

Precision Frequency Standard

**CONNOR
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PF-Series

Oven Controlled Crystal Oscillators

3.3V / 5.0V Series

LVC MOS / HCMOS Series

VCOC XO / OC XO



**14 Pin DIP Package
OC XO Series**



**14x20mm Surface Mount Package
OC XO Series**

Description

The Connor-Winfield 14 Pin DIP Oven Stabilized Crystal Controlled Oscillators (OC XO) series and Voltage Controlled Oven Stabilized Crystal Controlled Oscillators (VCOC XO) series are designed for use in applications requiring stabilities of $\pm 0.05\text{ppm}$ to $\pm 0.25\text{ppm}$.

Features

Frequency Range: 6.4 MHz to 40 MHz
OC XO - Fixed Frequency
VCOC XO - Voltage Controlled
3.3V or 5.0V Operation
LVC MOS or HCMOS Output Logic
Frequency Stabilities Available:

PF150xx Series: $\pm 0.05\text{ppm}$

PF151xx / PF161xx Series: $\pm 0.10\text{ppm}$

PF152xx / PF162xx Series: $\pm 0.15\text{ppm}$

PF153xx / PF163xx Series: $\pm 0.20\text{ppm}$

PF154xx / PF164xx Series: $\pm 0.25\text{ppm}$

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

Description

The Connor-Winfield 14x20mm Oven Stabilized Crystal Controlled Oscillators (OC XO series) and Voltage Controlled Oven Stabilized Crystal Controlled Oscillators (VCOC XO series) are designed for use in applications requiring stabilities of $\pm 0.05\text{ppm}$ to $\pm 0.25\text{ppm}$.

Features

Frequency Range: 6.4 to 40 MHz
OC XO - Fixed Frequency
VCOC XO - Voltage Controlled
3.3V or 5.0V Operation
LVC MOS or HCMOS Output Logic
Frequency Stabilities Available:

PF250xx Series: $\pm 0.05\text{ppm}$

PF251xx / PF261xx Series: $\pm 0.10\text{ppm}$

PF252xx / PF262xx Series: $\pm 0.15\text{ppm}$

PF253xx / PF263xx Series: $\pm 0.20\text{ppm}$

PF254xx / PF264xx Series: $\pm 0.25\text{ppm}$

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

Standard Frequencies: (Additional Frequencies are Available)

6.4 MHz, 8.192MHz, 9.72 MHz, 10.0 MHz, 12.8 MHz, 16.384 Hz, 19.44 MHz, 20.0 MHz 40.0 MHz

Ordering Information

PF	1	5	1	L	F	-	010.0M
Type: Precision Frequency Standard OC XO VCOC XO	Package Type: 1 = 14 Pin DIP 2 = SMT 20x14mm	Temperature Range: 5 = 0 to 70°C 6 = -40 to 85°C	Frequency Stability: 0 = $\pm 0.05\text{ppm}$ 1 = $\pm 0.10\text{ppm}$ 2 = $\pm 0.15\text{ppm}$ 3 = $\pm 0.20\text{ppm}$ 4 = $\pm 0.25\text{ppm}$	Supply Voltage / Output: L = 3.3Vdc / LVC MOS H = 5.0Vdc / HCMOS	Output: F = Fixed Frequency V = Voltage Controlled		Output Frequency: M = MHz xxx.xxM



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DIP Package Model Number	PF150LF	PF150HF	PF150LV	PF150HV	Note:
SM Package Model Number	PF250LF	PF250HF	PF250LV	PF250HV	
Frequency Range	6.4 to 40 MHz				1.2
Frequency Stability	±0.05ppm				
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	PF151LF	PF151HF	PF151LV	PF151HV	Note:
SM Package Model Number	PF251LF	PF251HF	PF251LV	PF251HV	
Frequency Range	6.4 to 40 MHz				1.2
Frequency Stability	±0.10ppm				
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	6.4 to 40 MHz				1.2
Frequency Stability	±0.10ppm				
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	6.4 to 40 MHz				1.2
Frequency Stability	±0.15ppm				
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	6.4 to 40 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	6.4 to 40 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	6.4 to 40 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	6.4 to 40 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	6.4 to 40 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.

Specifications subject to change without notice. All dimensions in inches. © Copyright 2008 The Connor-Winfield Corporation

PF15xxx / PF16xxx - Series



PF25xxx / PF26xxx - Series



FEATURES

OCXO - Fixed Frequency
VCOCXO - Voltage Controlled
Frequency Range: 6.4 to 40 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 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
7	VCOCXO - Voltage Control
8	Ground (Case)
14	Vcc

ORDERING INFORMATION

PF151LF - 010.0 M
OCXO SERIES CENTER FREQUENCY

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3.3V LVC MOS Model Specifications

ABSOLUTE MAXIMUM RATINGS

TABLE 1.3

PARAMETER	UNITS	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Storage Temperature		-55	-	125	°C	
Supply Voltage	(V _{cc})	-0.5	-	4.5	Vdc	
Control Voltage	(V _c)	-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	(V _{cc})	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 CHARACTERISTICS

TABLE 3.3

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

LVC MOS OUTPUT CHARACTERISTICS

TABLE 4.3

PARAMETER	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
LOAD	-	15	-	pF	
Voltage (High)	(V _{oh})	2.6	-	Vdc	
(Low)	(V _{ol})	-	0.4	Vdc	
Current (High)	(I _{oh})	-4	-	mA	
(Low)	(I _{ol})	-	4	mA	
Duty Cycle at 50% of V _{cc}	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 @ 25°C. VCOCXO model V_c = 1.50 Vdc.
- 2.3) Frequency stability vs. Change in temperature, referenced to 25°C.
- 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 V_c=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 @ 25°C, within 5 minutes, the unit will be within +/-0.1ppm of its reference frequency, measured after 30 minutes of continuous operation at a stable 25°C.
- 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	(V _{cc})	-0.5	-	4.5	Vdc	
Control Voltage	(V _c)	-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	(V _{cc})	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 CHARACTERISTICS

TABLE 8.3

PARAMETER	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
Control Voltage Range	(V _c)	0.5	2.0	4.1	Vdc
Frequency at V _c =0.5 Vdc	-	-7	-5	ppm	16.3
Frequency at V _c =4.1 Vdc	5	7	-	ppm	16.3
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)	(V _{oh})	V _{cc} -0.5	-	Vdc	
(Low)	(V _{ol})	-	0.4	Vdc	
Current (High)	(I _{oh})	-4	-	mA	
(Low)	(I _{ol})	-	4	mA	
Duty Cycle at 50% of V _{cc}	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 @ 25°C. VCOCXO model V_c = 2.0 Vdc.
- 10.3) Frequency stability vs. Change in temperature, referenced to 25°C.
- 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 V_c=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 @ 25°C, within 5 minutes, the unit will be within +/-0.1ppm of its reference frequency, measured after 30 minutes of continuous operation at a stable 25°C.
- 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.

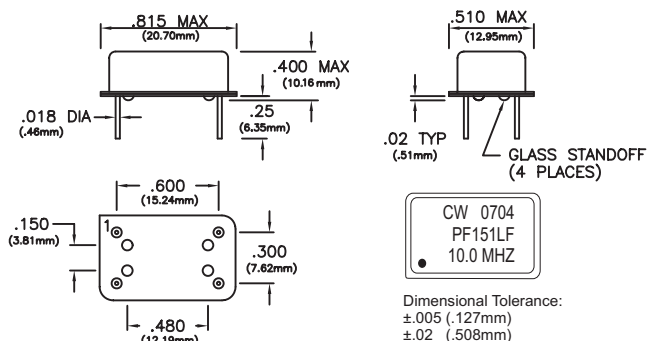
MECHANICAL CHARACTERISTICS

Vibration: Per MIL-STD-202, Method 204, Condition A. 10G's peak, 10Hz to 500Hz, 15 minute cycles 12 times each perpendicular axis.

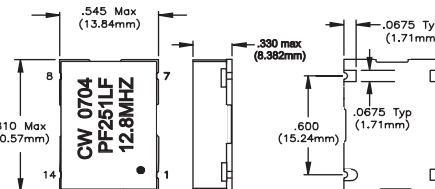
Shock: Per MIL-STD-202, Method 213, Condition F. 1500G's, 0.5ms, half sine, 3 shocks per direction.

Moisture Resistance: Per MIL-STD-202, Method 106. 95% RH @ 65°C, 10 cycles 10°C to 65°C.

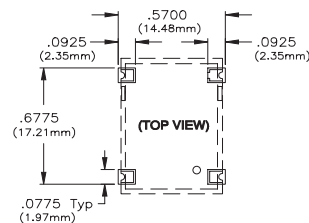
14 Pin DIP Package Outline



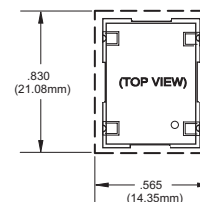
Surface Mount Package Outline



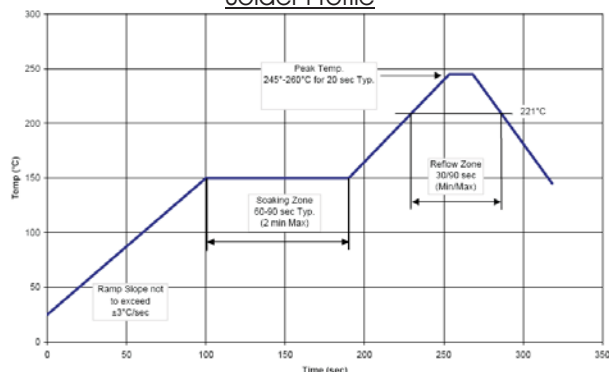
Suggested Pad Layout



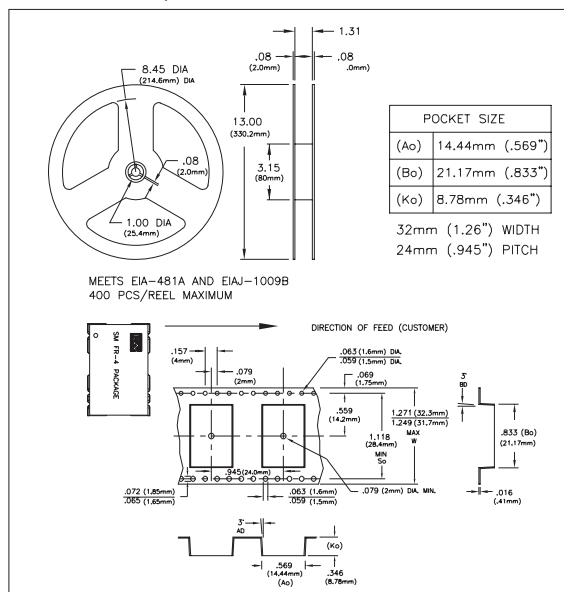
Keep Out Area



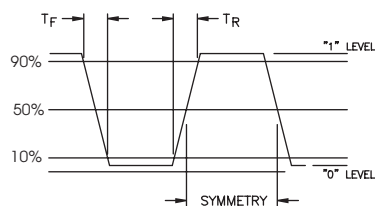
Solder Profile



Tape and Reel Information



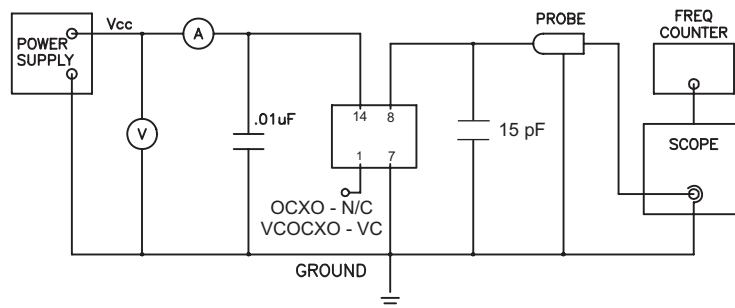
Output Waveform



Pin Connections

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

Test Circuit



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