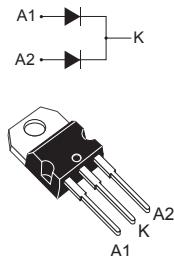


120 V power Schottky rectifier



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 | |
|-----------------------------|----------|
| STPS40M120C | |
| 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_{RRM} | Repetitive peak reverse voltage | 120 | V |
| $I_{F(RMS)}$ | Forward rms current | 30 | A |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ | $T_C = 130$ °C | Per diode |
| | | $T_C = 120$ °C | Per device |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10$ ms sinusoidal | 220 |
| P_{ARM} | Repetitive peak avalanche power | $t_p = 10$ µs, $T_j = 125$ °C | 1600 |
| T_{stg} | Storage temperature range | | -65 to +175 °C |
| T_j | Maximum operating junction temperature ⁽¹⁾ | 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 |
| | | Total | 0.80 |
| $R_{th(c)}$ | Coupling | 0.50 | °C/W |

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 | $T_j = 25$ °C | $V_R = V_{RRM}$ | - | 75 | 370 | µA |
| | | $T_j = 125$ °C | | - | 25 | 70 | mA |
| V_F ⁽²⁾ | Forward voltage drop | $T_j = 125$ °C | $I_F = 5$ A | - | 0.44 | 0.49 | V |
| | | $T_j = 125$ °C | $I_F = 10$ A | - | 0.52 | 0.57 | |
| | | $T_j = 25$ °C | $I_F = 20$ A | - | | 0.79 | |
| | | $T_j = 125$ °C | | - | 0.61 | 0.67 | |

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

2. Pulse test: $t_p = 380$ µs, $\delta < 2\%$

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)

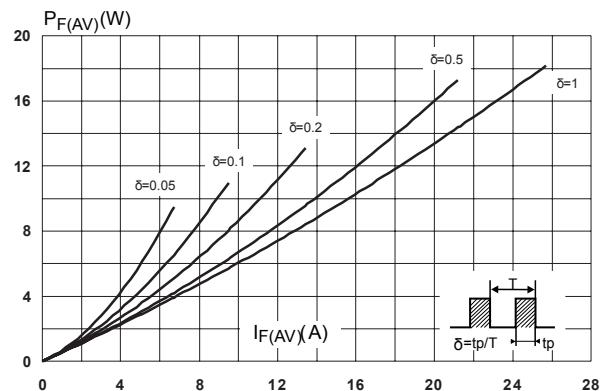


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)

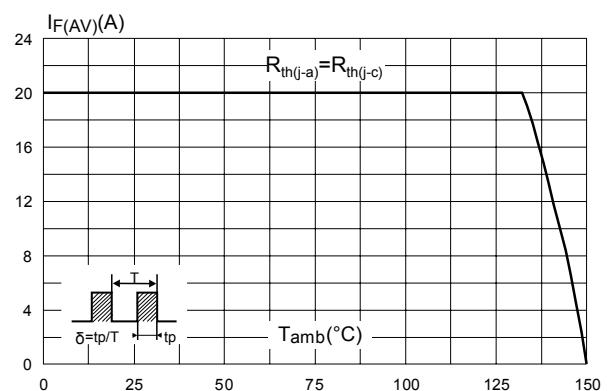


Figure 3. Normalized avalanche power derating versus pulse duration ($T_j = 125$ °C)

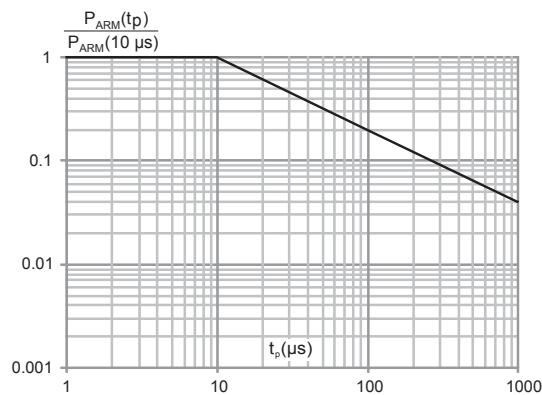


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

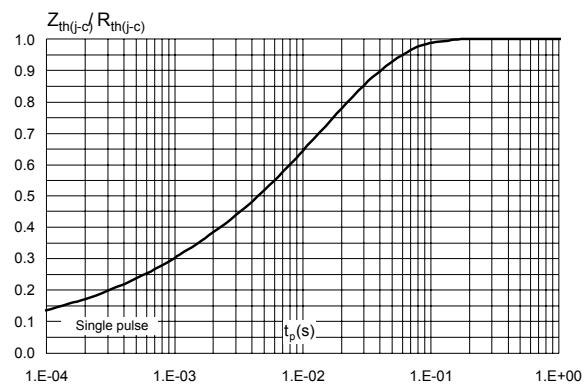


Figure 5. Reverse leakage current versus reverse voltage applied (typical values, per diode)

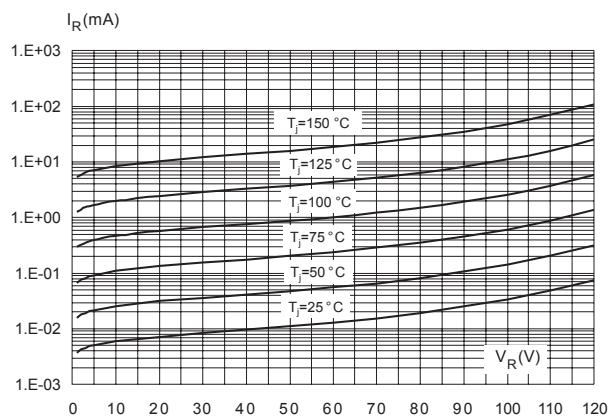


Figure 6. Junction capacitance versus reverse voltage applied (typical values, per diode)

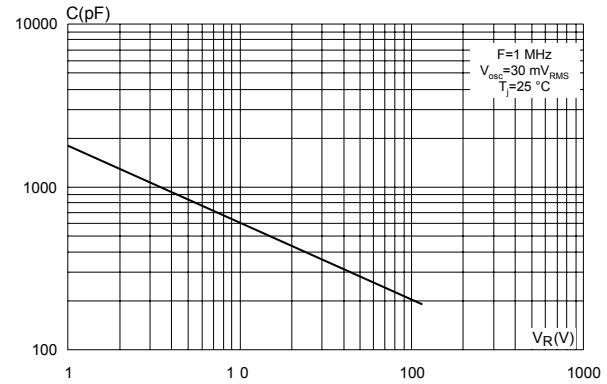
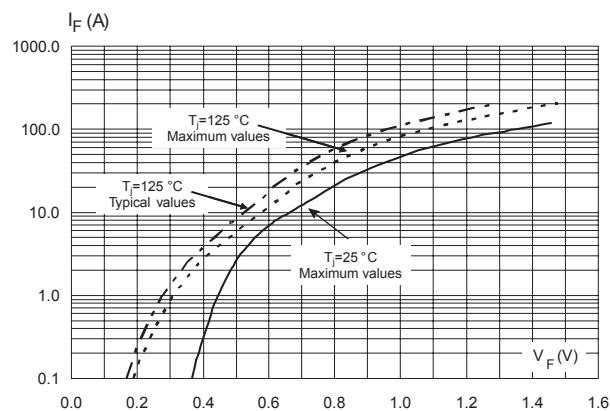


Figure 7. Forward voltage drop versus forward current (per diode)



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. 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

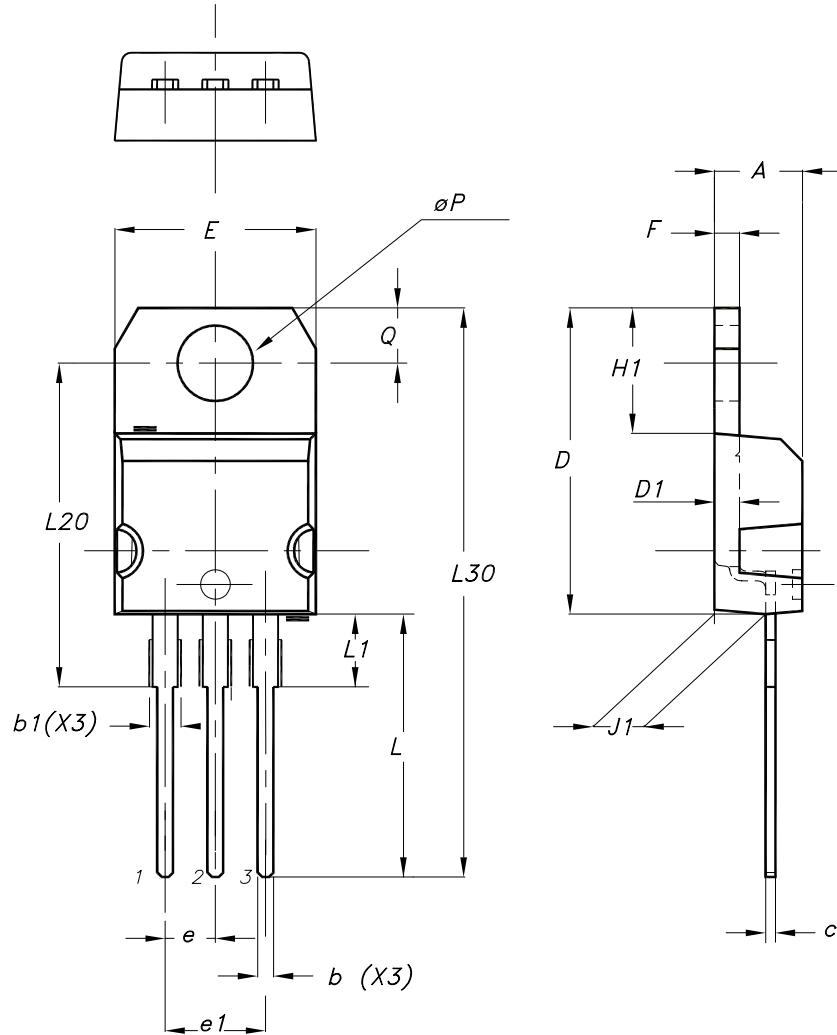


Table 4. TO-220AB package mechanical data

| 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 °C) . Removed TO-220AB narrow leads and I ² PAK package information. |
| 13-Nov-2018 | 3 | Updated Table 5 . |

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