

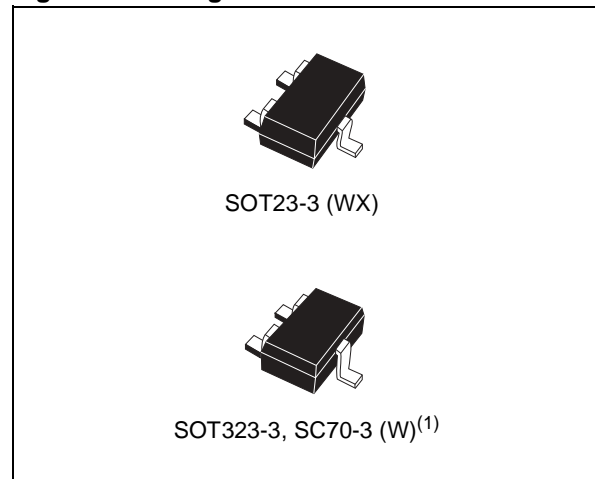


Low Power Voltage Detector

FEATURES

- FACTORY-TRIMMED VOLTAGE THRESHOLDS IN 0.1V INCREMENTS FROM 1.6V TO 5.5V
- $\pm 2\%$ VOLTAGE THRESHOLD ACCURACY
- OPERATING VOLTAGE 0.7V to 6.0V
- OPEN DRAIN OUTPUT
- LOW SUPPLY CURRENT - 0.9 μ A (typ)
- GUARANTEED $\overline{\text{OUT}}$ ASSERTION DOWN TO $V_{\text{CC}} = 0.7\text{V}$
- POWER SUPPLY TRANSIENT IMMUNITY
- AVAILABLE IN SOT23-3 and SOT323-3 (SC70-3) PACKAGES
- OPERATING TEMPERATURE -40°C TO 85°C

Figure 1. Packages



Note: 1. Contact local sales office for availability.

TABLE OF CONTENTS

| | |
|--------------------------------------------------------------------------------------------|-----------|
| FEATURES | 1 |
| Figure 1. Packages | 1 |
| SUMMARY DESCRIPTION | 4 |
| Figure 2. Logic Diagram | 4 |
| Table 1. Signal Names | 4 |
| Figure 3. SOT23-3 Connections | 4 |
| Figure 4. SOT323-3 (SC70-3) Connections | 4 |
| Figure 5. N-Channel Open Drain Output Block Diagram | 5 |
| Figure 6. STM1061N Active-Low, Open Drain Hardware Hookup | 5 |
| PIN DESCRIPTIONS | 6 |
| Table 2. Pin Functions | 6 |
| OPERATION | 6 |
| Output | 6 |
| Negative-Going V_{CC} Transients and Undershoot | 6 |
| TYPICAL OPERATING CHARACTERISTICS | 7 |
| Figure 7. Supply Current vs. Input Voltage | 7 |
| Figure 8. Supply Current vs. Ambient Temperature | 7 |
| Figure 9. Output Detect Delay Time vs. Ambient Temperature | 8 |
| Figure 10. Output Release Delay Time vs. Ambient Temperature | 8 |
| Figure 11. Maximum Transient Duration vs. Reset Threshold Overdrive | 9 |
| Figure 12. Detect, Release Voltage vs. Ambient Temperature for $V_{TH-} = 3.4V$ | 9 |
| Figure 13. N-channel Driver Output Current vs. V_{DS} | 10 |
| Figure 14. N-channel Driver Output Current vs. Input Voltage | 10 |
| MAXIMUM RATING | 11 |
| Table 3. Absolute Maximum Ratings | 11 |
| DC AND AC PARAMETERS | 12 |
| Table 4. Operating and AC Measurement Conditions | 12 |
| Figure 15. AC Testing Input/Output Waveforms | 12 |
| Figure 16. Voltage Timing Waveform | 12 |
| Table 5. DC and AC Characteristics | 13 |
| PACKAGE MECHANICAL | 14 |
| Figure 17. SOT23-3 – 3-lead Small Outline Transistor Package Outline | 15 |
| Table 6. SOT23-3 – 3-lead Small Outline Transistor Package Mechanical Data | 15 |
| Figure 18. SOT323-3 (SC70-3) – 3-lead Small Outline Transistor Package Outline | 16 |
| Table 7. SOT323-3 (SC70-3) – 3-lead Small Outline Transistor Package Mechanical Data | 16 |

PART NUMBERING 17

 Table 8. Ordering Information Scheme 17

 Table 9. Factory-Trimmed Thresholds with Marking Description 18

REVISION HISTORY..... 20

 Table 10. Document Revision History 20

SUMMARY DESCRIPTION

The STM1061 low power voltage detector provides monitoring of battery, power-supply, and regulated system voltages. A precision voltage reference and comparator monitors the V_{CC} input and compares it with a specified voltage threshold condition. When V_{CC} falls below a specified trip point threshold, the output (\overline{OUT}) is forced low and remains asserted as long as the V_{CC} input re-

mains below V_{TH-} + hysteresis (V_{HYST}). The STM1061 device is guaranteed to output the correct logic state for V_{CC} down to 0.7V. They are also designed to ignore fast transients on V_{CC} .

This small, low power device is ideal for portable applications and is available in space-saving SOT23-3 and SOT323-3 (SC70-3) packages.

Figure 2. Logic Diagram

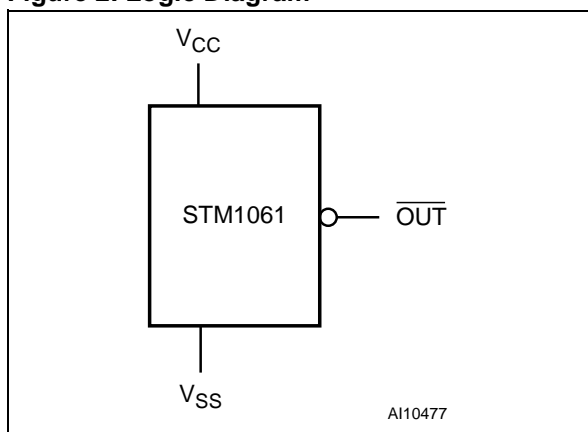


Table 1. Signal Names

| | |
|------------------|------------------------------|
| \overline{OUT} | Open Drain Active-Low Output |
| V_{CC} | Supply Voltage |
| V_{SS} | Ground |

Figure 3. SOT23-3 Connections

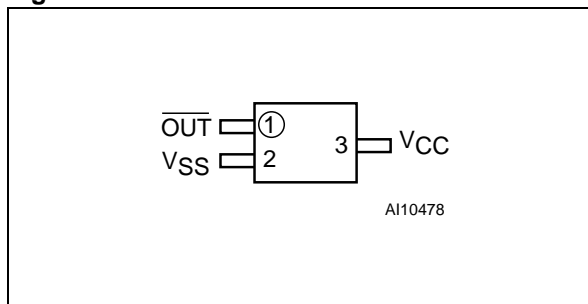


Figure 4. SOT323-3 (SC70-3) Connections

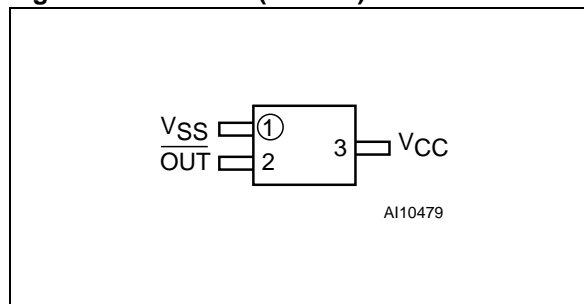


Figure 5. N-Channel Open Drain Output Block Diagram

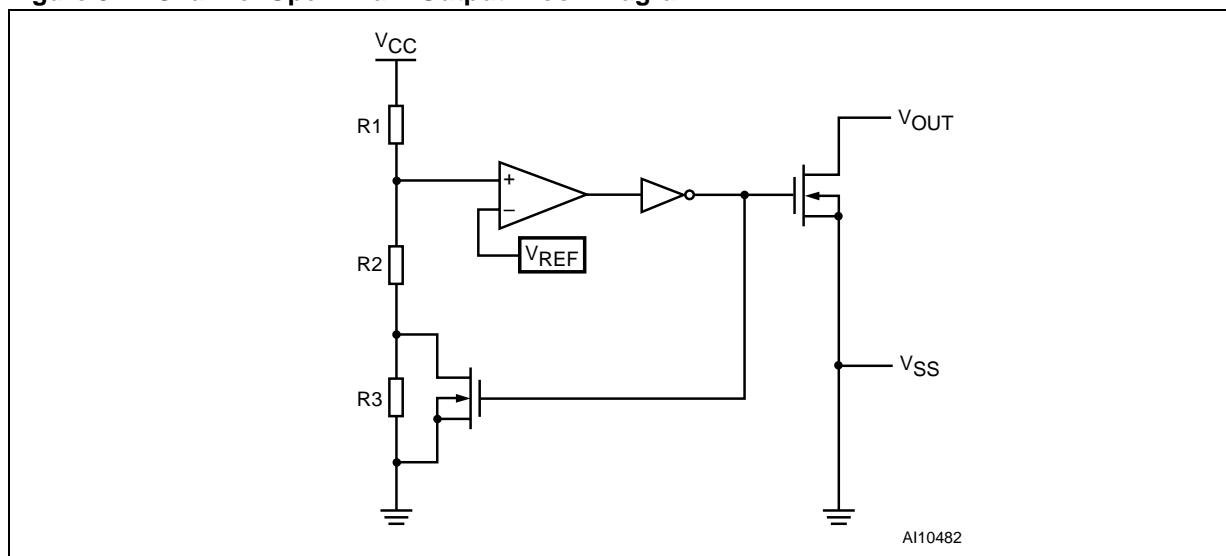
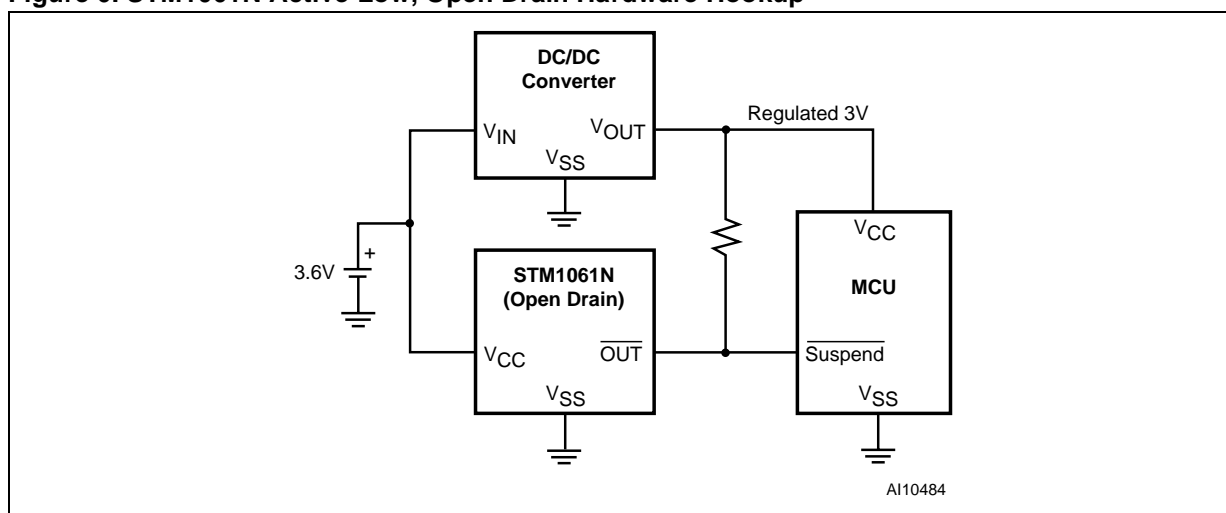


Figure 6. STM1061N Active-Low, Open Drain Hardware Hookup



PIN DESCRIPTIONS

See [Figure 2., page 4](#) and [Table 1., page 4](#) for a brief overview of the signals connected to this device.

$\overline{\text{OUT}}$ (Open Drain). This is the Open Drain Output. It goes low when V_{CC} drops below V_{TH-} , and remains low as long as V_{CC} is below $V_{TH-} + V_{HYST}$.

V_{CC} . This is the Supply voltage and input for the Voltage Detector.

V_{SS} . Ground, V_{SS} , is the reference for the power supply. It must be connected to the system ground.

Table 2. Pin Functions

| Pin | | Name | Function |
|---------|-------------------|-------------------------|------------------------------|
| SOT23-3 | SOT323-3 (SC70-3) | | |
| 1 | 2 | $\overline{\text{OUT}}$ | Active-Low Open Drain Output |
| 3 | 3 | V_{CC} | Supply Voltage |
| 2 | 1 | V_{SS} | Ground |

OPERATION

Output

The STM1061 Voltage Detector monitors system voltages from 1.6V to 5V in 100mV increments. The detector is designed to ignore fast transients on V_{CC} and has a voltage hysteresis (V_{HYST}). The STM1061 asserts an output signal ($\overline{\text{OUT}}$) whenever V_{CC} goes below the Voltage Detect Threshold (V_{TH-}). The output signal ($\overline{\text{OUT}}$) stays asserted until V_{CC} goes above the Voltage Detect Release (V_{TH+}). Output voltage (V_{OUT}) is guaranteed valid down to $V_{CC} = 0.7V$ at 25°C.

The STM1061 has an open drain active-low output which will sink current when output is asserted. Connect a pull-up resistor from $\overline{\text{OUT}}$ to any supply voltage up to 6V (see [Figure 6., page 5](#)). Select a resistor value large enough to register a logic low, and small enough to register a logic high while all of the input current and leakage paths connected to the reset output line are being supplied. A 10k pull-up is sufficient in most applications.

The advantages of open drain output is the ability to connect more open drain outputs in parallel (wired OR connections) as well as connect the output to a power supply voltage different from V_{CC} .

Negative-Going V_{CC} Transients and Undershoot

The STM1061 device is relatively immune to negative-going V_{CC} transients (glitches). The graph (see [Figure 11., page 9](#)) 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.

A 0.1 μ F bypass capacitor mounted as close as possible to the V_{CC} pin provides additional transient immunity.

TYPICAL OPERATING CHARACTERISTICS

Figure 7. Supply Current vs. Input Voltage

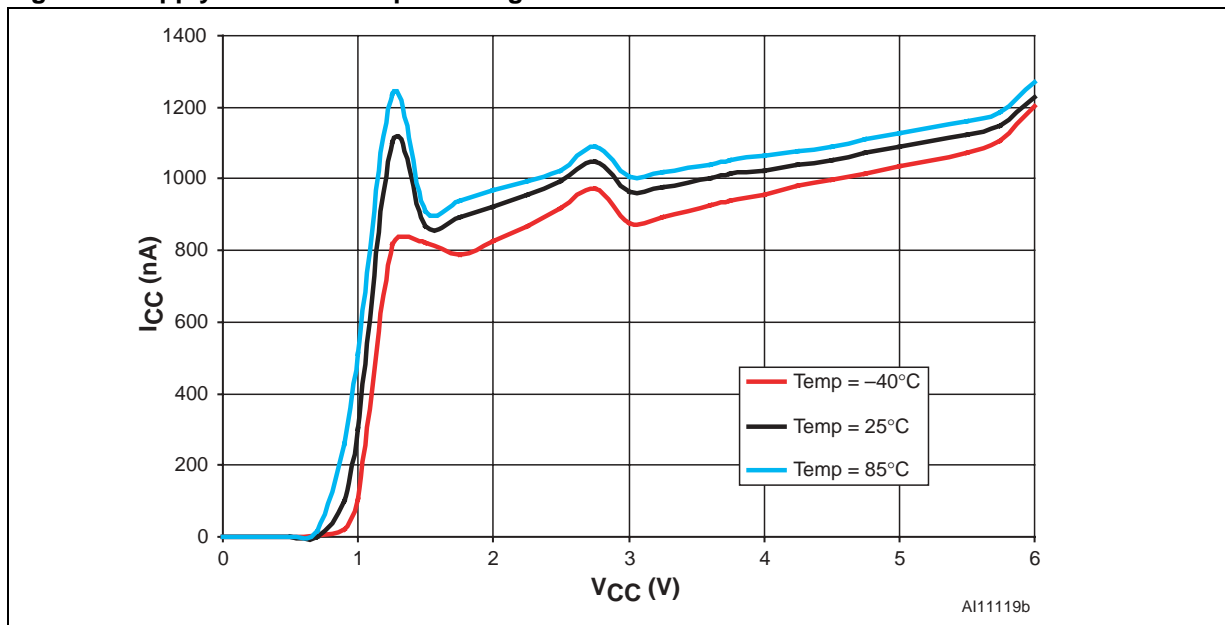


Figure 8. Supply Current vs. Ambient Temperature

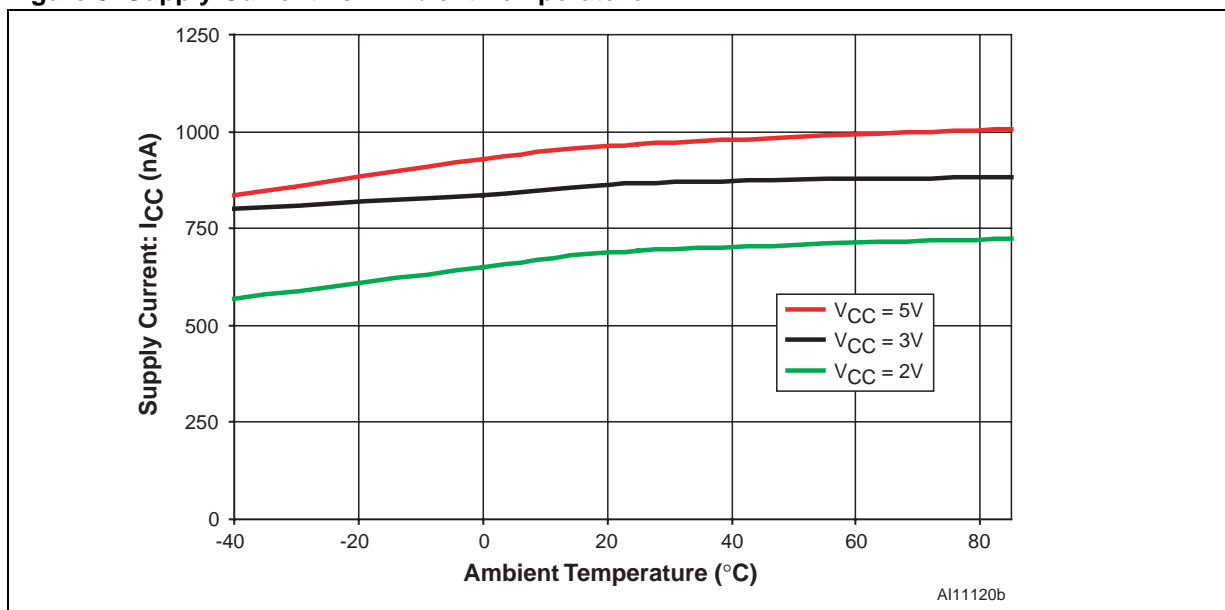


Figure 9. Output Detect Delay Time vs. Ambient Temperature

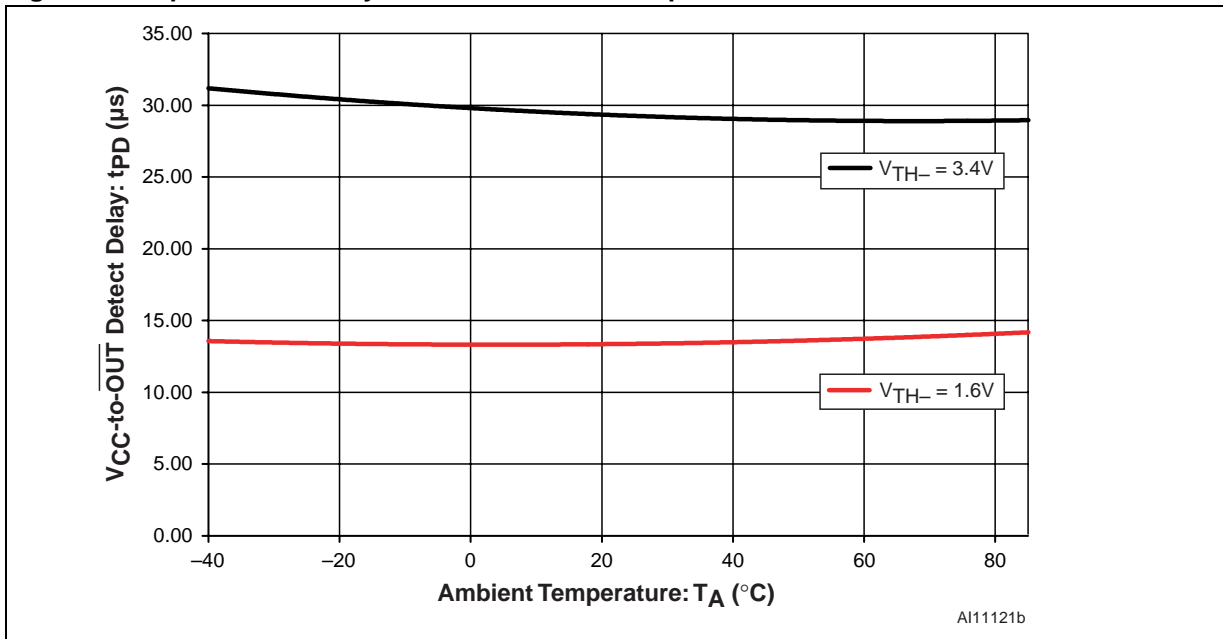


Figure 10. Output Release Delay Time vs. Ambient Temperature

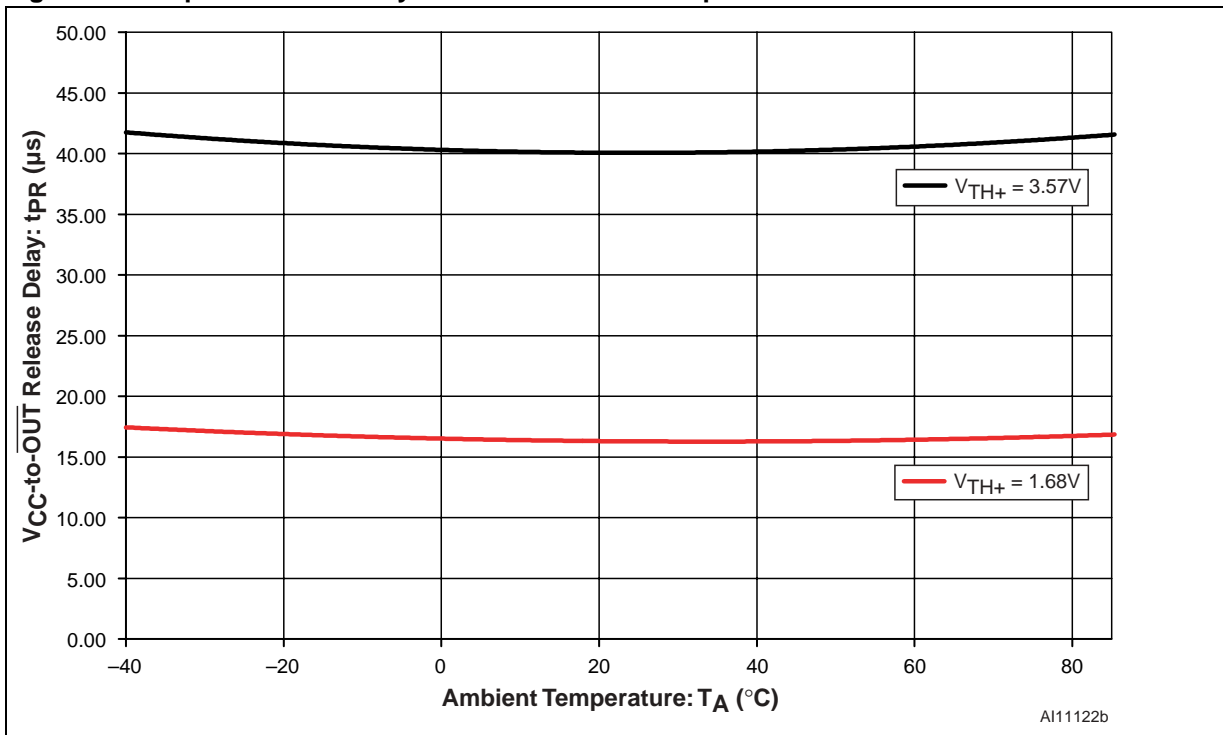
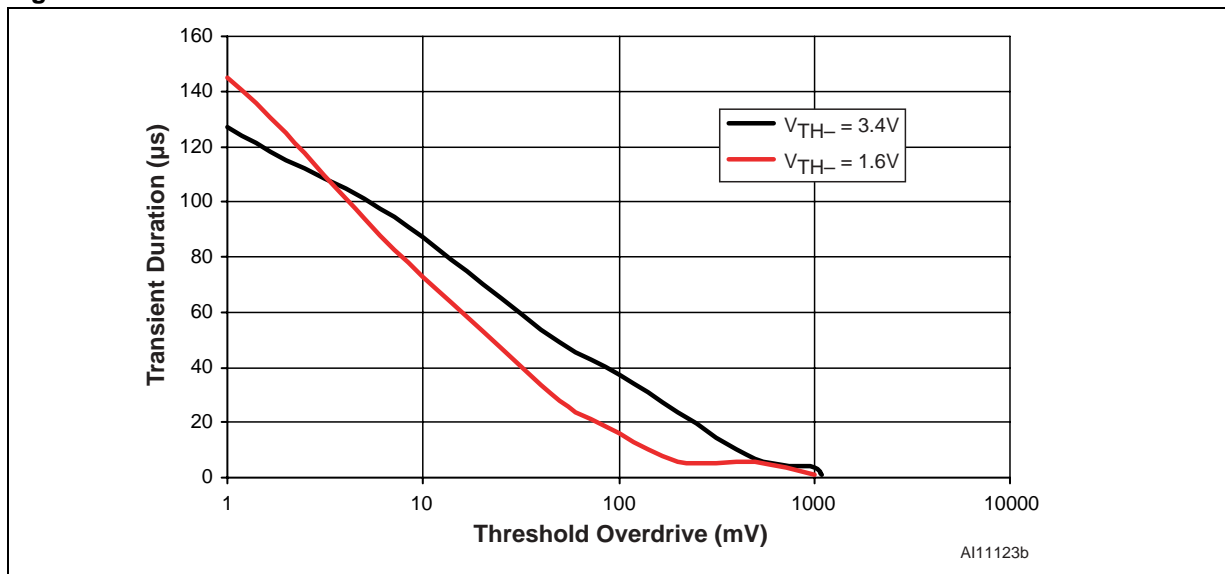


Figure 11. Maximum Transient Duration vs. Reset Threshold Overdrive



Note: Reset occurs above the curve.

Figure 12. Detect, Release Voltage vs. Ambient Temperature for $V_{TH-} = 3.4V$

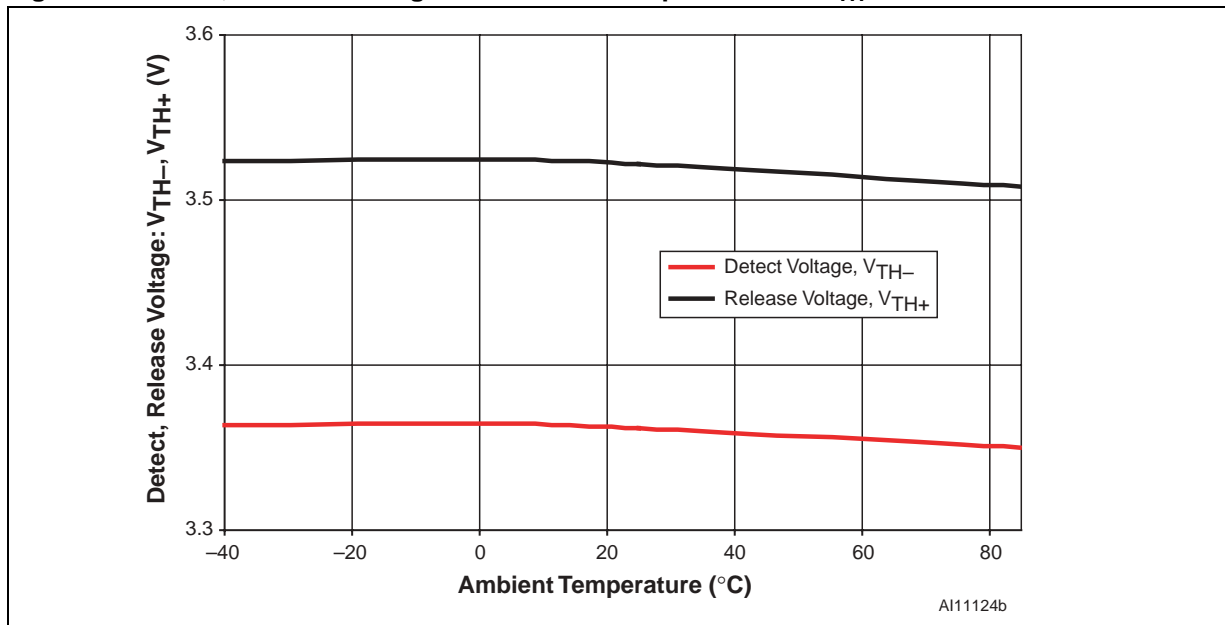


Figure 13. N-channel Driver Output Current vs. V_{DS}

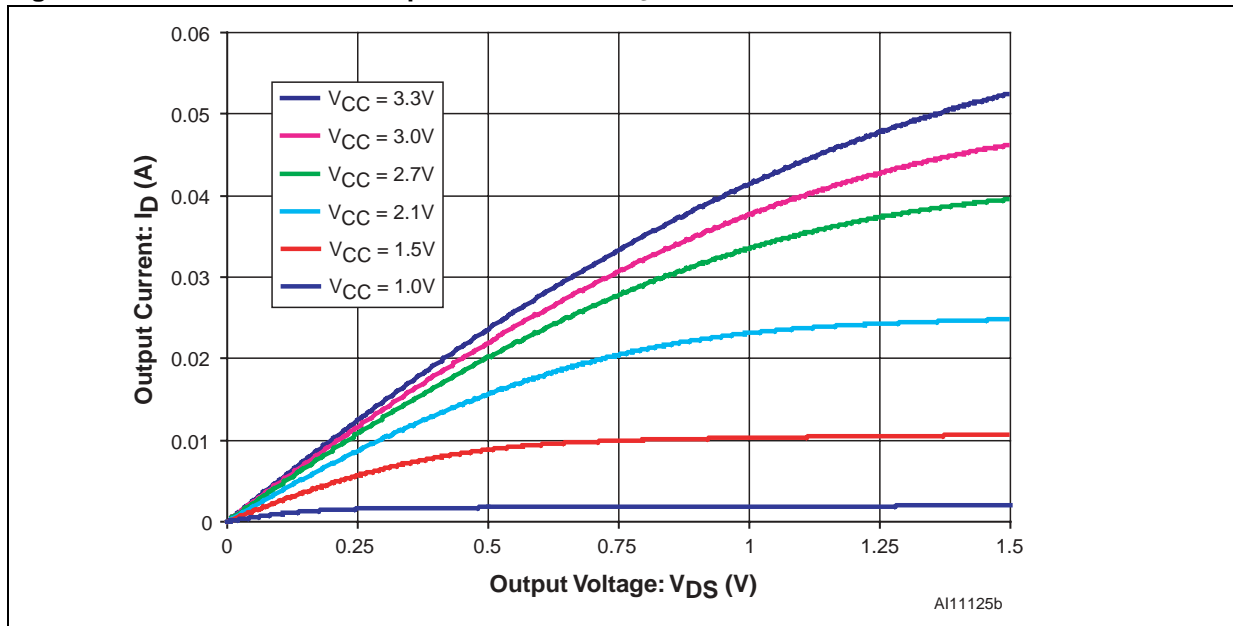
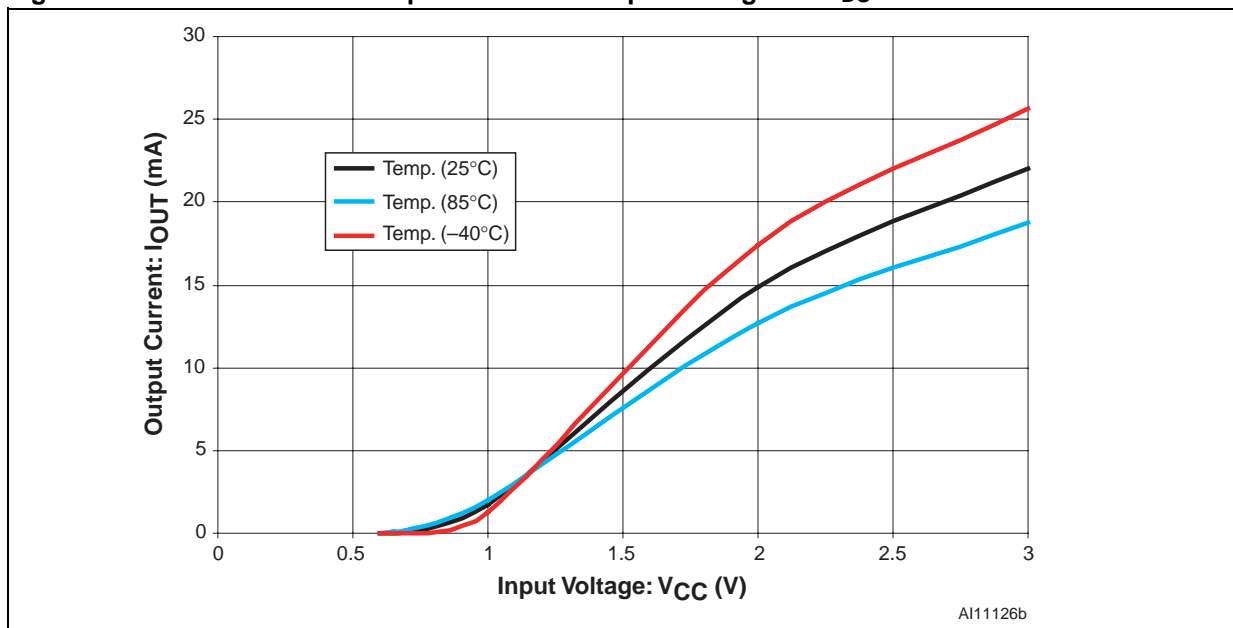


Figure 14. N-channel Driver Output Current vs. Input Voltage for $V_{DS} = 0.5V$



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, V _{BAT} 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 | 0.7 to 6.0 | 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 | STM1061 | Unit |
|---------------------------------------|---------------------------|------|
| V _{CC} Supply Voltage | 0.7 to 6.0 | V |
| 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 15. AC Testing Input/Output Waveforms

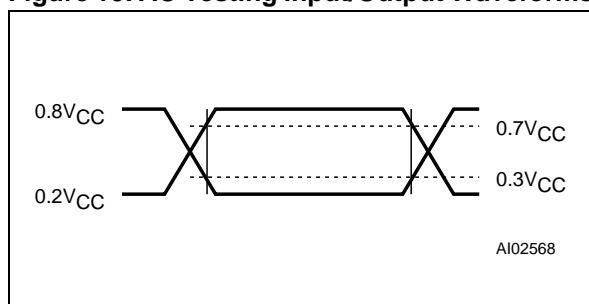


Figure 16. Voltage Timing Waveform

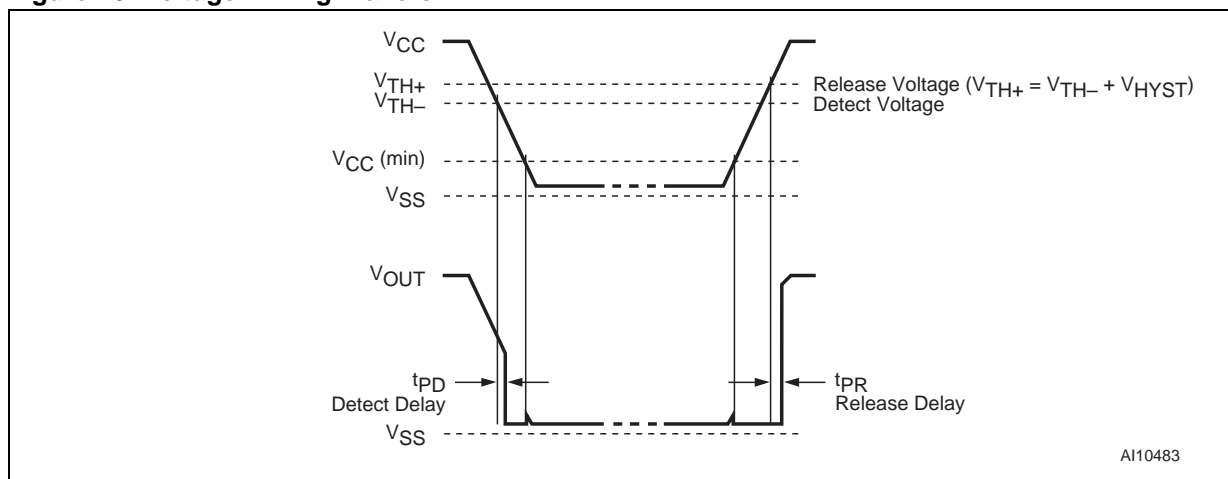


Table 5. DC and AC Characteristics

| Sym | Description | Test Condition ⁽¹⁾ | Min | Typ | Max | Unit |
|---------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------|-----------------------|------------|
| V _{CC} | Operating Voltage | | 0.7 | | 6.0 | V |
| I _{CC} | V _{CC} Supply Current | V _{CC} = 3.0V, No Load | | 0.9 | 3.0 | μA |
| | | V _{CC} = 5.5V, No Load | | 1.1 | 3.6 | μA |
| I _{OUT} | Output Current, N-channel (V _{DS} = 0.5V), Reset asserted | V _{CC} = 1.0V | 1.0 | 1.7 | | mA |
| | | V _{CC} = 2.0V | 3.0 | 14 | | mA |
| | | V _{CC} = 3.0V | 5.0 | 22 | | mA |
| | | V _{CC} = 4.0V | 6.0 | 26 | | mA |
| | | V _{CC} = 5.0V | 7.0 | 30 | | mA |
| Voltage Thresholds | | | | | | |
| V _{TH-} | Detect Voltage (see Table 9., page 18 for detailed listing) | | V _{TH-} - 2% | V _{TH-} | V _{TH-} + 2% | V |
| V _{TH+} | Release Voltage | | | V _{TH-} + V _{HYST} | | V |
| V _{HYST} | Threshold Hysteresis | | 0.02V _{TH-} | 0.05V _{TH-} | 0.08V _{TH-} | V |
| t _{PD} | V _{CC} to $\overline{\text{OUT}}$ Detect Delay | V _{CC} falling from (V _{TH-} + 100mV) to (V _{TH-} - 100mV) at 10mV/μs | | 25 | | μs |
| t _{PR} | V _{CC} to $\overline{\text{OUT}}$ Release Delay | V _{CC} rising from (V _{TH+} - 100mV) to (V _{TH+} + 100mV) at 10mV/μs | | 30 | 200 | μs |
| | Threshold Temperature Coefficient | | | ±100 | | ppm/ °C |

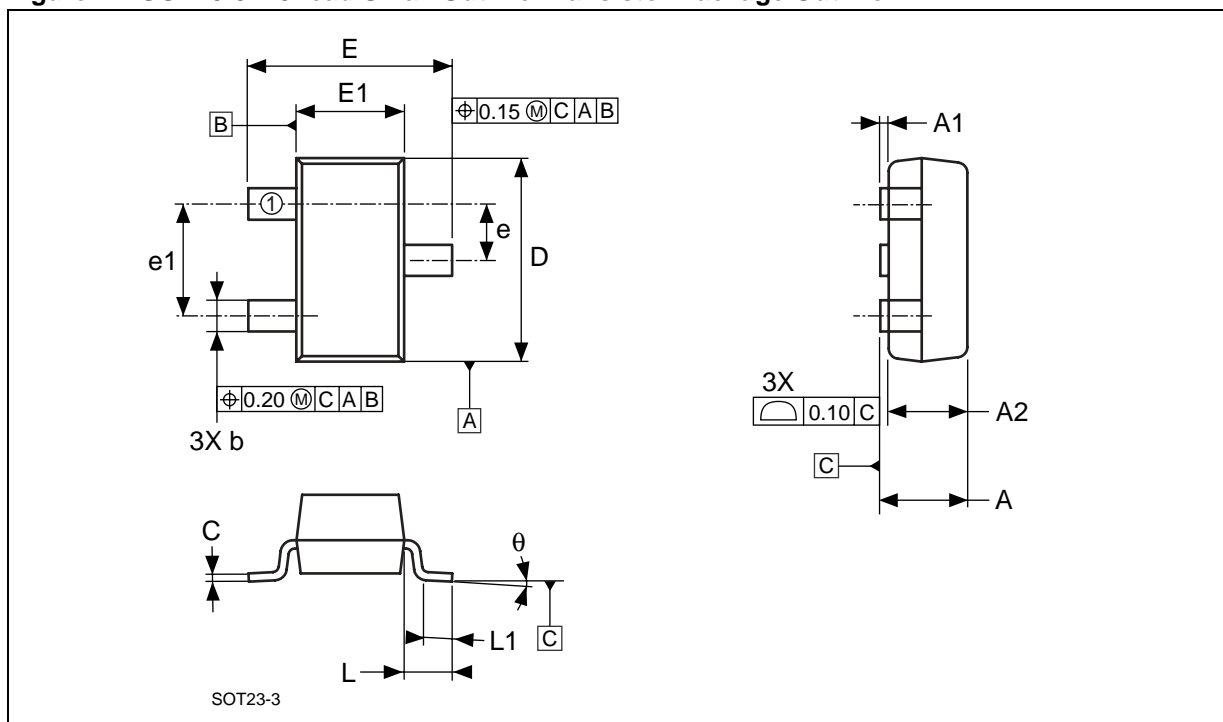
Note: 1. Valid for Ambient Operating Temperature: T_A = 25°C.

PACKAGE MECHANICAL

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.

Figure 17. SOT23-3 – 3-lead Small Outline Transistor Package Outline

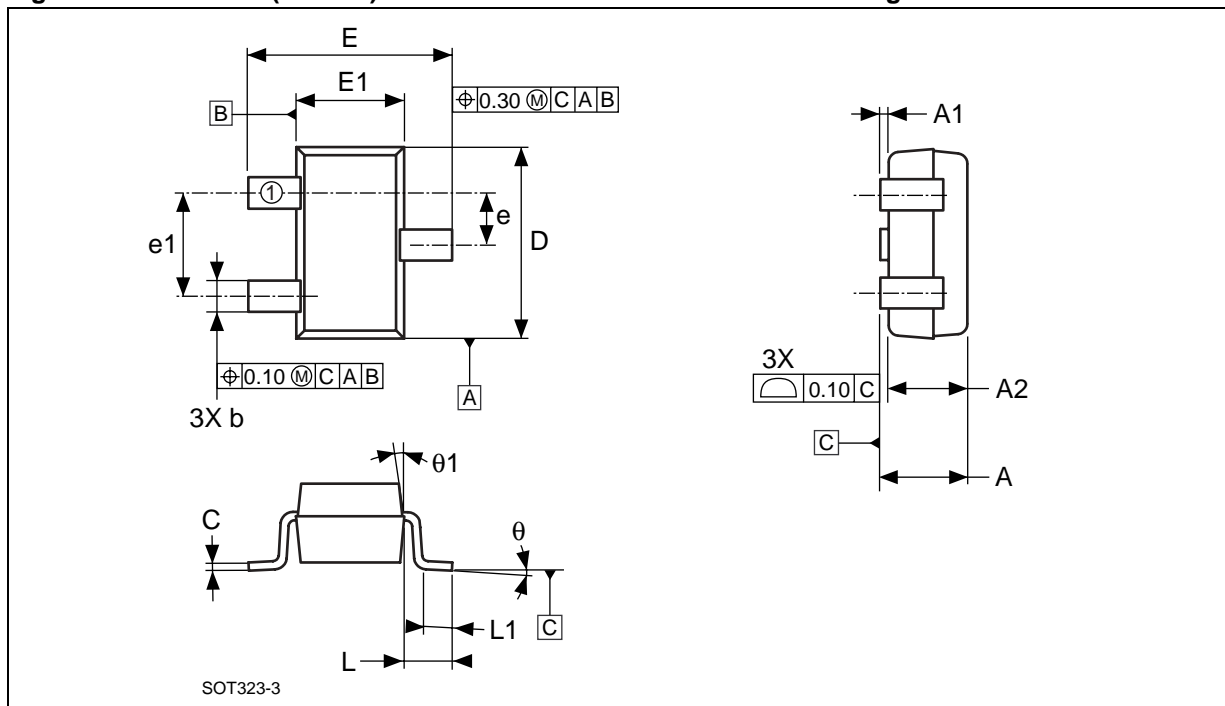


Note: Drawing is not to scale.

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 18. SOT323-3 (SC70-3) – 3-lead Small Outline Transistor Package Outline



Note: Drawing is not to scale.

Table 7. SOT323-3 (SC70-3) – 3-lead Small Outline Transistor Package Mechanical Data

| Symbol | mm | | | inches | | |
|------------|-----|------|------|--------|-------|-------|
| | Typ | Min | Max | Typ | Min | Max |
| A | | 0.80 | 1.10 | | 0.031 | 0.043 |
| A1 | | 0.00 | 0.10 | | 0.000 | 0.004 |
| A2 | | 0.80 | 1.00 | | 0.031 | 0.039 |
| b | | 0.25 | 0.40 | | 0.010 | 0.016 |
| C | | 0.10 | 0.18 | | 0.004 | 0.007 |
| D | | 1.80 | 2.20 | | 0.071 | 0.087 |
| E | | 1.80 | 2.40 | | 0.071 | 0.094 |
| E1 | | 1.15 | 1.35 | | 0.045 | 0.053 |
| e | | 0.65 | | | 0.026 | |
| e1 | | 1.30 | | | 0.051 | |
| L | | 0.35 | 0.45 | | 0.014 | 0.018 |
| L1 | | 0.10 | 0.30 | | 0.004 | 0.012 |
| θ | | 0° | 30° | | 0° | 30° |
| $\theta 1$ | | 8° | 12° | | 8° | 12° |
| N | | 3 | | | 3 | |

PART NUMBERING

Table 8. Ordering Information Scheme

| Example: | STM1061 | N | xx | WX | 6 | F |
|----------------------------------------------------------|---------|-----------------------------|--------------------------------------------|------------------------------------------------------|-----------------|----------------------------------|
| Device Type | STM1061 | | | | | |
| Output Type | | N = Open Drain (Active-Low) | | | | |
| Threshold Voltage (1.6V to 5.5V, 0.1V increments) | | | xx = See Table 9., page 18 | | | |
| Package | | | | WX = SOT23-3 W = SOT323-3 (SC70-3) ⁽¹⁾ | | |
| Temperature Range | | | | | 6 = -40 to 85°C | |
| Shipping Method | | | | | | F = ECOPACK Package, Tape & Reel |

Note: 1. Contact local sales office for availability.

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

Table 9. Factory-Trimmed Thresholds with Marking Description

| Suffix | Threshold Voltage V_{TH-} (V) at $T_A = 25^\circ\text{C}$ | | | Topside Marking |
|-------------------|-------------------------------------------------------------|--------------|--------------|-----------------|
| | Min (-2%) | Typ | Max (+2%) | |
| 16 | 1.568 | 1.600 | 1.632 | 16Nx |
| 17 | 1.666 | 1.700 | 1.734 | 17Nx |
| 18 ⁽¹⁾ | 1.764 | 1.800 | 1.836 | 18Nx |
| 19 ⁽¹⁾ | 1.862 | 1.900 | 1.938 | 19Nx |
| 20 ⁽¹⁾ | 1.960 | 2.000 | 2.040 | 20Nx |
| 21 ⁽¹⁾ | 2.058 | 2.100 | 2.142 | 21Nx |
| 22 | 2.156 | 2.200 | 2.244 | 22Nx |
| 23 | 2.254 | 2.300 | 2.346 | 23Nx |
| 24 ⁽¹⁾ | 2.352 | 2.400 | 2.448 | 24Nx |
| 25 ⁽¹⁾ | 2.450 | 2.500 | 2.550 | 25Nx |
| 26 | 2.548 | 2.600 | 2.652 | 26Nx |
| 27 | 2.646 | 2.700 | 2.754 | 27Nx |
| 28 | 2.744 | 2.800 | 2.856 | 28Nx |
| 29 | 2.842 | 2.900 | 2.958 | 29Nx |
| 30 ⁽¹⁾ | 2.940 | 3.000 | 3.060 | 30Nx |
| 31 | 3.038 | 3.100 | 3.162 | 31Nx |
| 32 ⁽¹⁾ | 3.136 | 3.200 | 3.264 | 32Nx |
| 33 ⁽¹⁾ | 3.234 | 3.300 | 3.366 | 33Nx |
| 34 | 3.332 | 3.400 | 3.468 | 34Nx |
| 35 ⁽¹⁾ | 3.430 | 3.500 | 3.570 | 35Nx |
| 36 ⁽¹⁾ | 3.528 | 3.600 | 3.672 | 36Nx |
| 37 ⁽¹⁾ | 3.626 | 3.700 | 3.774 | 37Nx |
| 38 ⁽¹⁾ | 3.724 | 3.800 | 3.876 | 38Nx |
| 39 ⁽¹⁾ | 3.822 | 3.900 | 3.978 | 39Nx |
| 40 ⁽¹⁾ | 3.920 | 4.000 | 4.080 | 40Nx |
| 41 ⁽¹⁾ | 4.018 | 4.100 | 4.182 | 41Nx |
| 42 ⁽¹⁾ | 4.116 | 4.200 | 4.284 | 42Nx |
| 43 ⁽¹⁾ | 4.214 | 4.300 | 4.386 | 43Nx |
| 44 ⁽¹⁾ | 4.312 | 4.400 | 4.488 | 44Nx |
| 45 ⁽¹⁾ | 4.410 | 4.500 | 4.590 | 45Nx |
| 46 ⁽¹⁾ | 4.508 | 4.600 | 4.692 | 46Nx |

| Suffix | Threshold Voltage V_{TH-} (V) at $T_A = 25^\circ\text{C}$ | | | Topside Marking |
|-------------------|-------------------------------------------------------------|-------|-----------|-----------------|
| | Min (-2%) | Typ | Max (+2%) | |
| 47 ⁽¹⁾ | 4.606 | 4.700 | 4.794 | 47Nx |
| 48 ⁽¹⁾ | 4.704 | 4.800 | 4.896 | 48Nx |
| 49 ⁽¹⁾ | 4.802 | 4.900 | 4.998 | 49Nx |
| 50 ⁽¹⁾ | 4.900 | 5.000 | 5.100 | 50Nx |
| 51 ⁽¹⁾ | 4.998 | 5.100 | 5.202 | 51Nx |
| 52 ⁽¹⁾ | 5.096 | 5.200 | 5.304 | 52Nx |
| 53 ⁽¹⁾ | 5.194 | 5.300 | 5.406 | 53Nx |
| 54 ⁽¹⁾ | 5.292 | 5.400 | 5.508 | 54Nx |
| 55 ⁽¹⁾ | 5.390 | 5.500 | 5.610 | 55Nx |

Note: 1. Contact local ST sales office for availability.

REVISION HISTORY**Table 10. Document Revision History**

| Date | Version | Description |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 20-January-2004 | 1.0 | First Edition |
| 01-Aug-05 | 1.1 | Update Operation section, characteristics; insert new graphics; add ECOPACK information (Figure 7, 8, 9, 10, 11, 12, 13, 14; Table 5, 8, 9) |
| 02-Sep-05 | 1.2 | Update characteristics, remove 'push-pull output' reference (Figure 8, 9, 10, 11, 12, 16; Table 2, 4, 5, 8) |
| 19-Oct-05 | 2.0 | Status upgrade; update characteristics; add Marking information (Figure 7, 8, 9, 10, 11, 12, 13, 14; Table 8, 9) |

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics.

All other names are the property of their respective owners

© 2005 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com