



## PRODUCT SELECTION GUIDE

### Product Summary:

Output Wave Form: Clipped Sine Wave					
TCXO	VCTCXO	Available Frequency Range	RoHS Compliant Equivalent Model		Package Description
Thru-Hole Types					
M38S	VM38S	9.6 ~ 26 MHz	M38GS	VM38GS	4 pin DIP
M39S	VM39S	9.6 ~ 26 MHz	M39GS	VM39GS	4 pin DIP
M14S	VM14S	9.6 ~ 26 MHz	M14GS	VM14GS	4 pin DIP. Hermetically sealed.
M15S	VM15S	9.6 ~ 26 MHz	M15GS	VM15GS	4 pin DIP. With trimmer
M8S	VM8S	10.0 ~ 26 MHz	M8GS	VM8GS	4 pin DIP. Half size. Hermetically sealed.
M9S	VM9S	10.0 ~ 26 MHz	M9GS	VM9GS	4 pin DIP. Half size. With trimmer
Gull Wing Surface Mount Types					
M55S	VM55S	9.6 ~ 26 MHz	N / A	N / A	4 pin gull wing
M47S	VM47S	9.6 ~ 26 MHz	M47GS	VM47GS	4 pin gull wing
M24S	VM24S	9.6 ~ 26 MHz	M24GS	VM24GS	4 pin gull wing. Hermetically sealed.
M25S	VM25S	9.6 ~ 26 MHz	M25GS	VM25GS	4 pin gull wing. With trimmer
M28S	VM28S	10.0 ~ 26 MHz	M28GS	VM28GS	4 pin gull wing. Half size. Hermetically sealed.
M29S	VM29S	10.0 ~ 26 MHz	M29GS	VM29GS	4 pin Gull wing. Half size. With trimmer
Leadless Surface Mount Types					
M62S	VM62S	10.0 ~ 26 MHz	M62GS	VM62GS	6 pad FR4 substrate. 2.5 mm H
M42S	VM42S	10.0 ~ 26 MHz	M42GS	VM42GS	4 pad FR4 substrate. 2.5mm H
M64S	VM64S	9.6 ~ 26 MHz	M64GS	VM64GS	6 pad FR4 substrate. 4.7 mm H
M44S	VM44S	9.6 ~ 26 MHz	M44GS	VM44GS	4 pad FR4 substrate. 4.7 mm H
M57S	VM57S	10.0 ~ 26 MHz	Same <sup>(1)</sup>	Same <sup>(1)</sup>	4 pad ceramic substrate. 5x7 mm
M53S	VM53S	12.5 ~26 MHz	Same <sup>(1)</sup>	Same <sup>(1)</sup>	4 pad ceramic substrate. 5x3.2 mm

“\_” is voltage code. Please see the table on next page.

For RoHS equivalent model please add “G” after the package code. For example: M14GS.

<sup>(1)</sup> M57S, VM57S, M53S and VM53S are RoHS compliant and lead free products. .

Note: Frequency tuning by the built-in mechanical trimmer is standard for all models except for M57S, VM57S, M53S and VM53S.


### Product Options

- No mechanical Trimmer models are available to allow for aqueous washing.
- Narrow ( $\pm 1$  ppm max.) or wide electrical tuning range ( $\pm 35$  ppm max.)
- Negative slope polarity
- Hi-rel ( $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ) VCTCXOs and TCXOs.
- +15V, +12V, +10V or +9V DC supply voltages are also available in some packages.
- Analog sensor output (TCXOs only); Digital sensor output (TCXOs only)

**MERCURY** [www.mercury-crystal.com](http://www.mercury-crystal.com)

Taiwan: TEL (886)-2-2406-2779, FAX (886)-2-0769, e-mail: [sales-tw@mercury-crystal.com](mailto:sales-tw@mercury-crystal.com)

U.S.A.: TEL (1)-909-466-0427, FAX (1)-909-466-0762, e-mail: [sales-us@mercury-crystal.com](mailto:sales-us@mercury-crystal.com)

<b>“TCXO” and “VCTCXO”</b> <b>Wave Form: Clipped Sine Wave</b>	<b>“S” Series</b>		<b>MERCURY</b> Since 1973
---	-------------------	---	------------------------------

**General Specifications** (at +25°C and specified input voltage)

Frequency Range			9.6 MHz ~ 26.0 MHz		
Output Wave Form			Clipped Sine wave. Wave form code is “S”		
Initial Calibration Tolerance			With mechanical trimmer: < ±0.5 ppm. +25°C ±2°C. Without mechanical trimmer: ±2 ppm at +25°C ±2°C.		
Standard Frequencies (partial list)			9.6, 10.0, 12.8, 13.0, 14.4, 15.36, 16.384, 19.2, 19.440, 19.68 MHz		
Frequency Stability vs Temperature vs Aging vs Voltage Change vs Load Change vs reflow (SMD models only)			±1 ppm , ±1.5 ppm, ±2.0 ppm, ±2.5 ppm, ±3 ppm, or ±5 ppm, over operating temperature range. Referenced to frequency reading at +25°C. ±1.0 ppm max. first year at +25°C ±0.2 ppm max. for a ±5% input voltage change ±0.2 ppm max. for a ±10% loading condition change ±1 ppm max. 1 reflow and measured 24 hours afterwards		
Typical Operating Temperature Range (examples)			0°C to +60°C      0°C to +70°C      -10°C to +60°C -20 °C to +70°C    -30°C to +60°C    -30°C to +75°C -30°C to +85°C    -40°C to +85°C. or custom.		
			Hi Rel: -55°C to +85°C or -55°C to +125°C. Selected models only. Customer package and /or pin configurations are welcome.		
Output Voltage Level (peak to peak)			0.8 V p-p min.		
Current Consumption. (Over operating temperature range.)			9.6~13 MHz: 1.3 mA max. 13.1~20 MHz: 1.5 mA max. 20.1~26 MHz: 2.0 mA max.		
Mechanical Frequency Tuning		Standard	±3 ppm min. tuning. (not for aqueous washing cycles) Note: VM57 and VM53 have no mechanical trimmer built-in.		
		Option	No mechanical trimmer built-in (Able to withstand aqueous washing cycles). Part number: Please add “1” after the regular model prefix. For example: M381S3.		
Input Voltage Range		Option	+15.0V, +12.0V, +10.0V, +9.0; +3.3V D.C.		
		Standard	+ 2.75 V D.C. min.; +5.0 V D.C. max. +3.0 V (voltage code is “3”)      +5.0 V (voltage code is “5”)		
Pin 1 Options	VCTCXO only	Control voltage		+1.5 V±1.0 V	+2.5 V±2.0 V. +1.5 V±1.0 V for VM57S5
		Frequency Deviation Range	Standard	±10 ppm min. for +1.5 V±1.0 V	
			Option	Narrow: ±1 ppm max. or custom Wide: ±35 min. or custom	
		Slope Polarity	Standard	Positive slope. Positive voltage for positive frequency shift.	
			Option	Negative slope. Selected packages only.	
		Linearity		10 % max.	
		Modulation Band Width		10 KHz min. Measured at -3 dB.	
	Input Impedance		1 meg Ω min.		
	Analog Sensor Output. TCXOs only.		Linear analog voltage-temperature output on pin 1. Part number: Please add “2” after the regular model prefix. For example: M472S3.		
	Digital Sensor Output. TCXOs only.		Digital voltage-temperature output on pin 1. Part number: Please add “3” after the regular model prefix. For example: M473S3		
Start-Up Time.			2 m. sec. Typical, 3 m. sec. max. (reach 90% amplitude and at +25°C±2°C)		
Output Load			10 K Ω // 10 pF ±10%		
Harmonics Distortion			- 7dBc max.		
Output Format			DC block, AC coupled. VM53 and M53 are DC coupled.		
Storage Temperature			-40°C to +85°C or -55°C to +125°C (package dependent)		

**Note 1:** Some specifications are package dependent. Please refer to the spec. sheet of individual packages once a package is selected..

# “TCXO” and “VCTCXO” Wave Form: Clipped Sine Wave

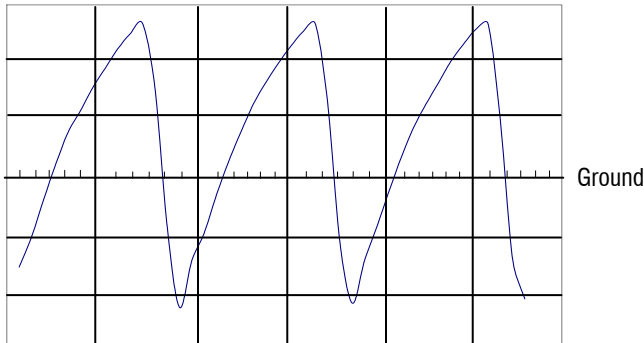
“S” Series



**MERCURY**  
Since 1973

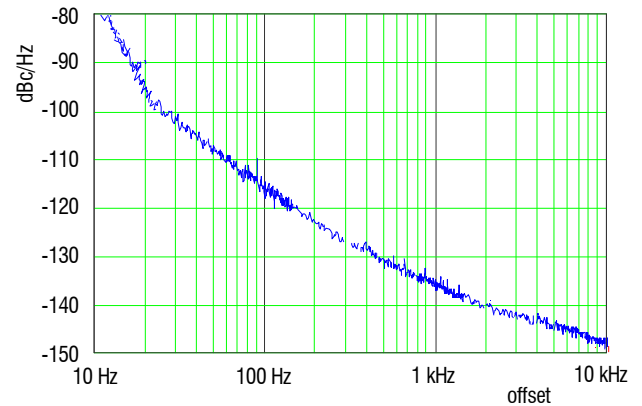
**Note 2:** TCXO products ordered without mechanical and electrical frequency tuning should have a frequency tolerance of  $\pm 2$  ppm (at +25°C) and the frequency stability over temperature will be from that measured value.

## Wave Form – clipped sine wave



## Typical Phase Noise

VM53S3-20.000



## Part Number Format and Examples:

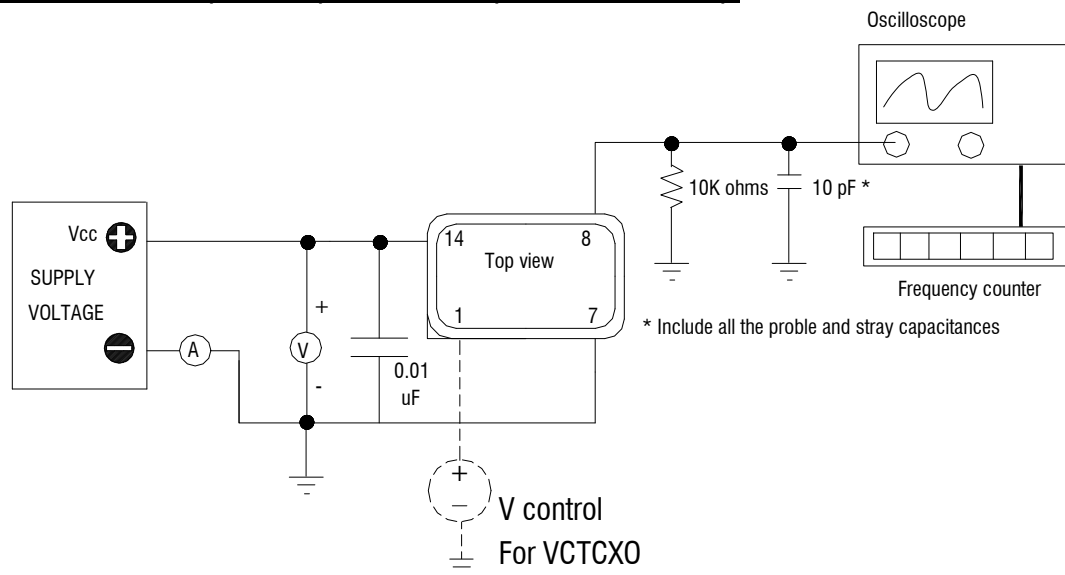
**Example of TCXO:** M38S5-12.800-2.5/-30+75;

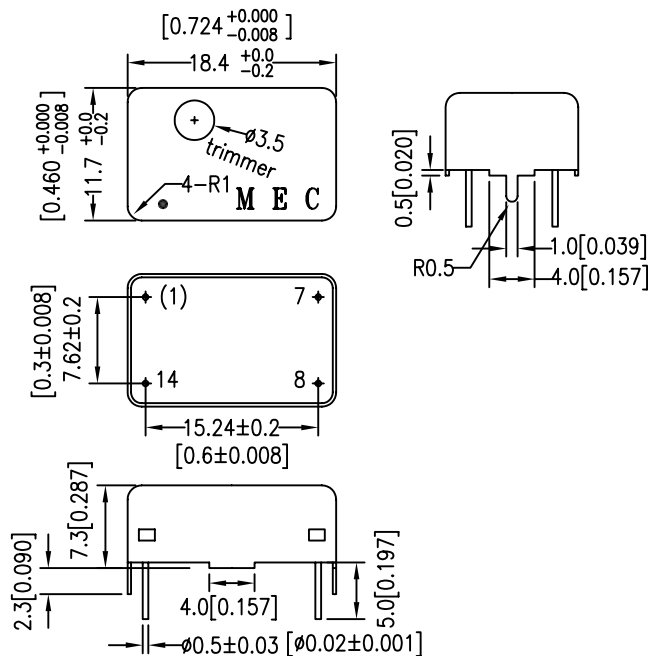
**Example of VCTCXO:** VM38S5-12.800-2.5/-30+75

										: customer to specify
V	M38	S	5	—	12.800	—	2.5	/	-30+75	
❶	❷	❸	❹		❺		❻		❼	

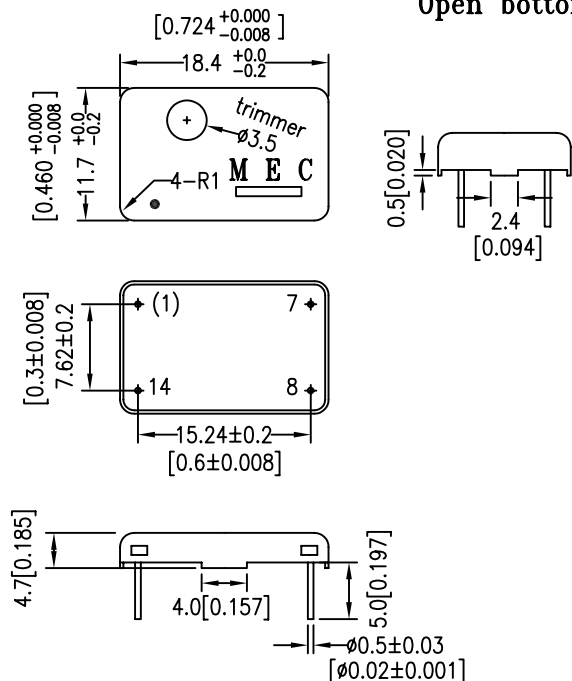
❶: “V” for VCTCXO; “blank” for TCXO ❷: Package code ❸: Wave form code “S” for clipped sine wave ❹: Supply voltage code: “28” for +2.8V, “3” for +3.0V, “33” for “+3.3V, “5” for +5.0V  
❺: Frequency in MHz ❻: Frequency stability in  $\pm$ ppm ❼: Operating temperature range in °C

## Clipped Sine Wave TCXO (VCTCXO) Test Circuit (example of VM14):



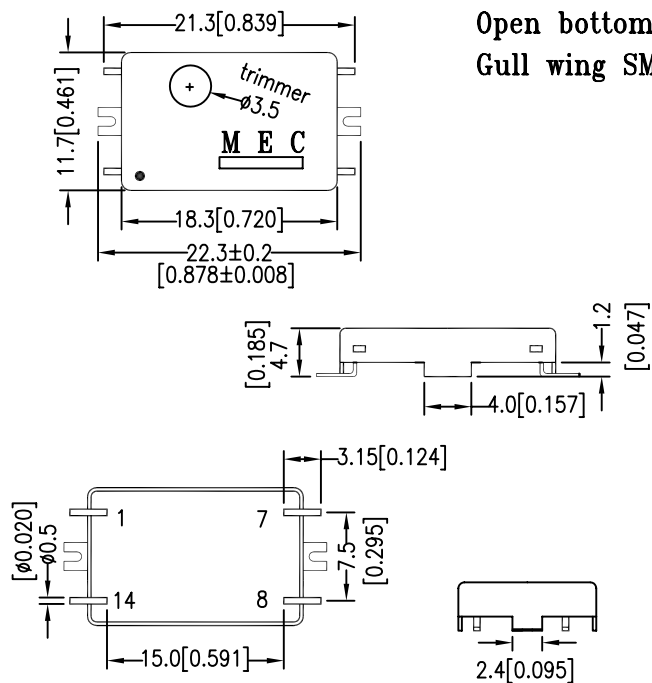
**Package: M38S,VM38S****Open bottom****Pin Connections**

Pin 1: Voltage Control for VCTCXO; No physical pin 1 for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

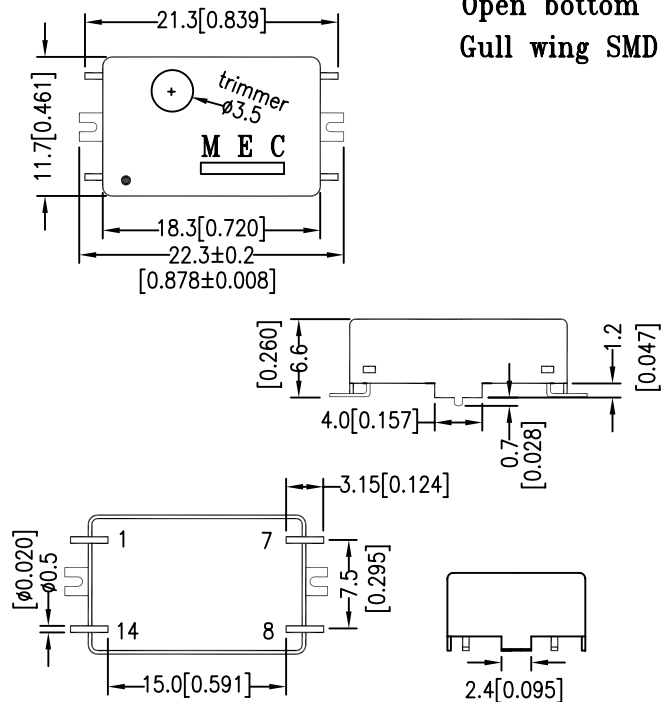
**Package: M39S,VM39S****Unit: mm [inches]****Open bottom****Pin Connections**

Pin 1: Voltage Control for VCTCXO; No physical pin 1 for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

TCXO;VCTCXO

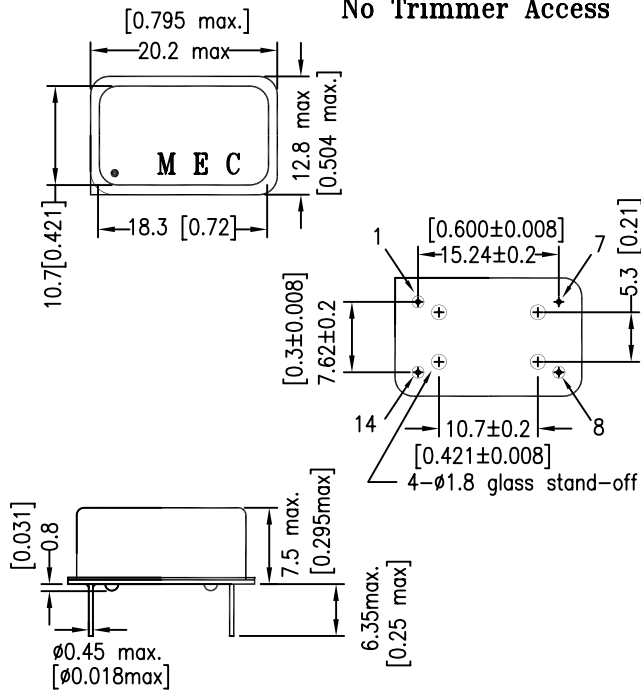
**Package: M47S,VM47S****Open bottom  
Gull wing SMD****Pin Connections**

Pin 1: Voltage Control for VCTCXO. No Connection for TCXO.  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

**Package: M55S,VM55S****Open bottom  
Gull wing SMD****Pin Connections**

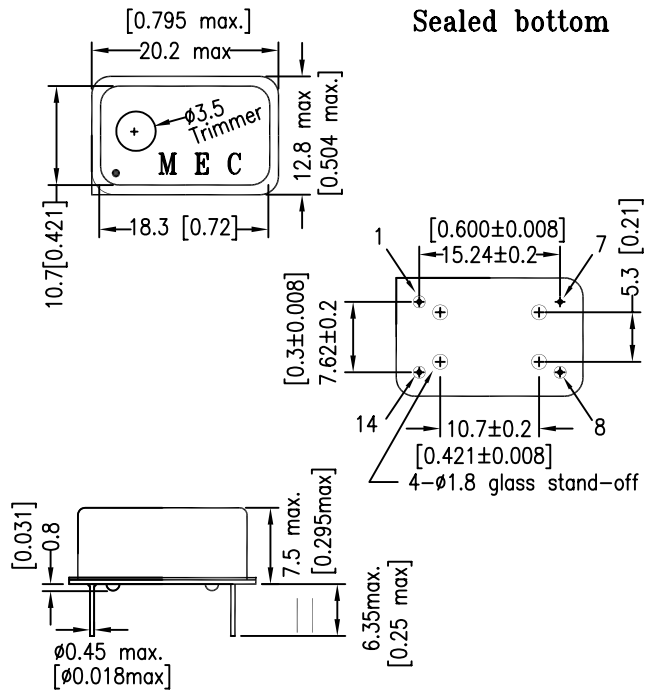
Pin 1: Voltage Control for VCTCXO. No Connection for TCXO.  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

**Package: M14S,VM14S**      **Hermetically Sealed DIP**  
**No Trimmer Access**



**Pin Connections**      Square corner denotes pin 1  
 Pin 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

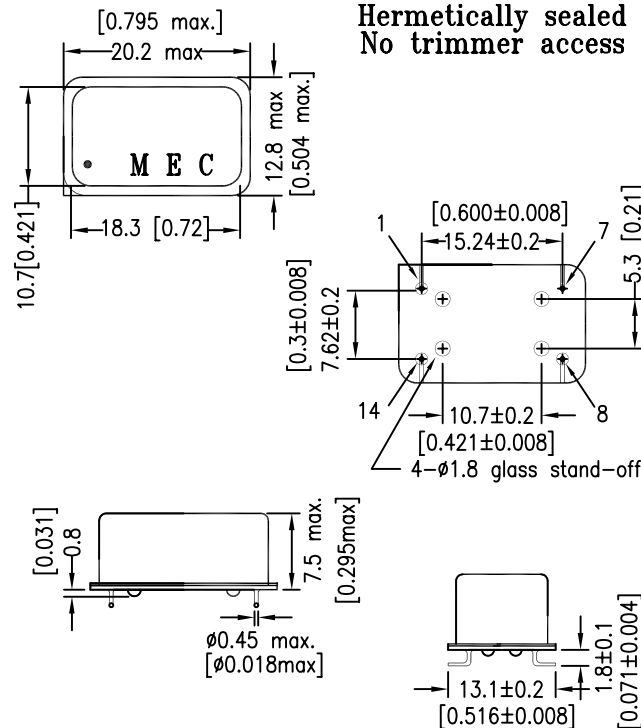
**Package: M15S,VM15S**      **Unit: mm [inches]**  
**Sealed bottom**



**Pin Connections**      Square corner denotes pin 1  
 Pin 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

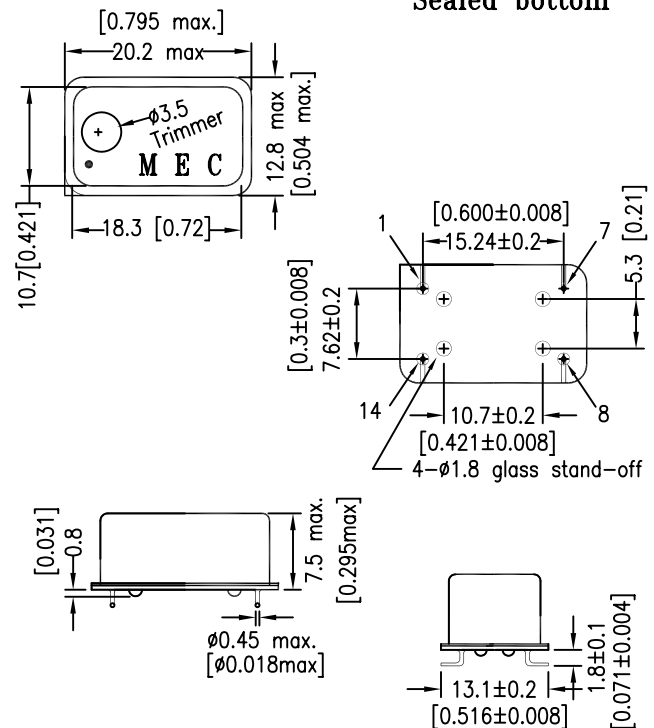
TCXO;VCTCXO

**Package: M24S,VM24S**      **Hermetically sealed**  
**No trimmer access**

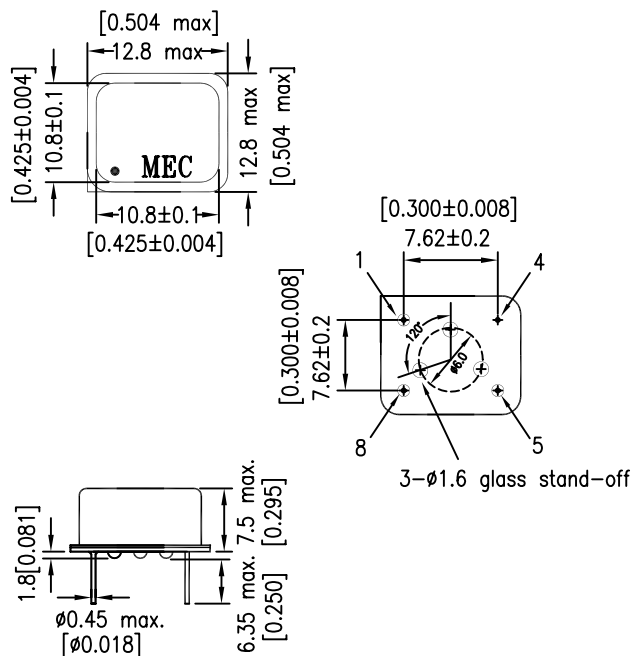


**Pin Connections**      Square corner denotes pin 1  
 Pin 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

**Package:M25S,VM25S**      **Sealed bottom**



**Pin Connections**      Square corner denotes pin 1  
 Pin 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pin 7: Ground and case  
 Pin 8: Output  
 Pin 14: Supply Voltage

**Package: M8S,VM8S****Hermetically Sealed DIP  
No trimmer Access****Pin Connections**

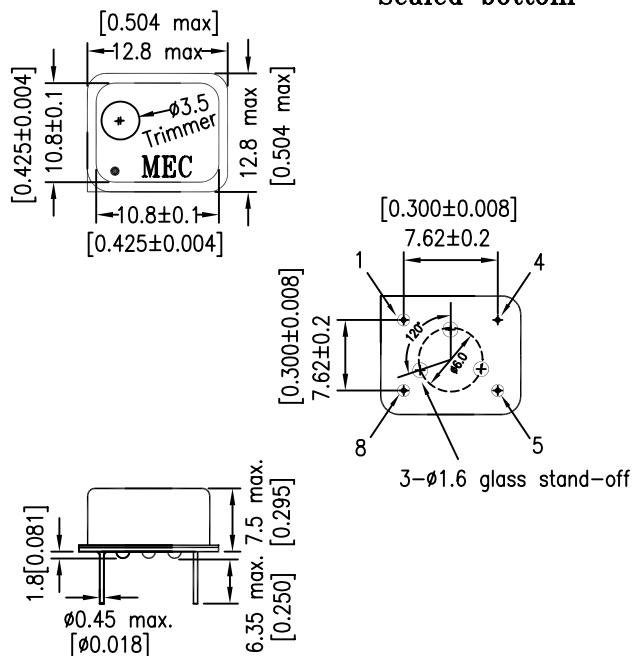
Square corner denotes pin 1

Pin 1: Voltage Control for VCTCXO or No Connection for TCXO

Pin 4: Ground and case

Pin 5: Output

Pin 8: Supply Voltage

**Package: M9S,VM9S****Unit: mm [inches]  
Sealed bottom****Pin Connections**

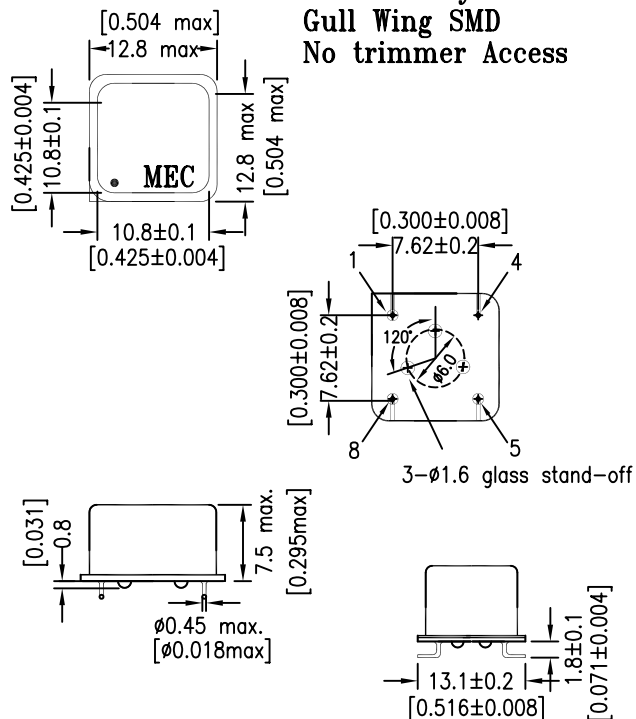
Square corner denotes pin 1

Pin 1: Voltage Control for VCTCXO or No Connection for TCXO

Pin 4: Ground and case

Pin 5: Output

Pin 8: Supply Voltage

**TCXO;VCTCXO****Package: M28S,VM28S****Hermetically Sealed  
Gull Wing SMD  
No trimmer Access****Pin Connections**

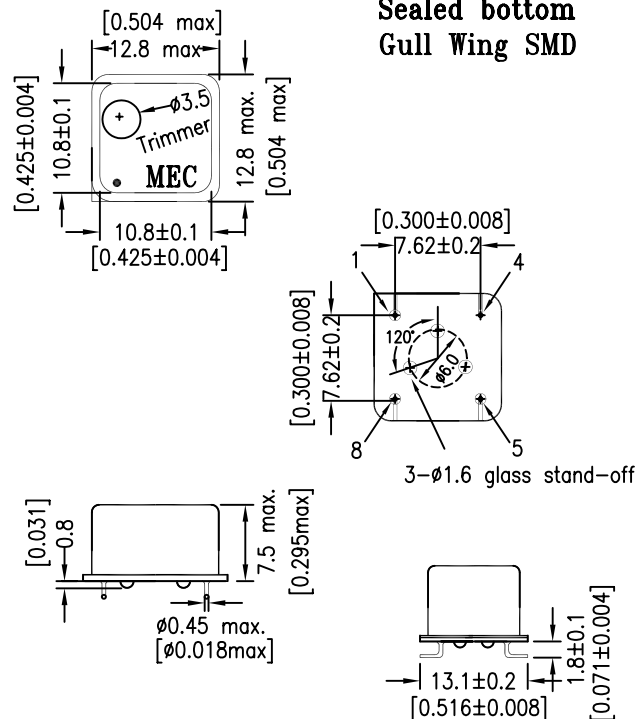
Square corner denotes pin 1

Pin 1: Voltage Control for VCTCXO or No Connection for TCXO

Pin 4: Ground and case

Pin 5: Output

Pin 8: Supply Voltage

**Package: M29S,VM29S****Sealed bottom  
Gull Wing SMD****Pin Connections**

Square corner denotes pin 1

Pin 1: Voltage Control for VCTCXO or No Connection for TCXO

Pin 4: Ground and case

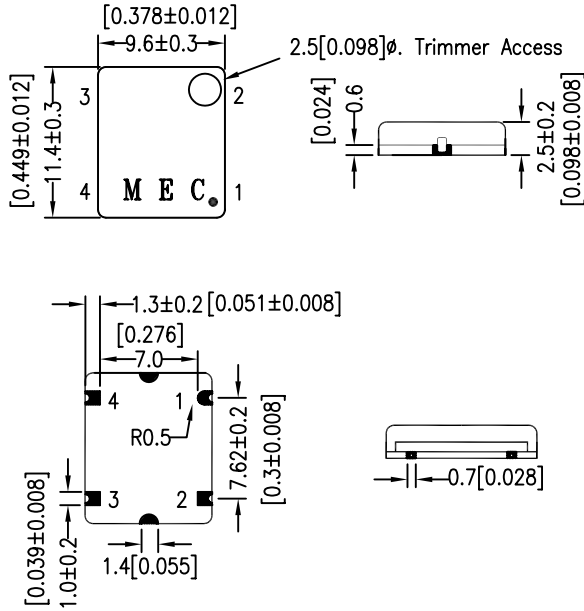
Pin 5: Output

Pin 8: Supply Voltage

**Package: M42S,VM42S**

FR4 substrate

"42" represents 4 pads and 2.5 mm overall height

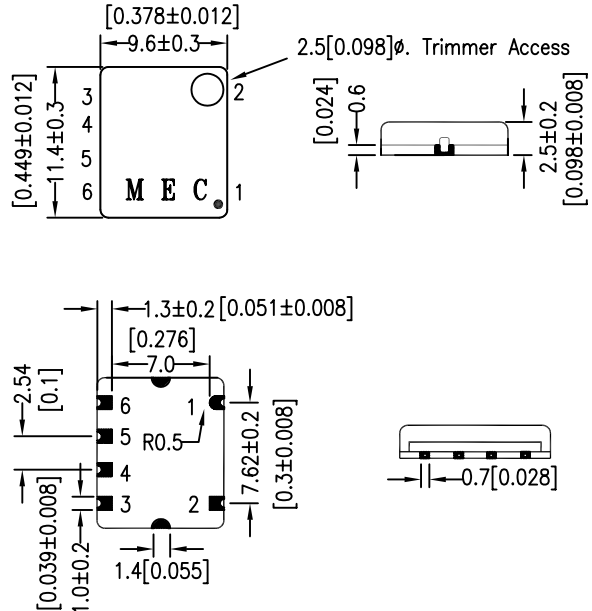
**Pad Connections:**

Pad 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pad 2: Ground and case  
 Pad 3: Output  
 Pad 4: Supply Voltage

**Package: M62S,VM62S**

FR4 substrate

"62" represents 6 pads and 2.5 mm overall height

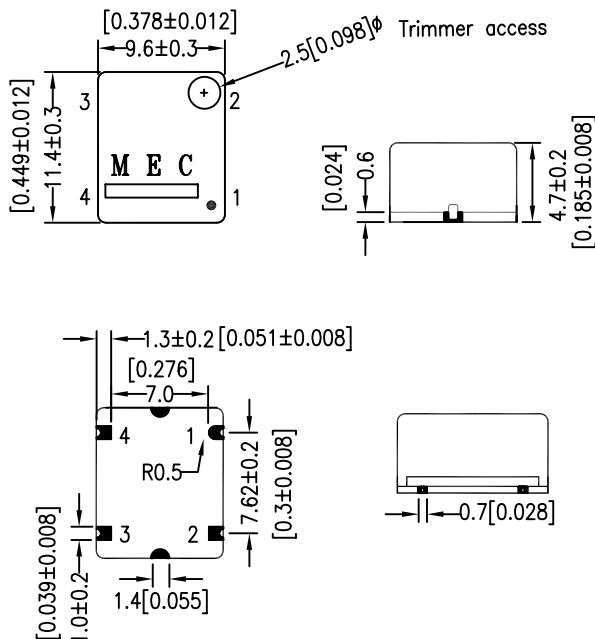
**Pad Connections:**

Pad 1,2,4: Ground and case  
 Pad 3: Output  
 Pad 5: Voltage Control for VCTCXO; No Connection for TCXO  
 Pad 6: Supply Voltage

**Package: M44S,VM44S**

FR4 substrate

"44" represents 4 pads and 4.7 mm overall height

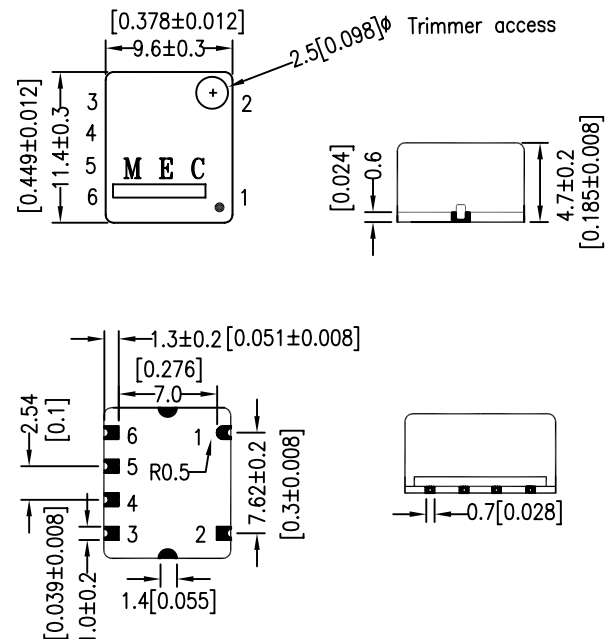
**Pad Connections:**

Pad 1: Voltage Control for VCTCXO; No Connection for TCXO  
 Pad 2: Ground and case  
 Pad 3: Output  
 Pad 4: Supply Voltage

**Package: M64S,VM64S**

FR4 substrate

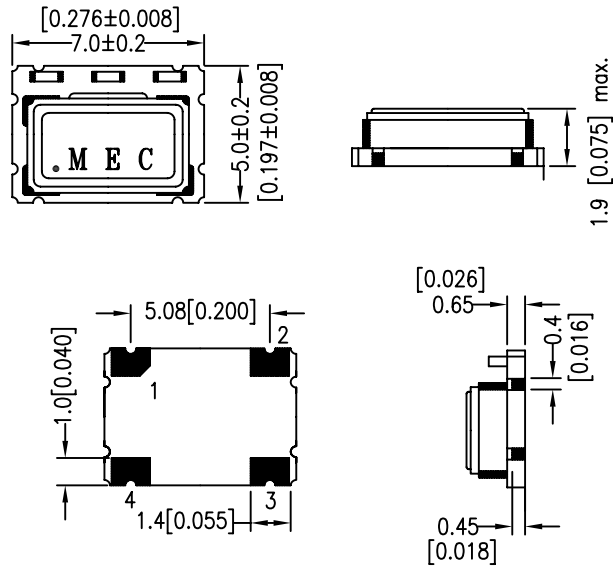
"64" represents 6 pads and 4.7 mm overall height

**Pad Connections:**

Pad 1,2,4: Ground and case  
 Pad 3: Output  
 Pad 5: Voltage Control for VCTCXO; No Connection for TCXO  
 Pad 6: Supply Voltage

# Package: M57S,VM57S

Ceramic SMD

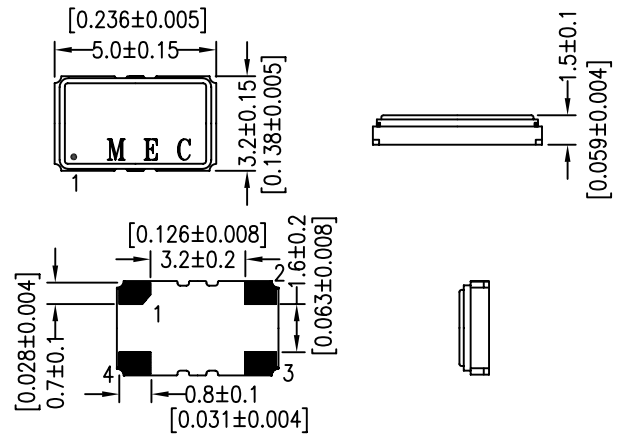


## Pad Connections:

Pad 1: Ground for TCXO; Voltage Control for VCTCXO  
 Pad 2: Ground and metal lid  
 Pad 3: Output  
 Pad 4: Supply Voltage

# Package: M53S,VM53S

Ceramic SMD



## Pad Connections:

Pad 1: Ground for TCXO; Voltage Control for VCTCXO  
 Pad 2: Ground and metal lid  
 Pad 3: Output  
 Pad 4: Supply Voltage

TCXO;VCTCXO