

Turbo 2 ultrafast high voltage rectifier

Features

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

Description

The STTH15R06D/FP, which is using ST Turbo 2 600 V technology, is specially suited as boost diode in continuous mode power factor corrections and hard switching conditions.

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

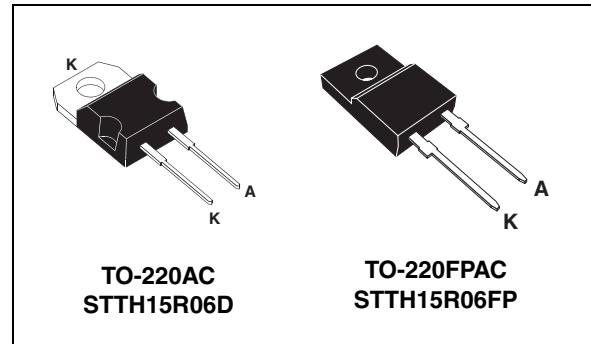


Table 1. Device summary

| Symbol | Value |
|---------------|--------|
| $I_{F(AV)}$ | 15 A |
| V_{RRM} | 600 V |
| $I_{RM}(typ)$ | 8 A |
| $T_j(max)$ | 175 °C |
| $V_F(max)$ | 1.8 V |
| $t_{rr}(max)$ | 50 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 current | 30 | A | |
| $I_{F(AV)}$ | Average forward current | 15 | A | |
| I_{FSM} | Surge non repetitive forward current | $T_p = 10$ ms sinusoidal | 150 | A |
| T_{stg} | Storage temperature range | -65 to + 175 | °C | |
| T_j | Maximum operating junction temperature | 175 | °C | |

Table 3. Thermal parameter

| Symbol | Parameter | Maximum | Unit |
|---------------|------------------|------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC | 1.5 |
| | | TO-220FPAC | 4.0 |

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------|-------------------------|-----------------|---------------|------|------|---------|
| I_R | Reverse leakage current | $T_j = 25$ °C | $V_R = 600$ V | | 60 | μ A |
| | | $T_j = 125$ °C | | 70 | 800 | |
| V_F | Forward voltage drop | $T_j = 25$ °C | $I_F = 15$ A | | 2.9 | V |
| | | $T_j = 125$ °C | | 1.4 | 1.8 | |

To evaluate the maximum conduction losses use the following equation:

$$P = 1.16 \times I_{F(AV)} + 0.043 I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|--------------|--------------------------|-----------------------|---|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ °C}$ | $I_F = 0.5\text{ A}$, $I_{rr} = 0.25\text{ A}$, $I_R = 1\text{ A}$ | | | 30 | ns |
| | | | $I_F = 1\text{ A}$, $dI_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | | | 50 | |
| I_{RM} | | $T_j = 125\text{ °C}$ | $I_F = 15\text{ A}$, $dI_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 400\text{ V}$ | | 7.5 | 9.0 | A |
| S_{factor} | | | | | 0.15 | | - |
| Q_{rr} | | | | | 220 | | nC |
| t_{fr} | Forward recovery time | $T_j = 25\text{ °C}$ | $I_F = 15\text{ A}$, $dI_F/dt = 120\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 200 | ns |
| V_{FP} | Forward recovery voltage | | | | | 6 | V |

Figure 1. Conduction losses versus average current

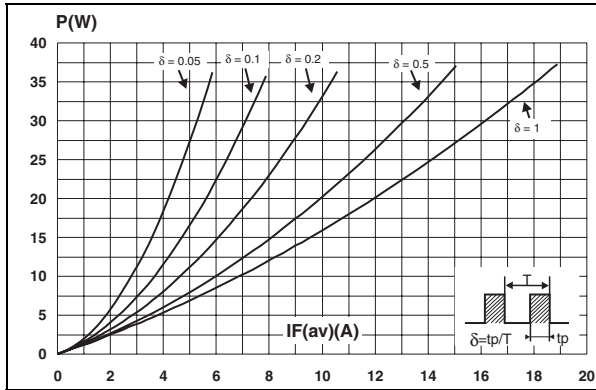


Figure 2. Forward voltage drop versus forward current

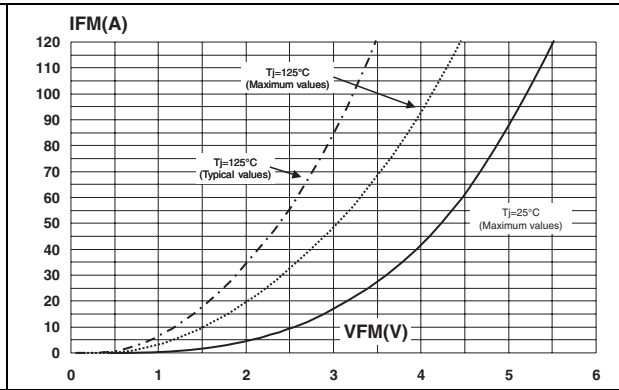


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC)

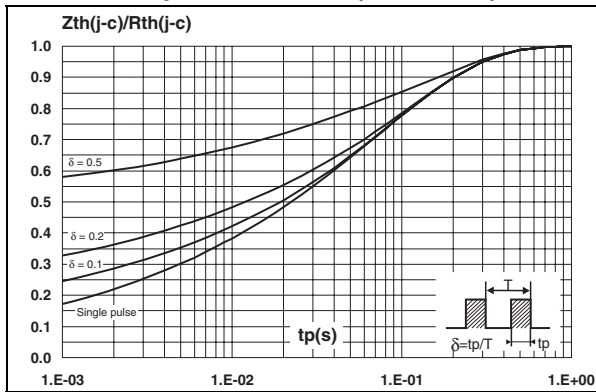


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

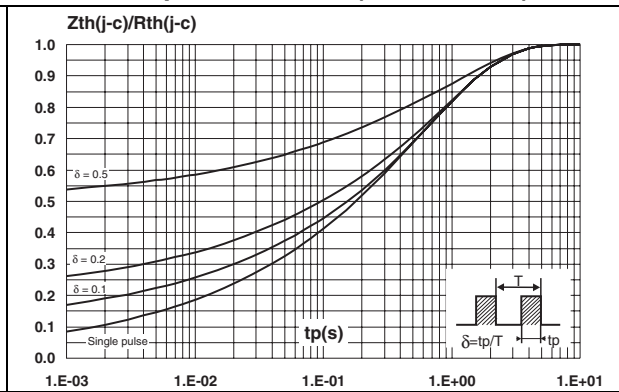


Figure 5. Peak reverse recovery current versus dI_F/dt (90% confidence)

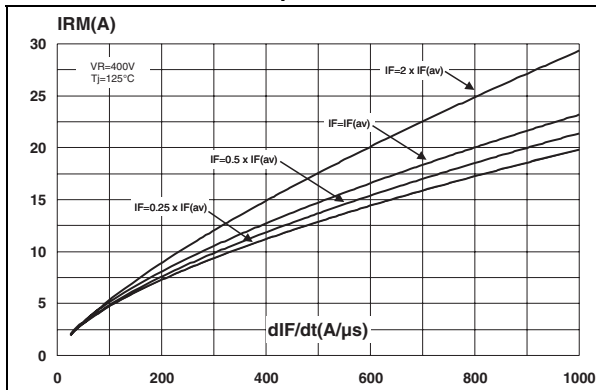


Figure 6. Reverse recovery time versus dI_F/dt (90% confidence)

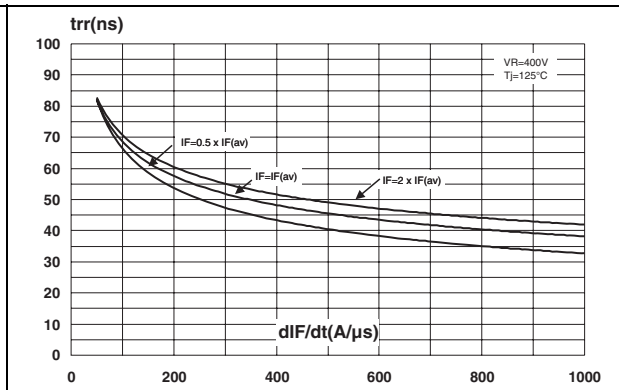


Figure 7. Reverse recovery charges versus di_F/dt (90% confidence)

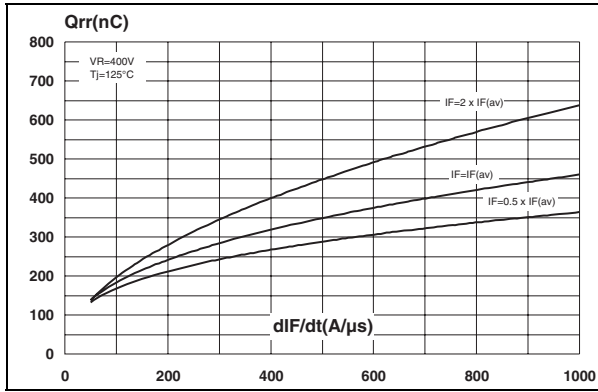


Figure 8. Softness factor versus di_F/dt (typical values)

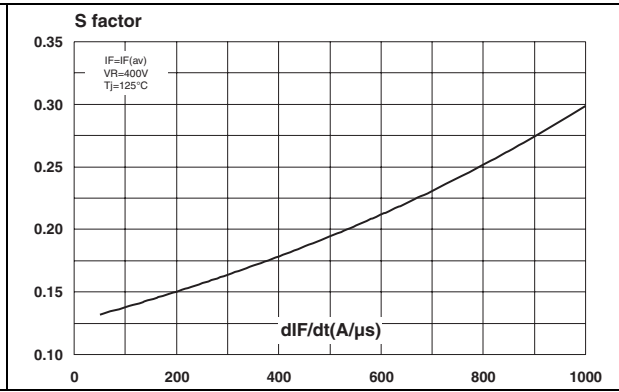


Figure 9. Relative variation of dynamic parameters versus junction temperature

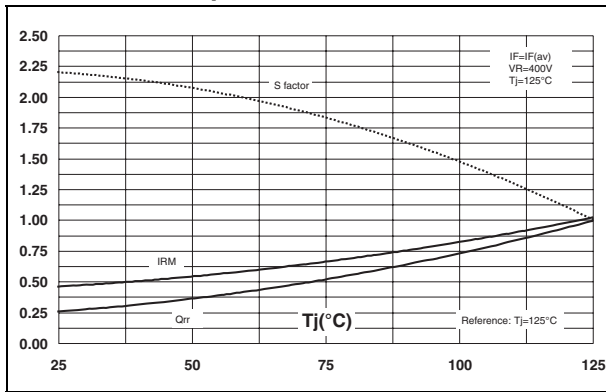


Figure 10. Transient peak forward voltage versus di_F/dt (90% confidence)

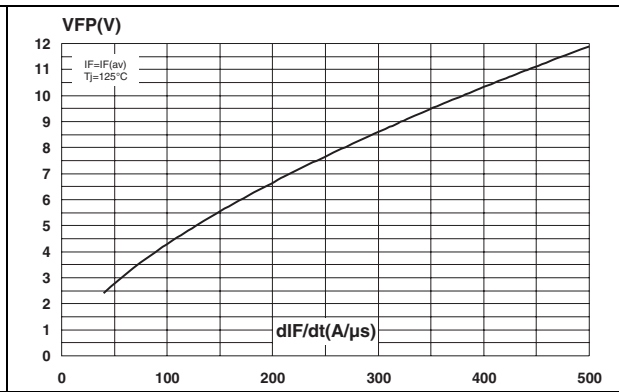


Figure 11. Forward recovery time versus di_F/dt (90% confidence)

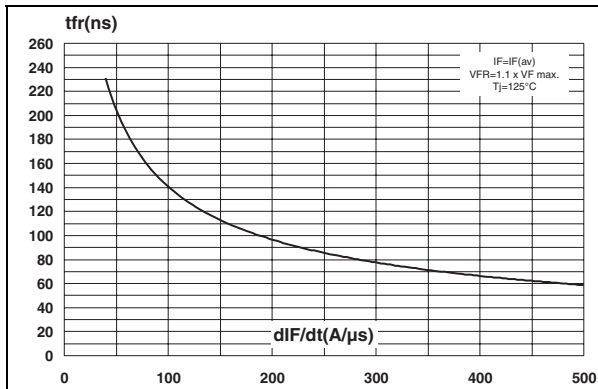
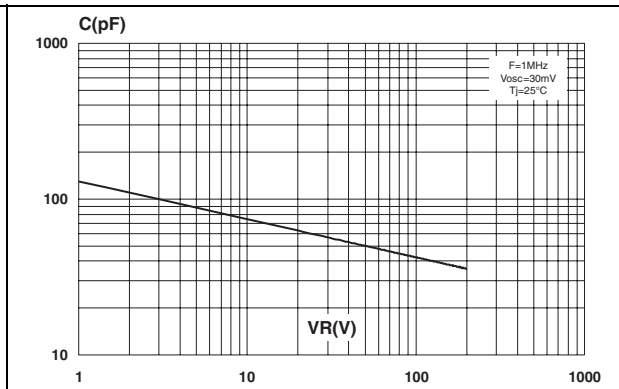


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

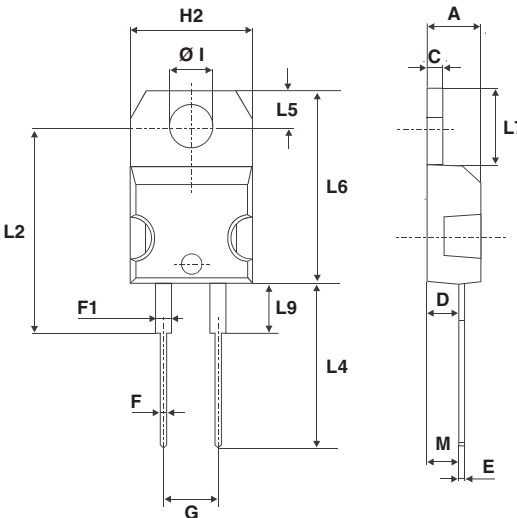


2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

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Table 6. TO-220AC dimensions



| 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. TO-220FPAC dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|-----------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| B | 2.5 | 2.7 | 0.098 | 0.106 |
| D | 2.5 | 2.75 | 0.098 | 0.108 |
| E | 0.45 | 0.70 | 0.018 | 0.027 |
| F | 0.75 | 1 | 0.030 | 0.039 |
| F1 | 1.15 | 1.70 | 0.045 | 0.067 |
| G | 4.95 | 5.20 | 0.195 | 0.205 |
| G1 | 2.4 | 2.7 | 0.094 | 0.106 |
| H | 10 | 10.4 | 0.393 | 0.409 |
| L2 | 16 Typ. | | 0.63 Typ. | |
| L3 | 28.6 | 30.6 | 1.126 | 1.205 |
| L4 | 9.8 | 10.6 | 0.386 | 0.417 |
| L5 | 2.9 | 3.6 | 0.114 | 0.142 |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 |
| Dia. | 3.00 | 3.20 | 0.118 | 0.126 |

3 Ordering information

Table 8. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|-------------|------------|--------|----------|---------------|
| STTH15R06D | STTH15R06D | TO-220AC | 1.9 g | 50 | Tube |
| STTH15R06FP | STTH15R06FP | TO-220FPAC | 1.7 g | 50 | Tube |

4 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| Jan-2002 | 1B | Last issue. |
| 18-Jul-2011 | 2 | Updated I_{FSM} from 120 A to 150 A. |

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