

# Temperature Compensated Crystal Oscillators [ TCXO " M " and VCTCXO " VM " ]

Clipped Sine Wave ; Waveform code " S " [ Dip Type ]

## Features

- Frequency stability as tight as  $\pm 0.5$  ppm over  $-30^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- Frequency stability as tight as  $\pm 1.0$  ppm over  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$



General Specifications [  $T_A = +25^{\circ}\text{C}$  ,  $V_{DD} =$  at specified voltage , Load : 10K ohms//10 pF ]

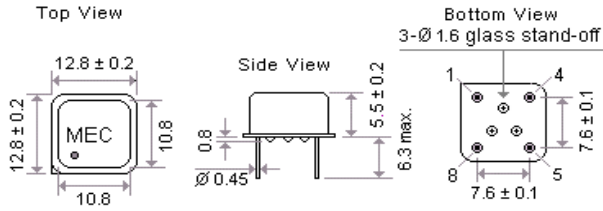
Output Waveform		Clipped Sine wave . Waveform code is " S "						
Suggested package ( Dip type )	M8S , VM8S	M9S , VM9S	M14S , VM14S	M15S , VM15S	M39S , VM39S			
Model with Trimmer	-----	with Trimmer	-----	with Trimmer	with Trimmer	with Trimmer		
Package size	12.8 x 12.8 x 5.5 mm	12.8 x 12.8 x 5.5 mm	20.2 x 12.8 x 7.0	20.2 x 12.8 x 7.0	18.4 x 11.7 x 4.7 mm			
Supply voltage ( $V_{DD}$ ) [ unit : V ]	1.8 , 2.5 , 3.0 , 3.3	1.8 , 2.5 , 3.0 , 3.3	1.8 , 2.5 , 3.0 , 3.3	1.8 , 2.5 , 3.0 , 3.3	1.8 , 2.5 , 3.0 , 3.3			
Frequency Range	6.4 ~ 52.0 MHz		6.4 ~ 52.0 MHz		6.4 ~ 52.0 MHz			
Standard Frequency ( Partial list ) [ MHz ]		10.000	12.800	13.000	14.400	14.7456	15.360	16.367667
		16.384	19.200	19.440	20.000	25.000	26.000	27.000
Initial Calibration Tolerance		< $\pm 1$ ppm. at $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for model with trimmer						
		< $\pm 2$ ppm. at $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for model without trimmer						
Frequency Stability ( ppm )		$\pm 0.5$ ppm	$\pm 1.0$ ppm	$\pm 1.5$ ppm	$\pm 2.0$ ppm	$\pm 2.5$ ppm	$\pm 3.0$ ppm	○ : available △ : contact us X : not available
Frequency Stability vs Temperature ( examples )		0°C to 50°C	○	○	○	○	○	
		-10°C to 60°C	△	○	○	○	○	
		-20°C to 70°C	△	○	○	○	○	
		-30°C to 75°C	△	○	○	○	○	
		-30°C to 85°C	△	○	○	○	○	
Frequency Stability		vs Aging at $T_a = +25^{\circ}\text{C}$	$\pm 1.0$ ppm / year ( max. )					
		vs Voltage Change	$\pm 0.2$ ppm ( max. ) , for a $\pm 5\%$ input voltage change .					
		vs Load Change	$\pm 0.2$ ppm ( max. ) , for a $\pm 10\%$ load condition change .					
		vs Reflow ( SMD type )	$\pm 1.0$ ppm ( max. ) , 1 reflow and measured 24 hours afterwards .					
Output Voltage Level ( peak to peak )		0.8 V p-p ( min. )						
Current Consumption. ( max. )		10.0 ~ 15 MHz: 1.5 mA ; 15.1 ~ 26.0 MHz: 2.0 mA ; 26.1 ~ 52.0 MHz : 3.5 mA						
Electrical Frequency Tuning ( EFC ) by external Control Voltage	Control Voltage Center		1.8 V		2.5 V		3.0 V / 3.3V	
			0.9 V $\pm$ 0.6 V		1.4 V $\pm$ 1.0 V		1.5 V $\pm$ 1.0 V	
	Frequency Deviation Range		$\pm 5.0$ ppm ( min. )					
	Slope Polarity ( Transfer Function )		Positive slope. Positive voltage for positive frequency shift.					
Control Voltage		Input Impedance : 1.0M $\Omega$ min.		Modulation Bandwidth : 3 KHz min.		Linearity : $\pm 10\%$ max.		
Start-Up Time.		2.0 msec. ( typ. ) , 5.0 msec. ( max. ) ( reach 90% amplitude and at $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ )						
Output Load		10 K $\Omega$ // 10 pF $\pm 10\%$						
Phase Noise [ dBc / Hz ; ( typ. ) ]	Offset	10 Hz	100 Hz	1 KHz	10 KHz	10 KHz		
	13.0 MHz	-80	-115	-135	-148	-148		
Storage Temperature		$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ or $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ ( package dependent )						

# Temperature Compensated Crystal Oscillators [ TCXO " M " and VCTCXO " VM " ]

Clipped Sine wave output code " S " [ Dip Type ]

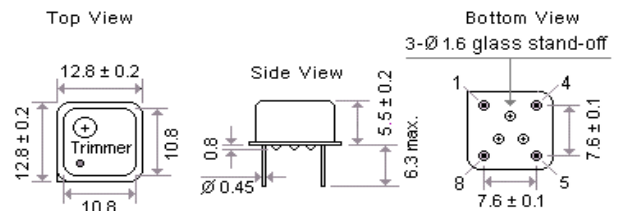
Outline Dimensions ( Unit : mm ) , Suggested pin Layout for SMDs

[ M8S \_\_ ] ; [ VM8S \_\_ ]



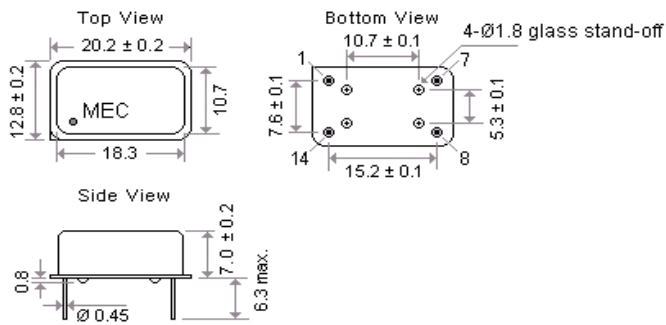
Pin Connections :  
 Pin 1 : Control voltage for VCTCXO ; No connection for TCXO.  
 Pin 4 : Ground ; Pin 5 : Output , Pin 8 : Supply Voltage

[ M9S \_\_ ] ; [ VM9S \_\_ ]



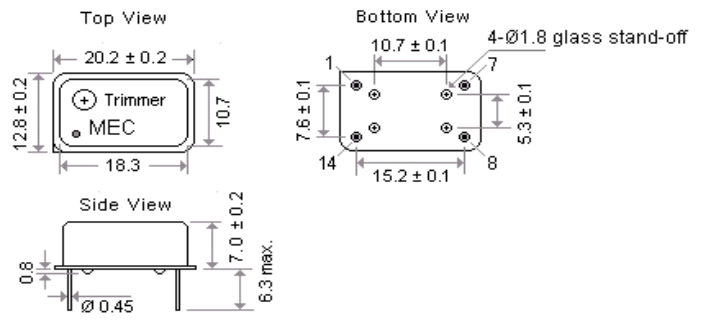
Pin Connections :  
 Pin 1 : Control voltage for VCTCXO ; No connection for TCXO.  
 Pin 4 : Ground ; Pin 5 : Output , Pin 8 : Supply Voltage

[ M14S \_\_ ] ; [ VM14S \_\_ ]



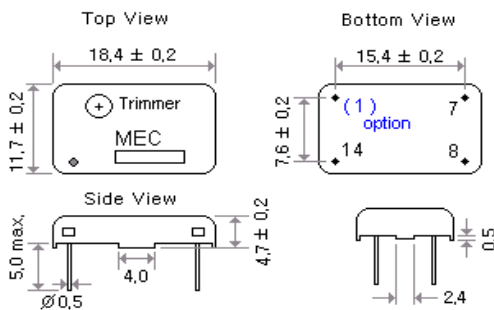
Pin Connections :  
 Pin 1 : Control voltage for VCTCXO , No connection for TCXO .  
 Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[ M15S \_\_ ] ; [ VM15S \_\_ ]



Pin Connections :  
 Pin 1 : Control voltage for VCTCXO , No connection for TCXO .  
 Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[ M39S \_\_ ] ; [ VM39S \_\_ ]



Pin Connections :  
 Pin 1 : Control voltage for VCTCXO  
 [ No physical pin 1 for TCXO. ( 3 pins only ). ]  
 Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

# Temperature Compensated Crystal Oscillators [ TCXO " M " and VCTCXO " VM " ]

Clipped Sine wave output code " S "

## Part Number Format and Example

[ 1 ]	[ 2 ]	[ 3 ]	-	[ 4 ]	-	[ 5 ]	/	[ 6 ]
Holder Type	Output Wave	Supply Voltage		Center Frequency		Frequency Stability		Operating Temp. Range

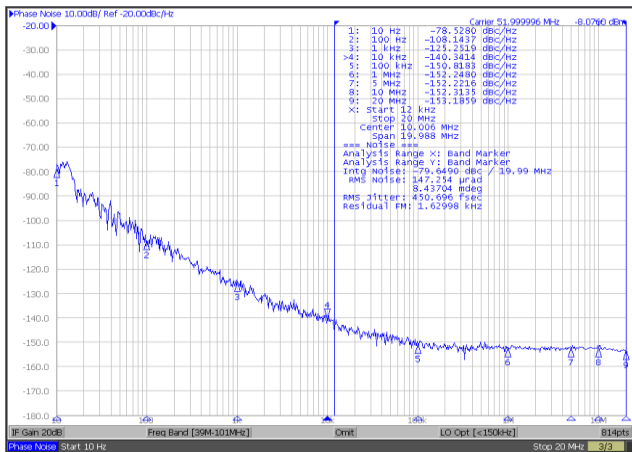
Examples	(1)	V M 39	S	3	-	10.000	-	1.5	/	-20+70
	(2)	M 32	S	18	-	20.000	-	2.5	/	-30+75

Ex (1) : VM39S3 - 10.000 - 1.5 / -20+70 [ VCTCXO , VM39 type , Clipped Sine Wave, 3.0V , 10.000MHz , ±1.5ppm from -20°C to 70°C ]

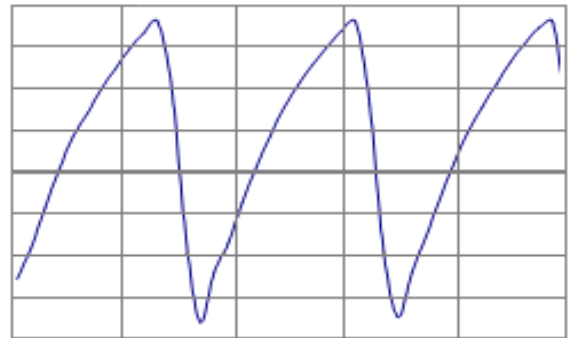
Ex (2) : M32S18 - 20.000 - 2.5 / -30+75 [ TCXO , M32 type , Clipped Sine Wave , 1.8V , 20.000MHz , ±2.5ppm from -30°C to 75°C ]

[ 1 ]	Holder Type " M " stands for TCXO , " VM " stands for VCTCXO
[ 2 ]	" S " stands for Clipped Sine Wave
[ 3 ]	Supply voltage , " 18 " stands for +1.8V ; " 25 " stands for +2.5V ; " 28 " stands for +2.8V ; " 3 " stands for +3.0V ; " 33 " stands for +3.3V
[ 4 ]	Center Frequency in MHz
[ 5 ]	Frequency stability in ±_ ppm ; ex 1 : ± 2.5ppm --- 2.5 , ex 2 : ± 1.0ppm --- 1.0
[ 6 ]	Operating temperature range in °C ex 1 : -10 °C to 60°C ----- -10+60 ; ex 2 : -20 °C to 70°C ----- -20+70 ; ex 3 : -30 °C to 85°C ----- -30+85

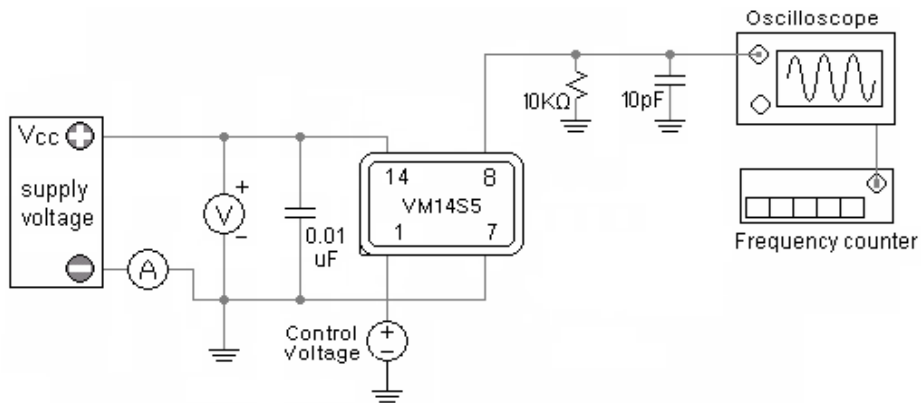
Clipped Sine Wave Typical Phase Noise ( M22S33-52.000 )



Clipped Sine Wave , " S " series



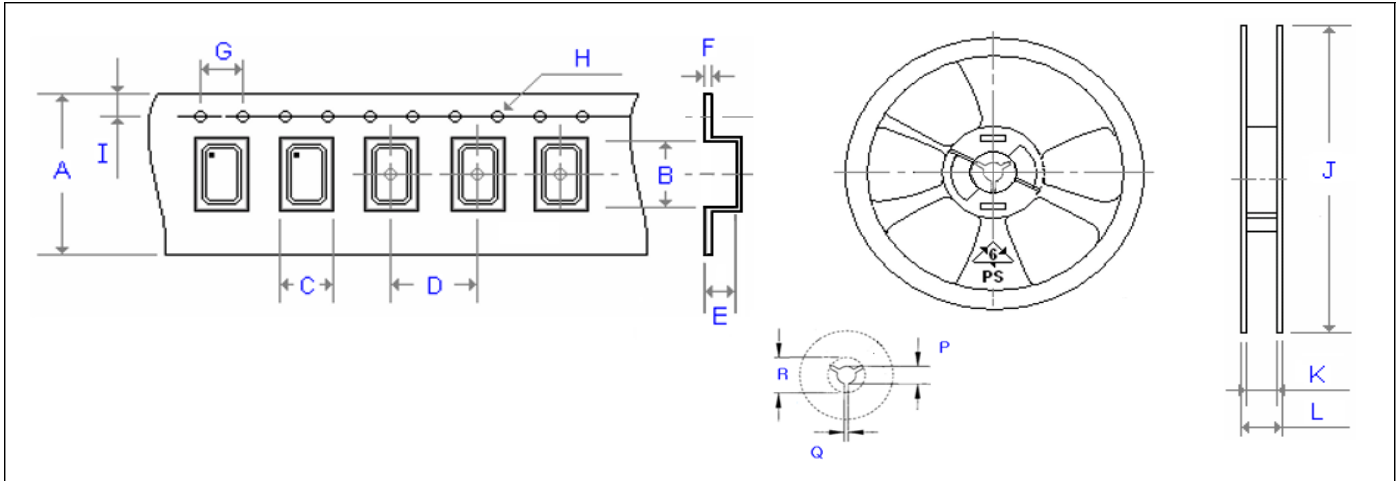
## ( VC )TCXO with clipped sine wave Test Circuits : Ex. VM14S3



## Emboss Taping and Reel Specifications

[ VCXO ]

[ ( VC )TCXO ]



Carrier Type Dimensions ( unit : mm ) ±0.3mm

	A	B	C	D	E	F	G	H	I	pcs / reel
G_226	8.00	2.80	2.25	4.00	1.10	0.30	4.00	∅ 1.50	1.75	3000
G_326	8.00	3.40	2.70	4.00	1.40	0.25	4.00	∅ 1.50	1.75	3000
G_536	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.55	1.75	1000
G_576	16.00	7.30	5.30	8.00	1.90	0.30	4.00	∅ 1.50	1.75	1000
G_538	12.00	5.40	3.60	8.00	1.70	0.30	4.00	∅ 1.55	1.75	1000
G_578	16.00	7.30	5.30	8.00	1.90	0.30	4.00	∅ 1.50	1.75	1000
(V)M21	8.00	2.30	1.90	4.00	0.90	0.25	4.00	∅ 1.55	1.75	3000
ME21	8.00	2.30	1.50	4.00	1.35	0.25	4.00	∅ 1.50	1.75	3000
(V)M22	8.00	2.80	2.25	4.00	1.10	0.30	4.00	∅ 1.50	1.75	3000
(V)M_32	8.00	3.71	2.80	4.00	1.75	0.25	4.00	∅ 1.50	1.75	3000
(V)M_326	12.00	3.60	2.90	4.00	1.70	0.30	4.00	∅ 1.50	1.75	1000
(V)M_53	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.50	1.75	1000
(V)M_538	12.00	5.40	3.60	8.00	1.70	0.30	4.00	∅ 1.50	1.75	1000
(V)M_57(2)	16.00	7.40	5.50	8.00	2.80	0.35	4.00	∅ 1.50	1.75	500
(V)M_43 (63)	24.00	11.80	10.00	16.00	5.00	0.30	4.00	∅ 1.50	1.75	500

Reel Dimensions ( unit : mm ) ±2mm

	J	K	L	P	Q	R	pcs / reel
G_226	180.00	9.00	12.00	13.20	2.10	-	3000
G_326	180.00	9.00	12.00	13.20	2.10	-	3000
G_536	180.00	13.00	16.00	13.20	2.50	-	1000
G_576	180.00	17.20	19.30	13.30	2.20	22.00	1000
G_538	180.00	13.00	16.00	13.20	2.50	-	1000
G_578	180.00	17.20	19.30	13.30	2.20	22.00	1000
(V)M21	180.00	9.00	12.00	13.20	2.10	-	3000
ME21	180.00	9.00	12.00	13.20	2.10	-	3000
(V)M22	180.00	9.00	12.00	13.20	2.10	-	3000
(V)M_32	180.00	9.00	12.00	13.20	2.10	-	3000
(V)M_326	180.00	13.00	16.00	13.20	2.50	-	1000
(V)M_53	180.00	13.00	16.00	13.20	2.50	-	1000
(V)M_538	180.00	13.00	16.00	13.20	2.50	-	1000
(V)M_57(2)	180.00	17.20	19.30	13.30	2.20	22.00	500
(V)M_43 (63)	330.00	24.50	29.10	13.00	2.20	17.30	500