

30A, 200V Ultrafast Diode

The RURG3020 is an ultrafast diode with soft recovery characteristics ($t_{rr} < 45\text{ns}$). 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 characteristics minimizes ringing and electrical noise in many power switching circuits, reducing power loss in the switching transistors.

Formerly developmental type TA09645.

Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|----------|
| RURG3020 | TO-247 | RURG3020 |

NOTE: When ordering, use the entire part number.

Symbol



Features

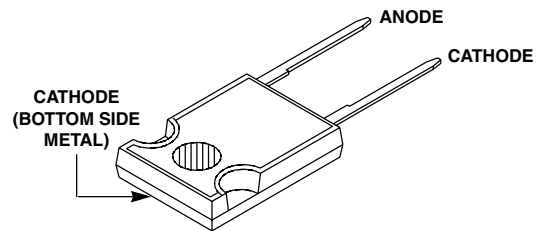
- Ultrafast with Soft Recovery <45ns
- Operating Temperature 175°C
- Reverse Voltage 200V
- Avalanche Energy Rated
- Planar Construction

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

| | RURG3020 | UNITS |
|--|------------|-------|
| Peak Repetitive Reverse Voltage | 200 | V |
| Working Peak Reverse Voltage | 200 | V |
| DC Blocking Voltage | 200 | V |
| Average Rectified Forward Current ($T_C = 145^\circ\text{C}$) | 30 | A |
| Repetitive Peak Surge Current (Square Wave, 20kHz) | 70 | A |
| Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz) | 325 | A |
| Maximum Power Dissipation | 125 | W |
| Avalanche Energy (See Figures 7 and 8) | 20 | mJ |
| Operating and Storage Temperature | -65 to 175 | °C |

RURG3020

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

| SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNITS |
|-----------------|---|-----|-----|------|---------------------------|
| V_F | $I_F = 30\text{A}$ | - | - | 1.0 | V |
| | $I_F = 30\text{A}, T_C = 150^\circ\text{C}$ | - | - | 0.85 | V |
| I_R | $V_R = 200\text{V}$ | - | - | 250 | μA |
| | $V_R = 200\text{V}, T_C = 150^\circ\text{C}$ | - | - | 1 | mA |
| t_{rr} | $I_F = 1\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | - | 45 | ns |
| | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | - | 50 | ns |
| t_a | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | 20 | - | ns |
| t_b | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | 15 | - | ns |
| $R_{\theta JC}$ | | - | - | 1.2 | $^\circ\text{C}/\text{W}$ |

DEFINITIONS:

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

I_R = Instantaneous reverse current.

t_{rr} = Reverse recovery time (See Figure 6), summation of $t_a + t_b$.

t_a = Time to reach peak reverse current (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

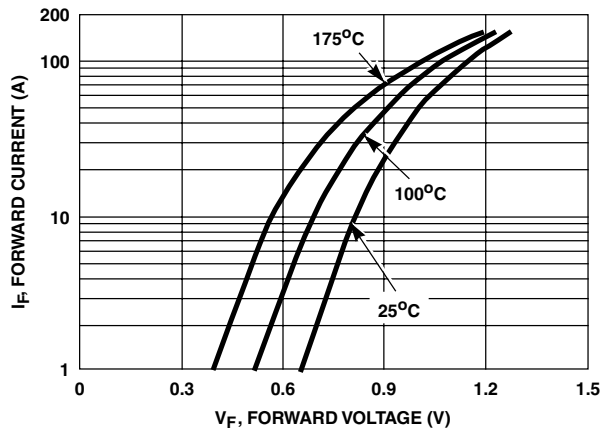


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

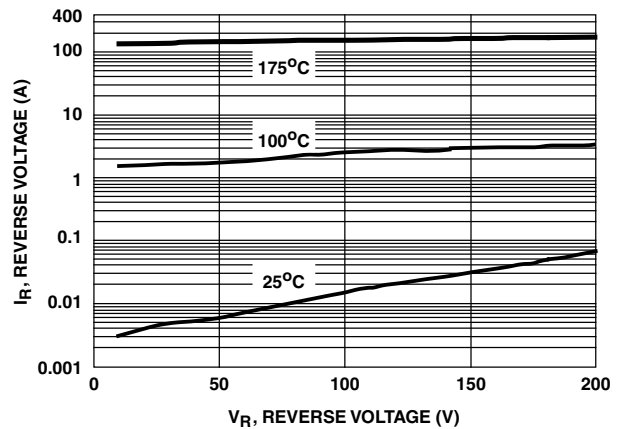


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

Typical Performance Curves (Continued)

