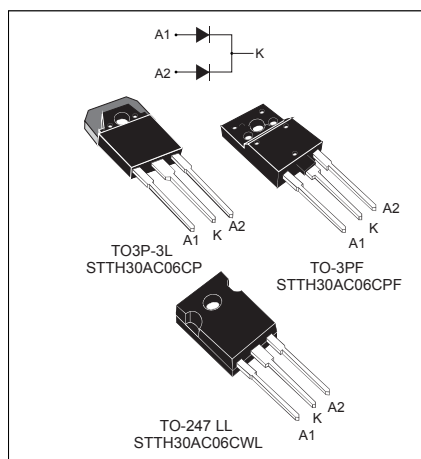


## Turbo 2 ultrafast high voltage rectifier



### Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- Insulated package TO-3PF:
  - Insulated voltage: 2500 V<sub>DC</sub>

### Description

The **STTH30AC06C** uses ST Turbo 2 600 V technology. It is suited as boost diode specially for use in air conditioning equipment as continuous mode interleaved power factor correction.

| Product status link         |          |
|-----------------------------|----------|
| <a href="#">STTH30AC06C</a> |          |
| Product summary             |          |
| <b>I<sub>F(AV)</sub></b>    | 2 x 15 A |
| <b>V<sub>RRM</sub></b>      | 600 V    |
| <b>t<sub>rr</sub> (typ)</b> | 40 ns    |
| <b>V<sub>F</sub> (typ)</b>  | 1.15 V   |
| <b>T<sub>j</sub></b>        | 175 °C   |

# 1 Characteristics

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

| Symbol       | Parameter                              |                          | Value       | Unit |
|--------------|----------------------------------------|--------------------------|-------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage        |                          | 600         | V    |
| $I_{F(RMS)}$ | Forward rms current                    |                          | 30          | A    |
| $I_{F(AV)}$  | Average forward current                | Per diode                | 15          | A    |
|              |                                        | Per device               | 30          |      |
| $I_{FSM}$    | Surge non repetitive forward current   | $t_p = 10$ ms sinusoidal | 140         | A    |
| $T_{stg}$    | Storage temperature range              |                          | -65 to +175 | °C   |
| $T_j$        | Maximum operating junction temperature |                          | 175         | °C   |

**Table 2. Thermal parameters**

| Symbol        | Parameter        |                    |           | Max. value | Unit |
|---------------|------------------|--------------------|-----------|------------|------|
| $R_{th(j-c)}$ | Junction to case | TO3P-3L, TO247 LL  | Per diode | 1.5        | °C/W |
|               |                  |                    | Total     | 0.85       |      |
|               |                  | TO-3PF             | Per diode | 3.5        |      |
|               |                  |                    | Total     | 2.7        |      |
| $R_{th(c)}$   | Coupling         | TO3P-3L, TO247 LL) |           | 0.2        |      |
|               |                  | TO-3PF             |           | 1.9        |      |

**Table 3. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Test conditions |                 | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|-----------------|-----------------|------|------|------|------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25$ °C   | $V_R = V_{RRM}$ | -    |      | 10   | μA   |
|             |                         | $T_j = 150$ °C  |                 | -    | 40   | 400  |      |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25$ °C   | $I_F = 15$ A    | -    |      | 1.95 | V    |
|             |                         | $T_j = 150$ °C  |                 | -    | 1.15 | 1.45 |      |
|             |                         | $T_j = 25$ °C   | $I_F = 30$ A    | -    |      | 2.25 |      |
|             |                         | $T_j = 150$ °C  |                 | -    | 1.42 | 1.8  |      |

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

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

To evaluate the conduction losses, use the following equation:

$$P = 1.1 \times I_{F(AV)} + 0.023 \times I_{F(RMS)}^2$$

**Table 4. Dynamic characteristics (per diode)**

| Symbol   | Parameters               | Test conditions       |                                                                                      | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------|--------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25\text{ °C}$  | $I_F = 0.5\text{ A}$ , $I_{rr} = 0.25\text{ A}$ , $I_R = 1\text{ A}$                 | -    |      | 30   | ns   |
|          |                          |                       | $I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$       | -    | 40   | 55   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 15\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$    | -    | 4    | 5.5  | A    |
| $t_{fr}$ | Forward recovery time    | $T_j = 25\text{ °C}$  | $I_F = 15\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.9\text{ V}$ | -    |      | 100  | ns   |
| $V_{FP}$ | Forward recovery voltage |                       |                                                                                      | -    | 2.5  |      | V    |

## 1.1 Characteristics (curves)

**Figure 1. Average forward power dissipation versus average forward current (per diode)**

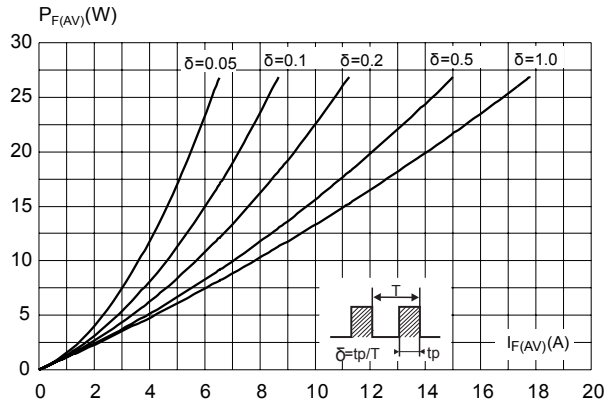


**Figure 2. Forward voltage drop versus forward current (typical values, per diode)**

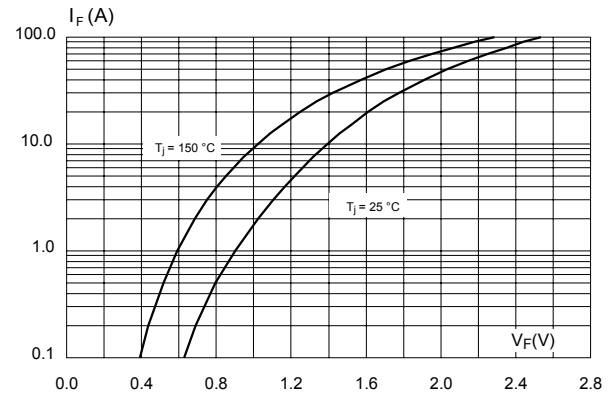


**Figure 3. Forward voltage drop versus forward current (maximum values, per diode)**

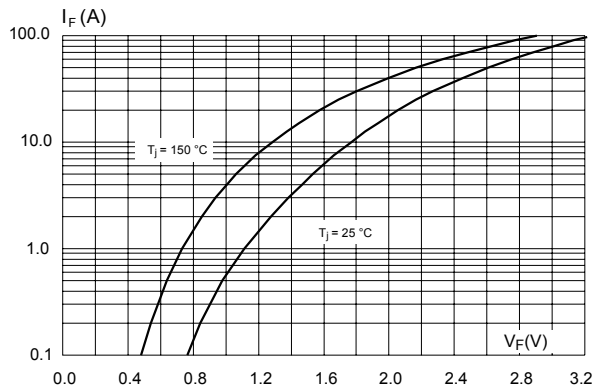


**Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration (TO3P-3L, TO247 LL)**

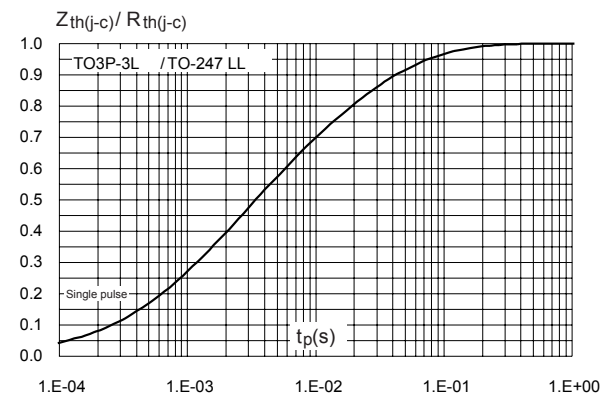


**Figure 5. Relative variation of thermal impedance, junction to case, versus pulse duration (TO3P-3L)**

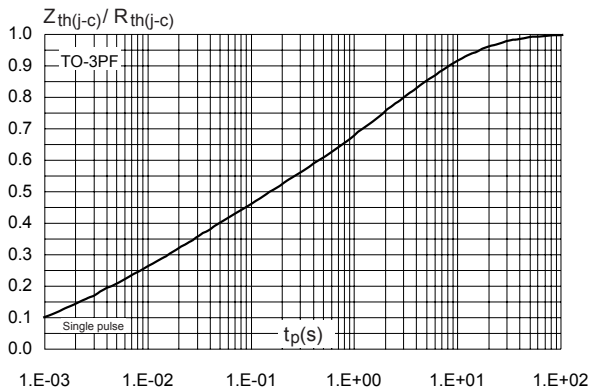


**Figure 6. Peak reverse recovery current versus  $di_F/dt$  (typical values, per diode)**

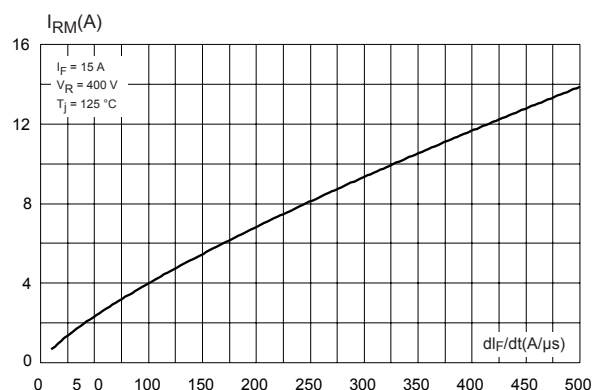


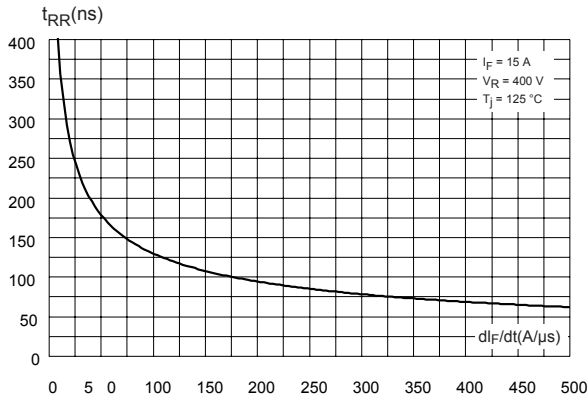
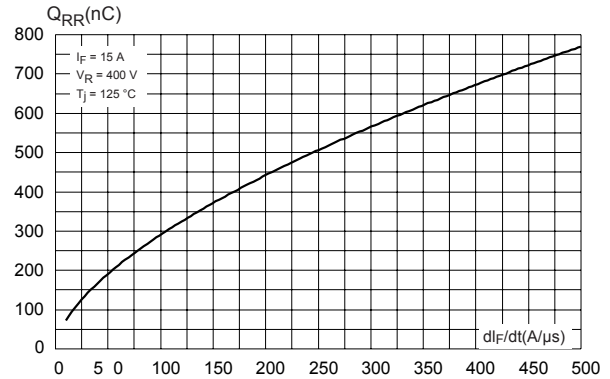
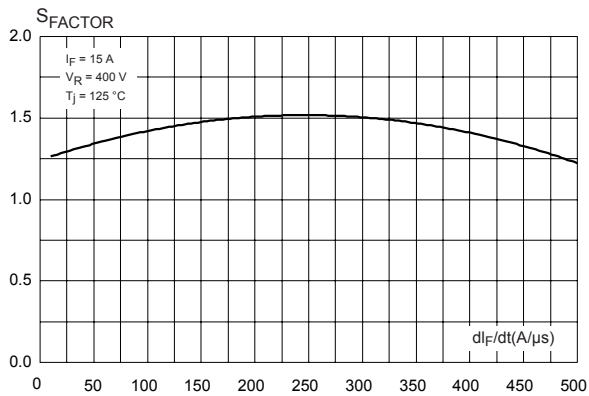
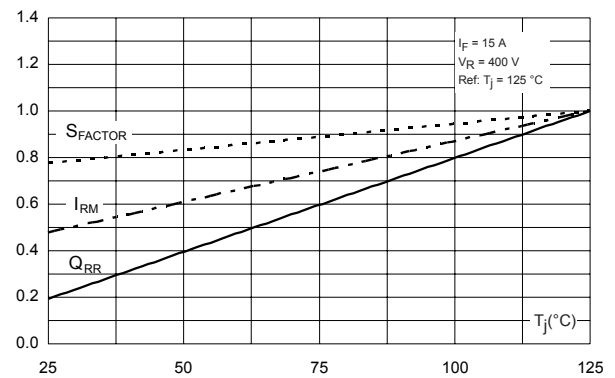
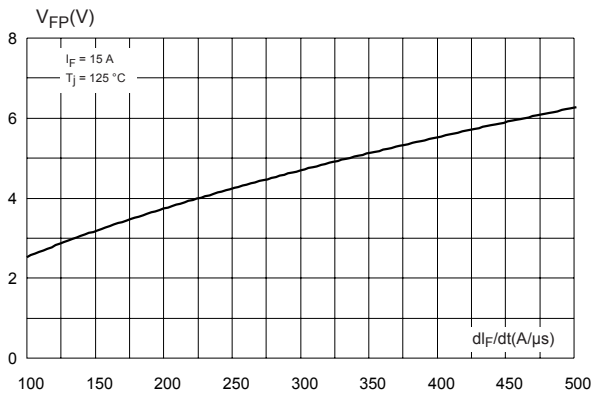
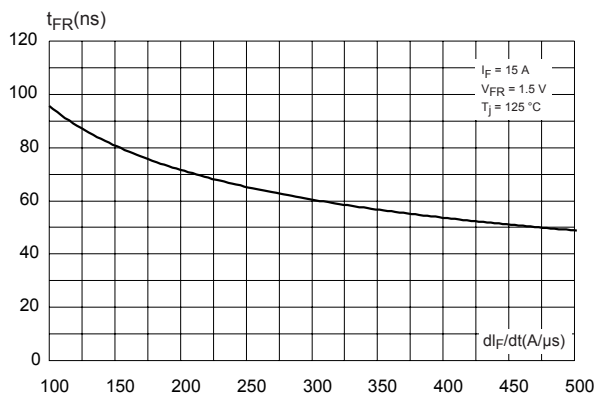
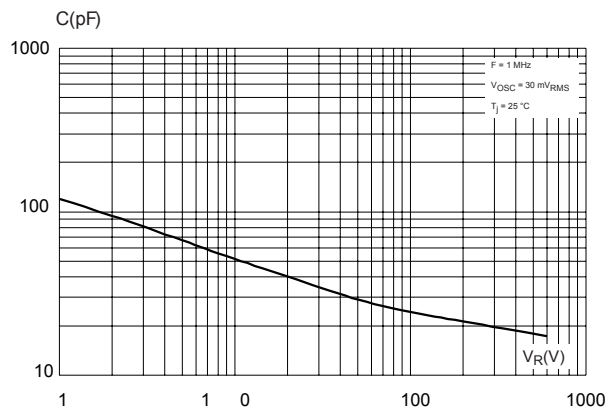
**Figure 7. Reverse recovery time versus  $dl_F/dt$  (typical values, per diode)**

**Figure 8. Reverse recovery charges versus  $dl_F/dt$  (typical values, per diode)**

**Figure 9. Reverse recovery softness factor versus  $dl_F/dt$  (typical values, per diode)**

**Figure 10. Relative variations of dynamic parameters versus junction temperature**

**Figure 11. Transient peak forward voltage versus  $dl_F/dt$  (typical values, per diode)**

**Figure 12. Forward recovery time versus  $dl_F/dt$  (typical values, per diode)**


**Figure 13. Junction capacitance versus reverse voltage applied (typical values, per diode)**



## 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 TO3P-3L package information

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

**Figure 14. TO3P-3L package outline**

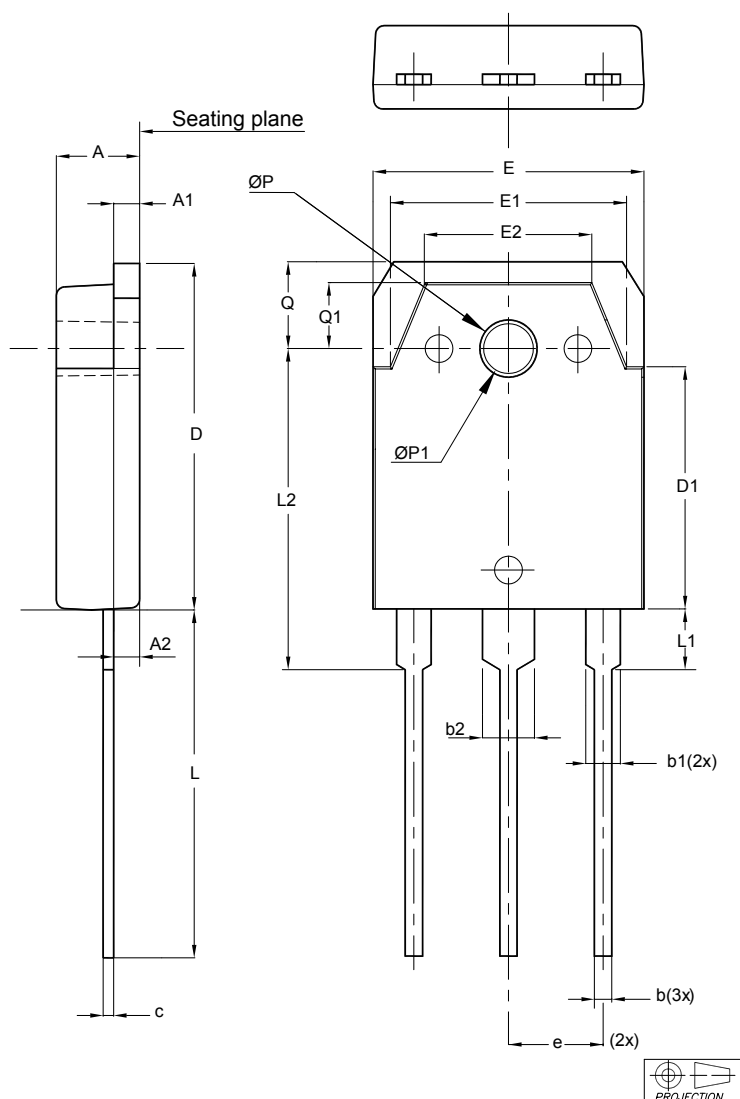


**Table 5. TO3P-3L package mechanical data**

| Ref.     | Dimensions  |       |       |        |      |      |
|----------|-------------|-------|-------|--------|------|------|
|          | Millimeters |       |       | Inches |      |      |
|          | Min.        | Typ.  | Max.  | Min.   | Typ. | Max. |
| A        | 4.60        | 4.80  | 5     | 0.18   | 0.19 | 0.19 |
| A1       | 1.45        | 1.50  | 1.65  | 0.05   | 0.06 | 0.06 |
| A2       | 1.20        | 1.40  | 1.60  | 0.04   | 0.05 | 0.06 |
| b        | 0.80        | 1.00  | 1.20  | 0.03   | 0.04 | 0.05 |
| b1       | 1.80        | 2.00  | 2.20  | 0.07   | 0.08 | 0.08 |
| b2       | 2.80        | 3.00  | 3.20  | 0.11   | 0.12 | 0.12 |
| c        | 0.55        | 0.60  | 0.75  | 0.02   | 0.02 | 0.03 |
| D        | 19.70       | 19.90 | 20.10 | 0.77   | 0.78 | 0.79 |
| D1       | 13.70       | 13.90 | 14.10 | 0.54   | 0.54 | 0.55 |
| E        | 15.40       | 15.60 | 15.80 | 0.60   | 0.61 | 0.62 |
| E1       | 13.40       | 13.60 | 13.80 | 0.53   | 0.53 | 0.54 |
| E2       | 9.40        | 9.60  | 9.90  | 0.37   | 0.38 | 0.39 |
| e        | 5.15        | 5.45  | 5.75  | 0.20   | 0.21 | 0.22 |
| L        | 19.80       | 20    | 20.20 | 0.78   | 0.78 | 0.79 |
| L1       | 3.30        | 3.50  | 3.70  | 0.13   | 0.14 | 0.14 |
| L2       | 18.20       | 18.40 | 18.60 | 0.71   | 0.72 | 0.73 |
| Diam. P  | 3.30        | 3.40  | 3.50  | 0.13   | 0.13 | 0.14 |
| Diam. P1 | 3.10        | 3.20  | 3.30  | 0.12   | 0.12 | 0.13 |
| Q        | 4.80        | 5     | 5.20  | 0.19   | 0.19 | 0.20 |
| Q1       | 3.60        | 3.80  | 4     | 0.14   | 0.15 | 0.16 |

## 2.2 TO-3PF package information

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

**Figure 15. TO-3PF package outline**

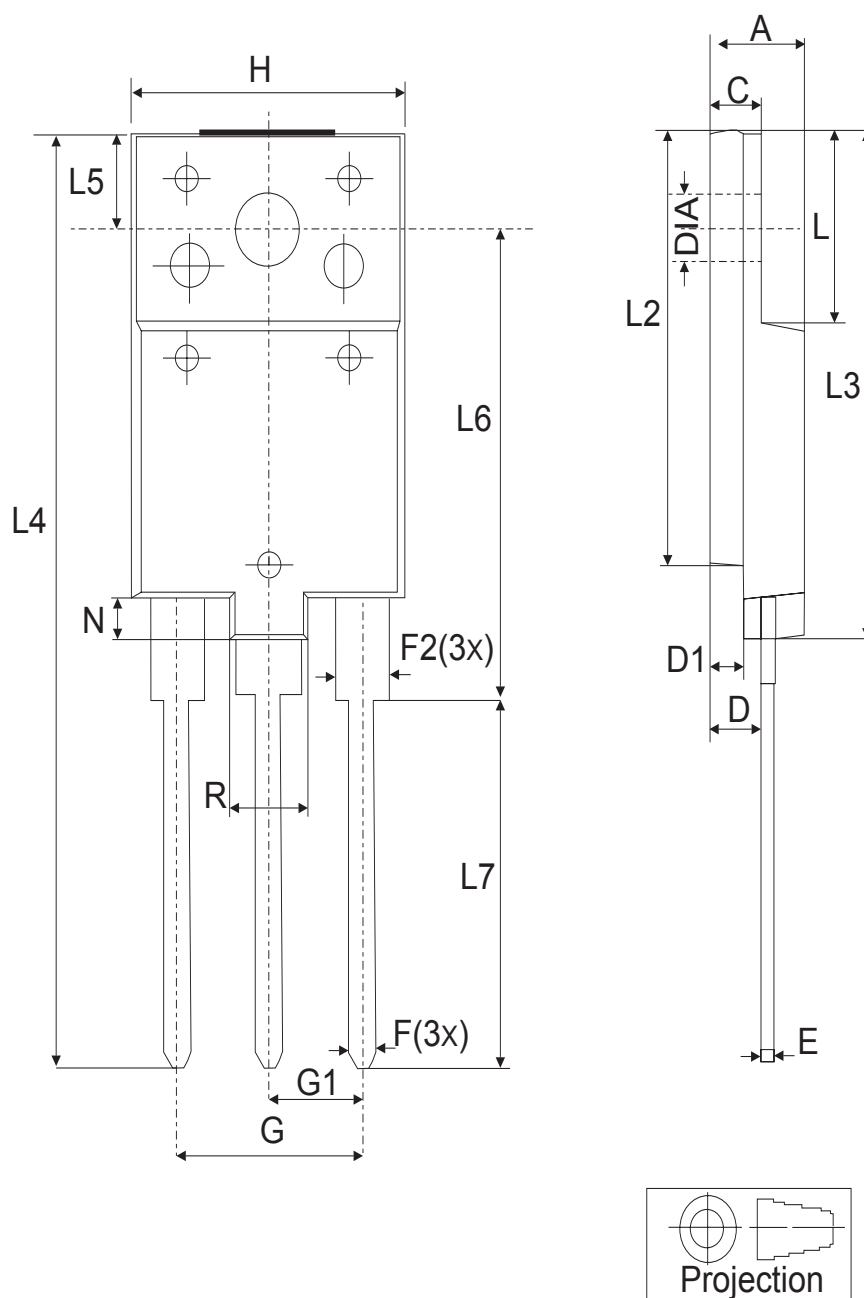


**Table 6. TO-3PF mechanical data**

| Dim. | mm    |      |       |
|------|-------|------|-------|
|      | Min.  | Typ. | Max.  |
| A    | 5.30  |      | 5.70  |
| C    | 2.80  |      | 3.20  |
| D    | 3.10  |      | 3.50  |
| D1   | 1.80  |      | 2.20  |
| E    | 0.80  |      | 1.10  |
| F    | 0.65  |      | 0.95  |
| F2   | 1.80  |      | 2.20  |
| G    | 10.30 |      | 11.50 |
| G1   |       | 5.45 |       |
| H    | 15.30 |      | 15.70 |
| L    | 9.80  | 10   | 10.20 |
| L2   | 22.80 |      | 23.20 |
| L3   | 26.30 |      | 26.70 |
| L4   | 43.20 |      | 44.40 |
| L5   | 4.30  |      | 4.70  |
| L6   | 24.30 |      | 24.70 |
| L7   | 14.60 |      | 15    |
| N    | 1.80  |      | 2.20  |
| R    | 3.80  |      | 4.20  |
| Dia  | 3.40  |      | 3.80  |

## 2.3 TO-247 long leads package information

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

**Figure 16. TO-247 long leads package outline**

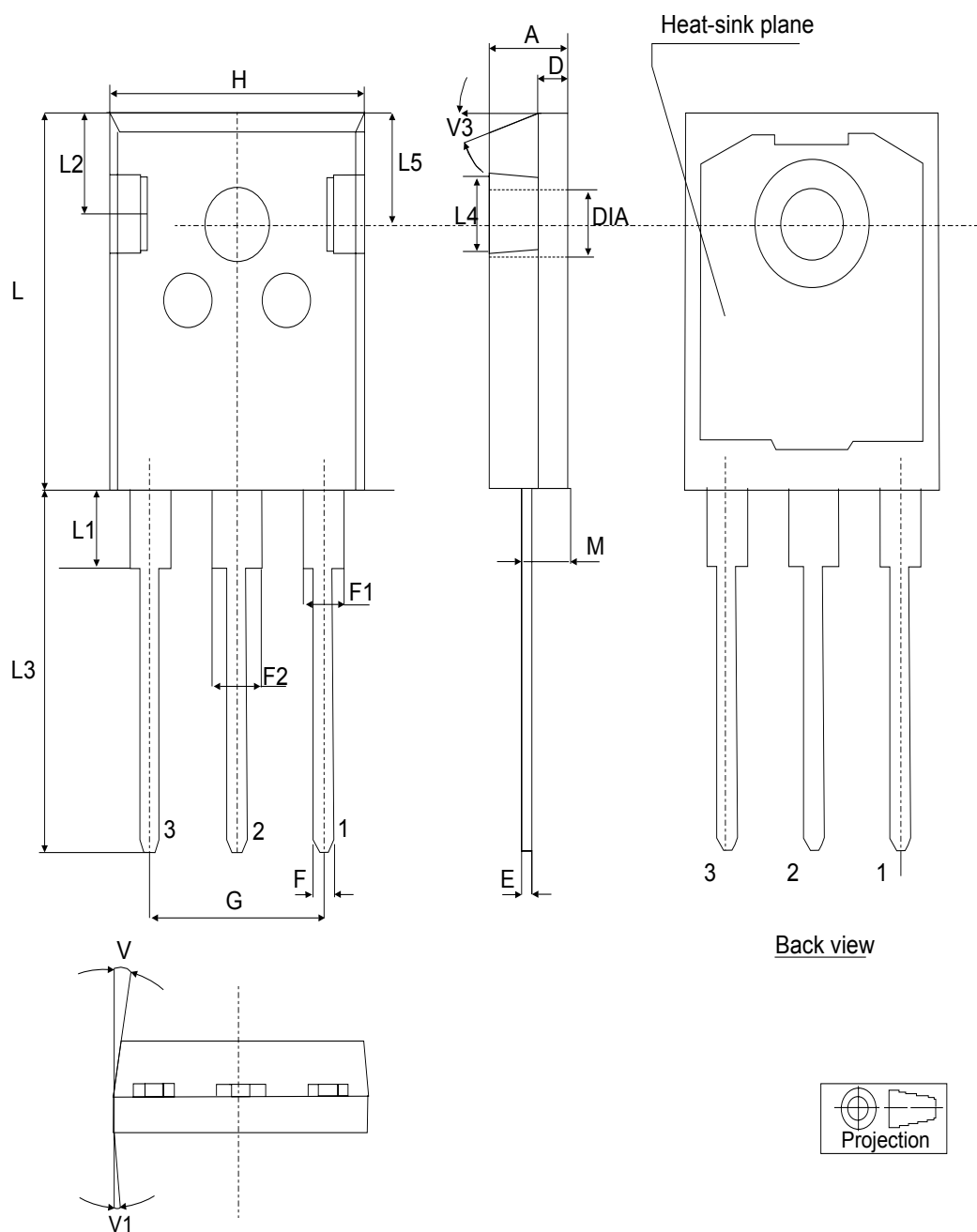


**Table 7. TO-247 long leads package mechanical data**

| Dim. | mm.       |      |       | 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  | 0.110     |      | 0.133 |
| G    | 10.90 BSC |      |       | 0.429 BSC |      |       |
| H    | 15.77     |      | 16.02 | 0.620     |      | 0.630 |
| L    | 20.82     |      | 21.07 | 0.810     |      | 0.820 |
| 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     |      | 0.100 |
| V    |           | 10°  |       |           | 10°  |       |
| V1   |           | 3°   |       |           | 3°   |       |
| V3   |           | 20°  |       |           | 20°  |       |
| DIA  | 3.55      |      | 3.66  | 0.139     |      | 0.143 |

### 3 STTH30AC06C Ordering information

**Table 8. Ordering information**

| Order code    | Marking       | Package   | Weight | Base qty. | Delivery mode |
|---------------|---------------|-----------|--------|-----------|---------------|
| STTH30AC06CP  | STTH30AC06C   | TO3P-3L   | 5.26 g | 30        | Tube          |
| STTH30AC06CPF | TH30AC06C     | TO-3PF    | 5.6 g  | 30        |               |
| STTH30AC06CWL | STTH30AC06CWL | TO-247 LL | 4.36 g | 30        |               |

## Revision history

**Table 9. Document revision history**

| Date        | Version | Changes                                                               |
|-------------|---------|-----------------------------------------------------------------------|
| 13-Nov-2013 | 1       | Initial release.                                                      |
| 25-Jun-2015 | 2       | Update of cover page and Table 7. Format updated to current standard. |
| 01-Jul-2015 | 3       | Updated Features.                                                     |
| 05-Sep-2016 | 4       | Updated Figure 16.                                                    |
| 18-Apr-2018 | 5       | Updated TO247LL POA drawing.                                          |

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