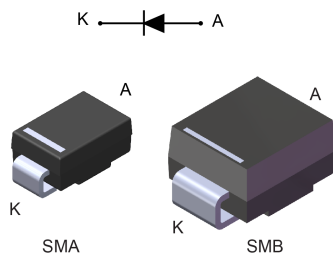


## 200 V - 2 A ultrafast recovery diode



### Features

- Very low conduction losses
- Negligible switching losses
- Low forward voltage drop
- High junction temperature
- ECOPACK<sup>®</sup>2 compliant

### Applications

- Switching diode
- LED Lighting
- Auxiliary power supply
- Flyback diode

### Description

The **STTH2R02** uses ST's patented 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Packaged in SMA, SMB, the **STTH2R02** is optimized for use low voltage, high frequency inverters, free wheeling and polarity protection

| Product status  |        |
|-----------------|--------|
| STTH2R02        |        |
| Product summary |        |
| Symbol          | Value  |
| $I_{F(AV)}$     | 2 A    |
| $V_{RRM}$       | 200 V  |
| $T_{j(max.)}$   | 175 °C |
| $V_{F(typ.)}$   | 0.7 V  |
| $t_{rr(typ.)}$  | 15 ns  |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

| Symbol      | Parameter  |                          | Value                           | Unit |   |
|-------------|--|--------------------------|---------------------------------|------|---|
| $V_{RRM}$   | Repetitive peak reverse voltage                      |                          | 200                             | V    |   |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ , square wave | SMA $T_L = 90\text{ °C}$ | 2                               | A    |   |
|             |  | SMB $T_L = 90\text{ °C}$ |                                 |      |   |
| $I_{FSM}$   | Surge non repetitive forward current                 |                          | $t_p = 10\text{ ms}$ sinusoidal | 75   | A |
| $T_{stg}$   | Storage temperature range                            |                          | -65 to +175                     | °C   |   |
| $T_j$       | Operating junction temperature                       |                          | +175                            | °C   |   |

**Table 2. Thermal resistance parameter**

| Symbol        | Parameter        |           | Max. value | Unit |
|---------------|------------------|-----------|------------|------|
| $R_{th(j-l)}$ | Junction to lead | SMA / SMB | 30         | °C/W |

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       |                    | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|--------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    | -    |      | 3    | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 2    | 20   |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 6\text{ A}$ | -    |      | 1.20 | V             |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 2\text{ A}$ | -    | 0.89 | 1.00 |               |
|             |                         | $T_j = 100\text{ °C}$ |                    | -    | 0.76 | 0.85 |               |
|             |                         | $T_j = 150\text{ °C}$ |                    | -    | 0.70 | 0.80 |               |

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 0.68 \times I_{F(AV)} + 0.06 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

**Table 4. Dynamic characteristics ( $T_j = 25\text{ °C}$  unless otherwise specified)**

| Symbol   | Parameters               | Test conditions   | Min. | Typ. | Max. | Unit |
|----------|--------------------------|---|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$                           | -    | 23   | 30   | ns   |
|          |                          | $I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$                          | -    | 15   | 20   |      |
| $I_{RM}$ | Reverse recovery current | $I_F = 2\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 160\text{ V}$ , $T_j = 125\text{ °C}$ | -    | 3    | 4    | A    |
| $t_{fr}$ | Forward recovery time    | $I_F = 2\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.1 V_{F(max.)}$                    | -    | 40   |      | ns   |
| $V_{FP}$ | Forward recovery voltage | $I_F = 2\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$   | -    | 2.0  |      | V    |

## 1.1 Characteristics (curves)

Figure 1. Peak current versus duty cycle

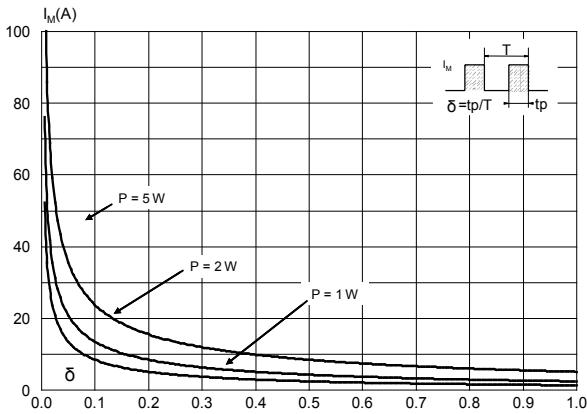


Figure 2. Forward voltage drop versus forward current (typical values)

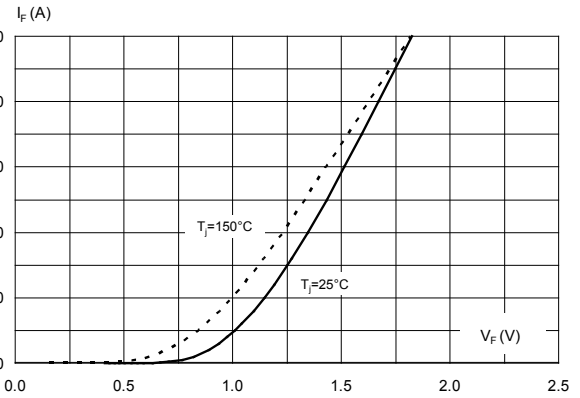


Figure 3. Forward voltage drop versus forward current (maximum values)

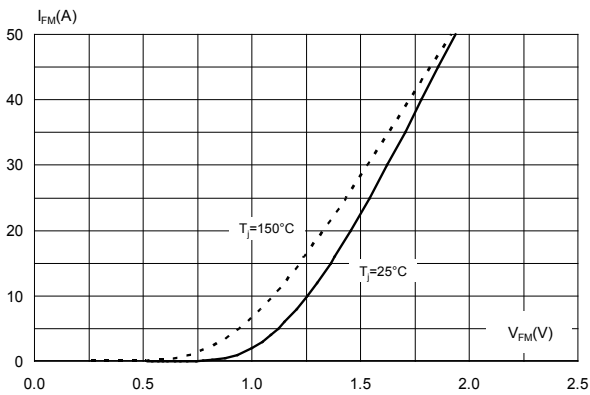
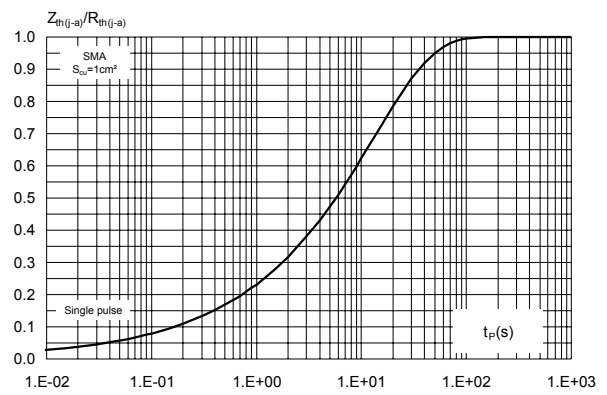
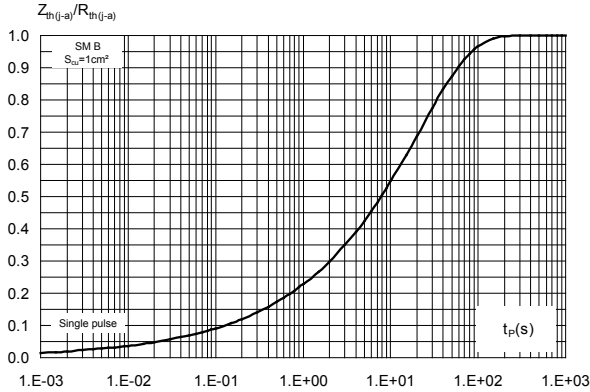


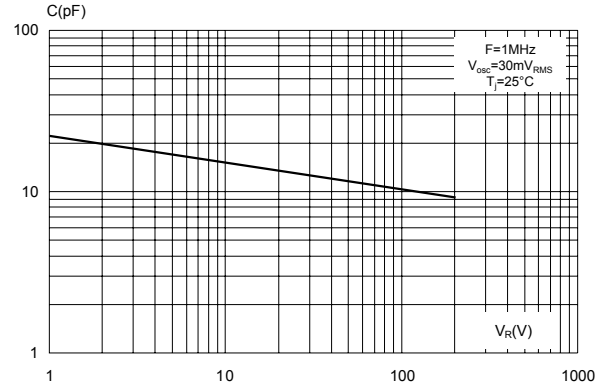
Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SMA)



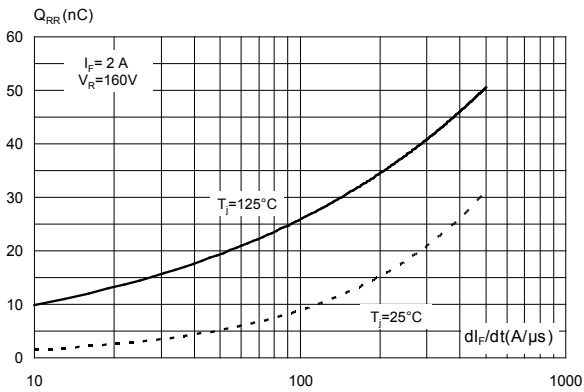
**Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)**



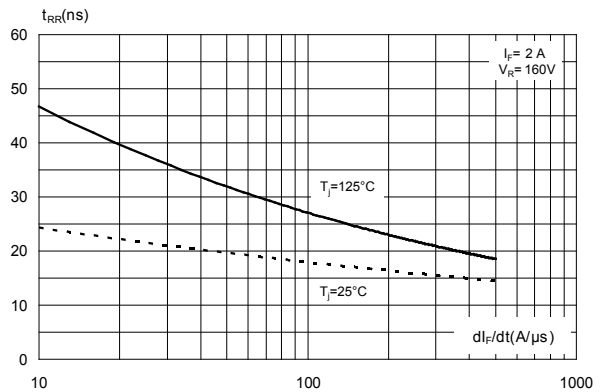
**Figure 6. Junction capacitance versus reverse voltage applied (typical values)**



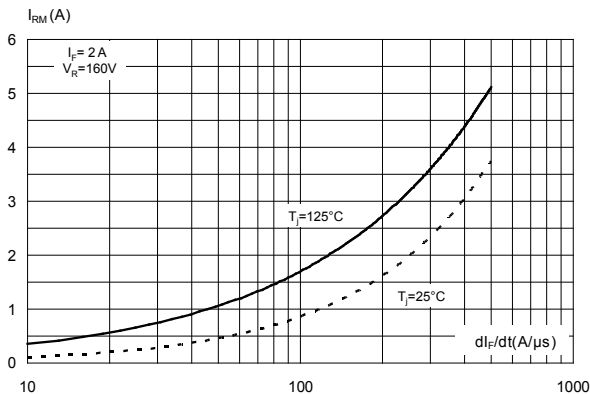
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



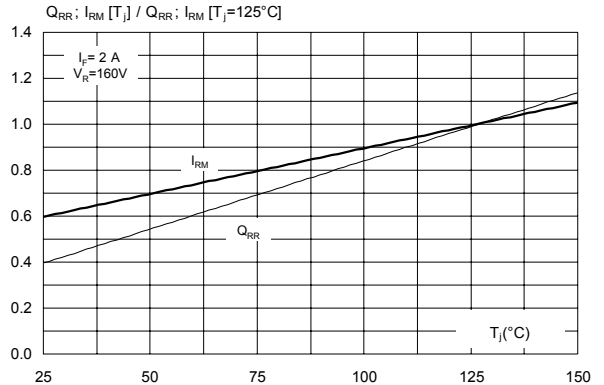
**Figure 8. Reverse recovery time versus  $di_F/dt$  (typical values)**



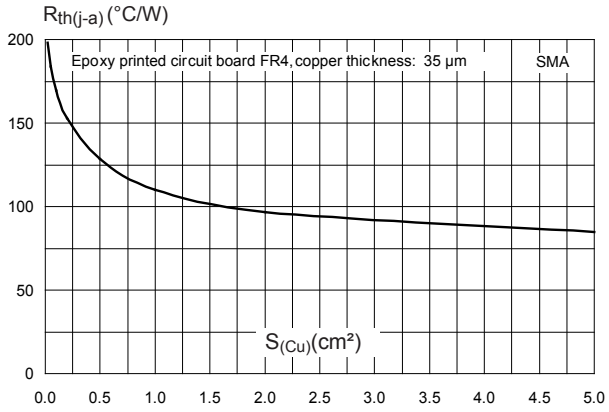
**Figure 9. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



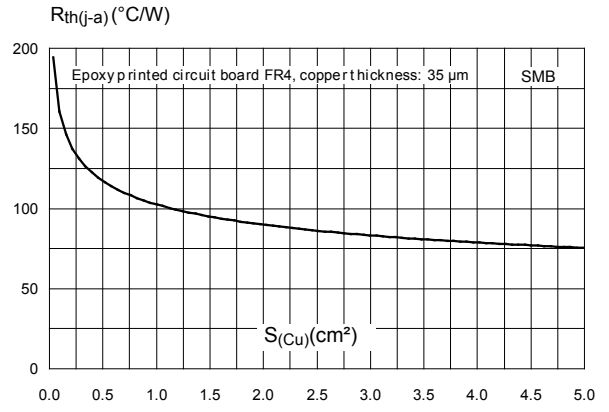
**Figure 10. Relative variations of dynamic parameters versus junction temperature**



**Figure 11. Thermal resistance junction to ambient versus copper surface under each lead (typical values)**



**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (typical values)**



## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

### 2.1 SMA package information

- Epoxy meets UL94, V0
- Cooling method : by conduction (C)

Figure 13. SMA package outline

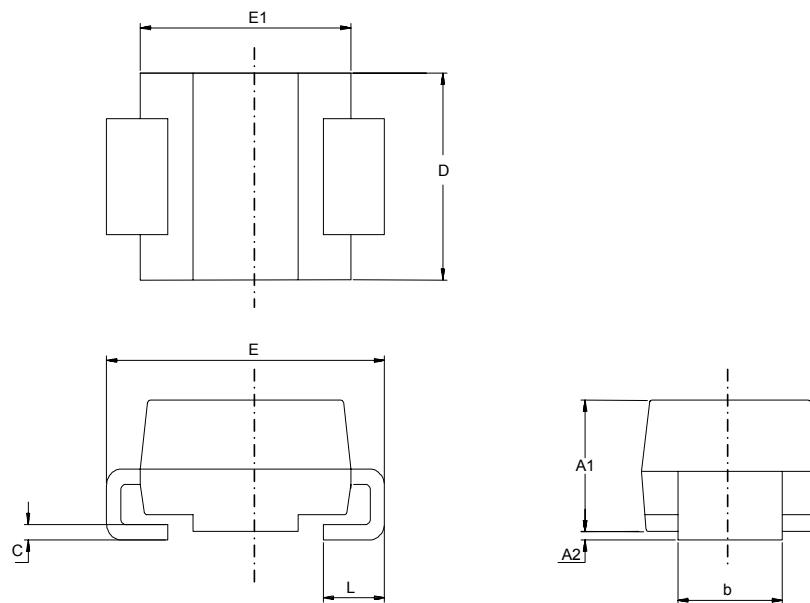
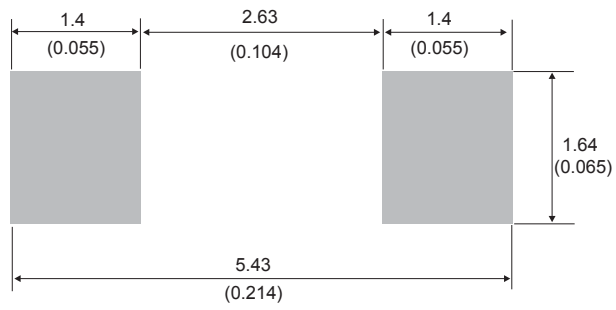


Table 5. SMA package mechanical data

| Ref. | Dimensions  |      |                             |       |
|------|-------------|------|-----------------------------|-------|
|      | Millimeters |      | Inches (for reference only) |       |
|      | Min.        | Max. | Min.                        | Max.  |
| A1   | 1.90        | 2.45 | 0.074                       | 0.097 |
| A2   | 0.05        | 0.20 | 0.001                       | 0.008 |
| b    | 1.25        | 1.65 | 0.049                       | 0.065 |
| c    | 0.15        | 0.40 | 0.005                       | 0.016 |
| D    | 2.25        | 2.90 | 0.088                       | 0.115 |
| E    | 4.80        | 5.35 | 0.188                       | 0.211 |
| E1   | 3.95        | 4.60 | 0.155                       | 0.182 |
| L    | 0.75        | 1.50 | 0.029                       | 0.060 |

**Figure 14. SMA recommended footprint in mm (inches)**

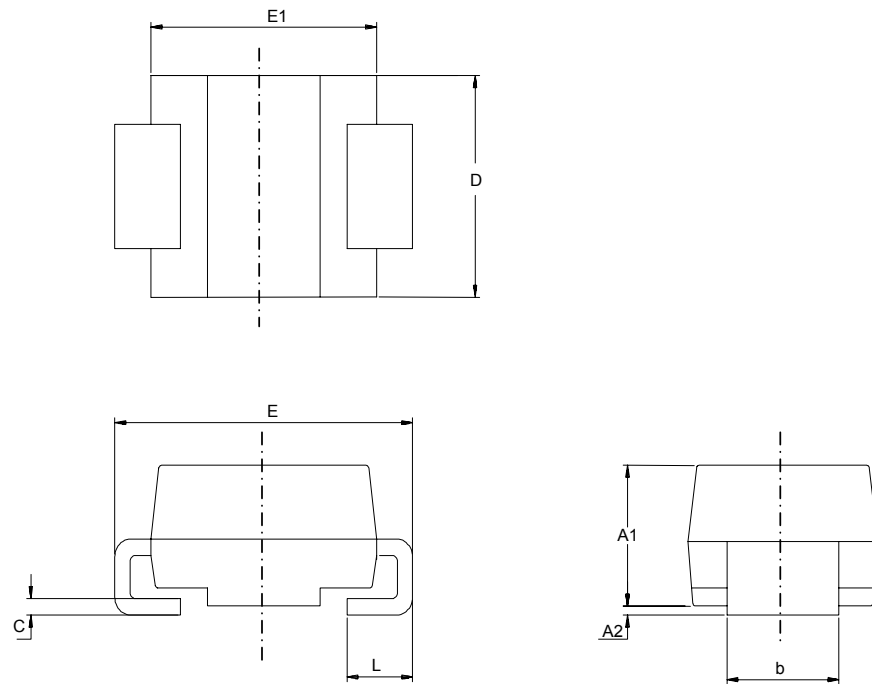




## 2.2 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

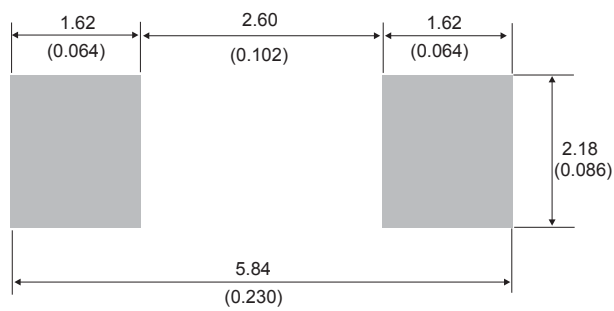
Figure 15. SMB package outline



**Table 6. SMB package mechanical data**

| Ref. | Dimensions  |      |                             |       |
|------|-------------|------|-----------------------------|-------|
|      | Millimeters |      | Inches (for reference only) |       |
|      | Min.        | Max. | Min.                        | Max.  |
| A1   | 1.90        | 2.45 | 0.074                       | 0.097 |
| A2   | 0.05        | 0.20 | 0.001                       | 0.008 |
| b    | 1.95        | 2.20 | 0.076                       | 0.087 |
| c    | 0.15        | 0.40 | 0.005                       | 0.016 |
| D    | 3.30        | 3.95 | 0.129                       | 0.156 |
| E    | 5.10        | 5.60 | 0.200                       | 0.221 |
| E1   | 4.05        | 4.60 | 0.159                       | 0.182 |
| L    | 0.75        | 1.50 | 0.029                       | 0.060 |

**Figure 16. SMB recommended footprint**



### 3 Ordering information

**Table 7. Ordering information**

| Order code | Marking | Package | Weight  | Base qty. | Delivery mode |
|------------|---------|---------|---------|-----------|---------------|
| STTH2R02A  | R2A     | SMA     | 0.068 g | 5000      | Tape and reel |
| STTH2R02U  | R2U     | SMB     | 0.107 g | 2500      | Tape and reel |

## Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 03-May-2006 | 1        | First issue.   |
| 13-Oct-2006 | 2        | Maximum $T_j$ set to 175° C for all packages in Table 1. |
| 11-Dec-2018 | 3        | Removed DO-15 package information.                       |

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