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15 A, 400 V - 600 V, Hyperfast Diode

The RHRP1540, RHRP1560 is a hyperfast diode with soft recovery characteristics. It has the half recovery time of ultrafast diodes and is silicon nitride passivated ionimplanted epitaxial planar construction. These devices are intended to be used as freewheeling/ clamping diodes and diodes 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.

Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|-------------|-------------|----------|
| RHRP1540 | TO-220AC-2L | RHRP1540 |
| RHRP1560 | TO-220AC-2L | RHRP1560 |

NOTE: When ordering, use the entire part number.

Symbol



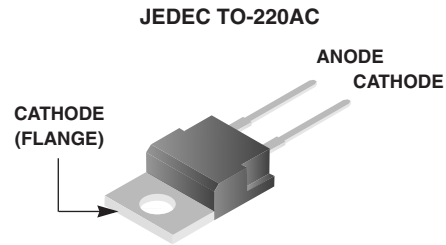
Features

- Hyperfast Recovery $t_{rr} = 40$ ns (@ $I_F = 15$ A)
- Max Forward Voltage, $V_F = 2.1$ V (@ $T_C = 25^\circ\text{C}$)
- 400 V, 600 V Reverse Voltage and High Reliability
- Avalanche Energy Rated
- RoHS Compliant

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Packaging



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

| | RHRP1540 | RHRP1560 | UNIT |
|--|------------|------------|------------------|
| Peak Repetitive Reverse Voltage | 400 | 600 | V |
| Working Peak Reverse Voltage | 400 | 600 | V |
| DC Blocking Voltage | 400 | 600 | V |
| Average Rectified Forward Current ($T_C = 140^\circ\text{C}$) | 15 | 15 | A |
| Repetitive Peak Surge Current (Square Wave, 20 kHz) | 30 | 30 | A |
| Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60 Hz) | 200 | 200 | A |
| Maximum Power Dissipation | 100 | 100 | W |
| Avalanche Energy (See Figures 10 and 11) | 20 | 20 | mJ |
| Operating and Storage Temperature | -65 to 175 | -65 to 175 | $^\circ\text{C}$ |

RHRP1540, RHRP1560

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

| SYMBOL | TEST CONDITION | RHRP1540 | | | RHRP1560 | | | UNIT |
|-----------------|---|----------|-----|-----|----------|-----|-----|---------------------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_F | $I_F = 15\text{ A}$ | - | - | 2.1 | - | - | 2.1 | V |
| | $I_F = 15\text{ A}, T_C = 150^\circ\text{C}$ | - | - | 1.7 | - | - | 1.7 | V |
| I_R | $V_R = 400\text{ V}$ | - | - | 100 | - | - | - | μA |
| | $V_R = 600\text{ V}$ | - | - | - | - | - | 100 | μA |
| | $V_R = 400\text{ V}, T_C = 150^\circ\text{C}$ | - | - | 500 | - | - | - | μA |
| | $V_R = 600\text{ V}, T_C = 150^\circ\text{C}$ | - | - | - | - | - | 500 | μA |
| T_{rr} | $I_F = 1\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | - | - | 35 | - | - | 35 | ns |
| | $I_F = 15\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | - | - | 40 | - | - | 40 | ns |
| t_a | $I_F = 15\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | - | 20 | - | - | 20 | - | ns |
| t_b | $I_F = 15\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | - | 15 | - | - | 15 | - | ns |
| Q_{rr} | $I_F = 15\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$ | - | 40 | - | - | 40 | - | nC |
| C_J | $V_R = 10\text{ V}, I_F = 0\text{ A}$ | - | 60 | - | - | 60 | - | pF |
| $R_{\theta JC}$ | | - | - | 1.5 | - | - | 1.5 | $^\circ\text{C}/\text{W}$ |

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300 μs , D = 2%).

I_R = Instantaneous reverse current.

T_{rr} = Reverse recovery time (See Figure 9), summation of $t_a + t_b$.

t_a = Time to reach peak reverse current (See Figure 9).

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 9).

Q_{rr} = Reverse Recovery Charge.

C_J = Junction Capacitance.

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

pw = Pulse Width.

D = Duty Cycle.

Typical Performance Curves

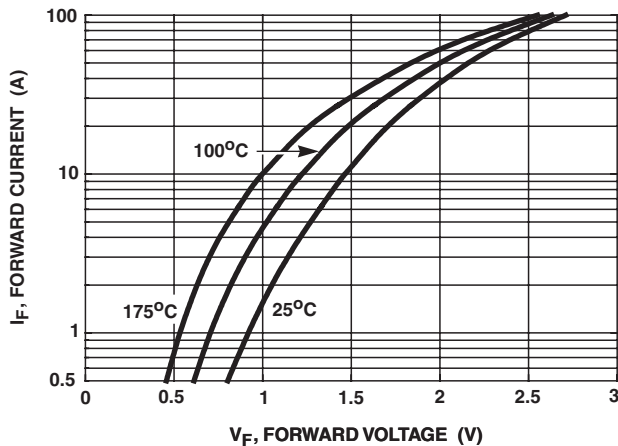


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

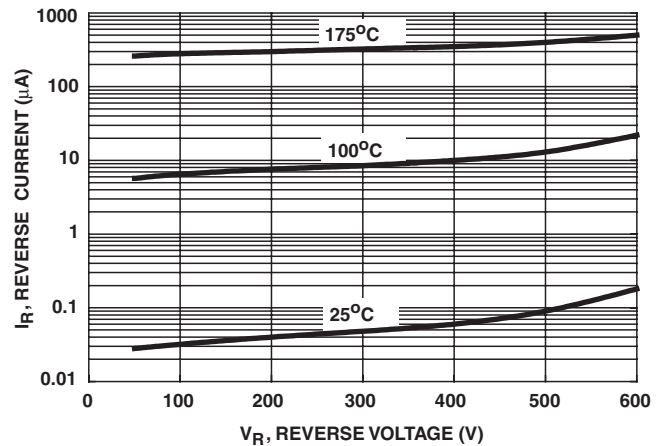


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

Typical Performance Curves (Continued)

