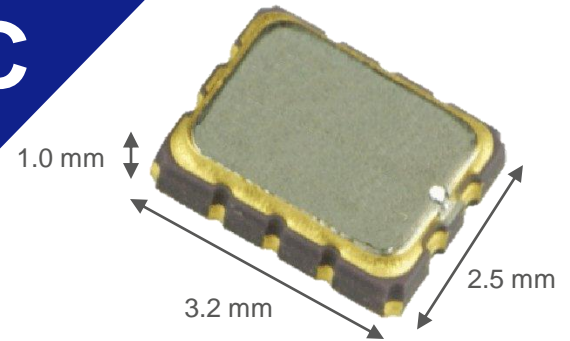


# HIGH-ACCURACY RX8900CE DTCXO RTC

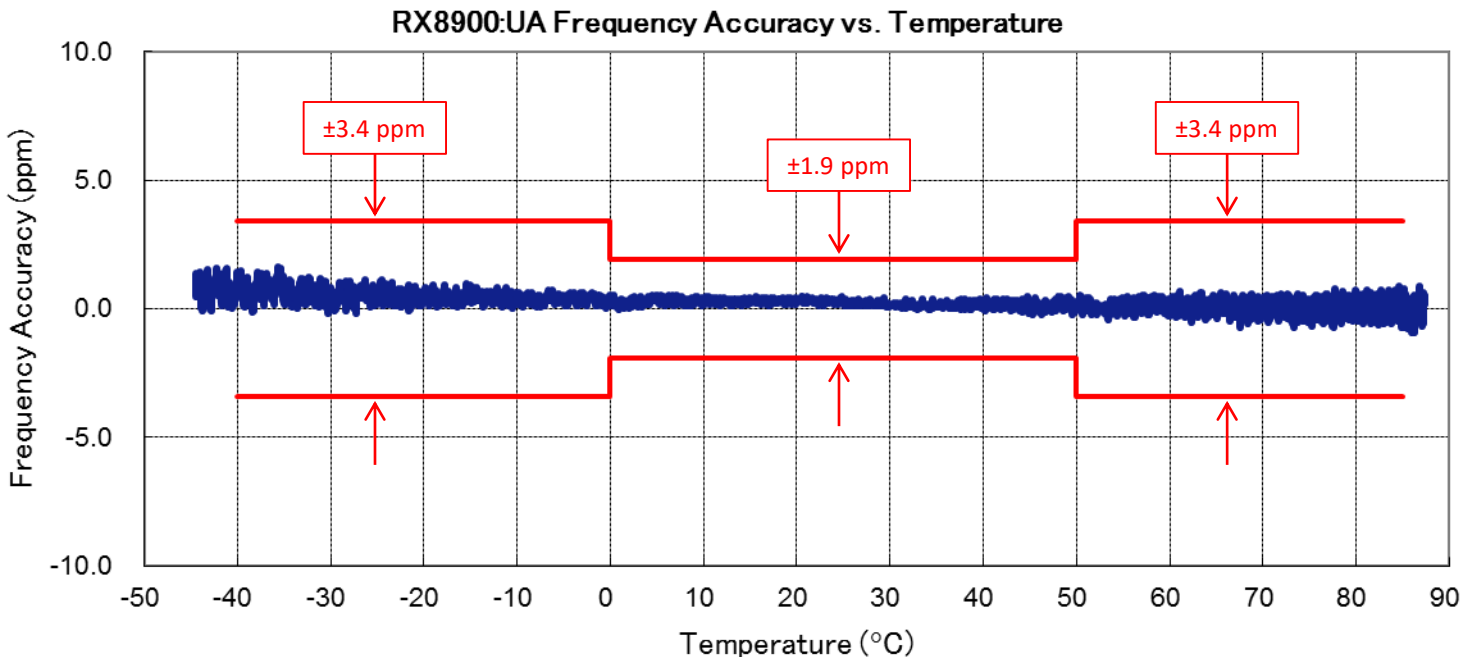
Precise Timekeeping. Small Size. Low Power.



## Epson RX8900CE High-Accuracy DTCXO RTC

- **Integrated Crystal with Factory-Calibrated DTCXO**
- **High Accuracy:**  $\pm 3.4$  ppm -40 to +85 °C ( $\pm 9$  s/mo.)
- **Clock Output:** 1 Hz, 1024 Hz, 32.768 kHz
- **I<sup>2</sup>C Interface:** Fast-mode (400 kHz)
- **Supply Voltage:** 2.5-5.5 V (main), 1.6-5.5 V (battery backup)
- **Low Power:** 0.7  $\mu$ A (typ) backup current
- **Small Size:** 3.2 x 2.5 x 1.0 or 10.1 x 7.4 x 3.3

The I<sup>2</sup>C-Bus is a trademark of NXP Semiconductors



Designed for precision time keeping, Epson's RX8900CE uses Digitally Temperature-Compensated Crystal Oscillator (DTCXO) technology to achieve  $\pm 3.4$  or  $\pm 5$  ppm accuracy over temperature, equivalent to  $\pm 9$  or  $\pm 13$  seconds per month. Compared to RTCs integrated into microcontrollers (MCUs), Epson's RX8900CE includes an integrated crystal, is lower power, and is far more accurate.

# Epson RX8900CE DTCXO RTC

Epson pioneered Real-Time Clocks by introducing the RTC module in 1986 and the world's first DTCXO RTC in 2008. Epson is the RTC module market leader with the #1 share. Epson continues to innovate, by improving accuracy, reducing power, and extending the temperature range of RTCs.

