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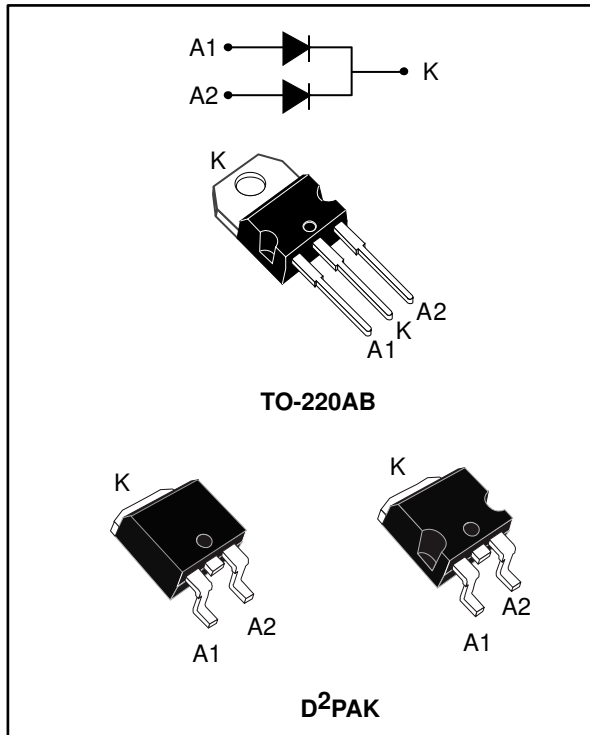
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High frequency secondary rectifier

Datasheet - production data



Description

Dual center tap fast recovery epitaxial diodes suited for switch mode power supply and high frequency DC to DC converters.

Packaged either in TO-220AB and D²PAK, this device is particularly intended for secondary rectification inside SMPS with high space and power density.

Table 1: Device summary

| Symbol | Value |
|-----------------|----------------|
| $I_{F(AV)}$ | 2 x 10 A |
| V_{RRM} | 300 V |
| T_j | -40 to +175 °C |
| V_F (typ.) | 0.8 V |
| t_{rr} (typ.) | 26 ns |

Features

- Ultrafast, soft and noise-free recovery
- Low forward voltage drop meaning very small conduction losses
- ECOPACK^{®2} compliant component for D²PAK on demand

1 Characteristics

Table 2: Absolute ratings (limiting values, per diode, at 25 °C, unless otherwise specified)

| Symbol | Parameter | | | Value | Unit |
|---------------------|---|-----------------------------------|------------|-------------|------|
| V _{RRM} | Repetitive peak reverse voltage | | | 300 | V |
| I _{F(RMS)} | Forward rms current | | | 30 | A |
| I _{F(AV)} | Average forward current δ = 0.5, square wave | T _C = 155 °C | Per diode | 10 | A |
| | | T _C = 150 °C | Per device | 20 | |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 ms sinusoidal | | 150 | A |
| T _{stg} | Storage temperature range | | | -65 to +175 | °C |
| T _j | Maximum operating junction temperature range | | | -40 to +175 | °C |

Table 3: Thermal parameters

| Symbol | Parameter | | Max. value | Unit |
|----------------------|------------------|-----------|------------|------|
| R _{th(j-c)} | Junction to case | Per diode | 1.5 | °C/W |
| | | Total | 1.0 | |
| R _{th(c)} | Coupling | | 0.5 | °C/W |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j (\text{diode1}) = P_{(\text{diode1})} \times R_{\text{th(j-c)}} (\text{per diode}) + P_{(\text{diode2})} \times R_{\text{th(c)}}$$

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 = V _{RRM} | - | | 10 | μA |
| | | T _j = 125 °C | | - | 10 | 100 | |
| V _F ⁽²⁾ | Forward voltage drop | T _j = 25 °C | I _F = 10 A | - | 0.95 | 1.2 | V |
| | | T _j = 125 °C | | - | 0.8 | 0.95 | |

Notes:

⁽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:

$$P = 0.8 \times I_{F(AV)} + 0.015 \times I_{F(RMS)}^2$$

Table 5: Dynamic electrical characteristics (per diode)

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|--------------|--------------------------|-----------------------|---|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ °C}$ | $I_F = 1\text{ A}$, $V_R = 30\text{ V}$, $di_F/dt = -100\text{ A}/\mu\text{s}$ | - | 26 | 35 | ns |
| | | | $I_F = 10\text{ A}$, $V_R = 200\text{ V}$, $di_F/dt = -200\text{ A}/\mu\text{s}$ | - | 55 | 72 | |
| I_{RM} | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 10\text{ A}$, $V_R = 200\text{ V}$, $di_F/dt = -200\text{ A}/\mu\text{s}$ | - | 9 | 12 | A |
| S_{factor} | Softness factor | | | - | 0.3 | | |
| Q_{RR} | Reverse recovery charges | | | - | 250 | 375 | nC |
| t_{fr} | Forward recovery time | $T_j = 25\text{ °C}$ | $I_F = 10\text{ A}$, $V_{FR} = 1.05\text{ V}$, $di_F/dt = 100\text{ A}/\mu\text{s}$ | - | | 200 | ns |
| V_{FP} | Forward recovery voltage | | | - | 2.5 | 3.5 | V |

1.1 Characteristics (curves)

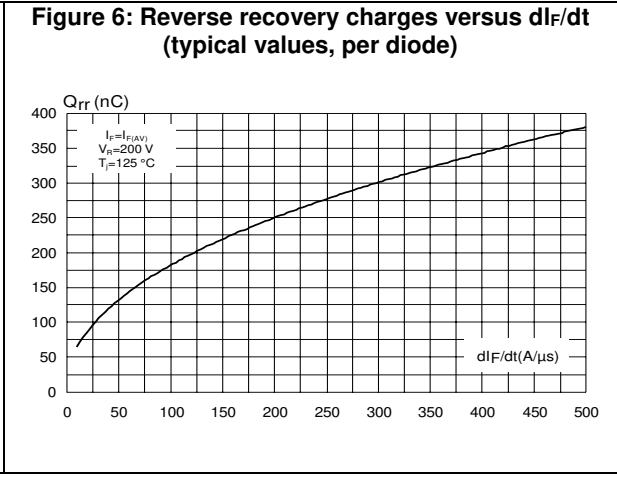
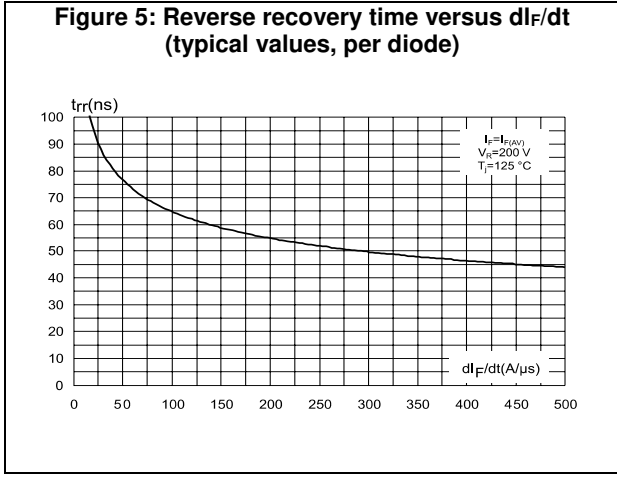
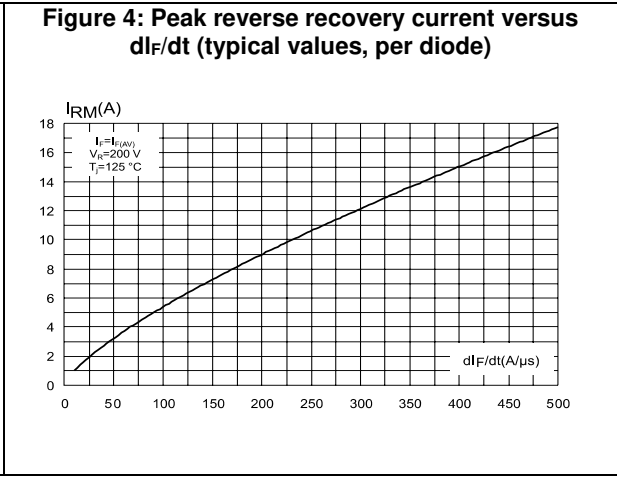
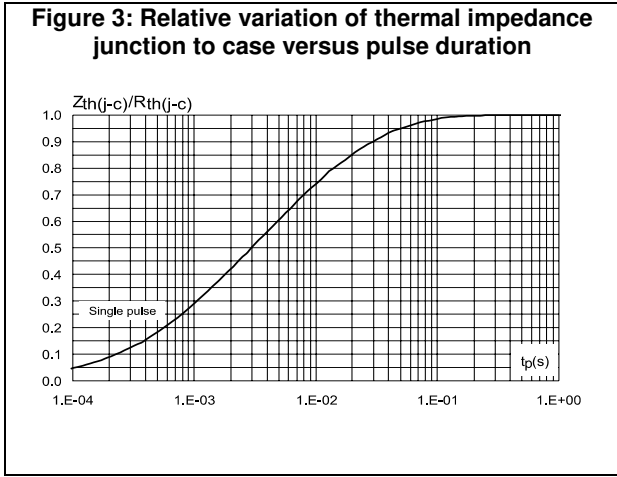
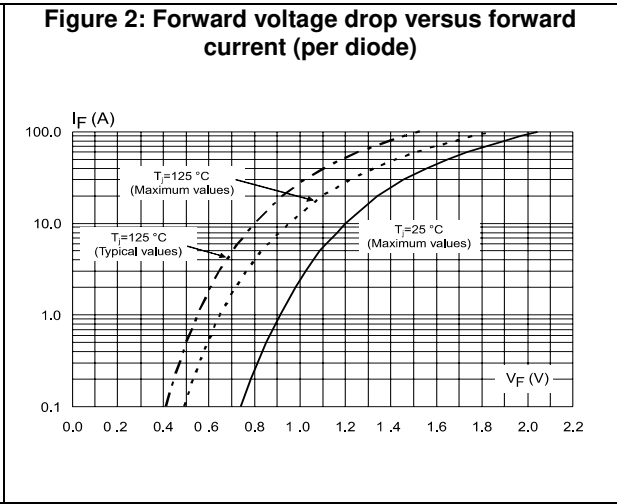
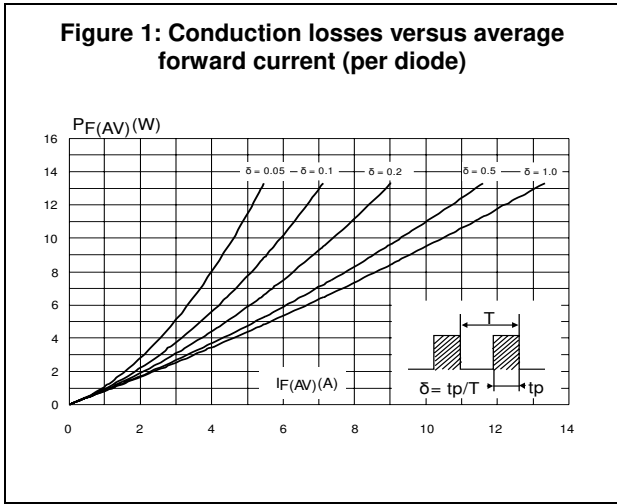


Figure 7: Reverse recovery softness factor versus di_F/dt (typical values, per diode)

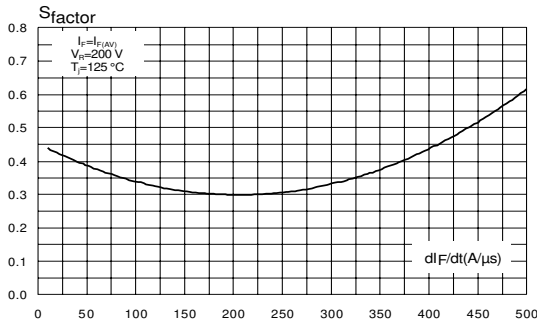


Figure 8: Relative variation of dynamic parameters versus junction temperature

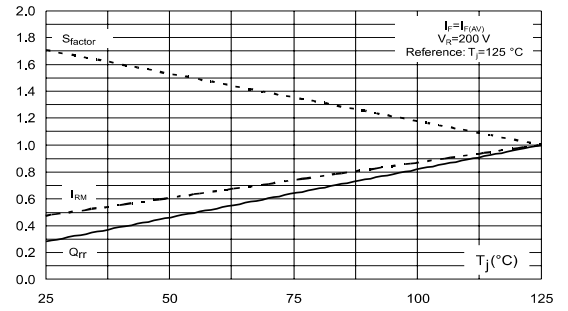


Figure 9: Transient peak forward voltage versus di_F/dt (typical values, per diode)

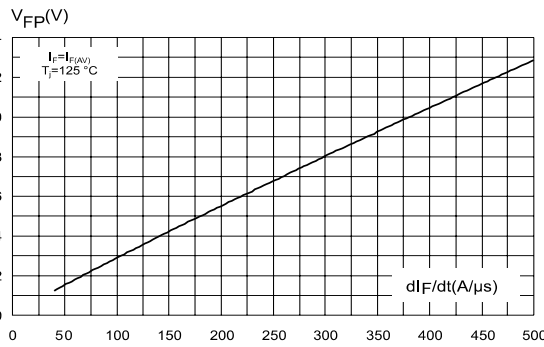


Figure 10: Forward recovery time versus di_F/dt (typical values, per diode)

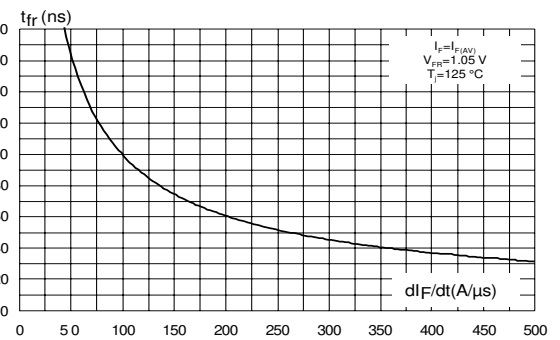


Figure 11: Junction capacitance versus reverse voltage applied (typical values, per diode)

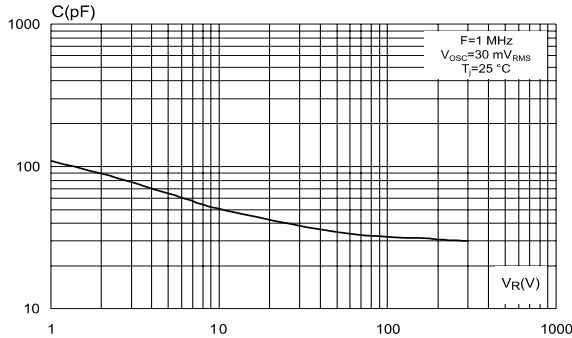
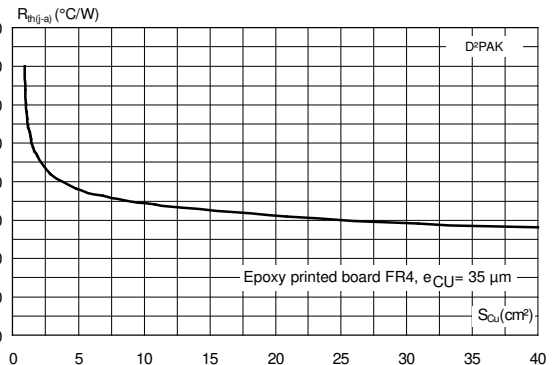


Figure 12: Thermal resistance, junction to ambient, versus copper surface under tab



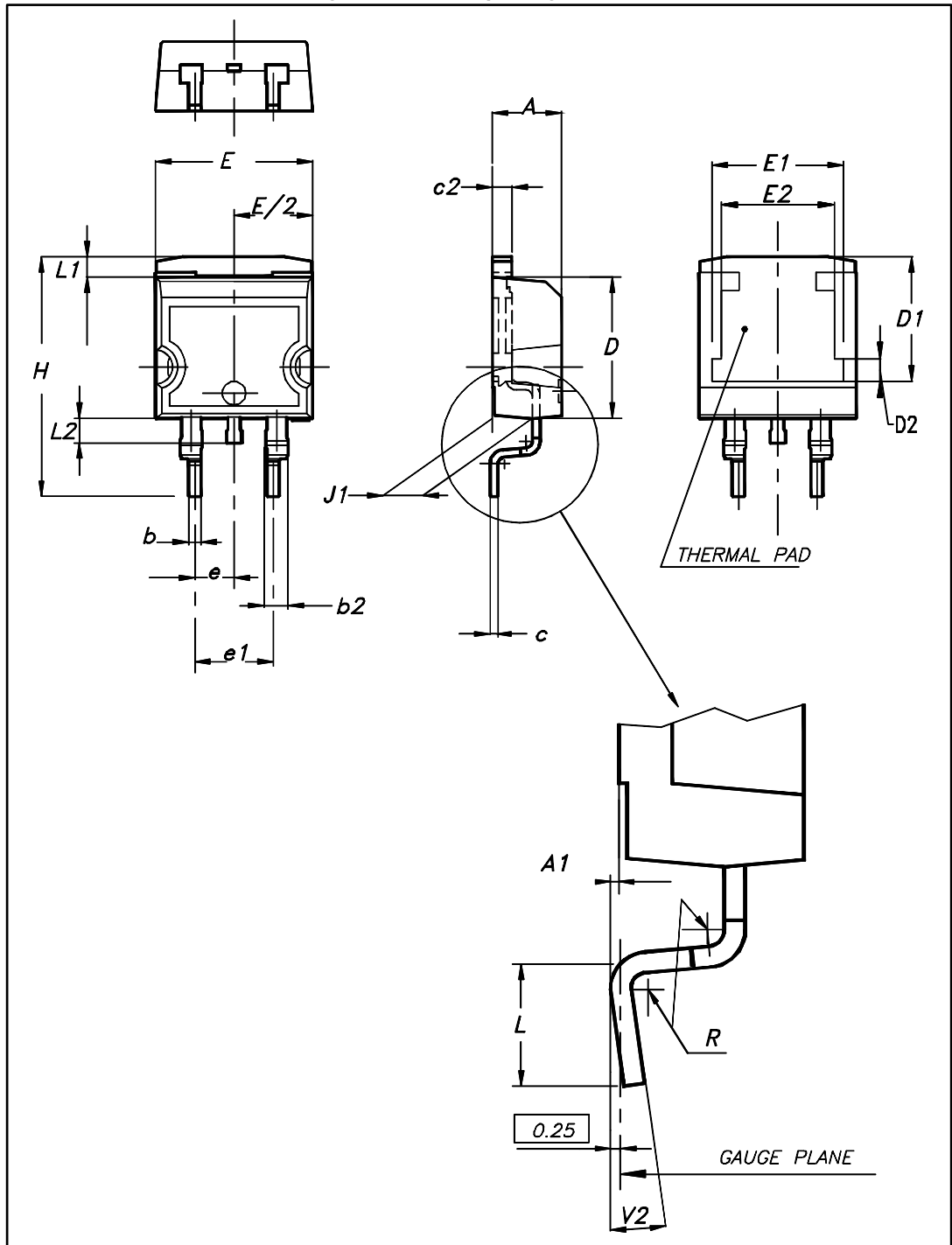
2 Package information

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.

- Cooling method: by conduction (C)
- Epoxy meets UL 94, V0
- Recommended torque value: 0.55 N·m (for TO-220AB)
- Maximum torque value: 0.7 N·m (for TO-220AB)

2.1 D²PAK package information

Figure 13: D²PAK package outline

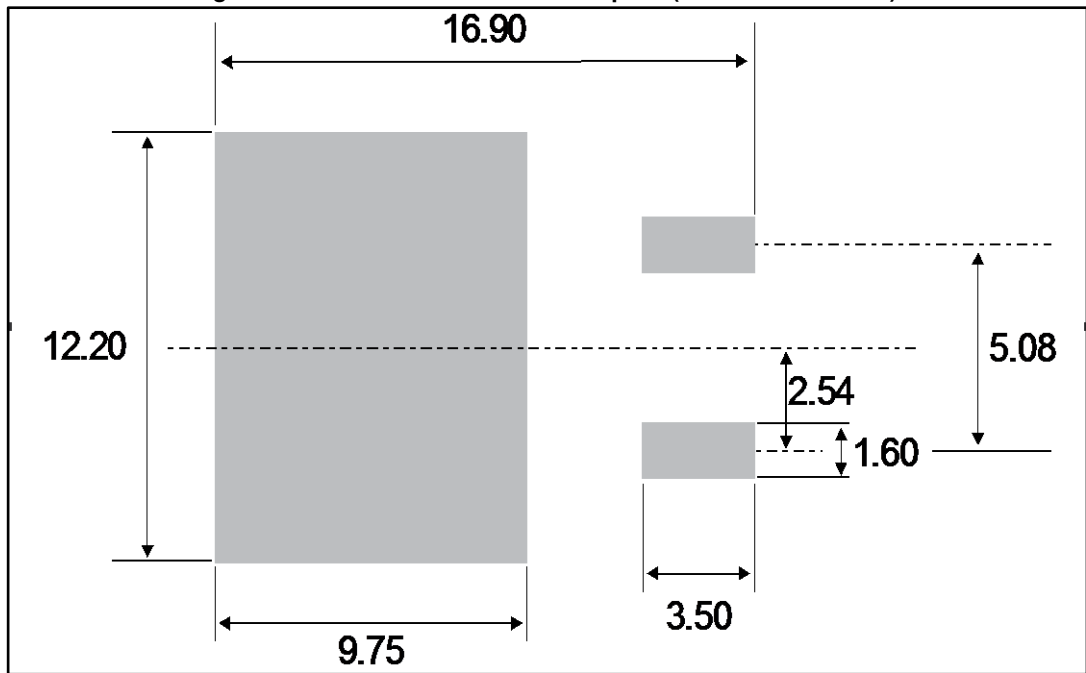


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6: D²PAK 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 14: D²PAK recommended footprint (dimensions in mm)



2.2 TO-220AB package information

Figure 15: TO-220AB package outline

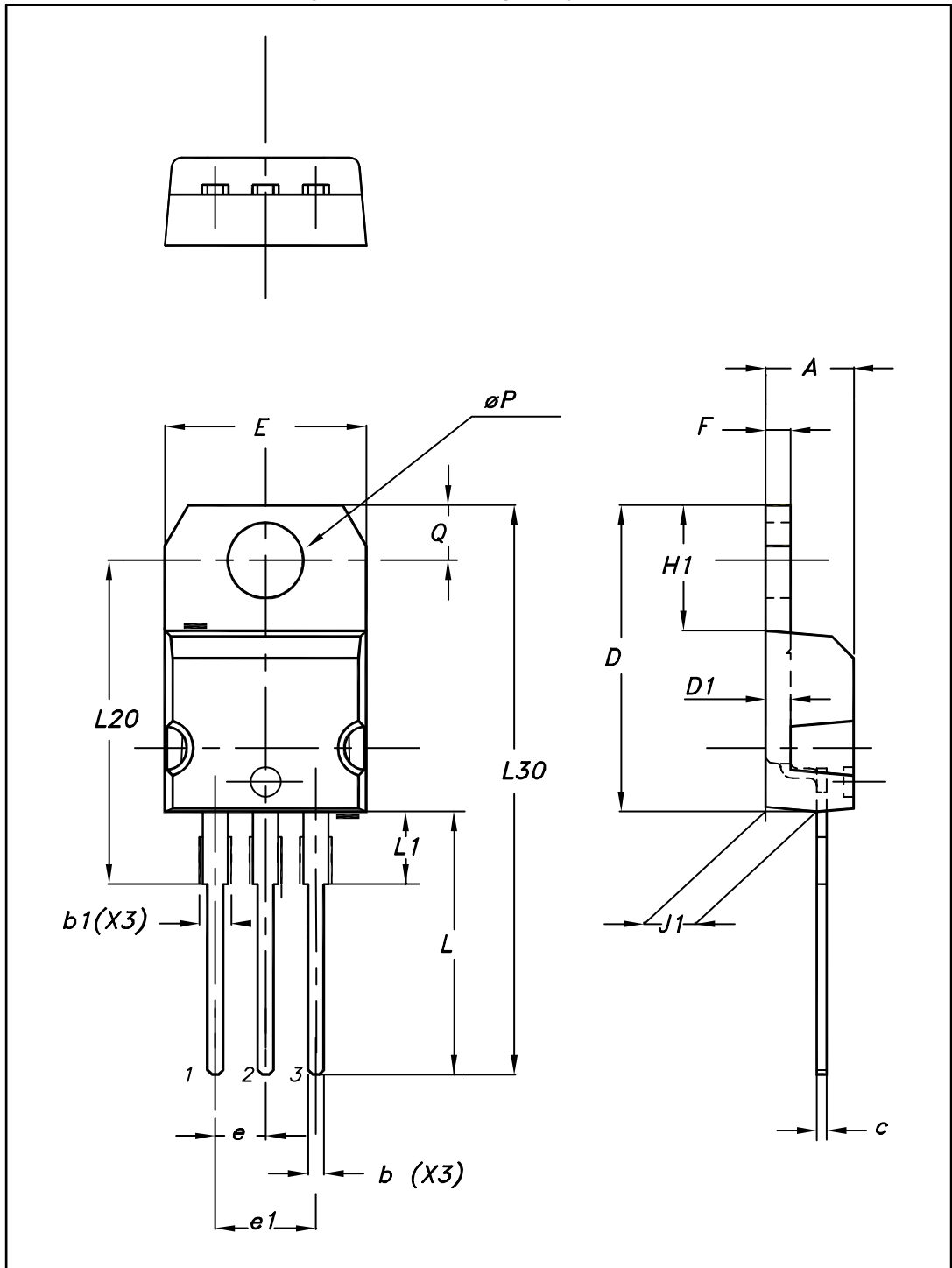


Table 7: TO-220AB package mechanical data

| Ref. | Dimensions | | | |
|------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| b | 0.61 | 0.88 | 0.240 | 0.035 |
| b1 | 1.14 | 1.70 | 0.045 | 0.067 |
| 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 8: Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|----------------|-------------|--------------------|--------|-----------|---------------|
| STTH20L03CT | STTH20L03CT | TO-220AB | 1.9 g | 50 | Tube |
| STTH20L03CG-TR | STTH20L03CG | D ² PAK | 1.38 g | 1000 | Tape and reel |

4 Revision history

Table 9: Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 22-Jun-2012 | 1 | Initial release. |
| 07-Oct-2016 | 2 | Updated cover page and Table 8: "Ordering information" . Updated Section 2.1: "D²PAK package information" . |

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