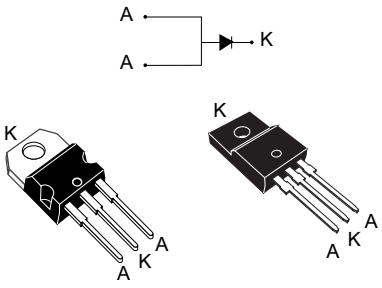
STPS20SM120S

Datasheet

120 V power Schottky rectifier



TO-220AB TO-220FPAB

Features

- High current capability
- Avalanche rated
- Low forward voltage drop
- High frequency operation
- Insulated package TO220FPAB:
  - Insulated voltage: 2000 V_{RMS} sine
- ECOPACK®2 compliant

Applications

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

Description

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

Packed in TO-220AB and TO-220FPAB, the STPS20SM120S is optimized for use in notebook, game station and desktop adapters, providing in these applications a good efficiency at both low and high load.

Product status
STPS20SM120S

Product summary	
$I_{F(AV)}$	20 A
V_{RRM}	120 V
T_j (max)	150 °C
V_F (typ)	0.65 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, anode terminals short circuited)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		120	V
$I_{F(RMS)}$	Forward rms current		50	A
$I_{F(AV)}$	Average forward current δ = 0.5, square wave		20	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal	220	A
P_{ARM}	Repetitive peak avalanche power	t_p = 10 µs, T_j = 125 °C	900	W
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Maximum operating junction temperature (1)		+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 parameter

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AB	1.55	°C/W
		TO-220FPAB	4	

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

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics (anode terminals short circuited)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	40	210	µA
		T_j = 125 °C		-	15	40	mA
V_F (2)	Forward voltage drop	T_j = 125 °C	I_F = 5 A	-	0.49	0.54	V
		T_j = 25 °C	I_F = 10 A	-		0.75	
		T_j = 125 °C		-	0.57	0.62	
		T_j = 25 °C	I_F = 20 A	-		0.89	
		T_j = 125 °C		-	0.65	0.72	

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:

$P = 0.56 \times I_{F(AV)} + 0.008\ I_F{}^2{}_{(RMS)}$

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

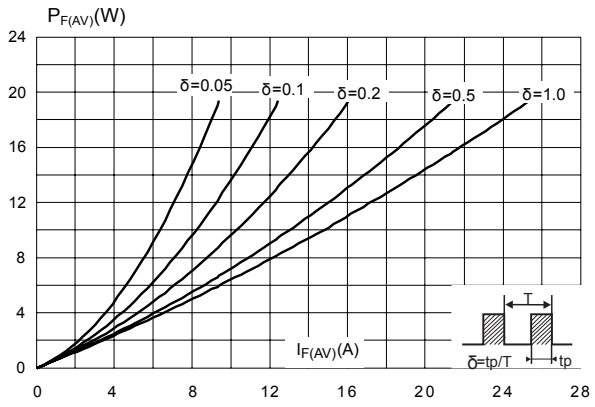


Figure 2. Average forward current versus ambient temperature (δ = 0.5, TO-220AB)

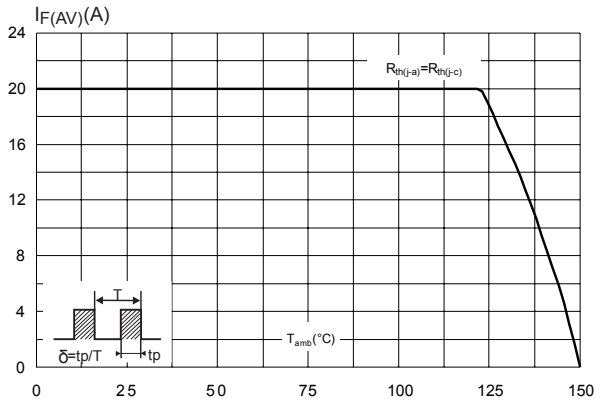


Figure 3. Normalized avalanche power derating versus pulse duration (T_j = 125 °C)

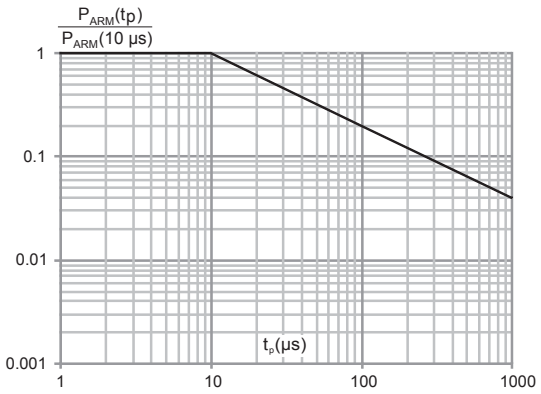


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB)

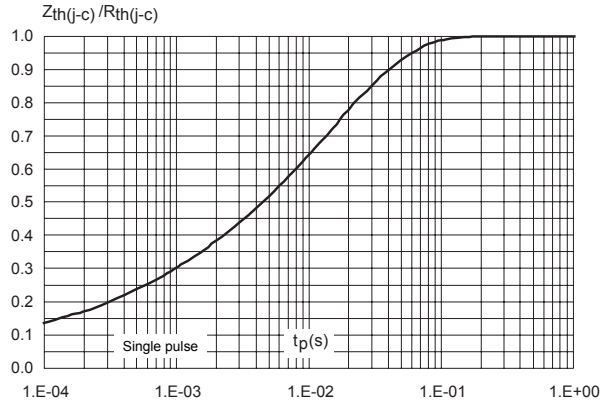


Figure 5. Reverse leakage current versus reverse voltage applied (typical values)

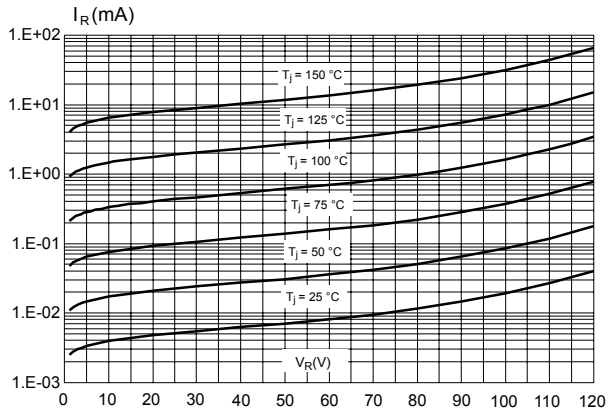


Figure 6. Junction capacitance versus reverse voltage applied (typical values)

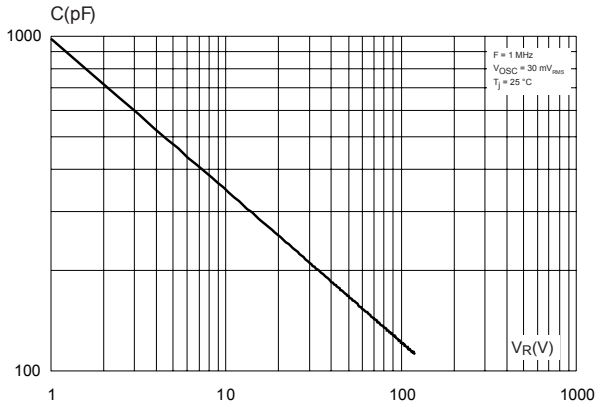
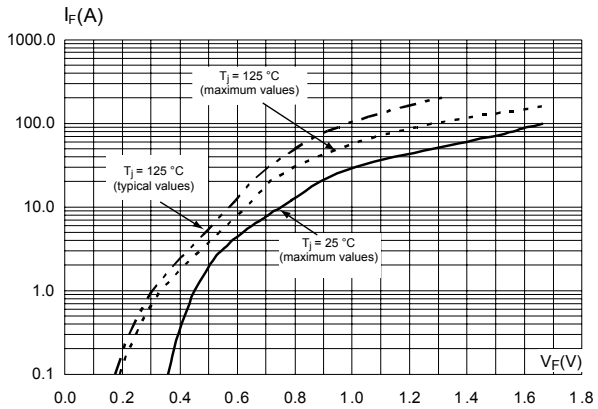


Figure 7. Forward voltage drop versus forward current



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 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

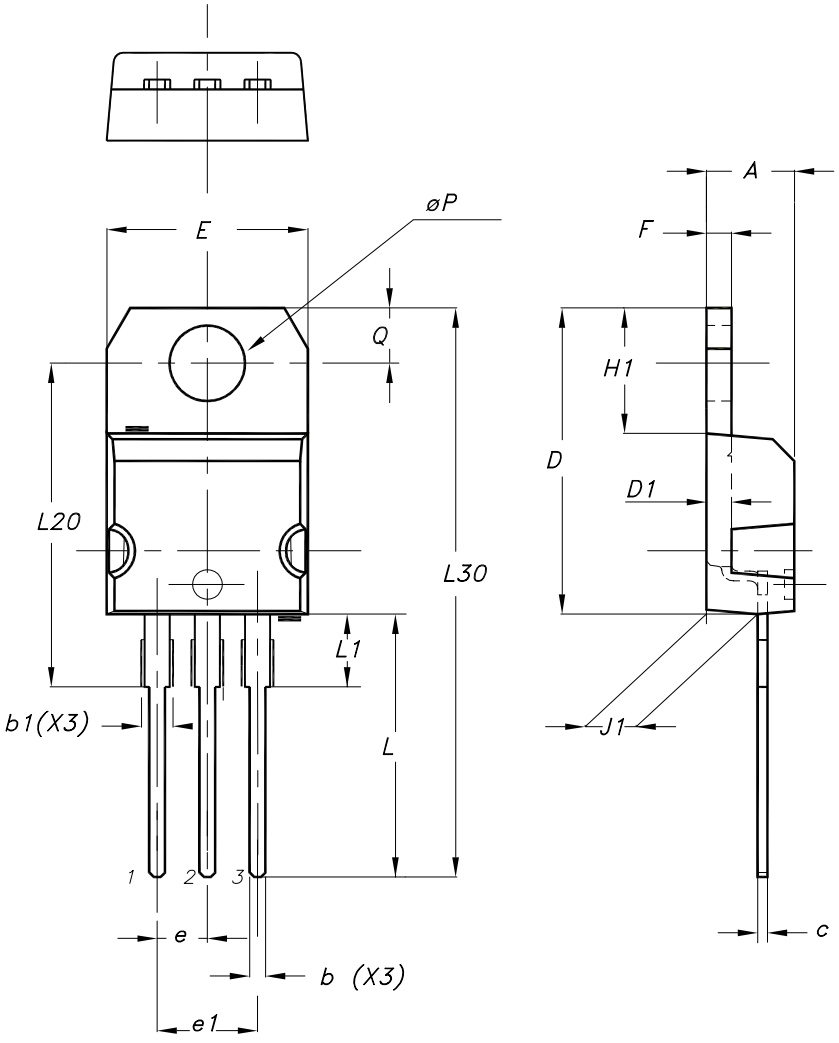


Table 4. TO-220AB package mechanical data

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 TO-220FPAB 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 9. TO-220FPAB package outline

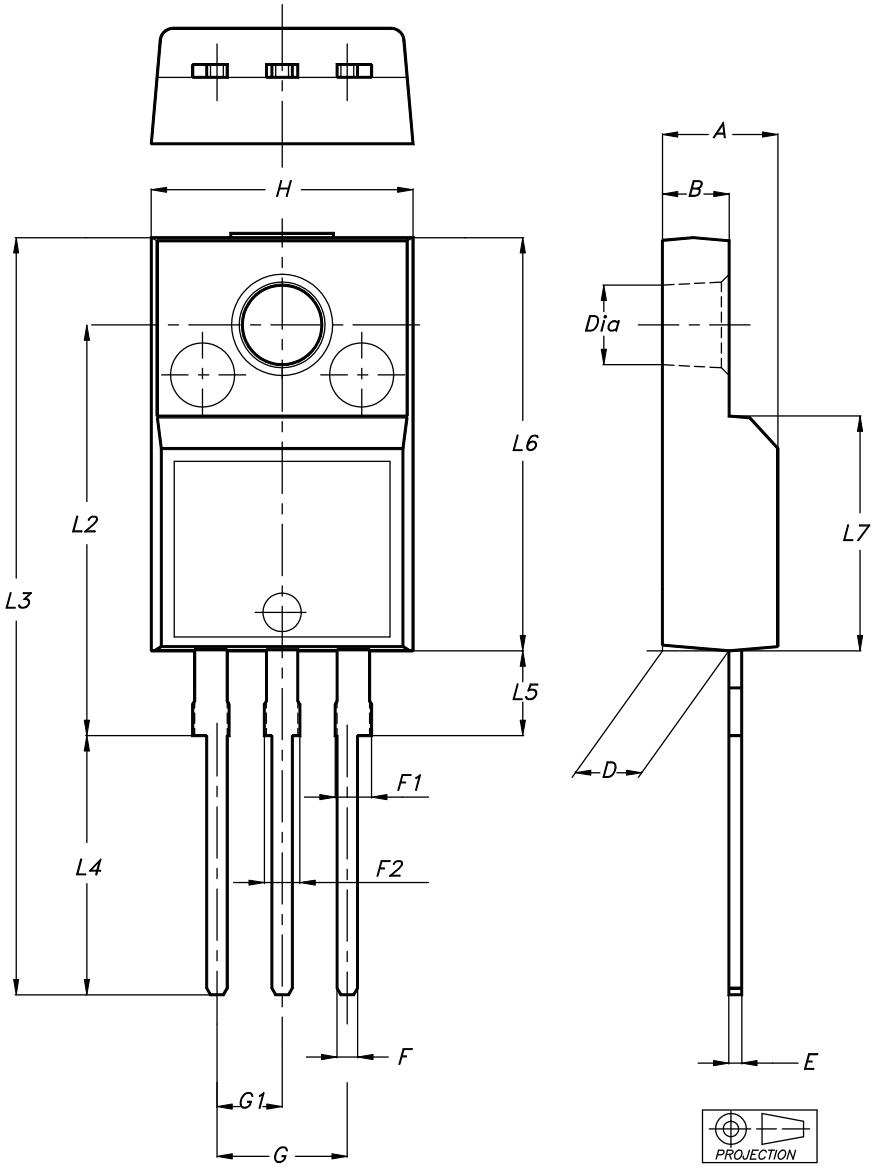


Table 5. **TO-220FPAB package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.1739	0.1818
B	2.50	2.70	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	1.00	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	10.60	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	3.00	3.20	0.1186	0.1265

3 Ordering information

Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS20SM120ST	PS20SM120ST	TO-220AB	1.95 g	50	Tube
STPS20SM120SFP	PS20SM120SFP	TO-220FPAB	1.90 g	50	Tube

Revision history

Table 7. Document revision history

Date	Revision	Changes
02-Apr-2012	1	First issue.
13-Nov-2014	2	Added TO-220AB and TO-220FPAB package information.
27-Jun-2018	3	Removed I²PAK and TO-220AB narrow leads package information. Updated Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, anode terminals short circuited) and Figure 3. Normalized avalanche power derating versus pulse duration (T_j = 125 °C).
29-Nov-2018	4	Updated Table 6.

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