



Voltage Comparators

LM119/LM219

LM119/LM219 high speed dual comparator general description

The LM119/LM219 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. Outstanding features include:

features

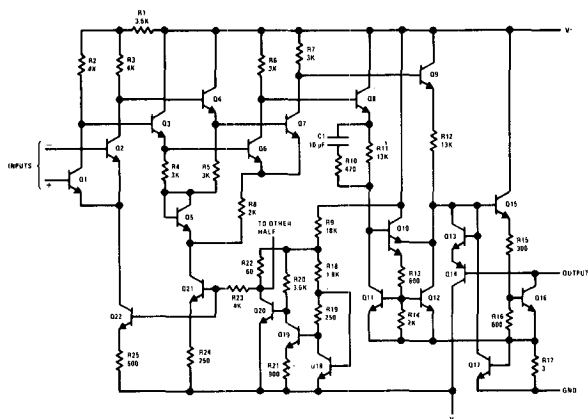
- Two independent comparators
- Operates from a single 5V supply
- Typically 80 ns response time at $\pm 15V$
- Minimum fan-out of 2 each side

- Maximum input current of $1 \mu A$ over temperature
- Inputs and outputs can be isolated from system ground
- High common mode slew rate

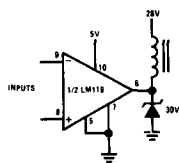
Although designed primarily for applications requiring operation from digital logic supplies, the LM119 is fully specified for power supplies up to $\pm 15V$. It features faster response than the LM111 at the expense of higher power dissipation. However, the high speed, wide operating voltage range and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

The LM219 is identical to the LM119, except that its performance is specified over a $-25^{\circ}C$ to $85^{\circ}C$ temperature range instead of $-55^{\circ}C$ to $125^{\circ}C$.

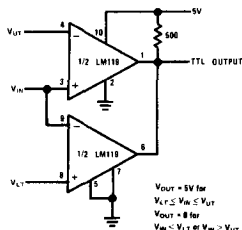
schematic and connection diagrams



typical applications

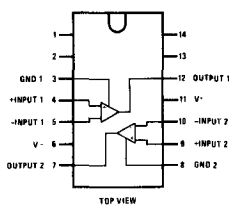


Relay Driver



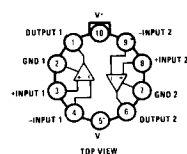
Window Detector

Dual-In-Line Package



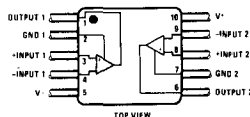
Order Number LM119D or LM219D
See Package 1

Metal Can Package



Order Number LM119H or LM219H
See Package 12

Flat Package



Order Number LM119F or LM219F
See Package 3

absolute maximum ratings

Total Supply Voltage	36V	Power Dissipation (Note 2)	500 mW
Output to Negative Supply Voltage	36V	Output Short Circuit Duration	10 sec
Ground to Negative Supply Voltage	25V	Operating Temperature Range LM119	-55°C to 125°C
Ground to Positive Supply Voltage	18V	LM219	-25°C to 85°C
Differential Input Voltage	±5V	Storage Temperature Range	-65°C to 150°C
Input Voltage (Note 1)	±15V	Lead Temperature (Soldering, 10 sec)	300°C

electrical characteristics (Note 3)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage (Note 4)	$T_A = 25^\circ\text{C}$, $R_S \leq 5k$		0.7	4.0	mV
Input Offset Current (Note 4)	$T_A = 25^\circ\text{C}$		30	75	nA
Input Bias Current	$T_A = 25^\circ\text{C}$		150	500	nA
Voltage Gain	$T_A = 25^\circ\text{C}$	10	40		V/mV
Response Time (Note 5)	$T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{V}$		80		ns
Saturation Voltage	$V_{IN} \leq -5\text{ mV}$, $I_{OUT} = 25\text{ mA}$ $T_A = 25^\circ\text{C}$		0.75	1.5	V
Output Leakage Current	$V_{IN} \geq 5\text{ mV}$, $V_{OUT} = 35\text{V}$ $T_A = 25^\circ\text{C}$		0.2	2	μA
Input Offset Voltage (Note 4)	$R_S \leq 5k$			7	mV
Input Offset Current (Note 4)				100	nA
Input Bias Current				1000	nA
Input Voltage Range	$V_S = \pm 15\text{V}$ $V^+ = 5\text{V}$, $V^- = 0$	1	±13	3	V
Saturation Voltage	$V^+ \geq 4.5\text{V}$, $V^- = 0$ $V_{IN} \leq -6\text{ mV}$, $I_{SINK} \leq 3.2\text{ mA}$ $T_A \geq 0^\circ\text{C}$ $T_A \leq 0^\circ\text{C}$		0.23	0.4 0.6	V V
Output Leakage Current	$V_{IN} \geq 5\text{ mV}$, $V_{OUT} = 35\text{V}$		1	10	μA
Differential Input Voltage				±5	V
Positive Supply Current	$T_A = 25^\circ\text{C}$, $V^+ = 5\text{V}$, $V^- = 0$		4.3		mA
Positive Supply Current	$T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{V}$		8	11.5	mA
Negative Supply Current	$T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{V}$		3	4.5	mA

Note 1: For supply voltages less than $\pm 15\text{V}$ the absolute maximum input voltage is equal to the supply voltage.

Note 2: The maximum junction temperature of the LM119 is 150°C , while that of the LM219 is 110°C . For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of 150°C/W , junction to ambient, or 45°C/W , junction to case. For the flat package, the derating is based on a thermal resistance of 185°C/W when mounted on a 1/16-inch-thick epoxy glass board with ten, 0.03-inch-wide, 2-ounce copper conductors. The thermal resistance of the dual-in-line package is 100°C/W , junction to ambient.

Note 3: These specifications apply for $V_S = \pm 15\text{V}$ and $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$, unless otherwise stated. With the LM219, however, all temperature specifications are limited to $-25^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single 5V supply up to $\pm 15\text{V}$ supplies.

Note 4: 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 5: The response time specified (see definitions) is for a 100 mV input step with 5 mV overdrive.

typical performance characteristics