



# STTH8R06

## Turbo 2 ultrafast high voltage rectifier

### Main product characteristics

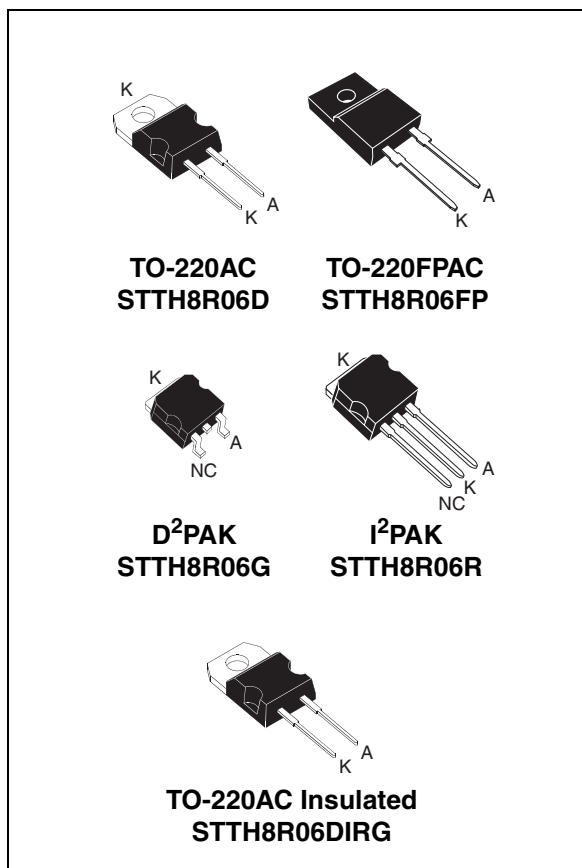
|                |       |
|----------------|-------|
| $I_{F(AV)}$    | 8 A   |
| $V_{RRM}$      | 600 V |
| $I_{RM}$ (typ) | 5.5 A |
| $T_j$          | 175°C |
| $V_F$ (typ)    | 1.4 V |
| $t_{rr}$ (max) | 25 ns |

### Features and benefits

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- Package insulation voltage:  
TO-220AC Ins: 2500 V<sub>RMS</sub>  
TO-220FPAC: 2000 V<sub>DC</sub>

### Description

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



### Order codes

| Part Number  | Marking    |
|--------------|------------|
| STTH8R06D    | STTH8R06D  |
| STTH8R06FP   | STTH8R06FP |
| STTH8R06R    | STTH8R06R  |
| STTH8R06G    | STTH8R06G  |
| STTH8R06G-TR | STTH8R06G  |
| STTH8R06DIRG | STTH8R06DI |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values)**

| Symbol              | Parameter                              |                                                                 |                         | Value        | Unit |
|---------------------|----------------------------------------|-----------------------------------------------------------------|-------------------------|--------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage        |                                                                 |                         | 600          | V    |
| I <sub>F(RMS)</sub> | RMS forward voltage                    | TO-220AC / TO-220FPAC / D <sup>2</sup> PAK / I <sup>2</sup> PAK |                         | 30           | A    |
|                     |                                        | TO-220AC Ins.                                                   |                         | 24           |      |
| I <sub>F(AV)</sub>  | Average forward current<br>δ = 0.5     | TO-220AC / D <sup>2</sup> PAK / I <sup>2</sup> PAK              | T <sub>c</sub> = 130° C | 8            | A    |
|                     |                                        | TO-220FPAC                                                      | T <sub>c</sub> = 85° C  |              |      |
|                     |                                        | TO-220AC Ins.                                                   | T <sub>c</sub> = 100° C |              |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current   |                                                                 | tp = 10ms sinusoidal    | 80           | A    |
| T <sub>stg</sub>    | Storage temperature range              |                                                                 |                         | -65 to + 175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature |                                                                 |                         | 175          | °C   |

**Table 2. Thermal resistance**

| Symbol        | Parameter        |                                                    | Value (max) | Unit |
|---------------|------------------|----------------------------------------------------|-------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / D <sup>2</sup> PAK / I <sup>2</sup> PAK | 2.2         | °C/W |
|               |                  | TO-220FPAC                                         | 4.6         |      |
|               |                  | TO-220AC Ins.                                      | 3.8         |      |

**Table 3. Static electrical characteristics**

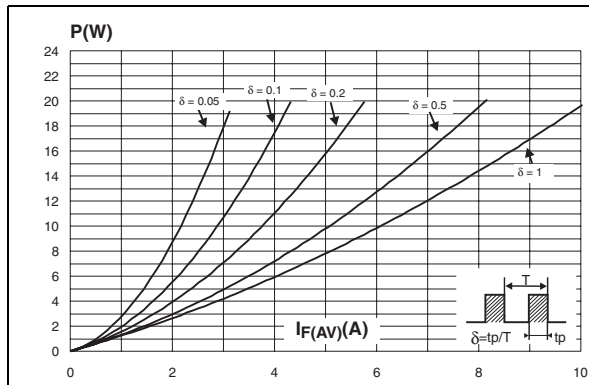
| Symbol | Parameter               | Test conditions            |                     | Min | Typ | Max | Unit          |
|--------|-------------------------|----------------------------|---------------------|-----|-----|-----|---------------|
| $I_R$  | Reverse leakage current | $T_j = 25^\circ \text{C}$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

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

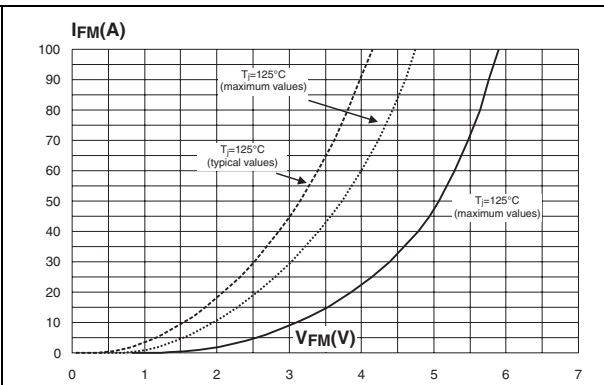
**Table 4. Dynamic characteristics**

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

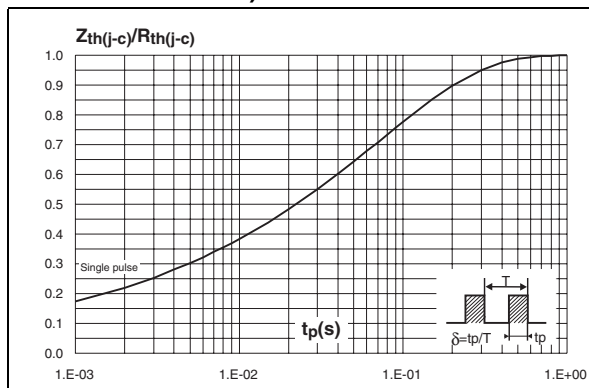
**Figure 1. Conduction losses versus average current**



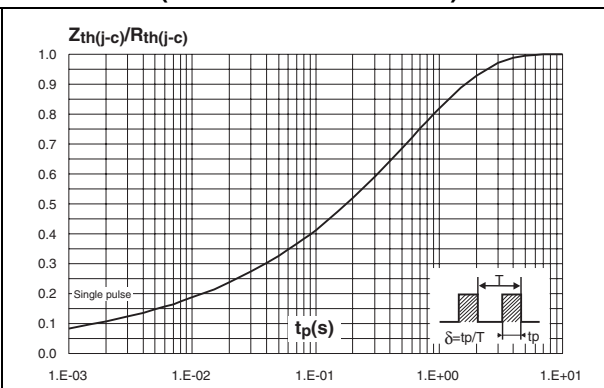
**Figure 2. Forward voltage drop versus forward current**



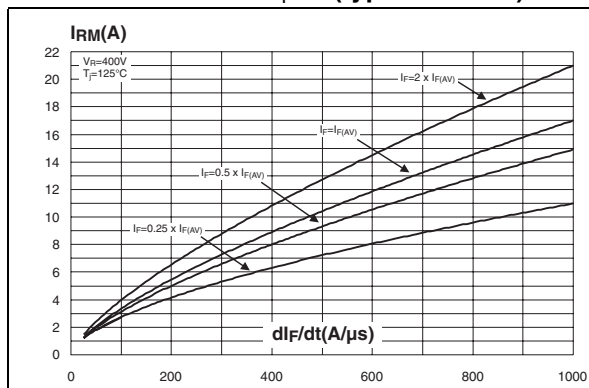
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, I<sup>2</sup>PAK, D<sup>2</sup>PAK)**



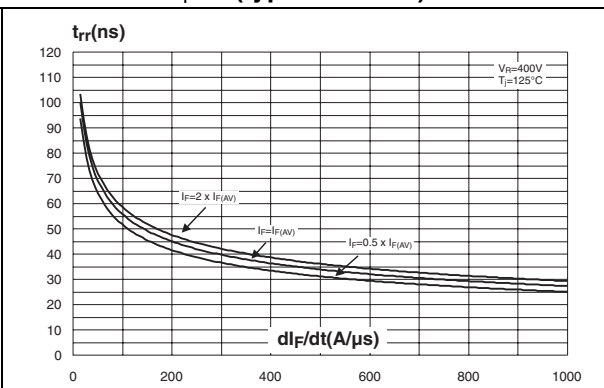
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC Insulated)**



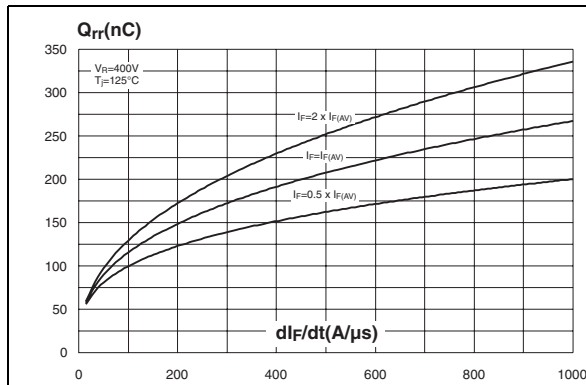
**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



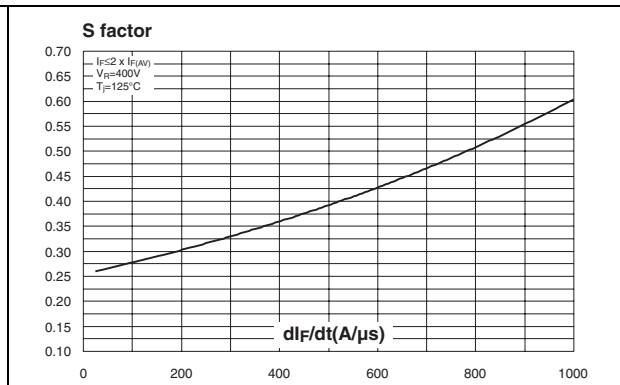
**Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values)**



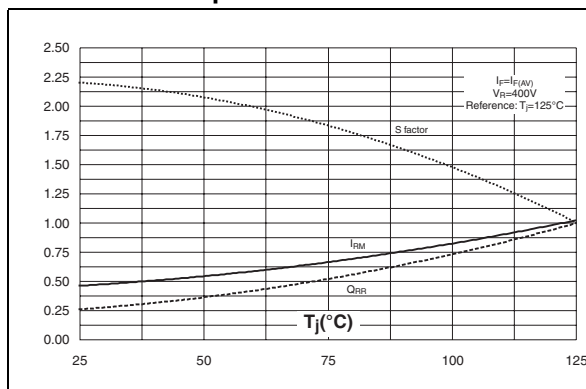
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



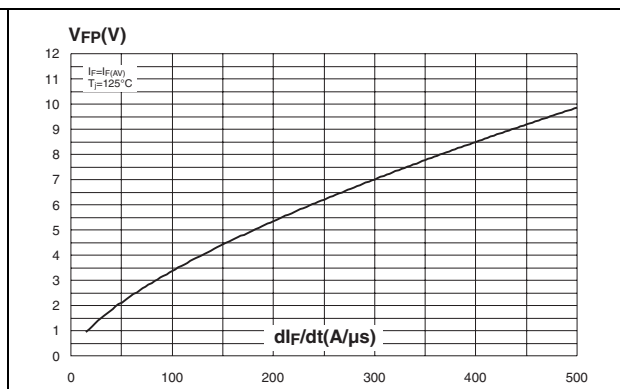
**Figure 8. Softness factor versus  $di_F/dt$  (typical values)**



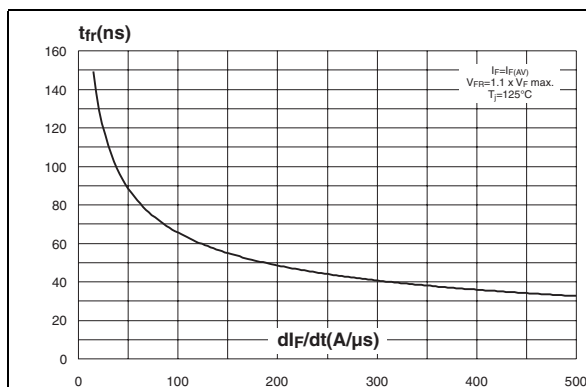
**Figure 9. Relative variations of dynamic parameters versus junction temperature**



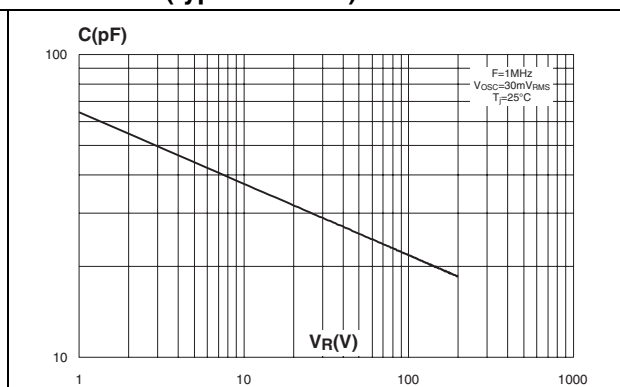
**Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



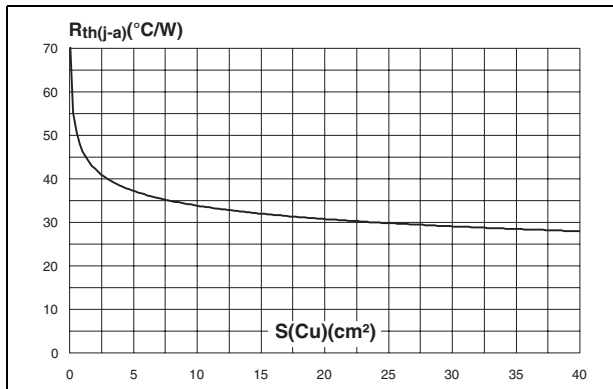
**Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)**



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



**Figure 13. Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4,  $e_{Cu} = 35 \mu m$ ) (D<sup>2</sup>PAK)**



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm (TO-220FPAC) / 0.55 Nm (TO-220AC)
- Maximum torque value: 1.0 Nm (TO-220FPAC) / 0.70 Nm (TO-220AC)

Table 5. 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 |

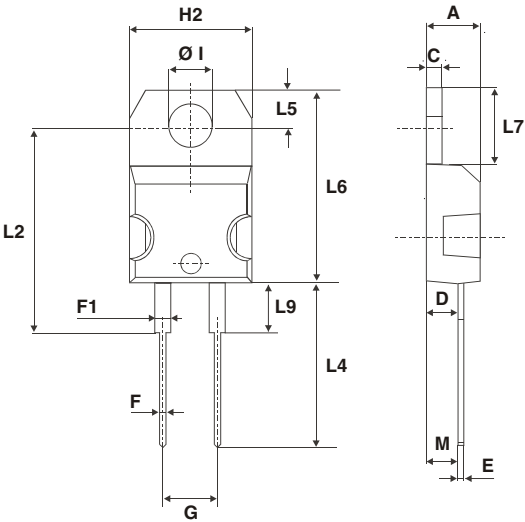


Table 6. TO-220FPAC Dimensions

| 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 |

Table 7. TO-220AC (Nlns. & Ins. 20-up) Dimensions

| 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 |       |

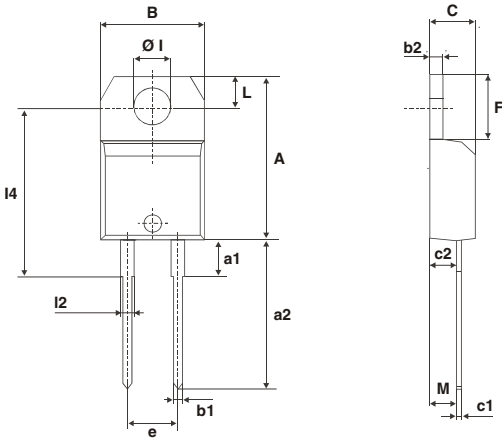




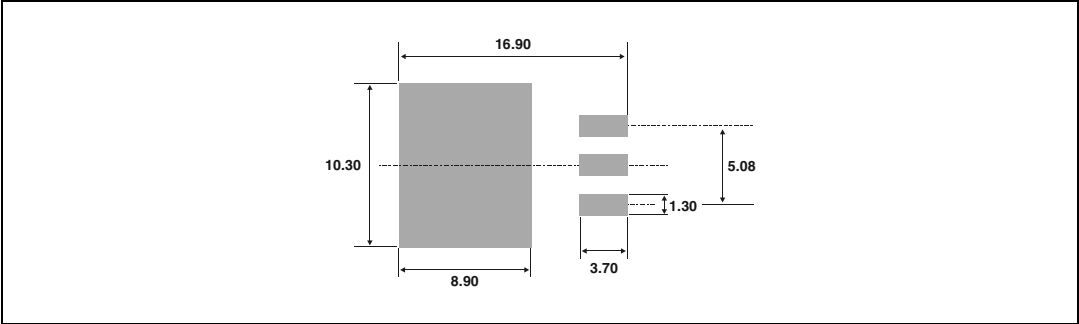
Table 8. I<sup>2</sup>PAK Dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.40        | 4.60  | 0.173  | 0.181 |
| A1   | 2.40        | 2.72  | 0.094  | 0.107 |
| b    | 0.61        | 0.88  | 0.024  | 0.035 |
| b1   | 1.14        | 1.70  | 0.044  | 0.067 |
| c    | 0.49        | 0.70  | 0.019  | 0.028 |
| c2   | 1.23        | 1.32  | 0.048  | 0.052 |
| D    | 8.95        | 9.35  | 0.352  | 0.368 |
| e    | 2.40        | 2.70  | 0.094  | 0.106 |
| e1   | 4.95        | 5.15  | 0.195  | 0.203 |
| E    | 10          | 10.40 | 0.394  | 0.409 |
| L    | 13          | 14    | 0.512  | 0.551 |
| L1   | 3.50        | 3.93  | 0.138  | 0.155 |
| L2   | 1.27        | 1.40  | 0.050  | 0.055 |

Table 9. D<sup>2</sup>PAK Dimensions

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| A1   | 2.49        | 2.69  | 0.098      | 0.106 |
| A2   | 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      | 0.024 |
| C2   | 1.23        | 1.36  | 0.048      | 0.054 |
| D    | 8.95        | 9.35  | 0.352      | 0.368 |
| E    | 10.00       | 10.40 | 0.393      | 0.409 |
| G    | 4.88        | 5.28  | 0.192      | 0.208 |
| L    | 15.00       | 15.85 | 0.590      | 0.624 |
| L2   | 1.27        | 1.40  | 0.050      | 0.055 |
| L3   | 1.40        | 1.75  | 0.055      | 0.069 |
| M    | 2.40        | 3.20  | 0.094      | 0.126 |
| R    | 0.40 typ.   |       | 0.016 typ. |       |
| V2   | 0°          | 8°    | 0°         | 8°    |

Figure 14. Footprint (dimensions in mm)



### 3 Ordering information

| Ordering type | Marking    | Package            | Weight | Base qty | Delivery mode |
|---------------|------------|--------------------|--------|----------|---------------|
| STTH8R06D     | STTH8R06D  | TO-220AC           | 1.90 g | 50       | Tube          |
| STTH8R06G     | STTH8R06G  | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STTH8R066G-TR | STTH8R06G  | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |
| STTH8R06FP    | STTH8R06FP | TO-220FPAC         | 1.70 g | 50       | Tube          |
| STTH8R06R     | STTH8R06R  | I <sup>2</sup> PAK | 1.5 g  | 50       | Tube          |
| STTH8R06DIRG  | STTH8R06DI | TO-220AC Ins.      | 1.86 g | 50       | Tube          |

### 4 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. |

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