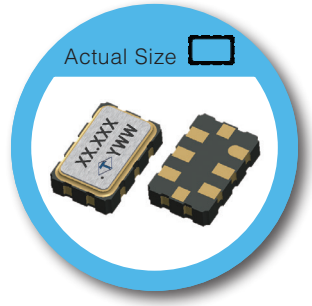
# OJ-M Type High Frequency and Ultra Low Noise
# 5.0 x 3.2 mm SMD Crystal Oscillator




RoHS Compliant

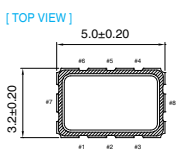
## FEATURE

- Low Power Supply Voltage: 3.3, 2.5, and 1.8V supply options
- Clock Output: LVPECL, LVDS, CML, HCSL and LVCMOS
- Output frequency support from 15MHz to 2.1GHz
- Ultra Low Noise, Phase Jitter < 300 fs
  (Typical: 150 fs at 12kHz to 20MHz frequency offsets)
- Tri-state enable / disable mode.
- Temperature Range: -40 to 85°C
- Pb-free/RoHS Compliant

## TYPICAL APPLICATION

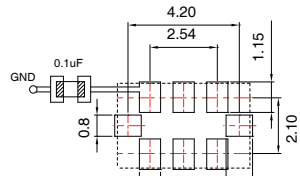
- SONET/SDH,. Gigabit Ethernet.
- Storage Area Networking (SAN)
- SD/HD video
- FPGA clock generation

## DIMENSION (mm)

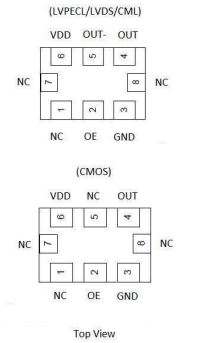



| PIN# | FUNCTION | |
|---|---|---|
| | LVPECL/LVDS/CML/HCSL | CMOS |
| 1 | NC | NC |
| 2 | OE | OE |
| 3 | GND | GND |
| 4 | Output | Output |
| 5 | Comp.Output | NC |
| 6 | VDD | VDD |
| 7 | NC | NC |
| 8 | NC | NC |

## SOLDER PAD LAYOUT(mm)




## PIN ASSIGNMENTS




## ELECTRICAL SPECIFICATION

| Parameter | | LVPECL 3.3V Min. | LVPECL 3.3V Max. | LVPECL 2.5V Min. | LVPECL 2.5V Max. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage Variation ($V_{DD}$) ± 10% | | $V_{DD}$ -10% | $V_{DD}$ +10% | $V_{DD}$ -10% | $V_{DD}$ +10% | V |
| Frequency Range | | 15 | 2100 | 15 | 2100 | MHz |
| Standard Frequency | | 100, 106.25, 125, 156.25, 187.5, 200, 212.5, 266, 300, 312.5, 400, 491.52, 622.08, 644.531250 | | | | MHz |
| Supply Current | | - | 110 | - | 95 | mA |
| Output Level | Output High | $V_{DD}$ – 1.165 | $V_{DD}$ – 0.8 | $V_{DD}$ – 1.165 | $V_{DD}$ – 0.8 | V |
| | Output Low | $V_{DD}$ – 2.0 | $V_{DD}$ – 1.55 | $V_{DD}$ – 2.0 | $V_{DD}$ – 1.55 | V |
| Transition Time (20% - 80%) | Rise Time | - | 0.35 | - | 0.35 | nSec |
| | Fall Time | - | 0.35 | - | 0.35 | nSec |
| Duty Cycle | | 45 | 55 | 45 | 55 | % |
| Startup Time | | - | 8 | - | 8 | mSec |
| Tri-State mode (Input to Pin 2) | Enable | 0.7 x $V_{DD}$ | - | 0.7 x $V_{DD}$ | - | V |
| | Disable | - | 0.3 x $V_{DD}$ | - | 0.3 x $V_{DD}$ | |
| Stand by Current | | - | 110 | - | 95 | mA |
| **Phase Noise** | | **Typ.** | **Max.** | **Typ.** | **Max.** | |
| At $V_{DD}$=3.3V, fout=873.515MHz | 1kHz offset | -106 | - | -106 | - | dBc/Hz |
| | 10kHz offset | -115 | - | -115 | - | dBc/Hz |
| | 100kHz offset | -123 | - | -123 | - | dBc/Hz |
| | 1MHz offset | -133 | - | -133 | - | dBc/Hz |
| | 20MHz offset | -150 | - | -150 | - | dBc/Hz |
| RMS Phase Jitter (12KHz to 20MHz) | | 150 | 300 | 150 | 300 | fs |
| Period Jitter | | - | 50 | - | 50 | ps |

**Note: not all combination of options are available. Other specifications may be available upon request.**



Specifications subject to change without notice.

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| Parameter | | LVDS | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | 3.3V | | 2.5V | | 1.8V | | |
| | | Min. | Max. | Min | Max. | Min | Max. | |
| Supply Voltage Variation (VDD) ± 5% | | - | - | - | - | 1.71 | 1.89 | V |
| Supply Voltage Variation (VDD) ± 10% | | 3.63 | 2.97 | 2.25 | 2.75 | - | - | V |
| Frequency Range | | 15 | 2100 | 15 | 2100 | 15 | 2100 | MHz |
| Standard Frequency | | 100, 106.25, 125, 156.25, 187.5, 200, 212.5, 266, 300, 312.5, 400, 491.52, 622.08, 644.531250 | | | | | | MHz |
| Supply Current | | - | 90 | - | 80 | - | 70 | mA |
| Output Level | Output High | - | 1.6 | - | 1.6 | - | 1.6 | V |
| | Output Low | 0.9 | - | 0.9 | -- | 0.9 | - | V |
| Transition Time (20% - 80%) | Rise Time | - | 0.35 | - | 0.35 | - | 0.35 | nSec |
| | Fall Time | - | 0.35 | - | 0.35 | - | 0.35 | nSec |
| Duty Cycle | | 45 | 55 | 45 | 55 | 45 | 55 | % |
| Startup Time | | - | 8 | - | 8 | - | 8 | mSec |
| Tri-State mode (Input to Pin 2) | Enable | 0.7 x VDD | - | 0.7 x VDD | - | 0.7 x VDD | - | V |
| | Disable | - | 0.3 x VDD | - | 0.3 x VDD | - | 0.3 x VDD | V |
| Stand by Current | | - | 90 | - | 80 | - | 70 | mA |
| **Phase Noise** | | **Typ.** | **Max.** | **Typ.** | **Max.** | **Typ.** | **Max.** | |
| At VDD=3.3V, fout=873.515MHz | 1kHz offset | -106 | - | -106 | - | -106 | - | dBc/Hz |
| | 10kHz offset | -115 | - | -115 | - | -115 | - | dBc/Hz |
| | 100kHz offset | -123 | - | -123 | - | -123 | - | dBc/Hz |
| | 1MHz offset | -133 | - | -133 | - | -133 | - | dBc/Hz |
| | 10MHz offset | -150 | - | -150 | - | -150 | - | dBc/Hz |
| RMS Phase Jitter (12KHz to 20MHz) | | 150 | 300 | 150 | 300 | 150 | 300 | fs |
| Period Jitter | | - | 50 | - | 50 | - | 50 | ps |

| Parameter | | CML | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | 3.3V | | 2.5V | | 1.8V | | |
| | | Min. | Max. | Min | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) ± 5% | | - | - | - | - | 1.71 | 1.89 | V |
| Supply Voltage Variation (VDD) ± 10% | | 3.63 | 2.97 | 2.25 | 2.75 | - | - | V |
| Frequency Range | | 15 | 2100 | 15 | 2100 | 15 | 2100 | MHz |
| Standard Frequency | | 100, 106.25, 125, 156.25, 187.5, 200, 212.5, 266, 300, 312.5, 400, 491.52, 622.08, 644.531250 | | | | | | MHz |
| Supply Current | | - | 90 | - | 80 | - | 70 | mA |
| Output Level | Output High | VDD – 0.085 | VDD | VDD – 0.085 | VDD | VDD – 0.085 | VDD | V |
| | Output Low | VDD – 0.6 | VDD – 0.32 | VDD – 0.6 | VDD – 0.32 | VDD – 0.6 | VDD – 0.32 | V |
| Transition Time (20% - 80%) | Rise Time | - | 0.35 | - | 0.35 | - | 0.35 | nSec |
| | Fall Time | - | 0.35 | - | 0.35 | - | 0.35 | nSec |
| Duty Cycle | | 45 | 55 | 45 | 55 | 45 | 55 | % |
| Startup Time | | - | 8 | - | 8 | - | 8 | mSec |
| Tri-State mode (Input to Pin 2) | Enable | 0.7 x VDD | - | 0.7 x VDD | - | 0.7 x VDD | - | V |
| | Disable | - | 0.3 x VDD | - | 0.3 x VDD | - | 0.3 x VDD | V |
| Stand by Current | | - | 90 | - | 80 | - | 70 | mA |
| **Phase Noise** | | **Typ.** | **Max.** | **Typ.** | **Max.** | **Typ.** | **Max.** | |
| At VDD=3.3V, Fout=805.664MHz | 1kHz offset | -107 | - | -107 | - | -107 | - | dBc/Hz |
| | 10kHz offset | -117 | - | -117 | - | -117 | - | dBc/Hz |
| | 100kHz offset | -125 | - | -125 | - | -125 | - | dBc/Hz |
| | 1MHz offset | -135 | - | -135 | - | -135 | - | dBc/Hz |
| | 20MHz offset | -150 | - | -150 | - | -150 | - | dBc/Hz |
| RMS Phase Jitter (12KHz to 20MHz) | | 150 | 300 | 150 | 300 | 150 | 300 | fs |
| Period Jitter | | - | 50 | - | 50 | - | 50 | ps |

| Parameter | | HCSL | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 3.3V | | 2.5V | | 1.8V | | Unit |
| | | Min. | Max. | Min | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD)±10% | | 3.63 | 2.97 | 2.25 | 2.75 | 1.71 | 1.89 | V |
| Frequency Range | | 15 | 700 | 15 | 700 | 15 | 700 | MHz |
| Supply Current | | - | 115 | - | 100 | - | 94 | mA |
| Output Level | Output High | 0.66 | 1.15 | 0.66 | 1.15 | 0.66 | 1.15 | V |
| | Output Low | 0 | 0.15 | 0 | 0.15 | 0 | 0.15 | V |
| Transition Time (20% - 80%) | Rise Time | - | 0.4 | - | 0.4 | - | 0.4 | nSec |
| | Fall Time | - | 0.4 | - | 0.4 | - | 0.4 | nSec |
| Duty Cycle | | 45 | 55 | | 55 | 45 | 55 | % |
| Startup Time | | - | 8 | | 8 | - | 8 | mSec |
| Tri-State mode (Input to Pin 2) | Enable | 0.7 x VDD | - | 0.7x VDD | - | 0.7xVDD | - | V |
| | Disable | - | 0.3 x VDD | - | 0.3 x VDD | - | 0.3 x VDD | V |
| Stand by Current | Disable | - | 115 | - | 100 | - | 94 | mA |
| Output Load | | 50 ohms to GND | | | | | | |
| **Phase Noise** | | **Typ.** | **Max.** | **Typ.** | **Max.** | **Typ.** | **Max.** | |
| At VDD=3.3V, fout= 873.515MHz | 1kHz offset | -87 | - | -87 | - | -87 | - | dBc/Hz |
| | 10kHz offset | -110 | - | -110 | - | -110 | - | dBc/Hz |
| | 100kHz offset | -127 | - | -127 | - | -127 | - | dBc/Hz |
| | 1MHz offset | -138 | - | -138 | - | -138 | - | dBc/Hz |
| | 10MHz offset | -153 | - | -153 | - | -153 | - | dBc/Hz |
| RMS Phase Jitter (12KHz to 20MHz) | | 150 | 300 | 150 | 300 | 150 | 300 | fs |
| Period Jitter | | - | 50 | - | 50 | - | 50 | ps |

**Note: not all combination of options are available. Other specifications may be available upon request.**

| Parameter | | CMOS | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | 3.3V | | 2.5V | | 1.8V | | |
| | | Min. | Max. | Min | Max. | Min | Max. | |
| Supply Voltage Variation (VDD) ±5% | | - | - | - | - | 1.71 | 1.89 | V |
| Supply Voltage Variation (VDD) ±10% | | 3.63 | 2.97 | 2.25 | 2.75 | - | - | V |
| Frequency Range | | 15 | 250 | 15 | 250 | 15 | 250 | MHz |
| Standard Frequency | | 100, 106.25, 125, 156.25, 187.5, 200, 212.5, 266, 300, 312.5, 400, 491.52, 622.08, 644.531250 | | | | | | MHz |
| Supply Current | | - | 90 | | 80 | | 70 | mA |
| Output Level | Output High | 0.9 x VDD | - | 0.9 x VDD | - | 0.9 x VDD | - | V |
| | Output Low | - | 0.1 x VDD | - | 0.1 x VDD | - | 0.1 x VDD | V |
| Transition Time (20% - 80%) | Rise Time | - | 1.2 | - | 1.5 | - | 2 | nSec |
| | Fall Time | - | 1.2 | - | 1.5 | - | 2 | nSec |
| Duty cycle | Fout < 100MHz | 45 | 55 | 45 | 55 | 45 | 55 | % |
| | Fout > 100MHz | 40 | 60 | 40 | 60 | 40 | 60 | % |
| Startup Time | | - | 8 | - | 8 | - | 8 | mSec |
| Tri-State mode (Input to Pin 2) | Enable | 0.7 x VDD | - | 0.7 x VDD | - | 0.7 x VDD | - | V |
| | Disable | - | 0.3 x VDD | - | 0.3 x VDD | - | 0.3 x VDD | V |
| Period Jitter | | - | 100 | - | 100 | - | 100 | ps |

## FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) \ ppm | ±20 | ±25 | ±30 | ±50 |
|---|---|---|---|---|
| -20~+70 | △ | O | O | O |
| -40~+85 | X | △ | O | O |

* O: Available △:Conditional X: Not available

*Inclusive of calibration @ 25°C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration