

## 50A, 600V Ultrafast Diode

The RURG5060 is an ultrafast diode with soft recovery characteristics ( $t_{rr} < 65\text{ns}$ ). It has low forward voltage drop 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 switching power supplies and other power switching applications. Its low stored charge and ultrafast recovery with soft recovery characteristic minimizes ringing and electrical noise in many power switching circuits, thus reducing power loss in the switching transistors.

Formerly developmental type TA09909.

## Ordering Information

| PART NUMBER | PACKAGE | BRAND    |
|-------------|---------|----------|
| RURG5060    | TO-247  | RURG5060 |

NOTE: When ordering, use the entire part number.

## Symbol



## Features

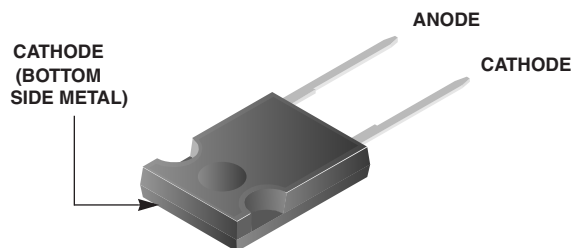
- Ultrafast with Soft Recovery . . . . . <65ns
- Operating Temperature . . . . . 175°C
- Reverse Voltage . . . . . 600V
- Avalanche Energy Rated
- Planar Construction

## Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

## Packaging

JEDEC STYLE 2 LEAD TO-247



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

|                                                                                          | RURG5060   | UNITS |
|------------------------------------------------------------------------------------------|------------|-------|
| 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 . . . . . $I_{F(AV)}$<br>( $T_C = 102^\circ\text{C}$ ) | 50         | A     |
| Repetitive Peak Surge Current . . . . . $I_{FRM}$<br>(Square Wave, 20kHz)                | 100        | A     |
| Nonrepetitive Peak Surge Current . . . . . $I_{FSM}$<br>(Halfwave, 1 Phase, 60Hz)        | 500        | A     |
| Maximum Power Dissipation . . . . . $P_D$                                                | 150        | W     |
| Avalanche Energy (See Figures 7 and 8) . . . . . $E_{AVL}$                               | 40         | mJ    |
| Operating and Storage Temperature . . . . . $T_{STG}, T_J$                               | -65 to 175 | °C    |

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

| SYMBOL          | TEST CONDITION                                           | MIN | TYP | MAX | UNITS                     |
|-----------------|----------------------------------------------------------|-----|-----|-----|---------------------------|
| $V_F$           | $I_F = 50\text{A}$                                       | -   | -   | 1.6 | V                         |
|                 | $I_F = 50\text{A}$ , $T_C = 150^\circ\text{C}$           | -   | -   | 1.4 | V                         |
| $I_R$           | $V_R = 600\text{V}$                                      | -   | -   | 250 | $\mu\text{A}$             |
|                 | $V_R = 600\text{V}$ , $T_C = 150^\circ\text{C}$          | -   | -   | 1.5 | mA                        |
| $t_{rr}$        | $I_F = 1\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$  | -   | -   | 65  | ns                        |
|                 | $I_F = 50\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ | -   | -   | 75  | ns                        |
| $t_a$           | $I_F = 50\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ | -   | 30  | -   | ns                        |
| $t_b$           | $I_F = 50\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ | -   | 20  | -   | ns                        |
| $R_{\theta JC}$ |                                                          | -   | -   | 1   | $^\circ\text{C}/\text{W}$ |

**DEFINITIONS**

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

$I_R$  = Instantaneous reverse current.

$t_{rr}$  = Reverse recovery time at  $dI_F/dt = 100\text{A}/\mu\text{s}$  (See Figure 6), summation of  $t_a + t_b$ .

$t_a$  = Time to reach peak reverse current at  $dI_F/dt = 100\text{A}/\mu\text{s}$  (See Figure 6).

$t_b$  = 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 6).

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

$p_w$  = Pulse width.

$D$  = Duty cycle.

**Typical Performance Curves**

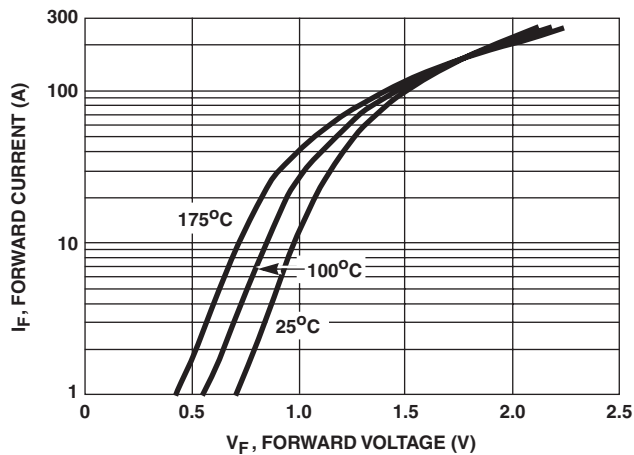


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

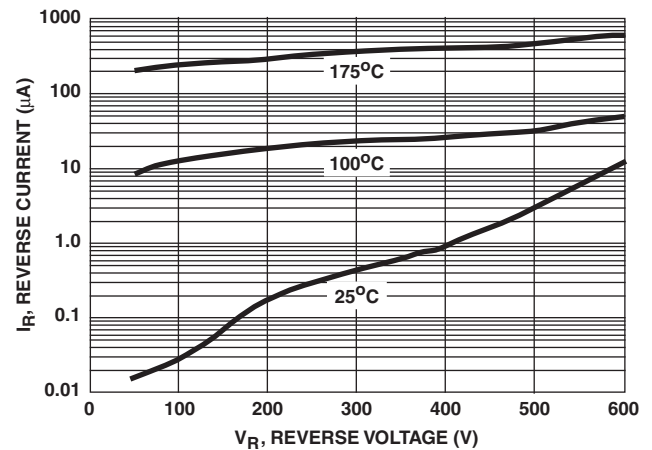


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

## Typical Performance Curves (Continued)

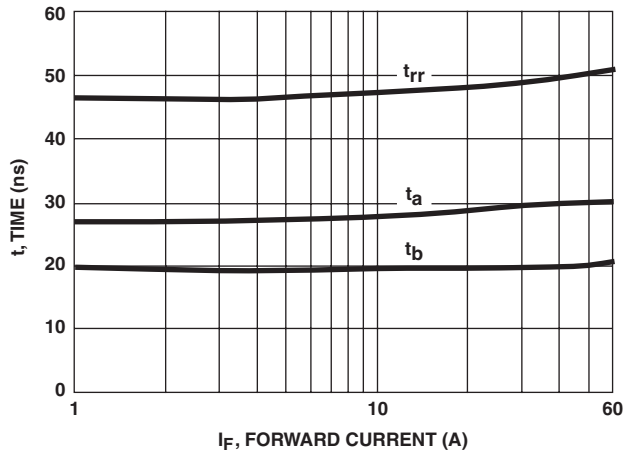


FIGURE 3.  $t_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

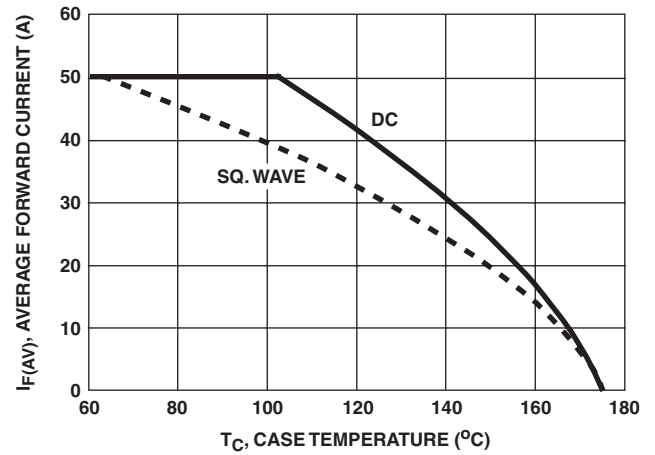


FIGURE 4. CURRENT DERATING CURVE

## Test Circuits and Waveforms

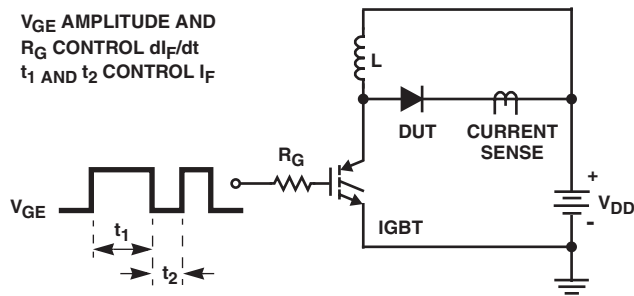


FIGURE 5.  $t_{rr}$  TEST CIRCUIT

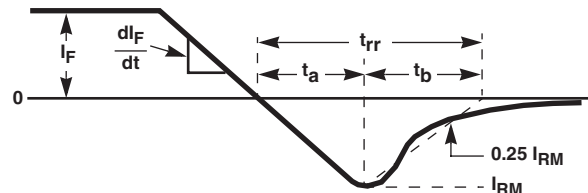


FIGURE 6.  $t_{rr}$  WAVEFORMS AND DEFINITIONS

$I = 1.4A$   
 $L = 40mH$   
 $R < 0.1\Omega$   
 $E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$   
 $Q_1 = IGBT (BV_{CES} > DUT V_{R(AVL)})$

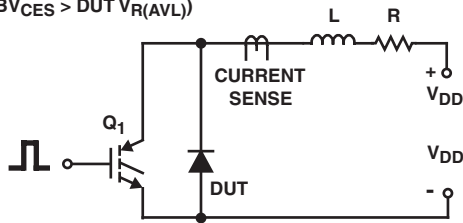


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

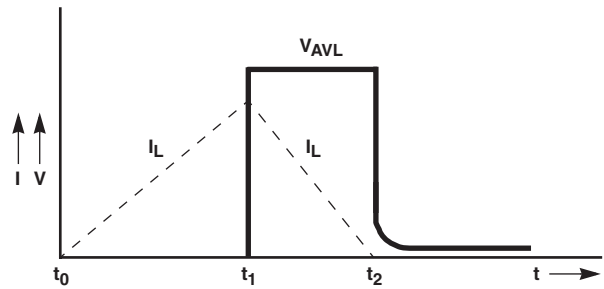


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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