

Power Schottky rectifier

Main product characteristics

| | |
|-------------|--------|
| $I_{F(AV)}$ | 7.5 A |
| V_{RRM} | 45 V |
| T_j (max) | 150° C |
| V_F (max) | 0.57 V |

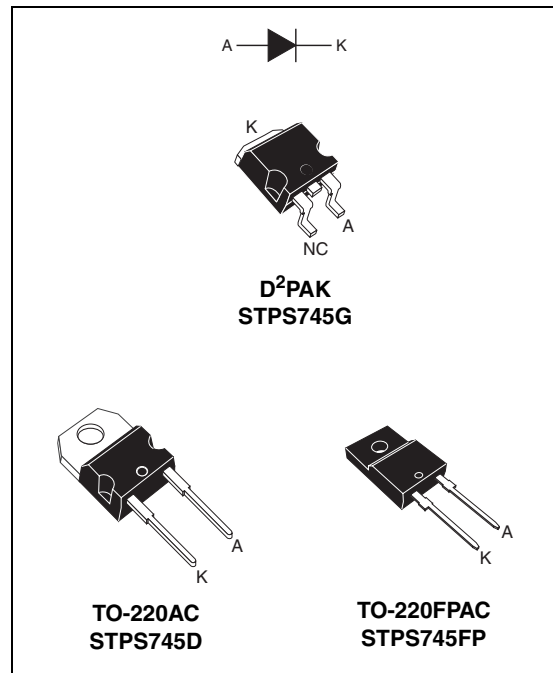
Features and Benefits

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Insulated package: TO-220FPAC
Insulating voltage = 2000 V DC
Capacitance = 12 pF
- Avalanche capability specified

Description

Single Schottky rectifier suited for Switch Mode Power Supply and high frequency DC to DC converters.

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



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 | | 20 | A | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ | TO-220AC / D ² PAK | $T_c = 160^\circ\text{C}$ | 7.5 | A |
| | | TO-220FPAC | $T_c = 145^\circ\text{C}$ | | |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms}$ Sinusoidal | 150 | A | |
| I_{RRM} | Repetitive peak reverse current | $t_p = 2\ \mu\text{s}$ square F = 1 kHz | 1 | A | |
| I_{RSM} | Non repetitive peak reverse current | $t_p = 100\ \mu\text{s}$ square | 2 | A | |
| P_{ARM} | Repetitive peak avalanche power | $t_p = 1\ \mu\text{s}$ $T_j = 25^\circ\text{C}$ | 2700 | W | |
| T_{stg} | Storage temperature range | | -65 to +175 | $^\circ\text{C}$ | |
| T_j | Maximum operating junction temperature ⁽¹⁾ | | 175 | $^\circ\text{C}$ | |
| dV/dt | Critical rate of rise of reverse voltage | | 10000 | V/ μs | |

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

Table 2. Thermal resistances

| Symbol | Parameter | | Value | Unit |
|---------------|------------------|-------------------------------|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / D ² PAK | 3.0 | $^\circ\text{C/W}$ |
| | | TO-220FPAC | 5.5 | |

Table 3. Static electrical characteristics (per diode)

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|---------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ\text{C}$ | $V_R = V_{RRM}$ | | | 100 | μA |
| | | $T_j = 125^\circ\text{C}$ | | | 5 | 15 | mA |
| $V_F^{(1)}$ | Forward voltage drop | $T_j = 125^\circ\text{C}$ | $I_F = 7.5\text{ A}$ | | 0.5 | 0.57 | V |
| | | $T_j = 25^\circ\text{C}$ | $I_F = 15\text{ A}$ | | | 0.84 | |
| | | $T_j = 125^\circ\text{C}$ | $I_F = 15\text{ A}$ | | 0.65 | 0.72 | |

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

To evaluate the conduction losses use the following equation:

$$P = 0.42 \times I_{F(AV)} + 0.020 I_{F(RMS)}^2$$

Figure 1. Average forward power dissipation versus average forward current

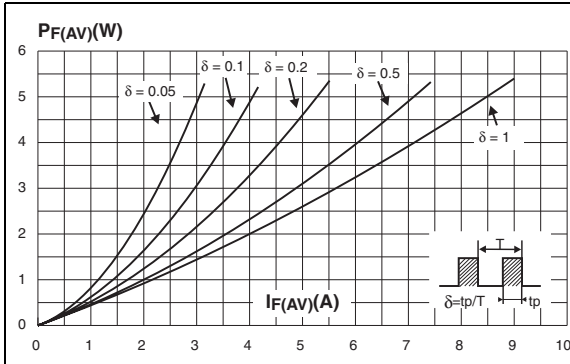


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$)

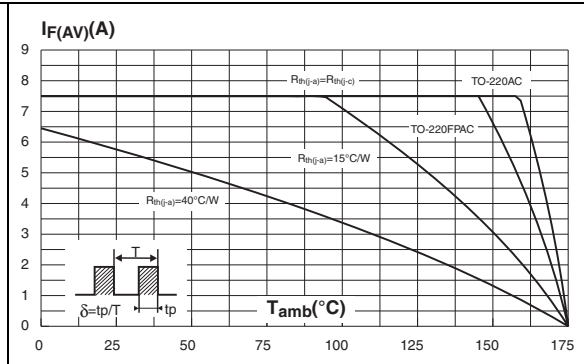


Figure 3. Normalized avalanche power derating versus pulse duration

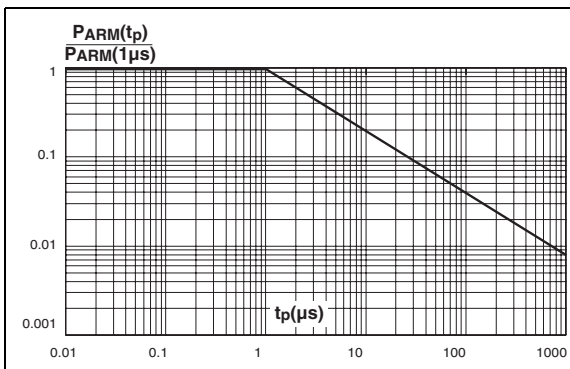


Figure 4. Normalized avalanche power derating versus junction temperature

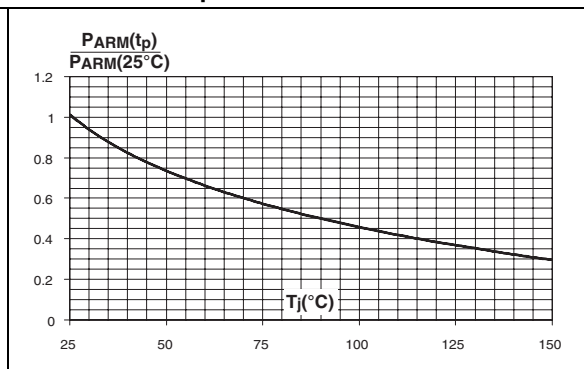


Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values) (TO-220AC and D²PAK)

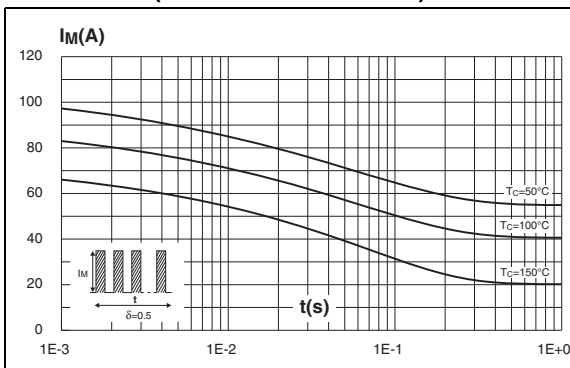


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values) (TO-220FPAC)

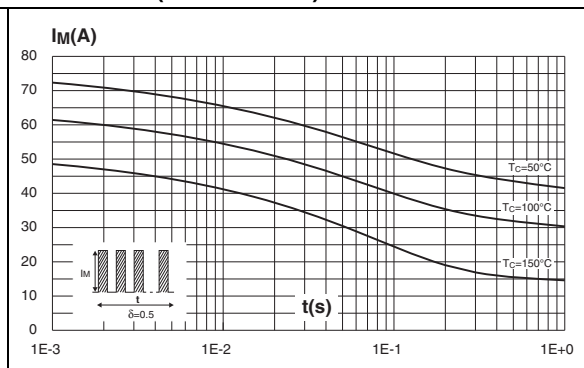


Figure 7. Relative variation of thermal transient impedance junction to case versus pulse duration (TO-220AC and D²PAK)

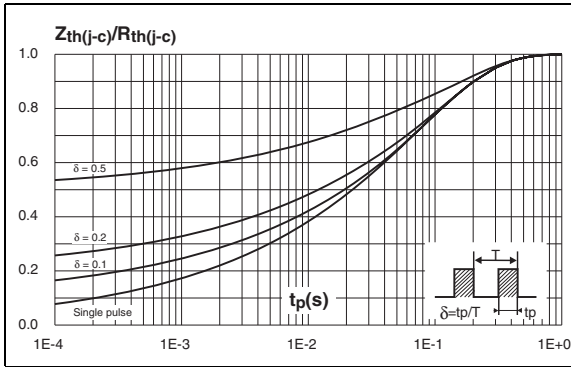


Figure 8. Relative variation of thermal transient impedance junction to case versus pulse duration (TO-220FPAC)

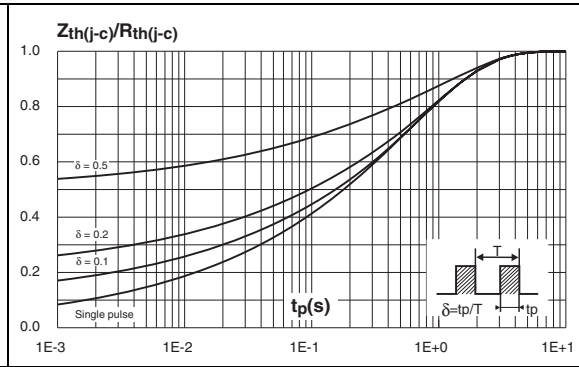


Figure 9. Reverse leakage current versus reverse voltage applied (typical values)

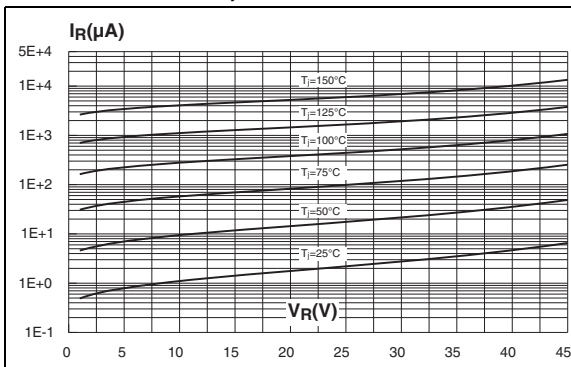


Figure 10. Junction capacitance versus reverse voltage applied (typical values)

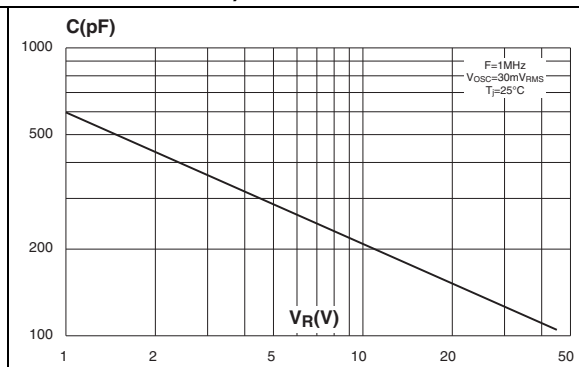


Figure 11. Forward voltage drop versus forward current (maximum values)

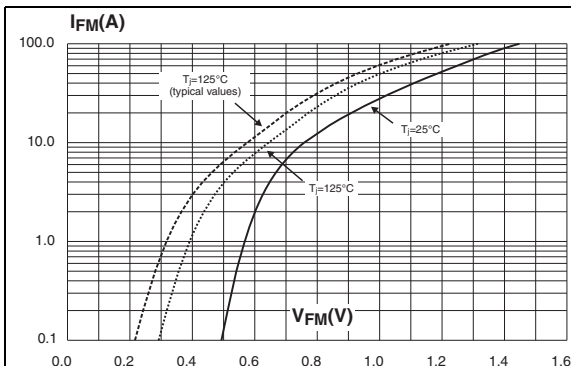
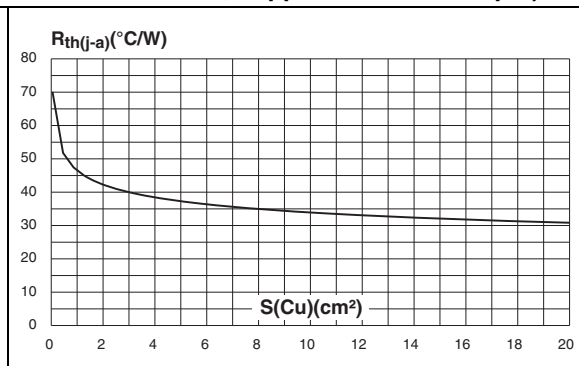


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board, copper thickness: 35 μm)



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. 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)

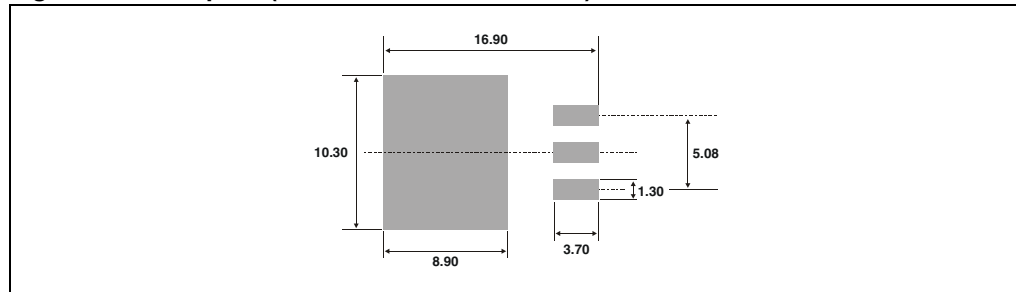


Table 5. TO-220FPAC dimensions

| 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 |
| 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 | 0.126 | 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 6. TO-220AC 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 |

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

3 Ordering information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|-----------|--------------------|--------|----------|---------------|
| STPS745D | STPS745D | TO-220AC | 1.86 g | 50 | Tube |
| STPS745G | STPS745G | D ₂ PAK | 1.48 g | 50 | Tube |
| STPS745G-TR | STPS745G | D ₂ PAK | 1.48 g | 1000 | Tape & reel |
| STPS745FP | STPS745FP | TO-220FPAC | 1.9 g | 50 | Tube |

4 Revision history

| Date | Revision | Description of Changes |
|-------------|----------|--------------------------|
| Jul-2003 | 6G | Last release. |
| 22-Mar-2007 | 7 | Removed ISOWATT package. |

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