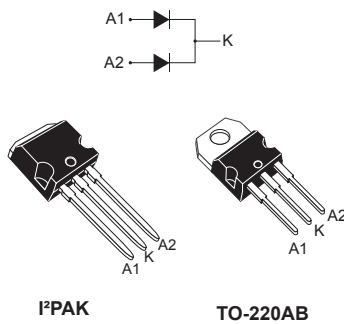


## 120 V power Schottky rectifier



### Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation
- ECOPACK<sup>®</sup>2 compliant

### Applications

- Switching diode
- SMPS
- DC/DC converter
- LED lighting
- Notebook adapter

### Description

This Schottky rectifier is suited for high frequency switch mode power supply.

The voltage drop versus leakage current trade-off is in keeping with medium power hi-density adapter design.

Packed in TO-220AB and I<sup>2</sup>PAK, the **STPS40SM120C** is optimized for use in notebook, game station and desktop adaptors, providing in these applications a good efficiency at both low and high load.

Product status link	
<a href="#">STPS40SM120C</a>	
Product summary	
Symbol	Value
$I_{F(AV)}$	2 x 20 A
$V_{RRM}$	120 V
$T_j$ (max.)	150 °C
$V_F$ (typ.)	0.63 V

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage		120	V
I <sub>F(RMS)</sub>	Forward rms current		30	A
I <sub>F(AV)</sub>	Average forward current, $\delta = 0.5$	T <sub>C</sub> = 125 °C    Per diode	20	A
		T <sub>C</sub> = 115 °C    Per device	40	
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal	210	A
P <sub>ARM</sub>	Repetitive peak avalanche power	t <sub>p</sub> = 10 $\mu$ s, T <sub>j</sub> = 125 °C	1150	W
T <sub>stg</sub>	Storage temperature range		-65 to +175	°C
T <sub>j</sub>	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 parameters**

Symbol	Parameter		Value	Unit
R <sub>th(j-c)</sub>	Junction to case	Per diode	1.35	°C/W
		Total	0.93	
R <sub>th(c)</sub>	Coupling		0.50	

When the diodes 1 and 2 are used simultaneously:

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

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

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**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>	-	55	275	$\mu$ A
		T <sub>j</sub> = 125 °C		-	20	50	mA
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 125 °C	I <sub>F</sub> = 5 A	-	0.46	0.51	V
		T <sub>j</sub> = 125 °C	I <sub>F</sub> = 10 A	-	0.55	0.60	
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 20 A	-		0.83	
		T <sub>j</sub> = 125 °C		-	0.63	0.69	

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

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

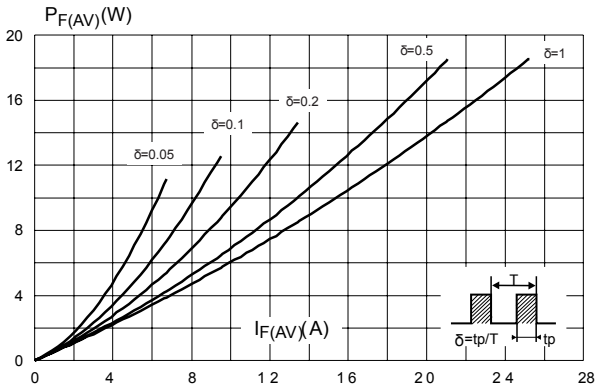
To evaluate the conduction losses, use the following equation:  $P = 0.52 \times I_{F(AV)} + 0.0085 \times I_F^2$  (RMS)

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

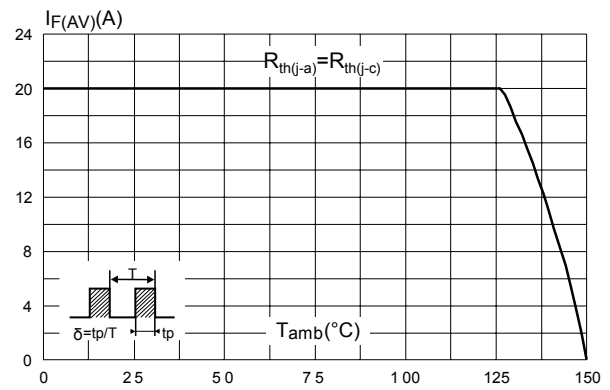
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

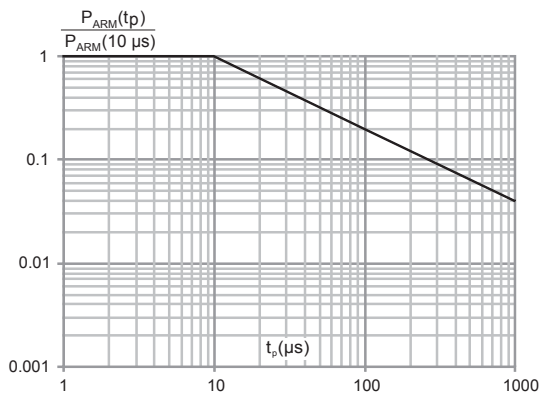
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



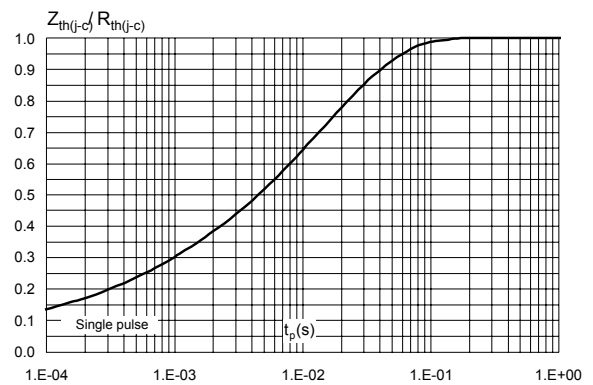
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



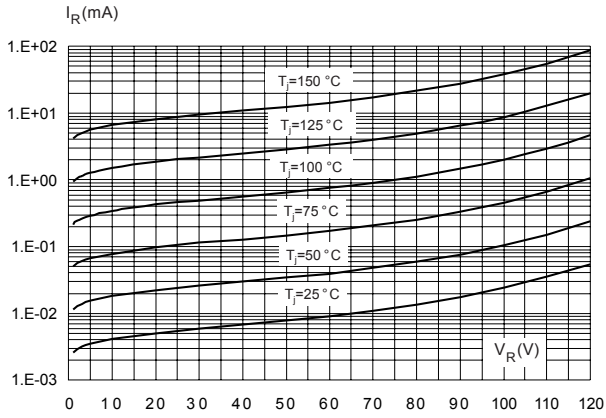
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125^\circ\text{C}$ )**



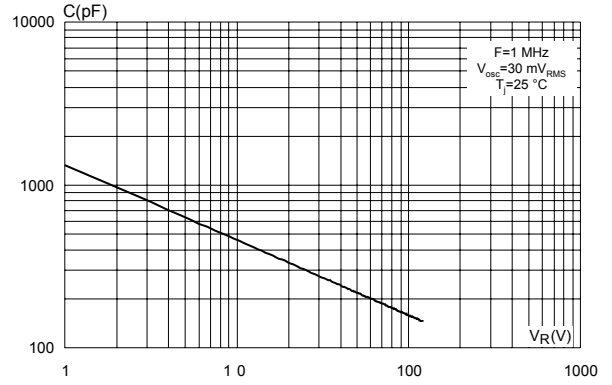
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



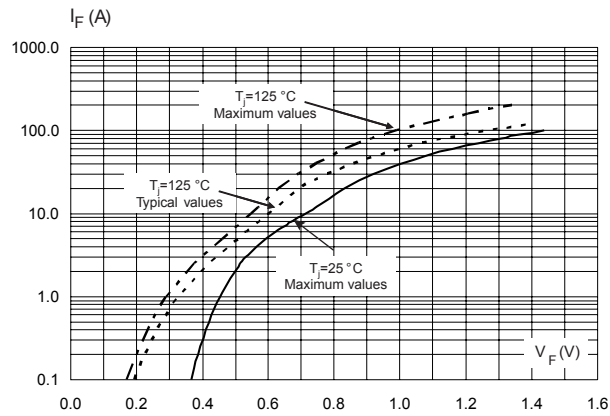
**Figure 5. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



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



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



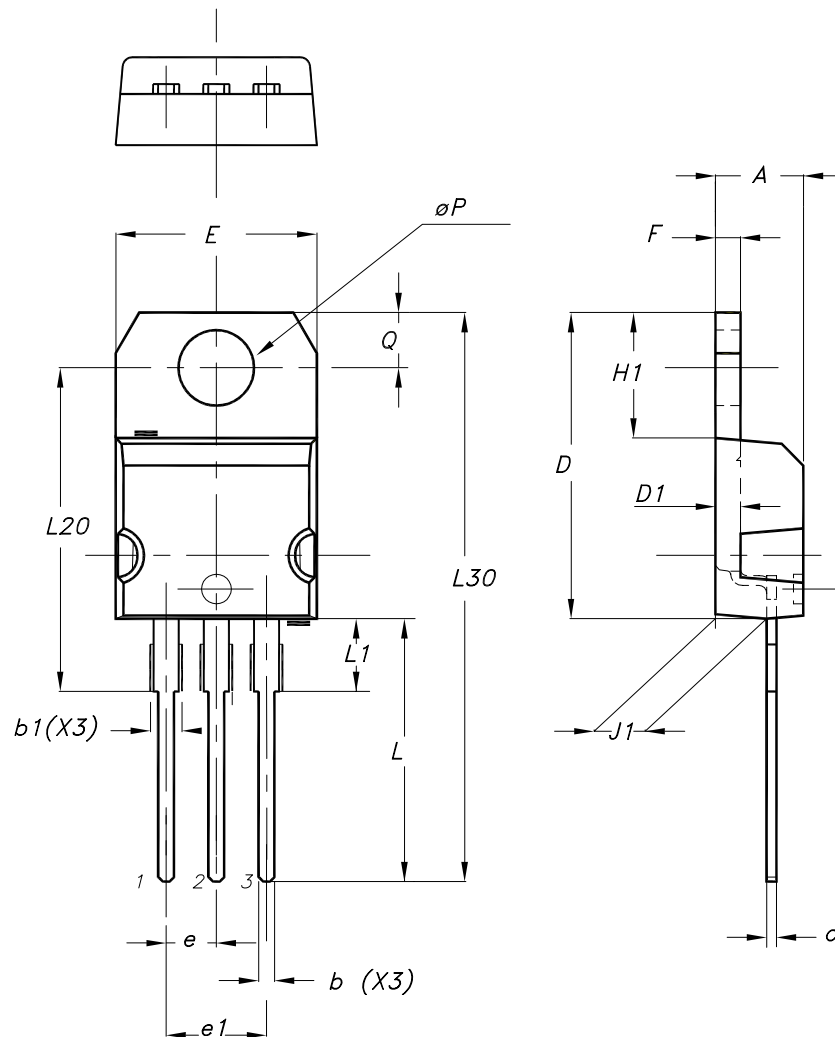
## 2 Package information

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 8. TO-220AB package outline



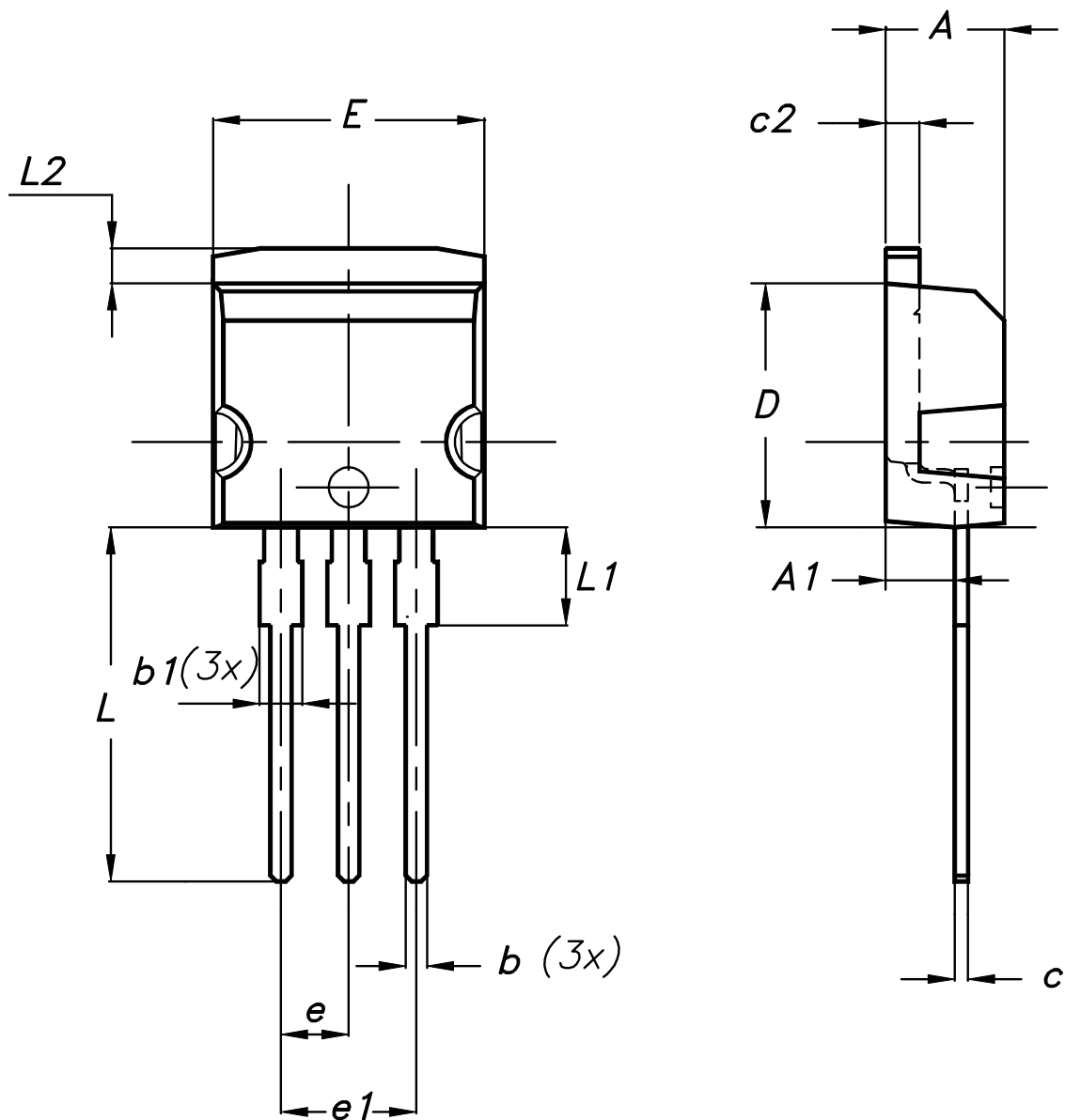
**Table 4. TO-220AB package mechanical data**

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

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

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



**Table 5. 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



### 3 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPS40SM100CT	PS40SM100CT	TO-220AB	1.95 g	50	Tube
STPS40SM100CR	PS40SM100CR	I <sup>2</sup> PAK	1.50 g	50	Tube

## Revision history

**Table 7. Document revision history**

Date	Version	Changes
02-Apr-2012	1	First issue.
04-Nov-2014	2	Added TO-220AB and TO-220FPAB package information.
11-Apr-2017	3	Updated Section 1: "Characteristics" and Section 1.1: "Characteristics (curves)".
27-Jun-2018	4	Updated <a href="#">Table 1. Absolute Ratings</a> (limiting values, per diode, at 25 °C, unless otherwise specified) and <a href="#">Figure 3. Normalized avalanche power derating versus pulse duration</a> ( $T_j = 125\text{ °C}$ ). Removed TO-220AB narrow leads package information.

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