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LM139/LM239/LM339/LM2901/LM3302

Low Power Low Offset Voltage Quad Comparators

General Description

The LM139 series consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The LM139 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic— where the low power drain of the LM339 is a distinct advantage over standard comparators.

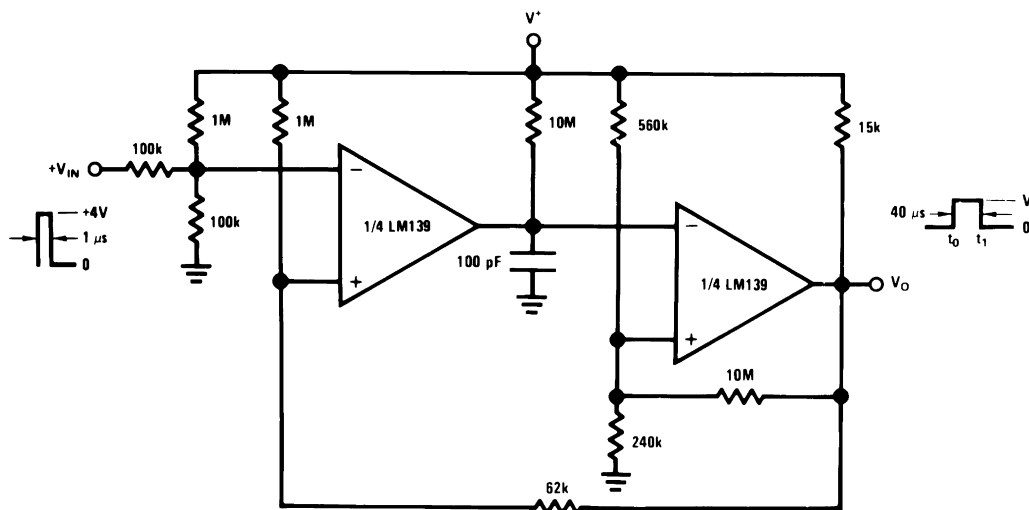
Features

- Wide supply voltage range
- LM139/139A Series 2 to 36 V_{DC} or ±1 to ±18 V_{DC}
- LM2901: 2 to 36 V_{DC} or ±1 to ±18 V_{DC}
- LM3302: 2 to 28 V_{DC} or ±1 to ±14 V_{DC}
- Very low supply current drain (0.8 mA) — independent of supply voltage
- Low input biasing current: 25 nA
- Low input offset current: ±5 nA
- Offset voltage: ±3 mV
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage: 250 mV at 4 mA
- Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems

Advantages

- High precision comparators
- Reduced V_{OS} drift over temperature
- Eliminates need for dual supplies
- Allows sensing near GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

One-Shot Multivibrator with Input Lock Out



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Absolute Maximum Ratings (Note 10)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

	LM139/LM239/LM339 LM139A/LM239A/LM339A LM2901	LM3302
Supply Voltage, V^+	$36 V_{DC}$ or $\pm 18 V_{DC}$	$28 V_{DC}$ or $\pm 14 V_{DC}$
Differential Input Voltage (Note 8)	$36 V_{DC}$	$28 V_{DC}$
Input Voltage	$-0.3 V_{DC}$ to $+36 V_{DC}$	$-0.3 V_{DC}$ to $+28 V_{DC}$
Input Current ($V_{IN} < -0.3 V_{DC}$), (Note 3)	50 mA	50 mA
Power Dissipation (Note 1)		
Molded DIP	1050 mW	1050 mW
Cavity DIP	1190 mW	
Small Outline Package	760 mW	
Output Short-Circuit to GND, (Note 2)	Continuous	Continuous
Storage Temperature Range	-65°C to $+150^{\circ}\text{C}$	-65°C to $+150^{\circ}\text{C}$
Lead Temperature (Soldering, 10 seconds)	260°C	260°C
Operating Temperature Range		-40°C to $+85^{\circ}\text{C}$
LM339/LM339A	0°C to $+70^{\circ}\text{C}$	
LM239/LM239A	-25°C to $+85^{\circ}\text{C}$	
LM2901	-40°C to $+85^{\circ}\text{C}$	
LM139/LM139A	-55°C to $+125^{\circ}\text{C}$	
Soldering Information		
Dual-In-Line Package		
Soldering (10 seconds)	260°C	260°C
Small Outline Package		
Vapor Phase (60 seconds)	215°C	215°C
Infrared (15 seconds)	220°C	220°C
See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.		
ESD rating (1.5 k Ω in series with 100 pF)	600V	600V

Electrical Characteristics

($V^+ = 5 V_{DC}$, $T_A = 25^{\circ}\text{C}$, unless otherwise stated)

Parameter	Conditions	LM139A			LM239A, LM339A			LM139			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	(Note 9)	1.0	2.0		1.0	2.0		2.0	5.0		mV _{DC}
Input Bias Current	$I_{IN(+)}$ or $I_{IN(-)}$ with Output in Linear Range, (Note 5), $V_{CM} = 0V$	25	100		25	250		25	100		nA _{DC}
Input Offset Current	$I_{IN(+)} - I_{IN(-)}$, $V_{CM} = 0V$	3.0	25		5.0	50		3.0	25		nA _{DC}
Input Common-Mode Voltage Range	$V^+ = 30 V_{DC}$ (LM3302, $V^+ = 28 V_{DC}$) (Note 6)	0	$V^+ - 1.5$		0	$V^+ - 1.5$		0	$V^+ - 1.5$		V _{DC}
Supply Current	$R_L = \infty$ on all Comparators, $R_L = \infty$, $V^+ = 36V$, (LM3302, $V^+ = 28 V_{DC}$)	0.8	2.0		0.8	2.0		0.8	2.0		mA _{DC}
					1.0	2.5		1.0	2.5		mA _{DC}
Voltage Gain	$R_L \geq 15 k\Omega$, $V^+ = 15 V_{DC}$, $V_o = 1 V_{DC}$ to $11 V_{DC}$	50	200		50	200		50	200		V/mV
Large Signal Response Time	$V_{IN} = \text{TTL Logic Swing}$, $V_{REF} = 1.4 V_{DC}$, $V_{RL} = 5 V_{DC}$, $R_L = 5.1 k\Omega$	300			300			300			ns
Response Time	$V_{RL} = 5 V_{DC}$, $R_L = 5.1 k\Omega$, (Note 7)	1.3			1.3			1.3			μs

Electrical Characteristics (Continued)(V⁺ = 5 V_{DC}, T_A = 25°C, unless otherwise stated)

Parameter	Conditions	LM139A		LM239A, LM339A			LM139			Units	
		Min	Typ	Max	Min	Typ	Max	Min	Typ		Max
Output Sink Current	V _{IN(-)} = 1 V _{DC} , V _{IN(+)} = 0, V _O ≤ 1.5 V _{DC}	6.0	16		6.0	16		6.0	16		mA _{DC}
Saturation Voltage	V _{IN(-)} = 1 V _{DC} , V _{IN(+)} = 0, I _{SINK} ≤ 4 mA		250	400		250	400		250	400	mV _{DC}
Output Leakage Current	V _{IN(+)} = 1 V _{DC} , V _{IN(-)} = 0, V _O = 5 V _{DC}		0.1			0.1			0.1		nA _{DC}

Electrical Characteristics(V⁺ = 5 V_{DC}, T_A = 25°C, unless otherwise stated)

Parameter	Conditions	LM239, LM339			LM2901			LM3302			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	(Note 9)		2.0	5.0		2.0	7.0		3	20	mV _{DC}
Input Bias Current	I _{IN(+)} or I _{IN(-)} with Output in Linear Range, (Note 5), V _{CM} = 0V		25	250		25	250		25	500	nA _{DC}
Input Offset Current	I _{IN(+)} - I _{IN(-)} , V _{CM} = 0V		5.0	50		5	50		3	100	nA _{DC}
Input Common-Mode Voltage Range	V ⁺ = 30 V _{DC} (LM3302, V ⁺ = 28 V _{DC}) (Note 6)	0		V ⁺ - 1.5	0		V ⁺ - 1.5	0		V ⁺ - 1.5	V _{DC}
Supply Current	R _L = ∞ on all Comparators, R _L = ∞, V ⁺ = 36V, (LM3302, V ⁺ = 28 V _{DC})		0.8	2.0		0.8	2.0		0.8	2.0	mA _{DC}
			1.0	2.5		1.0	2.5		1.0	2.5	mA _{DC}
Voltage Gain	R _L ≥ 15 kΩ, V ⁺ = 15 V _{DC} , V _O = 1 V _{DC} to 11 V _{DC}	50	200		25	100		2	30		V/mV
Large Signal Response Time	V _{IN} = TTL Logic Swing, V _{REF} = 1.4 V _{DC} , V _{RL} = 5 V _{DC} , R _L = 5.1 kΩ,		300			300			300		ns
Response Time	V _{RL} = 5 V _{DC} , R _L = 5.1 kΩ, (Note 7)		1.3			1.3			1.3		μs
Output Sink Current	V _{IN(-)} = 1 V _{DC} , V _{IN(+)} = 0, V _O ≤ 1.5 V _{DC}	6.0	16		6.0	16		6.0	16		mA _{DC}
Saturation Voltage	V _{IN(-)} = 1 V _{DC} , V _{IN(+)} = 0, I _{SINK} ≤ 4 mA		250	400		250	400		250	500	mV _{DC}
Output Leakage Current	V _{IN(+)} = 1 V _{DC} , V _{IN(-)} = 0, V _O = 5 V _{DC}		0.1			0.1			0.1		nA _{DC}

Electrical Characteristics(V⁺ = 5.0 V_{DC}, (Note 4))

Parameter	Conditions	LM139A		LM239A, LM339A			LM139			Units	
		Min	Typ	Max	Min	Typ	Max	Min	Typ		Max
Input Offset Voltage	(Note 9)			4.0		4.0			9.0		mV _{DC}
Input Offset Current	I _{IN(+)} - I _{IN(-)} , V _{CM} = 0V			100		150			100		nA _{DC}
Input Bias Current	I _{IN(+)} or I _{IN(-)} with Output in Linear Range, V _{CM} = 0V (Note 5)			300		400			300		nA _{DC}
Input Common-Mode Voltage Range	V ⁺ = 30 V _{DC} (LM3302, V ⁺ = 28 V _{DC}) (Note 6)	0		V ⁺ - 2.0	0		V ⁺ - 2.0	0		V ⁺ - 2.0	V _{DC}
Saturation Voltage	V _{IN(-)} = 1 V _{DC} , V _{IN(+)} = 0, I _{SINK} ≤ 4 mA			700		700			700		mV _{DC}

Electrical Characteristics (Continued)

($V^+ = 5.0 V_{DC}$, (Note 4))

Parameter	Conditions	LM139A		LM239A, LM339A			LM139		Units	
		Min	Typ	Max	Min	Typ	Max	Min		Typ
Output Leakage Current	$V_{IN(+)}=1 V_{DC}$, $V_{IN(-)}=0$, $V_O=30 V_{DC}$, (LM3302, $V_O=28 V_{DC}$)			1.0			1.0			μA_{DC}
Differential Input Voltage	Keep all V_{IN} 's $\geq 0 V_{DC}$ (or V^- , if used), (Note 8)			36			36			V_{DC}

Electrical Characteristics

($V^+ = 5.0 V_{DC}$, (Note 4))

Parameter	Conditions	LM239, LM339			LM2901			LM3302			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	(Note 9)			9.0	9	15			40		mV_{DC}
Input Offset Current	$I_{IN(+)} - I_{IN(-)}$, $V_{CM}=0V$			150	50	200			300		nA_{DC}
Input Bias Current	$I_{IN(+)}$ or $I_{IN(-)}$ with Output in Linear Range, $V_{CM}=0V$ (Note 5)			400	200	500			1000		nA_{DC}
Input Common-Mode Voltage Range	$V^+=30 V_{DC}$ (LM3302, $V^+=28$ V_{DC}) (Note 6)			$V^+-2.0$	0	$V^+-2.0$	0		$V^+-2.0$		V_{DC}
Saturation Voltage	$V_{IN(-)}=1 V_{DC}$, $V_{IN(+)}=0$, $I_{SINK} \leq 4 mA$			700	400	700			700		mV_{DC}
Output Leakage Current	$V_{IN(+)}=1 V_{DC}$, $V_{IN(-)}=0$, $V_O=30 V_{DC}$, (LM3302, $V_O=28$ V_{DC})			1.0			1.0				μA_{DC}
Differential Input Voltage	Keep all V_{IN} 's $\geq 0 V_{DC}$ (or V^- , if used), (Note 8)			36			36		28		V_{DC}

Note 1: For operating at high temperatures, the LM339/LM339A, LM2901, LM3302 must be derated based on a 125°C maximum junction temperature and a thermal resistance of 95°C/W which applies for the device soldered in a printed circuit board, operating in a still air ambient. The LM239 and LM139 must be derated based on a 150°C maximum junction temperature. The low bias dissipation and the "ON-OFF" characteristic of the outputs keeps the chip dissipation very small ($P_D \leq 100 mW$), provided the output transistors are allowed to saturate.

Note 2: Short circuits from the output to V^+ can cause excessive heating and eventual destruction. When considering short circuits to ground, the maximum output current is approximately 20 mA independent of the magnitude of V^+ .

Note 3: This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the comparators to go to the V^+ voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will re-establish when the input voltage, which was negative, again returns to a value greater than $-0.3 V_{DC}$ (at 25°C).

Note 4: These specifications are limited to $-55^\circ C \leq T_A \leq +125^\circ C$, for the LM139/LM139A. With the LM239/LM239A, all temperature specifications are limited to $-25^\circ C \leq T_A \leq +85^\circ C$, the LM339/LM339A temperature specifications are limited to $0^\circ C \leq T_A \leq +70^\circ C$, and the LM2901, LM3302 temperature range is $-40^\circ C \leq T_A \leq +85^\circ C$.

Note 5: The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the reference or input lines.

Note 6: 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 $V^+ - 1.5V$ at 25°C, but either or both inputs can go to $+30 V_{DC}$ without damage (25V for LM3302), independent of the magnitude of V^+ .

Note 7: The response time specified is a 100 mV input step with 5 mV overdrive. For larger overdrive signals 300 ns can be obtained, see typical performance characteristics section.

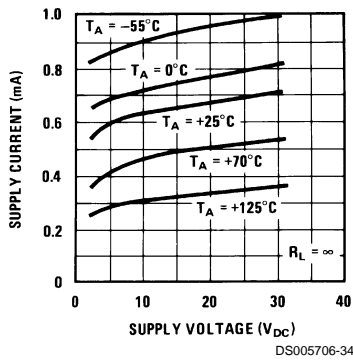
Note 8: Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be less than $-0.3 V_{DC}$ (or $0.3 V_{DC}$ below the magnitude of the negative power supply, if used) (at 25°C).

Note 9: At output switch point, $V_O = 1.4 V_{DC}$, $R_S = 0\Omega$ with V^+ from $5 V_{DC}$ to $30 V_{DC}$; and over the full input common-mode range ($0 V_{DC}$ to $V^+ - 1.5 V_{DC}$), at 25°C. For LM3302, V^+ from $5 V_{DC}$ to $28 V_{DC}$.

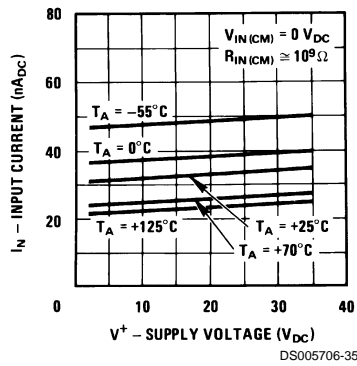
Note 10: Refer to RETS139AX for LM139A military specifications and to RETS139X for LM139 military specifications.

Typical Performance Characteristics LM139/LM239/LM339, LM139A/LM239A/LM339A, LM3302

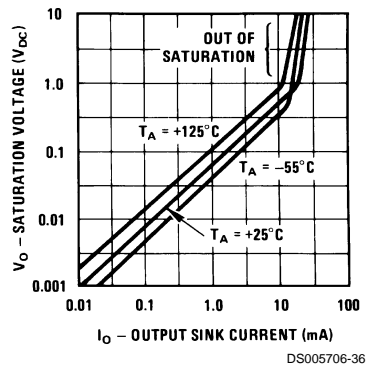
Supply Current



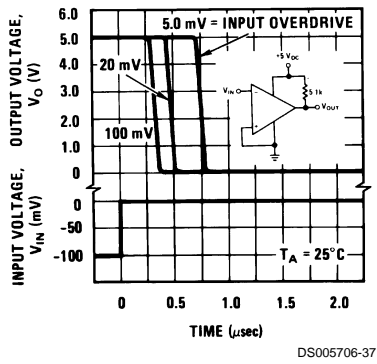
Input Current



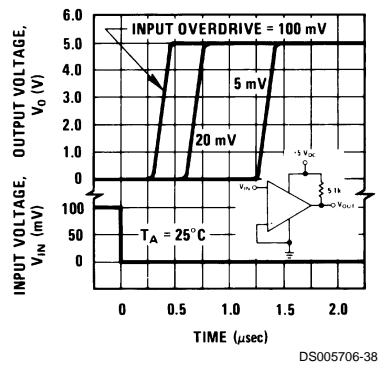
Output Saturation Voltage



Response Time for Various Input Overdrives — Negative Transition

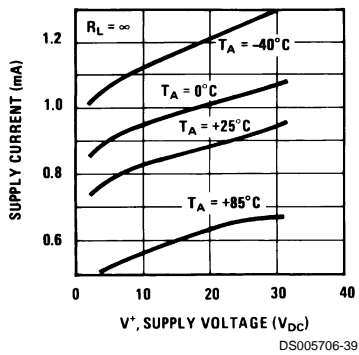


Response Time for Various Input Overdrives — Positive Transition

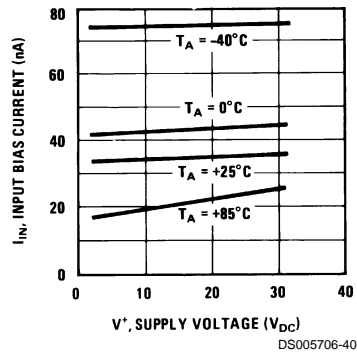


Typical Performance Characteristics LM2901

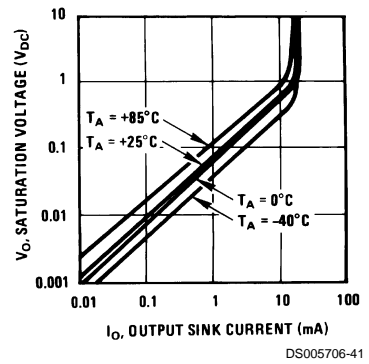
Supply Current



Input Current

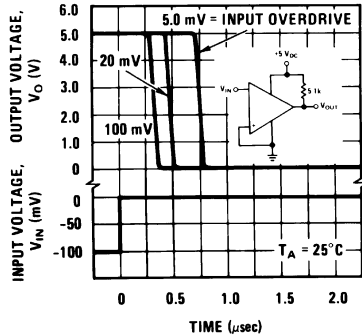


Output Saturation Voltage



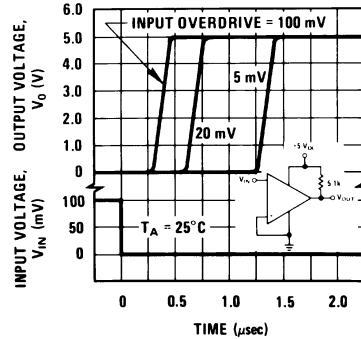
Typical Performance Characteristics LM2901 (Continued)

Response Time for Various Input Overdrives — Negative Transition



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Response Time for Various Input Overdrives-Positive Transition



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Application Hints

The LM139 series are high gain, wide bandwidth devices which, like most comparators, can easily oscillate if the output lead is inadvertently allowed to capacitively couple to the inputs via stray capacitance. This shows up only during the output voltage transition intervals as the comparator changes states. Power supply bypassing is not required to solve this problem. Standard PC board layout is helpful as it reduces stray input-output coupling. Reducing this input resistors to $< 10 \text{ k}\Omega$ reduces the feedback signal levels and finally, adding even a small amount (1 to 10 mV) of positive feedback (hysteresis) causes such a rapid transition that oscillations due to stray feedback are not possible. Simply socketing the IC and attaching resistors to the pins will cause input-output oscillations during the small transition intervals unless hysteresis is used. If the input signal is a pulse waveform, with relatively fast rise and fall times, hysteresis is not required.

All pins of any unused comparators should be tied to the negative supply.

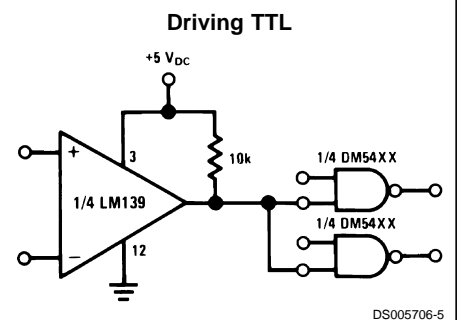
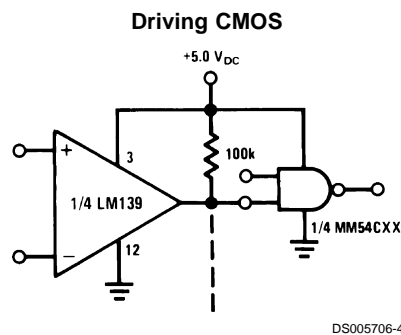
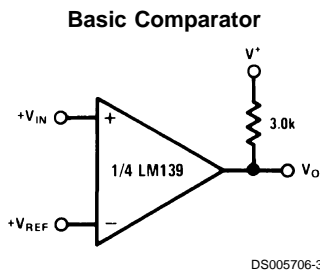
The bias network of the LM139 series establishes a drain current which is independent of the magnitude of the power supply voltage over the range of from $2 V_{DC}$ to $30 V_{DC}$.

It is usually unnecessary to use a bypass capacitor across the power supply line.

The differential input voltage may be larger than V^+ without damaging the device. Protection should be provided to prevent the input voltages from going negative more than $-0.3 V_{DC}$ (at 25°C). An input clamp diode can be used as shown in the applications section.

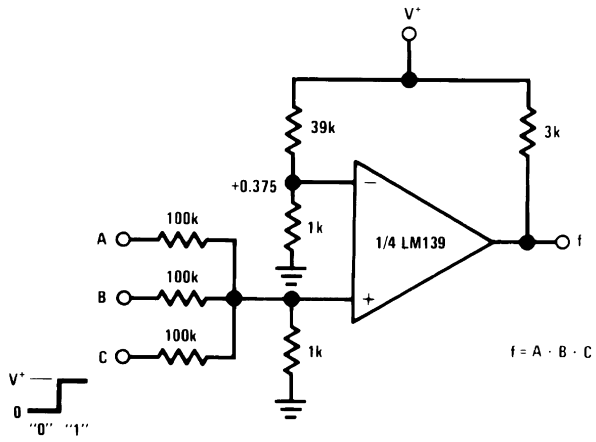
The output of the LM139 series is the uncommitted collector of a grounded-emitter NPN output transistor. Many collectors can be tied together to provide an output OR'ing function. An output pull-up resistor can be connected to any available power supply voltage within the permitted supply voltage range and there is no restriction on this voltage due to the magnitude of the voltage which is applied to the V^+ terminal of the LM139A package. The output can also be used as a simple SPST switch to ground (when a pull-up resistor is not used). The amount of current which the output device can sink is limited by the drive available (which is independent of V^+) and the β of this device. When the maximum current limit is reached (approximately 16 mA), the output transistor will come out of saturation and the output voltage will rise very rapidly. The output saturation voltage is limited by the approximately $60\Omega R_{SAT}$ of the output transistor. The low offset voltage of the output transistor (1 mV) allows the output to clamp essentially to ground level for small load currents.

Typical Applications ($V^+ = 5.0 V_{DC}$)

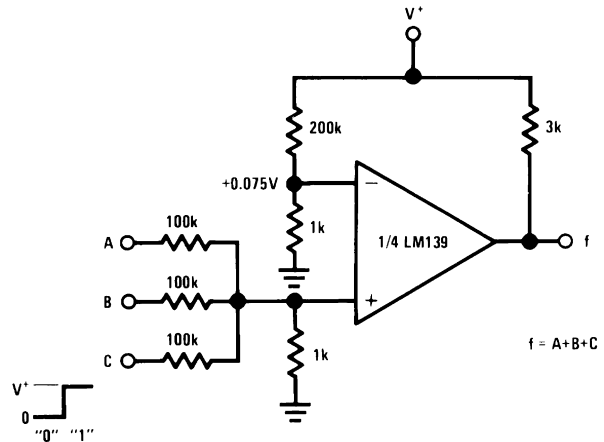


Typical Applications ($V^+ = 5.0 V_{DC}$) (Continued)

AND Gate

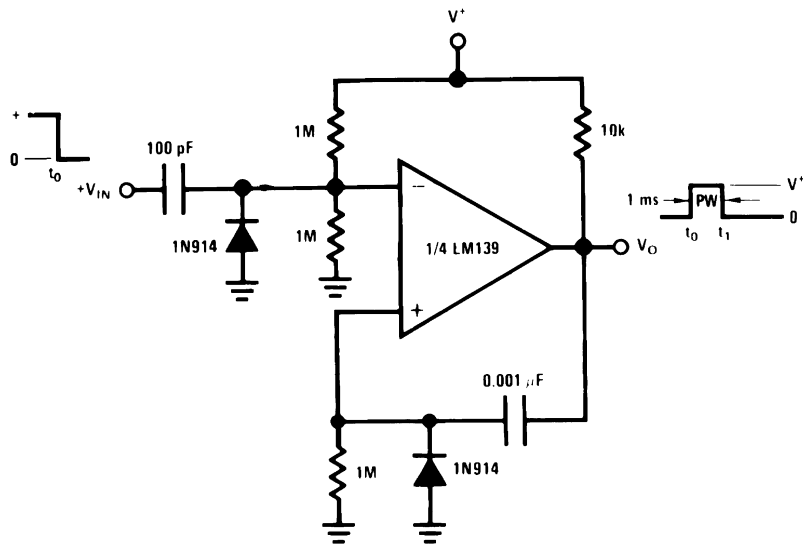


OR Gate

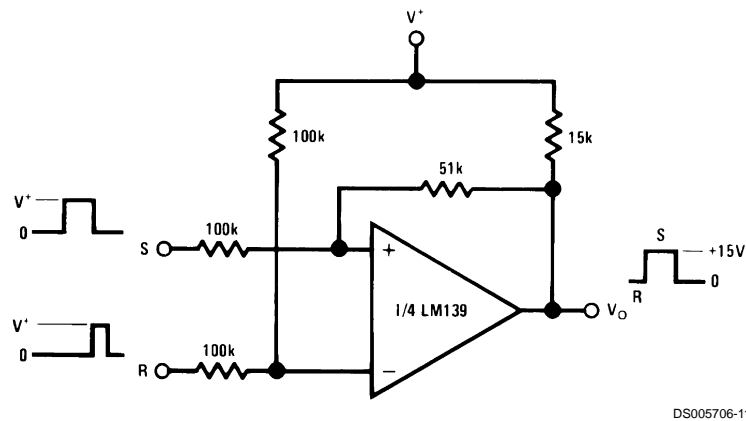


Typical Applications ($V^+ = 15 V_{DC}$)

One-Shot Multivibrator

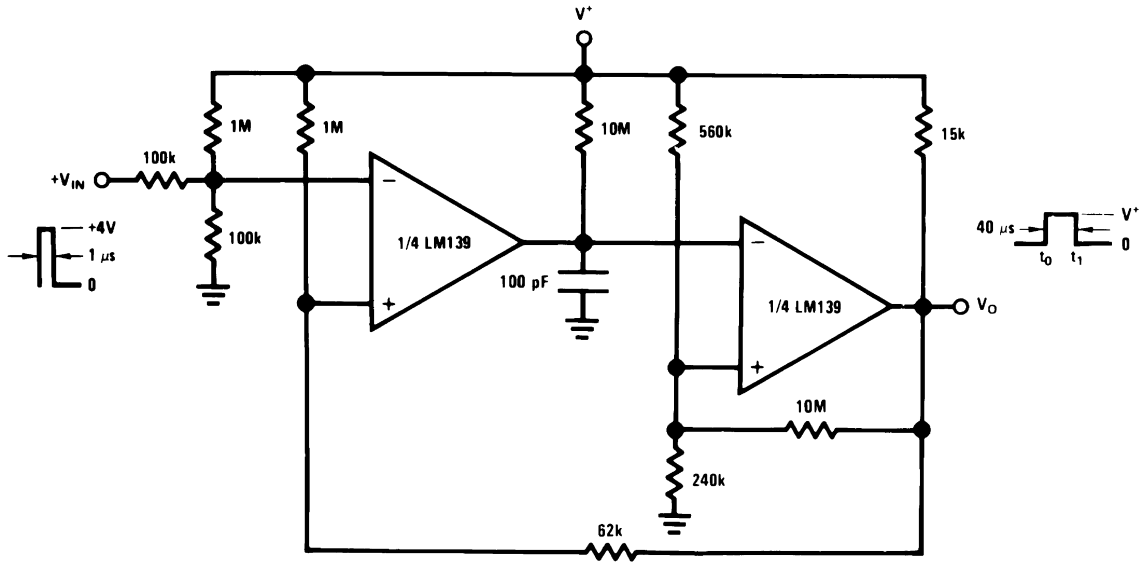


Bi-Stable Multivibrator



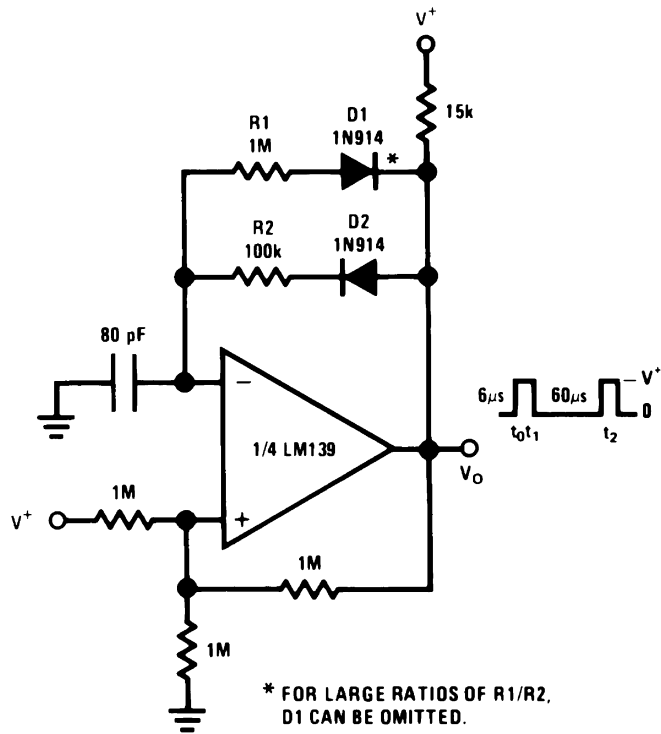
Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

One-Shot Multivibrator with Input Lock Out



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Pulse Generator

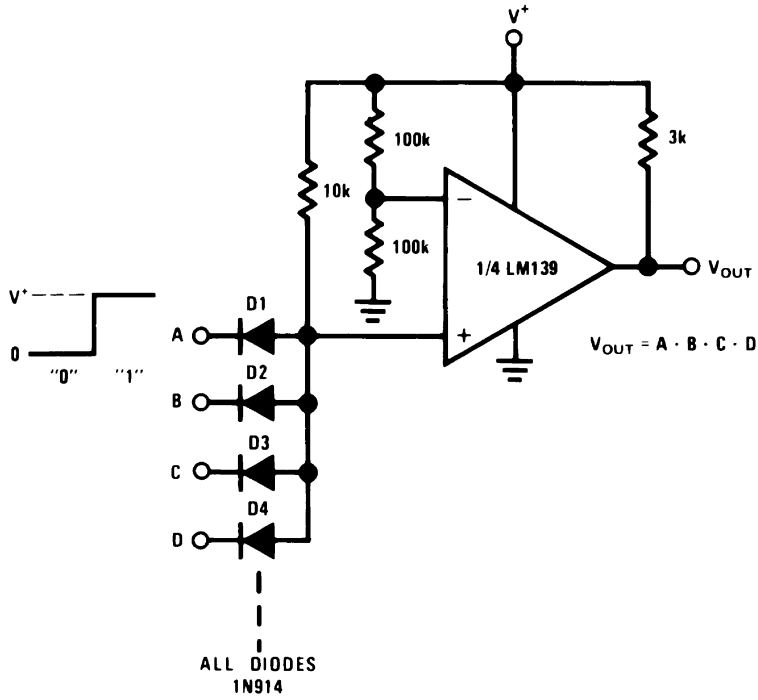


* FOR LARGE RATIOS OF $R1/R2$,
D1 CAN BE OMITTED.

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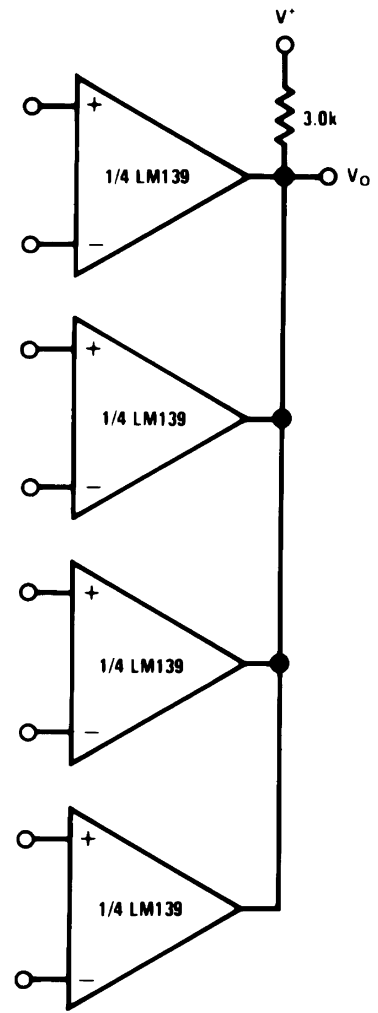
Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

Large Fan-In AND Gate



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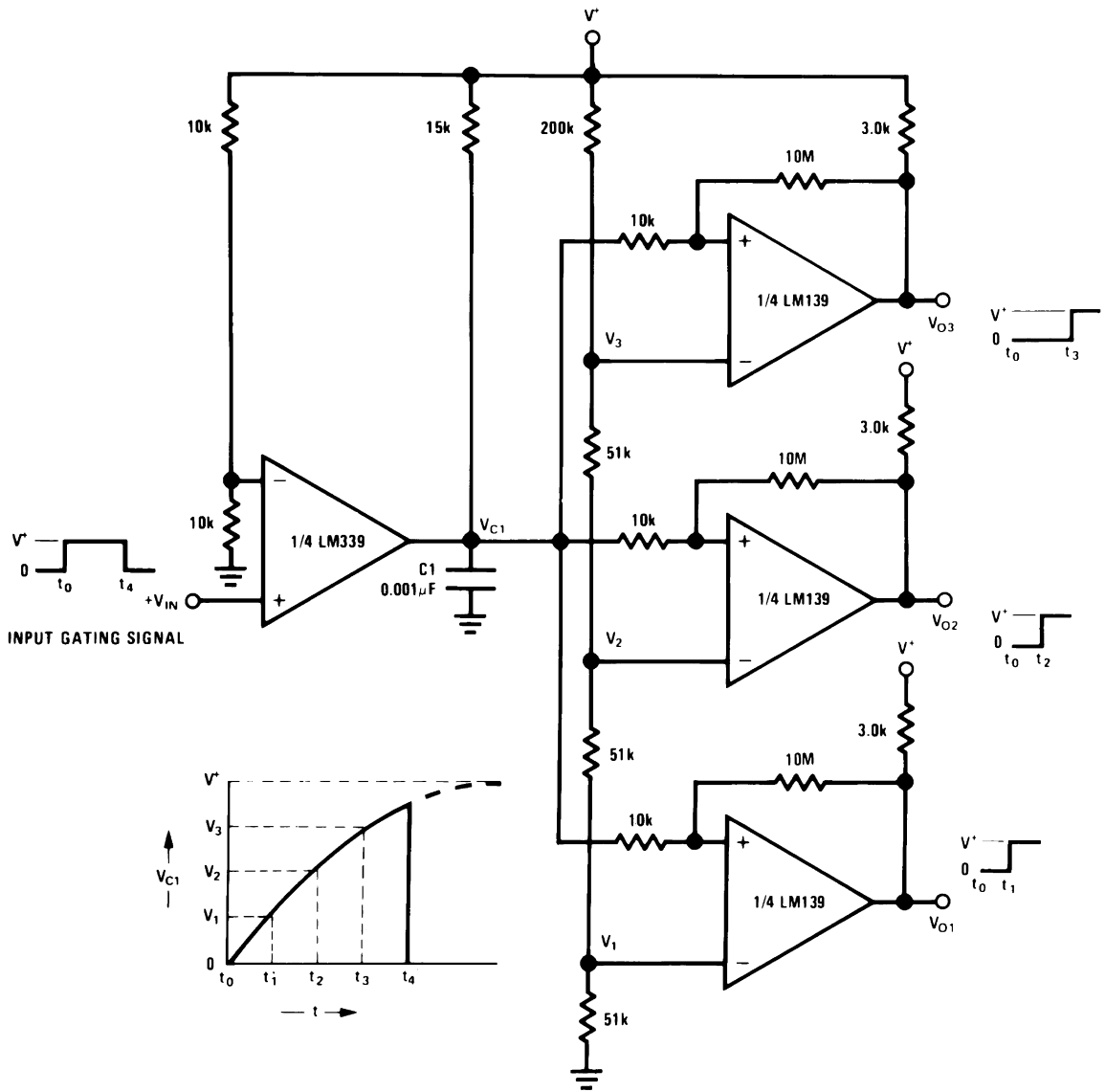
ORing the Outputs



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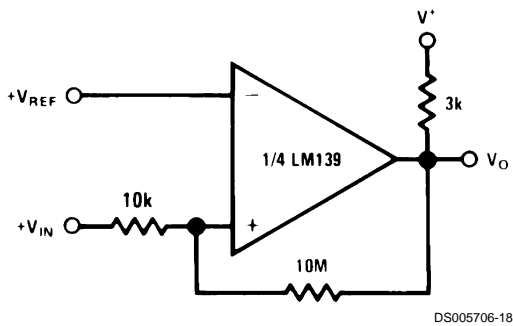
Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

Time Delay Generator



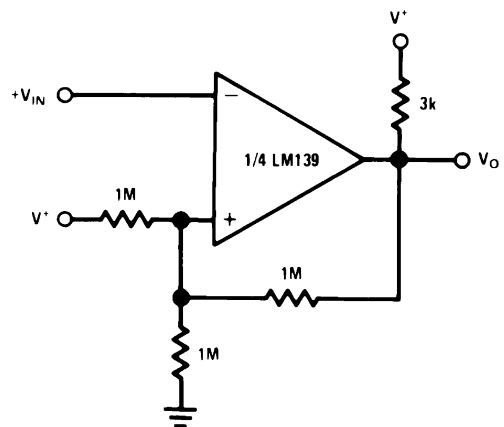
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Non-Inverting Comparator with Hysteresis



DS005706-18

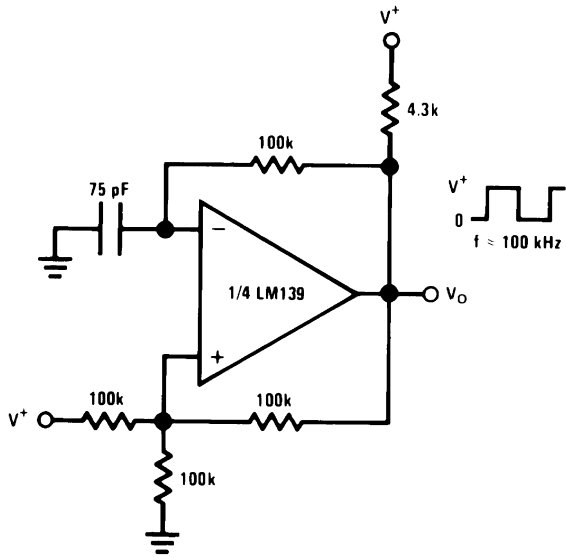
Inverting Comparator with Hysteresis



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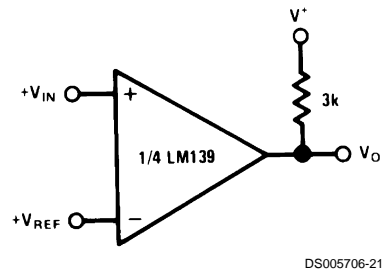
Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

Squarewave Oscillator



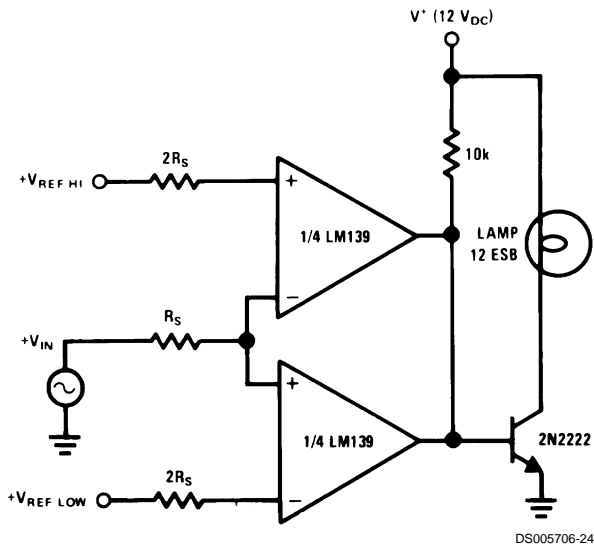
DS005706-16

Basic Comparator



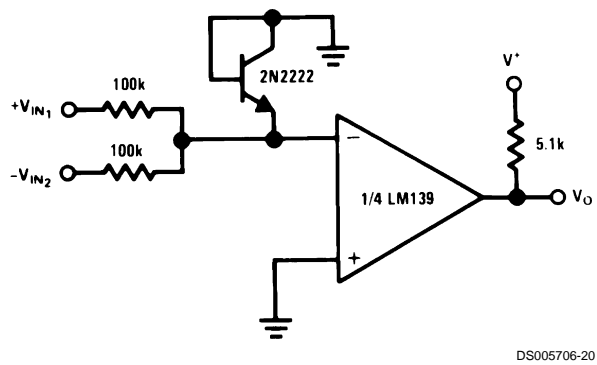
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Limit Comparator



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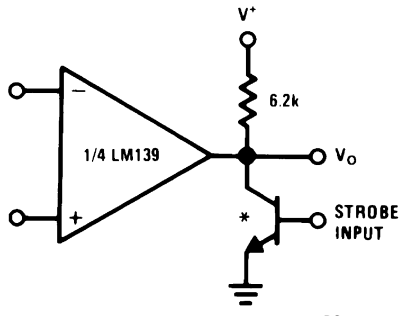
Comparing Input Voltages of Opposite Polarity



DS005706-20

Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

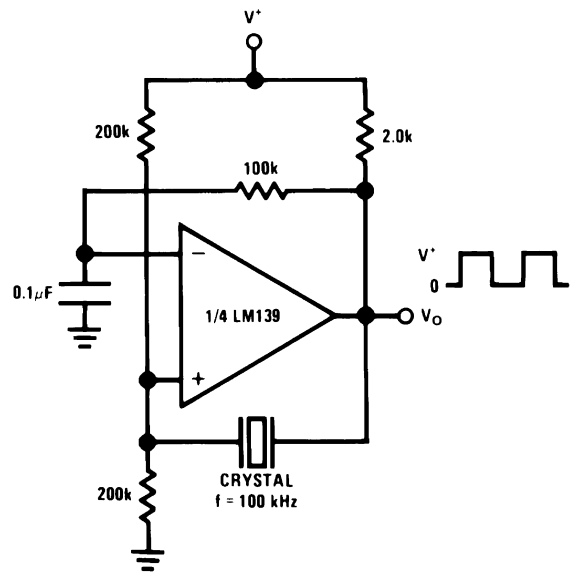
Output Strobing



DS005706-22

* Or open-collector logic gate without pull-up resistor

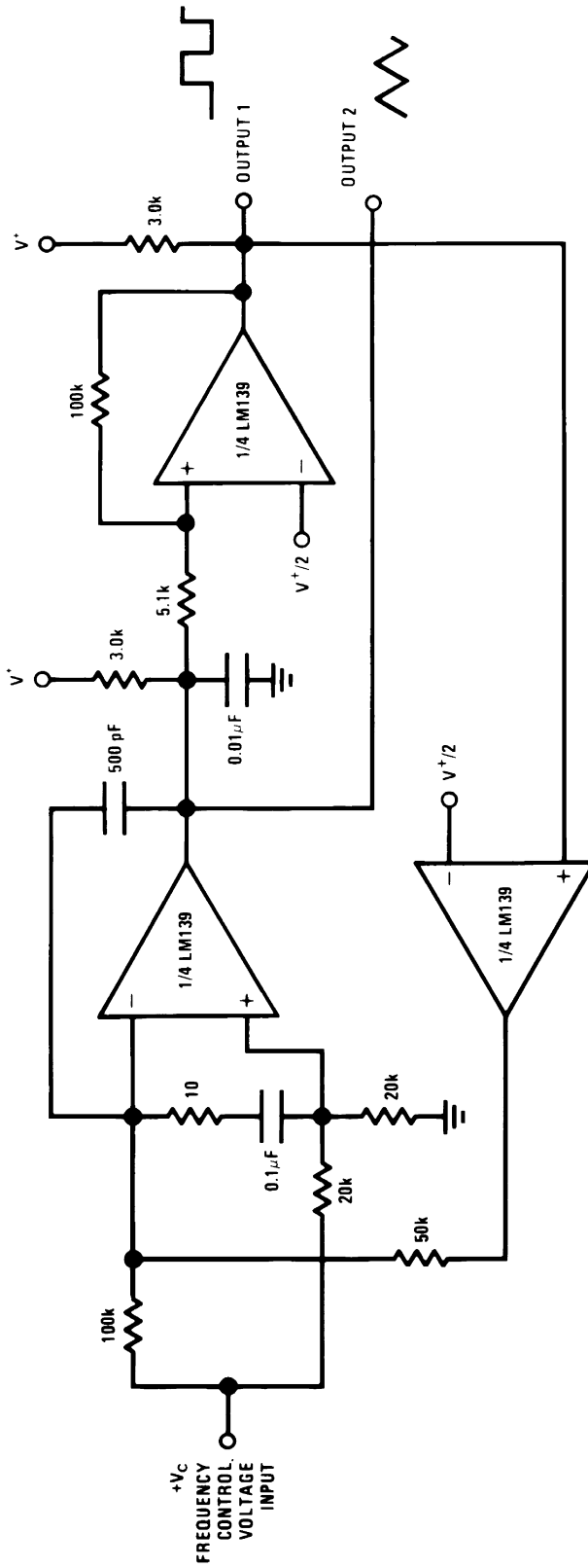
Crystal Controlled Oscillator



DS005706-25

Typical Applications $(V^+ = 15 V_{DC})$ (Continued)

Two-Decade High-Frequency VCO

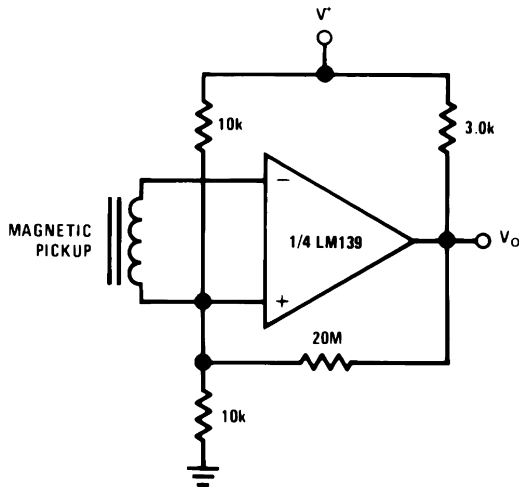


$V^+ = +30 V_{DC}$
 $250 mV_{DC} \leq V_{GS} \leq +50 V_{DC}$
 $700 Hz \leq f_o \leq 100 kHz$

DS005706-23

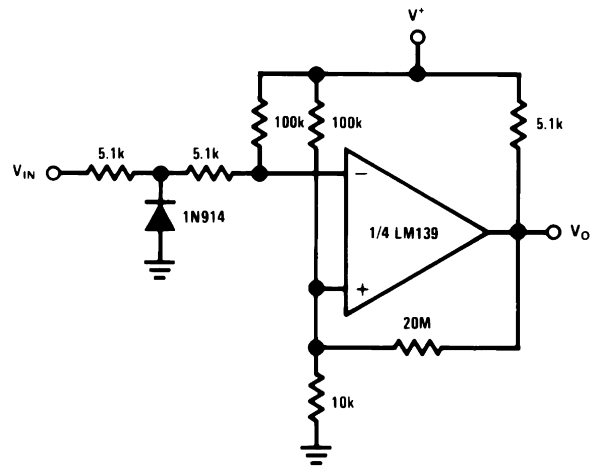
Typical Applications ($V^+ = 15 V_{DC}$) (Continued)

Transducer Amplifier



DS005706-28

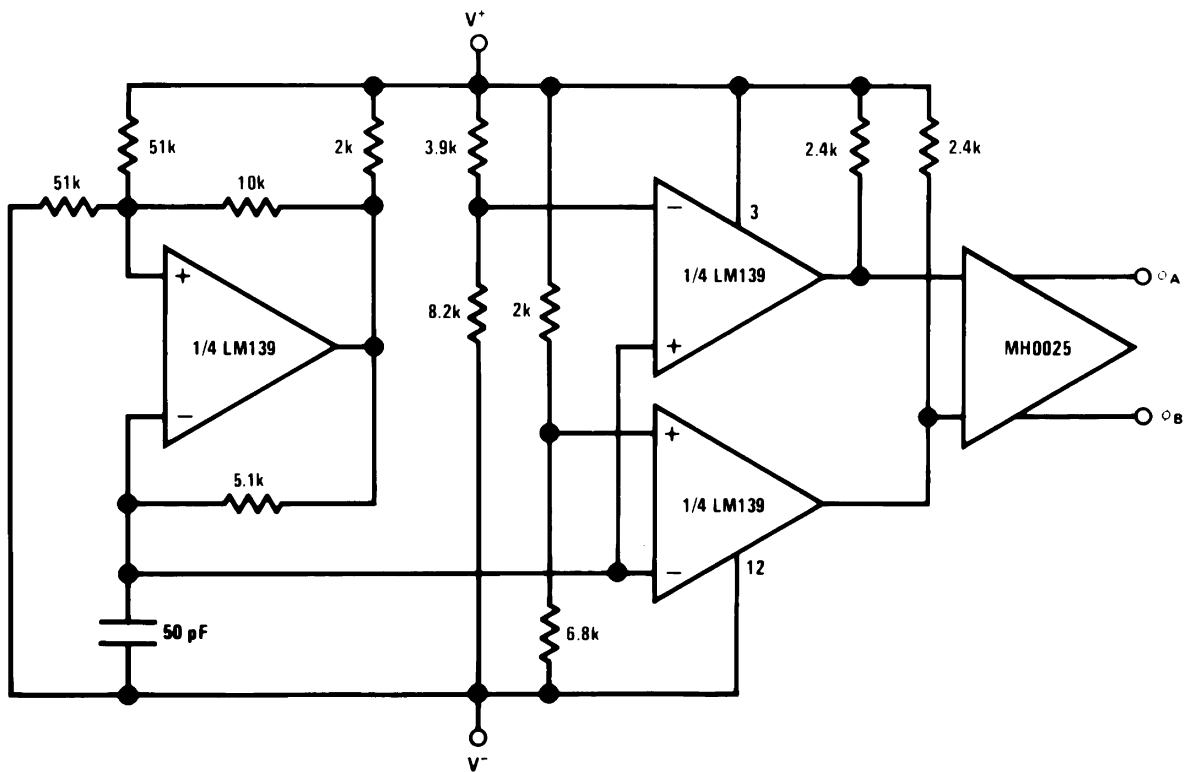
Zero Crossing Detector (Single Power Supply)



DS005706-30

Split-Supply Applications ($V^+ = +15 V_{DC}$ and $V^- = -15 V_{DC}$)

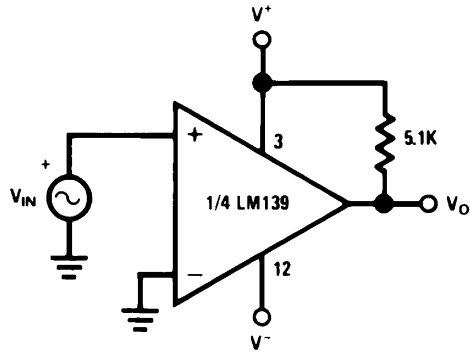
MOS Clock Driver



DS005706-31

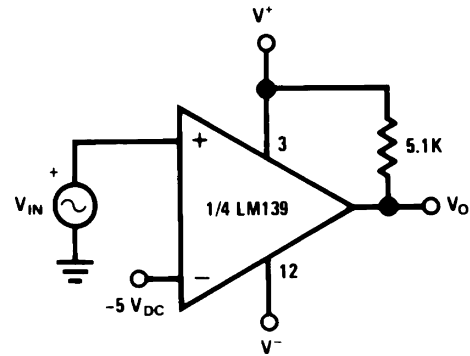
Split-Supply Applications ($V^+=+15\text{ V}_{DC}$ and $V^-=-15\text{ V}_{DC}$) (Continued)

Zero Crossing Detector



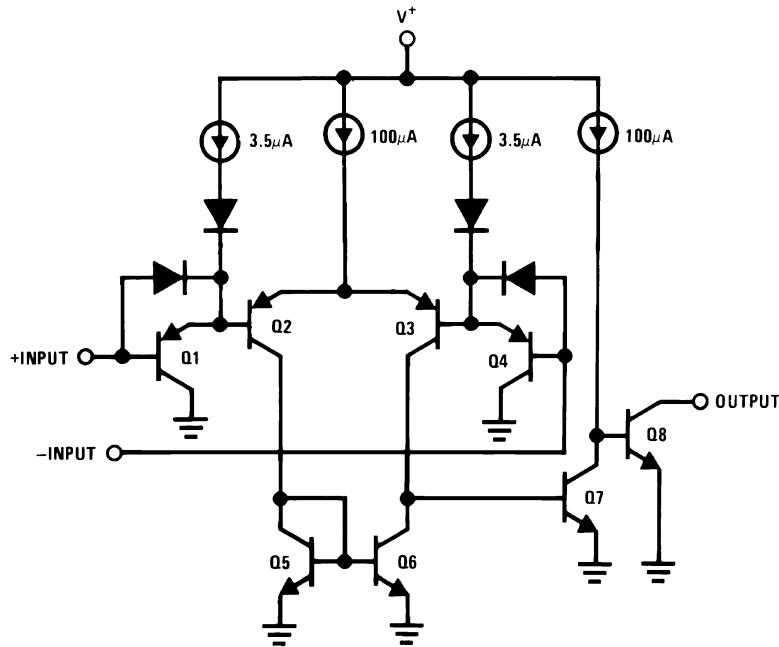
DS005706-32

Comparator With a Negative Reference



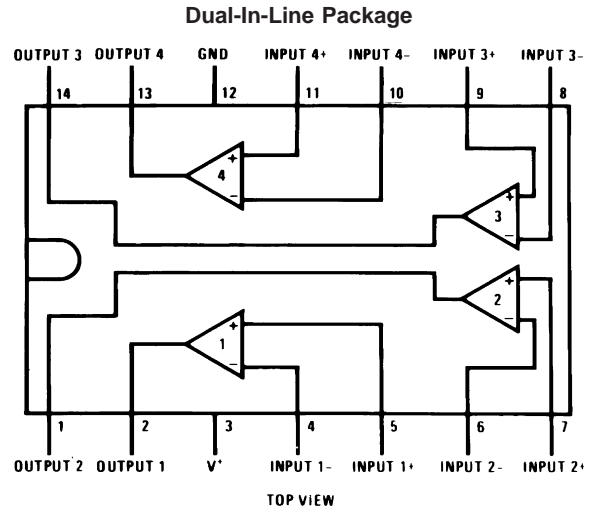
DS005706-33

Schematic Diagram



DS005706-1

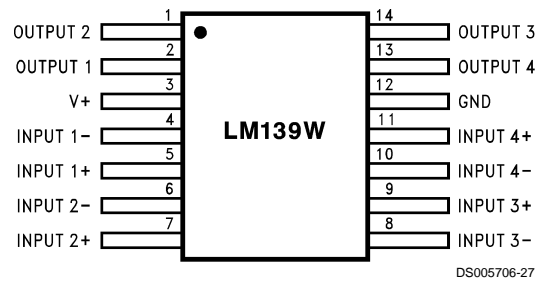
Connection Diagrams



**Order Number LM139J, LM139J/883 (Note 11), LM139AJ,
LM139AJ/883 (Note 12), LM239J, LM239AJ, LM339J**
See NS Package Number J14A

Order Number LM339AM, LM339AMX, LM339M, LM339MX or LM2901M
See NS Package Number M14A

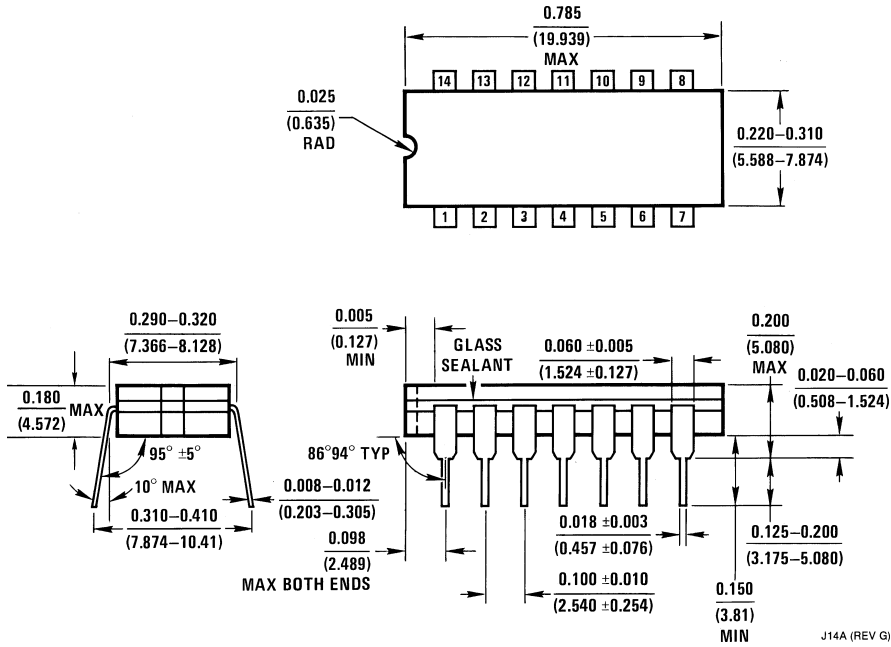
Order Number LM339N, LM339AN, LM2901N or LM3302N
See NS Package Number N14A



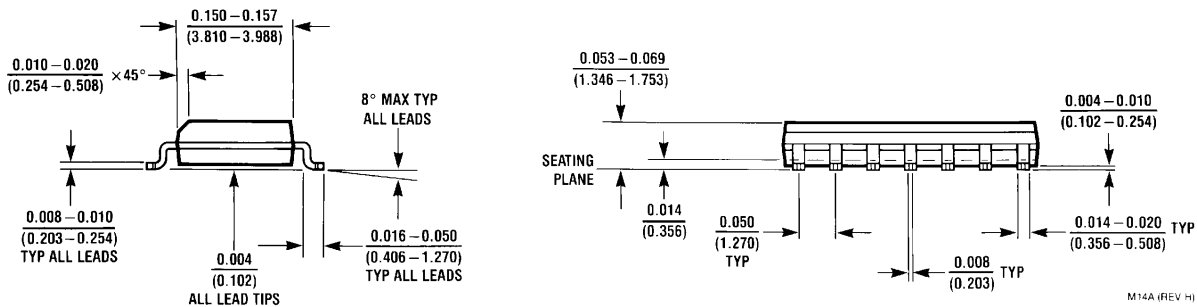
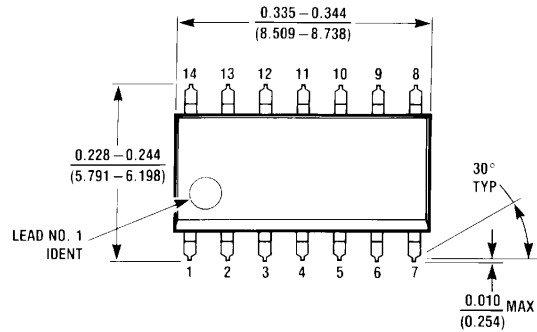
Order Number LM139AW/883 or LM139W/883 (Note 11)
See NS Package Number W14B,
LM139AWGRQMLV (Note 13)
See NS Package Number WG14A

Note 11: Available per JM38510/11201
Note 12: Available per SMD# 5962-8873901
Note 13: See STD Mil Dwg 5962R96738 for Radiation Tolerant Device

Physical Dimensions inches (millimeters) unless otherwise noted

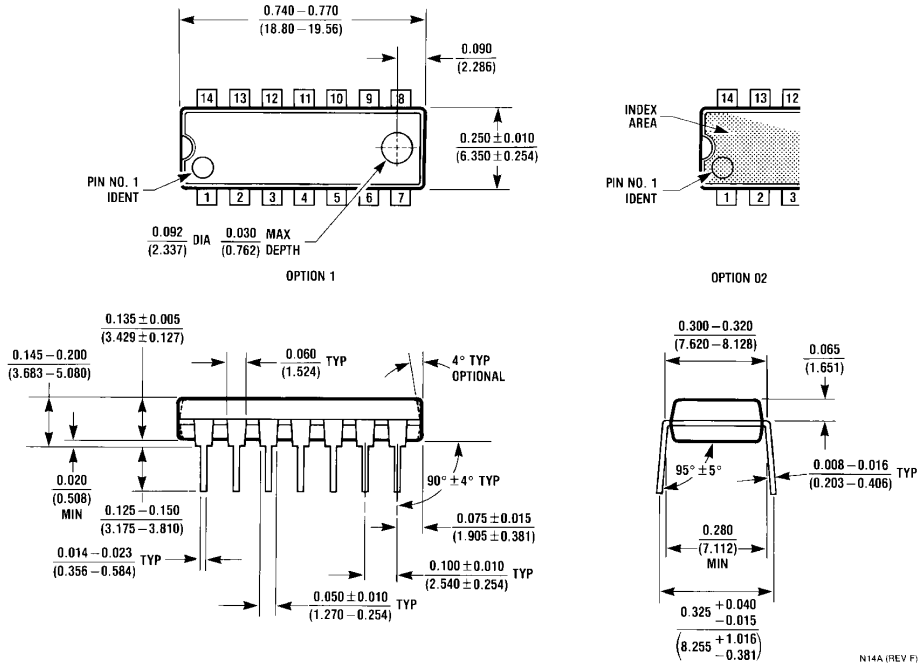


Ceramic Dual-In-Line Package (J)
 Order Number LM139J, LM139J/883, LM139AJ,
 LM139AJ/883, LM239J, LM239AJ, LM339J
 NS Package Number J14A

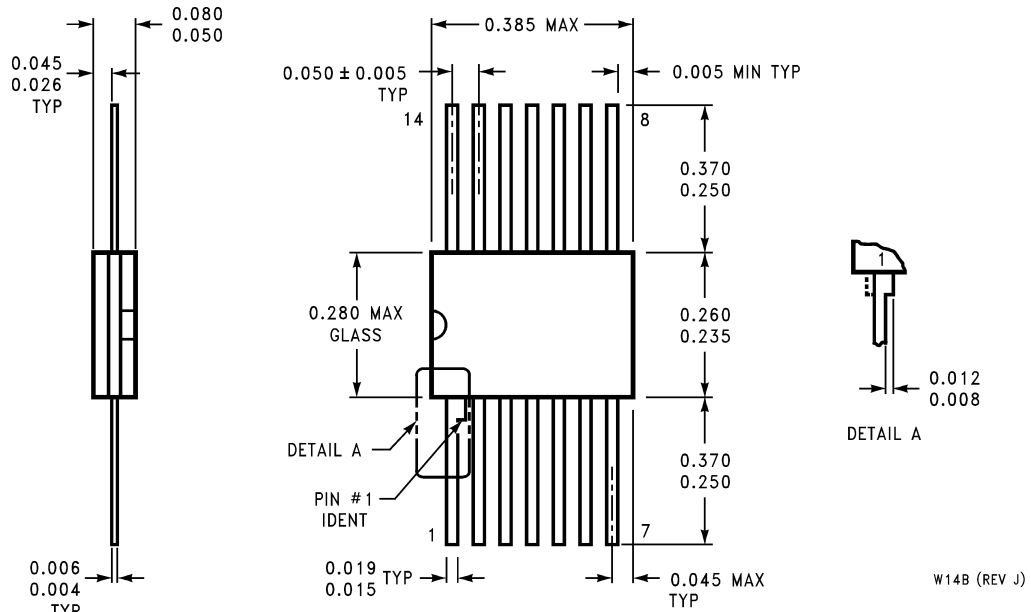


S.O. Package (M)
 Order Number LM339AM, LM339AMX, LM339M, LM339MX, LM2901M or LM2901MX
 NS Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Molded Dual-In-Line Package (N)
Order Number LM339N, LM339AN, LM2901N or LM3302N
NS Package Number N14A



Order Number LM139AW/883, LM139W/883, LM139AWG/883 or LM139WG/883
NS Package Number W14B

Notes

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LM3302 Product Folder

Low Power Low Offset Voltage Quad Comparator

[General Description](#)
[Features](#)
[Datasheet](#)
[Package & Models](#)
[Samples & Pricing](#)
[Design Tools](#)

Parametric Table

Number of Channels	4
Response Time, typ (us)	.50
Supply Voltage, min (Volt)	2
Supply Voltage, max (Volt)	28
Supply Current per Channel, typ (mA)	.20

Parametric Table

Input Range	Vcm to V-
Output Type	Open Drain
Output Current, typ (mA)	16
Vos, Room max (mV)	20
Input Bias Current, max (nA)	1000
Special Functions	-

Datasheet

Title	Size in Kbytes	Date	View Online	Download	Receive via Email
LM139 LM239 LM339 LM2901 LM3302 Low Power Low Offset Voltage Quad Comparators	400 Kbytes	5-Mar-01	View Online	Download	Receive via Email

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Package Availability, Models, Samples & Pricing

Part Number	Package			Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	Pins	MSL		SPICE	IBIS		Qty	\$US each		
LM3302N	MDIP	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.2600	rail of 25	[logo]cUcZc3cTcP LM3302N
LM3302 MDA	Die			Full production	N/A	N/A	Samples			tray of N/A	-
LM3302 MWA	Wafer			Full production	N/A	N/A				wafer jar of N/A	-

General Description

The LM139 series consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The LM139 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic- where the low power drain of the LM339 is a distinct advantage over standard comparators.

Features

Wide supply voltage range	
LM139/139A Series	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM2901:	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM3302:	2 to 28 V _{DC} or ± 1 to ± 14 V _{DC}
Very low supply current drain (0.8 mA) - independent of supply voltage	
Low input biasing current:	25 nA
Low input offset current:	± 5 nA
Offset voltage:	± 3 mV
Input common-mode voltage range includes GND	
Differential input voltage range equal to the power supply voltage	
Low output saturation voltage:	250 mV at 4 mA
Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems	

Applications

- High precision comparators
- Reduced V_{OS} drift over temperature
- Eliminates need for dual supplies
- Allows sensing near GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

Design Tools

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LM139 Product Folder

Low Power Low Offset Voltage Quad Comparator

[General Description](#)

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[Design Tools](#)

[Application Notes](#)

Parametric Table

Number of Channels	4
Response Time, typ (us)	.50
Supply Voltage, min (Volt)	2
Supply Voltage, max (Volt)	36
Supply Current per Channel, typ (mA)	.20

Parametric Table

Input Range	Vcm to V-
Output Type	Open Drain
Output Current, typ (mA)	16
Vos, Room max (mV)	2, 5
Input Bias Current, max (nA)	300
Special Functions	-

Datasheet

Title	Size in Kbytes	Date	View Online	Download	Receive via Email
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Package Availability, Models, Samples & Pricing

Part Number	Package			Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	Pins	MSL		SPICE	IBIS		Qty	\$US each		
LM139AJ	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$1.7300	rail of 25	[logo]cUcZc3cTcP LM139AJ

LM139J	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	250+	\$1.1200	rail of 25	[logo]cUcZc3cTcP LM139J
5962-87739012A	LCC	20	MSL	Full production	N/A	N/A	Buy Now	50+	\$10.8000	rail of 50	[logo]cZcSc4cA QcMSE 5962-87739012A
LM139AE/883	LCC	20	MSL	Full production	N/A	N/A	Buy Now	50+	\$6.4000	rail of 50	[logo]cZcSc4cA LM139AE /883QcM SE
LM139E/883	LCC	20	MSL	Full production	N/A	N/A	Buy Now	50+	\$8.5500	rail of 50	[logo]cZcSc4cA LM139E /883QcM SE
LM139J-MPR	CERDIP	14	MSL	Preliminary	N/A	N/A				rail of N/A	[logo]cZcSc4cASE LM139AJ-MPR PROTO
RM139AJ-MPR	CERDIP	14	MSL	Preliminary	N/A	N/A				rail of N/A	[logo]cZcSc4cASE RM139AJ-MPR WAFER # cR
5962-8773901CA	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$3.5200	rail of 25	[logo]cZcSc4cASE 5962-8773901CA/QcM
LM139AJ/883	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$2.5000	rail of 25	[logo]cZcSc4cASE LM139AJ/883QcM
LM139J/883	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$1.8000	rail of 25	[logo]cZcSc4cASE LM139J/883QcM
5962-8773901DA	CERPACK	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$10.4000	rail of 19	[logo]cZcSc4cA QcMSE 5962-8773901DA
LM139AW/883	CERPACK	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$10.4000	rail of 19	[logo]cZcSc4cASE LM139AW/883 QcM
LM139W/883	CERPACK	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$8.5000	rail of 19	[logo]cZcSc4cASE LM139W/883 QcM
LM139AWG/883	Ceramic SOIC	14	MSL	Full production	N/A	N/A		50+	\$9.9500	tray of 42	[logo]cZcSc4cASE LM139AWG/883 QcM
LM139WG/883	Ceramic SOIC	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$8.0000	tray of 42	[logo]cZcSc4cASE LM139WG/883 QcM
5962-8773901XA	Ceramic SOIC	14	MSL	Full production	N/A	N/A	Buy Now	50+	\$10.0000	tray of 42	[logo]cZcSc4cASE 5962-8773901XA Q
JM38510/11201BC	CERDIP	14	MSL	Full production	N/A	N/A		50+	\$3.2000	rail of 25	[logo] cZcSc4cASE JM38510/11201BCA 27014 QS
JM38510/11201BD	CERPACK	14	MSL	Full production	N/A	N/A		50+	\$8.8000	rail of 19	[logo]cZcSc4cASE JM38510/ 11201BDA 27014 QS
JL139BZA	Ceramic SOIC	14	MSL	Full production	N/A	N/A				tray of N/A	[logo]cZcSc4cASE JM38510/ 11201BZA 27014 Q

RM139AJRQMLV	CERDIP	14	MSL	Preliminary	N/A	N/A				rail of N/A	[logo]cZcSc4cASE RM139AJRQMLV cR WAFER#
JM38510/11201SC	CERDIP	14	MSL	Full production	N/A	N/A		50+	\$175.0000	rail of 25	[logo] cZcSc4cASE JM38510/11201SCA 27014 Q
5962-9673801VCA	CERDIP	14	MSL	Full production	N/A	N/A		50+	\$190.0000	rail of 25	[logo]cZcSc4cASE LM139AJ-QMLV 5962-9673801VCA
RM139AWRQMLV	CERPACK	14	MSL	Preliminary	N/A	N/A				rail of N/A	[logo]cZcSc4cASE RM139AWR QMLV cR WAFER#
JM38510/11201SD	CERPACK	14	MSL	Full production	N/A	N/A		50+	\$175.0000	rail of 19	[logo]cZcSc4cA JM38510/ 11201SDA 27014 QSE
5962-9673801VDA	CERPACK	14	MSL	Full production	N/A	N/A		50+	\$186.0000	rail of 19	[logo]cZcSc4cASE LM139AW- QMLV 5962- 9673801VDA
JL139SZA	Ceramic SOIC	14	MSL	Full production	N/A	N/A				tray of N/A	[logo]cZcSc4cASE JM38510/ 11201SZA 27014 Q
5962-9673801VXA	Ceramic SOIC	14	MSL	Full production	N/A	N/A		50+	\$188.0000	tray of 42	[logo]cZcSc4cASE LM139AWG- QMLV 5962- 9673801VXA
LM139AJ-MLS	CERDIP	14	MSL	Full production	N/A	N/A				rail of N/A	[logo]cZcSc4cASE LM139AJ-MLS
LM139AW-MLS	CERPACK	14	MSL	Full production	N/A	N/A				rail of N/A	[logo]cZcSc4cA LM139AW- MLS SE
LM139W-MLS	CERPACK	14	MSL	Full production	N/A	N/A				rail of N/A	[logo]cZcSc4cA LM139W- MLS SE
LM139 MD8	Die			Full production	N/A	N/A	Samples			tray of N/A	-
LM139 MDS	Die			Full production	N/A	N/A		50+	\$37.5000	tray of 100	-
LM139 MW8	Wafer			Full production	N/A	N/A				wafer jar of N/A	-

General Description

The LM139 series consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The LM139 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic- where the low power drain of the LM339 is a distinct advantage over standard comparators.

Features

Wide supply voltage range	
LM139/139A Series	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM2901:	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM3302:	2 to 28 V _{DC} or ± 1 to ± 14 V _{DC}
Very low supply current drain (0.8 mA) - independent of supply voltage	
Low input biasing current:	25 nA
Low input offset current:	± 5 nA
Offset voltage:	± 3 mV
Input common-mode voltage range includes GND	
Differential input voltage range equal to the power supply voltage	
Low output saturation voltage:	250 mV at 4 mA
Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems	

Applications

- High precision comparators
- Reduced V_{OS} drift over temperature
- Eliminates need for dual supplies
- Allows sensing near GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

Design Tools

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AN-74: Application Note 74 LM139/LM239/LM339 A Quad of Independently Functioning Comparators	555 Kbytes	24-Feb-99	View Online	Download	Receive via Email
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LM339 Product Folder

Low Power Low Offset Voltage Quad Comparator

See Also: [LMV339](#) - lower voltage
[LM393](#) - dual version

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[Application Notes](#)

Parametric Table

Number of Channels	4
Response Time, typ (us)	.50
Supply Voltage, min (Volt)	2
Supply Voltage, max (Volt)	36
Supply Current per Channel, typ (mA)	.20

Parametric Table

Input Range	Vcm to V-
Output Type	Open Drain
Output Current, typ (mA)	16
Vos, Room max (mV)	2, 5
Input Bias Current, max (nA)	400
Special Functions	-

Datasheet

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Package Availability, Models, Samples & Pricing

Part Number	Package			Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	Pins	MSL		SPICE	IBIS		Qty	\$US each		
LM339AM	SOIC NARROW	14	MSL	Full production	N/A	N/A	<input type="button" value="Buy Now"/>	1K+	\$0.1200	rail of 55	[logo]cUcZc2cT LM339AM
LM339M	SOIC NARROW	14	MSL	Full production	N/A	N/A	<input type="button" value="24 Hour Buy Now"/>	1K+	\$0.0900	rail of 55	[logo]cUcZc2cT LM339M

LM339AMX	SOIC NARROW	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.1200	reel of 2500	[logo]cUcZc2cT LM339AM
LM339MX	SOIC NARROW	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.0900	reel of 2500	[logo]cUcZc2cT LM339M
LM339AN	MDIP	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.1500	rail of 25	[logo]cUcZc3cTcP LM339AN
LM339N	MDIP	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.1030	rail of 25	[logo]cUcZc3cTcP LM339N
LM339J	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	1K+	\$0.8800	rail of 25	[logo]cUcZc3cTcP LM339J
LM339 MDC	Die			Full production	N/A	N/A	Samples			tray of N/A	-
LM339 MWC	Wafer			Full production	N/A	N/A				wafer jar of N/A	-

General Description

The LM139 series consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. The LM139 series was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic- where the low power drain of the LM339 is a distinct advantage over standard comparators.

Features

Wide supply voltage range	
LM139/139A Series	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM2901:	2 to 36 V _{DC} or ± 1 to ± 18 V _{DC}
LM3302:	2 to 28 V _{DC} or ± 1 to ± 14 V _{DC}

Very low supply current drain (0.8 mA) - independent of supply voltage	
Low input biasing current:	25 nA
Low input offset current:	± 5 nA
Offset voltage:	± 3 mV
Input common-mode voltage range includes GND	
Differential input voltage range equal to the power supply voltage	
Low output saturation voltage:	250 mV at 4 mA
Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems	

Applications

- High precision comparators
- Reduced V_{OS} drift over temperature
- Eliminates need for dual supplies
- Allows sensing near GND
- Compatible with all forms of logic
- Power drain suitable for battery operation

Design Tools

Title	Size in Kbytes	Date	<input type="checkbox"/> View Online	<input type="checkbox"/> Download	<input type="checkbox"/> Receive via Email
Amplifiers Selection Guide software for Windows	7 Kbytes	12-Jun-2002	View		

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Application Notes

Title	Size in Kbytes	Date	<input type="checkbox"/> View Online	<input type="checkbox"/> Download	<input type="checkbox"/> Receive via Email
AN-74: Application Note 74 LM139/LM239/LM339 A Quad of Independently Functioning Comparators	555 Kbytes	24-Feb-99	View Online	Download	Receive via Email
CN-1: Analog to Digital Conversion Techniques with COPS Family Microcontrollers	601 Kbytes	28-Jun-96	View Online	Download	Receive via Email
AN-274: CMOS A/D Converter Interfaces Easily with Many Microprocessors	99 Kbytes	4-Nov-95	View Online	Download	Receive via Email
AN-286: Applications of the LM392 Comparator Op Amp IC	135 Kbytes	4-Nov-95	View Online	Download	Receive via Email

AN-288: Application Note 288 System-Oriented DC-DC Conversion Techniques	405 Kbytes	1-May-98	View Online	Download	Receive via Email
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