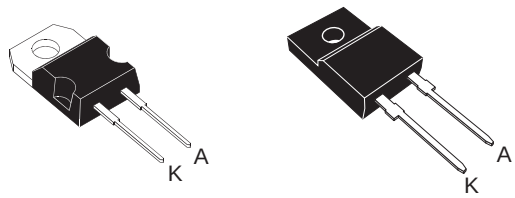
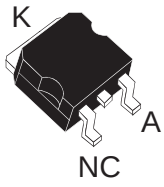
# STTH15L06

## Turbo 2 ultrafast high voltage rectifier

**Datasheet - production data**




**TO-220AC** **TO-220FPAC**




**D²PAK**

## Description

The STTH15L06, which is using ST Turbo 2 600 V technology, is specially suited for use in switching power supplies, and industrial applications, as rectification and discontinuous mode PFC boost diode.

**Table 1. Device summary**

| Symbol | Value |
|---|---|
| $I_{F(AV)}$ | Up to 20 A |
| $V_{RRM}$ | 600 V |
| $T_j$ | 175 °C |
| $V_F$ (typ) | 0.95 V |
| $t_{rr}$ (max) | 55 ns |

## Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching and conduction losses
- Low thermal resistance

# 1 Characteristics

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

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage | | | 600 | V |
| $I_{F(RMS)}$ | Forward rms current | | | 30 | A |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ | TO-220AC / $D^2PAK$ | $T_c$ = 140 °C<br>$T_c$ = 120 °C | 15<br>20 | A |
| | | TO-220FPAC | $T_c$ = 90 °C | 15 | |
| $I_{FSM}$ | Surge non repetitive forward current | $t_p$ = 10 ms sinusoidal | | 200 | A |
| $T_{stg}$ | Storage temperature range | | | -65 to + 175 | °C |
| $T_j$ | Maximum operating junction temperature | | | 175 | °C |

**Table 3. Thermal parameter**

| Symbol | Parameter | | Maximum | Unit |
|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / $D^2PAK$ | 1.7 | °C/W |
| | | TO-220FPAC | 4.0 | |

**Table 4. Static electrical characteristics**

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_R$(1) | Reverse leakage current | $T_j$ = 25 °C | $V_R = V_{RRM}$ | | | 15 | µA |
| | | $T_j$ = 150 °C | | | 40 | 400 | |
| $V_F$(2) | Forward voltage drop | $T_j$ = 25 °C | $I_F$ = 15 A | | | 1.55 | V |
| | | $T_j$ = 150 °C | | | 0.95 | 1.2 | |

1. Pulse test: $t_p$ = 5 ms, $\delta$ < 2 %
2. Pulse test: $t_p$ = 380 µs, $\delta$ < 2 %

To evaluate the maximum conduction losses use the following equation:
$P = 0.94 \times I_{F(AV)} + 0.017\ I_F{}^2{}_{(RMS)}$

**Table 5. Dynamic electrical characteristics**

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $t_{rr}$ | Reverse recovery time | $T_j$ = 25 °C | $I_F$ = 0.5 A, $I_{rr}$ = 0.25 A, $I_R$ = 1 A | | | 55 | ns |
| | | | $I_F$ = 1 A, $dI_F/dt$ = 50 A/µs, $V_R$ = 30 V | | 60 | 85 | |
| $I_{RM}$ | Reverse recovery current | $T_j$ = 125 °C | $I_F$ = 15 A, $dI_F/dt$ = 100 A/µs, $V_R$ = 400 V | | 8.5 | 12 | A |
| $t_{fr}$ | Forward recovery time | $T_j$ = 25 °C | $I_F$ = 15 A, $dI_F/dt$ = 100 A/µs $V_{FR}$ = 1.1 x $V_{Fmax}$ | | | 300 | ns |
| $V_{FP}$ | Forward recovery voltage | | | | 3 | | V |

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

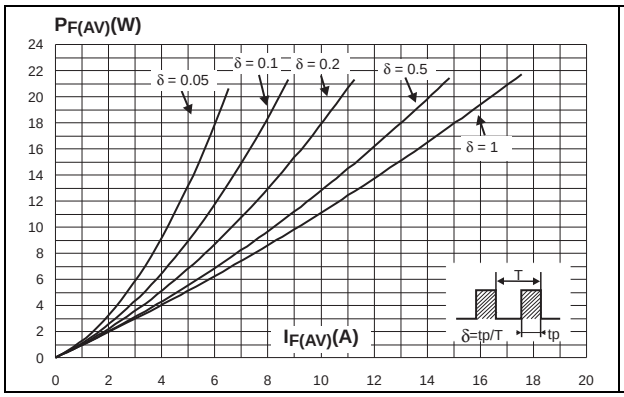



**Figure 2. Forward voltage drop versus forward current**

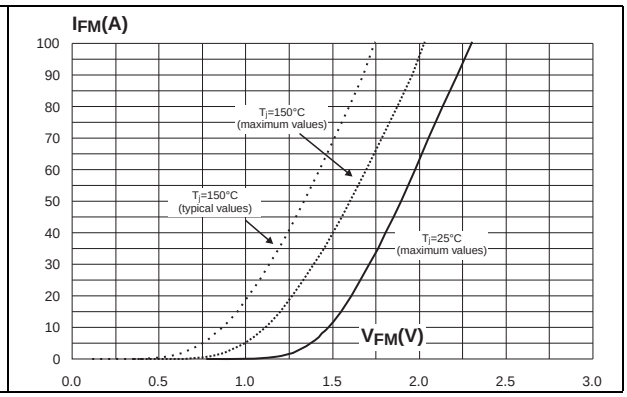



**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, D²PAK)**

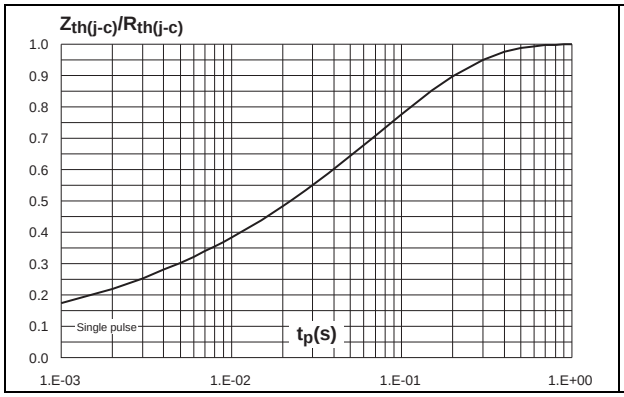



**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)**

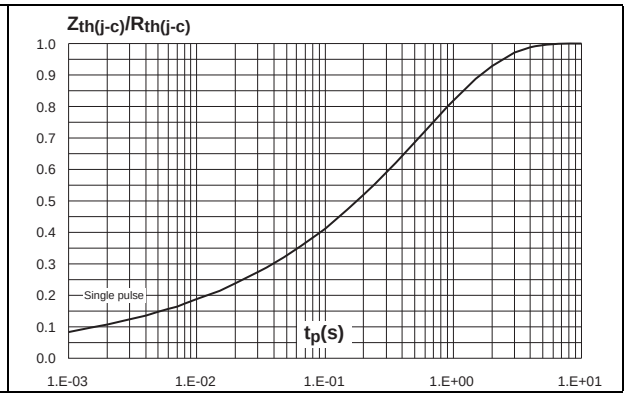


**Figure 5. Peak reverse recovery current versus $dI_F/dt$ (90 % confidence)**

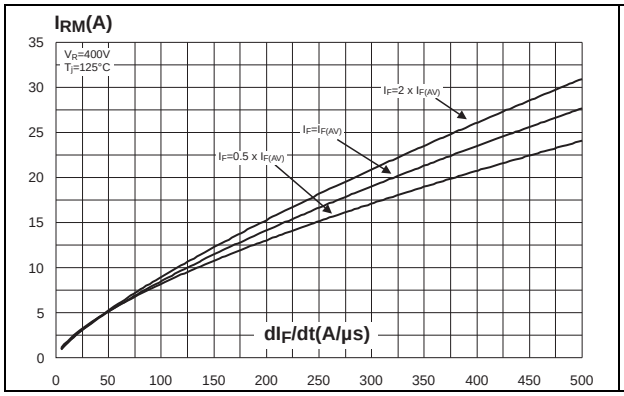



**Figure 6. Reverse recovery time versus $dI_F/dt$ (90 % confidence)**

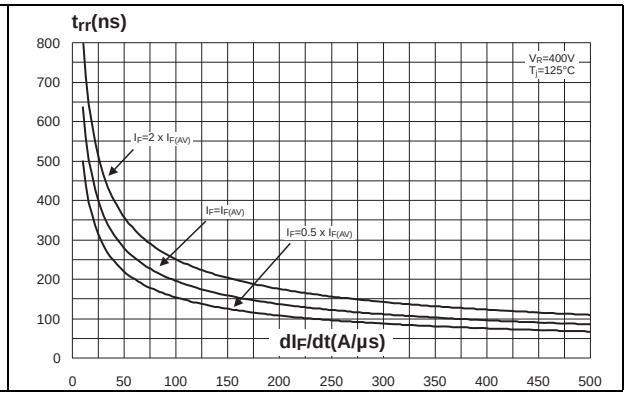



**Figure 7. Reverse recovery charges versus $dI_F/dt$ (90 % confidence)**

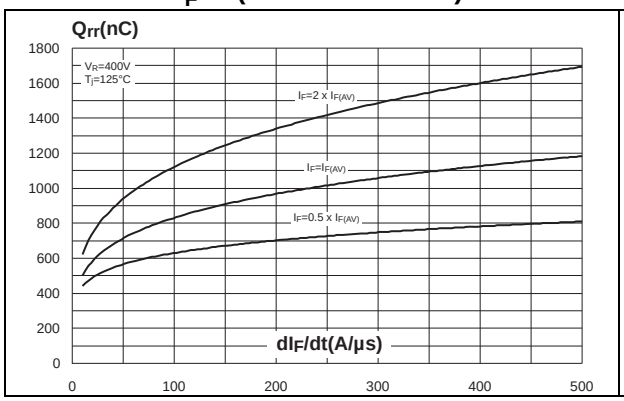



**Figure 8. Softness factor versus $dI_F/dt$ (typical values)**

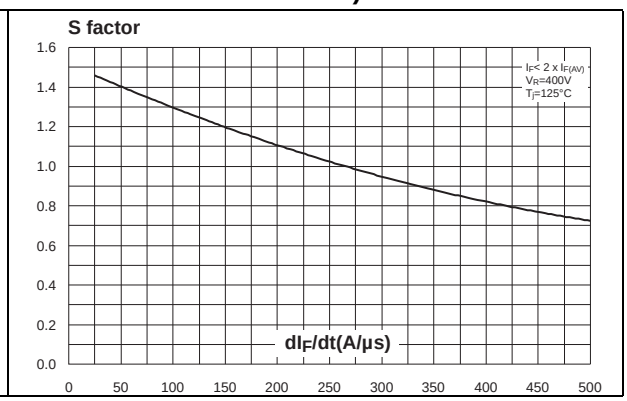



**Figure 9. Relative variations of dynamic parameters versus junction temperature**

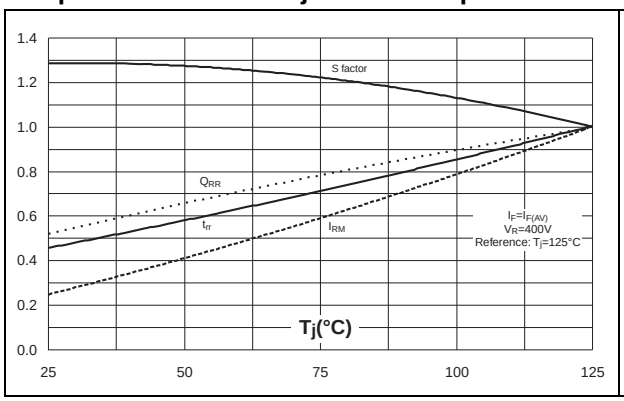



**Figure 10. Transient peak forward voltage versus $dI_F/dt$ (90 % confidence)**

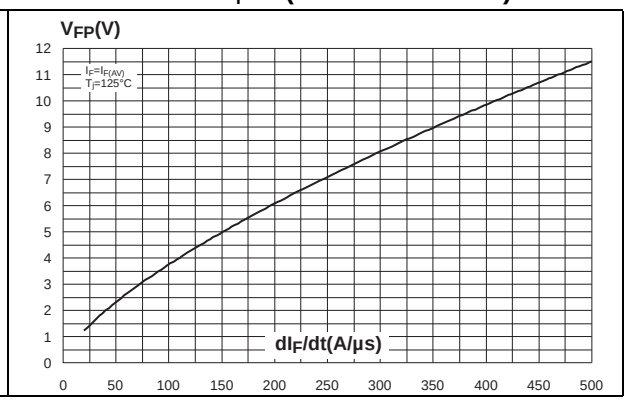


**Figure 11. Forward recovery time versus $dI_F/dt$ (90 % confidence)**

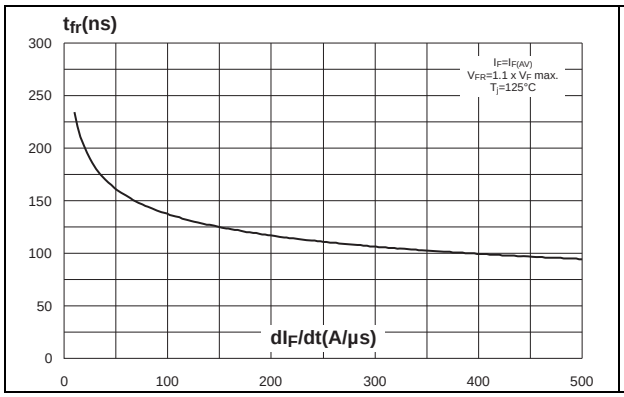



**Figure 12. Junction capacitance versus reverse voltage applied (typical values)**

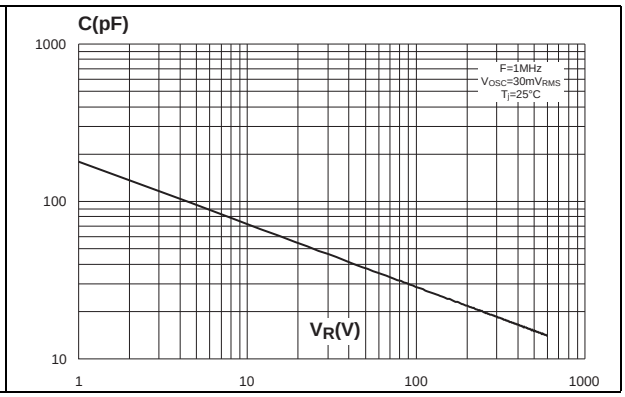
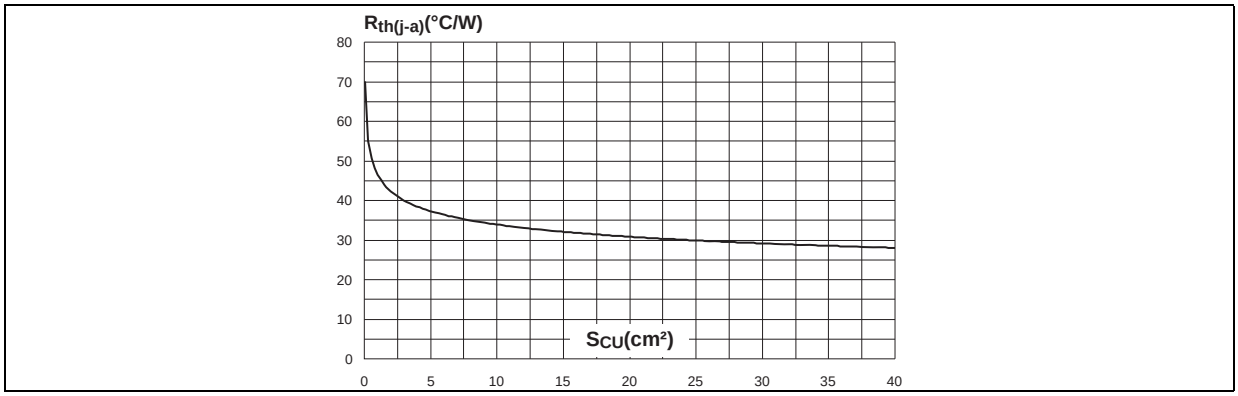



**Figure 13. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4 copper thickness = 35 µm) ($D^2PAK$)**



# 2 Package information

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

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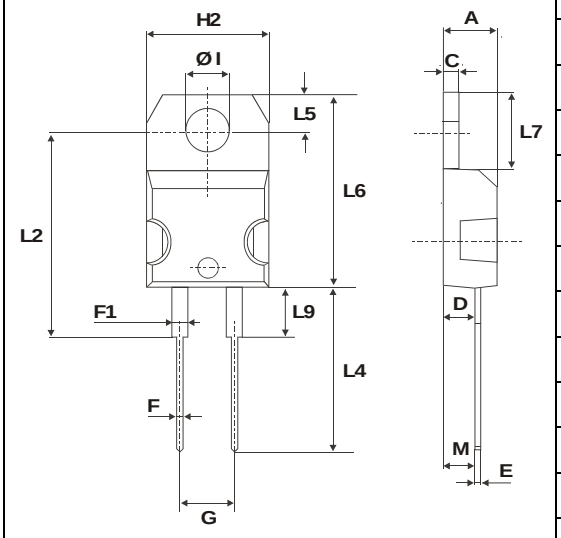
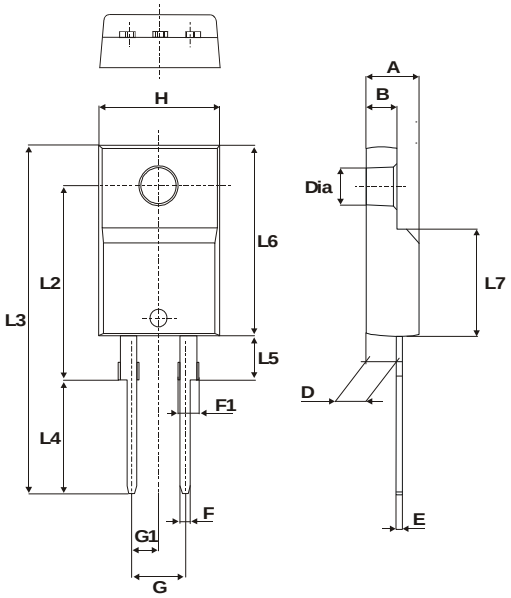
**Table 6. TO-220AC dimensions**



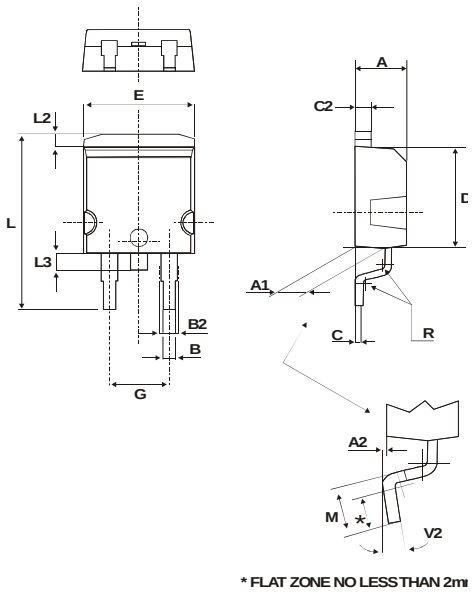

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 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. | |
| Dia. I | 3.75 | 3.85 | 0.147 | 0.151 |

**Table 7. TO-220FPAC dimensions**



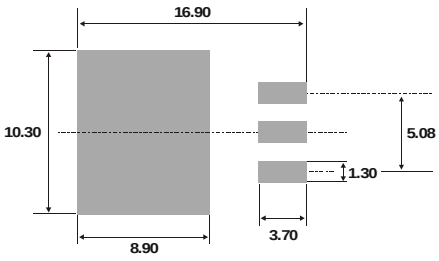

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| B | 2.5 | 2.7 | 0.098 | 0.106 |
| D | 2.5 | 2.75 | 0.098 | 0.108 |
| E | 0.45 | 0.70 | 0.018 | 0.027 |
| F | 0.75 | 1 | 0.030 | 0.039 |
| F1 | 1.15 | 1.70 | 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. D²PAK 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

**Table 9. Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| STTH15L06D | STTH15L06D | TO-220AC | 1.90 g | 50 | Tube |
| STTH15L06G | STTH15L06G | $D^2PAK$ | 1.48 g | 50 | Tube |
| STTH15L06G-TR | STTH15L06G | $D^2PAK$ | 1.48 g | 1000 | Tape and reel |
| STTH15L06FP | STTH15L06FP | TO-220FPAC | 1.70 g | 50 | Tube |

# 4 Revision history

**Table 10. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 07-Sep-2004 | 1 | First issue |
| 15-Jul-2011 | 2 | Updated $I_{FSM}$ from 130 A to 150 A. |
| 01-Apr-2014 | 3 | Updated $I_{FSM}$ from 150 A to 200 A. |

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