

April 1995

50A, 400V - 600V Ultrafast Diodes

Features

- Ultrafast with Soft Recovery <65ns
- Operating Temperature +175°C
- Reverse Voltage Up To 600V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RURG5040, RURG5050 and RURG5060 (TA9909) are ultrafast diodes with soft recovery characteristics ($t_{RR} < 65\text{ns}$). 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.

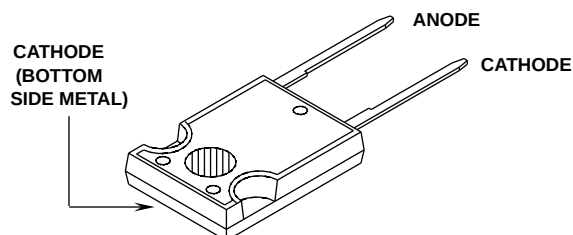
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURG5040	TO-247	RURG5040
RURG5050	TO-247	RURG5050
RURG5060	TO-247	RURG5060

NOTE: When ordering, use the entire part number.

Package

JEDEC STYLE 2 LEAD TO-247



Symbol



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

	RURG5040	RURG5050	RURG5060	UNITS
Peak Repetitive Reverse Voltage V_{RRM}	400	500	600	V
Working Peak Reverse Voltage V_{RWM}	400	500	600	V
DC Blocking Voltage V_R	400	500	600	V
Average Rectified Forward Current $I_{F(AV)}$ ($T_C = +102^\circ\text{C}$)	50	50	50	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	100	100	100	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz)	500	500	500	A
Maximum Power Dissipation P_D	150	150	150	W
Avalanche Energy E_{AVL}	40	40	40	mJ
Operating and Storage Temperature T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	°C

Specifications RURG5040, RURG5050, RURG5060

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

SYMBOL	TEST CONDITION	LIMITS									UNITS
		RURG5040			RURG5050			RURG5060			
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V _F	I _F = 50A, T _C = +25°C	-	-	1.6	-	-	1.6	-	-	1.6	V
V _F	I _F = 50A, T _C = +150°C	-	-	1.4	-	-	1.4	-	-	1.4	V
I _R	V _R = 400V, T _C = +25°C	-	-	500	-	-	-	-	-	-	μA
	V _R = 500V, T _C = +25°C	-	-	-	-	-	500	-	-	-	μA
	V _R = 600V, T _C = +25°C	-	-	-	-	-	-	-	-	500	μA
I _R	V _R = 400V, T _C = 150°C	-	-	1.5	-	-	-	-	-	-	mA
	V _R = 500V, T _C = 150°C	-	-	-	-	-	1.5	-	-	-	mA
	V _R = 600V, T _C = 150°C	-	-	-	-	-	-	-	-	1.5	mA
t _{RR}	I _F = 1A, dI _F /dt = 100A/μs	-	-	65	-	-	65	-	-	65	ns
	I _F = 50A, dI _F /dt = 100A/μs	-	-	75	-	-	75	-	-	75	ns
t _A	I _F = 50A, dI _F /dt= 100A/μs	-	30	-	-	30	-	-	30	-	ns
t _B	I _F = 50A, dI _F /dt = 100A/μs	-	20	-	-	20	-	-	20	-	ns
R _{θJC}		-	-	1	-	-	1	-	-	1	°C/W

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300 μs , 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).

pw = pulse width.

D = duty cycle.

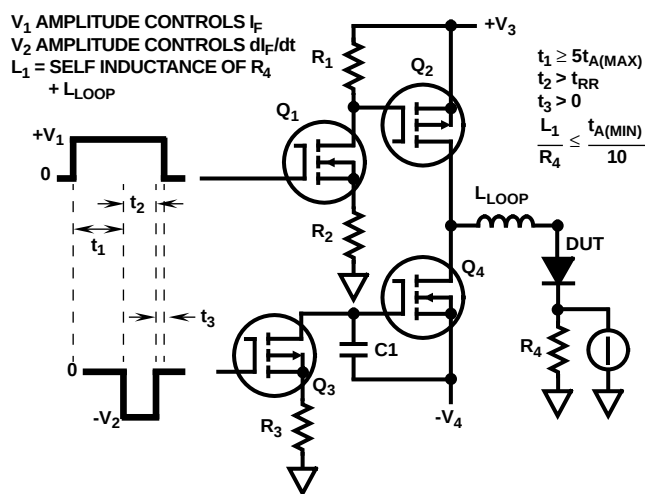


FIGURE 1. t_{RR} TEST CIRCUIT

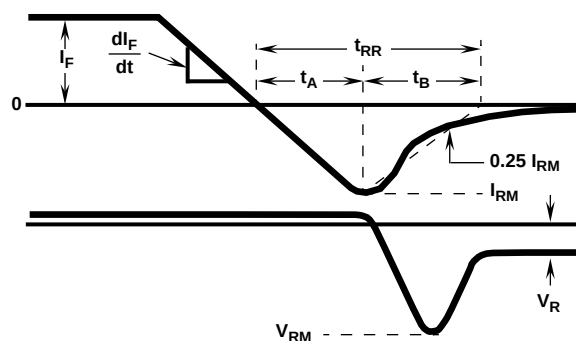


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

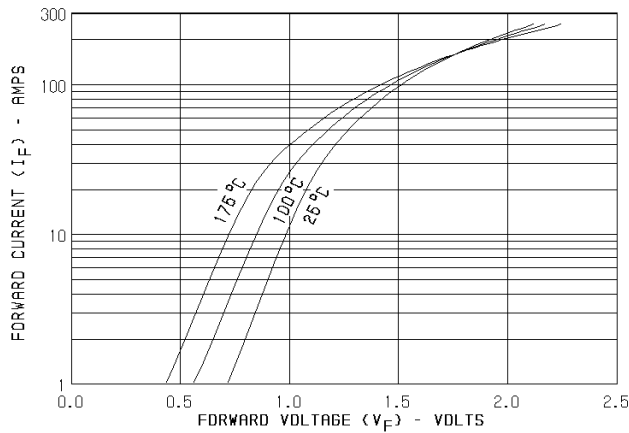


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

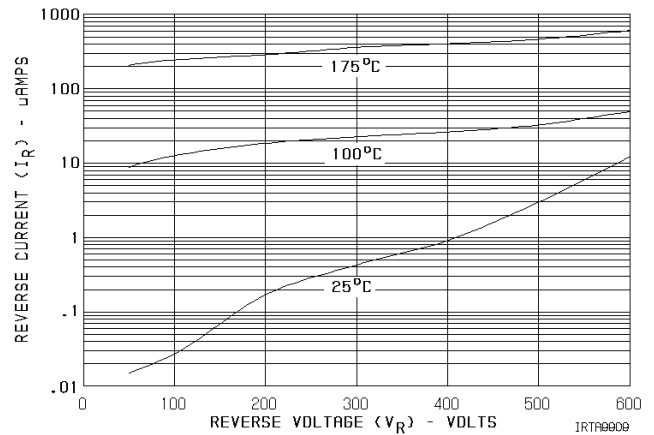


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

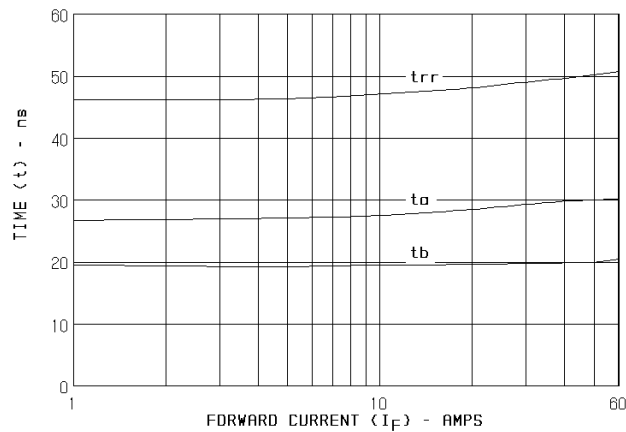


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT

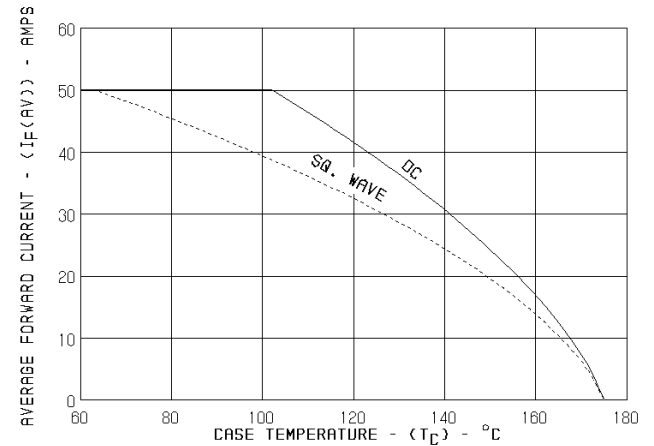


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

$$I_{MAX} = 1A$$

$$L = 40mH$$

$$R < 0.1\Omega$$

$$E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$$

$$Q_1 \text{ \& \> } Q_2 \text{ ARE 1000V MOSFETS}$$

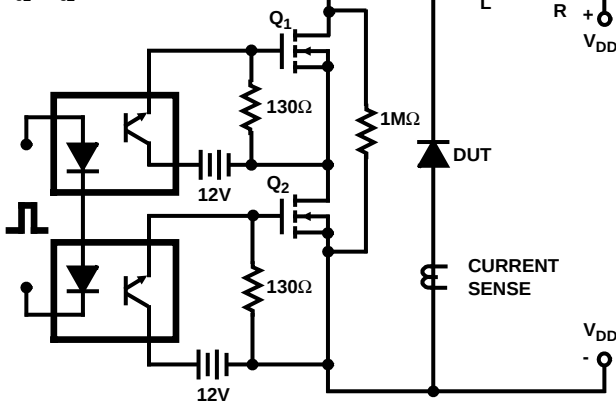


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

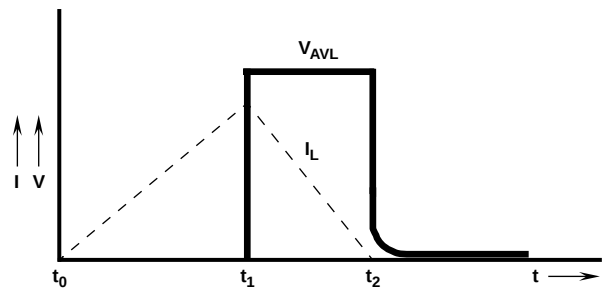


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS