

# DATA SHEET

## **LM219/LM319** Dual voltage comparator

Product data  
Supersedes data of 1994 Aug 31  
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2001 Aug 03

# Dual voltage comparator

# LM219/LM319

## DESCRIPTION

The LM319 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 5 V logic supply and ground. Further, they have higher gain and lower input currents than devices like the  $\mu A710$ . The uncommitted collector of the output stage makes the LM319 compatible with RTL, DTL, and TTL as well as capable of driving lamps and relays at currents up to 25 mA.

Although designed primarily for applications requiring operation from digital logic supplies, the LM319 series are fully specified for power supplies up to  $\pm 15$  V. 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 LM319 much more versatile than older devices like the  $\mu A711$ .

## FEATURES

- Two independent comparators
- Operates from a single 5 V supply
- Typically 80 ns response time at  $\pm 15$  V
- Minimum fanout of 3 (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

## PIN CONFIGURATION

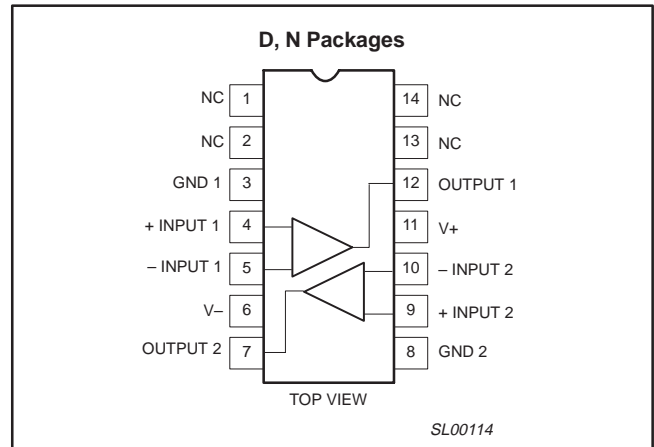


Figure 1. Pin Configuration

## EQUIVALENT SCHEMATIC

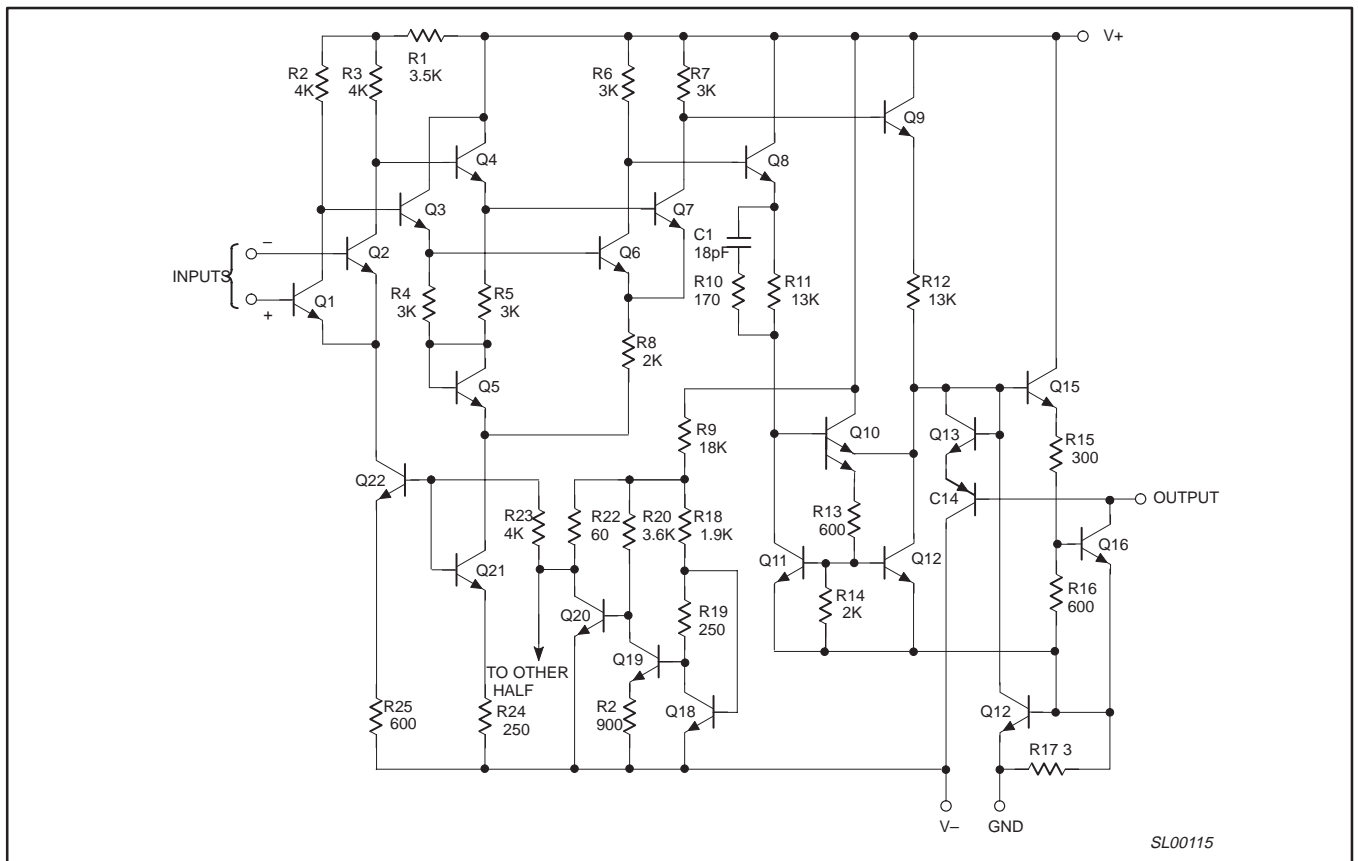


Figure 2. Equivalent Schematic

## Dual voltage comparator

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## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Plastic Small Outline (SO) Package	-25 °C to +85 °C	LM219D	SOT108-1
14-Pin Plastic Small Outline (SO) Package	0 °C to +70 °C	LM319D	SOT108-1
14-Pin Plastic Dual In-Line Package (DIP)	0 °C to +70 °C	LM319N	SOT27-1

## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
$V_S$	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
$V_{IN}$	Input voltage <sup>1</sup>	±15	V
	Maximum power dissipation, $T_{amb} = 25\text{ °C}$ (still-air) <sup>2</sup>		
	N package	1420	mW
	D package	1040	mW
	Output short-circuit duration	10	s
$T_{amb}$	Operating temperature range	LM219	-25 to +85
		LM319	0 to +70
$T_{stg}$	Storage temperature range	-65 to +150	°C
$T_{sld}$	Lead soldering temperature (10 sec max)	230	°C

## NOTES:

- For supply voltages less than ±15 V, the absolute maximum rating is equal to the supply voltage.
- Derate above 25 °C, at the following rates:  
N package at 11.4 mW/°C  
D package at 8.3 mW/°C

## DC ELECTRICAL CHARACTERISTICS

$V_S = \pm 15\text{ V}$ ; -25 °C ≤  $T_{amb}$  ≤ +85 °C for LM219, 0 °C ≤  $T_{amb}$  ≤ +70 °C for LM319, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	LM219			LM319			UNIT
			Min	Typ	Max	Min	Typ	Max	
$V_{OS}$	Input offset voltage <sup>1, 2</sup>	$R_S \leq 5\text{ k}\Omega$ ; $T_{amb} = 25\text{ °C}$ Over temp.		0.7	4.0 7		2.0 8.0 10	mV	
$I_{OS}$	Input offset current <sup>1, 2</sup>	$T_{amb} = 25\text{ °C}$ Over temp.		30	75 100		80 200 300	nA	
$I_B$	Input bias current <sup>1</sup>	$T_{amb} = 25\text{ °C}$ Over temp.		150	500 1000		250 1000 1200	nA nA	
$A_V$	Voltage gain	$T_{amb} = 25\text{ °C}$	8	40		8	40	V/mV	
$V_{OL}$	Saturation voltage	$V_{IN} \leq -10\text{ mV}$ ; $I_{OUT} = 25\text{ mA}$ ; $T_{amb} = 25\text{ °C}$ ; $V_+ \geq 4.5\text{ V}$ ; $V_- = 0\text{ V}$ $V_{IN} \leq -10\text{ mV}$ ; $I_{OUT} = 3.2\text{ mA}$		0.75	1.5		0.75	1.5	V
				0.3	0.6		0.3	0.4	
$I_{OH}$	Output leakage current	$V_- = 0\text{ V}$ ; $V_{IN} \geq 10\text{ mV}$ $V_{OUT} = 35\text{ V}$ ; $T_{amb} = 25\text{ °C}$		0.2	10		0.2	10	μA
$V_{IN}$	Input voltage range	$V_S = \pm 15\text{ V}$ $V_+ = 5\text{ V}$ , $V_- = 0\text{ V}$	1	±13	3	1	±13	3	V
$V_{ID}$	Differential input voltage				±5			±5	V
$I_+$	Positive supply current	$V_+ = 5\text{ V}$ ; $V_- = 0\text{ V}$ ; $T_{amb} = 25\text{ °C}$		4.3			4.3		mA
$I_+$	Positive supply current	$V_S = \pm 15\text{ V}$ ; $T_{amb} = 25\text{ °C}$		8.0	12.5		8.0	12.5	mA
$I_-$	Negative supply current	$V_S = \pm 15\text{ V}$ ; $T_{amb} = 25\text{ °C}$		3.0	5.0		3.0	5.0	mA

## NOTES:

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

# Dual voltage comparator

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## AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
$t_R$	Response time <sup>1</sup>	$V_S = \pm 15\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$ $R_L = 500\ \Omega$ (see test figure)		80		ns

**NOTE:**

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

## TEST CIRCUIT

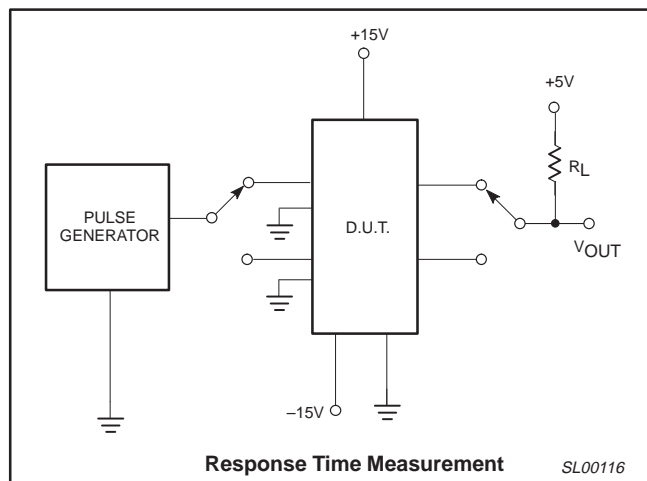


Figure 3. Test Circuit

# Dual voltage comparator

# LM219/LM319

## TYPICAL PERFORMANCE CHARACTERISTICS

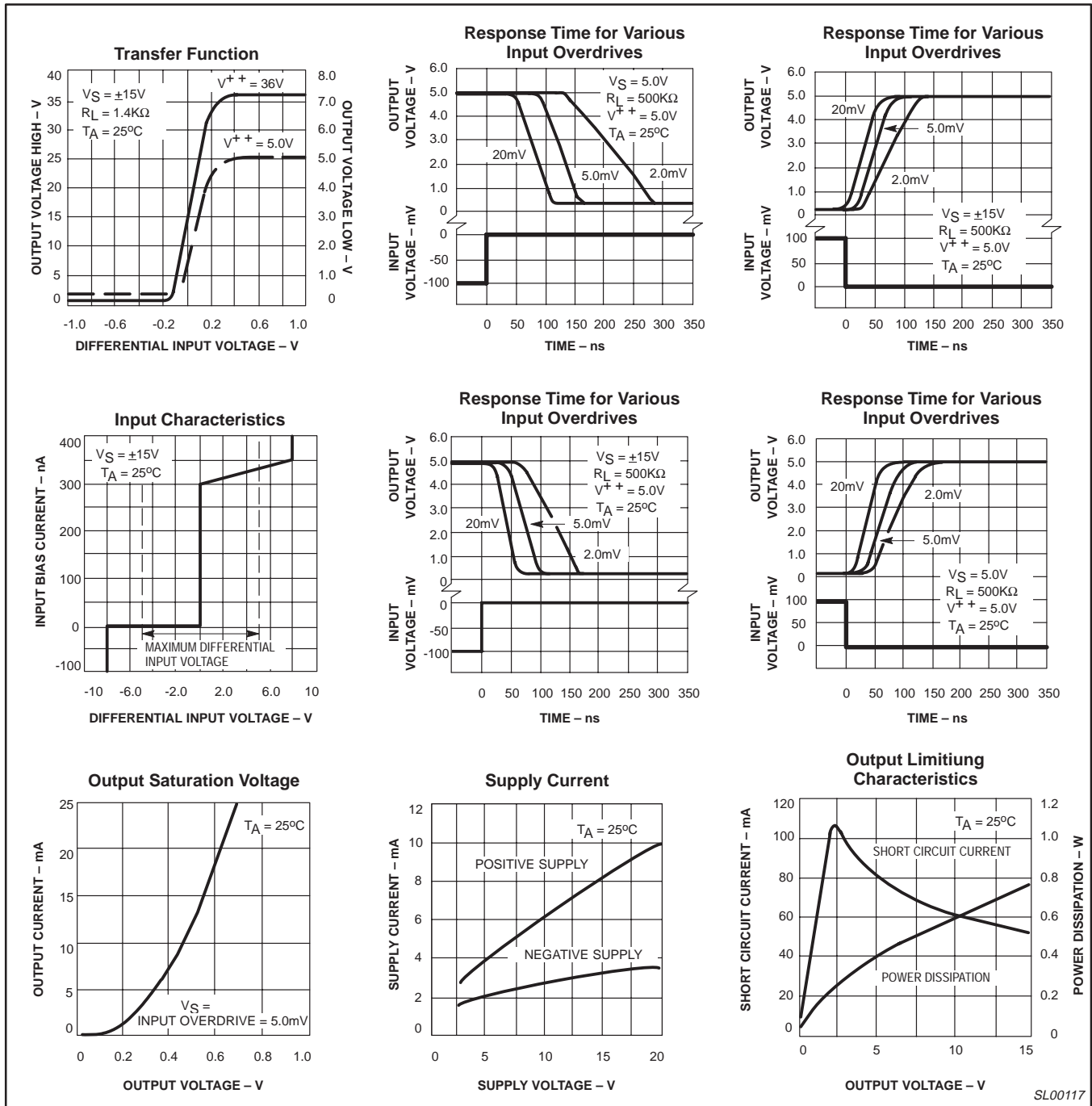


Figure 4. Typical Performance Characteristics

SL00117

# Dual voltage comparator

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## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

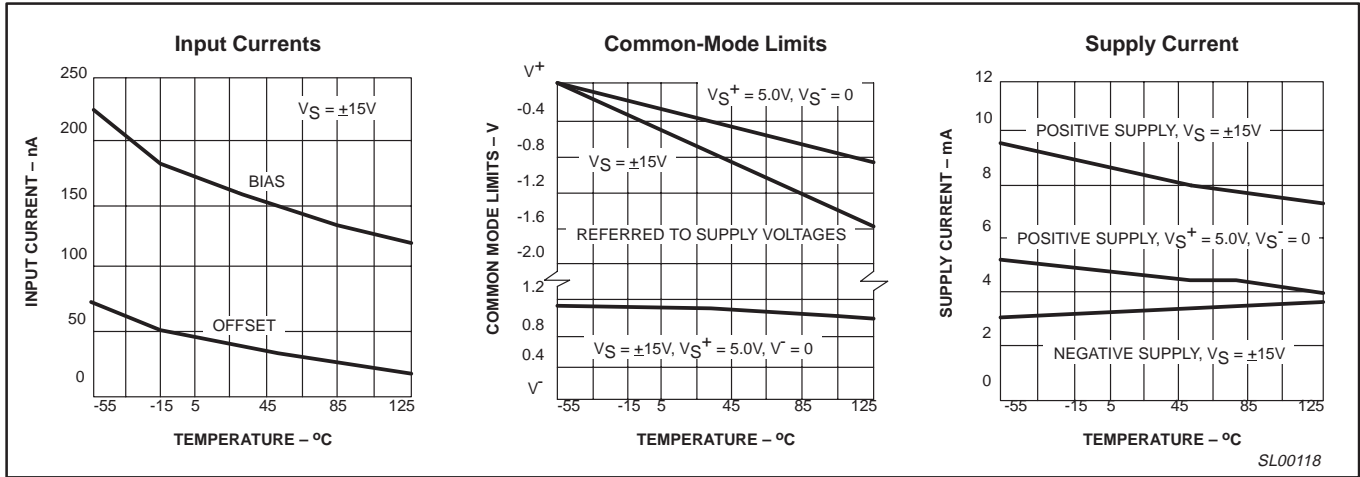


Figure 5. Typical Performance Characteristics

## TYPICAL APPLICATIONS

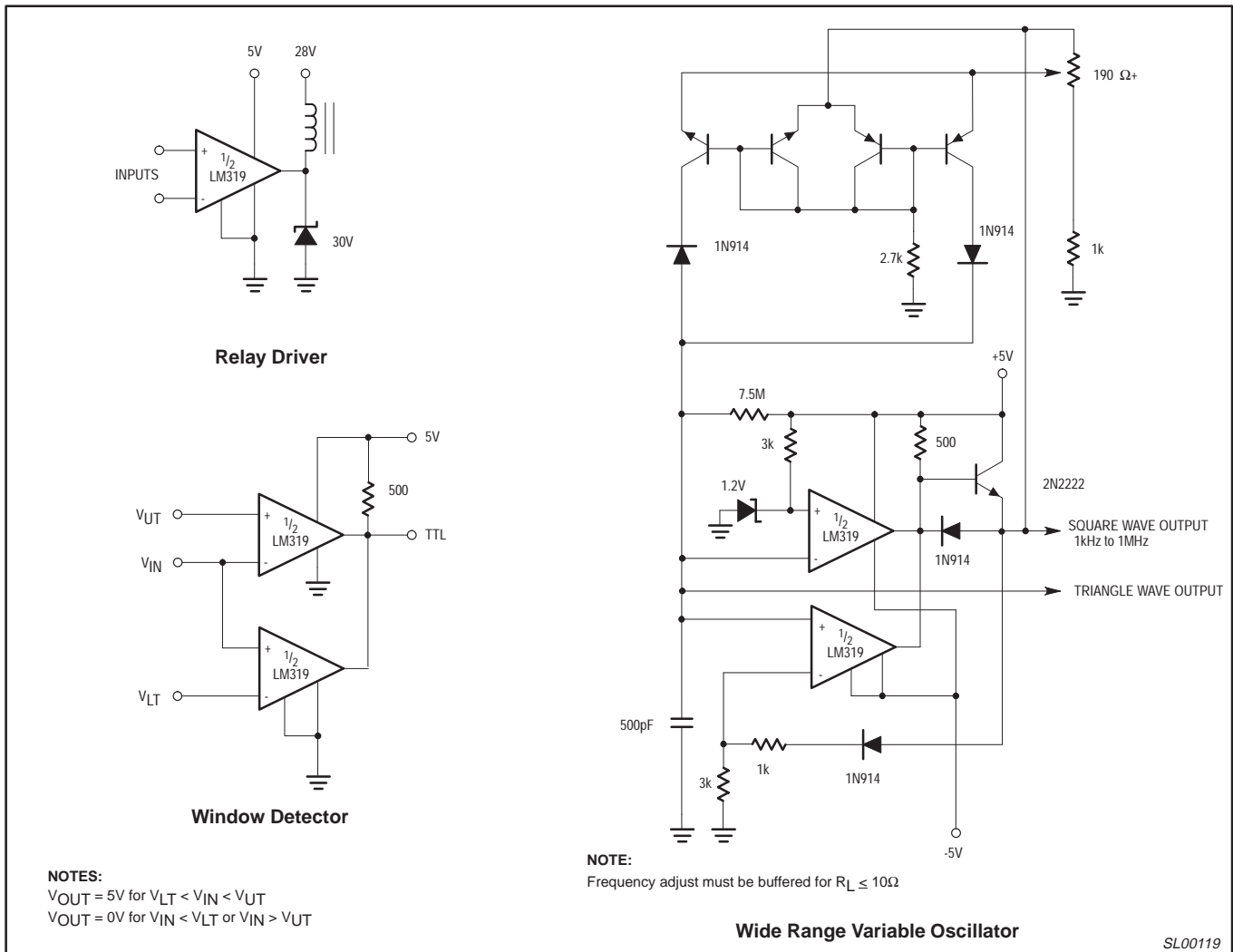


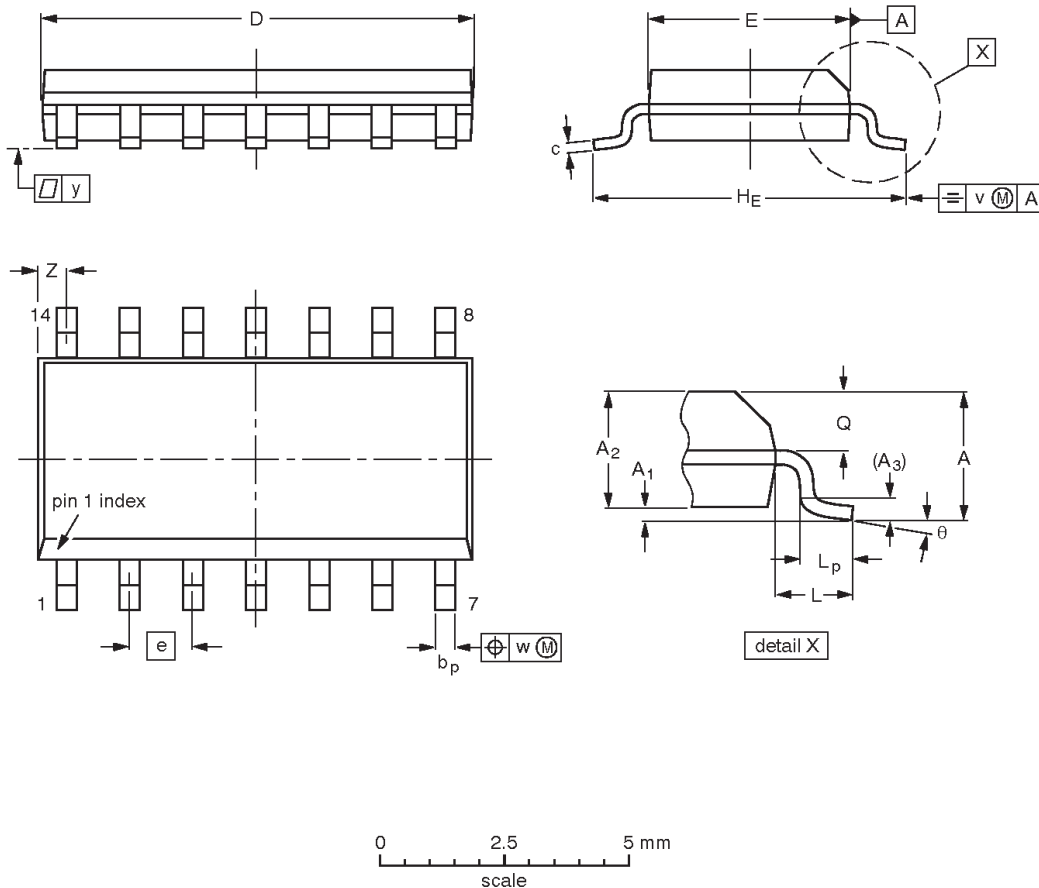
Figure 6. Typical Applications

# Dual voltage comparator

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SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

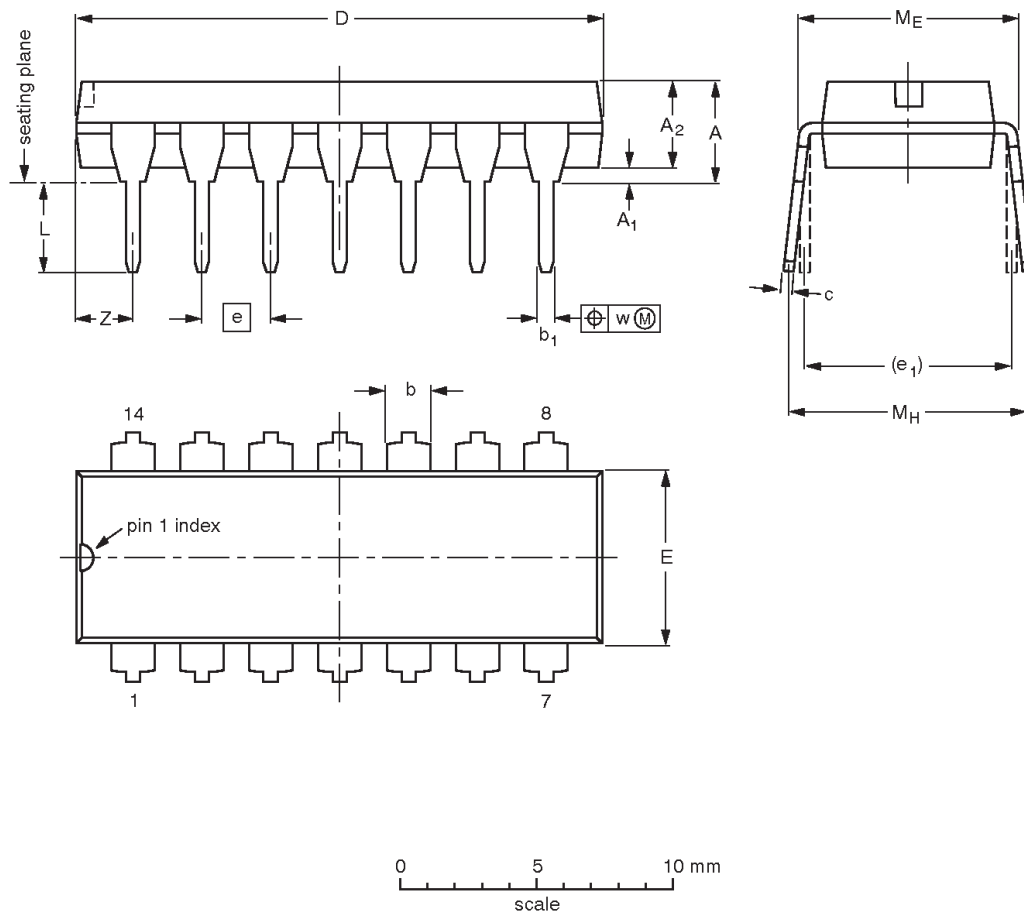
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06	MS-012				97-05-22 99-12-27

# Dual voltage comparator

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DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001	SC-501-14			95-03-11 99-12-27

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**NOTES**

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