

## Developed 2016/2520-size differential-output SPXO that achieves the world's highest levels<sup>(\*1)</sup> of high-frequency, high-accuracy, and low-jitter for next-generation data centers and optical transceivers

In October 2024, Nippon Dempa Kogyo Co., Ltd. developed a differential-output crystal oscillator that achieves a small size (2.0 × 1.6 × 0.66mm, 2.5 × 2.0 × 0.74mm) despite its high fundamental frequency (156MHz~625MHz), high accuracy ( $\pm 20 \times 10^{-6}$ ), and low jitter (28fs) for use in optical communication speed 800Gbps and 1.6Tbps optical transceivers used in next-generation data centers.

Starting with the fundamental 156.25MHz, 312.5MHz, the frequencies are expanded sequentially to support the fundamental 625MHz.

This product is also compatible with automotive applications, and can be used as a high-frequency, high-accuracy, noise-resistant oscillation source to meet customer needs as the in-vehicle network becomes faster in the future.

### **【Product photography】**



### **【Product features】**

- Supports fundamental and high frequency (156~625MHz)
- Compatible with high accuracy (max.  $\pm 20 \times 10^{-6}$ )
- Low-Phase-Jitter (typ.28fs)
- Supports high temperature of 105° C

### **【Applications and markets】**

- data centers
- optical transceiver
- clocks for DSP

### **【Sample and mass production】**

- Sample available
- Mass production: Scheduled for April 2025(156.25MHz)  
for April 2026(312.5MHz)

With the spread of generating AI in recent years, communications traffic has increased, and data servers, including data centers, are becoming increasingly high-speed and large-capacity.

In addition, with the rapid demand for higher-capacity applications, mainly for AI and machine-learning, optical transmission modules in datacenters are shifting from 800Gbps to 1.6Tbps for high-speed standards. As a reference clock source for high-speed transmission, demand for crystal products is expected to continue to grow.

As optical transmission modules become smaller and faster, the number of components increases and the size of circuit boards shrinks. As a result, smaller components are required for surface mount components, and the temperature inside the modules that handle high-speed, large-capacity data rises. As a result, there is an increasing demand for reliable performance that can withstand high temperatures.

In addition, high-speed data communication quality requires a reference clock source with high frequency and low phase jitter<sup>(\*2)</sup>.

For long-distance transmission over 40km in particular, a reference clock source with a frequency-tolerance of  $\pm 20 \times 10^{-6}$  or less is required.

Against this background, we developed a high-temperature-compatible fundamental and high-frequency crystal resonator using photolithography technology. We also developed a small IC and small packages that compensate for the low-phase jitter and the frequency-temperature characteristics of the crystal resonator. We also developed a 2.0 x 1.6mm size and 2.5 x 2.0mm size differential-output oscillator that achieves the world's highest levels high-frequency, high-accuracy, and low jitter at a high temperature of 105° C.

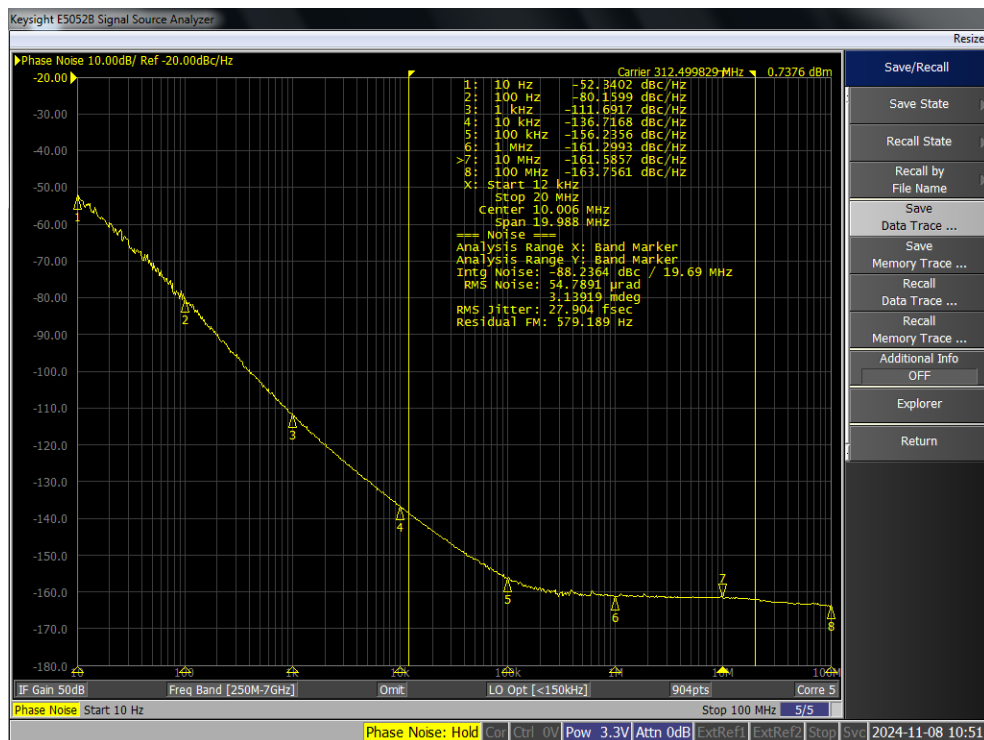
We will continue to contribute to the realization of a safe, secure, and comfortable society through our crystal device business by offering a product lineup that is even more compact, high-frequency, and low-noise.

(※1) Our survey as of November 2024

(※2) Shift or fluctuation of the time axis that occurs in the waveform when a digital signal is transmitted

### 【Phase noise/phase jitter data NP2016SBE/312.5MHz/LVDS/3.3V】

Phase jitter: 28 fs (12kHz~20MHz)



### 【Product characteristics】

Size	2.0 × 1.6 × 0.66 mm 2.5 × 2.0 × 0.74 mm			
Model	NP2016SAE NP2520SAE	NP2016SBE NP2520SBE	NP2016SFE NP2520SFE	NP2016SGE NP2520SGE
Output	LVPECL	LVDS		
Nominal frequency range	156MHz~625MHz (Typical frequency : 156.25MHz, 312.5MHz, 625MHz)			
Operating temperature range	-40°C ~ +105°C			
Total frequency tolerance	Max. ± 20 × 10 <sup>-6</sup>			
Output voltage	V <sub>OH</sub> : min.V <sub>CC</sub> -1.1V V <sub>OL</sub> : max.V <sub>CC</sub> -1.5V	V <sub>OD</sub> : 250~450mV	V <sub>OD</sub> : 300~600mV	V <sub>OD</sub> : 400~800mV
Phase jitter (156.25MHz , 3.3V)	typ.41 fs max.70 fs	typ.36 fs max.60 fs		

Phase jitter (312.5MHz , 3.3V)	typ.29 fs max.60 fs	typ.28 fs max.50 fs
Supply voltage[V <sub>cc</sub> ]	+2.5V/+3.3V	+1.8V +2.5V/+3.3V

If you have any questions about our products, please contact us at the following address.

**【Contact】**

Nihon Dempa Kogyo Co., Ltd.

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