

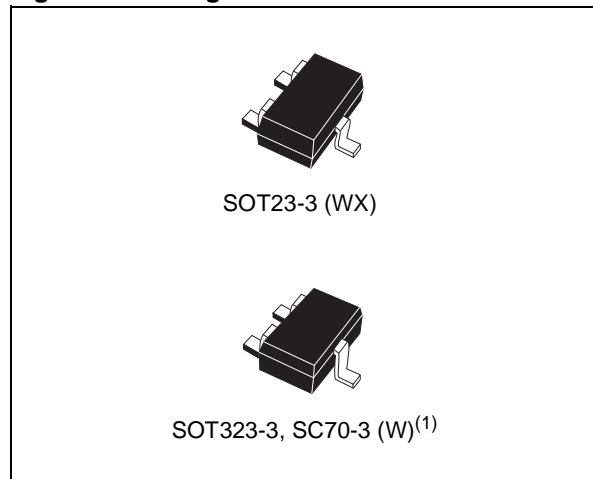


## Low Power Voltage Detector

### 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 $\mu$ 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  $-40^{\circ}\text{C}$  TO  $85^{\circ}\text{C}$

Figure 1. Packages



Note: 1. Contact local sales office for availability.

## TABLE OF CONTENTS

<b>FEATURES</b> .....	<b>1</b>
Figure 1. Packages .....	1
<b>SUMMARY DESCRIPTION</b> .....	<b>4</b>
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
<b>PIN DESCRIPTIONS</b> .....	<b>6</b>
Table 2. Pin Functions .....	6
<b>OPERATION</b> .....	<b>6</b>
<b>Output</b> .....	<b>6</b>
<b>Negative-Going <math>V_{CC}</math> Transients and Undershoot</b> .....	<b>6</b>
<b>TYPICAL OPERATING CHARACTERISTICS</b> .....	<b>7</b>
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
<b>MAXIMUM RATING</b> .....	<b>11</b>
Table 3. Absolute Maximum Ratings .....	11
<b>DC AND AC PARAMETERS</b> .....	<b>12</b>
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
<b>PACKAGE MECHANICAL</b> .....	<b>14</b>
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  $V_{TH-} + \text{hysteresis} (V_{HYST})$ . 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

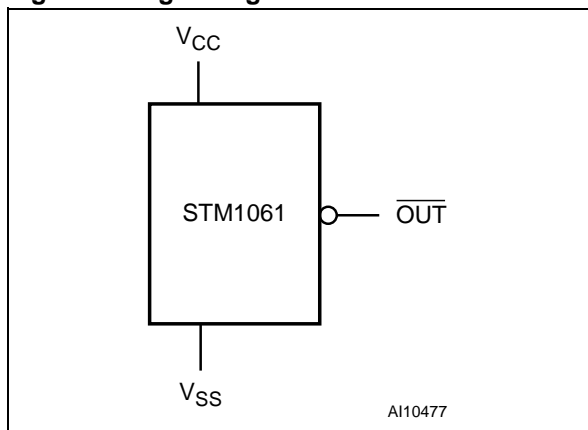


Table 1. Signal Names

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

Figure 3. SOT23-3 Connections

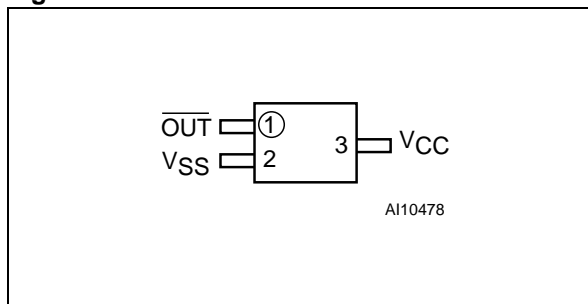


Figure 4. SOT323-3 (SC70-3) Connections

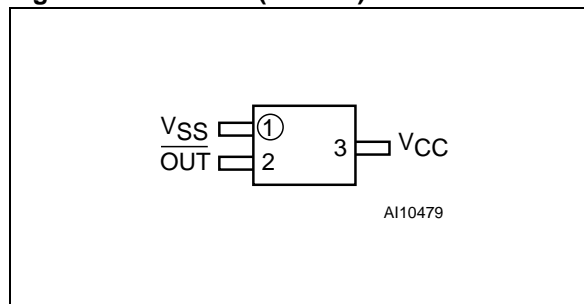


Figure 5. N-Channel Open Drain Output Block Diagram

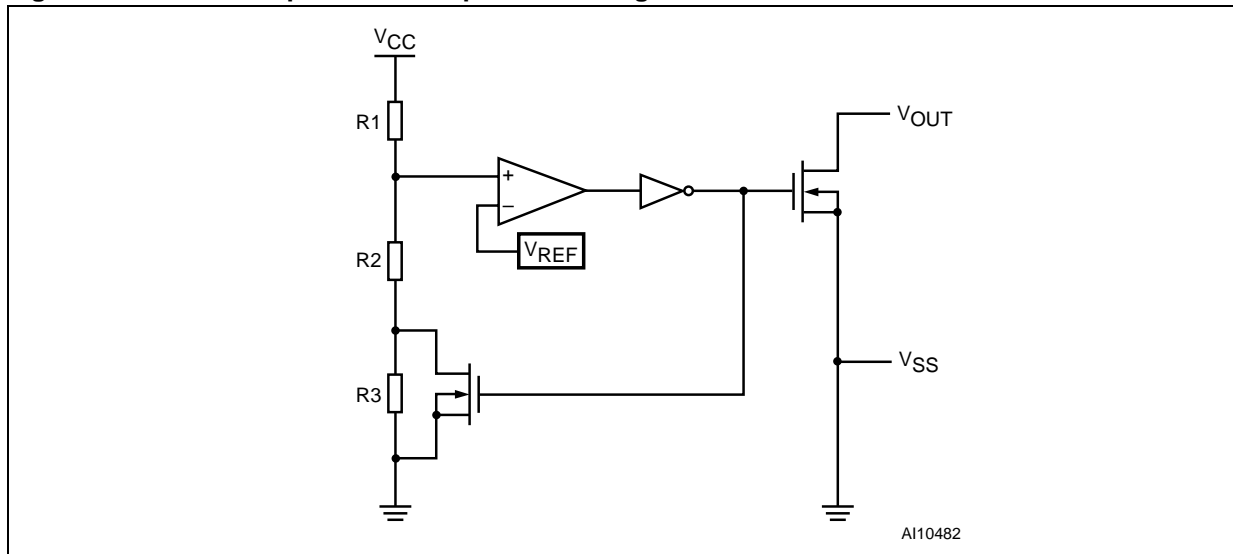
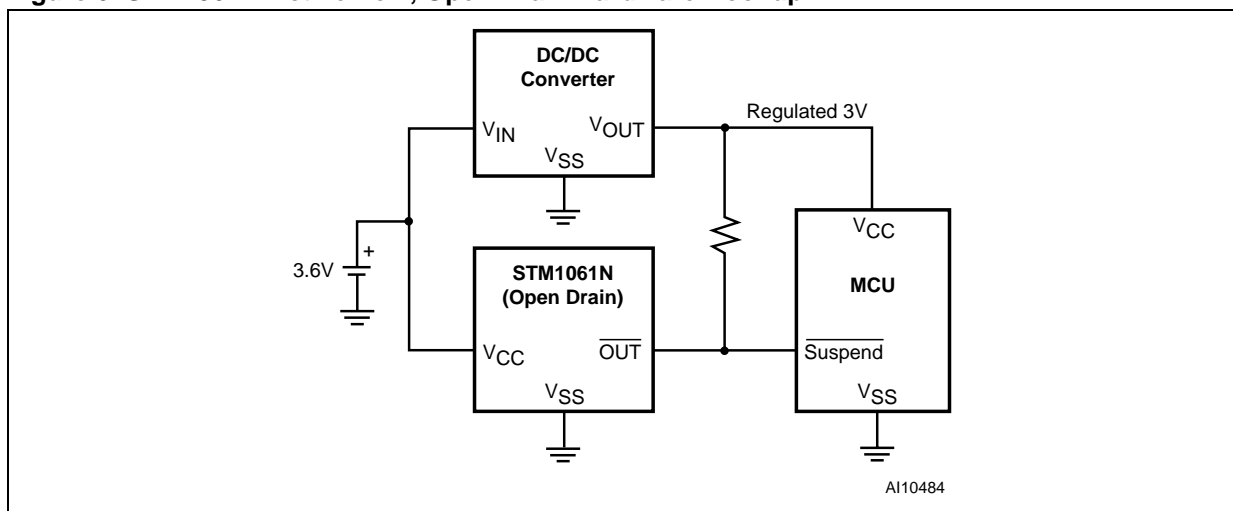


Figure 6. STM1061N Active-Low, Open Drain Hardware Hookup



## 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  $V_{\text{CC}}$  drops below  $V_{\text{TH-}}$ , and remains low as long as  $V_{\text{CC}}$  is below  $V_{\text{TH-}} + V_{\text{HYST}}$ .

**$V_{\text{CC}}$ .** This is the Supply voltage and input for the Voltage Detector.

**$V_{\text{SS}}$ .** Ground,  $V_{\text{SS}}$ , 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	$V_{\text{CC}}$	Supply Voltage
2	1	$V_{\text{SS}}$	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  $V_{\text{CC}}$  and has a voltage hysteresis ( $V_{\text{HYST}}$ ). The STM1061 asserts an output signal ( $\overline{\text{OUT}}$ ) whenever  $V_{\text{CC}}$  goes below the Voltage Detect Threshold ( $V_{\text{TH-}}$ ). The output signal ( $\overline{\text{OUT}}$ ) stays asserted until  $V_{\text{CC}}$  goes above the Voltage Detect Release ( $V_{\text{TH+}}$ ). Output voltage ( $V_{\text{OUT}}$ ) is guaranteed valid down to  $V_{\text{CC}} = 0.7\text{V}$  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  $V_{\text{CC}}$ .

### Negative-Going $V_{\text{CC}}$ Transients and Undershoot

The STM1061 device is relatively immune to negative-going  $V_{\text{CC}}$  transients (glitches). The graph (see [Figure 11., page 9](#)) indicates the maximum pulse width a negative  $V_{\text{CC}}$  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 $\mu\text{F}$  bypass capacitor mounted as close as possible to the  $V_{\text{CC}}$  pin provides additional transient immunity.

TYPICAL OPERATING CHARACTERISTICS

Figure 7. Supply Current vs. Input Voltage

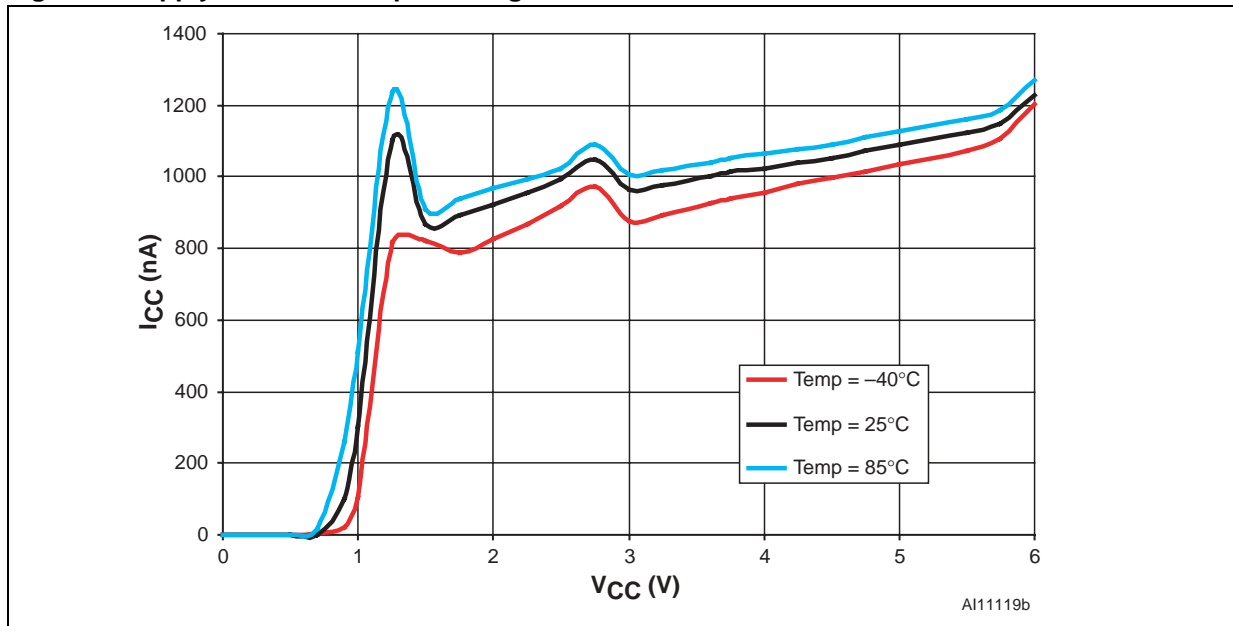


Figure 8. Supply Current vs. Ambient Temperature

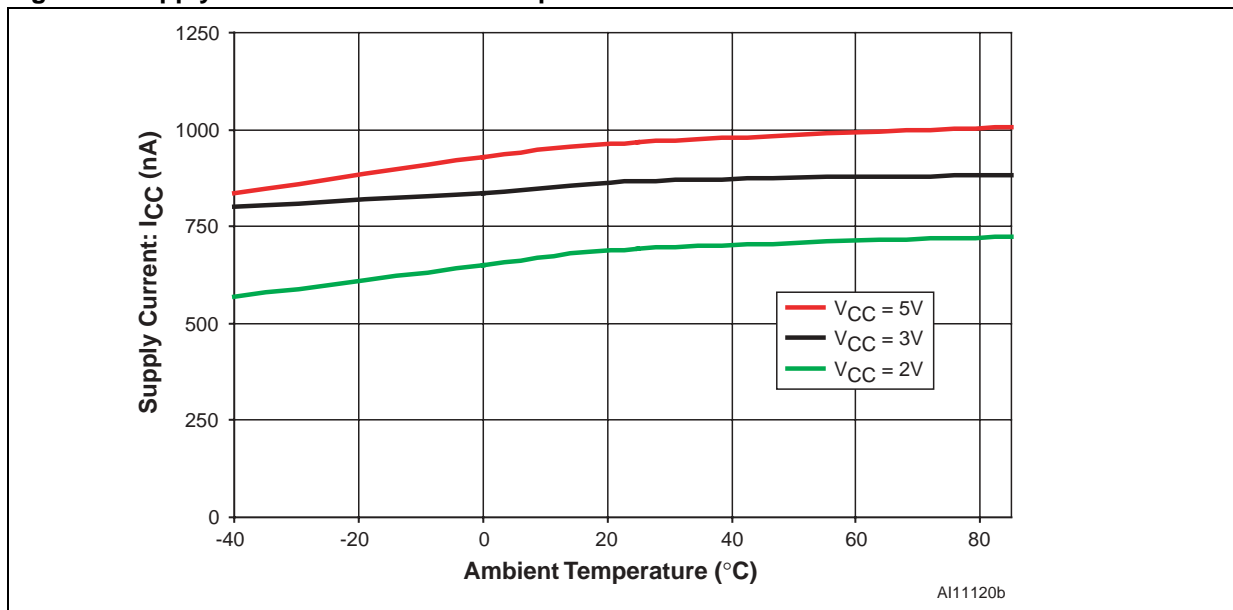


Figure 9. Output Detect Delay Time vs. Ambient Temperature

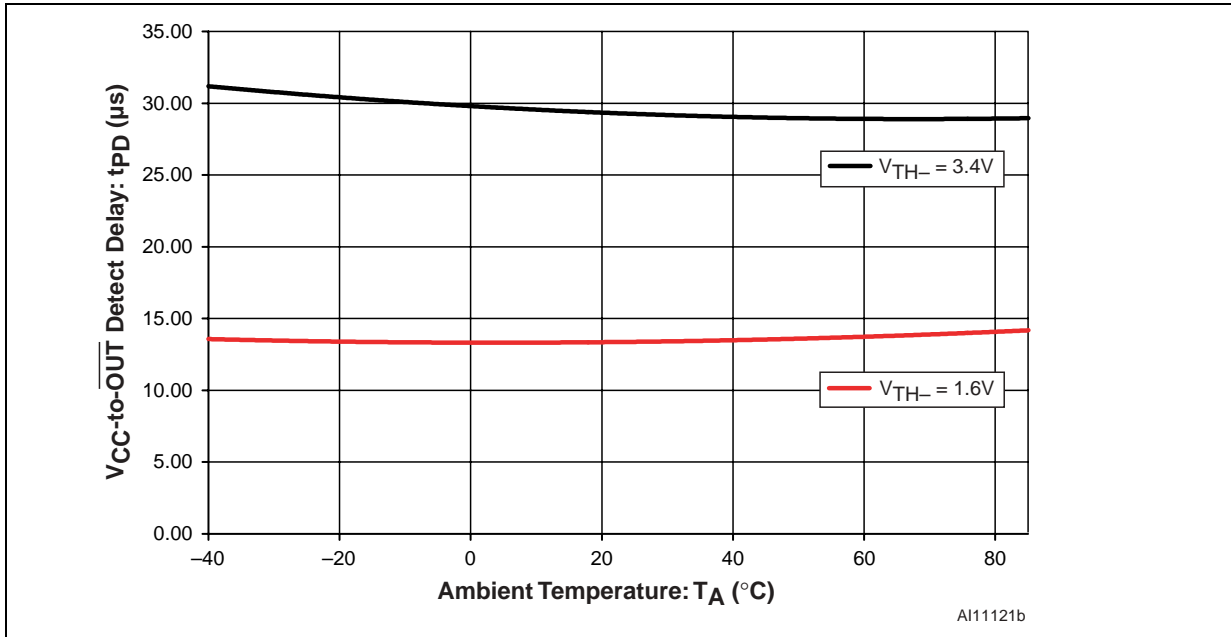


Figure 10. Output Release Delay Time vs. Ambient Temperature

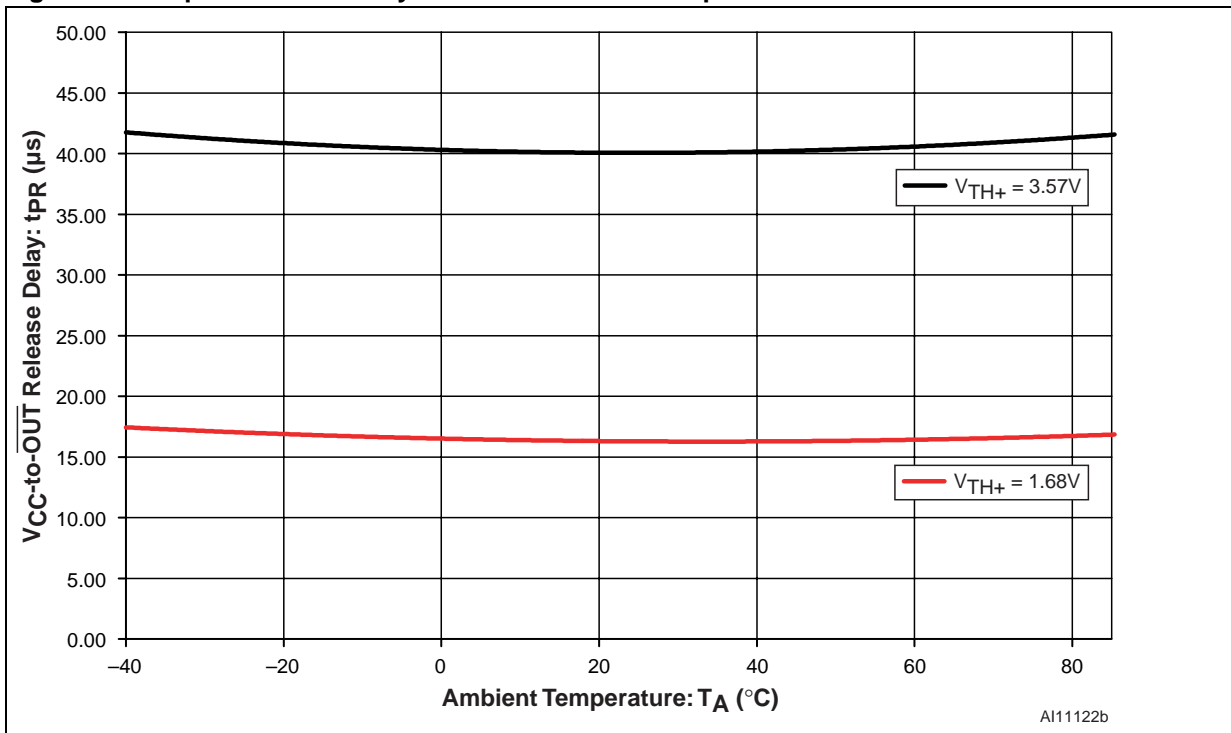
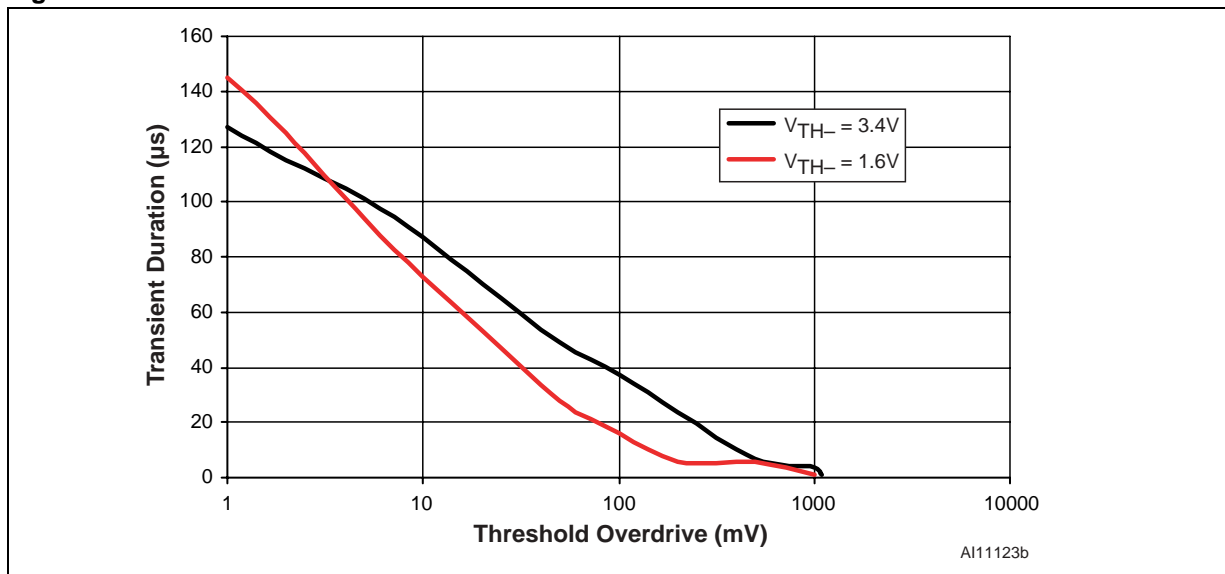




Figure 11. Maximum Transient Duration vs. Reset Threshold Overdrive



Note: Reset occurs above the curve.

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

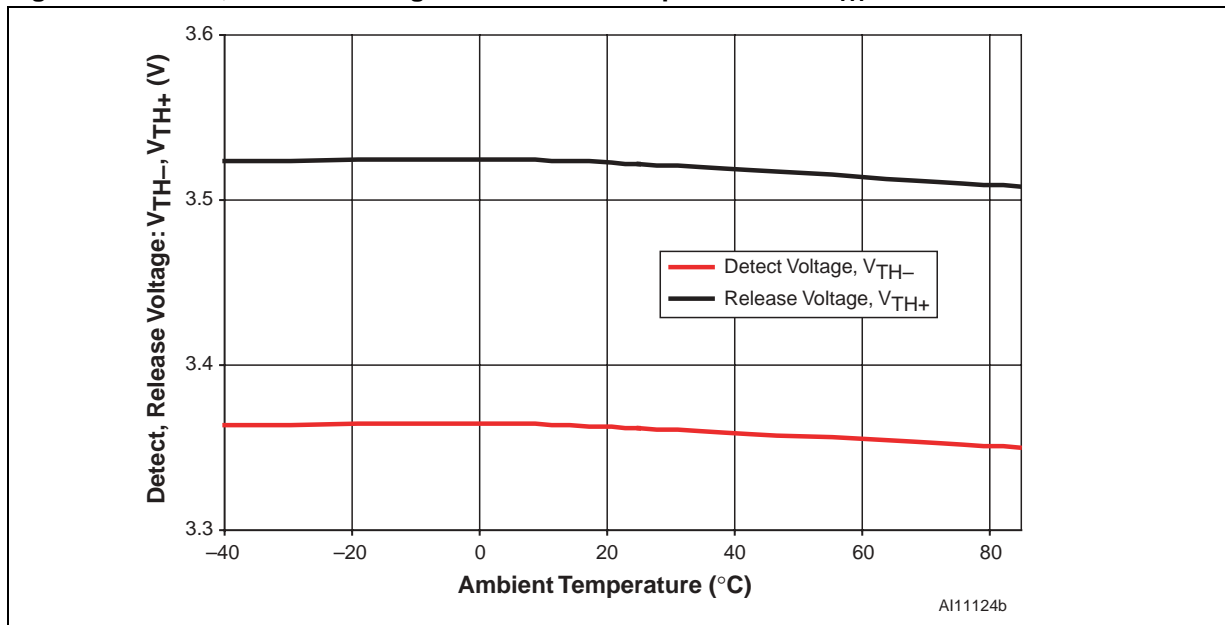


Figure 13. N-channel Driver Output Current vs.  $V_{DS}$

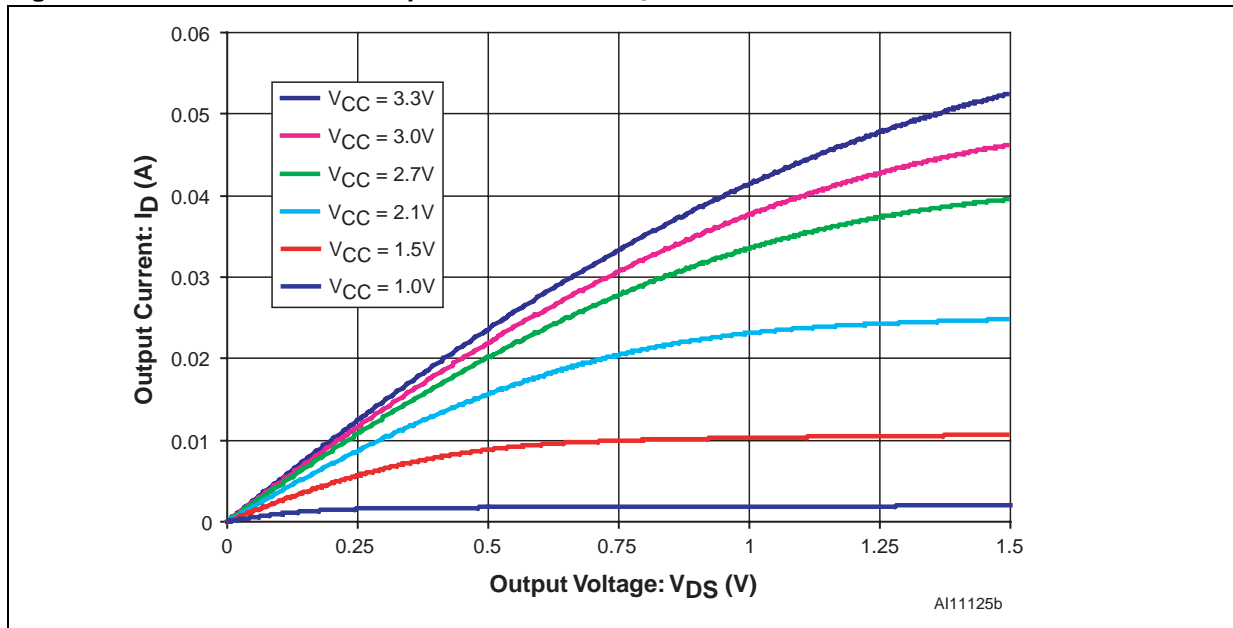
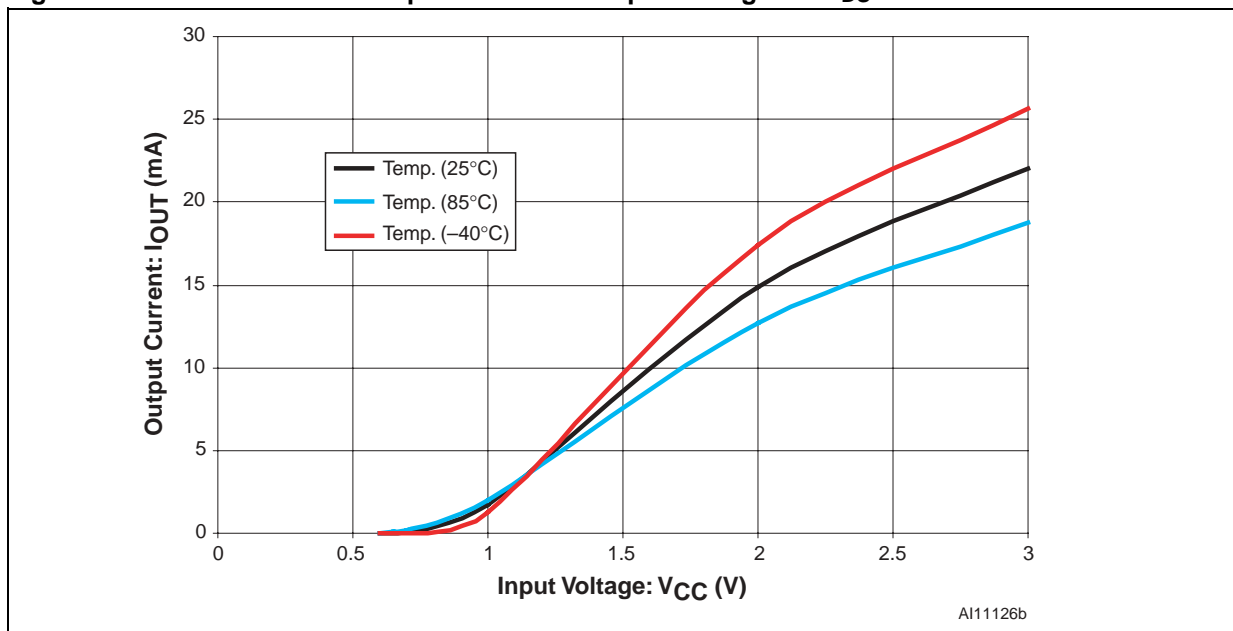


Figure 14. N-channel Driver Output Current vs. Input Voltage for  $V_{DS} = 0.5V$



## 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 <sub>STG</sub>	Storage Temperature (V <sub>CC</sub> Off, V <sub>BAT</sub> Off)	-55 to 150	°C
T <sub>SLD</sub> <sup>(1)</sup>	Lead Solder Temperature for 10 seconds	260	°C
V <sub>IO</sub>	Input or Output Voltage	-0.3 to V <sub>CC</sub> +0.3	V
V <sub>CC</sub>	Supply Voltage	0.7 to 6.0	V
I <sub>O</sub>	Output Current	20	mA
P <sub>D</sub>	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

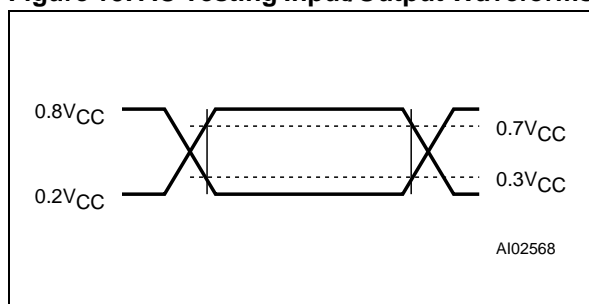
This section summarizes the operating measurement conditions, and the DC and AC characteristics of the device. The parameters in the DC and AC characteristics Tables that follow, are derived from tests performed under the Measurement

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 <sub>CC</sub> Supply Voltage	0.7 to 6.0	V
Input Rise and Fall Times	≤ 5	ns
Input Pulse Voltages	0.2 to 0.8V <sub>CC</sub>	V
Input and Output Timing Ref. Voltages	0.3 to 0.7V <sub>CC</sub>	V

**Figure 15. AC Testing Input/Output Waveforms**



**Figure 16. Voltage Timing Waveform**

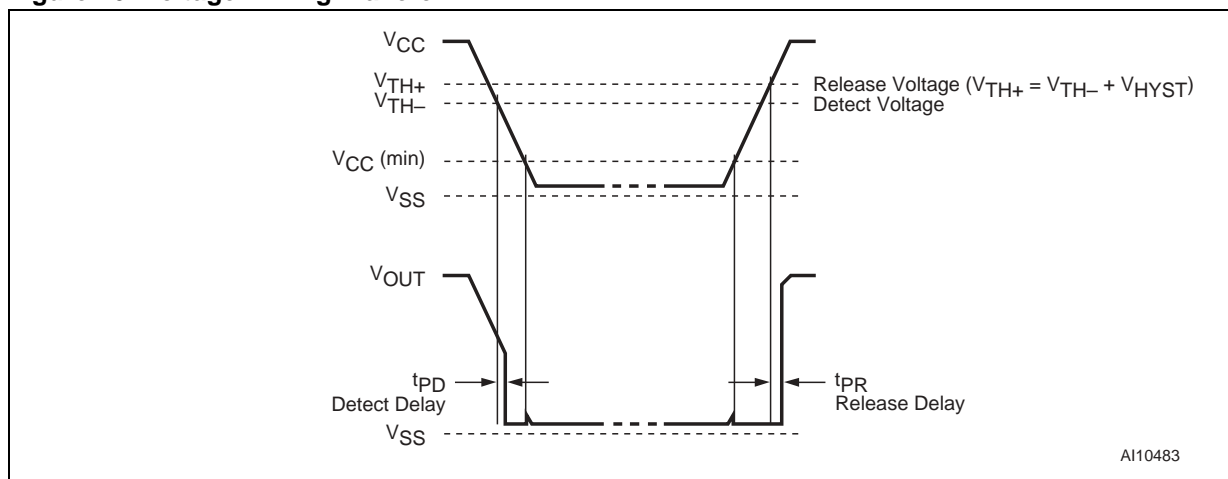


Table 5. DC and AC Characteristics

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

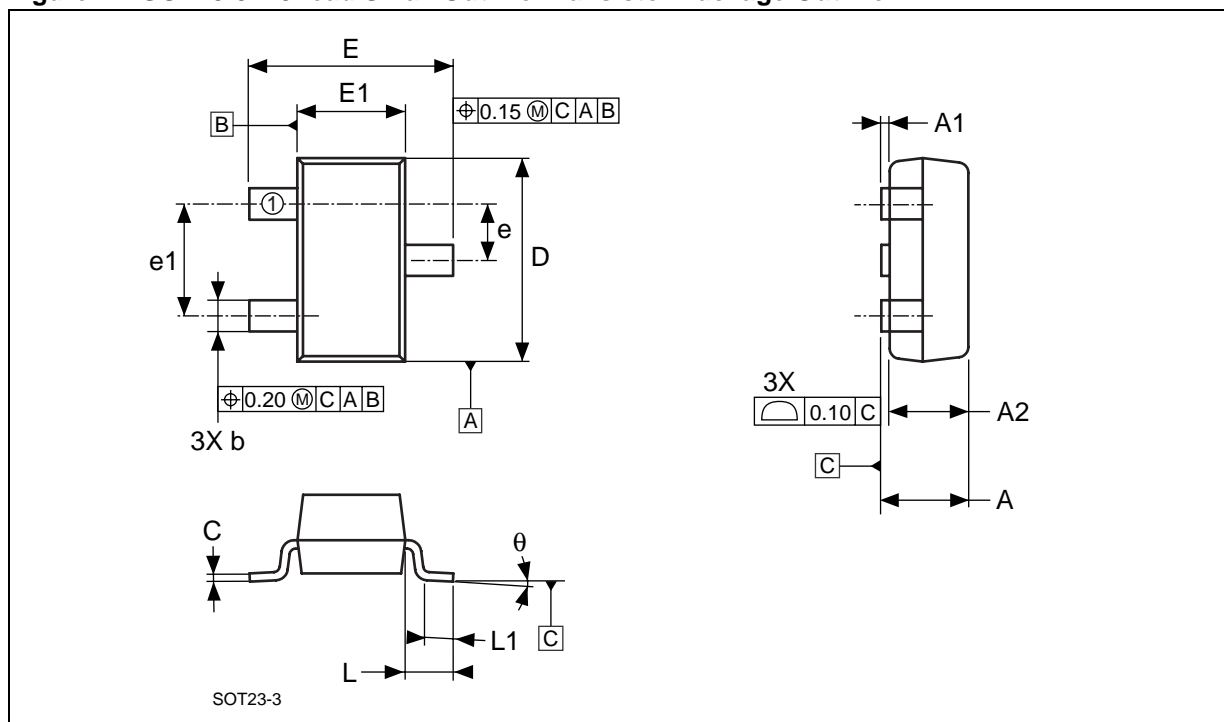
Note: 1. Valid for Ambient Operating Temperature: T<sub>A</sub> = 25°C.

## **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](http://www.st.com).

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

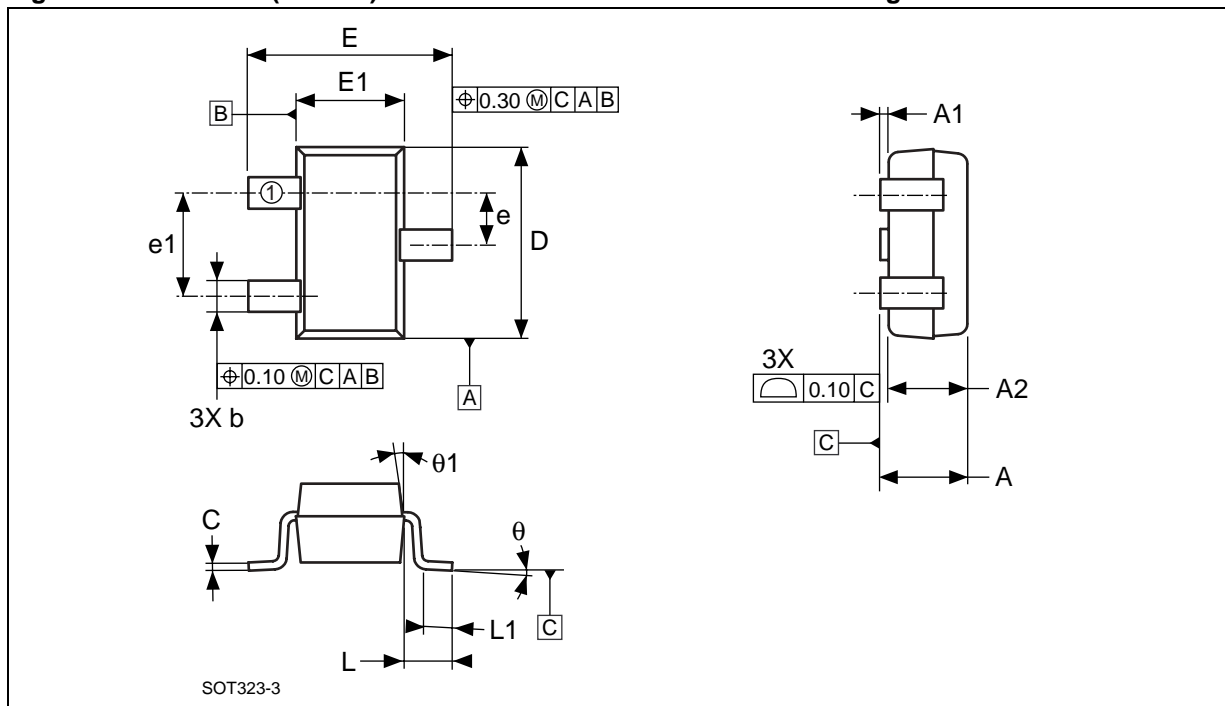


Note: Drawing is not to scale.

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
$\theta$		0°	30°		0°	30°
$\theta1$		8°	12°		8°	12°
N		3			3	



## PART NUMBERING

**Table 8. Ordering Information Scheme**

Example:	STM1061	N	xx	WX	6	F
<b>Device Type</b>						
STM1061						
<b>Output Type</b>						
N = Open Drain (Active-Low)						
<b>Threshold Voltage (1.6V to 5.5V, 0.1V increments)</b>						
xx = See <a href="#">Table 9., page 18</a>						
<b>Package</b>						
WX = SOT23-3						
W = SOT323-3 (SC70-3) <sup>(1)</sup>						
<b>Temperature Range</b>						
6 = -40 to 85°C						
<b>Shipping Method</b>						
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%)	
<b>16</b>	<b>1.568</b>	<b>1.600</b>	<b>1.632</b>	<b>16Nx</b>
<b>17</b>	<b>1.666</b>	<b>1.700</b>	<b>1.734</b>	<b>17Nx</b>
18 <sup>(1)</sup>	1.764	1.800	1.836	18Nx
19 <sup>(1)</sup>	1.862	1.900	1.938	19Nx
20 <sup>(1)</sup>	1.960	2.000	2.040	20Nx
21 <sup>(1)</sup>	2.058	2.100	2.142	21Nx
<b>22</b>	<b>2.156</b>	<b>2.200</b>	<b>2.244</b>	<b>22Nx</b>
<b>23</b>	<b>2.254</b>	<b>2.300</b>	<b>2.346</b>	<b>23Nx</b>
24 <sup>(1)</sup>	2.352	2.400	2.448	24Nx
25 <sup>(1)</sup>	2.450	2.500	2.550	25Nx
<b>26</b>	<b>2.548</b>	<b>2.600</b>	<b>2.652</b>	<b>26Nx</b>
<b>27</b>	<b>2.646</b>	<b>2.700</b>	<b>2.754</b>	<b>27Nx</b>
<b>28</b>	<b>2.744</b>	<b>2.800</b>	<b>2.856</b>	<b>28Nx</b>
<b>29</b>	<b>2.842</b>	<b>2.900</b>	<b>2.958</b>	<b>29Nx</b>
30 <sup>(1)</sup>	2.940	3.000	3.060	30Nx
<b>31</b>	<b>3.038</b>	<b>3.100</b>	<b>3.162</b>	<b>31Nx</b>
32 <sup>(1)</sup>	3.136	3.200	3.264	32Nx
33 <sup>(1)</sup>	3.234	3.300	3.366	33Nx
<b>34</b>	<b>3.332</b>	<b>3.400</b>	<b>3.468</b>	<b>34Nx</b>
35 <sup>(1)</sup>	3.430	3.500	3.570	35Nx
36 <sup>(1)</sup>	3.528	3.600	3.672	36Nx
37 <sup>(1)</sup>	3.626	3.700	3.774	37Nx
38 <sup>(1)</sup>	3.724	3.800	3.876	38Nx
39 <sup>(1)</sup>	3.822	3.900	3.978	39Nx
40 <sup>(1)</sup>	3.920	4.000	4.080	40Nx
41 <sup>(1)</sup>	4.018	4.100	4.182	41Nx
42 <sup>(1)</sup>	4.116	4.200	4.284	42Nx
43 <sup>(1)</sup>	4.214	4.300	4.386	43Nx
44 <sup>(1)</sup>	4.312	4.400	4.488	44Nx
45 <sup>(1)</sup>	4.410	4.500	4.590	45Nx
46 <sup>(1)</sup>	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 <sup>(1)</sup>	4.606	4.700	4.794	47Nx
48 <sup>(1)</sup>	4.704	4.800	4.896	48Nx
49 <sup>(1)</sup>	4.802	4.900	4.998	49Nx
50 <sup>(1)</sup>	4.900	5.000	5.100	50Nx
51 <sup>(1)</sup>	4.998	5.100	5.202	51Nx
52 <sup>(1)</sup>	5.096	5.200	5.304	52Nx
53 <sup>(1)</sup>	5.194	5.300	5.406	53Nx
54 <sup>(1)</sup>	5.292	5.400	5.508	54Nx
55 <sup>(1)</sup>	5.390	5.500	5.610	55Nx

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

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

<b>Date</b>	<b>Version</b>	<b>Description</b>
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)

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