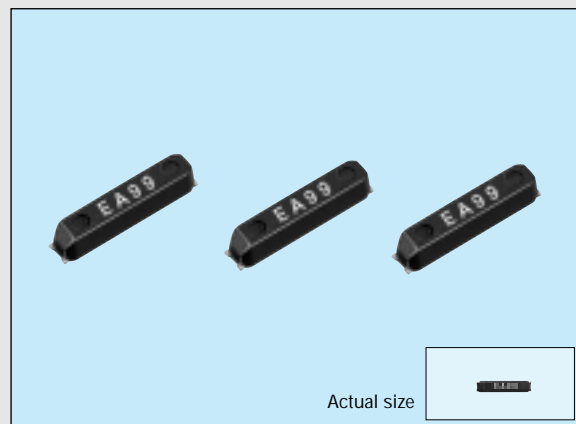


## THIN SMD LOW/MEDIUM-FREQUENCY CRYSTAL UNIT

## MC-146

- High-density mounting-type SMD of 1.4mm thickness.
- Small packaging area and light weight.
- Excellent shock resistance and environmental capability.
- Most suitable for small communications devices.



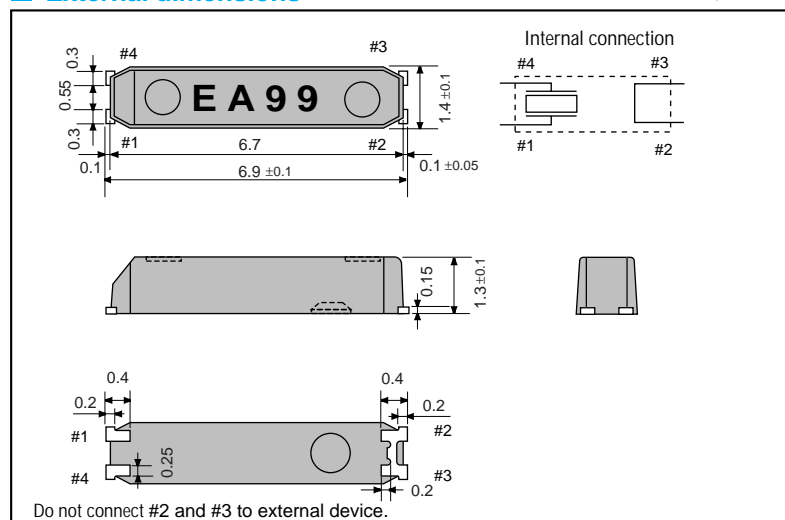
## ■ Specifications (characteristics)

Item	Symbol	Specifications		Remarks
Nominal frequency	f	32.768kHz	75.000kHz	please contact us for inquiries about usable frequencies
Temperature range	Storage temperature	T <sub>STG</sub>	-55°C to +125°C	
	Operating temperature	T <sub>OPR</sub>	-40°C to +85°C	
Maximum drive level	GL	1.0μW max.		Operating drive level 0.5μW max.
Soldering condition	T <sub>SOL</sub>	Twice at under 260°C within 10 sec. or under 230°C within 3 min.		
Frequency tolerance(standard)	Δf/f	±20ppm, ±50ppm		T <sub>a</sub> =25°C, DL=0.1μW
Peak temperature(frequency)	θT	25°C ±5°C		
Temperature coefficient(frequency)	a	-0.04ppm/°C <sup>2</sup> max.		
Load capacitance	C <sub>L</sub>	6pF to ∞		Please specify
Series resistance	R <sub>1</sub>	65 kΩ max.	30kΩ max.	
Motional capacitance	C <sub>1</sub>	1.9fF typ.		
Shunt capacitance	C <sub>0</sub>	0.8pF typ.		
Insulation resistance	IR	500 MΩ min.		
Aging	f <sub>a</sub>	±3ppm/year max.		T <sub>a</sub> =25°C ±3°C, first year
Shock resistance	S.R.	±5ppm max.		Three drops on a hard board from 75 cm or excitation test with 3000G x 0.3ms x 1/2 sine wave x 3 directions

Metal may be exposed on the top of this product. This won't affect any quality, reliability or electrical spec.

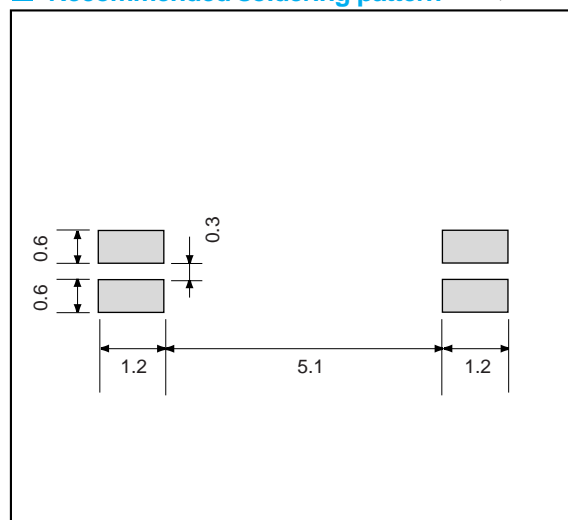
## ■ External dimensions

(Unit: mm)



## ■ Recommended soldering pattern

(Unit: mm)



# THE CRYSTALMASTER



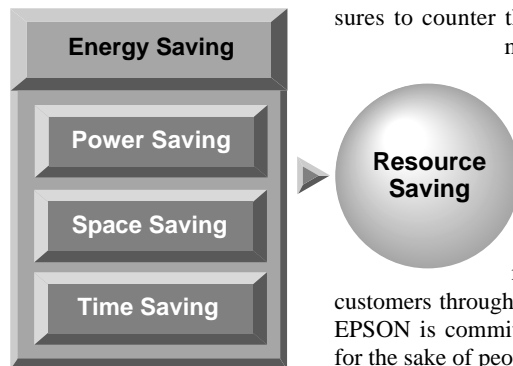
## ENERGY SAVING EPSON

EPSON offers effective savings to its customers through a wide range of electronic devices, such as semiconductors, liquid crystal display (LCD) modules, and crystal devices. These savings are achieved through a sophisticated melding of three different efficiency technologies.

Power saving technology provides low power consumption at low voltages.

Space saving technology provides further reductions in product size and weight through super-precise processing and high-density assembly technology.

Time saving technology shortens the time required for design and development on the customer side and shortens delivery times.



Our concept of Energy Saving technology conserves resources by blending the essence of these three efficiency technologies. The essence of these technologies is represented in each of the products that we provide to our customers.

In the industrial sector, leading priorities include measures to counter the greenhouse effect by reducing CO<sub>2</sub>, measures to preserve the global environment, and the development of energy-efficient products. Environmental problems are of global concern, and although the contribution of energy-saving technology developed by EPSON may appear insignificant, we seek to contribute to the development of energy-saving products by our customers through the utilization of our electronic devices. EPSON is committed to the conservation of energy, both for the sake of people and of the planet on which we live.



**SEIKO EPSON CORP. QUARTZ DEVICE DIVISION acquired ISO9001 and ISO14001 certification by B.V.Q.I. (Bureau Veritas Quality International) .**

**ISO9001 in October, 1992.**

**ISO14001 in November, 1997.**

### NOTICE

No part of this material may be reproduced or duplicated in any form or by any means without the written permission of Seiko Epson. Seiko Epson reserves the right to make changes to this material without notice. Seiko Epson does not assume any liability of any kind arising out of any inaccuracies contained in this material or due to its application or use in any product or circuit and, further, there is no representation that this material is applicable to products requiring high level reliability, such as, medical products. Moreover, no license to any intellectual property rights is granted by implication or otherwise, and there is no representation or warranty that anything made in accordance with this material will be free from any patent or copyright infringement of a third party. This material or portions there may contain technology or the subject relating to strategic products under the control of the Foreign Exchange and Foreign Trade Control Law of Japan and may require an export license from the Ministry of International Trade and Industry or other approval from another government agency.