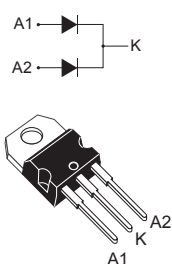


## 120 V power Schottky rectifier



TO-220AB

### Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation
- ECOPACK®2 compliant

### Applications

- Switching diode
- SMPS
- DC/DC converter
- LED lighting
- Notebook adapter

### Description

This Schottky rectifier is suited for high frequency switch mode power supply.

The voltage drop versus leakage current trade-off is in keeping with medium power hi-density adapter design.

Packed in TO-220AB, the **STPS40M120C** is optimized for use in notebook, game station and desktop adaptors, providing in these applications a good efficiency at both low and high load.

| Product status link         |          |
|-----------------------------|----------|
| <a href="#">STPS40M120C</a> |          |
| Product summary             |          |
| Symbol                      | Value    |
| $I_{F(AV)}$                 | 2 x 20 A |
| $V_{RRM}$                   | 120 V    |
| $T_j$ (max.)                | 150 °C   |
| $V_F$ (typ.)                | 0.61 V   |

# 1 Characteristics

**Table 1. Absolute Ratings (limiting values, per diode, at 25 °C, unless otherwise specified)**

| Symbol              | Parameter                                             |                                                  |            | Value       | Unit |
|---------------------|-------------------------------------------------------|--------------------------------------------------|------------|-------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                       |                                                  |            | 120         | V    |
| I <sub>F(RMS)</sub> | Forward rms current                                   |                                                  |            | 30          | A    |
| I <sub>F(AV)</sub>  | Average forward current, δ = 0.5                      | T <sub>C</sub> = 130 °C                          | Per diode  | 20          | A    |
|                     |                                                       | T <sub>C</sub> = 120 °C                          | Per device | 40          |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sinusoidal                |            | 220         | A    |
| P <sub>ARM</sub>    | Repetitive peak avalanche power                       | t <sub>p</sub> = 10 μs , T <sub>j</sub> = 125 °C |            | 1600        | W    |
| T <sub>stg</sub>    | Storage temperature range                             |                                                  |            | -65 to +175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature <sup>(1)</sup> |                                                  |            | 150         | °C   |

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

**Table 2. Thermal resistance parameters**

| Symbol        | Parameter        |           | Value | Unit |
|---------------|------------------|-----------|-------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 1.10  | °C/W |
|               |                  | Total     | 0.80  |      |
| $R_{th(c)}$   | Coupling         |           | 0.50  |      |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j (\text{diode1}) = P_{(\text{diode1})} \times R_{th(j-c)} (\text{per diode}) + P_{(\text{diode2})} \times R_{th(c)}$$

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Test conditions       |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    | 75   | 370  | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 25   | 70   | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 125\text{ °C}$ | $I_F = 5\text{ A}$  | -    | 0.44 | 0.49 | V             |
|             |                         | $T_j = 125\text{ °C}$ | $I_F = 10\text{ A}$ | -    | 0.52 | 0.57 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 20\text{ A}$ | -    |      | 0.79 |               |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.61 | 0.67 |               |

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

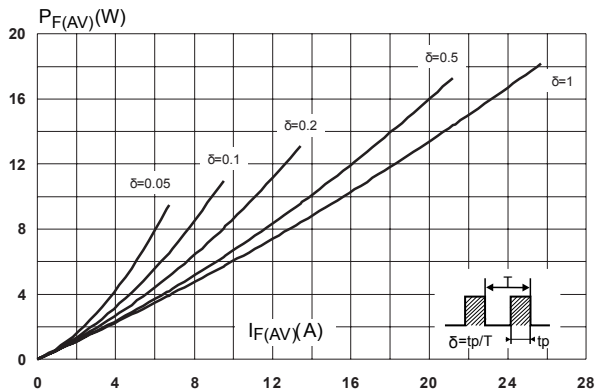
To evaluate the conduction losses, use the following equation:  $P = 0.54 \times I_{F(AV)} + 0.0065 \times I_F^2 (RMS)$

For more information, please refer to the following application notes related to the power losses :

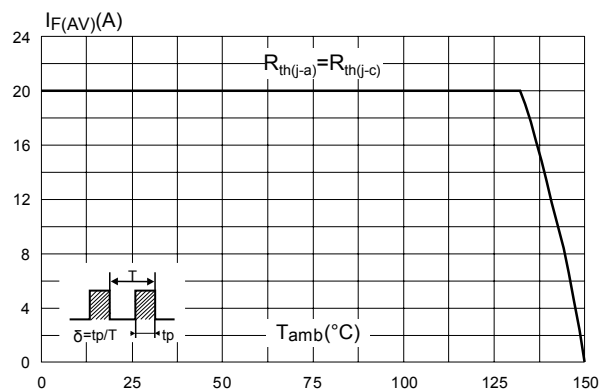
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

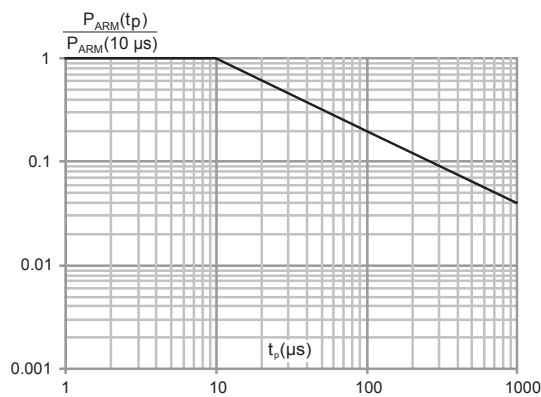
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



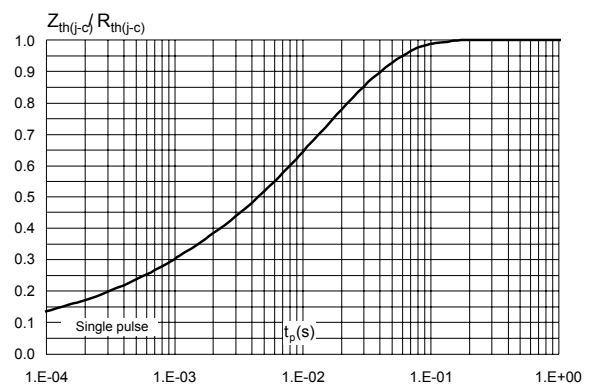
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



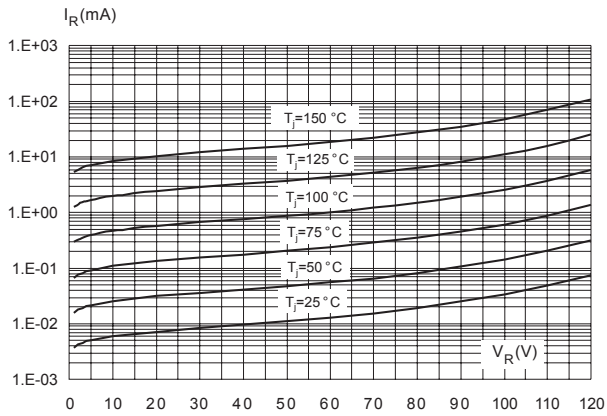
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125^\circ\text{C}$ )**



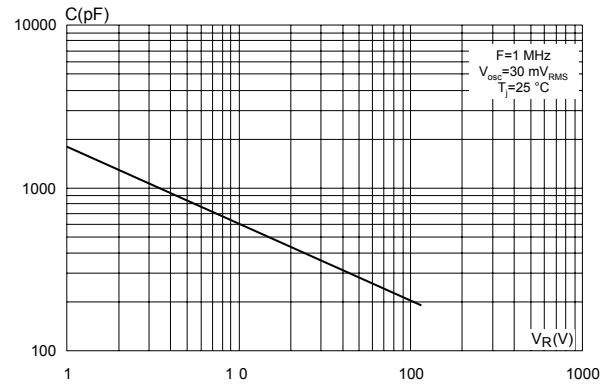
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



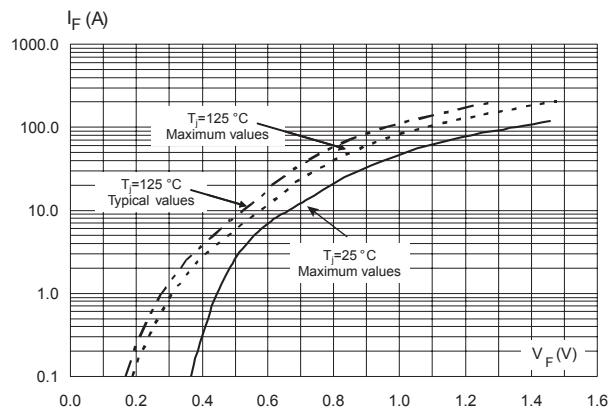
**Figure 5. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**Figure 6. Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 7. Forward voltage drop versus forward current (per diode)**



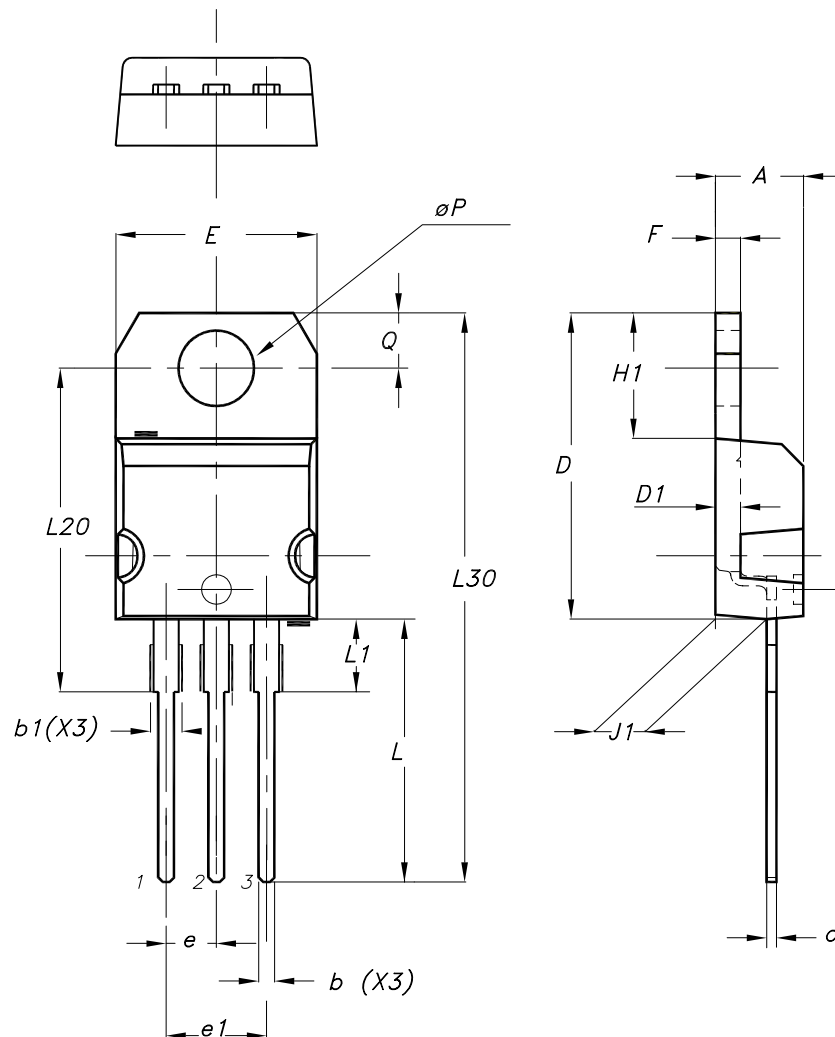
## 2 Package information

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.

### 2.1 TO-220AB package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

**Figure 8. TO-220AB package outline**



**Table 4. TO-220AB package mechanical data**

| Ref. | Dimensions  |       |                             |       |
|------|-------------|-------|-----------------------------|-------|
|      | Millimeters |       | Inches (for reference only) |       |
|      | Min.        | Max.  | Min.                        | Max.  |
| A    | 4.40        | 4.60  | 0.173                       | 0.181 |
| b    | 0.61        | 0.88  | 0.240                       | 0.035 |
| b1   | 1.14        | 1.55  | 0.045                       | 0.061 |
| c    | 0.48        | 0.70  | 0.019                       | 0.028 |
| D    | 15.25       | 15.75 | 0.600                       | 0.620 |
| D1   | 1.27 typ.   |       | 0.050 typ.                  |       |
| E    | 10.00       | 10.40 | 0.394                       | 0.409 |
| e    | 2.40        | 2.70  | 0.094                       | 0.106 |
| e1   | 4.95        | 5.15  | 0.195                       | 0.203 |
| F    | 1.23        | 1.32  | 0.048                       | 0.052 |
| H1   | 6.20        | 6.60  | 0.244                       | 0.260 |
| J1   | 2.40        | 2.72  | 0.094                       | 0.107 |
| L    | 13.00       | 14.00 | 0.512                       | 0.551 |
| L1   | 3.50        | 3.93  | 0.138                       | 0.155 |
| L20  | 16.40 typ.  |       | 0.646 typ.                  |       |
| L30  | 28.90 typ.  |       | 1.138 typ.                  |       |
| θP   | 3.75        | 3.85  | 0.148                       | 0.152 |
| Q    | 2.65        | 2.95  | 0.104                       | 0.116 |

### 3 Ordering information

**Table 5. Ordering information**

| Order code   | Marking    | Package  | Weight | Base qty. | Delivery mode |
|--------------|------------|----------|--------|-----------|---------------|
| STPS40M120CT | PS40M120CT | TO-220AB | 1.95 g | 50        | Tube          |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes                                                                                                                                                                                                                                                                           |
|-------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 02-Apr-2012 | 1       | First issue.                                                                                                                                                                                                                                                                      |
| 27-Jun-2018 | 2       | Updated Table 1. Absolute Ratings (limiting values, per diode, at 25 °C, unless otherwise specified) and Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125\text{ °C}$ ). Removed TO-220AB narrow leads and I <sup>2</sup> PAK package information. |
| 13-Nov-2018 | 3       | Updated Table 5.                                                                                                                                                                                                                                                                  |

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