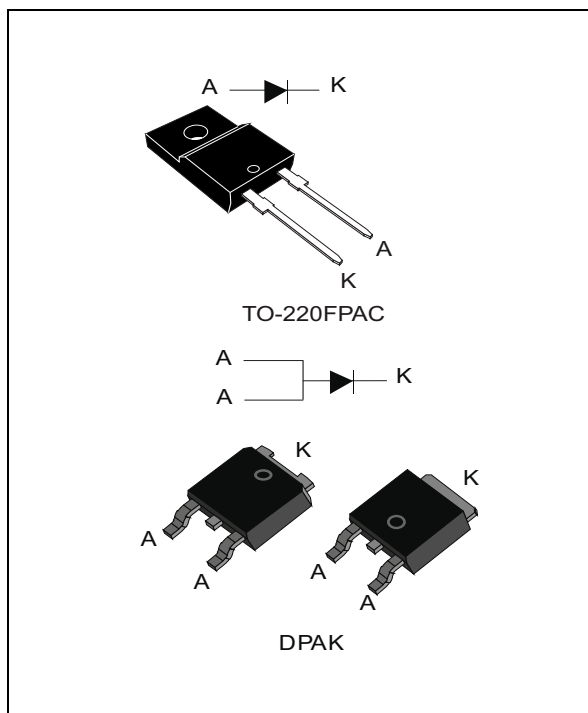


## Turbo 2 ultrafast - high voltage rectifier for flat panel displays

Datasheet - production data



### Description

The STTH10LCD06 uses ST Turbo 2 technology. This device is suited for power applications in flat panel displays and especially applicable to switching power supplies in LCD.

Table 1. Device summary

| Symbol         | Value  |
|----------------|--------|
| $I_{F(AV)}$    | 10 A   |
| $V_{RRM}$      | 600 V  |
| $T_j(max)$     | 175 °C |
| $V_F (typ)$    | 1.3 V  |
| $t_{rr} (typ)$ | 35 ns  |

### Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduce conduction and switching losses
- ECOPACK<sup>®</sup>2 compliant component for DPAK on demand
- Insulated package: TO-220FPAC
  - Insulated voltage: 2000 V<sub>RMS</sub> sine

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise stated)**

| Symbol       | Parameter                                             |                                  | Value        | Unit |
|--------------|-------------------------------------------------------|----------------------------------|--------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage                       |                                  | 600          | V    |
| $I_{F(RMS)}$ | RMS forward current                                   | DPAK                             | 18           | A    |
|              |                                                       | TO-220FPAC                       | 35           |      |
| $I_{F(AV)}$  | Average forward current, $\delta = 0.5$ , square wave | DPAK                             | 10           | A    |
|              |                                                       | TO-220FPAC                       |              |      |
|              |                                                       | $T_c = 105^\circ \text{C}$       |              |      |
|              |                                                       | $T_c = 55^\circ \text{C}$        |              |      |
| $I_{FSM}$    | Surge non repetitive forward current                  | $t_p = 10 \text{ ms}$ Sinusoidal | 100          | A    |
| $T_{stg}$    | Storage temperature range                             |                                  | -65 to + 175 | °C   |
| $T_j$        | Maximum operating junction temperature <sup>(1)</sup> |                                  | 175          | °C   |

1.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistance**

| Symbol        | Parameter        |            | Value | Unit |
|---------------|------------------|------------|-------|------|
| $R_{th(j-c)}$ | Junction to case | DPAK       | 3.5   | °C/W |
|               |                  | TO-220FPAC | 6     |      |

**Table 4. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions            |                      | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|----------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ \text{C}$  | $V_R = V_{RRM}$      |      |      | 5    | $\mu\text{A}$ |
|             |                         | $T_j = 150^\circ \text{C}$ |                      |      | 13   | 130  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25^\circ \text{C}$  | $I_F = 10 \text{ A}$ |      |      | 2    | V             |
|             |                         | $T_j = 150^\circ \text{C}$ |                      |      | 1.3  | 1.6  |               |

1. Pulse test:  $t_p = 5 \text{ ms}$ ,  $\delta < 2\%$   
 2. Pulse test:  $t_p = 380 \mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 1.20 \times I_{F(AV)} + 0.040 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

| Symbol   | Parameter                | Test conditions                                                                                                                   | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $I_F = 1\text{ A}$ , $dI_F/dt = -50\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$             |      | 35   | 50   | ns   |
| $I_{RM}$ | Reverse recovery current | $I_F = 10\text{ A}$ , $dI_F/dt = -50\text{ A}/\mu\text{s}$ ,<br>$V_R = 400\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$          |      | 2.0  | 2.8  | A    |
| $t_{fr}$ | Forward recovery time    | $I_F = 10\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25\text{ }^\circ\text{C}$ |      |      | 230  | ns   |
| $V_{FP}$ | Forward recovery voltage | $I_F = 10\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25\text{ }^\circ\text{C}$ |      | 4    |      | V    |

Figure 1. Conduction losses versus average current

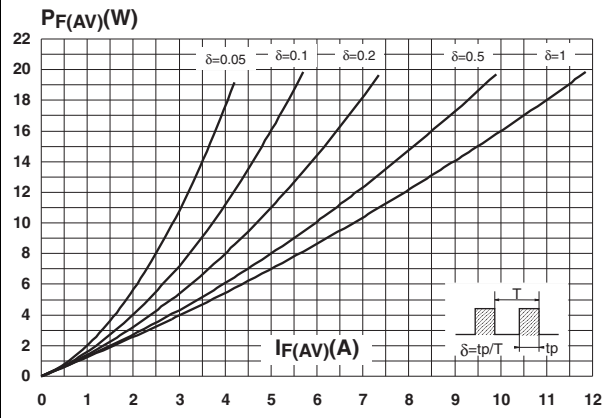


Figure 2. Forward voltage drop versus forward current

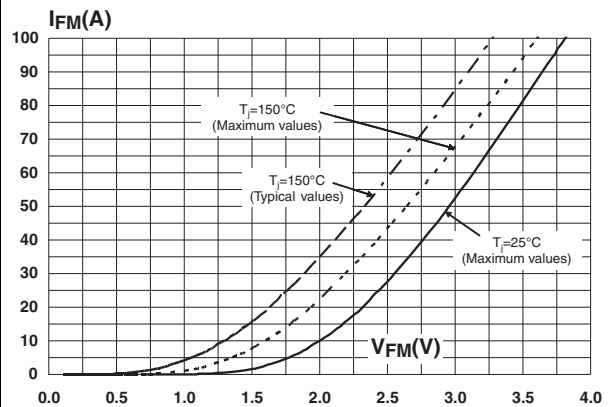


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (DPAK)

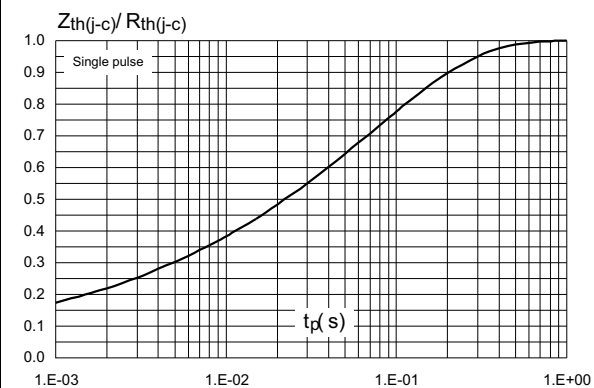
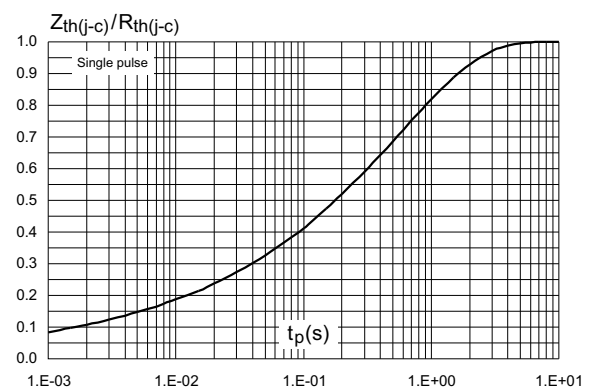
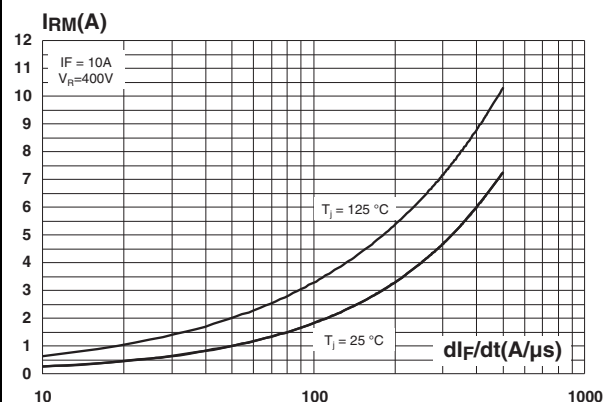


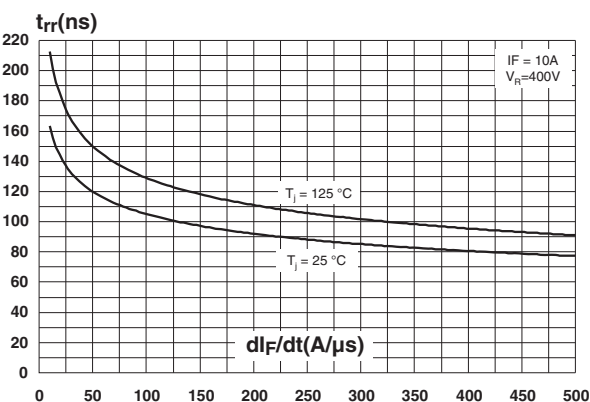
Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)



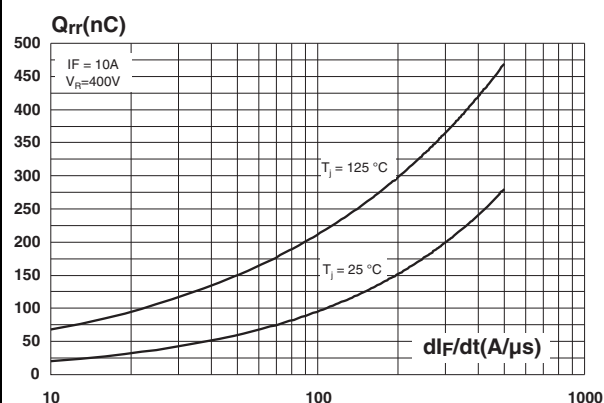
**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



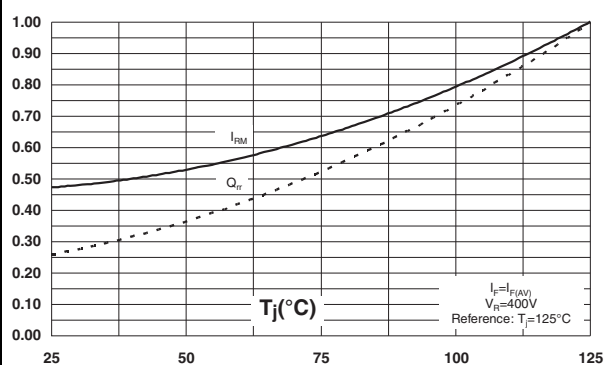
**Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values)**



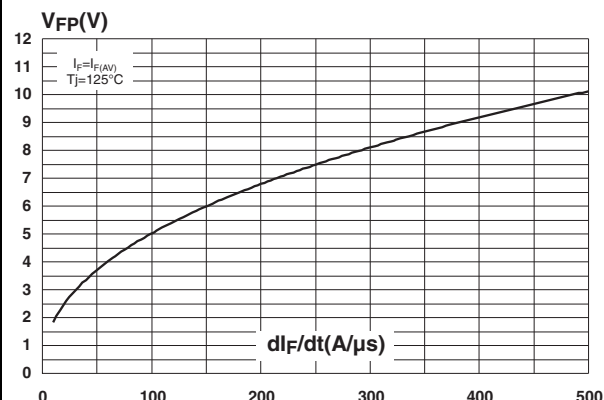
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



