MIC6270

IttyBitty Comparator

Features

- 2V to 36V Supply
- 300 µA Supply Current Independent of Supply
- 25 nA Input Bias Current
- ±5 nA Input Offset Current
- ±3 mV Input Offset Voltage
- Input Common Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equal to the Power Supply Voltage
- 250 mV and 4 mA Output Saturation Voltage
- Output Compatible with TTL, DTL, ECL, MOS, and CMOS Logic

Applications

- Limit Comparators
- A/D Converters
- Pulse, Square-Wave, Time-Delay Generators
- Wide-Range VCO
- MOS Clock Timers
- Multi-Vibrators and High-Voltage Digital Logic Gates

General Description

The MIC6270 is a precision voltage comparator with an offset voltage specification of 5 mV maximum.

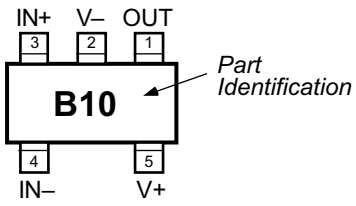
The MIC6270 is designed to operate from a single 2V to 36V power supply. Operation from split power supplies is also possible. Its low supply current drain is independent of the magnitude of the supply voltage.

This comparator also features an input common-mode voltage range that includes ground. Inputs are protected against reverse polarity (input voltage less than V–) and ESD.

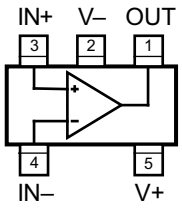
The MIC6270 has an open-collector output that directly interfaces with TTL, CMOS, and other types of logic. Several MIC6270 outputs can be connected together for wired-OR logic. The output also features an internal pull-up current source that can be used instead of an external load in some applications.

Package Type

MIC6270
SOT23-5 (M5)
(Top View)



MIC6270
Functional Pinout



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage ($V_{V+} – V_{V–}$) ..... +36V or ±18V
Differential Input Voltage ($V_{IN+} – V_{IN–}$) ..... +36V
Input Voltage ..... –0.3V to +36V
Input Current (V_{IN} < –0.3V) ..... 50 mA
Output Short-Circuit to GND, Note 1 ..... ∞

Operating Ratings ‡

Supply Voltage ..... +2V to +36V

† Notice: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

‡ Notice: The device is not guaranteed to function outside the operating ratings.

Note 1: A short-circuit from OUT to V+ can cause excessive heating and damage the device. The maximum short-circuit output current (OUT to V–) is approximately 20 mA, independent of V_{V+}.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: V+ = 5V; T_A = +25°C, unless noted.

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Input Offset Voltage	V_{OS}	—	2	5	mV	Note 1
		—	—	9		Note 1, –40°C ≤ T_A ≤ +85°C
Input Bias Current	I_B	—	25	250	nA	$I_{IN(+)}$ or $I_{IN(–)}$ with output in linear range, V_{CM} = 0V, Note 2
		—	—	400		$I_{IN(+)}$ or $I_{IN(–)}$ with output in linear range, V_{CM} = 0V, Note 2, –40°C ≤ T_A ≤ +85°C
Input Offset Current	I_{OS}	—	5	50	nA	$I_{IN(+)} – I_{IN(–)}$, V_{CM} = 0V
		—	—	150		$I_{IN(+)} – I_{IN(–)}$, V_{CM} = 0V, –40°C ≤ T_A ≤ +85°C
Input Voltage Range	V_{CM}	0	—	V+ – 1.5	V	V+ = 30V, Note 3
		—	—	V+ – 2		V+ = 30V, Note 3, –40°C ≤ T_A ≤ +85°C
Supply Current	I_S	—	0.3	0.9	mA	R_L = ∞
		—	0.4	1.2		R_L = ∞, V+ = 36V
Voltage Gain	—	50	200	—	V/mV	R_L ≥ 15 kΩ, V+ = 15V V_O = 1V to 11V
Large Signal Response Time	—	—	300	—	ns	V_{IN} = TTL logic swing, V_{REF} = 1.4V V_{RL} = 5V, R_L = 5.1 kΩ
Response Time	—	—	0.6	—	µs	V_{RL} = 5V, R_L = 5.1 kΩ, Note 4
Output Sink Current	—	10	20	—	mA	$V_{IN(–)}$ = 1V, $V_{IN(+)}$ = 0V, V_O ≤ 1.5V
Output Pull-Up Current	—	—	15	50	µA	—
Saturation Voltage	—	—	250	400	mV	$V_{IN(–)}$ = 1V, $V_{IN(+)}$ = 0, I_{SINK} ≤ 4 mA
	—	—	—	700		$V_{IN(–)}$ = 1V, $V_{IN(+)}$ = 0, I_{SINK} ≤ 4 mA, –40°C ≤ T_A ≤ +85°C
Differential Input Voltage	—	—	—	36	V	$V_{IN(+)}$, $V_{IN(–)}$ ≥ 0V (or V–, if used), Note 5

Note 1: Measured at the output switch point where $V_{OUT} \approx 1.4V_{DC}$ with R_S = 0Ω, V+ = $5V_{DC}$ to $30V_{DC}$, and over the full input common-mode range ($0V_{DC}$ to V+ – $1.5V_{DC}$).

2: The direction of input current is out of the device due to its PNP input.

3: The input common-mode voltage, V_{IN+}, or $V_{IN–}$ must not go below –0.3V. The upper end of the common-mode voltage range is V+ – 1.5V at 25°C, but either or both inputs can go to $+36V_{DC}$ without damage, independent of V_{V+}.

4: The response time measured using a 100 mV input step with 5 mV overdrive. With greater overdrive, 300 ns can be obtained. See "Typical Performance Curves."

5: Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be below $–0.3V_{DC}$ (or $0.3V_{DC}$ below $V_{V–}$).

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Ambient Temperature Range	T_A	–40	—	+125	°C	—
Storage Temperature Range	T_S	–65	—	+150	°C	—
Lead Temperature	—	—	—	+260	°C	Soldering, 10s
Package Thermal Resistance						
Thermal Resistance SOT-23-5	θ_{JA}	—	220	—	°C/W	Mounted to printed circuit board.

2.0 TYPICAL PERFORMANCE CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

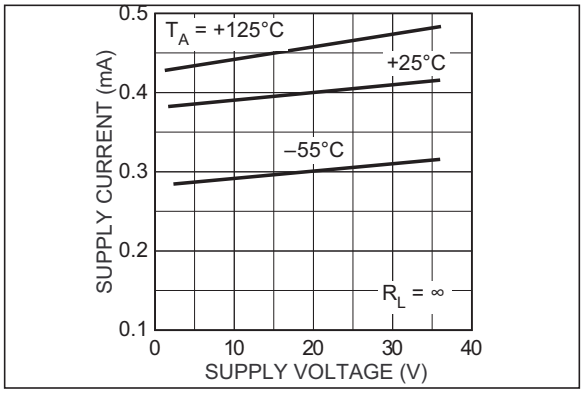


FIGURE 2-1: *Supply Current vs. Supply Voltage.*

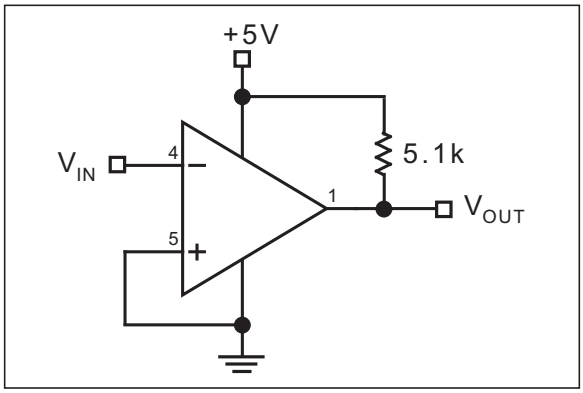


FIGURE 2-4: *Output Response Time vs. Overdrive (Test Circuit).*

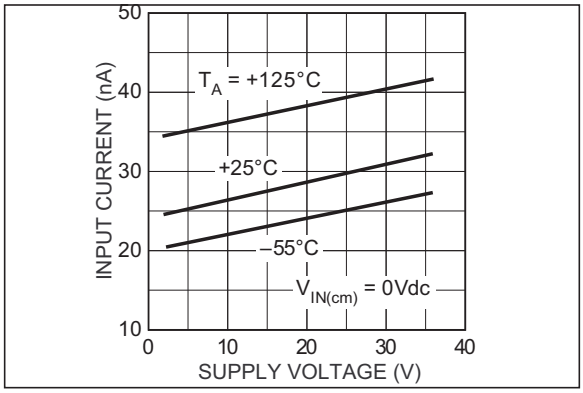


FIGURE 2-2: *Input Current vs. Supply Voltage.*

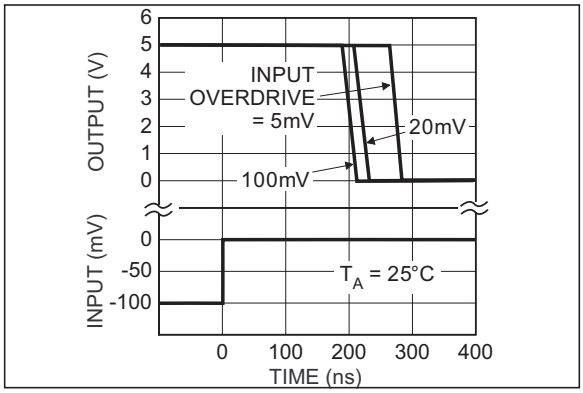


FIGURE 2-5: *Output Response Time vs. Overdrive.*

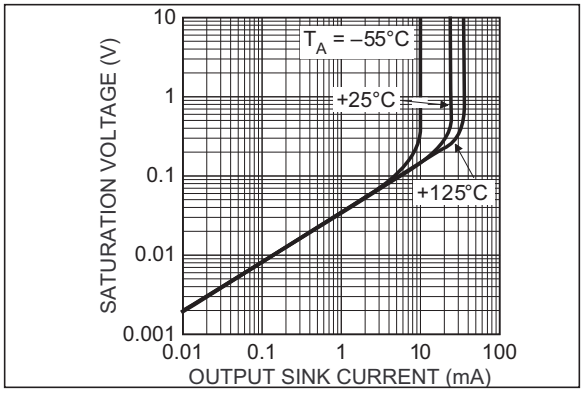


FIGURE 2-3: *Output Saturation Voltage.*

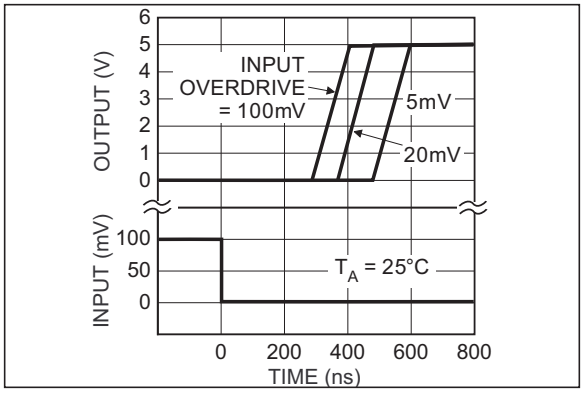


FIGURE 2-6: *Output Response Time vs. Overdrive.*

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 3-1.

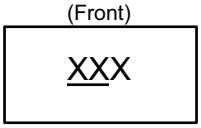
TABLE 3-1: PIN FUNCTION TABLE

Pin Number	Symbol	Description
1	OUT	Comparator output.
2	V–	Negative Supply: Negative supply for split supply application or ground for single supply application.
3	IN+	Non-inverting input.
4	IN–	Inverting input.
5	V+	Positive supply.

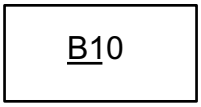
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

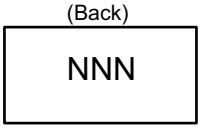
5-Lead SOT23* (Front)



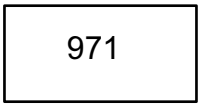
Example



5-Lead SOT23* (Back)



Example



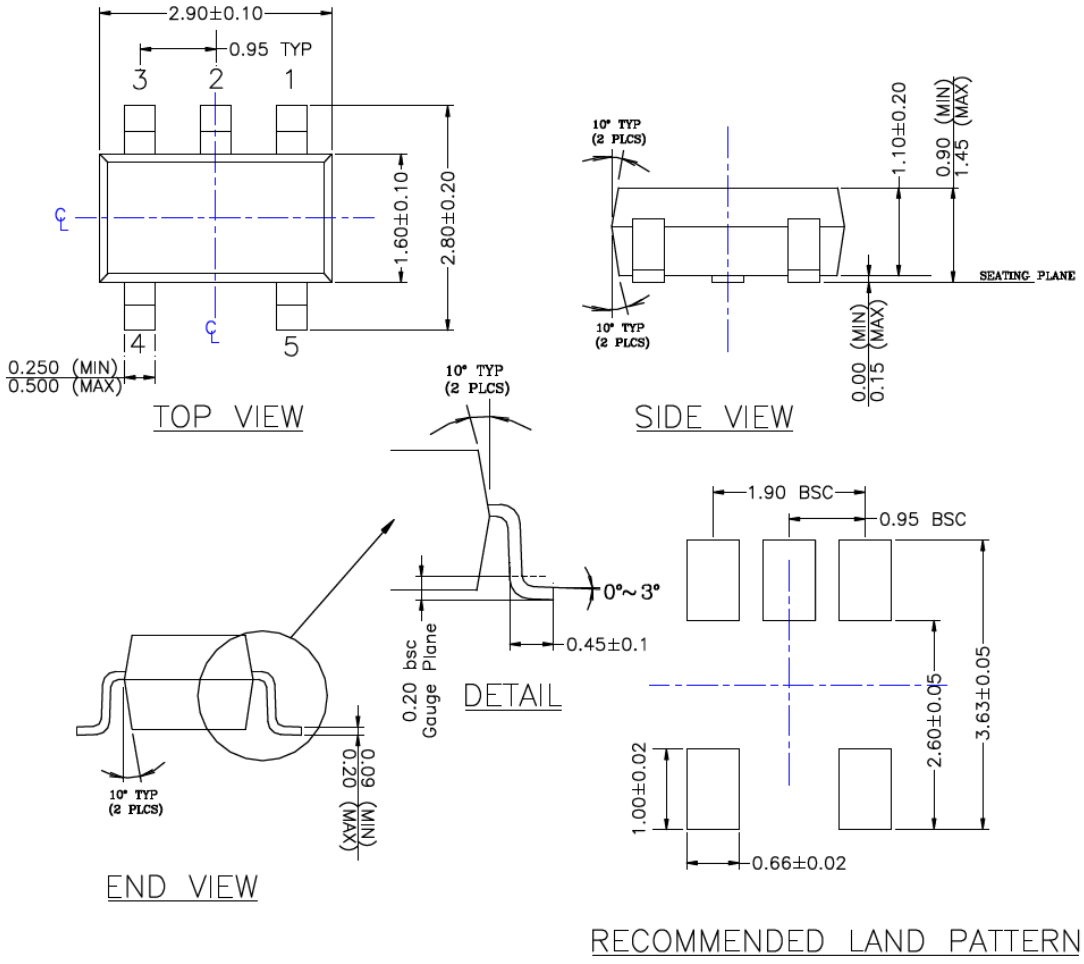
Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:		In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.
		Underbar (_) and/or Overbar (¯) symbol may not be to scale.

5-Lead SOT23 Package Outline and Recommended Land Pattern

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

TITLE
5 LEAD SOT23 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOT23-5LD-PL-1	UNIT	MM



NOTE:
1. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & BURR.
2. PACKAGE OUTLINE INCLUSIVE OF SOLER PLATING.
3. DIMENSION AND TOLERANCE PER ANSI Y14.5M, 1982.
4. FOOT LENGTH MEASUREMENT BASED ON GAUGE PLANE METHOD.
5. DIE FACES UP FOR MOLD, AND FACES DOWN FOR TRIM/FORM.
6. ALL DIMENSIONS ARE IN MILLIMETERS.

APPENDIX A: REVISION HISTORY

Revision A (January 2020)

- Converted Micrel document MIC6270 to Microchip data sheet template DS20006294A.
- Minor text changes throughout.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	X	XX	-XX
Device	Temperature	Package	Media Type

Device:	MIC6270:	IttyBitty® Comparator	
Temperature:	Y	=	–40°C to +85°C
Package:	M5	=	5-Lead SOT-23
Media Type:	TR	=	3,000/Reel

Examples:

a) MIC6270YM5-TR: IttyBitty® Comparator, –40°C to +85°C Junction Temperature Range, 5-Pin SOT-23 Package, 3,000/Reel

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

NOTES:

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