STPS40M60C

High efficiency 60 V power Schottky rectifier

Features

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

Description

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

Packaged in TO-220AB, I^2PAK and D^2PAK, this device is particularly suited for use in notebook, game station and desktop adapters, providing these applications with a good efficiency at both low and high load.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	2 x 20 A
V_{RRM}	60 V
T_j (max)	150 °C
V_F (typ)	385 mV

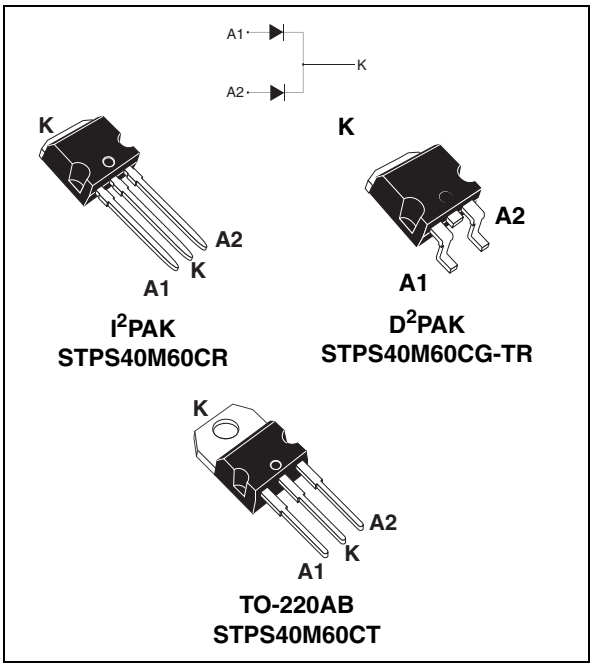
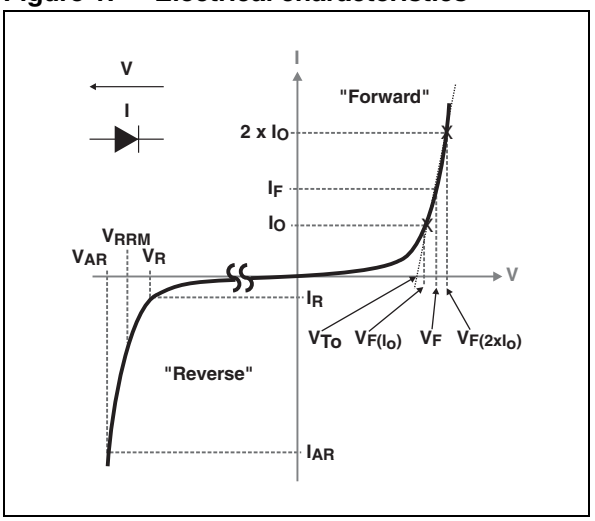


Figure 1. Electrical characteristics(a)



a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in *Figure 13*. 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 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			30	A
$I_{F(AV)}$	Average forward current, δ = 0.5	T_c = 130 °C T_c = 120 °C	Per diode Per device	20 40	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal		220	A
P_{ARM}(1)	Repetitive peak avalanche power	T_j = 25 °C, t_p = 1 µs		23000	W
V_{ARM}(2)	Maximum repetitive peak avalanche voltage	t_p < 1 µs, T_j < 150 °C, I_{AR} < 86.3 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 3 and 4. 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 13*
3. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	per diode	1.40	°C/W
		total	0.95	
$R_{th(c)}$	Coupling		0.50	°C/W

When the two diodes 1 and 2 are used simultaneously:

ΔT_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 (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	V_R = 60 V	-	25	110	µA
		T_j = 125 °C		-		85	mA
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 5A	-	0.430	0.460	V
		T_j = 125 °C		-	0.325	0.355	
		T_j = 25 °C	I_F = 10 A	-	0.470	0.505	
		T_j = 125 °C		-	0.385	0.435	
		T_j = 25 °C	I_F = 20 A	-	0.540	0.595	
		T_j = 125 °C		-	0.475	0.535	
		T_j = 25 °C	I_F = 40 A	-	0.645	0.730	
		T_j = 125 °C		-	0.605	0.675	

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:
$P = 0.395 \times I_{F(AV)} + 0.007 \times I_F{}^2{}_{(RMS)}$

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

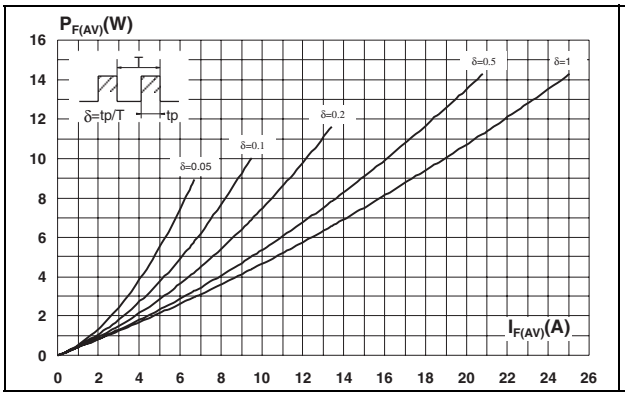


Figure 3. Average forward current versus ambient temperature (δ = 0.5, per diode)

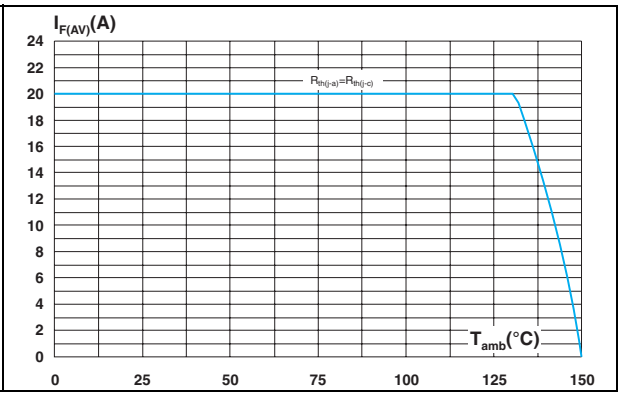


Figure 4. Normalized avalanche power derating versus pulse duration

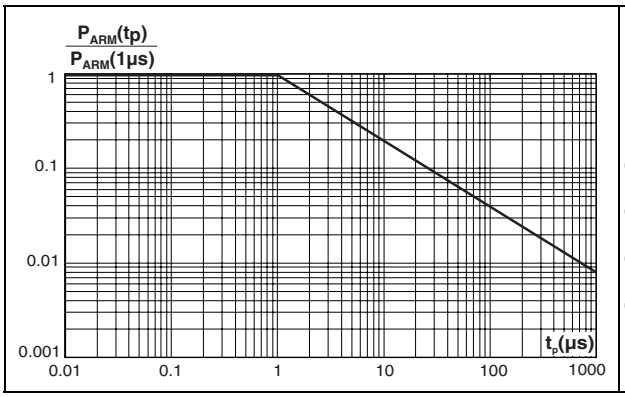


Figure 5. Normalized avalanche power derating versus junction temperature

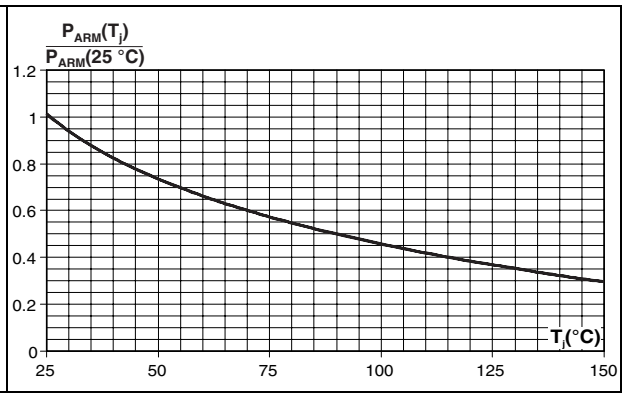


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)

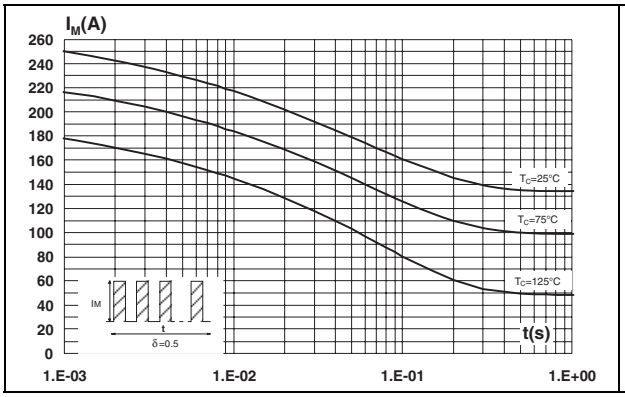


Figure 7. Relative thermal impedance junction to case versus pulse duration

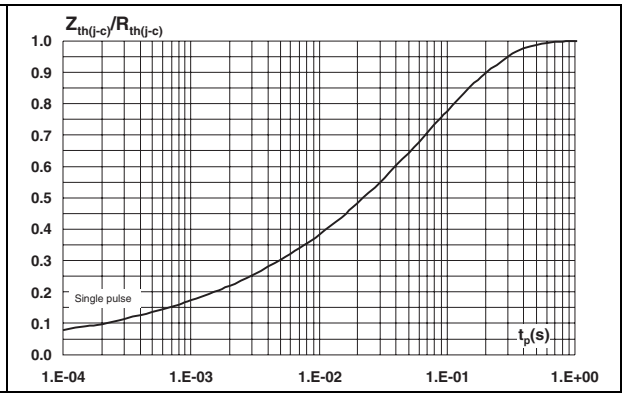


Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)

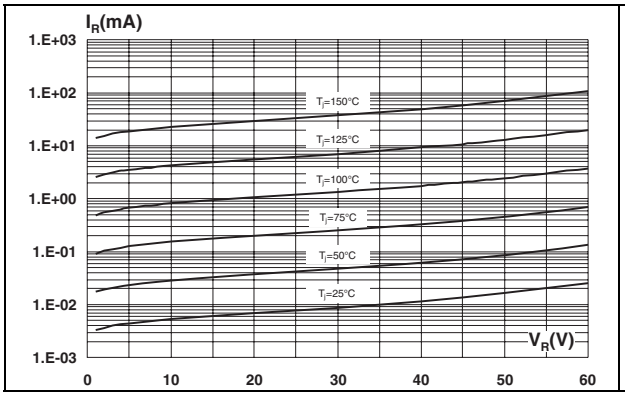


Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)

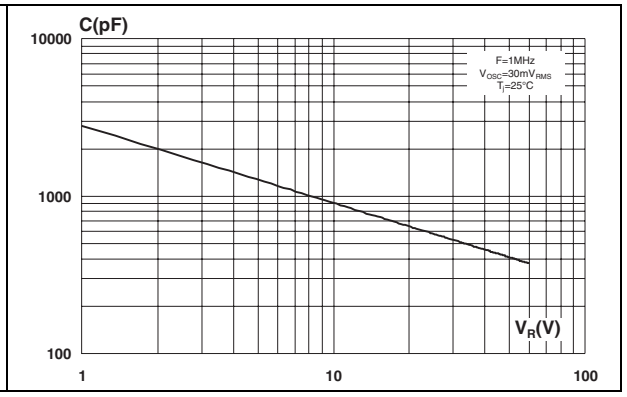


Figure 10. Forward voltage drop versus forward current (per diode, low level)

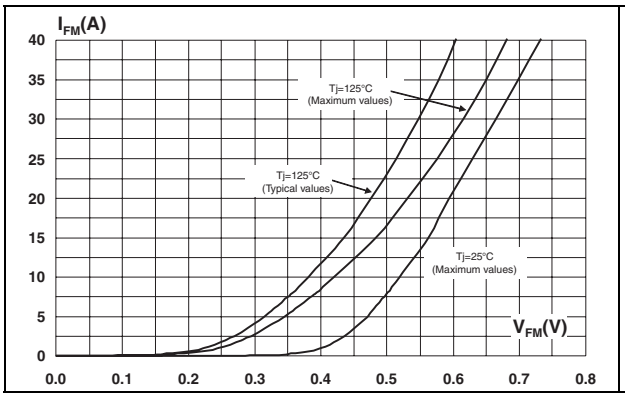


Figure 11. Forward voltage drop versus forward current (per diode, high level)

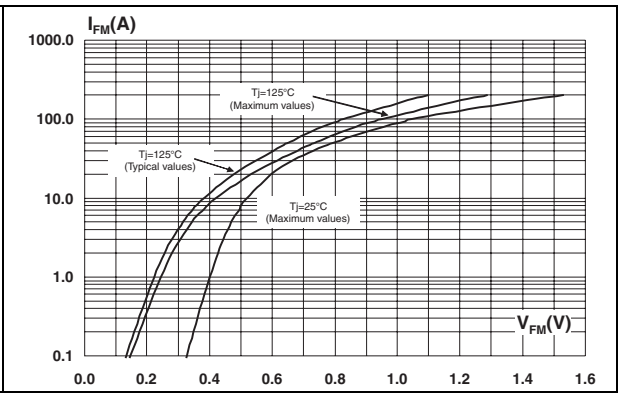


Figure 12. Thermal resistance junction to ambient versus copper surface under tab for D^2PAK

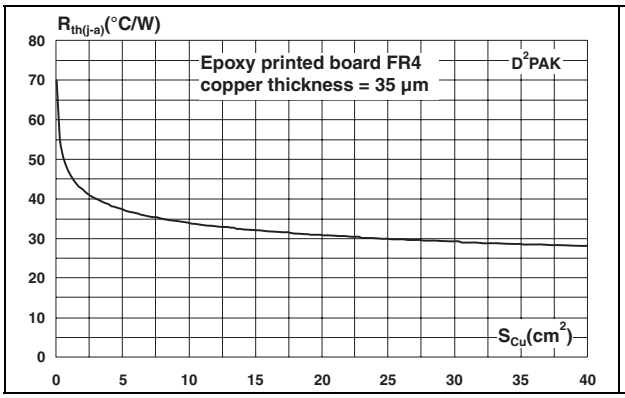
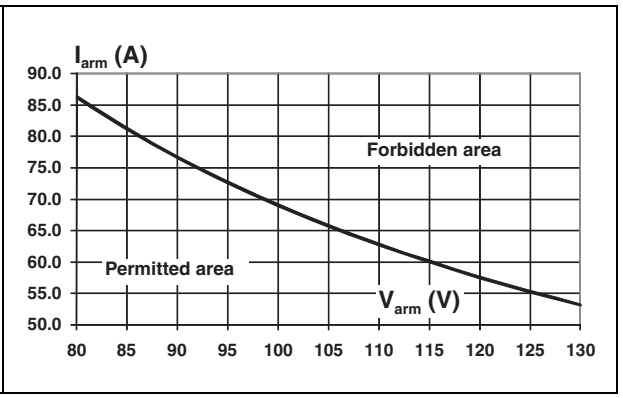


Figure 13. Reverse safe operating area (t_p < 1 µs and T_j < 150 °C)

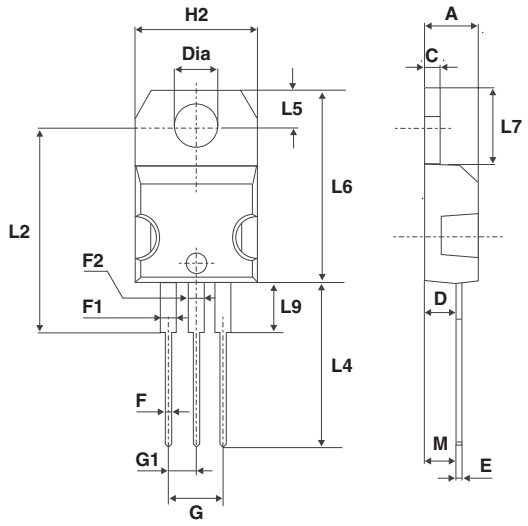


2 Package information

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

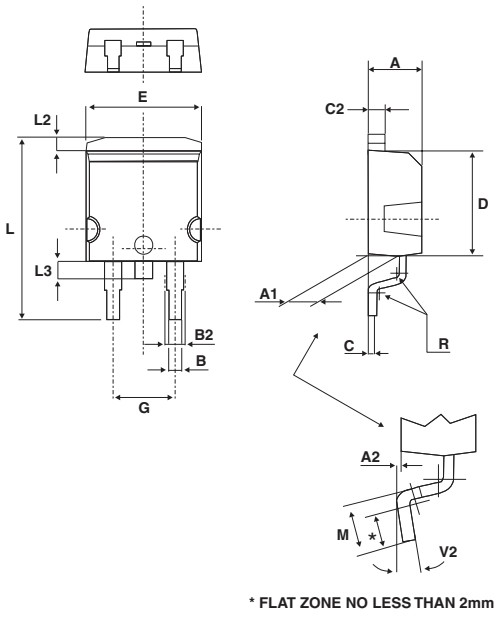
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Table 5. TO-220AB dimensions



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 14. D²PAK footprint (dimensions in mm)

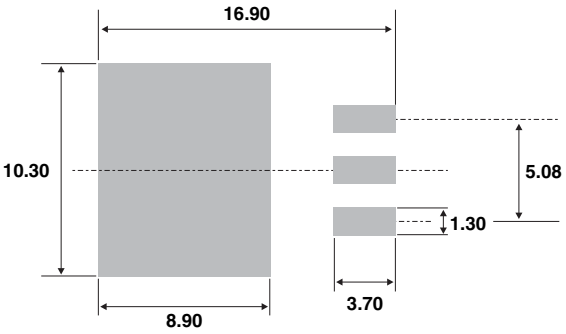
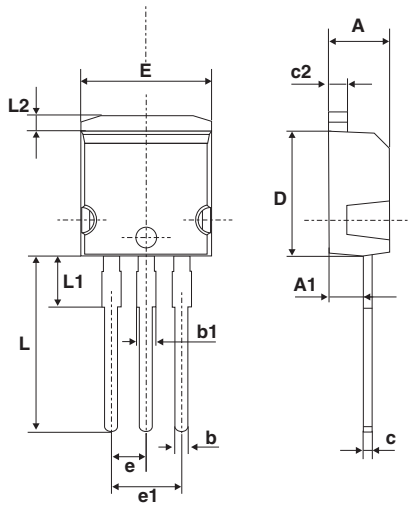


Table 7. I^2PAK dimensions



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
STPS40M60CT	STPS40M60CT	TO-220AB	2.2 g	50	Tube
STPS40M60CR	STPS40M60CR	I^2PAK	1.6 g	50	Tube
STPS40M60CG-TR	STPS40M60CG	D^2PAK	1.5 g	1000	Tape and reel

4 Revision history

Table 9. Revision history

Date	Revision	Changes
11-May-2011	1	First issue.

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