**Figure 8. Relative variations of dynamic parameters versus junction temperature**



**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



**Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)**

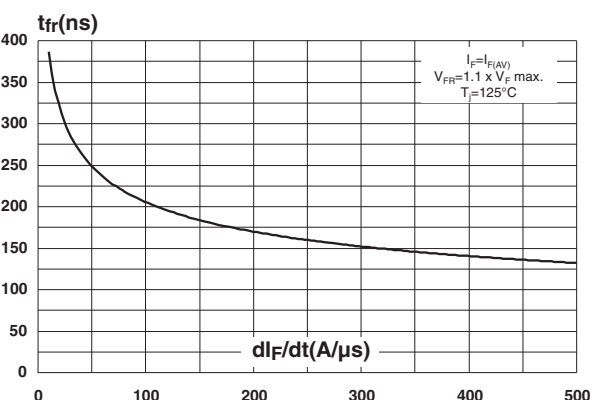
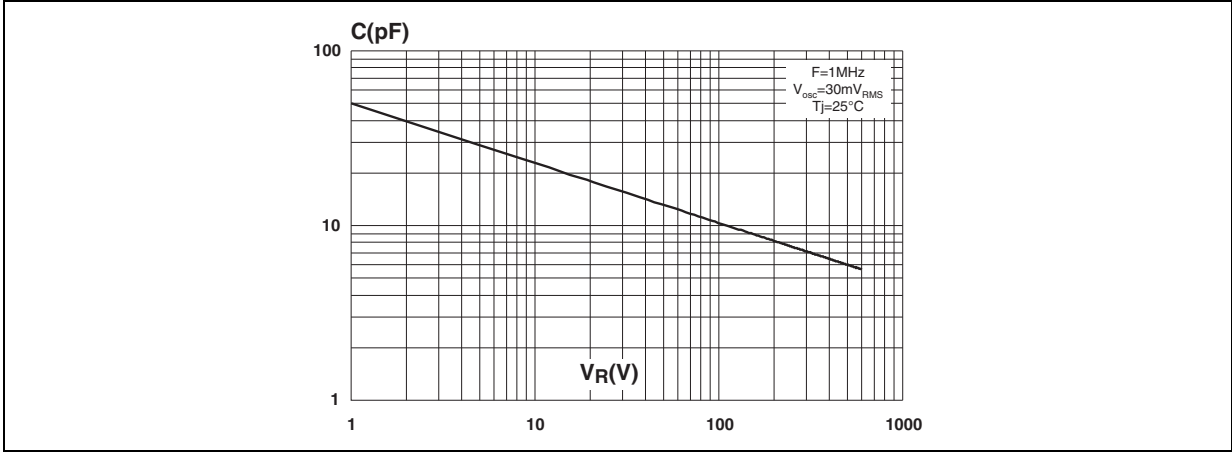


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



## 2 Package information

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

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](http://www.st.com). ECOPACK® is an ST trademark.

