

Turbo 2 ultrafast high voltage rectifier

Main product characteristics

| | |
|----------------|---------------------------|
| $I_{F(AV)}$ | 5 A |
| V_{RRM} | 600 V |
| I_R (max) | 125 μ A / 150 μ A |
| T_j (max) | 175 °C |
| V_F (max) | 1.05 V |
| t_{rr} (max) | 95 ns |

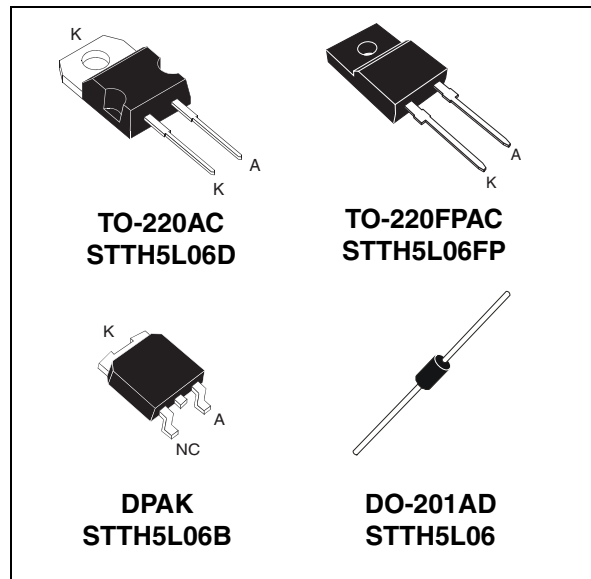
Features and benefits

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

Description

The STTH5L06, which uses ST Turbo 2 600V technology, is specially suited as boost diode in discontinuous or critical mode power factor corrections.

This device, available in TO-220AC, TO-220FPAC, DPAK and DO-201AD, is also intended for use as a free wheeling diode in power supplies and other power switching applications



Order codes

| Part number | Marking |
|--------------|------------|
| STTH5L06 | STTH5L06 |
| STTH5L06RL | STTH5L06 |
| STTH5L06D | STTH5L06D |
| STTH5L06B | STTH5L06B |
| STTH5L06B-TR | STTH5L06B |
| STTH5L06FP | STTH5L06FP |

1 Characteristics

Table 1. Absolute ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|---------------------|--|--------------------------------|---|------|---|
| V _{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| I _{F(RMS)} | RMS forward current | TO-220AC, TO-220FPAC, DO-201AD | 20 | A | |
| | | DPAK | 10 | | |
| I _{F(AV)} | Average forward current | TO-220AC, DPAK | T _c = 150 °C δ = 0.5 | 5 | A |
| | | DO-210AD | T _l = 50° C δ = 0.5 | | |
| | | TO-220FPAC | T _c = 135 °C δ = 0.5 | | |
| I _{FRM} | Repetitive peak forward current | | t _p = 5 μs, F = 5 kHz square | 65 | A |
| I _{FSM} | Surge non repetitive forward current | tp = 10 ms Sinusoidal | TO-220AC, TO-220FPAC | 90 | A |
| | | | DO-201AD | 110 | |
| | | | DPAK | 60 | |
| T _{stg} | Storage temperature range | | - 65 + 175 | °C | |
| T _j | Maximum operating junction temperature | | + 175 | °C | |

Table 2. Thermal parameters

| Symbol | Parameter | | Maximum | Unit |
|----------------------|-------------------------|----------------|----------|------|
| R _{th(j-c)} | Junction to case | TO-220AC, DPAK | 3.5 | °C/W |
| | | TO-220FPAC | 6.0 | |
| R _{th(j-l)} | Junction to lead | L = 10 mm | 20 | |
| R _{th(j-a)} | Junction to ambient (1) | | DO-201AD | |

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

Table 3. Static electrical characteristics

| Symbol | Parameter | Tests conditions | | Min. | Typ. | Max. | Unit | |
|----------------|-------------------------|------------------------|------------------------|----------------------------|------|------|------|-----|
| I _R | Reverse leakage current | V _R = 600 V | T _j = 25°C | | | 5 | μA | |
| | | | T _j = 150°C | TO-220AC, DPAK, TO-220FPAC | | 10 | | 125 |
| | | | | DO-201AD | | 25 | | 150 |
| V _F | Forward voltage drop | I _F = 5 A | T _j = 25°C | | | 1.3 | V | |
| | | | T _j = 150°C | | 0.85 | 1.05 | | |

To evaluate the maximum conduction losses use the following equation:

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

Table 4. Dynamic electrical characteristics

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

Figure 1. Conduction losses versus average current

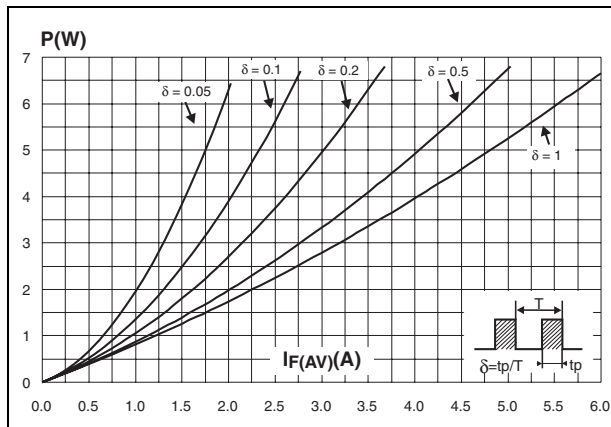


Figure 2. Forward voltage drop versus forward current

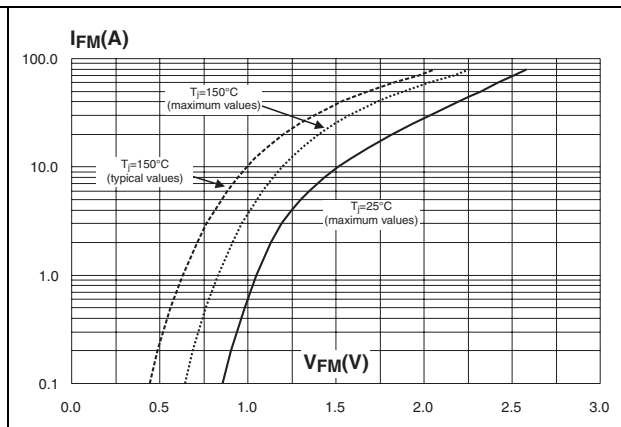


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK)

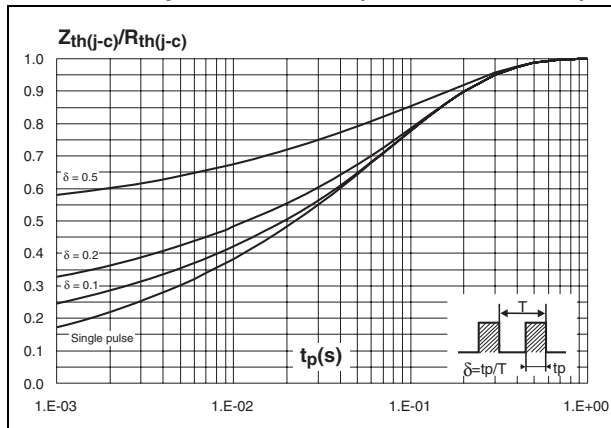


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

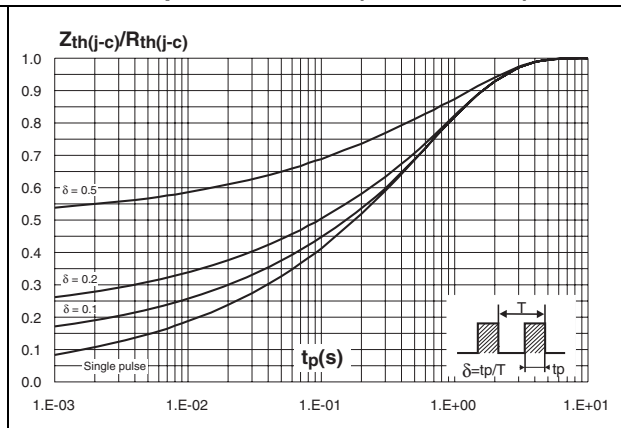


Figure 5. Relative variation of thermal impedance junction ambient versus pulse duration (Epoxy FR4, $L_{leads} = 10$ mm) (DO-201AD)

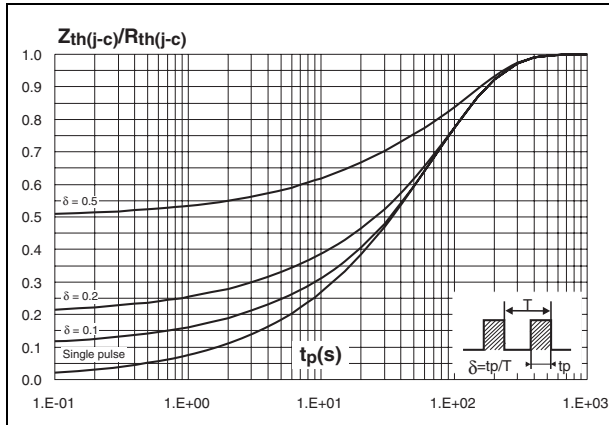


Figure 6. Peak reverse recovery current versus di_F/dt (90% confidence)

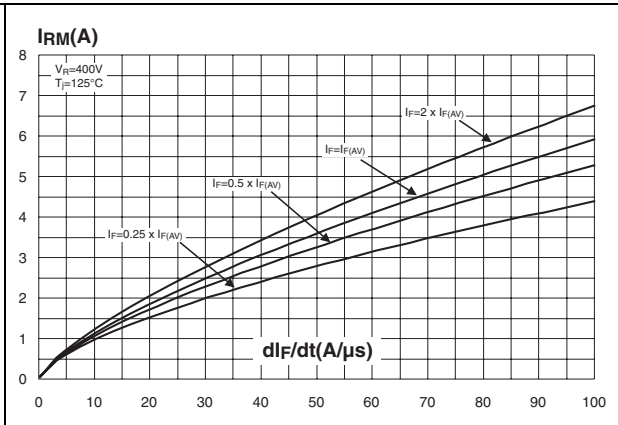


Figure 7. Reverse recovery time versus di_F/dt (90% confidence)

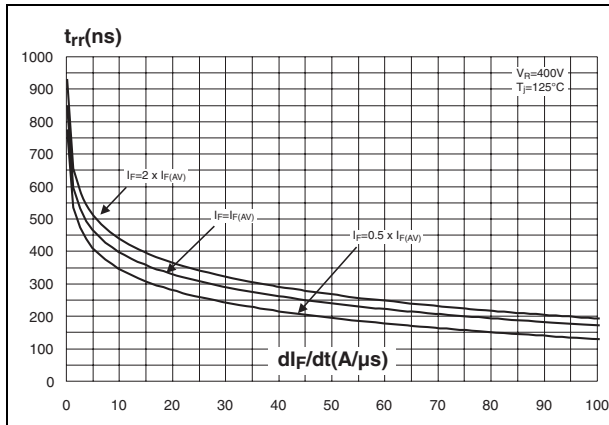


Figure 8. Reverse recovery charges versus di_F/dt (90% confidence)

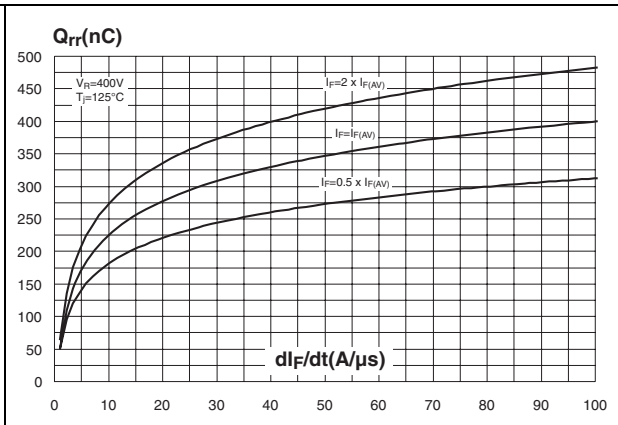


Figure 9. Softness factor versus di_F/dt (typical values)

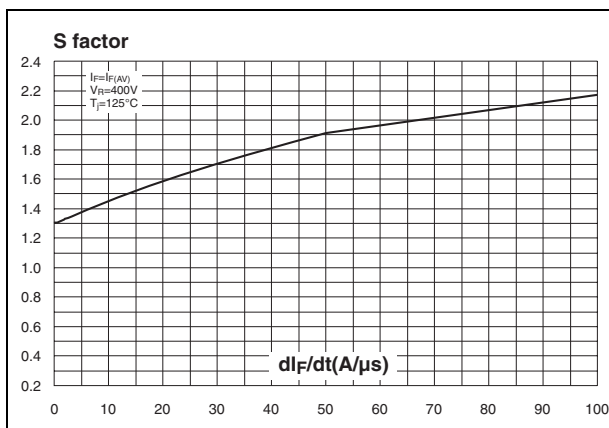


Figure 10. Relative variations of dynamic parameters versus junction temperature

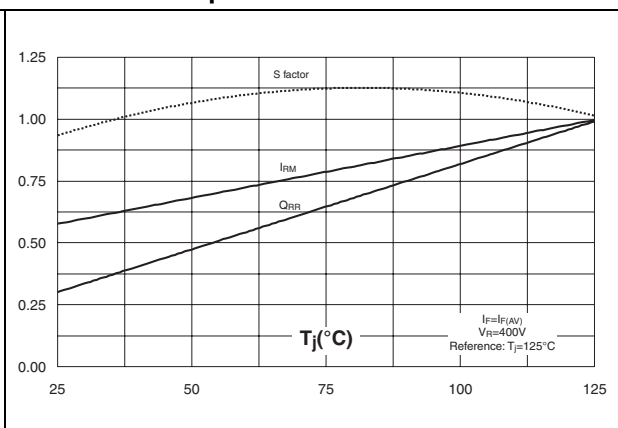


Figure 11. Transient peak forward voltage versus di_F/dt (90% confidence)

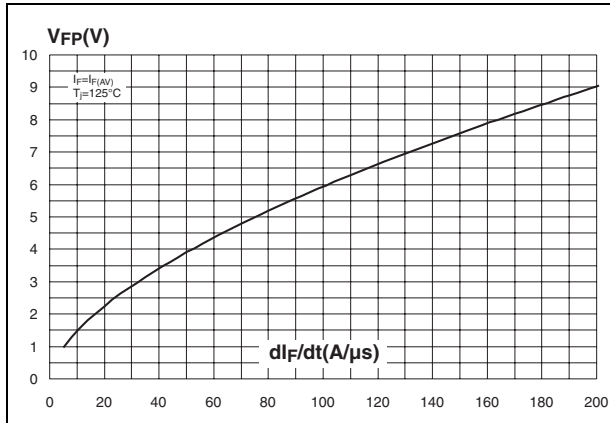


Figure 12. Forward recovery time versus di_F/dt (90% confidence)

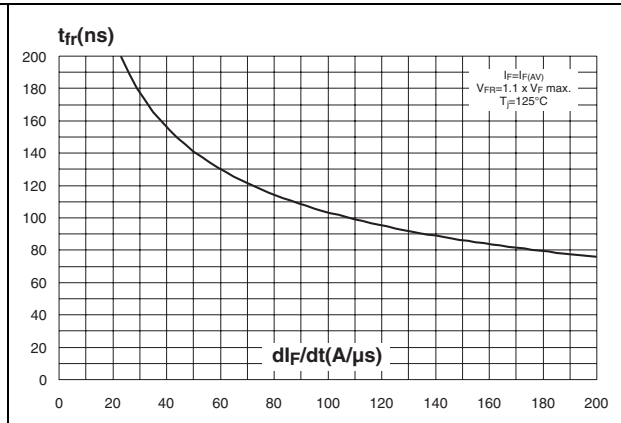


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

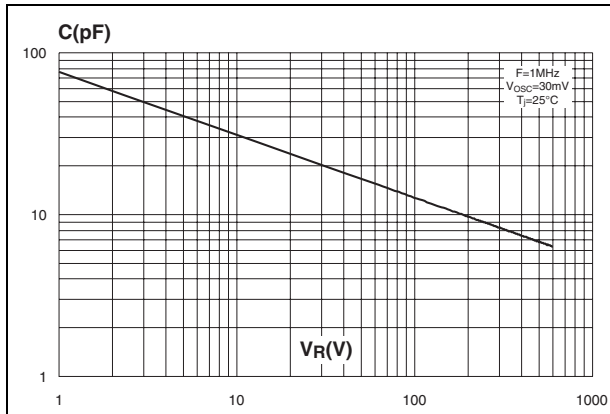


Figure 14. Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4, $e_{CU} = 35 \mu m$) (DPAK)

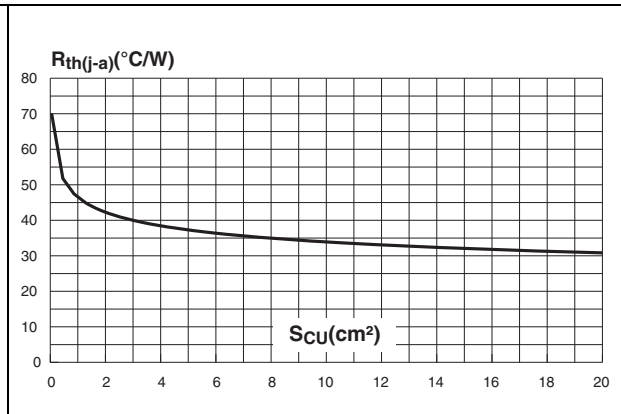
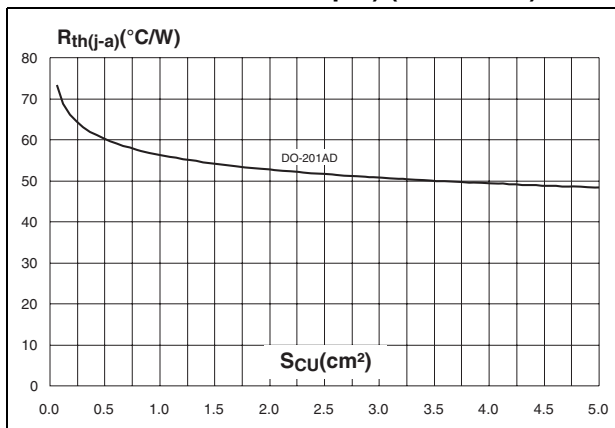


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy printed circuit board FR4, copper thickness: $35 \mu m$) (DO-201AD)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm (TO-220FPAC) / 0.55 Nm (TO-220AC)
- Maximum torque value: 1.0 Nm (TO-220FPAC) / 0.70 Nm (TO-220AC)

Table 5. 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 |

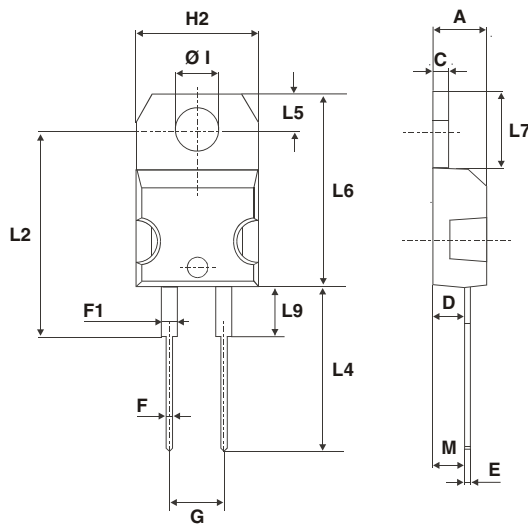


Table 6. TO-220FPAC dimensions

| 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 |

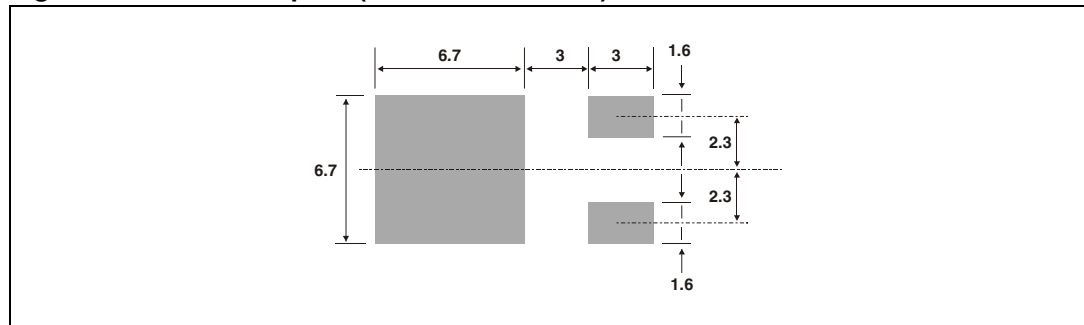
Table 7. DO-201AD dimensions

| Ref. | Dimensions | | | |
|-------|--|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | | 9.50 | | 0.374 |
| B | 25.40 | | 1.000 | |
| C | | 5.30 | | 0.209 |
| D | | 1.30 | | 0.051 |
| E | | 1.25 | | 0.049 |
| Notes | 1 - The lead diameter $\varnothing D$ is not controlled over zone E 2 - The minimum length which must stay straight between the right angles after bending is 0.59"(15mm) | | | |

Table 8. DPAK dimensions

| Ref. | Dimensions | | | |
|------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 2.20 | 2.40 | 0.086 | 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 |
| B2 | 5.20 | 5.40 | 0.204 | 0.212 |
| C | 0.45 | 0.60 | 0.017 | 0.023 |
| C2 | 0.48 | 0.60 | 0.018 | 0.023 |
| D | 6.00 | 6.20 | 0.236 | 0.244 |
| E | 6.40 | 6.60 | 0.251 | 0.259 |
| G | 4.40 | 4.60 | 0.173 | 0.181 |
| H | 9.35 | 10.10 | 0.368 | 0.397 |
| L2 | 0.80 typ. | | 0.031 typ. | |
| L4 | 0.60 | 1.00 | 0.023 | 0.039 |
| V2 | 0° | 8° | 0° | 8° |

Figure 16. DPAK footprint (dimensions in mm)



In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

3 Ordering information

| Ordering code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|------------|------------|--------|----------|---------------|
| STTH5L06 | STTH5L06 | DO-201AD | 1.16 G | 600 | Ammopack |
| STTH5L06RL | STTH5L06 | | | 1900 | Tape & reel |
| STTH5L06D | STTH5L06D | TO-220AC | 1.9 g | 50 | Tube |
| STTH5L06B | STTH5L06B | DPAK | 0.3 g | 75 | Tube |
| STTH5L06B-TR | STTH5L06B | | | 2500 | Tape & reel |
| STTH5L06FP | STTH5L06FP | TO-220FPAC | 1.7 g | 50 | Tube |

4 Revision history

| Date | Revision | Changes |
|-------------|----------|---|
| Nov-2001 | 1A | Last release. |
| 31-Mar-2007 | 2 | Merge with TO-220AC, TO-220FPAC and DPAK version. |

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