STPS20M100S

Power Schottky rectifier

Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation
- Insulated package:
  - Insulation voltage 2000 V rms
  - Package capacitance = 12 pF

Description

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

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

Table 1. Device summary

$I_{F(AV)}$	20 A
V_{RRM}	100 V
T_j (max)	150 °C
V_F(typ)	0.455 V

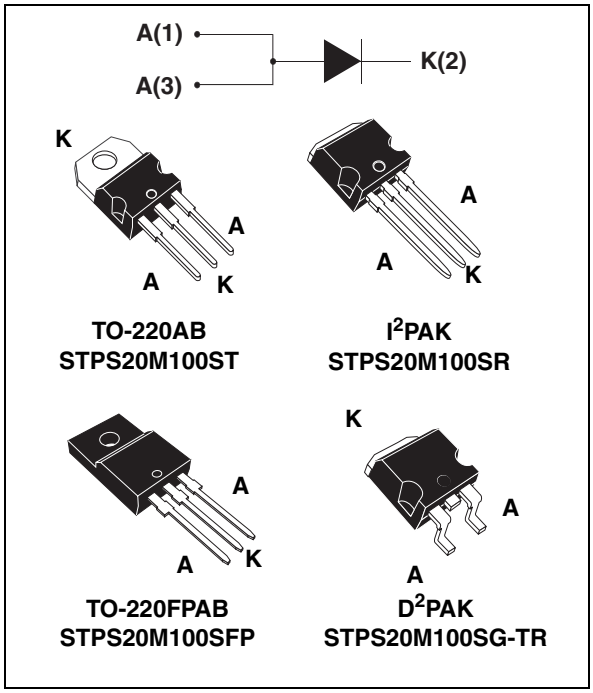
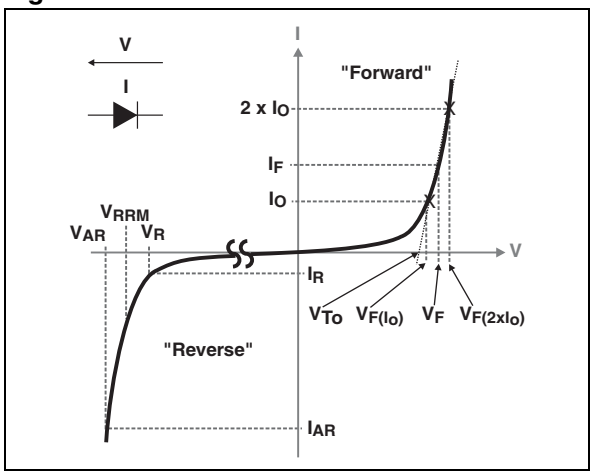


Figure 1. Electrical characteristics (a)



a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in *Figure 14* 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)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		100	V
$I_{F(RMS)}$	Forward current rms		30	A
$I_{F(AV)}$	Average forward current $\delta = 0.5$	TO-220AB, D^2PAK, I^2PAK, T_c = 130 °C	20	A
		TO-220FPAB, T_c = 85 °C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal, terminals 1 and 3 short circuited	530	A
P_{ARM} (1)	Repetitive peak avalanche power	t_p = 1 µs T_j = 25 °C	16000	W
V_{ARM} (2)	Maximum repetitive peak avalanche voltage	t_p < 1 µs T_j < 150 °C I_{AR} < 40 A	120	V
V_{ASM} (2)	Maximum single pulse peak avalanche voltage	t_p < 1 µs T_j < 150 °C I_{AR} < 40 A	120	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, refer to *Figure 4.* and *Figure 5.*. More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.
2. Refer to *Figure 14*
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	TO-220AB, D^2PAK, I^2PAK	1.2	°C/W
		TO-220FPAB	4	

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 = 70 V		5		µA
		T_j = 125 °C			5		mA
		T_j = 25 °C	V_R = 100 V		10	40	µA
		T_j = 125 °C			10	40	mA
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 5 A		550		mV
		T_j = 125 °C			455		
		T_j = 25 °C	I_F = 10A		660	730	
		T_j = 125 °C			530	600	
		T_j = 25 °C	I_F = 20 A		775	850	
		T_j = 125 °C			610	690	

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:
$P = 0.425 \times I_{F(AV)} + 0.0088 \times I_F{}^2{}_{(RMS)}$

Figure 2. Average forward power dissipation versus average forward current

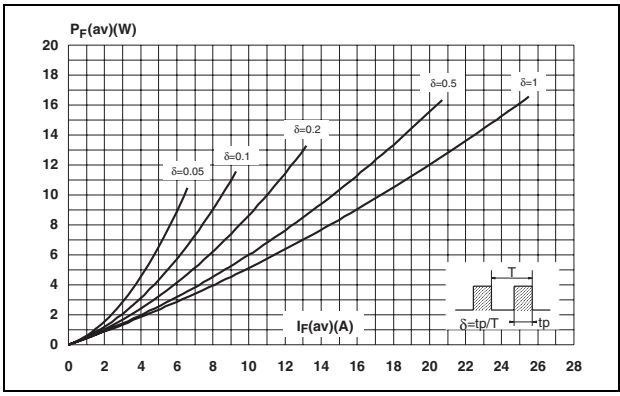


Figure 3. Average forward current versus ambient temperature (δ = 0.5)

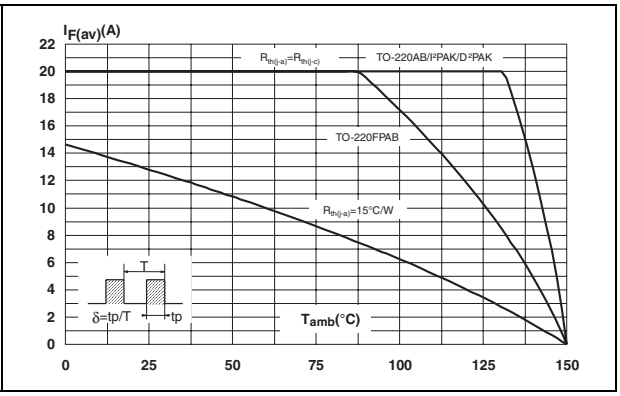


Figure 4. Normalized avalanche power derating versus pulse duration

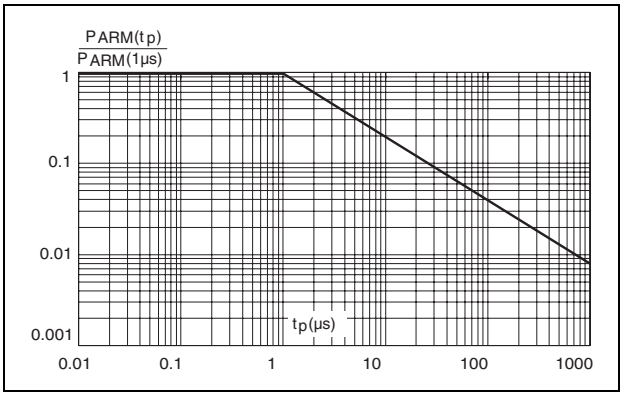


Figure 5. Normalized avalanche power derating versus junction temperature

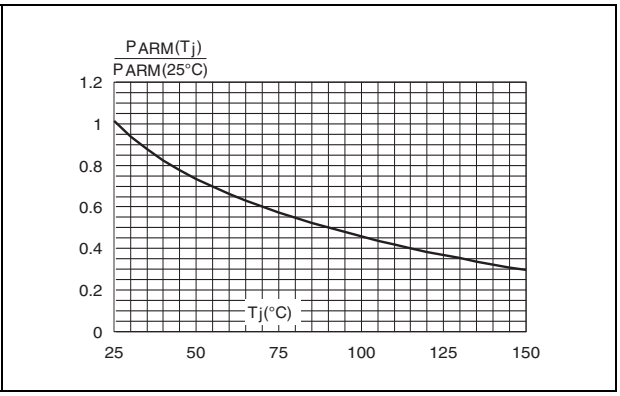


Figure 6. Non repetitive surge peak forward current versus overload duration, maximum values

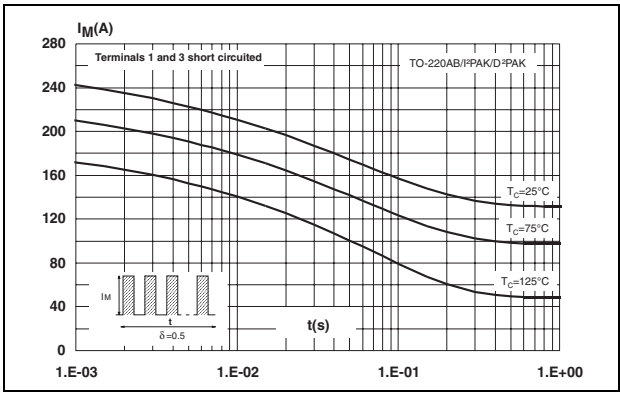


Figure 7. Non repetitive surge peak forward current versus overload duration, maximum values

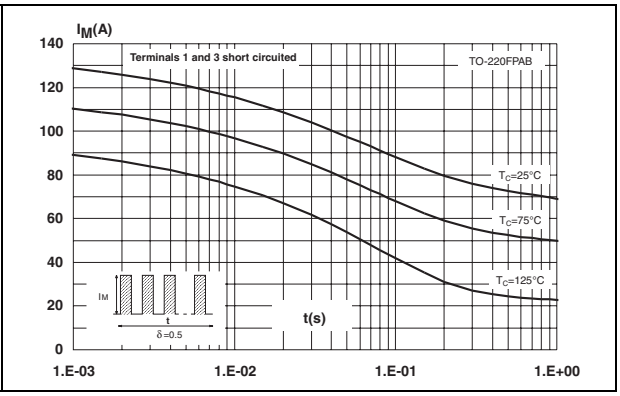


Figure 8. Relative variation of thermal impedance junction to case versus pulse duration

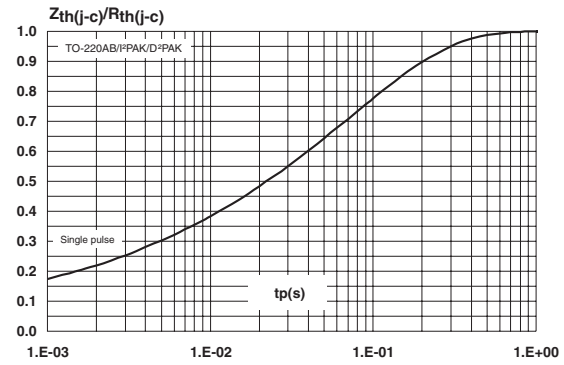


Figure 9. Relative variation of thermal impedance junction to case versus pulse duration

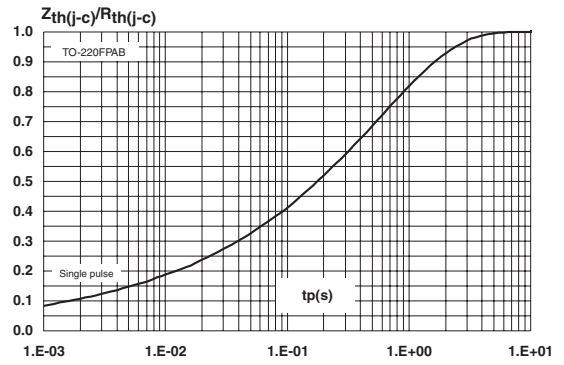


Figure 10. Thermal resistance junction to ambient versus copper surface under tab

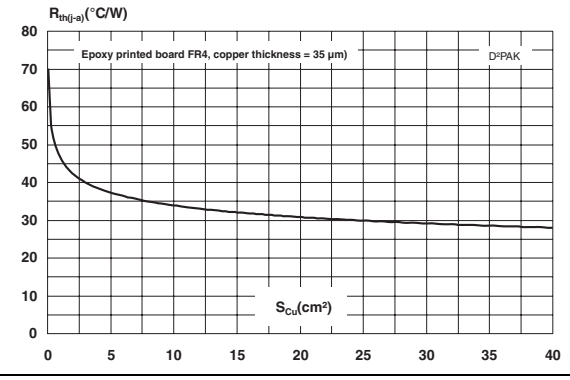


Figure 11. Reverse leakage current versus reverse voltage applied (typical values)

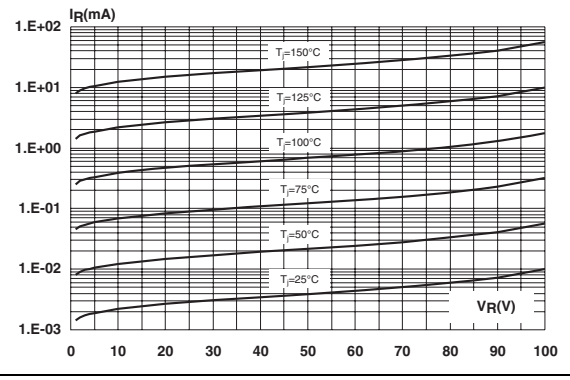


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

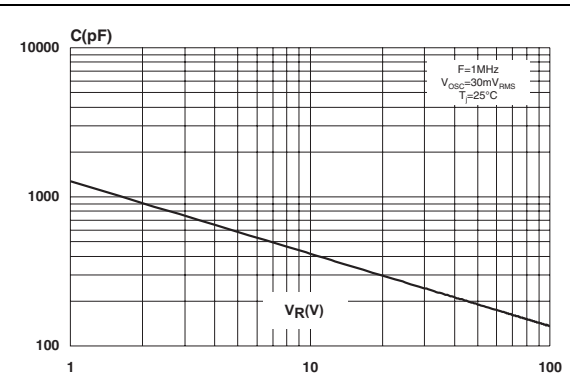


Figure 13. Forward voltage drop versus forward current (terminals 1 and 3 short circuited)

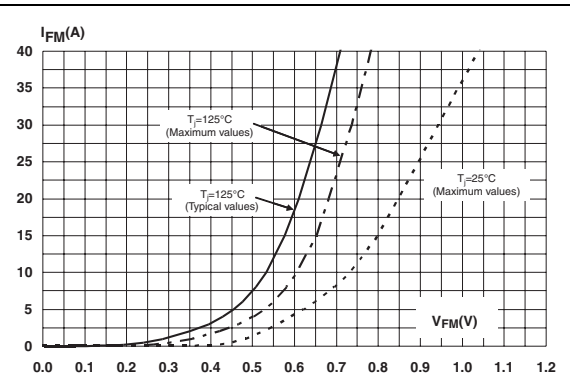
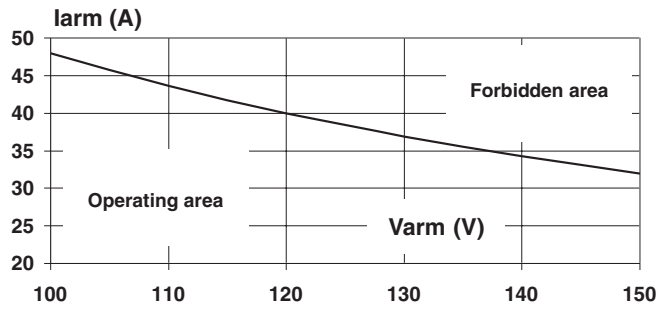


Figure 14. Reverse safe operating area (t_p < 1 µs and T_j < 150 °C)

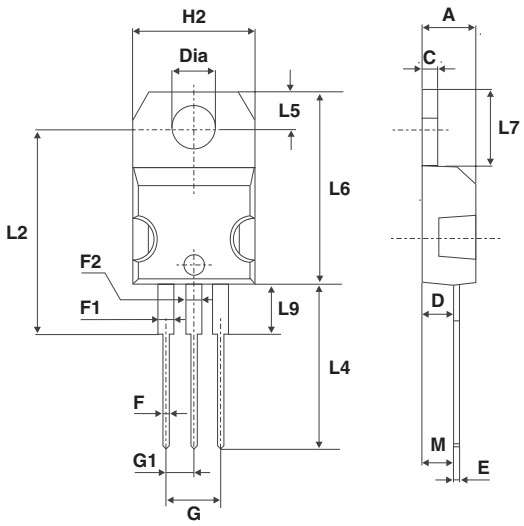


2 Package information

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

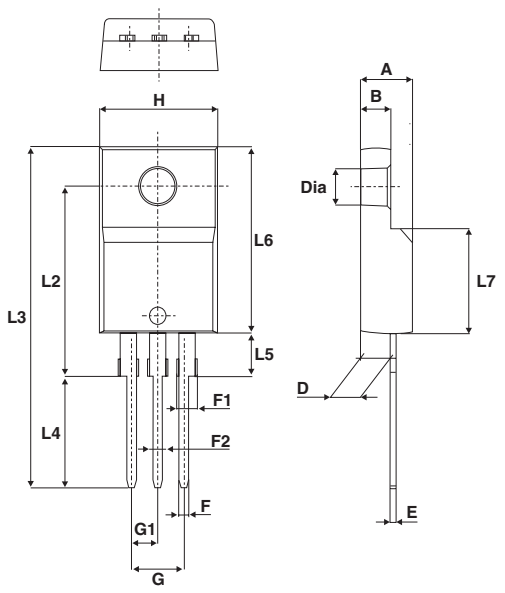
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

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.	
Diam.	3.75	3.85	0.147	0.151

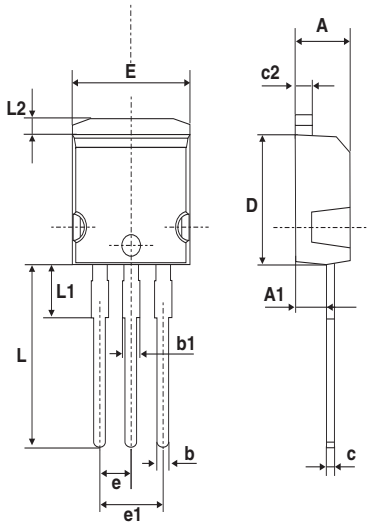
Table 6. TO-220FPAB dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	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
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
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

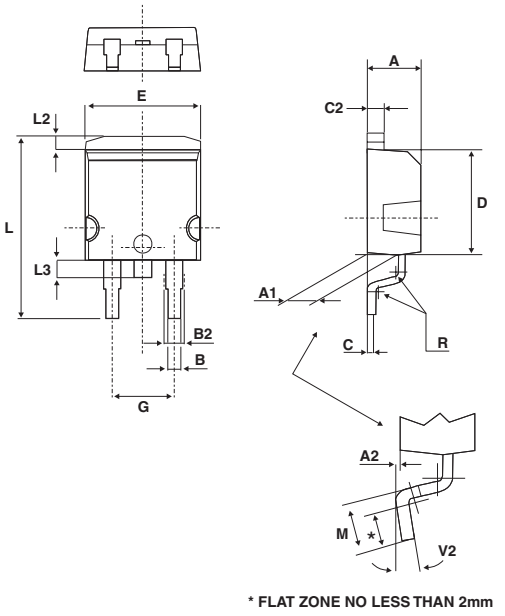
Mounting (soldering) the I^2PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

Table 7. I^2PAK dimensions



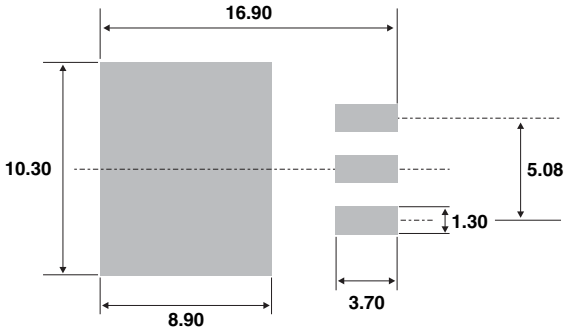
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.40	2.72	0.094	0.107
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.044	0.067
c	0.49	0.70	0.019	0.028
c2	1.23	1.32	0.048	0.052
D	8.95	9.35	0.352	0.368
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.195	0.203
E	10	10.40	0.394	0.409
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

Table 8. 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 15. D²PAK footprint (dimensions in mm)



3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS20M100ST	PS20M100ST	TO-220AB	2.2 g	50	Tube
STPS20M100SFP	PS20M100SFP	TO-220FPAB	1.70 g	50	Tube
STPS20M100SR	PS20M100SR	I^2PAK	1.49 g	50	Tube
STPS20M100SG-TR	PS20M100SG	D^2PAK	1.48 g	1000	Tape and reel

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
25-Mar-2009	1	First issue
16-Apr-2010	2	Updated package graphic for TO-220AB on front page and in *Table 5*.

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