

Power Schottky rectifier

Technical Literature

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Rev 6.1		Document change
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**DOCUMENT APPROVAL**

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STPS41L60C

Power Schottky rectifier

Features

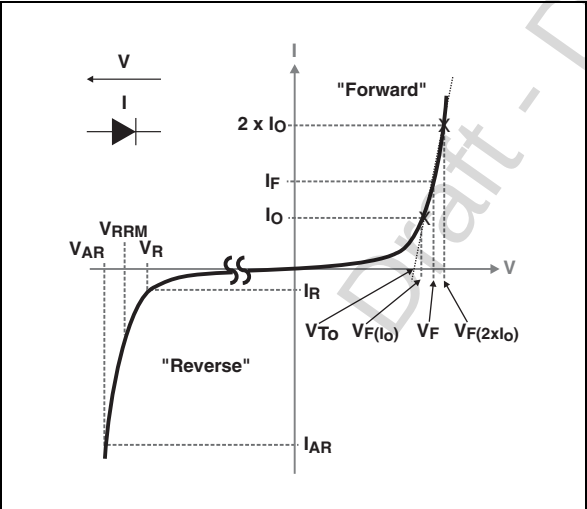
- Low forward voltage drop
- Negligible switching losses
- Low thermal resistance
- Avalanche capability specified

Description

These dual center tap Schottky rectifiers are suited for switch mode power supplies and high frequency DC to DC converters.

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

Figure 1. Electrical characteristics (a)



a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in [Figure 12](#). 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

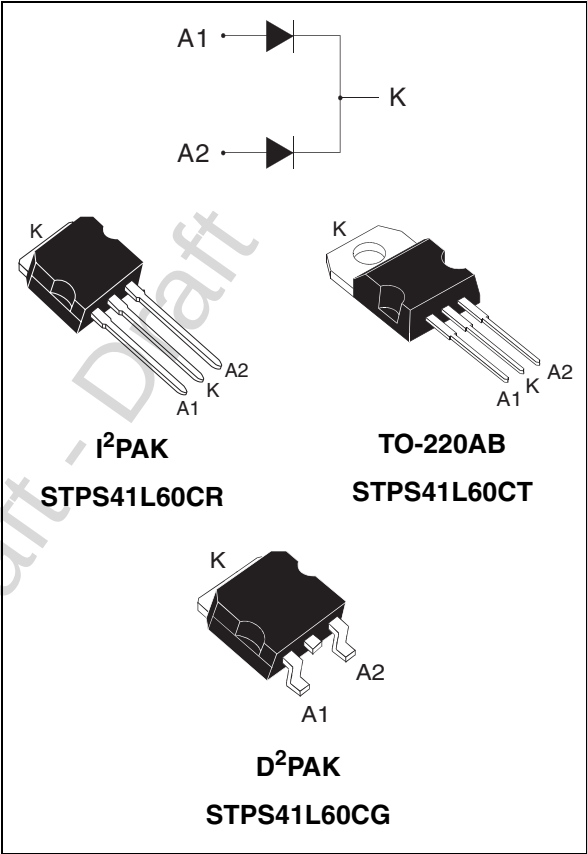


Table 1. Device summary

$I_{F(AV)}$	2 x 20 A
V_{RRM}	60 V
$T_j(max)$	150 °C
$V_F(max)$	0.58 V

1 Characteristics

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

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	T _C = 125 °C δ = 0.5	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 _p = 1 μs T _j = 25 °C		9500	W
V _{ARM} ⁽²⁾	Maximum repetitive peak avalanche voltage	t _p < 1 μs, T _j < 150 °C, I _{AR} < 35 A		80	V
V _{ASM} ⁽²⁾	Maximum single pulse peak avalanche voltage	t _p < 1 μs, T _j < 150 °C, I _{AR} < 35 A		80	V
T _{stg}	Storage temperature range				-65 to + 175 °C
T _j	Maximum operating junction temperature ⁽³⁾				150 °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 12](#)
- $\frac{dP_{Tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ 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	Per diode Total	1.5 0.8	°C/W
R _{th(c)}	Coupling		0.1	

When the diodes 1 and 2 are used simultaneously :

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

Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
I _R ⁽¹⁾	Reverse leakage current	T _j = 25 °C	V _R = V _{RRM}			600	μA
		T _j = 125 °C			100	175	mA
V _F ⁽¹⁾	Forward voltage drop	T _j = 25 °C	I _F = 20 A			0.60	V
		T _j = 125 °C	I _F = 20 A		0.50	0.58	
		T _j = 25 °C	I _F = 40A			0.77	
		T _j = 125 °C	I _F = 40A		0.67	0.71	

- Pulse test: t_p = 380 μs, δ < 2%

To evaluate the conduction losses use the following equation:

$$P = 0.42 \times I_{F(AV)} + 0.007 \times I_{F(RMS)}^2$$

Figure 2. Conduction losses versus average current

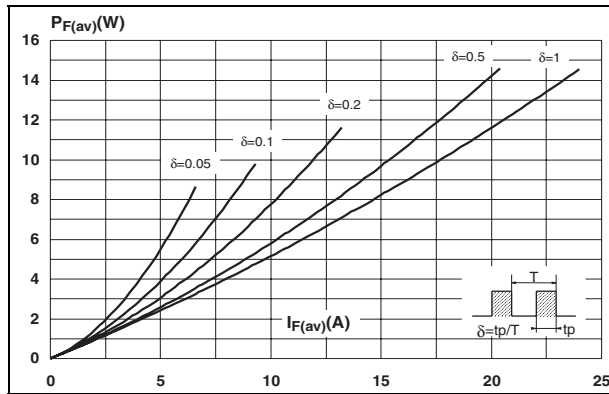


Figure 3. Average forward current versus ambient temperature ($\delta = 0.5$)

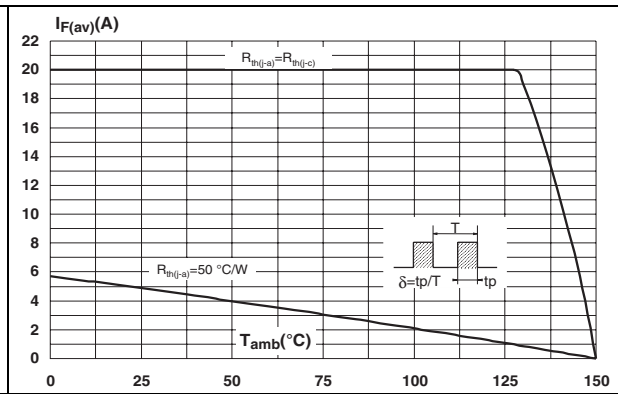


Figure 4. Normalized avalanche power derating versus pulse duration

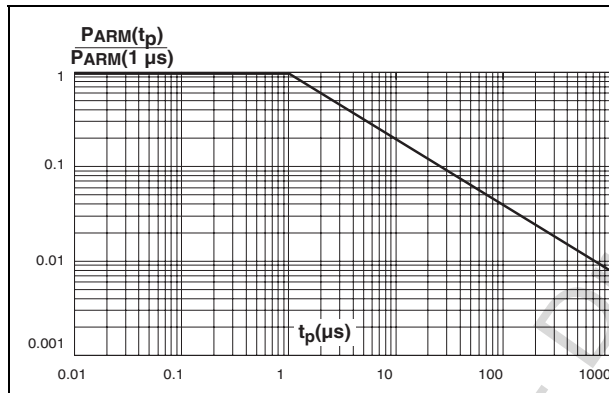


Figure 5. Normalized avalanche power derating versus junction temperature

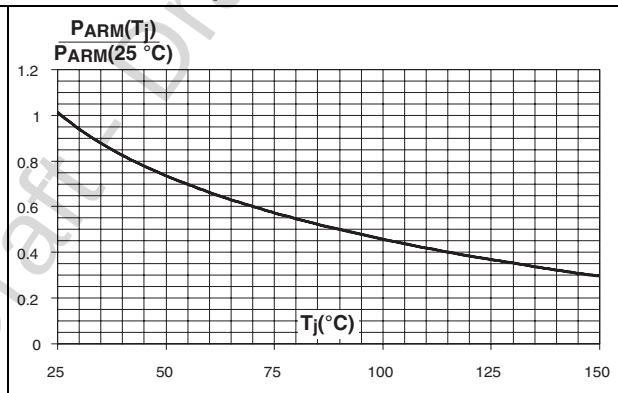


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values)

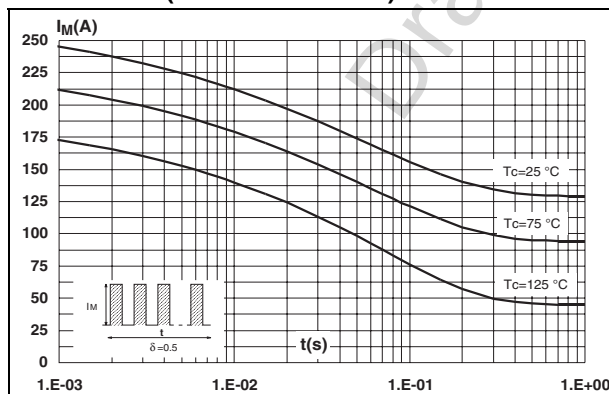


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

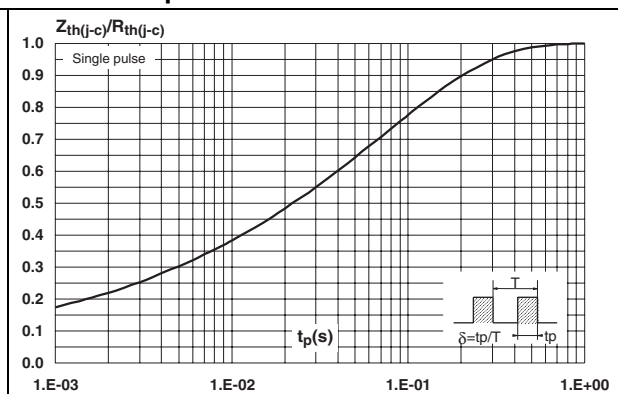


Figure 8. Reverse leakage current versus reverse voltage applied (typical values)

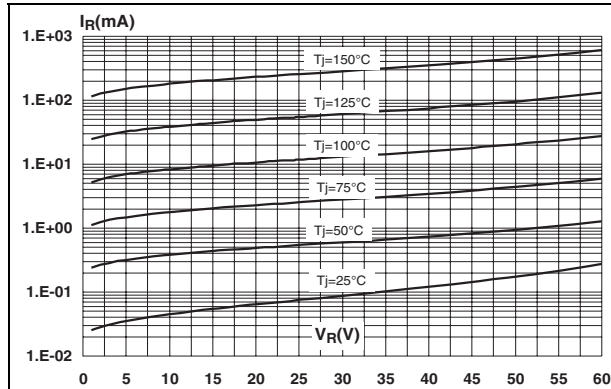


Figure 9. Junction capacitance versus reverse voltage applied (typical values)

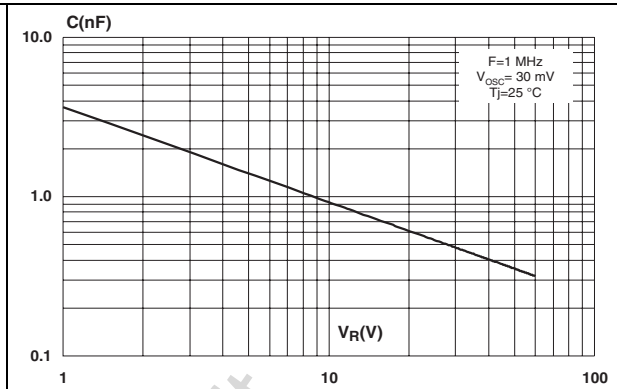


Figure 10. Forward voltage drop versus forward current

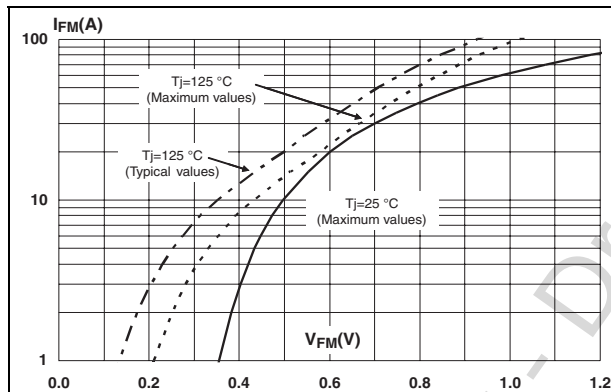


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (STPS41L60CG only)

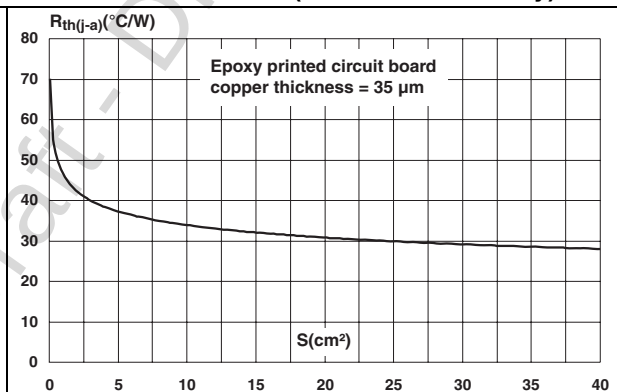
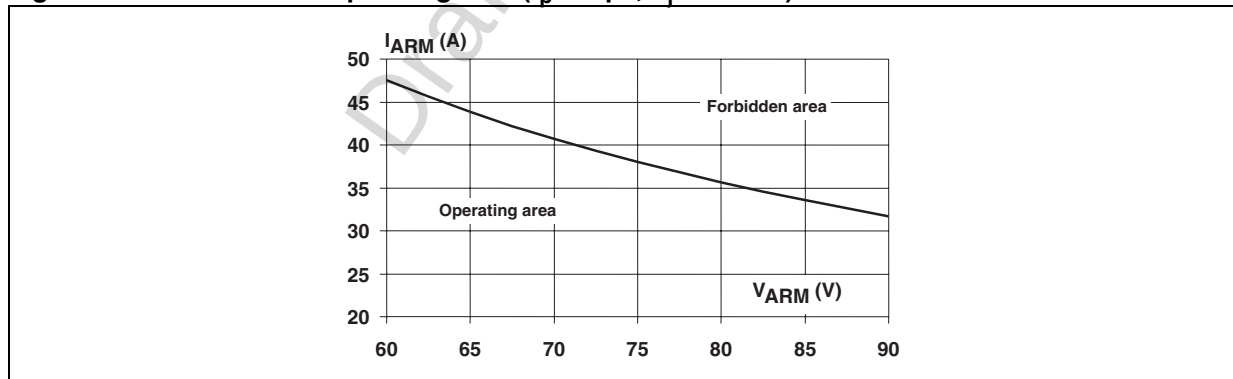


Figure 12. Reverse safe operating area ($t_p < 1 \mu s$, $T_J > 150^\circ C$)



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.

Figure 13. Package dimensions I²PAK

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
b	0.70	0.93	0.028	0.037
b1	1.14	1.17	0.044	0.046
b2	1.14	1.17	0.044	0.046
c	0.45	0.60	0.018	0.024
c2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
e	2.40	2.70	0.094	0.106
E	10.0	10.4	0.394	0.409
L	13.1	13.6	0.516	0.535
L1	3.48	3.78	0.137	0.149
L2	1.27	1.40	0.050	0.055

Figure 14. Package dimensions D²PAK

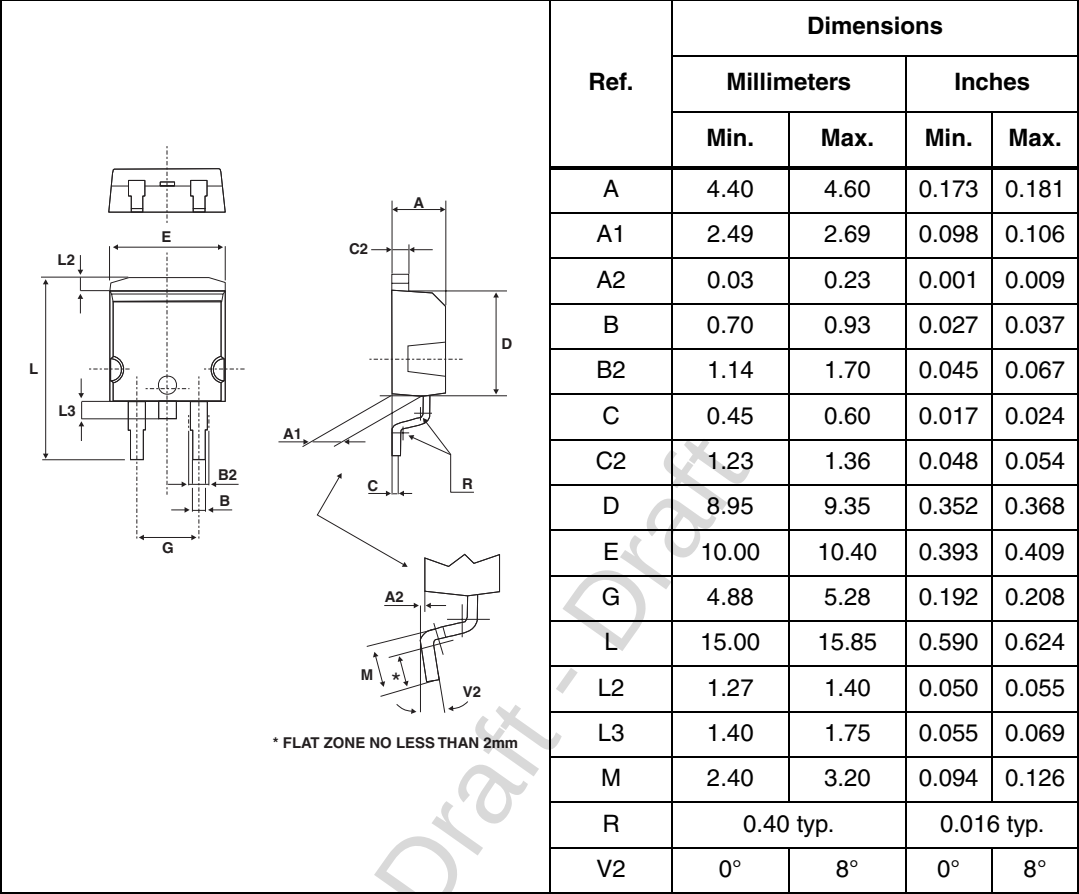


Figure 15. Footprint

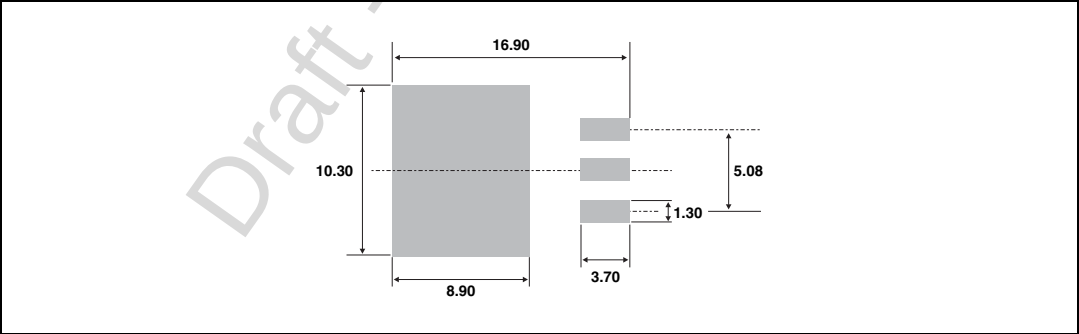
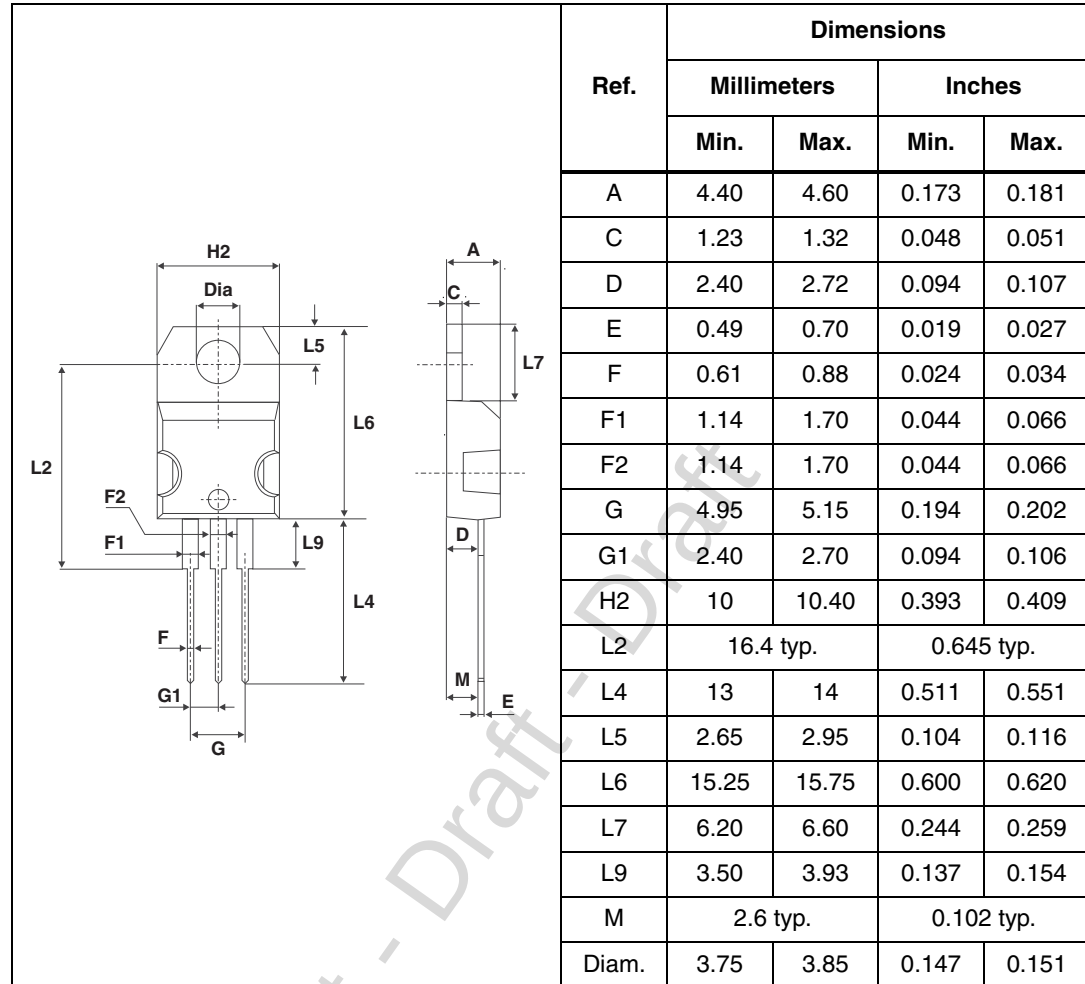


Figure 16. Package dimensions TO-220AB



3 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS41L60CG	STPS41L60CG	D ² PAK	1.48 g	50	Tube
STPS41L60CG-TR	STPS41L60CG	D ² PAK	1.48 g	1000	Tape and reel
STPS41L60CT	STPS41L60CT	TO-220AB	2.20 g	50	Tube
STPS41L60CR	STPS41L60CR	I ² PAK	1.49 g	50	Tube

4 Revision history

Table 6. Document revision history

Date	Revision	Changes
July 2003	3A	Previous issue
10-Jan-2007	4	Reformatted to current standards. Added ECOPACK statement Removed I_{RRM} and dV/dT from the Absolute ratings table on page 1. Updated reverse leakage current values in Table 3 and Figure 7.
28-May-2007	5	Updated figures 1, 2, and 5 to 10.
15-Jul-2011	6	Added electrical diagram on first page. Added parameters V_{ARM} and V_{ASM} to Table 2 . Added Figure 12 .

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