

Power Schottky rectifiers

Features

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low thermal resistance
- Avalanche capability specified
- ECOPACK[®]2 compliant component (STPS4045CT)

Description

This dual center tap Schottky rectifier is suited for switchmode power supply and high frequency DC to DC converters.

Packaged in TO-247 or TO-220AB this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.

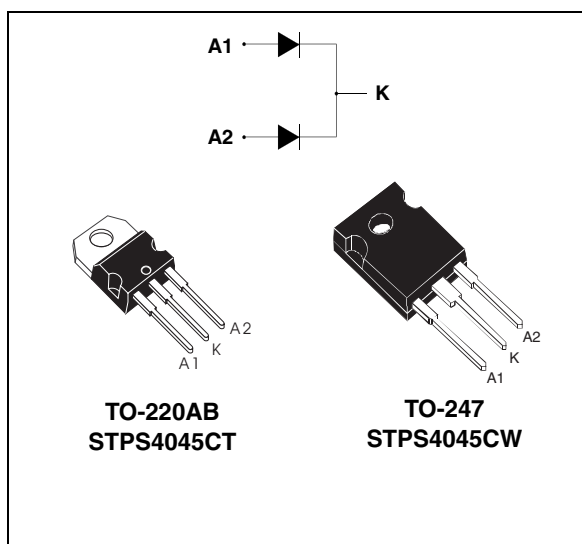


Table 1. Device summary

| Symbol | Value |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 20 A |
| V_{RRM} | 45 V |
| $T_j(max)$ | 175 °C |
| $V_F(max)$ | 0.63 V |

1 Characteristics

Table 2. Absolute ratings (limiting values, per diode)

| Symbol | Parameter | | | Value | Unit | |
|---------------------|---|----------|--|--------------|------|---|
| V _{RRM} | Repetitive peak reverse voltage | | | 45 | V | |
| I _{F(RMS)} | Forward rms current | | | 30 | A | |
| I _{F(AV)} | Average forward current | TO-247 | T _C = 150 °C, δ = 0.5 | Per diode | 20 | A |
| | | | T _C = 145 °C, δ = 0.5 | Per device | 40 | |
| | | TO-220AB | T _C = 145 °C, δ = 0.5 | Per diode | 20 | A |
| | | | T _C = 130 °C, δ = 0.5 | Per device | 40 | |
| I _{FSM} | Surge non repetitive forward current | | t _p = 10 ms sinusoidal | 220 | A | |
| I _{RRM} | Repetitive peak reverse current | | t _p = 2 μs square F=1 kHz | 1 | A | |
| I _{RSM} | Non repetitive peak reverse current | | t _p = 100 μs square | 3 | A | |
| P _{ARM} | Repetitive peak avalanche power | | t _p = 1 μs T _j = 25 °C | 6000 | W | |
| T _{stg} | Storage temperature range | | | -65 to + 175 | °C | |
| T _j | Maximum operating junction temperature ⁽¹⁾ | | | 175 | °C | |
| dV/dt | Critical rate of rise reverse voltage | | | 10000 | V/μs | |

1. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ 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 | TO-247 | Per diode | 1.5 | °C/W |
| | | | Total | 0.8 | |
| | | TO-220AB | Per diode | 1.8 | |
| | | | Total | 1.3 | |
| R _{th(c)} | Coupling | TO-247 | | 0.1 | |
| | | TO-220AB | | 0.8 | |

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

Table 4. Static electrical characteristics (per diode)

| Symbol | Parameter | Tests conditions | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|-----------------------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^\circ\text{C}$ | - | - | 200 | μA |
| | | $T_j = 125\text{ }^\circ\text{C}$ | | | | |
| $V_F^{(1)}$ | Forward voltage drop | $T_j = 25\text{ }^\circ\text{C}$ | - | - | 0.76 | V |
| | | $T_j = 125\text{ }^\circ\text{C}$ | | | | |
| | | $T_j = 25\text{ }^\circ\text{C}$ | - | 0.56 | 0.63 | |
| | | $T_j = 125\text{ }^\circ\text{C}$ | | | | |

