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STPS40M100C

Power Schottky rectifier

Features

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

Description

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

Packaged in TO-220AB 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

Symbol	Value
$I_{F(AV)}$	2 x 20 A
V_{RRM}	100 V
T_j (max)	150 °C
V_F(typ)	0.420 V

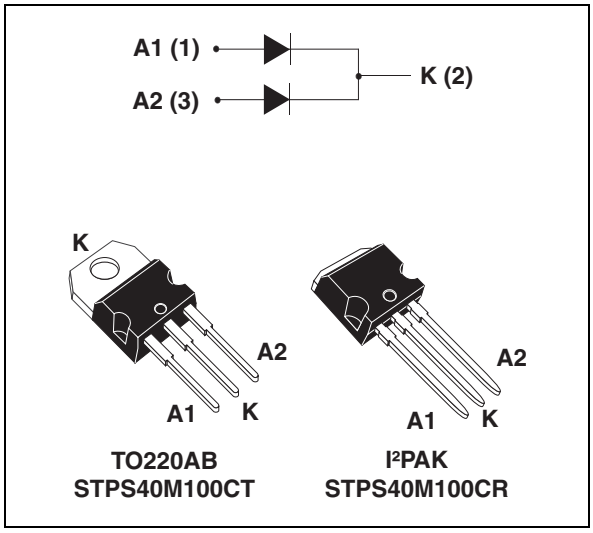
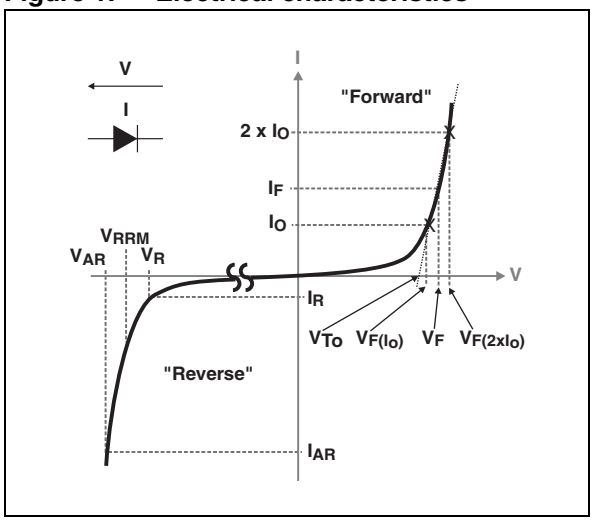


Figure 1. Electrical characteristics (a)



a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in *Figure 11* 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 per diode at 25 °C unless otherwise stated)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			100	V
$I_{F(RMS)}$	Forward current rms			60	A
$I_{F(AV)}$	Average forward current δ = 0.5	T_c = 125 °C	Per diode	20	A
		T_c = 120 °C	Per package	40	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal		530	A
P_{ARM} (1)	Repetitive peak avalanche power	t_p = 1 µs T_j = 25 °C		23 200	W
V_{ARM} (2)	Maximum repetitive peak avalanche voltage	t_p < 1 µs T_j < 150 °C, I_{AR} < 58 A		120	V
V_{ASM} (2)	Maximum single pulse peak avalanche voltage	t_p < 1 µs T_j < 150 °C, I_{AR} < 58 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 11*
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	Per diode	1.4	°C/W
		Total	0.95	
$R_{th(c)}$	Coupling		0.5	°C/W

When diodes 1 and 2 are used simultaneously

T_j(diode 1) = P(diode 1) x $R_{th(j-c)}$(Per diode) + P(diode 2) x $R_{th(c)}$

Table 4. Static electrical characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-	-	70	µA
		T_j = 125 °C		-	15	70	mA
		T_j = 25 °C	V_R = 70 V	-	-	40	µA
		T_j = 125 °C		-	7.5	40	mA
V_F (2)	Forward voltage drop	T_j = 125 °C	I_F = 5 A	-	0.415	0.500	V
		T_j = 125 °C	I_F = 10A	-	0.500	0.560	-
		T_j = 25 °C	I_F = 20 A	-	-	0.780	-
		T_j = 125 °C		-	0.585	0.640	-

