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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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FAIRCHILD SEMICONDUCTOR®

# RURD4120, RURD4120S

**Data Sheet** **January 2002**

## 4A, 1200V Ultrafast Diodes

The RURD4120 and RURD4120S are ultrafast diodes with soft recovery characteristics ($t_{rr}$ < 70ns). 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.

Formerly developmental type TA49036.

## Ordering Information

| 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.

## Symbol


## Features

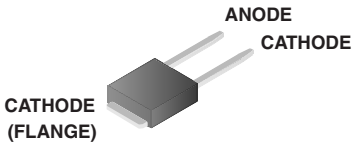
- Ultrafast with Soft Recovery . . . . . <70ns
- Operating Temperature . . . . . 175°C
- Reverse Voltage . . . . . 1200V
- Avalanche Energy Rated
- Planar Construction

## Applications

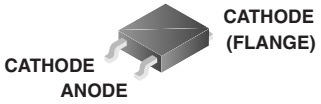
- Switching Power Supplies
- Power Switching Circuits
- General Purpose

## Packaging

**JEDEC STYLE TO-251**




**JEDEC STYLE TO-252**




## Absolute Maximum Ratings $T_C = 25^oC$, 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 ($T_C = 152^oC$) | $I_{F(AV)}$ | 4 | A |
| Repetitive Peak Surge Current (Square Wave, 20kHz) | $I_{FRM}$ | 8 | A |
| Nonrepetitive Peak Surge Current (Halfwave, 1 Phase, 60Hz) | $I_{FSM}$ | 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 | $^oC$ |

**Electrical Specifications** $T_C = 25^oC$, Unless Otherwise Specified

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

DEFINITIONS

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

$I_R$ = Instantaneous reverse current.

$t_{rr}$ = Reverse recovery time (See Figure 9), summation of $t_a + t_b$.

$t_a$ = Time to reach peak reverse current (See Figure 9).

$t_b$ = 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 9).

$Q_{RR}$ = Reverse recovery time.

$C_J$ = Junction capacitance.

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

pw = Pulse width.

D = Duty cycle.

## *Typical Performance Curves*

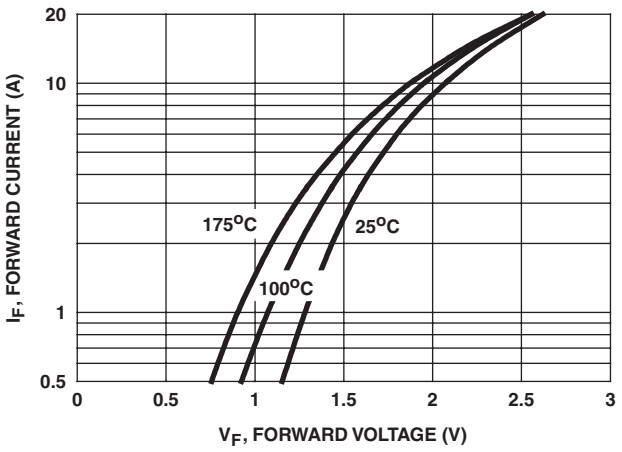



**FIGURE 1. FORWARD CURRENT vs FORWARD VOLTAGE**

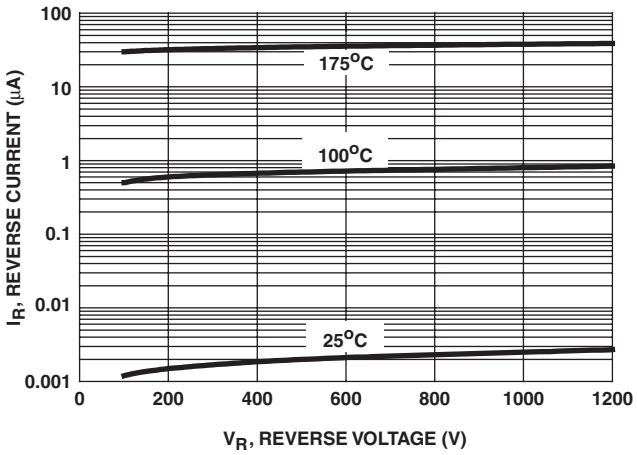



**FIGURE 2. REVERSE CURRENT vs REVERSE VOLTAGE**

## Typical Performance Curves (Continued)

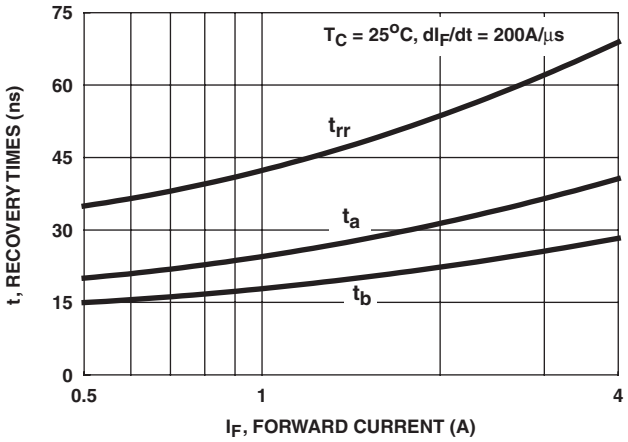



FIGURE 3. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

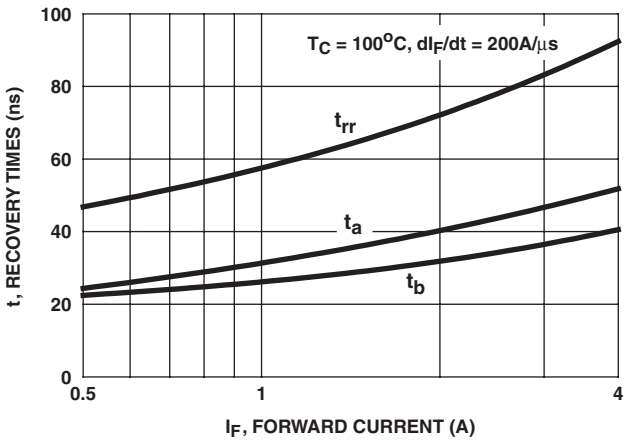



FIGURE 4. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

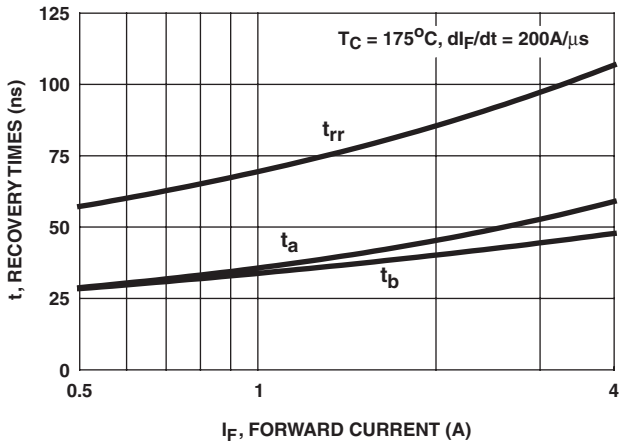



FIGURE 5. $t_{rr}$, $t_a$ AND $t_b$ CURVES vs FORWARD CURRENT

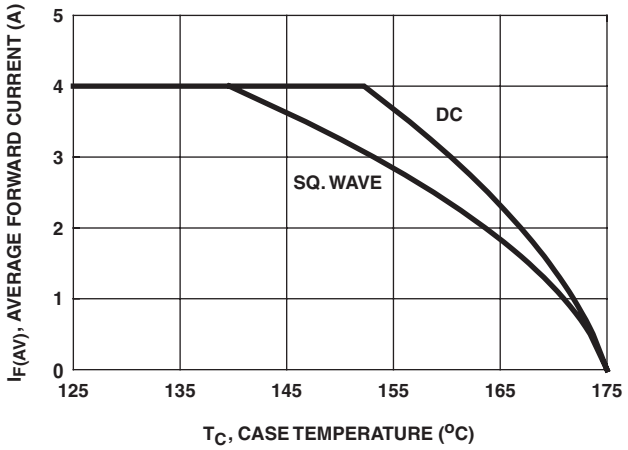



FIGURE 6. CURRENT DERATING CURVE

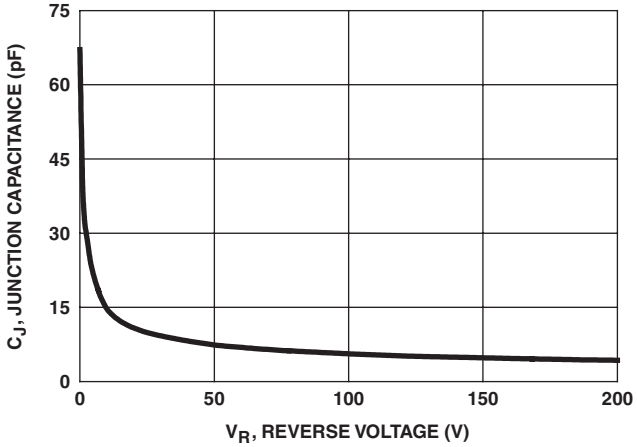



FIGURE 7. JUNCTION CAPACITANCE vs REVERSE VOLTAGE

## Test Circuits and Waveforms

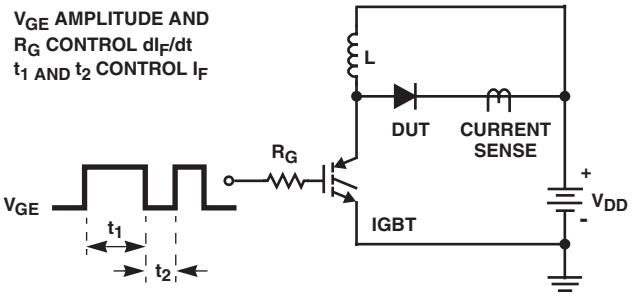



FIGURE 8. $t_{rr}$ TEST CIRCUIT

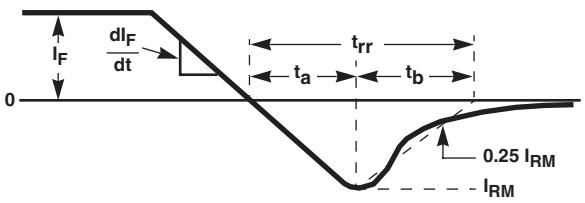



FIGURE 9. $t_{rr}$ WAVEFORMS AND DEFINITIONS

I = 1A
L = 20mH
R < 0.1Ω
$E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$
$Q_1$ = IGBT ($BV_{CES}$ > DUT $V_{R(AVL)}$)

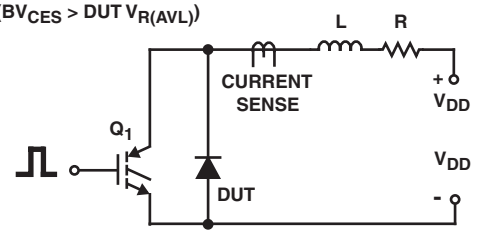



FIGURE 10. AVALANCHE ENERGY TEST CIRCUIT

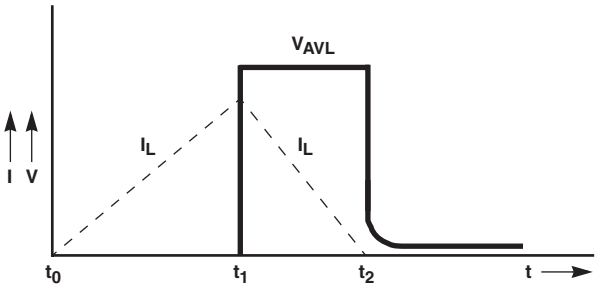



FIGURE 11. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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