

April 1995

30A, 400V - 600V Ultrafast Diodes

### 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

RURP3010, RURP3015, RURP3020 are ultrafast diodes ( $t_{RR} < 55\text{ns}$ ) with soft recovery characteristics. They have a low forward voltage drop and are of planar, silicon nitride passivated, ion-implanted, epitaxial construction.

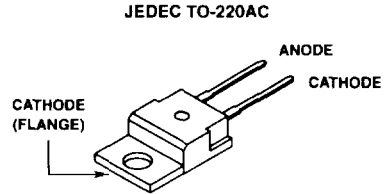
These devices are intended for use as energy steering/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristics minimizes ringing and electrical noise in many power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

#### PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURP3040	TO-220AC	RURP3040
RURP3050	TO-220AC	RURP3050
RURP3060	TO-220AC	RURP3060

NOTE: When ordering, use the entire part number.

### Package



### Symbol



### Absolute Maximum Ratings $T_C = +25^\circ\text{C}$ , Unless Otherwise Specified

	RURP3040	RURP3050	RURP3060
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 (Total device forward current at rated $V_R$ and $T_C = +150^\circ\text{C}$ )..... $I_{F(AV)}$	30A	30A	30A
Peak Forward Repetitive Current (Rated $V_R$ , square wave 20kHz)..... $I_{FRM}$	70A	70A	70A
Nonrepetitive Peak Surge Current (Surge applied at rated load condition halfwave 1 phase 60Hz)..... $I_{FSM}$	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

# Specifications RURP3040, RURP3050, RURP3060

**Electrical Specifications**  $T_C = +25^\circ\text{C}$ , Unless Otherwise Specified

SYMBOL	TEST CONDITION	LIMITS									UNITS
		RURP3040			RURP3050			RURP3060			
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_F$	$I_F = 30\text{A}$ $T_C = +150^\circ\text{C}$	-	-	1.30	-	-	1.30	-	-	1.30	V
	$I_F = 30\text{A}$ $T_C = +25^\circ\text{C}$	-	-	1.50	-	-	1.50	-	-	1.50	V
$I_R$ at $T_C = +150^\circ\text{C}$	$V_R = 400\text{V}$	-	-	1	-	-	-	-	-	-	mA
	$V_R = 500\text{V}$	-	-	-	-	-	1	-	-	-	mA
	$V_R = 600\text{V}$	-	-	-	-	-	-	-	-	1	mA
$I_R$ at $T_C = +25^\circ\text{C}$	$V_R = 400\text{V}$	-	-	500	-	-	-	-	-	-	$\mu\text{A}$
	$V_R = 500\text{V}$	-	-	-	-	-	500	-	-	-	$\mu\text{A}$
	$V_R = 600\text{V}$	-	-	-	-	-	-	-	-	500	$\mu\text{A}$
$t_{RR}$	$I_F = 1\text{A}$	-	-	55	-	-	55	-	-	55	ns
	$I_F = 30\text{A}$	-	-	60	-	-	60	-	-	60	ns
$t_A$	$I_F = 1\text{A}$	-	20	-	-	20	-	-	20	-	ns
	$I_F = 30\text{A}$	-	38	-	-	38	-	-	38	-	ns
$t_B$	$I_F = 1\text{A}$	-	15	-	-	15	-	-	15	-	ns
	$I_F = 30\text{A}$	-	20	-	-	20	-	-	20	-	ns
$R_{\theta JC}$		-	-	1.2	-	-	1.2	-	-	1.2	$^\circ\text{C/W}$
$E_{AVL}$	See Figure 7 and 8	-	-	20	-	-	20	-	-	20	mJ

**DEFINITIONS**

- $V_F$  = Instantaneous forward voltage ( $p_w = 300\mu\text{s}$ ,  $D = 2\%$ ).
- $I_R$  = Instantaneous reverse current.
- $t_{RR}$  = 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.
- $E_{AVL}$  = Controlled avalanche energy (See Figures 7 and 8).
- $p_w$  = pulse width.
- $D$  = duty cycle.

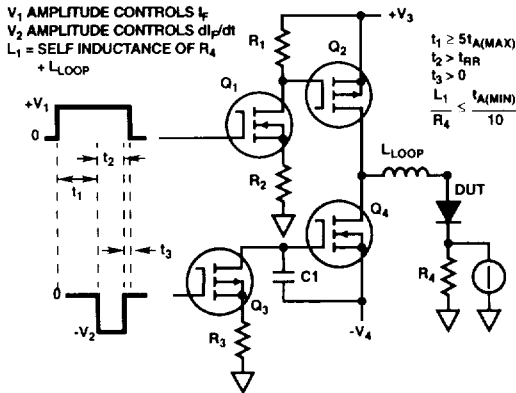


FIGURE 1.  $t_{RR}$  TEST CIRCUIT

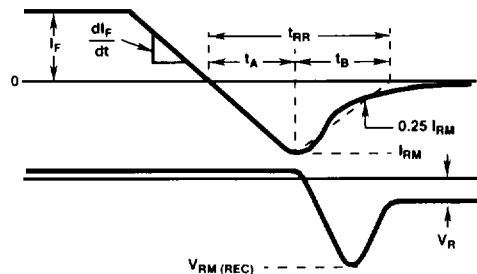


FIGURE 2. DEFINITIONS OF  $t_{RR}$ ,  $t_A$  AND  $t_B$

**5**  
ULTRAFAST  
SINGLE DIODES

Typical Performance Curves

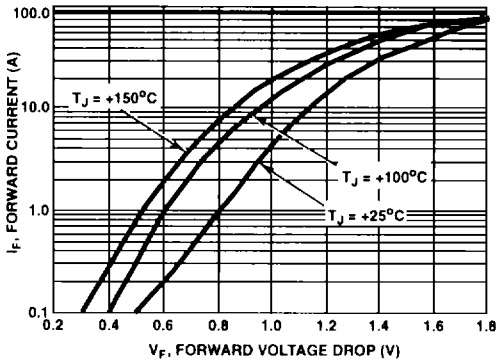


FIGURE 3. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

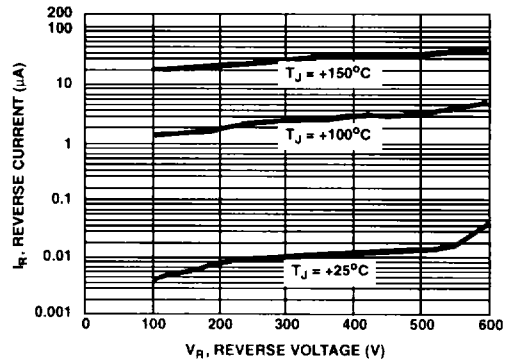


FIGURE 4. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

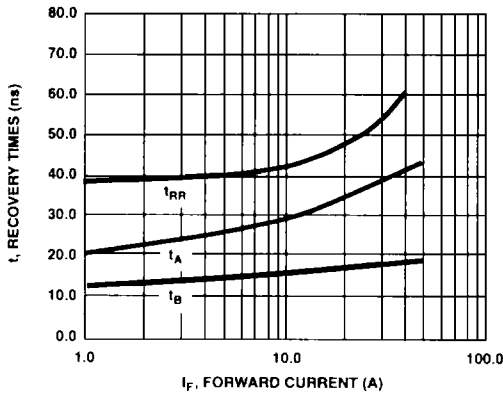


FIGURE 5. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT

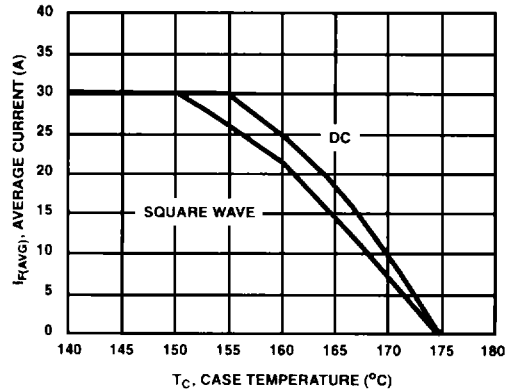


FIGURE 6. TYPICAL CURRENT DERATING CURVE vs CASE TEMPERATURE

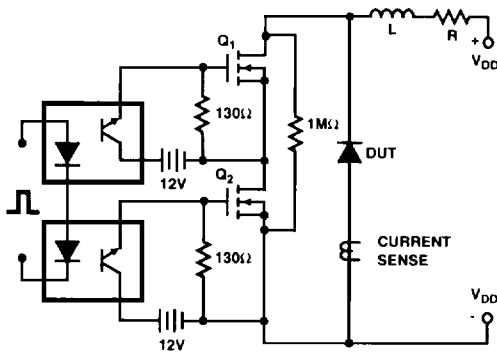


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

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

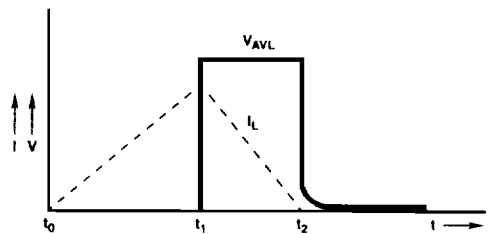


FIGURE 8. CURRENT VOLTAGE WAVEFORM