

April 1995

30A, 1200V Ultrafast Diode

Features

- Ultrafast with Soft Recovery <110ns
- Operating Temperature +175°C
- Reverse Voltage 1200V
- Avalanche Energy Rated
- Planar Construction

Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

Description

The RURP30120 (49031) is an ultrafast diode with soft recovery characteristic ($t_{RR} < 110\text{ns}$). It has low forward voltage drop and is silicon nitride passivated ion-implanted epitaxial planar construction.

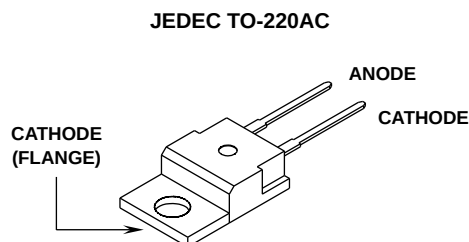
This device is intended for use as a freewheeling/clamping diode and rectifier in a variety of switching power supplies and other power switching applications. Its low stored charge and ultrafast recovery with soft recovery characteristic minimize ringing and electrical noise in many power switching circuits, reducing power loss in the switching transistors.

PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURP30120	TO-220AC	RUR30120

NOTE: When ordering, use the entire part number.

Package



Symbol



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

	RURP30120	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 $I_{F(AV)}$ ($T_C = +110^\circ\text{C}$)	30	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	60	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz)	300	A
Maximum Power Dissipation P_D	125	W
Avalanche Energy ($L = 40\text{mH}$) E_{AVL}	30	mj
Operating and Storage Temperature T_{STG}, T_J	-65 to +175	°C

Specifications RURP30120

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

SYMBOL	TEST CONDITION	LIMITS			UNITS
		MIN	TYP	MAX	
V_F	$I_F = 30\text{A}$, $T_C = +25^\circ\text{C}$	-	-	2.1	V
V_F	$I_F = 30\text{A}$, $T_C = +150^\circ\text{C}$	-	-	1.9	V
I_R	$V_R = 1200\text{V}$, $T_C = +25^\circ\text{C}$	-	-	500	μA
I_R	$V_R = 1200\text{V}$, $T_C = +150^\circ\text{C}$	-	-	1	mA
t_{RR}	$I_F = 1\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$	-	-	110	ns
	$I_F = 30\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$	-	-	150	ns
t_A	$I_F = 30\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$	-	90	-	ns
t_B	$I_F = 30\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$	-	45	-	ns
$R_{\theta JC}$		-	-	1.2	$^\circ\text{C}/\text{W}$

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).

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

E_{AVL} = Controlled avalanche energy (See Figures 7 and 8).

p_w = pulse width.

D = duty cycle.

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

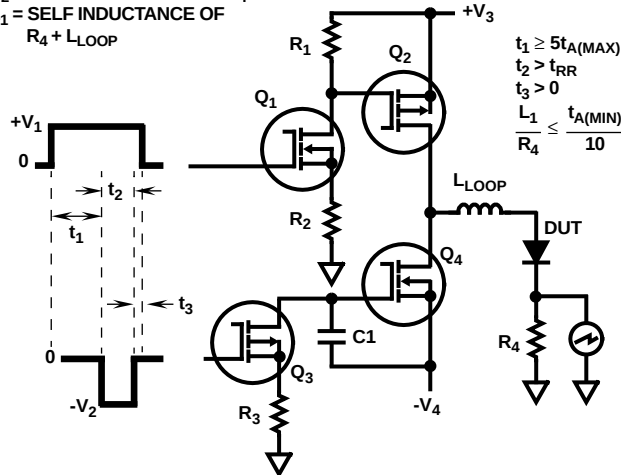


FIGURE 1. t_{RR} TEST CIRCUIT

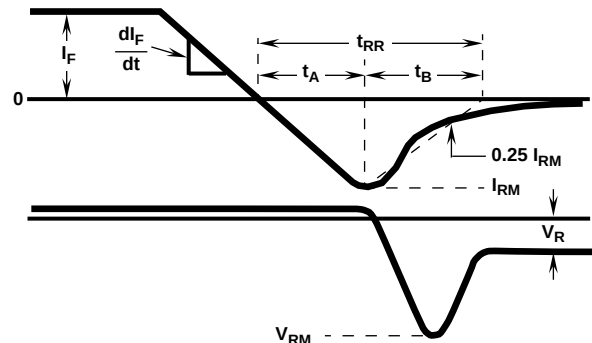


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

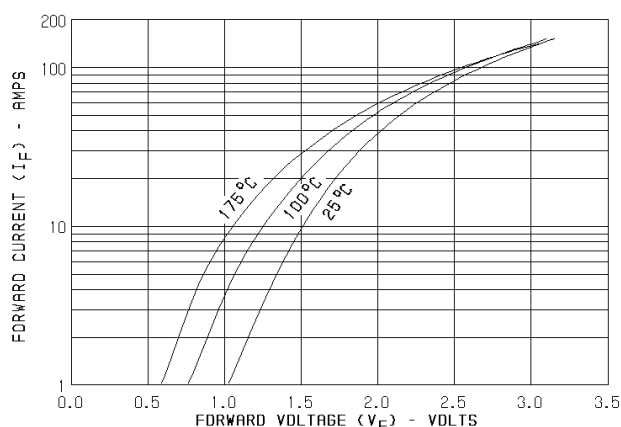


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

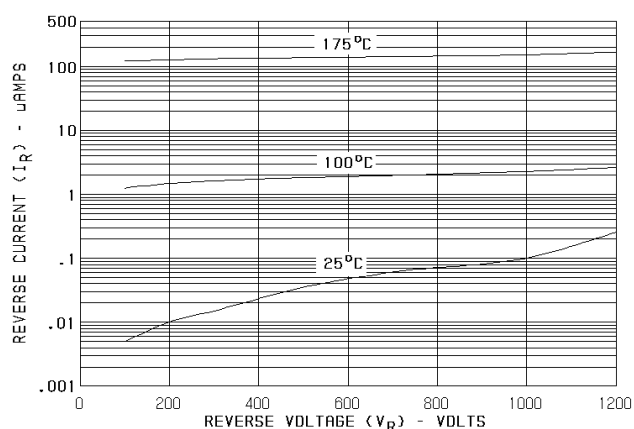


FIGURE 4. TYPICAL REVERSE CURRENT vs VOLTAGE

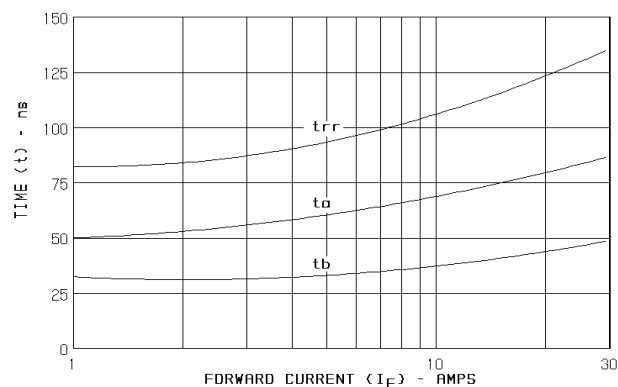


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT

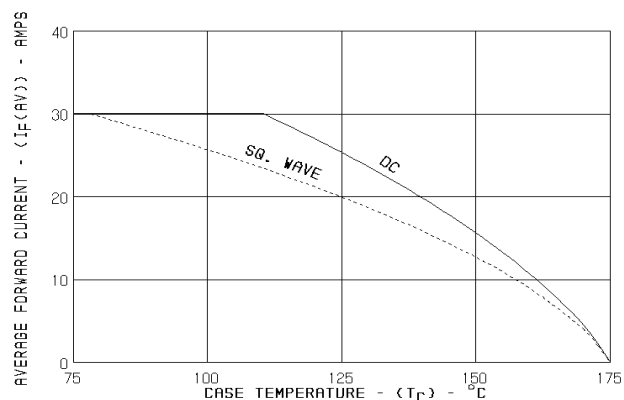


FIGURE 6. CURRENT DERATING CURVE FOR ALL TYPES

$I_{MAX} = 1A$

$L = 40mH$

$R < 0.1\Omega$

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

Q_1 AND Q_2 ARE 1000V MOSFETS

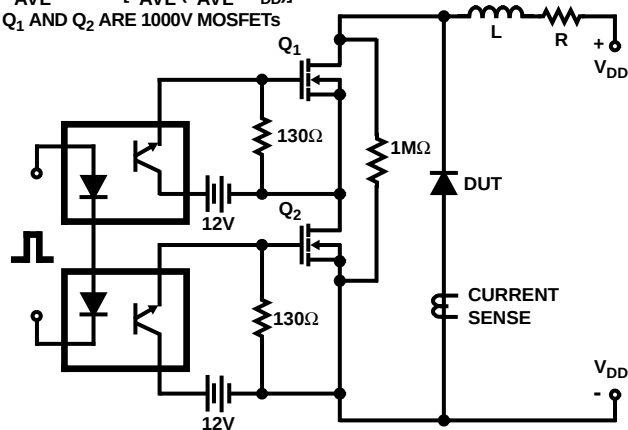


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

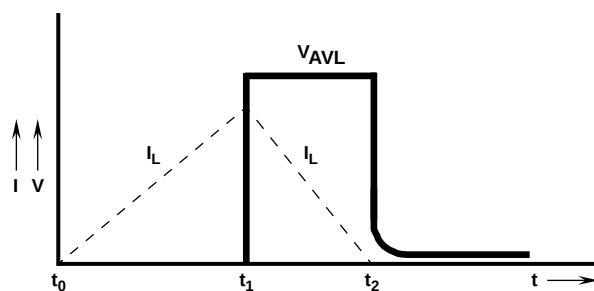


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS