

### Features

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

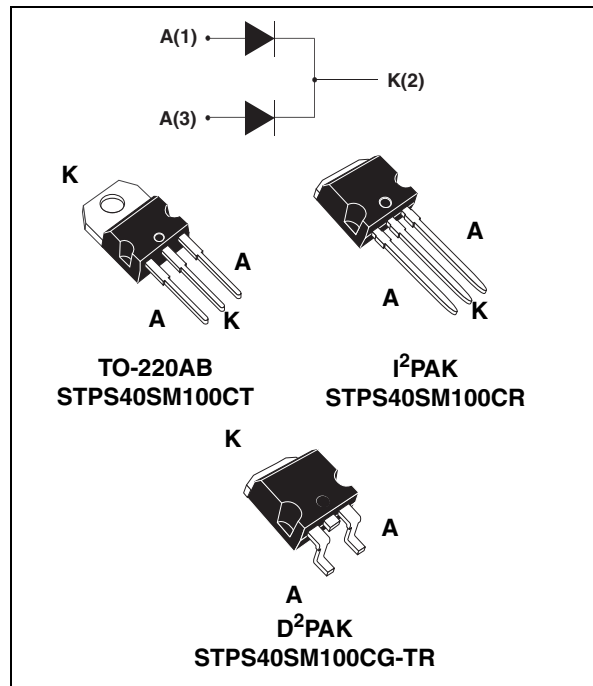
### Description

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

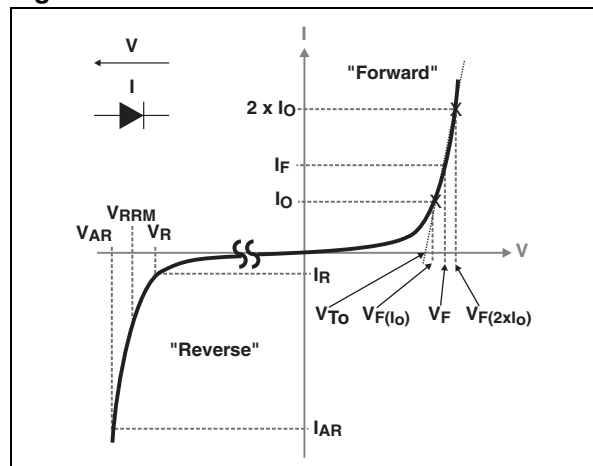
Packaged in TO-220AB, D<sup>2</sup>PAK and I<sup>2</sup>PAK, this device is intended to be used in notebook, game station and desktop adaptors, providing in these applications a good efficiency at both low and high load.

**Table 1. Device summary**

|             |          |
|-------------|----------|
| $I_{F(AV)}$ | 2 x 20 A |
| $V_{RRM}$   | 100 V    |
| $T_j (max)$ | 150 °C   |
| $V_F(typ)$  | 0.435 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)**

| Symbol                          | Parameter   | Value  | Unit  |   |
|---------------------------------|---|--|-------|---|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       | 100  | V     |   |
| I <sub>F(RMS)</sub>             | Forward current rms                                   | 60   | A     |   |
| I <sub>F(AV)</sub>              | Average forward current $\delta = 0.5$                | T <sub>c</sub> = 130 °C<br>Per diode   | 20    | A |
|                                 |   | T <sub>c</sub> = 125 °C<br>Per device  | 40    |   |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sinusoidal  | 530   | A |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       | t <sub>p</sub> = 1 $\mu$ s T <sub>j</sub> = 25 °C                            | 18000 | W |
| V <sub>ARM</sub> <sup>(2)</sup> | Maximum repetitive peak avalanche voltage             | t <sub>p</sub> < 1 $\mu$ s T <sub>j</sub> < 150 °C<br>I <sub>AR</sub> < 45 A | 120   | V |
| V <sub>ASM</sub> <sup>(2)</sup> | Maximum single pulse peak avalanche voltage           | t <sub>p</sub> < 1 $\mu$ s T <sub>j</sub> < 150 °C<br>I <sub>AR</sub> < 45 A | 120   | V |
| T <sub>stg</sub>                | Storage temperature range                             | -65 to + 175   | °C    |   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> | 150  | °C    |   |

- 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.
- Refer to [Figure 11](#).
- $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistance**

| Symbol               | Parameter        | Value     | Unit |
|----------------------|------------------|-----------|------|
| R <sub>th(j-c)</sub> | Junction to case | Per diode | 1.3  |
|                      |                  | Total     | 0.7  |
| R <sub>th(c)</sub>   | Coupling         | 0.1       | °C/W |

**Table 4. Static electrical characteristics (per diode, at 25 °C unless otherwise specified)**

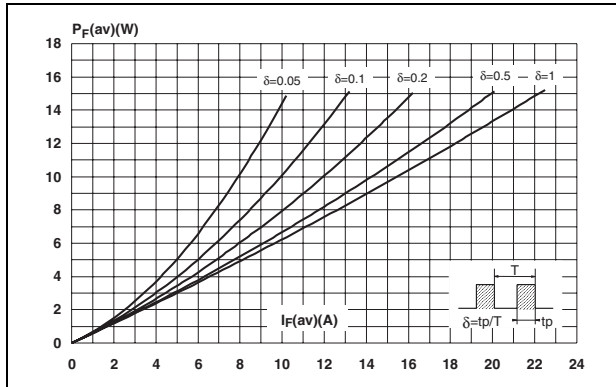
| Symbol                        | Parameter               | Test conditions         | Min.                   | Typ. | Max. | Unit |         |
|-------------------------------|-------------------------|-------------------------|------------------------|------|------|------|---------|
| I <sub>R</sub> <sup>(1)</sup> | Reverse leakage current | T <sub>j</sub> = 25 °C  | V <sub>R</sub> = 70 V  |      | 7    |      | $\mu$ A |
|                               |                         | T <sub>j</sub> = 125 °C |                        |      | 7    |      | mA      |
|                               |                         | T <sub>j</sub> = 25 °C  | V <sub>R</sub> = 100 V |      | 13   | 45   | $\mu$ A |
|                               |                         | T <sub>j</sub> = 125 °C |                        |      | 13   | 45   | mA      |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 5 A   |      | 520  |      | mV      |
|                               |                         | T <sub>j</sub> = 125 °C |                        |      | 435  |      |         |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 10A   |      | 620  | 700  |         |
|                               |                         | T <sub>j</sub> = 125 °C |                        |      | 520  | 580  |         |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 20 A  |      | 740  | 810  |         |
|                               |                         | T <sub>j</sub> = 125 °C |                        |      | 605  | 665  |         |

- Pulse test: t<sub>p</sub> = 5 ms,  $\delta < 2\%$
- Pulse test: t<sub>p</sub> = 380  $\mu$ s,  $\delta < 2\%$

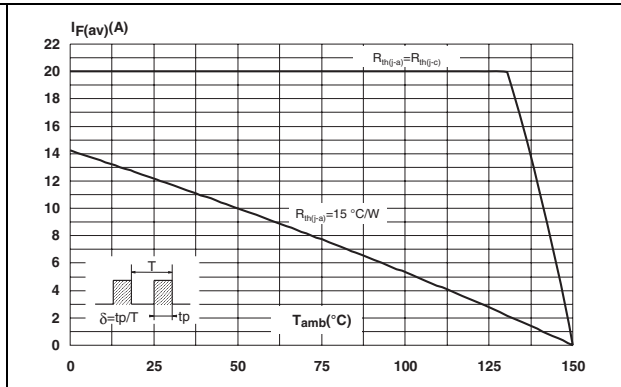
To evaluate the conduction losses use the following equation:

$$P = 0.580 \times I_{F(AV)} + 0.0043 \times I_{F(RMS)}^2$$

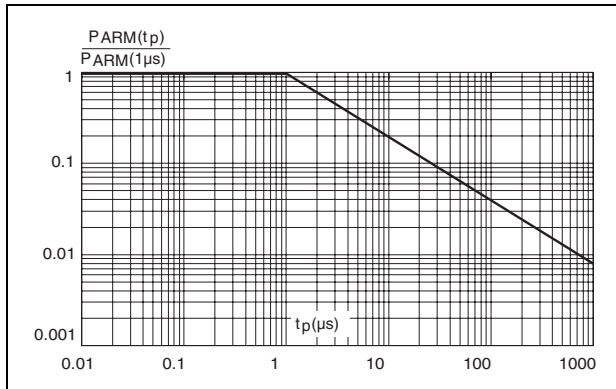
**Figure 2. Average forward power dissipation versus average forward current (per diode)**



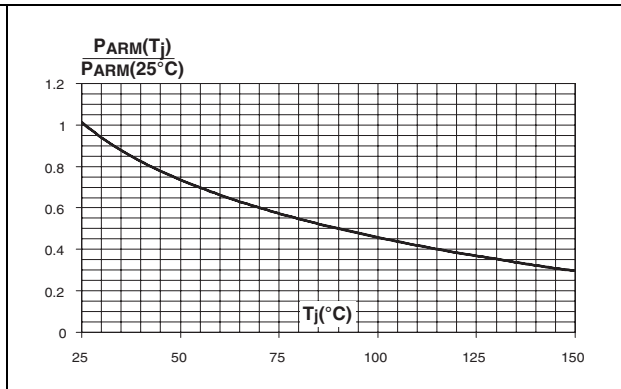
**Figure 3. Average forward current versus ambient temperature (delta = 0.5, per diode)**



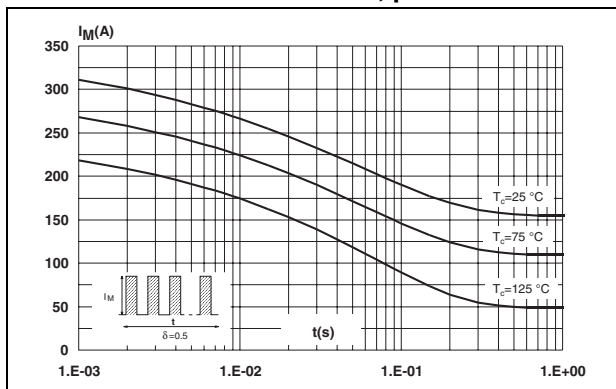
**Figure 4. Normalized avalanche power derating versus pulse duration**



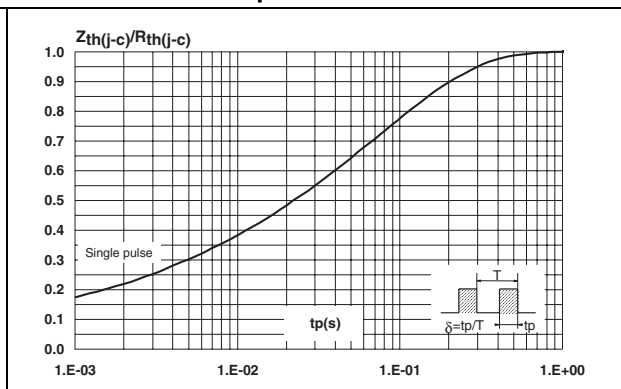
**Figure 5. Normalized avalanche power derating versus junction temperature**



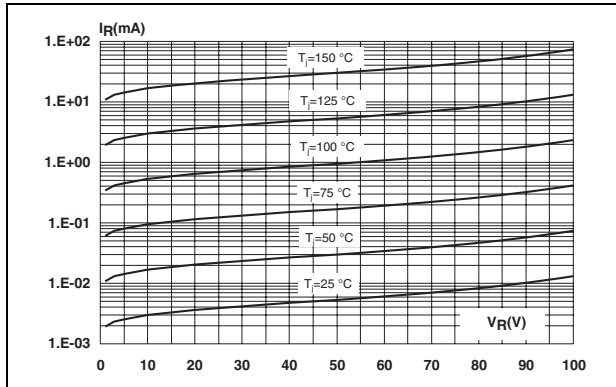
**Figure 6. Non repetitive surge peak forward current versus overload duration, maximum values, per diode**



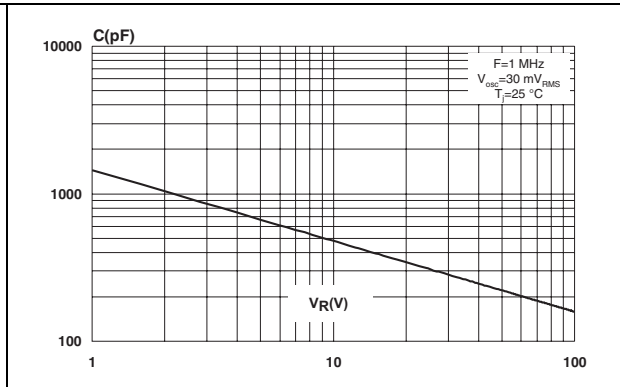
**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration**



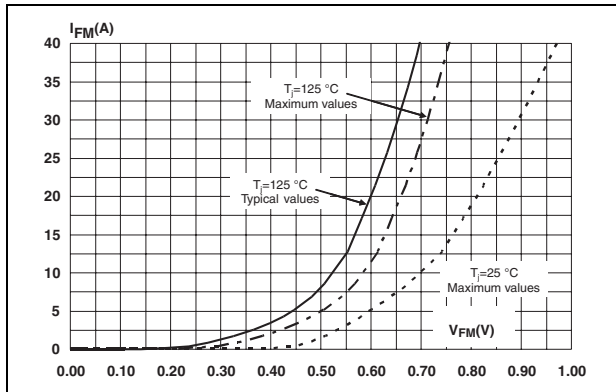
**Figure 8. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



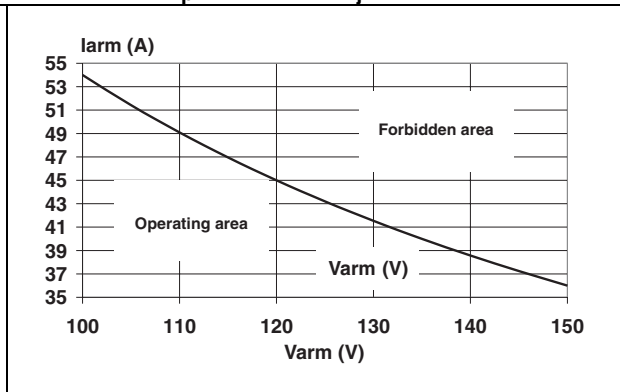
**Figure 9. Junction capacitance versus reverse voltage applied (typical values, per diode)**



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



**Figure 11. Reverse safe operating area ( $t_p < 1 \mu s$  and  $T_j < 150$  °C)**



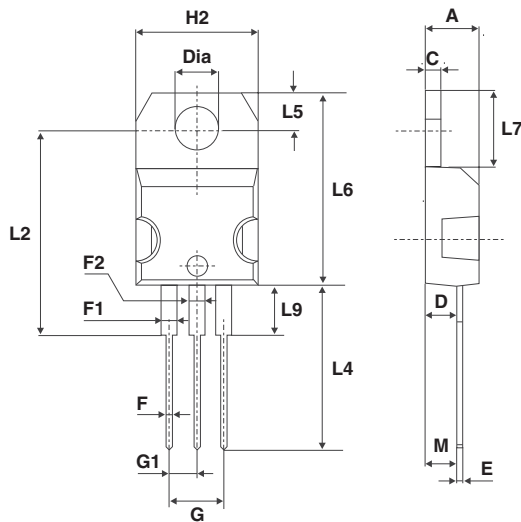
## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 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](http://www.st.com). ECOPACK® is an ST trademark.

**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 I<sup>2</sup>PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

**Table 6. I<sup>2</sup>PAK 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 |

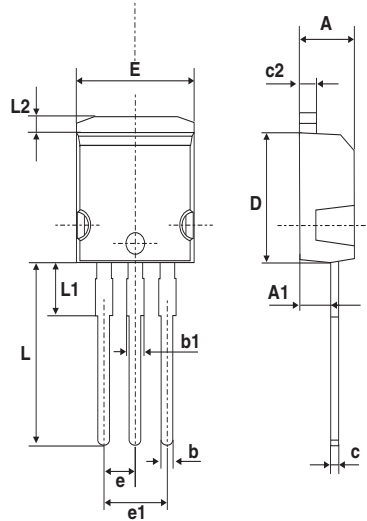
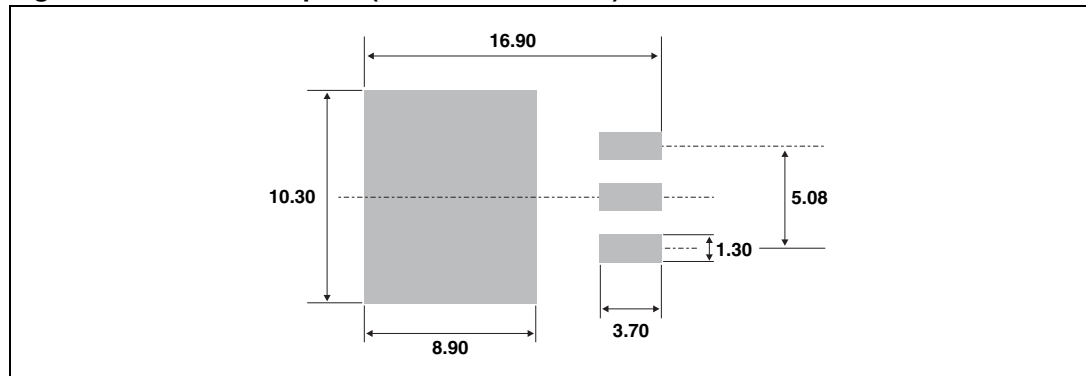


Table 7. D<sup>2</sup>PAK dimensions

| 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 12. D<sup>2</sup>PAK footprint (dimensions in mm)



### 3 Ordering information

**Table 8. Ordering information**

| Order code       | Marking     | Package            | Weight | Base qty | Delivery mode |
|------------------|-------------|--------------------|--------|----------|---------------|
| STPS40SM100CT    | PS40SM100CT | TO-220AB           | 2.2 g  | 50       | Tube          |
| STPS40SM100CR    | PS40SM100CR | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |
| STPS40SM100CG    | PS40SM100CG | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STPS40SM100CG-TR | PS40SM100CG | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |

### 4 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 25-Mar-2009 | 1        | First issue.   |
| 15-Apr-2010 | 2        | Updated package graphics for TO-220AB on front page and in <a href="#">Table 5</a> . |



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