

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

|       |        |           |      |     |      |                |                |                 |                  |
|-------|--------|-----------|------|-----|------|----------------|----------------|-----------------|------------------|
| TCXO  | VCTCXO |           |      |     |      |                |                |                 |                  |
| M _ T | VM _ T | MHz range | CMOS | SMD | 15pF | 1.8 V<br>3.0 V | 2.5 V<br>3.3 V | Min.<br>6.4 MHz | Max.<br>52.0 MHz |

## Features

- Wide frequency range : [ 6.4 MHz ~ 52.0 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



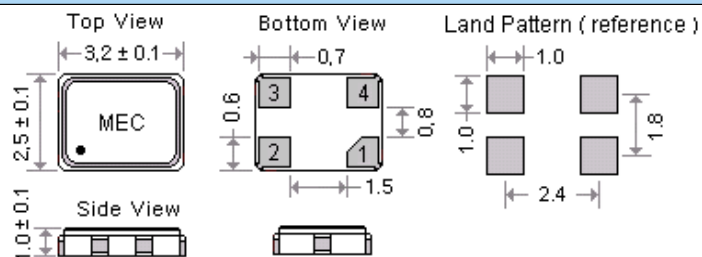
| Output Waveform                                                         |  |                                                         | Square wave [ CMOS ] . Waveform code is “ T ” |                                                                                                                               |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|-------------------------------------------------------------------------|--|---------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------|----------------------------------------|----------------------------------|-------|-----------------------------------|-------|---------------|---|-----------|---|------------------------------------------------------|
| Type                                                                    |  |                                                         | M32T , VM32T                                  |                                                                                                                               | M53T , VM53T    |                                   | M572T , VM572T                         |                                  |       |                                   |       |               |   |           |   |                                                      |
| Package size ( mm )                                                     |  |                                                         | 3.2 x 2.5 x 1.0                               |                                                                                                                               | 5.0 x 3.2 x 1.3 |                                   | 7.0 x 5.0 x 2.3                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Frequency Range                                                         |  |                                                         | 8.192 ~ 40.0 MHz                              |                                                                                                                               | 6.4 ~ 40.0 MHz  |                                   | 6.4 ~ 52.0 MHz                         |                                  |       |                                   |       |               |   |           |   |                                                      |
| Supply Voltage V <sub>DD</sub> ( code )                                 |  |                                                         |                                               | +1.8 V ± 5%<br>( code is “ 18 ” )                                                                                             |                 | +2.5 V ± 5%<br>( code is “ 25 ” ) |                                        | +3.0 V ± 5%<br>( code is “ 3 ” ) |       | +3.3 V ± 5%<br>( code is “ 33 ” ) |       |               |   |           |   |                                                      |
| Current Consumption. ( max. )<br>( Over operating temperature range . ) |  |                                                         | Package                                       | M32T                                                                                                                          | 6 mA            |                                   | 6 mA                                   |                                  | 6 mA  |                                   | 6 mA  |               |   |           |   |                                                      |
|                                                                         |  |                                                         |                                               | M53T                                                                                                                          | 6 mA            |                                   | 6 mA                                   |                                  | 6 mA  |                                   | 6 mA  |               |   |           |   |                                                      |
|                                                                         |  |                                                         |                                               | M572T                                                                                                                         | 10 mA           |                                   | 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 : < ± 1.0 ppm. +25°C ± 2°C.<br>Models without mechanical trimmer : < ± 2.0 ppm at +25°C ± 2°C. |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Frequency Stability ( ppm )                                             |  |                                                         |                                               | ± 0.5 ppm                                                                                                                     |                 | ± 1.0 ppm                         |                                        | ± 1.5 ppm                        |       | ± 2.0 ppm                         |       | ± 2.5 ppm     |   | ± 3.0 ppm |   | ○ : available<br>△ : contact us<br>X : not available |
| Frequency Stability vs Temperature<br>( 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                                  |                                               | ± 1.0 ppm / year ( max. )                                                                                                     |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|                                                                         |  | vs Voltage Change                                       |                                               | ± 0.3 ppm ( max. ) , for a ±5% input voltage change .                                                                         |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|                                                                         |  | vs Load Change                                          |                                               | ± 0.3 ppm ( max. ) , for a ±10% load condition change .                                                                       |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|                                                                         |  | vs Reflow ( SMD type )                                  |                                               | ± 1.0 ppm ( max. ) , 1 reflow and measured 24 hours afterwards .                                                              |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Electrical Frequency<br>Tuning<br>( EFC ) by external                   |  | Control Voltage Center                                  |                                               | 0.9 V ± 0.6 V ( 1.8 V ) ; 1.4 V ± 1.0 V ( 2.5V ) ; 1.5 V ± 1.0 V ( 3.0V / 3.3V )                                              |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|                                                                         |  | Frequency Deviation Range                               |                                               | ± 5.0 ppm ( min. )                                                                                                            |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
|                                                                         |  | Slope Polarity ( Transfer Function )                    |                                               | Positive slope. Positive voltage for positive frequency shift.                                                                |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Control Voltage                                                         |  |                                                         |                                               | Input Impedance : 1.0M Ω ( min. )                                                                                             |                 |                                   | Modulation Bandwidth : 20 KHz ( min. ) |                                  |       | Linearity : ± 10 % ( max. )       |       |               |   |           |   |                                                      |
| Output Load                                                             |  | 15 pF                                                   |                                               |                                                                                                                               |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Duty Cycle                                                              |  | Standard: 50 % ± 10 % ; Option: 50 % ± 5 %              |                                               |                                                                                                                               |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Storage Temperature                                                     |  | -40°C to +85°C or -55°C to +125°C ( package dependent ) |                                               |                                                                                                                               |                 |                                   |                                        |                                  |       |                                   |       |               |   |           |   |                                                      |
| Phase Noise<br>[ 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 |   |           |   |                                                      |

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

CMOS Wave Output Code " T "

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

[ (V) M32T\_\_ ]

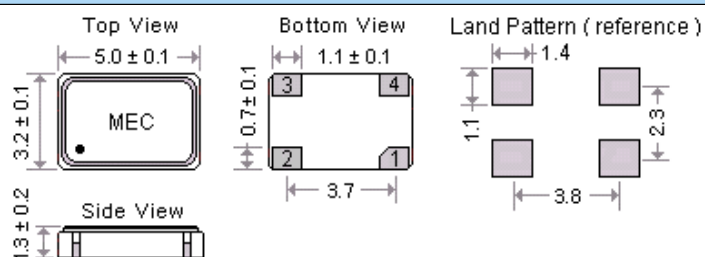


Pad Connections :

Pad 1 : Control voltage for VCTCXO ; Ground for TCXO .

Pad 2 : Ground ; Pin 3 : Output , Pin 4 : Supply Voltage

[ (V) M53T\_\_ ]

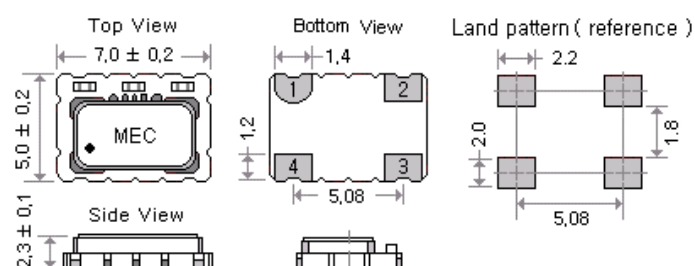


Pad Connections :

Pad 1 : Control voltage for VCTCXO ; Ground for TCXO .

Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

[ (V) M572T\_\_ ]



Pad Connections :

Pad 1 : NC --- TCXO ; Vcon --- VCTCXO

Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

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

## CMOS Wave Output Code " T "

### Part Number Format and Example

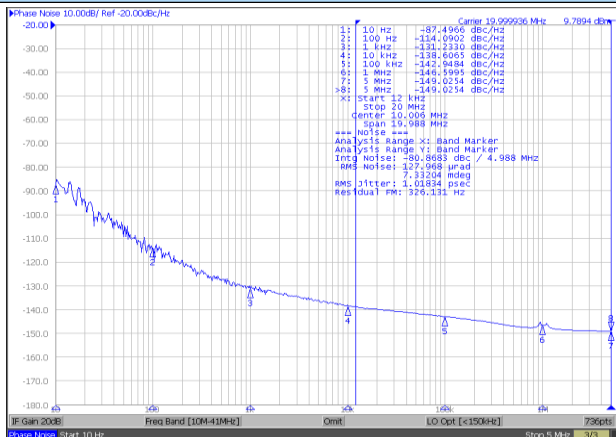
|          | [ 1 ]       | [ 2 ]       | [ 3 ]          | - | [ 4 ]            | - | [ 5 ]               | / | [ 6 ]                 |
|----------|-------------|-------------|----------------|---|------------------|---|---------------------|---|-----------------------|
|          | Holder Type | Output Wave | Supply Voltage |   | Center Frequency |   | Frequency Stability |   | Operating Temp. Range |
| Examples | (1) VM32    | T           | 3              | - | 10.000           | - | 1.5                 | / | -20+70                |
|          | (2) M572    | T           | 3              | - | 20.000           | - | 2.5                 | / | -30+85                |

Ex (1) : VM32T3 - 10.000 - 1.5 / -20+70 [ VCTCXO , VM32 type , CMOS output , 3.0V , 10.000MHz ,  $\pm 1.5$ ppm from -20°C to 70°C ]

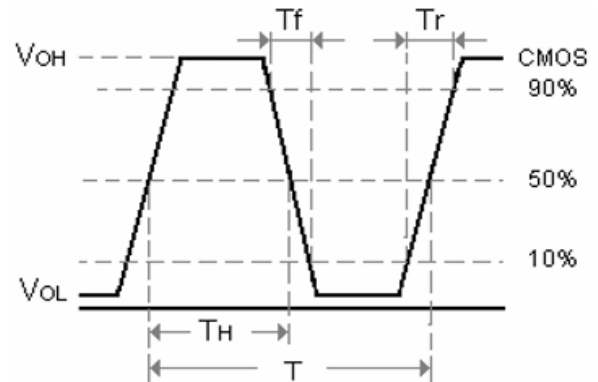
Ex (2) : M572T3 - 20.000 - 2.5 / -30+85 [ TCXO , M572 type , CMOS output , 3.0V , 20.000MHz ,  $\pm 2.5$ ppm from -30°C to 85°C ]

|       |                                                                                                                                           |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------|
| [ 1 ] | Holder Type<br>" M " stands for TCXO , " VM " stands for VCTCXO                                                                           |
| [ 2 ] | " T " stands for Square Wave<br>ex 1 : VM32T --- VCTCXO , VM32 package , CMOS Output ; ex 2 : M572T --- TCXO , M572 package , CMOS Output |
| [ 3 ] | Supply voltage , " 18 " stands for +1.8V ; " 25 " stands for +2.5V ; " 3 " stands for +3.0V ; " 33 " stands for +3.3V                     |
| [ 4 ] | Center Frequency in MHz                                                                                                                   |
| [ 5 ] | Frequency stability in $\pm$ ppm ; ex 1 : $\pm 1.5$ ppm --- 1.5 , ex 2 : $\pm 2.5$ ppm --- 2.5                                            |
| [ 6 ] | Operating temperature range in °C<br>ex 1 : -20 °C to 70°C ----- -20+70 ; ex 2 : -30 °C to 85°C ----- -30+85                              |

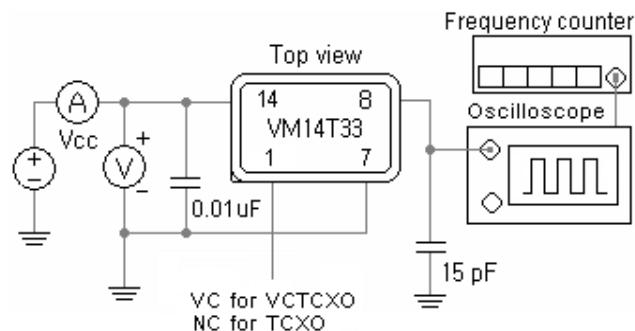
CMOS Typical Phase Noise ( M572T33-20.000 )



