

# 1 Characteristics

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

| Symbol              | Parameter                                         |                                      |                  | Value       | Unit |
|---------------------|---------------------------------------------------|--------------------------------------|------------------|-------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                   |                                      |                  | 600         | V    |
| I <sub>F(RMS)</sub> | RMS forward current                               |                                      | TO-220AC         | 20          | A    |
|                     |                                                   |                                      | DPAK             | 10          | A    |
| I <sub>F(AV)</sub>  | Average forward current,<br>δ = 0.5, square wave. | T <sub>c</sub> = 145° C              | TO-220AC<br>DPAK | 5           | A    |
| I <sub>FSM</sub>    | Surge non repetitive forward current              | t <sub>p</sub> = 10 ms<br>Sinusoidal | TO-220AC         | 70          | A    |
|                     |                                                   |                                      | DPAK             | 55          | A    |
| T <sub>stg</sub>    | Storage temperature range                         |                                      |                  | -65 to +175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature            |                                      |                  | 175         | °C   |

**Table 3. Thermal parameters**

| Symbol        | Parameter        | Max. value | Unit |
|---------------|------------------|------------|------|
| $R_{th(j-c)}$ | Junction to case | 3.5        | °C/W |

**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    | $T_j = 25^\circ \text{C}$  | $I_F = 5 \text{ A}$ | -    |      | 1.85 | V             |
|             |                         | $T_j = 150^\circ \text{C}$ |                     | -    | 1.10 | 1.40 |               |

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

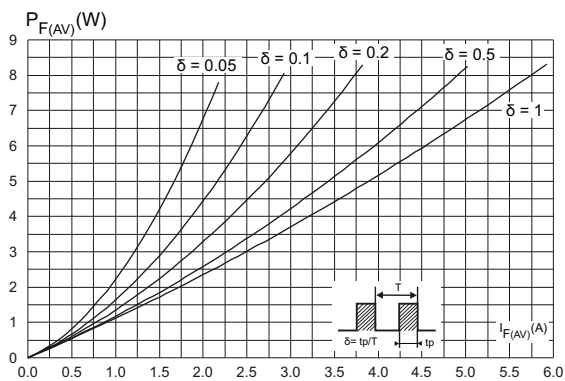
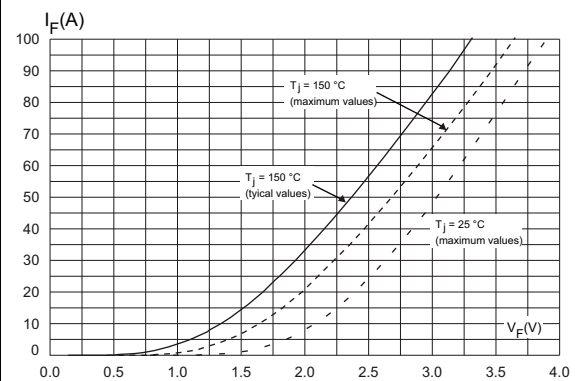
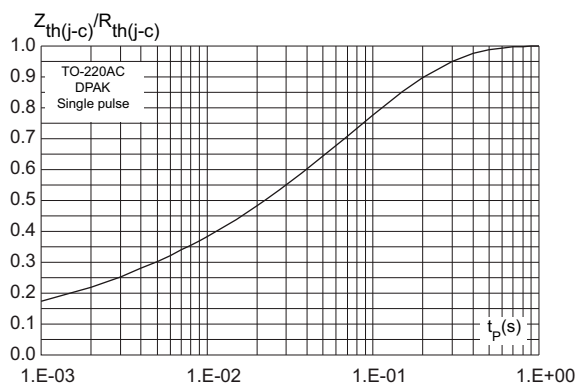
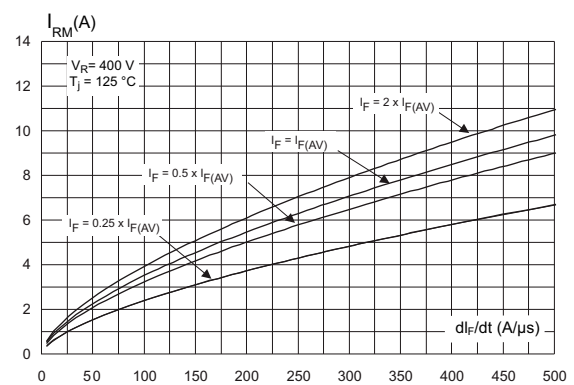
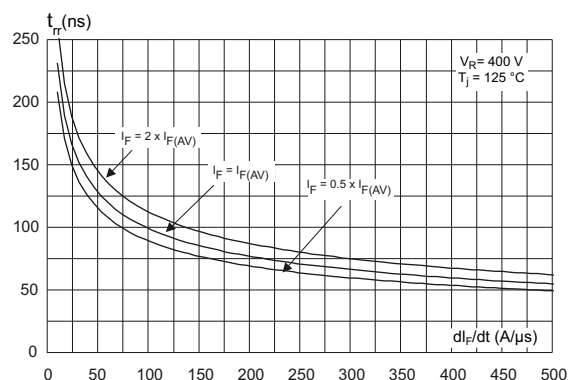
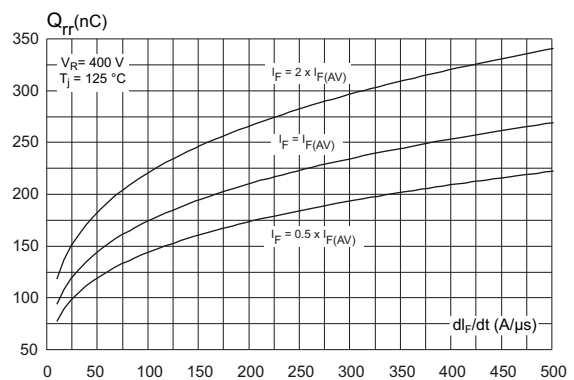
2. Pulse test:  $t_p = 380 \mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

