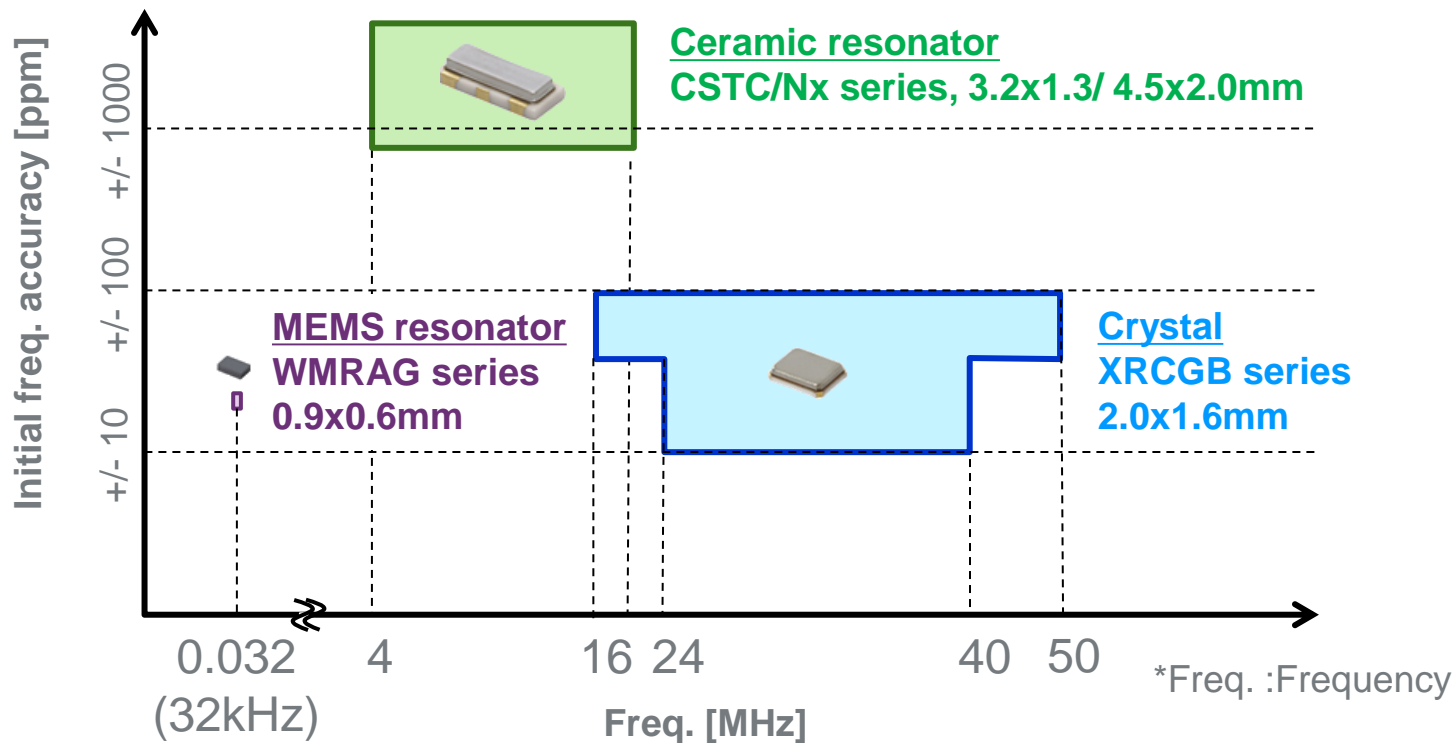


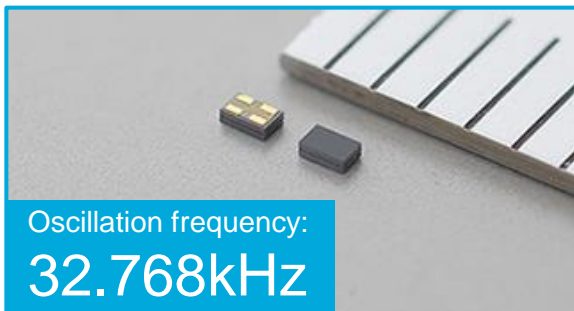
Murata MEMS resonator

November, 2021





MEMS resonator



Function:

- Real time clock, sleep clock, etc

Applications:

- Module, wearable, etc
(Non-automotive application)

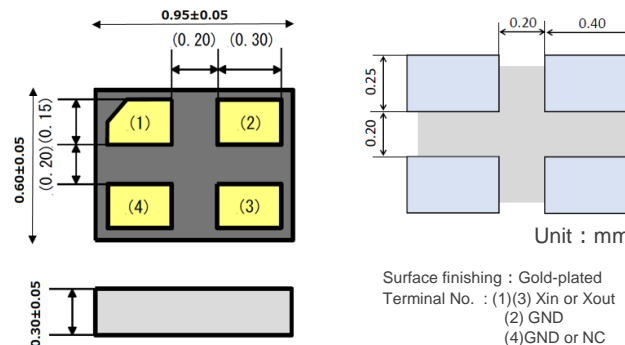
Features:

- **World's smallest size**
- High performance
- High reliability

Specifications:

Item	Specifications
Package Size	0.95 x 0.60 x 0.30mm
Operating Temp	-30 to +85°C (-40 to 125°C max)
Nominal frequency	32.7680kHz
Frequency Tolerance (at +25°C)	+/-20ppm
Frequency Stability (-30 to +85°C)	-150 to +10ppm
Motional Resistance (ESR)	75k ohm max.
Frequency Aging	+/-3ppm
Drive Level	0.2uW max.

Dimensions:



Comparison table

Product

- Size [mm]
- Initial frequency tolerance
- Operating temperature
- ESR
- External load cap

- Frequency stability (-40°C~85°C)

MEMS Resonator (Passive)

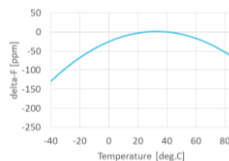
0.9x0.6x0.35

±20ppm

-40 to 125°C

75kohm

No load cap



-200~+10ppm

Crystal Resonator (Passive)

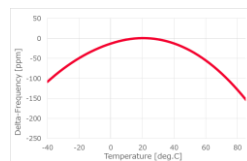
1.6x1.0x0.5

±20ppm

-40 to 85°C

90kohm

Mandatory



-196~0 ppm

MEMS Oscillator (Passive + Active IC)

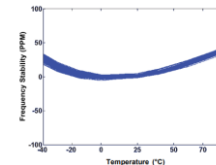
1.5x0.8x0.6

±20ppm

-40 to 85°C

N/A

No load cap



+100ppm

Differentiation of MEMS resonator



| Low power consumption

| High robustness to resin molding

| Real multi-sourced solution for 32kHz device

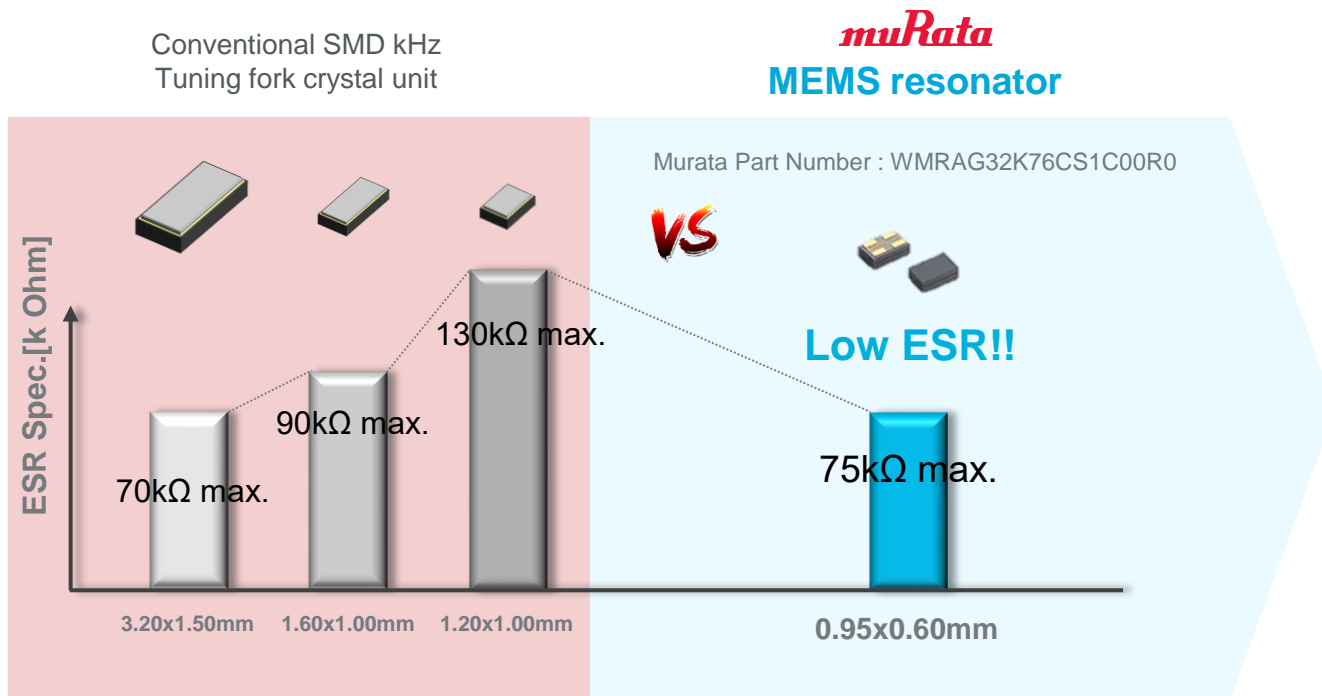
Differentiation of MEMS resonator

| **Low power consumption**

| High robustness to resin molding

| Real multi-sourced solution for 32kHz device

Better performance



Realized by Murata's **MEMS technology.**

Differentiation of MEMS resonator



| Low power consumption

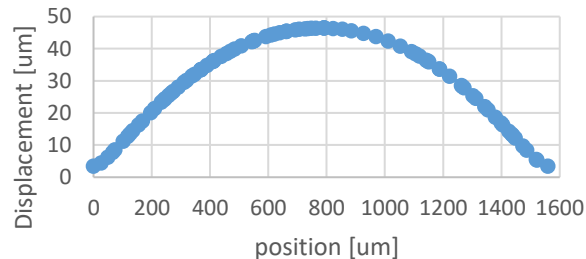
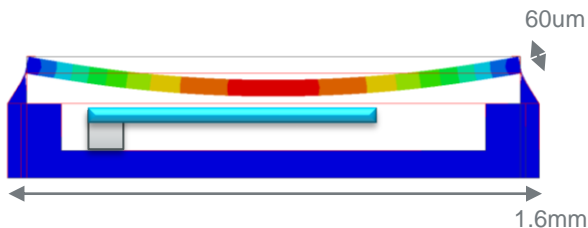
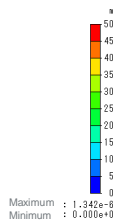
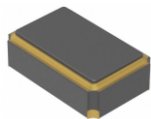
| High robustness to resin molding

| Real multi-sourced solution for 32kHz device

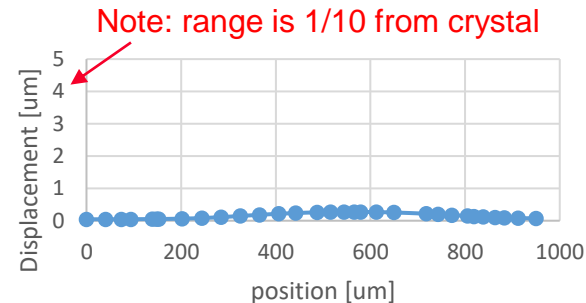
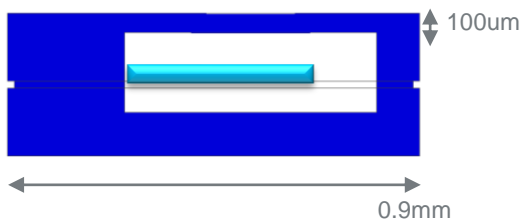
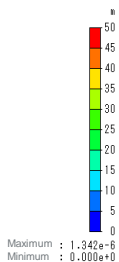
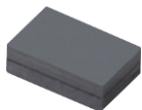
Simulation result

[Simulation condition] - Mold resin: Epoxy / Mold pressure: 19MPa

1610 crystal



0906 MEMS



MEMS resonator is “Low warpage” thanks to **thicker lid** and **small cavity length**.

Differentiation of MEMS resonator



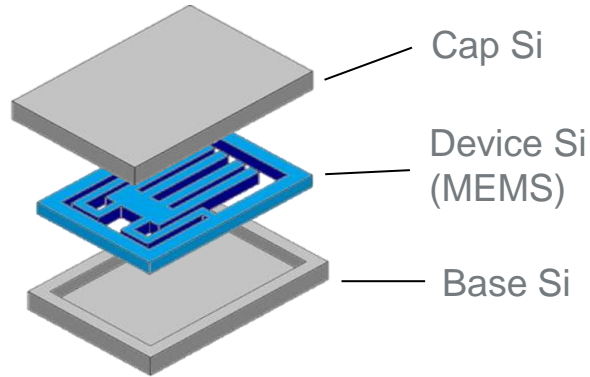
| Low power consumption

| High robustness to resin molding

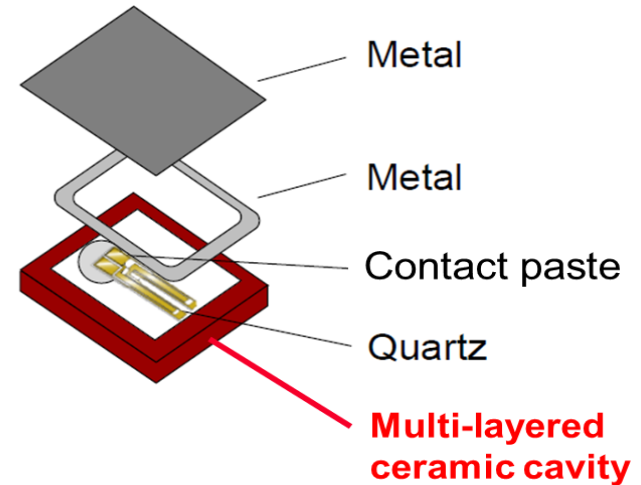
| **Real multi-sourced solution for 32kHz device**

Structural difference

Murata MEMS



Crystal



Real multi-sourced solution for 32kHz device



Murata Proposal

Co-layout land pattern with 3215

Co-layout land pattern with 2012

Land pattern of 1210 crystal

Multi-source

MEMS and 3215 crystal

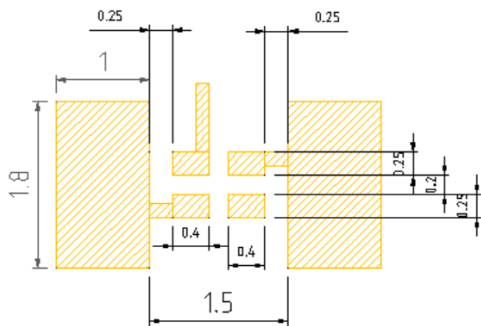
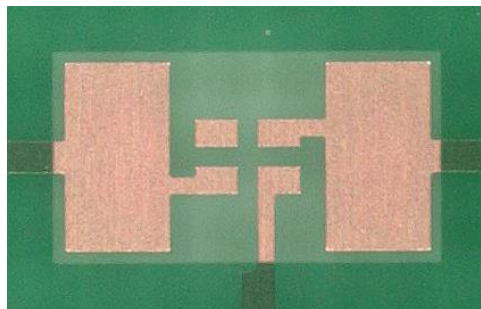
MEMS and 2012 crystal

MEMS and 1210 crystal

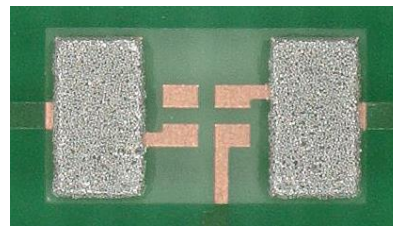
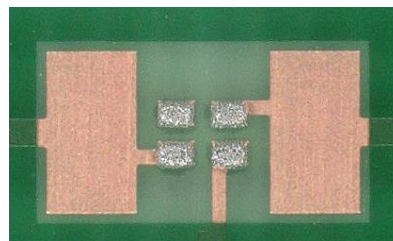
You can realize **real multi-sourced solution** for 32kHz device!

Co-layout land pattern with 3215 crystal

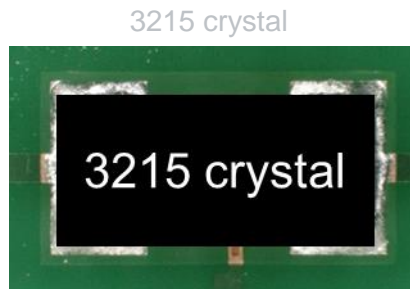
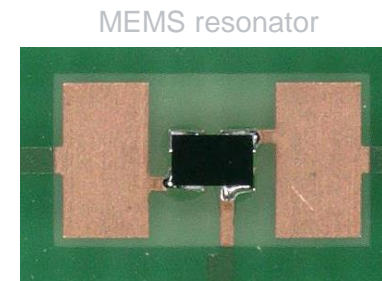
Co-layout land pattern
with 3215 crystal



Solder printing

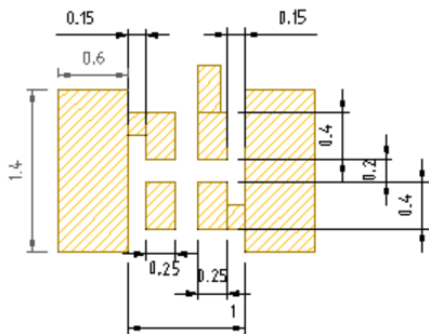
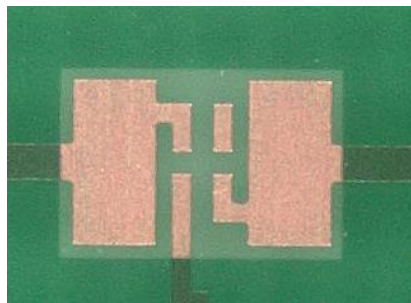


After reflow

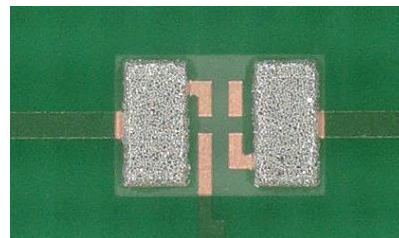
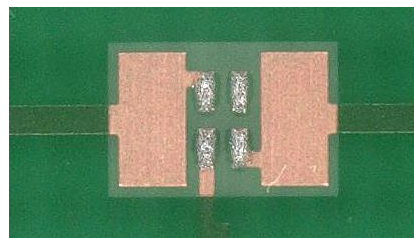


Co-layout land pattern with 2012 crystal

Co-layout land pattern
with 2012 crystal

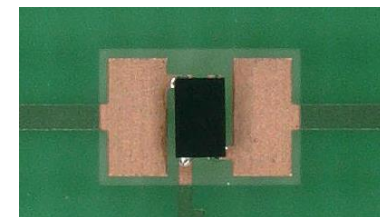


Solder printing

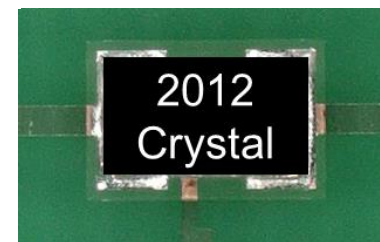


After reflow

MEMS resonator



2012 crystal

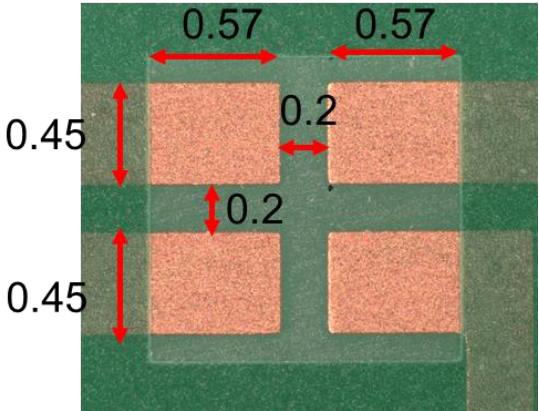


MEMS resonator and 1210 crystal

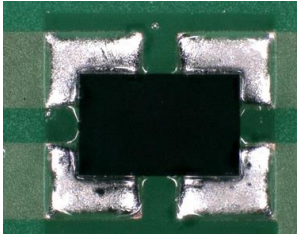
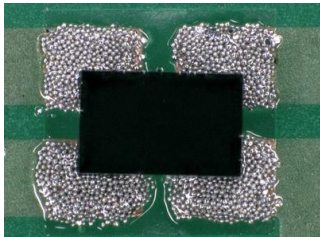
Land pattern for
1210 crystal

Before reflow

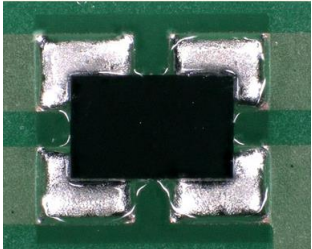
After reflow



Rotate



30°



Self-alignment

Summary

- World's smallest kHz resonator
- Low power consumption
- High robustness to resin molding
- Real multi-sourced solution for 32kHz device

Line up

	85°C	85°C (wide range)	105°C	125°C
Part number	WMRAG32K76CS1C00R0	WMRAG32K76CS2C00R0	WMRAG32K76CS3C00R0	WMRAG32K76CS4C00R0
Size	0.95mm x 0.60mm x 0.30mm			
Nominal Frequency	32.768kHz			
Initial tolerance	±20ppm			
Frequency stability	+10/-150ppm	+10/-200ppm	+10/-200ppm	+10/-270ppm
Storage temp	-30°C to 85°C	-40°C to 85°C	-40°C to +105°C	-40°C to +125°C
Operate temp	-30°C to 85°C	-40°C to 85°C	-40°C to +105°C	-40°C to +125°C
Cs	8 / 9 / 10.5 / 12.5 / 16pF			
Frequency aging	±3ppm			

Thank you
for your attention!

