

# Hyperfast Rectifier

## 50 A, 600 V

### RHRG5060-F085

#### Description

The RHRG5060-F085 is an hyperfast diode with softrecovery characteristics ( $t_{rr} < 45\text{ns}$ ). It has half the recovery time of ultrafast diode and is of silicon nitride passivated ion-implanted epitaxial planar construction.

This device is intended for use as a freewheeling/clamping diode and rectifier in a variety of automotive switching power supplies and other power switching automotive applications. Its low stored charge and hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits, thus reducing power loss in the switching transistors.

#### Features

- High Speed Switching ( $t_{rr} = 45\text{ ns (Typ.) @ } I_F = 50\text{ A}$ )
- Low Forward Voltage ( $V_F = 1.67\text{ V (Typ.) @ } I_F = 50\text{ A}$ )
- Avalanche Energy Rated
- AEC-Q101 Qualified
- This Device is Pb-Free

#### Applications

- Switching Power Supply
- Power Switching Circuits
- General Purpose
- Automotive and General Purpose

#### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

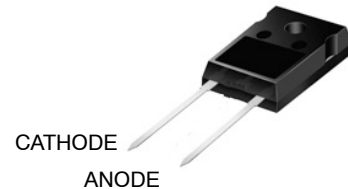
Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$	600	V
Working Peak Reverse Voltage	$V_{RWM}$	600	V
DC Blocking Voltage	$V_R$	600	V
Average Rectified Forward Current @ $T_C = 25^\circ\text{C}$	$I_{F(AV)}$	50	A
Non-repetitive Peak Surge Current (Halfwave 1 Phase 50 Hz)	$I_{FSM}$	150	A
Avalanche Energy (1.4 A, 40 mH)	$E_{AVL}$	40	mJ
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

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.



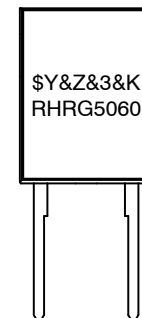
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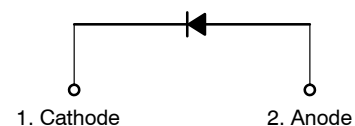


TO-247-2L  
340CL

#### MARKING DIAGRAM



\$Y = ON Semiconductor Logo  
 &Z = Assembly Plant Code  
 &3 = Numeric Date Code  
 &K = Lot Code  
 RHRG5060 = Specific Device Code



#### ORDERING INFORMATION

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

## RHRG5060–F085

### THEMAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Maximum Thermal Resistance, Junction to Case	0.42	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	45	$^\circ\text{C}/\text{W}$

### PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Tube	Quantity
RHRG5060	RHRG5060–F085	TO–247	–	30

### ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$I_R$	Instantaneous Reverse Current	$V_R = 600\text{ V}$	$T_C = 25^\circ\text{C}$	–	–	250	$\mu\text{A}$
			$T_C = 175^\circ\text{C}$	–	–	1.5	$\text{mA}$
$V_{FM}$ (Note 1)	Instantaneous Forward Voltage	$I_F = 50\text{ A}$	$T_C = 25^\circ\text{C}$	–	1.67	2.1	$\text{V}$
			$T_C = 175^\circ\text{C}$	–	1.29	1.7	$\text{V}$
$t_{rr}$ (Note 2)	Reverse Recovery Time	$I_F = 1\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{CC} = 390\text{ V}$	$T_C = 25^\circ\text{C}$	–	37	45	$\text{ns}$
			$T_C = 25^\circ\text{C}$	–	45	60	$\text{ns}$
			$T_C = 175^\circ\text{C}$	–	200	–	$\text{ns}$
$t_a$	Reverse Recovery Time	$I_F = 50\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{CC} = 390\text{ V}$	$T_C = 25^\circ\text{C}$	–	25	–	$\text{ns}$
$t_b$	Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	–	20	–	$\text{ns}$
$Q_{rr}$			$T_C = 25^\circ\text{C}$	–	45	–	$\text{nC}$

1. Pulse : Test Pulse width = 300  $\mu\text{s}$ , Duty Cycle = 2%

2. Guaranteed by design

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.

TEST CIRCUITS AND WAVEFORMS

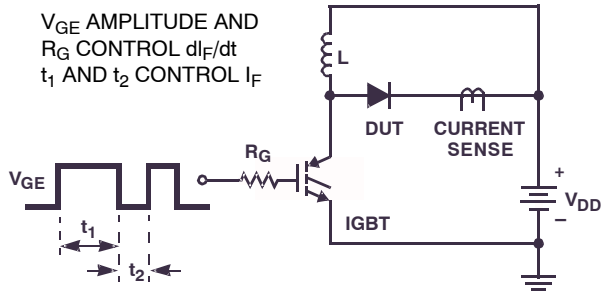


Figure 1.  $T_{rr}$  Test Circuit

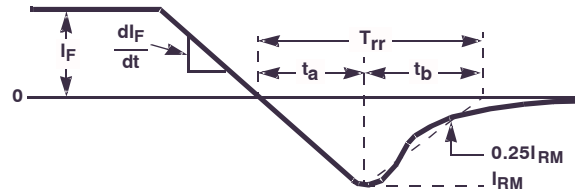


Figure 2.  $T_{rr}$  Waveforms and Definitions

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

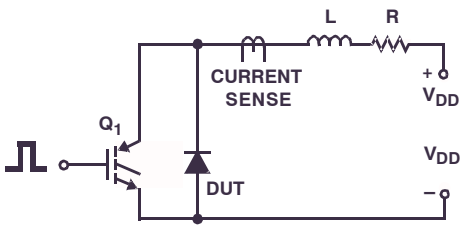


Figure 3. Avalanche Energy Test Circuit

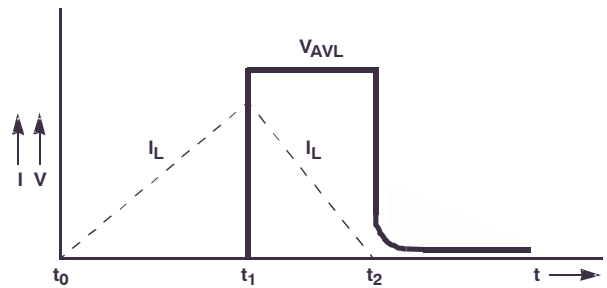


Figure 4. Avalanche Current and Voltage Waveforms

TYPICAL PERFORMANCE CHARACTERISTICS

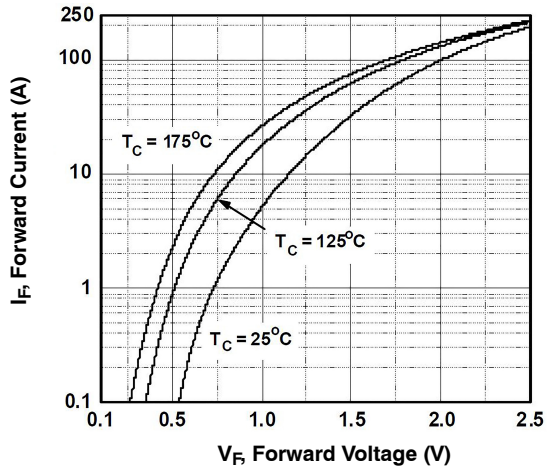


Figure 5. Typical Forward Voltage Drop vs. Forward Current

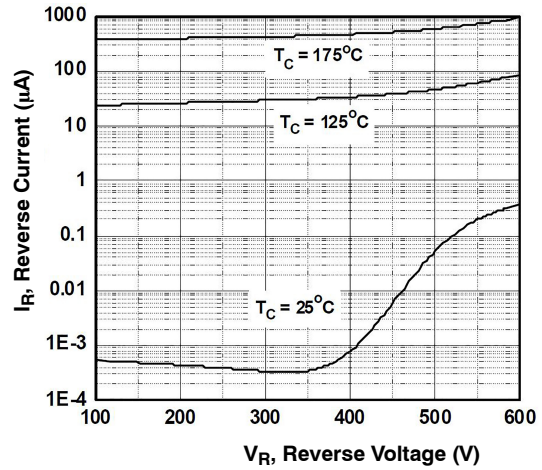


Figure 6. Typical Reverse Current vs. Reverse Voltage

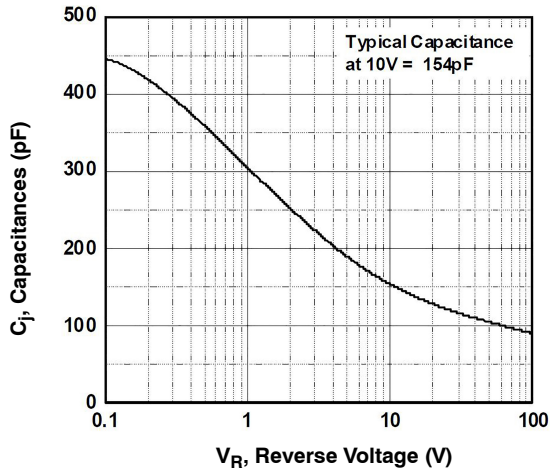


Figure 7. Typical Junction Capacitance

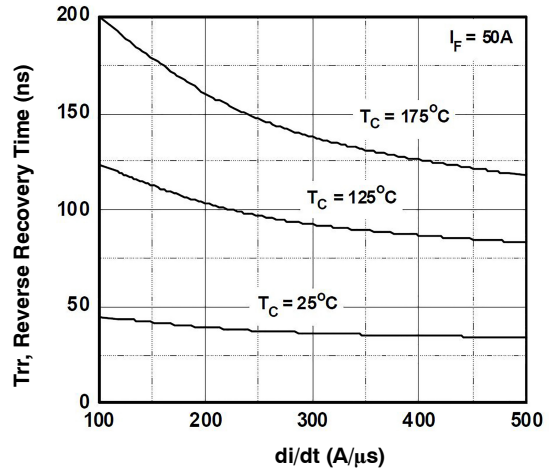


Figure 8. Typical Reverse Recovery Time vs. di/dt

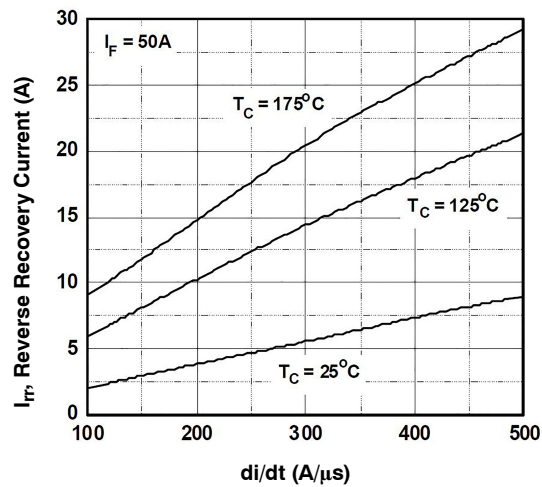


Figure 9. Typical Reverse Recovery Current vs. di/dt

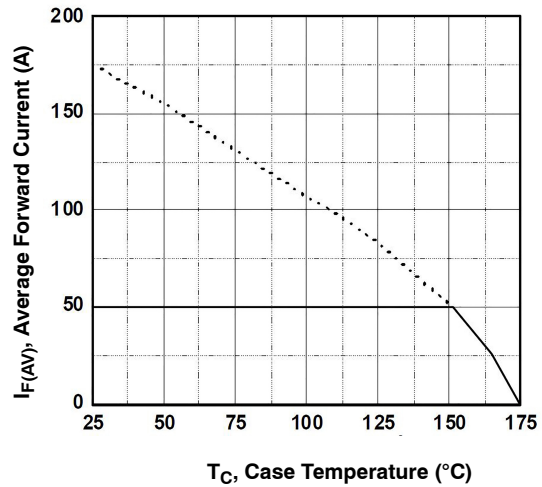


Figure 10. Forward Current Derating Curve

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

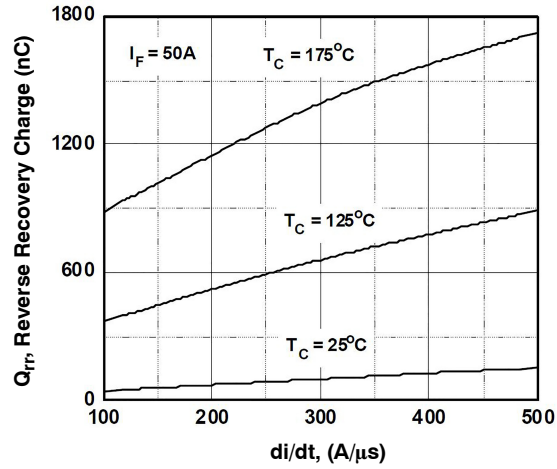


Figure 11. Reverse Recovery Charge

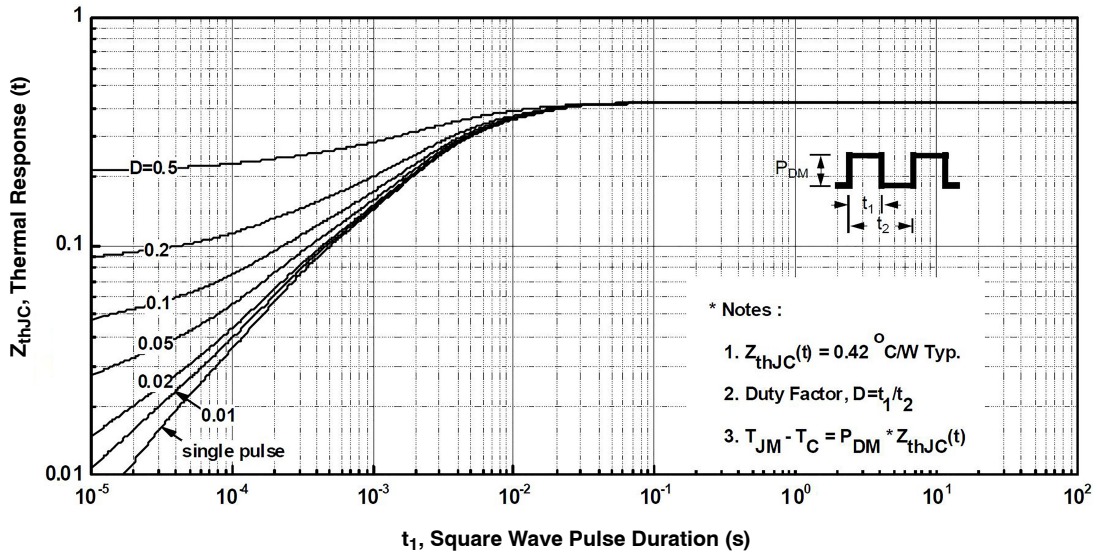


Figure 12. Transient Thermal Response Curve

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



TO-247-2LD  
CASE 340CL  
ISSUE A

DATE 03 DEC 2019



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

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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DESCRIPTION:	TO-247-2LD	PAGE 1 OF 1

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