HARRIS SEMICONDUCTOR

RURG5040, RURG5050, RURG5060

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} < 65ns). 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.

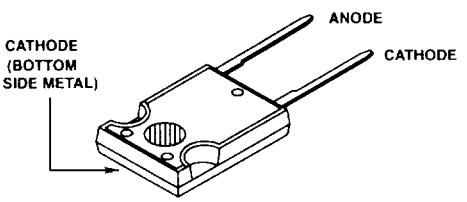
PACKAGING AVAILABILITY

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°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 (T_C = +102°C)	$I_{F(AV)}$	50	50	50	A
Repetitive Peak Surge Current (Square Wave, 20kHz)	I_{FSM}	100	100	100	A
Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz)	I_{FSM}	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

File Number **3211.2**

Electrical Specifications T_C = +25°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
$R_{\theta JC}$		-	-	1	-	-	1	-	-	1	°C/W

DEFINITIONS

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

I_R = Instantaneous reverse current.

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).

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

E_{AVL} = Controlled avalanche energy (See Figures 7 and 8).

pw = pulse width.

D = duty cycle.

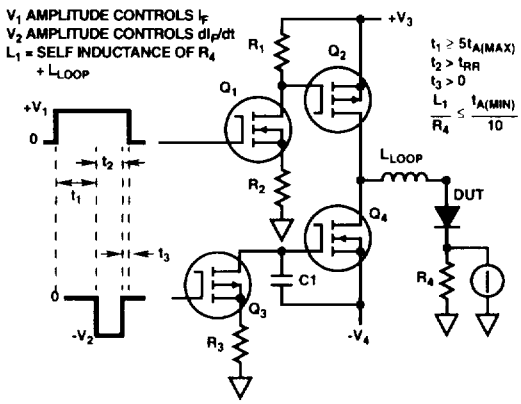


FIGURE 1. t_{RR} TEST CIRCUIT

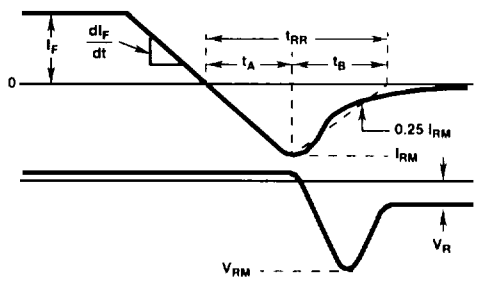


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

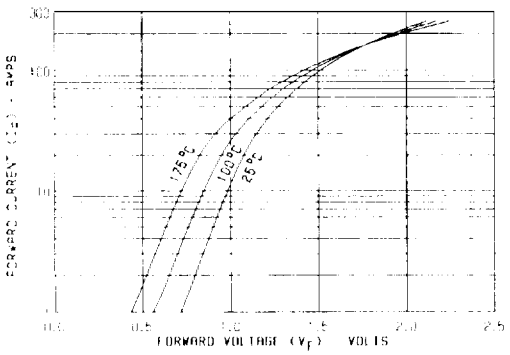


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

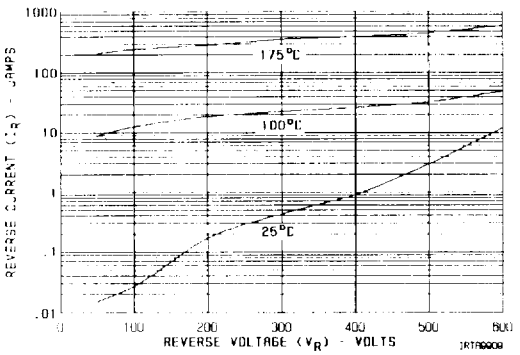


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

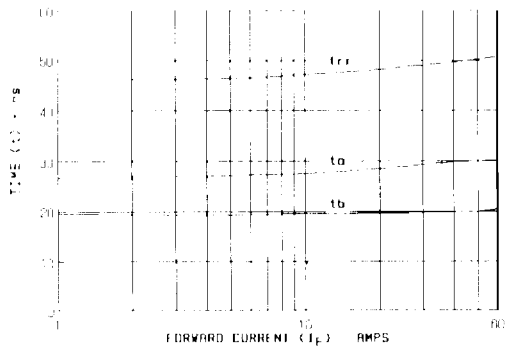


FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT

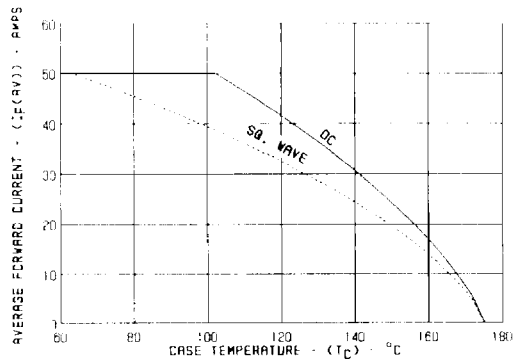


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

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

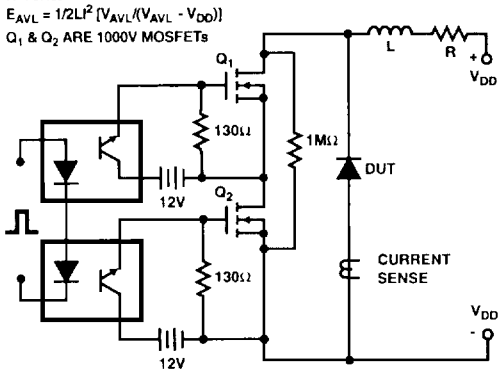


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

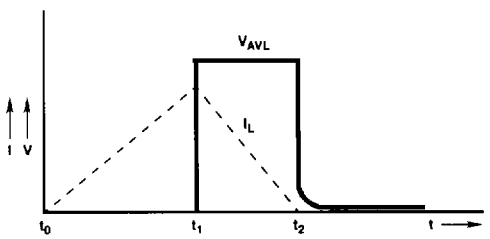


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS