

Crystal Oscillator (TCXO VCXO OCXO VC-TCXO)

- **Voltage Controlled Crystal Oscillators(CMOS Output)**

| PAGE | SERIES | DIMENSION |
|------|--------|---------------|
| 1 | CV5 | 5.0*3.2*1.2mm |
| 2 | CV7 | 7.0*5.0*1.6mm |

- **Voltage Controlled Temperature Compensated Crystal Oscillators**

| PAGE | SERIES | DIMENSION |
|------|--------|----------------|
| 3 | VC2 | 2.5*2.0*0.75mm |
| 4 | VC3 | 3.2*2.5*0.9mm |
| 5 | VC5 | 5.0*3.2*1.15mm |
| 6 | VH5 | 5.0*3.2*1.55mm |
| 7 | VA7 | 7.0*5.0*1.85mm |

- **Crystal Oscillators(PECL/LVDS/HCSL Output)**

| PAGE | SERIES | DIMENSION |
|------|--------|---------------|
| 8 | TP5 | 5.0*3.2*1.2mm |
| 9 | TU7 | 7.0*5.0*1.5mm |
| 10 | TL7 | 7.0*5.0*1.6mm |

- **Crystal Oscillator(CMOS Output)**

| PAGE | SERIES | DIMENSION |
|------|--------|----------------|
| 11 | TC2 | 2.5*2.0*.9mm |
| 12 | TC3 | 3.2*2.5*1.05mm |
| 13 | TC5 | 5.0*3.2*1.2mm |
| 14 | TC7 | 7.0*5.0*1.4mm |

- **Programmable Crystal Oscillators**

| PAGE | SERIES | DIMENSION |
|------|--------|----------------|
| 15 | TB2 | 2.5*2.0*0.9mm |
| 16 | TB3 | 3.2*2.5*1.05mm |

- **Voltage Controlled Crystal Oscillator(PECL/LVDS Output)**

| PAGE | SERIES | DIMENSION |
|------|--------|---------------|
| 17 | PV5 | 5.0*3.2*1.2mm |
| 18 | PV7 | 7.0*5.0*1.6mm |

- **Oven Controlled Crystal Oscillators**

| PAGE | SERIES | DIMENSION |
|------|--------|------------------|
| 19 | OCD | 14.3*9.3*6.0mm |
| 20 | OCW | 20.6*20.6*11.0mm |
| 21 | OSD | 25.4*22.1*11.0mm |
| 22 | OCH | 25.4*25.4*12.7mm |
| 23 | OSH | 36.3*27.2*12.7mm |

VC5 Series

5.0*3.2mm SMD VCTCXO

FEATURE

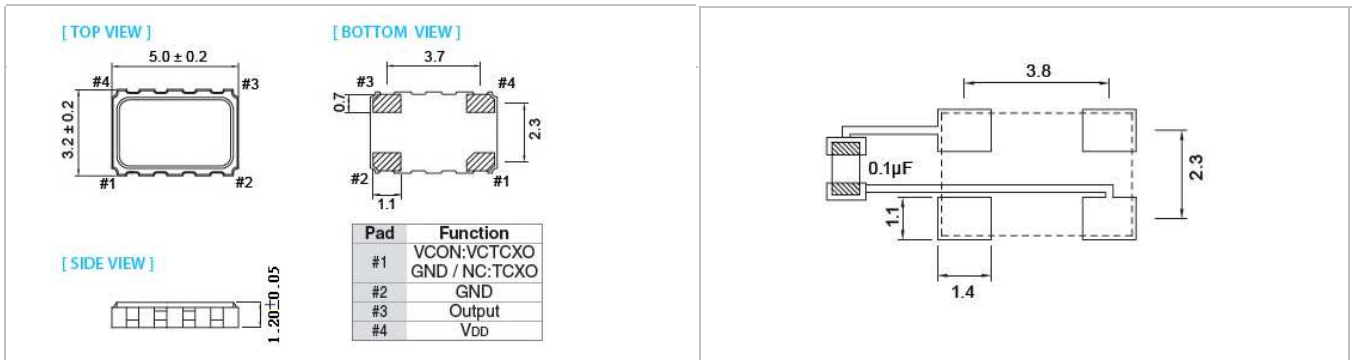
- Typical 5.0 x 3.2 x 1.15 mm ceramic SMD package
- For automatic assembly
- Compactness and light weight
- Low power consumption
- CMOS and Clipped Sine Wave (Without DC-CUT capacitor) output optional.



TYPICAL APPLICATION

- WLAN / WiMAX
- Telecommunication
- Mobile Phone

RoHS Compliant Standard



ELECTRICAL SPECIFICATION

| Parameter | 5.0V | | 3.3V | | Unit |
|--|--|------|--|------|----------|
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 4.75 | 5.25 | 2.97 | 3.63 | V |
| Frequency Range | 10 | 26 | 10 | 40 | MHz |
| Standard Frequency | 13.0, 14.4, 16.368, 16.369, 16.8, 19.2, 19.68, 20.0, 24.5535, 26.0 | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | |
| Vs Supply Voltage (±5%) change (Clipped Sine Wave) | - | ±0.2 | - | ±0.2 | ppm |
| Vs Supply Voltage (±5%) change (CMOS) | - | - | - | ±0.4 | |
| Vs Load (±10%) change | - | ±0.2 | - | ±0.2 | |
| Vs Aging | - | ±1.0 | - | ±1.0 | ppm/year |
| Supply Current | 10 MHz ≤ F0 < 15 MHz (Clipped Sine Wave) | | 10 MHz ≤ F0 < 15 MHz (Clipped Sine Wave) | | mA |
| | 15 MHz ≤ F0 < 26 MHz (Clipped Sine Wave) | | 15 MHz ≤ F0 < 26 MHz (Clipped Sine Wave) | | |
| | 26 MHz ≤ F0 ≤ 40 MHz (Clipped Sine Wave) | | 26 MHz ≤ F0 ≤ 40 MHz (Clipped Sine Wave) | | |
| | 10 MHz ≤ F0 ≤ 40 MHz (CMOS) | | 10 MHz ≤ F0 ≤ 40 MHz (CMOS) | | |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | Vp-p |
| Output Level (CMOS) | Output High (Logic "1") | | 90% VDD | | V |
| | Output Low (Logic "0") | | 10% VDD | | V |
| | Duty | | 45 | | % |
| Load (Clipped Sine Wave) | 10KΩ/10pF | | 10KΩ/10pF | | |
| Load (CMOS) | - | | 15pF | | |
| Control Voltage Range (VCTCXO) | 0.5 | 2.5 | 0.5 | 2.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | - | ±5.0 | - | ppm |
| Vc Input Impedance (VCTCXO) | 100 | - | 100 | - | KΩ |
| Phase Noise @ 13.0 MHz | | | | | |
| 100 Hz | - | -115 | - | -115 | dBc/Hz |
| 1 KHz | - | -135 | - | -135 | |
| 10 KHz | - | -148 | - | -148 | |
| Start Time | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25°C, 1 hour after reflow

Packing: Tape & Reel 1000 pcs per Reel

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | |
|------------|------|------|
| | ±0.5 | ±1.0 |
| 0~+55 | O | O |
| -10~+60 | O | O |
| -20~+70 | O | O |
| -30~+85 | △ | O |
| -40~+85 | X | △ |

* O: Available △: Conditional X: Not available

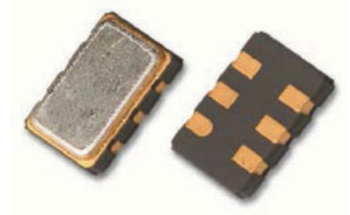
" Pulling Range < 10 ppm available

Series CV7

7.0 x 5.0 mm SMD SEAM SEALED OSCILLATOR

FEATURE

- Typical 7.0 x 5.0 x1.6 mm 6 pads ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Tri-state enable/disable

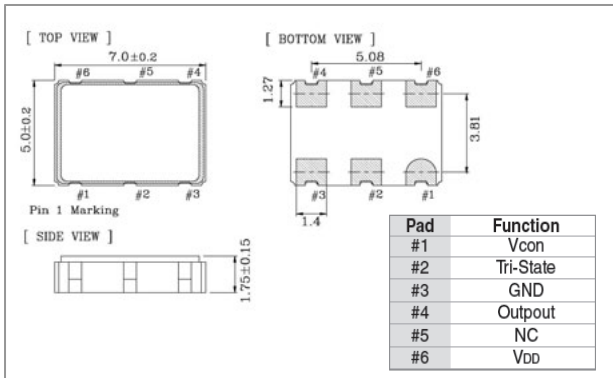


TYPICAL APPLICATION

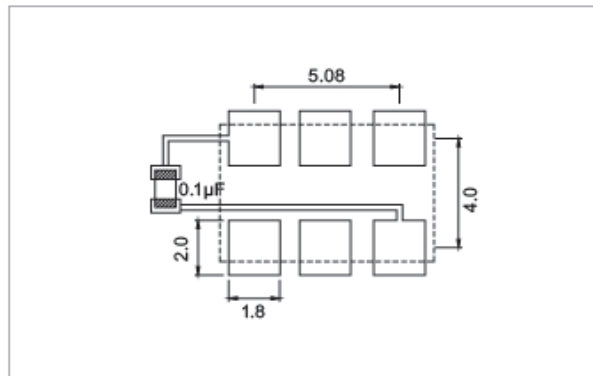
- Set-top Box, HDTV
- Wimax/WLAN
- Xdsl/VoIP, Cable modem

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 5.0V | | 3.3V | | Unit |
|--|--|------|--------|------|--------|
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 4.5 | 5.5 | 2.97 | 3.63 | V |
| Frequency Range | 1.5 | 50 | 1.5 | 200 | MHz |
| Standard Frequency | 10,20,25,27,32,768,35,328,38,88,61,44,122,88 | | | | |
| Absolute Pulling Range (APR) | ±50 | - | ±50 | - | ppm |
| Control Voltage Range | 0.5 | 4.5 | 0.3 | 3.0 | V |
| Supply Current | 1.5MHz ≤ F0 < 20 MHz | | - | | mA |
| | 20MHz ≤ F0 < 50 MHz | | - | | |
| | 50MHz ≤ F0 ≤ 80 MHz | | - | | |
| | 80MHz < F0 < 160 MHz | | - | | |
| | 160MHz ≤ F0 ≤ 200 MHz | | - | | |
| Output Level(CMOS) | Output High (Logic "1") | | 90%VDD | | V |
| | Output Low (Logic "0") | | 10%VDD | | |
| Transition Time : Rise/ Fall Time* | 1.5MHz ≤ F0 < 20 MHz | | - | | nSec |
| | 20MHz ≤ F0 < 50 MHz | | - | | |
| | 50MHz ≤ F0 ≤ 80 MHz | | - | | |
| | 80MHz < F0 ≤ 200 MHz | | - | | |
| Start Time | - | | - | | mSec |
| Tri-State(Input to Pin 2) | Enable(High voltage or floating) | | 0.7VDD | | V |
| | Disable(Low voltage or GND) | | 0.3VDD | | |
| Absolute Clock Period Jitter | - | | - | | pSec |
| RMS Phase Jitter(Integrated 12 KHz~20 MHz) | - | | - | | pSec |
| Linearity | - | | - | | % |
| Modulation Bandwidth(BW) | 1.5MHz ≤ F0 ≤ 175 MHz | | 15 | | KHz |
| | 175MHz < F0 ≤ 200 MHz | | 45 | | |
| Input Impedance | 1.5MHz ≤ F0 < 100 MHz | | 2000 | | KΩ |
| | 100MHz ≤ F0 ≤ 200 MHz | | 50 | | |
| Phase Noise @35.328 MHz | 100 Hz | | - | | dBc/Hz |
| | 1 KHz | | - | | |
| | 10 KHz | | - | | |
| Aging (@25°C 1st year) | - | | ±3 | | ppm |
| Storage Temp. Range | -55 | | 125 | | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

+ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

Packing: Tape & Reel 1000/3000pcs per Reel..

