HARRIS SEMICONDUCTOR

RHRG3040CC RHRG3050CC, RHRG3060CC

November 1994

30A, 400V - 600V Hyperfast Dual Diodes

Features

- Hyperfast with Soft Recovery.....<40ns
- Operating Temperature.....+175°C
- Reverse Voltage Up To 600V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RHRG3040CC, RHRG3050CC and RHRG3060CC (TA49063) are hyperfast diodes with soft recovery characteristics (t_{RR} < 40ns). 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.

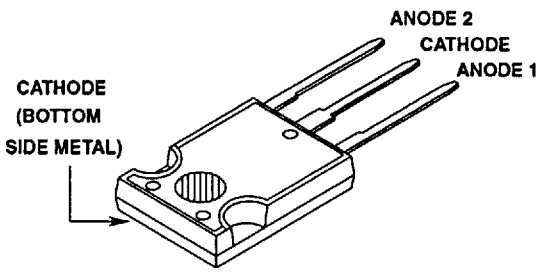
These devices are supplied in the JEDEC style TO-247 plastic package.

Due to space limitations, the brand on this part is abbreviated to HR3040CC, HR3050CC or HR3060CC.

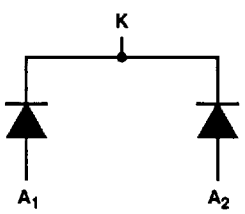
To order this part use the full part number, e.g. RHRG3060CC.

Package

JEDEC STYLE TO-247
TOP VIEW



Symbol



Absolute Maximum Ratings *(per leg)* T_C = +25°C, Unless Otherwise Specified

		RHRG3040CC	RHRG3050CC	RHRG3060CC	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 = +120°C)	$I_{F(AV)}$	30	30	30	A
Repetitive Peak Surge Current (Square Wave, 20kHz)	I_{FSM}	70	70	70	A
Nonrepetitive Peak Surge Current (Halfwave, 1 phase, 60Hz)	I_{FSM}	325	325	325	A
Maximum Power Dissipation	P_D	125	125	125	W
Avalanche Energy (See Figures 10 and 11)	E_{AVL}	20	20	20	mj
Operating and Storage Temperature	T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	°C

File Number **3939**

Electrical Specifications ***(per leg)*** T_C = +25°C, Unless Otherwise Specified

SYMBOL	TEST CONDITION	RHRG3040CC			RHRG3050CC			RHRG3060CC			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	I_F = 30A, T_C = +25°C	-	-	2.1	-	-	2.1	-	-	2.1	V
	I_F = 30A, T_C = +150°C	-	-	1.7	-	-	1.7	-	-	1.7	V
I_R	V_R = 400V, T_C = +25°C	-	-	250	-	-	-	-	-	-	µA
	V_R = 500V, T_C = +25°C	-	-	-	-	-	250	-	-	-	µA
	V_R = 600V, T_C = +25°C	-	-	-	-	-	-	-	-	250	µA
I_R	V_R = 400V, T_C = +150°C	-	-	1.0	-	-	-	-	-	-	mA
	V_R = 500V, T_C = +150°C	-	-	-	-	-	1.0	-	-	-	mA
	V_R = 600V, T_C = +150°C	-	-	-	-	-	-	-	-	1.0	mA
t_{RR}	I_F = 1A, dI_F/dt = 100A/µs	-	-	40	-	-	40	-	-	40	ns
	I_F = 30A, dI_F/dt = 100A/µs	-	-	45	-	-	45	-	-	45	ns
t_A	I_F = 30A, dI_F/dt = 100A/µs	-	22	-	-	22	-	-	22	-	ns
t_B	I_F = 30A, dI_F/dt = 100A/µs	-	20	-	-	20	-	-	20	-	ns
Q_{RR}	I_F = 30A, dI_F/dt = 100A/µs	-	50	-	-	50	-	-	50	-	nC
C_J	V_R = 10V, I_F = 0A	-	85	-	-	85	-	-	85	-	pF
$R_{\theta JC}$		-	-	1.2	-	-	1.2	-	-	1.2	°C/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).

Q_{RR} = Reverse recovery charge.

C_J = Junction Capacitance.

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

pw = pulse width.

D = duty cycle.

