

Turbo 2 ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching and conduction losses
- Low thermal resistance

Description

The STTH1L06/U/A, which is using ST Turbo 2 600 V technology, is specially suited as boost diode in discontinuous or critical mode power factor corrections.

The device is also intended for use as a free wheeling diode in power supplies and other power switching applications.

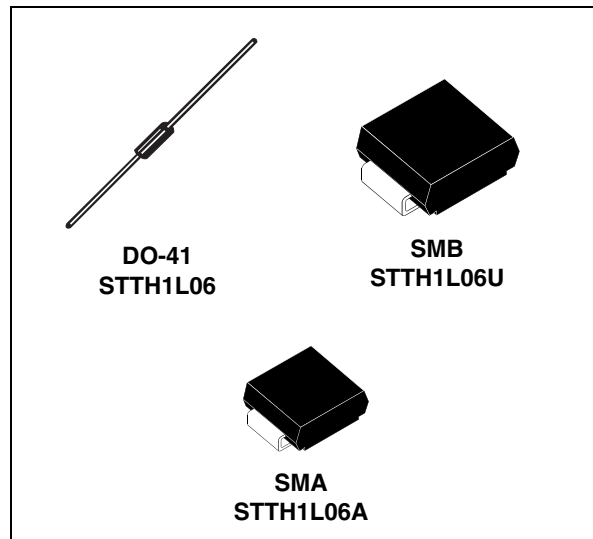


Table 1. Device summary

| Symbol | Value |
|----------------|------------|
| $I_{F(AV)}$ | 1 A |
| V_{RRM} | 600 V |
| I_R (max) | 75 μ A |
| T_j (max) | 175 °C |
| V_F (max) | 1.05 V |
| t_{rr} (max) | 80 ns |

1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|--------------|--|---|--------------|------------------|-----------------------------------|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| $I_{F(RMS)}$ | Forward rms voltage | DO-41 | 10 | A | |
| | | SMA / SMB | 7 | | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ | DO-41 | 1 | A | |
| | | SMA | | | $T_c = 120\text{ }^\circ\text{C}$ |
| | | SMB | | | $T_c = 135\text{ }^\circ\text{C}$ |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms}$ sinusoidal DO-41 | 30 | A | |
| | | $t_p = 10\text{ ms}$ sinusoidal SMA / SMB | | | 20 |
| T_{stg} | Storage temperature range | | -65 to + 175 | $^\circ\text{C}$ | |
| T_j | Maximum operating junction temperature | | 175 | $^\circ\text{C}$ | |

Table 3. Thermal parameters

| Symbol | Parameter | | | Value (max) | Unit |
|---------------|------------------------------------|-----------|-------|-------------|--------------------|
| $R_{th(j-l)}$ | Junction to lead | L = 10 mm | DO-41 | 45 | $^\circ\text{C/W}$ |
| | | | SMA | 30 | |
| | | | SMB | 25 | |
| $R_{th(j-a)}$ | Junction to ambient ⁽¹⁾ | L = 10 mm | DO-41 | 70 | |

1. $R_{th(j-a)}$ is measured with a copper area $S = 5\text{ cm}^2$ (see [Figure 14.](#))

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|--------|-------------------------|-----------------------------------|----------------------|------|------|------|---------------|
| I_R | Reverse leakage current | $T_j = 25\text{ }^\circ\text{C}$ | $V_R = 600\text{ V}$ | | | 1 | μA |
| | | $T_j = 150\text{ }^\circ\text{C}$ | | | 10 | 75 | |
| V_F | Forward voltage drop | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{ A}$ | | | 1.3 | V |
| | | $T_j = 150\text{ }^\circ\text{C}$ | | | 0.85 | 1.05 | |

To evaluate the conduction losses use the following equation:

$$P = 0.89 \times I_{F(AV)} + 0.165 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|----------------------------------|--|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{ A}$, $dI_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | | 55 | 80 | ns |
| t_{fr} | Forward recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 3.5\text{ V}$ | | | 50 | ns |
| V_{FP} | Forward recovery voltage | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$ | | | 10 | V |

Figure 1. Conduction losses versus average current

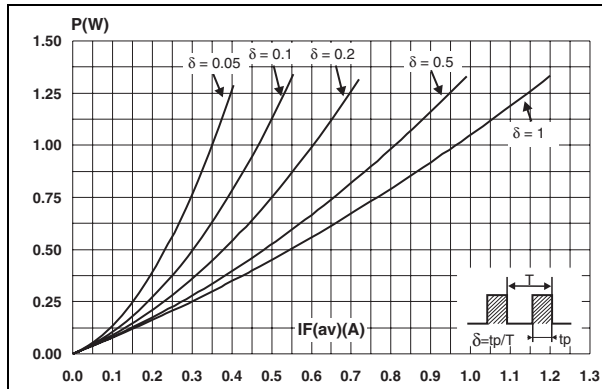


Figure 2. Forward voltage drop versus forward current

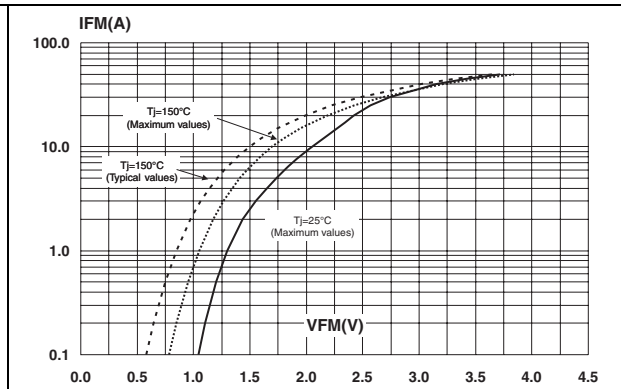


Figure 3. Relative variation of thermal impedance junction ambient versus pulse duration

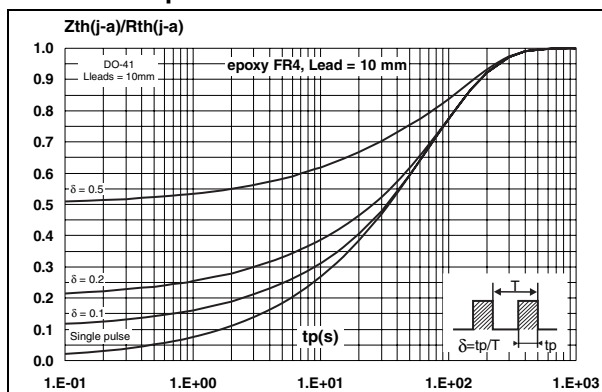


Figure 4. Relative variation of thermal impedance junction ambient versus pulse duration

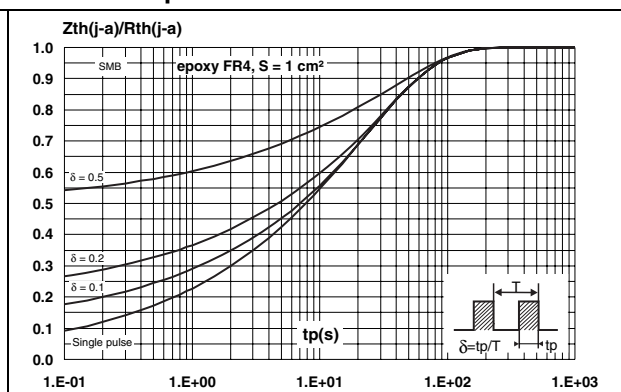


Figure 5. Relative variation of thermal impedance junction ambient versus pulse duration (epoxy FR4)

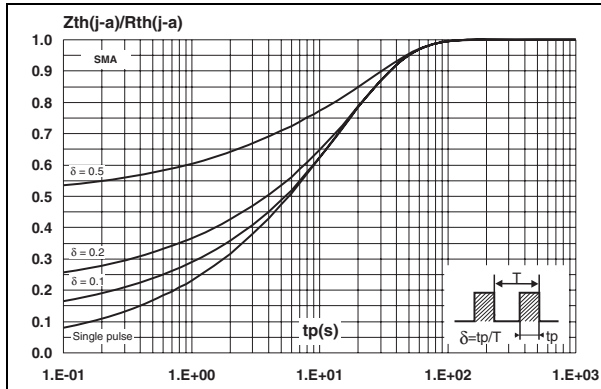


Figure 6. Peak reverse recovery current versus dI_F/dt (90% confidence)

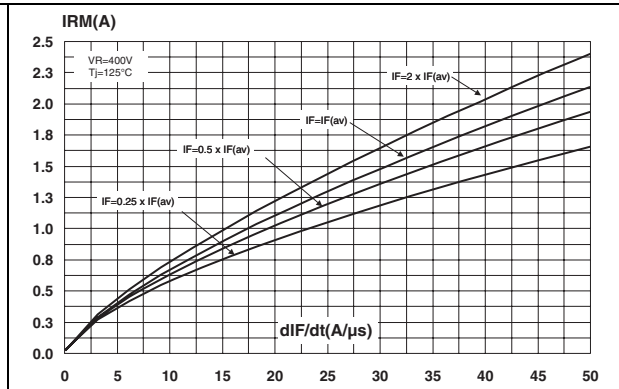


Figure 7. Reverse recovery time versus dI_F/dt (90% confidence)

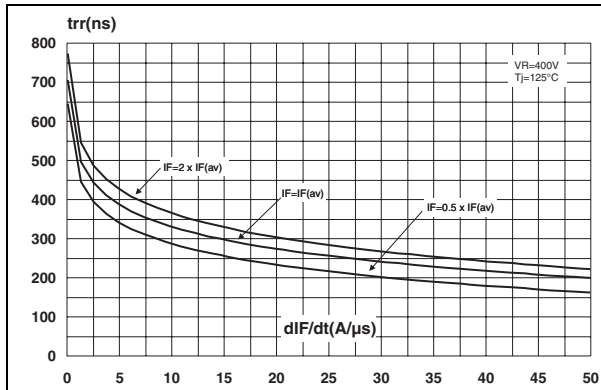


Figure 8. Reverse recovery charges versus dI_F/dt (90% confidence)

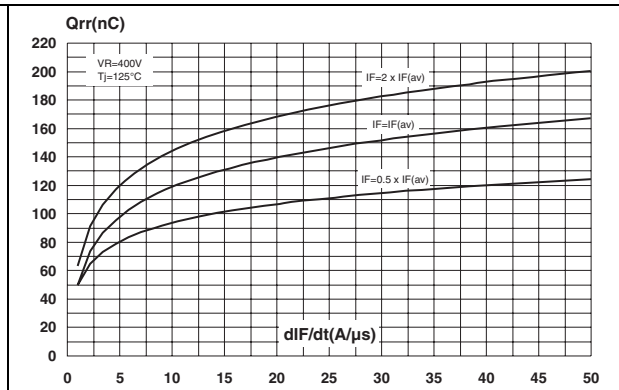


Figure 9. Softness factor versus dI_F/dt (typical values)

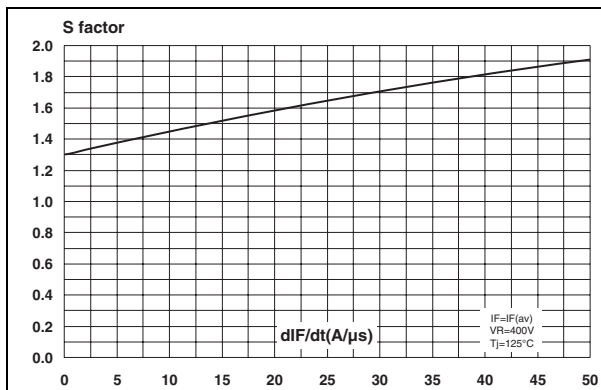


Figure 10. Relative variations of dynamic parameters versus junction temperature

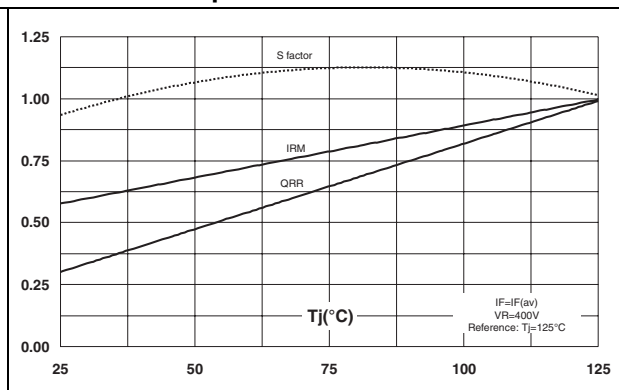


Figure 11. Transient peak forward voltage versus dI_F/dt (90% confidence)

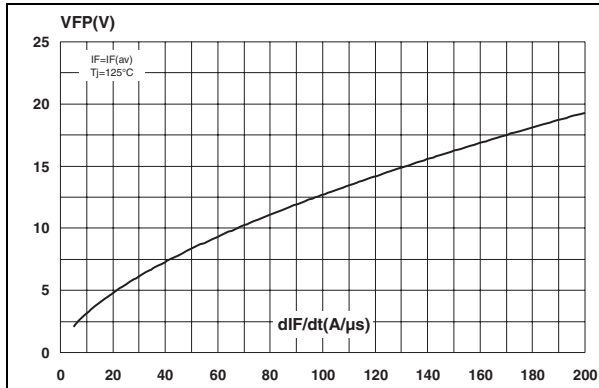


Figure 12. Forward recovery time versus dI_F/dt (90% confidence)

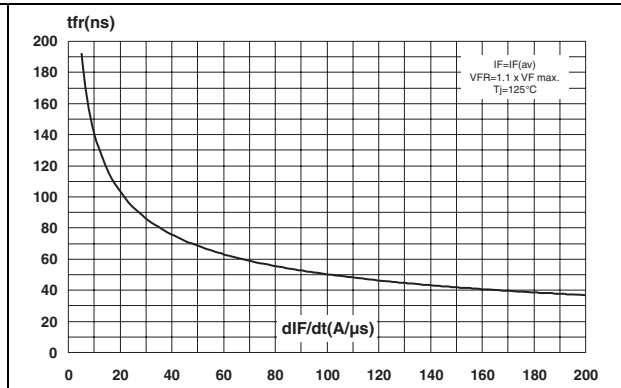


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

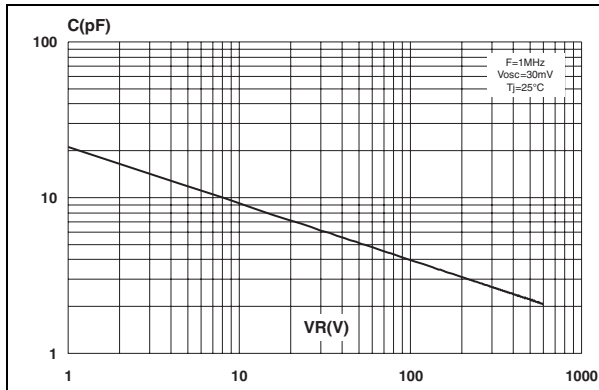


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead

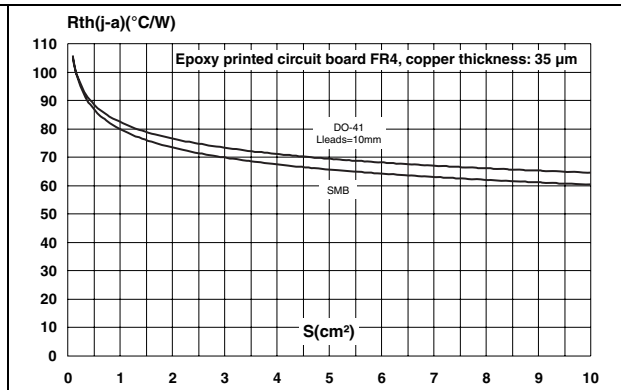
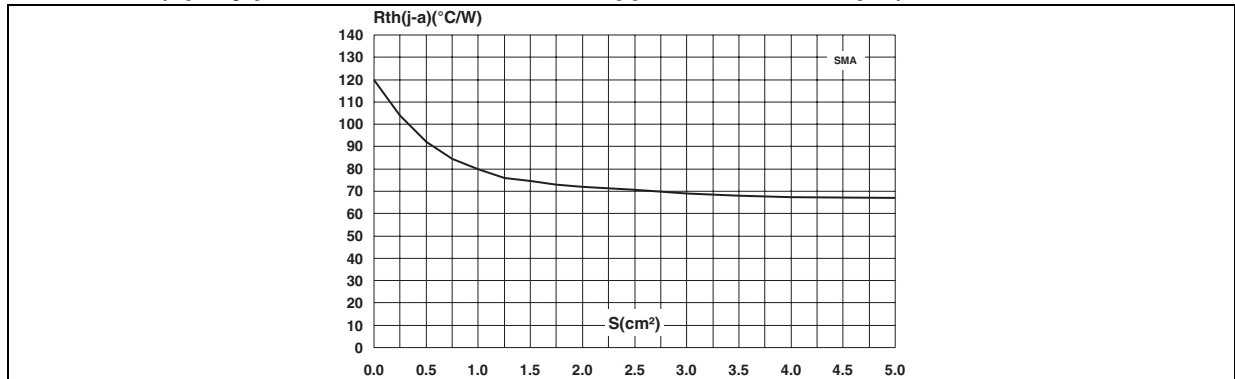


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (Epoxy printed circuit board FR4, copper thickness: 35 μ m)



2 Package information

- Epoxy meets UL 94, V0
- Band indicates cathode
- Bending method (DO-41): see Application note AN1471

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Table 6. SMA dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.094 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 1.25 | 1.65 | 0.049 | 0.065 |
| c | 0.15 | 0.40 | 0.006 | 0.016 |
| D | 2.25 | 2.90 | 0.089 | 0.114 |
| E | 4.80 | 5.35 | 0.189 | 0.211 |
| E1 | 3.95 | 4.60 | 0.156 | 0.181 |
| L | 0.75 | 1.50 | 0.030 | 0.059 |

Figure 16. Footprint (dimensions in mm)

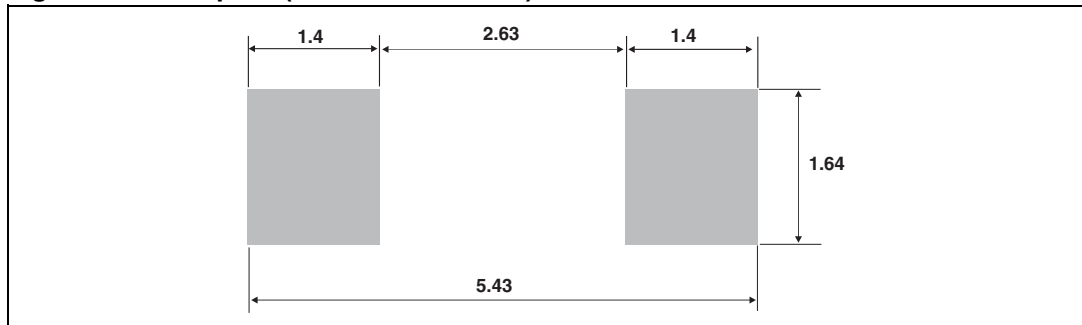


Table 7. SMB dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.096 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 1.95 | 2.20 | 0.077 | 0.087 |
| c | 0.15 | 0.40 | 0.006 | 0.016 |
| D | 3.30 | 3.95 | 0.130 | 0.156 |
| E | 5.10 | 5.60 | 0.201 | 0.220 |
| E1 | 4.05 | 4.60 | 0.159 | 0.181 |
| L | 0.75 | 1.50 | 0.030 | 0.059 |

Figure 17. Footprint (dimensions in mm)

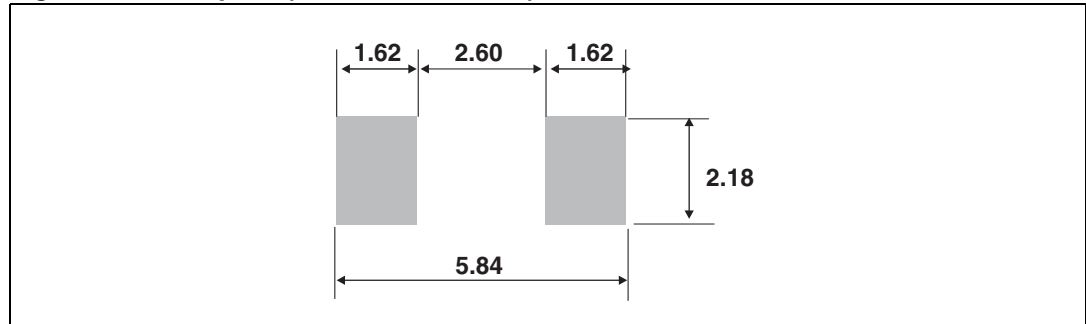


Table 8. DO-41 (plastic) dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.07 | 5.20 | 0.160 | 0.205 |
| B | 2.04 | 2.71 | 0.080 | 0.107 |
| C | 25.4 | | 1 | |
| D | 0.71 | 0.86 | 0.028 | 0.034 |

3 Ordering information

Table 9. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|------------|----------|---------|---------|----------|---------------|
| STTH1L06 | STTH1L06 | DO-41 | 0.34 g | 2000 | Ammopack |
| STTH1L06RL | STTH1L06 | DO-41 | 0.34 g | 5000 | Tape and reel |
| STTH1L06U | BL6 | SMB | 0.11 g | 2500 | Tape and reel |
| STTH1L06A | HL6 | SMA | 0.068 g | 5000 | Tape and reel |

4 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|-------------------------------------|
| Jul-2002 | 3C | Last issue. |
| 30-Sep-2009 | 4 | Updated table 8 package dimensions. |

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