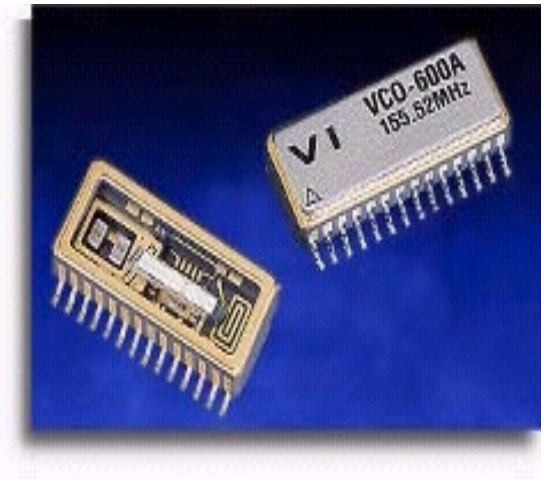
Product Data Sheet

VCO-600A

Voltage Controlled Saw Oscillator



The VCO600A Voltage Controlled SAW Oscillator

Features

- Output Frequency @ 155 MHz to 1 GHz
- Low jitter, 3pS for 622, 6pS for 155 (typical)
- Ideal for clock smoothing, frequency translation, clock and data retiming applications
- 10K ECL, PECL logic levels with fast transition times
- Complementary outputs
- Low profile, surface mount package
- Output disable feature
- Low-frequency clock through feature
- Miniature hermetically sealed ceramic surface-mount package (SO-28, approx.0.7in. x 0.3in)

Applications

- OC192/OC48/OC12 Clock Smoothing
- Frequency Translation

Description

The VCO600A is a SAW stabilized, voltage controlled oscillator that operates at the fundamental frequency of the internal SAW filter. This filter is a high stability, high-Q quartz device that enables the circuit to achieve low phase jitter performance over a wide operating temperature range. The oscillator is housed in a hermetically sealed 28-lead surface mount package. It has a unique output disable and clock through feature to facilitate on-board testing.

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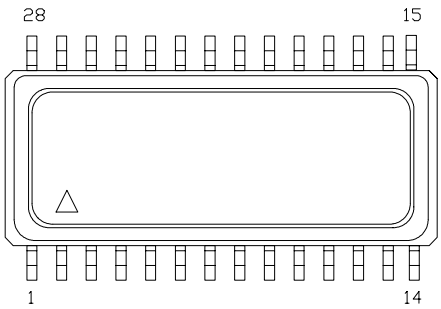
Pin Information

Table 1. Pin Function

Pin	Symbol	Function	Top View of Package
2,12,27	V_{CC}	Positive Supply	
4	CLKIN [1]	Test Clock In	
5,6,7,8	NC	No Connect	
10	V_{EE}	Negative Supply	
17	V_{BW} [2]	Modulation Bandwidth Adjust	
19	V_C	Control Voltage	
21	OD [3]	Output Disable	
23	CLKOUT	ECL Output	
25	$\overline{\text{CLKOUT}}$	Complementary ECLOutput	
1,3,9,11,13,14,15, 16,18,20,22,24,26,28	GND	Case and Circuit Ground	

1. By setting OD low, a test signal may be applied at CLKIN and fed through the VCO-600A to both the CLKOUT and $\overline{\text{CLKOUT}}$ to facilitate on board testing. The test signal input applied at CLKIN may be either an ECL or sinewave input (up to 1Vpp, AC coupled). CLKIN is biased internally to VBB (Vcc-1.3V)
2. An optional capacitor to ground can be placed on VBW to reduce the modulation bandwidth for narrow bandwidth phase-lock loop applications. The modulation bandwidth will be approximately 1/(12000*C)Hz, where C is equal to the capacitance in Farads. If the optional capacitor is not utilized, VBW becomes a no connect (NC) and the modulation bandwidth will be approximately equal to the nominal device frequency ÷1200.
3. By setting OD low, the outputs are disabled and CLKOUT is held high while $\overline{\text{CLKOUT}}$ is held low. The threshold for OD is 1.4V above VEE. OD should not be driven above mid supply and during normal operation, should be left floating (use with an open collector or 3-State gate for interfacing with standard logic). If the OD feature is used during normal operation, then CLKIN should be tied through 10KΩ to GND to avoid any possibility of chatter on the CLKOUT outputs.

Performance Characteristics

Table 2. Electrical Performance

Parameter	Symbol	Minimum	Typical	Maximum	Units
Center Frequency, *see ordering information*	F_N	155		1000	MHz
Operating Temperature	T_{OP}	-40	25	+85	°C
Supply Current	I_{EE}		55	70	mA
Supply Voltage [1]	V_{EE}	-4.5	-5	-5.5	V
Absolute Pull Range (Vc= -0.5 to -4.5)	APR	±50	-	-	ppm
Positive Gain Transfer (freq vs Vc) 155.520MHz	K_V	175	350	700	ppm/V
Positive Gain Transfer (freq vs Vc) 622.080MHz	K_V	60	135	290	ppm/V
Linearity	Lin		±3		%
Frequency Stability, -40 to 85 wrt 25°C	F_{STAB}		±150		ppm
Output Level Low [2]	V_{OL}	-1.95	-	-1.63	V
Output Level High [2]	V_{OH}	-0.98	-	-0.75	V
Output Rise Time [3]	t_R	100	250	400	pS
Output Fall Time [3]	t_F	100	250	400	pS
Spurious Suppression		-50	-60		dB
Data Symmetry	SYM	45	49/51	55	%
Control Voltage Input Impedance	Z_c	8	10	12	KΩ
Control Voltage Modulation Bandwidth [4]	BW	-	500	-	kHz
Control Voltage Range	V_C	V_{EE}	-	V_{CC}	V
Output Current	I_{OUT}	-	-	20	mA
Storage Temperature	T_S	-55	-	125	°C
Soldering Temp./Time	T_{LS}	-	-	240/10	°C/S

1. The VCO-600A may be configured for PECL operation. All outputs and inputs including V_C are referenced to Vcc
2. Output Levels are standard 10K ECL and are fully 100K ECL compatible.
3. Transition times are measured from 20% to 80% of a full 10K ECL level swing.
4. The modulation bandwidth is a function of nominal center frequency and may be adjusted down through the use of an external capacitor on pin 17. Please see Figure 1 and Figure 2 along with Notes 1, 2 and 3.

Table 3. Typical Single Side-Band Phase Noise (dBc/Hz)

Offset from Carrier	100 Hz	1kHz	10kHz	100kHz
VCO600A 622.080	-64	-93	-109	-127

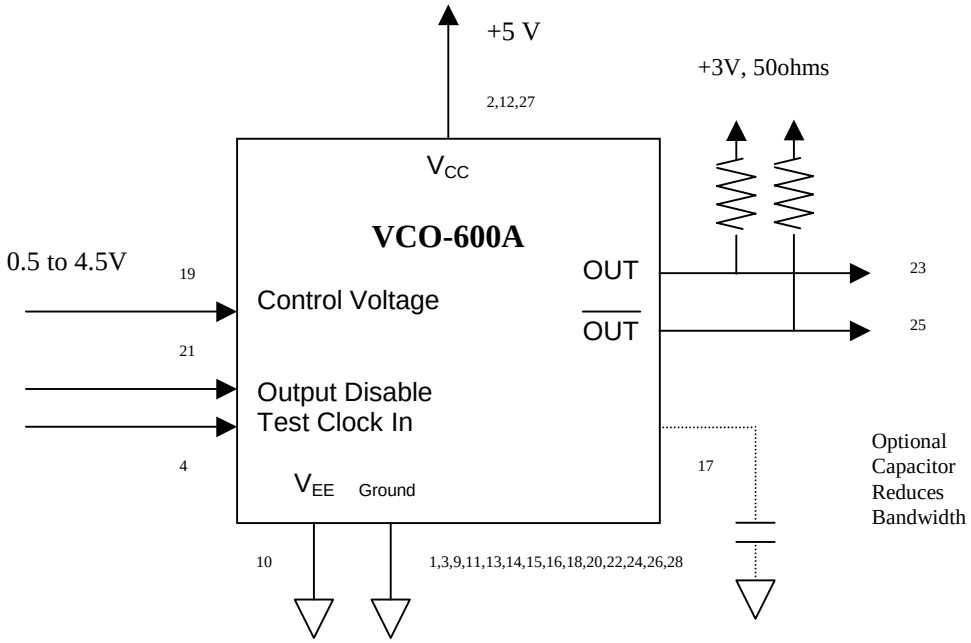


Figure 1. PECL Operation

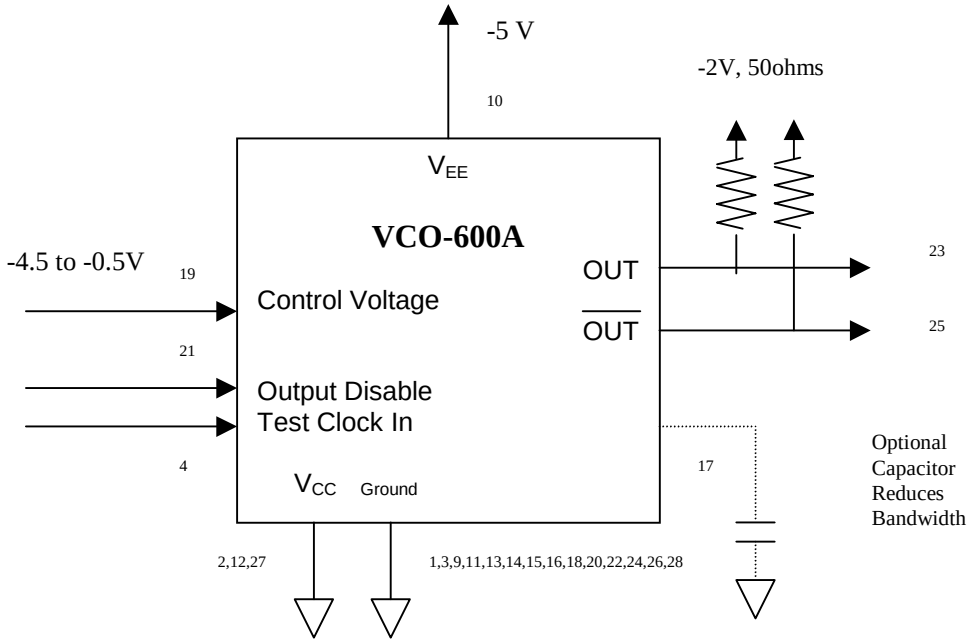


Figure 2. ECL Operation

1. By setting OD low, a test signal may be applied at CLKIN and fed through the VCO-600A to both the CLKOUT and $\overline{\text{CLKOUT}}$ to facilitate on board testing. The test signal input applied at CLKIN may be either an ECL or sinewave input (up to 1Vpp, AC coupled). CLKIN is biased internally to VBB (Vcc-1.3V)
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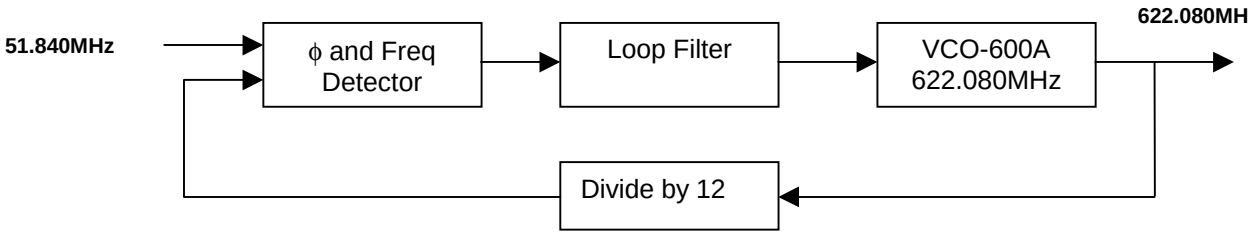

Figure 3. Typical Frequency Translation Diagram

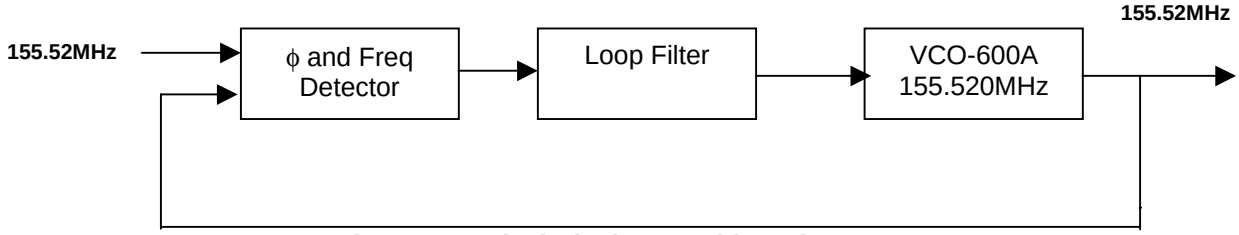

Figure 4. Typical Clock Smoothing Diagram

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.

Table 4. Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power Supply	V_{EE}	-8 to 0	V
Output Current[1]	Iout	20	mA
Output Current[2]	Iout	50	mA
Voltage Control Range[1]	V_C	V_{EE} to V_{CC}	V
Voltage Control Range[2]	V_C	V_{EE}-0.5 to V_{CC}+0.5	V

1 Limts beyond which performance can not be guarenteed.
2 Limits beyond which device life may be impaired.

Qualification Conformance

The VCO-600A family has undergone, and passed, the following Mil-Std qualification.

Table 5. Environmental Compliance

Parameter	Conditions
Mechanical Shock	MIL-STD-883C 2002.3, TEST A
Mechanical Vibration	MIL-STD-883C 2007.1, TEST A
Solderability	MIL-STD-883C 2003.5,
Gross and Fine Leak	MIL-STD-883C, 1014.7, 100% Tested
Resistance to Solvents	MIL-STD-883C 2016

Handling Precautions

Although ESD protection circuitrry has been designed into the the VCO-600A, proper precautions should be taken when handling and mounting. VI employs a human body model and a charged-device model (CDM) for ESD susceptibility testing and design protection evaluation. ESD thresholds are dependent on the circuit parameters used to define the model. Although no industry wide standard has been adopted for the CDM, a standard HBM of resistance=1.5Kohms and capacitance = 100pF is widely used and therefore can be used for comparison purposes.

Table 6. ESD Ratings

Model	Minimum
Human Body Model	1000 V
Charged Device Model	1000 V

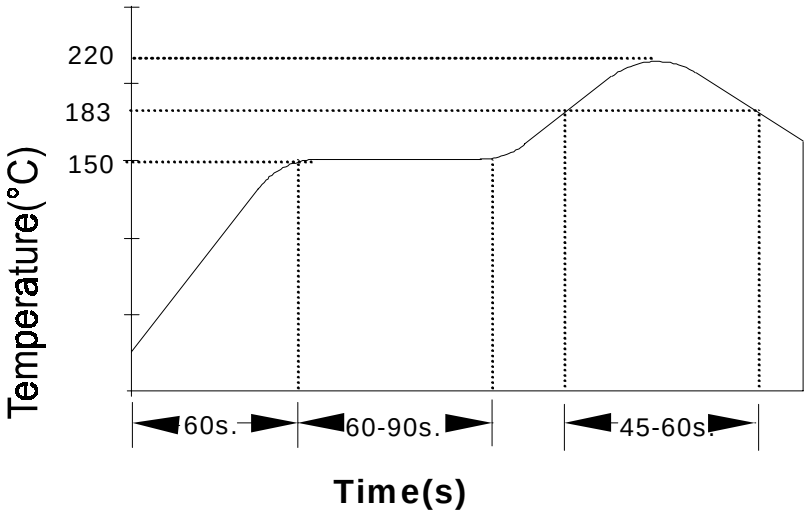

Figure 5. Suggested IR profile

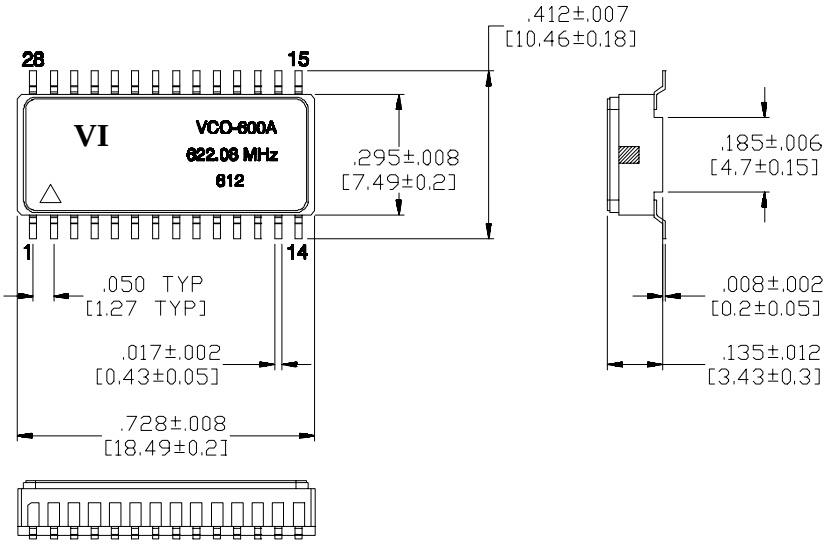

Figure 6. Outline Diagram

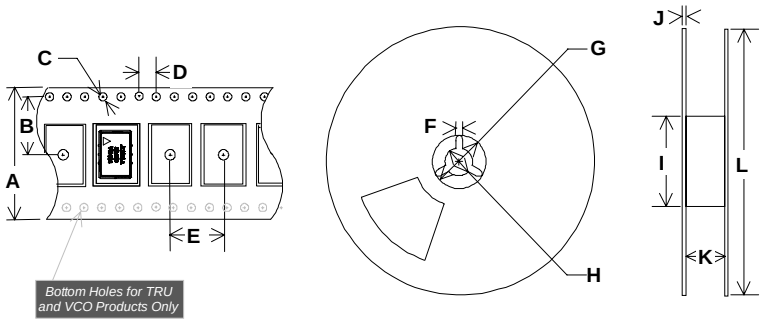

Figure 7. Tape Reel Drawing

Table 7. Tape and Reel Dimensions (mm)

Tape Dimensions						Reel Dimensions							# Per
Product	A	B	C	D	E	F	G	H	I	J	K	L	Reel
VCO600A	32	14.2	1.5	4	16	1.78	21	13	100	5	33	330	200

Ordering information

Table 8. Part number ordering information

Part Number	Packaging	Comcode
VCO600A 155.52MHz	Tube	107040537
VCO600A 155.52MHz	Tape and Reel	407611896
VCO600A 278.528MHz	Tube	107316457
VCO600A 278.852MHz	Tape and Reel	
VCO600A 311.040MHz	Tube	107012551
VCO600A 311.040MHz	Tape and Reel	
VCO600A 368.640MHz	Tube	107237539
VCO600A 368.640MHz	Tape and Reel	407875244
VCO600A 622.080MHz	Tube	107012569
VCO600A 622.080MHz	Tape and Reel	407961762
VCO600A 666.5143MHz	Tube	330016544
VCO600A 666.5143MHz	Tape and Reel	330018383

For Additional Information, Please Contact:

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