MIC6270

IttyBitty™ Comparator

Advance Information

General Description

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

Features

- 2V to 36V supply
- 300µA supply current independent of supply
- 25nA input bias current
- ±5nA input offset current
- ±3mV input offset voltage
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- 250mV at 4mA output saturation voltage
- Output compatible with TTL, DTL, ECL, MOS, and CMOS logic

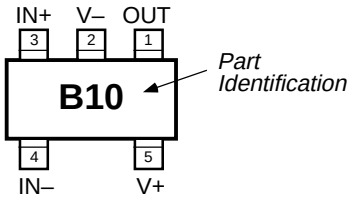
Applications

- Limit comparators
- A/D converters
- Pulse, square wave, time delay generators
- Wide range VCO
- MOS clock timers
- Multivibrators and high-voltage digital logic gates

Ordering Information

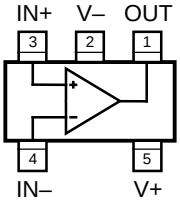
Part Number	Temperature Range	Package
MIC6270BM5	–40°C to +85°C	SOT-23-5

Pin Configuration



SOT-23-5 (M5)

Functional Configuration



SOT-23-5 (M5)

Pin Description

Pin Number	Pin Name	Pin Function
1	OUT	Comparator Output:
2	V–	Negative Supply: Negative supply for split supply application or ground for single supply application.
3	IN+	Noninverting Input:
4	IN–	Inverting Input:
5	V+	Positive Supply:

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 +36 V
Input Current (V_{IN} < –0.3V) 50mA
Output Short-Circuit to GND, **Note 1** ..... ∞
Storage Temperature Range ..... –65°C to +150°C
Lead Temperature (soldering, 10 secs.) ..... 260°C

Operating Ratings

Supply Voltage ..... 2V to 36V
Ambient Temperature Range ..... –40°C to +85°C
SOT-23-5 Thermal Resistance (θ_{JA}) ..... 220°C/W
(mounted to printed circuit board)

Electrical Characteristics

V+ = 5V; T_A = 25°C, **bold** values indicate –40°C ≤ T_A ≤ +85°C, T_A = T_J; unless noted

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{OS}	Input Offset Voltage	**Note 2**		2	5 **9**	mV mV
I_B	Input Bias Current	$I_{IN(+)}$ or $I_{IN(–)}$ with output in linear range, V_{CM} = 0V, **Note 3**		25	250 **400**	nA nA
I_{OS}	Input Offset Current	$I_{IN(+)} – I_{IN(–)}$, V_{CM} = 0V		5	50 **150**	nA nA
V_{CM}	Input Voltage Range	V+ = 30V, **Note 4**	0		V+ – 1.5 **V+ – 2**	V V
I_S	Supply Current	R_L = ∞ R_L = ∞, V+ = 36V		0.3 0.4	0.9 1.2	mA mA
	Voltage Gain	R_L ≥ 15kΩ, V+ = 15V V_O = 1V to 11V	50	200		V/mV
	Large Signal Response Time	V_{IN} = TTL logic swing, V_{REF} = 1.4V V_{RL} = 5V, R_L = 5.1kΩ		300		ns
	Response Time	V_{RL} = 5V, R_L = 5.1kΩ, **Note 5**		0.6		µs
	Output Sink Current	$V_{IN(–)}$ = 1V, $V_{IN(+)}$ = 0, V_O ≤ 1.5V	10	20		mA
	Output Pull-Up Current			15	50	µA
	Saturation Voltage	$V_{IN(–)}$ = 1V, $V_{IN(+)}$ = 0, I_{SINK} ≤ 4mA		250	400 **700**	mV mV
	Differential Input Voltage	$V_{IN(+)}$, $V_{IN(–)}$ ≥ 0V (or V–, if used), **Note 6**			36	V

General Note: Devices are ESD protected; however, handling precautions are recommended.

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 20mA, independent of V_{V+}.

Note 2: Measured at the output switch point where V_{OUT} ≅ 1.4Vdc with R_S = 0Ω, V+ = 5Vdc to 30Vdc, and over the full input common-mode range (0Vdc to V+ – 1.5Vdc).

Note 3: The direction of input current is out of the device due to its PNP input.

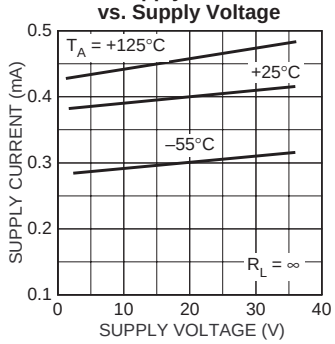
Note 4: The input common-mode voltage, V_{IN+}, or $V_{IN–}$ must not go below –0.3V. The upper end of the common-mode voltage range is V+ – 1.5V at 25°C, but either or both inputs can go to +36Vdc without damage, independent of of V_{V+}.

Note 5: The response time measured using a 100mV input step with 5mV overdrive. With greater overdrive, 300ns can be obtained. See “Typical Characteristics.”

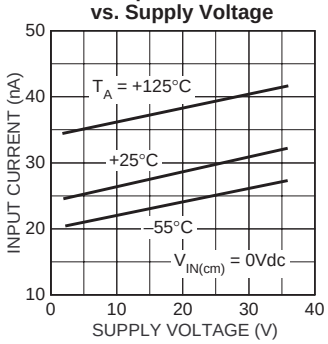
Note 6: Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be below –0.3Vdc (or 0.3Vdc below $V_{V–}$).

Typical Characteristics

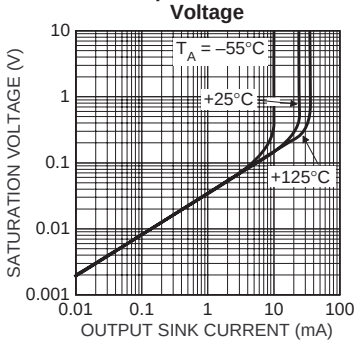
Supply Current vs. Supply Voltage



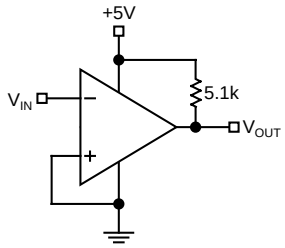
Input Current vs. Supply Voltage



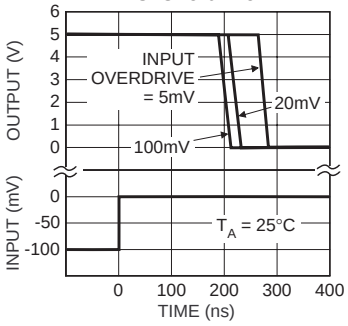
Output Saturation Voltage



Output Response Time vs. Overdrive (Test Circuit)



Output Response Time vs. Overdrive



Output Response Time vs. Overdrive

