

## Epson Timings Devices - Overview

Epson is the world leader in Crystal technologies being one of only seven timing device manufacturers to have their own autoclaves (to manufacture synthetic quartz) and the only company with their own IC fab. This level of vertical integration gives Epson the most complete product portfolio of timing devices in the entire industry.

**Key products:**

- kHz and MHz Crystals
- Real Time Clock Module
- SPXO & P-SPXO
- TCXO / VCXO / VCSO



### KHz Crystals

Also known as Tuning Fork Crystal or Clock Crystal

**Important Specs:**

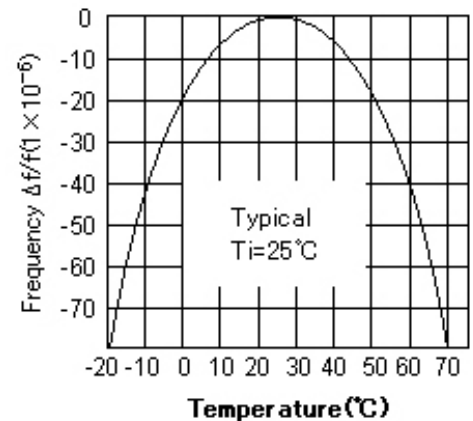
- Size
- Height
- Frequency tolerance
- Load capacitance
- ESR - Equivalent Series Resistance

**Key Applications**

- MCU clocking
- Real Time Clock clocking



### KHz Temperature Curve



### MHz Crystals

Also known as AT Crystal or RF Crystal

**Important Specs:**

- Size
- Frequency
- Frequency tolerance and stability
- Operating temperature
- Load capacitance
- ESR - Equivalent Series Resistance

**Key Applications**

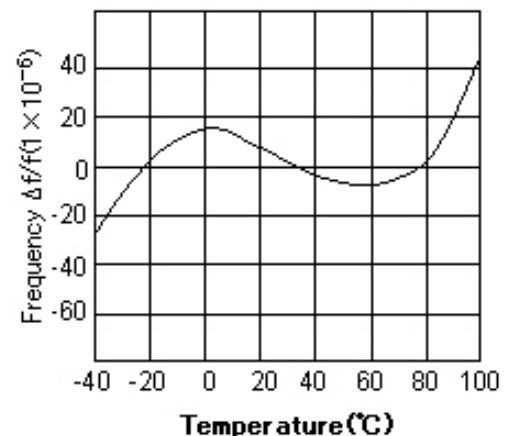
- Connectivity (Wi-Fi, BT etc.) clocking
- RF clocking
- MCU clocking



*Thickness Shear Vibration Mode*



### MHz Temperature Curve



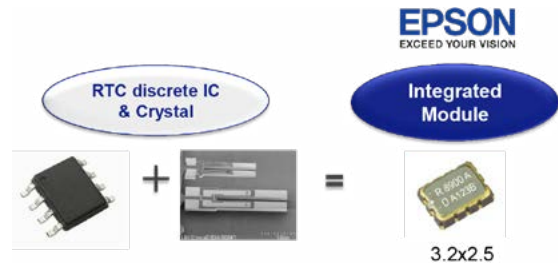
# EPSON Timing Devices: RTC, SPXO, P-SPXO, TCXO

## Real Time Clock (RTC) modules

In many cases an MCU's built-in RTC will suffice but, if you need accurate timekeeping, ultra-low power consumption with battery switchover or event detection / anti-tamper protection you need a dedicated Epson RTC module (32.768KHz crystal + RTC IC)

## The Epson RTC Module portfolio gives you

- Low power (as little as 100nA in idle)
- High accuracy (<=9 secs / mth)
- Back-up battery / supercap switch
- Event detection
- Sleep / wake-up functionality
- High stability over temperature range



## Key Applications

- Security
- Smart home
- Access control: timekeeping independent of network
- Smart grids
- Industry 4.0

## SPXO - Simple Packaged Crystal Oscillators

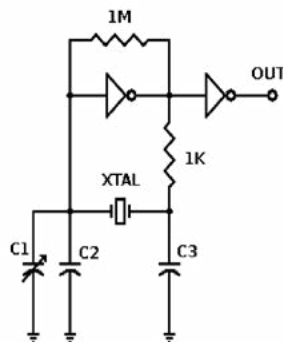
Crystal + amplifier IC packaged together. 3 different types available: Photo AT, AT-HFF, AT+PLL

## Important Specs:

- Phase noise / jitter
- Package size
- Tolerance

## Key Applications

- Medical
- Networking
- Test & measurement
- Industrial automation



## P-SPXO - Programmable Oscillators

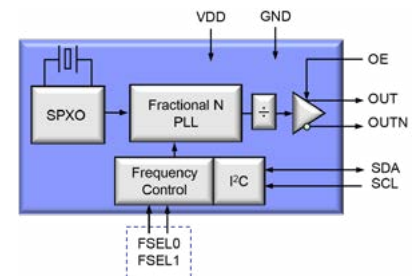
Programmable oscillator using fractional-N PLL to synthesise any frequency.

## Important Specs:

- Frequency
- Tolerance
- Operating temperature
- Phase noise / jitter

## Key Applications

- Medical
- Networking
- Test & measurement
- Industrial automation



## TCXO - Temperature Compensated Crystal Oscillator

Basic principle: measure temperature -> adjust frequency

## Important Specs:

- Size, frequency, voltage
- Stability: +/- 2ppm or +/- 0.5ppm
- Operating temperature
- Voltage control

## Key Applications

- GPS reference
- RF reference

## NB

Epson produce several Automotive grade TCXOs.

Also available: VCXO / VCSO portfolio for networking applications

## TCXO output: Green curve

