

April 1995

## 30A, 1200V Hyperfast Diode

### Features

- Hyperfast with Soft Recovery ..... <65ns
- Operating Temperature ..... +175°C
- Reverse Voltage ..... 1200V
- Avalanche Energy Rated
- Planar Construction

### Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

### Description

The RHRP30120 (TA49041) is a hyperfast diode with soft recovery characteristics ( $t_{RR} < 65\text{ns}$ ). It has half the recovery time of ultrafast diodes and is silicon nitride passivated ion-implanted epitaxial planar construction.

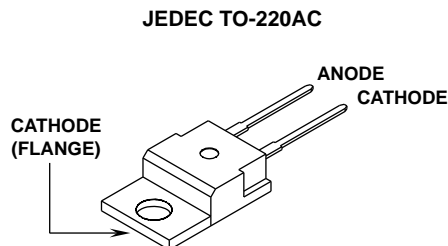
This device is intended for use as a freewheeling/clamping diode and rectifier in a variety of high frequency switching power supplies and other power switching applications. Its low stored charge and hyperfast soft recovery minimize ringing and electrical noise in many power switching circuits, reducing power loss in the switching transistors.

#### PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRP30120	TO-220AC	RHR30120

NOTE: When ordering, use the entire part number.

### Package



### Symbol



### Absolute Maximum Ratings $T_C = +25^\circ\text{C}$

	RHRP30120	UNITS
Peak Repetitive Reverse Voltage .....	$V_{RRM}$ 1200	V
Working Peak Reverse Voltage .....	$V_{RWM}$ 1200	V
DC Blocking Voltage .....	$V_R$ 1200	V
Average Rectified Forward Current .....	$I_{F(AV)}$ 30	A
( $T_C = +78^\circ\text{C}$ )		
Repetitive Peak Surge Current .....	$I_{FSM}$ 60	A
(Square Wave, 20kHz)		
Nonrepetitive Peak Surge Current .....	$I_{FSM}$ 300	A
(Halfwave, 1 Phase, 60Hz)		
Maximum Power Dissipation .....	$P_D$ 125	W
Avalanche Energy ( $L = 40\text{mH}$ ) .....	$E_{AVL}$ 30	mj
Operating and Storage Temperature .....	$T_{STG}, T_J$ -65 to +175	$^\circ\text{C}$

# Specifications RHRP30120

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

SYMBOL	TEST CONDITION	LIMITS			UNITS
		MIN	TYP	MAX	
$V_F$	$I_F = 30\text{A}$	-	-	3.2	V
$V_F$	$I_F = 30\text{A}$ $T_C = +150^\circ\text{C}$	-	-	2.6	V
$I_R$	$V_R = 1200\text{V}$	-	-	500	$\mu\text{A}$
$I_R$	$V_R = 1200\text{V}$ $T_C = +150^\circ\text{C}$	-	-	1	mA
$t_{RR}$	$I_F = 1\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$	-	-	65	ns
$t_{RR}$	$I_F = 30\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$	-	-	75	ns
$t_A$	$I_F = 30\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$	-	48	-	ns
$t_B$	$I_F = 30\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$	-	22	-	ns
$R_{\theta JC}$		-	-	1.2	$^\circ\text{C}/\text{W}$

### 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 2), summation of  $t_A + t_B$ .

$t_A$  = Time to reach peak reverse current (See Figure 2).

$t_B$  = 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 2).

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

$E_{AVL}$  = Controlled avalanche energy (See Figures 7 and 8).

$p_w$  = pulse width.

$D$  = duty cycle.

