAX  | MIN                 | TYP | MAX  | MIN                 | TYP | MAX  |       |
| V <sub>F</sub>                              | I <sub>F</sub> = 15A<br>T <sub>C</sub> = +150°C | -                   | -   | 1.12 | -                   | -   | 1.20 | -                   | -   | 1.20 | V     |
|   | I <sub>F</sub> = 15A<br>T <sub>C</sub> = +25°C  | -                   | -   | 1.25 | -                   | -   | 1.50 | -                   | -   | 1.50 | V     |
| I <sub>R</sub> @<br>T <sub>C</sub> = +150°C | V <sub>R</sub> = 400V                           | -                   | -   | 500  | -                   | -   | -    | -                   | -   | -    | μA    |
|   | V <sub>R</sub> = 500V                           | -                   | -   | -    | -                   | -   | 500  | -                   | -   | -    | μA    |
|   | V <sub>R</sub> = 600V                           | -                   | -   | -    | -                   | -   | -    | -                   | -   | 500  | μA    |
| I <sub>R</sub> @<br>T <sub>C</sub> = +25°C  | V <sub>R</sub> = 400V                           | -                   | -   | 10   | -                   | -   | -    | -                   | -   | -    | μA    |
|   | V <sub>R</sub> = 500V                           | -                   | -   | -    | -                   | -   | 10   | -                   | -   | -    | μA    |
|   | V <sub>R</sub> = 600V                           | -                   | -   | -    | -                   | -   | -    | -                   | -   | 10   | μA    |
| t <sub>rr</sub>                             | I <sub>F</sub> = 1A                             | -                   | -   | 55   | -                   | -   | 55   | -                   | -   | 55   | ns    |
|   | I <sub>F</sub> = 15A                            | -                   | -   | 60   | -                   | -   | 60   | -                   | -   | 60   | ns    |
| t <sub>a</sub>                              | I <sub>F</sub> = 1A                             | -                   | 20  | -    | -                   | 20  | -    | -                   | 20  | -    | ns    |
|   | I <sub>F</sub> = 15A                            | -                   | 30  | -    | -                   | 30  | -    | -                   | 30  | -    | ns    |
| t <sub>b</sub>                              | I <sub>F</sub> = 1A                             | -                   | 15  | -    | -                   | 15  | -    | -                   | 15  | -    | ns    |
|   | I <sub>F</sub> = 15A                            | -                   | 17  | -    | -                   | 17  | -    | -                   | 20  | -    | ns    |
| R <sub>θjc</sub>                            |   | -                   | -   | 1.5  | -                   | -   | 1.5  | -                   | -   | 1.5  | °C/W  |
| W <sub>avl</sub>                            | see Fig. 7&8                                    | -                   | -   | 20   | -                   | -   | 20   | -                   | -   | 20   | mJ    |

**Definitions**

V<sub>F</sub> = Instantaneous forward voltage (pw = 300μs, D = 2%).

I<sub>R</sub> = Instantaneous reverse current (pw = 300μs, D = 2%).

t<sub>rr</sub> = Reverse recovery time at di/dt = 100A/μs (See Figure 2), summation of t<sub>a</sub> + t<sub>b</sub>.

t<sub>a</sub> = Time to reach peak reverse current at di/dt = 100A/μs (See Figure 2).

t<sub>b</sub> = Time from peak I<sub>RM</sub> to projected zero crossing of I<sub>RM</sub> based on a straight line from peak I<sub>RM</sub> through 25% of I<sub>RM</sub>. (See Figure 2)

R<sub>θjc</sub> = Thermal resistance junction to case.

W<sub>avl</sub> = Controlled avalanche energy (See Figures 7 & 8).

pw = pulse width.

D = duty cycle.

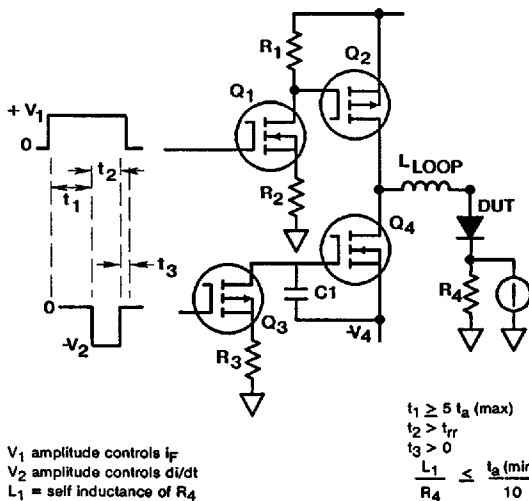


FIGURE 1. t<sub>rr</sub> TEST CIRCUIT

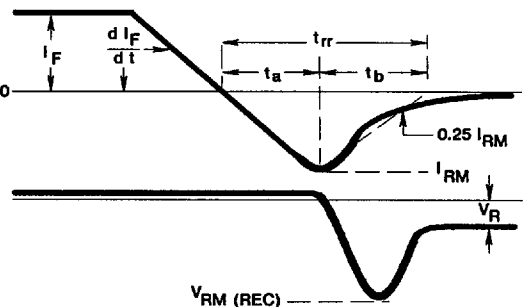


FIGURE 2. DEFINITIONS OF t<sub>rr</sub>, t<sub>a</sub> AND t<sub>b</sub>

12  
 ULTRA-FAST  
 RECTIFIERS

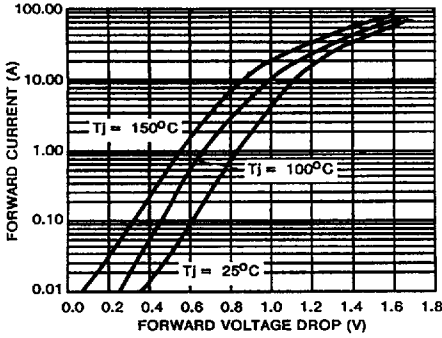


FIGURE 3. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

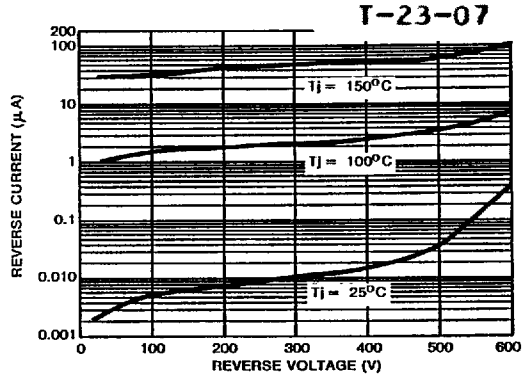


FIGURE 4. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

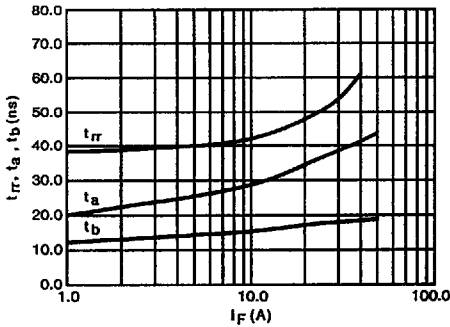


FIGURE 5. TYPICAL  $t_{rr}$ ,  $t_a$ ,  $t_b$  vs FORWARD CURRENT

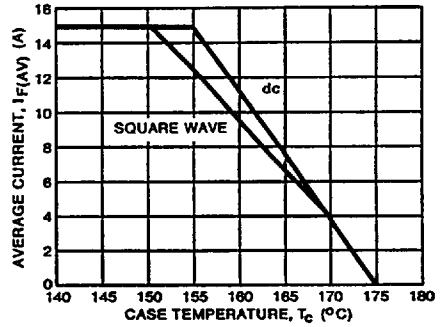


FIGURE 6. TYPICAL CURRENT DERATING CURVE w.r.t. CASE TEMPERATURE

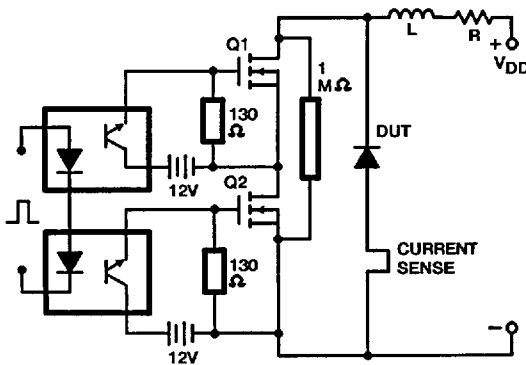


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

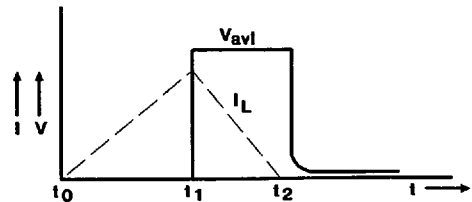


FIGURE 8. CURRENT VOLTAGE WAVEFORM

$$I_{Lpeak} = 1A, L = 40mH, R < 0.1\Omega, W_{avl} = (1/2) L I^2 [V_{avl} / (V_{avl} - V_{dd})]$$