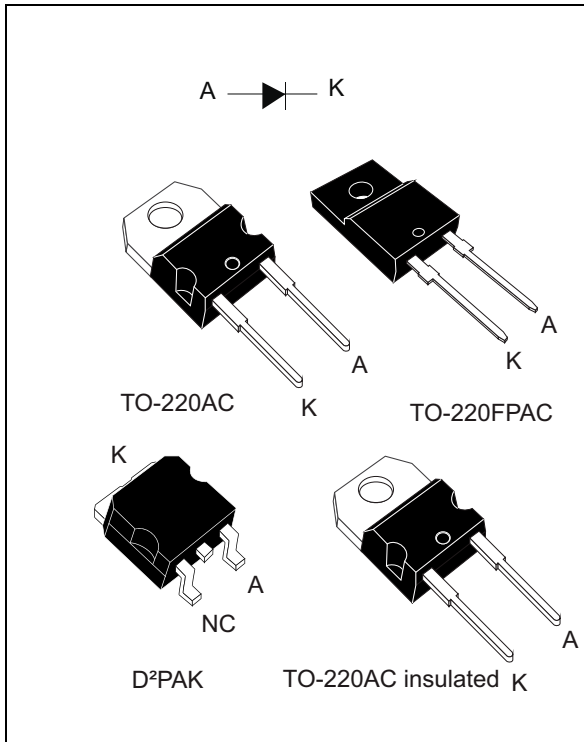


Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



Description

The STTH8R06, which uses ST Turbo 2 600 V technology, is specially suited as boost diode in continuous mode power factor corrections and hard switching conditions.

Table 1. Device summary

| Symbol | Value |
|----------------|--------|
| $I_{F(AV)}$ | 8 A |
| V_{RRM} | 600 V |
| I_{RM} (typ) | 5.5 A |
| T_j (max) | 175 °C |
| V_F (typ) | 1.4 V |
| t_{rr} (max) | 25 ns |

Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- Package insulation voltage:
 - TO-220AC Ins: 2500 V_{RMS} sine
 - TO-220FPAC: 2000 V_{RMS} sine

1 Characteristics

Table 2. Absolute ratings (limiting values at 25 °C unless otherwise specified)

| Symbol | Parameter | | Value | Unit | |
|--------------|--|--|--------------------------|------|---|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| $I_{F(RMS)}$ | Forward current rms | TO-220AC / TO-220FPAC / D ² PAK | 30 | A | |
| | | TO-220AC ins. | 24 | | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$, square wave | TO-220AC / D ² PAK | 8 | A | |
| | | TO-220FPAC | | | |
| | | TO-220AC ins. | | | |
| I_{FSM} | Surge non repetitive forward current | | $t_p = 10$ ms sinusoidal | 80 | A |
| 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 |
|---------------|------------------|-------------------------------|-------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / D ² PAK | 2.2 | °C/W |
| | | TO-220FPAC | 4.6 | |
| | | TO-220AC ins. | 3.8 | |

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|--------|-------------------------|-----------------|-----------------|------|------|------|---------|
| I_R | Reverse leakage current | $T_j = 25$ °C | $V_R = V_{RRM}$ | | | 30 | μ A |
| | | $T_j = 125$ °C | | | 35 | 400 | |
| V_F | Forward voltage drop | $T_j = 25$ °C | $I_F = 8$ A | | | 2.9 | V |
| | | $T_j = 125$ °C | | | 1.4 | 1.8 | |

To evaluate the conduction losses use the following equation: $P = 1.16 \times I_{F(AV)} + 0.08 I_{F(RMS)}^2$

Table 5. Dynamic characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------------------|--|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 0.5\text{ A},$ $I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$ | | | 25 | ns |
| | | | $I_F = 1\text{ A},$ $di_F/dt = -50\text{ A}/\mu\text{s},$ $V_R = 30\text{ V}$ | | | 45 | |
| I_{RM} | Reverse recovery current | $T_j = 125\text{ }^\circ\text{C}$ | $I_F = 8\text{ A}, V_R = 400\text{ V},$ $di_F/dt = -200\text{ A}/\mu\text{s}$ | | 5.5 | 7.2 | A |
| S factor | Softness factor | | | | 0.3 | | |
| Q_{rr} | Reverse recovery charges | | | | 150 | | nC |
| t_{fr} | Forward recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 8\text{ A},$ $di_F/dt = 64\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 150 | ns |
| V_{FP} | Forward recovery voltage | | | | | 5 | V |

Figure 1. Conduction losses versus average current

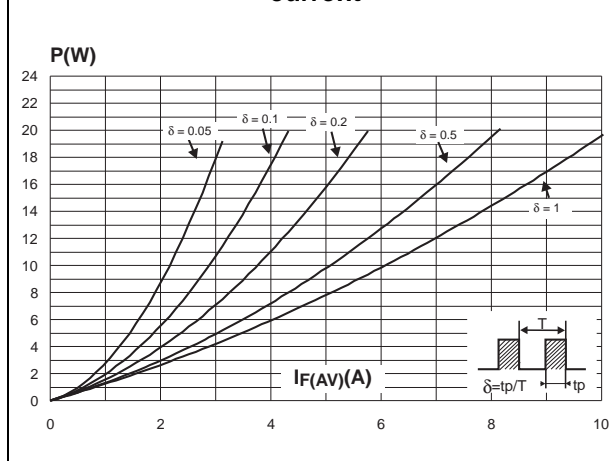
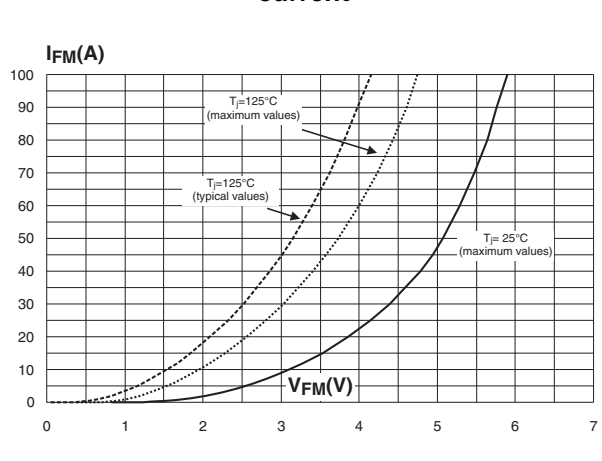


Figure 2. Forward voltage drop versus forward current



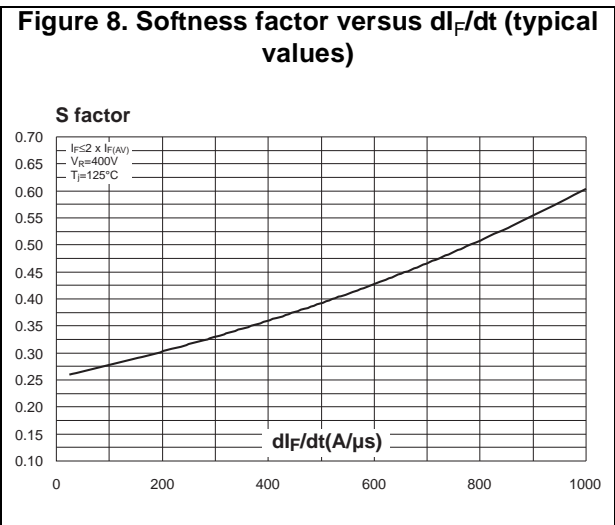
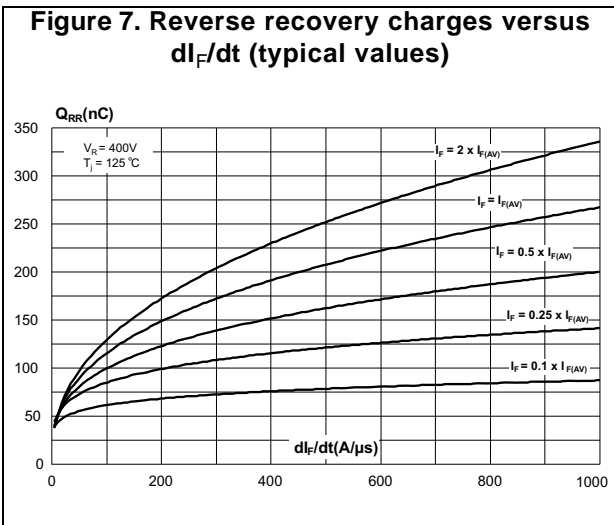
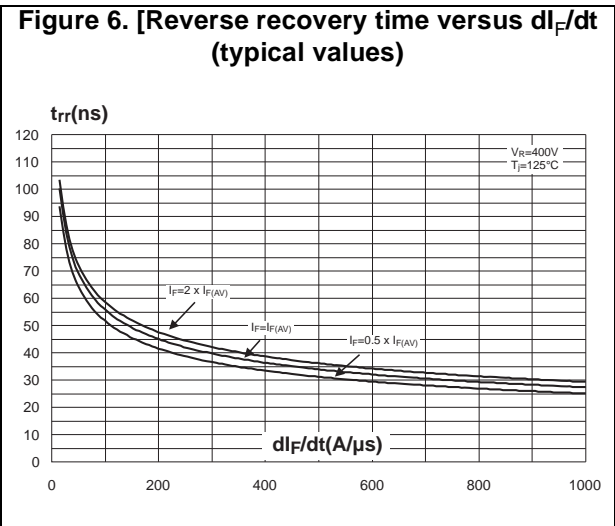
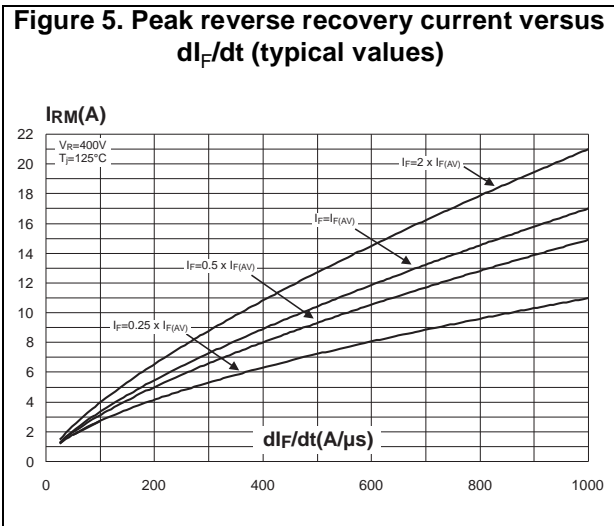
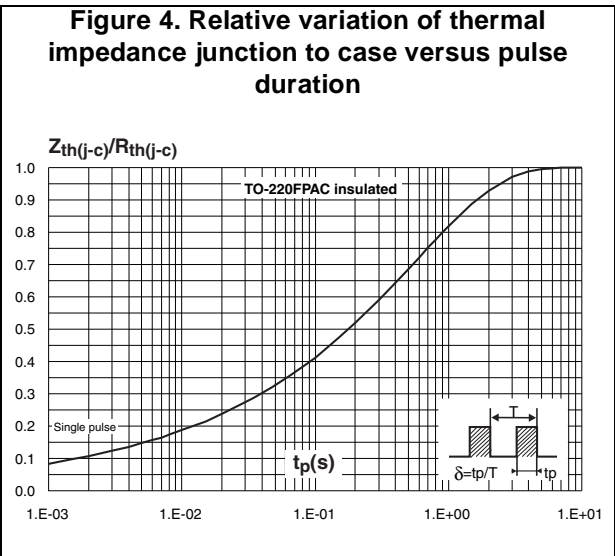
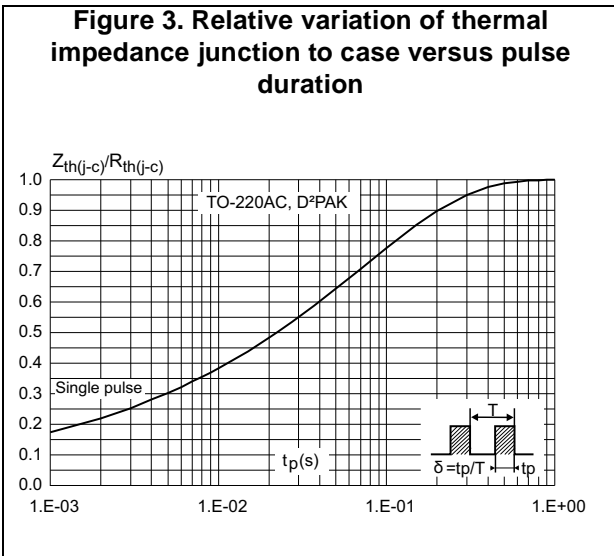


Figure 9. Relative variations of dynamic parameters versus junction temperature

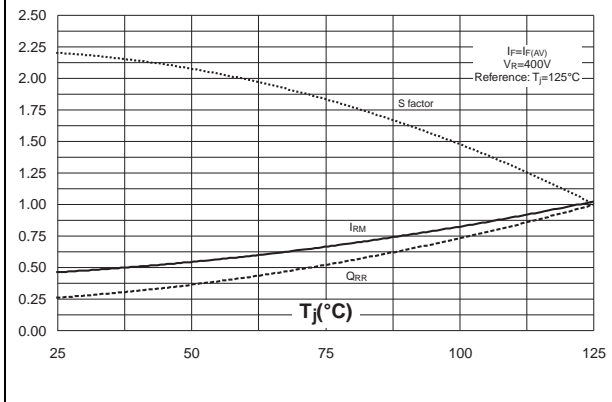


Figure 10. Transient peak forward voltage versus di_F/dt (typical values)

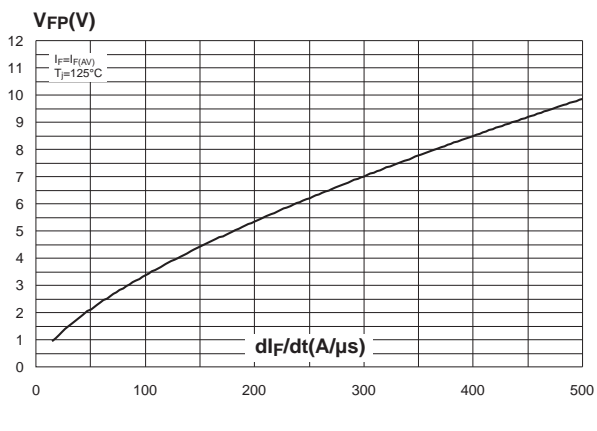


Figure 11. Forward recovery time versus di_F/dt (typical values)

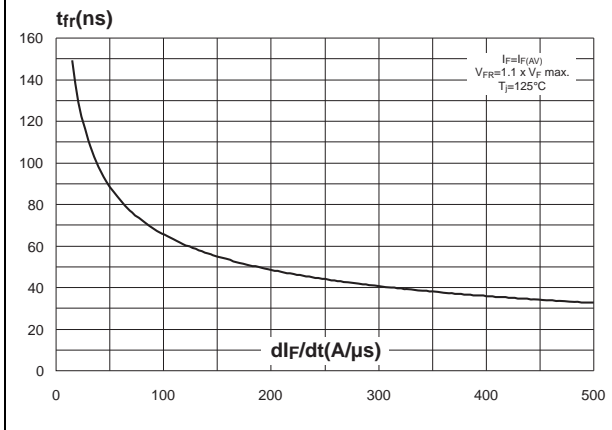


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

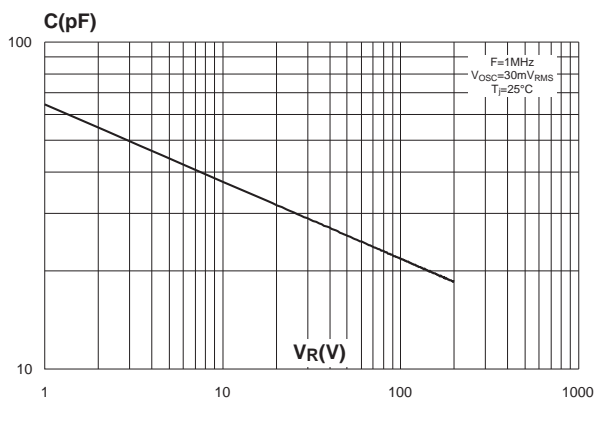
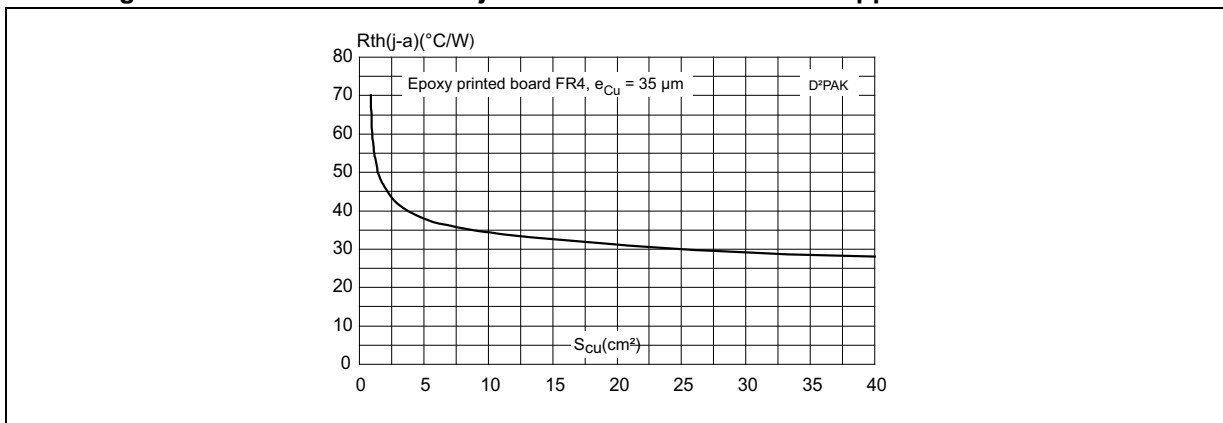


Figure 13. Thermal resistance junction to ambient versus copper surface under tab



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque values: 0.55 N·m (TO-220FPAC, TO-220AC, TO-220AC ins.)
- Maximum torque values: 0.7 N·m (TO-220FPAC, TO-220AC, TO-220AC ins.)

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 TO-220AC package information

Figure 14. TO-220AC package outline

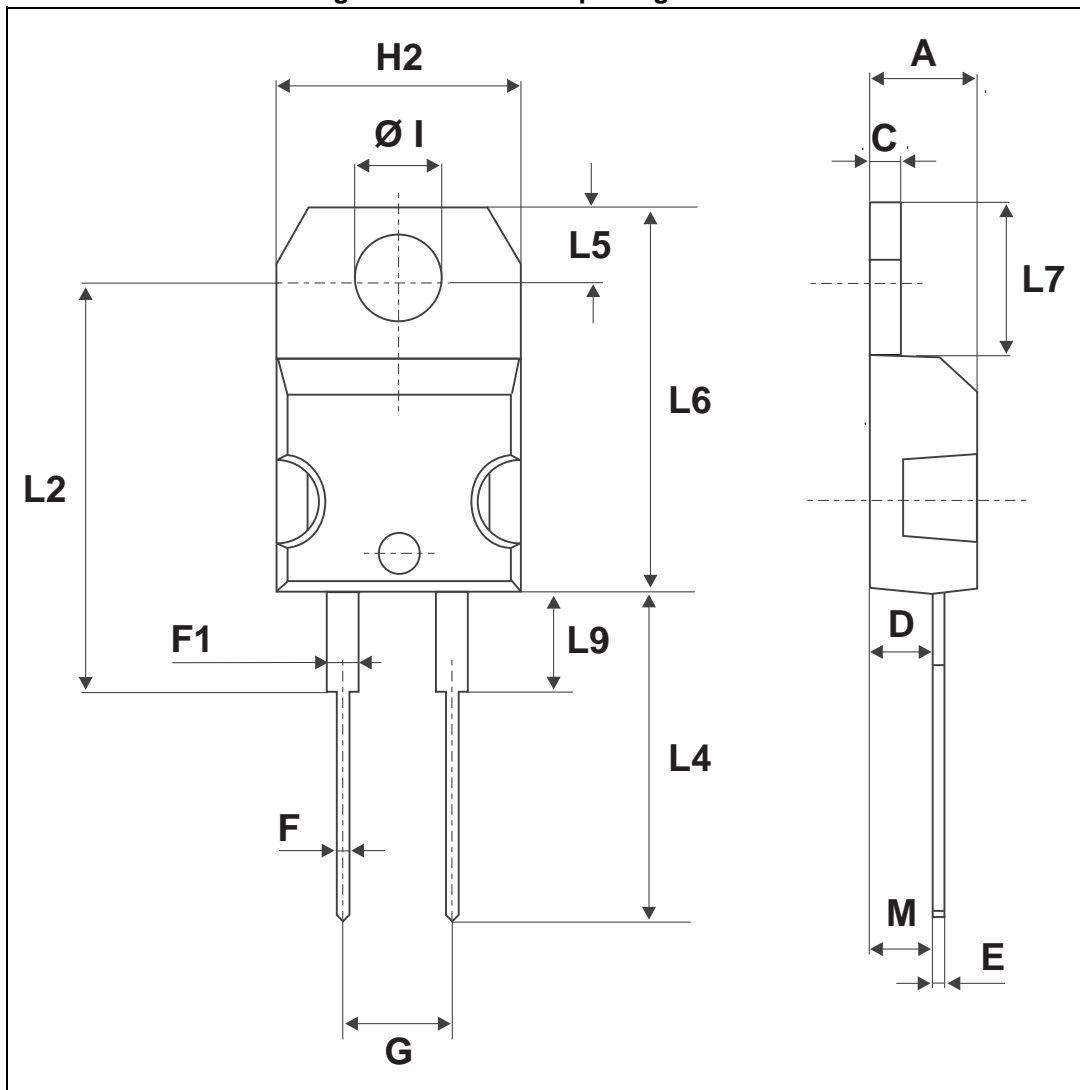


Table 6. TO-220AC dimension values

| Ref. | Dimensions | | | | | |
|---------|-------------|------------|-------|--------|------------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | 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 |

2.2 TO-220FPAC package information

Figure 15. TO-220FPAC package outline

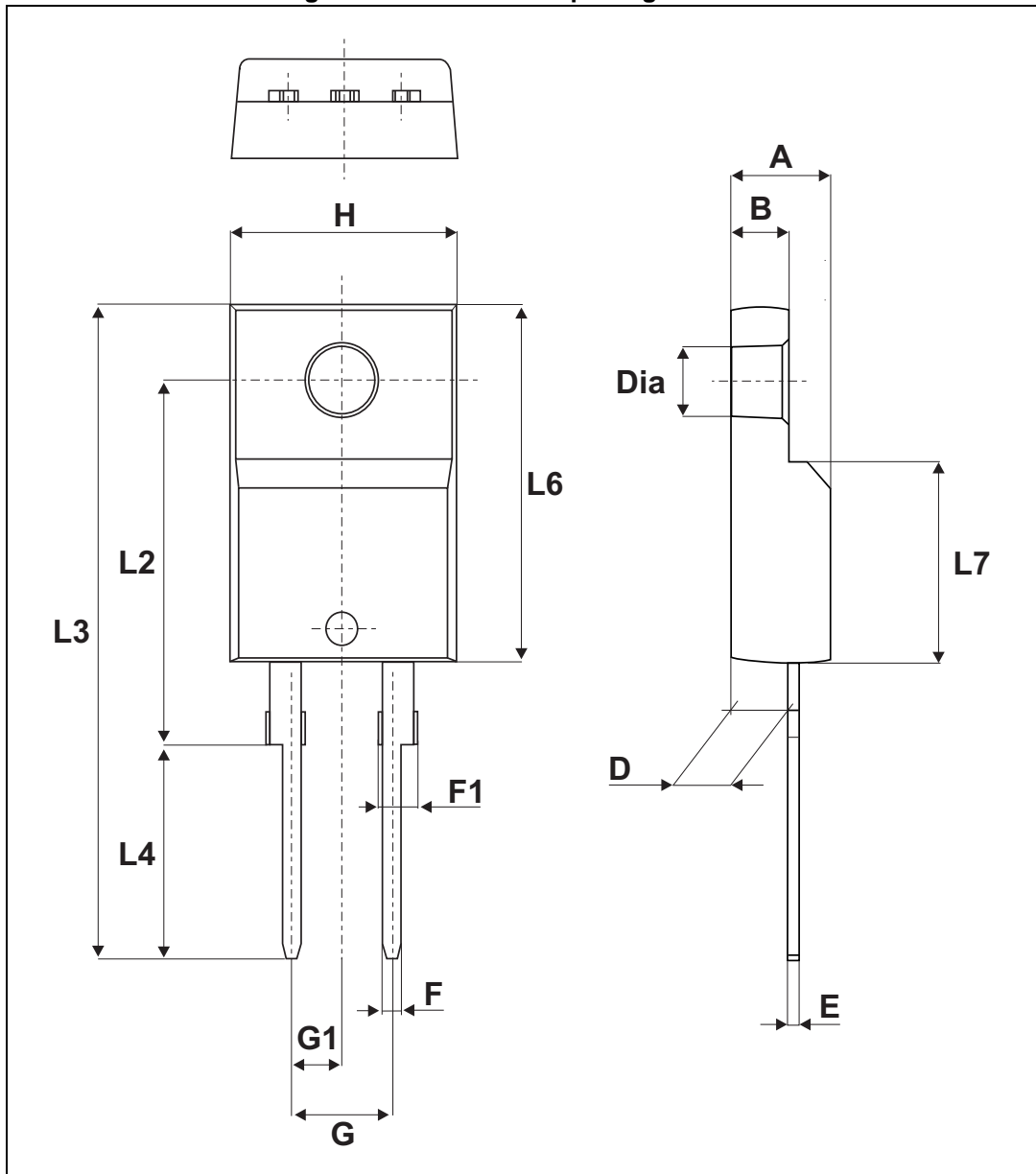


Table 7. TO-220FPAC dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|---------|------|--------|-----------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | 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 |
| 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 |

2.3 TO-220AC package information

Figure 16. TO-220AC insulated package outline

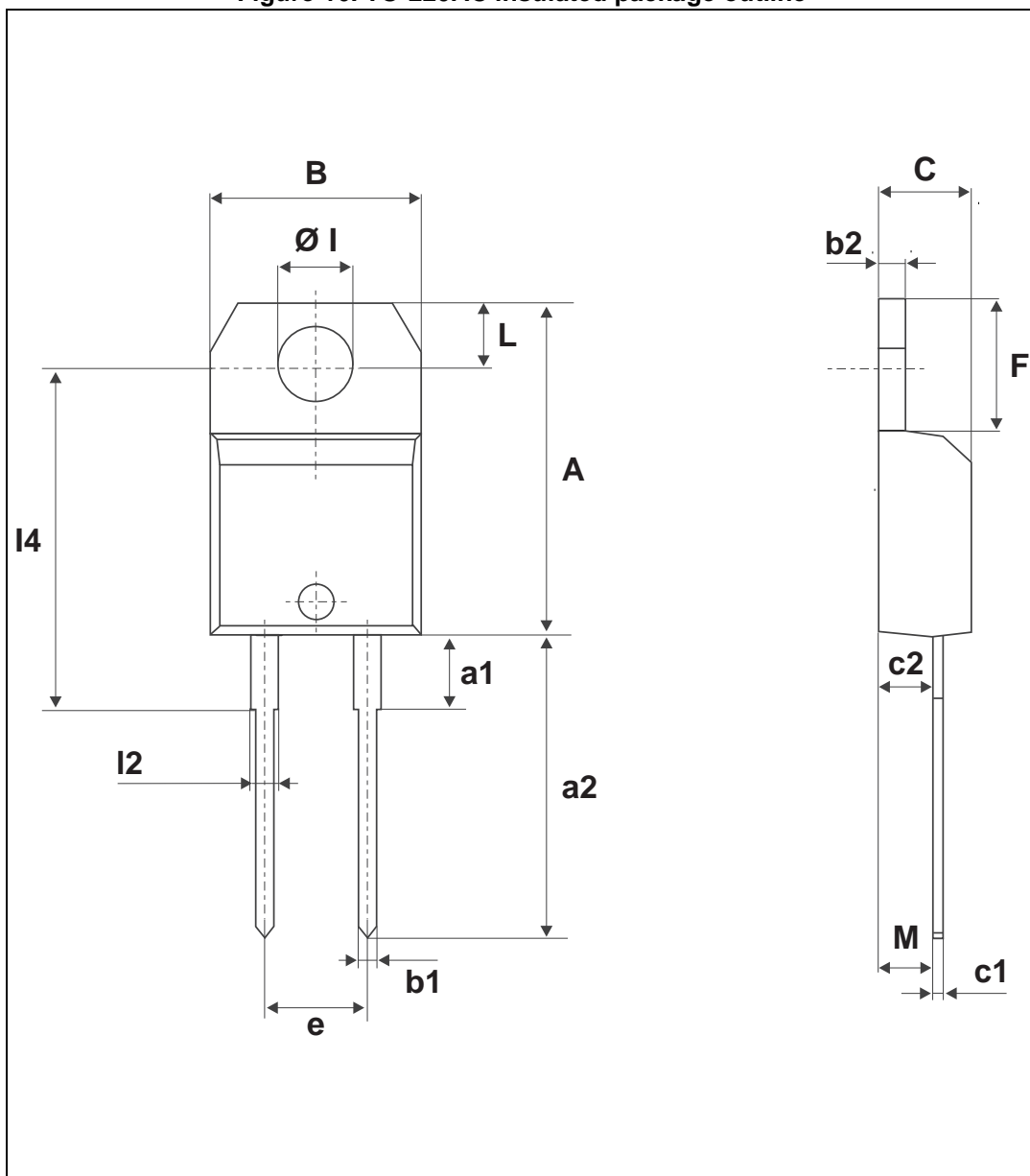


Table 8. TO-220AC insulated dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.20 | | 15.90 | 0.598 | | 0.625 |
| a1 | | 3.75 | | | 0.147 | |
| a2 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| B | 10.00 | | 10.40 | 0.393 | | 0.409 |
| b1 | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b2 | 1.23 | | 1.32 | 0.048 | | 0.051 |
| C | 4.40 | | 4.60 | 0.173 | | 0.181 |
| c1 | 0.49 | | 0.70 | 0.019 | | 0.027 |
| c2 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| e | 4.80 | | 5.40 | 0.189 | | 0.212 |
| F | 6.20 | | 6.60 | 0.244 | | 0.259 |
| ØI | 3.75 | | 3.85 | 0.147 | | 0.151 |
| l4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| l2 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| M | | 2.60 | | | 0.102 | |

2.4 D²PAK package information

Figure 17. D²PAK package outline

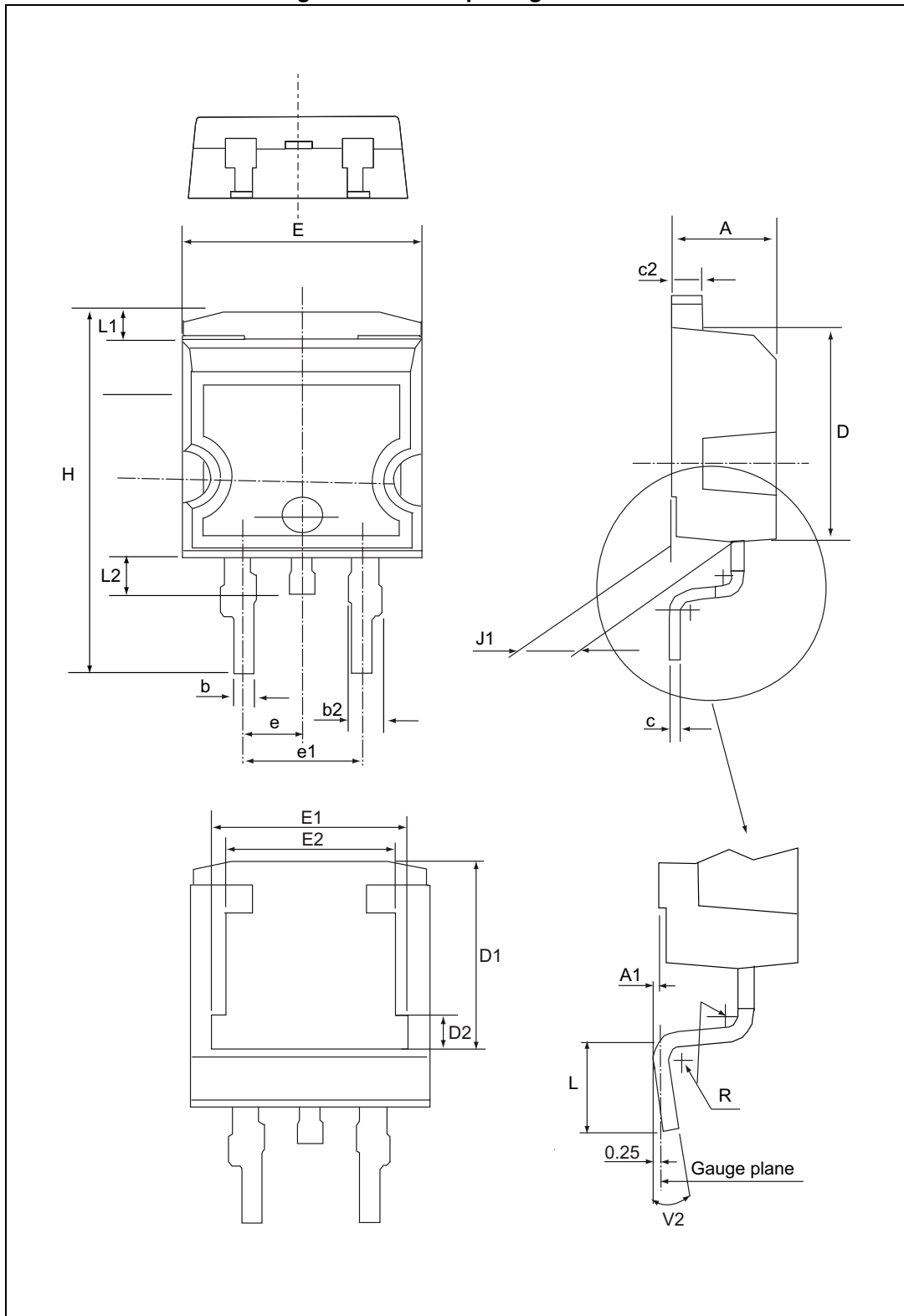
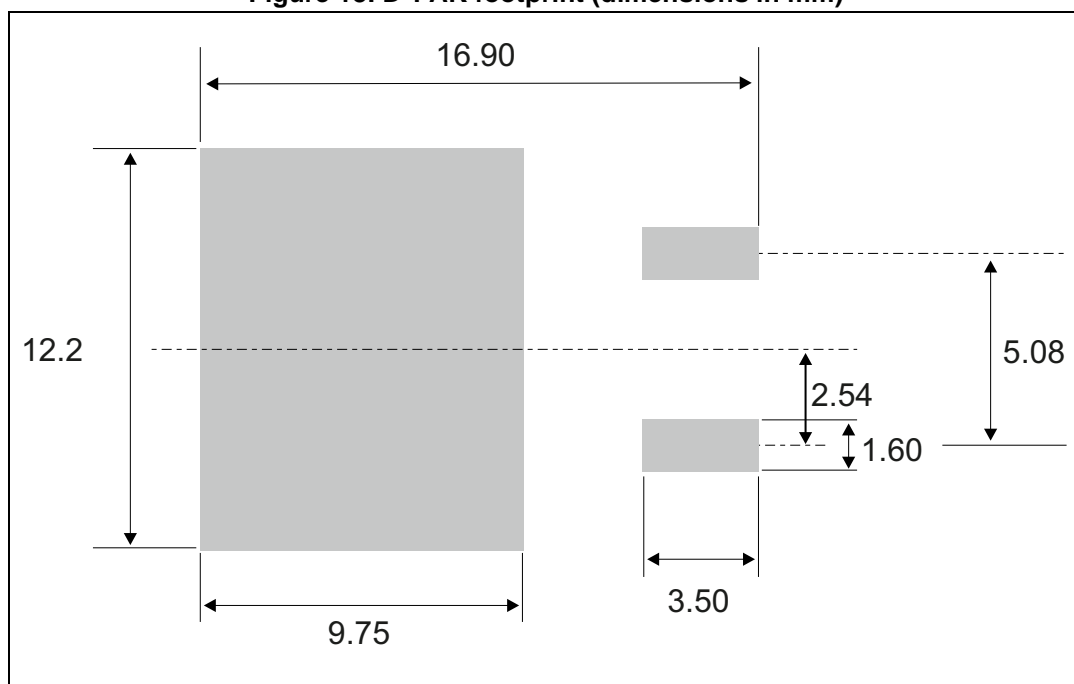


Table 9. D²PAK package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|-----------|-------|------------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| A1 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| b | 0.70 | | 0.93 | 0.027 | | 0.037 |
| b2 | 1.14 | | 1.70 | 0.045 | | 0.067 |
| c | 0.45 | | 0.60 | 0.017 | | 0.023 |
| c2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | 7.50 | 7.75 | 8.0 | 0.295 | 0.305 | 0.315 |
| D2 | 1.10 | 1.30 | 1.50 | 0.043 | 0.051 | 0.060 |
| E | 10.00 | | 10.40 | 0.393 | | 0.409 |
| E1 | 8.50 | 8.70 | 8.90 | 0.334 | 0.342 | 0.350 |
| E2 | 6.85 | 7.05 | 7.25 | 0.269 | 0.277 | 0.285 |
| e | | 2.54 | | | 0.1 | |
| e1 | 4.88 | | 5.28 | 0.192 | | 0.208 |
| H | 15.00 | | 15.85 | 0.590 | | 0.624 |
| J1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| L | 2.29 | | 2.79 | 0.090 | | 0.110 |
| L1 | 1.27 | | 1.40 | 0.050 | | 0.055 |
| L2 | 1.30 | | 1.75 | 0.051 | | 0.069 |
| R | | 0.40 typ. | | 0.016 typ. | | |
| V2 | 0° | | 8° | 0° | | 8° |

Figure 18. D²PAK footprint (dimensions in mm)



3 Ordering information

Table 10. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|--------------|------------|--------------------|--------|----------|---------------|
| STTH8R06D | STTH8R06D | TO-220AC | 1.90 g | 50 | Tube |
| STTH8R06G-TR | STTH8R06G | D ² PAK | 1.38 g | 1000 | Tape and reel |
| STTH8R06FP | STTH8R06FP | TO-220FPAC | 1.90 g | 50 | Tube |
| STTH8R06DIRG | STTH8R06DI | TO-220AC Ins. | 1.76 g | 50 | Tube |

4 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|--------------|----------|--|
| May-2001 | 1 | First issue |
| January-2002 | 2 | D ² PAK and I ² PAK packages added |
| 18-Oct-2004 | 3 | TO-220AC Insulated package added |
| 05-Dec-2004 | 4 | D ² PAK foot print correction |
| 10-Aug-2006 | 5 | Reformatted to current standard. Added package insulation voltage data on page 1. Changed order code STTH8R06DI to STTH8R06DIRG. |
| 16-Apr-2008 | 6 | Reformatted to current standards. Corrected label for right hand curve in Figure 2 from T _j = 125 °C to T _j = 25 °C. Updated torque value recommendations and added ECOPACK statement in Section 2: Package information . Corrected order code in Table 10 . |
| 22-Oct-2013 | 7 | Updated Figure 7 . |
| 30-Apr-2015 | 8 | Removed I ² PAK package information. Updated D ² PAK package information and reformatted to current standard. |

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