

## High voltage power Schottky rectifier

### Main product characteristics

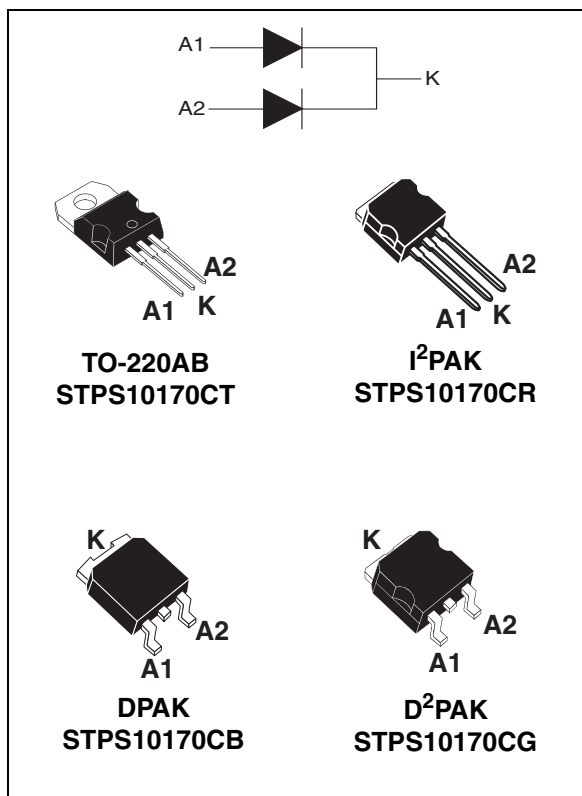
|             |         |
|-------------|---------|
| $I_{F(AV)}$ | 2 x 5 A |
| $V_{RRM}$   | 170 V   |
| $T_j$       | 175° C  |
| $V_F$ (typ) | 0.69 V  |

### Features and benefits

- High junction temperature capability
- Good trade-off between leakage current and forward voltage drop
- Low leakage current
- Avalanche capability specified

### Description

Dual centre tab Schottky rectifier designed for high frequency switch mode power supplies.



### Order codes

| Part Number    | Marking     |
|----------------|-------------|
| STPS10170CT    | STPS10170CT |
| STPS10170CG    | STPS10170CG |
| STPS10170CG-TR | STPS10170CG |
| STPS10170CR    | STPS10170CR |
| STPS10170CB    | PS10170CB   |
| STPS10170CB-TR | PS10170CB   |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values per diode,  $T_{amb} = 25^{\circ}C$  unless otherwise specified)**

| Symbol       | Parameter                                             |                          |                | Value        | Unit        |
|--------------|-------------------------------------------------------|--------------------------|----------------|--------------|-------------|
| $V_{RRM}$    | Repetitive peak reverse voltage                       |                          |                | 170          | V           |
| $I_{F(RMS)}$ | RMS forward current                                   |                          |                | 10           | A           |
| $I_{F(AV)}$  | Average forward current, $\delta = 0.5$               | $T_c = 155^{\circ}C$     | Per diode      | 5            | A           |
|              |                                                       |                          | Total package  | 10           |             |
| $I_{FSM}$    | Surge non repetitive forward current                  | $t_p = 10$ ms Sinusoidal |                | 75           | A           |
| $P_{ARM}$    | Relative peak avalanche power                         | $T_j = 25^{\circ}C$      | $t_p = 1\mu s$ | 3100         | W           |
| $T_{stg}$    | Storage temperature range                             |                          |                | -65 to + 175 | $^{\circ}C$ |
| $T_j$        | Maximum operating junction temperature <sup>(1)</sup> |                          |                | 175          | $^{\circ}C$ |
| $dV/dt$      | Critical rate of rise of reverse voltage              |                          |                | 10 000       | V/ $\mu s$  |

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 parameters**

| Symbol        | Parameter        |           | Value | Unit          |
|---------------|------------------|-----------|-------|---------------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 4     | $^{\circ}C/W$ |
|               |                  | Total     | 2.4   |               |
| $R_{th(c)}$   | Coupling         |           | 0.7   |               |

**Table 3. Static electrical characteristics**

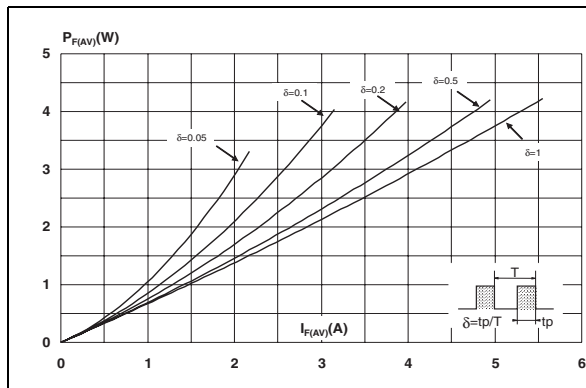
| Symbol      | Parameter               | Test conditions      |                 | Min. | Typ  | Max. | Unit    |
|-------------|-------------------------|----------------------|-----------------|------|------|------|---------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^{\circ}C$  | $V_R = V_{RRM}$ |      |      | 10   | $\mu A$ |
|             |                         | $T_j = 125^{\circ}C$ |                 |      |      | 10   | mA      |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25^{\circ}C$  | $I_F = 5$ A     |      |      | 0.92 | V       |
|             |                         | $T_j = 125^{\circ}C$ |                 |      | 0.69 | 0.75 |         |
|             |                         | $T_j = 25^{\circ}C$  | $I_F = 10$ A    |      |      | 1    |         |
|             |                         | $T_j = 125^{\circ}C$ |                 |      | 0.79 | 0.85 |         |

1. Pulse test:  $t_p = 5$  ms,  $\delta < 2\%$   
 2. Pulse test:  $t_p = 380$   $\mu s$ ,  $\delta < 2\%$

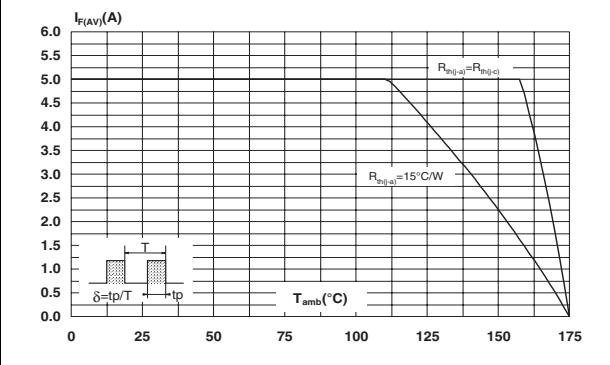
To evaluate the conduction losses use the following equation:

$$P = 0.65 \times I_{F(AV)} + 0.02 \times I_{F(RMS)}^2$$

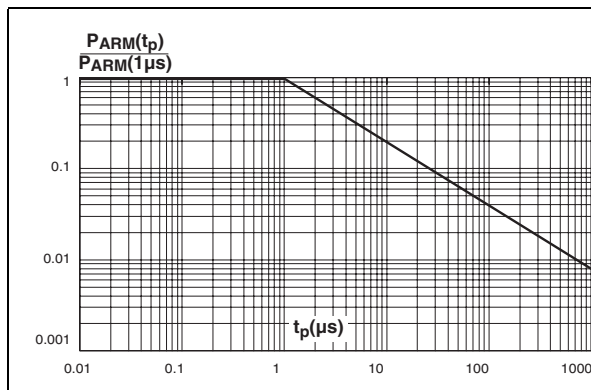
**Figure 1. Conduction losses versus average forward current (per diode)**



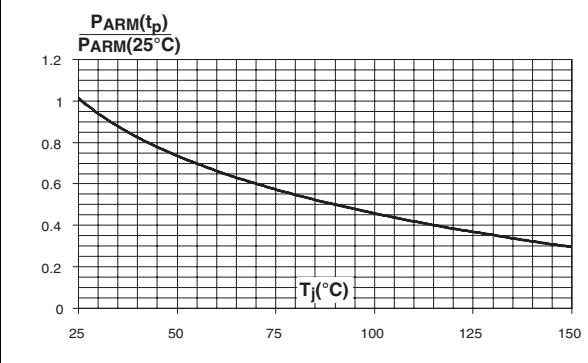
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



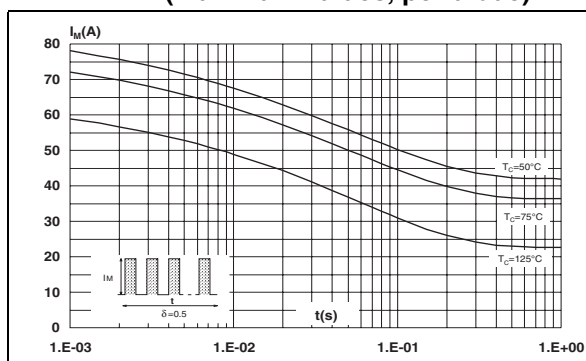
**Figure 3. Normalized avalanche power derating versus pulse duration**



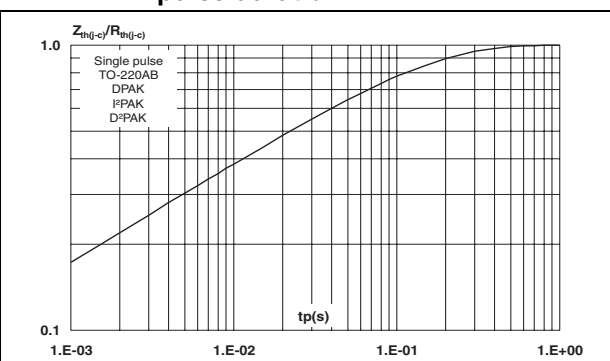
**Figure 4. Normalized avalanche power derating versus junction temperature**



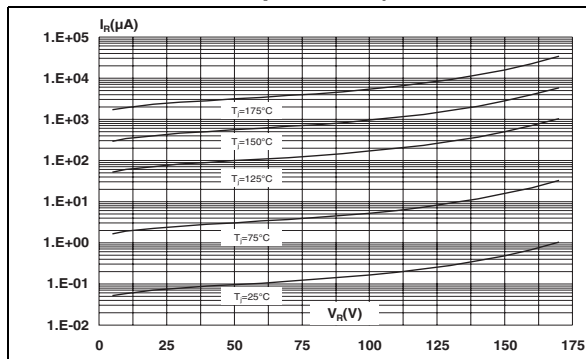
**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



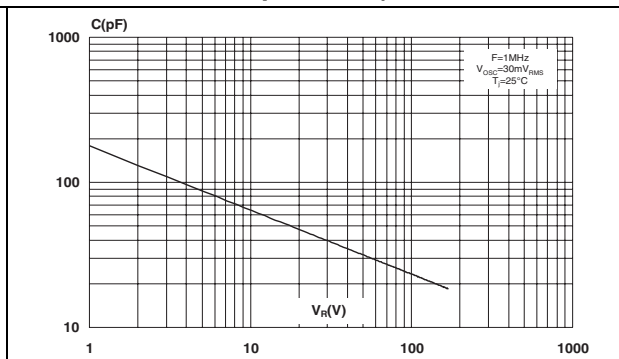
**Figure 6. Relative variation of thermal impedance, junction to case versus pulse duration**



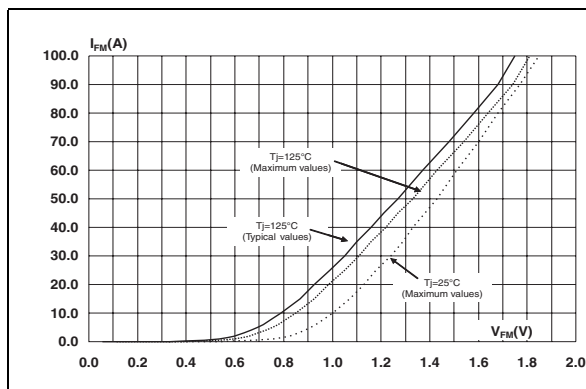
**Figure 7. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



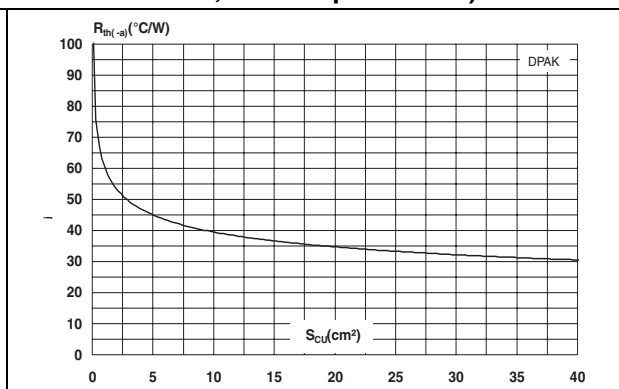
**Figure 8. Junction capacitance versus reverse voltage applied (typical values, per diode)**



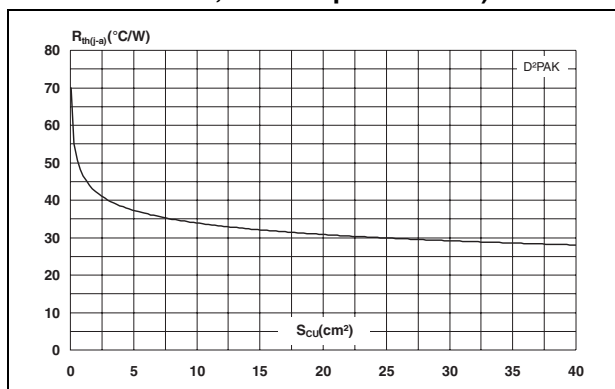
**Figure 9. Forward voltage drop versus forward current (per diode)**



**Figure 10. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed board FR4, Cu = 35  $\mu$ m - DPAK)**



**Figure 11. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed board FR4, Cu = 35  $\mu$ m - D²PAK)**



## 2 Package dimensions

Epoxy meets UL94, V0

Table 4. T0-220AB 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 5. I<sup>2</sup>PAK dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.40        | 4.60  | 0.173  | 0.181 |
| A1   | 2.40        | 2.72  | 0.094  | 0.107 |
| b    | 0.61        | 0.88  | 0.024  | 0.035 |
| b1   | 1.14        | 1.70  | 0.044  | 0.067 |
| c    | 0.49        | 0.70  | 0.019  | 0.028 |
| c2   | 1.23        | 1.32  | 0.048  | 0.052 |
| D    | 8.95        | 9.35  | 0.352  | 0.368 |
| e    | 2.40        | 2.70  | 0.094  | 0.106 |
| e1   | 4.95        | 5.15  | 0.195  | 0.203 |
| E    | 10          | 10.40 | 0.394  | 0.409 |
| L    | 13          | 14    | 0.512  | 0.551 |
| L1   | 3.50        | 3.93  | 0.138  | 0.155 |
| L2   | 1.27        | 1.40  | 0.050  | 0.055 |

Table 6. DPAK dimensions

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max   | Min.       | Max.  |
| A    | 2.20        | 2.40  | 0.086      | 0.094 |
| A1   | 0.90        | 1.10  | 0.035      | 0.043 |
| A2   | 0.03        | 0.23  | 0.001      | 0.009 |
| B    | 0.64        | 0.90  | 0.025      | 0.035 |
| B2   | 5.20        | 5.40  | 0.204      | 0.212 |
| C    | 0.45        | 0.60  | 0.017      | 0.023 |
| C2   | 0.48        | 0.60  | 0.018      | 0.023 |
| D    | 6.00        | 6.20  | 0.236      | 0.244 |
| E    | 6.40        | 6.60  | 0.251      | 0.259 |
| G    | 4.40        | 4.60  | 0.173      | 0.181 |
| H    | 9.35        | 10.10 | 0.368      | 0.397 |
| L2   | 0.80 typ.   |       | 0.031 typ. |       |
| L4   | 0.60        | 1.00  | 0.023      | 0.039 |
| V2   | 0°          | 8°    | 0°         | 8°    |

Figure 12. DPAK footprint (dimensions in mm)

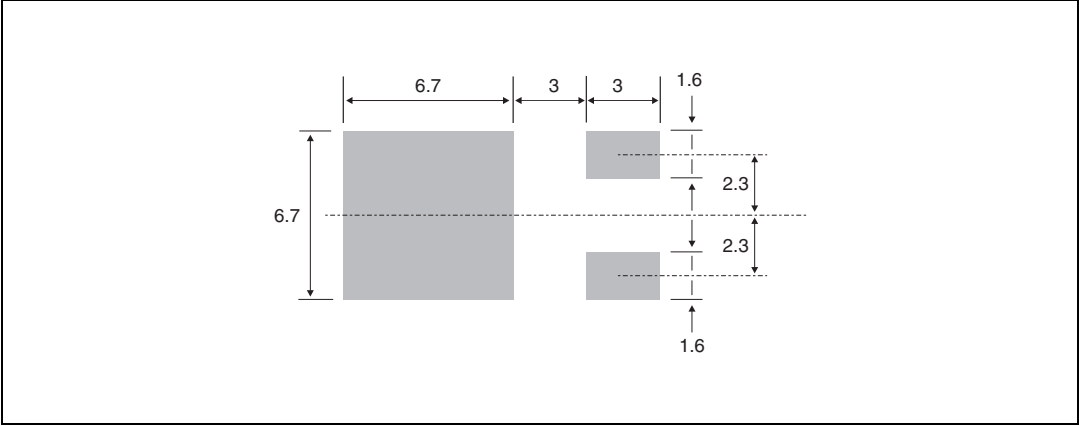
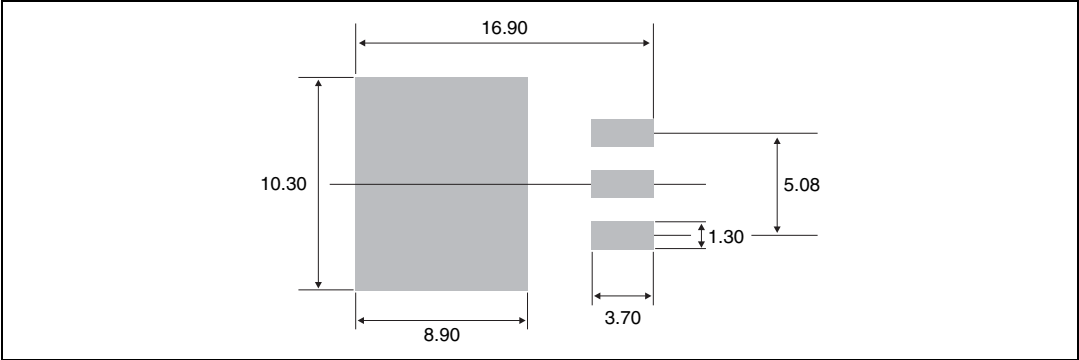


Table 7. D<sup>2</sup>PAK dimensions

| 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. D<sup>2</sup>PAK footprint (dimensions in mm)



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](http://www.st.com).



### 3 Ordering information

| Part number    | Marking     | Package            | Weight | Base qty | Delivery mode |
|----------------|-------------|--------------------|--------|----------|---------------|
| STPS10170CT    | STPS10170CT | TO-220AB           | 2.23 g | 50       | Tube          |
| STPS10170CG    | STPS10170CG | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STPS10170CG-TR | STPS10170CG | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |
| STPS10170CB    | PS10170CB   | DPAK               | 0.3 g  | 75       | Tube          |
| STPS10170CB-TR | PS10170CB   | DPAK               | 0.3 g  | 2500     | Tape and reel |
| STPS10170CR    | STPS10170CR | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |

### 4 Revision history

| Date        | Revision | Description of changes |
|-------------|----------|------------------------|
| 13-Jul-2006 | 1        | First issue.           |

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