



## HIGH SPEED DUAL COMPARATORS

- TWO INDEPENDENT COMPARATORS
- SUPPLY VOLTAGE : +5V TO  $\pm 15V$
- TYPICALLY 80ns RESPONSE TIME AT  $\pm 15V$
- MINIMUM FAN-OUT OF 2 EACH SIDE
- MAXIMUM INPUT CURRENT OF  $1\mu A$  OVER OPERATING TEMPERATURE RANGE
- INPUTS AND OUTPUTS CAN BE ISOLATED FROM SYSTEM GROUND
- HIGH COMMON-MODE SLEW RATE

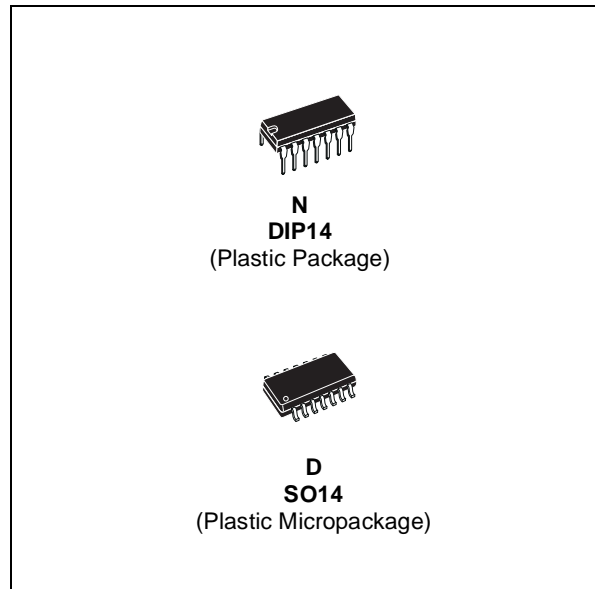
### DESCRIPTION

These products are precision high speed dual comparators designed to operate over a wide range of supply voltages down to a single 5V logic supply and ground and have low input currents and high gains.

The open collector of the output stage makes compatible with 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 comparators are fully specified for power supplies up to  $\pm 15V$ .

They feature faster response than LM111 at the expense of higher current consumption. However, the high speed, wide operating voltage range and low package count make the much more versatile.

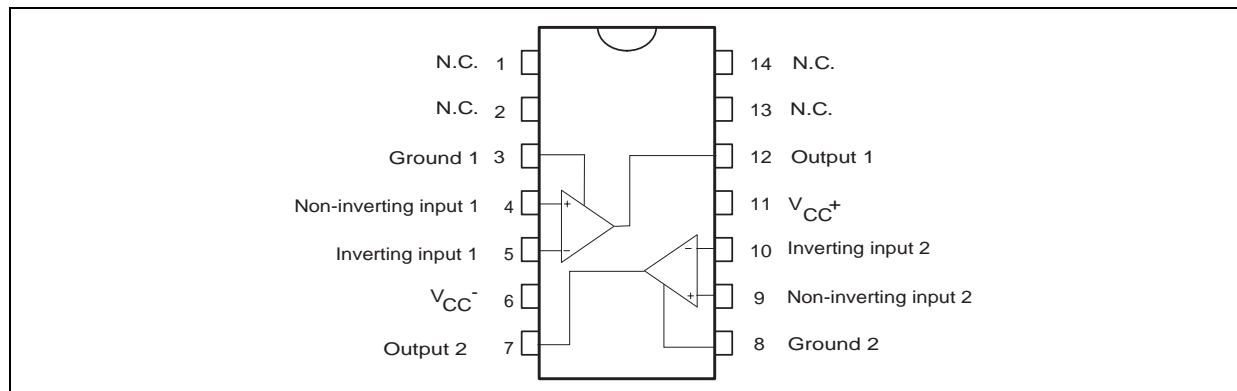


### ORDER CODE

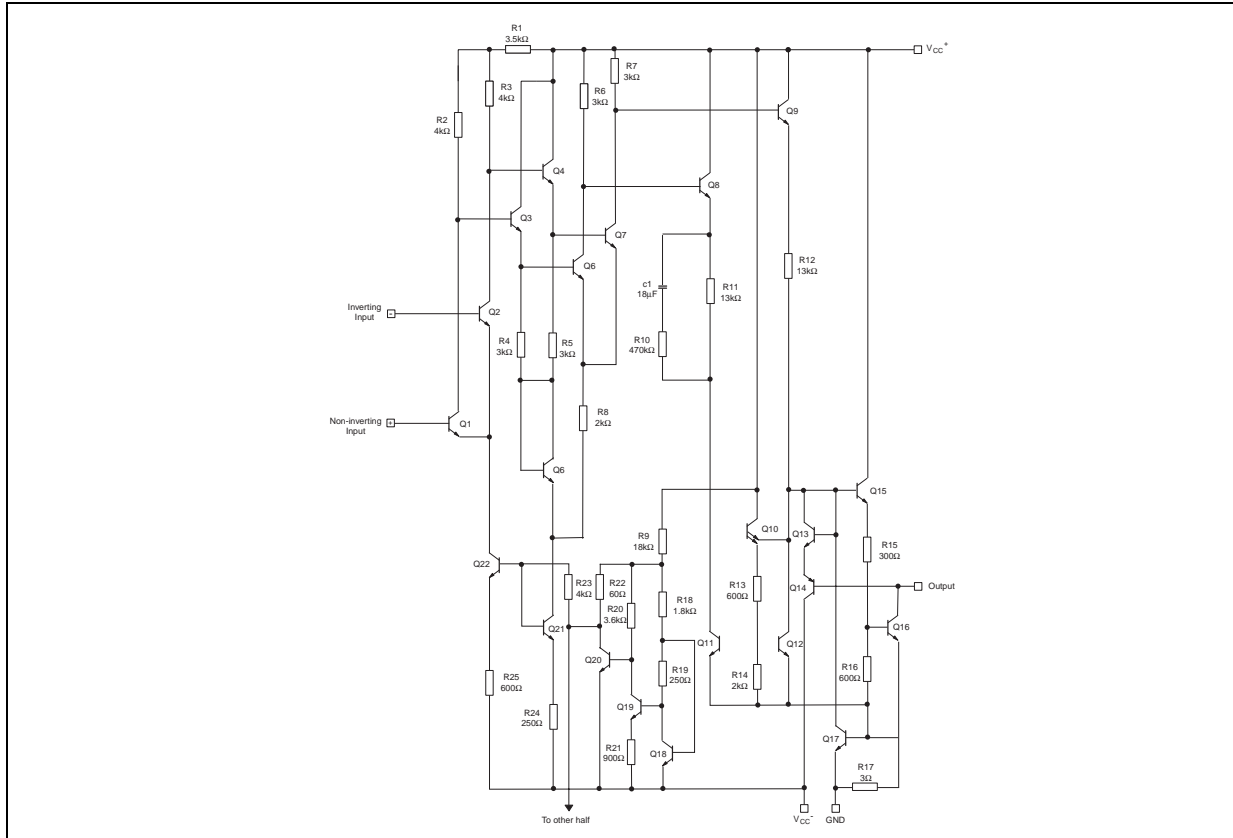
Part Number	Temperature Range	Package	
		N	D
LM119	-55°C, +125°C	•	•
LM219	-40°C, +105°C	•	•
LM319	0°C, +70°C	•	•
<b>Example : LM219N</b>			

N = Dual in Line Package (DIP)  
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

### PIN CONNECTIONS (top view)



**SCHEMATIC DIAGRAM (1/2 LM119)**



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit	
$V_o - V_{CC}^-$	Output to Negative Supply Voltage	36	V	
$V_{CC}^-$	Negative Supply Voltage	-25	V	
$V_{CC}^+$	Positive Supply Voltage	18	V	
$V_{id}$	Differential Input Voltage	$\pm 5$	V	
$V_i$	Input Voltage - note <sup>1)</sup>	$\pm 15$	V	
	Output Short-circuit to Ground	Infinite		
$P_d$	Power Dissipation <sup>2)</sup>	DIP14 SO14	1500 830	mW
$T_{stg}$	Storage Temperature Range	-65 to +150	$^{\circ}C$	

1. For supply voltage less than  $\pm 15V$  the absolute maximum input voltage is equal to the supply voltage.

2.  $P_d$  is calculated with  $T_{amb} = +25^{\circ}C$ ,  $T_j = +150^{\circ}C$  and  $R_{thja} = 80^{\circ}C/W$  for DIP14 package  
 $= 150^{\circ}C/W$  for SO14 package

**OPERATING CONDITIONS**

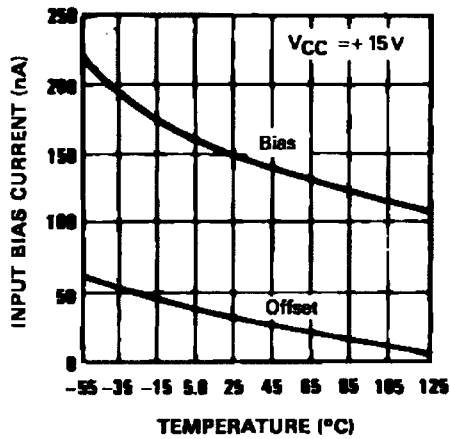
Symbol	Parameter	Value	Unit	
$V_{CC}$	Supply Voltage	5 to $\pm 15$	V	
$T_{oper}$	Operating Free-Air Temperature range	LM119 LM219 LM319	-55 to +125 -40 to +105 0 to +70	$^{\circ}C$

**ELECTRICAL CHARACTERISTICS** $V_{CC} = \pm 15V$ ,  $T_{amb} = +25^{\circ}C$  (unless otherwise specified)

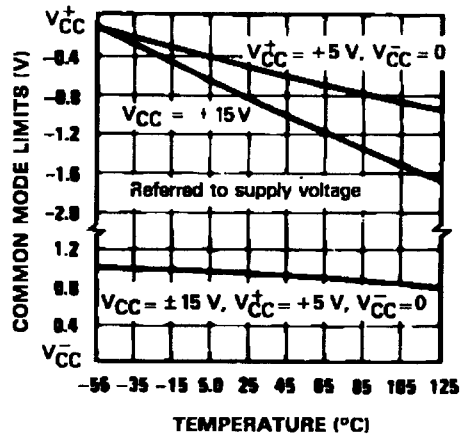
Symbol	Parameter	LM119 - LM219			LM319			Unit
		Min.	Typ.	Max.	Min	Typ.	Max.	
$V_{io}$	Input Offset Voltage ( $R_S \leq 5k\Omega$ ) - see note <sup>1)</sup> & <sup>2)</sup> $T_{amb} = +25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		0.7	4 7		2 8 10		mV
$I_{io}$	Input Offset Current - see note 1 $T_{amb} = +25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		30	75 100		80 200 300		nA
$I_{ib}$	Input Bias Current - see note 1 $T_{amb} = +25^{\circ}C$ $T_{min} \leq T_{amb} \leq T_{max}$		150	500 1000		250 1000 1200		nA
$A_{vd}$	Large Signal Voltage Gain	10	40		8	40		V/mV
$I_{CC}^{+}$	Positive Supply Current $V_{CC} = \pm 15V$ $V_{CC}^{+} = +5V, V_{CC}^{-} = 0V$		8 4.3	11.5		8 4.3	12.5	mA
$I_{CC}^{-}$	Negative Supply Current		3	4.5		3	5	mA
$V_{icm}$	Input Common Mode Voltage Range $V_{CC} = \pm 15V$ $V_{CC}^{+} = +5V, V_{CC}^{-} = 0V$	$\pm 12$ 1	$\pm 13$	3	$\pm 12$ 1	$\pm 13$	3	V
$V_{OL}$	Low Level Output Voltage $T_{amb} = +25^{\circ}C, I_O = 25mA$ $V_i \leq -5mV$ $V_i \leq -10mV$ $T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC}^{+} \geq +4.5V, V_{CC}^{-} = 0V, I_{O(sink)} < 3.2mA$ $V_i \leq -6mV$ $V_i \leq -10mV$		0.75	1.5		0.75 0.3	1.5 0.4	V
$I_{OH}$	High Level Output Current ( $V_O = +35V$ ) $T_{amb} = +25^{\circ}C$ $V_i \leq 5mV$ $V_i \leq 10mV$ $T_{min} \leq T_{amb} \leq T_{max}$ $V_i \leq 5mV$		0.2 1	2 10		0.2	10	$\mu A$
tre	Response Time - see note <sup>3)</sup>		80			80		ns

- These specifications apply for  $V_{CC} = \pm 15V$ , unless otherwise stated. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5V up to  $\pm 15V$  supplies. The offset voltages and offset current given are the maximum values required to drive the output down to 1V or up to +14V with a 1mA load current. Thus, these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.
- At output switch point,  $V_O \approx 1.4V$ , no load, with  $V_{CC}$  from 5V to  $\pm 15V$  and over the full input common-mode range.
- The response time specified is for a 100mV input step with 5mV overdrive.

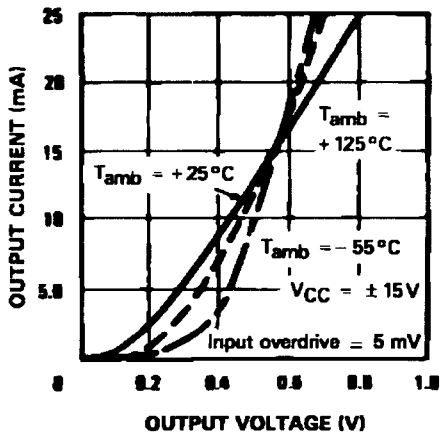
INPUT BIAS CURRENTS



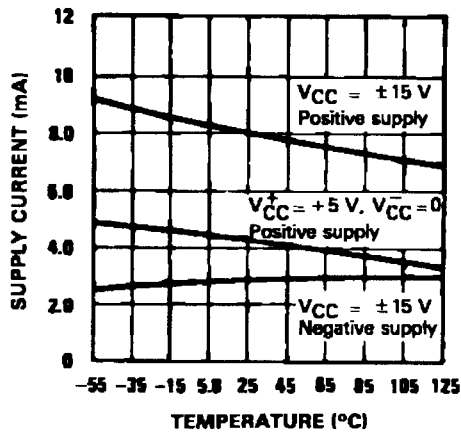
COMMON MODE LIMITS



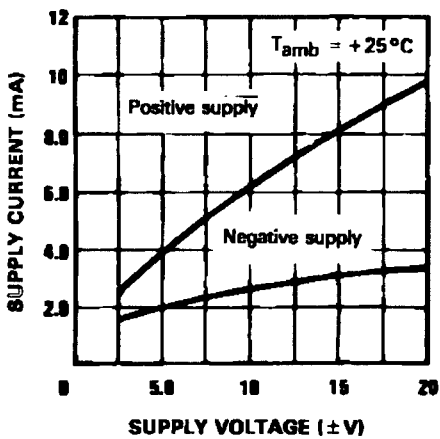
OUTPUT SATURATION VOLTAGE



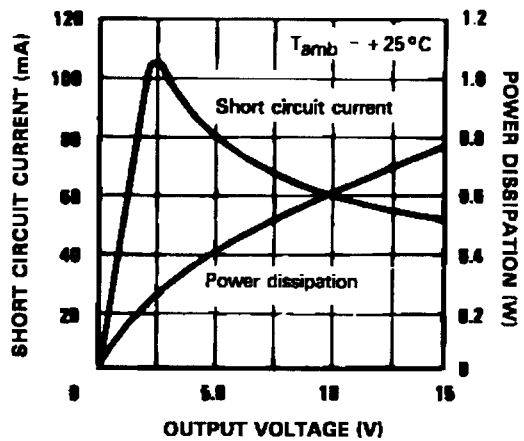
SUPPLY CURRENT



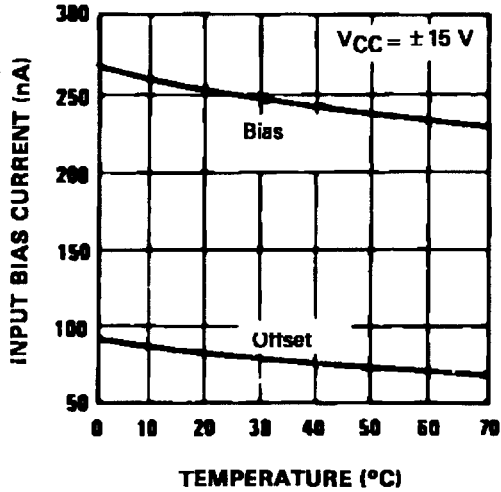
SUPPLY CURRENT



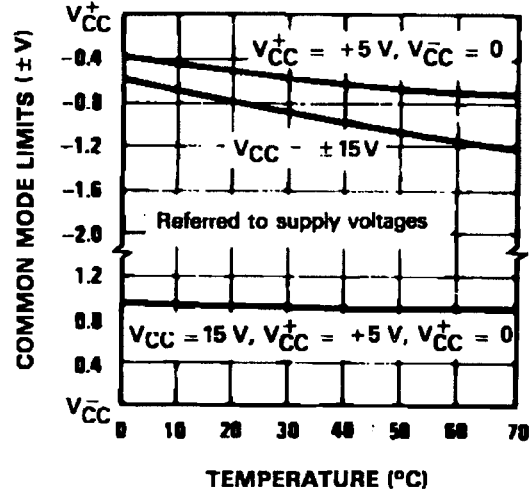
OUTPUT LIMITING CHARACTERISTICS



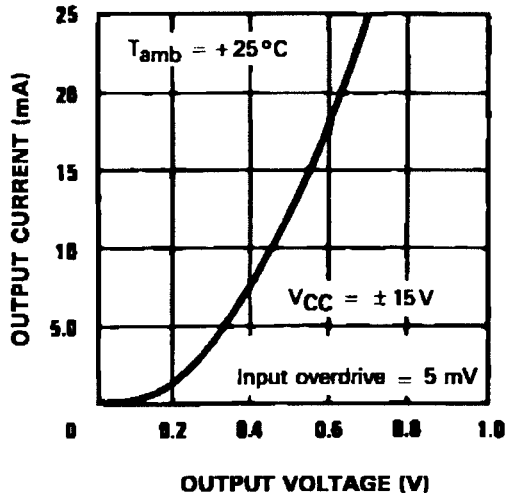
**INPUT BIAS CURRENTS**



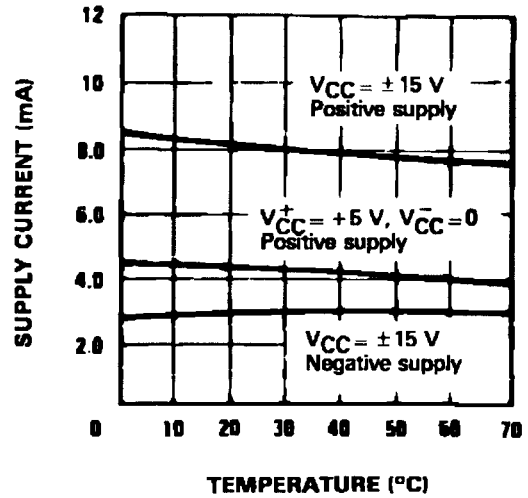
**COMMON MODE LIMITS**



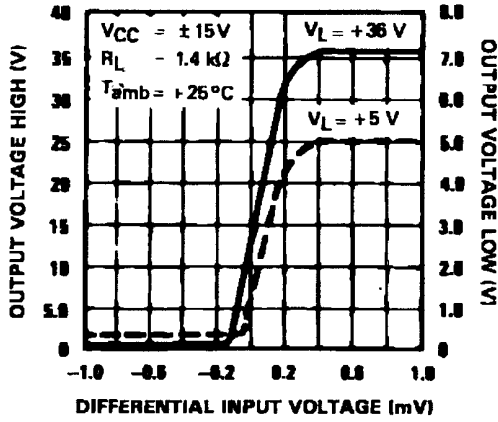
**OUTPUT SATURATION VOLTAGE**



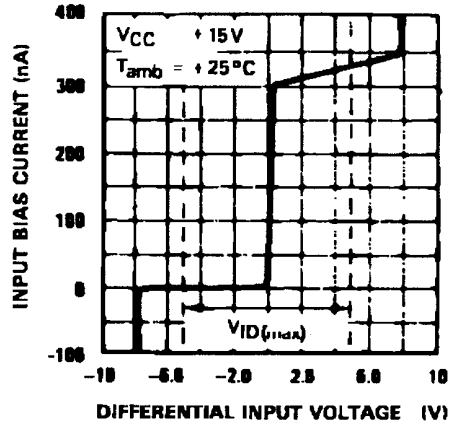
**SUPPLY CURRENT**



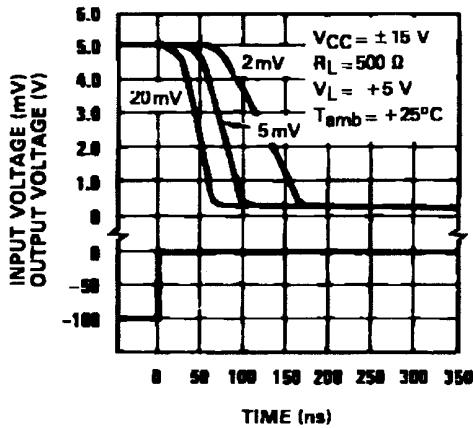
TRANSFER FUNCTION



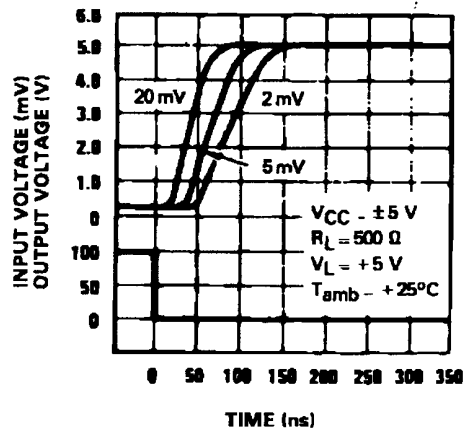
INPUT CHARACTERISTICS



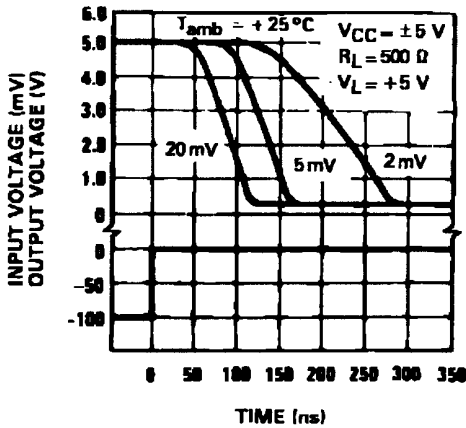
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



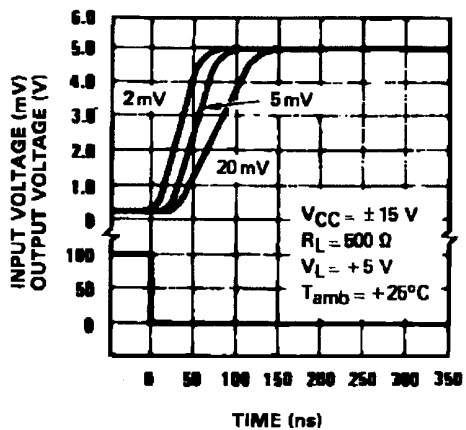
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



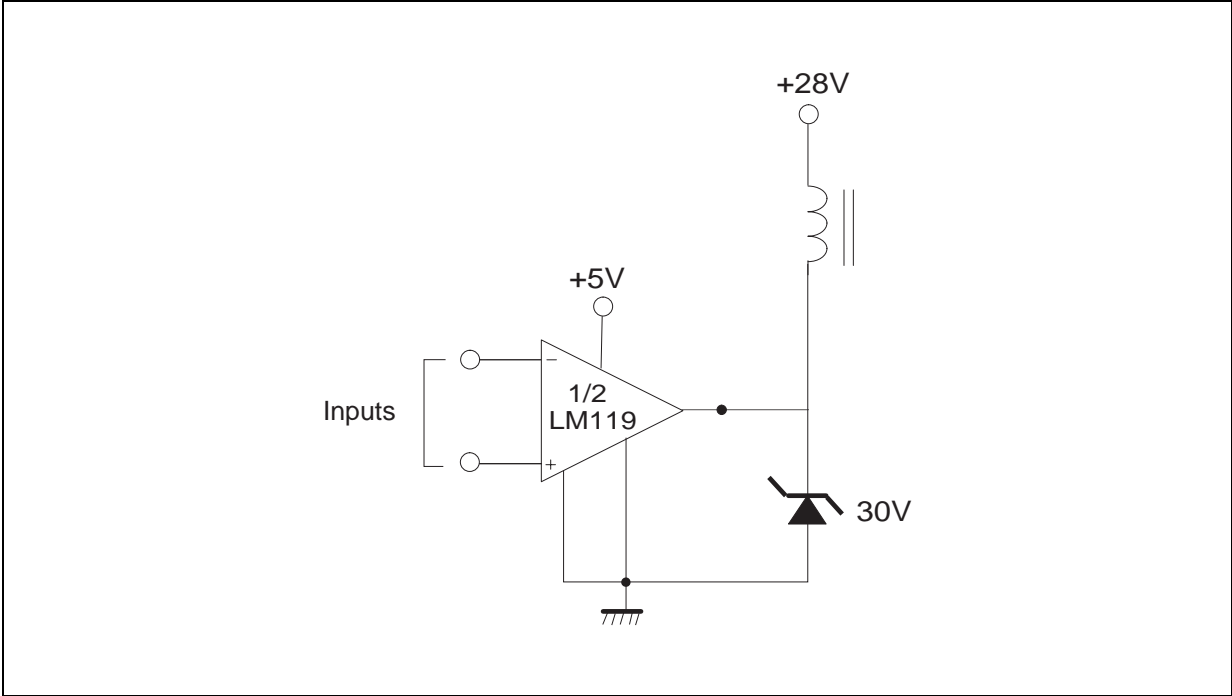
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



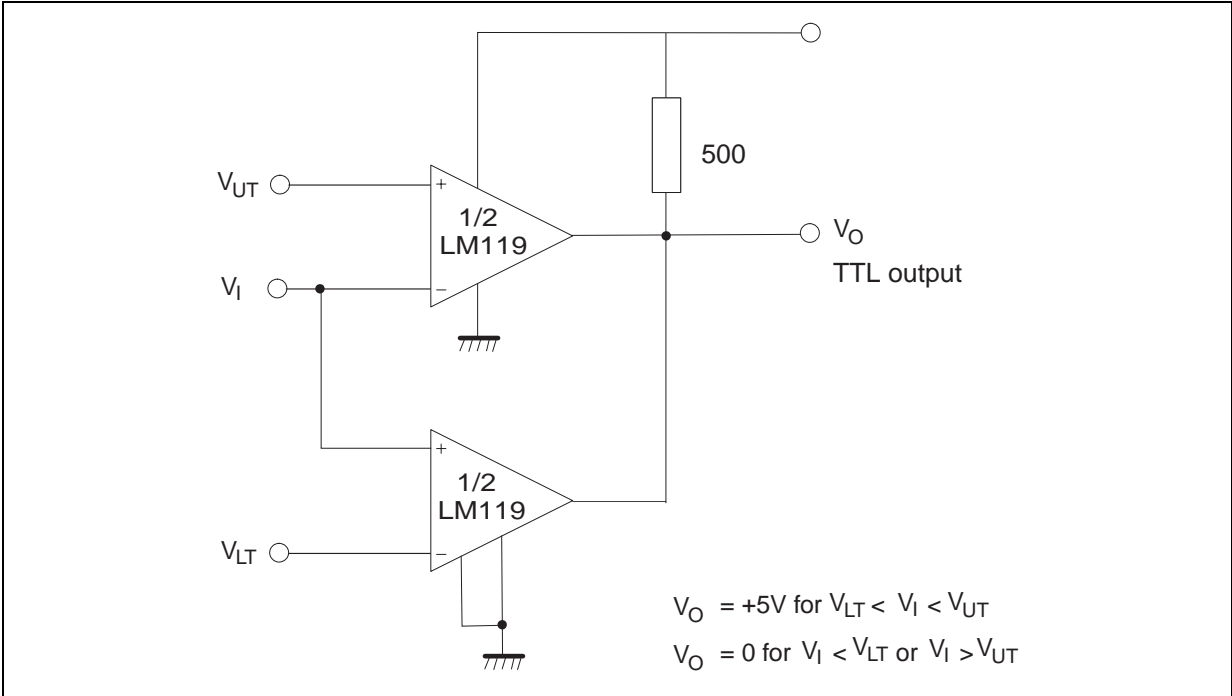
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



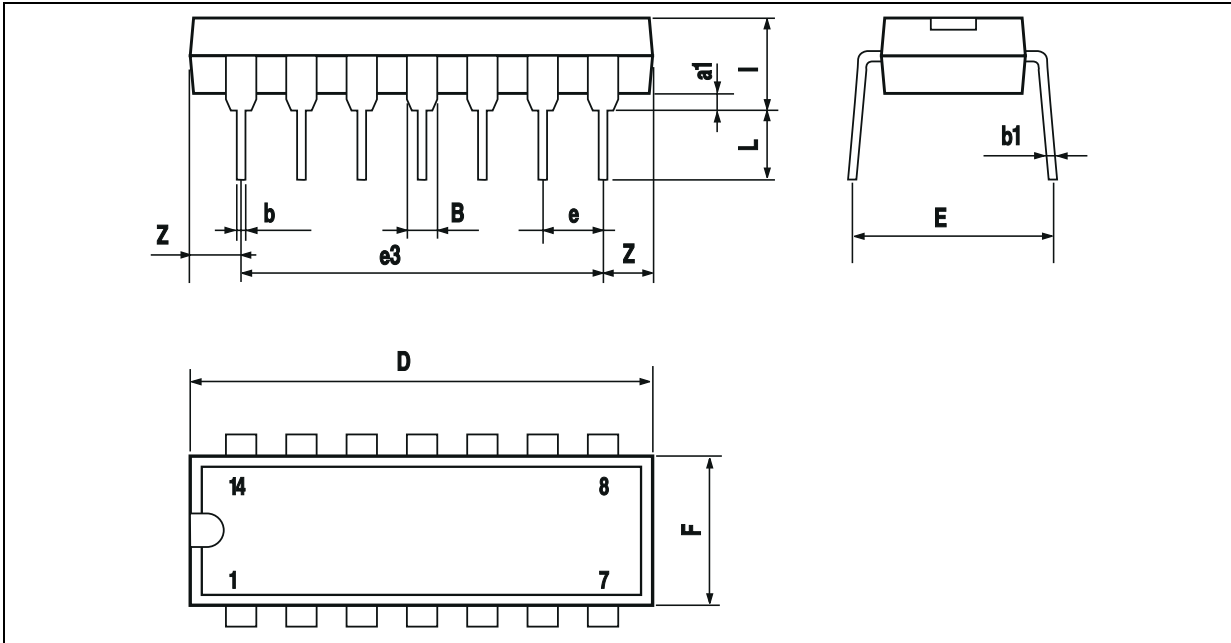
TYPICAL APPLICATION DIAGRAMS  
RELAY DRIVER



WINDOW DETECTOR



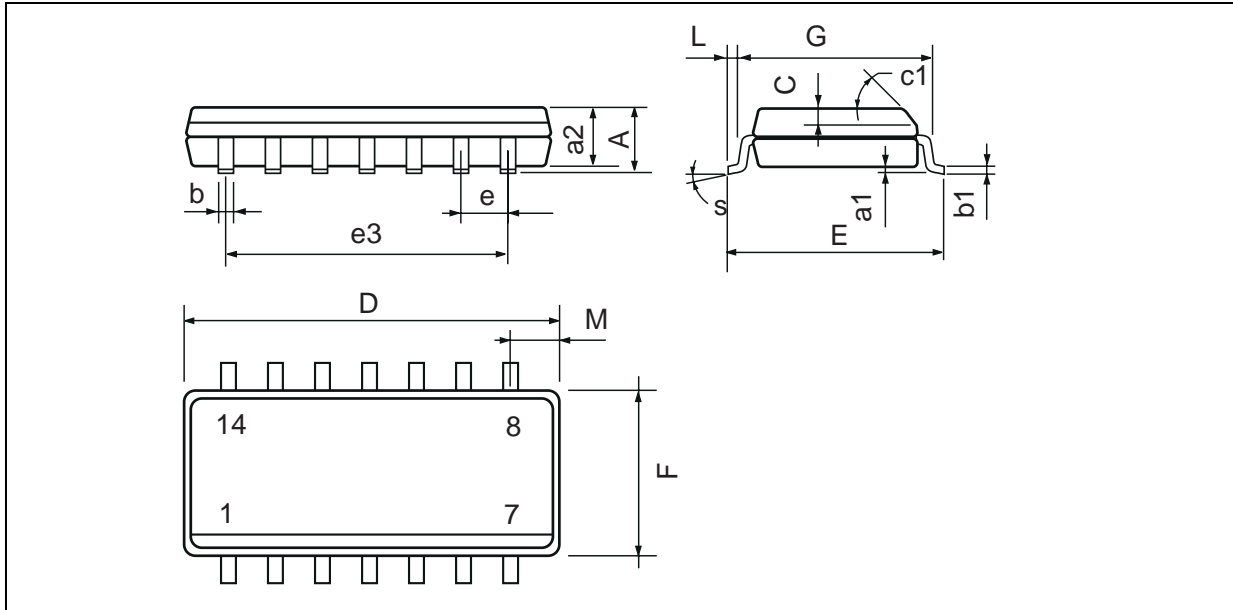
**PACKAGE MECHANICAL DATA**  
14 PINS - PLASTIC DIP



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



**PACKAGE MECHANICAL DATA**  
 14 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D (1)	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F (1)	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
M			0.68			0.027
S	8° (max.)					

Note : (1) D and F do not include mold flash or protrusions - Mold flash or protrusions shall not exceed 0.15mm (.066 inc) ONLY FOR DATA BOOK.

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