

April 1995

30A, 700V - 1000V Hyperfast Diodes

Features

- Hyperfast with Soft Recovery <65ns
- Operating Temperature +175°C
- Reverse Voltage Up To 1000V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RHRG3070, RHRG3080, RHRG3090 and RHRG30100 (TA49064) are hyperfast diodes with soft recovery characteristics ($t_{RR} < 65\text{ns}$). They have half the recovery time of ultrafast diodes and are silicon nitride passivated ion-implanted epitaxial planar construction.

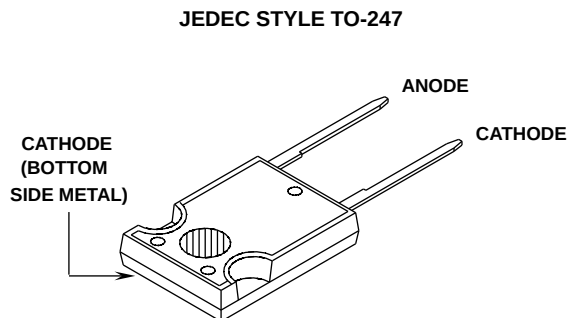
These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power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

PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRG3070	TO-247	RHRG3070
RHRG3080	TO-247	RHRG3080
RHRG3090	TO-247	RHRG3090
RHRG30100	TO-247	RHRG30100

NOTE: When ordering, use the entire part number.

Package



Symbol



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

	RHRG3070	RHRG3080	RHRG3090	RHRG30100	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 $I_{F(AV)}$ ($T_C = +95^\circ\text{C}$)	30	30	30	30	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	70	70	70	70	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz)	325	325	325	325	A
Maximum Power Dissipation P_D	125	125	125	125	W
Avalanche Energy (See Figures 10 and 11) E_{AVL}	20	20	20	20	mj
Operating and Storage Temperature T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	-65 to +175	$^\circ\text{C}$

Specifications RHRG3070, RHRG3080, RHRG3090, RHRG30100

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

SYMBOL	TEST CONDITION	RHRG3070			RHRG3080			RHRG3090			RHRG30100			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	$I_F = 30\text{A}$, $T_C = +25^{\circ}\text{C}$	-	-	3.0	-	-	3.0	-	-	3.0	-	-	3.0	V
	$I_F = 30\text{A}$, $T_C = +150^{\circ}\text{C}$	-	-	2.5	-	-	2.5	-	-	2.5	-	-	2.5	V
I_R	$V_R = 700\text{V}$, $T_C = +25^{\circ}\text{C}$	-	-	250	-	-	-	-	-	-	-	-	-	μA
	$V_R = 800\text{V}$, $T_C = +25^{\circ}\text{C}$	-	-	-	-	-	500	-	-	-	-	-	-	μA
	$V_R = 900\text{V}$, $T_C = +25^{\circ}\text{C}$	-	-	-	-	-	-	-	-	500	-	-	-	μA
	$V_R = 1000\text{V}$, $T_C = +25^{\circ}\text{C}$	-	-	-	-	-	-	-	-	-	-	-	500	μA
	$V_R = 700\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	1.0	-	-	-	-	-	-	-	-	-	mA
I_R	$V_R = 800\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	-	-	-	1.0	-	-	-	-	-	-	mA
	$V_R = 900\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	-	-	-	-	-	-	1.0	-	-	-	mA
	$V_R = 1000\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	-	-	-	-	-	-	-	-	-	1.0	mA
	$V_R = 700\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	-	-	-	-	-	-	-	-	-	-	mA
t_{RR}	$I_F = 1\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	-	65	-	-	65	-	-	65	-	-	65	ns
	$I_F = 30\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	-	75	-	-	75	-	-	75	-	-	75	ns
t_A	$I_F = 30\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	35	-	-	35	-	-	35	-	-	35	-	ns
t_B	$I_F = 30\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	33	-	-	33	-	-	33	-	-	33	-	ns
Q_{RR}	$I_F = 30\text{A}$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	200	-	-	200	-	-	200	-	-	200	-	nC
C_J	$V_R = 10\text{V}$, $I_F = 0\text{A}$	-	100	-	-	100	-	-	100	-	-	100	-	pF
$R_{\theta JC}$		-	-	1.2	-	-	1.2	-	-	1.2	-	-	1.2	$^{\circ}\text{C}/\text{W}$

DEFINITIONS

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

I_R = Instantaneous reverse current.

t_{RR} = Reverse recovery time (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).

Q_{RR} = Reverse recovery charge.

C_J = Junction Capacitance.

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

E_{AVL} = Controlled avalanche energy. (See Figures 10 and 11).

p_w = pulse width.

D = duty cycle.

V_1 AMPLITUDE CONTROLS I_F
 V_2 AMPLITUDE CONTROLS di_F/dt
 L_1 = SELF INDUCTANCE OF
 $R_4 + L_{\text{LOOP}}$

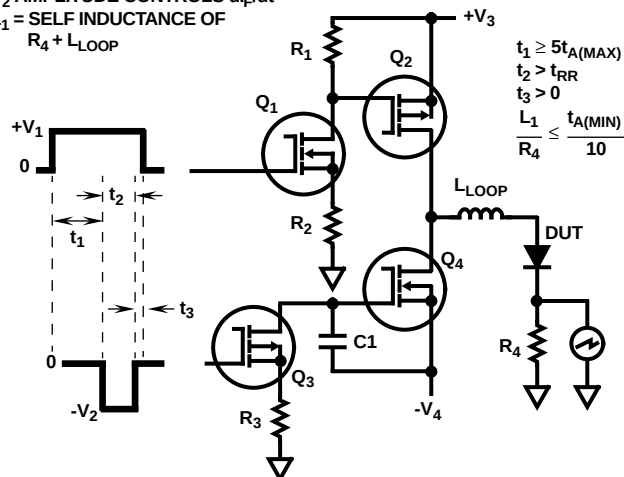


FIGURE 1. t_{RR} TEST CIRCUIT

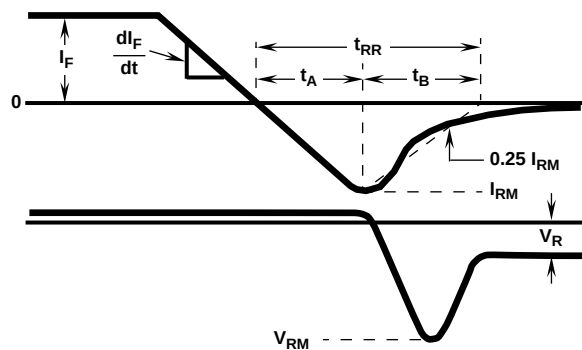


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

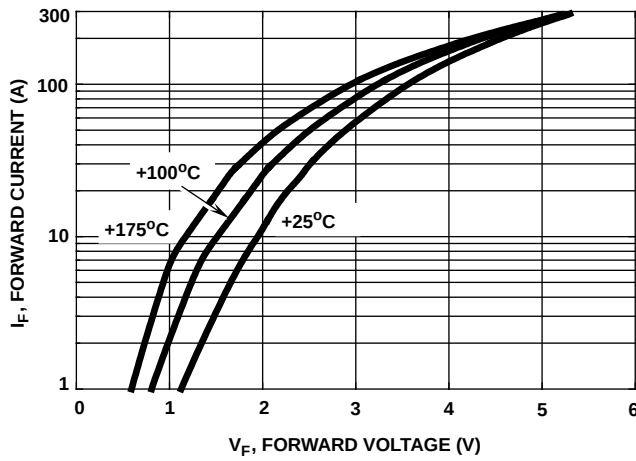


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

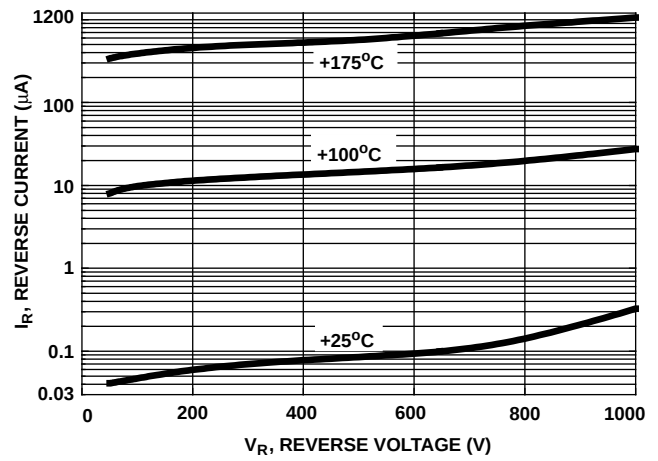


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

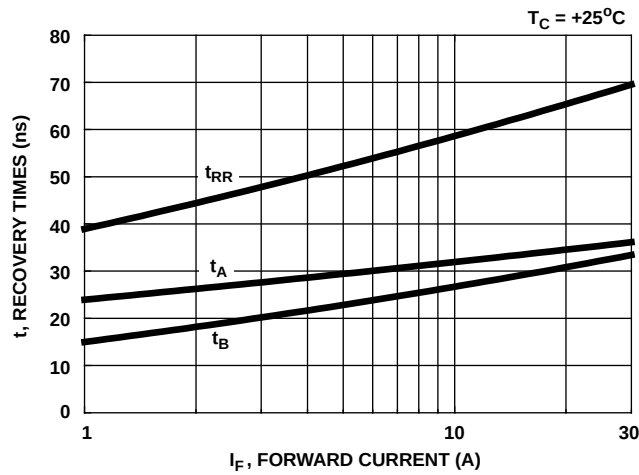


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

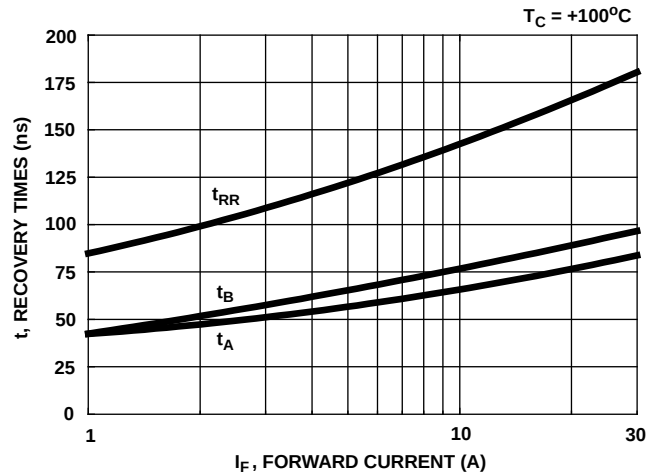


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

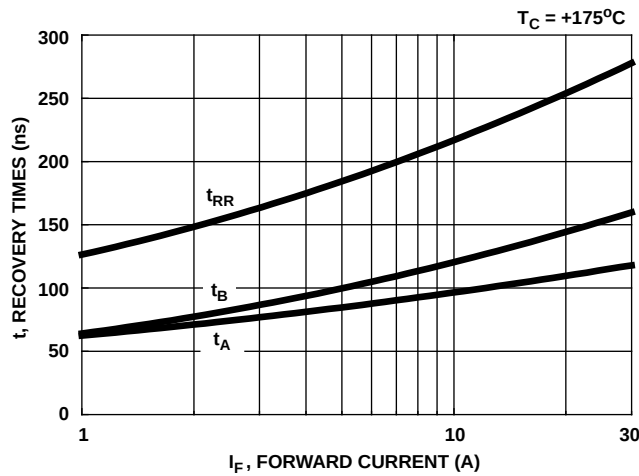


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

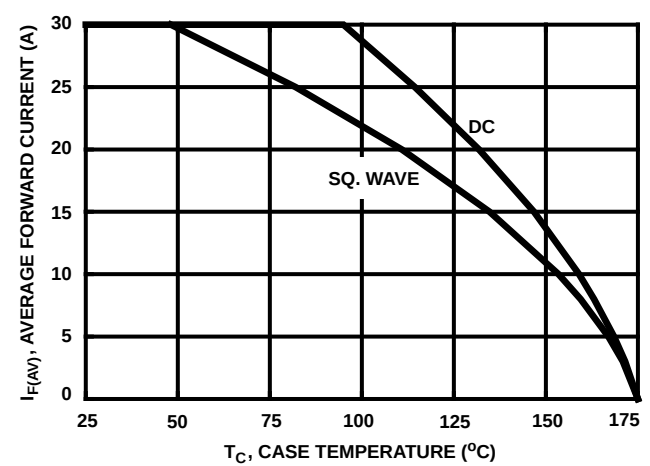


