

January 1996

6A, 1200V Hyperfast Dual Diode

Features

- Hyperfast with Soft Recovery<55ns
- Operating Temperature+175°C
- Reverse Voltage1200V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

The RHRP6120CC is a hyperfast dual diode with soft recovery characteristics ($t_{RR} < 55\text{ns}$). 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 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.

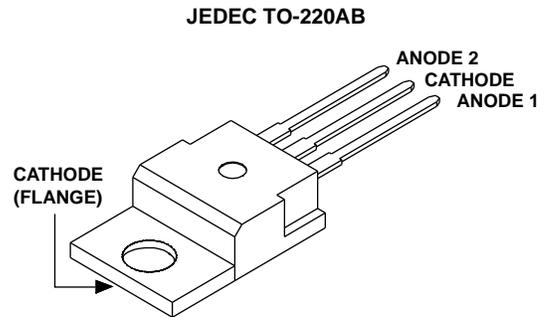
PACKAGE AVAILABILITY

| PART NUMBER | PACKAGE | BRAND |
|-------------|----------|----------|
| RHRP6120CC | TO-220AB | RHR6120C |

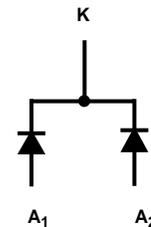
NOTE: When ordering, use the entire part number.

Formerly developmental type TA49058.

Package



Symbol



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

| | RHRP6120CC | 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..... $I_{F(AV)}$ ($T_C = 130^\circ\text{C}$) | 6 | A |
| Repetitive Peak Surge Current..... I_{FSM} (Square Wave, 20kHz) | 12 | A |
| Nonrepetitive Peak Surge Current..... I_{FSM} (Halfwave, 1 phase, 60Hz) | 60 | A |
| Maximum Power Dissipation..... P_D | 50 | W |
| Avalanche Energy (See Figures 10 and 11)..... E_{AVL} | 10 | mJ |
| Operating and Storage Temperature..... T_{STG}, T_J | -55 to +175 | °C |

Specifications RHRP6120CC

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

| SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNITS |
|-----------------|--|-----|-----|-----|---------------------------|
| V_F | $I_F = 6\text{A}, T_C = +25^\circ\text{C}$ | - | - | 3.2 | V |
| | $I_F = 6\text{A}, T_C = +150^\circ\text{C}$ | - | - | 2.6 | V |
| I_R | $V_R = 1200\text{V}, T_C = +25^\circ\text{C}$ | - | - | 100 | μA |
| | $V_R = 1200\text{V}, T_C = +150^\circ\text{C}$ | - | - | 500 | μA |
| t_{RR} | $I_F = 1\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$ | - | - | 55 | ns |
| | $I_F = 6\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$ | - | - | 65 | ns |
| t_A | $I_F = 6\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$ | - | 33 | - | ns |
| t_B | $I_F = 6\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$ | - | 22 | - | ns |
| Q_{RR} | $I_F = 6\text{A}, dl_F/dt = 200\text{A}/\mu\text{s}$ | - | 210 | - | nC |
| C_J | $V_R = 10\text{V}, I_F = 0\text{A}$ | - | 22 | - | pF |
| $R_{\theta JC}$ | | - | - | 3 | $^\circ\text{C}/\text{W}$ |

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).

Q_{RR} = Reverse recovery charge.

C_J = Junction Capacitance.

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

E_{AVL} = Controlled Avalanche Energy (See Figures 10 and 11).

p_w = pulse width.

D = duty cycle.

