

STPS40SM120C

Power Schottky rectifier

Datasheet - production data

Features

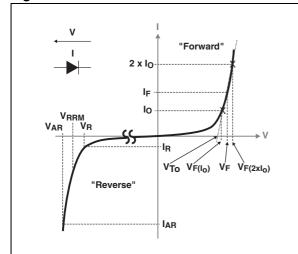
- High current capability
- Avalanche rated
- Low forward voltage drop
- High frequency operation

Description

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

Packaged in TO-220AB, TO-220AB narrow leads and I²PAK, 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.

Figure 1. Electrical characteristics^(a)



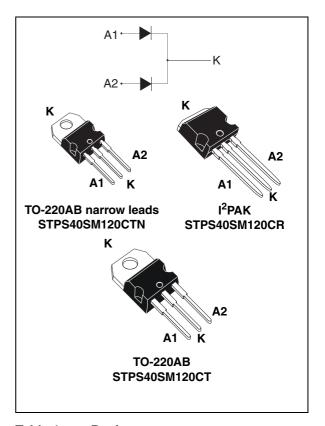


Table 1. Device summary

Symbol	Value
I _{F(AV)}	2 x 20 A
V _{RRM}	120 V
T _j (max)	150 °C
V _F (typ)	0.46 V

V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in *Figure 9*. V_{AR} and I_{AR} are pulse measurements (t_p < 10 µs). V_R, I_R, V_{RRM} and V_F, are static characteristics

Characteristics STPS40SM120C

1 Characteristics

Table 2. Absolute ratings (limiting values per diode at T_{amb} = 25 °C, unless otherwise specified)

Symbol	Parameter				Value	Unit
V _{RRM}	Repetitive peak reverse ve	oltage			120	V
I _{F(RMS)}	Forward rms current				30	Α
	Average forward current	Per diode	T _c = 125 °C	20	Α	
I _{F(AV)}	Average forward current, $\delta = 0$		Per device	T _c = 115 °C	40	A
I _{FSM}	Surge non repetitive forward current $t_p = 10$			t _p = 10 ms sinusoidal		Α
P _{ARM} ⁽¹⁾	Repetitive peak avalanche	e power $T_j = 125 {}^{\circ}\text{C}, t_p = 10 \mu\text{s}$			1150	W
V _{ARM} ⁽²⁾	Maximum repetitive peak avalanche voltage	t _p < 10 μs, T _j < 125 °C, I _{AR} < 7.7 A			150	V
V _{ASM} ⁽²⁾	Maximum single-pulse peak avalanche voltage	t _p < 10 μs, T _j < 125 °C, I _{AR} < 7.7 A			150	V
T _{stg}	Storage temperature rang	ge			-65 to +175	°C
Tj	Maximum operating junction temperature ⁽³⁾			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".

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit	
D	Junction to case	Per diode	1.35	
$R_{th(j-c)}$ Ju	Junction to case	Total	0.93	°C/W
R _{th(c)}	Coupling	0.50		

When the two diodes 1 and 2 are used simultaneously:

$$\Delta T_j$$
(diode 1) = P(diode 1) x $R_{th(j-c)}$ (Per diode) + P(diode 2) x $R_{th(c)}$

^{2.} See Figure 9

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

STPS40SM120C Characteristics

Table 4.	Static electrical characteristics (per diode)
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Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
I _R ⁽¹⁾	L (1) Bayaraa laakaga ayrrant	T _j = 25 °C	V - V	-	55	275	μΑ
I _R ⁽¹⁾ Reverse leakage current	T _j = 125 °C	$V_R = V_{RRM}$	-	20	50	mA	
	V (2)	T _j = 125 °C	I _F = 5 A	-	0.46	0.51	
V _E ⁽²⁾		T _j = 125 °C	I _F = 10 A	-	0.55	0.60	V
v _{F`} / Forward v	Forward voltage drop	T _j = 25 °C	1 20 A	-		0.83	v
		T _i = 125 °C	I _F = 20 A	-	0.63	0.69	

- 1. Pulse test: $t_p = 5$ ms, $\delta < 2\%$
- 2. Pulse test: $t_p = 380 \mu s$, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.52 \text{ x I}_{F(AV)} + 0.0085 \text{ x I}_{F^2(RMS)}^2$$

Figure 2. Average forward power dissipation Figure 3. versus average forward current (per diode)

Average forward current versus ambient temperature (δ = 0.5, per diode)

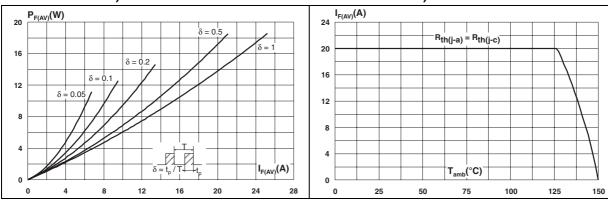
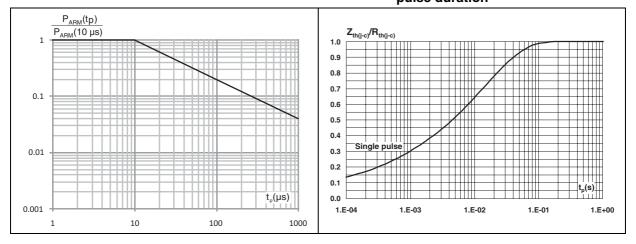


Figure 4. Normalized avalanche power derating versus pulse duration

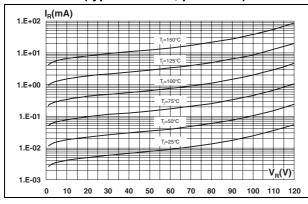
Figure 5. Relative variation of thermal impedance junction to case versus pulse duration



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

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



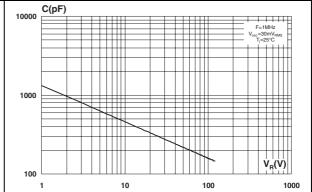
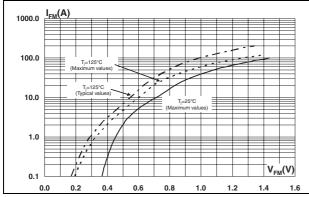
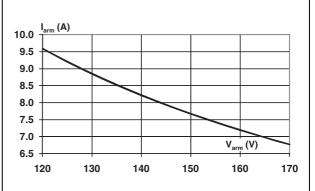


Figure 8. Forward voltage drop versus forward current (per diode)

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





2 Package information

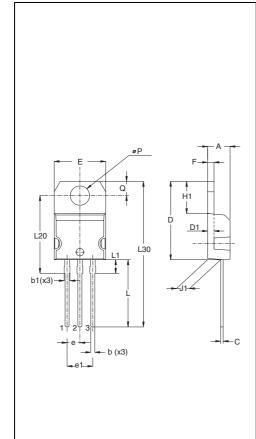
Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.4 to 0.6 N⋅m

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.

Table 5. TO-220AB narrow leads dimensions

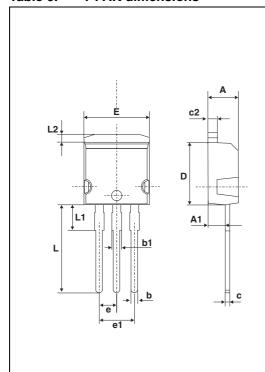


	Dimensions					
Ref.	Millimeters					
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	4.40		4.60	0.17		0.18
b	0.61		0.88	0.024		0.034
b1	0.95		1.20	0.037		0.047
С	0.48		0.70	0.019		0.027
D	15.25		15.75	0.60		0.62
D1	1.27		0.05			
Е	10.00		10.40	0.39		0.41
е	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.19		0.20
F	1.23		1.32	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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Devices in I²PAK 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.

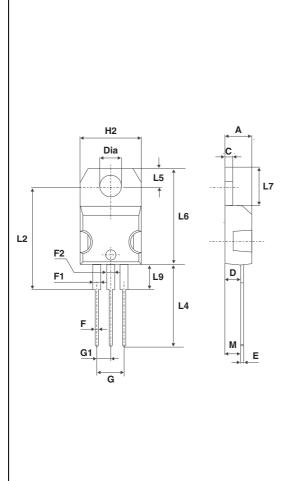
Table 6. I²PAK dimensions



	Dimensions					
Ref.	Millim	neters	Inc	hes		
	Min.	Max.	Min.	Max.		
Α	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		
Е	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		

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Table 7. TO-220AB dimensions



	Dimensions					
Ref.	Millin	neters	Inc	hes		
	Min.	Max.	Min.	Max.		
Α	4.40	4.60	0.173	0.181		
С	1.23	1.32	0.048	0.051		
D	2.40	2.72	0.094	0.107		
Е	0.49	0.70	0.019	0.027		
F	0.61	0.88	0.024	0.034		
F1	1.14	1.70	0.044	0.066		
F2	1.14	1.70	0.044	0.066		
G	4.95	5.15	0.194	0.202		
G1	2.40	2.70	0.094	0.106		
H2	10	10.40	0.393	0.409		
L2	16.4	Тур.	0.645 Typ.			
L4	13	14	0.511	0.551		
L5	2.65	2.95	0.104	0.116		
L6	15.25	15.75	0.600	0.620		
L7	6.20	6.60	0.244	0.259		
L9	3.50	3.93	0.137	0.154		
М	2.6	Тур.	0.102	2 Тур.		
Dia.	3.75	3.85	0.147	0.151		

Ordering information STPS40SM120C

3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS40SM120CTN	PS40SM120CTN	TO-220AB narrow leads	1.9 g	50	Tube
STPS40SM120CT	PS40SM120CT	TO-220AB	1.9 g	50	Tube
STPS40SM120CR	PS40SM120CR	I ² PAK	1.49 g	50	Tube

4 Revision history

Table 9. Document revision history

Date	Revision	Changes
02-Apr-2012	1	First issue.

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