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 = 0.560 x $I_{F(AV)}$ + 0.004x $I_F{}^2{}_{(RMS)}$

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

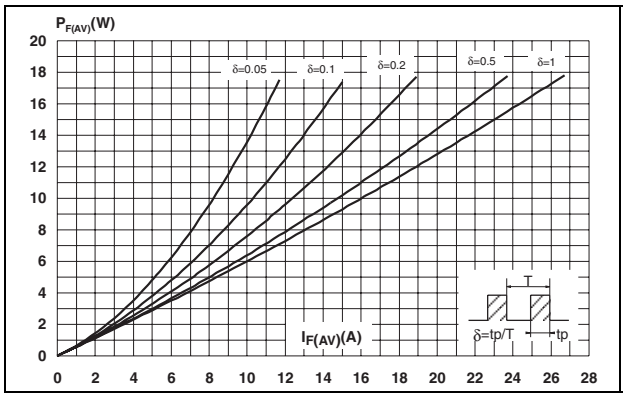


Figure 3. Average forward current per diode versus ambient temperature (δ = 0.5)

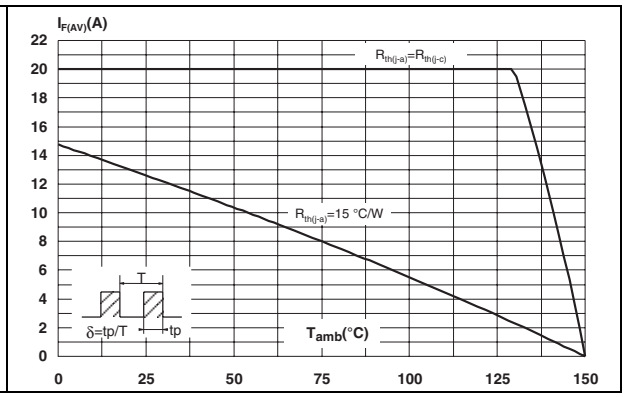


Figure 4. Normalized avalanche power derating versus pulse duration

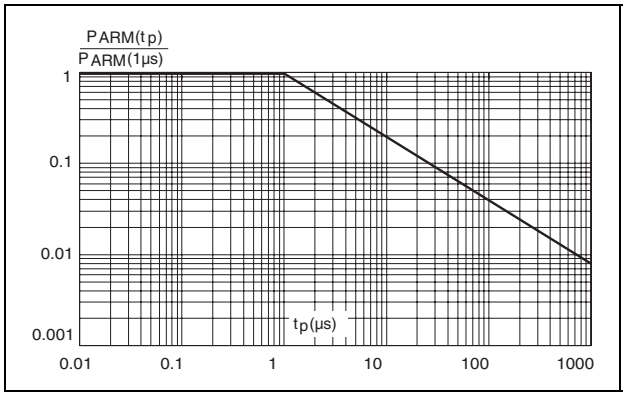


Figure 5. Normalized avalanche power derating versus junction temperature

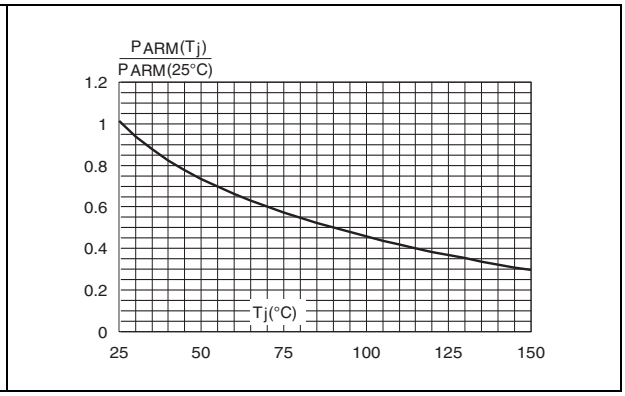


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values per diode)

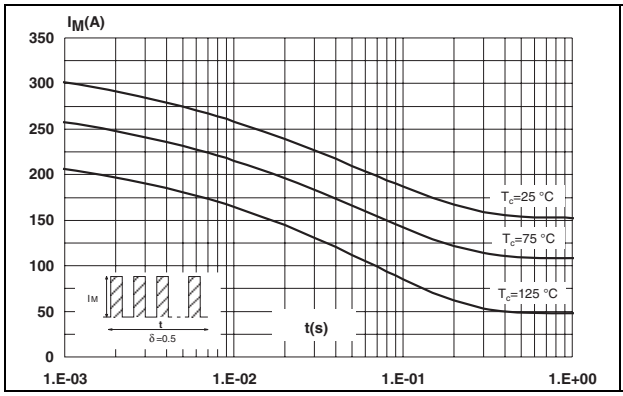


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

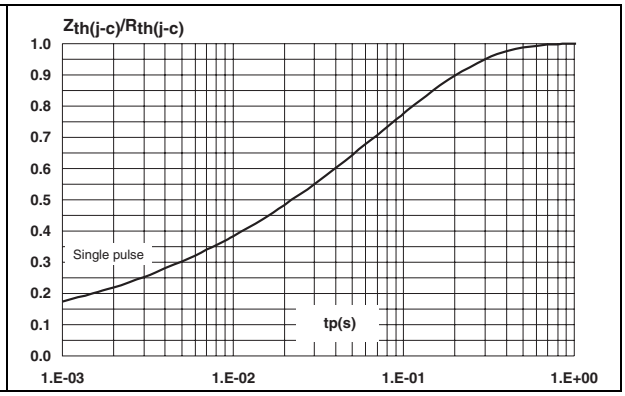


Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)

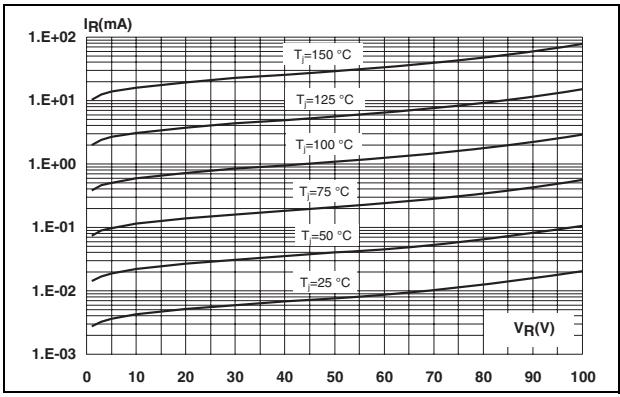


Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)

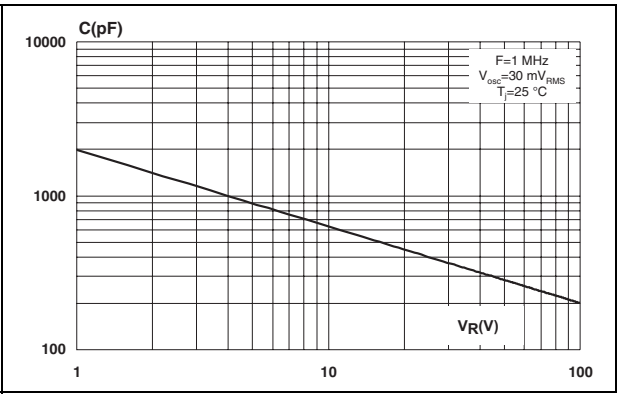


Figure 10. Forward voltage drop versus forward current (per diode)

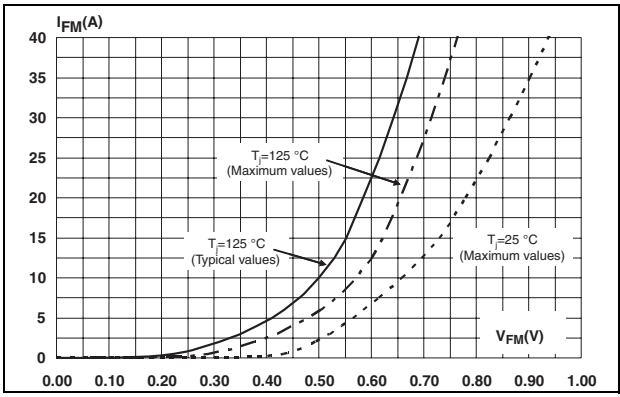
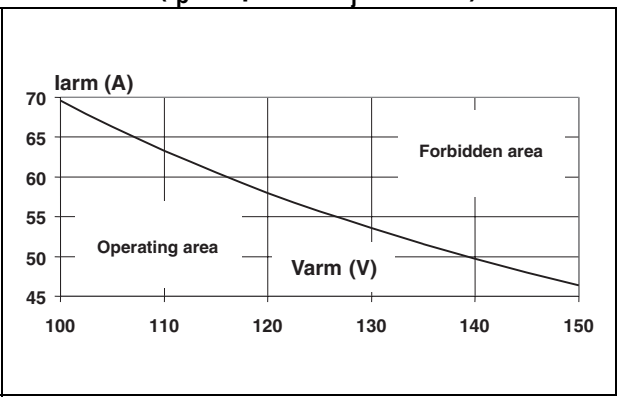


Figure 11. Reverse safe operating area (t_p < 1 µs and T_j < 150 °C)

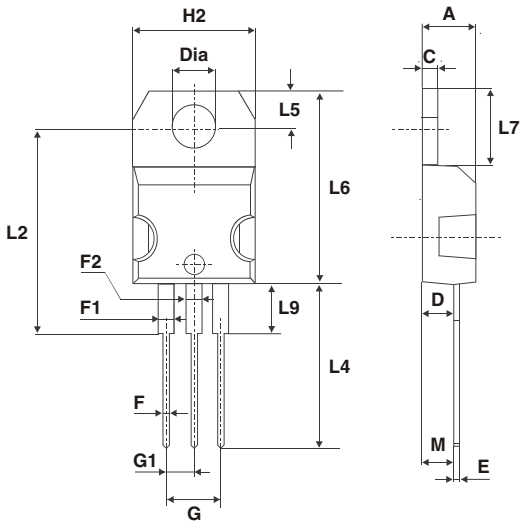


2 Package information

- Epoxy meets UL94, V0
- Cooling method: conduction
- 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.

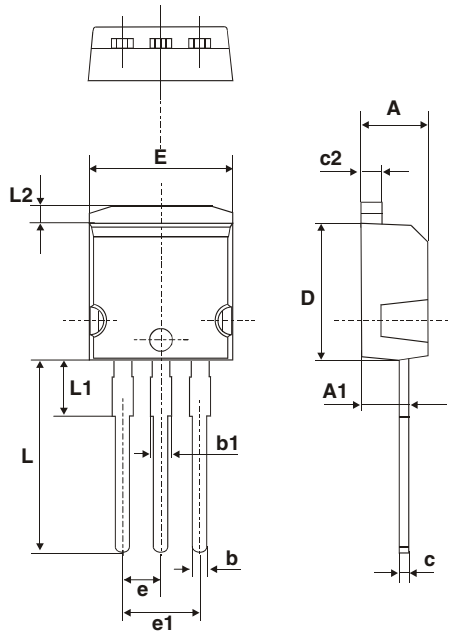
Table 5. TO-220AB dimensions



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

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. 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 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS40M100CT	STPS40M100CT	TO-220AB	1.9 g	50	Tube
STPS40M100CR	STPS40M100CR	I^2PAK	1.5 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
25-Mar-2009	1	First issue.
10-Apr-2010	2	Updated package graphics.
29-Apr-2010	3	Added I²PAK package. Updated weight in *Table 7.*