

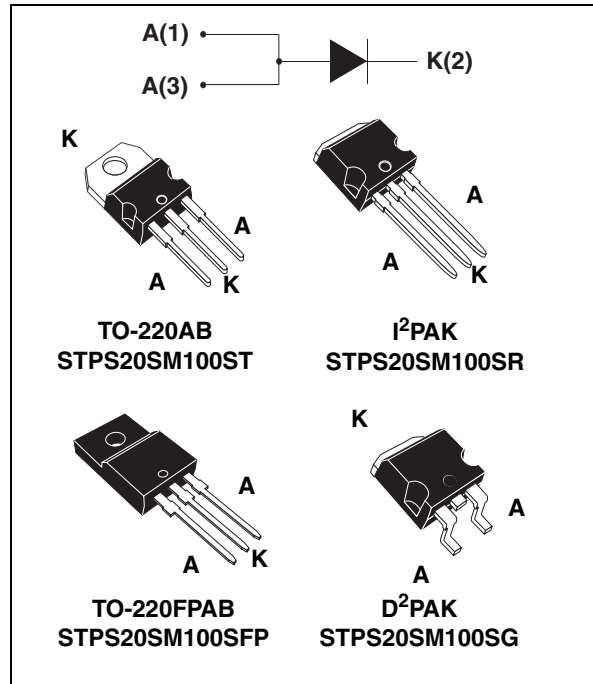
### Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation
- Insulated package (TO-220FPAB):
  - Insulation voltage 2000 V rms
  - Package capacitance = 12 pF

### Description

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

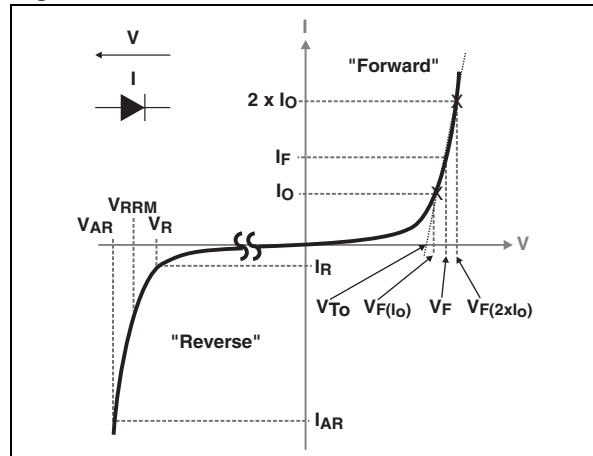
Packaged in TO-220AB, TO-220FPAB, D<sup>2</sup>PAK and I<sup>2</sup>PAK, this device is intended to be used in notebook, game station and desktop adaptors, providing in these applications a good efficiency at both low and high load.



**Table 1. Device summary**

|             |         |
|-------------|---------|
| $I_{F(AV)}$ | 20 A    |
| $V_{RRM}$   | 100 V   |
| $T_j$ (max) | 150 °C  |
| $V_F$ (typ) | 0.480 V |

**Figure 1. Electrical characteristics (a)**



- a.  $V_{ARM}$  and  $I_{ARM}$  must respect the reverse safe operating area defined in [Figure 14](#).  $V_{AR}$  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 with terminals 1 and 3 short circuited)**

| Symbol          | Parameter                                             | Value                                                                                        | Unit               |
|-----------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------|
| $V_{RRM}$       | Repetitive peak reverse voltage                       | 100                                                                                          | V                  |
| $I_{F(RMS)}$    | Forward rms current                                   | 30                                                                                           | A                  |
| $I_{F(AV)}$     | Average forward current $\delta = 0.5$                | TO-220AB, D <sup>2</sup> PAK, I <sup>2</sup> PAK $T_c = 125\text{ }^{\circ}\text{C}$         | 20                 |
|                 |                                                       | TO-220FPAB $T_c = 85\text{ }^{\circ}\text{C}$                                                |                    |
| $I_{FSM}$       | Surge non repetitive forward current                  | $t_p = 10\text{ ms}$ sinusoidal, terminals 1 and 3 short circuited                           | 350                |
| $P_{ARM}^{(1)}$ | Repetitive peak avalanche power                       | $t_p = 1\text{ }\mu\text{s}$ $T_j = 25\text{ }^{\circ}\text{C}$                              | 15000              |
| $V_{ARM}^{(2)}$ | Maximum repetitive peak avalanche voltage             | $t_p < 1\text{ }\mu\text{s}$ $T_j < 150\text{ }^{\circ}\text{C}$<br>$I_{AR} < 37.5\text{ A}$ | 120                |
| $V_{ASM}^{(2)}$ | Maximum single pulse peak avalanche voltage           | $t_p < 1\text{ }\mu\text{s}$ $T_j < 150\text{ }^{\circ}\text{C}$<br>$I_{AR} < 37.5\text{ A}$ | 120                |
| $T_{stg}$       | Storage temperature range                             | -65 to + 150                                                                                 | $^{\circ}\text{C}$ |
| $T_j$           | Maximum operating junction temperature <sup>(3)</sup> | 150                                                                                          | $^{\circ}\text{C}$ |

- 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 14.](#)
- $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistance**

| Symbol        | Parameter        | Value                                            | Unit |
|---------------|------------------|--------------------------------------------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB, D <sup>2</sup> PAK, I <sup>2</sup> PAK | 1.3  |
|               |                  | TO-220FPAB                                       | 4    |

**Table 4. Static electrical characteristics (terminals 1 and 3 short circuited)**

| Symbol      | Parameter               | Test conditions                     | Min.                | Typ. | Max. | Unit          |
|-------------|-------------------------|-------------------------------------|---------------------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^{\circ}\text{C}$  | $V_R = V_{RRM}$     | 10   | 30   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     | 10   | 30   | $\text{mA}$   |
|             |                         | $T_j = 25\text{ }^{\circ}\text{C}$  | $V_R = 70\text{ V}$ | 5    |      | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     | 5    |      | $\text{mA}$   |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 5\text{ A}$  | 565  |      | $\text{mV}$   |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     | 480  |      |               |
|             |                         | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 10\text{ A}$ | 685  |      |               |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     | 560  | 620  |               |
|             |                         | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 20\text{ A}$ | 800  | 900  |               |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                     | 630  | 700  |               |

- Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$
- Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.6 \times I_{F(AV)} + 0.005 \times I_F^2_{(RMS)}$$

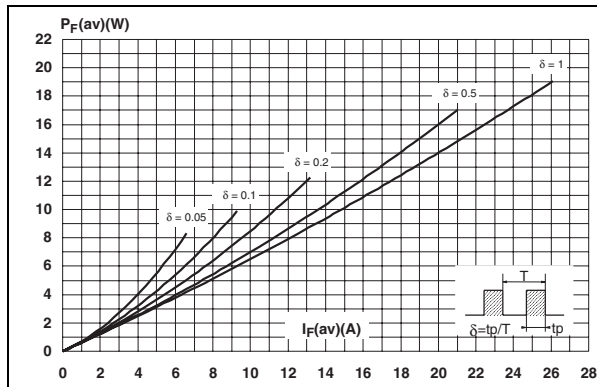
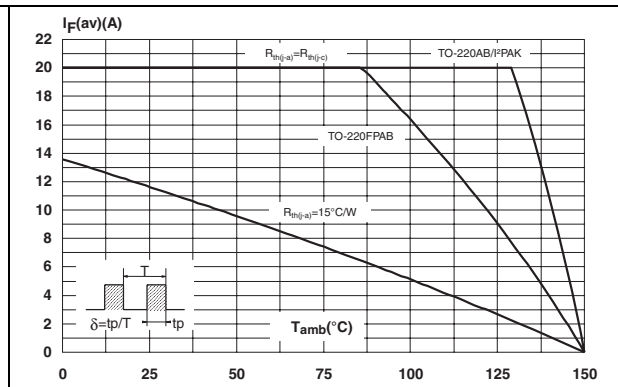
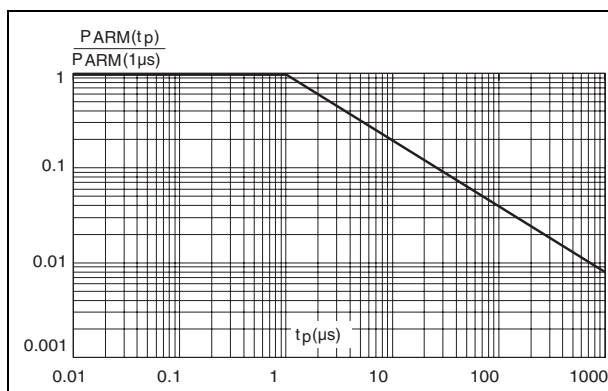
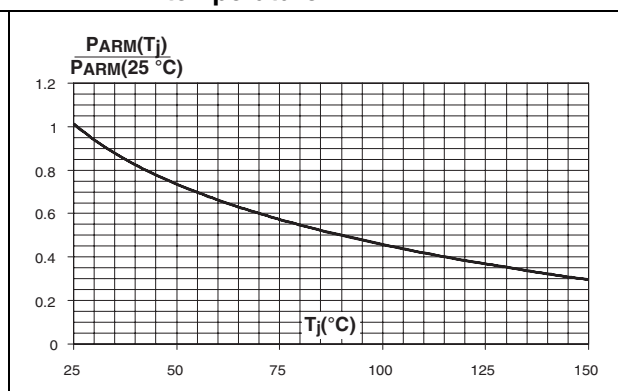
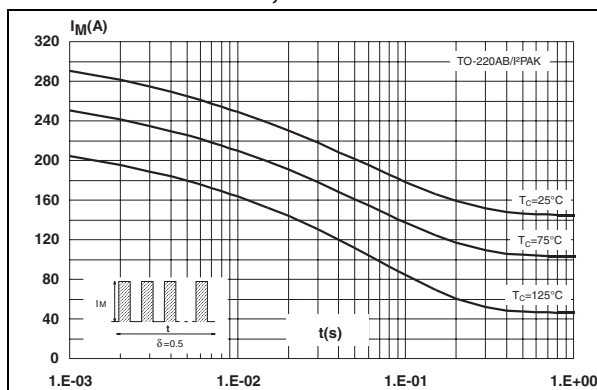
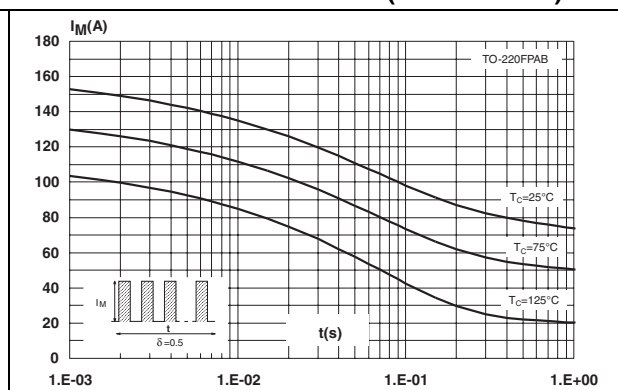
**Figure 2. Average forward power dissipation versus average forward current****Figure 3. Average forward current versus ambient temperature ( $\delta = 0.5$ )****Figure 4. Normalized avalanche power derating versus pulse duration****Figure 5. Normalized avalanche power derating versus junction temperature****Figure 6. Non repetitive surge peak forward current versus overload duration, maximum values****Figure 7. Non repetitive surge peak forward current versus overload duration, maximum values (TO-220FPAB)**

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

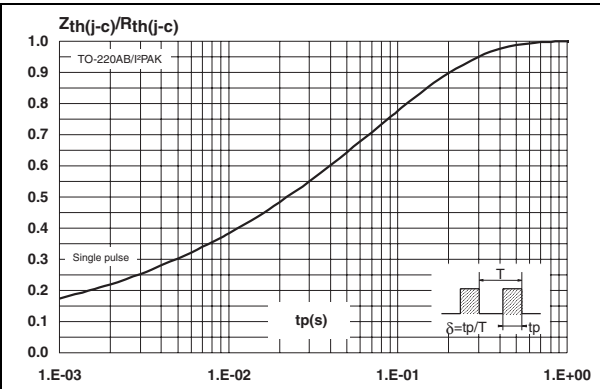


Figure 9. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)

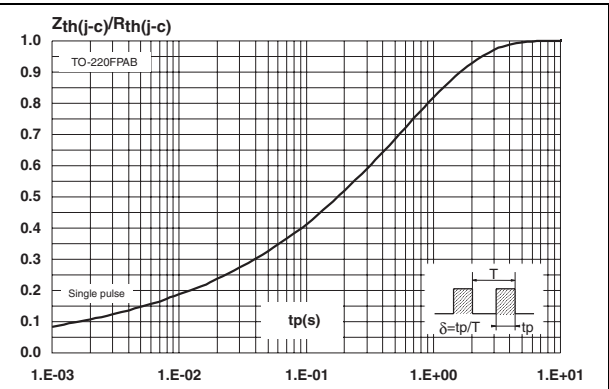


Figure 10. Reverse leakage current versus reverse voltage applied (typical values)

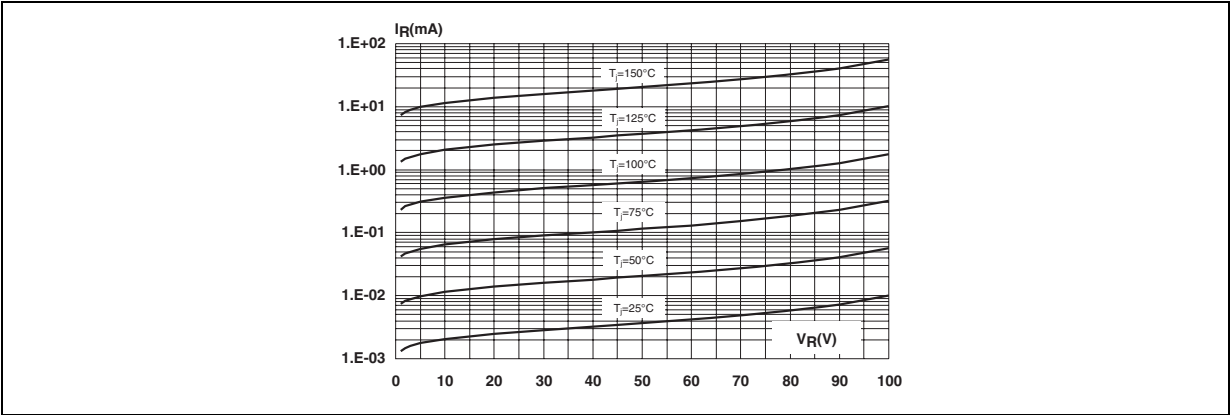


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

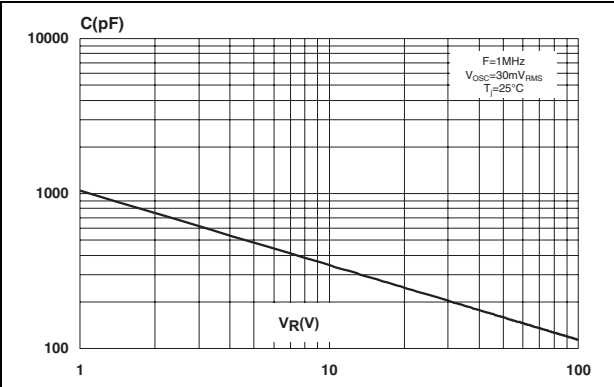


Figure 12. Forward voltage drop versus forward current (terminals 1 and 3 short circuited)

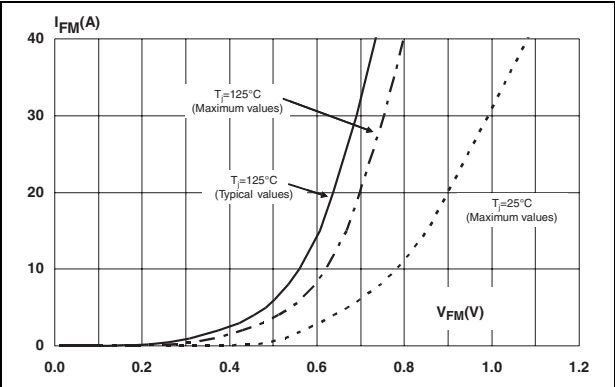


Figure 13. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK

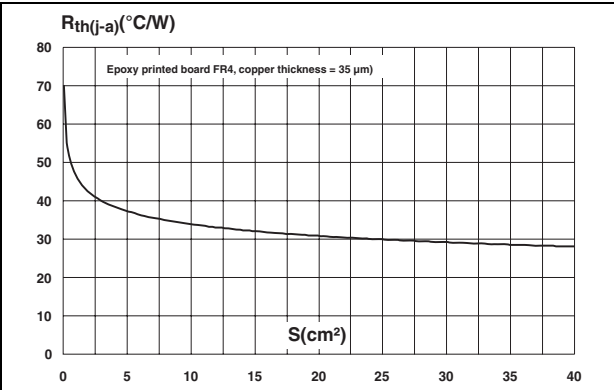
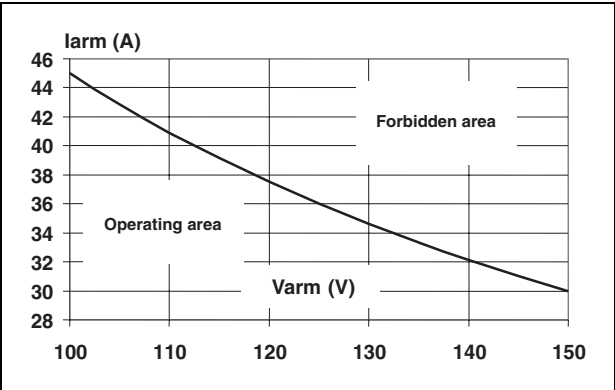


Figure 14. Reverse safe operating area ( $t_p < 1 \mu\text{s}$  and  $T_j < 150^\circ\text{C}$ )



## 2 Package information

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

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**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. |       |
| Diam. | 3.75        | 3.85  | 0.147      | 0.151 |

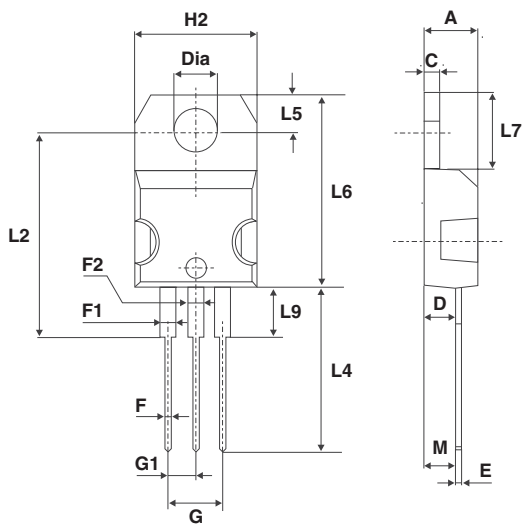


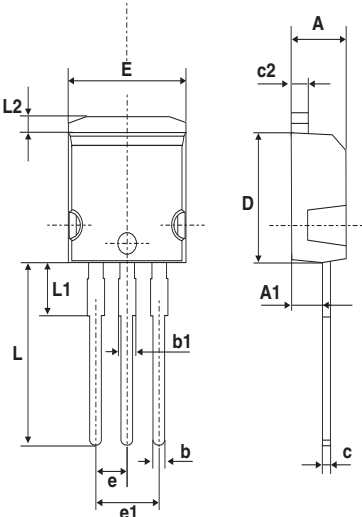
Table 6. TO-220FPAB dimensions

| Ref. | Dimensions  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.4         | 4.6  | 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 |

Mounting (soldering) the I<sup>2</sup>PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

Table 7. 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 |



Technical drawing of a Tee fitting, showing front, side, and detail views with dimensions labeled A through V2. The drawing includes a note: \* 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 showing the front and side views of a mechanical part with the following dimensions:

- Overall width: 16.90
- Overall height: 10.30
- Base width: 8.90
- Side view width: 3.70
- Side view height: 5.08
- Side view segment height: 1.30

### 3 Ordering information

**Table 9. Ordering information**

| Order code       | Marking      | Package            | Weight | Base qty | Delivery mode |
|------------------|--------------|--------------------|--------|----------|---------------|
| STPS20SM100ST    | PS20SM100ST  | TO-220AB           | 2.2 g  | 50       | Tube          |
| STPS20SM100SFP   | PS20SM100SFP | TO-220FPAB         | 1.70 g | 50       | Tube          |
| STPS20SM100SR    | PS20SM100SR  | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |
| STPS20SM100SG-TR | PS20SM100SG  | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |

### 4 Revision history

**Table 10. Document revision history**

| Date        | Revision | Changes                                                                             |
|-------------|----------|-------------------------------------------------------------------------------------|
| 25-Mar-2009 | 1        | First issue.                                                                        |
| 16-Apr-2010 | 2        | Updated package graphic for TO-220AB on front page and in <a href="#">Table 5</a> . |

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