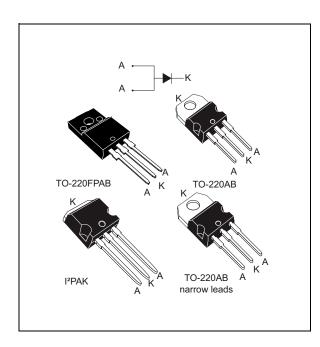


### **STPS30SM120S**

### Power Schottky rectifier

Datasheet - production data



#### **Features**

- High current capability
- Avalanche rated
- Low forward voltage drop
- High frequency operation
- Insulated package TO220FP-AB:
  - Insulated voltage: 2000 V<sub>RMS</sub> sine
- ECOPACK<sup>®</sup>2 compliant component on TO-220AB and TO-220FPAB.

### **Description**

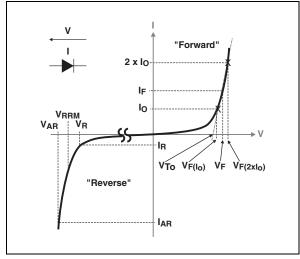
This Schottky diode is suited for high frequency switch mode power supply.

Packaged in TO-220AB narrow leads, TO-220AB, TO-220FPAB and I<sup>2</sup>PAK, this device is intended to be used in notebook, game station and desktop adapters, providing in these applications a good efficiency at both low and high load.

**Table 1. Device summary** 

Symbol	Value
I <sub>F(AV)</sub>	30 A
V <sub>RRM</sub>	120 V
T <sub>j</sub>	150 °C
V <sub>F</sub> (typ)	0.47 V

Figure 1. Electrical characteristics<sup>(a)</sup>



V<sub>ARM</sub> and I<sub>ARM</sub> must respect the reverse safe operating area defined in *Figure 9*. V<sub>AR</sub> and I<sub>AR</sub> are pulse measurements (t<sub>p</sub> < 10 μs). V<sub>R</sub>, I<sub>R</sub>, V<sub>RRM</sub> and V<sub>F</sub>, are static characteristics

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Characteristics STPS30SM120S

#### 1 Characteristics

Table 2. Absolute ratings (limiting values with terminals 1 and 3 short circuited at  $T_{amb}$  = 25 °C, unless otherwise specified)

Symbol	Parameter	Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage	120	V	
I <sub>F(RMS)</sub>	Forward rms current	50	Α	
I <sub>F(AV)</sub>	Average forward current	30	Α	
I <sub>FSM</sub>	Surge non repetitive forward current $t_p = 10 \text{ ms sine-wave}$		240	Α
P <sub>ARM</sub> <sup>(1)</sup>	Repetitive peak avalanche power $T_j = 125  ^{\circ}\text{C}, t_p = 10  \mu\text{s}$		1200	W
V <sub>ARM</sub> <sup>(2)</sup>	Maximum repetitive peak avalanche voltage	150	V	
V <sub>ASM</sub> <sup>(2)</sup>	Maximum single-pulse peak avalanche voltage	150	V	
T <sub>stg</sub>	Storage temperature range	-65 to +175	°C	
Tj	Maximum operating junction temperature <sup>(3)</sup>		150	°C

For pulse time duration deratings, please refer to Figure 4. 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".

3.  $\frac{dPtot}{dT_j} < \frac{1}{Rth(j-a)}$  condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

Symbol	Parameter		Value	Unit
D	R <sub>th(i,c)</sub> Junction to case	TO-220AB and TO-220AB narrow leads	1.35	°C/W
R <sub>th(j-c)</sub>	Junction to case	TO-220FPAB	4	C/VV

Table 4. Static electrical characteristics (terminals 1 and 3 short circuited)

Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Povorco logicado current	T <sub>j</sub> = 25 °C	V - V	-	55	275	μΑ
'R`	I <sub>R</sub> <sup>(1)</sup> Reverse leakage current	T <sub>j</sub> = 125 °C	$V_R = V_{RRM}$	-	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	-	0.47	0.52	
		T <sub>j</sub> = 125 °C	I <sub>F</sub> = 10 A	-	0.55	0.60	
V_(2)		T <sub>j</sub> = 25 °C	I - 15 A	-		0.79	V
V F		T <sub>j</sub> = 125 °C	I <sub>F</sub> = 15 A	-	0.60	0.65	V
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 30 A	-		0.95	
		T <sub>j</sub> = 125 °C	1F - 30 A	-	0.68	0.76	

<sup>1.</sup> Pulse test:  $t_p = 5 \text{ ms}, \delta < 2\%$ 

To evaluate the conduction losses use the following equation:

$$P = 0.56 \times I_{F(AV)} + 0.0067 \times I_{F}^{2}_{(RMS)}$$

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<sup>2.</sup> See Figure 9

<sup>2.</sup> Pulse test:  $t_p = 380 \mu s$ ,  $\delta < 2\%$ 

STPS30SM120S Characteristics

Figure 2. Average forward power dissipation Figure 3. Average forward current versus versus average forward current ambient temperature ( $\delta$  = 0.5)

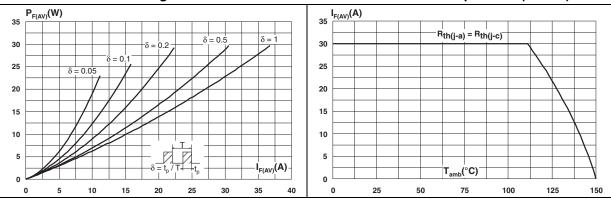


Figure 4. Normalized avalanche power derating versus pulse duration

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

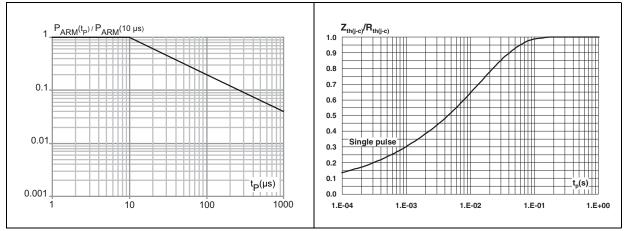
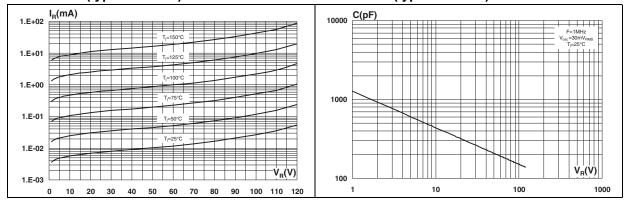


Figure 6. Reverse leakage current versus reverse voltage applied (typical values)

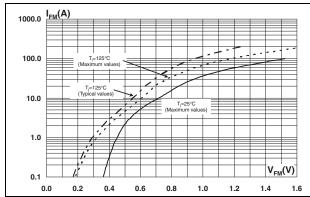
Figure 7. Junction capacitance versus reverse voltage applied (typical values)

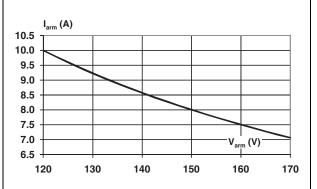


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Figure 8. Forward voltage drop versus forward current

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





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## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value for TO-220AB and TO-220FPAB: 0.4 N⋅m to 0.6 N⋅m

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

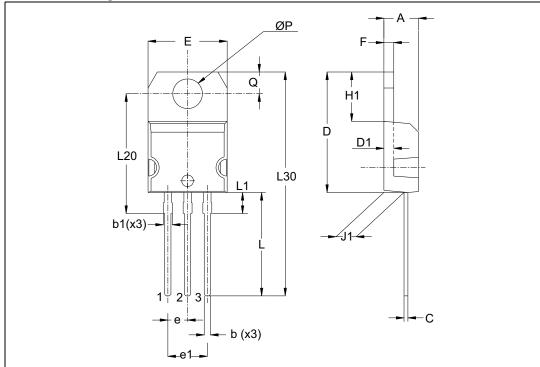


Figure 10. TO-220AB narrow leads dimension definitions

Table 5. TO-220AB narrow leads dimension values

			Dime	nsions		
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	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
С	0.48		0.70	0.019		0.027
D	15.25		15.75	0.60		0.62
D1		1.27			0.05	
Е	10.00		10.40	0.39		0.41
е	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

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STPS30SM120S Package information

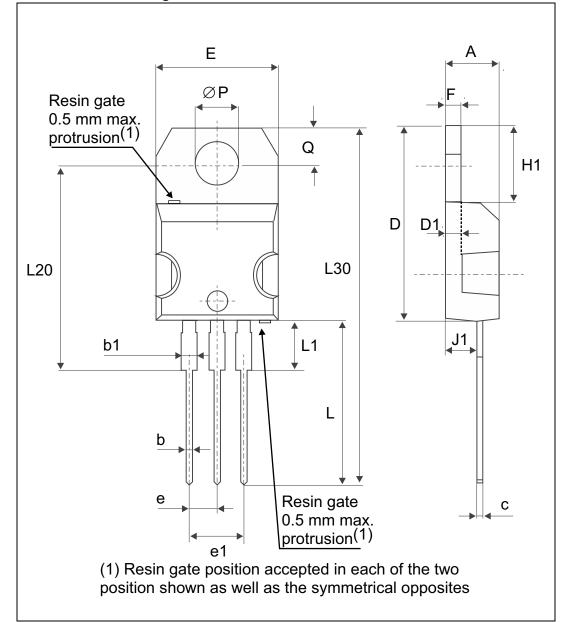


Figure 11. TO-220AB dimension definitions

Table 6. TO-220AB dimension values

	Dimensions			
Ref.	Millim	Millimeters		nes
	Min.	Max.	Min.	Max.
А	4.40	4.60	0.17	0.181
b	0.61	0.88	0.024	0.035
b1	1.14	1.50	0.045	0.059
С	0.48	0.70	0.019	0.027
D	15.25	15.75	0.60	0.62
D1	1.27	1.27 typ.		typ.
E	10	10.40	0.39	0.41
е	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



STPS30SM120S Package information

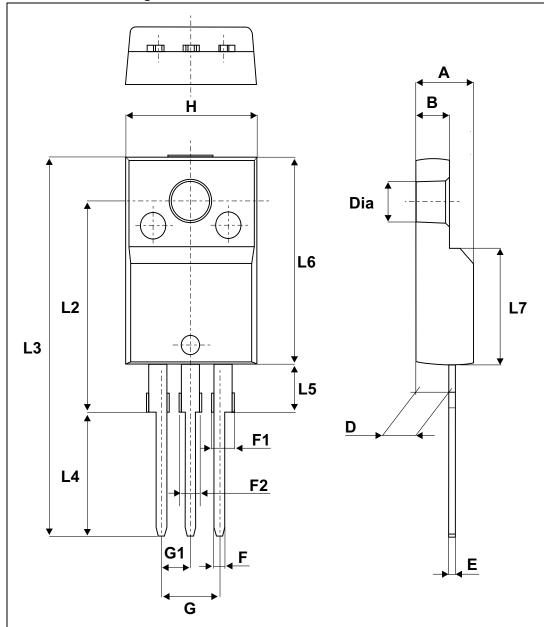


Figure 12. TO-220FPAB dimension definitions

Table 7. TO-220FPAB dimension values

	Dimensions					
Ref.	Millin	neters	Inches			
	Min.	Max.	Min.	Max.		
А	4.4	4.6	0.173	0.181		
В	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		
Н	10	10.4	0.393	0.409		
L2	16 <sup>-</sup>	Тур.	0.63	Тур.		
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		

STPS30SM120S Package information

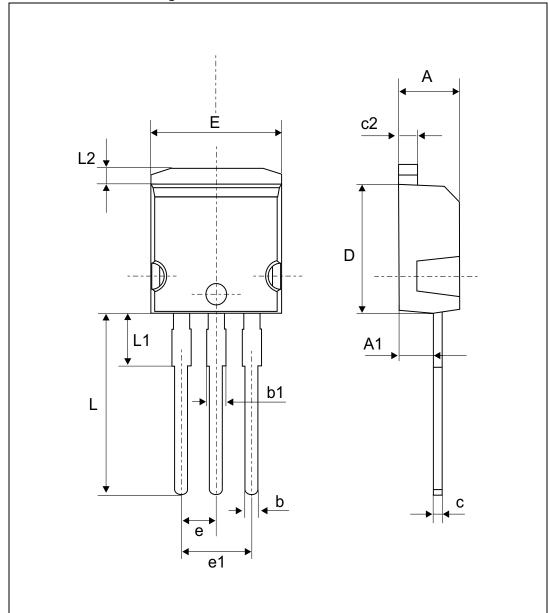


Figure 13. I<sup>2</sup>PAK dimension definitions

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

	Dimensions				
Ref.	Millimeters		Inc	hes	
	Min.	Max.	Min.	Max.	
А	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	
С	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	
е	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	

# **3** Ordering information

**Table 9. Ordering information** 

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS30SM120SR	PS30SM120SR	I <sup>2</sup> PAK	1.49 g	50	Tube
STPS30SM120STN	PS30SM120STN	TO-220AB narrow leads	1.9 g	50	Tube
STPS30SM120ST	PS30SM120ST	TO-220AB	2.2 g	50	Tube
STPS30SM120SFP	PS30SM120SFP	TO-220FPAB	1.7 g	50	Tube

## 4 Revision history

Table 10. Document revision history

Date	Revision	Changes		
02-Apr-2012	1	First issue.		
13-Nov-2014	2	Added TO-220AB and TO-220FPAB package information.		



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