

# Hyperfast Diode

## 50 A, 600 V

### RHRG5060

#### Description

The RHRG5060 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 (  $t_{rr} = 50 \text{ ns}$  ( @  $I_F = 50 \text{ A}$  )
- Max Forward Voltage(  $V_F = 2.1 \text{ V}$  ( @  $T_C = 25^\circ\text{C}$  )
- 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- This Device is Pb-Free and is RoHS Compliant

#### Applications

- Switching Power Supplies
- Power Switching Circuits
- 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 ( $T_C = 93^\circ\text{C}$ ) | $I_{F(AV)}$    | 50          | A                |
| Repetitive Peak Surge Current (Square Wave, 20 kHz)            | $I_{FRM}$      | 100         | A                |
| Nonrepetitive Peak Surge Current (Halfwave 1 Phase, 60 Hz)     | $I_{FSM}$      | 500         | A                |
| Maximum Power Dissipation                                      | $P_D$          | 150         | W                |
| Avalanche Energy (See Figure 10 and Figure 11)                 | $E_{AVL}$      | 40          | mJ               |
| Operating and Storage Temperature                              | $T_{STG}, T_J$ | -65 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.

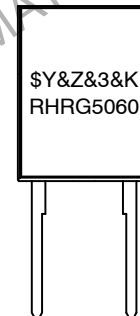


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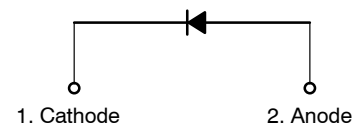
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#### MARKING DIAGRAM



\$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

## PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Package   | Brand    |
|-------------|-----------|----------|
| RHRG5060    | TO-247-2L | RHRG5060 |

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

| Symbol          | Parameter                                                                                                                                               | Test Conditions                                               | Min | Typ | Max | Unit                      |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----|-----|-----|---------------------------|
| $V_F$           | Instantaneous Forward Voltage<br>(Pulse Width = 300 $\mu\text{s}$ , Duty Cycle = 2%)                                                                    | $I_F = 50\text{ A}$                                           |     |     | 2.1 | V                         |
|                 |                                                                                                                                                         | $I_F = 50\text{ A}$ ,<br>$T_C = 150^\circ\text{C}$            |     |     | 1.7 | V                         |
| $I_R$           | Instantaneous Reverse Current                                                                                                                           | $V_R = 600\text{ V}$                                          |     |     | 250 | $\mu\text{A}$             |
|                 |                                                                                                                                                         | $V_R = 600\text{ V}$ ,<br>$T_C = 150^\circ\text{C}$           |     |     | 1.5 | mA                        |
| $t_{rr}$        | Reverse Recovery Time (See Figure 9 )<br>Summation of $t_a + t_b$                                                                                       | $I_F = 1\text{ A}$ ,<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$  |     |     | 45  | ns                        |
|                 |                                                                                                                                                         | $I_F = 50\text{ A}$ ,<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$ |     |     | 50  | ns                        |
| $t_a$           | Time to Reach Peak Reverse Current (See Figure 9)                                                                                                       | $I_F = 50\text{ A}$ ,<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$ |     | 25  |     | ns                        |
| $t_b$           | Time from Peak $I_{RM}$ to Projected Zero Crossing of $I_{RM}$<br>Based on a Straight Line from Peak $I_{RM}$ Through 25%<br>of $I_{RM}$ (See Figure 9) | $I_F = 50\text{ A}$ ,<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$ |     | 20  |     | ns                        |
| $Q_{rr}$        | Reverse Recovery Charge                                                                                                                                 | $I_F = 50\text{ A}$ ,<br>$dI_F/dt = 100\text{ A}/\mu\text{s}$ |     | 65  |     | nC                        |
| $C_J$           | Junction Capacitance                                                                                                                                    | $V_R = 10\text{ V}$ ,<br>$I_F = 0\text{ A}$                   |     | 140 |     | pF                        |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case                                                                                                                     |                                                               |     |     | 1.0 | $^\circ\text{C}/\text{W}$ |

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.

## TYPICAL PERFORMANCE CURVES

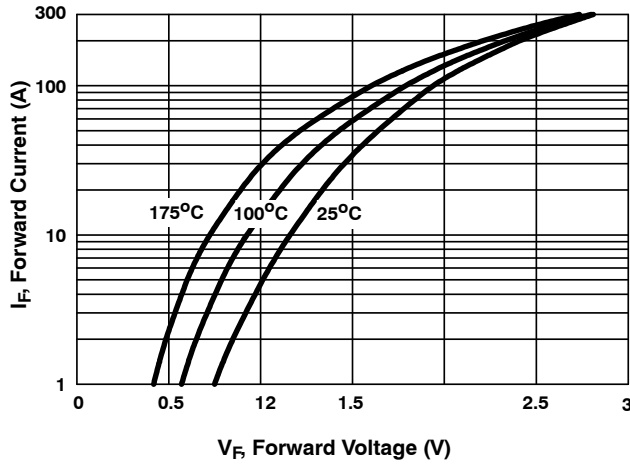


Figure 1. Forward Current vs. Forward Voltage

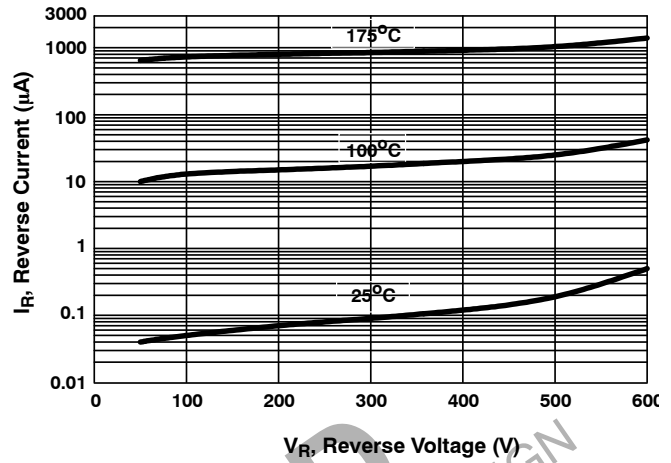


Figure 2. Reverse Current vs. Reverse Voltage

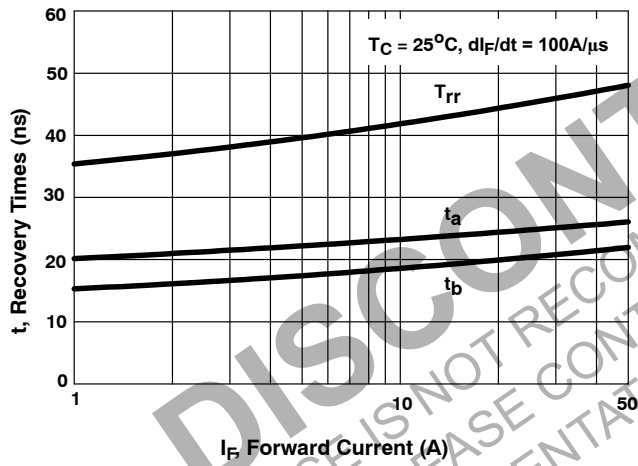
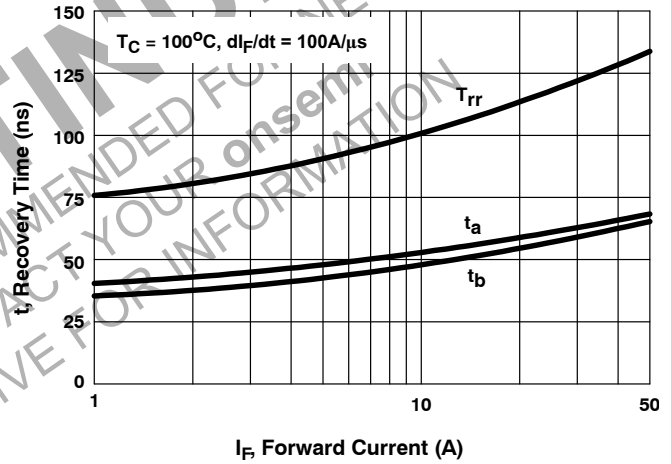
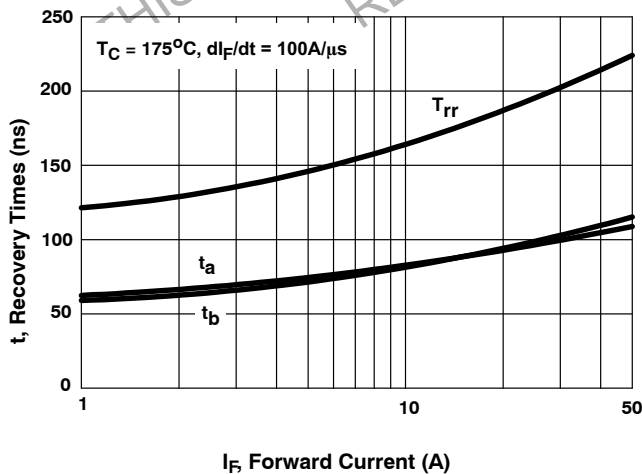
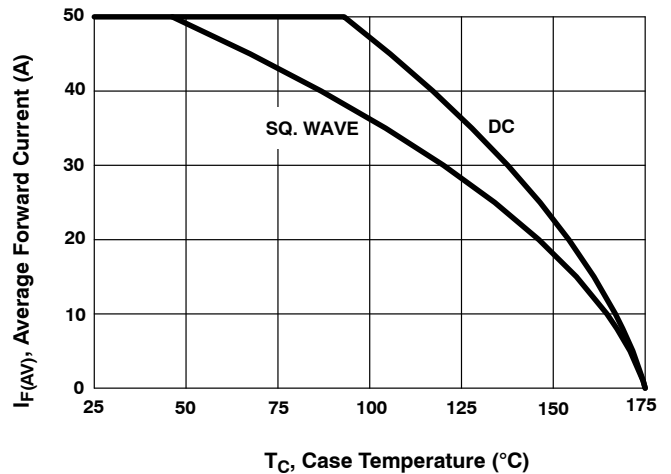
Figure 3.  $T_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward CurrentFigure 4.  $T_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward CurrentFigure 5.  $T_{rr}$ ,  $t_a$  and  $t_b$  Curves vs. Forward Current

Figure 6. Current Derating Curve

TYPICAL PERFORMANCE CURVES (continued)

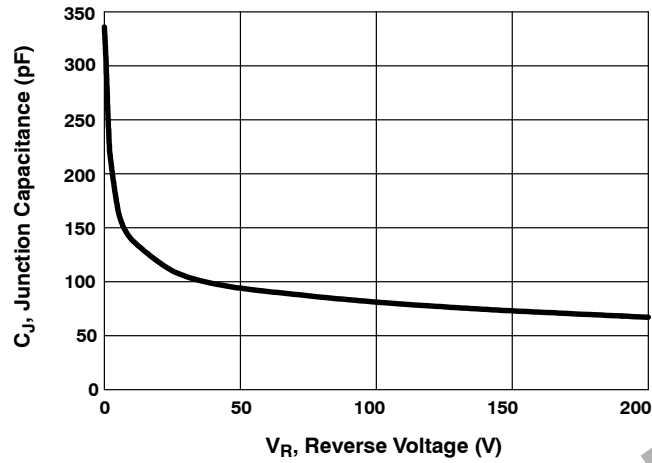


Figure 7. Junction Capacitance vs. Reverse Voltage

TEST CIRCUITS AND WAVEFORMS

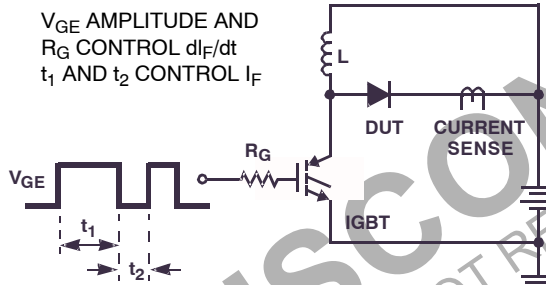


Figure 8.  $T_{rr}$  Test Circuit

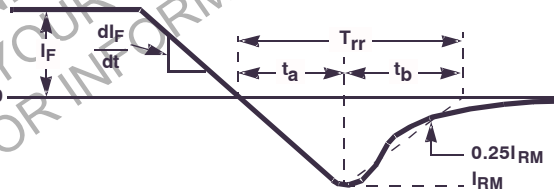


Figure 9.  $T_{rr}$  Waveforms and Definitions

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

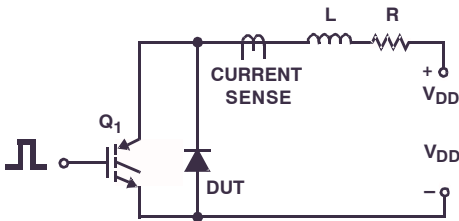


Figure 10. Avalanche Energy Test Circuit

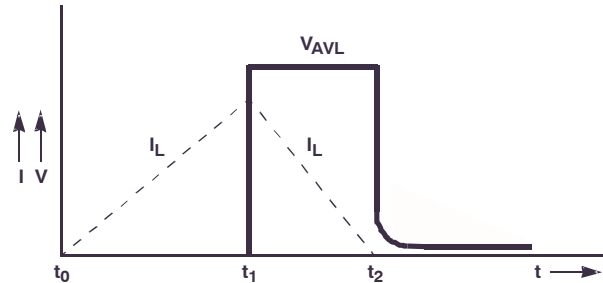


Figure 11. Avalanche Current and Voltage Waveforms

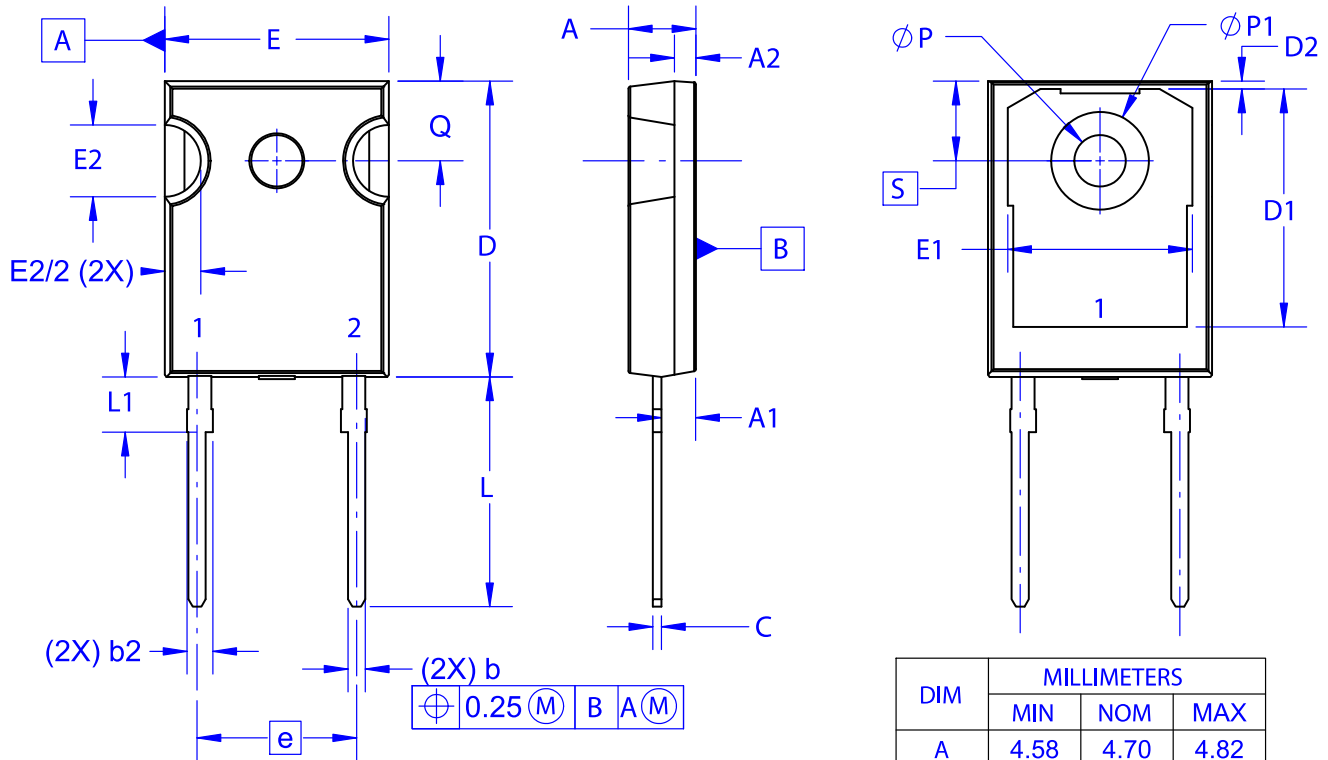
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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ON

TO-247-2LD  
CASE 340CL  
ISSUE A

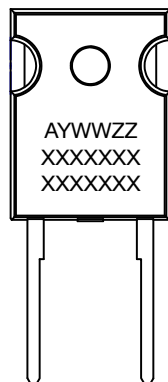
DATE 03 DEC 2019



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.

|                  |             |                                                                                                                                                                                     |
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