

## Automotive Turbo 2 ultrafast high voltage rectifier

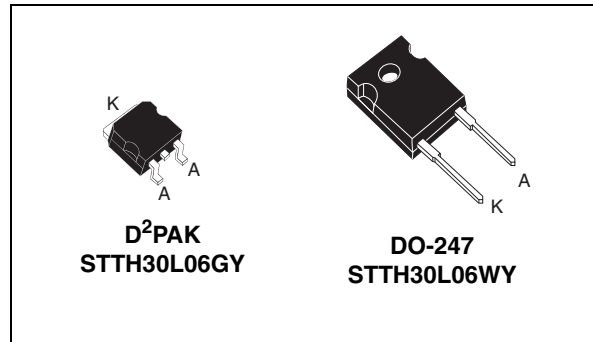
Datasheet — production data

### Features

- AEC-Q101 qualified
- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- ECOPACK®2 compliant component (DO-247)

### Description

The STTH30L06 uses ST Turbo 2 600 V technology and is especially suited for use in rectification and discontinuous mode PFC boost diode for automotive applications.



**Table 1. Device summary**

|                |        |
|----------------|--------|
| $I_{F(AV)}$    | 30 A   |
| $V_{RRM}$      | 600 V  |
| $T_j$          | 175 °C |
| $V_F$ (typ)    | 1.10 V |
| $t_{rr}$ (max) | 65 ns  |

# 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 voltage                  |                                     | 50          | A    |
| $I_{F(AV)}$  | Average forward current              | $T_c = 125\text{ °C } \delta = 0.5$ | 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 3. Thermal resistance**

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

**Table 4. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     |      |      | 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:

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

**Table 5. Dynamic Characteristics**

| Symbol   | Parameter                | Test conditions       |                                                                                                | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------|------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25\text{ °C}$  | $I_F = 0.5\text{ A}$ , $I_{rr} = 0.25\text{ A}$ ,<br>$I_R = 1\text{ A}$                        |      |      | 65   | ns   |
|          |                          |                       | $I_F = 1\text{ A}$ , $dl_F/dt = 50\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$              |      | 65   | 90   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 30\text{ A}$ , $V_R = 400\text{ V}$ ,<br>$dl_F/dt = 100\text{ A}/\mu\text{s}$           |      | 11.5 | 16   | A    |
| $t_{fr}$ | Forward recovery time    | $T_j = 25\text{ °C}$  | $I_F = 30\text{ A}$ , $dl_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{FR} = 1.1 \times V_{Fmax}$ |      |      | 500  | ns   |
| $V_{FP}$ | Forward recovery voltage | $T_j = 25\text{ °C}$  | $I_F = 30\text{ A}$ , $dl_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{FR} = 1.1 \times V_{Fmax}$ |      | 2.5  |      | V    |

Figure 1. Conduction losses versus average forward current

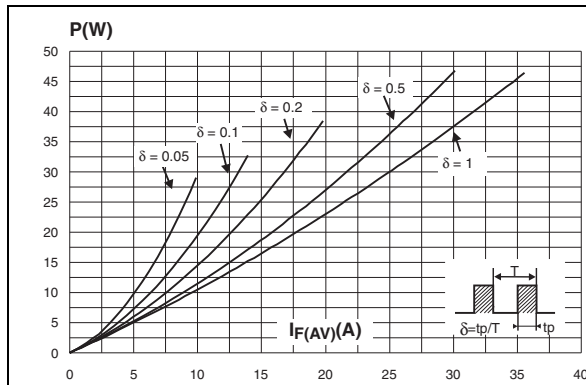


Figure 2. Forward voltage drop versus forward current

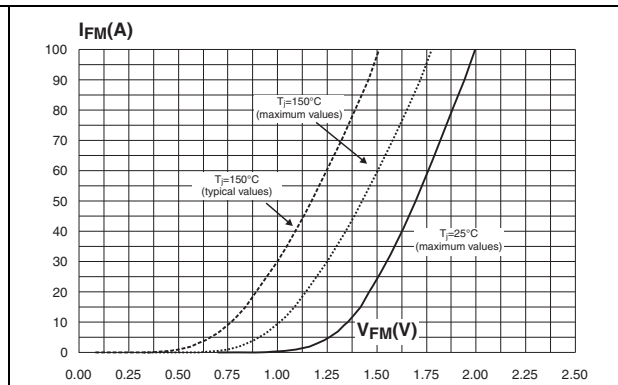


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

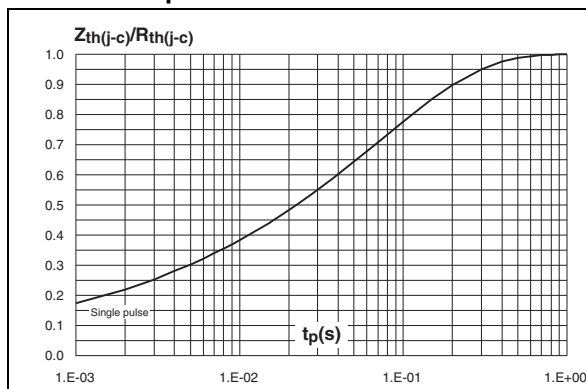
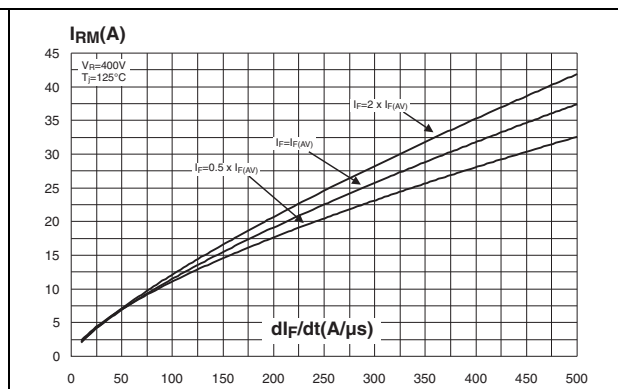
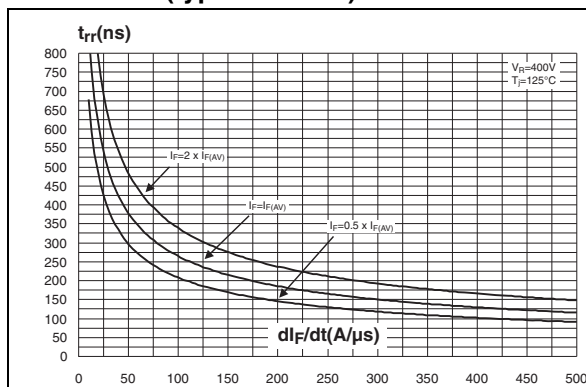
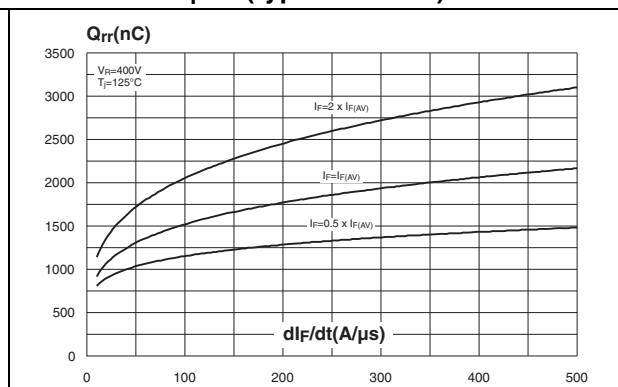
Figure 4. Peak reverse recovery current versus  $di_F/dt$  (typical values)Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

Figure 7. Reverse recovery softness factor versus  $di_F/dt$  (typical values)

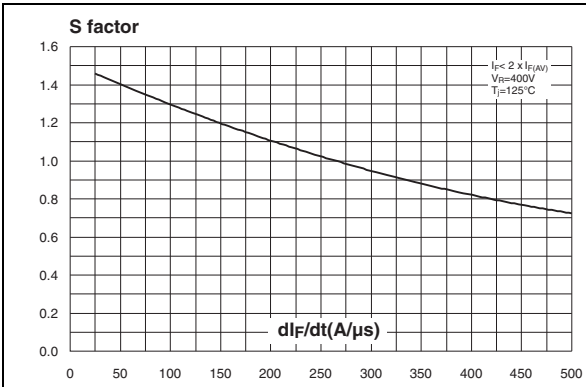


Figure 8. Relative variations of dynamic parameters versus junction temperature

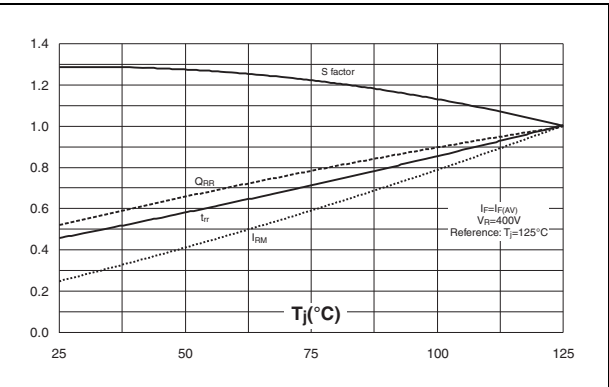


Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)

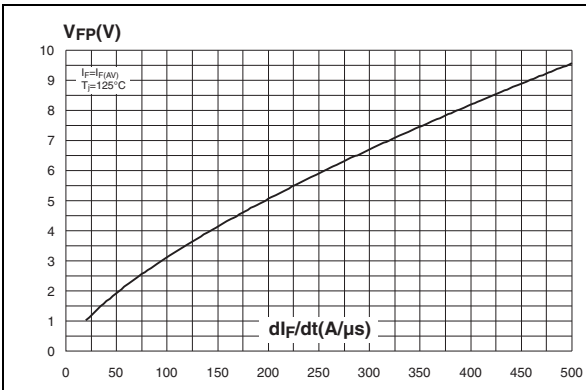


Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)

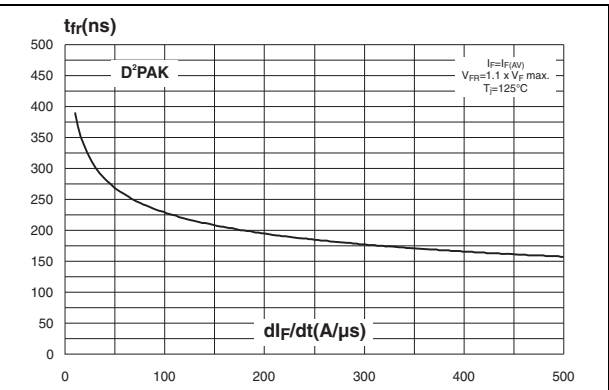


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

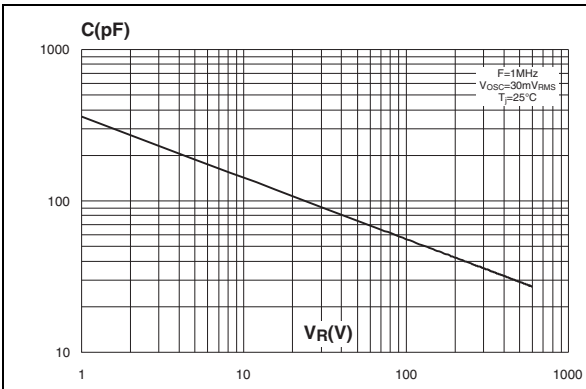
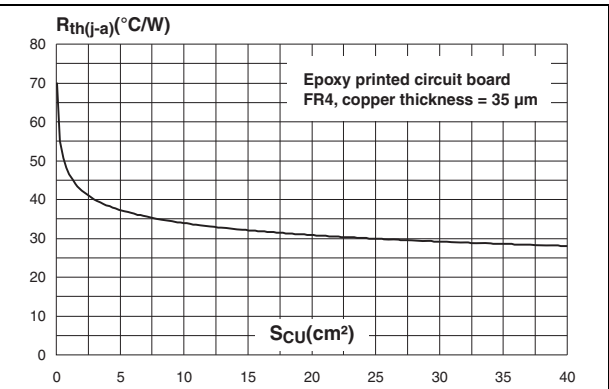


Figure 12. Thermal resistance junction to ambient versus copper surface under tab



## 2 Package information

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

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**Table 6. D<sup>2</sup>PAK 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 13. D<sup>2</sup>PAK footprint (dimensions in mm)**

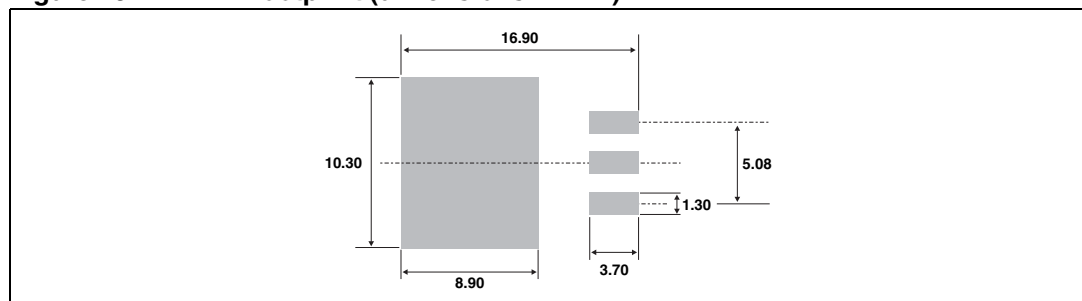


Table 7. DO-247 dimensions

| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 4.85        |       | 5.15  | 0.191  |       | 0.203 |
| D    | 2.20        |       | 2.60  | 0.086  |       | 0.102 |
| E    | 0.40        |       | 0.80  | 0.015  |       | 0.031 |
| F    | 1.00        |       | 1.40  | 0.039  |       | 0.055 |
| F2   |             | 2.00  |       |        | 0.078 |       |
| F3   | 2.00        |       | 2.40  | 0.078  |       | 0.094 |
| G    |             | 10.90 |       |        | 0.429 |       |
| H    | 15.45       |       | 15.75 | 0.608  |       | 0.620 |
| L    | 19.85       |       | 20.15 | 0.781  |       | 0.793 |
| L1   | 3.70        |       | 4.30  | 0.145  |       | 0.169 |
| L2   |             | 18.50 |       |        | 0.728 |       |
| L3   | 14.20       |       | 14.80 | 0.559  |       | 0.582 |
| L4   |             | 34.60 |       |        | 1.362 |       |
| L5   |             | 5.50  |       |        | 0.216 |       |
| M    | 2.00        |       | 3.00  | 0.078  |       | 0.118 |
| V    |             | 5°    |       |        | 5°    |       |
| V2   |             | 60°   |       |        | 60°   |       |
| Dia. | 3.55        |       | 3.65  | 0.139  |       | 0.143 |

### 3 Ordering information

**Table 8. 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             | 4.40 g | 30       | Tube          |

### 4 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 24-Oct-2012 | 1        | First issue. |

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