An RTC is essentially an I<sup>2</sup>C-accessible wristwatch for electronic systems. Epson's RX8900CE includes a crystal, a digitally temperature-compensated crystal oscillator (DTCXO), and counters to keep track of time and date. Epson's RX8900CE also includes time-keeping functions such as alarms and timers.

## ADVANTAGES

- Built-in kHz Crystal
- High Accuracy Enabled by DTCXO Technology
- Automatic Battery Backup
- Small Size
- Low power

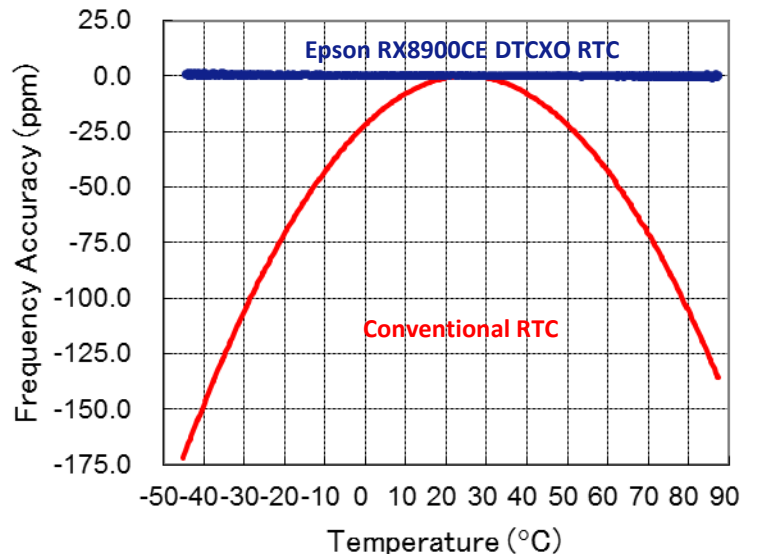
### High Accuracy Enabled by DTCXO Technology

The accuracy of conventional RTCs is determined by the frequency vs. temperature stability of a tuning-fork crystal. Conventional RTCs generally specify accuracy only at room temperature. Over an industrial temperature range, conventional RTCs are accurate to typically -150 ppm, which is 6.5 minutes per month.

Epson's RX8900CE uses a Digitally Temperature-Compensated Crystal Oscillator (DTCXO) and is factory calibrated to achieve <math>\pm 3.4\text{ ppm}</math> from -40 to +85 °C. This ensures accuracy of better than  $\pm 9$  seconds per month, which is essential for precise time keeping, as required by eMeters, lighting, and other industrial or outdoor applications.

DTCXO technology is only possible with an integrated crystal. Integrating the crystal eliminates frequency variation due to load capacitance on the board and allows manufacturing calibration of the oscillator and crystal combination. In addition to improving accuracy, the integrated crystal saves board space and avoids startup problems due to humidity or board leakage.

Frequency Accuracy vs. Temperature



Product	Microcontroller with RTC	Epson RTC	Epson RX8900CE DTCXO RTC
Crystal	external	integrated	integrated
Power	1 $\mu\text{A}$ - 50 $\mu\text{A}$	0.13 $\mu\text{A}$ - 1 $\mu\text{A}$	0.7 $\mu\text{A}$
Accuracy	$\pm 30$ ppm @ +25 °C +28 -214 ppm -40 to +85 °C	5 $\pm$ 23 ppm @ +25 °C -120 +10 ppm -20 to +70 °C	UA: $\pm 3.4$ ppm -40 to +85 °C UB: $\pm 5$ ppm -40 to +85 °C

\*RX6110SAB Application manual

### Low Power for Long Battery Life

While it is easy to build digital functions at low power, the oscillator is an analog component. Achieving high accuracy, low power, and dependable startup at the same time is very difficult. Using a special low-ESR crystal co-packaged with a DTCXO oscillator and fabricated with low-leakage transistor technology, Epson's RX8900CE achieves far better accuracy than conventional RTCs and lower power than RTCs integrated into MCUs. Epson's non-DTCXO RTCs, for example RX6110, RX8010, and RX8130, achieve even lower power.

### Time-Keeping Functions

All clock and calendar functions, including alarms and timers, are accessible via the I<sup>2</sup>C interface. Epson's RX8900CE also has a frequency output pin which can be programmed to 1 Hz, 1024 Hz, or 32.768 kHz.

### Automatic Battery Backup

Epson's RX8900CE can detect the loss of main power and automatically switch to backup power from a battery or supercapacitor. The Epson RX8900CE is intended for use with a 2.5-5.5 V main power supply. In backup mode, time keeping functions with battery voltages down to 1.6V with temperature compensation down to 2.0V.

### Ordering Options

Epson's RX8900CE is available in three stability grades and two package sizes.

Stability Grades		
UA	$\pm 1.9$ ppm +0 to +50 °C	$\pm 3.4$ ppm -40 to +85 °C
UB	$\pm 3.8$ ppm +0 to +50 °C	$\pm 5.0$ ppm -40 to +85 °C
UC	$\pm 3.8$ ppm +0 to +50 °C	$\pm 5.0$ ppm -30 to +70 °C

Packages	
CE	3.2 mm x 2.5 mm x 1.0 mm
SA	10.1 mm x 7.4 mm x 3.3 mm