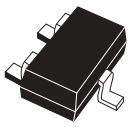
STM1061

Low Power Voltage Detector

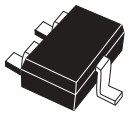
FEATURES

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

Figure 1. Packages



SOT23-3 (WX)



SOT323-3, SC70-3 (W)(1)

Note: 1. Contact local sales office for availability.

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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 remains 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

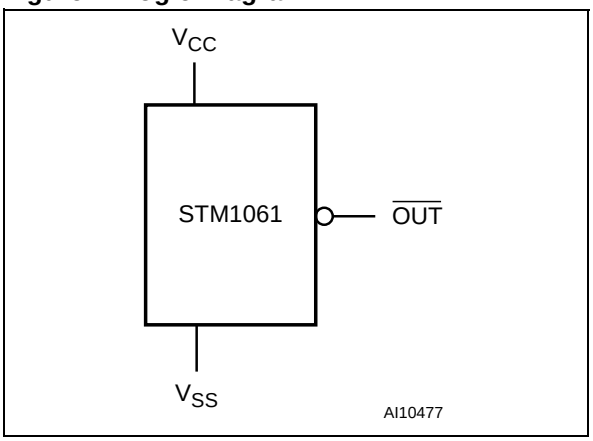


Table 1. Signal Names

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

Figure 3. SOT23-3 Connections

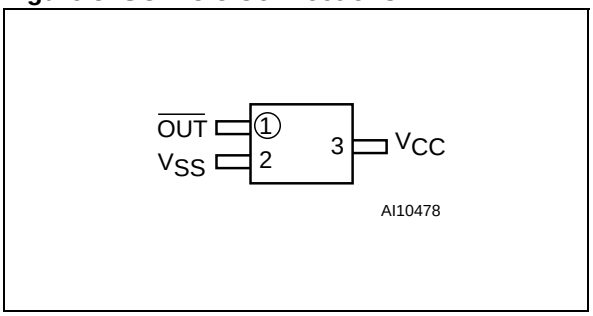


Figure 4. SOT323-3 (SC70-3) Connections

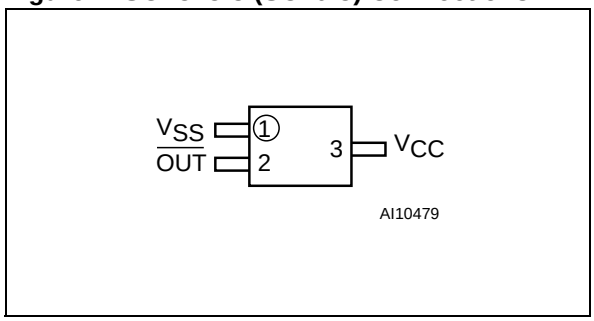


Figure 5. N-Channel Open Drain Output Block Diagram

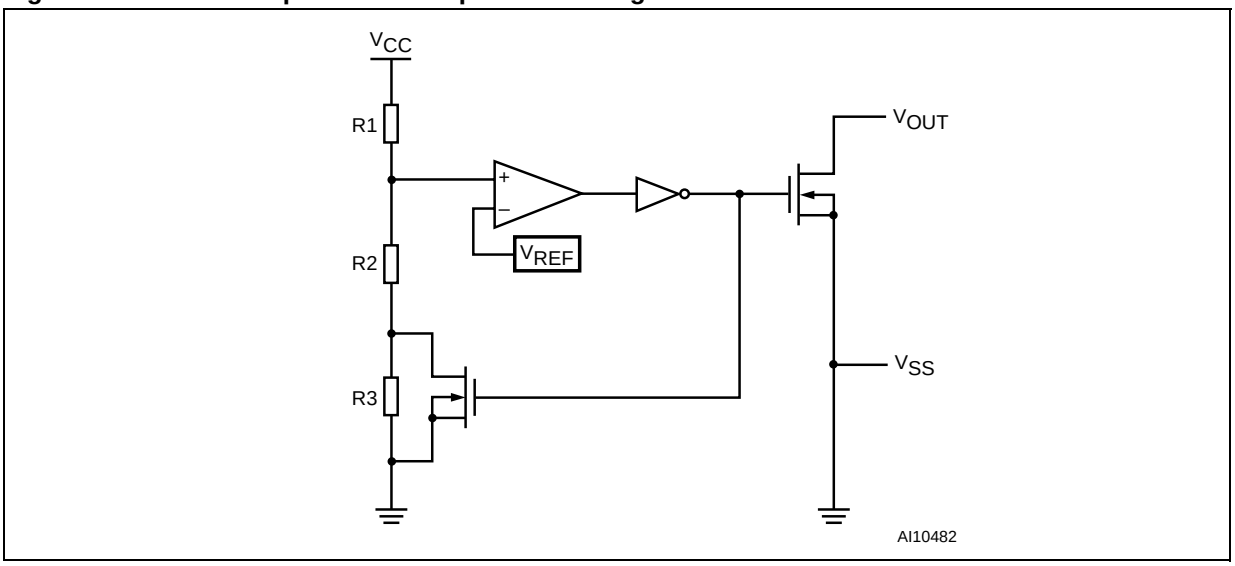
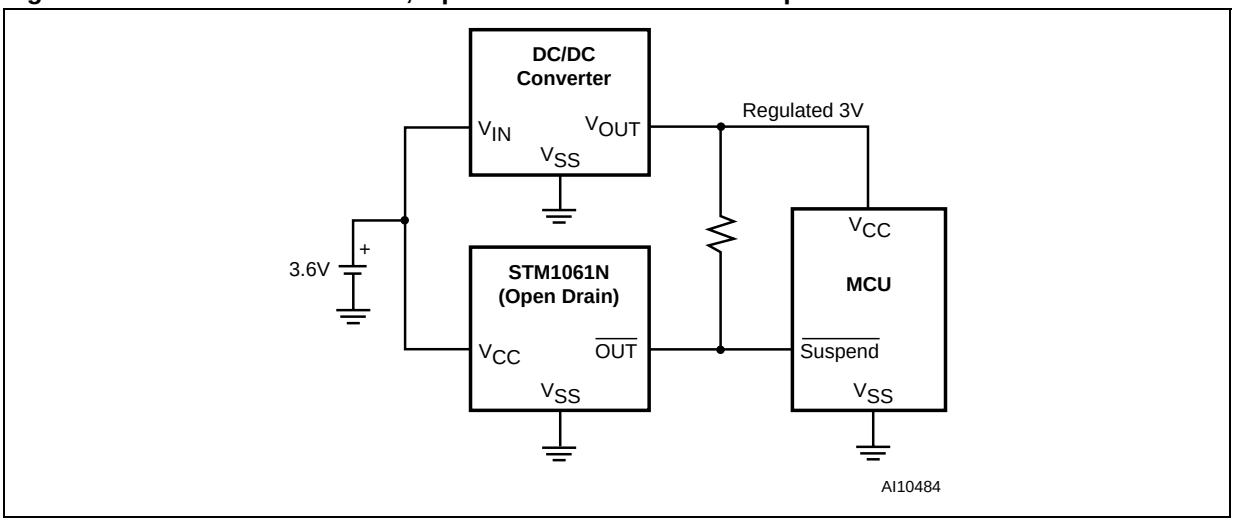


Figure 6. STM1061N Active-Low, Open Drain Hardware Hookup



PIN DESCRIPTIONS

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

$\overline{OUT}$ (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	$\overline{OUT}$	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 ($\overline{OUT}$) whenever V_{CC} goes below the Voltage Detect Threshold (V_{TH-}). The output signal ($\overline{OUT}$) 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 STM1061has an open drain active-low output which will sink current when output is asserted. Connect a pull-up resistor from $\overline{OUT}$ 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 0.1µF 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

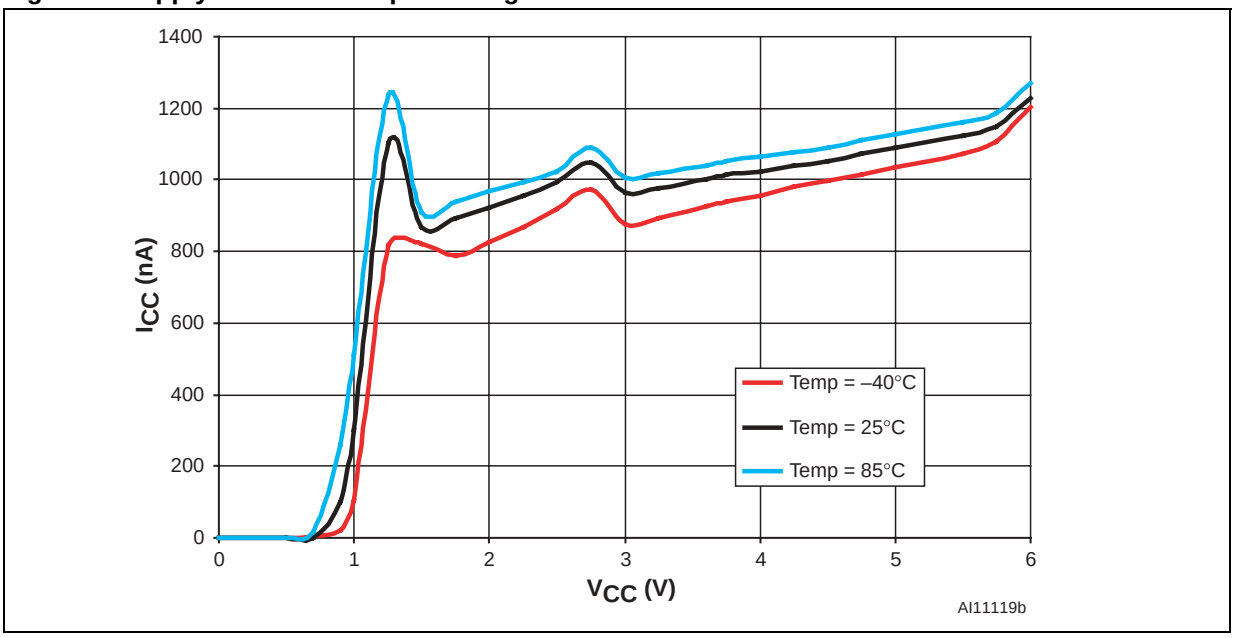


Figure 8. Supply Current vs. Ambient Temperature

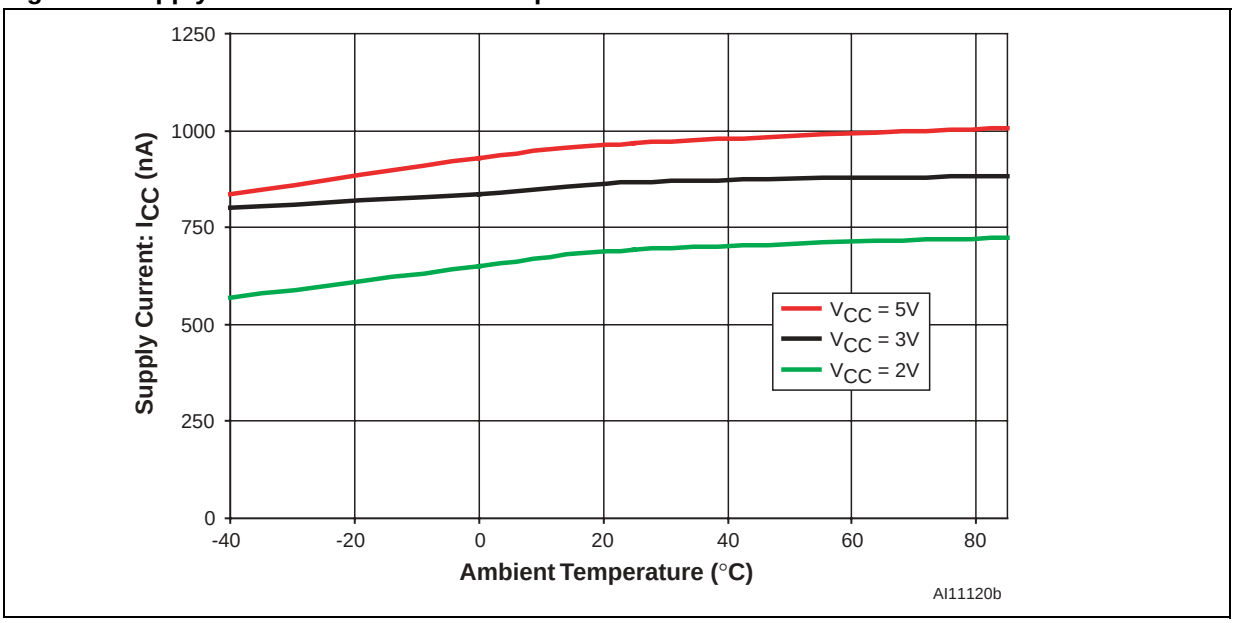


Figure 9. Output Detect Delay Time vs. Ambient Temperature

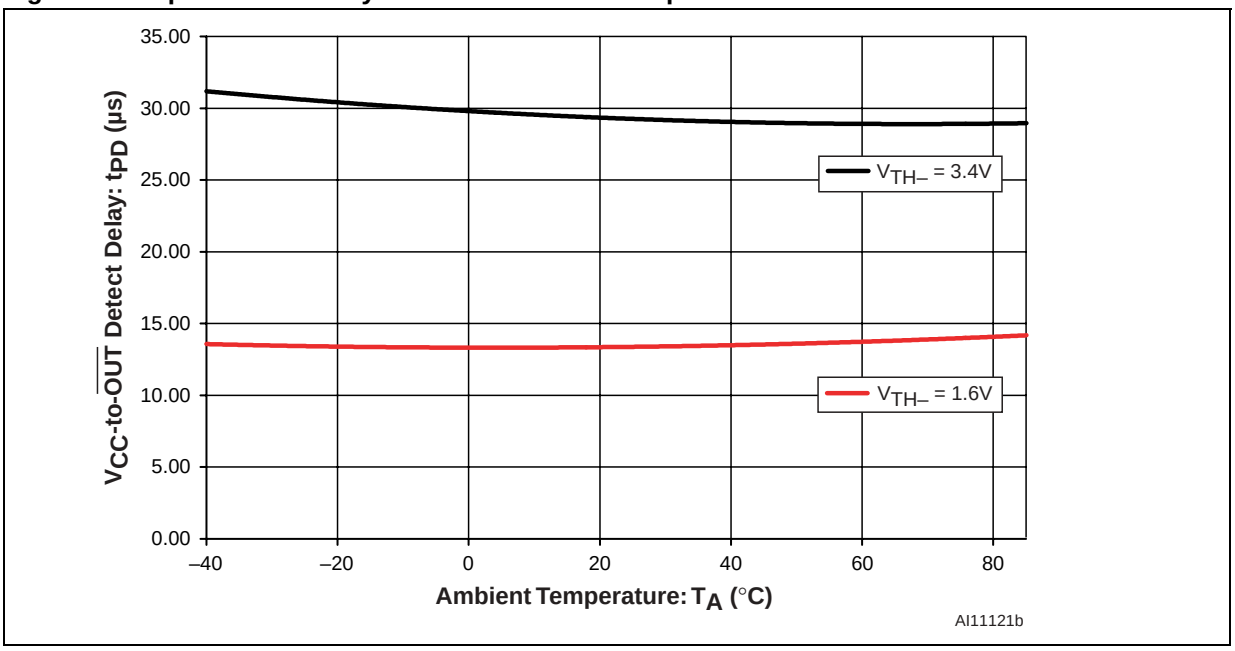


Figure 10. Output Release Delay Time vs. Ambient Temperature

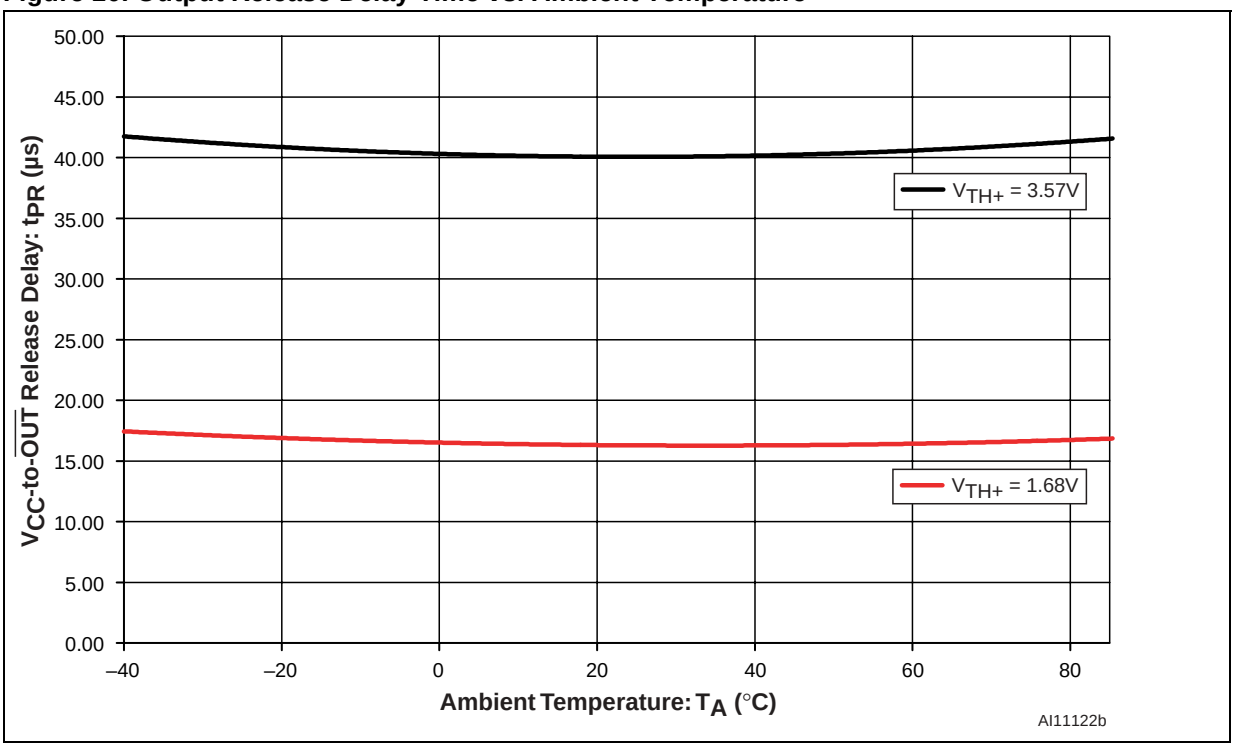
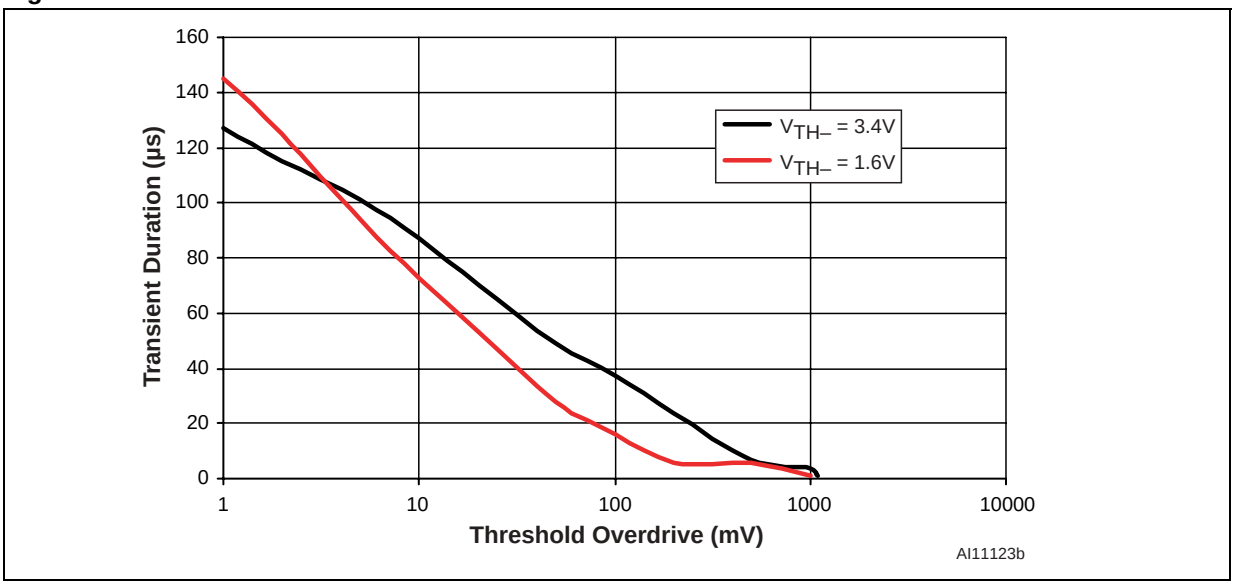


Figure 11. Maximum Transient Duration vs. Reset Threshold Overdrive



Note: Reset occurs above the curve.

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

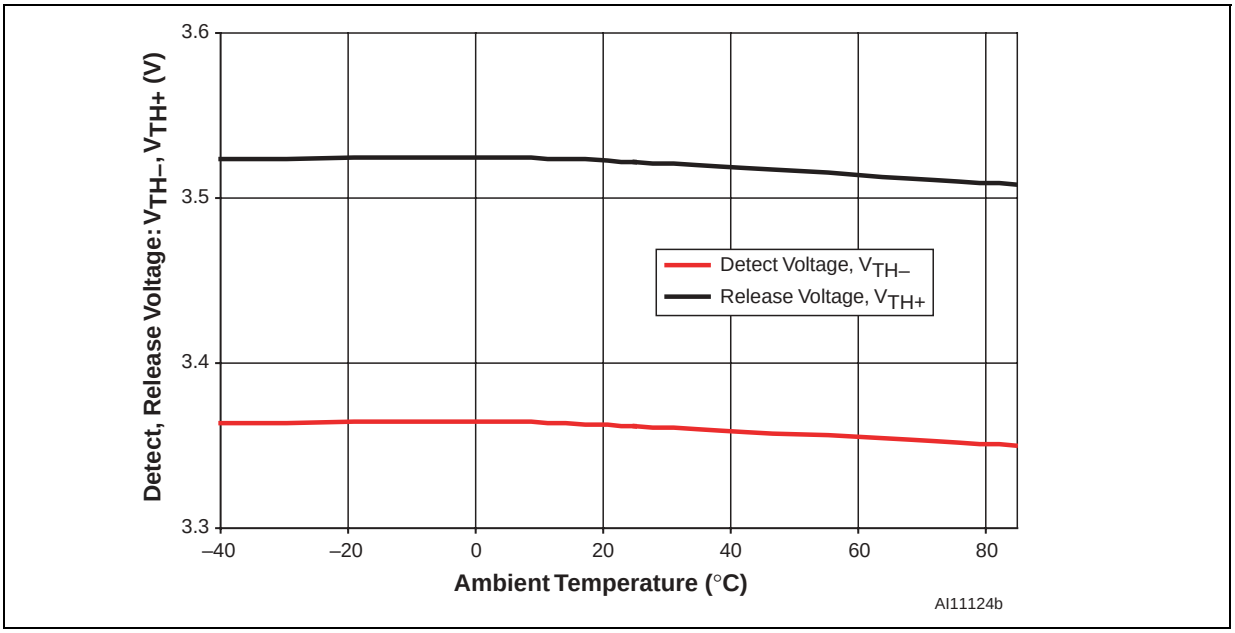


Figure 13. N-channel Driver Output Current vs. V_{DS}

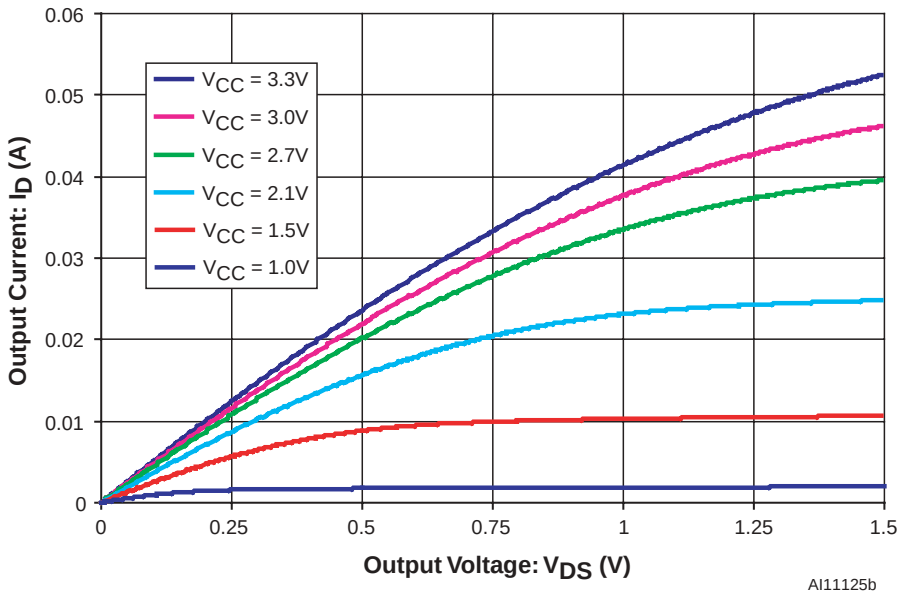
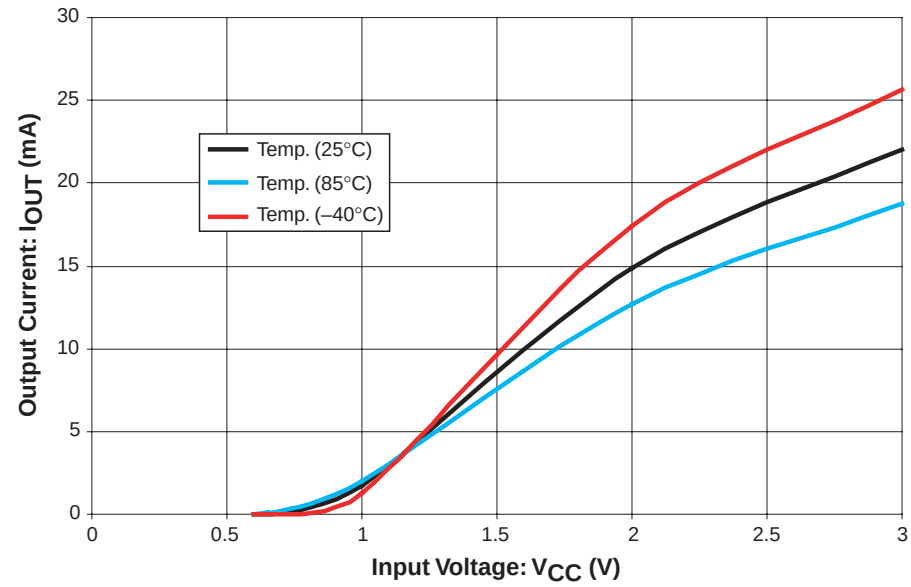


Figure 14. N-channel Driver Output Current vs. Input Voltage for V_{DS} = 0.5V



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 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 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

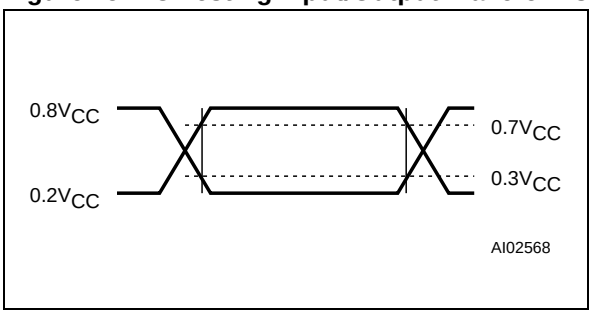


Figure 16. Voltage Timing Waveform

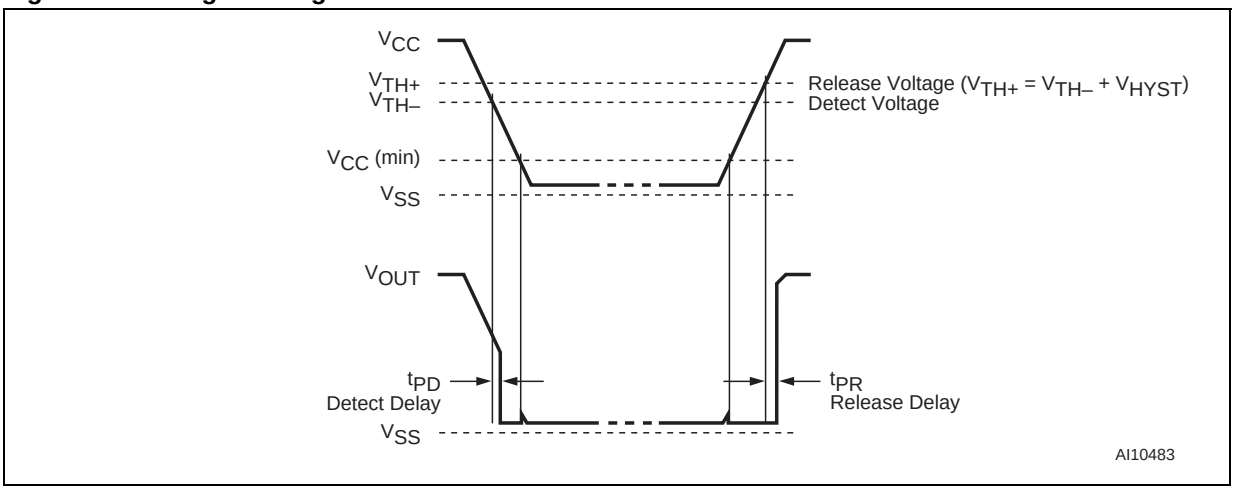


Table 5. DC and AC Characteristics

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 $\overline{OUT}$ Detect Delay	V_{CC} falling from (V_{TH-} + 100mV) to (V_{TH-} – 100mV) at 10mV/µs		25		µs
t_{PR}	V_{CC} to $\overline{OUT}$ 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

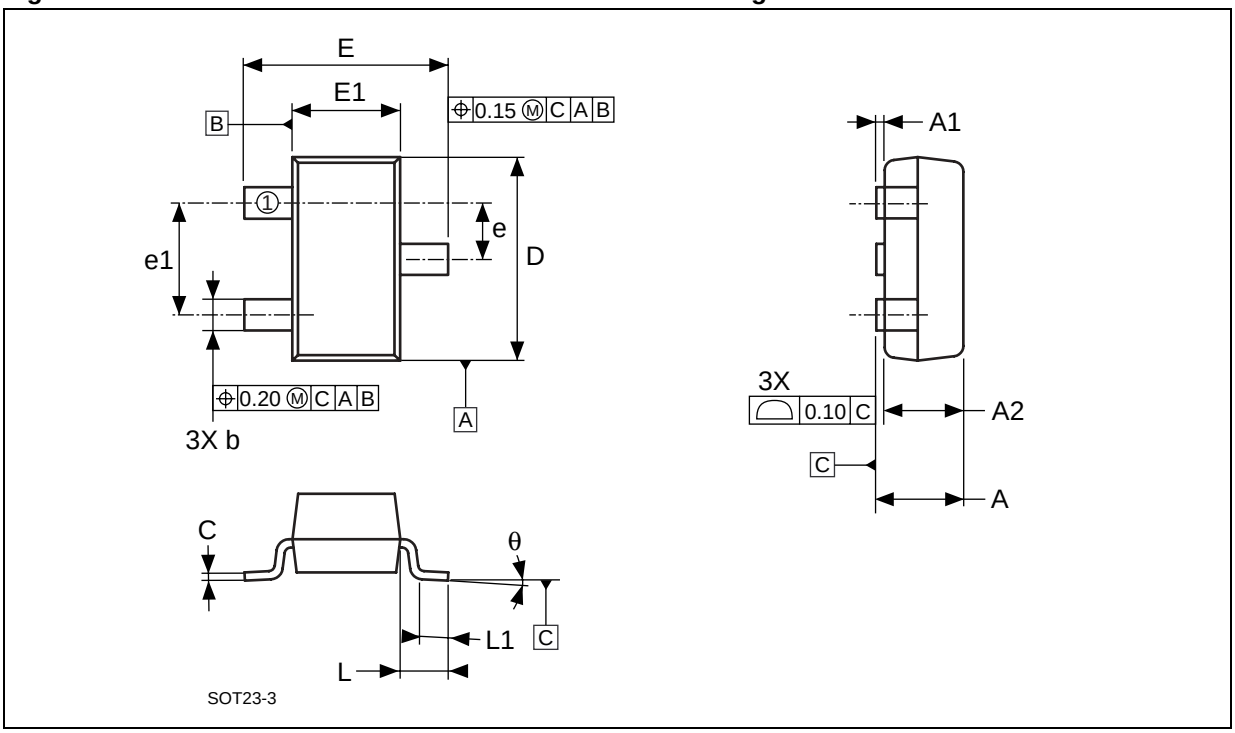
Note: 1. Valid for Ambient Operating Temperature: T_A = 25°C.

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

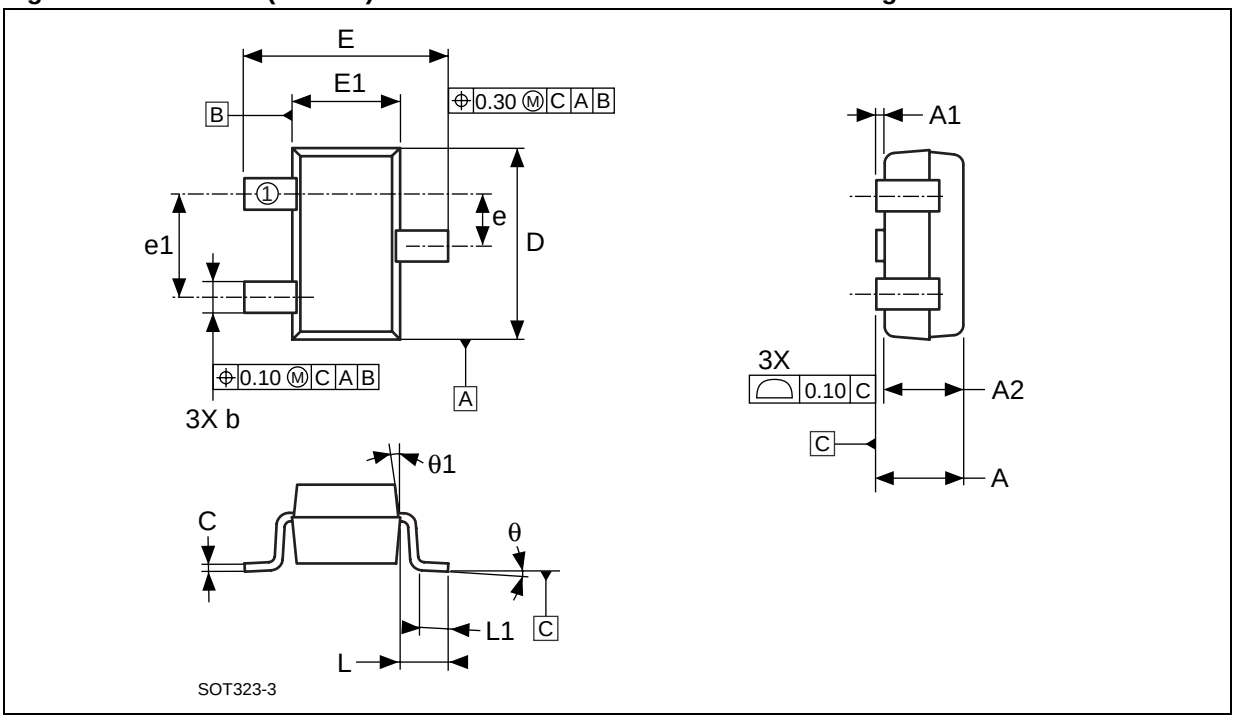


Note: Drawing is not to scale.

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°
Θ1		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°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°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)

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