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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**



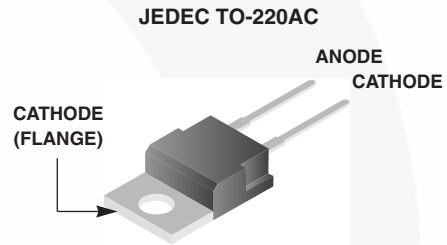
**Features**

- 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 . . . . .	$V_{RRM}$	400	600	V
Working Peak Reverse Voltage . . . . .	$V_{RWM}$	400	600	V
DC Blocking Voltage . . . . .	$V_R$	400	600	V
Average Rectified Forward Current . . . . . ( $T_C = 140^\circ\text{C}$ )	$I_{F(AV)}$	15	15	A
Repetitive Peak Surge Current . . . . . (Square Wave, 20 kHz)	$I_{FRM}$	30	30	A
Nonrepetitive Peak Surge Current . . . . . (Halfwave, 1 Phase, 60 Hz)	$I_{FSM}$	200	200	A
Maximum Power Dissipation . . . . .	$P_D$	100	100	W
Avalanche Energy (See Figures 10 and 11) . . . . .	$E_{AVL}$	20	20	mJ
Operating and Storage Temperature . . . . .	$T_{STG}, T_J$	-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	-	-	-	$\mu\text{A}$
	$V_R = 600\text{ V}$	-	-	-	-	-	100	$\mu\text{A}$
	$V_R = 400\text{ V}, T_C = 150^\circ\text{C}$	-	-	500	-	-	-	$\mu\text{A}$
	$V_R = 600\text{ V}, T_C = 150^\circ\text{C}$	-	-	-	-	-	500	$\mu\text{A}$
$T_{rr}$	$I_F = 1\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	-	-	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  $\mu\text{s}$ , 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

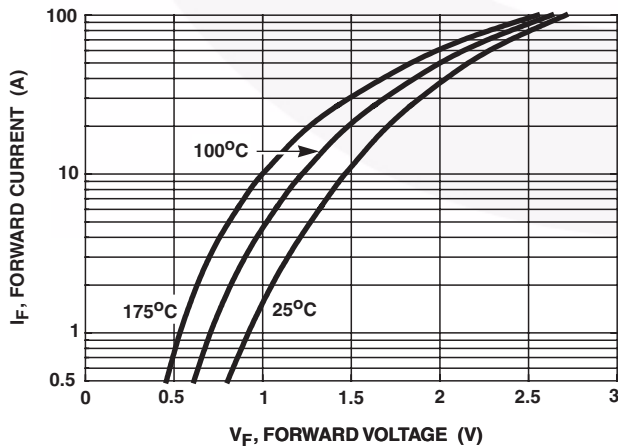


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

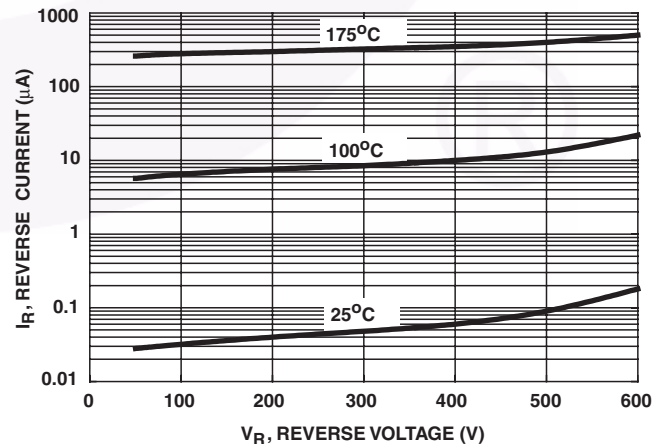


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

Typical Performance Curves (Continued)

