

High voltage power Schottky rectifier

Main product characteristics

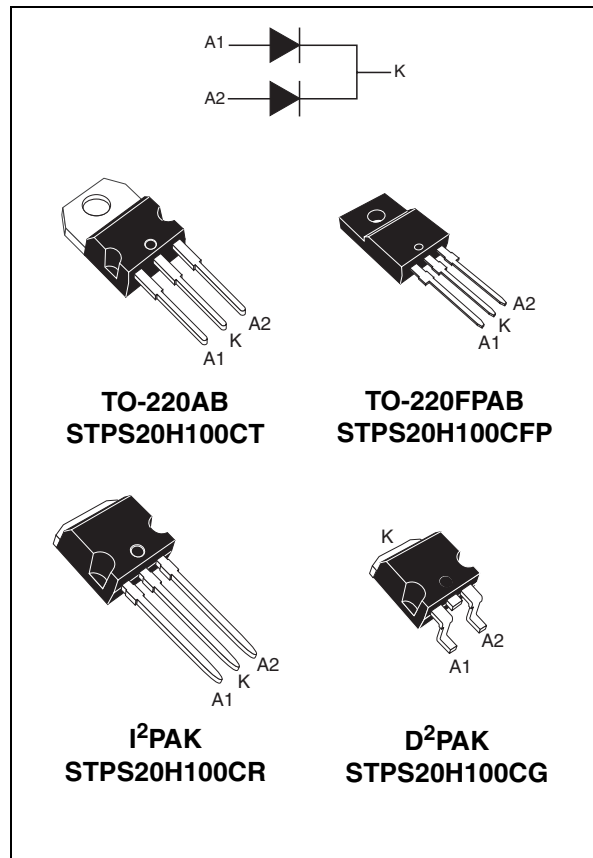
| | |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 10 A |
| V_{RRM} | 100 V |
| T_j (max) | 175° C |
| V_F (max) | 0.64 V |

Features and benefits

- Negligible switching losses
- High junction temperature capability
- Good trade off between leakage current and forward voltage drop
- Low leakage current
- Avalanche rated
- Insulated package: TO-220FPAB
Insulating voltage = 2000 V DC
Capacitance = 45 pF
- Avalanche capability specified

Description

Dual center tap schottky rectifier designed for high frequency miniature switched mode power supplies such as adaptators and on board DC/DC converters.



1 Characteristics

Table 1. Absolute ratings (limiting values, per diode)

| Symbol | Parameter | | | Value | Unit | |
|--------------|---|---|---|--------------|------------------|---|
| V_{RRM} | Repetitive peak reverse voltage | | | 100 | V | |
| $I_{F(RMS)}$ | RMS forward current | | | 30 | A | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ | TO-220AB D ² PAK / I ² PAK | $T_c = 160^\circ\text{C}$ | Per diode | 10 | A |
| | | TO-220FPAB | $T_c = 145^\circ\text{C}$ | Per device | 20 | |
| I_{FSM} | Surge non repetitive forward current | | $t_p = 10\text{ ms}$ sinusoidal | 250 | A | |
| I_{RRM} | Repetitive peak reverse current | | $t_p = 2\ \mu\text{s}$ square F= 1 kHz | 1 | A | |
| I_{RSM} | Non repetitive peak reverse current | | $t_p = 100\ \mu\text{s}$ square | 3 | A | |
| P_{ARM} | Repetitive peak avalanche power | | $t_p = 1\ \mu\text{s}$ $T_j = 25^\circ\text{C}$ | 10800 | W | |
| T_{stg} | Storage temperature range | | | -65 to + 175 | $^\circ\text{C}$ | |
| T_j | Maximum operating junction temperature ⁽¹⁾ | | | 175 | $^\circ\text{C}$ | |
| 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 2. Thermal resistance

| Symbol | Parameter | | | Value | Unit |
|---------------|------------------|--|-----------|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB / D ² PAK / I ² PAK | Per diode | 1.6 | $^\circ\text{C/W}$ |
| | | TO-220FPAB | Per diode | 4 | |
| | | TO-220AB / D ² PAK / I ² PAK | Total | 0.9 | $^\circ\text{C/W}$ |
| | | TO-220FPAB | Total | 3.2 | |
| $R_{th(c)}$ | | TO-220AB / D ² PAK / I ² PAK | Coupling | 0.15 | $^\circ\text{C/W}$ |
| | | TO-220FPAB | Coupling | 2.5 | |

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 3. Static electrical characteristics (per diode)

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|----------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ \text{C}$ | $V_R = V_{RRM}$ | | | 4.5 | μA |
| | | $T_j = 125^\circ \text{C}$ | | | 2 | 6 | mA |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25^\circ \text{C}$ | $I_F = 8 \text{ A}$ | | | 0.71 | V |
| | | $T_j = 25^\circ \text{C}$ | $I_F = 10 \text{ A}$ | | | 0.77 | |
| | | $T_j = 25^\circ \text{C}$ | $I_F = 16 \text{ A}$ | | | 0.81 | |
| | | $T_j = 25^\circ \text{C}$ | $I_F = 20 \text{ A}$ | | | 0.88 | |
| | | $T_j = 125^\circ \text{C}$ | $I_F = 8 \text{ A}$ | | 0.56 | 0.58 | |
| | | $T_j = 125^\circ \text{C}$ | $I_F = 10 \text{ A}$ | | 0.59 | 0.64 | |
| | | $T_j = 125^\circ \text{C}$ | $I_F = 16 \text{ A}$ | | 0.65 | 0.68 | |
| | | $T_j = 125^\circ \text{C}$ | $I_F = 20 \text{ A}$ | | 0.67 | 0.73 | |

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

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

To evaluate the conduction losses use the following equation:

$$P = 0.55 \times I_{F(AV)} + 0.009 I_{F(RMS)}^2$$

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

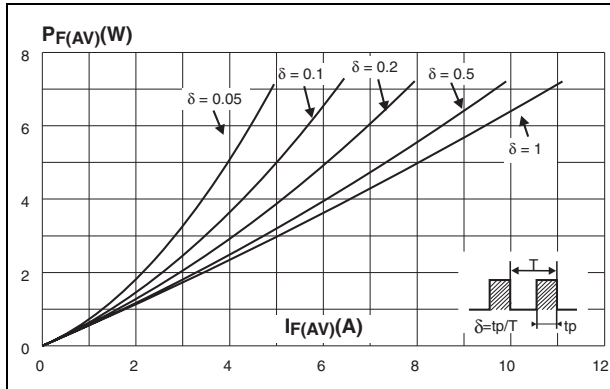


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)

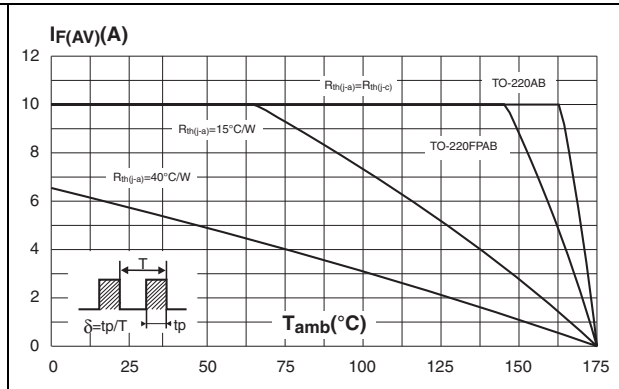


Figure 3. Normalized avalanche power derating versus pulse duration

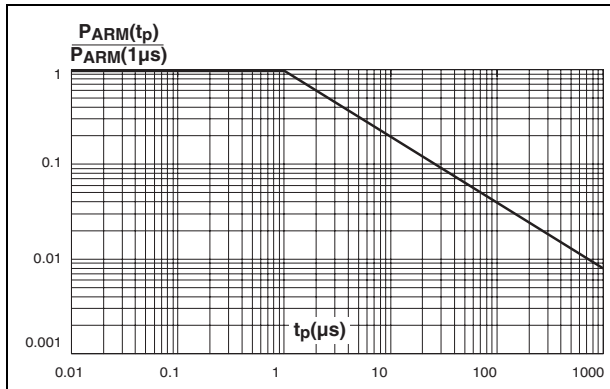


Figure 4. Normalized avalanche power derating versus junction temperature

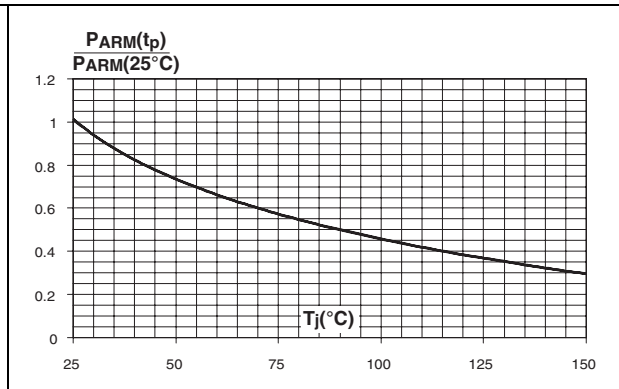


Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode, TO-220AB, D²PAK, I²PAK)

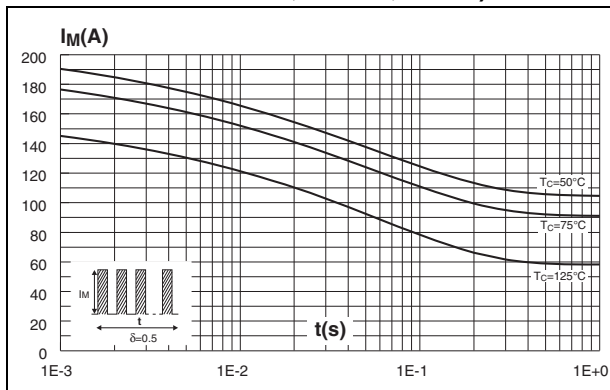


Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values, per diode, TO-220FPAB)

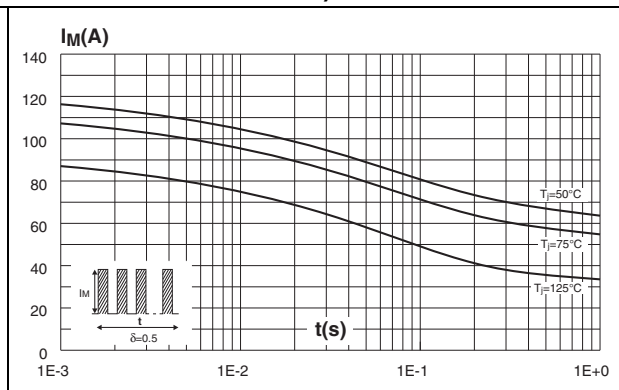


Figure 7. Relative variation of thermal impedance junction to case versus pulse duration (per diode, TO-220AB, D²PAK, I²PAK)

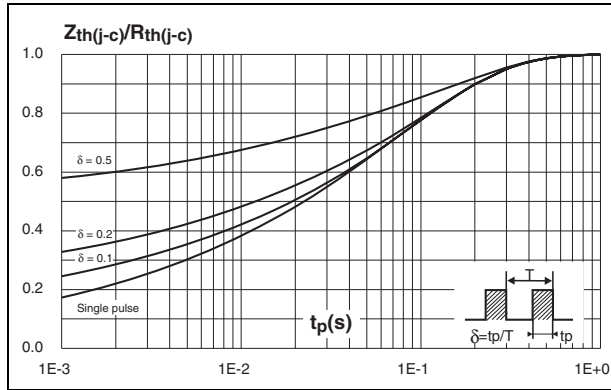


Figure 8. Relative variation of thermal impedance junction to case versus pulse duration (per diode, TO-220FPAB)

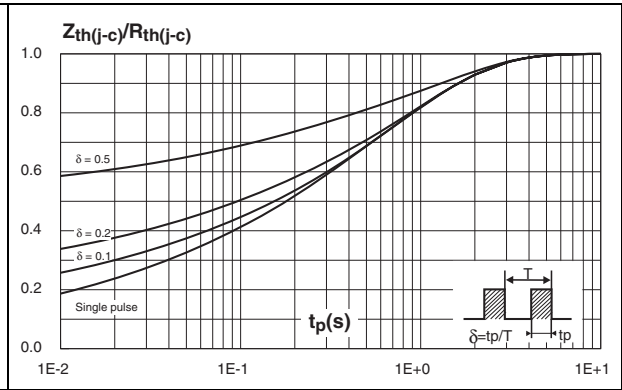


Figure 9. Reverse leakage current versus reverse voltage applied (typical values, per diode)

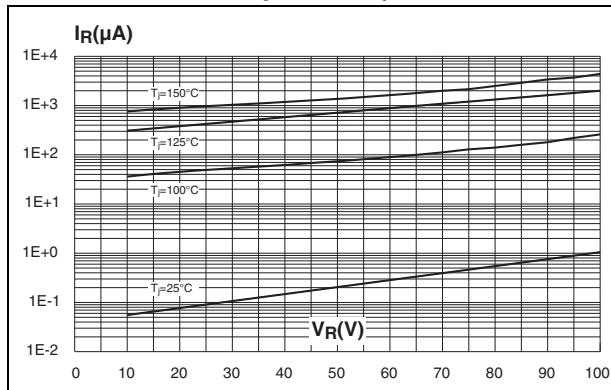


Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)

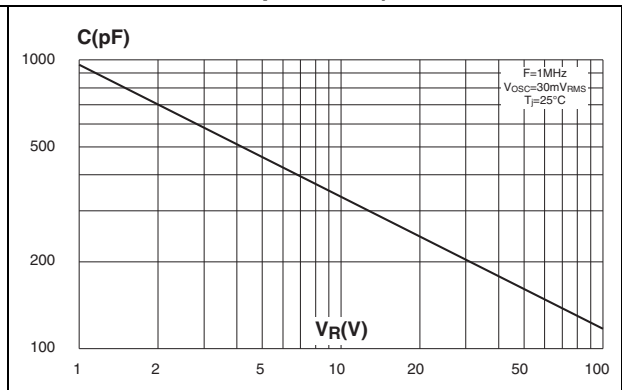


Figure 11. Forward voltage drop versus forward current (maximum values, per diode)

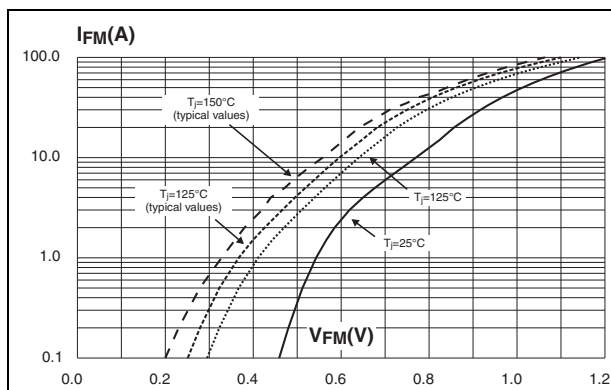
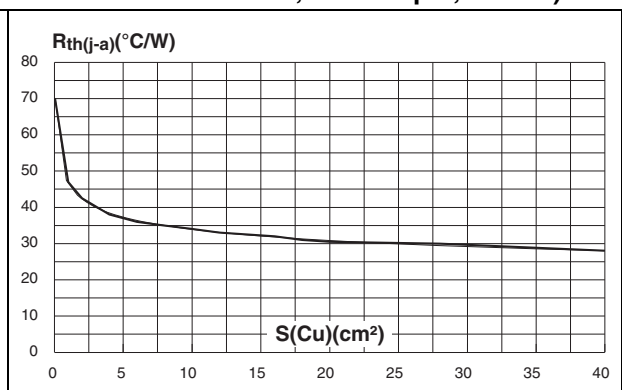


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed circuit board FR4, Cu = 35 μm , D²PAK)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm
- Maximum torque value: 0.70 Nm

Table 4. 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 |

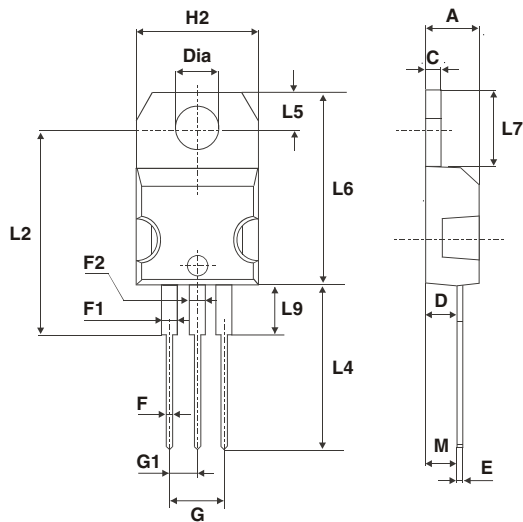


Table 5. TO-220FPAB dimensions

| Ref | Dimensions | | | |
|------|-------------|------|-----------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| B | 2.5 | 2.7 | 0.098 | 0.106 |
| D | 2.5 | 2.75 | 0.098 | 0.108 |
| E | 0.45 | 0.70 | 0.018 | 0.027 |
| F | 0.75 | 1 | 0.30 | 0.039 |
| F1 | 1.15 | 1.70 | 0.045 | 0.067 |
| F2 | 1.15 | 1.70 | 0.045 | 0.067 |
| G | 4.95 | 5.20 | 0.195 | 0.205 |
| G1 | 2.4 | 2.7 | 0.094 | 0.106 |
| H | 10 | 10.4 | 0.393 | 0.409 |
| L2 | 16 typ. | | 0.63 typ. | |
| L3 | 28.6 | 30.6 | 1.126 | 1.205 |
| L4 | 9.8 | 10.6 | 0.386 | 0.417 |
| L5 | 2.9 | 3.6 | 0.114 | 0.142 |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 |
| Dia. | 3 | 3.20 | 0.118 | 0.126 |

Table 6. 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 13. Footprint (dimensions in millimeters)

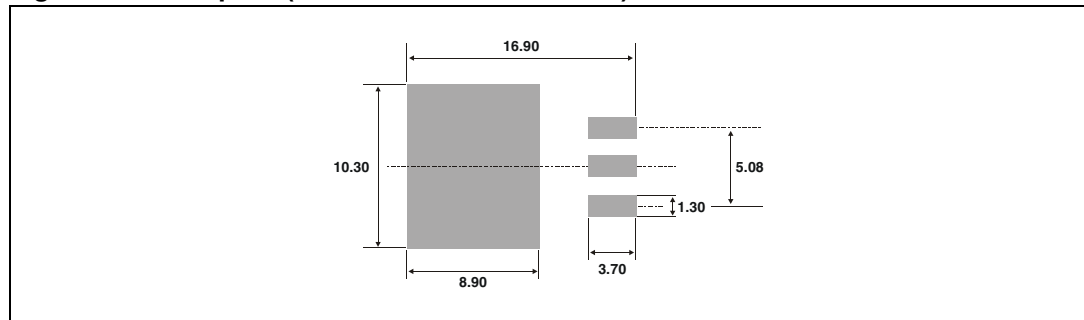


Table 7. I²PAK dimensions

| 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 |
| b | 0.70 | 0.93 | 0.028 | 0.037 |
| b1 | 1.14 | 1.17 | 0.044 | 0.046 |
| b2 | 1.14 | 1.17 | 0.044 | 0.046 |
| c | 0.45 | 0.60 | 0.018 | 0.024 |
| c2 | 1.23 | 1.36 | 0.048 | 0.054 |
| D | 8.95 | 9.35 | 0.352 | 0.368 |
| e | 2.40 | 2.70 | 0.094 | 0.106 |
| E | 10.0 | 10.4 | 0.394 | 0.409 |
| L | 13.1 | 13.6 | 0.516 | 0.535 |
| L1 | 3.48 | 3.78 | 0.137 | 0.149 |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 |

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.

3 Ordering information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|-----------------|---------------|--------------------|--------|----------|---------------|
| STPS20H100CT | STPS20H100CT | TO-220AB | 2.20 g | 50 | Tube |
| STPS20H100CFP | STPS20H100CFP | TO-220FPAB | 2.0 g | 50 | Tube |
| STPS20H100CR | STPS20H100CR | I ² PAK | 1.49 g | 50 | Tube |
| STPS20H100CG | STPS20H100CG | D ² PAK | 1.48 g | 50 | Tube |
| STPS20H100CG-TR | STPS20H100CG | D ² PAK | 1.48 g | 1000 | Tape & reel |

4 Revision history

| Date | Revision | Description of Changes |
|-------------|----------|--------------------------|
| Jul-2003 | 4G | Last release. |
| 21-Mar-2007 | 5 | Removed ISOWATT package. |

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