

RHRU7570, RHRU7580, RHRU7590, RHRU75100

March 2001

75A, 700V - 1000V Hyperfast Diode

Features

- Hyperfast with Soft Recovery <85ns
- Operating Temperature +175°C
- Reverse Voltage Up To 1000V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

RHRU7570, RHRU7580, RHRU7590 and RHRU75100 (TA49068) are hyperfast diodes with soft recovery characteristics ($t_{RR} < 85\text{ns}$). 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.

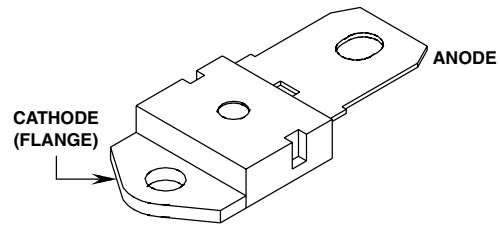
These devices are supplied in the single lead JEDEC style TO-218 plastic package.

Due to space limitations, the brand on the RHRU75100 is abbreviated to HRU75100.

To order this part use the full part number, i.e. RHRU75100.

Package

JEDEC STYLE SINGLE LEAD TO-218
TOP VIEW



Symbol



Absolute Maximum Ratings ($T_C = +25^\circ\text{C}$), Unless Otherwise Specified

	RHRU7570	RHRU7580	RHRU7590	RHRU75100	UNITS
Peak Repetitive Reverse Voltage V_{RRM}	700	800	900	1000	V
Working Peak Reverse Voltage V_{RWM}	700	800	900	1000	V
DC Blocking Voltage V_R	700	800	900	1000	V
Average Rectified Forward Current $I_{F(AV)}$ ($T_C = +52^\circ\text{C}$)	75	75	75	75	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	150	150	150	150	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 phase, 60Hz)	750	750	750	750	A
Maximum Power Dissipation P_D	190	190	190	190	W
Avalanche Energy (L = 40mH) (See Figures 10 and 11) E_{AVL}	50	50	50	50	mj
Operating and Storage Temperature T_{STG}, T_J	-65 to +175	-65 to +175	-65 to +175	-65 to +175	°C

Specifications RHRU7570, RHRU7580, RHRU7590, RHRU75100

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

SYMBOL	TEST CONDITION	RHRU7570			RHRU7580			RHRU7590			RHRU75100			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	$I_F = 75\text{A}, T_C = +25^\circ\text{C}$	-	-	3.0	-	-	3.0	-	-	3.0	-	-	3.0	V
	$I_F = 75\text{A}, T_C = +150^\circ\text{C}$	-	-	2.5	-	-	2.5	-	-	2.5	-	-	2.5	V
I_R	$V_R = 700\text{V}, T_C = +25^\circ\text{C}$	-	-	50	-	-	-	-	-	-	-	-	-	μA
	$V_R = 800\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	50	-	-	-	-	-	-	μA
	$V_R = 900\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	-	-	-	50	-	-	-	μA
	$V_R = 1000\text{V}, T_C = +25^\circ\text{C}$	-	-	-	-	-	-	-	-	-	-	-	50	μA
I_R	$V_R = 700\text{V}, T_C = +150^\circ\text{C}$	-	-	2.0	-	-	-	-	-	-	-	-	-	mA
	$V_R = 800\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	2.0	-	-	-	-	-	-	mA
	$V_R = 900\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	-	-	-	2.0	-	-	-	mA
	$V_R = 1000\text{V}, T_C = +150^\circ\text{C}$	-	-	-	-	-	-	-	-	-	-	-	2.0	mA
t_{RR}	$I_F = 1\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	-	85	-	-	85	-	-	85	-	-	85	ns
	$I_F = 75\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	-	100	-	-	100	-	-	100	-	-	100	ns
t_A	$I_F = 75\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	55	-	-	55	-	-	55	-	-	55	-	ns
t_B	$I_F = 75\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	40	-	-	40	-	-	40	-	-	40	-	ns
Q_{RR}	$I_F = 75\text{A}, di_F/dt = 100\text{A}/\mu\text{s}$	-	240	-	-	240	-	-	240	-	-	240	-	nC
C_J	$V_R = 10\text{V}, I_F = 0\text{A}$	-	220	-	-	220	-	-	220	-	-	220	-	pF
$R_{\theta JC}$		-	-	0.8	-	-	0.8	-	-	0.8	-	-	0.8	$^\circ\text{C}/\text{W}$

DEFINITIONS

V_F = Instantaneous Forward Voltage (pw = 300 μs , D = 2%)

I_R = Instantaneous Reverse Current

t_{RR} = Reverse Recovery Time (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)

Q_{RR} = Reverse Recovery Charge

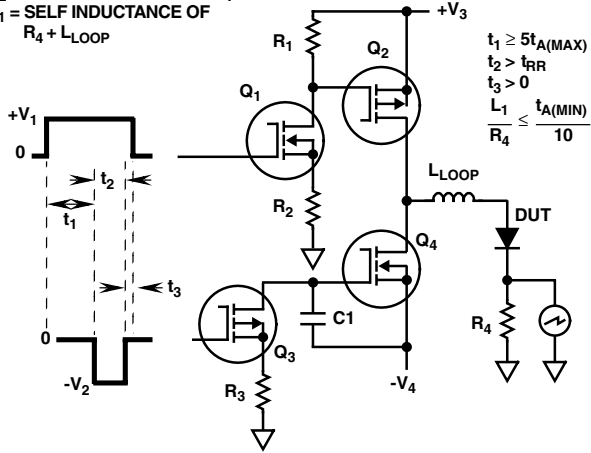
C_J = Junction Capacitance

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

pw = Pulse Width

D = Duty Cycle

V_1 AMPLITUDE CONTROLS I_F
 V_2 AMPLITUDE CONTROLS di_F/dt
 $L_1 = \text{SELF INDUCTANCE OF}$
 $R_4 + L_{\text{LOOP}}$



$t_1 \geq 5t_{A(\text{MAX})}$
 $t_2 > t_{\text{RR}}$
 $t_3 > 0$
 $L_1 \leq \frac{t_{A(\text{MIN})}}{10}$
 $\frac{L_1}{R_4} \leq \frac{t_{A(\text{MIN})}}{10}$

FIGURE 1. t_{RR} TEST CIRCUIT

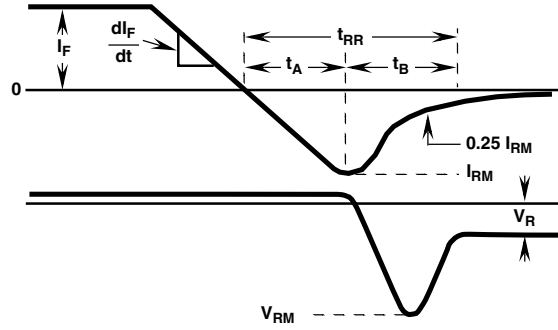


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

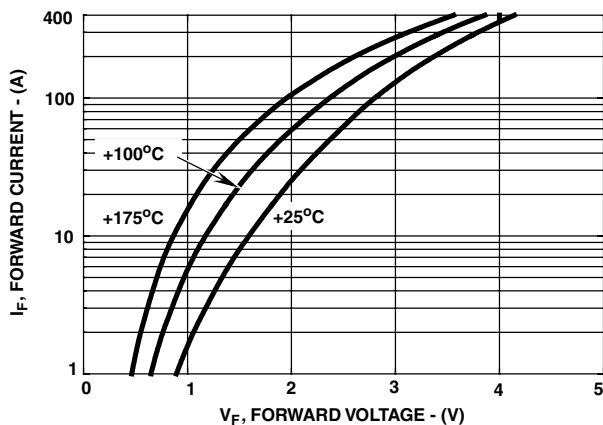


FIGURE 3. TYPICAL FORWARD CURRENT vs. FORWARD VOLTAGE DROP

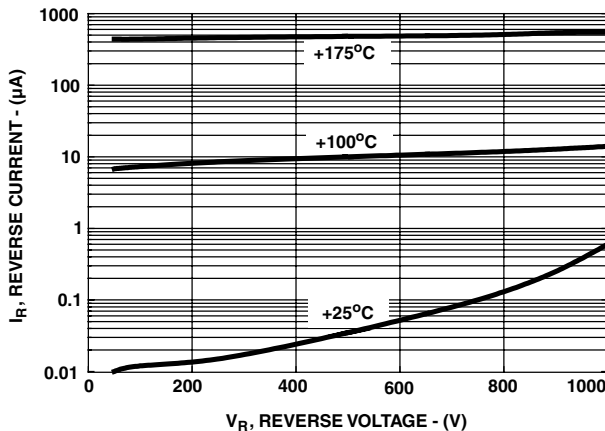


FIGURE 4. TYPICAL REVERSE CURRENT vs. REVERSE VOLTAGE

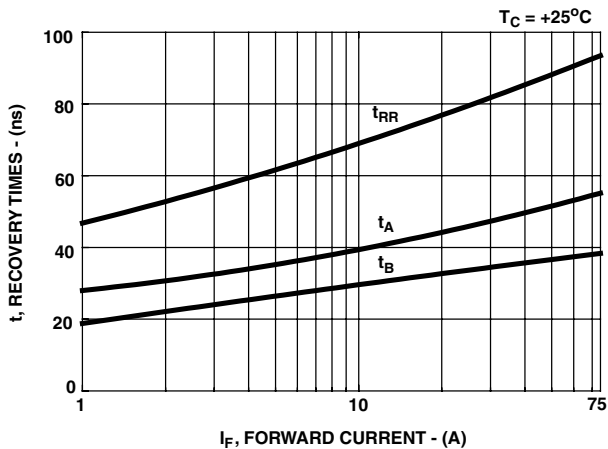


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs. FORWARD CURRENT AT +25°C

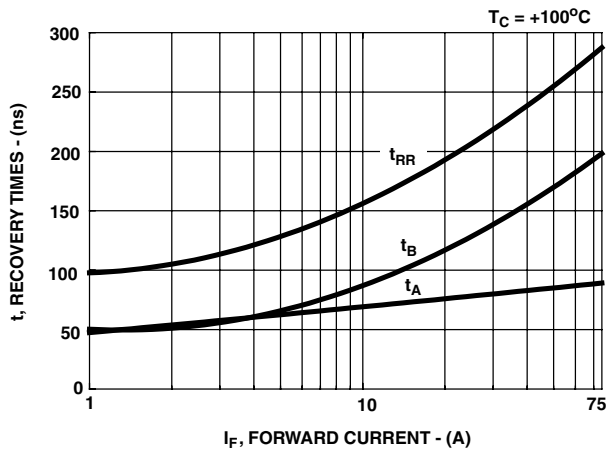


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs. FORWARD CURRENT AT +100°C

RHRU7570, RHRU7580, RHRU7590, RHRU75100

Typical Performance Curves (Continued)

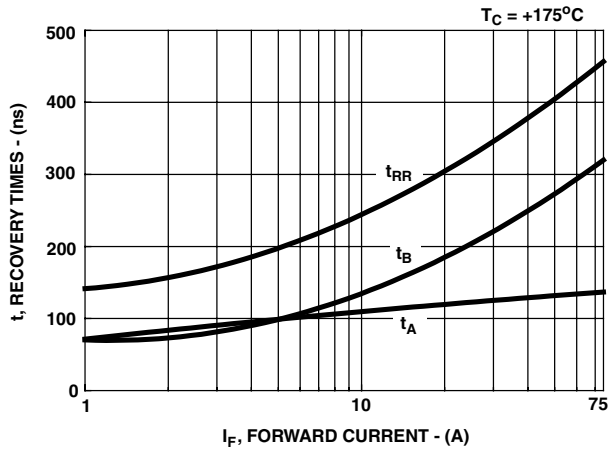


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs. FORWARD CURRENT AT $+175^\circ\text{C}$

