

**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



## 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	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	ΔF / F : ±3 ppm / year ( max. )
Storage Temperature Range	- 50°C to 105°C

Table 1

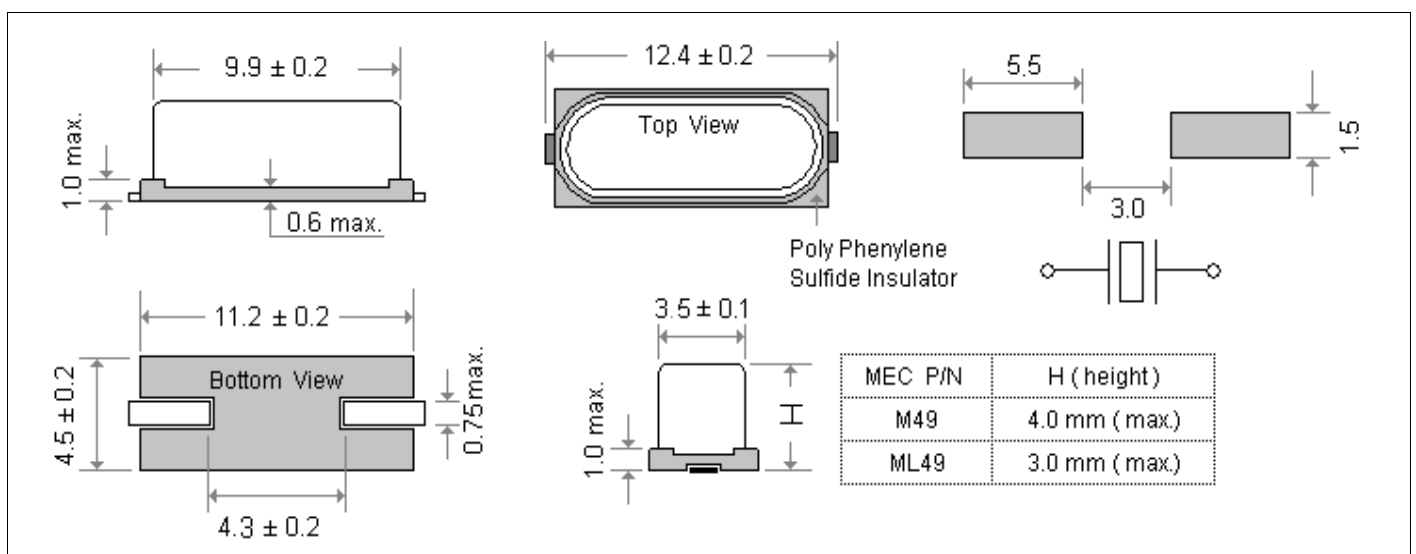
ESR ( Equivalent Series Resistance )					
Freq.(MHz)	Osc. Mode	E.S.R.	Freq.(MHz)	Osc. Mode	E.S.R.
3.2 ~ 3.4	AT , Fund.	300 Ω	24.0~ 48.0	BT , Fund.	40 Ω
3.5 ~ 6.0	AT , Fund.	120 Ω	27.0~ 30.0	AT , 3rd	150 Ω
6.1~ 10.0	AT , Fund.	60 Ω	30.1~50.0	AT , 3rd	100 Ω
10.1~ 30.0	AT , Fund.	40 Ω	50.1~70.0	AT , 3rd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

Mercury [www.mercury-crystal.com](http://www.mercury-crystal.com)

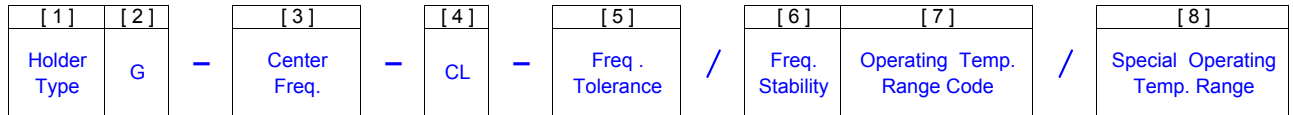
# Part Number Formats and Product Marking Rules

## 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



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

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]	industrial temp. range --- X : -10°C to 60°C ; Y : -20°C to 70°C ; I : -40°C to 85°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
<p>( X22 , X32 , X42 , MJ , MF , MQ series are not included.)</p> <p>Suffix " G " for RoHS compliant .</p> <p>Frequency ← XX,XXX G</p> <p>← MECXXXXX → Date code</p> <p>( Cutting method ) : ← ( month ) : Table 2</p> <p>( Year ) : ← ex: 2010 --- 0</p> <p>2011 --- 1</p> <p>← Load capacitance (CL) : Table 1</p> <p>A : AT-cut (fundamental) B : BT-cut (fundamental) 3 : AT-cut (3rd overtone) 5 : AT-cut (5th overtone)</p>	<p>MQ, MF, MJ, X42 marking rules</p> <p>← XX,XXX → Freq.</p> <p>← MECXXXXX → Date code</p> <p>← (Month) --- Table 2</p> <p>← (Year) --- 2010 --- 0</p> <p>← Load capacitance (CL) : Table 1</p> <p>( Cutting method ) :</p> <p>A : AT-cut , fundamental B : BT-cut , fundamental 3 : AT-cut , 3rd overtone 5 : AT-cut , 5rd overtone</p>	<p>X22, X32 marking rules</p> <p>← XX,X X → Freq.</p> <p>← Load capacitance (CL) : Table 1</p> <p>← M XXX → Date code</p> <p>← (Month) --- Table 2</p> <p>← (Year) 2010 --- 0</p> <p>2011 --- 1</p>

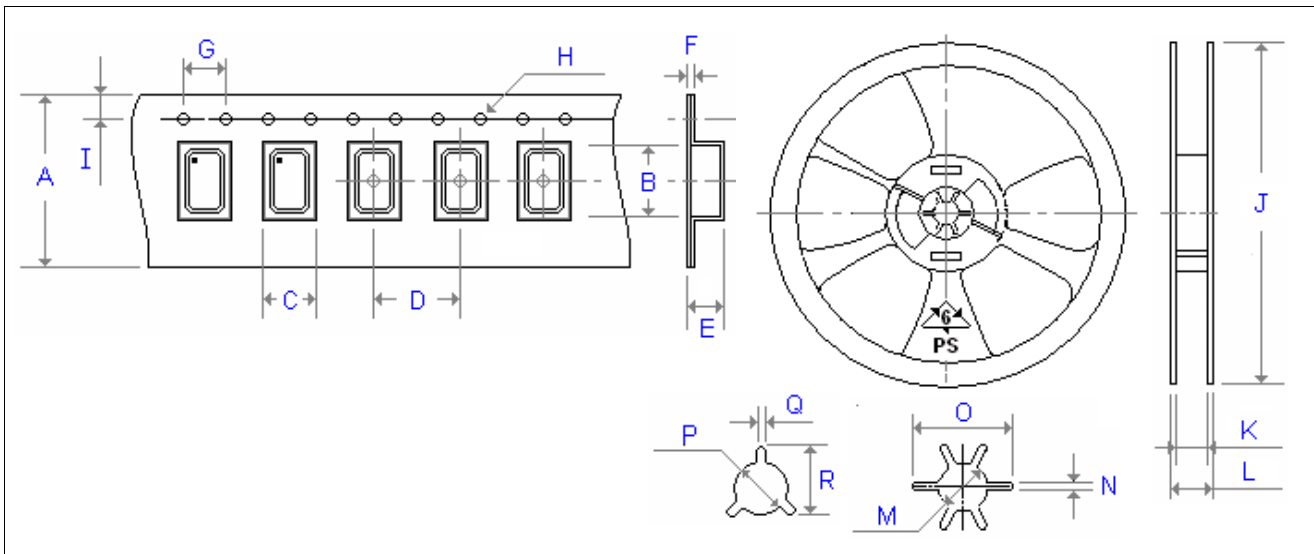
Table 1	CL	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	>34	Series
	Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b

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

# 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
<b>X22</b>	8	2.7	2.3	4.0	1.2	0.3	4.0	Ø1.5	1.7	3000
<b>X32</b>	8 or 12	3.3	2.7	4.0	1.4	0.3	4.0	Ø1.5	1.7	3000
<b>X42</b>	12	4.3	2.7	8.0	1.3	0.3	4.0	Ø1.5	1.7	1000
<b>MJ</b>	16	5.4	3.6	8.0	1.6	0.3	4.0	Ø1.5	1.8	1000
<b>MF</b>	16	6.3	3.8	8.0	2.0	0.4	4.0	Ø1.5	1.7	1000
<b>MQ</b>	16	8.0	5.5	8.0	2.0	0.3	4.0	Ø1.4	1.8	1000
<b>M49</b>	24	14.0	5.6	8.0	4.5	0.4	4.0	Ø1.4	1.8	1000
<b>ML49</b>	24	14.0	5.6	8.0	3.7	0.4	4.0	Ø1.4	1.7	1000
<b>MP4</b>	24	13.0	5.6	8.0	5.5	0.5	4.0	Ø1.45	1.7	1000
<b>MP5</b>	24	13.0	5.6	8.0	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
<b>X22</b>	180	11.5	8.5	13	2.2	22	-	-	-	3000
<b>X32</b>	180	18.5	12.5	13	2.2	22	-	-	-	3000
<b>X42</b>	180	18.5	12.5	13	2.2	22	-	-	-	1000
<b>MJ</b>	180	19.6	16.5	-	-	-	13.5	2.5	19.5	1000
<b>MF</b>	180	19.6	16.5	-	-	-	13.5	2.5	19.5	1000
<b>MQ</b>	180	19.6	16.5	-	-	-	13.5	2.5	19.5	1000
<b>M49</b>	330	30.0	25.0	-	-	-	13.5	2.5	19.5	1000
<b>ML49</b>	330	30.0	25.0	-	-	-	13.5	2.5	19.5	1000
<b>MP4</b>	330	30.0	25.0	-	-	-	13.5	2.5	19.5	1000
<b>MP5</b>	330	30.0	25.0	-	-	-	13.5	2.5	19.5	1000

Mercury [www.mercury-crystal.com](http://www.mercury-crystal.com)

# 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



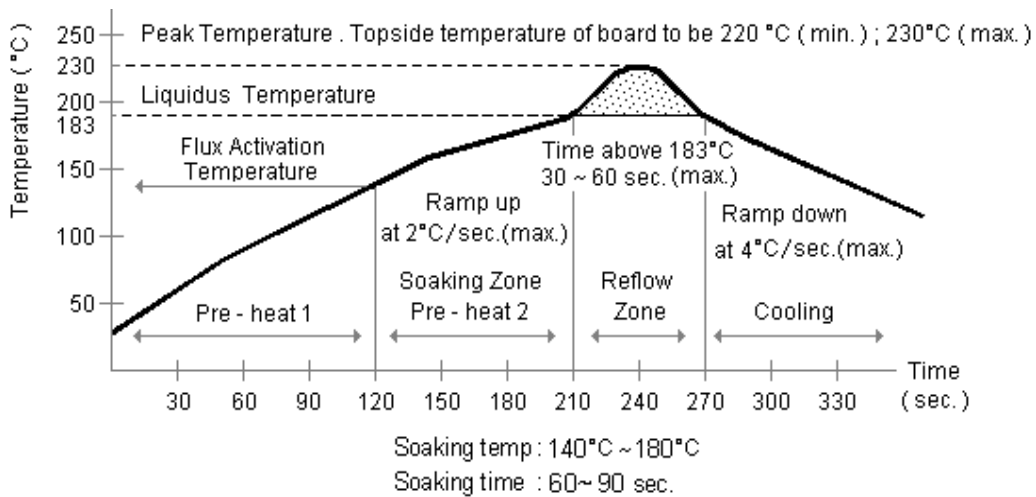
**RoHS Compliant Product  
by Mercury**

### 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 .

