

GS393

Low Power Low Offset Voltage Dual Comparators

Product Description

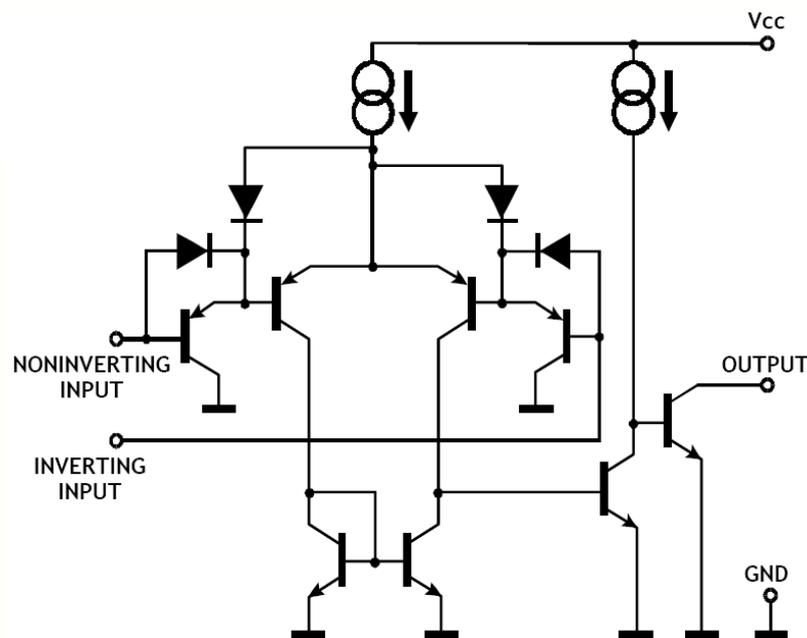
The GS393 consists of two independent precision voltage comparators which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power 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 GS393 was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, the GS393 will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

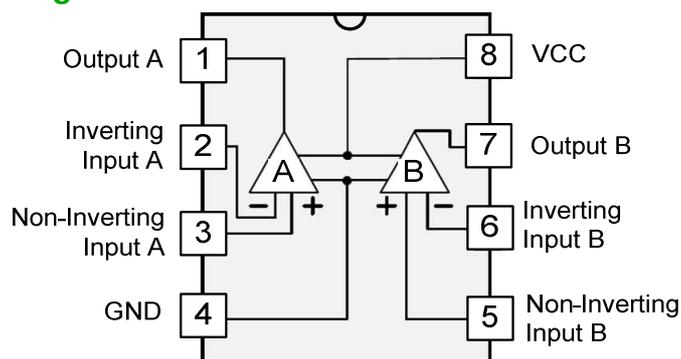
Features

- Wide supply Voltage range: 2.0V to 36V.
- Low supply current drain independent of supply voltage.
- Low input biasing current: 25 nA typ.
- Low input offset current: 5 nA typ.
- Low input offset voltage: 2 mV typ.
- Input common-mode voltage range includes GND.
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage.
- Output voltage compatible with TTL, MOS and CMOS logic.

Block Diagram

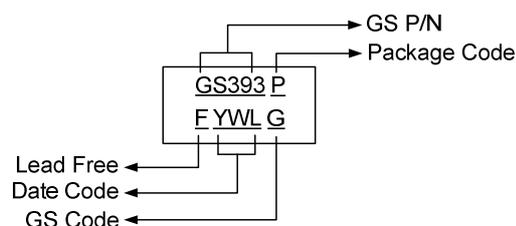
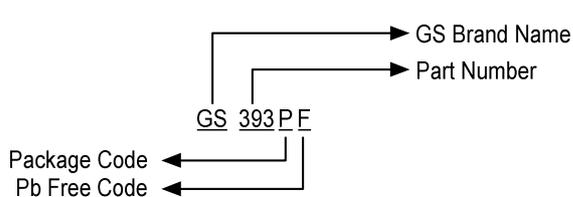


Packages & Pin Assignments



Device	Package	Quantity Reel
GS393SF	SOP-8	4000 PCS

Ordering & Marking Information



Ordering

Marking

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	36	V
V _{IDR}	Differential Input Voltage	36	V
V _{IN}	Input Voltage	-0.3 to +36	V
I _{IN}	Input Current	20	mA
POWER DISSIPATION (Note 1)			
	Molded DIP	780	mW
	Small Outline Package	510	mW
I _{OS}	Output Short-Circuit to GND	Continuous	
T _A	Operating Temperature Range	-40 to 85	°C
T _{STG}	Storage temperature Range	-65 to 150	°C
θ _{JA}	Junction to Ambient Thermal Resistance	SOP-8	160 °C/W
θ _{Jc}	Junction to Case Thermal Resistance	SOP-8	22 °C/W
ESD	ESD Rating (HBM)	2K	V

Note 1: For operating at high temperatures, the GS393 must be derated based on a 125°C maximum junction temperature and a thermal resistance of 170°C /W which applies for the device soldered in a PCB, operating in a still air ambient. The low bias dissipation and the "ON-OFF" characteristic of the outputs keeps the chip dissipation very small ($P_D \leq 100\text{mW}$), provided the output transistors are allowed to saturate.

Electrical Characteristics

at specified free-air temperature, $V_{CC}=5V$ (Unless Otherwise Noted)

Symbol	Parameter	*Test conditions	Min	Typ	Max	Unit
V_{IO}	Input offset voltage	$T_A = 25^\circ C$		2	5	mV
		$0^\circ C \leq T_A \leq 70^\circ C$			9	
I_{IO}	Input offset current	$T_A = 25^\circ C$		5	50	nA
		$0^\circ C \leq T_A \leq 70^\circ C$			150	
I_{IB}	Input bias current	$T_A = 25^\circ C$		-25	-250	nA
		$0^\circ C \leq T_A \leq 70^\circ C$			-400	
V_{ICR}	Common-mode input voltage range	$T_A = 25^\circ C$	0		$V_{CC} - 1.5$	V
		$0^\circ C \leq T_A \leq 70^\circ C$	0		$V_{CC} - 2.0$	
G_V	Large-signal differential voltage amplification	$V_{CC} = 15V$, $R_L \geq 15k\Omega$ to V_{CC}	50	200		V/mV
I_{OH}	High-level output current	$V_{IN(+)} \geq 1.0V$, $V_{IN(-)} = 0V$, $V_O = 5.0V$		0.1	50	nA
		$V_{IN(+)} \geq 1.0V$, $V_{IN(-)} = 0V$, $V_O = 30V$			1	μA
V_{OL}	Low-level output voltage	$V_{IN(-)} \geq 1.0V$, $V_{IN(+)} = 0V$, $I_{SINK} \leq 4.0mA$		130	400	mV
		$V_{IN(-)} \geq 1.0V$, $V_{IN(+)} = 0V$, $I_{SINK} \leq 4.0mA$, $0^\circ C \leq T_A \leq 70^\circ C$			700	
I_{SINK}	Low-level output current	$V_{OL} = 1.5V$, $V_{ID} = 1V$	6	16		mA
I_{CC}	Supply current	$R_L = \infty$		0.4	1	mA
		$V_{CC} = 30V$			2.5	
V_{id}	Differential Input Voltage				V_{CC}^+	V

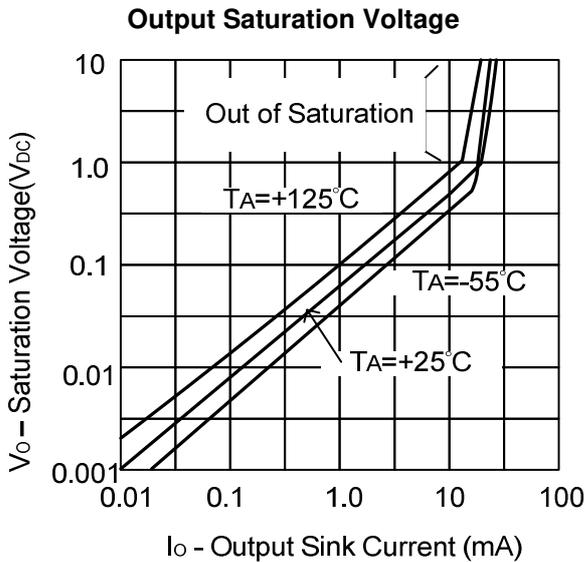
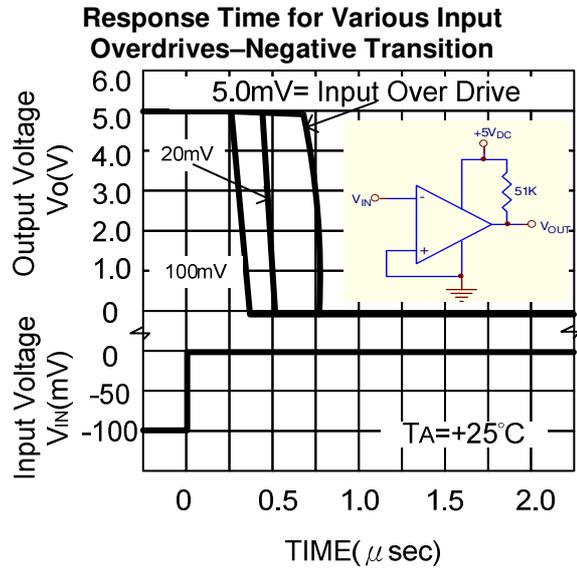
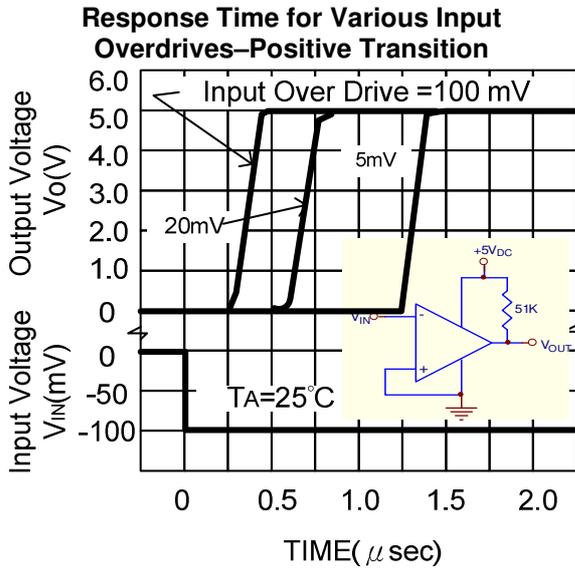
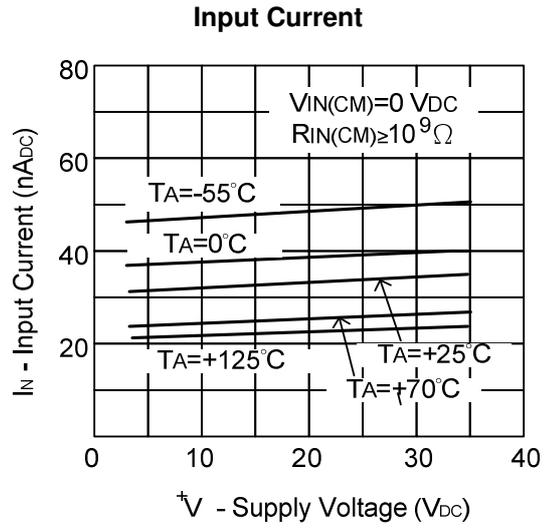
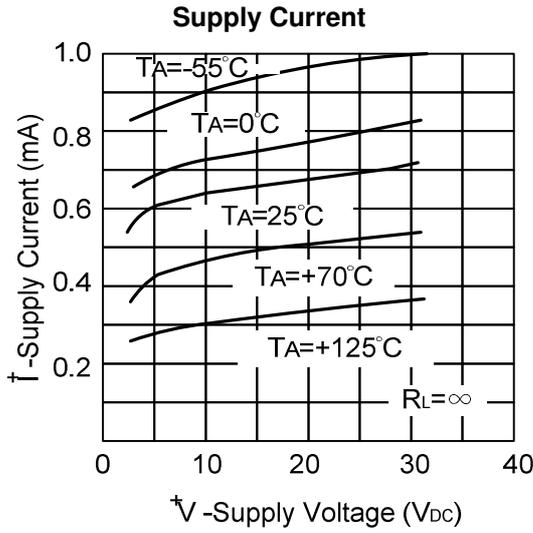
Switching Characteristics $V_{CC}=5V$, $T_A=25^\circ C$

Symbol	Parameter	Typ	Unit
t_{re}	Response time $V_{RL} = 5.0V$, $R_L = 5.1k\Omega$	1.3	μs
t_{rel}	Large Signal Response Time $V_{IN} = TTL, V_{REF} = 1.4V$	0.3	

* C_L includes probe and jig capacitance.

Note 1: The response time specified is the interval between the input step function and the instant when the output crosses 1.4V.

Typical Performance Characteristics



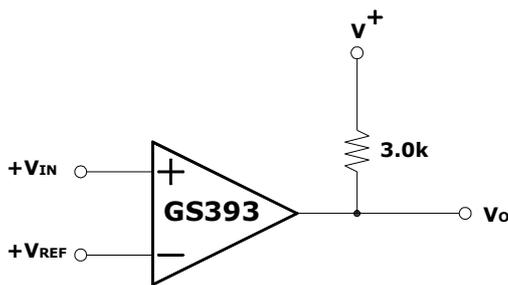
Typical Application ($V_{CC}=5V$)

The GS393 dual comparators feature high gain, wide bandwidth characteristic. This gives the device oscillation tendencies if the outputs are capacitively coupled to the inputs via stray capacitance. This oscillation manifests itself during output transitions (V_{OL} to V_{OH}). To alleviate this situation, input resistors $< 10k\Omega$ should be used.

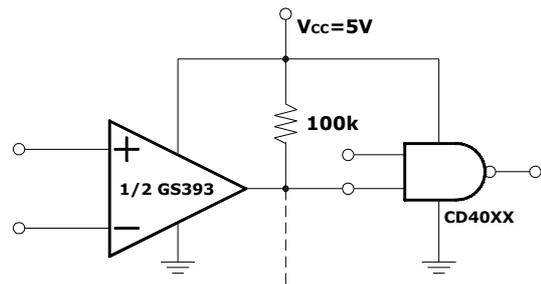
The addition of positive feedback ($< 10mV$) is also recommended. It is good design practice to ground all unused pins.

Differential input voltages may be larger than supply voltage without damaging the comparator's input. Voltage is more negative than $-0.3V$ should not be used.

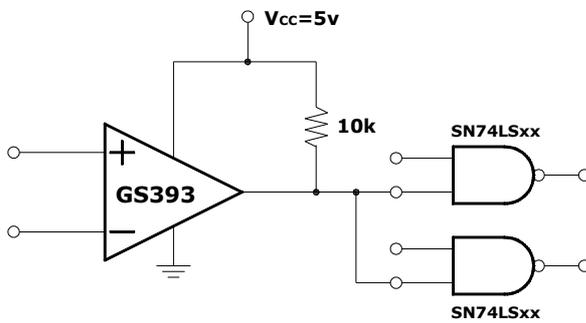
Basic Comparator



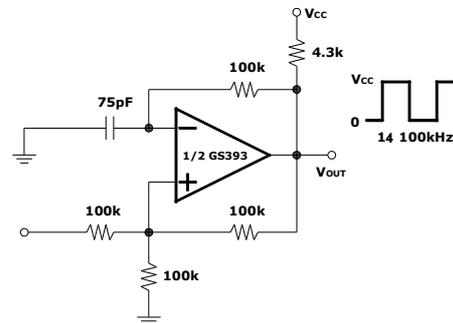
Driving CMOS



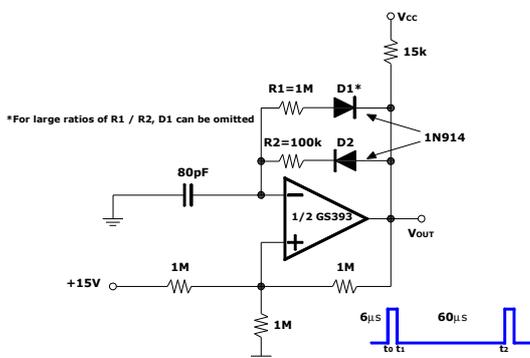
Driving TTL



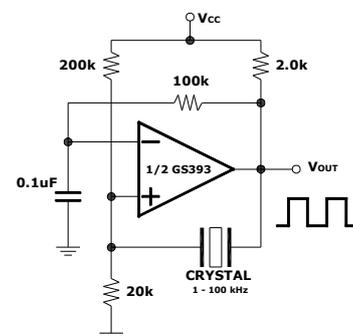
Square-Wave Oscillator



Pulse Generator

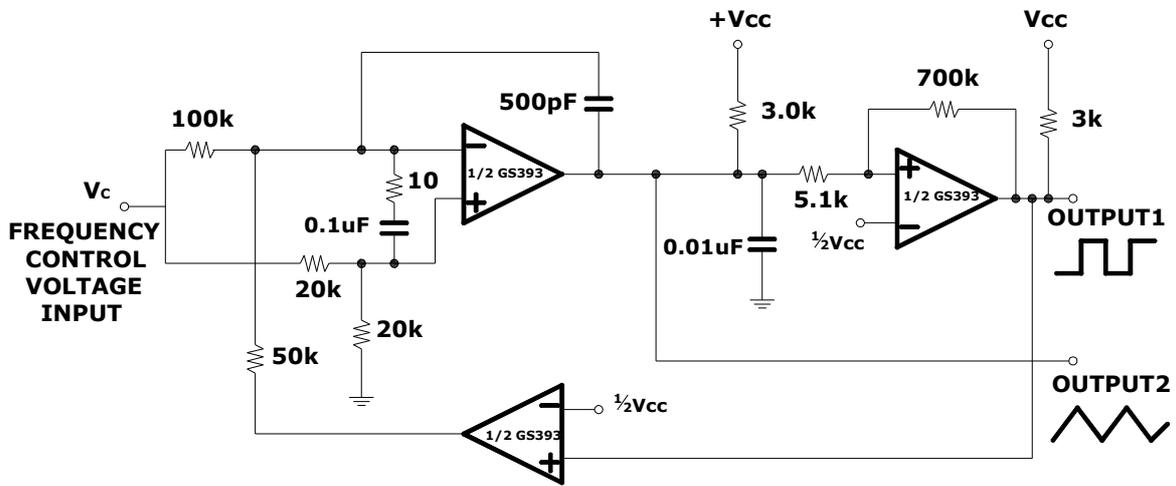


Crystal Controlled Oscillator

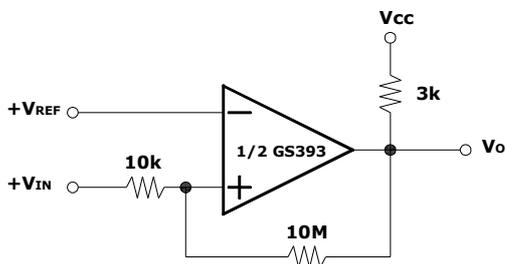


Typical Application (Continue)

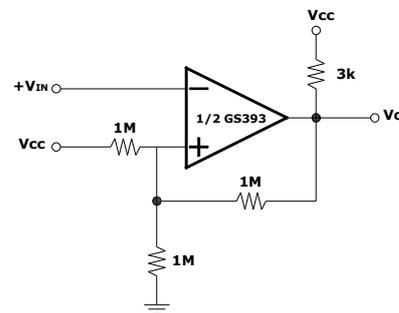
Two-Decade High-Frequency VCO



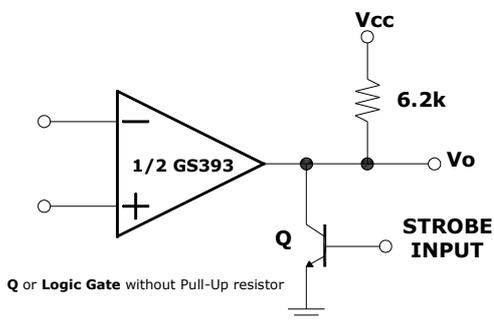
Non-Inverting Comparator with Hysteresis



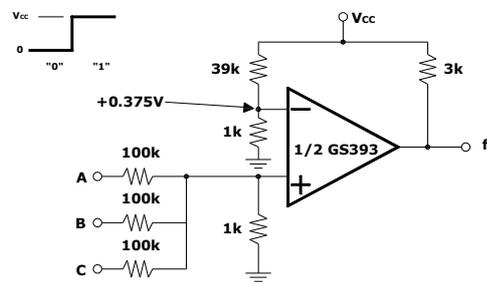
Inverting Comparator with Hysteresis



Output Strobing

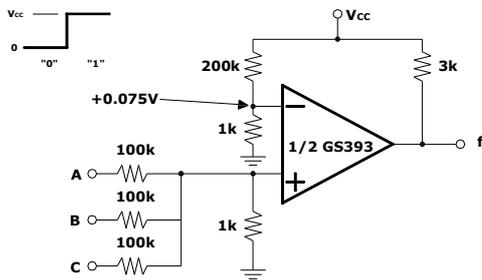


And Gate

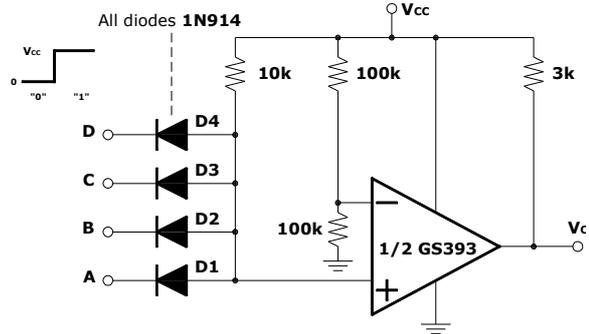


Typical Application (Continue)

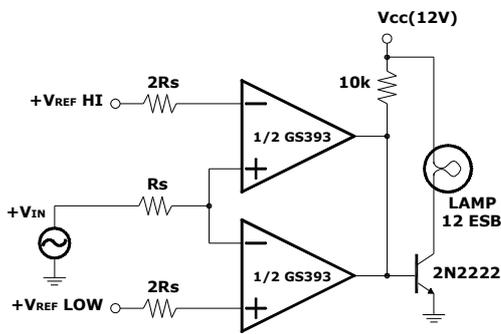
OR Gate



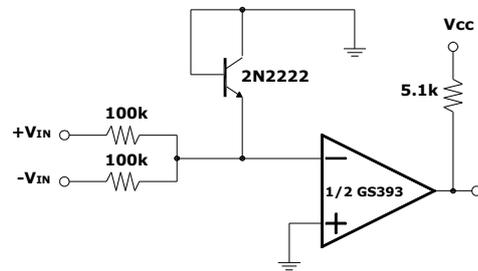
Large Fan-in AND Gate



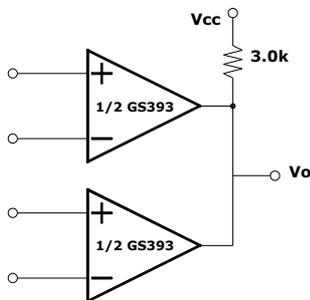
Limit Comparator



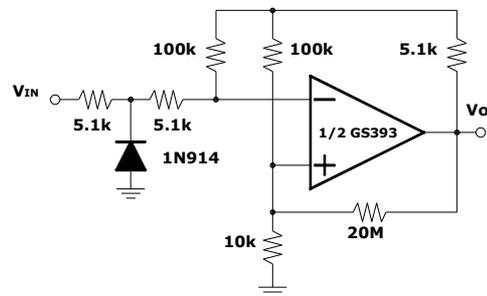
Comparing Input Voltages of Opposite Polarity



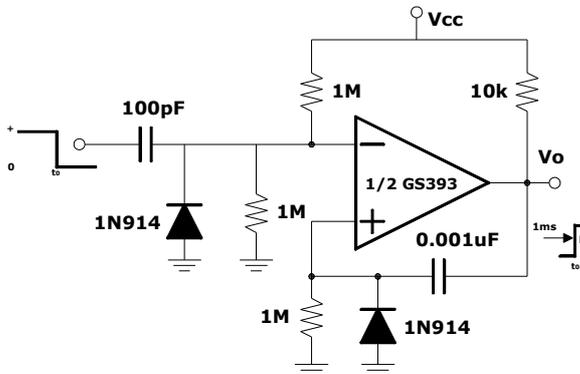
ORing the Outputs



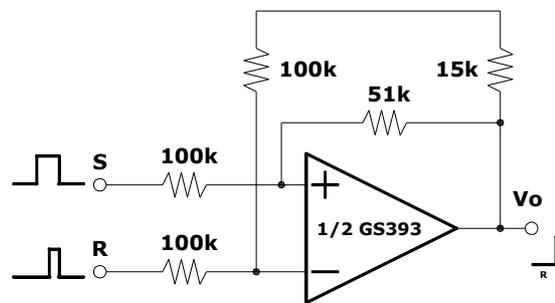
Zero Crossing Detector (Single Power Supply)



One-Shot Multi-vibrator

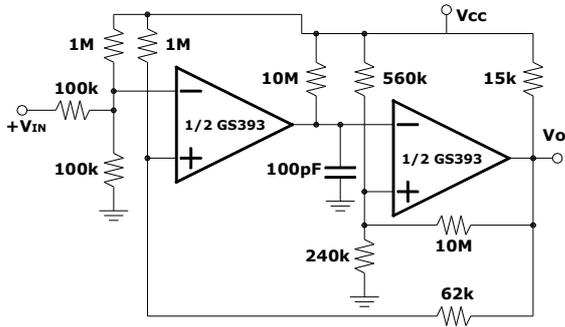


Bi-Stable Multi-vibrator

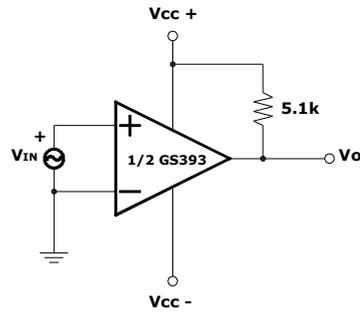


Typical Application (Continue)

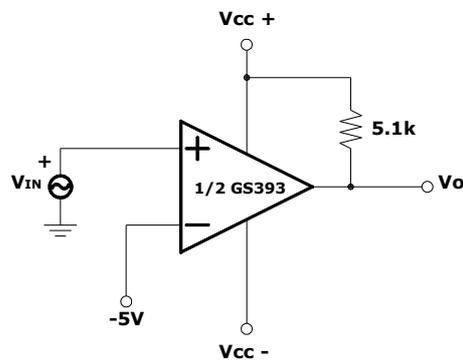
One-Shot Multi-vibrator with Input Lock Out



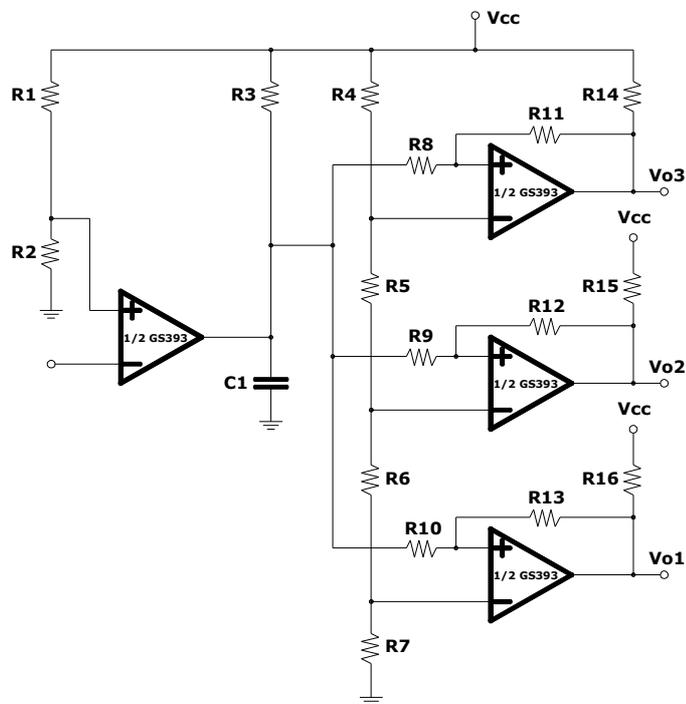
Zero Crossing Detector



Comparator With a Negative Reference

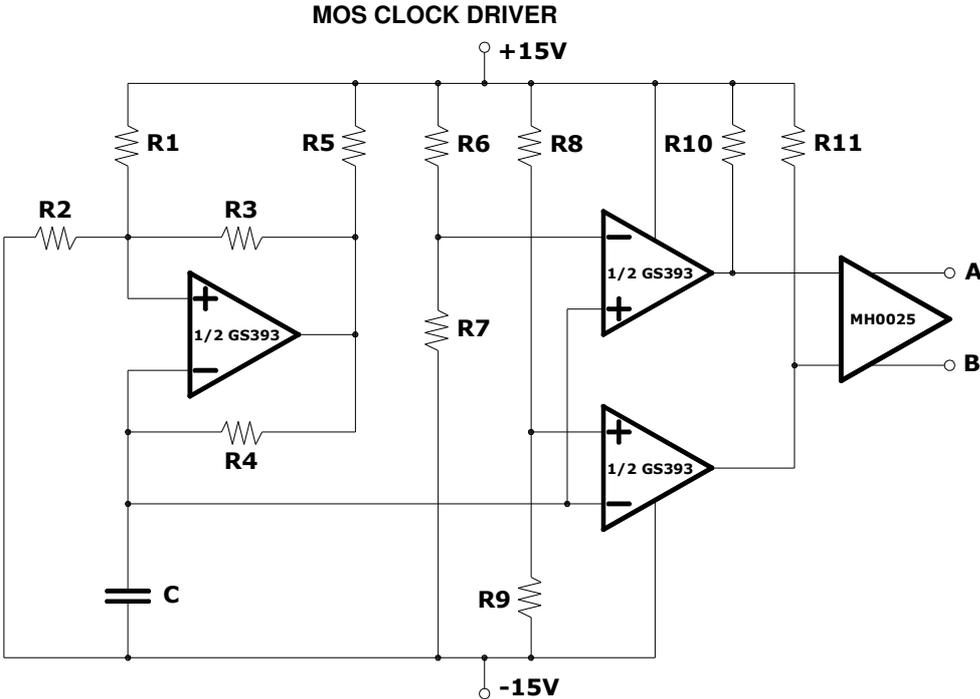


Time Delay Generator



R1=10k, R2=10k, R3=15k, R4=200k, R5=51k, R6=51k, R7=51k, R8=10k, R9=10k, R10=10k, R11=10M, R12=10M, R13=10M, R14=3k, R15=3k, R16=3k, C1=0.001uF

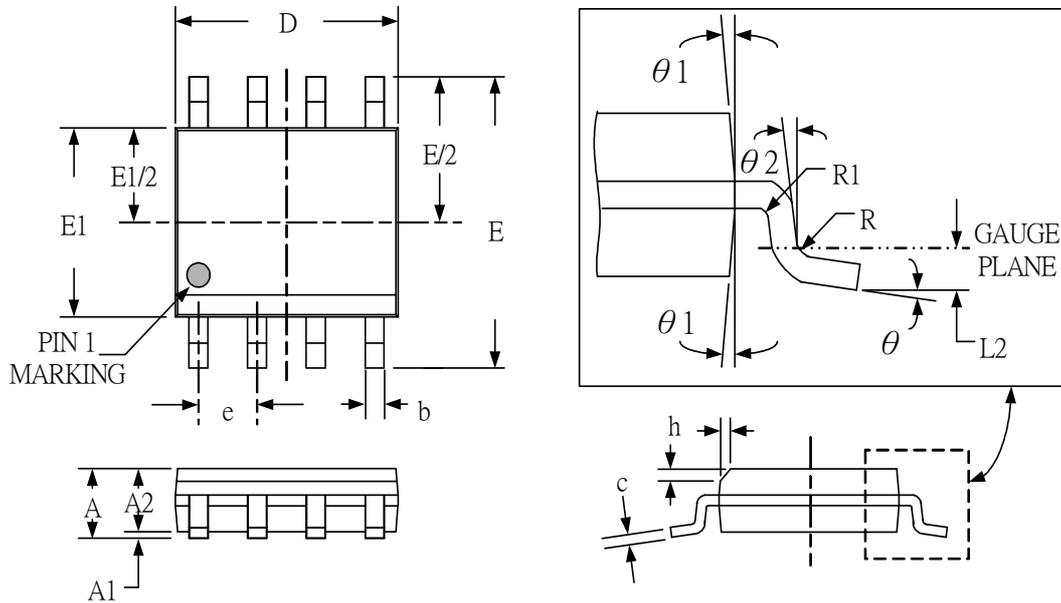
Split-Supply Applications



R1=51k , R2=51k , R3=10k , R4=5.1k , R5=2k , R6=3.9k
 R7=8.2k , R8=2k , R9=6.8k , R10=2.4k , R11=2.4k C=50pF

Package Dimension

SOP-8 PLASTIC PACKAGE



Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	1.35	1.75	.053	.069
A1	0.10	0.25	.004	.010
A2	1.25	1.65	.049	.065
b	0.31	0.51	.012	.020
b1	0.28	0.48	.011	.019
c	0.17	0.25	.007	.010
D	4.90 (TYP)		.193 (TYP)	
E	6.00 (TYP)		.236 (TYP)	
E1	3.90 (TYP)		.154 (TYP)	
e	1.27 (TYP)		.050 (TYP)	
L	0.40	1.27	.016	.050
L1	1.04 (TYP)		.041 (TYP)	
L2	0.25 (TYP)		.010 (TYP)	
R	0.07	-	.003	-
R1	0.07	-	.003	-
h	0.25	0.50	.010	.020
θ	0°	8°	0°	8°
θ1	5°	15°	5°	15°
θ2	0°	-	0°	-

NOTICE

Information furnished is believed to be accurate and reliable. However Globaltech Semiconductor assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties, which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Globaltech Semiconductor. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information without express written approval of Globaltech Semiconductor.

CONTACT US

GS Headquarter	
	4F.,No.43-1,Lane11,Sec.6,Minquan E.Rd Neihu District Taipei City 114, Taiwan (R.O.C)
	886-2-2657-9980
	886-2-2657-3630
	sales_twn@gs-power.com

RD Division	
	824 Bolton Drive Milpitas. CA. 95035
	1-408-457-0587