

## Power Schottky rectifiers

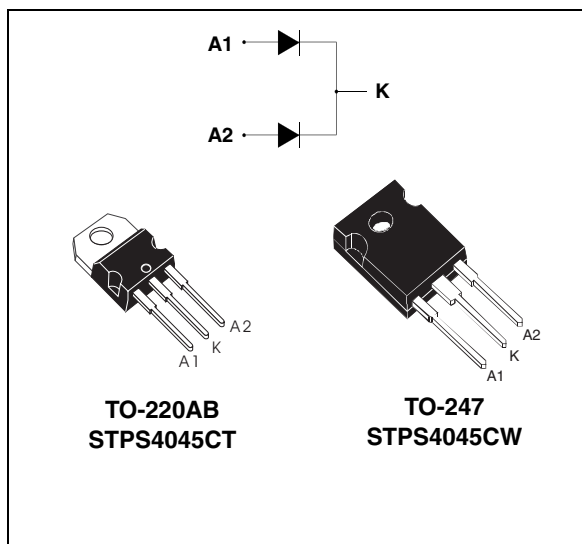
### Features

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low thermal resistance
- Avalanche capability specified
- ECOPACK<sup>®</sup>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 <sub>RRM</sub>    | Repetitive peak reverse voltage                       |          |  | 45           | V    |   |
| I <sub>F(RMS)</sub> | Forward rms current                                   |          |  | 30           | A    |   |
| I <sub>F(AV)</sub>  | Average forward current                               | TO-247   | T <sub>C</sub> = 150 °C, δ = 0.5             | Per diode    | 20   | A |
|                     |   |          | T <sub>C</sub> = 145 °C, δ = 0.5             | Per device   | 40   |   |
|                     |   | TO-220AB | T <sub>C</sub> = 145 °C, δ = 0.5             | Per diode    | 20   | A |
|                     |   |          | T <sub>C</sub> = 130 °C, δ = 0.5             | Per device   | 40   |   |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  |          | t <sub>p</sub> = 10 ms sinusoidal            | 220          | A    |   |
| I <sub>RRM</sub>    | Repetitive peak reverse current                       |          | t <sub>p</sub> = 2 μs square F=1 kHz         | 1            | A    |   |
| I <sub>RSM</sub>    | Non repetitive peak reverse current                   |          | t <sub>p</sub> = 100 μs square               | 3            | A    |   |
| P <sub>ARM</sub>    | Repetitive peak avalanche power                       |          | t <sub>p</sub> = 1 μs T <sub>j</sub> = 25 °C | 6000         | W    |   |
| T <sub>stg</sub>    | Storage temperature range                             |          |  | -65 to + 175 | °C   |   |
| T <sub>j</sub>      | Maximum operating junction temperature <sup>(1)</sup> |          |  | 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 <sub>th(j-c)</sub> | Junction to case | TO-247   | Per diode | 1.5   | °C/W |
|                      |                  |          | Total     | 0.8   |      |
|                      |                  | TO-220AB | Per diode | 1.8   |      |
|                      |                  |          | Total     | 1.3   |      |
| R <sub>th(c)</sub>   | Coupling         | TO-247   |           | 0.1   |      |
|                      |                  | TO-220AB |           | 0.8   |      |

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

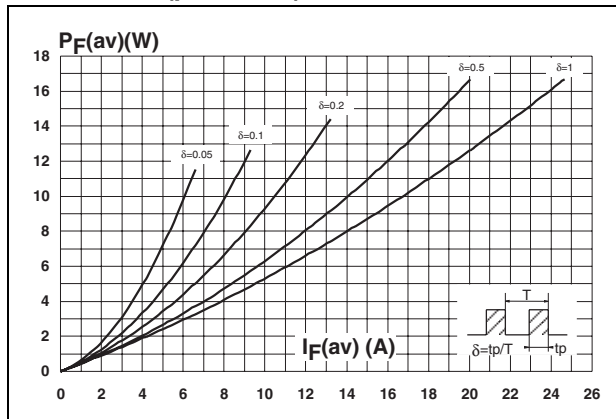
**Table 4. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Tests conditions                  | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^\circ\text{C}$  | -    | -    | 200  | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |      |      | 40   | $\text{mA}$   |
| $V_F^{(1)}$ | Forward voltage drop    | $T_j = 25\text{ }^\circ\text{C}$  | -    | -    | 0.76 | V             |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |      |      | 0.63 |               |
|             |                         | $T_j = 25\text{ }^\circ\text{C}$  | -    | -    | 0.94 |               |
|             |                         | $T_j = 125\text{ }^\circ\text{C}$ |      |      | 0.83 |               |

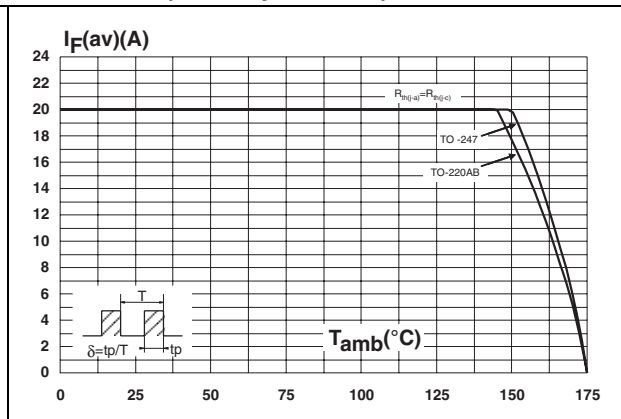
1. Pulse test :  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

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

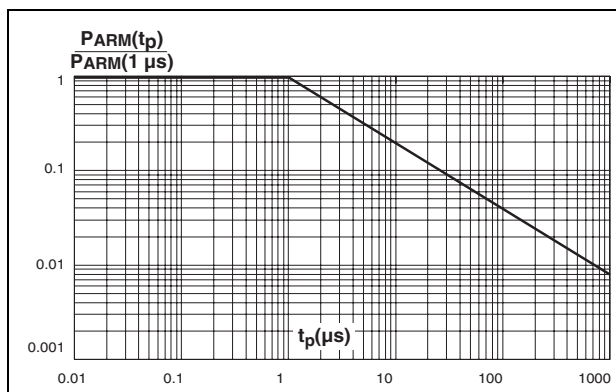
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



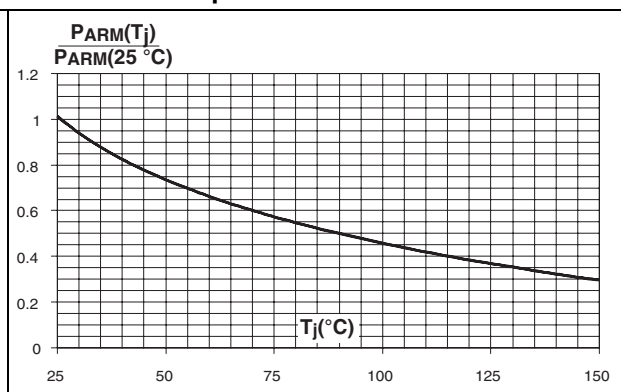
**Figure 2. Average forward current versus ambient temperature (delta = 0.5 per diode)**



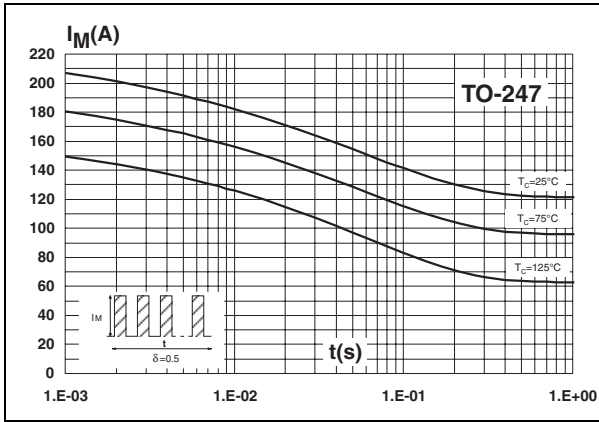
**Figure 3. Normalized avalanche power derating versus pulse duration**



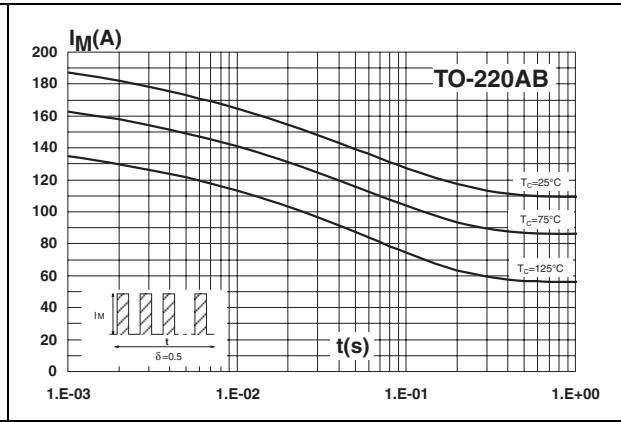
**Figure 4. Normalized avalanche power derating versus junction temperature**



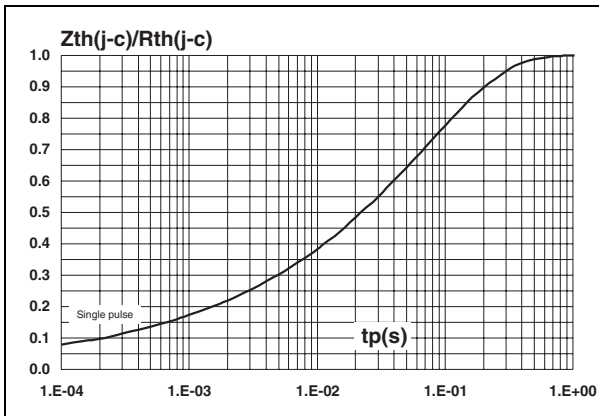
**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



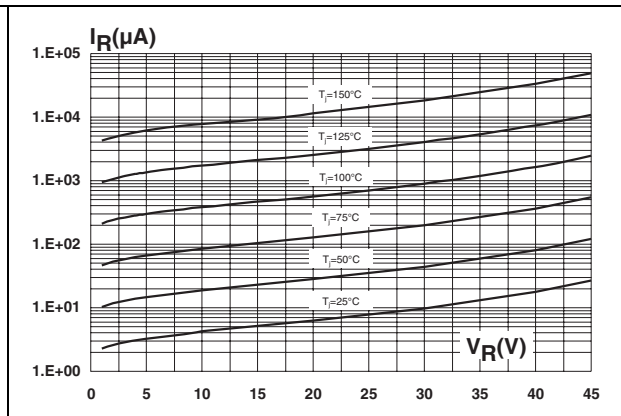
**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



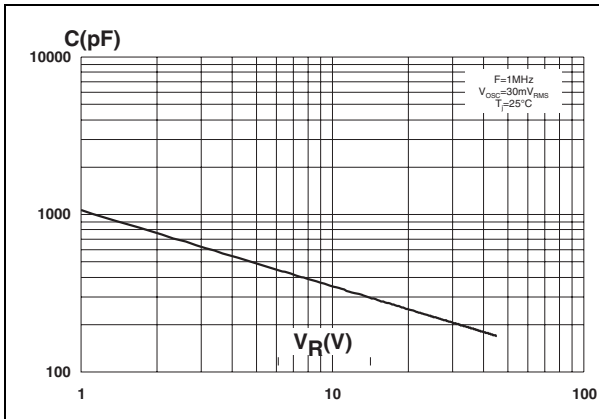
**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration**



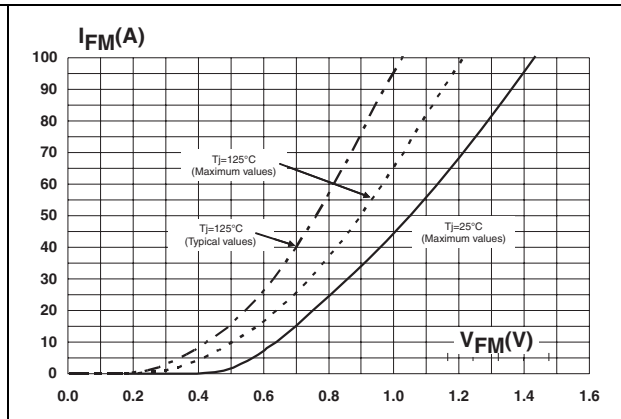
**Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**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](http://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 |

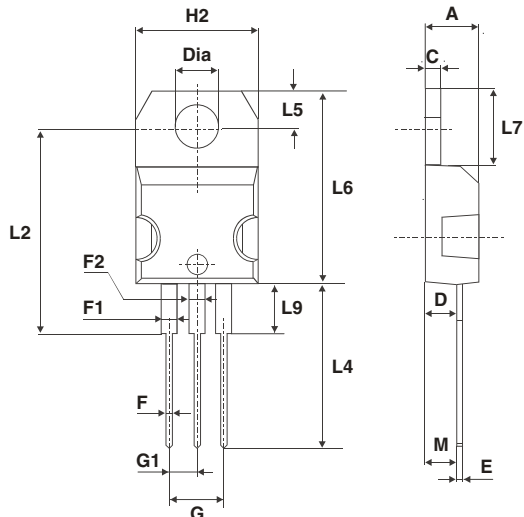


Table 6. TO-247 dimensions

| 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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