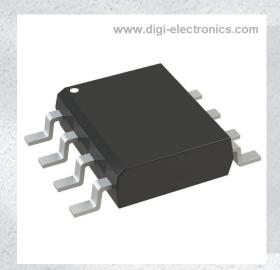


# LM2903S-13 Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number LM2903S-13-DG

Manufacturer Diodes Incorporated

Manufacturer Product Number LM2903S-13

Description IC COMPARATOR 2 DIFF 8SO

Detailed Description Comparator General Purpose 8-SO



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RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.



# **Purchase and inquiry**

Manufacturer Product Number:	Manufacturer:	
LM2903S-13	Diodes Incorporated	
Series:	Product Status:	
	Active	
Type:	Number of Elements:	
General Purpose	2	
Output Type:	Voltage - Supply, Single/Dual (±):	
	2V ~ 36V, ±1V ~ 18V	
Voltage - Input Offset (Max):	Current - Input Bias (Max):	
7mV @ 5V	0.25μA @ 5V	
Current - Output (Typ):	Current - Quiescent (Max):	
16mA @ 5V	1.7mA	
CMRR, PSRR (Typ):	Propagation Delay (Max):	
Hysteresis:	Operating Temperature:	
-	-40°C ~ 125°C	
Package / Case:	Mounting Type:	
8-SOIC (0.154", 3.90mm Width)	Surface Mount	
Supplier Device Package:	Base Product Number:	
8-50	LM2903	

# **Environmental & Export classification**

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	3 (168 Hours)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	

8542.33.0001





#### **DUAL AND QUAD DIFFERENTIAL COMPARATORS**

#### **Description**

The LM2901/2903 series comparators consist of four and two independent precision voltage comparators with very low input offset voltage specification. They are designed to operate from a single power supply over a wide range of voltages; however operation from split power supplies is also possible. They offer low power supply current independent of the magnitude of the power supply voltage.

The LM2901/2903 series comparators are designed to directly interface with TTL and CMOS. When operating from both plus and minus power supplies, the LM2901/2903 series comparators will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

The dual devices are available in SO-8, TSSOP-8, and MSOP-8, and the quad devices available in SO-14 and TSSOP-14 with industry standard pinouts. Both use green mold compound as standard.

#### **Features**

Wide Power Supply Range:

Single Supply: 2V to 36V
 Dual Supplies: ±1.0V to ±18V

Very Low Supply Current Drain—Independent of Supply Voltage

LM2903: 0.6mALM2901: 0.9mA

Low Input Bias Current: 25nA
 Low Input Offset Current: ±5nA

Typical Offset Voltage:

Non-A Device: 2mV
 A Device: 1mV

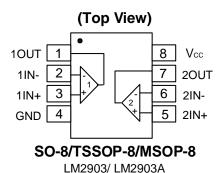
- Common-Mode Input Voltage Range Includes Ground
- Differential Input Voltage Range Equal to the Power Supply Voltage
- Low Output Saturation Voltage:

LM2903: 200mV at 4mA

LM2901: 100mV at 4mA

- Output Voltage Compatible with TTL, MOS and CMOS
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

### **Pin Assignments**



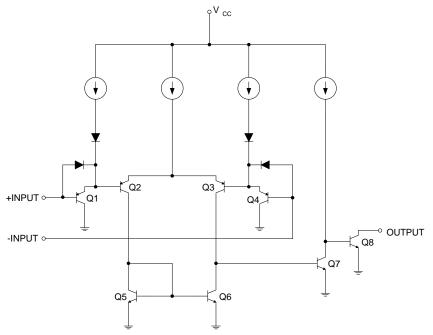
(Top View) 10UT 3OUT 2 13 2OUT 40UT 3 12 **GND** Vcc 4 4IN+ 2IN-11 2IN+ 5 10 4IN-9 1IN-3IN+ 6 1IN+ 8 3IN-

**SO-14/TSSOP-14** LM2901/ LM2901A

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- 2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.



### **Schematic Diagram**



Functional Block Diagram of LM2901/2901A/2903/2903A (Each Comparator)

### **Pin Descriptions**

001, LM2901A			
Pin Name	Pin #	Function	
1OUT	1	Channel 1 Output	
2OUT	2	Channel 2 Output	
V <sub>CC</sub>	3	Chip Supply Voltage	
2IN-	4	Channel 2 Inverting Input	
2IN+	5	Channel 2 Non-Inverting Input	
1IN-	6	Channel 1 Inverting Input	
1IN+	7	Channel 1 Non-Inverting Input	
3IN-	8	Channel 3 Inverting Input	
3IN+	9	Channel 3 Non-Inverting Input	
4IN-	10	Channel 4 Inverting Input	
4IN+	11	Channel 4 Non-Inverting Input	
GND	12	Ground	
4OUT	13	Channel 4 Output	
3OUT	14	Channel 3 Output	
903, LM2903A			
1OUT	1	Channel 1 Output	
1IN-	2	Channel 1 Inverting Input	
1IN+	3	Channel 1 Non-Inverting Input	
GND	4	Ground	
2IN+	5	Channel 2 Non-Inverting Input	
2IN-	6	Channel 2 Inverting Input	
2OUT	7	Channel 2 Output	
V <sub>CC</sub>	8	Chip Supply Voltage	



### Absolute Maximum Ratings (Note 4) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	F	Parameter	Rating	Unit	
V <sub>CC</sub>	Supply Voltage		36	V	
$V_{ID}$	Differential Input Voltage		36	V	
V <sub>IN</sub>	Input Voltage		-0.3 to +36	V	
I <sub>IN</sub>	Input Current (V <sub>IN</sub> < -0.3V)		50	mA	
Vo	Output Voltage		36	V	
lo	Output Current		20	mA	
_	Duration of Output Short Circuit to	Ground (Note 5)	Unlimited	_	
		SO-8	110		
	De de con Theore de la constant	MSOP-8	160		
$\theta_{JA}$	Package Thermal Impedance (Note 6)	TSSOP-8	185	°C/W	
	(Note o)	SO-14	100		
		TSSOP-14	129		
		SO-8	8.5		
	5	MSOP-8	25		
$\theta_{JC}$	Package Thermal Impedance (Note 6)	TSSOP-8	17	°C/W	
	(Note 6)	SO-14	16		
		TSSOP-14	6.3		
T <sub>A</sub>	Operating Temperature Range	Operating Temperature Range		°C	
$T_J$	Operating Junction Temperature		150	°C	
T <sub>ST</sub>	Storage Temperature Range		-65 to +150	°C	
T <sub>LEAD</sub>	Lead Temperature (Soldering, 10 seconds)		260	°C	
ESD	Human Body Mode ESD Protection (Note 7)		500	V	
ESD	Machine Mode ESD Protection		100	l v	

<sup>4.</sup> Stresses beyond those listed under Absolute Maximum Ratings can cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to

absolute-maximum-rated conditions for extended periods can affect device reliability. 5. Short circuits from outputs to  $V_{\rm CC}$  can cause excessive heating and eventual destruction.

<sup>6.</sup> Maximum power dissipation is a function of  $T_{J(MAX)}$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_{J(MAX)} - T_A)/\theta_{JA}. \ \, \text{Operating at the absolute maximum $T_J$ of 150°C can affect reliability.} \\ 7. \ \, \text{Human body model}, \ \, 1.5 \text{k}\Omega \ \, \text{in series with 100pF}. \\$ 



#### Electrical Characteristics (Notes 8 & 9) (@V<sub>CC</sub> = 5.0V, GND = 0V, T<sub>A</sub> = +25°C, unless otherwise specified.)

	Parameter	Condi	tions	TA	Min	Тур	Max	Unit
		V <sub>IC</sub> = V <sub>CMR</sub> Min,		T <sub>A</sub> = +25°C	_	2	7	
	lanut Offeet Veltere	$V_0 = 1.4V$ ,	Non-A Device	Full Range	_	_	15	\/
$V_{IO}$	Input Offset Voltage	$V_{CC} = 5V \text{ to } 30V$	A-Suffix Device	T <sub>A</sub> = +25°C	_	1	2	mV
		(Note 10)	A-Sullix Device	Full Range	_	I	4	
I <sub>B</sub>	Input Bias Current	I <sub>IN+</sub> or I <sub>IN</sub> - with OUT in	Linear Range,	T <sub>A</sub> = +25°C		25	250	nA
ıB	Imput bias Current	V <sub>CM</sub> = 0V (Note 11)		Full Range	_	_	500	ш
I <sub>IO</sub>	Input Offset Current	$I_{IN+} - I_{IN-}, V_{CM} = 0V$		$T_A = +25$ °C	_	5	50	nA
IO	input onset ounent	11N+ - 11N-, VCM - OV		Full Range	_	_	200	ПА
	Input Common-Mode			T <sub>A</sub> = +25°C	0 to V <sub>CC</sub> -1.5	_	_	.,
V <sub>CMR</sub>	Voltage Range	Vcc = 30V (Note 12)		Full Range	0 to V <sub>CC</sub> -2	_	_	V
		R <sub>L</sub> = ∞ on Quad Channels	V 20V	T <sub>A</sub> = +25°C	_	1.2	2.5	mA
	Supply Current		$V_{CC} = 30V$	Full Range	_		3.5	
Icc	(Four Comparators)		$V_{CC} = 5V$	T <sub>A</sub> = +25°C	_	0.9	2	
			ACC = 2A	Full Range	_		3.0	
$A_V$	Voltage Gain	$V_{CC} = 15V$ , $V_{OUT} = 1V$ $R_L \ge 15k\Omega$ ,	to 11V,	T <sub>A</sub> = +25°C	50	200	_	V/mV
_	Large Signal Response time	$V_{IN}$ = TTL Logic Swing $V_{RL}$ = 5V, $R_L$ = 5.1k $\Omega$	, V <sub>REF</sub> = 1.4V,	T <sub>A</sub> = +25°C	_	300	_	ns
_	Response Time	$V_{RL} = 5V$ , $R_L = 5.1k\Omega$	(Note 13)	T <sub>A</sub> = +25°C	_	1.3	_	μs
I <sub>O(SINK)</sub>	Output Sink Current	$V_{IN-} = 1V, V_{IN+} = 0, V_O \le 1.5V$		T <sub>A</sub> = +25°C	6	16	_	mA
	Caturatian Valtana	V 4V V 2 1	4 4 mm A	T <sub>A</sub> = +25°C	_	100	400	<u>,,</u>
$V_{SAT}$	Saturation Voltage	$V_{IN-} = 1V, V_{IN+} = 0, I_{SINK} \le 4mA$		Full Range	_	_	700	mV
	Output Lagles as Comment	$V_{IN-} = 0V, V_{IN+} = 1, V_{C}$	) = 5V	T <sub>A</sub> = +25°C	_	0.1	_	nA
I <sub>O(LEAK)</sub>	Output Leakage Current	$V_{IN-} = 0V, V_{IN+} = 1, V_{C}$	) = 30V	Full Range	_		1	μΑ
V <sub>ID</sub>	Differential Input Voltage	All V <sub>IN</sub> ≥0V (or V- if us	ed) (Note 14)	Full Range	_	_	36	V

<sup>8.</sup> Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration. The typical values are not tested and are not guaranteed on shipped production material.

<sup>9.</sup> All limits are guaranteed by testing or statistical analysis. Limits over the full temperature are guaranteed by design, but not tested in production.

<sup>10.</sup>  $V_O \cong 1.4V$ ,  $R_S = 0\Omega$  with  $V_{CC}$  from 5V to 30V;

<sup>11.</sup> The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.

<sup>12.</sup> The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V (@ +25°C). The upper end of the common-mode voltage range is V<sub>CC</sub> -1.5V (@ +25°C), but either or both inputs can go to +36V without damage, independent of the magnitude of V<sub>CC</sub>.

13. The response time specified is for a 100mV step input with 5mV overdrive. For larger overdrive signals 300ns can be obtained, see typical performance

characteristics.

<sup>14.</sup> Positive excursions of input voltage may exceed the power supply level. As long as other voltages remain within the common mode range, the comparator will provide a proper output stage. The low voltage state must not be less than -0.3V (or 0.3V below the magnitude of the negative power supply, if used).



#### Electrical Characteristics (Notes 8 & 9) (@V<sub>CC</sub> = 5.0V, GND = 0V, T<sub>A</sub> = +25°C, unless otherwise specified.)

.M2903, LI	M2903A							
	Parameter	Conditi	ions	T <sub>A</sub>	Min	Тур	Max	Unit
		V <sub>IC</sub> = V <sub>CMR</sub> Min,	Non-A Device	T <sub>A</sub> = +25°C	_	2	7	mV
V/	Input Offset Voltage	$V_0 = 1.4V$ ,	Non-A Device	Full Range	_	1	15	
$V_{IO}$	input Onset Voltage	$V_{CC} = 5V \text{ to } =30V$	A-Suffix Device	$T_A = +25$ °C	_	1	2	IIIV
		(Note 10)	A-Sullix Device	Full Range	_		4	
I <sub>B</sub>	Input Bias Current	I <sub>IN+</sub> or I <sub>IN-</sub> with OUT in	Linear Range,	$T_A = +25$ °C	_	25	250	nA
ıB	input bias current	V <sub>CM</sub> = 0V (Note 11)		Full Range	_		500	ПА
l.a	Input Offset Current	$I_{IN+} - I_{IN-}, V_{CM} = 0V$		$T_A = +25$ °C	_	5	50	nA
I <sub>IO</sub>	input Onset Current	IIN+ - IIN-, VCM = UV		Full Range	_	_	200	IIA
.,	Input Common-Mode Voltage	tage V <sub>CC</sub> = 30V (Note 12)		T <sub>A</sub> = +25°C	0 to V <sub>CC</sub> -1.5	_	_	V
V <sub>CMR</sub>	Range			Full Range	0 to V <sub>CC</sub> -2	_	_	
		R <sub>L</sub> = ∞ on Both Channels	V <sub>CC</sub> = 30V	T <sub>A</sub> = +25°C	_	0.7	1.7	- mA
	Cumply Current			Full Range	_	_	3.0	
Icc	Supply Current			T <sub>A</sub> = +25°C	_	0.6	1	
			$V_{CC} = 5V$	Full Range	_	_	2.0	
$A_V$	Voltage Gain	$V_{CC} = 15V$ , $V_{OUT} = 1V$ $R_L \ge 15k\Omega$ ,	to 11V,	T <sub>A</sub> = +25°C	50	200	_	V/mV
_	Large Signal Response Time	$V_{IN}$ = TTL Logic Swing $V_{RL}$ = 5V, $R_L$ = 5.1k $\Omega$	, V <sub>REF</sub> = 1.4V,	T <sub>A</sub> = +25°C	_	300	_	ns
_	Response Time	$V_{RL} = 5V, R_{L} = 5.1k\Omega$	(Note 13)	T <sub>A</sub> = +25°C	_	1.3	_	μs
I <sub>O(SINK)</sub>	Output Sink Current	$V_{IN-} = 1V$ , $V_{IN+} = 0$ , $V_O \le 1.5V$		T <sub>A</sub> = +25°C	6	16	_	mA
				T <sub>A</sub> = +25°C	_	200	400	mV
$V_{SAT}$	Saturation Voltage	$V_{IN-} = 1V, V_{IN+} = 0, I_{SINK} \le 4mA$		Full Range	_		700	
	Output Laglages Comes	V <sub>IN</sub> -= 0V, V <sub>IN+</sub> = 1, V <sub>O</sub>	= 5V	T <sub>A</sub> = +25°C	_	0.1	_	nA
I <sub>O(LEAK)</sub>	Output Leakage Current	$V_{IN-} = 0V, V_{IN+} = 1, V_{C}$	) = 30V	Full Range	_	_	1	μA
V <sub>ID</sub>	Differential Input Voltage	All V <sub>IN</sub> ≥0V (or V- if use	ed) (Note 14)	Full Range	_		36	V

<sup>8.</sup> Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration. The typical values are not tested and are not guaranteed on shipped production material.

<sup>9.</sup> All limits are guaranteed by testing or statistical analysis. Limits over the full temperature are guaranteed by design, but not tested in production.

<sup>10.</sup>  $V_O \cong 1.4V$ ,  $R_S = 0\Omega$  with  $V_{CC}$  from 5V to 30V;

<sup>11.</sup> The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the input lines.

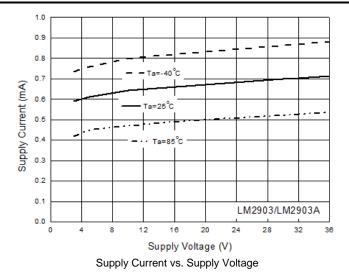
The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V (@ +25°C). The upper end of the common-mode voltage range is V<sub>CC</sub> -1.5V (@ +25°C), but either or both inputs can go to +36V without damage, independent of the magnitude of V<sub>CC</sub>.
 The response time specified is for a 100mV step input with 5mV overdrive. For larger overdrive signals 300ns can be obtained, see typical performance

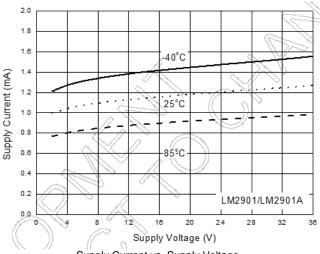
characteristics.

<sup>14.</sup> Positive excursions of input voltage may exceed the power supply level. As long as other voltages remain within the common mode range, the comparator will provide a proper output stage. The low voltage state must not be less than -0.3V (or 0.3V below the magnitude of the negative power supply, if used).

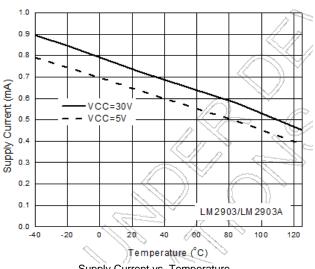


### **Performance Characteristics**

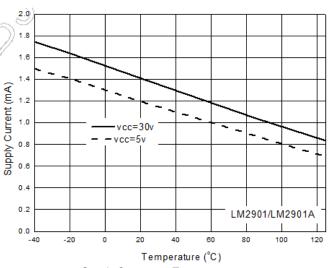




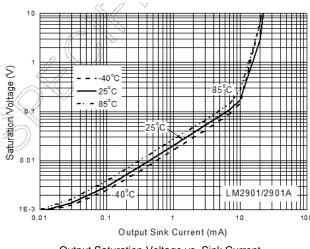
Supply Current vs. Supply Voltage



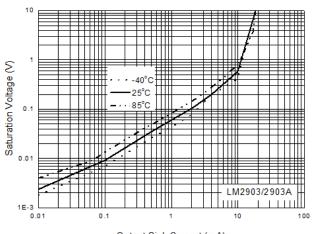
Supply Current vs. Temperature



Supply Current vs. Temperature



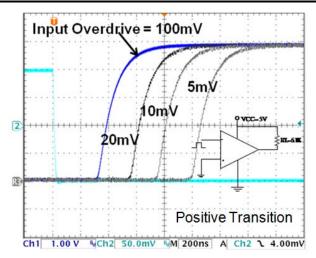
Output Saturation Voltage vs. Sink Current



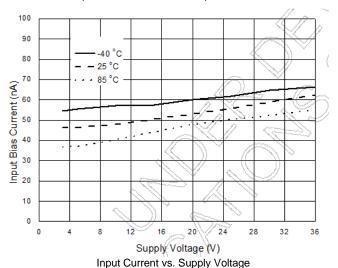
Output Sink Current (mA) Output Saturation Voltage vs. Sink Current

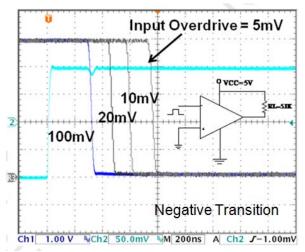


### **Performance Characteristics** (continued)

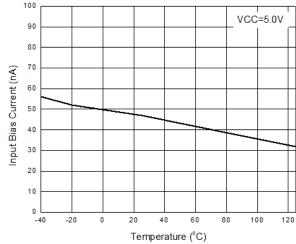








Response Time for Various Input Overdrive





#### **Application Information**

#### **General Information**

The LM2901/2903 series comparators are high-gain, wide bandwidth devices. Like most comparators, the series can easily oscillate if the output lead is inadvertently allowed to capacitive couple to the inputs via stray capacitance. This shows up only during the output voltage transition intervals as the comparators change states. Standard PC board layout is helpful as it reduces stray input-output coupling. Reducing the input resistors to  $<10k\Omega$  reduces the feedback signal levels. Finally, adding even a small amount (1.0mV to 10mV) of positive feedback (hysteresis) causes such a rapid transition that oscillations, due to stray feedback, are not possible. Simply socketing the IC and attaching resistors to the pins will cause input-output oscillations during the small transition intervals unless hysteresis is used. If the input signal is a pulse waveform, with relatively fast rise and fall times, hysteresis is not required. All input pins of any unused comparators should be tied to the negative supply.

The bias network of the LM2901/2903 series comparators establishes a quiescent current independent of the magnitude of the power supply voltage over the range of from  $2.0V_{DC}$  to  $30V_{DC}$ .

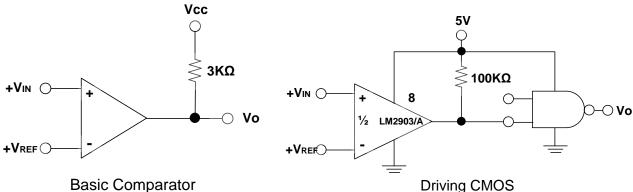
The differential input voltage may be larger than  $V_{CC}$  without damaging the device. Protection should be provided to prevent the input voltages from going negative more than  $-0.3V_{DC}$  (@  $+25^{\circ}$ C). An input clamp diode can be used as shown in the applications section.

The output of the LM2901/2903 series comparators is the uncommitted collector of a grounded-emitter NPN output transistor. Many collectors can be tied together to provide an output ORing function. An output pull-up resistor can be connected to any available power supply voltage within the permitted supply voltage range and there is no restriction on this voltage due to the magnitude of the voltage applied to the V<sub>CC</sub> terminal of LM2901/2903 series comparator package. The output can also be used as a simple SPST switch to ground (when a pull-up resistor is not used).

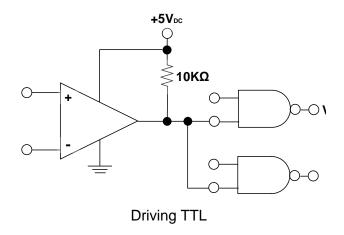
The amount of current the output device can sink is limited by the drive available (which is independent of  $V_{CC}$ ) and the  $\beta$  of this device. When the maximum current limit is reached (approximately 16mA), the output transistor will come out of saturation and the output voltage will rise very rapidly. The output saturation voltage is limited by the approximately  $60\Omega$  R<sub>SAT</sub> of the output transistor. The low offset voltage of the output transistor (1.0mV) allows the output to clamp essentially to ground level for small load currents.

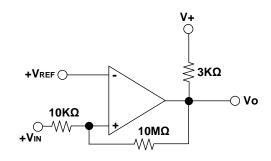


### **Typical Application Circuit** $(V_{CC} = 5.0V_{DC})$

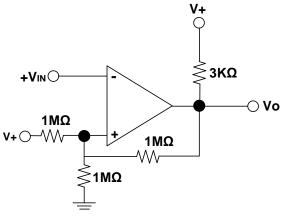




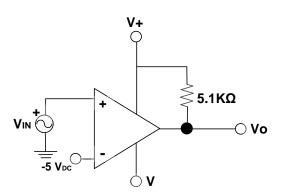




Non-Inverting Comparator with Hysteresis



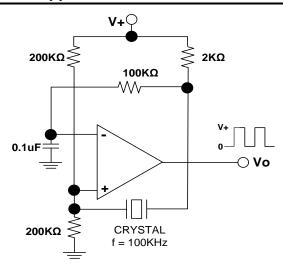
**Inverting Comparator with** Hysteresis



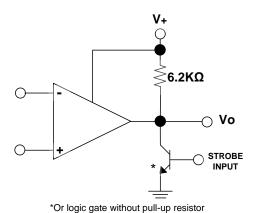
Comparator with a Negative Reference



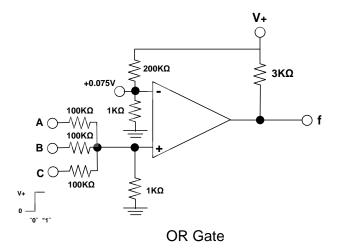
### Typical Application Circuit (V<sub>CC</sub> = 5.0V<sub>DC</sub>) (continued)

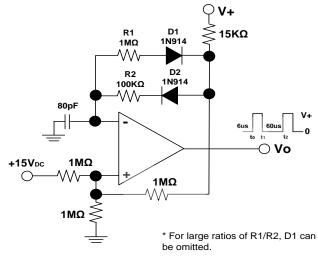


Crystal Controlled Oscillator

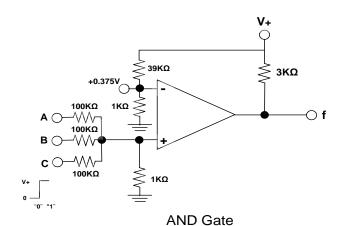


**Output Strobing** 





**Pulse Generator** 



V+
0
100KΩ
3KΩ

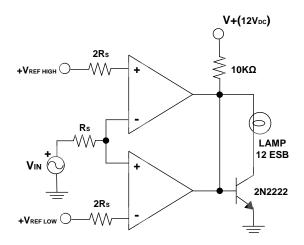
D1
100KΩ

D2
B
D3
C
D4
D4
D0

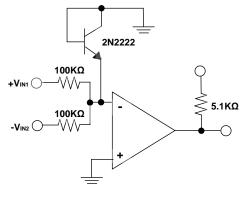
Large Fan-in AND Gate



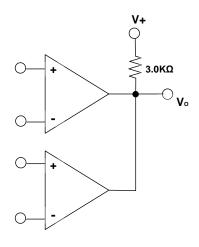
### **Typical Application Circuit** (V<sub>CC</sub> = 5.0V<sub>DC</sub>) (continued)



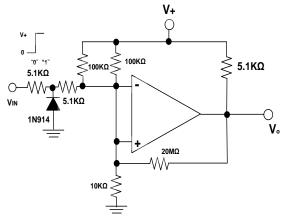
**Limit Comparator** 



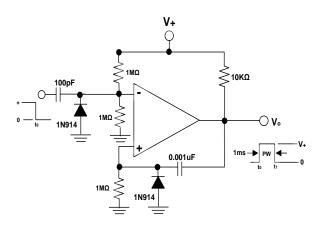
Comparing Input Voltage of Opposite Polarity



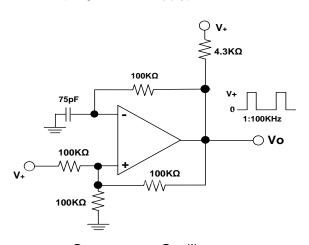
ORing the Outputs



Zero Crossing Detector (Single Power Supply)



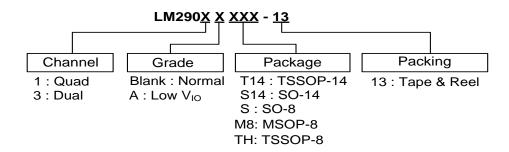
One-Shot Multivibrator



Squarewave Oscillator



### **Ordering Information** (Note 15)



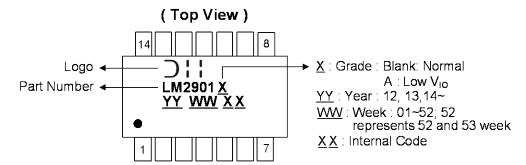
Part Number	Dookses Code	Dockoning	13" Tape a	and Reel
Part Number	Package Code	Packaging	Quantity	Part Number Suffix
LM2901T14-13	T14	TSSOP-14	2500/Tape & Reel	-13
LM2901AT14-13	T14	TSSOP-14	2500/Tape & Reel	-13
LM2901S14-13	S14	SO-14	2500/Tape & Reel	-13
LM2901AS14-13	S14	SO-14	2500/Tape & Reel	-13
LM2903S-13	S	SO-8	2500/Tape & Reel	-13
LM2903AS-13	S	SO-8	2500/Tape & Reel	-13
LM2903AM8-13	M8	MSOP-8	2500/Tape & Reel	-13
LM2903M8-13	M8	MSOP-8	2500/Tape & Reel	-13
LM2903ATH-13	TH	TSSOP-8	2500/Tape & Reel	-13
LM2903TH-13	TH	TSSOP-8	2500/Tape & Reel	-13

Note: 15. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

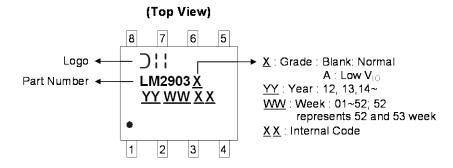


#### **Marking Information**

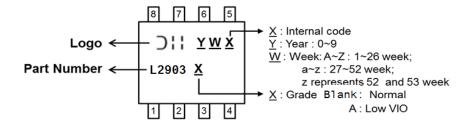
#### (1) TSSOP-14 and SO-14



#### (2) SO-8



#### (3) MSOP-8 & TSSOP-8

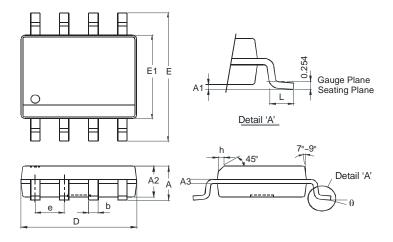




### **Package Outline Dimensions**

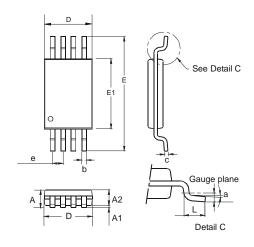
Please see http://www.diodes.com/package-outlines.html for the latest version.

#### **SO-8**



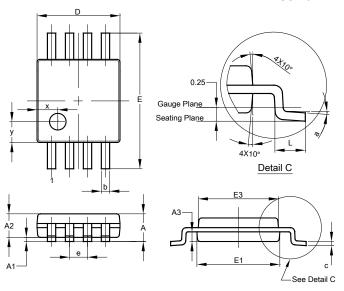
	SO-8	
Dim	Min	Max
Α	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
Е	5.90	6.10
E1	3.85	3.95
е	1.27	Тур
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Di	mension	s in mm

TSSOP-8



TSSOP-8					
Dim	Min	Max	Тур		
а	0.09	Î	_		
Α	-	1.20	_		
<b>A</b> 1	0.05	0.15	_		
A2	0.825	1.025	0.925		
b	0.19	0.30	_		
С	0.09	0.20	_		
D	2.90	3.10	3.025		
е	-	Î	0.65		
Е	1	1	6.40		
E1	4.30	4.50	4.425		
L	0.45	0.75	0.60		
All	Dimens	ions in	mm		

#### MSOP-8



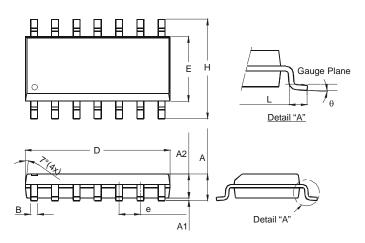
	MSOP-8					
Dim	Min	Max	Тур			
Α	-	1.10	_			
<b>A</b> 1	0.05	0.15	0.10			
A2	0.75	0.95	0.86			
A3	0.29	0.49	0.39			
b	0.22	0.38	0.30			
С	0.08	0.23	0.15			
D	2.90	3.10	3.00			
Е	4.70	5.10	4.90			
E1	2.90	3.10	3.00			
E3	2.85	3.05	2.95			
е	-	-	0.65			
L	0.40	0.80	0.60			
а	0°	8°	4°			
Х	_	_	0.750			
У	-	-	0.750			
All C	Dimen	sions	in mm			



### Package Outline Dimensions (continued)

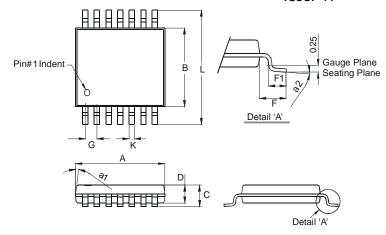
Please see http://www.diodes.com/package-outlines.html for the latest version.





	SO-14					
Dim	Min	Max				
Α	1.47	1.73				
A1	0.10	0.25				
A2	1.45	Тур				
В	0.33	0.51				
D	8.53	8.74				
Е	3.80	3.99				
е	1.27	Тур				
H	5.80	6.20				
L	0.38	1.27				
θ	0°	8°				
All Dimensions in mm						



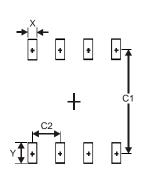


TSSOP-14					
Dim	Min	Max			
a1	7° (	4X)			
a2	0°	8°			
Α	4.9	5.10			
В	4.30	4.50			
С	-	1.2			
D	8.0	1.05			
F	1.00	Тур			
F1	0.45	0.75			
G	0.65 Typ				
K	0.19	0.30			
L	- 6.40 Typ				
All Dimensions in mm					



### **Suggested Pad Layout**

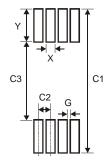
Please see http://www.diodes.com/package-outlines.html for the latest version.



3 <b>-</b> 08	3
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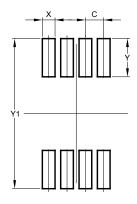
<b>Dimensions</b>	Value (in mm)
X	0.60
Υ	1.55
C1	5.4
C2	1.27

TSSOP-8



Dimensions	Value (in mm)
Х	0.45
Y	1.78
C1	7.72
C2	0.65
C3	4.16
G	0.20

MSOP-8

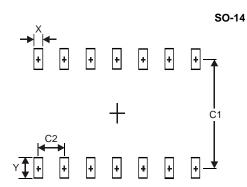


Dimensions	Value (in mm)
С	0.650
Х	0.450
Υ	1.350
Y1	5.300



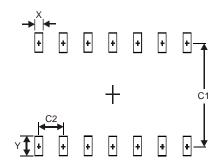
### Suggested Pad Layout (continued)

Please see http://www.diodes.com/package-outlines.html for the latest version.



Dimensions	Value (in mm)
Х	0.60
Υ	1.50
C1	5.4
C2	1.27

TSSOP-14



Dimensions	Value (in mm)
Х	0.45
Y	1.45
C1	5.9
C2	0.65



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