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STPS41L60CG

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# Power Schottky rectifier

## Technical Literature



### CUSTOM ATTRIBUTES

| | |
|---|---|
| **Alternate Identifier(s)** | 8616 |
| **Key process** | Product Development |
| **ISO Definition** | Specification |
| **Confidentiality Level** | Public |
| **Document Type** | Technical Literature |
| **Document Category** | Datasheet |
| **Document Family** | |
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| **Original Repository** | |
| **Status** | IN APPROVAL |
| **Responsible** | Caramanna Marcello |
| **Keywords** | Technical Literature, 8616, Product Development, Specification, Datasheet, STPS41L60C, |

**DOCUMENT HISTORY**

| Version | Release Date | Change Qualifier |
|---|---|---|
| Rev 6.1 | | Document change |
| 07/01/2014 AUTOMATIC REVALIDATION DATE WORKFLOW STARTED | | |

## DOCUMENT APPROVAL

| LABEL | USER FUNCTION | DATE |
|---|---|---|
| Donohoo Sean Michael | Document Controller | 17-Apr-2015 |

# STPS41L60C

## Power Schottky rectifier

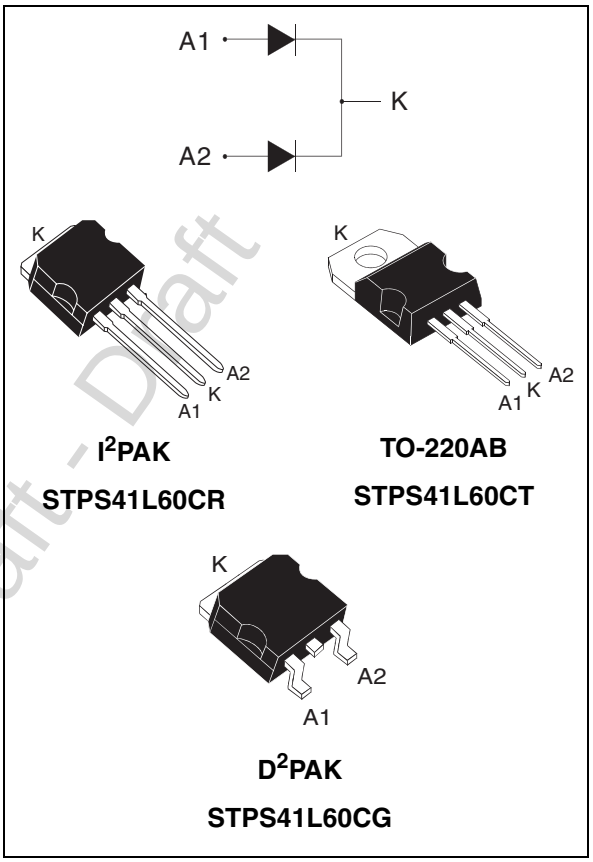
## Features

- 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 $D^2PAK$, $I^2PAK$ and TO-220AB, this device is intended for use in low voltage, high frequency inverters, free-wheeling and polarity protection applications.




**$I^2PAK$**
**STPS41L60CR**

**TO-220AB**
**STPS41L60CT**

**$D^2PAK$**
**STPS41L60CG**

**Figure 1. Electrical characteristics (a)**

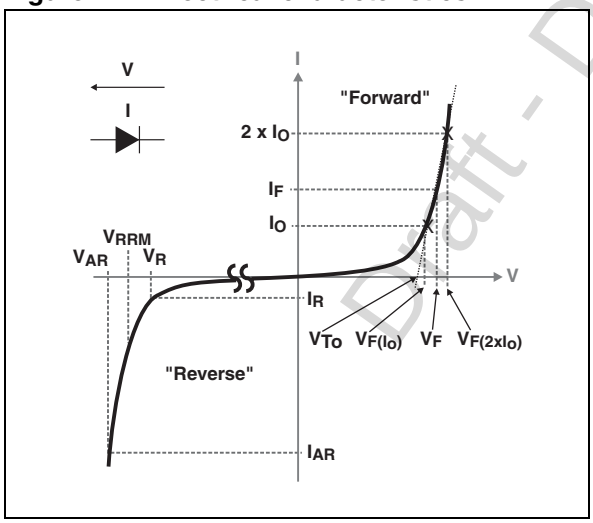



**Table 1. Device summary**

| | |
|---|---|
| $I_{F(AV)}$ | 2 x 20 A |
| $V_{RRM}$ | 60 V |
| $T_{j\ (max)}$ | 150 °C |
| $V_{F\ (max)}$ | 0.58 V |

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 µs). $V_R$, $I_R$, $V_{RRM}$ and $V_F$, are static characteristics

# 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<br>$\delta$ = 0.5 | Per diode<br>Per device | 20<br>40 | A |
| $I_{FSM}$ | Surge non repetitive forward current | tp = 10 ms Sinusoidal | | 220 | A |
| $P_{ARM}$ (1) | Repetitive peak avalanche power | tp = 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 |

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 12*
3. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ 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<br>Total | 1.5<br>0.8 | ° C/W |
| $R_{th\ (c)}$ | Coupling | | 0.1 | |

When the diodes 1 and 2 are used simultaneously :
$\Delta$Tj(diode 1) = P(diode1) x $R_{th(j-c)}$(Per diode) + P(diode 2) x $R_{th(c)}$

**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 | |

1. Pulse test: $t_p$ = 380 µs, $\delta$ < 2%

To evaluate the conduction losses use the following equation:
P = 0.42 x $I_{F(AV)}$ + 0.007 x $I_F{}^2{}_{(RMS)}$

**Figure 2. Conduction losses versus average current**

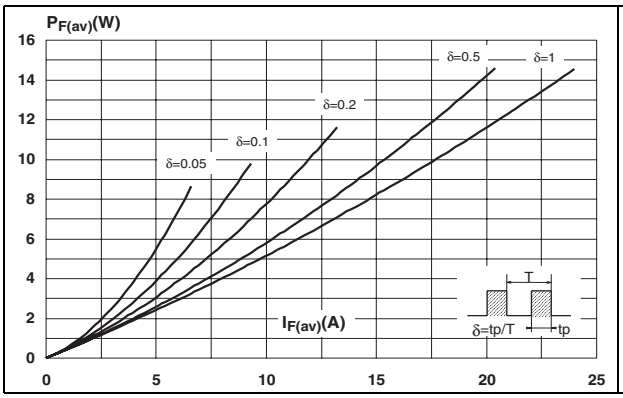



**Figure 3. Average forward current versus ambient temperature (δ = 0.5)**

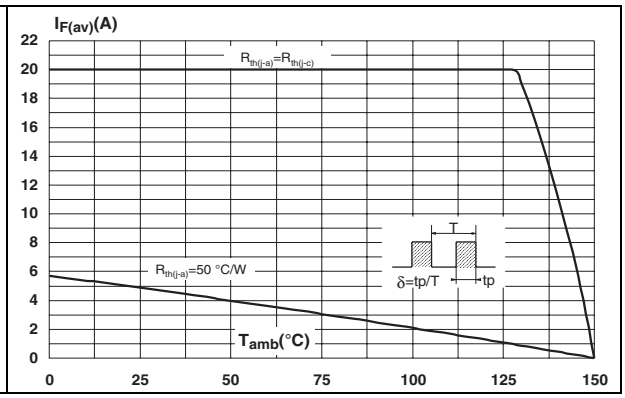



**Figure 4. Normalized avalanche power derating versus pulse duration**

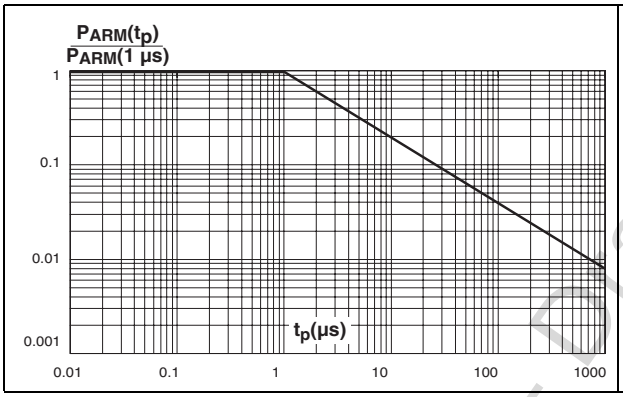



**Figure 5. Normalized avalanche power derating versus junction temperature**

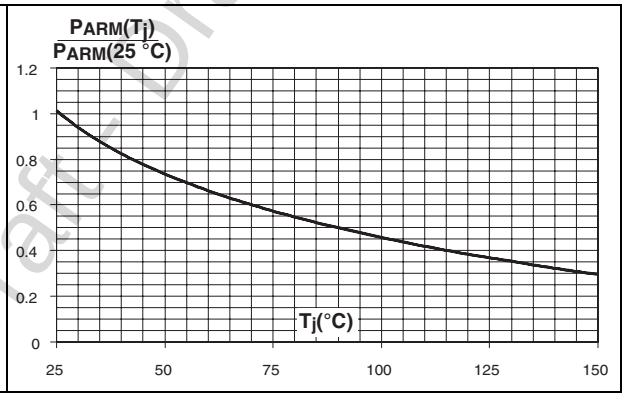



**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values)**

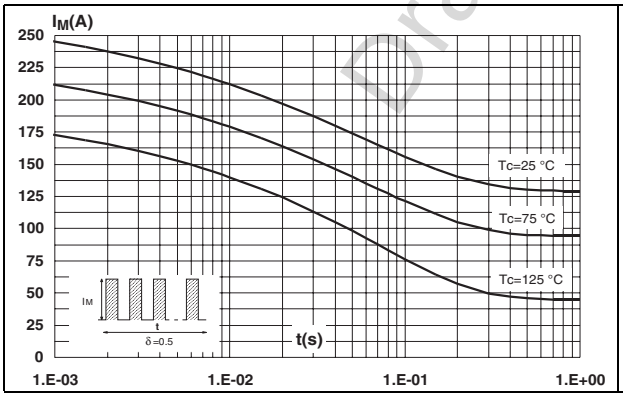



**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration**

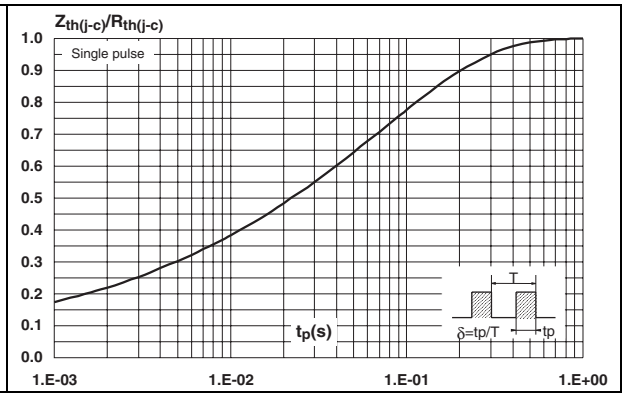


**Figure 8. Reverse leakage current versus reverse voltage applied (typical values)**

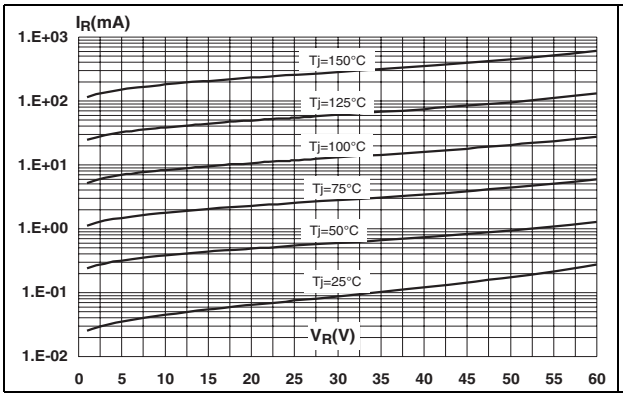



**Figure 9. Junction capacitance versus reverse voltage applied (typical values)**

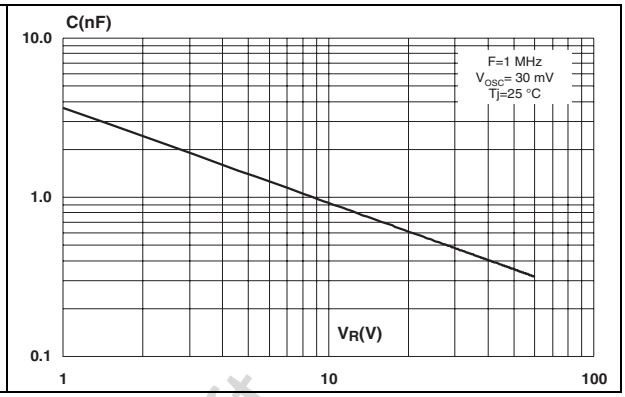



**Figure 10. Forward voltage drop versus forward current**

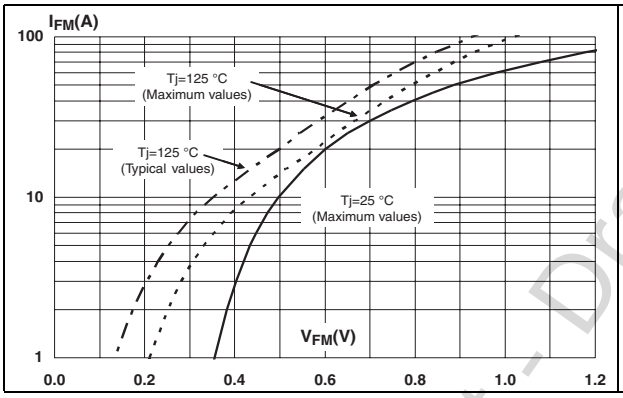



**Figure 11. Thermal resistance junction to ambient versus copper surface under tab (STPS41L60CG only)**

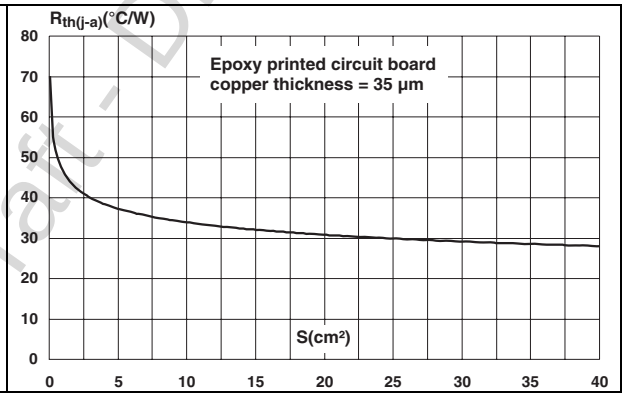
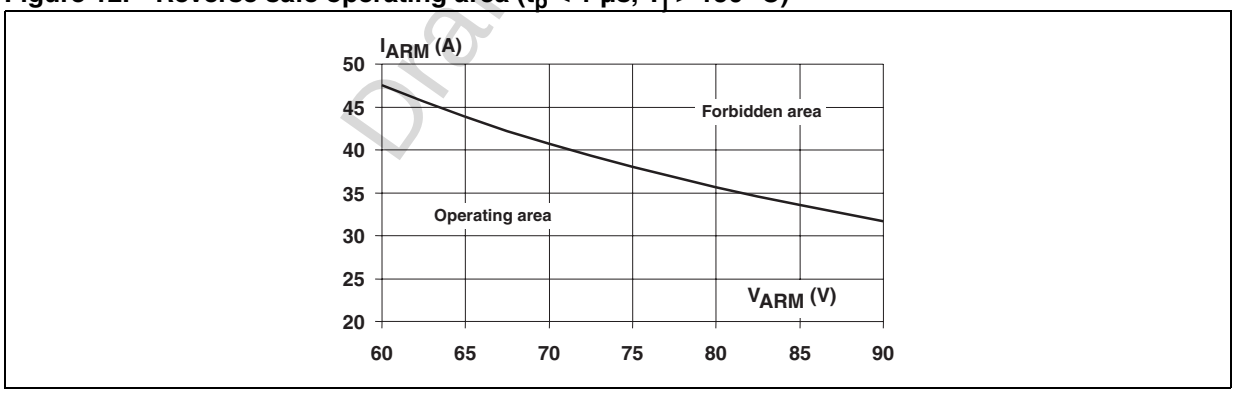



**Figure 12. Reverse safe operating area ($t_p$ < 1 µs, $T_j$ > 150 °C)**

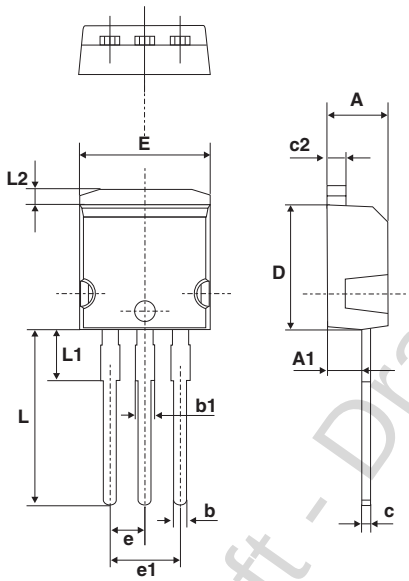


# 2 Package information

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

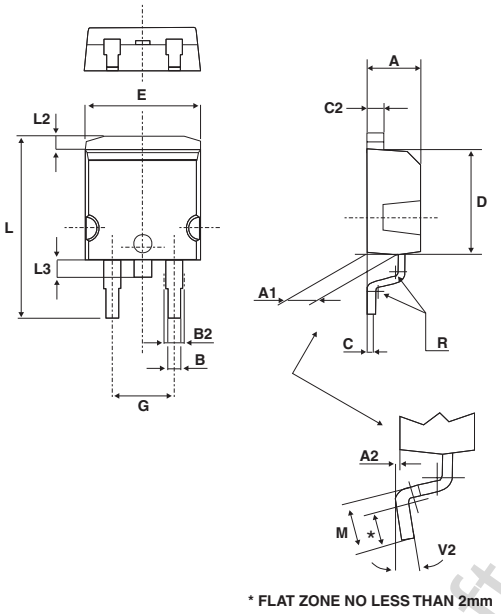
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

**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 $D^2PAK$**




| 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. Footprint**

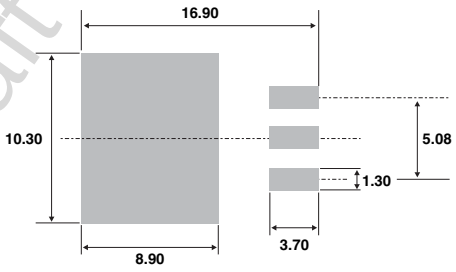
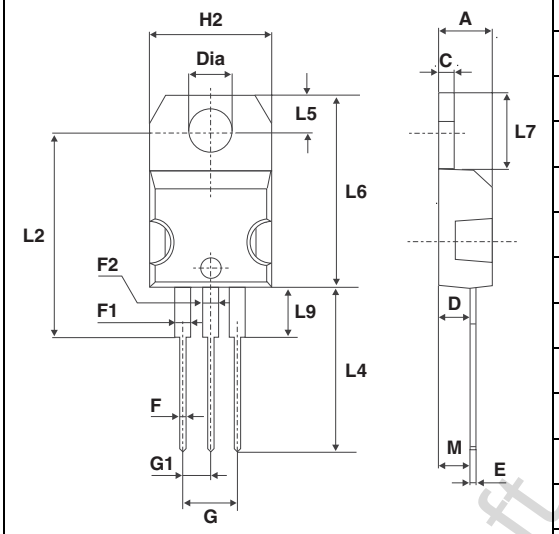


**Figure 16. Package dimensions TO-220AB**




| 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 |

# 3 Ordering information

**Table 5. Ordering information**

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