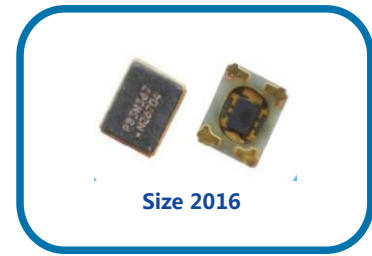


Feature

- Typical 2.0 x 1.6 x 0.8 mm ceramic SMD package.
- For automatic assembly.
- Compactness and lightweight.
- VCTCXO available.
- Miniature size and low profile.



Specifications

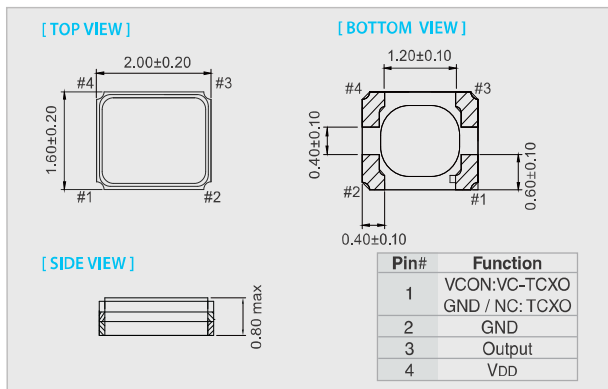
RoHS Compliant REACH Compliant

Parameter	3.3 / 3.0 / 2.8 V		2.5 V		1.8 V		Unit	
	Min.	Max.	Min.	Max.	Min.	Max.		
Supply Voltage Variation (VDD)	2.66	3.465	2.375	2.625	1.71	1.89	V	
Frequency Range	10	52	10	52	10	52	MHz	
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		
Vs Aging (@1st year)	-	±1.0	-	±1.0	-	±1.0		
Supply Current	10 MHz ≤ Fo ≤ 26 MHz	-	1.5	-	1.5	-	1.5	mA
	26 MHz < Fo ≤ 52 MHz	-	2.0	-	2.0	-	2.0	
Output Level (Clipped sine wave)	0.8	-	0.8	-	0.8	-	Vp-p	
Load	10 KΩ // 10pF		10 KΩ // 10pF		10 KΩ // 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		-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.

Outline Drawing



Frequency Stability Vs. Temperature Range

Temp.(°C)	Ppm	±0.5	±1.0	±1.5	±2.0	±2.5
-20 ~ +70		☺	☺	☺	☺	☺
-30 ~ +85		☺	☺	☺	☺	☺
-40 ~ +85		☺	☺	☺	☺	☺

☺ Standard + Available(case by case) ☹ Not Available

Ordering Information

Part Number Guide

RFW	T1	E	C	D	D	S	A	N	F	Freq.
OSC	Package Size (mm)	Supply Voltage (V)	Pulling Range (ppm)	Frequency Stability (ppm)	Temp. Range (°C)	Output Logic & Symmetry	Oscillator Mode	Appearance	Lead Free	(Mhz)
	1:2.0*1.6	E:2.8-3.3 J:2.5 K:1.8	A:±5 B:±8 C:±10 T:TCXO	A:±0.5 B:±1.0 P:±1.5 C:±2.0 D:±2.5	I:-10~+60 C:-20~+70 L:-40~+85 D:-30~+85	S:Clipped sine wave 10kΩ//10pF	A:AT Fundamental Not selectable by customer	N:Normal	F:RoHs Compliant	XX.XXXXXX

Example RFWT1ECDDSANF -26.000000MHz
TCXO,RoHS Compliant, 2.0*1.6mm;Voltage=3.3V;Freq. Stability:+/-2.5ppm;Operating Temp. Range:-30~85 °C;
Clipped sine wave ;Freq.26.000000MHz.

**Not all combinations of options are available.

TY Type

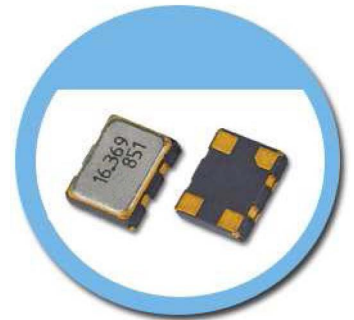
2.5 x 2.0 mm SMD Voltage Controlled Temperature Compensated Crystal Oscillator

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

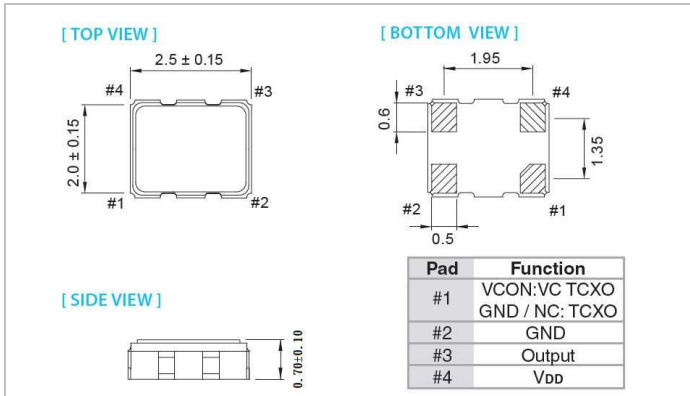
TYPICAL APPLICATION

- GPS
- WiMAX, WLAN
- Mobile Phone

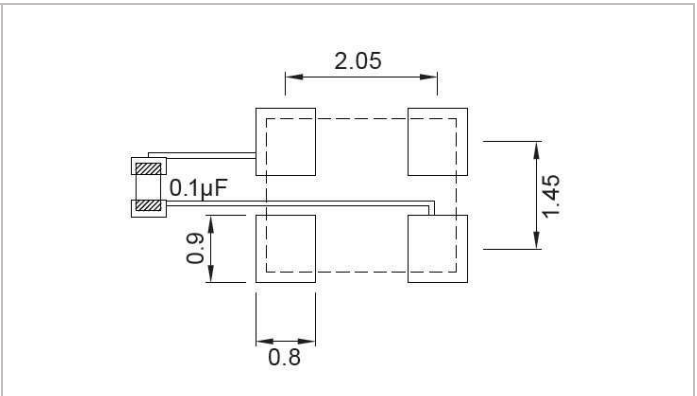


RoHS Compliant Standard

DIMENSION (mm)



SOLDER PAD LAYOUT (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	2.0	-	2.0	-	2.0	mA
	26 MHz ≤ F0 ≤ 52 MHz	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	△△	O	O	O	O
-40~+85	△△	△△	O	O	O

* O: Available △: Conditional X: Not available

TX Type

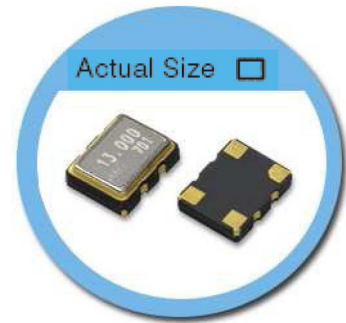
3.2 x 2.5 mm SMD Voltage Controlled Temperature Compensated Crystal Oscillator

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

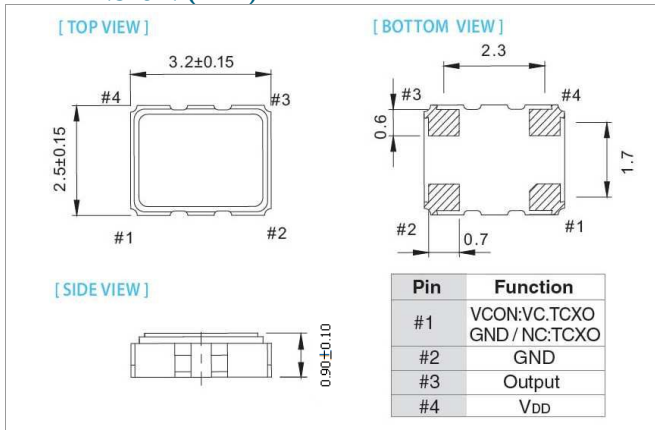
TYPICAL APPLICATION

- GPS
- WLAN / WiMAX
- Mobile Phone

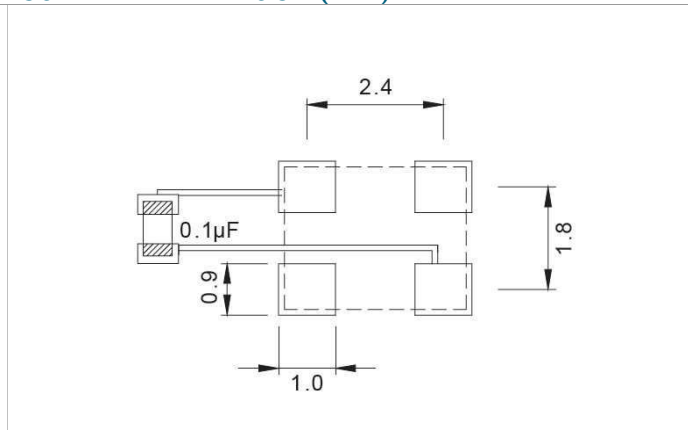


RoHS Compliant Standard

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	-	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		100 Hz		100 Hz		dBc/Hz
	1 KHz		1 KHz		1 KHz		
	10 KHz		10 KHz		10 KHz		
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	△△	O	O	O	O
-40~+85	△△	△△	O	O	O

* O: Available △ : Conditional X: Not available

TV Type 5.0 x 3.2 mm SMD Voltage Controlled Temperature Compensated Crystal Oscillator

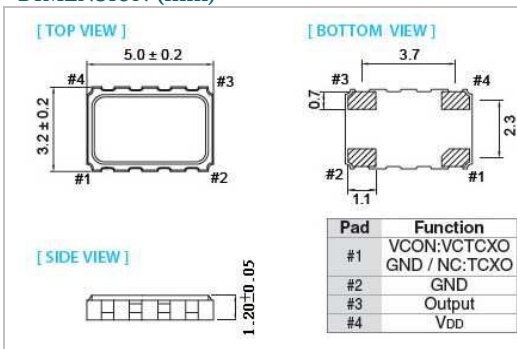
FEATURE

- 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.

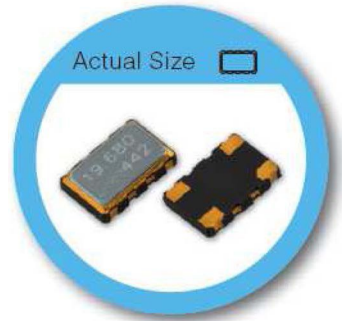
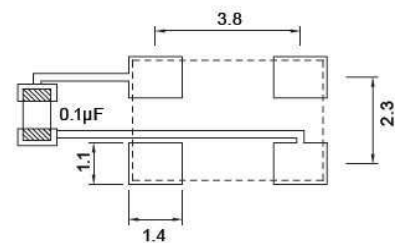
TYPICAL APPLICATION

- WLAN / WiMAX
- Telecommunication
- Mobile Phone

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



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	ppm/year
Vs Aging	-	±1.0	-	±1.0	
Supply Current					mA
10 MHz ≤ F0 < 15 MHz (Clipped Sine Wave)	-	1.5	-	1.5	
15 MHz ≤ F0 < 26 MHz (Clipped Sine Wave)	-	2.0	-	2.0	
26 MHz ≤ F0 ≤ 40 MHz (Clipped Sine Wave)	-	-	-	2.5	
10 MHz ≤ F0 ≤ 40 MHz (CMOS)	-	-	-	6.0	
Output Level (Clipped Sine Wave)	0.8	-	0.8	-	Vp-p
Output Level (CMOS)					V
Output High (Logic "1")	-	-	90% VDD	-	
Output Low (Logic "0")	-	-	-	10% VDD	
Duty	-	-	45	55	%
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					dBc/Hz
100 Hz	-	-115	-	-115	
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

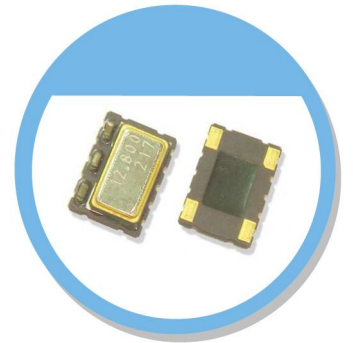
Master Crystal - Tel +33(0)2 36 45 80 17 - Mail : master.crystal@mastercrystal.com

TT Type < for Stratum 3 >

7.0 x 5.0 mm SMD Voltage Controlled Temperature Compensated Crystal Oscillator

FEATURE

- Typical 7.0x5.0x1.9 mm ceramic SMD package.
- Stratum 3 (Overall ± 4.6 ppm including 20 years aging.)
- CMOS and Clipped Sine wave (without DC-cut capacitor) output optional



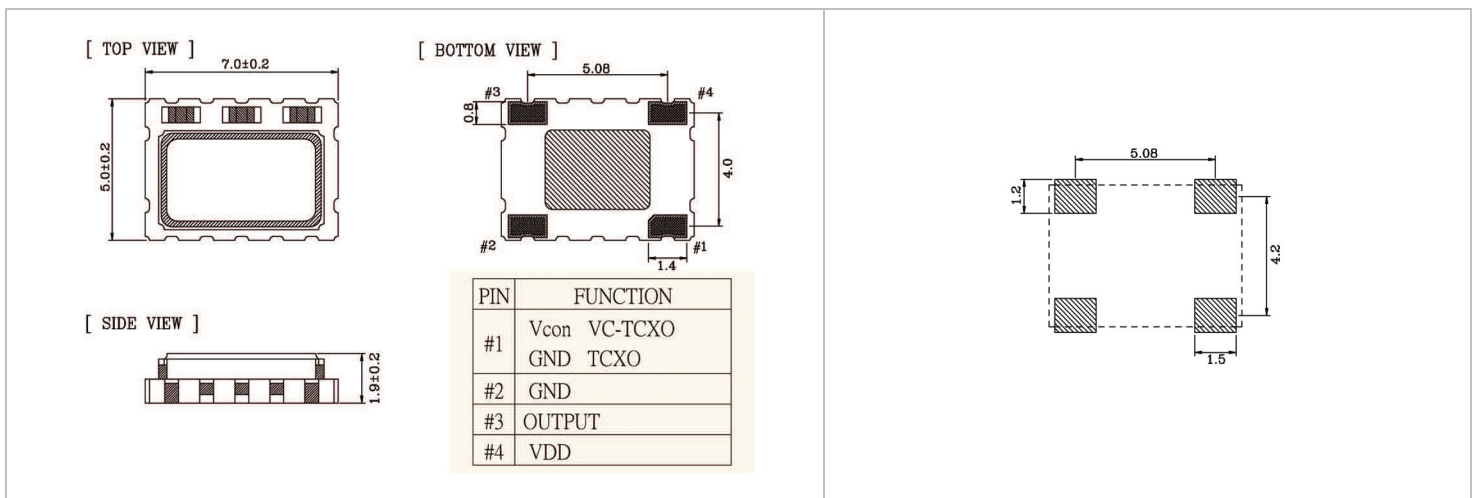
RoHS Compliant Standard

TYPICAL APPLICATION

- Stratum 3
- Femtocell, Base Stations,

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	3.13	3.47	V
Frequency Range	5	26	5	26	MHz
Standard Frequency	10, 12.8, 16.384, 19.2, 19.44, 20, 25, 26				
Operating Temp. Range	-20 ~ 70 -40 ~ 85				°C
Frequency Stability (Overall, 20 Years)*	-	± 4.6	-	± 4.6	ppm
Frequency Stability Vs Temp. Range (Ref. to (F _{MAX} +F _{MIN})/2)	-	± 0.14 (-20~+70 °C) ± 0.28 (-40~+85 °C)	-	± 0.14 (-20~+70 °C) ± 0.28 (-40~+85 °C)	ppm
Holdover Stability *	-	± 0.32	-	± 0.32	ppm
Supply Current (CMOS output)	-	6	-	6	mA
Supply Current (Clipped Sine Wave)	-	3.5	-	3.5	mA
Output Level (CMOS) Output High (Logic "1") Output Low (Logic "0") Duty	90% V _{DD}	-	90% V _{DD}	-	V
	-	10% V _{DD}	-	10% V _{DD}	%
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	-	± 5.0	-	ppm
Vc Input Impedance (VCTCXO)	100	-	100	-	KΩ
Phase Noise @ 12.8 MHz (Typ) 100 Hz 1 KHz 10 KHz			-130		dBc/Hz
			-145		
			-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

* Including calibration @ 25°C, supply voltage VDD $\pm 5\%$, load $\pm 10\%$, reflow soldering, 20 years aging and frequency stability over temperature.

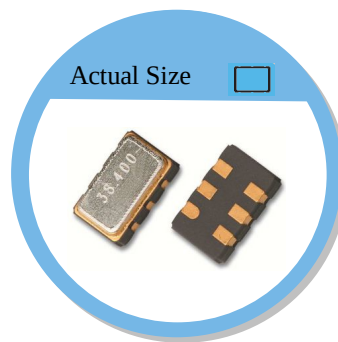
+ Including 24 hours aging, supply voltage VDD $\pm 5\%$ and frequency stability over temperature.

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

Master Crystal - Tel +33(0)2 36 45 80 17 - Mail : master.crystal@mastercrystal.com

Specifications subject to change without notice

VW Type 5.0 x 3.2 mm SMD Voltage Controlled Crystal Oscillator



RoHS Compliant Standard

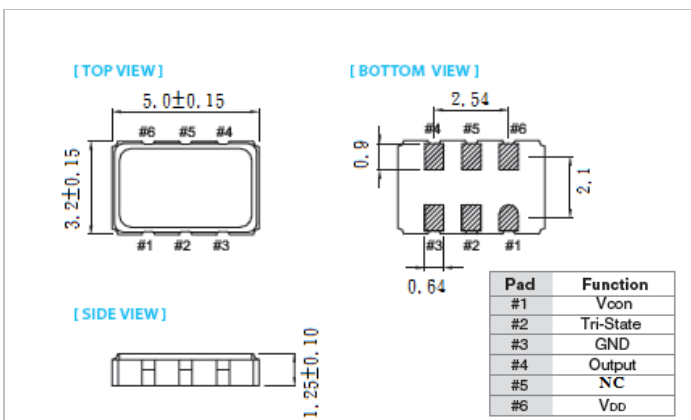
FEATURE

- 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

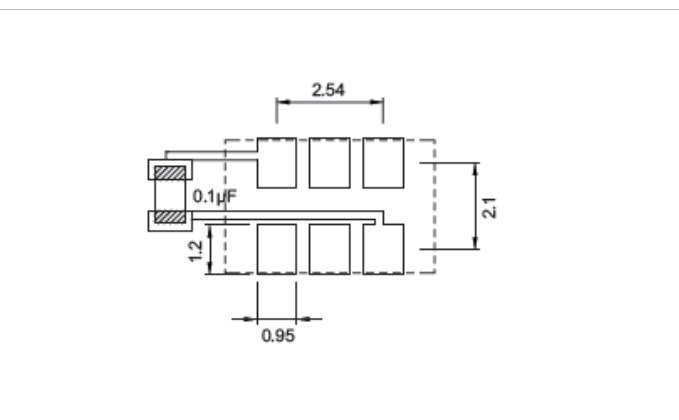
TYPICAL APPLICATION

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

DIMENSION (mm)



SOLDER PAD LAYOUT (mm)



ELECTRICAL SPECIFICATION

Parameter	5.0V		3.3V		Unit
	Min.	Max.	Min.	Max.	
Supply Voltage Variation (V _{DD}) 10%	4.5	5.5	2.97	3.63	V
Frequency Range	1.5	80	1.5	80	MHz
Standard Frequency	19.44,38.4				
Absolute Pulling Range (APR)	±50	-	±50	-	ppm
Control Voltage Range	0.5	4.5	0.3	3.0	V
Supply Current	1.5MHz ≤ F ₀ < 20 MHz	--	15	-	mA
	20MHz ≤ F ₀ < 50 MHz	-	30	-	
	50MHz ≤ F ₀ ≤ 80 MHz	-	35	-	
Output Level	Output High (Logic "1")	90%V _{DD}	-	90%V _{DD}	V
	Output Low (Logic "0")	-	10%V _{DD}	-	
Transition Time : Rise/ Fall Time *	1.5MHz ≤ F ₀ < 20 MHz	-	4	-	nSec
	20MHz ≤ F ₀ < 50 MHz	-	3	-	
	50MHz ≤ F ₀ ≤ 80 MHz	-	2	-	
Start Time	-	5	-	5	mSec
Tri-State(Input to Pin 2)	Enable(High voltage or floating)	0.7V _{DD}	-	0.7V _{DD}	V
	Disable(Low voltage or GND)	-	0.3V _{DD}	-	
Linearity	-	10	-	10	%
Modulation Bandwidth (BW)	1.5MHz ≤ F ₀ < 80 MHz	15	-	15	KHz
Input Impedance	2000	-	2000	-	KΩ
Absolute Period Jitter	-	40	-	40	pSec
RMS Phase Jitter (Integrated 12KHz~20MHz)	-	1	-	1	pSec
Phase Noise @38.4 MHz 100 Hz	-	-100	-	-100	dBc/Hz
	1 KHz	-	-130	-	
	10 KHz	-	-140	-	
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 10% and 90% of V_{DD}, with an output load of 15pF.

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 (1st year), shock, and vibration

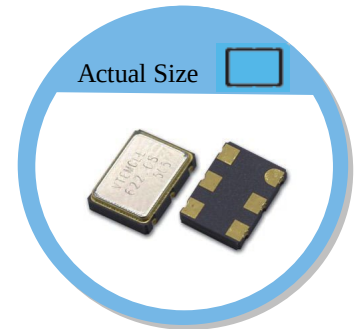
VT-M Type 7.0 x 5.0 mm SMD Differential Output Voltage Controlled Crystal Oscillator

FEATURE

- Typical 7.0 x 5.0 x1.6 mm 6 pads ceramic SMD package.
- Low jitter performance: <1 pS RMS from 12k~20MHz
- Wide frequency control range.
- LVPECL output.
- Output frequency up to 800 MHz
- Tri-state enable/disable

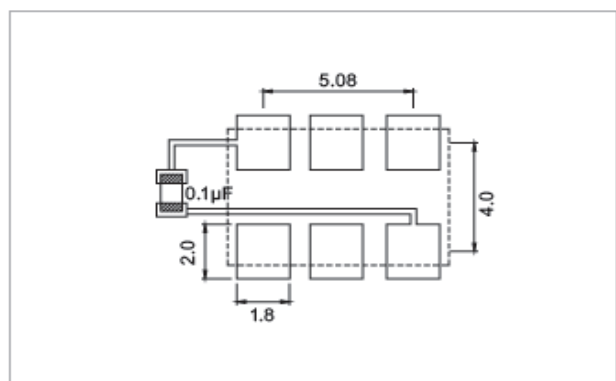
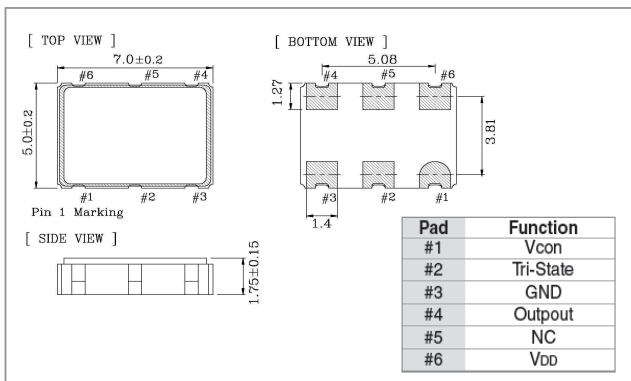
TYPICAL APPLICATION

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



RoHS Compliant Standard

SOLDER PAD LAYOUT (mm)



Parameter	PECL 3.3V		Unit
	Min.	Max.	
Supply Voltage Variation (VDD) 10%	2.97	3.63	V
Frequency Range	100	800	MHz
Standard Frequency	122.88,125,155.52,200,491.52,622.08		
Absolute Pulling Range (APR)	±50	-	ppm
Control Voltage Range	0.3	3.0	V
Supply Current	60 MHz ≤ F0 < 160 MHz	-	mA
	160 MHz ≤ F0 ≤ 800 MHz	75	
Output Level	Output High (Logic "1")	2.275	V
	Output Low (Logic "0")	-	
Transition Time : Rise/ Fall Time +	-	1.0	nSec
Start Time	-	3	mSec
Tri-State(Input to Pin 2)			
Enable(High voltage or floating)	0.7VDD	-	V
Disable(Low voltage or GND)	-	0.3VDD	
Linearity	-	10	%
Modulation Bandwidth(BW)	25	-	KHz
Input Impedance	2000	-	KΩ
RMS Phase Jitter (Integrated 12KHz~20MHz)	-	1	pSec
Phase Noise @614.4 MHz	100 Hz	-70	dBc/Hz
	1 KHz	-95	
	10 KHz	-105	
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 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	O	O
-20~+70	△	O
-40~+85	X	O

* O:Available △ : Conditional X: Not available

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