

# Hyperfast Diode

30 A, 400 V – 600 V

## RHRG3040, RHRG3060

### Description

The RHRG3040, RHRG3060 is a hyperfast diode with soft recovery characteristics. It has the half recovery time of ultrafast diodes and is silicon nitride passivated ionimplanted epitaxial planar construction. These devices are intended to be used as freewheeling/clamping diodes and diodes 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.

### Features

- Hyperfast Recovery  $t_{rr} = 45 \text{ ns}$  (@  $I_F = 30 \text{ A}$ )
- Max Forward Voltage,  $V_F = 2.1 \text{ V}$  (@  $T_C = 25^\circ\text{C}$ )
- 400 V, 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- These Devices are Pb-Free and are RoHS Compliant

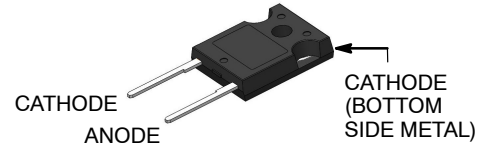
### Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose



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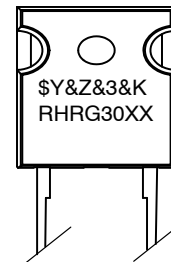


TO-247-2LD  
CASE 340CL

### SYMBOL



### MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
RHRG30XX	= Specific Device Code
XX	= 40, 60

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# RHRG3040, RHRG3060

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

Parameter	Symbol	RHRG3040	RHRG3060	Unit
Peak Repetitive Reverse Voltage	V <sub>RRM</sub>	400	600	V
Working Peak Reverse Voltage	V <sub>RWM</sub>	400	600	V
DC Blocking Voltage	V <sub>R</sub>	400	600	V
Average Rectified Forward Current (T <sub>C</sub> = 120°C)	I <sub>F(AV)</sub>	30	30	A
Repetitive Peak Surge Current (Square Wave, 20 kHz)	I <sub>FRM</sub>	70	70	A
Non-repetitive Peak Surge Current (Halfwave, 1 Phase, 60 Hz)	I <sub>FSM</sub>	325	325	A
Maximum Power Dissipation	P <sub>D</sub>	125	125	W
Avalanche Energy (See Figures 10 and 11)	E <sub>AVL</sub>	20	20	mJ
Operating and Storage Temperature	T <sub>STG, T<sub>J</sub></sub>	-65 to 175	-65 to 175	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Shipping
RHRG3040	RHRG3040	TO-247-2LD	450 / Tube
RHRG3060	RHRG3060	TO-247-2LD	450 / Tube

## ELECTRICAL SPECIFICATION (T<sub>C</sub> = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Condition	RHRG3040			RHRG3060			Unit
			Min	Typ	Max	Min	Typ	Max	
Instantaneous Forward Voltage (Pulse Width = 300 μs, Duty Cycle = 2%)	V <sub>F</sub>	I <sub>F</sub> = 30 A	-	-	2.1	-	-	2.1	V
		I <sub>F</sub> = 30 A, T <sub>C</sub> = 150°C	-	-	1.7	-	-	1.7	V
Instantaneous Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 400 V	-	-	250	-	-	-	μA
		V <sub>R</sub> = 600 V	-	-	-	-	-	250	μA
		V <sub>R</sub> = 400 V, T <sub>C</sub> = 150°C	-	-	1.0	-	-	-	mA
		V <sub>R</sub> = 600 V, T <sub>C</sub> = 150°C	-	-	-	-	-	1.0	mA
Reverse Recovery Time (See Figure 9) Summation of t <sub>a</sub> + t <sub>b</sub>	t <sub>rr</sub>	I <sub>F</sub> = 1 A, dI <sub>F</sub> /dt = 200 A/μs	-	-	40	-	-	40	ns
		I <sub>F</sub> = 30 A, dI <sub>F</sub> /dt = 200 A/μs	-	-	45	-	-	45	ns
Time to Reach Peak Reverse Current (See Figure 9)	t <sub>a</sub>	I <sub>F</sub> = 30 A, dI <sub>F</sub> /dt = 200 A/μs	-	22	-	-	22	-	ns
Time from Peak I <sub>RM</sub> to Projected Zero Crossing of I <sub>RM</sub> Based on a Straight Line from Peak I <sub>RM</sub> through 25% of I <sub>RM</sub> (See Figure 9)	t <sub>b</sub>	I <sub>F</sub> = 30 A, dI <sub>F</sub> /dt = 200 A/μs	-	18	-	-	18	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = 30 A, dI <sub>F</sub> /dt = 200 A/μs	-	100	-	-	100	-	nC
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 10 V, I <sub>F</sub> = 0 A	-	85	-	-	85	-	pF
Thermal Resistance Junction to Case	R <sub>θJC</sub>		-	-	1.2	-	-	1.2	°C/W

