

**30A Ultrafast Dual Diode
 With Soft Recovery Characteristic**

May 1991

Features

- Ultrafast with Soft Recovery Characteristic ($t_{rr} < 45\text{ns}$)
- +175°C Rated Junction Temperature
- Reverse Voltage Up to 200V
- Avalanche Energy Rated

Applications

- Switching Power Supply
- Power Switching Circuits
- General Purpose

Description

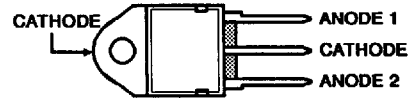
RURD3010, RURD3015, RURD3020 are ultrafast dual diodes ($t_{rr} < 45\text{ns}$) with soft recovery characteristics ($t_a/t_b \approx 1$). They have a low forward voltage drop and are of planar, silicon nitride passivated, ion-implanted, epitaxial construction.

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.

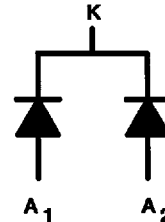
All are supplied in TO-218AC packages.

Package

TO-218AC
 TOP VIEW



Symbol



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

| | RURD3010 | RURD3015 | RURD3040 |
|--|-----------------|-----------------|-----------------|
| Peak Repetitive Reverse Voltage..... V_{RRM} | 100V | 150V | 200V |
| Working Peak Reverse Voltage..... V_{RWM} | 100V | 150V | 200V |
| DC Blocking Voltage..... V_R | 100V | 150V | 200V |
| Average Rectified Forward Current..... $I_{F(AV)}$ (Total device forward current at rated V_F and $T_C = 150^\circ\text{C}$) | 30A | 30A | 30A |
| Peak Forward Repetitive Current..... I_{FRM} (Rated V_F , square wave 20kHz) | 70A | 70A | 70A |
| Nonrepetitive Peak Surge Current..... I_{FSM} (Surge Applied at rated load condition halfwave 1 phase 60Hz) | 325A | 325A | 325A |
| Operating and Storage Temperature..... T_{STG}, T_J | -55°C to +175°C | -55°C to +175°C | -55°C to +175°C |

12

ULTRA-FAST
 RECTIFIERS

Electrical Characteristics At Case Temperature ($T_C = +25^\circ\text{C}$) Unless Otherwise Specified.

| SYMBOL | TEST CONDITION | RURD3010 LIMITS | | | RURD3015 LIMITS | | | RURD3020 LIMITS | | | UNITS |
|---------------------------------------|--|-----------------|-----|------|-----------------|-----|------|-----------------|-----|------|---------------------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_F | $I_F = 30\text{A}$ $T_C = +150^\circ\text{C}$ | | | 0.85 | | | 0.85 | | | 0.85 | V |
| | $I_F = 30\text{A}$ $T_C = +25^\circ\text{C}$ | | | 1.00 | | | 1.00 | | | 1.00 | V |
| $I_R @$ $T_C = +150^\circ\text{C}$ | $V_R = 100\text{V}$ | | | 500 | | | | | | | μA |
| | $V_R = 150\text{V}$ | | | | | | 500 | | | | μA |
| | $V_R = 200\text{V}$ | | | | | | | | | 500 | μA |
| $I_R @$ $T_C = +25^\circ\text{C}$ | $V_R = 100\text{V}$ | | | 30 | | | | | | | μA |
| | $V_R = 150\text{V}$ | | | | | | 30 | | | | μA |
| | $V_R = 200\text{V}$ | | | | | | | | | 30 | μA |
| t_{rr} | $I_F = 1\text{A}$ | | | 45 | | | 45 | | | 45 | ns |
| | $I_F = 30\text{A}$ | | | 50 | | | 50 | | | 50 | ns |
| t_a | $I_F = 1\text{A}$ | | 24 | | | 24 | | 24 | | | ns |
| | $I_F = 30\text{A}$ | | 28 | | | 28 | | 28 | | | ns |
| t_b | $I_F = 1\text{A}$ | | 17 | | | 17 | | 17 | | | ns |
| | $I_F = 30\text{A}$ | | 20 | | | 20 | | 20 | | | ns |
| $R_{\theta jc}$ | | | | 1.2 | | | 1.2 | | | 1.2 | $^\circ\text{C}/\text{W}$ |
| W_{AVI} | see Fig. 7&8 | | | 20 | | | 20 | | | 20 | mj |

Definitions

V_F = Instantaneous forward voltage ($p_w = 300\mu\text{s}$, $D = 2\%$).

I_R = Instantaneous reverse current ($p_w = 300\mu\text{s}$, $D = 2\%$).

t_{rr} = Reverse recovery time at $di_F/dt = 100\text{A}/\mu\text{s}$ (See Figure 2), summation of $t_a + t_b$.

t_a = Time to reach peak reverse current at $di_F/dt = 100\text{A}/\mu\text{s}$ (See Figure 2).

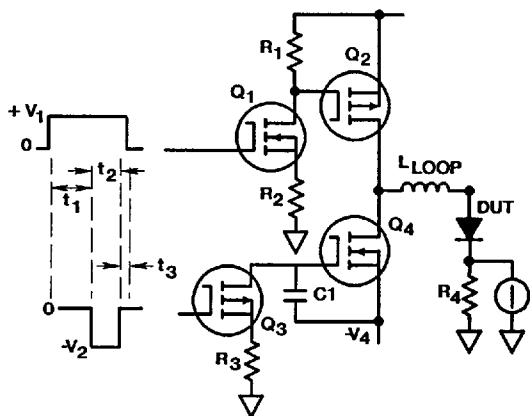
t_b = Time from peak I_{RM} to projected zero crossing of I_{RM} based on a straight line from peak I_{RM} through 25% of I_{RM} . (See Figure 2)

$R_{\theta jc}$ = Thermal resistance junction to case.

