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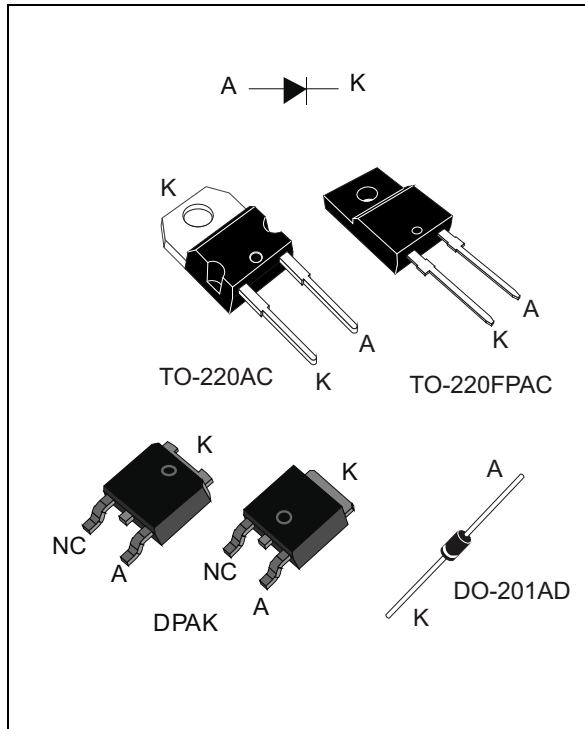
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Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



Description

The STTH5L06 is developed using ST's Turbo 2 600 V technology. It is well-suited as a boost diode, especially for use in continuous mode power factor corrections and hard switching conditions. This 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 |
|----------------|--------------------------|
| $I_{F(AV)}$ | 5 A |
| V_{RRM} | 600 V |
| $I_R(max)$ | 125 μ A/ 150 μ A |
| $T_J(max)$ | 175 °C |
| V_F (typ) | 0.85 V |
| t_{rr} (typ) | 65 ns |

Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching losses
- Low thermal resistance
- Insulated package: TO-220FPAC
 - Insulation voltage: 2000 V_{RMS} sine
- ECOPACK[®]2 compliant component for DPAK on demand

1 Characteristics

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

| Symbol | Parameter | | Value | Unit | |
|--------------|--|----------------------------------|--|------|---|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| $I_{F(RMS)}$ | Forward rms current | TO-220AC / TO-220FPAC / DO-201AD | 20 | A | |
| | | DPAK | 10 | | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$, square wave | TO-220AC / DPAK | $T_C = 150\text{ °C}$ | A | |
| | | DO-201AD | $T_I = 50\text{ °C}$ | | |
| | | TO-220FPAC | $T_C = 135\text{ °C}$ | | |
| I_{FRM} | Repetitive peak forward current | | $t_p = 5\text{ }\mu\text{s}$, $F = 5\text{ kHz}$ square | 65 | A |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms}$ sinusoidal | TO-220AC / TO-220FPAC | 90 | A |
| | | | DO-201AD | 110 | |
| | | | DPAK | 60 | |
| T_{stg} | Storage temperature range | | -65 to + 175 | °C | |
| T_j | Maximum operating junction temperature | | 175 | °C | |

Table 3. Thermal parameter

| Symbol | Parameter | | Value | Unit |
|---------------|------------------------------------|--------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / DPAK | 3.5 | °C/W |
| | | TO-220FPAC | 6 | |
| $R_{th(j-l)}$ | Junction to lead | L = 10 m, DO-201AD | 20 | |
| $R_{th(j-a)}$ | Junction to ambient ⁽¹⁾ | | 75 | |

1. With recommended pad layout (see [Figure 15](#))

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ | Max. | Unit |
|-------------|-------------------------|-----------------------|----------------------|--------------------------------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$ | $V_R = 600\text{ V}$ | | | 5 | μA |
| | | $T_j = 150\text{ °C}$ | $V_R = 600\text{ V}$ | TO-220AC TO-220FPAC DPAK | 10 | 125 | |
| | | | | DO-201AD | 25 | 150 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 5\text{ A}$ | | | 1.3 | V |
| | | $T_j = 150\text{ °C}$ | | 0.85 | 1.05 | | |

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

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

To evaluate the maximum conduction losses use the following equation:

$$P = 0.89 \times I_{F(AV)} + 0.033 I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ | Max. | Unit |
|----------|--------------------------|----------------------------------|---|------|-----|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{ A}$, $di_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | | 65 | 95 | ns |
| t_{fr} | Forward recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 5\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$ | | | 150 | ns |
| V_{FP} | Forward recovery voltage | | | | | 7 | V |

Figure 1. Conduction losses versus average current

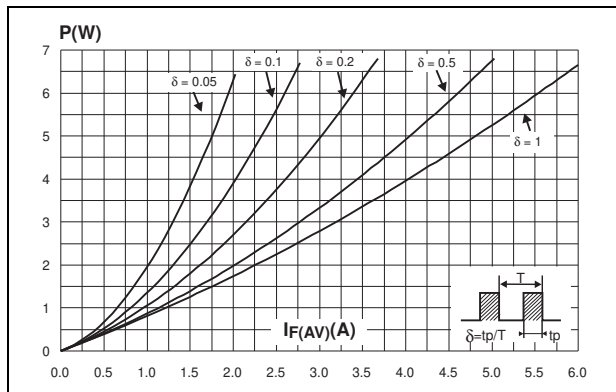


Figure 2. Forward voltage drop versus forward current

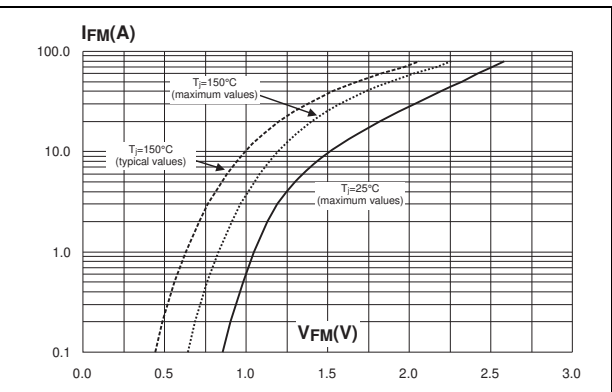


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK)

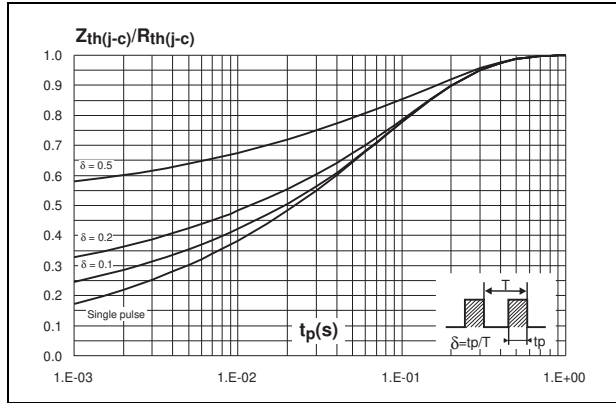


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

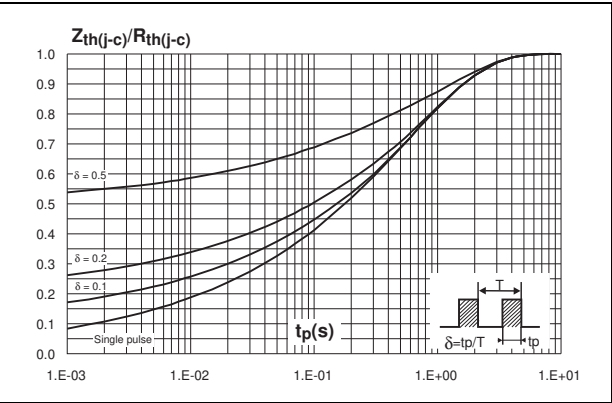


Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (DO-201AD)

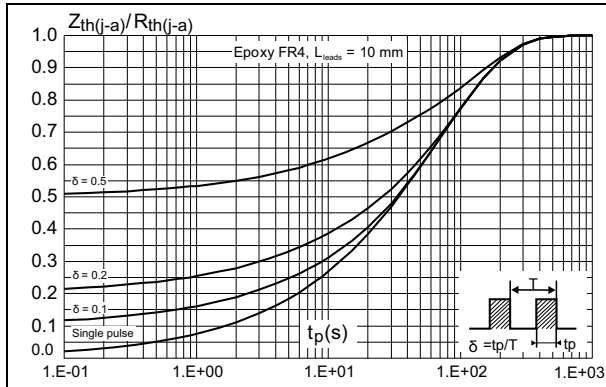


Figure 6. Peak reverse recovery current versus di_F/dt (typical values)