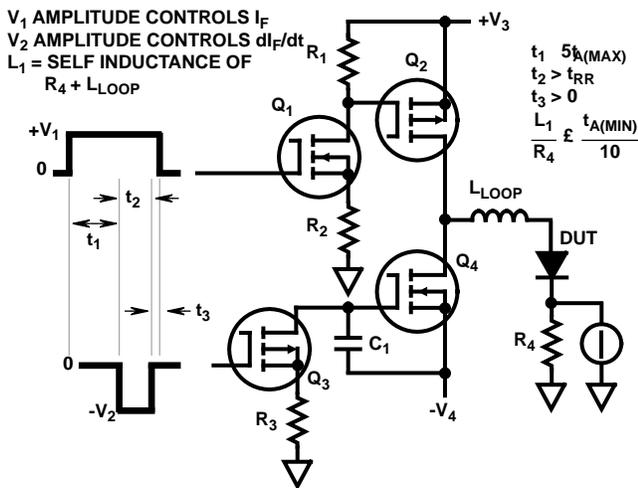


FIGURE 1. t_{RR} TEST CIRCUIT

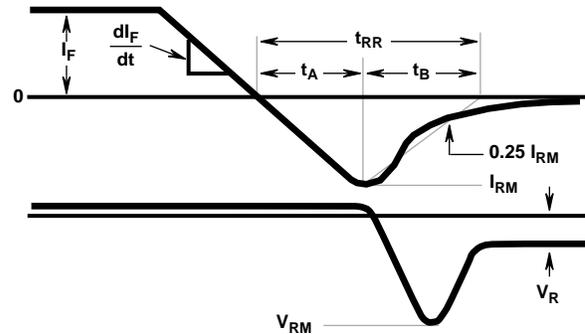


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

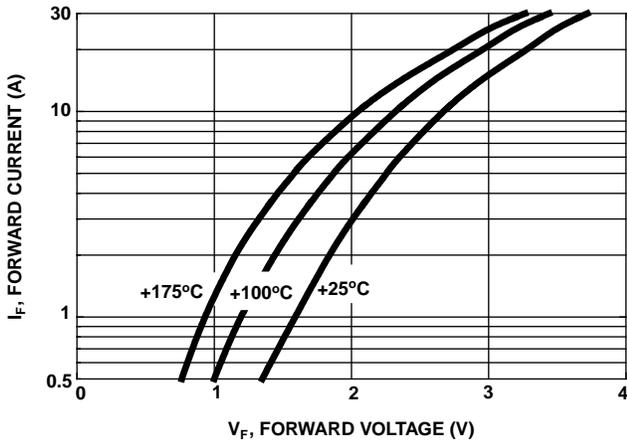


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

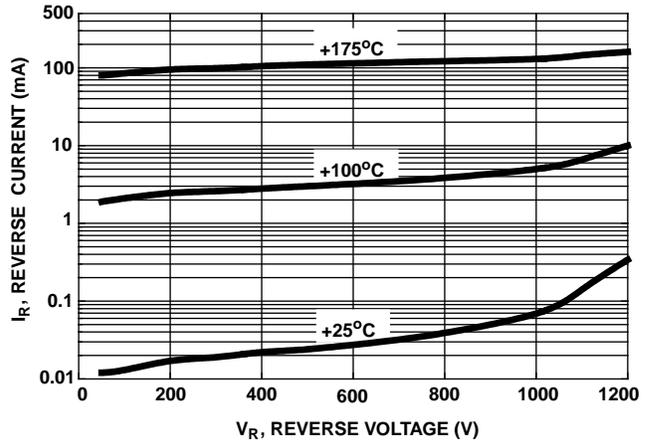


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

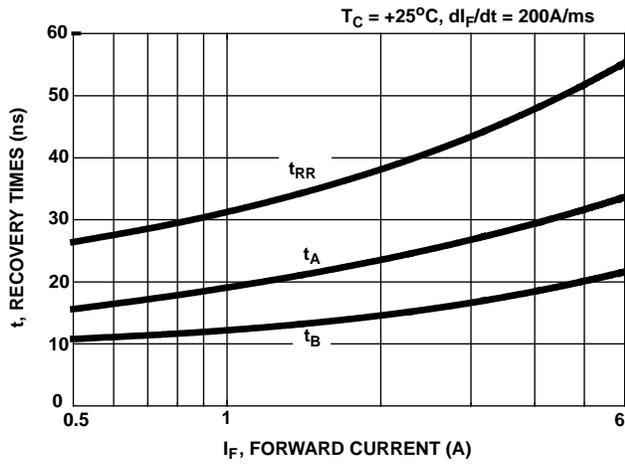


