



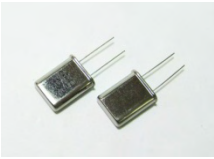



# CONVENTIONAL METAL PACKAGE

## LOW PROFILE METAL-GLASS PACKAGE

AOR offers wide variety of industry standard metal package crystals, ideally suited for the clock signal generation source of the CPU to master signal source for communications equipment that requires tight specification and a broad frequency range.

The product satisfies strict temperature characteristics standards, in shock resistant and has excellent frequency reproducibility.

LEAD TYPE CRYSTALS	UM-1, UM5, UM-4		SMD TYPE CRYSTALS	HC-49/US-SMD	
	HC-49/US			49S-SMD-QA/B	
	HC-49/U, 49/T			49S-SMD-QC	

LOW-PROFILE METAL-GLASS PACKAGE	
SL-MG	



AOR, LTD.  
Tokyo, Japan  
[www.aorja.com](http://www.aorja.com)



UM series are metal packaged crystal units with wide frequency ranges and excellent temperature characteristics. This high precision and excellent shock resistance are ideal for radio communication equipments and other standard applications.

□ FEATURES

- Resistance weld sealing metal package.
- Low ESR
- Slim, Metal Jacket & Lead Forming available.
- Complied with RoHS.

□ STANDARD SPECIFICATIONS

Part Number		UM-1	UM-5	UM-4
Frequency Range	Fundamental	6.0 MHz ~ 60.0 MHz	8.0 MHz ~ 60.0 MHz	20.0 MHz ~ 60.0 MHz
	3rd Overtone	24.0 MHz ~ 180.0 MHz	24.0 MHz ~ 180.0 MHz	60.0 MHz ~ 180.0 MHz
	5th Overtone	80.0 MHz ~ 2000.0 MHz	80.0 MHz ~ 200.0 MHz	100.0 MHz ~ 200.0 MHz
Frequency Tolerance (@25°C±3°C)		±5 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup>		
Temperature Characteristics (NOTE)		±5 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup>		
Operating Temperature Range		-10°C ~ +60°C		
Storage Temperature Range		-45°C ~ +85°C		
Load Capacitance		12pF ~ 32pF, Series		
Series Resistance ( Ω Max.)		See table		
Drive Level		10μW ~ 2000μW		
Aging		±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for other specifications.

□ ESR TABLE ( Ω max. )

Frequency (MHz)		UM-1	UM-5	UM-4
Fund.	6.0 ~ 8.0	40	-	-
	8.0 ~ 20.0	40	50	-
	20.0 ~ 60.0	25	25	30
3rd	24.0 ~ 30.0	60	80	-
	30.0 ~ 60.0	60	60	-
	60.0 ~ 180.0	40	40	80
5th	80.0 ~ 100.0	80	100	-
	100.0 ~ 120.0	80	100	100
	120.0 ~ 200.0	70	100	100

□ CASE SIZE ( LEAD TYPE )

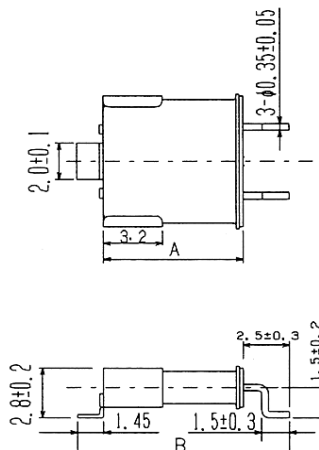
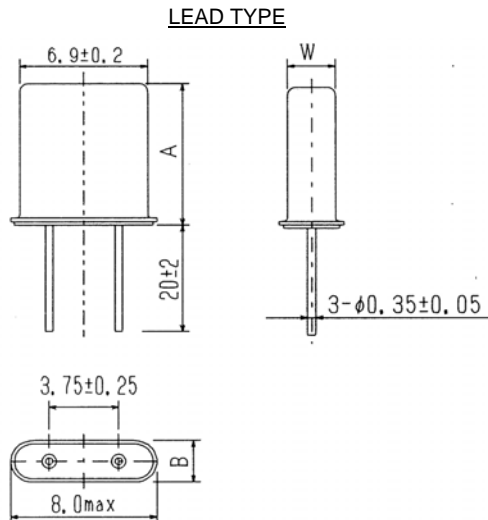
Model No.	A (mm)	B (mm)	W (mm)
UM-1	8.0 max.	3.0 ± 0.2	2.2 ± 0.2
UM-5	6.0 max.	3.0 ± 0.2	2.2 ± 0.2
UM-4	4.5 max.	3.0 ± 0.2	2.2 ± 0.2
UM-1S	8.0 max.	2.5 ± 0.2	1.8 ± 0.2
UM-5S	6.0 max.	2.5 ± 0.2	1.8 ± 0.2
UM-4S	4.5 max.	2.5 ± 0.2	1.8 ± 0.2

□ CASE SIZE ( METAL JACKET )

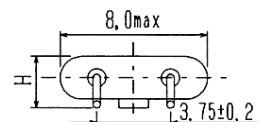
Model No.	A (mm)	B (mm)	H (mm)
UM-1MJ	7.8 ± 0.2	11.5 ± 0.3	3.1 ± 0.2
UM-5MJ	5.8 ± 0.2	9.7 ± 0.3	3.1 ± 0.2
UM-4MJ	4.4 ± 0.2	8.3 ± 0.3	3.1 ± 0.2
UM-1SMJ	7.8 ± 0.2	11.5 ± 0.3	2.8 ± 0.2
UM-5SMJ	5.8 ± 0.2	9.7 ± 0.3	2.8 ± 0.2
UM-4SMJ	4.4 ± 0.2	8.3 ± 0.3	2.8 ± 0.2

□ OUTLINE DRAWING:

Dimensions in mm. Do not scale.



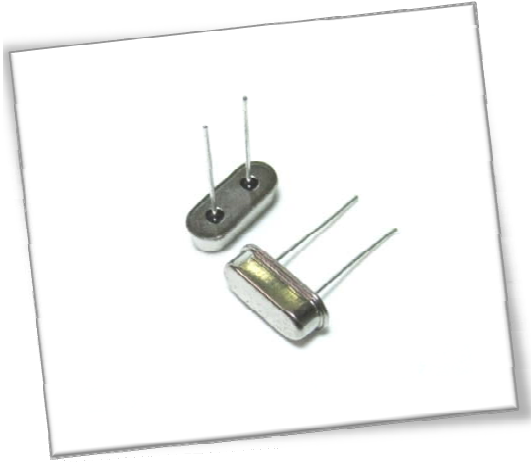
**METAL JACKET TYPE**



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Tokyo - Japan

# HC-49/US SERIES

# LEAD TYPE CRYSTAL UNIT



HC-49/US series are one of the most popular through-hole packaged crystal units with wide frequency ranges. This highly reliable, stable, and rugged design can be used in various applications such as OA / AV, car electronics, Clock source for microprocessor, etc.

## □ FEATURES

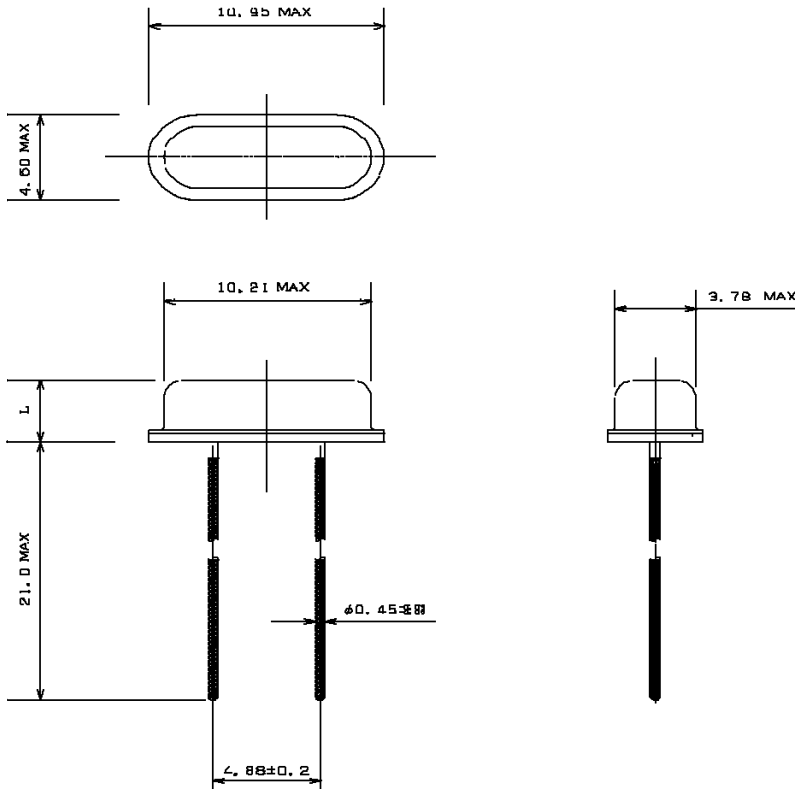
- Resistance weld sealing metal package.
- Rugged, resistant to shock and vibration.
- Available in 5 different heights (2.0, 2.5, 3.0, 3.5, 4.0mm).
- Complied with RoHS.

## □ STANDARD SPECIFICATIONS

Part Number	HC-49/US		
Mode of Vibration	AT Fundamental	BT Fundamental	3rd Overtone
Frequency Range	3.500 MHz ~ 36.000 MHz	22.000 MHz ~ 46.000 MHz	32.000 MHz ~ 65.000 MHz
Frequency Tolerance (@25°C±3°C)	±30 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup> (NOTE)		
Temperature Characteristics (NOTE)	±50 x 10 <sup>-6</sup>	±100 x 10 <sup>-6</sup>	±50 x 10 <sup>-6</sup>
Operating Temperature Range	-40°C ~ +85°C		
Storage Temperature Range	-55°C ~ +105°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	100μW typical		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

## □ OUTLINE DRAWINGS Dimensions in mm. Do not scale.



## □ ESR TABLE

	Frequency Range (MHz)	Maximum ESR (Ω)
AT Fundamental	3.5 - 4.0	180
	4.0 - 5.0	150
	5.0 - 6.0	120
	6.0 - 7.0	100
	7.0 - 9.0	80
	9.0 - 13.0	60
	13.0 - 20.0	50
BT	22.0 - 46.0	40
OT	32.0 - 65.0	80

## □ L SIZE (Height)

Model No.	L (max.)
HC-49/US-L20	2.0mm
HC-49/US-L25	2.5mm
HC-49/US-L30	3.0mm
HC-49/US-L35	4.0mm
HC-49/US-L40	5.0mm

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HC-49/U & HC-49/T are through-hole packaged crystal units with wide frequency ranges and low ESR. This high reliability, excellent stability, and rugged design can be used in microprocessor, radio communication, and other standard applications.

### □ FEATURES

- Resistance weld sealing metal package.
- Rugged, resistant to shock and vibration.
- Low ESR
- Metal Jacket & Lead Forming available.
- Complied with RoHS.

### □ STANDARD SPECIFICATIONS

Part Number	HC-49/U / HC-49/T		
Mode of Vibration	Fundamental	3rd Overtone	5th Overtone
Frequency Range	4.0 MHz ~ 40.0 MHz	20.0 MHz ~ 120.0 MHz	80.0 MHz ~ 200.0 MHz
Frequency Tolerance (@25°C±3°C)	±5 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup>		
Temperature Characteristics (NOTE)	±5 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup>		
Operating Temperature Range	-10°C ~ +60°C		
Storage Temperature Range	-45°C ~ +85°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	10μW ~ 2000μW		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

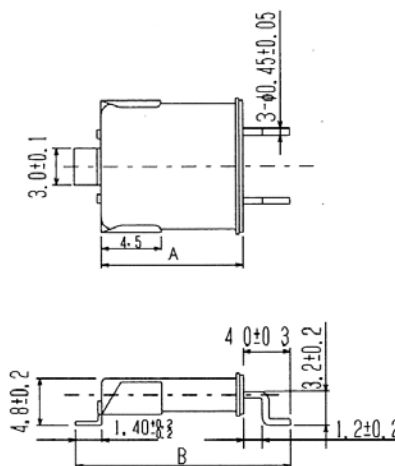
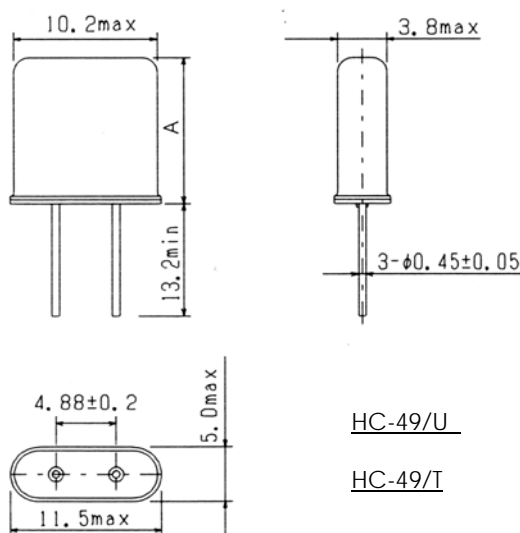
### □ ESR TABLE

Frequency Range (MHz)	Mode	ESR (Ω)
4.0 - 8.0	Fundamental	50 max.
8.0 - 40.0	Fundamental	40 max.
20.0 - 120.0	3rd Overtone	60 max.
80.0 - 200.0	5th Overtone	80 max.

### □ HEIGHT ( A, B SIZE )

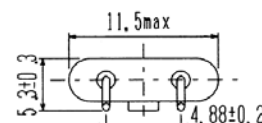
Model No.	A (mm)	B (mm)
HC-49/U	13.5 max.	-
HC-49/T	11.2 max.	-
HC-49/UMJ	13.2 ± 0.2	18.8 ± 0.3
HC-49/TMJ	11.2 ± 0.2	16.8 ± 0.3

### □ OUTLINE DRAWINGS Dimensions in mm. Do not scale.



HC-49/U -MJ

HC-49/T-MJ



# HC-49/US-SMD SERIES

# SMD TYPE CRYSTAL UNIT



HC-49/US-SMD series are low profile SMD metal packaged crystal units with wide frequency ranges. This highly reliable, stable, and rugged design can be used in various applications such as OA / AV, car electronics, Clock source for microprocessor, etc.

## □ FEATURES

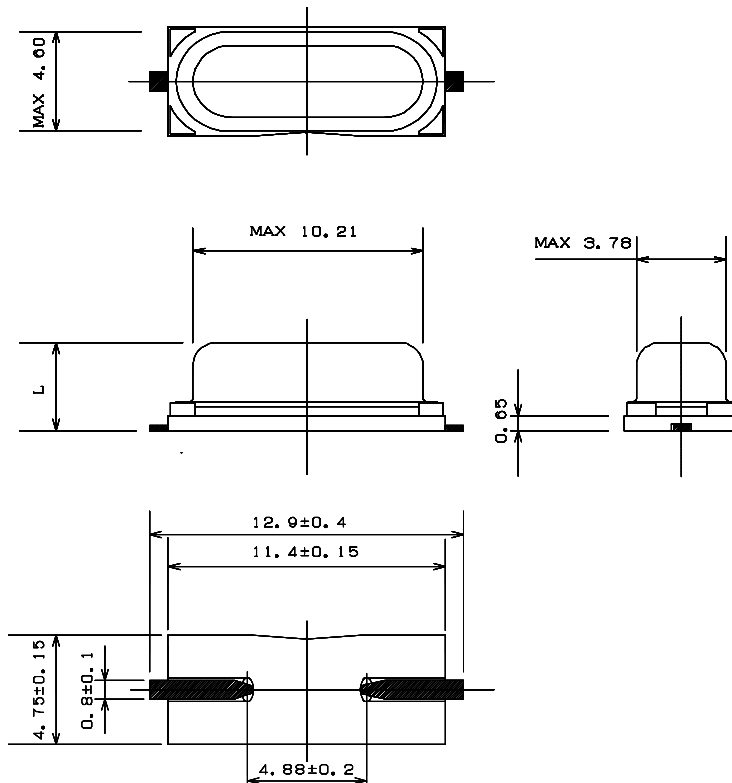
- Resistance weld sealing metal package.
- Available in 4 different heights (2.5, 3.0, 3.5, 4.0mm).
- Tape & Reel available. 1,000 pcs / reel.
- IR Reflow ready.
- Complied with RoHS.

## □ STANDARD SPECIFICATIONS

Part Number	HC-49/US-SMD-L		
Mode of Vibration	AT Fundamental	BT Fundamental	3rd Overtone
Frequency Range	3.500 MHz ~ 36.000 MHz	22.000 MHz ~ 46.000 MHz	32.000 MHz ~ 65.000 MHz
Frequency Tolerance (@25°C±3°C)	±30 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup> (NOTE)		
Temperature Characteristics (NOTE)	±50 x 10 <sup>-6</sup>	±100 x 10 <sup>-6</sup>	±50 x 10 <sup>-6</sup>
Operating Temperature Range	-40°C ~ +85°C		
Storage Temperature Range	-55°C ~ +105°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	100μW typical		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

## □ OUTLINE DRAWINGS Dimensions in mm. Do not scale.



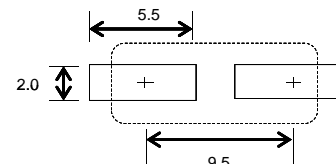
## □ ESR TABLE

	Frequency Range (MHz)	Maximum ESR (Ω)
AT Fundamental	3.5 - 4.0	180
	4.0 - 5.0	150
	5.0 - 6.0	120
	6.0 - 7.0	100
	7.0 - 9.0	80
	9.0 - 13.0	60
	13.0 - 20.0	50
BT	22.0 - 46.0	40
OT	32.0 - 65.0	80

## □ L SIZE (Height)

Part No.	L (max.)
HC-49/US-SMD-L25	2.5mm
HC-49/US-SMD-L30	3.2mm
HC-49/US-SMD-L35	3.7mm
HC-49/US-SMD-L40	4.2mm

## □ REFERENCE LAND PATTERN



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# 49S-SMD-QA/QB SERIES

# SMD TYPE CRYSTAL UNIT



49S-SMD-QA/QB series are 4-pad SMD crystal unit designed to be offered land pattern compatibility to the plastic encapsulated crystal units.

The QA and QB series offer excellent stability when mounted to PCB as the 4-pad construction minimize the coplanarity problem which typically seen in the standard 2-pad HC-49/US-SMD series crystal unit.

## □ FEATURES

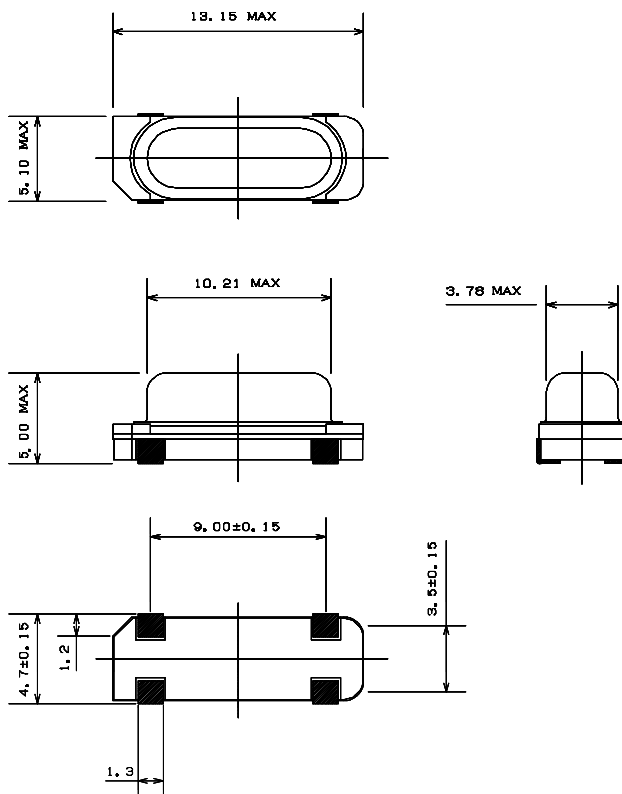
- Compatible to popular molded crystal configurations.
- Proven resistance weld seal package.
- Tape & Reel available. 1,000 pcs / reel.
- IR Reflow ready.
- QA series complied with RoHS (QB series not available).

## □ STANDARD SPECIFICATIONS

Part Number	49S-SMD-QA / 49S-SMD-QB		
Mode of Vibration	AT Fundamental	BT Fundamental	3rd Overtone
Frequency Range	3.500 MHz ~ 36.000 MHz	22.000 MHz ~ 46.000 MHz	32.000 MHz ~ 65.000 MHz
Frequency Tolerance (@25°C±3°C)	±30 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup> (NOTE)		
Temperature Characteristics (NOTE)	±50 x 10 <sup>-6</sup>	±100 x 10 <sup>-6</sup>	±50 x 10 <sup>-6</sup>
Operating Temperature Range	-40°C ~ +85°C		
Storage Temperature Range	-55°C ~ +105°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	100µW typical		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

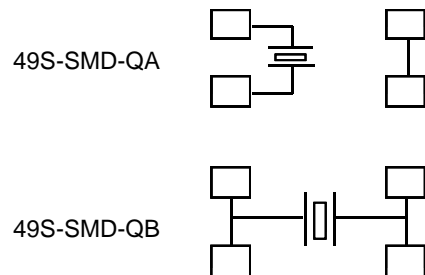
## □ OUTLINE DRAWINGS Dimensions in mm. Do not scale.



## □ ESR TABLE

	Frequency Range (MHz)	Maximum ESR (Ω)
AT Fundamental	3.5 - 4.0	180
	4.0 - 5.0	150
	5.0 - 6.0	120
	6.0 - 7.0	100
	7.0 - 9.0	80
	9.0 - 13.0	60
	13.0 - 20.0	50
BT	22.0 - 46.0	40
OT	32.0 - 65.0	80

## □ PIN CONFIGURATION



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# 49S-SMD-QC

## SMD TYPE CRYSTAL UNIT



The 49S-SMD-QC is a 4-pad land pattern compatible with popular mold packaged crystal units. The 49S-SMD-QC offers excellent stability and aging, and ideal for all-purpose applications.

### FEATURES

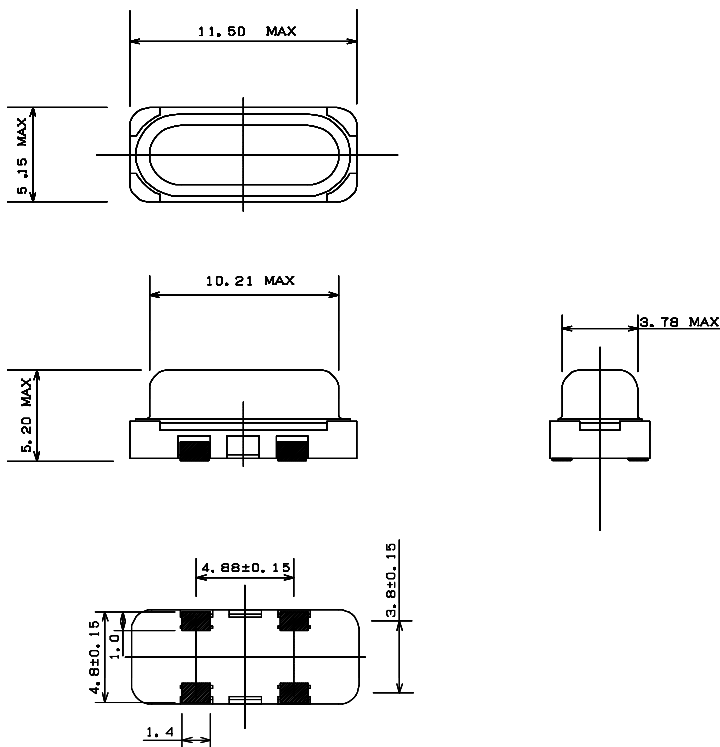
- Compatible to popular molded crystal configurations.
- Proven resistance weld seal package.
- Tape & Reel available. 1,000 pcs / reel.
- IR Reflow ready.
- Complied with RoHS.

### STANDARD SPECIFICATIONS

Part Number	49S-SMD-QC		
Mode of Vibration	AT Fundamental	BT Fundamental	3rd Overtone
Frequency Range	3.500 MHz ~ 36.000 MHz	22.000 MHz ~ 46.000 MHz	32.000 MHz ~ 65.000 MHz
Frequency Tolerance (@25°C±3°C)	±30 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup> (NOTE)		
Temperature Characteristics (NOTE)	±50 x 10 <sup>-6</sup>	±100 x 10 <sup>-6</sup>	±50 x 10 <sup>-6</sup>
Operating Temperature Range	-40°C ~ +85°C		
Storage Temperature Range	-55°C ~ +105°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	100µW typical		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

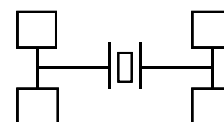
### OUTLINE DRAWINGS Dimensions in mm. Do not scale.



### ESR TABLE

	Frequency Range (MHz)	Maximum ESR (Ω)
AT Fundamental	3.5 - 4.0	180
	4.0 - 5.0	150
	5.0 - 6.0	120
	6.0 - 7.0	100
	7.0 - 9.0	80
	9.0 - 13.0	60
	13.0 - 20.0	50
BT	22.0 - 46.0	40
OT	32.0 - 65.0	80

### PIN CONFIGURATION





Being of the small and low profile SMD that featuring high efficiency in mounting, the SLMG is ideal for application to high-density circuit boards.

Excellent environmental characteristics have been guided, due to the use of the proven resistance weld metal package.

### □ FEATURES

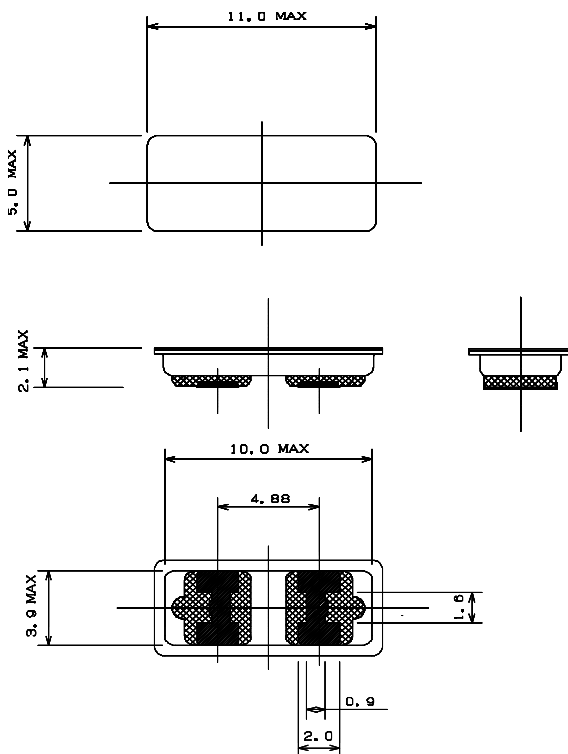
- Low profile and small size SMD type (11.0 x 5.0 x 2.0mm).
- Resistance weld metal package to improve EMI characteristics.
- Ideal for low frequency application (Below 5.0MHz).
- Tape & Reel available. 1,000 pcs / reel.
- IR Reflow ready.
- Complied with RoHS.

### □ STANDARD SPECIFICATIONS

Part Number	SLMG		
Mode of Vibration	AT Fundamental	BT Fundamental	3rd Overtone
Frequency Range	3.500 MHz ~ 40.000 MHz	25.000 MHz ~ 46.000 MHz	32.000 MHz ~ 90.000 MHz
Frequency Tolerance (@25°C±3°C)	±30 x 10 <sup>-6</sup> ~ ±100 x 10 <sup>-6</sup> (NOTE)		
Temperature Characteristics (NOTE)	±50 x 10 <sup>-6</sup>	±100 x 10 <sup>-6</sup>	±50 x 10 <sup>-6</sup>
Operating Temperature Range	-40°C ~ +85°C		
Storage Temperature Range	-55°C ~ +105°C		
Load Capacitance	12pF ~ 32pF, Series		
Series Resistance	See table		
Drive Level	100μW typical		
Aging	±5 x 10 <sup>-6</sup> / year		

NOTE: Please consult us for tight stability and different load capacitance.

### □ OUTLINE DRAWINGS Dimensions in mm. Do not scale.



### □ ESR TABLE

	Frequency Range (MHz)	Maximum ESR (Ω)
AT Fundamental	3.5 - 4.0	180
	4.0 - 5.0	150
	5.0 - 6.0	120
	6.0 - 7.0	100
	7.0 - 9.0	80
	9.0 - 13.0	60
	13.0 - 20.0	50
	20.0 - 40.0	40
BT	22.0 - 46.0	40
OT	32.0 - 90.0	80

### □ PIN CONFIGURATION