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

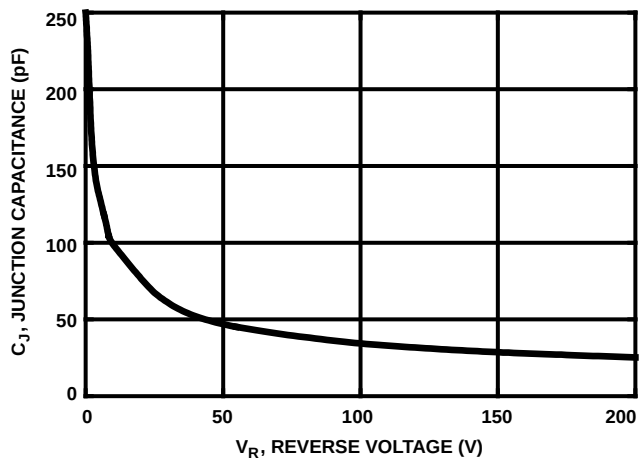


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuit and Waveforms

$$I_{MAX} = 1A$$

$$L = 40mH$$

$$R < 0.1\Omega$$

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

Q₁ AND Q₂ ARE 1000V MOSFETs

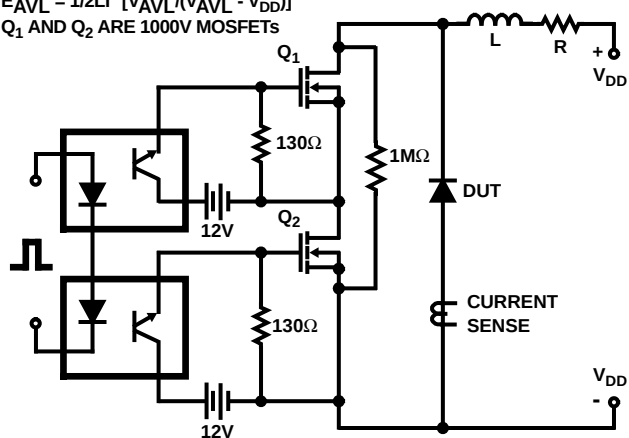


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

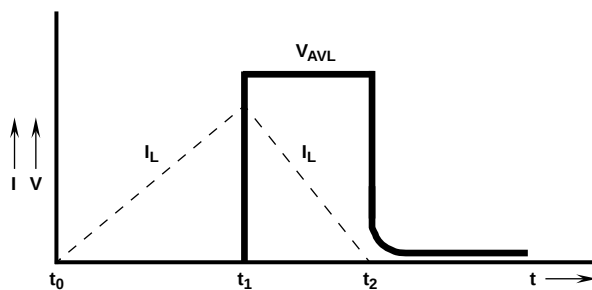


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS