

## 15A, 600V Ultrafast Diode

The RUR1S1560S is an ultrafast diode ( $t_{rr} < 55\text{ns}$ ) with soft recovery characteristics. It has low forward voltage drop and is of silicon nitride passivated ion-implanted, epitaxial planar construction.

This device is intended for use as 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 minimizes ringing and electrical noise in many power switching circuits, thus reducing power loss in the switching transistor.

Formerly developmental type TA9905.

## Ordering Information

| PART NUMBER | PACKAGE | BRAND   |
|-------------|---------|---------|
| RUR1S1560S  | TO-263  | RUR1560 |

NOTE: When ordering, use the entire part number. Add the suffix 9A to obtain the TO-263 variant in tape and reel, i.e. RUR1S1560S9A.

## Symbol



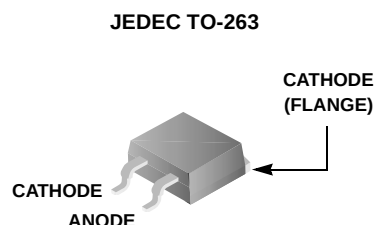
## Features

- Ultrafast Recovery . . . . .  $t_{rr} < 55\text{ns}$
- Operating Temperature . . . . .  $175^{\circ}\text{C}$
- Reverse Voltage . . . . . 600V
- Avalanche Energy Rated

## Applications

- Switching Power Supplies
- Power Switching Circuits
- General Purpose

## Packaging



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

| SYMBOL                        | PARAMETER                                                                                                                    | RUR1S1560S | UNITS                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------|
| $V_{RRM}$                     | Peak Repetitive Reverse Voltage                                                                                              | 600        | V                                        |
| $V_{RWM}$                     | Working Peak Reverse Voltage                                                                                                 | 600        | V                                        |
| $V_R$                         | DC Blocking Voltage                                                                                                          | 600        | V                                        |
| $I_{F(AV)}$                   | Average Rectified Forward Current                                                                                            | 15         | A                                        |
| $I_{FRM}$                     | Repetitive Peak Surge Current (20kHz Square Wave)                                                                            | 30         | A                                        |
| $I_{FSM}$                     | Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)                                                                     | 200        | A                                        |
| $P_D$                         | Power Dissipation                                                                                                            | 100        | W                                        |
| $E_{AVL}$                     | Avalanche Energy (1A, 40mH)                                                                                                  | 20         | mJ                                       |
| $T_J, T_{STG}$                | Operating and Storage Temperature                                                                                            | -55 to 175 | $^{\circ}\text{C}$                       |
| $T_L$<br>$T_{pkg}$            | Maximum Temperature for Soldering<br>Leads at 0.063in (1.6mm) from Case for 10s<br>Package Body for 10s, See Techbrief TB334 | 300<br>260 | $^{\circ}\text{C}$<br>$^{\circ}\text{C}$ |
| <b>THERMAL SPECIFICATIONS</b> |                                                                                                                              |            |                                          |
| $R_{\theta JC}$               | Thermal Resistance Junction to Case                                                                                          | 1.5        | $^{\circ}\text{C/W}$                     |
| $R_{\theta JA}$               | Thermal Resistance Junction to Ambient                                                                                       | 60         | $^{\circ}\text{C/W}$                     |

### NOTES:

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

## RUR1S1560S

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

| SYMBOL   | TEST CONDITION                                                                | MIN | TYP | MAX | UNITS         |
|----------|-------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_F$    | $I_F = 15\text{A}$                                                            | -   | -   | 1.5 | V             |
|          | $I_F = 15\text{A}$ , $T_C = 150^\circ\text{C}$                                | -   | -   | 1.2 | V             |
| $I_R$    | $V_R = 600\text{V}$                                                           | -   | -   | 100 | $\mu\text{A}$ |
|          | $V_R = 600\text{V}$ , $T_C = 150^\circ\text{C}$                               | -   | -   | 500 | $\mu\text{A}$ |
| $t_{rr}$ | $I_F = 1\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$  | -   | -   | 55  | ns            |
|          | $I_F = 15\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$ | -   | -   | 60  | ns            |
| $t_a$    | $I_F = 1\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$  | -   | 20  | -   | ns            |
|          | $I_F = 15\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$ | -   | 30  | -   | ns            |
| $t_b$    | $I_F = 1\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$  | -   | 15  | -   | ns            |
|          | $I_F = 15\text{A}$ , $dI_F/dt = 100\text{A}/\mu\text{s}$ , $V_R = 30\text{V}$ | -   | 17  | -   | ns            |

#### 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 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).

$pw$  = pulse width.

$D$  = duty cycle.

## Typical Performance Curves

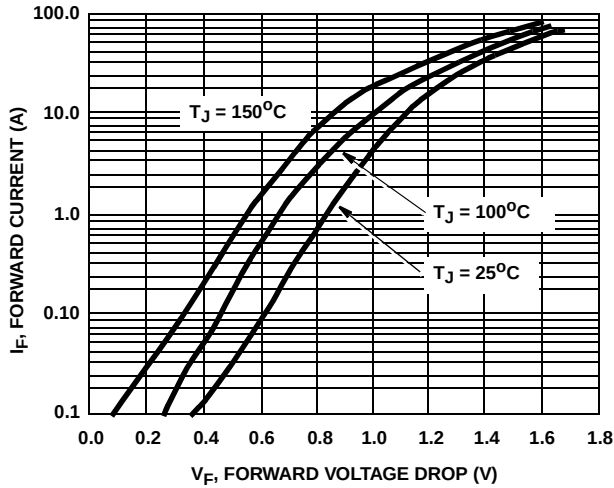


FIGURE 1. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

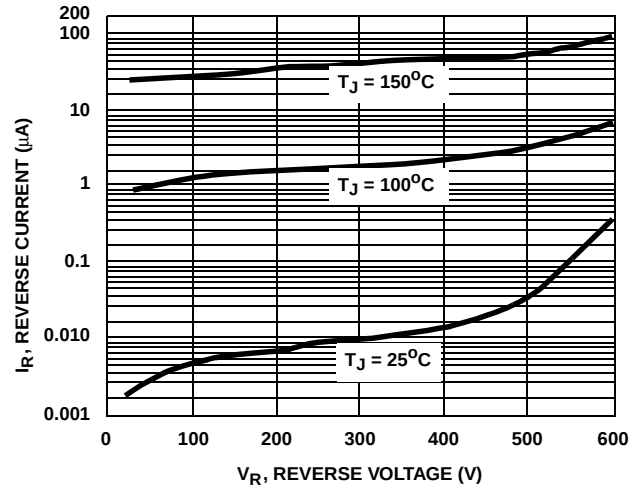


FIGURE 2. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

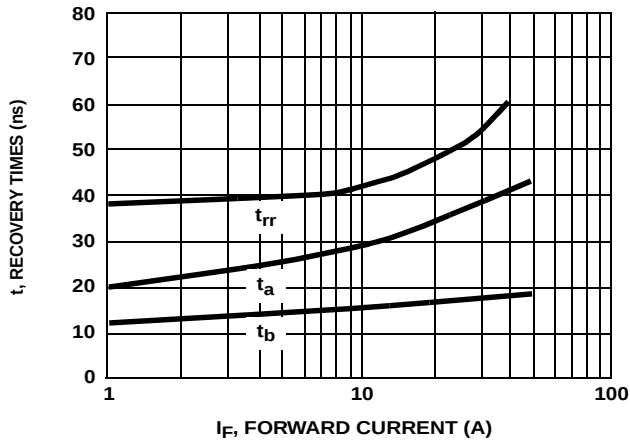


FIGURE 3. 5. TYPICAL  $t_{RR}$ ,  $t_A$  AND  $t_B$  CURVES vs FORWARD CURRENT

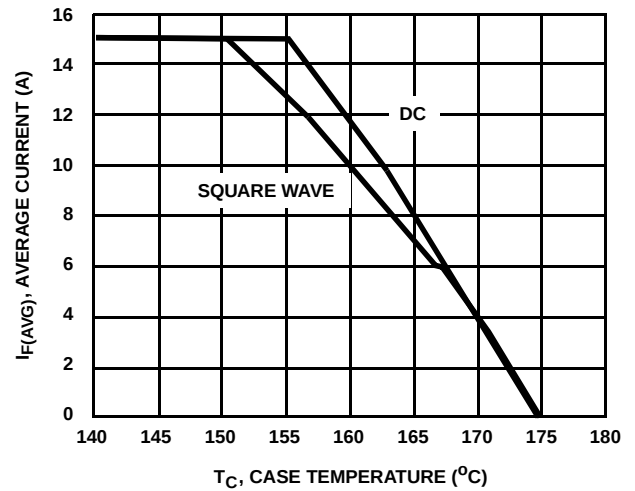


FIGURE 4. 6. TYPICAL CURRENT DERATING CURVE vs CASE TEMPERATURE

## Test Circuits and Waveforms

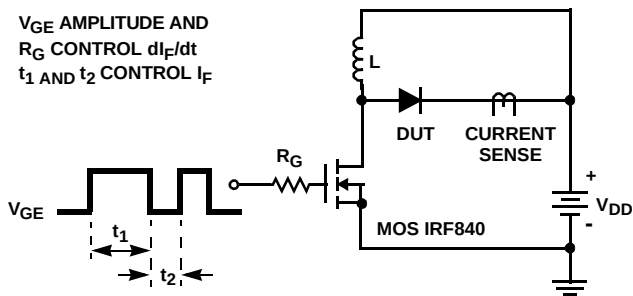


FIGURE 5.  $t_{rr}$  TEST CIRCUIT

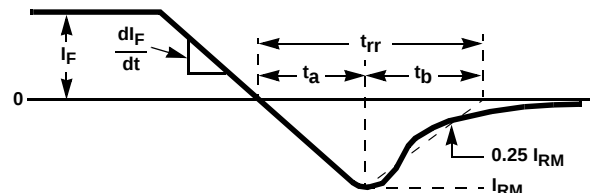


FIGURE 6.  $t_{rr}$  WAVEFORMS AND DEFINITIONS

## Test Circuits and Waveforms (Continued)

$$I = 1A$$

$$L = 40mH$$

$$R < 0.1\Omega$$

$$V_{DD} = 50V$$

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

$$Q_1 = IGBT (BV_{CES} > DUT V_{R(AVL)})$$

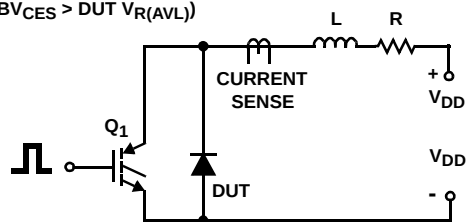


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

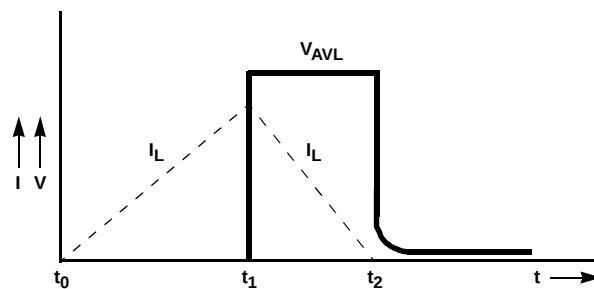


FIGURE 8. AVALANCHE CURRENT AND VOLTAGE WAVEFORMS

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