

April 1995

15A, 400V - 600V Hyperfast Dual Diodes

Features

- Hyperfast with Soft Recovery < 35ns
- Operating Temperature +175°C
- Reverse Voltage Up To 600V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RHRG1540CC, RHRG1550CC and RHRG1560CC (TA49061) are hyperfast dual diodes with soft recovery characteristics ($t_{RR} < 35\text{ns}$). They have half the recovery time of ultrafast diodes and are silicon nitride passivated ion-implanted epitaxial planar construction.

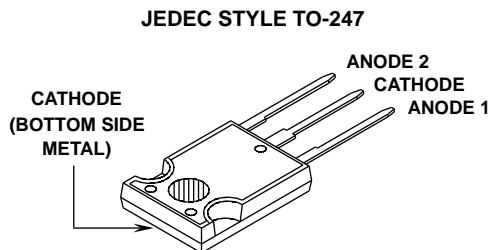
These devices are intended for use as freewheeling/clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power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

PACKAGING AVAILABILITY

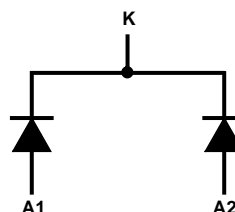
| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|-----------|
| RHRG1540CC | TO-247 | RHRG1540C |
| RHRG1550CC | TO-247 | RHRG1550C |
| RHRG1560CC | TO-247 | RHRG1560C |

NOTE: When ordering, use the entire part number.

Package



Symbol



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

| | RHRG1540CC | RHRG1550CC | RHRG1560CC | UNITS |
|---|-------------|-------------|-------------|-------|
| Peak Repetitive Reverse Voltage V_{RRM} | 400 | 500 | 600 | V |
| Working Peak Reverse Voltage V_{RWM} | 400 | 500 | 600 | V |
| DC Blocking Voltage V_R | 400 | 500 | 600 | V |
| Average Rectified Forward Current $I_{F(AV)}$ ($T_C = +140^\circ\text{C}$) | 15 | 15 | 15 | A |
| Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz) | 30 | 30 | 30 | A |
| Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz) | 200 | 200 | 200 | A |
| Maximum Power Dissipation P_D | 100 | 100 | 100 | W |
| Avalanche Energy ($L = 40\text{mH}$) E_{AVL} | 20 | 20 | 20 | mJ |
| Operating and Storage Temperature T_{STG}, T_J | -65 to +175 | -65 to +175 | -65 to +175 | °C |

Specifications RHRG1540CC, RHRG1550CC, RHRG1560CC

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

| SYMBOL | TEST CONDITION | LIMITS | | | | | | | | | UNITS |
|------------------|---|------------|-----|-----|------------|-----|-----|------------|-----|-----|-------|
| | | RHRG1540CC | | | RHRG1550CC | | | RHRG1560CC | | | |
| | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| V _F | I _F = 15A, T _C = +25°C | - | - | 2.1 | - | - | 2.1 | - | - | 2.1 | V |
| | I _F = 15A, T _C = +150°C | - | - | 1.7 | - | - | 1.7 | - | - | 1.7 | V |
| I _R | V _R = 400V, T _C = +25°C | - | - | 100 | - | - | - | - | - | - | μA |
| | V _R = 500V, T _C = +25°C | - | - | - | - | - | 100 | - | - | - | μA |
| | V _R = 600V, T _C = +25°C | - | - | - | - | - | - | - | - | 100 | μA |
| I _R | V _R = 400V, T _C = +150°C | - | - | 500 | - | - | - | - | - | - | μA |
| | V _R = 500V, T _C = +150°C | - | - | - | - | - | 500 | - | - | - | μA |
| | V _R = 600V, T _C = +150°C | - | - | - | - | - | - | - | - | 500 | μA |
| t _{RR} | I _F = 1A, dI _F /dt = 100A/μs | - | - | 35 | - | - | 35 | - | - | 35 | ns |
| | I _F = 15A, dI _F /dt = 100A/μs | - | - | 40 | - | - | 40 | - | - | 40 | ns |
| t _A | I _F = 15A, dI _F /dt = 100A/μs | - | 20 | - | - | 20 | - | - | 20 | - | ns |
| t _B | I _F = 15A, dI _F /dt = 100A/μs | - | 15 | - | - | 15 | - | - | 15 | - | ns |
| Q _{RR} | I _F = 15A, dI _F /dt = 100A/μs | - | 40 | - | - | 40 | - | - | 40 | - | nC |
| C _J | V _R = 10V, I _F = 0A | - | 60 | - | - | 60 | - | - | 60 | - | pF |
| R _{θJC} | | - | - | 1.5 | - | - | 1.5 | - | - | 1.5 | °C/W |

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300 μs , 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 10 and 11).

pw = pulse width.

D = duty cycle.

V_1 AMPLITUDE CONTROLS I_F
 V_2 AMPLITUDE CONTROLS dl_F/dt
 L_1 = SELF INDUCTANCE OF
 $R_4 + L_{\text{LOOP}}$

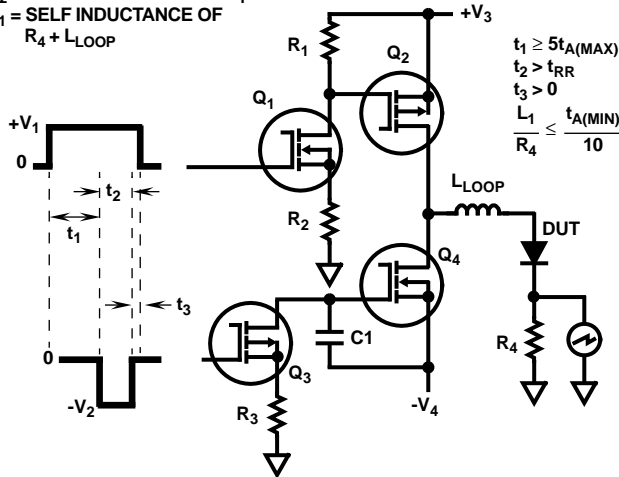


FIGURE 1. t_{RR} TEST CIRCUIT

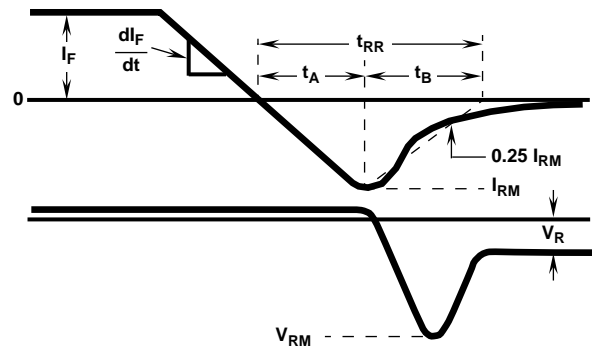


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

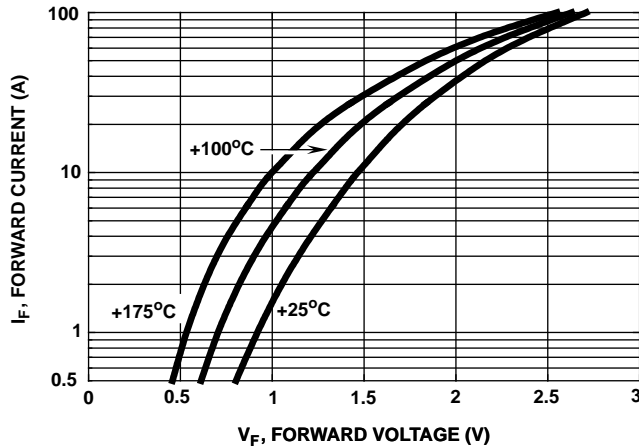


