

kHz RANGE CRYSTAL UNIT



Product Number  
MC-146 : Q1xMC1462xxxx0X

MC-146 / MC-146 TYPE

- Frequency range : MC-146...32.768 kHz  
: MC-146 TYPE...32 kHz to 100 kHz
- External dimension : 7.0 × 1.5 × 1.4 mm
- Overtone order : Fundamental
- Applications : Small communications devices



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		MC-146	MC-146 TYPE	
Nominal frequency range	f <sub>nom</sub>	32.768 kHz	32 kHz to 100 kHz	Please contact us about available frequencies.
Storage temperature	T <sub>stg</sub>	-55 °C to +125 °C		Storage as single product.
Operating temperature	T <sub>use</sub>	-40 °C to +85 °C		
Level of drive	DL	1.0 μW Max.		Operating Drive level 0.5 μW Max.
Frequency tolerance (standard)	f <sub>tol</sub>	± 20 × 10 <sup>-6</sup> , ± 50 × 10 <sup>-6</sup>	± 50 × 10 <sup>-6</sup> , ± 100 × 10 <sup>-6</sup>	+25 °C, DL=0.1 μW
Turnover temperature	T <sub>i</sub>	+25 °C ± 5 °C		
Parabolic coefficient	B	-0.04 × 10 <sup>-6</sup> / °C <sup>2</sup> Max.		
Load capacitance	CL	7 pF, 9 pF, 12.5 pF		Please specify
Motional resistance (ESR)	R <sub>1</sub>	65 kΩ Max.	65 kΩ to 25 kΩ	
Motional capacitance	C <sub>1</sub>	1.9 fF Typ.	2.5 fF to 0.6 fF	
Shunt capacitance	C <sub>0</sub>	0.8 pF Typ.	1.2 pF to 0.5 pF	
Frequency aging	f <sub>age</sub>	±3 × 10 <sup>-6</sup> / year Max.	±5 × 10 <sup>-6</sup> / year Max.	+25 °C, First year

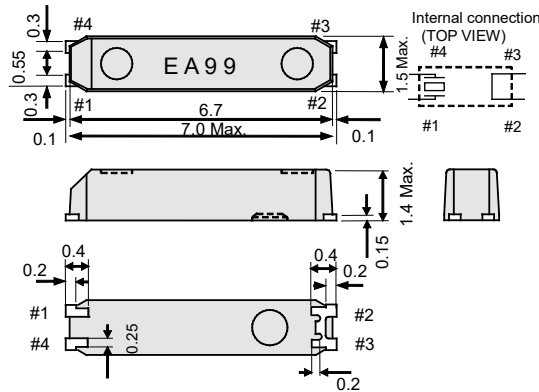
Product name MC-146 32.768000kHz 12.5 +20.0-20.0

(Standard form)

- ① Model    ② Frequency    ③ Load capacitance(pF)    ④ Frequency tolerance(× 10<sup>-6</sup>, +25 °C)

External dimensions

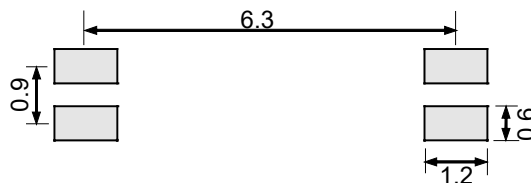
(Unit:mm)



Do not connect #2 and #3 to external device.  
The metal case inside of the molding compound may be exposed on the top or bottom of this product.  
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Footprint (Recommended)

(Unit:mm)



## PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Seiko Epson, all environmental initiatives operate under the Plan-Do-Check-Action (PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification.





ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

## WORKING FOR HIGH QUALITY

In order provide high quality and reliable products and services than meet customer needs, Seiko Epson made early efforts towards obtaining ISO9000 series certification and has acquired ISO9001 for all business establishments in Japan and abroad. We have also acquired IATF 16949 certification that is requested strongly by major automotive manufacturers as standard.

IATF 16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

### ► Explanation of the mark that are using it for the catalog

	► Pb free.
	► Complies with EU RoHS directive. *About the products without the Pb-free mark. Contains Pb in products exempted by EU RoHS directive. (Contains Pb in sealing glass, high melting temperature type solder or other.)
	► Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.
	► Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc ).

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