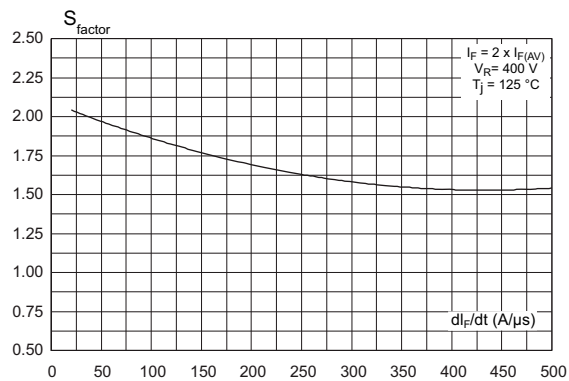
$$P = 1.07 \times I_{F(AV)} + 0.066 \times I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

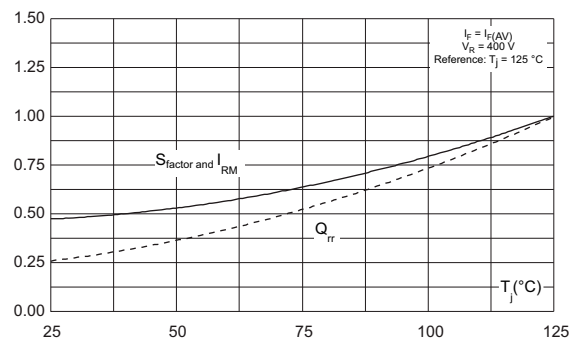
| Symbol   | Parameter                | Test conditions            |                                                                                                | Min. | Typ | Max. | Unit |
|----------|--------------------------|----------------------------|------------------------------------------------------------------------------------------------|------|-----|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25^\circ \text{C}$  | $I_F = 0.5 \text{ A}$<br>$I_{rr} = 0.25 \text{ A}$<br>$I_R = 1 \text{ A}$                      | -    |     | 30   | ns   |
|          |                          |                            | $I_F = 1 \text{ A}$<br>$V_R = 30 \text{ V}$<br>$dl_F/dt = -50 \text{ A}/\mu\text{s}$           | -    | 35  | 50   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125^\circ \text{C}$ | $I_F = 5 \text{ A}$<br>$V_R = 400 \text{ V}$<br>$dl_F/dt = -100 \text{ A}/\mu\text{s}$         | -    | 3.5 | 5    | A    |
| $Q_{rr}$ | Reverse recovery charges |                            |                                                                                                | -    | 175 |      | nC   |
| $t_{fr}$ | Forward recovery time    | $T_j = 25^\circ \text{C}$  | $I_F = 5 \text{ A}$<br>$V_{FR} = 1.1 \times V_{Fmax}$<br>$dl_F/dt = 100 \text{ A}/\mu\text{s}$ | -    |     | 180  | ns   |
| $V_{FP}$ | Forward recovery voltage |                            |                                                                                                | -    | 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****Figure 4. Peak reverse recovery current versus  $dI_F/dt$  (typical values)****Figure 5. Reverse recovery time versus  $dI_F/dt$  (typical values)****Figure 6. Reverse recovery charges versus  $dI_F/dt$  (typical values)**

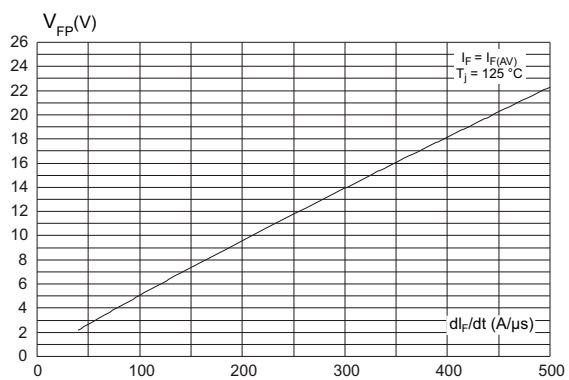
**Figure 7. Softness factor versus  $dl_F/dt$  (typical values)**



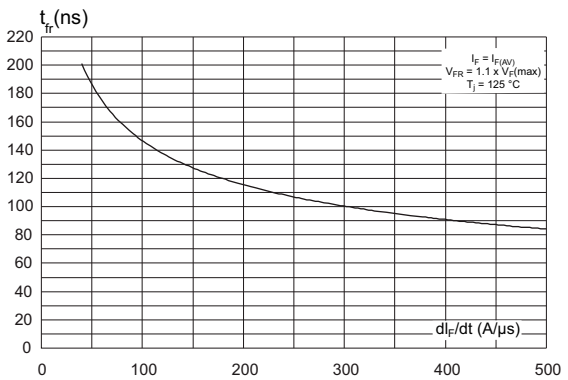
**Figure 8. Relative variations of dynamic parameters versus junction temperature**



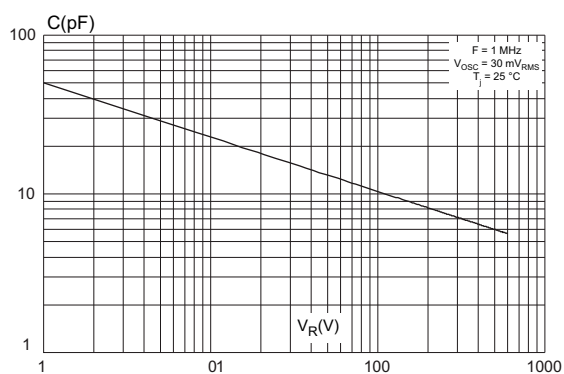
**Figure 9. Transient peak forward voltage versus  $dl_F/dt$  (typical values)**



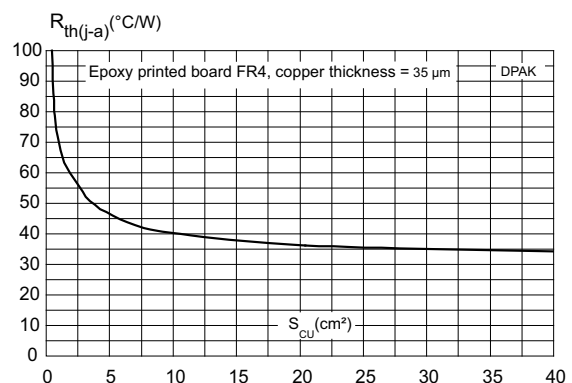
**Figure 10. Forward recovery time versus  $dl_F/dt$  (typical values)**



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



**Figure 12. Thermal resistance junction to ambient versus copper surface under tab**



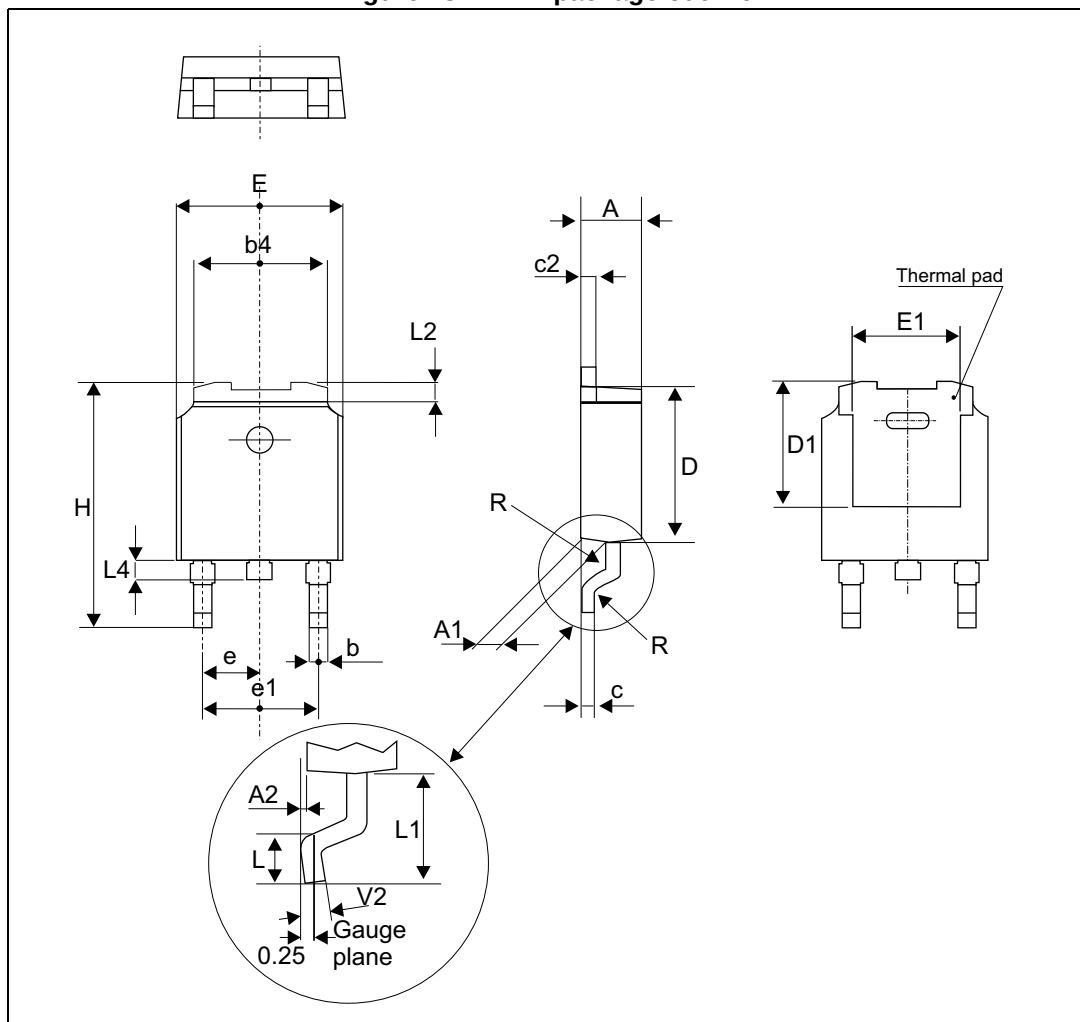
## 2 Package Information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm for TO-220AC
- Maximum torque value: 0.7 Nm for TO-220AC

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### 2.1 DPAK package information

Figure 13. DPAK package outline

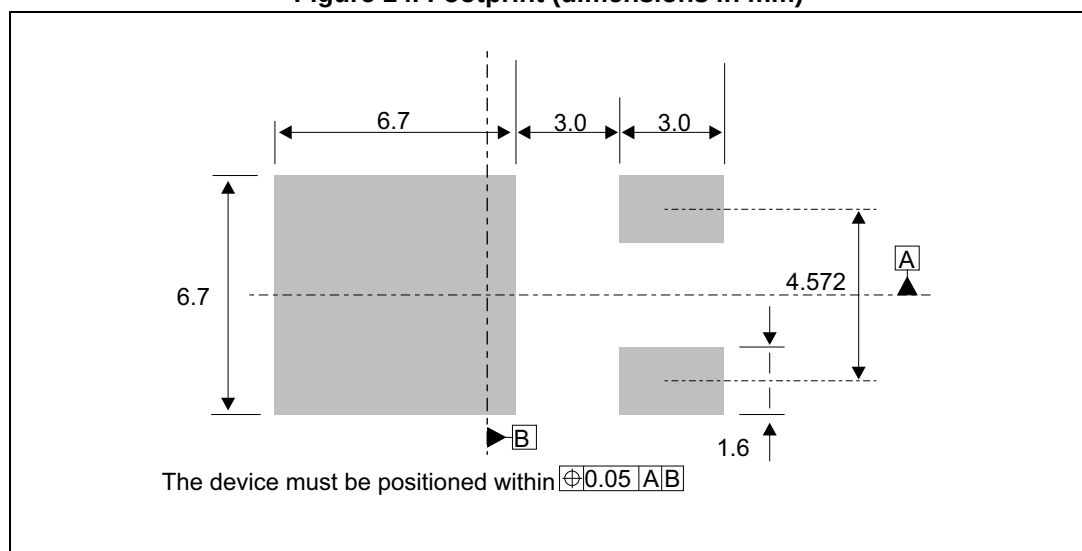


**Note:** This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. 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        |      | 5.60  | 0.194  |       | 0.220 |
| E    | 6.35        |      | 6.73  | 0.250  |       | 0.264 |
| E1   | 4.32        |      | 5.50  | 0.170  |       | 0.216 |
| 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)



## 2.2 TO-220AC package information

Figure 15. TO-220AC package outline

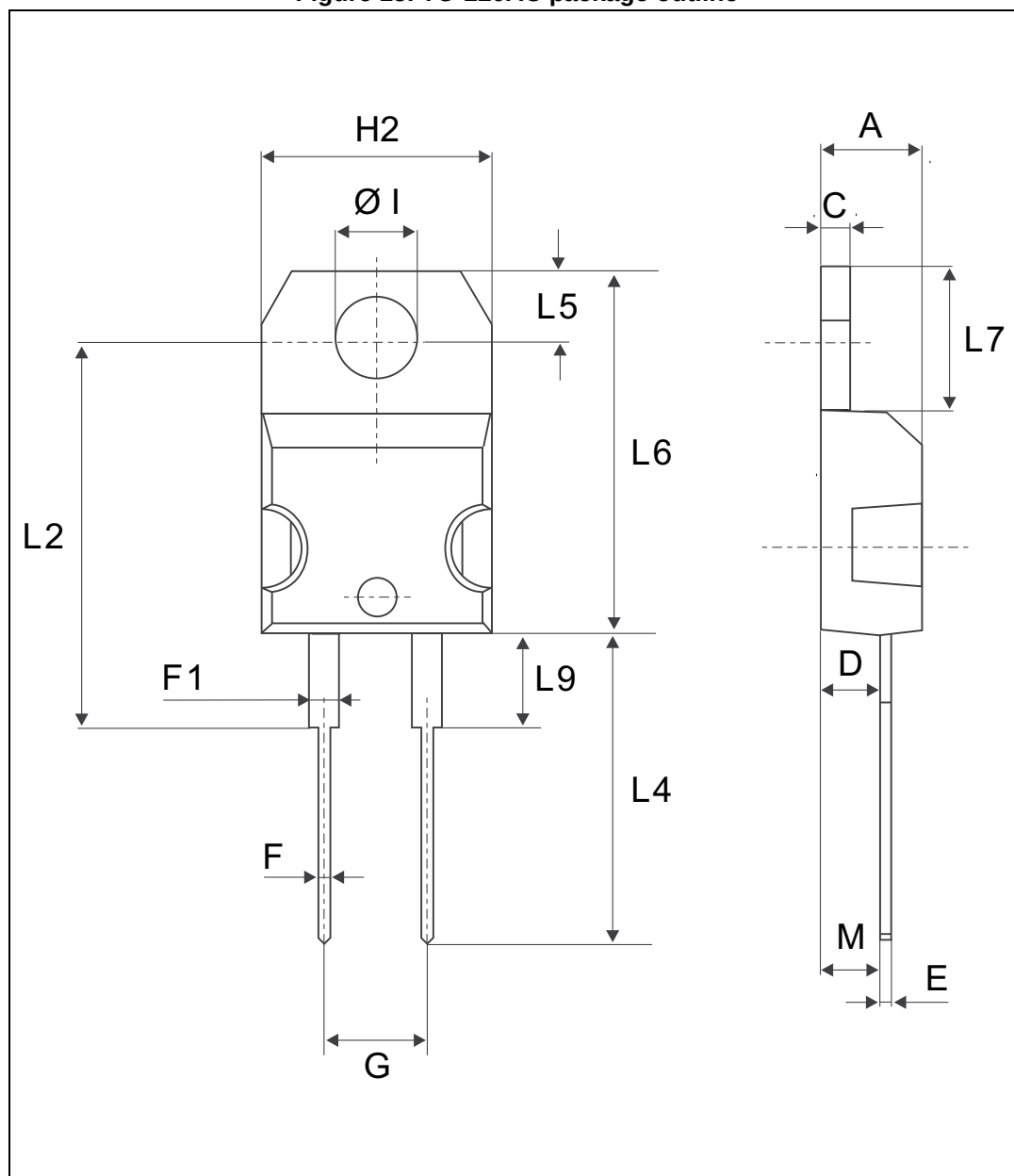


Table 7. TO-220AC package mechanical data

| 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 |

### 3 Ordering Information

**Table 8. Ordering information**

| Order code  | Marking   | Package  | Weight | Base qty | Delivery mode |
|-------------|-----------|----------|--------|----------|---------------|
| STTH506B-TR | STTH 506B | DPAK     | 0.30 g | 2500     | Tape and reel |
| STTH506B    | STTH 506B | DPAK     | 0.30 g | 75       | Tube          |
| STTH506D    | STTH506D  | TO-220AC | 1.86 g | 50       | Tube          |

### 4 Revision history

**Table 9. Document revision history**

| Date        | Revision | Description of Changes                                                |
|-------------|----------|-----------------------------------------------------------------------|
| 14-Oct-2008 | 1        | First issue.                                                          |
| 08-Aug-2014 | 2        | Updated DPAK package information and removed TO-220AB package.        |
| 26-Nov-2014 | 3        | Updated Figure 13 and Figure 14.                                      |
| 03-Nov-2016 | 4        | Updated DPAK package information and reformatted to current standard. |

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