Precision Frequency Standard

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PF-Series
Oven Controlled Crystal Oscillators
3.3V / 5.0V Series
LVCMOS / HCMOS Series
Adjustable / Fixed

14 Pin DIP Package
OCXO Series

Description

The Connor-Winfield 14 Pin DIP Oven Stabilized Crystal Controlled Oscillators (OCXO) series and Voltage Controlled Oven Stabilized Crystal Controlled Oscillators (VCOCXO) series are designed for use in applications requiring stabilities of +/-0.05ppm to +/-0.25ppm over the commercial or the industrial temperature ranges.

Features

Frequency Range: 1.6 MHz to 20 MHz
OCXO - Fixed Frequency
VCOCXO - Voltage Controlled
3.3V or 5.0V Operation
LVCMOS or HCMOS Output Logic
Frequency Stabilities Available:
- PF150xx / PF160xx Series: ±0.05ppm
- PF151xx / PF161xx Series: ±0.10ppm
- PF152xx / PF162xx Series: ±0.15ppm
- PF153xx / PF163xx Series: ±0.20ppm
- PF154xx / PF164xx Series: ±0.25ppm

Temperature Ranges Available:
- PF15xxx Series: 0 to 70°C
- PF16xxx Series: -40 to 85°C

Low Jitter <1pS RMS
14 Pin DIP Package
RoHS Compliant / Lead Free

14x20mm Surface Mount Package
OCXO Series

Description

The Connor-Winfield 14x20mm Oven Stabilized Crystal Controlled Oscillators (OCXO series) and Voltage Controlled Oven Stabilized Crystal Controlled Oscillators (VCOCXO series) are designed for use in applications requiring stabilities of +/-0.05ppm to +/-0.25ppm over the commercial or the industrial temperature ranges.

Features

Frequency Range: 1.6 to 20 MHz
OCXO - Fixed Frequency
VCOCXO - Voltage Controlled
3.3V or 5.0V Operation
LVCMOS or HCMOS Output Logic
Frequency Stabilities Available:
- PF250xx / PF260xx Series: ±0.05ppm
- PF251xx / PF261xx Series: ±0.10ppm
- PF252xx / PF262xx Series: ±0.15ppm
- PF253xx / PF263xx Series: ±0.20ppm
- PF254xx / PF264xx Series: ±0.25ppm

Temperature Ranges Available:
- PF25xxx Series: 0 to 70°C
- PF26xxx Series: -40 to 85°C

Low Jitter <1pS RMS
Surface Mount Package
Tape and Reel Packing
RoHS Compliant / Lead Free

RoHS COMPLIANT

Standard Frequencies that are Available*

6.4 MHz	8.192 MHz	9.72 MHz	10.0 MHz
12.8 MHz	16.384 MHz	19.44 MHz	20.0 MHz

Ordering Information

PF	1	5	1	L	F	-	010.0M
Type: Precision Frequency Standard OCXO VCOCXO	Package Type: 1 = 14 Pin DIP 2 = SMT 20x14mm	Temperature Range: 5 = 0 to 70° C 6 = -40 to 85° C	Frequency Stability: 0 = +/-0.05ppm 1 = +/-0.10ppm 2 = +/-0.15ppm 3 = +/-0.20ppm 4 = +/-0.25ppm	Supply Voltage / Output: L = 3.3Vdc / LVCMOS H = 5.0Vdc / HCMOS	Output: F = Fixed Frequency V = Voltage Controlled		Output Frequency: M = MHz xxx.xxM

Frequencies available from the factory for small quantities or quick deliveries, addition frequencies are available.

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Model Specifications

DIP Package Model Number	PF150LF	PF150HF	PF150LV	PF150HV	Note:
SM Package Model Number	PF250LF	PF250HF	PF250LV	PF250HV	
Frequency Range	1.6 to 20 MHz				
Frequency Stability	±0.05ppm				1.2
Temperature Range	0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF160LF	PF160HF	PF160LV	PF160HV	Note:
SM Package Model Number	PF260LF	PF260HF	PF260LV	PF260HV	
Frequency Range	1.6 to 20 MHz				
Frequency Stability	±0.05ppm				1.2
Temperature Range	-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF151LF	PF151HF	PF151LV	PF151HV	Note:
SM Package Model Number	PF251LF	PF251HF	PF251LV	PF251HV	
Frequency Range	1.6 to 20 MHz				
Frequency Stability	±0.10ppm				1.2
Temperature Range	0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF161LF	PF161HF	PF161LV	PF161HV	Note:
SM Package Model Number	PF261LF	PF261HF	PF261LV	PF261HV	
Frequency Range	1.6 to 20 MHz				
Frequency Stability	±0.10ppm				1.2
Temperature Range	-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF152LF	PF152HF	PF152LV	PF152HV	Note:
SM Package Model Number	PF252LF	PF252HF	PF252LV	PF252HV	
Frequency Range	1.6 to 20 MHz				
Frequency Stability	±0.15ppm				1.2
Temperature Range	0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF162LF	PF162HF	PF162LV	PF162HV	Note:
SM Package Model Number	PF262LF	PF262HF	PF262LV	PF262HV	
Frequency Range	1.6 to 20 MHz				1.2
Frequency Stability	±0.15ppm				
Temperature Range	-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF153LF	PF153HF	PF153LV	PF153HV	Note:
SM Package Model Number	PF253LF	PF253HF	PF253LV	PF253HV	
Frequency Range	1.6 to 20 MHz				1.2
Frequency Stability	±0.20ppm				
Temperature Range	0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF163LF	PF163HF	PF163LV	PF163HV	Note:
SM Package Model Number	PF263LF	PF263HF	PF263LV	PF263HV	
Frequency Range	1.6 to 20 MHz				1.2
Frequency Stability	±0.20ppm				
Temperature Range	-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF154LF	PF154HF	PF154LV	PF154HV	Note:
SM Package Model Number	PF254LF	PF254HF	PF254LV	PF254HV	
Frequency Range	1.6 to 20 MHz				1.2
Frequency Stability	±0.25ppm				
Temperature Range	0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

DIP Package Model Number	PF164LF	PF164HF	PF164LV	PF164HV	Note:
SM Package Model Number	PF264LF	PF264HF	PF264LV	PF264HV	
Frequency Range	1.6 to 20 MHz				1.2
Frequency Stability	±0.25ppm				
Temperature Range	-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	
OCXO / VCOCXO	OCXO	OCXO	VCOCXO	VCOCXO	

Note:
1.2) Frequency stability vs. change in temperature.

PF15xxx / PF16xxx - Series

PF25xxx / PF26xxx - Series

FEATURES

OCXO - Fixed Frequency
VCOCXO - Voltage Controlled
Frequency Range: 1.6 to 20 MHz
3.3V or 5.0V Operation
LVCMOS / HCMOS Output Logic
PF15xxx / PF16xxx Series -14 Pin DIP Package
PF25xxx / PF26xxx Series -Surface Mount Package
Frequency Stabilities Available:
- PF150xx / PF160xx Series: ±0.05ppm
- PF250xx / PF260xx Series: ±0.05ppm
- PF151xx / PF161xx Series: ±0.10ppm
- PF251xx / PF261xx Series: ±0.10ppm
- PF152xx / PF162xx Series: ±0.15ppm
- PF252xx / PF262xx Series: ±0.15ppm
- PF153xx / PF163xx Series: ±0.20ppm
- PF253xx / PF263xx Series: ±0.20ppm
- PF154xx / PF164xx Series: ±0.25ppm
- PF254xx / PF264xx Series: ±0.25ppm

Temperature Ranges Available:
- PF15xxx: 0 to 70°C
- PF16xxx: -40 to 85°C

Low Jitter <1pS RMS
Tape and Reel Packaging
RoHS Compliant / Lead Free

PIN CONNECTIONS

Pin	Function
1	OCXO – N/C VCOCXO - Voltage Control
7	Ground (Case)
8	Output
14	Vcc

ORDERING INFORMATION

PF151LF - 010.0 M

PF151LF: OCXO SERIES
010.0 M: CENTER FREQUENCY

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3.3V LVCMOS Model Specifications

ABSOLUTE MAXIMUM RATINGS TABLE 1.3

PARAMETER	UNITS	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Storage Temperature		-55	-	125	°C	
Supply Voltage	(Vcc)	-0.5	-	4.5	Vdc	
Control Voltage	(Vc)	-0.5	-	4.5	Vdc	

OPERATING SPECIFICATIONS TABLE 2.3

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Frequency Calibration		-1.0		1.0	ppm	1.3, 4.3
Frequency Stability			See Page 2		ppm	2.3
Frequency vs. Change in Supply Voltage		-0.05	-	0.05	ppm	3.3
Aging (Daily)		-30	-	30	ppb	4.3
Aging (1st year)		-1.0	-	1.0	ppm	
Total Frequency Tolerance (20 years)		-4.6	-	4.6	ppm	5.3
Supply Voltage	(Vcc)	3.13	3.3	3.47	Vdc	
Supply Power (0 to 70°C)		-	-	1.5	Watts	
Supply Power (-40 to 85°C)		-	-	2.7	Watts	
Phase Jitter (BW =10Hz to Fo/2)		-	-	3	pS RMS	
Phase Jitter (BW =10KHz to Fo/2)		-	-	1	pS RMS	
Period Jitter		-	-	1	pS RMS	
Allan Variance (1 Second)		-	1.00 E-10	-		
SSB Phase Noise at 10Hz offset		-	-90	-	dBc/Hz	6.3
SSB Phase Noise at 100Hz offset		-	-120	-	dBc/Hz	6.3
SSB Phase Noise at 1KHz offset		-	-140	-	dBc/Hz	6.3
SSB Phase Noise at 10KHz offset		-	-150	-	dBc/Hz	6.3
Start-Up Time: Oscillator		-	-	35	ms	
Warm Up Time		-	-	5	Minutes	7.3

VCOCXO INPUT CHARACTERISTICS TABLE 3.3

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Control Voltage Range	(Vc)	0.3	1.5	3.0	Vdc	
Frequency at Vc=0.3 Vdc		-	-7	-5	ppm	8.3
Frequency at Vc=3.0 Vdc		5	7	-	ppm	8.3
Slope of Frequency Adjust		3.7	-	-	ppm/V	
Input Impedance		100k	-	-	Ohm	

LVCMOS OUTPUT CHARACTERISTICS TABLE 4.3

PARAMETER			MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
LOAD			-	15	-	pF	
Voltage	(High)	(Voh)	2.6	-	-	Vdc	
	(Low)	(Vol)	-	-	0.4	Vdc	
Current	(High)	(Ioh)	-4	-	-	mA	
	(Low)	(Iol)	-	-	4	mA	
Duty Cycle at 50% of Vcc			45	50	55	%	
Rise / Fall Time 10% to 90%			-	-	6	nS	

PACKAGE CHARACTERISTICS TABLE 5.3

PF1xxxx-Series DIP Package	14 pin DIP, hermetically sealed, grounded, welded package.
PF2xxxx-Series Surface Mount Package	Surface Mount, Non-hermetic package consisting of an FR4 substrate with grounded metal cover.

Notes:
1.3) Initial calibration @ 25C. VCOCXO model Vc = 1.50 Vdc.
2.3) Frequency stability vs. Change in temperature, referenced to 25C.
3.3) Frequency stability per 5% change in supply voltage.
4.3) At the time of shipment after 48 hours of operation.
5.3) Inclusive of calibration, operating temperature range, supply voltage change, shock and vibration 20 years aging, VCOCXO models Vc=1.5V.
6.3) Typical phase noise, results will vary depending on center frequency. The phase noise shown are typical for 20 MHz.
7.3) Measured @ 25C, within 5 minutes, the unit will be within +/-0.1ppm of its reference frequency, measured after 30 minutes of continuous operation at a stable 25C.
8.3) VCOCXO models pullability referenced to Fo @ 25°C, Positive Transfer Characteristic.

5.0V HCMOS Model Specifications

ABSOLUTE MAXIMUM RATINGS TABLE 6.3

PARAMETER	UNITS	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Storage Temperature		-55	-	125	°C	
Supply Voltage	(Vcc)	-0.5	-	4.5	Vdc	
Control Voltage	(Vc)	-0.5	-	4.5	Vdc	

OPERATING SPECIFICATIONS TABLE 7.3

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Frequency Calibration		-1.0		1.0	ppm	9.3, 12.3
Frequency Stability			See Page 2		ppm	10.3
Frequency vs. Change in Supply Voltage		-0.05	-	0.05	ppm	11.3
Aging (Daily)		-30	-	30	ppb	123
Aging (1st year)		-1.0	-	1.0	ppm	
Total Frequency Tolerance (20 years)		-4.6	-	4.6	ppm	13.3
Supply Voltage	(Vcc)	4.75	5.0	5.25	Vdc	
Supply Power (0 to 70°C)		-	-	1.5	Watts	
Supply Power (-40 to 85°C)		-	-	2.7	Watts	
Phase Jitter (BW =10Hz to Fo/2)		-	-	3	pS RMS	
Phase Jitter (BW =10KHz to Fo/2)		-	-	1	pS RMS	
Period Jitter		-	-	1	pS RMS	
Allan Variance (1 Second)		-	1.00 E-10	-		
SSB Phase Noise at 10Hz offset		-	-90	-	dBc/Hz	14.3
SSB Phase Noise at 100Hz offset		-	-120	-	dBc/Hz	14.3
SSB Phase Noise at 1KHz offset		-	-140	-	dBc/Hz	14.3
SSB Phase Noise at 10KHz offset		-	-150	-	dBc/Hz	14.3
Start-Up Time: Oscillator		-	-	35	ms	
Warm Up Time		-	-	5	Minutes	15.3

VCOCXO INPUT CHARACTERISTICS TABLE 8.3

PARAMETER		MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Control Voltage Range	(Vc)	0.5	2.0	4.1	Vdc	
Frequency at Vc=0.5 Vdc		-	-7	-5	ppm	16.4
Frequency at Vc=4.1 Vdc		5	7	-	ppm	16.4
Slope of Frequency Adjust		3.7	-	-	ppm/V	
Input Impedance		100k	-	-	Ohm	

HCMOS OUTPUT CHARACTERISTICS TABLE 9.3

PARAMETER			MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
LOAD				15	-	pF	
Voltage	(High)	(Voh)	Vcc-0.5	-	-	Vdc	
	(Low)	(Vol)	-	-	0.4	Vdc	
Current	(High)	(Ioh)	-4	-	-	mA	
	(Low)	(Iol)	-	-	4	mA	
Duty Cycle at 50% of Vcc			45	50	55	%	
Rise / Fall Time 10% to 90%			-	-	6	nS	

PACKAGE CHARACTERISTICS TABLE 10.3

PF1xxxx-Series DIP Package	14 pin DIP, hermetically sealed, grounded, welded package.
PF2xxxx-Series Surface Mount Package	Surface Mount, Non-hermetic package consisting of an FR4 substrate with grounded metal cover.

Notes:
9.3) Initial calibration @ 25C. VCOCXO model Vc = 2.0 Vdc.
10.3) Frequency stability vs. Change in temperature, referenced to 25C.
11.3) Frequency stability per 5% change in supply voltage.
12.3) At the time of shipment after 48 hours of operation.
13.3) Inclusive of calibration, operating temperature range, supply voltage change, shock and vibration 20 years aging, VCOCXO models Vc=2.0V.
14.3) Typical phase noise, results will vary depending on center frequency. The phase noise shown are typical for 20 MHz.
15.3) Measured @ 25C, within 5 minutes, the unit will be within +/-0.1ppm of its reference frequency, measured after 30 minutes of continuous operation at a stable 25C.
16.3) VCOCXO models pullability referenced to Fo @ 25°C, Positive Transfer Characteristic.

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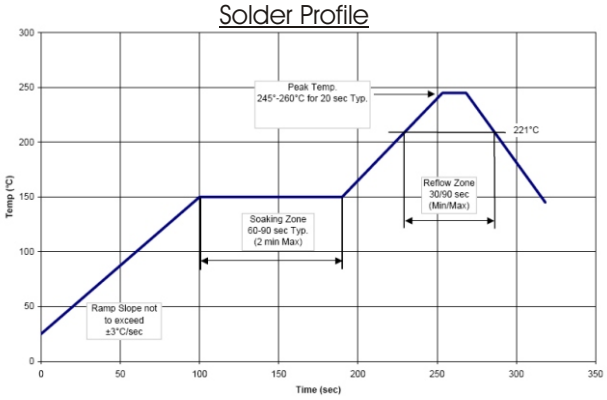
14 Pin DIP Package Environmental Characteristics

ENVIRONMENTAL CHARACTERISTICS
Temperature Cycle: Per MIL-STD-883, Method 1010, Condition B. -55°C to 125°C, 300 cycles, 10 minute dwell, 1minute transition.
Gross Leak Test: Per MIL-STD-202, Method 112, Condition D. No Bubbles in flourinert (FC-43) at 125°C ±5°C for 20 seconds.
SOLDERING
Pin Solderability: Per MIL-STD-883, Method 2003. 8 hour steam age prior to 254°C ±5°C Solder pot dip, 95% Coverage.
Resistance to Solder Heat: Per MIL-STD-202, Method 210, Condition C. Wave: Topside board-mount product, 260°C ±5°C for 20 seconds.
MECHANICAL CHARACTERISTICS
Vibration: Per MIL-STD-202, Method 204, Condition A. 10G's peak, 10Hz to 500Hz, 15 minute cycles 12 times each perpendicular axis.
Shock: Per MIL-STD-202, Method 213, Condition F. 1500G's, 0.5ms, half sine, 3 shocks per direction.
Moisture Resistance: Per MIL-STD-202, Method 106. 95% RH @ 65°C, 10 cycles 10°C to 65°C.

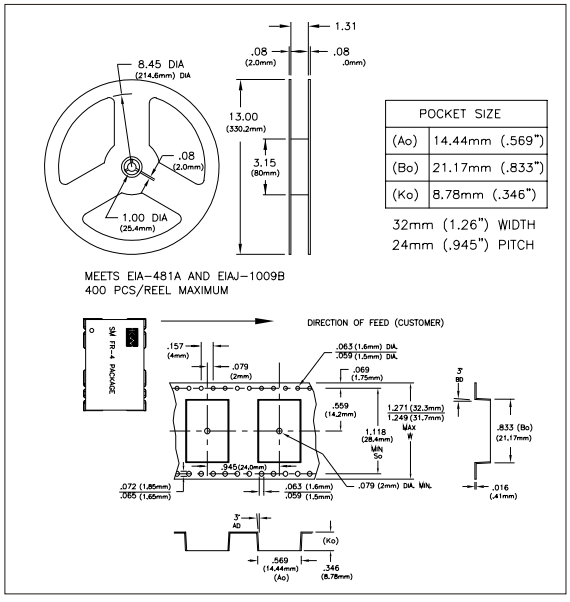
Surface Mount Package Environmental Characteristics

ENVIRONMENTAL CHARACTERISTICS
Temperature Cycle: Per MIL-STD-883, Method 1010, Condition B. -55°C to 125°C, 300 cycles, 10 minute dwell, 1minute transition.
MECHANICAL CHARACTERISTICS
Vibration: Per MIL-STD-202, Method 204, Condition A. 10G's peak, 10Hz to 500Hz, 15 minute cycles 12 times each perpendicular axis.
Shock: Per MIL-STD-202, Method 213, Condition F. 1500G's, 0.5ms, half sine, 3 shocks per direction.
Moisture Resistance: Per MIL-STD-202, Method 106. 95% RH @ 65°C, 10 cycles 10°C to 65°C.

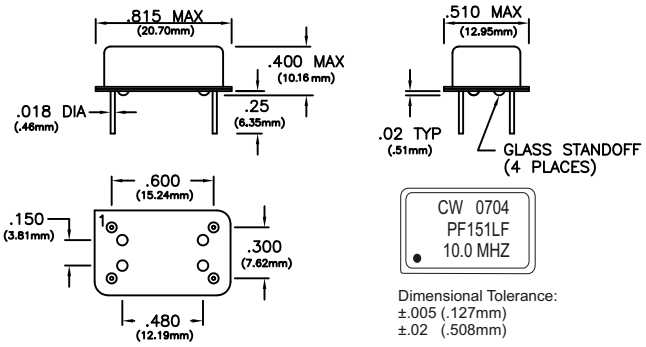
Solder Profile



Tape and Reel Information

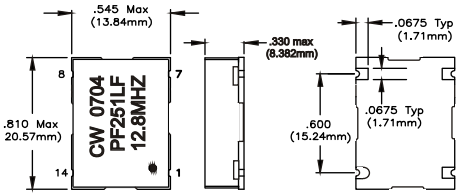


14 Pin DIP Package Outline

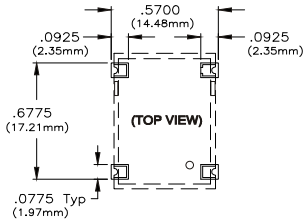


Dimensional Tolerance:
±.005 (.127mm)
±.02 (.508mm)

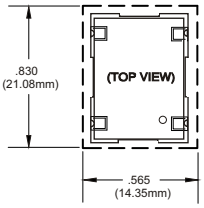
Surface Mount Package Outline



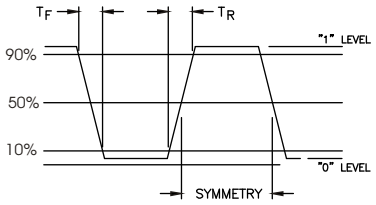
Suggested Pad Layout



Keep Out Area



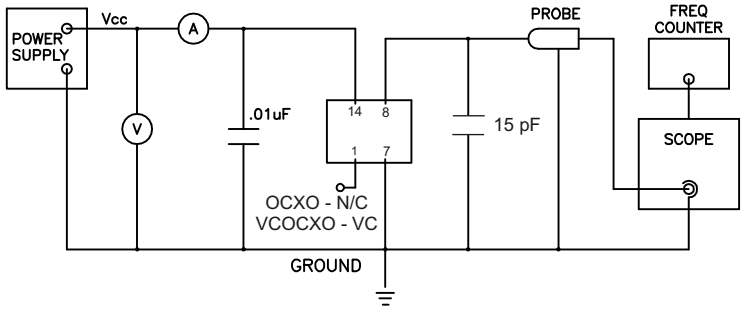
Output Waveform



Pin Connections

Pin	Function
1	OCXO – N/C VCOCXO - Voltage Control
7	Ground (Case)
8	Output
14	Vcc

Test Circuit



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