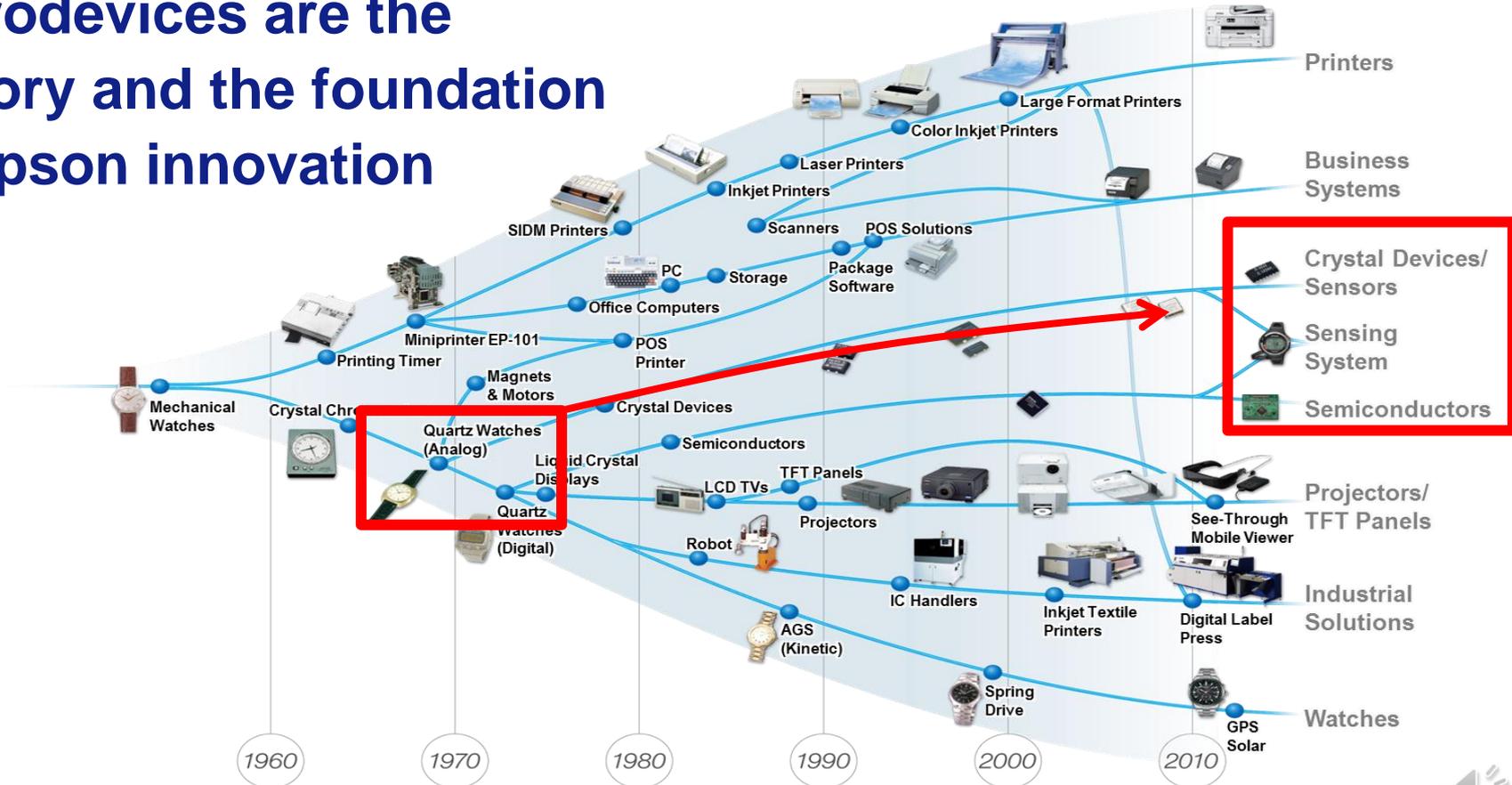


# EPSON – TIMING DEVICES



# Epson Microdevices History

Microdevices are the history and the foundation of Epson innovation



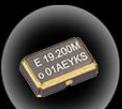
# Synchronization across segments



Wired Network Wireless Network



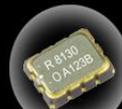
VCSO



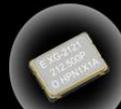
TCXO



Broadcasting & Audio



Real time clock module



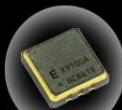
SPXO (SAW)



Automotive



Real time clock module



Gyro sensor



Security



Gyro Sensor



Real time clock module



Factory automation



Programmable SPXO



SPXO



Measurement instruments



Programmable SPXO



TCXO



# Big Things in **Small** Packages



**#1** Market Share

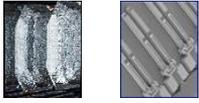


Over **2B pcs** shipped



Market leader since **2005**

# Epson Timing Device Manufacturing Plants



Synthetic Quartz    Crystal

**R&D HQ  
Pilot Production**



Synthetic Quartz



Crystal Units    Gyros    Crystal Oscillators



Crystal Units    Crystal Oscillators



Crystal Oscillators



Synthetic Quartz



**Miyazaki  
Japan**



**Ina  
Japan**



**Hachinohe  
Japan**



**Kuala Lumpur  
Malaysia**



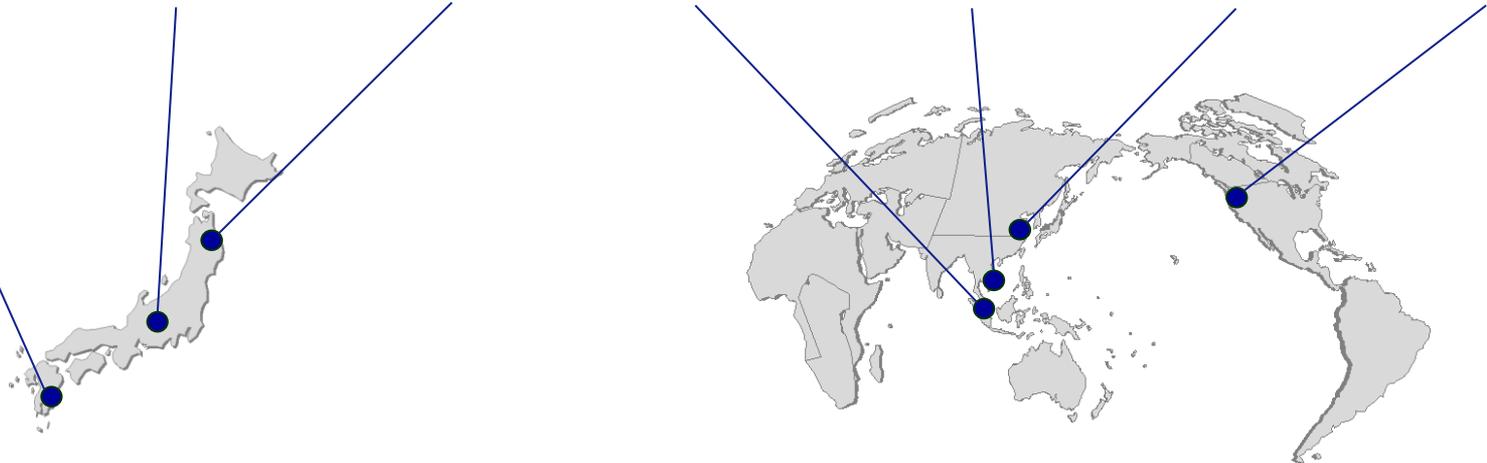
**Chachensao  
Thailand**



**Suzhou  
China**



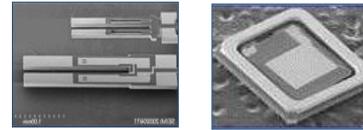
**Longview  
WA, USA**



# Industry's Most Complete Product Line



## Crystals



kHz

MHz

## Oscillators



SPXO

P-SPXO

SPSO

VCXO

P-VCXO

VCSO

TCXO

## RTCs (Real-Time Clocks)



# Networking TCXO Family – Key Advantages

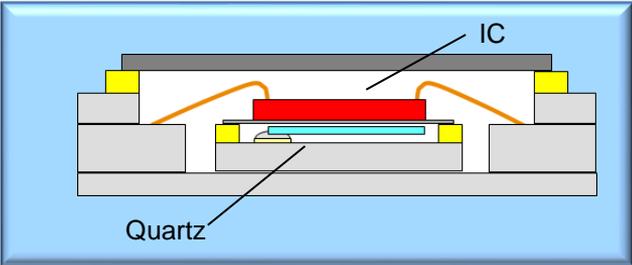
	TG7050CKN	TG551xCA	TG5032CGN
Frequency/temperature (ppb)	<b>+/-100</b>	<b>+/-280</b>	<b>+/-100</b>
Phase noise (dBc/Hz) f0 = 19.2 MHz	-145 @ 1kHz	-145 @ 1kHz	-140 @ 1kHz
Size (mm)	7.0 x 5.0	7.0 x 5.0	5.0 x 3.2
Operating temperature range (°C)	-40 to +105	-40 to +105	-40 to +85
Double seal technology			



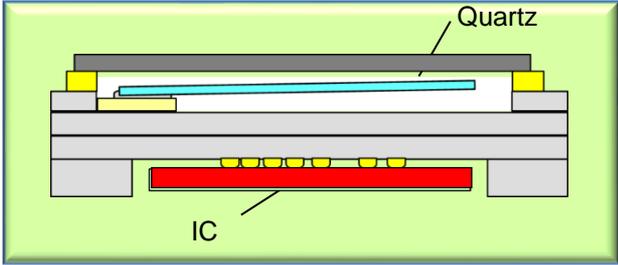
# EPSON Advantage – DoubleSeal™

Patented **DoubleSeal™** structure  
for  
Network TCXOs

**EPSON**



**Competitor**



### Features

- IC & crystal in close contact causes stronger thermal coupling
- Second seal provides isolation from external conditions

### Advantages

- Reduction of temperature difference between IC and XTAL
- Immune to **airflow degradation**

### Applications

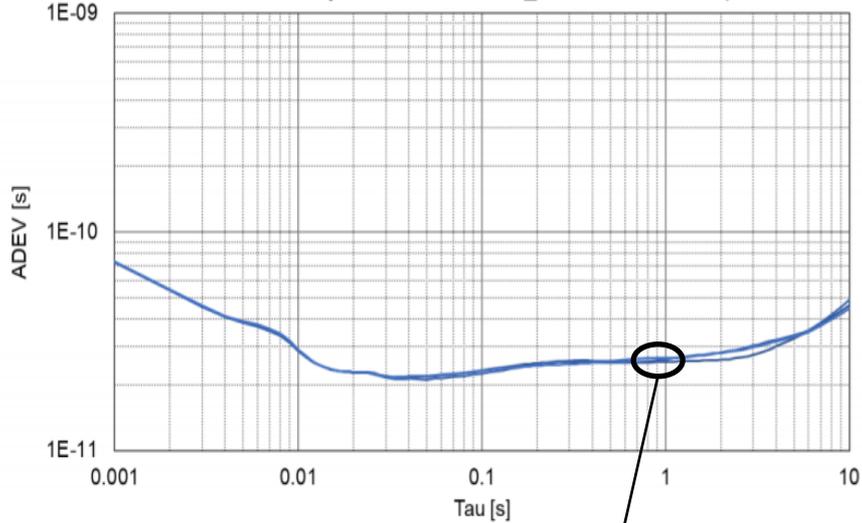
- SyncE / 1588 wander masks requirements can be met with **EPSON TCXO** under real-world environmental conditions



# TG7050CKN

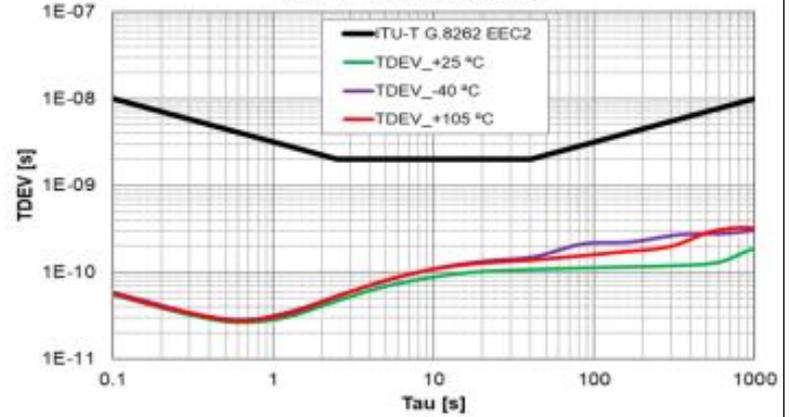


Short term stability fo = 38.88 MHz, T\_use = 25 °C, n = 3 pcs

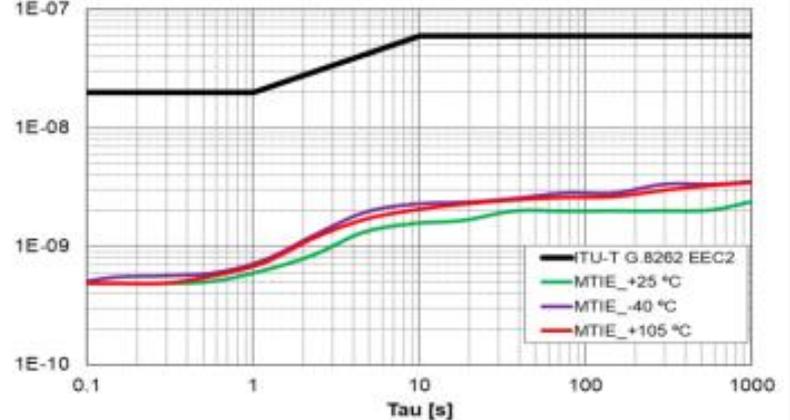


2.8x10<sup>-11</sup>

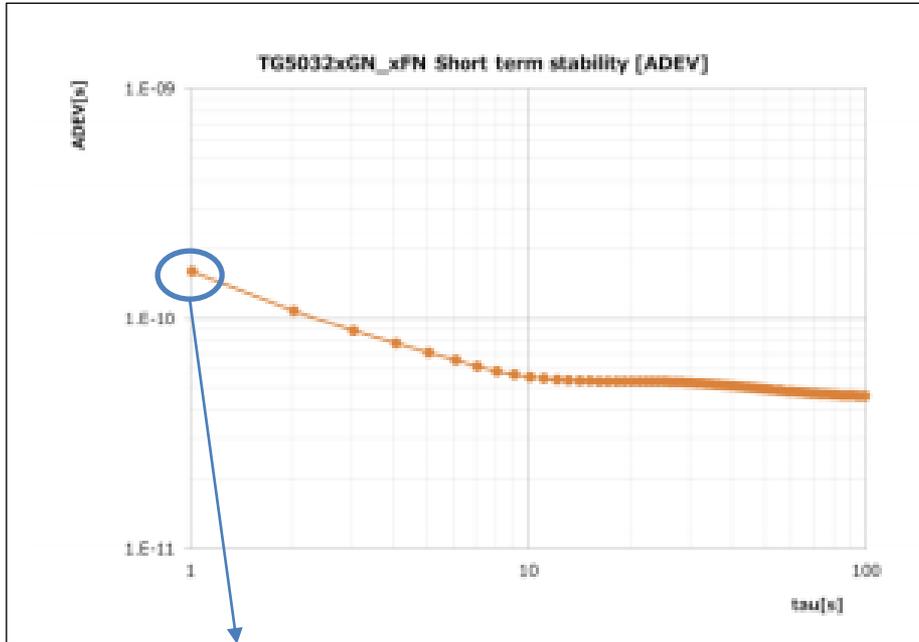
TDEV fo = 38.88 MHz



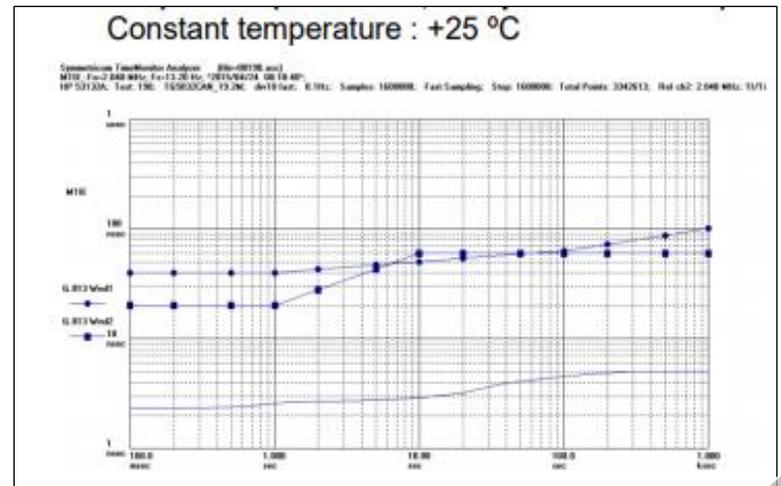
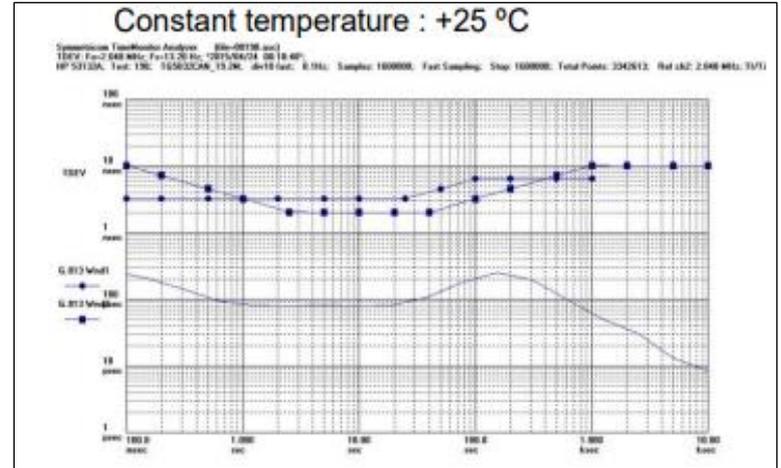
MTIE fo = 38.88 MHz



