

February 1988

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.

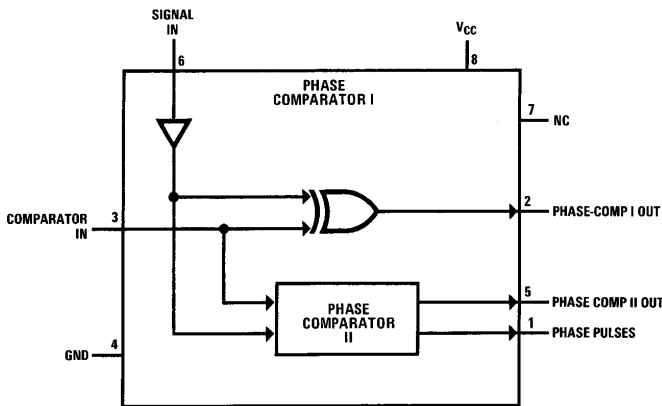
Phase comparator I, an exclusive-OR gate, provides a digital error signal (phase comp. I out) and maintains 90° phase shifts at the VCO center frequency. Between signal input and comparator input (both at 50% duty cycle), it may lock onto the signal input frequencies that are close to harmonics of the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

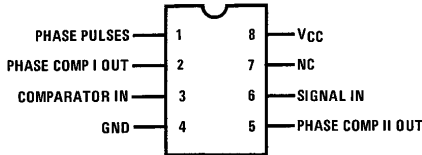
- Wide supply voltage range
- Convenient mini-DIP package
- TRI-STATE® phase-comparator output (comparator II)
- 200 mV input voltage (signal in) sensitivity (typical)

Block and Connection Diagrams



TL/F/5921-1

Dual-In-Line Package



TL/F/5921-2

Top View

Order Number MM54C932 or MM74C932

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at Any Pin	−0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	−55°C to +125°C
MM54C932	−40°C to +85°C
MM74C932	−65°C to +150°C
Storage Temperature Range	−65°C to +150°C

Power Dissipation (P_D)

Dual-In-Line	700 mW
Small Outline	500 mW
Operating V_{CC} Range	3V to 15V
Absolute Maximum V_{CC}	18V
Lead Temperature (Soldering, 10 seconds)	260°C

DC Electrical Characteristics

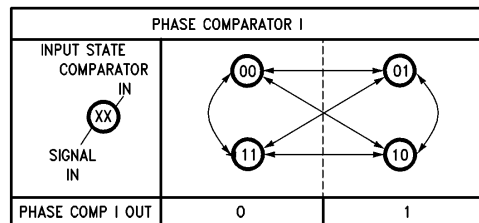
Symbol	Parameter	Conditions	Min	Typ	Max	Units
I_{CC}	Quiescent Device Current	PIN 5 = V_{CC} , PIN 8 = V_{CC} , PIN 3 = 0V V_{CC} = 5V		0.005	150	μA
		V_{CC} = 10V		0.01	300	μA
		V_{CC} = 15V		0.015	600	μA
		PIN 6 = Open, PIN 3 = GND V_{CC} = 5V		5	205	μA
		V_{CC} = 10V		20	710	μA
		V_{CC} = 15V		50	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			1.5	V
		V_{CC} = 10V, V_O = 1V or 9V			3.0	V
		V_{CC} = 15V, V_O = 1.5V or 13.5V			4.0	V
V_{IH}	High Level Input Voltage Comparator and Signal	V_{CC} = 5V, V_O = 0.5V or 4.5V	3.5			V
		V_{CC} = 10V, V_O = 1V or 9V	7.0			V
		V_{CC} = 15V, V_O = 1.5V or 13.5V	11.0			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			7.5	pF
P_D	Total Power Dissipation	f_o = 10 kHz, $R1 = 1 M\Omega$ $R2 = \infty$, $V_{COIN} = V_{CC}/2$				
		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.

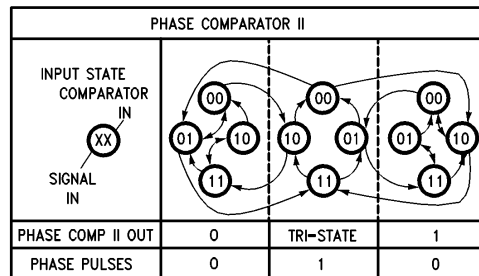
Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
R_{IN}	Phase Comparators Input Resistance Signal Input	$V_{CC} = 5V$	1.0	3.0		$M\Omega$
		$V_{CC} = 10V$	0.2	0.7		$M\Omega$
		$V_{CC} = 15V$	0.1	0.3		$M\Omega$
	Comparator Input	$V_{CC} = 5V$		10^6		$M\Omega$
		$V_{CC} = 10V$		10^6		$M\Omega$
		$V_{CC} = 15V$		10^6		$M\Omega$
	AC Coupled Signal Input Voltage Sensitivity	$C_{SERIES} = 1000\text{ pF}$ $f = 50\text{ kHz}$				
				200	400	mV
				400	800	mV
				700	1400	mV

Phase Comparator State Diagrams



TL/F/5921-3



TL/F/5921-4

FIGURE 1

Typical Waveforms

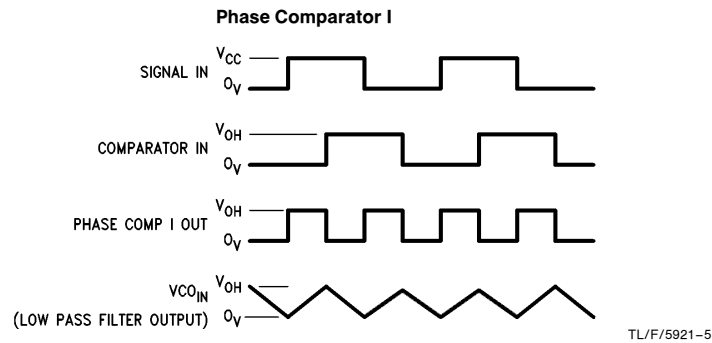


FIGURE 2. Typical Waveform Employing Phase Comparator I in Locked Condition

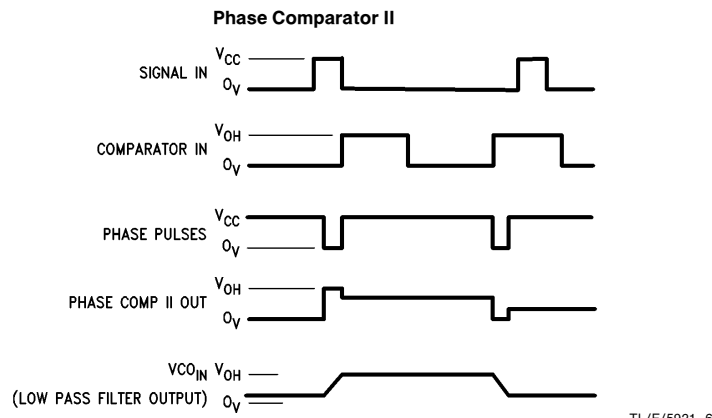
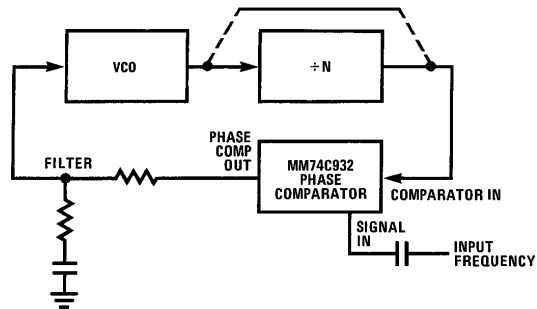


FIGURE 3. Typical Waveform Employing Phase Comparator II in Locked Condition

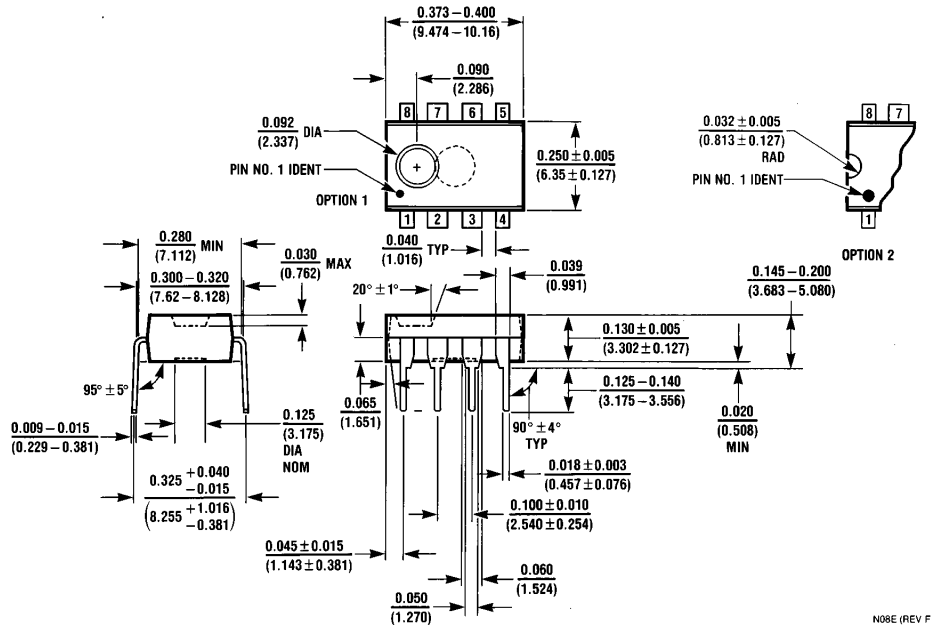
Typical Phase Locked Loop



TL/F/5921-7



Physical Dimensions inches (millimeters)



Molded Dual-In-Line Package (N)
Order Number MM54C932N or MM74C932N
NS Package Number N08E

N08E (REV F)

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
19th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.