



ON Semiconductor®

# RURG5060-F085 50A, 600V Ultrafast Rectifier

## Features

- High Speed Switching (  $t_{rr}=70\text{ns(Typ.)}$  @  $I_F=50\text{A}$  )
- Low Forward Voltage(  $V_F=1.6\text{V(Max.)}$  @  $I_F=50\text{A}$  )
- Avalanche Energy Rated
- AEC-Q101 Qualified

## Applications

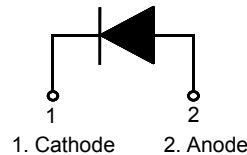
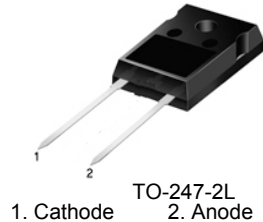
- Automotive DCDC converter
- Automotive On Board Charger
- Switching Power Supply
- Power Switching Circuits

## 50A, 600V Ultrafast Rectifier

The RURG5060-F085 is an ultrafast diode with soft recovery characteristics ( $t_{rr}< 90\text{ns}$ ). It has low forward voltage drop and is 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.

## Pin Assignments



## Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

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

## Thermal Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Maximum Thermal Resistance, Junction to Case	0.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient	45	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Tube	Quantity
RURG5060	RURG5060-F085	TO-247	-	30

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Units	
I <sub>R</sub>	Instantaneous Reverse Current	V <sub>R</sub> = 600V	T <sub>C</sub> = 25 °C	-	-	250	uA
			T <sub>C</sub> = 175 °C	-	-	2	mA
V <sub>FM</sub> <sup>1</sup>	Instantaneous Forward Voltage	I <sub>F</sub> = 50A	T <sub>C</sub> = 25 °C	-	1.28	1.6	V
			T <sub>C</sub> = 175 °C	-	1.09	1.4	V
t <sub>rr</sub> <sup>2</sup>	Reverse Recovery Time	I <sub>F</sub> = 1A, di/dt = 100A/μs, V <sub>CC</sub> = 390V	T <sub>C</sub> = 25 °C	-	42	65	ns
		I <sub>F</sub> = 50A, di/dt = 100A/μs, V <sub>CC</sub> = 390V	T <sub>C</sub> = 25 °C	-	70	90	ns
			T <sub>C</sub> = 175 °C	-	285	-	ns
t <sub>a</sub>	Reverse Recovery Time	I <sub>F</sub> = 50A, di/dt = 100A/μs, V <sub>CC</sub> = 390V	T <sub>C</sub> = 25 °C	-	36	-	ns
t <sub>b</sub>	Reverse Recovery Time			-	34	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge			-	112	-	nC
E <sub>AVL</sub>	Avalanche Energy	I <sub>AV</sub> = 1.4A, L = 40mH	40	-	-	mJ	

### Notes:

1. Pulse : Test Pulse width = 300μs, Duty Cycle = 2%
2. Guaranteed by design

## Test Circuit and Waveforms

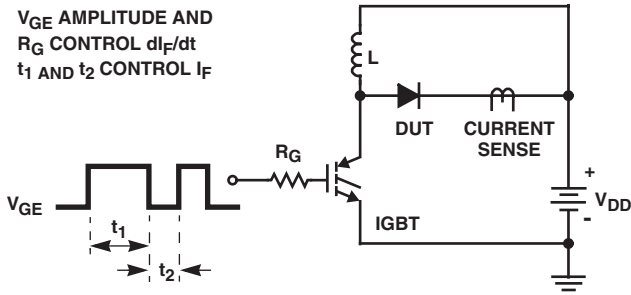


FIGURE 5. t<sub>rr</sub> TEST CIRCUIT

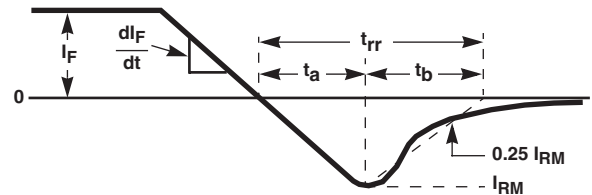


FIGURE 6. t<sub>rr</sub> WAVEFORMS AND DEFINITIONS

I = 1.4A  
L = 40mH  
R < 0.1Ω  
E<sub>AVL</sub> = 1/2L I<sup>2</sup> [V<sub>R(AVL)</sub> / (V<sub>R(AVL)</sub> - V<sub>DD</sub>)]  
Q<sub>1</sub> = IGBT (BV<sub>CES</sub> > DUT V<sub>R(AVL)</sub>)

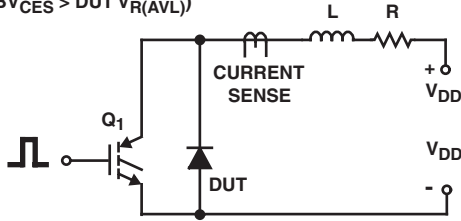


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

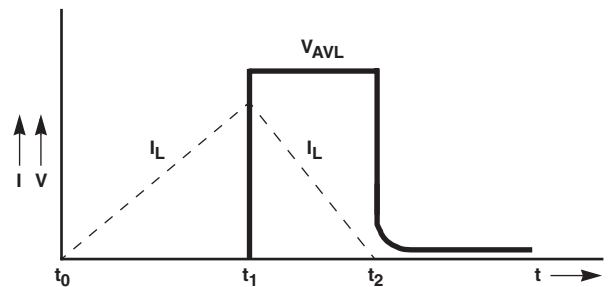
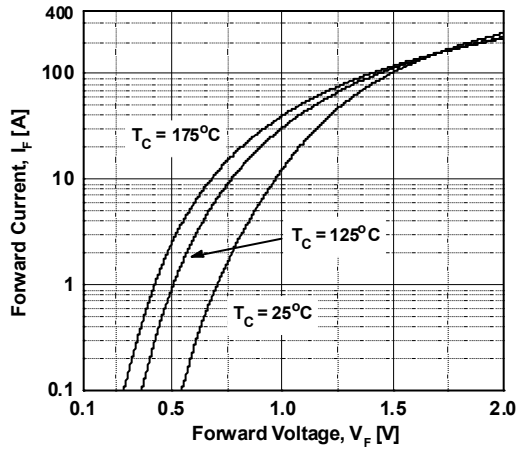


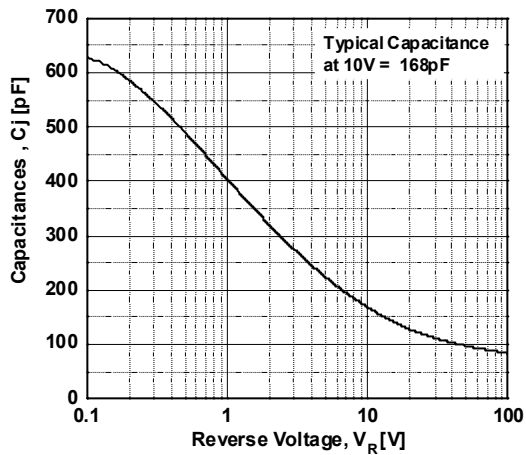
FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

## Typical Performance Characteristics

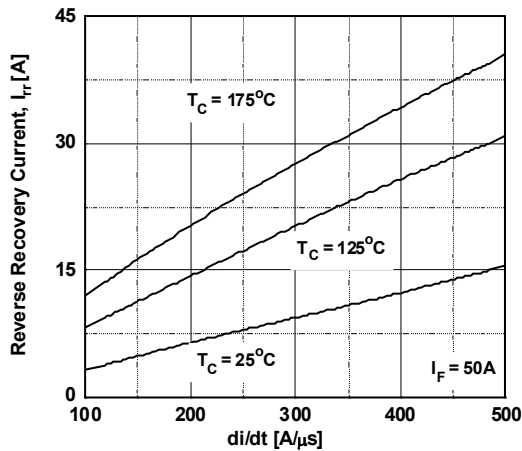
**Figure 1. Typical Forward Voltage Drop vs. Forward Current**



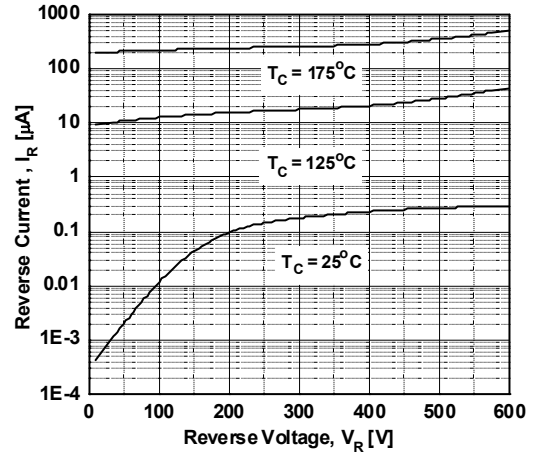
**Figure 3. Typical Junction Capacitance**



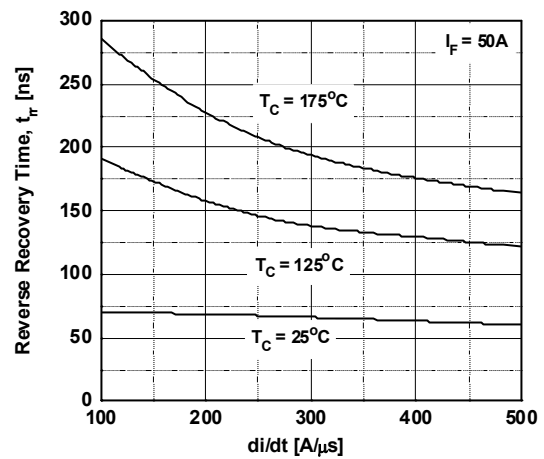
**Figure 5. Typical Reverse Recovery Current vs. di/dt**



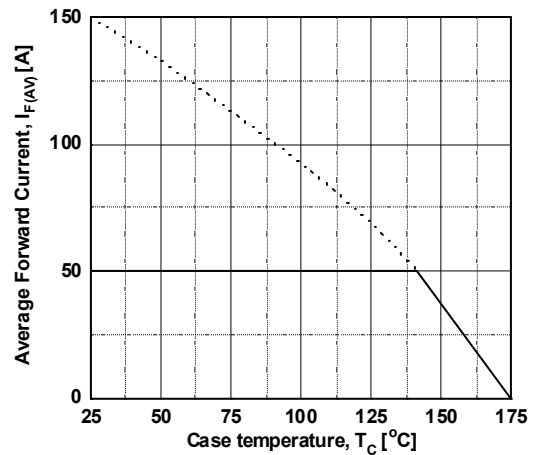
**Figure 2. Typical Reverse Current vs. Reverse Voltage**



**Figure 4. Typical Reverse Recovery Time vs. di/dt**



**Figure 6. Forward Current Derating Curve**



Typical Performance Characteristics (Continued)

Figure 7. Reverse Recovery Charge

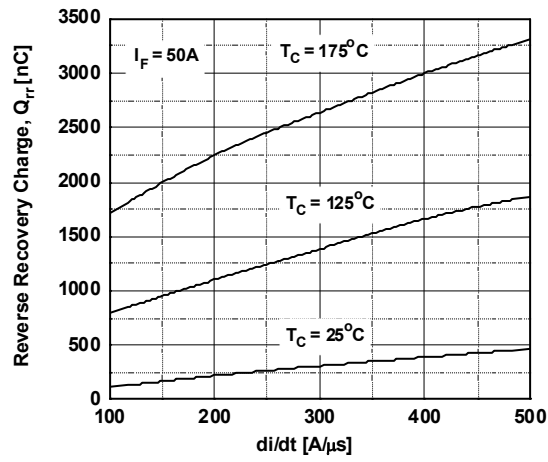
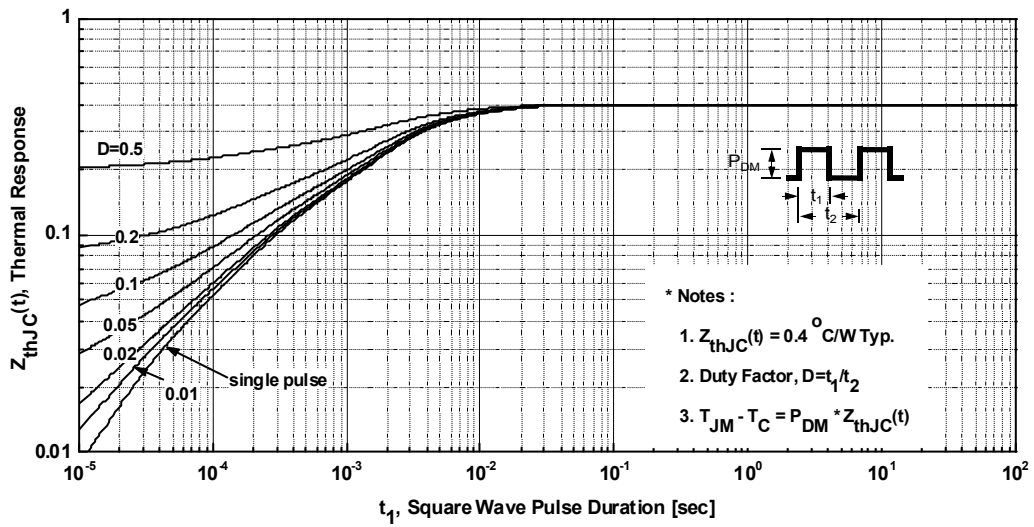
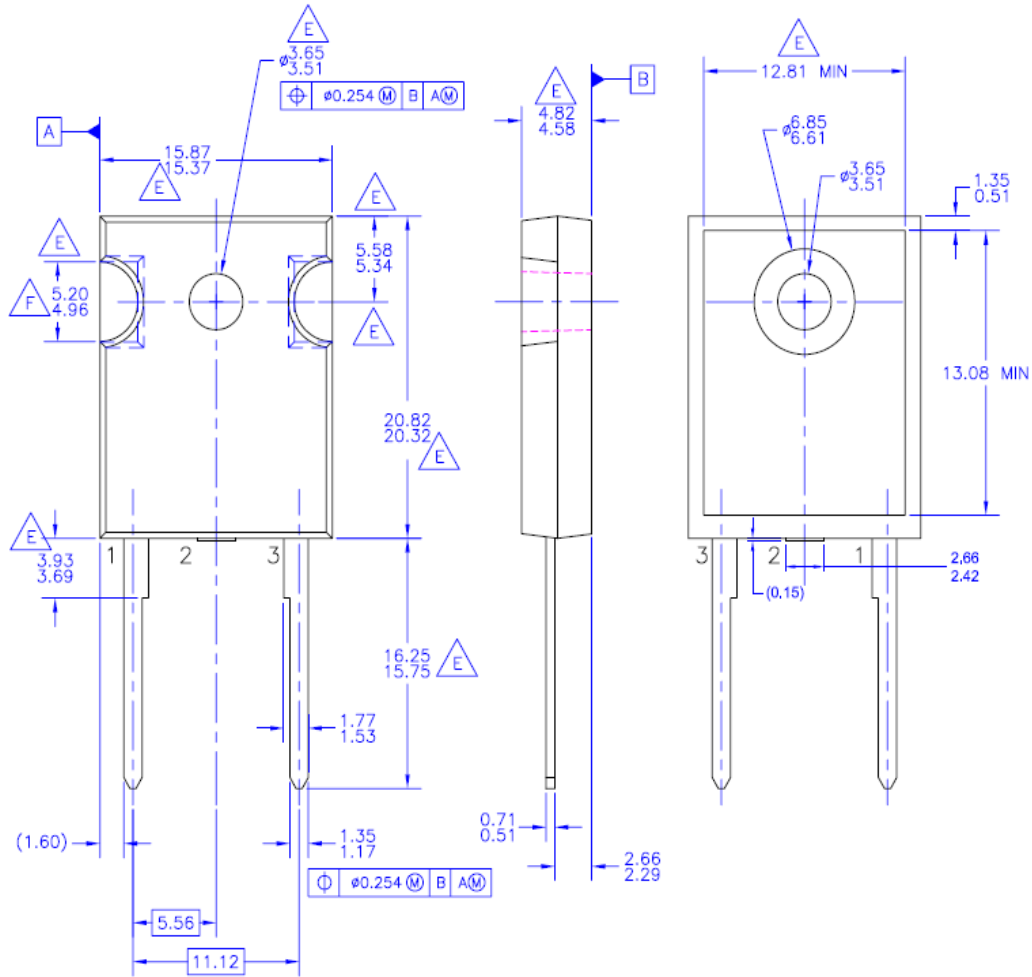


Figure 8. Transient Thermal Response Curve



Mechanical Dimensions

TO-247-2L



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Dimensions in Millimeters

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