

Ultrafast recovery diode

Main product characteristics

| | |
|----------------|--------|
| $I_{F(AV)}$ | 2 A |
| V_{RRM} | 200 V |
| T_j (max) | 175° C |
| V_F (typ) | 0.7 V |
| t_{rr} (typ) | 15 ns |

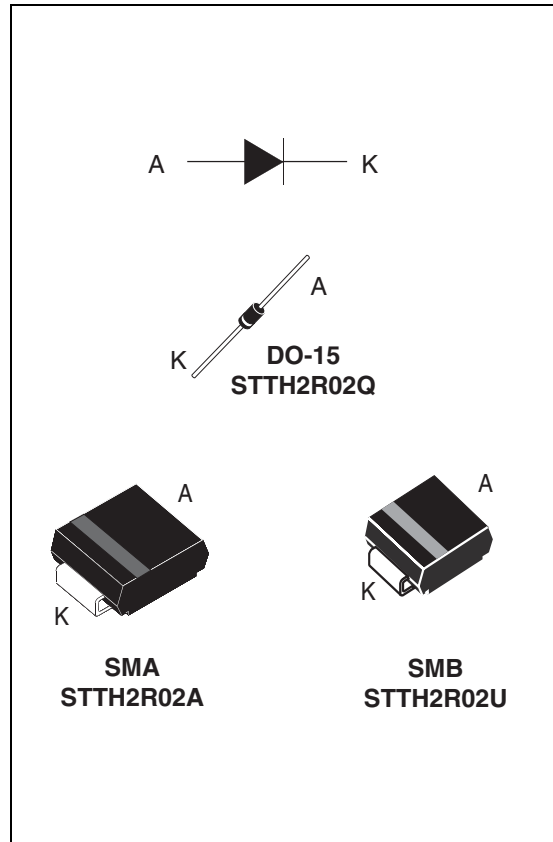
Features and benefits

- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature

Description

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

Packaged in DO-15, SMA, and SMB, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.



Order codes

| Part Number | Marking |
|-------------|----------|
| STTH2R02Q | STTH2R02 |
| STTH2R02QRL | STTH2R02 |
| STTH2R02A | R2A |
| STTH2R02U | R2U |

1 Characteristics

Table 1. Absolute ratings (limiting values at $T_j = 25^\circ \text{C}$, unless otherwise specified)

| Symbol | Parameter | | Value | Unit |
|--------------|---|--|--------------|-------------------|
| V_{RRM} | Repetitive peak reverse voltage | | 200 | V |
| I_{FRM} | Repetitive peak forward current | DO-15 ⁽¹⁾ $t_p = 5 \mu\text{s}$, $F = 5 \text{ kHz}$ | 60 | A |
| | | SMA, SMB | | |
| $I_{F(RMS)}$ | RMS forward current | DO-15 | 60 | A |
| | | SMA, SMB | | |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ | DO-15 $T_{lead} = 90^\circ \text{C}$ | 2 | A |
| | | SMA, SMB $T_c = 90^\circ \text{C}$ | | |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10 \text{ ms}$ Sinusoidal | 75 | A |
| T_{stg} | Storage temperature range | | -65 to + 175 | $^\circ \text{C}$ |
| T_j | Maximum operating junction temperature | | 175 | $^\circ \text{C}$ |

1. On infinite heatsink with 10 mm lead length

Table 2. Thermal parameters

| Symbol | Parameter | | Value | Unit |
|---------------|------------------|--|----------|------|
| $R_{th(j-c)}$ | Junction to lead | Lead Length = 10 mm on infinite heatsink | DO-15 | 45 |
| | Junction to case | | SMA, SMB | 30 |

$^\circ \text{C/W}$

Table 3. Static electrical characteristics

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

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

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

To evaluate the conduction losses use the following equation:

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

Table 4. Dynamic characteristics

| Symbol | Parameter | Test conditions | Min. | Typ | Max. | Unit |
|----------|--------------------------|--|------|-----|------|------|
| t_{rr} | Reverse recovery time | $I_F = 1 \text{ A}$, $dI_F/dt = -50 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$, $T_j = 25^\circ \text{ C}$ | | 23 | 30 | ns |
| | | $I_F = 1 \text{ A}$, $dI_F/dt = -100 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$, $T_j = 25^\circ \text{ C}$ | | 15 | 20 | |
| I_{RM} | Reverse recovery current | $I_F = 2 \text{ A}$, $dI_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 160 \text{ V}$, $T_j = 125^\circ \text{ C}$ | | 3 | 4 | A |
| t_{fr} | Forward recovery time | $I_F = 2 \text{ A}$, $dI_F/dt = 100 \text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ \text{ C}$ | | 40 | | ns |
| V_{FP} | Forward recovery voltage | $I_F = 2 \text{ A}$, $dI_F/dt = 100 \text{ A}/\mu\text{s}$, $T_j = 25^\circ \text{ C}$ | | 2.0 | | V |