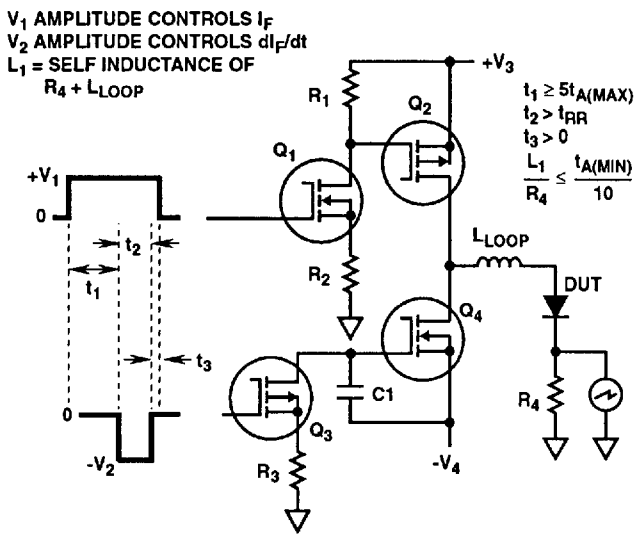


FIGURE 1. t_{RR} TEST CIRCUIT

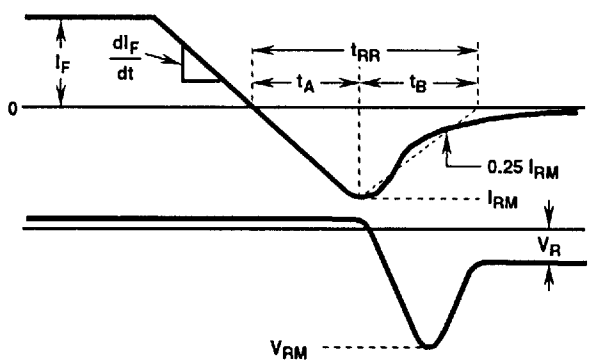


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

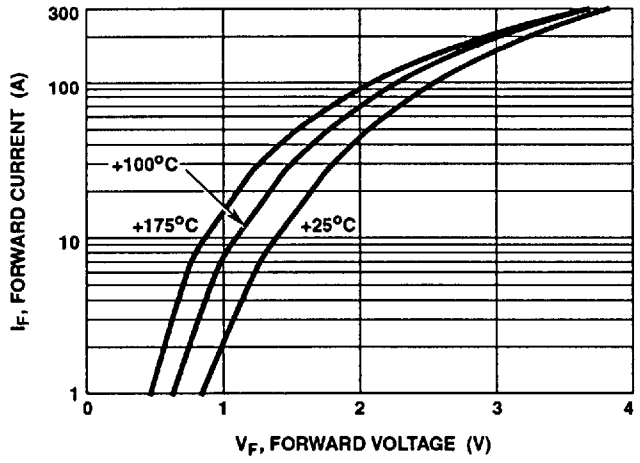


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

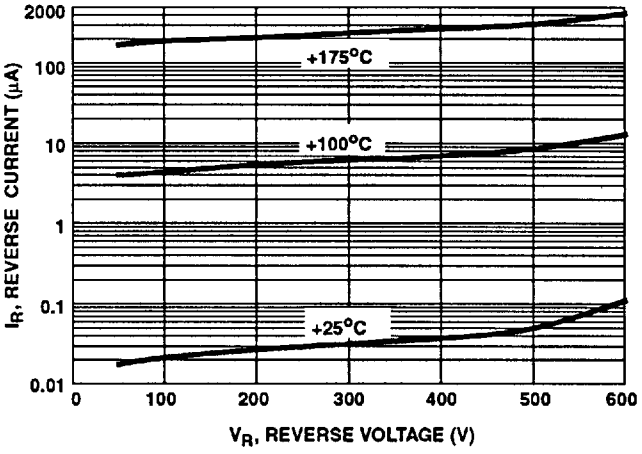


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

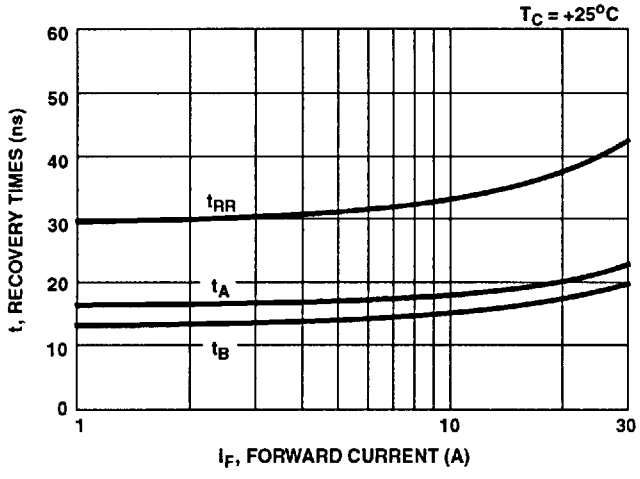


FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

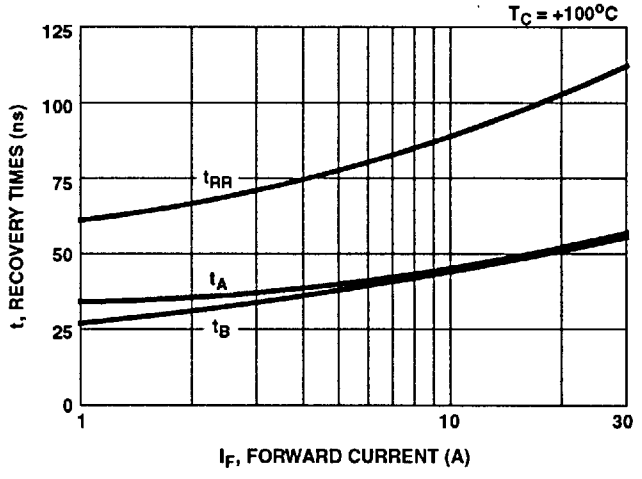


FIGURE 6. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

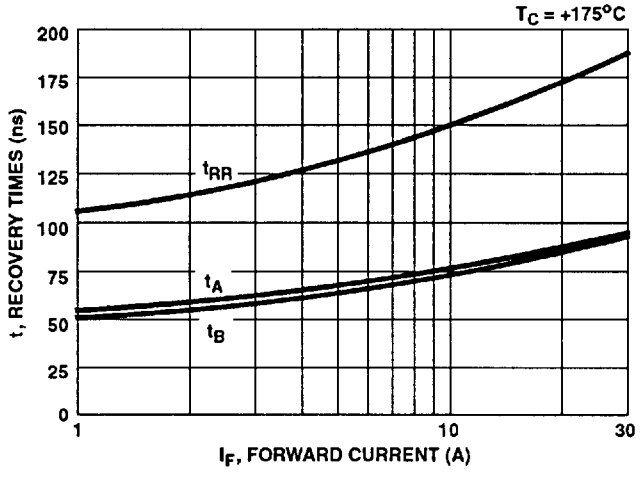


FIGURE 7. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

