# 1 Characteristics

**Table 1. Absolute Ratings (limiting values)**

| Symbol | Parameter | | | | Value | Unit |
|---|---|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage | | | | 45 | V |
| $I_{F(RMS)}$ | RMS forward voltage | | | | 30 | A |
| $I_{F(AV)}$ | Average forward current | TO-220AB / $D^2PAK$ | $T_c$ =135° C<br>$\delta$ = 0.5 | Per diode<br>Per device | 10<br>20 | A |
| | | TO-220FPAB | $T_c$ = 115° C<br>$\delta$ = 0.5 | Per diode<br>Per device | 10<br>20 | A |
| $I_{FSM}$ | Surge non repetitive forward current | | $t_p$ = 10 ms Sinusoidal | | 180 | A |
| $I_{RRM}$ | Peak repetitive reverse current | | $t_p$ = 2 µs square F = 1 kHz | | 1 | A |
| $I_{RSM}$ | Non repetitive peak reverse current | | $t_p$ = 100 µs square | | 2 | A |
| $P_{ARM}$ | Repetitive peak avalanche power | | $t_p$ = 1 µs $T_j$ = 25°C | | 4000 | W |
| $T_{stg}$ | Storage temperature range | | | | -65 to + 150 | °C |
| $T_j$ | Maximum operating junction temperature (1) | | | | 150 | °C |
| dV/dt | Critical rate of rise of reverse voltage | | | | 10000 | V/µs |

1. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

**Table 2. Thermal resistances**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | TO-220FPAB | Per diode<br>Total<br>Coupling | 4.5<br>3.5<br>2.5 | °C/W |
| $R_{th(j-c)}$ | Junction to case | TO-220AB / $D^2PAK$ | Per diode<br>Total<br>Coupling | 2.2<br>1.3<br>0.3 | °C/W |

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 3. Static electrical characteristics (per diode)**

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_R$(1) | Reverse leakage current | $T_j$ = 25° C | $V_R = V_{RRM}$ | | | 0.2 | mA |
| | | $T_j$ = 125° C | | | 65 | 130 | mA |
| $V_F$(1) | Forward voltage drop | $T_j$ = 25° C | $I_F$ = 10 A | | | 0.55 | V |
| | | $T_j$ = 125° C | $I_F$ = 10 A | | 0.44 | 0.5 | |
| | | $T_j$ = 25° C | $I_F$ = 20 A | | | 0.73 | |
| | | $T_j$ = 125° C | $I_F$ = 20 A | | 0.62 | 0.72 | |

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

To evaluate the conduction losses use the following equation:
$P = 0.28 \times I_{F(AV)} + 0.022\ I_F{}^2{}_{(RMS)}$

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

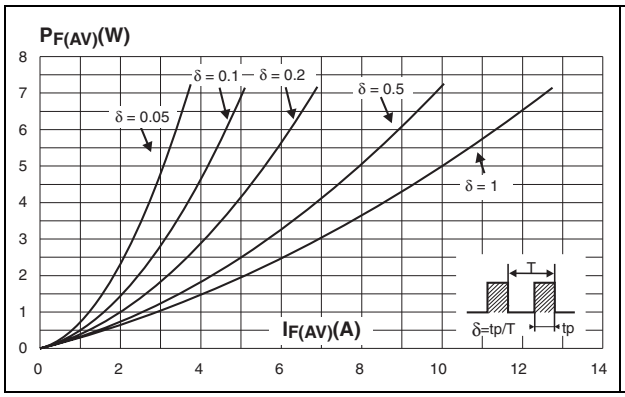



**Figure 2. Average forward current versus ambient temperature (δ = 0.5, per diode)**

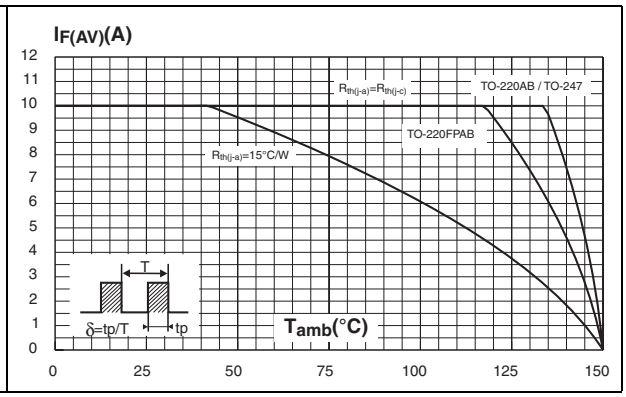



**Figure 3. Normalized avalanche power derating versus pulse duration**

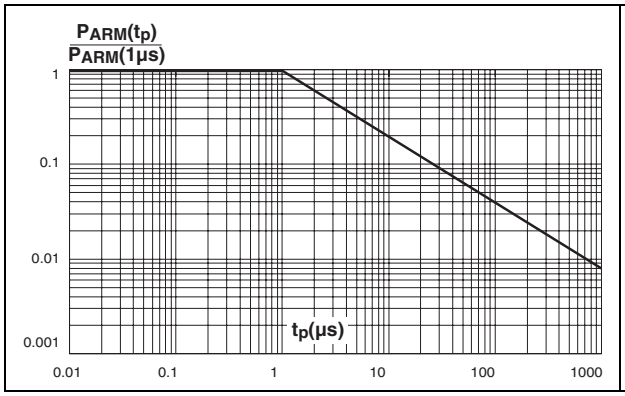



**Figure 4. Normalized avalanche power derating versus junction temperature**

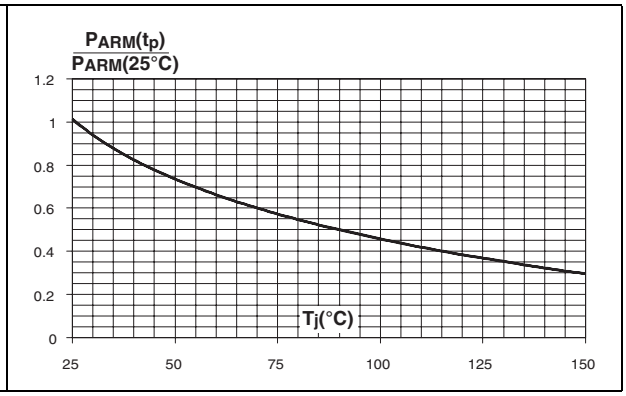



**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode, TO-220AB, D²PAK)**

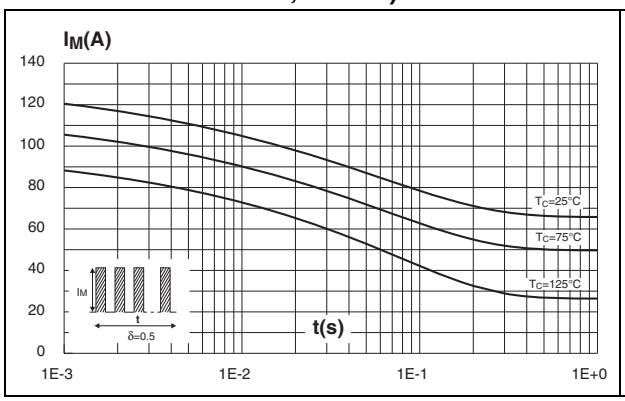



**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode, TO-220FPAB)**

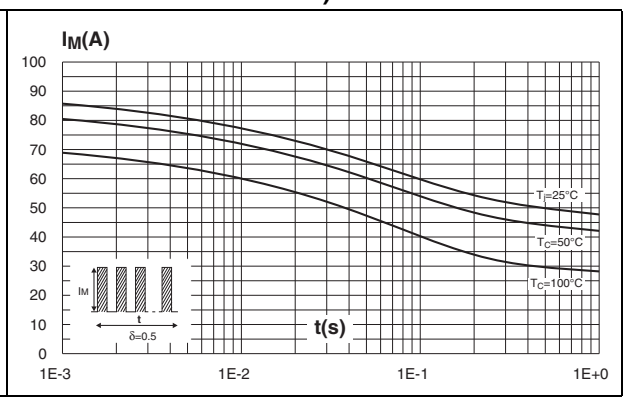


**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, D²PAK)**

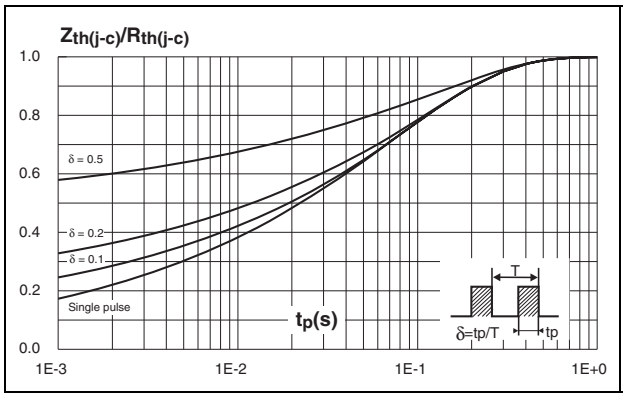



**Figure 8. Relative variation of thermal impedance junction to case versus pulse duration ( TO-220FPAB)**

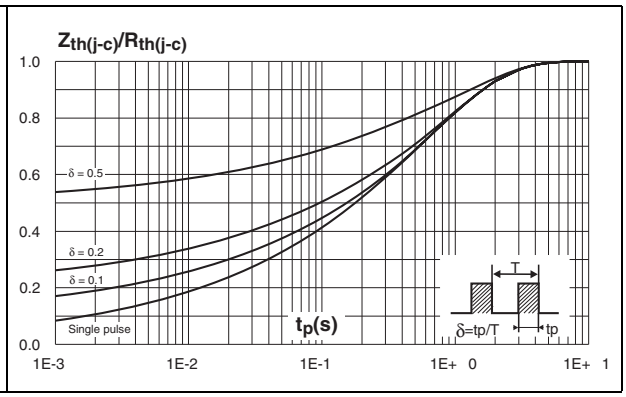



**Figure 9. Reverse leakage current versus reverse voltage applied (typical values, per diode)**

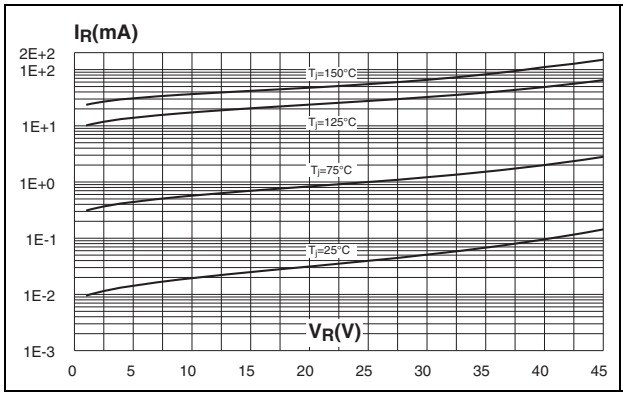



**Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)**

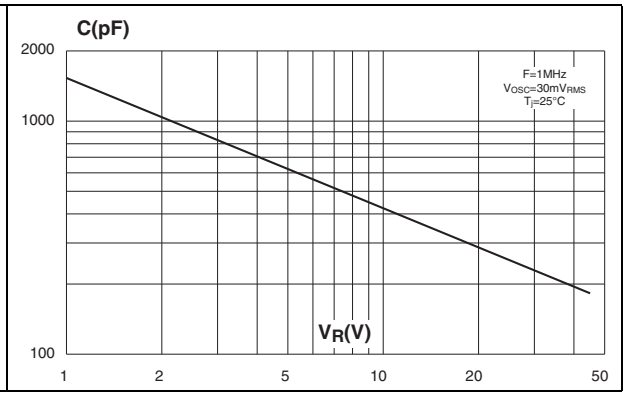



**Figure 11. Forward voltage drop versus forward current (maximum values, per diode)**

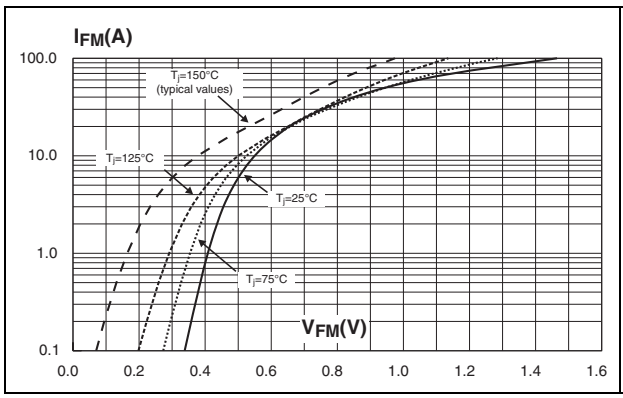
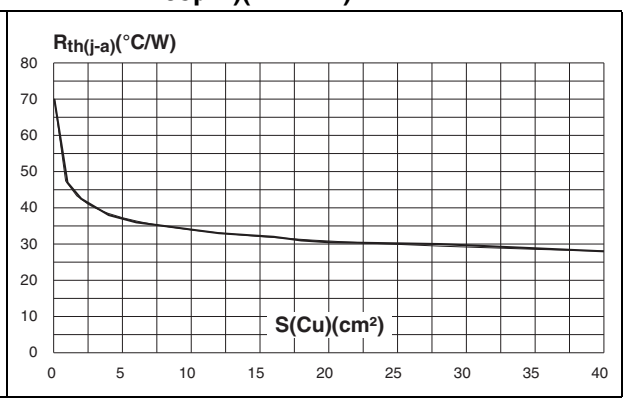


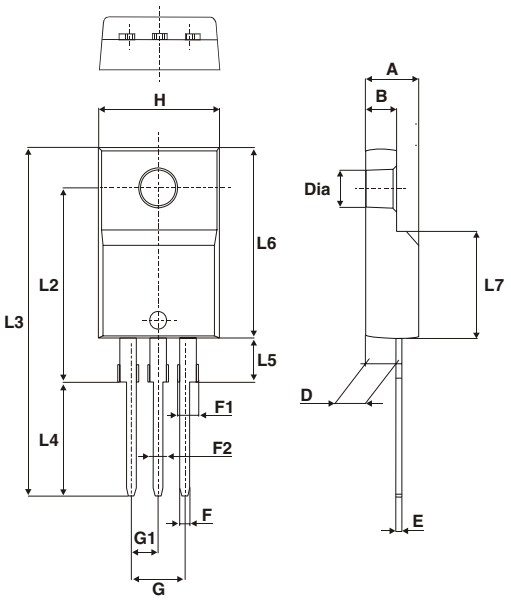

**Figure 12. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, copper thickness: 35µm)( D²PAK)**



# 2 Package information

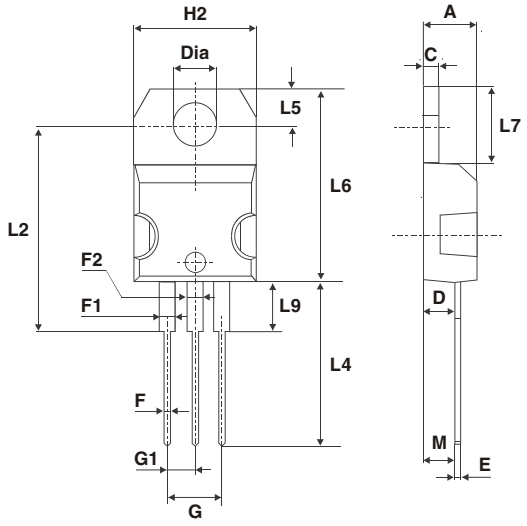
- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm
- Maximum torque value: 0.70 Nm

**Table 4. TO-220FPAB dimensions**



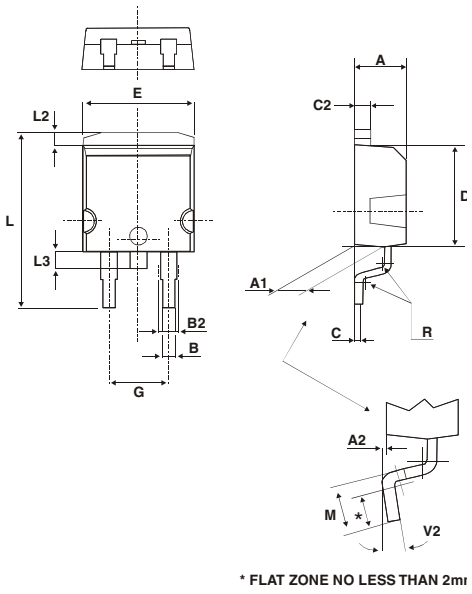

| Ref | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| B | 2.5 | 2.7 | 0.098 | 0.106 |
| D | 2.5 | 2.75 | 0.098 | 0.108 |
| E | 0.45 | 0.70 | 0.018 | 0.027 |
| F | 0.75 | 1 | 0.030 | 0.039 |
| F1 | 1.15 | 1.70 | 0.045 | 0.067 |
| F2 | 1.15 | 1.70 | 0.045 | 0.067 |
| G | 4.95 | 5.20 | 0.195 | 0.205 |
| G1 | 2.4 | 2.7 | 0.094 | 0.106 |
| H | 10 | 10.4 | 0.393 | 0.409 |
| L2 | 16 Typ. | | 0.63 Typ. | |
| L3 | 28.6 | 30.6 | 1.126 | 1.205 |
| L4 | 9.8 | 10.6 | 0.386 | 0.417 |
| L5 | 2.9 | 3.6 | 0.114 | 0.142 |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 |
| Dia. | 3.00 | 3.20 | 0.118 | 0.126 |

**Table 5. TO-220AB dimensions**



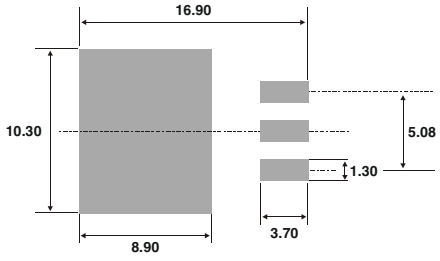

| Ref | Dimensions | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 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. | |
| Diam. | 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 13. Footprint (dimensions in millimeters)**

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# 3 Ordering Information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| STPS20L45CFP | STPS20L45CFP | TO-220FPAB | 2 g | 50 | Tube |
| STPS20L45CT | STPS20L45CT | TO-220AB | 2 g | 50 | Tube |
| STPS20L45CG | STPS20L45CG | $D^2PAK$ | 1.48 g | 50 | Tube |
| STPS20L45CG-TR | STPS20L45CG | $D^2PAK$ | 1.48 g | 1000 | Tape & Reel |

# 4 Revision history

| Date | Revision | Description of Changes |
|---|---|---|
| Jul_2003 | 3C | Last release. |
| 22-Mar-2007 | 4 | Removed ISOWATT and TO-247 packages. |

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