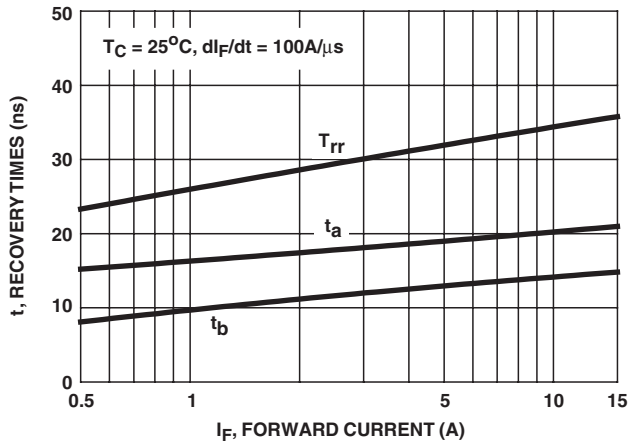


FIGURE 3. T_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

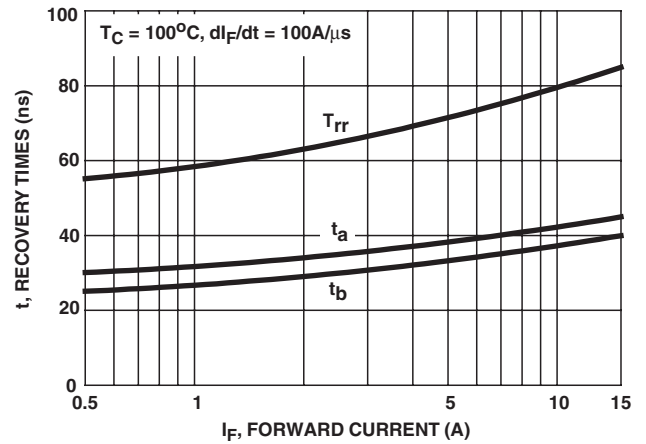


FIGURE 4. T_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

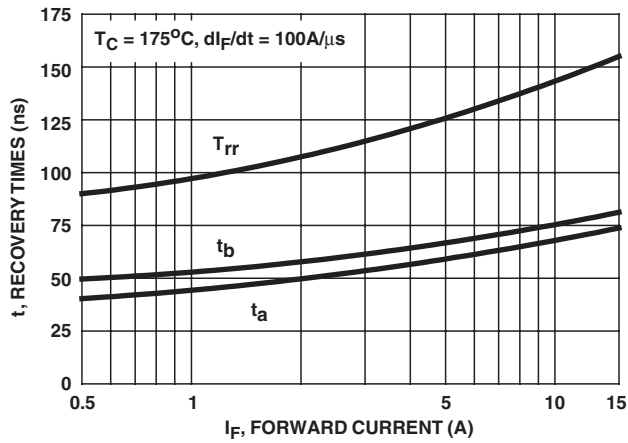


FIGURE 5. T_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

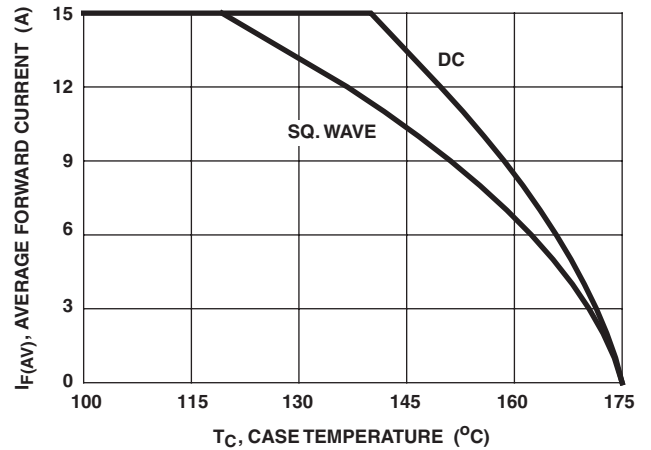


FIGURE 6. CURRENT DERATING CURVE

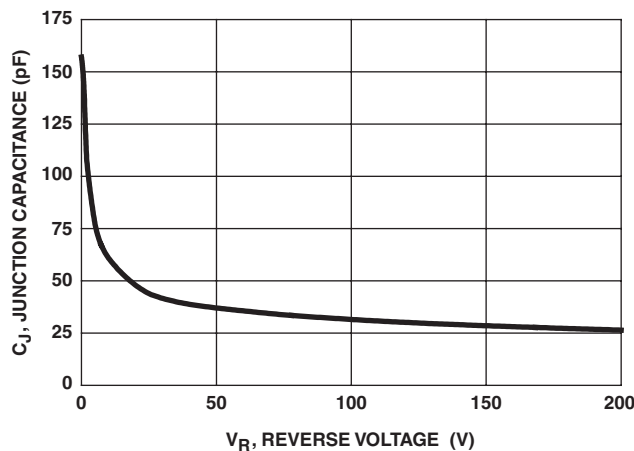


FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuits and Waveforms

V_{GE} AMPLITUDE AND
 R_G CONTROL di_F/dt
 t_1 AND t_2 CONTROL I_F

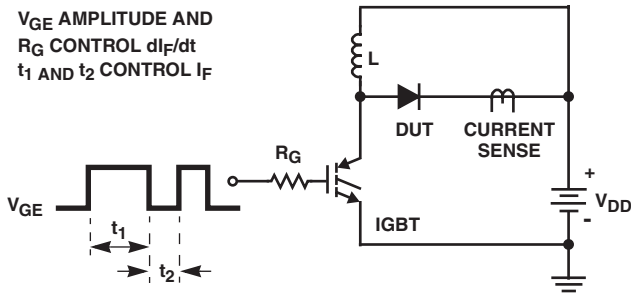


FIGURE 8. T_{rr} TEST CIRCUIT

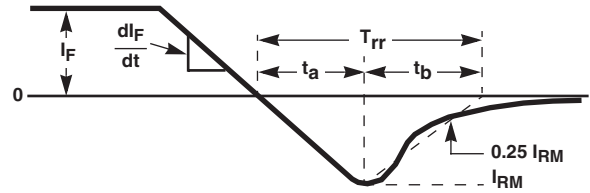


FIGURE 9. T_{rr} WAVEFORMS AND DEFINITIONS

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

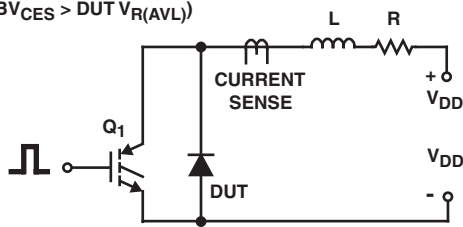


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

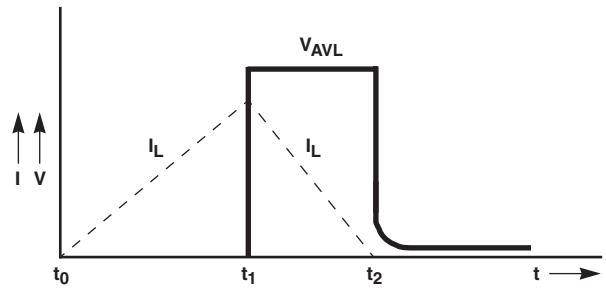


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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