

## **O-CDFXYZXX-X-X-X-10MHz/100MHz Precision Ultra Low Phase Noise Dual Frequency OCXO Reference Module (DFRM)**

The DFRM consists of 2 Ultra Low Phase Noise OCXO at 10 MHz and 100 MHz. Both are packaged in hermetically sealed metal cans. The unit at 100 MHz is phase/frequency locked to the 10 MHz one. Lower frequency OCXO provides for excellent frequency stability over temperature, time (aging), supply and load variations, as well as exceptionally low phase noise close to the carrier, and short-term stability (Allan Deviation). 100 MHz OCXO provides for ultra low phase noise on the noise floor and high output power.

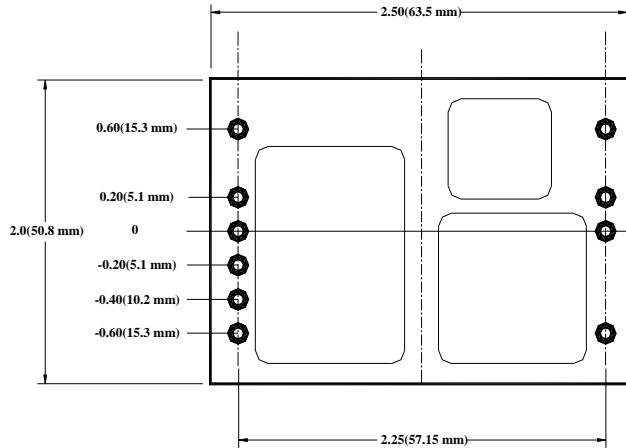
### **Features:**

- Two frequency outputs 10.000 MHz and 100.000 MHz
- Ultra Low Phase Noise
  - -118 dBc/Hz at 1 Hz offset, -147 dBc/Hz at 10 Hz offset for 10 MHz
  - -123 dBc/Hz at 10 Hz offset, to -185 dBc/Hz at 100KHz for 100 MHz
- Excellent temperature stability from 2 ppb peak to peak
- Low aging from 0.25 ppb/day
- Excellent short term stability ADEV < 1E-12 at 1 s

### **Applications:**

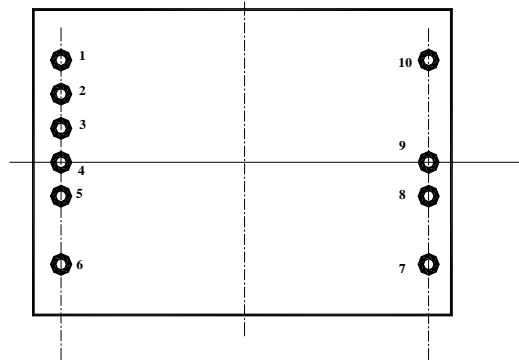
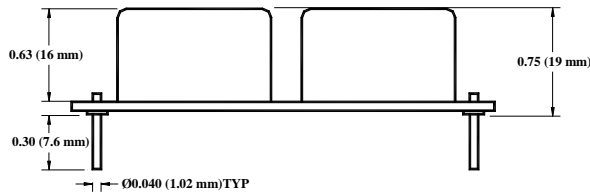
- Instrumentation
- High Performance Synthesizers
- Radar
- Telecommunication Equipment





**PINOUT:**

- Pin#1 – Vcc10; Pin#2 – Vc;
- Pin#3 – Vref; Pin#4 – GND;
- Pin#5 – RF OUT 10 MHz
- Pin#6 – GND; Pin#7 – GND;
- Pin#8 – RF OUT 100 MHz
- Pin#9 – GND; Pin#10 – Vcc 100



**Specifications:**

Parameter	Symb	Condition	Min	Typ	Max	Unit	Note
<b>Absolute Maximum Ratings</b>							
<b>Input Break Down Voltage</b>	Vcc	12 V supply 5 V supply	-0.5 -0.5		13.0 5.5	V	
<b>Storage temper.</b>	Ts		-50		90	°C	
<b>Control Voltage</b>	Vc		-1 -5 -1		5.5 5 11	V	Slope option "P" Slope option "N" Slope option "L"

**Electrical (6)**

<b>Frequency</b>	F10			10.000		MHz	Pin5
	F100			100.000			Pin8
<b>Frequency stability</b>	$\Delta F/F$	vs. Temp. 4*		$\pm 20$		ppb	See chart below
		vs. Supply		0.2	0.3	ppb/10%Vcc	
<b>Aging</b>		per day per year, first year second year		5E-10 1E-7 3E-8			after 30 days 5E-8 available
<b>Allan Deviation</b>		0.1s 1s 10s		5E-13 2E-12 5E-12			
<b>SSB Phase Noise (achieved after 10 minutes warm-up)</b>	$\mathcal{L}(\Delta f)$	1Hz 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz				-118 -147 -158 -162 -170 -172	dBc/Hz 10 MHz output
		1Hz 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz		-125		-90 -123 -130 -160 -172 -180	dBc/Hz 100 MHz output, Grade "U"
		1Hz 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz		-125		-90 -123 -130 -160 -180 -185	dBc/Hz 100 MHz output, Grade "E", available with 5V supply only (option 0). Optimized for best phase noise at 10 Hz offset
		1Hz 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz		-122 -135 -165		-90 -120 -133 -163 -180 -185	dBc/Hz 100 MHz output, Grade "M", available with supply option 0. This is modified "E" grade to optimize phase noise in midrange
<b>Retrace</b>		After 30 minutes			$\pm 10$	ppb	24 Hours off 3*
<b>G-sensitivity</b>		worst direction			$\pm 1.0$	ppb/G	
<b>Input Voltage</b>	Vcc		4.75 11.4	5.0 12.0	5.25 12.6	V	See chart below to specify
<b>Power consumption, Still air</b>	P	steady state, 25°C steady state, -30°C start-up @ -30°C		2.2 4.5 5.0	2.5 6.0	W	Standard Operating Temperature*. Roughly split in half between 10 and 100 MHz
<b>Spectral Purity</b>		Subharmonics Spurious Harmonics		-90 -35	-80 -80 -30	dBc	At 100 MHz output  Either output
<b>Load</b>		Internally AC-coupled 50 Ohm					



<b>Warm-up time</b>	$\tau$	to 0.1ppm accuracy		3	5	minutes	
<b>Output Waveform</b>			Sinewave				
<b>Output Power</b>			+10	+13		dBm	Both Outputs
<b>Control voltage</b>	Vc		0 -4.0 0		Vref 4.0 10.0	V	Slope option "P" Slope option "N" Slope option "L"
<b>Input impedance</b>	Zin	At Vc pin	10			KOhm	
<b>Modulation bandwidth</b>	Fm		DC		1	KHz	Note 7
<b>Reference Voltage</b>	Vref			4.5		V	Pin#3 is not connected with slope options "N" and "L"
<b>Output Impedance</b>		At Vref pin		100		Ohm	
<b>Pull range</b>		from nominal F	$\pm 0.4$	$\pm 0.6$		ppm	
<b>Deviation slope</b>		Monotonic, positive Monotonic, negative Monotonic, positive		1.0/Vref -0.13 0.12		ppm/V	Slope option "P" Slope option "N" Slope option "L"
<b>Setability</b>	Vc0	@25°C, Fnom.  No internal bias for slope option "L"		Vref/2 $\pm$ 0.5 0 $\pm$ 0.5 5 $\pm$ 0.5		V	Slope option "P" 3* Slope option "N" Slope option "L"

Notes:

- \*. For highest operating temperature higher than 70°C the power consumption will be higher (about 20% for 85°C). Values listed are for test in still air environment, the values will go up while testing in the temperature chamber.
- 2\*. It is recommended to specify Slope option "N" for Ultimate Phase noise performance. For recommended phase noise test, contact factory. It's assumed that phase noise test is performed under static conditions (no vibration), in still air, and care is taken for minimizing EMI.
- 3\*. Longer storage time, especially at low temperatures, may affect both retrace and setability parameters. It may require few days on power for re-stabilization.
- 4\*. Temperature stability is specified as  $\pm$  vs. frequency at 25°C. For Stabilities better than  $\pm 10$ ppb, the height of the module may increase by 0.15" (3.8mm).
- 5\*. Pin 3 is connected to Vref only for Slope Option "P".
6. All parameters, unless otherwise specified, are at nominal conditions, ie: T=25°C, Nominal Vcc & Nominal Load.
7. Older and stock units may have MBW of 150 Hz Max.

**Environmental and Mechanical**

<b>Operating temp. range</b>	-30°C to 70°C Standard, Other options – see chart below
<b>Mechanical Shock</b>	Per MIL-STD-202, 30G, 11ms
<b>Vibration</b>	Per MIL-STD-202, 5G to 2000 Hz
<b>Soldering Conditions</b>	260°C for 10s Max leads only

**Electrical Connections**

<b>Pin Out</b>	Pin #1-Vcc for 10 MHz ; Pin#2 – Vc; Pin #3 – Vref or N/C (5*); Pin #4- GND ; Pin #5- RF OUT 10 MHz; Pins## 6,7,9 – GND, Pin#8 – RF OUT 100 MHz; Pin#10 – Vcc 100 MHz
----------------	--



**Creating a Part Number**

**Q - C DF X YZ XX - X - X X - 10MHz/100MHz**

**OCXO**  
Conventional Power

DFRM

**Supply Voltage**

Code	Specification
0	5V ± 5%
F	12V± 5%

**Temperature Stability 4\***

Code	Specification
17	±1x10 <sup>-7</sup>
58	±5x10 <sup>-8</sup>
28	±2x10 <sup>-8</sup>
18	±1x10 <sup>-8</sup>
YZ	±Yx10 <sup>-Z</sup>

**Temperature Range**

Code	In 5°C steps 8*
First letter	Lowest temperature from A = -40°C
Second letter	Highest temperature to Z = 85°C
Examples	
IS	0°C to 50°C
GU	-10°C to 60°C
EW	-20°C to 70°C

Not all combinations available, consult factory

**8\*Temperature Code Table**

Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C	Letter	Temp °C
A	-40	F	-15	K	10	P	35	U	60	Z	85
B	-35	G	-10	L	15	Q	40	V	65		
C	-30	H	-5	M	20	R	45	W	70		
D	-25	I	0	N	25	S	50	X	75		
E	-20	J	5	O	30	T	55	Y	80		

**Environmental**

Code	Specification
L	Contains a level of lead that is in excess of RoHS directive and is not designed for reflow
R	RoHS compliant, not designed for reflow

**Phase Noise Grade (100 MHz)**

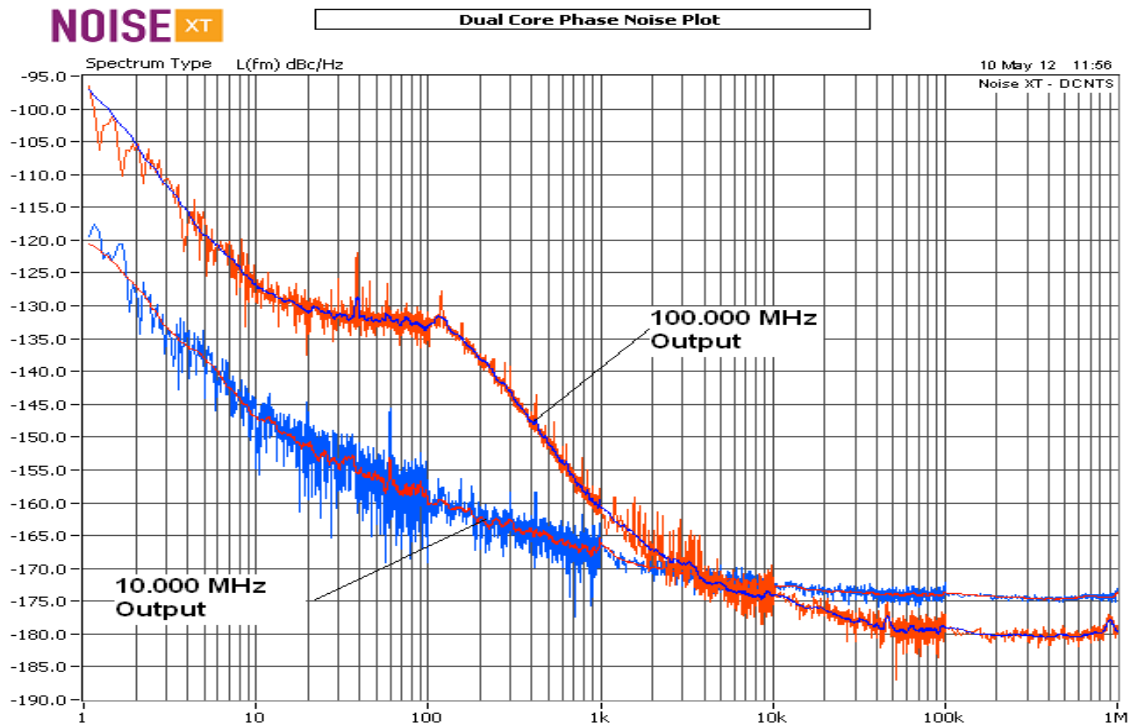
Code	Specification
U	Ultimate
E	Extraordinary
M	Modified-E

**Deviation slope**

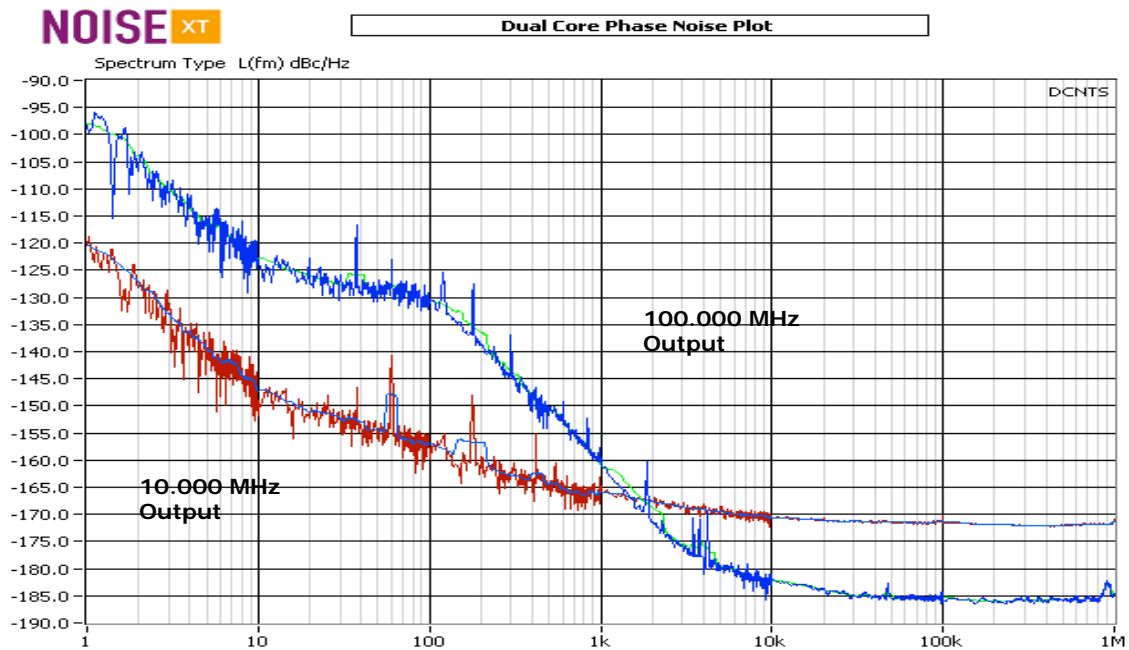
Code	Specification
P	Positive, 0 to Vref
N	Negative, -4 to 4V
L	Positive, 0 to 10 V



Grade "U" Phase Noise



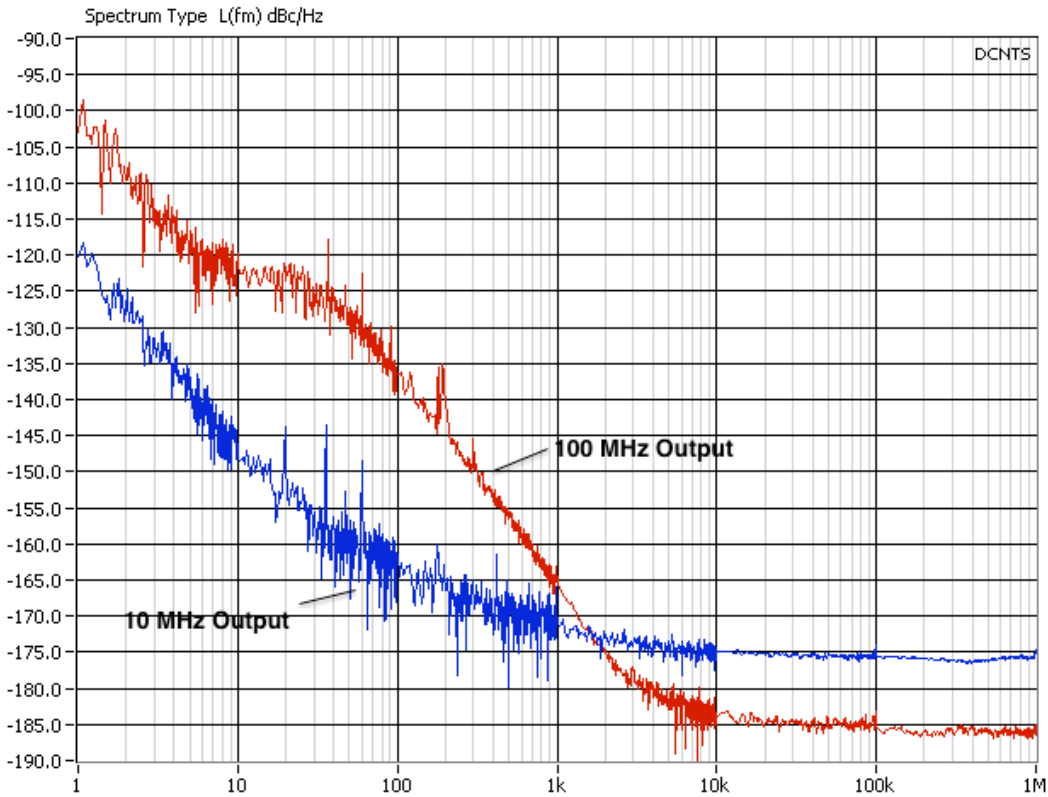
Grade "E" Phase Noise



Grade "M" Phase Noise

NOISE XT

PN9000 Phase Noise Plot



FREQUENCY  
CONTROLS, INC.

357 Beloit Street, P.O. Box 457, Burlington, WI 53105-0457 U.S.A. Phone 262/763-3591 FAX 262/763-2881

Email: [nelsales@nelfc.com](mailto:nelsales@nelfc.com) www.nelfc.com