



STM809, STM810 STM811, STM812

Reset Circuit

FEATURES SUMMARY

- PRECISION MONITORING OF 3V, 3.3V, and 5V SUPPLY VOLTAGES
- TWO OUTPUT CONFIGURATIONS
 - Push-pull $\overline{\text{RST}}$ Output (STM809/811)
 - Push-pull RST Output (STM810/812)
- 140ms RESET PULSE WIDTH (MIN)
- LOW SUPPLY CURRENT - 6 μ A (TYP)
- GUARANTEED $\overline{\text{RST}}$ /RST ASSERTION DOWN TO $V_{\text{CC}} = 1.0\text{V}$
- OPERATING TEMPERATURE:
–40°C to 85°C (Industrial Grade)
- LEAD-FREE, SMALL SOT23 and SOT143 PACKAGE

Table 1. Device Options

| | Active-Low RESET | Active-High RESET | Manual RESET Input | Package |
|--------|------------------|-------------------|--------------------|----------|
| STM809 | ✓ | | | SOT23-3 |
| STM810 | | ✓ | | SOT23-3 |
| STM811 | ✓ | | ✓ | SOT143-4 |
| STM812 | | ✓ | ✓ | SOT143-4 |

Figure 1. Packages

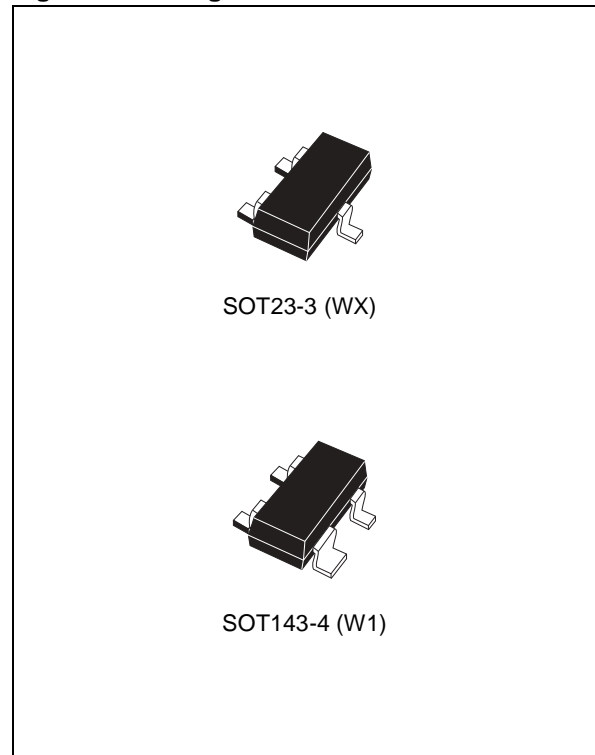


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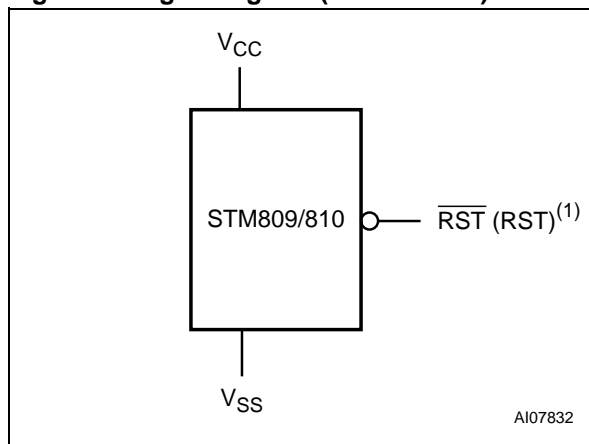
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SUMMARY DESCRIPTION

The STM809/810/811/812 MICROPROCESSOR RESET Circuits are low-power supervisory devices used to monitor power supplies. They perform a single function: asserting a reset signal whenever the V_{CC} supply voltage drops below a preset

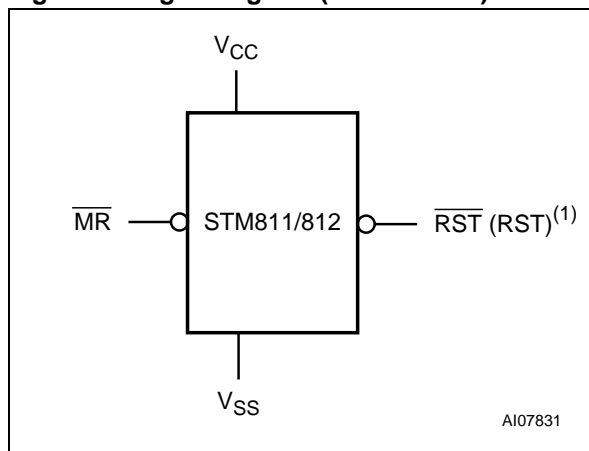
value and keeping it asserted until V_{CC} has risen above the preset threshold for a minimum period of time (t_{rec}). The STM811/812 also provide a push-button reset input (MR).

Figure 2. Logic Diagram (STM809/810)



Note: 1. For STM810

Figure 3. Logic Diagram (STM811/812)



Note: 1. For STM812

Table 2. Signal Names

| | |
|--------------------------------|--------------------------|
| V_{SS} | Ground |
| \overline{RST} | Active-Low RESET Output |
| RST ⁽¹⁾ | Active-High RESET Output |
| V_{CC} | Supply Voltage |
| \overline{MR} ⁽²⁾ | Manual Reset Input |

Note: 1. STM810/812 only
2. STM811/812 only

Figure 4. SOT23-3 Connections

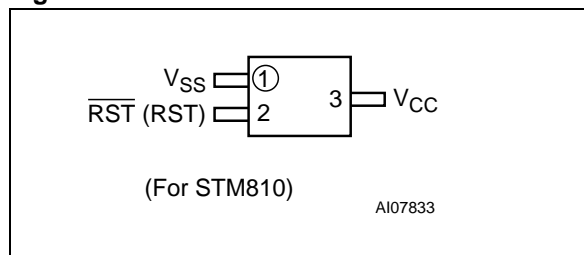


Figure 5. SOT143-4 Connections

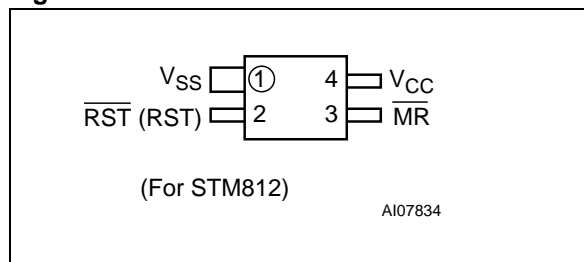
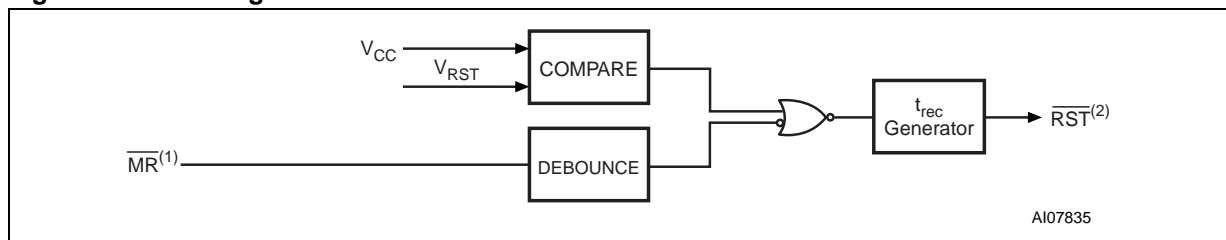
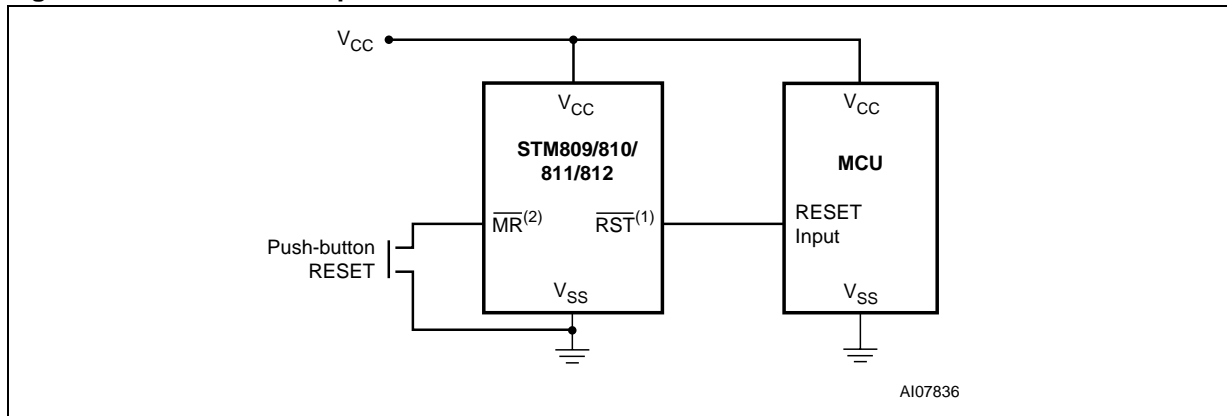


Figure 6. Block Diagram



Note: 1. STM811/812 only
2. RST for STM810/812

Figure 7. Hardware Hookup



Note: 1. STM809/811 only (RST for STM810/812)
2. STM811/812 only

OPERATION

Reset Output

The STM809/810/811/812 MICROPROCESSOR RESET CIRCUIT asserts a reset signal to the MCU whenever V_{CC} goes below the reset threshold (V_{RST}), or when the push-button reset input (\overline{MR}) is taken low (see Figure 15., page 11). RST (active high for STM810/812) is guaranteed valid down to $V_{CC} = 1V$ (0° to $70^\circ C$).

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}) and active-high reset (RST) both source and sink current.

Push-Button Reset Input (STM811/812)

A logic low on \overline{MR} asserts \overline{RST} . \overline{RST} remains asserted while \overline{MR} is low, and for t_{rec} after it returns high. The \overline{MR} input has an internal $20k\Omega$ pull-up resistor, allowing it to be left open if not used. This input can be driven with TTL/CMOS-logic levels or with open-drain/collector outputs. Connect a normally open push-button switch from \overline{MR} to GND to create a manual reset function; external debounce circuitry is not required. If the device is used in a noisy environment, connect a $0.1\mu F$ capacitor from \overline{MR} to GND to provide additional noise immunity.

Negative-Going V_{CC} Transients

The STM809/810/811/812 are relatively immune to negative-going V_{CC} transients (glitches). Figure 13., page 9 shows typical transient duration versus reset comparator overdrive (for which the STM809/810/811/812 will NOT generate a reset pulse). The graph was generated using a negative pulse applied to V_{CC} , starting at $0.5V$ 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 $100mV$ below the reset threshold and lasts $20\mu s$ or less will not cause a reset pulse. A $0.1\mu F$ bypass capacitor mounted as close as possible to the V_{CC} pin provides additional transient immunity.

Valid \overline{RST} Output Down to $V_{CC} = 0V$

When V_{CC} falls below $1V$, the \overline{RST} (STM809/811) output no longer sinks current, but becomes an open circuit. In most systems this is not a problem, as most MCUs do not operate below $1V$. However, in applications where \overline{RST} output must be valid down to $0V$, a pull-down resistor may be added to hold the \overline{RST} output low. This resistor must be large enough to not load the \overline{RST} output, and still be small enough to pull the output to ground. A $100k\Omega$ resistor is recommended.

Note: The same situation applies for the active-high RST of the STM810/812. A $100k\Omega$ pull-up resistor to V_{CC} should be used if RST must remain valid for $V_{CC} < 1.0V$.

TYPICAL OPERATING CHARACTERISTICS

Note: Typical values are at $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$ 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 8. Supply Current vs. Temperature, L/M/R/S/T (no load)

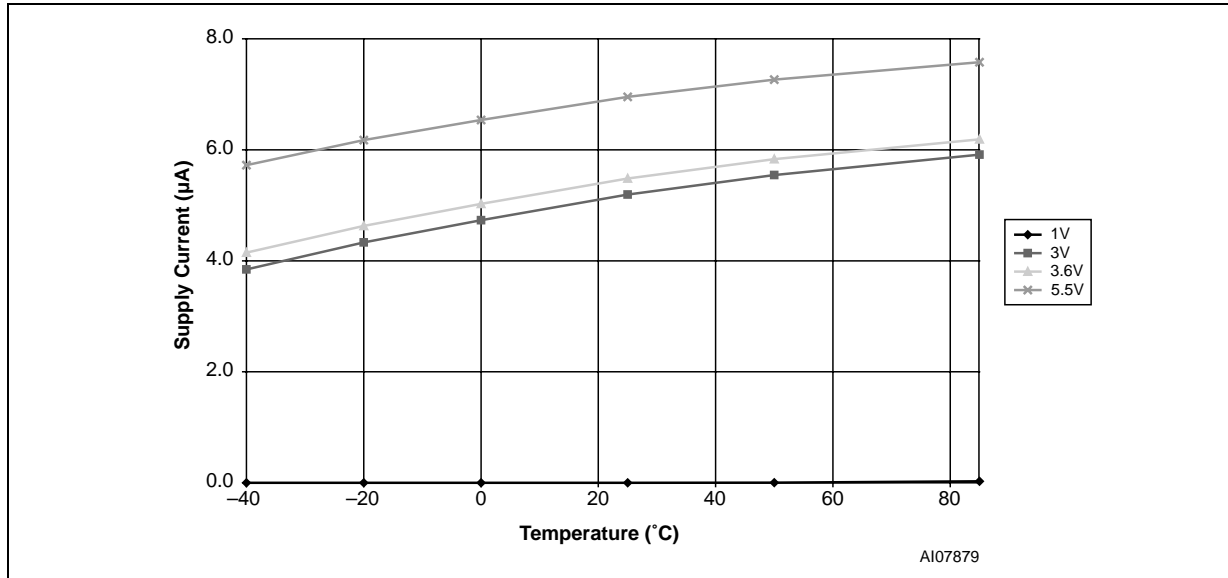


Figure 9. Power-down Reset Delay vs. Temperature - $V_{OD} = V_{TH} - V_{CC}$ (L/M)

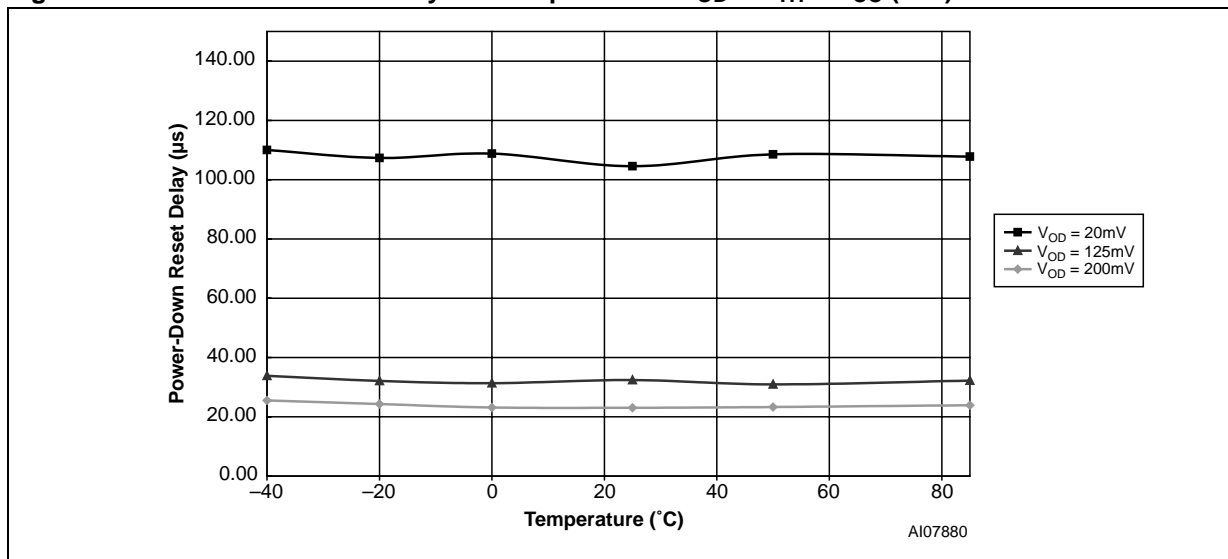


Figure 10. Power-down Reset Delay vs. Temperature - $V_{OD} = V_{TH} - V_{CC}$ (R/S/T)

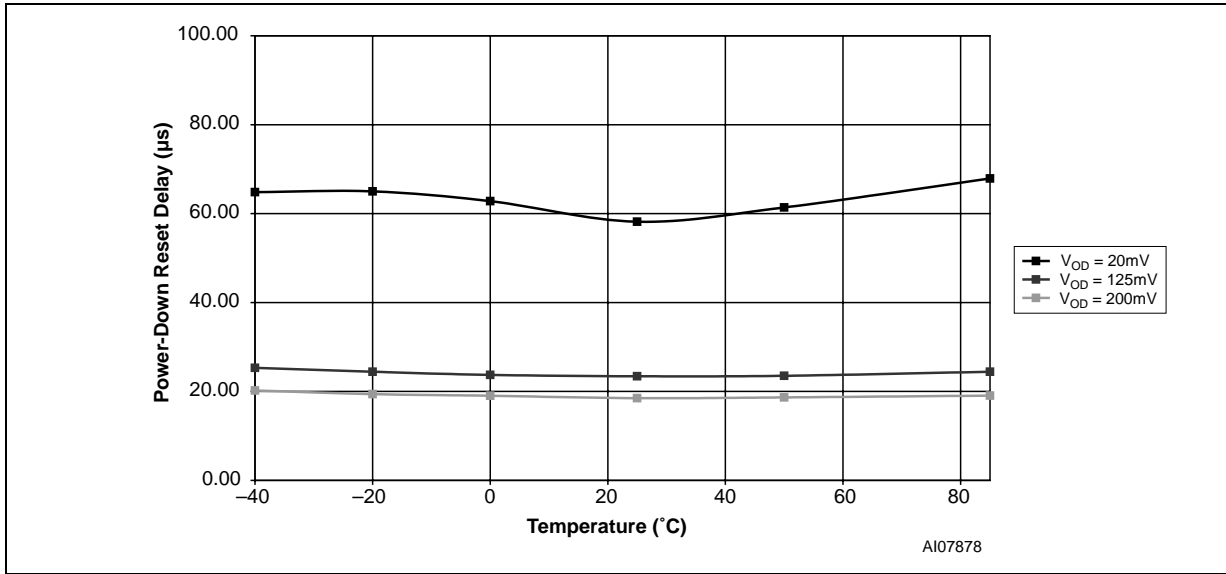


Figure 11. Power-up t_{rec} vs. Temperature

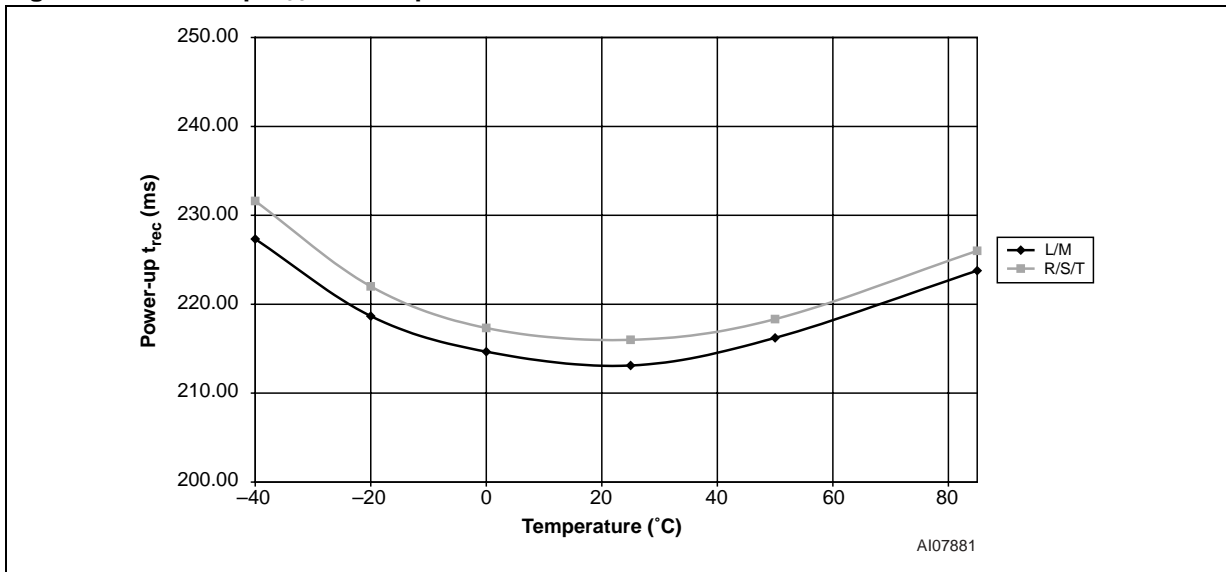


Figure 12. Normalized Reset Threshold vs. Temperature

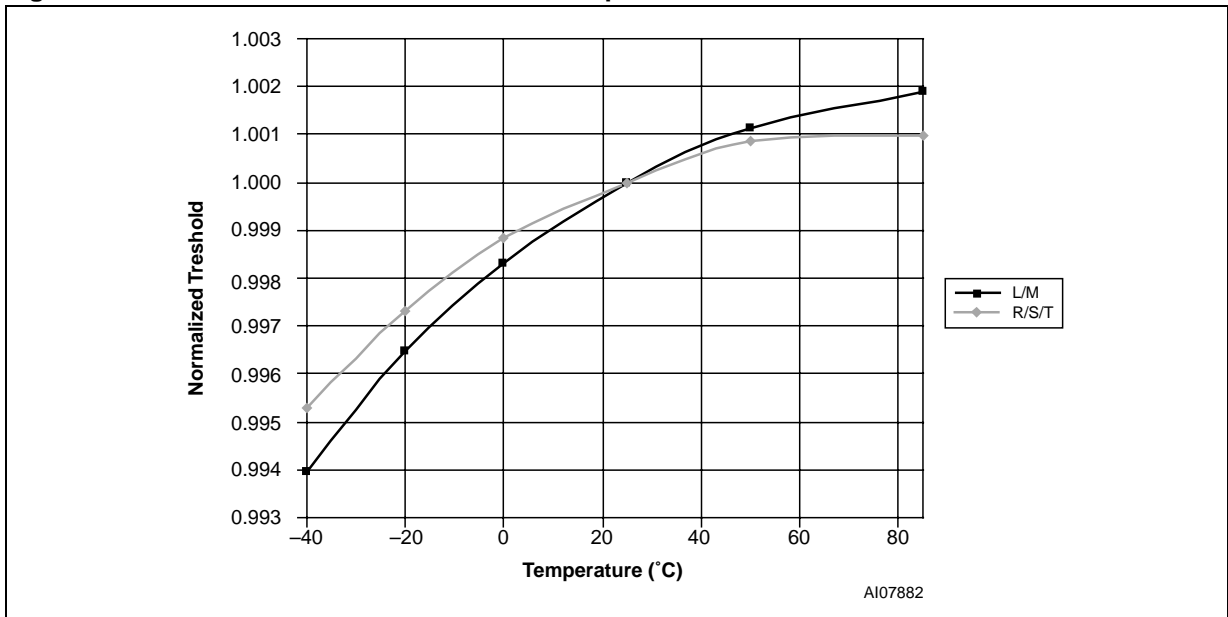
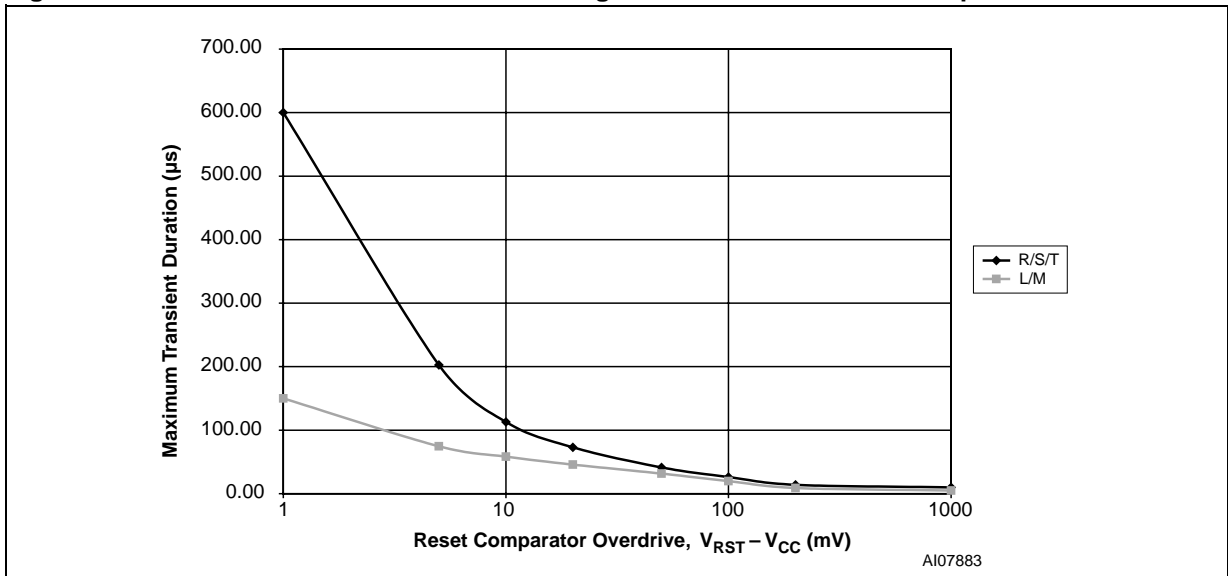


Figure 13. Max Transient Duration NOT Causing Reset Pulse vs. Reset Comparator Overdrive



MAXIMUM RATING

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 im-

plied. 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 3. 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 |

Note: 1. Reflow at peak temperature of 255°C to 260°C for < 30 seconds (total thermal budget not to exceed 180°C for between 90 to 150 seconds).

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 4.](#), 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 4. Operating and AC Measurement Conditions

| Parameter | STM809/810/811/812 | Unit |
|---|---------------------------|------|
| V _{CC} Supply Voltage | 1.0 to 5.5 | V |
| Ambient Operating Temperature (T _A) | -40 to 85 | °C |
| Input Rise and Fall Times | ≤ 5 | ns |
| Input Pulse Voltages | 0.2 to 0.8V _{CC} | V |
| Input and Output Timing Ref. Voltages | 0.3 to 0.7V _{CC} | V |

Figure 14. AC Testing Input/Output Waveforms

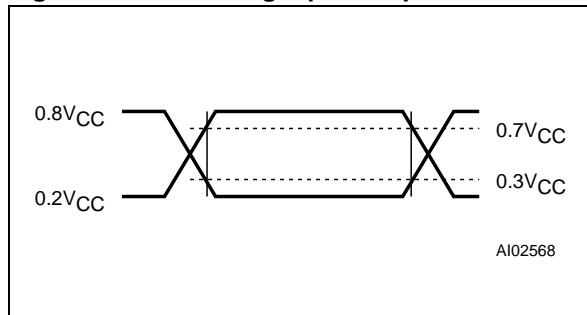
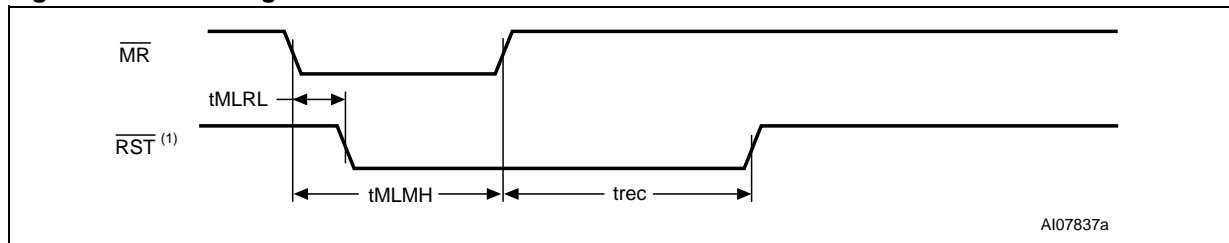


Figure 15. MR Timing Waveform



Note: 1. RST for STM810/812

Table 5. DC and AC Characteristics

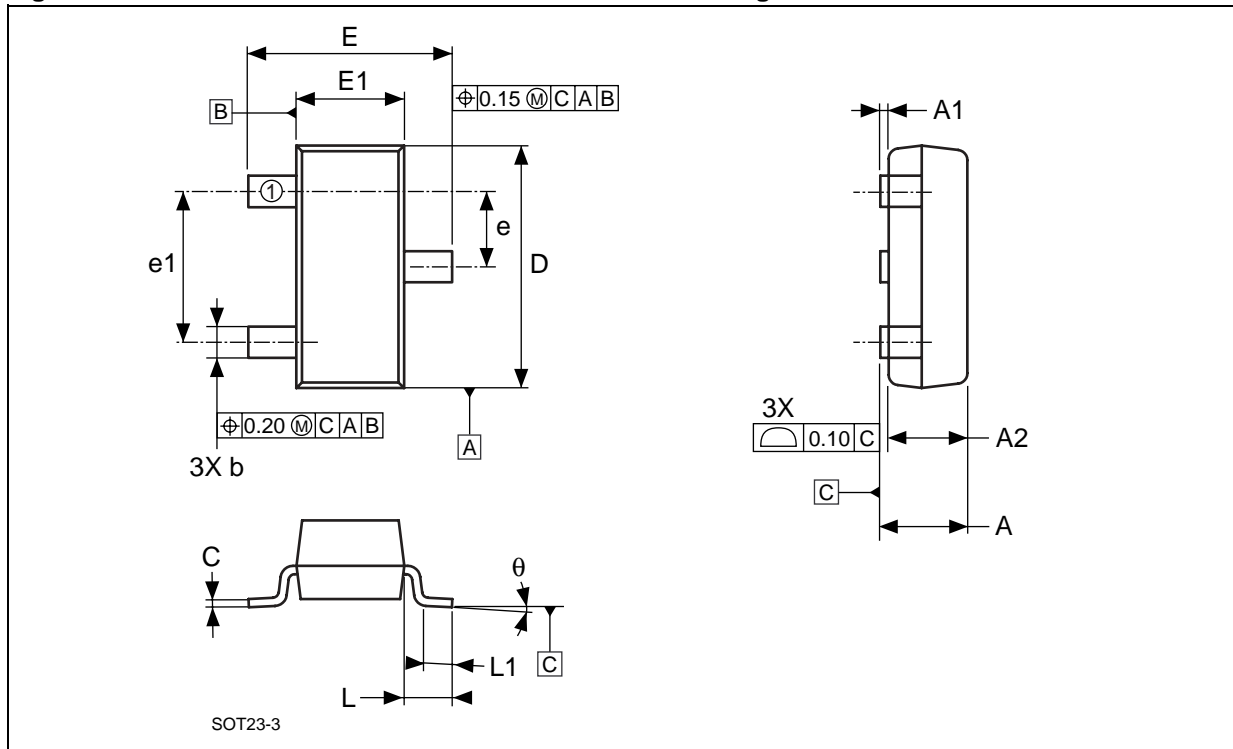
| Sym | Alternative | Description | Test Condition ⁽¹⁾ | Min | Typ | Max | Unit | |
|--------------------------------|------------------|--|---|--------------------|------|---------------------|-------|----|
| V _{CC} | | Operating Voltage | T _A = -40 to +85°C | 1.2 | | 5.5 | V | |
| | | | T _A = 0 to +70°C | 1.0 | | 5.5 | V | |
| I _{CC} | | V _{CC} Supply Current | V _{CC} < 3.6V | | 5.5 | 10 | μA | |
| | | | V _{CC} < 5.5V | | 7 | 15 | μA | |
| V _{IH} | | $\overline{\text{MR}}$ Input High Voltage | V _{CC} > V _{RST} (max), STM8XXL/M | 2.2 | | | V | |
| | | | V _{CC} > V _{RST} (max), STM8XXR/S/T | 0.7V _{CC} | | | V | |
| V _{IL} | | $\overline{\text{MR}}$ Input Low Voltage | V _{CC} > V _{RST} (max), STM8XXL/M | | | 0.8 | V | |
| | | | V _{CC} > V _{RST} (max), STM8XXR/S/T | | | 0.25V _{CC} | V | |
| V _{OL} | | $\overline{\text{RST}}$ Output Low Voltage (Active High ⁽²⁾ or Low) | STM8XXR/S/T only, I _{OL} = 1.2mA V _{CC} = V _{RST} (min) | | | 0.3 | V | |
| | | | STM8XXL/M only, I _{OL} = 3.2mA V _{CC} = V _{RST} (min) | | | 0.4 | V | |
| V _{OL} | | $\overline{\text{RST}}$ Output Low Voltage | I _{OL} = 50μA; V _{CC} > 1.0V | | | 0.3 | V | |
| V _{OH} | | $\overline{\text{RST}}$ Output High Voltage | STM8XXR/S/T only, I _{OH} = 500μA | 0.8V _{CC} | | | V | |
| | | | STM8XXL/M only, I _{OH} = 800μA | 0.8V _{CC} | | | V | |
| | | RST Output High Voltage | I _{OH} = 150μA, 1.8V < V _{CC} < V _{RST} (min) | 0.8V _{CC} | | | V | |
| RESET Thresholds | | | | | | | | |
| V _{RST} | | Reset Threshold | STM8XXL | 25°C | 4.56 | 4.63 | 4.70 | V |
| | | | | -40 to 85°C | 4.50 | | 4.75 | V |
| | | | STM8XXM | 25°C | 4.31 | 4.38 | 4.45 | V |
| | | | | -40 to 85°C | 4.25 | | 4.50 | V |
| | | | STM8XXT | 25°C | 3.04 | 3.08 | 3.11 | V |
| | | | | -40 to 85°C | 3.00 | | 3.15 | V |
| | | | STM8XXS | 25°C | 2.89 | 2.93 | 2.96 | V |
| | | | | -40 to 85°C | 2.85 | | 3.00 | V |
| STM8XXR | 25°C | 2.59 | 2.63 | 2.66 | V | | | |
| | -40 to 85°C | 2.55 | | 2.70 | V | | | |
| | | V _{RST} Temperature Coefficient | V _{CC} = 3.3V | | 45 | | ppm/C | |
| | | V _{CC} to $\overline{\text{RST}}$ Delay | V _{CC} = V _{RST} to (V _{RST} - 100mV) | STM8XXL/M | | 40 | | μs |
| | STM8XXR/S/T | | | | 20 | | μs | |
| Push-Button RESET Input | | | | | | | | |
| t _{MLMH} | t _{MR} | $\overline{\text{MR}}$ Pulse Width | | 10 | | | μs | |
| t _{MLRL} | t _{MRD} | $\overline{\text{MR}}$ to $\overline{\text{RST}}$ Output Delay ⁽³⁾ | | | 0.5 | | μs | |
| | | $\overline{\text{MR}}$ Glitch Immunity ⁽⁴⁾ | | | 100 | | ns | |
| | | $\overline{\text{MR}}$ Pull-up Resistance | | 10 | 20 | 30 | kΩ | |
| | t _{rec} | $\overline{\text{RST}}$ Pulse Width | | 140 | 210 | 280 | ms | |

Note: 1. Valid for Ambient Operating Temperature: T_A = -40 to 85°C; V_{CC} = 1.2V to 5.5V (except where noted).
 2. For Active High (RST); V_{CC} = V_{RST} (max)
 3. RST output for STM810/812
 4. "Glitches" of 100ns or less typically will not generate a RESET pulse.



PACKAGE MECHANICAL

Figure 16. SOT23-3 – 3-lead Small Outline Transistor Package Outline

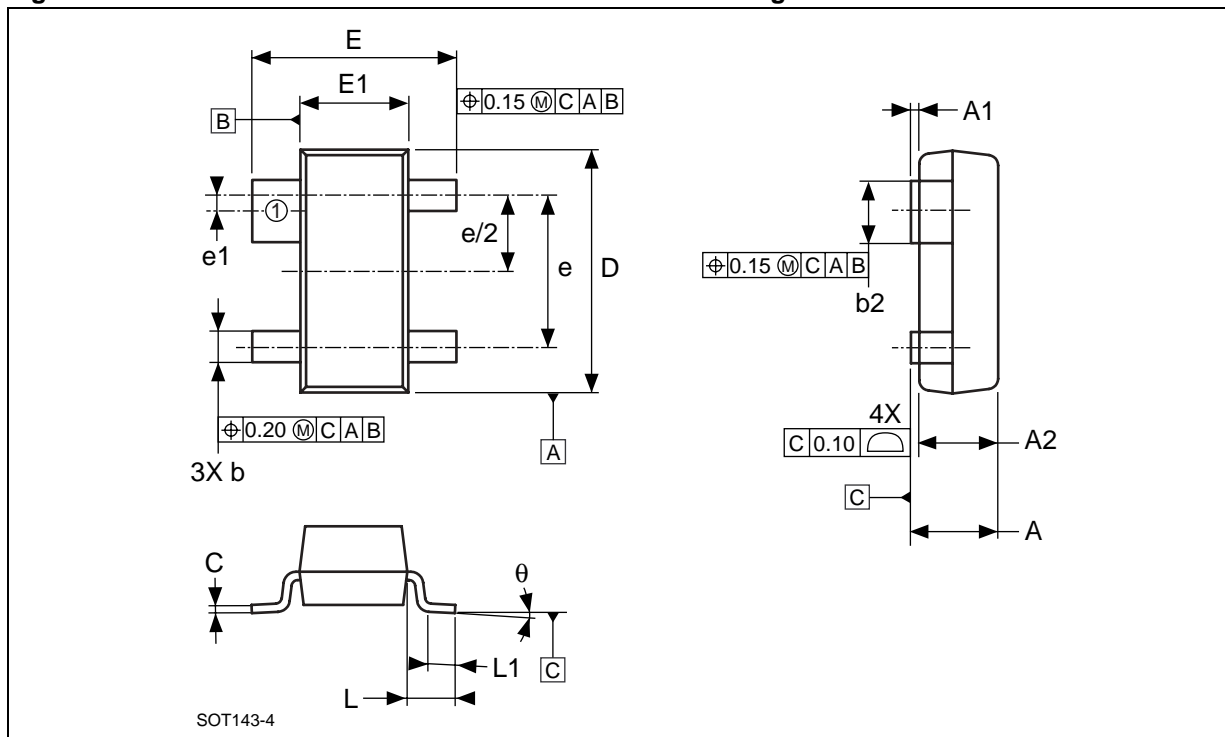


Note: Drawing is not to scale.

Table 6. 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 |
| θ | | 0° | 8° | | 0° | 8° |
| N | | 3 | | | 3 | |

Figure 17. SOT143-4 – 4-lead Small Outline Transistor Package Outline



Note: Drawing is not to scale.

Table 7. SOT143-4 – 4-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 | | 0.37 | 0.51 | | 0.015 | 0.020 |
| b2 | | 0.76 | 0.94 | | 0.030 | 0.037 |
| C | | 0.09 | 0.18 | | 0.004 | 0.007 |
| 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 | 1.92 | | | 0.076 | | |
| e1 | 0.20 | | | 0.008 | | |
| L | 0.55 | | | 0.022 | | |
| L1 | | 0.40 | 0.60 | | 0.016 | 0.024 |
| θ | | 0° | 10° | | 0° | 10° |
| N | | 4 | | | 4 | |

PART NUMBERING

Table 8. Ordering Information Scheme

| | | | | | |
|--|--------|---|----|---|---|
| Example: | STM8XX | L | WX | 6 | F |
| Device Type | | | | | |
| STM8XX | | | | | |
| Reset Threshold Voltage | | | | | |
| L = $V_{RST} = 4.50V$ to $4.75V$ | | | | | |
| M = $V_{RST} = 4.25V$ to $4.50V$ | | | | | |
| T = $V_{RST} = 3.00V$ to $3.15V$ | | | | | |
| S = $V_{RST} = 2.85V$ to $3.00V$ | | | | | |
| R = $V_{RST} = 2.55V$ to $2.70V$ | | | | | |
| Package | | | | | |
| WX = SOT23-3 (STM809, STM810) | | | | | |
| W1 = SOT143-4 (STM811, STM812) | | | | | |
| Temperature Range | | | | | |
| 6 = -40 to $85^{\circ}C$ | | | | | |
| Shipping Method | | | | | |
| F = Pb-Free Package (ECO ² PACK [®]), Tape & Reel | | | | | |

For a list of available options (e.g., Speed, Package) or for further information on any aspect of this device, please contact the ST Sales Office nearest to you.

Table 9. Marking Description

| Part Number | Reset Threshold | Output | Topside Marking |
|-------------|-----------------|----------------------------|-----------------|
| STM809L | 4.63V | Push-Pull \overline{RST} | 8AAx |
| STM809M | 4.38V | Push-Pull \overline{RST} | 8ABx |
| STM809T | 3.08V | Push-Pull \overline{RST} | 8ACx |
| STM809S | 2.93V | Push-Pull \overline{RST} | 8ADx |
| STM809R | 2.63V | Push-Pull \overline{RST} | 8AEx |
| STM810L | 4.63V | Push-Pull RST | 8AFx |
| STM810M | 4.38V | Push-Pull RST | 8AGx |
| STM810T | 3.08V | Push-Pull RST | 8AHx |
| STM810S | 2.93V | Push-Pull RST | 8AJx |
| STM810R | 2.63V | Push-Pull RST | 8AKx |
| STM811L | 4.63V | Push-Pull \overline{RST} | 8ALx |
| STM811M | 4.38V | Push-Pull \overline{RST} | 8AMx |
| STM811T | 3.08V | Push-Pull \overline{RST} | 8ANx |
| STM811S | 2.93V | Push-Pull \overline{RST} | 8APx |
| STM811R | 2.63V | Push-Pull \overline{RST} | 8AQx |
| STM812L | 4.63V | Push-Pull RST | 8ARx |
| STM812M | 4.38V | Push-Pull RST | 8ASx |
| STM812T | 3.08V | Push-Pull RST | 8ATx |
| STM812S | 2.93V | Push-Pull RST | 8AUx |
| STM812R | 2.63V | Push-Pull RST | 8AVx |

REVISION HISTORY

Table 10. Document Revision History

| Date | Version | Revision Details |
|-----------|---------|--|
| 02-Sep-03 | 1.0 | First Issue |
| 03-Oct-03 | 1.1 | Update Operating Characteristics (Figure 8, 9, 10, 11, 12, 13) |
| 16-Oct-03 | 1.2 | Update characteristics (Table 5); modify illustration (Figure 13) |
| 17-Nov-03 | 1.3 | Modified with JEDEC timing symbols (Figure 15; Table 5) |
| 04-Dec-03 | 2.0 | Reformatted; promoted; updated (Figure 15; Table 5, 6) |
| 09-Dec-03 | 2.1 | Correct timing label, combine characteristics (Figure 11; Table 5) |
| 10-Feb-04 | 3.0 | Clarify package; update DC Characteristics (Table 5, 8) |
| 19-Nov-04 | 4.0 | Update dimensions (Table 6) |

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