Precision Frequency Standard

CONNOR WINFIELD

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PF-Series
Oven Controlled Crystal Oscillators
3.3V / 5.0V Series
LVCMOS / HCMOS / Sinewave Series
OCVCXO / OCXO

14 Pin DIP Package
OCXO Series

Description

The Connor-Winfield 14 Pin DIP Oven Stabilized Crystal Controlled Oscillators (OCXO) series and Oven Stabilized Crystal Controlled Voltage Controlled Oscillators (OCVCXO) series are designed for use in applications requiring stabilities of +/- 0.05ppm to +/-0.25ppm.

Features

Freq. Range (CMOS): 6.4 MHz to 40 Mhz
Freq. Range (Sinewave): 12.8 MHz to 40 MHz
OCXO - Fixed Frequency
OCVCXO - Voltage Controlled
3.3V or 5.0V Operation
LVCMOS, HCMOS or Sinewave Output
Frequency Stabilities Available:
PF150xx 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 Oven Stabilized Crystal Controlled Voltage Controlled Oscillators (OCVCXO series) are designed for use in applications requiring stabilities of +/-0.05ppm to +/-0.25ppm.

Features

Freq. Range (CMOS): 6.4 MHz to 40 Mhz
Freq. Range (Sinewave): 12.8 MHz to 40 MHz
OCXO - Fixed Frequency
OCVCXO - Voltage Controlled
3.3V or 5.0V Operation
LVCMOS, HCMOS or Sinewave Output
Frequency Stabilities Available:
PF250xx 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: (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 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 S = 5.0Vdc / Sinewave	Output: F = Fixed Frequency V = Voltage Controlled		Output Frequency: M = MHz xxx.xxM

* Models PF160xx and PF260xx are not available at this time.

Bulletin	Cx123
Page	1 of 4
Revision	04
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Model Specifications

DIP Package Model / SM Package Model	PF150LF / PF250LF	PF150HF / PF250HF	PF150SF / PF250SF	PF150LV / PF250LV	PF150HV / PF250HV	PF150SV / PF250SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	
Frequency Stability			±0.05ppm				1.2
Temperature Range			0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF151LF / PF251LF	PF151HF / PF251HF	PF151SF / PF251SF	PF151LV / PF251LV	PF151HV / PF251HV	PF151SV / PF251SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	
Frequency Stability			±0.10ppm				1.2
Temperature Range			0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF161LF / PF261LF	PF161HF / PF261HF	PF161SF / PF261SF	PF161LV / PF261LV	PF161HV / PF261HV	PF161SV / PF261SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	
Frequency Stability			±0.10ppm				1.2
Temperature Range			-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Mode / SM Package Model	PF152LF / PF252LF	PF152HF / PF252HF	PF152SF / PF252SF	PF152LV / PF252LV	PF152HV / PF252HV	PF152SV / PF252SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	
Frequency Stability			±0.15ppm				1.2
Temperature Range			0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF162LF / PF262LF	PF162HF / PF262HF	PF162SF / PF262SF	PF162LV / PF262LV	PF162HV / PF262HV	PF162SV / PF262SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	1.2
Frequency Stability			±0.15ppm				
Temperature Range			-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF153LF / PF253LF	PF153HF / PF253HF	PF153SF / PF253SF	PF153LV / PF253LV	PF153HV / PF253HV	PF153SV / PF253SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	1.2
Frequency Stability			±0.20ppm				
Temperature Range			0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF163LF / PF263LF	PF163HF / PF263HF	PF163SF / PF263SF	PF163LV / PF263LV	PF163HV / PF263HV	PF163SV / PF263SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	1.2
Frequency Stability			±0.20ppm				
Temperature Range			-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF154LF / PF254LF	PF154HF / PF254HF	PF154SF / PF254SF	PF154LV / PF254LV	PF154HV / PF254HV	PF154SV / PF254SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	1.2
Frequency Stability			±0.25ppm				
Temperature Range			0 to 70°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

DIP Package Model / SM Package Model	PF164LF / PF264LF	PF164HF / PF264HF	PF164SF / PF264SF	PF164LV / PF264LV	PF164HV / PF264HV	PF164SV / PF264SV	Note:
Frequency Range	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	6.4 to 40 MHz	6.4 to 40 MHz	12.8 to 40 MHz	1.2
Frequency Stability			±0.25ppm				
Temperature Range			-40 to 85°C				
Supply Voltage	3.3 Vdc	5.0 Vdc	5.0 Vdc	3.3 Vdc	5.0 Vdc	5.0 Vdc	
OCXO / OCVCXO	OCXO	OCXO	OCXO	OCVCXO	OCVCXO	OCVCXO	
Output Type	LVCMOS	HCMOS	Sinewave	LVCMOS	HCMOS	Sinewave	

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

PF15xxx / PF16xxx - Series

PF25xxx / PF26xxx - Series

FEATURES

OCXO - Fixed Frequency
OCVCXO - Voltage Controlled
Frequency Range CMOS: 6.4 to 40 Mhz
Frequency Range Sinewave: 12.8 to 40 MHz
3.3V or 5.0V Operation
LVCMOS, HCMOS or Sinewave Output
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 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

OCVCXO 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. OCVCXO 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, OCVCXO 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) OCVCXO models pullability referenced to Fo @ 25°C, Positive Transfer Characteristic.

5.0V HCMOS / Sinewave 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

OCVCXO 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	

SINEWAVE OUTPUT CHARACTERISTICS TABLE 10.3

PARAMETER	MINIMUM	NOMINAL	MAXIMUM	UNITS	NOTE
LOAD	-	50	-	Ohms	
Output Power	1	-	-	dBm	
Harmonics	-	-	-30	dBc	
Spurious	-	-	-80	dBc	

PACKAGE CHARACTERISTICS TABLE 11.3

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. OCVCXO 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, OCVCXO 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) OCVCXO models pullability referenced to Fo @ 25°C, Positive Transfer Characteristic.

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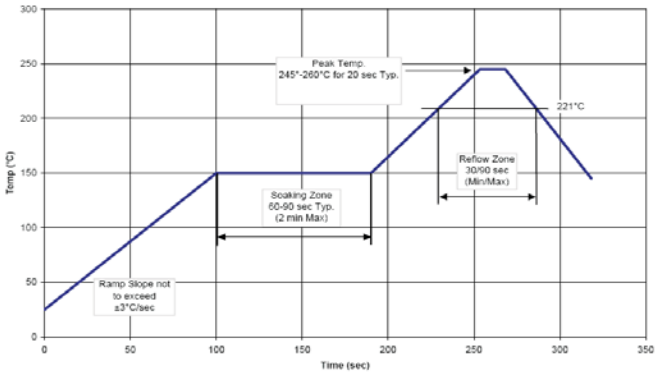
14 Pin DIP Package
Environmental Characteristics

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.

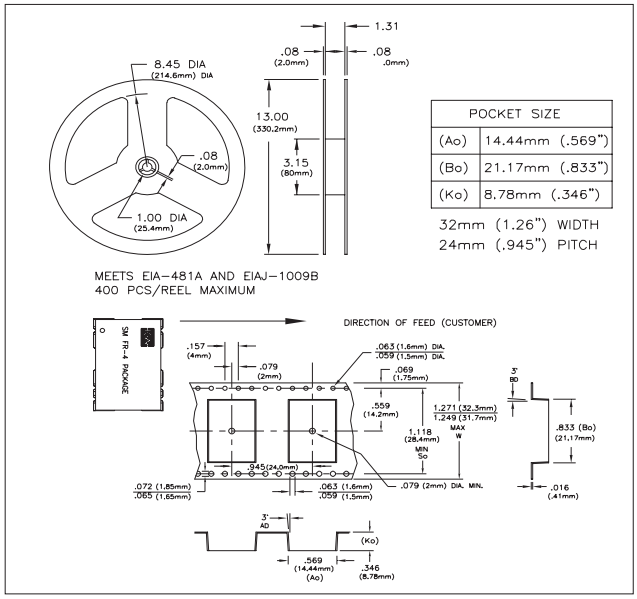
Surface Mount Package
Environmental Characteristics

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.

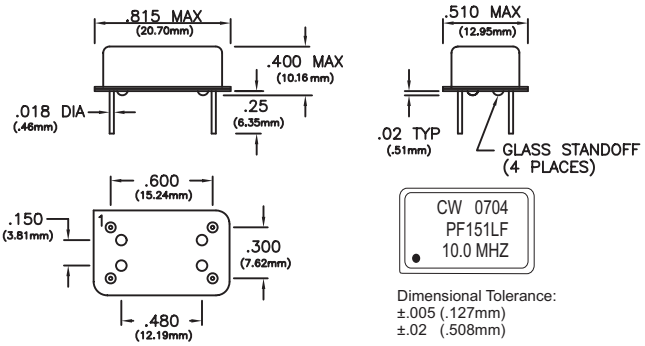
Solder Profile



Tape and Reel Information

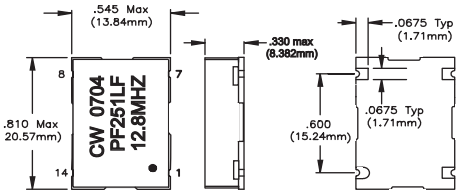


14 Pin DIP Package Outline

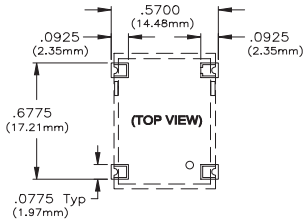


Dimensional Tolerance:
±.005 (.127mm)
±.02 (.508mm)

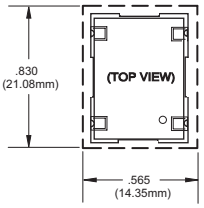
Surface Mount Package Outline



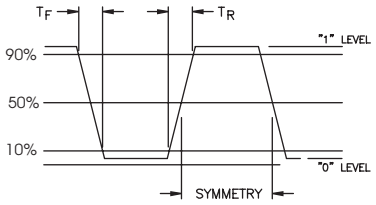
Suggested Pad Layout



Keep Out Area



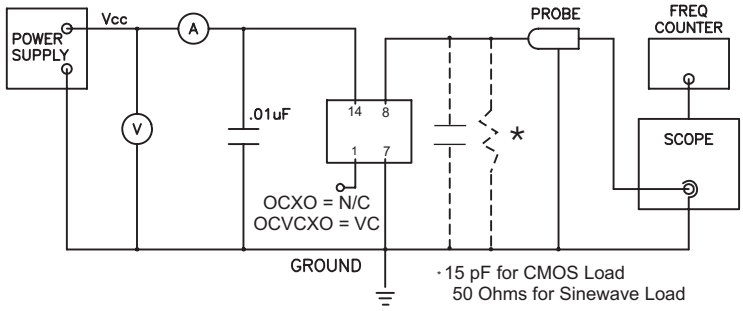
CMOS Output Waveform



Pin Connections

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

Test Circuit



*15 pF for CMOS Load
50 Ohms for Sinewave Load

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Bulletin	Cx123
Page	4 of 4
Revision	04
Date	18 Oct 2010