

**6A, 600V Hyperfast Diodes**

The RHRD660 and RHRD660S are hyperfast diodes with soft recovery characteristics ( $t_{rr} < 30ns$ ). 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.

Formerly developmental type TA49057.

**Ordering Information**

PART NUMBER	PACKAGE	BRAND
RHRD660	TO-251	RHR660
RHRD660S	TO-252	RHR660

NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252 variant in tape and reel, e.g. RHRD660S9A.

**Symbol**



**Features**

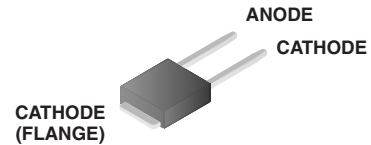
- Hyperfast with Soft Recovery . . . . . <30ns
- Operating Temperature . . . . . 175°C
- Reverse Voltage Up To . . . . . 600V
- Avalanche Energy Rated
- Planar Construction

**Applications**

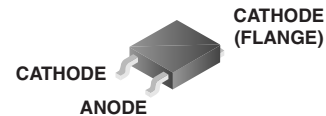
- Switching Power Supplies
- Power Switching Circuits
- General Purpose

**Packaging**

JEDEC STYLE TO-251



JEDEC STYLE TO-252



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

	RHRD660, RHRD660S	UNITS
Peak Repetitive Reverse Voltage . . . . . $V_{RRM}$	600	V
Working Peak Reverse Voltage . . . . . $V_{RWM}$	600	V
DC Blocking Voltage . . . . . $V_R$	600	V
Average Rectified Forward Current . . . . . $I_{F(AV)}$ ( $T_C = 152^\circ C$ )	6	A
Repetitive Peak Surge Current . . . . . $I_{FRM}$ (Square Wave, 20kHz)	12	A
Nonrepetitive Peak Surge Current . . . . . $I_{FSM}$ (Halfwave, 1 Phase, 60Hz)	60	A
Maximum Power Dissipation . . . . . $P_D$	50	W
Avalanche Energy (See Figures 10 and 11) . . . . . $E_{AVL}$	10	mJ
Operating and Storage Temperature . . . . . $T_{STG}, T_J$	-65 to 175	°C
Maximum Lead Temperature for Soldering (Leads at 0.063 in. (1.6mm) from case for 10s) . . . . . $T_L$	300	°C
Package Body for 10s, see Tech Brief 334. . . . . $T_{PKG}$	260	°C

# RHRD660, RHRD660S

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

SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNITS
$V_F$	$I_F = 6\text{A}$	-	-	2.1	V
	$I_F = 6\text{A}, T_C = 150^\circ\text{C}$	-	-	1.7	V
$I_R$	$V_R = 600\text{V}$	-	-	100	$\mu\text{A}$
	$V_R = 600\text{V}, T_C = 150^\circ\text{C}$	-	-	500	$\mu\text{A}$
$t_{rr}$	$I_F = 1\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	30	ns
	$I_F = 6\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	35	ns
$t_a$	$I_F = 6\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$	-	16	-	ns
$t_b$	$I_F = 6\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$	-	8.5	-	ns
$Q_{RR}$	$I_F = 6\text{A}, dI_F/dt = 200\text{A}/\mu\text{s}$	-	45	-	nC
$C_J$	$V_R = 10\text{V}, I_F = 0\text{A}$	-	20	-	pF
$R_{\theta JC}$		-	-	3	$^\circ\text{C}/\text{W}$

### DEFINITIONS

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

$I_R$  = 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.

$pw$  = Pulse width.

$D$  = Duty cycle.

## Typical Performance Curves

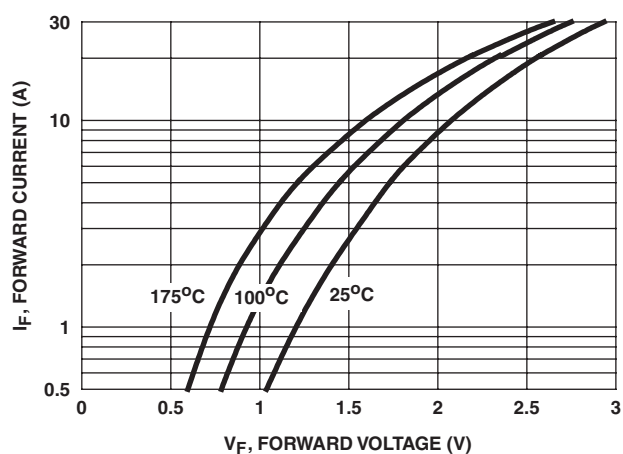


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

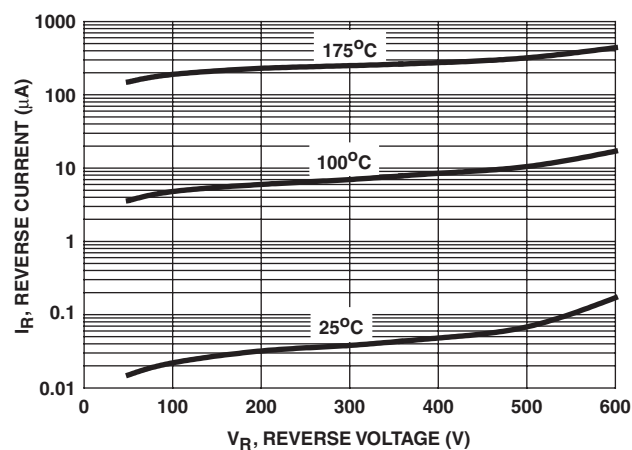


FIGURE 2. REVERSE CURRENT vs REVERSE

Typical Performance Curves (Continued)

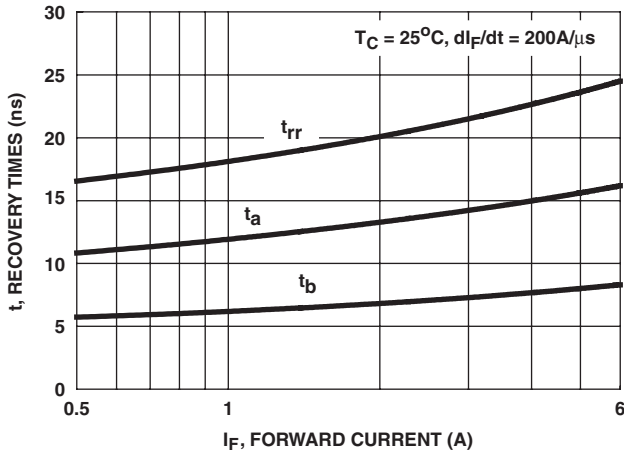


FIGURE 3.  $t_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

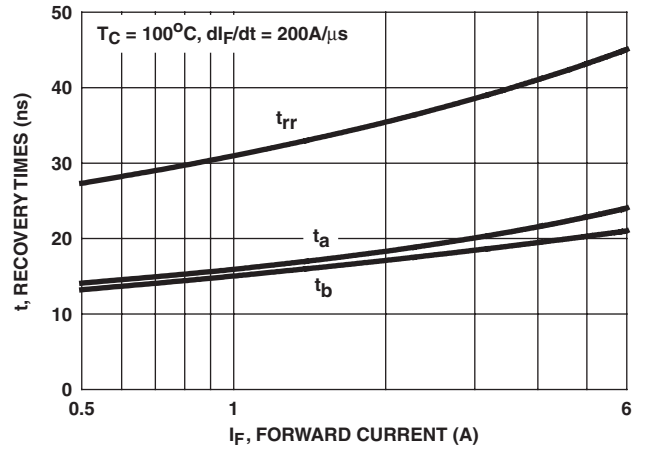


FIGURE 4.  $t_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

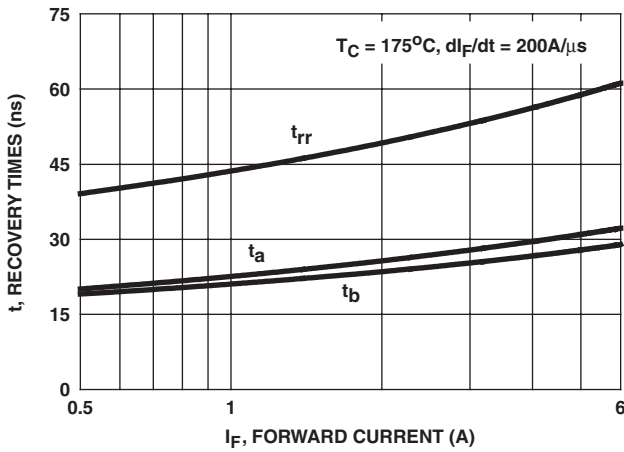


FIGURE 5.  $t_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

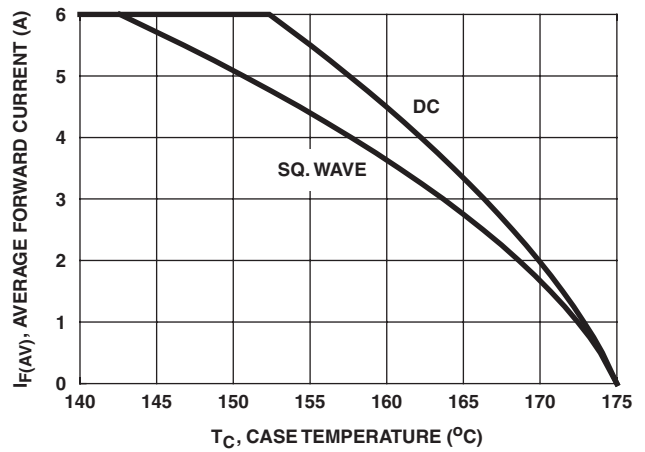


FIGURE 6. CURRENT DERATING CURVE

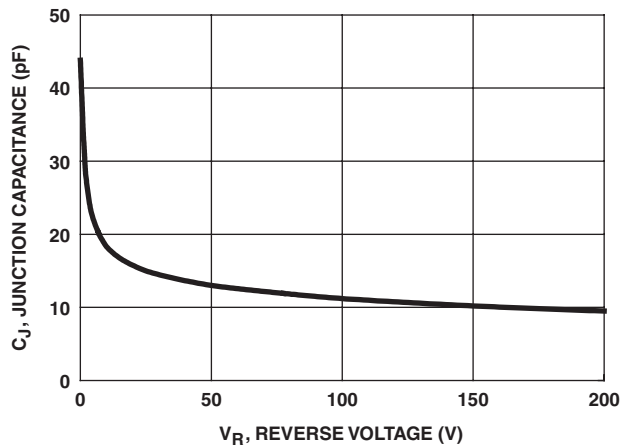


FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

**Test Circuits and Waveforms**

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

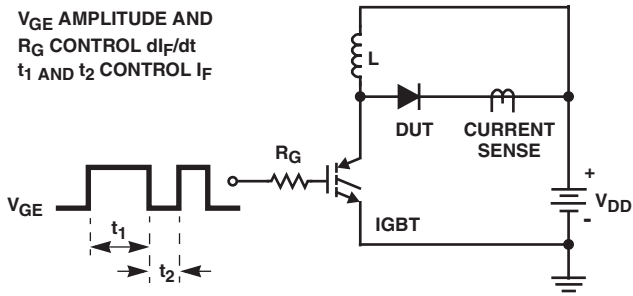


FIGURE 8.  $t_{rr}$  TEST CIRCUIT

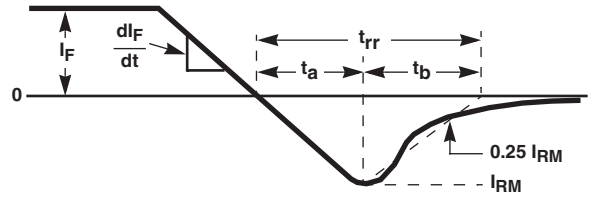


FIGURE 9.  $t_{rr}$  WAVEFORMS AND DEFINITIONS

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

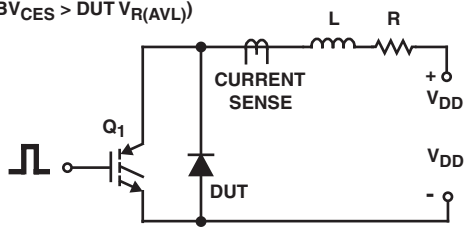


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

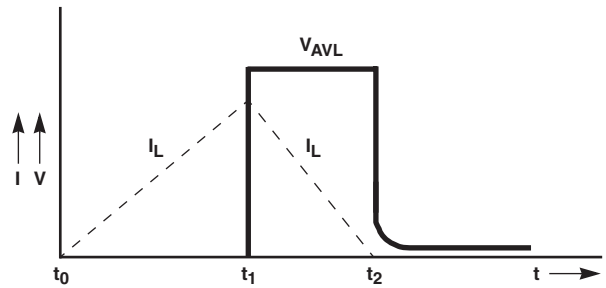


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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## PRODUCT STATUS DEFINITIONS

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