

4A, 400V - 600V Hyperfast Diodes

The RHRD440, RHRD460, RHRD440S and RHRD460S are hyperfast diodes with soft recovery characteristics ($t_{rr} < 30ns$). They have half the recovery time of ultrafast diodes and are of 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.

Formerly developmental type TA49055.

Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|--------|
| RHRD440 | TO-251 | RHR440 |
| RHRD460 | TO-251 | RHR460 |
| RHRD440S | TO-252 | RHR440 |
| RHRD460S | TO-252 | RHR460 |

NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252AA variant in the tape and reel, i.e., RHRD460S9A.

Symbol



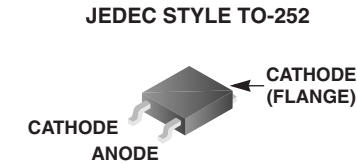
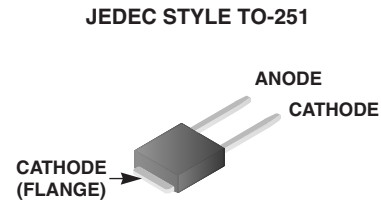
Features

- Hyperfast with Soft Recovery <30ns
- Operating Temperature 175°C
- Reverse Voltage Up to 600V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Packaging



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

| | RHRD440, RHRD440S | RHRD460, RHRD460S | UNITS |
|--|----------------------|----------------------|-------|
| Peak Repetitive Reverse Voltage V_{RRM} | 400 | 600 | V |
| Working Peak Reverse Voltage V_{RWM} | 400 | 600 | V |
| DC Blocking Voltage V_R | 400 | 600 | V |
| Average Rectified Forward Current $I_{F(AV)}$ ($T_C = 157^\circ C$) | 4 | 4 | A |
| Repetitive Peak Surge Current I_{FRM} (Square Wave, 20kHz) | 8 | 8 | A |
| Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz) | 40 | 40 | A |
| Maximum Power Dissipation P_D | 50 | 50 | W |
| Avalanche Energy (See Figures 10 and 11) E_{AVL} | 10 | 10 | mJ |
| Operating and Storage Temperature T_{STG}, T_J | -65 to 175 | -65 to 175 | °C |
| Maximum Lead Temperature for Soldering (Leads at 0.063 in. (1.6mm) from case for 10s) T_L | 300 | 300 | °C |
| Package Body for 10s, see Tech Brief 334. T_{PKG} | 260 | 260 | °C |

RHRD440, RHRD460, RHRD440S, RHRD460S

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

| SYMBOL | TEST CONDITION | RHRD440, RHRD440S | | | RHRD460, RHRD460S | | | UNITS |
|-----------------|--|-------------------|-----|-----|-------------------|-----|-----|---------------------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_F | $I_F = 4\text{A}$ | - | - | 2.1 | - | - | 2.1 | V |
| | $I_F = 4\text{A}, T_C = 150^\circ\text{C}$ | - | - | 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} | $I_F = 1\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$ | - | - | 30 | - | - | 30 | ns |
| | $I_F = 4\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$ | - | - | 35 | - | - | 35 | ns |
| t_a | $I_F = 4\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$ | - | 16 | - | - | 16 | - | ns |
| t_b | $I_F = 4\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$ | - | 7 | - | - | 7 | - | ns |
| Q_{RR} | $I_F = 4\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$ | - | 45 | - | - | 45 | - | nC |
| C_J | $V_R = 10\text{V}, I_F = 0\text{A}$ | - | 15 | - | - | 15 | - | pF |
| $R_{\theta JC}$ | | - | - | 3 | - | - | 3 | $^\circ\text{C}/\text{W}$ |

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 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.

p_w = Pulse width.

D = Duty cycle.

Typical Performance Curves

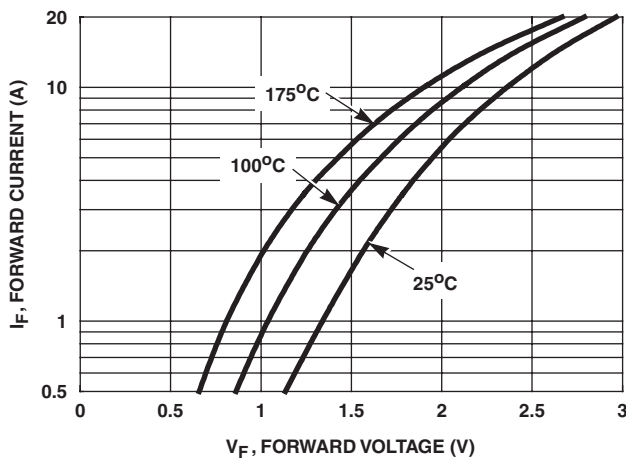


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

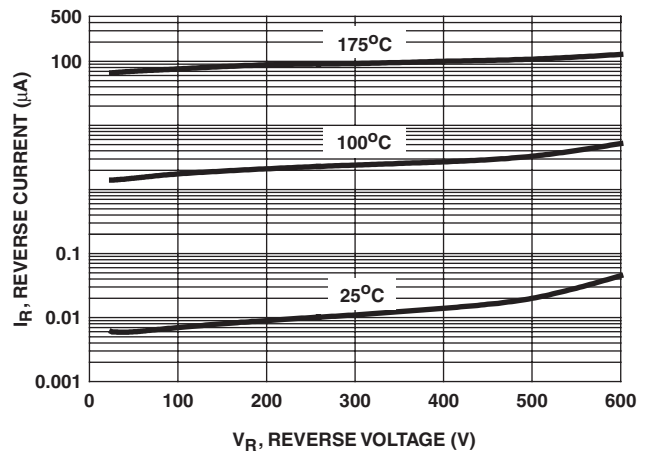


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

Typical Performance Curves (Continued)

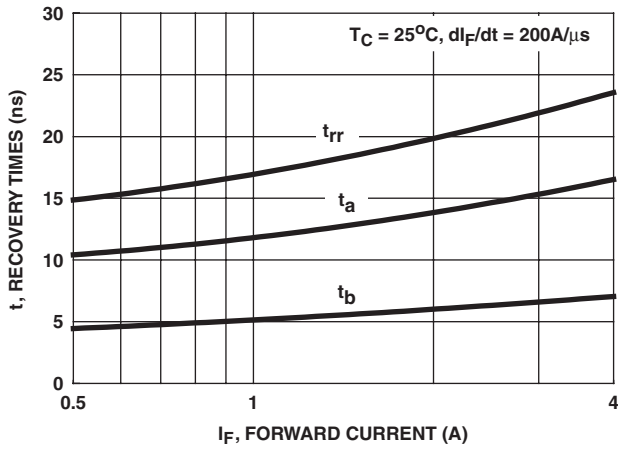


FIGURE 3. t_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

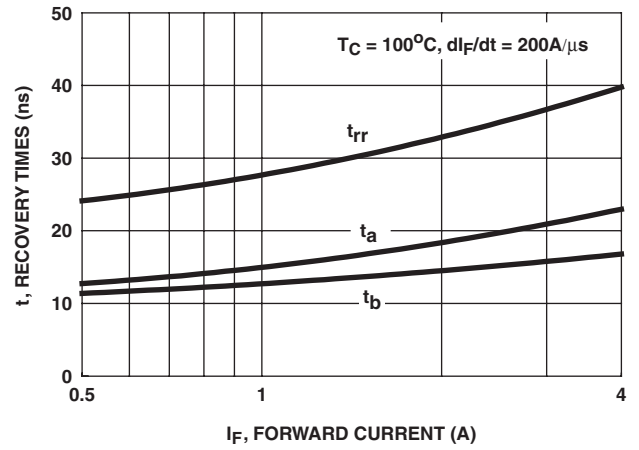


FIGURE 4. t_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

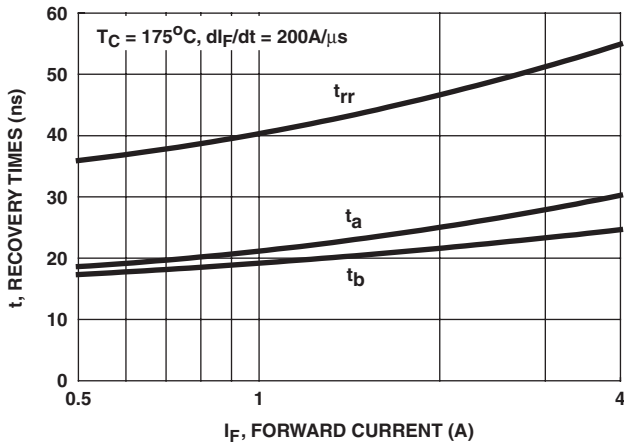


FIGURE 5. t_{rr} , t_a AND t_b CURVES vs FORWARD CURRENT

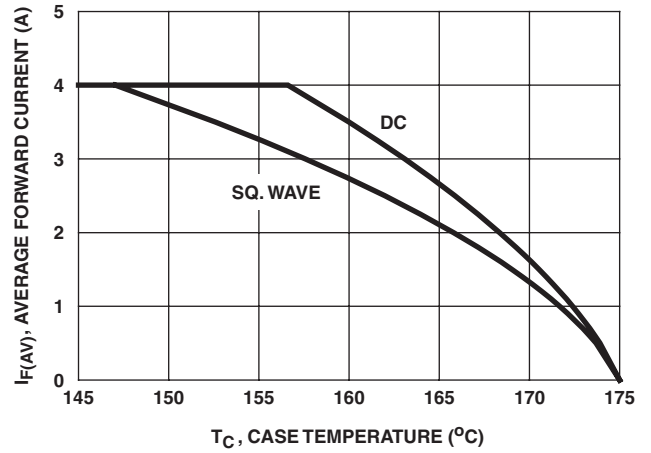


FIGURE 6. CURRENT DERATING CURVE

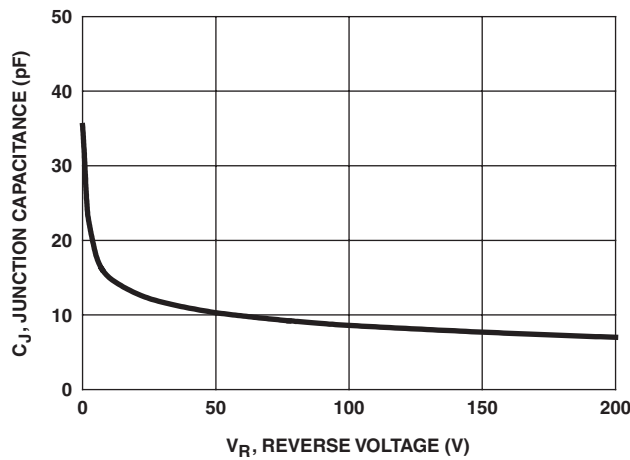


FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuits and Waveforms

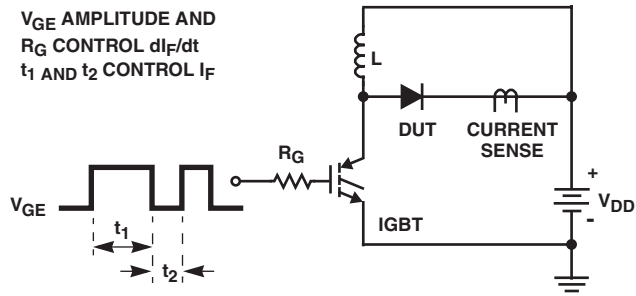


FIGURE 8. t_{rr} TEST CIRCUIT

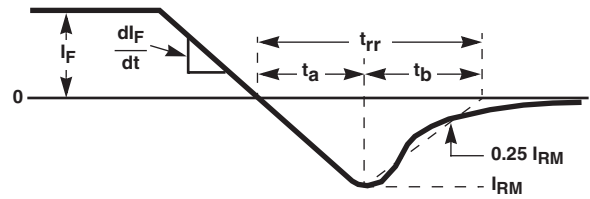


FIGURE 9. t_{rr} WAVEFORMS AND DEFINITIONS

$I_{MAX} = 1A$
 $L = 20mH$
 $R < 0.1\Omega$
 $E_{AVL} = 1/2Li^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$
 $Q_1 = IGBT (BV_{CES} > DUT V_{R(AVL)})$

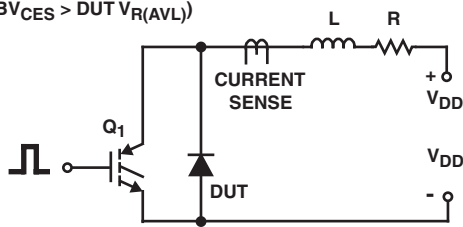


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

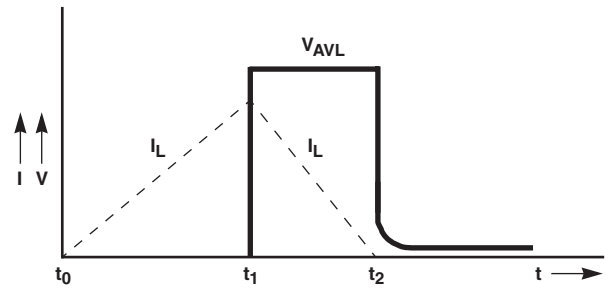


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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| DOMET TM | HiSeC TM | PowerTrench [®] | SuperSOT TM -8 | |
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