



MM54C932/MM74C932 Phase Comparator

General Description

The MM74C932/MM54C932 consists of two independent output phase comparator circuits. The two phase comparators have a common signal input and a common comparator input. The signal input can be directly coupled for a large voltage signal, or capacitively coupled to the self-biasing amplifier at the signal input for a small voltage signal.

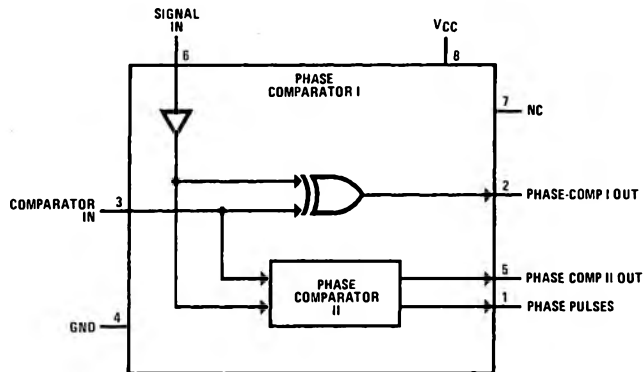
Phase comparator I, an exclusive-OR gate, provides a digital error signal (phase comp. I out) and maintains 90° phase shifts at the VCO center frequency. Between signal input and comparator input (both at 50% duty cycle), it may lock onto the signal input frequencies that are close to harmonics of the VCO center frequency.

Phase comparator II is an edge-controlled digital memory network. It provides a digital error signal (phase comp. II out) and lock in signal (phase pulses) to indicate a locked condition and maintains a 0° phase shift between signal input and comparator input.

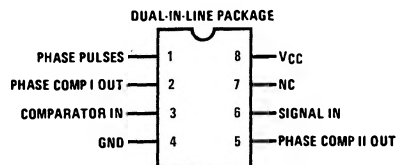
Features

- Wide supply voltage range
- Convenient mini-DIP package
- TRI-STATE® phase-comparator output (comparator II)
- 200 mV input voltage (signal in) sensitivity (typical)

Block Diagram



Connection Diagram



Absolute Maximum Ratings Note 1

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	
MM54C932	-55°C to +125°C
MM74C932	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Package Dissipation	500 mW
Operating V_{CC} Range	3V to 15V
Absolute Maximum V_{CC}	18V
Lead Temperature (Soldering, 10 seconds)	300°C

DC Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Units
I _{CC} Quiescent Device Current	PIN 5 = V_{CC} , PIN 8 = V_{CC} , PIN 3 = 0V $V_{CC} = 5V$		0.005	150	μA
	$V_{CC} = 10V$		0.01	300	μA
	$V_{CC} = 15V$		0.015	600	μA
	PIN 5 = V_{CC} , PIN 8 = Open, PIN 3 = 0V $V_{CC} = 5V$		5	205	μA
	$V_{CC} = 10V$		20	710	μA
	$V_{CC} = 15V$		50	1800	μA
V _{OL} Low Level Output Voltage	$V_{CC} = 5V$		0	0.05	V
	$V_{CC} = 10V$		0	0.05	V
	$V_{CC} = 15V$		0	0.05	V
V _{OH} High Level Output Voltage	$V_{CC} = 5V$	4.95	5		V
	$V_{CC} = 10V$	9.95	10		V
	$V_{CC} = 15V$	14.95	15		V
V _{IL} Low Level Input Voltage Comparator and Signal	$V_{CC} = 5V, V_O = 0.5V$ or 4.5V		2.25	1.5	V
	$V_{CC} = 10V, V_O = 1V$ or 9V		4.5	3.0	V
	$V_{CC} = 15V, V_O = 1.5V$ or 13.5V		6.25	4.0	V
V _{IH} High Level Input Voltage Comparator and Signal	$V_{CC} = 5V, V_O = 0.5V$ or 4.5V	3.5	2.75		V
	$V_{CC} = 10V, V_O = 1V$ or 9V	7.0	5.5		V
	$V_{CC} = 15V, V_O = 1.5V$ or 13.5V	11.0	8.25		V
I _{OL} Low Level Output Current	$V_{CC} = 5V, V_O = 0.4V$	0.36	0.88		mA
	$V_{CC} = 10V, V_O = 0.5V$	0.9	2.25		mA
	$V_{CC} = 15V, V_O = 1.5V$	2.4	8.8		mA
I _{OH} High Level Output Current	$V_{CC} = 5V, V_O = 4.6V$	-0.36	-0.88		mA
	$V_{CC} = 10V, V_O = 9.5V$	-0.9	-2.25		mA
	$V_{CC} = 15V, V_O = 13.5V$	-2.4	-8.8		mA
I _{IN} Input Current	All Inputs Except Signal Input $V_{CC} = 15V, V_{IN} = 0V$		-10-5	-1.0	μA
	$V_{CC} = 15V, V_{IN} = 15V$		10-5	1.0	μA
C _{IN} Input Capacitance	Any Input, (Note 3)			7.5	pF
P _T Total Power Dissipation	$f_o = 10$ kHz, $R_1 = 1$ M Ω $R_2 = \infty, V_{COIN} = V_{CC}/2$				
	$V_{CC} = 5V$		0.07		mW
	$V_{CC} = 10V$		0.6		mW
	$V_{CC} = 15V$		2.4		mW

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Units
Phase Comparators					
R _{IN} Input Resistance Signal Input	V _{CC} = 5V	1.0	3.0		MΩ
	V _{CC} = 10V	0.2	0.7		MΩ
	V _{CC} = 15V	0.1	0.3		MΩ
Comparator Input	V _{CC} = 5V		10 ⁶		MΩ
	V _{CC} = 10V		10 ⁶		MΩ
	V _{CC} = 15V		10 ⁶		MΩ
AC Coupled Signal Input Voltage Sensitivity	C _{SERIES} = 1000pF f = 50kHz				
	V _{CC} = 5V		200	400	mV
	V _{CC} = 10V		400	800	mV
	V _{CC} = 15V		700	1400	mV

Phase Comparator State Diagrams

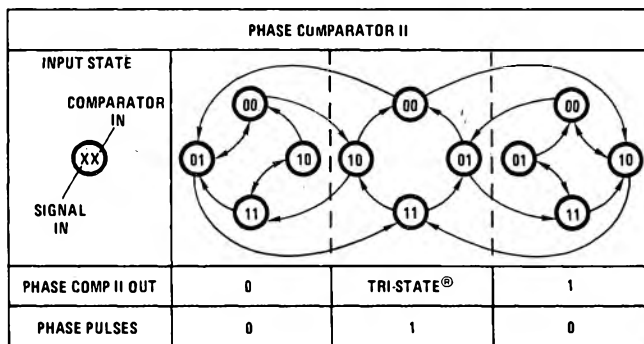
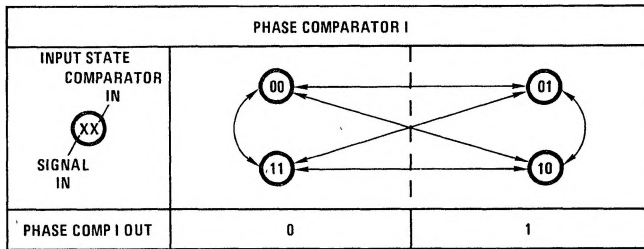


Figure 1.

Typical Waveforms

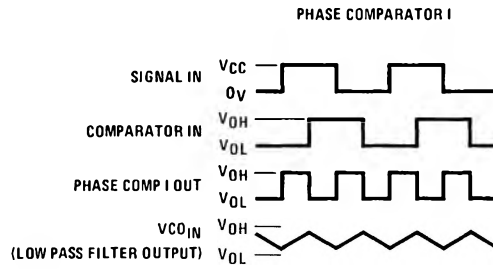


Figure 2. Typical Waveform Employing Phase Comparator I in Locked Condition

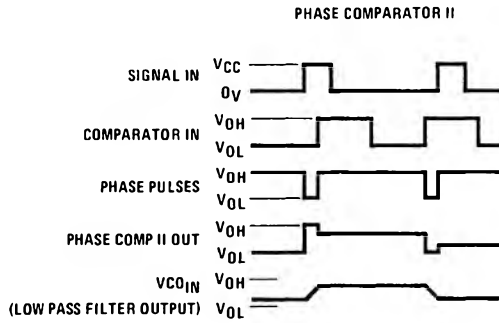


Figure 3. Typical Waveform Employing Phase Comparator II in Locked Condition

Typical Phase Locked Loop

