July 13th, 2022
Nihon Dempa Kogyo Co., Ltd.
Representative Director and President
Hiromi Katoh

Industry's first (*1) High-temperature operation (+125deg.C)/High-frequency (upto 100MHz) Developed 2016-size TCXO

Nihon Dempa Kogyo Co., Ltd. has developed the industry's first 2.0×1.6mm-sized (0.8mm height) temperature operable (+125deg.C) and high frequency output-compatible (100MHz) TCXO (temperature-compensated crystal oscillator) for the automotive market.
Sample shipments will begin in September 2022.

Technological trends in automotive applications are expected to include improved ADAS (*2) performance, mandatory AEBS (*3) standardized equipment, and increased use of Wi-Fi ® in-vehicle applications, as well as greater convenience and functionality through OTAs (*4) with external vehicles, as well as an increase in the number of crystal device installations.

The reference clock used for the ToF (*5) and FMCW (*6) methods in pulsed signals and the reference clock for signal reception and various radio communications from GNSS (*7) are required to have a frequency stability TCXO in order to improve and maintain performance in measuring range using LiDAR (*8) and Radar.

With regard to high-temperature operation, there is a need for TCXO that can be used even in higher temperatures, such as by installing ADAS equipment in the engine compartment, and by installing GNSS receivers and Wi-Fi®/Bluetooth ® equipment in the roof antenna unit from the interior of a conventional vehicle.

For high-frequency applications, the phase noise properties of radio circuits are crucial for 5G and Beyond-5G, as well as for high-frequency and broadband communications in next-generation Wi-Fi and other applications.
When generating a communication frequency, if the multiplication number of the reference clock increases, the noise component increases, and the modulation accuracy (signal phase and amplitude deviation) deteriorates, resulting in deterioration of reception sensitivity and reduction of communication efficiency.
One of these measures is to increase the frequency of the reference clock.
This will reduce the multiplication factor and improve the radio communication performance. Therefore, the demand for higher frequencies for TCXO is expected to grow even further in the future.
To meet such demands, we have worked to achieve high-temperature operation and high-frequency operation of automotive TCXO and have been developing them.
Now, we have a long track record in the automotive market. We have developed the industry's first TCXO by using high-quality, high-Q-value (*9) artificial quartz crystal developed in-house, optimizing crystal oscillator designs through the photolithography process, and using them in conjunction with oscillator circuits that support high-temperature operation and high-frequency operation.

We will continue to refine our technologies aimed at improving the quality of quartz devices, while at the same time meeting customer needs by offering a product lineup that offers compactness, high temperature, and high frequency compactness.

(*1) Our survey as of April 2022
(*2) ADAS(Advanced Driver Assistance Systems) : Advanced driving support system
(*3) AEBS(Advanced Emergency Braking System) : Advanced emergency braking system
(*4) OTA(Over The Air) : Communications using wireless networks
(*5) ToF(Time of Flight) : The time it takes for light or radio waves to bounce off an object.
(*6) FMCW(Frequency Modulated Continuous Wave) : One of the ranging methods used for radar, etc.
(*7) GNSS(Global Navigation Satellite Systems): Generic name of position positioning system using satellites, etc.
(*8) LiDAR(Light Detection and Ranging) : One of the arts to measure the distance and direction to an object using laser light.
(*9) For crystal resonators, this value indicates the degree of resonance sharpness, which means that the larger (higher) the value, the more stable the vibration.

[Sample and mass production]
Sample shipments are scheduled for September 2022 and mass production is scheduled for March 2023.

【Product appearance】

【Specifications / Characteristics】

Model Number	NT2016SHC
Dimension Size	2.0×1.6×0.8mm

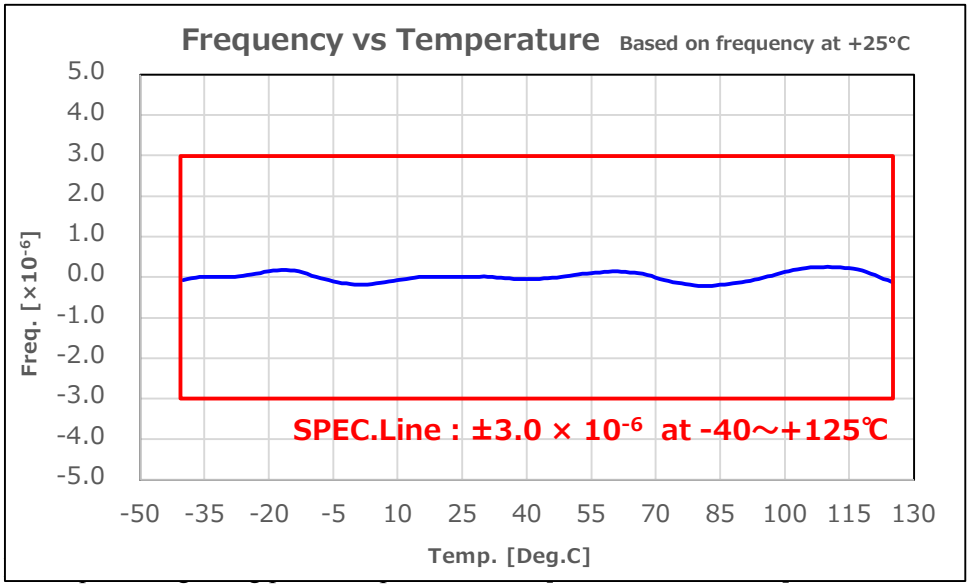
【ELECTRICAL CHARACTERISTICS】

Nominal frequency	26MHz、40MHz、50MHz、76.8MHz、100MHz
Standard frequency	100MHz
Power supply voltage (Vcc)	+3.3V+/-5% （note1）
Load Impedance	10kOhm//10pF
Operating temperature range	-40～+125deg.C
Current consumption Max.	Max. 5.0mA /100MHz (at Operation)
	Max. 10.0uA /100MHz (at Stand-by)
Output Waveform	Clipped Sine Wave
Output Voltage	Typ. 0.8 V（p-p）（DC Coupling(Note2)） Min. 0.5 V（p-p）（DC Coupling(Note2)）
Frequency Temperature Characteristics	Max. +/-3.0 × 10^{-6}
Long-Term Frequency Stability	Max. +/-2.0 × 10^{-6}/year (at +25deg.C)

(Note 1) : Available in the range of DC+1.7V ～ +3.6V.

(Note 2) The DC cut capacitor is not built in. Connect the capacitor (1,000pF) in series with the oscillator output line.

【Frequency Temperature Characteristics】
Condition: Nominal frequency 100MHz



【Contact Information】

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