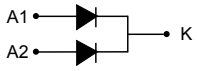
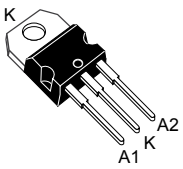
# STPS20150C

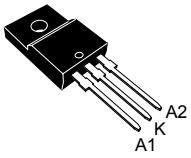
Datasheet

## High voltage power Schottky rectifier

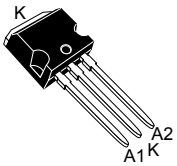


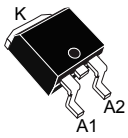

TO-220AB

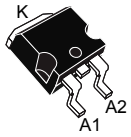



TO-220FPAB




I²PAK




D²PAK

| Product status link |
|---|
| STPS20150C |

| Product summary | |
|---|---|
| $I_{F(AV)}$ | 2 x 10 A |
| $V_{RRM}$ | 150 V |
| $T_j$ (max) | 175 °C |
| $V_F$ (typ) | 0.69 V |

## Features

- High junction temperature capability
- Good trade off between leakage current and forward voltage drop
- Low leakage current
- Avalanche capability specified
- Insulated package: TO-220FPAB
  - Insulating voltage = 2000 $V_{RMS}$ sine
- ECOPACK®2 compliant component for D²PAK on demand

## Description

Dual center tap Schottky rectifier designed for high frequency switch mode power supplies.

# 1 Characteristics

**Table 1. Absolute ratings (limiting values, per diode, at 25 °C, unless otherwise specified)**

| Symbol | Parameter | | | | Value | Unit |
|---|---|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage | | | | 150 | V |
| $I_{F(RMS)}$ | Forward rms current | | | | 30 | A |
| $I_{F(AV)}$ | Average forward current δ = 0.5, square wave | TO-220AB, $D^2PAK$, $I^2PAK$ | $T_C$ = 155 °C | Per diode | 10 | A |
| | | TO-220FPAB | $T_C$ = 135 °C | Per diode | | |
| | | All types | | Per device | 20 | |
| $I_{FSM}$ | Surge non repetitive forward current | tp = 10 ms sinusoidal | | | 180 | A |
| $P_{ARM}$ | Repetitive peak avalanche power | tp = 10 µs, $T_j$= 125 °C | | | 480 | W |
| $T_{stg}$ | Storage temperature range | | | | -65 to + 175 | °C |
| $T_j$ | Maximum operating junction temperature (1) | | | | + 175 | °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 parameter**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | TO-220AB, $D^2PAK$, $I^2PAK$ | Per diode | 2.2 | °C/W |
| | | TO-220FPAB | | 4.5 | |
| | | TO-220AB, $D^2PAK$, $I^2PAK$ | Total | 1.3 | |
| | | TO-220FPAB | | 3.5 | |
| $R_{th(c)}$ | Coupling | TO-220AB, $D^2PAK$, $I^2PAK$ | - | 0.3 | °C/W |
| | | TO-220FPAB | | 2.5 | |

When the diodes 1 and 2 are used simultaneously :
$\Delta Tj(diode\ 1) = P(diode1) \times R_{th(j-c)}(Per\ diode) + P(diode\ 2) \times R_{th(c)}$

**Table 3. Static electrical characteristics (per diode)**

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_R$ (1) | Reverse leakage current | $T_j$ = 25 °C | $V_R = V_{RRM}$ | - | | 5.0 | µA |
| | | $T_j$ = 125 °C | | - | | 5.0 | mA |
| $V_F$ (2) | Forward voltage drop | $T_j$ = 25 °C | $I_F$ = 10 A | - | | 0.92 | V |
| | | | | - | 0.69 | 0.75 | |
| | | | $I_F$ = 20A | - | | 1.0 | |
| | | | | - | 0.79 | 0.86 | |

1. *Pulse test: $t_p$ = 5 ms, δ < 2%*
2. *Pulse test: $t_p$ = 380 µs, δ < 2%*

To evaluate the conduction losses use the following equation: $P = 0.64 \times I_{F(AV)} + 0.011\ I_F{}^2{}_{(RMS)}$

## 1.1 Characteristics (curves)

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

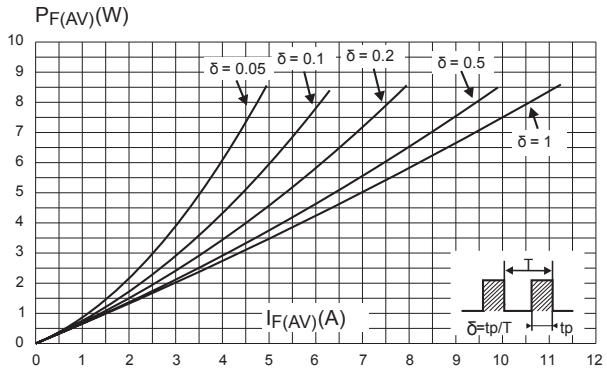



**Figure 2. Average forward current versus ambient temperature (δ= 0.5, per diode)**

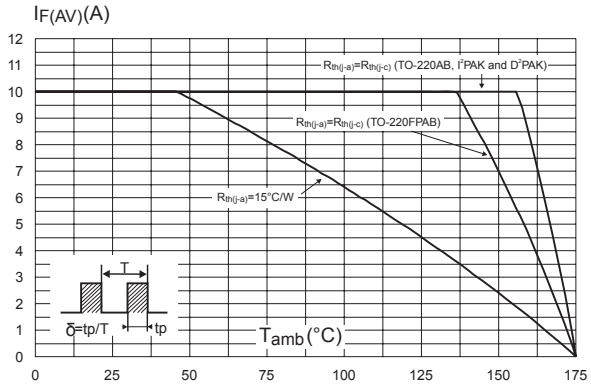



**Figure 3. Normalized avalanche power derating versus pulse ($T_j$= 125 °C)**

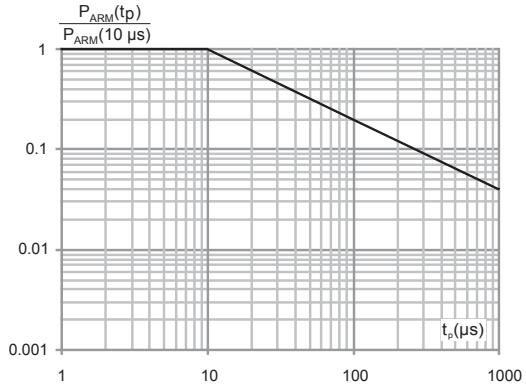



**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (per diode)**

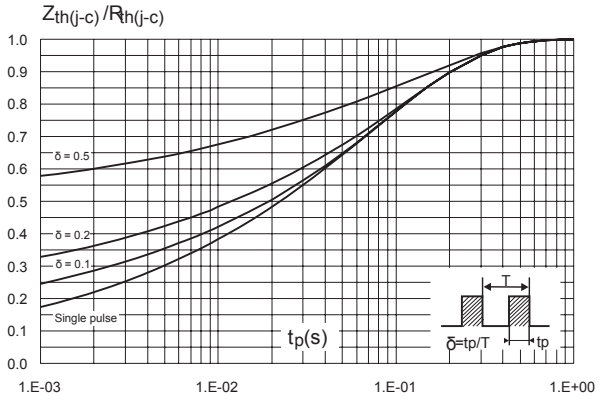



**Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (per diode)**

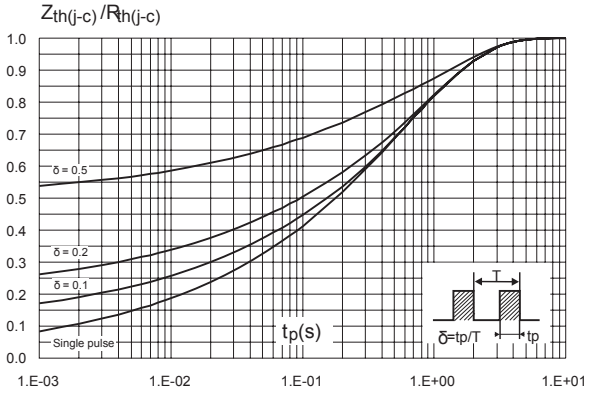



**Figure 6. Reverse leakage current versus reverse voltage applied (typical values, per diode)**

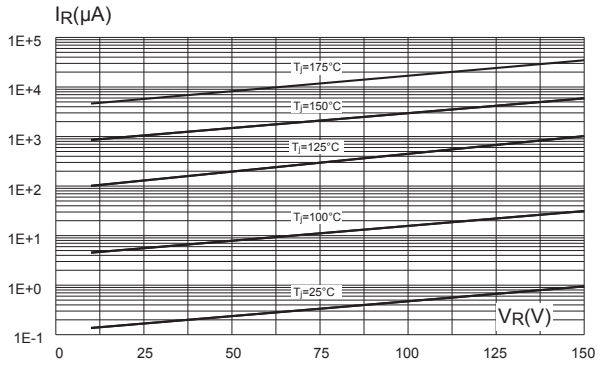


**Figure 7. Junction capacitance versus reverse voltage applied (typical values, per diode)**

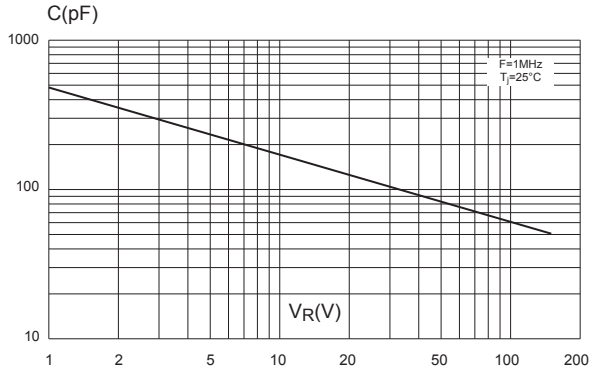



**Figure 8. Forward voltage drop versus forward current (maximum values, per diode)**

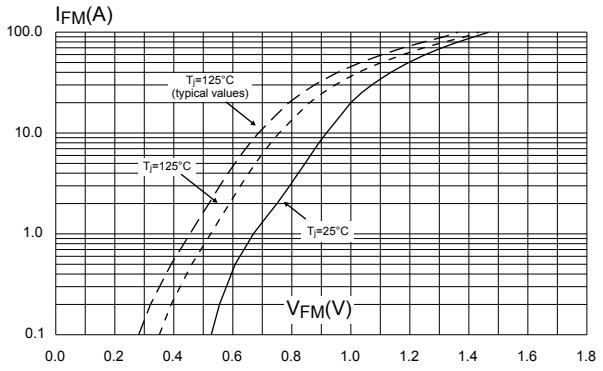
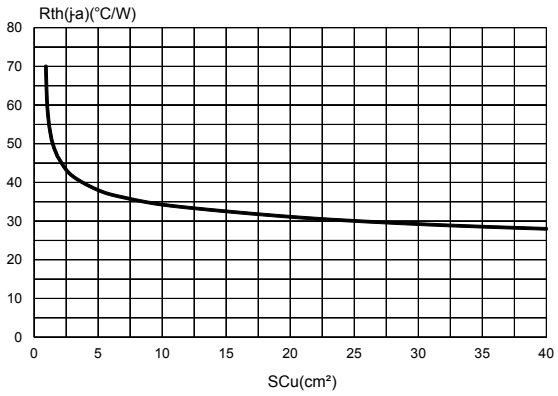



**Figure 9. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed board FR4, $e_{Cu}$ = 35 µm) (D²PAK)**



# 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. ECOPACK® is an ST trademark.

## 2.1 D²PAK package information

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

Figure 10. D²PAK package outline

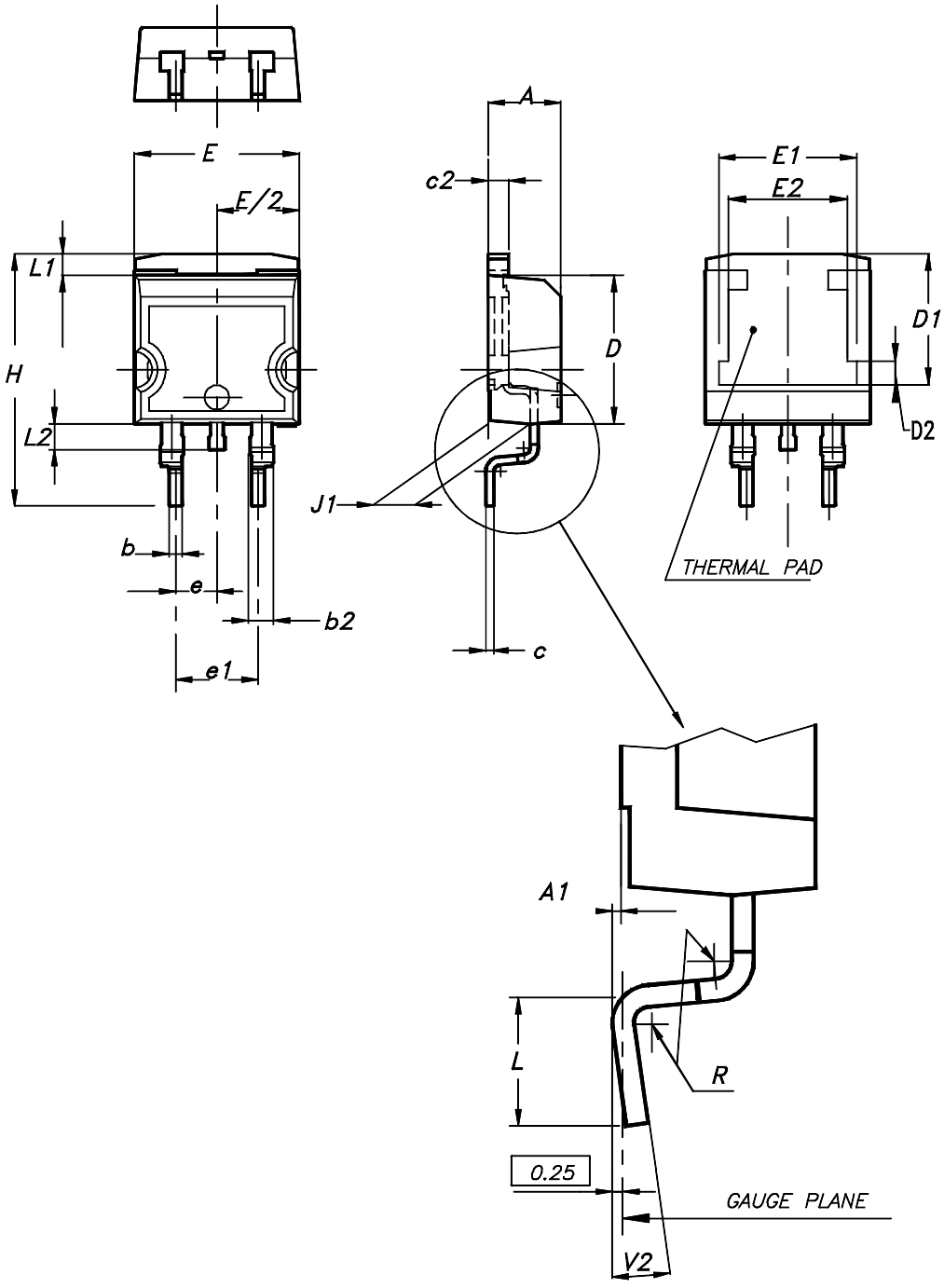
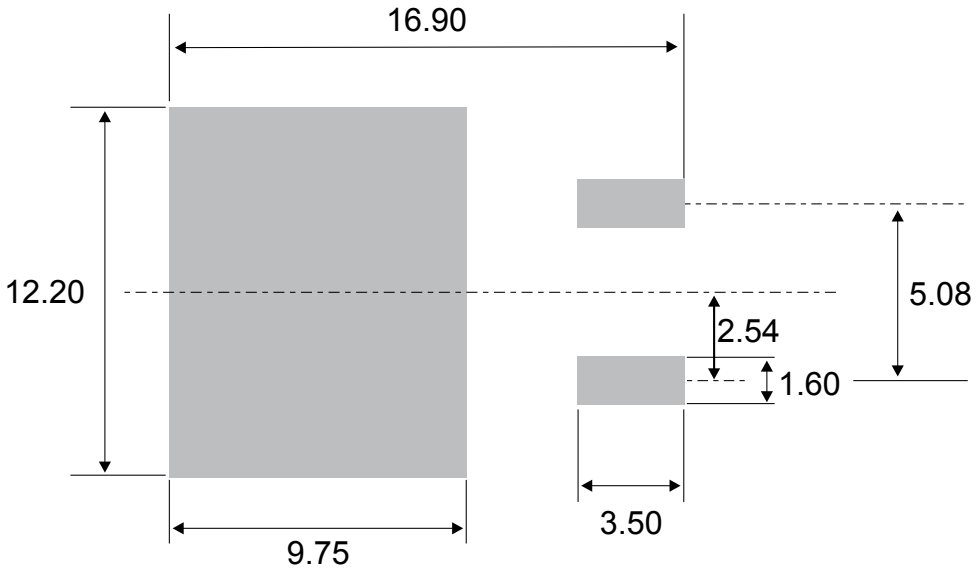


Table 4. **D²PAK package mechanical data**

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | 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 11. D²PAK Recommended footprint



## 2.2 I²PAK package information

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

**Figure 12. I²PAK package outline**

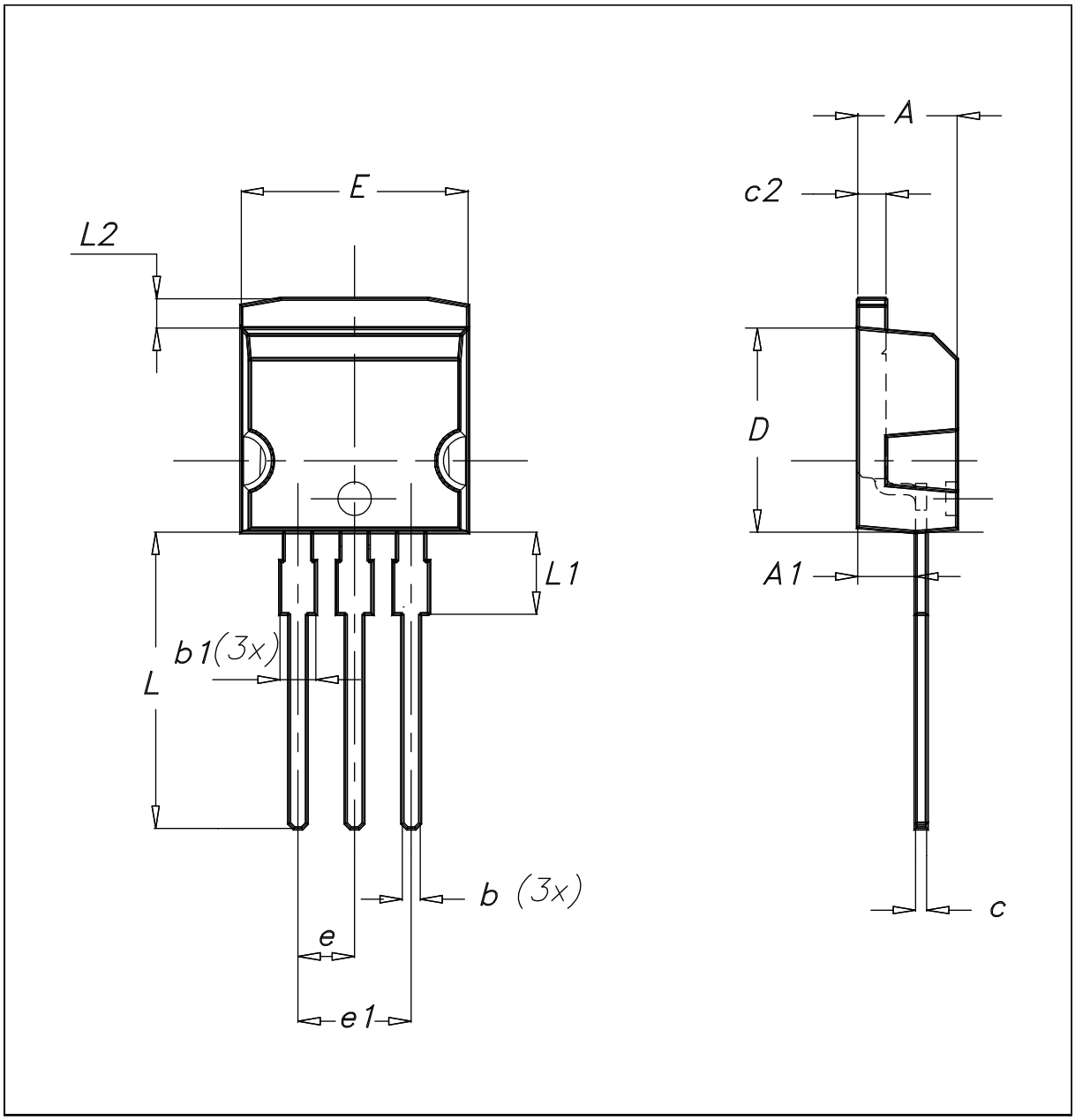


Table 5. I²PAK package mechanical data

| 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 | 10.00 | 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 |

## 2.3 TO-220AB package information

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.7 N·m

**Figure 13. TO-220AB package outline**

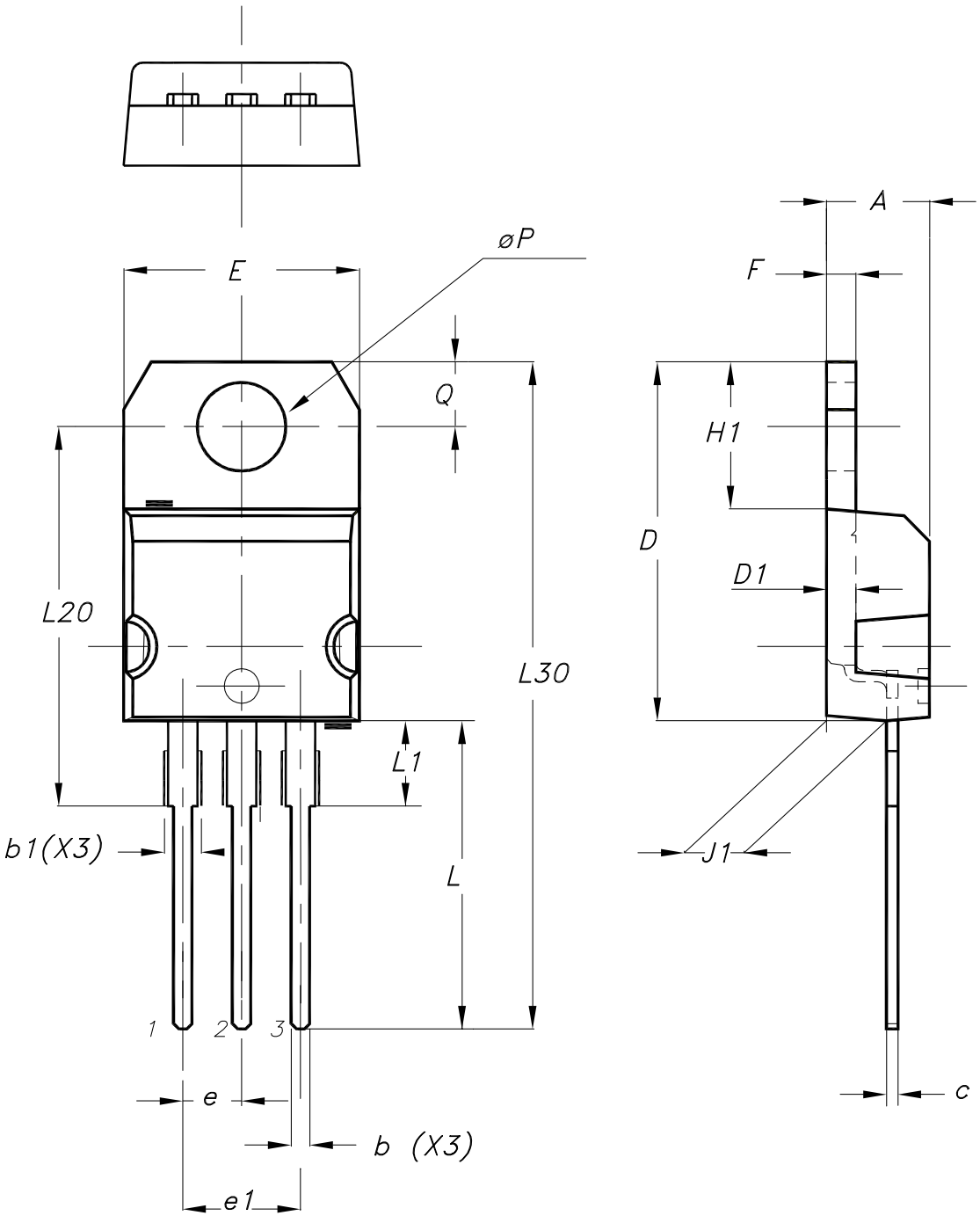


**Table 6. TO-220AB package mechanical data**

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | 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 |

## 2.4 TO-220FPAB package information

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.7 N·m

Figure 14. **TO-220FPAB package outline**

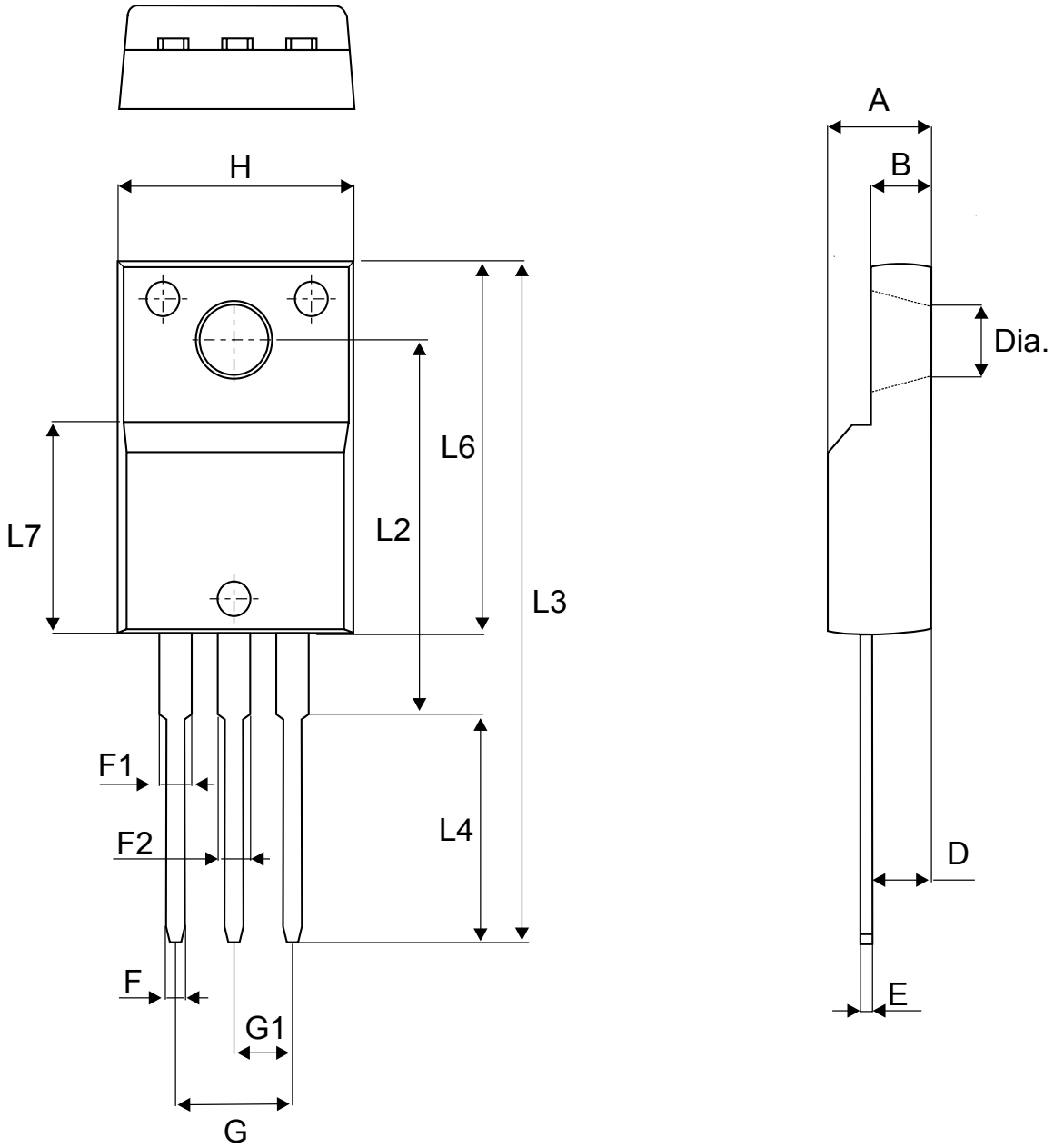


Table 7. **TO-220FPAB package mechanical data**

| Ref. | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches (for reference only) | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.1739 | 0.1818 |
| B | 2.5 | 2.7 | 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 | 1.0 | 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 | 10.6 | 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 | 3.0 | 3.20 | 0.1186 | 0.1265 |

# 3 Ordering information

Table 8. **Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| STPS20150CT | STPS20150CT | TO-220AB | 1.95 g | 50 | Tube |
| STPS20150CFP | STPS20150CFP | TO-220FPAB | 1.9 g | 50 | Tube |
| STPS20150CR | STPS20150CR | $I^2PAK$ | 1.5 g | 50 | Tube |
| STPS20150CG-TR | STPS20150CG | $D^2PAK$ | 1.38 g | 1000 | Tape and reel |
| STPS20150CG | STPS20150CG | $D^2PAK$ | 1.38 g | 50 | Tube |

## Revision history

Table 9. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| Jul-2003 | 6D | Last update |
| 11-May-2006 | 7 | Reformatted to current standard. Added ECOPACK statement.<br>Changed nF to pF in Figure 10. |
| 07-Mar-2007 | 8 | Reworked footnote to Table 1. Corrected typing error in Table 3. |
| 28-Jan-2011 | 9 | Updated weight in Table 9. Added warning paragraph above Table 6. |
| 24-Aug-2015 | 10 | Updated features, Table 1: "Device summary" and packages silhouette in cover page.<br>Updated Section 1: "Characteristics" and Section 1.1: "Characteristics(curves)".<br>Updated Section 2.2: "D²PAK package information". |
| 08-Fev-2018 | 11 | Updated I²PAK package information. |
| 10-Apr-2018 | 12 | Updated Table 5. I²PAK package mechanical data. |