HARRIS SEMICONDUCTOR

RHRD4120, RHRD4120S

April 1995

4A, 1200V Hyperfast Diodes

Features

- **Hyperfast with Soft Recovery . . . . . <60ns**
- **Operating Temperature . . . . . +175^{o}C**
- **Reverse Voltage 1200V**
- **Avalanche Energy Rated**
- **Planar Construction**

Applications

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

Description

RHRD4120 and RHRD4120S (TA49056) 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.

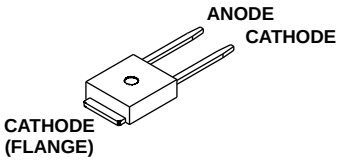
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RHRD4120	TO-251	HR4120
RHRD4120S	TO-252	HR4120

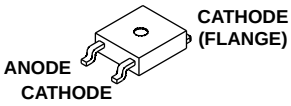
NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252AA variant in the tape and reel, i.e., RHRD4120S9A.

Package

JEDEC STYLE TO-251



JEDEC STYLE TO-252



Symbol

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

		RHRD4120 RHRD4120S	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 (T_C = +147.5^{o}C)	$I_{F(AV)}$	4	A
Repetitive Peak Surge Current (Square Wave, 20kHz)	I_{FSM}	8	A
Nonrepetitive Peak Surge Current (Halfwave, 1 phase, 60Hz)	I_{FSM}	40	A
Maximum Power Dissipation	P_D	50	W
Avalanche Energy (L = 40mH)	E_{AVL}	10	mj
Operating and Storage Temperature	T_{STG}, T_J	-65 to +175	^{o}C

File Number **3626.2**

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

SYMBOL	TEST CONDITION	RHRD4120, RHRD4120S			UNITS
		MIN	TYP	MAX	
V_F	I_F = 4A, $T_C = +25^oC$	-	-	3.2	V
V_F	I_F = 4A, $T_C = +150^oC$	-	-	2.6	V
I_R	V_R = 1200V, $T_C = +25^oC$	-	-	100	μA
I_R	V_R = 1200V, $T_C = +150^oC$	-	-	500	μA
t_{RR}	I_F = 1A, dI_F/dt = 100A/μs	-	-	60	ns
	I_F = 4A, dI_F/dt = 100A/μs	-	-	70	ns
t_A	I_F = 4A, dI_F/dt = 100A/μs	-	40	-	ns
t_B	I_F = 4A, dI_F/dt = 100A/μs	-	25	-	ns
Q_{RR}	I_F = 4A, dI_F/dt = 100A/μs	-	140	-	nC
C_J	V_R = 10V, I_F = 0A	-	15	-	pF
$R_{\theta JC}$		-	-	3	$^oC/W$

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 Figure 9 and Figure 10).

pw = pulse width.

D = duty cycle.

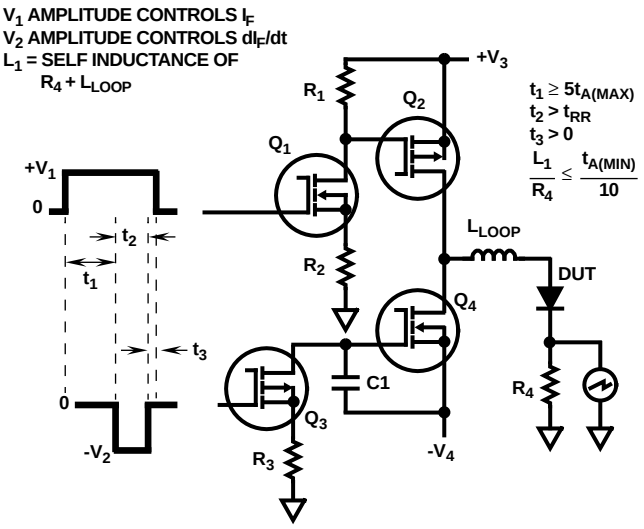


FIGURE 1. t_{RR} TEST CIRCUIT

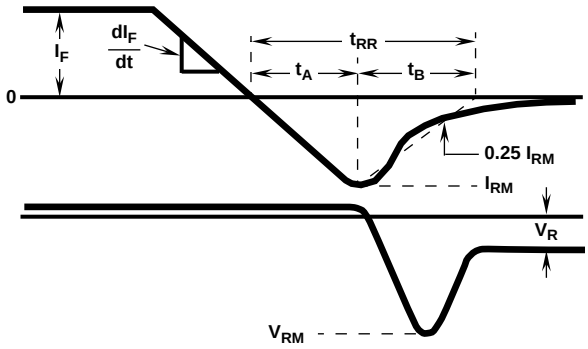


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

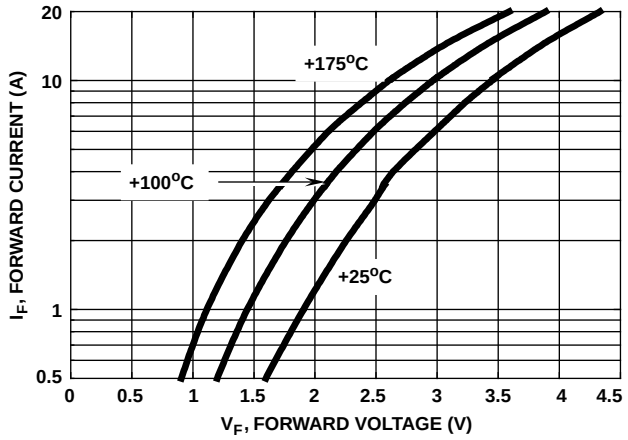


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

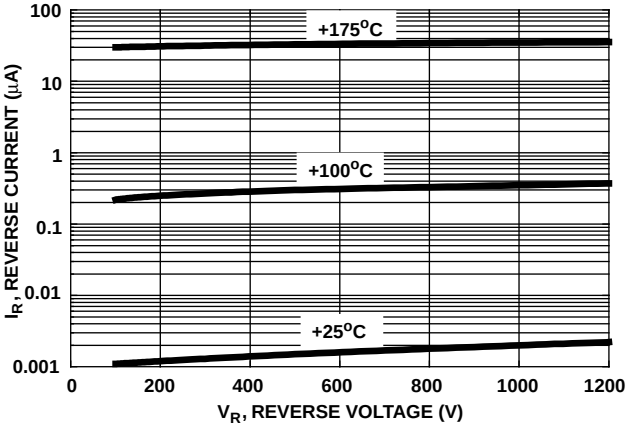


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

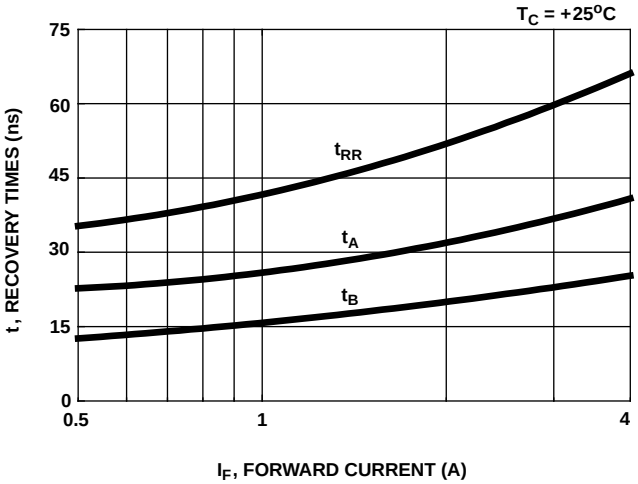


FIGURE 5. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT

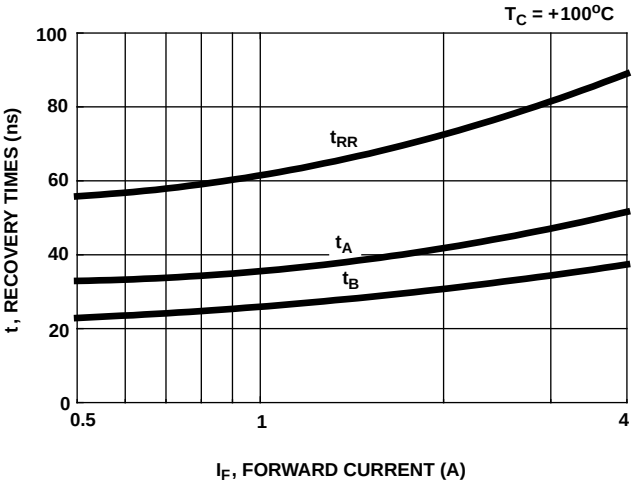