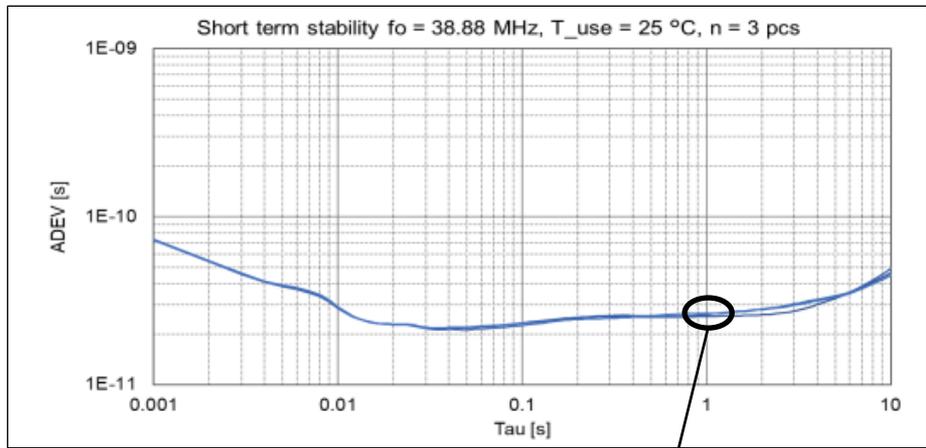
# TG5032CGN



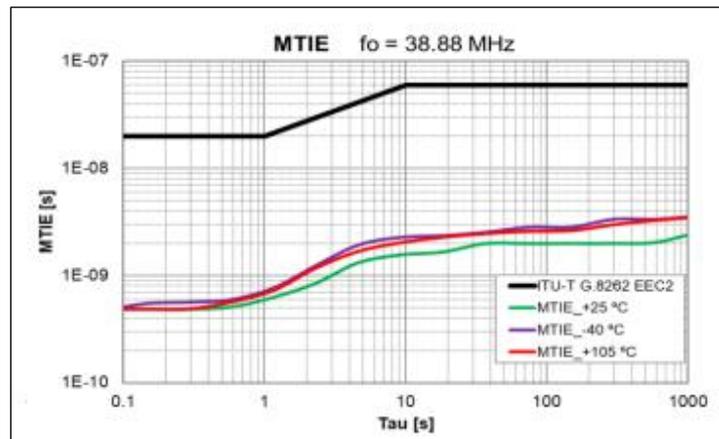
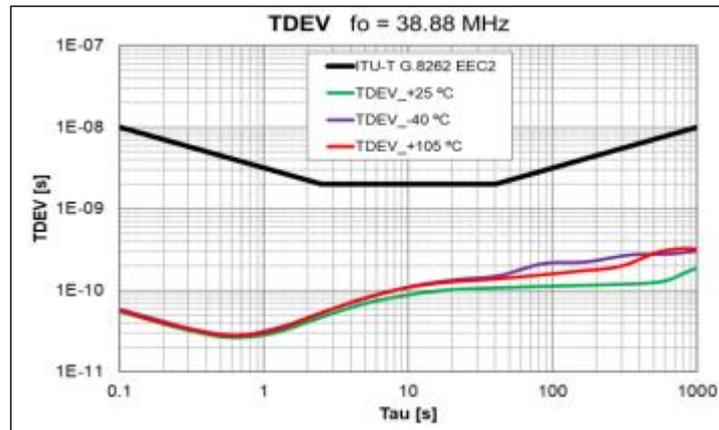
$1.7 \times 10^{-10}$



# TG-551xCA



$2.8 \times 10^{-10}$



# Low Jitter Differential SPXOs

	SG3225*EN	SG2520*GN	SG2520*HN
Jitter f0 = 156.25MHz	50fs	38fs	38fs
Frequency Stability	±50ppm	±50ppm	<b>±20ppm</b>
Package Size	3.2x2.5mm	2.5x2.0mm	2.5x2.0mm
Frequency	25 to 500MHz	25 to 500MHz	25 to 500MHz
Supply Voltage	2.5V 3.3V	2.5V 3.3V	1.8V 2.5V 3.3V
Operating temperature	-40 to 85C -40 to 105C	-40 to 85C -40 to 105C	-40 to 85C -40 to 105C

**Thank you!**