CMOS Output Wave , " T " series



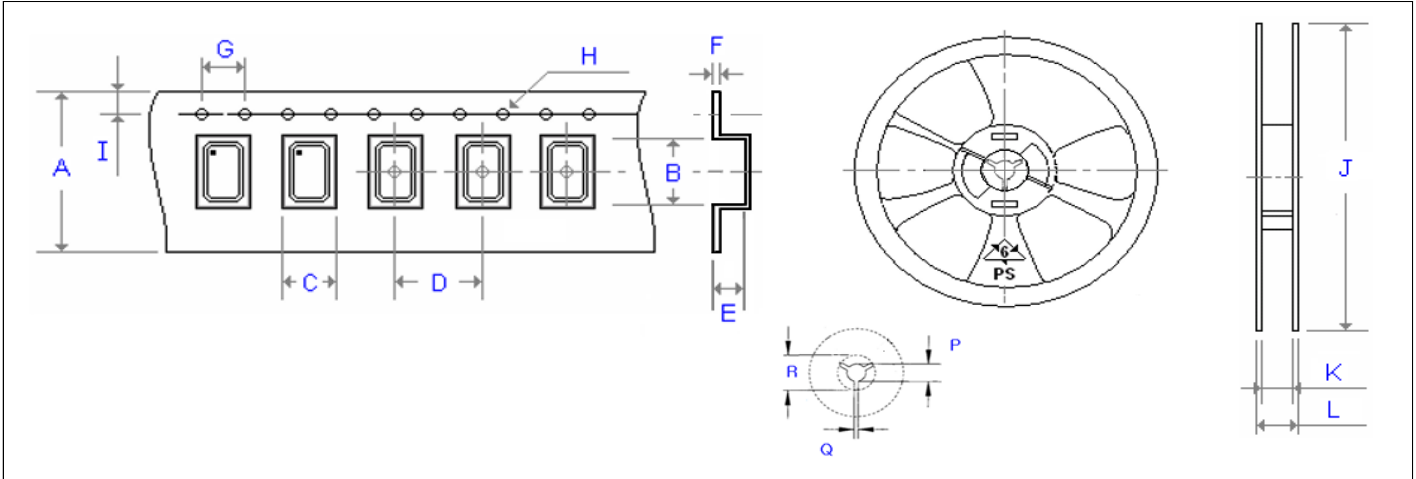
( VC ) TCXO with CMOS square wave: Ex. VM14T33



## 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 | Ø 1.50 | 1.75 | 3000       |
| G_326        | 8.00  | 3.40  | 2.70  | 4.00  | 1.40 | 0.25 | 4.00 | Ø 1.50 | 1.75 | 3000       |
| G_536        | 12.00 | 5.30  | 3.60  | 8.00  | 1.40 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| G_576        | 16.00 | 7.30  | 5.30  | 8.00  | 1.90 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| G_538        | 12.00 | 5.40  | 3.60  | 8.00  | 1.70 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| G_578        | 16.00 | 7.30  | 5.30  | 8.00  | 1.90 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| (V)M21       | 8.00  | 2.30  | 1.90  | 4.00  | 0.90 | 0.25 | 4.00 | Ø 1.50 | 1.75 | 3000       |
| ME21         | 8.00  | 2.30  | 1.50  | 4.00  | 1.35 | 0.25 | 4.00 | Ø 1.50 | 1.75 | 3000       |
| (V)M22       | 8.00  | 2.80  | 2.25  | 4.00  | 1.10 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 3000       |
| (V)M_32      | 8.00  | 3.71  | 2.80  | 4.00  | 1.75 | 0.25 | 4.00 | Ø 1.50 | 1.75 | 3000       |
| (V)M_326     | 12.00 | 3.60  | 2.90  | 4.00  | 1.70 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| (V)M_53      | 12.00 | 5.30  | 3.60  | 8.00  | 1.40 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| (V)M_538     | 12.00 | 5.40  | 3.60  | 8.00  | 1.70 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 1000       |
| (V)M_57(2)   | 16.00 | 7.40  | 5.50  | 8.00  | 2.80 | 0.35 | 4.00 | Ø 1.50 | 1.75 | 500        |
| (V)M_43 (63) | 24.00 | 11.80 | 10.00 | 16.00 | 5.00 | 0.30 | 4.00 | Ø 1.50 | 1.75 | 500        |

Reel Dimensions ( unit : mm ) +2.0 / -0.0mm

|              | 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        |