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

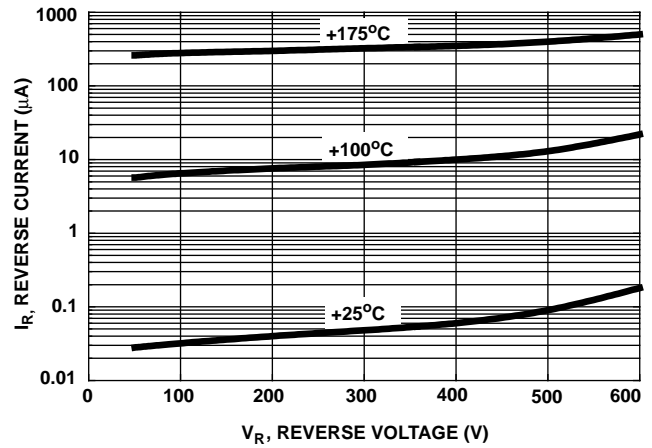


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

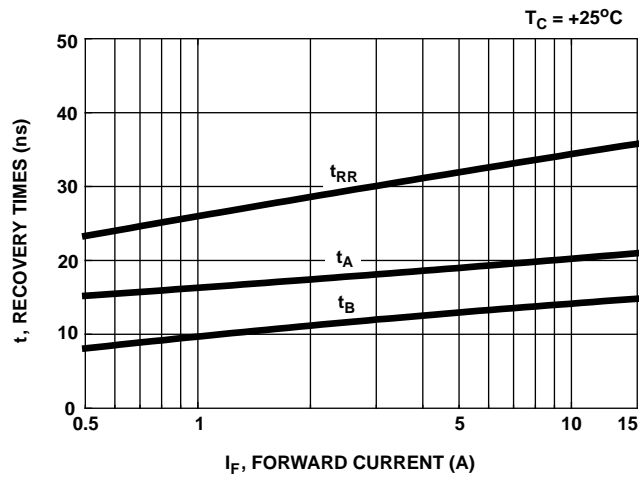


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

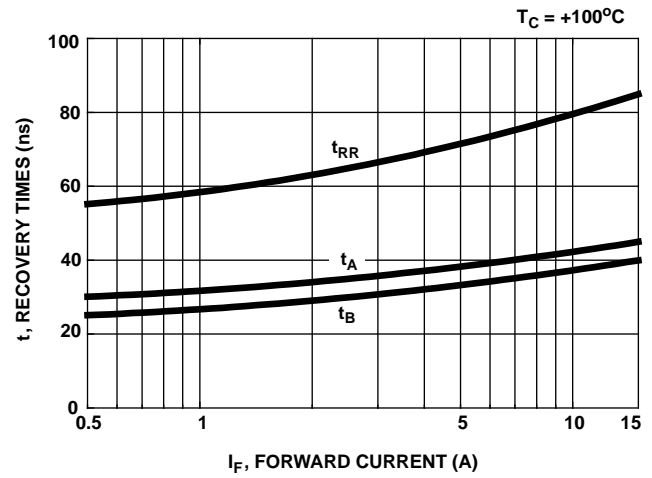


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

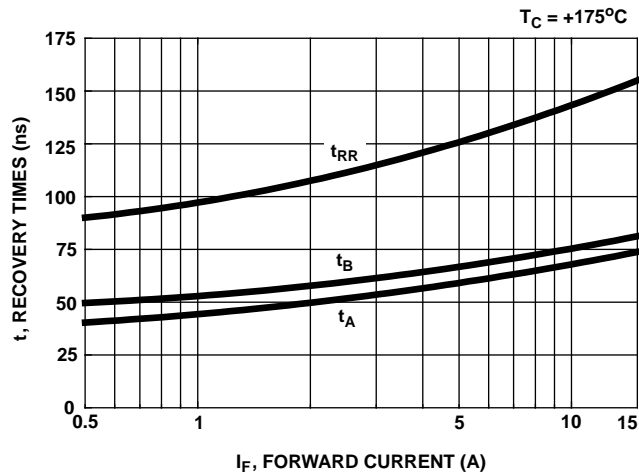


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

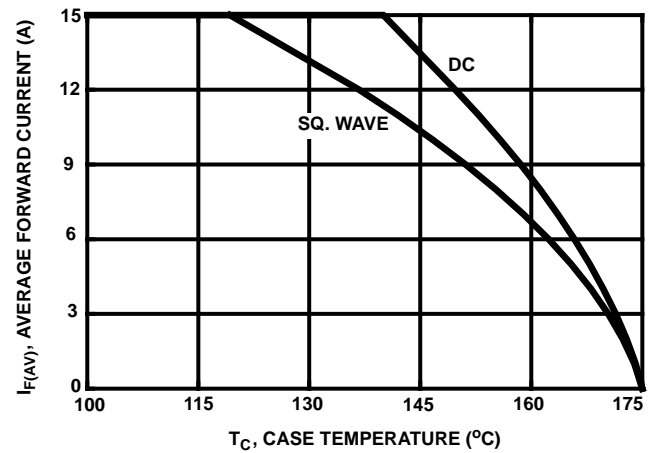


