

# WTL 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

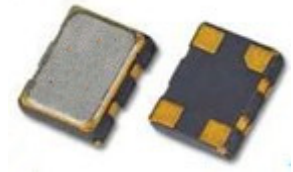
# VC5 Series

## 5.0x3.2mm SMD VCTCXO



### FEATURE

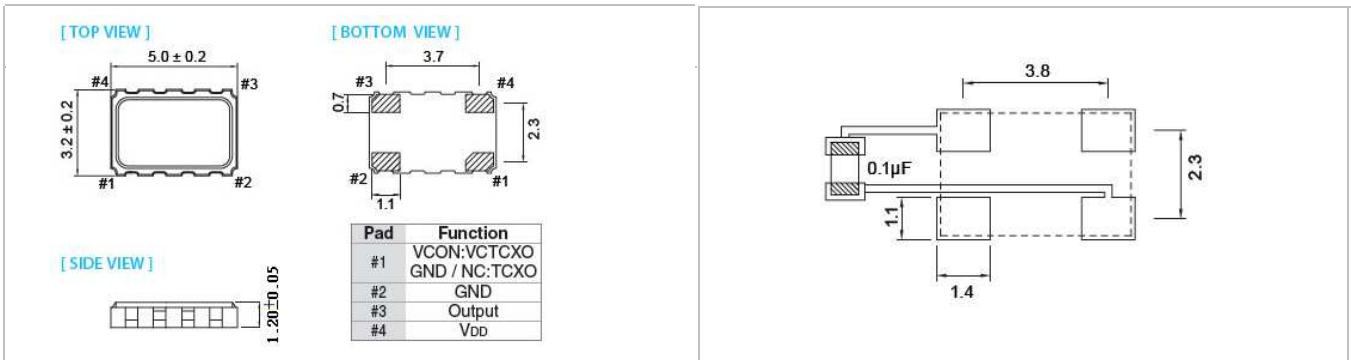
- Typical 5.0 x 3.2 x 1.15 mm ceramic SMD package
- For automatic assembly
- Compactness and light weight
- Low power consumption
- CMOS and Clipped Sine Wave (Without DC-CUT capacitor) output optional.



### 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		
	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

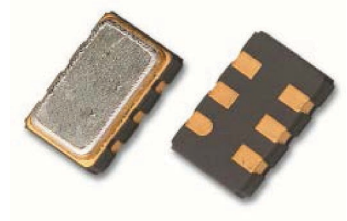
# Series CV7

## 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

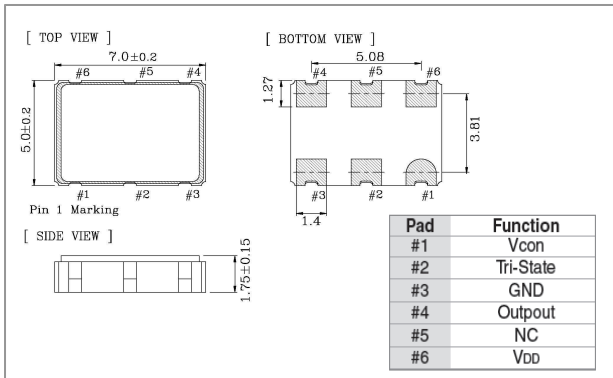


### TYPICAL APPLICATION

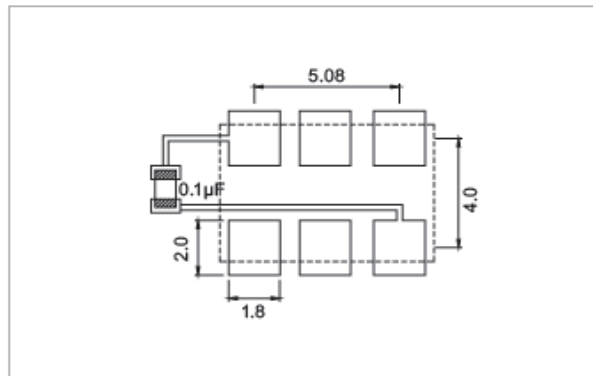
- Set-top Box, HDTV
- Wimax/WLAN
- Xdsl/VoIP, Cable modem

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	-	-	10	mA
	20MHz ≤ F0 < 50 MHz	15	-	20	
	50MHz ≤ F0 ≤ 80 MHz	-	-	30	
	80MHz < F0 < 160 MHz	35	-	40	
	160MHz ≤ F0 ≤ 200 MHz	-	-	50	
Output Level(CMOS)					
Output High (Logic "1")	90%VDD	-	90%VDD	-	V
Output Low (Logic "0")	-	10%VDD	-	10%VDD	
Transition Time : Rise/ Fall Time*					
1.5MHz ≤ F0 < 20 MHz	-	4	-	5	nSec
20MHz ≤ F0 < 50 MHz	-	3	-	4	
50MHz ≤ F0 ≤ 80 MHz	-	2	-	3	
80MHz < F0 ≤ 200 MHz	-	-	-	2	
Start Time	-	5	-	5	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	
Absolute Clock Period Jitter	-	40	-	40	pSec
RMS Phase Jitter(Integrated 12 KHz~20 MHz)	-	1	-	1	pSec
Linearity	-	10	-	10	%
Modulation Bandwidth(BW)					
1.5MHz ≤ F0 ≤ 175 MHz	15	-	15	-	KHz
175MHz < F0 ≤ 200 MHz	45	-	45	-	
Input Impedance					
1.5MHz ≤ F0 < 100 MHz	2000	-	2000	-	KΩ
100MHz ≤ F0 ≤ 200 MHz	50	-	50	-	
Phase Noise @35.328 MHz					
100 Hz	-	-80	-	-80	dBc/Hz
1 KHz	-	-130	-	-130	
10 KHz	-	-140	-	-140	
Aging ( @25°C 1st year)	-	±3	-	±3	
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 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 (1<sup>st</sup> year), shock, and vibration

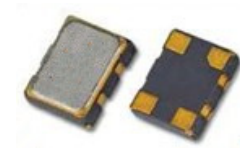
# VC2 Series

## 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



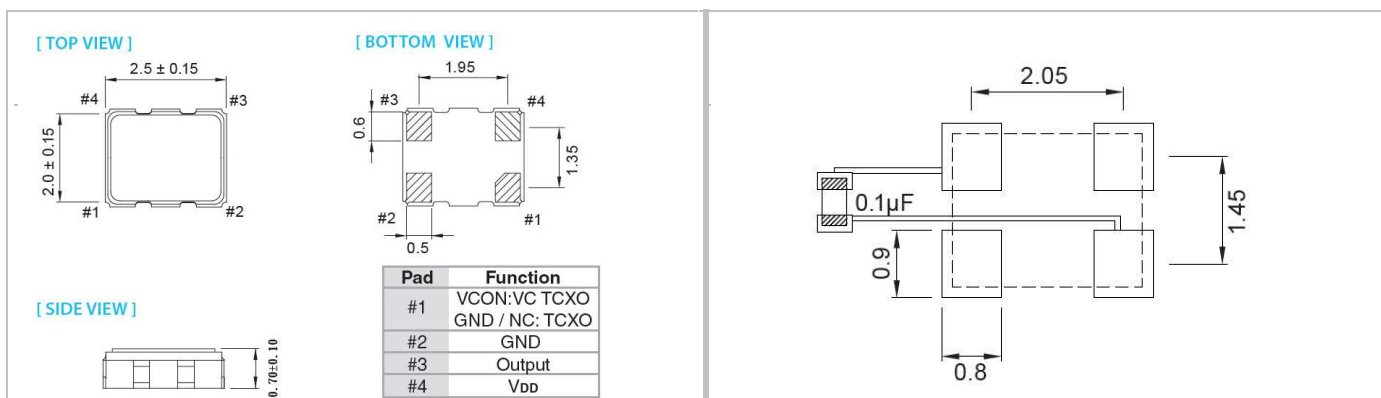
### TYPICAL APPLICATION

- 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							
1 KHz	-115		-115		-115		dBc/Hz
10 KHz	-135		-135		-135		
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



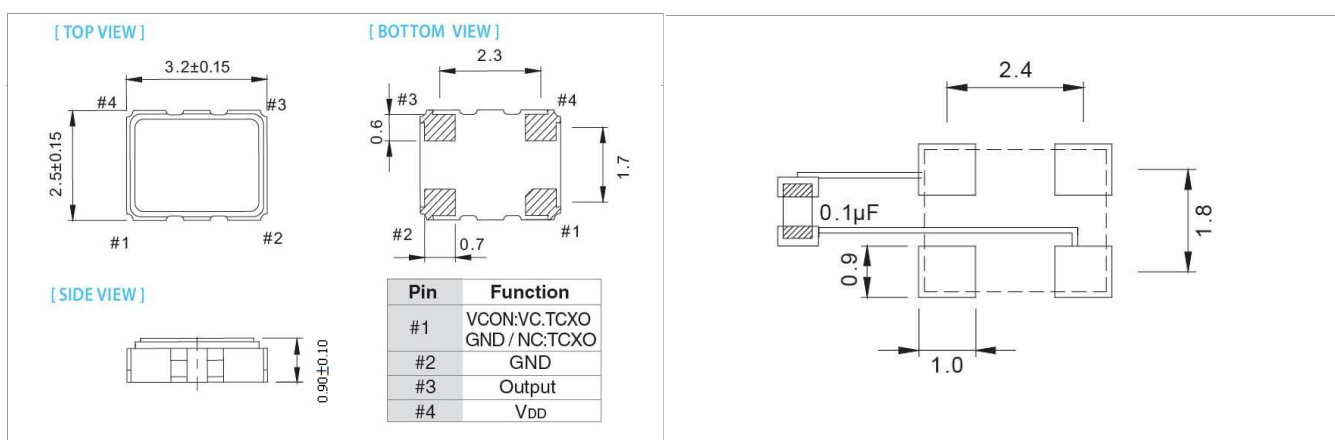
**RoHS Compliant Standard**

### 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 <sup>st</sup> year)	-	±1.0	-	±1.0	-	±1.0	ppm
Supply Current 10 MHz ≤ F0 < 26	-	2.0	-	2.0	-	2.0	mA
26 MHz ≤ F0 ≤ 52	-	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)	0.5	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

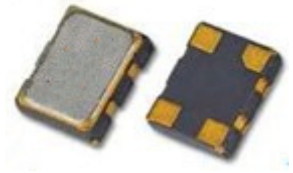
# VC5 Series

## 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.

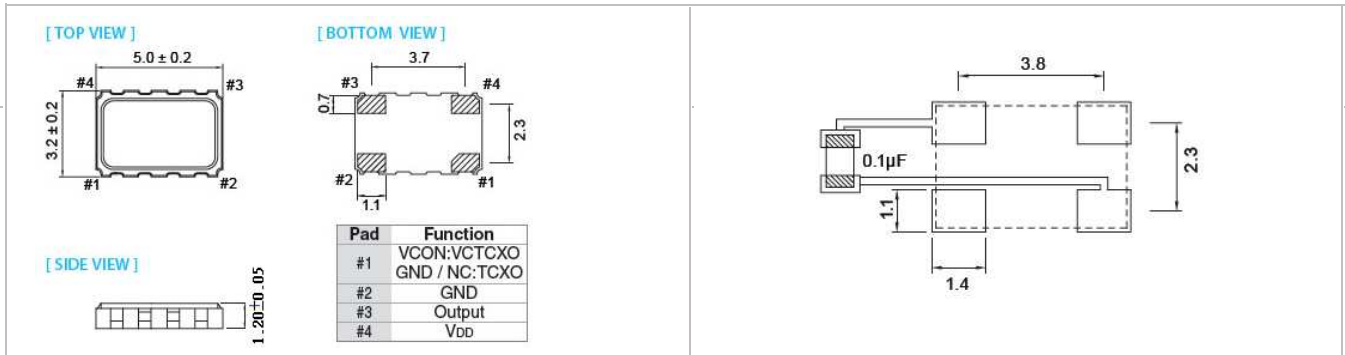


### TYPICAL APPLICATION

- 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")		10% VDD		
	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

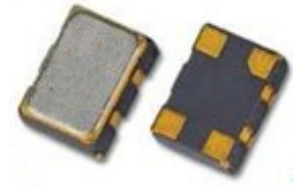
# Series VH5

50x32mm SMD High Precision Voltage Controlled Temperature Compensated Crystal Oscillator



## FEATURE

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

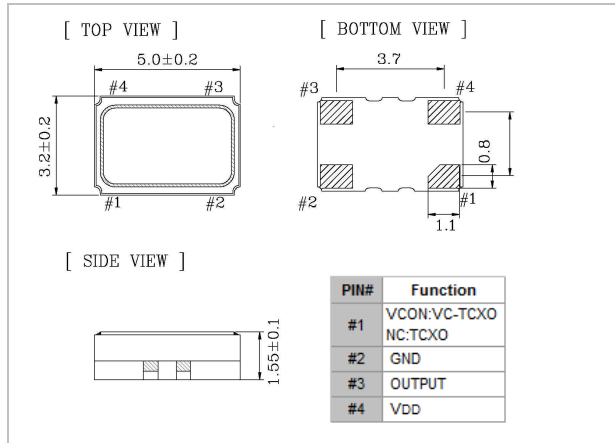


## TYPICAL APPLICATION

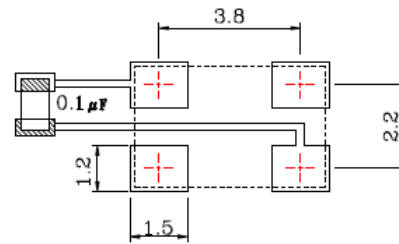
- Base Stations, Stratum 3
- Femtocell

**RoHS Compliant Standard**

## DIMENSION (mm)



## SOLDER PAD LAYOUT (mm)



☆ To ensure optimal oscillator performance, Place a by-pass capacitor of 0.1µF as close to the part as possible between Vdd and GND pads.

## 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*	-	$\pm 2.0$	-	$\pm 2.0$	ppm
Frequency Stability					
Vs Supply Voltage ( $\pm 5\%$ ) change (CMOS)	-	$\pm 0.2$	-	$\pm 0.2$	ppm
Vs Load ( $\pm 10\%$ ) change	-	$\pm 0.2$	-	$\pm 0.2$	ppm
Vs Aging (after 1 year)	-	$\pm 1.0$	-	$\pm 1.0$	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)	10K $\Omega$ /10pF		10K $\Omega$ /10pF		
Control Voltage Range (VCTCXO)	0.5	2.5	0.5	2.5	V
Pulling Range (VCTCXO)	$\pm 5.0$	$\pm 10.0$	$\pm 5.0$	$\pm 10.0$	ppm
Vc Input Impedance (VCTCXO)	100	-	100	-	K $\Omega$
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	$^{\circ}\text{C}$

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

\*Frequency at 25  $^{\circ}\text{C}$  1 hour after reflow

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

## FREQ. STABILITY vs. TEMP. RANGE

Temp. ( $^{\circ}\text{C}$ )	ppm	$\pm 0.05$	$\pm 0.1$	$\pm 0.2$	$\pm 0.28$	$\pm 0.5$
0~+55		O	O	O	O	O
-10~+60		O	O	O	O	O
-10~+70		$\Delta$	O	O	O	O
-40~+85		X	X	$\Delta$	O	O

\* O: Available  $\Delta$ : 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

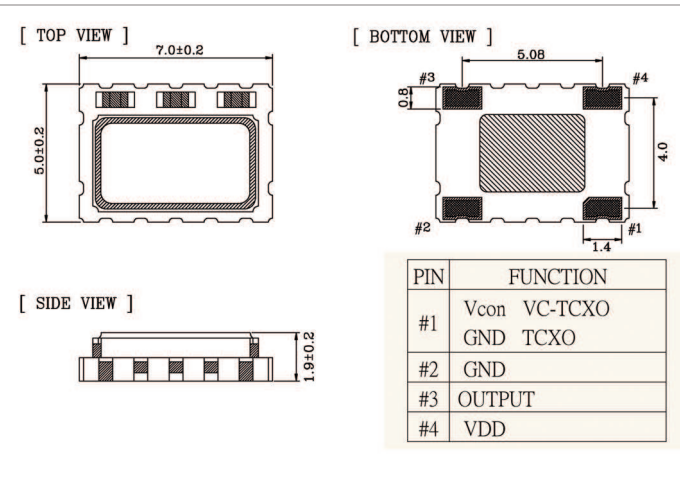


## TYPICAL APPLICATION

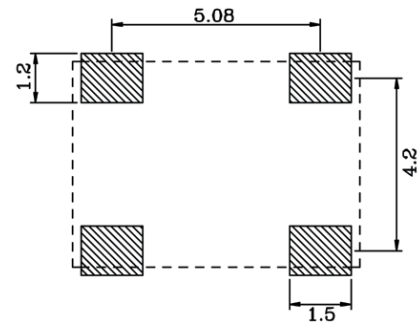
- Femtocell, Base Stations
- WLAN/WiMAX/WiFi, Wireless Communications

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 <sub>DD</sub>	-	90% V <sub>DD</sub>	-	V
Output Low (Logic "0")	-	10% V <sub>DD</sub>	-	10% V <sub>DD</sub>	V
Duty	45	55	45	55	%
Output Level (Clipped Sine Wave)	0.8	-	0.8	-	V <sub>p-p</sub>
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	○	○	○	○	○
-10~+60	○	○	○	○	○
-10~+70	△	○	○	○	○
-40~+85	X	X	X	○	○

\* O: Available △: Conditional X: Not available



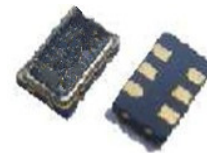
# TP5 Series

## 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

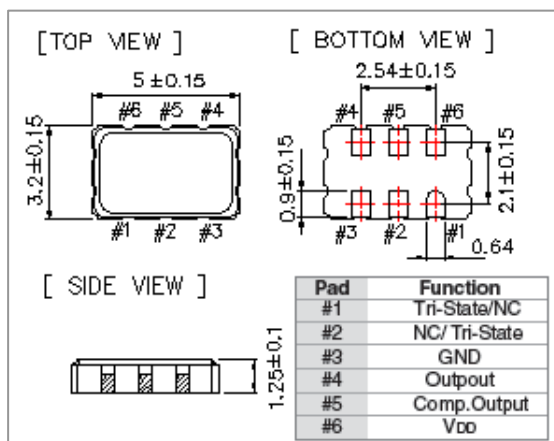


### TYPICAL APPLICATION

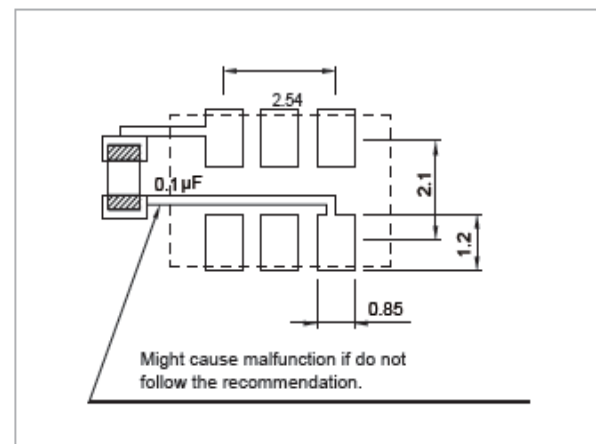
- 10G-BIT, Ethernet, Fiber Channel, Storage Area Network, SONET
- Enterprise Servers, Reference clocks for ADC and DAC
- Telecom

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 <sub>DD</sub> ) 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 <sub>o</sub> < 160 MHz		75		50		50		mA
	160 MHz ≤ F <sub>o</sub> < 250 MHz		100		50		50		
	250 MHz ≤ F <sub>o</sub> ≤ 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 <sup>+</sup>	-		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 <sub>DD</sub>		-		0.7 V <sub>DD</sub>		V
	Disable (Low voltage or GND)		-		0.3 V <sub>DD</sub>		-		
RMS Phase Jitter (Integrated 12 KHz ~ 20 MHz)									
	80 MHz ≤ F <sub>o</sub> < 125 MHz		0.9		-		0.9		pSec
	125 MHz ≤ F <sub>o</sub> < 150 MHz		0.7		-		0.7		
	150 MHz ≤ F <sub>o</sub> < 200 MHz		0.5		-		0.5		
	200 MHz ≤ F <sub>o</sub>		0.3		-		0.3		
Phase Noise	100 Hz		-70		-		-70		dBc/Hz
	1 KHz		-100		-		-100		
	10 KHz		-125		-		-125		
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 V<sub>DD</sub>.

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 (1<sup>st</sup> year), shock, and vibration

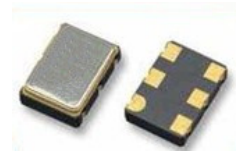
# TU7 Series

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



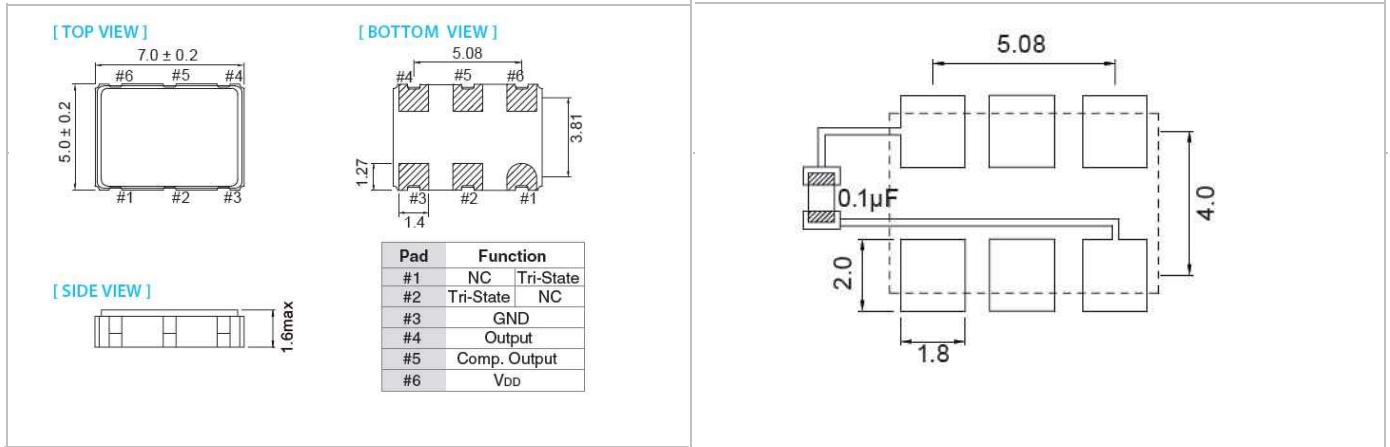
## TYPICAL APPLICATION

- 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	○

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

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

# TL7 Series

## 7.0\*5.0mm SMD PECL/LVDS Crystal Oscillator

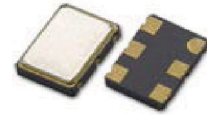


### FEATURE

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

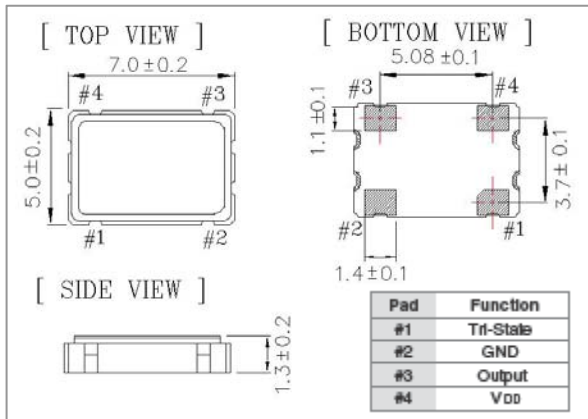
### TYPICAL APPLICATION

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

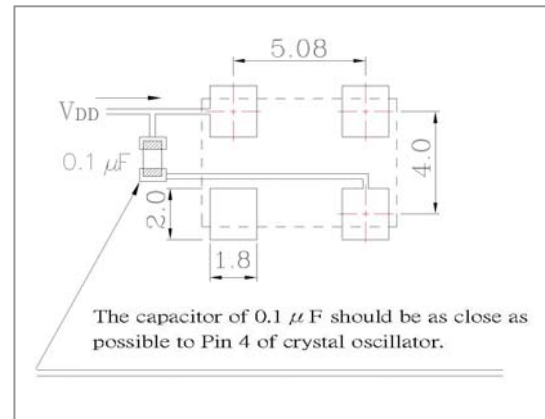


**RoHS Compliant Standard**

### 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 (±10%)	-2	2	-2	2	-2	2	ppm
Supply Current	1MHz ≤ F0 ≤ 110MHz		-		-		mA
	110MHz < F0 ≤ 166MHz		-		-		
	166MHz < F0 ≤ 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 <sup>+</sup>	-						
1MHz ≤ F0 ≤ 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 <sup>*</sup>	-	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.

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

<sup>\*</sup> 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

<sup>\*</sup> Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1<sup>st</sup> 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

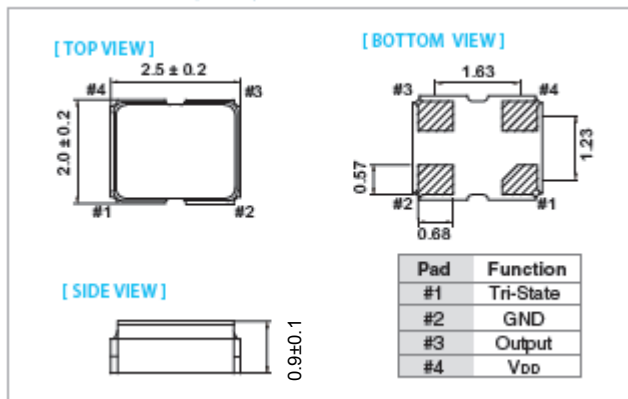


### TYPICAL APPLICATION

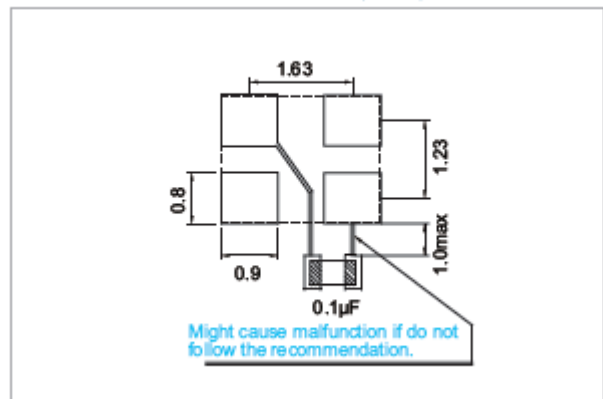
- WLAN/WiMax,
- Mobile Phone
- DSC, Set-top Box, HDTV

**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	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 <sup>+</sup>							
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 (1<sup>st</sup> year), shock, and vibration

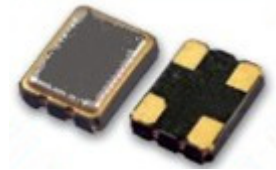
# Series TC3

## 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

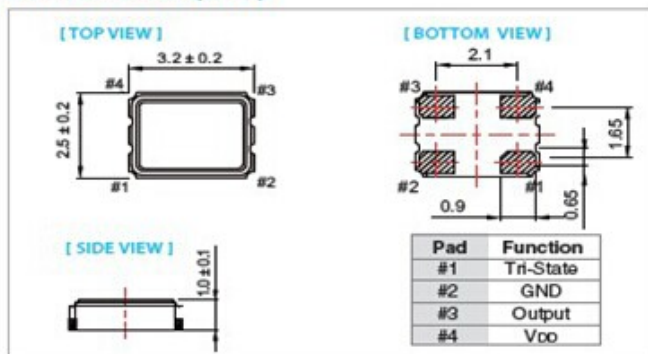


RoHS Compliant Standard

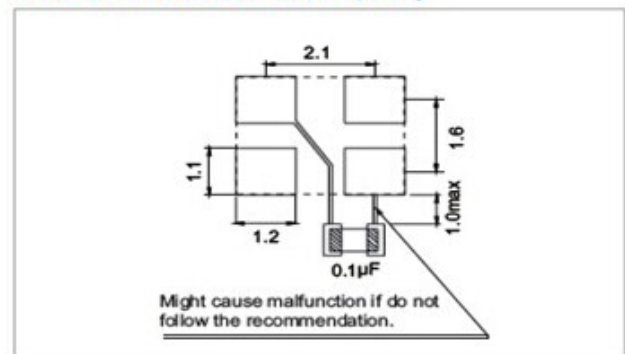
### TYPICAL APPLICATION

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

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

<sup>+</sup> Transition times are measured between 10% and 90% of V<sub>DD</sub>, 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

<sup>+</sup> Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1<sup>st</sup> 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

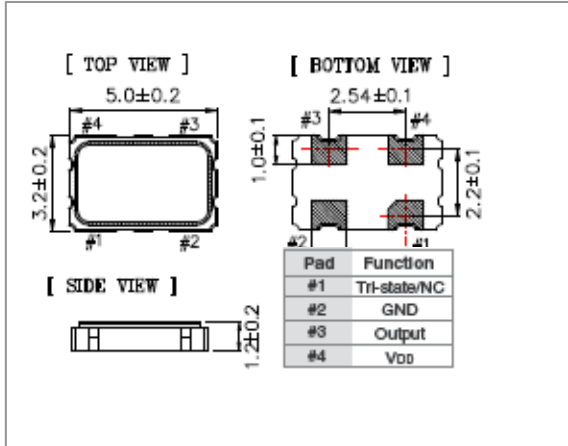
### TYPICAL APPLICATION

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

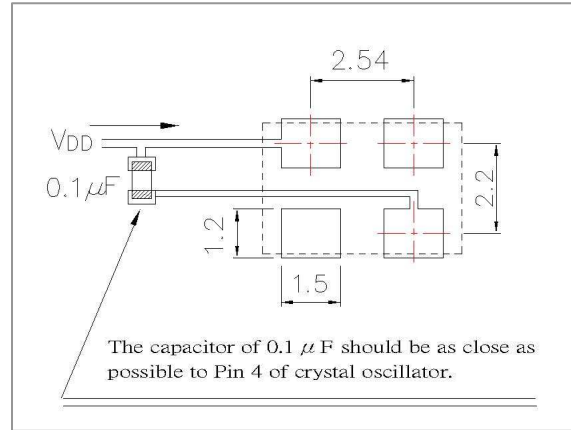


RoHS Compliant Standard

### 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 (VDD) 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 $\leq$ F0 $\leq$ 93 KHz	-	1	-	0.5	-	0.1	mA
0.3125MHz $\leq$ F0 $\leq$ 50 MHz (A1)	-	10	-	8	-	7	
40MHz $\leq$ F0 < 75MHz	-	20	-	18	-	15	
75MHz $\leq$ F0 <133MHz	-	35	-	30	-	25	
133MHz $\leq$ F0	-	45	-	40	-	-	
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 <sup>+</sup>							
13.7KHz $\leq$ F0 $\leq$ 70KHz	-	50	-	50	-	50	nSec
0.3125MHz $\leq$ F0 < 100MHz	-	5	-	5	-	5	
100MHz $\leq$ F0	-	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)	0.7VDD	-	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 (Integated 12KHz~20MHz)	-	1	-	1	-	1	pSec
Standby Current	-	10	-	10	-	10	$\mu$ A
Aging ( @25°C 1st year)	-	$\pm$ 3	-	$\pm$ 3	-	$\pm$ 3	ppm
Storage Temp. Range	-55	125	-55	125	-55	125	$^{\circ}$ C

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

<sup>+</sup> 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. ( $^{\circ}$ C)	ppm	$\pm$ 20	$\pm$ 25	$\pm$ 50
-10 ~ +60		○	○	○
-20 ~ +70		△	○	○
-40 ~ +85		△	○	○

\* ○: Available △: Conditional X: Not available

\* Inclusive of calibration @ 25  $^{\circ}$ C, operating temperature range, input voltage variation, load variation, aging (1<sup>st</sup> year), shock, and vibration

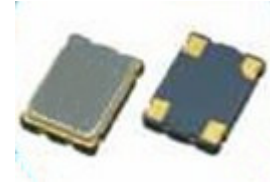
# Series TC7

## 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

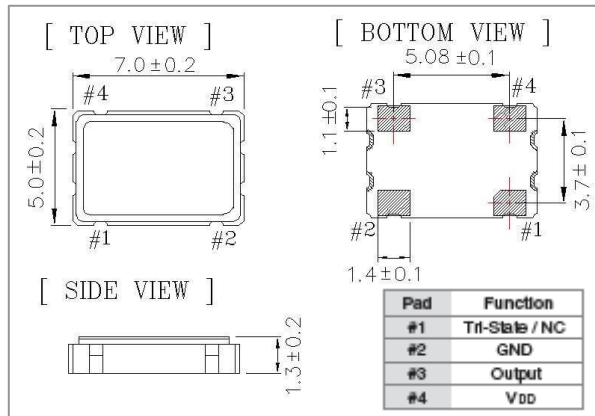


### TYPICAL APPLICATION

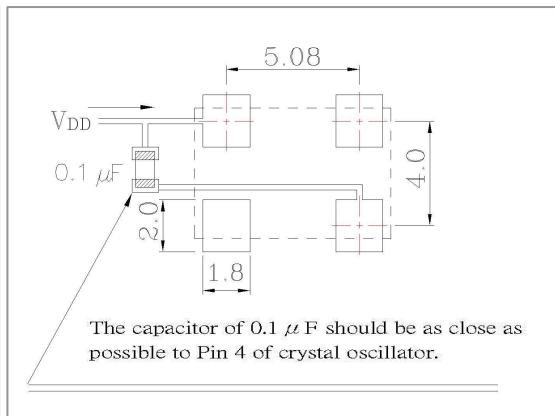
- xDSL, WLAN, Fiber/10G-Bit Ethernet
- Notebook, PDA
- PC main board, VGA card

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 $\leq$ F0 $\leq$ 70KHz	-	1	-	0.5	-	0.1	mA
0.3125MHz $\leq$ F0 $\leq$ 35.328MHz (A1)	-	10	-	8	-	7	
30MHz $\leq$ F0 < 75MHz	-	20	-	18	-	15	
75MHz $\leq$ F0 < 133MHz	-	35	-	30	-	25	
133MHz $\leq$ 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 $\leq$ F0 $\leq$ 70KHz	-	50	-	50	-	50	nSec
0.3125MHz $\leq$ F0 < 100MHz	-	5	-	5	-	5	
100MHz $\leq$ F0	-	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)	0.7VDD	-	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	-	10	-	10	-	10	$\mu$ A
Aging ( @ 25°C 1st year)	-	$\pm$ 3	-	$\pm$ 3	-	$\pm$ 3	ppm
Storage Temp. Range	-55	125	-55	125	-55	125	$^{\circ}$ 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. ( $^{\circ}$ C)	ppm	$\pm$ 20	$\pm$ 25	$\pm$ 50
-10 - +60		○	○	○
-20 - +70		△	○	○
-40 - +85		△	○	○

○: Available △: Conditional X: Not available

\* Inclusive of calibration @ 25  $^{\circ}$ C, operating temperature range, input voltage variation, load variation, aging (1<sup>st</sup> year), shock, and vibration

# Series TB2

## 2.5X2.0 MM SMD Crystal Oscillator



### FEATURE

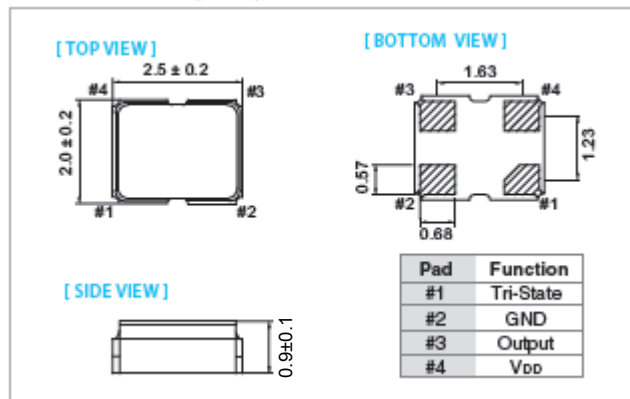
- Typical 2.5 x 2.0 x 0.9 mm ceramic SMD package.
- Tight symmetry (45 to 55%) available.
- Operation voltage: 1.8V, 2.5V, 3.3V
- Tri-state enable/disable



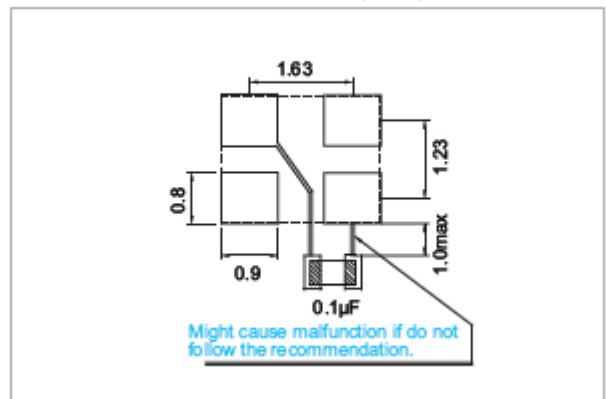
### TYPICAL APPLICATION

- 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 <sup>+</sup>							
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 <sup>**</sup>	-	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.

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

<sup>\*\*</sup> 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 (1<sup>st</sup> year), shock, and vibration



# Series TB3

## 3.2X2.5 MM SMD Crystal Oscillator

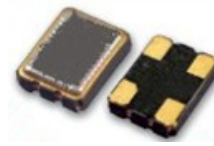


### FEATURE

- 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

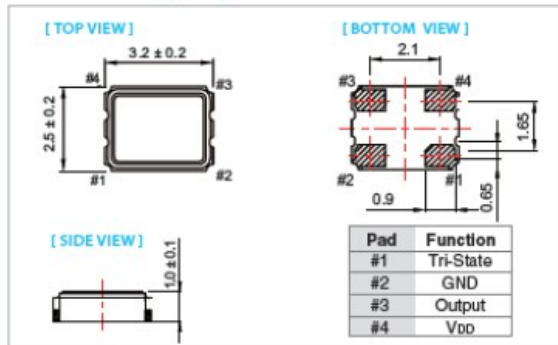
### TYPICAL APPLICATION

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

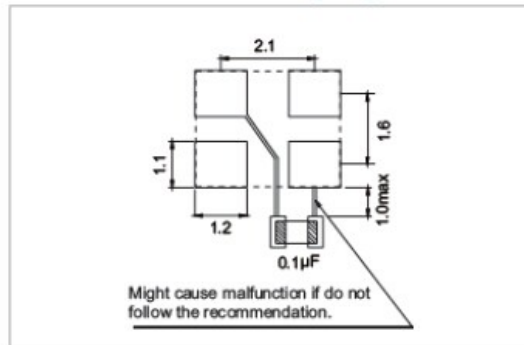


RoHS Compliant Standard

### 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.	
<b>Supply Voltage Variation (VDD) 10%</b>	2.97	3.63	2.25	2.75	1.62	1.98	V
<b>Frequency Range</b>	1	200	1	166	1	100	MHz
<b>VDD Sensitivity (±10 %)</b>	-2	2	-2	2	-2	2	ppm
<b>Supply Current</b>							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	-	-	-	-	
<b>Duty Cycle</b>	45	55	45	55	45	55	%
<b>Output Level (CMOS)</b>							V
Output High (Logic "1")	90%VDD	-	90%VDD	-	90%VDD	-	
Output Low (Logic "0")	-	10%VDD	-	10%VDD	-	10%VDD	
<b>Transition Time: Rise/Fall Time<sup>+</sup></b>							nSec
1 MHz ≤ Fo < 10 MHz	-	3	-	4	-	5	
10 MHz ≤ Fo	-	2	-	3	-	4	
<b>Start Time</b>	-	2	-	2	-	2	mSec
<b>Tri-State (Input to Pin 1)</b>							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	
<b>Absolute Clock Period Jitter</b>							pSec
Specific Frequency <sup>*</sup>	-	40	-	40	-	40	
Others	-	200	-	200	-	200	
<b>Standby Current</b>	-	15	-	15	-	15	µA
<b>Aging (@ 25°C 1st year)</b>	-	±3	-	±3	-	±3	ppm
<b>Storage Temp. Range</b>	-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

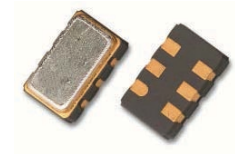
\* Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1<sup>st</sup> year), shock, and vibration

**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**

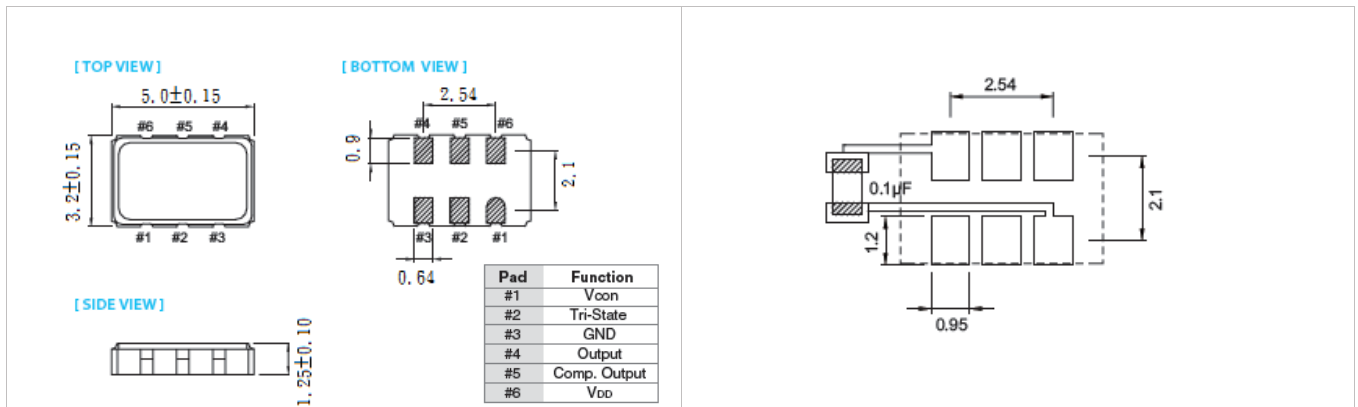
- Set-top Box, HDTV
- Wimax/WLAN
- xDSL/ VoIP, Cable modem



**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 (V <sub>DD</sub> ) 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 ≤ F <sub>0</sub> ≤ 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 <sup>+</sup>	-	1.0	-	1.0	nSec
Start Time	-	3	-	3	mSec
Tri-State(Input to Pin 2)					
Enable(High voltage or floating)	0.7V <sub>DD</sub>	-	0.7V <sub>DD</sub>	-	V
Disable(Low voltage or GND)	-	0.3V <sub>DD</sub>	-	0.3V <sub>DD</sub>	
Linearity	-	10	-	10	%
Modulation Bandwidth (BW)	20	-	20	-	KHz
Input Impedance	5	-	5	-	MΩ
RMS Phase Jitter					
F <sub>0</sub> < 100MHz	-	1.0	-	1.0	pSec
100 MHz ≤ F <sub>0</sub> < 125 MHz	-	0.7	-	0.7	
125 MHz ≤ F <sub>0</sub> < 150 MHz	-	0.5	-	0.5	
150 MHz ≤ F <sub>0</sub> ≤ 175MHz	-	0.3	-	0.3	
Phase Noise @122.88 MHz					
100 Hz	-	-85	-	-85	dBc/Hz
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.

<sup>+</sup> Transition times are measured between 20% and 80% of V<sub>DD</sub>.

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

**FREQ. STABILITY vs. TEMP. RANGE**

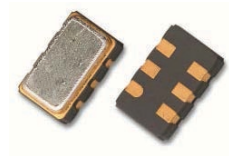
Temp. (°C)	ppm	±25	±50
-10 ~ +60		○	○
-20 ~ +70		○	○
-40 ~ +85		×	○

\* ○: Available △: Conditional X: Not available

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

## 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

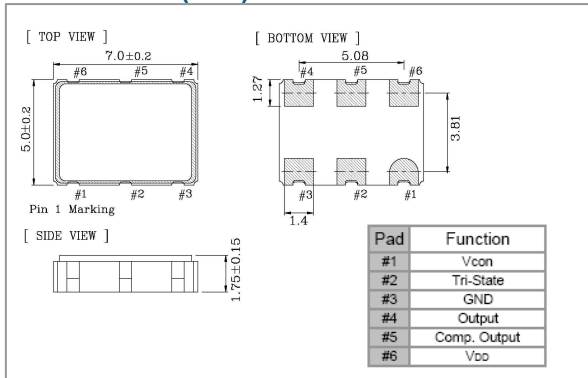


## TYPICAL APPLICATION

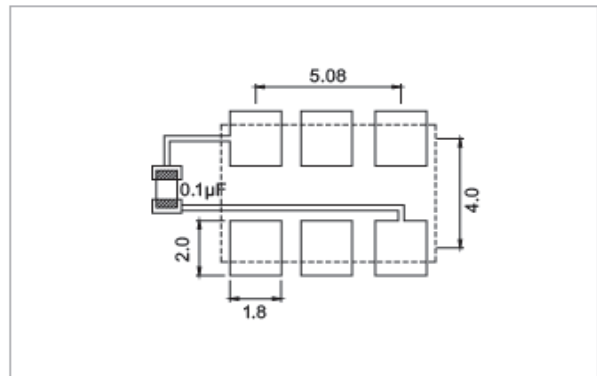
- Set-top Box, HDTV
- WiMAX/WLAN
- xDSL/ VoIP, Cable modem
- Jitter Attenuator, ADC

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		-		75		-		mA
	65MHz ≤ F0 ≤ 200 MHz		-		100		-		mA
Output Level	Output High (Logic "1")		2.275		-		1.475		V
	Output Low (Logic "0")		-		1.68		-		V
Transition Time : Rise/ Fall Time*	-		1.0		-		1.0		nSec
Start Time	-		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		-		-80
	1 kHz		-		-110		-		-110
	10 kHz		-		-133		-		-133
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 (1<sup>st</sup> year), shock, and vibration

Series OCD  
14.3 x 9.3 mm Oven Controlled Crystal Oscillator

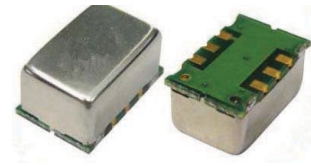


**FEATURE**

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

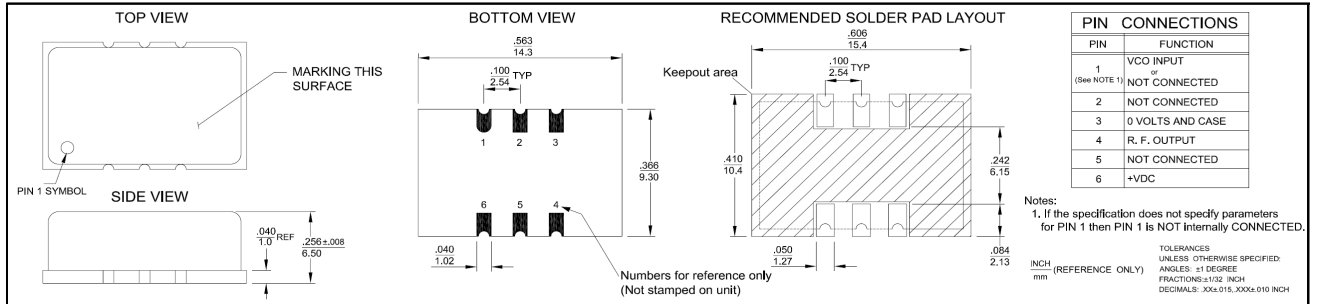
**TYPICAL APPLICATION**

- 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	-5.0		+5.0	ppb	after 30 days
10 years	-1.0		+1.0	ppm	
Voltage	-4.0		+4.0	ppm	
Warm-up	-20		+20	ppb	$\pm 5\%$ Change
	-0.1		+0.1	ppm	In 5 minutes @ +25 °C, referenced to 1 hour
Phase Noise					
			-90		@10Hz
			-115		@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	$\pm 50$	$\pm 100$	$\pm 200$
0 ~ +70		O	O	O
-30 ~ +70		$\Delta$	O	O
-40 ~ +85		$\Delta$	O	O

\* O: Available  $\Delta$ : Conditional X: Not available

**FEATURE**

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

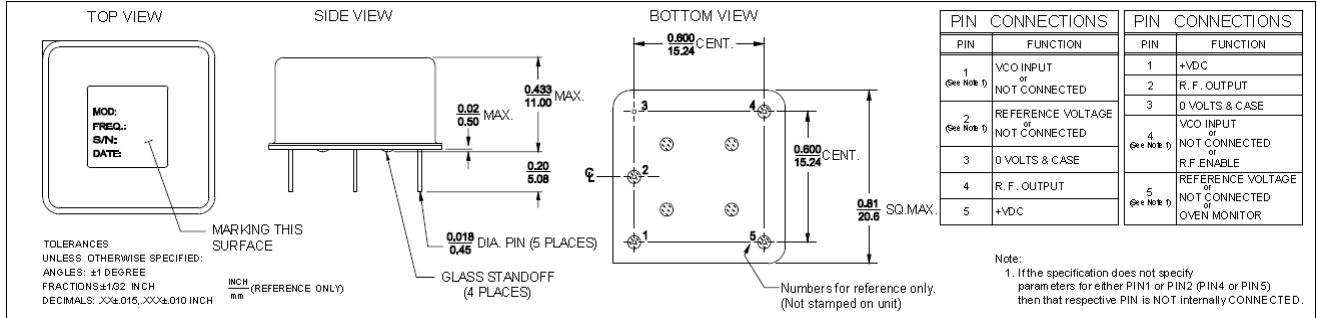
**TYPICAL APPLICATION**

- 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
<b>Output Frequency</b>		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.
<b>Wave Form</b>		Rectangular			Sine wave output is available. Consult factory for more information
<b>Level</b>		HCMOS			
"1" Level	+3.5			V	
"0" Level			+0.5		
<b>Load</b>		15		pF	
<b>Duty cycle</b>	45	50	55	%	@+2.0 V
<b>Spurious</b>			-60	dBc	
<b>Frequency Stability</b>					
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
<b>Phase Noise</b>			-115		@10Hz
			-135	dBc/Hz	@100Hz
			-145		@1KHz
			-150		@10KHz
<b>Electrical Frequency Adjustment</b>					
Range			-0.5	ppm	Vco @ 0 V
	+0.5			ppm	Vco @ +4.0V
<b>Control</b>	0	2.0	4.0	V	
<b>Slope</b>		Positive			
<b>Input impedance</b>	100			KΩ	
<b>Input Power</b>					
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
<b>Reference Voltage</b>					
Voltage	3.8	4.0	4.2	V	
Load	9			KΩ	
<b>Temperature Stability</b>	-0.1		+0.1	V	Over temperature range

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

**FREQ. STABILITY vs. TEMP. RANGE**

ppb Temp. (°C)	±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

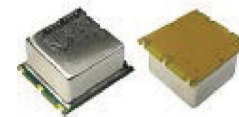


**FEATURE**

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

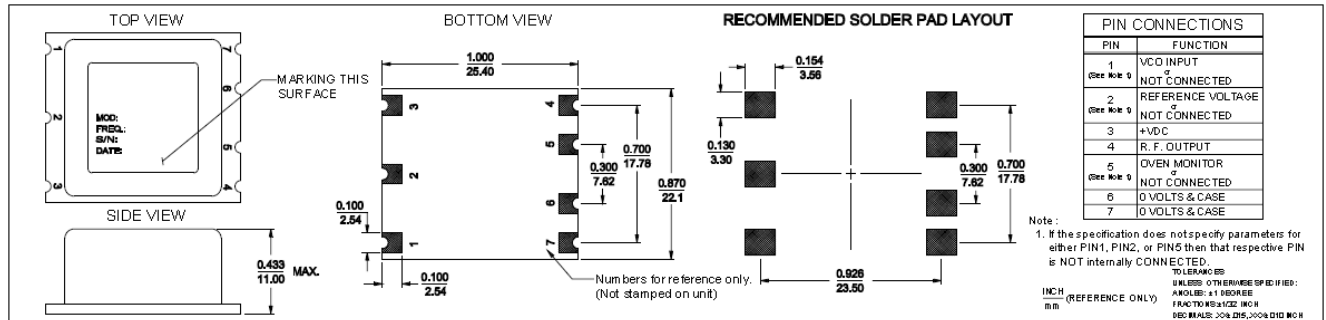
**TYPICAL APPLICATION**

- 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
<b>Output Frequency</b>		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		
Load		15		pF	
Duty cycle	45	50	55	%	@+1.4 V
Spurious			-60	dBc	
<b>Frequency Stability</b>					0 °C to +70 °C, referenced to +25 °C Refer to Freq. Stability Vs Temp. Range table..
Ambient	-10		+10	ppb	
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
<b>Electrical Frequency Adjustment</b>					
Range			-0.5	ppm	Vco @ 0 V
	+0.5			ppm	Vco @ +2.8V
Control	0	1.4	2.8	V	
Slope		Positive			
Input impedance	100			KΩ	
<b>Input Power</b>					5.0V Input voltage is available. Consult factory for Control voltage and output level.
Voltage	3.135	3.3	3.465	V	
Current			1000	mA	@ turn on
Steady state			0.8	W	@ +25 °C
<b>Reference Voltage</b>					
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

### FEATURE

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

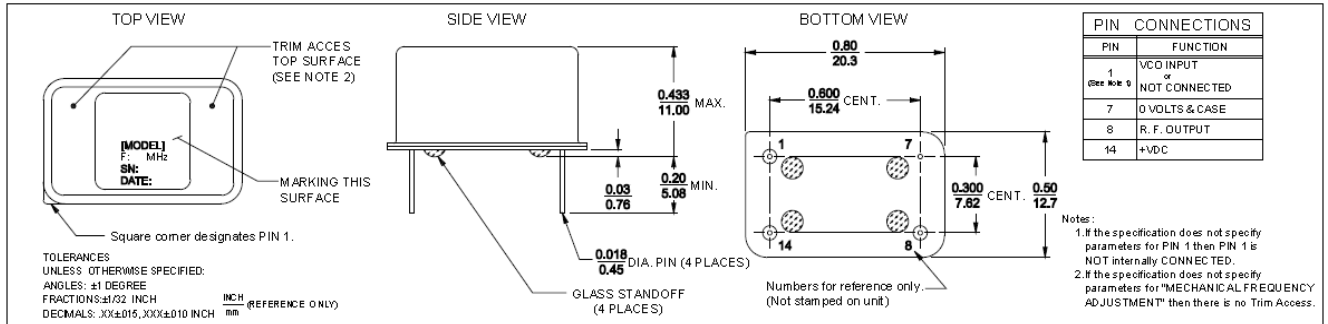


### TYPICAL APPLICATION

- 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 $\Omega$	
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	△	O	O
-40 ~ +85	△	O	O

\* O: Available △: Conditional X: Not available

**FEATURE**

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

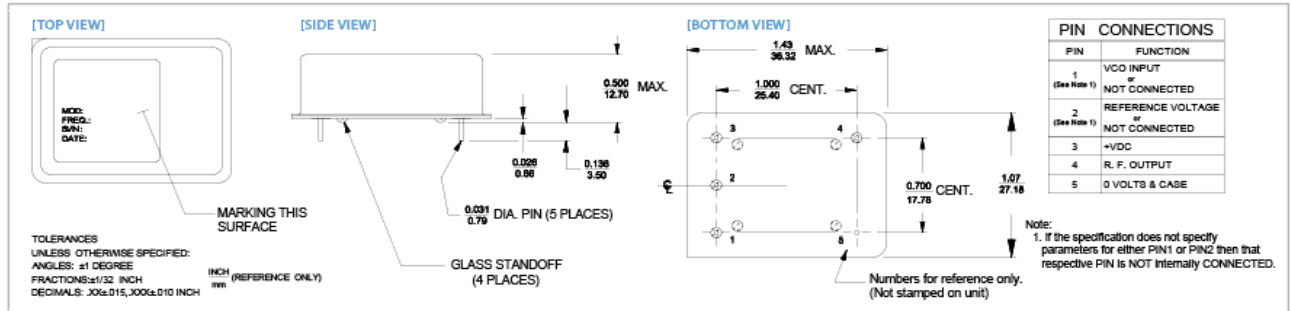


**TYPICAL APPLICATION**

- 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
<b>Output Frequency</b>		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		
Load		15		pF	
Duty cycle	45	50	55	%	@+1.4 V
Spurious			-60	dBc	
<b>Frequency Stability</b>					
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		@100Hz
			-145		@1KHz
			-150		@10KHz
<b>Electrical Frequency Adjustment</b>					
Range			-0.5	ppm	Vco @ 0 V
	+0.5				Vco @ +5.0V
Control Slope	0	2.5	5.0	V	
Input pedance	100	Positive		KΩ	
<b>Input Power</b>					
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**

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

\* O: Available △: Conditional X: Not available