FIGURE 6. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT

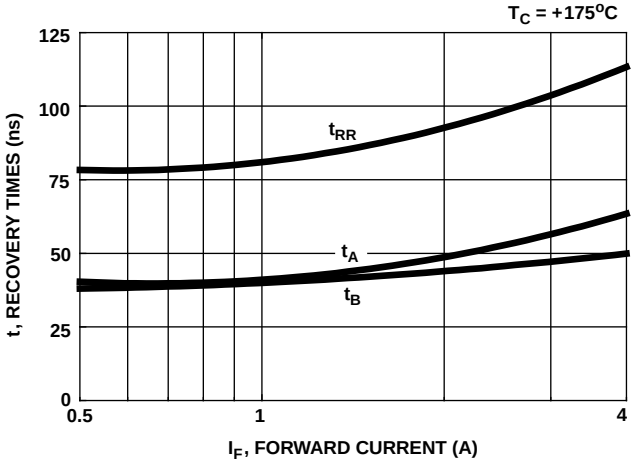


FIGURE 7. TYPICAL t_{RR}, t_A AND t_B CURVES vs FORWARD CURRENT

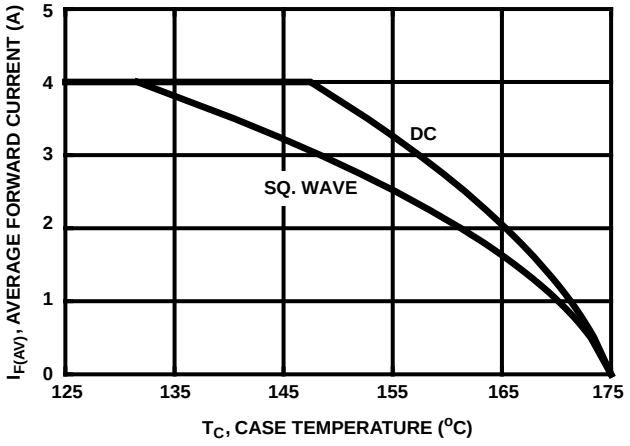


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

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

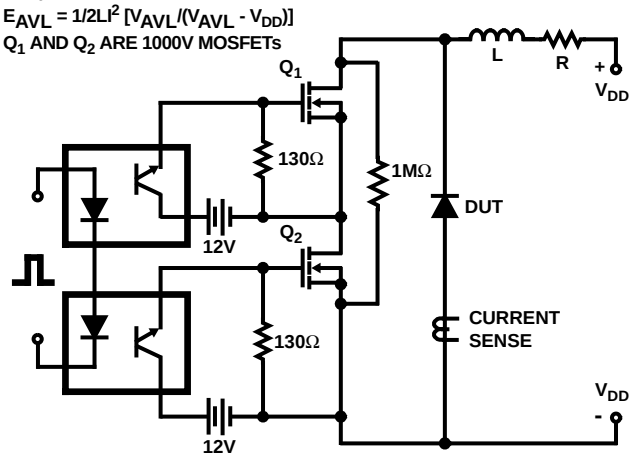


FIGURE 9. AVALANCHE ENERGY TEST CIRCUIT

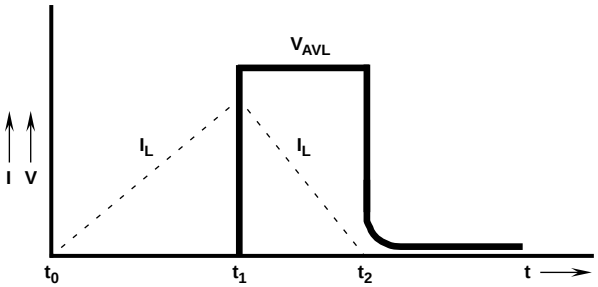


FIGURE 10. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS