

Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation
- Insulated package (TO-220FPAB):
 - Insulation voltage 2000 V rms
 - Package capacitance = 12 pF

Description

Single Schottky rectifier, suited for high frequency switch mode power supply.

Packaged in TO-220AB, TO-220FPAB, D²PAK and I²PAK, 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.

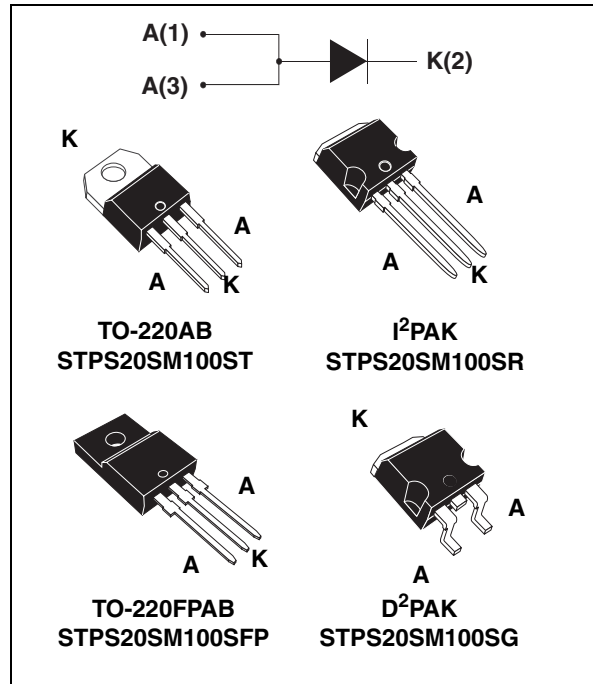
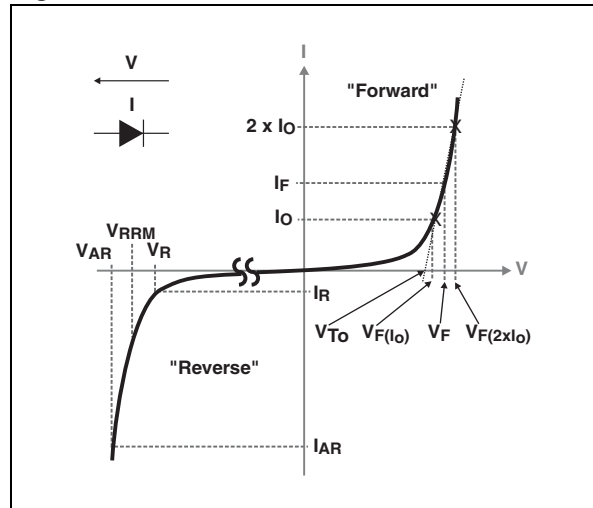


Table 1. Device summary

$I_{F(AV)}$	20 A
V_{RRM}	100 V
T_j (max)	150 °C
V_F (typ)	0.480 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 ($t_p < 1 \mu s$). 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 rms current	30	A
$I_{F(AV)}$	Average forward current $\delta = 0.5$	20	A
	TO-220AB, D ² PAK, I ² PAK $T_c = 125\text{ }^{\circ}\text{C}$ TO-220FPAB $T_c = 85\text{ }^{\circ}\text{C}$		
I_{FSM}	Surge non repetitive forward current	350	A
	$t_p = 10\text{ ms}$ sinusoidal, terminals 1 and 3 short circuited		
$P_{ARM}^{(1)}$	Repetitive peak avalanche power	15000	W
	$t_p = 1\text{ }\mu\text{s}$ $T_j = 25\text{ }^{\circ}\text{C}$		
$V_{ARM}^{(2)}$	Maximum repetitive peak avalanche voltage	120	V
	$t_p < 1\text{ }\mu\text{s}$ $T_j < 150\text{ }^{\circ}\text{C}$ $I_{AR} < 37.5\text{ A}$		
$V_{ASM}^{(2)}$	Maximum single pulse peak avalanche voltage	120	V
	$t_p < 1\text{ }\mu\text{s}$ $T_j < 150\text{ }^{\circ}\text{C}$ $I_{AR} < 37.5\text{ A}$		
T_{stg}	Storage temperature range	-65 to + 150	$^{\circ}\text{C}$
T_j	Maximum operating junction temperature ⁽³⁾	150	$^{\circ}\text{C}$

- 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.
- Refer to [Figure 14.](#)
- $\frac{dP_{Tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ 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	1.3	$^{\circ}\text{C/W}$
	TO-220AB, D ² PAK, I ² PAK		
	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	$T_j = 25\text{ }^{\circ}\text{C}$		10	30	μA
		$T_j = 125\text{ }^{\circ}\text{C}$		10	30	mA
		$T_j = 25\text{ }^{\circ}\text{C}$		5		μA
		$T_j = 125\text{ }^{\circ}\text{C}$		5		mA
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^{\circ}\text{C}$		565		mV
		$T_j = 125\text{ }^{\circ}\text{C}$		480		
		$T_j = 25\text{ }^{\circ}\text{C}$		685		
		$T_j = 125\text{ }^{\circ}\text{C}$		560	620	
		$T_j = 25\text{ }^{\circ}\text{C}$		800	900	
		$T_j = 125\text{ }^{\circ}\text{C}$		630	700	

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

To evaluate the conduction losses use the following equation:

$$P = 0.6 \times I_{F(AV)} + 0.005 \times I_F^2(RMS)$$

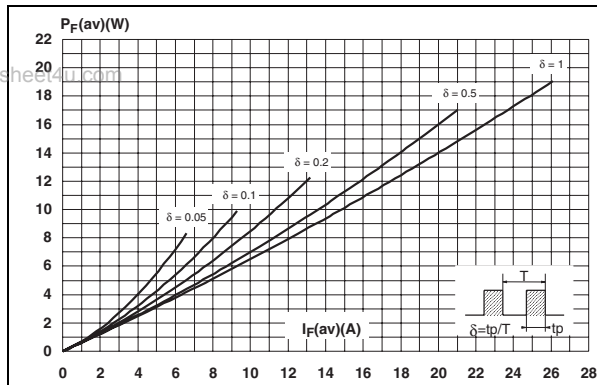
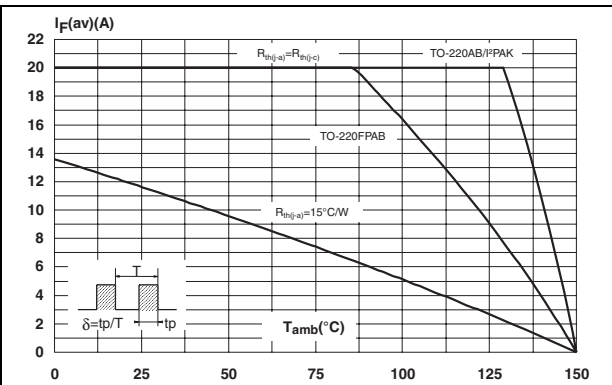
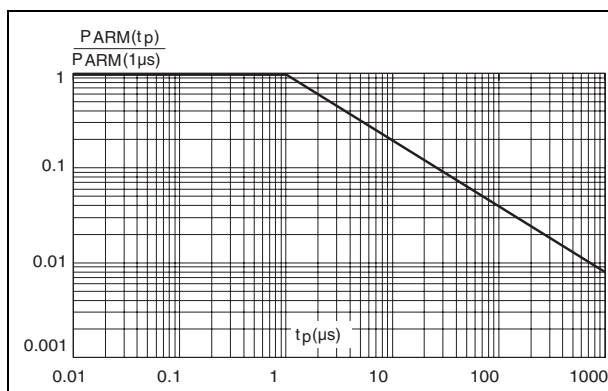
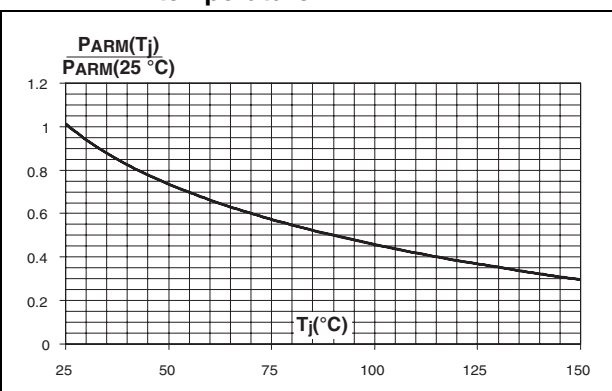
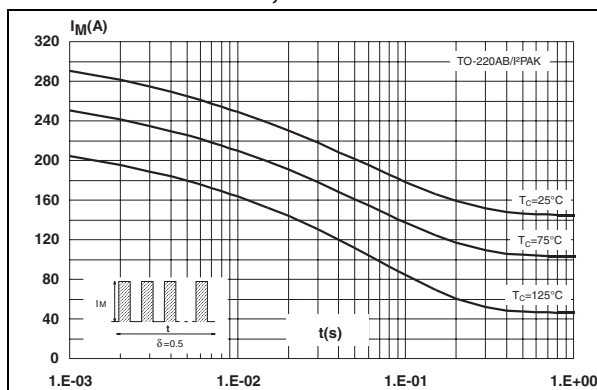
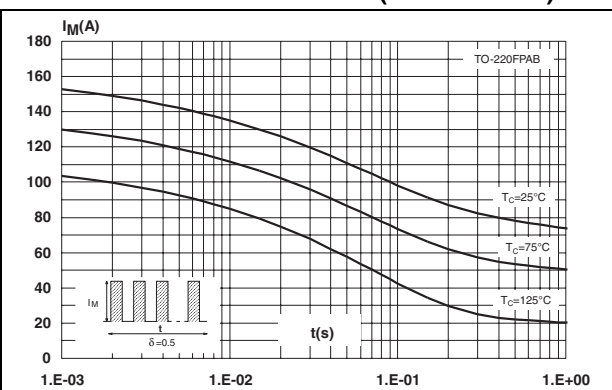
Figure 2. Average forward power dissipation versus average forward current**Figure 3. Average forward current versus ambient temperature ($\delta = 0.5$)****Figure 4. Normalized avalanche power derating versus pulse duration****Figure 5. Normalized avalanche power derating versus junction temperature****Figure 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 (TO-220FPAB)**

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

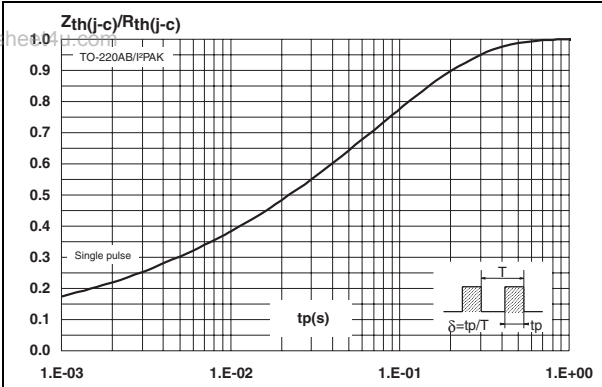


Figure 9. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)

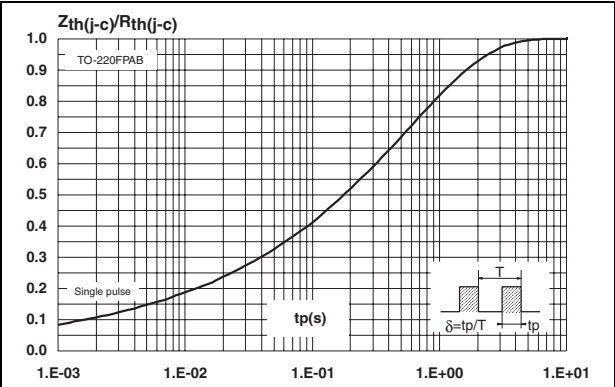


Figure 10. Reverse leakage current versus reverse voltage applied (typical values)

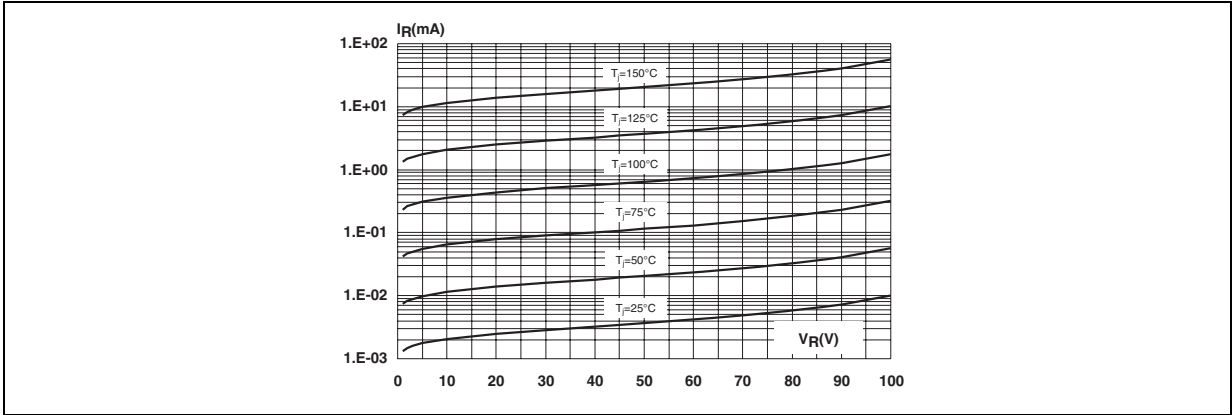


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

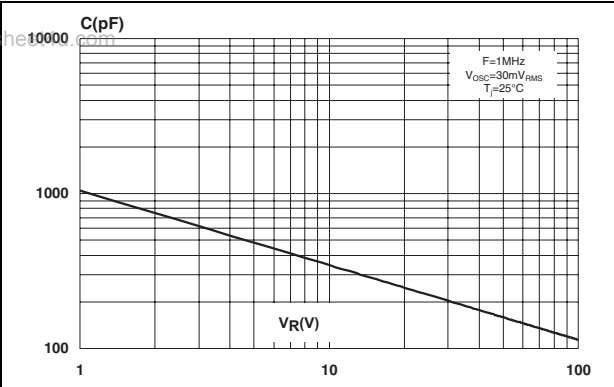


Figure 12. Forward voltage drop versus forward current (terminals 1 and 3 short circuited)

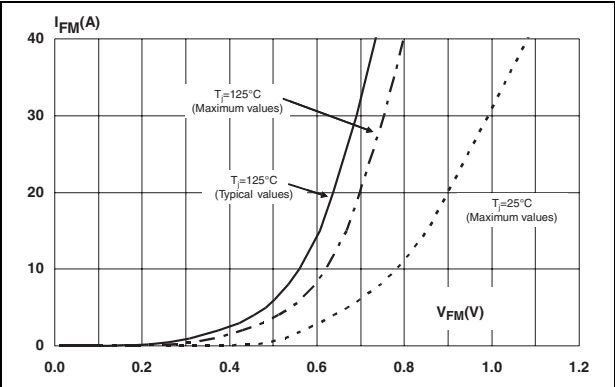


Figure 13. Thermal resistance junction to ambient versus copper surface under tab for D²PAK

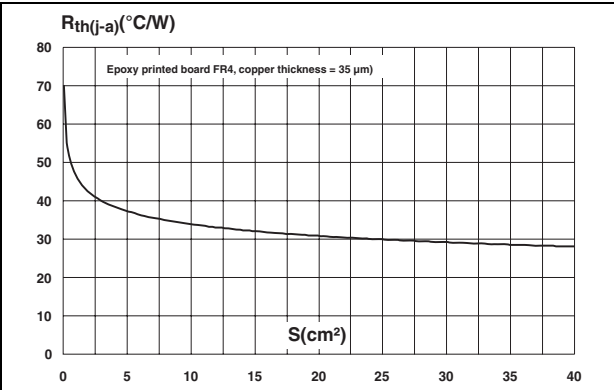
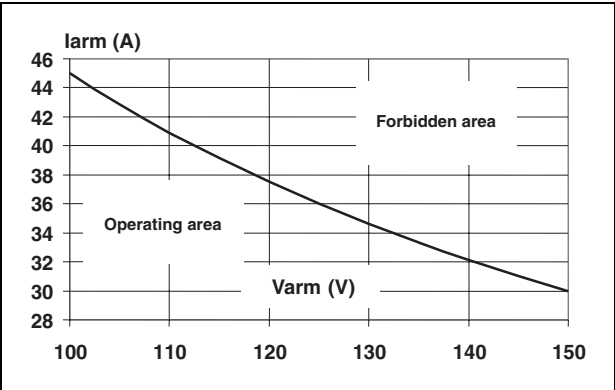


Figure 14. Reverse safe operating area ($t_p < 1 \mu\text{s}$ and $T_j < 150^\circ\text{C}$)



2 Package information

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- Epoxy meets UL94, V0
- Cooling method: 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.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	

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	1.50	0.045	0.059
F2	1.15	1.50	0.045	0.059
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

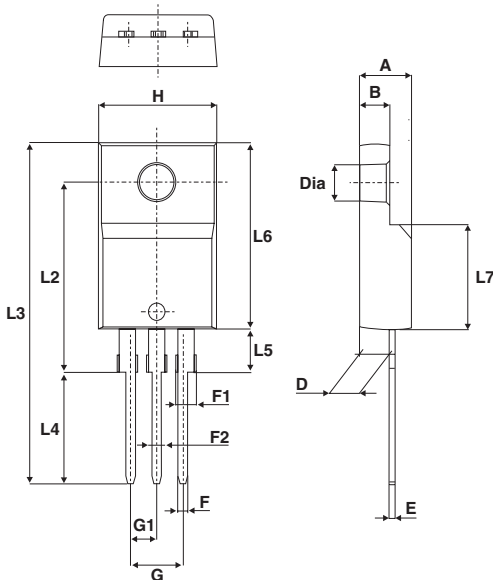
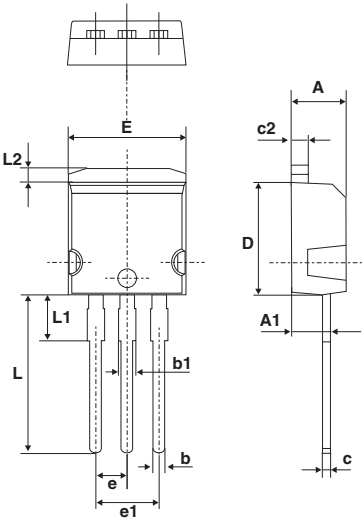


Table 7. I²PAK dimensions

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

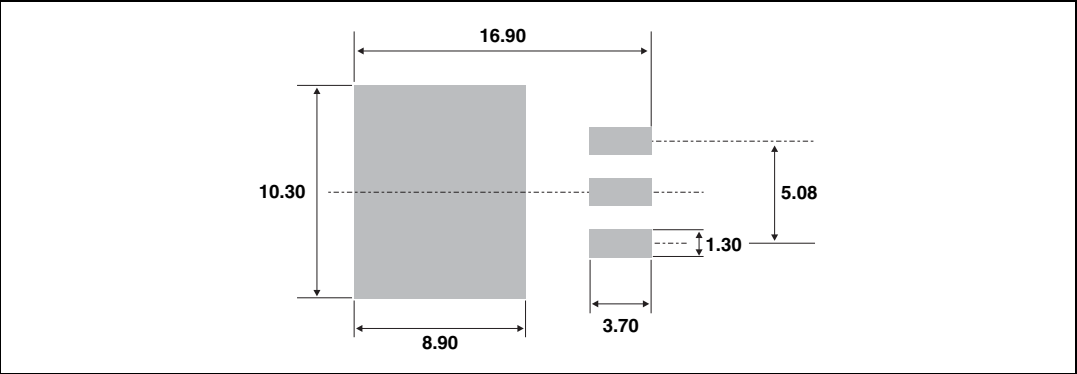


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Table 8. D²PAK dimensions

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

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Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS20SM100ST	PS20SM100ST	TO-220AB	2.2 g	50	Tube
STPS20SM100SFP	PS20SM100SFP	TO-220FPAB	1.70 g	50	Tube
STPS20SM100SR	PS20SM100SR	I ² PAK	1.49 g	50	Tube
STPS20SM100SG-TR	PS20SM100SG	D ² PAK	1.48 g	1000	Tape and reel

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
25-Mar-2009	1	First issue

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