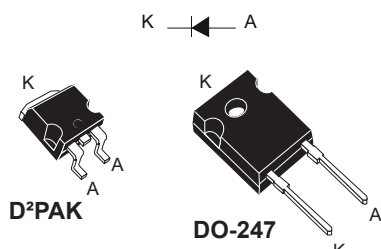


## Automotive 600 V, 30 A low drop ultrafast diode



### Features

- AEC-Q101 qualified 
- Ultrafast recovery
- Low conduction losses
- High surge capability
- Low leakage current
- High junction temperature
- $V_{RRM}$  guaranteed from -40 to +175 °C
- ECOPACK2 compliant (DO-247)

### Applications

- OBC in EV-HEV
- Charging station
- Output rectification
- PFC topologies

### Description

The STTH30L06-Y is an ultrafast recovery power rectifier dedicated to energy efficiency housed in DO-247 and D²PAK.

The STTH30L06-Y is especially designed for PFC boost function in Automotive applications.

| Product status link         |        |
|-----------------------------|--------|
| <a href="#">STTH30L06-Y</a> |        |
| Product summary             |        |
| $I_{F(AV)}$                 | 30 A   |
| $V_{RRM}$                   | 600 V  |
| $V_F$ typ.)                 | 1.10 V |
| $t_{rr}$ (max.)             | 65 ns  |
| $T_j$ (max.)                | 175 °C |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

| Symbol       | Parameter                                                                     |                                 | Value       | Unit |
|--------------|-------------------------------------------------------------------------------|---------------------------------|-------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage ( $T_j = -40\text{ °C}$ to $+175\text{ °C}$ ) |                                 | 600         | V    |
| $I_{F(RMS)}$ | Forward rms current                                                           |                                 | 50          | A    |
| $I_{F(AV)}$  | Average forward current $\delta = 0.5$ , square wave                          | $T_c = 125\text{ °C}$           | 30          | A    |
| $I_{FSM}$    | Surge non repetitive forward current                                          | $t_p = 10\text{ ms}$ sinusoidal | 300         | A    |
| $T_{stg}$    | Storage temperature range                                                     |                                 | -65 to +175 | °C   |
| $T_j$        | Operating junction temperature range                                          |                                 | -40 to +175 | °C   |

**Table 2. Thermal resistance parameter**

| Symbol        | Parameter        | Max. value | Unit |
|---------------|------------------|------------|------|
| $R_{th(j-c)}$ | Junction to case | 1.1        | °C/W |

For more information, please refer to the following application note :

- **AN5088** : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 25   | $\mu\text{A}$ |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 80   | 800  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 30\text{ A}$ | -    |      | 1.55 | V             |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 1.0  | 1.25 |               |

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:

$$P = 0.95 \times I_{F(AV)} + 0.010 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

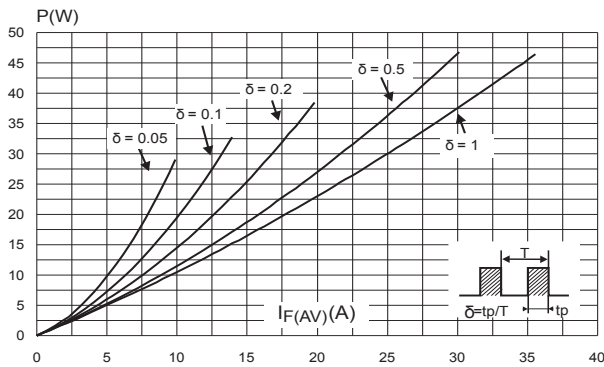
- **AN604**: Calculation of conduction losses in a power rectifier
- **AN4021**: Calculation of reverse losses on a power diode
- **AN5028**: Calculation of turn-off power losses generated by an ultrafast diode

**Table 4. Dynamic characteristics ( $T_j = 25\text{ °C}$  unless otherwise specified)**

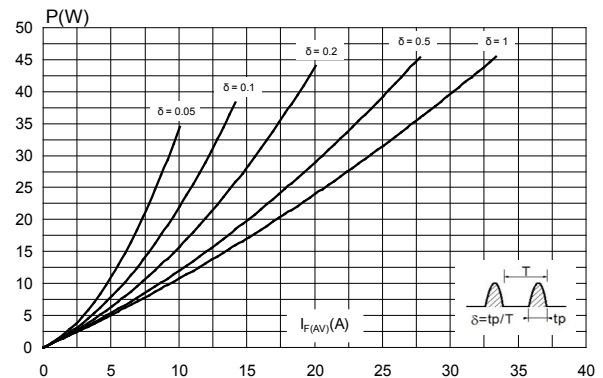
| Symbol   | Parameters               | Test conditions                                                                                | Min. | Typ. | Max. | Unit |
|----------|--------------------------|------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{RR} = 0.25\text{ A}$                           | -    |      | 65   | ns   |
|          |                          | $I_F = 1\text{ A}$ , $V_R = 30\text{ V}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$                 | -    | 65   | 90   |      |
| $I_{RM}$ | Reverse recovery current | $I_F = 30\text{ A}$ , $V_R = 400\text{ V}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$              | -    | 11.5 | 16   | A    |
| $t_{fr}$ | Forward recovery time    | $I_F = 30\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.1\text{ V}_{F(max.)}$ | -    |      | 500  | ns   |
| $V_{FP}$ | Forward recovery voltage | $I_F = 30\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.1\text{ V}_{F(max.)}$ | -    | 2.5  |      | V    |

## 1.1 Characteristics (curves)

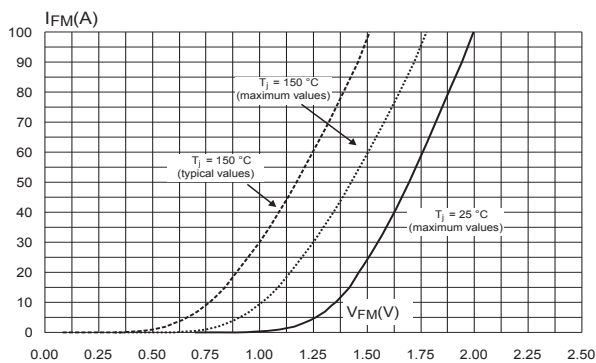
**Figure 1. Conduction losses versus average forward current (square waveform)**



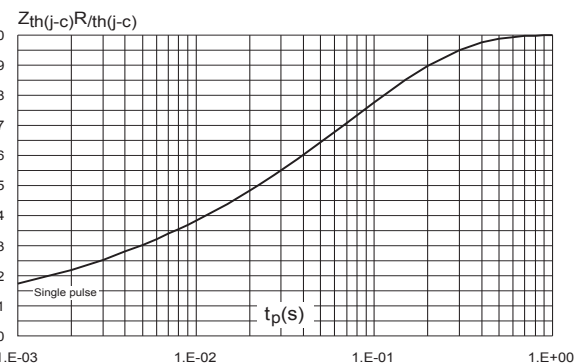
**Figure 2. Conduction losses versus average forward current (sinusoidal waveform)**



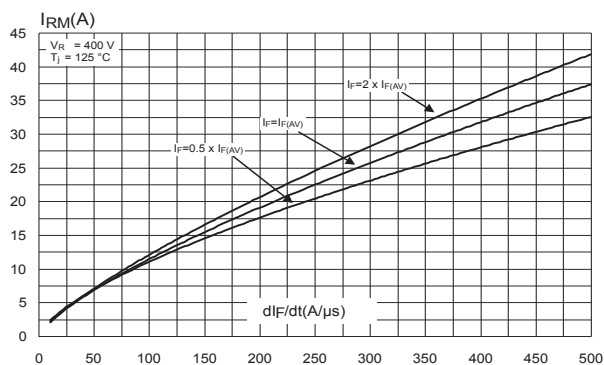
**Figure 3. Forward voltage drop versus forward current**



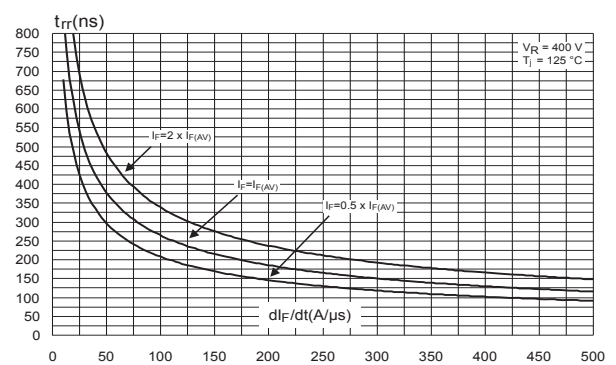
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**

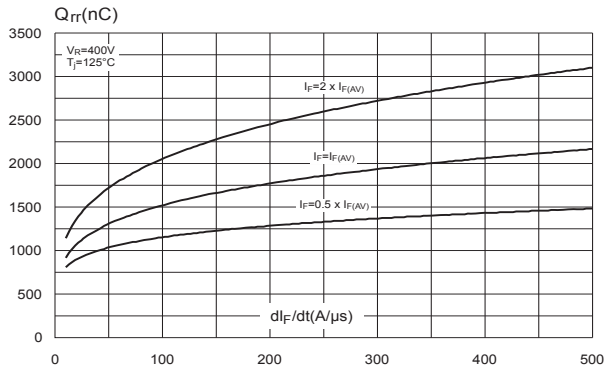
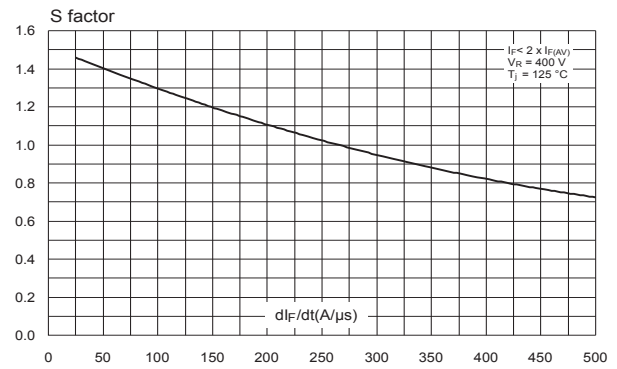
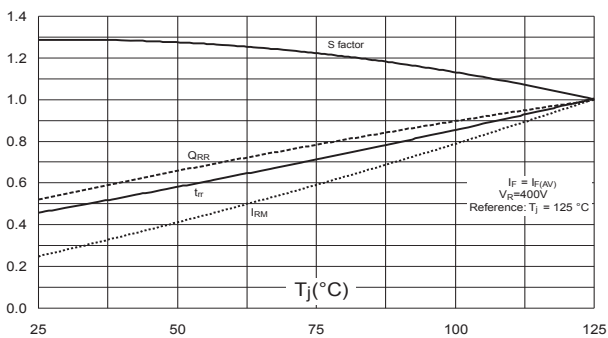
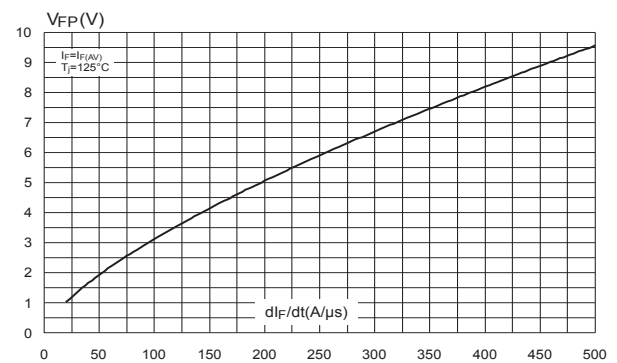
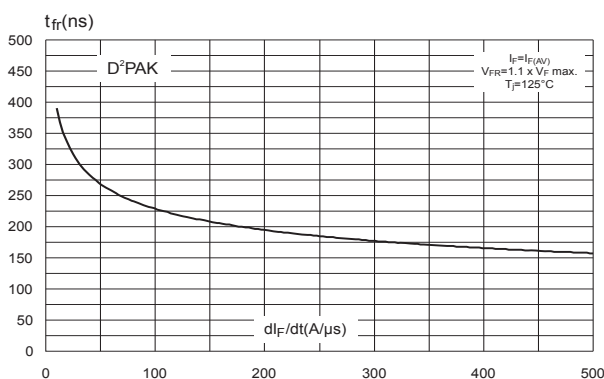
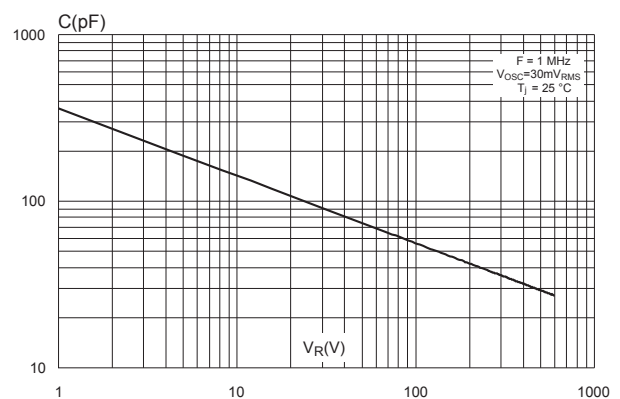


**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values)**

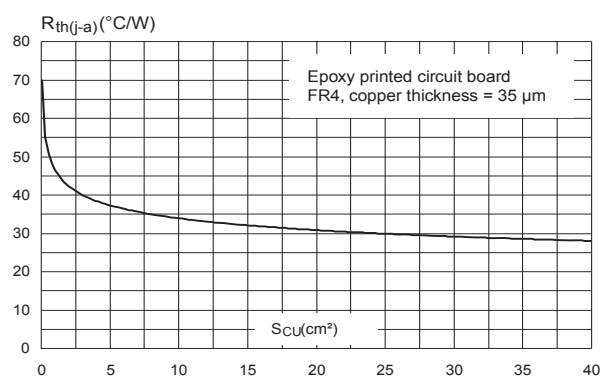


**Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values)**



**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**

**Figure 8. Reverse recovery 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  $di_F/dt$  (typical values)**

**Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)**

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


**Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (typical values)**



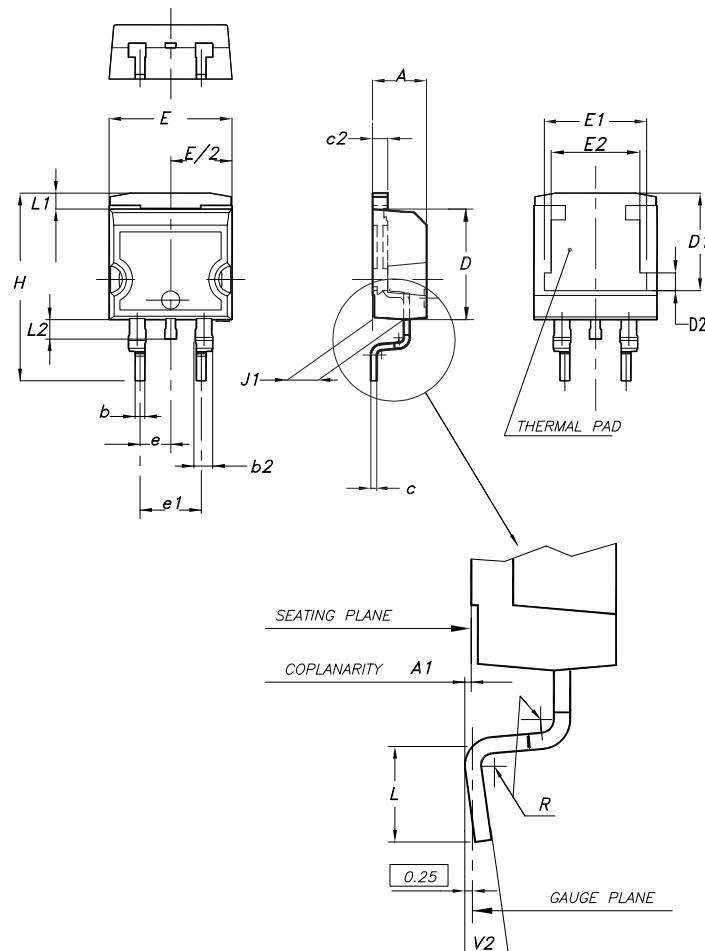
## 2 Package information

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.

### 2.1 D<sup>2</sup>PAK package information

- Epoxy meets UL94, V0.
- Cooling method: by conduction (C)

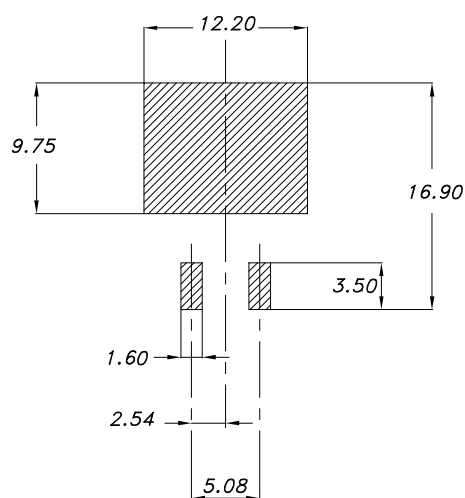
**Figure 14. D<sup>2</sup>PAK package outline**



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

**Table 5. D<sup>2</sup>PAK package mechanical data**

| Ref. | Dimensions  |      |       |                             |       |       |
|------|-------------|------|-------|-----------------------------|-------|-------|
|      | Millimeters |      |       | Inches (for reference only) |       |       |
|      | Min.        | Typ. | Max.  | Min.                        | Typ.  | Max.  |
| A    | 4.40        |      | 4.60  | 0.173                       |       | 0.181 |
| A1   | 0.03        |      | 0.23  | 0.001                       |       | 0.009 |
| b    | 0.70        |      | 0.93  | 0.028                       |       | 0.037 |
| b2   | 1.14        |      | 1.70  | 0.045                       |       | 0.067 |
| c    | 0.45        |      | 0.60  | 0.018                       |       | 0.024 |
| c2   | 1.23        |      | 1.36  | 0.048                       |       | 0.053 |
| D    | 8.95        |      | 9.35  | 0.352                       |       | 0.368 |
| D1   | 7.50        | 7.75 | 8.00  | 0.295                       | 0.305 | 0.315 |
| D2   | 1.10        | 1.30 | 1.50  | 0.043                       | 0.051 | 0.060 |
| E    | 10.00       |      | 10.40 | 0.394                       |       | 0.409 |
| E1   | 8.30        | 8.50 | 8.70  | 0.335                       | 0.343 | 0.346 |
| E2   | 6.85        | 7.05 | 7.25  | 0.266                       | 0.278 | 0.282 |
| e    |             | 2.54 |       |                             | 0.100 |       |
| e1   | 4.88        |      | 5.28  | 0.190                       |       | 0.205 |
| H    | 15.00       |      | 15.85 | 0.591                       |       | 0.624 |
| J1   | 2.49        |      | 2.69  | 0.097                       |       | 0.106 |
| L    | 2.29        |      | 2.79  | 0.090                       |       | 0.110 |
| L1   | 1.27        |      | 1.40  | 0.049                       |       | 0.055 |
| L2   | 1.30        |      | 1.75  | 0.050                       |       | 0.069 |
| R    |             | 0.40 |       |                             | 0.015 |       |
| V2   | 0°          |      | 8°    | 0°                          |       | 8°    |

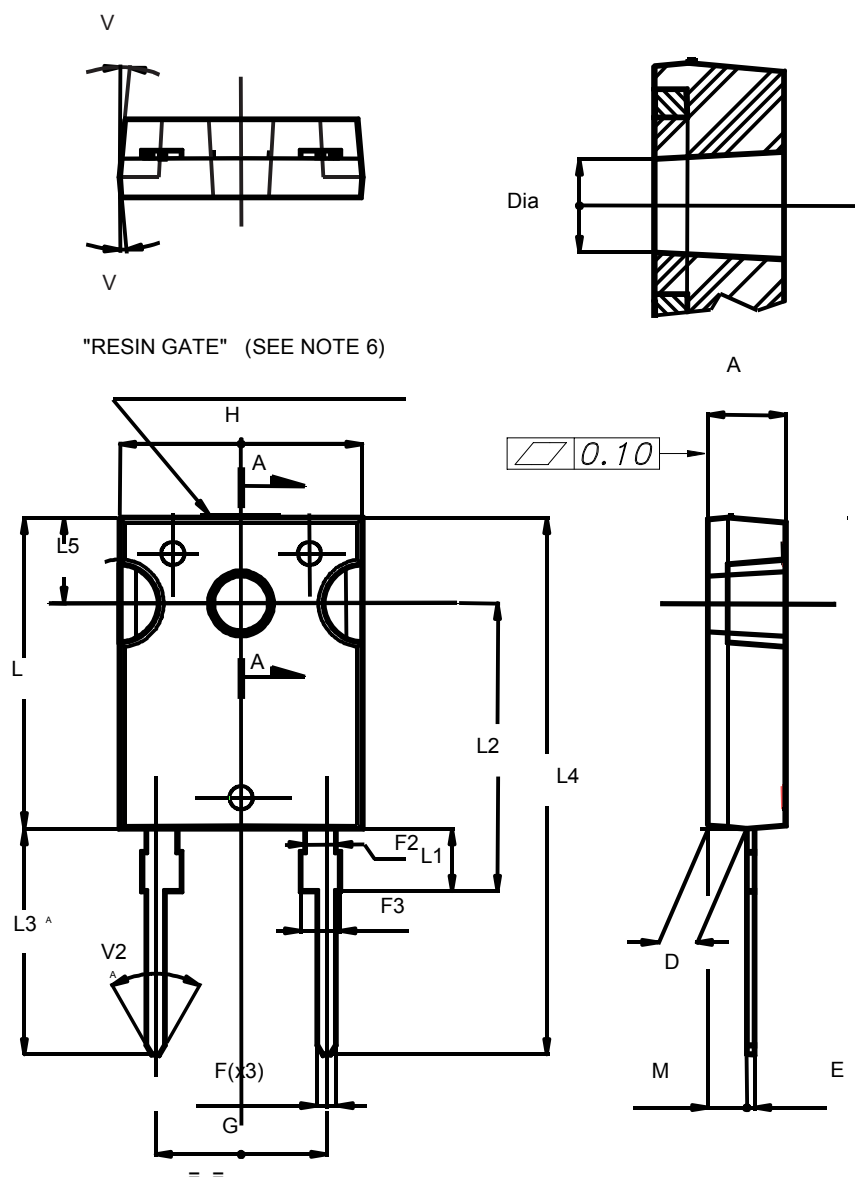
**Figure 15. D<sup>2</sup>PAK recommended footprint (dimensions are in mm)**


Footprint\_26

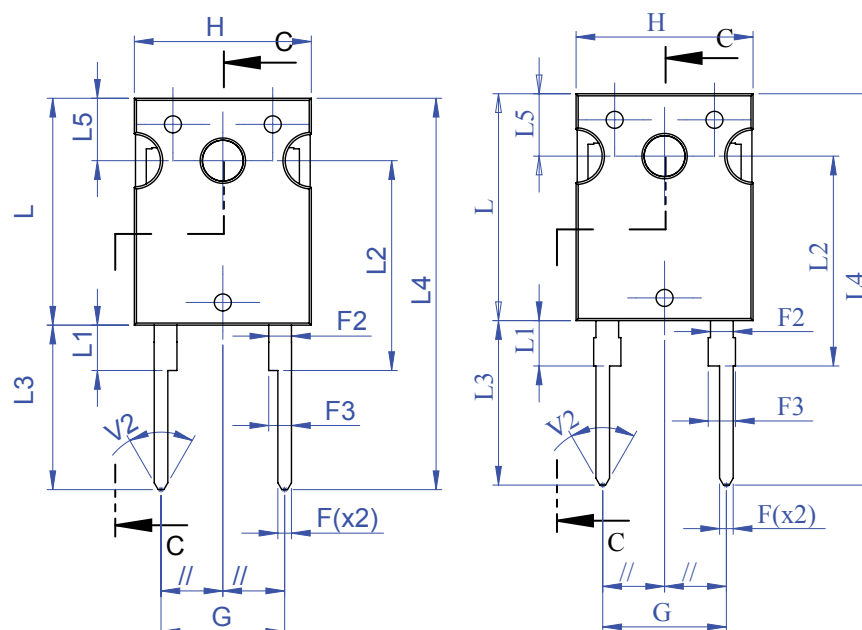
## 2.2 DO-247 package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 16. DO-247 package outline



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

**Figure 17. DO-247 package min-max drawing**

**Table 6. DO-247 package mechanical data**

| Ref.  | Dimensions  |      |       |                             |        |        |
|-------|-------------|------|-------|-----------------------------|--------|--------|
|       | Millimeters |      |       | Inches (for reference only) |        |        |
|       | Min.        | Typ. | Max.  | Min.                        | Typ.   | Max.   |
| A     | 4.85        |      | 5.15  | 0.1909                      |        | 0.2027 |
| D     | 2.2         |      | 2.6   | 0.0866                      |        | 0.1023 |
| E     | 0.4         |      | 0.8   | 0.0157                      |        | 0.0314 |
| F     | 1           |      | 1.4   | 0.0393                      |        | 0.0551 |
| F2    |             | 2    |       |                             | 0.0787 |        |
| F3    | 2           |      | 2.4   | 0.0787                      |        | 0.0944 |
| G     |             | 10.9 |       |                             | 0.4291 |        |
| H     | 15.45       |      | 15.75 | 0.6082                      |        | 0.6200 |
| L     | 19.85       |      | 20.15 | 0.7814                      |        | 0.7933 |
| L1    | 3.7         |      | 4.3   | 0.1456                      |        | 0.1692 |
| L2    |             | 18.5 |       |                             | 0.7283 |        |
| L3    | 14.2        |      | 14.8  | 0.5590                      |        | 0.5826 |
| L4    |             | 34.6 |       |                             | 1.3622 |        |
| L5    |             | 5.5  |       |                             | 0.2165 |        |
| M     | 2           |      | 3     | 0.0787                      |        | 0.1181 |
| V     |             | 5°   |       |                             | 5°     |        |
| V2    |             | 60°  |       |                             | 60°    |        |
| Diam. | 3.55        |      | 3.65  | 0.1397                      |        | 0.1437 |

### 3 Ordering information

**Table 7. Ordering information**

| Order code     | Marking     | Package            | Weight | Base qty. | Delivery mode |
|----------------|-------------|--------------------|--------|-----------|---------------|
| STTH30L06GY-TR | STTH30L06GY | D <sup>2</sup> PAK | 1.48 g | 1000      | Tape and reel |
| STTH30L06WY    | STTH30L06WY | DO-247             | 4.36 g | 30        | Tube          |

## Revision history

**Table 8. Document revision history**

| Date        | Version | Changes                                                                                                                                  |
|-------------|---------|------------------------------------------------------------------------------------------------------------------------------------------|
| 24-Oct-2012 | 1       | First issue.                                                                                                                             |
| 21-Sep-2020 | 2       | Updated package information.<br>Added <a href="#">Figure 2. Conduction losses versus average forward current (sinusoidal waveform)</a> . |
| 21-Oct-2020 | 3       | Added <a href="#">Figure 17</a> .                                                                                                        |

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