

## Precision Ultra Low Phase Noise Dual Frequency OCXO Reference Module (DFRM)



63.5 x 50.8 x 19 mm  
Datasheet 1205A

### Features

- Two Frequency Outputs 10.000 MHz and 100.000 MHz
- Ultra-Low phase Noise
  - 10MHz carrier:
    - 123dBc/Hz at 1 Hz offset
    - 151 dBc/Hz at 10 Hz offset
  - 100MHz carrier:
    - 125dBc/Hz at 10 Hz offset
    - 185 dBc/Hz at 100 KHz offset
- Excellent temperature Stability from 2 ppb peak to peak
- Low aging from 0.25 ppb/day
- Excellent short-term stability ADEV< 2E-13 at 1s

### Applications

- Instrumentation
- High Performance Synthesizers
- Radar
- Telecommunication Equipment

### Absolute Maximum Rating

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
Input Break Down Voltage	Vcc	5 V Supply	-0.5		5.5	V	
Storage temper.	Ts		-50		90	°C	
Control Voltage	Vc		-1 -5 -1		5.5 5 11	V	Slope option "P" Slope option "N" Slope option "L"

### Electrical

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
Frequency	F10			10.000		MHz	Pin5
	F100			100.000			Pin8
Frequency Stability	$\Delta F/F$	vs. Temp. 4*		$\pm 20$		ppb	See chart below
		vs. Supply		0.2	0.3	ppb/10%Vcc	
Aging		Per day		5E-10			after 30 days
		Per year, first year		1E-7			
		Second year		3E-8			
		Per day		2E-10			after 30 days
		Per year, first year		3E-8			Grade "S"
		Second year		1E-8			
Allan Deviation		0.1s		5E-13			
		1s		2E-12			
		10s		5E-12			
		0.1s		15E-14			Grade "S"
		1s		2E-13			
		10s		8E-13			
SSB Phase Noise (achieved after 10 minutes warm-up)	$\xi(\Delta f)$	1Hz 10Hz 100Hz 1KHz 10 KHz 100KHz			-118 -147 -158 -162 -170 -170	dBc/Hz	10 MHz output

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### Electrical (cont.)

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
SSB Phase Noise (achieved after 10 minutes warm-up)	£(Δf)	0.1 Hz		-91	-89	dBc/Hz	10 MHz output, Grade "S", slope Options "P" or "L" only. Package height may be 0.75"
		1Hz		-123	-121		
		10 Hz		-151	-150		
		100 Hz		-162	-160		
		1 KHz		-170	-168		
		10 KHz		-172	-170		
		100 KHz		-172	-170		
		1Hz		-125	-90	dBc/Hz	100 MHz output, Grade "U"
		10Hz			-123		
		100Hz			-130		
		1KHz			-160		
		10 KHz		-172	-172		
		100KHz		-180	-180		
		1Hz		-125	-90	dBc/Hz	100 MHz output, Grade "E". Optimized for best phase noise at 10 Hz offset
		10Hz			-123		
		100Hz			-130		
		1KHz			-160		
		10 KHz		-180	-180		
		100KHz		-185	-185		
		1Hz		-122	-90	dBc/Hz	100 MHz output, Grade "M", available with supply option 0. This is modified "E" grade to optimize phase noise in midrange
		10Hz			-120		
		100Hz			-133		
		1KHz			-163		
		10 KHz		-180	-180		
		100KHz		-185	-185		
		0.1 Hz		-65	-93	dBc/Hz	100 MHz output, Grade "S"
		1Hz		-95	-122		
		10 Hz		-125	-133		
		100 Hz		-135	-163		
		1 KHz		-165	-180		
		10 KHz			-180		
		100 KHz			-185		
Retrace		After 30 minutes			±10	ppb	24 Hours off 3*
G-sensitivity		worst direction			±1.0	ppb/G	
Input Voltage	Vcc		4.7	5.0	5.25	V	See chart below to specify

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### Electrical (Cont.)

Parameters	Symbol	Condition	Min	Typ	Max	Unit	Notes
Power consumption, Still air	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
Spectral Purity		Subharmonics Spurious Harmonics		-90 -35	-80 -80 -30	dBc	At 100 MHz output  Either output
Load	Internally AC-coupled 50 Ohm						
Warm-up time	$\tau$	to 0.1ppm accuracy		3	5	minutes	
Output Waveform	Sinewave						
Output Power			+10	+13		dBm	Both Outputs
Control voltage	Vc		0 -4.0 0		Vref 4.0 10.0	V	Slope option "P" Slope option "N" Slope option "L"
Input impedance	Zin	At Vc pin	10			KOhm	
Modulation bandwidth	Fm		DC		1	KHz	
Reference Voltage	Vref			4.5		V	Pin#3 is not connected with slope options "N" and "L"
Output Impedance		At Vref pin		100		Ohm	
Pull range		from nominal F	$\pm 0.4$	$\pm 0.6$		ppm	Phase Noise Grade "U", "E", and "M"
			$\pm 0.3$	$\pm 0.4$		ppm	Phase Noise Grade "S"
Deviation slope		Monotonic, positive Monotonic, negative Monotonic, positive		1.0/Vref -0.13 0.12		ppm/V	Slope option "P" Slope option "N" Slope option "L"
Setability	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"

### Environmental and Mechanical

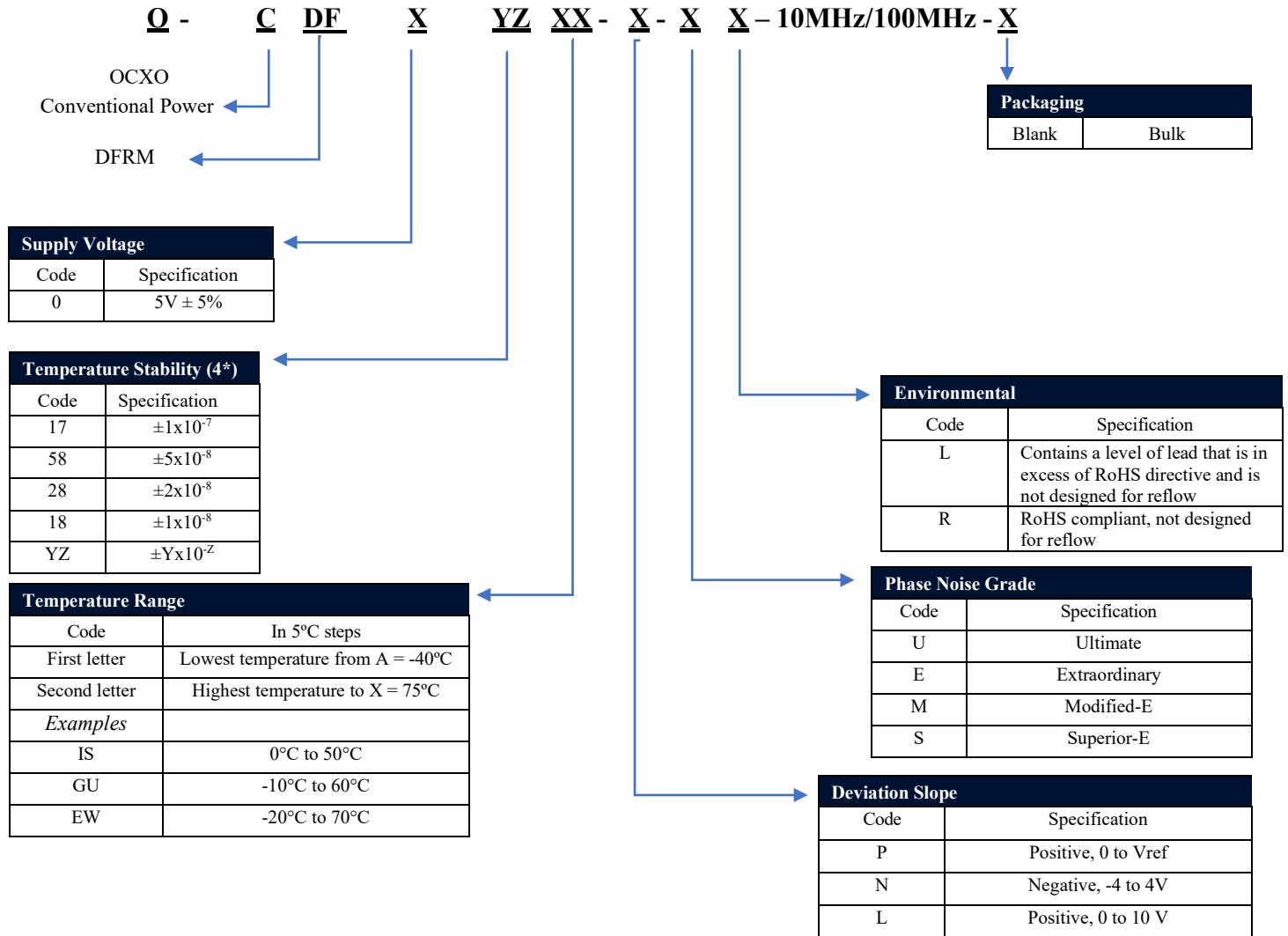
Parameter	Description
Operating temp. range	-30°C to 70°C Standard, Other options – see chart below
Mechanical Shock	Per MIL-STD-202, 30G, 11ms
Vibration	Per MIL-STD-202, 5G to 2000 Hz
Soldering Conditions	260°C for 10s Max leads only

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### Creating a Part Number



Not all combinations are available. Consult Factory.

### 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		

Notes:

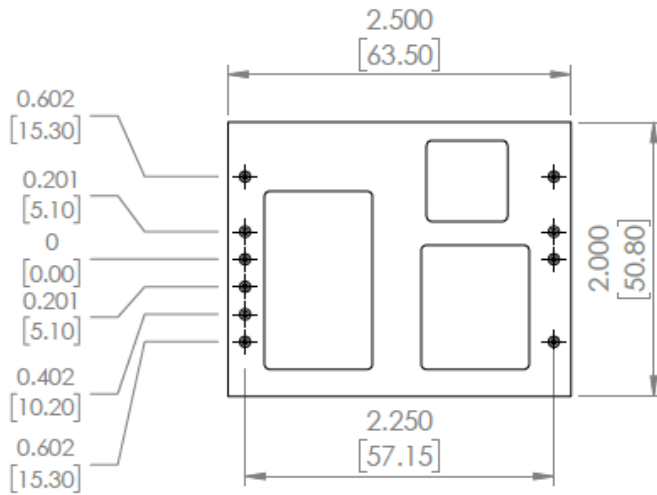
- 2) It's assumed that phase noise test is performed under static Conditions (no vibration), in still air, and care is taken for minimizing EMI.
- 3\* Longer Storage time, especially at low temperatures, may affect both retrace and stability parameters. It may require few days on power for re-stabilization.
- 4\* Temperature stability is specified as ± vs. frequency at 25°C. For stabilities better than ±10ppb, 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, i.e.: T=25°C, Nominal Vcc & Nominal Load.

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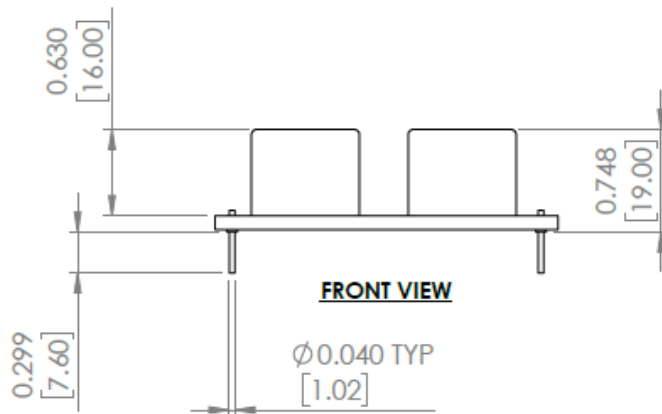


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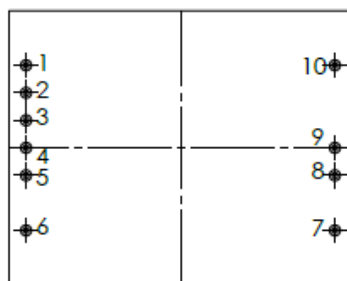
### Mechanical Dimensions



**TOP VIEW**



**FRONT VIEW**



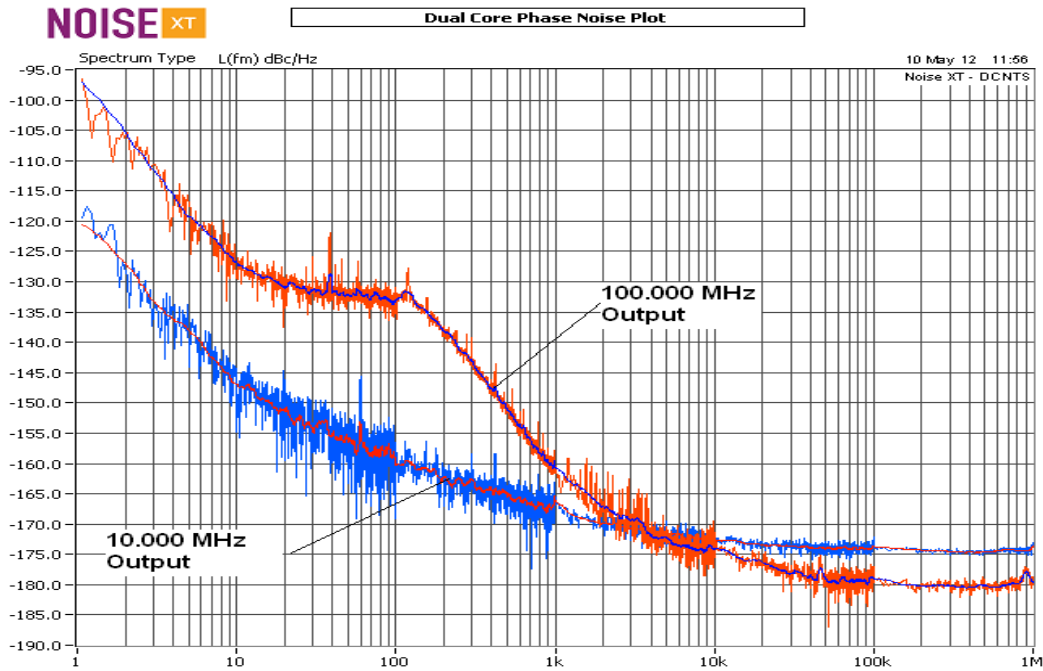
**BOTTOM VIEW**

Pin #	Function
1	Vcc for 10MHz
2	Vc
3	Vref or N/C (5*)
4	GND
5	RF OUT 10 MHz
6	GND
7	GND
8	RF OUT 100 MHz
9	GND
10	Vcc 100 MHz

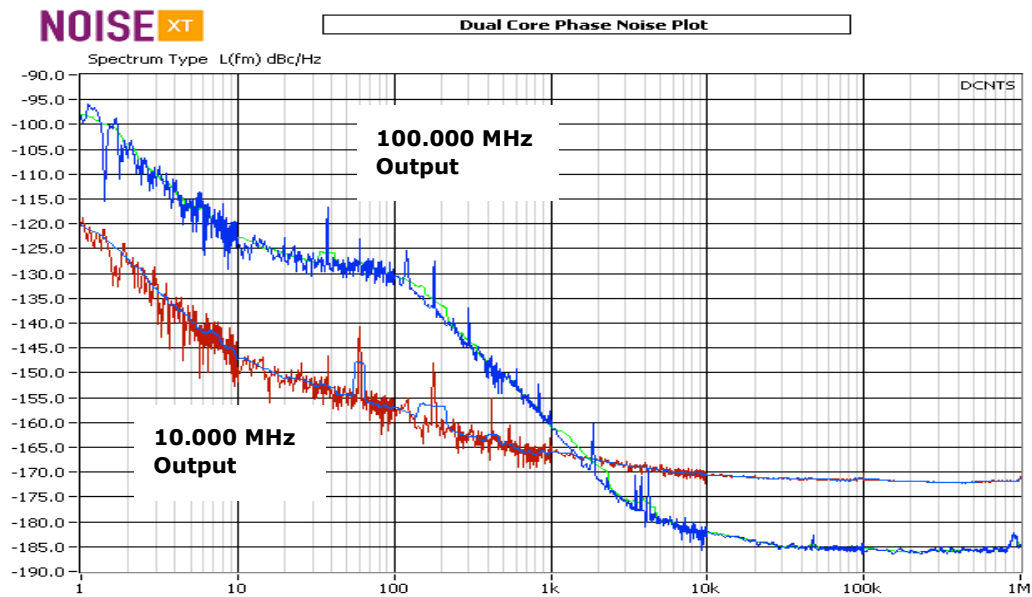
Dimensions: inches [mm]

## Phase Noise Plots

### Grade “U” Phase Noise



### Grade “E” Phase Noise



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### Grade "M" Phase Noise