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | |
|------------|-----|-----|
| | ±25 | ±50 |
| -10~+60 | ○ | ○ |
| -20~+70 | ○ | ○ |
| -40~+85 | △ | ○ |

* O: Available △: Conditional X: Not available

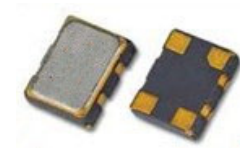
* Inclusive of calibration @ 25°C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration

VC2 Series

2.5*2.0 mm SMD VCTCXO

FEATURE

- Typical 2.5 x 2.0 x 0.75 mm ceramic SMD package
- For automatic assembly
- Compactness and light weight
- VCTCXO available
- Low thickness



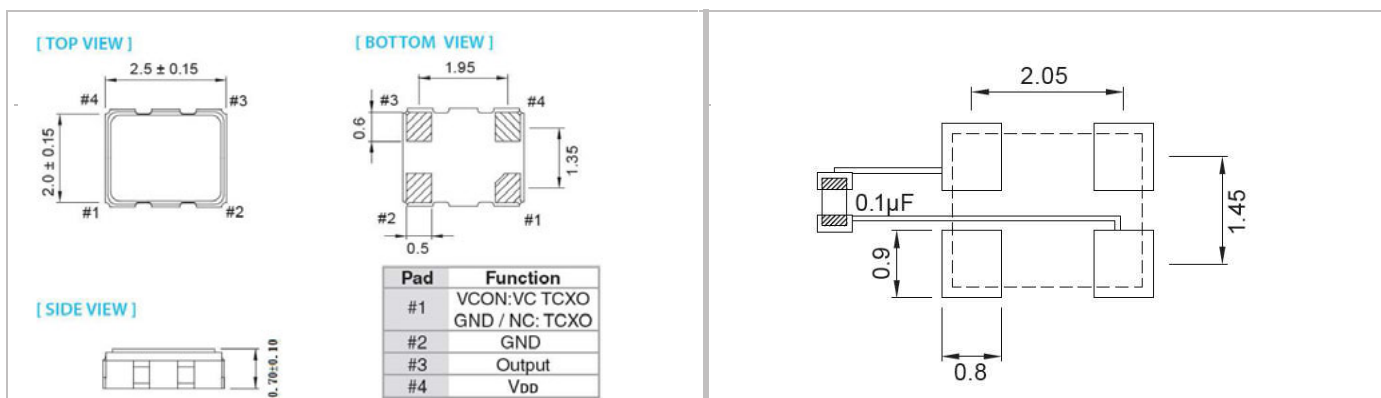
TYPICAL APPLICATION

- GPS
- WiMAX, WLAN
- Mobile Phone

RoHS Compliant Standard

SOLDER PAD LAYOUT (mm)

DIMENSION (mm)



ELECTRICAL SPECIFICATION

| Parameter | 2.8V | | 2.5V | | 1.8V | | Unit |
|-----------------------------------|--|------|----------------------|-------|-----------|------|----------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 2.66 | 2.94 | 2.375 | 2.625 | 1.71 | 1.89 | V |
| Frequency Range | 13 | 52 | 13 | 52 | 13 | 52 | MHz |
| Standard Frequency | 16.367667, 16.368, 16.369, 19.2, 19.68, 20, 26, 40 | | | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | | | |
| Vs Supply Voltage (±5%) change | - | ±0.2 | - | ±0.2 | - | ±0.2 | ppm |
| Vs Load (±10%) change | - | ±0.2 | - | ±0.2 | - | ±0.2 | ppm |
| Vs Aging | - | ±1.0 | - | ±1.0 | - | ±1.0 | ppm/year |
| Supply Current | 13 MHz ≤ F0 < 26 MHz | | 26 MHz ≤ F0 ≤ 52 MHz | | | | |
| | - | 2.0 | - | 2.0 | - | 2.0 | mA |
| | - | 2.5 | - | 2.5 | - | 2.5 | mA |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | 0.8 | - | Vp-p |
| Load | 10KΩ/10pF | | 10KΩ/10pF | | 10KΩ/10pF | | |
| Control Voltage Range (VCTCXO) | 0.4 | 2.4 | 0.4 | 2.4 | 0.3 | 1.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | - | ±5.0 | - | ±5.0 | - | ppm |
| Vc Input Impedance (VCTCXO) | 500 | - | 500 | - | 500 | - | KΩ |
| Phase Noise @ 19.2 MHz | | | | | | | |
| 100 Hz | -115 | | -115 | | -115 | | dBc/Hz |
| 1 KHz | -135 | | -135 | | -135 | | |
| 10 KHz | -148 | | -148 | | -148 | | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25°C, 1 hour after reflow

Packing: Tape & Reel 3000 pcs per Reel

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | | | | |
|------------|-----|------|------|------|------|------|
| | | ±0.5 | ±1.0 | ±1.5 | ±2.0 | ±2.5 |
| 0~+55 | | O | O | O | O | O |
| -10~+60 | | O | O | O | O | O |
| -20~+70 | | O | O | O | O | O |
| -30~+85 | | Δ | O | O | O | O |
| -40~+85 | | Δ | Δ | O | O | O |

* O: Available Δ: Conditional X: Not available

VC3 Series

3.2*2.5 mm SMD VCTCXO

FEATURE

- Typical 3.2 x 2.5 x 0.9 mm ceramic SMD package
- For automatic assembly
- Compactness and light weight
- Low power consumption
- VCTCXO available
- Low thickness



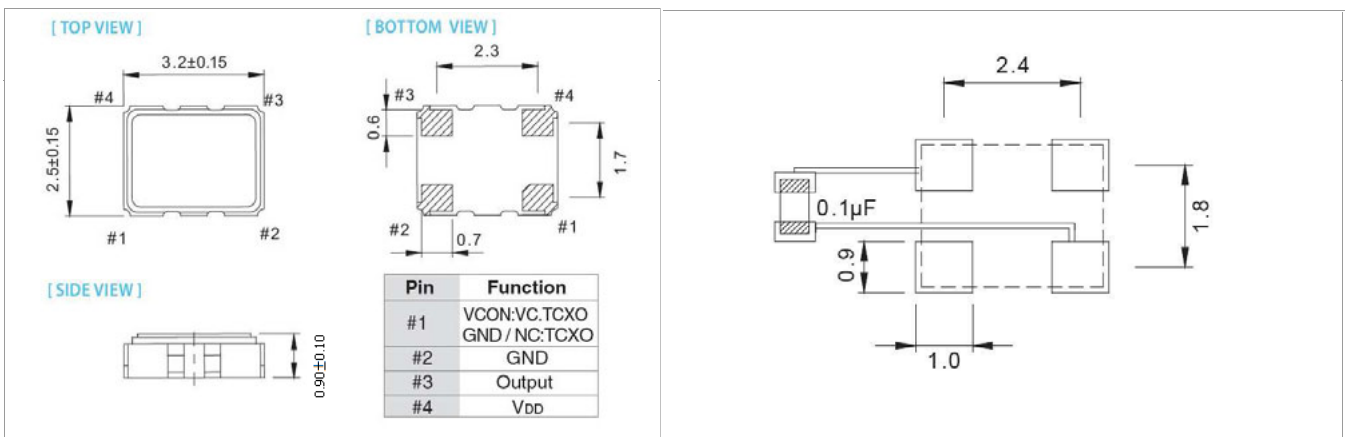
RoHS Compliant Standard

TYPICAL APPLICATION

- GPS
- WLAN / WiMAX
- Mobile Phone

DIMENSION (mm)

SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.0V | | 2.5V | | 1.8V | | Unit |
|---|---|------|------------|-------|------------|------|------------------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 2.85 | 3.15 | 2.375 | 2.625 | 1.71 | 1.89 | V |
| Frequency Range | 10 | 52 | 10 | 52 | 10 | 52 | MHz |
| Standard Frequency | 12.8, 16.367667, 16.368, 16.369, 19.2, 20, 26, 40 | | | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | | | |
| Vs Supply Voltage (±5%) change | - | ±0.2 | - | ±0.2 | - | ±0.2 | ppm |
| Vs Load (±10%) change | - | ±0.2 | - | ±0.2 | - | ±0.2 | ppm |
| Vs Aging (@1 st year) | - | ±1.0 | - | ±1.0 | - | ±1.0 | ppm |
| Supply Current 10 MHz ≤ F ₀ < 26 | - | 2.0 | - | 2.0 | - | 2.0 | mA |
| 26 MHz ≤ F ₀ ≤ 52 | - | 2.5 | - | 2.5 | - | 2.5 | mA |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | 0.8 | - | V _{p-p} |
| Load | 10KΩ//10pF | | 10KΩ//10pF | | 10KΩ//10pF | | |
| Control Voltage Range (VCTCXO) | 0.5 | 2.5 | 0.4 | 2.4 | 0.3 | 1.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | - | ±5.0 | - | ±5.0 | - | ppm |
| Vc Input Impedance (VCTCXO) | 500 | - | 500 | - | 500 | - | KΩ |
| Phase Noise @ 19.2 MHz | 100 Hz | | -115 | | -115 | | dBc/Hz |
| | 1 KHz | | -135 | | -135 | | |
| | 10 KHz | | -148 | | -148 | | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25°C, 1 hour after reflow

Packing: Tape & Reel 3000 pcs per Reel

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | | | |
|------------|------|------|------|------|------|
| | ±0.5 | ±1.0 | ±1.5 | ±2.0 | ±2.5 |
| 0~+55 | ○ | ○ | ○ | ○ | ○ |
| -10~+60 | ○ | ○ | ○ | ○ | ○ |
| -20~+70 | ○ | ○ | ○ | ○ | ○ |
| -30~+85 | △ | ○ | ○ | ○ | ○ |
| -40~+85 | △ | △ | ○ | ○ | ○ |

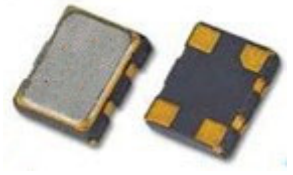
* O: Available △: Conditional X: Not available

VC5 Series

5.0*3.2mm SMD VCTCXO

FEATURE

- Typical 5.0 x 3.2 x 1.15 mm ceramic SMD package
- For automatic assembly
- Compactness and light weight
- Low power consumption
- CMOS and Clipped Sine Wave (Without DC-CUT capacitor) output optional.

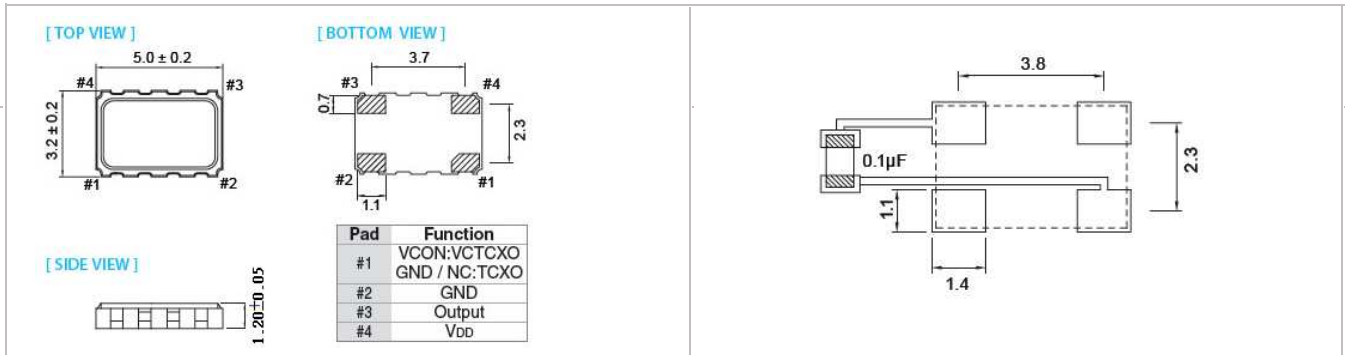


TYPICAL APPLICATION

- WLAN / WiMAX
- Telecommunication
- Mobile Phone

RoHS Compliant Standard

SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 5.0V | | 3.3V | | Unit |
|--|--|------|-----------|------|----------|
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 4.75 | 5.25 | 2.97 | 3.63 | V |
| Frequency Range | 10 | 26 | 10 | 40 | MHz |
| Standard Frequency | 13.0, 14.4, 16.368, 16.369, 16.8, 19.2, 19.68, 20.0, 24.5535, 26.0 | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | |
| Vs Supply Voltage (±5%) change (Clipped Sine Wave) | - | ±0.2 | - | ±0.2 | ppm |
| Vs Supply Voltage (±5%) change (CMOS) | - | - | - | ±0.4 | |
| Vs Load (±10%) change | - | ±0.2 | - | ±0.2 | |
| Vs Aging | - | ±1.0 | - | ±1.0 | ppm/year |
| Supply Current | 10 MHz ≤ F0 < 15 MHz (Clipped Sine Wave) | | - | | mA |
| | 15 MHz ≤ F0 < 26 MHz (Clipped Sine Wave) | | - | | |
| | 26 MHz ≤ F0 ≤ 40 MHz (Clipped Sine Wave) | | - | | |
| | 10 MHz ≤ F0 ≤ 40 MHz (CMOS) | | - | | |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | Vp-p |
| Output Level (CMOS) | Output High (Logic "1") | | 90% VDD | | V |
| | Output Low (Logic "0") | | - | | |
| | Duty | | 45 | | % |
| Load (Clipped Sine Wave) | 10KΩ/10pF | | 10KΩ/10pF | | |
| Load (CMOS) | - | | 15pF | | |
| Control Voltage Range (VCTCXO) | 0.5 | 2.5 | 0.5 | 2.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | - | ±5.0 | - | ppm |
| Vc Input Impedance (VCTCXO) | 100 | - | 100 | - | KΩ |
| Phase Noise @ 13.0 MHz | | | | | |
| 100 Hz | - | -115 | - | -115 | dBc/Hz |
| 1 KHz | - | -135 | - | -135 | |
| 10 KHz | - | -148 | - | -148 | |
| Start Time | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25°C, 1 hour after reflow

Packing: Tape & Reel 1000 pcs per Reel

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | |
|------------|------|------|
| | ±0.5 | ±1.0 |
| 0~+55 | O | O |
| -10~+60 | O | O |
| -20~+70 | O | O |
| -30~+85 | Δ | O |
| -40~+85 | X | Δ |

* O: Available Δ: Conditional X: Not available

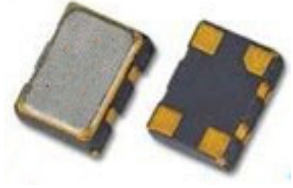
" Pulling Range < 10 ppm available

Series VH5

50x32mm SMD High Precision Voltage Controlled Temperature Compensated Crystal Oscillator

FEATURE

- Typical 5.0 x 3.2 x 1.55 mm ceramic SMD package.
- ± 0.2 ppm, $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$; ± 0.05 ppm, $-10^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- CMOS and Clipped Sine wave (without DC-cut capacitor) output optional.



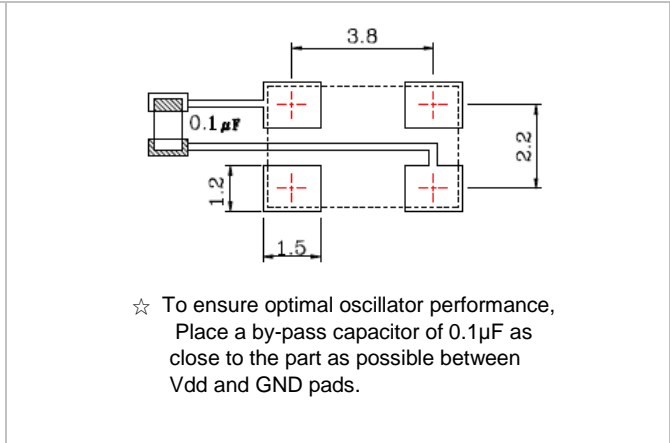
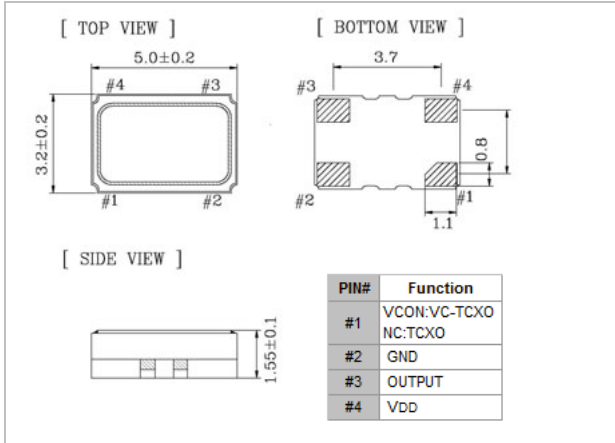
TYPICAL APPLICATION

- Base Stations, Stratum 3
- Femtocell

RoHS Compliant Standard

DIMENSION (mm)

SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 5.0V | | 3.3V | | Unit |
|---------------------------------------|-------------------------------|---------|-----------|---------|----------|
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 4.75 | 5.25 | 2.97 | 3.63 | V |
| Frequency Range | 10 | 40 | 10 | 40 | MHz |
| Standard Frequency (for CMOS) | 10, 12.8, 19.2, 20, 26, 30.72 | | | | |
| Standard Frequency (for Clipped Sine) | 10, 12.8, 19.2, 20, 26, 30.72 | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | |
| Vs Supply Voltage (±5%) change (CMOS) | - | ±0.2 | - | ±0.2 | ppm |
| Vs Load (±10%) change | - | ±0.2 | - | ±0.2 | ppm |
| Vs Aging (after 1 year) | - | ±1.0 | - | ±1.0 | ppm/year |
| Supply Current (CMOS output) | - | 6 | - | 6 | mA |
| Supply Current (Clipped Sine Wave) | - | 3.5 | - | 3.5 | mA |
| Output Level (CMOS) | | | | | V |
| Output High (Logic "1") | 90% VDD | - | 90% VDD | - | |
| Output Low (Logic "0") | - | 10% VDD | - | 10% VDD | |
| Duty | 45 | 55 | 45 | 55 | % |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | Vp-p |
| Load (CMOS) | 15pF | | 15pF | | |
| Load (Clipped Sine Wave) | 10KΩ/10pF | | 10KΩ/10pF | | |
| Control Voltage Range (VCTCXO) | 0.5 | 2.5 | 0.5 | 2.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | ±10.0 | ±5.0 | ±10.0 | ppm |
| Vc Input Impedance (VCTCXO) | 100 | - | 100 | - | KΩ |
| Phase Noise @ 12.8 MHz | | | | | dBc/Hz |
| 100 Hz | -125 | | -125 | | |
| 1 KHz | -145 | | -145 | | |
| 10 KHz | -150 | | -150 | | |
| Start Time | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25 °C 1 hour after reflow

Packing: Tape & Reel, 1000/3000 pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ±0.05 | ±0.1 | ±0.2 | ±0.28 | ±0.5 |
|------------|-----|-------|------|------|-------|------|
| 0~+55 | | O | O | O | O | O |
| -10~+60 | | O | O | O | O | O |
| -10~+70 | | △ | O | O | O | O |
| -40~+85 | | X | X | △ | O | O |

* O: Available △: Conditional X: Not available

Series VA7

7.0x5.0mm SMD Voltage Controlled Temperature Compensated Crystal Oscillator

FEATURE

- Typical 7.0x5.0x1.9 mm ceramic SMD package.
- High Precision for -40°C ~ +85°C, ±0.2ppm
- CMOS and Clipped Sine wave (without DC-cut capacitor) output optional

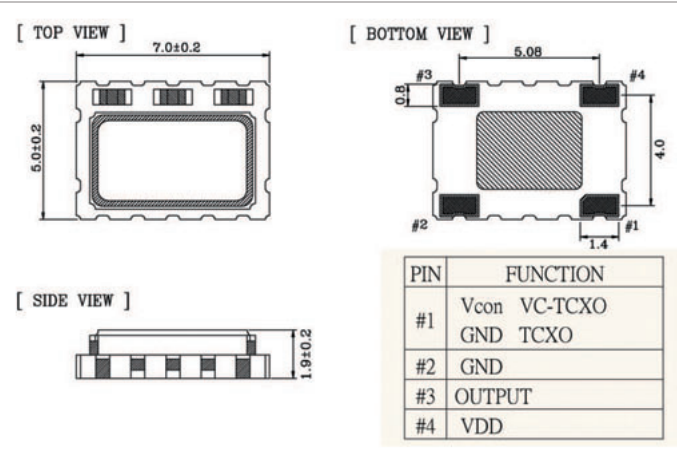


TYPICAL APPLICATION

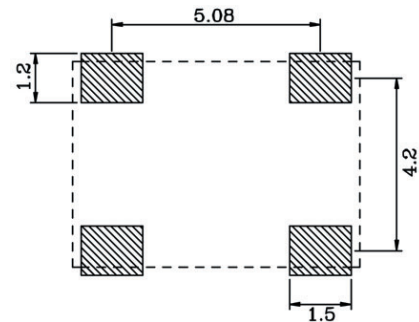
- Femtocell, Base Stations
- WLAN/WiMAX/WiFi, Wireless Communications

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 5.0V | | 3.3V | | Unit |
|---------------------------------------|---|---------------------|---------------------|---------------------|------------------|
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 4.75 | 5.25 | 2.97 | 3.63 | V |
| Frequency Range | 5 | 40 | 5 | 40 | MHz |
| Standard Frequency | 10, 12.8, 16.384, 19.2, 19.44, 20, 25, 26 | | | | |
| Frequency Tolerance* | - | ±2.0 | - | ±2.0 | ppm |
| Frequency Stability | | | | | |
| Vs Supply Voltage (±5%) change (CMOS) | - | ±0.1 | - | ±0.05 | ppm |
| Vs Load (±10%) change | - | ±0.05 | - | ±0.05 | ppm |
| Vs Aging (@1st year) | - | ±1.0 | - | ±1.0 | ppm/year |
| Supply Current (CMOS output) | - | 6 | - | 6 | mA |
| Supply Current (Clipped Sine Wave) | - | 3.5 | - | 3.5 | mA |
| Output Level (CMOS) | | | | | |
| Output High (Logic "1") | 90% V _{DD} | - | 90% V _{DD} | - | V |
| Output Low (Logic "0") | - | 10% V _{DD} | - | 10% V _{DD} | V |
| Duty | 45 | 55 | 45 | 55 | % |
| Output Level (Clipped Sine Wave) | 0.8 | - | 0.8 | - | V _{p-p} |
| Load (CMOS) | 15pF | | 15pF | | |
| Load (Clipped Sine Wave) | 10KΩ//10pF | | 10KΩ//10pF | | |
| Control Voltage Range (VCTCXO) | 0.5 | 2.5 | 0.5 | 2.5 | V |
| Pulling Range (VCTCXO) | ±5.0 | - | ±5.0 | - | ppm |
| Vc Input Impedance (VCTCXO) | 100 | - | 100 | - | KΩ |
| Phase Noise @ 12.8 MHz (Typ.) | | | | | |
| 100 Hz | | | | | -130 |
| 1 KHz | | | | | -145 |
| 10 KHz | | | | | -154 |
| Start Time | - | 2 | - | 2 | mSec |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position

*Frequency at 25°C, 1 hour after 2 times reflow

Packing: Tape & Reel, 1000/3000 pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | | | |
|------------|-------|------|-------|------|-------|
| | ±0.05 | ±0.1 | ±0.14 | ±0.2 | ±0.28 |
| 0~+55 | O | O | O | O | O |
| -10~+60 | O | O | O | O | O |
| -10~+70 | △ | O | O | O | O |
| -40~+85 | X | X | X | O | O |

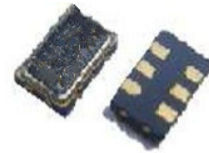
* O: Available △: Conditional X: Not available

TP5 Series

5.0*3.2 mm SMD PECL/LVDS Crystal Oscillator

FEATURE

- Typical 5.0 x 3.2 x 1.2 mm hermetically sealed ceramic package.
- Very low jitter performance: typical 0.3 pS RMS from 12k-20MHz.
- Fundamental/3rd overtone crystal design.
- Output frequency up to 320 MHz.
- Tri-state enable/disable

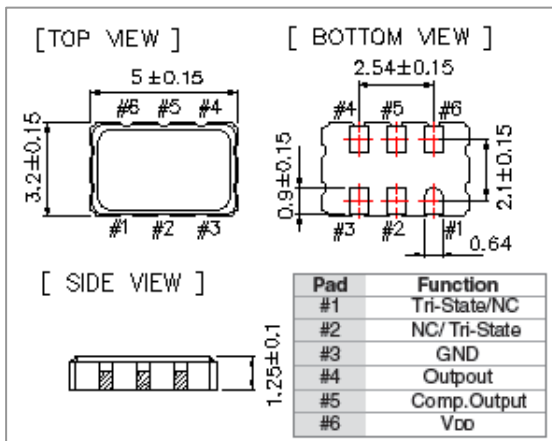


TYPICAL APPLICATION

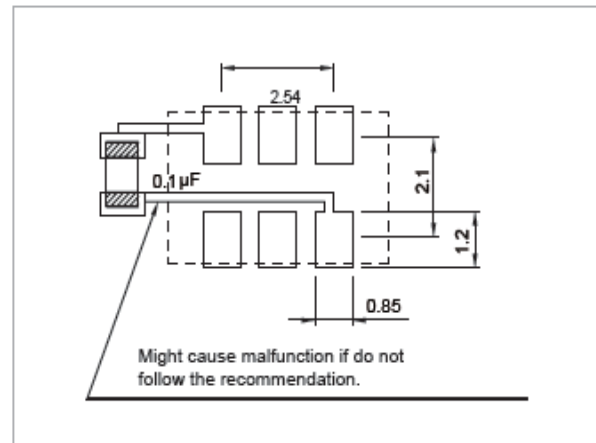
- 10G-BIT, Ethernet, Fiber Channel, Storage Area Network, SONET
- Enterprise Servers, Reference clocks for ADC and DAC
- Telecom

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | PECL | | | | LVDS | | | | unit |
|--|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------|
| | 3.3 V | | 2.5 V | | 3.3 V | | 2.5 V | | |
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (V _{DD}) 5% | 3.135 | 3.465 | 2.375 | 2.625 | 3.135 | 3.465 | 2.375 | 2.625 | V |
| Frequency Range | 80 | 320 | 80 | 320 | 80 | 320 | 80 | 320 | MHz |
| Standard Frequency | 106.25, 125, 155.52, 156.25, 187.5, 212.5, 312.5 | | | | | | | | |
| Supply Current | 80 MHz ≤ F _o < 160 MHz | | 75 | | 50 | | 50 | | mA |
| | 160 MHz ≤ F _o < 250 MHz | | 100 | | 50 | | 50 | | |
| | 250 MHz ≤ F _o ≤ 320 MHz | | 100 | | 65 | | 65 | | |
| Output Level | Output High (Logic "1") | | 2.275 | | 1.475 | | - | | V |
| | Output Low (Logic "0") | | - | | 1.68 | | 1.095 | | |
| Transition Time: Rise/Fall Time ⁺ | - | | 1.0 | | - | | 1.0 | | nSec |
| Start Time | - | | 3 | | - | | 3 | | mSec |
| Tri-State(Input to Pin 2 or Pin 1) | | | | | | | | | |
| Enable (High voltage or floating) | 0.7 V _{DD} | - | 0.7 V _{DD} | - | 0.7 V _{DD} | - | 0.7 V _{DD} | - | V |
| Disable (Low voltage or GND) | - | 0.3 V _{DD} | - | 0.3 V _{DD} | - | 0.3 V _{DD} | - | 0.3 V _{DD} | |
| RMS Phase Jitter (Integrated 12 KHz ~ 20 MHz) | | | | | | | | | |
| 80 MHz ≤ F _o < 125 MHz | - | 0.9 | - | 0.9 | - | 0.9 | - | 0.9 | pSec |
| 125 MHz ≤ F _o < 150 MHz | - | 0.7 | - | 0.7 | - | 0.7 | - | 0.7 | |
| 150 MHz ≤ F _o < 200 MHz | - | 0.5 | - | 0.5 | - | 0.5 | - | 0.5 | |
| 200 MHz ≤ F _o | - | 0.3 | - | 0.3 | - | 0.3 | - | 0.3 | |
| Phase Noise | 100 Hz | | - | | -70 | | - | | dBc/Hz |
| | 1 KHz | | - | | -100 | | - | | |
| | 10 KHz | | - | | -125 | | - | | |
| Aging (@ 25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

+ Transition times are measured between 20% and 80% of V_{DD}.

Packing: Tape & Reel, 1000/3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ±25 | ±50 |
|------------|-----|-----|-----|
| -10 ~ +60 | | △ | ○ |
| -20 ~ +70 | | △ | ○ |
| -40 ~ +85 | | X | ○ |

* ○: Available △: Conditional X: Not available

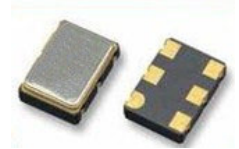
* Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration

TU7 Series

7.0*5.0 mm SMD Ultra Low Phase Jitter PECL Crystal Oscillator

FEATURE

- Typical 7.0 x 5.0 x 1.5 mm 6 pads ceramic SMD package
- Ultra low jitter performance: < 100 fs RMS from 12k-20MHz
- Tight symmetry (45 to 55%) available
- Complementary output



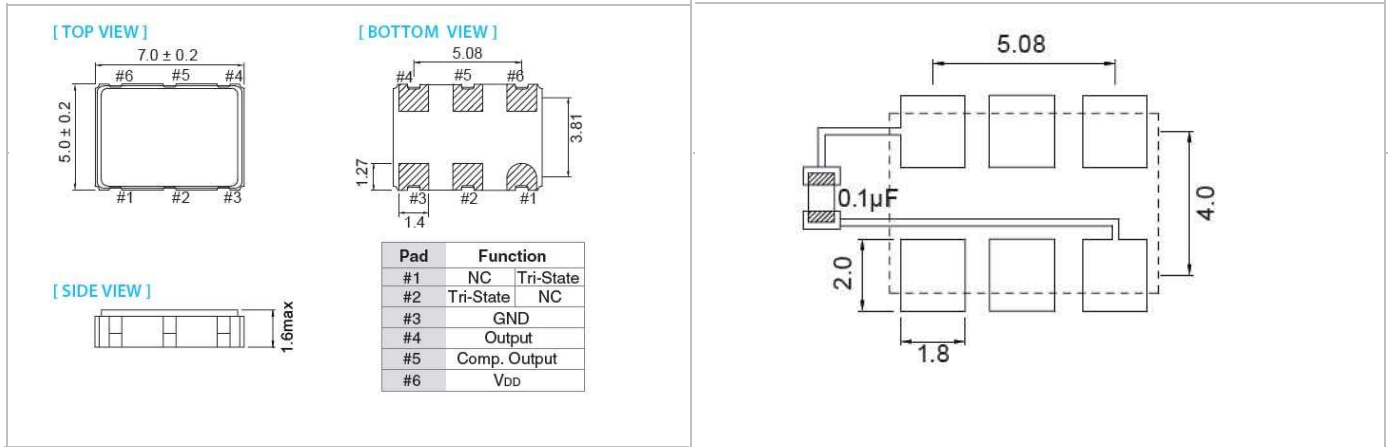
TYPICAL APPLICATION

- 40G-Bit/100G-Bit Ethernet, MAN, SONET
- WLAN/WiMax, xDSL
- Fiber Channel
- Test Instrumentation

RoHS Compliant Standard

SOLDER PAD LAYOUT (mm)

DIMENSION (mm)



ELECTRICAL SPECIFICATION

| Parameter | PECL | | | | Unit |
|---|-----------------------|--------|--------|--------|------|
| | 3.3V | | 2.5V | | |
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 3.135 | 3.465 | 2.375 | 2.625 | V |
| Frequency Range | 70 | 170 | 100 | 160 | MHz |
| Standard Frequency | 100,125,155.52,156.25 | | | | |
| Supply Current | | | | | |
| 70MHz ≤ F0 ≤ 170MHz | - | 75 | - | 75 | mA |
| Output Level | | | | | |
| Output High (Logic "1") | 2.275 | - | 1.475 | - | V |
| Output Low (Logic "0") | - | 1.68 | - | 1.095 | |
| Transition Time:Rise/Fall Time+ | - | 1.0 | - | 1.0 | nSec |
| Start Time | - | 3 | - | 3 | mSec |
| Tri-State(Input to Pin 2 or Pin 1) | | | | | |
| Enable | 0.7VDD | - | 0.7VDD | - | V |
| Disable | - | 0.3VDD | - | 0.3VDD | |
| RMS Phase Jitter (integrated 12KHz ~ 20MHz) | | | | | |
| 70MHz ≤ F0 ≤ 170MHz | - | 0.1 | - | 0.1 | pSec |
| Aging | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position
 +Transition times are measured between 20% and 80% of VDD
 Packing: Tape & Reel, 1000/3000pcs per Reel

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ppm | |
|------------|-----|-----|-----|
| | | ±25 | ±50 |
| -10~+60 | | △ | ○ |
| -20~+70 | | △ | ○ |
| -40~+85 | | X | ○ |

* O: Standard △:Available (case by case) X: Not available

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

TL7 Series

7.0*5.0mm SMD PECL/LVDS Crystal Oscillator

FEATURE

- Typical 7.0 x 5.0 x 1.3 mm ceramic SMD package.
- Output frequency up to 200 MHz
- Tri-state enable/disable

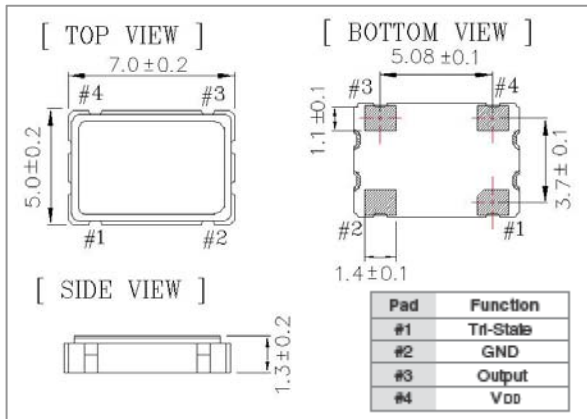


TYPICAL APPLICATION

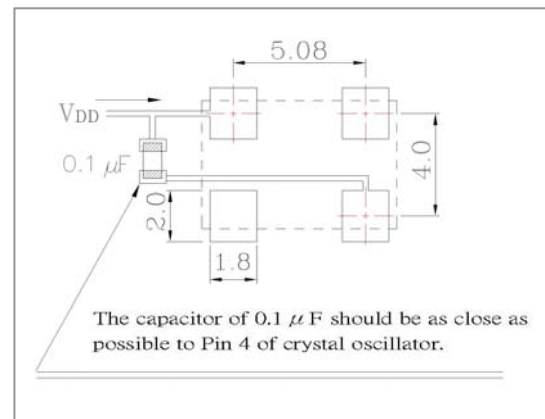
- xDSL, WLAN, Fiber/10G-Bit Ethernet
- Notebook, PDA
- PC main board, VGA card

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3V | | 2.5V | | 1.8V | | Unit |
|--|------------------------------|---------|--------|---------|--------|---------|---------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 1 | 200 | 1 | 166 | 11 | 110 | MHz |
| Standard Frequency | 75,100,125,150,200 | | | | | | MHz |
| VDD Sensitivity ($\pm 10\%$) | -2 | 2 | -2 | 2 | -2 | 2 | ppm |
| Supply Current | 1MHz \leq F0 \leq 110MHz | | - | | - | | mA |
| | 110MHz < F0 \leq 166MHz | | - | | - | | |
| | 166MHz < F0 \leq 200MHz | | - | | - | | |
| Duty Cycle | 40 | 60 | 40 | 60 | 40 | 60 | % |
| Output Level (CMOS) | - | | | | | | |
| Output High (Logic "1") | 90%VDD | - | 90%VDD | - | 90%VDD | - | V |
| Output High (Logic "0") | - | 10%VDD | - | 10%VDD | - | 10%VDD | |
| Transition Time: Rise/Fall Time ⁺ | - | | | | | | |
| 1MHz \leq F0 \leq 200MHz | - | 5 | - | 5 | - | 5 | nSec |
| Start Time | - | 5 | - | 5 | - | 5 | mSec |
| Tri-State (Input to Pin1) | - | | | | | | |
| Enable (High voltage or floatig) | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | V |
| Disable (Low voltage or GND) | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | |
| Absolute Clock Period Jitter | - | | | | | | |
| Specific Frequency [*] | - | 40 | - | 40 | - | 40 | pSec |
| Others | - | 200 | - | 200 | - | 200 | |
| Standby Current | - | 15 | - | 15 | - | 15 | μ A |
| Aging (@25°C 1st year) | - | ± 3 | - | ± 3 | - | ± 3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

⁺ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

^{*} Specific frequency including 4.0, 6.0, 8.0, 12.0, 13.0, 16.0, 19.2, 20.0, 24.0, 26.0, 32.0, 38.4 and 40.0MHz

Packing: Tape & Reel, 1000/3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ± 20 | ± 25 | ± 50 |
|------------|-----|----------|----------|----------|
| -10 - +60 | | ○ | ○ | ○ |
| -20 - +70 | | △ | ○ | ○ |
| -40 - +85 | | △ | ○ | ○ |

○: Available △: Conditional X: Not available

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

Series TC2

2.5X2.0MM SMD Crystal Oscillator

FEATURE

- Typical 2.5x2.0x0.9 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Operation voltage: 1.8V, 2.5V, 3.3V
- Tri-state enable/disable

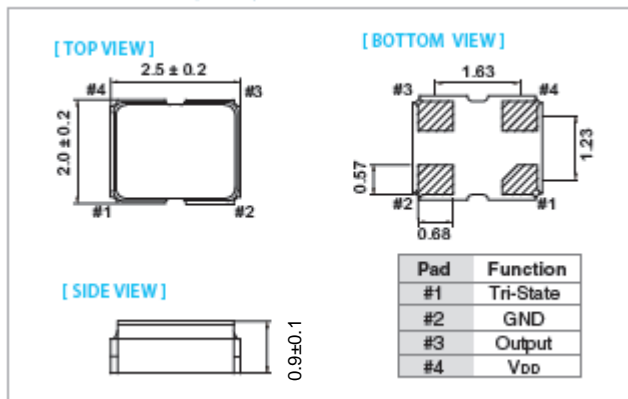


RoHS Compliant Standard

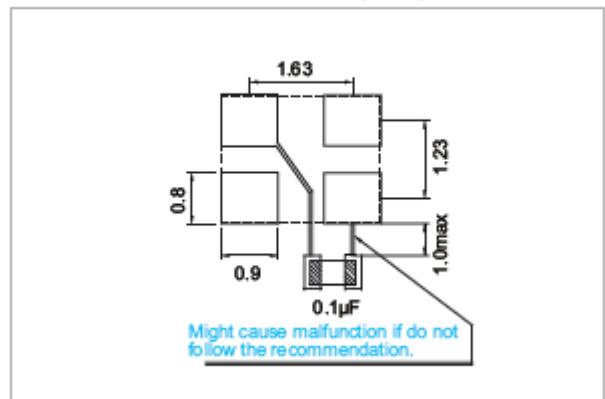
TYPICAL APPLICATION

- WLAN/WiMax,
- Mobile Phone
- DSC, Set-top Box, HDTV

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3V | | 2.5V | | 1.8V | | Unit |
|--|-------------|--------|--------|--------|--------|--------|------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 1 | 50 | 1 | 50 | 1 | 50 | MHz |
| Standard Frequency | 24,26,30,40 | | | | | | |
| Supply Current | - | 15 | - | 10 | - | 7 | mA |
| Duty Cycle | 45 | 55 | 45 | 55 | 45 | 55 | % |
| Output Level (CMOS) | | | | | | | |
| Output High (Logic "1") | 90%VDD | - | 90%VDD | - | 90%VDD | - | V |
| Output Low (Logic "0") | - | 10%VDD | - | 10%VDD | - | 10%VDD | |
| Transition Time: Rise/Fall Time ⁺ | | | | | | | |
| 1 MHz ≤ F0 < 20MHz | - | 3 | - | 4 | - | 5 | nSec |
| 20 MHz ≤ F0 < 50MHz | - | 2 | - | 3 | - | 4 | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec |
| Tri-State (Input to Pin1) | | | | | | | |
| Enable (High voltage or floatig) | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | V |
| Disable (Low voltage or GND) | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | |
| Absolute Clock Period Jitter | - | 40 | - | 40 | - | 40 | pSec |
| RMS Phase Jitter (Integrated 12KHz~20MHz) | - | 1 | - | 1 | - | 1 | pSec |
| Standby Current | - | 15 | - | 15 | - | 15 | µA |
| Aging (@25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

+ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

Packing: Tape & Reel, 3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp.(°C) | ppm | | |
|-----------|-----|-----|-----|
| | ±20 | ±25 | ±50 |
| -10 ~ +60 | ○ | ○ | ○ |
| -20 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | X | ○ | ○ |

* ○: Available △: Conditional X: Not available

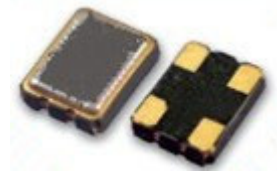
* Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration

Series TC3

3.2X2.5 MM SMD Crystal Oscillator

FEATURE

- Typical 3.2x2.5x1.05 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Operation voltage: 1.8V, 2.5V, 3.3V
- Tri-state enable/disable

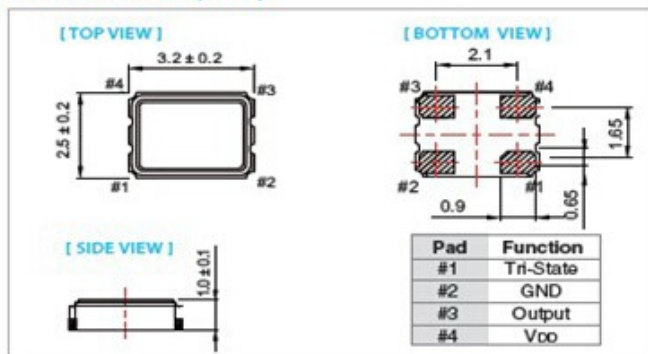


RoHS Compliant Standard

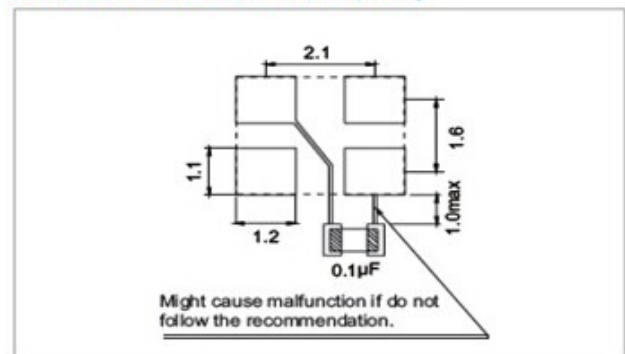
TYPICAL APPLICATION

- WLAN/WiMax,
- Mobile Phone
- DSC, Set-top Box, HDTV

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3 V | | 2.5 V | | 1.8 V | | unit |
|--|-----------------------------------|---------|-----------------------------------|---------|-----------------------------------|---------|------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 0.032768 | 125 | 0.032768 | 125 | 0.032768 | 125 | MHz |
| Standard Frequency | 24, 26, 32, 38.4, 40 | | | | | | |
| Supply Current | F0 = 0.032768KHz | | F0 = 0.032768KHz | | F0 = 0.032768KHz | | |
| | - | 3 | - | 2 | - | 1.5 | mA |
| | 1MHz ≤ F0 < 100MHz | | 1MHz ≤ F0 < 100MHz | | 1MHz ≤ F0 < 100MHz | | |
| | - | 15 | - | 10 | - | 7 | |
| | 100MHz ≤ F0 < 125MHz | | 100MHz ≤ F0 < 125MHz | | 100MHz ≤ F0 < 125MHz | | |
| | - | 25 | - | 20 | - | 12 | |
| Duty Cycle | 45 | 55 | 45 | 55 | 45 | 55 | % |
| Output Level (CMOS) | Output High (Logic "1") | | Output High (Logic "1") | | Output High (Logic "1") | | V |
| | 90%VDD | - | 90%VDD | - | 90%VDD | - | |
| | Output Low (Logic "0") | | Output Low (Logic "0") | | Output Low (Logic "0") | | |
| | - | 10%VDD | - | 10%VDD | - | 10%VDD | |
| Transition Time: Rise/Fall Time ⁺ | F0 = 0.032768KHz | | F0 = 0.032768KHz | | F0 = 0.032768KHz | | nSec |
| | - | 50 | - | 50 | - | 50 | |
| | 1MHz ≤ F0 < 20MHz | | 1MHz ≤ F0 < 20MHz | | 1MHz ≤ F0 < 20MHz | | |
| | - | 3 | - | 4 | - | 5 | |
| | 20MHz ≤ F0 < 125MHz | | 20MHz ≤ F0 < 125MHz | | 20MHz ≤ F0 < 125MHz | | |
| | - | 2 | - | 3 | - | 4 | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec |
| Tri-State (Input to Pin 1) | Enable (High voltage or floating) | | Enable (High voltage or floating) | | Enable (High voltage or floating) | | V |
| | 0.7 VDD | - | 0.7 VDD | - | 0.7 VDD | - | |
| | Disable (Low voltage or GND) | | Disable (Low voltage or GND) | | Disable (Low voltage or GND) | | |
| | - | 0.3 VDD | - | 0.3 VDD | - | 0.3 VDD | |
| Absolute Clock Period Jitter | - | 40 | - | 40 | - | 40 | pSec |
| RMS Phase Jitter (Integrated 12KHz - 20MHz) | - | 1 | - | 1 | - | 1 | pSec |
| Standby Current | - | 15 | - | 15 | - | 15 | µA |
| Aging (@ 25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

⁺ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

Packing: Tape & Reel, 3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | |
|------------|-----|-----|-----|
| | ±20 | ±25 | ±50 |
| -10 ~ +60 | ○ | ○ | ○ |
| -20 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | X | ○ | ○ |

* ○: Available △: Conditional X: Not available

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

Series TC5

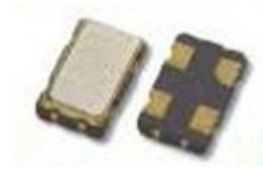
5.0X3.2MM SMD Crystal Oscillator

FEATURE

- Typical 5.0 x 3.2 x 1.2 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Realize the standby function with Tri-State

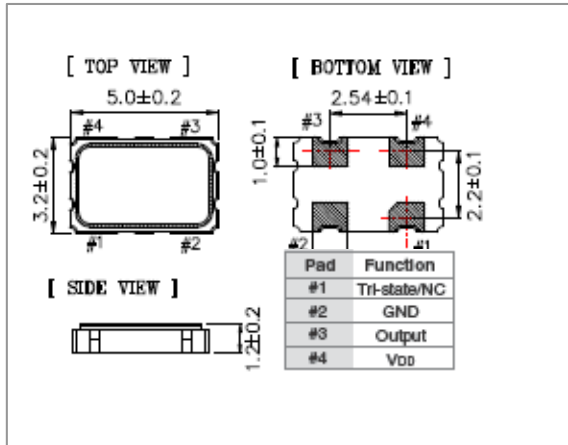
TYPICAL APPLICATION

- GPS, Mobile Phone,
- WLAN, Wireless, Fiber/10G-Bit Ethernet
- Notebook, PDA, DSC

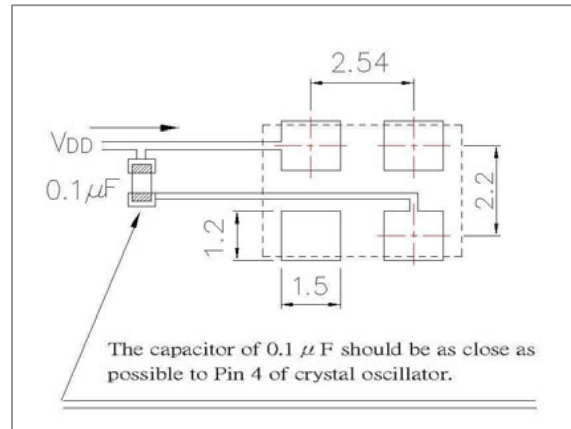


RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3V | | 2.5V | | 1.8V | | Unit |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (V _{DD}) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 0.0137 | 125 | 0.0137 | 133 | 0.0137 | 125 | MHz |
| Standard Frequency | 2.048,25,26,27,50,66.667,100,125 | | | | | | MHz |
| Supply Current | | | | | | | |
| 13.7KHz \leq F ₀ \leq 93 KHz | - | 1 | - | 0.5 | - | 0.1 | mA |
| 0.3125MHz \leq F ₀ \leq 50 MHz (A1) | - | 10 | - | 8 | - | 7 | |
| 40MHz \leq F ₀ < 75MHz | - | 20 | - | 18 | - | 15 | |
| 75MHz \leq F ₀ <133MHz | - | 35 | - | 30 | - | 25 | |
| 133MHz \leq F ₀ | - | 45 | - | 40 | - | - | |
| Output Level (CMOS) Output High (Logic "1") | 90%V _{DD} | - | 90%V _{DD} | - | 90%V _{DD} | - | V |
| Output Low (Logic "0") | - | 10%V _{DD} | - | 10%V _{DD} | - | 10%V _{DD} | |
| Transition Time: Rise/Fall Time ⁺ | | | | | | | |
| 13.7KHz \leq F ₀ \leq 70KHz | - | 50 | - | 50 | - | 50 | nSec |
| 0.3125MHz \leq F ₀ < 100MHz | - | 5 | - | 5 | - | 5 | |
| 100MHz \leq F ₀ | - | 3 | - | 3 | - | 3 | |
| Start Time | - | 5 | - | 5 | - | 5 | mSec |
| Output Drive Capability (CL) | - | 15 | - | 15 | - | 15 | pF |
| Tri-State(Input to Pin1) Enable(High voltage or floatig) | 0.7V _{DD} | - | 0.7V _{DD} | - | 0.7V _{DD} | - | V |
| Disable(Low voltage or GND) | - | 0.3V _{DD} | - | 0.3V _{DD} | - | 0.3V _{DD} | |
| Absolute Clock Period Jitter | - | 40 | - | 40 | - | 40 | pSec |
| RMS Phase Jitter (Integated 12KHz~20MHz) | - | 1 | - | 1 | - | 1 | pSec |
| Standby Current | - | 10 | - | 10 | - | 10 | μ A |
| Aging (@25°C 1st year) | - | \pm 3 | - | \pm 3 | - | \pm 3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

⁺ Transition times are measured between 10% and 90% of V_{DD}, with an output load of 15pF. * Output waveform CMOS only.

Packing: Tape & Reel, 1000/3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | |
|------------|----------|----------|----------|
| | \pm 20 | \pm 25 | \pm 50 |
| -10 ~ +60 | ○ | ○ | ○ |
| -20 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | △ | ○ | ○ |

* ○: Available △: Conditional X: Not available

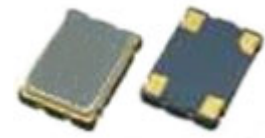
* Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration

Series TC7

7.0X5.0MM SMD Crystal Oscillator

FEATURE

- Typical 7.0 x 5.0 x 1.3 mm ceramic SMD package.
- Output frequency up to 200 MHz
- Tri-state enable/disable

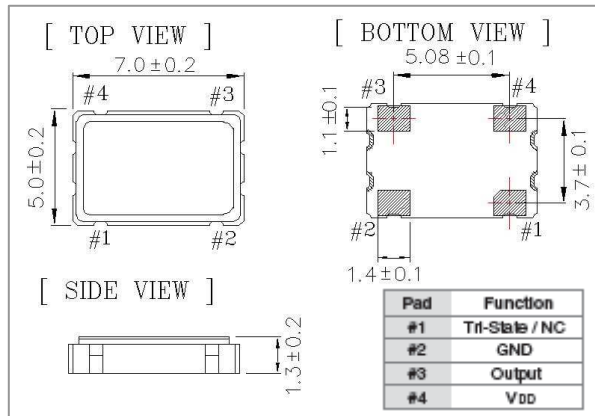


TYPICAL APPLICATION

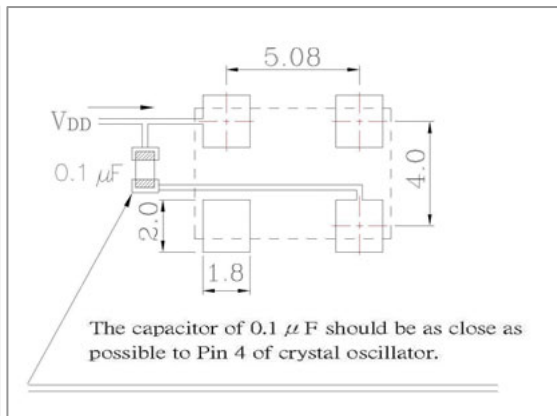
- xDSL, WLAN, Fiber/10G-Bit Ethernet
- Notebook, PDA
- PC main board, VGA card

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3V | | 2.5V | | 1.8V | | Unit |
|---|----------------------------------|--------|--------|--------|--------|--------|------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 0.0137 | 166 | 0.0137 | 133 | 0.0137 | 125 | MHz |
| Standard Frequency | 2.048,25,26,27,50,66.667,100,125 | | | | | | MHz |
| Supply Current | | | | | | | |
| 13.7KHz ≤ F0 ≤ 70KHz | - | 1 | - | 0.5 | - | 0.1 | mA |
| 0.3125MHz ≤ F0 ≤ 35.328MHz (A1) | - | 10 | - | 8 | - | 7 | |
| 30MHz ≤ F0 < 75MHz | - | 20 | - | 18 | - | 15 | |
| 75MHz ≤ F0 < 133MHz | - | 35 | - | 30 | - | 25 | |
| 133MHz ≤ F0 | - | 45 | - | 40 | - | - | |
| Output Level (CMOS) | 90%VDD | - | 90%VDD | - | 90%VDD | - | V |
| Output High (Logic "1") | - | 10%VDD | - | 10%VDD | - | 10%VDD | |
| Output Low (Logic "0") | | | | | | | |
| Transition Time: Rise/Fall Time* | | | | | | | |
| 13.7KHz ≤ F0 ≤ 70KHz | - | 50 | - | 50 | - | 50 | nSec |
| 0.3125MHz ≤ F0 < 100MHz | - | 5 | - | 5 | - | 5 | |
| 100MHz ≤ F0 | - | 3 | - | 3 | - | 3 | |
| Start Time | - | 5 | - | 5 | - | 5 | mSec |
| Output Drive Capability (CL) | - | 15 | - | 15 | - | 15 | pF |
| Tri-State (Input to Pin1) | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | V |
| Enable (High voltage or floatig) | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | |
| Disable (Low voltage or GND) | | | | | | | |
| Absolute Clock Period Jitter | - | 40 | - | 40 | - | 40 | pSec |
| RMS Phase Jitter (Integrated 12KHz~20MHz) | - | 1 | - | 1 | - | 1 | pSec |
| Standby Current | - | 10 | - | 10 | - | 10 | µA |
| Aging (@ 25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

* Transition times are measured between 10% and 90% of VDD, with an output load of 15pF. • Output waveform CMOS only.

Packing: Tape & Reel, 1000/3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ±20 | ±25 | ±50 |
|------------|-----|-----|-----|-----|
| -10 - +60 | | ○ | ○ | ○ |
| -20 - +70 | | △ | ○ | ○ |
| -40 - +85 | | △ | ○ | ○ |

* ○: Available △: Conditional X: Not available

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

Series TB2

2.5X2.0 MM SMD Crystal Oscillator

FEATURE

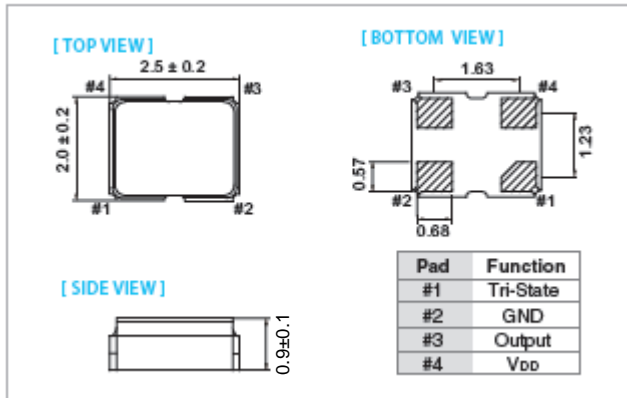
- Typical 2.5 x 2.0 x 0.9 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Operation voltage: 1.8V, 2.5V, 3.3V
- Tri-state enable/disable



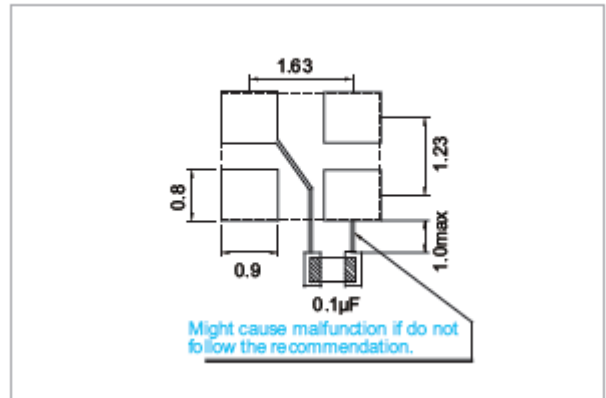
TYPICAL APPLICATION

- Computer Peripherals
- Set-top Box, HDTV
- DSC, PDA

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3V | | 2.5V | | 1.8V | | Unit | | | | | | | |
|--|----------|--------|------|--------|------|--------|------|--------|----|--------|----|--------|----|------|
| | Min. | Max. | Min. | Max. | Min. | Max. | | | | | | | | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V | | | | | | | |
| Frequency Range | 1 | 200 | 1 | 166 | 1 | 100 | MHz | | | | | | | |
| Standard Frequency | 24,26,40 | | | | | | | | | | | | | |
| VDD Sensitivity (±10%) | -2 | 2 | -2 | 2 | -2 | 2 | ppm | | | | | | | |
| Supply Current | | | | | | | | | | | | | | |
| 1 MHz ≤ F0 < 30MHz | | | | | | | | - | 10 | - | 8 | - | 6 | mA |
| 30 MHz ≤ F0 < 75MHz | | | | | | | | - | 15 | - | 10 | - | 8 | |
| 75 MHz ≤ F0 < 133MHz | | | | | | | | - | 20 | - | 15 | - | 12 | |
| 133 MHz ≤ F0 < 166MHz | | | | | | | | - | 22 | - | 15 | - | - | |
| 166 MHz ≤ F0 < 200MHz | - | 25 | - | - | - | - | | | | | | | | |
| Duty Cycle | 45 | 55 | 45 | 55 | 45 | 55 | % | | | | | | | |
| Output Level (CMOS) | | | | | | | | | | | | | | |
| Output High (Logic "1") | | | | | | | | 90%VDD | - | 90%VDD | - | 90%VDD | - | V |
| Output Low (Logic "0") | - | 10%VDD | - | 10%VDD | - | 10%VDD | | | | | | | | |
| Transition Time: Rise/Fall Time ⁺ | | | | | | | | | | | | | | |
| 1 MHz ≤ F0 < 10MHz | | | | | | | | - | 3 | - | 4 | - | 5 | nSec |
| 10 MHz ≤ F0 | - | 2 | - | 3 | - | 4 | | | | | | | | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec | | | | | | | |
| Tri-State (Input to Pin1) | | | | | | | | | | | | | | |
| Enable (High voltage or floatig) | | | | | | | | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | V |
| Disable (Low voltage or GND) | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | | | | | | | | |
| Absolute Clock Period Jitter | | | | | | | | | | | | | | |
| Specific Frequency ^{**} | | | | | | | | - | 40 | - | 40 | - | 40 | pSec |
| Others | - | 200 | - | 200 | - | 200 | | | | | | | | |
| Standby Current | - | 15 | - | 15 | - | 15 | μA | | | | | | | |
| Aging (@25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | ppm | | | | | | | |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C | | | | | | | |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

⁺ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

^{**} Specific frequency including 4.0, 13.0, 20.0, 26.0 and 40.0 MHz.

Packing: Tape & Reel, 3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | | |
|------------|-----|-----|-----|
| | ±20 | ±25 | ±50 |
| -10 ~ +60 | ○ | ○ | ○ |
| -20 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | X | ○ | ○ |

* ○: Available △: Conditional X: Not available

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

Series TB3

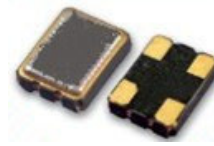
3.2X2.5 MM SMD Crystal Oscillator

FEATURE

- Typical 3.2 x 2.5 x 1.05 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Operation voltage: 1.8V, 2.5V, 3.3V
- Tri-state enable/disable

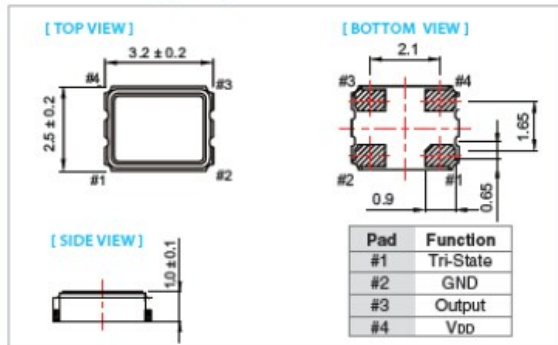
TYPICAL APPLICATION

- Computer Peripherals
- Set-top Box , HDTV
- DSC, PDA

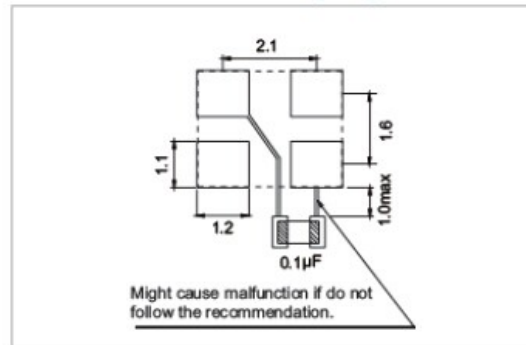


RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | 3.3 V | | 2.5 V | | 1.8 V | | unit |
|--|---------|---------|---------|---------|---------|---------|------|
| | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 10% | 2.97 | 3.63 | 2.25 | 2.75 | 1.62 | 1.98 | V |
| Frequency Range | 1 | 200 | 1 | 166 | 1 | 100 | MHz |
| VDD Sensitivity (±10 %) | -2 | 2 | -2 | 2 | -2 | 2 | ppm |
| Supply Current | | | | | | | mA |
| 1 MHz ≤ Fo < 30MHz | - | 10 | - | 8 | - | 6 | |
| 30 MHz ≤ Fo < 75MHz | - | 15 | - | 10 | - | 8 | |
| 75 MHz ≤ Fo < 133MHz | - | 20 | - | 15 | - | 12 | |
| 133 MHz ≤ Fo < 166MHz | - | 22 | - | 15 | - | - | |
| 166 MHz ≤ Fo ≤ 200MHz | - | 25 | - | - | - | - | |
| Duty Cycle | 45 | 55 | 45 | 55 | 45 | 55 | % |
| Output Level (CMOS) | | | | | | | V |
| Output High (Logic "1") | 90%VDD | - | 90%VDD | - | 90%VDD | - | |
| Output Low (Logic "0") | - | 10%VDD | - | 10%VDD | - | 10%VDD | |
| Transition Time: Rise/Fall Time ⁺ | | | | | | | nSec |
| 1 MHz ≤ Fo < 10 MHz | - | 3 | - | 4 | - | 5 | |
| 10 MHz ≤ Fo | - | 2 | - | 3 | - | 4 | |
| Start Time | - | 2 | - | 2 | - | 2 | mSec |
| Tri-State (Input to Pin 1) | | | | | | | V |
| Enable (High voltage or floating) | 0.7 VDD | - | 0.7 VDD | - | 0.7 VDD | - | |
| Disable (Low voltage or GND) | - | 0.3 VDD | - | 0.3 VDD | - | 0.3 VDD | |
| Absolute Clock Period Jitter | | | | | | | pSec |
| Specific Frequency [*] | - | 40 | - | 40 | - | 40 | |
| Others | - | 200 | - | 200 | - | 200 | |
| Standby Current | - | 15 | - | 15 | - | 15 | μA |
| Aging (@ 25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

+ Transition times are measured between 10% and 90% of VDD, with an output load of 15pF.

* Specific frequency including 4.0, 6.0, 8.0, 12.0, 13.0, 16.0, 19.2, 20.0, 24.0, 26.0, 32.0, 38.4 and 40.0MHz

Packing: Tape & Reel, 3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp.(°C) | ppm | | |
|-----------|-----|-----|-----|
| | ±20 | ±25 | ±50 |
| -10 ~ +60 | ○ | ○ | ○ |
| -20 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | X | ○ | ○ |

* ○: Available △: Conditional X: Not available

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

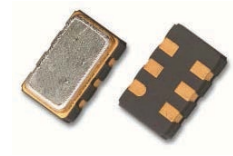
Series PV5 SEAM SEALED OSCILLATOR 5.0X3.2MM SMD

FEATURE

- Typical 5.0 x 3.2 x 1.2 mm 6 pads ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Tri-state enable/disable

TYPICAL APPLICATION

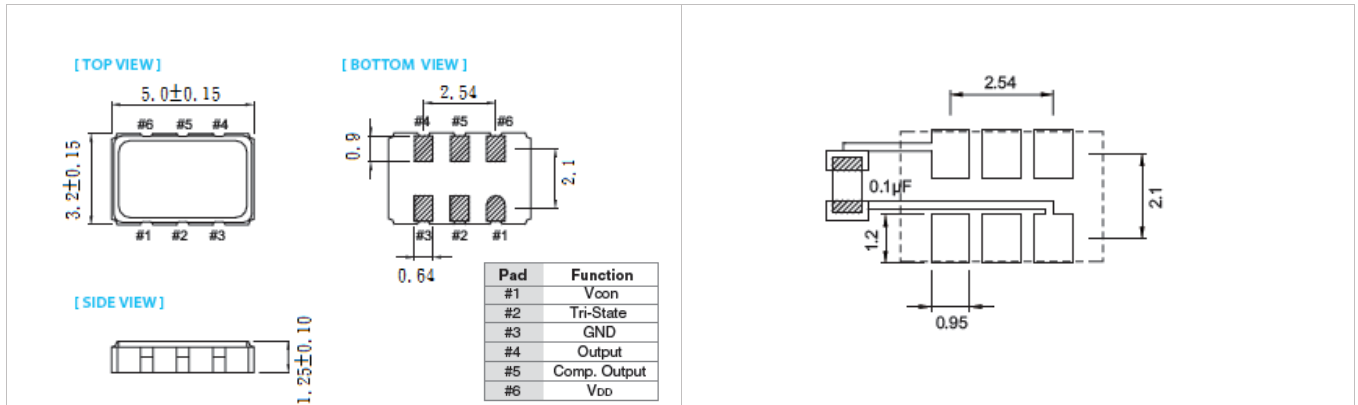
- Set-top Box, HDTV
- Wimax/WLAN
- xDSL/ VoIP, Cable modem



RoHS Compliant Standard

DIMENSION (mm)

SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | PECL | | LVDS | | Unit |
|--|---------------------|--------|--------|--------|--------|
| | 3.3V | | 3.3V | | |
| | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 3.135 | 3.465 | 3.135 | 3.465 | V |
| Frequency Range | 60 | 175 | 60 | 175 | MHz |
| Standard Frequency | 153.6,155.52,156.25 | | | | |
| Absolute Pulling Range (APR) | ±50 | - | ±50 | - | ppm |
| Control Voltage Range | 0.3 | 3.0 | 0.3 | 3.0 | V |
| Supply Current 60MHz ≤ F0 ≤ 175 MHz | | 100 | | 75 | mA |
| Output Level | | | | | |
| Output High (Logic "1") | 2.275 | - | - | 1.6 | V |
| Output Low (Logic "0") | - | 1.68 | 0.9 | - | |
| Transition Time : Rise/ Fall Time ⁺ | - | 1.0 | - | 1.0 | nSec |
| Start Time | - | 3 | - | 3 | mSec |
| Tri-State(Input to Pin 2) | | | | | |
| Enable(High voltage or floating) | 0.7VDD | - | 0.7VDD | - | V |
| Disable(Low voltage or GND) | - | 0.3VDD | - | 0.3VDD | |
| Linearity | - | 10 | - | 10 | % |
| Modulation Bandwidth (BW) | 20 | - | 20 | - | KHz |
| Input Impedance | 5 | - | 5 | - | MΩ |
| RMS Phase Jitter | | | | | |
| F0 < 100MHz | - | 1.0 | - | 1.0 | pSec |
| 100 MHz ≤ F0 < 125 MHz | - | 0.7 | - | 0.7 | |
| 125 MHz ≤ F0 < 150 MHz | - | 0.5 | - | 0.5 | |
| 150 MHz ≤ F0 ≤ 175MHz | - | 0.3 | - | 0.3 | |
| Phase Noise @122.88 MHz | | | | | dBc/Hz |
| 100 Hz | - | -85 | - | -85 | |
| 1 KHz | - | -115 | - | -115 | |
| 10 KHz | - | -130 | - | -130 | |
| Aging (@25°C 1st year) | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

+ Transition times are measured between 20% and 80% of VDD.

Packing: Tape & Reel, 1000/2000/3000/5000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | ±25 | ±50 |
|------------|-----|-----|-----|
| -10 ~ +60 | | ○ | ○ |
| -20 ~ +70 | | ○ | ○ |
| -40 ~ +85 | | X | ○ |

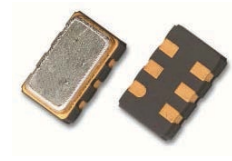
* ○: Available △: Conditional X: Not available

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

Series PV7 SEAM SEALED OSCILLATOR 7.0X5.0MM SMD

FEATURE

- Typical 7.0 x 5.0 x 1.6 mm 6pads ceramic SMD package.
- Very low jitter performance: typical 0.3pS RMS from 12k~20MHz.
- Wide frequency control range.
- Complementary Output.
- Tri-state enable/disable

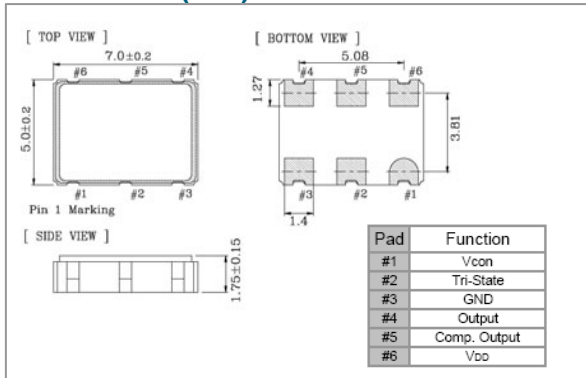


TYPICAL APPLICATION

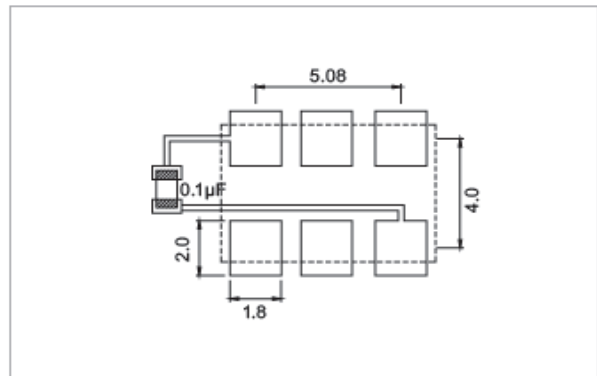
- Set-top Box, HDTV
- WiMAX/WLAN
- xDSL/ VoIP, Cable modem
- Jitter Attenuator, ADC

RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

| Parameter | PECL | | | | LVDS | | | | Unit |
|--|---|--------|--------|--------|-------------------------|--------|--------|--------|--------|
| | 3.3V | | 2.5V | | 3.3V | | 2.5V | | |
| | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| Supply Voltage Variation (VDD) 5% | 3.135 | 3.465 | 2.375 | 2.625 | 3.135 | 3.465 | 2.375 | 2.625 | V |
| Frequency Range | 1.5 | 200 | 65 | 200 | 1.5 | 200 | 65 | 200 | MHz |
| Standard Frequency | 77.76, 106.25, 122.88, 125, 155.52, 156.25, 200 | | | | | | | | |
| Absolute Pulling Range (APR) | ±50 | - | ±50 | - | ±50 | - | ±50 | - | ppm |
| Control Voltage Range | 0.3 | 3.0 | 0 | 2.5 | 0.3 | 3.0 | 0 | 2.5 | V |
| Supply Current | 1.5MHz ≤ F0 < 65 MHz | | - | | 1.5MHz ≤ F0 < 65 MHz | | - | | |
| | - | 75 | - | 75 | - | 45 | - | 45 | mA |
| | 65MHz ≤ F0 ≤ 200 MHz | | - | | 65MHz ≤ F0 ≤ 200 MHz | | - | | |
| | - | 100 | - | 100 | - | 80 | - | 80 | mA |
| Output Level | Output High (Logic "1") | | 2.275 | | Output High (Logic "1") | | 1.6 | | V |
| | Output Low (Logic "0") | | - 1.68 | | Output Low (Logic "0") | | - 0.9 | | V |
| Transition Time : Rise/ Fall Time* | - | 1.0 | - | 1.0 | - | 1.0 | - | 1.0 | nSec |
| Start Time | - | 3 | - | 3 | - | 3 | - | 3 | mSec |
| Tri-State(input to Pin 2, Enable Low) | | | | | | | | | |
| Enable (Low voltage or GND or floating) | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | - | 0.3VDD | V |
| Disable (Low voltage or GND) | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | 0.7VDD | - | V |
| Linearity | - | 10 | - | 10 | - | 10 | - | 10 | % |
| Modulation Bandwidth(BW) | 25 | - | 25 | -1 | 25 | - | 25 | - | kHz |
| Input Impedance | 50 | - | 50 | - | 50 | - | 50 | - | kΩ |
| RMS Phase Jitter(Integrated 12kHz~20MHz) | | | | | | | | | |
| F0 < 100 MHz | - | 1 | - | 1 | - | 1 | - | 1 | pSec |
| 100 MHz ≤ F0 < 125 MHz | - | 0.7 | - | 0.7 | - | 0.7 | - | 0.7 | pSec |
| 125 MHz ≤ F0 < 150 MHz | 0.5 | - | 0.5 | - | 0.5 | - | 0.5 | - | pSec |
| 150 MHz ≤ F0 | 0.3 | - | 0.3 | - | 0.3 | - | 0.3 | - | pSec |
| Phase Noise | 100 Hz | | -80 | | 100 Hz | | -80 | | |
| | 1 kHz | | -110 | | 1 kHz | | -110 | | dBc/Hz |
| | 10 kHz | | -133 | | 10 kHz | | -133 | | dBc/Hz |
| Aging (@25°C 1st year) | - | ±3 | - | ±3 | - | ±3 | - | ±3 | ppm |
| Storage Temp. Range | -55 | 125 | -55 | 125 | -55 | 125 | -55 | 125 | °C |

Standard frequencies are frequencies which the crystal has been designed and does not imply a stock position.

* Transition times are measured between 20% and 80% of VDD.

Packing: Tape & Reel 1000/3000pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppm | |
|------------|-----|-----|
| | ±25 | ±50 |
| -10~+60 | △ | ○ |
| -20~+70 | △ | ○ |
| -40~+85 | X | ○ |

* 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

Series OCD

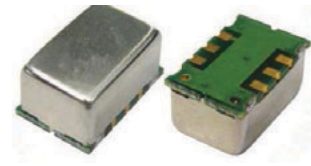
14.3 x 9.3 mm Oven Controlled Crystal Oscillator

FEATURE

- Dimension 14.3 x 9.3 x 6.5 mm typical.
- Stratum 3 (Overall ± 4.6 ppm including 10 years aging.)

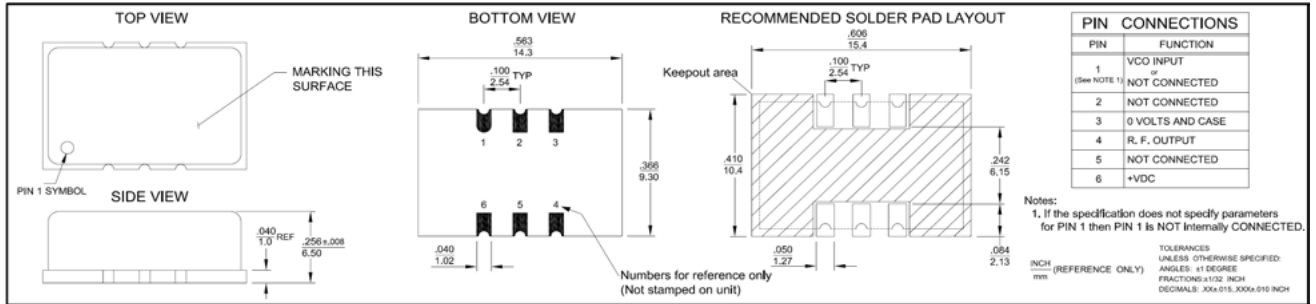
TYPICAL APPLICATION

- SDH/SONET , Telecommunication base station
- Test and measurement equipment
- Synthesizer , Digital switch , Reference Timing Circuit



RoHS Compliant Standard

DIMENSION



ELECTRICAL SPECIFICATION

| Parameter | Min. | Typ. | Max. | Unit | Test Condition & Notes |
|---------------------|-------|-------------|-------|--------|--|
| Output Frequency | | 20 | | MHz | Available frequency range is from 5MHz to 40MHz. Standard Frequencies are 10,12.8,15.36,19.2,20,25 and 38.88MHz. |
| Wave Form | | Rectangular | | | Sine wave output is available. Consult factory for more information |
| Level | | HCMOS | | | |
| "1" Level | 2.8 | | | V | |
| "0" Level | | | 0.4 | | |
| Load | | 15 | | pF | |
| Duty cycle | 45 | 50 | 55 | % | @+1.65 V |
| Spurious | | | -60 | dBc | |
| Frequency Stability | | | | | |
| Ambient | -0.1 | | +0.1 | ppm | -40 °C to +85 °C, referenced to +25 °C. Refer to Freq. Stability Vs Temp. Range table.. |
| Aging | | | | | |
| Daily | -5.0 | | +5.0 | ppb | Per day, at time of shipment |
| Yearly | -1.0 | | +1.0 | ppm | after 30 days |
| 10 years | -4.0 | | +4.0 | ppm | |
| Voltage | -20 | | +20 | ppb | $\pm 5\%$ Change |
| Warm-up | -0.1 | | +0.1 | ppm | In 5 minutes @ +25 °C, referenced to 1 hour |
| Phase Noise | | | -90 | | @10Hz |
| | | | -115 | dBc/Hz | @100Hz |
| | | | -135 | | @1KHz |
| | | | -145 | | @10KHz |
| Input Power | | | | | |
| Voltage | 3.135 | 3.3 | 3.465 | V | 5.0V Input voltage is available. Consult factory for Control voltage and output level. |
| Current | | | 500 | mA | @ turn on |
| Steady state | | 0.4 | 0.6 | W | @ +25 °C |

Packing: Tape & Reel, 500pcs per Reel.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppb ± 50 | ppb ± 100 | ppb ± 200 |
|------------|--------------|---------------|---------------|
| 0 ~ +70 | O | O | O |
| -30 ~ +70 | Δ | O | O |
| -40 ~ +85 | Δ | O | O |

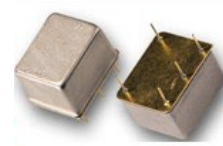
* O: Available Δ : Conditional X: Not available

Series OCW

20.6X20.6MM OCXO

FEATURE

- Dimension 20.6 x 20.6 x 11.0 mm typical.
- SC or AT Cut Crystal.

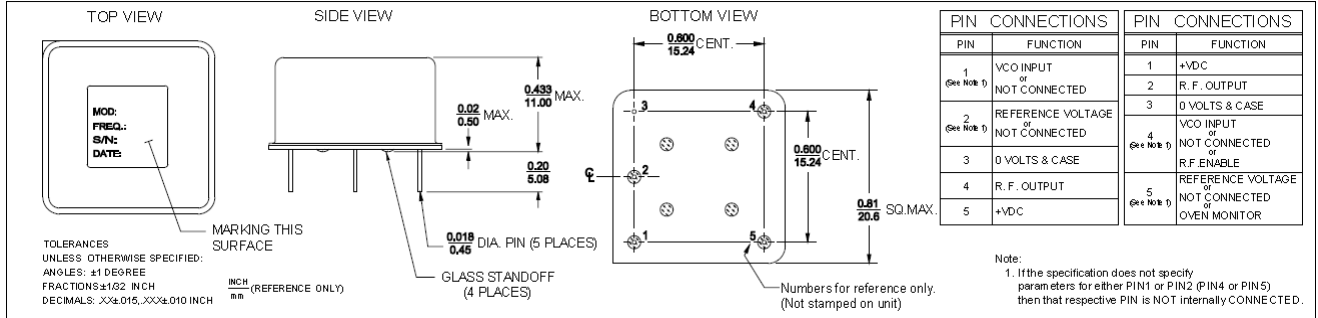


TYPICAL APPLICATION

- SDH/SONET , Telecommunication base station
- Test and measurement equipment
- Synthesizer , Digital switch , Reference Timing Circuit

RoHS Compliant Standard

DIMENSION



ELECTRICAL SPECIFICATION

| Parameter | Min. | Typ. | Max. | Unit | Test Condition & Notes |
|--|------|-------------|------|--------|--|
| Output Frequency | | 10 | | MHz | Available frequency range is from 5MHz to 40MHz. Standard Frequencies are 10, 12.8, 15.36, 16.384, 19.2, 20 and 25MHz. |
| Wave Form | | Rectangular | | | Sine wave output is available. Consult factory for more information |
| Level | | HCMOS | | | |
| "1" Level | +3.5 | | | V | |
| "0" Level | | | +0.5 | | |
| Load | | 15 | | pF | |
| Duty cycle | 45 | 50 | 55 | % | @+2.0 V |
| Spurious | | | -60 | dBc | |
| Frequency Stability | | | | | |
| Ambient | -10 | | +10 | ppb | -30 °C to +70 °C, referenced to +25 °C Refer to Freq. Stability Vs Temp. Range table.. |
| Aging | -0.5 | | +0.5 | ppb | Per day, at time of shipment |
| Daily | -0.5 | | +0.5 | ppb | after 30 days |
| Yearly | -50 | | +50 | ppb | |
| 10 years | -0.3 | | +0.3 | ppm | |
| Voltage | -0.5 | | +0.5 | ppb | ±5% Change |
| Warm-up | -50 | | +50 | ppb | In 3 minutes @ +25 °C, referenced to 1 hour |
| Phase Noise | | | -115 | | @10Hz |
| | | | -135 | dBc/Hz | @100Hz |
| | | | -145 | | @1KHz |
| | | | -150 | | @10KHz |
| Electrical Frequency Adjustment | | | | | |
| Range | | | -0.5 | ppm | V _{co} @ 0 V |
| | +0.5 | | | ppm | V _{co} @ +4.0V |
| Control | 0 | 2.0 | 4.0 | V | |
| Slope | | Positive | | | |
| Input impedance | 100 | | | KΩ | |
| Input Power | | | | | |
| Voltage | 4.75 | 5.0 | 5.25 | V | 3.3V Input voltage is available. Consult factory for Control voltage and output level. |
| Current | | | 500 | mA | @ turn on |
| Steady state | | | 1.0 | W | @ +25 °C |
| Reference Voltage | | | | | |
| Voltage | 3.8 | 4.0 | 4.2 | V | |
| Load | 9 | | | KΩ | |
| Temperature Stability | -0.1 | | +0.1 | V | Over temperature range |

Packing: 40 pcs/Box, 5 boxes/Cartron, 200 pcs/Cartron.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppb | | |
|------------|-----|-----|-----|
| | ±5 | ±10 | ±20 |
| 0~+70 | O | O | O |
| -30 ~ +70 | △ | O | O |
| -40 ~ +85 | △ | O | O |

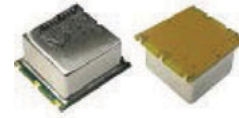
* O: Available △: Conditional X: Not available

Series OSD

25.4 x 22.1 mm Oven Controlled Crystal Oscillator

FEATURE

- Dimension 25.4 x 22.1 x 11.0 mm typical.
- SC or AT Cut Crystal.

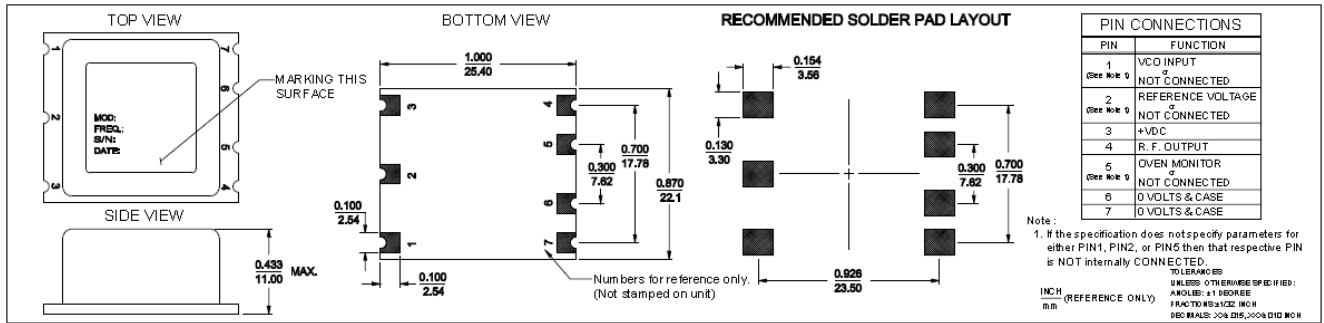


TYPICAL APPLICATION

- SDH/SONET , Telecommunication base station
- Test and measurement equipment
- Synthesizer , Digital switch , Reference Timing Circuit

RoHS Compliant Standard

DIMENSION



ELECTRICAL SPECIFICATION

| Parameter | Min. | Typ. | Max. | Unit | Test Condition & Notes |
|--|-------|-------------|-------|------|--|
| Output Frequency | | 10 | | MHz | Available frequency range is from 5MHz to 40MHz. Standard Frequencies are 10, 12.8, 15.36, 16.384, 19.2, 20 and 25MHz. |
| Wave Form | | Rectangular | | | Sine wave output is available. Consult factory for more information |
| Level | | HCMOS | | | |
| "1" Level | +2.8 | | | V | |
| "0" Level | | | +0.4 | V | |
| Load | | 15 | | pF | |
| Duty cycle | 45 | 50 | 55 | % | @ +1.4 V |
| Spurious | | | -60 | dBc | |
| Frequency Stability Ambient | -10 | | +10 | ppb | 0 °C to +70 °C, referenced to +25 °C. Refer to Freq. Stability Vs Temp. Range table.. |
| Aging | -0.5 | | +0.5 | ppb | Per day, at time of shipment |
| Daily | -0.5 | | +0.5 | ppb | after 30 days |
| Yearly | -50 | | +50 | ppb | |
| 10 years | -0.3 | | +0.3 | ppm | |
| Voltage | -0.5 | | +0.5 | ppb | ±5% Change |
| Warm-up | -10 | | +10 | ppb | In 2 minutes @ +25 °C, referenced to 1 hour |
| Phase Noise | | | -120 | | @ 10Hz |
| | | | -135 | | @ 100Hz |
| | | | -145 | | @ 1KHz |
| | | | -150 | | @ 10KHz |
| Electrical Frequency Adjustment Range | | | -0.5 | ppm | V _{CO} @ 0 V |
| | +0.5 | | | ppm | V _{CO} @ +2.8V |
| Control Slope | 0 | 1.4 | 2.8 | V | |
| Input impedance | 100 | | | KΩ | |
| Input Power Voltage | 3.135 | 3.3 | 3.465 | V | 5.0V Input voltage is available. Consult factory for Control voltage and output level. |
| Current | | | 1000 | mA | @ turn on |
| Steady state | | | 0.8 | W | @ +25 °C |
| Reference Voltage Voltage | 2.7 | 2.8 | 2.9 | V | |
| Load | 9 | | | KΩ | |
| Temperature Stability | -0.1 | | +0.1 | V | Over temperature range |

Packing: 125pcs per reel.

FREQ. STABILITY vs. TEMP. RANGE

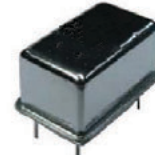
| Temp. (°C) | ±5 | ±10 | ±20 |
|------------|----|-----|-----|
| 0 ~ +70 | ○ | ○ | ○ |
| -30 ~ +70 | △ | ○ | ○ |
| -40 ~ +85 | △ | ○ | ○ |

* ○: Available △: Conditional X: Not available

Series OCH 20.3 x 12.7 mm Oven Controlled Crystal Oscillator

FEATURE

- Dimension 20.3 x 12.7 x 11.0 mm typical.
- Stratum 3 (Overall ± 4.6 ppm including 10 years aging.)

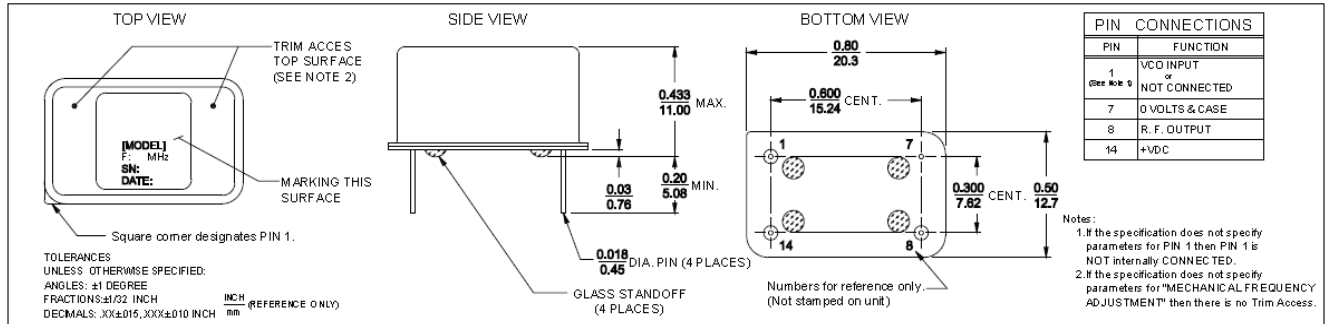


TYPICAL APPLICATION

- SDH/SONET , Telecommunication base station
- Test and measurement equipment
- Synthesizer , Digital switch , Reference Timing Circuit

RoHS Compliant Standard

DIMENSION



ELECTRICAL SPECIFICATION

| Parameter | Min. | Typ. | Max. | Unit | Test Condition & Notes |
|---------------------------------------|------|-------------|------|------------|--|
| Output Frequency | | 10 | | MHz | Available frequency range is from 5MHz to 40MHz. Standard Frequencies are 10, 12.8, 15.36, 19.2, 20, 26 and 38.8MHz. |
| Wave Form | | Rectangular | | | Sine wave output is available. Consult factory for more information |
| Level | | HCMOS | | | |
| "1" Level | 3.5 | | | V | |
| "0" Level | | | 0.5 | V | |
| Load | | 15 | | pF | |
| Duty cycle | 45 | 50 | 55 | % | @ +2.0 V |
| Spurious | | | -60 | dBc | |
| Frequency Stability Ambient | -0.1 | | +0.1 | ppm | -30 °C to +70 °C, referenced to +25 °C Refer to Freq. Stability Vs Temp. Range table.. |
| Aging | -5.0 | | +5.0 | ppb | Per day, at time of shipment |
| Daily | -5.0 | | +5.0 | ppb | after 30 days |
| Yearly | -0.5 | | +0.5 | ppm | |
| 10 years | -3.0 | | +3.0 | ppm | |
| Voltage | -50 | | +50 | ppb | $\pm 5\%$ Change |
| Warm-up | -0.1 | | +0.1 | ppm | In 2 minutes @ +25 °C, referenced to 1 hour |
| Phase Noise | | | -105 | dBc/Hz | @ 10Hz |
| | | | -130 | dBc/Hz | @ 100Hz |
| | | | -140 | dBc/Hz | @ 1KHz |
| | | | -150 | dBc/Hz | @ 10KHz |
| Electrical Frequency Adjustment Range | | | -5.0 | ppm | Vco @ 0 V |
| | +5.0 | | | ppm | Vco @ +5.0V |
| Control | 0 | 2.5 | 5.0 | V | |
| Slope | | Positive | | | |
| Input impedance | 100 | | | K Ω | |
| Input Power Voltage | 4.75 | 5.0 | 5.25 | V | 3.3V Input voltage is available. Consult factory for Control voltage and output level. |
| Current | | | 400 | mA | @ turn on |
| Steady state | | | 0.8 | W | @ +25 °C |

Packing: 100 pcs/Box, 5 boxes/Carton, 500 pcs/Carton.

FREQ. STABILITY vs. TEMP. RANGE

| Temp. (°C) | ppb ± 50 | ppb ± 100 | ppb ± 200 |
|------------|--------------|---------------|---------------|
| 0 ~ +70 | O | O | O |
| -30 ~ +70 | Δ | O | O |
| -40 ~ +85 | Δ | O | O |

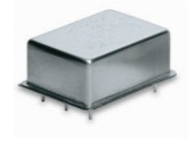
* O: Available Δ : Conditional X: Not available

Series OSH

36.3X27.2MM OCXO

FEATURE

- Dimension 36.3 x 27.2 x 12.7 mm typical.
- SC Cut Crystal.

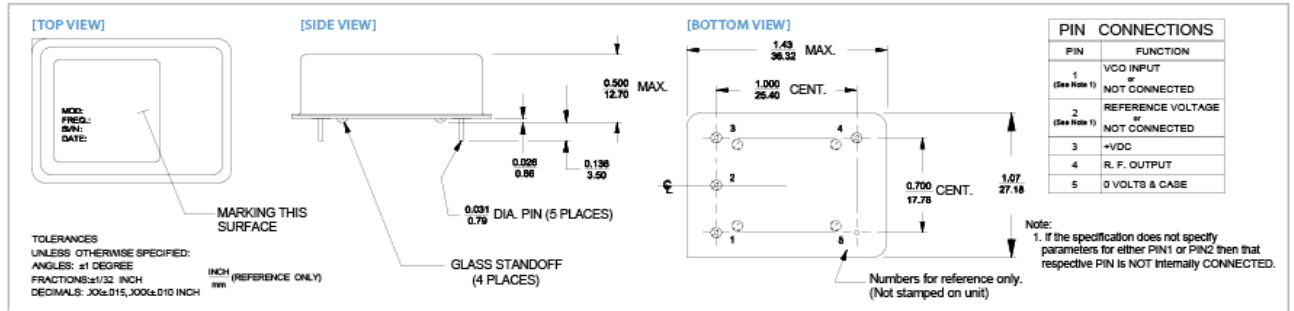


TYPICAL APPLICATION

- SDH/SONET , Telecommunication base station
- Test and measurement equipment
- Synthesizer , Digital switch , Reference Timing Circuit

RoHS Compliant Standard

DIMENSION



ELECTRICAL SPECIFICATION

| Parameter | Min. | Typ. | Max. | Unit | Test Condition & Notes |
|--|------|--------------|------|--------|---|
| Output Frequency | | 10 | | MHz | Available frequency range is from 5MHz to 40MHz. Standard Frequencies are 10,12.8,13,15.36,19.2,20,25 and 38.88MHz. |
| Wave Form | | Rectangular | | | Sine wave output is available. Consult factory for more information |
| Level | | LVTTTL | | | |
| "1" Level | 2.4 | 2.8 | | V | |
| "0" Level | | | 0.4 | V | |
| Load | | 15 | | pF | |
| Duty cycle | 45 | 50 | 55 | % | @+1.4 V |
| Spurious | | | -60 | dBc | |
| Frequency Stability | | | | | |
| Ambient | -5.0 | | +5.0 | ppb | -40 °C to +85 °C, referenced to +25 °C Refer to Freq. Stability Vs Temp. Range table.. |
| Aging | -0.5 | | +0.5 | ppb | Per day, at time of shipment |
| Daily | -0.5 | | +0.5 | ppb | after 30 days |
| Yearly | -50 | | +50 | ppb | |
| 10 years | -0.3 | | +0.3 | ppm | |
| Voltage | -0.5 | | +0.5 | ppb | ±5% Change |
| Warm-up | -10 | | +10 | ppb | In 10 minutes @ +25 °C, referenced to 1 hour |
| Phase Noise | | | -120 | dBc/Hz | @10Hz |
| | | | -135 | dBc/Hz | @100Hz |
| | | | -145 | dBc/Hz | @1KHz |
| | | | -150 | dBc/Hz | @10KHz |
| Electrical Frequency Adjustment | | | | | |
| Range | | | -0.5 | ppm | Vco @ 0 V |
| | +0.5 | | | ppm | Vco @ +5.0V |
| Control Slope | 0 | 2.5 Positive | 5.0 | V | |
| Input pedance | 100 | | | KΩ | |
| Input Power | | | | | |
| Voltage | 4.75 | 5.0 | 5.25 | V | 3.3V Input voltage is available. Consult factory for Control voltage and output level. |
| Current | | | 850 | mA | @ turn on |
| Steady state | | | 1.3 | W | @ +25 °C |

Packing: 40 pcs/Box, 5 boxes/Carton, 200 pcs/Carton.

FREQ. STABILITY vs. TEMP. RANGE

| ppb | ±3 | ±5 | ±10 |
|------------|----|----|-----|
| Temp. (°C) | | | |
| 0~+70 | O | O | O |
| -30~+70 | △ | O | O |
| -40~+85 | △ | O | O |

* O: Available △: Conditional X: Not available