

# ON Semiconductor

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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

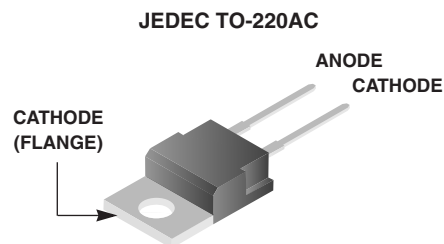
NOTE: When ordering, use the entire part number.

**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	$^\circ\text{C}$

**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**

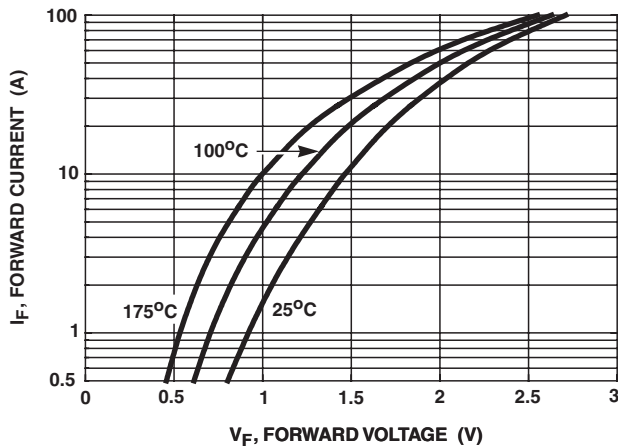


FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE

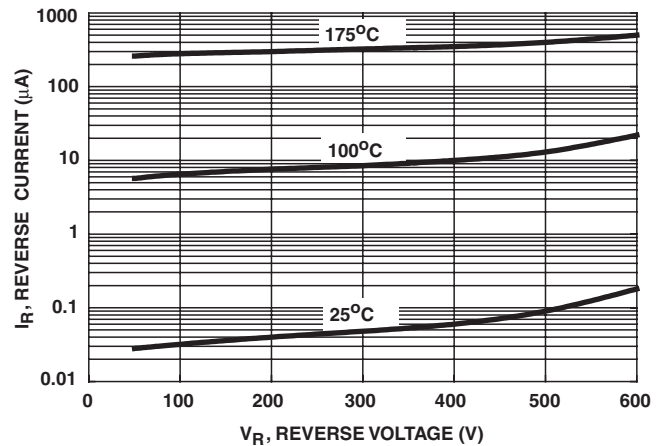


FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE

Typical Performance Curves (Continued)