W_{AVI} = Controlled avalanche energy (See Figures 7 & 8).

p_w = pulse width.

D = duty cycle.



V_1 amplitude controls I_F
 V_2 amplitude controls di/dt
 L_1 = self inductance of R_4

$$t_1 \geq 5 t_a \text{ (max)}$$

$$t_2 > t_{rr}$$

$$t_3 > 0$$

$$\frac{L_1}{R_4} \leq \frac{t_a \text{ (min)}}{10}$$

FIGURE 1. t_{rr} TEST CIRCUIT

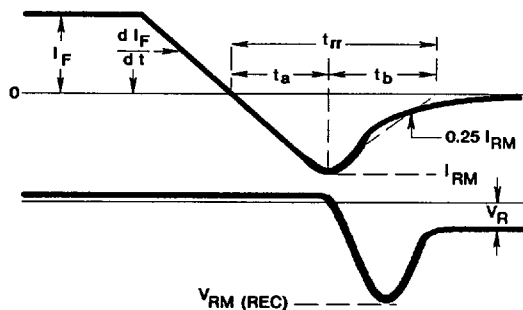


FIGURE 2. DEFINITIONS OF t_{rr} , t_a AND t_b

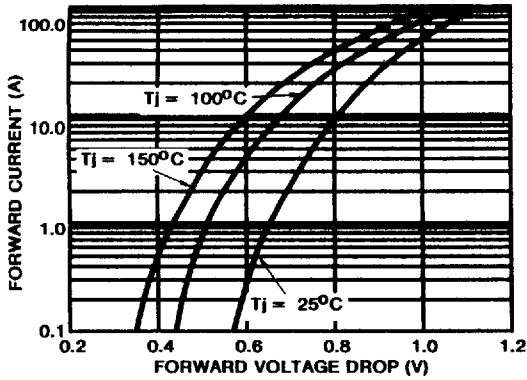


FIGURE 3. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

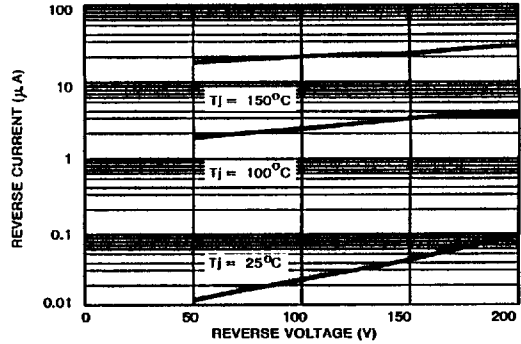


FIGURE 4. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

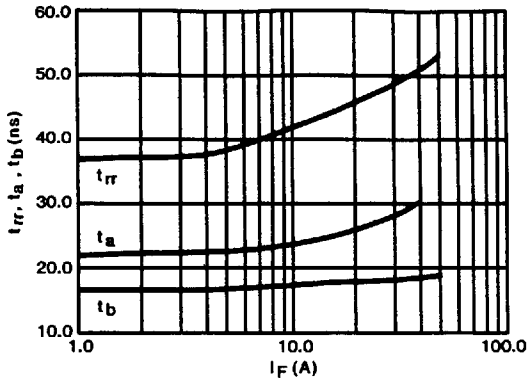


FIGURE 5. TYPICAL t_{rr} , t_a , t_b vs FORWARD CURRENT

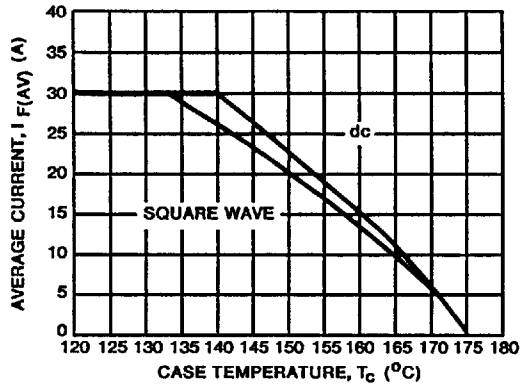


FIGURE 6. TYPICAL CURRENT DERATING CURVE w.r.t. CASE TEMPERATURE

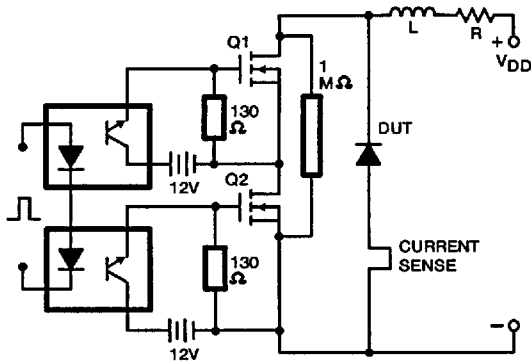


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

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

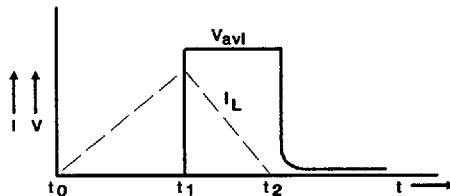


FIGURE 8. CURRENT VOLTAGE WAVEFORM