Contents

Mercury Company Profile

Taiwan Plant

Mercury Electronic Industrial Co., Ltd

瑪居禮電波工業股份有限公司

台灣新北市瑞芳區瑞芳工業區頂坪路31號

No.31, Ting-Ping Rd., Shui-Fong Ind.Park, Shui-Fong,

New Taipei City. Taiwan 224, R.O.C.

Tel : 886-2-2406-2779 Fax : 886-2-2496-0769

E-mail : sales-tw@mercury-crystal.com

Web site : www.mercury-crystal.com

- Established in 1973 .
- Proud to be a pioneer of the crystal industry in Taiwan .
- Corporate headquarters and volume production facility .
- ISO 9001 and 14001 certified .

U.S.A. Plant

Mercury United Electronics , Inc.

9299 9th Street , Rancho Cucamonga,

California 91730 U.S.A.

Tel : 1-(909)-466-0427 Fax : 1-(909)-466-0762

E-mail : sales-us@mercury-crystal.com

- Established in 1990 .
- Small volume production facility .
- R & D center .
- Quick turn (from same day to 4 weeks) service of clock oscillators , VCXOs , TCXOs and OCXOs .

China Plant

Mercury Crystal Technology (Kun Shan) Inc.

瑪居禮石英晶體科技(昆山)有限公司

中國江蘇省昆山市經濟技術開發區三巷路99號

99 , San Xiang Rd. , Kun-Shan Economic & Technical

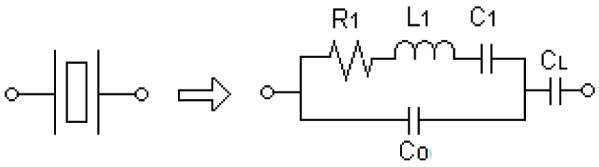
Development Zone , Kun Shan City , Jiang Su , China

Tel : 86-(512)-5763-8100 Fax : 86-(512)-5763-8103

E-mail : sales-cn@mecxtal.com

- Established in 2002.
- Volume production facility.
- ISO 9001 certified .

How To Specify A Quartz Crystal



C_O : Shunt Capacitance
C_1 : Motional Capacitance
L_1 : Motional Inductance
R_1 : Equivalent Series Resistance
C_L : Load Capacitance

RoHS Compliance

Holder Type

SMD Type

- ☐ X21 (2.0 * 1.6 * 0.6mm)
- ☐ X22 (2.5 * 2.0 * 0.6mm)
- ☐ X32 (3.2 * 2.5 * 0.7mm)
- ☐ X42 (4.0 * 2.5 * 0.6mm)
- ☐ MJ (5.0 * 3.2 * 0.9mm)
- ☐ MF (6.0 * 3.5 * 1.0mm)
- ☐ MQ (7.0 * 5.0 * 1.2mm)
- ☐ M49 (12.4 * 4.5 * 4.0mm)
- ☐ ML49 (12.4 * 4.5 * 3.0mm)
- ☐ MP5 (12.9 * 4.5 * 4.8mm)

Thru - Hole Type

- ☐ H49 (10.7 * 4.5 * 13.6mm)
- ☐ 49T (10.7 * 4.5 * 11.2mm)
- ☐ T39 (3.0Ø * 9.0mm)
- ☐ T38 (3.0Ø * 8.0mm)
- ☐ T26 (2.0Ø * 6.0mm)
- ☐ HUS (10.7 * 4.3 * 3.5mm)
- ☐ HUSL (10.7 * 4.3 * 2.5mm)
- ☐ U5 (7.8 * 3.2 * 6.0mm)
- ☐ U1 (7.8 * 3.2 * 8.0mm)

A Basic Spec. must be specified

A-1 : Holder type: _____ ☐ Thru-Hole type ☐ SMD Gull Wing type ☐ SMD Leadless

A-2 : Frequency : _____MHz or _____ KHz

A-3 : Circuit Condition : ☐ Series ☐ Parallel

If ***Series*** resonance : Assign " **S** " as circuit load .

If ***Parallel*** : Specify CL (Load Capacitance) _____ pF (Typical range is 8 to 32 pF) .

A-4 : Calibration Tolerance: ± _____ ppm at 25°C

A-5 : Frequency Stability: ± _____ ppm over _____°C to _____ °C

A-6 : Maximum Equivalent Series Resistance (ESR): _____ ohms (max.)

B Other Spec. If not specified MEC standards will be applied.

B-1 : Shunt Capacitance (Co) : _____ pF (max.)

B-2 : Motional Capacitance (C1) :_____ fF ± _____ %

B-3 : Motional Inductance (L1) : _____ mH ± _____ %

B-4 : Capacitance Ratio (Co/C1) : _____ ± _____ %

B-5 : Trim Sensitivity : _____ ppm / pF

B-6 : Frequency Pull Ability : When CL= _____pF, _____ppm (max.) ; When CL= _____pF, _____ppm (min.)

B-7 : Drive Level : _____ micro Watts (uW) (max.).

B-8 : Crystal cutting angle type : ☐ AT - cut BT - cut ☐ SL - cut

B-9 : Mode of Oscillation : ☐ Fundamental mode ☐ 3rd overtone ☐ 5th overtone

B-10 : Spurious: _____ dB (or ohms) (min.) in ± _____ kHz range of the main mode

B-11 : Crystal Q: _____ (min.)

B-12 : Aging: _____ ppm per year (max.)

B-13 : Shock: _____ ; Vibration: _____

Part Number Format and Example

Example: X32 - 16.000 - 10P - 15 / 20 / -30+75 /100R ✍ = User to specify

✍		✍		✍		✍		✍		✍		✍	
X32	-	16.000	-	10P	-	15	/	20	/	-30+75	/	100R	
(1)		(2)		(3)		(4)		(5)		(6)		(7)	

(1) Package code ; (2) Frequency in MHz ; (3) Load Capacitance in pF or "**S**" for series resonance ; (4) Frequency tolerance at 25°C ; (5) Frequency stability ;

(6) Operating temperature range -30°C to +75°C in this example. Use " **X** " for -10°C ~ 60°C ; Use " **Y** " for -20°C ~ 70°C ; Use " I " for -40°C ~ 85°C' ; (7) ESR max.

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

How To Specify A Crystal Oscillator

Output Wave Forms and Logics

- Crystal Oscillators
  - Spread Spectrum (P.28)
  - VCXO (P.41)
  - Clock Osc. (P.19)
    - ☐ Square Wave
      - ☐ CMOS
      - ☐ LVPECL
      - ☐ LVDS
      - ☐ LPO series (CMOS)
    - ☐ Sine Wave
      - ☐ 50Ω load
      - ☐ 10KΩ // 10pF load
  - (VC)TCXO (P.52)
  - OCXO (P.68)

RoHS Compliance

Part Number Format : " H " - - - for Oscillators

" _ " - - - represents PRODUCT SERIES selections in table 1and 2 below .

- SMD Leadless
  - ☐ H_22 (2.5 * 2.0 * 0.9mm)
  - ☐ H_53 (5.0 * 3.2 * 1.2mm)
  - ☐ H_42 (11.4 * 9.6 * 2.5mm)
  - ☐ H_32 (3.2 * 2.5 * 1.0mm)
  - ☐ SWO (7.0 * 5.0 * 1.4mm)
  - ☐ H_43 (11.4 * 9.6 * 3.0mm)
- SMD Gull Wing
  - ☐ H_24 (20.2 * 12.8 * 7.6mm)
  - ☐ H_18 (12.8 * 12.8 * 7.6mm)
- Thru-Hole Type
  - ☐ H_14 (20.2 * 12.8 * 5.08mm)
  - ☐ H_8 (12.8 * 12.8 * 5.08mm)

Basic Spec. must be specified

1 : Holder type with output wave : _____ ☐ Thru-Hole type ☐ SMD type ☐ Gull Wing type

Output Wave type :

Table 1 - - - Square Wave	
output wave	product series
☐ CMOS	H , HB , HK , HF , HV , HW
☐ LVPECL	HPF , HPW
☐ LVDS	HDF , HDW

Table 2 - - - Sine Wave	
output load	product series
☐ 50Ω load	HS
☐ 10KΩ // 10pF load	HSR

2 : Frequency : _____ MHz or _____ KHz

3 : Input Voltage : ☐ +5.0V ☐ +3.3V ☐ +3.0V ☐ +2.5V ☐ +1.8V ☐ others : _____

4 : Frequency Stability :

Stability / Temp .	Commercial -10°C ~ +70 °C	Industrial -40°C ~ +85 °C
± 25ppm	☐ A	☐ D
± 50ppm	☐ B	☐ E
± 100ppm	☐ C	☐ F
☐ Custom (± _____ ppm over _____ to _____ ℃)		

5 : Output Logic " 1 " _____ V (min.) ; Output Logic " 0 " _____ V (max.)

6 : Rise time (Tr) and Fall time (Tf) : _____ nano seconds (max.) .

7 : Start-up time : _____ mini seconds (max.) .

8 : Current Consumption : _____ mA (max.) or _____ uA (max.).

9 : Symmetry (Duty Cycle) : ☐ Standard (50%±10%) ☐ Option (50%±5%) [Add " S " at the end of part number] .

10 : Pin 1 options : ☐ No Connection ☐ Tri - state (Output Enable) ☐ Power-down (Note : Tri-state is standard for SWO , H53 and H32 series) .

Part Number Format and Example

Example: 3H42 - DT - 33.000-S ✍ = User to specify ★ = Option

✍	✍	★		✍	★		✍		★	
3	H_42	G	-	D	T	-	33.000	-	S	
(1)	(2)	(3)		(4)	(5)		(6)		(7)	

(1) Supply voltage code : " 3 " for "+3.3V ; " 5 " for "+5.0V ; (2) Package code ; (3) RoHS compliance (omit " G " if not required) ; (4) Frequency Stability

(5) Tri-state option. Omit "T" if not required ; (6) Center Frequency in MHz ; (7) Add " S " for 50% ± 5% duty cycle . Omit " S " if not required .

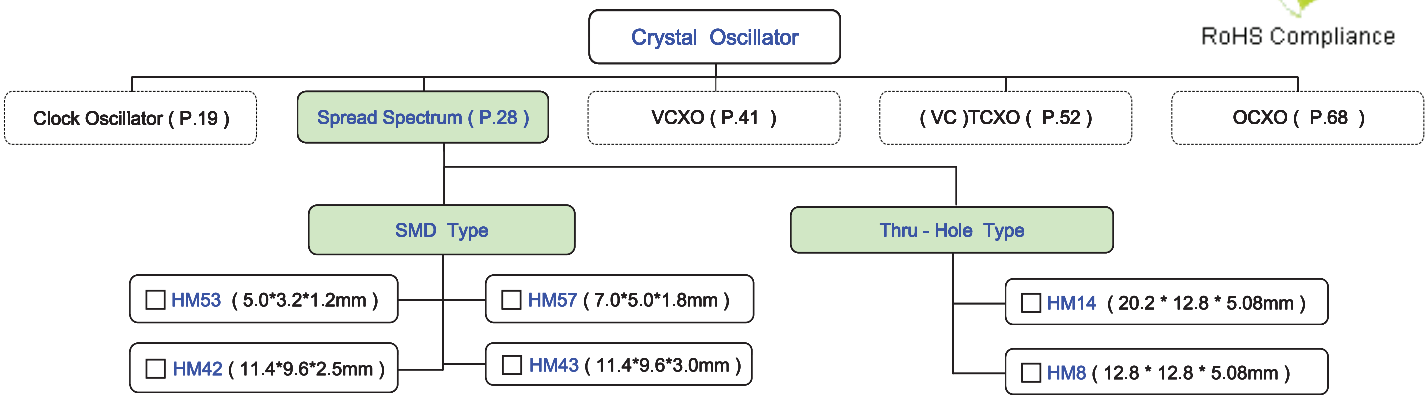
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

How To Specify A EMI Reduction Spread Spectrum Clock Oscillator

Holder Type

RoHS Compliance



Basic Spec. must be specified

1 : Holder type: _____ ☐ Thru-Hole type ☐ SMD type

2 : Frequency : _____ MHz

3 : Input Voltage : ☐ +3.3V

4 : Output Wave : Square Wave (CMOS)

5 : Frequency Stability :

(Exclude frequency modulation)

Stability / Temp .	Commercial -10°C ~ +70 °C	Industrial -40°C ~ +85 °C
± 25ppm	☐ A	☐ D
± 50ppm	☐ B	☐ E
± 100ppm	☐ C	☐ F
☐ Custom (± _____ ppm over _____ to _____ ℃)		

6 : Group & Spread type :

(1) ☐ Group R (250 ps cycle-to-cycle jitter) :

☐ Center spread : ☐ C0.5: ±0.5 % ☐ C1.5: ±1.5 %

☐ Down spread : ☐ D1.0 : -1.0 % ☐ D3.0 : -3.0 %

(2) ☐ Group Y (100 ps cycle-to-cycle jitter) :

☐ Center spread : ☐ C0.5: ±0.5 % ☐ C1.0: ±1.0 % ☐ C1.5: ±1.5 %

☐ Down spread : ☐ D1.0 : -1.0 % ☐ D2.0 : -2.0 % ☐ D3.0 : -3.0 %

(3) ☐ Group P (100 ps cycle-to-cycle jitter) :

☐ Center spread : ☐ ±0.25 % ☐ ±0.375 % ☐ ±0.625 % ☐ ±1.0 % ☐ ±1.25 % ☐ ±1.5 % ☐ ±1.75 % ☐ ±1.875 %

☐ Down spread : ☐ -0.5 % ☐ -0.75 % ☐ -1.25 % ☐ -2.0 % ☐ -2.5 % ☐ -3.0 % ☐ -3.5 % ☐ -3.75 %

Part Number Format and Example

Examples of Low EMI Oscillator : 3HM57-DT-33.000R-C0.5 ✍ = User to specify ★ = Option

	✍		✍	★		✍	✍		✍	
3	HM57	-	D	T	-	33.000	R	-	C0.5	
(1)	(2)		(4)	(5)		(6)	(7)		(8)	

(1) Supply voltage code : " 3 " for "+3.3V ; (2) Package code ; (3) RoHS compliance. Omit " G " is not required. ; (4) Frequency stability ;

(5) Tri-state option (Tri - state is standard for group " R " and " Y " ; Tri - state is not available for group " P ") ; (6) Frequency in MHz ; (7) Group ;

(8) Spread type & percentage ; " C " for center spread , " D " for down spread. C0.5 represents center spread ± 0.5% (total 1%).

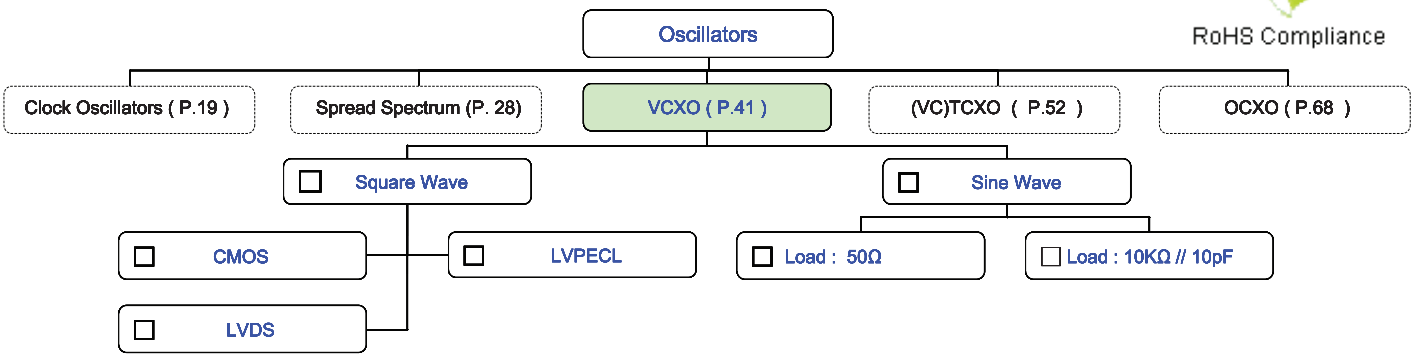
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

How To Specify A VCXO

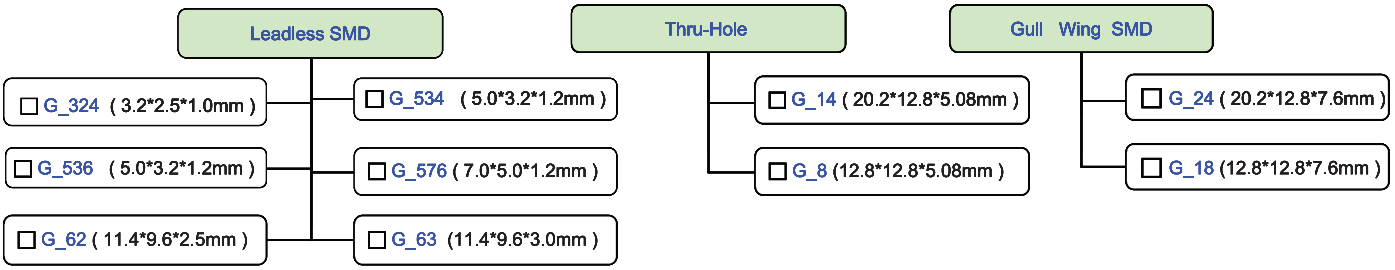
Holder Type

RoHS Compliance



Part Number Format : " G " - - - for VCXO

" _ " - - - represents PRODUCT SERIES selections in table 1and 2 below .



Basic Spec. must be specified

1 : Holder type : _____ ☐ Thru-Hole type ☐ Leadless SMD type ☐ Gull Wing type

Output Wave type :

Table 1 - - - Square Wave	
output wave	product series
☐ CMOS	G , GF , GV , GW
☐ LVPECL	GPF , GPW
☐ LVDS	GDF , GDW

Table 2 - - - Sine Wave	
output load	product series
☐ 50Ω load	GS
☐ 10KΩ // 10pF load	GSR

2 : Frequency : _____ MHz

3 : Input Voltage :	☐ +5.0V	☐ +3.3V	☐ +1.8V
4 : Control voltage center and range :	☐ +2.5V ± 2V (0.5V ~ 4.5V)	☐ +1.65V ± 1.35V (0.3V ~ 3.0V)	☐ +0.9V ± 0.72V (0.183V ~ 1.62V)

5 : Frequency Stability :

Stability / Temp .	Commercial: -10°C ~ +70 °C	Industrial: -40°C ~ +85 °C
± 25ppm	☐ A	☐ D
± 50ppm	☐ B	☐ E
± 100ppm	☐ C	☐ F
☐ Custom (± _____ ppm over _____ to _____ ℃)		

6 : Frequency deviation range : ± _____ ppm ☐ min. ☐ max. ☐ typical (± 20%) .

7 : Linearity : _____ % (max.)

8 : Transfer function : ☐ Positive

9 : Input Impedance : _____ KΩ (min.)

10 : Modulation band width : ± _____ KHz (min.)

Part Number Format and Example

Examples of VCXO : 3G62G - DT - 150M - 27.000 ✍ = User to specify ★ = Option

✍	✍	★		✍	★		✍		✍	
3	G_62	G	-	D	T	-	150M	-	27.000	
(1)	(2)	(3)		(4)	(5)		(6)		(7)	

(1) Supply voltage code : " 18 " for "+1.8V , " 3 " for "+3.3V , " 5 " for +5.0V ; (2) Package code ; (3) RoHS compliance . Omit " G " if not required ;

(4) Frequency stability ; (5) Tri-state ; (6) Pulling range in ppm (" N " : minimum , " M " : maximum , " T " : typical) ; (7) Center Frequency in MHz

How To Specify A (VC)TCXO

Holder Type

RoHS Compliance

Oscillators

Clock Oscillators (P.19) | Spread Spectrum (P.28) | VCXOs (P.41) | (VC)TCXOs (P.52) | OCXOs (P.68)

☐ CMOS ☐ LVPECL ☐ LVDS ☐ Clipped Sine

Part Number Format : " M " for TCXO ; " VM " for VCTCXO (TCXO with voltage control function)

" _ "- - - represents PRODUCT SERIES selections in table 1and 2 below .

SMD Type

- ☐ (V)M_42 (11.4 * 9.6 * 2.5mm)
- ☐ (V)M_62 (11.4 * 9.6 * 2.5mm)
- ☐ (V)M_43 (11.4 * 9.6 * 3.0mm)
- ☐ (V)M_63 (11.4 * 9.6 * 3.0mm)
- ☐ (V)M_57 (7.0 * 5.0 * 2.0mm)
- ☐ (V)M53 (5.0 * 3.2 * 1.2mm)
- ☐ (V)M32 (3.2 * 2.5 * 1.3mm)

Thru-Hole Type

- ☐ (V)M_38 (18.4 * 11.7 *7.3mm)
- ☐ (V)M_39 (18.4 * 11.7 * 4.7mm)
- ☐ (V)M_8 (12.8 * 12.8 * 7.5mm)
- ☐ (V)M_14 (20.2 * 12.8 * 7.5mm)
- ☐ (V)M_15 (20.2 * 12.8 * 7.5mm)

Gull Wing Type

- ☐ (V)M_28 (12.8 * 12.8 * 9.3mm)
- ☐ (V)M_47 (18.4 * 11.7 * 4.7mm)
- ☐ (V)M_24 (20.2 * 12.8 * 9.3mm)
- ☐ (V)M_25 (20.2 * 12.8 * 9.3mm)

Basic Spec. must be specified

1 : ☐ TCXO (code " M " series) ☐ VCTCXO (code " VM " series)

2 : Holder type: _____ ☐ Thru-Hole type ☐ SMD type ☐ Gull Wing type

Output Wave type : " _ "- - - represents Package Code . See page 67 and 68 .

Clipped Sine Wave	
TCXO	VCTCXO
M _ S	VM _ S

Square Wave								
output wave	product series							
	TCXO - - - " M "				VCTCXO - - - " VM "			
☐ CMOS	M_T	MF_T	MV_T	MW_T	VM_T	VMF_T	VMV_T	VMW_T
☐ PECL	MF_P		MW_P		VMF_P		VMW_P	
☐ LVDS	MF_D		MW_D		VMF_D		VMW_D	

3 : Frequency : _____ MHz or _____ KHz

4 : Input Voltage : ☐ +5.0V ☐ +3.3V ☐ +3.0V ☐ +1.8V ☐ others : _____

5 : Frequency Stability :

☐ ± 1.0ppm	☐ ± 1.5ppm	☐ ± 2.0ppm
☐ ± 2.5ppm	☐ ± 3.0ppm	☐ ± 5.0ppm

6 : Operating Temp. :

☐ 0 °C ~ +60 °C	☐ 0 °C ~ +70 °C	☐ -10 °C ~ +60 °C	☐ -20 °C ~ +70 °C
☐ -30 °C ~ +60 °C	☐ -30 °C ~ +70 °C	☐ -40 °C ~ +85 °C	

7 : ● [" ***T*** " series , Square Wave] : Output Voltage " 1 ": _____ V min.; Output Voltage " 0 ": _____ V (max.)

● [" ***S*** " series , Clipped Sine Wave] : Output Voltage Level : _____ Vp-p (min.)

8 : Start-up time : _____ mini seconds (max.) .

9 : Current Consumption : _____ mA (max.)

10 : ● Mechanical frequency tuning (MFT) range : ± _____ ppm (min.). For TCXOs and VCTCXOs. (No MFT for (V)M32, (V)M53, (V)M57 packages .)

● Electrical frequency tuning range (EFT) : ± _____ ppm (min.). For VCTCXOs only.

● Control voltage center and range : ***1.5V ± 1.0V*** is standard for 5.0V, 3.3V, 1.5V supply voltages .

Part Number Format and Example

Examples of TCXO : **VM38GS5-12.800-2.5/-30+75** ✍ = User to specify; ★ = Option

✍	✍	★	✍	✍		✍		✍		✍	✍ customer to specify
V	M38	G	S	5	-	12.800	-	2.5	/	-30+75	
(1)	(2)	(3)	(4)	(5)		(6)		(7)		(8)	

(1) " ***V*** " for VCTCXO ; Omit 'V" if TCXO ; (2) Package code ; (3) " G " RoHS compliance . Omit " G " if not required .

(4) Wave form code " ***S*** " for clipped sine wave ; (5) Supply voltage code: " ***3*** " for +3.0V, " ***33*** " for "+3.3V, " ***5*** " for +5.0V ;

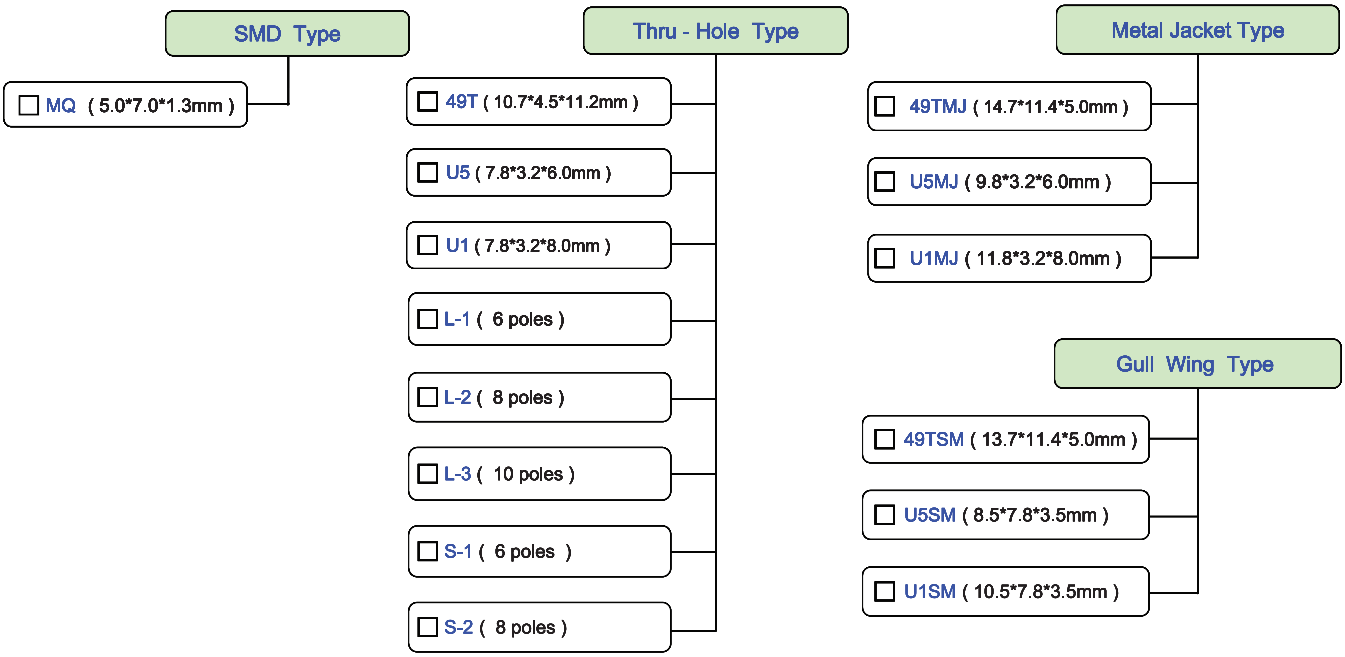
(6) Frequency in MHz ; (7) Frequency stability in ±ppm ; (8) Operating temperature range in °C. "-30+75" represents -30C to +75°C operating temperature range.

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

How To Specify A Monolithic Crystal Filter

Holder Type



Basic Spec. must be specified

A-1 : Holder type: _____ ☐ SMD Leadless ☐ Thru-Hole type ☐ SMD Gull Wing type ☐ Jacket type

A-2 : Frequency : _____MHz ☐ 10.7 MHz (10.5 MHz ~ 11.000 MHz available only in 49T series)

☐ 21.400 MHz ☐ 21.700 MHz ☐ 45.000 MHz (fundamental mode) ☐ 45.000 MHz (3rd overtone)

A-3 : No. of poles : ☐ 2 poles ☐ 4 poles ☐ 6 poles ☐ 8 poles ☐ 10 poles

A-4 : Pass Bandwidth : ☐ ±3.75 KHz ☐ ±4.5 KHz ☐ ±7.5 KHz ☐ ±12.0 KHz ☐ ±15.0 KHz min at 3 dB

A-5 : Stop Bandwidth : ± _____ KHz max at _____ dB and ± _____ KHz max at _____ dB

A-6 : Ripple : _____ dB (max.)

A-7 : Insertion Loss : _____ dB (max.)

A-8 : Guaranteed Attenuation : fo + _____ KHz to fo - _____ KHz min. at _____ dB

A-9 : Terminating Impedance : _____ Ω // _____ pF

A-10 : Operating Temperature : _____ °C to _____ °C

Part Number Format and Example

Examples of quartz crystal : 21.7M15DU5SMG ✍ = User to specify; ★ = Option

✍		✍		✍		✍		✍		★	✍ User to specify
21.7 M		15		D		U5		SM		G	
(1)		(2)		(3)		(4)		(5)		(6)	

(1) Frequency code ; (2) Pass Bandwidth code (" ***7.5*** " for ±3.75 KHz band width, " ***15*** " for ±7.5 KHz band width, " ***30*** " for ±15.0 KHz band width) ;

(3) No. of poles (" ***A*** " for 2 poles , " ***B*** " for 4 poles , " ***C*** " for 6 poles , " ***D*** " for 8 poles , " ***E*** " for 10 poles) ;

(4) Package code ; (5) Gull Wing Type ; (6) RoHS compliance (If not , leave blank) ;

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

X21

[2.0 * 1.6 * 0.6 mm]

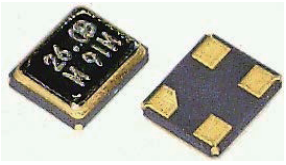
Surface Mount Crystals | **Fund.** | Min. **20MHz** | Max. **54MHz**

RoHS Compliance

Features

Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads .
- Small footprint. Ideal for space constrained applications
- Exhibits extremely low aging with a high shock & vibration resistance.



General Specifications

Item / Type	**X21** series (2.0 * 1.6 * 0.6 mm)
Frequency Range	20.000 ~ 54.000 MHz
Crystal Cut	Fundamental Mode , AT-Cut
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

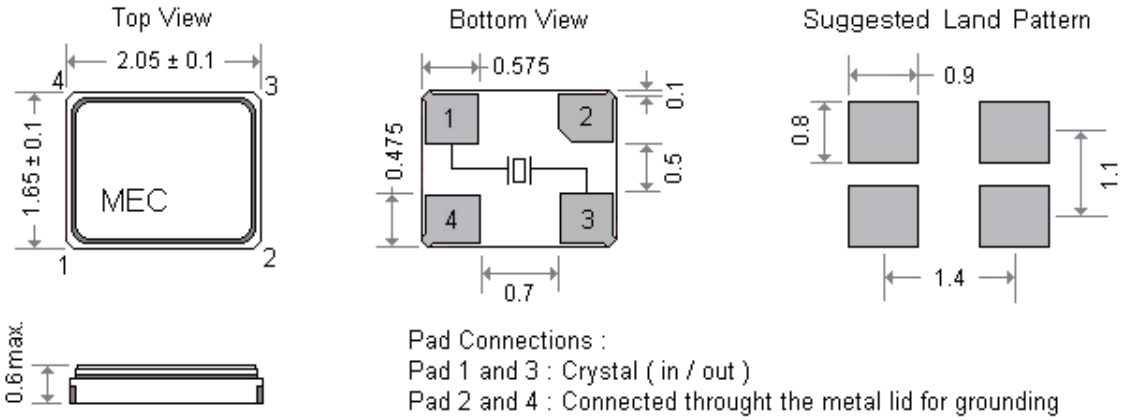
ESR (Equivalent Series Resistance)	
Frequency Range	E. S. R.
20.000 ~ 30.000 MHz	120 Ω max.
30.100 ~ 54.000 MHz	80 Ω max

Table 2

Frequency stability Vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	▲	○	○	○	○	○
Y	-20 to 70°C		○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



Pad Connections :
Pad 1 and 3 : Crystal (in / out)
Pad 2 and 4 : Connected throught the metal lid for grounding
Chamferred pad is pad No.2

X22

[2.5 * 2.0 * 0.6 mm]

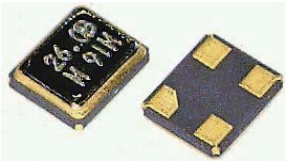
Surface Mount Crystals | **Fund.** | Min. **16MHz** | Max. **60MHz**

RoHS Compliance

Features

Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads .
- Small footprint. Ideal for space constrained applications
- Exhibits extremely low aging with a high shock & vibration resistance.



General Specifications

Item / Type	**X22** series (2.5 * 2.0 * 0.6 mm)
Frequency Range	16.000 ~ 60.000 MHz
Crystal Cut	Fundamental Mode , AT-Cut
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

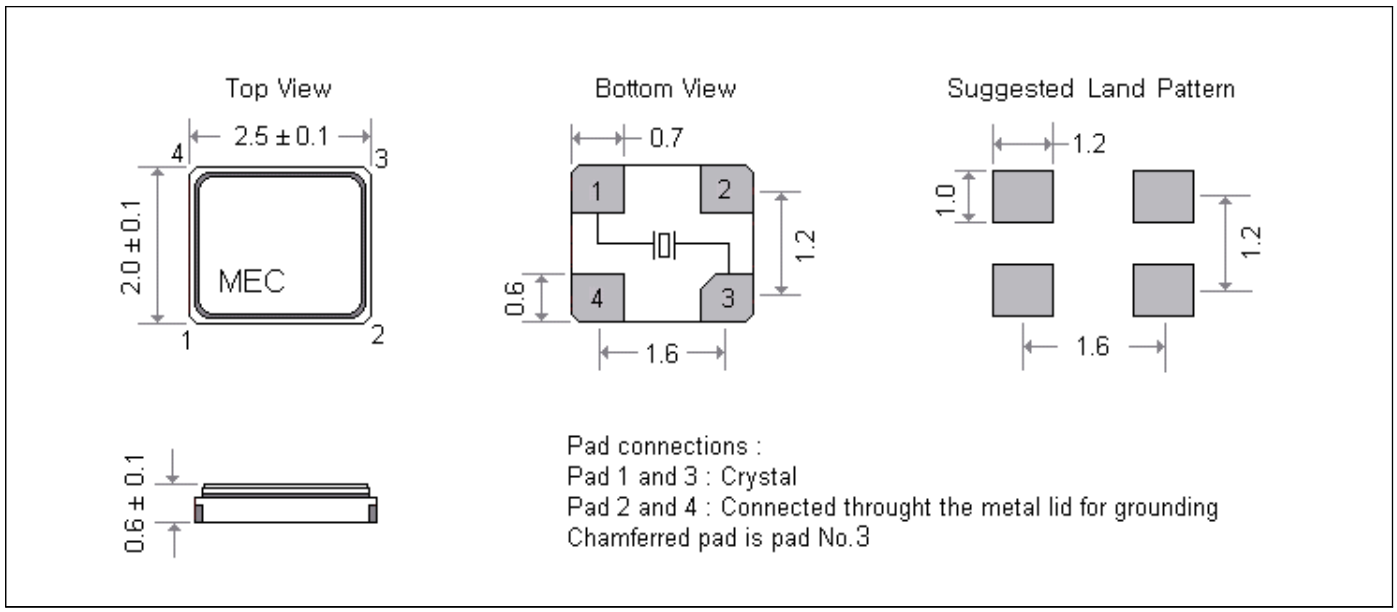
ESR (Equivalent Series Resistance)	
Frequency Range	E. S. R.
16.000 ~ 21.000 MHz	120 Ω max.
21.100 ~ 26.000 MHz	80 Ω max
26.100 ~ 60.000 MHz	60 Ω max

Table 2

Frequency stability Vs Operating temperature range							
Stability code	Temp. (ºC) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



X32

[3.2 * 2.5 * 0.7 mm]

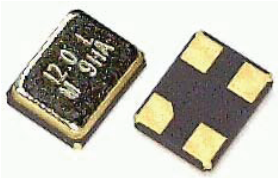
Surface Mount Crystals | **Fund.** | Min. **12MHz** | Max. **60MHz**

RoHS Compliance

Features

Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads .
- Small footprint. Ideal for space constrained applications
- Exhibits extremely low aging with a high shock & vibration resistance.



General Specifications

Item / Type	**X32** series (3.2 * 2.5 * 0.7 mm)
Frequency Range	12.000 ~ 60.000 MHz
Crystal Cut	Fundamental Mode , AT-Cut
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

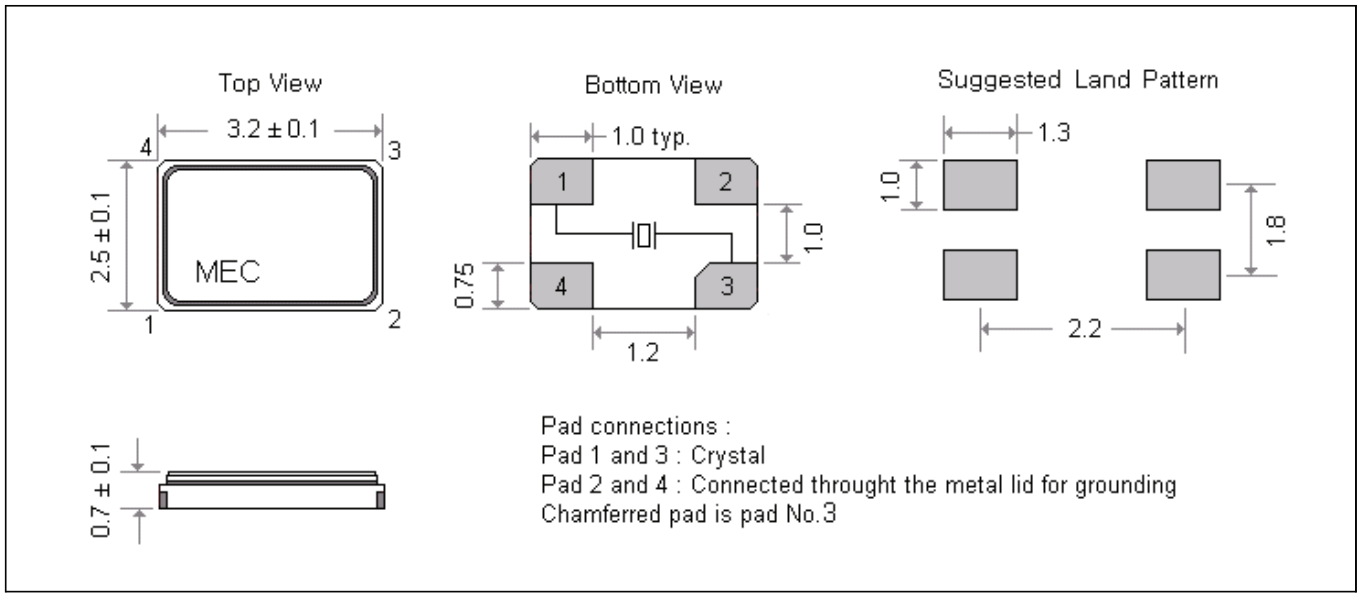
ESR (Equivalent Series Resistance)	
Frequency Range	E. S. R.
12.000 ~ 20.000 MHz	100 Ω max.
20.100 ~ 60.000 MHz	60Ω max

Table 2

Frequency stability Vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



X42

[4.0 * 2.5 * 0.7 mm]

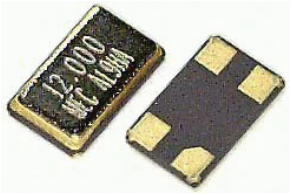
Surface Mount Crystals | **Fund.** | Min. **12MHz** | Max. **60MHz**

RoHS Compliance

Features

Specifications

- Exhibits extremely low aging and a high shock and vibration resistance .
- The entire package can be grounded via the top metal lid and two bottom pads .
- This low 0.6mm package height is ideal for height constrained applications.



General Specifications

Item / Type	**X42** series (4.0 * 2.5 * 0.6 mm)
Frequency Range	12.000 ~ 60.000 MHz , AT-cut , Fundamental Mode (see Table 1)
Crystal Cut	Fundamental Mode , AT-Cut
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

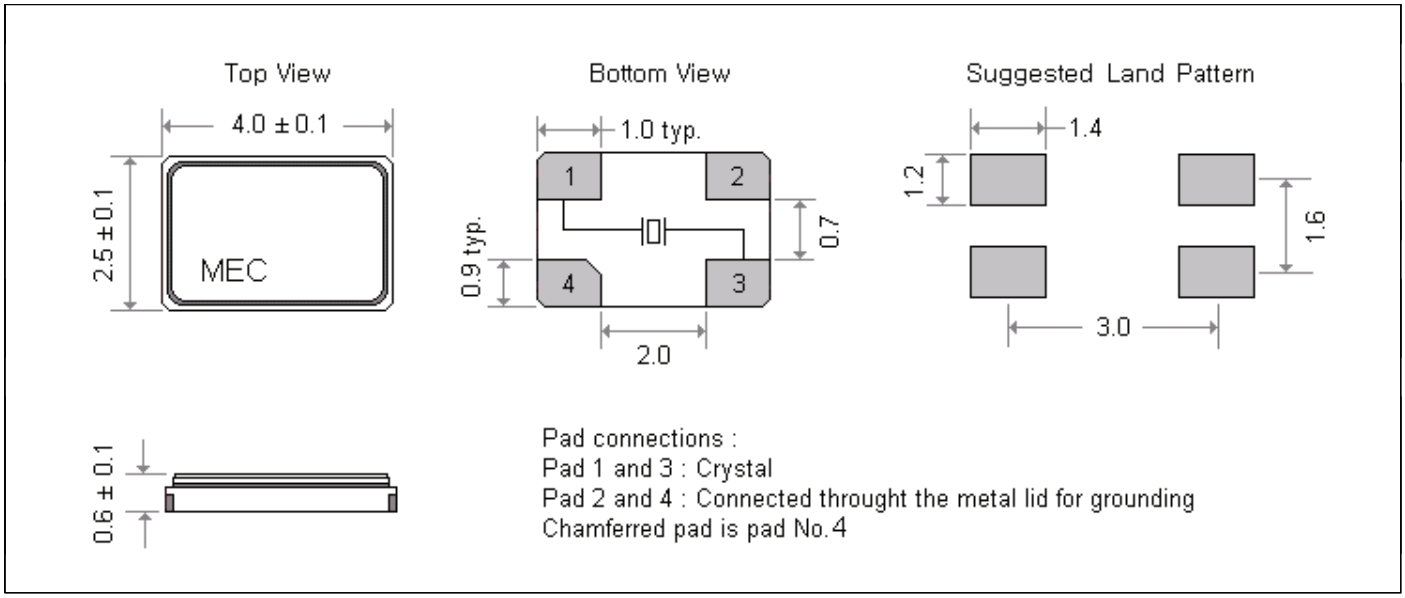
ESR (Equivalent Series Resistance)	
Frequency Range	E. S. R.
12.000 ~ 16.000 MHz	80 Ω max
16.100 ~ 60.000 MHz	50 Ω max

Table 2

Frequency stability vs Operating temperature range							
Stability code	Temp. (ºC) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



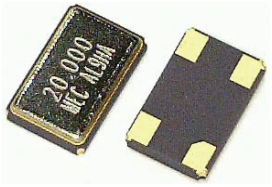
MJ [5.0 * 3.2 * 0.9 mm]	Surface Mount Crystals	Fund.	3rd O.T.	Min. 8MHz	Max. 125MHz

RoHS Compliance

Features

Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads
- Frequency tolerance as tight as +/-5ppm is available.



General Specifications

Item / Type	**MJ** series (5.0 * 3.2 * 0.9 mm)
Frequency Range & Crystal Cut	8.000 ~ 50.000 MHz , AT-cut , Fundamental Mode (see Table 1) 40.000 ~ 125.000 MHz , AT-cut , 3rd overtone (see Table 1)
	NOTE : Frequencies between 40 and 50 MHz can be either AT fundamental or AT 3rd overtone. Please add " AF " after the frequency on the part number for an AT-cut fundamental mode crystal and " A3 " for an AT-Cut 3rd overtone crystal. For example: MJ-40.000AF-20P.
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

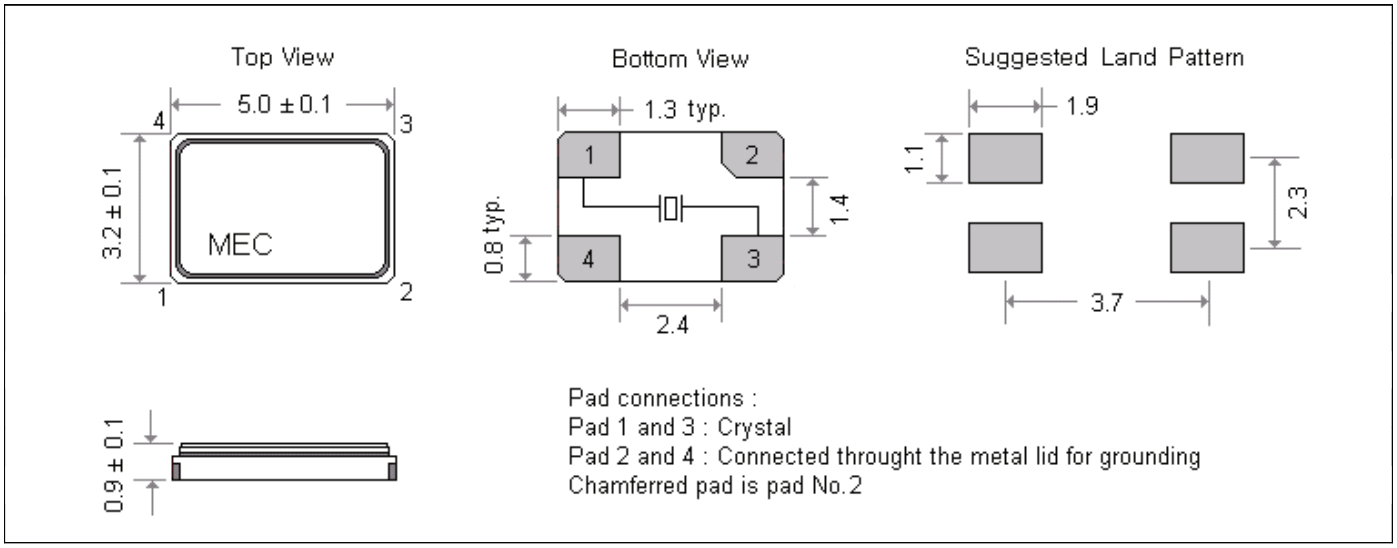
ESR (Equivalent Series Resistance)		
Frequency Range	Oscillator Mode	E. S. R.
8.000 ~ 10.000 MHz	AT-Cut , Fund. Mode	80 Ω max
10.100 ~ 50.000 MHz	AT-Cut , Fund. Mode	50 Ω max
40.000 ~ 125.000 MHz	AT-Cut , 3rd Overtone	80 Ω max

Table 2

Frequency stability vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

MF

[6.0 * 3.5 * 1.0 mm]

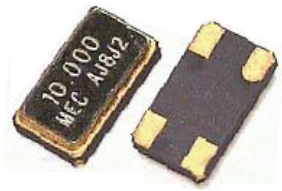
Surface Mount Crystals	Fund.	3rd O.T.	Min.	Max.
			8MHz	125MHz

RoHS Compliance

Features

Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads.
- This tight tolerance and tight stability crystal is ideal for telecommunications.
- This crystal package will withstand solder reflow .



General Specifications

Item / Type	**MF** series (6.0 * 3.5 * 1.0 mm)
Frequency Range & Crystal Cut	8.000 ~ 50.000 MHz , AT-cut , Fundamental Mode (see Table 1) 30.000 ~ 125.000 MHz , AT-cut , 3rd overtone (see Table 1)
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

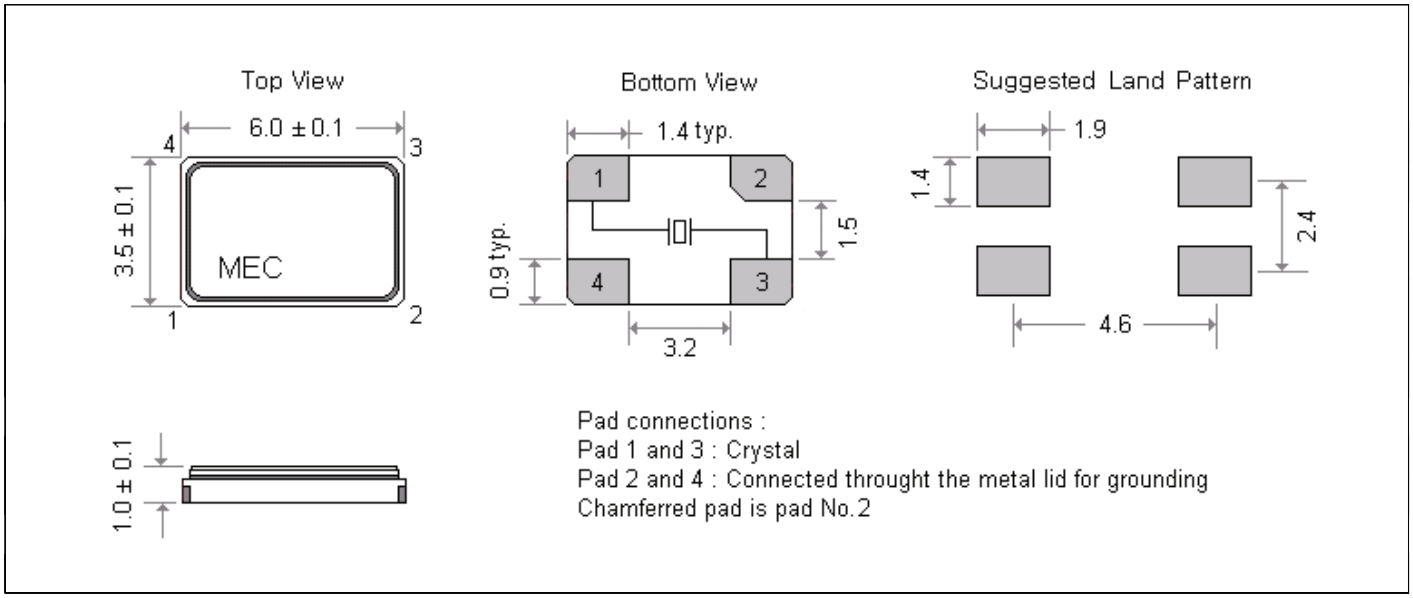
ESR (Equivalent Series Resistance)					
Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
8.0 ~ 12.0	AT , Fund.	80 Ω	30.0~ 40.0	AT , 3rd	100 Ω
12.1 ~ 16.0	AT , Fund.	60 Ω	40.1~ 50.0	AT , 3rd	80 Ω
16.1~ 50.0	AT , Fund.	40 Ω	50.1~ 125.0	AT , 3rd	50 Ω

Table 2

Frequency stability vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



MQ

[7.0 * 5.0 * 1.2 mm]

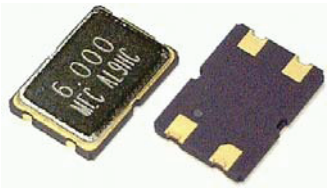
Surface Mount Crystals	Fund.	3rd O.T.	Min.	Max.
			6MHz	125MHz

RoHS Compliance

Features

Specifications

- 1.2 mm height. Ideal for space-constrained applications such as PCMCIA
- A ceramic package with a seam sealed kovar lid.
- The whole package can be grounded via the top metal lid and the two bottom pads .



General Specifications

Item / Type	**MQ** series (7.0 * 5.0 * 1.2 mm)
Frequency Range & Crystal Cut	6.000 ~ 50.000 MHz , AT-cut , Fundamental Mode (see Table 1) 30.000 ~ 125.000 MHz , AT-cut , 3rd overtone (see Table 1)
Load Capacitance	Series or Parallel (8 to 32 pF) resonance
Drive Level	10μ W typica (100μ W max.)
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C
Frequency Stability	See Table 2
Aging	△F / F : ±3 ppm / year (max.)
Storage Temperature Range	- 50°C to 105°C

Table 1

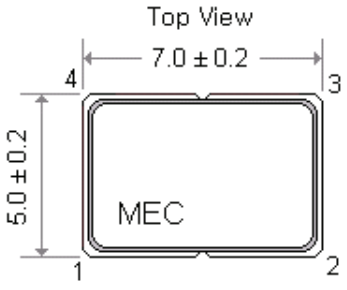
ESR (Equivalent Series Resistance)					
Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
6.0 ~ 8.0	AT , Fund.	80 Ω	30.0~ 40.0	AT , 3rd	100 Ω
8.1 ~ 11.0	AT , Fund.	60 Ω	40.1~ 50.0	AT , 3rd	80 Ω
11.1~ 14.0	AT , Fund.	50 Ω	50.1~125.0	AT , 3rd	90 Ω
14.1~ 50.0	AT , Fund.	40 Ω			

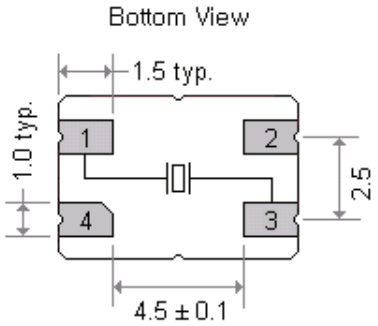
Table 2

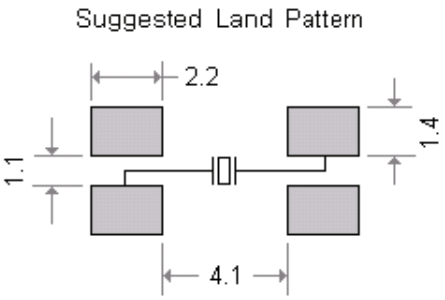
Frequency stability Vs Operating temperature range							
Stability code	Temp. (ºC) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)







Pad connections :
Pad 1 and 3 : Crystal
Pad 2 and 4 : Connected throught the metal lid for grounding
Chamferred pad is pad No.4

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

M49 [12.4 * 4.5 * 4.0 mm]	ML49 [12.4 * 4.5 * 3.0 mm]	Surface Mount Crystals	Fund.	3rd O.T.	Min. 3.2MHz	Max. 70MHz

Features

Specifications

- High frequency fundamental mode is available in BT-cut
- Withstands solder reflow and is available in EIA-481A tape and ree .l
- AT-strip crystal inside. Optimized for low spurious.
- Lowest cost among all Mercury SMD crystals

RoHS Compliance

General Specifications

Item / Type	**M49** (12.4 * 4.5 * 4.0mm)	ML49 (12.4 * 4.5 * 3.0mm) series
Frequency Range & Crystal Cut	3.2.000 ~ 48.000 MHz , AT-cut , Fundamental Mode (see Table 1) 27.000 ~ 70.000 MHz , AT-cut , 3rd overtone (see Table 1) 24.000 ~ 48.000 MHz , BT-cut , Fundamental Mode (see Table 1)	
Load Capacitance	Series or Parallel (8 to 32 pF) resonance	
Drive Level	100μ W typical (500μ W max.)	
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C	
Frequency Stability	See Table 2	
Aging	△F / F : ±3 ppm / year (max.)	
Storage Temperature Range	- 50°C to 105°C	

Table 1

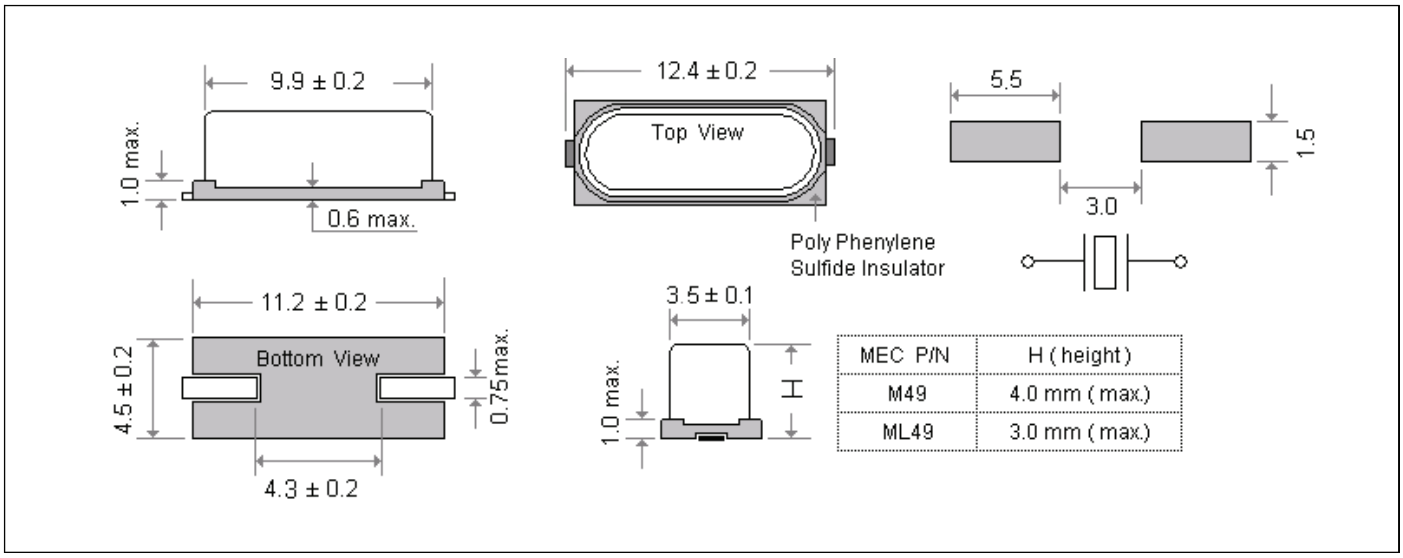
ESR (Equivalent Series Resistance)					
Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
3.2 ~ 3.4	AT , Fund.	300 Ω	24.0 ~ 48.0	BT , Fund.	40 Ω
3.5 ~ 6.0	AT , Fund.	120 Ω	27.0 ~ 30.0	AT , 3rd	150 Ω
6.1 ~ 10.0	AT , Fund.	60 Ω	30.1 ~ 50.0	AT , 3rd	100 Ω
10.1 ~ 30.0	AT , Fund.	40 Ω	50.1 ~ 70.0	AT , 3rd	80 Ω

Table 2

Frequency stability Vs Operating temperature range						
Stability code	Temp. (ºC) \ ppm	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○
I	-40 to 85°C		○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

MP4 , MP5
[12.9 * 4.5 * 4.8 (3.8) mm]

MP24 , MP25
[11.4 * 5.0 * 4.8 (3.8) mm]

Surface Mount Crystals | Fund. | 3rd O.T. | Min. 3.2MHz | Max. 70MHz

Features

Specifications

● MP4 , MP5 , MP24 and MP25 are designed for top board assembly and a one time solder reflow only . Do not mount these products with the metal housing downward.

RoHS Compliance

General Specifications

Item / Type	**MP4** (12.9 * 4.5 * 3.8 mm)	**MP5** (12.9 * 4.5 * 4.8 mm) series
	MP24 (11.4 * 5.0 * 3.8 mm)	**MP25** (11.4 * 5.0 * 4.8 mm) series
Frequency Range & Crystal Cut	3.2.000 ~ 48.000 MHz , AT-cut , Fundamental Mode (see Table 1) 27.000 ~ 70.000 MHz , AT-cut , 3rd overtone (see Table 1) 24.000 ~ 48.000 MHz , BT-cut , Fundamental Mode (see Table 1)	
Load Capacitance	Series or Parallel (8 to 32 pF) resonance	
Drive Level	100μ W typical (500μ W max.)	
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C	
Frequency Stability	See Table 2	
Aging	△F / F : ±3 ppm / year (max.)	
Storage Temperature Range	- 50°C to 105°C	

Table 1

ESR (Equivalent Series Resistance)					
Freq. (MHz)	Osc. Mode	E.S.R	Freq. (MHz)	Osc. Mode	E.S.R
3.2 ~ 3.4	AT , Fund.	300 Ω	24.0 ~ 48.0	BT , Fund.	40 Ω
3.5 ~ 6.0	AT , Fund.	120 Ω	27.0 ~ 30.0	AT , 3rd	150 Ω
6.1 ~ 10.0	AT , Fund.	60 Ω	30.1 ~ 50.0	AT , 3rd	100 Ω
10.1 ~ 30.0	AT , Fund.	40 Ω	50.1 ~ 70.0	AT , 3rd	80 Ω

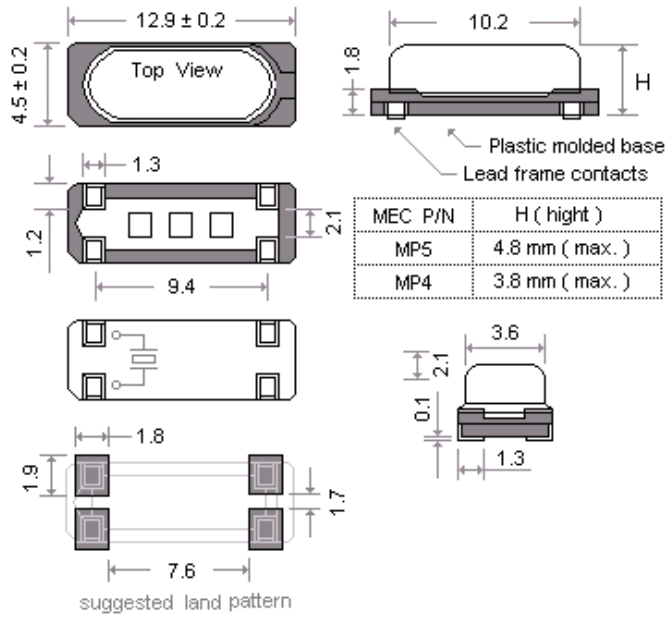
Table 2

Frequency stability vs Operating temperature range						
Stability code	Temp. (°C) \ ppm	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○
I	-40 to 85°C		○	○	○	○

○ : available ; ▲ : contact Mercury

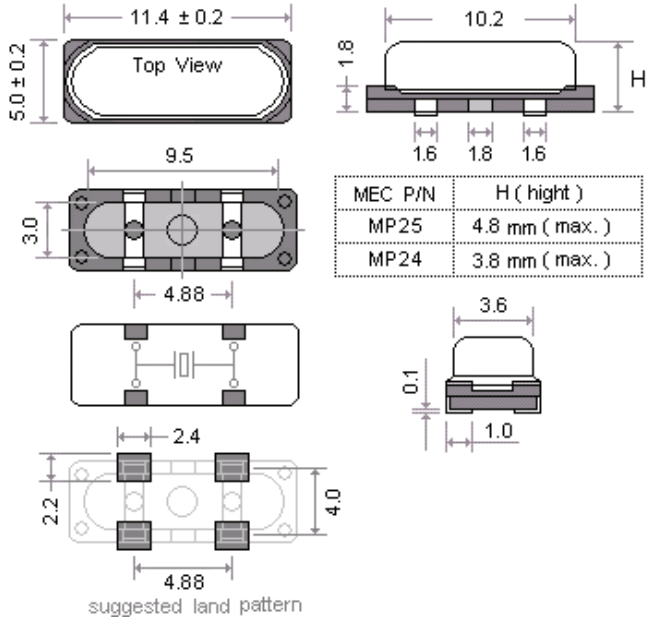
Outline Dimensions (Unit : mm)

[MP4] ; [MP5]



MEC P/N	H (hight)
MP5	4.8 mm (max.)
MP4	3.8 mm (max.)

[MP24] ; [MP25]



MEC P/N	H (hight)
MP25	4.8 mm (max.)
MP24	3.8 mm (max.)

HUS [10.7 * 4.3 * 3.5 mm]	HUSL [10.7 * 4.3 * 2.5 mm]	Thru - Hole Crystals	Fund.	3rd O.T.	Min. 3.2MHz	Max. 70MHz

Features

Specifications

- Available in HUSL (2.5mm height) & HUS (3.5mm height)
- Low cost and light weight
- High frequency fundamental mode is available in BT cut

RoHS Compliance

General Specifications

Item / Type	**HUSL** (10.7 * 4.3 * 2.5mm)	**HUS** (10.7 * 4.3 * 3.5mm) series
Frequency Range & Crystal Cut	3.2.000 ~ 48.000 MHz , AT-cut , Fundamental Mode (see Table 1) 27.000 ~ 70.000 MHz , AT-cut , 3rd overtone (see Table 1) 24.000 ~ 48.000 MHz , BT-cut , Fundamental Mode (see Table 1)	
Load Capacitance	Series or Parallel (8 to 32 pF) resonance	
Drive Level	100μ W typical (500μ W max.)	
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C	
Frequency Stability	See Table 2	
Aging	△F / F : ±3 ppm (max.)	
Storage Temperature Range	- 50°C to 105°C	

Table 1

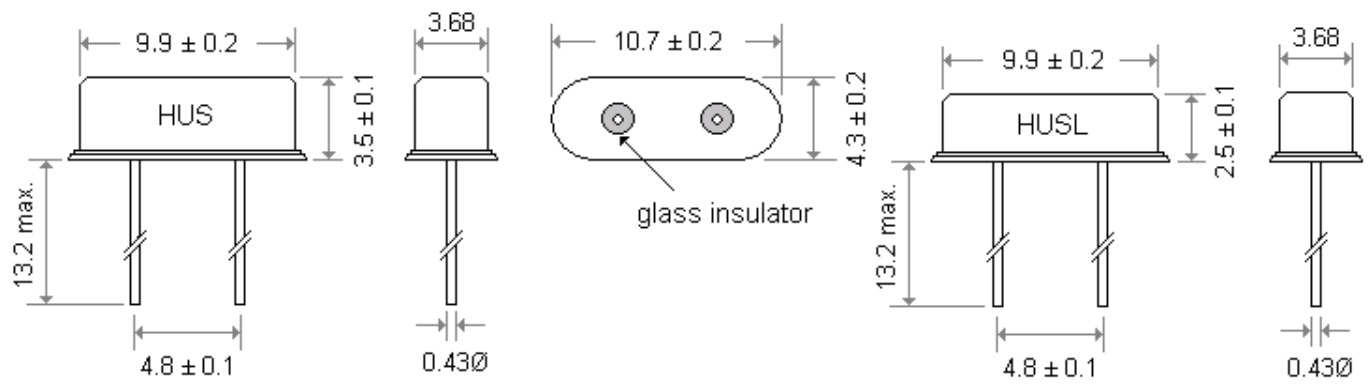
ESR (Equivalent Series Resistance)					
Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
3.2 ~ 3.4	AT , Fund.	300 Ω	24.0 ~ 48.0	BT , Fund.	40 Ω
3.5 ~ 6.0	AT , Fund.	120 Ω	27.0 ~ 30.0	AT , 3rd	150 Ω
6.1 ~ 10.0	AT , Fund.	60 Ω	30.1 ~ 50.0	AT , 3rd	100 Ω
10.1 ~ 30.0	AT , Fund.	40 Ω	50.1 ~ 70.0	AT , 3rd	80 Ω

Table 2

Frequency stability vs Operating temperature range						
Stability code	Temp. (°C) \ ppm	± 10	± 15	± 20	± 25	± 30
X	-10 to 60°C	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○
I	-40 to 85°C		○	○	○	○

○ : available ; ▲ : contact Mercury

Outline Dimensions (Unit : mm)



U1 , U5 [7.8 * 3.2 * 8.0 (6.0) mm]	U1SL [7.8 * 2.6 * 8.0 mm]	Thru - Hole Crystals	Fund.	3rd O.T.	5th O.T.	Min. 1.0MHz	Max. 200MHz

Features

Specifications

- A round shaped AT-Cut crystal plate inside.
- Available up to 200 MHz using a 5th overtone crystal mode
- Annealed and pre-aged for low frequency drift over a long-term operation

RoHS Compliance

General Specifications

Item / Type	U1	U1SL	U5	U1MJ	U5MJ
Frequency Range	U1 & U1MJ : 1.0 ~ 1.2MHz , 4.0 ~ 200.0MHz ; U5 : 10.0 ~ 200MHz				
Load Capacitance	Series or Parallel (8 to 32 pF) resonance				
Drive Level	100μ W typical (500μ W max.)				
Frequency Tolerance	AT-cut : ± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C SL-cut : ± 50 ppm at 25°C				
Frequency Stability	See Table 2				
Aging	△F / F : ±3 ppm / year (max.)				
Storage Temperature Range	- 50°C to 105°C				

Table 1

U1 & U1MJ ESR (Equivalent Series Resistance)

Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
1.0 ~ 1.2	SL , Fund.	5K Ω	11.0 ~ 12.9	AT , Fund.	40 Ω
6.0 ~ 6.9	AT , Fund.	100 Ω	13.0 ~ 45.0	AT , Fund.	25 Ω
7.0 ~ 7.9	AT , Fund.	90 Ω	30.0 ~ 50.0	AT , 3rd	40 Ω
8.0 ~ 8.9	AT , Fund.	80 Ω	50.1 ~ 100.0	AT , 3rd	50 Ω
9.0 ~ 10.9	AT , Fund.	90 Ω	80.0 ~ 200.0	AT , 5th	80 Ω

U5 & U5MJ ESR (Equivalent Series Resistance)

Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
10.0 ~ 11.9	AT , Fund.	60 Ω	90.1 ~ 135.0	AT , 3rd	40 Ω
12.0 ~ 14.9	AT , Fund.	50 Ω	90.1 ~ 159.0	AT , 5th	100 Ω
15.0 ~ 35.0	AT , Fund.	30 Ω	160.0 ~ 200.0	AT , 5th	80 Ω
35.1 ~ 90.0	AT , 3rd	60 Ω			

Table 2

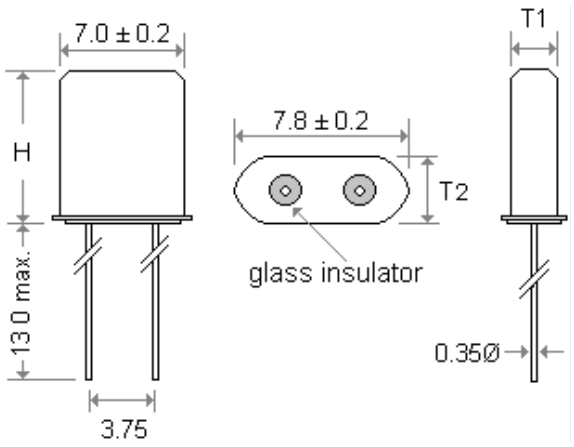
Frequency stability vs Operating temperature range

Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30	± 50	± 100 (SL-cut)
X	-10 to 60°C	○	○	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○	○	○
I	-40 to 85°C		▲	○	○	○	○	○	○

○ : available ; ▲: contact Mercury

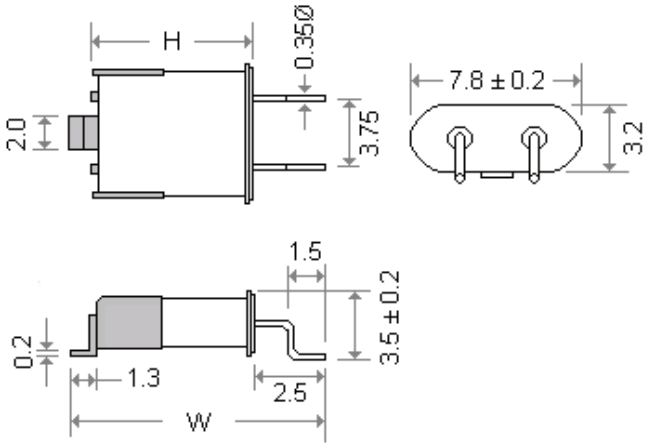
Outline Dimensions (Unit : mm)

Dip type (U1 , U1SL , U5)



	H	T1	T2
U1	8.0 ± 0.2	2.2 ± 0.2	3.2 ± 0.2
U1SL	8.0 ± 0.2	1.8 ± 0.2	2.6 ± 0.2
U5	6.0 ± 0.2	2.2 ± 0.2	3.2 ± 0.2

Metal jacket (U1MJ , U5MJ)



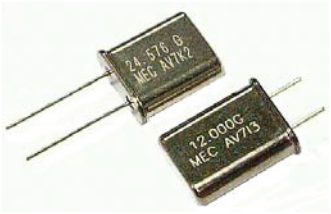
	H	W
U1MJ	8.0 ± 0.2	11.8 ± 0.2
U5MJ	6.0 ± 0.2	9.8 ± 0.2

H49	49T	Thru - Hole Crystals	Fund.	3rd O.T.	5th O.T.	Min.	Max.
[10.7 * 4.5 * 13.6 mm]	[10.7 * 4.5 * 11.2 mm]					1.0MHz	160MHz

Features

Specifications

- Tight tolerance and stability. Ideal for communication equipment
- Available up to 200 MHz using a 5th overtone crystal mode
- RoHS compliant versions are also available.



RoHS Compliance

General Specifications

Item / Type	H49	H49MJ	49T	49TMJ
Frequency Range	1.0 ~ 1.3MHz , 1.8 ~ 200.0MHz (see Table 1)		3.1 ~ 200.0MHz (see Table 1)	
Load Capacitance	Series or Parallel (8 to 32 pF) resonance			
Drive Level	100μ W typical (500μ W max.)			
Frequency Tolerance	AT-cut: ± 5 ppm , ± 10 ppm , ± 20 ppm or ± 30 ppm at 25°C			
	SL-cut: ± 50 ppm at 25°C			
Frequency Stability	See Table 2			
Aging	△F / F : ±2 ppm / year (max.)			
Storage Temperature Range	- 50°C to 105°C			

Table 1

H49 ; 49T ESR (Equivalent Series Resistance)							
Freq. (MHz)	Hold Type	crystal cut and osc. Mode	E.S.R.	Freq. (MHz)	Hold Type	crystal cut and osc. Mode	E.S.R.
1.0 ~ 1.3	H49	SL , Fund.	5K Ω	7.1 ~ 10.0	H49 , 49T	AT , Fund.	35 Ω
1.8 ~ 3.0	H49	AT , Fund.	400 Ω	10.1 ~ 30.0	H49 , 49T	AT , Fund.	25 Ω
3.1 ~ 3.5	H49	AT , Fund.	150 Ω	30.1 ~ 45.0	H49 , 49T	AT , Fund.	20 Ω
3.6 ~ 5.0	H49 , 49T	AT , Fund.	100 Ω	24.0 ~ 100.0	H49 , 49T	AT , 3rd	60 Ω
5.1 ~ 7.0	H49 , 49T	AT , Fund.	50 Ω	80.0 ~ 160.0	H49 , 49T	AT , 5th	70 Ω

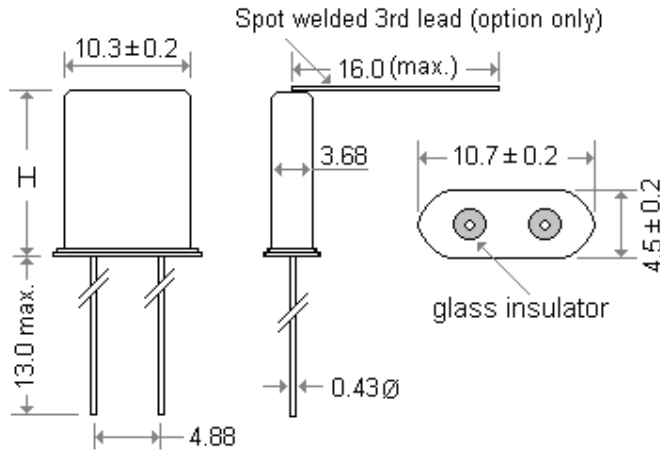
Table 2

Frequency stability vs Operating temperature range									
Stability code	Temp. (°C) \ ppm	± 5	± 10	± 15	± 20	± 25	± 30	± 50	± 100 (SL-cut)
X	-10 to 60°C	○	○	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○	○	○
I	-40 to 85°C		○	○	○	○	○	○	○

○ : available ; ▲: contact Mercury

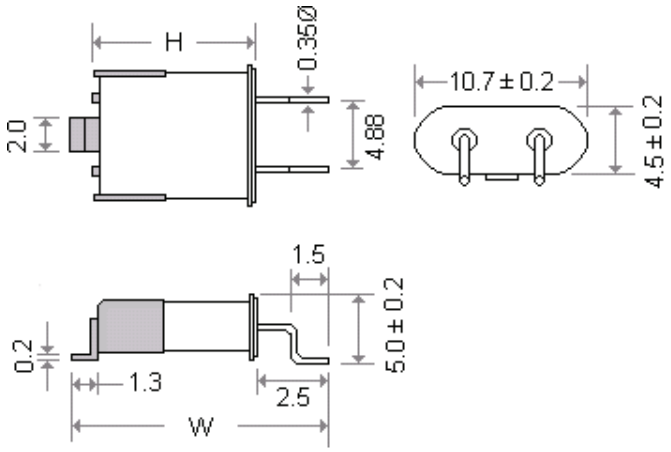
Outline Dimensions (Unit : mm)

Dip type (H49 , 49T)



	H
H49	13.6 ± 0.2
49T	11.2 ± 0.2

Jacket type (H49MJ , 49TMJ)



	H	W
H49MJ	13.8 ± 0.2	17.1 ± 0.2
49TMJ	11.4 ± 0.2	14.7 ± 0.2

Mercury Crystal Oscillator Products Lineup

- Clock Oscillators (XOs)
- VCXOs (Voltage Controlled XOs)
- TCXOs (Temperature Compensated XOs)
- VCTCXOs (Voltage Controlled Temperature Compensated XOs)
- OCXOs (Oven Controlled XOs)

RoHS Compliance

Clock Oscillator Selection Guide

Output Wave / Output Logic	Product Series		Supply Voltage	Product Description / Features
Square Wave **CMOS**	H		1.8 / 2.5 / 3.3 / 5.0	General purpose clock oscillators. 20.0 KHz to 160.0 MHz .
	SWO		1.8 / 2.5 / 3.3 / 5.0	General purpose clock oscillators. 0.3 to 125.0 MHz .
	H	F	2.5 / 3.3	125.01 MHz to 320.0 MHz , phase jitter : 0.4 ps(typ.) , period jitter RMS : 3.0 ps(typ.) .
		V	3.3	125.01 MHz to 200.0 MHz , phase jitter : 2.3 ps(typ.) , period jitter RMS : 4.0 ps(typ.) . Low cost .
		W	3.3	125.01 MHz to 800.0 MHz , phase jitter : 2.6 ps(typ.) , period jitter RMS : 4.3 ps(typ.) .
	HM		3.3	**EMI Reduction Spread Spectrum Clocl Oscillators** (at least 10 dBc.) 5.0 MHz to 220.0 MHz , Drop-in replacements for all types of packages including 5x7 and 5x3.2 .
	HK		1.8 / 2.5 / 3.3	Ultra Low Current. Consumes less than one tenth of current when compared with other 0.25 KHz to 50.0 MHz ,equivalent HCMOS oscillators .
	LPO		3.3 / 5.0	Low Power oscillators designed for battery-operated devices. Current consumption in the uA range . 3.0V to 15.0V supply.1Hz to 160 KHz includes popular 32.768 KHz. X-cut tuning fork crystals used .
Square Wave **HCSL**	HC	K	3.3	10.0 MHz to 220.0 MHz , phase jitter : 0.2 ps(typ.) ,Phase Noise : 100K (144dBc/Hz) , 10M (155dBc/Hz)
Square Wave **PECL**	HP	K	3.3	10.0 MHz to 220.0 MHz , phase jitter : 0.2 ps(typ.) ,Phase Noise : 100K (144dBc/Hz) , 10M (155dBc/Hz)
		F	3.3	38.0 MHz to 640.0 MHz , phase jitter : 0.4 ps(typ.) , period jitter RMS : 3.0 ps(typ.) .
		W	3.3	0.75 MHz to 800.0 MHz , phase jitter : 2.35 ps(typ.) , period jitter RMS : 4.3 ps(typ.) .
Square Wave **LVDS**	HD	K	3.3	10.0 MHz to 220.0 MHz , phase jitter : 0.2 ps(typ.) ,Phase Noise : 100K (144dBc/Hz) , 10M (155dBc/Hz)
		F	3.3	38.0 MHz to 640.0 MHz , phase jitter : 0.4 ps(typ.) , period jitter RMS : 3.0 ps(typ.) .
		W	3.3	0.75 MHz to 800.0 MHz , phase jitter : 2.35 ps(typ.) , period jitter RMS : 4.3 ps(typ.) .
Sine Wave	HSR		2.8 / 3.0 / 5.0	10.0 MHz to 52.0 MHz , Output level 1.0 V p-p into 10K Ω // 10 pF load .
	HS		3.3	10.0 MHz to 800.0 MHz , Output level is greater than 0 dBm into 50 Ω load .
			5.0	10.0 MHz to 156.0 MHz , Output level is greater than 0 dBm into 50 Ω load .

VCXO Selection Guide

Output Wave / Output Logic	Product Series		Supply Voltage	Product Description / Features
Square Wave **CMOS**	G		1.8 / 3.3 / 5.0	General purpose VCXOs. 0.5 to 50.0 MHz .
	G	F	3.3	Up to 640 MHz. PLL-based. 0.4 ps Phase Jitter. -128 dBc/Hz at 100 KHz offset (for 155.520 MHz).
		V	3.3	Up to 200 MHz. PLL-based. -121 dBc/Hz at 100 KHz offset (for 155.520 MHz). Low cost and high performance.
		W	3.3	Up to 800 MHz and low jitter. PLL-based. RMS Phase jitter (12 KHz ~20 MHz) 2.6 ps. -121 dBc/Hz at 100 KHz offset (for 155.520 MHz).
Square Wave **PECL**	GP	F	3.3	38.0 MHz to 640.0 MHz , phase jitter : 0.4 ps(typ.) , period jitter RMS : 3.0 ps(typ.) .
		W	3.3	0.75 MHz to 800.0 MHz , phase jitter : 2.6 ps(typ.) , period jitter RMS : 4.3 ps(typ.) .
Square Wave **LVDS**	GD	F	3.3	38.0 MHz to 640.0 MHz , phase jitter : 0.4 ps(typ.) , period jitter RMS : 3.0 ps(typ.) .
		W	3.3	0.75 MHz to 800.0 MHz , phase jitter : 2.6 ps(typ.) , period jitter RMS : 4.3 ps(typ.) .
Sine Wave	GSR		2.8 / 3.0 / 5.0	10.0 MHz to 40.0 MHz , Output level 1.0 V p-p into 10K Ω // 10 pF load .
	GS		3.3	10.0 MHz to 800.0 MHz , Output level > 0 dBm into 50 Ω load .
			5.0	10.0 MHz to 160.0 MHz , Output level > 0 dBm into 50 Ω load .

Mercury Crystal Oscillators : **TCXOs , VCTCXOs** and **OCXOs**

TCXO (M series) & VCTCXO (VM series) Selection Guide ; Note " __ " is the package code

Output Wave Output Logic	Product Series	Supply Voltage	Available Frequency / Product Description / Features
Clipped Sine	(V) M_ _S	3.0 / 3.3 / 5.0	DC-blocked AC coupled 0.8V p-p and 1.0V p-p clipped sine wave output . except VM53S and VM32S
Square Wave **CMOS**	(V) M_ _T	3.0 / 3.3 / 5.0	General purpose TCXOs & VCTCXOs. Up to 156 MHz . 20.0 KHz ~ 50.0 KHz is also available .
	(V) MB_ _T	2.8 / 3.0 / 3.3	" B " group . Frequency Range : 1.0 ~ 200.0 MHz , Quick Turn , Short Lead time . From 1 day to 1 week .
	(V) MV_ _T	3.3	" V " group . Frequency Range : 27.0 ~ 200.0 MHz , Integrated Phase Jitter : 2.3 ps typical , 4.0 ps max.
	(V) MW_ _T	3.3	" W " group . Frequency Range : 200.01 ~ 800.0 MHz , Integrated Phase Jitter : 2.6 ps typical , 4.0 ps max.
Square Wave **LVPECL**	(V) MW_ _P	3.3	Differential PECL square wave , " W " group . Freq. Range : 10.0 ~ 800 MHz Integrated Phase Jitter : 2.6 ps typical , 4.0 ps max.
Square Wave **LVDS**	(V) MW_ _D	3.3	Differential LVDS square wave , " W " group . Freq. Range : 12.0 ~ 800 MHz Integrated Phase Jitter : 2.6 ps typical , 4.0 ps max.

OCXO Selection Guide

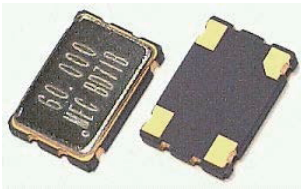
Output Wave Output Logic	Product Series	Supply Voltage	Product Description / Features : Please refer to page 69 ~ 70 for product series selections.			
Sine Wave **50 ohm load**	OC_E	3.3	+3.3 V [OC14E , OC24E offers only] : 1.25 MHz to 40.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.75 ~ ± 0.2 ppm	± 0.15 ~ ± 0.3 ppm	± 0.25 ~ ± 0.5 ppm
		5.0	+5.0 V : 1.25 MHz to 100.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.02 ~ ± 0.05 ppm	± 0.05 ~ ± 0.1 ppm	± 0.1 ~ ± 0.2 ppm
			SC - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.01 ppm	± 0.01 ~ ± 0.02 ppm	± 0.3 ppm
		12.0	+12.0 V 10.0 MHz to 100.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.02 ~ ± 0.05 ppm	± 0.05 ~ ± 0.1 ppm	± 0.1 ~ ± 0.2 ppm
			SC - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.01 ppm	± 0.01 ~ ± 0.02 ppm	± 0.3 ppm
Square Wave **CMOS**	OC_T	3.3	+3.3 V [OC14T , OC24T offers only] : 1.25 MHz to 100.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.075 ~ ± 0.2 ppm	± 0.15 ~ ± 0.3 ppm	± 0.25 ~ ± 0.5 ppm
		5.0	+5.0 V : 1.25 MHz to 100.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.02 ~ ± 0.05 ppm	± 0.05 ~ ± 0.1 ppm	± 0.1 ~ ± 0.2 ppm
			SC - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.01 ppm	± 0.01 ~ ± 0.02 ppm	± 0.3 ppm
		12.0	+12.0 V 1.25 MHz to 100.0 MHz			
			AT - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.02 ~ ± 0.05 ppm	± 0.05 ~ ± 0.1 ppm	± 0.1 ~ ± 0.2 ppm
			SC - cut Freq. Stability			
			Temperature Range	0°C to +60°C	-20°C to +70°C	-40°C to +85°C
			Freqency Stability	± 0.01 ppm	± 0.01 ~ ± 0.02 ppm	± 0.3 ppm

H	Thru-Hole	SMD	TTL / CMOS	1.8V	2.5V	3.3V	5.0V	Min. 20KHz	Max. 160MHz

Applications

- CPU , Graphics , Multimedia A / V clocks
- MPEG / DVD / HDTV clocks
- Laser engine pixel / set - top clocks
- OC-3 , OC-12 , OC-48 and OC-192 clocks
- SONET / SDH / ATM clocks
- Fast Ethernet and Gigabit Ethernet clocks
- NTSC / PAL encoder / decoder clocks
- PLL / synthesizer clocks
- Fibre channel and ADSL clocks

RoHS Compliance



General Specifications [TA = +25°C , V_{DD}= at specified voltage , Load : 15 pF]

Model		" H " series			
Input Voltage (V_{DD})		+ 1.8V D.C.±5%	+ 2.5V D.C.±5%	+ 3.3 V D.C.±5%	+ 5.0V D.C.±10%
		code is " 18 "	code is " 25 "	code is " 3 "	code is " 5 "
Frequency Range		1.8 MHz ~ 60 MHz	0.3 MHz ~ 125 MHz	20KHz ~ 130 MHz	20 KHz ~ 160 MHz
Output Wave Form		CMOS	CMOS	T T L / CMOS	T T L / CMOS
Output Logic High " 1 "	T T L			2.4 V (min.)	2.4 V (min.)
	CMOS	1.62 V (min.)	2.25 V (min.)	2.97 V (min.)	4.5 V (min.)
Output Logic Low " 0 "	T T L			0.4 V (max.)	0.4 V (max.)
	CMOS	0.18 V (max.)	0.25 V (max.)	0.33 V (max.)	0.5 V (max.)

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " For example : " C20 " ±20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

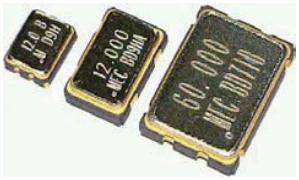
Output Load	T T L	2 ~ 10 (LS) T T L gates
	CMOS	15 pF typical; 30 pF load for frequencies up to 70 MHz ; Contact Mercury for 50 pF load
Rise Time (Tr)	T T L	10 n sec.(max.) ; 3 n sec.(typical) . Measured between $0.4V_{DC}$ ↔ $2.4V_{DC}$ (RL=390Ω ; CL = 15pF)
Fall Time (Tf)	CMOS	10 n sec.(max.) ; 3 n sec.(typical) . Measured between 10% to 90% wave form (CL=15pF)
Duty Cycle	T T L	40% (min.) , 60%(max.) Measured at +1.4V
	CMOS	40% (min.) , 60%(max.) Measured at 50% of wave form [50% ± 5% is also available , add " S " at the end of the part number
Start -Up Time (Ts)		10 m sec. (max.) ; 5 m sec. (typical)
Current Consumption		10 ~ 45 mA (frequency dependent)
Storage Temperature		- 50°C to 100°C
Aging		±5 ppm per year (max.)
Tri-State Option.		Output is high impedance when " 0 " is applied to pin 1 . Disable time is 150 n sec. max. Add " T " in part number for Tri-State option

H22 **H32** **H53** **SWO** | SMD | TTL / CMOS | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V | Min. 25.0 KHz | Max. 160 MHz

RoHS Compliance

Applications

- CPU , Graphics , Multimedia A / V clocks
- MPEG / DVD / HDTV clocks
- Laser engine pixel / set - top clocks
- OC-3 , OC-12 , OC-48 and OC-192 clocks
- SONET / SDH / ATM clocks
- Fast Ethernet and Gigabit Ethernet clocks
- NTSC / PAL encoder / decoder clocks
- PLL / synthesizer clocks
- Fibre channel and ADSL clocks



General Specifications [TA = +25°C , V_{DD}= at specified voltage , Load : 15 pF]

Model	" **H22** " ; " **H32** " ; " **H53** " and " **SWO** " series [Output Logic : T T L / CMOS]							
	" **H22** " series		" **H32** " series		" **H53** " series		" **SWO** " series	
Dimensions	2.5 x 2.0 x 0.95 mm		3.2 x 2.5 x 1.0 mm		5.0 x 3.2 x 1.2 mm		7.0 x 5.0 x 1.4 mm	
Available Freq. Range by Voltage	1.2 V	312.0 KHz ~ 60.0 MHz	1.2 V	312.0 KHz ~ 60.0 MHz	1.2 V	312.0 KHz ~ 60.0 MHz	1.2 V	312.0 KHz ~ 60.0 MHz
	1.5 V		1.5 V		1.5 V		1.5 V	
	1.8 V	156.0 KHz ~ 130.0 MHz	1.8 V	25.0 KHz ~ 101.0 KHz 156.0 KHz ~ 160.0 MHz	1.8 V	25.0 KHz ~ 101.0 KHz 156.0 KHz ~ 160.0 MHz	1.8 V	25.0 KHz ~ 101.0 KHz 156.0 KHz ~ 160.0 MHz
	2.5 V		2.5 V		2.5 V		2.5 V	
	3.3 V		3.3 V		3.3 V		3.3 V	
	5.0 V		5.0 V		5.0 V		5.0 V	

Supply Voltage (V_{DD})		**+ 1.2V** D.C.±5%	**+ 1.5V** D.C.±5%	**+ 1.8V** D.C.±5%	**+ 2.5V** D.C.±5%	**+ 3.3 V** D.C.±5%	**+ 5.0V** D.C.±10%
		code is " 10 "	code is " 15 "	code is " 18 "	code is " 25 "	code is " 3 "	code is " 5 "
High "1" (90% of V_{DD} min.)		0.9 V min.	1.35 V min.	1.62 V min.	2.25 V min.	2.97 V min.	4.5 V min.
Logic Low "0" (10% of V_{DD} max.)		0.1 V max.	0.15 V max.	0.18 V max.	0.25 V max.	0.33 V max.	0.5 V max.
Current Consumption		[1.0 ~ 1.5 MHz] 4 mA max.	[0.3 ~ 1.5 MHz] 4 mA max.	[1.0 ~ 1.5 MHz] 5 mA max.	[0.3 ~ 1.5 MHz] 5 mA max.	[0.3 ~ 1.5 MHz] 5 mA max.	[0.3 ~ 1.5 MHz] 5 mA max.
		[1.5 ~ 20 MHz] 4 mA max.	[1.5 ~ 20 MHz] 4 mA max.	[1.5 ~ 20 MHz] 8 mA max.	[1.5 ~ 20 MHz] 8 mA max.	[1.5 ~ 20 MHz] 8 mA max.	[1.5 ~ 20 MHz] 10 mA max.
		[20.0 ~ 50.0 MHz] 4 mA max.	[20.0 ~ 50.0 MHz] 4 mA max.	[20.0 ~ 50.0 MHz] 15 mA max.	[20.0 ~ 50.0 MHz] 15 mA max.	[20.0 ~ 50.0 MHz] 15 mA max.	[20.0 ~ 50.0 MHz] 15 mA max.
		[50.1 ~ 160.0 MHz] 12 mA max.	[50.1 ~ 160.0 MHz] 12 mA max.	[50.1 ~ 160.0 MHz] 22 mA max.	[50.1 ~ 160.0 MHz] 25 mA max.	[50.1 ~ 160.0 MHz] 35 mA max.	[50.1 ~ 160.0 MHz] 40 mA max.
Tri-state Function on pad No. 1	Pad No. 1	Tri - state	Tri - state	Tri - state	Tri - state	Tri - state	Tri - state
	Package	H32 , H53 ,SWO	H32 , H53 ,SWO	H22 ,H32 ,H53 ,SWO	H22 ,H32 ,H53 ,SWO	H22 ,H32 ,H53 ,SWO	H22 ,H32 ,H53 ,SWO
Rise Time (Tr) / Fall Time (Tf)		6 n sec. (max.)	6 n sec. (max.)	7 n sec. (max.)	7 n sec. (max.)	10 n sec. (max.)	10 n sec. (max.)
		Measured between 10% ↔ 90% of wave form (CL = 15pF)					

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " For example : " C20 " ±20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

Load	15 pF ; (30 pF and 50 pF load are also available for +3.3V and +5.0V V_{DD})
Duty Cycle (at 50% of wave form)	Standard: 50% ± 10%; Option: 50% ± 5%. Please add "**-S**" at the end of the part number for ± 5% .
Start -up Time (Ts)	1.0 ~ 32.0 MHz : 5 m sec. (max.) ; 32.0 ~ 160.0 MHz : 10 m sec. (max.)
Storage Temperature	- 50°C to 100°C
Aging	± 3 ppm per year (max.)

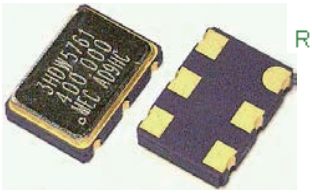
Note : [1] Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

HF **HW** **HV** | Thru-Hole | SMD | LVCMOS | 2.5V | 3.3V | 5.0V | Min. 125.01 KHz | Max. 800 MHz

Applications

For high frequency (>125.0 MHz) LVCMOS output clock oscillators, Mercury offers HF, HW and HW series.

- " HF " series: Best performance among the three series. Phase jitter is less than 1 ps.
- " HW " and "HV" use a high-Q fundamental crystal and a multiplier circuit for low cost applications.
- All have moderate jitter. HW is up to 800 MHz. HV series is up to 200 MHz .



RoHS Compliance

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

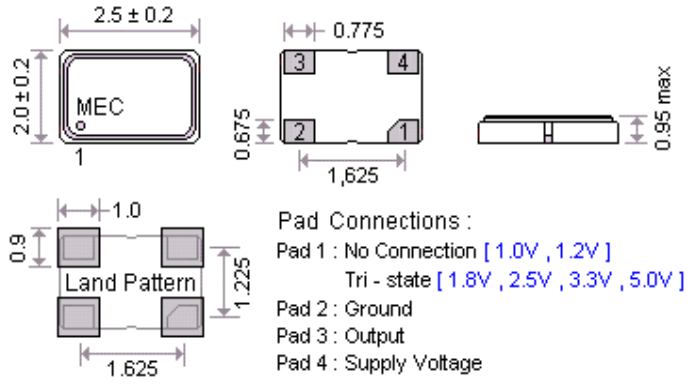
Model	" HF " series		" HW " series			" HV " series
Technology	High Q fundamental crystal + ultra low jitter multiplier circuit		High Q fundamental crystal + low jitter multiplier circuit			High Q fundamental crystal + low jitter multiplier circuit
Output Logic	LVCMOS					
Available Frequency Range	125.01 MHz ~ 200.0 MHz (15 pF load) 125.01 MHz ~ 320.0 MHz (10 pF load)		125.01 MHz ~ 800.0 MHz			125.01 MHz ~ 200.0 MHz
Supply Voltage V_{DD}	+ 2.5V D.C.±5%	+3.3 V_{DD} ± 5%	+ 3.3 V D.C.±5%			+ 3.3 V D.C.±5%
Supply Voltage Code	" 25 "	" 3 "	" 3 "			" 3 "
Output Logic " High " , " 1 "	90% of V_{DD} min.					
Output Logic " Low " , " 0 "	10% of V_{DD} max.					
Integrated Phase Jitter (12 KHz to 20 MHz)	0.4 ps typical; 0.5 ps max. For 156.250 MHz		2.6 ps typical; 4 ps max. For 155.520 MHz			2.3 ps typical; 4 ps max. For 155.520 MHz
Period Jitter RMS ; Decoupling capacitor between V_{DD} and ground	3 ps typical; 5 ps max. For 156.250 MHz		4.3 ps typical. For 155.520 MHz			4.0 ps typical. For 155.520 MHz
Period Jitter (peak-to-peak ; Decoupling capacitor between V_{DD} and ground)	20 ps typical; 30 ps max. For 156.250 MHz		27 ps typical. For 155.520 MHz			27 ps typical. For 155.520 MHz
Current Consumption (15 pF load)	45 mA max.		45 mA max.			45 mA max.
Rise Time / Fall Time	0.7 ns typical (0.3 V ↔ 3.0V, 15 pF load)		2.4 ns typical (0.3 V ↔ 3.0V, 15 pF load)			2.4 ns typical (0.3 V ↔ 3.0V, 15 pF load)
Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range		± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)		*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)		*D*	*E*	*F*	
Load	15 pF					
Start-up Time	10 m sec. (max.)					
Duty Cycle	50% ± 5% (measured at 50% V_{DD})					
Input Static Discharge Protection	2 KV (min.)					
Storage Temperature	-55°C to + 100°C					
Aging at Ta=+25ºC	± 3 ppm max. first year ; ± 2 ppm max. per year thereafter					
Tri - State Function — 5761 on pad No. 1	Output (pad 4) is normal if Tri-state pad is no connection or connected to logic HIGH					
Tri - State Function — 5762 on pad No. 2	Output (pad 4) is high impedance if Tri-state pad is connected to logic LOW.					
Phase Noise (typical)	Offset	Frequency: 156.250 MHz	Frequency: 155.520 MHz			Frequency: 155.520 MHz
	10 Hz	-62 dBc / Hz	-65 dBc / Hz			-65 dBc / Hz
	100 Hz	-92 dBc / Hz	-95 dBc / Hz			-95 dBc / Hz
	1 KHz	-120 dBc / Hz	-120 dBc / Hz			-120 dBc / Hz
	10 KHz	-132 dBc / Hz	-125 dBc / Hz			-128 dBc / Hz
	100 KHz	-128 dBc / Hz	-121 dBc / Hz			-122 dBc / Hz
	1 MHz	-140 dBc / Hz	-120 dBc / Hz			-120 dBc / Hz
	10 MHz	-150 dBc / Hz	-140 dBc / Hz			-140 dBc / Hz

[1] Inclusive of 25ºC tolerance, operating temperature range, ±10% input voltage variation, load change, aging shock and vibration

Clock Oscillators [T T L / CMOS]

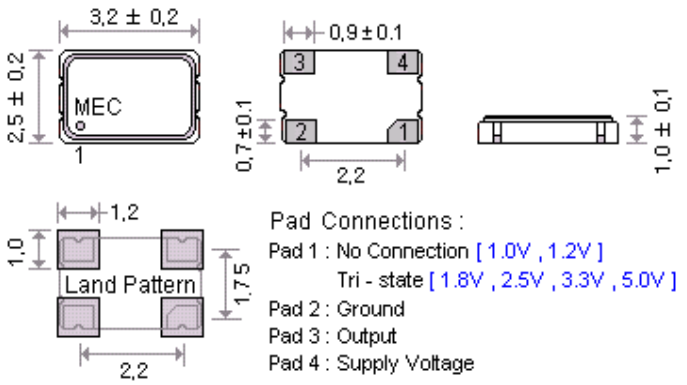
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 3 for product series selections .]

[H22]



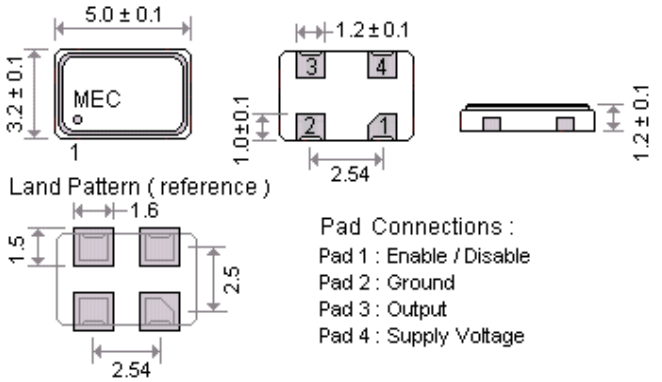
Pad Connections :
Pad 1 : No Connection [1.0V , 1.2V]
Tri - state [1.8V , 2.5V , 3.3V , 5.0V]
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

[H32]



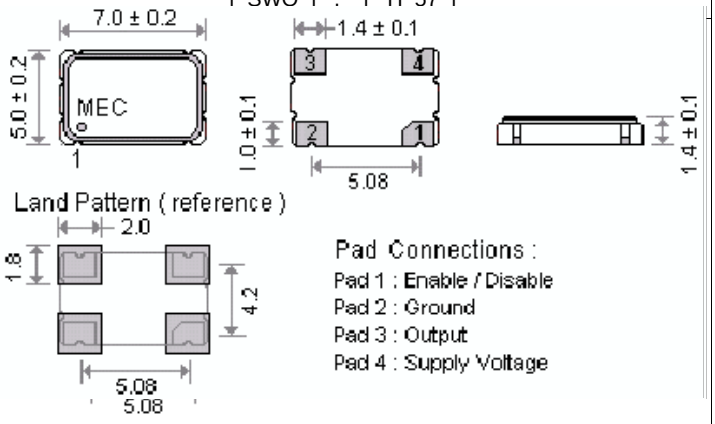
Pad Connections :
Pad 1 : No Connection [1.0V , 1.2V]
Tri - state [1.8V , 2.5V , 3.3V , 5.0V]
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

[H_53]



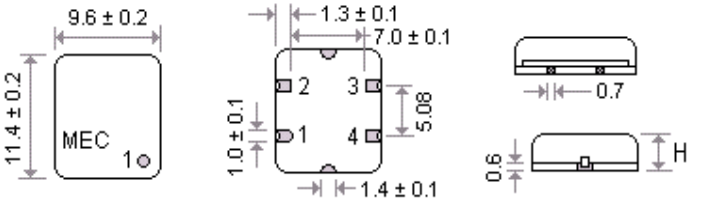
Pad Connections :
Pad 1 : Enable / Disable
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

[SWO] , [H 57]



Pad Connections :
Pad 1 : Enable / Disable
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

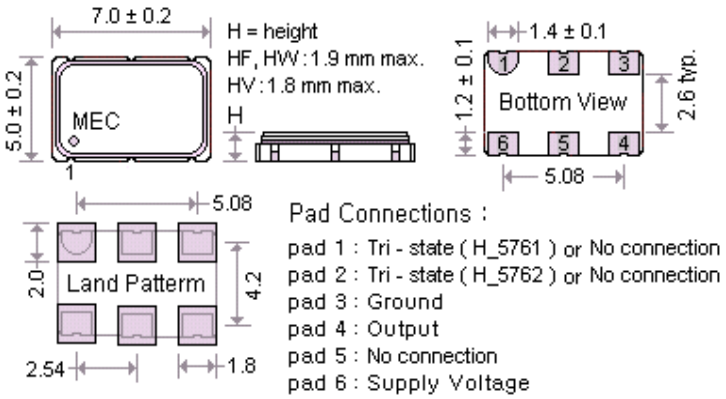
[H42 , HF42 , HW42 , HV42] , [H43 , HF43 , HW43 , HV43]



Pad Connections :
Pad 1 : No connection
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply voltage

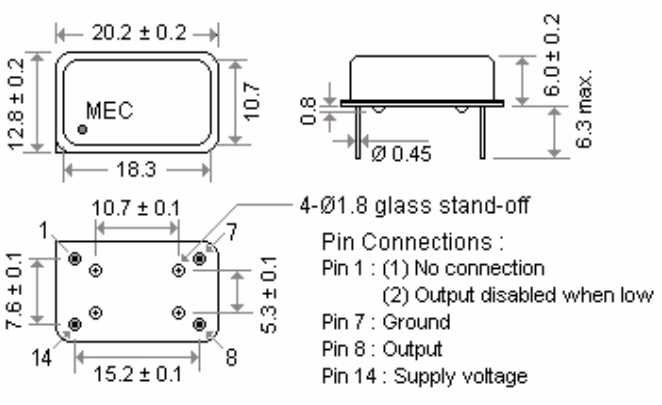
MEC P/N	H (height)
H42	2,5 ± 0,2
H43	3,0 ± 0,2

[HF5761 , HW5761] , [HF5762 , HW5762 , HV5762]



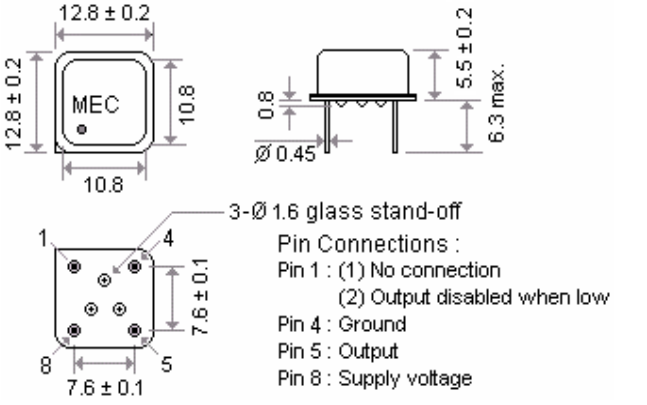
Pad Connections :
pad 1 : Tri - state (H_5761) or No connection
pad 2 : Tri - state (H_5762) or No connection
pad 3 : Ground
pad 4 : Output
pad 5 : No connection
pad 6 : Supply Voltage

[H14 , HF14 , HW14 , HV14]



Pin Connections :
Pin 1 : (1) No connection
(2) Output disabled when low
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[H8 , HF8 , HW8 , HV8]

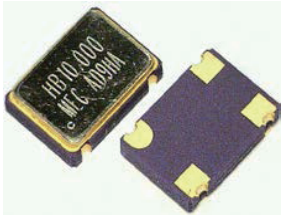


Pin Connections :
Pin 1 : (1) No connection
(2) Output disabled when low
Pin 4 : Ground
Pin 5 : Output
Pin 8 : Supply voltage

HB	Programmable Quick Turn	Thru-Hole	SMD	LVCMOS	1.8V	2.5V	3.3V	Min. 1.0MHz	Max. 200MHz

Applications

- Short lead time. From 1 day to 1 week
- Low jitter. Peak-to-peak period jitter is 70 ps typical
- Low phase noise: -114 dBc/Hz at 1 KHz offset (133 MHz)
- Custom frequencies can easily be configured
- 1.8V, 2.5V or 3.3V supply voltages.



RoHS Compliance

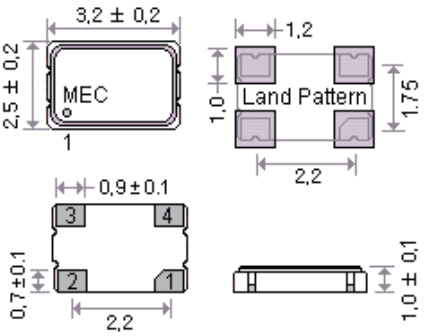
General specifications of all available packages , at Ta=+25°C , CL=15pF

Model	" HB " series			
Output Logic	LVCMOS			
Supply Voltage V_{DD}	1.8 V_{DD} ± 10%	+2.5 V_{DD} ± 10%		+3.3 V_{DD} ± 10%
Available Frequency Range	1.0 ~ 110.0 MHz	1.0 ~ 166.0 MHz		1.0 ~ 200.0 MHz
Output Logic " High " , " 1 "	90% of V_{DD} min.			
Output Logic " Low " , " 0 "	10% of V_{DD} max.			
Supply Current [25 MHz]	2.5 mA max. [15pF]	3.0 mA max. [15pF]		4.0 mA max. [15pF]
PLL Off : Supply Current [25 MHz]	2.0 mA max. [15pF]	2.5 mA max. [15pF]		4.0 mA max. [15pF]
Supply Current [200 MHz]	8.0 mA max. [15pF]	13.0 mA max. [15pF]		20.0 mA max. [15pF]
PLL On : Supply Current [200 MHz]	8.5 mA max. [15pF]	12.5 mA max. [15pF]		20.0 mA max. [15pF]
Rise Time / Fall Time	4.0 ns typ. [25.0 MHz , PLL off] 1.5 ns typ. [200.0 MHz , PLL off]	3.0 ns typ. [25.0 MHz , PLL off] 1.5 ns typ. [200.0 MHz , PLL off]		3.0 ns typ. [25.0 MHz , PLL off] 1.5 ns typ. [200.0 MHz , PLL off]
Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*
	If non-standard , please enter the desired stability after the " C " or " I " For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C			
Load	15 pF			
Start-up Time	5 m sec. (max.)			
Duty Cycle	50% ± 5% (measured at 50% V_{DD})			
Input Static Discharge Protection	2 KV (min.)			
Tri-state Function on pad No. 1	Tri-state on pad 1 is standard for SWO, H53, H32 and H22 series. Output (pad 3) is normal if pad 1 is no connection or connected to logic HIGH Output (pad 3) is high impedance if pad 1 is connected to logic LOW. Disable time is 150 n sec. max. Enable time is 150 n sec max.			
Storage Temperature	-55°C to + 150°C			
Aging at Ta=+25ºC	± 3 ppm max. first year ; ± 2 ppm max. per year thereafter			

[1] Inclusive of 25ºC tolerance, operating temperature range, ±10% input voltage variation, load change, aging shock and vibration

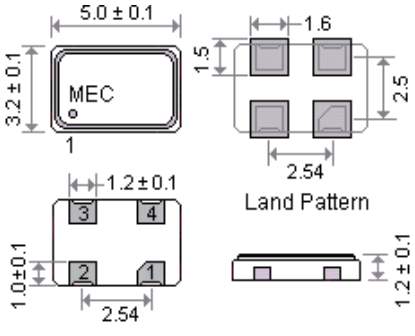
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs

[HB32]



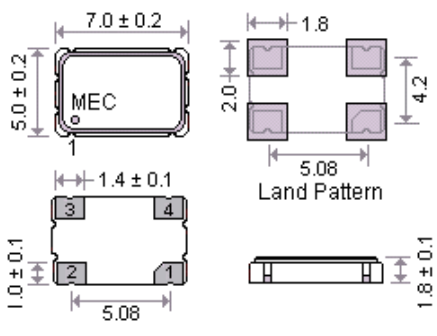
Pin connections :
pin 1 : Enable / Disable pin 2 : Ground
pin 3 : Output pin 4 : Supply Voltage

[HB53]



Pin connections :
pin 1 : Enable / Disable pin 2 : Ground
pin 3 : Output pin 4 : Supply Voltage

[HB57]



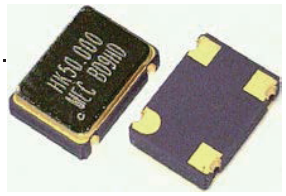
Pin connections :
pin 1 : Enable / Disable pin 2 : Ground
pin 3 : Output pin 4 : Supply Voltage

HK

Ultra Low Current | Thru-Hole | SMD | CMOS | 1.8V | 2.5V | 3.3V | Min. 250 KHz | Max. 50 MHz

Applications

- Designed for hand-held consumer electronic devices requiring a low current consumption .
- Less than 1.7 mA current consumption for 27 MHz at 1.8V and less than 2 uA at disabled mode .
- Phase noise is -130 dBc/Hz at 10 KHz offset .
- 1.8 V, 2.5V or 3.3V supply voltage



RoHS Compliance

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

Model		HK53			HK57		
Frequency Range		0.37 ~ 50.0 MHz			0.25 ~ 50.0 MHz		
Input Voltage Range (V_{DD})		+1.8 V ± 10%	+2.5 V ± 10%	+3.3 V ± 10%	+1.8 V ± 10%	+2.5 V ± 10%	+3.3 V ± 10%
Output Voltage High " 1 " (V_{OH})	10% ⟷ 90% of the wave form	+ 1.4 V (min.)	+ 2.0 V (min.)	+ 2.4 V (min.)	+ 1.4 V (min.)	+ 2.0 V (min.)	+ 2.4 V (min.)
Output Voltage Low " 0 " (V_{OL})		+ 0.2 V (max.)	+ 0.3 V (max.)	+ 0.4 V (max.)	+ 0.2 V (max.)	+ 0.3 V (max.)	+ 0.4 V (max.)
Current Consumption mA , (typical)	10.000 MHz	- - -	- - -	- - -	0.7 mA	1.0 mA	1.5 mA
	13.500 MHz	- - -	- - -	- - -	0.9 mA	1.3 mA	1.9 mA
	16.000 MHz	1.1 mA	1.6 mA	2.2 mA	1.1 mA	1.6 mA	2.2 mA
	20.945 MHz	1.4 mA	1.9 mA	2.6 mA	1.4 mA	1.9 mA	2.6 mA
	25.000 MHz	1.6 mA	2.2 mA	3.1 mA	1.6 mA	2.2 mA	3.1 mA
	27.000 MHz	1.7 mA	2.4 mA	3.3 mA	1.7 mA	2.4 mA	3.3 mA
	30.000 MHz	2.0 mA	2.8 mA	3.8 mA	2.0 mA	2.8 mA	3.8 mA
	38.000 MHz	2.3 mA	3.3 mA	4.5 mA	2.3 mA	3.3 mA	4.5 mA
	50.000 MHz	2.7 mA	4.0 mA	5.0 mA	2.7 mA	4.0 mA	5.0 mA
Rise Time (Tr) / Fall Time (Tf)		4 n sec. (typical) when measured from (10% V_{DD} ↔ 90% V_{DD})					
Fanout (Drive Capability)		12 mA (typical)					
Duty Cycle (at 50% of wave form)		50% ± 5% . measured at +1.4V VD.C.					
Start -up Time (Ts)		10 m sec. (typical) ; V_{DD} reaches 1.62 V					
Load		15 pF					
Voltage Sensitivity		± 0.8 ppm (typical) with 10% variation of V_{DD}					

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " . For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

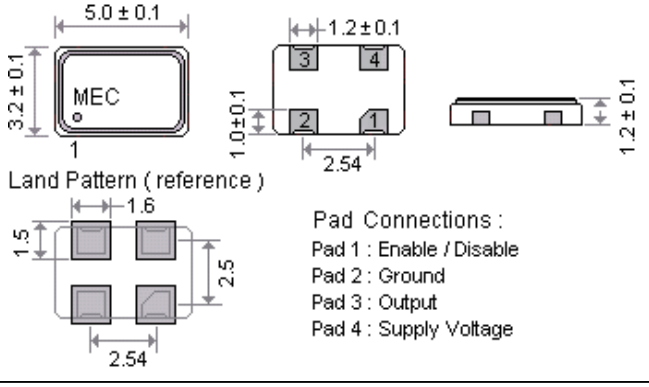
Storage Temperature	- 50°C to 100°C
Aging	± 5 ppm per year (max.)
Tri-state Function on pad No. 1	When connected to ground : Output is disabled (oscillator is off) When not connected or connected to logic high : Clock output Disable time is 10 m sec. (typical) Enable time (when ground is removed from pad 1) is 10 m sec. max.

Note : [1] Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

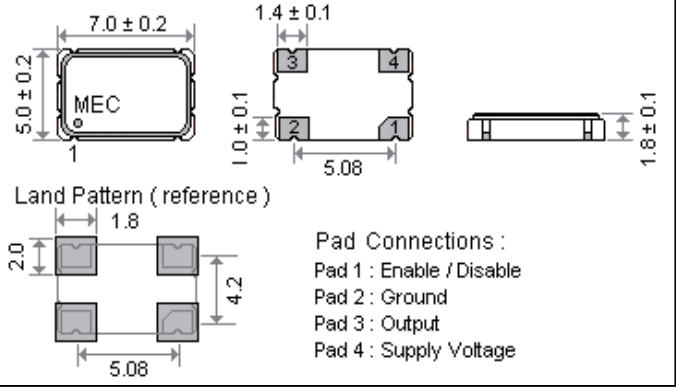
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs

[Please check the hold type and part No. with page 3 .]

[HK53]



[HK57]



Part Number Format and Examples

[1]	[2]	[3]		[4]	[5]		[6]
Supply Voltage	Holder Type	G	–	Frequency Stability	T	–	Center Frequency

Examples								
	(1)	18	SWO		–	B	T	– 25.000
	(2)	5	H14	G	–	C30		– 10.000
	(3)	3	HDW5761		–	E		– 156.250

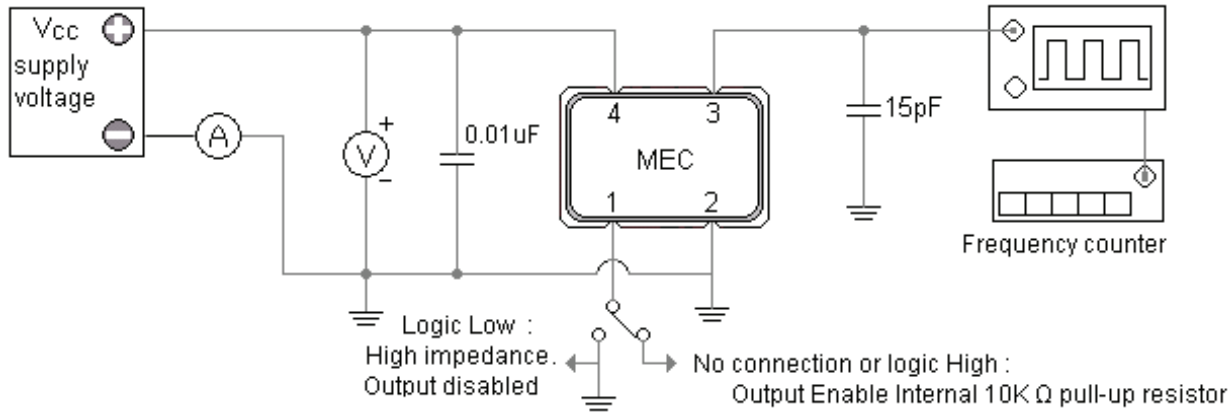
Ex (1) : 18SWO - BT - 25.000 [1.8V , SWO type , ±50ppm from -10°C to 70°C , Tri-state , 25.000MHz ,]

Ex (2) : 5H14G - C30 - 10.000 [5.0V , H14 type , RoHS , ±30ppm from -10°C to 70°C , 10.000MHz]

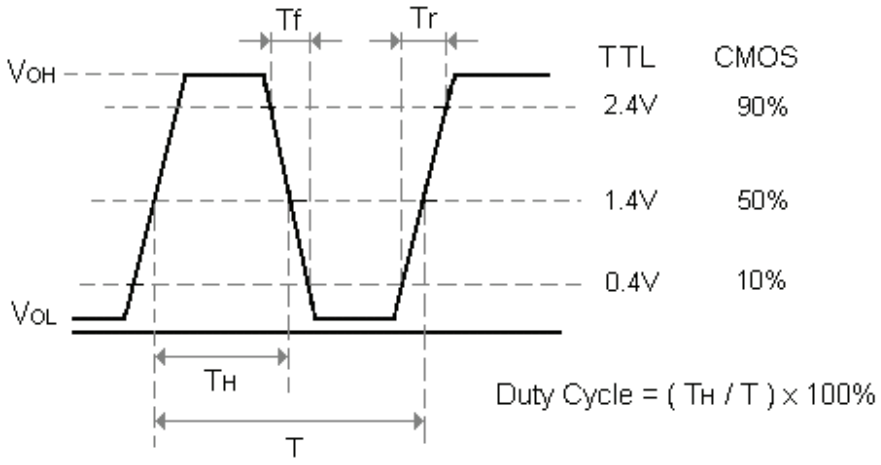
Ex (3) : 3HDW621G - E - 156.250 [3.3V , (HDW62 type , Tri-state on pin 1) , RoHS , ±50ppm from -40°C to 85°C , 156.250MHz]

[1]	Supply voltage , " 1 " for +1.0V ;" 12 " for +1.2V ; " 18 " for +1.8V ;" 25 " for +2.5V ; " 28 " for +2.8V ; " 3 " for +3.3V ; " 5 " for +5.0V	
[2]	Holder Type	
[3]	Please add "G" after the " type code " for RoHS compliant (Does not apply to SWO , H_53 , H_32 , H22 , H_576_ , H_534 series)	
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[5]	" T " for Tri-state , Leave this space blank if no connection on pin 1 or pad 1 .	
[6]	Frequency in MHz	
	Assigned by Mercury if customer spec , (1) : S ---- duty cycle ± 5% , ex : " - S " ; (2) : 50p ---- output load 50pF , ex : " - 50p "	

T T L / HCMOS Square Wave Test Circuit

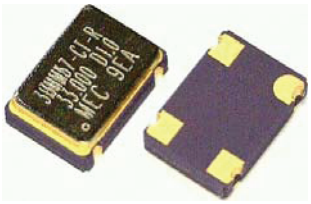


T T L / HCMOS Output Wave Form



EMI Reduction Spread Spectrum Clock Oscillators

A Drop-in Replacement Solution For Your EMI / EMC Compliance Problem.



RoHS Compliance

The principle sources of the EMI problems come from the system clocks. Therefore, rather than patching the problem with ferrite beads, EMI filters, ground plane and metal shielding, the most efficient and economical way to reduce the peak radiation energy is to use a spread spectrum clock oscillator .

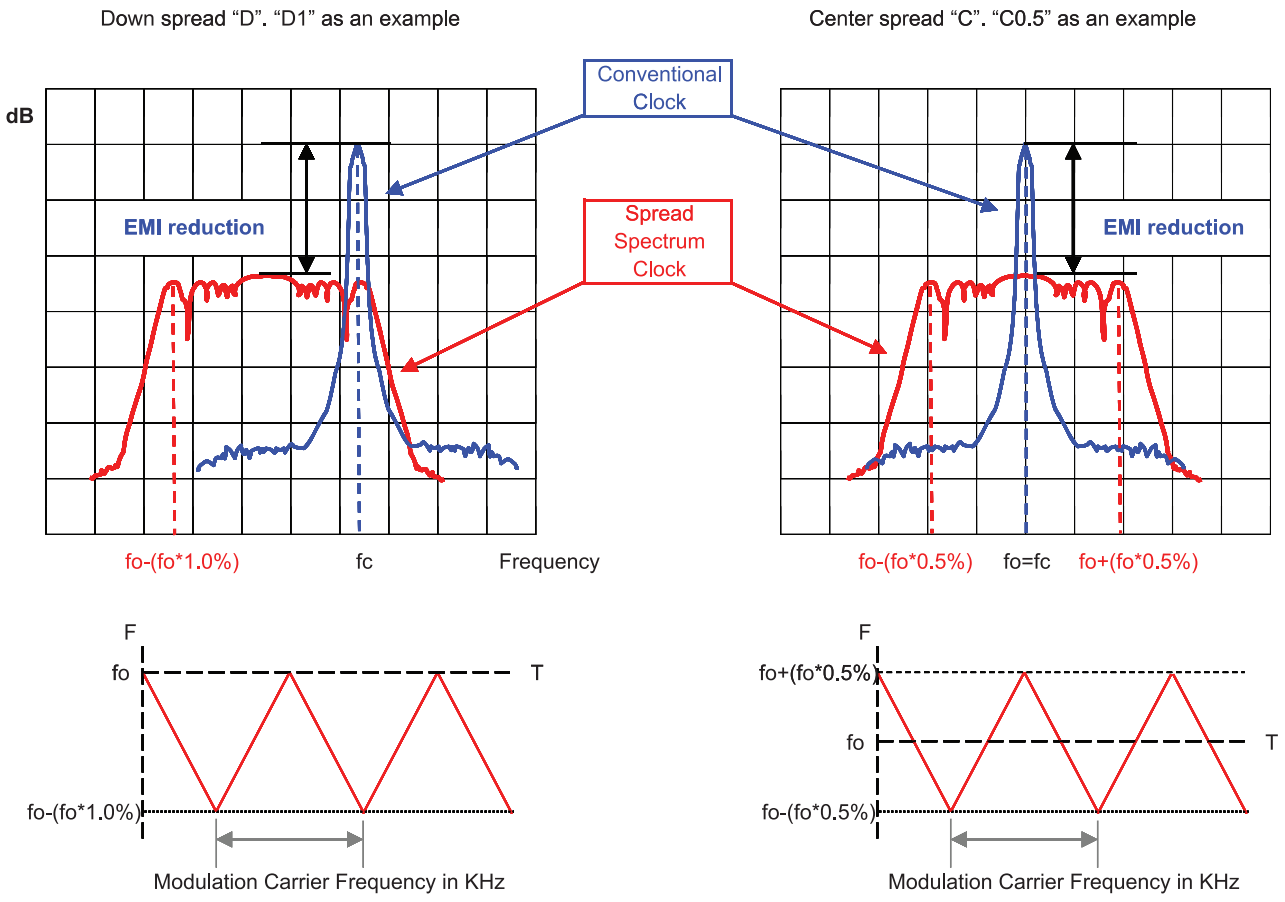
Compared with conventional clock oscillator , Mercury's HM series spread spectrum (dithered) clock oscillator can reduce EMI as much as -12dB.
The beauty is that it is a drop-in replacement for your existing 5x7mm or 5x3.2mm clock oscillator.
No need to re-spin the board.

3HM57 and 3HM53 reduces EMI and shortens time to market.

Applications :

- Printers; Multiple function printers (MPCs)
- Digital copiers; PDAs
- Networking; LAN / WAN; Routers
- Storage systems (CD-ROM, VCD, DVD and HDD)
- Scanner; Modems; projectors
- Hand-held ID readers
- Embedded systems; Electrical musical instrument
- Automotive; GPS car navigation systems
- LCD PC monitors / LCD TVs
- ADSL; PCMCIA
- Still Digital cameras (SDCs)

Modulation Types : [Output amplitude (dB) vs frequency span (MHz)]



Spread Spectrum Clock (SSC) :

Unlike a conventional clock, the mode energy of a spread spectrum clock is spread over a wider bandwidth, resulting from the **frequency modulation** technique.

The modulation carrier frequency is in the KHz range which makes the modulation process transparent to the oscillator frequency.

The controlled modulation process can be all on one side of the nominal frequency (**down spread**) or 50% higher and 50% lower (**center spread**) of the nomial frequency. Down spread is preferred if over-clocking is a problem to the system.

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

Group	R			Y				P		
Model , Frequency Range	(1) 3HM57 - **R** (7.0 * 5.0 * 1.8 mm) (3.5 ~ 165.0 MHz)			(1) 3HM57 - **Y** (7.0 * 5.0 * 1.8 mm) (8.0 ~ 165.0 MHz)				3HM57 - **P** (7.0 * 5.0 * 1.8 mm) (13.0 ~ 220.0 MHz)		
	(2) 3HM53 - **R** (5.0 * 3.2 * 1.2 mm) (6.0 ~ 160.0 MHz)			(2) 3HM53 - **Y** (5.0 * 3.2 * 1.2 mm) (10.0 ~ 160.0 MHz)						
Spread Type	Total%	Down Spread	Center Spread	Type	Total%	Down Spread	Center Spread	Total%	Down Spread	Center Spread
Spread Percentage	0.5%	-0.5% (D0.5)	± 0.25% (C0.25)	3HM53	1.0%	-1.0% (D1.0)	± 0.5% (C0.5)	0.5%	-0.5% (D0.5)	± 0.25% (C0.25)
		Not available if Tri-state chosen			3.0%	-3.0% (D3.0)	±1.5 % (C1.5)	0.75%	-0.75% (D0.75)	± 0.375% (C0.375)
	1.0%	-1.0% (D1.0)	±0.5 % (C0.5)	3HM57	1.0%	-1.0% (D1.0)	±0.5 % (C0.5)	1.25%	-1.25% (D1.25)	± 0.625% (C0.625)
					2.0%	-2.0% (D2.0)	±1.0 % (C1.0)	2.0%	-2.0% (D2.0)	± 1.0% (C1.0)
	3.0%	-3.0% (D3.0)	±1.5 % (C1.5)		3.0%	-3.0% (D3.0)	±1.5 % (C1.5)	3.0%	-3.0% (D3.0)	± 1.5% (C1.5)
								3.75%	-3.75% (D3.75)	± 1.875% (C1.875)
EMI Reduction (EMI reduction applys to the whole spectrum.)	-7 dBc (min.) , 100MHz at C0.25 -9 dBc (min.) , 100MHz at C0.5 -15 dBc (min.) , 100MHz at C1.5 (dBc : with respect to no modulation)			-9 dBc (min.) , 100MHz at C0.5 -12 dBc (min.) , 100MHz at C1.0 -15 dBc (min.) , 100MHz at C1.5 (dBc : with respect to no modulation)				EMI reduction (dB) = 10 Log Total%"x"SSC Frequency (MHz)" / 0.12 See 125MHz example on next page		
Modulation Carrier Frequency (Dither rate)	6.9 KHz (min.) ; 55.5 KHz (max.) Frequency dependent . Call for details			12 KHz (min.) ; 42 KHz (max.) Frequency dependent . Call for details				25.3 KHz (min.) ; 58.6 KHz (max.) Frequency dependent . Call for details		
Output Logic	CMOS (Square Wave)			CMOS (Square Wave)				CMOS (Square Wave)		
Input Voltage (V_{DD})	V_{DD} = +3.3V D.C. ±5%			V_{DD} = +3.3V D.C. ±5%				V_{DD} = +3.3V D.C. ±5%		
Frequency Stability [1] Codes (exclude modulation)	Frequency Stability over Operating Temperature Range			± 25 ppm		± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " represents . For example : " C20 " ± 20ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C		
	Commercial (*-10°C to +70°C*)			*A*		*B*	*C*			
	Industrial (*-40°C to +85°C*)			*D*		*E*	*F*			
Output Logic " High " , " 1 "	2.4V (min.) ; 3.2V (typ.) [at 90% V_{DD}]			2.0V (min.) ; 3.2V (typ.) [at 90% V_{DD}]				2.4V (min.) ; [at 80% V_{DD}]		
Output Logic " Low " , " 0 "	0.5V (max.) ; 0.2V (typ.) [at 10% V_{DD}]			0.8V (max.) ; 0.2V (typ.) [at 10% V_{DD}]				0.4V (max..) ; [at 20% V_{DD}]		
Rise Time / Fall Time	4n sec. (max.) [10% V_{DD} ↔ 90% V_{DD}]			4n sec. (max.) [10% V_{DD} ↔ 90% V_{DD}]				1.3 n sec. (max.) [20% V_{DD} ↔ 80% V_{DD}]		
Load	15pF			15pF				15pF		
Start-up Time	2 m sec. (typ.) ; 5 m sec. (max.)			2 m sec. (typ.) ; 5 m sec. (max.)				2 m sec. (typ.) ; 5 m sec. (max.)		
Current Consumption	10.0 ~ 50.000 MHz : 10mA (typ.) 50.0 ~ 100.0 MHz : 18mA (typ.) 100.0 ~ 160.0 MHz : 35mA (typ.)			10.0 ~ 50.000 MHz : 10mA (typ.) 50.0 ~ 125.0 MHz : 27mA (typ.) , 44mA (max.)				25mA (typ.) ; Frequency dependent		
Duty Cycle	50% ± 5% (CL=15pF ; at 50% V_{DD})			50% ± 5% (CL=15pF ; at 50% V_{DD})				50% ± 5% (CL=15pF ; at 50% V_{DD})		
Cycle-to-Cycle Jitter	±250 ps (typ.) ; ±300 ps (max.)			±100 ps (typ.) ; ±150 ps (max.)				±100 ps (typ.)		
Static Discharge Voltage	>2,000V (per MIL-STD-883 , method 3015)			>2,000V (per MIL-STD-883 , method 3015)				>2,000V (per MIL-STD-883, , method 3015)		
Storage Temperature	-65°C to + 150°C			-65°C to + 150°C				-65°C to + 150°C		
Aging	± 5 ppm per year (max.) ; Ta = +25°C			± 5 ppm per year (max.) ; Ta = +25°C				± 5 ppm per year (max.) ; Ta = +25°C		
Packaging	16mm tape and reel . 1000pcs per reel			16mm tape and reel . 1000pcs per reel				16mm tape and reel . 1000pcs per reel		
Pin 1 Option	Tri-State enable high. Output is high impedance when taken low . Enable / disable time: 100 ms max.							Do not make connection to this pad . No Tri-State option available.		

EMI Reduction Spread Spectrum Clock Oscillators

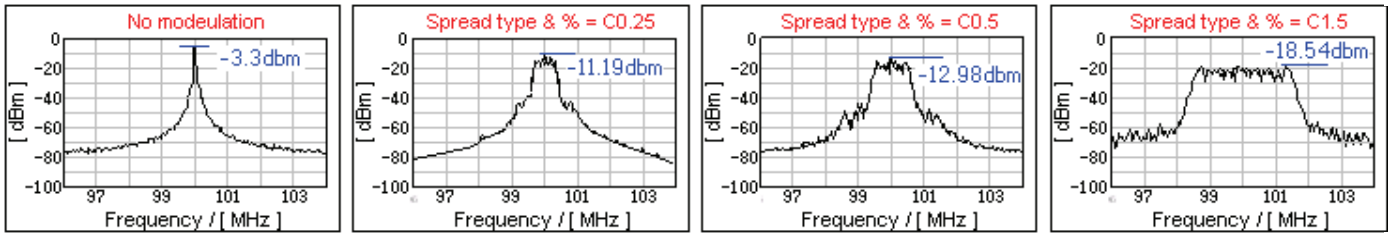
Part Number Format and Example

[1]	[2]	[3]	–	[4]	[5]	–	[6]	[7]	–	[8]
Supply Voltage	Holder Type	G	–	Frequency Stability	T	–	Center Frequency	Group Type	–	Spread type Percentage

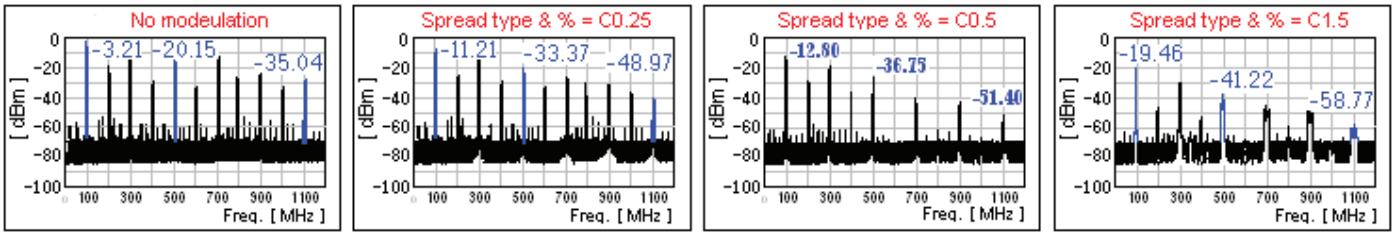
Examples											
	(1)	3	H M 576		–	B	T	–	10.000	R	–	C1.5
	(2)	3	H M 53		–	F	T	–	75.000	Y	–	D1.0
	(3)	3	H M 14	G	–	C30		–	100.000	P	–	D3.0

[1]	Supply voltage , " 3 " for +3.3V ; " 5 " for +5.0V	
[2]	Holder Type	
[3]	Please add " G " after the " type code " for RoHS compliant (Does not apply to HM53 , HM57 series) .	
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[5]	" T " for Tri-state , Leave this space blank if no connection on pin 1 or pad 1 .	
[6]	Frequency in MHz	
[7]	Group " R " , " P " or " Y "	
[8]	Spread type & percentage ; " C " for center spread , " D " for down spread	

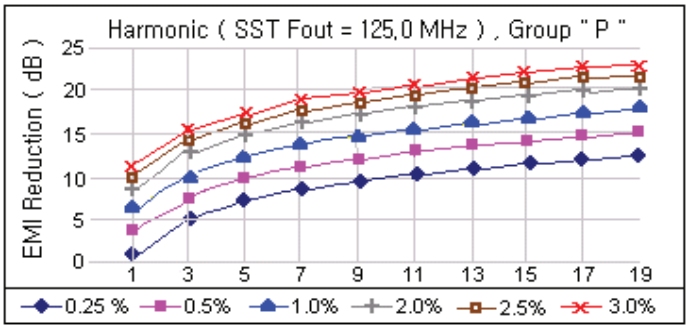
EMI Test Data : 3HM57-B-100.000R , 100.0MHz Group " R " , Modulation Carrier Frequency = 34.687KHz

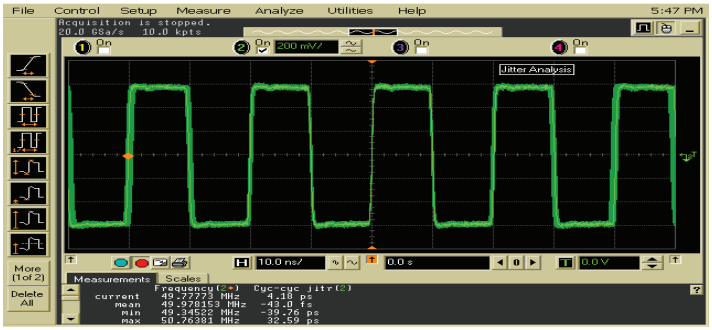


Whole Spectrum EMI Data : 3HM57-B-100.000R , 100.0MHz Group " R " , Modulation Carrier Frequency = 34.687KHz



EMI Test Data	Jitter Test Data
125.0 MHz at various spread percentages. Modulation Carrier Frequency : 48.8 KHz	" P " group , cycle to cycle jitter . 32.59 ps (min.) ; 39.76 ps (max.)





Main mode :
EMI reduction (dB) = 10 Log ($\frac{\text{total \% * freqency (MHz)}}{0.12}$)

3rd Harmonic :
EMI reduction (dB) = 10 Log ($\frac{\text{total \% * freqency (MHz) * 3}}{0.12}$)

5th Harmonic :
EMI reduction (dB) = 10 Log ($\frac{\text{total \% * freqency (MHz) * 5}}{0.12}$)

Sample rate:20.0 G Sa/sec.;No. of sample :1000;Edge Direction: Rising edges

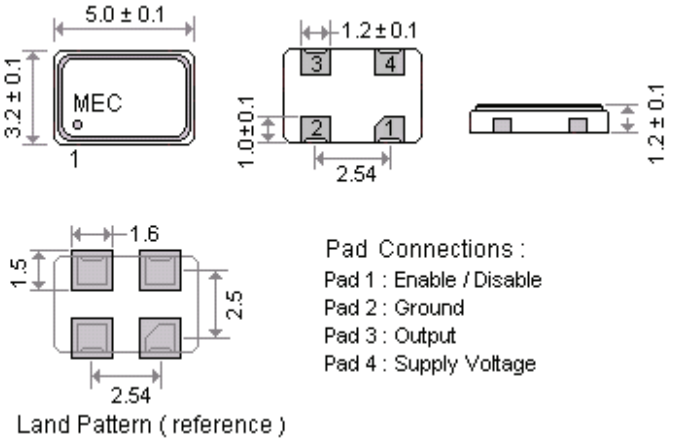
For more technical information please visit the following web site :

www . mercury -crystal.com and down load our technical note

TN-020 (Title : Low EMI Spread Spectrum Clock Oscillators)

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

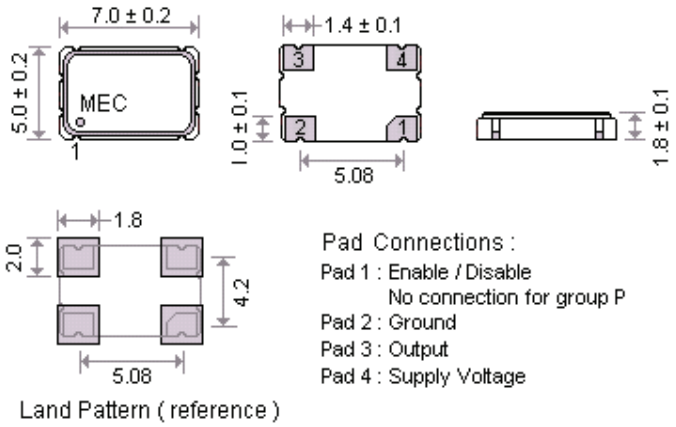
[HM 53]



Land Pattern (reference)

Pad Connections :
Pad 1 : Enable / Disable
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

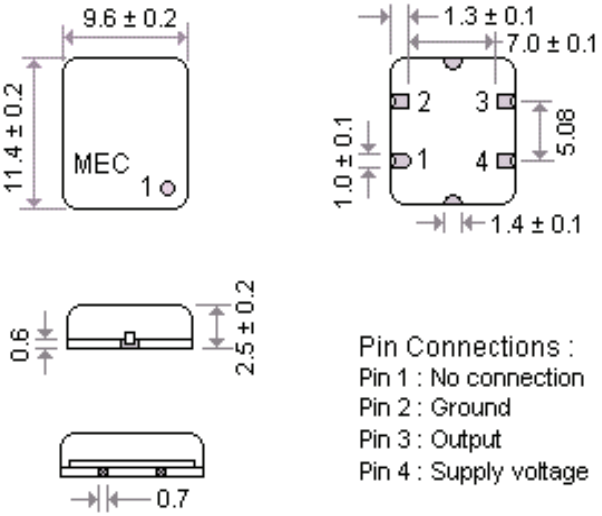
[HM 57]



Land Pattern (reference)

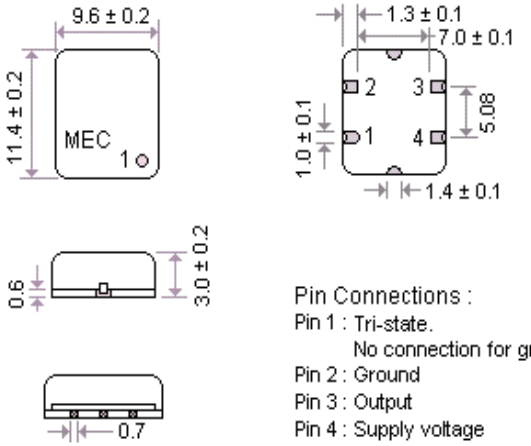
Pad Connections :
Pad 1 : Enable / Disable
No connection for group P
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

[HM 42]



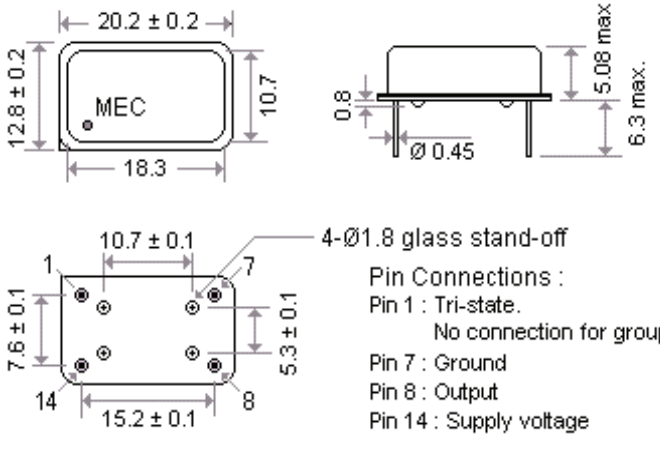
Pin Connections :
Pin 1 : No connection
Pin 2 : Ground
Pin 3 : Output
Pin 4 : Supply voltage

[HM 43]



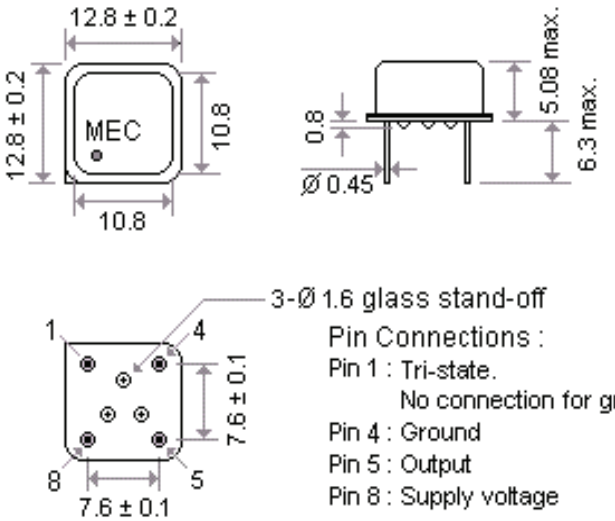
Pin Connections :
Pin 1 : Tri-state.
No connection for group P
Pin 2 : Ground
Pin 3 : Output
Pin 4 : Supply voltage

[HM 14]



Pin Connections :
Pin 1 : Tri-state.
No connection for group P
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[HM 8]



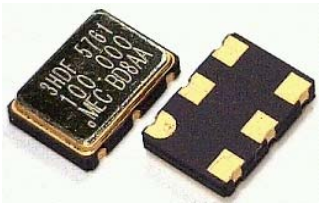
Pin Connections :
Pin 1 : Tri-state.
No connection for group P
Pin 4 : Ground
Pin 5 : Output
Pin 8 : Supply voltage

HP

LVPECL Differential | K group | F group | W group | SMD | 2.5V | 3.3V | Min. 750KHz | Max. 800MHz

Applications

- HPK femto second integrated phase jitter (200 fs typical , 12 KHz to 20 MHz) .
- HPK supeior phase noise (-138 dBc/Hz at 10 KHz and -144 dBc/Hz at 100 KHz offset)
- 2.5 V or 3.3 V supply voltage .



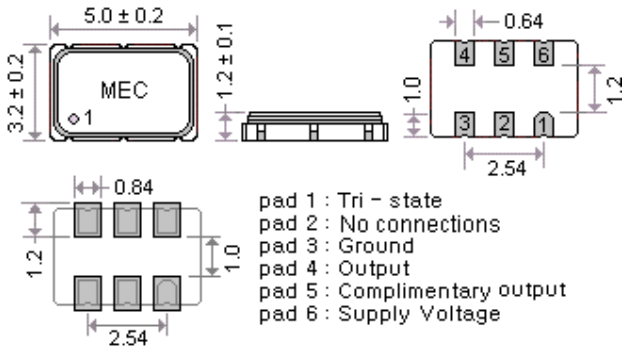
RoHS Compliance

General specifications , at Ta=+25°C , CL=15pF

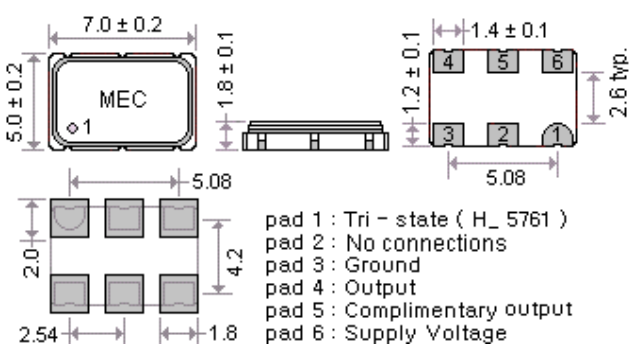
Model		HPK		HPF		HPW	
Output Logic		LVPECL Differential					
Supply Voltage V_{DD}		+2.5 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	+2.5 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	
Supply Voltage Code		" 25 "	" 3 "	" 25 "	" 3 "	" 3 "	
Available Frequency Range	min.	13.5 MHz	10.0MHz	38.0 MHz		750 KHz	
	max.	220.1MHz		640.0 MHz		800.0 MHz	
Integrated Phase Jitter (12 KHz to 20 MHz)		0.2 ps typical; 0.5 ps max. For 156.250 MHz		0.4 ps typical; 0.5 ps max. For 156.250 MHz		2.6 ps typical; 4 ps max. For 155.520 MHz	
Current Consumption (15 pF load)		30 mA typical , 50 mA max.		38 MHz ~ 100 MHz: 65 mA max 100.01 MHz ~ 320 MHz: 80 mA max. 320.01 MHz ~ 640 MHz: 90 mA max..		< 24 MHz: 25 mA max 24.01 MHz ~ 96 MHz: 65 mA max. 96.01 MHz~700 MHz: 100 mA max..	
Rise Time / Fall Time (20%↔80% of the PECL wave form)		0.3 ns typical , 0.5 ns max.		0.4 ns typical , 0.6 ns max.		0.6 ns typical , 1.5 ns max.	
SSB Phase Noise [dBc / Hz (typical)]		Offset	62.5 MHz / 156.250 MHz	Offset	156.250 MHz	Offset	155.520 MHz
		10 Hz	-50 / -50	10 Hz	-62	10 Hz	-60
		100 Hz	-82 / -80	100 Hz	-92	100 Hz	-90
		1 KHz	-116 / -115	1 KHz	-120	1 KHz	-115
		10 KHz	-138 / -135	10 KHz	-132	10 KHz	-125
		100 KHz	-144 / -142	100 KHz	-128	100 KHz	-119
		1 MHz	-149 / -147	1 MHz	-140	1 MHz	-120
		10 MHz	-155 / -152	10 MHz	-150	10 MHz	-140
Output Logic " High " , " 1 "		V_{DD} - 1.025 min. Termination: R_L=50 Ω to (V_{DD} - 2.0V). See test circuit below.					
Output Logic " Low " , " 0 "		V_{DD} - 1.620 max. Termination: R_L=50 Ω to (V_{DD} - 2.0V). See test circuit below.					
Output Voltage Swing		595 mV min. , 750 mV typ. , 930 mV max.					
Load		50 Ω into Vcc - 2V or Thevenin equivalent					
Start-up Time		5.0 ms typical , 10 m sec. (max.)					
Duty Cycle		50% ± 5% (measured at V_{DD} -1.25V)					
Input Static Discharge Protection		2 KV (min.)					
Storage Temperature		-55°C to + 150°C					
Aging at Ta = +25°C		± 3 ppm max. first year ; ± 2 ppm max. per year thereafter					
Frequency Stability [1] Codes		Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " represents . For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C	
		Commercial (*-10°C to +70°C*)	*A*	*B*	*C*		
		Industrial (*-40°C to +85°C*)	*D*	*E*	*F*		
Tri - State Function. 5761 on pad No. 1 5762 on pad No. 2	No Connection	Differential PECL and compliantary PECL outputs .					
	Disable	Both outputs are disabled (high impedance) when the Tri-state pad taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)					
	Enable	At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) ; Enable time : 10ns + one period of the output frequency (max.)					

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

HPK 5361



HP_5761



Mercury www .mercury-crystal.com

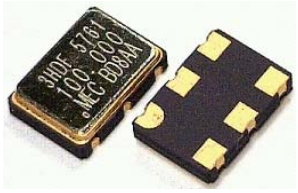
■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

HD

LVDS Differential | K group | F group | W group | SMD | 2.5V | 3.3V | Min. 750KHz | Max. 800MHz

Applications

- HDK femto second integrated phase jitter (200 fs typical , 12 KHz to 20 MHz) .
- HDK supeior phase noise (-138 dBc/Hz at 10 KHz and -144 dBc/Hz at 100 KHz offset)
- 2.5 V or 3.3 V supply voltage .



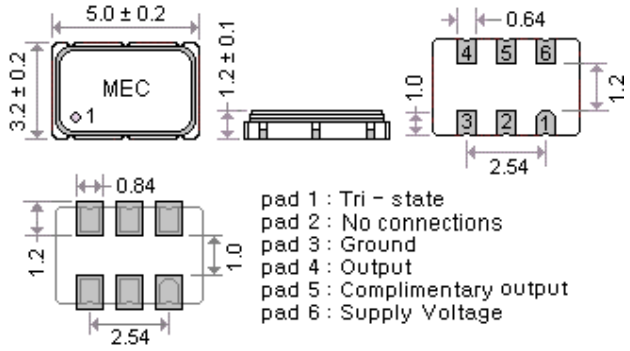
RoHS Compliance

General specifications , at Ta=+25°C , CL=15pF

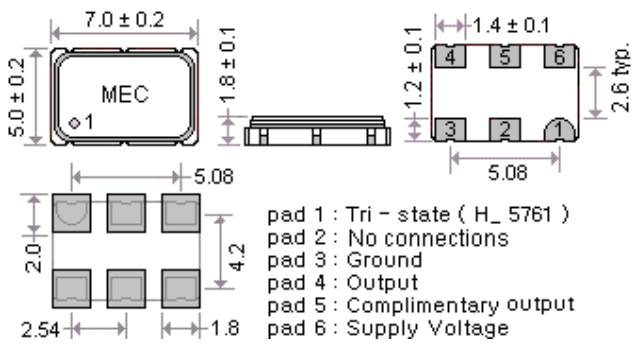
Model		HDK		HDF		HDW	
Output Logic		LVDS Differential					
Supply Voltage V_{DD}		+2.5 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	+2.5 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	
Supply Voltage Code		" 25 "	" 3 "	" 25 "	" 3 "	" 3 "	
Available Frequency Range	min.	13.5 MHz	10.0MHz	38.0 MHz		750 KHz	
	max.	220.1MHz		640.0 MHz		800.0 MHz	
Integrated Phase Jitter (12 KHz to 20 MHz)		0.2 ps typical; 0.5 ps max. For 156.250 MHz		0.4 ps typical; 0.5 ps max. For 156.250 MHz		2.6 ps typical; 4 ps max. For 155.520 MHz	
Current Consumption (15 pF load)		16 mA typical , 27 mA max.		38 MHz ~ 100 MHz: 65 mA max 100.01 MHz ~ 320 MHz: 80 mA max. 320.01 MHz ~ 640 MHz: 90 mA max..		< 24 MHz: 25 mA max 24.01 MHz ~ 96 MHz: 65 mA max. 96.01 MHz~700 MHz: 100 mA max..	
Rise Time / Fall Time (20%↔80% of the PECL wave form)		0.2 ns typical , 0.4 ns max.		0.4 ns typical , 0.6 ns max.		0.6 ns typical , 1.5 ns max.	
SSB Phase Noise [dBc / Hz (typical)]		Offset	62.5 MHz / 156.250 MHz	Offset	156.250 MHz	Offset	155.520 MHz
		10 Hz	-50 / -50	10 Hz	-62	10 Hz	-60
		100 Hz	-82 / -80	100 Hz	-92	100 Hz	-90
		1 KHz	-116 / -115	1 KHz	-120	1 KHz	-115
		10 KHz	-138 / -135	10 KHz	-132	10 KHz	-125
		100 KHz	-144 / -142	100 KHz	-128	100 KHz	-119
		1 MHz	-149 / -147	1 MHz	-140	1 MHz	-120
		10 MHz	-155 / -152	10 MHz	-150	10 MHz	-140
Output Logic " High " , " 1 "		1.43V typical. ; 1.6V max. , RL = 100 Ω ,					
Output Logic " Low " , " 0 "		0.9V typical. ; 1.1V max. , RL = 100 Ω ,					
Output Voltage Swing		250 mV min. , 350 mV typ. , 450 mV max. , RL = 100 Ω ,					
Load		100 Ω between output and complimentary output					
Start-up Time		5.0 ms typical , 10 m sec. (max.)					
Duty Cycle		50% ± 5% (measured at V_{DD} -1.25V)					
Input Static Discharge Protection		2 KV (min.)					
Storage Temperature		-55°C to + 150°C					
Aging at Ta = +25°C		± 3 ppm max. first year ; ± 2 ppm max. per year thereafter					
Frequency Stability [1] Codes		Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " represents . For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C	
		Commercial (*-10°C to +70°C*)	*A*	*B*	*C*		
		Industrial (*-40°C to +85°C*)	*D*	*E*	*F*		
Tri - State Function. 5761 on pad No. 1 5762 on pad No. 2	No Connection	Differential PECL and compliantary PECL outputs .					
	Disable	Both outputs are disabled (high impedance) when the Tri-state pad taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)					
	Enable	At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) ; Enable time : 10ns + one period of the output frequency (max.)					

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

HCK5361



HD _ 5761



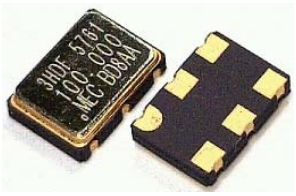
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

HCK	HCSL Differential	SMD	Jitter 0.2 ps	NON - PLL	K group	2.5V	3.3V	Min. 40 MHz	Max. 200 MHz

Applications

- Femto second integrated phase jitter (200 fs typical , 12 KHz to 20 MHz) .
- Supeior phase noise (-138 dBc/Hz at 10 KHz and -144 dBc/Hz at 100 KHz offset)
- High performance with surprisingly low price .
- 2.5 V or 3.3 V supply voltage .



RoHS Compliance

General specifications , at Ta=+25°C , CL=15pF

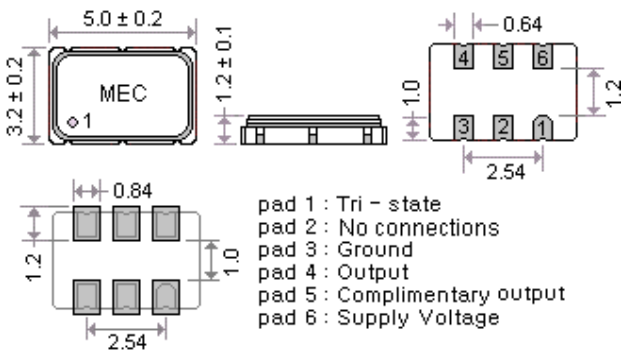
Model	HCK		
Output Logic	HCSL Differential		
Available Frequency Range	13.5 MHz ~ 220.0 MHz		
Supply Voltage V_{DD}	+2.5 V_{DD} ± 5%	+3.3 V_{DD} ± 5%	
Supply Voltage Code	" 25 "	" 3 "	
Integrated Phase Jitter (12 KHz to 20 MHz)	0.2 ps typical ; For 155.520 MHz		
Output Logic " High " : , " 1 ", V_{OH}	660 mV min. , 740 mV typ. , 850 mV max.		
Output Logic " Low " , " 0 ", V_{OL}	-150 mV min. , 0 mV typ. , 150 mV max.		
Output Voltage Swing	620 mV min. , 700 mV typ. , 780 mV max.		
Load	50 Ω to ground on each output		
Current Consumption (15 pF load)	< 90 MHz: 17 mA typ. , 27 mA max 90.1 MHz ~ 160 MHz : 25 mA max. 160.1 MHz ~ 200 MHz : 30 mA max..		
Rise Time / Fall Time (RL=100 Ω , CL=10 pF)	0.15 ns typical , 0.4 ns max. (20%↔81% of the HCSL wave form)		
SSB Phase Noise [dBc / Hz (typical)]	Offset	125.0 MHz	156.250 MHz
	10 Hz	-50	-50
	100 Hz	-82	-80
	1 KHz	-116	-115
	10 KHz	-138	-135
	100 KHz	-144	-142
	1 MHz	-149	-147
	10 MHz	-155	-152
Start-up Time	5 ms typical ; 10 m sec. (max.)		
Duty Cycle	50% ± 5%. Measured at 1.25V		
Storage Temperature	-55°C to + 105°C		
Aging at Ta = +25°C	± 3 ppm max. first year ; ± 2 ppm max. per year thereafter		

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " represents . For example : " C20 " ± 20 ppm over -10°C to +70°C ; " I20 " ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

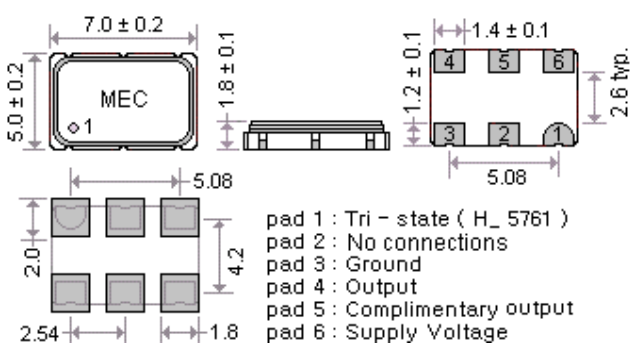
Tri - State Function. 5761 on pad No. 1 5762 on pad No. 2		
	No Connection	Differential output wave and compliantary wave form outputs .
	Disable	Both outputs are disabled (high impedance) when the Tri-state pad is taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)
	Enable	At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) . Enable time : 10ns + one period of the output frequency (max.)

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

HCK5361



HCK5761



Part Number Format and Example

[1]	[2]	[3]	[4]		[5]		[6]
Supply Voltage	Holder Type	1 or 2	G	–	Frequency Stability	–	Center Frequency

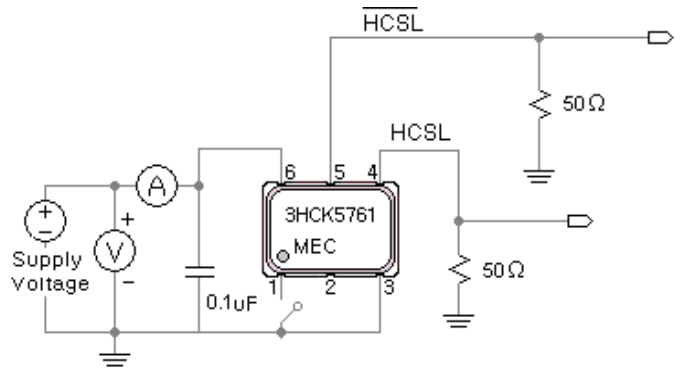
Example	(1)	3	HPF576	2		–	A	– 100.000
	(2)	3	HDW62	1	G	–	E	– 200.000

Ex (1) : 3HPF5762 - A - 100.000 [+3.3V , H_ _ 576 type , PECL output , F characteristics ,Tri-state on pad # 2 , ±25 ppm from -10°C to 70°C , 100.000MHz]

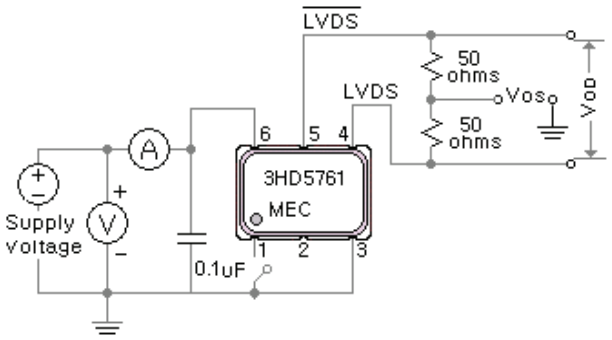
Ex (2) : 3HDW621 - E - 200.000 [+3.3V , H_ _ 576 type , LVDS output , W characteristics ,Tri-state on pad # 1 , ±50 ppm from -40°C to 85°C , 200.000MHz]

[1]	Supply voltage , " 3 " for +3.3V	
[2]	Holder Type	
[3]	" 1 " : Tri-state function on pad # 1 , " 2 " : Tri-state function on pad # 2	
[4]	Please add " G " after the " type code " for RoHS compliance , H_576_ is RoHS compliant and lead free product. Please omit " G ".	
[5]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[6]	Frequency in MHz	
	Assigned by Mercury if customer spec , (1) : S ---- duty cycle ± 5% , ex : " - S " ; (2) : 50p ---- output load 50pF , ex : " - 50p "	

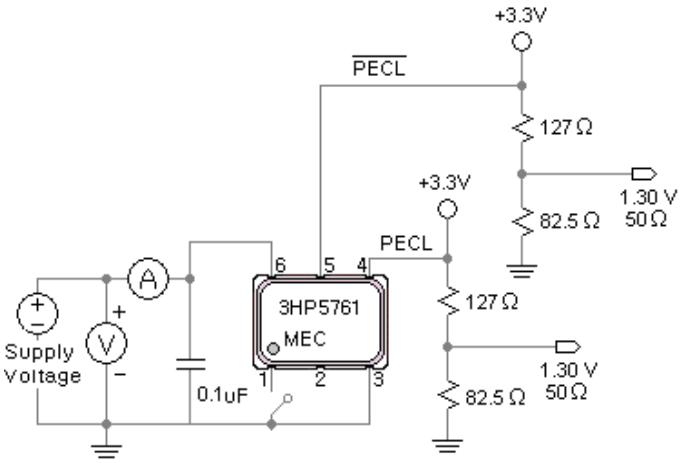
HCSL Square Wave Test Circuit



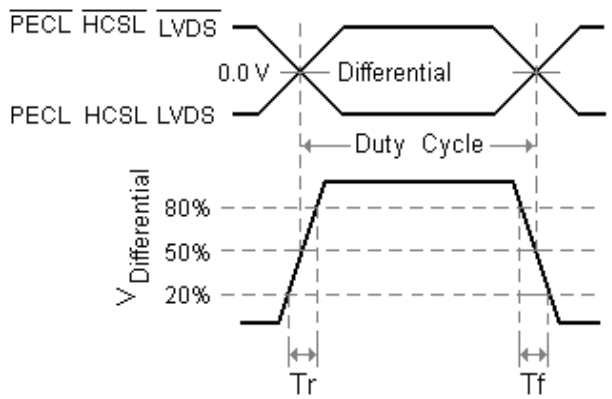
LVDS Square Wave Test Circuit



PECL Square Wave Test Circuit



LVDS Square Wave Output Wave Form

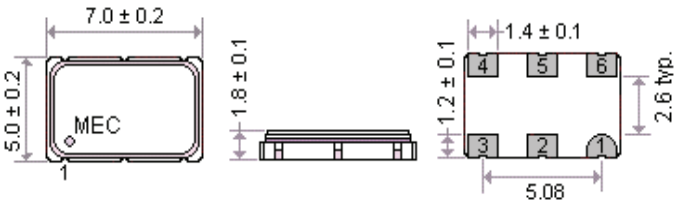


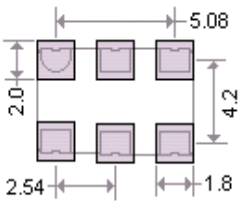
HP_ [LVPECL DIfferential]

HD_ [LVDS Differential]

Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 3 for product series selections.]

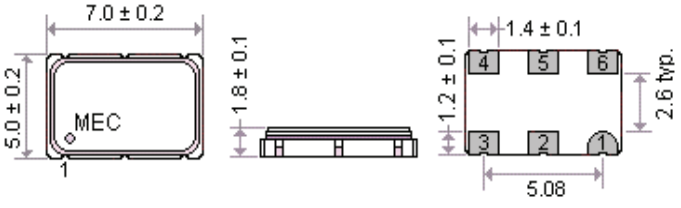
[HPF5761 , HPW5761] , [HDF5761 , HDW5761]

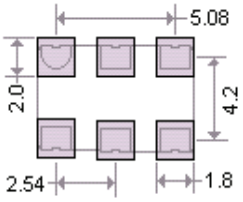




Pad Connections :
pad 1 : Tri - state (H_ 5761)
pad 2 : No connections
pad 3 : Ground
pad 4 : Output
pad 5 : Complimentary output
pad 6 : Supply Voltage

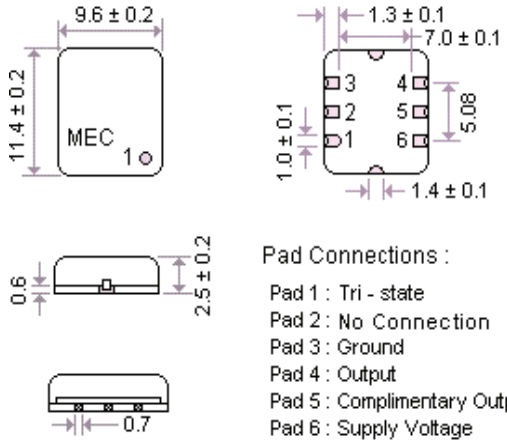
[HPF5762 , HPW5762] , [HDF5762 , HDW5762]





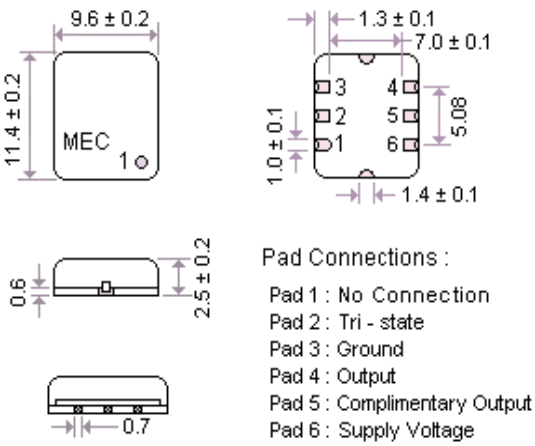
Pad Connections :
pad 1 : No connections
pad 2 : Tri - state (H_ 5762)
pad 3 : Ground
pad 4 : Output
pad 5 : Complimentary output
pad 6 : Supply Voltage

[HPF621 , HPW621] , [HDF621 , HDW621]



Pad Connections :
Pad 1 : Tri - state
Pad 2 : No Connection
Pad 3 : Ground
Pad 4 : Output
Pad 5 : Complimentary Output
Pad 6 : Supply Voltage

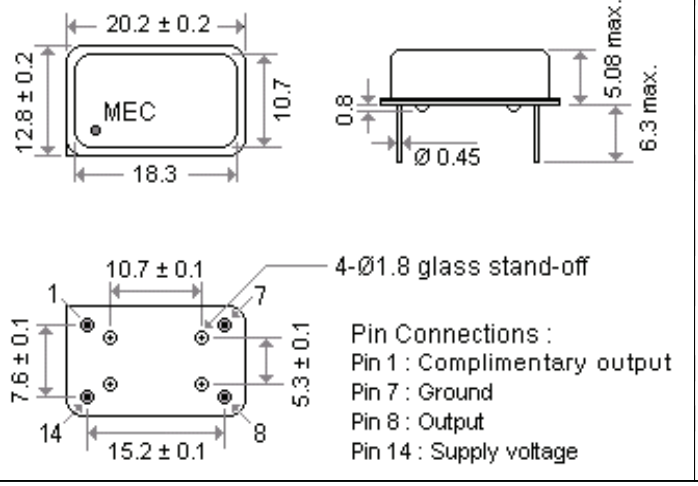
[HPF622 , HPW622] , [HDF622 , HDW622]



Pad Connections :
Pad 1 : No Connection
Pad 2 : Tri - state
Pad 3 : Ground
Pad 4 : Output
Pad 5 : Complimentary Output
Pad 6 : Supply Voltage

[HPF14 , HPW14] , [HDF14 , HDW14]

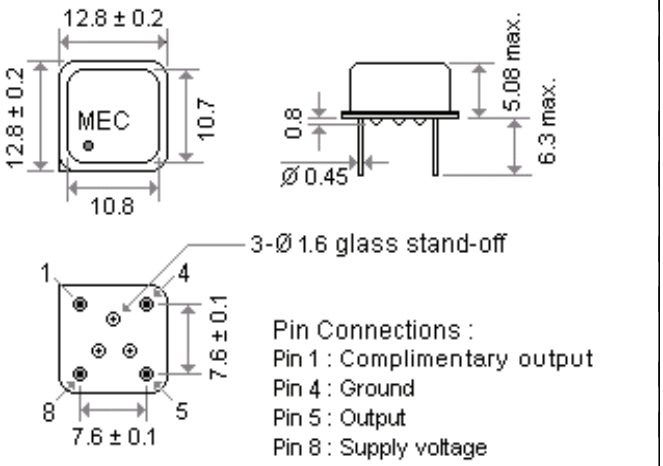
Gull - wing SMD is also available .



Pin Connections :
Pin 1 : Complimentary output
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[HPF8 , HPW8] , [HDF8 , HDW8]

Gull - wing SMD is also available .

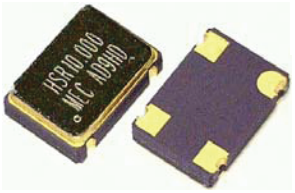


Pin Connections :
Pin 1 : Complimentary output
Pin 4 : Ground
Pin 5 : Output
Pin 8 : Supply voltage

HS 50Ω load | **HSR** 10KΩ//10pF load | True Sine Wave | Thru-Hole | SMD | 2.8V | 3.3V | 5.0V | Min. 10MHz | Max. 52MHz

Applications

- True Sine wave clock oscillators in 3.2x5.0 mm and 5.0x7.0 mm SMD. First in the market .
- High purity and low total harmonic distortion. Ideal for audio modulation applications .
- For VCXOs with sine wave output, please refer to GS series



RoHS Compliance

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

Model	" HS " series		" HSR " series		
Load	50Ω. (Internally AC coupled)		10 KΩ // 10 pF load		
Output Wave Form	True Sine Wave				
Input Voltage (V_{DD})	+3.3V D.C.±5%	+5.0V D.C.±10%	+2.8V D.C.±5%	+3.3V D.C.±5%	+5.0V D.C.±10%
Frequency Range	10.0 ~ 800.0MHz	10.0 ~ 156.0MHz	10.0MHz ~ 52.0MHz		
Output Level	Standard: +3.0 dBm min. Tolerance: ± 1 dB Maximum Power: +7 dBm (User to specify)	Standard: +5.0 dBm min. Tolerance: ± 1 dB Maximum Power: +13 dBm (User to specify)	1.0 V p-p typical		
Current Consumption	10 MHz : 9 mA (typ.)	10 MHz : 18 mA (typ.)	1.0 mA	1.5 mA	1.2 mA
	100 MHz : 18 mA (typ.)	100 MHz : 34 mA (typ.)			
	150 MHz : 19 mA (typ.)	150 MHz : 36 mA (typ.)			
Harmonics	< - 30dBc (frequency dependent)		< - 25dBc (frequency dependent)		
Start -up Time	6.0 m Sec.(typ.)		2.0 m Sec.(typ.)		
Storage Temperature	- 50°C to 100°C		- 55°C to 125°C		
Pin 1 option	Tri-state , Output disable when taken low		No Tri-state option		

Frequency Stability (1) Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard please enter the desired stability after the " C " or " I " . represents . For example : " C20 " : ±20 ppm over -10°C to +70°C " I20 " : ±20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

Sub-Harmonics	None
Aging	± 5 ppm per year (max.)

Note : (1) Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

True Sine Wave Clock Oscillators [(HS series) / (HSR series)]

Part Number Format and Example

[1]	[2]	[3]		[4]		[5]		[6]
Supply Voltage	Holder Type	G	–	Frequency Stability	–	Center Frequency	–	Output Power [HS series only]

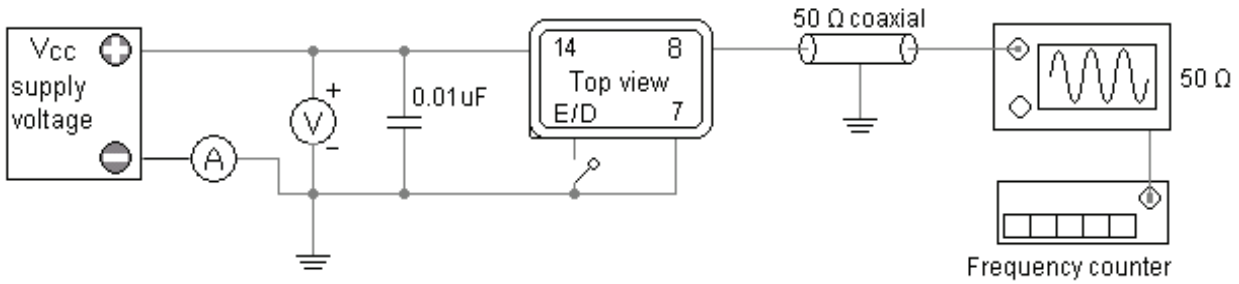
Example	(1)	3	HS14	G	–	A	–	100.000	– 5
	(2)	5	HSR53		–	E	–	20.000	–

Ex (1) : 3HS14G - A - 100.000 - 5 [+3.3V , True Sine wave , 50 Ω load , RoHS , ±25ppm from -10°C to 70°C , 100.000MHz , Output power is 5dBm ±1dB

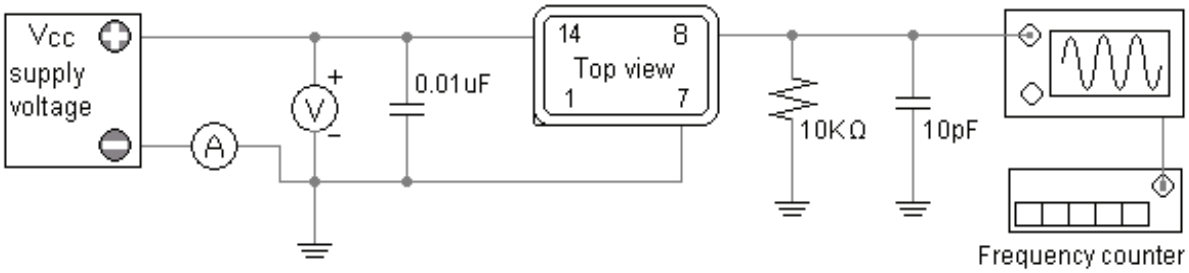
Ex (2) : 5HSR53 - E - 20.000 [+5.0V , True Sine wave , 10 KΩ // 10 pF load , ±50ppm from -40°C to 85°C , 20.000MHz]

[1]	Supply voltage , " 28 " for +2.8V ; " 3 " for +3.3V ; " 5 " for +5.0V	
[2]	Holder Type	
[3]	Please add " G " after the " type code " for RoHS compliance . Omit " G " if not required.	
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[5]	Frequency in MHz	
[6]	Output power in dBm (HS series only)	

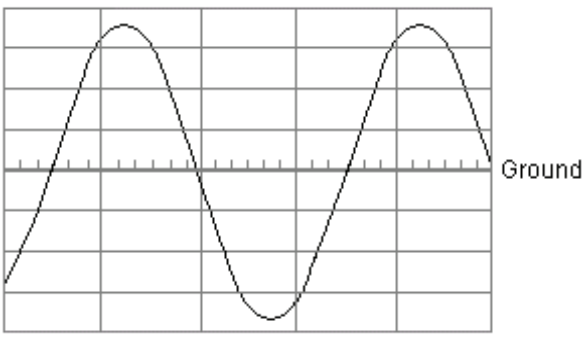
50 Ω Load Test Circuit : For " HS " series



10 KΩ // 10 pF Load Test Circuit : For " HSR " series



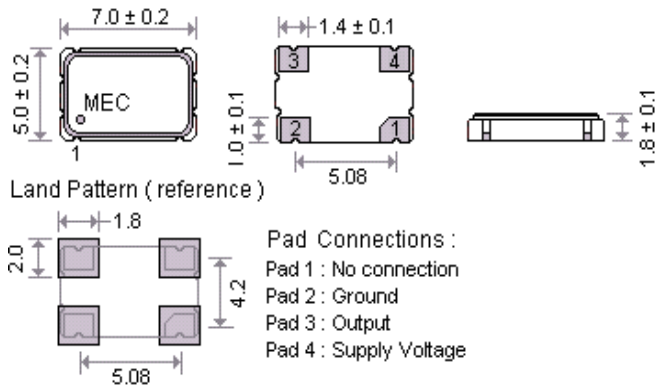
Output Wave Form



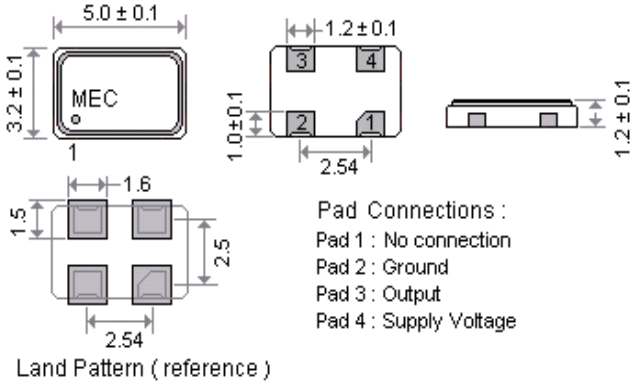
True Sine Wave Clock Oscillators [(HS series) / (HSR series)]

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

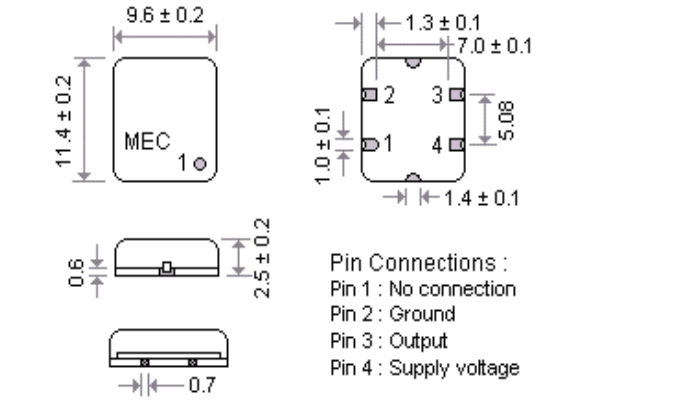
[HSR57]



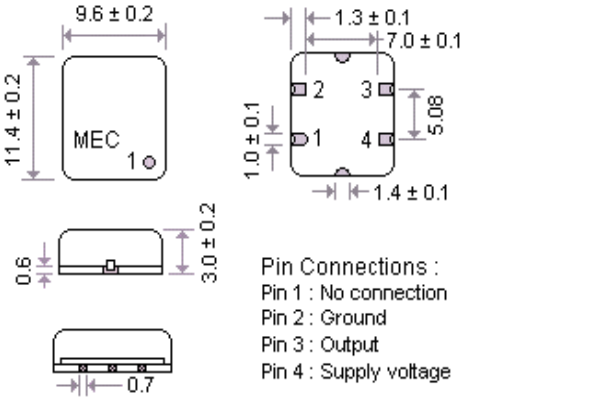
[HSR53]



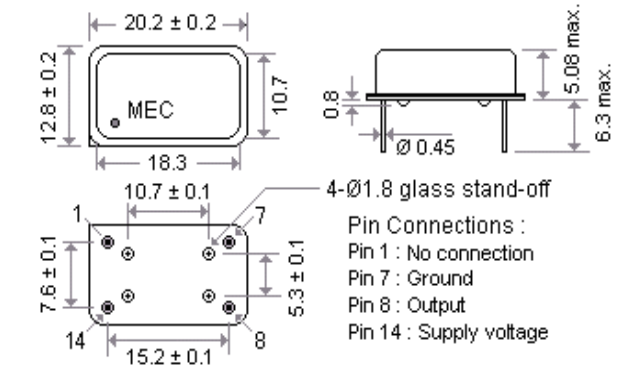
[HSR42]



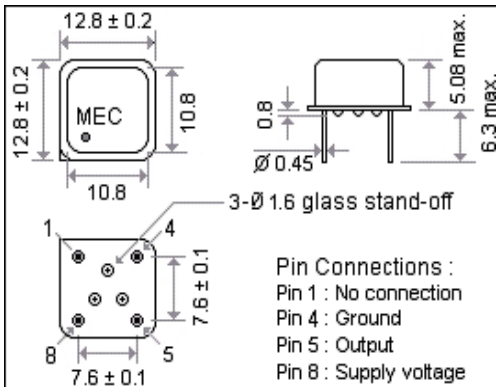
[HSR43]



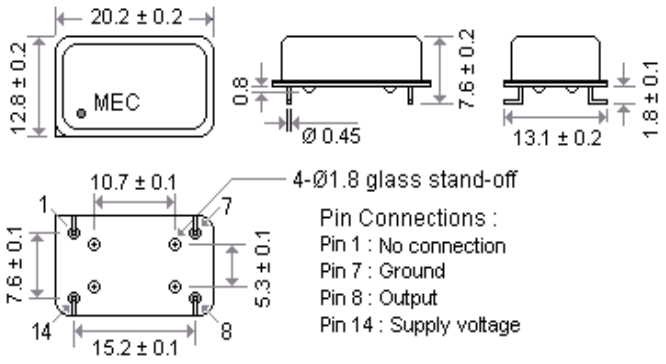
[HS14] , [HSR14]



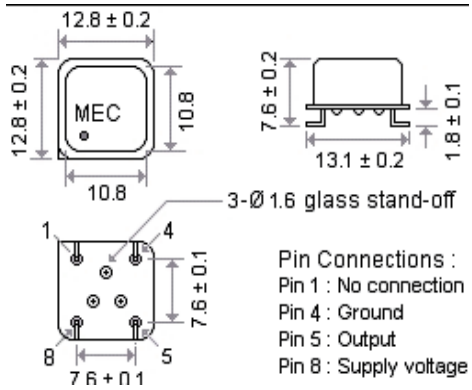
[HSR 8]



[HS24] , [HSR24]



[HSR18]

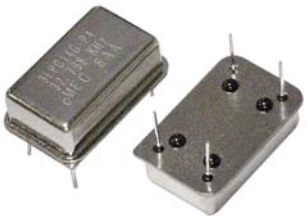


LPO

Low Power | CMOS | Thru-Hole | 3.3V | 5.0V | 12V | 15V | Min. 1 Hz | Max. 160 KHz

Applications

- Frequency Range : Hz and KHz range using a tuning fork crystal.
- Current consumption: μA range
- LPO (Low Power Oscillator), such as 32.768 KHz, provides a time base for a real time clock.
- Low current consumption.
- Suitable for battery-operated devices such as data logging and portable test equipment.

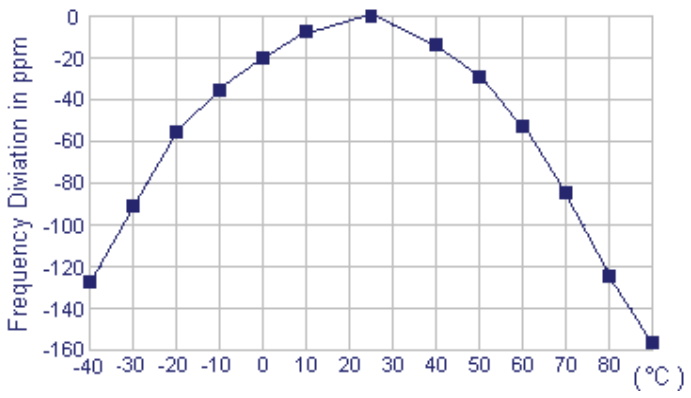


General specifications of all available packages , at Ta=+25°C , CL=15pF

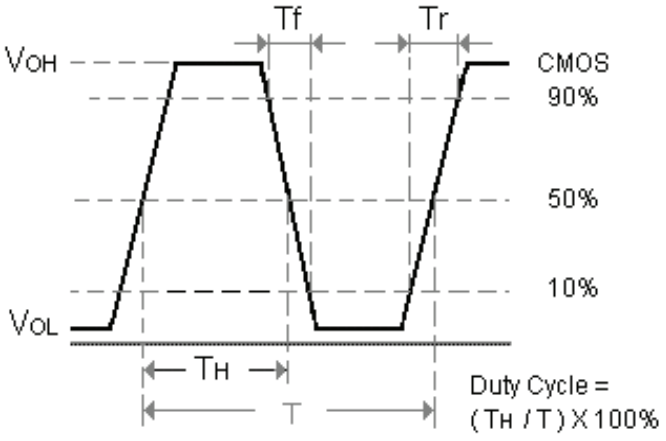
Model	LPO	
Input Voltage (VDD)	+3.3V D.C.±5%	+5.0V D.C.±10%
	+3.0V to +15V is also available	
Frequency Range	1Hz to 160KHz	
Output Wave Form	CMOS (square wave)	
Frequency Tolerance (at 25°C)	± 10 ppm (Tolerance Code is " ***P*** ")	± 50 ppm (Tolerance Code is " ***B*** ")
	± 25 ppm (Tolerance Code is " ***A*** ")	± 100 ppm (Tolerance Code is " ***C*** ")
Frequency Stability (1)	-100 ppm (typ.) over 0°C to +70°C	
	-160 ppm (typ.) over -40°C to +85°C	
Current Consumption	26 μA (typ.)	45 μA (typ.)
Output Logic High " 1 "	2.97 V (min.)	4.5 V (min.)
Output Logic Low " 0 "	0.33V (max.)	0.5 V (max.)
Rise Time (Tr) & Fall Time (Tf)	0.5 μsec (typ.) ; 1.0 μsec. (max.)	25 μsec (typ.) ; 50 μsec. (max.)
Fan-out	2 CMOS gates	
Start-up Time	450 m Sec.(max.)	
Duty Cycle	50%±5% (typ.) ; 50%±10% (max.)	
Storage Temperature	-50°C to 100°C	
Aging	±5 ppm per year (max.)	

Note : (1) Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

Typical Frequency Stability vs Temperature Curve



CMOS Output Wave Form



Low Power Clock Oscillator [(LPO series) CMOS square wave]

Part Number Format and Example

[1]	[2]	[3]		[4]		[5]
Supply Voltage	Holder Type	G	–	Frequency Tolerance (25 °C)	–	Center Frequency

Example	(1)	3	LPO14	G	–	P	– 32.768K
	(2)	5	LPO8	G	–	A	– 25.600K

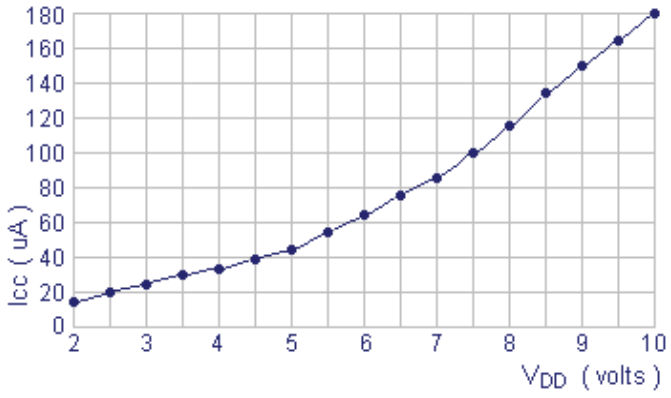
Ex (1) : 3LPO14G - P - 32.768K [+3.3V input voltage , full size package 4 pins Dip type , RoHS compliant , ±10ppm frequency tolerance , 32.768 KHz]

Ex (2) : 5LPO8G - A - 25.600K [+5.0V input voltage , half size 4 pin package Dip type , RoHS compliant , ±25 ppm frequency tolerance, 25.600 KHz

[1]	Supply voltage , " 3 " for +3.3V ; " 5 " for +5.0V			
[2]	Holder Type			
[3]	Please add " G " after the " type code " for RoHS compliance . Omit " G " if not required.			
[4]	± 10 ppm (Code is " P ")	± 25 ppm (Code is " A ")	± 50 ppm (Code is " B ")	± 100 ppm (Code is " C ")
[5]	Frequency in KHz			

Current Consumption (Icc) vs Supply Voltage V_{DD} , Measured with 10pF Load .

LPO 32.768 KHz model " 4 "



To calculate the frequency deviation at one particular temperature

To calculate the frequency deviation at one particular temperature (Tx) with respect to the frequency at +25ºC:

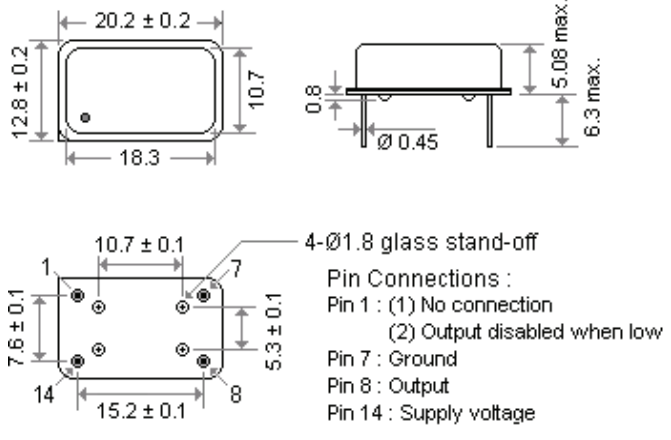
$\Delta f / f\ (ppm) = -0.035 * (Tx - 25)^2$

Example: At +60ºC, the frequency drift is -42.8 ppm

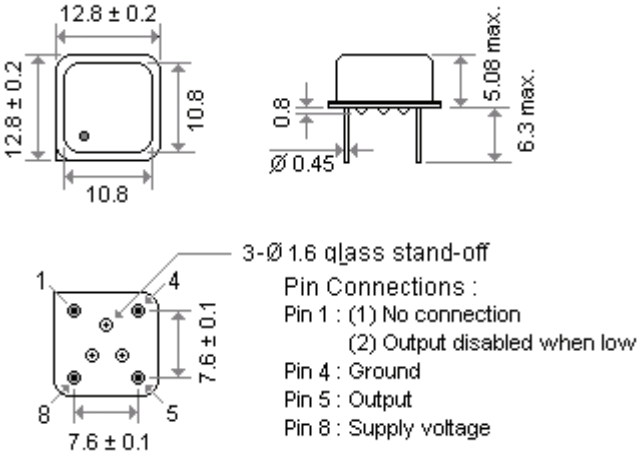
$\Delta f / f\ (ppm) = -0.035 * (60 - 25)^2 = -42.8$

Outline Dimensions (Unit : mm)

[LPO 14]



[LPO 8]

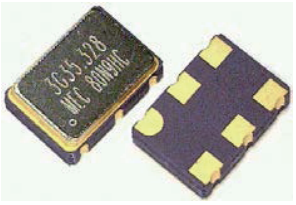


VCXO " G "

Thru-Hole | SMD | TTL / CMOS | 1.8V | 2.5V | 3.3V | 5.0V | Min. 625KHz | Max. 50MHz

Unlike regular clock oscillators that have a fixed output frequency, the output frequency of VCXOs (also known as " frequency modulators ") can be tuned ± 50 ~ ± 200ppm up or down from the nominal frequency by varying the control voltage on the voltage control pin . A varactor , a voltage variable capacitance tuning diode , is used to achieve this purpose .

Applications include (PLL) phase lock loop , SONET / ATM , set -top boxes , MPEG , audio -video modulations , video game consoles and HDTV sets. ONET , 10GbE , Fibre Channel , wireless repeaters , transponders , HDTV , FPGAs , data acquisition



RoHS Compliance

General Specifications of " G " series , [TA = +25°C , V_{DD}= at specified voltage , Load : 15 pF]

Model		" G " series			
Input Voltage (V_{DD})		V_{DD} = +1.8V D.C.±5%	V_{DD} = +2.5V D.C.±5%	V_{DD} = +3.3V D.C.±5%	V_{DD} = +5.0V D.C.±10%
Frequency Range		16.0 MHz ~ 50.0 MHz (Fundamental crystal used)	0.625 MHz ~ 50.0 MHz (Fundamental crystal used)	0.625 MHz ~ 50.0 MHz (Fundamental crystal used)	1.0 MHz ~ 50.0 MHz (Fundamental crystal used)
Output Wave Form		T T L / CMOS	T T L / CMOS	T T L / CMOS	T T L / CMOS
Initial Freq. Accuracy (at 25 °C)		To tune to the nomial frequency with Vc = 0.9V ± 0.15V	To tune to the nomial frequency with Vc = 1.25V ± 0.2V	To tune to the nomial frequency with Vc = 1.65V ± 0.2V	To tune to the nomial frequency with Vc = 2.5V ± 0.2V
Output Logic High " 1 "	T T L	- - - - -	- - - - -	2.4 V (min.)	2.4 V (min.)
	CMOS	1.62 V (min.)	2.25 V (min.)	2.97 V (min.)	4.5 V (min.)
Output Logic Low " 0 "	T T L	- - - - -	- - - - -	0.4 V (max.)	0.4 V (max.)
	CMOS	0.183 V (max.)	0.25 V (max.)	0.33 V (max.)	0.5 V (max.)
Frequency Deviation Range		Standard : ± 80 ppm (min.)	Standard : ± 80 ppm (min.)	Standard : ± 80 ppm (min.)	Standard : ± 80 ppm (min.) ; ± 200 ppm (min.) available
Control Voltage Center		0.9 V_{DC}	1.25 V_{DC}	1.65 V_{DC}	2.5 V_{DC}
Control Voltage Range		0.0V to 1.8V	0.25 V to 2.25 V	0.3V to 3.0V	0.5V to 4.5V

Frequency Stability [(1)] Codes	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard please enter the desired stability after the " C " or " I " For example : " C20 " : ± 20 ppm over -10°C to +70°C ; " I20 " : ± 20 ppm over -40°C to +85°C
Frequency Stability over Operating Temperature Range				
Commercial " C " (*-10°C to +70°C*)	*A*	*B*	*C*	
Industrial " I " (*-40°C to +85°C*)	*D*	*E*	*F*	

Output Load	T T L	2 T T L gates
	CMOS	15 pF
Rise Time (Tr) Fall Time (Tf)	T T L	6 nSec.(max.) ; 4 nSec.(typical) . Measured between 0.4V to 2.4V.
	CMOS	6 nSec.(max.) ; 4 nSec.(typical) . Measured between 20% to 80% of wave form (CL=15pF)
Duty Cycle	T T L	50% ± 10% (standard) , 50% ± 5% (optional, add " ***- S*** " as suffix to part number). Measured at +1.4V.
	CMOS	50% ± 10% (standard) , 50% ± 5% (optional, add " ***- S*** " as suffix to part number). Measured at 50% of wave form.
Integrated Phase Jitter		1 ps max. (12 KHz to 20 MHz) .
Periode Jitter RMS		2.0 pS (typ.)
Periode Jitter Peak-to-Peak		14 pS max.

Phase Noise [typical of 27.0 MHz] [at 3.3V]	10 Hz	100 Hz	1k Hz	10K Hz	100K Hz	1 MHz
	-40 dBc/Hz	-104 dBc/Hz	-132 dBc/Hz	-147 dBc/Hz	-152 dBc/Hz	-150 dBc/Hz

Start-up Time (Ts)	10 mSec. (max.) ; 5 mSec. (typical)
Current Consumption	10 ~ 45 mA (Frequency dependent). For 27 MHz: 10 mA typical at +3.3 V_{DD} and 20 mA typical. at 5.0 V_{DD}.
Linearity	6% typical ; 10% max.
Modulation Bandwidth	10 KHz min. Measured at -3 dB with Vcontrol at 1.65V or at 2.5V
Input Impedance	1 MΩ typical
Slope Polarity (Transfer Function)	Monotonic and Positive : Increasing control voltage always increases output frequency ,
Aging	± 3 ppm per year (max.)
Tri - State Control Characteristics	Tri-State enable high. No connection or V_{DD}-0.5V min. is applied to Tri-State pin to enable output. Ground+0.5V max. to disable output (high impedance).

Note : [(1)] Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

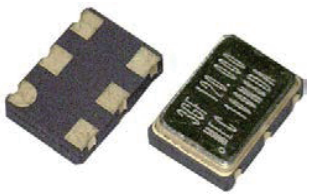
GF phase jitter < 1.0 ps | **GW** phase jitter < 4.3 ps | **GV** phase jitter < 4.0 ps | Thru-Hole | SMD | TTL / CMOS | 3.3V | Min. 50.01MHz | Max. 800MHz

Applications

GF, GW & GV CMOS VCXOs are available with frequencies above 50MHz.

- " GF " series: Best performance among the three. Phase jitter is less than 0.5 ps.
- " GW " and " GV " high-Q fundamental crystals and multiplier circuits with moderate jitter.
  " GW " is available up to 800MHz and " GV " up to 200MHz and at a low cost .

RoHS Compliance



General specifications of GF, GW and GV series , at Ta=+25°C , CL=15pF

Model	" GF" series		" GW " series		" GV " series
Technology	High Q fundamental crystal + ultra low jitter multiplier circuit		High Q fundamental crystal + low jitter multiplier circuit		High Q fundamental crystal + low jitter multiplier circuit
Output Logic	LVCMOS				
Available Frequency Range	50.01 MHz ~ 640.0 MHz		200.1 MHz ~ 800.0 MHz		50.01 MHz ~ 200.0 MHz
Supply Voltage V_{DD}	+3.3 V_{DD} ± 5%		+3.3 V_{DD} ± 5%		+3.3 V_{DD} ± 5%
Supply Voltage Code	" 3 "		" 3 "		" 3 "
Output Logic High " 1 "	90% of V_{DD} min.				
Output Logic Low " 0 "	10% of V_{DD} max.				
Integrated Phase Jitter (12 KHz to 20 MHz)	0.4 ps typical; 0.5 ps max. for 156.250 MHz		2.6 ps typical; 4 ps max. for 155.520 MHz		2.3 ps typical; 4 ps max. for 155.520 MHz
Period Jitter RMS ; Decoupling capacitor between V_{DD} and	3 ps typical; 5 ps max. for 156.250 MHz		4.3 ps typical. for 155.520 MHz		4.0 ps typical. for 155.520 MHz
Period Jitter (peak-to-peak ; Decoupling capacitor between V_{DD} and ground)	20 ps typical; 30 ps max. for 156.250 MHz		27 ps typical. for 155.520 MHz		27 ps typical. for 155.520 MHz
Phase Noise (typical) , Vcon : GND	Offset	Frequency: 156.250 MHz	Frequency: 155.520 MHz		Frequency: 155.520 MHz
	10 Hz	-62 dBc / Hz	-65 dBc / Hz		-65 dBc / Hz
	100 Hz	-92 dBc / Hz	-95 dBc / Hz		-95 dBc / Hz
	1 KHz	-120 dBc / Hz	-120 dBc / Hz		-120 dBc / Hz
	10 KHz	-132 dBc / Hz	-125 dBc / Hz		-128 dBc / Hz
	100 KHz	-128 dBc / Hz	-121 dBc / Hz		-122 dBc / Hz
	1 MHz	-140 dBc / Hz	-120 dBc / Hz		-120 dBc / Hz
	10 MHz	-150 dBc / Hz	-140 dBc / Hz		-140 dBc / Hz
Current Consumption (15 pF load)	< 100 MHz : 30 mA max. 100 MHz ~ 320 MHz : 40 mA max.		200 MHz ~ 800 MHz : 50 mA max.		40 mA max.
Rise Time / Fall Time	0.7 ns typical (0.3 V ↔ 3.0V, 15 pF load)		2.4 ns typical (0.3 V ↔ 3.0V, 15 pF load)		2.4 ns typical (0.3 V ↔ 3.0V, 15 pF load)
Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range		± 25 ppm	± 50 ppm	± 100 ppm
	Commercial " C " (-10°C to +70°C)		A	B	C
	Industrial " I " (-40°C to +85°C)		D	E	F
	If non-standard , please enter the desired stability after the " C " or " I " For example : " C20 " : ± 20 ppm over -10°C to +70°C ; " I20 " : ± 20 ppm over -40°C to +85°C				
Frequency Deviation range	Standard : ±80 ppm (min.)				
Load	15 pF				
Start-up Time	10 m sec. (max.)				
Duty Cycle	50% ± 5% (measured at 50% V_{DD})				
Linearity	6% typical ; 10% max.				
Modulation Bandwidth (at -3 dB)	25 KHz min. 0V ≤ Vcontrol ≤ 3.3V				
Input Impedance	60 KΩ min.		2 MΩ min.		2 MΩ min.
Slope Polarity (Transfer Function)	Monotonic and Positive : Increasing control voltage always increases output frequency ,				
Tri - State Control Characteristics	Tri-State enable high. No connection or 70% of V_{DD} min. is applied to Tri-State pad to enable output. 30% of V_{DD} max. to disable output (high impedance).				
Aging at Ta=+25ºC	± 3 ppm max. first year ; ± 2 ppm max. per year thereafter				

[1] Inclusive of 25ºC tolerance, operating temperature range, ±10% input voltage variation, load change, aging shock and vibration

VCXO

Voltage Controlled Crystal Oscillators [CMOS output]

Part Number Format and Examples

[1]	[2]	[3]	[4]		[5]	[6]		[7]
Supply Voltage	Holder Type	G	Frequency Stability	–	Pulling Range	Range Code	–	Center Frequency

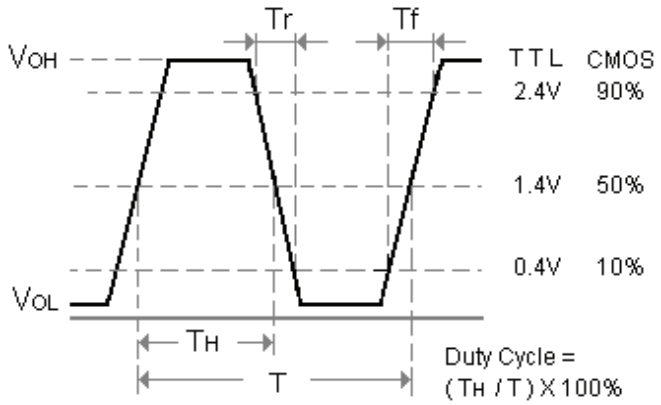
Examples										
	(1)	5	G14	G	B	–	100	N	–	35.328
	(2)	3	GV576		D	–	80	T	–	27.000

Ex (1) : 5G14GB - 100N - 35.328 [+5.0V , full size 4 pin Dip type , RoHS , ±50ppm (-10°C to 70°C) , pulling : ±100 ppm (min.) , 35.328 MHz]

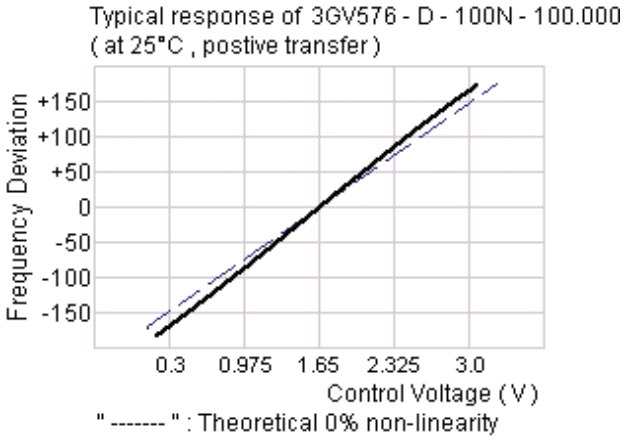
Ex (2) : 3GV576D - 80T - 27.000 [+3.3V , G_576 type (V characteristics) , ±25ppm (-40°C to 85°C) , pulling : ±80 ppm (typical) , 27.000 MHz]

[1]	Supply voltage , " 18 " for +1.8V ; " 25 " for +2.5V ; " 3 " for +3.3V ; " 5 " for +5.0V		
[2]	Holder Type		
[3]	Please add " G " after the " type code " for RoHS compliant equivalent (Does not apply to G_534 , G_536 , G_576 series).		
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;	
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C	
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;	
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C	
[5]	Freqency Pulling Range	3.3V	From ±30ppm ~ ±150ppm , control Voltage range : 0.3V ~ 3.0 ; control voltage center : ± 1.65 V
		5.0V	From ±70ppm ~ ±200ppm , control Voltage range : 0.5V ~ 4.5V ; control voltage center : ± 2.5 V
[6]	Pulling Range Code	" M " stands for maximum ; " N " stands for minimum ; " T " stands for typical (tolerance is ± 20%)	
[7]	Center Frequency in MHz		

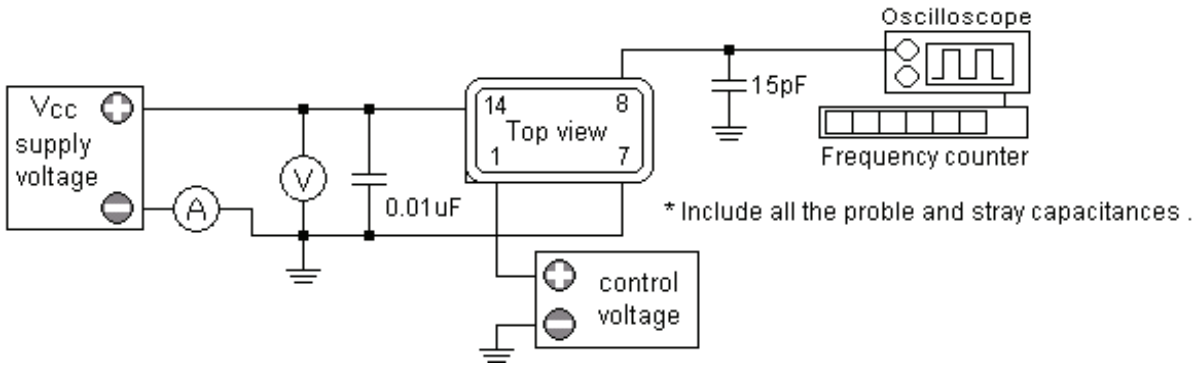
T T L / CMOS Output Wave Form



Transfer Function



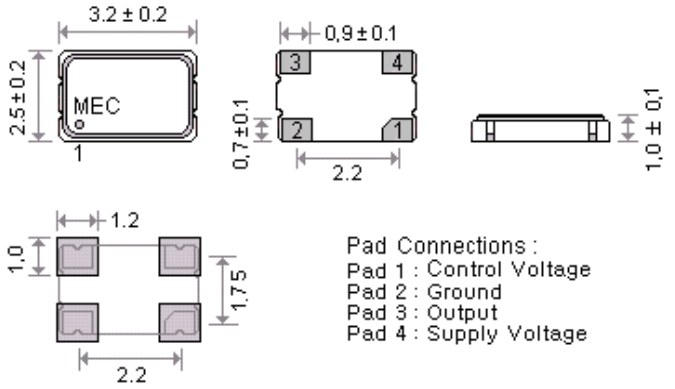
T T L / CMOS Square Wave Test Circuit



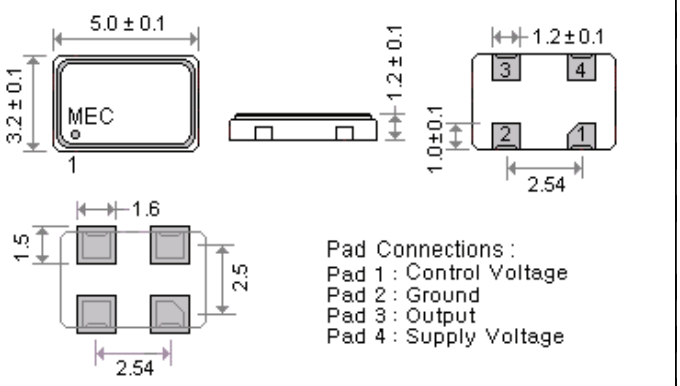
Voltage Controlled Crystal Oscillators [CMOS output]

Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 5 for product series selections .]

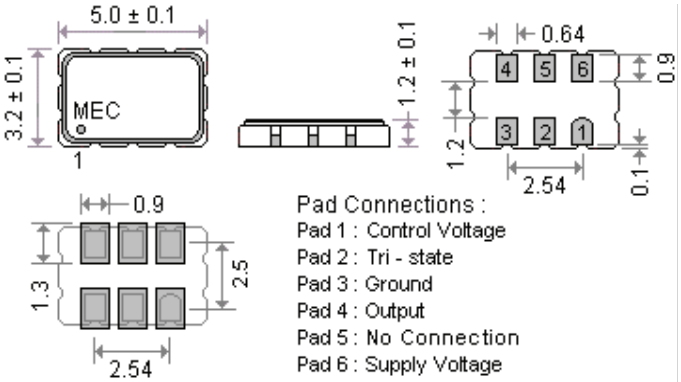
[G324]



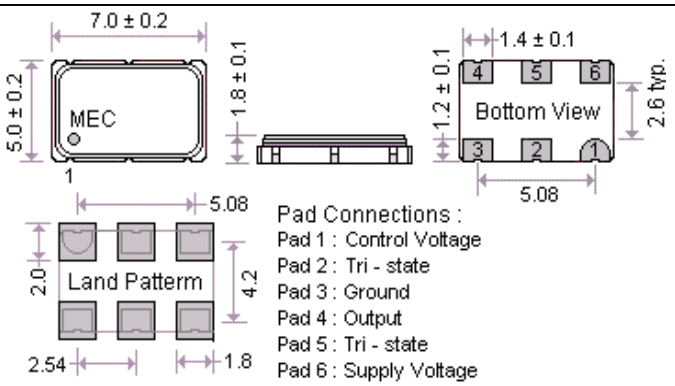
[G534]



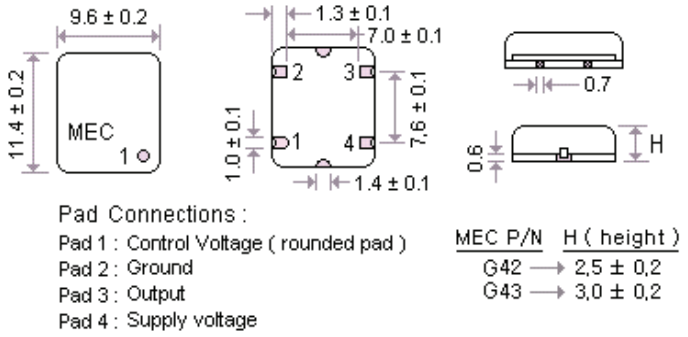
[G536] - - - (available in 1.8 V , 3.3 V , 5.0 V only)



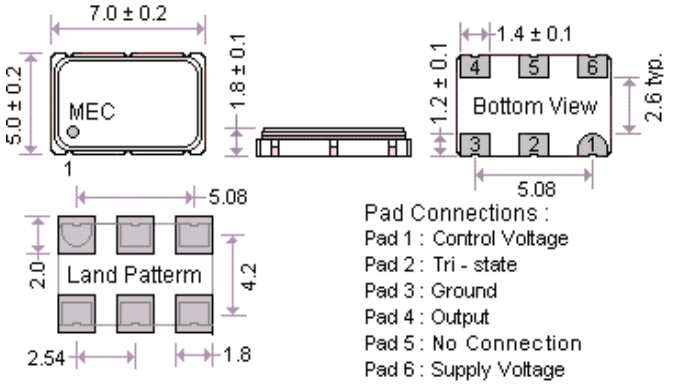
[G576 , GV576]



[G42, GF42, GW42, GV42] ; [G43, GF43, GW43, GV43]

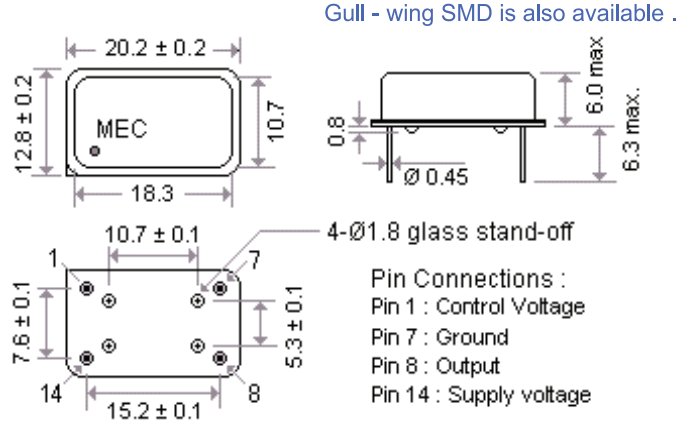


[GF576 , GW576]



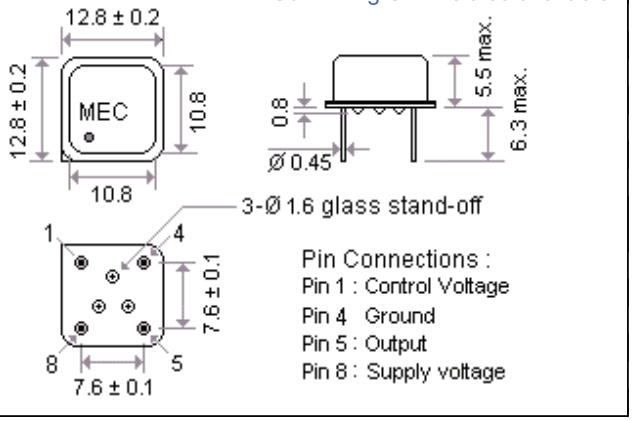
[G14, GF14, GW14, GV14]

Gull - wing SMD is also available .



[G8, GF8, GW8, GV8]

Gull - wing SMD is also available .

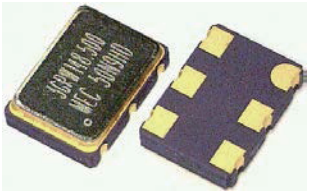


VCXO

GP	LVPECL Differential	F group 0.5 ps	W group 4.0 ps	Thru-Hole	SMD	3.3V	Min. 750KHz	Max. 800MHz

Applications

- GPF and GPW uses high-Q fundamental crystals and low jitter multiplier circuits.
- GPF offers < 1 ps phase jitter at only a fraction of the cost of a high frequency fundamental crystal VCXO. GPW series has moderate jitter at a low cost.



RoHS Compliance

General specifications of GPF and GPW only , at Ta=+25°C , CL=15pF

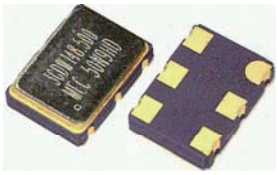
Model			" GPF " series			" GPW " series	
Technology			High Q fundamental crystal + low jitter multiplier circuit			High Q fundamental crystal + multiplier circuit	
Output Logic			LVPECL Differential				
Available Frequency Range			38.0 MHz ~ 640.0 MHz			750 KHz ~ 800.0 MHz	
Supply Voltage V_{DD}			+3.3 V_{DD} ± 5%			+3.3 V_{DD} ± 5%	
Supply Voltage Code			*" 3 "*			*" 3 "*	
Output Logic " High " , " 1 "			V_{DD}-1.025 min. Termination: R_L=50 Ω to (V_{DD}-2.0V). See test circuit below.				
Output Logic " Low " , " 0 "			V_{DD}-1.620 max. Termination: R_L=50 Ω to (V_{DD}-2.0V). See test circuit below.				
Integrated Phase Jitter (12 KHz to 20 MHz)			0.4 ps typical; 0.5 ps max. [for 156.250 MHz]			2.6 ps typical; 4 ps max. [for 155.520 MHz]	
Period Jitter (RMS ; Decoupling capacitor between V_{DD} and ground)			3.0 ps typical; 5 ps max. [for 156.250 MHz]			4.3 ps typical. [for 155.520 MHz]	
Period Jitter (peak-to-peak ;Decoupling capacitor between V_{DD} and ground)			20 ps typical; 30 ps max. [for 156.250 MHz]			27 ps typical. [for 155.520 MHz]	
Current Consumption (15 pF load)			38 MHz ~ 100 MHz - - - - - - - - - 65 mA max 100.01 MHz ~ 320 MHz - - - - - - - 80 mA max. 320.01 MHz ~ 640 MHz - - - - - - 90 mA max..			< 24 MHz - - - - - - - - - - - - - - - - 25 mA max 24.01 MHz ~ 96 MHz - - - - - - - - 65 mA max 96.01 MHz ~ 800 MHz - - - - - - - 100 mA max..	
Rise Time / Fall Time			0.55 ns max. (20%↔80% of the PECL wave form)			1.5 ns max. (20%↔80% of the PECL wave form)	
Frequency Stability [1] Codes		Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard please enter the desired stability after the " C " or " I " For example : " C20 " : ± 20 ppm over -10°C to +70°C ; " I20 " : ± 20 ppm over -40°C to +85°C	
		Commercial " C " (*-10°C to +70°C*)	*A*	*B*	*C*		
		Industrial " I " (*-40°C to +85°C*)	*D*	*E*	*F*		
Load			R_L=50 Ω to (V_{DD}-2.0V). See test circuit below.				
Start-up Time			10 m sec. (max.)				
Duty Cycle			50% ± 5% (measured at V_{DD} -1.3V)				
Aging at Ta = +25°C			± 3 ppm max. first year ; ± 2 ppm max. per year thereafter				
Pad 1 Voltage Control Characteristics	Control Voltage Center , Range		+ 1.65 V , Vcon =+0.3V to +3.0V				
	Frequency Deviation Range		±80 ppm (min.) . Use " N " (minimum) , " M " (maxiimum) , " T " (typical,±20%) for the desired range . Example : " 100M " represents ±120ppm (min.) .				
	Linearity		6% typical ; 10% max.				
	Slope Polarity		Positive : Positive voltage for positive frequency shift				
	Modulation Bandwidth		25 KHz min. (-3dB , 0V ≤ Vcontrol ≤ 3.3V)				
	Input Impedance		60 KΩ min.			2 MΩ min.	
Tri - State Function. on pad No. 2	No Connection		Differential PECL and compliantary PECL outputs .				
	Disable		Both outputs are disabled (high impedance) when pad No.2 is taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)				
	Enable		At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) ; Enable time : 10ns + one period of the output frequency (max.)				
Phase Noise : Tested with Vcontrol pin connected to ground (typical)		Offset	Frequency: 156.250 MHz			Frequency: 155.520 MHz	
		10 Hz	-62 dBc / Hz			-60 dBc / Hz	
		100 Hz	-92 dBc / Hz			-90 dBc / Hz	
		1 KHz	-120 dBc / Hz			-115 dBc / Hz	
		10 KHz	-132 dBc / Hz			-125 dBc / Hz	
		100 KHz	-128 dBc / Hz			-119 dBc / Hz	
		1 MHz	-140 dBc / Hz			-120 dBc / Hz	
		10 MHz	-150 dBc / Hz			-140 dBc / Hz	

[1] Inclusive of 25ºC tolerance, operating temperature range, ±10% input voltage variation, load change, aging shock and vibration

GD	LVDS Differential	F group 0.5 ps	W group 4.0 ps	Thru-Hole	SMD	3.3V	Min. 750KHz	Max. 800MHz

Applications

- GDF and GDW uses a high-Q fundamental crystal and a low jitter multiplier circuit.
- GDF offers < 1 ps phase jitter at only a fraction of the cost of a high frequency fundamental crystal VCXO. GDW series has moderate jitter at a low cost.



RoHS Compliance

General specifications of GDF and GDW only , at Ta=+25°C , CL=15pF

Model	" **GDF** " series	" **GDW** " series
Technology	High Q fundamental crystal + low jitter multiplier circuit	High Q fundamental crystal + multiplier circuit
Output Logic	LVDS	
Available Frequency Range	38.0 MHz ~ 640.0 MHz	750 KHz ~ 800.0 MHz
Supply Voltage V_{DD}	+3.3 V_{DD} ± 5%	+3.3 V_{DD} ± 5%
Supply Voltage Code	***" 3 "***	***" 3 "***
Output Logic " High " , " 1 "	1.4 V typical ; 1.6 V max.	
Output Logic " Low " , " 0 "	0.9 V min. ; 1.1 V typical.	
Differential Output Voltage, V_{OD}	247 mV min.; 355 mV typical ; 454 mV max. Output 1 - output 2	
Differential Output Error, V_{OD}	-50 mV min ; 50 mV max.	
Output Offset Voltage, Vos	1.125 V min. ; 1.200 V typical ; 1.375 V max.	
Offset Magnitude Error (△Vos)	0 mV min. ; 3 mV typical ; 25 m V max.	
Integrated Phase Jitter (12 KHz to 20 MHz)	0.4 ps typical; 0.5 ps max. [for 156.250 MHz]	2.6 ps typical; 4 ps max. [for 155.520 MHz]
Period Jitter (RMS ; Decoupling capacitor between V_{DD} and ground)	3.0 ps typical; 5 ps max. [for 156.250 MHz]	4.3 ps typical. [for 155.520 MHz]
Period Jitter(peak-to-peak ;Decoupling capacitor between V_{DD} and ground)	20 ps typical; 30 ps max. [for 156.250 MHz]	27 ps typical. [for 155.520 MHz]
Current Consumption (15 pF load)	38 MHz ~ 100 MHz - - - - - - - - - 65 mA max 100.01 MHz ~ 320 MHz - - - - - - - 80 mA max. 320.01 MHz ~ 640 MHz - - - - - - 90 mA max.	< 24 MHz - - - - - - - - - - - - - - - - 25 mA max 24.01 MHz ~ 96 MHz - - - - - - - - 65 mA max 96.01 MHz ~ 800 MHz - - - - - - - 100 mA max..
Rise Time / Fall Time	0.7 ns typical , 1.0 ns max. (20%↔80% of the LVDS wave form)	1.5 ns max. (20%↔80% of the LVDS wave form)

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I " . For example : " C20 " : ± 20 ppm over -10°C to +70°C " I20 " : ± 20 ppm over -40°C to +85°C
	Commercial "C" (*-10°C ~ +70°C*)	*A*	*B*	*C*	
	Industrial " I " (*-40°C to +85°C*)	*D*	*E*	*F*	

Load	50 Ω from each output		
Start-up Time	5 m sec. typical; 10 m sec. max.		
Duty Cycle	50% ± 5% (measured at 1.25V)		
Drive Capability	100 ohms between LVDS output and complimentary LVDS output.		
Aging at Ta = +25°C	± 3 ppm max. first year ; ± 2 ppm max. per year thereafter		
Pad 1 Voltage Control Characteristics — Control Voltage Center , Range	+ 1.65 V , Vcon =+0.3V to +3.0V		
Pad 1 Voltage Control Characteristics — Frequency Deviation Range	±80 ppm (min.) . Use " N " (minimum) , " M " (maxiimum) , " T " (typical,±20%) for the desired range . Example : " 100N " represents ±100ppm (min.) .		
Pad 1 Voltage Control Characteristics — Linearity	6% typical ; 10% max.		
Pad 1 Voltage Control Characteristics — Slope Polarity	Positive : Positive voltage for positive frequency shift		
Pad 1 Voltage Control Characteristics — Modulation Bandwidth	25 KHz min. (-3dB , 0V ≤ Vcontrol ≤ 3.3V)		
Pad 1 Voltage Control Characteristics — Input Impedance	60 KΩ min.		2 MΩ min.
Tri - State Function. on pad No. 2 — No Connection	Differential LVDS and compliantary LVDS outputs .		
Tri - State Function. on pad No. 2 — Disable	Both outputs are disabled (high impedance) when pad No.2 is taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)		
Tri - State Function. on pad No. 2 — Enable	At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) ; Enable time : 10ns + one period of the output frequency (max.)		

Phase Noise : Tested with Vcontrol pin connected to ground (typical)	Offset	Frequency: 156.250 MHz	Frequency: 155.520 MHz
	10 Hz	-62 dBc / Hz	-60 dBc / Hz
	100 Hz	-92 dBc / Hz	-90 dBc / Hz
	1 KHz	-120 dBc / Hz	-115 dBc / Hz
	10 KHz	-132 dBc / Hz	-125 dBc / Hz
	100 KHz	-128 dBc / Hz	-119 dBc / Hz
	1 MHz	-140 dBc / Hz	-120 dBc / Hz
	10 MHz	-150 dBc / Hz	-140 dBc / Hz

[1] Inclusive of 25ºC tolerance, operating temperature range, ±10% input voltage variation, load change, aging shock and vibration

GP_ [LVPECL Differential output]

GD_ [LVDS Differential output]

Part Number Format and Example

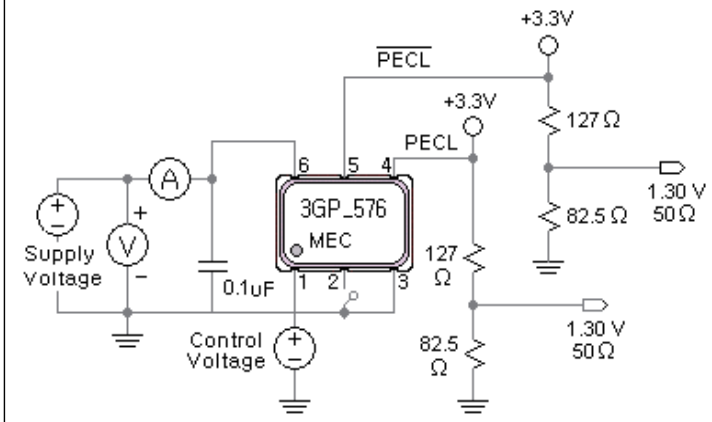
	[1]	[2]	[3]	[4]		[5]	[6]		[7]
	Supply Voltage	Holder Type Output Wave	G	Frequency Stability	–	Pulling Range	Range Code	–	Center Frequency
Examples	(1)	5	GPF14	G	B	–	100	N	–	35.328
	(2)	3	GV576		D	–	80	T	–	27.000

Ex (1) : 3GPF14GB - 100N - 155.520 [+3.3V , G_ 14 type (F characteristics , PECL output) , RoHS , ±50ppm(-10°C to 70°C) , pulling : ±100 ppm (min.) , 155.520 MHz]

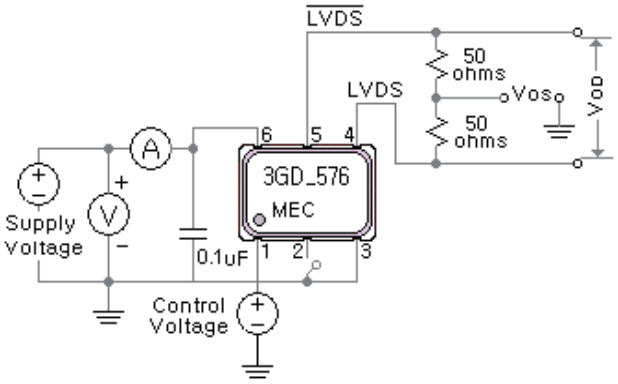
Ex (2) : 3GWD576D - 80T - 125.000 [+3.3V , G_576 type (W characteristics , LVDS output) , ±25ppm (-40°C to 85°C) , pulling : ±80 ppm (typical) , 125.000 MHz]

[1]	Supply voltage , " 3 " for +3.3V		
[2]	Holder type and output wave [" P " for PECL differential , " D " for LVDS differential]		
[3]	Please add " G " after the " type code " for RoHS compliant equivalent (Does not apply to G_576 series) .		
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;	
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C	
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;	
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C	
[5]	Freqency Pulling Range	3.3V	From ±30ppm ~ ±150ppm , control Voltage range : 0.3V ~ 3.0 ; control voltage center : ± 1.65 V
		5.0V	From ±70ppm ~ ±200ppm , control Voltage range : 0.5V ~ 4.5V ; control voltage center : ± 2.5 V
[6]	Pulling Range Code	" M " stands for maximum ; " N " stands for minimum ; " T " stands for typical (tolerance is ± 20%)	
[7]	Center Frequency in MHz		

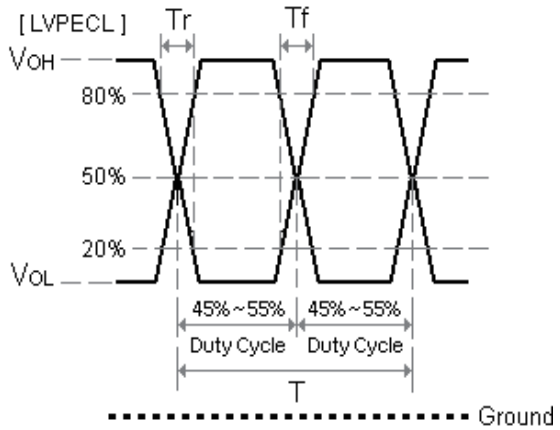
PECL Square Wave Test Circuit



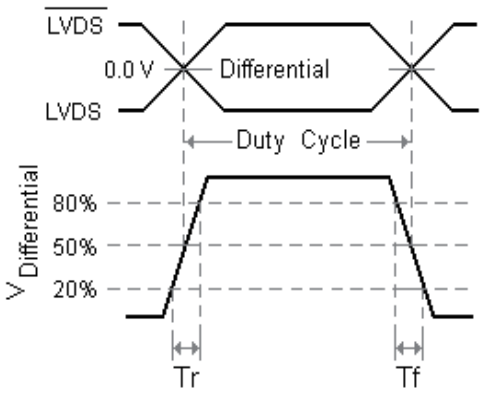
LVDS Square Wave Test Circuit



PECL Square Wave Output Wave Form

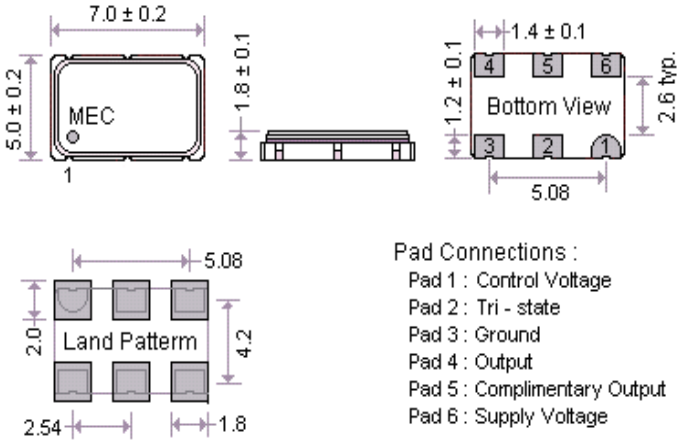


LVDS Square Wave Output Wave Form



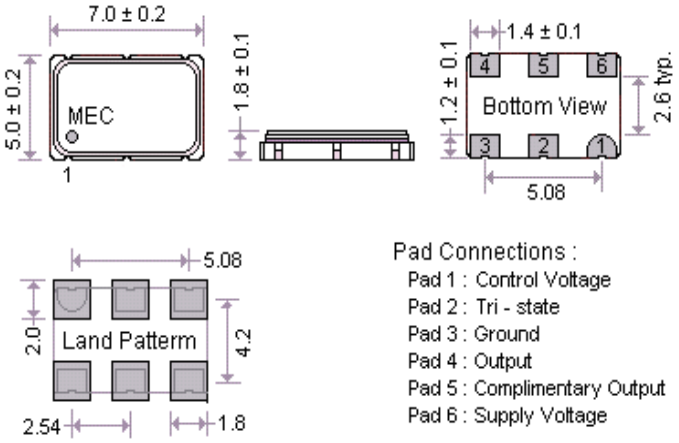
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 5 for product series selections.]

[GPF576 , GPW576] - - - PECL Differential Output



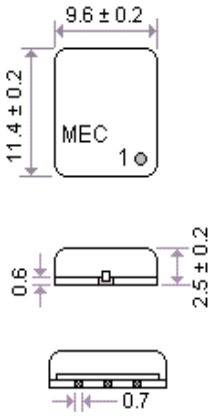
Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : Output
- Pad 5 : Complimentary Output
- Pad 6 : Supply Voltage

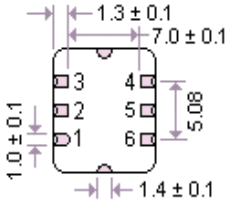
[GDF576 , GDW576] - - - LVDS Differential Output



Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : Output
- Pad 5 : Complimentary Output
- Pad 6 : Supply Voltage

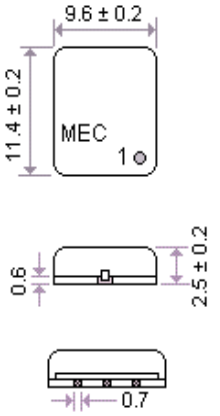
[GPF62 , GPW62] - - - PECL Differential Output

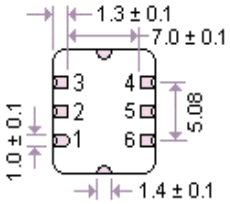




Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : PECL Output
- Pad 5 : Complimentary PECL Output
- Pad 6 : Supply Voltage

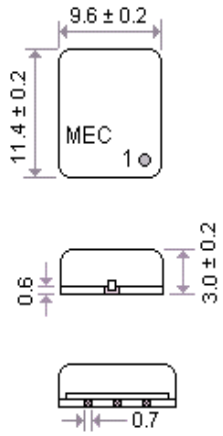
[GDF62 , GDW62] - - - LVDS Differential Output

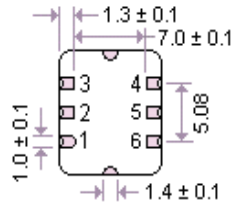




Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : LVDS Output
- Pad 5 : Complimentary LVDS Output
- Pad 6 : Supply Voltage

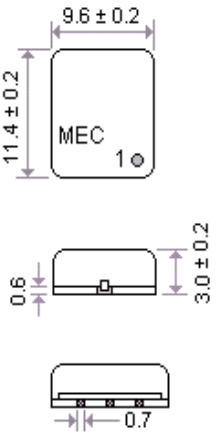
[GPF63 , GPW63] - - - PECL Differential Output

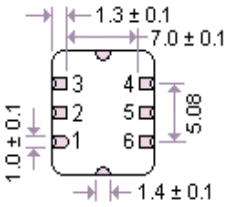




Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : PECL Output
- Pad 5 : Complimentary PECL Output
- Pad 6 : Supply Voltage

[GDF63 , GDW63] - - - LVDS Differential Output





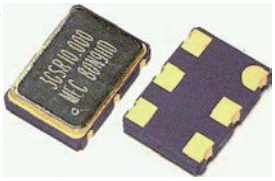
Pad Connections :
- Pad 1 : Control Voltage
- Pad 2 : Tri - state
- Pad 3 : Ground
- Pad 4 : LVDS Output
- Pad 5 : Complimentary PECL Output
- Pad 6 : Supply Voltage

VCXO

GS	GSR	True Sine Wave	Thru-Hole	SMD	3.3V	5.0V	Min.	Max.
50Ω load	10KΩ//10pF load						10MHz	800MHz

Applications

- True Sine wave VCXOs in 3.2x5.0 mm and 5.0x7.0 mm SMD ("GSR" series). First in the market.
- High purity and low total harmonic distortion. Ideal for audio applications
- For Sine wave clock oscillators, please refer to "HS" and "HSR" series VCXOs.



RoHS Compliance

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

Model	" GS " series		" GSR " series	
Output Wave Form	True Sine Wave			
Input Voltage (VDD)	+3.3V D.C.±5%	+5.0V D.C.±10%	+3.3V D.C.±5%	+5.0V D.C.±10%
Frequency Range	10.0 ~ 800.0MHz	10.0 ~ 156.0MHz	10.0MHz ~ 30.0MHz	
Initial Freq. Accuracy (at 25 °C)	Vc= 1.65V ± 0.2V	Vc= 2.5V ± 0.2V	Vc= 1.65V ± 0.2V	Vc= 2.5V ± 0.2V
Control Voltage Center	1.65 V_{DC}	2.5 V_{DC}	1.65 V_{DC}	2.5 V_{DC}
Control Voltage Range	0.3 V to 3.0 V	0.5 V to 4.5 V	0.3 V to 3.0 V	0.5 V to 4.5 V
Output Level	Standard: + 3.0 dBm min. Tolerance: ± 1 dB Maximum Power: + 7 dBm User to specify	Standard: + 5.0 dBm min. Tolerance: ± 1 dB Maximum Power: + 13 dBm User to specify	1.0 V p-p typical	
Load	50Ω. (Internally AC coupled)		10 KΩ // 10 pF load	
Harmonics	< - 30dBc (frequency dependent)		< - 25dBc (frequency dependent)	
Current Consumption	10 MHz : 9 mA (typ.) 100 MHz : 18 mA (typ.) 150 MHz : 19 mA (typ.)	10 MHz : 18 mA (typ.) 100 MHz : 34 mA (typ.) 150 MHz : 36 mA (typ.)	1.1 mA	1.2 mA
Frequency Deviation Range	± 80 ppm (min.)		± 50 ppm typical	
Input Impedance	> 10 K Ω		> 0.5 M Ω	
Modulation Bandwidth (at -3 dB)	10 KHz min.		25 KHz min.	

Frequency Stability [1] Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard please enter the desired stability after the " C " or " I " represents . For example : " C2 0" : ± 20 ppm over -10°C to +70°C " I20 " : ± 20 ppm over -40°C to +85°C
	Commercial (*-10°C to +70°C*)	*A*	*B*	*C*	
	Industrial (*-40°C to +85°C*)	*D*	*E*	*F*	

Sub-Harmonics	None			
Voltage Control Range	0.0 V to V_{DD} with control voltage center at 50% of V_{DD}			
Linearity	±10 % max.			
Slope Polarity	Positive. Increasing control voltage increases output frequency			
Phase Noise (typical)	Offset	125.0 MHz as example	Offset	13.0 MHz as example
	10 Hz	-75 dBc /Hz	10 Hz	-95 dBc /Hz
	100 Hz	-110 dBc /Hz	100 Hz	-123 dBc /Hz
	1 KHz	-125 dBc /Hz	1 KHz	-135 dBc /Hz
	10 KHz	-132 dBc /Hz	10 KHz	-140 dBc /Hz
	100 KHz	-128 dBc /Hz	100 KHz	-145 dBc /Hz
Start -up Time	6.0 m Sec.(typ.)		2.0 m Sec.(typ.)	
Aging	± 5 ppm per year (max.)			

Note : (1) Inclusive of 25°C tolerance , operating temperature range , ±10% input voltage variation , load change , aging , shock and vibration.

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

Voltage Controlled Clock Oscillators [(GS series) / (GSR series)]

Part Number Format and Example

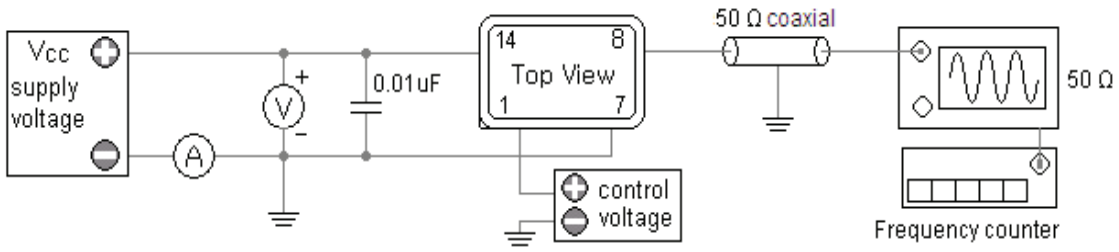
	[1]	[2]	[3]	[4]		[5]	[6]		[7]		[8]
	Supply Voltage	Holder Type	G	Frequency Stability	–	Pulling Range	Range Code	–	Center Frequency	–	Output Power [HS series only]
Example	(1) 3	GS14	G	A	–	100.000	N	–	100.000	–	5
	(2) 5	GSR53		E	–	20.000	T	–	20.000	–	

Ex (1) : 3GS14GA - 80N - 100.000 - 5 [+3.3V , G_14 type , 50 Ω load , RoHS , ±25ppm (-10°C to 70°C) , pulling : ±80 ppm (min) , 100.000MHz , power : 5dBm ±1dB]

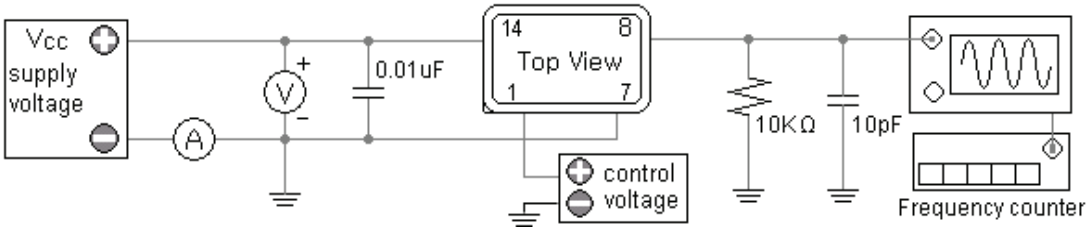
Ex (2) : 5GSR53E - 100T - 20.000 [+5.0V , G_53 type , 10KΩ // 10pF load , ±50ppm (-40°C to 85°C) , pulling : ±100 ppm (typical) , 20.000MHz]

[1]	Supply voltage , " 3 " for +3.3V ; " 5 " for +5.0V		
[2]	Holder Type		
[3]	Please add " G " after the " type code " for RoHS compliance . Omit " G " if not required.		
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;	
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C	
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;	
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C	
[5]	Freqency Pulling Range	3.3V	From ±30ppm ~ ±150ppm , control Voltage range : 0.3V ~ 3.0 ; control voltage center : ± 1.65 V
		5.0V	From ±70ppm ~ ±200ppm , control Voltage range : 0.5V ~ 4.5V ; control voltage center : ± 2.5 V
[6]	Pulling Range Code	" M " stands for maximum ; " N " stands for minimum ; " T " stands for typical (tolerance is ± 20%)	
[7]	Center Frequency in MHz		
[8]	Output power in dBm (HS series only)		

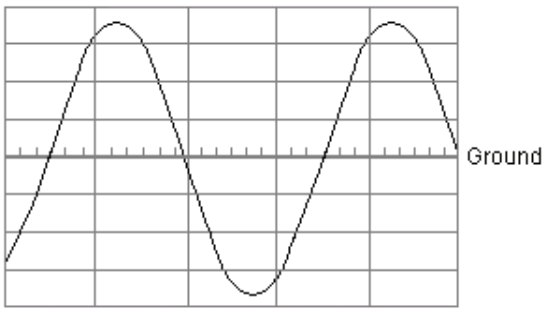
" **GS** " series : 50 Ω Load Test Circuit :



" **GSR** " series : 10 KΩ // 10 pF Load Test Circuit :



Output Wave Form

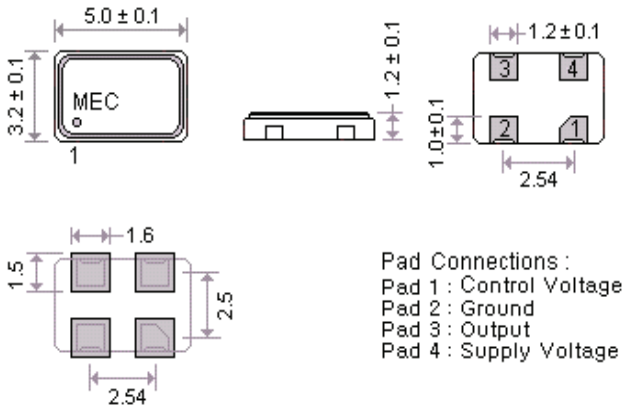


VCXO

Voltage Controlled Clock Oscillators [(GS series) / (GSR series)]

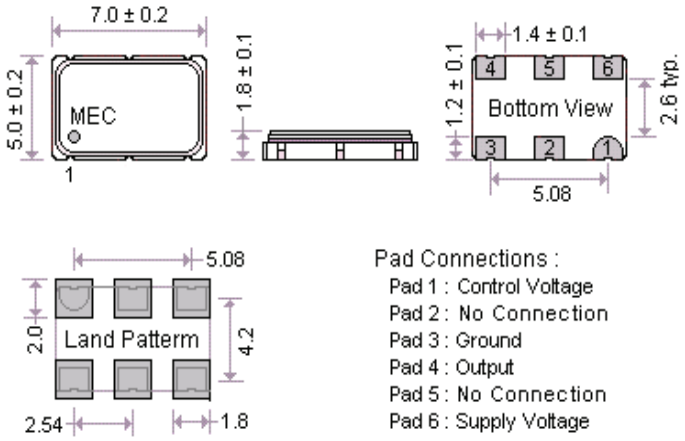
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs

[GSR53]



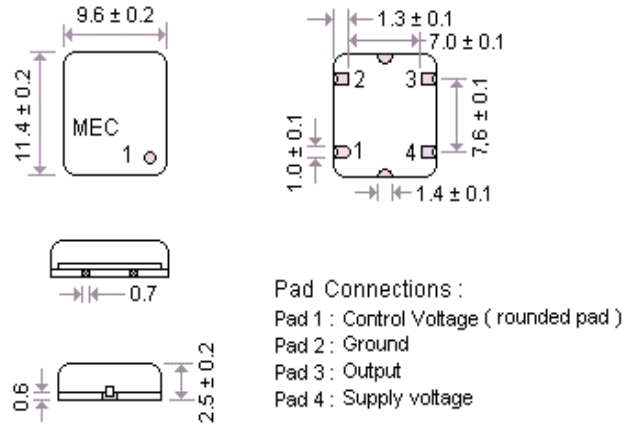
Pad Connections :
Pad 1 : Control Voltage
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply Voltage

[GSR57]



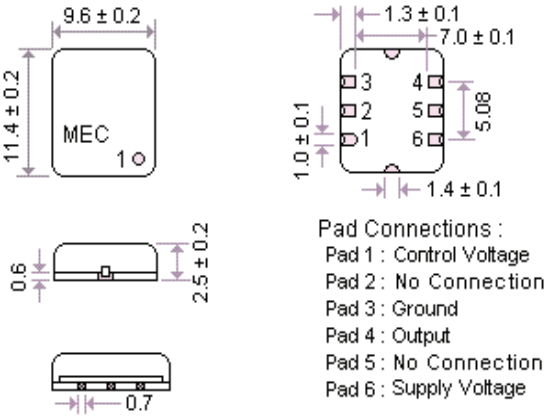
Pad Connections :
Pad 1 : Control Voltage
Pad 2 : No Connection
Pad 3 : Ground
Pad 4 : Output
Pad 5 : No Connection
Pad 6 : Supply Voltage

[GSR42]



Pad Connections :
Pad 1 : Control Voltage (rounded pad)
Pad 2 : Ground
Pad 3 : Output
Pad 4 : Supply voltage

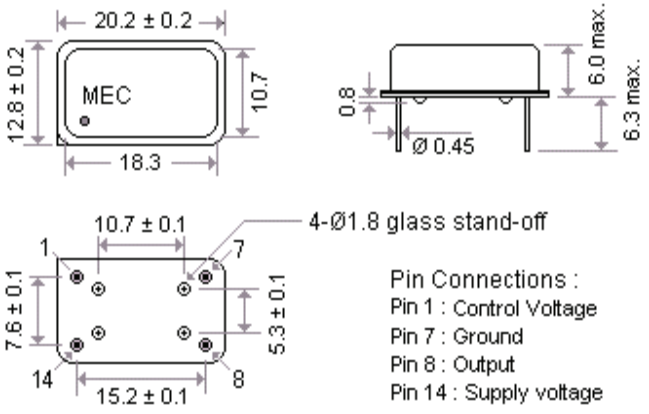
[GSR62]



Pad Connections :
Pad 1 : Control Voltage
Pad 2 : No Connection
Pad 3 : Ground
Pad 4 : Output
Pad 5 : No Connection
Pad 6 : Supply Voltage

[GS14] , [GSR14]

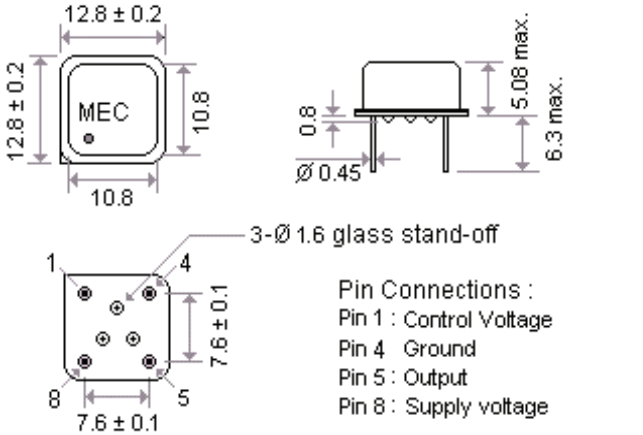
Gull - wing SMD is also available .



Pin Connections :
Pin 1 : Control Voltage
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[GSR8]

Gull - wing SMD is also available .



Pin Connections :
Pin 1 : Control Voltage
Pin 4 Ground
Pin 5 : Output
Pin 8 : Supply voltage

Temperature Compensated Crystal Oscillators

Output wave form : Clipped Sine " **S** " [" TCXO , **M _ _ S** " and " VCTCXO , **VM _ _ S** "]

Product Summary :

Product Selection Guide

TCXO	VCTCXO	Available Freq. Range	RoHS Compliant Equivalent Model		Package Description	
● Thru - hole Types						
M38S _	VM38S _	9.6 ~ 40.000 MHz	M38GS_	VM38GS_	Dip Type	4 pins for VCTCXOs 3 pins for TCXOs
M39S _	VM39S _	9.6 ~ 40.000 MHz	M39GS_	VM39GS_	Dip Type	4 pins for VCTCXOs 3 pins for TCXOs
M14S _	VM14S _	9.6 ~ 40.000 MHz	M14GS_	VM14GS_	Dip Type (4 pins) , Hermetically Sealed	
M15S _	VM15S _	9.6 ~ 40.000 MHz	M15GS_	VM15GS_	Dip Type (4 pins) , With Trimmer	
M8S _	VM8S _	10.0 ~ 40.000 MHz	M8GS_	VM8GS_	Dip Type (4 pins) , Half size , Hermetically Sealed	
● Gull Wing Surface Mount Types						
M47S _	VM47S _	9.6 ~ 27.000 MHz	M47GS_	VM47GS_	Gull Wing SMD Type (4 pins) ,	
M24S _	VM24S _	9.6 ~ 27.000 MHz	M24GS_	VM24GS_	Gull Wing SMD Type (4 pins) , Hermetically Sealed	
M25S _	VM25S _	9.6 ~ 27.000 MHz	M25GS_	VM25GS_	Gull Wing SMD Type (4 pins) , With Trimmer	
M28S _	VM28S _	10.0 ~ 27.000 MHz	M28GS_	VM28GS_	Gull Wing SMD Type (4 pins) , Half size , Hermetically Sealed no trimmer access .	
● Leadless Surface Mount Types						
M62S _	VM62S _	10.0 ~ 40.000 MHz	M62GS_	VM62GS _	6 pad FR4 substrate SMD . (Height : 2.5 mm)	
M42S _	VM42S _	10.0 ~ 40.000 MHz	M42GS_	VM42GS_	4 pad FR4 substrate SMD. (Height : 2.5 mm)	
M64S _	VM64S _	10.0 ~ 40.000 MHz	M64GS_	VM64GS_	6 pad FR4 substrate SMD. (Height : 4.7 mm)	
M44S _	VM44S _	10.0 ~ 40.000 MHz	M44GS_	VM44GS_	4 pad FR4 substrate SMD. (Height : 4.7 mm)	
M57S _	VM57S _	10.0 ~ 27.000 MHz	Same (1)		4 pad ceramic substrate SMD. (7.0 * 5.0 * 1.9 mm)	
M53S _	VM53S _	10.0 ~ 27.000 MHz	Same (1)		4 pad ceramic substrate SMD. (5.0 * 3.2 * 1.5 mm)	
M32S _	VM32S _	16.0 ~ 40.000 MHz	Same (1)		4 pad ceramic substrate SMD. (2.5 * 3.2 * 1.1 mm)	

" _ " is voltage code. Please see the table on next page.

For RoHS equivalent model please add "G" after the package code. For example: M14GS3 is RoHS equivalent model of M14S3 .

Note: Frequency tuning by the built-in mechanical trimmer is standard for all models except for (V)M57S, (V)M53S and (V)M32S.

Product Options :

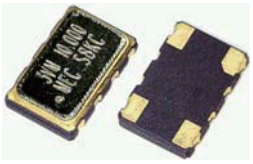
● No mechanical trimmer models are available to allow for aqueous washing cycles . To order such option

Please add " 1 " after the package code . For example : M421 is M42 without mechanical trimmer .

Note: Non-hermetically sealed (VC)TCXO products are not subject to the washing cycles as the solvent will degrade the trimmer capacitor . If cleaning is mandatory please choose hermetically sealed packages or no-trimmer option.

Temperature Compensated Crystal Oscillators

Clipped Sine Wave ; Wave form code " **S** " [**VM_ _S** (VCTCXO) ; **M__S** (TCXO)]



RoHS Compliance

General Specifications[TA = +25°C , V_{DD}= at specified voltage , Load : 10K ohms//10 pF]

Frequency Range		**9.6 MHz ~ 40.0 MHz.**	V_{DD} = 5.0V [10 ~ 26 MHz]					
			V_{DD} = 2.8V [10 ~ 40 MHz]					
Output Wave Form		Clipped Sine wave . Wave form code is " *S* "						
Standard Frequency (Partial list) [MHz]		10.000	12.800	13.000	14.400	14.7456	15.360	16.367667
		16.384	19.200	19.440	20.000	25.000	26.000	27.000
Initial Calibration Tolerance		< ±1 ppm. At +25°C ±2°C for models with trimmer .						
		< ±2 ppm. At +25°C ±2°C for models without trimmer .						
Frequency Stability (ppm)		± 0.5 ppm	± 1.0 ppm	± 1.5 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	○ : available △: please contact us × : 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	○	○	○	○	○	
	-40°C to 85°C	X	○	○	○	○	○	
Frequency Stability	vs Aging	±1 ppm / year max. at 25C						
	vs Voltage Change	±0.2 ppm max. , for a ±5% input voltage change .						
	vs Load Change	±0.2 ppm max. , for a ±10% load condition change .						
	vs Reflow (SMD type)	±1.0 ppm max. , 1 reflow and measured 24 hours afterwards .						
Output Voltage Level (peak to peak)		0.8 V p-p (min.)						
Input Voltage Range		+5.0V (Voltage code is " ***5*** ") , +3.0V (Voltage code is " ***3*** ") , +2.8V (Voltage code is " ***28*** ")						
Current Consumption. (max.)		9.6 ~ 15 MHz: 1.5 mA max.	15.01 ~ 26.0 MHz : 2.0 mA	26.01 ~ 40.0 MHz : 2.5 mA				
(MFC) by built-in trimmmer	Standard	± 3.0 ppm (min.) tuning						
		Note: (V)M57 , (V)M53 and (V)M32 models have no built-in mechanical trimmer.						
	Option	No mechanical trimmer built -in (for aqueous washing cycles).						
		To order please add " ***1*** " after the regular model prefix . Example: M381.						
Electrical Frequency Tuning (EFC) by external control voltage	Control Voltage Center	Standard: +1.5 V ± 1.0 V for all Input voltages.						
	Frequency Deviation Range	± 5.0 ppm (min.) , Vcontrol = +1.5 V±1.0 V						
	Slope Polarity (Transfer Function)	Positive slope. Positive voltage for positive frequency shift.						
	Input Impedance	1.0 MΩ min.						
	Modulation Bandwidth	3 KHz min. Measured at -3 dB , Vcontrol = +1.5 V_{DC}						
	Linearity	10 % max.						
Start-Up Time.		2.0 m sec. (typ.) , 5.0 m sec. (max.) (reach 90% amplitude and at +25°C ± 2°C)						
Output Load		10 KΩ // 10 pF ± 10%						
Output Format		DC block, AC coupled. Except (V) M53 and (V) M32 model.						
Phase Noise (13.0 MHz as example) [dBc/Hz ; typical]		10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
		-80	-115	-135	-148	-148		
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 .

Temperature Compensated Crystal Oscillators

Output wave form : CMOS " **T** " [" TCXO , **M _ _ T** " and " VCTCXO , **VM _ _ T** "] - - - 20.0 KHz ~ 50.0 KHz ; 1.25 MHz ~ 800 MHz

Output wave form : PECL " **P** " [" TCXO , **M _ _ P** " and " VCTCXO , **VM _ _ P** "] - - - 10.0 MHz ~ 800 MHz

Output wave form : LVDS " **D** " [" TCXO , **M _ _ D** " and " VCTCXO , **VM _ _ D** "] - - - 10.0 MHz ~ 800 MHz

Product Selection Guide

TCXO	VCTCXO	Available Freq. Range	RoHS Compliant Equivalent Model		Package Description
CMOS output wave , " **T** " series					
● Thru - Hold Types					
M_38T _	VM_38T _	KHz range: 20.0 KHz ~ 50.0 KHz MHz Range: 1.25 MHz to 800 MHz	M_38GT _	VM_38GT _	Dip Type (4 pins)
M_39T _	VM_39T _		M_39GT _	VM_39GT _	3 pin if TCXO. Package height = 7.3 mm
M_14T _	VM_14T _		M_14GT _	VM_14GT _	3 pin if TCXO. Package height = 4.7mm
M_15T _	VM_15T _		M_15GT _	VM_15GT _	Dip Type (4 pins) , With Trimmer
M_8T _	VM_8T _		M_8GT _	VM_8GT _	Dip Type (4 pins) , Half size , Hermetically Sealed
● Gull Wing Surface Mount Types					
M_47T _	VM_47T _	KHz range: 20.0 KHz ~ 50.0 KHz MHz Range: 1.25 MHz to 800 MHz	M_47GT _	VM_47GT _	Gull Wing Type (4 pins) ,
M_24T _	VM_24T _		M_24GT _	VM_24GT _	Gull Wing Type (4 pins) , Hermetically Sealed
M_25T _	VM_25T _		M_25GT _	VM_25GT _	Gull Wing Type (4 pins) , With Trimmer
M_28T _	VM_28T _		M_28GT _	VM_28GT _	Gull Wing Type (4 pins) , Half size , Hermetically Sealed
● Leadless Surface Mount Types					
M_62T _	VM_62T _	KHz range: 20.0 KHz ~ 50.0 KHz	M_62GT _	VM_62GT _	6 pad FR4 substrate . (9.6 x 11.4 x 2.5 mm)
M_42T _	VM_42T _		M_42GT _	VM_42GT _	4 pad FR4 substrate . (9.6 x 11.4 x 2.5 mm)
M_572T _	VM_572T _		Same (1)		4 pad ceramic substrate . (7.0 * 5.0 * 2.5 mm)
M_536T _	VM_536T _	1.0 ~ 200.0 MHz	Same (1)		4 pad ceramic substrate . (3.2 * 5.0 * 2.0 mm)
PECL Differential PECL Outout , " **P** " series					
● Leadless Surface Mount Types					
M_5762P _	VM_5762P _	19.440 ~ 800 MHz	Same (1)		6 pad ceramic substrate . (7.0 * 5.0 * 2.8 mm)
LVDS Differential LVDS Output , " **D** " series					
● Leadless Surface Mount Types					
M_5762D _	VM_5762D _	19.440 ~ 800 MHz	Same (1)		6 pad ceramic substrate . (7.0 * 5.0 * 2.8 mm)

" _ " is voltage code. Please see the table in next page.

For RoHS equivalent models please add "***G***" after the package code. For example: M14GT is RoHS equivalent of M14T .

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

Note: Frequency tuning by built-in mechanical trimmer is standard for all models except for (V)M57T,(V)M57P,(V)M57D .

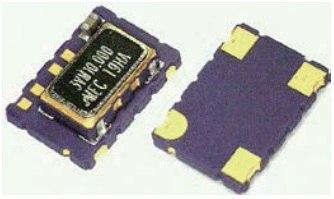
Note: Non-hermetically sealed (VC)TCXO products are not subject to the washing cycles as the solvent will degrade the trimmer capacitor .

If cleaning is mandatory please choose hermetically sealed packages or no-trimmer option.

TCXO	VCTCXO	KHz range	CMOS	Thru-Hole	SMD	15pF	3.3V	5.0V	32.768 KHz	Min.	Max.
M _ T	VM _ T									20.0 KHz	52.7 KHz

Features

- Wide frequency range : [32.768 KHz] , [20.0 KHz ~ 50.0 KHz]
- Frequency stability as tight as ± 0.5 ppm over 0°C to 50°C
  Frequency stability as tight as ± 1.0 ppm over -40°C to 85°C



RoHS Compliance

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

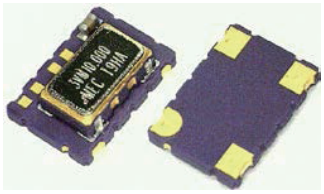
Frequency Range			**20.0 KHz ~ 52.7 KHz ; 32.768 KHz [From KHz with divider. mA current consumption.]**					
Output Wave Form			Square wave. Wave form code is " **T** "					
Initial Calibration Tolerance			Models with mechanical trimmer : < ±1.0 ppm. +25°C ±2°C. Models without mechanical trimmer : < ±2.0 ppm at +25°C ±2°C.					
Standard Frequency (Partial list)			32.768 KHz					
Frequency Stability (ppm)			± 0.5 ppm	± 1.0 ppm	± 1.5 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm
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	○	○	○	○	○
		-40°C to 85°C	X	○	○	○	○	○
○ : available △: please contact us X : not available								
Frequency Stability	vs Aging		± 1.0 ppm max., per year at 25°C .					
	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 .					
Output Logic			CMOS					
Mechanical Frequency Tuning		Standard	± 3.0 ppm (min.) tuning					
			Note: (V)M57 has no mechanical trimmer built -in.					
		Option	No mechanical trimmer built-in (for aqueous washing cycles).					
			To order please add " 1 " after the regular model prefix . Example: M381					
Input Voltage Range		Standard	+3.3 V (voltage code is " 33 ")			+5.0 V (voltage code is " 5 ")		
Output Logic Levels		Logic High " 1 "	90% of V_{DD} min.					
		Logic Low " 0 "	10% of V_{DD} max.					
Rise and Fall Time			10.0 n sec. max. Measured at 20% ↔ 80% of the wave form					
Current Consumption. (max.) (Over operating temperature range .)			8.0 mA (max.) for 32.768 KHz at +3.3V 12.0 mA (max.) for 50.0 KHz at +3.3V					
Rise and Fall Time			10.0 n sec. max. Measured at 20% ↔ 80% of the wave form					
Electrical Frequency Tuning (EFC) by external control voltage		Control Voltage Center	Standard: +1.5 V ± 1.0 V for all input voltages.					
		Frequency Deviation Range	± 5.0 ppm. (min..) with Vcon = +1.5 V±1.0 V					
		Slope Polarity (Transfer Function)	Positive slope. Positive voltage for positive frequency shift.					
		Input Impedance	10 KΩ min.					
		Modulation Bandwidth	3 KHz min. Measured at -3 dB, Vcontrol=+1.5 V_{DC}.					
		Linearity	10 % max.					
Duty Cycle			50 % ± 5 %					
Start-Up Time.			10.0m sec. (typ.) , 5.0m sec. (max.) (reach 90% amplitude and at+25°C±2°C)					
Output Load			15 pF					
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 **M _ T** | VCTCXO **VM _ T** | MHz range | CMOS | Thru-Hole | SMD | 15pF | 3.3V | 5.0V | Min. 1.25 MHz | Max. 156 MHz

Features

- Wide frequency range : [1.25 MHz ~ 156.0 MHz]
- Frequency stability as tight as ± 0.5 ppm over 0°C to 50°C
  Frequency stability as tight as ± 1.0 ppm over -40°C to 85°C



RoHS Compliance

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

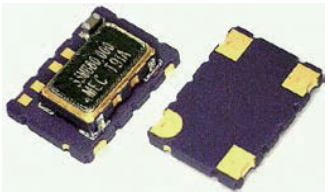
Frequency Range		**1.25 MHz ~ 156.0 MHz**							
Output Wave Form		Square wave. Wave form code is " **T** "							
Initial Calibration Tolerance		Models with mechanical trimmer : < ±1.0 ppm. +25°C ±2°C. Models without mechanical trimmer : ±2.0 ppm at +25°C ±2°C.							
Standard Frequency (Partial list) [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	38.880	40.000	54.000	77.760	125.000	155.520
Frequency Stability (ppm)		± 0.5 ppm	± 1.0 ppm	± 1.5 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	○ : available	△ : please 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	○	○	○	○	○			
	-40°C to 85°C	X	○	○	○	○	○			
Frequency Stability	vs Aging	± 1.0 ppm max., per year at 25°C .								
	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 .								
Output Voltage Level (peak to peak)		T T L / CMOS								
Mechanical Frequency Tuning	Standard	± 3.0ppm (min.) tuning Note: VM57 has no mechanical trimmer built-in.								
	Option	No mechanical trimmer built-in (for aqueous washing cycles). To order please add " 1 " after the regular model prefix . Example: M381T.								
Input Voltage Range	Standard	+2.8 V (voltage code is " 28 ")		+3.0 V (voltage code is " 3 ")		+3.3 V (voltage code is " 33 ")		+5.0 V (voltage code is " 5 ")		
Current Consumption. (typical) (Over operating temperature range .)		2 mA @ 8.192 MHz		2 mA @ 8.192 MHz				5 mA @ 8.192 MHz		
		3 mA @ 10.0 MHz		4 mA @ 10.0 MHz				7 mA @ 10.0 MHz		
		14 mA @ 77.760 MHz		17 mA @ 77.760 MHz				32 mA @ 77.760 MHz		
		26 mA @ 155.520 MHz		35 mA @ 155.520 MHz				50 mA @ 155.520 MHz		
Output Logic Levels	Logic High " 1 "	90% of V_{DD} min.								
	Logic Low " 0 "	10% of V_{DD} max.								
Electrical Frequency Tuning (EFC) by external control voltage	Control Voltage Center	Standard: +1.5 V ± 1.0 V for all input voltages.								
	Frequency Deviation Range	± 5.0 ppm. (min.) with Vcon = +1.5 V±1.0 V								
	Slope Polarity (Transfer Function)	Positive slope. Positive voltage for positive frequency shift.								
	Input Impedance	50K Ω min.								
	Modulation Bandwidth	20 KHz min.								
	Linearity	±10 % max.								
Rise Time and fall time		10.0 n sec. max.. ; 20% ↔ 80% of the wave form.								
Duty Cycle		Standard: 50 % ± 10 % ; Option: 50 % ± 5 % ; Measured at 50% V_{DD}.								
Start-Up Time.		5.0 m sec. (typ.) , 10.0 m sec. (max.) (reach 90% amplitude and at+25°C ± 2°C)								
Output Load		15 pF								
SSB Phase Noise at 25°C , 15pF	Offset / dBc / Hz [typical]	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
	M572T33 - 77.760	-74 dBc / Hz		-105 dBc / Hz		-120 dBc / Hz		-124 dBc / Hz		-120 dBc / Hz
	M572T33 - 155.520	-68 dBc / Hz		-96 dBc / Hz		-110 dBc / Hz		-117 dBc / Hz		-112 dBc / Hz
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	VCTCXO								
MB _ T	VMB _ T	Short lead time. Custom Freqencies.	CMOS	SMD	15pF	2.8V	3.3V	5.0V	Min. 1.0 MHz / Max. 200 MHz

Features

- Quick Turn , Short Lead time . From 1 day to 1 week .
- Low Jitter . Peak - to - peak period jitter is 70 ps (typical) .
- Low phase noise : -114 dbc / Hz at 1KHz offset (133.0 MHz) .
- Custom frequencies can easily be configued .
- 2.8V , 3.0V or 3.3V supply voltages
- TCXOs or VCTCXOs CMOS square wave output .

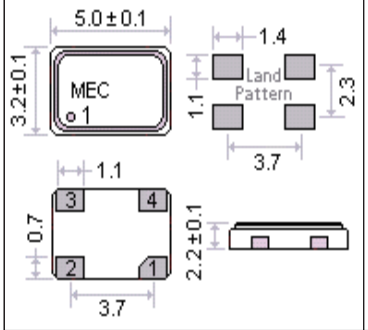
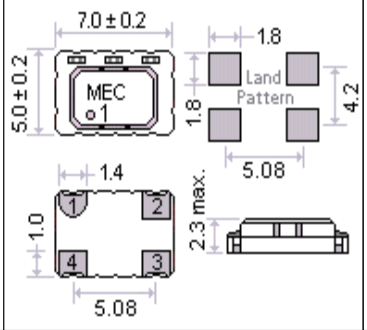
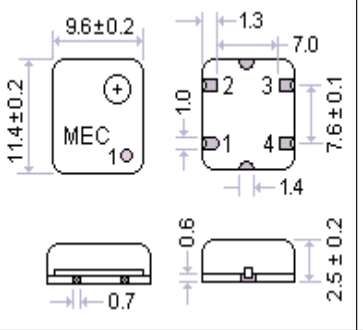
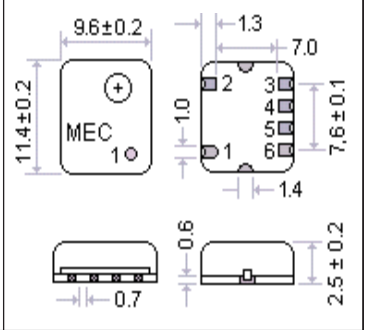


RoHS Compliance

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

Available Frequency Range			**1.0 ~ 200.0 MHz ; Custom frequencies**					
Output Wave Form			Square wave [LVCMOS]. Wave form code is " **T** "					
Supply Voltage V_{DD}			+ 2.8 V_{DD} ± 5 %	+ 3.0 V_{DD} ± 5 %		+ 3.3 V_{DD} ± 5 %		
Initial Calibration Tolerance			Models with mechanical trimmer : < ±1.0 ppm. +25°C ±2°C. 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
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	○	○	○	○	○
		-40°C to 85°C	X	○	○	○	○	○
Frequency Stability	vs Aging		± 1.0 ppm max., per year at 25°C .					
	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 .					
Mechanical Frequency Tuning	Standard		± 3.0 ppm (min.) tuning Note: VM57 has no mechanical trimmer built-in.					
	Option		No mechanical trimmer built-in (for aqueous washing cycles). To order please add " 1 " after the regular model prefix . Example: M381T.					
Current Consumption [15 pF]	Supply Current		8.0 mA max [25 MHz at +25 °C] ; 20.0 mA max [200 MHz at +25 °C]					
Output Logic Levels	Logic High " 1 "		90% of V_{DD} min.					
	Logic Low " 0 "		10% of V_{DD} max.					
Electrical Frequency Tuning (EFC) by external control voltage	Control Voltage Center		Standard: +1.5 V ± 1.0 V for all input voltages.					
	Frequency Deviation Range		± 5.0 ppm. (min.) with Vcon = +1.5 V±1.0 V					
	Slope Polarity (Transfer Function)		Positive slope. Positive voltage for positive frequency shift.					
	Input Impedance		50K Ω min.					
	Modulation Bandwidth		20 KHz min.					
	Linearity		±10 % max.					
Rise Time and fall time			10.0 n sec. max.. ; 20% ↔ 80% of the wave form.					
Duty Cycle			Standard: 50 % ± 10 % ; Option: 50 % ± 5 % ; Measured at 50% V_{DD}.					
Start-Up Time.			5.0 m sec. (typ.) , 10.0 m sec. (max.) (reach 90% amplitude and at+25°C ± 2°C)					
Output Load			15 pF					
SSB Phase Noise at 25°C , 15pF [typical]	Offset		10 Hz	100 Hz	1 KHz	10 KHz	100 KHz	
	MB572T33 - 133.333		-76 dBc / Hz	-102 dBc / Hz	-114 dBc / Hz	-110 dBc / Hz	-100 dBc / Hz	
Storage Temperature			-40°C to +85°C or -55°C to +125°C (package dependent)					

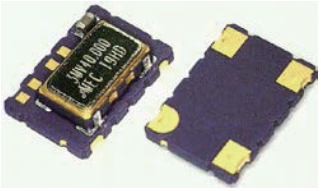
Note 1: Some specifications are package dependent. Please refer to the spec. sheet of individual packages once a package is selected .

(V) MB53		(V) MB572		(V) MB42		(V) MB62	
							
Pad 1	Do not connect for TCXO . Voltage control for VCTCXO .	Pad 1	Do not connect for TCXO . Voltage control for VCTCXO .	Pad 1	Do not connect for TCXO . Voltage control for VCTCXO .	Pad 1 , 2 , 4	Ground
Pad 2	Ground	Pad 2	Ground	Pad 2	Ground	Pad 3	Output
Pad 3	Output	Pad 3	Output	Pad 3	Output	Pad 5	Do not connect for TCXO . Voltage control for VCTCXO .
Pad 4	Supply Voltage	Pad 4	Supply Voltage	Pad 4	Supply Voltage	Pad 6	Supply Voltage

TCXO **MV _ T** | VCTCXO **VMV _ T** | **Low Cost . High Frequency .** | **CMOS** | **Thru-Hole** | **SMD** | **15pF** | **3.3V** | Min. **27.0 MHz** | Max. **200 MHz**

Features

- Wide frequency range : [27.0 MHz ~ 200.0 MHz]
- Frequency stability as tight as ± 0.5 ppm over 0°C to 50°C
  Frequency stability as tight as ± 1.0 ppm over -40°C to 85°C



RoHS Compliance

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

Frequency Range		**27.0 MHz ~ 200.0 MHz**						
Output Wave Form		Square wave. Wave form code is " **T** "						
Initial Calibration Tolerance		Models with mechanical trimmer: < ±1.0 ppm. +25°C ±2°C. Models without mechanical trimmer: < ±2.0 ppm at +25°C ±2°C.						
Standard Frequency (Partial list) [MHz]		30.000	32.768	38.880	40.000	50.000	54.000	64.000
		77.760	80.000	100.000	128.000	155.520	160.000	200.000
Frequency Stability (ppm)		± 0.5 ppm	± 1.0 ppm	± 1.5 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	○ : available △: please contact us × : 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	○	○	○	○	○	
	-40°C to 85°C	X	○	○	○	○	○	
Frequency Stability	vs Aging	± 1.0 ppm max., per year at 25°C .						
	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 .						
Mechanical Frequency Tuning		± 3.0 ppm (min.) tuning Note: VMV57 have no mechanical trimmer built -in.						
Input Voltage Range		+ 3.3 V (voltage code is " 33 ")						
Output Logic Levels	Logic High " 1 "	90% of V_{DD} min.						
	Logic Low " 0 "	10% of V_{DD} max..						
Rise Time and fall time		1.2 n sec. typical (0.3 V ↔ 3.0 V, 15 pF load)						
Electrical Frequency Tuning (EFC) by external control voltage	Control Voltage Center	Standard: +1.5 V ± 1.0 V for all input voltages.						
	Frequency Deviation Range	± 5.0 ppm. (min.) with Vcon = +1.5 V±1.0 V						
	Slope Polarity (Transfer Function)	Positive slope : Increasing control voltage (Vcon) increases output frequency .						
	Input Impedance	2 MΩ min.						
	Modulation Bandwidth	25 KHz min.						
	Linearity	10 % max.						
Current Consumption. (max.)		40 mA (max.) , Frequency dependent .						
Duty Cycle		50% ± 5% measured at 50% V_{DD}						
Start-Up Time.		5.0m sec. (typ.) , 10.0m sec. (max.) (reach 90% amplitude and at+25°C±2°C)						
Output Load		15 pF						
SSB Phase Noise [typical] at 25°C	Offset	10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
	MV572T33 - 77.760	-76 dBc / Hz	-105 dBc / Hz	-116 dBc / Hz	-120 dBc / Hz	-121 dBc / Hz		
	MV572T33 - 155.520	-65 dBc / Hz	-96 dBc / Hz	-110 dBc / Hz	-112 dBc / Hz	-115 dBc / Hz		
Storage Temperature		-55°C to +125°C						

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

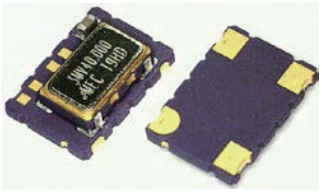
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

TCXO	VCTCXO	High Frequency .	CMOS	Thru-Hole	SMD	15pF	3.3V	Min.	Max.
MW _ T	VMW _ T	200 ~ 800 MHz						200 MHz	800 MHz

Features

- Wide frequency range : [200.01 MHz ~ 800.0 MHz]
- Frequency stability as tight as ± 0.5 ppm over 0°C to 50°C
  Frequency stability as tight as ± 1.0 ppm over -40°C to 85°C



RoHS Compliance

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

Frequency Range		**200.01 MHz ~ 800.0 MHz**						
Output Wave Form		Square wave. Wave form code is " T "						
Initial Calibration Tolerance		Models with mechanical trimmer: < ±1.0 ppm. +25°C ±2°C. Models without mechanical trimmer: < ±2.0 ppm at +25°C ±2°C.						
Standard Frequency (Partial list) [MHz]		200.000	204.8000	311.040	320.000	400.0000	409.600	622.080
Frequency Stability (ppm)		± 0.5 ppm	± 1.0 ppm	± 1.5 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	○ : available △: contact us × : not available
Frequency Stability vs Temperature (examples)	0°C to 50°C	○	○	○	○	○	○	
	-10°C to 60°C	△	○	○	○	○	○	
	-20°C to 70°C	×	○	○	○	○	○	
	-30°C to 75°C	×	○	○	○	○	○	
	-40°C to 85°C	×	○	○	○	○	○	
Frequency Stability	vs Aging	± 1.0 ppm max., per year at 25°C .						
	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 .						
Mechanical Frequency Tuning		± 3.0 ppm (min.) tuning Note: (V)MW57T has no mechanical trimmer built -in .						
Input Voltage Range		+3.3 V (voltage code is " 33 ")						
Output Logic Levels	Logic High " 1 "	90% of V_{DD} min.						
	Logic Low " 0 "	10% of V_{DD} max..						
Rise Time and fall time		1.2 n sec. typical (0.3 V ↔ 3.0 V, 15 pF load)						
Electrical Frequency Tuning (EFC) by external control voltage	Control Voltage Center	Standard: +1.5 V ± 1.0 V for all input voltages.						
	Frequency Deviation Range	± 5.0 ppm. (min.) with Vcon = +1.5 V±1.0 V						
	Slope Polarity (Transfer Function)	Positive slope : Increasing control voltage (Vcon) increases output frequency .						
	Input Impedance	2 MΩ min.						
	Modulation Bandwidth	25 KHz min.						
	Linearity	10 % max.						
Current Consumption. (max.)		65 mA (max.) , Frequency dependent .						
Duty Cycle		50% ± 5% measured at 50% V_{DD}						
Start-Up Time.		5.0m sec. (typ.) , 10.0m sec. (max.) (reach 90% amplitude and at+25°C±2°C)						
Output Load		15 pF						
SSB Phase Noise [typical] at 25°C	Offset	10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
	MW572T33 - 622.080	-50 dBc / Hz	-77 dBc / Hz	-102 dBc / Hz	-115 dBc / Hz	-108 dBc / Hz		
Storage Temperature		-55°C to +125°C						

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

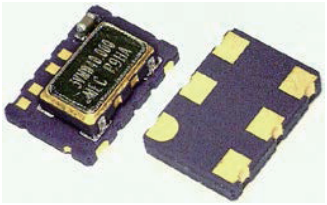
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

TCXO	VCTCXO							
MW _ P	VMW _ P	Low Cost . Wide Frequency Range.	PECL	Thru-Hole	SMD	15pF	3.3V	Min. 10 MHz / Max. 800 MHz

Features

- Wide frequency range : [10.0 MHz ~ 800.0 MHz]
- Low cost , low jitter , general purpose



RoHS Compliance

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

Frequency Range		**10.0 MHz ~ 800.0 MHz**						
Output Wave Form		Differential **PECL** square wave . Wave code is " P "						
Initial Calibration Tolerance		Models with mechanical trimmer: < ±2.0 ppm (+25°C ±2°C) .						
Standard Frequency (Partial list)		10.000	12.800	16.000	19.440	20.000	25.000	27.000
		30.000	32.000	32.768	38.880	40.000	50.000	54.000
		64.000	65.536	77.760	80.000	100.000	128.000	155.520
		160.000	200.000	204.800	311.040	320.000	409.600	622.080
Frequency Stability (ppm)		± 1.0 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	± 4.0 ppm	± 5.0 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	○	○	○	○	○	
	-40°C to 85°C	X	X	X	△	△	○	
Frequency Stability	vs Aging	± 1.0 ppm max., per year at 25°C .						
	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 .						
Mechanical Frequency Tuning		± 3.0 ppm (min.) tuning Note: (V)MW57P has no mechanical trimmer built-in .						
Input Voltage Range		+3.3 V (voltage code is " 33 ")						
Output Logic Levels	Logic High " 1 "	V_{OH} = 2.275 V(min.) , V_{DD} -1.025 V(min.) , Condition : RL = 50Ω to V_{DD}-2V						
	Logic Low " 0 "	V_{OL} = 1.680 V(max.) , V_{DD} -1.620 V (max.) , Condition : RL = 50Ω to V_{DD}-2V						
Rise Time and Fall Time		1.5 n sec. (max.) ; 20% ⟷ 80% of waveform .						
Current Consumption. (Measured with a PECL Thevenin equivalent load)		10 MHz≦fout≦25 MHz : 65 mA (max.) ; 25 MHz≦fout≦100 MHz : 85 mA (max.) 100 MHz≦fout≦800 MHz : 115 mA (max.)						
Duty Cycle		50% ± 5% measured at V_{DD}-1.3V						
Start-Up Time.		5.0m sec. (typ.) , 10.0m sec. (max.) (reach 90% amplitude and at+25°C±2°C)						
Output Load		50 Ω to V_{DD}-2.0 V						
Pad 1. Option VCTCXO only	Control Voltage Center , Range	+ 1.5 V ± 1.0V						
	Frequency Deviation Range	± 5.0 ppm (min.) with Vcon = +1.5 V±1.0 V						
	Linearity	6% typical ; 10% max.						
	Slope Polarity	Positive : Positive voltage for positive frequency shift						
Tri - State Function. on pad No. 2	No Connection	Differential PECL and compliantary PECL outputs .						
	Disable	Both outputs are disabled (high impedance) when pad No.2 is taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)						
	Enable	At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced to ground (threshold) ; Enable time : 10ns + one period of the output frequency (max.)						
SSB Phase Noise at 25°C [typical]	Offset	10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
	MW5762P33 - 155.520	-65 dBc / Hz	-95 dBc / Hz	-120 dBc / Hz	-125 dBc / Hz	-121 dBc / Hz		
	MW5762P33 - 622.080	-55 dBc / Hz	-85 dBc / Hz	-109 dBc / Hz	-115 dBc / Hz	-110 dBc / Hz		
Phase Jitter (RMS) (12 KHz to 20 MHz)		2.6 ps (typ.) , 4.0 ps (max.) for 155.520 MHz						
Period Jitter [typical]	Frequency Range	38.880 MHz	77.760 MHz	155.520 MHz	622.080 MHz			
	[RMS]	2.2 ps	3.5 ps	4.3 ps	5.0 ps			
	[Peak to peak]	17.0 ps	25.0 ps	27.0 ps	32.0 ps			
Storage Temperature		-55°C to +125°C						

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

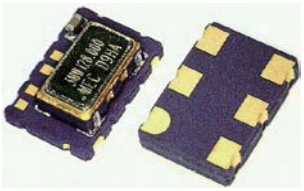
Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

TCXO	VCTCXO							
MW _ D	VMW _ D	Low Cost . Wide Frequency Range.	LVDS	Thru-Hole	SMD	15pF	3.3V	Min. 12 MHz	Max. 800 MHz

Features

- Wide frequency range : [12.0 MHz ~ 800.0 MHz]
- Low cost , Moderate jitter , Ideal for SONET , xDSL.



RoHS Compliance

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

Frequency Range			**12.0 MHz ~ 800.0 MHz**					
Output Wave Form			Differential ***LVDS*** square wave . Wave code is " D "					
Initial Calibration Tolerance			Models with mechanical trimmer: < ±2.0 ppm (+25°C ±2°C) .					
Standard Frequency (Partial list)			10.000	12.800	16.000	19.440	20.000	25.000	27.000
			30.000	32.000	32.768	38.880	40.000	50.000	54.000
			64.000	65.536	77.760	80.000	100.000	128.000	155.520
			160.000	200.000	311.040	320.000	409.600	622.080	800.000
Frequency Stability (ppm)			± 1.0 ppm	± 2.0 ppm	± 2.5 ppm	± 3.0 ppm	± 4.0 ppm	± 5.0 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	○	○	○	○	○	
		-40°C to 85°C	X	X	X	△	△	○	
Frequency Stability	vs Aging		± 1.0 ppm max., per year at 25°C .						
	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 .						
Mechanical Frequency Tuning			± 3.0 ppm (min.) tuning Note: VMW57D have no mechanical trimmer built-in .						
Input Voltage Range			+3.3 V (voltage code is " 33 ")						
Output Logic Levels	Logic High " 1 "		1.4 V typical ; 1.6 V min.						
	Logic Low " 0 "		0.9 V min. ; 1.1 V max.						
Output Differential Voltage, V_{OD}			247 mV min.; 355 mV typical ; 454 mV max. Output 1 - output 2						
Output Differential Error, dV_{OD}			-50 mV min ; 50 mV max.						
Output Offset Voltage, Vos			1.125 V min. ; 1.200 V typical ; 1.375 V max.						
Offset Magnitude Error, dVos			0 mV min. ; 3 mV typical ; 25 m V max.						
Rise Time and Fall Time			1.5 n sec. (max.) ; 20% ⟷ 80% of waveform .						
Current Consumption. (Measured with load)			24 MHz≦fout : 33 mA (max.) ; 24 MHz≦fout≦96 MHz : 50 mA (max.) 96 MHz≦fout≦700 MHz : 85 mA (max.)						
Duty Cycle			50% ± 5% measured at 1.25V						
Start-Up Time.			5.0m sec. (typ.) , 10.0m sec. (max.) (reach 90% amplitude and at+25°C±2°C)						
Output Load			50 Ω from each load						
Drive Capability			100 Ω between LVDS and complimentary LVDS output						
Pad 1. Option VCTCXO only	Control Voltage Center , Range		+ 1.5 V ± 1.0V						
	Frequency Deviation Range		± 5.0 ppm (min.) with Vcon = +1.5 V±1.0 V						
	Linearity		6% typical ; 10% max.						
	Slope Polarity		Positive : Positive voltage for positive frequency shift						
Tri - State Function. on pad No. 2	No Connection		Differential LVDS and compliantary LVDS outputs .						
	Disable		Both outputs are disabled (high impedance) when pad No.2 is taken below 0.45*Vcc referenced to ground (threshold) Oscillator is always On . Only buffer stage is disabled . Disable current : 50 uA max. (at 0.0V) , Disable time : 10 ns (max.)						
	Enable		At disabled mode , both outputs are enabled when Tri-state pad is taken above 0.45*Vcc referenced toground (threshold) ;Enable time : 10ns + one period of the output frequency (max.)						
SSB Phase Noise at 25°C (typical)	Offset		10 Hz	100 Hz	1 KHz	10 KHz	100 KHz		
	MW5762D33 - 100.000		-75 dBc / Hz	-104 dBc / Hz	-115 dBc / Hz	-120 dBc / Hz	-122 dBc / Hz		
	MW5762D33 - 622.080		-55 dBc / Hz	-85 dBc / Hz	-109 dBc / Hz	-115 dBc / Hz	-110 dBc / Hz		
Phase Jitter (RMS) (12 KHz to 20 MHz)			2.6 ps (typ.) 4.0 ps (max.) for 155.520 MHz						
Period Jitter [typical]	Frequency Range		38.880 MHz	77.760 MHz	155.520 MHz	622.080 MHz			
	[RMS]		2.5 ps	4.0 ps	5.0 ps	8.0 ps			
	[Peak to peak]		20.0 ps	32.0 ps	28.0 ps	45.0 ps			
Storage Temperature			-55°C to +125°C						

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

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

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

Clipped Sine " S " | CMOS " T " | PECL Differential " P " | LVDS Differential " D "

Part Number Format and Example

[1]	[2]	[3]	[4]		[5]		[6]	/	[7]
Holder Type	G	Output Wave	Supply Voltage	-	Center Frequency	-	Frequency Stability	/	Operating Temp. Range

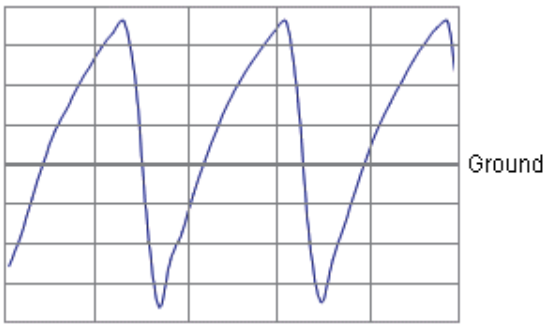
Examples	(1)	V M 38	G	T	5	-	10.000	-	1.5	/	**-20+70**
	(2)	M 57		S	3	-	20.000	-	2.5	/	**-30+75**

Ex (1) : VM38GT5 - 10.000 - 1.5 / -20+70 [VCTCXO , VM38 type , RoHS , CMOS output , 5.0V , 10.000MHz , ±1.5ppm from -20°C to 70°C]

Ex (2) : M57S3 - 20.000 - 2.5 / -30+75 [TCXO , M57 type , Clipped Sine W ave , 3.0V , 20.000MHz , ±2.5ppm from -30°C to 75°C]

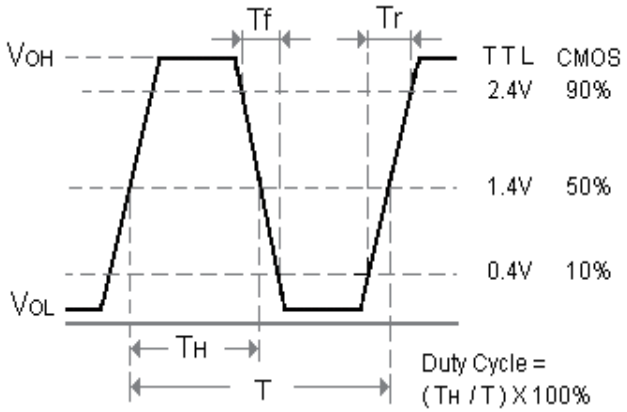
[1]	Holder Type
	" M " stands for TCXO , " VM " stands for VCTCXO
[2]	Please add "G " after the " type code " for RoHS compliant (Does not apply to (V)M32 , (V)M53 , (V)M536_ , (V)M57_ , (V)M576_)
[3]	" S " stands for Clipped Sine Wave ; " T " stands for Square Wave ; " D " stands for LVDS differential ; " P " stands for PECL differential
	ex 1 : M44T — TCXO , M44 pcakage , CMOS output ; ex 2 : VM38P — VCTCXO , VM38 package , PECL differential
[4]	Supply voltage , " 28 " stands for +2.8V ; " 3 " stands for +3.0V ; " 33 " stands for +3.3V ; " 5 " stands for +5.0V
[5]	Center Frequency in MHz
[6]	Frequency stability in ± _ ppm ; ex 1 : ± 2.5ppm — 2.5 , ex 2 : ± 1.0ppm — 1.0
[7]	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

Clipped Sine Wave , " S " series

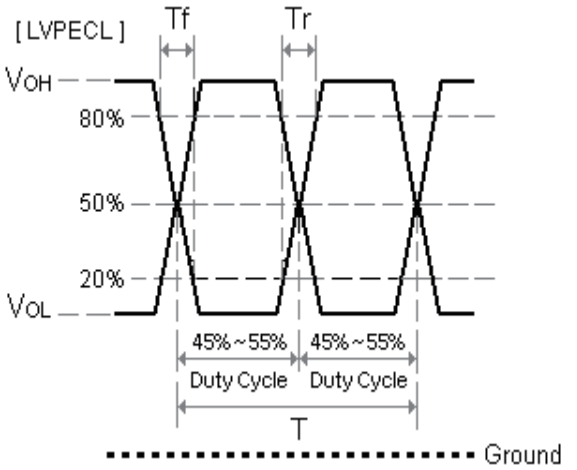


Exception : (V)53S , (V)32S have no DC-block at output

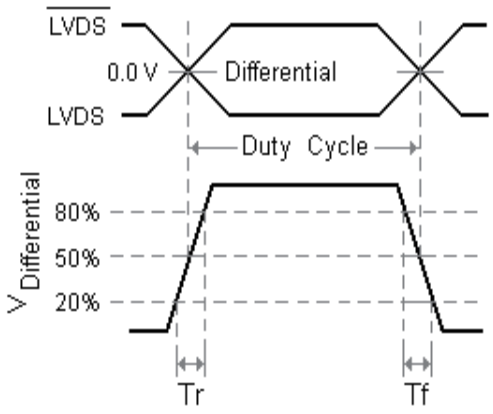
CMOS Output Wave , " T " series



PECL Square Wave Output Wave Form



LVDS Square Wave Output Wave Form

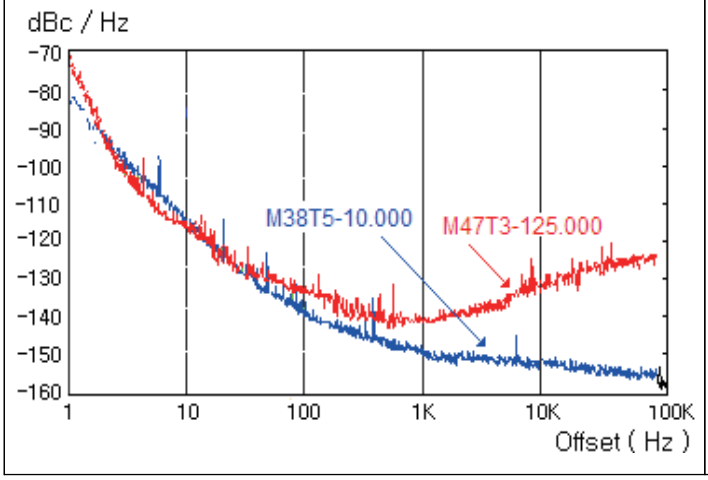


TCXOs VCTCXOs

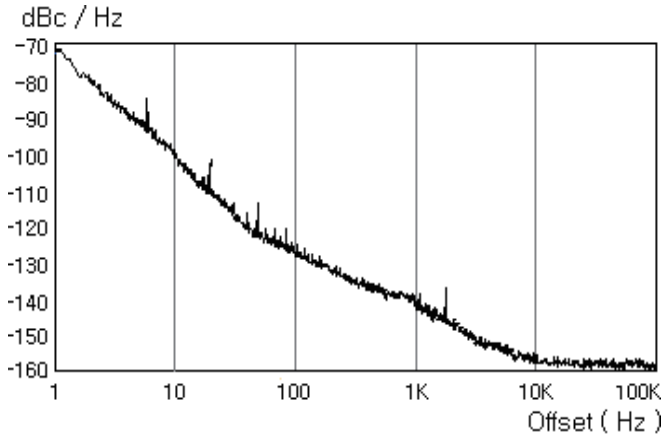
Temperature Compensated Crystal Oscillators [TCXO " **M** " and VCTCXO " **VM** "]

Clipped Sine " **S** " | CMOS " **T** " | PECL Differential " **P** " | LVDS Differential " **D** "

Square Wave Typical Phase Noise (M38T5 Series)

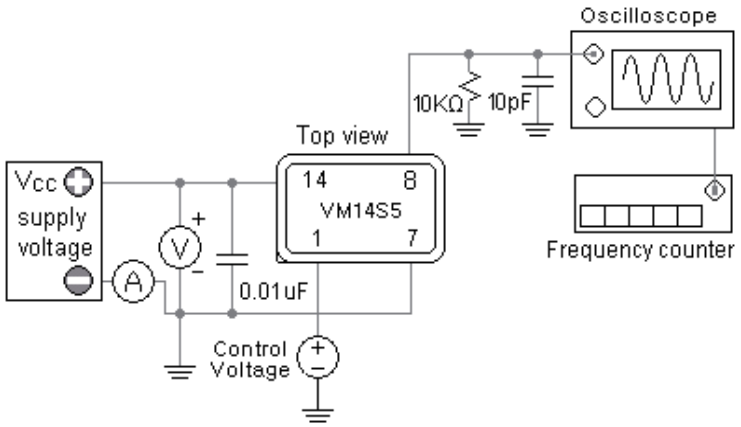


Clipped Sine Wave Typical Phase Noise (M38S5-10.000)

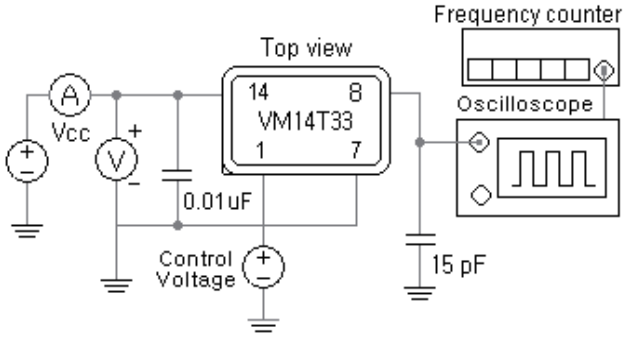


Test Circuits

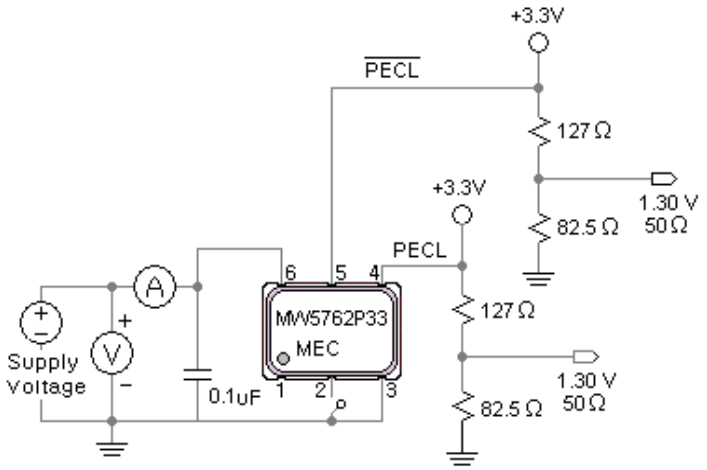
(VC)TCXO with **clipped sine** wave: Ex. VM14S5



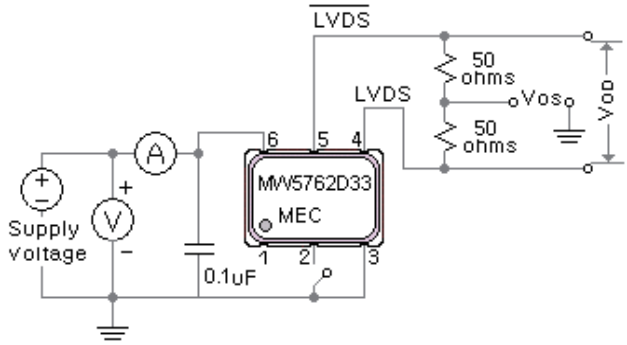
(VC)TCXO with **CMOS** square wave: Ex. VM14T33



(VC)TCXO with **PECL** output: Ex. VMW5762P33



(VC)TCXO with **LVDS** output: Ex. VMW5762D33

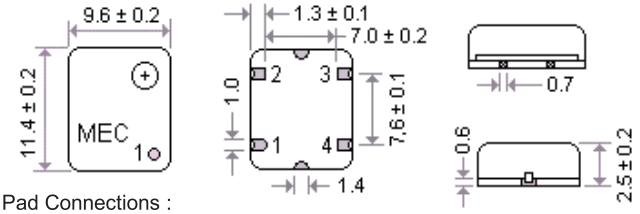


Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

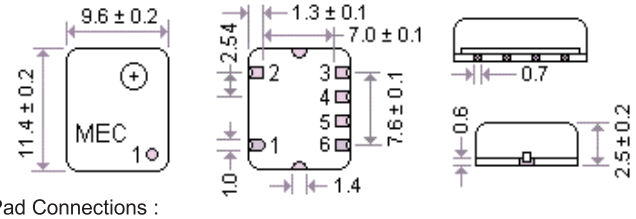
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 6 for product series selections .]

[(V) M_42 _ _]



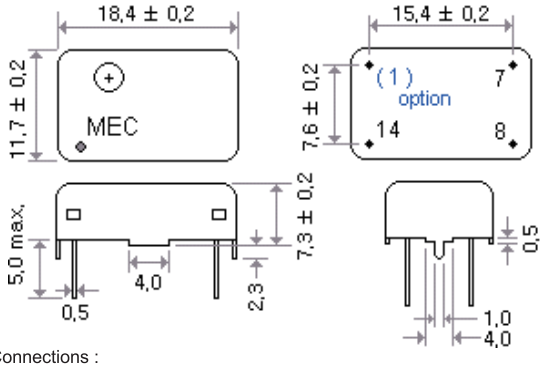
Pad Connections :
Pad 1 : Control voltage for VCTCXO. Make no connection if TCXO.
Pad 2 : Ground ; Pin 3 : Output , Pin 4 : Supply Voltage

[(V) M_62 _ _]



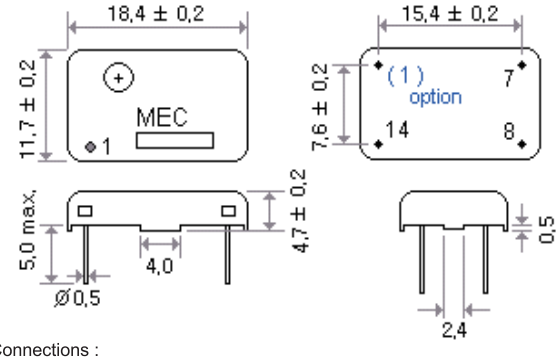
Pad Connections :
Pad 1 , 2 , 4 : Ground , Pad 3 : Output , Pad 6 : Supply Volyage
Pad 5 : Control voltage for VCTCXO. Make no connection if TCXO.

[(V) M38 _ _]



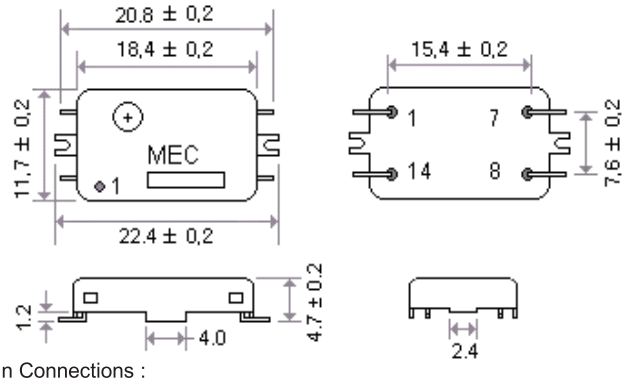
Pin Connections :
Pin 1 : Control Voltage for VCTCXO , No physical pin 1 for TCXO (3 pins only) .
Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[(V) M39 _ _]



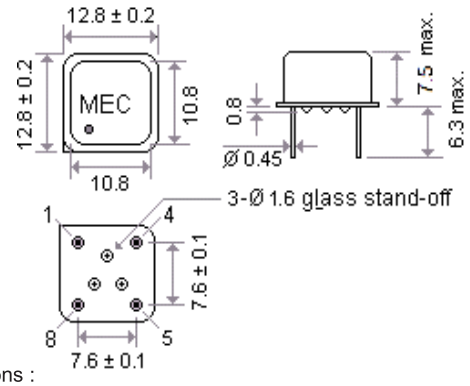
Pin Connections :
Pin 1 : Control voltage for VCTCXO [No physical pin 1 for TCXO. (3 pins only).]
Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[(V) M47 _ _]



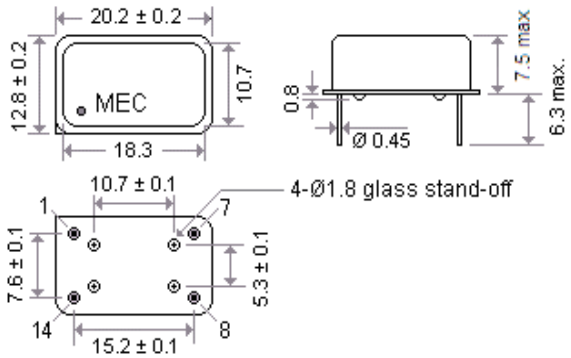
Pin Connections :
Pin 1 : Control voltage for VCTCXO , No connection for TCXO .
Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[(V) M8 _ _] - - - Gull - wing SMD is also available .



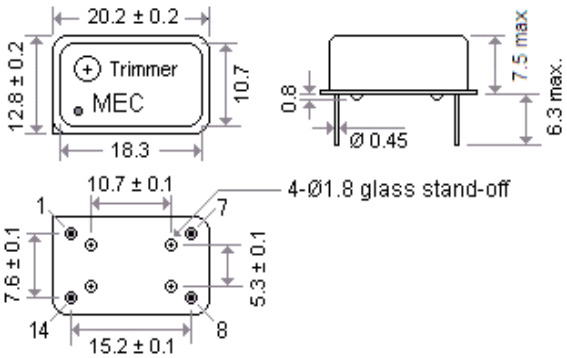
Pin Connections :
Pin 1 : Control voltage for VCTCXO ; No connection for TCXO.
Pin 4 : Ground ; Pin 5 : Output , Pin 8 : Supply Voltage

[(V) M14 _ _] - - - Gull - wing SMD is also available .



Pin Connections :
Pin 1 : Control voltage for VCTCXO , No connection for TCXO .
Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

[(V) M15 _ _] - - - Gull - wing SMD is also available .



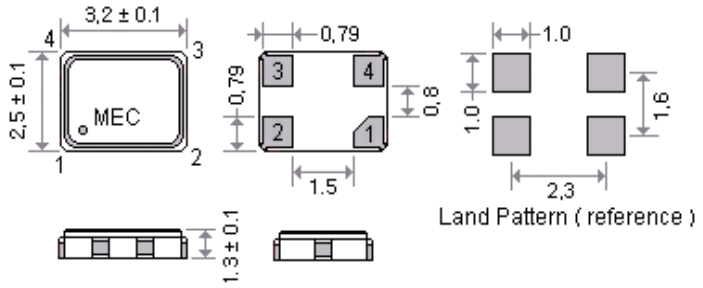
Pin Connections :
Pin 1 : Control voltage for VCTCXO , No connection for TCXO .
Pin 7 : Ground ; Pin 8 : Output , Pin 14 : Supply Voltage

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

Clipped Sine " S "	CMOS " T "	PECL Differential " P "	LVDS Differential " D "

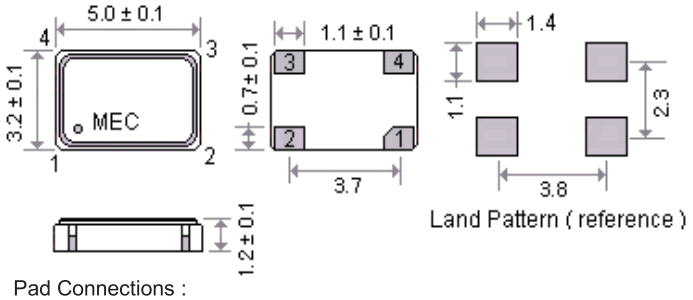
Outline Dimensions (Unit : mm) , Suggested pad Layout for SMDs [Please refer to page 6 for product series selections .]

[(V) M32S] - - - Clipped Sine wave



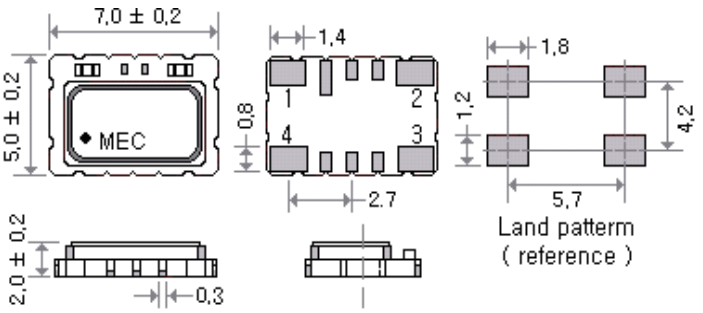
Pad Connections :
Pad 1 : Control voltage for VCTCXO ; Ground for TCXO .
Pad 2 : Ground ; Pin 3 : Output , Pin 4 : Supply Voltage

[(V) M53S] - - - Clipped Sine wave



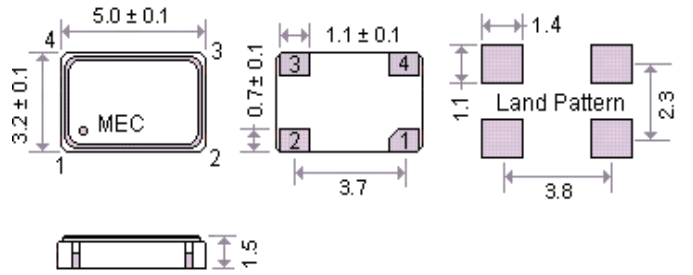
Pad Connections :
Pad 1 : Control voltage for VCTCXO ; Ground for TCXO .
Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

[(V) M57S] - - - Clipped Sine wave



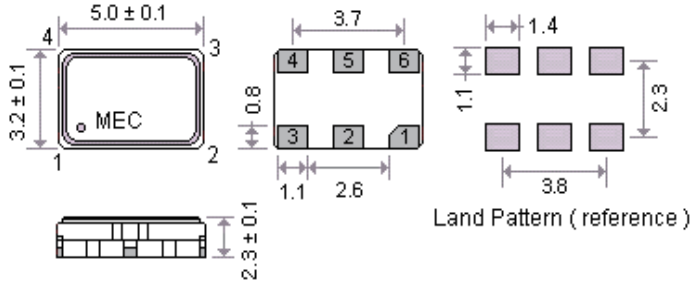
Pad Connections :
Pad 1 : Control voltage for VCTCXO ; Ground for TCXO .
Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

[(V) M_531T _] , [(V) M_53T _] - - - CMOS output



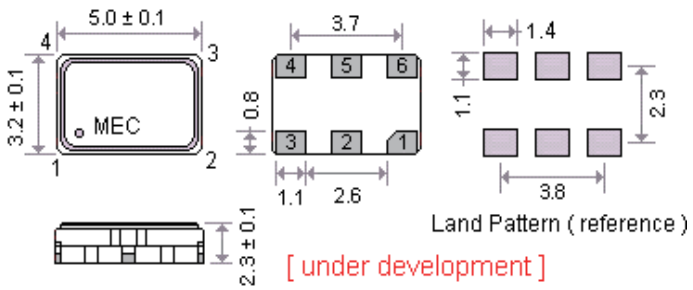
Pad Connections :
Pad 1 : Control voltage for VCTCXO. Make no connection if TCXO.
Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

[(V) M_536T _] - - - CMOS output



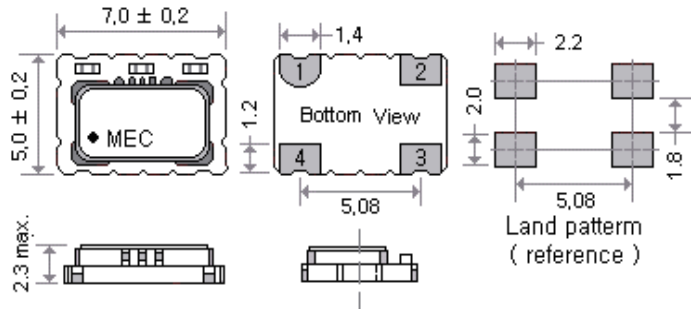
Pad Connections :
Pad 1 : Control voltage for VCTCXO. Make no connection if TCXO.
Pad 2 : N / C ; Pad 3 : Ground ; Pad 4 : Output
Pad 5 : N / C ; Pad 6 : Supply Voltage

[(V)M_536P for PECL] ; [(V)M_536D for LVDS]



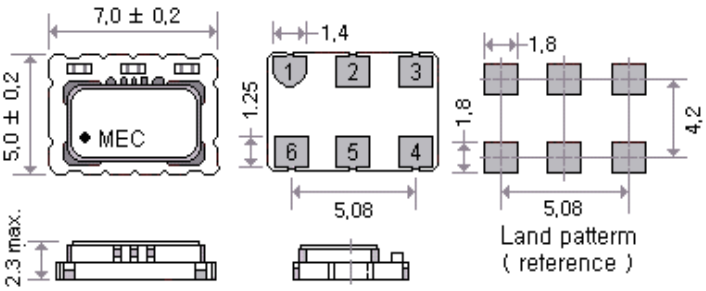
Pad Connections :
Pad 1 : Control voltage for VCTCXO. Make no connection if TCXO.
Pad 2 : Tri-state ; Pad 3 : Ground ; Pad 4 : PECL or LVDS output
Pad 5 : Complimentary PECL or LVDS Output ; Pad 6 : Supply Voltage

[(V) M_572T _] - - - CMOS output



Pad Connections :
Pad 1 : NC - - - TCXO ; Vcon - - - VCTCXO
Pad 2 : Ground ; Pad 3 : Output , Pad 4 : Supply Voltage

[(V)M5762P for PECL] ; [(V)M5762D for LVDS]



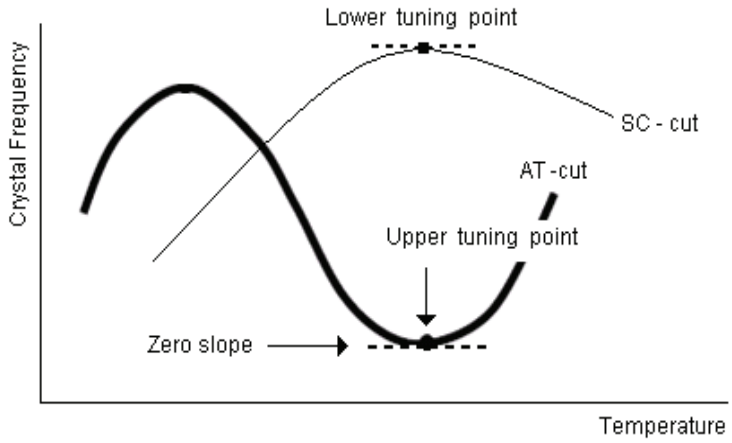
Pad Connections :
Pad 1 : Control voltage for VCTCXO. Do not make any connection for TCXO.
Pad 2 : Tri-state ; Pad 3 : Ground ; Pad 4 : PECL or LVDS output
Pad 5 :Complimentary PECL or LVDS Output ; Pad 6 : Supply Voltage

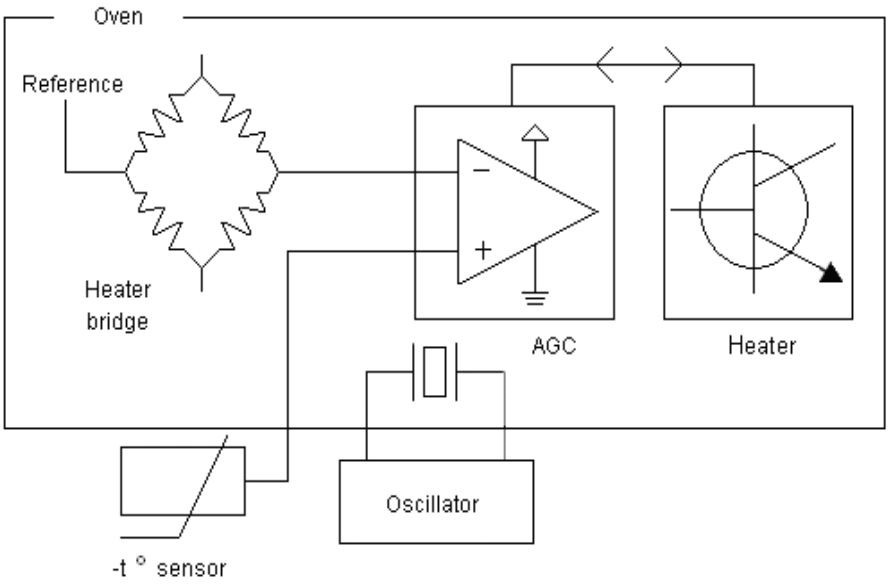
What is an OCXO ?

Relatively speaking , an OCXO perform in the ± 0.01 ~ ± 0.1ppm range , a TCXO performs in the ± 1.0 ~ ± 5.0ppm range while a non - compensated clock oscillator performs in the ±25 with ±50ppm range .

A TCXO relies upon on a resistor / capacitor compensation network to counter the crystal's temperature - dependent frequency behavior . An OCXO has a crystal that is " ovenized " . This means the crystal " sees " a constant temperature regardless of the ambient temperature condition . The oven consists of a proportional heater (power transistor) and an automatic gain control (AGC) circuit . Also , a thermister monitors the oven temperature and sends an offset signal to the AGC which then turns the power transistor on and off accordingly . Thermal gradient and heat loss are carefully controlled to minimize the set point fluctuation of the oven . The oven temperature is normally set near the upper tuning point (UPT) of the crystal's freq. - temp. curve . At the UPT , the slope is zero and ideally there is no frequency change if the crystal " sees " a constant temperature .

Applications for OCXOs include satellite radio beacons , Stratum 3 systems , PCS / GMS base stations , SONET clocks , frequency synthesizers and instrumentation .





" OCXO " [Oven Controlled Crystal Oscillators]

" OC_ _ T " series (Square Wave)

Product Selection Guide [CMOS output] , Wave form code " **T** "

" **OC14T** _ _ " series [Full / Size (20.3 * 13.2 * 10.5 mm) , 4 pins]									
" **OC24T** _ _ " series [Gull Wing SMD of Full / Size (20.3 * 13.2 * 12.0 mm) , 4 pins]									
Supply Voltage		+ 12 V			+ 5 V			+ 3.3 V		
Part No.	HCMOS models	(OC14T12A)			(OC14T5A)			(OC14T33A)		
	RoHS Equivalent	(OC14GT12A)			(OC14GT5A)			(OC14GT33A)		
Frequency Range		10.0 ~ 40.0 MHz			1.25 ~ 100.0 MHz			1.25 ~ 100.0 MHz		
(Only AT - cut)					40.0 MHz (max.) for RoHS models			40.0 MHz (max.) for RoHS models		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
Freq. Stability (typ.)		± 0.2 ppm	± 0.3 ppm	± 0.5 ppm	± 0.2 ppm	± 0.3 ppm	± 0.5 ppm	± 0.2 ppm	± 0.3 ppm	± 0.5 ppm
Freq. Stability (available)		± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.02 ppm	± 0.03 ppm	± 0.05 ppm	± 0.075 ppm	± 0.15 ppm	± 0.25 ppm

" **OC18T** _ _ " series [5 pins , (20.3 * 20.3 * 10.5 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		1.25 ~ 100.0 MHz			1.25 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT - cut)	Part No.	(OC18T12A)			(OC18T5A)		
	Freq. Stability	± 0.02 ppm	± 0.05 ppm	± 0.1 ppm	± 0.02 ppm	± 0.05 ppm	± 0.1 ppm
(SC - cut)	Part No.	(OC18T12S)			(OC18T5S)		
	Freq. Stability	± 0.01 ppm	± 0.01 ppm	± 0.03 ppm	± 0.01 ppm	± 0.01 ppm	± 0.03 ppm

" **OC11T** _ _ " series [5 pins , (25.4 * 25.4 * 16.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		1.25 ~ 100.0 MHz			1.25 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT - cut)	Part No.	(OC11T12A)			(OC11T5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(SC - cut)	Part No.	(OC11T12S)			(OC11T12S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC30T** _ _ " series [5 pins , (36.2 * 27.2 * 16.0 mm)]							
" **OC31T** _ _ " series [same package as OC30T _ _ except different pin configurations , Euro. Package]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		1.25 ~ 100.0 MHz			1.25 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT - cut)	Part No.	(OC30T12A)			(OC30T5A)		
	Freq. Stability	± 0.03 ppm	± 0.08 ppm	± 0.2 ppm	± 0.03 ppm	± 0.08 ppm	± 0.2 ppm
(SC - cut)	Part No.	(OC30T12S)			(OC30T5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC40T** _ _ " series [4 pins , (38.8 * 38.8 * 16.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		1.25 ~ 100.0 MHz			1.25 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT - cut)	Part No.	(OC40T12A)			(OC40T5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(SC - cut)	Part No.	(OC40T12S)			(OC40T5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC22T** _ _ " series [7 pins , (50.8 * 50.8 * 19.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		5.0 ~ 20.0 MHz			5.0 ~ 20.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT - cut)	Part No.	(OC22T12A)			(OC220T5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(SC - cut)	Part No.	(OC22T12S)			(OC22T5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" OCXO " [Oven Controlled Crystal Oscillators]

" OC_ _ E " series (True Sine Wave)

Product Selection Guide [True Sine output] , 50 ohm load true sine wave. Wave form code " **E** "

" **OC14E** _ _ " series [4 pins ,Full / Size (20.3 * 13.2 * 10.5 mm)]							
" **OC24E** _ _ " series [Gull Wing SMD of Full / Size (20.3 * 13.2 * 12.0 mm) , 4 pins]							
Supply Voltage		+ 12 V			+ 5.0 V		+ 3.3 V
Part No.	Sine Wave models	(OC14E12A)			(OC14T5A)		(OC1433A)
	RoHS Equivalent	(OC14GT12A)			(OC14GT5A)		(OC14GT33A)
Frequency Range		10.0 ~ 40.0 MHz			1.25 ~ 100.0 MHz		1.25 ~ 40.0 MHz
(AT - cut only)					40.0 MHz (max.) for RoHS models		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
Freq. Stability (typ.)		± 0.2 ppm	± 0.3 ppm	± 0.5 ppm	± 0.2 ppm	± 0.3 ppm	± 0.5 ppm
Freq. Stability (available)		± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.075 ppm	± 0.15 ppm	± 0.25 ppm

" **OC18E** _ _ " series [5 pins , (20.3 * 20.3 * 10.5 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		10.0 ~ 100.0 MHz			10.0 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT- cut)	Part No.	(OC18E12A)			(OC18E5A)		
	Freq. Stability	± 0.02 ppm	± 0.05 ppm	± 0.1 ppm	± 0.02 ppm	± 0.05 ppm	± 0.1 ppm
(ST- cut)	Part No.	(OC18E12S)			(OC18E5S)		
	Freq. Stability	± 0.01 ppm	± 0.01 ppm	± 0.03 ppm	± 0.01 ppm	± 0.01 ppm	± 0.03 ppm

" **OC11E** _ _ " series [5 pins , (25.4 * 25.4 * 16.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		10.0 ~ 100.0 MHz			10.0 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT- cut)	Part No.	(OC11E12A)			(OC11E5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(ST- cut)	Part No.	(OC11E12S)			(OC11E5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC30E** _ _ " series [5 pins , (36.2 * 27.2 * 16.0 mm)]							
" **OC31E** _ _ " series [same package as OC30T _ _ except different pin configurations , Euro. Package]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		10.0 ~ 100.0 MHz			10.0 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT- cut)	Part No.	(OC30E12A)			(OC30E5A)		
	Freq. Stability	± 0.03 ppm	± 0.08 ppm	± 0.2 ppm	± 0.03 ppm	± 0.08 ppm	± 0.2 ppm
(ST- cut)	Part No.	(OC30E12S)			(OC30E5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC40E** _ _ " series [4 pins , (38.8 * 38.8 * 16.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		10.0 ~ 100.0 MHz			10.0 ~ 100.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT- cut)	Part No.	(OC40E12A)			(OC40E5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(ST- cut)	Part No.	(OC40E12S)			(OC40E5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

" **OC22E** _ _ " series [7 pins , (50.8 * 50.8 * 19.0 mm)]							
Supply Voltage		+ 12 V			+ 5 V		
Frequency Range		5.0 ~ 20.0 MHz			5.0 ~ 20.0 MHz		
Operating Temp. Range		0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C	0 ~ +60°C	-20 ~ +70°C	-40 ~ +85°C
(AT- cut)	Part No.	(OC22E12A)			(OC220E5A)		
	Freq. Stability	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm	± 0.05 ppm	± 0.1 ppm	± 0.2 ppm
(ST- cut)	Part No.	(OC22E12S)			(OC22E5S)		
	Freq. Stability	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm	± 0.01 ppm	± 0.02 ppm	± 0.03 ppm

OC14T Square Wave | **OC14E** True Sine Wave | Best stability ±0.025 ppm | Voltage Control | Full Size | 12V | 5.0V | 3.3V | Min. 1.25 MHz | Max. 100 MHz

Applications

- For high stability applications inlcuding Stratum 3 requiring low jitter and an overall frequency tolerance of <±0.6ppm over 15 years.
- Full Size 4 pin dip full metal package
- +12.0V , +5.0V , +3.3V Supply Voltages
- AT - cut crystal
- Voltage control (Electronic Frequency Tuning) is standard .

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

Type of Crystal Cut Used			AT - cut , use " A " for crystal code .								
Output Wave From			Square wave. Wave form code is " T "						True Sine Wavee. Wave form code is " E "		
Supply Voltage			+12V		+5.0 V		+3.3 V		+12V		+5 V
Supply Voltage range , " Voltage code "			+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+3.3V ± 0.15V , " 33 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "
Frequency Range			1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		10.0 ~ 100.0 MHz		1.25 ~ 100.0 MHz
Initial Calibration Tolerance			± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)
			Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +1.65 V		Vcon = +2.5 V		Vcon = +2.5 V
Frequency Stability	vs Temperature (ppm)		typical	available	typical	available	typical	available	typical	available	typical	available
	0 ~ 60 °C		± 0.2	± 0.05	± 0.2	± 0.025	± 0.2	± 0.075	± 0.2	± 0.05	± 0.2	± 0.075
	-20 ~ 70°C		± 0.3	± 0.1	± 0.3	± 0.05	± 0.3	± 0.15	± 0.3	± 0.1	± 0.3	± 0.15
	-40 ~ 85°C		± 0.5	± 0.2	± 0.5	± 0.1	± 0.5	± 0.25	± 0.5	± 0.2	± 0.5	± 0.25
	vs Voltage Change		(±0.5V) < ± 0.1ppm		(±0.2V) < ± 0.1ppm		(±0.15V) < ± 0.1ppm		(±0.5V) < ± 0.1ppm		(±0.2V) < ± 0.1ppm	
	vs Warm -up time (+25°C)		3 minutes (max.)		3 minutes (max.)		5 minutes (max.)		3 minutes (max.)		3 minutes (max.)	
	vs Aging		± 0.7 ppm first year , < ± 4.0 ppm over 10 years .									
	vs Load Change		≦ ±0.01 ppm , for ±5 % load condition change .									
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range		± 4.0ppm (min.) , Reference to fo at +25°C									
	Control Voltage Range		(+12V , +5V) 0.0 to 5.0V ; (+3.3V) 0.0 to 3.3V									
	Transfer Function		Positive : Increasing control voltage increases output frequency .									
	Input Impedance		47 K ohms (min.)									
	EFC Linearity		± 10 % (max.)									
Power	Power Dissipation (at +25°C)	steady - state	1 W (max.)		1.5W (max.)		1.5W (max.)		1 W (max.)		1.5W (max.)	
		turn-on	2 W (max.)		2.5 W (max.)		2.5 W (max.)		2 W (max.)		2.5 W (max.)	
Output	Output Level (for True Sine)		—		---		---		+3 dBm (typ.) into 50Ω load .			
	Harmonic (for True Sine)		—		---		---		-10 dBc (min.)			
	Spurious (for True Sine)		—		---		---		-70 dBc (min.)			
	Load (Fan out)		10 LS		10 LS		10 LS or 47 pF		—		—	
	Output Logic High (V_{OH})		+4.5 V (min.)		+4.5 V (min.)		+2.8 V (min.)		—		—	
	Output Logic Low (V_{OL})		+ 0.4 V (max.)		+ 0.4 V (max.)		+ 0.4 V (max.)		—		—	
	Duty Cycle (at 50% Vcc)		50 % ± 10%						—		—	
	Rise and Fall Time (20% ~ 80%)		7 nS (max.) (measured at 20% → 80% of waveform)						—		—	
	Phase Noise [10.0 MHz] (typical)		Offset	[dBc / Hz]	Offset	[dBc / Hz]	Offset	[dBc / Hz]	Offset	[dBc / Hz]	Offset	[dBc / Hz]
			1 HZ	-60	1 HZ	-70	1 HZ	-80	1 HZ	-70	1 HZ	-80
			10 Hz	-90	10 Hz	-100	10 Hz	-110	10 Hz	-100	10 Hz	-110
			100 Hz	-120	100 Hz	-130	100 Hz	-135	100 Hz	-130	100 Hz	-135
			1 KHz	-130	1 KHz	-140	1 KHz	-145	1 KHz	-140	1 KHz	-145
			10 KHz	-140	10 KHz	-145	10 KHz	-150	10 KHz	-145	10 KHz	-150
Storage Temperature			- 65°C to + 125°C									
Shock			2000 G's , 0.3 ms 1/2 sine									
Vibration			10 to 2000 Hz / 10 G's									

OCXO

OC18T	OC18E	Best stability	Voltage Control	5 pins	12V	5.0V	Min.	Max.
Square Wave	True Sine Wave	±0.01 ppm (SC-cut) ±0.02 ppm (AT-cut)					1.25 MHz	100 MHz

Applications

- OC18_ (20.3 * 20.3 * 10.5 mm) , 5 pin solder sealed metal package
- +12.0V , +5.0V Supply Voltages
- " AT - cut " crystal or " SC - cut " crystal
- Voltage control (Electronic Frequency Tuning) is standard .

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

Type of Crystal Cut Used		AT - cut , use " A " for crystal code ; SC - cut , use " S " for crystal code .							
Output Wave From		Square wave. Wave form code is " T "				True Sine Wave. Wave form code is " E "			
Supply Voltage		+12V		+5 V		+12V		+5 V	
Supply Voltage range , " Voltage code "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "	
Frequency Range		1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		10.0 ~ 100.0 MHz		10.0 ~ 100.0 MHz	
Initial Calibration Tolerance		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)	
		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V	
Frequency Stability	vs Temperature (ppm)	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut
	0 ~ 60 °C	± 0.02	± 0.01	± 0.02	± 0.01	± 0.02	± 0.01	± 0.02	± 0.01
	-20 ~ 70°C	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01
	-40 ~ 85°C	± 0.1	± 0.03	± 0.1	± 0.03	± 0.1	± 0.03	± 0.1	± 0.03
	vs Warm -up time (+25°C)	AT - cut : 3.0 minutes (max.) , within ± 0.5 ppm of its reference frequency . SC - cut : 1.0 minutes (max.) , within ± 0.1 ppm of its reference frequency .							
	vs Aging	AT - cut : ± 5.0 ppb (max.) / day , ± 0.5 ppm (max.) / first year , ± 3.0 ppm (max.) over 10 years . SC - cut : ± 2.0 ppb (max.) / day , ± 0.1 ppm (max.) / first year , ± 0.5 ppm (max.) over 10 years .							
	vs Voltage Change	≦ ±20 ppb , supply voltage ±5 % variation							
	vs Load Change	≦ ±20 ppb , for a ±5 % load condition change .							
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range	AT - cut : ± 5.0ppm (min.) , ± 20ppm (max.) Reference to fo at +25°C and over operating temperature range . SC - cut : ± 0.5ppm (min.) , ± 2.0ppm (max.) Reference to fo at +25°C and over operating temperature range .							
	Control Voltage Range	2.5 V ± 2.0 V							
	Transfer Function	Positive : Increasing control voltage increases output frequency .							
	Input Impedance	100 K ohms (min.)							
	EFC Linearity	± 10 % (max.)							
Power	Power Dissipation (at +25°C)	200 mA (max.) at steady-state ; 500 mA (max.) at turn-on							
Output	Output Level (for True Sine)	---		---		+3 dBm (typ.) , +8 dBm (max.) into 50Ω load .			
	Harmonic (for True Sine)	---		---		-30 dBc (min.)			
	Spurious (for True Sine)	---		---		-75 dBc (min.)			
	Load (Fan out)	15 pF HCMOS (max.)				---		---	
	Output Logic High (V_{OH})	+4.5 V (min.)				---		---	
	Output Logic Low (V_{OL})	+ 0.5 V (max.)				---		---	
	Duty Cycle (at 50% Vcc)	50 % ± 10%				---		---	
	Rise and Fall Time (20% ~ 80%)	5 nS (max.) (measured at 20% → 80% of waveform)				---		---	
	Reference Voltage	+ 4.0 VD.C. ± 0.3 VD.C. or custom							
	Phase Noise (10.0 MHz) [Unit : dBc / Hz] (typical)	Offset	Crystal Type		Offset	Crystal Type		Offset	Crystal Type		Offset	Crystal Type	
			AT - cut	SC - cut		AT - cut	SC - cut		AT - cut	SC - cut		AT - cut	SC - cut
		1 HZ	-75	-85	1 HZ	-75	-85	1 HZ	-75	-85	1 HZ	-75	-85
		10 Hz	-100	-120	10 Hz	-100	-120	10 Hz	-100	-120	10 Hz	-100	-120
		100 Hz	-130	-140	100 Hz	-130	-140	100 Hz	-130	-140	100 Hz	-130	-140
		1 KHz	-140	-145	1 KHz	-140	-145	1 KHz	-140	-145	1 KHz	-140	-145
		10 KHz	-150	-150	10 KHz	-150	-150	10 KHz	-150	-150	10 KHz	-150	-150
Storage Temperature		- 55°C to + 125°C											
Shock		2000 G's , 0.3 ms 1/2 sine											
Vibration		10 to 2000 Hz / 10 G's											

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

OC11T	OC11E	Best stability	Voltage Control	5 pins	12V	5.0V	Min.	Max.
Square Wave	True Sine Wave	±0.01 ppm (SC-cut) ±0.05 ppm (AT-cut)					1.25 MHz	100 MHz

Applications

- OC11_ (25.4 * 25.4 * 16.0 mm) , 5 pin solder sealed metal package
- +12.0V , +5.0V Supply Voltages
- " AT - cut " crystal and " SC - cut " crystal
- Voltage control (Electronic Frequency Tuning) is standard .

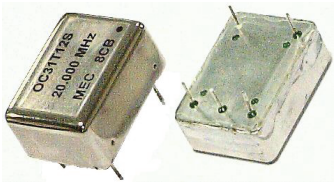
General Specifications (at+25°C and specified input voltage)

Type of Crystal Cut Used		AT - cut , use " A " for crystal code ; SC - cut , use " S " for crystal code .							
Output Wave From		Square wave. Wave form code is " T "				True Sine Wave. Wave form code is " E "			
Supply Voltage		+12V		+5 V		+12V		+5 V	
Supply Voltage range , " Voltage code "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "	
Frequency Range		1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		10.0 ~ 100.0 MHz		10.0 ~ 100.0 MHz	
Initial Calibration Tolerance		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)	
		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V	
Frequency Stability	vs Temperature (ppm)	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut
	0 ~ 60 °C	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01
	-20 ~ 70°C	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02
	-40 ~ 85°C	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03
	vs Warm -up time (+25°C)	AT - cut : 3.0 minutes (max.) , within ± 0.5 ppm of its reference frequency . SC - cut : 1.0 minutes (max.) , within ± 0.1 ppm of its reference frequency .							
	vs Aging	AT - cut : ± 5.0 ppb (max.) / day , ± 0.5 ppm (max.) / first year , ± 3.0 ppm (max.) over 10 years . SC - cut : ± 2.0 ppb (max.) / day , ± 0.1 ppm (max.) / first year , ± 0.5 ppm (max.) over 10 years .							
	vs Voltage Change	≦ ±20 ppb , supply voltage ±5 % variation							
	vs Load Change	≦ ±20 ppb , for a ±5 % load condition change .							
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range	AT - cut : ± 5.0 ppm (min.) , ± 20ppm (max.) Reference to fo at +25°C and over operating temperature range .							
		SC - cut : ± 0.5 ppm (min.), ± 2.0ppm (max.) Reference to fo at +25°C and over operating temperature range .							
	Control Voltage Range	2.5 V ± 2.0 V							
	Transfer Function	Positive : Increasing control voltage increases output frequency .							
	Input Impedance	100 K ohms (min.)							
	EFC Linearity	± 10 % (max.)							
Power	Power Dissipation (at +25°C)	1 Watt (max.) at steady-state ; 3 Watt (max.) at turn-on							
Output	Output Level (for True Sine)	---		---		+3 dBm (typ.) , +8 dBm (max.) into 50Ω load .			
	Harmonic (for True Sine)	---		---		-30 dBc (min.)			
	Spurious (for True Sine)	---		---		-75 dBc (min.)			
	Load (Fan out)	15 pF HCMOS (max.)				---		---	
	Output Logic High (V_{OH})	+4.5 V (min.)				---		---	
	Output Logic Low (V_{OL})	+ 0.5 V (max.)				---		---	
	Duty Cycle (at 50% Vcc)	50 % ± 10%				---		---	
	Rise and Fall Time (20% ~ 80%)	5 nS (max.) (measured at 20% → 80% of waveform)				---		---	
	Reference Voltage	+ 4.0 VD.C. ± 0.3 VD.C. or custom							
	Phase Noise (10.0 MHz) [Unit : dBc / Hz] (typical)	Offset	Crystal Type AT - cut	Crystal Type SC - cut	Offset	Crystal Type AT - cut	Crystal Type SC - cut	Offset	Crystal Type AT - cut	Crystal Type SC - cut	Offset	Crystal Type AT - cut	Crystal Type SC - cut
		1 HZ	-75	-80	1 HZ	-75	-80	1 HZ	-75	-80	1 HZ	-75	-80
		10 Hz	-100	-120	10 Hz	-100	-120	10 Hz	-100	-120	10 Hz	-100	-120
		100 Hz	-130	-140	100 Hz	-130	-140	100 Hz	-130	-140	100 Hz	-130	-140
		1 KHz	-140	-145	1 KHz	-140	-145	1 KHz	-140	-145	1 KHz	-140	-145
		10 KHz	-150	-150	10 KHz	-150	-150	10 KHz	-150	-150	10 KHz	-150	-150
Storage Temperature		- 55°C to + 125°C							
Shock		2000 G's , 0.3 ms 1/2 sine							
Vibration		10 to 2000 Hz / 10 G's							

OC30T	OC30E	Best stability						
Square Wave	True Sine Wave	±0.01 ppm (SC-cut) ±0.02 ppm (AT-cut)	Voltage Control	5 pins	12V	5.0V	Min. 1.25 MHz	Max. 100 MHz

Applications

- OC30_ (36.2 * 27.2 * 16.0 mm) , 5 pin solder sealed metal package
- +12.0V , +5.0V Supply Voltages
- " AT - cut " crystal or " SC - cut " crystal
- Voltage control (Electronic Frequency Tuning) is standard .



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

Type of Crystal Cut Used		AT - cut , use " **A** " for crystal code ; SC - cut , use " **S** " for crystal code .							
Output Wave From		Square wave. Wave form code is " T "				True Sine Wave. Wave form code is " E "			
Supply Voltage		+12V		+5 V		+12V		+5 V	
Supply Voltage range , " Voltage code "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "	
Frequency Range		1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		10.0 ~ 100.0 MHz		10.0 ~ 100.0 MHz	
Initial Calibration Tolerance		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)	
		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V	
Frequency Stability	vs Temperature (ppm)	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut
	0 ~ 60 °C	± 0.03	± 0.01	± 0.03	± 0.01	± 0.03	± 0.01	± 0.03	± 0.01
	-20 ~ 70°C	± 0.08	± 0.02	± 0.08	± 0.02	± 0.08	± 0.02	± 0.08	± 0.02
	-40 ~ 85°C	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03
	vs Warm -up time (+25°C)	AT - cut : 3.0 minutes (max.) , within ± 0.5 ppm of its reference frequency . SC - cut : 1.0 minutes (max.) , within ± 0.1 ppm of its reference frequency .							
	vs Aging	AT - cut : ± 5.0 ppb (max.) / day , ± 0.5 ppm (max.) / first year , ± 3.0 ppm (max.) over 10 years . SC - cut : ± 2.0 ppb (max.) / day , ± 0.1 ppm (max.) / first year , ± 0.5 ppm (max.) over 10 years .							
	vs Voltage Change	≦ ±20 ppb , supply voltage ±5 % variation							
	vs Load Change	≦ ±20 ppb , for a ±5 % load condition change .							
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range	AT - cut : ± 5.0 ppm (min.) , ± 20ppm (max.) Reference to fo at +25°C and over operating temperature range .							
		SC - cut : ± 0.5 ppm (min.) , ± 2.0ppm (max.) Reference to fo at +25°C and over operating temperature range .							
	Control Voltage Range	2.5 V ± 2.0 V							
	Transfer Function	Positive : Increasing control voltage increases output frequency .							
	Input Impedance	100 K ohms (min.)							
	EFC Linearity	± 10 % (max.)							
Power	Power Dissipation (at +25°C)	1.2 Watt (max.) at steady-state ; 3.5 Watt (max.) at turn-on							
Output	Output Level (for True Sine)	---		---		+3 dBm (typ.) , +8 dBm (max.) into 50Ω load .			
	Harmonic (for True Sine)	---		---		-30 dBc (min.)			
	Spurious (for True Sine)	---		---		-75 dBc (min.)			
	Load (Fan out)	15 pF HCMOS (max.)				---		---	
	Output Logic High (V_{OH})	+4.5 V (min.)				---		---	
	Output Logic Low (V_{OL})	+ 0.5 V (max.)				---		---	
	Duty Cycle (at 50% Vcc)	50 % ± 10%				---		---	
	Rise and Fall Time (20% ~ 80%)	5 nS (max.) (measured at 20% → 80% of waveform)				---		---	
	Reference Voltage	+ 4.0 VD.C. ± 0.3 VD.C. or custom							
	Phase Noise (10.0 MHz) [Unit : dBc / Hz] (typical)	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut
		1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85
		10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120
		100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140
		1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145
		10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150
Storage Temperature		- 55°C to + 125°C							
Shock		2000 G's , 0.3 ms 1/2 sine							
Vibration		10 to 2000 Hz / 10 G's							

OC40T	OC40E	Best stability	Voltage Control	5 pins	12V	5.0V	Min.	Max.
Square Wave	True Sine Wave	±0.01 ppm (SC-cut) ±0.05 ppm (AT-cut)					1.25 MHz	100 MHz

Applications

- OC40_ (38.8 * 38.8 * 16.0 mm) , 5 pin solder sealed metal package
- +12.0V , +5.0V Supply Voltages
- " AT- cut " crystal and " SC - cut " crystal
- Voltage control (Electronic Frequency Tuning) is standard .

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

Type of Crystal Cut Used		AT - cut , use " ***A*** " for crystal code ; SC - cut , use " ***S*** " for crystal code .							
Output Wave From		Square wave. Wave form code is " T "				True Sine Wave. Wave form code is " E "			
Supply Voltage (± 5%)		+12V		+5 V		+12V		+5 V	
Supply Voltage range , " Voltage code "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "	
Frequency Range		1.25 ~ 100.0 MHz		1.25 ~ 100.0 MHz		10.0 ~ 100.0 MHz		10.0 ~ 100.0 MHz	
Initial Calibration Tolerance		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)		± 0.5 ppm (max.)	
		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V		Vcon = +2.5 V	
Frequency Stability	vs Temperature (ppm)	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut
	0 ~ 60 °C	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01
	-20 ~ 70°C	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02
	-40 ~ 85°C	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03
	vs Warm -up time (+25°C)	AT - cut : 1 minutes (max.) , within ± 0.2 ppm of its reference frequency . SC - cut : 1 minutes (max.) , within ± 0.05 ppm of its reference frequency .							
	vs Aging	AT - cut : ± 3 ppb (max.) / day , ± 0.5 ppm (max.) / first year , ± 3.0 ppm (max.) over 10 years . SC - cut : ± 2 ppb (max.) / day , ± 0.1 ppm (max.) / first year , ± 0.5 ppm (max.) over 10 years .							
	vs Voltage Change	≦ ±20 ppb , supply voltage ±5 % variation							
	vs Load Change	≦ ±20 ppb , for a ±5 % load condition change .							
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range	AT - cut : ± 5.0 ppm (min.) , ± 20ppm (max.) Reference to fo at +25°C and over operating temperature range .							
		SC - cut : ± 0.5 ppm (min.) , ± 2.0ppm (max.) Reference to fo at +25°C and over operating temperature range .							
	Control Voltage Range	2.5 V ± 2.0 V							
	Transfer Function	Positive : Increasing control voltage increases output frequency .							
	Input Impedance	100 K ohms (min.)							
	EFC Linearity	± 10 % (max.)							
Power	Power Dissipation (at +25°C)	1.2 Watt (max.) at steady-state ; 3.6 Watt (max.) at turn-on							
Output	Output Level (for True Sine)	---		---		+2 dBm (typ.) , +8 dBm (max.) into 50Ω load .			
	Harmonic (for True Sine)	---		---		-25 dBc (min.)			
	Spurious (for True Sine)	---		---		-75 dBc (min.)			
	Load (Fan out)	15 pF HCMOS (max.)				---		---	
	Output Logic High (V_{OH})	+4.5 V (min.)				---		---	
	Output Logic Low (V_{OL})	+ 0.5 V (max.)				---		---	
	Duty Cycle (at 50% Vcc)	50 % ± 10%				---		---	
	Rise and Fall Time (20% ~ 80%)	5 nS (max.) (measured at 20% → 80% of waveform)				---		---	
	Reference Voltage	+ 4.0 VD.C. ± 0.3 VD.C. or custom							
	Phase Noise (10.0 MHz) [Unit : dBc / Hz] (typical)	Offset	Crystal Type	Offset	Crystal Type	Offset	Crystal Type	Offset	Crystal Type
			AT - cut / SC - cut		AT - cut / SC - cut		AT - cut / SC - cut		AT - cut / SC - cut
		1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85
		10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120
		100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140
		1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145
		10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150
Storage Temperature		- 55°C to + 125°C							
Shock		2000 G's , 0.3 ms 1/2 sine							
Vibration		10 to 2000 Hz / 10 G's							

Mercury www .mercury-crystal.com

■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

OC22T	OC22E	Best stability	Voltage Control	7 pins	12V	5.0V	Min.	Max.
Square Wave	True Sine Wave	±0.01 ppm (SC-cut) ±0.05 ppm (AT-cut)					5.0 MHz	20.0 MHz

Applications

- OC22_ (50.8 * 50.8 * 16.0 mm) , 7 pin solder sealed metal package
- +12.0V , +5.0V Supply Voltages
- " AT- cut " crystal and " SC - cut " crystal
- Voltage control (Electronic Frequency Tuning) is standard .

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

Type of Crystal Cut Used		AT - cut , use " **A** " for crystal code ; SC - cut , use " **S** " for crystal code .							
Output Wave From		Square wave. Wave form code is " T "				True Sine Wave. Wave form code is " E "			
Supply Voltage (± 5%)		+12V		+5 V		+12V		+5 V	
Supply Voltage range , " Voltage code "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "		+12V ± 0.5V , " 12 "		+5.0V ± 0.2V , " 5 "	
Frequency Range		5.0 ~ 20.0 MHz				5.0 ~ 20.0 MHz			
Initial Calibration Tolerance		± 0.1 ppm (max.) Vcon = +2.5 V		± 0.1 ppm (max.) Vcon = +2.5 V		± 0.1 ppm (max.) Vcon = +2.5 V		± 0.1 ppm (max.) Vcon = +2.5 V	
Frequency Stability	vs Temperature (ppm)	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut	AT - cut	SC - cut
	0 ~ 60 °C	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01	± 0.05	± 0.01
	-20 ~ 70°C	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02	± 0.1	± 0.02
	-40 ~ 85°C	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03	± 0.2	± 0.03
	vs Warm -up time (+25°C)	AT - cut : 1 minutes (max.) , within ± 0.2 ppm of its reference frequency . SC - cut : 5 minutes (max.) , within ± 10 ppb of its reference frequency .							
	vs Aging	AT - cut : ± 3 ppb (max.) / day , ± 0.5 ppm (max.) / first year , ± 3.0 ppm (max.) over 10 years . SC - cut : ± 0.5 ppb (max.) / day , ± 50 ppb (max.) / first year , ± 150 ppb (max.) over 10 years .							
	vs Voltage Change	≦ ±1.0 ppb , supply voltage ±5 % variation							
	vs Load Change	≦ ±1.0 ppb , for a ±5 % load condition change .							
Voltage Control On pin 1 (EFC) (Electronic Freq. Tuning)	Freq. Deviation Range	AT - cut : ± 5.0 ppm (min.) , ± 20 ppm (max.) Reference to fo at +25°C and over operating temperature range . SC - cut : ± 0.5 ppm (min.) , ± 1.0ppm (max.) Reference to fo at +25°C and over operating temperature range .							
	Control Voltage Range	2.5 V ± 2.0 V							
	Transfer Function	Positive : Increasing control voltage increases output frequency .							
	Input Impedance	100 K ohms (min.)							
	EFC Linearity	± 10 % (max.)							
Power	Power Dissipation (at +25°C)	2.0 Watt (max.) at steady-state ; 6.0 Watt (max.) at turn-on							
Output	Output Level (for True Sine)	---		---		+2 dBm (typ.) , +8 dBm (max.) into 50Ω load .			
	Harmonic (for True Sine)	---		---		-30 dBc (min.)			
	Spurious (for True Sine)	---		---		-75 dBc (min.)			
	Load (Fan out)	15 pF HCMOS (max.)				---		---	
	Output Logic High (V_{OH})	+4.5 V (min.)				---		---	
	Output Logic Low (V_{OL})	+ 0.5 V (max.)				---		---	
	Duty Cycle (at 50% Vcc)	50 % ± 5%				---		---	
	Rise and Fall Time (20% ~ 80%)	5 nS (max.) (measured at 20% → 80% of waveform)				---		---	
	Reference Voltage	+ 4.0 VD.C. ± 0.3 VD.C. or custom							
	Phase Noise (10.0 MHz) [Unit : dBc / Hz] (typical)	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut	Offset	Crystal Type AT - cut / SC - cut
		1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85	1 HZ	-75 / -85
		10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120	10 Hz	-100 / -120
		100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140	100 Hz	-130 / -140
		1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145	1 KHz	-140 / -145
		10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150	10 KHz	-150 / -150
Storage Temperature		- 55°C to + 125°C							
Shock		2000 G's , 0.3 ms 1/2 sine							
Vibration		10 to 2000 Hz / 10 G's							

" OCXO " [Oven Controlled Crystal Oscillators]

True Sine wave " OC _ E "

Square wave " OC _ T "

Part Number Format and Example

[1]	[2]	[3]	[4]	[5]		[6]		[7]		[8]
Holder Type	G	Output Wave	Supply Voltage	Cut Type	—	Center Frequency	—	Frequency Stability	/	Operating Temp. Range

Examples											
	(1)	OC14	G	T	3.3	**A**	-	10.000	-	0.5	/	**-40+85**
	(2)	OC30	G	E	12	**S**	-	100.000	-	0.02	/	**-20+70**
	(3)	OC22	G	T	5	**A**	-	20.000	-	0.2	/	**-30+75**

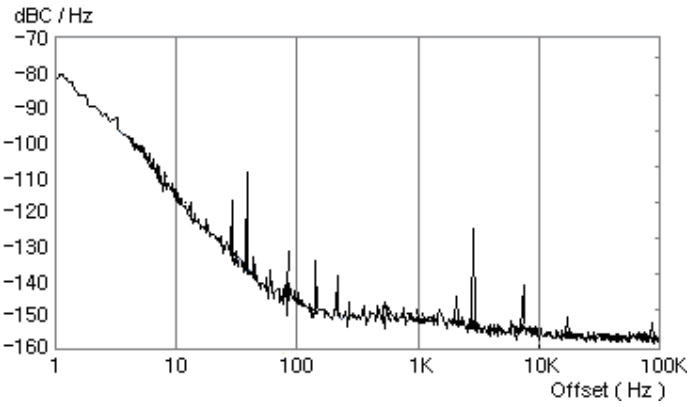
Ex (1) : OC14GT33A - 10.000 - 0.5 / -40+85 [OC14 type , RoHS , CMOS output , 3.3V , 10.000MHz , ± 0.5ppm from -40°C to 85°C]

Ex (2) : OC30GE12S - 100.000 - 0.02 / -20+70 [OC30 type , RoHS , True Sine wave , 12V , 100.000MHz , ± 0.02ppm from -20°C to 70°C]

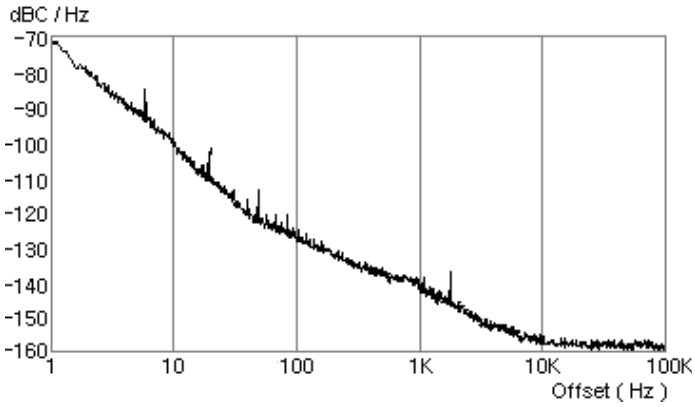
Ex (3) : OC22GT5A - 20.000 - 0.2 / -30+75 [OC22 type , RoHS , CMOS output , 5.0V , 20.000MHz , ± 0.2ppm from -30°C to 75°C]

[1]	Holder Type
	" OC_ _ " stands for OCXO ,
[2]	Please add "G " after the " type code " for RoHS compliant
[3]	" T " stands for Square Wave , " E " stands for True Sine Wave
	ex 1 : OC14T , OC14 pcakage , CMOS output ; ex 2 : OC30E , OC30 package , True Sine wave
[4]	Supply voltage , " 3 " for 3.3V D.C , " 5 " for 5.0V D.C , " 12 " for 12V D.C
[5]	Type of crystal used ; " A " stands for AT-cut crystal , " S " stands for SC-cut crystal
[6]	Center Frequency in MHz
[7]	Frequency stability in ± _ ppm ; ex 1 : ± 0.5ppm — 0.5 , ex 2 : ± 0.02ppm — 0.02
[8]	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

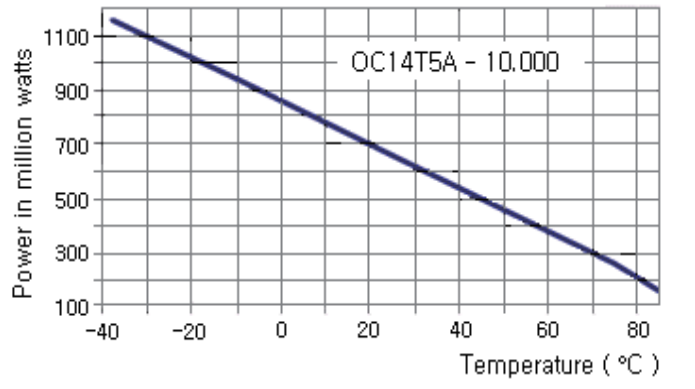
SSB Phase Noise : OC30E12S-10.000 (SC-cut crystal)



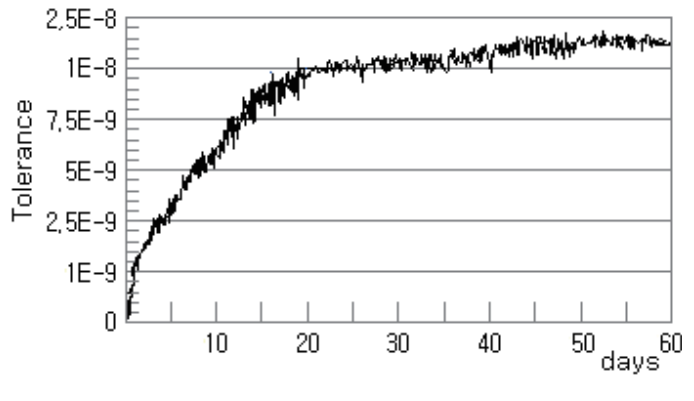
SSB Phase Noise : OC14T5A-10.000 (AT-cut crystal)



Power Consumption vs Temperature



Aging : OC30E12S-10.000 (SC - cut crystal)



OCXO

Mercury www .mercury-crystal.com

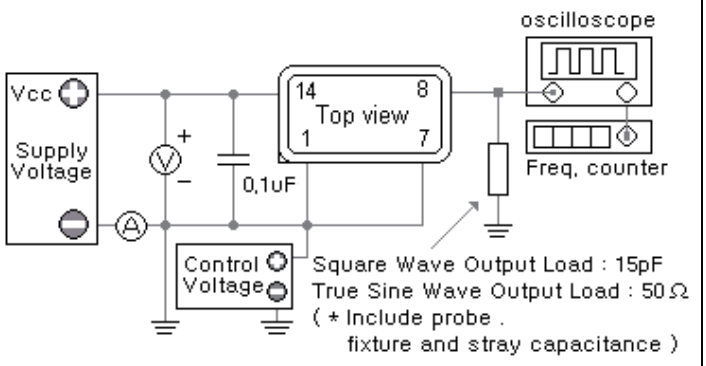
■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

True Sine wave " OC _ E "

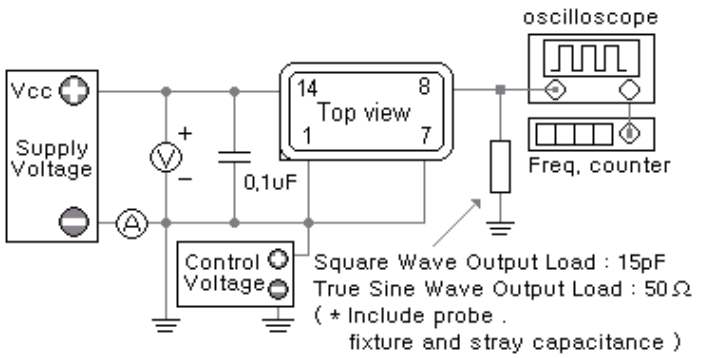
Square wave " OC _ T "

Test Circuits

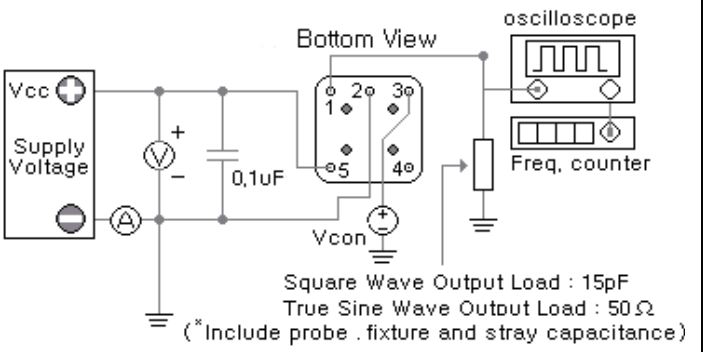
" OC14T_ _ " (square wave)



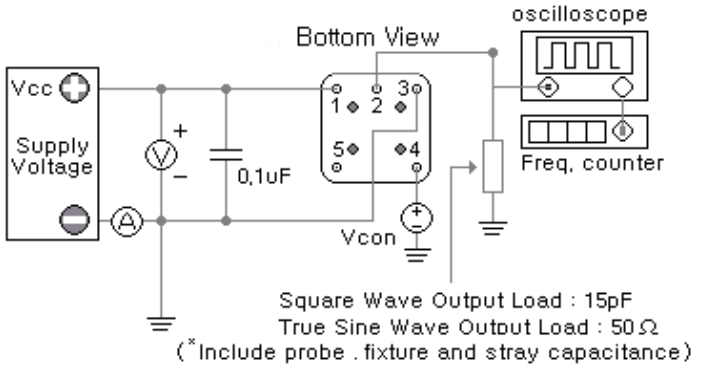
" OC24T_ _ " (square wave)



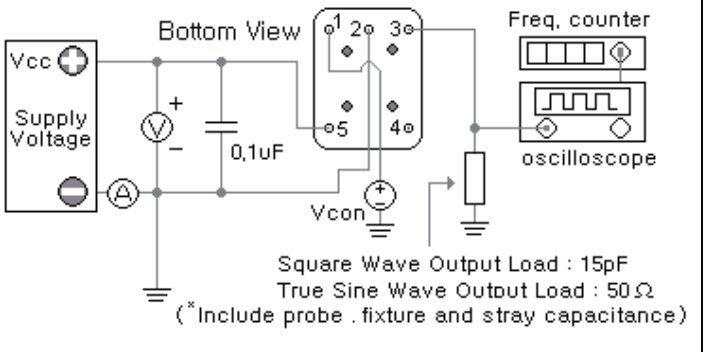
" OC11T_ _ " (square wave) and " OC11E " (true sine wave)



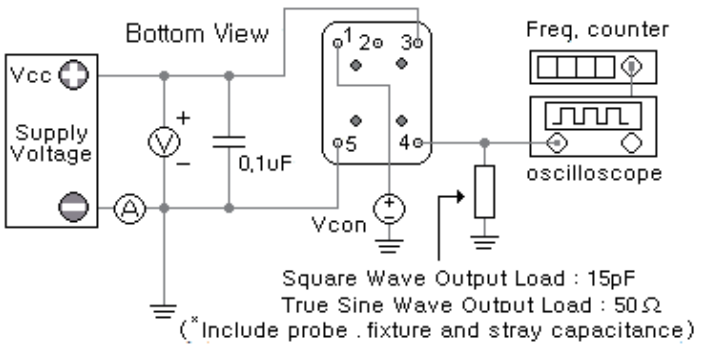
" OC18T_ _ " (square wave) and " OC18E " (true sine wave)



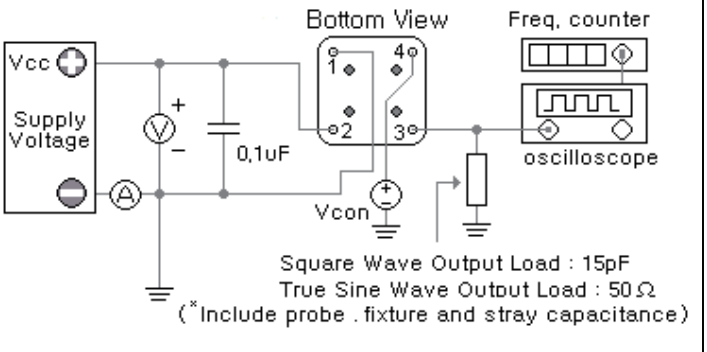
" OC30T_ _ " (square wave) and " OC30E " (true sine wave)



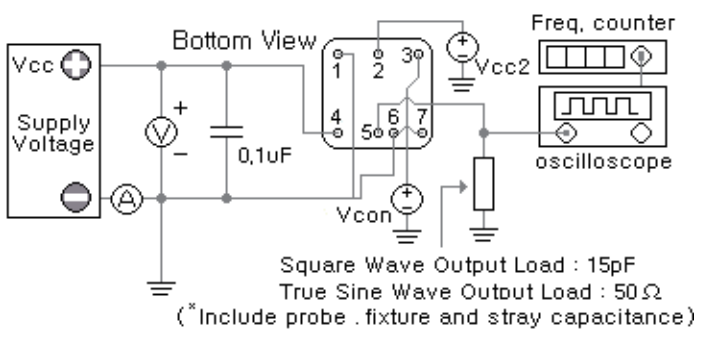
" OC31T_ _ " (square wave) and " OC31E " (true sine wave)



" OC40T_ _ " (square wave) and " OC40E " (true sine wave)



" OC22T_ _ " (square wave) and " OC22E " (true sine wave)

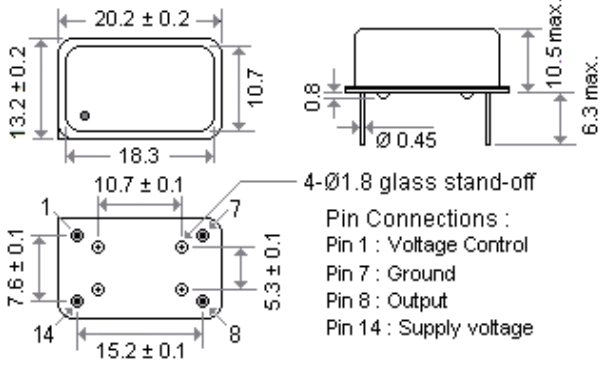


True Sine wave " OC _ E "

Square wave " OC _ T "

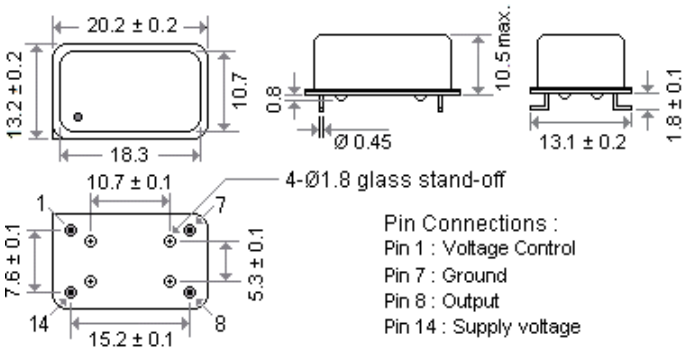
Outline Dimensions (Unit : mm)

[OC14 _ _]



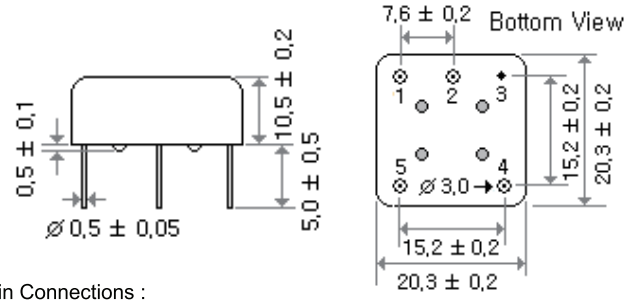
Pin Connections :
Pin 1 : Voltage Control
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[OC24 _ _]



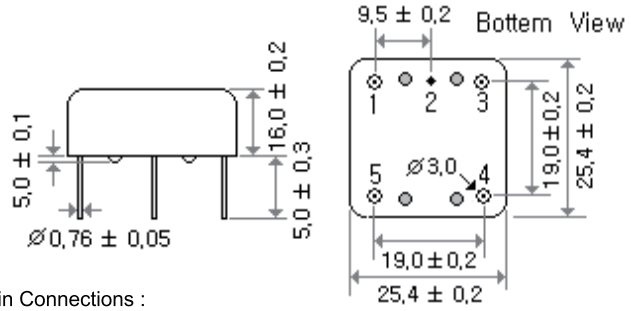
Pin Connections :
Pin 1 : Voltage Control
Pin 7 : Ground
Pin 8 : Output
Pin 14 : Supply voltage

[OC18 _ _]



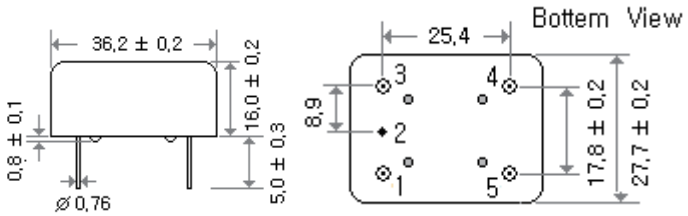
Pin Connections :
Pin 1 : Supply Voltage , Pin 2 : RF Output , Pin 3 : Ground / Case
Pin 4 : Voltage Control EFC , Pin 5 : Reference Voltage Output

[OC11 _ _]



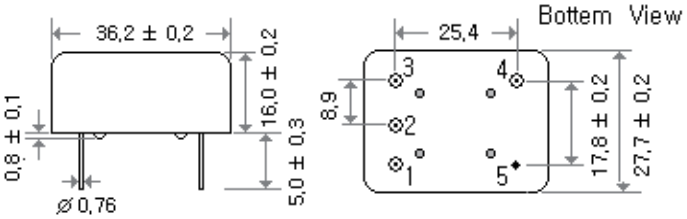
Pin Connections :
Pin 1 : RF Output , Pin 2 : Ground / Case , Pin 3 : Voltage Control EFC
Pin 4 : Reference Voltage Output , Pin 5 : Supply Voltage

[OC30 _ _]



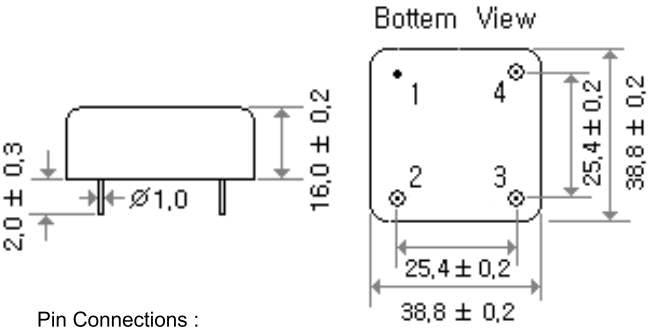
Pin Connections :
Pin 1 : Voltage Control EFC , Pin 2 : Ground , Case , Pin 3 : RF Output ,
Pin 4 : Reference Voltage Output , Pin 5 : Supply Voltage

[OC31 _ _]



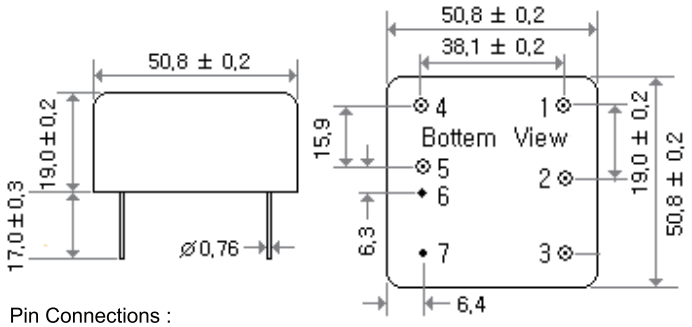
Pin Connections :
Pin 1 : Voltage Control EFC , Pin 2 : Reference Voltage Output ,
Pin 3 : Supply Voltage , Pin 4 : RF Output , Pin 5 : Ground / Case

[OC40 _ _]



Pin Connections :
Pin 1 : Ground / Case , Pin 2 : Supply Voltage
Pin 3 : RF Output , Pin 4 : Control Voltage

[OC22_ _]

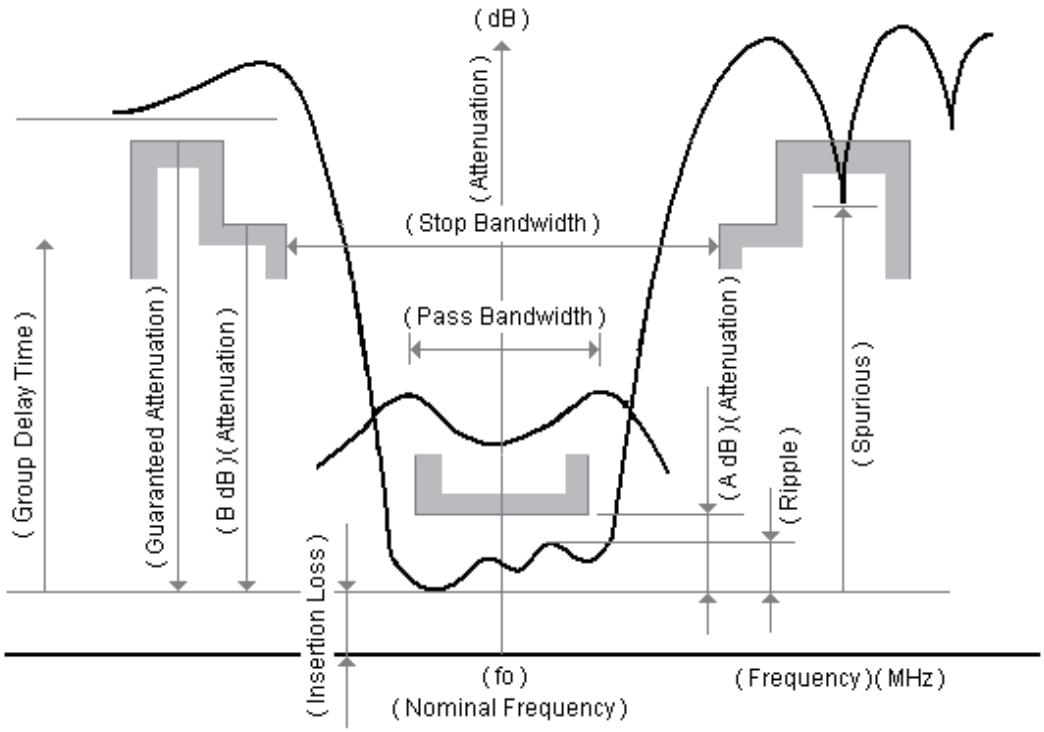


Pin Connections :
Pin 1 : Oven Return , Pin 2 : Osc. Supply Voltage ,
Pin 3 : Electronic Tuning , Pin 4 : Oven Supply Voltage , Pin 5 : Output ,
Pin 6 : RF Ground , Pin 7 : Ground / Case

M.C.F. (Monolithic Crystal Filters) features high quality quartz resonators with sharp cutoff characteristics , low loss , good inter-modulation and a high stability over a wide temperature range . Consider in applying band pass filters to communication systems .

RoHS Compliance

Characteristic diagram and terms of crystal filters



● Nominal Frequency :	This is the nominal value of the center frequency (fo) and is used as the reference frequency of related standards.
● Pass Bandwidth :	This is the frequency interval in which the relative attenuation (the attenuation from the minimum insertion loss) is equal to the specified value "A dB" (Usually 3dB).
● Insertion Loss :	This is the difference of attenuation when a filter is and isn't inserted. The minimum insertion loss is the minimum value of insertion loss and becomes as the reference level of attenuation characteristics specification. The constant loss is the insertion loss at the nominal frequency.
● Ripple :	This is the maximum value of the difference between the peak value of attenuation in the pass band and the minimum insertion loss.
● Stop Bandwidth :	This is the frequency interval in which the relative attenuation is equal to the specified value "B dB".
● Guaranteed Attenuation :	This is the relative attenuation guaranteed in the specified range within attenuation band scope.
● Spurious Response :	This is the value of relative attenuation generated by the secondary vibration in the specified range within attenuation band scope.
● Group Delay Time :	This is the difference between the maximum and the minimum value of the group delay in the specified range of the pass band.
● Terminating Impedance :	This is the impedance value terminated to the input and the output side of filter and is indicated by the resistance portion and the parallel capacity portion including the floating capacity.

Mercury www .mercury-crystal.com

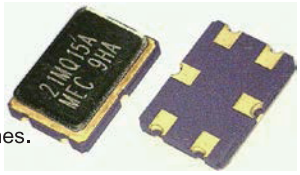
■Taiwan : Tel (886)-2-2406-2779 / sales-tw@mercury-crystal.com ■U.S.A: Tel: (1)-909-466-0427 / sales-us@mercury-crystal.com ■China: Tel: (86)-512-5763-8100 / sales-cn@mecxtal.com

MQ

[7.0 * 5.0 * 1.3 mm]

SMD ----- Ceramic Type | Fund. | 21.4 MHz | 21.7 MHz | 45.0 MHz | 2 poles | 4 poles

Features



RoHS Compliance

- Thin and light weight; excellent shock and vibration resistance
- Suitable for automatic pick and place; Solder reflow capable
- Specifically designed for mobile, wireless communications,pagers, cellular and cordless phones.

Surface Mount Type [Q series (21.400 , 21.700 , 45.000 MHz)]

Frequency (MHz)	Model	No. of poles	Pass Bandwidth		Stop Bandwidth		Ripple	Insertion Loss	Guaranteed Attenuation		Terminating Impedance	
			dB	kHz (min.)	dB	kHz (max.)	dB (max.)	dB (max.)	dB	kHz	ohms // pF	Cc (pF)
21.400	**21MQ7.5A**	2	3	± 3.75	20	± 18	1.0	2.0	70	-910	850 // 6.0	
	21MQ15A	2	3	± 7.5	18	± 25	0.5	1.5	70	-910	1500 // 2.5	
	21MQ15B	4	3	± 7.5	40	± 25	1.0	3.0	70	-910	1800 // 0.35	5.0
	21MQ30A	2	3	± 15	15	± 50	1.5	2.0	60	-910	2500 // 0	
21.700	**21.7MQ15A**	2	3	± 7.5	18	± 28	1.0	2.0	70	-910	1500 // 2.5	
	21.7MQ15B	4	3	± 7.5	40	± 25	1.0	3.0	70	-910	1750 // 0.35	5.0
	21.7MQ30A	2	3	± 15	15	± 50	1.5	2.0	50	-910	2500 // 0	
45.000	**45MQ15A**	2	3	± 7.5	15	± 25	1.0	2.0	70	-910	650 // 3.5	
	45MQ15B	4	3	± 7.5	30	± 25	1.0	3.0	80	-910	600 // 2.3	7.5
	45MQ30A	2	3	± 15	15	± 60	1.0	2.0	70	-910	1200 // 1.8	
	45MQ30B	4	3	± 15	30	± 40	1.0	3.0	70	-910	1200 // 1.0	2.5

(Operating Temperature Range : -20°C to +70°C ; Storage Temperature Range : -40°C to +85°C)

Environmental and Mechanical Specifications

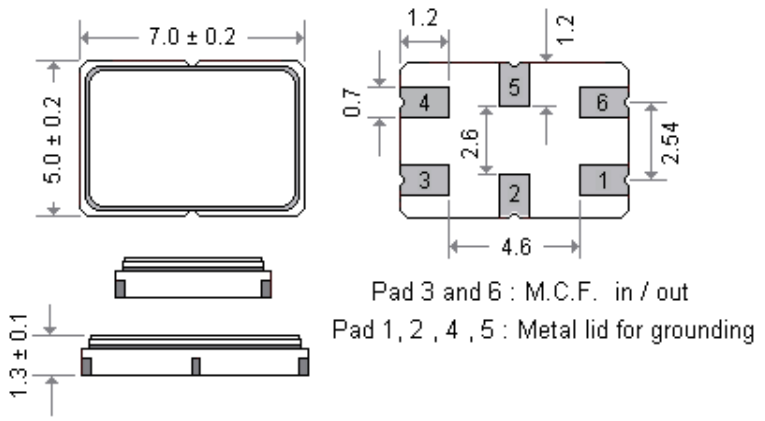
Green Requirement	RoHS compliant and Pb (lead free)
Gross Leak	60 sec min at +125°C in D.I. water or fluorocarbon fluid
Shock	Half sine wave acceleration of 100G peak amplitude for 11 m. sec. duration, 3 cycles each plane.
Vibration	±5 ppm max. Frequency:10 to 55 Hz, amplitude: 1.5 mm or 10 Gs rms. Duration : 6 hours.
Drop Test	Free drop onto hard wood board at 75 cm, 3 randon drops.
Humidity	After 48 hours at 85°C, 85% relative humidity non-condensing
Thermal Shock	Temperature cycling: Exposed at -40°C for 30 minutes then to +85°C for 30 minutes for duration of 5 days.
Drop Test	Free drop onto hard wood board at 75 cm, 3 radon drops.

Part Number Format and Example

[1]	[2]	[3]	[4]
Center Freq. Code M	Package Q	Band width	Poles code

[1]	Freq. code : " 21 " for 21.400MHz , " 21.7 " for 21.700MHz , " 45 " for 45.000MHz ,
[2]	" Q " series for (7.0 * 5.0 * 1.3mm) package
[3]	Pass band width (3dB) (min.) * 2 [" 7.5 " for ± 3.75kHz , " 15 " for ± 7.5kHz , " 30 " for ± 15kHz]
[4]	No. of poles [" A " for 2 poles]

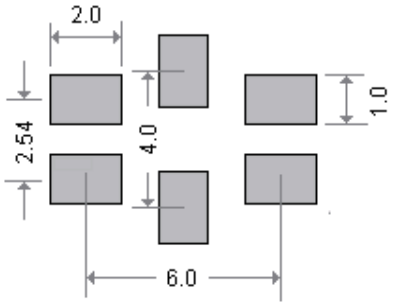
Outline Dimensions (Unit : mm)



Pad 3 and 6 : M.C.F. in / out

Pad 1, 2 , 4 , 5 : Metal lid for grounding

Recommended Land Pattern



M. C. F.

49T

[11.5 * 4.5 * 11.2 mm]

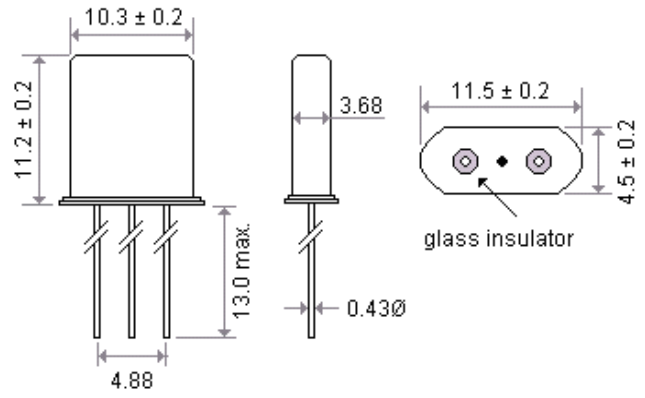
Dip Type | Jacket Type | Fund. | 10.7 MHz | 10.8 MHz | 2 poles | 4 poles | 6 poles | 8 poles

Thru - Hole Type (standard frequency 10.700 MHz) ; available frequency range (10.695 ~ 10.800 MHz)

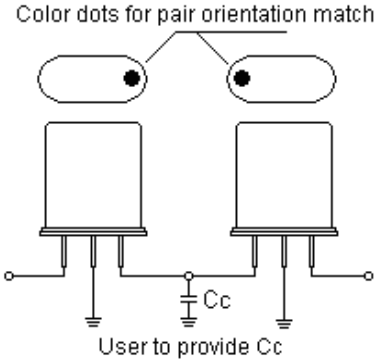
Channel Spacing (kHz)	Model	No. of poles	Pass Bandwidth		Stop Bandwidth		Ripple	Insertion Loss	Guaranteed Attenuation		Terminating Impedance	Package	
			dB	kHz (min.)	dB	kHz (max.)	dB (max.)	dB (max.)	dB	kHz	ohms // pF	Tandem set	One package
12.5	**10M7.5A**	2	3	± 3.75	20	± 18	0.5	1.5	35	±300 ~ ±1000	1.8K // 5.0	49T	
	10M7.5B	4	3	± 3.75	40	± 14	1.0	2.5	65	±300 ~ ±1000	1.8K // 4.5	49T a pair	
	10M7.5C	6	3	± 3.75	45	± 8.75	2.0	3.5	65	±12.5 ~ ±300	1.8K // 3.5	49T 3 pcs	L1
	10M7.5D	8	3	± 3.75	65	± 8.75	2.0	4.0	90	±12.5 ~ ±300	1.8K // 3.5	49T 4 pcs	L2
20.0	**10M12A**	2	3	± 6.0	18	± 25	0.5	2.0	35	±300 ~ ±1000	2.5K // 2.5	49T	
	10M12B	4	3	± 6.0	40	± 20	1.0	2.5	65	±300 ~ ±1000	2.5K // 1.5	49T a pair	
	10M12C	6	3	± 6.0	45	± 15	2.0	4.0	65	±20 ~ ±300	2.5K // 1.5	49T 3 pcs	L1
	10M12D	8	3	± 6.0	65	± 15	2.0	2.0	90	±20 ~ ±300	2.5K // 1.5	49T 4 pcs	L2
25.0	**10M15A**	2	3	± 7.5	18	± 25	0.5	1.5	35	±300 ~ ±1000	3.0K // 2.0	49T	
	10M15B	4	3	± 7.5	40	± 25	1.0	2.5	55	±300 ~ ±1000	3.0K // 1.5	49T a pair	
	10M15C	6	3	± 7.5	45	± 18	2.0	3.0	65	±25 ~ ±300	3.3K // 1.5	49T 3 pcs	L1
	10M15D	8	3	± 7.5	65	± 18	2.0	4.0	90	±25 ~ ±300	3.3K // 1.5	49T 4 pcs	L2
50.0	**10M30A**	2	3	± 15	15	± 50	0.5	1.5	30	±300 ~ ±1000	5.0K // 0	49T	
	10M30B	4	3	± 15	30	± 40	1.0	2.5	30	±300 ~ ±1000	5.5K // -1.0	49T a pair	
	10M30C	6	3	± 15	60	± 45	2.0	3.0	65	±45 ~ ±300	5.5K // -1.0	49T 3 pcs	L1
	10M30D	8	3	± 15	60	± 30	2.0	3.5	90	±50 ~ ±300	5.5K // -1.0	49T 4 pcs	L2

Part Number Format and Example

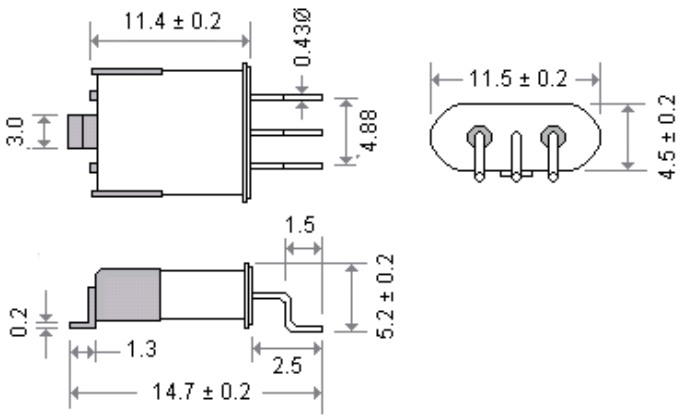
49T



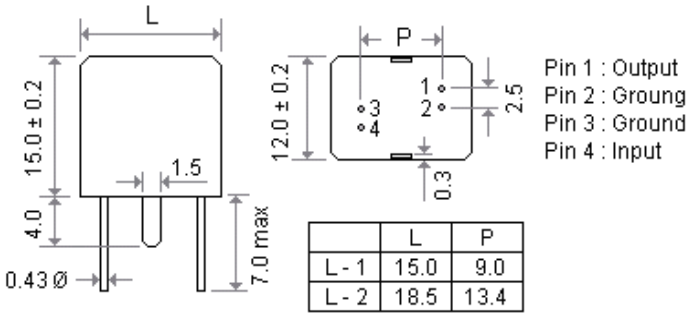
4 pole M.C.F. (Paired packages , Tandem set)



49TMJ



(L - 1) , (L - 2) , (L - 3) - - - One Package Type



	L	P
L - 1	15.0	9.0
L - 2	18.5	13.4

M. C. F.

U1 [7.8 * 3.1 * 8.0 mm] | **U5** [7.8 * 3.1 * 6.0 mm] | Dip Type / Jacket Type | Fund. | 21.4MHz | 45.0MHz | 2 poles | 4 poles | 6 poles | 8 poles

Thru - Hole Type (standard frequency 10.700 MHz) ; available frequency range (10.695 ~ 10.800 MHz)

Channel Spacing (kHz)	Model	No. of poles	Pass Bandwidth		Stop Bandwidth		Ripple	Insertion Loss	Guaranteed Attenuation		Terminating Impedance	Package	
			dB	kHz (min.)	dB	kHz (max.)	dB (max.)	dB (max.)	dB	kHz	ohms // pF	Tandem set	One package
12.5	**21M7.5A**	2	3	± 3.75	20	± 18	0.5	1.5	35	±300 ~ ±1000	850 // 6.0	U-1 , U-5	
	21M7.5B	4	3	± 3.75	40	± 15	1.0	2.5	65	±300 ~ ±1000	850 // 5.0	a pair (U -1,U-5)	
	21M7.5C	6	3	± 3.75	45	± 8.75	2.0	3.0	65	±12.5 ~ ±300	850 // 5.0	3 pcs	S1
	21M7.5D	8	3	± 3.75	65	± 8.75	2.0	4.0	90	±12.5 ~ ±300	850 // 5.0	4 pcs	S2
20.0	**21M12A**	2	3	± 6.0	20	± 25	0.5	1.5	35	±300 ~ ±1000	1.2K // 3.0	U-1 , U-5	
	21M12B	4	3	± 6.0	40	± 20	1.0	2.5	65	±300 ~ ±1000	1.2K // 2.5	a pair (U -1,U-5)	
	21M12C	6	3	± 6.0	45	± 15	2.0	3.0	65	±20 ~ ±300	1.2K // 2.5	3 pcs	S1
	21M12D	8	3	± 6.0	65	± 15	2.0	4.0	90	±20 ~ ±300	1.2K // 2.5	4 pcs	S2
25.0	**21M15A**	2	3	± 7.5	18	± 25	0.5	1.5	35	±300 ~ ±1000	1.5K // 2.0	U-1 , U-5	
	21M15B	4	3	± 7.5	40	± 25	1.0	2.5	65	±300 ~ ±1000	1.5K // 2.0	a pair (U -1,U-5)	
	21M15C	6	3	± 7.5	45	± 18	2.0	3.0	65	±25 ~ ±300	1.5K // 2.0	3 pcs	S1
	21M15D	8	3	± 7.5	65	± 18	2.0	4.0	90	±25 ~ ±300	1.5K // 2.0	4 pcs	S2
50.0	**21M30A**	2	3	± 15	15	± 45	0.5	1.5	35	±300 ~ ±1000	1.5K // 1.0	U-1 , U-5	
	21M30B	4	3	± 15	40	± 50	1.0	2.5	65	±300 ~ ±1000	2.2K // 0.5	a pair (U -1,U-5)	
	21M30C	6	3	± 15	45	± 35	2.0	3.0	65	±45 ~ ±300	2.2K // 0.5	3 pcs	S1
	21M30D	8	3	± 15	65	± 35	2.0	4.0	90	±50 ~ ±300	2.2K // 0.5	4 pcs	S2

Thru - Hole Type [standard frequency 45.000 MHz(Fundamental mode)] ; available frequency range (45.000 ~ 45.100 MHz)

Channel Spacing (kHz)	Model	No. of poles	Pass Bandwidth		Stop Bandwidth		Ripple	Insertion Loss	Guaranteed Attenuation		Terminating Impedance	Package Type	
			dB	kHz (min.)	dB	kHz (max.)	dB (max.)	dB (max.)	dB	kHz	ohms // pF		
12.5	**45M7.5A**	2	3	± 3.75	10	± 12.5	1.0	2.0	65	±300 ~ ±1000	200 // 4.0	U5	U1
	45M7.5B	4	3	± 3.75	30	± 12.5	1.0	4.0	80	±300 ~ ±1000	350 // 6.5	U5 a pair	U1 a pair
25.0	**45M15A**	2	3	± 7.5	15	± 25	1.0	2.0	35	±300 ~ ±1000	650 // 3.0	U5	U1
	45M15B	4	3	± 7.5	30	± 25	1.0	3.0	80	±300 ~ ±1000	650 // 3.0	U5 a pair	U1 a pair
50.0	**45M30A**	2	3	± 15	15	± 60	1.5	2.5	35	±300 ~ ±1000	1.2K // 0	U5	U1
	45M30B	4	3	± 15	30	± 50	1.0	3.0	80	±300 ~ ±1000	1.2K // 0.7	U5 a pair	U1 a pair

M. C. F.

Part Number Format and Example

SMD Type Part Number Format

[1]	[2]	[3]	[4]
Frequency Code	MQ	Width Code	Poles Code
Examples: 45	MQ	30	A

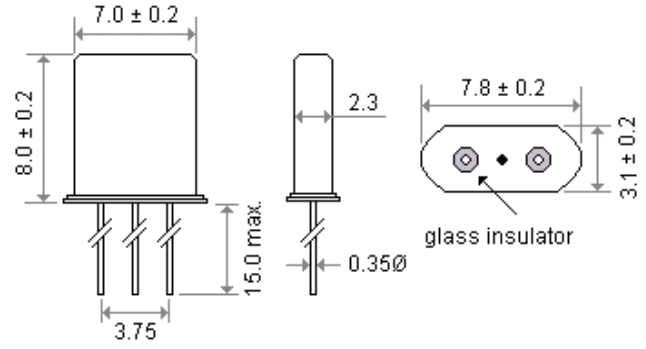
Dip Type Part Number Format

[1]	[2]	[3]	[4]	[5]	[6]
Frequency Code	M	Width Code	Poles Code	Holder Type	G
Examples: 21.7	M	7.5	D	U5SM	G

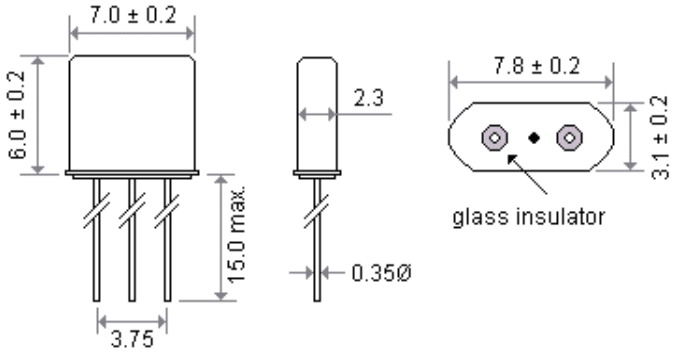
[1]	Freq. code : " 10 " for 10.700MHz , " 21 " for 21.400MHz , " 21.7 " for 21.700MHz , " 45 " for 45.000MHz ,
	Freq. code : If none standard freq. please show freqency with one decimal point .
[2]	" M " Dip Type series , " MQ " SMD Type (7.0 * 5.0 * 1.3 mm)
[3]	Pass band width (3dB) (min.)
	" 7.5 " for ± 3.75kHz , " 15 " for ± 7.5kHz , " 20 " for ± 10kHz , " 30 " for ± 15kHz ,
[4]	No. of poles
	" A " for 2 poles , " B " for 4 poles , " C " for 6 poles , " D " for 8 poles
[5]	Dip type holder type
[6]	Please add " G " after the " type code " for RoHS compliant (Does not apply to MQ series) .
[7]	Standard operating temperature range is -20°C to 70°C ,
	If non-standard please enter the desired temp. range after " / " , for example " / -30+70 " : -30°C to 70°C

Package Dimensions (unit : mm)

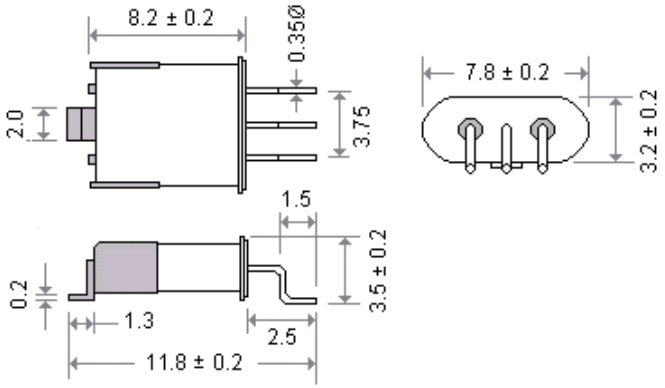
[U1]



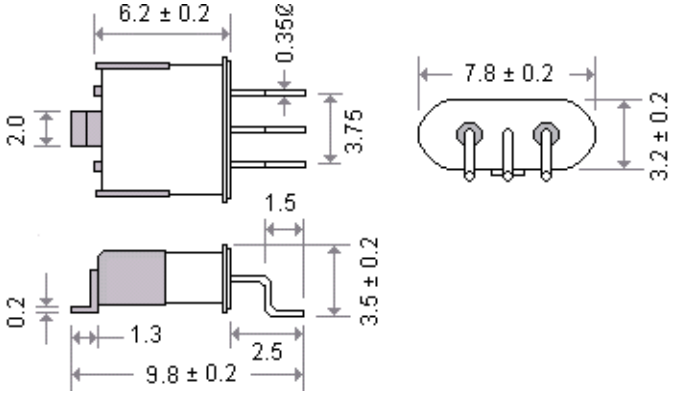
[U5]



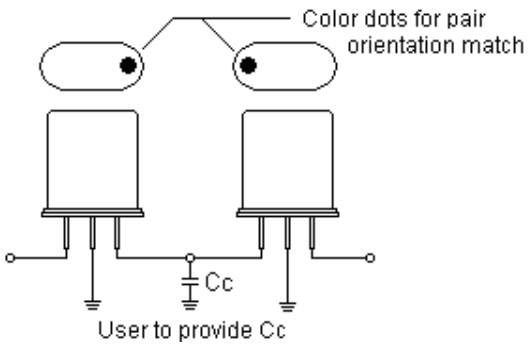
[U1MJ]



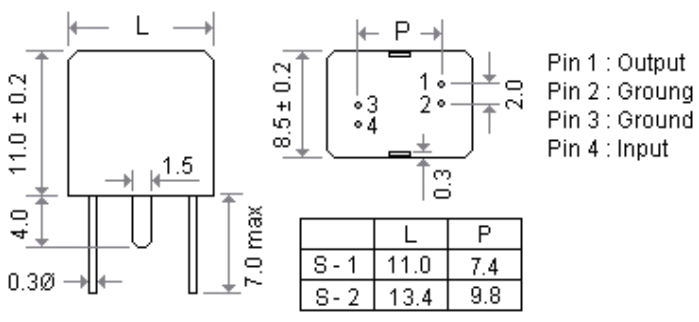
[U5MJ]



4 pole M.C.F. (paired packages)



[S-1] , [S-2]



	L	P
S-1	11.0	7.4
S-2	13.4	9.8

Mercury Green Program

Common points for all crystal products

Mercury Green Program

Mercury's Green Program is implemented in accordance with the European Union's directive on "Restriction of the use of certain Hazardous Substance(RoHS)".Mercury's Lead-Free and RoHS Compliant products follow the EU directive (2002/95/EC) and include test reports issued by SGS Group on hazardous substances levels for the six substances:lead(pb),cadmium(cd),mercury (Hg),hexavalent chromium(Cr+6), polybrominated biphenyl(PBB),and polybrominated diphenyl ether (PBDE).

- Crystal Green Program-Crystals
- Crystal Oscillator Green Program-XO、VCXO、VCTCXO、TCXO、OCXO
- Crystal Filter Green Program-Filters

RoHS Compliant Product by Mercury

Soldering conditions

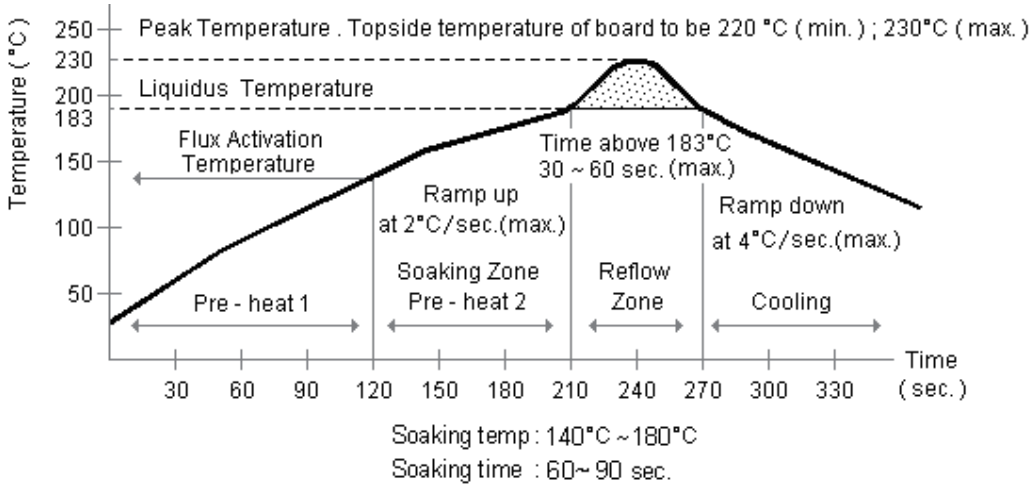
(1) Lead wires should be soldered within 3 seconds with the iron heated to a temperature of 380°C (max.) .

(2) In solder-dip mounting , it should be within 10 seconds with a temperature of 260°C (max.) .
Heating the whole crystal unit in the dip mounting process should be avoided .
Upright mounting is recommended (to prevent applying heat directly to the body of a crystal unit) .

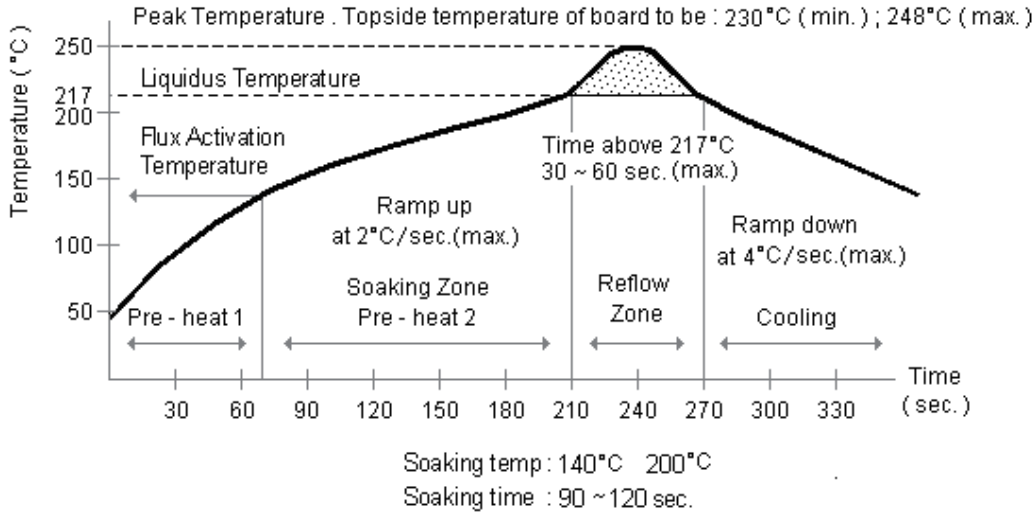
(3)Heating the whole body of the crystal unit , for example , in a reflow oven may affect the performance.
The holder is small and is sealed by solder material by press sealing , so that such a reflow process is not allowed to be applied .

Suggested Reflow Profile [SMD type products]

(1) Low temperature solder reflow : For Sn62 , Pb36 , Ag2 , Sn63 , Pb37 alloy .



(2) High temperature solder reflow : For Sn96.5% , Ag3.5% , Cu0.5% alloy .



Mercury Statement of REACH Initiative

Mercury supports the aim of REACH in improving the protection of human health and the environment and is active in limiting our use of chemicals.

REACH : Registration, Evaluation, Authorization and Restriction of Chemical Substances in accordance with Regulation (EC) No. 1907/2006.

We have reviewed our products and do not have any parts that we manufacture or purchase with a chemical content that requires REACH registration. Mercury is a producer of articles and its products do not contain any of the 16 Substances of Very High Concern (SVHCs) identified on a REACH regulation, ECHA proposed list (reference list on next page) in their composition or make-up. Additionally, Mercury, as a non-EU based entity, does not exceed 1 metric ton of exports of products to EU.

Mercury will continue to monitor the REACH requirement for any changes in the materials involving registration, and in particular, the SVHC list and the 38 substances currently on the list (updated on June 18, 2010 by ECHA , European Chemicals Agency). Should any changes be made to Mercury products that require REACH registration, or the list of items requiring registration changes, Mercury will notify you accordingly.

Yours truly,

Jason Yen, VP of Quality Assurance

P.S.:

The 38 substances currently on the list (updated on June 18, 2010 by ECHA, European Chemicals Agency) :

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Part Number Formats and Product Marking Rules

Quartz Crystals

Holder Type

SMD type :	X22	X32	X42	MJ	MF	MQ	M49	ML49	MP5	MP4
Dip type :	H49	49T	H50	H48	HUS	HUSL	U1	U5	T38	T26
Jecket type :	H49MJ	49TMJ	U1MJ	U5MJ	T38MJ	T26MJ				
Gull wing :	H49SM	49TSM	U1SM	U5SM	T38SM	T26SM				

Part Number Format

[1]	[2]	–	[3]	–	[4]	–	[5]	/	[6]	[7]	/	[8]
Holder Type	G	–	Center Freq.	–	CL	–	Freq . Tolerance	/	Freq. Stability	Operating Temp. Range Code	/	Special Operating Temp. Range

Example												
(1)	H49	G	-	40.000A3	-	12						
(2)	MJ		-	12.000	-	20	-	10	/	10	Y	
(3)	M49	G	-	24.000	-	18	-	20	/	30	/	-30+75

Ex (1) : H49G - 40.000A3 - 12 [49/U type , RoHS , 40.000MHz , AT-cut 3rd overtone , 12pF , ±30ppm (25°C) , ±30ppm (-10°C to 60°C)]

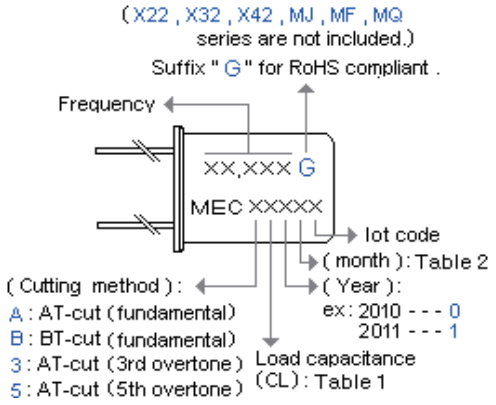
Ex (2) : MJ - 12.000 - 20 - 10 / 10 Y [MJ type , 12.000MHz , 20pF , ±10ppm (25°C) , ±10ppm (-20°C to 70°C)]

Ex (3) : M49G - 24.000 - 18 - 20 / 30 / -30+75 [M49 type , RoHS , 24.000MHz , 18pF , ±20ppm (25°C) , ±30ppm (-30°C to 75°C)]

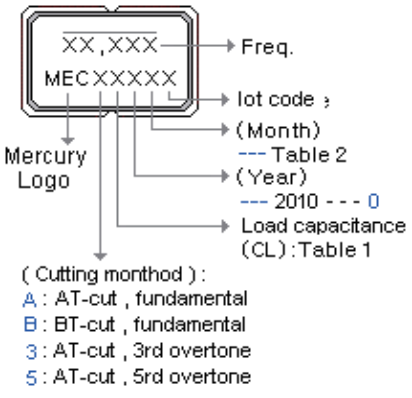
[1]	Holder Type								
[2]	Please add " G " after the " type code " for RoHS compliant (Does not apply to X22 , X32 , X42 , MJ , MF , MQ series)								
[3]	Center frequency . Please add " A3 , A5 or B " after the " Freq. in MHz " for the quartz cut other options .								
	Blank : AT-cut fund. mode ; A3 : AT-cut 3rd overtone ; A5 : AT-cut 5th overtone ; B : BT-cut fund. mode								
[4]	Load Capacitance (CL) : series (spec. code is " S ") or								
	Parallel (If parallel , please specify CL value , typical CL ranges from 8 to 32 pF)								
	Available Options " V " = Vinyl sleeve around holder , " K " = 3rd lead at bottom center , " R " = On reel								
	" G " = 3rd lead at top center , " I " = Teflon insulator at bottom								
[5]	Calibration tolerance value : freq. tolerance value (at 25°C) , industrial temp. range								
[6]	Frequency Stability , industrial temp. range								
[7]	Temp. Range	W	0°C ~ +50°C	X	-10°C ~ +60°C	Y	-20°C ~ +70°C	Y1	-30°C ~ +70°C
	Options	Y2	-10°C ~ +80°C	Y3	-30°C ~ +80°C	I	-40°C ~ +85°C	M	-55°C ~ +105°C
[8]	If non-standard please enter the desired temp. range after " / " , for example " / -30+70 " : -30°C to 70°C								

Production Marking Rules

General X'tal package type marking rules



MQ , MF , MJ , X42 marking rules



X22 , X32 marking rules

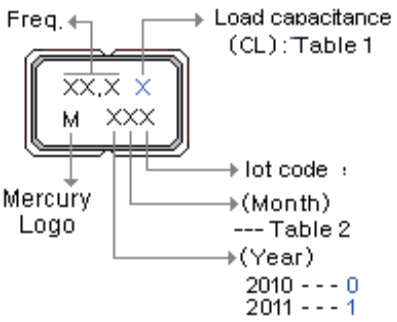


Table 1	CL	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	>34	Series
	Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b

Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Part Number Formats and Product Marking Rules

Crystal Oscillators

Holder Type

Product and Series	Output Wave Output Logic	Supply Voltage	SMD types	Thru-Hole types	Gull Wing types
SWO	Square Wave CMOS	1.8 / 2.5 / 3.3 / 5.0			
H x x		1.8 / 2.5 / 3.3 / 5.0	x x = 42 , 44 , 53 , 32	x x = 8 , 14	x x = 18 , 24
HF x x		2.5 / 3.3	x x = 42, 44, 62, 64, 5761, 5762		
HW x x x		3.3			
HV x x x		3.3			
HB x x		1.8 / 2.5 / 3.3 / 5.0	x x = 42 , 44 , 57 , 53 , 32		
HK x x		1.8 / 2.5 / 3.3 / 5.0	x x = 42 , 44 , 57 , 53		
LPO x x x		3.3 / 5.0		x x = 8 , 14	x x = 18 , 24
HPF x x x	Square Wave LVPECL	2.5 / 3.3	x x = 621 , 622 , 5761 , 5762	x x = 8 , 14	x x = 8 , 14
HPW x x x		3.3			
HDF x x x	Square Wave LVDS	2.5 / 3.3	x x = 621 , 622 , 5761 , 5762		
HDW x x x		3.3			
HSR x x x	True Sine Wave	2.8 / 3.0 / 5.0	x x = 42 , 44 , 62 , 64 , 53 , 57		
HS x x x		3.3 / 5.0			

x x = package code

Part Number Format

[1]	[2]	[3]		[4]	[5]		[6]
Supply Voltage	Holder Type	G	–	Frequency Stability	T	–	Center Frequency

Examples								
	(1)	18	SWO		–	B	T	– 25.000
	(2)	5	H14	G	–	C30		– 10.000
	(3)	3	HDW5761		–	E		– 156.250

Ex (1) : 18SWO - BT - 25.000 [1.8V , SWO type , ±50ppm from -10°C to 70°C , Tri-state , 25.000MHz ,]

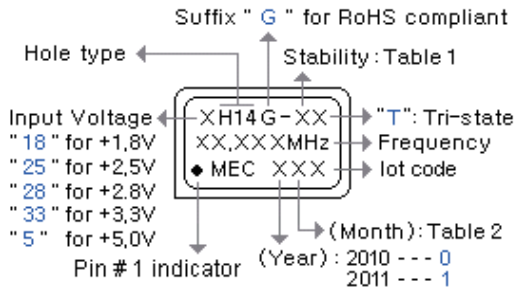
Ex (2) : 5H14G - C30 - 10.000 [5.0V , H14 type , RoHS , ±30ppm from -10°C to 70°C , 10.000MHz]

Ex (3) : 3HDW621G - E - 156.250 [3.3V , (HDW62 type , Tri-state on pin 1) , RoHS , ±50ppm from -40°C to 85°C , 156.250MHz]

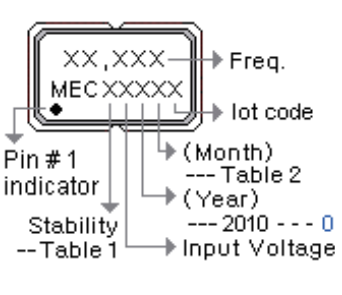
[1]	Supply voltage , " 1 " for +1.0V ;" 12 " for +1.2V ; " 18 " for +1.8V ;" 25 " for +2.5V ; " 28 " for +2.8V ; " 3 " for +3.3V ; " 5 " for +5.0V	
[2]	Holder Type	
[3]	Please add "G" after the " type code " for RoHS compliant (Does not apply to SWO , H_53 , H_32 , H22 , H_576_ , H_534 series)	
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[5]	" T " for Tri-state , Leave this space blank if no connection on pin 1 or pad 1 .	
[6]	Frequency in MHz	
	Assigned by Mercury if customer spec , Ex (1) : S — duty cycle ± 5% ,Ex : " - S " (2) : 50p — output load 50pF , Ex : " - 50p "	

Production Marking Rules

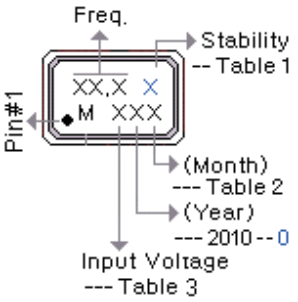
General Osc. Package types marking rules



SWO , H53 marking rules



H32 marking rules



H22 marking rules

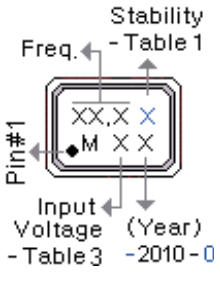


Table 1	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C10 " : ± 10ppm
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I10 " : ± 10ppm

Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Table 3	Input Voltage	(Enable / Disable)	5.0 V	3.3 V	2.8 V	2.5 V	1.8 V	1.2 V	1.0 V
			B	D	F	H	J	L	N

Part Number Formats and Product Marking Rules

Spread Spectrum Low EMI Clock Oscillators

Holder Type

Type	Thru-Hole types	Gull Wing types	SMD types	Wave form
HM x x	x x = 8 , 14	x x = 18 , 24	x x = 44 , 53 , 57	square wave

x x = package code

Part Number Format

[1]	[2]	[3]		[4]	[5]		[6]	[7]		[8]
Supply Voltage	Holder Type	G	-	Frequency Stability	T	-	Center Frequency	Group Type	-	Spread type Percentage

Examples	(1)	3	H M 576		-	B	T	-	10.000	R	-	C1.5
	(2)	3	H M 53		-	F	T	-	75.000	Y	-	D1.0
	(3)	3	H M 14	G	-	C30		-	100.000	P	-	D3.0

Ex (1) : 3HM57 - BT - 10.000R - C1.5 [3.3V , HM57 type , ±50ppm from -10°C to 70°C , Tri-state , 10.000MHz , R group , Center Spread 1.5%]

Ex (2) : 3HM53 - FT - 75.000Y - D1.0 [3.3V , HM57 type , ±100ppm from -40°C to 85°C , Tri-state , 75.000MHz , Y group , Down Spread 1.0%]

Ex (3) : 3HM14G - C30 - 100.000P - D3.0 [3.3V , HM14 type , RoHS , ±30ppm from -10°C to 70°C , 100.000MHz , P group , Down Spread 3.0%]

[1]	Supply voltage , " 3 " for +3.3V	
[2]	Holder Type	
[3]	Please add " G " after the " type code " for RoHS compliant (Does not apply to HM53 , HM57 series).	
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C
[5]	" T " for Tri-state , Leave this space blank if no connection on pin 1 or pad 1 .	
[6]	Frequency in MHz	
[7]	Group " R " , " P " or " Y "	
[8]	Spread type & percentage ; " C " for center spread , " D " for down spread	

Production Marking Rules

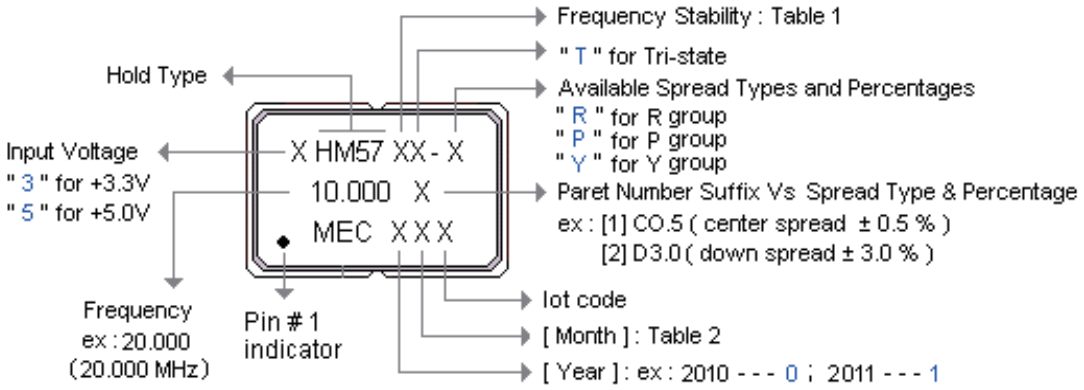


Table 1	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , Ex : " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , Ex : " I20 " : represents ±20ppm over -40 to +85°C

Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Part Number Formats and Product Marking Rules

[VCXO] Voltage Controlled Crystal Oscillators

Holder Type

Type	Output Wave	Supply Voltage	Note	SMD types	Thru-Hole	Gull Wing
G x x	CMOS	1.8 / 2.5 / 3.3 / 5.0		x x = 42, 62, 534, 536, 576	x x = 8 , 14	x x = 18 , 24
GF x x		3.3	Phase Jitter : 0.4 (typ.)	x x = 42, 62, 536, 576		
GW x x			Phase Jitter : 2.6 (typ.)	x x = 42, 62, 536, 576		
GV x x			Phase Jitter : 2.3 (typ.)	x x = 42, 62, 536, 576		
GPF x x	LVPECL		Phase Jitter : 0.4 (typ.)	x x = 42, 62, 576		
GPW x x			Phase Jitter : 2.6 (typ.)			
GDF x x	LVDS		Phase Jitter : 0.4 (typ.)	x x = 42, 62, 576		
GDW x x			Phase Jitter : 2.6 (typ.)			
GS x x	True Sine	3.3 / 5.0	Load : 50Ω Load	x x = 44		
GSR x x		3.3 / 5.0	Load : 10KΩ // 10pF	x x = 42, 44, 62 , 53, 57		

x x = package code

Part Number Format

[1]	[2]	[3]	[4]		[5]	[6]		[7]
Supply Voltage	Holder Type	G	Frequency Stability	-	Pulling Range	Range Code	-	Center Frequency

Examples	(1)	18	G14	G	B	-	80	N	-	35.328
	(2)	3	GPF576		C20	-	150	M	-	200.000
	(3)	5	GDW62	G	I30	-	100	T	-	800.000

EX (1) : 18G14GB - 80N - 35.328 [1.8V , G14 type , RoHS , ±50ppm from -10°C to 70°C , Pulling : ±80ppm (min.) , 35.328MHz ,]

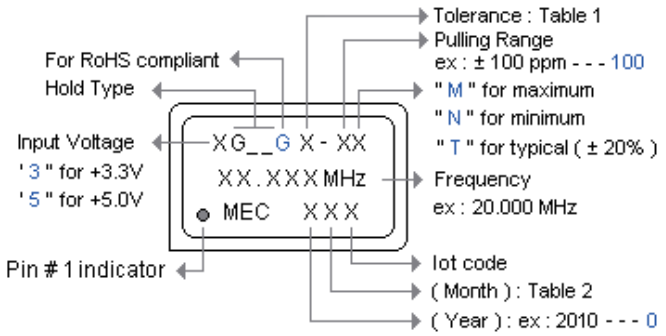
Ex (2) : 3GPF576C20 - 150M - 200.000 [3.3V , GPF576 type , ±10ppm from -10°C to 70°C , , Pulling : ±150ppm (max.) , 200.000MHz]

Ex (3) : 3GDW62GI30 - 100T - 800.000 [3.3V , GDW62 type , RoHS , ±30ppm from -40°C to 85°C , Pulling : ±150ppm (Typical) , 800.000MHz]

[1]	Supply voltage , " 18 " for +1.8V ; " 25 " for +2.5V ; " 3 " for +3.3V ; " 5 " for +5.0V		
[2]	Holder Type		
[3]	Please add " G " after the " type code " for RoHS compliant equivalent (Does not apply to G_534 , G_536 , G_576).		
[4]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;	
		If non-standard please enter the desired stability after " C " , for example " C15 " : represents ±15ppm over -10 to +70°C	
	-40°C ~ 85 °C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;	
		If non-standard please enter the desired stability after " I " , for example " I20 " : represents ±20ppm over -40 to +85°C	
[5]	Freqency Pulling Range	3.3V	From ±30ppm ~ ±150ppm , control Voltage range : 0.3V ~ 3.0 ; control voltage center : ± 1.65 V
		5.0V	From ±70ppm ~ ±200ppm , control Voltage range : 0.5V ~ 4.5V ; control voltage center : ± 2.5 V
[6]	Pulling Range Code	" M " stands for maximum ; " N " stands for minimum ; " T " stands for typical (tolerance is ± 20%)	
[7]	Center Frequency in MHz		

Production Marking Rules

General VCXO pcakage types marking rules



G_534 , G_536 , G_576 marking rules

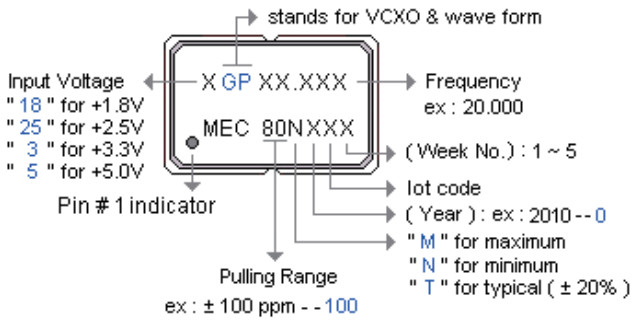


Table 1	-10°C ~ 70 °C [Commercial]	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;
		If non-standard please enter the desired stability after " C " , Ex : " C15 " : represents ±15ppm over -10 to +70°C
	-40°C ~ 85 °C [Industrial]	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
		If non-standard please enter the desired stability after " I " , Ex : " I20 " : represents ±20ppm over -40 to +85°C

Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Part Number Formats and Product Marking Rules

[TCXO vs VCTCXO] Temperature Compensated Crystal Oscillators

Holder Type

TCXO	VCTCXO	Wave Form	SMD types	Thru-Hole types	Gull Wing types
M x x (G) S	VM x x (G) S	Clipped Sine Wave	X X = 42 , 32 , 53 , 57 , 62	X X = 8 , 9 , 14 , 15 , 38 , 39	X X = 47
M x x (G) T	VM x x (G) T	CMOS output	X X = 42 , 53, 536 , 57 , 62		
MV x x (G) T	VMV x x (G) T				
MW x x (G) T	VMW x x (G) T				
MW x x (G) P	VMW x x (G) P	LVPECL output	X X = 536, 576	- - -	- - -
MF x x (G) P	VMF x x (G) P				
MW x x (G) D	VMW x x (G) D	LVDS output			
MF x x (G) D	VMF x x (G) D				

x x = package code

Part Number Format

[1]	[2]	[3]	[4]		[5]		[6]	/	[7]
Holder Type	G	Output Wave	Supply Voltage	-	Center Frequency	-	Frequency Stability	/	Operating Temp. Range

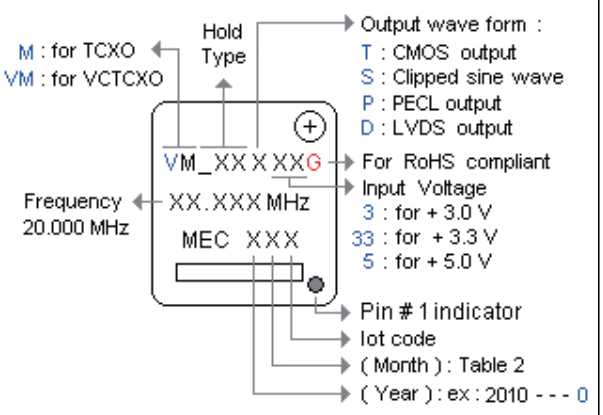
Examples										
(1)	V M 38	G	T	5	-	10.000	-	1.5	/	**-20+70**
(2)	M 57		S	3	-	20.000	-	2.5	/	**-30+75**
(2)	V M F 576		P	33	-	432.000	-	1.0	/	**0+50**

Ex (1) : VM38GT5 - 10.000 - 1.5 / -20+70 [VCTCXO , VM38 type , RoHS , CMOS output , 5.0V , 10.000MHz , ±1.5ppm from -20°C to 70°C]
Ex (2) : M57S3 - 20.000 - 2.5 / -30+75 [TCXO , M57 type , Clipped Sine W ave , 3.0V , 20.000MHz , ±2.5ppm from -30°C to 75°C]
Ex (3) : VMF576P33 - 432.000 -1.0 / 0+50 [VCTCXO , VMF576 type , PECL output , 3.3V , 432.000MHz , ±1.0ppm from 0°C to 50°C]

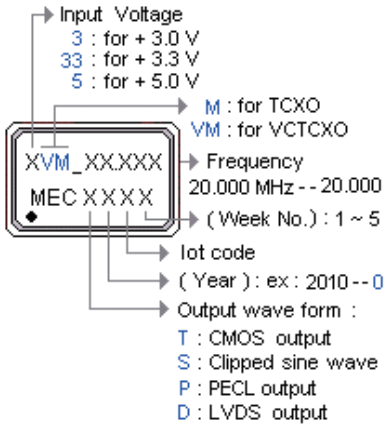
[1]	Holder Type
	" M " stands for TCXO , " VM " stands for VCTCXO
[2]	Please add "G " after the " type code " for RoHS compliant (Does not apply to (V)M32 , (V)M53 , (V)M536_ , (V)M57_ , (V)M576_)
[3]	" S " stands for Clipped Sine Wave ; " T " stands for CMOS output ; " D " stands for LVDS differential ; " P " stands for PECL differential
	ex 1 : M44T — TCXO , M44 pcakage , CMOS output ; ex 2 : VM38P — VCTCXO , VM38 package , PECL differential
[4]	Supply voltage , " 28 " stands for +2.8V ; " 3 " stands for +3.0V ; " 33 " stands for +3.3V ; " 5 " stands for +5.0V
[5]	Center Frequency in MHz
[6]	Frequency stability in ± _ ppm ; ex 1 : ± 2.5ppm --- 2.5 , ex 2 : ± 1.0ppm — 1.0
[7]	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

Production Marking Rules

General (VC)TCXO pcakage types marking rules



(V) M53_ , (V) M57_ , (V) M576_



(V) M32S

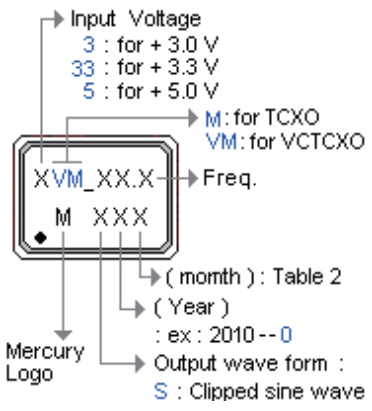


Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Part Number Formats and Product Marking Rules

[OCXO] Oven Controlled Crystal Oscillators

Holder Type

Type	Thru-Hole types	Gull Wing types	Wave Form
OC x x	x x = 14 , 22 , 30 , 78	x x = 24	Square Wave ; True Sine Wave

Part Number Format

[1]	[2]	[3]	[4]	[5]		[6]		[7]		[8]
Holder Type	G	Output Wave	Supply Voltage	Cut Type	—	Center Frequency	—	Frequency Stability	/	Operating Temp. Range

Examples	(1)	OC14	G	T	3.3	**A**	-	10.000	-	0.5	/ **-40+85**
	(2)	OC30	G	E	12	**S**	-	100.000	-	0.02	/ **-20+70**
	(2)	OC22	G	T	5	**A**	-	20.000	-	0.2	/ **-30+75**

Ex (1) : OC14GT33A - 10.000 - 0.5 / -40+85 [OC14 type , RoHS , CMOS output , 3.3V , 10.000MHz , ± 0.5ppm from -40°C to 85°C]
Ex (2) : OC30GE12S - 100.000 - 0.02 / -20+70 [OC30 type , RoHS , True Sine wave , 12V , 100.000MHz , ± 0.02ppm from -20°C to 70°C]
Ex (3) : OC22GT5A - 20.000 - 0.2 / -30+75 [OC22 type , RoHS , CMOS output , 5.0V , 20.000MHz , ± 0.2ppm from -30°C to 75°C]

[1]	Holder Type
	" OC_ _ " stands for OCXO ,
[2]	Please add "G " after the " type code " for RoHS compliant
[3]	" T " stands for Square Wave , " E " stands for True Sine Wave
	ex 1 : OC14T , OC14 pcakage , CMOS output ; ex 2 : OC30E , OC30 package , True Sine wave
[4]	Supply voltage , " 3 " for 3.3V D.C , " 5 " for 5.0V D.C , " 12 " for 12V D.C
[5]	Type of crystal used ; " A " stands for AT-cut crystal , " S " stands for SC-cut crystal
[6]	Center Frequency in MHz
[7]	Frequency stability in ± _ ppm ; ex 1 : ± 0.5ppm — 0.5 , ex 2 : ± 0.02ppm — 0.02
[8]	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

Production Marking Rules

General OCXO package types marking rules

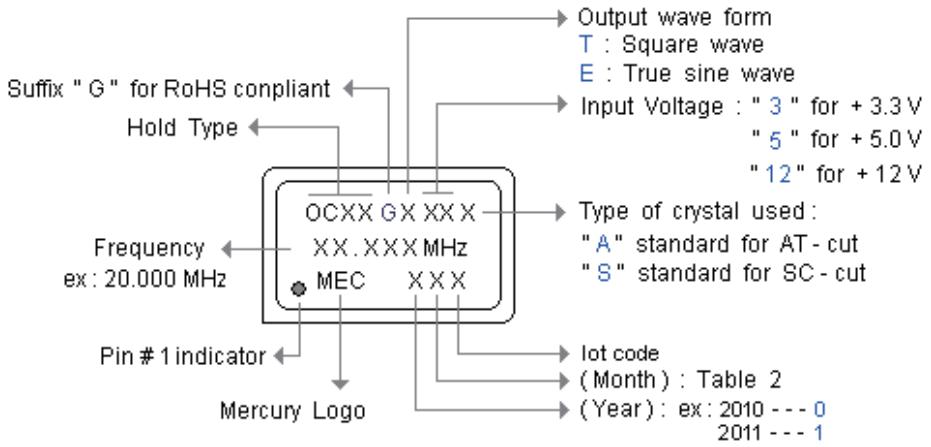


Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Part Number Formats and Product Marking Rules

[M. C. F.] Monolithic Crystal Filters

Holder Type

SMD Types :	MQ						
Dip Types :	49T	U1	U5	S1	S2	L1	L2
Jacket Types :	49TMJ	U1MJ	U5MJ				
Gull Wing Types :	49TSM	U1SM	U5SM				

SMD Type (7.0 * 5.0 * 1.3 mm) Part Number Format

[1]	[2]	[3]	[4]
Frequency Code	MQ	Width Code	Poles Code
Examples: 45	MQ	30	A

Ex : 45MQ30A [45.000MHz , SMD type MQ series (7.0 * 5.0 * 1.3 mm) , Passband : ±15KHz , 2poles]

Dip Type Part Number Format

[1]	[2]	[3]	[4]	[5]	[6]
Frequency Code	M	Width Code	Poles Code	Holder Type	G
Examples: 21.7	M	7.5	D	U5SM	G

Ex : 21.7M7.5DU5SMG [21.700MHz , Passband : ±3.75KHz , 8poles , RoHS compliant , Dip type (UM - 5 type , Gull Wing) , RoHS]

[1]	Freq. code : " 10 " for 10.700MHz , " 21 " for 21.400MHz , " 21.7 " for 21.700MHz , " 45 " for 45.000MHz ,
	Freq. code : If none standard freq. please show freqency with one decimal point .
[2]	" M " Dip Type series , " MQ " SMD Type (7.0 * 5.0 * 1.3 mm)
[3]	Pass band width (3dB) (min.)
	" 7.5 " for ± 3.75kHz , " 15 " for ± 7.5kHz , " 20 " for ± 10kHz , " 30 " for ± 15kHz ,
[4]	No. of poles
	" A " for 2 poles , " B " for 4 poles , " C " for 6 poles , " D " for 8 poles
[5]	Dip type holder type
[6]	Please add " G " after the " type code " for RoHS compliant (Does not apply to MQ series) .
[7]	Standard operating temperature range is -20°C to 70°C ,
	If non-standard please enter the desired temp. range after " / " , for example " / -30+70 " : -30°C to 70°C

Production Marking Rules

General MCF package types marking rules

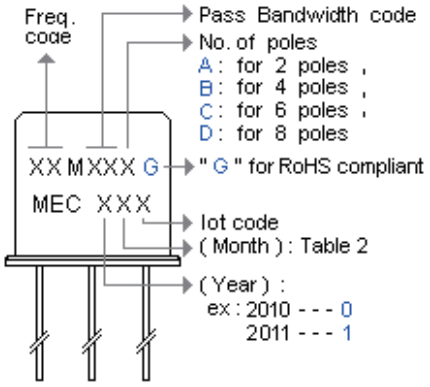
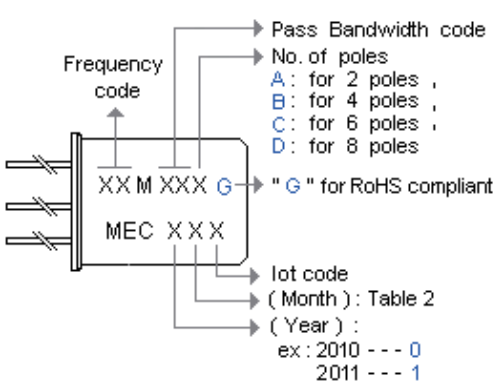
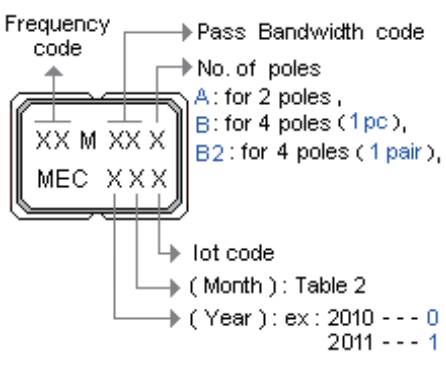
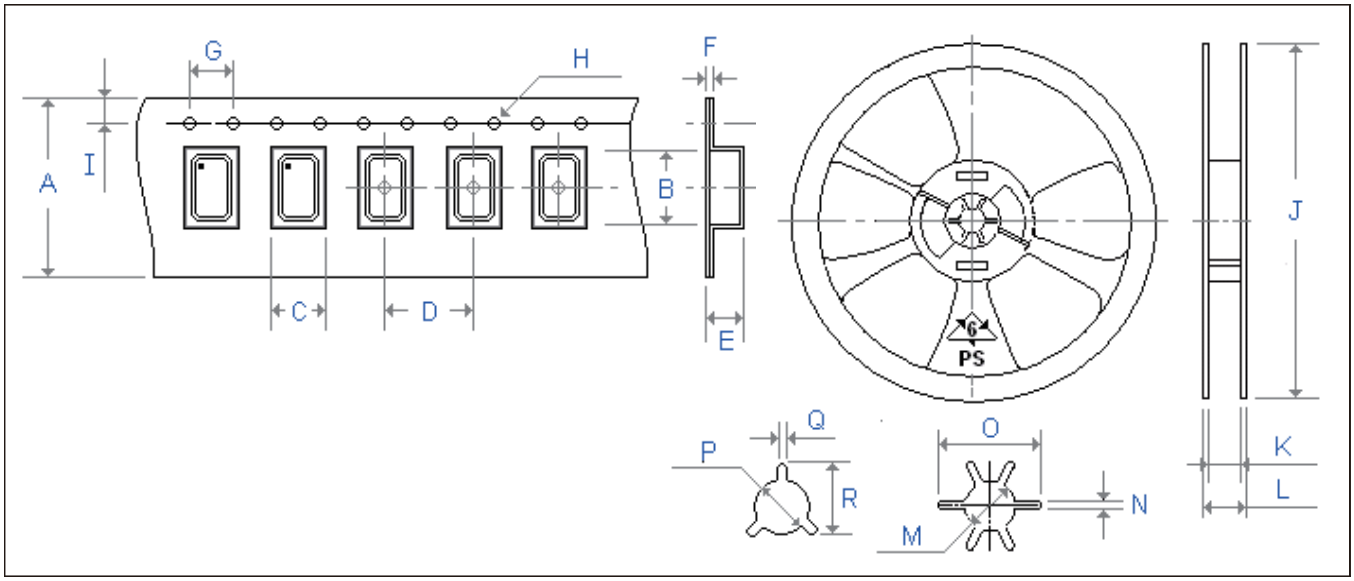
U5 series	U1 , 49T series	MQ series
		

Table 2 :	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	A	B	C	D	E	F	G	H	I	J	K	L

Emboss Taping and Reel Specifications

[Crystal Units] | [M . C . F . Units]



Carrier Type Dimensions (unit : mm)

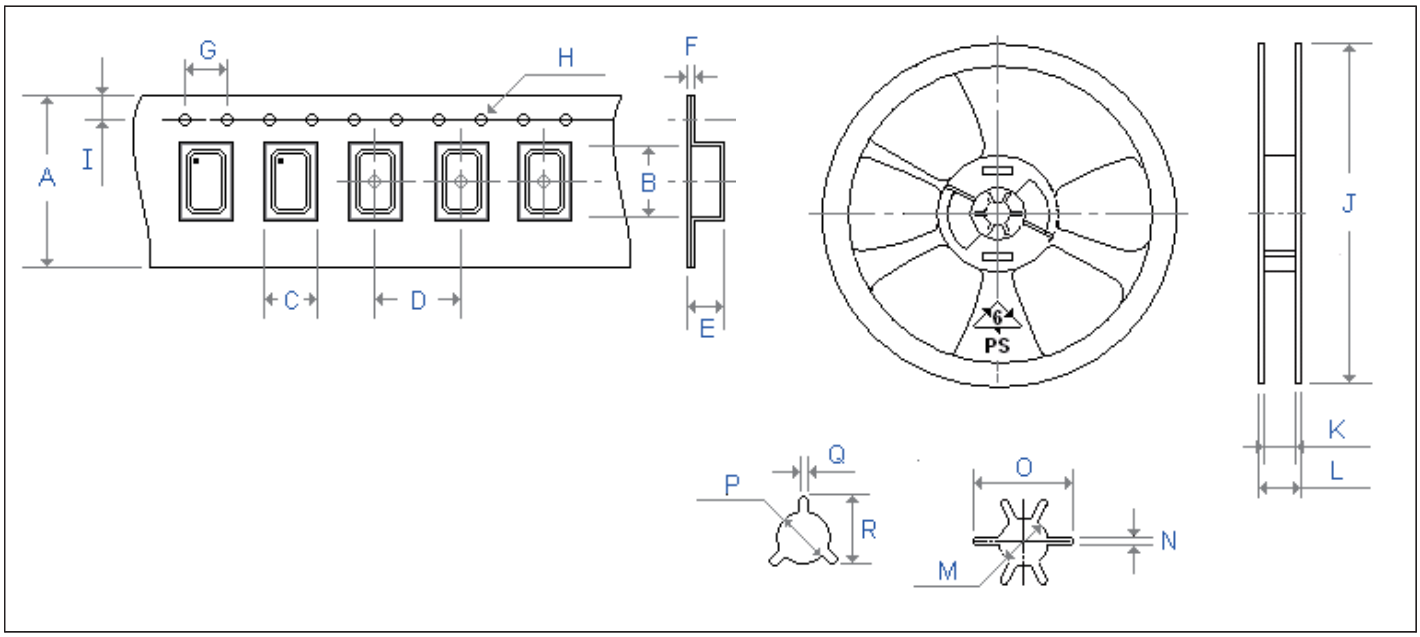
	A	B	C	D	E	F	G	H	I	pcs / reel
X21	8.0	2.3	1.9	4.0	1.2	0.3	4.0	Ø1.0	1.7	3000
X22	8.0	2.7	2.3	4.0	1.2	0.3	4.0	Ø1.5	1.7	3000
X32	12.0	3.3	2.7	3.7	1.4	0.3	4.0	Ø1.5	1.7	3000
X42	12.0	4.3	2.7	7.8	1.3	0.3	4.0	Ø1.5	1.7	1000
MJ	16.0	5.4	3.6	7.8	1.6	0.3	4.0	Ø1.5	1.8	1000
MF	16.0	6.3	3.8	7.9	2.0	0.4	4.1	Ø1.5	1.7	1000
MQ	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
M49	24.0	13.7	5.6	8.0	4.5	0.4	4.1	Ø1.4	1.8	1000
ML49	24.0	13.7	5.6	7.8	3.7	0.4	4.1	Ø1.4	1.7	1000
MP4	24.0	13.1	5.6	7.9	5.5	0.5	4.0	Ø1.45	1.7	1000
MP5	24.0	13.1	5.6	7.9	5.5	0.5	4.0	Ø1.45	1.7	1000

Reel Dimensions (unit : mm)

	J	K	L	M	N	O	P	Q	R	pcs / reel
X21	180.0	11.4	8.4	13.2	2.2	22.0	-	-	-	3000
X22	180.0	11.4	8.4	13.2	2.2	22.0	-	-	-	3000
X32	180.0	18.4	12.4	13.2	2.2	22.0	-	-	-	3000
X42	180.0	18.4	12.4	13.2	2.2	22.0	-	-	-	1000
MJ	180.0	19.6	16.5	-	-	-	13.4	2.5	19.5	1000
MF	180.0	19.6	16.5	-	-	-	13.4	2.5	19.5	1000
MQ	180.0	19.6	16.5	-	-	-	13.4	2.5	19.5	1000
M49	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	1000
ML49	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	1000
MP4	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	1000
MP5	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	1000

Emboss Taping and Reel Specifications

[Crystal Oscillator Units]



Carrier Type Dimensions (unit : mm)

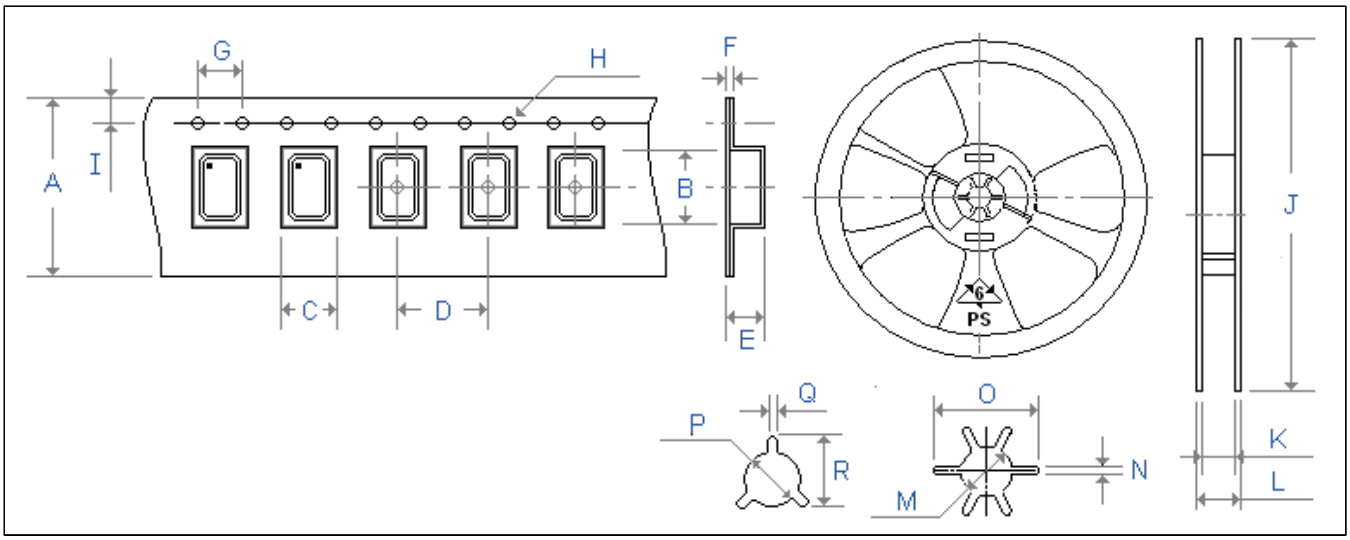
	A	B	C	D	E	F	G	H	I	pcs / reel
H_22	8.0	2.7	2.3	4.0	1.2	0.3	4.0	Ø1.0	1.8	3000
H_32	12.0	3.8	2.8	4.0	1.4	0.3	4.0	Ø1.5	1.8	3000
H_53	16.0	5.4	3.6	7.8	1.6	0.3	4.0	Ø1.5	1.8	1000
H_57	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
SWO	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
H _ 576	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
HP_ 576	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
HD_ 576	16.0	8.0	5.5	8.1	2.0	0.3	4.1	Ø1.4	1.8	1000
H_42	24.1	12.4	10.3	15.6	5.1	0.3	3.9	Ø1.45	1.8	500
H_44	24.1	12.4	10.3	15.6	5.1	0.3	3.9	Ø1.45	1.8	500

Reel Dimensions (unit : mm)

	J	K	L	M	N	O	P	Q	R	pcs / reel
H_32	180.0	9.0	12.0	13.2	2.2	22.0	-	-	-	3000
H_32	180.0	12.8	17.0	13.2	2.2	22.0	-	-	-	3000
H_53	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
H_57	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
SWO	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
H _ 576	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
HP_ 576	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
HD_ 576	180.0	16.5	19.6	-	-	-	13.4	2.5	19.5	1000
H_42	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	500
H_44	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	500

Emboss Taping and Reel Specifications

[VCXO] | [(VC)TCXO]



Carrier Type Dimensions (unit : mm)

	A	B	C	D	E	F	G	H	I	pcs / reel
G_534	16.0	5.4	3.6	7.8	1.6	0.3	4.0	1.5	1.8	1000
G_576	16.0	7.9	5.5	8.1	2.0	0.3	4.1	1.4	1.8	1000
G_42	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
G_44	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
G_62	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
G_64	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
(V)M_53	16.0	5.4	3.6	7.8	1.6	0.3	4.0	1.4	1.8	1000
(V)M_57	16.0	8.0	5.5	8.1	2.0	0.3	4.1	1.4	1.8	1000
(V)M_42	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
(V)M_44	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
(V)M_62	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
(V)M_64	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500
(V)M_64	24.0	12.4	10.3	15.5	5.0	0.3	3.9	1.4	1.8	500

Reel Dimensions (unit : mm)

	J	K	L	P	Q	R	pcs / reel
G_534	179.0	16.5	19.6	13.4	2.5	19.5	1000
G_576	179.0	16.5	19.6	13.4	2.5	19.5	1000
G_42	330.0	30.0	25.0	13.4	2.5	19.5	500
G_44	330.0	30.0	25.0	13.4	2.5	19.5	500
G_62	330.0	30.0	25.0	13.4	2.5	19.5	500
G_64	330.0	30.0	25.0	13.4	2.5	19.5	500
(V)M_53	179.0	16.5	19.6	13.4	2.5	19.5	1000
(V)M_57	179.0	16.5	19.6	13.4	2.5	19.5	1000
(V)M_42	330.0	30.0	25.0	13.4	2.5	19.5	500
(V)M_44	330.0	30.0	25.0	13.4	2.5	19.5	500
(V)M_62	330.0	30.0	25.0	13.4	2.5	19.5	500
(V)M_64	330.0	30.0	25.0	13.4	2.5	19.5	500
(V)M_64	330.0	30.0	25.0	13.4	2.5	19.5	500