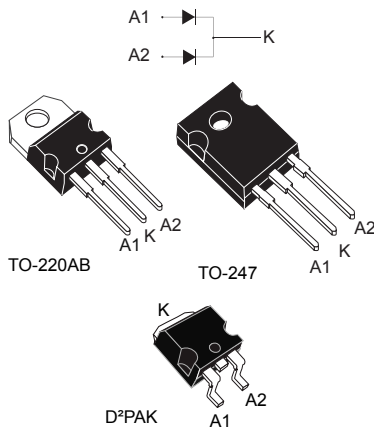


## 170 V power Schottky rectifier



### Features

- High junction temperature capability
- Low leakage current
- High voltage capabilities
- Good trade-off between leakage current and forward voltage drop
- Low thermal resistance
- High frequency operation
- Avalanche specification
- ECOPACK<sup>®</sup>2 compliant for TO-220AB and TO-247, on demand for D<sup>2</sup>PAK

### Applications

- Switching diode
- SMPS
- DC/DC converter
- Telecom power

### Description

This dual center tab Schottky rectifier is suited for high frequency switched mode power supplies.

Packaged in TO-247, D<sup>2</sup>PAK and TO-247, the **STPS40170C** is optimized for use to enhance the reliability in applications.

| Product status link        |          |
|----------------------------|----------|
| <a href="#">STPS40170C</a> |          |
| Product summary            |          |
| Symbol                     | Value    |
| $I_{F(AV)}$                | 2 x 20 A |
| $V_{RRM}$                  | 170 V    |
| $T_j$                      | 175 °C   |
| $V_F$ (typ.)               | 0.69 V   |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, per diode)**

| Symbol       | Parameter   | Value   | Unit |   |
|--------------|---|---|------|---|
| $V_{RRM}$    | Repetitive peak reverse voltage                             | 170   | V    |   |
| $I_{F(RMS)}$ | Forward rms current   | 60  | A    |   |
| $I_{F(AV)}$  | Average forward current, $\delta = 0.5$ square wave         | $T_c = 150\text{ °C}$ Per diode                       | 20   | A |
|              |   | $T_c = 145\text{ °C}$ Per device                      | 40   |   |
| $I_{FSM}$    | Surge non repetitive forward current                        | $t_p = 10\text{ ms}$ sinusoidal                       | 250  | A |
| $P_{ARM}$    | Repetitive peak avalanche power                             | $t_p = 10\text{ }\mu\text{s}$ , $T_j = 125\text{ °C}$ | 1015 | W |
| $T_{stg}$    | Storage temperature range                                   | -65 to +175   | °C   |   |
| $T_j$        | Maximum operating junction temperature range <sup>(1)</sup> | 175   | °C   |   |

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

**Table 2. Thermal resistance parameters**

| Symbol        | Parameter        | Max. value | Unit |      |
|---------------|------------------|------------|------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode  | 1.20 | °C/W |
|               |                  | Total      | 0.85 |      |
| $R_{th(c)}$   | Coupling         | 0.50       |      |      |

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 3. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Test conditions       | Min.                | Typ. | Max. | Unit |               |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 30   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 7    | 30   | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 20\text{ A}$ | -    |      | 0.92 | V             |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.69 | 0.75 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 40\text{ A}$ | -    |      | 1.00 |               |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.79 | 0.86 |               |

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

To evaluate the conduction losses, use the following equation:

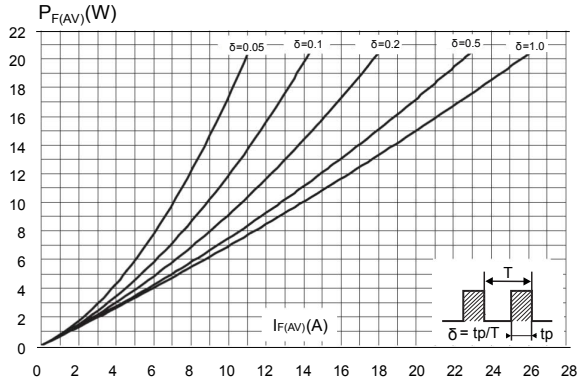
$$P = 0.64 \times I_{F(AV)} + 0.0055 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

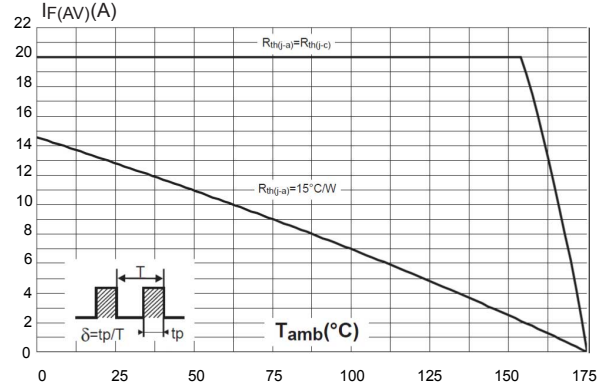
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

### 1.1 Characteristics (curves)

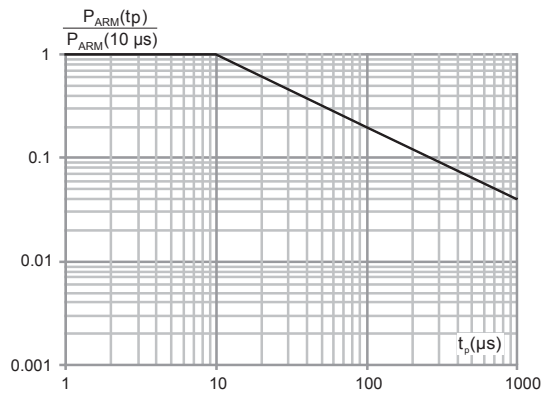
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



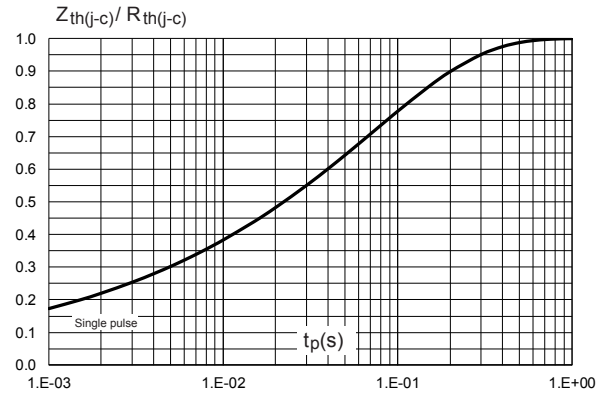
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



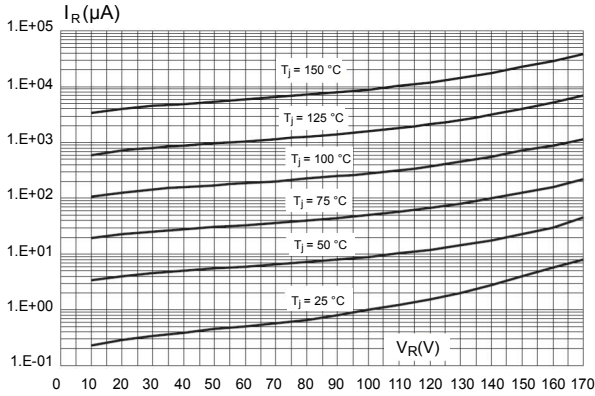
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125$  °C)**



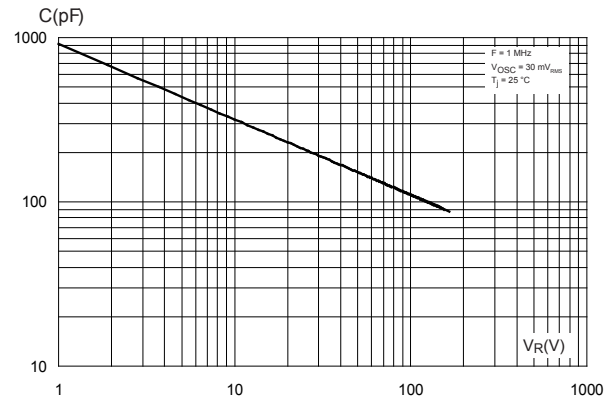
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



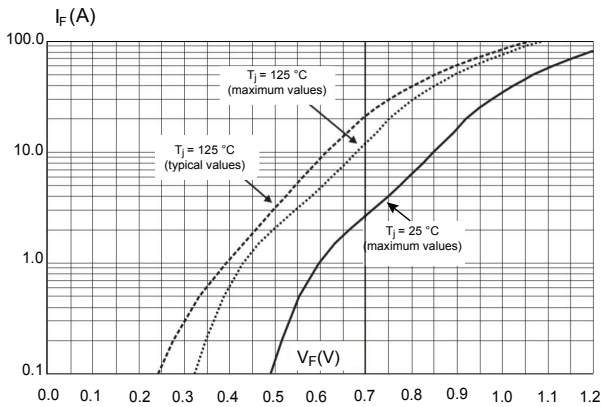
**Figure 5. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



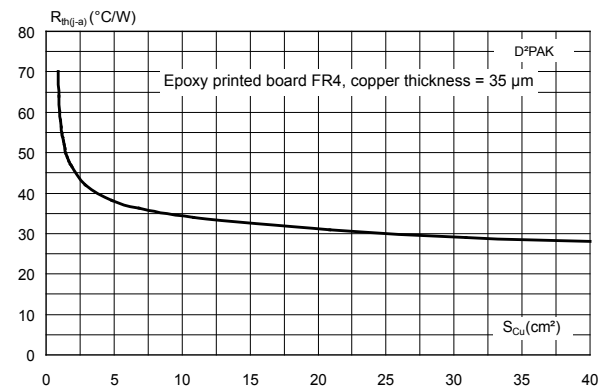
**Figure 6. Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 7. Forward voltage drop versus forward current (per diode)**



**Figure 8. Thermal resistance junction to ambient versus copper surface under tab**



## 2 Package information

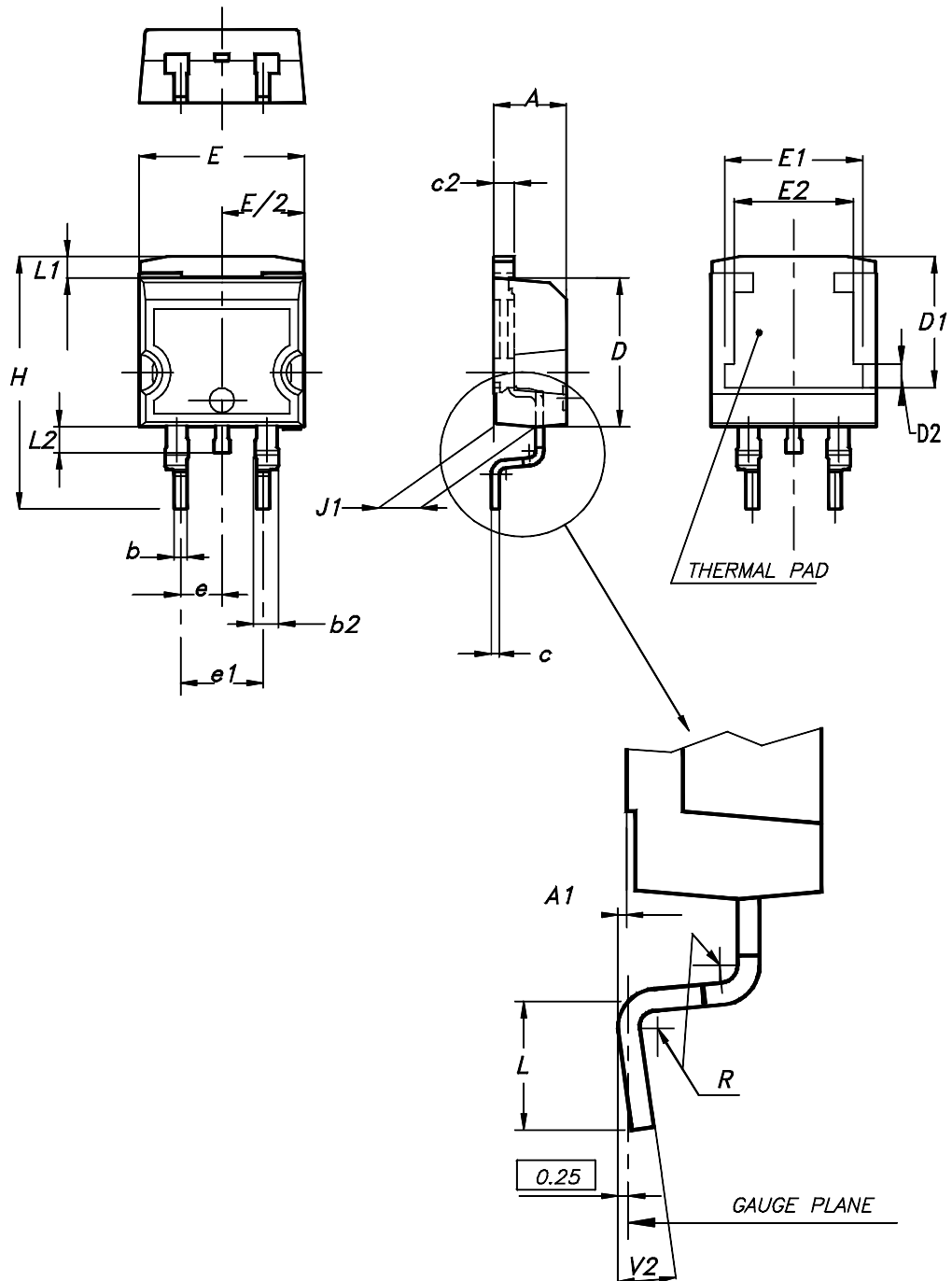
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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).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

### 2.1 D<sup>2</sup>PAK package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

Figure 9. D<sup>2</sup>PAK package outline

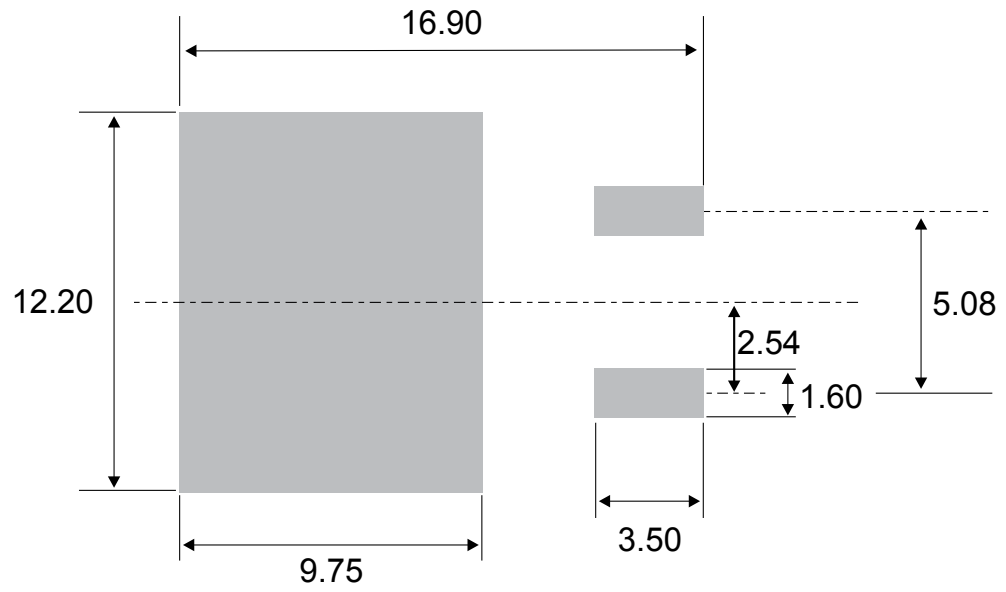


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

**Table 4. D<sup>2</sup>PAK package mechanical data**

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.36        | 4.60  | 0.172  | 0.181 |
| A1   | 0.00        | 0.25  | 0.000  | 0.010 |
| b    | 0.70        | 0.93  | 0.028  | 0.037 |
| b2   | 1.14        | 1.70  | 0.045  | 0.067 |
| c    | 0.38        | 0.69  | 0.015  | 0.027 |
| c2   | 1.19        | 1.36  | 0.047  | 0.053 |
| D    | 8.60        | 9.35  | 0.339  | 0.368 |
| D1   | 6.90        | 8.00  | 0.272  | 0.311 |
| D2   | 1.10        | 1.50  | 0.043  | 0.060 |
| E    | 10.00       | 10.55 | 0.394  | 0.415 |
| E1   | 8.10        | 8.90  | 0.319  | 0.346 |
| E2   | 6.85        | 7.25  | 0.266  | 0.282 |
| e    | 2.54 typ.   |       | 0.100  |       |
| e1   | 4.88        | 5.28  | 0.190  | 0.205 |
| H    | 15.00       | 15.85 | 0.591  | 0.624 |
| J1   | 2.49        | 2.90  | 0.097  | 0.112 |
| L    | 1.90        | 2.79  | 0.075  | 0.110 |
| L1   | 1.27        | 1.65  | 0.049  | 0.065 |
| L2   | 1.30        | 1.78  | 0.050  | 0.070 |
| R    | 0.4 typ.    |       | 0.015  |       |
| V2   | 0°          | 8°    | 0°     | 8°    |

Figure 10. D<sup>2</sup>PAK recommended footprint (dimensions in mm)

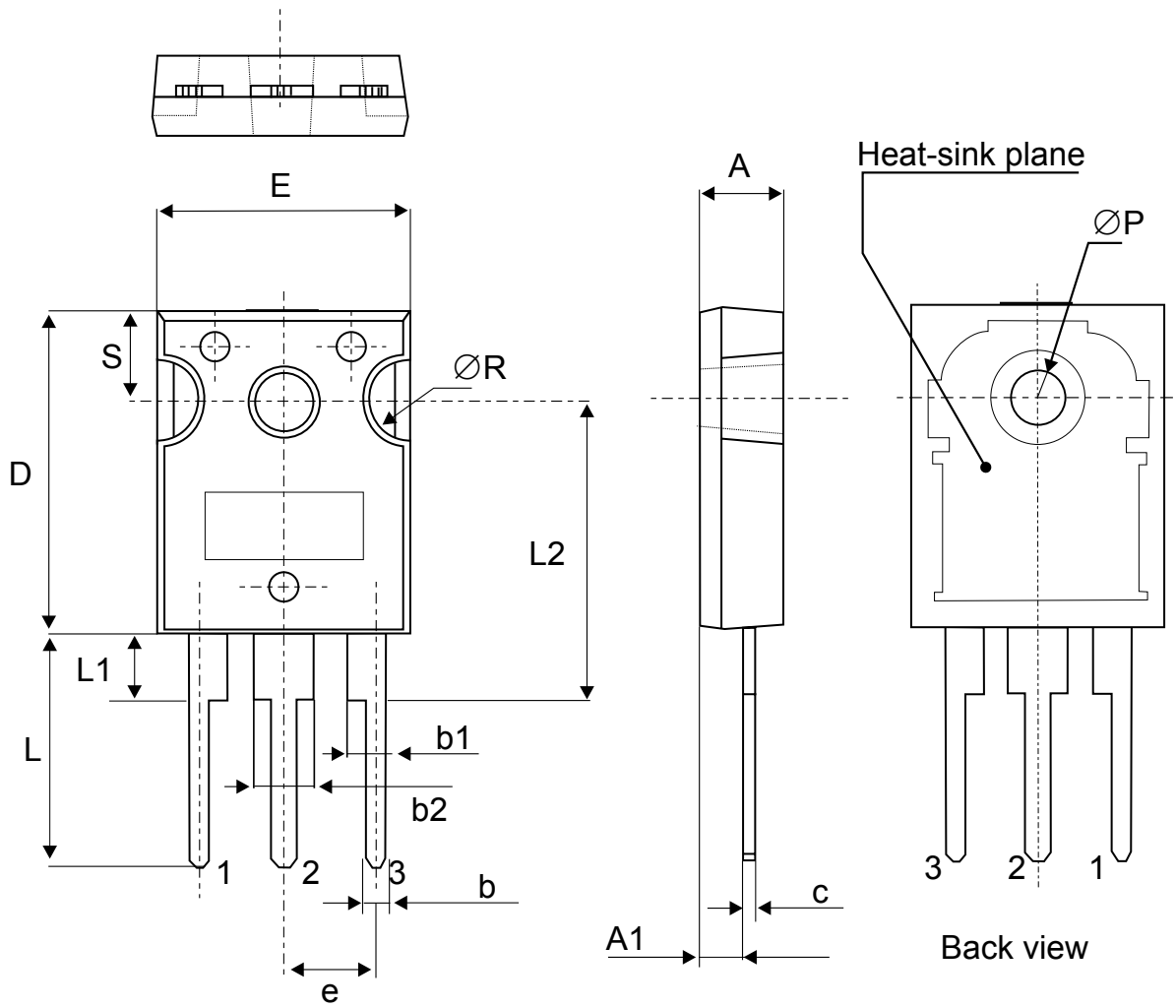




## 2.2 TO-247 package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 11. TO-247 package outline



**Table 5. TO-247 package mechanical data**

| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | 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    | 19.85       |       | 20.15 | 0.781  |       | 0.793 |
| E    | 15.45       |       | 15.75 | 0.608  |       | 0.620 |
| e    | 5.30        | 5.45  | 5.60  | 0.209  | 0.215 | 0.220 |
| L    | 14.20       |       | 14.80 | 0.559  |       | 0.582 |
| L1   | 3.70        |       | 4.30  | 0.145  |       | 0.169 |
| L2   |             | 18.50 |       |        | 0.728 |       |
| ØP   | 3.55        |       | 3.65  | 0.139  |       | 0.143 |
| ØR   | 4.50        |       | 5.50  | 0.177  |       | 0.217 |
| S    | 5.30        | 5.50  | 5.70  | 0.209  | 0.216 | 0.224 |

1. Inches dimensions given for reference only



| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| c    | 0.48        | 0.70  | 0.019      | 0.028 |
| D    | 15.25       | 15.75 | 0.600      | 0.620 |
| D1   | 1.27 typ.   |       | 0.050 typ. |       |
| E    | 10.00       | 10.40 | 0.394      | 0.409 |
| e    | 2.40        | 2.70  | 0.094      | 0.106 |
| e1   | 4.95        | 5.15  | 0.195      | 0.203 |
| F    | 1.23        | 1.32  | 0.048      | 0.052 |
| H1   | 6.20        | 6.60  | 0.244      | 0.260 |
| J1   | 2.40        | 2.72  | 0.094      | 0.107 |
| L    | 13.00       | 14.00 | 0.512      | 0.551 |
| L1   | 3.50        | 3.93  | 0.138      | 0.155 |
| L20  | 16.40 typ.  |       | 0.646 typ. |       |
| L30  | 28.90 typ.  |       | 1.138 typ. |       |
| θP   | 3.75        | 3.85  | 0.148      | 0.152 |
| Q    | 2.65        | 2.95  | 0.104      | 0.116 |

### 3 Ordering information

**Table 7. Ordering information**

| Order code     | Marking     | Package            | Weight | Base qty. | Delivery mode |
|----------------|-------------|--------------------|--------|-----------|---------------|
| STPS40170CT    | STPS40170CT | TO-220AB           | 1.95 g | 50        | Tube          |
| STPS40170CG-TR | STPS40170CG | D <sup>2</sup> PAK | 1.38 g | 10000     | Tape and reel |
| STPS40170CW    | STPS40170CW | TO-247             | 4.36 g | 30        | Tube          |

## Revision history

**Table 8. Document revision history**

| Date        | Version | Changes   |
|-------------|---------|---|
| 16-Sep-2005 | 1       | Initial release.  |
| 01-Jun-2018 | 2       | Updated $P_{ARM}$ value and removed "Normalized avalanche power derating" curves. |

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