

April 1995

50A, 700V - 1000V Ultrafast Diodes

### Features

- Ultrafast with Soft Recovery ..... <125ns
- Operating Temperature ..... +175°C
- Reverse Voltage Up To ..... 1000V
- Avalanche Energy Rated
- Planar Construction

### Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

### Description

RURG5070, RURG5080, RURG5090 and RURG50100 are ultrafast diodes with soft recovery characteristics ( $t_{RR} < 125\text{ns}$ ). They have low forward voltage drop and are silicon nitride passivated ion-implanted epitaxial planar construction.

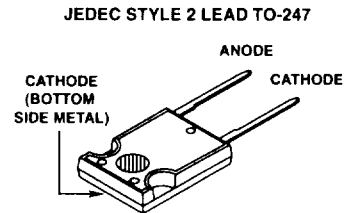
These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristic minimizes ringing and electrical noise in many power switching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

#### PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURG5070	TO-247	RURG5070
RURG5080	TO-247	RURG5080
RURG5090	TO-247	RURG5090
RURG50100	TO-247	RURG50100

NOTE: When ordering, use the entire part number.

### Package



### Symbol



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

	RURG5070	RURG5080	RURG5090	RURG50100	UNITS
Peak Repetitive Reverse Voltage ..... $V_{RRM}$	700	800	900	1000	V
Working Peak Reverse Voltage ..... $V_{RWM}$	700	800	900	1000	V
DC Blocking Voltage ..... $V_R$	700	800	900	1000	V
Average Rectified Forward Current ..... $I_{F(AV)}$ ( $T_C = +85^\circ\text{C}$ )	50	50	50	50	A
Repetitive Peak Surge Current ..... $I_{FSM}$ (Square Wave, 20kHz)	100	100	100	100	A
Nonrepetitive Peak Surge Current ..... $I_{FSM}$ (Halfwave, 1 Phase, 60Hz)	500	500	500	500	A
Maximum Power Dissipation ..... $P_D$	150	150	150	150	W
Avalanche Energy ..... $E_{AVL}$	40	40	40	40	mj
Operating and Storage Temperature ..... $T_{STG}, T_J$	-65 to +175	-65 to +175	-65 to +175	-65 to +175	°C

## Specifications RURG5070, RURG5080, RURG5090, RURG50100

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

SYMBOL	TEST CONDITION	LIMITS												UNITS
		RURG5070			RURG5080			RURG5090			RURG50100			
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_F$	$I_F = 50\text{A}, T_C = +25^\circ\text{C}$	-	-	1.9	-	-	1.9	-	-	1.9	-	-	1.9	V
$V_F$	$I_F = 50\text{A}, T_C = +150^\circ\text{C}$	-	-	1.7	-	-	1.7	-	-	1.7	-	-	1.7	V
$I_R$	$V_R = 700\text{V}, T_C = +25^\circ\text{C}$	-	-	500	-	-	-	-	-	-	-	-	-	$\mu\text{A}$
	$V_R = 800\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	500	-	-	-	-	-	-	$\mu\text{A}$
	$V_R = 900\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	-	-	-	500	-	-	-	$\mu\text{A}$
	$V_R = 1000\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	-	-	-	-	-	-	500	$\mu\text{A}$
$I_R$	$V_R = 700\text{V}, T_C = +150^\circ\text{C}$	-	-	1.5	-	-	-	-	-	-	-	-	-	mA
	$V_R = 800\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	1.5	-	-	-	-	-	-	mA
	$V_R = 900\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	-	-	-	1.5	-	-	-	mA
	$V_R = 1000\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	-	-	-	-	-	-	1.5	mA
$t_{RR}$	$I_F = 1\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	-	125	-	-	125	-	-	125	-	-	125	ns
	$I_F = 50\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	-	200	-	-	200	-	-	200	-	-	200	ns
$t_A$	$I_F = 50\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	110	-	-	110	-	-	110	-	-	110	-	ns
$t_B$	$I_F = 50\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	65	-	-	65	-	-	65	-	-	65	-	ns
$R_{\theta JC}$		-	-	1.0	-	-	1.0	-	-	1.0	-	-	1.0	$^\circ\text{C}/\text{W}$

### DEFINITIONS

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

$I_R$  = Instantaneous reverse current.

$t_{RR}$  = Reverse recovery time (See Figure 2), summation of  $t_A + t_B$ .

$t_A$  = Time to reach peak reverse current (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.

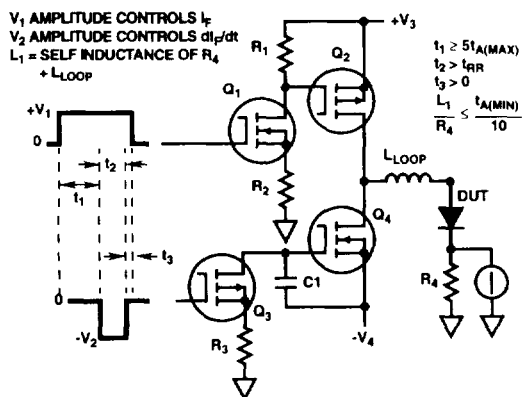


FIGURE 1.  $t_{RR}$  TEST CIRCUIT

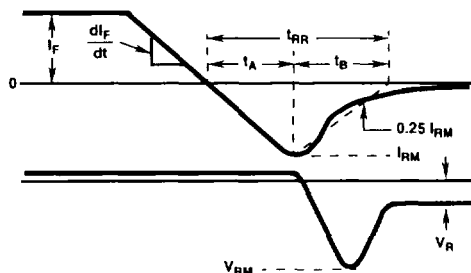


FIGURE 2.  $t_{RR}$  WAVEFORMS AND DEFINITIONS

Typical Performance Curves

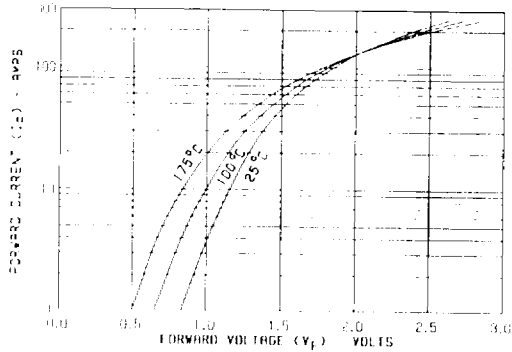


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

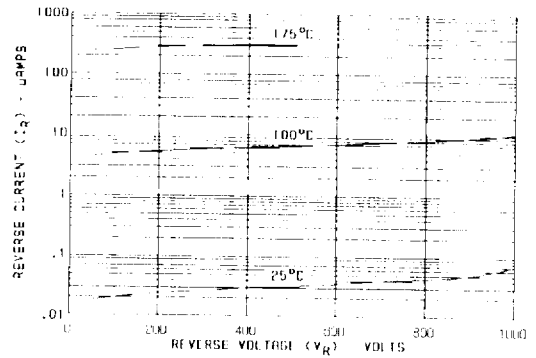


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

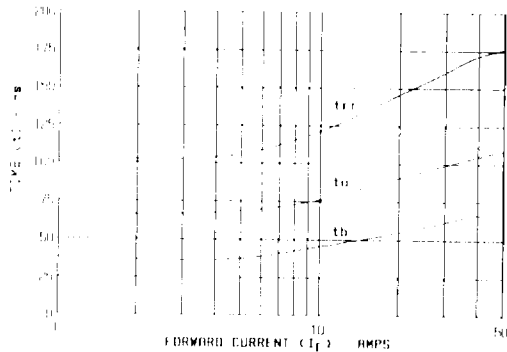


FIGURE 5. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT

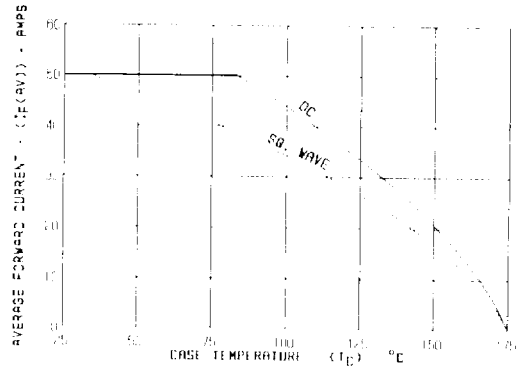


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

$I_{MAX} = 1A$   
 $L = 40mH$   
 $R < 0.1\Omega$   
 $E_{AVL} = 1/2 L I^2 [V_{AVL}/(V_{AVL} - V_{DD})]$   
 $Q_1$  &  $Q_2$  ARE 1000V MOSFETS

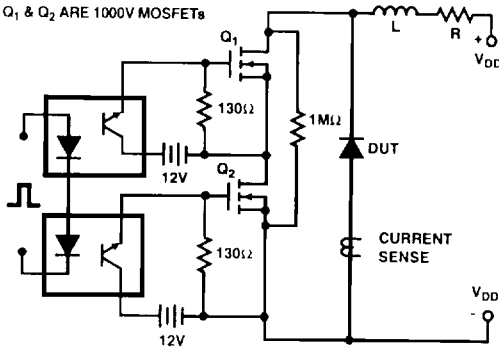


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

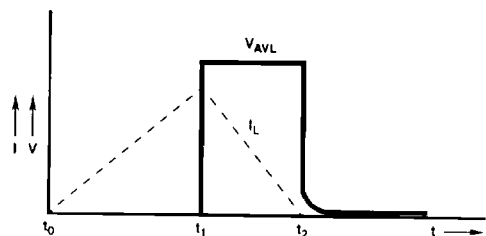


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS