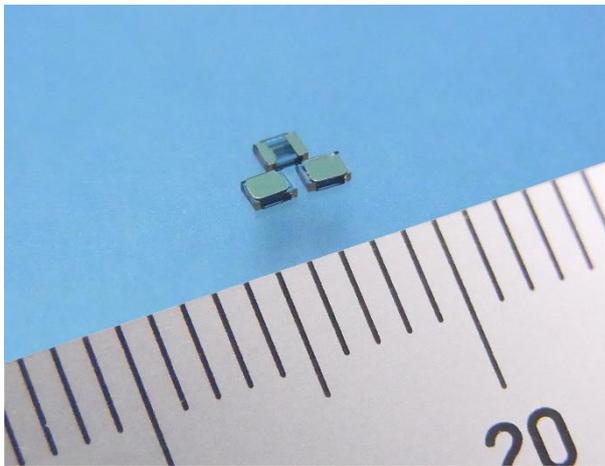


# PRESS RELEASE

## RIVER ELETEC Has Developed World's Smallest 32.768 kHz Tuning-Fork Quartz-Crystal Unit "TFX-05"

*utilizing innovative "Crystal Package" created with "Metal Diffusion Sealing" method*



**Japan, Jun. 5, 2017:** Breaking miniaturization barrier again, RIVER ELETEC has announced the development of "TFX-05", the world's smallest 32.768 kHz tuning fork quartz crystal unit. Trial samples are already available and mass production is scheduled to start in the second half of fiscal 2017.

The most remarkable feature of "TFX-05" is its extremely compact package (1.2×1.0×0.35 mm), which is 47.5% smaller and 75% lighter than the previous model (TFX-04). To meet market's growing needs for more compact, more accurate 32.768 kHz clock crystals for smartphones, wearable devices, and IoT products, RIVER ELETEC has achieved this considerable miniaturization by drawing on their unique technologies, such as crystal processing, microfabrication, and photolithography technology. RIVER ELETEC believes "TFX-05" is going to contribute greatly to miniaturization, light-weighting, and space-saving of many future electronic devices.

For "TFX-05", RIVER ELETEC has established a new package sealing method called "Metal Diffusion Sealing" to create an innovative "Crystal Package", which is a quartz crystal package integrated with a quartz crystal vibrator.

The innovative process employed for "TFX-05" is as follows:

Multiple caps, vibrators, and bases are micro-fabricated in three quartz crystal wafers individually. After the three crystal wafers are bonded together and hermetically sealed simultaneously, they are divided into individual crystal units.

This new packaging technology ensures superior weather-ability, such as aging and heat-resistance, as well as package strength equal to or greater than that of RIVER ELETEC's conventional "Electron Beam Sealing" products. The technology also enables environmental-friendly manufacturing because it can conserve resources. RIVER ELETEC is planning to apply the new process that enabled them to fabricate this unique package to their next-generation products, which will require higher dimensional accuracy.

"TFX-05" is ideal for the devices that require ultra-compact and low-profile designs, such as smartphones, wearable devices, and IoT products. "TFX-05" is also expected to be in high demand for applications including clock sources of power control functions, multi-function watches, and various modules.

#### Features:

- The world's smallest, 1210 size tuning fork quartz crystal unit (32.768 kHz)
- "Metal Diffusion Sealing" method, which is RIVER's new package sealing method to bond and seal the layers of quartz crystal wafers simultaneously
- "Crystal Package": a quartz crystal package integrated with a quartz crystal vibrator
- Excellent electrical performances rivaling previous models in spite of the considerable miniaturization
- ESR of 80kΩ enabled by high-vacuum package

#### Standard Specifications

Size (Max.)	1.2×1.0×0.35 mm
Nominal Frequency	32.768 kHz
Frequency Tolerance (@25°C)	±10 ppm, ±20 ppm, ±30 ppm, ±50 ppm, and others
Operating Temperature Range	-20 to +70°C / -40 to +85°C / -40 to +105°C and others
Equivalent Series Resistance (Max.)	80 kΩ
Motional Capacitance / Shunt Capacitance (Typ.)	7.0 fF / 1.5 pF
Load Capacitance	5.0 pF, 7.0 pF, 9.0 pF, and 12.5 pF (Custom values available on request)
Drive Level (Max.)	1.0 μW
Others	Lead-free RoHS-compliant Specifications in conformity with AEC-Q200 available on request

Please direct any inquiries 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)

9F-B7, New Green Island Building, Nanshan Road, Shenzhen  
Phone: (86) 0755-86528590  
Fax: (86) 0755-86528590

**Product Inquiries** [http://www.river-ele.co.jp/faq\\_en/faq01.html](http://www.river-ele.co.jp/faq_en/faq01.html)