Low Power Dual Voltage Comparators

LM393

General Description

The LM393 series consists of two independent preci-sion voltage comparators with an offset voltage speci-fication as low as 2mV. It can operate from a single supply or dual supply, and its current is not affected by the magnitude of the supply voltage.These comparators also have a unique characteristic in that the input common-mode voltage range includes ground even though operated from a single power supply voltage.

The LM393 series are available in 2 Packages:
DIP-8 and SOP-8.

Features

- Wide Supply Voltage Range
  - Single Supply: 2.0V to 36V
  - Dual Supplies: ±1.0V to ± 18V
- Very Low Supply Current Drain: 0.8mA
  - Independent of Supply Voltage
- Low Input Bias Current: 25nA (Typical)
- Low Input Offset Current: ±5nA (Typical)
- Low Input Offset Voltage: ±5mV (Typical)
- Differential input voltage range equal to the supply voltage
- TTL, DTL, ECL, MOS, CMOS compatible outputs

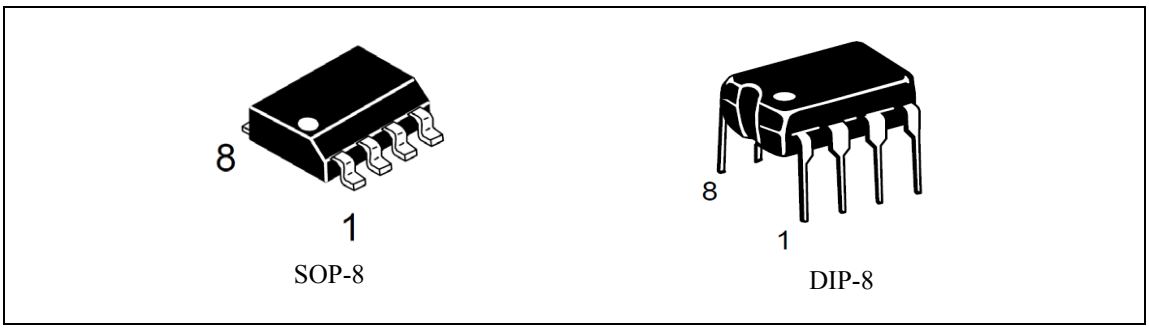


Figure 1. Package Types of LM393

Pin Configuration

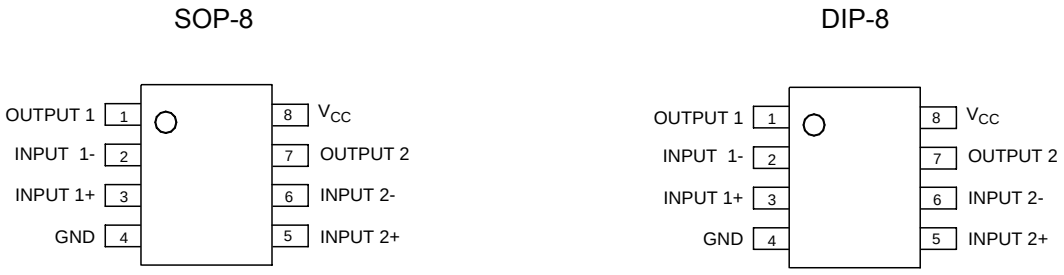


Figure 2. Pin Configuration of LM393 (Top View)

Functional Block Diagram

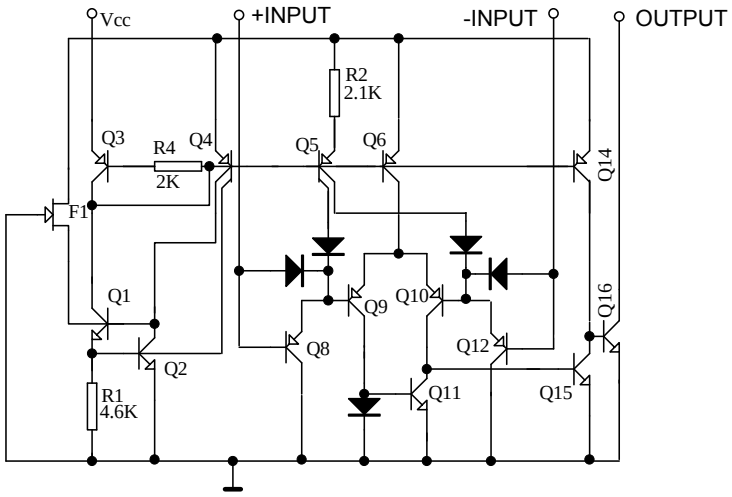


Figure 3. Functional Block Diagram of LM393
(Each Comparator)

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Supply Voltage	Single power	V_{CC}	±18	V
	Dual power		36	
Differential Input Voltage		V_{IDR}	36	V
Input Common Mode Voltage		V_{ICR}	-0.3 to 36	V
Output short circuit current to ground		I_{OG}	20	mA
Power Dissipation (T_A=25°C)		P_D	570	mW
Operating Junction Temperature		T_J	125	°C
Storage Temperature Range		T_{STG}	-65 to 150	°C
Operating Temperature Range		T_A	0 to 70	°C

Electrical Characteristics

V_{CC}=5V, T_A=25°C, unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	Ta=25°C		±1.0	±5.0	mV
	0°C≤Ta≤70°C			±5.0	
Input Bias Current	Ta=25°C		25	250	nA
	0°C≤Ta≤70°C			400	
Input Offset Current	Ta=25°C		±5.0	±50	nA
	0°C≤Ta≤70°C			±150	
Input Common Mode Voltage Range	Ta=25°C	0		V_{CC}-1.5	V
	0°C≤Ta≤70°C	0		V_{CC}-2.0	
Supply Current	R_L=∞, V_{CC}=5V		0.4	1.0	mA
	R_L=∞, V_{CC}=30V			2.5	
Voltage Gain	R_L≥15kΩ, V_{CC}=15V	50	200		V/mV
Large Signal Response Time	V_{IN}=TTL logic swing, V_{REF}=1.4V, V_{RL}=5V, R_L=5.1kΩ		300		ns
Response Time	V_{RL}=5V, R_L=5.1kΩ		1.3		μs
Differential Input Voltage				V_{CC}	V
Output Sink Current	V_{IN}-≥1V, V_{IN}+=0, V_O≤1.5V	6.0	16		mA
Saturation Voltage	V_{IN}-≥1V, V_{IN}+=0, I_{SINK} ≤4mA		150	400	mV
	V_{IN}-≥1V, V_{IN}+=0, I_{SINK} ≤4mA 0°C≤Ta≤70°C			700	
Output Leakage Current	V_{IN}-≥0, V_{IN}+=1V, V_O=5V		0.1		nA
	V_{IN}-≥0, V_{IN}+=1V, V_O=5V 0°C≤Ta≤70°C			1000	

Typical Application

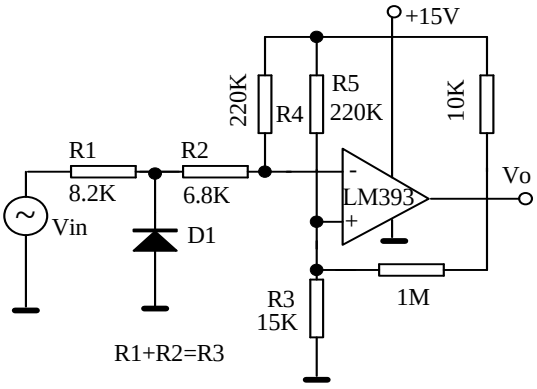


Figure 9. Zero crossing detector
(single power supply)

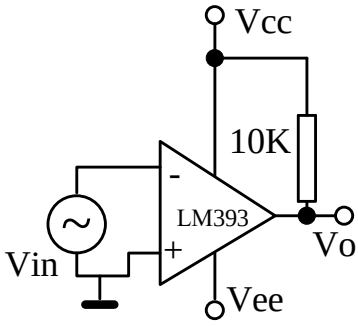


Figure 9. Zero crossing detector
(dual power supply)

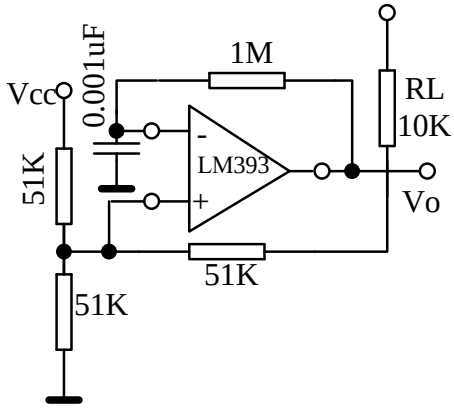


Figure 11. Squarewave oscillator

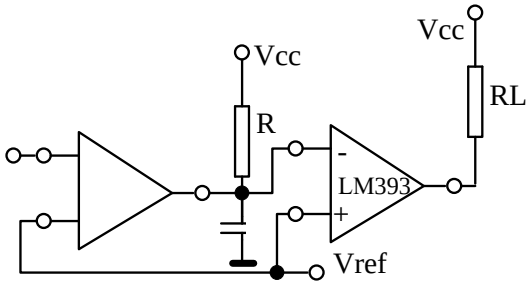
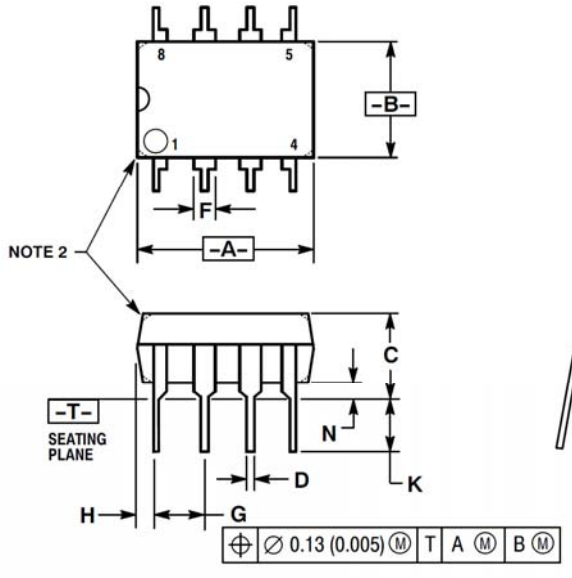


Figure 12. Delay generator

Package Outline Dimensions

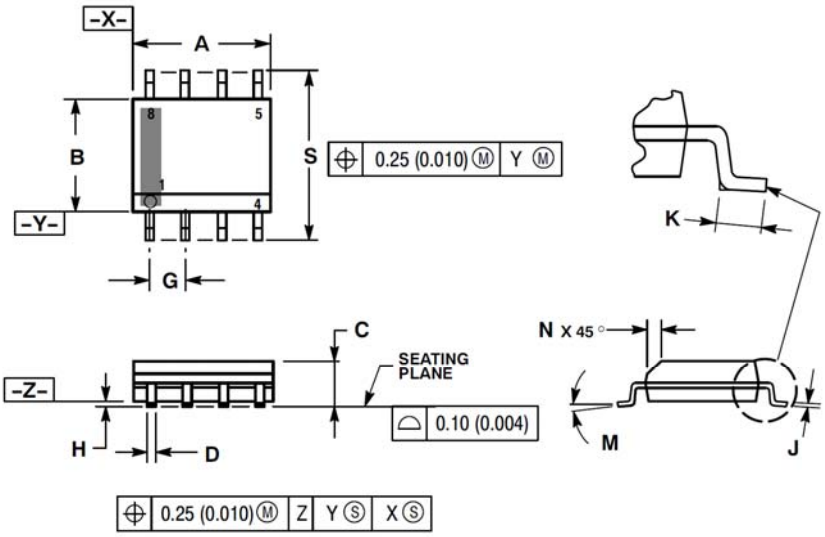
Unit: mm(inch)



NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	---	10°	---	10°
N	0.76	1.01	0.030	0.040

DIP8



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOP8

DISCLAIMER

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