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# RHRG3040, RHRG3060

## TYPICAL PERFORMANCE CURVES

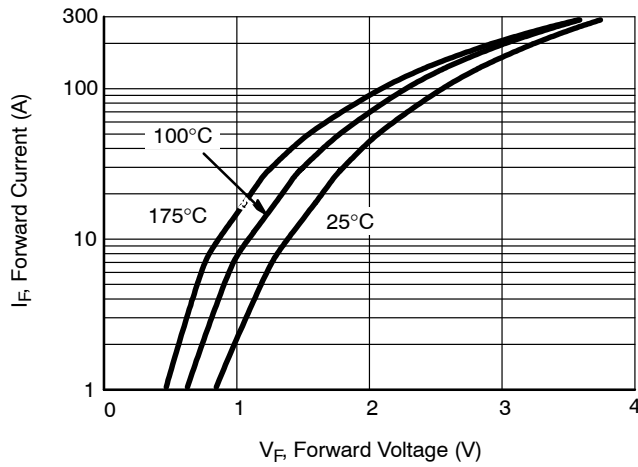


Figure 1. Forward Current vs. Forward Voltage

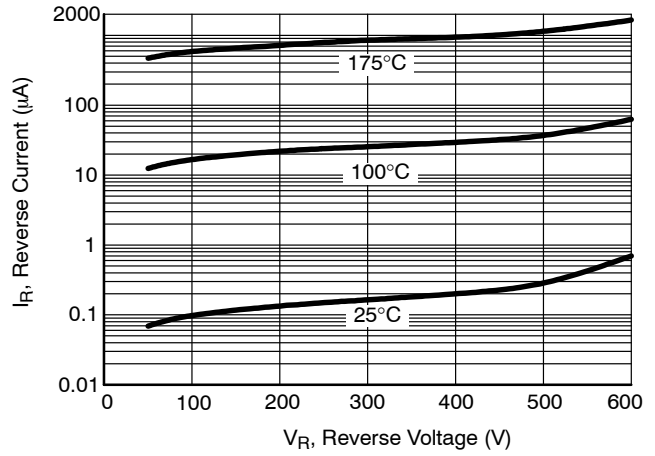


Figure 2. Reverse Current vs. Reverse Voltage

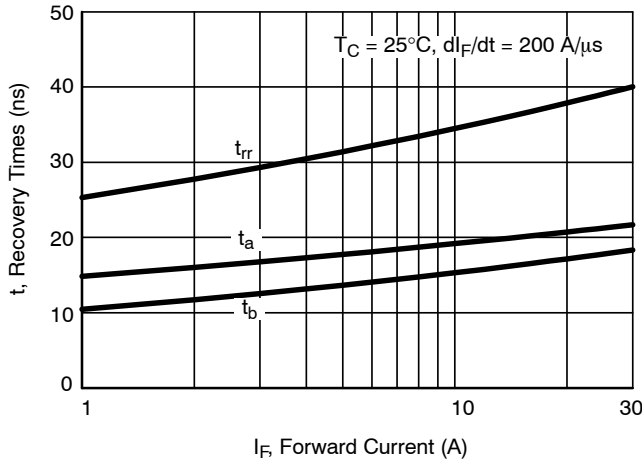


Figure 3.  $t_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward Current

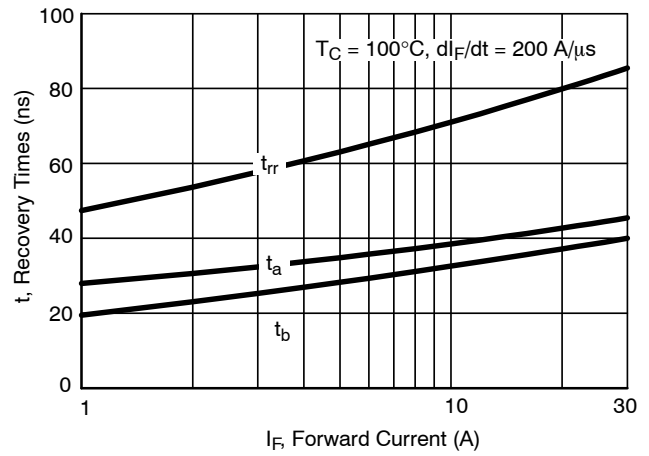


Figure 4.  $t_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward Current

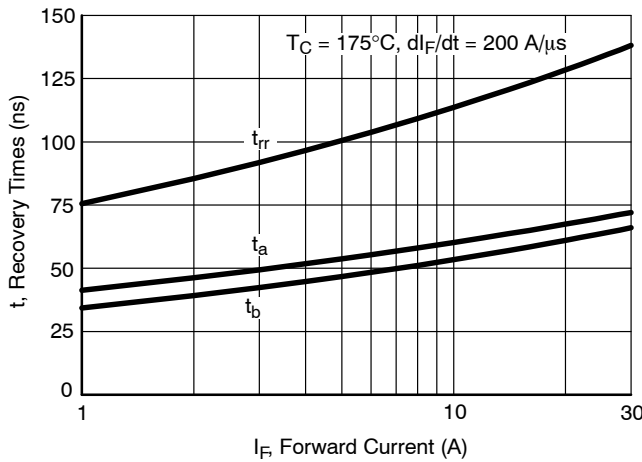


Figure 5.  $t_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward Current

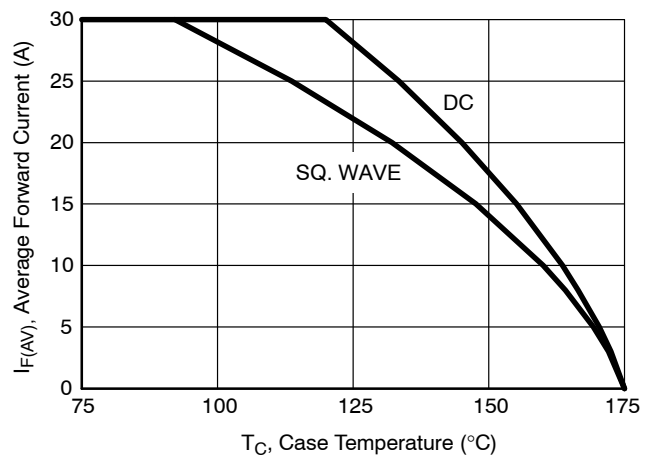


Figure 6. Current Derating Curve

TYPICAL PERFORMANCE CURVES (continued)

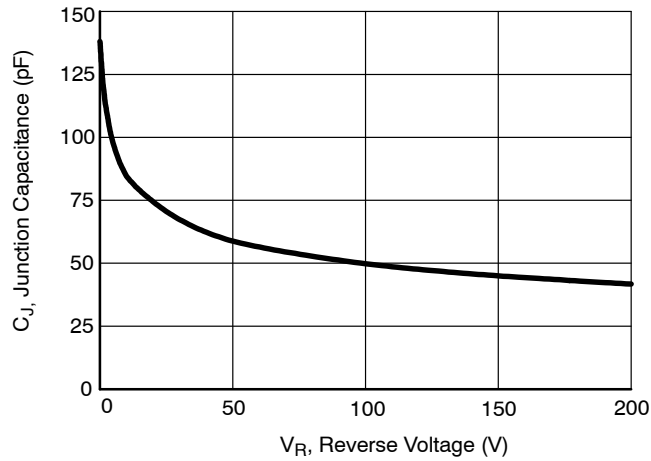


Figure 7. Junction Capacitance vs. Reverse Voltage

TEST CIRCUITS AND WAVEFORMS

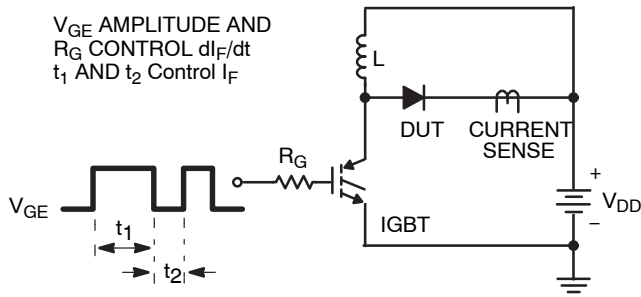


Figure 8.  $t_{rr}$  Test Circuit

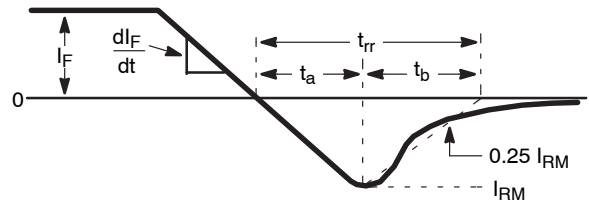


Figure 9.  $t_{rr}$  Waveforms and Definitions

$I_{MAX} = 1 \text{ A}$   
 $L = 40 \text{ mH}$   
 $R < 0.1 \Omega$   
 $E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$   
 $Q_1 = \text{IGBT (} BV_{CES} > \text{DUT } V_{R(AVL)} \text{)}$