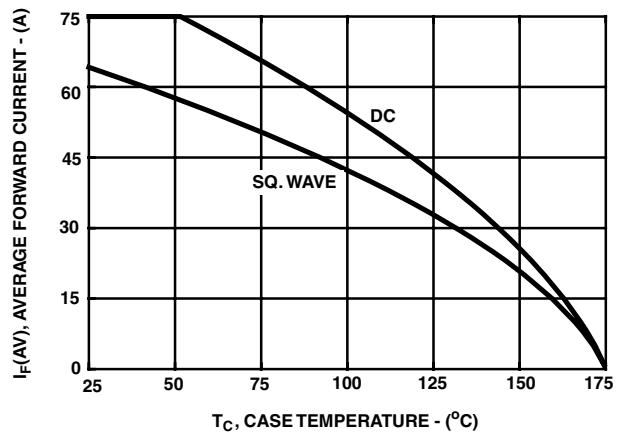


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

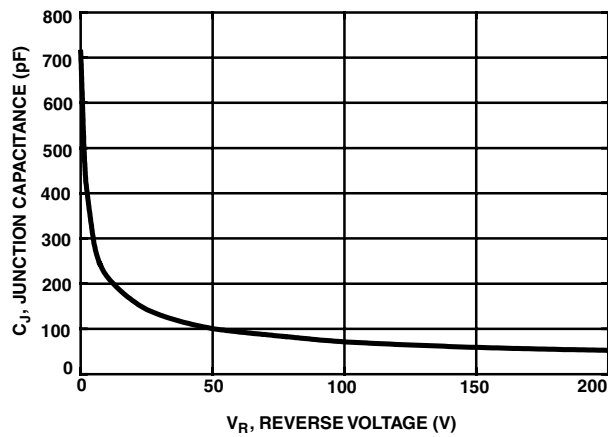


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs. REVERSE VOLTAGE

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

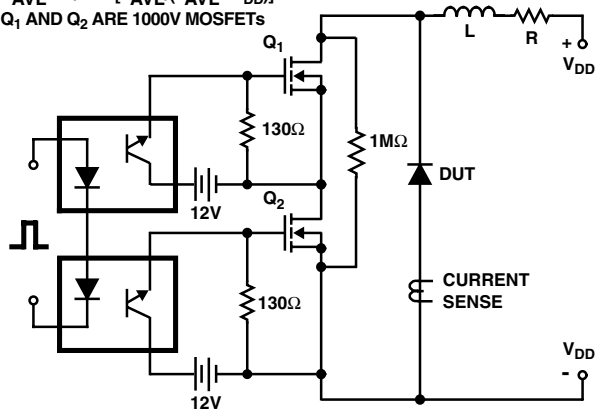


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

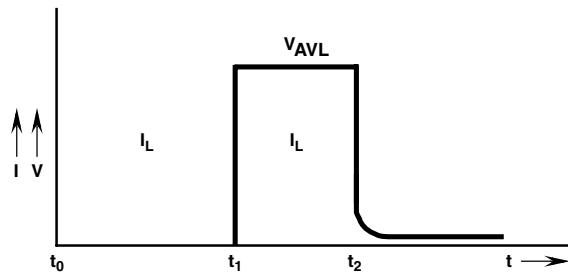
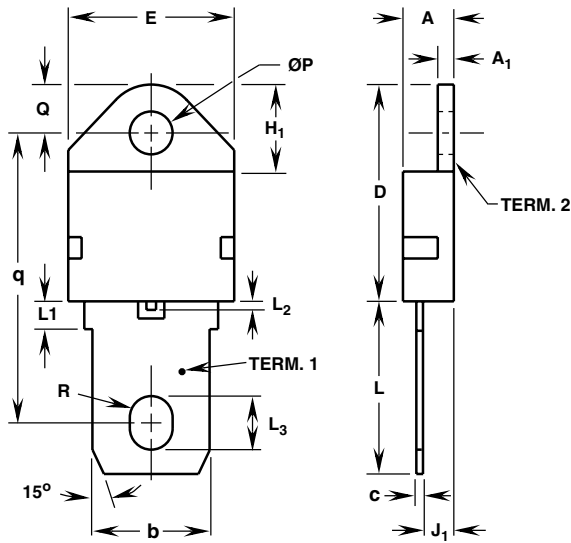


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

RHRU7570, RHRU7580, RHRU7590, RHRU75100

Packaging (Continued)



TO-218
SINGLE LEAD JEDEC STYLE TO-218 PLASTIC PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.185	0.195	4.70	4.95	-
A ₁	0.058	0.062	1.48	1.57	-
b	0.433	0.443	11.00	11.25	-
c	0.018	0.022	0.46	0.55	-
D	0.800	0.820	20.32	20.82	-
E	0.615	0.625	15.63	15.87	2
H ₁	-	0.330	-	8.38	-
J ₁	0.115	0.125	2.93	3.17	4
L	0.635	0.655	16.13	16.63	-
L ₁	-	0.130	-	3.30	-
L ₂	-	0.034	-	0.86	-
L ₃	0.195	0.205	4.96	5.20	-
ØP	0.159	0.163	4.04	4.14	-
Q	0.176	0.186	4.48	4.72	2
q	1.080	1.088	27.44	27.63	-
R	0.078	0.082	1.99	2.08	-

NOTES:

1. No current JEDEC outline for this package.
2. Tab outline optional within boundaries of dimensions E and Q.
3. Maximum radius of 0.050 inches (1.27mm) on all body edges and corners.
4. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
5. Controlling dimension: Inch.
6. Revision 1 dated 1-93.

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACE _x TM	FAST [®]	PACMAN TM	SuperSOT TM -3
Bottomless TM	FAST _r TM	POP TM	SuperSOT TM -6
CoolFET TM	GlobalOptoisolator TM	PowerTrench [®]	SuperSOT TM -8
CROSSVOLT TM	GTO TM	QFET TM	SyncFET TM
DenseTrench TM	HiSeC TM	QS TM	TinyLogic TM
DOMET TM	ISOPLANAR TM	QT Optoelectronics TM	UHC TM
EcoSPARK TM	LittleFET TM	Quiet Series TM	UltraFET TM
E ² CMOS TM	MicroFET TM	SILENT SWITCHER [®]	VCX TM
EnSigna TM	MICROWIRE TM	SMART START TM	
FACT TM	OPTOLOGIC TM	Star* Power TM	
FACT Quiet Series TM	OPTOPLANAR TM	Stealth TM	

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.