LM319 - High Speed Dual Comparator

Features

- Two independent comparators
- Operates from a single 5V supply
- Typically 80 ns response time at ±15V
- Minimum fan-out of 2 each side
- Maximum input current of 1 µA over temperature
- Inputs and outputs can be isolated from system ground
- High common mode slew rate

Parametric Table

Response Time	0.08 us
Output Bus	Open Drain
Supply Min	5 Volt
Supply Max	36 Volt
Channels	2 Channels
Offset Voltage max, 25C	8, 1 mV
Output Current	25 mA
Input Range	Not R-R
Supply Current Per Channel	4 mA
PowerWise Rating 3	320 uA x us
Max Input Bias Current	1200, 1000 nA
Special Features	Undefined
Temperature Min	0 deg C
Temperature Max	70 deg C
Function	Comparator
AEC Q-100 Automotive Grade	0

Datasheet

RoHS Compliance Information

LM119/LM219/LM319 High Speed Dual Comparator

Package Availability, Models

Part Number	Package							Factory Lead Time		Models				Std Pack Size	Package Marking Format
	Type	Pins	Spec.	MSL Rating	Peak Reflow	RoHS Report	CAD Symbols	Weeks	Qty						
LM319AM	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A				rail of 55	NSUZXYTT LM319AM
			NOPB	1	260			6 weeks	3000						
LM319M	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A				rail of 55	NSUZXYTT LM319M
			NOPB	1	260			6 weeks	2000						
LM319AMX	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A				reel of 2500	NSUZXYTT LM319AM
			NOPB	1	260			6 weeks	7500						
LM319MX	SOIC NARROW	14	STD	1	235	RoHS	Download	Full production		N/A				reel of 2500	NSUZXYTT LM319M
			NOPB	1	260			8 weeks	5000						
LM319N	MDIP	14	STD	1	NA	RoHS	Download	Full production		N/A				rail of 25	NSUZXYYTTE# LM319N
			NOPB	1	NA			8 weeks	1000						
LM319H	TO-100	10	NOPB	1	NA	RoHS	Download	Obsolete		N/A				box of 500	NSZXYTTE# LM319H
								6 weeks	1000						
LM319 MDA	Unpackaged Die							Lifetime buy		N/A				tray of N/A	-
								N/A	N/A						
LM319 MWA	Wafer							Full production		N/A				wafer jar of N/A	-
								N/A	150000						

Obsolete Versions

Obsolete Part	Alternate Part or Supplier	Source	Last Time Buy Date
LM319AN	NONE	NONE	03/10/98
LM319H	LM119H	NSC	12/03/2008
LM319J	LM319N	NATIONAL SEMICONDUCTOR	06/07/2001

General Description

The LM119 series are precision high speed dual comparators fabricated on a single monolithic chip. They are designed to operate over a wide range of supply voltages down to a single 5V logic supply and ground. Further, they have higher gain and lower input currents than devices like the LM710. The uncommitted collector of the output stage makes the LM119 compatible with RTL, DTL and TTL as well as capable of driving lamps and relays at currents up to 25 mA.

The LM319A offers improved precision over the standard LM319, with tighter tolerances on offset voltage, offset current, and voltage gain.

Although designed primarily for applications requiring operation from digital logic supplies, the LM119 series are fully specified for power supplies up to ±15V. It features faster response than the LM111 at the expense of higher power dissipation. However, the high speed, wide operating voltage range and low package count make the LM119 much more versatile than older devices like the LM711.

The LM119 is specified from -55°C to +125°C, the LM219 is specified from -25°C to +85°C, and the LM319A and LM319 are specified from 0°C to +70°C.

Reliability Metrics

Part Number	Process	EFR Reject	EFR Sample Size	PPM *	LTA Rejects	LTA Device Hours	FITS	MTTF (Hours)
LM319AM	SLM	0	42786	0	0	3352500	2	951281028
LM319AMX	SLM	0	42786	0	0	3352500	2	951281028
LM319M	SLM	0	42786	0	0	3352500	2	951281028
LM319MX	SLM	0	42786	0	0	3352500	2	951281028
LM319N	SLM	0	42786	0	0	3352500	2	951281028

Note: The Early Failure Rates were calculated as point estimates. The Long Term Failure Rates were calculated at 60% confidence using the Arrhenius equation at 0.7eV activation energy and derating the assumed stress temperature of 150°C to an application temperature of 55°C.

National Semiconductor

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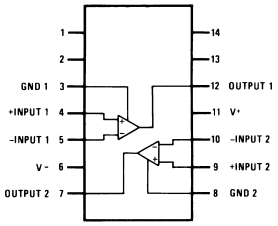
Connection Diagram

Dual-In-Line Package



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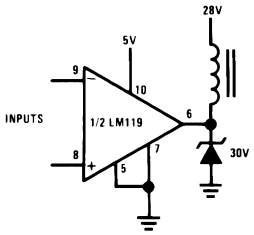
Top View
Order Number LM119J, LM119J/883 (Note 1)**, LM219J, LM319J, LM319AM, LM319M, LM319AN or LM319N**
See NS Package Number J14A, M14A or N14A

Note 1: Also available per SMD# 8601401 or JM38510/10306

Typical Applications (Note 2)

Relay Driver



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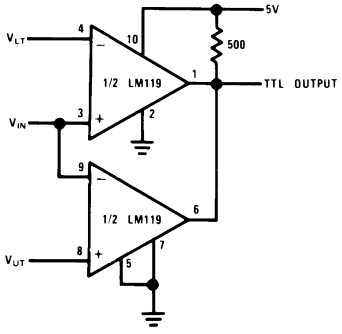
Note 2: Pin numbers are for metal can package.

Window Detector



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V_{OUT} = 5V for $V_{LT} \leq V_{IN} \leq V_{UT}$
V_{OUT} = 0 for $V_{IN} \leq V_{LT}$ or $V_{IN} \geq V_{UT}$

Absolute Maximum Ratings

LM319A/319 (Note 9)

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

Total Supply Voltage	36V
Output to Negative Supply Voltage	36V
Ground to Negative Supply Voltage	25V
Ground to Positive Supply Voltage	18V
Differential Input Voltage	±5V
Input Voltage (Note 10)	±15V
Power Dissipation (Note 11)	500 mW
Output Short Circuit Duration	10 sec
ESD rating (1.5 kΩ in series with 100 pF)	800V
Storage Temperature Range	−65˚C to 150˚C
Lead Temperature (Soldering, 10 sec.)	260˚C
Soldering Information	
Dual-In-Line Package	
Soldering (10 sec.)	260˚C
Small Outline Package	
Vapor Phase (60 sec.)	215˚C
Infrared (15 sec.)	220˚C

See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” for other methods of soldering surface mount devices.

Operating Temperature Range

LM319A, LM319	0˚C to 70˚C

Electrical Characteristics (Note 12)

Parameter	Conditions	LM319A			LM319			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage (Note 13)	T_A = 25˚C, $R_S \le 5k$		0.5	1.0		2.0	8.0	mV
Input Offset Current (Note 13)	T_A = 25˚C		20	40		80	200	nA
Input Bias Current	T_A = 25˚C		150	500		250	1000	nA
Voltage Gain	T_A = 25˚C (Note 15)	20	40		8	40		V/mV
Response Time (Note 14)	T_A = 25˚C, V_S = ±15V		80			80		ns
Saturation Voltage	$V_{IN} \le -10$ mV, I_{OUT} = 25 mA T_A = 25˚C		0.75	1.5		0.75	1.5	V
Output Leakage Current	$V_{IN} \ge 10$ mV, V_{OUT} = 35V, $V^- = V_{GND}$ = 0V, T_A = 25˚C		0.2	10		0.2	10	µA
Input Offset Voltage (Note 13)	$R_S \le 5k$			10			10	mV
Input Offset Current (Note 13)				300			300	nA
Input Bias Current				1000			1200	nA
Input Voltage Range	V_S = ±15V		±13			±13		V
	V^+ = 5V, V^- = 0	1		3	1		3	V
Saturation Voltage	$V^+ \ge 4.5V$, V^- = 0 $V_{IN} \le -10$ mV, $I_{SINK} \le 3.2$ mA		0.3	0.4		0.3	0.4	V
Differential Input Voltage				±5			±5	V
Positive Supply Current	T_A = 25˚C, V^+ = 5V, V^- = 0		4.3			4.3		mA
Positive Supply Current	T_A = 25˚C, V_S = ±15V		8	12.5		8	12.5	mA
Negative Supply Current	T_A = 25˚C, V_S = ±15V		3	5		3	5	mA

Note 10: For supply voltages less than ±15 the absolute maximum input voltage is equal to the supply voltage.

Note 11: The maximum junction temperature of the LM319A and LM319 is 85˚C. For operating at elevated temperatures, devices in the H10 package must be de-rated based on a thermal resistance of 160˚C/W, junction to ambient, or 19˚C/W, junction to case. The thermal resistance of the N14 and J14 package is 100˚C/W, junction to ambient. The thermal resistance of the M14 package is 115˚C/W, junction to ambient.

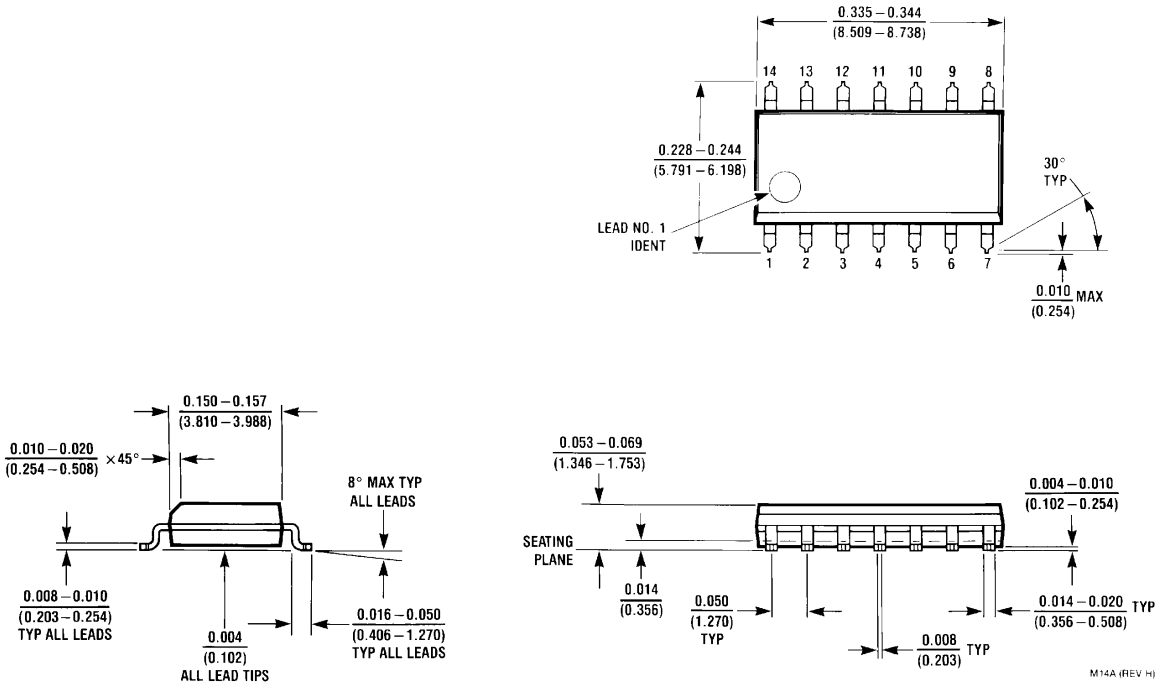
Note 12: These specifications apply for V_S = ±15V, and 0˚C ≤ T_A ≤ 70˚C, unless otherwise stated. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single 5V supply up to ±15V supplies. Do not operate the device with more than 16V from ground to V_S.

Note 13: The offset voltages and offset currents given are the maximum values required to drive the output within a volt of either supply with a 1 mA load. Thus, these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.

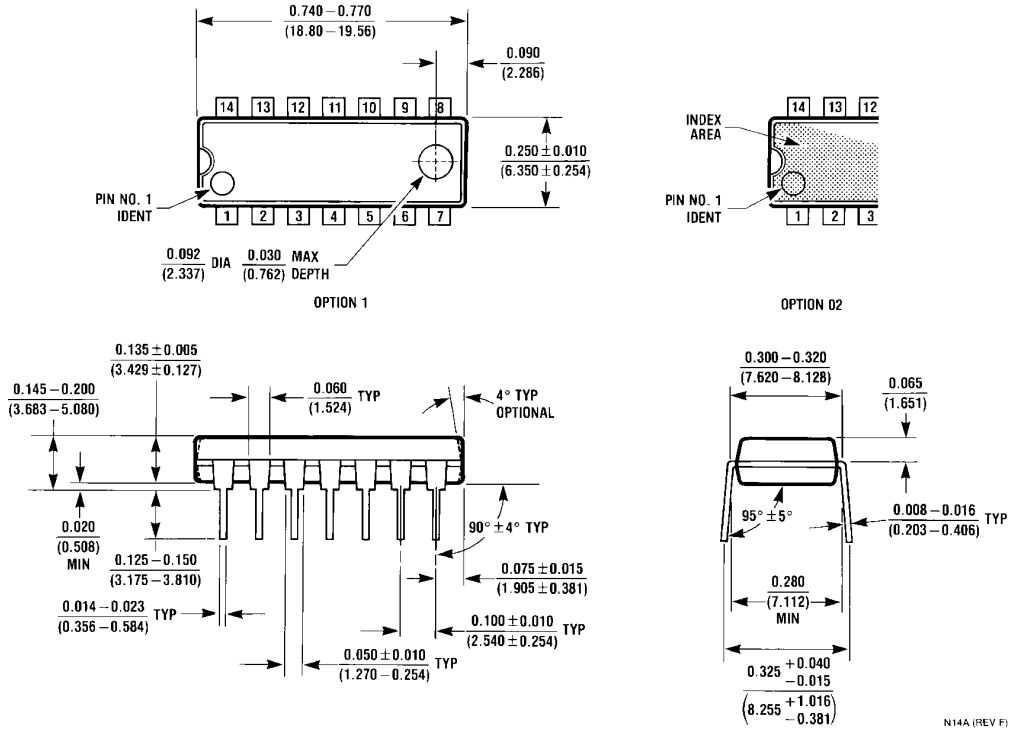
Note 14: The response time specified is for a 100 mV input step with 5 mV overdrive.

Note 15: Output is pulled up to 15V through a 1.4 kΩ resistor.

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

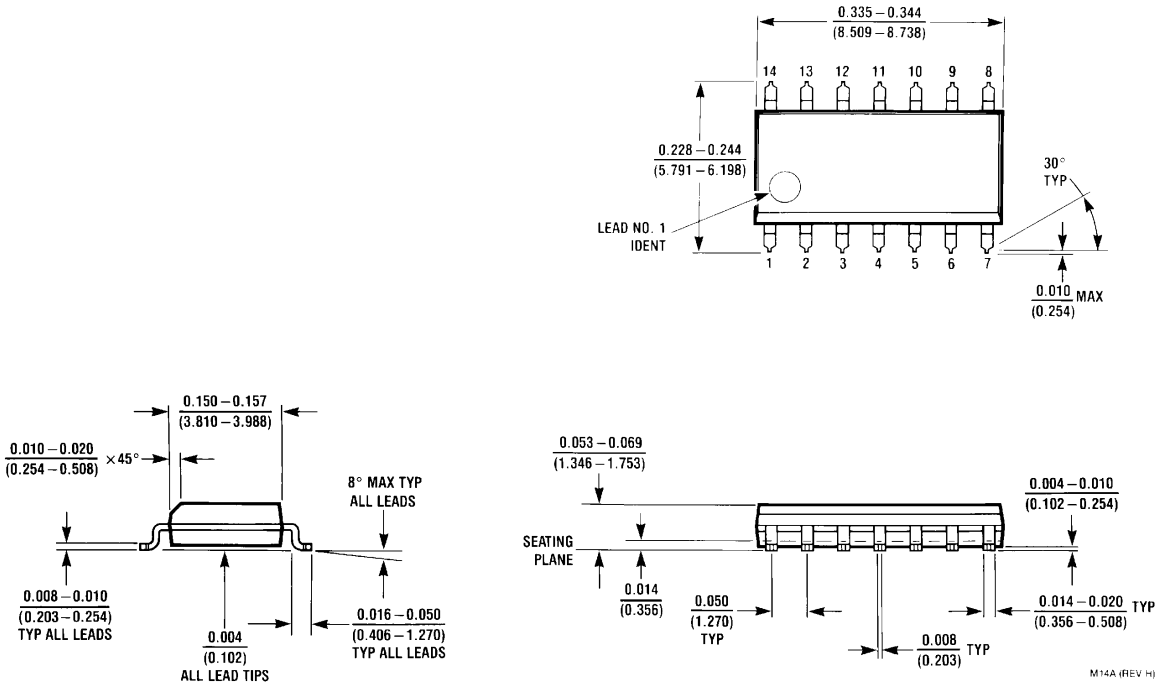


Dual-In-Line Package (M)
Order Number LM319AM or LM319M
NS Package Number M14A

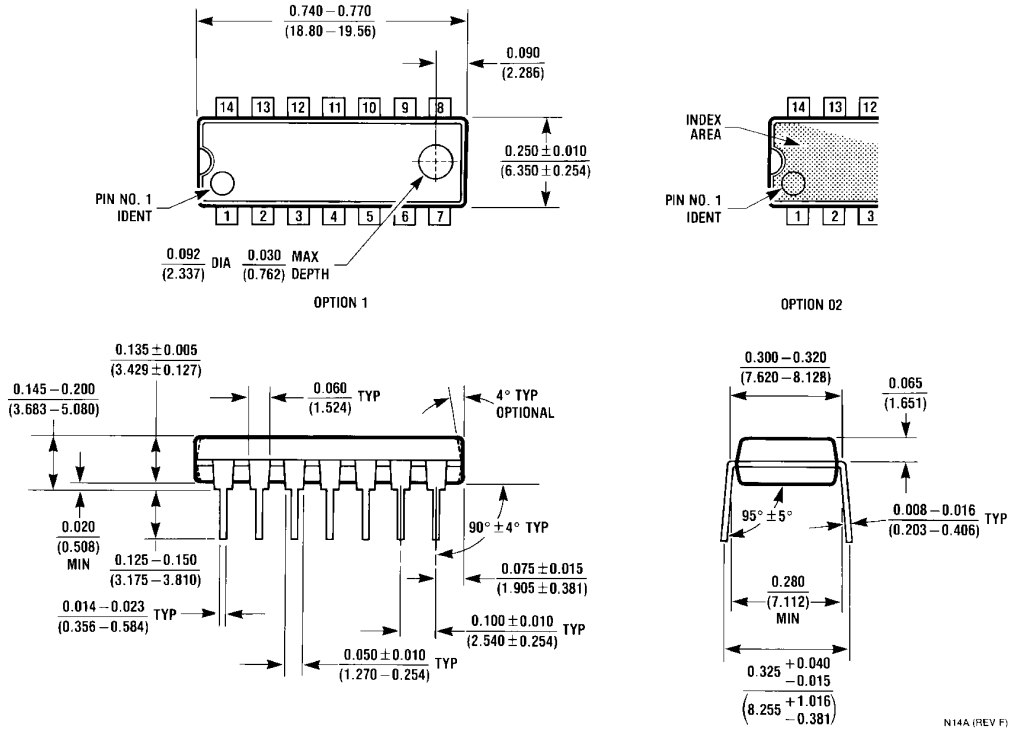


Molded Dual-In-Line Package (N)
Order Number LM319AN or LM319N
NS Package Number N14A

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



Dual-In-Line Package (M)
Order Number LM319AM or LM319M
NS Package Number M14A



Molded Dual-In-Line Package (N)
Order Number LM319AN or LM319N
NS Package Number N14A