

# LM119/219/319

## Dual Comparator

### Distinctive Characteristics

- The AMD LM119/219/319 are functionally, electrically, and pin-for-pin equivalent to the National LM119/219/319.
- Two independent comparators.
- Operates from single 5V supply.

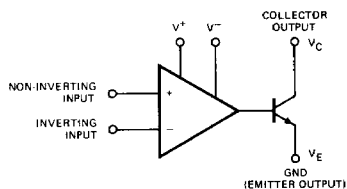
- Output drive — 35V and 25mA.
- Input bias current —  $1\mu\text{A}$  max. ( $1.2\mu\text{A}$  for Am319)
- Response time 80ns typical at  $\pm 15\text{V}$ .
- Minimum fan out of 2 each side.
- Inputs and outputs isolated from system ground.
- High common mode slew rate.

### FUNCTIONAL DESCRIPTION

The LM 119/219/319 are dual high-speed voltage comparators designed to operate over a wide range of voltage supplies down to a single 5V supply and ground. They have higher gain and lower input bias currents than devices such as the  $\mu\text{A}710$ . The uncommitted collector of the output stage facilitates RTL, DTL and TTL interfacing, and driving lamps and relays at currents up to 25mA. The device is specified for operation from power supplies up to  $\pm 15\text{V}$  and features faster response than the LM111 at the expense of higher power dissipation.

The LM119 performance is specified over the temperature range  $-55$  to  $125^\circ\text{C}$ , the LM219 performance is specified over the temperature range  $-25$  to  $85^\circ\text{C}$  and the Am319 performance is specified over the temperature range  $0$  to  $70^\circ\text{C}$ .

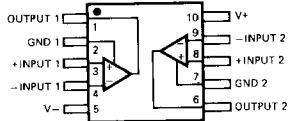
### FUNCTIONAL DIAGRAM (One Comparator)



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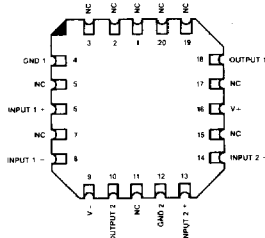
### CONNECTION DIAGRAMS — Top Views

Flat Package  
F-10-1

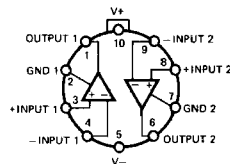


LIC-090 Pin 5 connected to bottom of package.

Leadless Chip-Pak  
L-20-1



Metal Can  
H-10-1



Pin 5 connected to case.

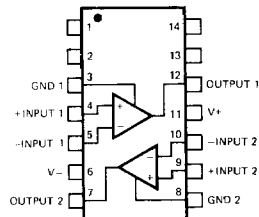
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### ORDERING INFORMATION\*

Part Number	Package Type	Temperature Range	Order Number
LM319	TO-99	0 to $+70^\circ\text{C}$	LM319H
	Hermetic DIP	0 to $+70^\circ\text{C}$	LM319D
	Molded DIP	0 to $+70^\circ\text{C}$	LM319N
	Dice	0 to $+70^\circ\text{C}$	LD319
	Leadless	0 to $+70^\circ\text{C}$	LM319L
LM219	TO-99	$-25$ to $+85^\circ\text{C}$	LM219H
	Hermetic DIP	$-25$ to $+85^\circ\text{C}$	LM219D
	Flat Pak	$-25$ to $+85^\circ\text{C}$	LM219F
	Leadless	$-25$ to $+85^\circ\text{C}$	LM219L
LM119	TO-99	$-55$ to $+125^\circ\text{C}$	LM119H
	Hermetic DIP	$-55$ to $+125^\circ\text{C}$	LM119D
	Flat Pak	$-55$ to $+125^\circ\text{C}$	LM119F
	Dice	$-55$ to $+125^\circ\text{C}$	LD119
	Leadless	$-55$ to $+125^\circ\text{C}$	LM119L

\*Also available with burn-in processing. To order add suffix B to part number.

### CONNECTION DIAGRAM Top View Hermetic and Molded Dual In-Line D-14-1, P-14-1



Pin 6 connected to bottom of package.

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## LM119/219/319

### MAXIMUM RATINGS (Above which the useful life may be impaired)

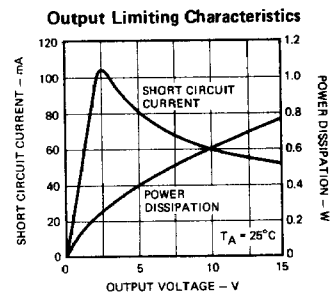
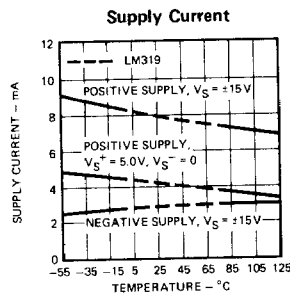
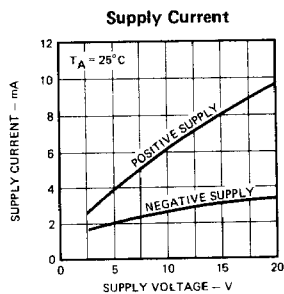
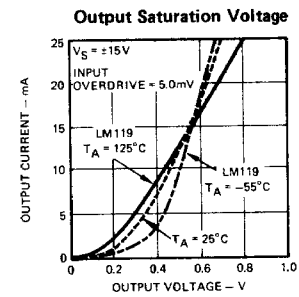
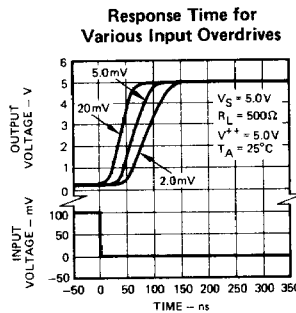
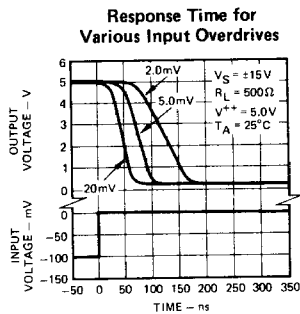
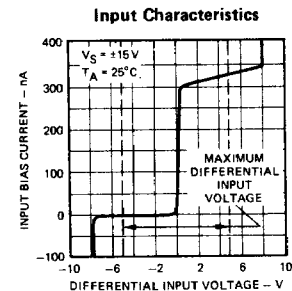
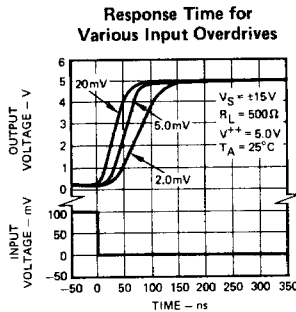
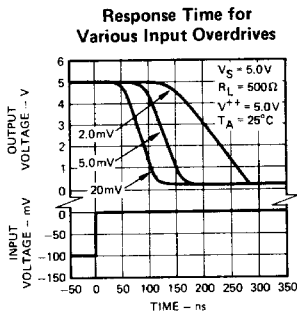
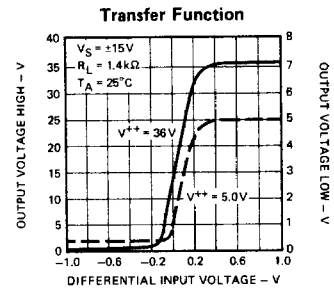
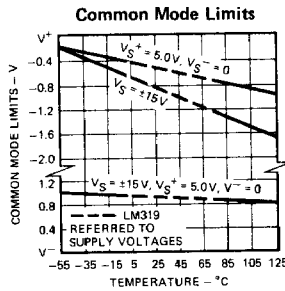
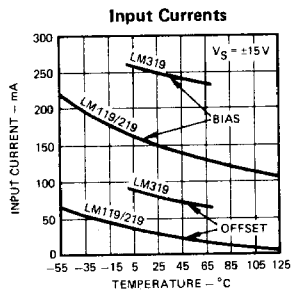
Voltage from $V^+$ to $V^-$	36V
Voltage from Collector Output to $V^-$	36V
Voltage from Ground to $V^+$	18V
Voltage from Ground to $V^-$	25V
Differential Input Voltage	$\pm 5.0V$
Input Voltage (Note 1)	$\pm 15V$
Power Dissipation (Note 2)	500mW
Output Short Circuit Duration	10s
Operating Temperature Range	
LM119	$-55^\circ C$ to $+125^\circ C$
LM219	$-25^\circ C$ to $+85^\circ C$
LM319	$0^\circ C$ to $+70^\circ C$
Storage Temperature Range	$-65^\circ C$ to $+150^\circ C$
Lead Temperature (soldering, 10 sec)	$300^\circ C$

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ C$ , Unless Otherwise Noted) (Note 3)

Parameters (See definitions)	Conditions	LM319			LM119/219			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage (Note 4)	$R_S \leq 5k$		2.0	8.0		0.7	4.0	mV
Input Offset Current (Note 4)			80	200		30	75	nA
Input Bias Current			250	1000		150	500	nA
Response Time (Note 5)			80			80		ns
Supply Current	Positive $V^+ = 5.0V, V^- = 0$ $V_S = \pm 15V$		4.3			4.3		mA
			8.0	12.5		8.0	11.5	
		Negative $V_S = \pm 15V$		3.0	5.0		3.0	
Voltage Gain		8.0	40		10	40		V/mV
Saturation Voltage	$V_{in} \leq -5.0mV, I_C = 25mA$					0.75	1.5	Volts
	$V_{in} \leq -10mV, I_C = 25mA$		0.75	1.5				
Output Leakage Current	$V_{in} \geq +5.0mV, V_C$ to $V_E = 35V$					0.2	2.0	$\mu A$
	$V_{in} \geq +10mV, V_C$ to $V_E = 35V$		0.2	10				
<b>The Following Specifications Apply Over The Operating Temperature Ranges</b>								
Input Offset Voltage (Note 4)	$R_S \leq 5k$			10			7.0	mV
Input Offset Current (Note 4)				300			100	nA
Input Bias Current				1200			1000	nA
Saturation Voltage	$V_{in} \leq -8.0mV, I_C = 3.2mA$	$T_A \geq 0^\circ C$				0.23	0.4	Volts
		$T_A \leq 0^\circ C$					0.6	
	$V_{in} \leq -12mV, I_C = 3.2mA$		0.3	0.4				
Output Leakage Current	$V_{in} \geq +8.0mV, V_C$ to $V_E = 35V$					1.0	10	$\mu A$
Input Voltage Range	$V_S = \pm 15V$		$\pm 13$			$\pm 13$		Volts
	$V^+ = 5.0V, V^- = 0$	1.0		3.0	1.0		3.0	

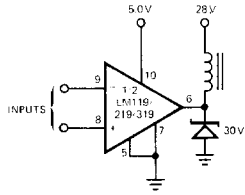
- Notes: 1. For supply voltages less than  $\pm 15V$  the absolute maximum rating is equal to the supply voltage.  
2. Derate Metal Can package at  $6.8mW/^\circ C$  for operation at ambient temperatures above  $75^\circ C$ , the Dual-In-Line at  $9mW/^\circ C$  for operation at temperatures above  $95^\circ C$ , and the Flat Package at  $5.4mW/^\circ C$  for operation at temperatures above  $57^\circ C$ .  
3. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single 5V supply up to  $\pm 15V$  supplies.  
4. The offset voltages and offset currents given are the maximum values required to drive the output within 1 volt of either supply with a 1mA load. Thus, these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.  
5. The response time specified is for a 100mV input step with 5mV overdrive.

TYPICAL PERFORMANCE CURVES



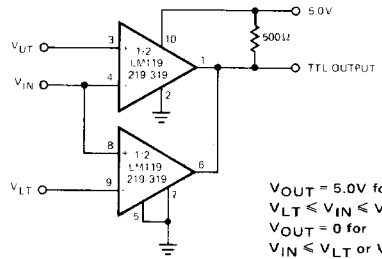
APPLICATIONS

Relay Driver



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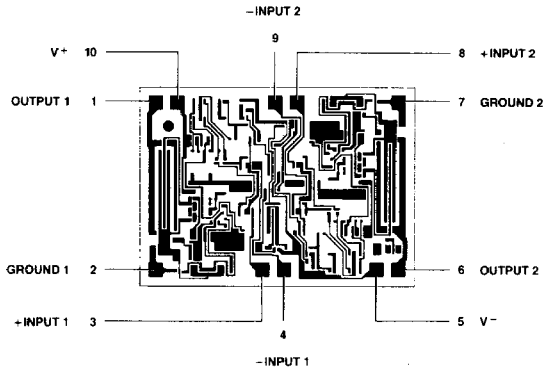
Window Detector



$V_{OUT} = 5.0V$  for  
 $V_{LT} \leq V_{IN} \leq V_{UT}$   
 $V_{OUT} = 0$  for  
 $V_{IN} \leq V_{LT}$  or  $V_{IN} \geq V_{UT}$

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Metallization and Pad Layout



DIE SIZE: 0.078" X 0.057"