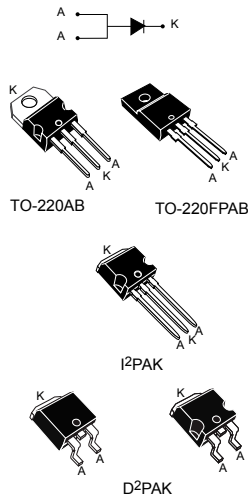


## 100 V, 20 A power Schottky rectifier



### Features

- Low forward voltage drop meaning very small conduction losses
- Avalanche rated
- Low frequency operation
- Insulated package TO-220FPAB:
  - Insulating voltage = 2000 V<sub>RMS</sub> sine
- **ECOPACK<sup>®</sup>2** compliant component for D<sup>2</sup>PAK on demand

### Applications

- Switching diode
- SMPS
- DC/DC converter
- LED lighting
- Adapter for notebook and game station

### 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, the **STPS20M100S** 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.

#### Product status link

[STPS20M100S](#)

#### Product summary

|                             |        |
|-----------------------------|--------|
| <b>I<sub>F(AV)</sub></b>    | 20 A   |
| <b>V<sub>RRM</sub></b>      | 100 V  |
| <b>V<sub>F</sub> (typ.)</b> | 0.61 V |
| <b>T<sub>j</sub> (max.)</b> | 150 °C |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values with anode terminals short circuited, at 25 °C unless otherwise specified)**

| 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 $\delta = 0.5$ , square wave  | TO-220AB<br>D <sup>2</sup> PAK<br>I <sup>2</sup> PAK | $T_C = 130\text{ °C}$                                 | 20   | A |
|              |   | TO-220FPAB   |   |      |   |
| $I_{FSM}$    | Surge non repetitive forward current                  |  | $t_p = 10\text{ ms}$ sinusoidal                       | 350  | A |
| $P_{ARM}$    | Repetitive peak avalanche power                       |  | $t_p = 10\text{ }\mu\text{s}$ , $T_j = 125\text{ °C}$ | 1150 | W |
| $T_{stg}$    | Storage temperature range                             |  | -65 to +175   | °C   |   |
| $T_j$        | Maximum operating junction temperature <sup>(1)</sup> |  | +150  | °C   |   |

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

**Table 2. Thermal resistance parameter**

| Symbol        | Parameter        |  | Value | Unit |
|---------------|------------------|--|-------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB, D <sup>2</sup> PAK, I <sup>2</sup> PAK | 1.2   | °C/W |
|               |                  | TO-220FPAB                                       | 4     |      |

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics (anode terminals short circuited)**

| Symbol               | Parameter               | Test conditions       |                      | Min. | Typ. | Max. | Unit          |
|----------------------|-------------------------|-----------------------|----------------------|------|------|------|---------------|
| $I_R$ <sup>(1)</sup> | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = 70\text{ V}$  | -    | 5    |      | $\mu\text{A}$ |
|                      |                         | $T_j = 125\text{ °C}$ |                      | -    | 5    |      | mA            |
|                      |                         | $T_j = 25\text{ °C}$  | $V_R = 100\text{ V}$ | -    | 10   | 40   | $\mu\text{A}$ |
|                      |                         | $T_j = 125\text{ °C}$ |                      | -    | 10   | 40   | mA            |
| $V_F$ <sup>(2)</sup> | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$   | -    | 550  |      | mV            |
|                      |                         | $T_j = 125\text{ °C}$ |                      | -    | 455  |      |               |
|                      |                         | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$  | -    | 660  | 730  |               |
|                      |                         | $T_j = 125\text{ °C}$ |                      | -    | 530  | 600  |               |
|                      |                         | $T_j = 25\text{ °C}$  | $I_F = 20\text{ A}$  | -    | 775  | 850  |               |
|                      |                         | $T_j = 125\text{ °C}$ |                      | -    | 610  | 690  |               |

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:

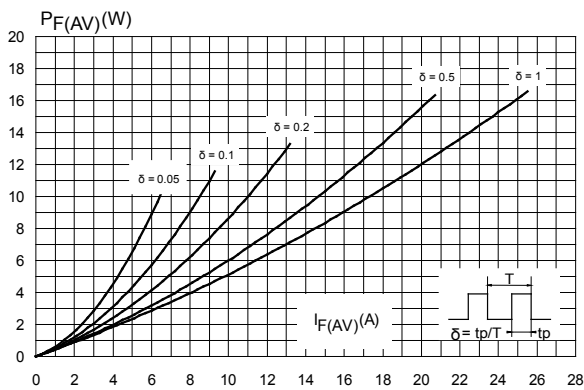
$$P = 0.425 \times I_{F(AV)} + 0.0088 \times I_F^2 (RMS)$$

For more information, please refer to the following application notes related to the power losses :

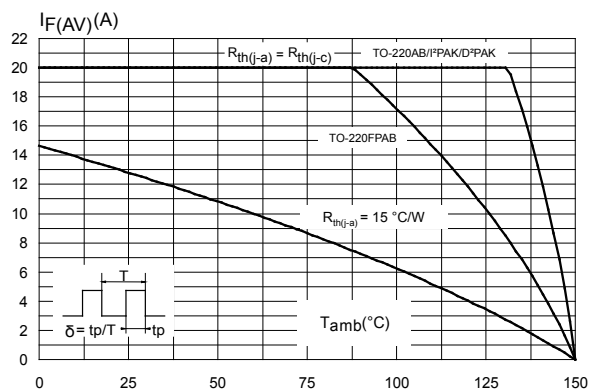
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

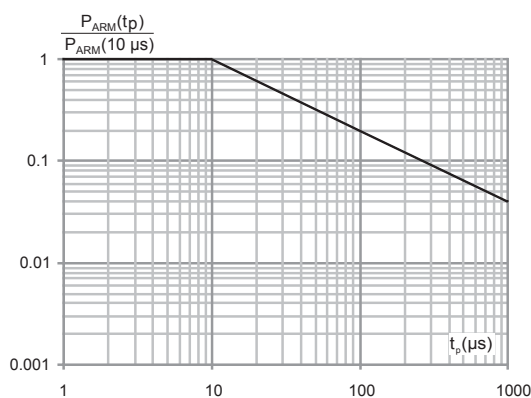
**Figure 1. Average forward power dissipation versus average forward current (anode terminals short circuited)**



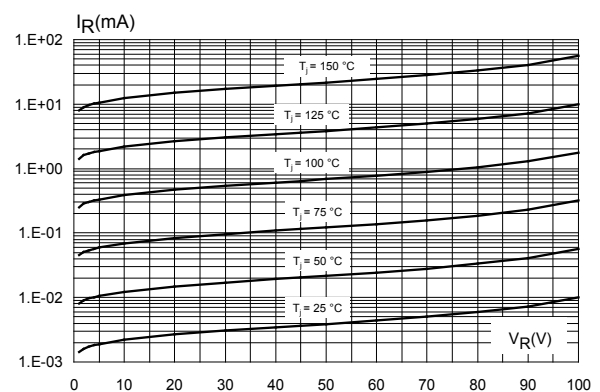
**Figure 2. Average forward current versus ambient temperature (delta = 0.5, anode terminals short circuited)**



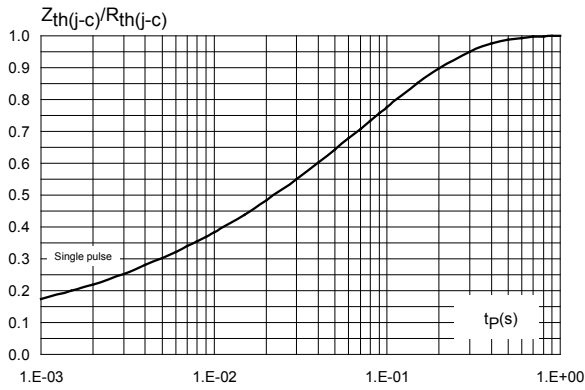
**Figure 3. Normalized avalanche power derating versus pulse duration (Tj = 125 °C)**



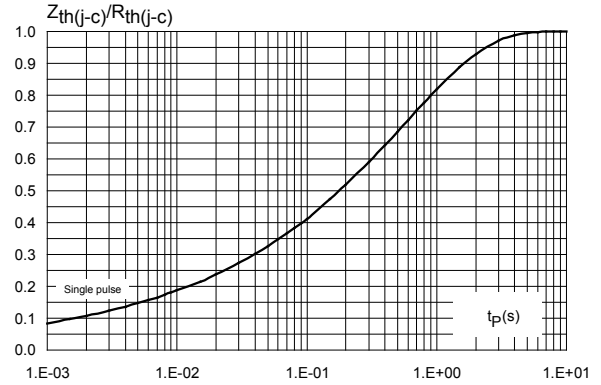
**Figure 4. Reverse leakage current versus reverse voltage applied (typical values)**



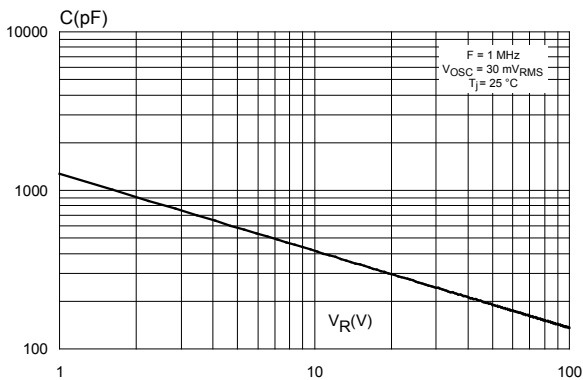
**Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, D<sup>2</sup>PAK, I<sup>2</sup>PAK)**



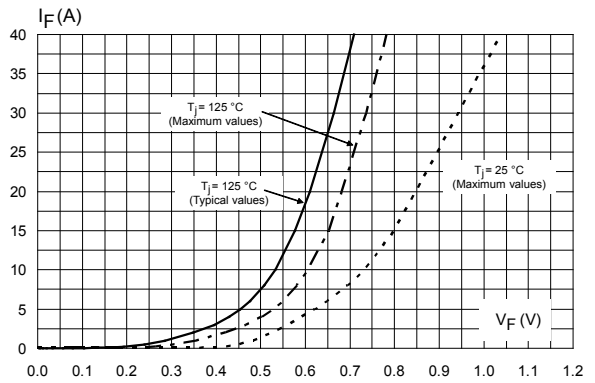
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)**



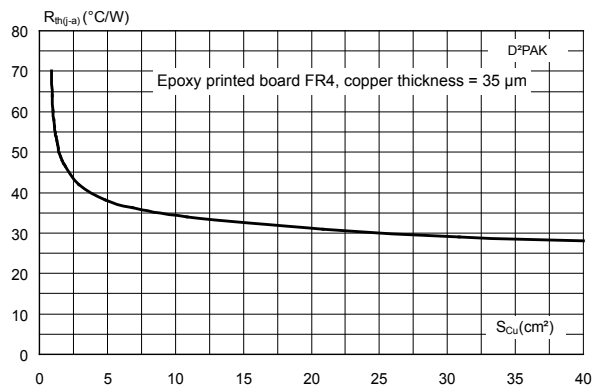
**Figure 7. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 8. Forward voltage drop versus forward current (anode terminals short circuited)**



**Figure 9. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK**



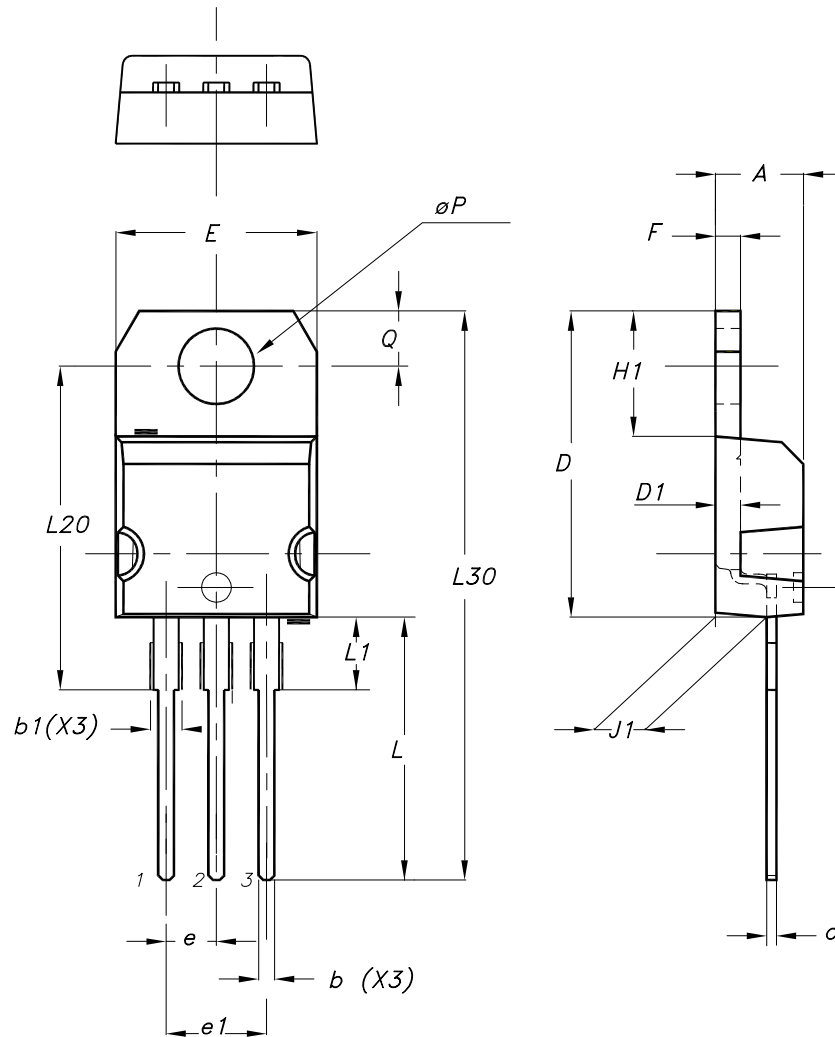
## 2 Package information

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 TO-220AB package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 10. TO-220AB package outline



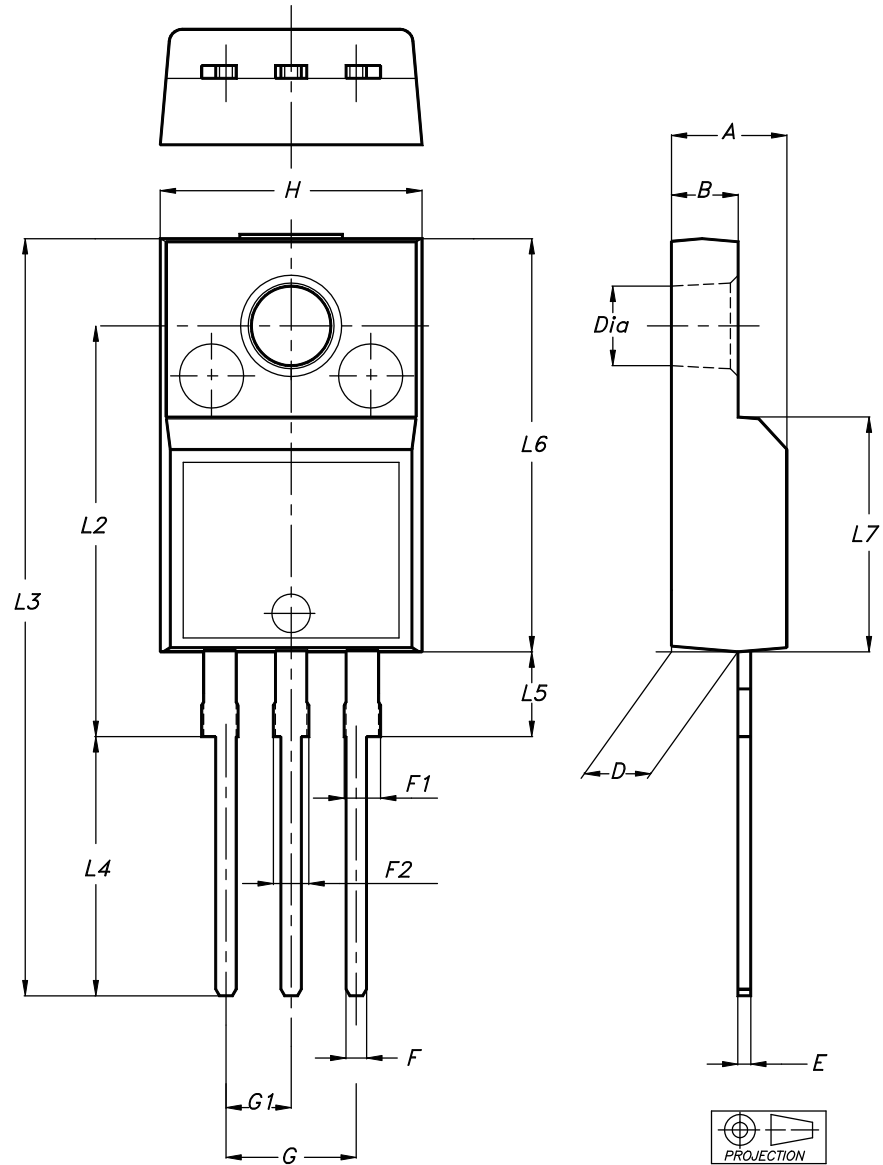
**Table 4. TO-220AB package mechanical data**

| Ref. | Dimensions  |       |                             |       |
|------|-------------|-------|-----------------------------|-------|
|      | Millimeters |       | Inches (for reference only) |       |
|      | Min.        | Max.  | Min.                        | Max.  |
| A    | 4.40        | 4.60  | 0.173                       | 0.181 |
| b    | 0.61        | 0.88  | 0.240                       | 0.035 |
| b1   | 1.14        | 1.55  | 0.045                       | 0.061 |
| c    | 0.48        | 0.70  | 0.019                       | 0.028 |
| D    | 15.25       | 15.75 | 0.600                       | 0.620 |
| D1   | 1.27 typ.   |       | 0.050 typ.                  |       |
| E    | 10.00       | 10.40 | 0.394                       | 0.409 |
| e    | 2.40        | 2.70  | 0.094                       | 0.106 |
| e1   | 4.95        | 5.15  | 0.195                       | 0.203 |
| F    | 1.23        | 1.32  | 0.048                       | 0.052 |
| H1   | 6.20        | 6.60  | 0.244                       | 0.260 |
| J1   | 2.40        | 2.72  | 0.094                       | 0.107 |
| L    | 13.00       | 14.00 | 0.512                       | 0.551 |
| L1   | 3.50        | 3.93  | 0.138                       | 0.155 |
| L20  | 16.40 typ.  |       | 0.646 typ.                  |       |
| L30  | 28.90 typ.  |       | 1.138 typ.                  |       |
| θP   | 3.75        | 3.85  | 0.148                       | 0.152 |
| Q    | 2.65        | 2.95  | 0.104                       | 0.116 |

## 2.2 TO-220FPAB package information

- Epoxy meets UL 94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 11. TO-220FPAB package outline



**Table 5. TO-220FPAB package mechanical data**

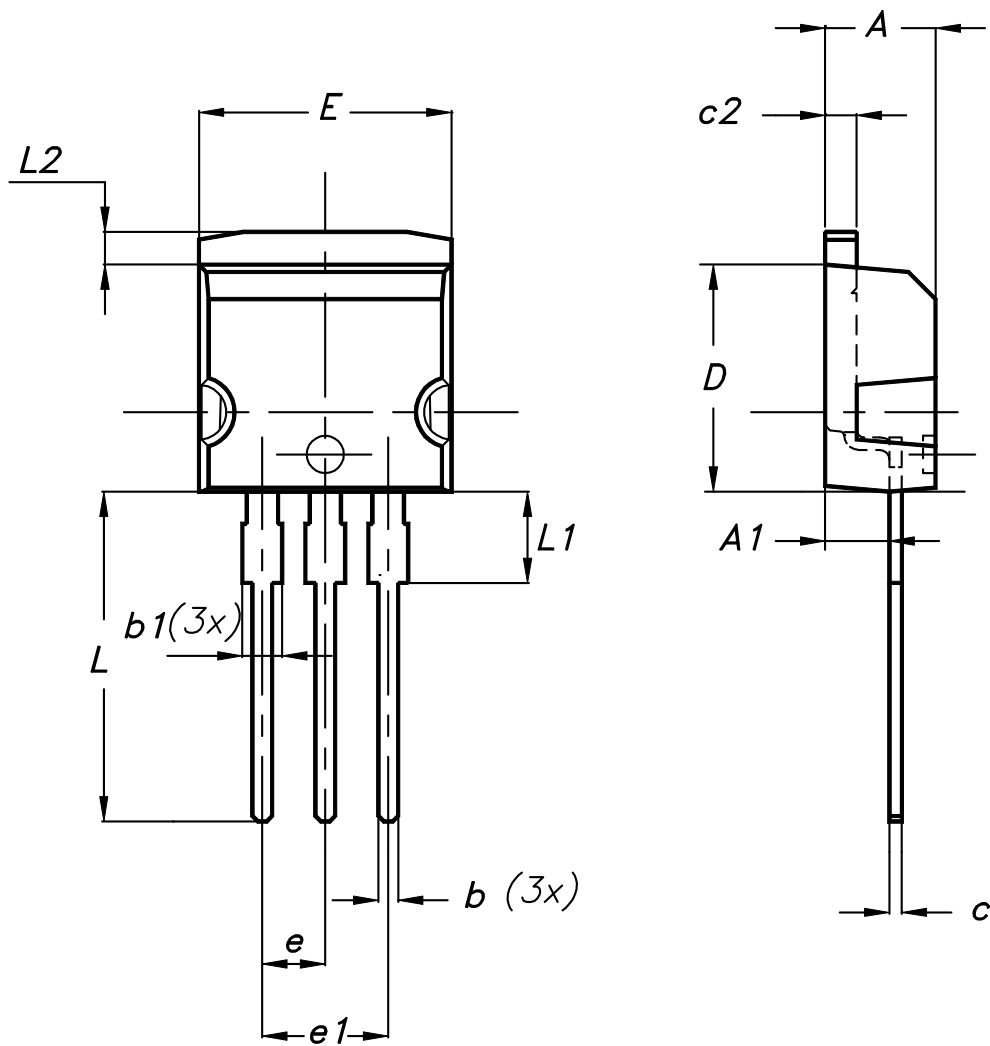
| Ref. | Dimensions  |       |                             |        |
|------|-------------|-------|-----------------------------|--------|
|      | Millimeters |       | Inches (for reference only) |        |
|      | Min.        | Max.  | Min.                        | Max.   |
| A    | 4.40        | 4.60  | 0.1739                      | 0.1818 |
| B    | 2.50        | 2.70  | 0.0988                      | 0.1067 |
| D    | 2.50        | 2.75  | 0.0988                      | 0.1087 |
| E    | 0.45        | 0.70  | 0.0178                      | 0.0277 |
| F    | 0.75        | 1.00  | 0.0296                      | 0.0395 |
| F1   | 1.15        | 1.70  | 0.0455                      | 0.0672 |
| F2   | 1.15        | 1.70  | 0.0455                      | 0.0672 |
| G    | 4.95        | 5.20  | 0.1957                      | 0.2055 |
| G1   | 2.40        | 2.70  | 0.0949                      | 0.1067 |
| H    | 10.00       | 10.40 | 0.3953                      | 0.4111 |
| L2   | 16.00 typ.  |       | 0.6324 typ.                 |        |
| L3   | 28.60       | 30.60 | 1.1304                      | 1.2095 |
| L4   | 9.80        | 10.60 | 0.3874                      | 0.4190 |
| L5   | 2.90        | 3.60  | 0.1146                      | 0.1423 |
| L6   | 15.90       | 16.40 | 0.6285                      | 0.6482 |
| L7   | 9.00        | 9.30  | 0.3557                      | 0.3676 |
| Dia  | 3.00        | 3.20  | 0.1186                      | 0.1265 |



### 2.3 I<sup>2</sup>PAK package information

- Epoxy meets UL 94, V0
- Cooling method: by conduction (C)

Figure 12. I<sup>2</sup>PAK package outline



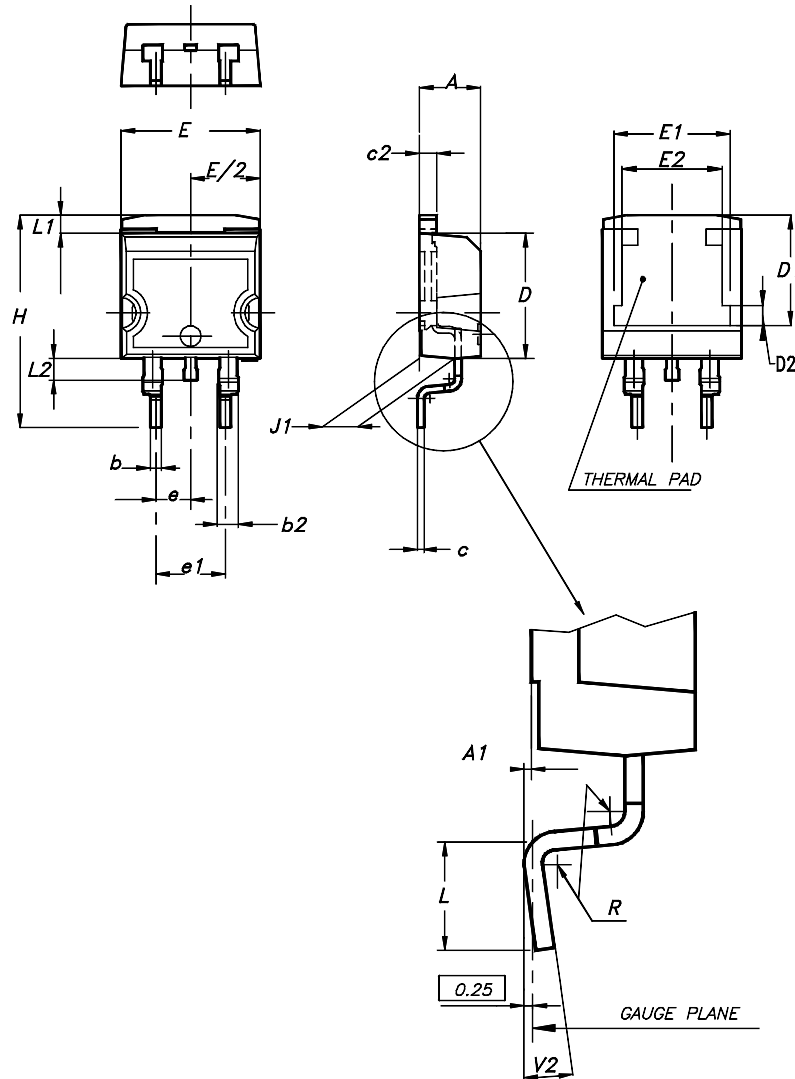
**Table 6. I<sup>2</sup>PAK package mechanical data**

| Ref. | Dimensions  |       |                             |       |
|------|-------------|-------|-----------------------------|-------|
|      | Millimeters |       | Inches (for reference only) |       |
|      | 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    | 10.00       | 10.40 | 0.394                       | 0.409 |
| L    | 13.00       | 14.00 | 0.512                       | 0.551 |
| L1   | 3.50        | 3.93  | 0.138                       | 0.155 |
| L2   | 1.27        | 1.40  | 0.050                       | 0.055 |

## 2.4 D<sup>2</sup>PAK package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

Figure 13. D<sup>2</sup>PAK package outline

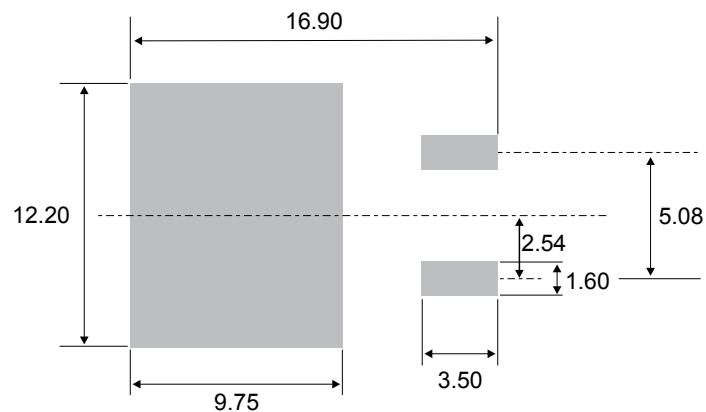


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

**Table 7. D<sup>2</sup>PAK package mechanical data**

| Ref. | Dimensions  |       |                             |       |
|------|-------------|-------|-----------------------------|-------|
|      | Millimeters |       | Inches (for reference only) |       |
|      | Min.        | Max.  | Min.                        | Max.  |
| A    | 4.36        | 4.60  | 0.172                       | 0.181 |
| A1   | 0.00        | 0.25  | 0.000                       | 0.010 |
| b    | 0.70        | 0.93  | 0.028                       | 0.037 |
| b2   | 1.14        | 1.70  | 0.045                       | 0.067 |
| c    | 0.38        | 0.69  | 0.015                       | 0.027 |
| c2   | 1.19        | 1.36  | 0.047                       | 0.053 |
| D    | 8.60        | 9.35  | 0.339                       | 0.368 |
| D1   | 6.90        | 8.00  | 0.272                       | 0.311 |
| D2   | 1.10        | 1.50  | 0.043                       | 0.060 |
| E    | 10.00       | 10.55 | 0.394                       | 0.415 |
| E1   | 8.10        | 8.90  | 0.319                       | 0.346 |
| E2   | 6.85        | 7.25  | 0.266                       | 0.282 |
| e    | 2.54 typ.   |       | 0.100                       |       |
| e1   | 4.88        | 5.28  | 0.190                       | 0.205 |
| H    | 15.00       | 15.85 | 0.591                       | 0.624 |
| J1   | 2.49        | 2.90  | 0.097                       | 0.112 |
| L    | 1.90        | 2.79  | 0.075                       | 0.110 |
| L1   | 1.27        | 1.65  | 0.049                       | 0.065 |
| L2   | 1.30        | 1.78  | 0.050                       | 0.070 |
| R    | 0.4 typ.    |       | 0.015                       |       |
| V2   | 0°          | 8°    | 0°                          | 8°    |

**Figure 14. D<sup>2</sup>PAK recommended footprint (dimensions in mm)**



### 3 Ordering information

**Table 8. Ordering information**

| Order code      | Marking     | Package            | Weight | Base qty. | Delivery mode |
|-----------------|-------------|--------------------|--------|-----------|---------------|
| STPS20M100ST    | PS20M100ST  | TO-220AB           | 1.95 g | 50        | Tube          |
| STPS20M100SFP   | PS20M100SFP | TO-220FPAB         | 1.90 g | 50        | Tube          |
| STPS20M100SR    | PS20M100SR  | I <sup>2</sup> PAK | 1.50 g | 50        | Tube          |
| STPS20M100SG-TR | PS20M100SG  | D <sup>2</sup> PAK | 1.48 g | 1000      | Tape and reel |

## Revision history

**Table 9. Document revision history**

| Date        | Version | Changes  |
|-------------|---------|--|
| 25-Mar-2009 | 1       | First issue.   |
| 16-Apr-2010 | 2       | Updated package graphic for TO-220AB on front page and in Table 5.   |
| 24-May-2016 | 3       | Updated cover page.<br>Complete Characteristics section update.<br>Updated Section 2.4: "D <sup>2</sup> PAK package information" and Table 9: "Ordering information".  |
| 28-Sep-2018 | 4       | Updated cover page, <a href="#">Table 1. Absolute ratings (limiting values with anode terminals short circuited, at 25 °C unless otherwise specified)</a> and <a href="#">Table 8. Ordering information</a> .<br>Removed figure 1 and figure 11.<br>Minor text changes to improve readability. |
| 18-Feb-2019 | 5       | Updated <a href="#">Table 1</a> .  |

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