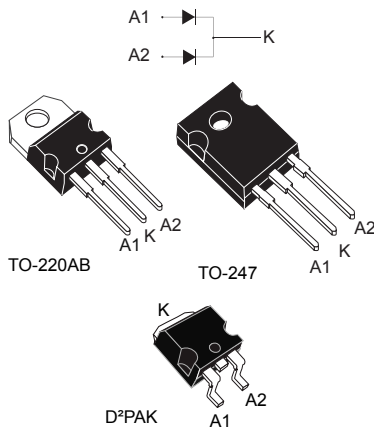


## 170 V power Schottky rectifier



### Features

- High junction temperature capability
- Low leakage current
- High voltage capabilities
- Good trade-off between leakage current and forward voltage drop
- Low thermal resistance
- High frequency operation
- Avalanche specification
- ECOPACK<sup>®</sup>2 compliant for TO-220AB and TO-247, on demand for D<sup>2</sup>PAK

### Applications

- Switching diode
- SMPS
- DC/DC converter
- Telecom power

### Description

This dual center tab Schottky rectifier is suited for high frequency switched mode power supplies.

Packaged in TO-247, D<sup>2</sup>PAK and TO-247, the **STPS40170C** is optimized for use to enhance the reliability in applications.

Product status link	
<a href="#">STPS40170C</a>	
Product summary	
Symbol	Value
$I_{F(AV)}$	2 x 20 A
$V_{RRM}$	170 V
$T_j$	175 °C
$V_F$ (typ.)	0.69 V

# 1 Characteristics

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

Symbol	Parameter		Value	Unit	
V <sub>RRM</sub>	Repetitive peak reverse voltage		170	V	
I <sub>F(RMS)</sub>	Forward rms current		60	A	
I <sub>F(AV)</sub>	Average forward current, $\delta = 0.5$ square wave	T <sub>c</sub> = 150 °C	Per diode	20	A
		T <sub>c</sub> = 145 °C	Per device	40	
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal	250	A	
P <sub>ARM</sub>	Repetitive peak avalanche power	t <sub>p</sub> = 10 $\mu$ s, T <sub>j</sub> = 125 °C	1015	W	
T <sub>stg</sub>	Storage temperature range		-65 to +175	°C	
T <sub>j</sub>	Maximum operating junction temperature range <sup>(1)</sup>		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 resistance parameters**

Symbol	Parameter		Max. value	Unit
R <sub>th(j-c)</sub>	Junction to case	Per diode	1.20	°C/W
		Total	0.85	
R <sub>th(c)</sub>	Coupling		0.50	

When the diodes 1 and 2 are used simultaneously :

$$\Delta T_j(\text{diode 1}) = P(\text{diode 1}) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

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

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-		30	$\mu$ A
		T <sub>j</sub> = 125 °C		-	7	30	mA
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 20 A	-		0.92	V
		T <sub>j</sub> = 125 °C		-	0.69	0.75	
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 40 A	-		1.00	
		T <sub>j</sub> = 125 °C		-	0.79	0.86	

1. Pulse test: t<sub>p</sub> = 5 ms,  $\delta < 2\%$

2. Pulse test: t<sub>p</sub> = 380  $\mu$ s,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

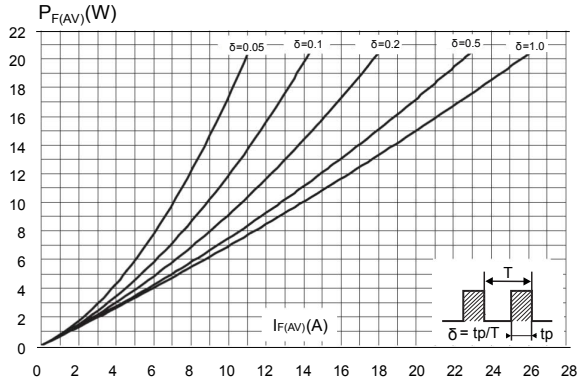
$$P = 0.64 \times I_{F(AV)} + 0.0055 \times I_{F(RMS)}^2$$

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

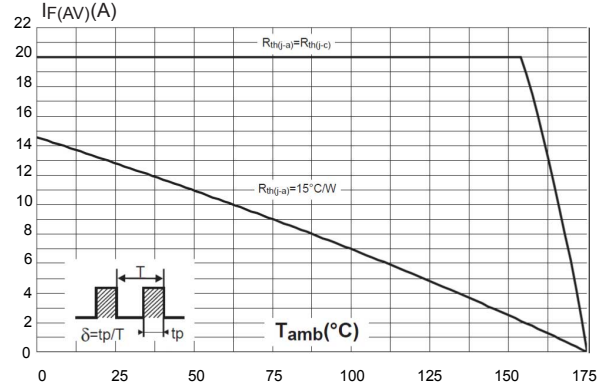
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

### 1.1 Characteristics (curves)

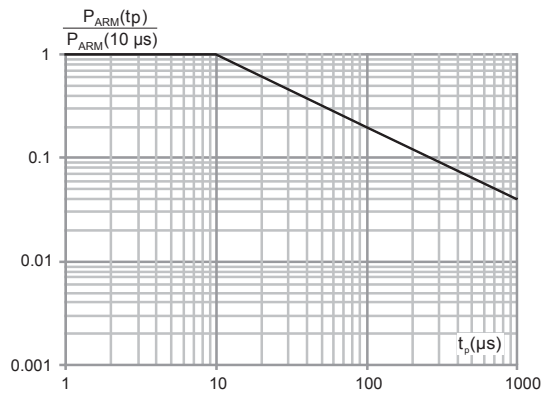
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



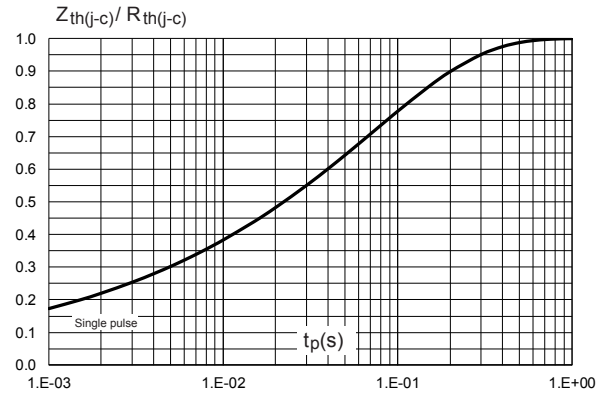
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



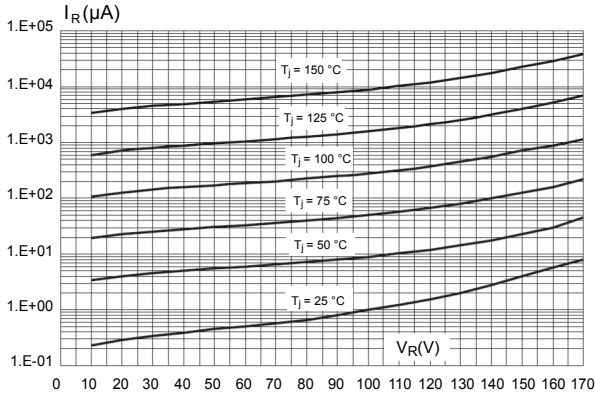
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125$  °C)**



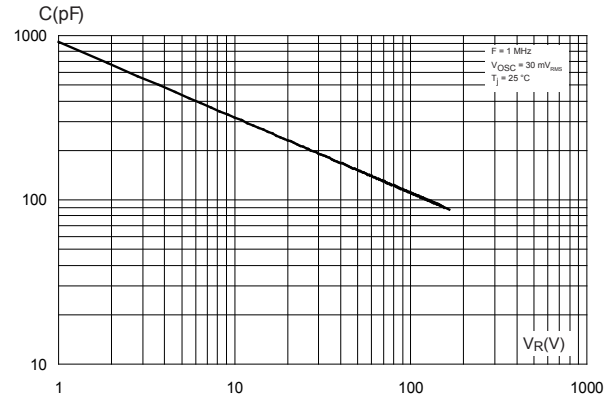
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



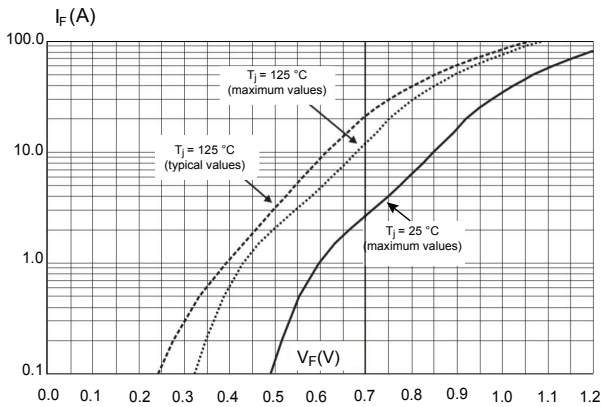
**Figure 5. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



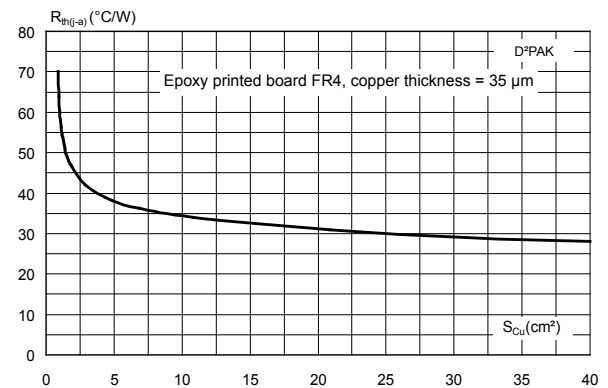
**Figure 6. Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 7. Forward voltage drop versus forward current (per diode)**



**Figure 8. Thermal resistance junction to ambient versus copper surface under tab**



## 2 Package information

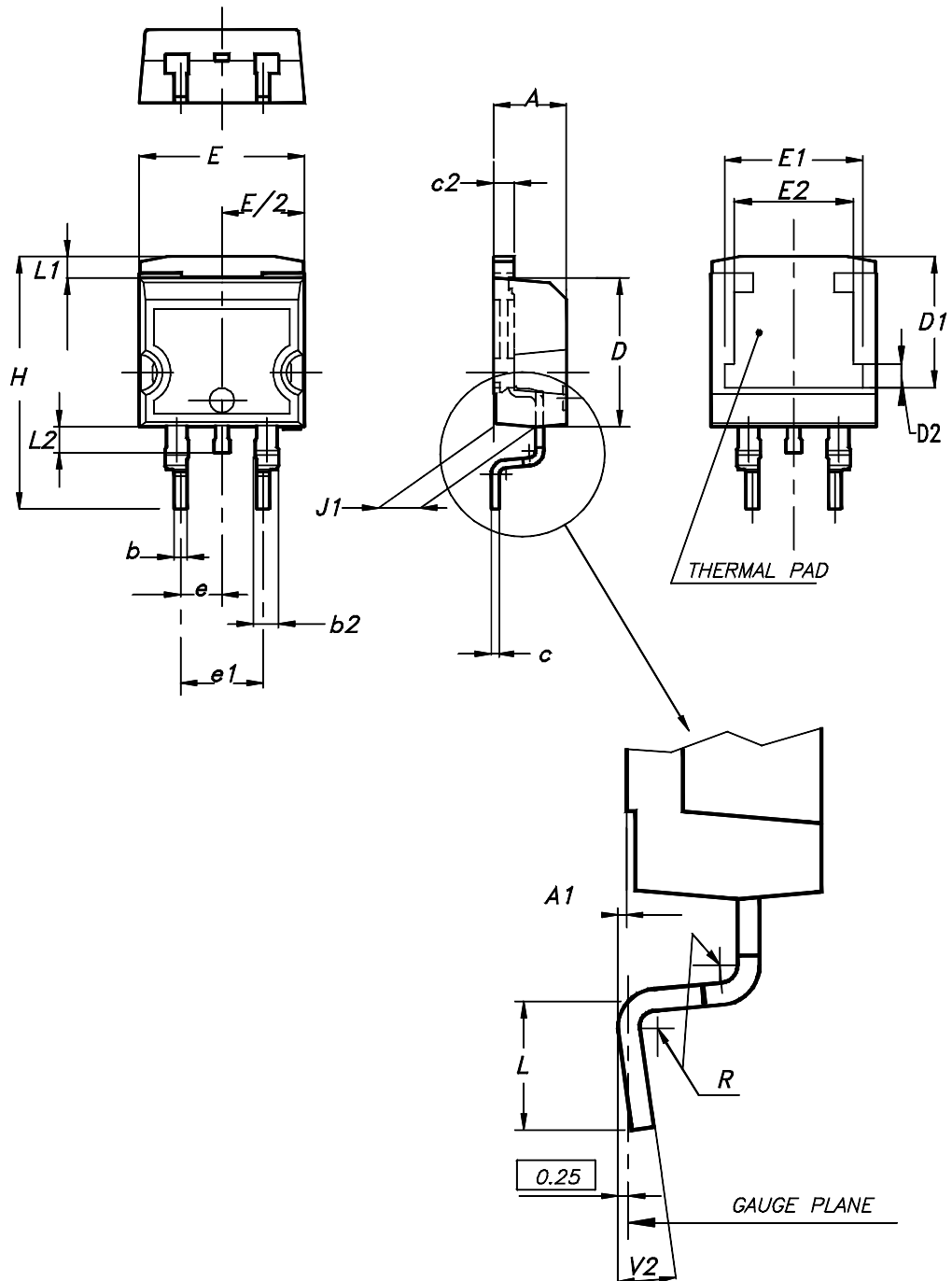
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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

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

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

Figure 9. D<sup>2</sup>PAK package outline

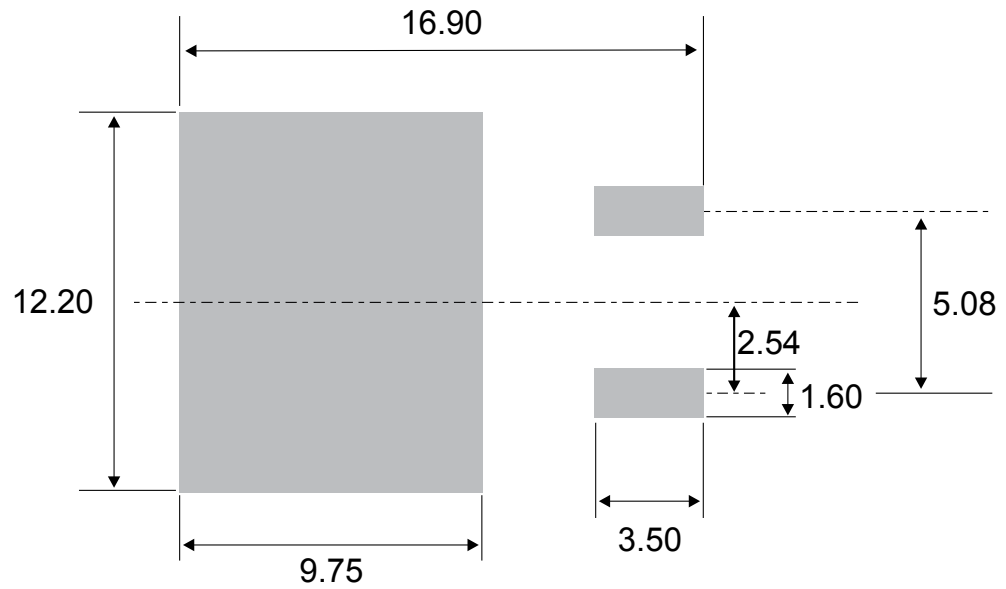


**Note:** This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

**Table 4. 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	0.25	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 10. D<sup>2</sup>PAK recommended footprint (dimensions in mm)

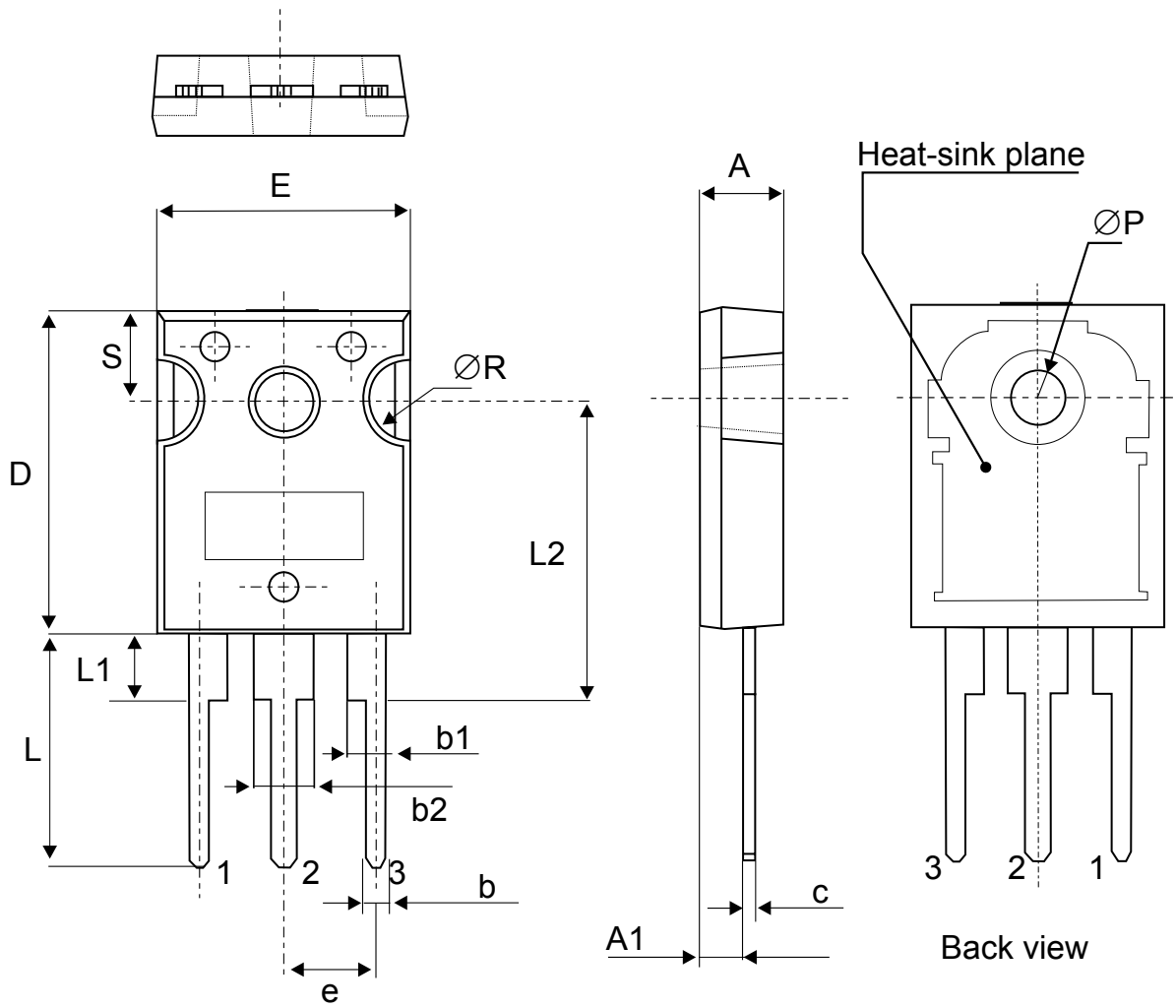




## 2.2 TO-247 package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 11. TO-247 package outline



**Table 5. TO-247 package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
A1	2.20		2.60	0.086		0.102
b	1.00		1.40	0.039		0.055
b1	2.00		2.40	0.078		0.094
b2	3.00		3.40	0.118		0.133
c	0.40		0.80	0.015		0.031
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e	5.30	5.45	5.60	0.209	0.215	0.220
L	14.20		14.80	0.559		0.582
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
ØP	3.55		3.65	0.139		0.143
ØR	4.50		5.50	0.177		0.217
S	5.30	5.50	5.70	0.209	0.216	0.224

1. Inches dimensions given for reference only

### 2.3 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 12. TO-220AB package outline

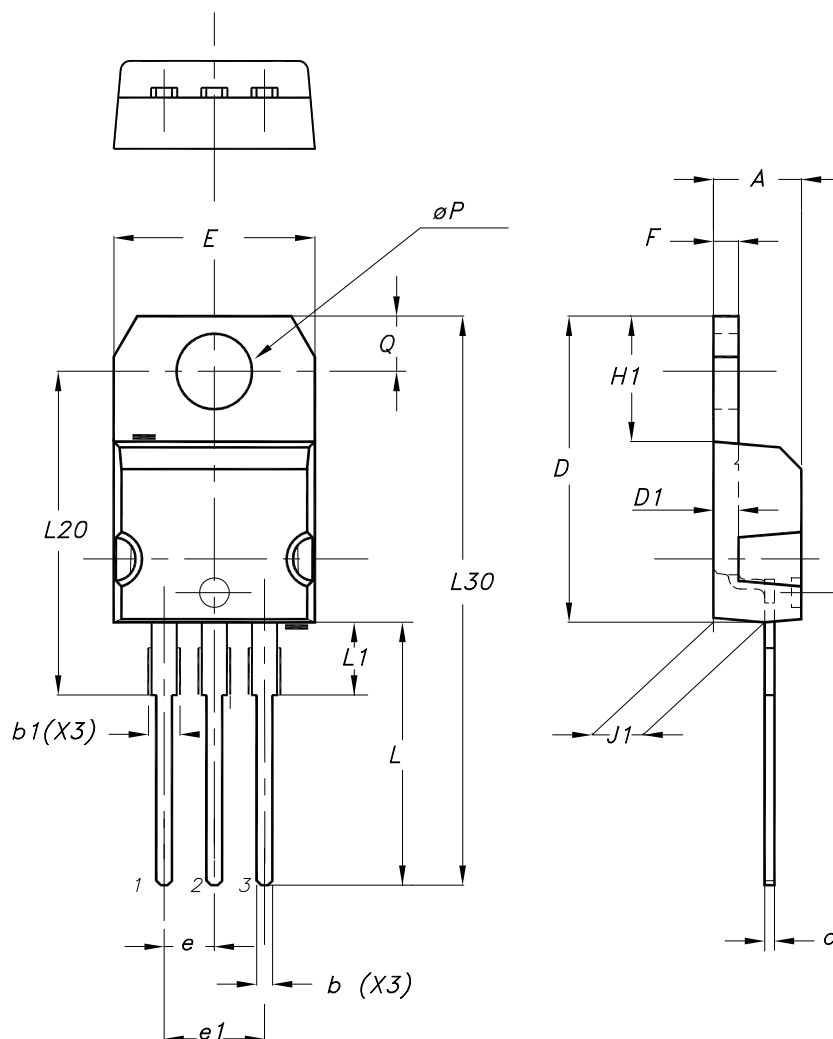


Table 6. TO-220AB package mechanical data

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

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
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

### 3 Ordering information

**Table 7. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPS40170CT	STPS40170CT	TO-220AB	1.95 g	50	Tube
STPS40170CG-TR	STPS40170CG	D <sup>2</sup> PAK	1.38 g	10000	Tape and reel
STPS40170CW	STPS40170CW	TO-247	4.36 g	30	Tube

## Revision history

**Table 8. Document revision history**

Date	Version	Changes
16-Sep-2005	1	Initial release.
01-Jun-2018	2	Updated $P_{ARM}$ value and removed "Normalized avalanche power derating" curves.

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