

“TCXO” and “VCTCXO” “T” Series 32.768 KHz
Wave Form: Square Wave



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PRODUCT SELECTION GUIDE

Product Summary:

Output Wave Form: Square Wave					
TCXO	VCTCXO	Available Frequency Range	RoHS Compliant Equivalent Model		Package Description
Thru-Hole Types					
M38T	VM38T	32.768 KHz	M38T G	VM38T G	4 pin DIP
M39T	VM39T		M39T G	VM39T G	4 pin DIP
M14T	VM14T		M14T G	VM14T G	4 pin DIP. Hermetically sealed.
M15T	VM15T		M15T G	VM15T G	4 pin DIP. With trimmer
M8T	VM8T		M8T G	VM8T G	4 pin DIP. Half size. Hermetically sealed.
M9T	VM9T		M9T G	VM9T G	4 pin DIP. Half size. With trimmer
Gull Wing Surface Mount Types					
M55T	VM55T	32.768 KHz	N / A	N / A	4 pin gull wing
M47T	VM47T		M47T G	VM47T G	4 pin gull wing
M24T	VM24T		M24T G	VM24T G	4 pin gull wing. Hermetically sealed.
M25T	VM25T		M25T G	VM25T G	4 pin gull wing. With trimmer
M28T	VM28T		M28T G	VM28T G	4 pin gull wing. Half size. Hermetically sealed.
M29T	VM29T		M29T G	VM29T G	4 pin Gull wing. Half size. With trimmer
Leadless Surface Mount Types					
M62T	VM62T	32.768 KHz	M62T G	VM62T G	6 pad FR4 substrate. 2.5 mm H
M42T	VM42T		M42T G	VM42T G	4 pad FR4 substrate. 2.5mm H
M64T	VM64T		M64T G	VM64T G	6 pad FR4 substrate. 4.7 mm H
M44T	VM44T		M44T G	VM44T G	4 pad FR4 substrate. 4.7 mm H
M57T	VM57T	Under development	Same ⁽¹⁾	Same ⁽¹⁾	4 pad ceramic substrate. 5x7 mm
M53T	VM53T		Same ⁽¹⁾	Same ⁽¹⁾	4 pad ceramic substrate. 5x3.2 mm

For RoHS equivalent model please add “G” after the voltage code. For example: M14T3G.

⁽¹⁾ M57T, VM57T, M53T and VM53T are RoHS compliant and lead free products. .

Note: Frequency tuning by the built-in mechanical trimmer is standard for all models except for M57T, VM57T, M53T and VM53T.

Product Options

- No mechanical Trimmer models are available to allow for aqueous washing.
- Narrow (± 1 ppm max.) or wide electrical tuning range (± 35 ppm max.)
- +15V, +12V, +10V or +9V DC supply voltages are also available in some packages.

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“TCXO” and “VCTCXO” “T” Series 32.768 KHz
Wave Form: Square Wave



