

## **O-CDFM-0XYZXX -X**

### **Precision Ultra Low Phase Noise Dual Frequency OCXO Reference Module (DFMRM) with multiple outputs**

The MFRM consists of two Ultra Low Phase Noise (ULPN) 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. The output of 100 MHz unit is then distributed to 4 different outputs. If only one output is going to be used in the system, it will provide the best phase noise enabled by the jumper. Lower frequency OCXO provides for excellent frequency stability over temperature, including optional double oven (DOCXO), 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, including multiple outputs.

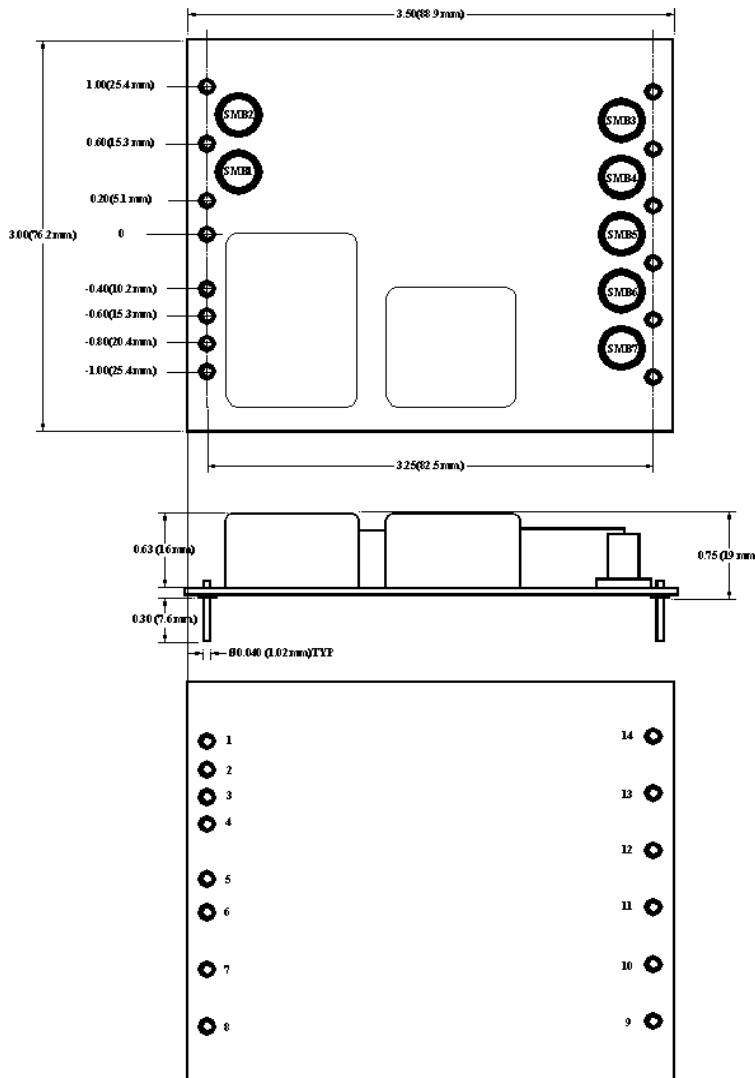
#### **Features:**

- Two frequency outputs 10 MHz and 100 MHz, 4 + 1 outputs on 100 MHz
- Ultra Low Phase Noise
  - -115 dBc/Hz at 1 Hz offset, -145 dBc/Hz at 10 Hz offset for 10 MHz
  - -123 dBc/Hz at 10 Hz offset, -180 dBc/Hz on the floor for 100 MHz
  - -185 dBc/Hz on the noise floor with single 100 MHz output
- Excellent temperature stability from 2 ppb peak to peak (single oven option), and from +/-0.1 ppb for DOCXO
- Low aging from 0.20 ppb/day
- Excellent short term stability  $ADEV < 1E-12$  at 1 s
- Optional External Reference
- All outputs are provided via snap-on SMB connectors

#### **Applications:**

- Instrumentation
- High Performance Synthesizers
- Radar
- Telecommunication Equipment





**Pin-out:**

Pin #1 = Vcc 10; Pin #2 = GND; Pin #3 = Vc; Pin#4 = Vref; Pin#5 = GND  
 Pin #6 = GND; Pin#6 = GND; Pin #7 = REF Select (optional); Pin #8 = GND; Pin  
 #9 = GND; Pin #10 = GND; Pin #11 = GND; Pin #12 = GND; Pin #13 = GND; Pin  
 #14 = Vcc 100  
 SMB #1 = 10 MHz Output; SMB#2 = External 10 MHz Reference IN (optional);  
 SMB#3 = 100 MHz Output 1; SMB#4 = 100 MHz Output 2; SMB#5 = 100 MHz  
 Output 3; SMB#6 = 100 MHz Output 4; SMB#7 = "E"-grade 100 MHz Output



**Specifications:**

| Parameter                       | Symb            | Condition  | Min            | Typ | Max            | Unit | Note   |
|---------------------------------|-----------------|------------|----------------|-----|----------------|------|--|
| <b>Absolute Maximum Ratings</b> |                 |            |                |     |                |      |  |
| Input Break Down Voltage        | V <sub>cc</sub> | 5 V supply | -0.5           |     | 5.5            | V    |  |
| Storage temper.                 | T <sub>s</sub>  |            | -50            |     | 90             | °C   |  |
| Control Voltage                 | V <sub>c</sub>  |            | -1<br>-5<br>-1 |     | 5.5<br>5<br>11 | V    | Slope option "P"<br>Slope option "N"<br>Slope option "L" |

**Electrical (6)**

|   |   |  |  |                                      |  |         |  |                        |        |
|---|---|--|--|--------------------------------------|--|---------|--|------------------------|--------|
| Frequency                                     | F10   |  |  | 10.000                               |  | MHz     | SMB #1                                       |                        |        |
|   | F100-E  |  |  | 100.000                              |  |         | SMB #7 8*                                    |                        |        |
|   | F100-1  |  |  | 100.000                              |  |         | SMB #3                                       |                        |        |
|   | F100-2  |  |  | 100.000                              |  |         | SMB #4                                       |                        |        |
|   | F100-3  |  |  | 100.000                              |  |         | SMB #5                                       |                        |        |
|   | F100-4  |  |  | 100.000                              |  |         | SMB #6                                       |                        |        |
|   | EXREF   |  |  | 10.000                               |  |         | SMB #2                                       |                        |        |
| Frequency stability 7*                        | $\Delta F/F$  | vs. Temp. 4*                                   |  | $\pm 10$                             |  | ppb     | See chart below                              |                        |        |
|   |   | vs. Supply                                     |  | 0.2                                  | 0.3  |         |  | ppb/10%V <sub>cc</sub> |        |
| Aging 7*                                      |   | per day<br>per year, first year<br>second year |  | 5E-10<br>1E-7<br>3E-8                |  |         | after 30 days<br>0.2 ppb/day available<br>3* |                        |        |
| Allan Deviation 7*                            |   | 0.1s<br>1s<br>10s                              |  | 5E-13<br>2E-12<br>5E-12              |  |         |  |                        |        |
|   | SSB Phase Noise<br>(achieved after 10<br>minutes warm-up)<br>2*, 7* | $\mathcal{L}(\Delta f)$                        | 1Hz<br>10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz |                                      | -115<br>-145<br>-157<br>-162<br>-170<br>-172 |         | dBc/Hz                                       | 10 MHz output<br>SMB1  |        |
|   |   |  | 10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz        |                                      | -125<br>-130<br>-163<br>-177<br>-180         | -123    |  |                        | dBc/Hz |
| 10 Hz<br>100 Hz<br>1 KHz<br>10 KHz<br>100 KHz |   |  |  | -125<br>-132<br>-164<br>-182<br>-185 | -123   | dBc/Hz  | 100 MHz output,<br>Grade "E", SMB7 8*        |                        |        |
| Retrace 7*                                    |   |  | After 30 minutes                                     |                                      |  |         |  | $\pm 10$               | ppb    |
| G-sensitivity 7*                              |   |  | worst direction                                      |                                      |  |         | $\pm 1.0$                                    | ppb/G                  |        |
| Input Voltage                                 |   |  | V <sub>cc</sub>                                      |                                      | 4.75   | 5.0     | 5.25   | V                      |        |
| Power consumption,<br>Still air               | P   | steady state, 25°C                             |  | 3.2                                  | 3.5  | W       | Standard Operating<br>Temperature*.          |                        |        |
|   |   | steady state, -30°C                            |  | 5.5                                  | 7.0  |         |  |                        |        |
|   |   | start-up @ -30°C                               |  | 6.0                                  | 7.0  |         |  |                        |        |
| Spectral Purity                               |   | Subharmonics                                   |  | -80                                  | -70  | dBc     | At 100 MHz outputs<br>Either output          |                        |        |
|   |   | Spurious                                       |  |                                      | -80  |         |  |                        |        |
|   |   | Harmonics                                      |  | -35                                  | -30  |         |  |                        |        |
| Load  | Internally AC-coupled 50 Ohm  |  |  |                                      |  |         | All Outputs                                  |                        |        |
| Warm-up time                                  | $\tau$  | to 0.1ppm accuracy                             |  | 3                                    | 5  | minutes |  |                        |        |
| Output Waveform                               | Sinewave  |  |  |                                      |  |         |  |                        |        |
| Output Power                                  |   |  | +10  | +13                                  |  | dBm     | 10 MHz<br>100 MHz                            |                        |        |
|   |   |  | +12  | +15                                  |  |         |  |                        |        |



|                                  |      |   |                                    |                           |                     |  |  |
|----------------------------------|------|---|------------------------------------|---------------------------|---------------------|--|--|
| <b>Port to port isolation</b>    |      |   |                                    | 40 dB                     |                     |  |  |
| <b>External Reference</b>        |      | Input Sine Wave   | +7                                 |                           |                     |  | dBm  |
|                                  |      | Accuracy  |                                    |                           | ± 0.5               |  | ppm  |
| <b>Reference Select function</b> |      | Floating Logic "0" (GND)  | Internal Reference                 |                           | External reference  |  | Pin #7   |
| <b>Control voltage</b>           | Vc   |   | 0<br>-4.0<br>0                     |                           | Vref<br>4.0<br>10.0 |  | Slope option "P"<br>Slope option "N"<br>Slope option "L" |
| <b>Input impedance</b>           | Zin  | At Vc pin   | 10                                 |                           |                     |  | KOhm   |
| <b>Modulation bandwidth</b>      | Fm   |   |                                    |                           | 1                   |  | Hz   |
| <b>Reference Voltage</b>         | Vref |   |                                    | 4.5                       |                     |  | V  |
| <b>Output Impedance</b>          |      | At Vref pin   |                                    | 100                       |                     |  | Ohm  |
| <b>Pull range</b>                |      | from nominal F  | ±0.4                               | ±0.6                      |                     |  | ppm  |
| <b>Deviation slope</b>           |      | Monotonic, positive<br>Monotonic, negative<br>Monotonic, positive |                                    | 1.0/Vref<br>-0.13<br>0.12 |                     |  | ppm/V  |
| <b>Setability</b>                | Vc0  | @25°C, Fnom.<br><br>No internal bias for slope option "L"         | Vref/2 ± 0.5<br>0 ± 0.5<br>5 ± 0.5 |                           |                     |  | V  |
|                                  |      |   |                                    |                           |                     |  | Slope option "P"<br>Slope option "N"<br>Slope option "L" |

Notes:

- \*. For highest operating temperature greater 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\*. 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\*. Double Oven Reference will be available in the first half of 2014 with frequency stabilities over temperature down to ± 0.1 ppb rivaling Rubidium standards.
- 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.
- 7\*. All parameters are for internal reference only. All stability parameters will be determined by reference. With external reference the phase noise may deteriorate (significantly) at Frequency offsets < 1 KHz
- 8\*. "E" grade output (SMB7) cannot be used simultaneously with 4 "U" grade outputs (SMB3 through SMB6), it's hard jumper selectable: either or.

**Environmental and Mechanical**

|                              |   |
|------------------------------|---|
| <b>Operating temp. range</b> | 0°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 10; Pin #2 = GND; Pin #3 = Vc; Pin#4 = Vref; Pin#5 = GND<br>Pin #6 = GND; Pin#6 = GND; Pin #7 = REF Select (optional); Pin #8 = GND; Pin #9 = GND; Pin #10 = GND; Pin #11 = GND; Pin #12 = GND; Pin #13 = GND; Pin #14 = Vcc 100<br>SMB #1 = 10 MHz Output; SMB#2 = External 10 MHz Reference IN (optional); SMB#3 = 100 MHz Output 1; SMB#4 = 100 MHz Output 2; SMB#5 = 100 MHz Output 3; SMB#6 = 100 MHz Output 4; SMB#7 = "E"-grade 100 MHz Output |
|----------------|--|



**Creating a Part Number**

**Q - C DFM 0 YZ XX - X**

**OCXO**  
Conventional Power

DFMRM

**Supply Voltage**

| Code | Specification |
|------|---------------|
| 0    | 5V ± 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> |

**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   |

**Temperature Range**

**Deviation slope**

| Code          | In 5°C steps 9*                   |
|---------------|-----------------------------------|
| 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                     |

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

**Not all combinations available, consult factory**

**9\*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      |        |         |

