

Quad Low-Power Voltage Comparators PM-139/PM-139A/PM-239

FEATURES

- Single or Dual Supply Operation
- Input Voltage Range Includes Ground
- Low Power Consumption (2mW/Comparator)
- Low Input Bias Current 25nA
- Low Input Offset Current ±5nA
- Low Offset Voltage ±2mV
- Low Output Saturation Voltage (250mV @ 4mA)
- Logic Outputs Compatible with TTL, DTL, ECL, MOS, and CMOS
- Directly Replaces LM139 and LM139A Comparators
- Available in Die Form

ORDERING INFORMATION[†]

+25°C	PA	PACKAGE			
V _{os} (mV)	DIP 14-PIN	LCC 20-CONTACT	OPERATING TEMPERATURE RANGE		
±2*	PM139AY*	PM139ARC/883	MIL		
±5*	PM139Y*	_	MIL		
±5	PM239P	_	XIND		

For devices processed in total compliance to MIL-STD-883, add/883 after part number. Consult factory for 883 data sheet.

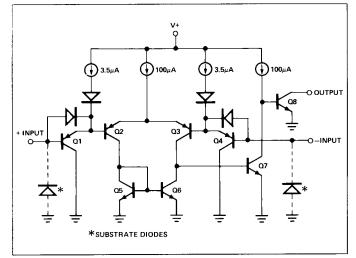
Burn-in is available on commercial and industrial temperature range parts in CerDIP, plastic DIP, and TO-can packages.

JAN ORDERING INFORMATION

JAN PART NUMBER	DESCRIPTION
JM38510/11201BCA	PM139Y5/38510 LEVEL B
JM38510/11201BCB	PM139Y2/38510 LEVEL B
JM38510/11201SCA*	PM139Y5/38510 LEVEL S

Table above is for MIL-M-38510 processing. Refer to 11201 slash sheet for electrical processing parameters.

* Undergoing Part I qualification. Consult ADI for availability.

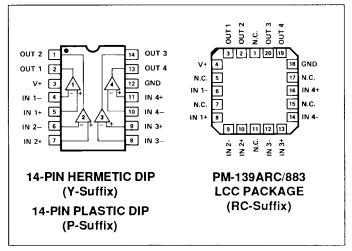


SIMPLIFIED SCHEMATIC (ONE COMPARATOR)

GENERAL DESCRIPTION

The PM-139 has four independent voltage comparators, each with precision DC specifications. Low offset voltage, bias current, power consumption and output saturation voltage are offered in a design that features single power supply operation. The input voltage range includes ground for convenient single supply operation. The 2mA power supply current, independent of supply voltage – coupled with the single supply operation, makes this comparator ideal for low power applications. Open collector outputs allow maximum applications flexibility.

PIN CONNECTIONS



ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V+						
Differential Input Voltage .						
Input Voltage		0.3V to +36V				
Derate Above 100°C						
Output Short-Circuit to Gre	C	ontinuous				
Input Current (V _{IN} < -0.3V	')		50mA			
Operating Temperature R						
PM-139A/139/139ARC		55°C to +125°C				
PM-239P		–40°C to +85°C				
Storage Temperature Rar	ıge	65°C to +150°C				
Lead Temperature (Solde	ring, 60 sec)		300°C			
Junction Temperature			+150°C			
PACKAGE TYPE	⊖ _{jA} (Note 1)	θ _{jc}	UNITS			
14-Pin Hermetic DIP (Y)	110	26	°C/W			
14-Pin Plastic DIP (P)	90	47	°C/W			
NOTE						

NOTE:

1. Θ_{jA} is specified for worst case mounting conditions, i.e., Θ_{jA} is specified for device in socket for CerDIP and P-DIP packages.

ELECTRICA	_ CHARACTERISTICS	at $V + = +5V$, T_A	= 25°C,	unless otherwise noted.
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			PM-139A PM-1				-139/239		
PARAMETER	SYMBOL	CONDITIONS	MIN	ТҮР	MAX	MIN	ТҮР	MÁX	UNITS
Input Offset Voltage	V _{OS}	(Note 1)		1	2		2	5	mV
Input Bias Current	۱ _B	l _{IN} (+) or l _{IN} (-) with Output in Linear Range	_	25	100	_	25	100	nA
Input Offset Current	I _{OS}	_{IN} (+) or _{IN} (−)		3	25		3	25	nA
Input Common-Mode Voltage Range	CMVR	(Notes 2, 5, 6)	0	_	3.5	0		3.5	v
Supply Current	۱ _s	$R_L = \infty$ on all Comparators V + = 30V	_	0.8	2	-	0.8	2	mA
Voltage Gain	A _{VO}	$R_L \ge 15k\Omega$, V+ = 15V (To support large V _O swing) (Note 5)	50	200	_	50	200	_	V/mV
Large-Signal Response Time	tr	$V_{IN} = TTL \ Logic \ Swing,$ $V_{REF} = 1.4V, \ V_{RL} = 5V,$ $R_L = 5.1 k\Omega, \ (Note 4)$	_	300	_		300	_	ns
Response Time	t _r	$V_{RL} = 5V, R_L = 5.1k\Omega$ (Notes 3, 4)	$V_{\rm RL} = 5V, R_{\rm L} = 5.1 k\Omega$ — 1.3 — —		1.3	_	μs		
Output Sink Current	I _{SINK}	$V_{ N}(-) \ge 1V, V_{ N}(+) = 0, V_{O} \le 1.5V$	6	16		6	16	_	mA
Saturation Voltage	V _{OL}	$V_{ N}(-) \ge 1V, V_{ N}(+) = 0,$ $I_{SINK} \le 4mA$		250	400	_	250	400	mV
Output Leakage Current	ILEAK	$V_{ N}(+) \ge 1V, V_{ N}(-) = 0, V_{O} = 30V$	_	0.1	_	_	0.1		nA

ELECTRICAL CHARACTERISTICS at V+ = +5V, $-55^{\circ}C \le T_A \le +125^{\circ}C$ for PM-139A and PM-139, $-40^{\circ}C \le T_A \le +85^{\circ}C$ for PM-239, unless otherwise noted.

			PM-139A			PM-139/239			
PARAMETER	SYMBOL	CONDITIONS	MIN	ТҮР	MAX	MIN	TYP	MAX	UNITS
Input Offset Voltage	V _{os}	(Note 1)			4		_	9	mV
Input Offset Current	los	I _{IN} (+) or I _{IN} (−)	_	_	100			100	nA
Input Bias Current	۱ _B	I _{IN} (+) OR I _{IN} (−) with Output in Linear Range	_		300	_	_	300	nA
Input Common-Mode Voltage Range	CMVR	(Notes 3, 5)	0		V+ -2	0	_	V+-2	v
Saturation Voltage	V _{OL}	$V_{IN}(-) \ge 1V, V_{IN}(+) = 0,$ $I_{SINK} \le 4mA$	_		700	-		700	mV
Output Leakage Current	ILEAK	$V_{1N}(+) \ge 1V, V_{1N}(-) = 0, V_0 = 30V$	_	_	1	_	-	1	μA
Differential Input Voltage		Keep All $V_{\text{IN's}} \ge 0V$		_	36	_	_	36	v

NOTES:

1. At output switch point, $V_O=1.4V, R_S=0\Omega$ with V+ from 5V, and over the full input common-mode range (0V to V+ –1.5V).

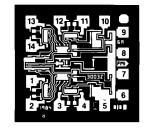
 The input common-mode voltage or either input voltage signal should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V+-1.5V, but either or both inputs can go to + 30V without damage. The response time specified is for a 100mV input step with 5mV overdrive. For larger overdrive signals 300ns can be obtained. See characteristics section.

4. Sample tested.

5. Guaranteed by design.

6. Positive CMVR limit equals V \pm –1.5V for supply voltages other than 5V.

DICE CHARACTERISTICS



DIE SIZE 0.051 \times 0.048 inch, 2448 sq. mils (1.295 \times 1.220 mm, 1.58 sq. mm)

- 1. OUTPUT (2)
- 2. OUTPUT (1)
- 3. POSITIVE SUPPLY
- 4. INVERTING INPUT (1)
- 5. NONINVERTING INPUT (1)
- 6. INVERTING INPUT (2)
- 7. NONINVERTING INPUT (2)
- 8. INVERTING INPUT (3)
- 9. NONINVERTING INPUT (3)
- 10. INVERTING INPUT (4)
- **11. NONINVERTING INPUT (4)**
- 12. GROUND (SUBSTRATE)
- 13. OUTPUT (4)
- 14. OUTPUT (3)

WAFER TEST LIMITS at V+ = +5V, $T_A = 25^{\circ}$ C, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	PM-139N LIMIT	UNITS
Input Offset Voltage	V _{OS}	$R_{S} = 0\Omega, R_{L} = 5.1 k\Omega$ $V_{O} = 1.4V, (Note 1)$	2	mV MAX
Input Offset Current	l _{os}	$I_{IN}(+) - I_{IN}(-)$ $R_{L} = 5.1k\Omega$ $V_{O} = 1.4V$	25	nA MAX
Input Bias Current	۱ _в	l _{IN} (+) or l _{IN} (−), (Note 1)	100	nA MAX
Voltage Gain	A _V	$R_L \ge 15k\Omega$, V+ = 15V, (Note 3)	50	V/mV MIN
Input Voltage Range	CMVR	(Notes 2, 3)	V+ - 1.5	V MAX
Common-Mode Rejection Ratio	CMRR	(Note 4)	60.5	dB MIN
Power Supply Rejection Ratio	PSRR	V + = 5V to + 18V	60.5	dB MIN
Saturation Voltage	V _{OL}	$\begin{split} & V_{IN}(-) \geq 1V, V_{IN}(+) = 0, \\ & I_{SINK} \leq 4mA \end{split}$	400	mV MAX
Output Sink Current	ISINK	$V_{IN}^{(-)} \ge 1V,$ $V_{IN}^{(+)} = 0, V_O \le 1.5V$	6	mA MIN
Output Leakage Current	ILEAK	$V_{IN}^{(+)} \ge 1V,$ $V_{IN}^{(-)} = 0, V_0 = 30V$	500	nA MAX
Supply Current	I+	$R_L = \infty$, All Comps V+ = 30V	2	mA MAX

NOTES:

Electrical tests are performed at wafer probe to the limits shown. Due to variations in assembly methods and normal yield loss, yield after packaging is not guaranteed for standard product dice. Consult factory to negotiate specifications based on dice lot qualification through sample lot assembly and testing.

TYPICAL ELECTRICAL CHARACTERISTICS at V+ = +5V, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	PM-139N TYPICAL	UNITS
Large-Signal Response Time	t _r	V _{IN} = TTL Logic Swing V _{REF} = 1.4V, (Note 5) V _{RL} = 5V, R _L = 5.1kΩ	600	ns
Small-Signal Response Time	t _r	$V_{IN} = 100mV$ Step, (Note 5) 5mV Overdrive $V_{RL} = 5V, R_L = 5.1k\Omega$	1.3	μS

NOTES:

1. At output switch point, $V_0 = 1.4V$, $R_S = 0\Omega$ with V+ from 5V; and over the full input common-mode range (0V to V+ - 1.5V).

2. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the

common-mode voltage range is V+ - 1.5V, but either or both inputs can go to + 30V without damage.

3. Guaranteed by design.

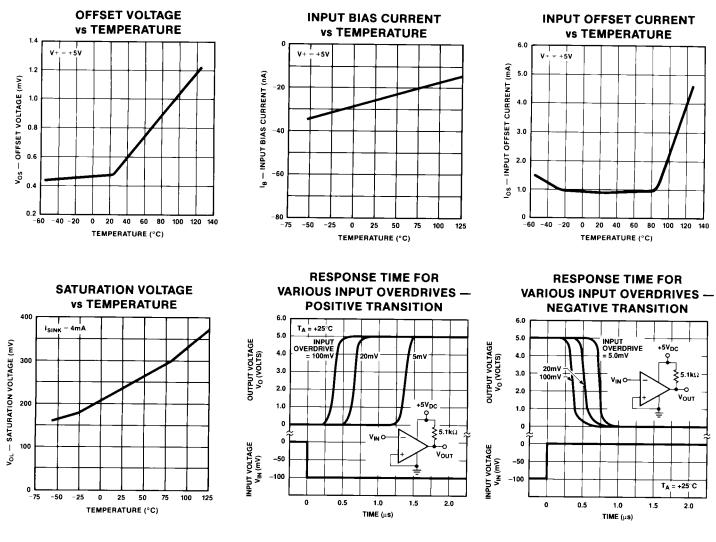
4. $R_L \geq 15 k \Omega, \ V_{CM}$ = 1.5V to 13.5V, V+ = 15V.

5. Sample tested.

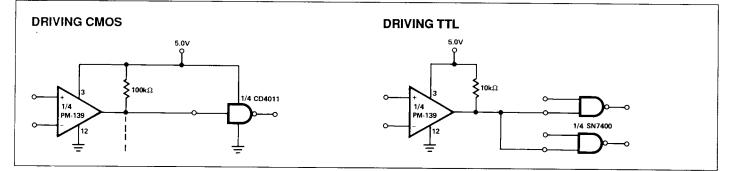
PM-139/PM-139A/PM-239

TYPICAL PERFORMANCE CHARACTERISTICS

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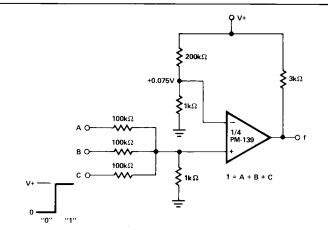


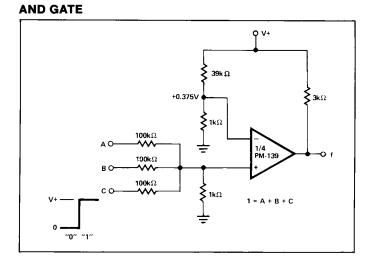
TYPICAL INTERFACE



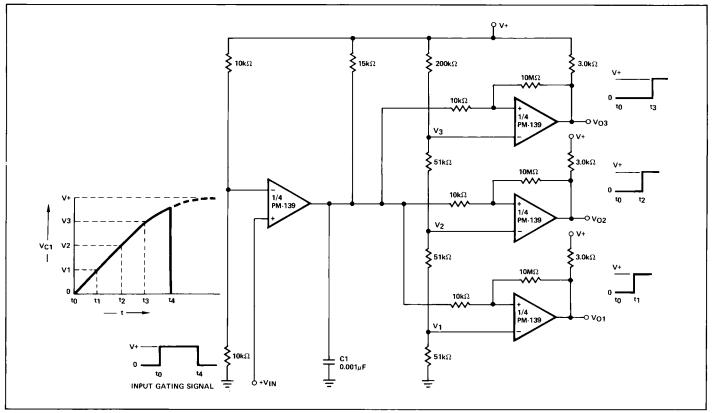
TYPICAL APPLICATIONS





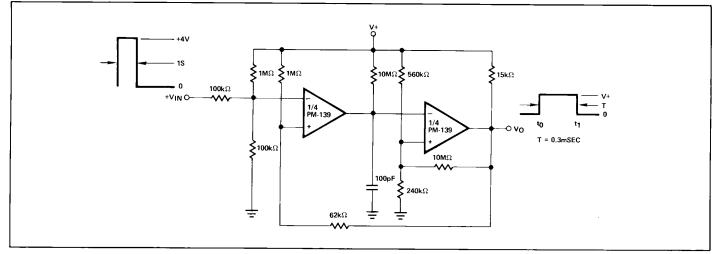


TIME DELAY GENERATOR

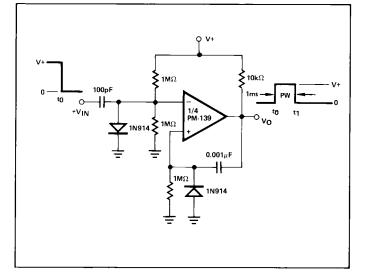


TYPICAL APPLICATIONS

ONE-SHOT MULTIVIBRATOR WITH INPUT LOCK-OUT



ONE-SHOT MULTIVIBRATOR



BURN-IN CIRCUIT

