



**PRODUCT SELECTION GUIDE**

**Product Summary:**

Output Wave Form: Clipped Sine Wave					
TCXO	VCTCXO	Available Frequency Range	RoHS Compliant Equivalent Model		Package Description
<b>Thru-Hole Types</b>					
<b>M38S_</b>	<b>VM38S_</b>	9.6 ~ 26 MHz	<b>M38GS_</b>	<b>VM38GS_</b>	4 pin DIP
<b>M39S_</b>	<b>VM39S_</b>	9.6 ~ 26 MHz	<b>M39GS_</b>	<b>VM39GS_</b>	4 pin DIP
<b>M14S_</b>	<b>VM14S_</b>	9.6 ~ 26 MHz	<b>M14GS_</b>	<b>VM14GS_</b>	4 pin DIP. Hermetically sealed.
<b>M15S_</b>	<b>VM15S_</b>	9.6 ~ 26 MHz	<b>M15GS_</b>	<b>VM15GS_</b>	4 pin DIP. With trimmer
<b>M8S_</b>	<b>VM8S_</b>	10.0 ~ 26 MHz	<b>M8GS_</b>	<b>VM8GS_</b>	4 pin DIP. Half size. Hermetically sealed.
<b>M9S_</b>	<b>VM9S_</b>	10.0 ~ 26 MHz	<b>M9GS_</b>	<b>VM9GS_</b>	4 pin DIP. Half size. With trimmer
<b>Gull Wing Surface Mount Types</b>					
<b>M55S_</b>	<b>VM55S_</b>	9.6 ~ 26 MHz	<b>N / A</b>	<b>N / A</b>	4 pin gull wing
<b>M47S_</b>	<b>VM47S_</b>	9.6 ~ 26 MHz	<b>M47GS_</b>	<b>VM47GS_</b>	4 pin gull wing
<b>M24S_</b>	<b>VM24S_</b>	9.6 ~ 26 MHz	<b>M24GS_</b>	<b>VM24GS_</b>	4 pin gull wing. Hermetically sealed.
<b>M25S_</b>	<b>VM25S_</b>	9.6 ~ 26 MHz	<b>M25GS_</b>	<b>VM25GS_</b>	4 pin gull wing. With trimmer
<b>M28S_</b>	<b>VM28S_</b>	10.0 ~ 26 MHz	<b>M28GS_</b>	<b>VM28GS_</b>	4 pin gull wing. Half size. Hermetically sealed.
<b>M29S_</b>	<b>VM29S_</b>	10.0 ~ 26 MHz	<b>M29GS_</b>	<b>VM29GS_</b>	4 pin Gull wing. Half size. With trimmer
<b>Leadless Surface Mount Types</b>					
<b>M62S_</b>	<b>VM62S_</b>	10.0 ~ 26 MHz	<b>M62GS_</b>	<b>VM62GS_</b>	6 pad FR4 substrate. 2.5 mm H
<b>M42S_</b>	<b>VM42S_</b>	10.0 ~ 26 MHz	<b>M42GS_</b>	<b>VM42GS_</b>	4 pad FR4 substrate. 2.5mm H
<b>M64S_</b>	<b>VM64S_</b>	9.6 ~ 26 MHz	<b>M64GS_</b>	<b>VM64GS_</b>	6 pad FR4 substrate. 4.7 mm H
<b>M44S_</b>	<b>VM44S_</b>	9.6 ~ 26 MHz	<b>M44GS_</b>	<b>VM44GS_</b>	4 pad FR4 substrate. 4.7 mm H
<b>M57S_</b>	<b>VM57S_</b>	10.0 ~ 26 MHz	<b>Same<sup>(1)</sup></b>	<b>Same<sup>(1)</sup></b>	4 pad ceramic substrate. 5x7 mm
<b>M53S_</b>	<b>VM53S_</b>	12.5 ~26 MHz	<b>Same<sup>(1)</sup></b>	<b>Same<sup>(1)</sup></b>	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°C to +125°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)**

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<b>“TCXO” and “VCTCXO” Wave Form: Clipped Sine Wave</b>	<b>“S” Series</b>		<b>MERCURY</b> Since 1973
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**General Specifications** (at +25°C and specified input voltage)

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

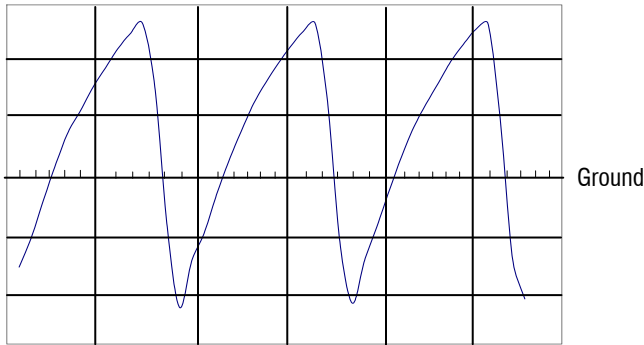
**“S” Series**



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Since 1973

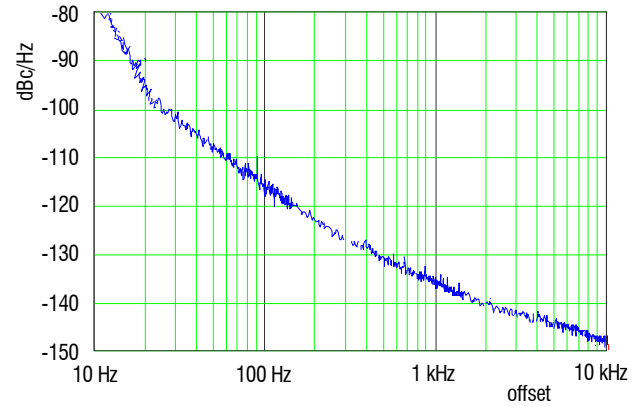
**Note 2:** TCXO products ordered without mechanical and electrical frequency tuning should have a frequency tolerance of  $\pm 2$  ppm (at +25°C) and the frequency stability over temperature will be from that measured value.

**Wave Form – clipped sine wave**



**Typical Phase Noise**

VM53S3-20.000



**Part Number Format and Examples:**

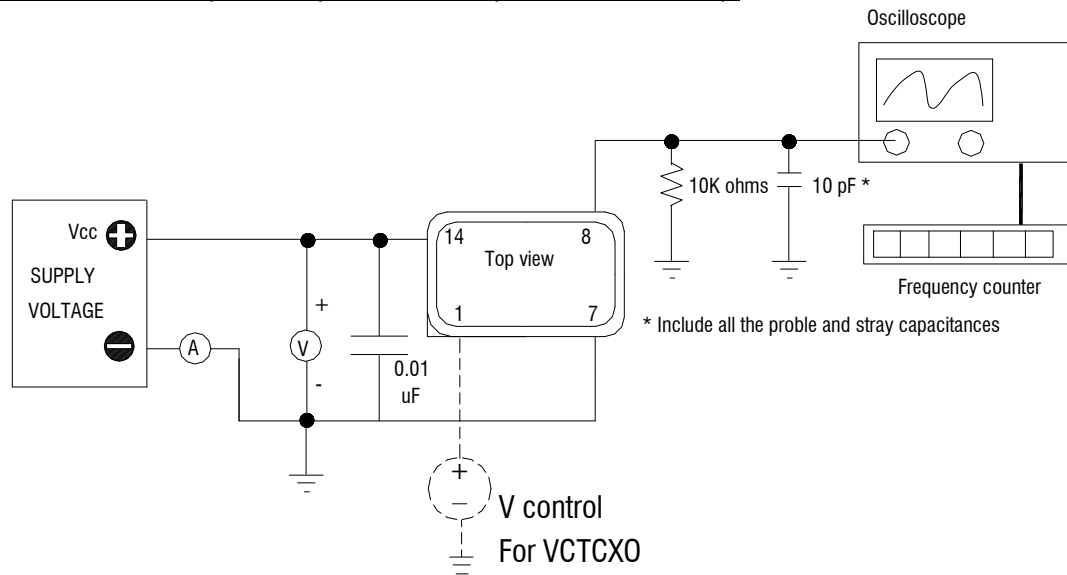
**Example of TCXO:** M38S5-12.800-2.5/-30+75;

**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	

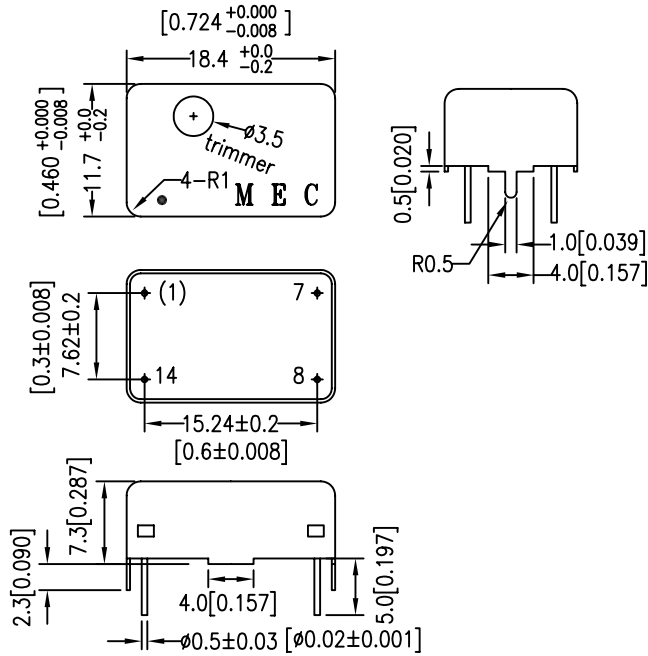
❶: “V” for VCTCXO; “blank” for TCXO  
 ❷: Package code  
 ❸: Wave form code “S” for clipped sine wave  
 ❹: Supply voltage code: “28” for +2.8V, “3” for +3.0V, “33” for +3.3V, “5” for +5.0V  
 ❺: Frequency in MHz  
 ❻: Frequency stability in  $\pm$ ppm  
 ❼: Operating temperature range in °C

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



**Package: M38S,VM38S**

**Open bottom**



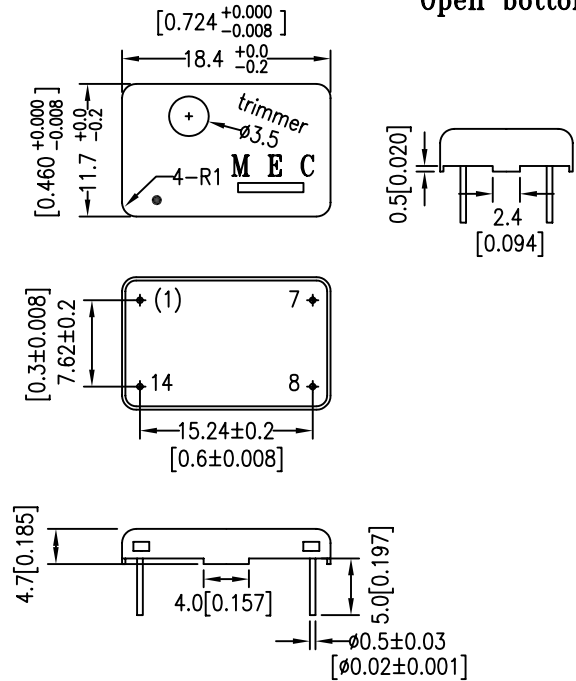
**Pin Connections**

- 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**



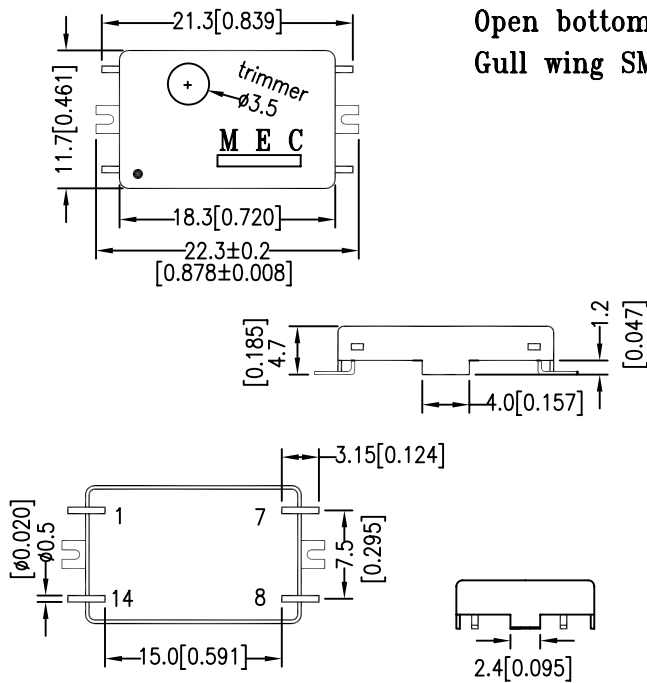
**Pin Connections**

- 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**

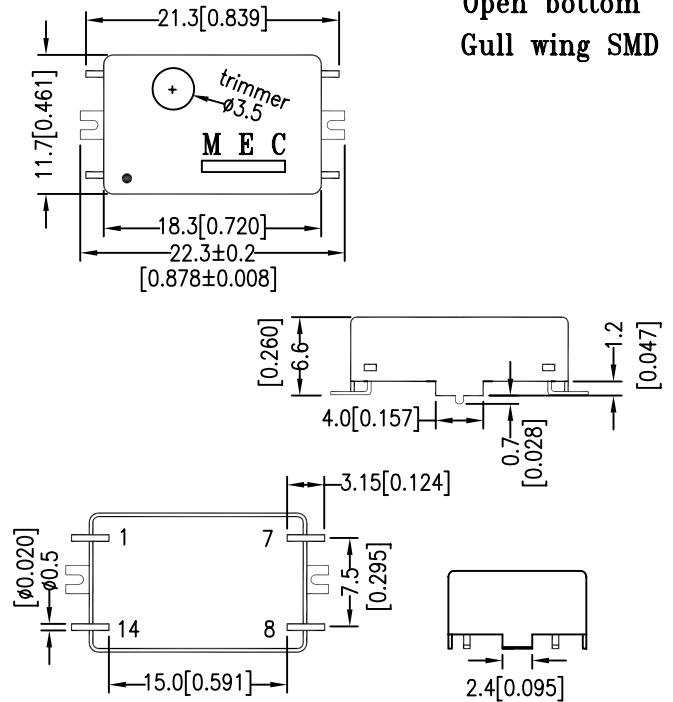


**Pin Connections**

- 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**

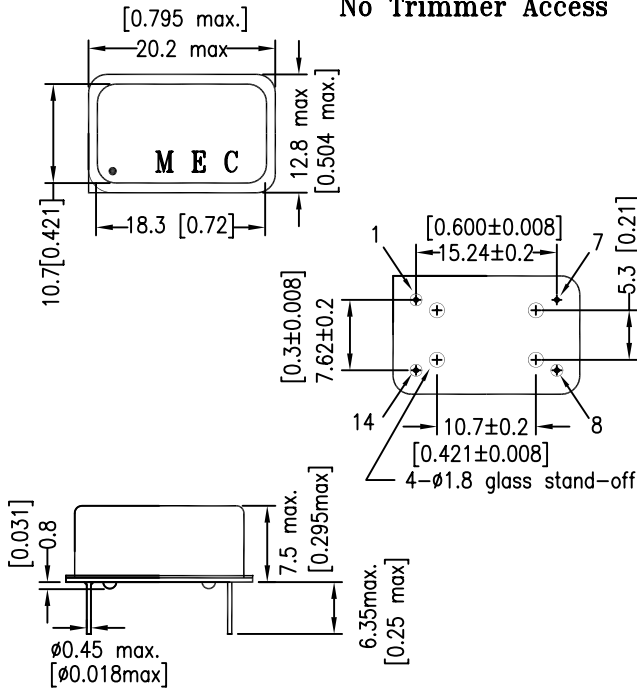
**Open bottom  
Gull wing SMD**



**Pin Connections**

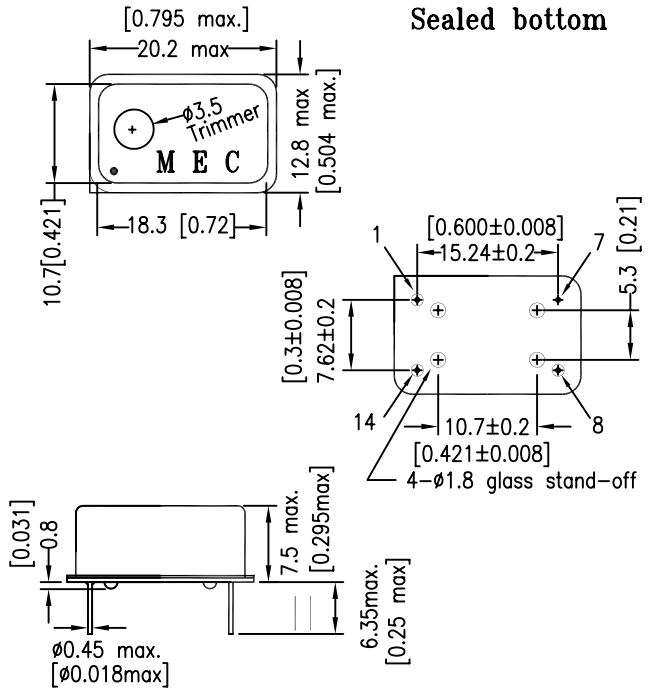
- Pin 1: Voltage Control for VCTCXO. No Connection for TCXO.
- Pin 7: Ground and case
- Pin 8: Output
- Pin 14: Supply Voltage

**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

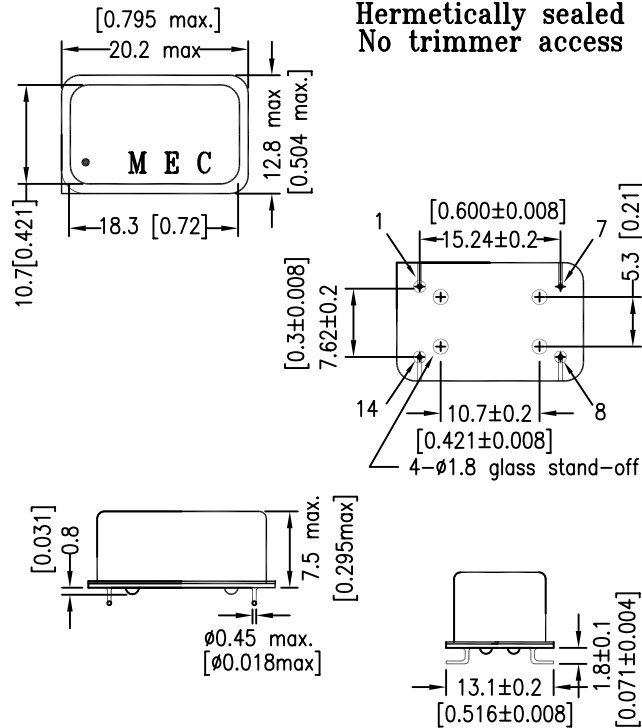
**Package: M15S,VM15S Unit: mm [inches] Sealed bottom**



**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

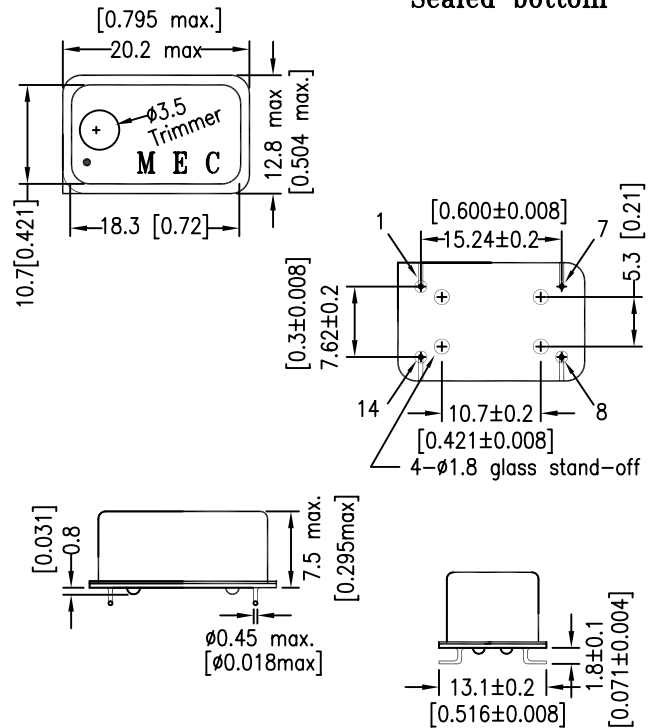
TCXO;VCTCXO

**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

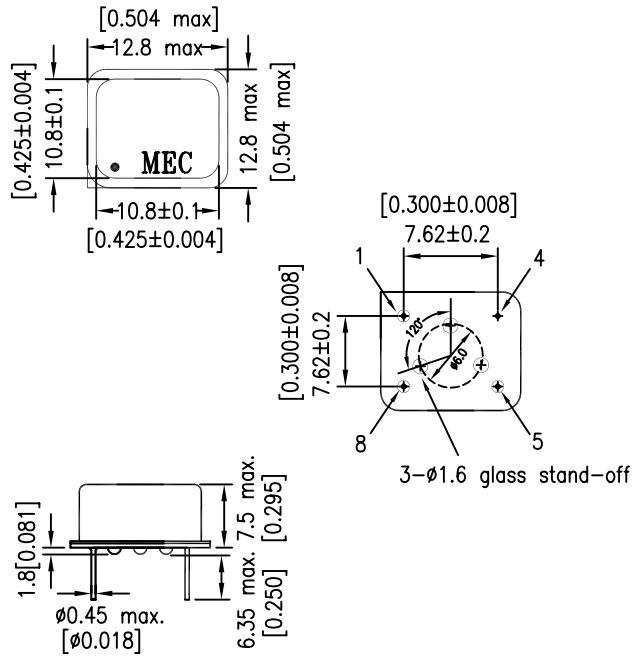
**Package: M25S,VM25S Sealed bottom**



**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



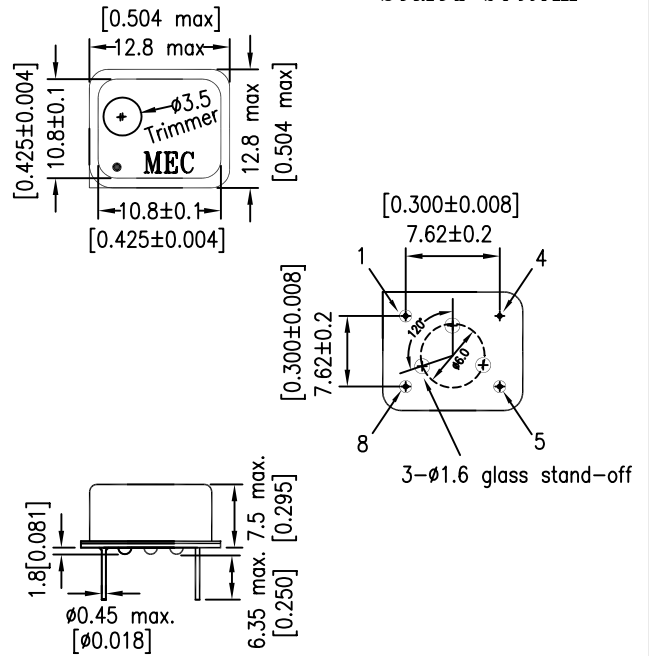
**Pin Connections**

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**

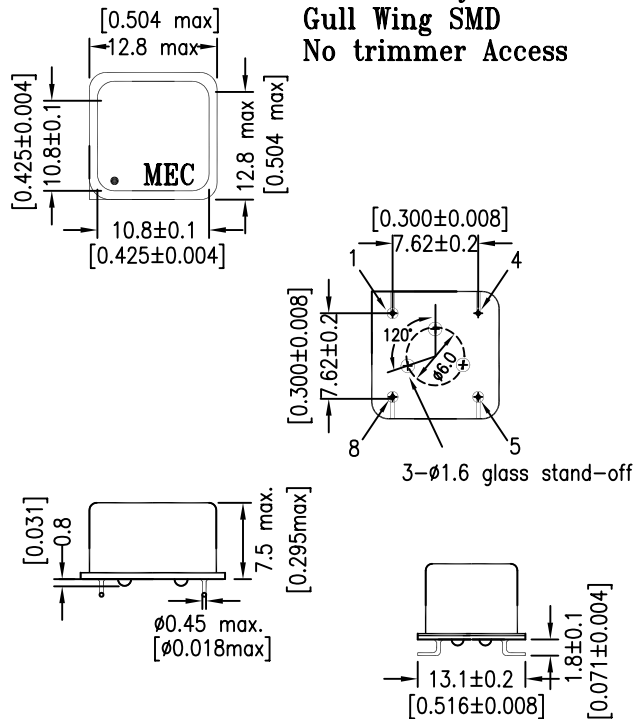
Square corner denotes pin 1

- 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



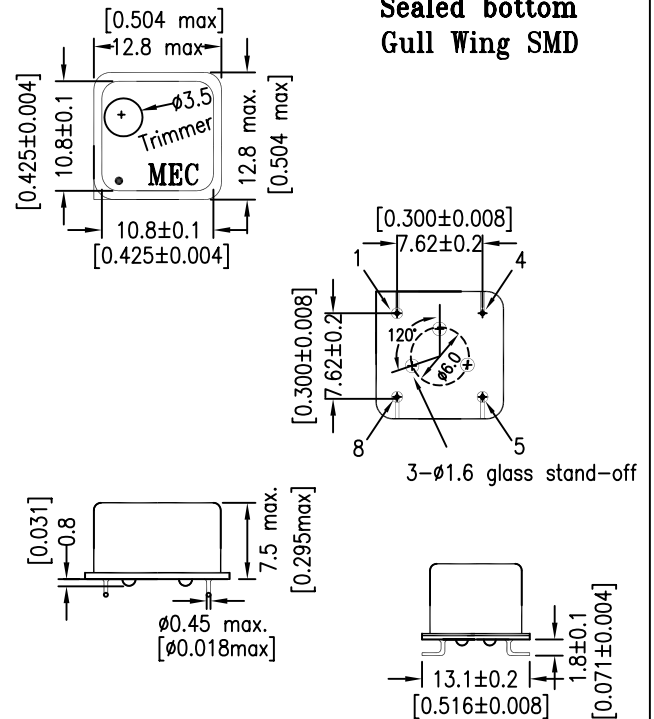
**Pin Connections**

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**

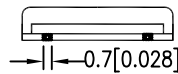
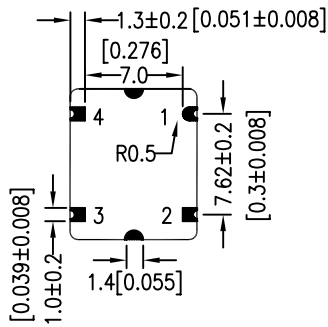
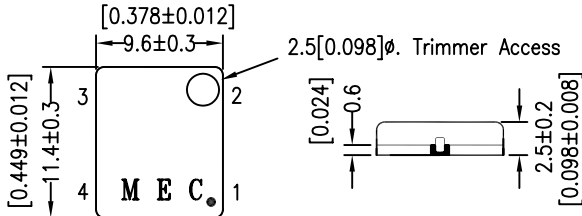
Square corner denotes pin 1

- 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

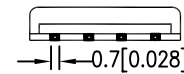
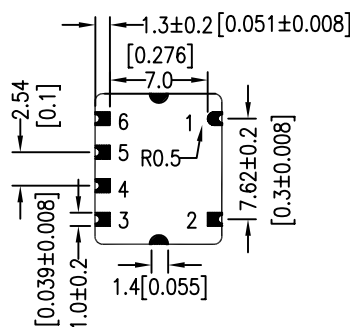
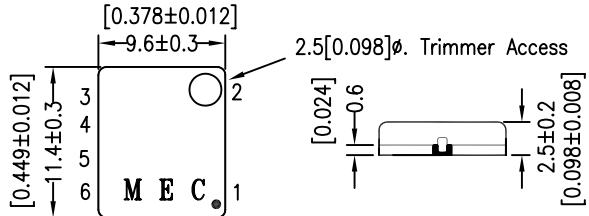
"42" represents 4 pads and 2.5 mm overall height



**Package: M62S,VM62S**

FR4 substrate

"62" represents 6 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

**Pad Connections:**

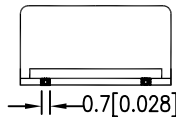
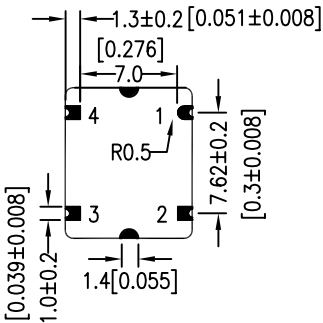
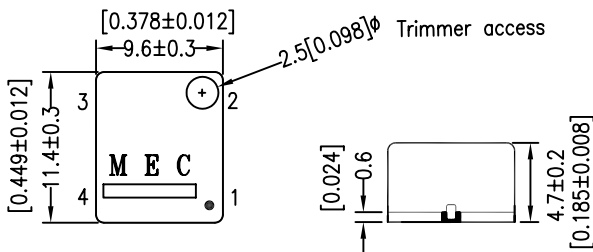
- Pad 1,2,4: Ground and case
- Pad 3: Output
- Pad 5: Voltage Control for VCTCXO; No Connection for TCXO
- Pad 6: Supply Voltage

TCXO;VCTCXO

**Package: M44S,VM44S**

FR4 substrate

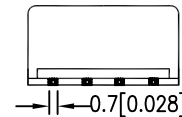
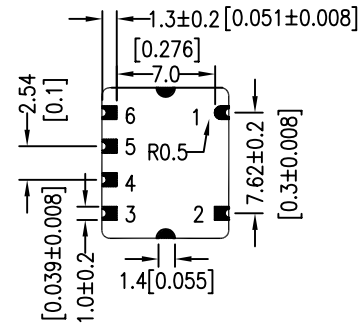
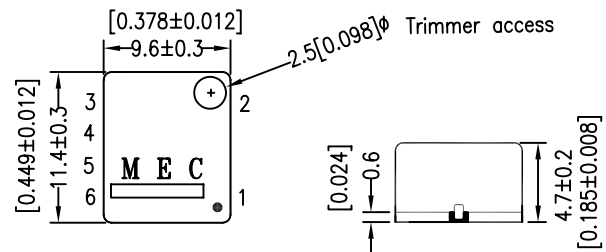
"44" represents 4 pads and 4.7 mm overall height



**Package: M64S,VM64S**

FR4 substrate

"64" represents 6 pads and 4.7 mm overall height



**Pad Connections:**

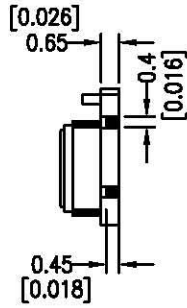
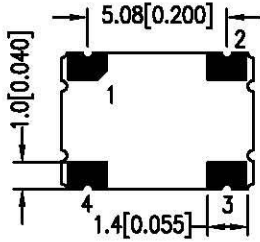
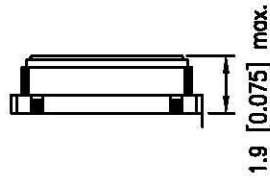
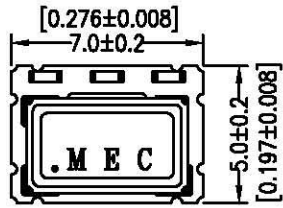
- Pad 1: Voltage Control for VCTCXO; No Connection for TCXO
- Pad 2: Ground and case
- Pad 3: Output
- Pad 4: Supply Voltage

**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

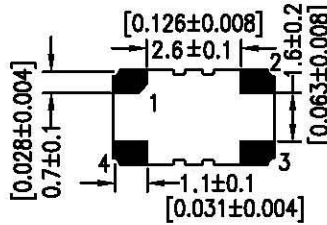
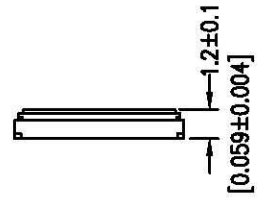
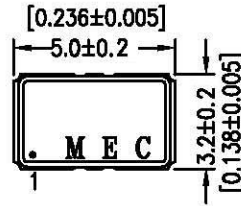


**Pad Connections:**

- 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