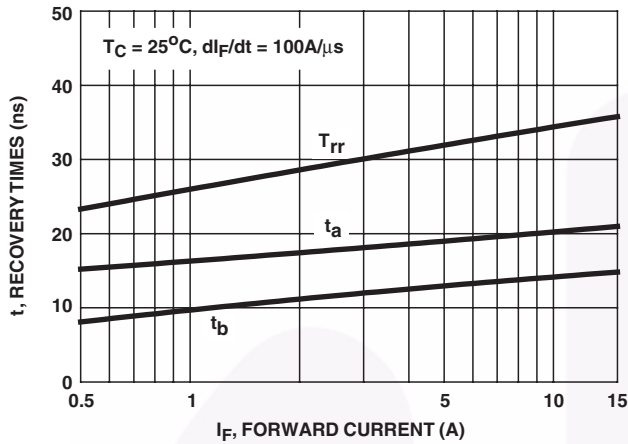


FIGURE 3.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

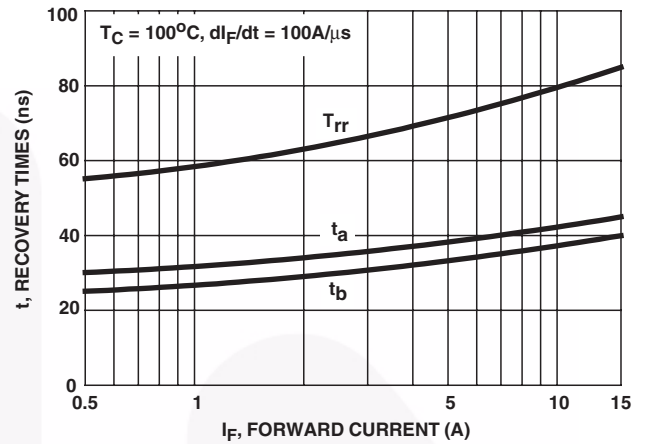


FIGURE 4.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

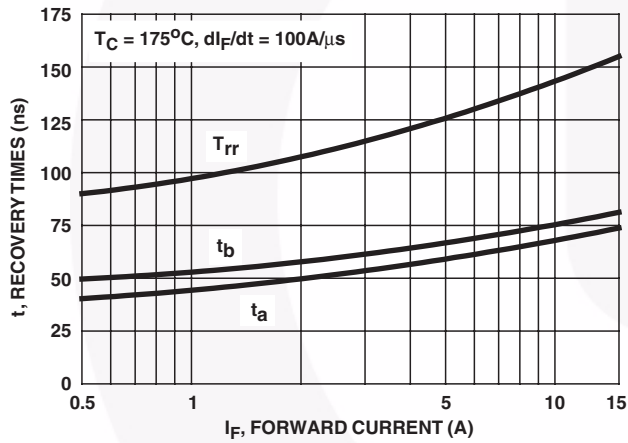


FIGURE 5.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

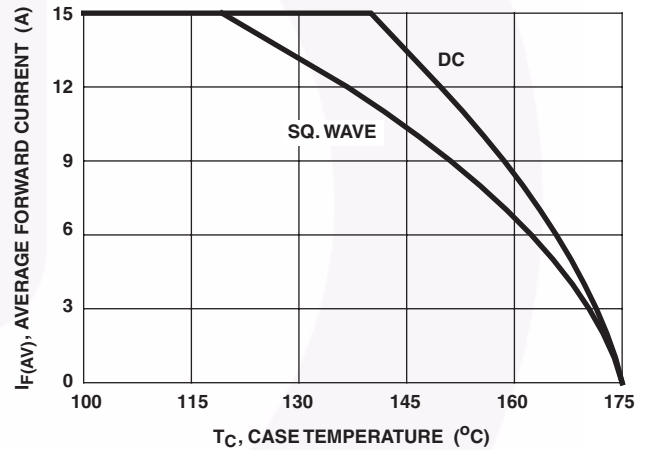


FIGURE 6. CURRENT DERATING CURVE

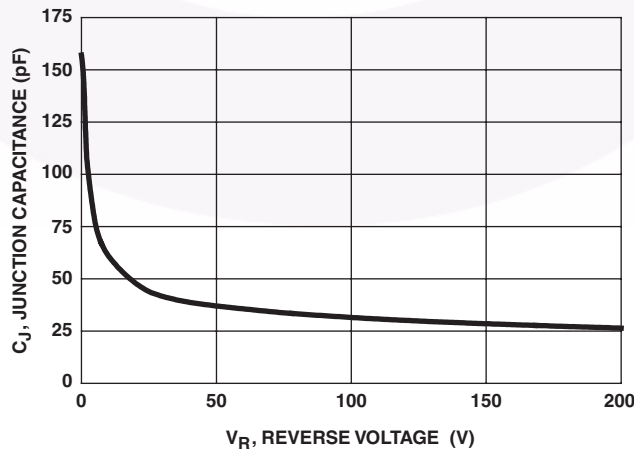


FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

**Test Circuits and Waveforms**

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

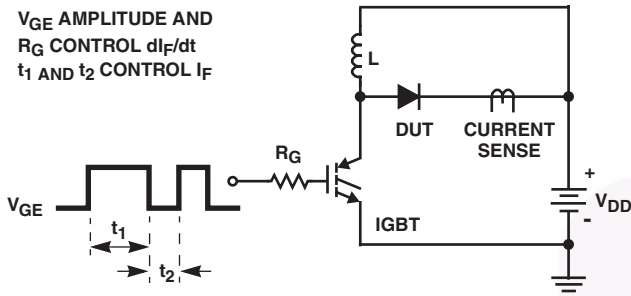


