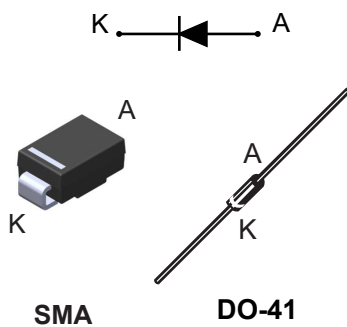


200 V - 1 A high efficiency ultrafast diode



Features

- Very low conduction losses
- Negligible switching losses
- Low forward voltage drop
- High junction temperature
- ECOPACK^{®2} compliant

Applications

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

Description

The **STTH102** 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 SMA and DO-41, the **STTH102** is ideal for use as a free wheeling diode in power supplies and other power switching applications.

| Product status | |
|-----------------|--------|
| STTH102 | |
| Product summary | |
| Symbol | Value |
| $I_{F(AV)}$ | 1 A |
| V_{RRM} | 200 V |
| $T_{j(max.)}$ | 175 °C |
| $V_F(typ.)$ | 0.68 V |
| $t_{rr}(typ.)$ | 12 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 | $T_L = 145\text{ °C}$ | 1 | A |
| | | DO-41 | $T_L = 130\text{ °C}$ | | |
| I_{FSM} | Surge non repetitive forward current | SMA | $t_p = 10\text{ ms sinusoidal}$ | 40 | A |
| | | DO-41 | | 50 | |
| 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 | 30 | °C/W |
| | Junction to lead | Lead length = 10 mm | DO-41 | 50 | |

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 | $T_j = 25\text{ °C}$ | $V_R = V_{RRM}$ | - | | 1 | μA |
| | | $T_j = 125\text{ °C}$ | | - | 1 | 25 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 1\text{ A}$ | - | | 0.97 | V |
| | | $T_j = 125\text{ °C}$ | | - | 0.68 | 0.78 | |

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:

$$P = 0.65 \times I_{F(AV)} + 0.130 \times I_{F(RMS)}^2$$

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 stated)

| Symbol | Parameters | Test conditions | Min. | Typ. | Max. | Unit |
|----------|--------------------------|--|------|------|------|------|
| t_{rr} | Reverse recovery time | $I_F = 0.5\text{ A}$, $I_{rr} = 0.25\text{ A}$, $I_R = 1\text{ A}$ | - | 12 | 20 | ns |
| t_{fr} | Forward recovery time | $I_F = 1\text{ A}$, $dI_F/dt = 50\text{ A/ms}$, $V_{FR} = 1.1 V_{F(max.)}$ | - | 50 | | ns |
| V_{FP} | Forward recovery voltage | $I_F = 1\text{ A}$, $dI_F/dt = 50\text{ A/}\mu\text{s}$ | - | 1.8 | | V |

1.1 Characteristics (curves)

Figure 1. Average forward power dissipation versus average forward current (SMA)

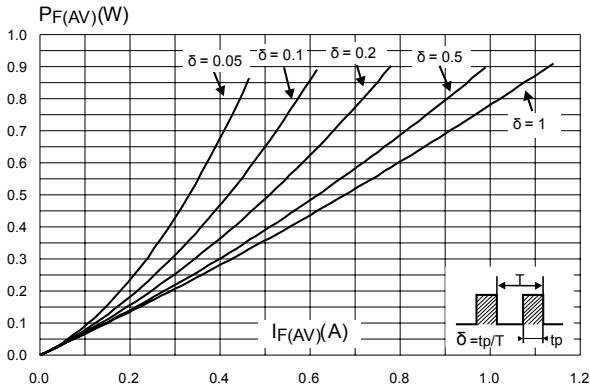


Figure 2. Average forward power dissipation versus average forward current (DO-41)

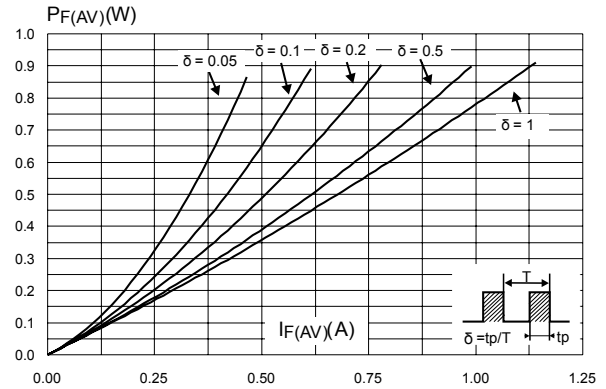


Figure 3. Average forward current versus ambient temperature ($\delta = 0.5$) (SMA)

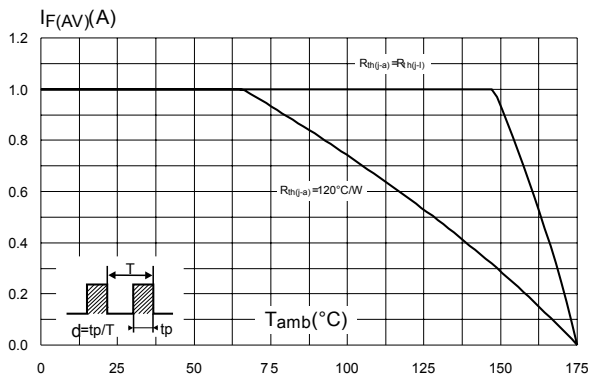


Figure 4. (DO-41) Average forward current versus ambient temperature ($\delta = 0.5$) (DO-41)

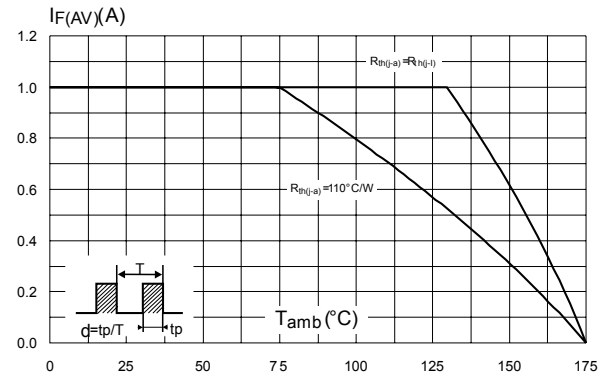


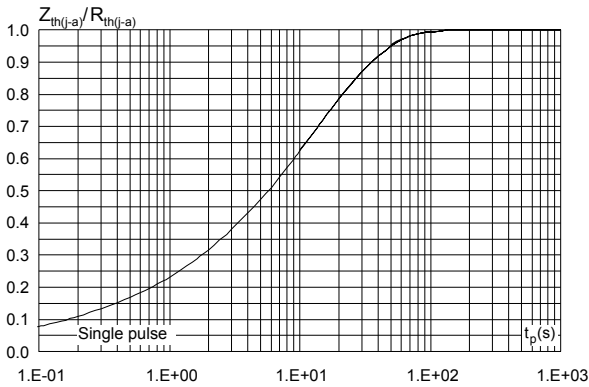
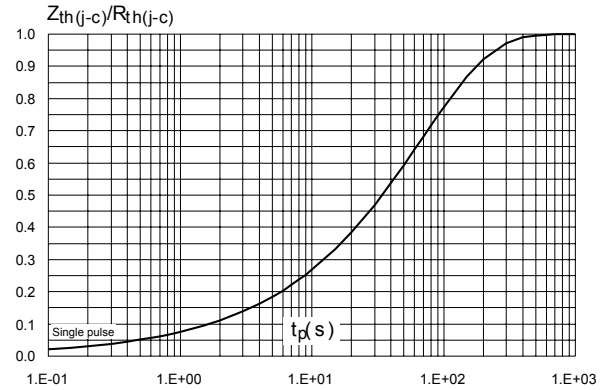
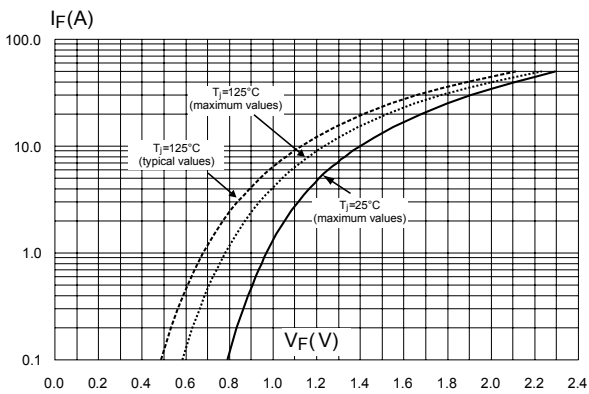
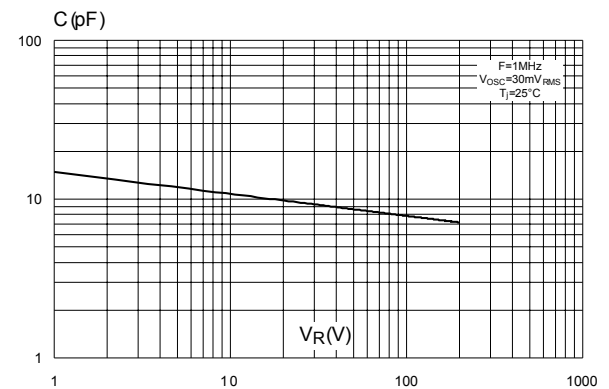
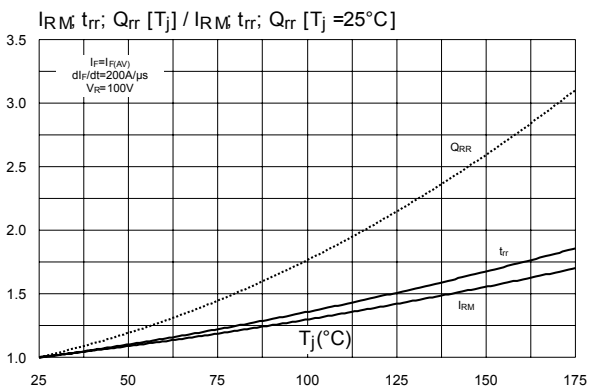
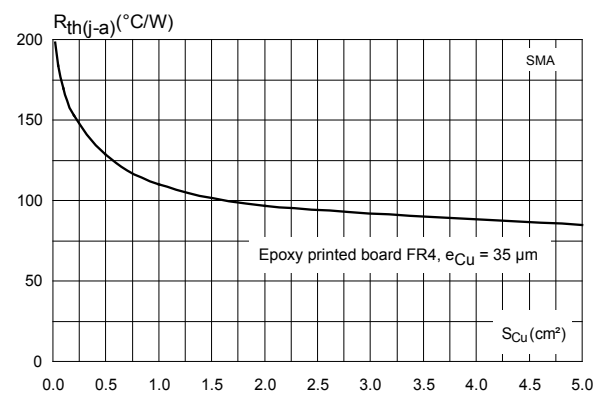
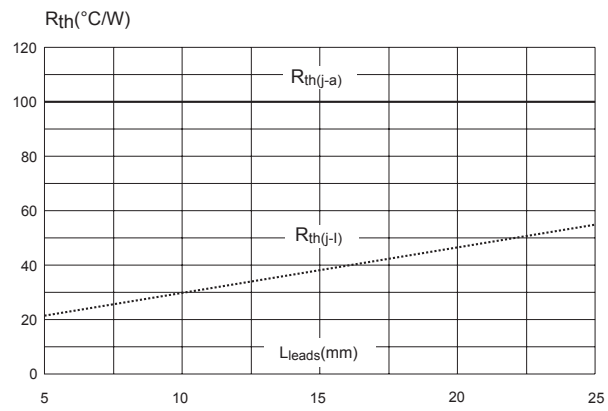
Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (epoxy printed circuit board, $e_{Cu} = 35 \mu\text{m}$, recommended pad layout) (SMA)

Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (DO-41)

Figure 7. Forward voltage drop versus forward current

Figure 8. Junction capacitance versus reverse voltage applied (typical values)

Figure 9. Relative variations of dynamic parameters versus junction temperature

Figure 10. Thermal resistance junction to ambient versus copper surface under each lead (typical values)


Figure 11. Thermal resistance versus lead length (DO-41)



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. ECOPACK[®] is an ST trademark.

2.1 DO-41 package information

- Epoxy meets UL 94, V0

Figure 12. DO-41 package outline

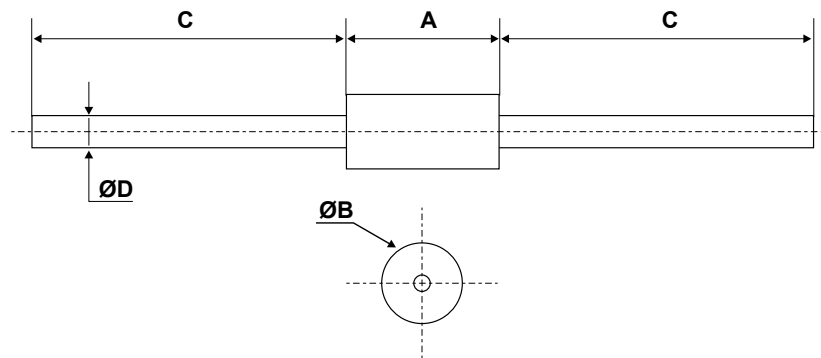


Table 5. DO-41 package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|-----------------------------|------|--------|
| | Millimeters | | | Inches (for reference only) | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.07 | - | 5.20 | 0.160 | - | 0.205 |
| B | 2.04 | - | 2.71 | 0.080 | - | 0.107 |
| C | 25.40 | - | | 1.000 | - | |
| D | 0.71 | - | 0.86 | 0.028 | - | 0.0034 |

2.2 SMA package information

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

Figure 13. SMA package outline

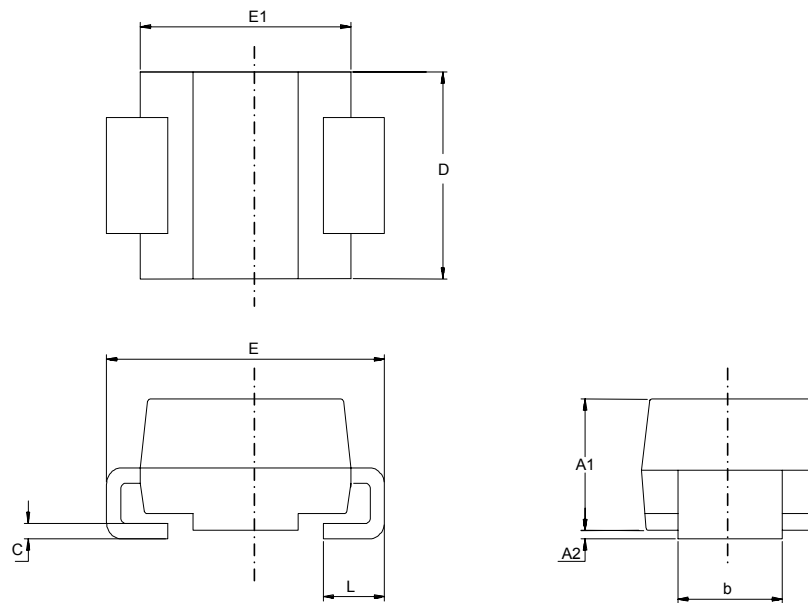
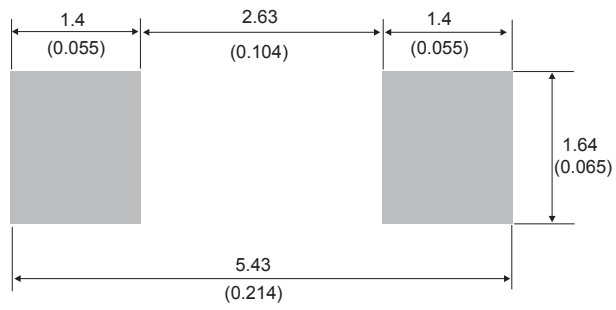


Table 6. SMA package mechanical data

| 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)



3 Ordering information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|------------|---------|---------|---------|-----------|---------------|
| STTH102A | U12 | SMA | 0.068 g | 5000 | Tape and reel |
| STTH102 | STTH102 | DO-41 | 0.34 g | 2000 | Ammopack |
| STTH102RL | STTH102 | DO-41 | 0.34 g | 5000 | Tape and reel |

Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| Jul-2003 | 2A | Last update. |
| Aug-2004 | 3 | SMA package dimensions update. Reference A1 max. changed from 2.70mm (0.106inc.) to 2.03mm (0.080). SMA and DO-41 datasheets merged. |
| 27-Jun-2005 | 4 | Corrected error in title. |
| 21-Nov-2006 | 5 | Reformatted to current standards. Added Table 4. Dynamic electrical characteristics. Updated dimensions table for DO-41 plastic package. Added cathode bands to package illustrations. |
| 05-Dec-2018 | 6 | Add electrical schematics of single diode and ECOPACK [®] 2 compliant. |

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