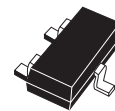




### Features

- Precision monitoring of 3 V, 3.3 V, and 5 V supply voltages
- Open drain  $\overline{RST}$  output
- 30 ms or 140 ms reset pulse width (min)
- Low supply current - 6  $\mu$ A (typ)
- Guaranteed  $\overline{RST}$  assertion down to  $V_{CC} = 1.0$  V
- Operating temperature:
  - $-40$  °C to  $85$  °C (industrial grade)
- Lead-free, small SOT23 package



SOT23-3 (WX)

# Contents

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# 1 Description

The STM1001 microprocessor reset circuit is a low-power supervisory device used to monitor power supplies. It performs a single function: asserting a reset signal whenever the  $V_{CC}$  supply voltage drops below a preset value and keeping it asserted until  $V_{CC}$  has risen above the preset threshold for a minimum period of time ( $t_{rec}$ ).

Figure 1. Logic diagram

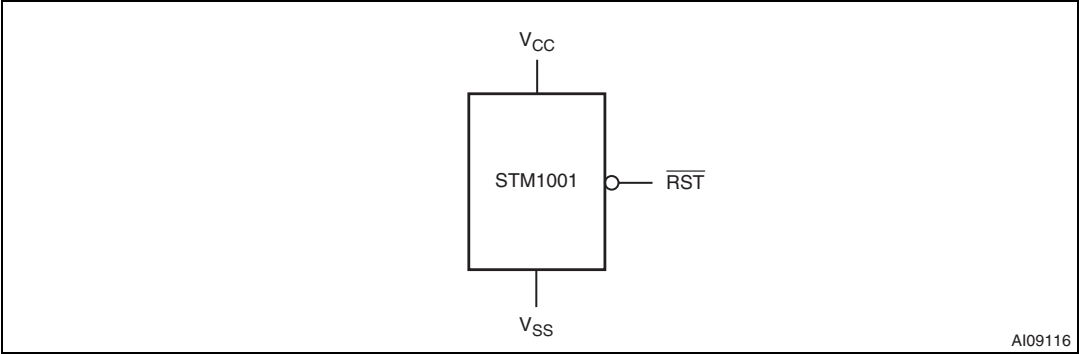


Table 1. Signal names

|          |                                      |
|----------|--------------------------------------|
| $V_{SS}$ | Ground                               |
| RST      | Active-low reset output (open drain) |
| $V_{CC}$ | Supply voltage                       |

Figure 2. Connections

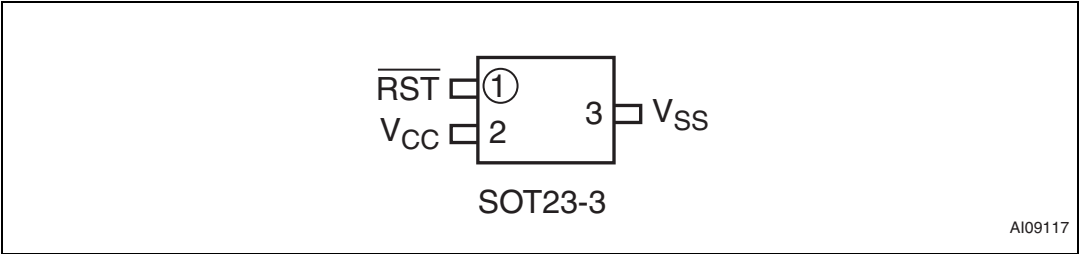
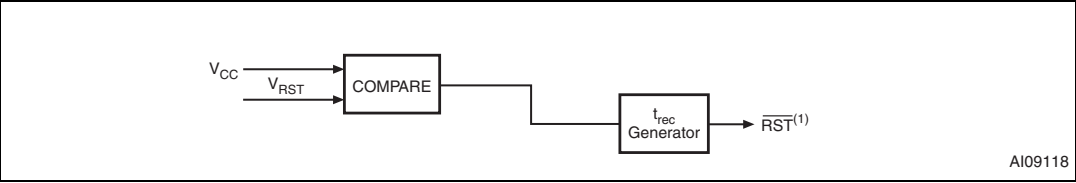
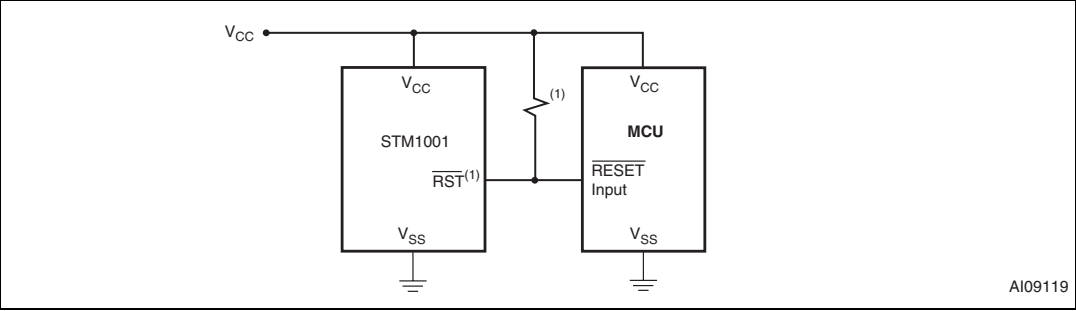


Figure 3. Block diagram



- 1. Open drain

Figure 4. Hardware hookup



- 1.  $\overline{RST}$  output requires pull-up resistor.

## 2 Operation

### 2.1 Reset output

The STM1001 microprocessor reset circuit asserts a reset signal to the MCU whenever  $V_{CC}$  goes below the reset threshold ( $V_{RST}$ ).  $\overline{RST}$  is guaranteed valid down to  $V_{CC} = 1\text{ V}$  ( $0^\circ$  to  $70^\circ\text{C}$ ).

During power-up, once  $V_{CC}$  exceeds the reset threshold an internal timer keeps  $\overline{RST}$  low for the reset time-out period,  $t_{rec}$ . After this interval,  $\overline{RST}$  returns high.

If  $V_{CC}$  drops below the reset threshold,  $\overline{RST}$  goes low. Each time  $\overline{RST}$  is asserted, it stays low for at least the reset time-out period. Any time  $V_{CC}$  goes below the reset threshold, the internal timer clears. The reset timer starts when  $V_{CC}$  returns above the reset threshold. The active-low reset ( $\overline{RST}$ ) is an open drain output.

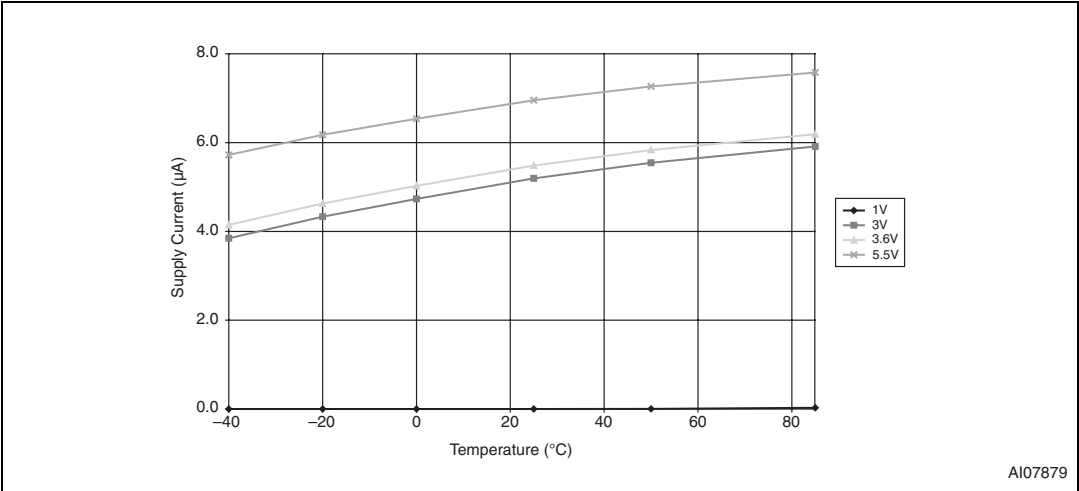
### 2.2 Negative-going $V_{CC}$ transients

The STM1001 is relatively immune to negative-going  $V_{CC}$  transients (glitches). [Figure 10 on page 10](#) shows typical transient duration versus reset comparator overdrive (for which the STM1001 will NOT generate a reset pulse). The graph was generated using a negative pulse applied to  $V_{CC}$ , starting at 0.5 V above the actual reset threshold and ending below it by the magnitude indicated (comparator overdrive). The graph indicates the maximum pulse width a negative  $V_{CC}$  transient can have without causing a reset pulse. As the magnitude of the transient increases (further below the threshold), the maximum allowable pulse width decreases. Any combination of duration and overdrive which lies under the curve will NOT generate a reset signal. Typically, a  $V_{CC}$  transient that goes 100 mV below the reset threshold and lasts 20  $\mu\text{s}$  or less will not cause a reset pulse. A 0.1  $\mu\text{F}$  bypass capacitor mounted as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

# 3 Typical operating characteristics

*Note:* Typical values are at  $T_A = 25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = 5\text{ V}$  for L/M versions,  $V_{CC} = 3.3\text{ V}$  for T/S versions, and  $V_{CC} = 3.0\text{ V}$  for R versions.

**Figure 5. Supply current vs. temperature, L/M/R/S/T (no load)**



**Figure 6. Power-down reset delay vs. temperature -  $V_{OD} = V_{TH} - V_{CC}$  (L/M)**

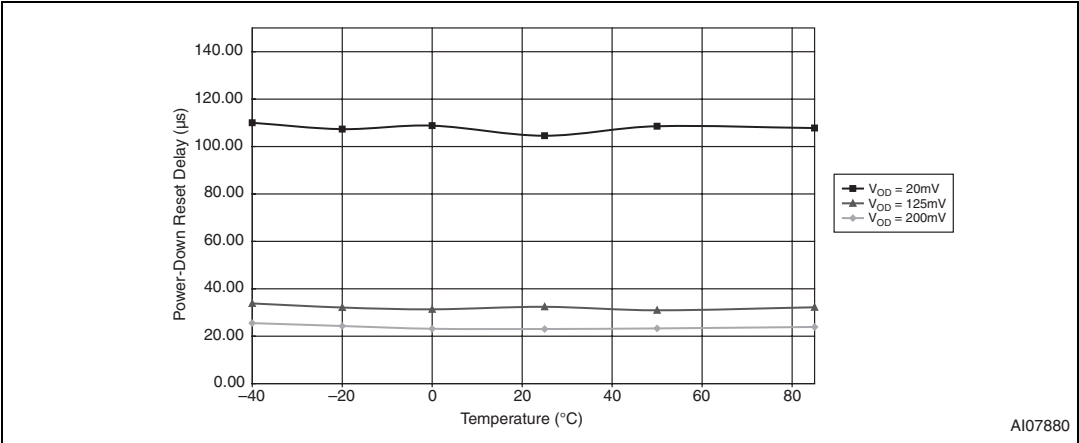


Figure 7. Power-down reset delay vs. temperature -  $V_{OD} = V_{TH} - V_{CC}$  (R/S/T)

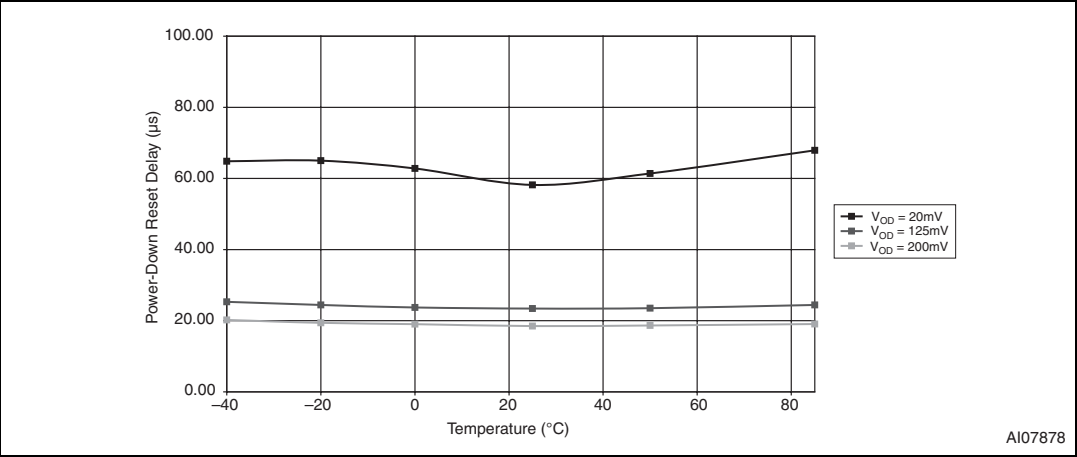
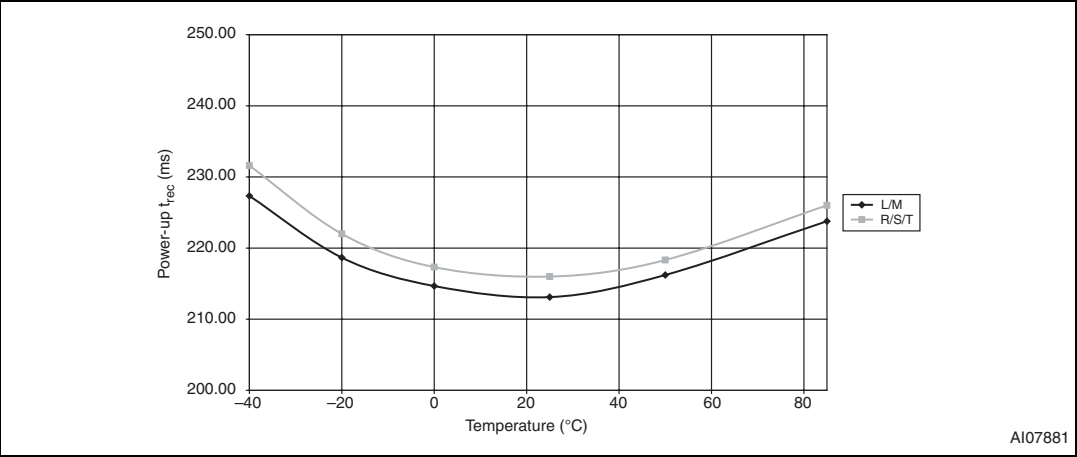


Figure 8. Power-up  $t_{rec}$  vs. temperature



Note: Valid for  $t_{rec} = 210$  ms (typ).

Figure 9. Normalized reset threshold vs. temperature

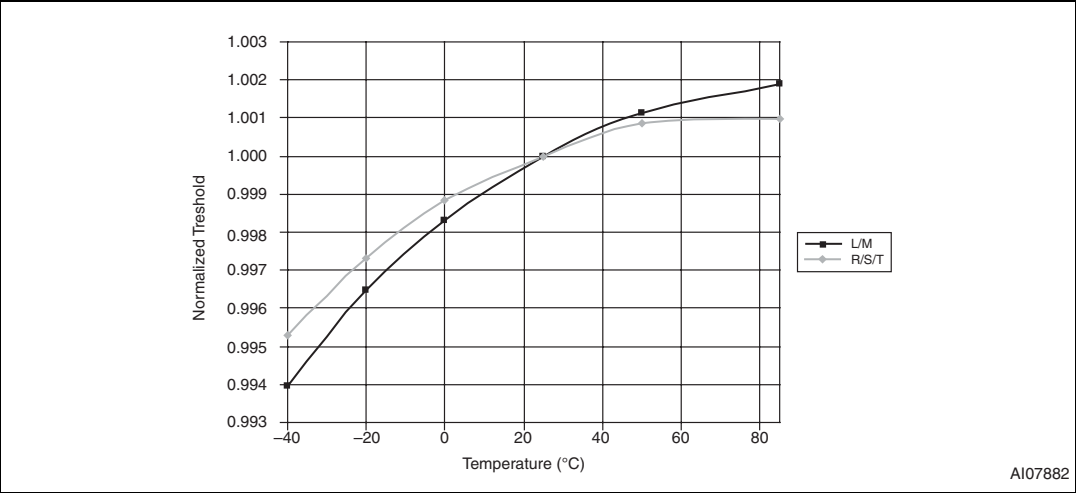
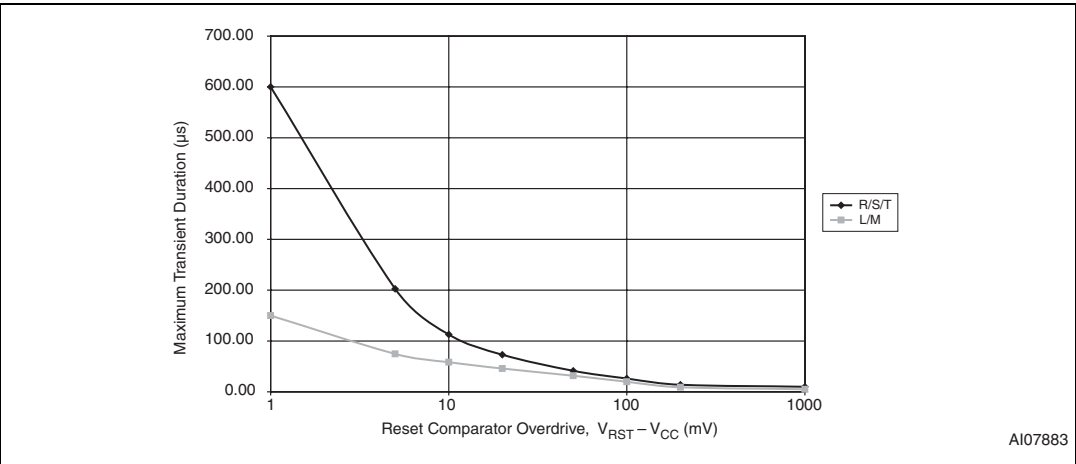


Figure 10. Max transient duration not causing reset pulse vs. reset comparator overdrive



## 4 Maximum ratings

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Refer also to the STMicroelectronics SURE Program and other relevant quality documents.

**Table 2. Absolute maximum ratings**

| Symbol          | Parameter                              | Value                  | Unit |
|-----------------|----------------------------------------|------------------------|------|
| $T_{STG}$       | Storage temperature ( $V_{CC}$ off)    | -55 to 150             | °C   |
| $T_{SLD}^{(1)}$ | Lead solder temperature for 10 seconds | 260                    | °C   |
| $V_{IO}$        | Input or output voltage                | -0.3 to $V_{CC} + 0.3$ | V    |
| $V_{CC}$        | Supply voltage                         | -0.3 to 7.0            | V    |
| $I_O$           | Output current                         | 20                     | mA   |
| $P_D$           | Power dissipation                      | 320                    | mW   |

1. Reflow at peak temperature of 260 °C. The time above 255 °C must not exceed 30 seconds.

5 DC and AC parameters

This section summarizes the operating measurement conditions, and the DC and AC characteristics of the device. The parameters in the DC and AC characteristics tables that follow, are derived from tests performed under the measurement conditions summarized in [Table 3: Operating and AC measurement conditions](#). Designers should check that the operating conditions in their circuit match the operating conditions when relying on the quoted parameters.

Table 3. Operating and AC measurement conditions

| Parameter                                       | STM1001                    | Unit |
|-------------------------------------------------|----------------------------|------|
| V <sub>CC</sub> supply voltage                  | 1.0 to 5.5                 | V    |
| Ambient operating temperature (T <sub>A</sub> ) | −40 to 85                  | °C   |
| Input rise and fall times                       | ≤ 5                        | ns   |
| Input pulse voltages                            | 0.2 to 0.8 V <sub>CC</sub> | V    |
| Input and output timing ref. voltages           | 0.3 to 0.7 V <sub>CC</sub> | V    |

Figure 11. AC testing input/output waveforms

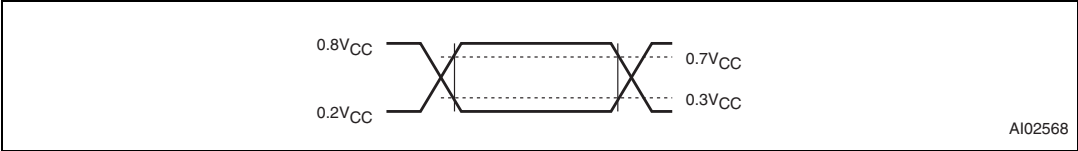


Table 4. DC and AC characteristics

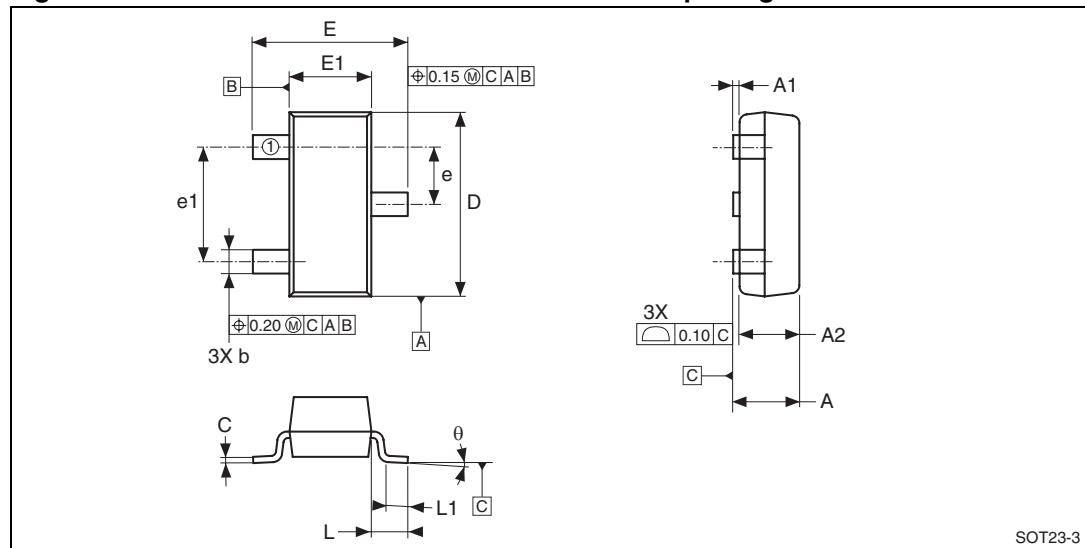
| Sym              | Description                                      | Test condition <sup>(1)</sup>                                                           | Min          | Typ  | Max  | Unit |        |
|------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------|--------------|------|------|------|--------|
| V <sub>CC</sub>  | Operating voltage                                | T <sub>A</sub> = −40 to +85 °C                                                          | 1.2          |      | 5.5  | V    |        |
|                  |                                                  | T <sub>A</sub> = 0 to +70 °C                                                            | 1.0          |      | 5.5  | V    |        |
| I <sub>CC</sub>  | V <sub>CC</sub> supply current                   | V <sub>CC</sub> < 3.6 V                                                                 |              | 5.5  | 10   | μA   |        |
|                  |                                                  | V <sub>CC</sub> < 5.5 V                                                                 |              | 7    | 15   | μA   |        |
| I <sub>LO</sub>  | Open drain reset output leakage current          | V <sub>CC</sub> > V <sub>RST</sub><br>Reset not asserted                                | −1           |      | +1   | μA   |        |
| V <sub>OL</sub>  | $\overline{\text{RST}}$ output low voltage       | STM1001R/S/T only, I <sub>OL</sub> = 1.2 mA<br>V <sub>CC</sub> = V <sub>RST</sub> (min) |              |      | 0.3  | V    |        |
|                  |                                                  | STM1001L/M only, I <sub>OL</sub> = 3.2 mA<br>V <sub>CC</sub> = V <sub>RST</sub> (min)   |              |      | 0.4  | V    |        |
| V <sub>OL</sub>  | $\overline{\text{RST}}$ output low voltage       | I <sub>OL</sub> = 50 μA; V <sub>CC</sub> > 1.0 V                                        |              |      | 0.3  | V    |        |
| RESET thresholds |                                                  |                                                                                         |              |      |      |      |        |
| V <sub>RST</sub> | Reset threshold                                  | STM1001L                                                                                | 25 °C        | 4.56 | 4.63 | 4.70 | V      |
|                  |                                                  |                                                                                         | −40 to 85 °C | 4.50 |      | 4.75 | V      |
|                  |                                                  | STM1001M                                                                                | 25 °C        | 4.31 | 4.38 | 4.45 | V      |
|                  |                                                  |                                                                                         | −40 to 85 °C | 4.25 |      | 4.50 | V      |
|                  |                                                  | STM1001T                                                                                | 25 °C        | 3.04 | 3.08 | 3.11 | V      |
|                  |                                                  |                                                                                         | −40 to 85 °C | 3.00 |      | 3.15 | V      |
|                  |                                                  | STM1001S                                                                                | 25 °C        | 2.89 | 2.93 | 2.96 | V      |
|                  |                                                  |                                                                                         | −40 to 85 °C | 2.85 |      | 3.00 | V      |
|                  |                                                  | STM1001R                                                                                | 25 °C        | 2.59 | 2.63 | 2.66 | V      |
|                  |                                                  |                                                                                         | −40 to 85 °C | 2.55 |      | 2.70 | V      |
|                  | V <sub>RST</sub> temperature coefficient         | V <sub>CC</sub> = 3.3 V                                                                 |              |      | 45   |      | ppm/°C |
|                  | V <sub>CC</sub> to $\overline{\text{RST}}$ delay | V <sub>CC</sub> = V <sub>RST</sub> to<br>(V <sub>RST</sub> − 100 mV)                    | STM1001L/M   |      | 40   |      | μs     |
|                  |                                                  |                                                                                         | STM1001R/S/T |      | 20   |      | μs     |
| t <sub>rec</sub> | $\overline{\text{RST}}$ pulse width              | Option B (refer to <a href="#">Table 6</a> )                                            |              | 20   | 30   | 40   | ms     |
|                  |                                                  | Option “Blank” (refer to <a href="#">Table 6</a> )                                      |              | 140  | 210  | 280  |        |

1. Valid for ambient operating temperature: T<sub>A</sub> = -40 to 85 °C; V<sub>CC</sub> = 1.2 V to 5.5 V (except where noted).

## 6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**Figure 12. SOT23-3 – 3-lead small outline transistor package outline**



Note: Drawing is not to scale.

**Table 5. SOT23-3 – 3-lead small outline transistor package mechanical data**

| Symbol | mm   |      |      | inches |       |       |
|--------|------|------|------|--------|-------|-------|
|        | Typ  | Min  | Max  | Typ    | Min   | Max   |
| A      |      | 0.89 | 1.12 |        | 0.035 | 0.044 |
| A1     |      | 0.01 | 0.10 |        | 0.001 | 0.004 |
| A2     |      | 0.88 | 1.02 |        | 0.035 | 0.042 |
| b      |      | 0.30 | 0.50 |        | 0.012 | 0.020 |
| C      |      | 0.08 | 0.20 |        | 0.003 | 0.008 |
| D      |      | 2.80 | 3.04 |        | 0.110 | 0.120 |
| E      |      | 2.10 | 2.64 |        | 0.083 | 0.104 |
| E1     |      | 1.20 | 1.40 |        | 0.047 | 0.055 |
| e      |      | 0.89 | 1.03 |        | 0.035 | 0.041 |
| e1     |      | 1.78 | 2.05 |        | 0.070 | 0.081 |
| L      | 0.54 |      |      | 0.021  |       |       |
| L1     |      | 0.40 | 0.60 |        | 0.016 | 0.024 |
| Q      |      | 0°   | 8°   |        | 0°    | 8°    |
| N      |      | 3    |      |        | 3     |       |

7 Part numbering

Table 6. Ordering information scheme

|                                   |         |   |   |    |   |   |
|-----------------------------------|---------|---|---|----|---|---|
| Example:                          | STM1001 | S | B | WX | 6 | F |
| Device type                       | STM1001 |   |   |    |   |   |
| Reset threshold voltage           |         |   |   |    |   |   |
| L = $V_{RST}$ = 4.50 V to 4.75 V  |         |   |   |    |   |   |
| M = $V_{RST}$ = 4.25 V to 4.50 V  |         |   |   |    |   |   |
| T = $V_{RST}$ = 3.00 V to 3.15 V  |         |   |   |    |   |   |
| S = $V_{RST}$ = 2.85 V to 3.00 V  |         |   |   |    |   |   |
| R = $V_{RST}$ = 2.55 V to 2.70 V  |         |   |   |    |   |   |
| RST pulse width ( $t_{rec}$ )     |         |   |   |    |   |   |
| B = 20 to 40 ms                   |         |   |   |    |   |   |
| Blank = 140 to 280 ms             |         |   |   |    |   |   |
| Package                           |         |   |   |    |   |   |
| WX = SOT23-3                      |         |   |   |    |   |   |
| Temperature range                 |         |   |   |    |   |   |
| 6 = -40 to 85 °C                  |         |   |   |    |   |   |
| Shipping method                   |         |   |   |    |   |   |
| F = ECOPACK® package, tape & reel |         |   |   |    |   |   |

For other options, or for more information on any aspect of this device, please contact the ST sales office nearest you.

**Table 7. Marking description**

| Part number   | Reset threshold | Output                             | Topside marking <sup>(1)</sup> |
|---------------|-----------------|------------------------------------|--------------------------------|
| STM1001LWX6F  | 4.63 V          | Open drain $\overline{\text{RST}}$ | 8BAx                           |
| STM1001MWX6F  | 4.38 V          | Open drain $\overline{\text{RST}}$ | 8BBx                           |
| STM1001TWX6F  | 3.08 V          | Open drain $\overline{\text{RST}}$ | 8BCx                           |
| STM1001SWX6F  | 2.93 V          | Open drain $\overline{\text{RST}}$ | 8BDx                           |
| STM1001RWX6F  | 2.63 V          | Open drain $\overline{\text{RST}}$ | 8BEx                           |
| STM1001SBWX6F | 2.93 V          | Open drain $\overline{\text{RST}}$ | 8BMx                           |

1. Lowercase "x" indicates date code.

## 8 Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                   |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09-Dec-2003 | 1        | First edition                                                                                                                                                                                                                                             |
| 19-Feb-2004 | 2        | Part number changed from STM6301                                                                                                                                                                                                                          |
| 22-Mar-2004 | 2.1      | Update DC characteristics ( <a href="#">Table 4</a> )                                                                                                                                                                                                     |
| 09-Apr-2004 | 3        | Device promoted; reformatted; marking updated ( <a href="#">Table 7</a> )                                                                                                                                                                                 |
| 19-Nov-2004 | 4        | Update dimensions ( <a href="#">Table 5</a> ).                                                                                                                                                                                                            |
| 19-Sep-2005 | 5        | Remove “Valid RST Output Down to V <sub>CC</sub> ...” text                                                                                                                                                                                                |
| 17-Feb-2010 | 6        | Updated <a href="#">Features</a> ; footnote in <a href="#">Table 2</a> ; <a href="#">Table 4</a> ; <a href="#">Table 6</a> ; <a href="#">Table 7</a> ; text in <a href="#">Section 6</a> ; added note to <a href="#">Figure 8</a> ; reformatted document. |

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