

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

CMOS Output

TCXO	VCTCXO	MHz range	CMOS	DIP	15pF	1.8 V	2.5 V	Min. 6.4 MHz	Max. 60.0 MHz
M _ T	VM _ T					3.0 V	3.3 V		

## Features

- Wide frequency range : [ 6.4 MHz ~ 60.0 MHz ]
- Frequency stability as tight as  $\pm 0.5$  ppm over 0°C to 50°C
- Frequency stability as tight as  $\pm 1.0$  ppm over -40°C to 85°C

General specifications of all available packages , at Ta=+25°C , CL=15pF



Output Waveform		Square wave [ CMOS ] . Waveform code is " T "							
Suggested package ( Dip type )		M8T , VM8T	M9T , VM9T	M14T , VM14T	M15T , VM15T	M39T , VM39T			
Model 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 <sub>DD</sub> ) [ 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 ~ 60.0 MHz	6.4 ~ 60.0 MHz	6.4 ~ 60.0 MHz	6.4 ~ 60.0 MHz	6.4 ~ 60.0 MHz			
Supply Voltage V <sub>DD</sub> ( code )			+1.8 V $\pm$ 5% ( code is " 18 " )	+2.5 V $\pm$ 10% ( code is " 25 " )	+3.0 V $\pm$ 10% ( code is " 3 " )	+3.3 V $\pm$ 10% ( code is " 33 " )			
Current Consumption. ( max. ) ( Over operating temperature range . )	Package	M8T	5 mA	7 mA	-----	10 mA			
		M9T	6 mA	6 mA	6 mA	6 mA			
		M14T	10 mA	10 mA	13 mA	13 mA			
		M15T	10 mA	10 mA	13 mA	13 mA			
		M39T	-----	10 mA	13 mA	13 mA			
Output Logic Levels	Logic High " 1 " ( min. )		1.62 V	2.25 V	2.7 V	2.97 V			
	Logic Low " 0 " ( max. )		0.25 V	0.25 V	0.3 V	0.33 V			
Standard Frequency ( Partial list ) [ MHz ]			10.000	12.800	13.000	14.7456	16.000	16.384	
			19.200	19.440	19.680	20.000	25.000	27.000	
Initial Calibration Tolerance		Models with mechanical trimmer : $< \pm 1.0$ ppm. +25°C $\pm$ 2°C. Models without mechanical trimmer : $< \pm 2.0$ ppm at +25°C $\pm$ 2°C.							
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		X	○	○	○	○	○	
	-30°C to 75°C		X	○	○	○	○	○	
	-30°C to 85°C		X	○	○	○	○	○	
	-40°C to 85°C		X	△	△	△	○	○	
Frequency Stability	vs Aging at Ta = +25°C		$\pm 1.0$ ppm / year ( max. )						
	vs Voltage Change		$\pm 0.3$ ppm ( max. ) , for a $\pm 5\%$ input voltage change .						
	vs Load Change		$\pm 0.3$ 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 .						
Electrical Frequency Tuning ( EFC ) by external Control Voltage	Control Voltage Center		0.9 V $\pm$ 0.6 V ( 1.8 V ) ; 1.4 V $\pm$ 1.0 V ( 2.5V ) ; 1.5 V $\pm$ 1.0 V ( 3.0V / 3.3V )						
	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 : 20 KHz ( min. )		Linearity : $\pm 10\%$ ( max. )		
Output Load		15 pF							
Rise and Fall Time		10.0 nsec. ( max. ) Measured at 20% $\leftrightarrow$ 80% of the waveform							
Start-Up Time.		5.0 msec. ( typ. ) , 10.0 msec. ( max. ) ( reach 90% amplitude and at+25°C $\pm$ 2°C)							
Duty Cycle		Standard: 50 % $\pm$ 10 % ; Option: 50 % $\pm$ 5 %							
Storage Temperature		-40°C to +85°C or -55°C to +125°C ( package dependent )							
Phase Noise [ dBc / Hz ( typ. ) ]	Offset		10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
	M572T33 - 10.000		-96 dBc / Hz	-122 dBc / Hz	-138 dBc / Hz	-145 dBc / Hz	-150 dBc / Hz		

