

**DAISHINKU develops crystal resonator  
with a dedicated temperature sensor of the smallest\* size in the world**

June 30, 2014

DAISHINKU CORP. (President: Sohei Hasegawa) announces development and release of crystal resonator with a dedicated temperature sensor of the smallest\* size in the world.

A crystal resonator with a dedicated temperature sensor is an electronic component utilized as a clock source for the RF and GPS functions in many information devices, such as smart phones and tablet PCs. In recent years, information devices have become more and more compact and feature very low profiles, while their performance and functionality have further advanced. This trend leads the same requirements to apply to the crystal device components within such information devices. We have been producing crystal resonators with a dedicated temperature sensor in sizes of 2520 (2.5 x 2.0 mm) and 2016 (2.0 x 1.6 mm). We now have successfully developed a further downsized model at a size of 1612 (1.6 x 1.2 mm), which represents one of the smallest\* in the world.

As the chipset uses the temperature information provided by a dedicated temperature sensor in a crystal resonator to control the temperature, the crystal specifications must be even more precise than those for general-use resonators. For example, the AT-cut crystal temperature coefficient and inflection point temperature vary according to the crystal's size and shape. As the crystal size becomes smaller, the more difficult it becomes to control quality uniformity. Thus, even higher accuracy in crystal production processes is required.

To address this issue, we have established a crystal design that is less susceptible to the variations caused by processing, ensuring the design margin of this smaller model is equal to or better than conventional models. We have also realized even greater processing accuracy utilizing existing production facilities to achieve continuous and uniform quality. The package is optimized by adopting a low-profile temperature sensor (NTC thermistor) to realize both downsizing and a low-profile, while also securing reliability equal to existing 2520 and 2016 crystal resonators with dedicated temperature sensors.

\* Source: survey by DAISHINKU CORP. valid as of June 29, 2014

<Features>

- Ultra miniature SMD crystal resonator with a dedicated temperature sensor (1.64 × 1.24 × 0.65mm max.)
- Built-in NTC thermistor
- A ceramic package with metal lid providing high precision reliability
- Pb Free
- RoHS Compliant

<Main applications>

Smart phones, tablet PCs

<Sample price>

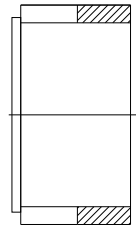
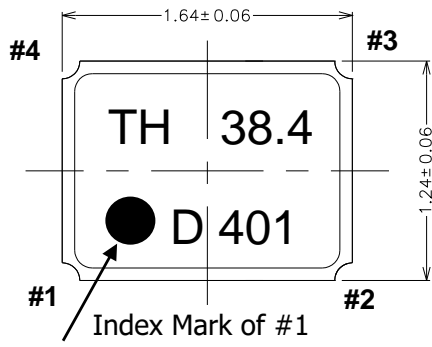
500 yen Samples are available now

<Electrical specification>

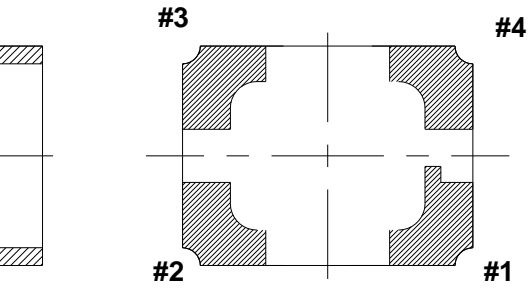
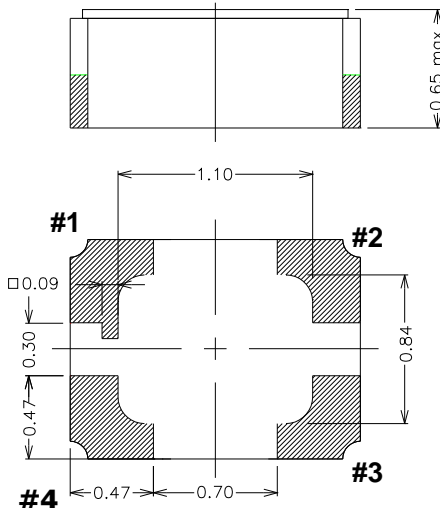
Item	Type	DSR1612ATH
Frequency Range		38.4MHz
Overtone Order		Fundamental
Load Capacitance		7pF, 8pF, 10pF, 12pF
Drive Level		10 $\mu$ W (100 $\mu$ W max.)
Frequency Tolerance		$\pm 10 \times 10^{-6}$ (at 25 $^{\circ}$ C)
Series Resistance		80k $\Omega$ max.
Frequency Characteristics over Temperature		$\pm 12 \times 10^{-6}$ / -30 $\sim$ +85 $^{\circ}$ C
Storage Temperature Range		-40 $\sim$ +125 $^{\circ}$ C
Thermistor Resistance		100k $\Omega$ (at +25 $^{\circ}$ C)
Thermistor B-constant		4250K (+25 $^{\circ}$ C/+50 $^{\circ}$ C)
Packing Unit		3,000pcs/reel ( $\phi$ 180)

Consult our sales representative for other specifications.

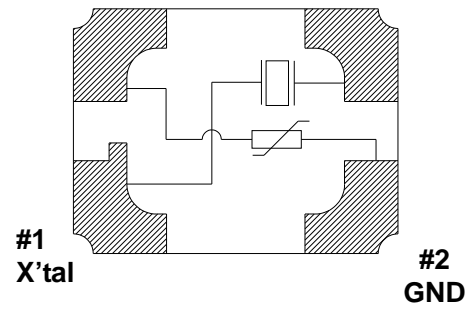
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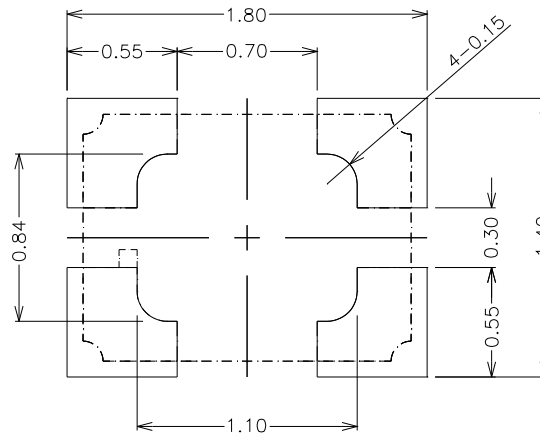
(Top View)



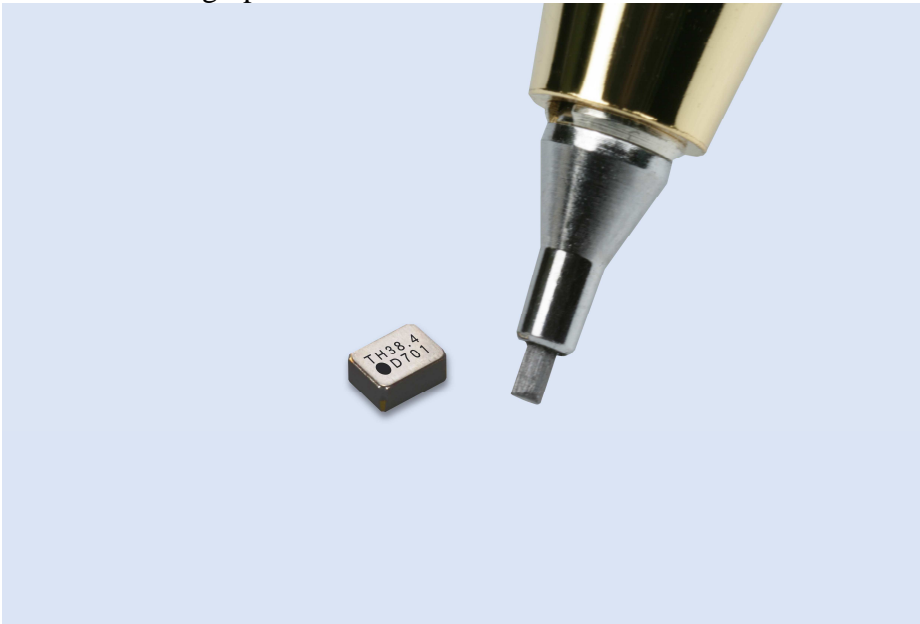
#4 SENSOR #3 X'tal



Recommended Land Pattern (Top View)



## <Product Photograph>



## <Terminology>

### •Temperature coefficient

The frequency-temperature characteristics of AT-cut crystal can be approximated by the following cubic polynomial.

$$f(t)=C3(t-t0)^3+C2(t-t0)^2+C1(t-t0)+C0$$

C0: Constant

C1: Primary temperature coefficient

C2: Secondary temperature coefficient

C3: Third temperature coefficient

t: Temperature

t0: Reference temperature

### •Inflection Point Temperature

This is the point where the graph of an AT-cut crystal resonator's frequency- temperature characteristics is symmetrical.

### •NTC thermistor (NTC Thermistor: Negative Temperature Coefficient Thermistor)

A thermistor in which resistance decreases as temperature increases.