STPS20SM60S

Power Schottky rectifier

Features

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

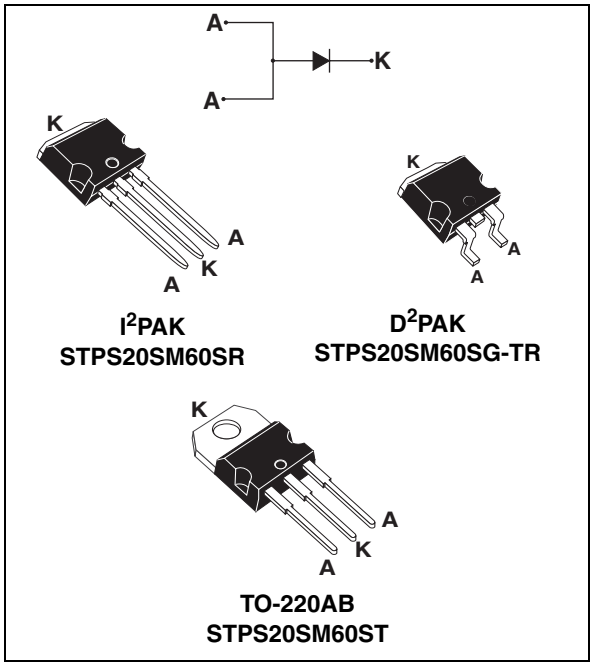
Description

The STPS20SM60S is a single Schottky diode, suited for high frequency switch mode power supply.

Packaged in TO-220AB, I^2PAK and D^2PAK, this device is intended to be used in notebook, game station and desktop adapters, providing in these aplications a good efficiency at both low and high load.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	20 A
V_{RRM}	60 V
V_F (typ)	0.410 V
T_j (max)	150 °C

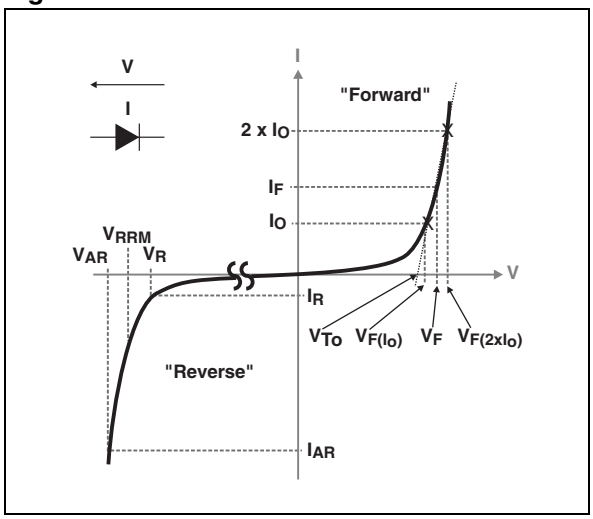


I^2PAK
STPS20SM60SR

D^2PAK
STPS20SM60SG-TR

TO-220AB
STPS20SM60ST

Figure 1. Electrical characteristics(a)



a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in *Figure 12*. V_{AR} and I_{AR} are pulse measurements (t_p < 1 µs). V_R, I_R, V_{RRM} and V_F, are static characteristics

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			60	V
$I_{F(RMS)}$	Forward rms current			60	A
$I_{F(AV)}$	Average forward current, δ = 0.5	T_c = 130 °C	Per package	20	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sine-wave		400	A
P_{ARM}(1)	Repetitive peak avalanche power	T_j = 25 °C, t_p = 1 µs		18400	W
V_{ARM}(2)	Maximum repetitive peak avalanche voltage	t_p < 1 µs, T_j < 150 °C, I_{AR} < 69 A		80	V
V_{ASM}(2)	Maximum single-pulse peak avalanche voltage	t_p < 1 µs, T_j < 150 °C, I_{AR} < 69 A		80	V
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature(3)			150	°C

1. For temperature or pulse time duration deratings, please refer to *Figure 4* and *5*. More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.
2. See *Figure 12*
3. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case	1.3	°C/W

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

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	20	85	µA
		T_j = 125 °C		-	15	50	mA
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-	0.495	0.535	V
		T_j = 125 °C		-	0.410	0.460	
		T_j = 25 °C	I_F = 20 A	-	0.570	0.630	
		T_j = 125 °C		-	0.510	0.580	

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:
$P = 0.430 \times I_{F(AV)} + 0.0075 \times I_F{}^2{}_{(RMS)}$

Figure 2. Average forward power dissipation versus average forward current

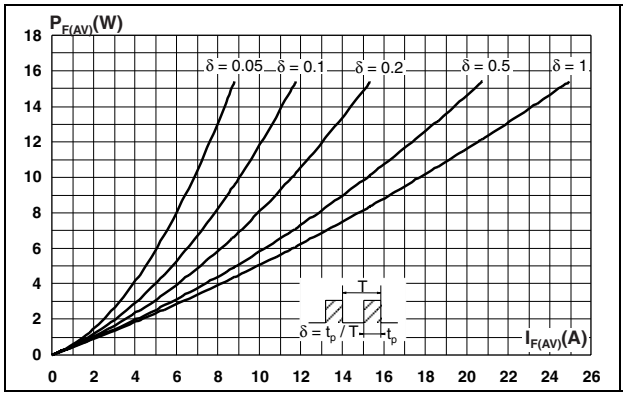


Figure 3. Average forward current versus ambient temperature (δ = 0.5)

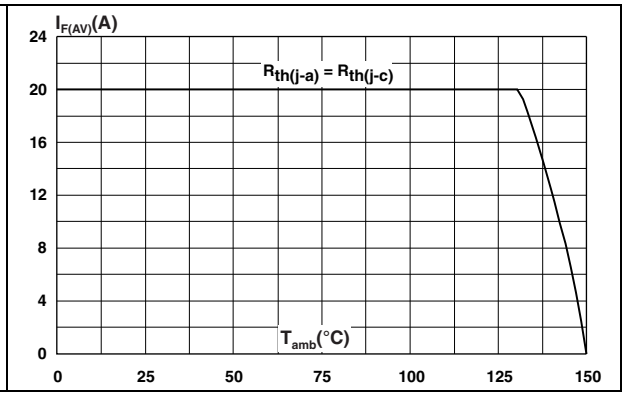


Figure 4. Normalized avalanche power derating versus pulse duration

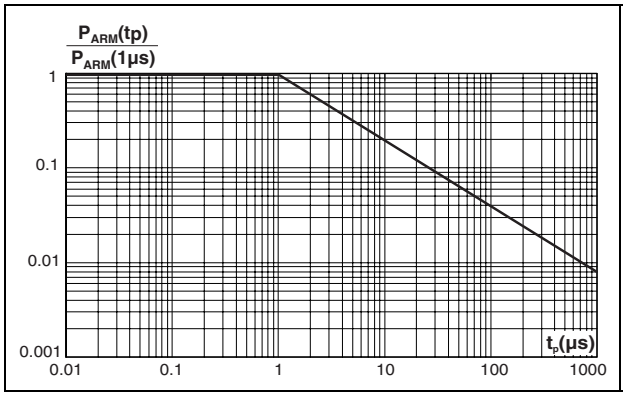


Figure 5. Normalized avalanche power derating versus junction temperature

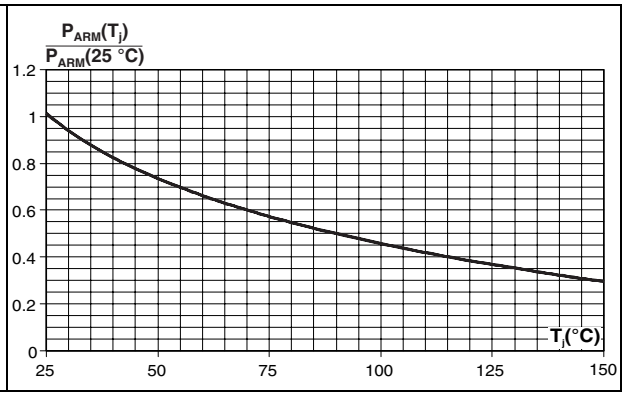


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values)

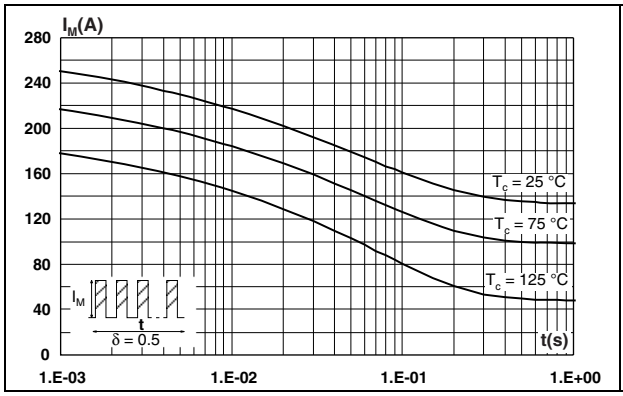


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

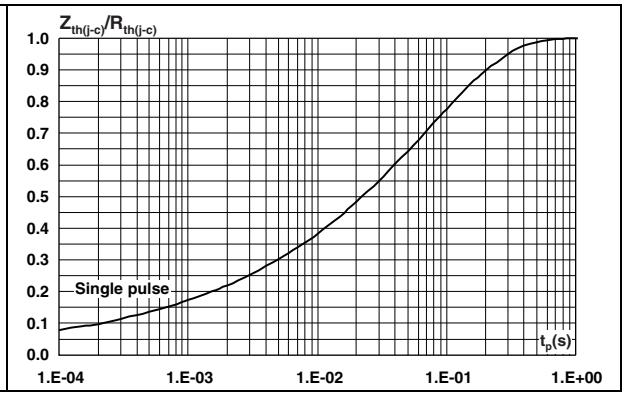


Figure 8. Reverse leakage current versus reverse voltage applied (typical values)

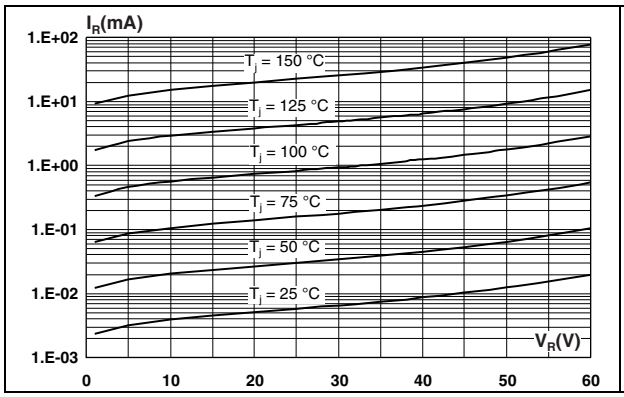


Figure 9. Junction capacitance versus reverse voltage applied (typical values)

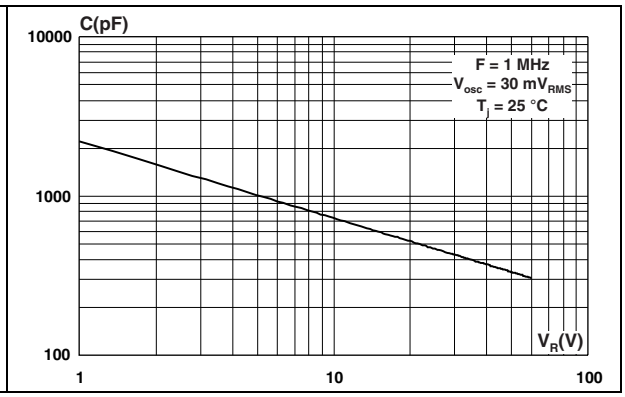


Figure 10. Forward voltage drop versus forward current

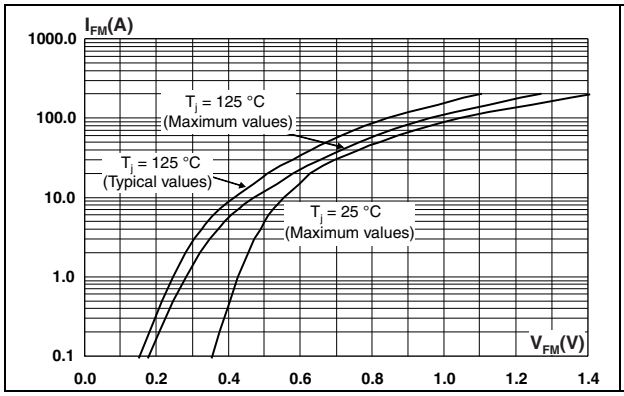


Figure 11. Thermal resistance junction to ambient versus copper surface under tab

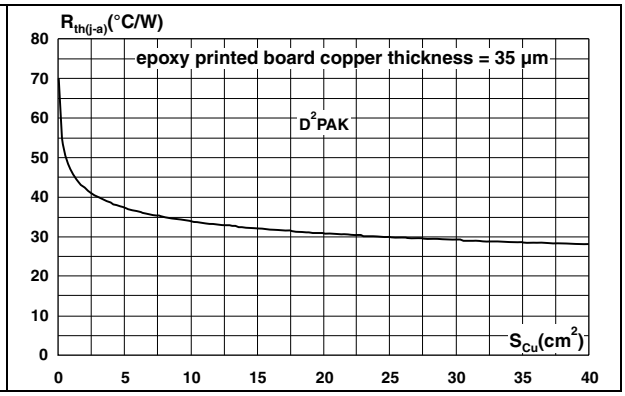
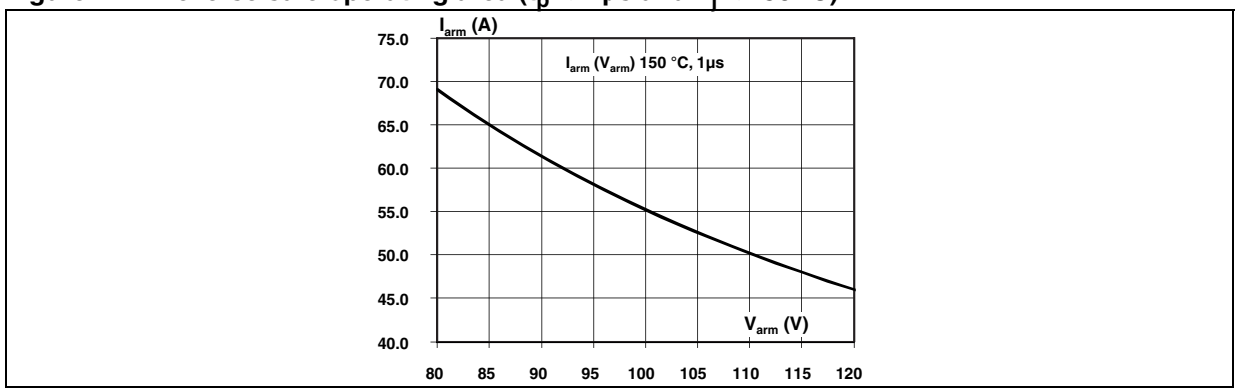


Figure 12. Reverse safe operating area (t_p < 1 µs and T_j < 150 °C)

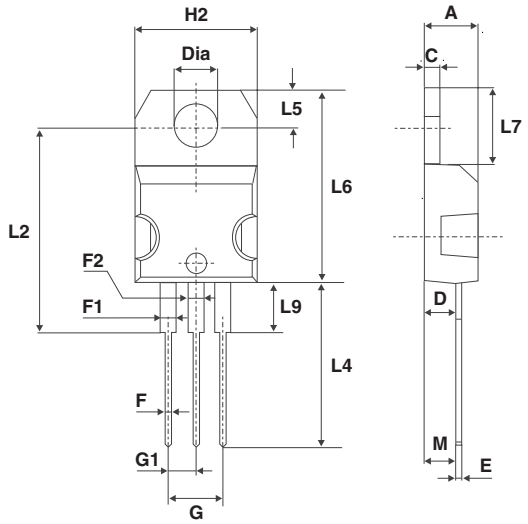


2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

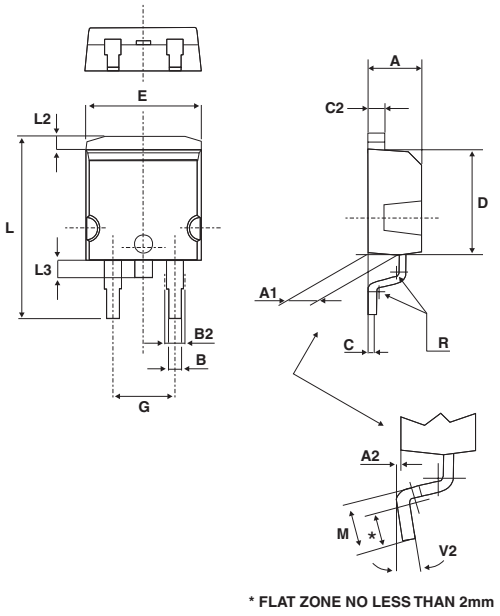
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 5. TO-220AB 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

Table 6. D²PAK dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 13. D²PAK footprint (dimensions in mm)

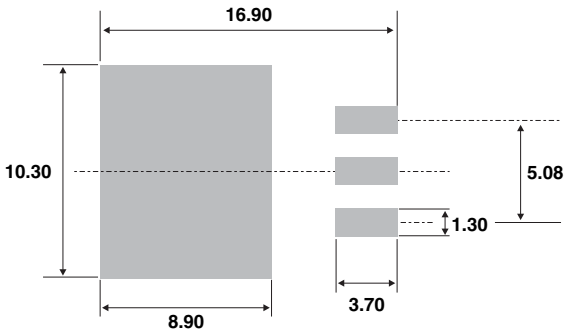
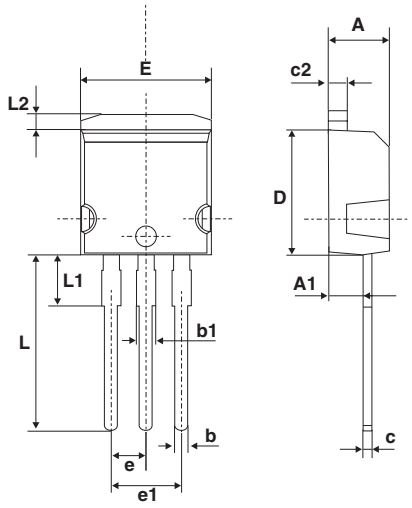


Table 7. I^2PAK dimensions



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

3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS20SM60ST	STPS20SM60ST	TO-220AB	2.2 g	50	Tube
STPS20SM60SR	STPS20SM60SR	I^2PAK	1.49 g	50	Tube
STPS20SM60SG-TR	STPS20SM60SG	D^2PAK	1.48 g	1000	Tape and reel

4 Revision history

Table 9. Revision history

Date	Revision	Changes
10-Oct-2011	1	Initial release.

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