

### Features

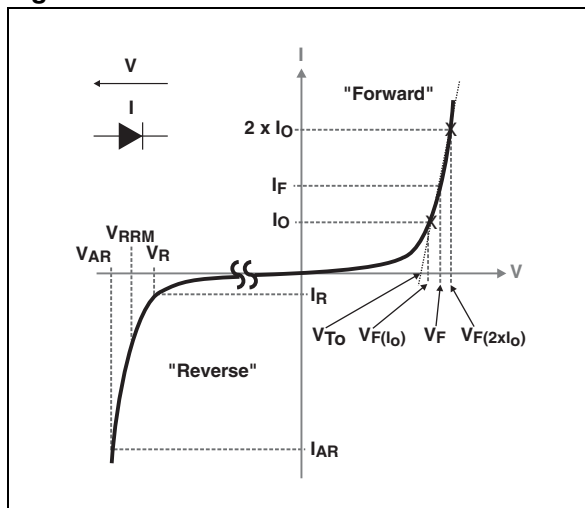
- Low forward voltage drop
- Negligible switching losses
- Low thermal resistance
- Avalanche capability specified

### Description

These dual center tap Schottky rectifiers are suited for switched mode power supplies and high frequency DC to DC converters.

Packaged in TO-220FPAB, TO-220AB narrow leads, TO-220AB, D<sup>2</sup>PAK, I<sup>2</sup>PAK and TO-247, this device is intended for use in high frequency inverters.

Figure 1. Electrical characteristics (a)



- a.  $V_{ARM}$  and  $I_{ARM}$  must respect the reverse safe operating area defined in [Figure 12](#).  $V_{AR}$  and  $I_{AR}$  are pulse measurements ( $t_p < 1 \mu s$ ).  $V_R$ ,  $I_R$ ,  $V_{RRM}$  and  $V_F$  are static characteristics

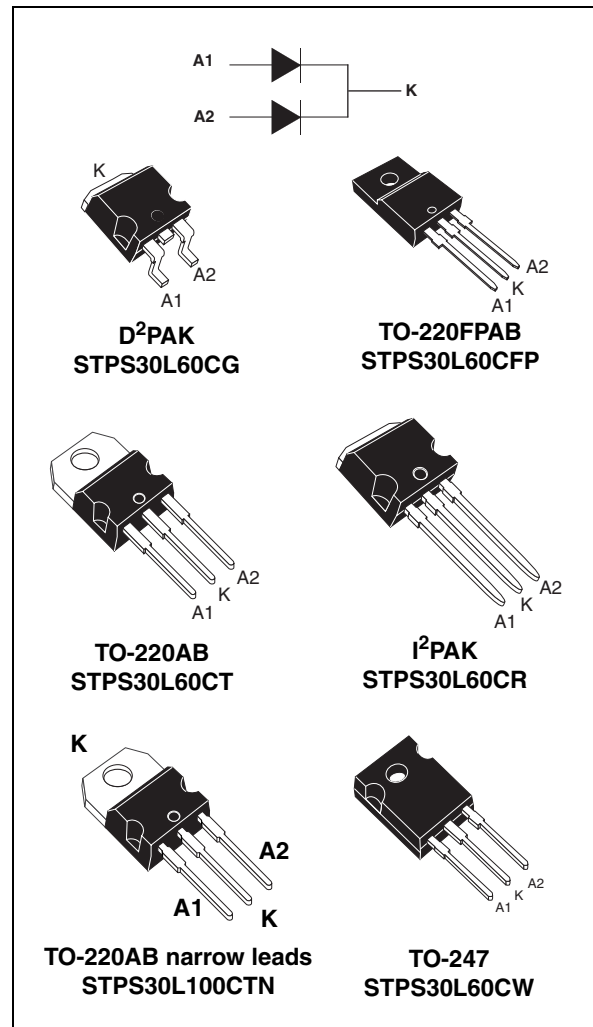


Table 1. Device summary

| Symbol      | Value    |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 15 A |
| $V_{RRM}$   | 60 V     |
| $T_J (max)$ | 150 °C   |
| $V_F (max)$ | 0.56 V   |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values, per diode)**

| Symbol                          | Parameter                                             |                                                                                                |                                                                           |                         | Value        | Unit |
|---------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------|--------------|------|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       |                                                                                                |                                                                           |                         | 60           | V    |
| I <sub>F(RMS)</sub>             | Forward rms current                                   |                                                                                                |                                                                           |                         | 30           | A    |
| I <sub>F(AV)</sub>              | Average forward current                               | TO-220AB narrow leads,<br>TO-220AB, I <sup>2</sup> PAK, D <sup>2</sup> PAK,<br>TO-247, δ = 0.5 | T <sub>c</sub> = 130 °C                                                   | Per diode<br>Per device | 15<br>30     | A    |
|                                 |                                                       | TO-220FPAB, δ = 0.5                                                                            | T <sub>c</sub> = 110 °C                                                   | Per diode<br>Per device | 15<br>30     |      |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  |                                                                                                | t <sub>p</sub> = 10 ms, sinusoidal                                        |                         | 230          | A    |
| I <sub>RRM</sub>                | Repetitive peak reverse current                       |                                                                                                | t <sub>p</sub> = 2 μs square, F = 1 kHz                                   |                         | 2            | A    |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       |                                                                                                | t <sub>p</sub> = 1 μs, T <sub>j</sub> = 25 °C                             |                         | 7800         | W    |
| V <sub>ARM</sub> <sup>(2)</sup> | Maximum repetitive peak avalanche voltage             |                                                                                                | t <sub>p</sub> < 1 μs, T <sub>j</sub> < 150 °C,<br>I <sub>AR</sub> < 29 A |                         | 80           | V    |
| V <sub>ASM</sub> <sup>(2)</sup> | Maximum single pulse peak avalanche voltage           |                                                                                                | t <sub>p</sub> < 1 μs, T <sub>j</sub> < 150 °C,<br>I <sub>AR</sub> < 29 A |                         | 80           | V    |
| T <sub>stg</sub>                | Storage temperature range                             |                                                                                                |                                                                           |                         | -65 to + 175 | °C   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> |                                                                                                |                                                                           |                         | 150          | °C   |
| dV/dt                           | Critical rate of rise reverse voltage                 |                                                                                                |                                                                           |                         | 10000        | V/μs |

- For temperature or pulse time duration deratings, refer to [Figure 4](#) and [Figure 5](#). More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.
- Refer to [Figure 12](#).
- $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistances**

| Symbol        | Parameter        |                                                                                    |           |  | Value | Unit                 |
|---------------|------------------|------------------------------------------------------------------------------------|-----------|--|-------|----------------------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB narrow leads,<br>TO-220AB, I <sup>2</sup> PAK, D <sup>2</sup> PAK, TO-247 | Per diode |  | 1.5   | $^{\circ}\text{C/W}$ |
|               |                  |                                                                                    | Total     |  | 0.8   |                      |
|               |                  | TO-220FPAB                                                                         | Per diode |  | 4.7   |                      |
|               |                  |                                                                                    | Total     |  | 3.95  |                      |
| $R_{th(c)}$   | Coupling         | TO-220AB narrow leads, TO-220AB, I <sup>2</sup> PAK,<br>D <sup>2</sup> PAK, TO-247 |           |  | 0.1   | $^{\circ}\text{C/W}$ |
|               |                  | TO-220FPAB                                                                         |           |  | 3.2   |                      |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode } 1) = P(\text{diode } 1) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode } 2) \times R_{th(c)}$$

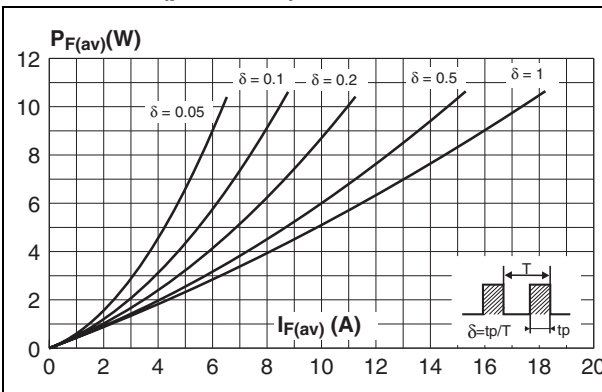
**Table 4. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Tests conditions                    |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-------------------------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^{\circ}\text{C}$  | $V_R = V_{RRM}$     |      |      | 480  | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     |      | 77   | 130  | mA            |
| $V_F^{(1)}$ | Forward voltage drop    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 15\text{ A}$ |      |      | 0.6  | V             |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 15\text{ A}$ |      | 0.5  | 0.56 |               |
|             |                         | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 30\text{ A}$ |      |      | 0.75 |               |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 30\text{ A}$ |      | 0.65 | 0.7  |               |

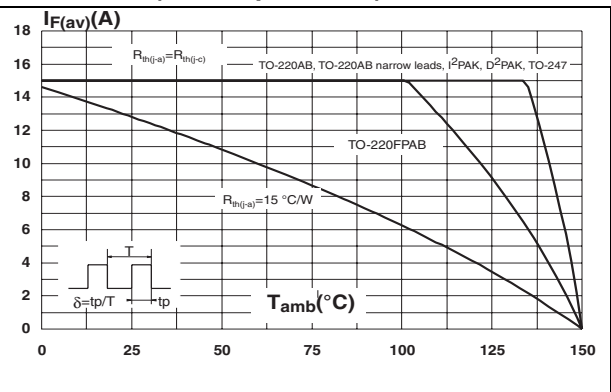
1. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 0.42 \times I_{F(AV)} + 0.009 \times I_{F(RMS)}^2$

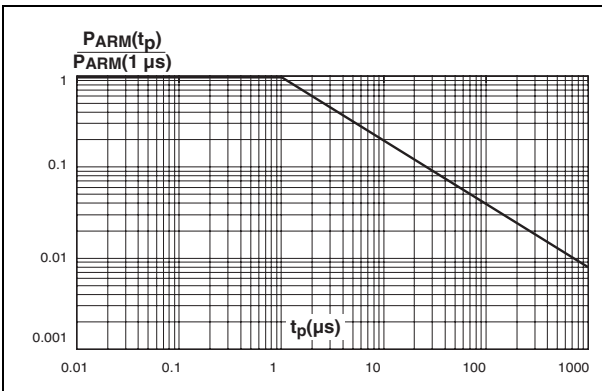
**Figure 2. Average forward power dissipation versus average forward current (per diode)**



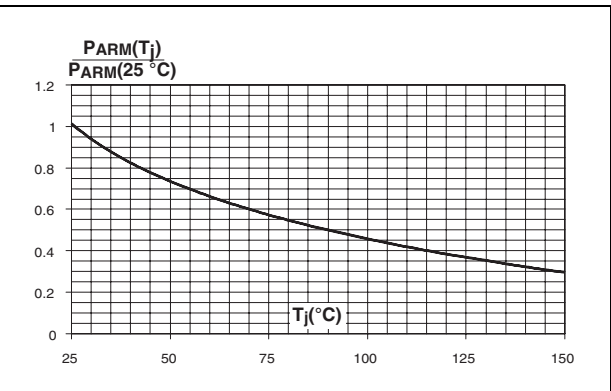
**Figure 3. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



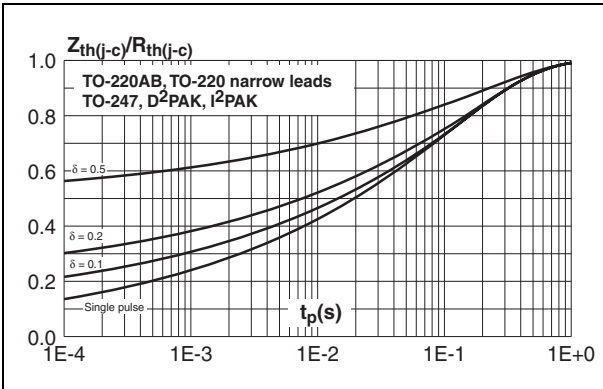
**Figure 4. Normalized avalanche power derating versus pulse duration**



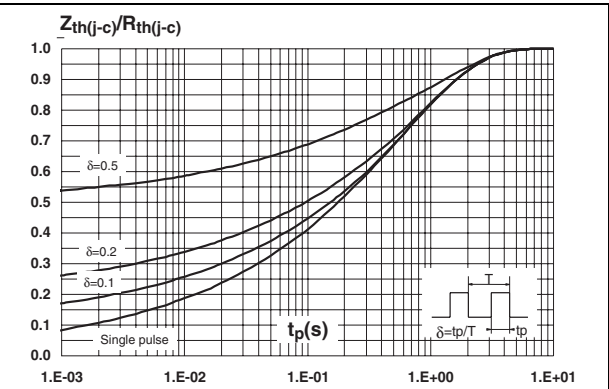
**Figure 5. Normalized avalanche power derating versus junction temperature**



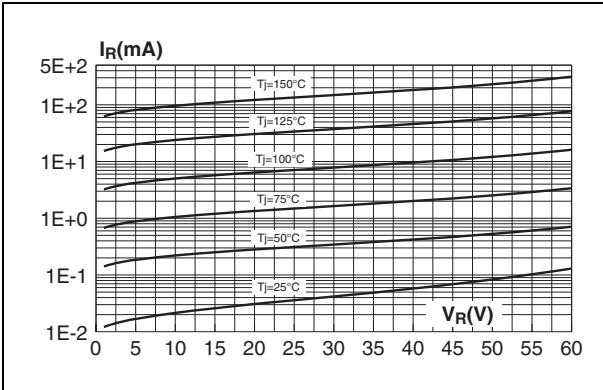
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**



**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)**



**Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)**

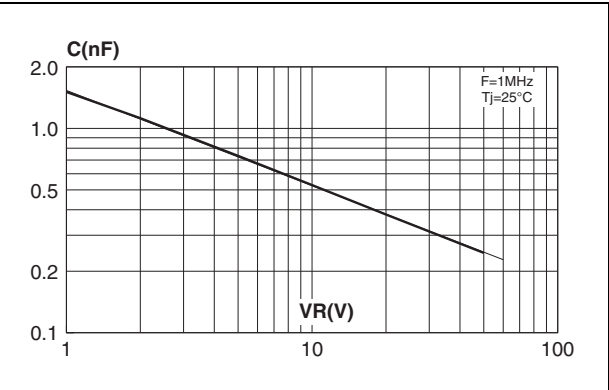


Figure 10. Forward voltage drop versus forward current (maximum values, per diode)

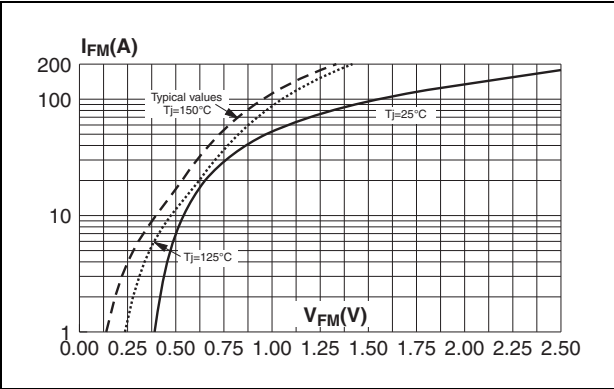


Figure 11. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK

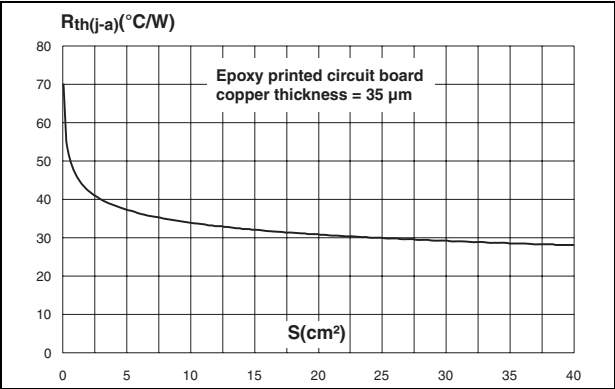
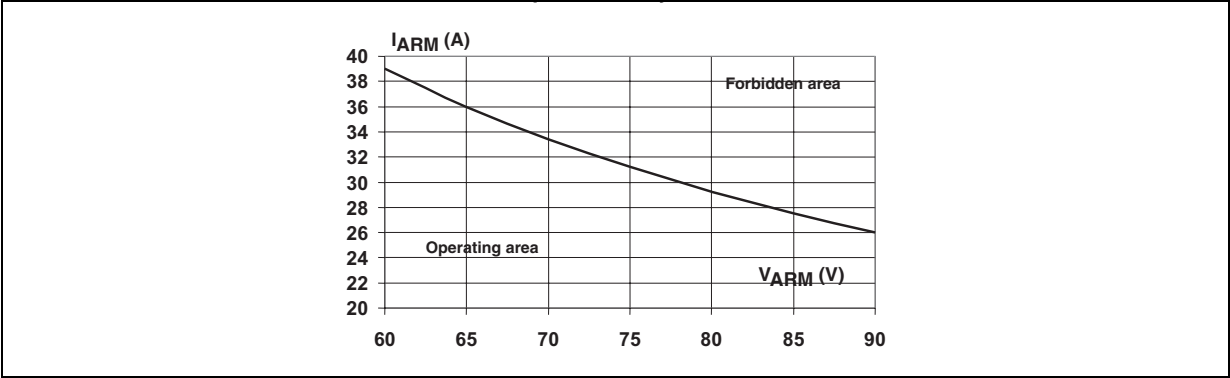


Figure 12. Reverse safe operating area ( $t_p < 1 \mu\text{s}$ ,  $T_j < 150^\circ\text{C}$ )



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque values: TO-220AB, TO-220AB narrow leads, and TO-220FPAB 0.4 to 0.6 N·m, TO-247 0.55 N·m (1.0 N·m maximum)

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.

**Table 5. TO-220FPAB dimensions**

| Ref. | Dimensions  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.4         | 4.6  | 0.173     | 0.181 |
| B    | 2.5         | 2.7  | 0.098     | 0.106 |
| D    | 2.5         | 2.75 | 0.098     | 0.108 |
| E    | 0.45        | 0.70 | 0.018     | 0.027 |
| F    | 0.75        | 1    | 0.030     | 0.039 |
| F1   | 1.15        | 1.70 | 0.045     | 0.067 |
| F2   | 1.15        | 1.70 | 0.045     | 0.067 |
| G    | 4.95        | 5.20 | 0.195     | 0.205 |
| G1   | 2.4         | 2.7  | 0.094     | 0.106 |
| H    | 10          | 10.4 | 0.393     | 0.409 |
| L2   | 16 Typ.     |      | 0.63 Typ. |       |
| L3   | 28.6        | 30.6 | 1.126     | 1.205 |
| L4   | 9.8         | 10.6 | 0.386     | 0.417 |
| L5   | 2.9         | 3.6  | 0.114     | 0.142 |
| L6   | 15.9        | 16.4 | 0.626     | 0.646 |
| L7   | 9.00        | 9.30 | 0.354     | 0.366 |
| Dia. | 3.00        | 3.20 | 0.118     | 0.126 |

Table 6. TO-220AB dimensions

| 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      | 0.067 |
| F2    | 1.14        | 1.70  | 0.044      | 0.06è |
| G     | 4.95        | 5.15  | 0.194      | 0.202 |
| G1    | 2.40        | 2.70  | 0.094      | 0.106 |
| H2    | 10          | 10.40 | 0.393      | 0.409 |
| L2    | 16.4 typ.   |       | 0.645 typ. |       |
| L4    | 13          | 14    | 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. |       |
| Diam. | 3.75        | 3.85  | 0.147      | 0.151 |

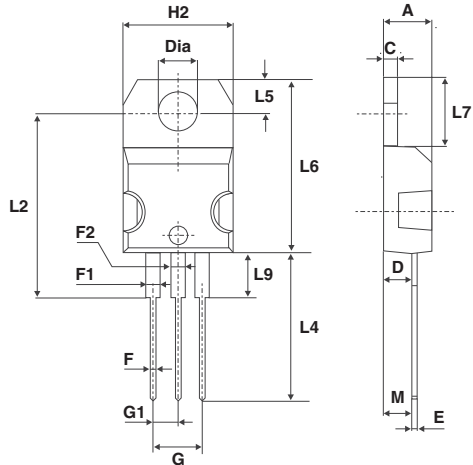
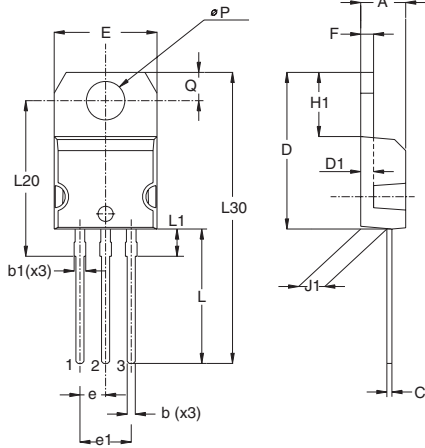


Table 7. TO-220AB narrow leads dimensions

| Ref. | Dimensions  |      |       |        |      |       |
|------|-------------|------|-------|--------|------|-------|
|      | Millimeters |      |       | Inches |      |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ. | Max.  |
| A    | 4.40        |      | 4.60  | 0.17   |      | 0.18  |
| b    | 0.61        |      | 0.88  | 0.024  |      | 0.034 |
| b1   | 0.95        |      | 1.20  | 0.037  |      | 0.047 |
| c    | 0.48        |      | 0.70  | 0.019  |      | 0.027 |
| D    | 15.25       |      | 15.75 | 0.60   |      | 0.62  |
| D1   | 1.27        |      |       | 0.05   |      |       |
| E    | 10.00       |      | 10.40 | 0.39   |      | 0.41  |
| e    | 2.40        |      | 2.70  | 0.094  |      | 0.106 |
| e1   | 4.95        |      | 5.15  | 0.19   |      | 0.20  |
| F    | 1.23        |      | 1.32  | 0.048  |      | 0.052 |
| H1   | 6.20        |      | 6.60  | 0.24   |      | 0.26  |
| J1   | 2.40        |      | 2.72  | 0.095  |      | 0.107 |
| L    | 13.00       |      | 14.00 | 0.51   |      | 0.55  |
| L1   | 2.60        |      | 2.90  | 0.102  |      | 0.114 |
| L20  | 15.40       |      |       | 0.61   |      |       |
| L30  | 28.90       |      |       | 1.14   |      |       |
| ØP   | 3.75        |      | 3.85  | 0.147  |      | 0.151 |
| Q    | 2.65        |      | 2.95  | 0.104  |      | 0.116 |



Technical drawing of a Tee fitting, showing front, side, and detail views. Dimensions are labeled as follows:

- Front View:** L (Overall Length), L2 (Top Flange Thickness), L3 (Bottom Flange Thickness), E (Flange Width), B (Bottom Flange Width), B2 (Bottom Flange Thickness), G (Gasket Groove Width).
- Side View:** A (Top Flange Thickness), C2 (Top Flange Width), D (Overall Height), C (Bottom Flange Width), R (Radius), A1 (Angle).
- Detail View:** A2 (Angle), M (Radius), V2 (Angle).

\* FLAT ZONE NO LESS THAN 2mm

| 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°    |

Technical drawing of a mechanical part showing a side view and a front view. The side view is a rectangle with a width of 16.90 and a height of 10.30. The front view shows a base of 8.90 and a total width of 16.90. The front view also shows a central section with a width of 3.70 and a height of 1.30. The side view shows a central section with a width of 3.70 and a height of 5.08.

Devices in I<sup>2</sup>PAK with nickel-plated back frame must NOT be mounted by frame soldering like SMDs. Such devices are intended to be through-hole mounted ONLY and in no circumstances shall ST be held liable for any lack of performance or damage arising out of soldering of nickel-plated back frames.

**Table 9. I<sup>2</sup>PAK dimensions**

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.40        | 4.60  | 0.173  | 0.181 |
| A1   | 2.40        | 2.72  | 0.094  | 0.107 |
| b    | 0.61        | 0.88  | 0.024  | 0.035 |
| b1   | 1.14        | 1.70  | 0.044  | 0.067 |
| c    | 0.49        | 0.70  | 0.019  | 0.028 |
| c2   | 1.23        | 1.32  | 0.048  | 0.052 |
| D    | 8.95        | 9.35  | 0.352  | 0.368 |
| e    | 2.40        | 2.70  | 0.094  | 0.106 |
| e1   | 4.95        | 5.15  | 0.195  | 0.203 |
| E    | 10          | 10.40 | 0.394  | 0.409 |
| L    | 13          | 14    | 0.512  | 0.551 |
| L1   | 3.50        | 3.93  | 0.138  | 0.155 |
| L2   | 1.27        | 1.40  | 0.050  | 0.055 |

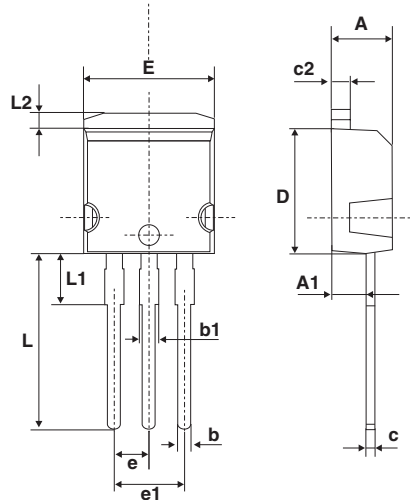


Table 10. TO-247 dimensions

| 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 |
| F1   |             | 3.00  |       |        | 0.118 |       |
| F2   |             | 2.00  |       |        | 0.078 |       |
| F3   | 2.00        |       | 2.40  | 0.078  |       | 0.094 |
| F4   | 3.00        |       | 3.40  | 0.118  |       | 0.133 |
| 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 11. Ordering information**

| Order code     | Marking      | Package                  | Weight | Base qty | Delivery mode |
|----------------|--------------|--------------------------|--------|----------|---------------|
| STPS30L60CW    | STPS30L60CW  | TO-247                   | 4.4 g  | 30       | Tube          |
| STPS30L60CT    | STPS30L60CT  | TO-220AB                 | 2.3 g  | 50       | Tube          |
| STPS30L60CG    | STPS30L60CG  | D <sup>2</sup> PAK       | 1.5 g  | 50       | Tube          |
| STPS30L60CG-TR | STPS30L60CG  | D <sup>2</sup> PAK       | 1.5 g  | 1000     | Tape and reel |
| STPS30L60CR    | STPS30L60CR  | I <sup>2</sup> PAK       | 1.49 g | 50       | Tube          |
| STPS30L60CFP   | STPS30L60CFP | TO-220FPAB               | 2.0 g  | 50       | Tube          |
| STPS30L60CTN   | STPS30L60CTN | TO-220AB<br>narrow leads | 1.9 g  | 50       | Tube          |

### 4 Revision history

**Table 12. Document revision history**

| Date        | Revision | Description of changes                                                                                                                                                                                                                                               |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| July-2003   | 3B       | Initial release                                                                                                                                                                                                                                                      |
| 16-Oct-2006 | 4        | Reformatted to current standards. Corrected dimensions for I <sup>2</sup> PAK in Table 5.                                                                                                                                                                            |
| 28-Nov-2006 | 5        | Added TO-220FPAB package. Added STPS30L60CG-TR to ordering information.                                                                                                                                                                                              |
| 07-Mar-2007 | 6        | Updated thermal parameters in Table 2.                                                                                                                                                                                                                               |
| 31-Mar-2007 | 7        | Updated T <sub>C</sub> = 110 °C in Table 1.                                                                                                                                                                                                                          |
| 25-Aug-2008 | 8        | Reformatted to current standards. Updated ECOPACK statement. Updated torque values and dimension illustration for TO-247 in <a href="#">Section 2</a> .                                                                                                              |
| 07-Feb-2011 | 9        | Added electrical diagram on first page. Added parameters V <sub>ARM</sub> and V <sub>ASM</sub> to <a href="#">Table 2</a> . Added <a href="#">Figure 12</a> . Updated and added warning paragraph above <a href="#">Table 9</a> . Updated <a href="#">Table 11</a> . |
| 15-Jun-2012 | 10       | Added TO-220AB narrow leads package.                                                                                                                                                                                                                                 |

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