

April 1995

4A, 1200V Ultrafast Diodes

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 RURD4120 and RURD4120S (TA49036) are ultrafast diodes with soft recovery characteristics ($t_{RR} < 70\text{ns}$). They have low forward voltage drop 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 ultrafast soft recovery minimize ringing and electrical noise in many power switching circuits reducing power loss in the switching transistors.

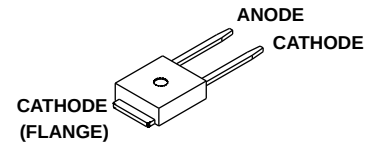
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURD4120	TO-251	UR4120
RURD4120S	TO-252	UR4120

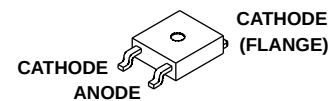
NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252 variant in the tape and reel, i.e., RURD4120S9A.

Packages

JEDEC STYLE TO-251



JEDEC STYLE TO-252



Symbol



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

	RURD4120, RURD4120S	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 $I_{F(AV)}$ ($T_C = +152^\circ\text{C}$)	4	A
Repetitive Peak Surge Current I_{FSM} (Square Wave, 20kHz)	8	A
Nonrepetitive Peak Surge Current I_{FSM} (Halfwave, 1 Phase, 60Hz)	40	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	°C

Specifications RURD4120, RURD4120S

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

SYMBOL	TEST CONDITION	RURD4120, RURD4120S			UNITS
		MIN	TYP	MAX	
V_F	$I_F = 4\text{A}$, $T_C = +25^{\circ}\text{C}$	-	-	2.1	V
	$I_F = 4\text{A}$, $T_C = +150^{\circ}\text{C}$	-	-	1.9	V
I_R	$V_R = 1200\text{V}$, $T_C = +25^{\circ}\text{C}$	-	-	100	μA
	$V_R = 1200\text{V}$, $T_C = +150^{\circ}\text{C}$	-	-	500	μA
t_{RR}	$I_F = 1\text{A}$, $dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	70	ns
	$I_F = 4\text{A}$, $dI_F/dt = 200\text{A}/\mu\text{s}$	-	-	90	ns
t_A	$I_F = 4\text{A}$, $dI_F/dt = 200\text{A}/\mu\text{s}$	-	40	-	ns
t_B	$I_F = 4\text{A}$, $dI_F/dt = 200\text{A}/\mu\text{s}$	-	28	-	ns
Q_{RR}	$I_F = 4\text{A}$, $dI_F/dt = 200\text{A}/\mu\text{s}$	-	335	-	nC
C_J	$V_R = 10\text{V}$, $I_F = 0\text{A}$	-	15	-	pF
$R_{\theta JC}$		-	-	3	$^{\circ}\text{C}/\text{W}$

DEFINITIONS

V_F = Instantaneous forward voltage (pw = 300 μs , D = 2%).

I_R = Instantaneous reverse current.

t_{RR} = Reverse recovery time (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 time.

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
 $R_4 + L_{\text{LOOP}}$

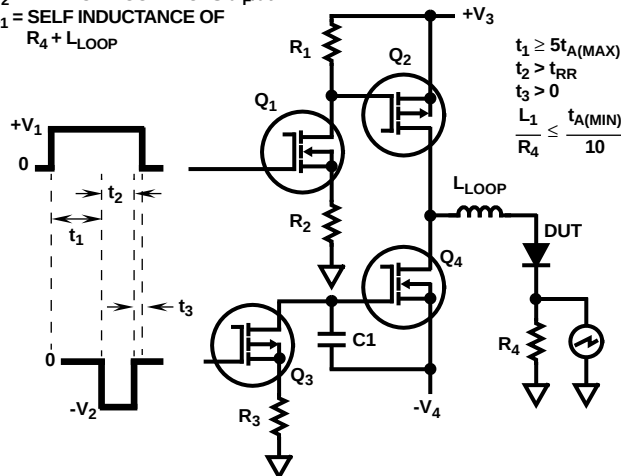


FIGURE 1. t_{RR} TEST CIRCUIT

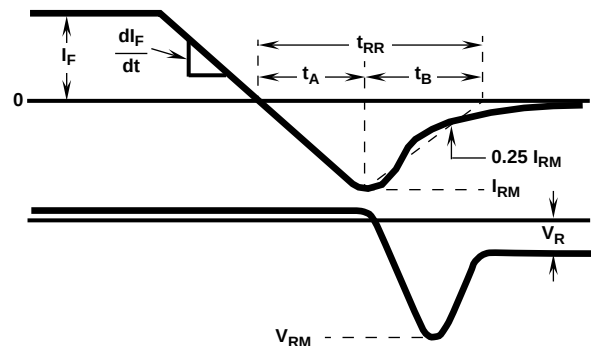


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

Typical Performance Curves

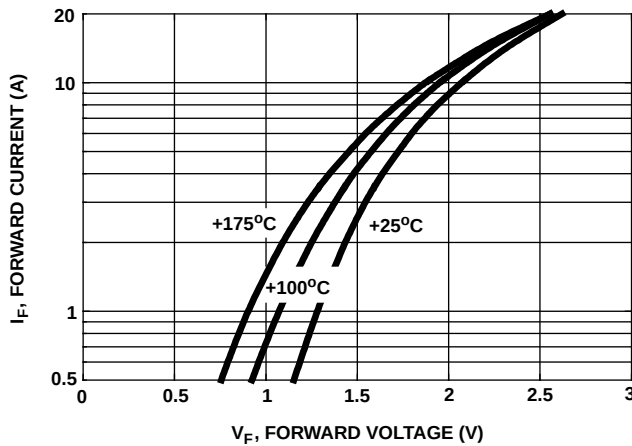


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

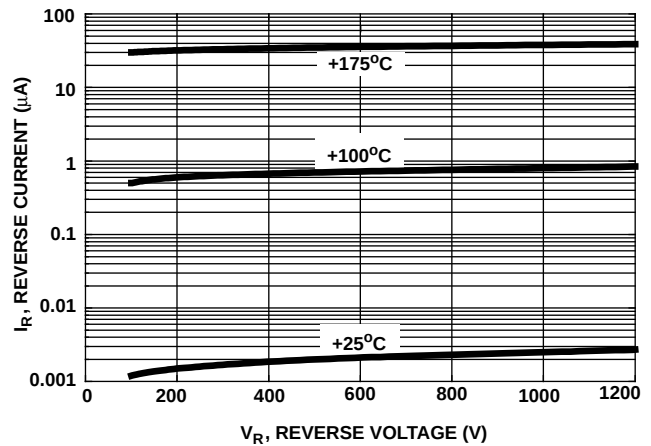


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

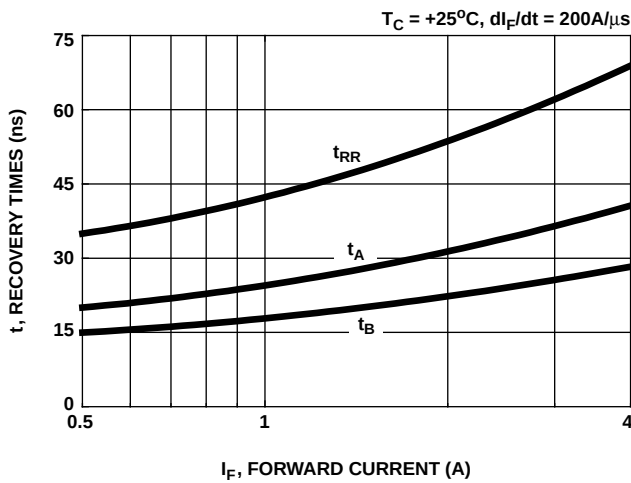


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

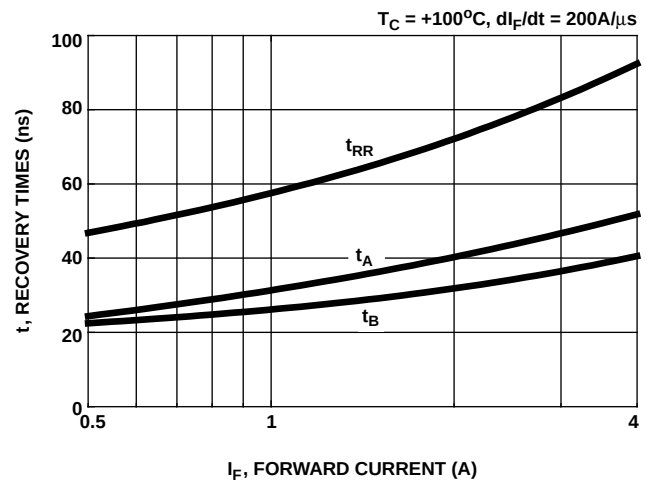


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

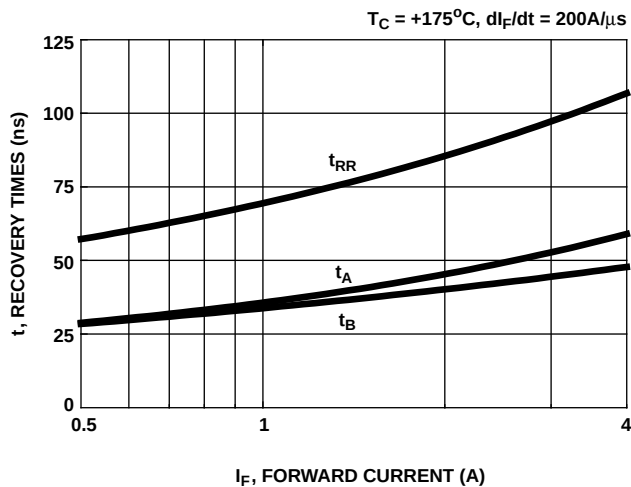


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

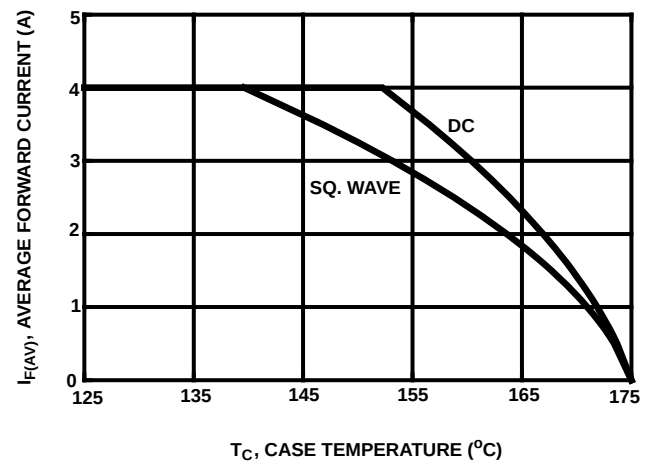


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

Typical Performance Curves (Continued)

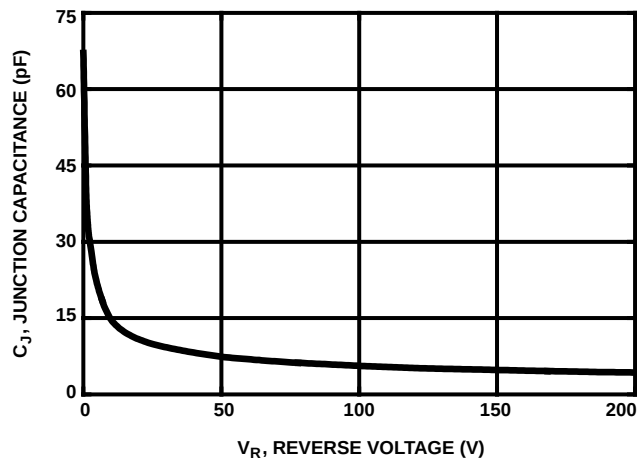


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

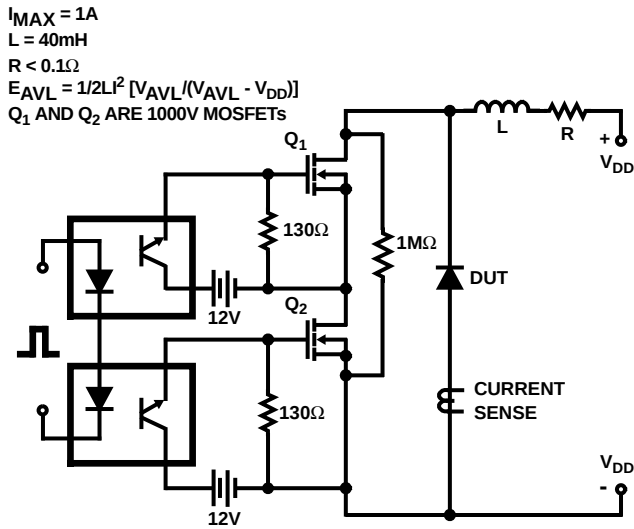


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

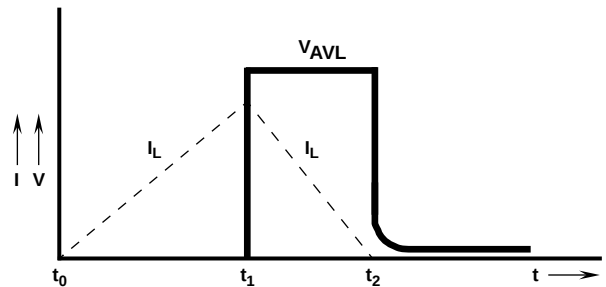


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS