

## Small signal Schottky diode

### Features

- very low conduction losses
- negligible switching losses
- low capacitance diode
- Flip Chip, 2-bump package

### Complies with the following standards

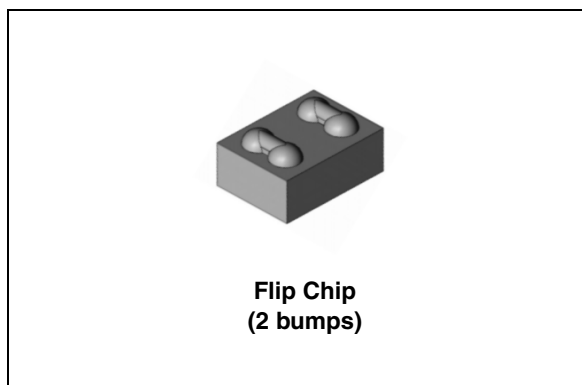
- IEC 61000-4-2 level 1:
  - ±2kV (air discharge)
  - ±2kV (contact discharge)

### Description

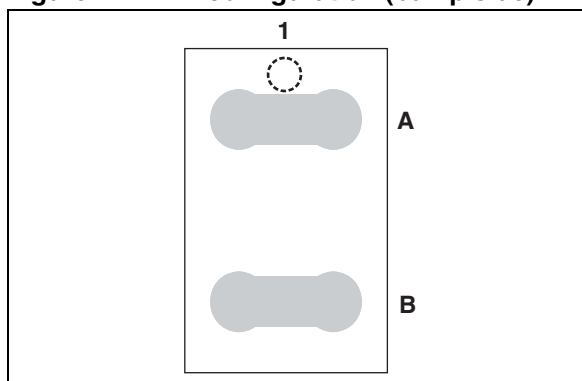
The BAT30F3 is a Schottky diode in a 2-bump, Flip-Chip package.

This device is specially suited for switching mode applications needing a low forward voltage drop diode.

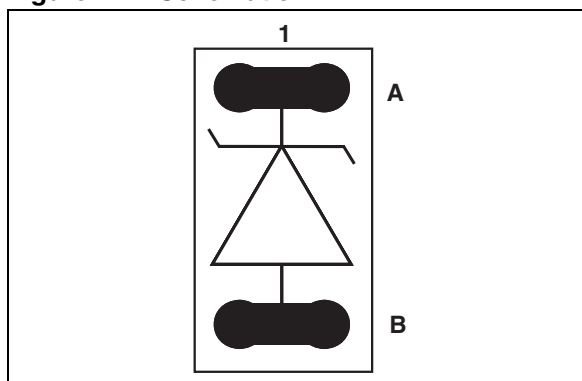
The electrical parameters are guaranteed across the operating temperature range (- 30 °C to 85 °C).



**Figure 1. Pin configuration (bump side)**



**Figure 2. Schematic**



# 1 Characteristics

**Table 1. Absolute maximum ratings (T<sub>amb</sub> = 25 °C)**

| Symbol           | Parameter   | Value       | Unit |
|------------------|---|-------------|------|
| V <sub>PP</sub>  | Peak pulse voltage:<br>IEC 61000-4-2 air discharge<br>IEC 61000-4-2 contact discharge | ±2<br>±2    | kV   |
| V <sub>RRM</sub> | Repetitive peak reverse voltage   | 20          | V    |
| T <sub>stg</sub> | Storage temperature range <sup>(1)</sup>  | -55 to +150 | °C   |
| T <sub>op</sub>  | Operating junction temperature range  | -30 to +85  | °C   |

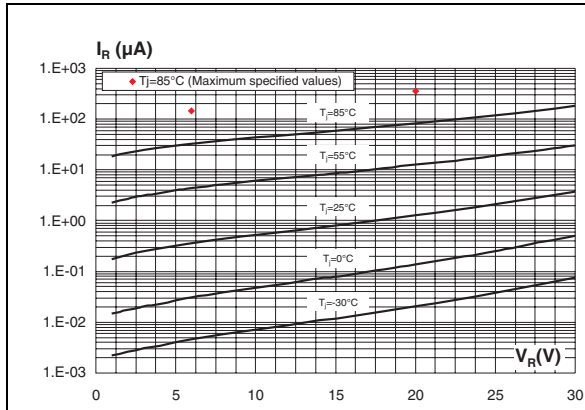
1.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 2. Electrical characteristics**

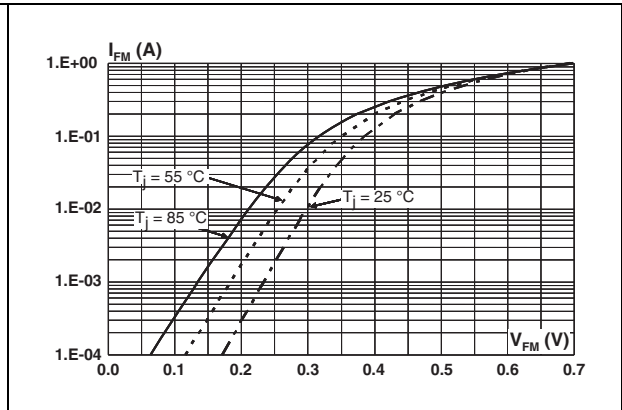
| Symbol                        | Parameter               | Test conditions | Min.                    | Typ. | Max. | Unit |    |
|-------------------------------|-------------------------|-----------------|-------------------------|------|------|------|----|
| I <sub>R</sub> <sup>(1)</sup> | Reverse leakage current | 25 °C           | V <sub>R</sub> = 6 V    | -    | -    | 2    | µA |
|                               |                         |                 | V <sub>R</sub> = 20 V   | -    | -    | 6    |    |
|                               |                         | 55 °C           | V <sub>R</sub> = 6 V    | -    | -    | 20   |    |
|                               |                         |                 | V <sub>R</sub> = 20 V   | -    | -    | 55   |    |
|                               |                         | 85 °C           | V <sub>R</sub> = 6 V    | -    | -    | 145  |    |
|                               |                         |                 | V <sub>R</sub> = 20 V   | -    | -    | 360  |    |
| V <sub>F</sub>                | Forward voltage drop    | 25 °C           | I <sub>F</sub> = 0.1 mA | -    | -    | 200  | mV |
|                               |                         |                 | I <sub>F</sub> = 1 mA   | -    | -    | 270  |    |
|                               |                         |                 | I <sub>F</sub> = 10 mA  | -    | -    | 340  |    |
|                               |                         |                 | I <sub>F</sub> = 100 mA | -    | -    | 440  |    |
|                               |                         |                 | I <sub>F</sub> = 200 mA | -    | -    | 500  |    |
|                               |                         |                 | I <sub>F</sub> = 300 mA | -    | -    | 560  |    |
|                               |                         | - 30 °C         | I <sub>F</sub> = 0.1 mA | -    | -    | 300  |    |
|                               |                         |                 | I <sub>F</sub> = 1 mA   | -    | -    | 355  |    |
|                               |                         |                 | I <sub>F</sub> = 10 mA  | -    | -    | 415  |    |
|                               |                         |                 | I <sub>F</sub> = 100 mA | -    | -    | 495  |    |
|                               |                         |                 | I <sub>F</sub> = 200 mA | -    | -    | 545  |    |
|                               |                         |                 | I <sub>F</sub> = 300 mA | -    | -    | 600  |    |

1. Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

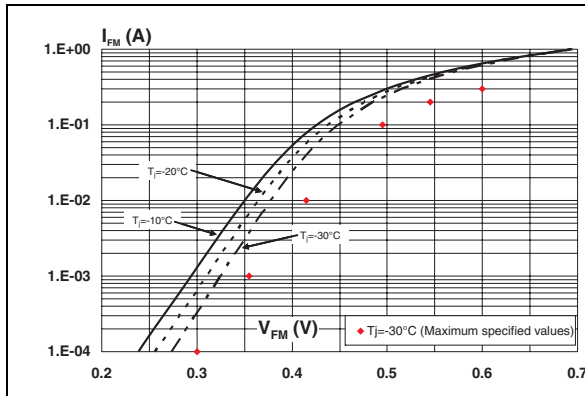
**Figure 3. Leakage current versus reverse applied voltage (typical values)**



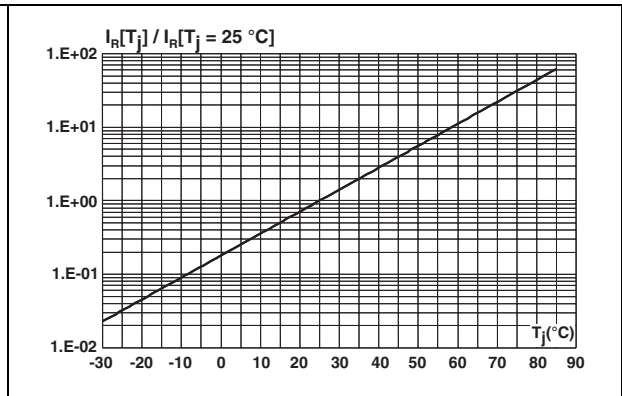
**Figure 4. Forward voltage drop versus forward current (typical values, positive temperatures)**



**Figure 5. Forward voltage drop versus forward current (typical values, negative temperatures)**

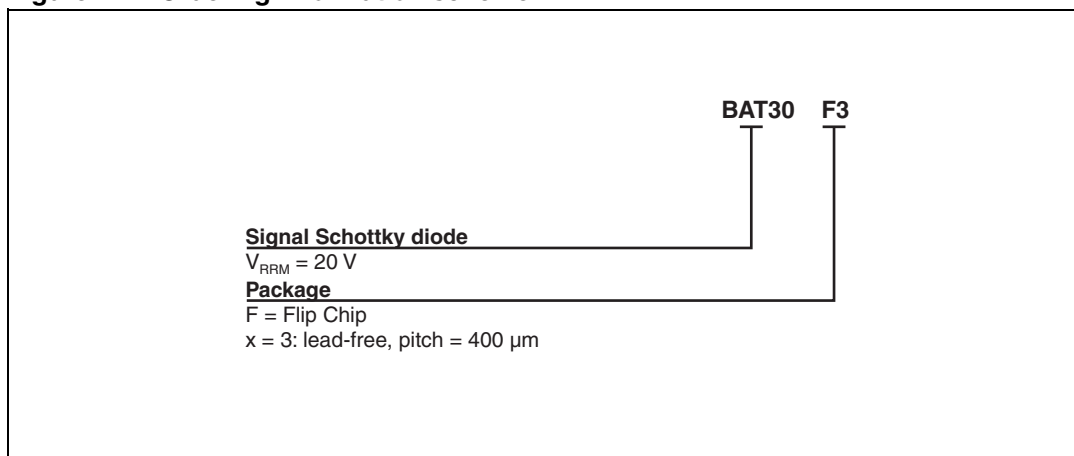


**Figure 6. Relative variation of reverse leakage current versus junction temperature (typical values)**



## 2 Ordering information scheme

Figure 7. Ordering information scheme



### 3 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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.

**Figure 8. Package dimensions (dimensions in mm)**

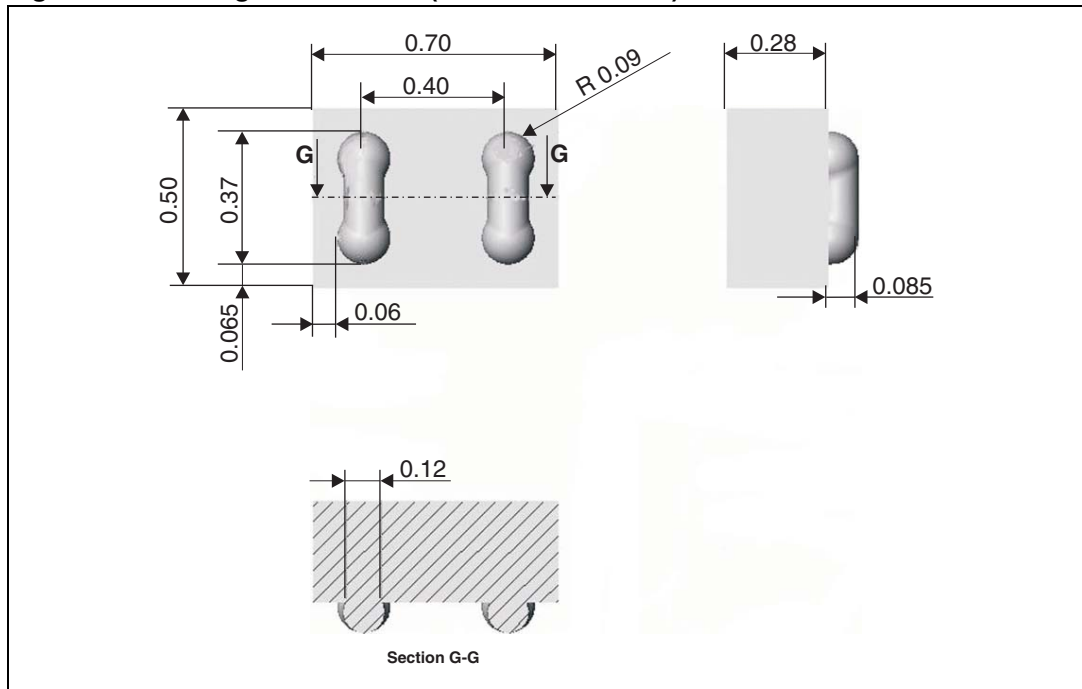
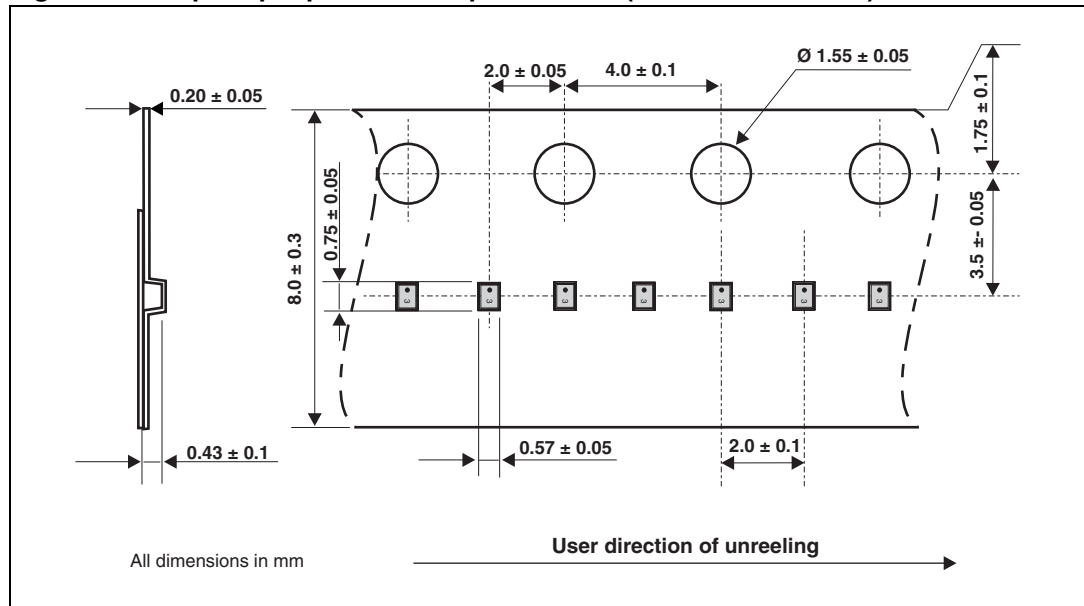


Figure 9. Flip Chip tape and reel specification (dimensions in mm)



## 4 PCB recommendations

### 4.1 Design

For optimum electrical performance and highly reliable solder joints, STMicroelectronics recommends the PCB design recommendations listed in [Table 3](#).

Table 3. PCB design recommendations for solder bar pitch 400 µm

|   |   |
|---|---|
| For NSMD PCB<br>non solder mask defined | Oblong pad: 370 x 180 µm<br>– Micro via SSBU allowed<br>– Micro via SBU to be avoided<br>– Micro via SBU filled (under qualification)   |
|   | Track:<br>– Only one track per pad<br>– Maximum track width = 100 µm<br>Track layout must be symmetrical to the die axis (to homogenize stress and welding attraction during reflow assembly) |
| For SMD PCB<br>solder mask defined      | Oblong pad:<br>– Micro via SSBU allowed<br>– Micro via SBU to be avoided<br>– Micro via SBU filled (under qualification)  |
| PCB Pad Finishing                       | Cu – Ni (2-6 µm) - Au (0.2 µm max)  |

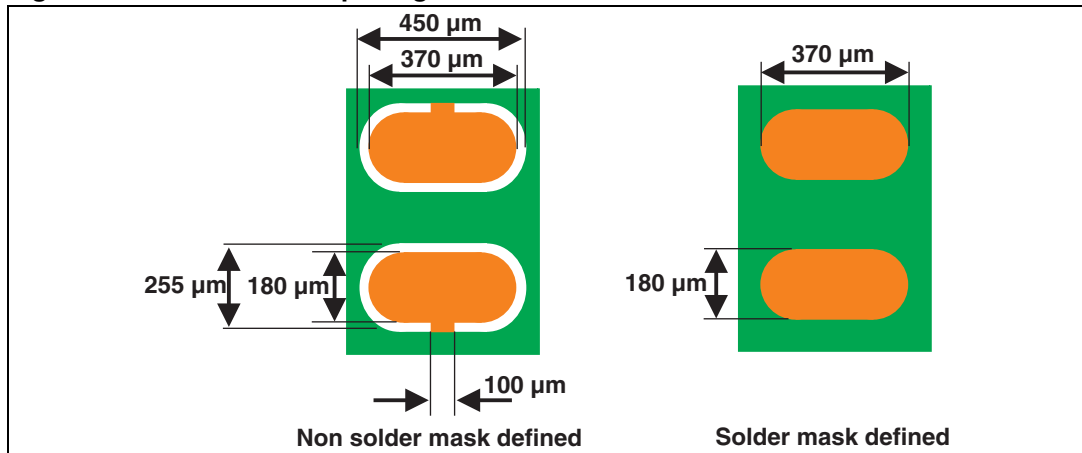
*Note:* A gold layer finishing on the PCB pad that is too thick (0.2 µm maximum) is not recommended (low joint reliability).

To optimize the natural self centering effect of CSP on the PCB, PCB pad positioning and size have to be properly designed (see [Figure 10](#))

**Micro vias**

An alternative to routing on the top surface is to route out on buried layers. To achieve this, the pads are connected to the lower layers using micro vias. Only SSBU via technology is approved.

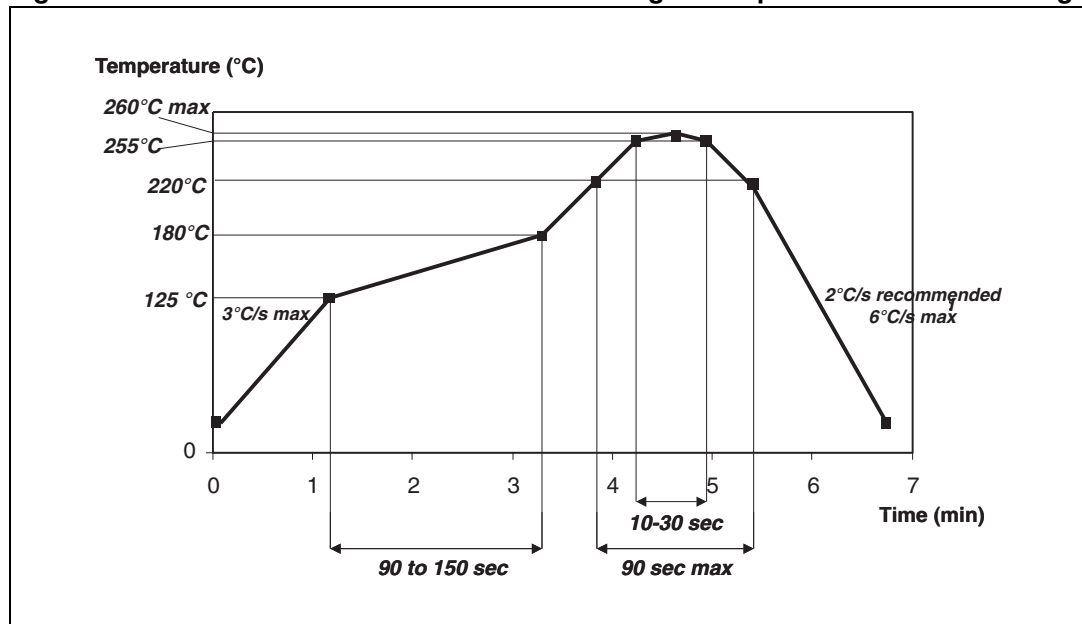
**Figure 10. Solder mask opening**



## 4.2 Assembly

For chip scale package mounting on the PCB, STMicroelectronics recommends the use of a solder stencil aperture of 330 x 330 µm maximum and a typical stencil thickness of 75 or 80 µm. Chip scale packages are fully compatible with the use of near eutectic 95.5 Sn, 4 Ag, 0.5 Cu solder paste with no-clean flux. ST's recommendations for chip scale package board mounting are illustrated on the soldering reflow profile shown in [Figure 11](#).

**Figure 11. ST ECOPACK® recommended soldering reflow profile for PCB mounting**



Dwell time in the soldering zone (with temperature higher than 220 °C) has to be kept as short as possible to prevent component and substrate damage. Peak temperature must not exceed 260 °C. Controlled atmosphere (N2 or N2H2) is recommended during the whole reflow, especially above 150 °C.

Chip scale packages are able to withstand three times the previous recommended reflow profile in order to be compatible with a double reflow when SMDs are mounted on both sides of the PCB and one additional repair.

A maximum of three soldering reflows are allowed for these lead-free packages (with repair step included).

The use of a no-clean flux is highly recommended to avoid any cleaning operation. To prevent any bump cracks, ultrasonic cleaning methods are not recommended.



## 5 Ordering information

Table 4. Ordering information

| Order code | Marking | Package   | Weight | Base qty | Delivery mode    |
|------------|---------|-----------|--------|----------|------------------|
| BAT30F3    | 3       | Flip Chip | 0.3 mg | 15000    | Tape and reel 7" |

## 6 Revision history

Table 5. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 14-Dec-2009 | 1        | Initial release.                                  |
| 21-Oct-2010 | 2        | Updated dot graphic in <a href="#">Figure 1</a> . |

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