FIGURE 8.  $T_{rr}$  TEST CIRCUIT

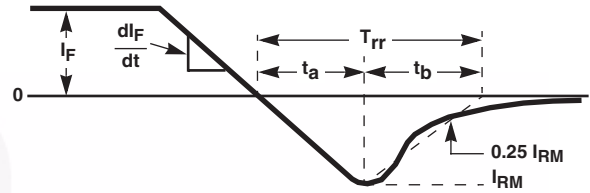


FIGURE 9.  $T_{rr}$  WAVEFORMS AND DEFINITIONS

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

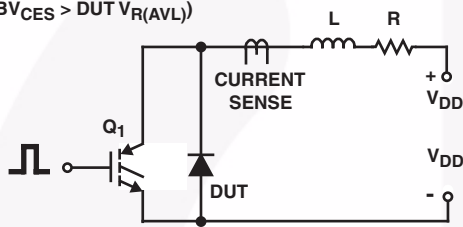


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

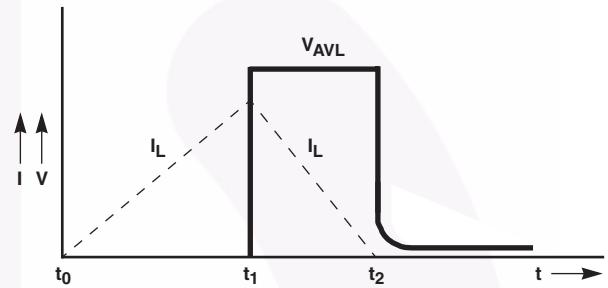
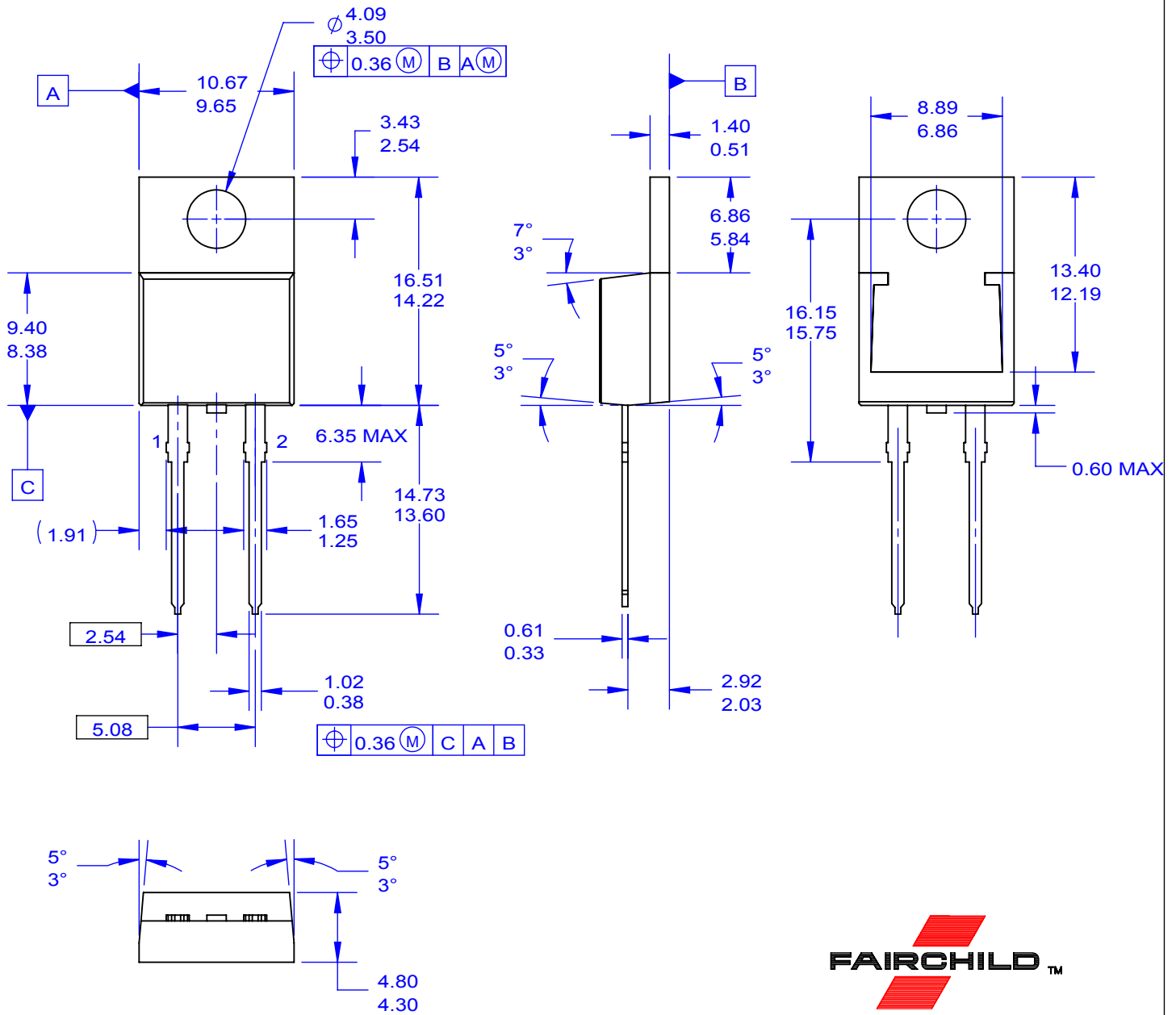


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS



**NOTES:**

- A. PACKAGE REFERENCE: JEDEC TO220,ISSUE K, VARIATION AC,DATED APRIL 2002.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DRAWING FILE NAME: TO220A02REV5



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