

Low drop power Schottky rectifier

Features

- Negligible switching losses
- Low leakage current
- Good trade off between leakage current and forward voltage drop
- Low thermal resistance
- Avalanche capability specified
- ECOPACK[®]2 “halogen-free” available (STPS41H100CR-H / STPS41H100CT-H)

Description

Dual center tab Schottky rectifier suited for switch mode power supply and high frequency DC to DC converters.

Packaged in D²PAK, I²PAK and TO-220AB, this device is intended for use in high frequency inverters.

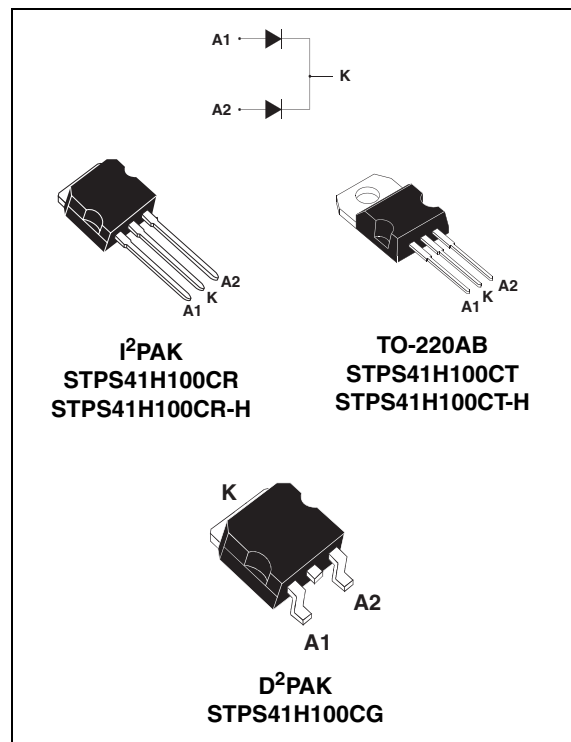


Table 1. Device summary

| Symbol | Value |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 20 A |
| V_{RRM} | 100 V |
| T_j (max) | 175 °C |
| V_F (max) | 0.67 V |

1 Characteristics

Table 2. Absolute ratings (limiting values, per diode)

| Symbol | Parameter | | Value | Unit | |
|---------------------|---|--|--------------|------|---|
| V _{RRM} | Repetitive peak reverse voltage | | 100 | V | |
| I _{F(RMS)} | Forward rms current | | 30 | A | |
| I _{F(AV)} | Average forward current | T _c = 50 °C | Per diode | 20 | A |
| | | δ = 0.5 | Per device | 40 | |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 ms sinusoidal | 220 | A | |
| I _{RRM} | Repetitive peak reverse current | t _p = 2 μs square F= 1 kHz | 1 | A | |
| P _{ARM} | Repetitive peak avalanche power | t _p = 1 μs T _j = 25 °C | 18100 | W | |
| T _{stg} | Storage temperature range | | -65 to + 175 | °C | |
| T _j | Maximum operating junction temperature ⁽¹⁾ | | 175 | °C | |
| dV/dt | Critical rate of rise of 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 resistance

| Symbol | Parameter | | Value | Unit |
|----------------------|------------------|-----------|-------|------|
| R _{th(j-c)} | Junction to case | Per diode | 1.5 | °C/W |
| | | Total | 0.8 | |
| R _{th(c)} | Coupling | | 0.1 | |

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 | Test conditions | | Min. | Typ. | Max. | Unit |
|-------------------------------|-------------------------|-------------------------|-----------------------------------|------|------|------|------|
| I _R ⁽¹⁾ | Reverse leakage current | T _j = 25 °C | V _R = V _{RRM} | | | 10 | μA |
| | | T _j = 125 °C | | | 3 | 10 | mA |
| V _F ⁽¹⁾ | Forward voltage drop | T _j = 25 °C | I _F = 20 A | | | 0.80 | V |
| | | T _j = 125 °C | I _F = 20 A | | 0.62 | 0.67 | |
| | | T _j = 25 °C | I _F = 40 A | | | 0.90 | |
| | | T _j = 125 °C | I _F = 40 A | | 0.70 | 0.76 | |

1. Pulse test: t_p = 380 μs, δ < 2%

To evaluate the conduction losses use the following equation:

$$P = 0.58 \times I_{F(AV)} + 0.0045 I_{F(RMS)}^2$$

Figure 1. Conduction losses versus average current

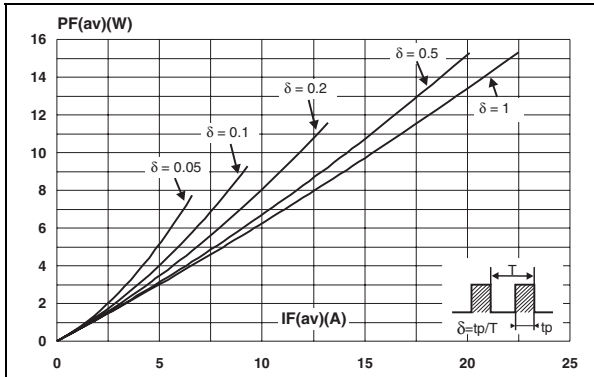


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$)

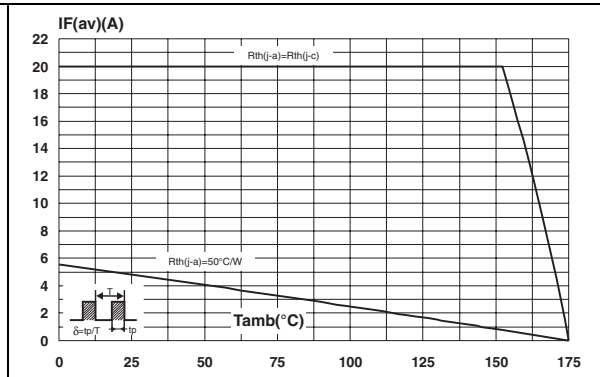


Figure 3. Normalized avalanche power derating versus pulse duration

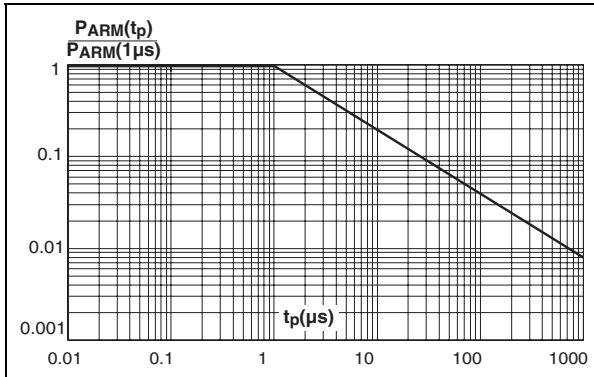


Figure 4. Normalized avalanche power derating versus junction temperature

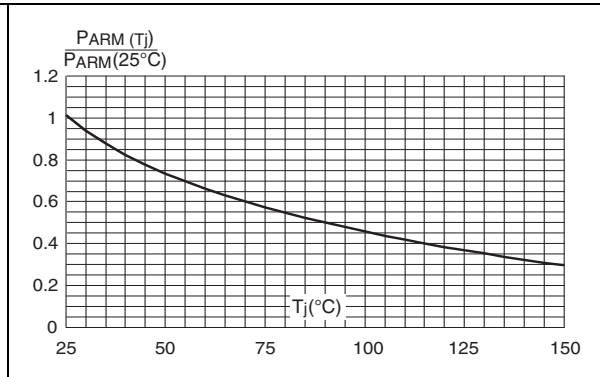


Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values)

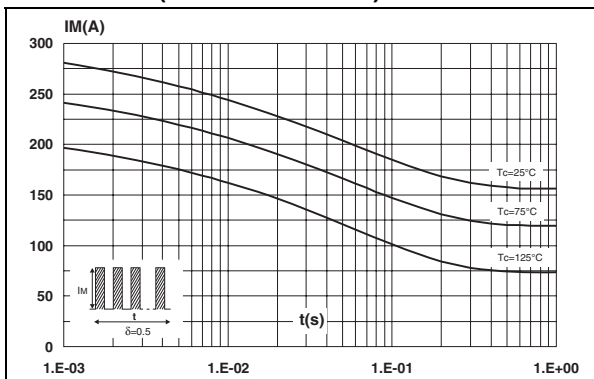


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

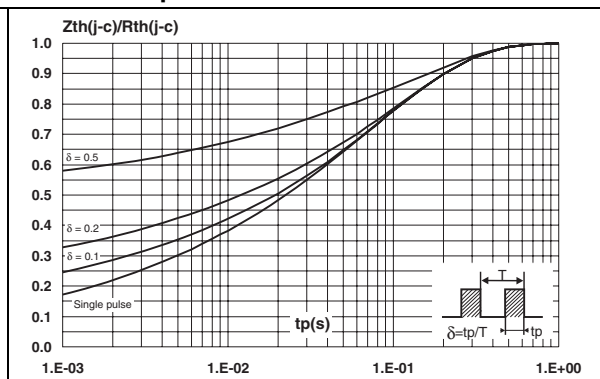


Figure 7. Reverse leakage current versus reverse voltage applied (typical values)

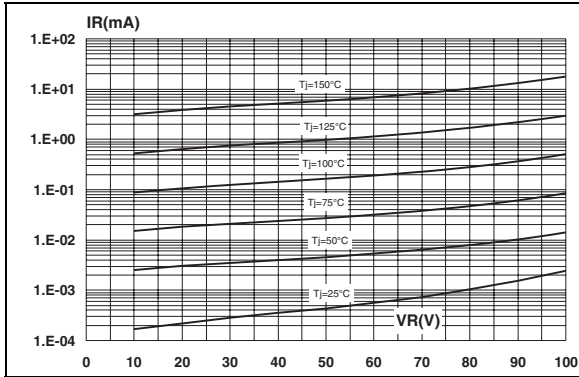


Figure 8. Junction capacitance versus reverse voltage applied (typical values)

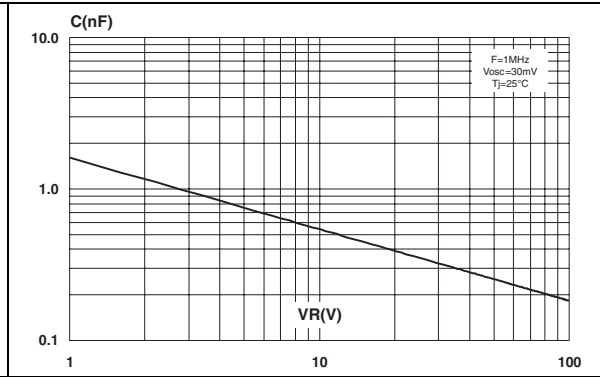


Figure 9. Forward voltage drop versus forward current

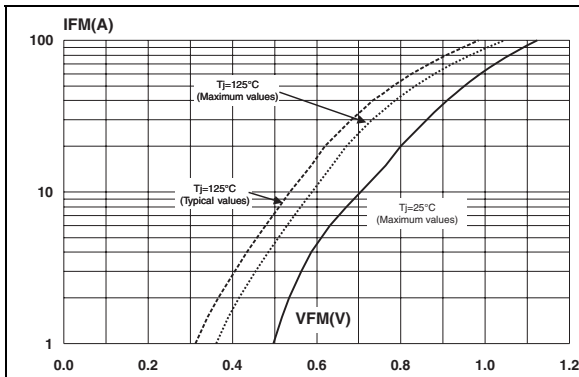
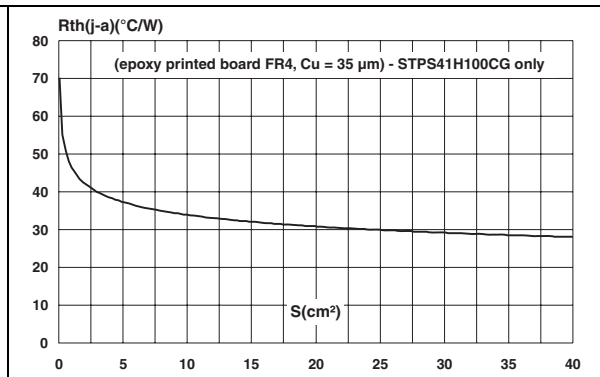


Figure 10. Thermal resistance junction to ambient versus copper surface under tab



2 Package information

- Epoxy meets UL94, V0
- Recommended torque values for TO-220AB: 0.4 to 0.6 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. ECOPACK® is an ST trademark.

Table 5. 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 |

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

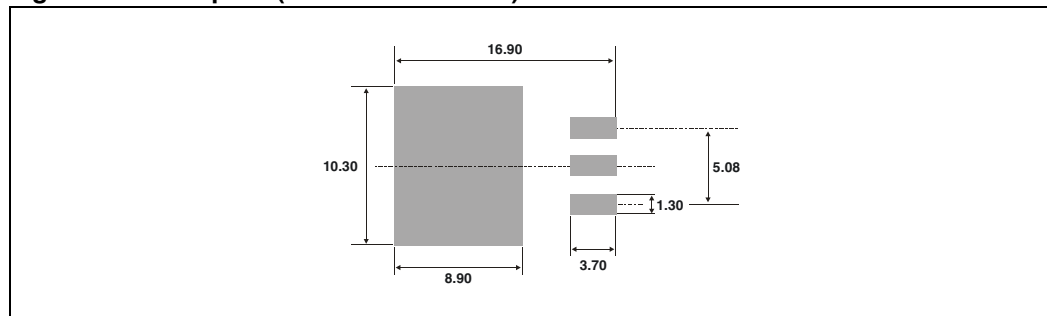
Table 6. TO-220AB dimensions

| 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 7. D²PAK 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 11. Footprint (dimensions in mm)



3 Ordering information

Table 8. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|-----------------|--------------|--------------------|--------|----------|---------------|
| STPS41H100CT | STPS41H100CT | TO-220AB | 2.20 g | 50 | Tube |
| STPS41H100CT-H | STPS41H100CT | TO-220AB | 2.20 g | 50 | Tube |
| STPS41H100CG | STPS41H100CG | D ² PAK | 1.48 g | 50 | Tube |
| STPS41H100CG-TR | STPS41H100CG | D ² PAK | 1.48 g | 1000 | Tape and reel |
| STPS41H100CR | STPS41H100CR | I ² PAK | 1.49 g | 50 | Tube |
| STPS41H100CR-H | STPS41H100CR | I ² PAK | 1.49 g | 50 | Tube |

4 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|-----------------------------------|
| Jul-2003 | 3A | Previous release. |
| 15-Jul-2011 | 4 | Updated Table 5 . |

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