
**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	2 x 10 A
$V_{RRM}$	45 V
$T_{j(max)}$	175 °C
$V_{F(typ)}$	0.57 V

### Features

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Insulated package: TO-220FPAB
  - Insulating voltage = 2000 V<sub>RMS</sub> sine
  - Capacitance = 12 pF
- Avalanche rated

### Description

Dual center tap Schottky rectifier suited for switch mode power supply and high frequency DC to DC converters.

Packaged either in TO-220AB, TO-220FPAB, I<sup>2</sup>PAK, or D<sup>2</sup>PAK, this device is especially intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.

# 1 Characteristics

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

Symbol	Parameter			Value	Unit	
V <sub>RRM</sub>	Repetitive peak reverse voltage			45	V	
I <sub>F(RMS)</sub>	Forward rms current			30	A	
I <sub>F(AV)</sub>	Average forward current δ = 0.5	TO-220AB D <sup>2</sup> PAK I <sup>2</sup> PAK	T <sub>c</sub> = 155 °C	Per diode	10	A
		TO-220FPAB	T <sub>c</sub> = 125 °C	Per device	20	
I <sub>FSM</sub>	Surge non repetitive forward current		t <sub>p</sub> = 10 ms sinusoidal		180	A
P <sub>ARM</sub> <sup>(1)</sup>	Repetitive peak avalanche power		T <sub>j</sub> = 125 °C, t <sub>p</sub> = 10 μs		280	W
V <sub>ARM</sub> <sup>(2)</sup>	Maximum repetitive peak avalanche voltage		t <sub>p</sub> < 10 μs, T <sub>j</sub> < 125 °C, I <sub>AR</sub> < 7.7 A		60	V
V <sub>ASM</sub> <sup>(2)</sup>	Maximum single-pulse peak avalanche voltage					
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 pulse time duration deratings, please refer to [Figure 3](#). More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the STMicroelectronics Application notes AN1768, "Admissible avalanche power of Schottky diodes" and AN2025, "Converter improvement using Schottky rectifier avalanche specification".
2. See [Figure 9](#)
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 resistances parameters**

Symbol	Parameter			Value	Unit
R <sub>th(j-c)</sub>	Junction to case	TO-220AB / D <sup>2</sup> PAK / I <sup>2</sup> PAK	Per diode	2.2	°C/W
			Total	1.4	
	TO-220FPAB	Per diode	4.5		
		Total	3.5		
R <sub>th(c)</sub>	Coupling	TO-220AB / D <sup>2</sup> PAK / I <sup>2</sup> PAK	Coupling	0.4	°C/W
		TO-220FPAB		2.5	

When the diodes 1 and 2 are used simultaneously:

$$T_j(\text{diode 1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode2}) \times R_{th(c)}$$

Table 4. Static electrical characteristics (per diode)

Symbol	Test conditions		Min.	Typ.	Max.	Unit	
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^\circ\text{C}$	$V_R = V_{RRM}$		100	$\mu\text{A}$	
		$T_j = 125\text{ }^\circ\text{C}$			7	15	mA
$V_F^{(1)}$	Forward voltage drop	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 10\text{ A}$		0.5	0.57	V
		$T_j = 25\text{ }^\circ\text{C}$	$I_F = 20\text{ A}$			0.84	
		$T_j = 125\text{ }^\circ\text{C}$			0.65	0.72	

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

To evaluate the conduction losses use the following equation:

$$P = 0.42 \times I_{F(AV)} + 0.015 I_F^2(RMS)$$

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

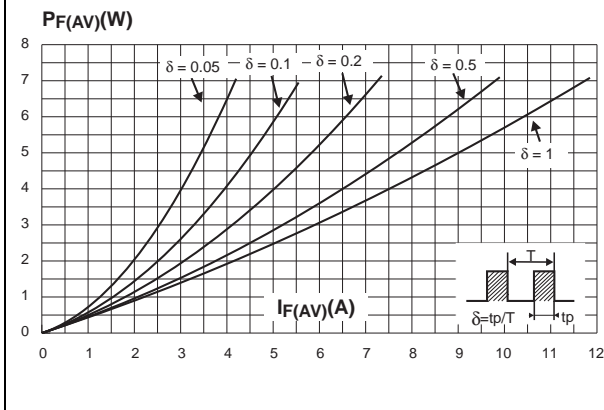


Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)

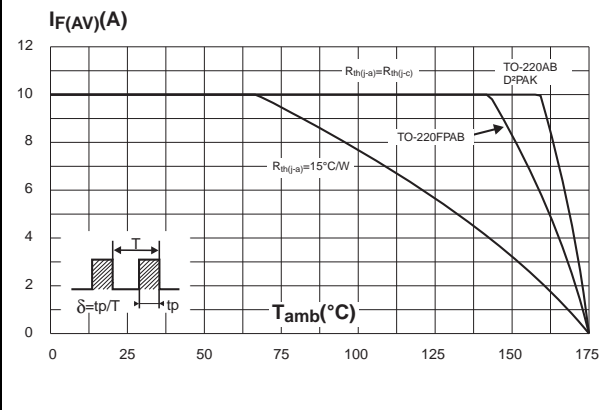


Figure 3. Normalized avalanche power deratings versus pulse duration

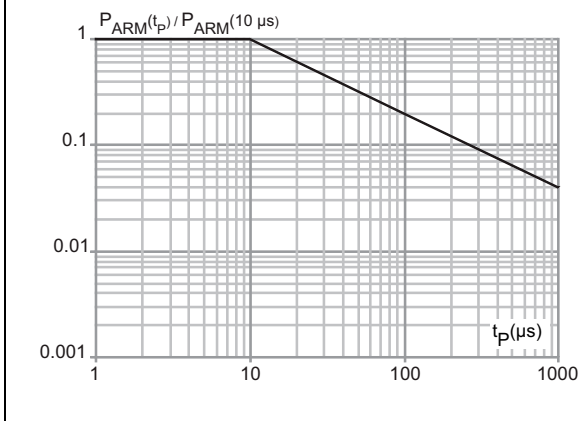
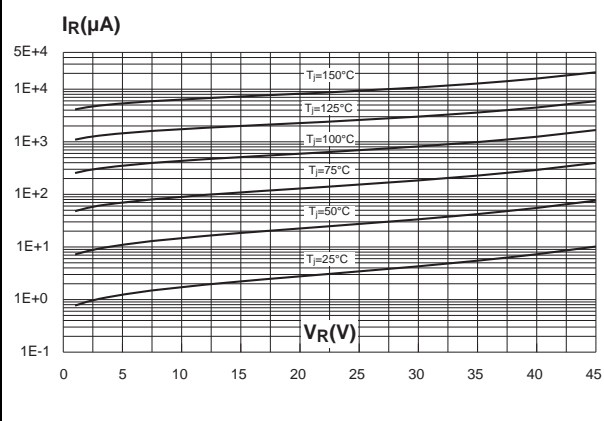
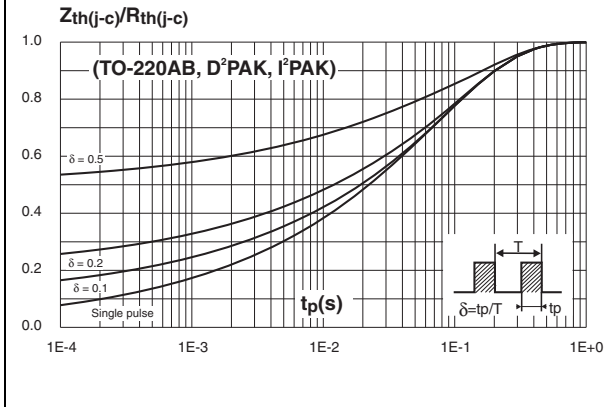


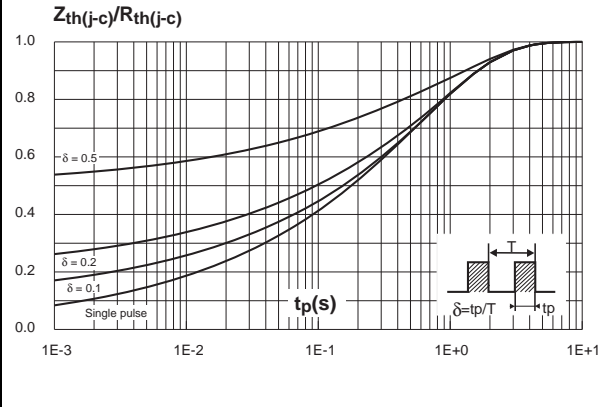
Figure 4. Reverse leakage current versus reverse voltage applied (typical values, per diode)



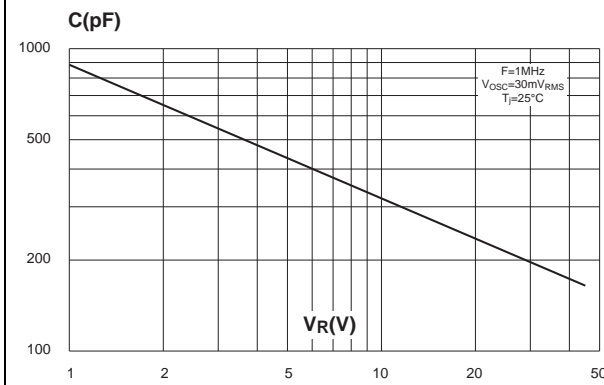
**Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration**



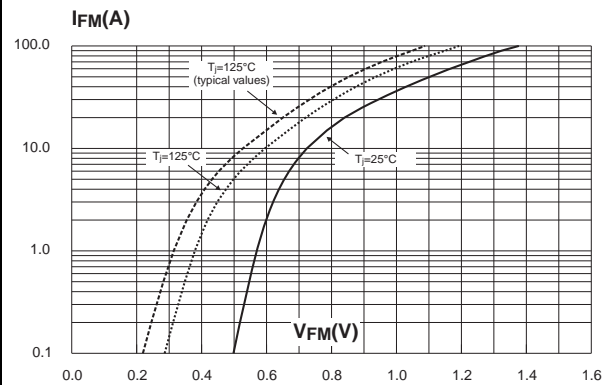
**Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (TO-220FPAB)**



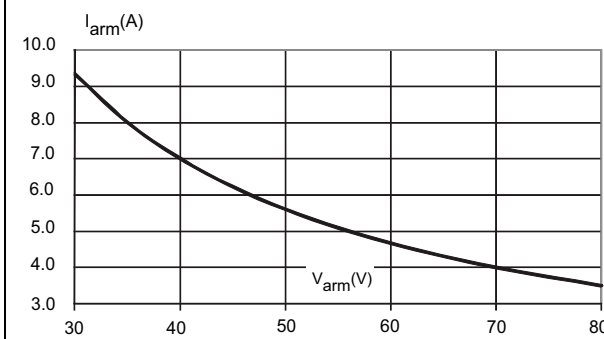
**Figure 7. Junction capacitance versus reverse voltage applied (typical values, per diode)**



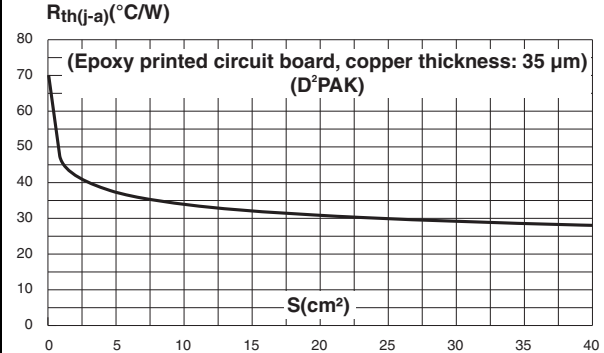
**Figure 8. Forward voltage drop versus forward current (maximum values, per diode)**



**Figure 9. Reverse safe operating area ( $t_p < 10 \mu\text{s}$  and  $T_j < 125^\circ\text{C}$ )**



**Figure 10. Thermal resistance junction to ambient versus copper surface under tab**



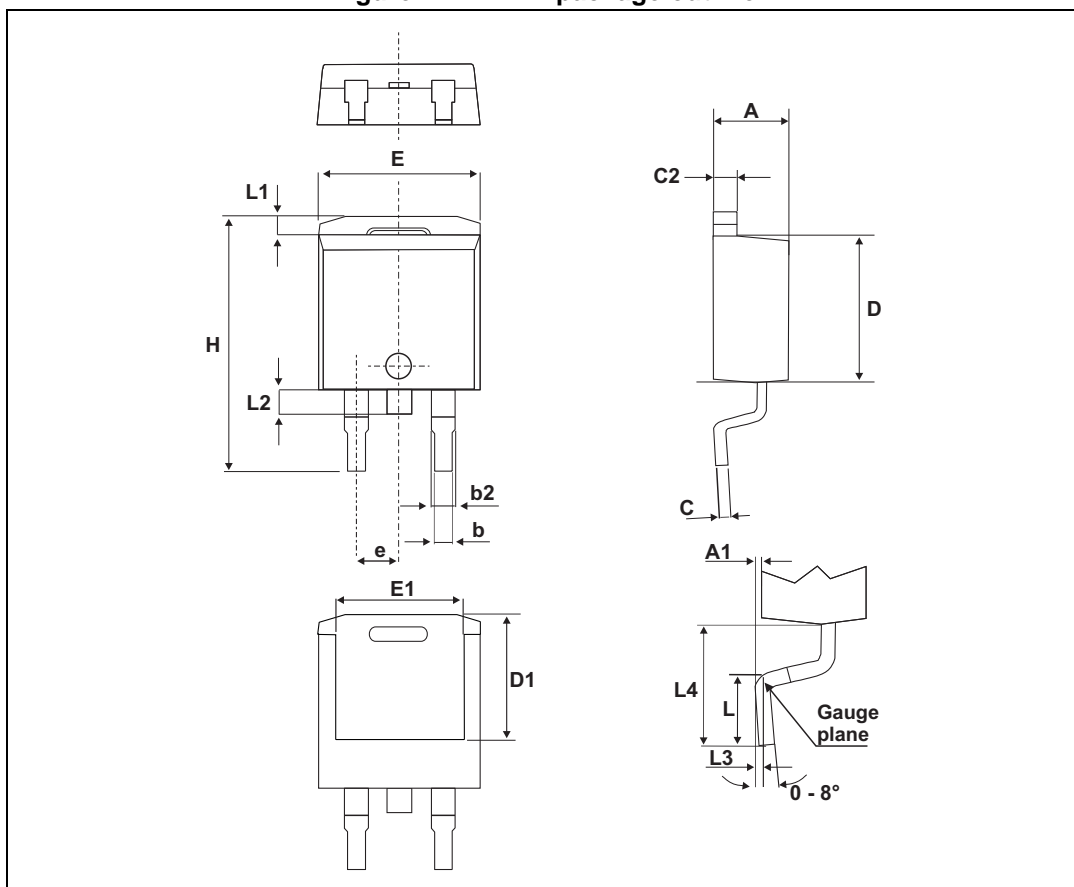
## 2 Package information

- Epoxy meets UL94, V0
- Recommended torque value (TO-220AB, TO-220FPAB): 0.55 N·m
- Maximum torque value (TO-220AB, TO-220FPAB): 0.7 N·m
- Cooling method: by conduction (C)

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

Figure 11. D<sup>2</sup>PAK package outline



This D<sup>2</sup>PAK above drawing is an illustration provided for information only.

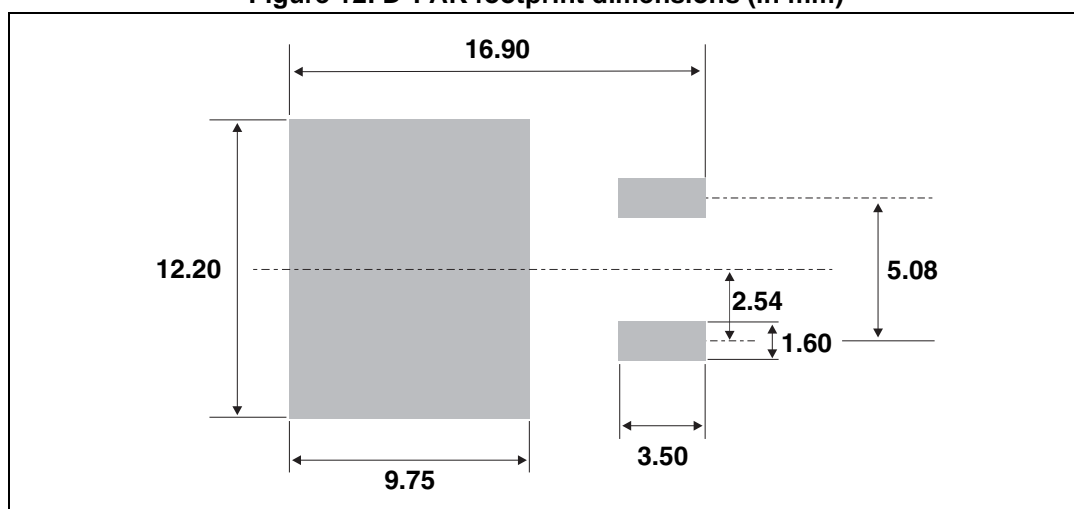
D<sup>2</sup>PAK real shape may slightly differ from this particular example.

Nevertheless, this mechanical dimensions specified in the table will remain applicable.

Table 5. D<sup>2</sup>PAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.36	4.60	0.172	0.181
A1	0.00	0.23	0.000	0.009
b	0.70	0.93	0.028	0.037
b2	1.14	1.70	0.045	0.067
c	0.38	0.694	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	-	0.272	-
E	10.00	10.55	0.394	0.415
E1	8.10	-	0.319	-
e	2.54 typ.		0.100 typ.	
H	15.00	15.85	0.591	0.624
L	1.90	2.79	0.075	0.110
L1	-	1.65	-	0.065
L2	-	1.78	-	0.070
L3	0.25 typ.		0.010 typ.	
L4	4.78	5.28	0.188	0.208

Figure 12. D<sup>2</sup>PAK footprint dimensions (in mm)



## 2.2 TO-220AB package information

Figure 13. TO-220AB package outline

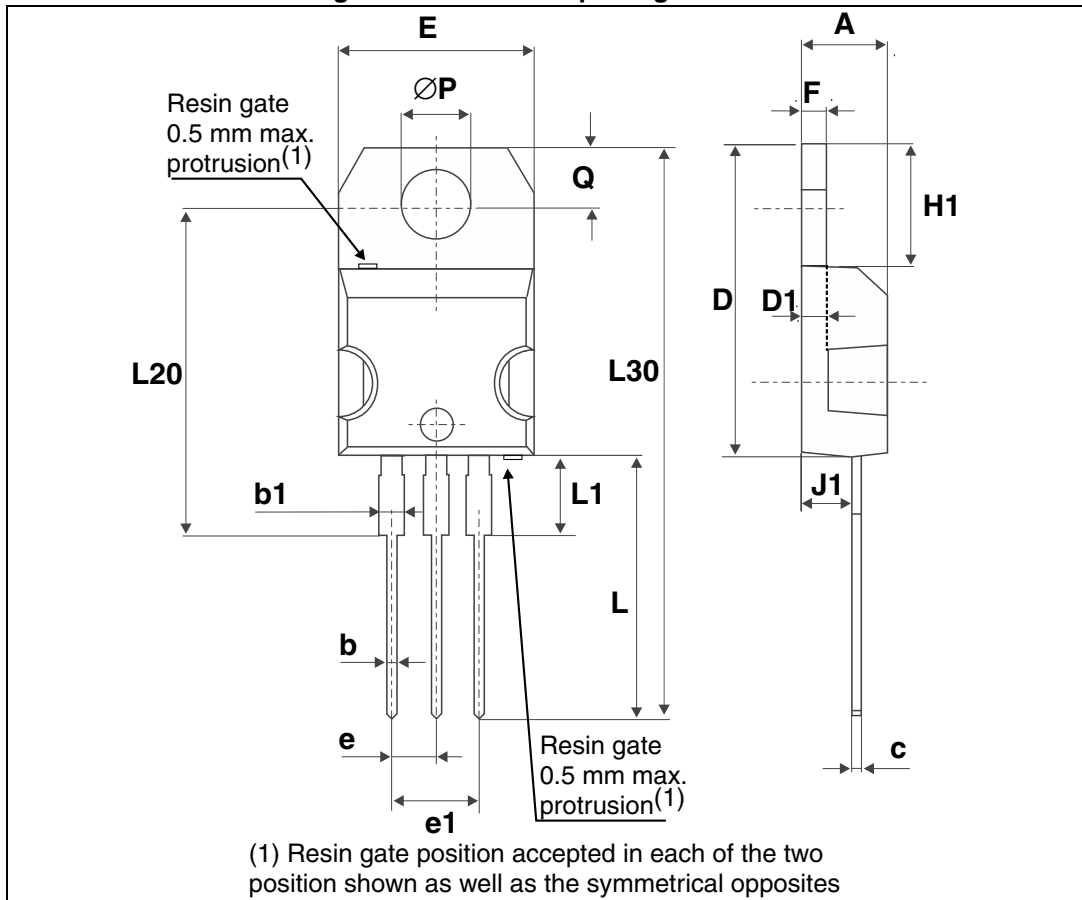


Table 6. TO-220AB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.17	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 typ.		0.05 typ.	
E	10	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	0.094	0.107
L	13	14	0.51	0.55
L1	3.50	3.93	0.137	0.154
L20	16.40 typ.		0.64 typ.	
L30	28.90 typ.		1.13 typ.	
ØP	3.75	3.85	0.147	0.151
Q	2.65	2.95	0.104	0.116



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

Devices in I<sup>2</sup>PAK with nickel-plated back frame must NOT be mounted by frame soldering like SMDs. Such devices are intended to be through-hole mounted ONLY and in no circumstances shall ST be held liable for any lack of performance or damage arising out of soldering of nickel-plated back frames.

Figure 14. I<sup>2</sup>PAK package outline

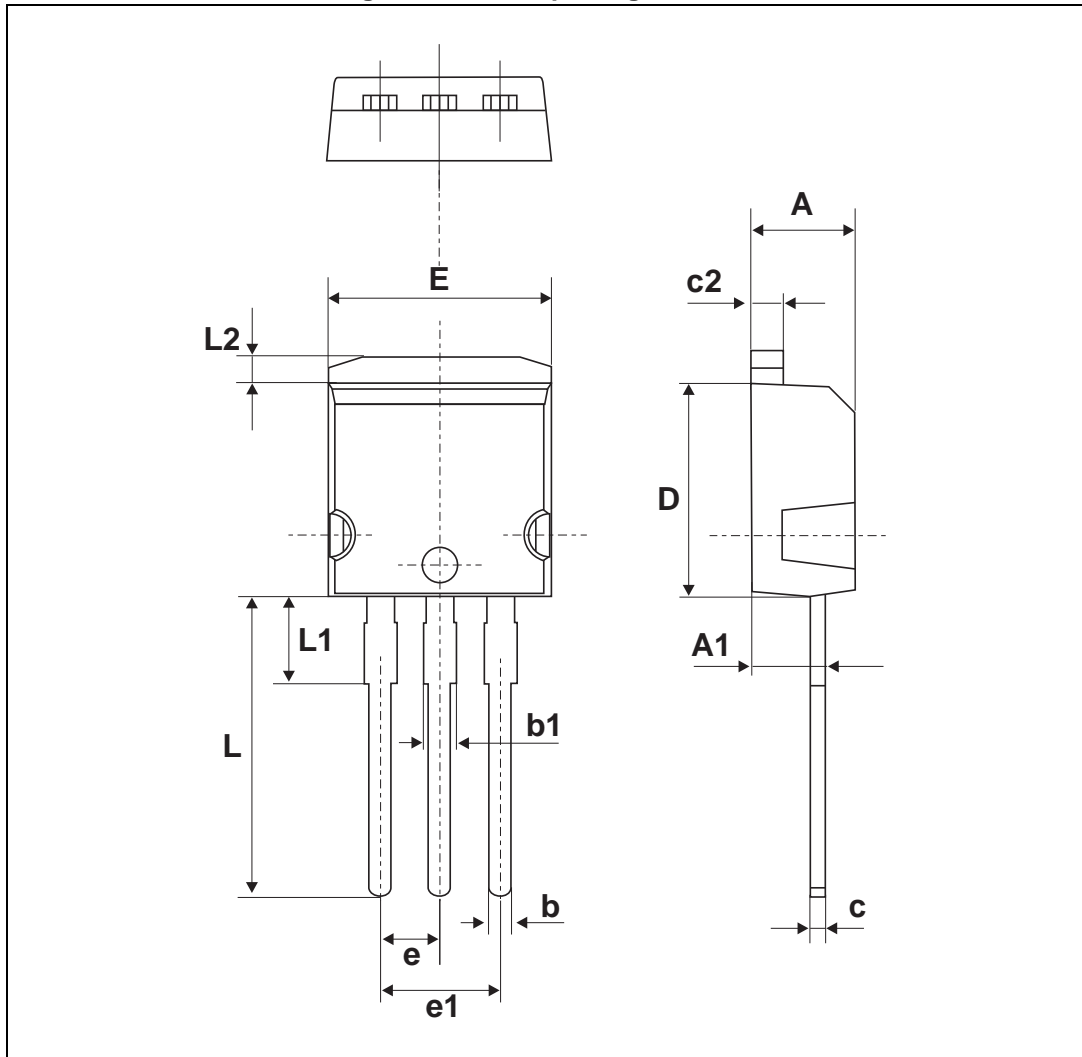


Table 7. I<sup>2</sup>PAK package mechanical data

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	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

## 2.4 TO-220FPAB package information

Figure 15. TO-220FPAB package outline

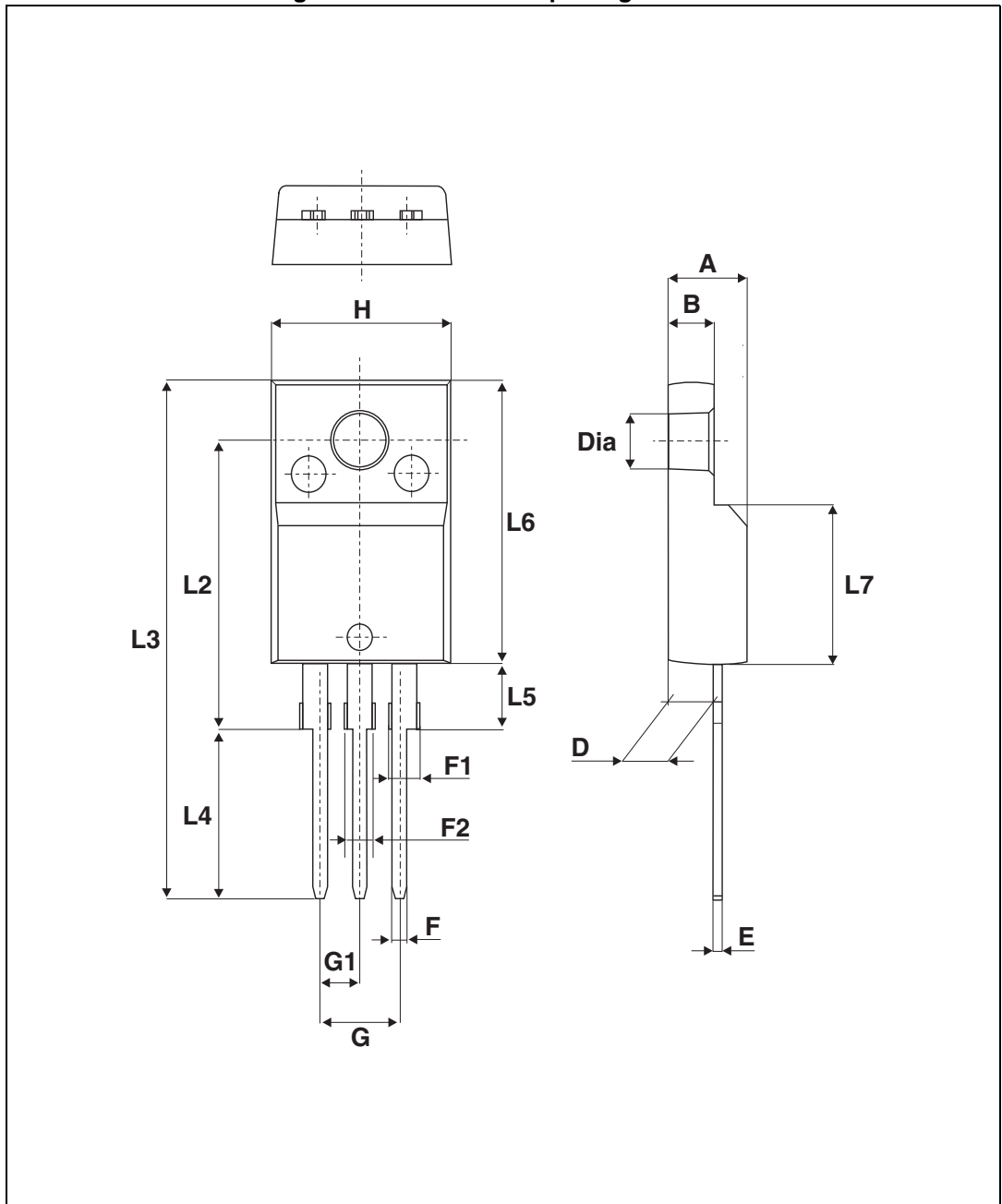


Table 8. TO-220FPAB package mechanical data

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

### 3 Ordering information

**Table 9. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS2045CT	STPS2045CT	TO-220AB	2.23 g	50	Tube
STPS2045CR	STPS2045CR	I <sup>2</sup> PAK	1.49 g	50	Tube
STPS2045CFP	STPS2045CFP	TO-220FPAB	2.0 g	50	Tube
STPS2045CG	STPS2045CG	D <sup>2</sup> PAK	1.48 g	50	Tube
STPS2045CG-TR	STPS2045CG			1000	Tape and reel

### 4 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
05-Oct-2004	4F	Last update
01-Dec-2004	5	Figure 16 (I <sup>2</sup> PAK Package Mechanical Data): references b1 and b2 changed from 1.17mm to 1.70mm.
05-Feb-2010	6	Updated <a href="#">Table 2</a> (removed voltage). Updated ECOPACK statement. Updated <a href="#">Table 6.: TO-220AB package mechanical data</a> .
05-Mar-2013	7	Updated <a href="#">Table 3</a>
21-Oct-2014	8	Updated <a href="#">Features</a> , <a href="#">Table 2</a> , <a href="#">Figure 3</a> and D <sup>2</sup> PAK package information. Added <a href="#">Figure 9</a> . Removed fig 4,5 and 6 of version 7.
17-Aug-2015	9	Corrected XML fragment and reformatted to current standard.

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