

Low drop power Schottky rectifier

Features

- low forward voltage drop meaning very small conduction losses
- low switching losses allowing high frequency operation
- low thermal resistance
- avalanche rated
- insulated package TO-220FPAB:
 - insulating voltage = 2000 V DC
 - capacitance = 45 pF
- avalanche capability specified

Description

Dual center tap Schottky rectifier suited for switched mode power supplies and high frequency DC to DC converters.

Packaged in TO-247, TO-220AB, TO-220FPAB, D²PAK and I²PAK this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.

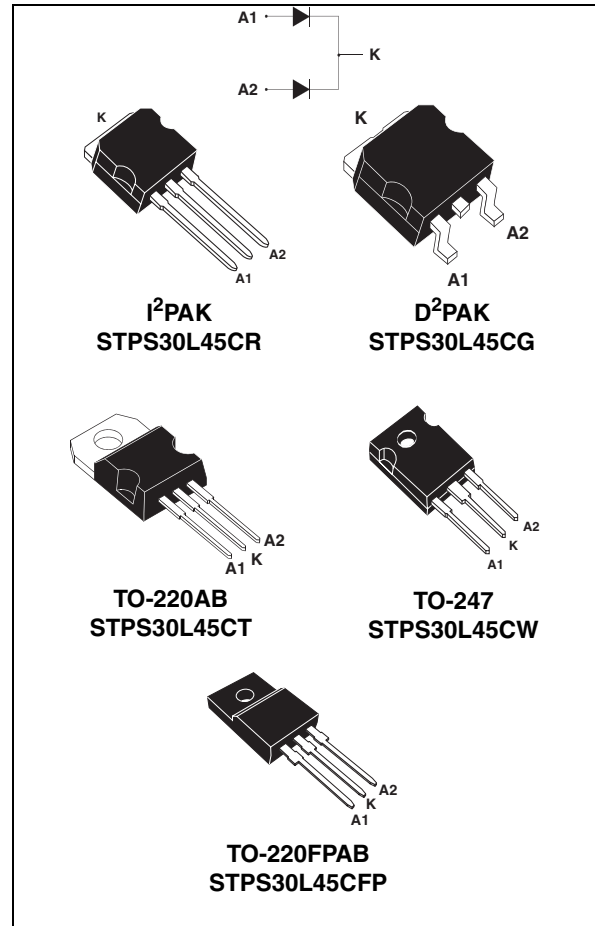


Table 1. Device summary

$I_{F(AV)}$	2 x 15 A
V_{RRM}	45 V
T_j (max)	150 °C
V_F (max)	0.5 V

1 Characteristics

Table 2. Absolute Ratings (limiting values, per diode)

Symbol	Parameter				Value	Unit
V_{RRM}	Repetitive peak reverse voltage				45	V
$I_{F(RMS)}$	Forward rms current				30	A
$I_{F(AV)}$	Average forward current	TO-220FPAB	$T_c = 110\text{ }^{\circ}\text{C}$, $\delta = 0.5$	Per diode	15	A
		TO-220AB, TO-247, I ² PAK, D ² PAK	$T_c = 135\text{ }^{\circ}\text{C}$, $\delta = 0.5$	Per device	30	
I_{FSM}	Surge non repetitive forward current			$t_p = 10\text{ ms Sinusoidal}$	220	A
I_{RRM}	Repetitive peak reverse current			$t_p = 2\text{ }\mu\text{s square F} = 1\text{ kHz}$	1	A
I_{RSM}	Non repetitive peak reverse current			$t_p = 100\text{ }\mu\text{s square}$	3	A
P_{ARM}	Repetitive peak avalanche power			$t_p = 1\text{ }\mu\text{s } T_j = 25\text{ }^{\circ}\text{C}$	6000	W
T_{stg}	Storage temperature range				-65 to + 150	$^{\circ}\text{C}$
T_j	Maximum operating junction temperature ⁽¹⁾				150	$^{\circ}\text{C}$
dV/dt	Critical rate of rise of reverse voltage				10000	V/ μs

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

Table 3. Thermal resistances

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220FPAB	Per diode	4	$^{\circ}\text{C/W}$
			Total	3.2	
		TO-220AB, TO-247, I ² PAK, D ² PAK	Per diode	1.60	
			Total	0.85	
$R_{th(c)}$	Coupling	TO-220FPAB		2.5	$^{\circ}\text{C/W}$
		TO-220AB, TO-247, I ² PAK, D ² PAK		0.10	

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_J = 25\text{ }^{\circ}\text{C}$	$V_R = V_{RRM}$			0.4	mA
		$T_J = 125\text{ }^{\circ}\text{C}$			100	200	mA
$V_F^{(1)}$	Forward voltage drop	$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 15\text{ A}$			0.55	V
		$T_J = 125\text{ }^{\circ}\text{C}$	$I_F = 15\text{ A}$		0.42	0.50	
		$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 30\text{ A}$			0.74	
		$T_J = 125\text{ }^{\circ}\text{C}$	$I_F = 30\text{ A}$		0.59	0.67	

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

To evaluate the conduction losses use the following equation: $P = 0.330 \times I_{F(AV)} + 0.011 I_F^2_{(RMS)}$

Figure 1. Average forward power dissipation versus average forward current (per diode)

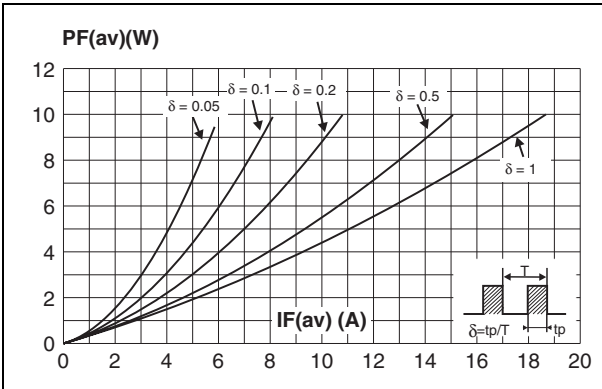


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)

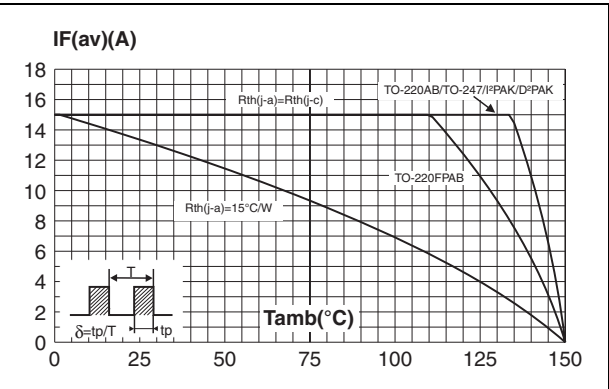


Figure 3. Normalized avalanche power derating versus pulse duration

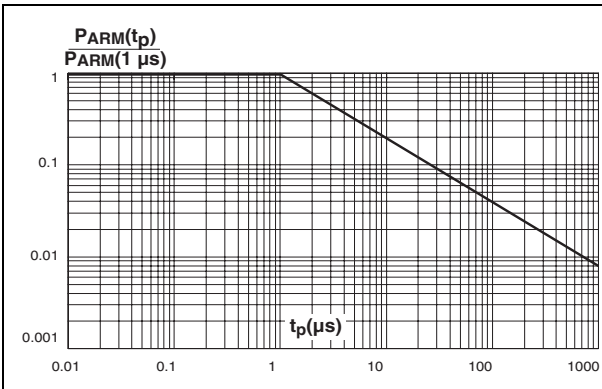


Figure 4. Normalized avalanche power derating versus junction temperature

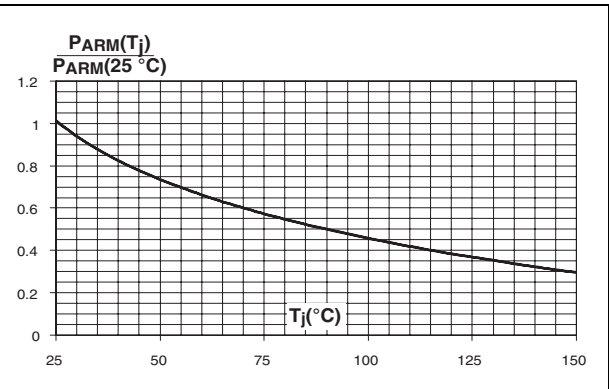


Figure 5. Non repetitive surge peak forward current versus overload duration

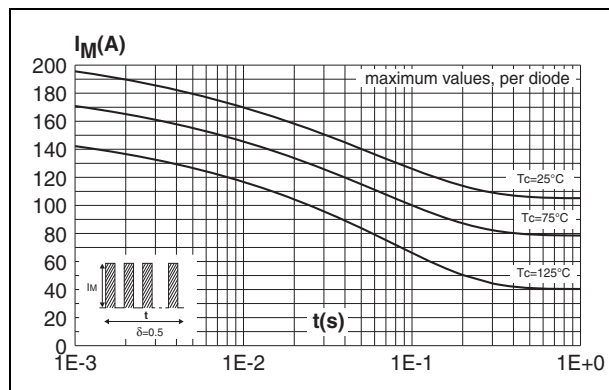


Figure 6. Non repetitive surge peak forward current versus overload duration (TO-220FPAB only)

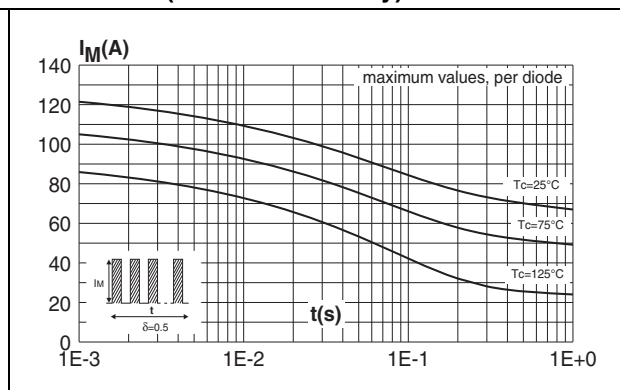


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

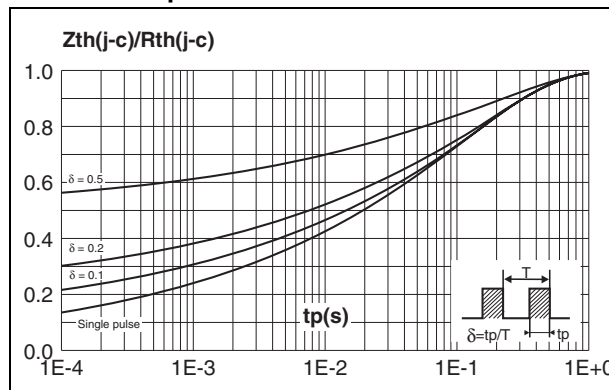


Figure 8. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)

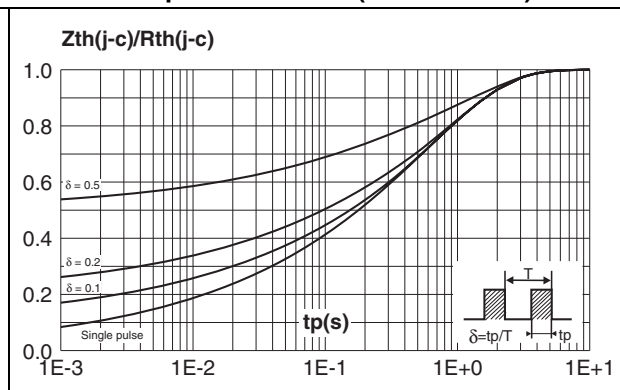


Figure 9. Reverse leakage current versus reverse voltage applied (typical values, per diode)

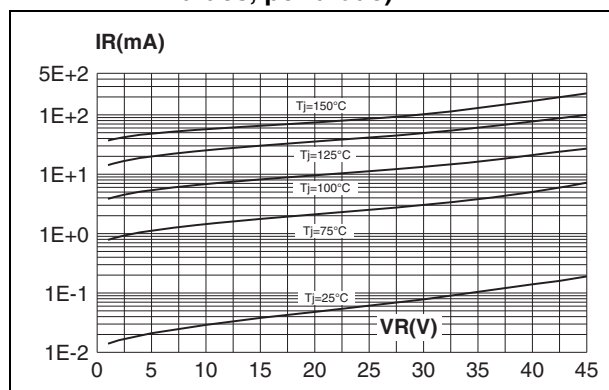


Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)

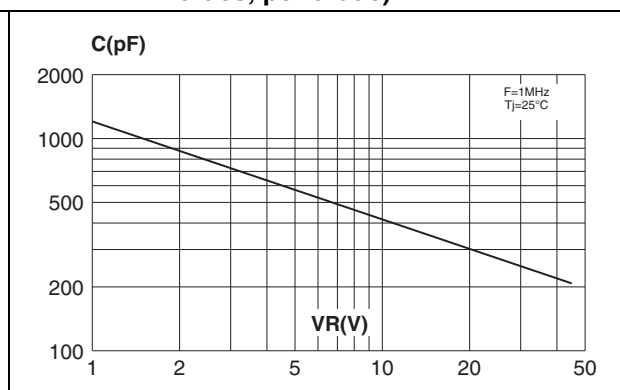


Figure 11. Forward voltage drop versus forward current (maximum values, per diode)

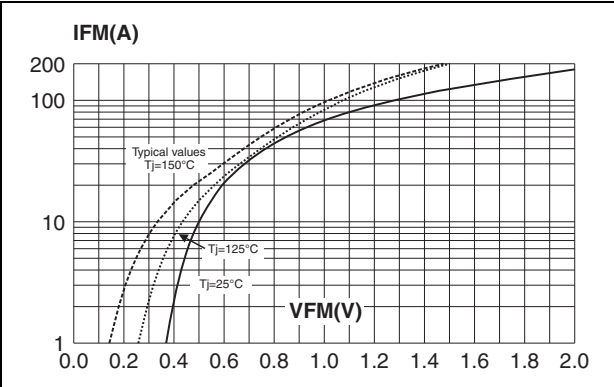
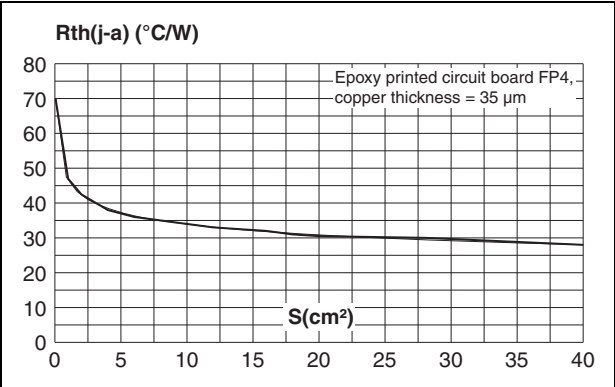


Figure 12. Thermal resistance junction to ambient versus copper surface under tab for D²PAK

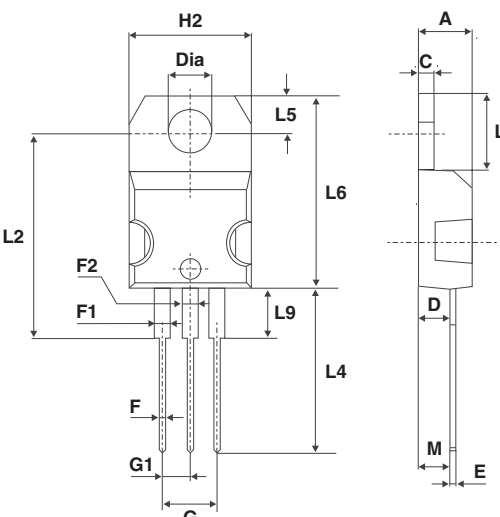


2 Package Information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque (TO-220AB, TO-220FPAB): 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 package 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

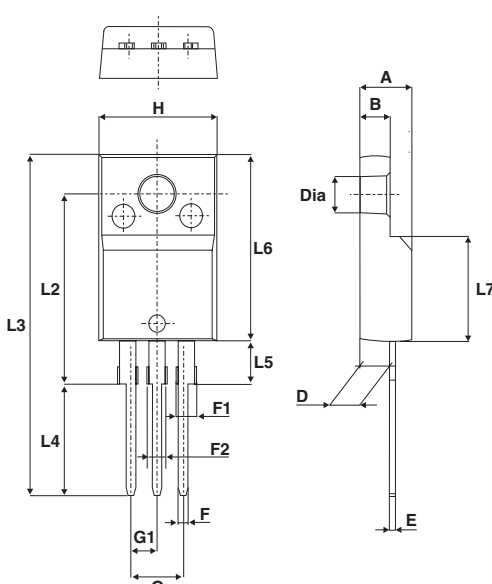
Mounting (soldering) the I²PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

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

Table 7. TO-220FPAB package 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



The technical drawing illustrates the TO-220FPAB package in three views: top, side, and a detail of the mounting tab. The top view shows a rectangular body with a central circular feature and two smaller circular features on either side. Dimensions L2, L3, L4, L5, L6, and L7 are indicated for the body and leads. The side view shows the profile of the package with dimensions A, B, D, and E. The detail view shows the mounting tab with dimensions F, F1, F2, G, and G1. The diameter of the mounting hole is labeled as Dia.

Table 8. D²PAK package 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 millimeters)

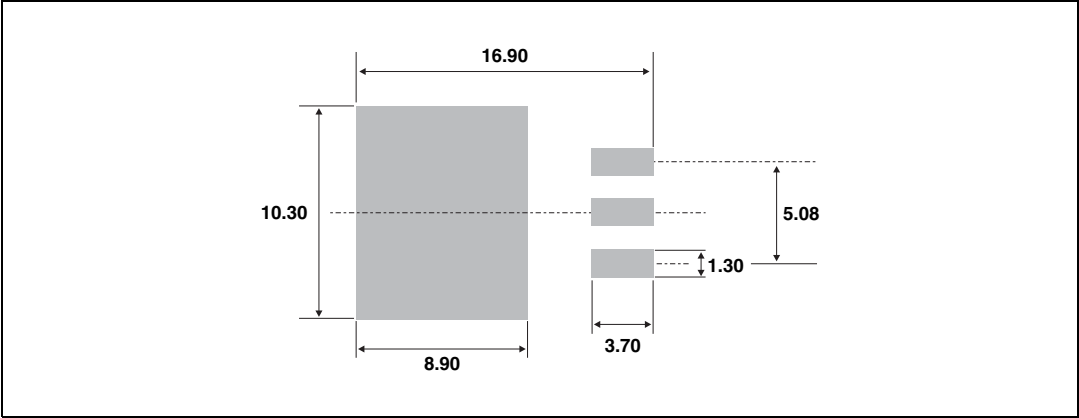


Table 9. TO-247 dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.85	5.15	0.191	0.203
A1	2.20	2.60	0.086	0.102
b	1.00	1.40	0.039	0.055
b1	2.00	2.40	0.078	0.094
b2	3.00	3.40	0.118	0.133
c	0.40	0.80	0.015	0.031
D ⁽¹⁾	19.85	20.15	0.781	0.793
E	15.45	15.75	0.608	0.620
e	5.45 typ.		0.215 typ.	
L	14.20	14.80	0.559	0.582
L1	3.70	4.30	0.145	0.169
L2	18.50 typ.		0.728 typ.	
ØP ⁽²⁾	3.55	3.65	0.139	0.143
ØR	4.50	5.50	0.177	0.217
S	5.50 typ.		0.216 typ.	

1. Dimension D plus gate protrusion does not exceed 20.5 mm
2. Resin thickness around the mounting hole is not less than 0.9 mm

3 Ordering Information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS30L45CT	STPS30L45CT	TO-220AB	2g	50	Tube
STPS30L45CG	STPS30L45CG	D ² PAK	1.8g	50	Tube
STPS30L45CG-TR	STPS30L45CG	D ² PAK	1.8g	500	Tape and reel
STPS30L45CW	STPS30L45CW	TO-247	4.4g	30	Tube
STPS30L45CR	STPS30L45CR	I ² PAK	1.4g	50	Tube
STPS30L45CFP	STPS30L45CFP	TO-220FPAB	1.9 g	50	Tube

4 Revision history

Table 11. Document revision history

Date	Revision	Changes
Jul-2003	3B	Previous issue
13-Oct-2010	4	Added paragraph above Table 6 and updated I ² PAK dimensions in Table 6 . Updated TO-247 dimensions in Table 9 .

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