Figure 1. Peak current versus duty cycle

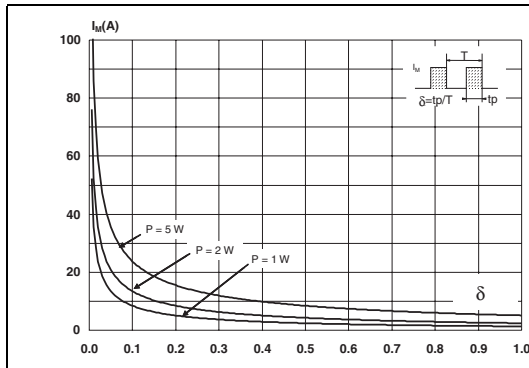


Figure 2. Forward voltage drop versus forward current (typical values)

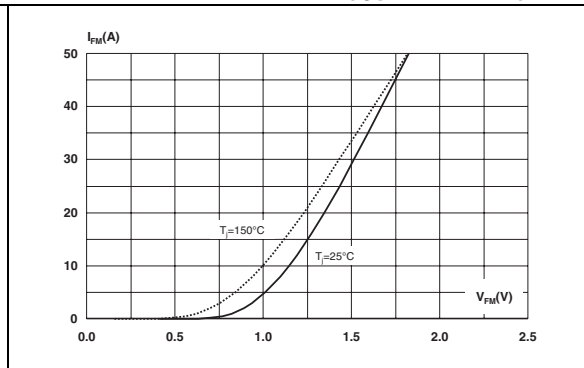


Figure 3. Forward voltage drop versus forward current (maximum values)

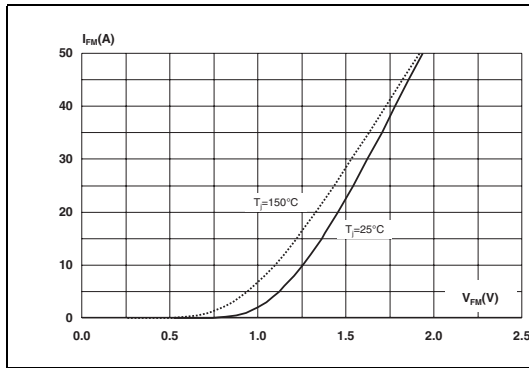


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (SMA)

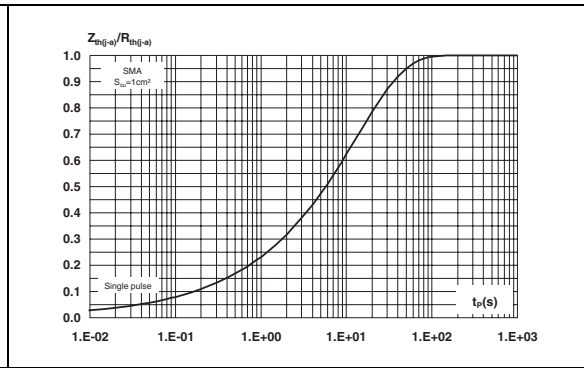


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (SMB)

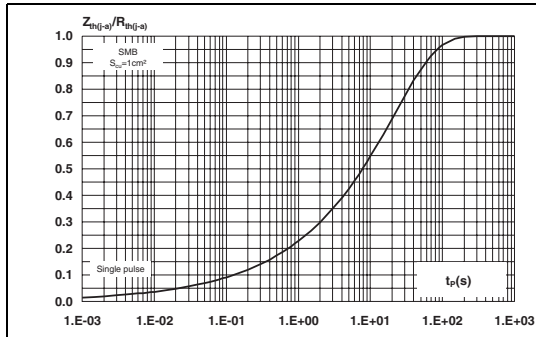


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (DO-15)

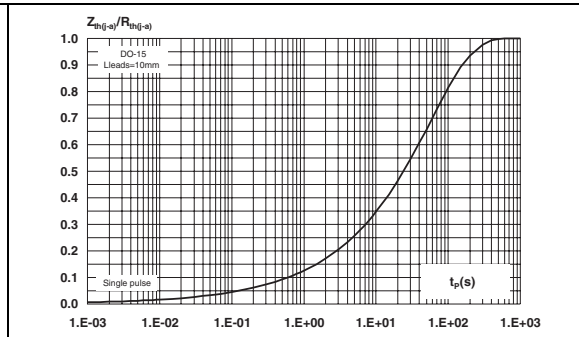


Figure 7. Junction capacitance versus reverse applied voltage (typical values)

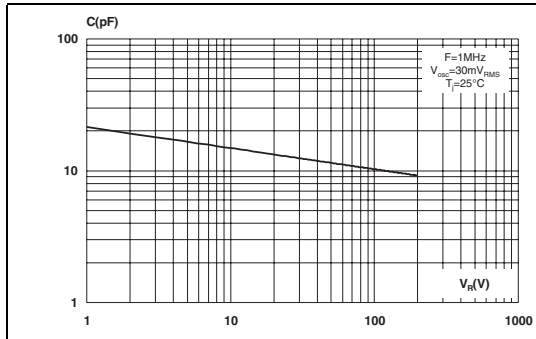


Figure 8. Reverse recovery charges versus di/dt (typical values)

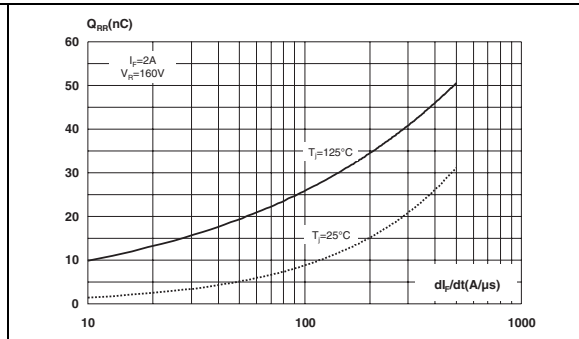


Figure 9. Reverse recovery time versus di/dt (typical values)

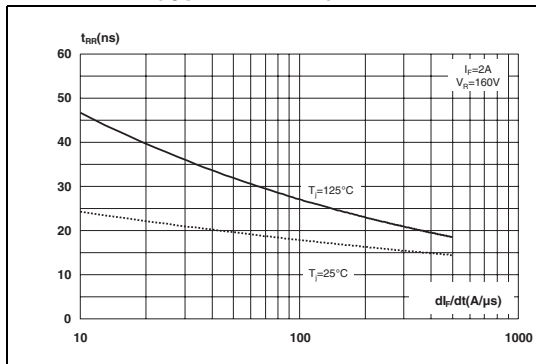


Figure 10. Peak reverse recovery current versus di/dt (typical values)

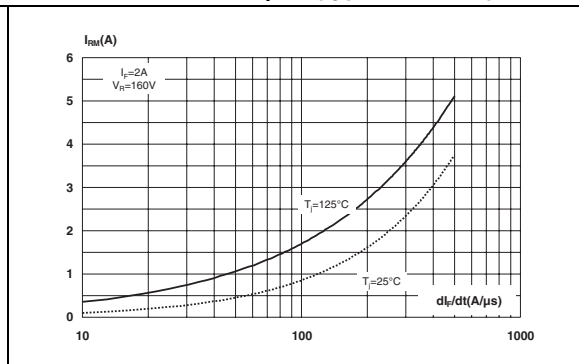


Figure 11. Dynamic parameters versus junction temperature

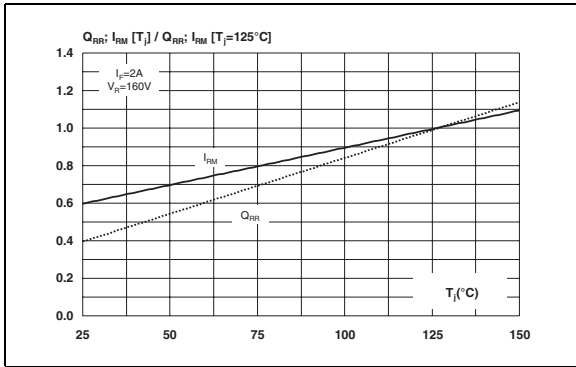


Figure 12. Thermal resistance, junction to ambient, versus copper surface under each lead - SMA/SMB (epoxy FR4, $e_{Cu} = 35 \mu m$)

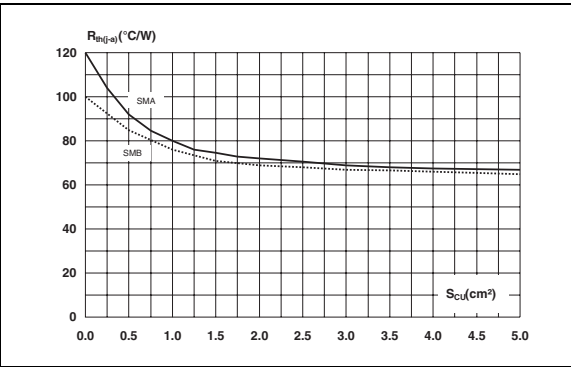
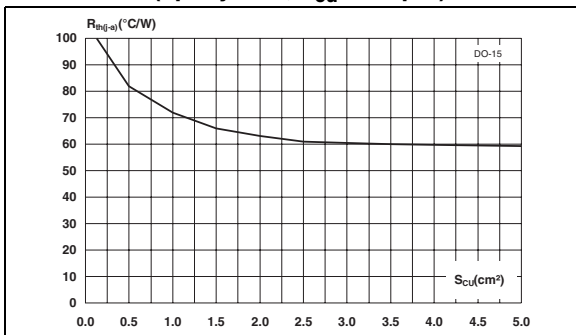
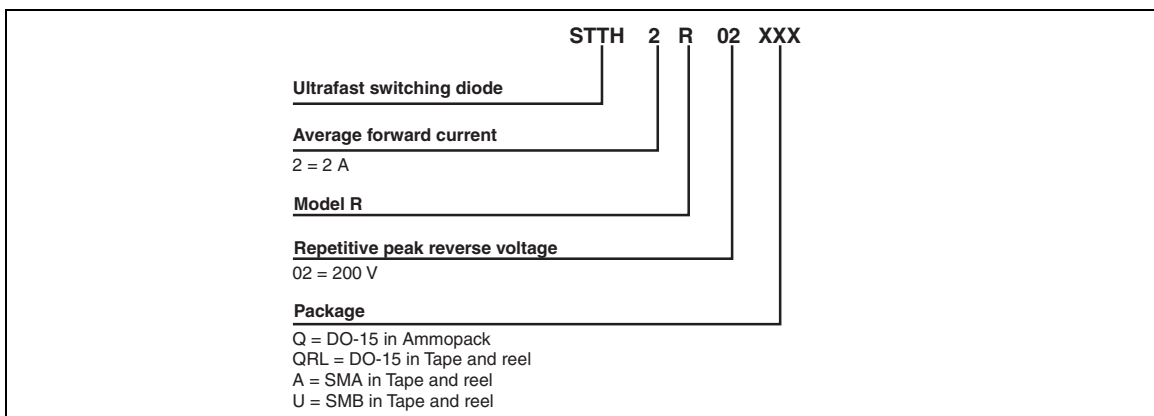


Figure 13. Thermal resistance, junction to ambient, versus copper surface under each lead DO-15 (epoxy FR4, $e_{Cu} = 35 \mu m$)



2 Ordering information scheme



3 Package information

Epoxy meets UL94, V0

Table 5. DO-15 Dimensions

| | DIMENSIONS | | | |
|---|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| | A | 6.05 | 6.75 | 0.238 |
| B | 2.95 | 3.53 | 0.116 | 0.139 |
| C | 26 | 31 | 1.024 | 1.220 |
| D | 0.71 | 0.88 | 0.028 | 0.035 |

Table 6. SMA dimensions

| | DIMENSIONS | | | | |
|---|-------------|------|--------|-------|-------|
| | Millimeters | | Inches | | |
| | Min. | Max. | Min. | Max. | |
| | A1 | 1.90 | 2.03 | 0.075 | 0.080 |
| | A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| | b | 1.25 | 1.65 | 0.049 | 0.065 |
| | c | 0.15 | 0.41 | 0.006 | 0.016 |
| | E | 4.80 | 5.60 | 0.189 | 0.220 |
| | E1 | 3.95 | 4.60 | 0.156 | 0.181 |
| | D | 2.25 | 2.95 | 0.089 | 0.116 |
| L | 0.75 | 1.60 | 0.030 | 0.063 | |

Figure 14. SMA footprint (dimensions in mm)

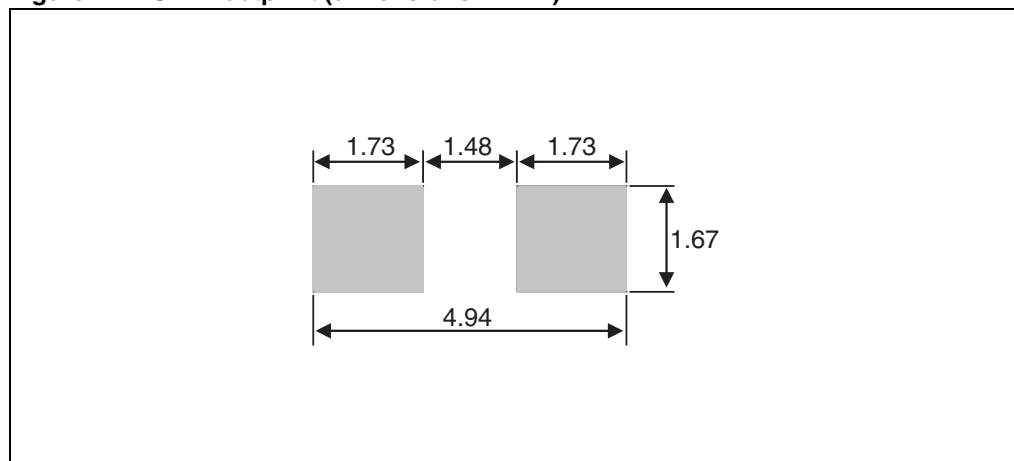
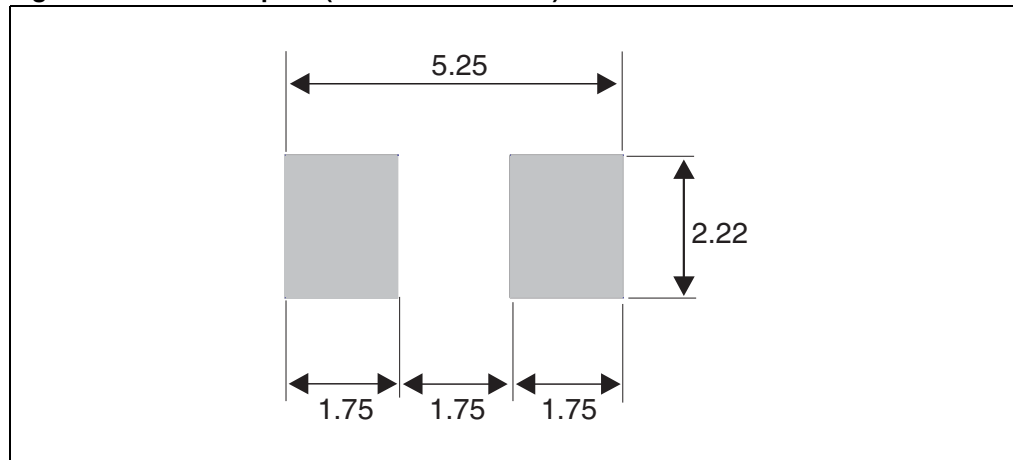


Table 7. SMB dimensions

| REF. | DIMENSIONS | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | | Max. | Min. | | Max. |
| A1 | 1.90 | 2.15 | 2.45 | 0.075 | 0.085 | 0.096 |
| A2 | 0.05 | 0.15 | 0.20 | 0.002 | 0.006 | 0.008 |
| b | 1.95 | | 2.20 | 0.077 | | 0.087 |
| c | 0.15 | | 0.41 | 0.006 | | 0.016 |
| E | 5.10 | 5.40 | 5.60 | 0.201 | 0.213 | 0.220 |
| E1 | 4.05 | 4.30 | 4.60 | 0.159 | 0.169 | 0.181 |
| D | 3.30 | 3.60 | 3.95 | 0.130 | 0.142 | 0.156 |
| L | 0.75 | 1.15 | 1.60 | 0.030 | 0.045 | 0.063 |

Figure 15. SMB footprint (dimensions in mm)



In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

4 Ordering information

| Part Number | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|----------|---------|---------|----------|---------------|
| STTH2R02Q | STTH2R02 | DO-15 | 0.4 g | 1000 | Ammopack |
| STTH2R02QRL | STTH2R02 | DO-15 | 0.4 g | 6000 | Tape and reel |
| STTH2R02A | R2A | SMA | 0.068 g | 5000 | Tape and reel |
| STTH2R02U | R2U | SMB | 0.12 g | 2500 | Tape and reel |

5 Revision history

| Date | Revision | Description of Changes |
|-------------|----------|--|
| 03-May-2006 | 1 | First issue |
| 13-Oct-2006 | 2 | Maximum T_j set to 175° C for all packages in Table 1. |

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