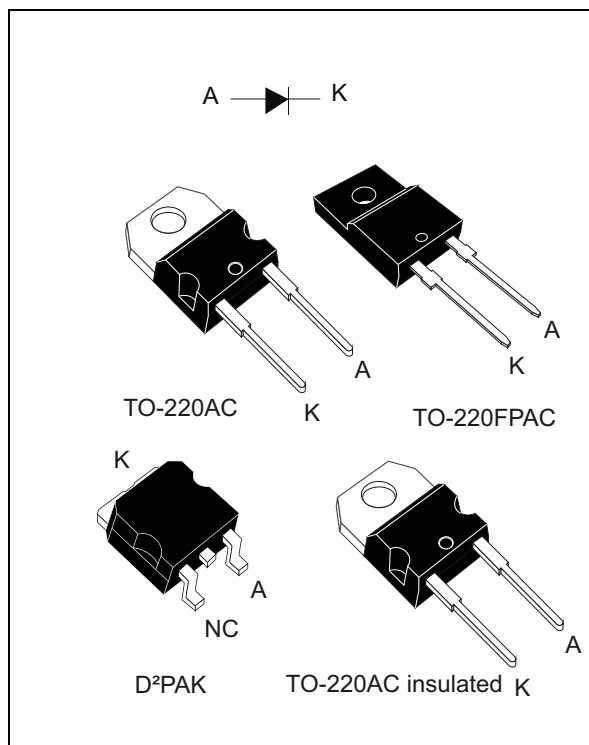


## Turbo 2 ultrafast high voltage rectifier

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<sub>RMS</sub> sine
  - TO-220FPAC: 2000 V<sub>RMS</sub> 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 <sup>2</sup> PAK |                                 | 30           | A    |
|              |                                                      | TO-220AC ins.                              |                                 | 24           |      |
| $I_{F(AV)}$  | Average forward current $\delta = 0.5$ , square wave | TO-220AC / D <sup>2</sup> PAK              | $T_C = 130\text{ °C}$           | 8            | A    |
|              |                                                      | TO-220FPAC                                 | $T_C = 85\text{ °C}$            |              |      |
|              |                                                      | TO-220AC ins.                              | $T_C = 100\text{ °C}$           |              |      |
| $I_{FSM}$    | Surge non repetitive forward current                 |                                            | $t_p = 10\text{ ms}$ 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 <sup>2</sup> 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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    |      |      | 30   | $\mu\text{A}$ |
|        |                         | $T_j = 125\text{ °C}$ |                    |      | 35   | 400  |               |
| $V_F$  | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 8\text{ A}$ |      |      | 2.9  | V             |
|        |                         | $T_j = 125\text{ °C}$ |                    |      | 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    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 0.5\text{ A}$ ,<br>$I_{rr} = 0.25\text{ A}$ , $I_R = 1\text{ A}$                       |      |      | 25   | ns   |
|          |                          |                                     | $I_F = 1\text{ A}$ ,<br>$dI_F/dt = -50\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$         |      |      | 45   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 8\text{ A}$ , $V_R = 400\text{ V}$ ,<br>$dI_F/dt = -200\text{ A}/\mu\text{s}$          |      | 5.5  | 7.2  | A    |
| S factor | Softness factor          |                                     |                                                                                               |      | 0.3  |      |      |
| $Q_{rr}$ | Reverse recovery charges |                                     |                                                                                               |      | 150  |      | nC   |
| $t_{fr}$ | Forward recovery time    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 8\text{ A}$ ,<br>$dI_F/dt = 64\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ |      |      | 150  | ns   |
| $V_{FP}$ | Forward recovery voltage |                                     |                                                                                               |      |      | 5    | V    |

Figure 1. Conduction losses versus average current

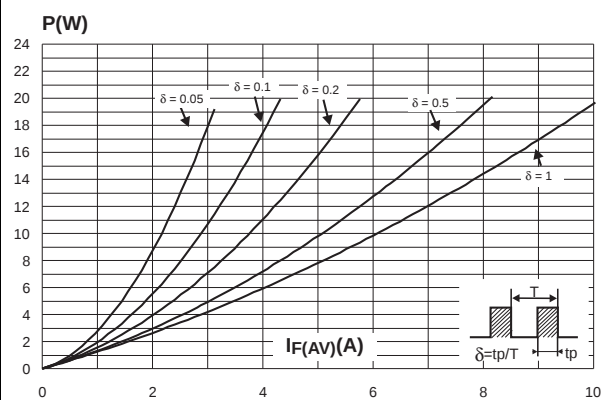
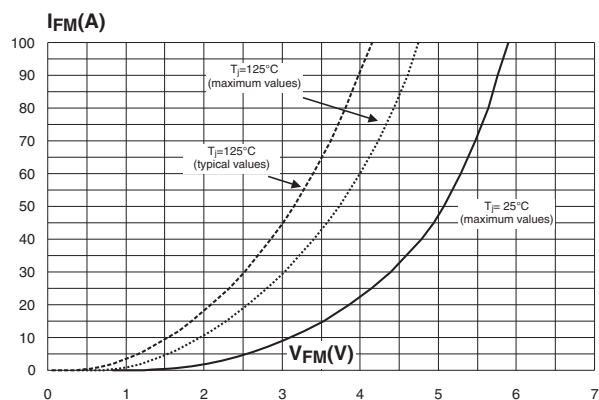
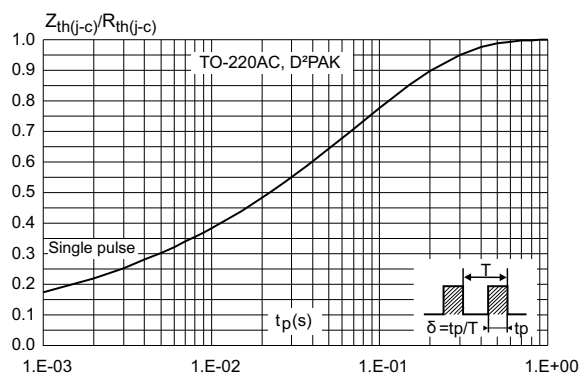


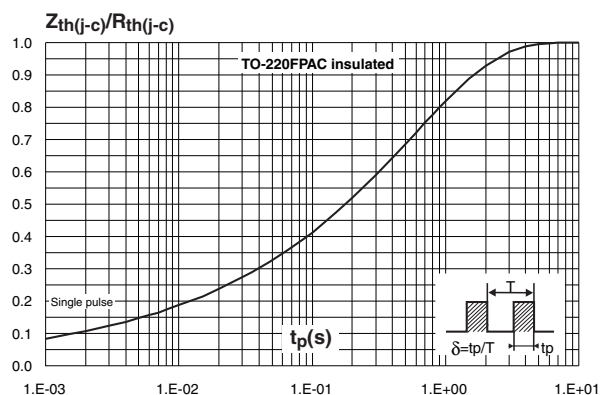
Figure 2. Forward voltage drop versus forward current



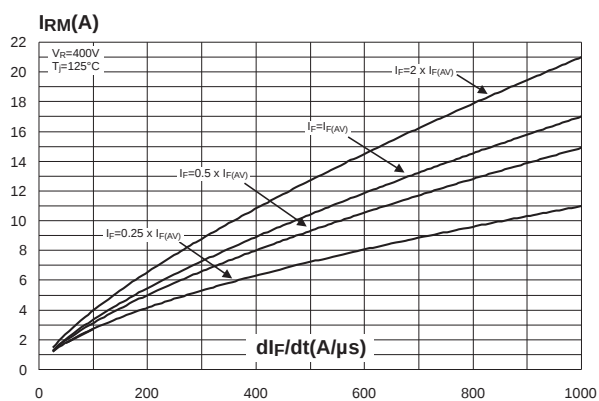
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



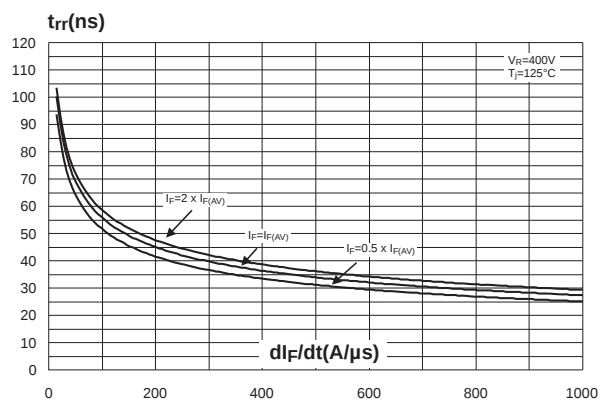
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



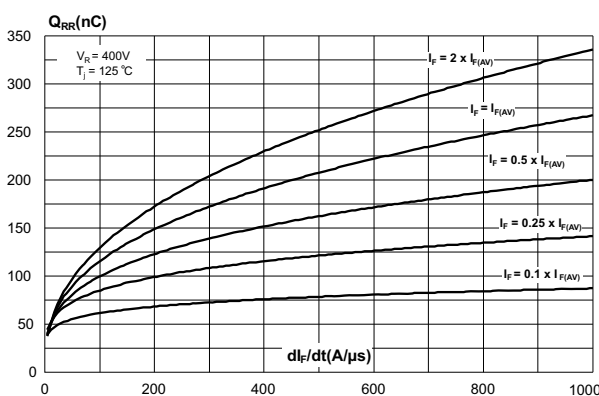
**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



**Figure 6. [Reverse recovery time versus  $di_F/dt$  (typical values)**



**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



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

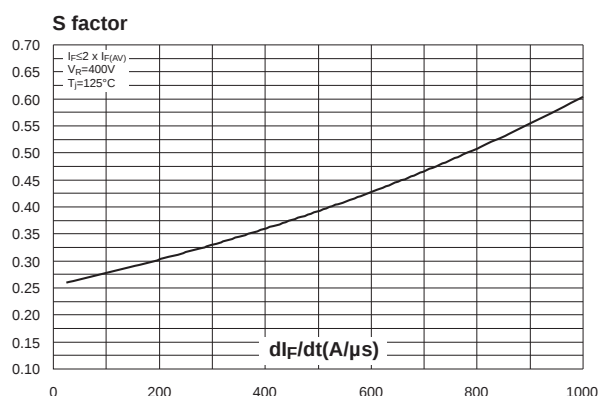


Figure 9. Relative variations of dynamic parameters versus junction temperature

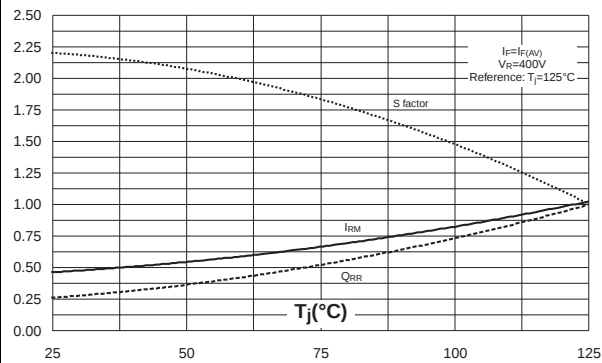
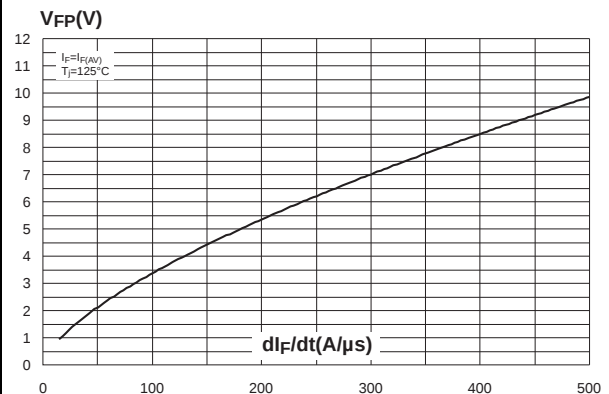
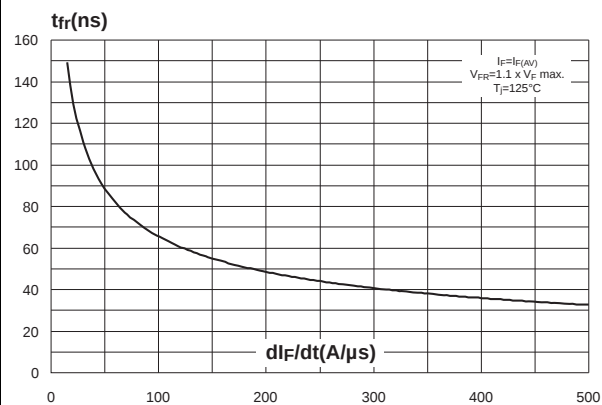
Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values)Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)

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

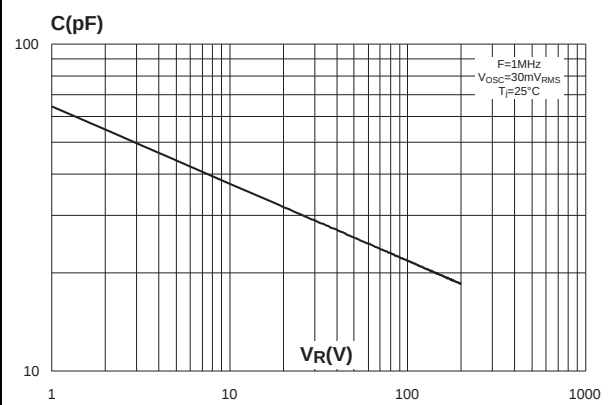
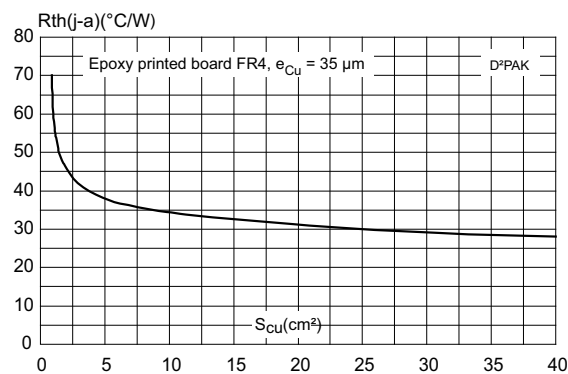


Figure 13. Thermal resistance junction to ambient versus copper surface under tab



## 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.)

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### 2.1 TO-220AC package information

Figure 14. TO-220AC package outline

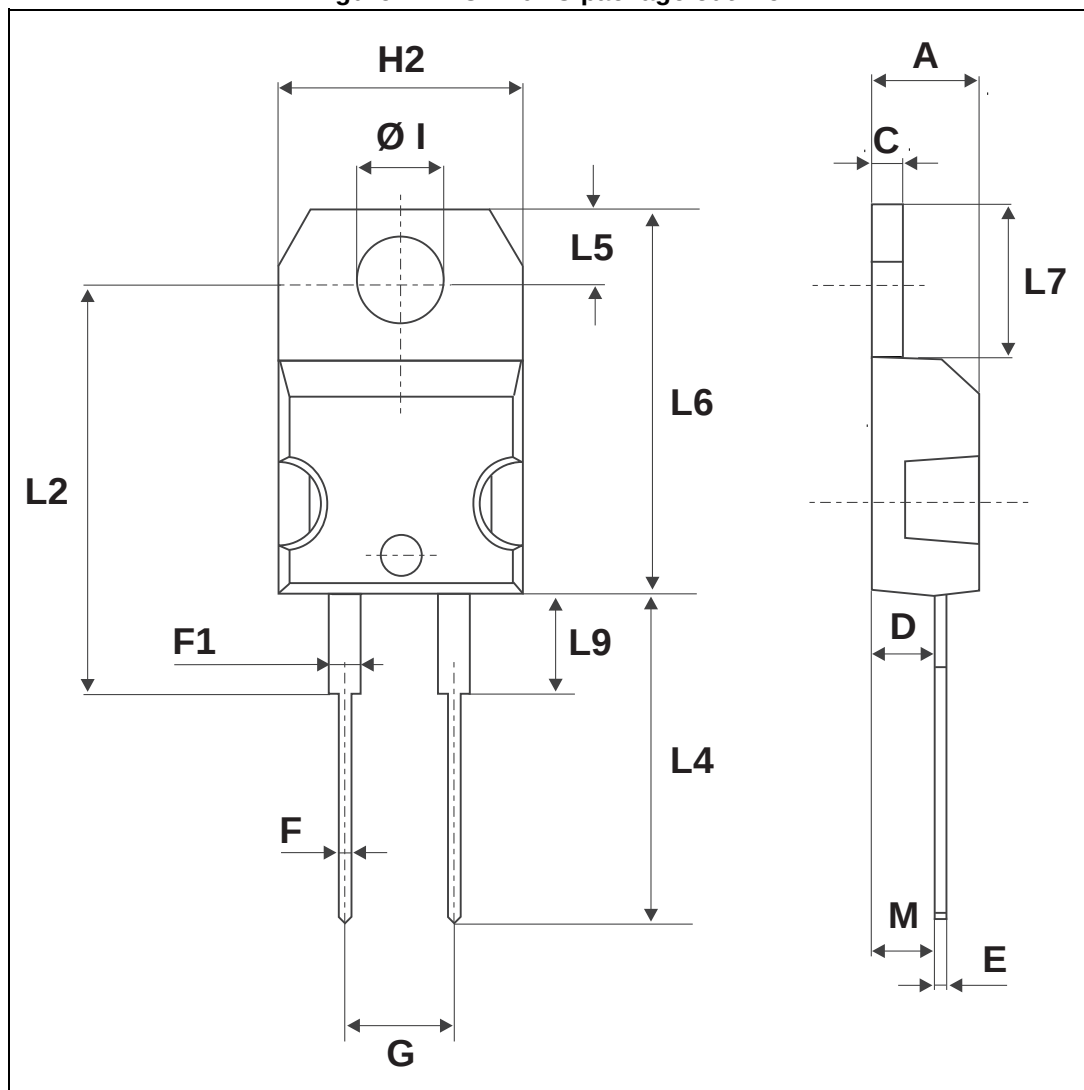


Table 6. TO-220AC dimension values

| 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

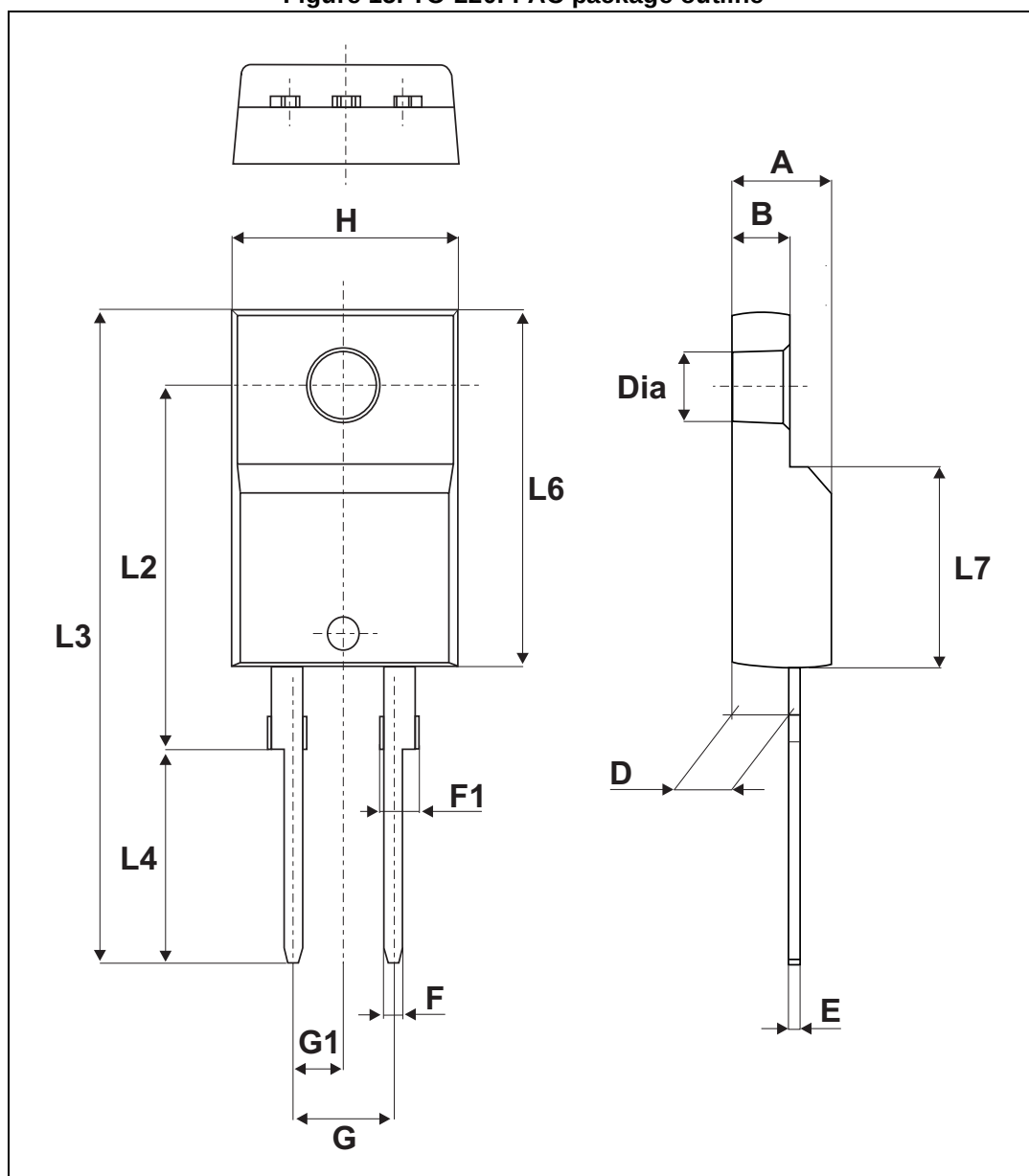


Table 7. TO-220FPAC dimension values

| 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

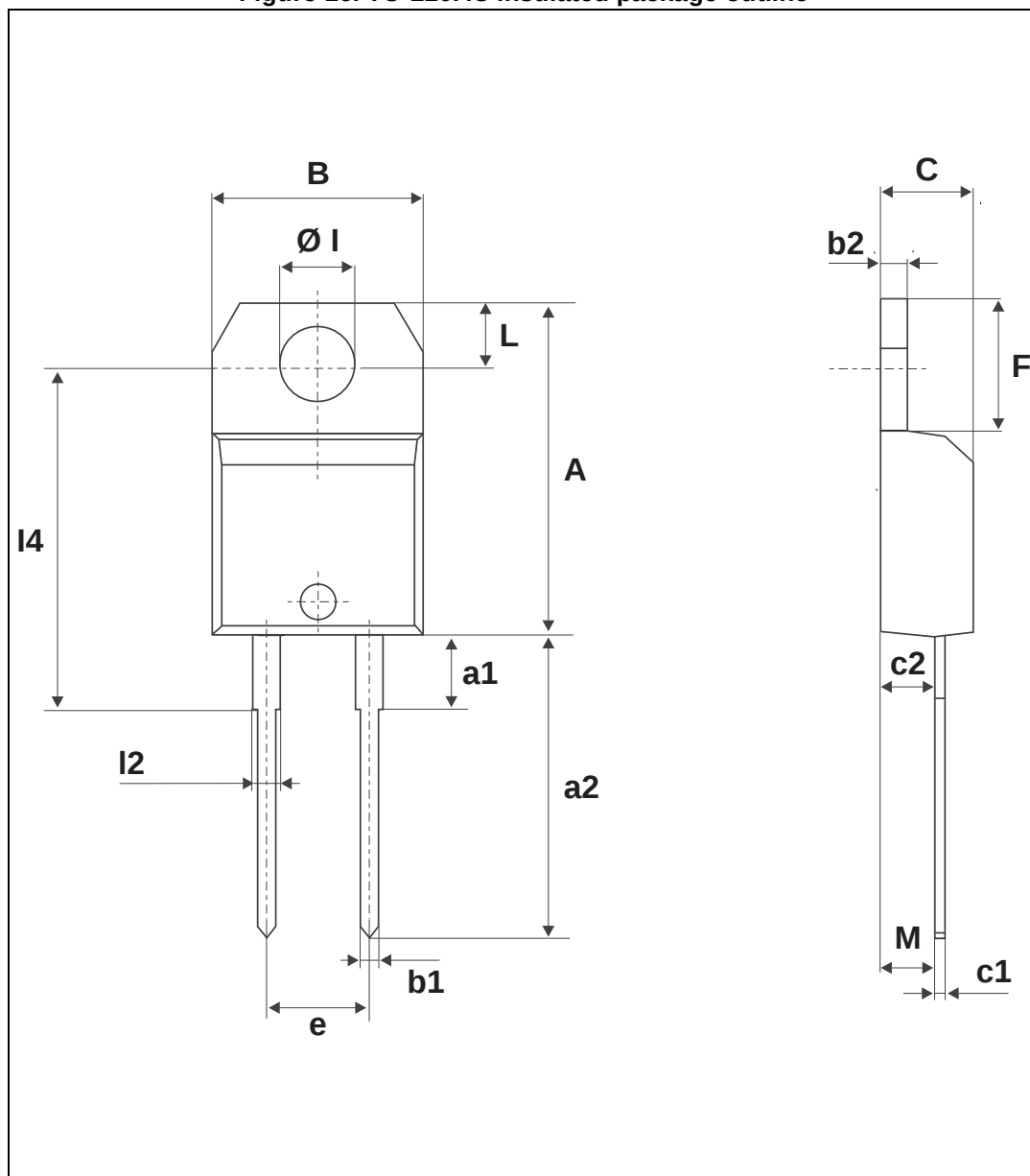


Table 8. TO-220AC insulated dimension values

| 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 D<sup>2</sup>PAK package information

Figure 17. D<sup>2</sup>PAK package outline

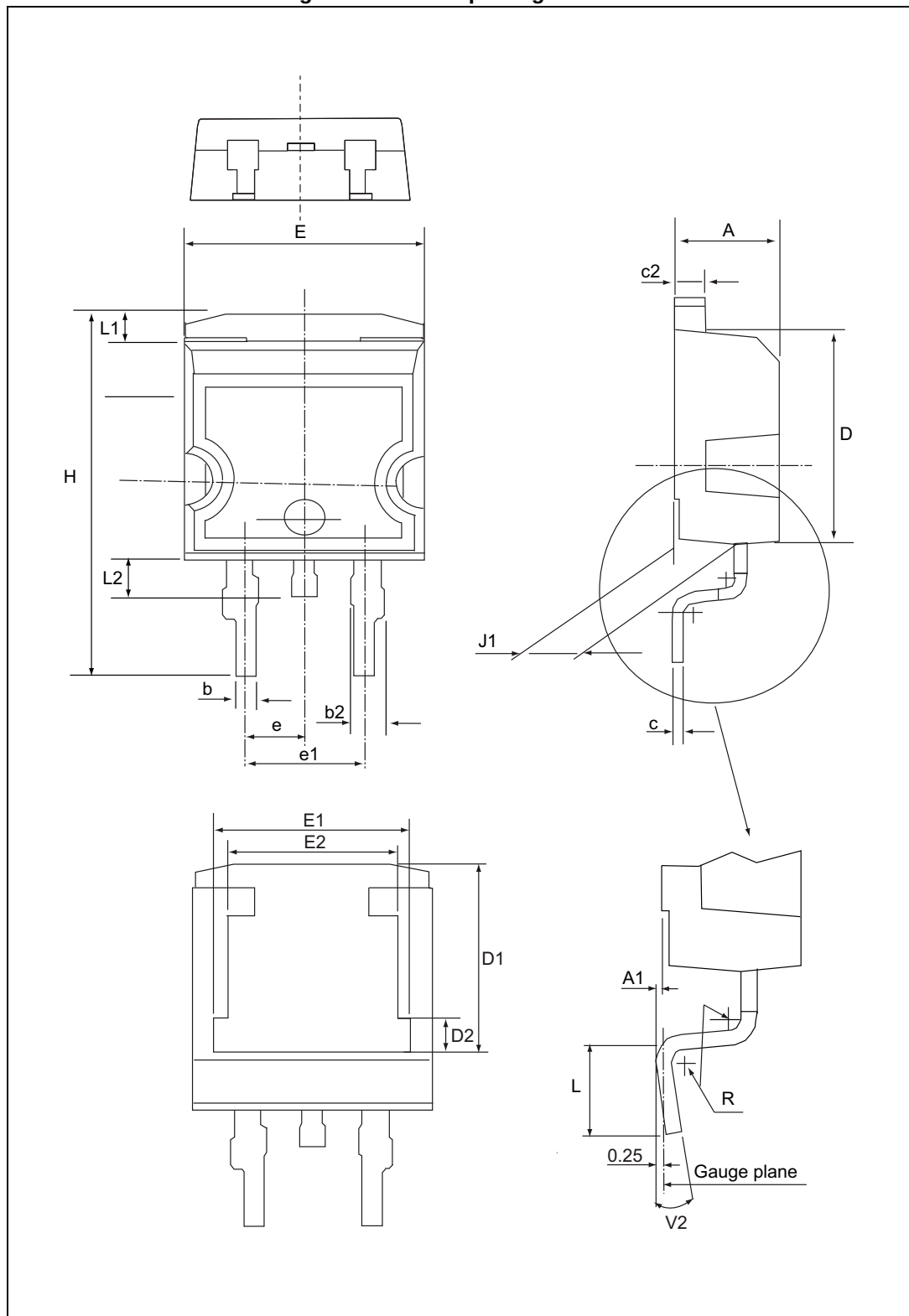
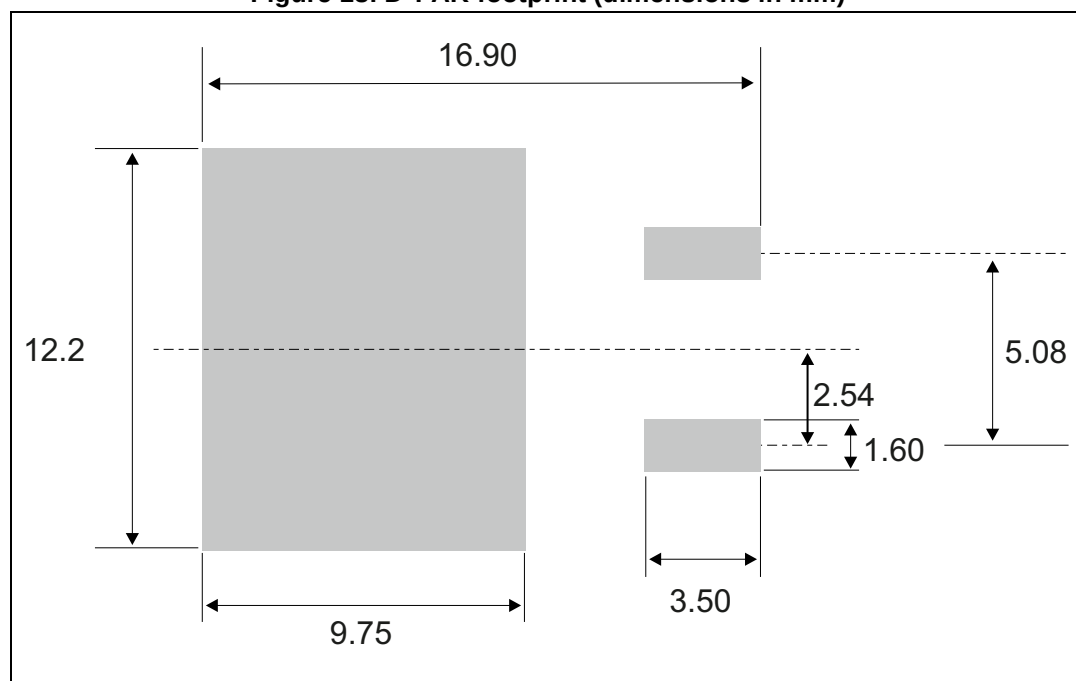


Table 9. D<sup>2</sup>PAK package mechanical data

| 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. D<sup>2</sup>PAK 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 <sup>2</sup> 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 <sup>2</sup> PAK and I <sup>2</sup> PAK packages added                                                                                                                                                                                                                                                                           |
| 18-Oct-2004  | 3        | TO-220AC Insulated package added                                                                                                                                                                                                                                                                                                   |
| 05-Dec-2004  | 4        | D <sup>2</sup> 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 <a href="#">Figure 2</a> from T <sub>j</sub> = 125 °C to T <sub>j</sub> = 25 °C. Updated torque value recommendations and added ECOPACK statement in <a href="#">Section 2: Package information</a> . Corrected order code in <a href="#">Table 10</a> . |
| 22-Oct-2013  | 7        | Updated <a href="#">Figure 7</a> .                                                                                                                                                                                                                                                                                                 |
| 30-Apr-2015  | 8        | Removed I <sup>2</sup> PAK package information. Updated D <sup>2</sup> PAK package information and reformatted to current standard.                                                                                                                                                                                                |

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