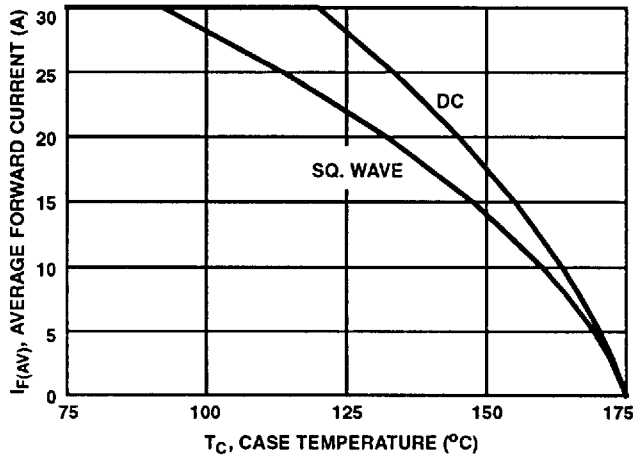


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

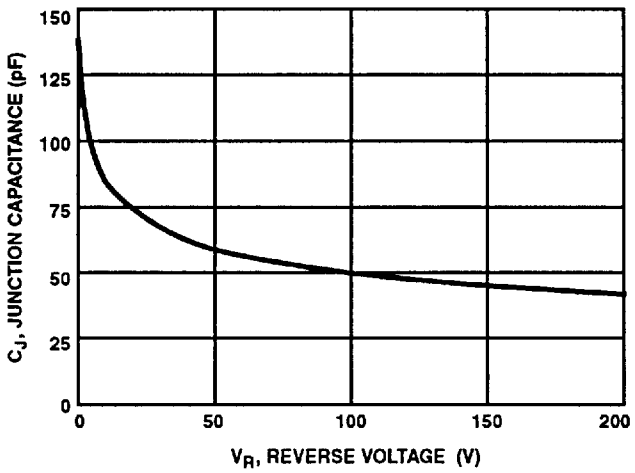


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

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

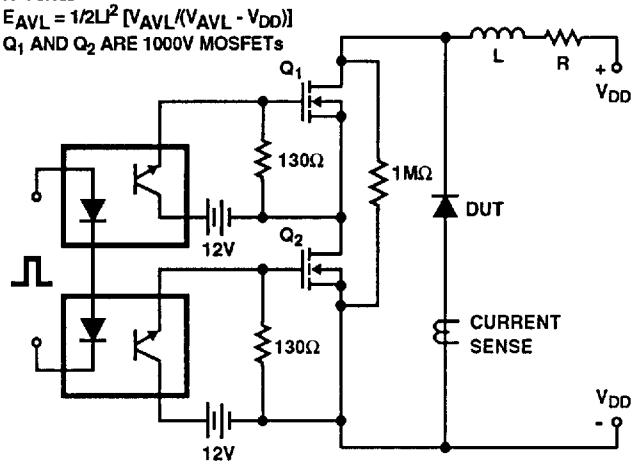


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

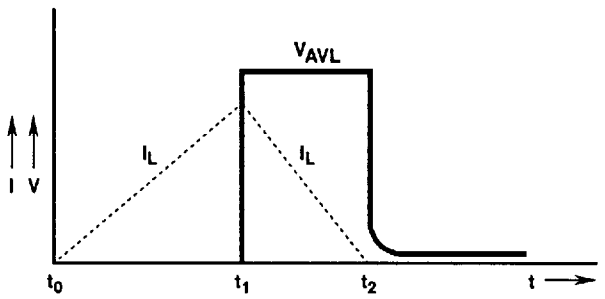
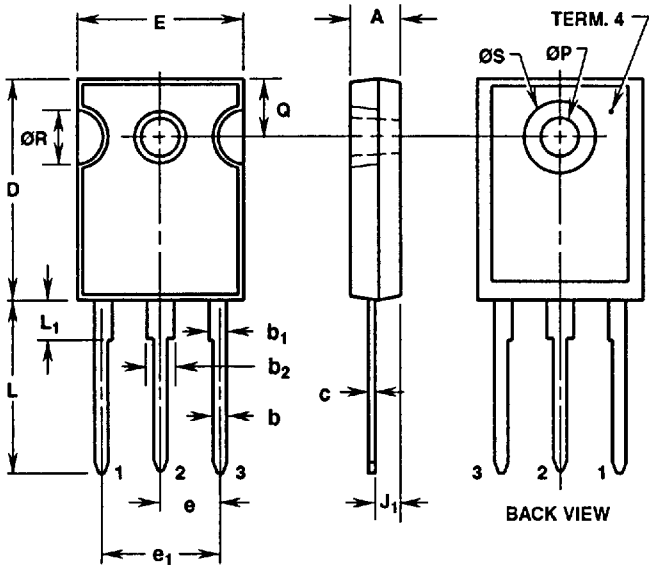


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

Packaging



LEAD 1. ANODE 1
LEAD 2. CATHODE
LEAD 3. ANODE 2
TERM 4. CATHODE

TO-247

3 LEAD JEDEC STYLE TO-247 PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.180	0.190	4.58	4.82	-
b	0.046	0.051	1.17	1.29	2, 3
b_1	0.060	0.070	1.53	1.77	1, 2
b_2	0.095	0.105	2.42	2.66	1, 2
c	0.020	0.026	0.51	0.66	1, 2, 3
D	0.800	0.820	20.32	20.82	-
E	0.605	0.625	15.37	15.87	-
e	0.219 TYP		5.56 TYP		4
e_1	0.438 BSC		11.12 BSC		4
J_1	0.090	0.105	2.29	2.66	5
L	0.620	0.640	15.75	16.25	-
L_1	0.145	0.155	3.69	3.93	1
ØP	0.138	0.144	3.51	3.65	-
Q	0.210	0.220	5.34	5.58	-
ØR	0.195	0.205	4.96	5.20	-
ØS	0.260	0.270	6.61	6.85	-

NOTES:

1. Lead dimension and finish uncontrolled in L_1.
2. Lead dimension (without solder).
3. Add typically 0.002 inches (0.05mm) for solder coating.
4. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
5. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
6. Controlling dimension: Inch.
7. Revision 1 dated 1-93.