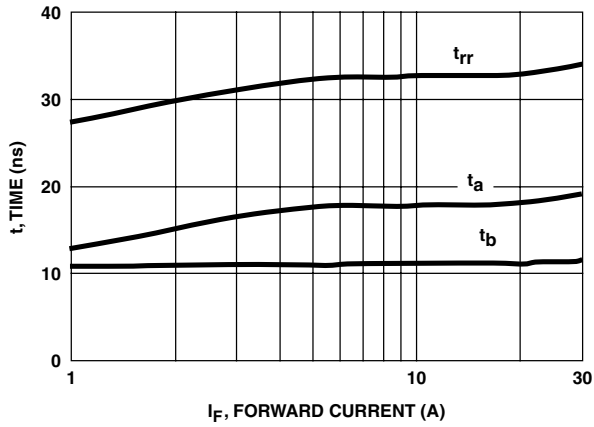


FIGURE 3. t_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

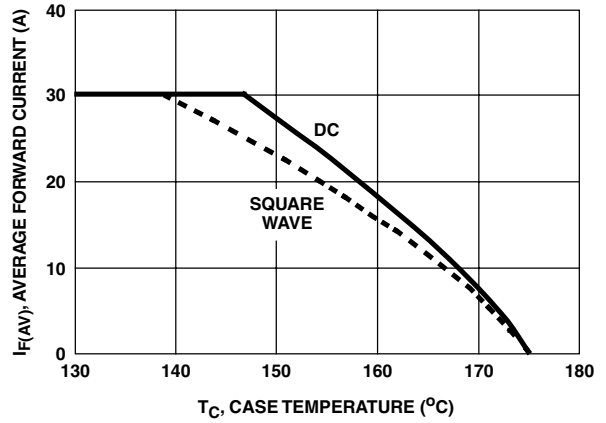


FIGURE 4. CURRENT DERATING CURVE

Test Circuits and Waveforms

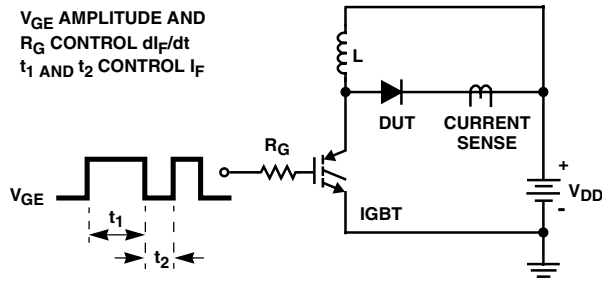


FIGURE 5. t_{rr} TEST CIRCUIT

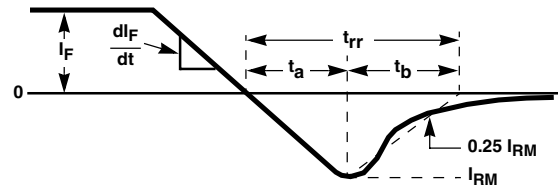


FIGURE 6. t_{rr} WAVEFORMS AND DEFINITIONS

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

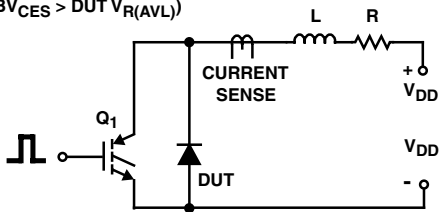


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

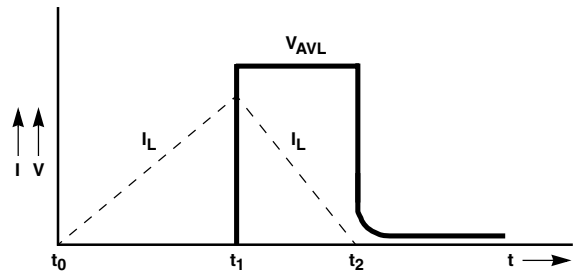


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | |
|-----------------------------------|----------------------------------|----------------------------------|---------------------------|
| ACE _x TM | FAST [®] | PACMAN TM | SuperSOT TM -3 |
| Bottomless TM | FAST _r TM | POP TM | SuperSOT TM -6 |
| CoolFET TM | GlobalOptoisolator TM | PowerTrench [®] | SuperSOT TM -8 |
| CROSSVOLT TM | GTO TM | QFET TM | SyncFET TM |
| DenseTrench TM | HiSeC TM | QS TM | TinyLogic TM |
| DOMET TM | ISOPLANAR TM | QT Optoelectronics TM | UHC TM |
| EcoSPARK TM | LittleFET TM | Quiet Series TM | UltraFET TM |
| E ² CMOS TM | MicroFET TM | SILENT SWITCHER [®] | VCX TM |
| EnSigna TM | MICROWIRE TM | SMART START TM | |
| FACT TM | OPTOLOGIC TM | Star* Power TM | |
| FACT Quiet Series TM | OPTOPLANAR TM | Stealth TM | |

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|------------------------|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only. |