$V_1$  AMPLITUDE CONTROLS  $I_F$

$V_2$  AMPLITUDE CONTROLS  $dI_F/dt$

$L_1$  = SELF INDUCTANCE OF

$R_4 + L_{\text{LOOP}}$

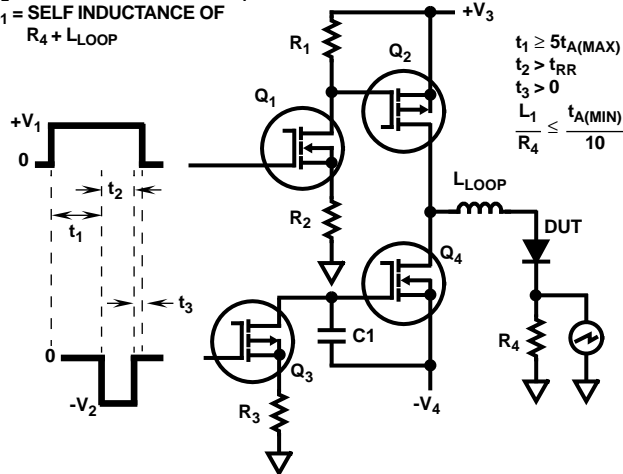


FIGURE 1.  $t_{RR}$  TEST CIRCUIT

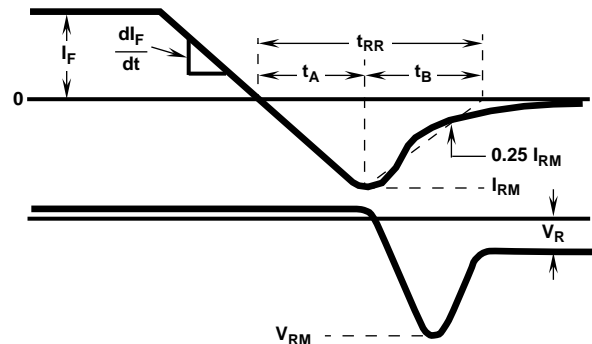


FIGURE 2.  $t_{RR}$  WAVEFORMS AND DEFINITIONS

# Typical Performance Curves

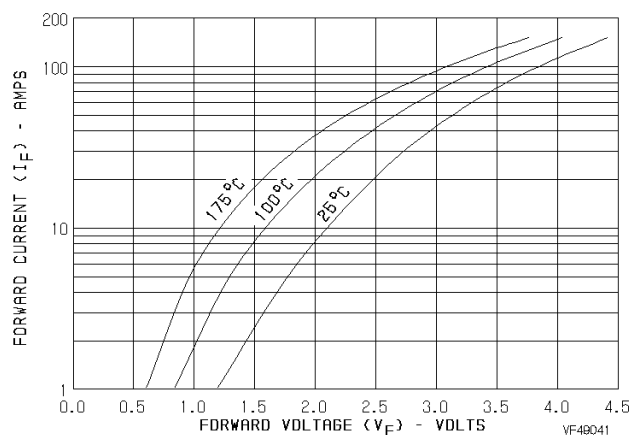


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

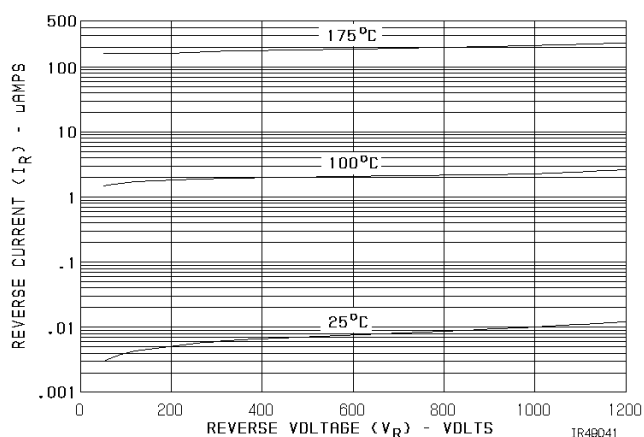


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

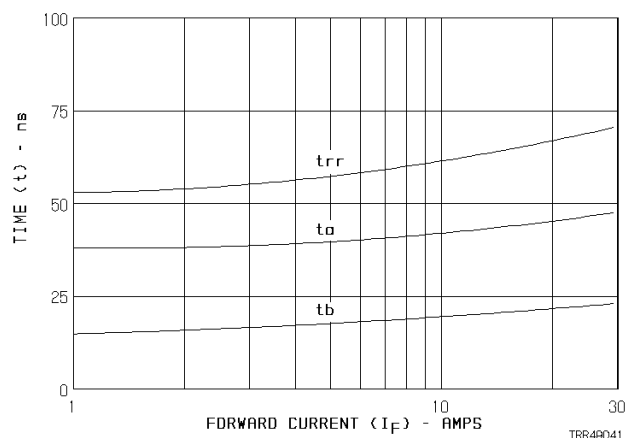


FIGURE 5. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT

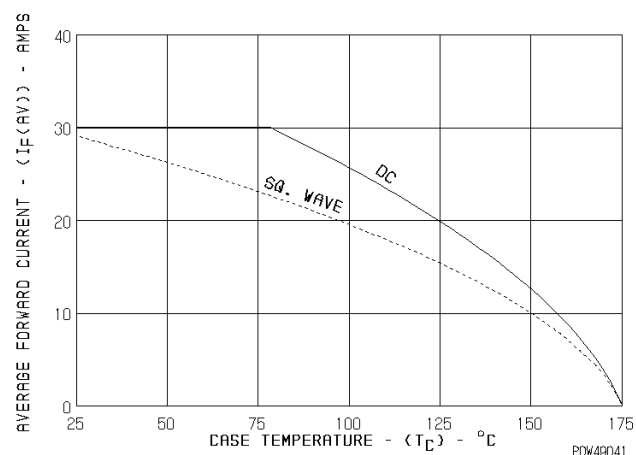


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPE

$I_{MAX} = 1A$

$L = 40mH$

$R < 0.1\Omega$

$E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$

$Q_1$  AND  $Q_2$  ARE 1000V MOSFETs

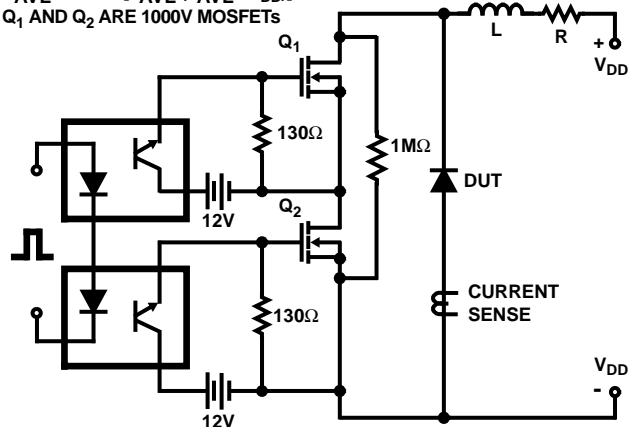


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

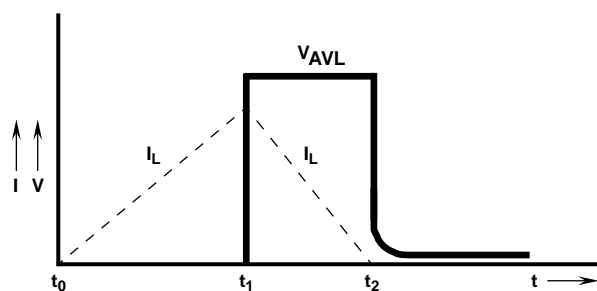


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS