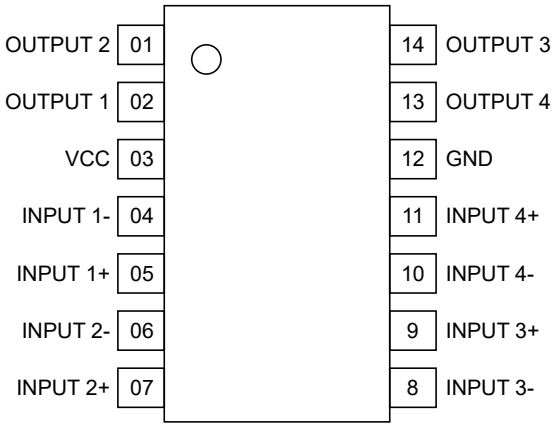
1.Features

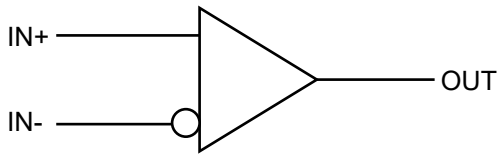
- Wide Supply Ranges
  – Single Supply: 2V to 36V
  (Tested to 30V for Non-V Devices and 32V for V-Suffix Devices)
  – Dual Supplies: ±1V to ±18V
  (Tested to ±15V for Non-V Devices and ±16 V for V-Suffix Devices)
- Low Supply-Current Drain Independent of Supply Voltage: 0.8mA (Typ)
- Low Input Bias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

2.Pinning Information

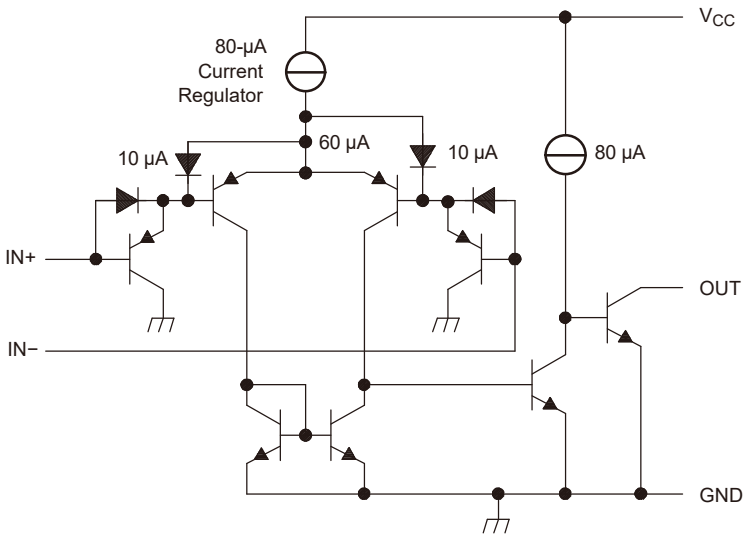


SOP-14/TSSOP-14

3.Symbol (Each Comparator)



4.Schematic (Each Comparator)



5.Absolute Maximum Ratings And Operating Conditions

Table 1. Absolute maximum ratings

Parameter		Symbol	Value	Units
Supply voltage		V_{CC}	±18 or 36	V
Differential input voltage		V_{ID}	±36	V
Input voltage		V_{IN}	-0.3 to +36	V
Output short-circuit to ground (1)			Infinite	
Thermal resistance junction to ambient (2)	SO14	R_{thja}	105	°C/W
	TSSOP14		100	°C/W
Thermal resistance junction to case (2)	SO14	R_{thjc}	31	°C/W
	TSSOP14		32	°C/W
Storage temperature range		T_{STG}	-65 to +150	°C
Junction temperature		T_J	+150	°C
Lead temperature (soldering 10 seconds)		T_{LEAD}	260	°C
Human body model (HBM) (3)		ESD	500	V
Machine model (MM) (4)			100	V
Charged device model (CDM) (5)			1500	V

1. Short-circuits from the output to V_{CC}+ can cause excessive heating and eventual destruction. The maximum output current is approximately 20 mA independent of the magnitude of V_{CC}+.
2. Short-circuits can cause excessive heating. These values are typical.
3. Human body model: a 100pF capacitor is charged to the specified voltage, then discharged through a 1.5kΩ resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
4. Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.
5. Charged device model: all pins and the package are charged together to the specified voltage and then discharged directly to the ground through only one pin. This is done for all pins.

Table 2. Operating conditions (T_{amb}=25°C)

Parameter		Symbol	Value	Units
Supply voltage		V_{CC}	2 to 32	V
			±1 to ±16	V
Common mode input voltage range		V_{ICM}	0 to (V_{CC}+ -1.5)	V
Operating free-air temperature range	– LM139, LM139A	T_{OPR}	-55 to +125	°C
	– LM239, LM2901		-40 to +105	°C
	– LM339, LM339A		0 to +70	°C

6.Electrical Characteristics (LM139)

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

Parameter	Symbol	Test Conditions(1)		T_A(2)	Min	Typ	Max	Units
Input offset voltage	V_{IO}	V_{CC}=5V to 30V, V_{IC}=V_{ICR} min V_O=1.4V		25°C		2	5	mV
				Full range			9	mV
Input offset current	I_{IO}	V_O=1.4V		25°C		3	25	nA
				Full range			100	nA
Input bias current	I_{IB}	V_O=1.4V		25°C		-25	-100	nA
				Full range			-300	nA
Common-mode input-voltage range(3)	V_{ICR}			25°C			0 to V_{CC}-1.5	V
				Full range			0 to V_{CC}-2	V
Large-signal differential - voltage amplification	A_{VD}	V_{CC+}=±7.5V V_O=-5V to 5V		25°C		200		V/mV
High-level output current	I_{OH}	V_{ID}=1V	V_{OH}=5V	25°C		0.1		nA
			V_{OH}=30V	Full range			1	μA
Low-level output voltage	V_{OL}	V_{ID}=-1V, I_{OL}=4mA		25°C		150	400	mV
				Full range			700	mV
Low-level output current	I_{OL}	V_{ID}=-1V, V_{OL}=1.5V		25°C	6	16		mA
Supply current (four comparators)	I_{CC}	V_O=2.5V, No load		25°C		0.8	2	mA

Notes:

(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 105°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 0.3V. The upper end of the commonmode 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 30V without damage.

7.Switching Characteristics

V_{CC}=5V, T_A=25°C

Parameter	Test Conditions		LM139	Unit
			TYP	
Response time	R_L connected to 5V through 5.1kΩ	100-mV input step with 5-mV overdrive	1.3	μs
	C_L=15pF(1) (2)	TTL-level input step	0.3	μs

Notes:

(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 1.4V.

8.Electrical Characteristics (LM239/LM339)

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

Parameter	Symbol	Test Conditions(1)		T_A(2)	Min	Typ	Max	Units
Input offset voltage	V_{IO}	V_{CC}=5V to 30V, V_{IC}=V_{ICR} min V_O=1.4V		25°C		2	5	mV
				Full range			9	mV
Input offset current	I_{IO}	V_O=1.4V		25°C		5	50	nA
				Full range			200	nA
Input bias current	I_{IB}	V_O=1.4V		25°C		-25	-250	nA
				Full range			-500	nA
Common-mode input-voltage range(3)	V_{ICR}			25°C			0 to V_{CC}-1.5	V
				Full range			0 to V_{CC}-2	V
Large-signal differential - voltage amplification	A_{VD}	V_{CC}=15V, V_O=1.4V to 11.4V R_L≥15kΩ to V_{CC}		25°C	50	200		V/mV
High-level output current	I_{OH}	V_{ID}=1V	V_{OH}=5V	25°C		0.1	50	nA
			V_{OH}=30V	Full range			1	μA
Low-level output voltage	V_{OL}	V_{ID}=-1V, I_{OL}=4mA		25°C		150	400	mV
				Full range			700	mV
Low-level output current	I_{OL}	V_{ID}=-1V, V_{OL}=1.5V		25°C	6	16		mA
Supply current (four comparators)	I_{CC}	V_O=2.5V, No load		25°C		0.8	2	mA

Notes:

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

(2) Full range (MIN to MAX) for LM239 is –20°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 0.3V. The upper end of the commonmode 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 30V without damage.

9.Switching Characteristics

V_{CC}=5V, T_A=25°C

Parameter	Test Conditions		LM239 LM339 TYP	Unit
Response time	R_L connected to 5V through 5.1kΩ C_L=15pF(1) (2)	100-mV input step with 5-mV overdrive	1.3	μs
		TTL-level input step	0.3	μs

Notes:

(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 1.4V.

10.Electrical Characteristics (LM2901)

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

Parameter	Symbol	Test Conditions(1)		T_A(2)	Min	Typ	Max	Units
Input offset voltage	V_{IO}	$V_{IC}=V_{ICR}$ min V_O=1.4V V_{CC}=5V to MAX(3)	Non-A devices	25°C		2	7	mV
				Full range			15	mV
			A-suffix devices	25°C		1	2	mV
				Full range			4	mV
Input offset current	I_{IO}	V_O=1.4V		25°C		5	50	nA
				Full range			200	nA
Input bias current	I_{IB}	V_O=1.4V		25°C		-25	-250	nA
				Full range			-500	nA
Common-mode input-voltage range(3)	V_{ICM}			25°C			V_{CC}^+-1.5	V
				Full range			V_{CC}^+-2	V
Large-signal differential - voltage amplification	A_{VD}	V_{CC}=15V, V_O=1.4V to 11.4V R_L≥15kΩ to V_{CC}		25°C	25	100		V/mV
High-level output current	I_{OH}	V_{ID}=1V	V_{OH}=5V	25°C		0.1	50	nA
			$V_{OH}=V_{CC}$ MAX(3)	Full range			1	μA
Low-level output voltage	V_{OL}	V_{ID}=-1V I_{OL}=4mA	Non-V devices	25°C		150	500	mV
			V-suffix devices			150	400	mV
			All devices	Full range			700	mV
Low-level output current	I_{OL}	V_{ID}=-1V	V_{OL}=1.5V	25°C	6	16		mA
Supply current (four comparators)	I_{CC}	V_O=2.5V No load	V_{CC}=1.5V	25°C		0.8	2	mA
			V_{CC}=MAX(3)			1	2.5	mA

Notes:

(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 105°C. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(3) V_{CC} MAX=30V for non-V devices, and 32V for V-suffix devices

(4) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3V. The upper end of the commonmode 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.

11.Switching Characteristics

V_{CC}=5V, T_A=25°C

Parameter	Test Conditions		LM2901	Unit
			TYP	
Response time	R_L connected to 5V through 5.1kΩ	100-mV input step with 5-mV overdrive	1.3	μs
	C_L=15pF(1) (2)	TTL-level input step	0.3	μs

Notes:

(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 1.4V.

12.Typical Characteristic

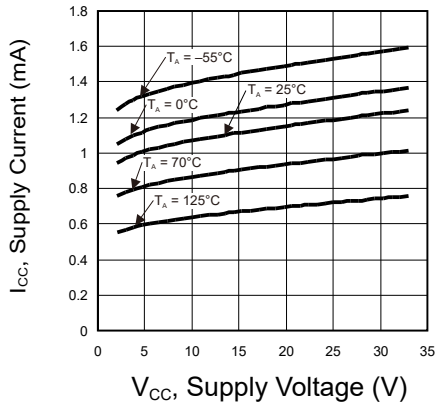


Figure 1: Supply Current vs Supply Voltage

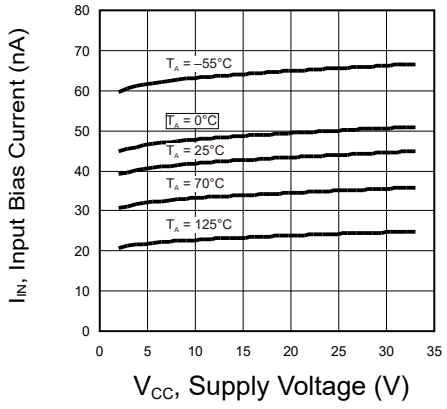


Figure 2: Input Bias Current vs Supply Voltage

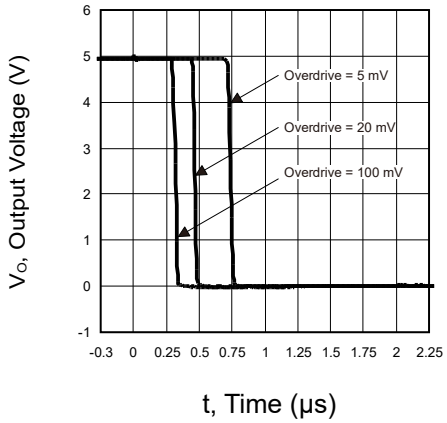


Figure 3: Response Time For Various Overdrives Negative Transition

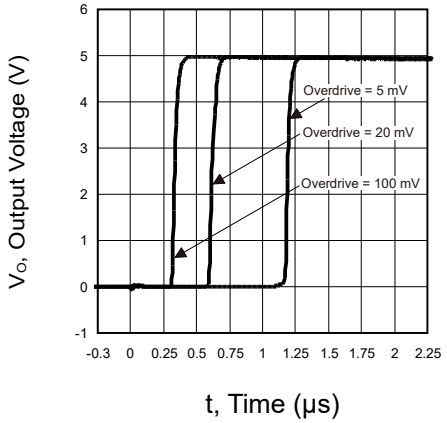


Figure 4: Response Time For Various Overdrives Positive Transition

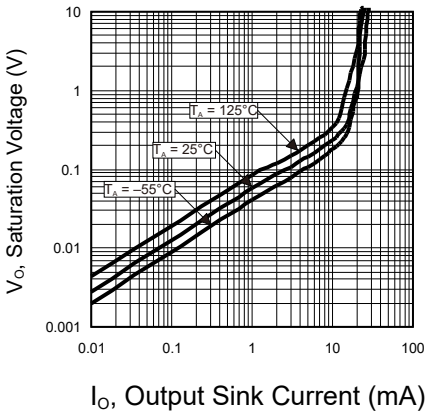
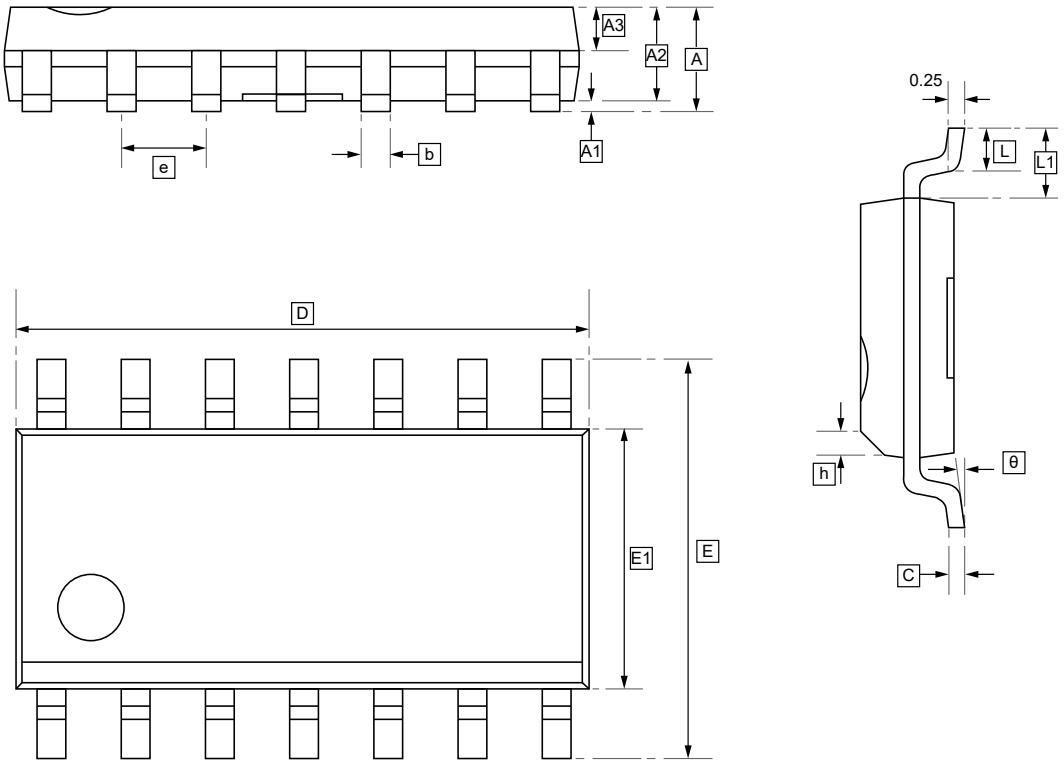


Figure 5: Output Saturation Voltage

13.1 SOP-14 Package Outline Dimensions

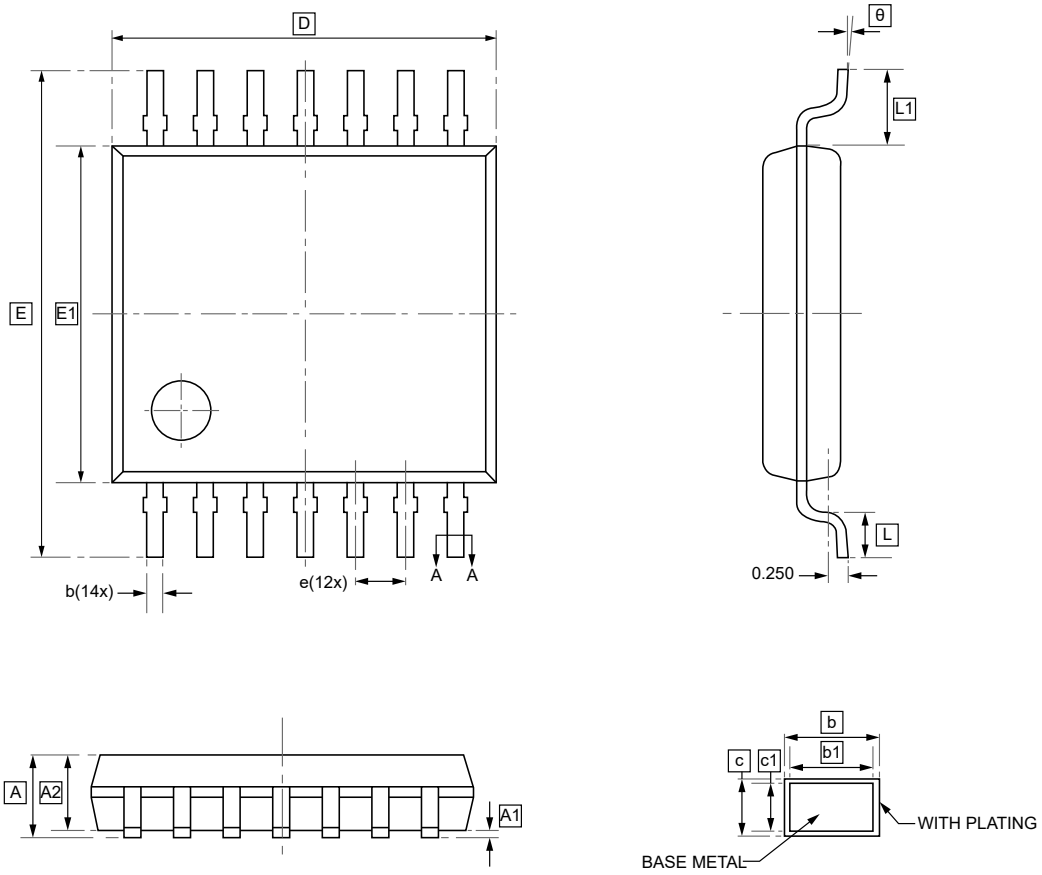


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

13.2 TSSOP-14 Package Outline Dimensions



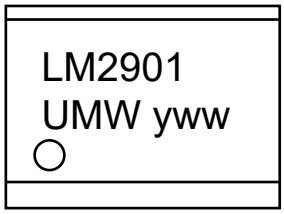
DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	4.90	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	5.10	6.60	4.50	BSC	1.15

Symbol	L	θ
Min	0.45	0°
Max	0.75	8°

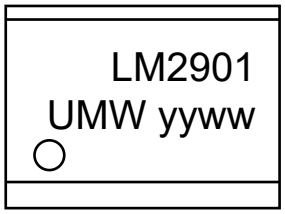
14.Ordering Information

TSSOP-14



yww: Batch Code

SOP-14



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW LM339DR	LM339	SOP-14	2500	Tape and reel
UMW LM239DR	LM239	SOP-14	2500	Tape and reel
UMW LM139DR	LM139	SOP-14	2500	Tape and reel
UMW LM2901DR	LM2901	SOP-14	2500	Tape and reel
UMW LM339PT	LM339	TSSOP-14	4000	Tape and reel
UMW LM339PWR	LM339	TSSOP-14	4000	Tape and reel
UMW LM2901PT	LM2901	TSSOP-14	4000	Tape and reel
UMW LM2901PWR	LM2901	TSSOP-14	4000	Tape and reel
UMW LM239APT	LM239	TSSOP-14	4000	Tape and reel
UMW LM239PT	LM239	TSSOP-14	4000	Tape and reel
UMW LM239PWR	LM239	TSSOP-14	4000	Tape and reel

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