RIVER ELETEC CORPORATION
2-1-11 Fujimigaoka,
Nirasaki, Yamanashi,
407-8502, Japan

Representative: Fujio Wakao
Stock code: 6666
Phone: 81-551-22-1211
Fax: 81-551-22-6645
www.river-ele.co.jp/index_en.html

RIVER ELETEC CORPORATION
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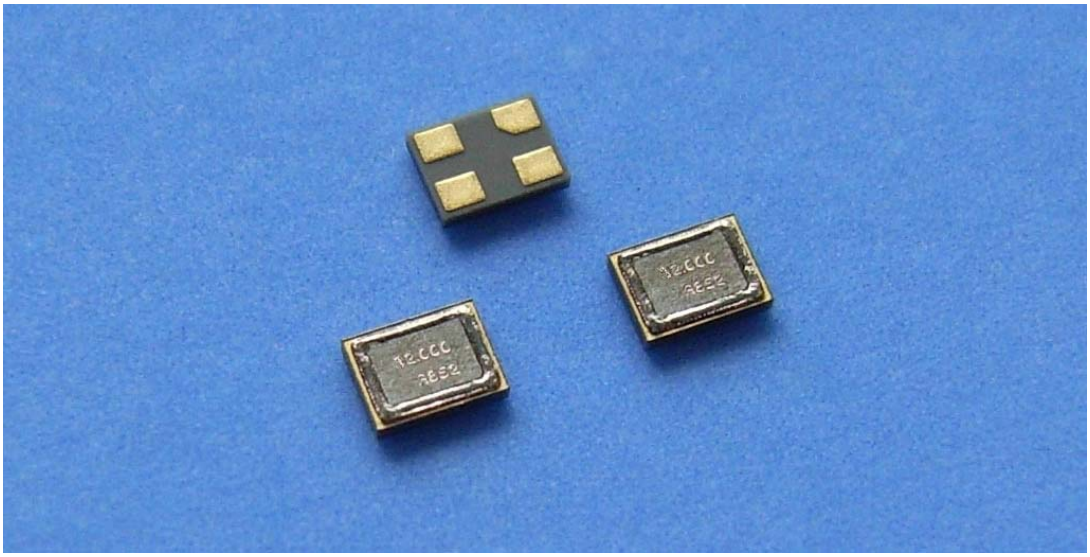
PRESS RELEASE

1.6×1.2 mm GT-Cut Quartz Crystal Units Developed

Meets current needs in a low-power, high-precision, compact, and low-profile unit operating at lower MHz frequencies.



Japan, Jan 31, 2014: RIVER ELETEC (headquartered in Nirasaki, Yamanashi, Japan) has developed an ultra-compact, lower MHz frequency quartz crystal unit. It offers the excellent frequency-temperature characteristics of GT-cut quartz crystal in a smaller package (no more than 1.6 × 1.2 × 0.33 mm) for applications at frequencies ranging from 8 to 20 MHz. Development draws on our ongoing research on 10 MHz range GT-cut components and years spent working with precision photolithography.

Originally developed in the 1940s as components offering outstanding frequency-temperature characteristics, GT-cut quartz crystal units have posed challenges in blank fabrication, limiting volume production. As for AT-cut quartz crystal units, on the other hand, recent years have seen a shift toward support for higher frequencies to respond to a trend of smaller packages, creating a need for smaller, low-power units operating at lower MHz frequencies.

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Advantages of the GT-cut quartz crystal unit

1. Compact, low-profile unit operating at lower MHz frequencies

The width-extensional mode of GT-cut quartz crystal units (Fig. 1) allows package design unconstrained by blank size, in turn enabling significantly smaller and lower-profile units operating at lower MHz frequencies, characteristics difficult to achieve with traditional AT-cut quartz crystal units. (See Table 1.) The equivalent circuit constants of GT-cut quartz crystal units are comparable to those of AT-cut units.

	dimension [mm^2]	volume [mm^3]	packages [mm] (length × width × height)
GT-Cut Quartz Crystal	1.9 (61.6% Down)	0.63 (74.7% Down)	1.6×1.2×0.33
AT-Cut Quartz Crystal (FCX-05 12MHz)	5.0	2.5	2.5×2.0×0.5

Table 1: Comparison of quartz crystal unit packages

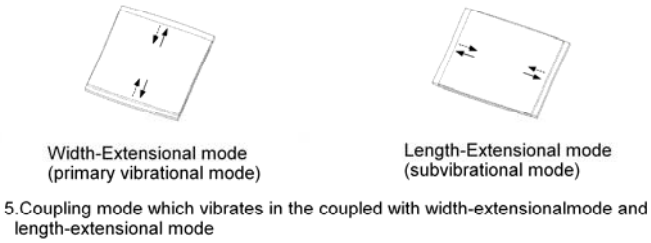
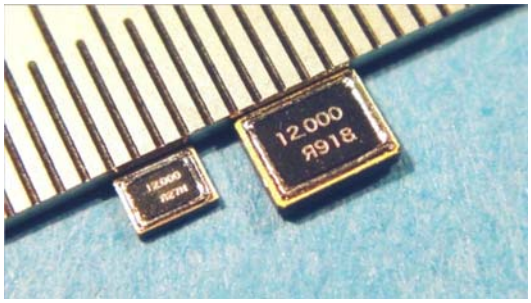


Fig. 1: Mode combining primary (width-extension) and secondary (length-extension) vibrational



Comparing: GT-Cut Quartz Crystal unit (left) and AT-Cut Quartz Crystal unit (right)

2. Stable frequency over a broad range of temperatures

GT-cut quartz crystal units are known for exceptionally superior frequency-temperature characteristics (Fig. 2). This development yields units with an outstanding value of ±3 ppm in the range of −20 to +70°C and or ±5ppm in the range of −40 to +85°C performance not possible with AT-cut quartz crystal units.

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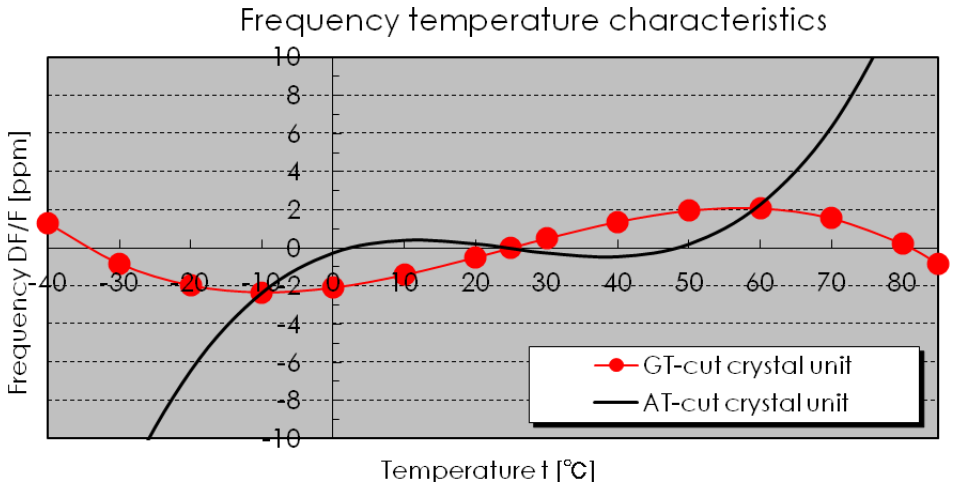

3. Can be driven at low power

Since smartphones, tablets, and wearable electronics are battery-powered, low power consumption is an essential characteristic of electronic components. Given the difficulty of achieving stable low-power vibration with AT-cut quartz crystal units, these components are typically driven at 10 µW or more. In contrast, GT-cut quartz crystal units permit the design of oscillators of the optimal profiles, size, and thickness to minimize vibration loss and ensure stable oscillation, even when driven at 5 µW or less.

Battery-powered mobile devices are often designed to operate intermittently to help minimize power consumption. Such devices require crystals capable of quickly resuming oscillation. Compared to traditional compact AT-cut quartz crystal units, GT-cut units achieve starting oscillation time approximately twice as fast—in a mere 550 µs (compared to 12 MHz FCX-05 in the same oscillation circuit and at the same frequency).

GT-cut quartz crystal units incorporate a wealth of technical expertise from other domains.

1. Design expertise for contour-mode vibration

RIVER ELETEC boasts a history of developing products that harness contour-mode vibration, including Lame-mode resonators. We have accumulated a significant store of technical and design expertise for various vibration modes, and the GT-cut quartz crystal units capitalize on this knowledge. These units use a contour-mode vibration in their width-extension mode.

2. High-precision photolithography

GT-cut quartz crystals are produced using precision fabrication in an order of several microns (µm), applying precision photolithography techniques refined through the production of tuning fork quartz crystal units.

3. e-beam sealing for superb reliability

GT-cut crystals are air-sealed with metal lids welded onto a ceramic package using a proprietary e-beam sealing technique. This protective seal guarantees high core performance by maintaining a high vacuum condition inside the package and ensures the same outstanding reliability found in other RIVER ELETEC products.

Schedule

Sample shipments are scheduled to begin in February 2014. Offering these products as frequency oscillation sources for many electronics that require performance difficult to achieve with AT-cut quartz crystal units—namely, stable frequency over a broader range of temperatures, ultra-compact, low-profile units operating at lower MHz frequencies, and low power consumption—we continue to expand our product lines across a wide range of frequencies.

	Reference Specifications	
Frequency range (proposed)	8 to 20 MHz	
Frequency tolerance (at 25 °C)	±5, ±10, ±20 ppm	
Storage temperature	−40 to +125°C	
Operating temperature	−20 to +70°C	−40 to +85°C
Frequency versus temperature characteristics (Refer to 25 °C)	±3, ±5 ppm	±5, ±10 ppm
Parallel capacitance	5.0 pF max.	
Insulation resistance	500 MΩ min. at 100V DC ±15V	
Level of drive	10 µW max.	
Motional resistance (ESR)	400 Ω max. (12 MHz)	

Please direct any inquires concerning this press release to the following contact points:

River Electronics (Singapore) Pte.Ltd.
49 Jalan Pemimpin #04-03 Aps Industrial Building Singapore 577203
Phone: 65-6258-7874
Fax: 65-6258-7366

Taiwan River Co.,Ltd
3F,No,14 Lane128,Sec.1,Jung Shing Rd. Wu-Gu Dist.New Taipei City Taiwan R.O.C.
Phone: 886-2-8988-2811
Fax: 886-2-2983-4785

Xi'an River Electronics Corporation (Shenzhen Liaison Office)
Room 7A02, Elite Building, 1024 Nanshan RD., Shenzhen, China
Phone: （86）0755-86528590
Fax: （86) 0755-86528590

Product Inquiries http://www.river-ele.co.jp/faq_en/faq01.html