HARRIS SEMICONDUCTOR

RHRG5040, RHRG5050, RHRG5060

April 1995

50A, 400V - 600V Hyperfast Diodes

Features

- **Hyperfast with Soft Recovery . . . . . <45ns**
- **Operating Temperature . . . . . +175^{o}C**
- **Reverse Voltage Up To 600V**
- **Avalanche Energy Rated**
- **Planar Construction**

Applications

- **Switching Power Supplies**
- **Power Switching Circuits**
- **General Purpose**

Description

RHRG5040, RHRG5050 and RHRG5060 (TA49065) are hyperfast diodes with soft recovery characteristics (t_{RR} <45ns). They have half the recovery time of ultrafast diodes 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 hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

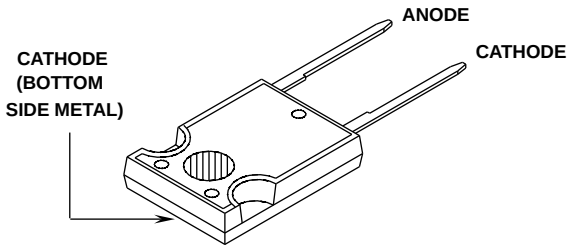
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRG5040	TO-247	RHRG5040
RHRG5050	TO-247	RHRG5050
RHRG5060	TO-247	RHRG5060

NOTE: When ordering, use the entire part number.

Package

JEDEC STYLE TO-247



Symbol

Absolute Maximum Ratings T_C = +25^{o}C, Unless Otherwise Specified

	RHRG5040	RHRG5050	RHRG5060	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 = +93^{o}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 (L = 40mH) . . . . . E_{AVL}	40	40	40	mj
Operating and Storage Temperature . . . . . T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	^{o}C

File Number **3920.1**

Electrical Specifications $T_C = +25^oC$, Unless Otherwise Specified

SYMBOL	TEST CONDITION	RHRG5040			RHRG5050			RHRG5060			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	$I_F = 50A, T_C = +25^oC$	-	-	2.1	-	-	2.1	-	-	2.1	V
	$I_F = 50A, T_C = +150^oC$	-	-	1.7	-	-	1.7	-	-	1.7	V
I_R	$V_R = 400V, T_C = +25^oC$	-	-	500	-	-	-	-	-	-	µA
	$V_R = 500V, T_C = +25^oC$	-	-	-	-	-	500	-	-	-	µA
	$V_R = 600V, T_C = +25^oC$	-	-	-	-	-	-	-	-	500	µA
I_R	$V_R = 400V, T_C = +150^oC$	-	-	1.5	-	-	-	-	-	-	mA
	$V_R = 500V, T_C = +150^oC$	-	-	-	-	-	1.5	-	-	-	mA
	$V_R = 600V, T_C = +150^oC$	-	-	-	-	-	-	-	-	1.5	mA
t_{RR}	$I_F = 1A, dI_F/dt = 100A/µs$	-	-	45	-	-	45	-	-	45	ns
	$I_F = 50A, dI_F/dt = 100A/µs$	-	-	50	-	-	50	-	-	50	ns
t_A	$I_F = 50A, dI_F/dt = 100A/µs$	-	25	-	-	25	-	-	25	-	ns
t_B	$I_F = 50A, dI_F/dt = 100A/µs$	-	20	-	-	20	-	-	20	-	ns
Q_{RR}	$I_F = 50A, dI_F/dt = 100A/µs$	-	65	-	-	65	-	-	65	-	nC
C_J	$V_R = 10V, I_F = 0A$	-	140	-	-	140	-	-	140	-	pF
$R_{\theta JC}$		-	-	1.0	-	-	1.0	-	-	1.0	$^oC/W$

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300µs, 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 10 and 11).

pw = pulse width.

D = Duty cycle.

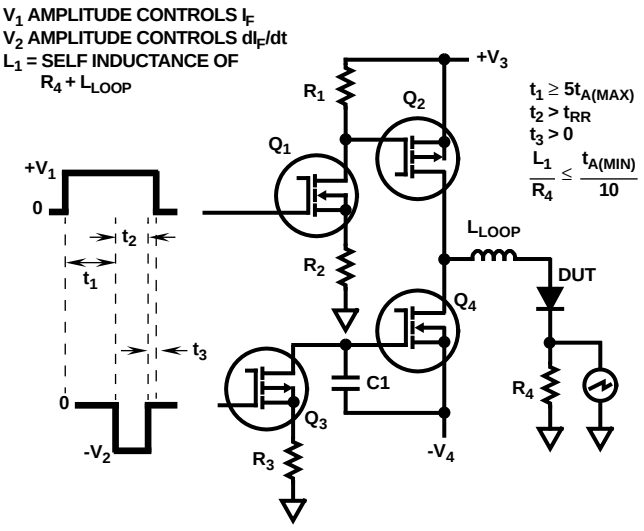


FIGURE 1. t_{RR} TEST CIRCUIT

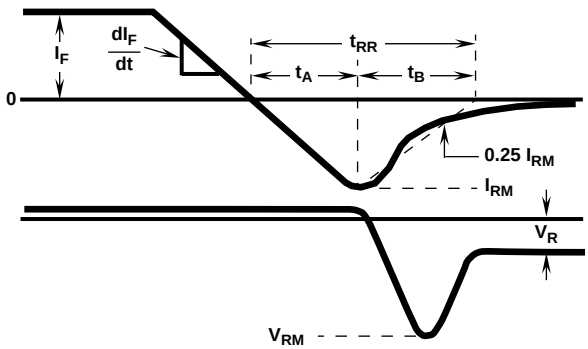


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

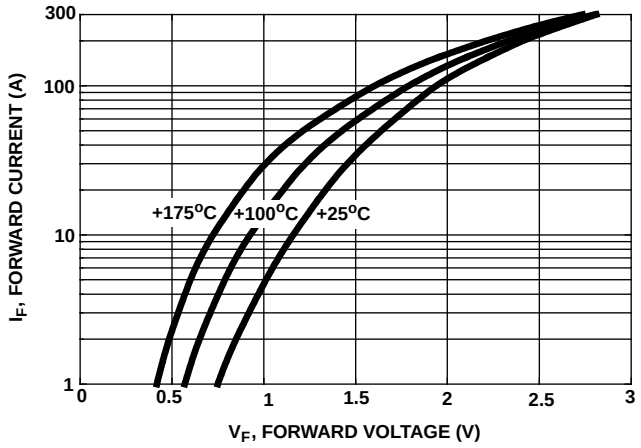


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

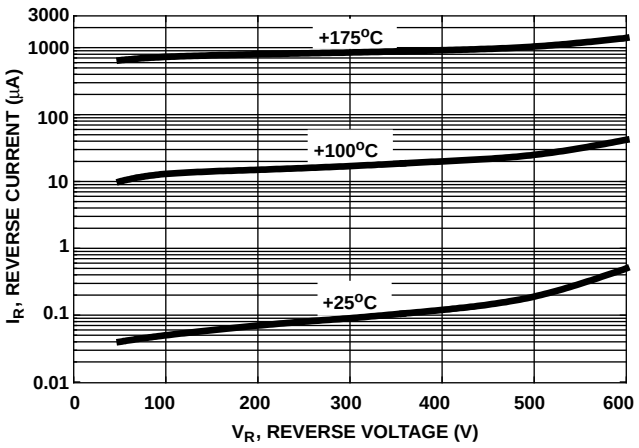


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

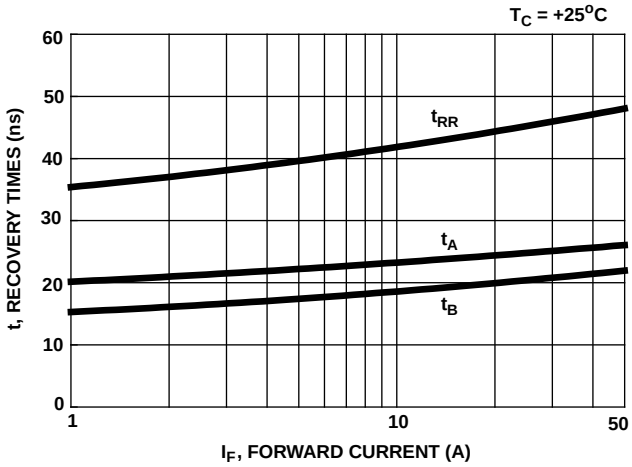


FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

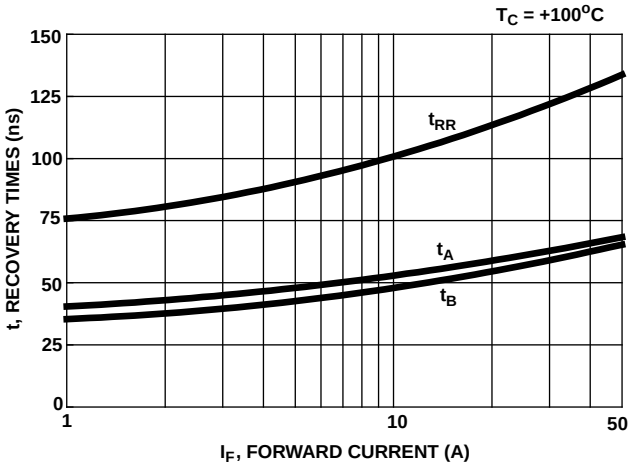


FIGURE 6. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

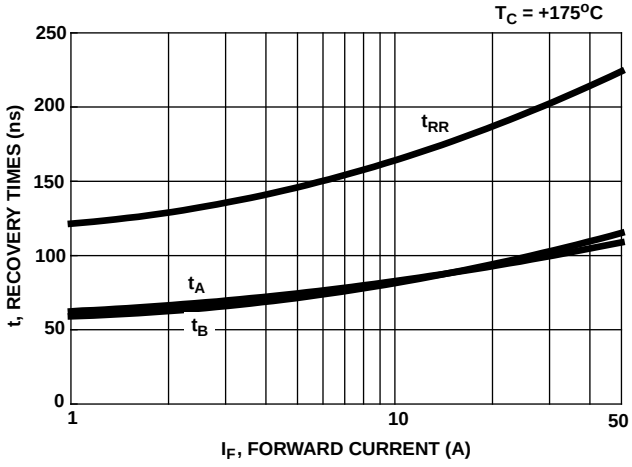


FIGURE 7. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

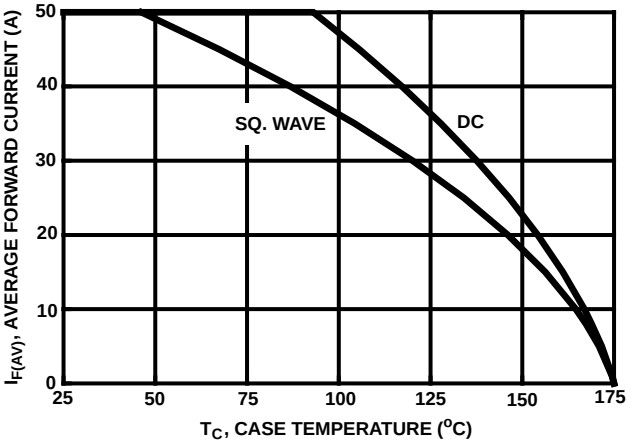


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

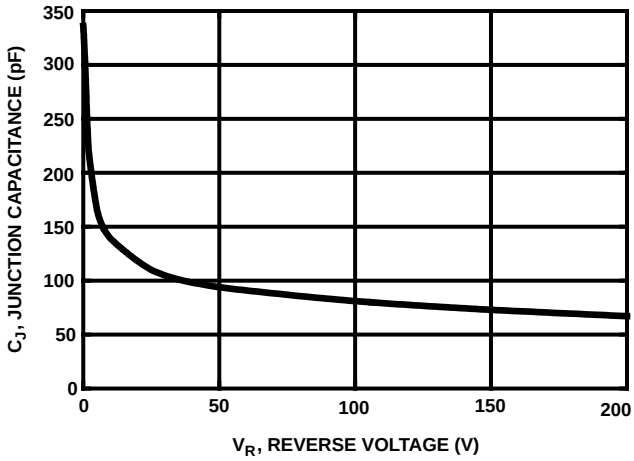


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuit and Waveforms

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

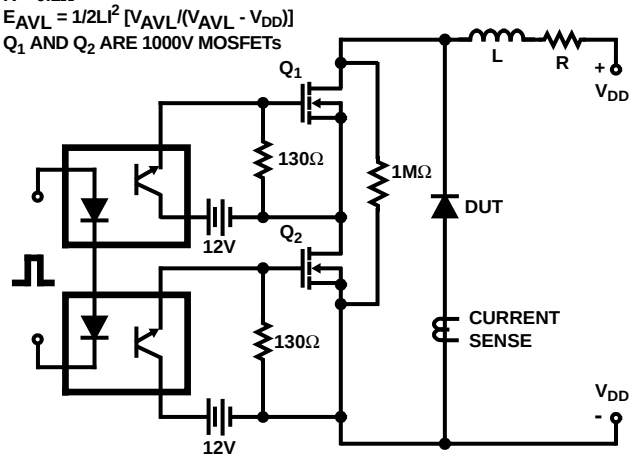


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

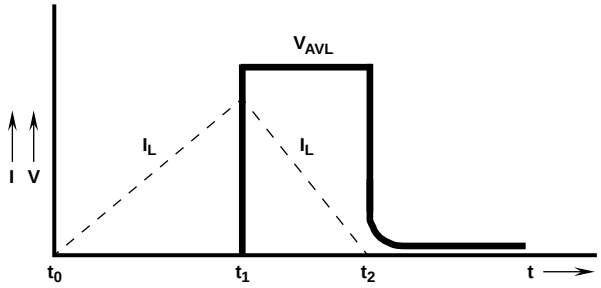


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS