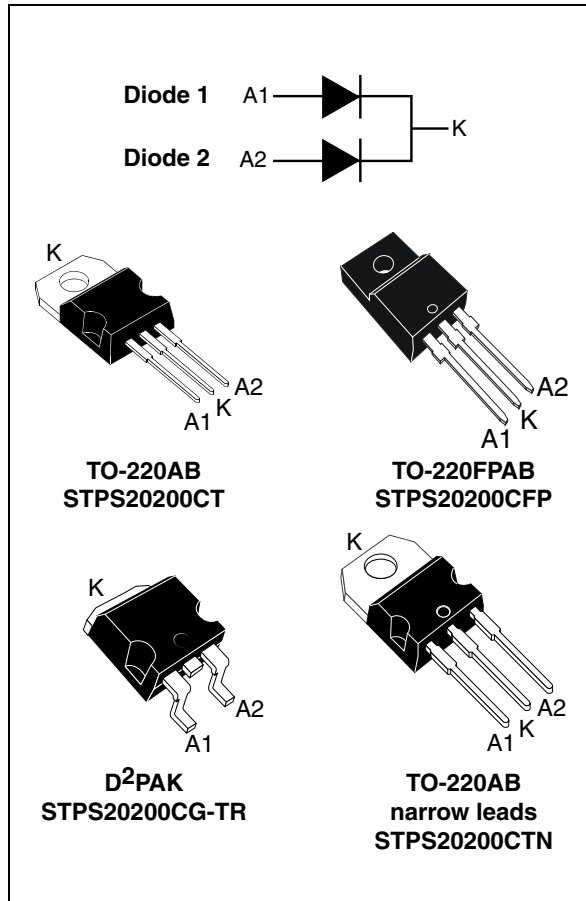




### Features

- Low forward voltage drop
- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low thermal resistance
- -40°C minimum operating  $T_j$
- Insulated package: TO-220FPAB
  - Insulating voltage: 2000 V DC
  - Capacitance: 45 pF
- ECOPACK<sup>®</sup>2 compliant component

### Description

This device is a dual center tap 200 V Schottky rectifier suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in TO-220AB, TO-220AB narrow-leads, TO-220FPAB and D<sup>2</sup>PAK, it is especially intended for use as secondary rectification in SMPS and is also ideal for all LED lighting applications.

Table 1. Device summary

| Symbol       | Value    |
|--------------|----------|
| $I_{F(AV)}$  | 2 x 10 A |
| $V_{RRM}$    | 200 V    |
| $T_{j(max)}$ | 175 °C   |
| $V_F(yp)$    | 0.64 V   |

# 1 Characteristics

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

| Symbol              | Parameter                                           |                                                             |                         |            | Value       | Unit |
|---------------------|-----------------------------------------------------|-------------------------------------------------------------|-------------------------|------------|-------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                     |                                                             |                         |            | 200         | V    |
| I <sub>F(RMS)</sub> | Forward rms current                                 |                                                             |                         |            | 30          | A    |
| I <sub>F(AV)</sub>  | Average forward current, δ = 0.5, square wave       | TO-220AB, D <sup>2</sup> PAK, TO 220AB narrow leads         | T <sub>C</sub> = 160 °C | Per device | 20          | A    |
|                     |                                                     | TO-220FPAB                                                  | T <sub>C</sub> = 105 °C | Per device | 20          | A    |
| I <sub>FSM</sub>    | Surge non repetitive forward current                | t <sub>p</sub> = 10 ms sinusoidal, T <sub>amb</sub> = 25 °C |                         |            | 180         | A    |
| T <sub>stg</sub>    | Storage temperature range                           |                                                             |                         |            | -65 to +175 | °C   |
| T <sub>j</sub>      | Operating junction temperature range <sup>(1)</sup> |                                                             |                         |            | -40 to +175 | °C   |

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

**Table 3. Thermal parameters**

| Symbol        | Parameter        |                                                     |            | Value | Unit                 |
|---------------|------------------|-----------------------------------------------------|------------|-------|----------------------|
| $R_{th(j-c)}$ | Junction to case | D <sup>2</sup> PAK, TO-220AB, TO-220AB narrow leads | Per diode  | 1.30  | $^{\circ}\text{C/W}$ |
|               |                  |                                                     | Per device | 0.75  |                      |
|               |                  | TO-220FPAB                                          | Per diode  | 5.00  |                      |
|               |                  |                                                     | Per device | 4.15  |                      |
| $R_{th(c)}$   | Coupling         | D <sup>2</sup> PAK, TO-220AB, TO-220AB narrow leads |            | 0.20  |                      |
|               |                  | TO-220FPAB                                          |            | 3.30  |                      |

General formula to calculate  $T_j(\text{diode1})$  and  $T_j(\text{diode2})$ :

$$T_j(\text{diode1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode2}) \times R_{th(c)} + T_{case}$$

$$T_j(\text{diode2}) = P(\text{diode2}) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode1}) \times R_{th(c)} + T_{case}$$

Table 4. Static electrical characteristics (per diode)

| Symbol      | Test conditions         |                                     |                      | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-------------------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^{\circ}\text{C}$  | $V_R = V_{RRM}$      |      |      | 15   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                      |      | 1.3  | 7    | mA            |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ | $V_R = 150\text{ V}$ |      |      | 4.5  |               |
| $V_F^{(1)}$ | Forward voltage drop    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 10\text{ A}$  |      |      | 0.86 | V             |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                      |      | 0.64 | 0.70 | V             |

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

To evaluate the maximum conduction losses use the following equation:

$$P = 0.6 \times I_{F(AV)} + 0.01 I_F^2 (RMS)$$

Note: More information is available in the application notes:

AN604 Calculation of conduction losses in a power rectifier

AN4021 Calculation of reverse losses in a power diode

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

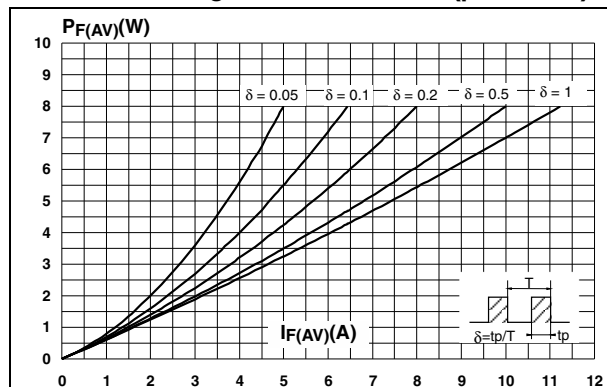


Figure 2. Forward voltage drop versus forward current (per diode)

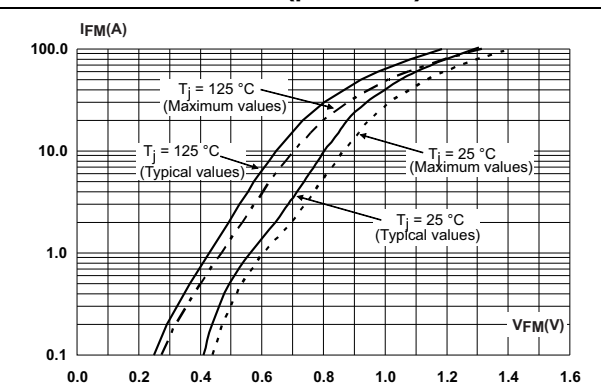


Figure 3. Reverse leakage current versus reverse voltage applied (typical values, per diode)

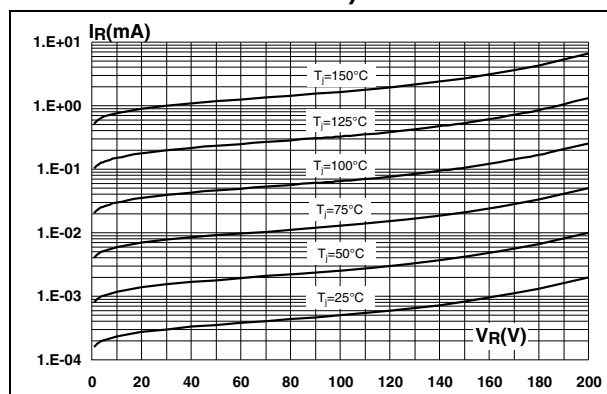


Figure 4. Junction capacitance versus reverse voltage applied (typical values, per diode)

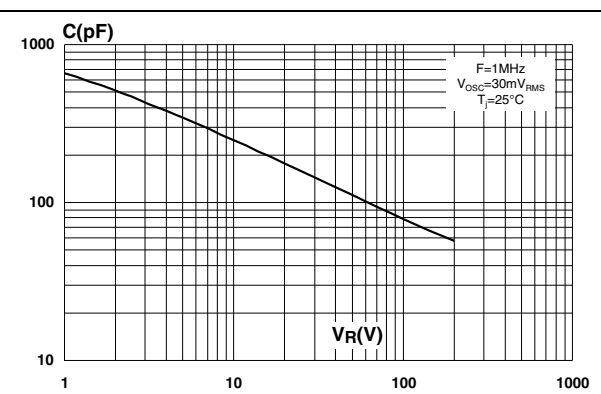


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

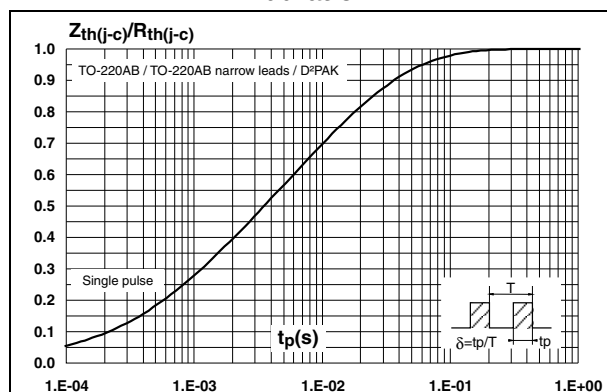


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)

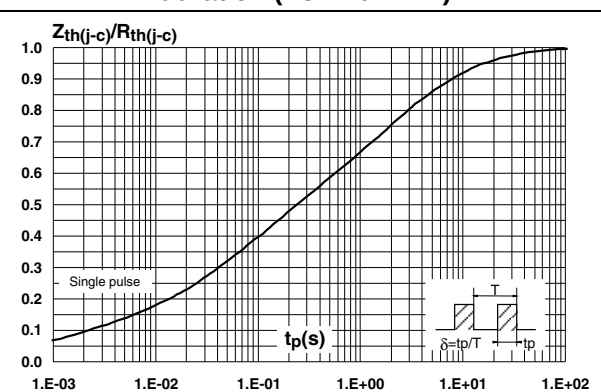
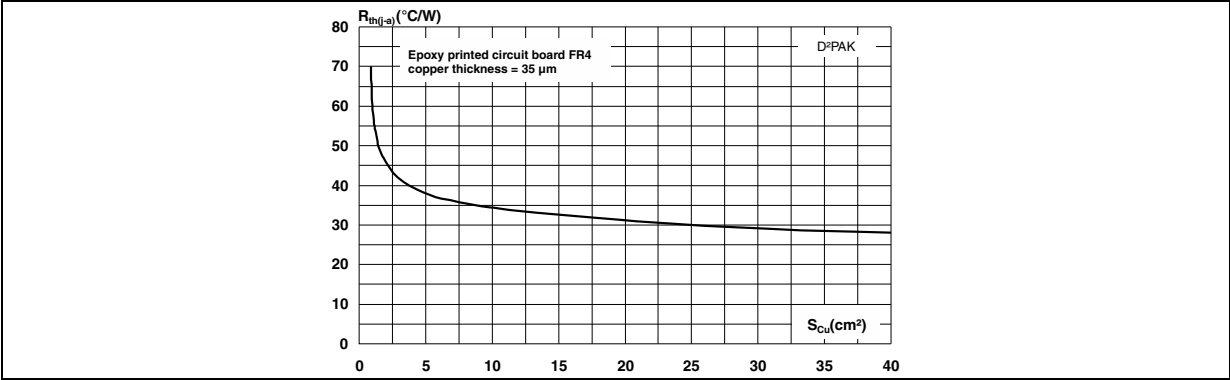


Figure 7. Thermal resistance junction to ambient versus copper surface under tab



## 2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- 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.

**Figure 8. TO-220AB dimension definitions**

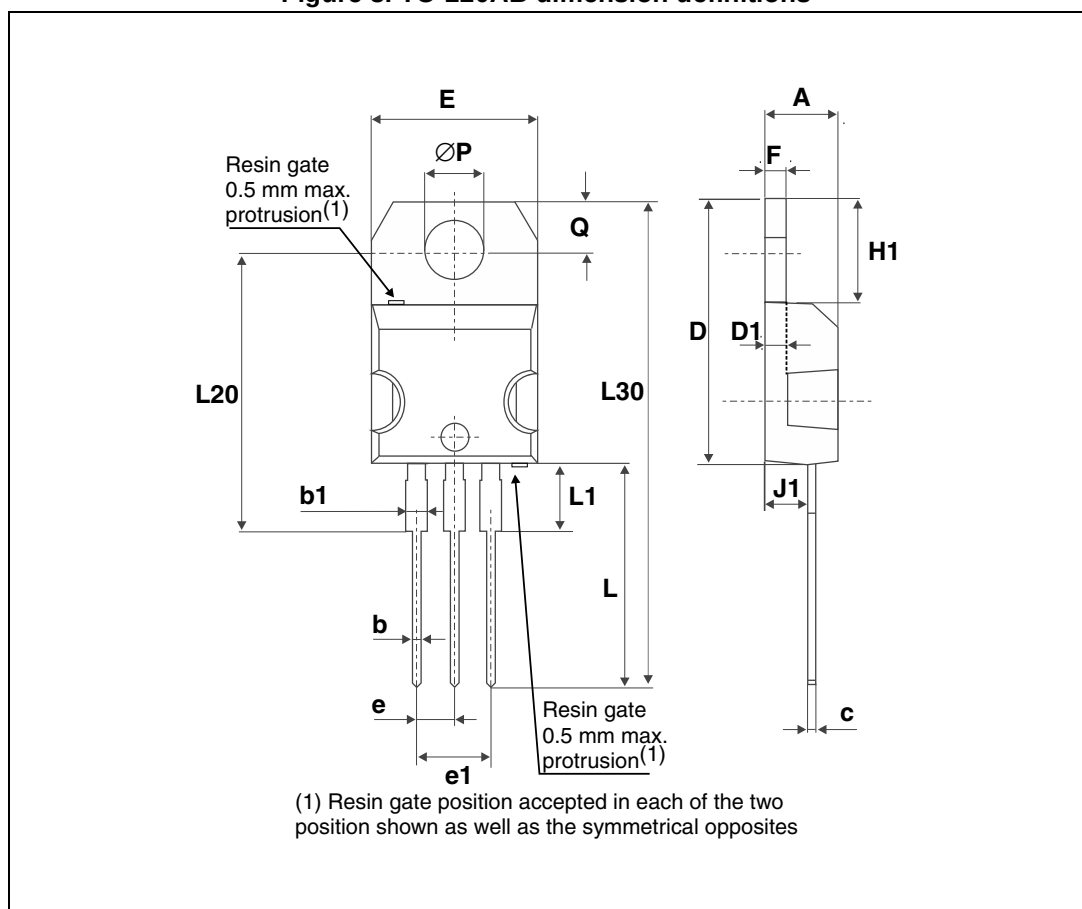


Table 5. TO-220AB dimension values

| 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  |       | 0.035 |
| b1   | 1.14        |       | 1.70  | 0.045  |       | 0.067 |
| 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          |       | 10.40 | 0.39   |       | 0.41  |
| e    | 2.40        | 0.40  | 2.70  | 0.094  |       | 0.106 |
| e1   | 4.95        | 0.60  | 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  | 0.094  |       | 0.107 |
| L    | 13          |       | 14    | 0.51   |       | 0.55  |
| L1   | 3.50        |       | 3.93  | 0.137  |       | 0.154 |
| L20  |             | 16.40 |       |        | 0.64  |       |
| L30  |             | 28.90 |       |        | 1.13  |       |
| ØP   | 3.75        |       | 3.85  | 0.147  |       | 0.151 |
| Q    | 2.65        |       | 2.95  |        | 0.104 |       |

Figure 9. TO-220AB narrow leads dimension definitions

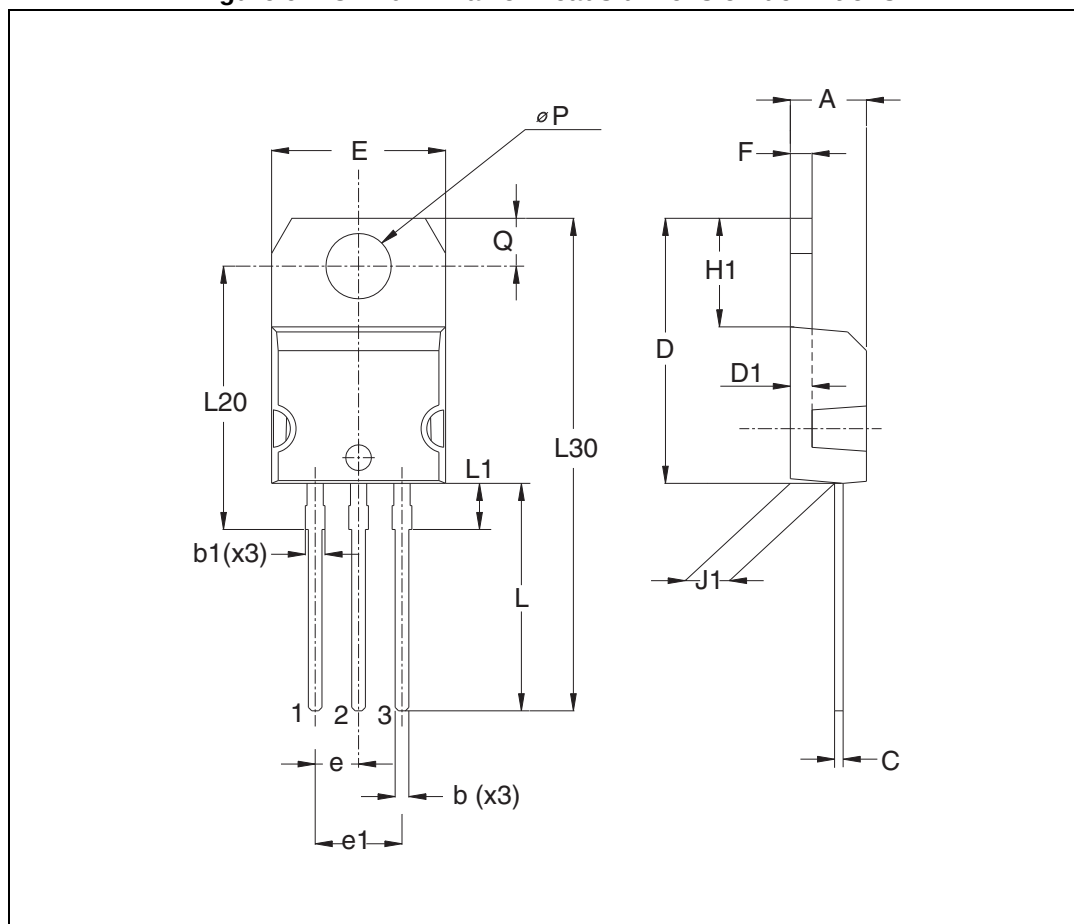


Table 6. TO-220AB narrow leads dimension values

| 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 |

Figure 10. TO-220FPAB dimension definitions

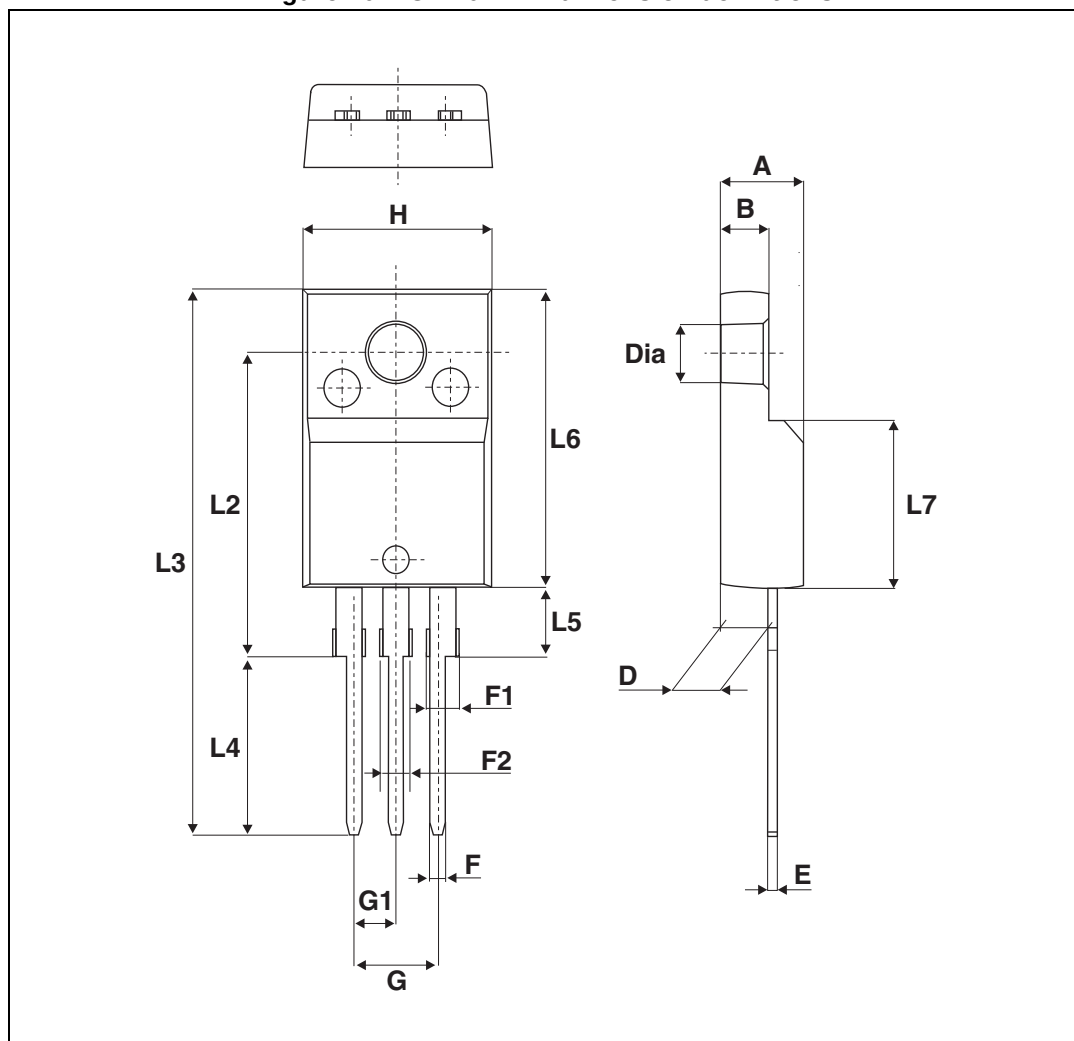


Table 7. TO-220FPAB dimension values

| Ref. | Dimensions  |      |      |        |      |       |
|------|-------------|------|------|--------|------|-------|
|      | Millimeters |      |      | Inches |      |       |
|      | Min.        | Typ. | Max. | Min.   | Typ. | 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   |      | .      | 0.63 |       |
| 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 |

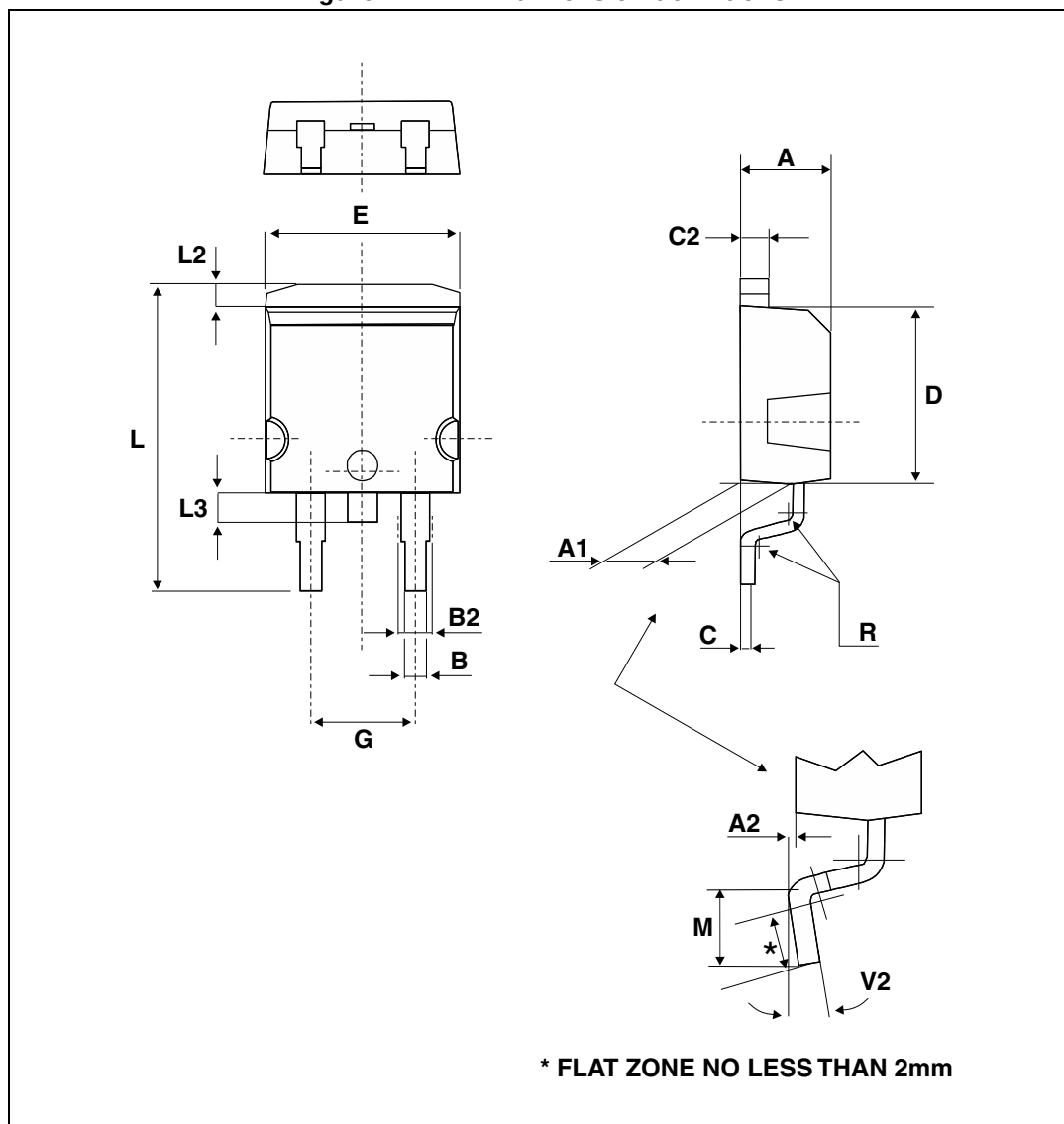
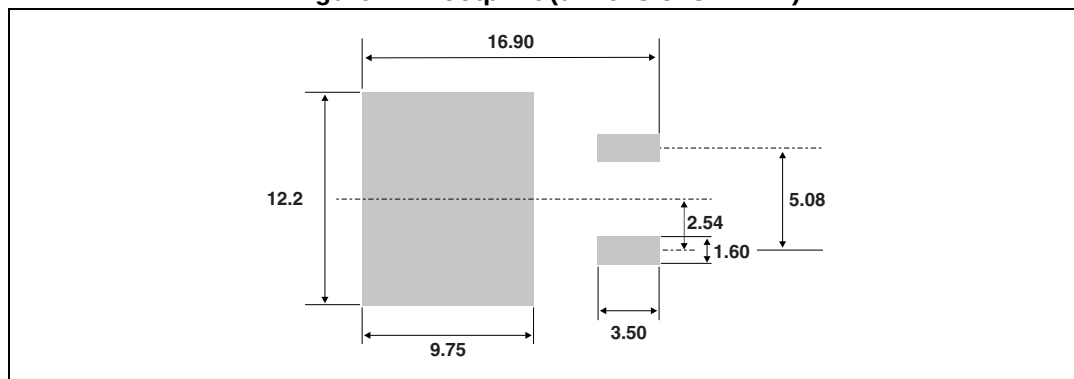
Figure 11. D<sup>2</sup>PAK dimension definitions

Table 8. D<sup>2</sup>PAK dimension values

| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 4.4         |      | 4.6   | 0.173  |       | 0.181 |
| A1   | 2.49        |      | 2.69  | 0.098  |       | 0.106 |
| A2   | 0.03        |      | 0.23  | 0.001  |       | 0.009 |
| B    | 0.7         |      | 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   | 1.30        |      | 1.75  | 0.051  |       | 0.069 |
| M    | 2.29        |      | 2.79  | 0.090  |       | 0.110 |
| R    |             | 0.40 |       |        | 0.016 |       |
| V2   | 0°          |      | 8°    | 0°     |       | 8°    |

Figure 12. Footprint (dimensions in mm)



### 3 Ordering information

Table 9. Ordering information

| Ordering type  | Marking      | Package                  | Weight | Base qty | Delivery mode |
|----------------|--------------|--------------------------|--------|----------|---------------|
| STPS20200CT    | STPS20200CT  | TO-220AB                 | 2.20 g | 50       | Tube          |
| STPS20200CTN   | STPS20200CTN | TO-220AB<br>narrow leads | 1.90 g | 50       | Tube          |
| STPS20200CFP   | STPS20200CFP | TO-220FPAB               | 2.0 g  | 50       | Tube          |
| STPS20200CG-TR | STPS20200CG  | D <sup>2</sup> PAK       | 1.48g  | 1000     | Tape and reel |

### 4 Revision history

Table 10. Document revision history

| Date        | Revision | Changes                           |
|-------------|----------|-----------------------------------|
| 11-Apr-2013 | 1        | First issue                       |
| 16-Oct-2013 | 2        | Updated <a href="#">Table 4</a> . |

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