

April 1995

30A, 700V - 1000V Ultrafast Diodes

Features

- Ultrafast with Soft Recovery <110ns
- Operating Temperature +175°C
- Reverse Voltage Up To 1000V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RURG3070, RURG3080, RURG3090 and RURG30100 (TA9904) are ultrafast diodes with soft recovery characteristics ($t_{RR} < 110\text{ns}$). They have low forward voltage drop and are silicon nitride passivated ion-implanted epitaxial planar construction.

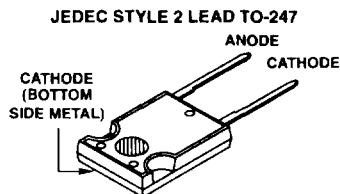
These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristic minimizes ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

PACKAGING AVAILABILITY

| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|-----------|
| RURG3070 | TO-247 | RURG3070 |
| RURG3080 | TO-247 | RURG3080 |
| RURG3090 | TO-247 | RURG3090 |
| RURG30100 | TO-247 | RURG30100 |

NOTE: When ordering, use the entire part number.

Package



Symbol



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

| | RURG3070 | RURG3080 | RURG3090 | RURG30100 | UNITS |
|---|-------------|-------------|-------------|-------------|------------------|
| Peak Repetitive Reverse Voltage V_{RRM} | 700 | 800 | 900 | 1000 | V |
| Working Peak Reverse Voltage V_{RWM} | 700 | 800 | 900 | 1000 | V |
| DC Blocking Voltage V_R | 700 | 800 | 900 | 1000 | V |
| Average Rectified Forward Current $I_{F(AV)}$ ($T_C = +117^\circ\text{C}$) | 30 | 30 | 30 | 30 | A |
| Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz) | 60 | 60 | 60 | 60 | A |
| Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz) | 300 | 300 | 300 | 300 | A |
| Maximum Power Dissipation P_D | 125 | 125 | 125 | 125 | W |
| Avalanche Energy E_{AVL} | 30 | 30 | 30 | 30 | mj |
| Operating and Storage Temperature T_{STG}, T_J | -65 to +175 | -65 to +175 | -65 to +175 | -65 to +175 | $^\circ\text{C}$ |

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ULTRAFAST
SINGLE DIODES

Specifications RURG3070, RURG3080, RURG3090, RURG30100

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

| SYMBOL | TEST CONDITION | LIMITS | | | | | | | | | | | | UNITS |
|-----------------|---|----------|-----|-----|----------|-----|-----|----------|-----|-----|-----------|-----|-----|---------------------------|
| | | RURG3070 | | | RURG3080 | | | RURG3090 | | | RURG30100 | | | |
| | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_F | $I_F = 30\text{A}, T_C = +25^\circ\text{C}$ | - | - | 1.8 | - | - | 1.8 | - | - | 1.8 | - | - | 1.8 | V |
| V_F | $I_F = 30\text{A}, T_C = +150^\circ\text{C}$ | - | - | 1.6 | - | - | 1.6 | - | - | 1.6 | - | - | 1.6 | V |
| I_R | $V_R = 700\text{V}, T_C = +25^\circ\text{C}$ | - | - | 500 | - | - | - | - | - | - | - | - | - | μA |
| | $V_R = 800\text{V}, T_C = +25^\circ\text{C}$ | - | - | - | - | - | 500 | - | - | - | - | - | - | μA |
| | $V_R = 900\text{V}, T_C = +25^\circ\text{C}$ | - | - | - | - | - | - | - | - | 500 | - | - | - | μA |
| | $V_R = 1000\text{V}, T_C = +25^\circ\text{C}$ | - | - | - | - | - | - | - | - | - | - | - | 500 | μA |
| I_R | $V_R = 700\text{V}, T_C = +150^\circ\text{C}$ | - | - | 1 | - | - | - | - | - | - | - | - | - | mA |
| | $V_R = 800\text{V}, T_C = +150^\circ\text{C}$ | - | - | - | - | - | 1 | - | - | - | - | - | - | mA |
| | $V_R = 900\text{V}, T_C = +150^\circ\text{C}$ | - | - | - | - | - | - | - | - | 1 | - | - | - | mA |
| | $V_R = 1000\text{V}, T_C = +150^\circ\text{C}$ | - | - | - | - | - | - | - | - | - | - | - | 1 | mA |
| t_{RR} | $I_F = 1\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | - | 110 | - | - | 110 | - | - | 110 | - | - | 110 | ns |
| | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | - | 150 | - | - | 150 | - | - | 150 | - | - | 150 | ns |
| t_A | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | 90 | - | - | 90 | - | - | 90 | - | - | 90 | - | ns |
| t_B | $I_F = 30\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$ | - | 45 | - | - | 45 | - | - | 45 | - | - | 45 | - | ns |
| $R_{\theta JC}$ | | - | - | 1.2 | - | - | 1.2 | - | - | 1.2 | - | - | 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 2), summation of $t_A + t_B$.

t_A = Time to reach peak reverse current (See Figure 2).