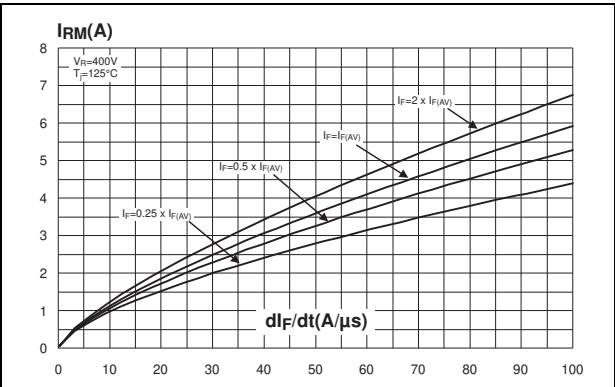


Figure 7. Reverse recovery time versus di_F/dt (typical values)

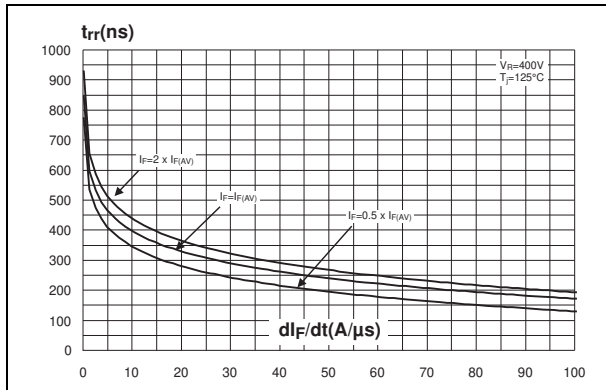


Figure 8. Reverse recovery charges versus di_F/dt (typical values)

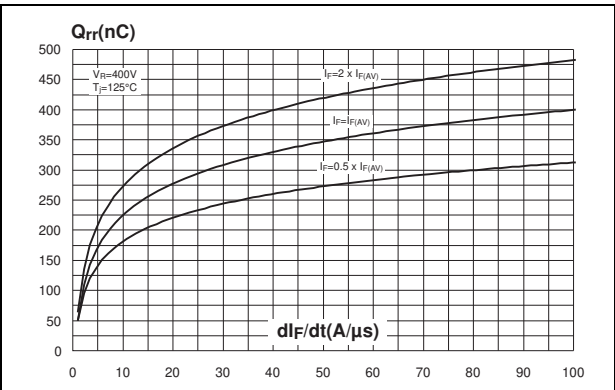


Figure 9. Softness factor versus di_F/dt (typical values)

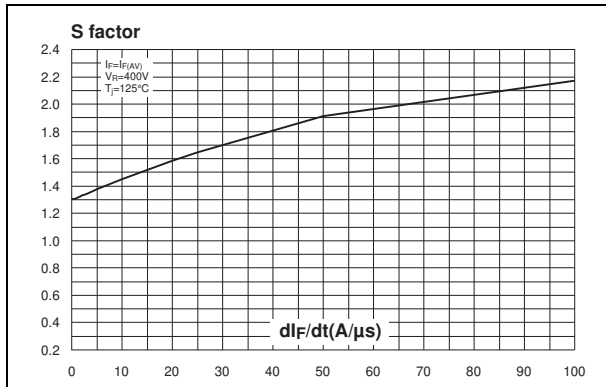


Figure 10. Relative variations of dynamic parameters versus junction temperature

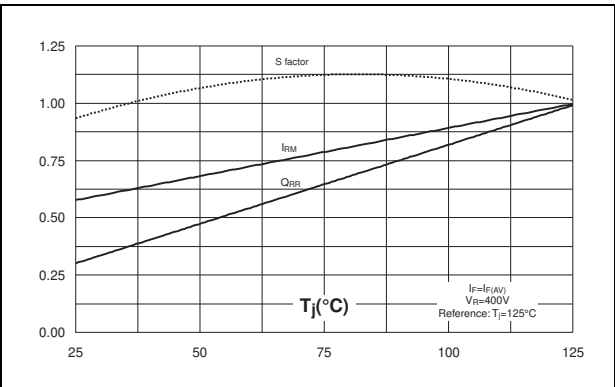


Figure 11. Transient peak forward voltage versus di_F/dt (typical values)

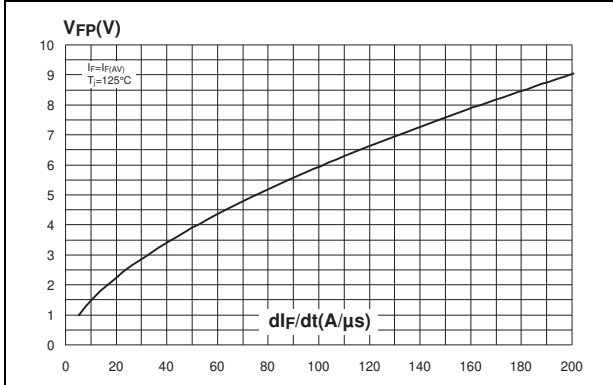


Figure 12. Forward recovery time versus di_F/dt (typical values)

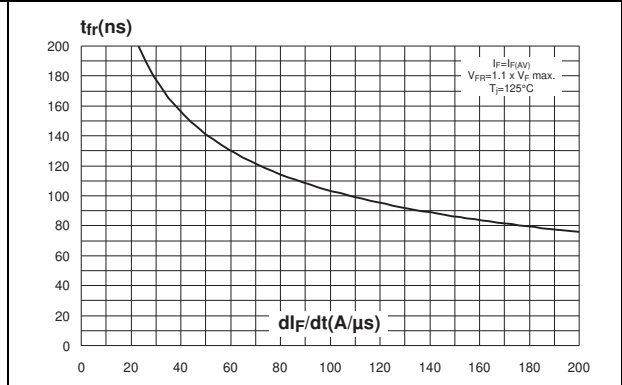


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

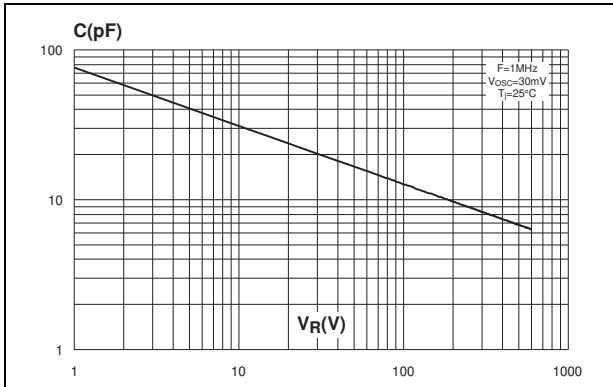


Figure 14. Thermal resistance junction to ambient versus copper surface under tab

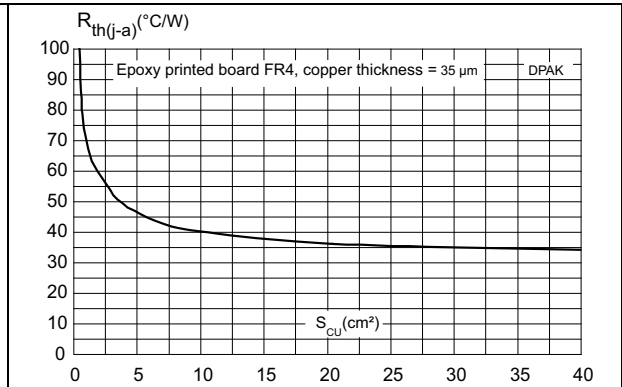
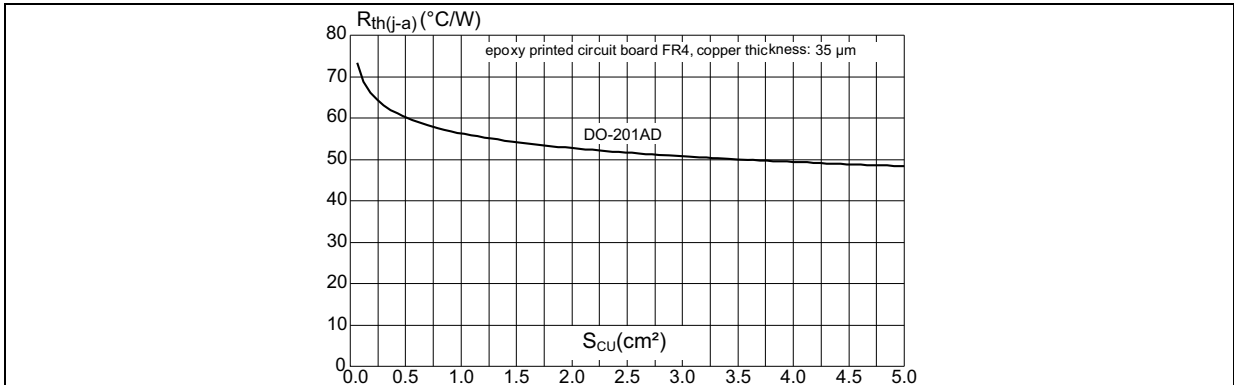


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead



2 Package information

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

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. ECOPACK® is an ST trademark.

Figure 16. TO-220AC dimension definitions

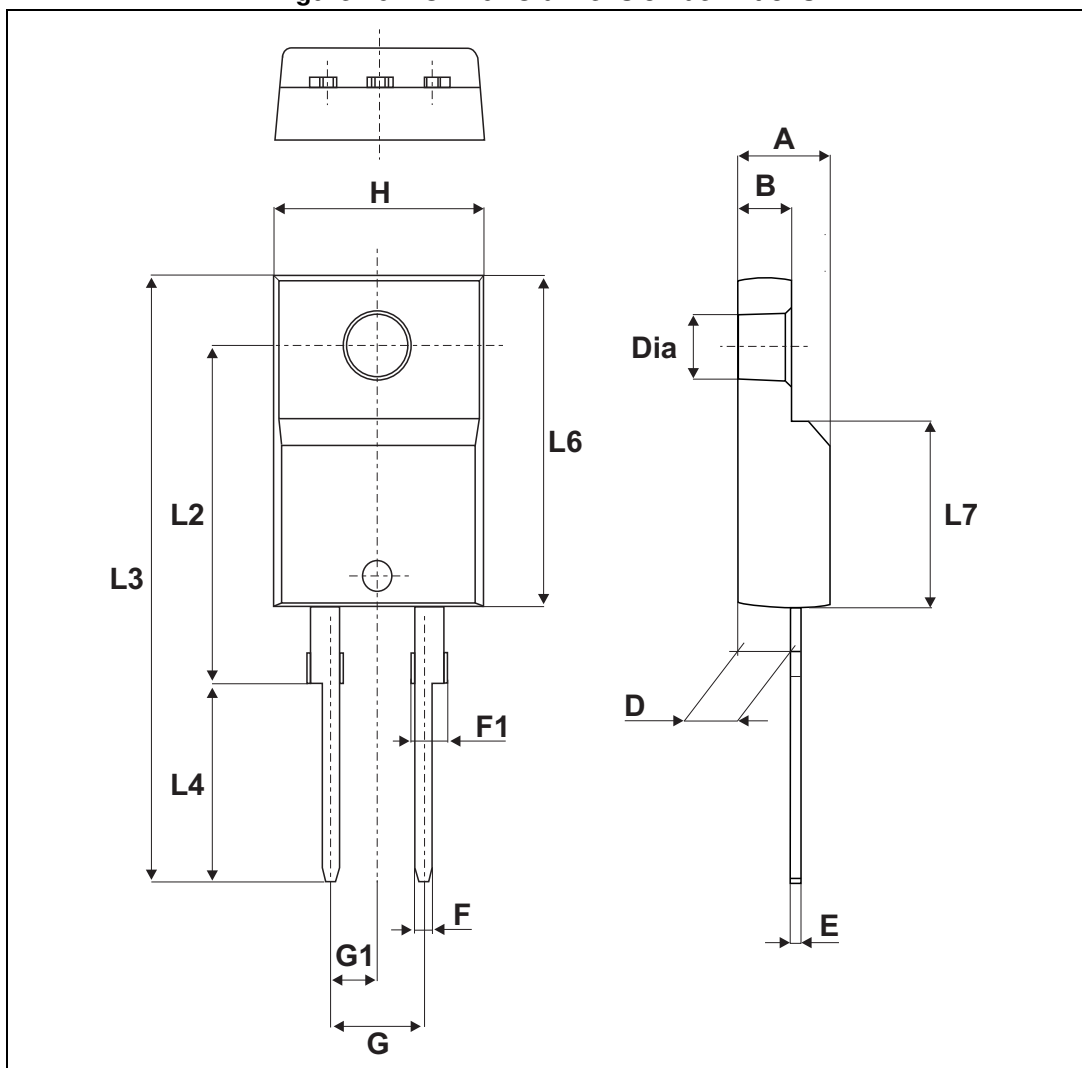


Table 6. TO-220AC dimension values

| 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 |

Figure 17. TO-220FPAC dimension definitions

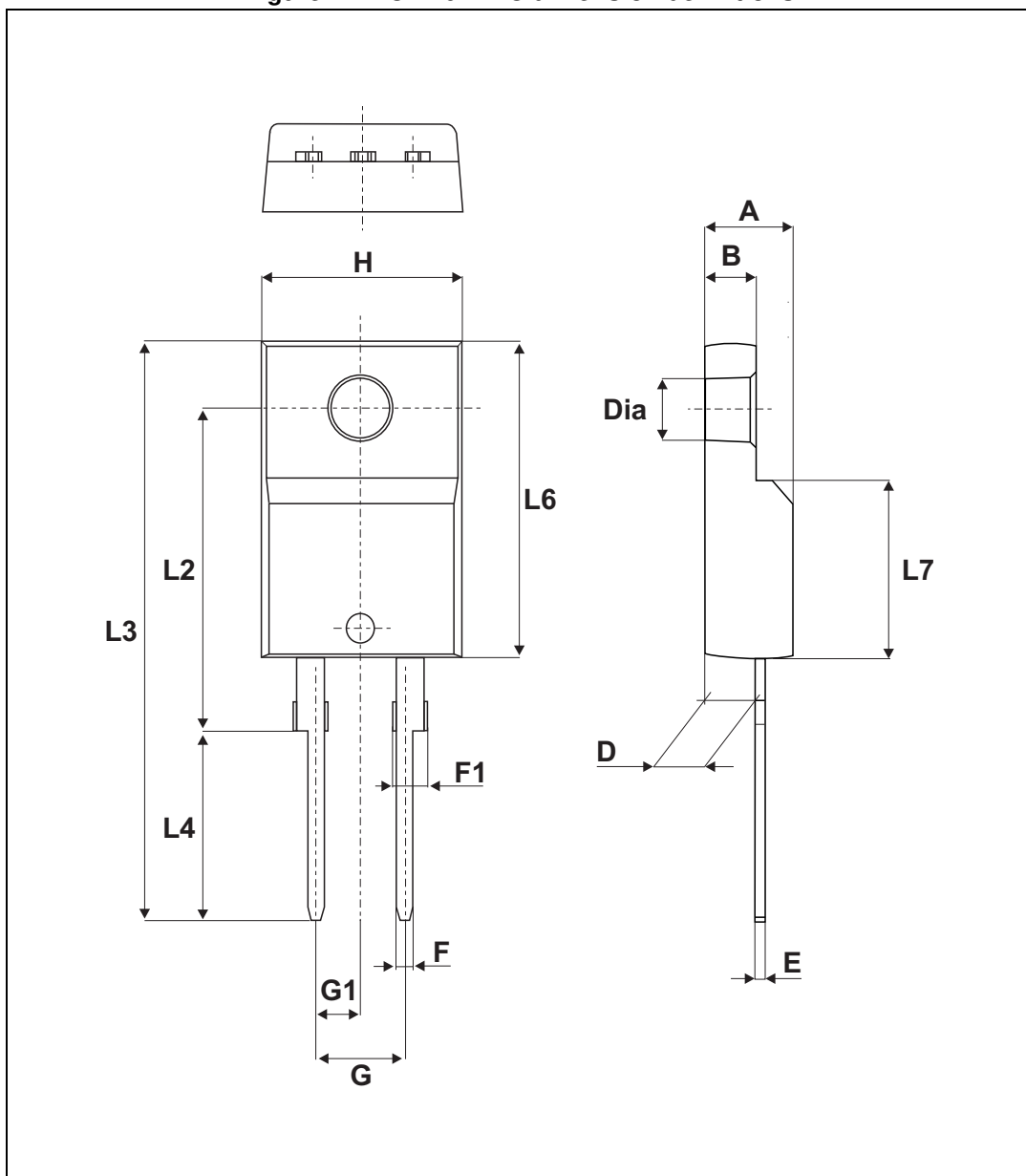


Table 7. TO-220FPAC dimension values

| 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 |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 |
| Diam. | 3.00 | 3.20 | 0.118 | 0.126 |

Figure 18. DO-201AD dimensions (definitions)

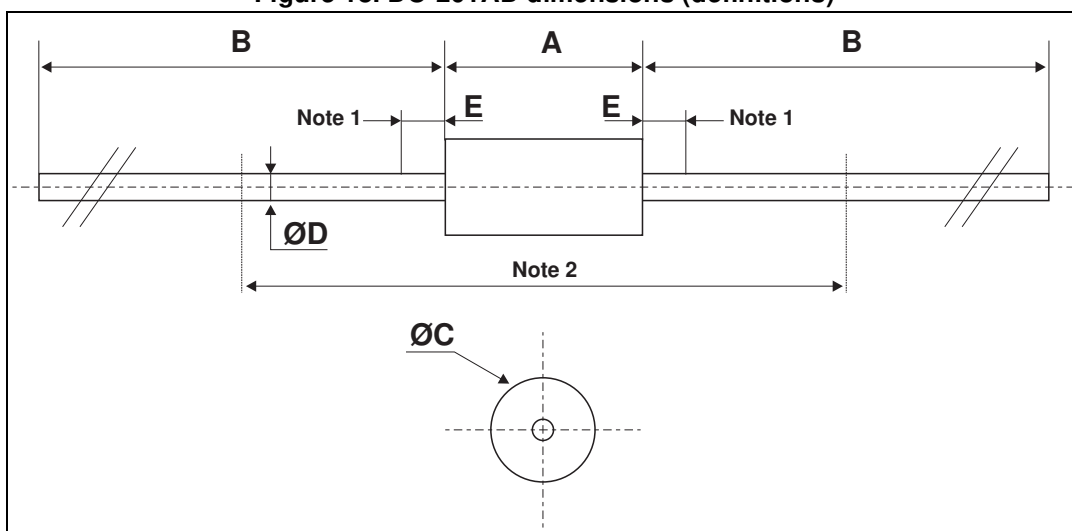
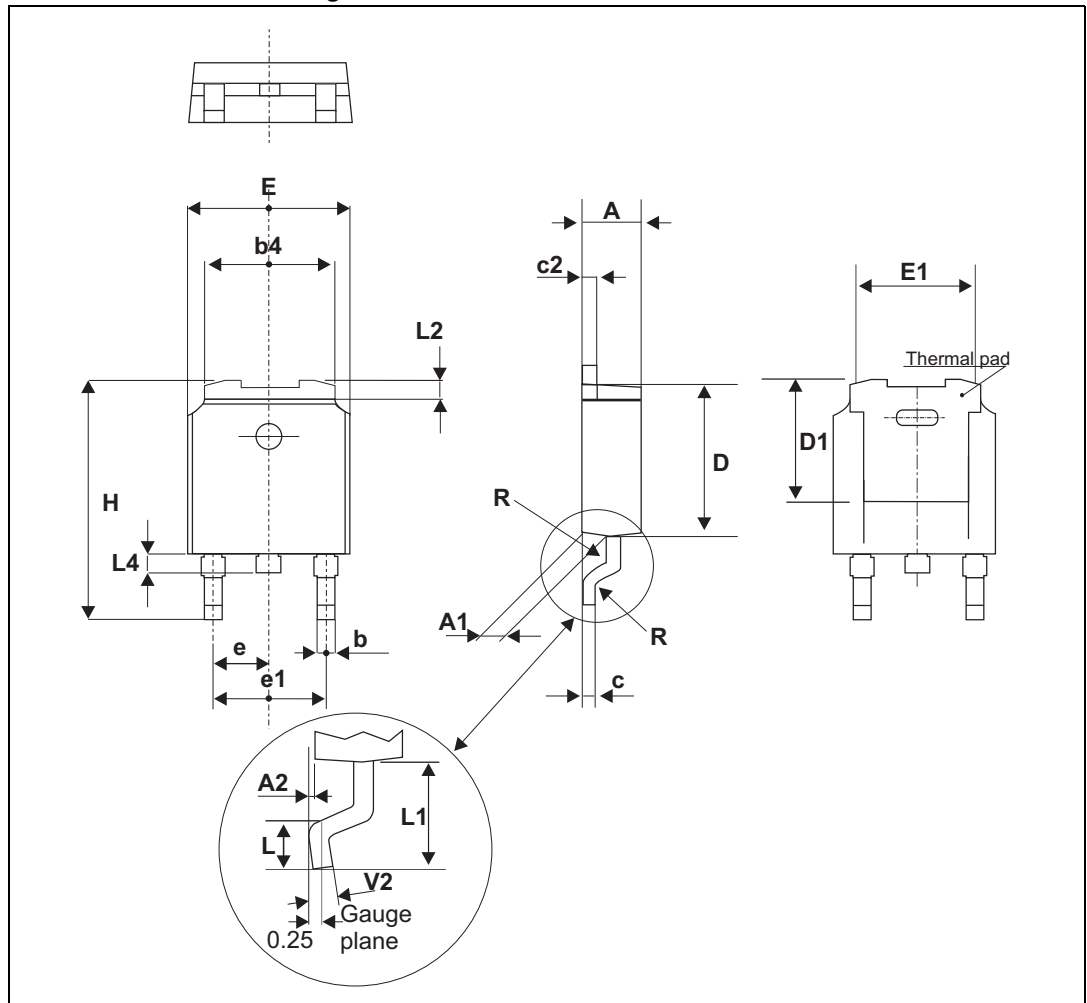


Table 8. DO-201AD dimensions (values)

| Ref. | Dimensions | | | |
|-----------------------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | | 9.50 | | 0.374 |
| B | 25.40 | | 1.000 | |
| C | | 5.30 | | 0.209 |
| D ⁽¹⁾ | | 1.30 | | 0.051 |
| E | | 1.25 | | 0.049 |
| Note 2 ⁽²⁾ | 15 | | 0.59 | |

1. The lead diameter D is not controlled over zone E
2. The minimum length, which must stay straight between the right angles after bending, is 15 mm (0.59")

Figure 19. DPAK dimension definitions

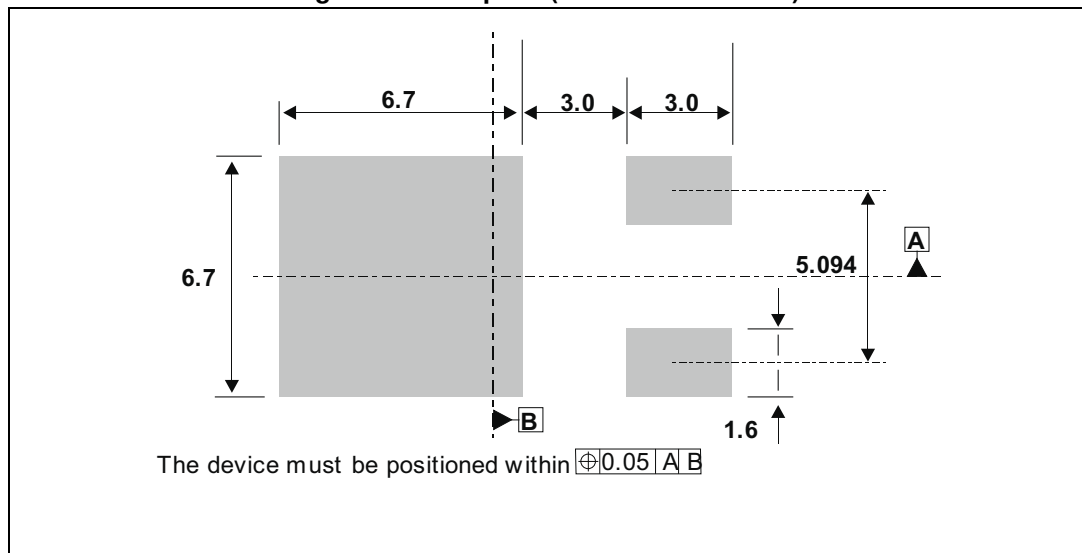


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 9. DPAK dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|--------|------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.18 | | 2.40 | 0.085 | | 0.094 |
| A1 | 0.90 | | 1.1 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.01 |
| b | 0.64 | | 0.90 | 0.025 | | 0.035 |
| b4 | 4.95 | | 5.46 | 0.195 | | 0.215 |
| c | 0.46 | | 0.61 | 0.018 | | 0.024 |
| c2 | 0.46 | | 0.60 | 0.018 | | 0.024 |
| D | 5.97 | | 6.22 | 0.235 | | 0.245 |
| D1 | 5.10 | | | 0.201 | | |
| E | 6.35 | | 6.73 | 0.250 | | 0.265 |
| E1 | 4.32 | | | 0.170 | | |
| e1 | 4.4 | | 4.7 | 0.173 | | 0.185 |
| H | 9.35 | | 10.40 | 0.368 | | 0.407 |
| L | 1.0 | | 1.78 | 0.039 | | 0.070 |
| L2 | | | 1.27 | | | 0.05 |
| L4 | 0.6 | | 1.02 | 0.024 | | 0.040 |
| V2 | 0° | | 8° | 0° | | 8° |

Figure 20. Footprint (dimensions in mm)



3 Ordering information

Table 10. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|--------------|------------|------------|--------|----------|---------------|
| STTH5L06 | STTH5L06 | DO-201AD | 1.16 g | 600 | Ammopack |
| STTH5L06RL | STTH5L06 | | | 1900 | Tape and reel |
| STTH5L06D | STTH5L06D | TO-220AC | 1.9 g | 50 | Tube |
| STTH5L06B-TR | STTH5L06B | DPAK | 0.32 g | 2500 | Tape and reel |
| STTH5L06FP | STTH5L06FP | TO-220FPAC | 1.9 g | 50 | Tube |

4 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 16-Nov-2001 | 1 | Last release. |
| 31-Mar-2007 | 2 | Merged with TO-220AC, TO-220FPAC and DPAK version. |
| 26-Nov-2014 | 3 | Updated DPAK and reformatted to current standard. |
| 05-Dec-2014 | 4 | Updated Features . |

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