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

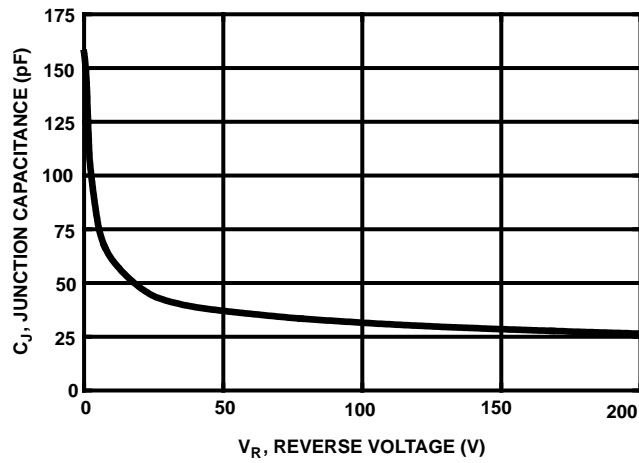


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuit and Waveforms

$I_{MAX} = 1A$
 $L = 40mH$
 $R < 0.1\Omega$
 $E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$
 Q_1 AND Q_2 ARE 1000V MOSFETs

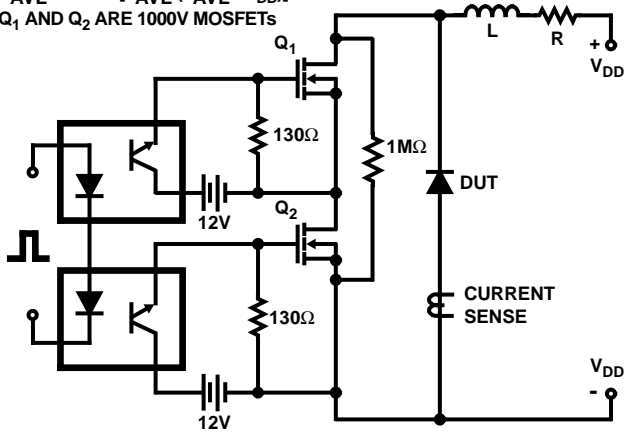


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

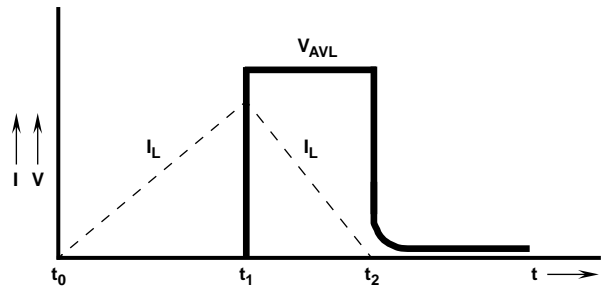


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS