

Turbo 2 ultrafast high voltage rectifier

Main product characteristics

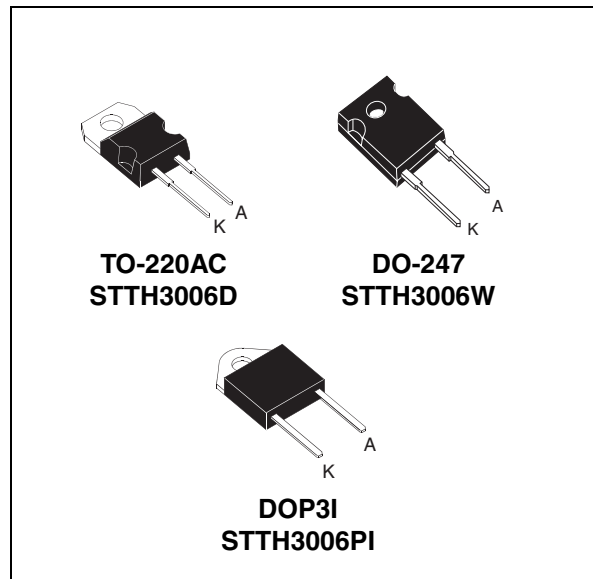
| | |
|----------------|--------|
| $I_{F(AV)}$ | 30 A |
| V_{RRM} | 600 V |
| T_j | 175° C |
| V_F (typ) | 1.10 V |
| t_{rr} (max) | 50 ns |

Features and benefits

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching & conduction losses
- Package insulation voltage:
DOP3I : 2500 V_{RMS}

Description

The STTH3006 uses ST Turbo 2 600 V technology and is especially suited for use in switching power supplies, and industrial applications, such as rectification and continuous mode PFC boost diode.



Order Codes

| Part Number | Marking |
|-------------|------------|
| STTH3006D | STTH3006D |
| STTH3006W | STTH3006W |
| STTH3006PI | STTH3006PI |

Table 1. Absolute Ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|--------------|--|-------------------|--|------|-----|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| $I_{F(RMS)}$ | RMS forward voltage | | 50 | A | |
| $I_{F(AV)}$ | Average forward current | TO-220AC / DO-247 | $T_c = 115^\circ\text{C}$ $\delta = 0.5$ | 30 | A |
| | | DOP3I | $T_c = 85^\circ\text{C}$ $\delta = 0.5$ | | |
| I_{FSM} | Surge non repetitive forward current | | $t_p = 10\text{ ms}$ sinusoidal | 160 | A |
| T_{stg} | Storage temperature range | | -65 to + 175 | | ° C |
| T_j | Maximum operating junction temperature | | 175 | | ° C |

1 Characteristics

Table 2. Thermal resistance

| Symbol | Parameter | | Value (max). | Unit |
|---------------|------------------|-------------------|--------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / DO-247 | 1.1 | °C/W |
| | | DOP3I | 1.7 | |

Table 3. Static electrical characteristic

| Symbol | Parameter | Test conditions | | Min. | Typ | Max. | Unit |
|-------------|-------------------------|---------------------|-----------------|------|------|------|---------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ C$ | $V_R = V_{RRM}$ | | | 25 | μA |
| | | $T_j = 150^\circ C$ | | | 80 | 800 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25^\circ C$ | $I_F = 30 A$ | | | 1.85 | V |
| | | $T_j = 150^\circ C$ | | | 1.10 | 1.40 | |

1. Pulse test: $t_p = 5 ms, \delta < 2\%$
2. Pulse test: $t_p = 380 \mu s, \delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 1.07 \times I_{F(AV)} + 0.011 I_F^2(RMS)$$

Table 4. Dynamic characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ | Max. | Unit |
|----------|--------------------------|---------------------|--|------|-----|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25^\circ C$ | $I_F = 0.5 A \quad I_{rr} = 0.25 A \quad I_R = 1 A$ | | | 50 | ns |
| | | | $I_F = 1 A \quad dl_F/dt = -50 A/\mu s$ $V_R = 30 V$ | | 50 | 70 | |
| I_{RM} | Reverse recovery current | $T_j = 125^\circ C$ | $I_F = 30 A \quad V_R = 400 V$ $dl_F/dt = -100 A/\mu s$ | | 8 | 11 | A |
| t_{fr} | Forward recovery time | $T_j = 25^\circ C$ | $I_F = 30 A \quad dl_F/dt = 100 A/\mu s$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 500 | ns |
| V_{FP} | Forward recovery voltage | $T_j = 25^\circ C$ | $I_F = 30 A \quad dl_F/dt = 100 A/\mu s$ $V_{FR} = 1.1 \times V_{Fmax}$ | | 2.5 | | V |

Figure 1. Conduction losses versus average forward current

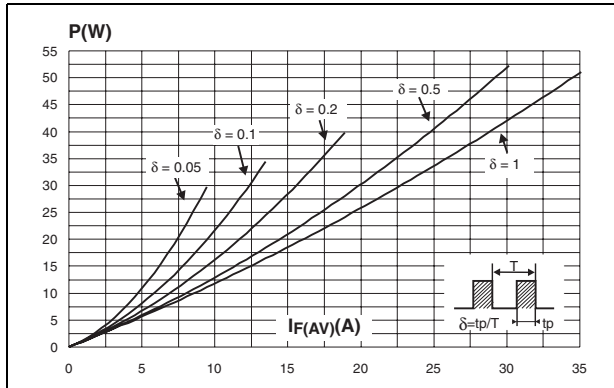


Figure 2. Forward voltage drop versus forward current

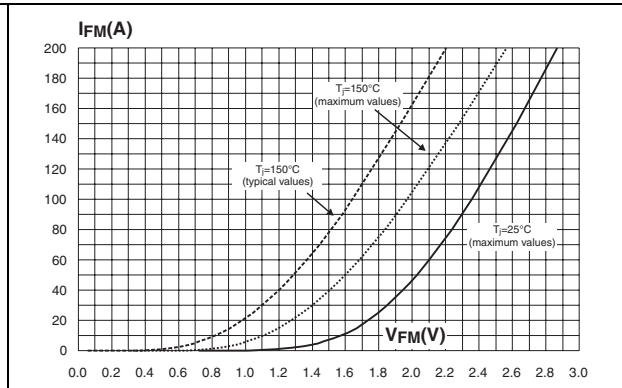


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

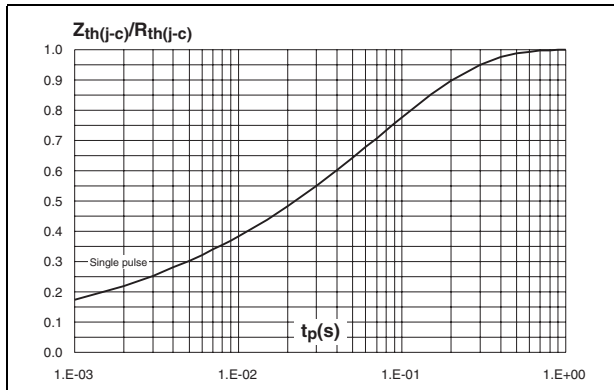


Figure 4. Peak reverse recovery current versus di_F/dt (typical values)

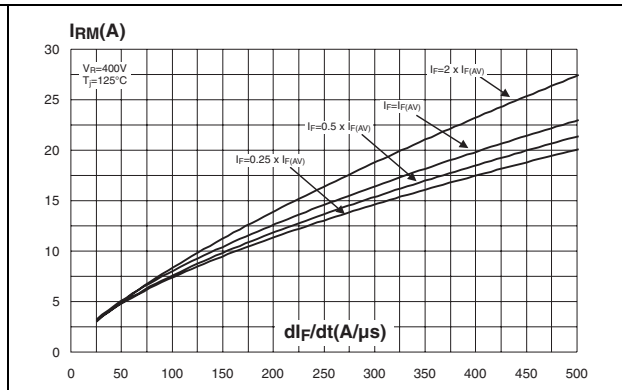


Figure 5. Reverse recovery time versus di_F/dt (typical values)

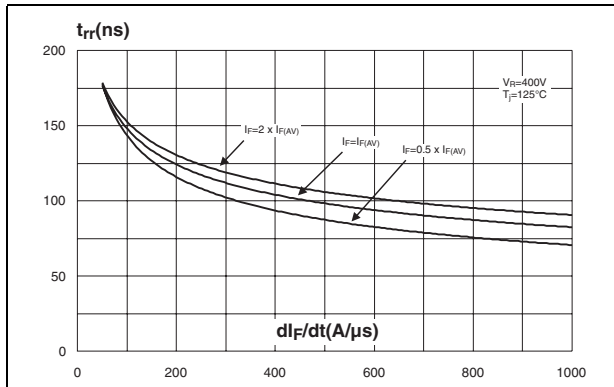


Figure 6. Reverse recovery charges versus di_F/dt (typical values)

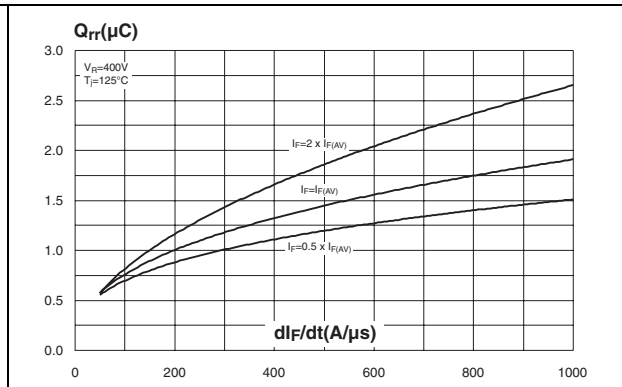


Figure 7. Softness factor versus di_F/dt (typical values)

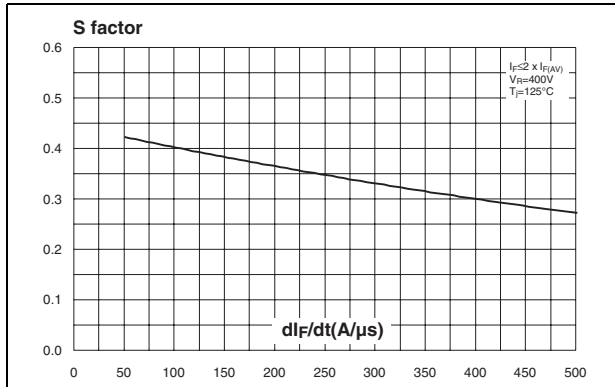


Figure 8. Relative variations of dynamic parameters versus junction temperature

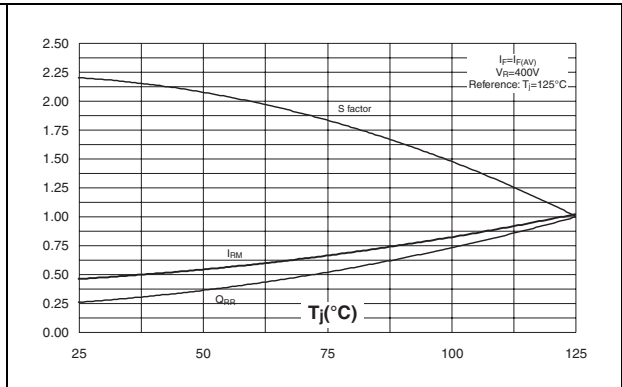


Figure 9. Transient peak forward voltage versus di_F/dt (typical values)

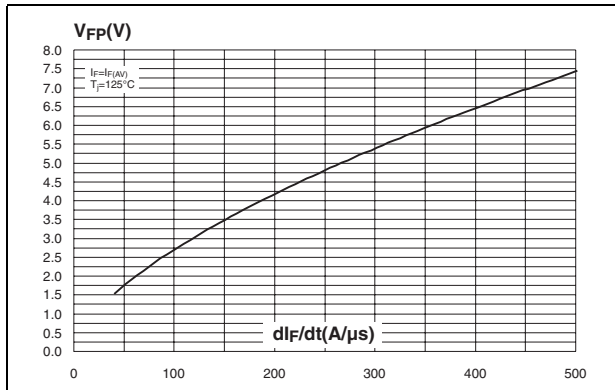


Figure 10. Forward recovery time versus di_F/dt (typical values)

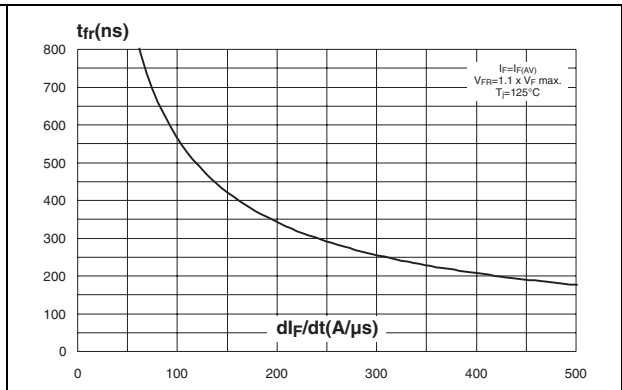
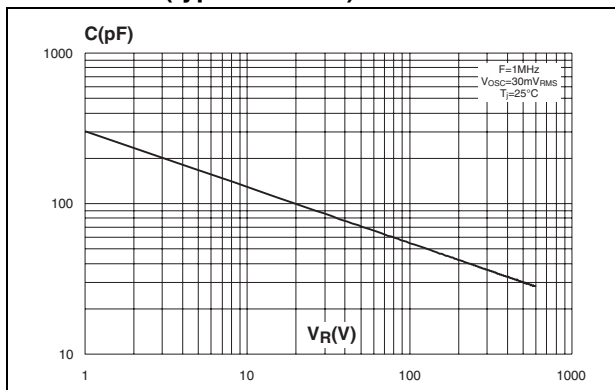


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm (TO-220AC)
- Maximum torque value: 0.70 Nm (TO-220AC)

Table 5. DO247 dimensions

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.85 | | 5.15 | 0.191 | | 0.203 |
| D | 2.20 | | 2.60 | 0.086 | | 0.102 |
| E | 0.40 | | 0.80 | 0.015 | | 0.031 |
| F | 1.00 | | 1.40 | 0.039 | | 0.055 |
| F2 | | 2.00 | | | 0.078 | |
| F3 | 2.00 | | 2.40 | 0.078 | | 0.094 |
| G | | 10.90 | | | 0.429 | |
| H | 15.45 | | 15.75 | 0.608 | | 0.620 |
| L | 19.85 | | 20.15 | 0.781 | | 0.793 |
| L1 | 3.70 | | 4.30 | 0.145 | | 0.169 |
| L2 | | 18.50 | | | 0.728 | |
| L3 | 14.20 | | 14.80 | 0.559 | | 0.582 |
| L4 | | 34.60 | | | 1.362 | |
| L5 | | 5.50 | | | 0.216 | |
| M | 2.00 | | 3.00 | 0.078 | | 0.118 |
| V | | 5° | | | 5° | |
| V2 | | 60° | | | 60° | |
| Dia. | 3.55 | | 3.65 | 0.139 | | 0.143 |

Table 6. TO-220AC dimensions

The technical drawing shows two views of a TO-220AC package. The front view (left) shows a cylindrical body with a diameter of $\phi 1$ and a total height of L2. The top flange has a diameter of H2 and a thickness of L5. The body has a diameter of L6. The mounting tab has a width of F1 and a height of L9. The total height of the mounting tab is L4. The diameter of the mounting tab is F. The diameter of the mounting tab at the base is G. The side view (right) shows the package profile with dimensions A (total height), C (flange thickness), L7 (body height), D (mounting tab height), M (mounting tab thickness), and E (mounting tab diameter).

| Ref. | Dimensions | | | |
|---------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 1.70 | 0.044 | 0.066 |
| G | 4.95 | 5.15 | 0.194 | 0.202 |
| H2 | 10.00 | 10.40 | 0.393 | 0.409 |
| L2 | 16.40 typ. | | 0.645 typ. | |
| L4 | 13.00 | 14.00 | 0.511 | 0.551 |
| L5 | 2.65 | 2.95 | 0.104 | 0.116 |
| L6 | 15.25 | 15.75 | 0.600 | 0.620 |
| L7 | 6.20 | 6.60 | 0.244 | 0.259 |
| L9 | 3.50 | 3.93 | 0.137 | 0.154 |
| M | 2.6 typ. | | 0.102 typ. | |
| Diam. I | 3.75 | 3.85 | 0.147 | 0.151 |

Table 7. DOP3I dimensions

| Ref. | Dimensions | | | |
|------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| b | 1.20 | 1.40 | 0.047 | 0.055 |
| c | 1.45 | 1.55 | 0.057 | 0.061 |
| c1 | 0.50 | 0.70 | 0.020 | 0.028 |
| D | 12.15 | 13.10 | 0.474 | 0.516 |
| E | 15.10 | 15.50 | 0.594 | 0.610 |
| E1 | 7.55 | 7.75 | 0.297 | 0.305 |
| e | 10.80 | 11.30 | 0.425 | 0.445 |
| G | 20.4 | 21.10 | 0.815 | 0.831 |
| L | 14.35 | 15.60 | 0.565 | 0.614 |
| P | 4.08 | 4.17 | 0.161 | 0.164 |
| Q | 2.70 | 2.90 | 0.106 | 0.114 |
| R | 4.60 typ. | | 0.181 typ. | |
| Y | 15.80 | 16.50 | 0.622 | 0.650 |

3 Ordering information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|------------|----------|--------|----------|---------------|
| STTH3006D | STTH3006D | TO-220AC | 1.90 g | 50 | Tube |
| STTH3006W | STTH3006W | DO-247 | 4.40 g | 30 | Tube |
| STTH3006PI | STTH3006PI | DOP3I | 4.46 g | 30 | Tube |

4 Revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 22-May-2006 | 1 | Initial release. |
| 10-Aug-2006 | 2 | Added Package insulation voltage on page 1 for DOP3I. |

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