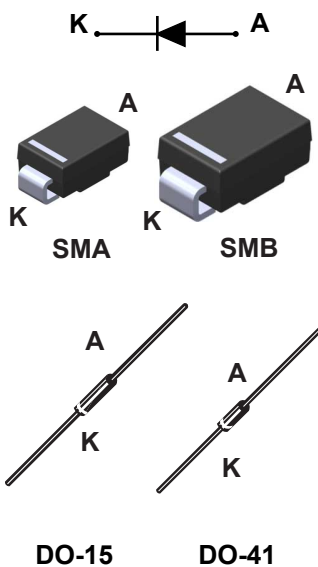


200 V - 1.5 A ultrafast recovery diode



Features

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

Applications

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

Description

The **STTH1R02** 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, SMB, DO-41 and DO-15, the **STTH1R02** is ideal for use low voltage, high frequency inverters, free wheeling and polarity protection

| Product status | |
|-----------------|--------|
| STTH1R02 | |
| Product summary | |
| Symbol | Value |
| $I_{F(AV)}$ | 1.5 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, SMB $T_L = 150\text{ °C}$ | 1.5 | A | |
| | | DO-41, DO-15 $T_L = 135\text{ °C}$ | | | |
| I_{FSM} | Surge non repetitive forward current | | $t_p = 10\text{ ms}$ sinusoidal | 60 | 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 |
| $R_{th(j-l)}$ | Junction to lead | Lead length = 10 mm on infinite heatsink DO-15, DO-41 | 45 | |

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 | μA |
| | | $T_j = 125\text{ °C}$ | | - | 2 | 20 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 1.5\text{ A}$ | - | 0.89 | 1.00 | V |
| | | $T_j = 100\text{ °C}$ | | - | 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:

$$P = 0.68 \times I_{F(AV)} + 0.08 \times I_{F(RMS)}^2$$

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 | $I_F = 1\text{ A}$, $di_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 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 | $I_F = 1.5\text{ A}$, $di_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 160\text{ V}$, $T_j = 125\text{ °C}$ | - | 3 | 4 | A |
| t_{fr} | Forward recovery time | $I_F = 1.5\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 V_{F(max.)}$ | - | 50 | | ns |
| V_{FP} | Forward recovery voltage | $I_F = 1.5\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | - | 2.1 | | V |

1.1 Characteristics (curves)

Figure 1. Peak current versus duty cycle

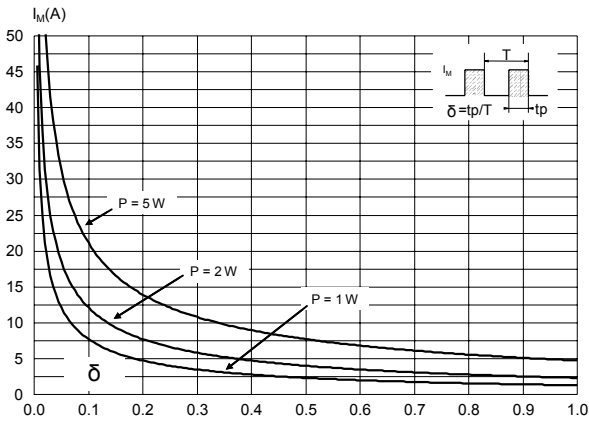


Figure 2. Forward voltage drop versus forward current (typical values)

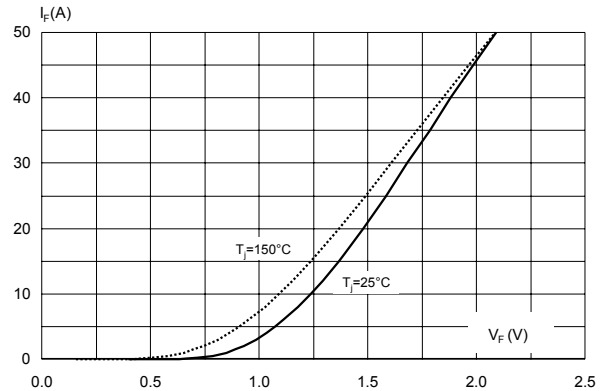


Figure 3. Forward voltage drop versus forward current (maximum values)

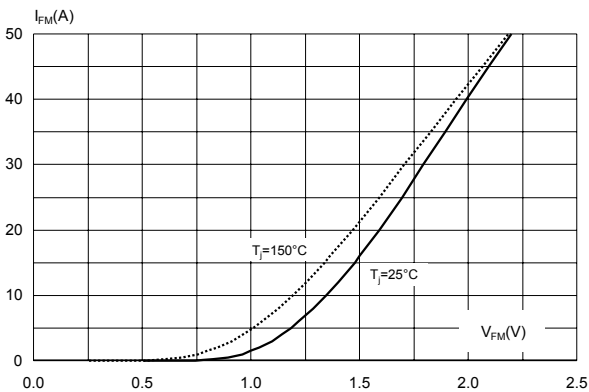


Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SMA)

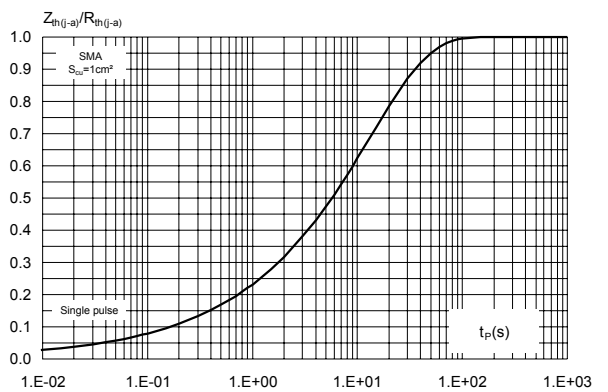


Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)

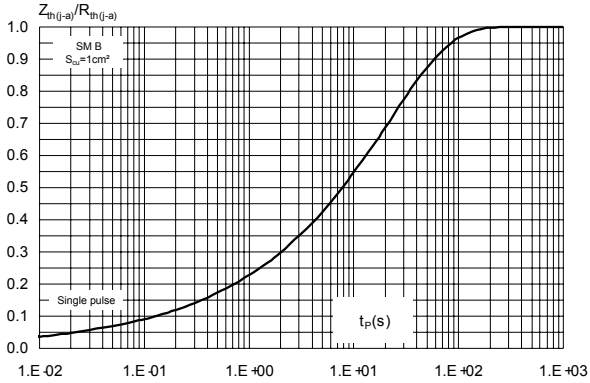


Figure 6. Relative variation of thermal impedance junction to lead versus pulse duration (DO-41)

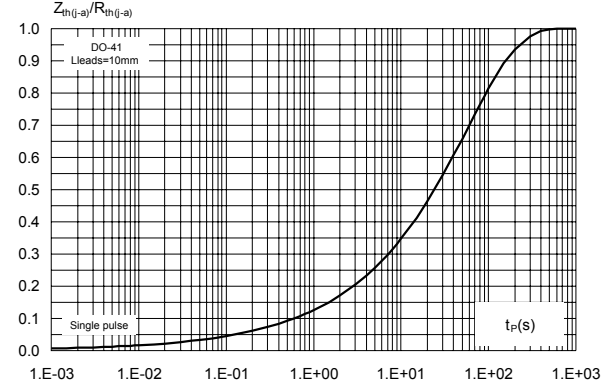


Figure 7. Relative variation of thermal impedance junction to lead versus pulse duration (DO-15)

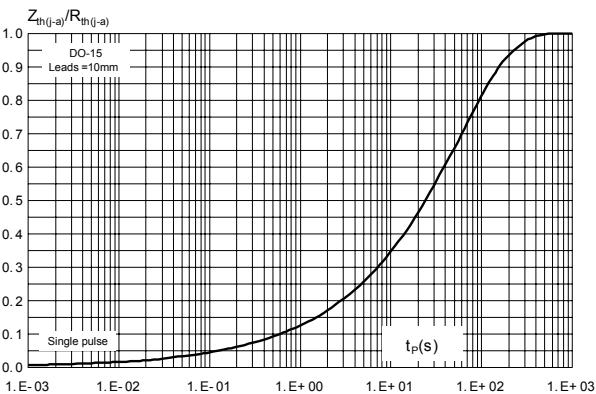


Figure 8. Junction capacitance versus reverse voltage applied (typical values)

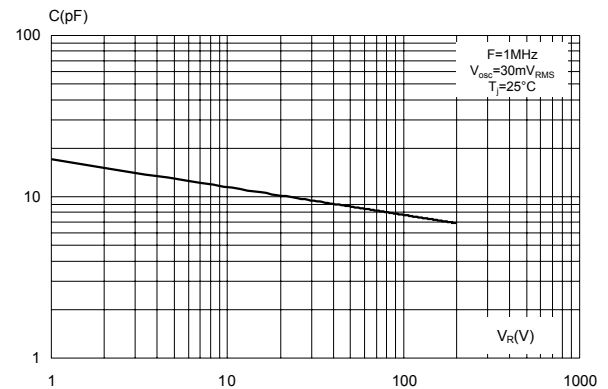


Figure 9. Reverse recovery charges versus di_F/dt (typical values)

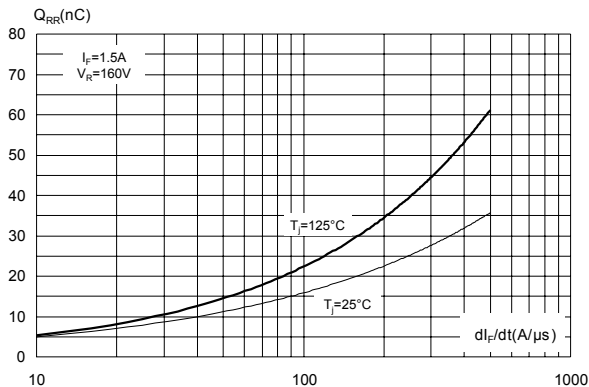


Figure 10. Reverse recovery time versus di_F/dt (typical values)

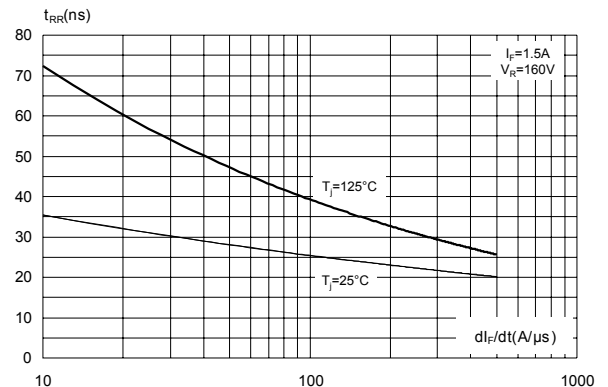


Figure 11. Peak reverse recovery current versus di_F/dt (typical values)

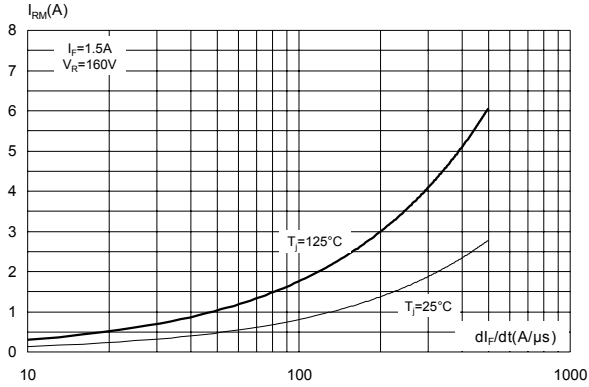


Figure 12. Relative variations of dynamic parameters versus junction temperature

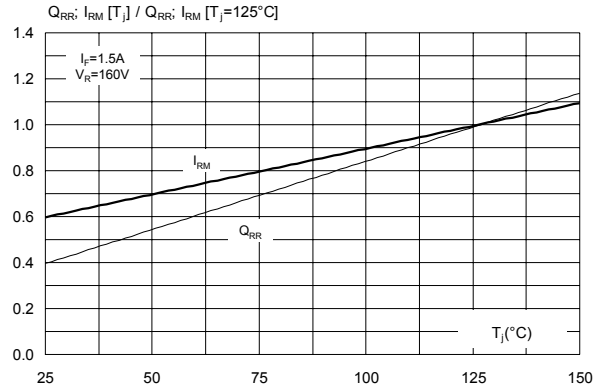


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

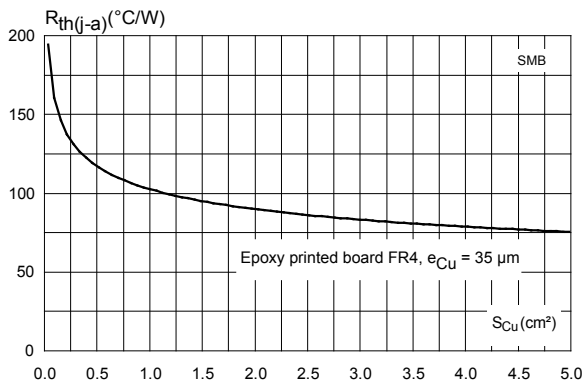


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

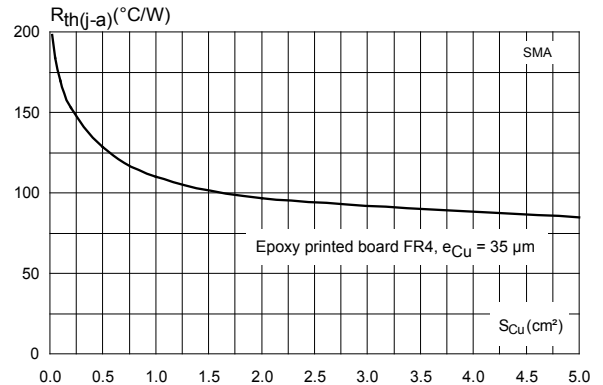


Figure 15. Thermal resistance junction to ambient versus lead length (DO-41)

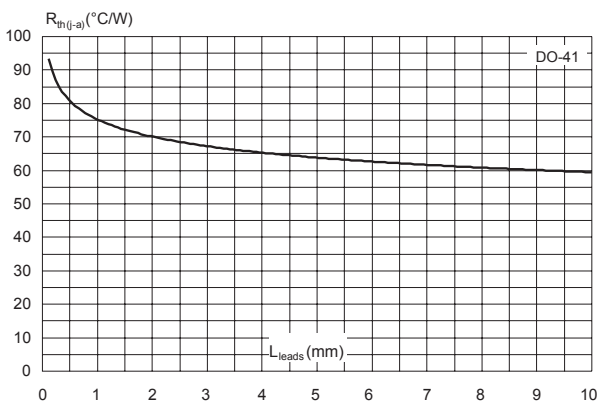
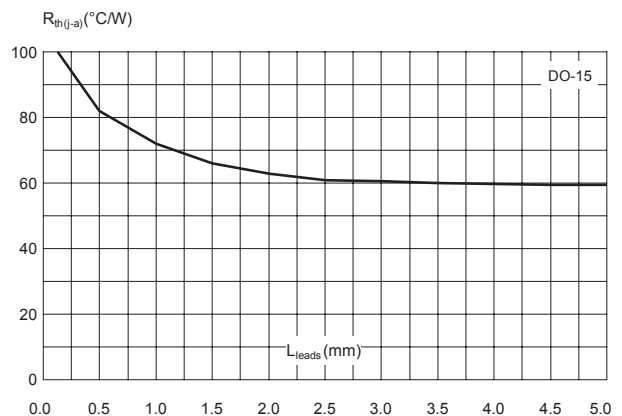


Figure 16. Thermal resistance junction to ambient versus lead length (DO-15)



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 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 17. SMB package outline

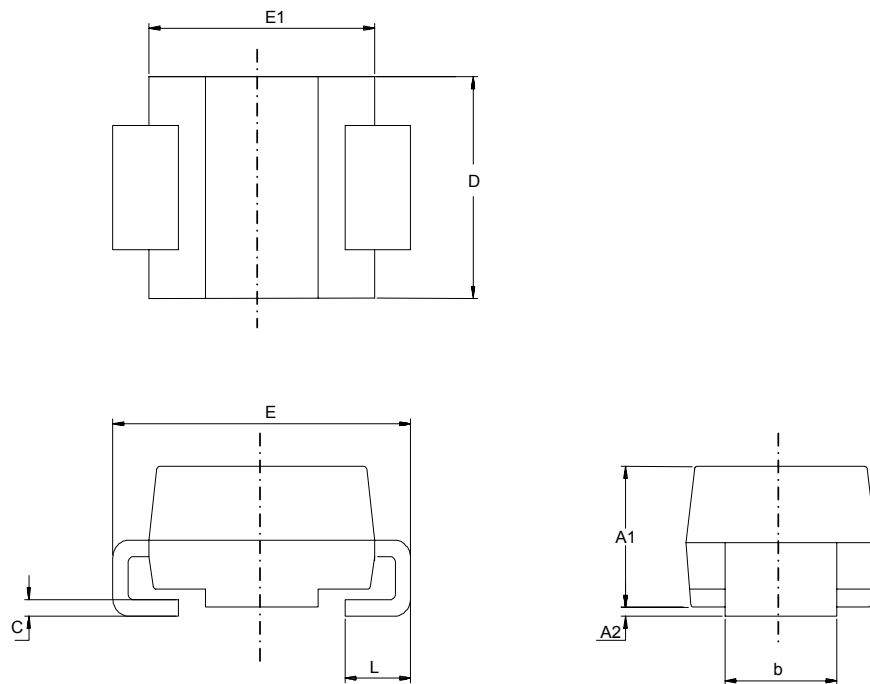
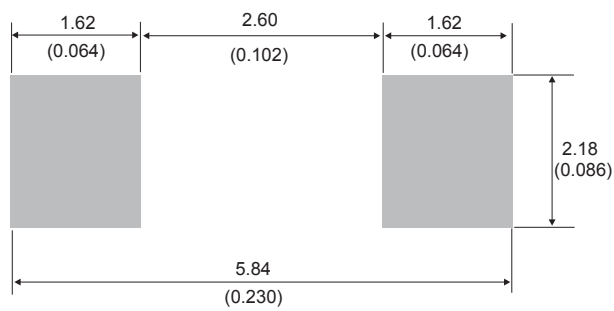


Table 5. SMB package mechanical data

| 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 18. SMB recommended footprint



2.2 SMA package information

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

Figure 19. SMA package outline

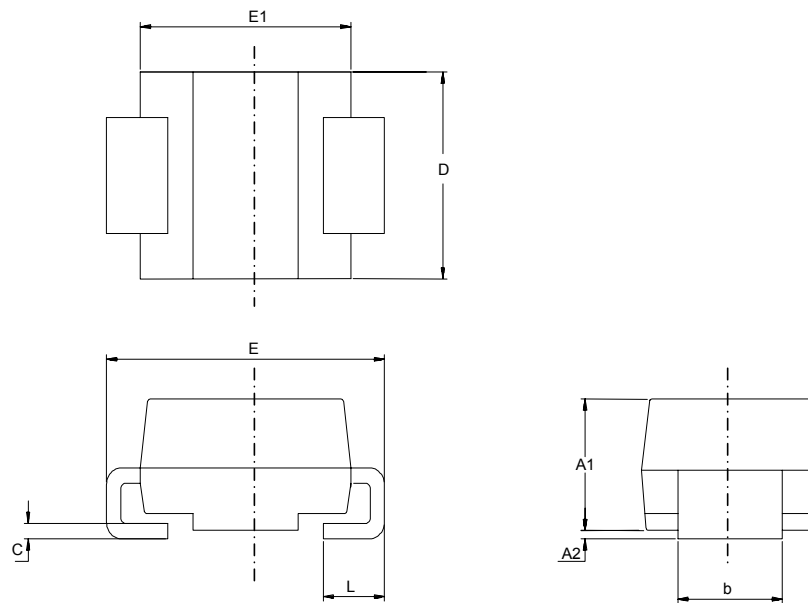
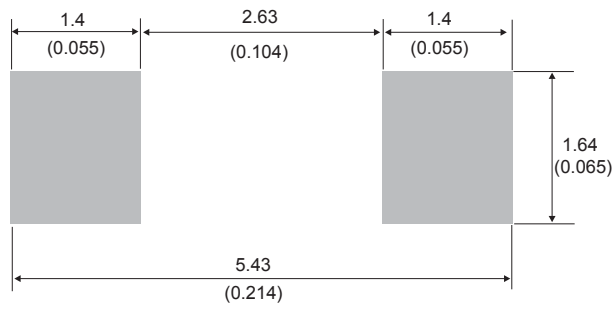


Table 6. SMA package mechanical data

| 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 20. SMA recommended footprint in mm (inches)



2.3 DO-41 package information

- Epoxy meets UL 94, V0

Figure 21. DO-41 package outline

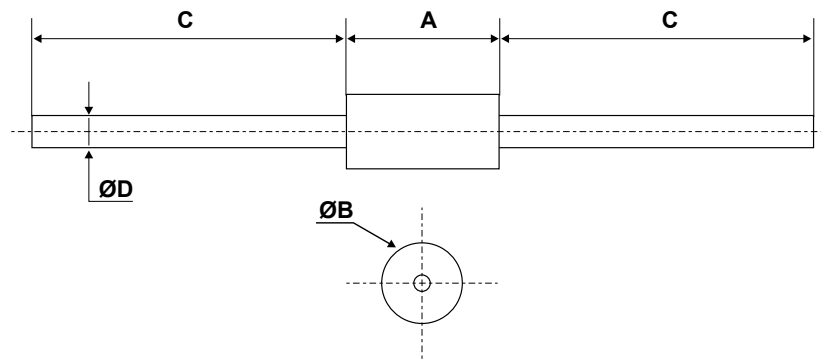


Table 7. DO-41 package mechanical data

| 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 |

2.4 DO-15 package information

- Epoxy meets UL 94, V0

Figure 22. DO-15 package outline

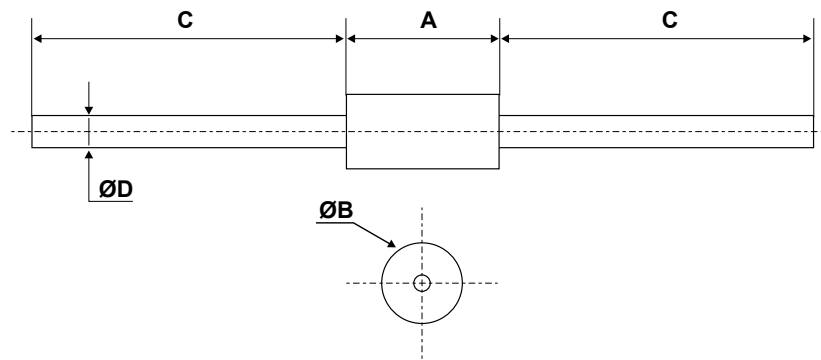


Table 8. DO-15 package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|-----------------------------|------|--------|
| | Millimeters | | | Inches (for reference only) | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 6.05 | - | 6.75 | 0.238 | - | 0.266 |
| B | 2.95 | - | 3.53 | 0.116 | - | 0.139 |
| C | 26.00 | - | 31.00 | 1.024 | - | 1.220 |
| D | 0.71 | - | 0.88 | 0.028 | - | 0.0035 |

3 Ordering information

Table 9. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|-------------|-----------|---------|---------|-----------|---------------|
| STTH1R02A | R1A | SMA | 0.068 g | 5000 | Tape and reel |
| STTH1R02U | 1R2S | SMB | 0.107 g | 2500 | Tape and reel |
| STTH1R02 | STTH1R02 | DO-41 | 0.34 g | 2000 | Ammopack |
| STTH1R02RL | STTH1R02 | DO-41 | 0.34 g | 5000 | Tape and reel |
| STTH1R02Q | STTH1R02Q | DO-15 | 0.40 g | 1000 | Ammopack |
| STTH1R02QRL | STTH1R02Q | DO-15 | 0.40 g | 6000 | Tape and reel |

Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 03-May-2006 | 1 | First issue. |
| 13-Oct-2006 | 2 | Added DO-15 and SMB packages. |
| 08-Mar-2007 | 3 | Replaced Figure 8. Replaced ecu with copper thickness. |
| 05-Dec-2018 | 4 | Updated Section Applications . Minor text changes. |

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