

STTH1R06

Turbo 2 ultrafast high voltage rectifier

Features

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

Description

The STTH1R06, which is using ST Turbo 2 600 V technology, is specially suited as boost diode in power factor correction circuitry.

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

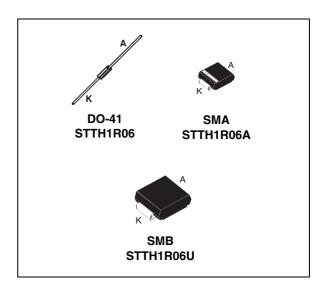


Table 1. Device summary

| Symbol | Value |
|-----------------------|--------|
| I _{F(AV)} | 1 A |
| V _{RRM} | 600 V |
| I _R (max) | 75 µA |
| T _j | 175 °C |
| V _F (typ) | 1.0 V |
| t _{rr} (max) | 25 ns |

Characteristics STTH1R06

1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol | Param | Value | Unit | | | |
|----------------------------|--|---|---|-----|----|--|
| V _{RRM} | Repetitive peak reverse voltage | | | 600 | V | |
| 1 | Forward rms current | DO-41 | | 10 | Α | |
| I _F (RMS) | Polward mis current | SMA / SMB | | 7 | Α. | |
| | I _{F(AV)} Average forward current | DO-41 | $T_c = 100 ^{\circ}\text{C} \delta = 0.5$ | | | |
| I _{F(AV)} | | SMA | $T_c = 125 ^{\circ}\text{C} \delta = 0.5$ | 1 | Α | |
| | | SMB | $T_c = 135 ^{\circ}C \delta = 0.5$ | | | |
| | Surge per repetitive ferward current | DO-41 | $t_{\rm p} = 10$ ms sinusoidal | 25 | ۸ | |
| I _{FSM} Surge non | Surge non repetitive forward current | rge non repetitive forward current SMA / SMB t _p | | 20 | Α | |
| T _{stg} | Storage temperature range | -65 to + 175 | °C | | | |
| T _j | Maximum operating junction temperature | | | 175 | °C | |

Table 3. Thermal resistance

| Symbol | Parameter | Value (max) | Unit | | |
|----------------------|------------------------------------|-------------|-------|----|------|
| | | L = 10 mm | DO-41 | 45 | |
| R _{th(j-l)} | Junction to lead | | SMA | 30 | °C/W |
| | | | SMB | 25 | |
| R _{th(j-a)} | Junction to ambient ⁽¹⁾ | L = 10 mm | DO-41 | 70 | °C/W |

^{1.} $R_{th(j-a)}$ is measured with a copper area S = Scm2 (see *Figure 14*).

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Тур. | Max. | Unit |
|--------|--|-------------------------|---------------------|------|------|------|------|
| ı | Povorce leakage current | T _j = 25 °C | $V_R = V_{RRM}$ | | | 1 | |
| 'R | I _R Reverse leakage current | T _j = 150 °C | | | 10 | 75 | μΑ |
| V | Forward voltage drap | T _j = 25 °C | I = 1A | | | 1.7 | V |
| ٧F | V _F Forward voltage drop | | I _F = 1A | | 1.0 | 1.25 | V |

To evaluate the conduction losses use the following equation: $P = 1.03 \times I_{F(AV)} + 0.27 I_{F^2(RMS)}$

STTH1R06 Characteristics

Table 5. Dynamic characteristics

| Symbol | Parameter | Test conditions | | Min. | Тур. | Max. | Unit |
|-----------------|--------------------------|------------------------|--|------|------|------|------|
| + | Reverse recovery | T = 25 °C | $I_F = 0.5A$ $I_{rr} = 0.25A$ $I_R = 1A$ $I_F = 1A$ $dI_F/dt = -50$ $A/\mu s$ $V_R = 30V$ | | | 25 | ns |
| t _{rr} | time | $I_j = 25 \text{ C}$ | $I_F = 1A dI_F/dt = -50 A/\mu s V_R = 30V$ | | 30 | 45 | 115 |
| t _{fr} | Forward recovery time | T _j = 25 °C | $I_F = 1A \qquad dI_F/dt = 100 \text{ A/}\mu\text{s}$ $V_{FR} = 1.1 \text{ x } V_{Fmax}$ | | | 100 | ns |
| V _{FP} | Forward recovery voltage | T _j = 25 °C | $I_F = 1A$ $dI_F/dt = 100 A/\mu s$ $V_{FR} = 1.1 x V_{Fmax}$ | | | 10 | V |

Figure 1. Conduction losses versus average Figure 2. Forward voltage drop vs forward current current

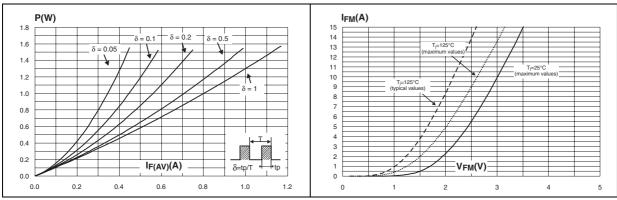
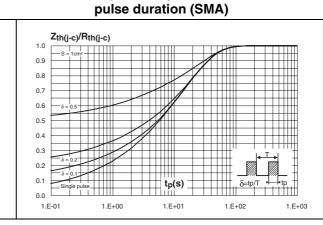


Figure 4.

Figure 3. Relative variation of thermal impedance junction to case vs pulse duration (DO-41)



Relative variation of thermal

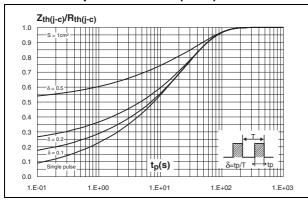
impedance junction to case vs

 $Z_{th(j-c)}/R_{th(j-c)}$ 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 δ=tp/T 0.0 1.E-01 1.E+00 1.E+01 1.E+02

Characteristics STTH1R06

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

Figure 6. Peak reverse recovery current vs dl_F/dt (typical values)



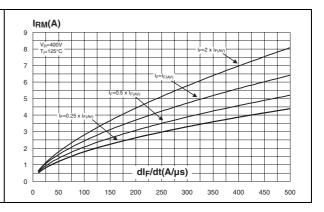
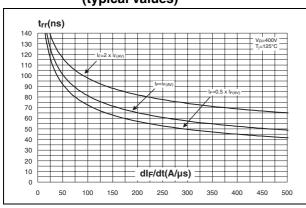


Figure 7. Reverse recovery time versus dl_F/dt Figure 8. Reverse recovery charges versus (typical values)



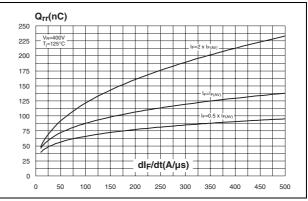
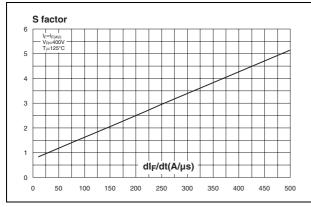
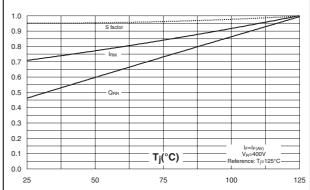


Figure 9. Reverse recovery softness factor vs dl_F/dt (typical values)

Figure 10. Relative variations of dynamic parameters vs junction temperature





STTH1R06 Characteristics

Figure 11. Transient peak forward voltage vs Figure 12. Forward recovery time vs dl_F/dt dl_F/dt (typical values) (typical values)

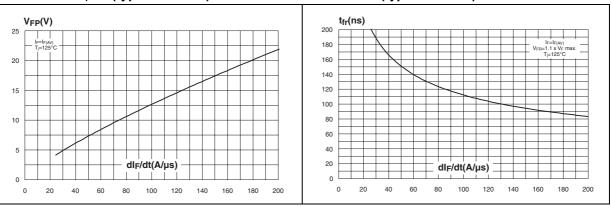


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

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

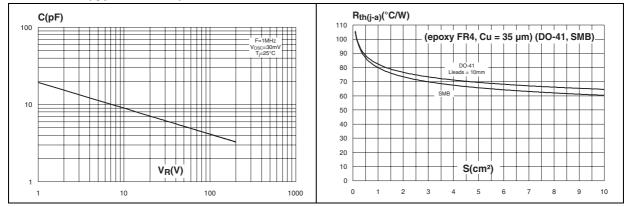
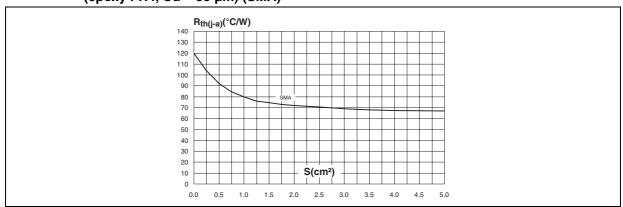


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, Cu = 35 μ m) (SMA)



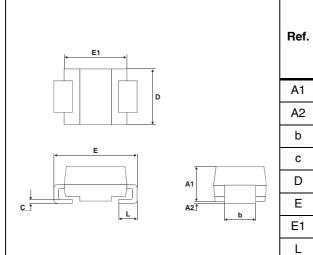
Package information STTH1R06

2 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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.

Table 6. SMA dimensions



| | Dimensions | | | | |
|------|------------|--------|-------|-------|--|
| Ref. | Millin | neters | Inc | hes | |
| | 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 | |
| С | 0.15 | 0.40 | 0.006 | 0.016 | |
| D | 2.25 | 2.90 | 0.089 | 0.114 | |
| Е | 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)

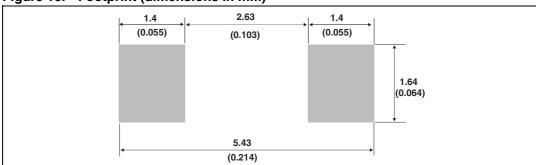
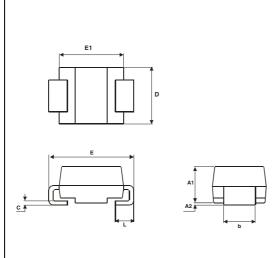


Table 7. SMB dimensions



| | Dimensions | | | | |
|------|------------|--------|-------|-------|--|
| Ref. | Millim | neters | Inc | hes | |
| | 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 | |
| С | 0.15 | 0.40 | 0.006 | 0.016 | |
| Е | 5.10 | 5.60 | 0.201 | 0.220 | |
| E1 | 4.05 | 4.60 | 0.159 | 0.181 | |
| D | 3.30 | 3.95 | 0.130 | 0.156 | |
| L | 0.75 | 1.50 | 0.030 | 0.059 | |

Figure 17. Footprint (dimensions in mm)

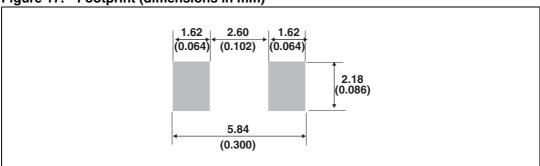
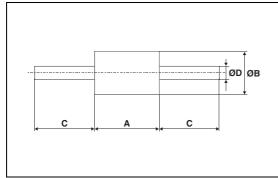


Table 8. DO-41 (plastic) dimensions



| | | Dimensions | | | | |
|------|--------|------------|-------|-------|--|--|
| Ref. | Millim | neters | Inc | hes | | |
| | Min. | Max. | Min. | Max. | | |
| Α | 4.07 | 5.20 | 0.160 | 0.205 | | |
| В | 2.04 | 2.71 | 0.080 | 0.107 | | |
| С | 25.4 | | 1 | | | |
| D | 0.71 | 0.86 | 0.028 | 0.034 | | |

Ordering information STTH1R06

3 Ordering information

Table 9. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|------------|----------|---------|---------|----------|---------------|
| STTH1R06 | STTH1R06 | DO-41 | 0.34 g | 2000 | Ammopack |
| STTH1R06RL | STTH1R06 | DO-41 | 0.34 g | 5000 | Tape and reel |
| STTH1R06A | HR6 | SMA | 0.068 g | 5000 | Tape and reel |
| STTH1R06U | BR6 | SMB | 0.11 g | 2500 | Tape and reel |

4 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| Apr-2003 | 1 | First issue. |
| 07-Sep-2004 | 2 | DO-41 and SMA packages added. |
| 24-Feb-2005 | 3 | SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106 inc.) to 2.03 mm (0.080). |
| 02-Jul-2007 | 4 | Reformatted to current standards. Added cathode bars to cover illustrations. Updated dimensions and footprint illustrations for SMA and SMB packages. Corrected part number in Table 9. |
| 30-Sep-2009 | 5 | Updated table 8 package dimensions. |

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