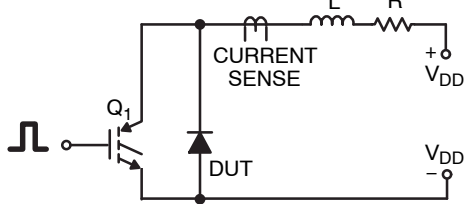


Figure 10. Avalanche Energy Test Circuit

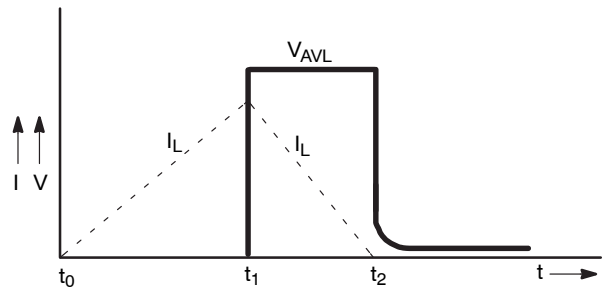


Figure 11. Avalanche Current and Voltage Waveforms

# MECHANICAL CASE OUTLINE

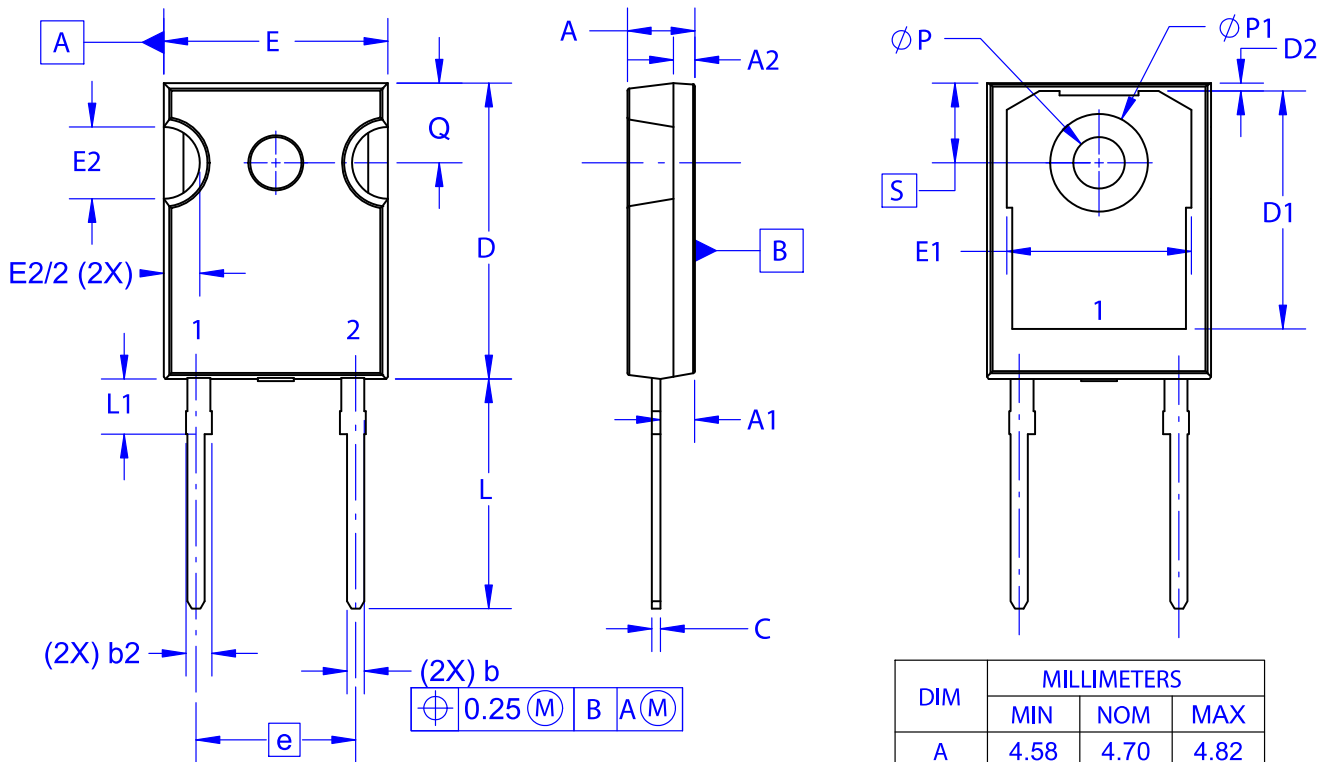
## PACKAGE DIMENSIONS

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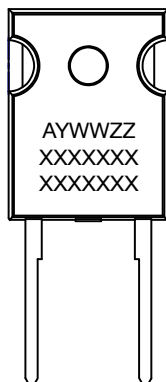


$\oplus 0.25 (M) B A (M)$

NOTES: UNLESS OTHERWISE SPECIFIED.

- A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
- D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
- E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

### GENERIC MARKING DIAGRAM\*



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.29	2.40	2.66
A2	1.30	1.50	1.70
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	16.37	16.57	16.77
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	11.12	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
∅P	3.51	3.58	3.65
∅P1	6.61	6.73	6.85
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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