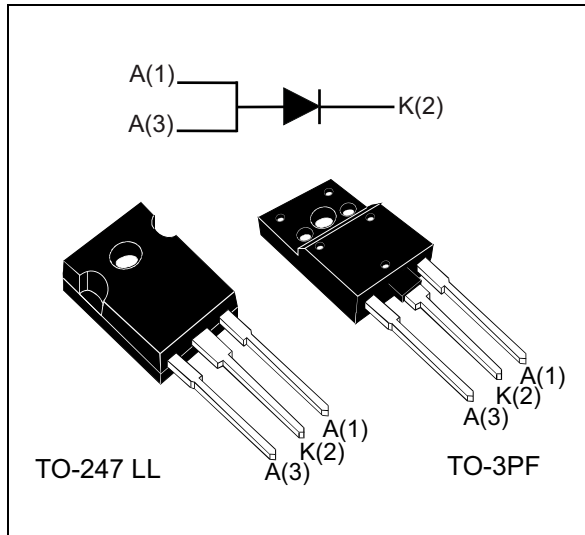


## Turbo 2 ultrasoft high voltage rectifier

Datasheet - production data



### Description

The STTH31AC06S, implementing a new technology with very high softness during the reverse commutation, is suitable as a boost diode in PFC. This device is highly recommended in air conditioning equipment for continuous mode interleaved power factor correction.

Table 1. Device summary

| Symbol          | Value  |
|-----------------|--------|
| $I_{F(AV)}$     | 30 A   |
| $V_{RRM}$       | 600 V  |
| $t_{rr}$ (typ.) | 45 ns  |
| $V_F$ (typ.)    | 1.35 V |
| $T_j$ (max.)    | 175 °C |

### Features

- Ultrafast switching
- Low reverse recovery current
- High thermal resistance
- Reduces switching losses
- ECOPACK®2 compliant component

# 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                    |                          | 45          | A    |
| $I_{F(AV)}$  | Average forward current                |                          | 30          | A    |
| $I_{FSM}$    | Surge non repetitive forward current   | $t_p = 10$ ms sinusoidal | 150         | A    |
| $T_{stg}$    | Storage temperature range              |                          | -40 to +175 | °C   |
| $T_j$        | Maximum operating junction temperature |                          | 175         | °C   |

**Table 3. Thermal parameters**

| Symbol        | Parameter        |           | Value | Unit |
|---------------|------------------|-----------|-------|------|
| $R_{th(j-c)}$ | Junction to case | TO-247 LL | 1.25  | °C/W |
|               |                  | TO-3PF    | 2.9   |      |

**Table 4. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions |                 | Min. | Typ. | Max. | Unit    |
|-------------|-------------------------|-----------------|-----------------|------|------|------|---------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25$ °C   | $V_R = V_{RRM}$ |      |      | 10   | $\mu$ A |
|             |                         | $T_j = 150$ °C  |                 |      | 20   | 200  |         |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25$ °C   | $I_F = 30$ A    |      | 1.55 | 2.00 | V       |
|             |                         | $T_j = 150$ °C  |                 |      | 1.35 | 1.75 |         |

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

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

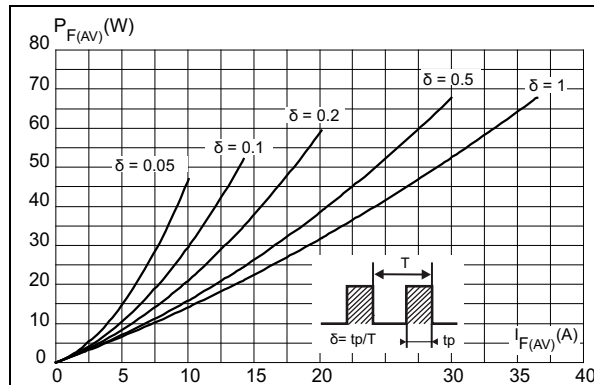
To evaluate the conduction losses use the following equation:

$$P = 1.24 \times I_{F(AV)} + 0.017 I_{F(RMS)}^2$$

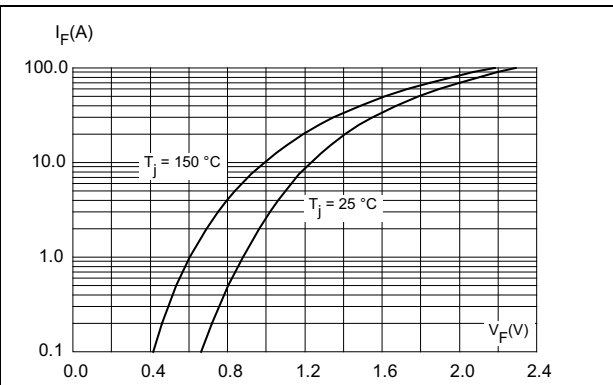
Table 5. Recovery characteristics

| Symbol       | Parameter                | Test conditions                     |                                                                                         | Min. | Typ. | Max. | Unit          |
|--------------|--------------------------|-------------------------------------|-----------------------------------------------------------------------------------------|------|------|------|---------------|
| $t_{rr}$     | Reverse recovery time    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 1\text{ A}$ , $V_R = 30\text{ V}$ ,<br>$di_F/dt = -100\text{ A}/\mu\text{s}$     |      | 45   | 65   | ns            |
| $I_{RM}$     | Reverse recovery current | $T_j = 150\text{ }^{\circ}\text{C}$ | $I_F = 30\text{ A}$ , $V_R = 400\text{ V}$ ,<br>$di_F/dt = -1000\text{ A}/\mu\text{s}$  |      | 36   |      | A             |
| $Q_{RR}$     | Reverse recovery charges |                                     |                                                                                         |      | 2.5  |      | $\mu\text{C}$ |
| $S_{factor}$ | Softness factor          |                                     |                                                                                         |      | 2.2  |      |               |
| $t_{fr}$     | Forward recovery time    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 30\text{ A}$ , $V_{FR} = 2.5\text{ V}$ ,<br>$di_F/dt = 500\text{ A}/\mu\text{s}$ |      |      | 150  | ns            |
| $V_{FP}$     | Forward recovery voltage |                                     |                                                                                         |      | 5.5  |      | V             |

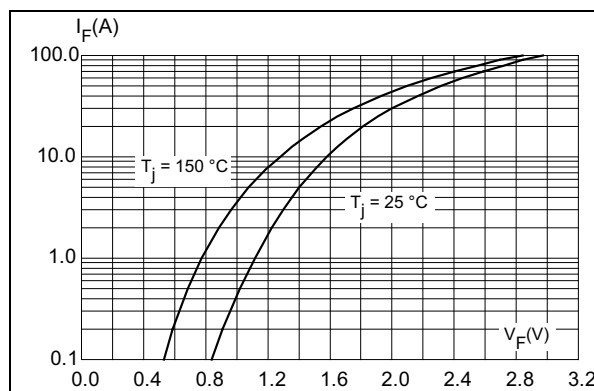
**Figure 1. Average forward power dissipation versus average forward current**



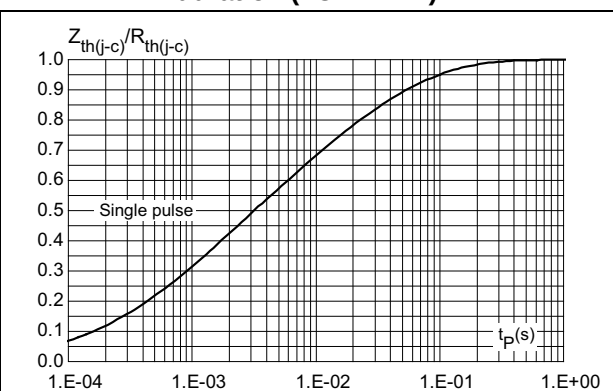
**Figure 2. Forward voltage drop versus forward current (typical values)**



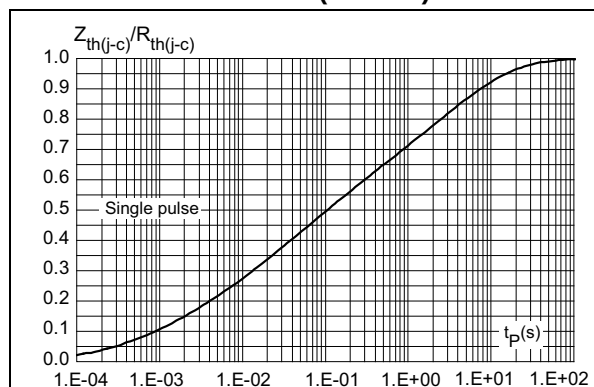
**Figure 3. Forward voltage drop versus forward current (maximum values)**



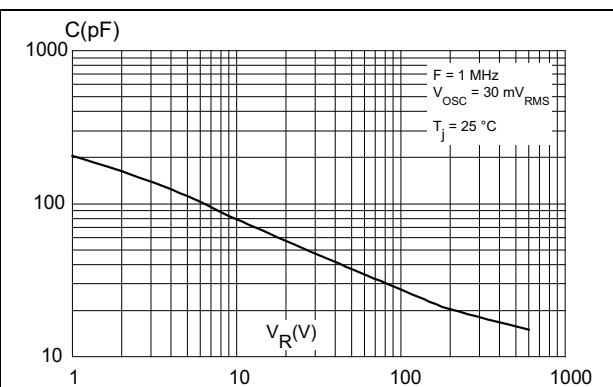
**Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-247 LL)**



**Figure 5. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-3PF)**



**Figure 6. Junction capacitance versus reverse voltage applied (typical values)**



## 2 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

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### 2.1 TO-247 LL package information

Figure 7. TO-247 LL package outline

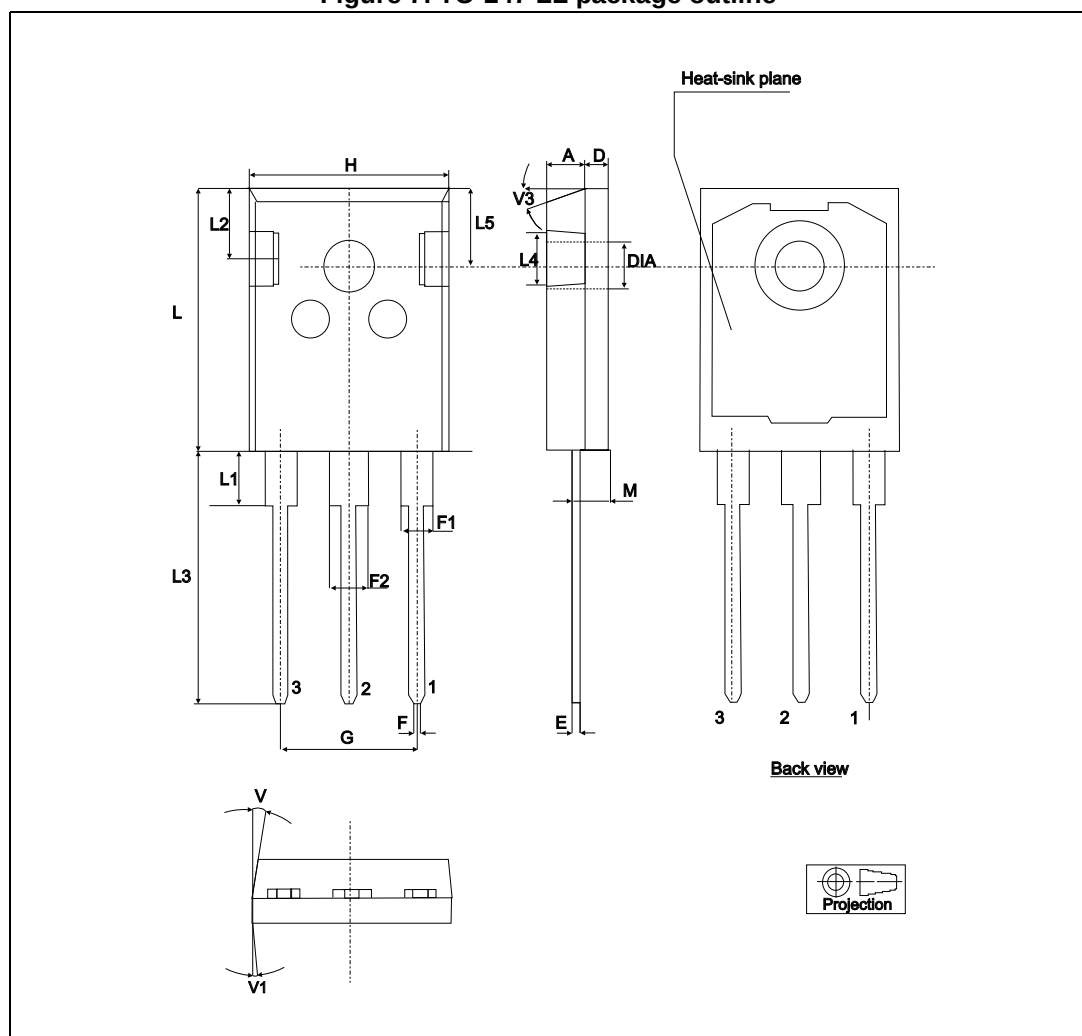


Table 6. TO-247 LL package mechanical data

| Ref. | Dimensions  |      |       |           |     |       |
|------|-------------|------|-------|-----------|-----|-------|
|      | Millimeters |      |       | Inches    |     |       |
|      | Min.        | Typ. | Max.  | Min.      | Typ | Max.  |
| A    | 4.90        |      | 5.15  | 0.192     |     | 0.202 |
| D    | 1.85        |      | 2.10  | 0.072     |     | 0.082 |
| E    | 0.55        |      | 0.67  | 0.021     |     | 0.026 |
| F    | 1.07        |      | 1.32  | 0.042     |     | 0.051 |
| F1   | 1.90        |      | 2.38  | 0.074     |     | 0.093 |
| F2   | 2.87        |      | 3.38  | 0.11      |     | 0.133 |
| G    | 10.90 BSC   |      |       | 0.429 BSC |     |       |
| H    | 15.77       |      | 16.02 | 0.62      |     | 0.63  |
| L    | 20.82       |      | 21.07 | 0.81      |     | 0.82  |
| L1   | 4.16        |      | 4.47  | 0.163     |     | 0.175 |
| L2   | 5.49        |      | 5.74  | 0.216     |     | 0.225 |
| L3   | 20.05       |      | 20.30 | 0.789     |     | 0.799 |
| L4   | 3.68        |      | 3.93  | 0.144     |     | 0.154 |
| L5   | 6.04        |      | 6.29  | 0.237     |     | 0.247 |
| M    | 2.25        |      | 2.55  | 0.088     |     | 0.10  |
| V    |             | 10°  |       |           | 10° |       |
| V1   |             | 3°   |       |           | 3°  |       |
| V3   |             | 20°  |       |           | 20° |       |
| Ø    | 3.55        |      | 3.66  | 0.139     |     | 0.143 |

## 2.2 TO-3PF package information

Figure 8. TO-3PF package outline

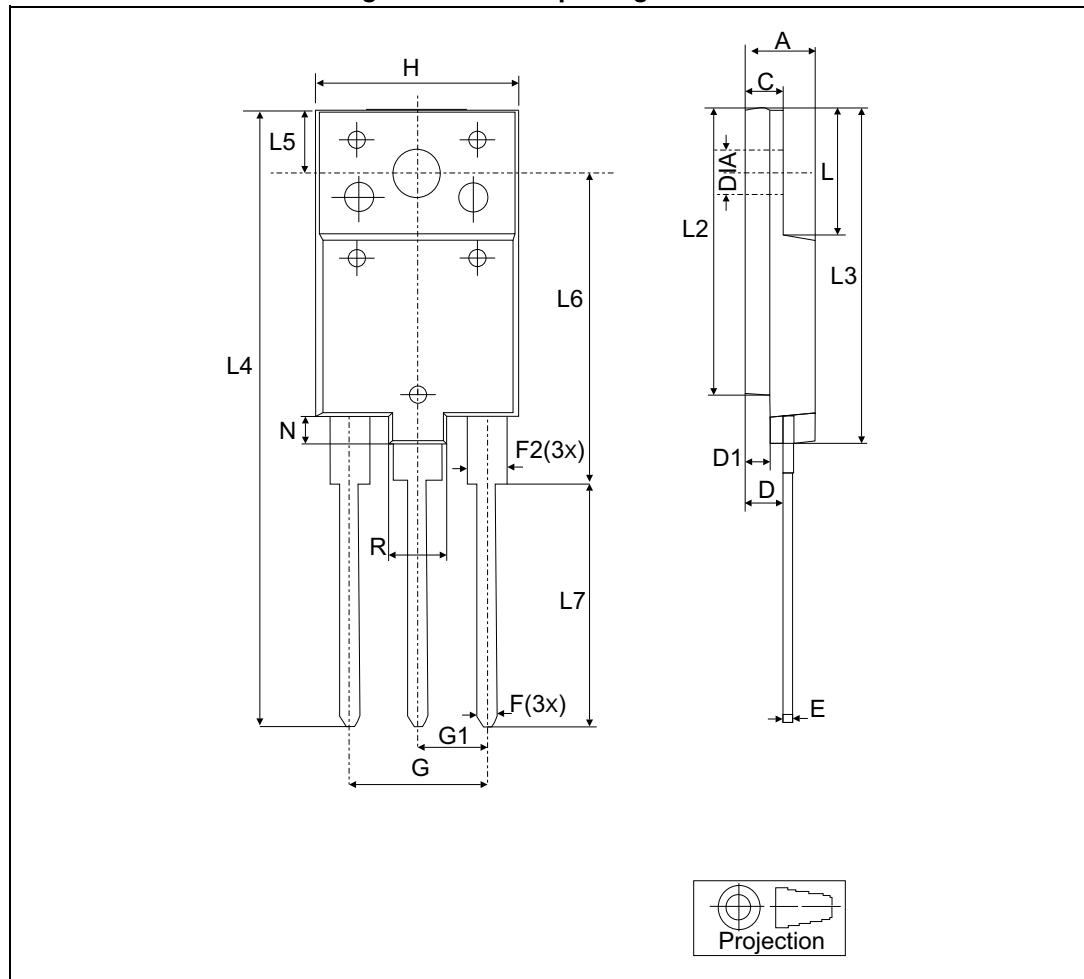


Table 7. TO-3PF package mechanical data

| Ref. | Dimensions  |      |       |        |      |       |
|------|-------------|------|-------|--------|------|-------|
|      | Millimeters |      |       | Inches |      |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ. | Max.  |
| A    | 5.30        |      | 5.70  | 0.2    |      | 0.22  |
| C    | 2.80        |      | 3.20  | 0.11   |      | 0.12  |
| D    | 3.10        |      | 3.50  | 0.12   |      | 0.13  |
| D1   | 1.80        |      | 2.20  | 0.07   |      | 0.08  |
| E    | 0.80        |      | 1.10  | 0.03   |      | 0.04  |
| F    | 0.65        |      | 0.95  | 0.025  |      | 0.037 |
| F2   | 1.80        |      | 2.20  | 0.07   |      | 0.08  |
| G    | 10.30       |      | 11.50 | 0.40   |      | 0.45  |
| G1   |             | 5.45 |       |        | 0.21 |       |
| H    | 15.30       |      | 15.70 | 0.60   |      | 0.61  |
| L    | 9.80        | 10   | 10.20 | 0.38   | 0.39 | 0.40  |
| L2   | 22.20       |      | 22.80 | 0.87   |      | 0.90  |
| L3   | 26.30       |      | 26.70 | 1.03   |      | 1.05  |
| L4   | 43.20       |      | 44.40 | 1.70   |      | 1.74  |
| L5   | 4.30        |      | 4.70  | 0.16   |      | 1.18  |
| L6   | 24.30       |      | 24.70 | 0.95   |      | 0.97  |
| L7   | 14.60       |      | 15    | 0.57   |      | 0.59  |
| N    | 1.80        |      | 2.20  | 0.07   |      | 0.08  |
| R    | 3.80        |      | 4.20  | 0.14   |      | 0.16  |
| Dia  | 3.40        |      | 3.80  | 0.13   |      | 0.15  |



### 3 Ordering information

**Table 8. Ordering information**

| Order code    | Marking       | Package   | Weight | Base qty. | Delivery mode |
|---------------|---------------|-----------|--------|-----------|---------------|
| STTH31AC06SWL | STTH31AC06SWL | TO-247 LL | 4.36 g | 30        | Tube          |
| STTH31AC06SPF | TH31AC06      | TO-3PF    | 5.6    | 30        | Tube          |

### 4 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes                           |
|-------------|----------|-----------------------------------|
| 30-Sep-2014 | 1        | First release.                    |
| 23-Mar-2016 | 2        | Added TO-3PF package information. |

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