HARRIS SEMICONDUCTOR

RHRU15040, RHRU15050, RHRU15060

April 1995

150A, 400V - 600V Hyperfast Diodes

Features

- **Hyperfast with Soft Recovery . . . . . <60ns**
- **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

RHRU15040, RHRU15050 and RHRU15060 (TA49071) are hyperfast diodes with soft recovery characteristics (t_{RR} < 60ns). 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.

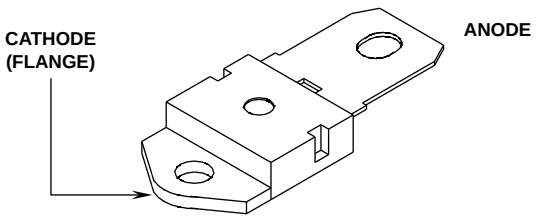
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRU15040	TO-218	RHRU15040
RHRU15050	TO-218	RHRU15050
RHRU15060	TO-218	RHRU15060

NOTE: When ordering, use the entire part number.

Package

JEDEC STYLE TO-218



Symbol

Absolute Maximum Ratings T_C = +25^{o}C

		RHRU15040	RHRU15050	RHRU15060
Peak Repetitive Reverse Voltage	V_{RRM}	400V	500V	600V
Working Peak Reverse Voltage	V_{RWM}	400V	500V	600V
DC Blocking Voltage	V_R	400V	500V	600V
Average Rectified Forward Current (T_C = +72^{o}C)	$I_{F(AV)}$	150A	150A	150A
Repetitive Peak Surge Current (Square Wave, 20kHz)	I_{FSM}	300A	300A	300A
Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz)	I_{FSM}	1500A	1500A	1500A
Maximum Power Dissipation	P_D	375W	375W	375W
Avalanche Energy (L = 40mH)	E_{AVL}	50mj	50mj	50mj
Operating and Storage Temperature	T_{STG},T_J	-65^{o}C to +175^{o}C	-65^{o}C to +175^{o}C	-65^{o}C to +175^{o}C

File Number **3089.2**

Electrical Specifications

T_C = +25°C, Unless Otherwise Specified

SYMBOL	TEST CONDITION		RHRU15040 LIMITS			RHRU15050 LIMITS			RHRU15060 LIMITS			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	I_F = 150A		-	-	2.1	-	-	2.1	-	-	2.1	V
V_F	I_F = 150A	T_C = +150°C	-	-	1.6	-	-	1.6	-	-	1.6	V
I_R	V_R = 400V		-	-	500	-	-	-	-	-	-	µA
	V_R = 500V		-	-	-	-	-	500	-	-	-	µA
	V_R = 600V		-	-	-	-	-	-	-	-	500	µA
I_R	V_R = 400V	T_C = +150°C	-	-	2.0	-	-	-	-	-	-	mA
	V_R = 500V	T_C = +150°C	-	-	-	-	-	2.0	-	-	-	mA
	V_R = 600V	T_C = +150°C	-	-	-	-	-	-	-	-	2.0	mA
t_{RR}	I_F = 1A, dI_F/dt = 100A/µs		-	-	60	-	-	60	-	-	60	ns
t_{RR}	I_F = 150A, dI_F/dt = 100A/µs		-	-	70	-	-	70	-	-	70	ns
t_A	I_F = 150A, dI_F/dt = 100A/µs		-	43	-	-	43	-	-	43	-	ns
t_B	I_F = 150A, dI_F/dt = 100A/µs		-	20	-	-	20	-	-	20	-	ns
$R_{\theta JC}$			-	-	0.4	-	-	0.4	-	-	0.4	°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 7 and 8).

pw = pulse width.

D = duty cycle.

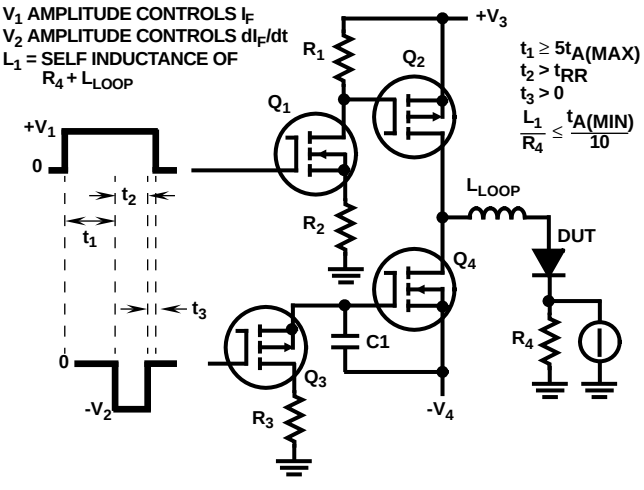


FIGURE 1. t_{RR} TEST CIRCUIT

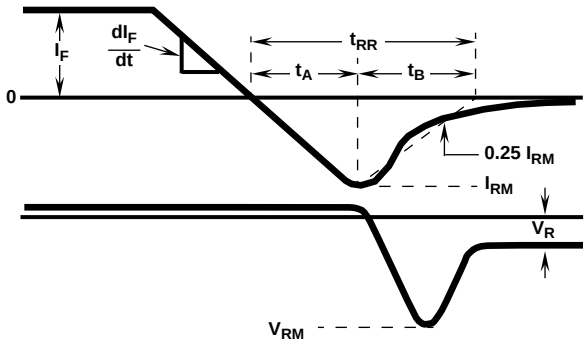


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

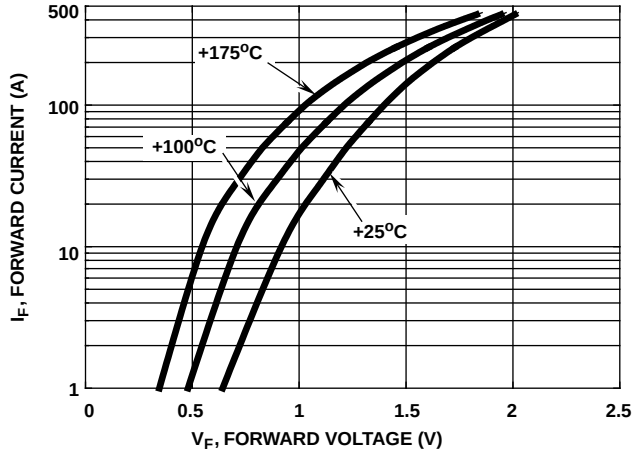


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

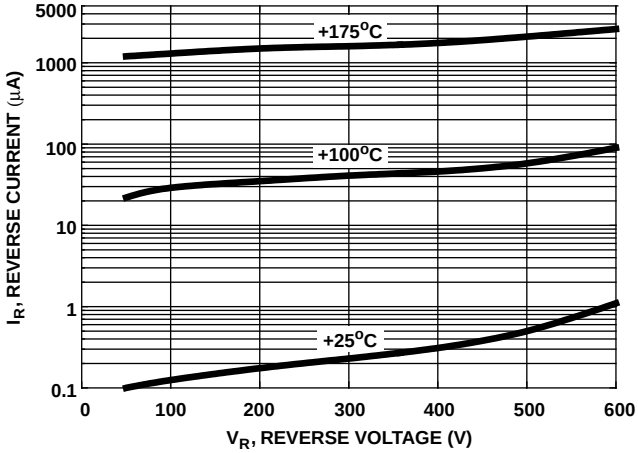


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

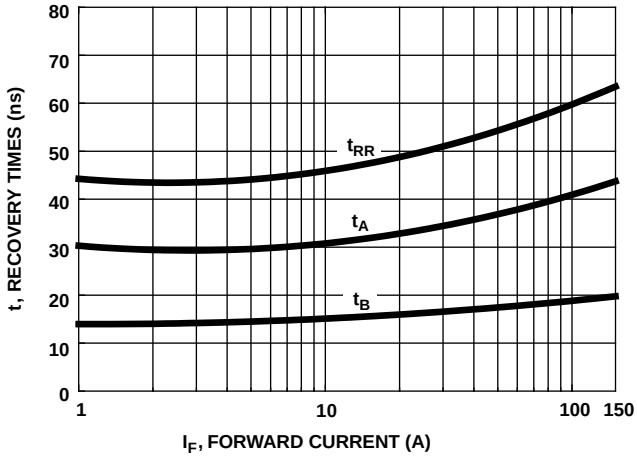


FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT

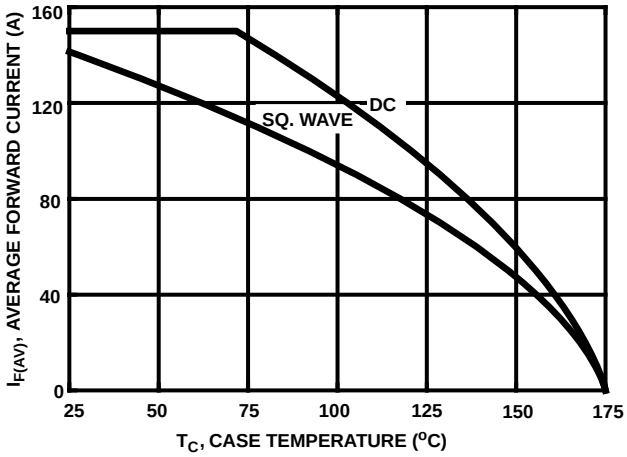


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

I_{MAX} = 1A
L = 40mH
R < 0.1Ω
$E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$
Q_1 & Q_2 ARE 1000V MOSFETs

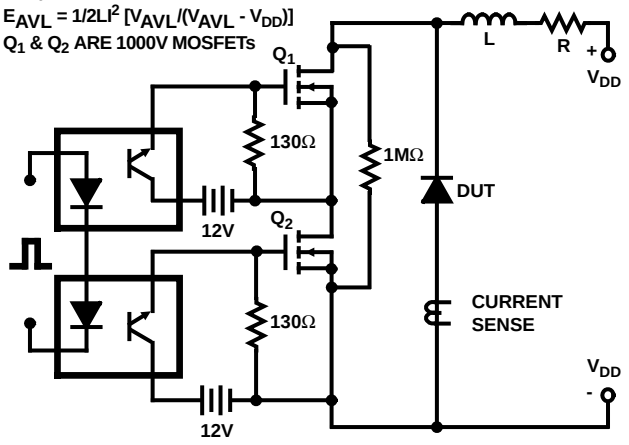


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

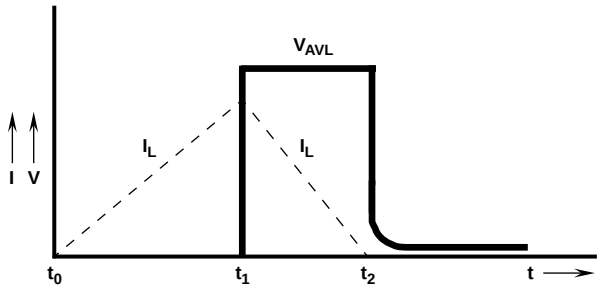


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS