Dual Low Power 1.5% Comparator With 400 mV Reference

ADCMP670

FEATURES

400 mV ± 1.5% threshold
Supply range: 1.7 V to 5.5 V
Low quiescent current: 6.5 μA typical
Input range includes ground
Internal hysteresis: 8.9 mV typical
Low input bias current: ±10 nA maximum
Open-drain outputs
Supports wire-AND connections
Input polarities: one inverting and one noninverting
Low profile (1 mm) TSOT package
Drop-in replacement for the LT6700-1

APPLICATIONS

Li-Ion monitoring
Portable applications
Hand-held instruments
Window comparators
LED/relay driving
Optoisolator driving
Control systems

GENERAL DESCRIPTION

The ADCMP670 consists of two low power, high accuracy, comparator and reference circuits in a 6-lead TSOT package. The internal 400 mV reference provides the ability to monitor low voltage supplies. The device operates on a supply voltage from 1.7 V to 5.5 V and draws only 6.5 μA typical, making it suitable for low power system monitoring and portable applications. Hysteresis is included in the comparators. The comparator outputs are open-drain and the output can be pulled up to any voltage up to 5.5 V. The output stage is guaranteed to sink greater than 5 mA over temperature.

The ADCMP670 is currently available in one model, the ADCMP670-1. This model has one inverting input and one noninverting input, making it suitable for use as a window comparator. The device is suitable for portable, commercial, industrial, and automotive applications.

FUNCTIONAL BLOCK DIAGRAM

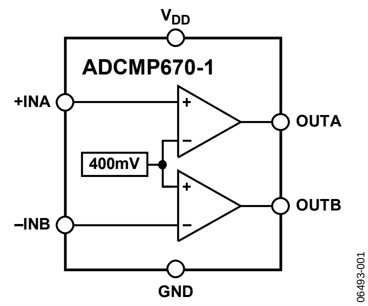

Figure 1.

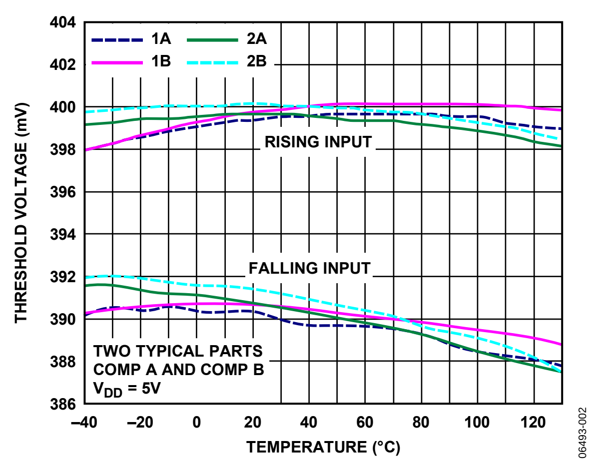

Figure 2. Comparator Thresholds vs. Temperature

Rev. A

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113

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REVISION HISTORY

7/09—Rev. 0 to Rev. A

Changes to Figure 12 ... 9

2/07—Revision 0: Initial Version

SPECIFICATIONS

V_{DD} = 1.7 V to 5.5 V, T_A = 25°C, unless otherwise noted.

Table 1.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
THRESHOLDS[1]					
Rising Input Threshold Voltage	394	400	406	mV	V_{DD} = 1.7 V
	395	400	405	mV	V_{DD} = 5.5 V
Falling Input Threshold Voltage	386	391.1	401	mV	V_{DD} = 1.7 V
	387	391.1	400	mV	V_{DD} = 5.5 V
Hysteresis = $V_{TH(R)} - V_{TH(F)}$	7	8.9	11	mV	
INPUT CHARACTERISTICS					
Input Bias Current		0.01	10	nA	V_{DD} = 1.7 V, V_{IN} = V_{DD}
		4	10	nA	V_{DD} = 1.7 V, V_{IN} = 0.1 V
OPEN-DRAN OUTPUTS					
Output Low Voltage[2]		140	200	mV	V_{DD} = 1.7 V, I_{OUT} = 3 mA
		130	200	mV	V_{DD} = 5.5 V, I_{OUT} = 5 mA
Output Leakage Current[3]		0.01	0.8	µA	V_{DD} =1.7 V, V_{OUT} = V_{DD}
		0.01	0.8	µA	V_{DD} =1.7 V, V_{OUT} = 5.5 V
DYNAMIC PERFORMANCE[2, 4]					
High-to-Low Propagation Delay		10		µs	V_{DD} = 5.5 V, V_{OL} = 400 mV
Low-to-High Propagation Delay		8		µs	V_{DD} = 5.5 V, V_{OH} = 0.9 × V_{DD}
Output Rise Time		0.5		µs	V_{DD} = 5.5 V, V_O = (0.1 to 0.9) × V_{DD}
Output Fall Time		0.07		µs	V_{DD} = 5.5 V, V_O = (0.1 to 0.9) × V_{DD}
POWER SUPPLY					
Supply Current[5]		5.7	10	µA	V_{DD} = 1.7 V
		6.5	11	µA	V_{DD} = 5.5 V

[1] R_L = 100 kΩ, V_O = 2 V swing.
[2] 10 mV input overdrive.
[3] V_{IN} = 40 mV overdrive.
[4] R_L = 10 kΩ.
[5] No load current.

V_{DD} = 1.7 V to 5.5 V, 0°C ≤ T_A ≤ 70°C, unless otherwise noted.

Table 2.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
THRESHOLDS[1]					
Rising Input Threshold Voltage	391		409	mV	V_{DD} = 1.7 V
	392.5		407.5	mV	V_{DD} = 5.5 V
Falling Input Threshold Voltage	383.5		403.5	mV	V_{DD} = 1.7 V
	384.5		402.5	mV	V_{DD} = 5.5 V
Hysteresis = $V_{TH(R)} - V_{TH(F)}$	6.5		12.5	mV	
INPUT CHARACTERISTICS					
Input Bias Current			15	nA	V_{DD} = 1.7 V, $V_{IN} = V_{DD}$
			15	nA	V_{DD} = 1.7 V, V_{IN} = 0.1 V
OPEN-DRAIN OUTPUTS					
Output Low Voltage[2]			250	mV	V_{DD} = 1.7 V, I_{OUT} = 3 mA
			250	mV	V_{DD} = 5.5 V, I_{OUT} = 5 mA
Output Leakage Current[3]			1	µA	V_{DD} =1.7 V, $V_{OUT} = V_{DD}$
			1	µA	V_{DD} =1.7 V, V_{OUT} = 5.5 V
POWER SUPPLY					
Supply Current[4]			13	µA	V_{DD} = 1.7 V
			14	µA	V_{DD} = 5.5 V

[1] R_L = 100 kΩ, V_O = 2 V swing.
[2] 10 mV input overdrive.
[3] V_{IN} = 40 mV overdrive.
[4] No load.

V_{DD} = 1.7 V to 5.5 V, −40°C ≤ T_A ≤ 85°C, unless otherwise noted.

Table 3.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
THRESHOLDS[1]					
Rising Input Threshold Voltage	390		410	mV	V_{DD} = 1.7 V
	392		408	mV	V_{DD} = 5.5 V
Falling Input Threshold Voltage	382.5		404.5	mV	V_{DD} = 1.7 V
	383.5		403.5	mV	V_{DD} = 5.5 V
Hysteresis = $V_{TH(R)} - V_{TH(F)}$	5.5		13.0	mV	
INPUT CHARACTERISTICS					
Input Bias Current			15	nA	V_{DD} = 1.7 V, $V_{IN} = V_{DD}$
			15	nA	V_{DD} = 1.7 V, V_{IN} = 0.1 V
OPEN-DRAIN OUTPUTS					
Output Low Voltage[2]			250	mV	V_{DD} = 1.7 V, I_{OUT} = 3 mA
			250	mV	V_{DD} = 5.5 V, I_{OUT} = 5 mA
Output Leakage Current[3]			1	µA	V_{DD} =1.7 V, $V_{OUT} = V_{DD}$
			1	µA	V_{DD} =1.7 V, V_{OUT} = 5.5 V
POWER SUPPLY					
Supply Current[4]			14	µA	V_{DD} = 1.7 V
			15	µA	V_{DD} = 5.5 V

[1] R_L = 100 kΩ, V_O = 2 V swing.
[2] 10 mV input overdrive.
[3] V_{IN} = 40 mV overdrive.
[4] No load.

V_{DD} = 1.7 V to 5.5 V, −40°C ≤ T_A ≤ 125°C, unless otherwise noted.

Table 4.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
THRESHOLDS[1]					
Rising Input Threshold Voltage	390		411	mV	V_{DD} = 1.7 V
	392		410	mV	V_{DD} = 5.5 V
Falling Input Threshold Voltage	381.5		405.5	mV	V_{DD} = 1.7 V
	381.05		404.5	mV	V_{DD} = 5.5 V
Hysteresis = $V_{TH(R)} - V_{TH(F)}$	2		13.5	mV	
INPUT CHARACTERISTICS					
Input Bias Current			45	nA	V_{DD} = 1.7 V, $V_{IN} = V_{DD}$
			45	nA	V_{DD} = 1.7 V, V_{IN} = 0.1 V
OPEN-DRAIN OUTPUTS					
Output Low Voltage[2]			250	mV	V_{DD} = 1.7 V, I_{OUT} = 3 mA
			250	mV	V_{DD} = 5.5 V, I_{OUT} = 5 mA
Output Leakage Current[3]			1	µA	V_{DD} = 1.7 V, $V_{OUT} = V_{DD}$
			1	µA	V_{DD} = 1.7 V, V_{OUT} = 5.5 V
POWER SUPPLY					
Supply Current[4]			16	µA	V_{DD} = 1.7 V
			17	µA	V_{DD}= 5.5 V

[1] R_L = 100 kΩ, V_O = 2 V swing.
[2] 10 mV input overdrive.
[3] V_{IN} = 40 mV overdrive.
[4] No load.

ABSOLUTE MAXIMUM RATINGS

Table 5.

Parameter	Range
V_{DD}	−0.3 V to +6 V
+INA, −INB	−0.3 V to +6 V
OUTA, OUTB	−0.3 V to +6 V
Output Short Circuit Duration[1]	Indefinite
Input Current	−10 mA
Operating Temperature Range	−40°C to +125°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature	
Soldering (10 sec)	300°C
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C

[1] When the output is shorted indefinitely, the use of a heat sink may be required to keep the junction temperature within the absolute maximum ratings.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

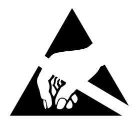
THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Table 6. Thermal Resistance

Package Type	θ_{JA}	Unit
6-Lead TSOT	200	°C/W

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

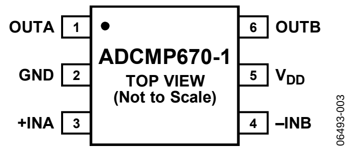


Figure 3. Pin Configuration

Table 7. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	OUTA	Open-Drain Output for Comparator A.
2	GND	Ground.
3	+INA	Monitors analog input voltage on Comparator A. Connected to noninverting input. The other input of Comparator A is connected to a 400 mV reference.
4	−INB	Monitors analog input voltage on Comparator B. Connected to inverting input. The other input of Comparator B is connected to a 400 mV reference.
5	V_{DD}	Power Supply Pin.
6	OUTB	Open-Drain Output for Comparator B.

TYPICAL PERFORMANCE CHARACTERISTICS

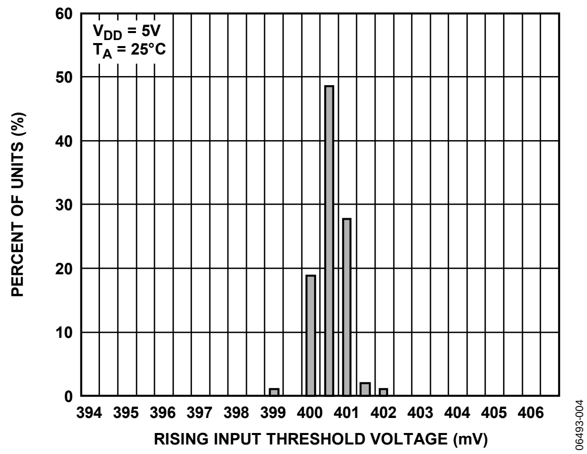


Figure 4. Distribution of Rising Input Threshold Voltage

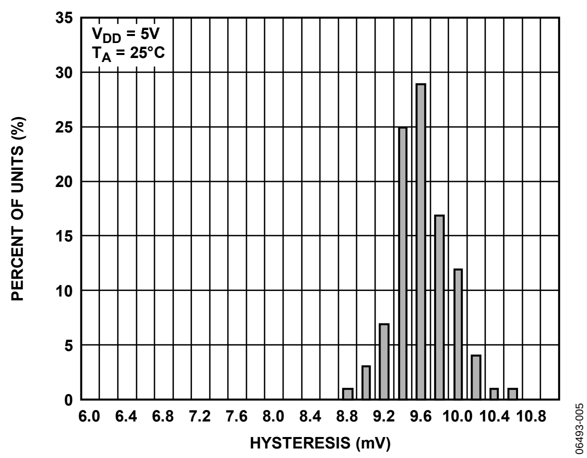


Figure 5. Distribution of Hysteresis

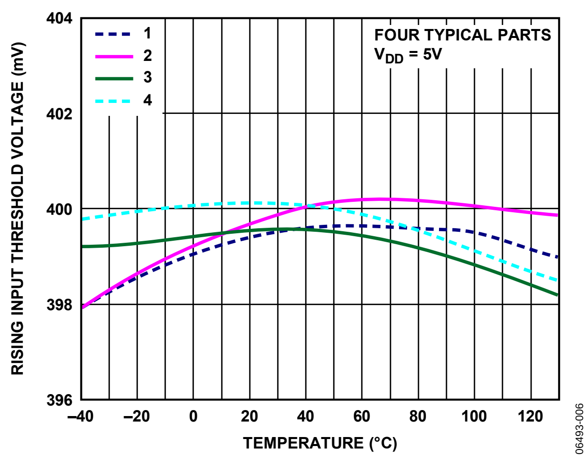


Figure 6. Rising Input Threshold Voltage vs. Temperature

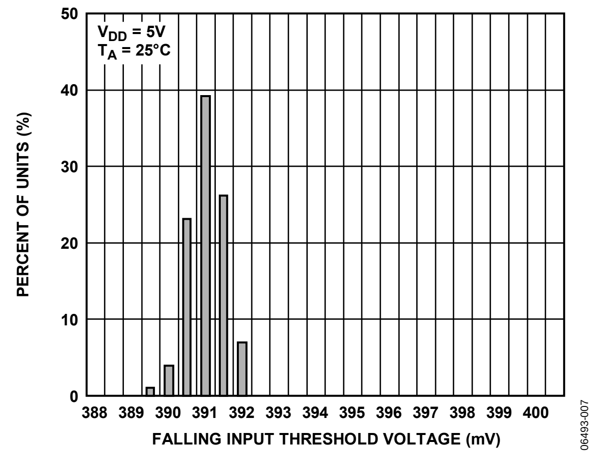


Figure 7. Distribution of Falling Input Threshold Voltage

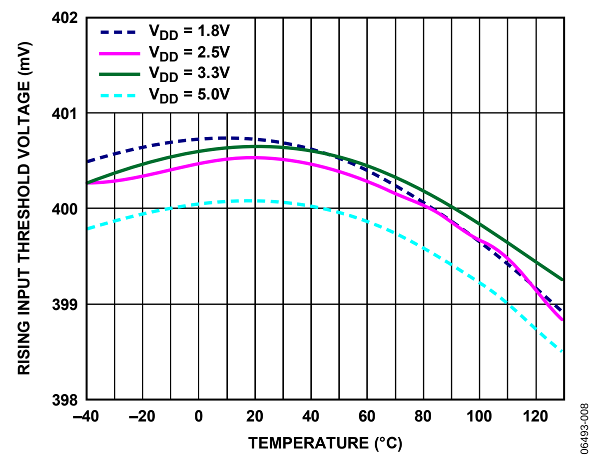


Figure 8. Rising Input Threshold Voltage vs. Temperature

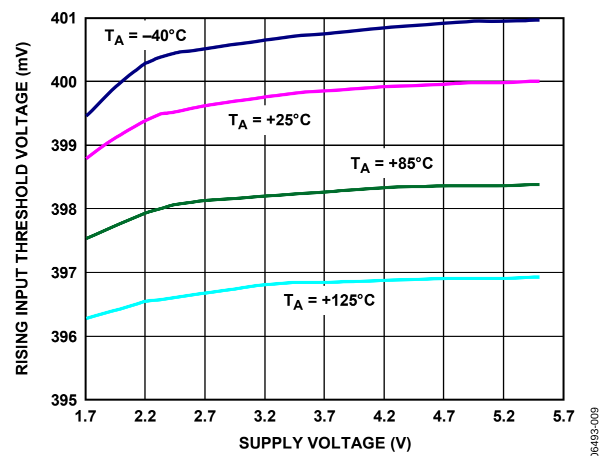


Figure 9. Rising Input Threshold Voltage vs. Supply Voltage

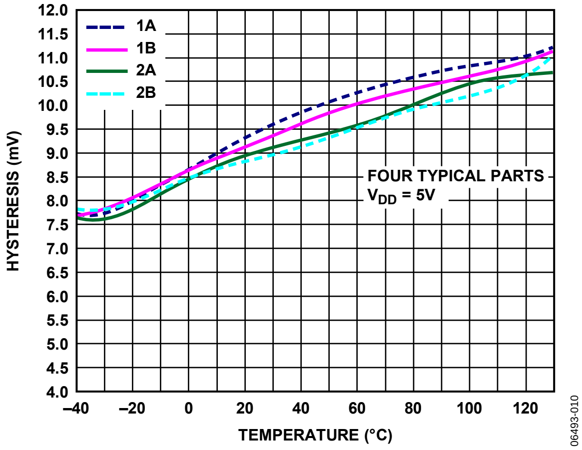


Figure 10. Hysteresis vs. Temperature

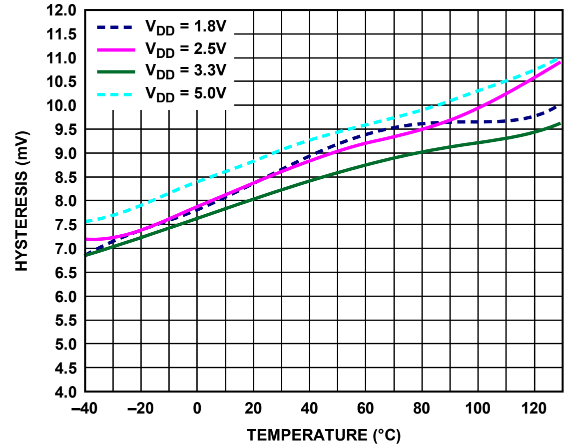


Figure 13. Hysteresis vs. Temperature

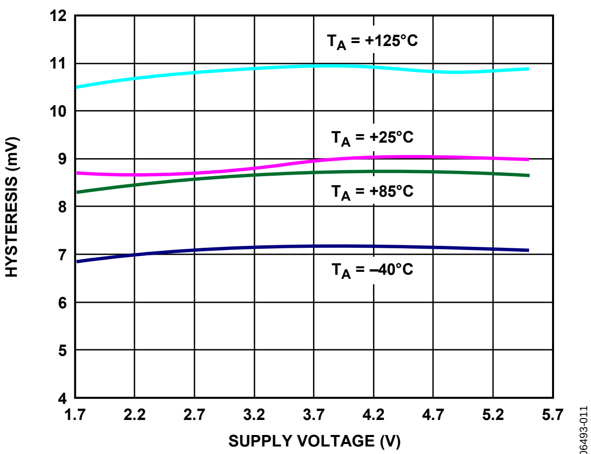


Figure 11. Hysteresis vs. Supply Voltage

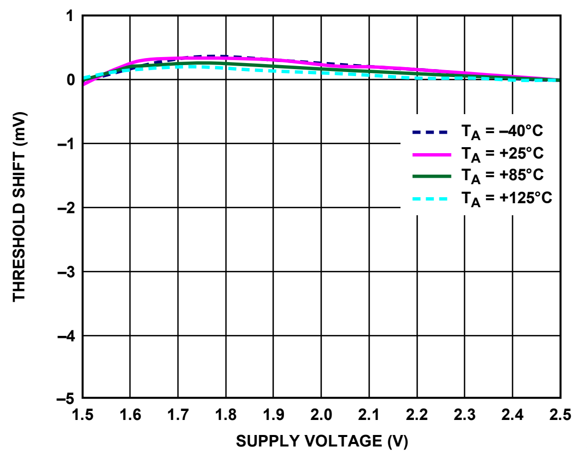


Figure 14. Minimum Supply Voltage

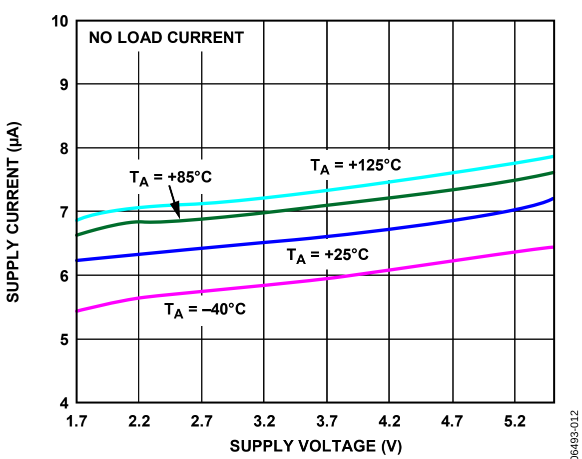


Figure 12. Quiescent Supply Current vs. Supply Voltage

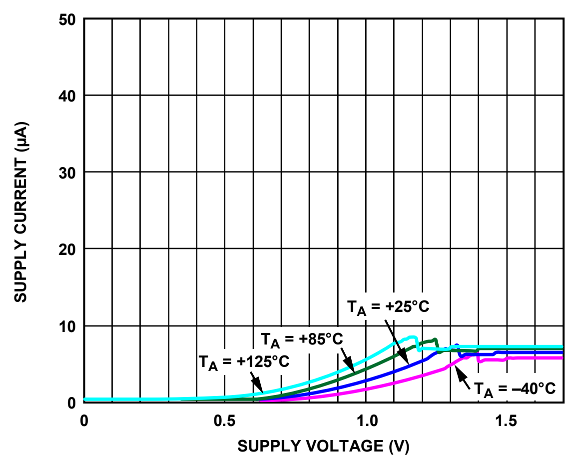


Figure 15. Startup Supply Current

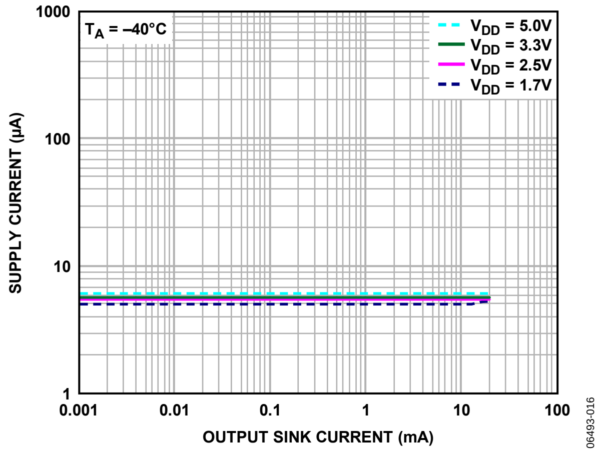


Figure 16. Supply Current vs. Output Sink Current

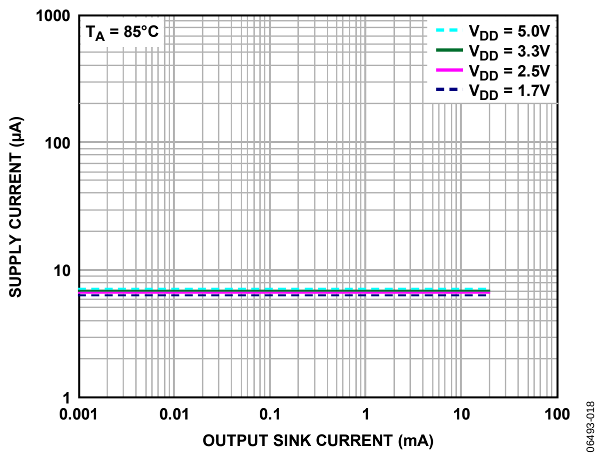


Figure 17. Supply Current vs. Output Sink Current

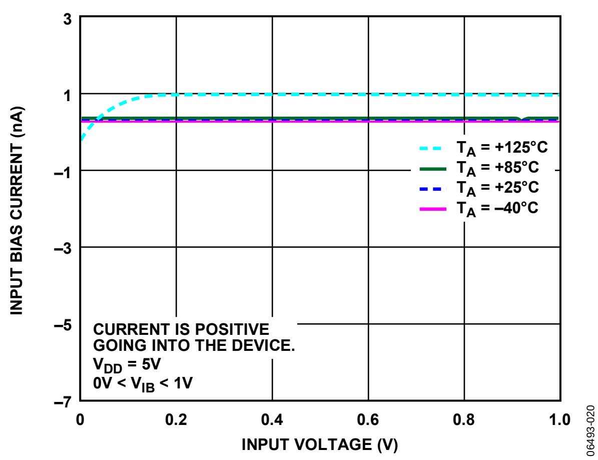


Figure 18. Low Level Input Bias Current

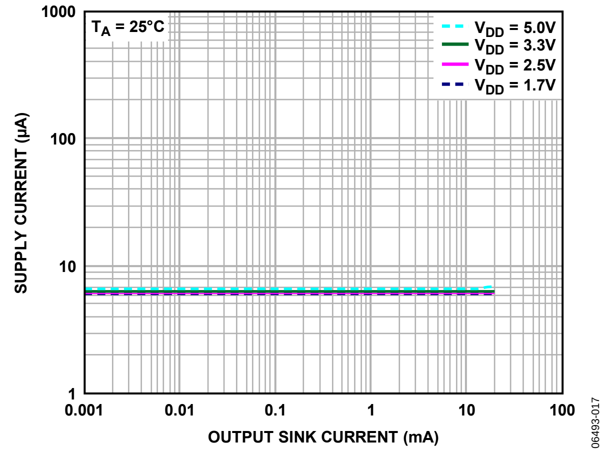


Figure 19. Supply Current vs. Output Sink Current

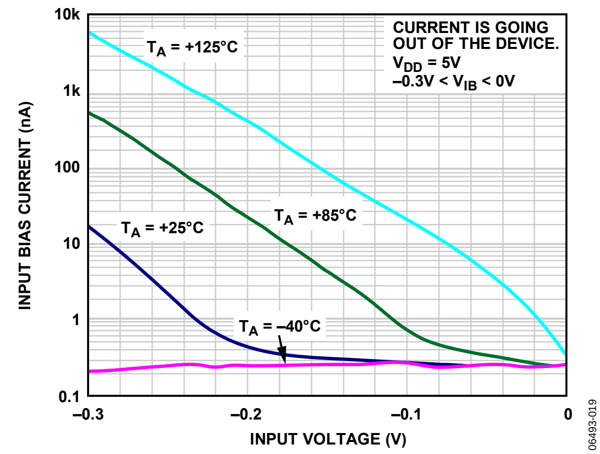


Figure 20. Below Ground Input Bias Current

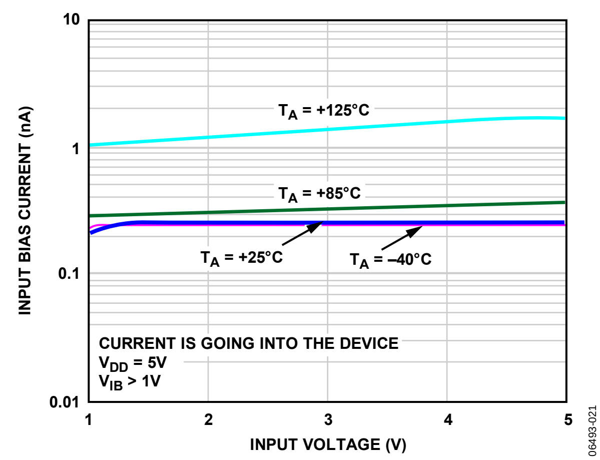


Figure 21. High Level Input Bias Current

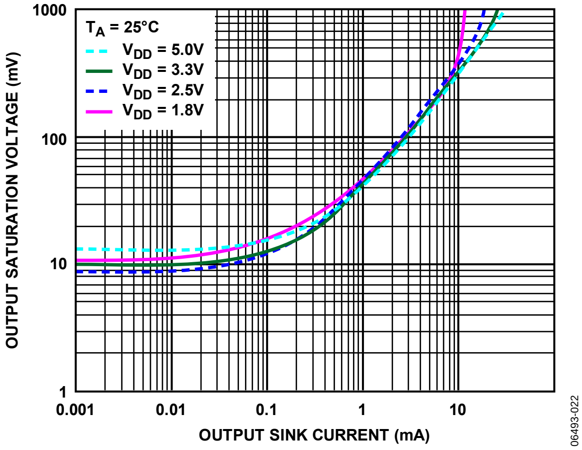


Figure 22. Output Saturation Voltage vs. Output Sink Current

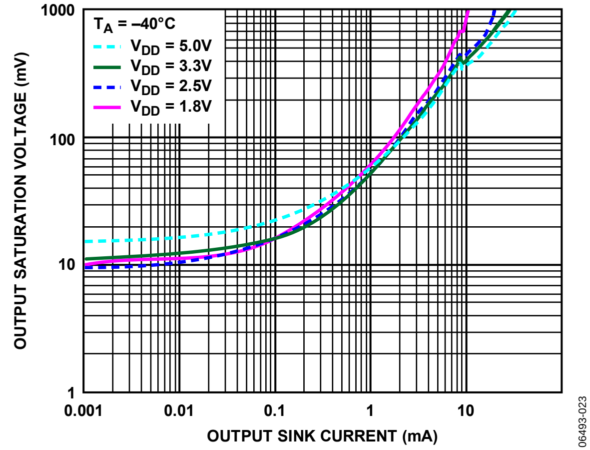


Figure 25. Output Saturation Voltage vs. Output Sink Current

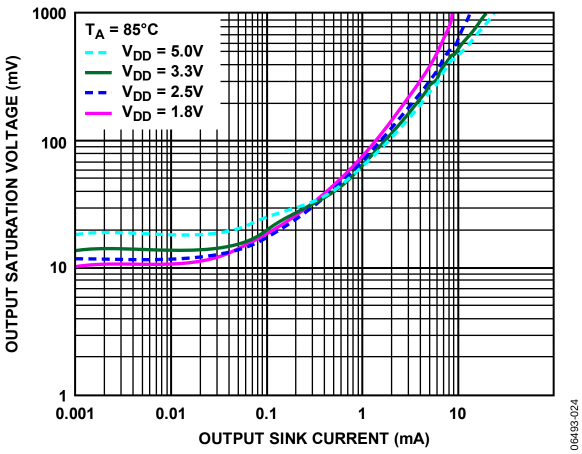


Figure 23. Output Saturation Voltage vs. Output Sink Current

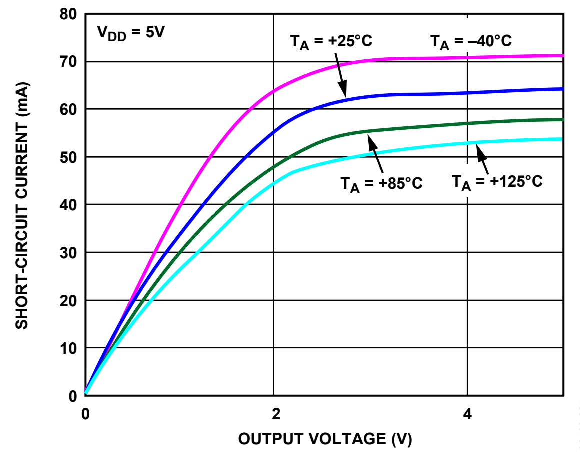


Figure 26. Output Short-Circuit Current

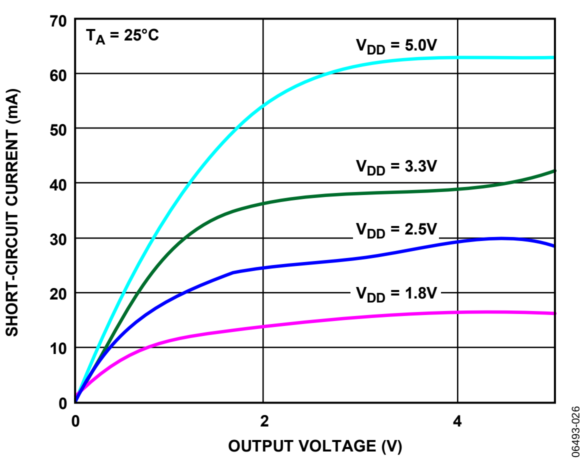


Figure 24. Output Short-Circuit Current

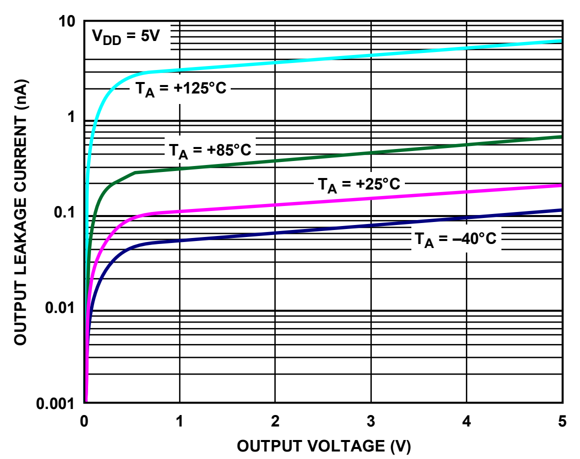


Figure 27. Output Leakage Current

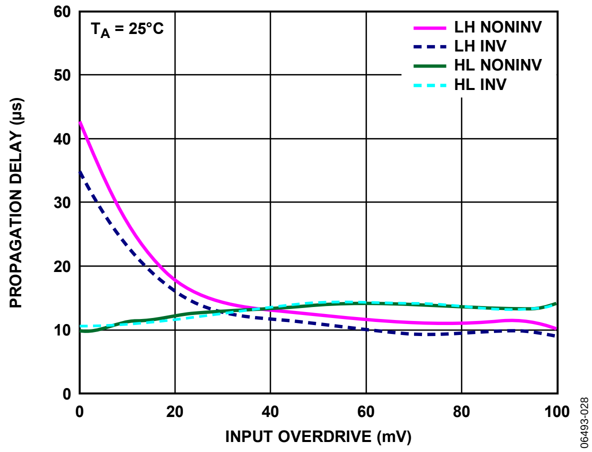


Figure 28. Propagation Delay vs. Input Overdrive

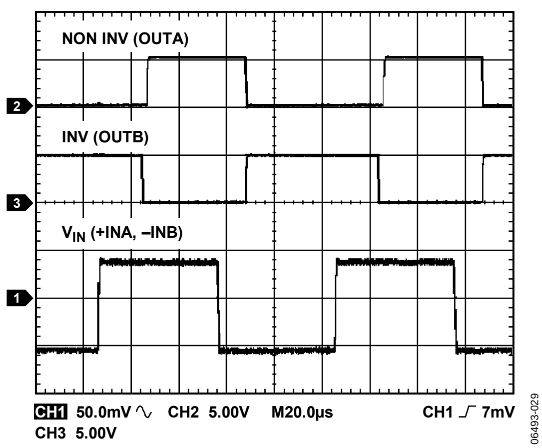


Figure 29. Noninverting and Inverting Comparators Propagation Delay

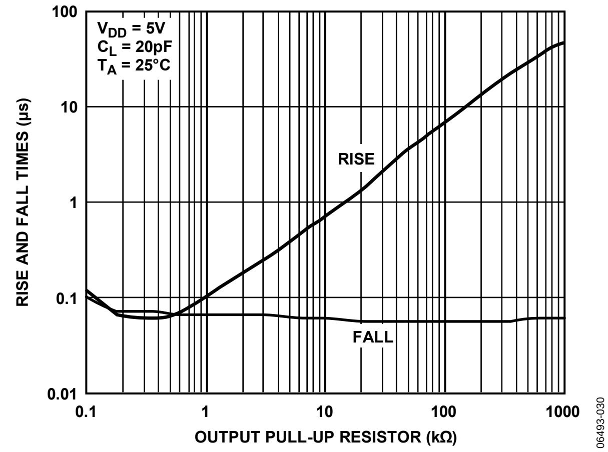


Figure 30. Rise and Fall Times vs. Output Pull-Up Resistor

APPLICATION INFORMATION

The ADCMP670 is a dual low power comparator with a built-in 400 mV reference that operates from 1.7 V to 5.5 V. The comparator is 1.5% accurate with a built-in hysteresis of 8.9 mV. The outputs are open-drain, capable of sinking 40 mA.

COMPARATORS AND INTERNAL REFERENCE

Each comparator has one input available externally. Comparator A has a noninverting input and Comparator B has an inverting input available. The other comparator inputs are connected internally to the 400 mV reference. The rising input threshold voltage of the comparators is designed to be equal to that of the reference.

POWER SUPPLY

The ADCMP670 is designed to operate from 1.7 V to 5.5 V. A 0.1 μF decoupling capacitor is recommended between V_{DD} and GND.

INPUTS

The comparator inputs are limited to the maximum V_{DD} voltage range. The voltage on these inputs can be above V_{DD} but never above the maximum allowed V_{DD} voltage. When adding a resistor string to the input, care must be taken when choosing resistor values. This is due to the fact that the input bias current will be in parallel with the bottom resistor of the string. This bottom resistor must therefore be chosen first to control the error introduced by this bias current.

OUTPUTS

The comparator outputs are open-drain and are also limited to the maximum specified V_{DD} voltage range, regardless of the V_{DD} voltage. These outputs are capable of sinking up to 40 mA. Outputs can be tied together to provide a window comparator with a single output.

ADDING HYSTERESIS

To prevent oscillations at the output caused by noise or slowly moving signals passing the switching threshold, each comparator has built-in hysteresis of approximately 8.9 mV. Positive feedback can be used to increase hysteresis to the noninverting comparator.

OUTLINE DIMENSIONS

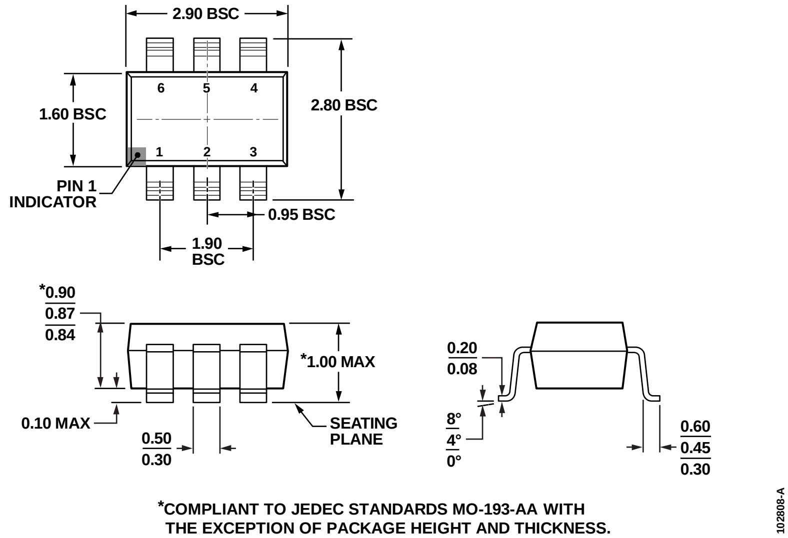


Figure 31. . 6-Lead Thin Small Outline Transistor Package [TSOT]
(UJ-6)
Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding
ADCMP670-1YUJZ-RL7[1]	–40°C to +125°C	6-Lead Thin Small Outline Transistor Package [TSOT]	UJ-6	M97

[1] Z = RoHS Compliant Part.

NOTES

NOTES

D06493-0-7/09(A)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения **«JONHON»**, а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов **«FORSTAR»**.

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А