HARRIS SEMICONDUCTOR

RHRP1540, RHRP1550, RHRP1560

April 1995

15A, 400V - 600V Hyperfast Diodes

Features

- **Hyperfast with Soft Recovery . . . . . <35ns**
- **Operating Temperature . . . . . +175^{o}C**
- **Reverse Voltage Up To 600V**
- **Avalanche Energy Rated**
- **Planar Construction**

Applications

- **Switching Power Supplies**
- **Power Switching Circuits**
- **General Purpose**

Description

RHRP1540, RHRP1550 and RHRP1560 (TA49061) are hyperfast diodes with soft recovery characteristics (t_{RR} < 35ns). 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.

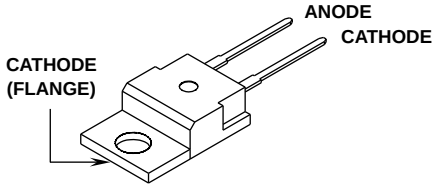
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRP1540	TO-220AC	RHRP1540
RHRP1550	TO-220AC	RHRP1550
RHRP1560	TO-220AC	RHRP1560

NOTE: When ordering, use the entire part number.

Package

JEDEC TO-220AC



Symbol

Absolute Maximum Ratings

T_C = +25^{o}C, Unless Otherwise Specified

		RHRP1540	RHRP1550	RHRP1560	UNITS
Peak Repetitive Reverse Voltage	V_{RRM}	400	500	600	V
Working Peak Reverse Voltage	V_{RWM}	400	500	600	V
DC Blocking Voltage	V_R	400	500	600	V
Average Rectified Forward Current (T_C = +140^{o}C)	$I_{F(AV)}$	15	15	15	A
Repetitive Peak Surge Current (Square Wave, 20kHz)	I_{FSM}	30	30	30	A
Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz)	I_{FSM}	200	200	200	A
Maximum Power Dissipation	P_D	100	100	100	W
Avalanche Energy (L = 40mH)	E_{AVL}	20	20	20	mj
Operating and Storage Temperature	T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	^{o}C

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File Number **3685.1**

Electrical Specifications $T_C = +25^oC$, Unless Otherwise Specified

SYMBOL	TEST CONDITION	LIMITS									UNITS
		RHRP1540			RHRP1550			RHRP1560			
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	I_F = 15A, T_C = +25°C	-	-	2.1	-	-	2.1	-	-	2.1	V
	I_F = 15A, T_C = +150°C	-	-	1.7	-	-	1.7	-	-	1.7	V
I_R	V_R = 400V, T_C = +25°C	-	-	100	-	-	-	-	-	-	µA
	V_R = 500V, T_C = +25°C	-	-	-	-	-	100	-	-	-	µA
	V_R = 600V, T_C = +25°C	-	-	-	-	-	-	-	-	100	µA
I_R	V_R = 400V, T_C = +150°C	-	-	500	-	-	-	-	-	-	µA
	V_R = 500V, T_C = +150°C	-	-	-	-	-	500	-	-	-	µA
	V_R = 600V, T_C = +150°C	-	-	-	-	-	-	-	-	500	µA
t_{RR}	I_F = 1A, dI_F/dt = 100A/µs	-	-	35	-	-	35	-	-	35	ns
	I_F = 15A, dI_F/dt = 100A/µs	-	-	40	-	-	40	-	-	40	ns
t_A	I_F = 15A, dI_F/dt = 100A/µs	-	20	-	-	20	-	-	20	-	ns
t_B	I_F = 15A, dI_F/dt = 100A/µs	-	15	-	-	15	-	-	15	-	ns
Q_{RR}	I_F = 15A, dI_F/dt = 100A/µs	-	40	-	-	40	-	-	40	-	nC
C_J	V_R = 10V, I_F = 0A	-	60	-	-	60	-	-	60	-	pF
$R_{\theta JC}$		-	-	1.5	-	-	1.5	-	-	1.5	°C/W

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300µs, 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 10 and 11).

pw = pulse width.

D = duty cycle.

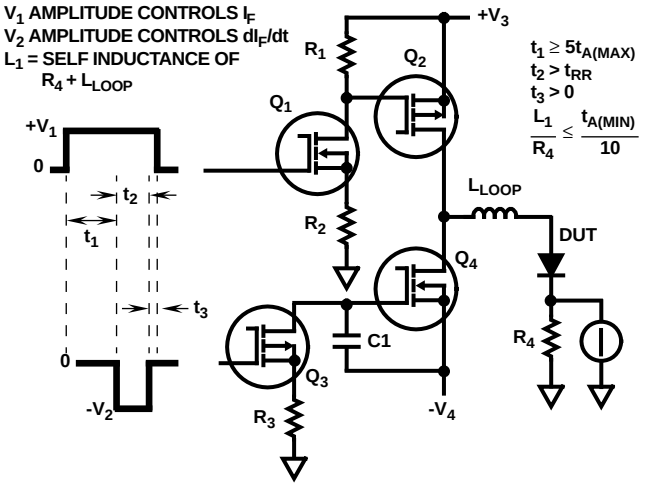

FIGURE 1. t_{RR} TEST CIRCUIT

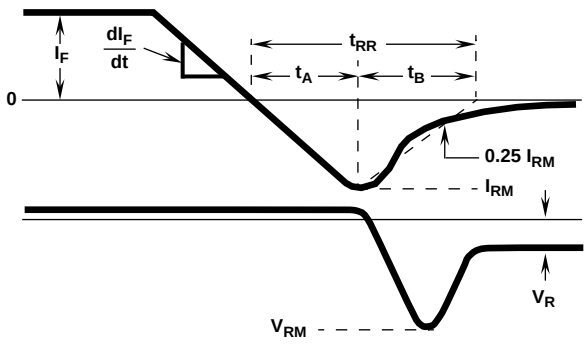

FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

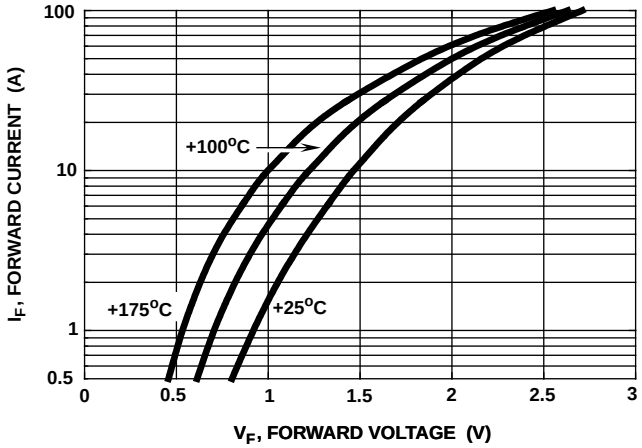

FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

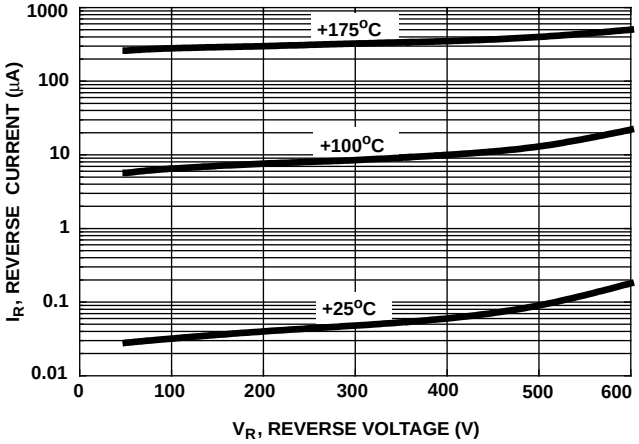

FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

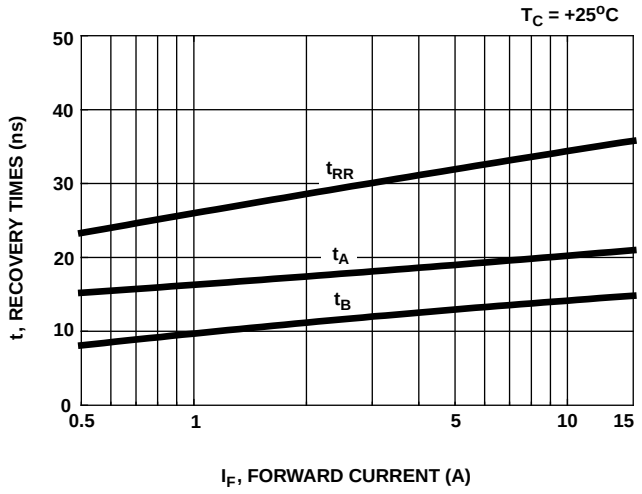

FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

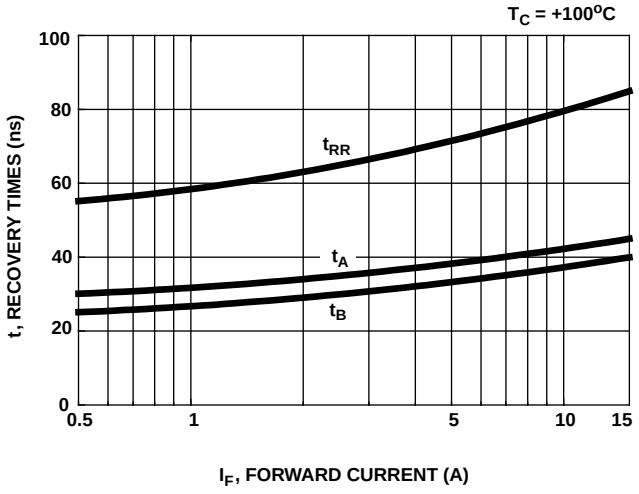

FIGURE 6. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

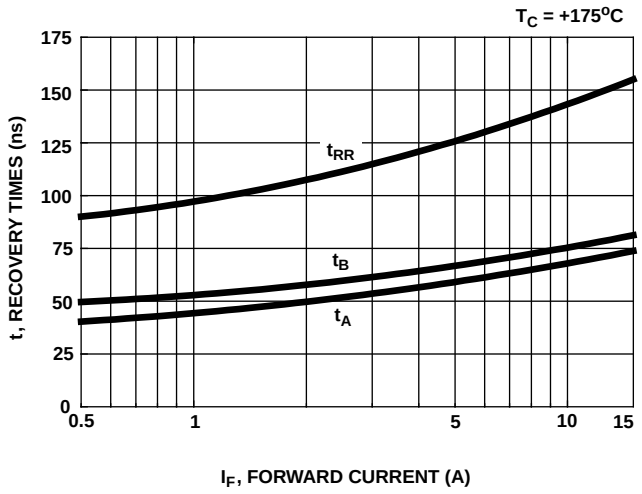

FIGURE 7. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

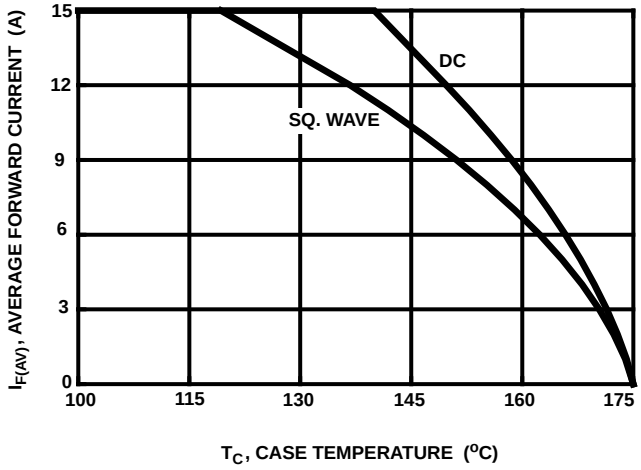

FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

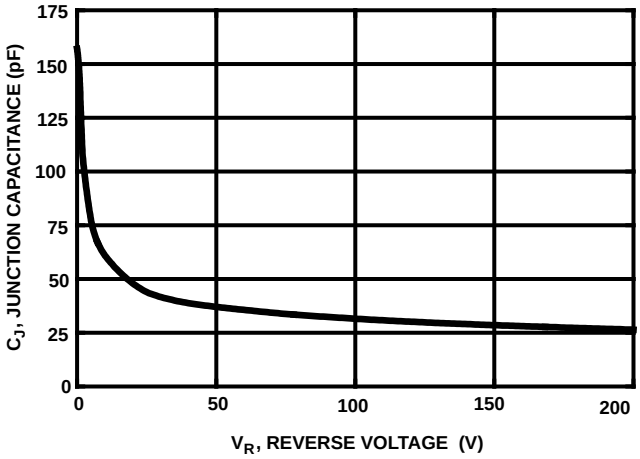

FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

Test Circuit and Waveforms

I_{MAX} = 1A
L = 40mH
R < 0.1Ω
$E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$
Q1 and Q2 ARE 1000V MOSFETS

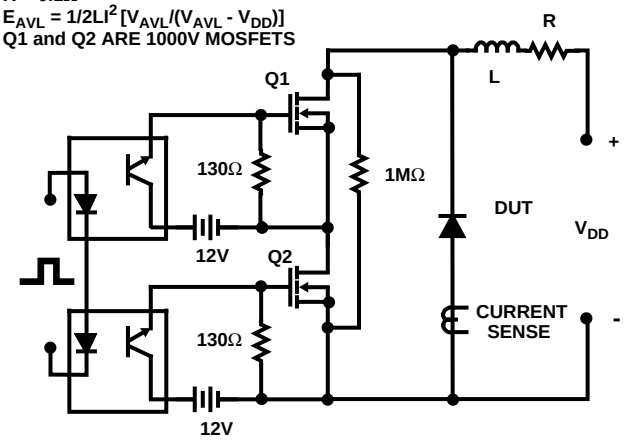

FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

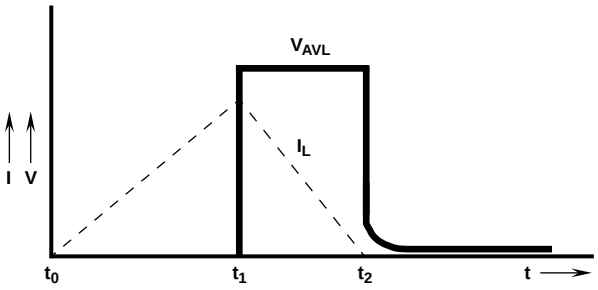

FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS