

## Turbo 2 ultrafast high voltage rectifier

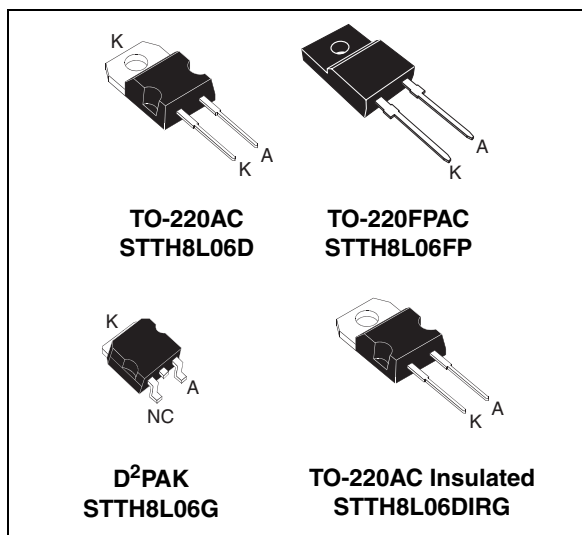
### Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching and conduction losses
- Package insulation voltage:
  - TO-220AC Ins: 2500 V rms
  - TO-220FPAC: 2000 V DC

### Description

The STTH8L06, which is using ST Turbo2 600 V technology, is specially suited as boost diode in discontinuous or critical mode power factor corrections.

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       |
|----------------|-------------|
| $I_{F(AV)}$    | 8 A         |
| $V_{RRM}$      | 600 V       |
| $I_R$ (max)    | 200 $\mu$ A |
| $T_j$          | 175 °C      |
| $V_F$ (typ)    | 0.85 V      |
| $t_{rr}$ (typ) | 75 ns       |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

| Symbol              | Parameter                            |                                            |                                   | Value      | Unit |
|---------------------|--------------------------------------|--------------------------------------------|-----------------------------------|------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage      |                                            |                                   | 600        | V    |
| I <sub>F(RMS)</sub> | Forward rms current                  | TO-220AC / TO-220FPAC / D <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              | T <sub>c</sub> = 150 °C           | 8          | A    |
|                     |                                      | TO-220FPAC                                 | T <sub>c</sub> = 125 °C           |            |      |
|                     |                                      | TO-220AC Ins.                              | T <sub>c</sub> = 135 °C           |            |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current |                                            | t <sub>p</sub> = 10 ms sinusoidal | 120        | A    |
| T <sub>stg</sub>    | Storage temperature range            |                                            |                                   | -65 to 175 | °C   |
| T <sub>j</sub>      | Operating junction temperature range |                                            |                                   | -40 to 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 | 2.5         | °C/W |
|               |                  | TO-220FPAC                    | 5           |      |
|               |                  | TO-220AC Ins.                 | 4           |      |

**Table 4. Static electrical characteristics**

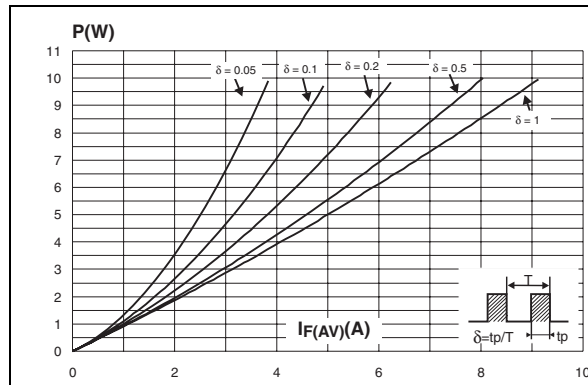
| Symbol | Parameter               | Test conditions       |                    | Min. | Typ. | Max. | Unit          |
|--------|-------------------------|-----------------------|--------------------|------|------|------|---------------|
| $I_R$  | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    |      |      | 8    | $\mu\text{A}$ |
|        |                         | $T_j = 150\text{ °C}$ |                    |      | 16   | 200  |               |
| $V_F$  | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 8\text{ A}$ |      |      | 1.3  | V             |
|        |                         | $T_j = 150\text{ °C}$ |                    |      | 0.85 | 1.05 |               |

To evaluate the conduction losses use the following equation:  $P = 0.89 \times I_{F(AV)} + 0.022 I_{F(RMS)}^2$

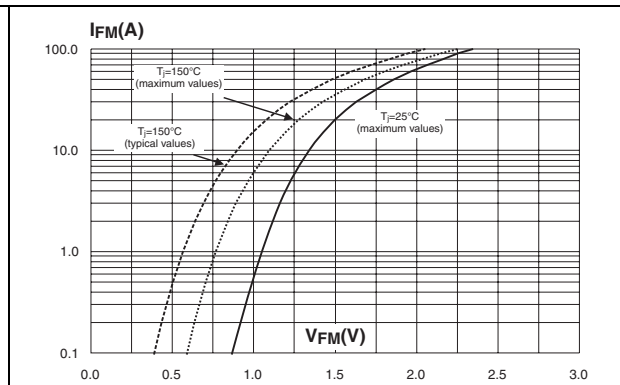
**Table 5. Dynamic characteristics**

| Symbol   | Parameter                | Test conditions       |                                                                                            | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------|--------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25\text{ °C}$  | $I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$            |      | 75   | 105  | ns   |
| $I_{RM}$ | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 8\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$           |      | 7.2  | 10   | A    |
| $t_{fr}$ | Forward recovery time    | $T_j = 25\text{ °C}$  | $I_F = 8\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.1 \times V_{Fmax}$ |      |      | 150  | ns   |
| $V_{FP}$ | Forward recovery voltage |                       | $I_F = 8\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$                                  |      |      | 6    | V    |

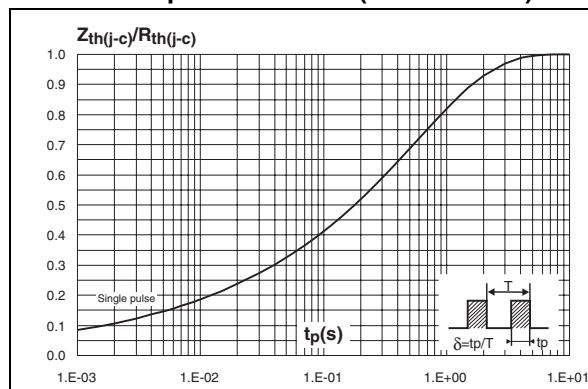
**Figure 1. Conduction losses versus average current**



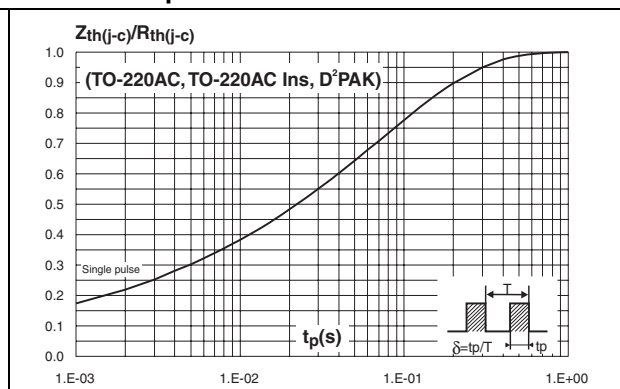
**Figure 2. Forward voltage drop versus forward current**



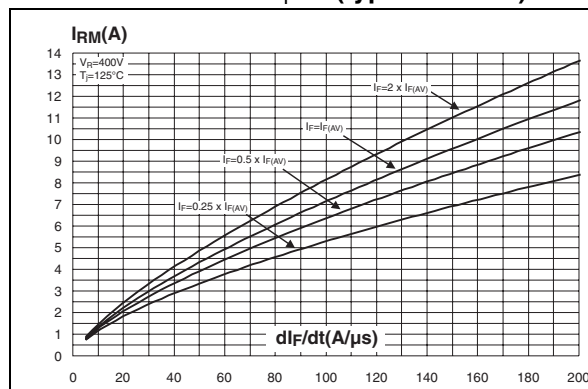
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)**



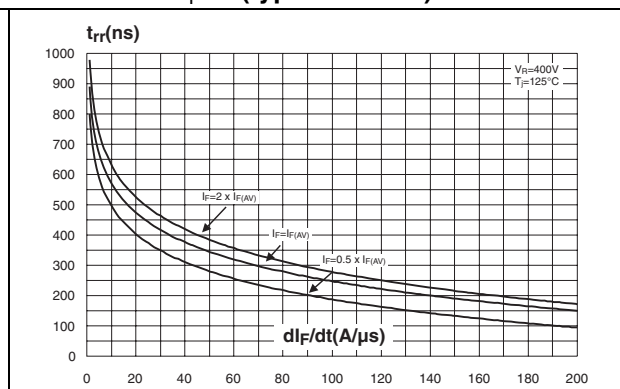
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



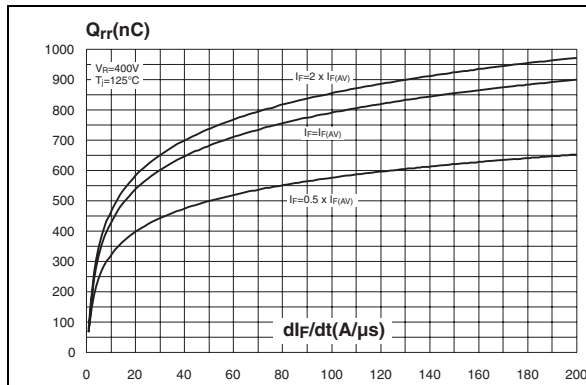
**Figure 5. Peak reverse recovery current versus  $dI_F/dt$  (typical values)**



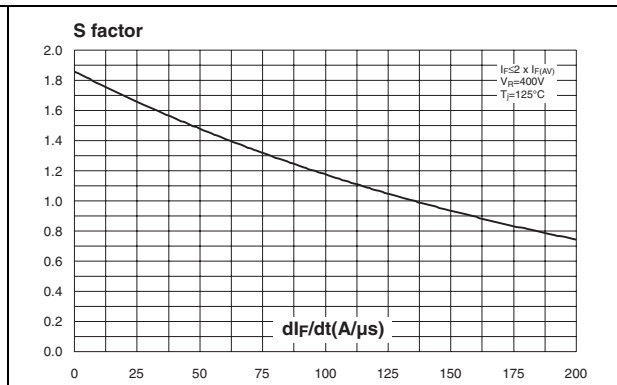
**Figure 6. Reverse recovery time versus  $dI_F/dt$  (typical values)**



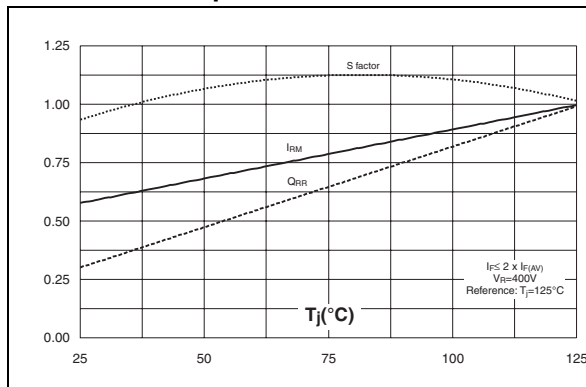
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



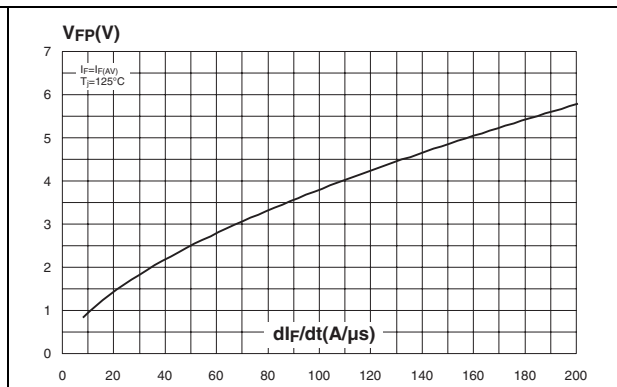
**Figure 8. Softness factor versus  $di_F/dt$  (typical values)**



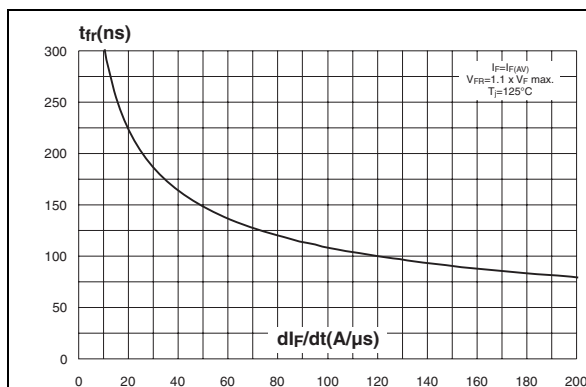
**Figure 9. Relative variations of dynamic parameters versus junction temperature**



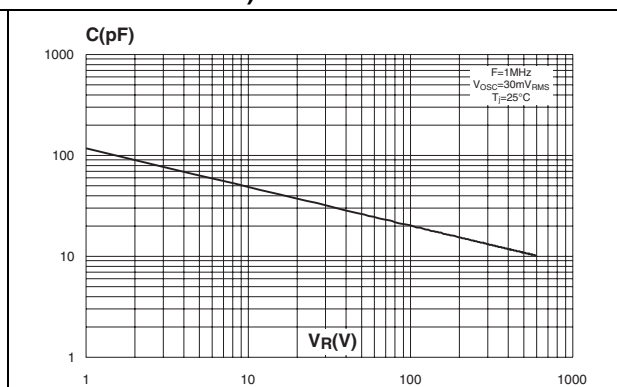
**Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values)**

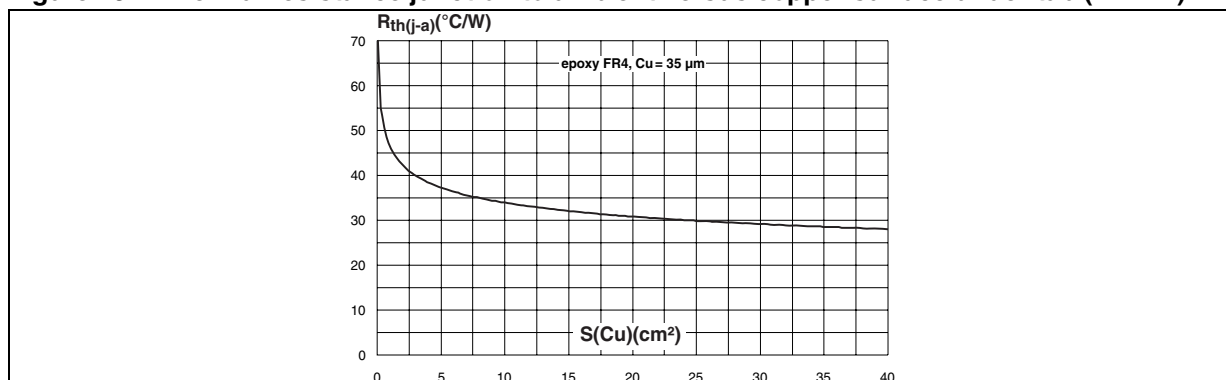


**Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)**



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



**Figure 13. Thermal resistance junction to ambient versus copper surface under tab (D<sup>2</sup>PAK)**

## 2 Package information

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

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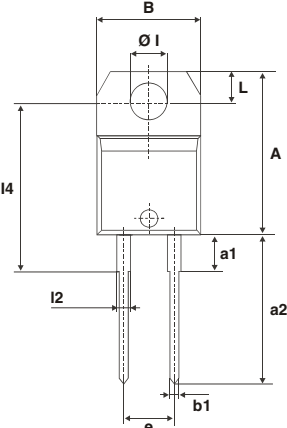
**Table 6. TO-220AC dimensions**

| 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 |

Table 8. TO-220AC (Nins. &amp; 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 |
|                                                                                   | I4   | 15.80       | 16.40 | 16.80 | 0.622  | 0.646 | 0.661 |
|                                                                                   | L    | 2.65        |       | 2.95  | 0.104  |       | 0.116 |
|                                                                                   | I2   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
|                                                                                   | M    |             | 2.60  |       |        | 0.102 |       |

**Table 9. D<sup>2</sup>PAK dimensions**

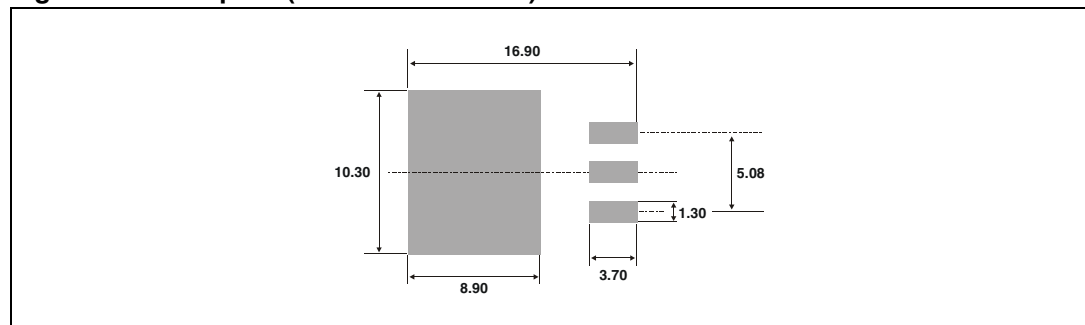
Technical drawing of a 150mm x 150mm x 15mm stainless steel plate. The drawing includes a top view, a side view, and a detail view of the corner. Dimensions are labeled as follows:

- Top View:** L (Overall Length), L2 (Distance from top edge to center of hole), L3 (Distance from bottom edge to center of hole), E (Overall Width), B (Distance from center of hole to bottom edge), B2 (Distance from center of hole to bottom edge of plate), G (Distance from center of hole to bottom edge of plate).
- Side View:** A (Overall Thickness), C2 (Distance from top edge to center of hole), E (Overall Width), R (Radius of corner), C (Distance from center of hole to bottom edge of plate).
- Detail View:** A2 (Distance from center of hole to bottom edge of plate), M (Distance from center of hole to bottom edge of plate), V2 (Distance from center of hole to bottom edge of plate).

\* FLAT ZONE NO LESS THAN 2mm

| 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

**Table 10. Ordering information**

| Order code    | Marking    | Package            | Weight | Base qty | Delivery mode |
|---------------|------------|--------------------|--------|----------|---------------|
| STTH8L06D     | STTH8L06D  | TO-220AC           | 1.90 g | 50       | Tube          |
| STTH8L06G     | STTH8L06G  | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STTH8L066G-TR | STTH8L06G  | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |
| STTH8L06FP    | STTH8L06FP | TO-220FPAC         | 1.70 g | 50       | Tube          |
| STTH8L06DIRG  | STTH8L06DI | TO-220AC Ins.      | 1.86 g | 50       | Tube          |

### 4 Revision history

**Table 11. Document revision history**

| Date        | Revision | Changes                                                                                                                          |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------|
| Nov-2002    | 2A       | Last issue                                                                                                                       |
| 18-Oct-2004 | 3        | TO-220AC Insulated and D <sup>2</sup> PAK packages added                                                                         |
| 13-Jun-2005 | 4        | T <sub>j</sub> changed from value 175 to range -40 to 175 °C - Page1                                                             |
| 10-Aug-2006 | 5        | Reformatted to current standard. Added package insulation voltage data on page 1. Changed order code STTH8L06DI to STTH8L06DIRG. |
| 07-Feb-2012 | 6        | Added I <sub>RM</sub> to <a href="#">Table 4</a> .                                                                               |

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