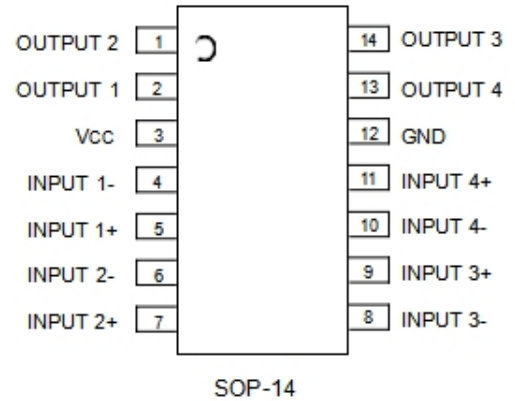
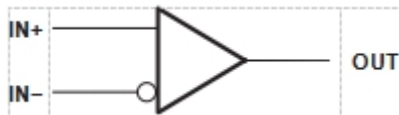


FEATURES

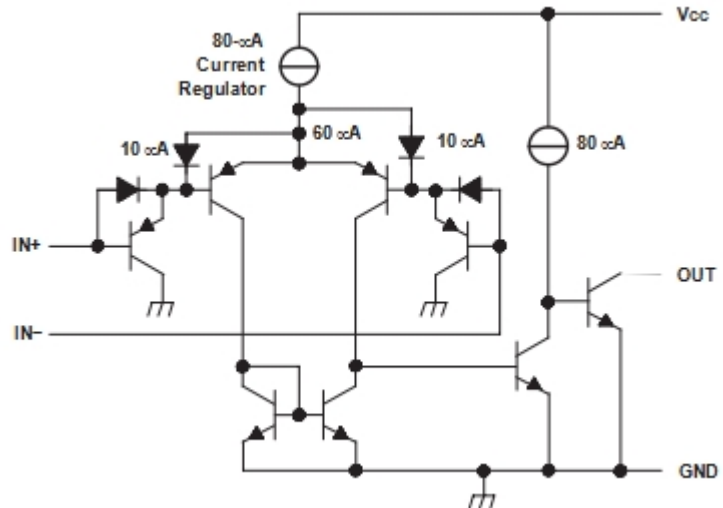
- Wide Supply Ranges
 - – Single Supply: 2 V to 36 V
 - (Tested to 30 V for Non-V Devices and 32 V for V-Suffix Devices)
 - – Dual Supplies: ± 1 V to ± 18 V
 - (Tested to ± 15 V for Non-V Devices and ± 16 V for V-Suffix Devices)
- Low Supply-Current Drain Independent of Supply Voltage: 0.8 mA (Typ)
- Low Input Bias Current: 25 nA (Typ)
- Low Input Offset Current: 3 nA (Typ) (LM139)
- Low Input Offset Voltage: 2 mV (Typ)
- Common-Mode Input Voltage Range Includes Ground
- Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage: ± 36 V
- Low Output Saturation Voltage
- Output Compatible With TTL, MOS, and CMOS



SYMBOL (EACH COMPARATOR)



SCHEMATIC (EACH COMPARATOR)



ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS ⁽¹⁾	T_A ⁽²⁾	LM139			UNIT
			MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{CC} = 5\text{ V to }30\text{ V}$, $V_{IC} = V_{ICR\text{ min}}$, $V_O = 1.4\text{ V}$	25°C		2	5	mV
		Full range			9	
I_{IO} Input offset current	$V_O = 1.4\text{ V}$	25°C		3	25	nA
		Full range			100	
I_{IB} Input bias current	$V_O = 1.4\text{ V}$	25°C		-25	-100	nA
		Full range			-300	
V_{ICR} Common-mode input-voltage range ⁽³⁾		25°C		0 to	$V_{CC} - 1.5$	V
		Full range		0 to	$V_{CC} - 2$	
A_{VD} Large-signal differential-voltage amplification	$V_{CC+} = \pm 7.5\text{ V}$, $V_O = -5\text{ V to }5\text{ V}$	25°C		200		V/mV
I_{OH} High-level output current	$V_{ID} = 1\text{ V}$	$V_{OH} = 5\text{ V}$	25°C		0.1	nA
		$V_{OH} = 30\text{ V}$	Full range			1
V_{OL} Low-level output voltage	$V_{ID} = -1\text{ V}$, $I_{OL} = 4\text{ mA}$	25°C		150	400	mV
		Full range			700	
I_{OL} Low-level output current	$V_{ID} = -1\text{ V}$, $V_{OL} = 1.5\text{ V}$	25°C		6	16	mA
I_{CC} Supply current (four comparators)	$V_O = 2.5\text{ V}$, No load	25°C		0.8	2	mA

(1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(2) Full range (MIN to MAX) for LM139 is -40°C to 125°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(3) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5\text{ V}$; however, one input can exceed V_{CC} , and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to 30 V without damage.

SWITCHING CHARACTERISTICS

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	LM139		UNIT	
		TYP			
Response time	R_L connected to 5 V through 5.1 kΩ, $C_L = 15\text{ pF}$ ⁽¹⁾ ⁽²⁾		100-mV input step with 5-mV overdrive	1.3	ps
			TTL-level input step	0.3	

(1) C_L includes probe and jig capacitance.

(2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS ⁽¹⁾	T_A ⁽²⁾	LM239 LM339			UNIT
			MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{CC} = 5\text{ V to }30\text{ V}$, $V_{IC} = V_{ICR\text{ min}}$, $V_O = 1.4\text{ V}$	25°C	2	5		mV
		Full range			9	
I_{IO} Input offset current	$V_O = 1.4\text{ V}$	25°C	5	50		nA
		Full range			150	
I_{IB} Input bias current	$V_O = 1.4\text{ V}$	25°C	-25	-250		nA
		Full range			-400	
V_{ICR} Common-mode input-voltage range ⁽³⁾		25°C	0 to $V_{CC} - 1.5$			V
		Full range	0 to $V_{CC} - 2$			
A_{VD} Large-signal differential-voltage amplification	$V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to }11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega\text{ to }V_{CC}$	25°C	50	200		V/mV
I_{OH} High-level output current	$V_{ID} = 1\text{ V}$	$V_{OH} = 5\text{ V}$	25°C	0.1	50	nA
		$V_{OH} = 30\text{ V}$	Full range		1	pA
V_{OL} Low-level output voltage	$V_{ID} = -1\text{ V}$, $I_{OL} = 4\text{ mA}$	25°C	150	400		mV
		Full range			700	
I_{OL} Low-level output current	$V_{ID} = -1\text{ V}$, $V_{OL} = 1.5\text{ V}$	25°C	6	16		mA
I_{CC} Supply current (four comparators)	$V_O = 2.5\text{ V}$, No load	25°C	0.8	2		mA

- (1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
- (2) Full range (MIN to MAX) for LM239 is -25°C to 85°C , and for LM339 is 0°C to 70°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
- (3) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is $V_{CC+} - 1.5\text{ V}$; however, one input can exceed V_{CC} , and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to 30 V without damage.

SWITCHING CHARACTERISTICS

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	LM239 LM339	UNIT	
		TYP		
Response time	R_L connected to 5 V through 5.1 k Ω , $C_L = 15\text{ pF}$ ⁽¹⁾ ⁽²⁾	100-mV input step with 5-mV overdrive	1.3	ps
		TTL-level input step	0.3	

- (1) C_L includes probe and jig capacitance.
- (2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

ELECTRICAL CHARACTERISTICS

at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS ⁽¹⁾		T _A ⁽²⁾	LM2901			UNIT
				MIN	TYP	MAX	
V _{IO} Input offset voltage	V _{IC} = V _{ICR} min, V _O = 1.4 V, V _{CC} = 5 V to MAX ⁽³⁾	Non-A devices	25°C	2	7	mV	
			Full range	15			
		A-suffix devices	25°C	1	2		
			Full range	4			
I _{IO} Input offset current	V _O = 1.4 V	25°C	5	50	nA		
		Full range	200				
I _{IB} Input bias current	V _O = 1.4 V	25°C	-25	-250	nA		
		Full range	-500				
V _{ICR} Common-mode input-voltage range ⁽⁴⁾		25°C	0 to V _{CC} - 1.5		V		
		Full range	0 to V _{CC} - 2				
A _{VD} Large-signal differential-voltage amplification	V _{CC} = 15 V, V _O = 1.4 V to 11.4 V, R _L ≥ 15 kΩ to V _{CC}		25°C	25	100	V/mV	
I _{OH} High-level output current	V _{ID} = 1 V	V _{OH} = 5 V	25°C	0.1	50	nA	
		V _{OH} = V _{CC} MAX ⁽³⁾	Full range	1		PA	
V _{OL} Low-level output voltage	V _{ID} = -1 V, I _{OL} = 4 mA	Non-V devices	25°C	150	500	mV	
		V-suffix devices		150	400		
		All devices	Full range	700			
I _{OL} Low-level output current	V _{ID} = -1 V,	V _{OL} = 1.5 V	25°C	6	16	mA	
I _{CC} Supply current (four comparators)	V _O = 2.5 V, No load	V _{CC} = 5 V	25°C	0.8	2	mA	
		V _{CC} = MAX ⁽³⁾		1	2.5		

(1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(2) Full range (MIN to MAX) for LM2901 is -40°C to 125°C. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(3) V_{CC} MAX = 30 V for non-V devices, and 3.2 V for V-suffix devices

(4) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is V_{CC+} - 1.5 V; however, one input can exceed V_{CC}, and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to V_{CC} MAX without damage.

SWITCHING CHARACTERISTICS

V_{CC} = 5 V, T_A = 25°C

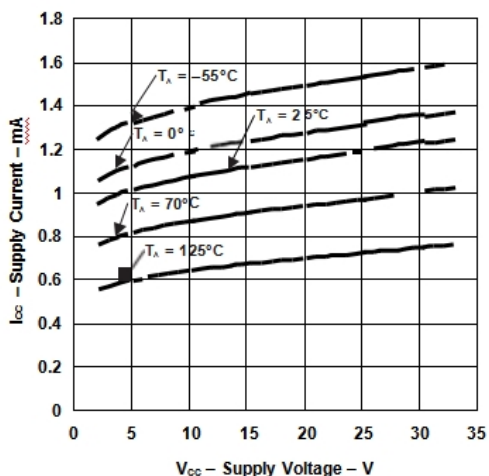
PARAMETER	TEST CONDITIONS		LM2901	UNIT
			TYP	
Response time	R _L connected to 5 V through 5.1 kΩ, C _L = 15 pF ⁽¹⁾ ⁽²⁾	100-mV input step with 5-mV overdrive	1.3	ps
		TTL-level input step	0.3	

(1) C_L includes probe and jig capacitance.

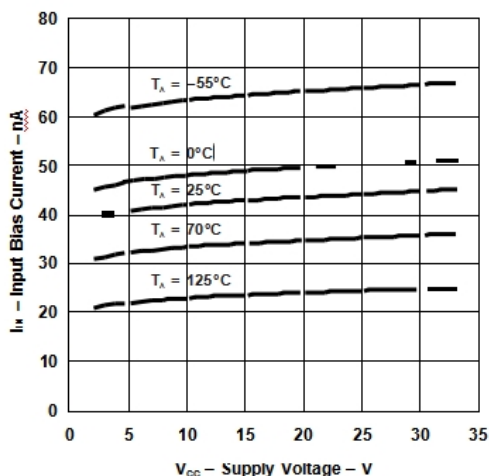
(2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

TYPICAL CHARACTERISTICS

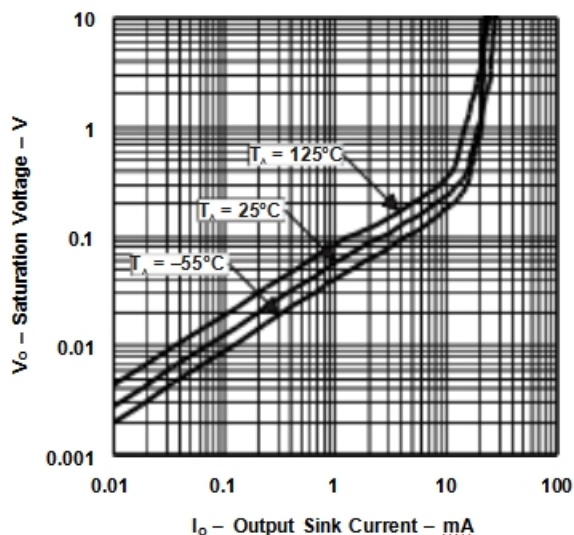
SUPPLY CURRENT
Vs
SUPPLY VOLTAGE



INPUT BIAS CURRENT
vs
SUPPLY VOLTAGE

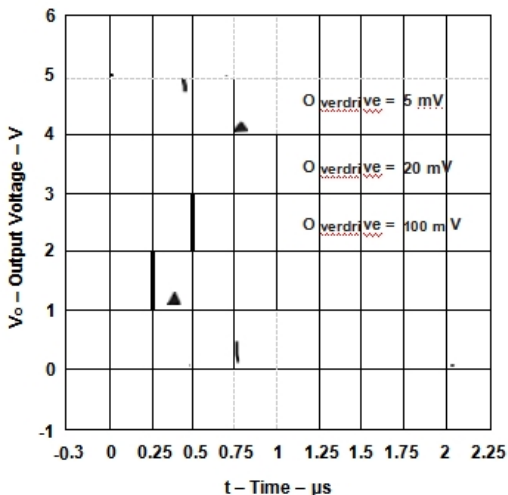


OUTPUT SATURATION VOLTAGE

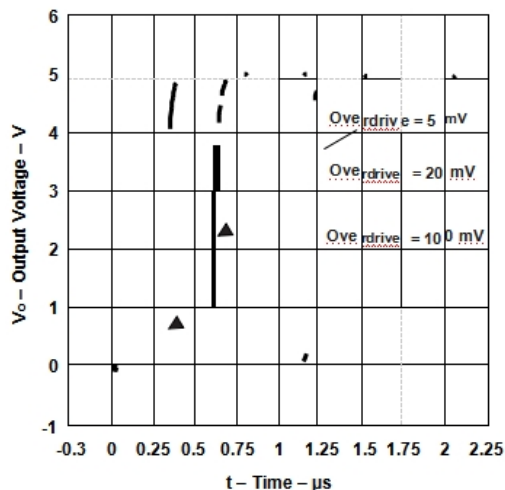


TYPICAL CHARACTERISTICS (continued)

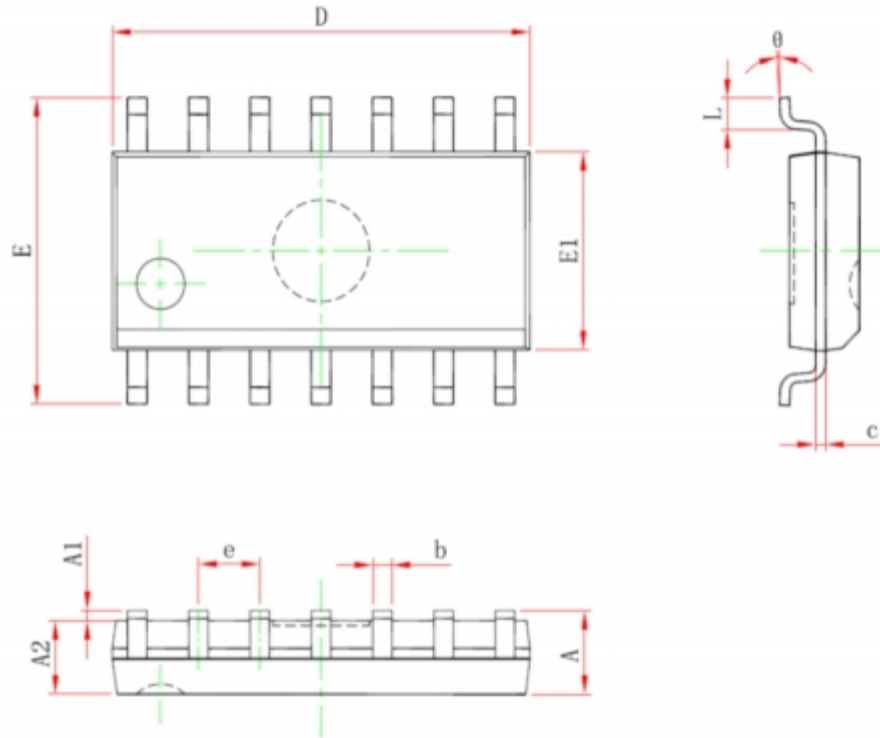
RESPONSE TIME FOR VARIOUS OVERDRIVES
NEGATIVE TRANSITION



RESPONSE TIME FOR VARIOUS OVERDRIVES
POSITIVE TRANSITION



PACKAGE SOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	---	1.750	---	0.069
A1	0.100	0.250	0.004	0.010
A2	1.250	---	0.049	---
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Ordering information

Order code	Package	Baseqty	Deliverymode
UMW LM339DR	SOP- 14	2500	Tape and reel
UMW LM239DR	SOP- 14	2500	Tape and reel
UMW LM139DR	SOP- 14	2500	Tape and reel
UMW LM2901DR	SOP- 14	2500	Tape and reel