

April 1995

6A, 400V - 600V Ultrafast Diodes

Features

- **Ultrafast with Soft Recovery** <55ns
- **Operating Temperature** +175°C
- **Reverse Voltage Up To** 600V
- **Avalanche Energy Rated**
- **Planar Construction**

Applications

- **Switching Power Supplies**
- **Power Switching Circuits**
- **General Purpose**

Description

RURD640, RURD650, RURD660, RURD640S, RURD650S and RURD660S (TA49038) are ultrafast diodes with soft recovery characteristics ($t_{RR} < 55ns$). 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.

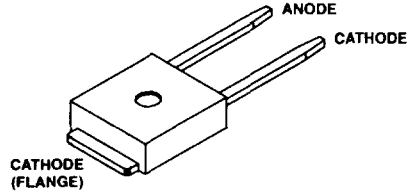
PACKAGING AVAILABILITY

PART NUMBER	PACKAGE	BRAND
RURD640	TO-251	RUR640
RURD650	TO-251	RUR650
RURD660	TO-251	RUR660
RURD640S	TO-252	RUR640
RURD650S	TO-252	RUR650
RURD660S	TO-252	RUR660

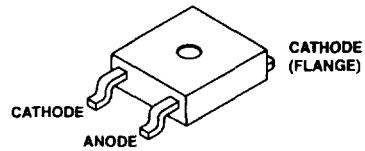
NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-252 variant in the tape and reel, i.e., RURD640S9A.

Package

JEDEC STYLE TO-251



JEDEC STYLE TO-252



Symbol



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

	RURD640 RURD640S	RURD650 RURD650S	RURD660 RURD660S	UNITS
Peak Repetitive Reverse Voltage.....	400	500	600	V
Working Peak Reverse Voltage.....	400	500	600	V
DC Blocking Voltage.....	400	500	600	V
Average Rectified Forward Current..... ($T_C = +155^\circ C$)	6	6	6	A
Repetitive Peak Surge Current..... (Square Wave, 20kHz)	12	12	12	A
Nonrepetitive Peak Surge Current..... (Halfwave, 1 Phase, 60Hz)	60	60	60	A
Maximum Power Dissipation.....	50	50	50	W
Avalanche Energy (See Figures 10 and 11).....	10	10	10	mj
Operating and Storage Temperature.....	-65 to +175	-65 to +175	-65 to +175	°C

Specifications RURD640, RURD650, RURD660, RURD640S, RURD650S, RURD660S

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

SYMBOL	TEST CONDITION	RURD640, RURD640S			RURD650, RURD650S			RURD660, RURD660S			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	$I_F = 6\text{A}, T_C = +25^{\circ}\text{C}$	-	-	1.5	-	-	1.5	-	-	1.5	V
	$I_F = 6\text{A}, T_C = +150^{\circ}\text{C}$	-	-	1.2	-	-	1.2	-	-	1.2	V
I_R	$V_R = 400\text{V}, T_C = +25^{\circ}\text{C}$	-	-	100	-	-	-	-	-	-	μA
	$V_R = 500\text{V}, T_C = +25^{\circ}\text{C}$	-	-	-	-	-	100	-	-	-	μA
	$V_R = 600\text{V}, T_C = +25^{\circ}\text{C}$	-	-	-	-	-	-	-	-	100	μA
I_{RM}	$V_R = 400\text{V}, T_C = +150^{\circ}\text{C}$	-	-	500	-	-	-	-	-	-	μA
	$V_R = 500\text{V}, T_C = +150^{\circ}\text{C}$	-	-	-	-	-	500	-	-	-	μA
	$V_R = 600\text{V}, T_C = +150^{\circ}\text{C}$	-	-	-	-	-	-	-	-	500	μA
t_{RR}	$I_F = 1\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	-	-	55	-	-	55	-	-	55	ns
	$I_F = 6\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	-	-	60	-	-	60	-	-	60	ns
t_A	$I_F = 6\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	-	28	-	-	28	-	-	28	-	ns
t_B	$I_F = 6\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	-	16	-	-	16	-	-	16	-	ns
Q_{RR}	$I_F = 6\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	-	150	-	-	150	-	-	150	-	nC
C_J	$V_R = 10\text{V}, I_F = 0\text{A}$	-	25	-	-	25	-	-	25	-	pF
$R_{\theta JC}$		-	-	3	-	-	3	-	-	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.

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

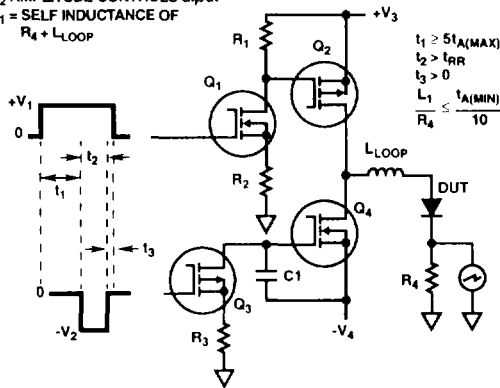


FIGURE 1. t_{RR} TEST CIRCUIT

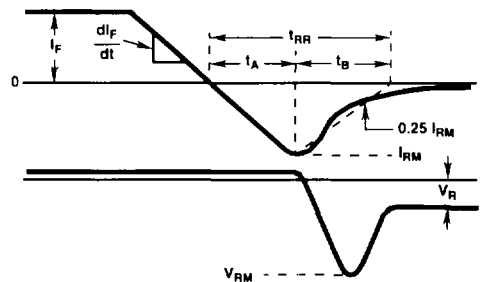


FIGURE 2. t_{RR} WAVEFORMS AND DEFINITIONS

RURD640, RURD650, RURD660, RURD640S, RURD650S, RURD660S

Typical Performance Curves

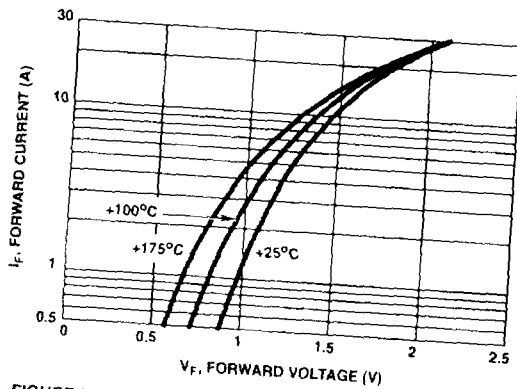


FIGURE 3. TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE DROP

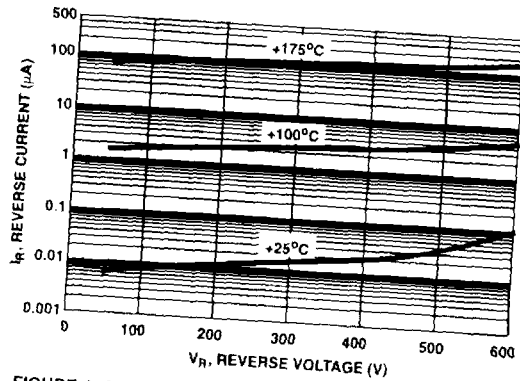


FIGURE 4. TYPICAL REVERSE CURRENT vs REVERSE VOLTAGE

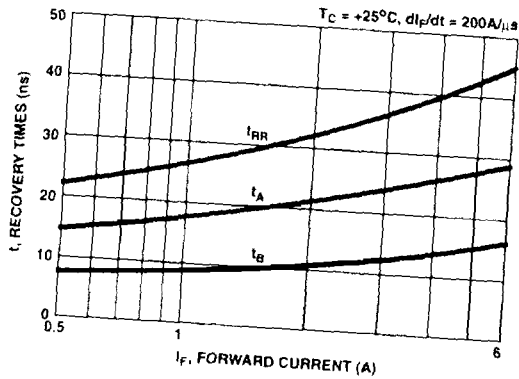


FIGURE 5. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +25°C

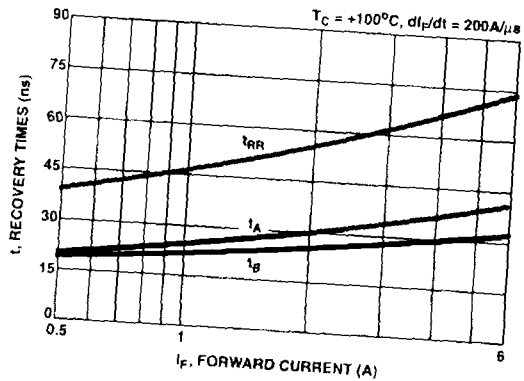


FIGURE 6. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +100°C

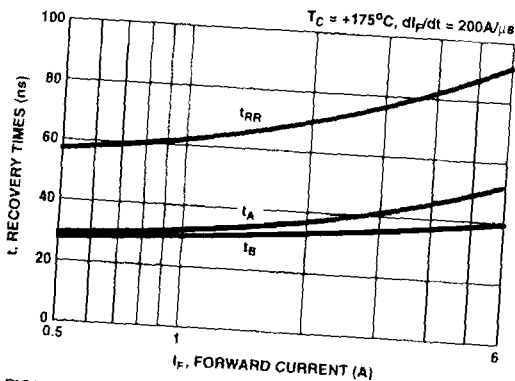


FIGURE 7. TYPICAL t_{RR} , t_A AND t_B CURVES vs FORWARD CURRENT AT +175°C

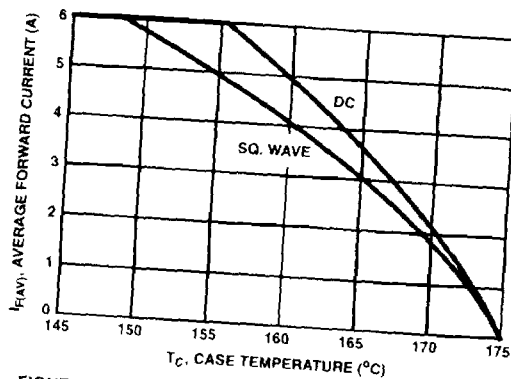


FIGURE 8. CURRENT DERATING CURVE FOR ALL TYPES

5
ULTRAFAST
SINGLE DIODES

Typical Performance Curves (Continued)

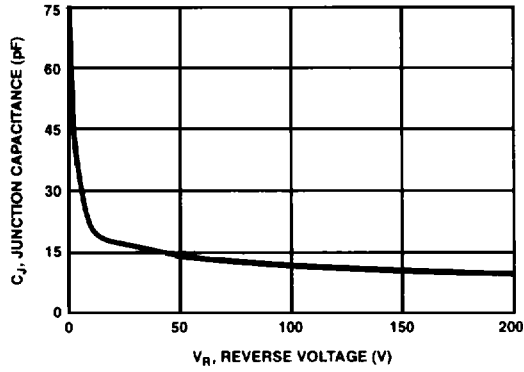


FIGURE 9. TYPICAL JUNCTION CAPACITANCE vs REVERSE VOLTAGE

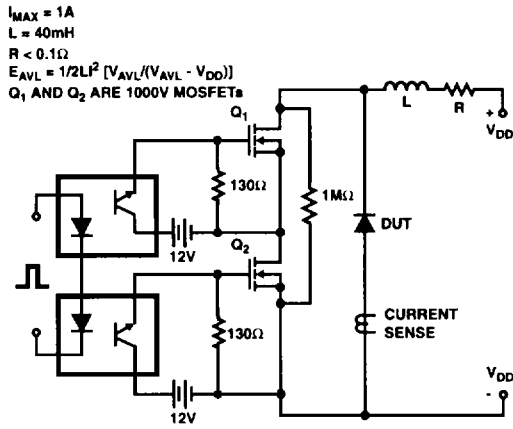


FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

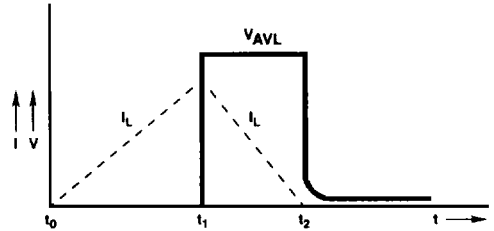


FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS