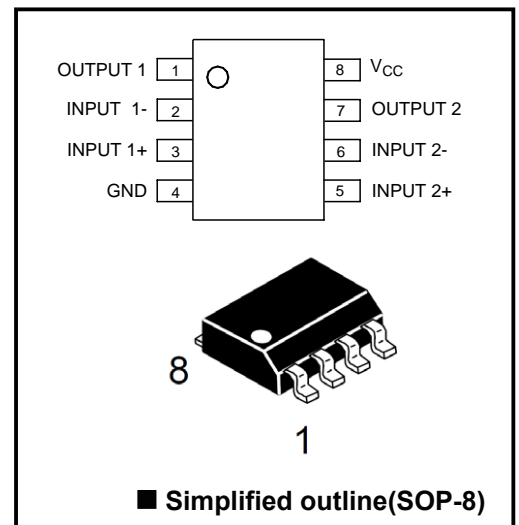


■ Low Power Dual Voltage Comparators

Features

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

MARKING: LM393



General Description

The LM393 series consists of two independent precision voltage comparators with an offset voltage specification 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.

Functional Block Diagram

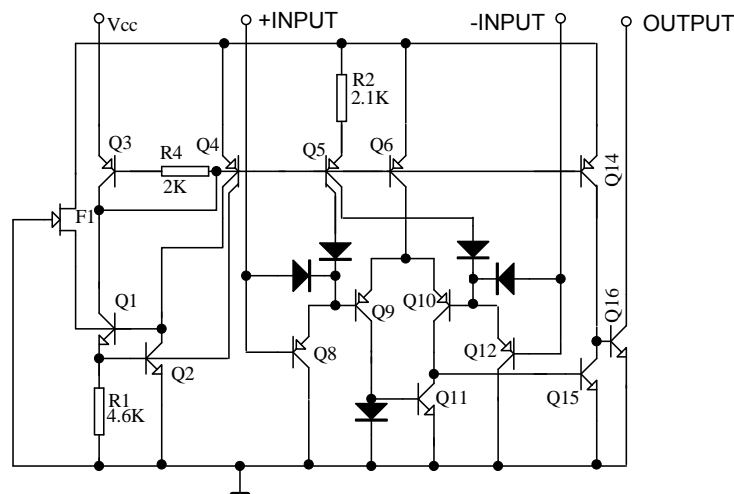


Figure 3. Functional Block Diagram of LM393
(Each Comparator)

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	Single power	± 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 ($T_A=25^\circ\text{C}$)	P_D	570	mW
Operating Junction Temperature	T_J	125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 to 150	$^\circ\text{C}$
Operating Temperature Range	T_A	0 to 70	$^\circ\text{C}$

Electrical Characteristics $V_{CC}=5\text{V}$, $T_A=25^\circ\text{C}$, unless otherwise specified.

Parameter	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$T_A=25^\circ\text{C}$		± 3.0	± 5.0	mV
	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$			± 5.0	
Input Bias Current	$T_A=25^\circ\text{C}$		25	250	nA
	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$			400	
Input Offset Current	$T_A=25^\circ\text{C}$		± 5.0	± 50	nA
	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$			± 150	
Input Common Mode Voltage Range	$T_A=25^\circ\text{C}$	0		$V_{CC}-1.5$	V
	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$	0		$V_{CC}-2.0$	
Supply Current	$R_L=\infty$, $V_{CC}=5\text{V}$		0.4	1.0	mA
	$R_L=\infty$, $V_{CC}=30\text{V}$			2.5	
Voltage Gain	$R_L \geq 15\text{k}\Omega$, $V_{CC}=15\text{V}$	50	200		V/mV
Large Signal Response Time	$V_{IN}=\text{TTL logic swing}$, $V_{REF}=1.4\text{V}$, $V_{RL}=5\text{V}$, $R_L=5.1\text{k}\Omega$		300		ns
Response Time	$V_{RL}=5\text{V}$, $R_L=5.1\text{k}\Omega$		1.3		μs
Differential Input Voltage				V_{CC}	V
Output Sink Current	$V_{IN} \geq 1\text{V}$, $V_{IN^+}=0$, $V_O \leq 1.5\text{V}$	6.0	16		mA
Saturation Voltage	$V_{IN} \geq 1\text{V}$, $V_{IN^+}=0$, $I_{SINK} \leq 4\text{mA}$		150	400	mV
	$V_{IN} \geq 1\text{V}$, $V_{IN^+}=0$, $I_{SINK} \leq 4\text{mA}$ $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$			700	
Output Leakage Current	$V_{IN} \geq 0$, $V_{IN^+}=1\text{V}$, $V_O=5\text{V}$		0.1		nA
	$V_{IN} \geq 0$, $V_{IN^+}=1\text{V}$, $V_O=5\text{V}$ $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$			1000	

Typical Application

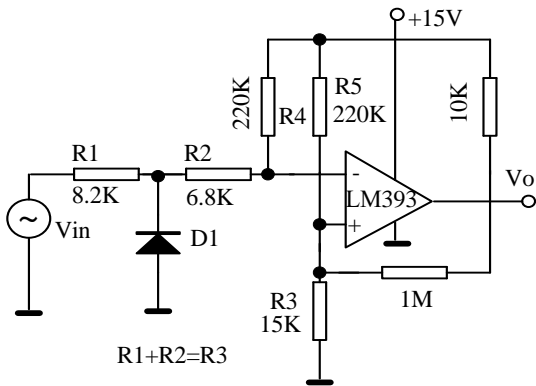


Figure 9. Zero crossing detector (single power supply)

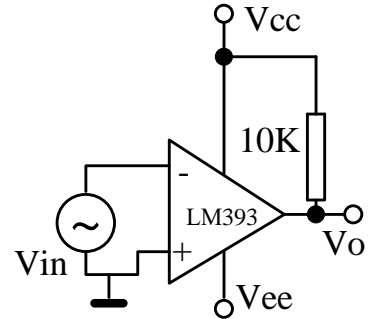


Figure 9. Zero crossing detector (dual power supply)

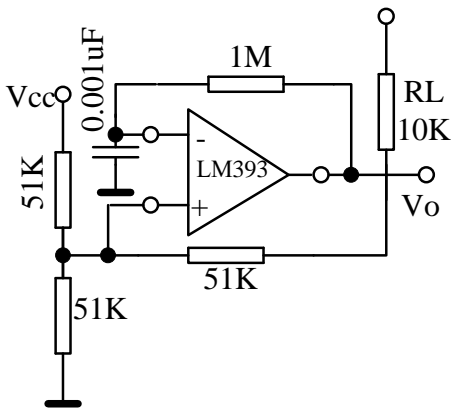


Figure 11. Squarewave oscillator

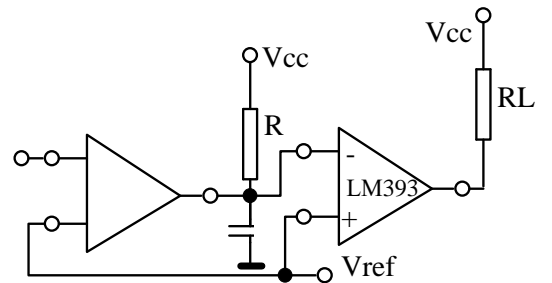
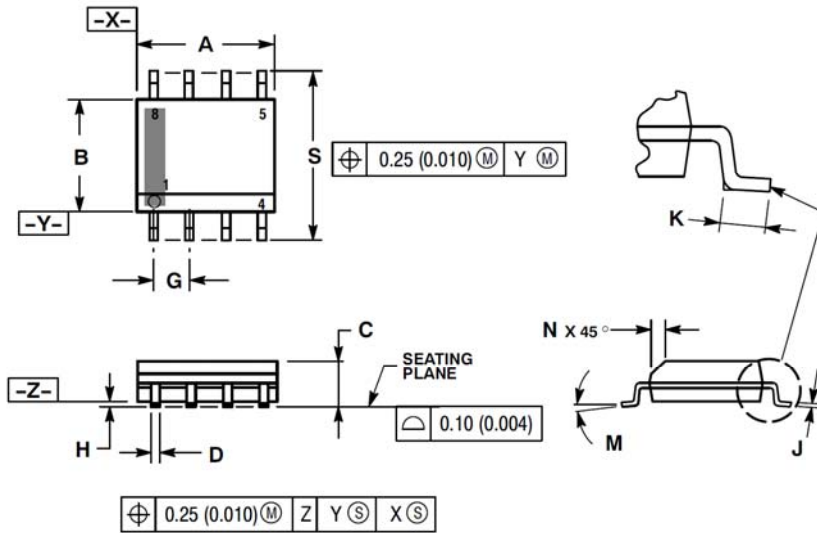


Figure 12. Delay generator



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.

DIM	MILLIMETERS		INCHES	
	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

Summary of Packing Options

Package	Package Description	Packing Quantity	Industry Standard
SOP-8	Tape/Reel, 7" reel	2500	EIA-481-1