

Power Schottky rectifier

Features

- High current capability
- Avalanche rated
- Low forward voltage drop current
- High frequency operation

Description

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

Packaged in TO-220AB and I²PAK, this device is intended to be used in notebook, game station and desktop adaptors, providing in these applications a good efficiency at both low and high load.

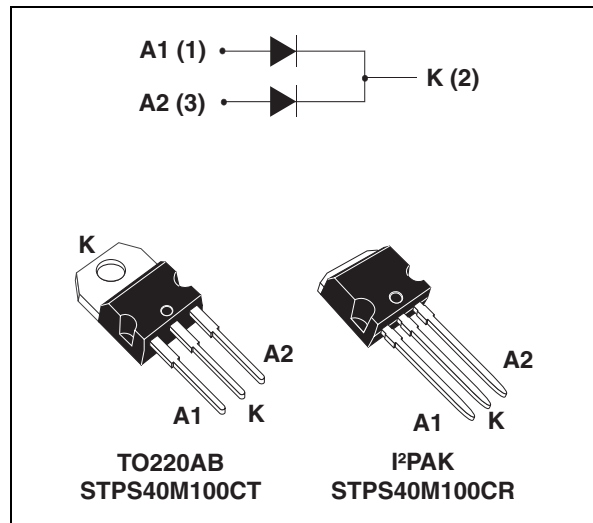
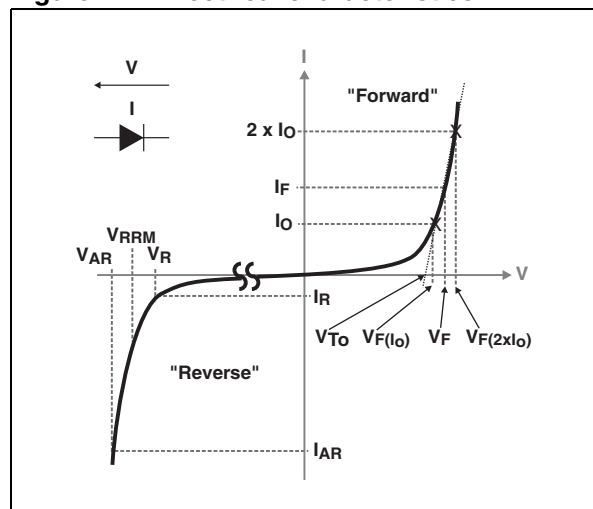


Table 1. Device summary

| Symbol | Value |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 20 A |
| V_{RRM} | 100 V |
| T_j (max) | 150 °C |
| V_F (typ) | 0.420 V |

Figure 1. Electrical characteristics (a)



- a. V_{ARM} and I_{ARM} must respect the reverse safe operating area defined in [Figure 11](#) V_{AR} and I_{AR} are pulse measurements ($t_p < 1 \mu s$). V_R , I_R , V_{RRM} and V_F , are static characteristics

1 Characteristics

Table 2. Absolute ratings (limiting values per diode at 25 °C unless otherwise stated)

| Symbol | Parameter | | Value | Unit | |
|---------------------------------|---|---|--------------|------|---|
| V _{RRM} | Repetitive peak reverse voltage | | 100 | V | |
| I _{F(RMS)} | Forward current rms | | 60 | A | |
| I _{F(AV)} | Average forward current δ = 0.5 | T _c = 125 °C | Per diode | 20 | A |
| | | T _c = 120 °C | Per package | 40 | |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 ms sinusoidal | 530 | A | |
| P _{ARM} ⁽¹⁾ | Repetitive peak avalanche power | t _p = 1 μs T _j = 25 °C | 23 200 | W | |
| V _{ARM} ⁽²⁾ | Maximum repetitive peak avalanche voltage | t _p < 1 μs T _j < 150 °C, I _{AR} < 58 A | 120 | V | |
| V _{ASM} ⁽²⁾ | Maximum single pulse peak avalanche voltage | t _p < 1 μs T _j < 150 °C, I _{AR} < 58 A | 120 | V | |
| T _{stg} | Storage temperature range | | -65 to + 175 | °C | |
| T _j | Maximum operating junction temperature ⁽³⁾ | | 150 | °C | |

1. For temperature or pulse time duration deratings, refer to [Figure 4](#), and [Figure 5](#). More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.
2. Refer to [Figure 11](#)
3. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

| Symbol | Parameter | | Value | Unit |
|----------------------|------------------|-----------|-------|------|
| R _{th(j-c)} | Junction to case | Per diode | 1.4 | °C/W |
| | | Total | 0.95 | |
| R _{th(c)} | Coupling | | 0.5 | °C/W |

When diodes 1 and 2 are used simultaneously

$$T_j(\text{diode 1}) = P(\text{diode 1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

Table 4. Static electrical characteristics

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-------------------------------|-------------------------|-------------------------|-----------------------------------|------|-------|-------|------|
| I _R ⁽¹⁾ | Reverse leakage current | T _j = 25 °C | V _R = V _{RRM} | - | - | 70 | μA |
| | | T _j = 125 °C | | - | 15 | 70 | mA |
| | | T _j = 25 °C | V _R = 70 V | - | - | 40 | μA |
| | | T _j = 125 °C | | - | 7.5 | 40 | mA |
| V _F ⁽²⁾ | Forward voltage drop | T _j = 125 °C | I _F = 5 A | - | 0.415 | 0.500 | V |
| | | T _j = 125 °C | I _F = 10A | - | 0.500 | 0.560 | - |
| | | T _j = 25 °C | I _F = 20 A | - | - | 0.780 | - |
| | | T _j = 125 °C | | - | 0.585 | 0.640 | - |

1. Pulse test: t_p = 5 ms, δ < 2%
2. Pulse test: t_p = 380 μs, δ < 2%

To evaluate the conduction losses use the following equation:
 $P = 0.560 \times I_{F(AV)} + 0.004 \times I_{F(RMS)}^2$

Figure 2. Average forward power dissipation versus average forward current (per diode)

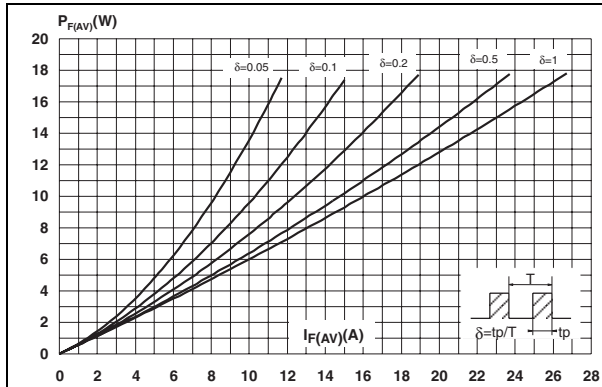


Figure 3. Average forward current per diode versus ambient temperature ($\delta = 0.5$)

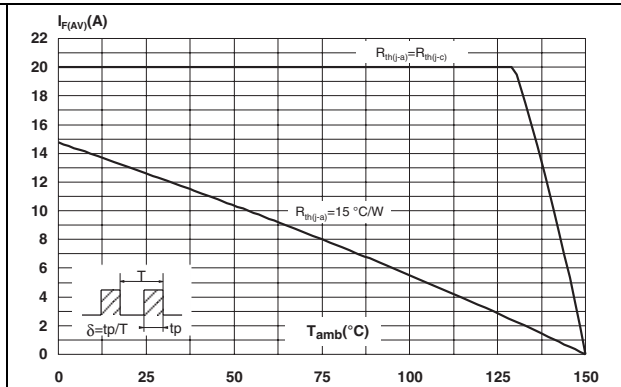


Figure 4. Normalized avalanche power derating versus pulse duration

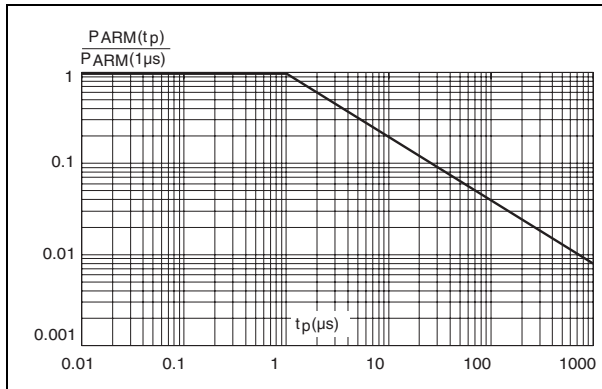


Figure 5. Normalized avalanche power derating versus junction temperature

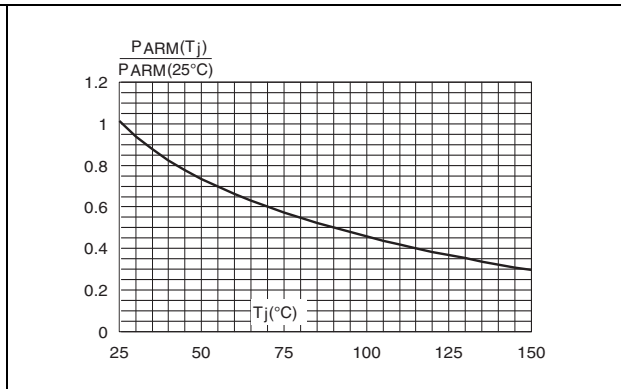


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values per diode)

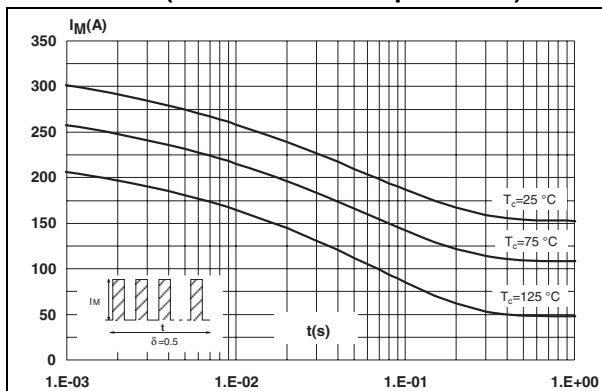


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration

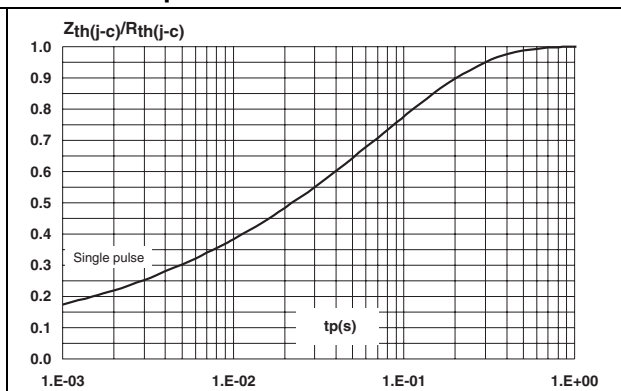


Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)

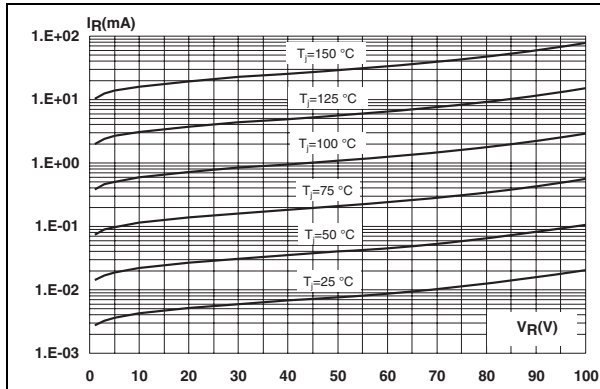


Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)

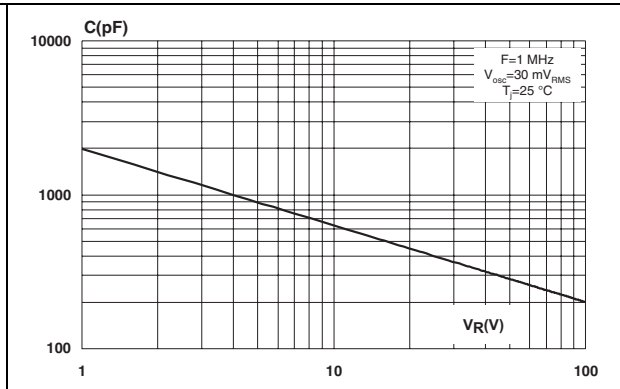


Figure 10. Forward voltage drop versus forward current (per diode)

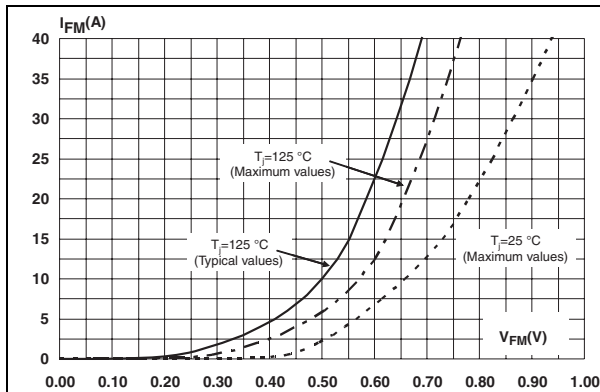
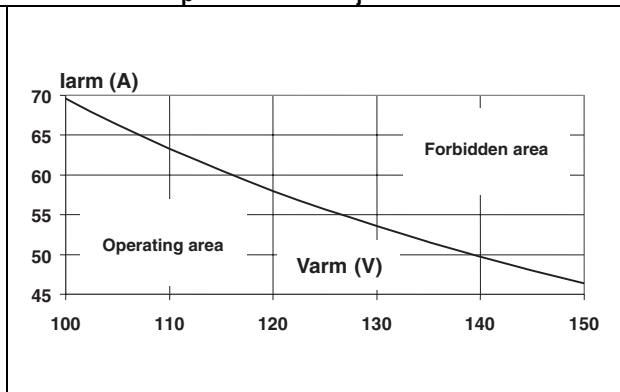


Figure 11. Reverse safe operating area ($t_p < 1\ \mu\text{s}$ and $T_j < 150^\circ\text{C}$)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: conduction
- Recommended torque value: 0.4 to 0.6 N·m

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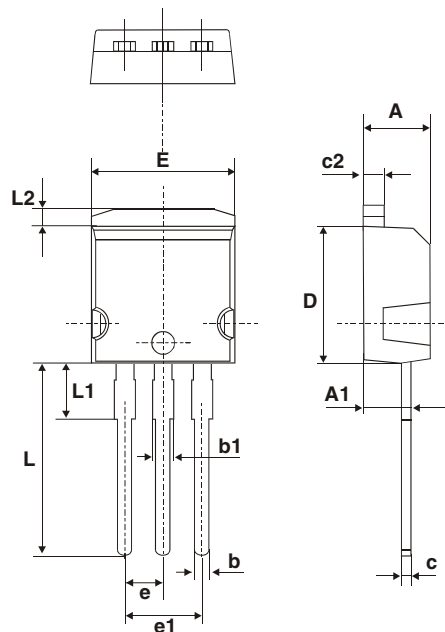
Table 5. TO-220AB dimensions

| 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 |

Mounting (soldering) the I2PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

Table 6. I²PAK 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 |



3 Ordering information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|--------------|--------------|--------------------|--------|----------|---------------|
| STPS40M100CT | STPS40M100CT | TO-220AB | 1.9 g | 50 | Tube |
| STPS40M100CR | STPS40M100CR | I ² PAK | 1.5 g | 50 | Tube |

4 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 25-Mar-2009 | 1 | First issue. |
| 10-Apr-2010 | 2 | Updated package graphics. |
| 29-Apr-2010 | 3 | Added I ² PAK package. Updated weight in Table 7 . |

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