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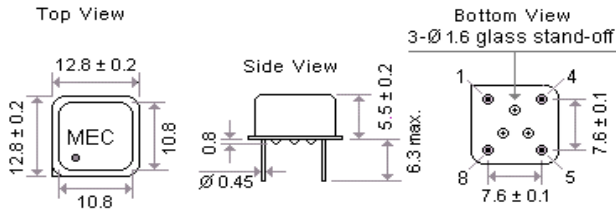
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# Temperature Compensated Crystal Oscillators [ TCXO " M " and VCTCXO " VM " ]

CMOS wave output code " T "

Outline Dimensions ( Unit : mm ) , Suggested pin Layout

[ (V) M\_8T \_\_ ] - - - Gull - wing SMD is also available .

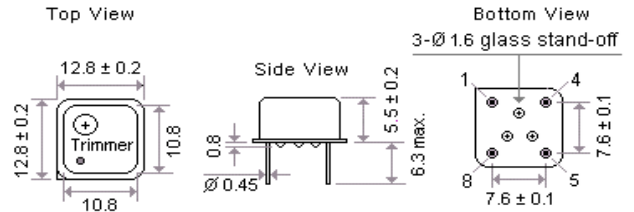


Pad Connections :

Pin 1 : Control voltage for VCTCXO , No connection for TCXO .

Pin 4 : Ground ; Pin 5 : Output , Pin 8 : Supply Voltage

[ (V) M\_9T \_\_ ] - - - with mechanical trimmer

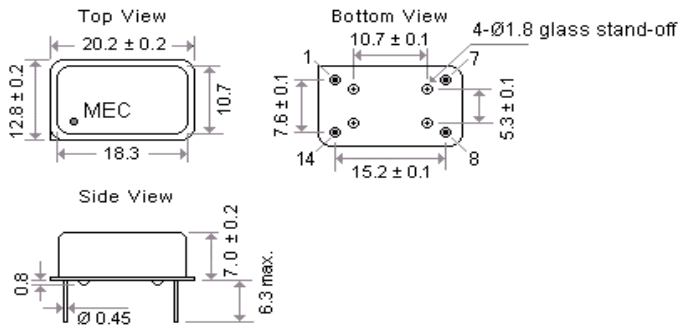


Pad Connections :

Pin 1 : Control voltage for VCTCXO , No connection for TCXO .

Pin 4 : Ground ; Pin 5 : Output , Pin 8 : Supply Voltage

[ (V) M\_14T \_\_ ] - - - Gull - wing SMD is also available .

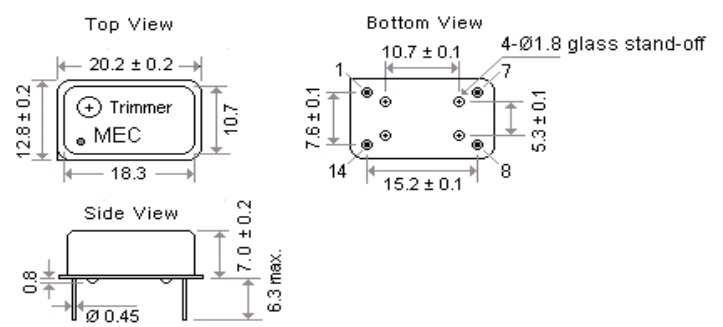


Pad Connections :

Pin 1 : Control voltage for VCTCXO ; No connection for TCXO .

Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[ (V) M\_15T \_\_ ] - - - with mechanical trimmer

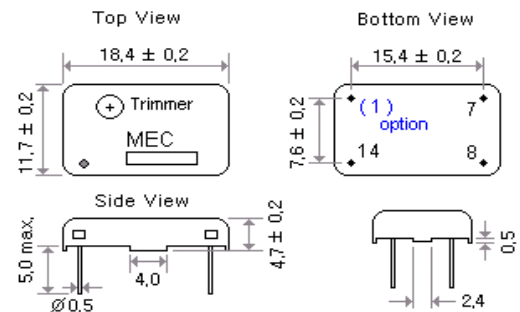


Pad Connections :

Pin 1 : Control voltage for VCTCXO ; No connection for TCXO .

Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[ (V) M\_39T \_\_ ]



Pad 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 " ]

## CMOS wave output code " T "

### Part Number Format and Example

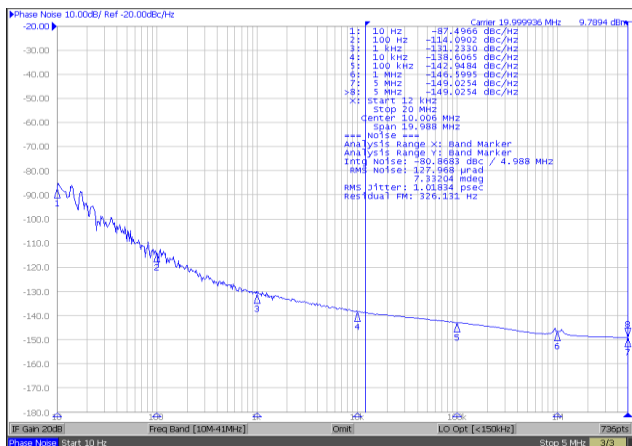
	[ 1 ]	[ 2 ]	[ 3 ]	-	[ 4 ]	-	[ 5 ]	/	[ 6 ]		
	Holder Type	Output Wave	Supply Voltage		Center Frequency		Frequency Stability		Operating Temp. Range		
Examples	(1)	V M 39	T		3	-	10.000	-	1.5	/	-20+70
	(2)	M572	T		3	-	20.000	-	2.5	/	-30+85

Ex (1) : VM39T3 - 10.000 - 1.5 / -20+70 [ VCTCXO , VM39 type , CMOS output , 3.0V , 10.000MHz , ±1.5ppm from -20°C to 70°C ]

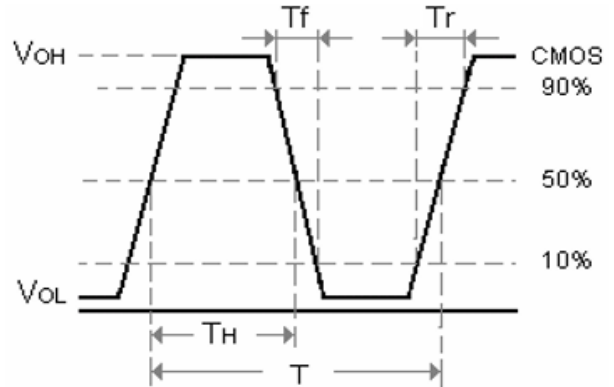
Ex (2) : M572T3 - 20.000 - 2.5 / -30+85 [ TCXO , M572 type , CMOS output , 3.0V , 20.000MHz , ±2.5ppm from -30°C to 85°C ]

[ 1 ]	Holder Type " M " stands for TCXO , " VM " stands for VCTCXO
[ 2 ]	" T " stands for Square Wave ex 1 : M43T --- TCXO , M43 package , CMOS output
[ 3 ]	Supply voltage , " 18 " stands for +1.8V ; " 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 : -40 °C to 85°C ----- -40+85

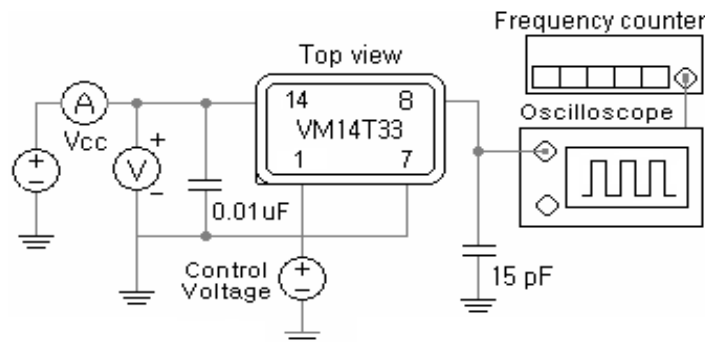
CMOS Typical Phase Noise ( M572T33-20.000 )



CMOS Output Wave , " T " series



( VC )TCXO with CMOS square wave: Ex. VM14T33



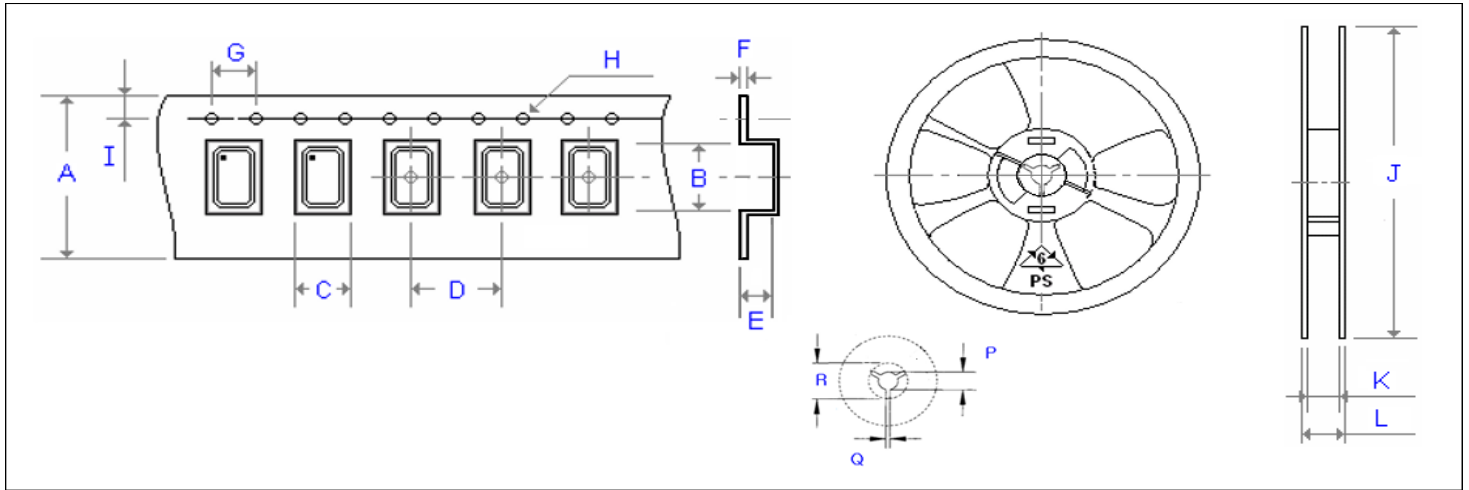
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## Emboss Taping and Reel Specifications

[ 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_534	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.50	1.75	1000
G_576	16.00	7.30	5.30	8.00	1.90	0.32	4.00	∅ 1.50	1.75	1000
G_43	24.00	11.80	10.00	16.00	5.00	0.30	4.00	∅ 1.50	1.75	500
G_63	24.00	11.80	10.00	16.00	5.00	0.30	4.00	∅ 1.50	1.75	500
G_JF538	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.50	1.75	1000
G_JF578	16.00	7.30	5.30	8.00	1.90	0.32	4.00	∅ 1.50	1.75	1000
(V)M21	8.00	2.30	1.90	4.00	0.90	0.25	4.00	∅ 1.50	1.75	3000
(V)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)MQ_326	12.00	3.60	2.90	4.00	1.70	0.30	4.00	∅ 1.50	1.75	3000
(V)M_53	12.00	5.30	3.60	8.00	1.40	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	8.40	11.40	13.00	2.50	20.20	3000
G_326	180.00	9.00	12.00	13.00	2.50	20.20	3000
G_534	180.00	13.00	16.00	13.00	2.50	20.20	1000
G_576	180.00	17.20	19.30	13.00	2.50	20.20	1000
G_43	330.00	24.50	29.10	13.00	2.50	20.20	500
G_63	330.00	24.50	29.10	13.00	2.50	20.20	500
G_JF538	180.00	13.00	16.00	13.00	2.50	20.20	1000
G_JF578	180.00	17.20	19.30	13.00	2.50	20.20	1000
(V)M21	180.00	8.40	11.40	13.00	2.50	20.20	3000
(V)ME21	180.00	9.00	12.00	13.00	2.50	20.20	3000
(V)M22	180.00	8.40	11.40	13.00	2.50	20.20	3000
(V)M_32	180.00	9.00	11.40	13.00	2.50	20.20	3000
(V)MQ_326	180.00	13.00	16.00	13.00	2.50	20.20	3000
(V)M_53	180.00	13.00	16.00	13.00	2.50	20.20	1000
(V)M_57(2)	180.00	17.20	19.30	13.00	2.50	20.20	500
(V)M_43 (63)	330.00	24.50	29.10	13.00	2.50	20.20	500

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