

October 1995

## 6A, 1200V Ultrafast Dual Diode

### Features

- Ultrafast with Soft Recovery . . . . . <70ns
- Operating Temperature . . . . . +175°C
- Reverse Voltage . . . . . 1200V
- Avalanche Energy Rated
- Planar Construction

### Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

### Description

The RURP6120CC is an ultrafast dual diode with soft recovery characteristics ( $t_{RR} < 70\text{ns}$ ). It has low forward voltage drop 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 ultrafast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

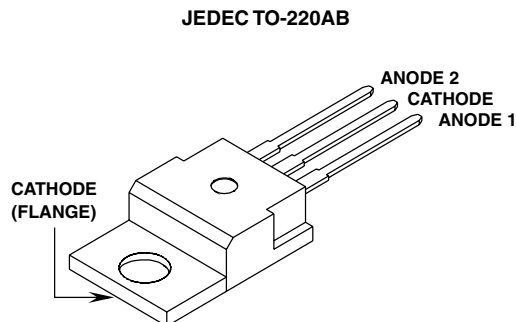
#### PACKAGE AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURP6120CC	TO-220AB	RUR6120C

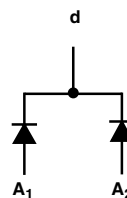
NOTE: When ordering, use the entire part number.

Formerly developmental type TA49039.

### Package



### Symbol



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

	RURP6120CC	UNITS
Peak Repetitive Reverse Voltages . . . . . $V_{RRM}$	1200	V
Working Peak Reverse Voltage . . . . . $V_{RWM}$	1200	V
DC Blocking Voltage . . . . . $V_R$	1200	V
Average Rectified Forward Current . . . . . $I_{F(AV)}$ $T_C = +140^\circ\text{C}$	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 . . . . . $T_{STG}, T_J$	-65 to +175	$^\circ\text{C}$

## Specifications RURP6120CC

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

SYMBOL	TEST CONDITION	RURP6120CC LIMITS			UNITS
		MIN	TYP	MAX	
$V_F$	$I_F = 6\text{A}$ , $T_C = +25^\circ\text{C}$	-	-	2.1	V
	$I_F = 6\text{A}$ , $T_C = +150^\circ\text{C}$	-	-	1.9	V
$I_R$	$V_R = 1200\text{V}$ , $T_C = +25^\circ\text{C}$	-	-	100	$\mu\text{A}$
	$V_R = 1200\text{V}$ , $T_C = +150^\circ\text{C}$	-	-	500	$\mu\text{A}$
$t_{RR}$	$I_F = 1\text{A}$ , $dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	70	ns
	$I_F = 6\text{A}$ , $dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	90	ns
$t_A$	$I_F = 6\text{A}$ , $dI_F/dt = 200\text{A}/\mu\text{s}$	-	45	-	ns
$t_B$	$I_F = 6\text{A}$ , $dI_F/dt = 200\text{A}/\mu\text{s}$	-	30	-	ns
$Q_{RR}$	$I_F = 6\text{A}$ , $dI_F/dt = 200\text{A}/\mu\text{s}$	-	400	-	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 (pw = 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).

pw = pulse width.

D = duty cycle.

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

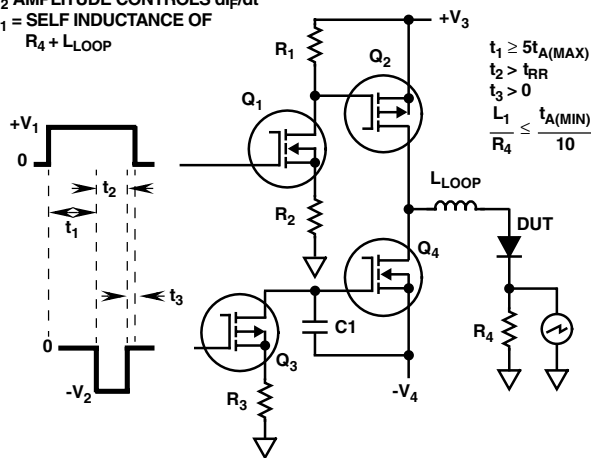


FIGURE 1.  $t_{RR}$  TEST CIRCUIT

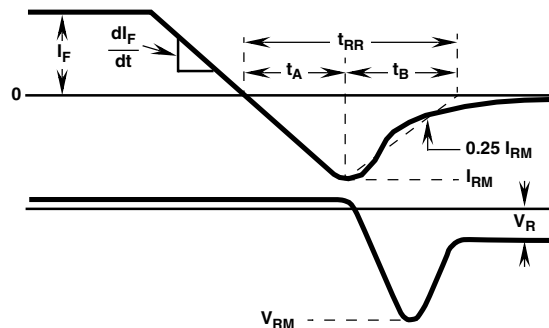


FIGURE 2.  $t_{RR}$  WAVEFORMS AND DEFINITIONS

# Typical Performance Curves

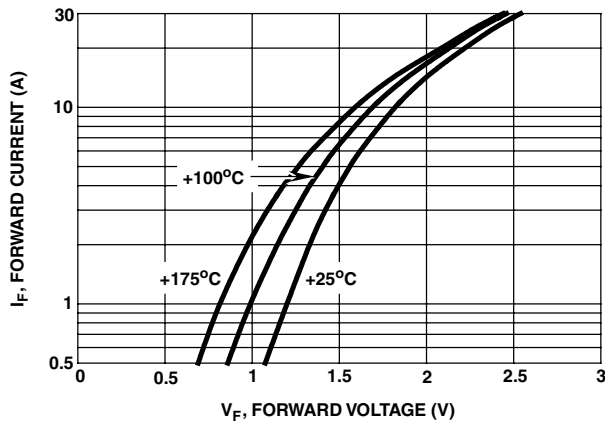


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

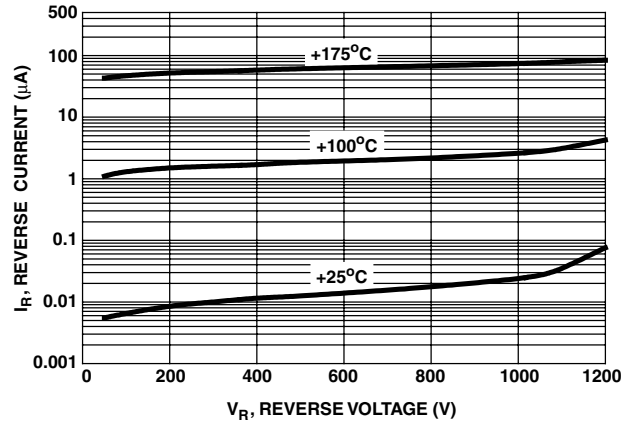


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

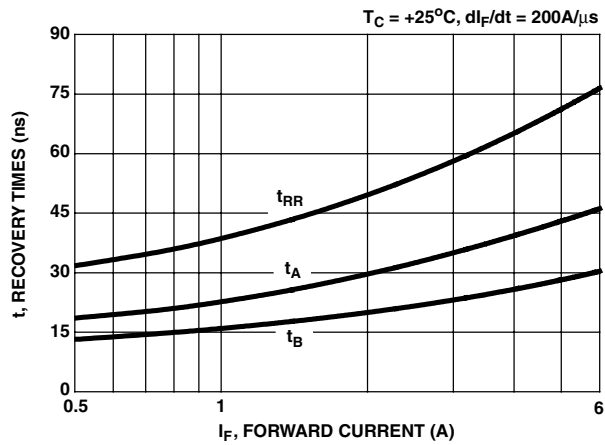


FIGURE 5. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT AT +25°C

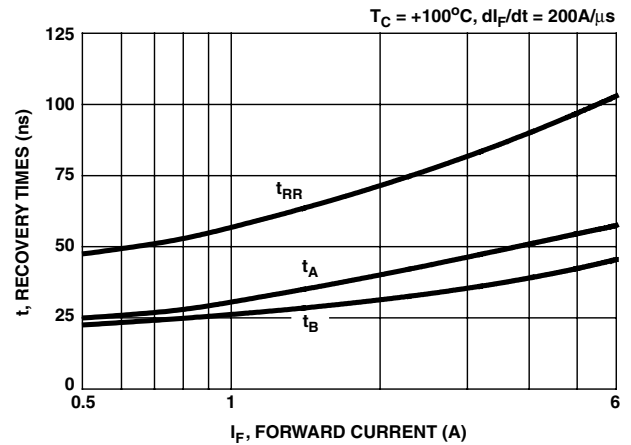


FIGURE 6. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT AT +100°C

Typical Performance Curves (Continued)

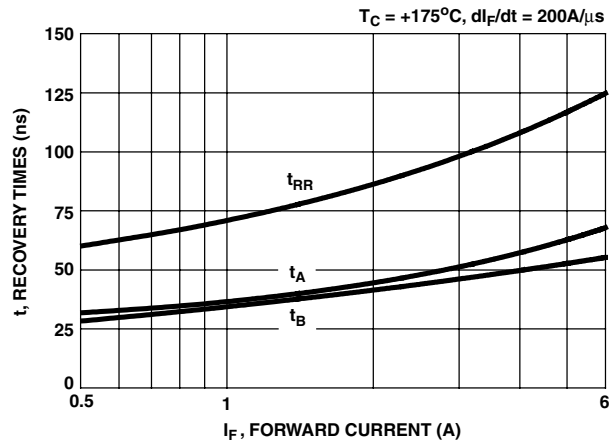


FIGURE 7. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT AT  $+175^\circ\text{C}$

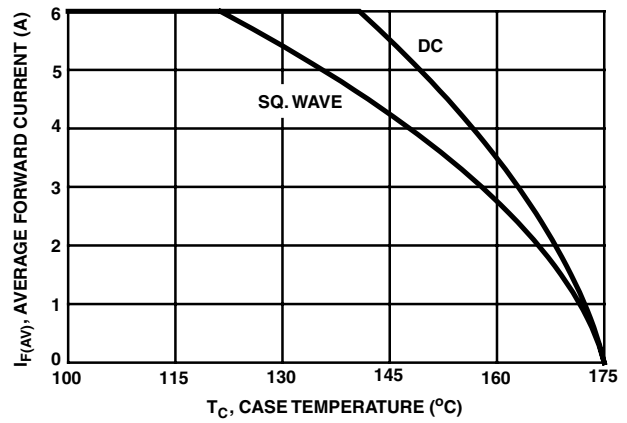


FIGURE 8. CURRENT DERATING CURVE

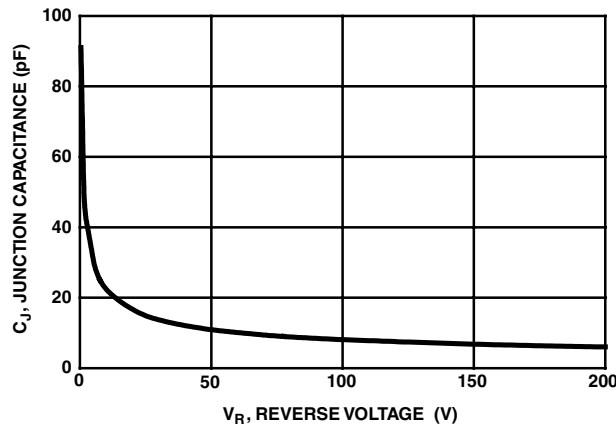


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

$L = 40\text{mH}$

$R < 0.1\Omega$

$E_{AVL} = 1/2LI^2 [V_{AVL}/(V_{AVL} - V_{DD})]$

$Q_1$  AND  $Q_2$  ARE 1000V MOSFETs

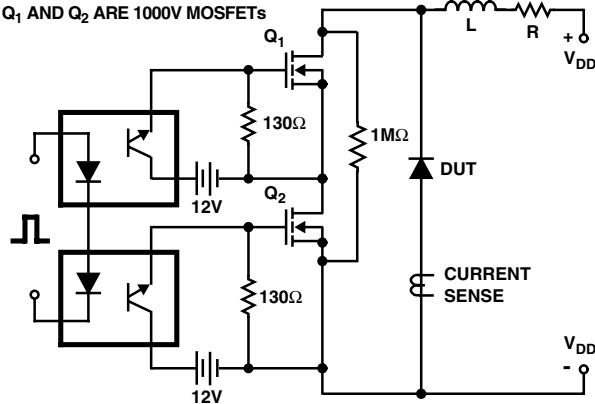


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

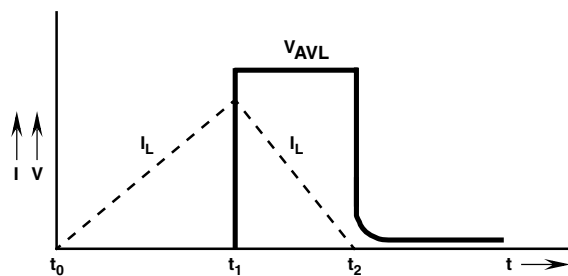
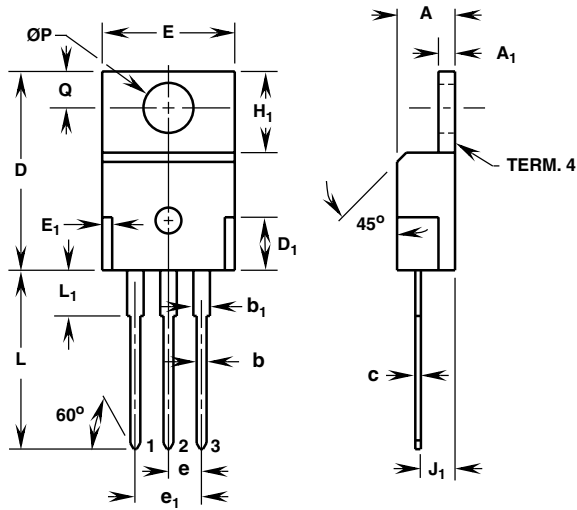


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

# RURP6120CC

## Plastic Packages



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 <sub>1</sub>	0.048	0.052	1.22	1.32	-
b	0.030	0.034	0.77	0.86	3, 4
b <sub>1</sub>	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 <sub>1</sub>	-	0.160	-	4.06	-
E	0.395	0.410	10.04	10.41	-
E <sub>1</sub>	-	0.030	-	0.76	-
e	0.100 TYP		2.54 TYP		5
e <sub>1</sub>	0.200 BSC		5.08 BSC		5
H <sub>1</sub>	0.235	0.255	5.97	6.47	-
J <sub>1</sub>	0.100	0.110	2.54	2.79	6
L	0.530	0.550	13.47	13.97	-
L <sub>1</sub>	0.130	0.150	3.31	3.81	2
$\varnothing P$	0.149	0.153	3.79	3.88	-
Q	0.102	0.112	2.60	2.84	-

#### NOTES:

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

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