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 2).

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

E_{AVL} = Controlled avalanche energy. (See Figures 7 and 8).

p_w = pulse width.

D = duty cycle.

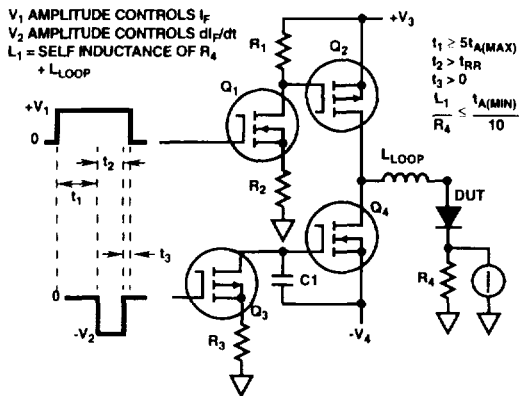


FIGURE 1. t_{RR} TEST CIRCUIT

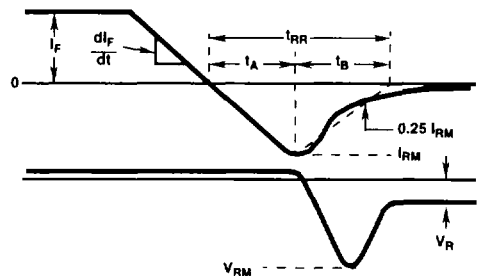


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

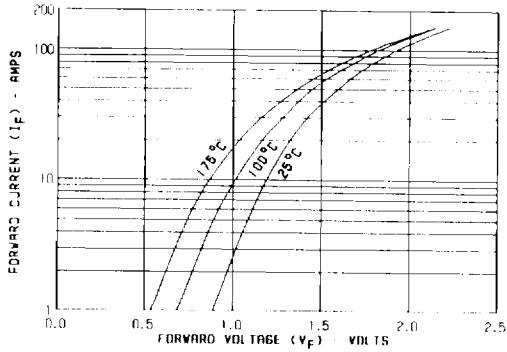


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

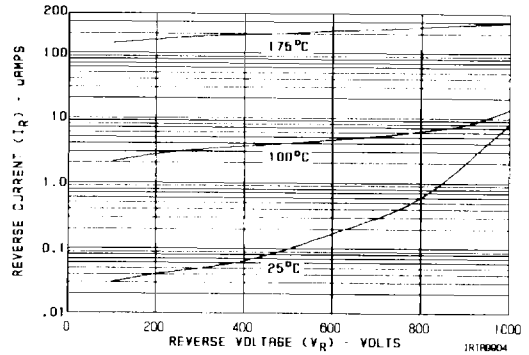


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

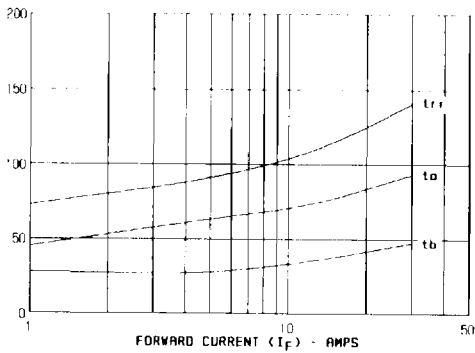


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT

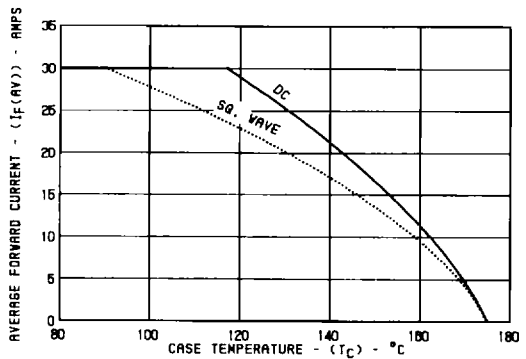


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

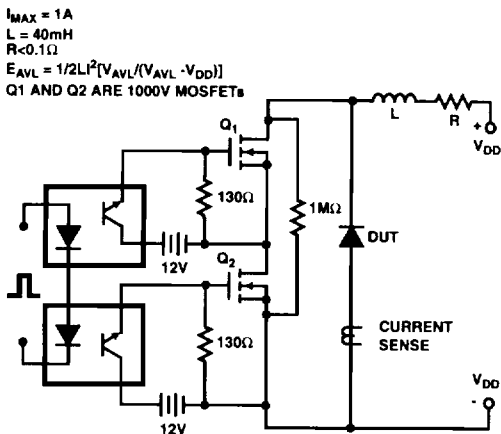


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

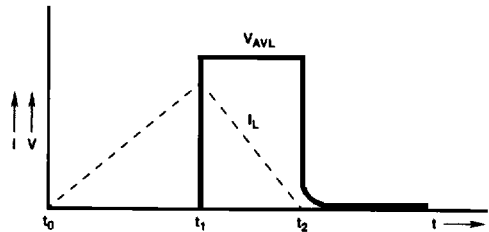


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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