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

Frequency		32.768 KHz				
Output Wave Form		Square wave. Wave form code is “T”				
Initial Calibration Tolerance		Models with mechanical trimmer: $\pm 1\text{ ppm}$. +25°C $\pm 2^\circ\text{C}</math>.Models without mechanical trimmer: \pm 2\text{ ppm}</math> at +25°C \pm 2^\circ\text{C}</math>.$				
Frequency Stability vs Temperature vs Aging vs Voltage Change vs Load Change vs reflow (SMD models only)		$\pm 1\text{ ppm}</math>, \pm 1.5\text{ ppm}</math>, \pm 2.0\text{ ppm}</math>, \pm 2.5\text{ ppm}</math>, \pm 3\text{ ppm}</math>, or \pm 5\text{ ppm}</math>, over operating temperature range. Referenced to frequency reading at +25°C.\pm 1.0\text{ ppm}</math> max. first year at +25°C\pm 0.3\text{ ppm}</math> max. for a \pm 5\% input voltage change\pm 0.3\text{ ppm}</math> max. for a \pm 10\% loading condition change\pm 1\text{ ppm}</math> max. 1 reflow and measured 24 hours afterwards$				
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)		CMOS				
Mechanical Frequency Tuning		Standard	$\pm 3\text{ ppm}</math> min. tuningNote: VM57 and VM53 have no mechanical trimmer built-in.$			
		Option	No mechanical trimmer built-in (for aqueous washing cycles). Part number: Please add “1” after the regular model prefix. For example: M381T3.			
Input Voltage Range		Option	+15.0V, +12.0V, +10.0V, +9.0; +3.0 V D.C.			
		Standard	+ 2.75 V D.C. min.; +5.0 V D.C. max. +3.3 V (voltage code is “33”) +5.0 V (voltage code is “5”)			
Output Voltage Level	Logic High “1”	2.4 V typ.; 2.2 V min.		4.2 V typ.; 3.9 V min.		
	Logic Low “0”	0.3 V typ.; 0.4 V max.		0.3 V typ.; 0.4 V max.		
Current Consumption. (Over operating temperature range.)		3.5 mA typical.		7.0 mA typical		
Duty Cycle		45% ~55%				
Rise Time (0.1V_{DD} → 0.9 V_{DD})		3.0 n sec. typical; 5.0 n sec max.				
Fall Time (0.9V_{DD} → 0.1 V_{DD})		3.0 n sec. typical; 5.0 n sec max.				
Pin 1 Options	VCTCXO only	Control voltage		+1.5 V $\pm 1.0\text{ V}</math> +2.5 V \pm 2.0\text{ V}</math>.+1.5 V \pm 1.0\text{ V}</math> for VM57T5$		
		Frequency Deviation Range	Standard	$\pm 10\text{ ppm}</math> min. for +1.5 V \pm 1.0\text{ V}</math>$		
			Option	Narrow: $\pm 1\text{ ppm}</math> max. or customWide: \pm 35\text{ min.}</math> or custom$		
		Slope Polarity	Standard	Positive slope. Positive voltage for positive frequency shift.		
			Option	Negative slope. Selected packages only.		
Linearity		10 % max.				
SSB Phase Noise	Offset	10 Hz	100 Hz	1 KHz	10 KHz	100 KHz
	typical	-65 dBc/Hz	-100 dBc/Hz	-130 dBc/Hz	-140 dBc/Hz	-145 dBc/Hz
Start-Up Time.		2 m. sec. Typical, 10 m. sec. max. (reach 90% amplitude and at +25°C $\pm 2^\circ\text{C}</math>)$				
Output Load		15 pF				
Output Format		AC block, 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..

Note 2: TCXO products ordered without mechanical and electrical frequency tuning should have a frequency tolerance of ± 2

**“TCXO” and “VCTCXO” “T” Series 32.768 KHz
Wave Form: Square Wave**



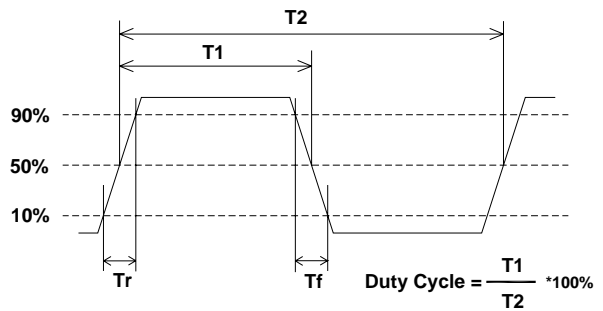
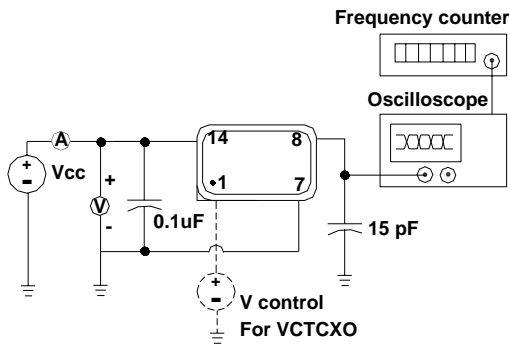
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ppm (at +25°C) and the frequency stability over temperature will be from that measured value.

Part Number Format and Examples:

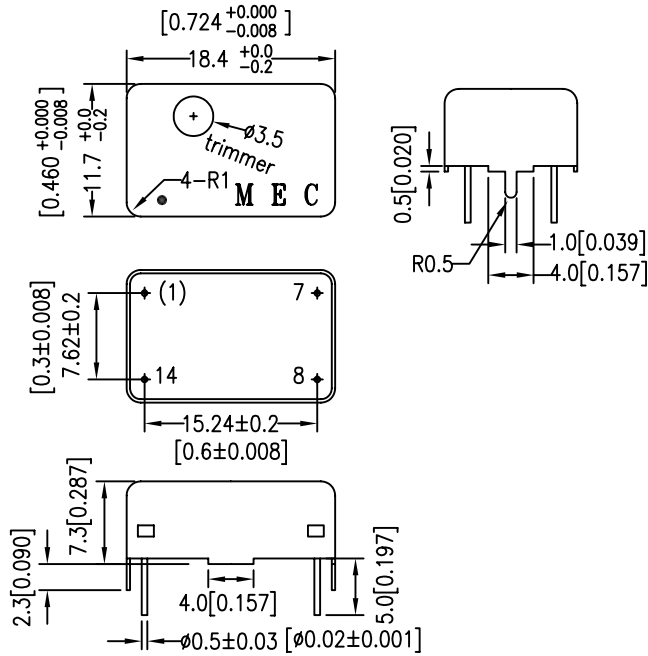
Example of TCXO: M38T33-32.768K-2.5/-30+75; Example of VCTCXO: VM38T5-32.768K-2.5/-30+75										
										: customer to specify
V	M38	T	5	—	32.768K	—	2.5	/	-30+75	
❶	❷	❸	❹		❺		❻		❼	
❶: “V” for VCTCXO; “blank” for TCXO ❷: Package code ❸: Wave form code “T” for Square wave ❹: Supply voltage code: “28” for +2.8V, “3” for +3.0V, “33” for “+3.3V, “5” for +5.0V ❺: Frequency in MHz ❻: Frequency stability in ± ppm ❼: Operating temperature range in °C										

Square Wave TCXO (VCTCXO) Test Circuit (example of VM14) and Output Wave Form:



Package: M38T,VM38T

Open bottom



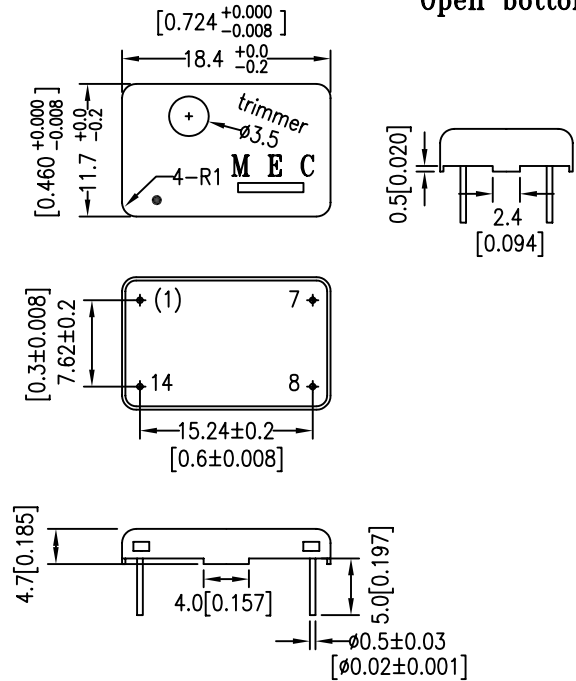
Pin Connections

- 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: M39T,VM39T

Unit: mm [inches]

Open bottom



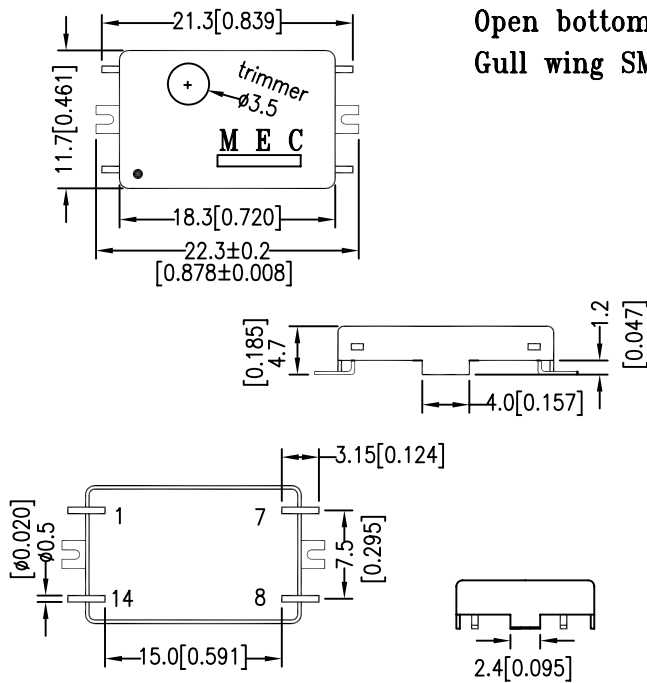
Pin Connections

- 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: M47T,VM47T

**Open bottom
Gull wing SMD**

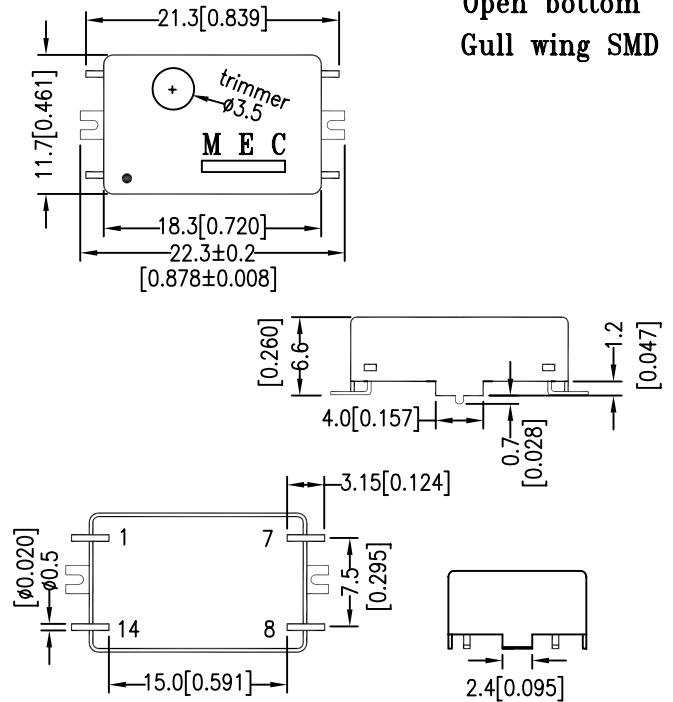


Pin Connections

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

Package: M55T,VM55T

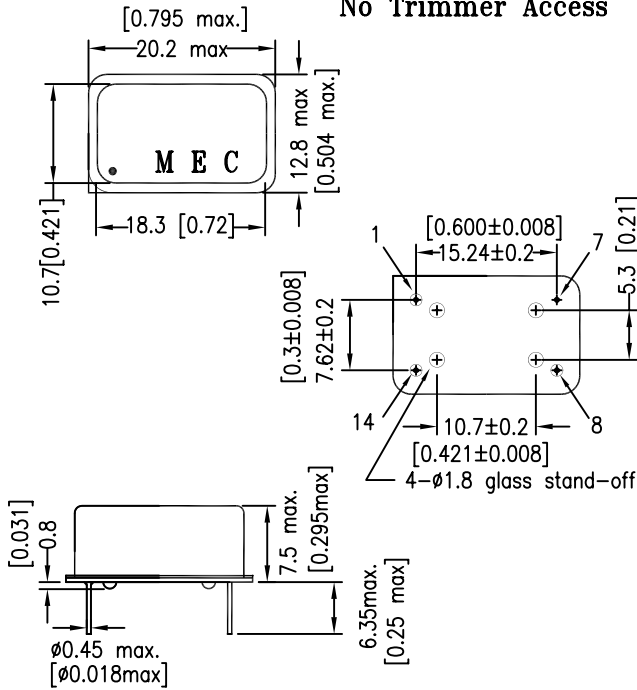
**Open bottom
Gull wing SMD**



Pin Connections

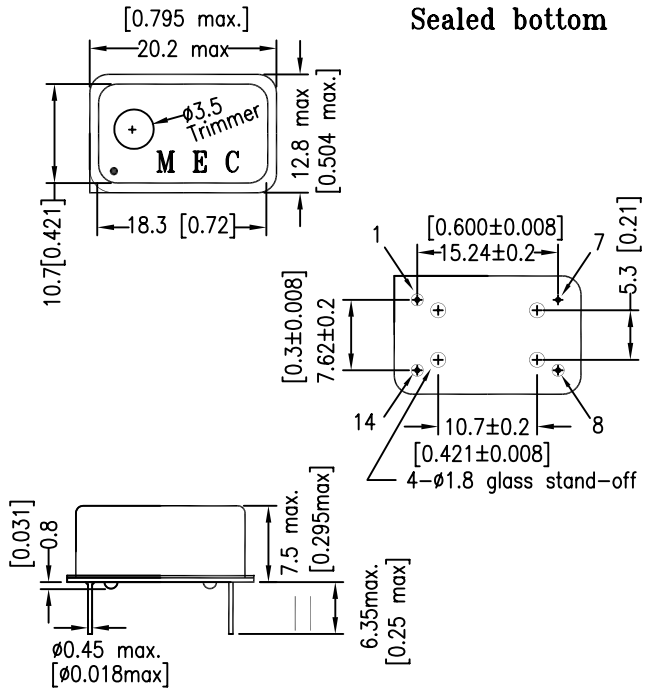
- Pin 1: Voltage Control for VCTCXO. No Connection for TCXO.
- Pin 7: Ground and case
- Pin 8: Output
- Pin 14: Supply Voltage

Package: M14T,VM14T 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

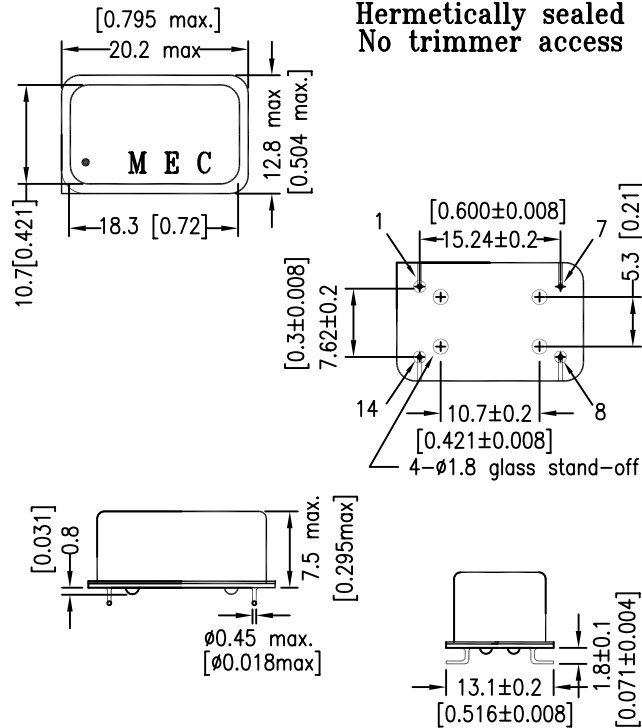
Package: M15T,VM15T Unit: mm [inches] Sealed bottom



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

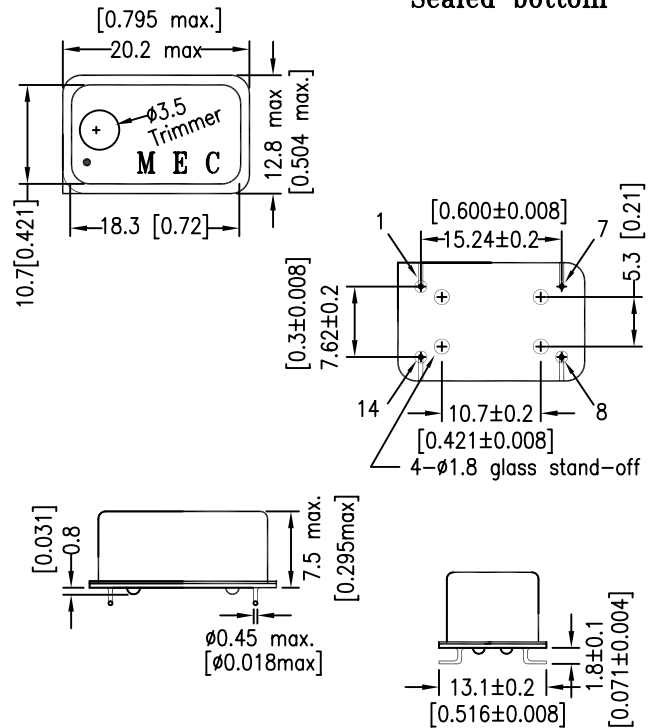
TCXO;VCTCXO

Package: M24T,VM24T 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

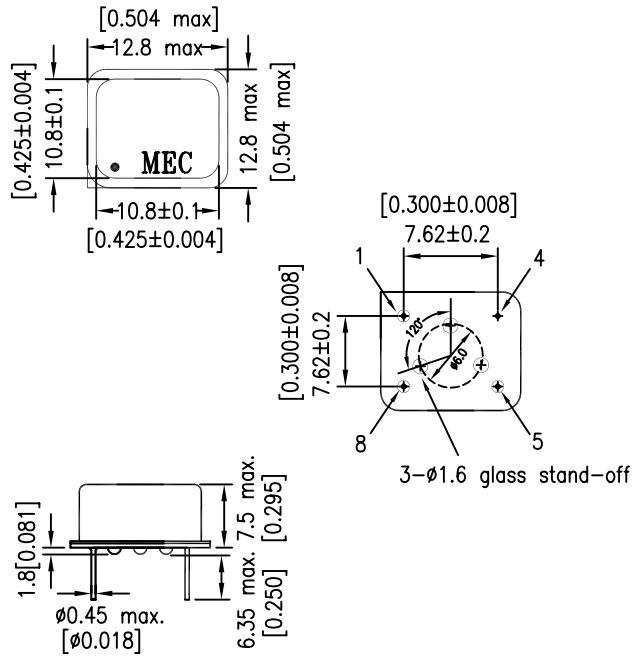
Package: M25T,VM25T Sealed bottom



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: M8T,VM8T

Hermetically Sealed DIP
No trimmer Access



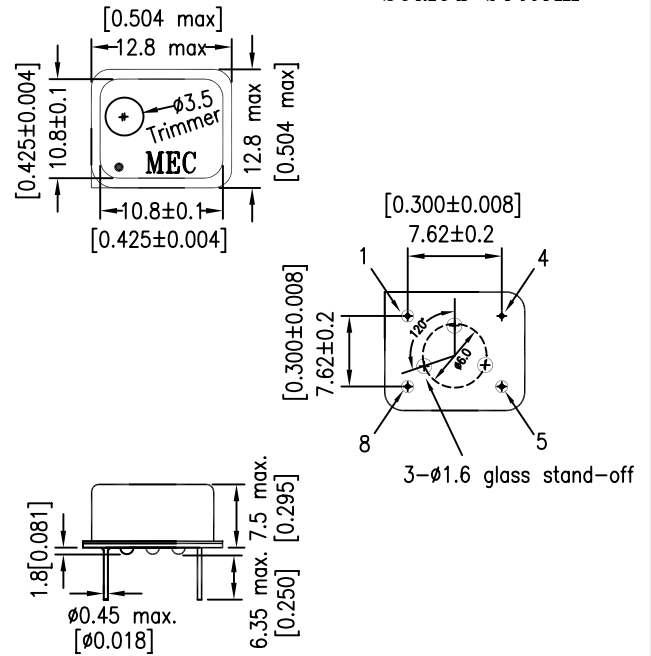
Pin Connections

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: M9T,VM9T

Unit: mm [inches]
Sealed bottom



Pin Connections

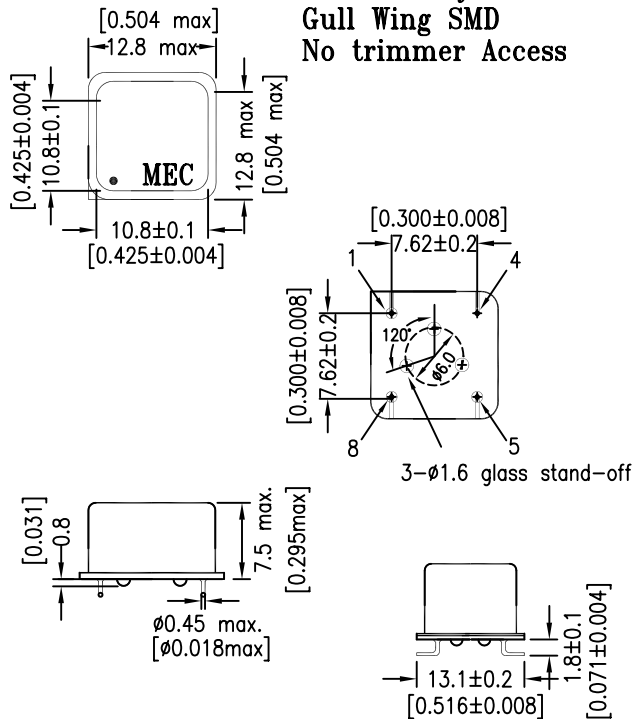
Square corner denotes pin 1

- 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: M28T,VM28T

Hermetically Sealed
Gull Wing SMD
No trimmer Access



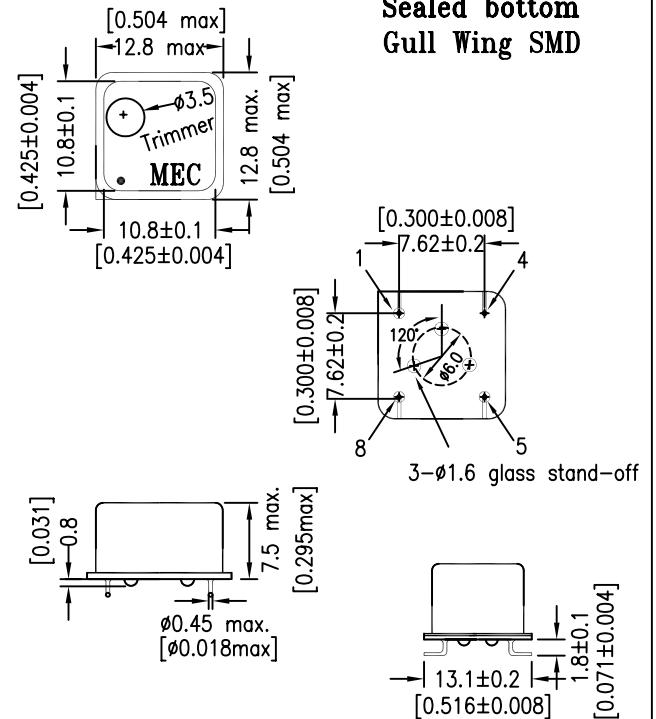
Pin Connections

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: M29T,VM29T

Sealed bottom
Gull Wing SMD



Pin Connections

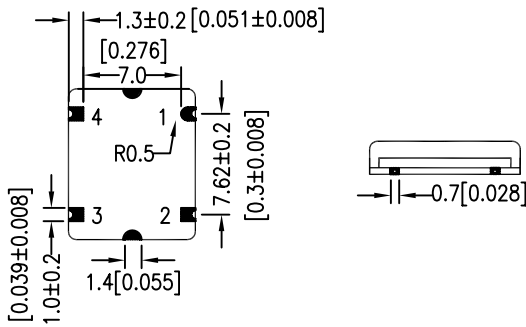
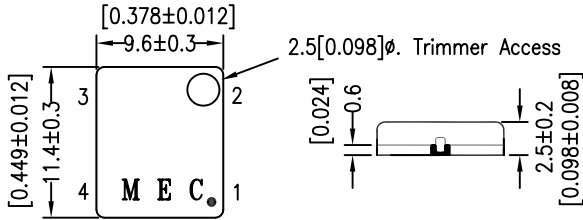
Square corner denotes pin 1

- Pin 1: Voltage Control for VCTCXO or No Connection for TCXO
- Pin 4: Ground and case
- Pin 5: Output
- Pin 8: Supply Voltage

Package: M42T,VM42T

FR4 substrate

"42" represents 4 pads and 2.5 mm overall height



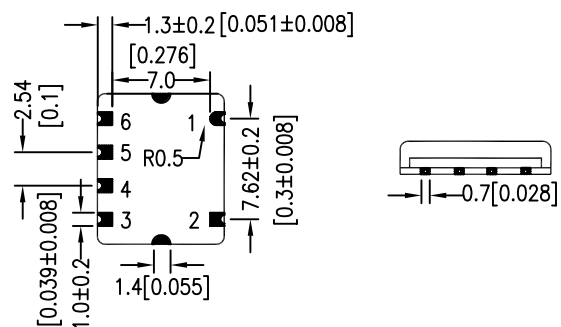
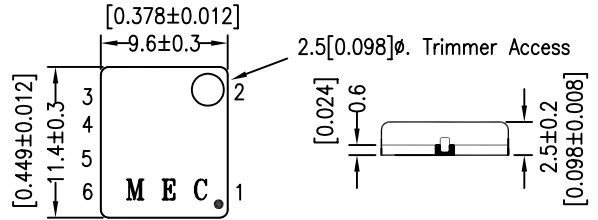
Pad Connections:

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

Package: M62T,VM62T

FR4 substrate

"62" represents 6 pads and 2.5 mm overall height



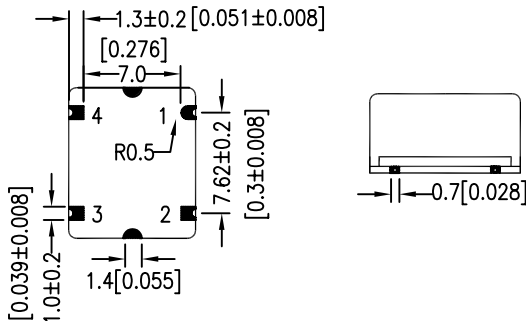
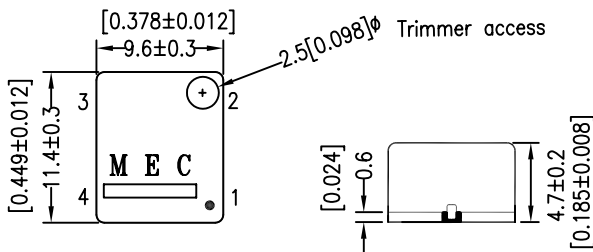
Pad Connections:

- 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: M44T,VM44T

FR4 substrate

"44" represents 4 pads and 4.7 mm overall height



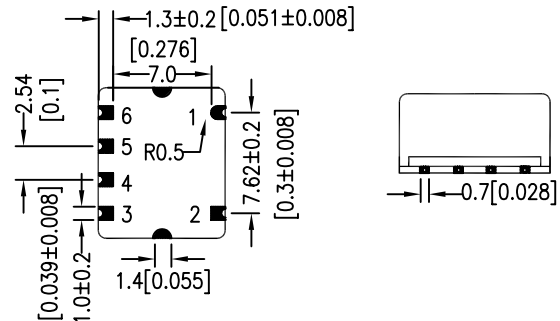
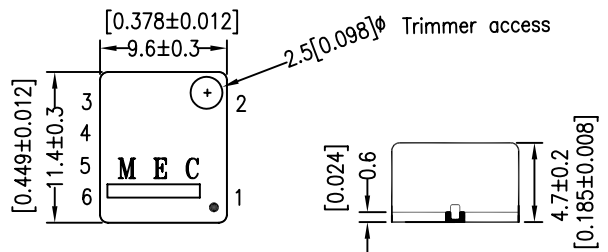
Pad Connections:

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

Package: M64T,VM64T

FR4 substrate

"64" represents 6 pads and 4.7 mm overall height



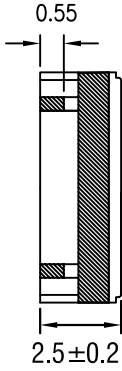
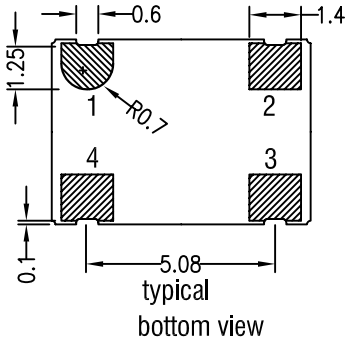
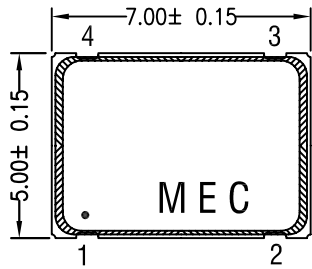
Pad Connections:

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

TCXO;VCTCXO

Package: M57T,VM57T

Ceramic SMD

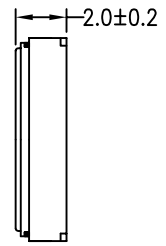
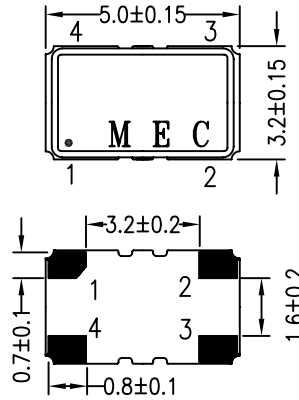


Pad Connections:

- Pad 1: "Do not connect" for TCXO; Voltage Control for VCTCXO
- Pad 2: Ground and metal lid
- Pad 3: Output
- Pad 4: Supply Voltage

Package: M53T,VM53T

Ceramic SMD



Pad Connections:

- Pad 1: "Do not connect" for TCXO; Voltage Control for VCTCXO
- Pad 2: Ground and metal lid
- Pad 3: Output
- Pad 4: Supply Voltage

TCXO;VCTCXO