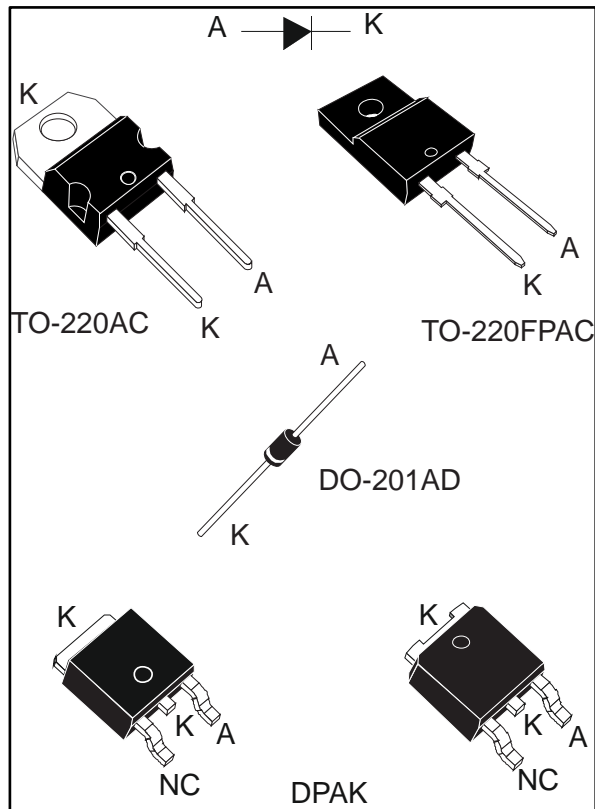


## Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



### Description

The device 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 $\mu$ A / 150 $\mu$ 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<sup>®</sup>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<br>TO-220FPAC<br>DO-201AD                 | 20                     | A    |   |
|              |   | DPAK   | 10                     |      |   |
| $I_{F(AV)}$  | Average forward current<br>$\delta = 0.5$ , 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                         | $t_p = 5\ \mu\text{s}$ , $F = 5\text{ kHz}$ square | 65                     | A    |   |
| $I_{FSM}$    | Surge non repetitive forward current                    | $t_p = 10\text{ ms}$ sinusoidal                    | TO-220AC<br>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           |                     | Max. 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 mm, DO-201AD | 20         | °C/W |
| $R_{th(j-a)}$ | Junction to ambient |                     | 75         |      |

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    | $\mu\text{A}$ |
|             |                         | $T_j = 150\text{ °C}$ | $V_R = 600\text{ V}$ |  | 10   | 125  |               |
|             |                         |                       |                      | TO-220AC<br>TO-220FPAC<br>DPAK<br>DO-201AD | -    | 25   |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$   | -  |      | 1.30 | V             |
|             |                         | $T_j = 150\text{ °C}$ |                      | -  | 0.85 | 1.05 |               |

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

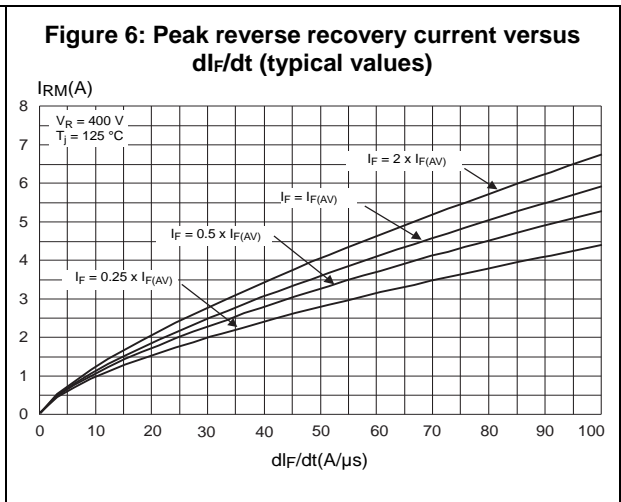
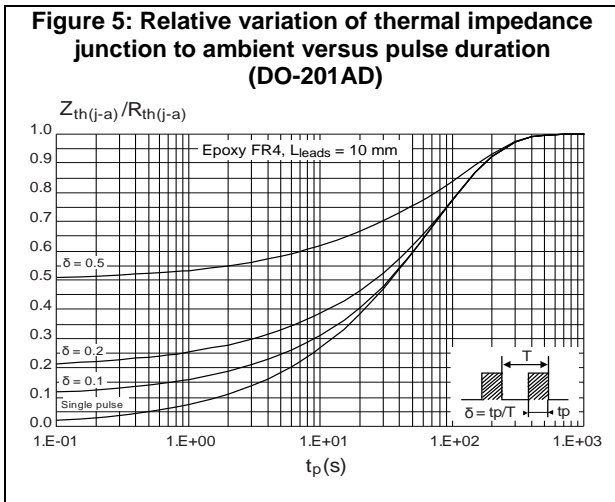
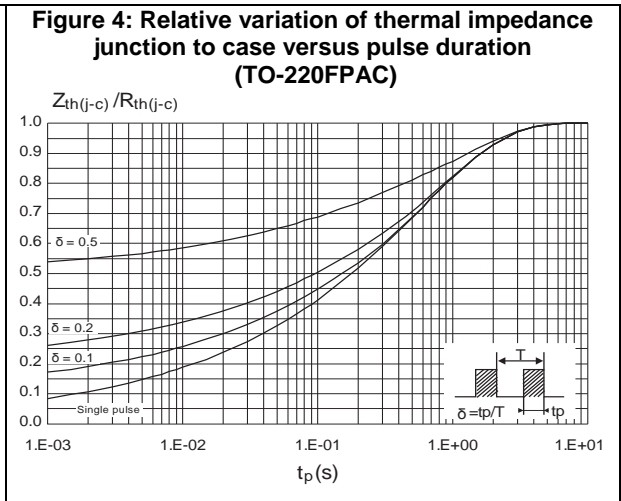
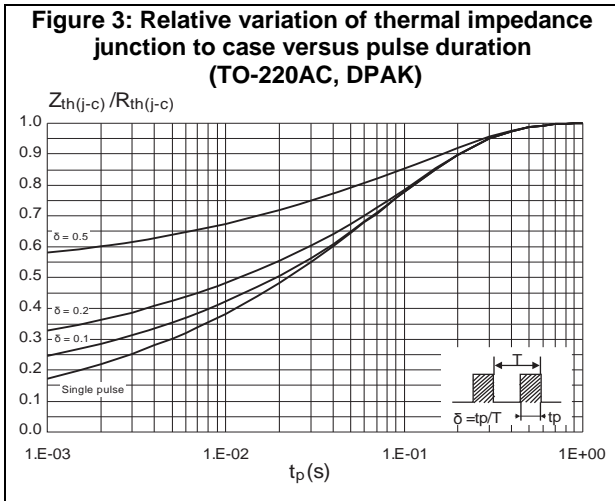
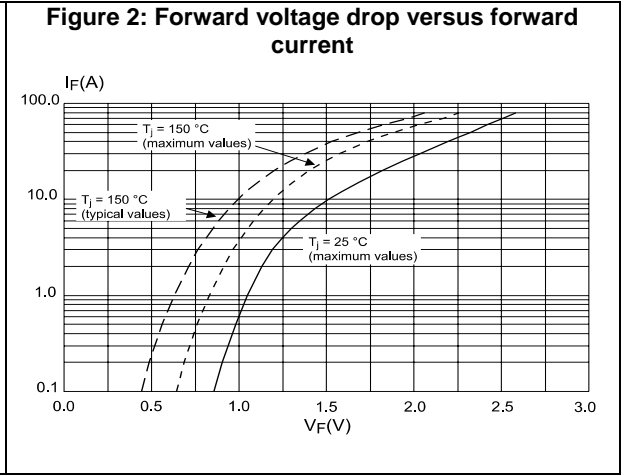
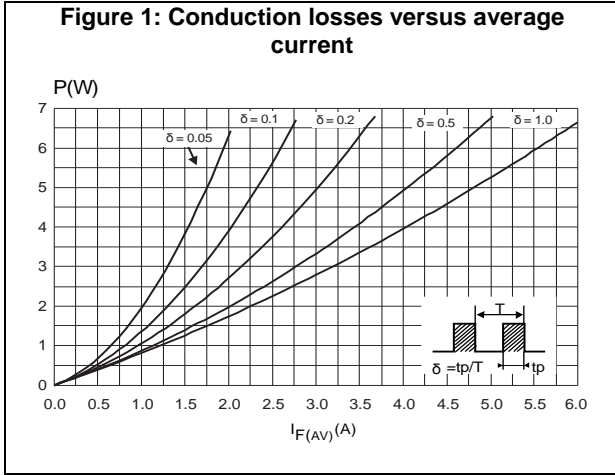
To evaluate the conduction losses, use the following equation:

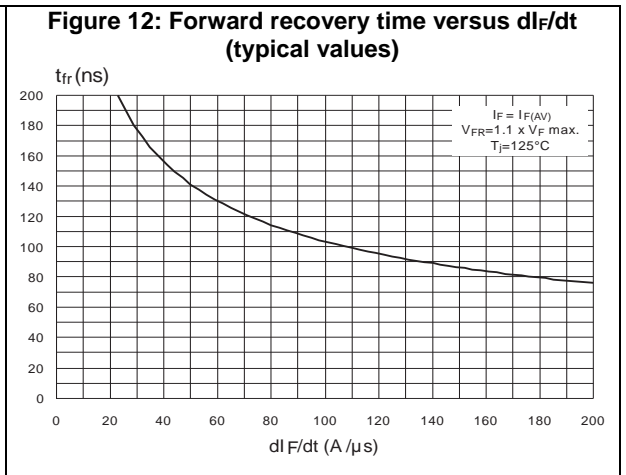
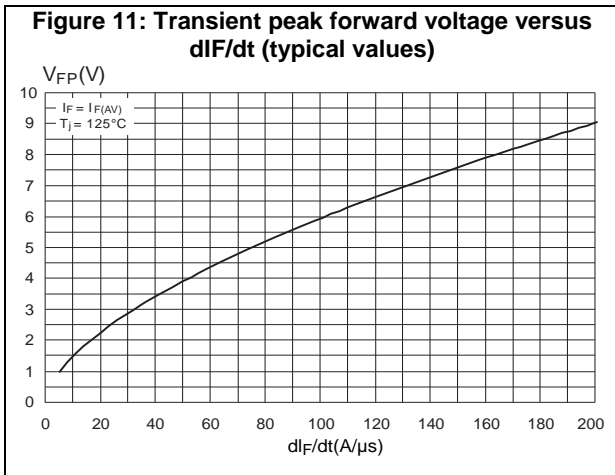
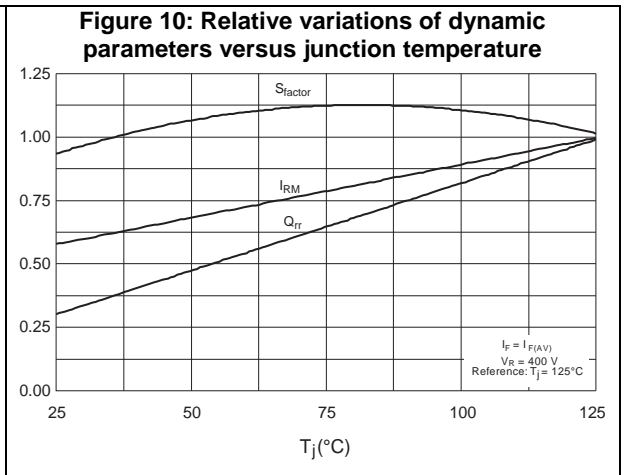
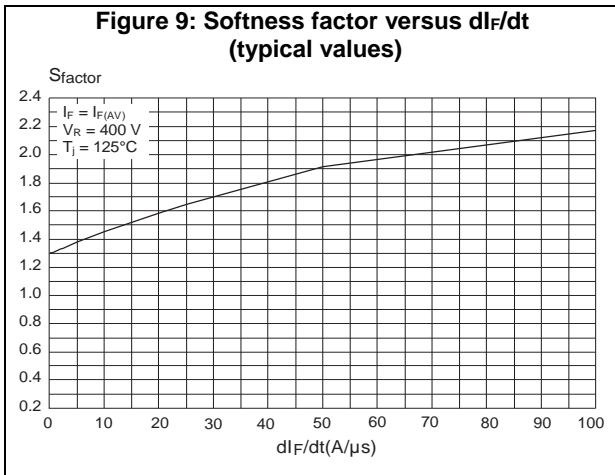
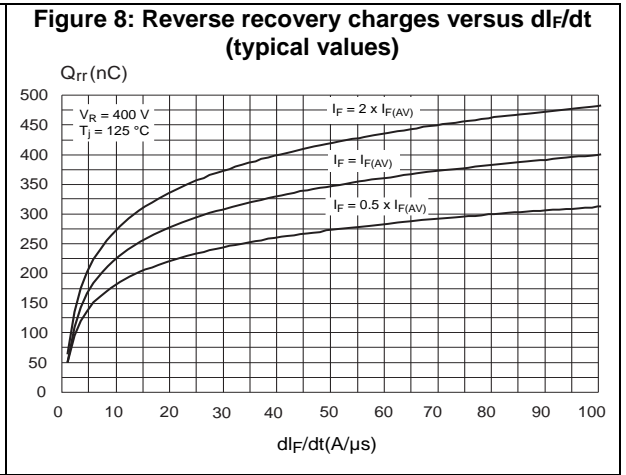
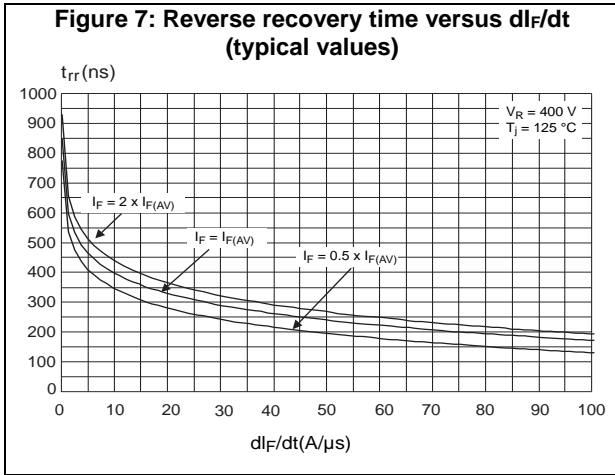
$$P = 0.89 \times I_{F(AV)} + 0.033 \times I_F^2(RMS)$$

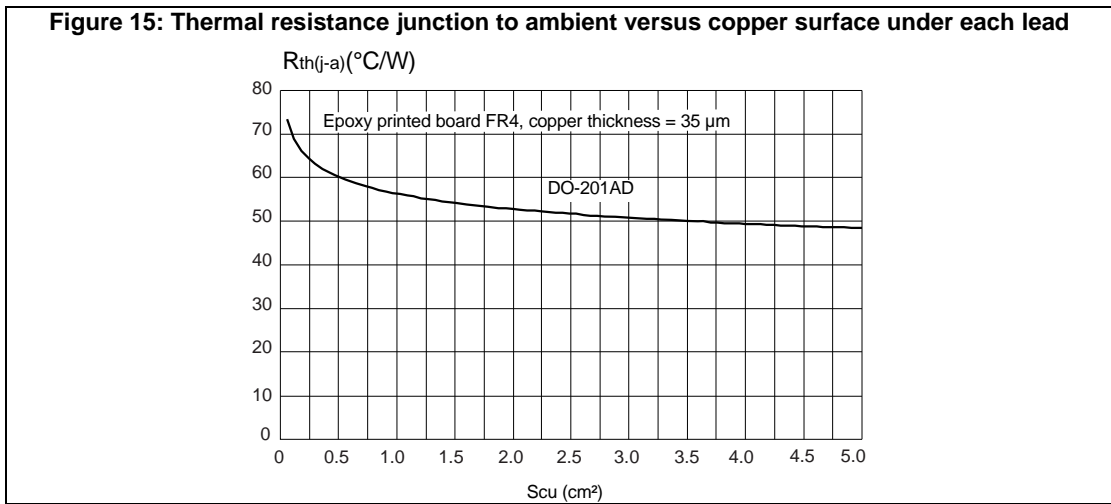
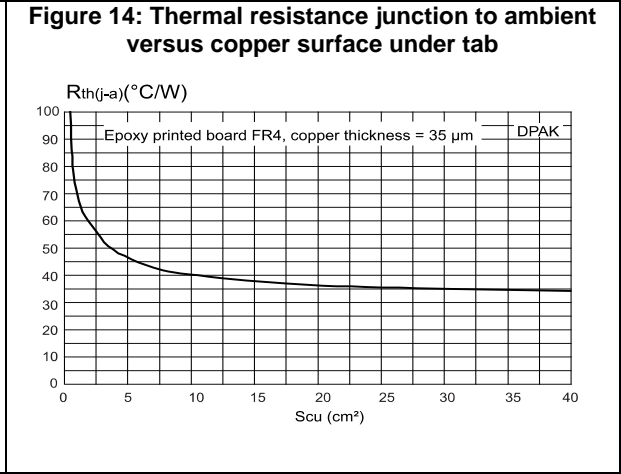
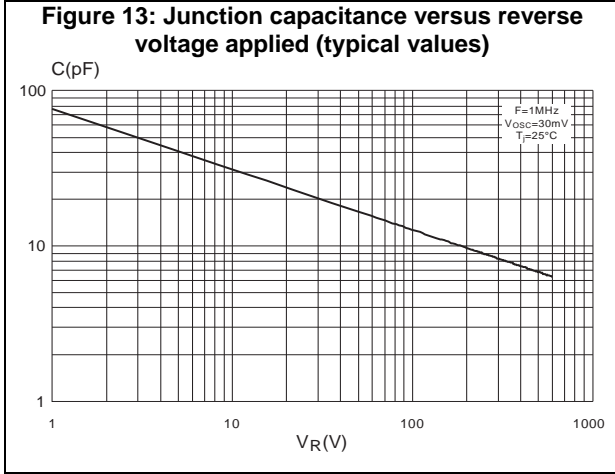
Table 5: Dynamic electrical characteristics

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

# 1.1 Characteristics (curves)







## 2 Package information

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.

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m (for TO-220FPAC / TO-220AC)
- Maximum torque value: 0.7 N·m (for TO-220FPAC / TO-220AC)

### 2.1 TO-220AC package information

Figure 16: TO-220AC package outline

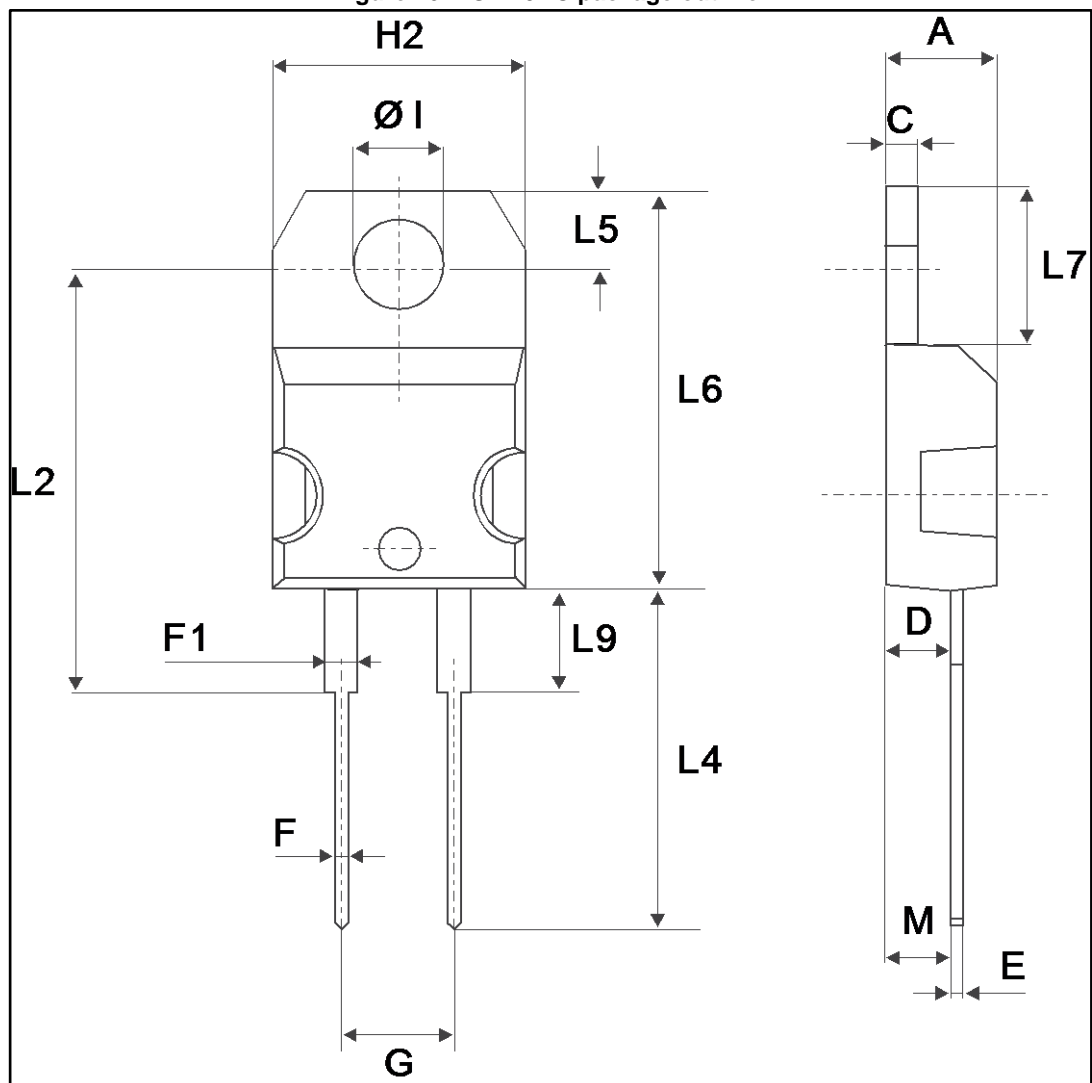


Table 6: TO-220AC package mechanical data

| 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. |       |
| ØI   | 3.75        | 3.85  | 0.147      | 0.151 |



## 2.2 TO-220FPAC package information

Figure 17: TO-220FPAC package outline

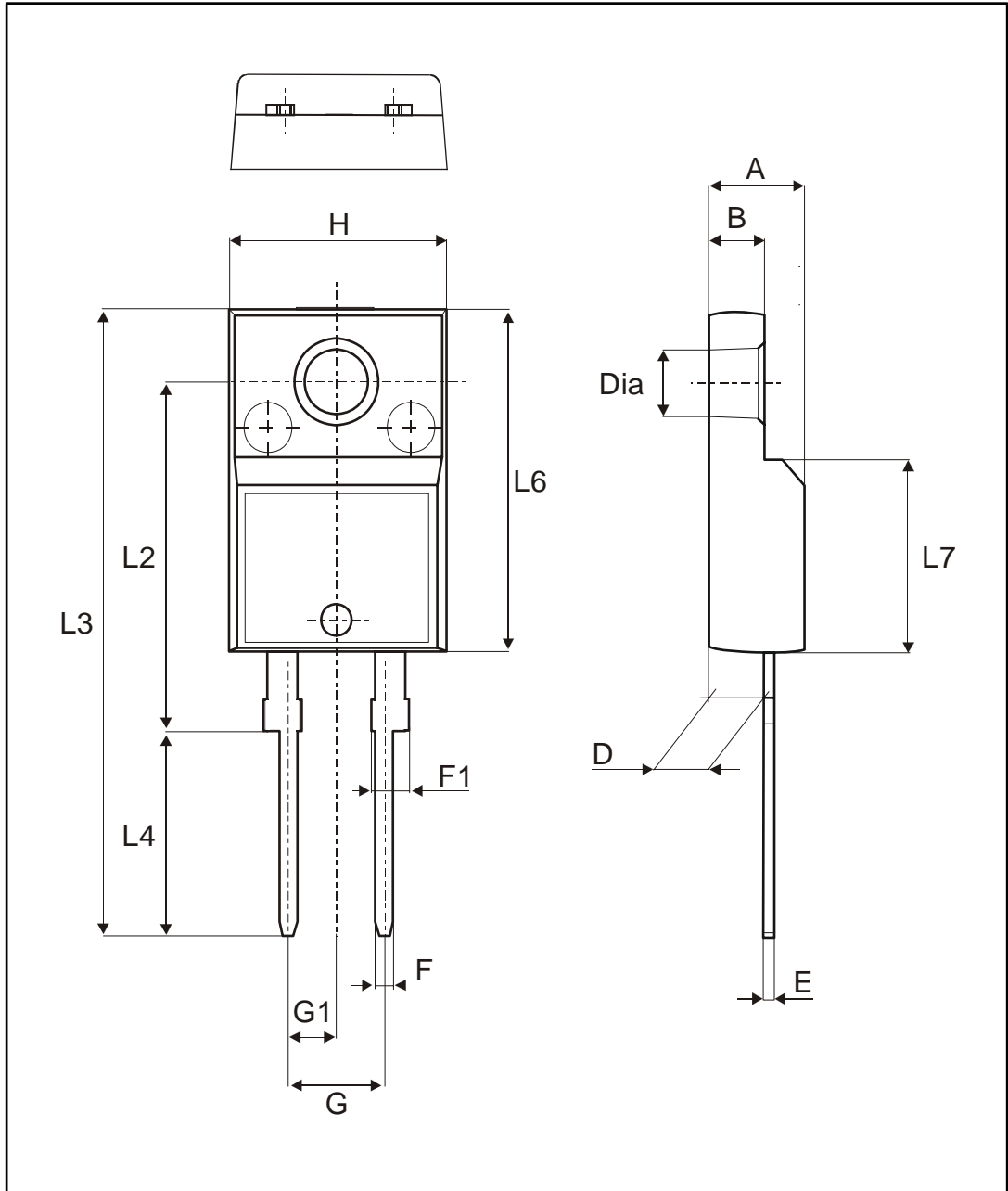


Table 7: TO-220FPAC package mechanical data

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | 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 | 0.126      | 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 |

### 2.3 DO-201AD package information

Figure 18: DO-201AD package outline

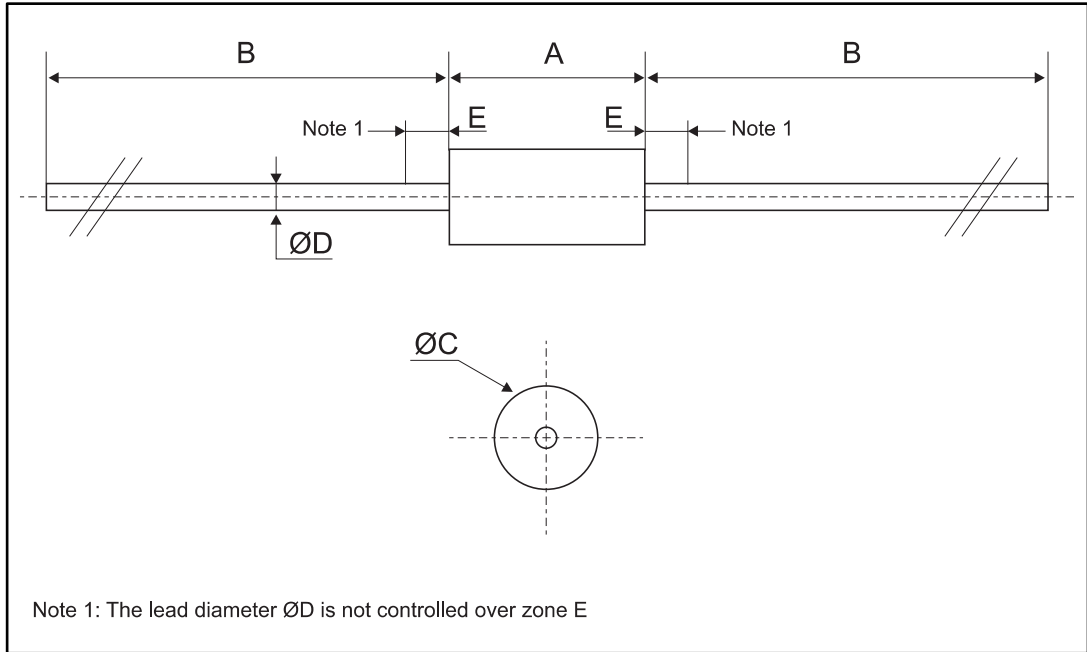
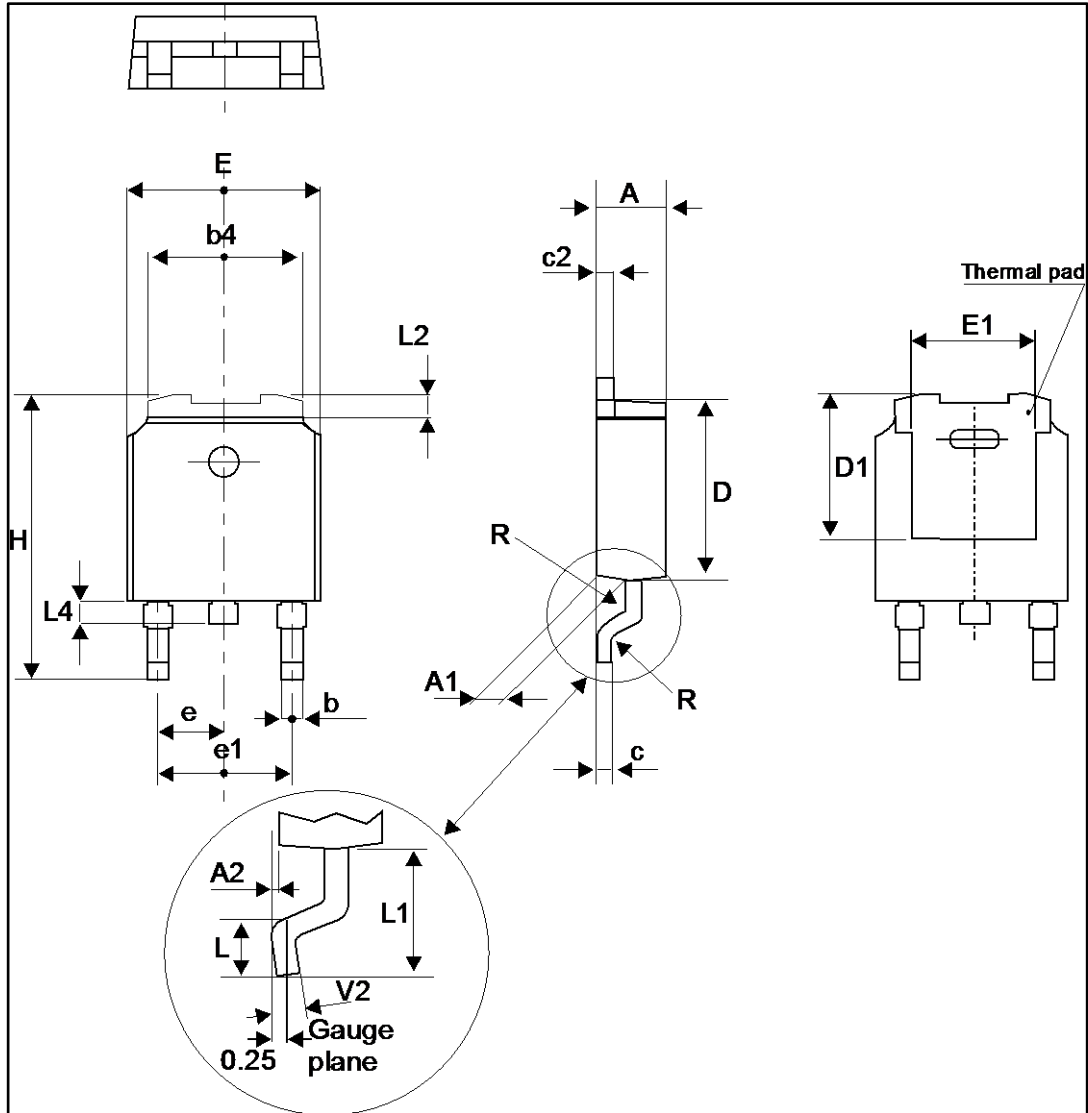


Table 8: DO-201AD package mechanical data

| Ref.            | Dimensions  |      |        |       |
|-----------------|-------------|------|--------|-------|
|                 | Millimeters |      | Inches |       |
|                 | Min.        | Max. | Min.   | Max.  |
| A               |             | 9.50 |        | 0.374 |
| B               | 25.40       |      | 1.000  |       |
| $\varnothing C$ |             | 5.30 |        | 0.209 |
| $\varnothing D$ |             | 1.30 |        | 0.051 |
| E               |             | 1.25 |        | 0.049 |

## 2.4 DPAK package information

Figure 19: DPAK package outline

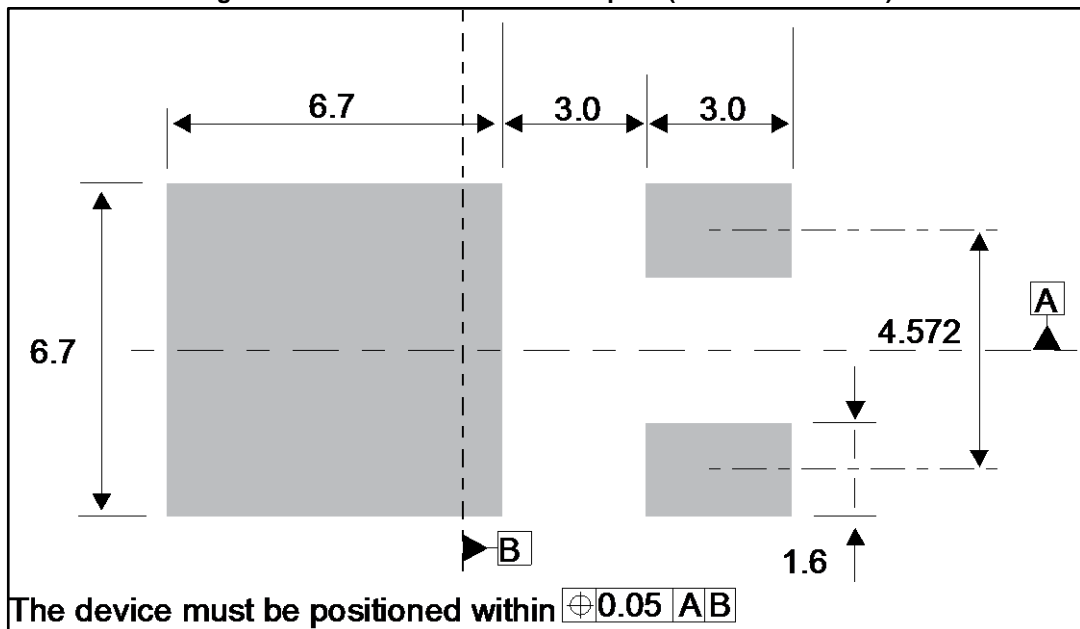


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 9: DPAK package mechanical data

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | 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      | 0.215 |
| 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      | 0.265 |
| E1   | 4.32        | 5.50  | 0.170      | 0.216 |
| e    | 2.286 typ.  |       | 0.090 typ. |       |
| e1   | 4.40        | 4.70  | 0.173      | 0.185 |
| H    | 9.35        | 10.40 | 0.368      | 0.409 |
| L    | 1.0         | 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 20: DPAK recommended footprint (dimensions in mm)



### 3 Ordering information

Table 10: Ordering information

| Order code   | Marking    | Package    | Weight | Base qty | Delivery mode |
|--------------|------------|------------|--------|----------|---------------|
| STTH5L06     | STTH5L06   | DO-201AD   | 1.12 g | 600      | Ammopack      |
| STTH5L06RL   | STTH5L06   |            |        | 1900     | Tape and reel |
| STTH5L06D    | STTH5L06D  | TO-220AC   | 1.9 g  | 50       | Tube          |
| STTH5L06B-TR | STTH5 L06B | 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        | First issue.  |
| 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.   |
| 17-May-2017 | 5        | Updated DPAK package information and reformatted to current standard. |

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