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

To evaluate the conduction losses use the following equation :
 $P = 0.43 \times I_{F(AV)} + 0.01 \times I_{F(RMS)}^2$

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

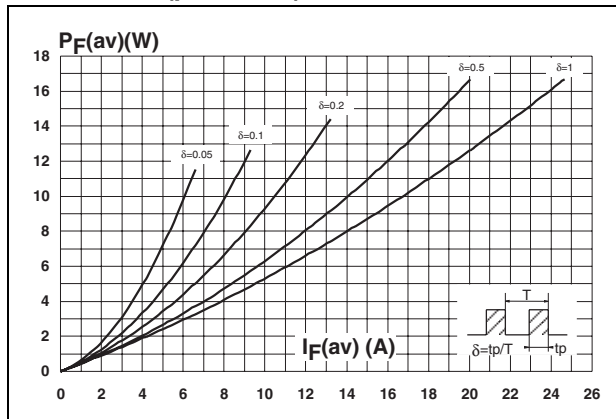


Figure 2. Average forward current versus ambient temperature (delta = 0.5 per diode)

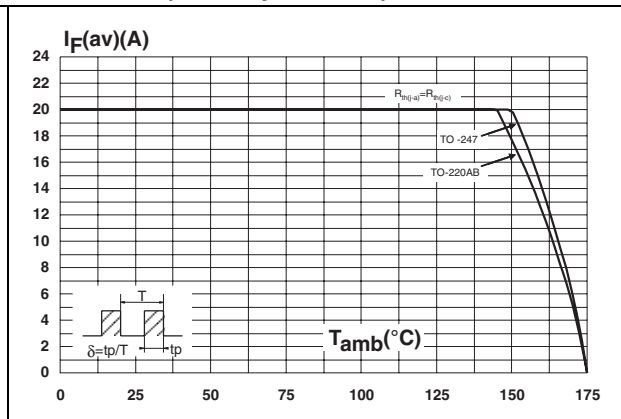


Figure 3. Normalized avalanche power derating versus pulse duration

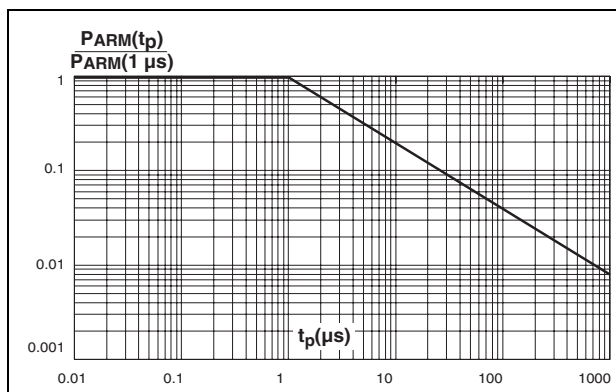


Figure 4. Normalized avalanche power derating versus junction temperature

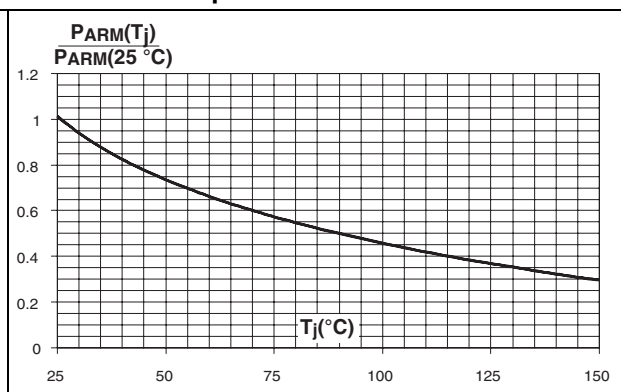


Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)

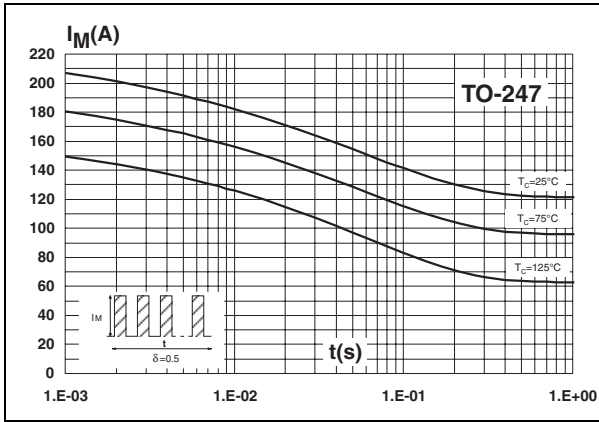


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)

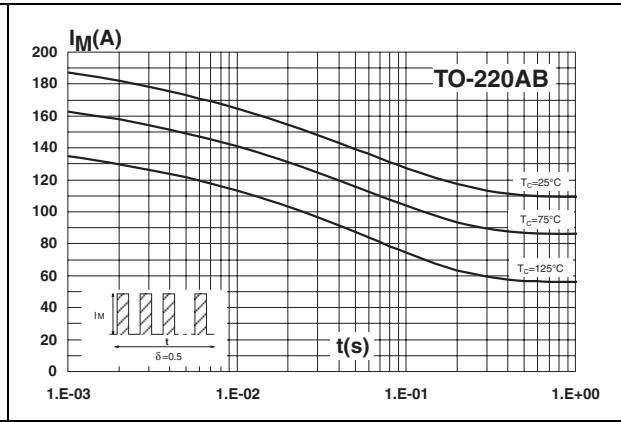


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

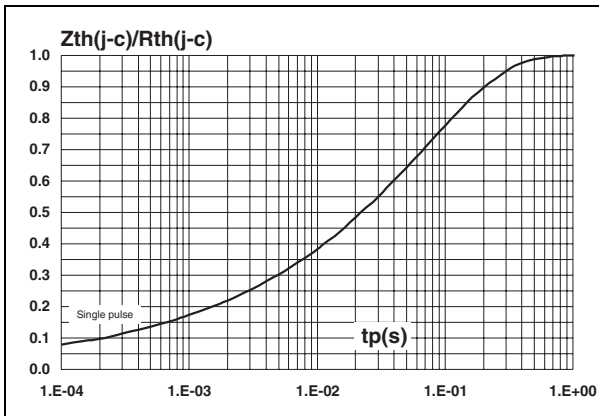


Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)

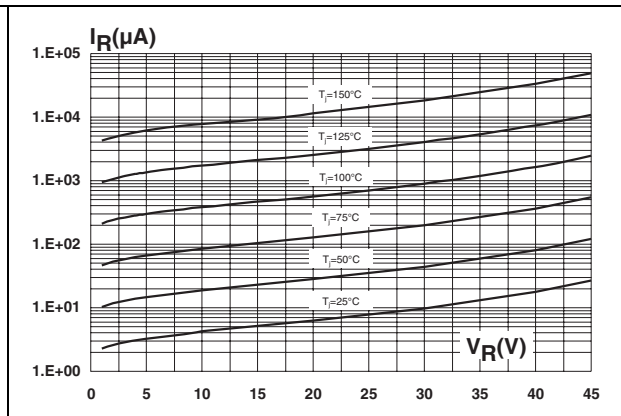


Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)

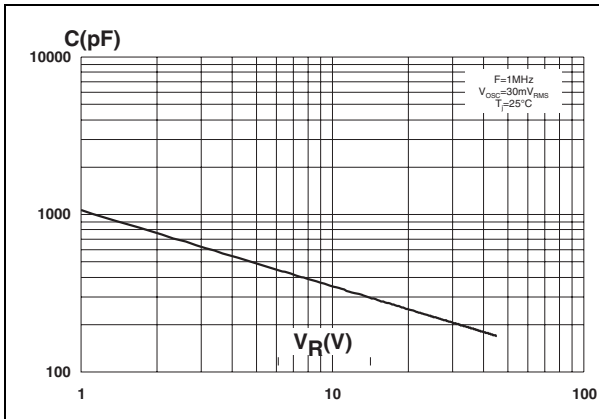
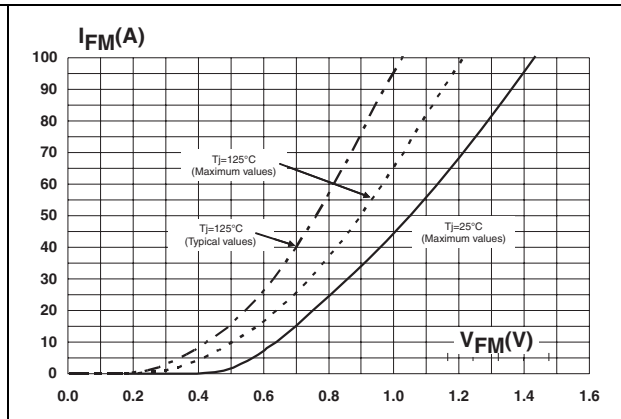


Figure 10. Forward voltage drop versus forward current (per diode)



2 Package information

- Epoxy meets UL94,V0
- Cooling method: by conduction (C)
- Recommended torque values: TO-220AB 0.4 to 0.6 N·m, TO-247 0.55 N·m
- Maximum torque value: TO-247 1.0 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.

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 |

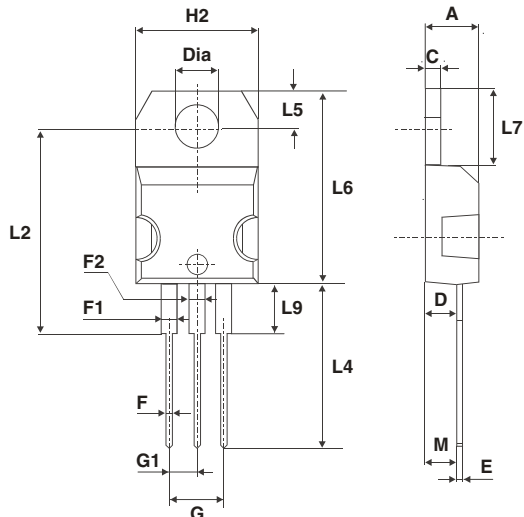


Table 6. TO-247 dimensions

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.85 | | 5.16 | 0.191 | | 0.203 |
| D | 2.20 | | 2.60 | 0.086 | | 0.102 |
| E | 0.40 | | 0.80 | 0.015 | | 0.031 |
| F | 1.00 | | 1.40 | 0.039 | | 0.055 |
| F1 | | 3.00 | | | 0.118 | |
| F2 | | 2.00 | | | 0.079 | |
| F3 | 1.90 | | 2.40 | 0.075 | | 0.094 |
| F4 | 3.00 | | 3.40 | 0.118 | | 0.134 |
| G | | 10.90 | | | 0.429 | |
| H | 15.45 | | 16.03 | 0.608 | | 0.631 |
| L | 19.85 | | 21.09 | 0.781 | | 0.830 |
| L1 | 3.70 | | 4.30 | 0.146 | | 0.169 |
| L2 | 18.30 | | 19.13 | 0.720 | | 0.753 |
| L3 | 14.20 | | 20.30 | 0.559 | | 0.799 |
| L4 | 34.05 | | 41.38 | 1.341 | | 1.629 |
| L5 | 5.35 | | 6.30 | 0.211 | | 0.248 |
| M | 2.00 | | 3.00 | 0.079 | | 0.118 |
| V | | 5° | | | 5° | |
| V2 | | 60° | | | 60° | |
| Dia. | 3.55 | | 3.65 | 0.140 | | 0.144 |

3 Ordering information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|------------|------------|----------|--------|-----------|---------------|
| STPS4045CW | STPS4045CW | TO-247 | 4.46 g | 30 | Tube |
| STPS4045CT | STPS4045CT | TO-220AB | 1.9 g | 50 | Tube |

4 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| July-2003 | 4C | Previous issue. |
| 09-Nov-2009 | 5 | Added TO-220AB package. Removed SOT-93 package. |

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