

DESCRIPTION

The LM393DR-CN is dual independent precision voltage comparators capable of single or split supply operation. The LM393DR-CN is designed to permit a common mode range-to-ground level with single supply operation. Input offset voltage specifications as low as 3.0 mV make this device an excellent selection for many applications in consumer, automotive, and industrial electronics. The LM393DR-CN is available in a SOP8 package.

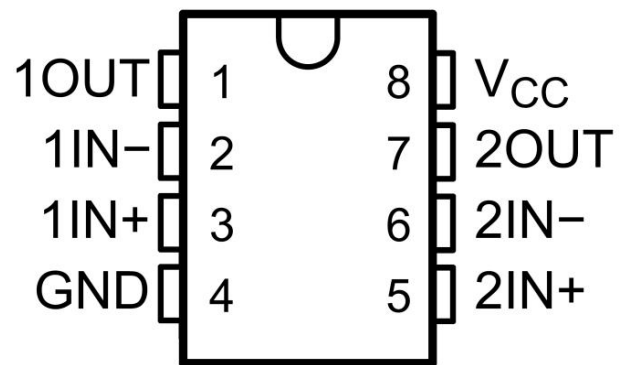
APPLICATIONS

- Industrial Equipment
- Automotive
- Power Monitoring
- Peak Detectors
- Logic Voltage Conversion
- Electrical Appliances

FEATURES

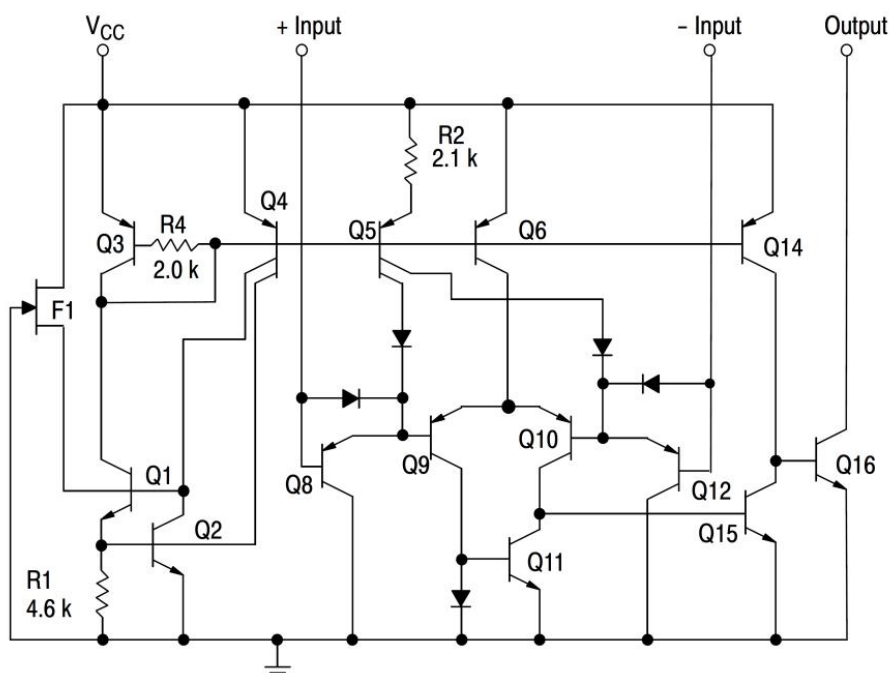
- Wide Supply Range:
 - Single Supply: 3.0V to 36V
 - Split Supply: $\pm 1.5\text{V}$ to $\pm 18\text{V}$
- Low Input Bias Current: 25nA Typ
- Low Input Offset Current: $\pm 5.0\text{nA}$ Typ

Pin Configuration



SOP8

Simplified Schematic(Each Comparator)



Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	MAX	UNIT
Supply Voltage	Signal-supply		36	V
	Dual-supply		±18	V
Differential input voltage			±36	V
Input voltage range		-0.3	36	V
Output voltage			36	V
Input common mode voltage			$V_{CC} - 1.5$	V
Output Current			20	mA
Maximum Junction Temperature			+150	°C
Storage Temperature Range		-65	+150	°C
Lead Temperature(soldering, 10sec)			+260	°C

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
Supply Voltage, $V_S=(V_+) - (V_-)$	Signal-supply	3		32	V
	Dual-supply	±1.5		±16	V
Operating Temperature Range		-20	+25	+85	°C

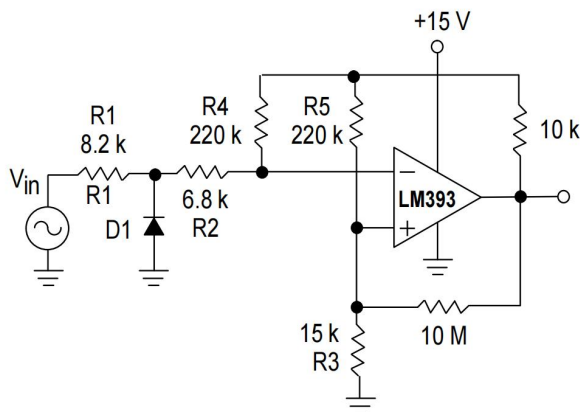
Electrical Characteristics

(At $T_A=+25^{\circ}\text{C}$, $V_{CC}=5\text{V}$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	$T_A=25^{\circ}\text{C}$	-	±1	±5	mV
		$-20^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	-	-	±7	
Input Offset Current	I_{IO}	$T_A=25^{\circ}\text{C}$	-	±5	±50	nA
		$-20^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	-	-	±150	
Input Bias Current	I_{IB}	$T_A=25^{\circ}\text{C}$	-	25	250	nA
		$-20^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	-	-	400	
Input common mode voltage range	V_{ICR}	$T_A=25^{\circ}\text{C}$	0	-	$V_{CC} - 1.5$	V
		$-20^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$	0	-	$V_{CC} - 2.0$	
Supply Current	I_{CC}	$R_L=\infty$, $V_{CC}=5\text{V}$	-	0.4	1.0	mA
		$R_L=\infty$, $V_{CC}=30\text{V}$	-	0.45	2.5	
Voltage Gain	G_V	$R_L \geq 15\text{K}\Omega$, $V_{CC}=15\text{V}$	50	200	-	V/mV
Response time	t_{RES}	$V_{RL}=5\text{V}$, $R_L=5.1\text{K}\Omega$	TTL input with $V_{REF}=1.4\text{V}$		-	us
			Input overdrive=5mV, Input step=100mV		-	
Input differential voltage	V_{ID}	-	-0.3	-	V_{CC}	V

Low-level output current	I_{SINK}	$IN- \geq 1.0V, IN+ = 0V, V_O \leq 1.5V$	6	16	-	mA
Output saturation voltage	V_{SAT}	$IN- \geq 1.0V, IN+ = 0V, I_{SINK} \leq 4.0mA,$	-	150	400	mV
		$IN- \geq 1.0V, IN+ = 0V, I_{SINK} \leq 4.0mA,$ $-20^{\circ}C \leq T_A \leq +85^{\circ}C$	-	-	700	
Output Leakage Current	I_{OL}	$IN+ \geq 1.0V, IN- = 0V, V_O = 5V$	-	0.1	-	uA
		$IN+ \geq 1.0V, IN- = 0V, V_O = 30V$ $-20^{\circ}C \leq T_A \leq +85^{\circ}C$	-	-	1	

Typical Applications

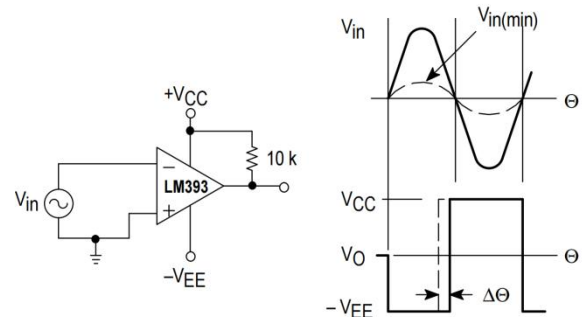


D1 prevents input from going negative by more than 0.6 V.

$$R1 + R2 = R3$$

$$R3 \leq \frac{R5}{10} \text{ for small error in zero crossing.}$$

Figure 1. Zero Crossing Detector(Single Supply)



$$V_{in(min)} \approx 0.4 \text{ V peak for } 1\% \text{ phase distortion } (\Delta\Theta).$$

Figure 2. Zero Crossing Detector(Split Supply)

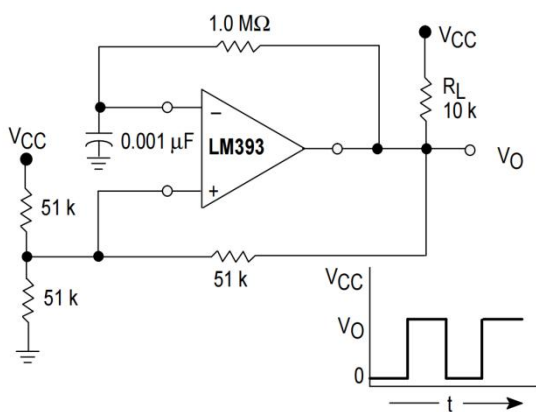
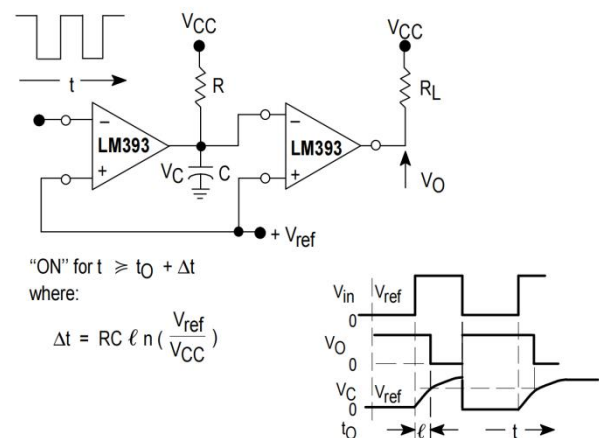


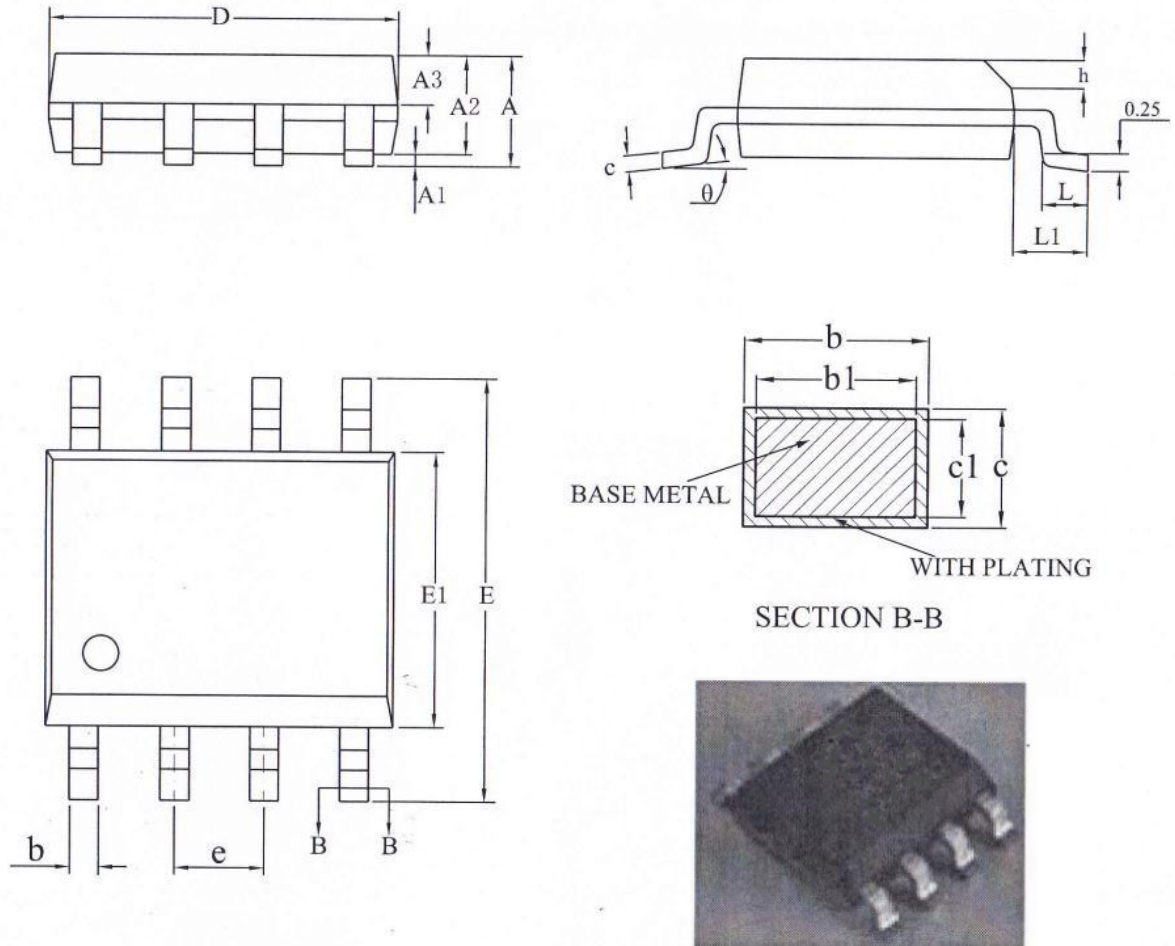
Figure 3. Free-Running Square-Wave Oscillator



"ON" for $t \geq t_0 + \Delta t$
 where:

$$\Delta t = RC \ln \left(\frac{V_{ref}}{V_{CC}} \right)$$

Figure 4. Time Delay Generator

PACKAGE OUTLINE DIMENSIONS
SOP8


SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	-	-	1.75	D	4.80	4.90	5.00
A1	0.10	-	0.225	E	5.80	6.00	6.20
A2	1.30	1.40	1.50	E1	3.80	3.90	4.00
A3	0.60	0.65	0.70	e	1.27 BSC		
b	0.39	-	0.47	h	0.25	-	0.50
b1	0.38	0.41	0.44	L	0.50	-	0.80
c	0.20	-	0.24	L1	1.05REF		
c1	0.19	0.20	0.21	θ	0°	-	8°

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