

SN54S124, SN74S124 DUAL VOLTAGE-CONTROLLED OSCILLATORS

SDLS201

DECEMBER 1983 -- REVISED MARCH 1988

- Two Independent VCOs in a 16-Pin Package
- Output Frequency Set by Single External Component:
Capacitor for Fixed- or Variable-Frequency Operation
- Separate Supply Voltage Pins for Isolation of Frequency Control Inputs and Oscillators from Output Circuitry
- Highly Stable Operation over Specified Temperature and/or Supply Voltage Ranges
- Typical f_{max} 85 MHz
Typical Power Dissipation 525 mW
- Frequency Spectrum . . . 1 Hz to 60 MHz

description

The 'S124 features two independent voltage-controlled oscillators (VCO) in a single monolithic chip. The output frequency of each VCO is established by an external capacitor in combination with two voltage-sensitive inputs, one for frequency range and one for frequency control. These inputs can be used to vary the output frequency as shown under typical characteristics. These highly stable oscillators can be set to operate at any frequency typically between 0.12 hertz and 85 megahertz. Under the conditions used in Figure 1, the output frequency can be approximated as follows:

$$f_o = \frac{5 \times 10^{-2}}{C_{ext}}$$

where: f_o = output frequency in hertz
 C_{ext} = external capacitance in farads.

logic

While the enable input is low, the output is enabled.
While the enable input is high, the output is high.

These devices can operate from a single 5-volt supply. However, one set of supply-voltage and ground pins (V_{CC} and GND) is provided for the enable, synchronization-gating, and output sections, and a separate set ($\ominus V_{CC}$ and $\ominus GND$) is provided for the oscillator and associated frequency-control circuits so that effective isolation can be accomplished in the system.

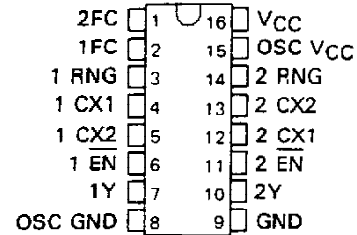
The enable input of these devices starts or stops the output pulses when it is low or high, respectively. The internal oscillator of the 'S124 is started and stopped by the enable input. The enable input is one standard load; it and the buffered output operate at standard Schottky-clamped TTL levels.

The pulse synchronization-gating section ensures that the first output pulse is neither clipped nor extended. Duty cycle of the square-wave output is fixed at approximately 50 percent.

The SN54S124 is characterized for operation over the full military temperature range of -55°C to 125°C ; the SN74S124 is characterized for operation from 0°C to 70°C .

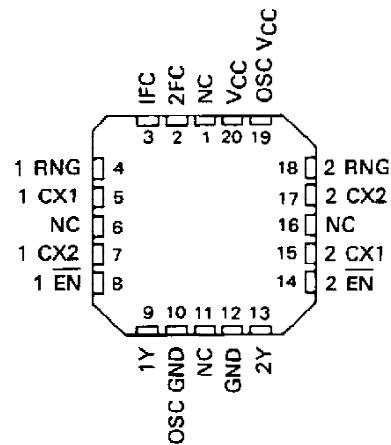
SN54S124 . . . J OR W PACKAGE
SN74S124 . . . D OR N PACKAGE

(TOP VIEW)



SN54S124 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

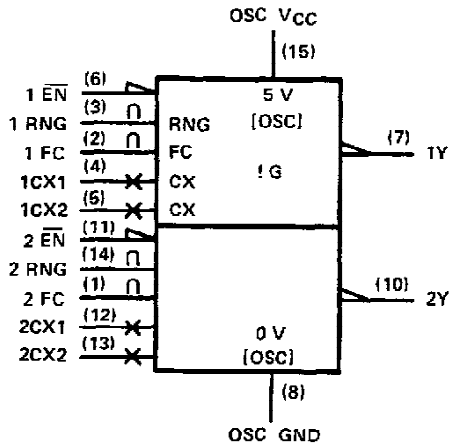
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

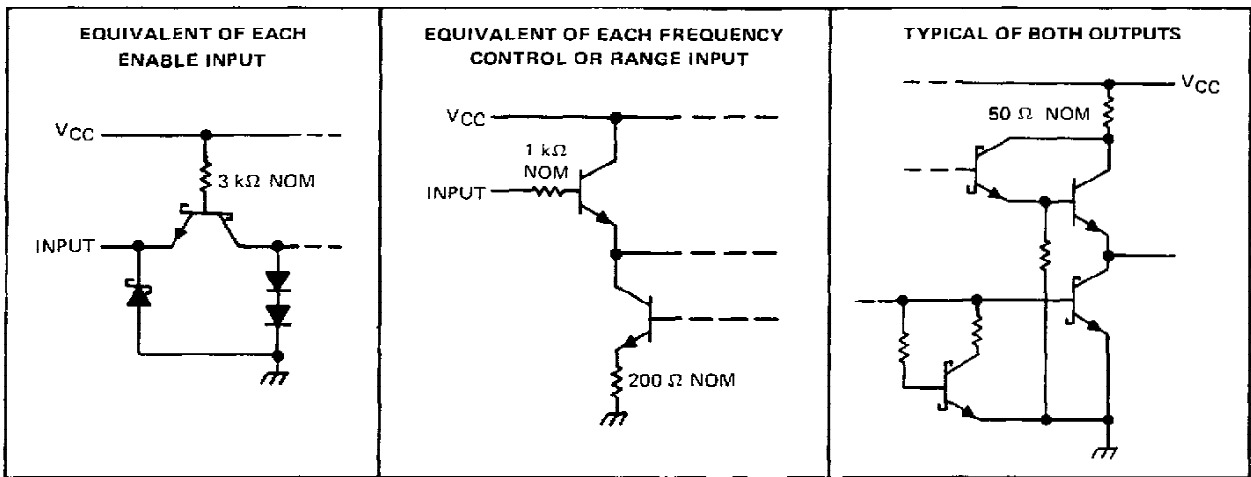
SN54S124, SN74S124 DUAL VOLTAGE-CONTROLLED OSCILLATORS

logic symbol†



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (See Notes 1 and 2)	7V
Input voltage	5.5 V
Operating free-air temperature range: SN54S124	-55°C to 125°C
SN74S124	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTES: 1. Voltage values are with respect to the appropriate ground terminal.
2. Throughout this data sheet, the symbol V_{CC} is used for the voltage applied to both the V_{CC} and $\ominus V_{CC}$ terminals, unless otherwise noted.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN54S124, SN74S124 DUAL VOLTAGE-CONTROLLED OSCILLATORS

recommended operating conditions

	SN54S124			SN74S124			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC} (see Note 1)	4.5	5	5.5	4.75	5	6.25	V
Input voltage at frequency control or range input, $V_{I(freq)}$ or $V_{I(rng)}$	1		5	1		5	V
High-level output current, I_{OH}			-1			-1	mA
Low-level output current, I_{OL}			20			20	mA
Output frequency (enabled), f_o	1			1			Hz
	60			60			MHz
Operating free-air temperature, T_A	-55			125			$^{\circ}$ C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS [†]	MIN	TYP [‡]	MAX	UNIT	
V_{IH}	High-level input voltage at enable		2			V	
V_{IL}	Low-level input voltage at enable				0.8	V	
V_{IK}	Input clamp voltage at enable	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.2	V	
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OH} = -1 \text{ mA}$	SN54S ⁴	2.5	3.4	V	
			SN74S ⁴	2.7	3.4		
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = 20 \text{ mA}$			0.5	V	
I_I	Input current	Freq control or range	$V_{CC} = \text{MAX}$	$V_I = 5 \text{ V}$	10	50	μ A
				$V_I = 1 \text{ V}$	1	15	
I_{II}	Input current at maximum input voltage	Enable	$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$		1	mA	
I_{IH}	High-level input current	Enable	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$		50	μ A	
I_{IL}	Low-level input current	Enable	$V_{CC} = \text{MAX}$, $V_I = 0.5 \text{ V}$		-2	mA	
I_{OS}	Short-circuit output current [§]	$V_{CC} = \text{MAX}$	-40		-100	mA	
I_{CC}	Supply current, total into V_{CC} and $\ominus V_{CC}$	$V_{CC} = \text{MAX}$, See Note 3		105	150	mA	
		$V_{CC} = \text{MAX}$, $T_A = 125^{\circ}\text{C}$, See Note 3	W package only		110		

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡]All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

[§]Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTE 3: I_{CC} is measured with the outputs disabled and open.

switching characteristics, $V_{CC} = 5 \text{ V}$, $R_L = 280 \Omega$, $C_L = 15 \text{ pF}$, $T_A = 25^{\circ}\text{C}$ (see note 4)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_o	Output frequency	$C_{ext} = 2 \text{ pF}$	$V_{I(freq)} = 4 \text{ V}$, $V_{I(rng)} = 1 \text{ V}$	60	85	MHz
			$V_{I(freq)} = 1 \text{ V}$, $V_{I(rng)} = 5 \text{ V}$	25	40	
	Output duty cycle	$C_{ext} = 8.3 \text{ pF}$ to $500 \mu\text{F}$		50%		
t_{PHL}	Propagation delay time, high-to-low-level output from enable	$f_o = 1 \text{ Hz}$ to 20 MHz		1.4		s
		$f_o > 20 \text{ MHz}$		70		ns

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.


**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN54S124, SN74S124
DUAL VOLTAGE-CONTROLLED OSCILLATORS

TYPICAL CHARACTERISTICS

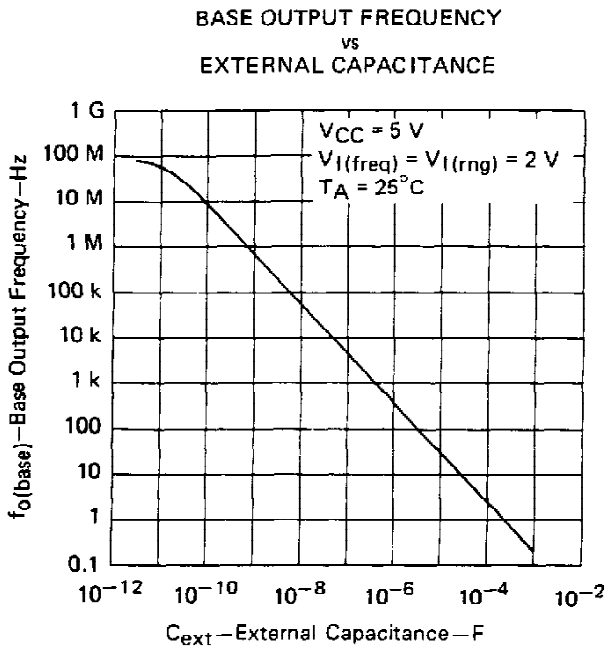


FIGURE 1

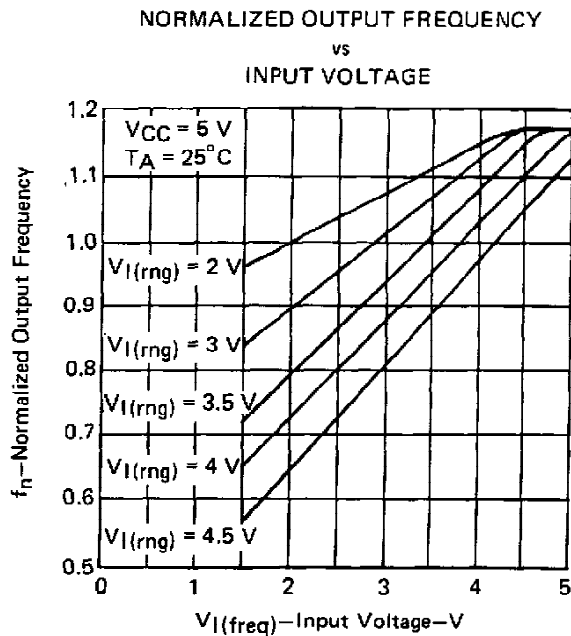


FIGURE 2

NOTE: $f_o = f_n \times f_o(\text{base})$

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.