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT 25°C

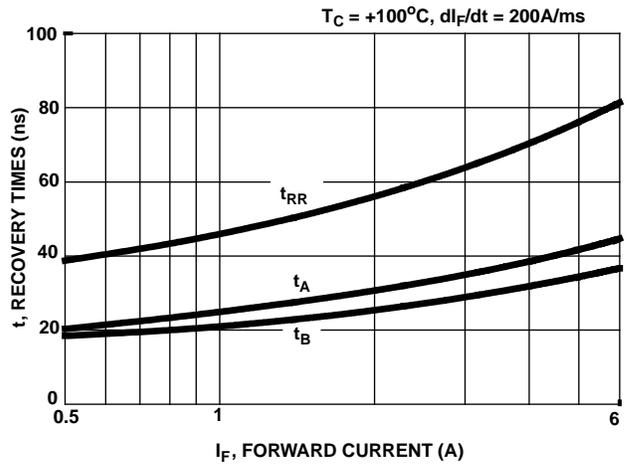


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT 100°C

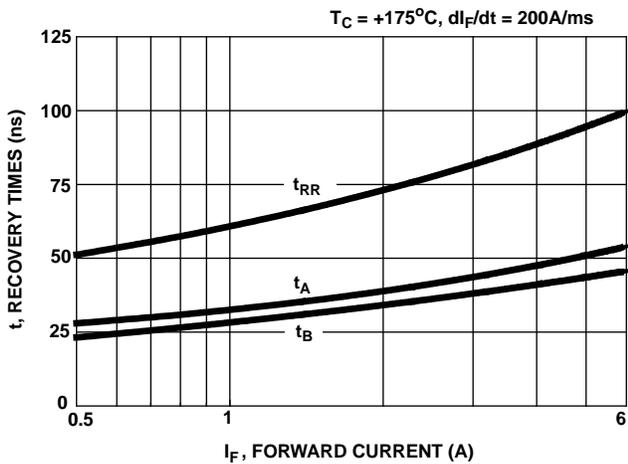


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT 175°C

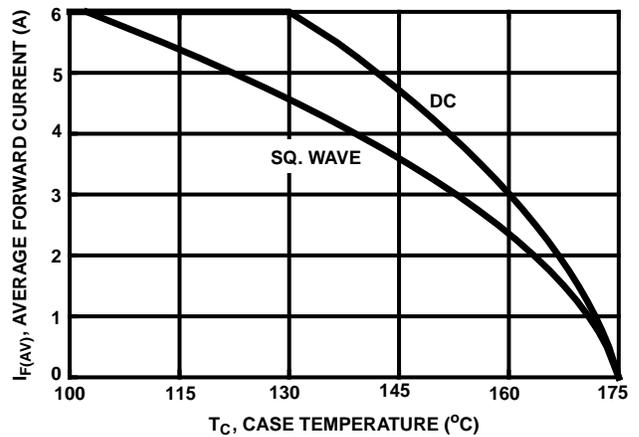


FIGURE 8. CURRENT DERATING CURVE

Typical Performance Curves (Continued)

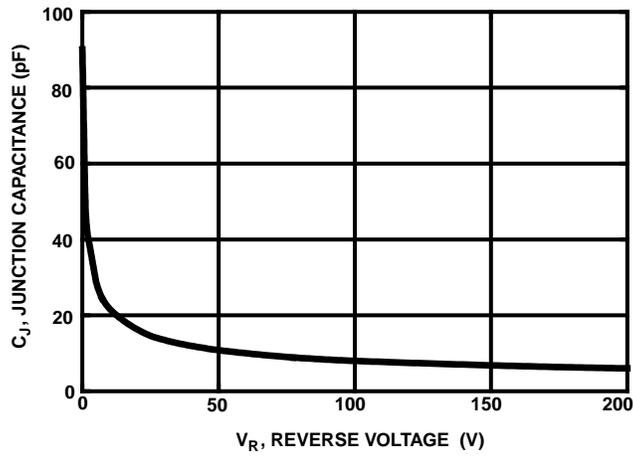


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs. REVERSE VOLTAGE

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

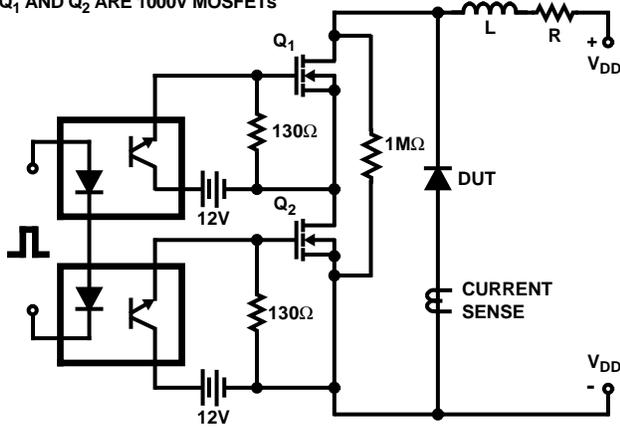


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

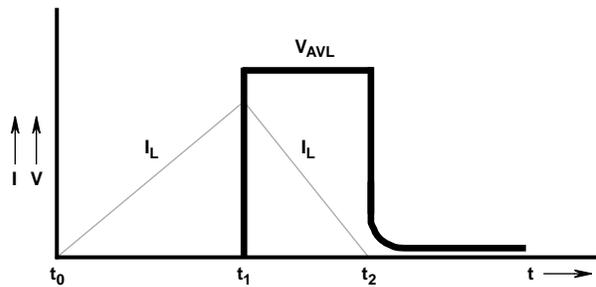
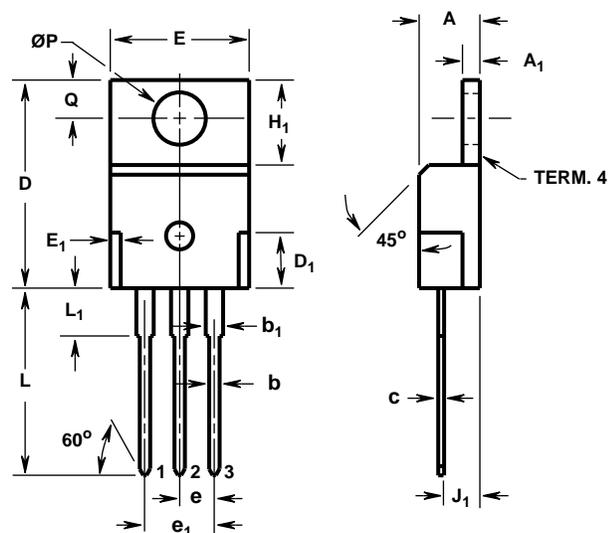


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

RHRP6120CC

Packaging



LEAD 1. ANODE 1
LEAD 2. CATHODE
LEAD 3. ANODE 2
TERM. 4. CATHODE

TO-220AB 3 LEAD JEDEC TO-220AB PLASTIC PACKAGE

| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|----------------|-----------|-------|-------------|-------|---------|
| | MIN | MAX | MIN | MAX | |
| A | 0.170 | 0.180 | 4.32 | 4.57 | - |
| A ₁ | 0.048 | 0.052 | 1.22 | 1.32 | - |
| b | 0.030 | 0.034 | 0.77 | 0.86 | 3, 4 |
| b ₁ | 0.045 | 0.055 | 1.15 | 1.39 | 2, 3 |
| c | 0.014 | 0.019 | 0.36 | 0.48 | 2, 3, 4 |
| D | 0.590 | 0.610 | 14.99 | 15.49 | - |
| D ₁ | - | 0.160 | - | 4.06 | - |
| E | 0.395 | 0.410 | 10.04 | 10.41 | - |
| E ₁ | - | 0.030 | - | 0.76 | - |
| e | 0.100 TYP | | 2.54 TYP | | 5 |
| e ₁ | 0.200 BSC | | 5.08 BSC | | 5 |
| H ₁ | 0.235 | 0.255 | 5.97 | 6.47 | - |
| J ₁ | 0.100 | 0.110 | 2.54 | 2.79 | 6 |
| L | 0.530 | 0.550 | 13.47 | 13.97 | - |
| L ₁ | 0.130 | 0.150 | 3.31 | 3.81 | 2 |
| ØP | 0.149 | 0.153 | 3.79 | 3.88 | - |
| Q | 0.102 | 0.112 | 2.60 | 2.84 | - |

NOTES:

- These dimensions are within allowable dimensions of Rev. J of JEDEC TO-220AB outline dated 3-24-87.
- Lead dimension and finish uncontrolled in L₁.
- Lead dimension (without solder).
- Add typically 0.002 inches (0.05mm) for solder coating.
- Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
- Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
- Controlling dimension: Inch.
- Revision 1 dated 1-93.

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