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STPS40M120C

Power Schottky rectifier

Datasheet – production data

Features

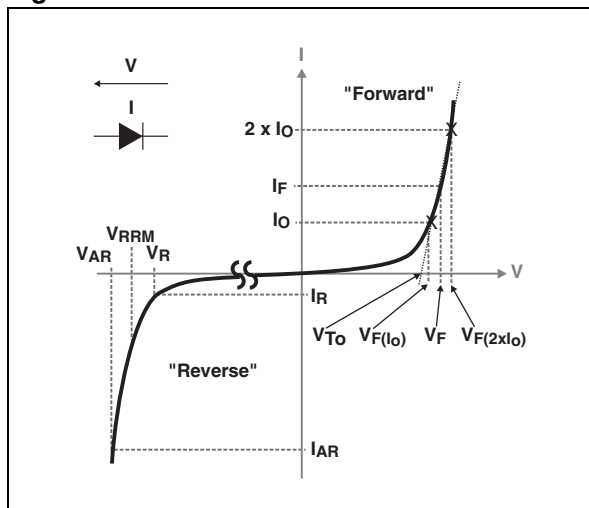
- High current capability
- Avalanche rated
- Low forward voltage drop
- High frequency operation

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)



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

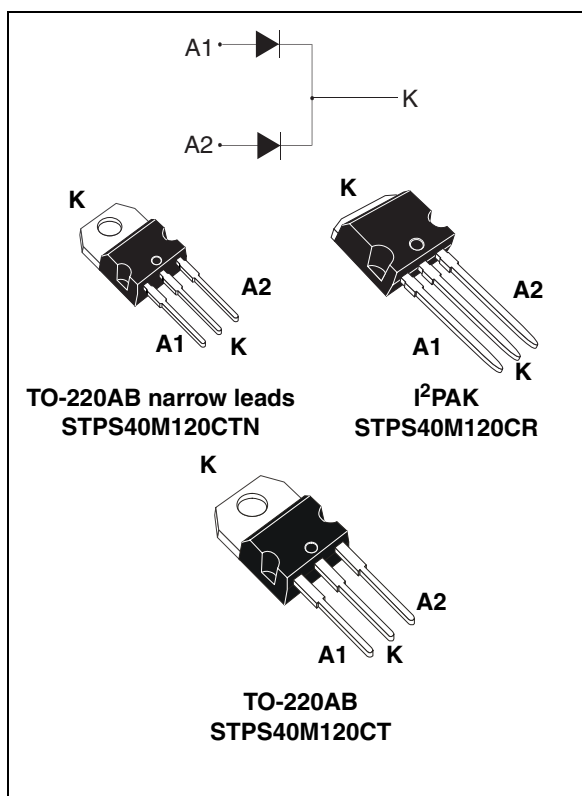


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	2 x 20 A
V_{RRM}	120 V
T_j (max)	150 °C
V_F (typ)	0.44 V

Characteristics

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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 voltage		120	V	
I _{F(RMS)}	Forward rms current		30	A	
I _{F(AV)}	Average forward current, δ = 0.5	Per diode	T _c = 130 °C	20	A
		Per device	T _c = 120 °C	40	
I _{FSM}	Surge non repetitive forward current		t _p = 10 ms sinusoidal	220	A
P _{ARM} ⁽¹⁾	Repetitive peak avalanche power		T _j = 125 °C, t _p = 10 μs	1600	W
V _{ARM} ⁽²⁾	Maximum repetitive peak avalanche voltage	t _p < 10 μs, T _j < 125 °C, I _{AR} < 10.7 A		150	V
V _{ASM} ⁽²⁾	Maximum single-pulse peak avalanche voltage	t _p < 10 μs, T _j < 125 °C, I _{AR} < 10.7 A		150	V
T _{stg}	Storage temperature range		-65 to +175	°C	
T _j	Maximum operating junction temperature ⁽³⁾		150	°C	

1. 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".

2. See [Figure 9](#)

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

Table 3. Thermal resistance

Symbol	Parameter		Value	Unit
R _{th(j-c)}	Junction to case	Per diode	1.10	°C/W
		Total	0.80	
R _{th(c)}	Coupling		0.50	

When the two diodes 1 and 2 are used simultaneously:

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

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Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^\circ\text{C}$	$V_R = V_{RRM}$	-	75	370	μA
		$T_j = 125\text{ }^\circ\text{C}$		-	25	70	mA
$V_F^{(2)}$	Forward voltage drop	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 5\text{ A}$	-	0.44	0.49	V
		$T_j = 125\text{ }^\circ\text{C}$	$I_F = 10\text{ A}$	-	0.52	0.57	
		$T_j = 25\text{ }^\circ\text{C}$	$I_F = 20\text{ A}$	-		0.79	
		$T_j = 125\text{ }^\circ\text{C}$		-	0.61	0.67	

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

To evaluate the conduction losses use the following equation:

$$P = 0.54 \times I_{F(AV)} + 0.0065 \times I_{F(RMS)}^2$$

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

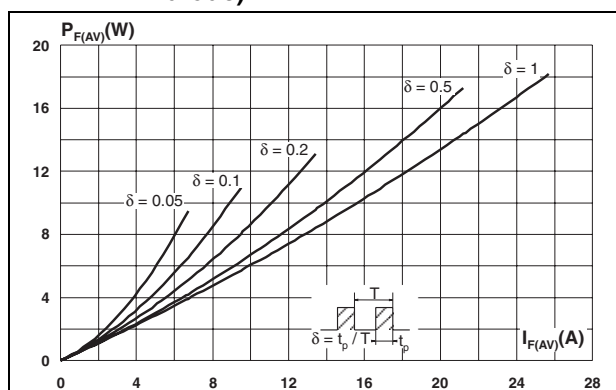


Figure 3. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)

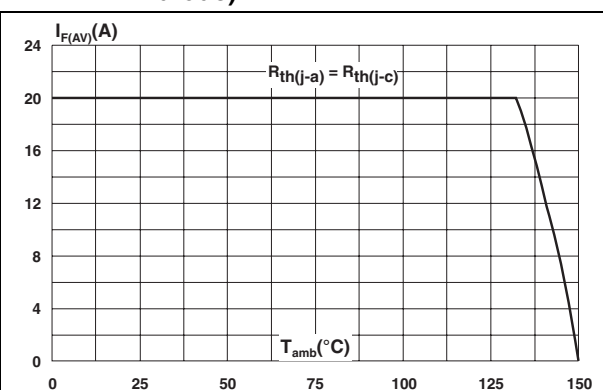


Figure 4. Normalized avalanche power derating versus pulse duration

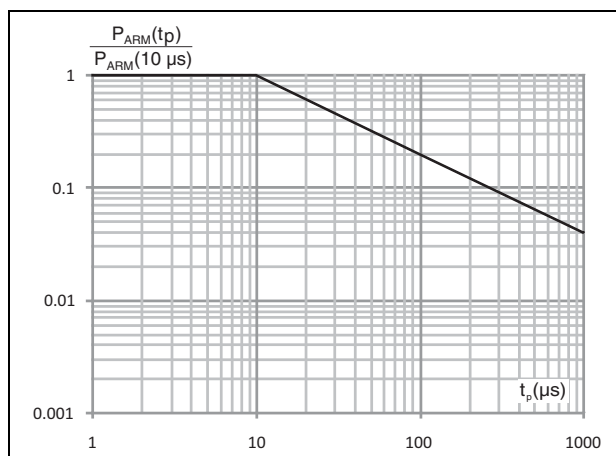
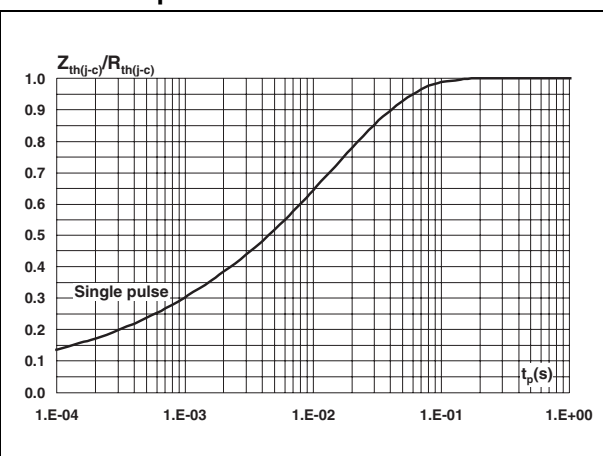


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration



Characteristics

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

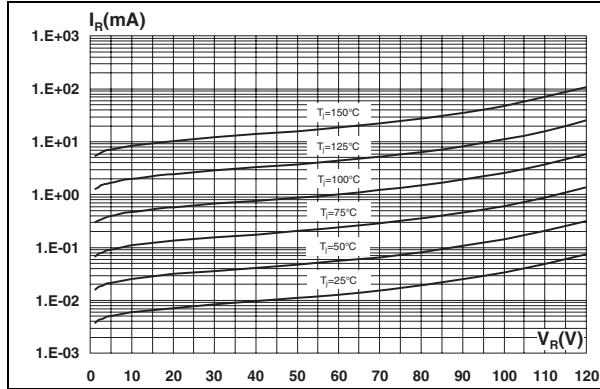


Figure 7. Junction capacitance versus reverse voltage applied (typical values, per diode)

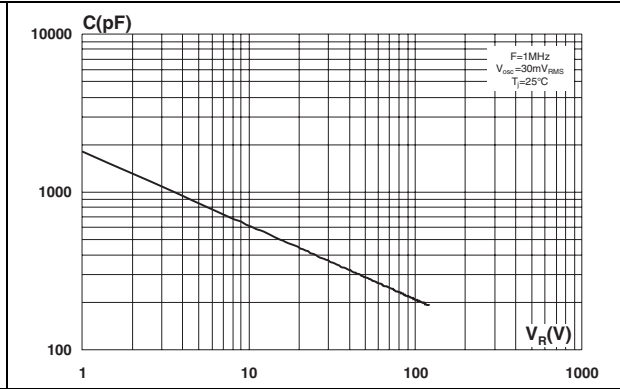


Figure 8. Forward voltage drop versus forward current (per diode)

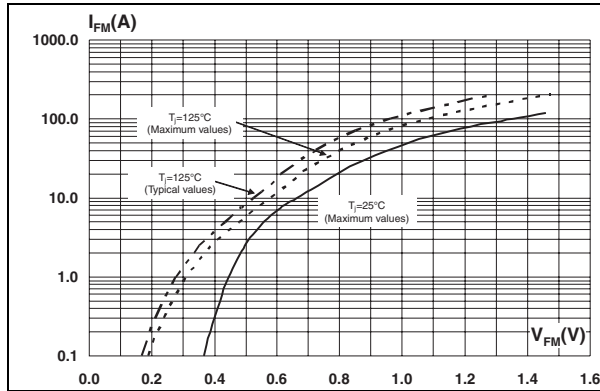
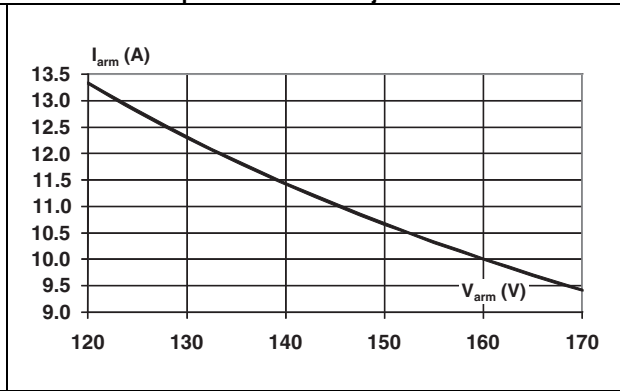


Figure 9. Reverse safe operating area ($t_p < 10 \mu\text{s}$ and $T_j < 125^\circ\text{C}$)



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Package information

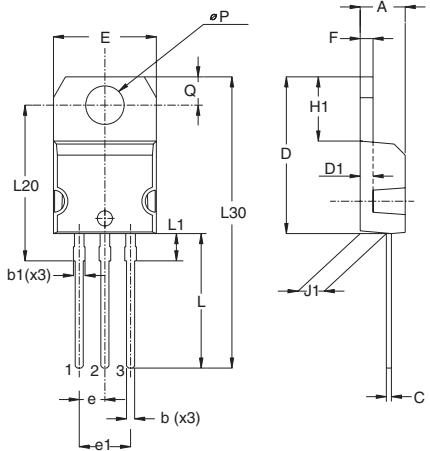
2 Package information

- 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

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	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
c	0.48		0.70	0.019		0.027
D	15.25		15.75	0.60		0.62
D1	1.27			0.05		
E	10.00		10.40	0.39		0.41
e	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



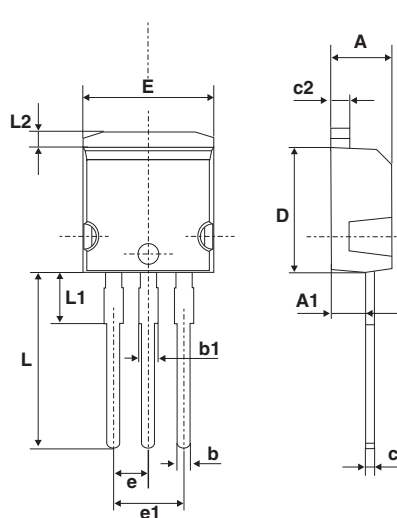
Package information

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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

Ref.	Dimensions			
	Millimeters		Inches	
	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	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

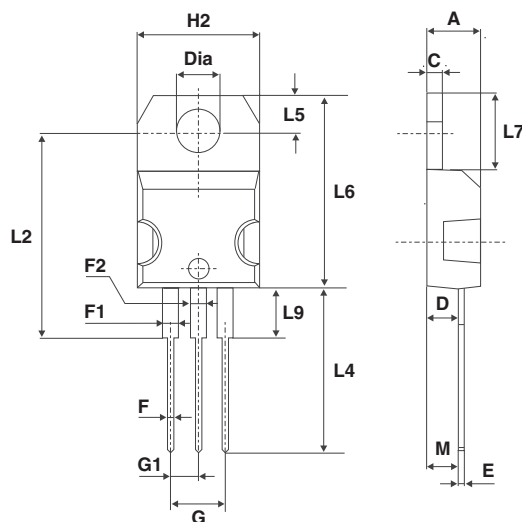


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Package information

Table 7. TO-220AB dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	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 Typ.		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
M	2.6 Typ.		0.102 Typ.	
Dia.	3.75	3.85	0.147	0.151



3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS40M120CTN	PS40M120CTN	TO-220AB narrow leads	1.9 g	50	Tube
STPS40M120CT	PS40M120CT	TO-220AB	1.9 g	50	Tube
STPS40M120CR	PS40M120CR	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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