



30A Ultrafast Dual Diode With Soft Recovery Characteristic

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HARRIS SEMICONDUCTOR

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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

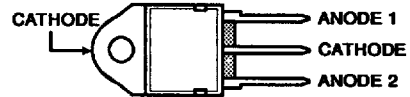
Description

RURD3040, RURD3050, RURD3060 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.

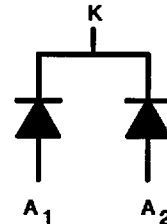
These devices are intended for use as energy steering/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristics minimizes ringing and electrical noise in many power 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 ($T_C = +25^\circ\text{C}$)

	RURD3040	RURD3050	RURD3060
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	$I_{F(AV)}$ 30A	30A	30A
(Total device forward current at rated V_R and $T_C = 150^\circ\text{C}$)			
Peak Forward Repetitive Current	I_{FRM} 70A	70A	70A
(Rated V_R , square wave 20kHz)			
Nonrepetitive Peak Surge Current	I_{FSM} 325A	325A	325A
(Surge applied at rated load condition halfwave 1 phase 60Hz)			
Operating and Storage Temperature	T_{STG}, T_J -55°C to +175°C	-55°C to +175°C	-55°C to +175°C

Electrical Characteristics (T_C = +25°C) Unless Otherwise Specified.

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SYMBOL	TEST CONDITION	RURD3040 LIMITS			RURD3050 LIMITS			RURD3060 LIMITS			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V _F	I _F = 30A T _C = +150°C	-	-	1.30	-	-	1.30	-	-	1.30	V
	I _F = 30A T _C = +25°C	-	-	1.50	-	-	1.50	-	-	1.50	V
I _R @ T _C = +150°C	V _R = 400V	-	-	1	-	-	-	-	-	-	mA
	V _R = 500V	-	-	-	-	-	1	-	-	-	mA
	V _R = 600V	-	-	-	-	-	-	-	-	1	mA
I _R @ T _C = +25°C	V _R = 400V	-	-	30	-	-	-	-	-	-	μA
	V _R = 500V	-	-	-	-	-	30	-	-	-	μA
	V _R = 600V	-	-	-	-	-	-	-	-	30	μA
t _{rr}	I _F = 1A	-	-	55	-	-	55	-	-	55	ns
	I _F = 30A	-	-	60	-	-	60	-	-	60	ns
t _a	I _F = 1A	-	20	-	-	20	-	-	20	-	ns
	I _F = 30A	-	38	-	-	38	-	-	38	-	ns
t _b	I _F = 1A	-	15	-	-	15	-	-	15	-	ns
	I _F = 30A	-	20	-	-	20	-	-	20	-	ns
R _{θjc}		-	-	1.2	-	-	1.2	-	-	1.2	°C/W
W _{avl}	see Fig. 7&8	-	-	20	-	-	20	-	-	20	mJ

Definitions

V_F = Instantaneous forward voltage (p_w = 300μs, D = 2%).

I_R = Instantaneous reverse current (p_w = 300μs, D = 2%).

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

t_a = Time to reach peak reverse current at di_F/dt = 100A/μs (See Figure 2).

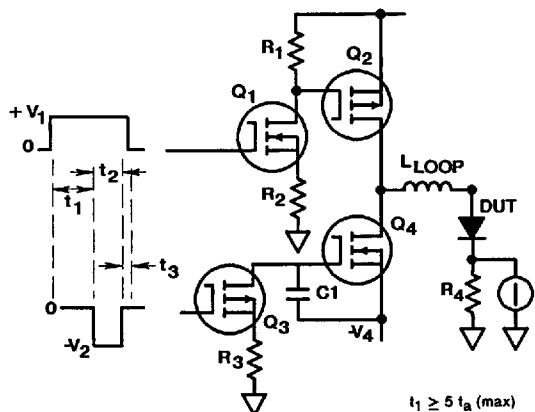
t_b = Time from peak I_{RM} to projected zero crossing of I_{RM} based on a straight line from peak I_{RM} through 25% of I_{RM}. (See Figure 2)

R_{θjc} = Thermal resistance junction to case.

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

p_w = pulse width.

D = duty cycle.



V₁ amplitude controls I_F
V₂ amplitude controls di_F/dt
L₁ = self inductance of R₄

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

$$t_2 > t_{rr}$$

$$t_3 > 0$$

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

FIGURE 1. t_{rr} TEST CIRCUIT

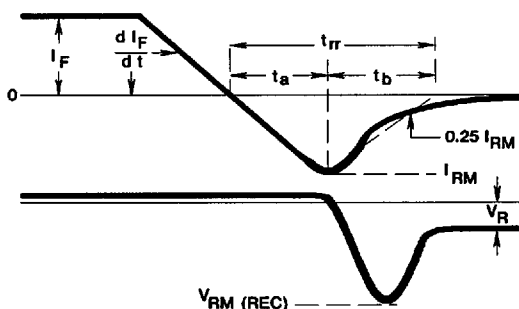


FIGURE 2. DEFINITIONS OF t_{rr}, t_a AND t_b

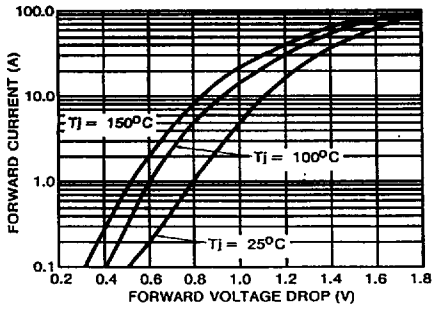


FIGURE 3. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

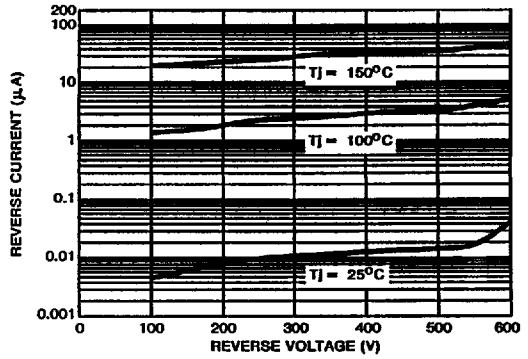


FIGURE 4. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

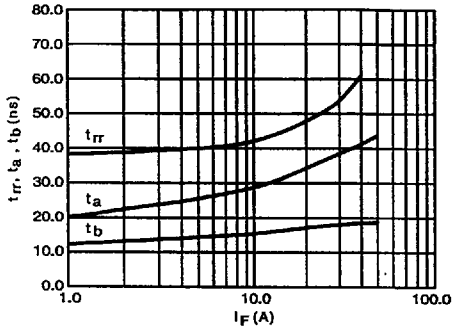


FIGURE 5. TYPICAL trr, ta, tb vs FORWARD CURRENT

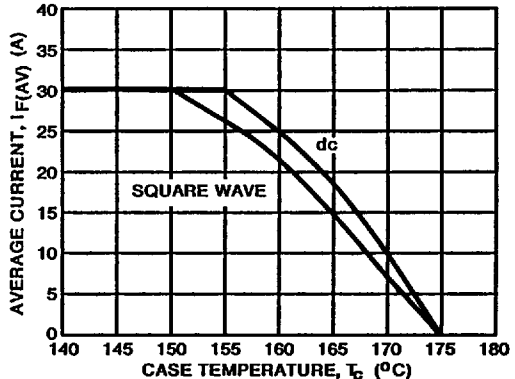


FIGURE 6. TYPICAL CURRENT DERATING CURVE w.r.t. CASE TEMPERATURE

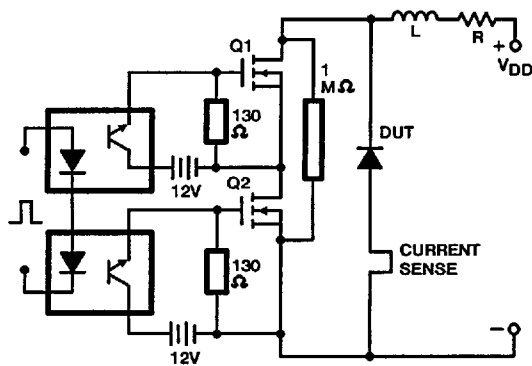


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

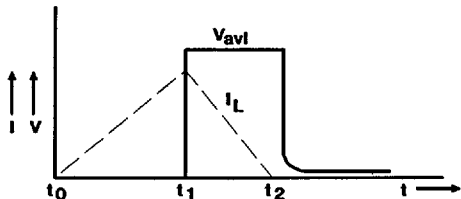


FIGURE 8. CURRENT VOLTAGE WAVEFORM

$$I_{L\text{peak}} = 1\text{A}, L = 40\text{mH}, R < 0.1\Omega, W_{\text{av1}} = (1/2) L I_L^2 [V_{\text{av1}} / (V_{\text{av1}} - V_{\text{DD}})]$$