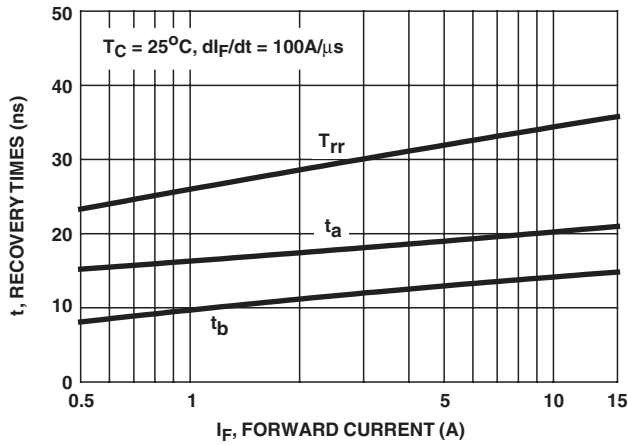


FIGURE 3.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

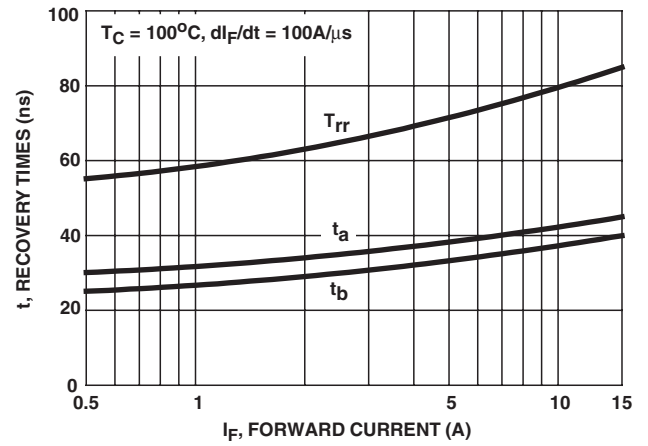


FIGURE 4.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

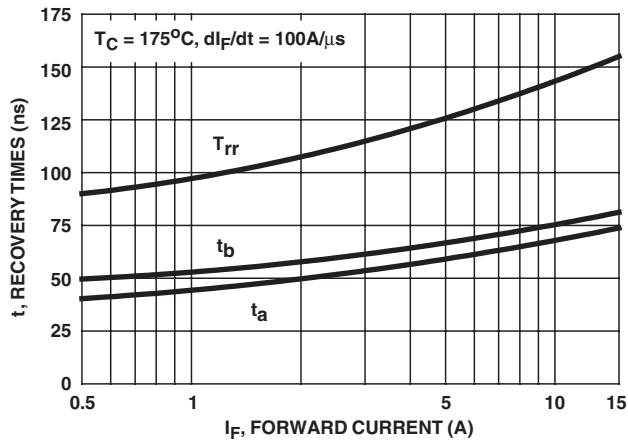


FIGURE 5.  $T_{rr}$ ,  $t_a$  AND  $t_b$  CURVES vs FORWARD CURRENT

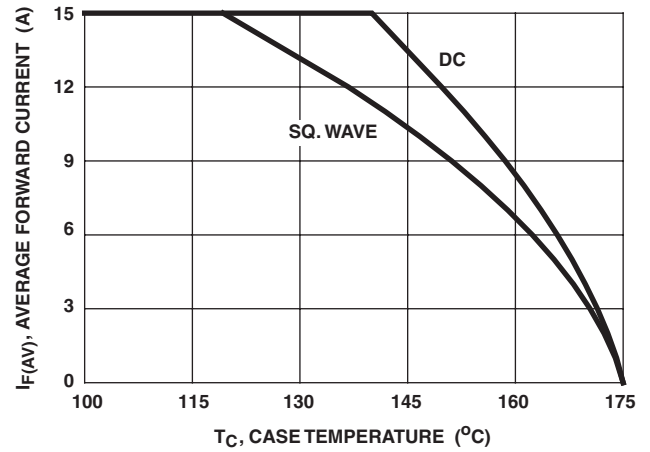


FIGURE 6. CURRENT DERATING CURVE

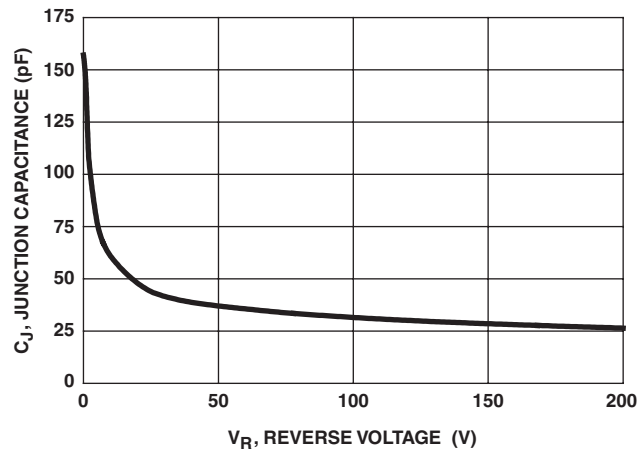


FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

## Test Circuits and Waveforms

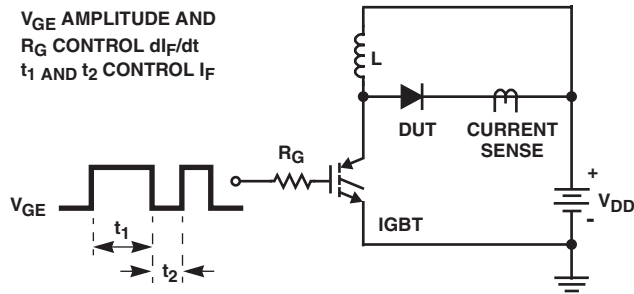


FIGURE 8.  $T_{rr}$  TEST CIRCUIT

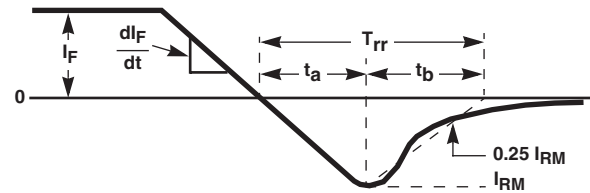


FIGURE 9.  $T_{rr}$  WAVEFORMS AND DEFINITIONS

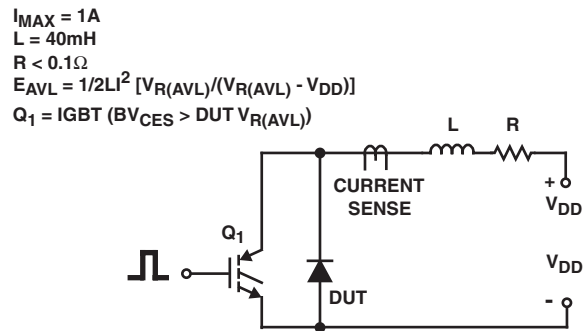


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

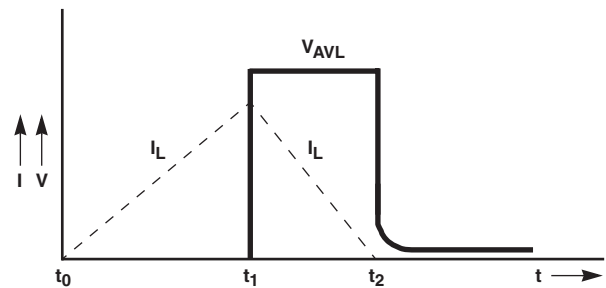


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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