DUAL VOLTAGE COMPARATOR

LM119/219/319

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 μA710. 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 25mA.

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 μA711.

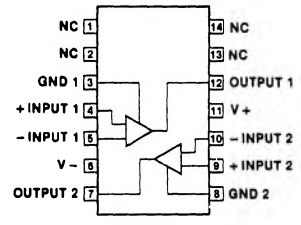
The LM119 is specified from -55°C to +125°C, the LM219 is specified from -25°C to +85°C, and the LM319 is specified from 0°C to +70°C.

FEATURES

- **Two independent comparators**
- **Operates from a single 5V supply**
- **Typically 80ns response time at ±15V**
- **Minimum fan-out of 3 (each side)**
- **Maximum input current of 1μA over temperature**
- **Inputs and outputs can be isolated from system ground**
- **High common mode slew rate**
- **MIL-STD-883 A, B, C available**

PIN CONFIGURATIONS

D,F,N PACKAGE

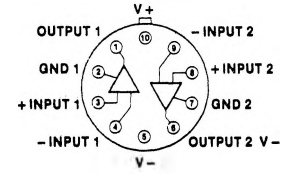


TOP VIEW

ORDER NUMBERS

LM119F LM219F LM319D,F,N

H PACKAGE*

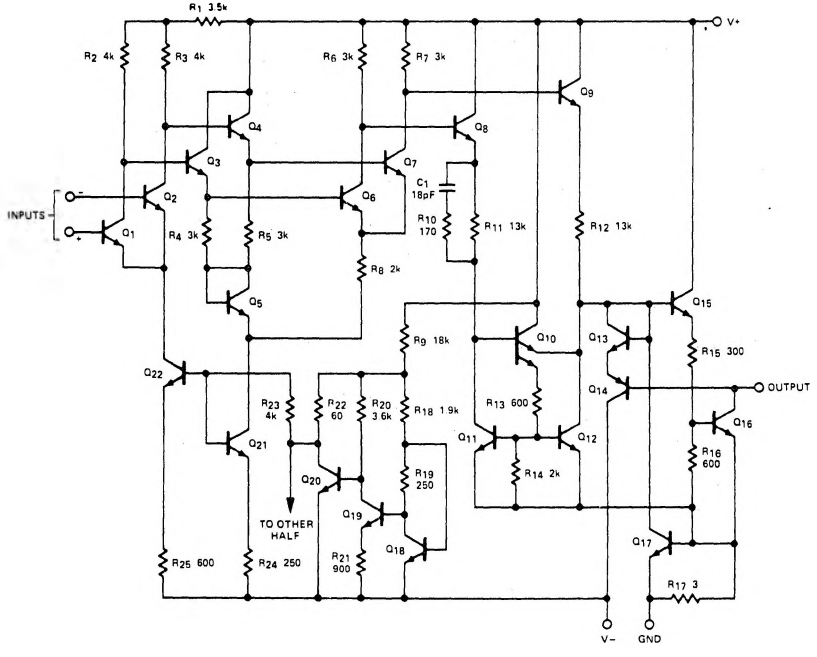


ORDER NUMBERS

LM119H LM219H LM319H

*Metal cans (H) not recommended for new designs

EQUIVALENT SCHEMATIC



DUAL VOLTAGE COMPARATOR — LM119/219/319

ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Total supply voltage	36	V
Output to negative supply voltage	36	V
Ground to negative supply voltage	25	V
Ground to positive supply voltage	18	V
Differential input voltage	±5	V
Input voltage[1]	±15	V
Power dissipation[2]	500	mW
Output short circuit duration	10	s
Operating temperature range		
LM119	-55 to +125	°C
LM219	-25 to +85	°C
LM319	0 to +70	°C
Storage temperature range	-65 to +150	°C
Lead temperature (soldering, 10sec)	300	°C

NOTES

1. For supply voltages less than ±15V, the absolute maximum rating is equal to the supply voltage.
2. The absolute maximum junction temperature is 150°C. Device dissipation must be derated as follows:
   K package—150°C/watt above 75°C
   F package —110°C/watt above 95°C

DC ELECTRICAL CHARACTERISTICS

$V_S = \pm 15V$, for LM119, $-55°C \le T_A \le 125°C$; LM219, $-25°C \le T_A \le 85°C$; LM319, $0°C \le T_A \le 70°C$ } unless otherwise specified.

	PARAMETER	TEST CONDITIONS	LM119/219			LM319			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Input offset voltage[1,2]	$R_S \le 5K\Omega$, $T_A = 25°C$		0.7	4.0		2.0	8.0	mV
		Over temp.			7			10	mV
I_{OS}	Input offset current[1,2]	$T_A = 25°C$		30	75		80	200	nA
		Over temp.			100			300	nA
I_B	Input bias current[1]	$T_A = 25°C$		150	500		250	1000	nA
		Over temp.			1000			1200	nA
A_V	Voltage gain	$T_A = 25°C$	10	40		8	40		V/mV
V_{OL}	Saturation voltage	$V_{IN} = 5mV$, $I_{OUT} = 25mA$, $T_A = 25°C$		0.75	1.5				V
		$V_{IN} = 10mV$, $I_{OUT} = 25mA$, $T_A = 25°C$					0.75	1.5	V
		$V^+ \ge 4.5V$, $V^- = 0$							
		$V_{IN} = 6mV$, $I_{OUT} = 3.2mA$							
		$T_A \ge 0°C$		0.23	0.4				V
		$T_A \le 0°C$			0.6				
		$V_{IN} = 10mV$, $I_{OUT} = 3.2mA$					0.3	0.4	V
I_{OH}	Output leakage current	$V^- = 0V$, $V_{IN} = 5mV$							
		$V_{OUT} = 35V$, $T_A = 25°C$		0.2	2				μA
		Over temp.		1	10				μA
		$V^- = 0V$, $V_{IN} = 10mV$							
		$V_{OUT} = 35V$, $T_A = 25°C$					0.2	10	μA
V_{IN}	Input voltage range	$V_S = \pm 15V$		±13			±13		V
		$V^+ = 5V$, $V^- = 0V$	1		3	1		3	V
V_{ID}	Differential input voltage				±5			±5	V
I^+	Positive supply current	$V^+ = 5V$, $V^- = 0V$, $T_A = 25°C$		4.3			4.3		mA
I^+	Positive supply current	$V_S = \pm 15V$, $T_A = 25°C$		8.0	11.5		8.0	12.5	mA
I^-	Negative supply current	$V_S = \pm 15V$, $T_A = 25°C$		3.0	4.5		3.0	5.0	mA

NOTES

1. V_{OS}, I_{OS} and I_B specifications apply for a supply voltage range of $V_S = \pm 15V$ down to a single 5V supply.
2. The offset voltages and offset currents given are the maximum values required to drive the output to 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.

DUAL VOLTAGE COMPARATOR — LM119/219/319

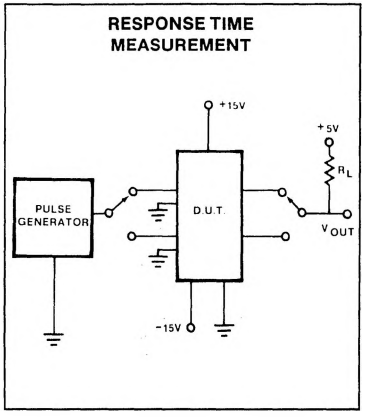
AC ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITIONS	LIMITS			UNIT
		Min	Typ	Max	
Response time*	$V_S = \pm 15V$, $T_A = 25°C$ $R_L = 500\Omega$ (see test figure)		80		ns

*NOTE

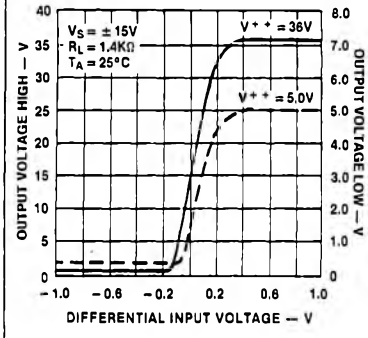
The response time specified is for a 100mV step with 5mV overdrive.

TEST CIRCUIT

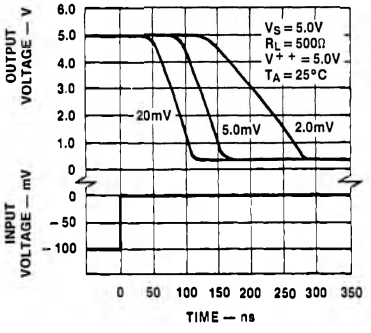


TYPICAL PERFORMANCE CHARACTERISTICS

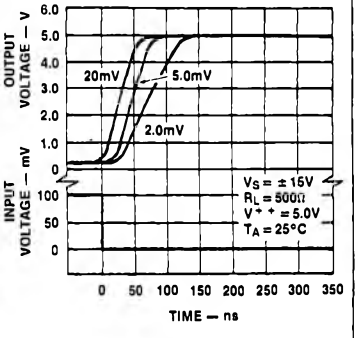
TRANSFER FUNCTION



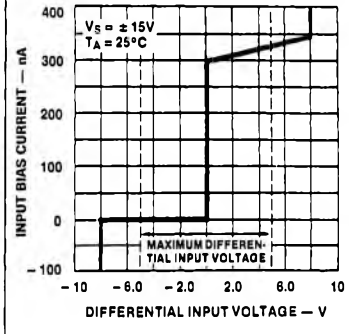
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



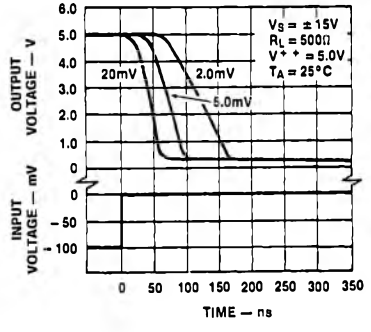
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



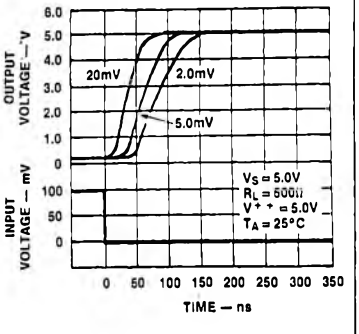
INPUT CHARACTERISTICS



RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

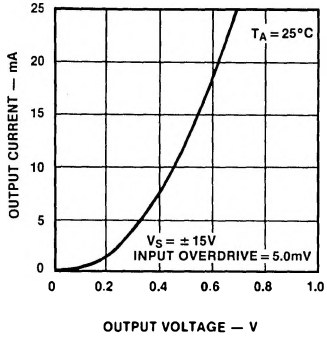


RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

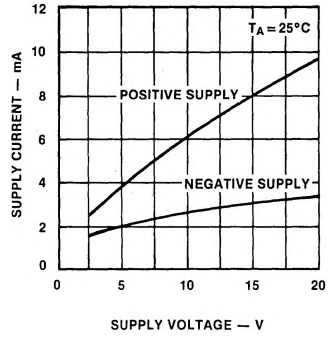


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

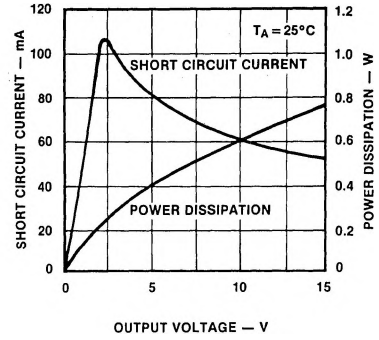
OUTPUT SATURATION VOLTAGE



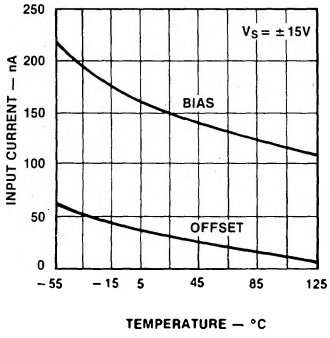
SUPPLY CURRENT



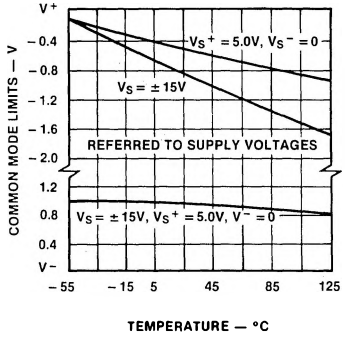
OUTPUT LIMITING CHARACTERISTICS



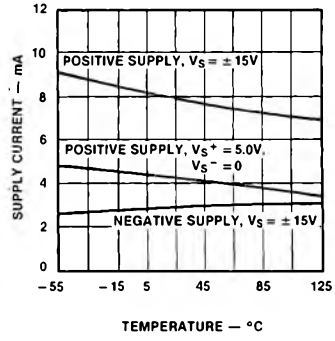
INPUT CURRENTS (LM119/219)



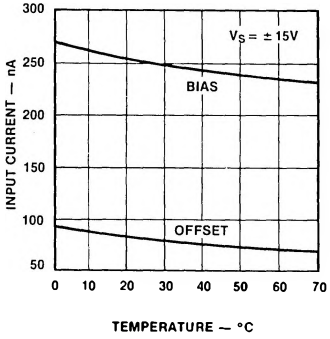
COMMON MODE LIMITS (LM119/219)



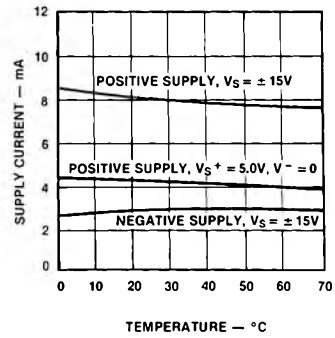
SUPPLY CURRENT (LM119/219)



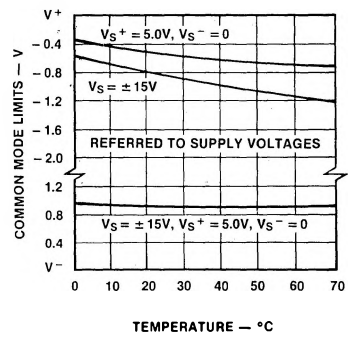
INPUT CURRENTS (LM319)



SUPPLY CURRENTS (LM319)



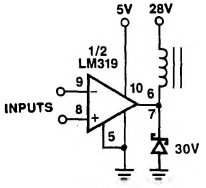
COMMON MODE LIMITS (LM319)



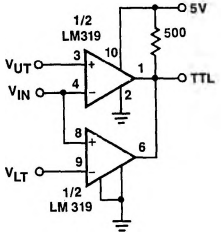
DUAL VOLTAGE COMPARATOR LM119/219/319

TYPICAL APPLICATIONS

RELAY DRIVER



WINDOW DETECTOR



V_{OUT} = 5V for $V_{LT} < V_{IN} < V_{UT}$
V_{OUT} = 0 for $V_{IN} < V_{LT}$ or $V_{IN} > V_{UT}$

WIDE RANGE VARIABLE OSCILLATOR