



# THE DATASHEET OF STPS10M80CFP



## Power Schottky rectifier

### Features

- High junction temperature capability
- Optimized trade-off between leakage current and forward voltage drop
- Low leakage current
- Avalanche capability specified
- Insulated package TO-220FPAB
  - insulated voltage: 2000 V
  - package capacitance: 45 pF

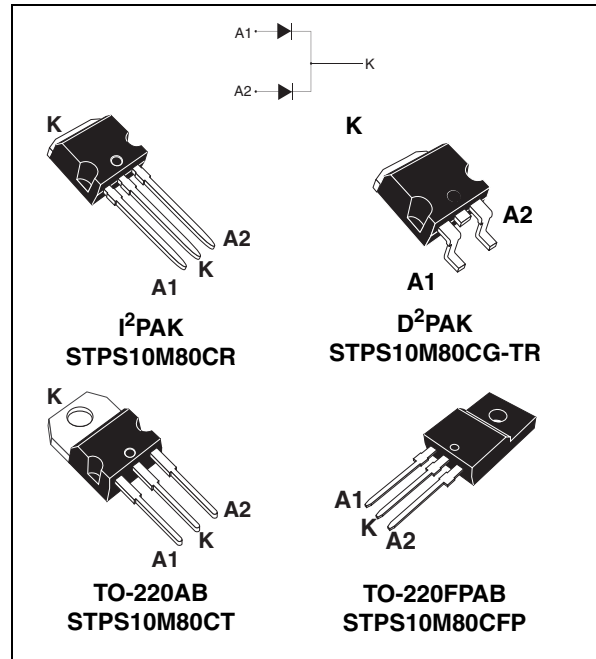
### Description

This dual diode Schottky rectifier is suited for high frequency switch mode power supply.

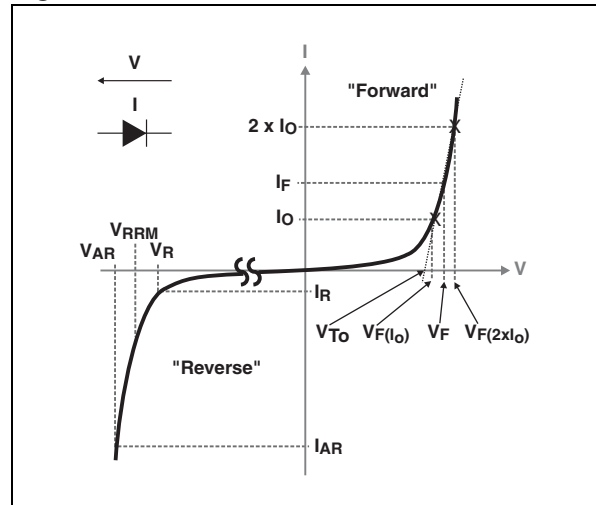
Packaged in TO-220AB, I<sup>2</sup>PAK, D<sup>2</sup>PAK and TO-220FPAB, this device is particularly suited for use in notebook, game station, LCD TV and desktop adapters, providing these applications with a good efficiency at both low and high load.

**Table 1. Device summary**

| Symbol      | Value   |
|-------------|---------|
| $I_{F(AV)}$ | 2 x 5 A |
| $V_{RRM}$   | 80 V    |
| $T_j$ (max) | 175 °C  |
| $V_F$ (typ) | 465 mV  |



**Figure 1. Electrical characteristics<sup>(a)</sup>**



a.  $V_{ARM}$  and  $I_{ARM}$  must respect the reverse safe operating area defined in [Figure 13](#).  $V_{AR}$  and  $I_{AR}$  are pulse measurements ( $t_p < 1 \mu s$ ).  $V_R$ ,  $I_R$ ,  $V_{RRM}$  and  $V_F$  are static characteristics

# 1 Characteristics

**Table 2. Absolute ratings (limiting values, per diode, at T<sub>amb</sub> = 25 °C unless otherwise specified)**

| Symbol                          | Parameter   |  |  | Value                   | Unit    |   |
|---------------------------------|---|--|--|-------------------------|---------|---|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       |  |  | 80                      | V       |   |
| I <sub>F(RMS)</sub>             | Forward rms current                                   |  |  | 30                      | A       |   |
| I <sub>F(AV)</sub>              | Average forward current, δ = 0.5                      | TO-220AB, I <sup>2</sup> PAK, D <sup>2</sup> PAK                       | T <sub>c</sub> = 160 °C<br>T <sub>c</sub> = 160 °C | Per diode<br>Per device | 5<br>10 | A |
|                                 |   | TO-220FPAB   | T <sub>c</sub> = 150 °C<br>T <sub>c</sub> = 140 °C | Per diode<br>Per device | 5<br>10 |   |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sinusoidal                                      |  | T <sub>c</sub> = 25 °C  | 150     | A |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       |  | T <sub>j</sub> = 25 °C, t <sub>p</sub> = 1 μs      |                         | 4000    | 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, I <sub>AR</sub> < 12 A |  |                         | 100     | 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, I <sub>AR</sub> < 12 A |  |                         | 100     | V |
| T <sub>stg</sub>                | Storage temperature range                             |  |  | -65 to +175             | °C      |   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> |  |  | 175                     | °C      |   |

1. For temperature or pulse time duration deratings, please refer to figure 3 and 4. More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.
2. See [Figure 13](#)
3.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal parameters**

| Symbol               | Parameter        |  |           | Value | Unit |
|----------------------|------------------|--|-----------|-------|------|
| R <sub>th(j-c)</sub> | Junction to case | TO-220AB<br>I <sup>2</sup> PAK, D <sup>2</sup> PAK | per diode | 3.10  | °C/W |
|                      |                  |  | total     | 1.88  |      |
|                      |                  | TO-220FPAB   | per diode | 5.90  |      |
|                      |                  |  | total     | 4.75  |      |
| R <sub>th(c)</sub>   | Coupling         | TO-220AB<br>I <sup>2</sup> PAK, D <sup>2</sup> PAK |           | 0.65  | °C/W |
|                      |                  | TO-220FPAB   |           | 3.60  |      |

When the two 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               | Test conditions                   |                      | Min. | Typ.  | Max.  | Unit          |
|-------------|-------------------------|-----------------------------------|----------------------|------|-------|-------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^\circ\text{C}$  | $V_R = V_{RRM}$      | -    | 4     | 20    | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |                      | -    | 3.5   | 15    | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ }^\circ\text{C}$  | $I_F = 2.5\text{ A}$ | -    | 0.540 | 0.580 | V             |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |                      | -    | 0.465 | 0.495 |               |
|             |                         | $T_j = 25\text{ }^\circ\text{C}$  | $I_F = 5\text{ A}$   | -    | 0.640 | 0.705 |               |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |                      | -    | 0.550 | 0.590 |               |
|             |                         | $T_j = 25\text{ }^\circ\text{C}$  | $I_F = 10\text{ A}$  | -    | 0.775 | 0.850 |               |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |                      | -    | 0.635 | 0.705 |               |

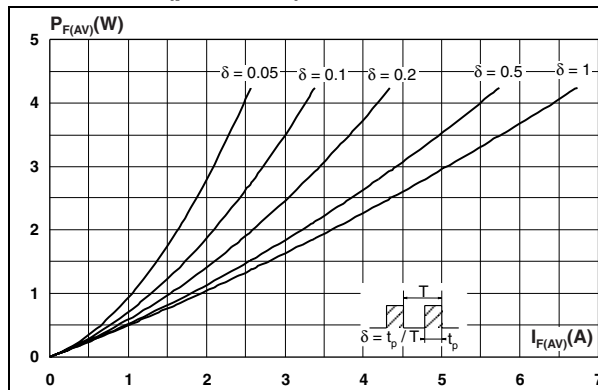
1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

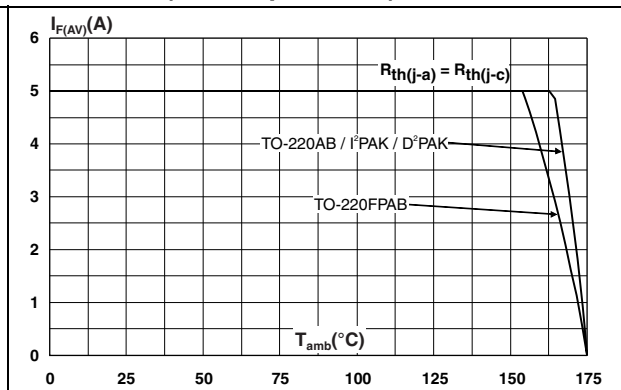
To evaluate the conduction losses use the following equation:

$$P = 0.475 \times I_{F(AV)} + 0.023 \times I_{F(RMS)}^2$$

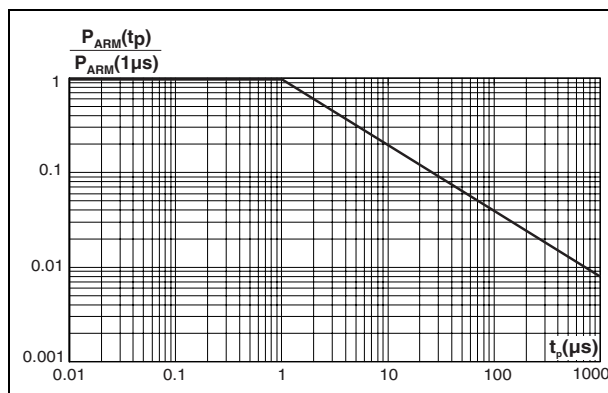
**Figure 2. Average forward power dissipation versus average forward current (per diode)**



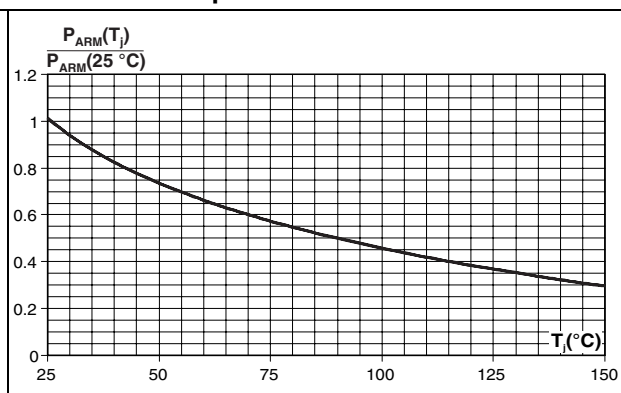
**Figure 3. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



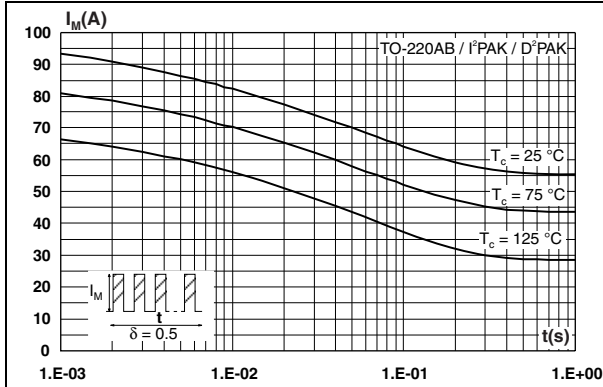
**Figure 4. Normalized avalanche power derating versus pulse duration**



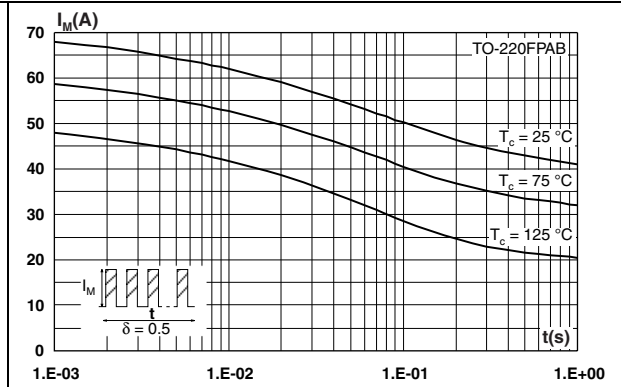
**Figure 5. Normalized avalanche power derating versus junction temperature**



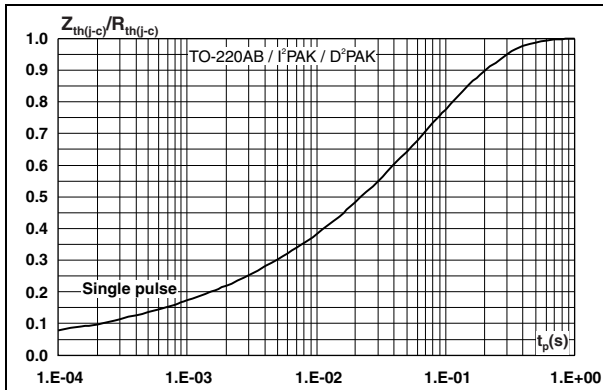
**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



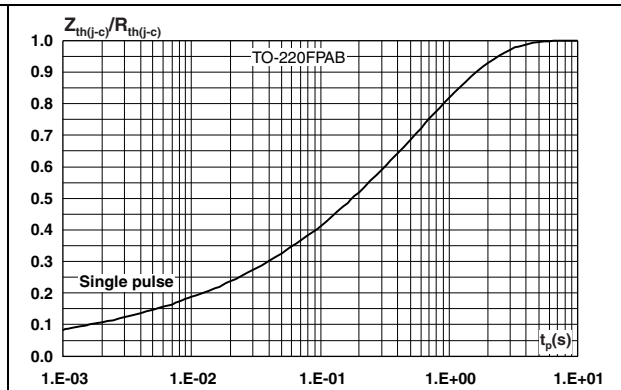
**Figure 7. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



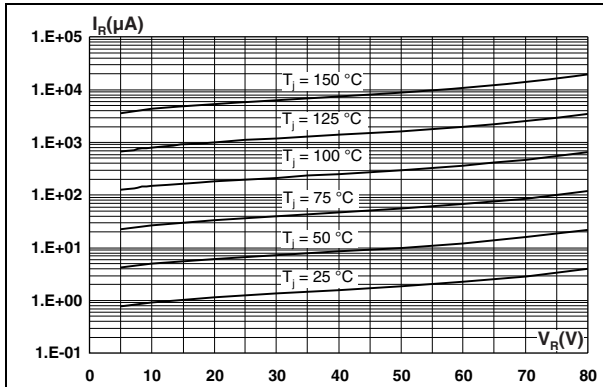
**Figure 8. Relative thermal impedance junction to case versus pulse duration**



**Figure 9. Relative thermal impedance junction to case versus pulse duration (TO-220FPAB)**



**Figure 10. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)**

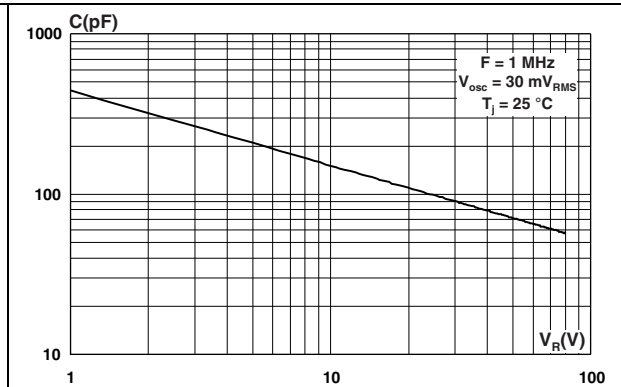


Figure 12. Forward voltage drop versus forward current (per diode)

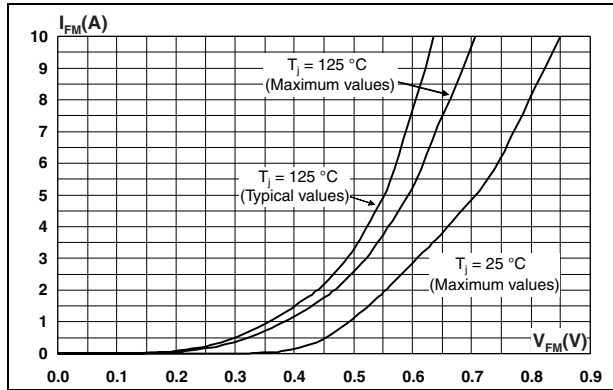


Figure 13. Reverse safe operating area ( $t_p < 1\ \mu\text{s}$  and  $T_j < 150\text{ °C}$ )

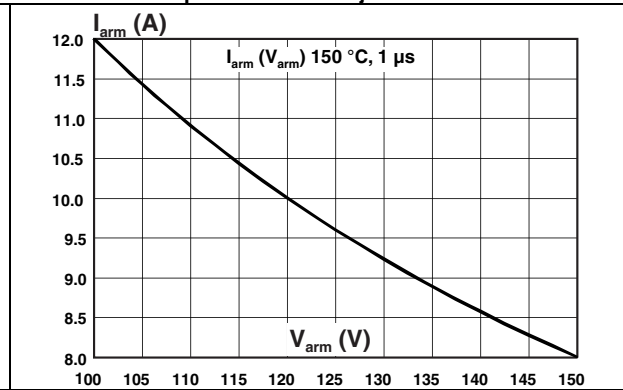
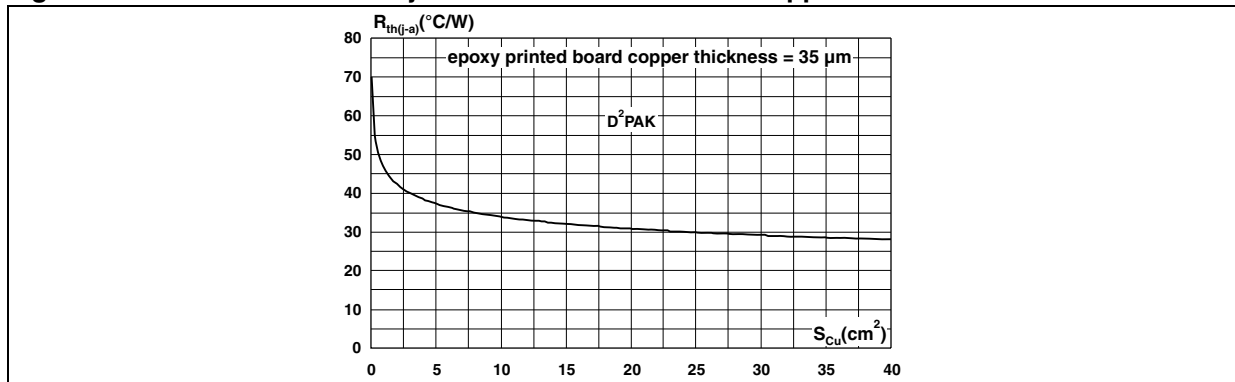


Figure 14. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

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-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      | 0.066 |
| F2   | 1.14        | 1.70  | 0.044      | 0.066 |
| 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. |       |
| Dia. | 3.75        | 3.85  | 0.147      | 0.151 |

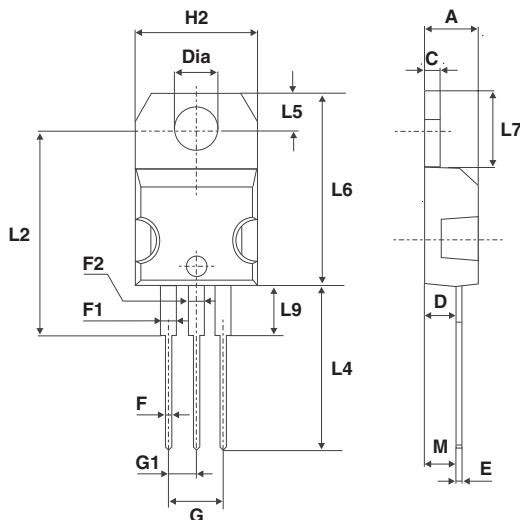


Table 6. TO-220FPAB dimensions

| Ref. | Dimensions  |      |            |       |
|------|-------------|------|------------|-------|
|      | Millimeters |      | Inches     |       |
|      | Min.        | Max. | Min.       | Max.  |
| A    | 4.4         | 4.9  | 0.173      | 0.192 |
| B    | 2.5         | 2.9  | 0.098      | 0.114 |
| D    | 2.45        | 2.75 | 0.096      | 0.108 |
| E    | 0.4         | 0.7  | 0.016      | 0.028 |
| F    | 0.6         | 1    | 0.024      | 0.039 |
| F1   | 1.15        | 1.7  | 0.045      | 0.067 |
| F2   | 1.15        | 1.7  | 0.045      | 0.067 |
| G    | 4.95        | 5.2  | 0.195      | 0.205 |
| G1   | 2.4         | 2.7  | 0.094      | 0.106 |
| H    | 10          | 10.7 | 0.394      | 0.421 |
| L2   | 16 Typ.     |      | 0.630 Typ. |       |
| L3   | 28.6        | 30.6 | 1.126      | 1.205 |
| L4   | 9.8         | 10.7 | 0.386      | 0.421 |
| L6   | 15.8        | 16.4 | 0.622      | 0.646 |
| L7   | 9           | 9.9  | 0.354      | 0.390 |
| Dia. | 2.9         | 3.5  | 0.114      | 0.138 |

Table 7. 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 15. D<sup>2</sup>PAK footprint (dimensions in mm)

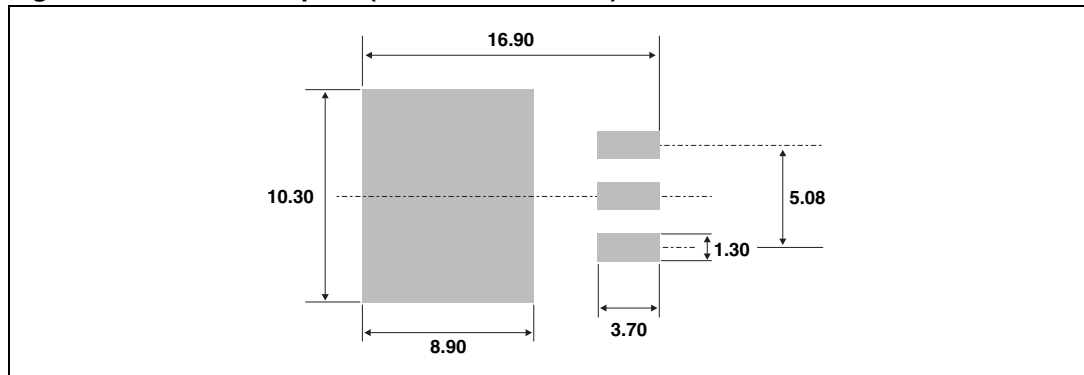
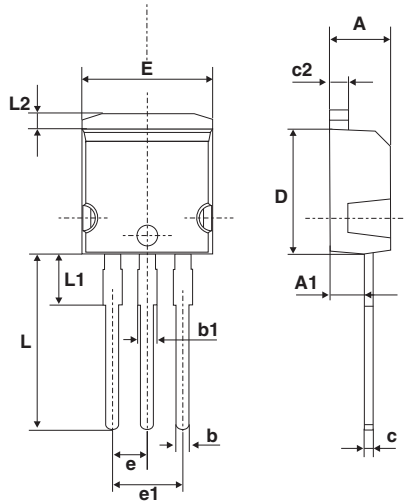


Table 8. I<sup>2</sup>PAK dimensions

| 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 |



### 3 Ordering information

**Table 9. Ordering information**

| Order code     | Marking      | Package            | Weight | Base qty | Delivery mode |
|----------------|--------------|--------------------|--------|----------|---------------|
| STPS10M80CT    | STPS10M80CT  | TO-220AB           | 1.9 g  | 50       | Tube          |
| STPS10M80CFP   | STPS10M80CFP | TO-220FPAB         | 2.0 g  | 50       | Tube          |
| STPS10M80CR    | STPS10M80CR  | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |
| STPS10M80CG-TR | STPS10M80CG  | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |

### 4 Revision history

**Table 10. Revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 14-Apr-2011 | 1        | First issue. |

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