### 2.1 TO-220FPAC package information

Figure 12. TO-220FPAC package outline

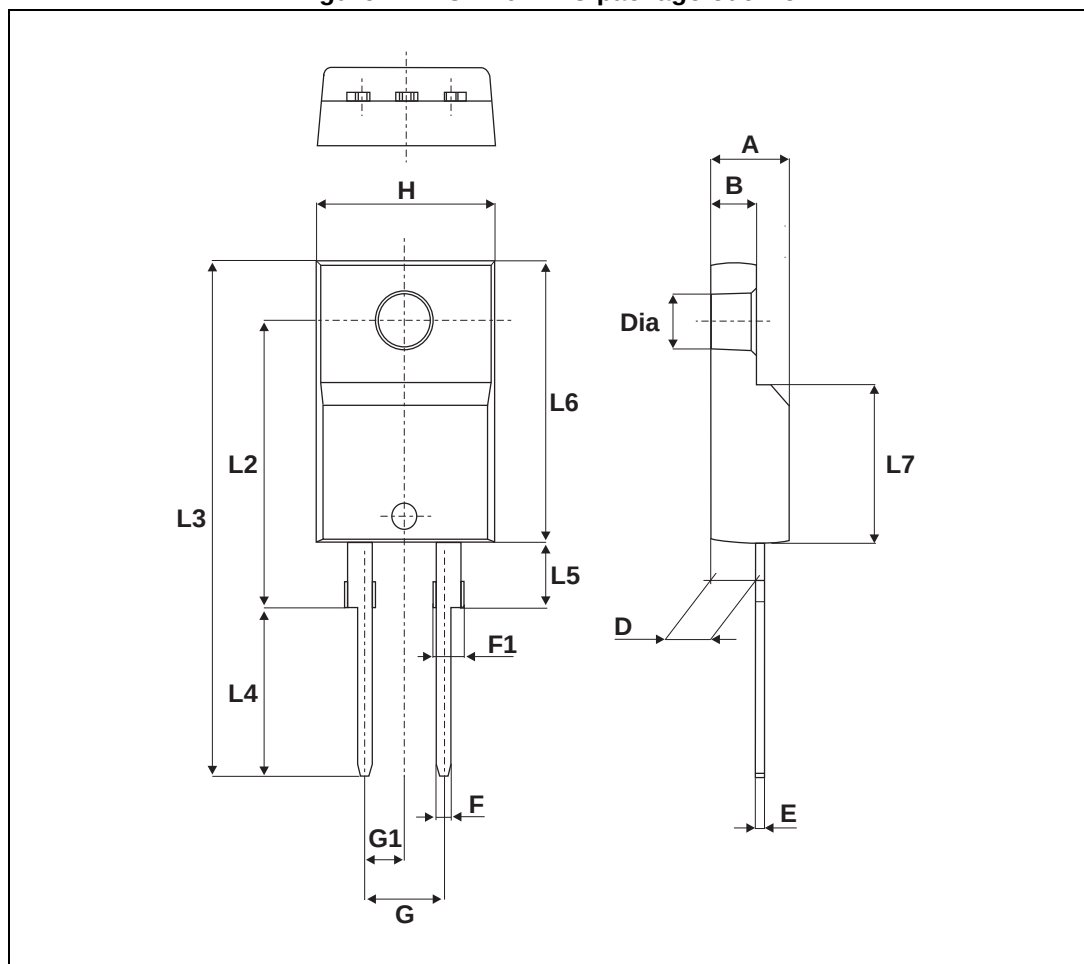
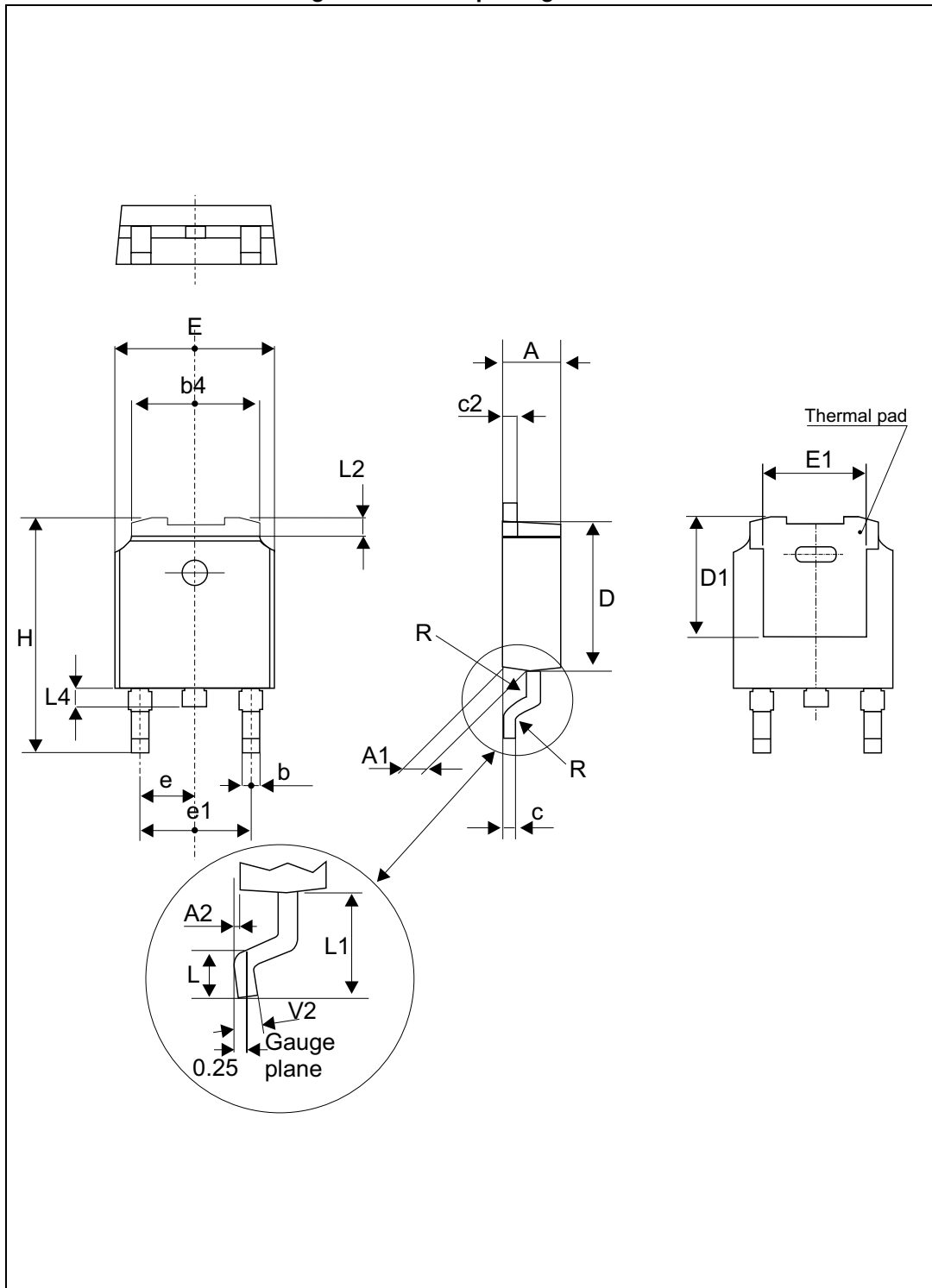


Table 6. TO-220FPAC package mechanical data

| Ref. | Dimensions  |            |       |        |            |       |
|------|-------------|------------|-------|--------|------------|-------|
|      | Millimeters |            |       | Inches |            |       |
|      | Min.        | Typ.       | Max.  | Min.   | Typ.       | Max.  |
| A    | 4.40        |            | 4.60  | 0.173  |            | 0.181 |
| B    | 2.50        |            | 2.70  | 0.098  |            | 0.106 |
| D    | 2.50        |            | 2.75  | 0.098  |            | 0.108 |
| E    | 0.45        |            | 0.70  | 0.018  |            | 0.027 |
| F    | 0.75        |            | 1.00  | 0.030  |            | 0.039 |
| F1   | 1.15        |            | 1.70  | 0.045  |            | 0.067 |
| G    | 4.95        |            | 5.20  | 0.195  |            | 0.205 |
| G1   | 2.40        |            | 2.70  | 0.094  |            | 0.106 |
| H    | 10.00       |            | 10.40 | 0.393  |            | 0.409 |
| L2   |             | 16.00 Typ. |       |        | 0.630 Typ. |       |
| L3   | 28.60       |            | 30.60 | 1.126  |            | 1.205 |
| L4   | 9.80        |            | 10.60 | 0.386  |            | 0.417 |
| L6   | 15.90       |            | 16.40 | 0.626  |            | 0.646 |
| L7   | 9.00        |            | 9.30  | 0.354  |            | 0.366 |
| Dia. | 3.00        |            | 3.20  | 0.118  |            | 0.126 |

## 2.2 DPAK package information

Figure 13. DPAK package outline



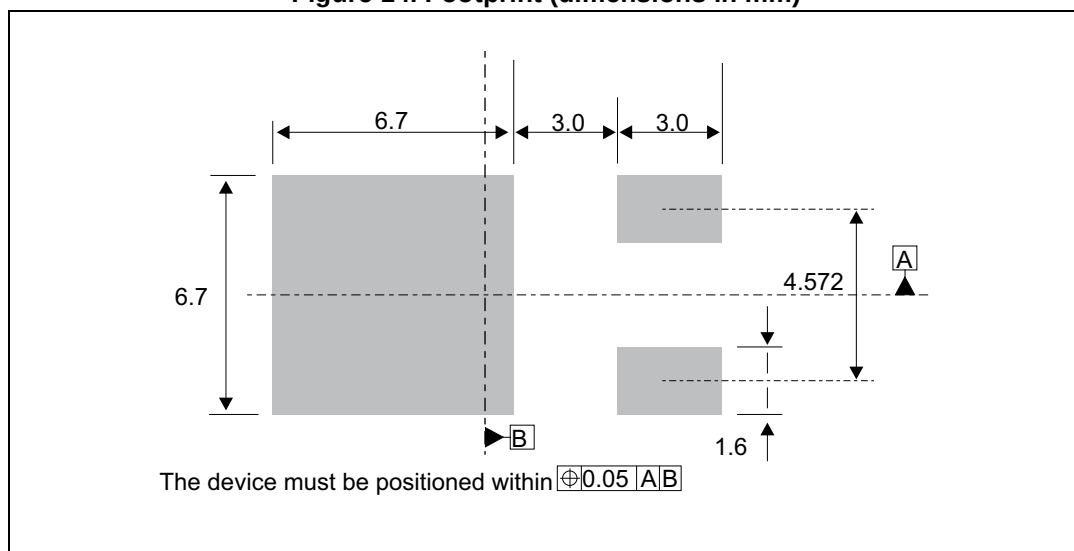
**Note:** This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.



Table 7. DPAK package mechanical data

| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 2.18        |      | 2.40  | 0.085  |       | 0.094 |
| A1   | 0.90        |      | 1.10  | 0.035  |       | 0.043 |
| A2   | 0.03        |      | 0.23  | 0.001  |       | 0.009 |
| b    | 0.64        |      | 0.90  | 0.025  |       | 0.035 |
| b4   | 4.95        |      | 5.46  | 0.194  |       | 0.214 |
| c    | 0.46        |      | 0.61  | 0.018  |       | 0.024 |
| c2   | 0.46        |      | 0.60  | 0.018  |       | 0.023 |
| D    | 5.97        |      | 6.22  | 0.235  |       | 0.244 |
| D1   | 4.95        |      |       | 0.194  |       |       |
| E    | 6.35        |      | 6.73  | 0.250  |       | 0.264 |
| E1   | 4.32        |      |       | 0.170  |       |       |
| e    |             | 2.28 |       |        | 0.090 |       |
| e1   | 4.40        |      | 4.70  | 0.173  |       | 0.185 |
| H    | 9.35        |      | 10.40 | 0.368  |       | 0.409 |
| L    | 1.00        |      | 1.78  | 0.039  |       | 0.070 |
| L2   |             |      | 1.27  |        |       | 0.050 |
| L4   | 0.60        |      | 1.02  | 0.023  |       | 0.040 |
| V2   | -8°         |      | +8°   | -8°    |       | 8°    |

Figure 14. Footprint (dimensions in mm)



### 3 Ordering information

**Table 8. Ordering information**

| Order code       | Marking       | Package    | Weight | Base qty | Delivery mode |
|------------------|---------------|------------|--------|----------|---------------|
| STTH10LCD06FP    | STTH10LCD06FP | TO-220FPAC | 1.9 g  | 50       | Tube          |
| STTH10LCD06SB-TR | TH10LCD06S    | DPAK       | 1.8 g  | 2500     | Tape and reel |

### 4 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes                                                                                                                              |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------|
| 14-May-2008 | 1        | First issue.                                                                                                                         |
| 23-Oct-2008 | 2        | Updated DPAK package information and reformatted to current standard.                                                                |
| 13-Nov-2015 | 3        | Removed TO-220FPAC and D <sup>2</sup> PAK package information. Updated DPAK package information and reformatted to current standard. |

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