

## NXP high-precision RTCs with time stamp and advanced power back-up PCF2127A, PCF2129A

# Highly accurate RTCs with embedded quartz crystal

Equipped with a temperature-compensated crystal oscillator, these RTCs eliminate the need for a heated quartz or GPS frequency references.

### Key features

- ▶ Time keeping with accuracy of  $\pm 3$  ppm typically
- ▶ Fully integrated quartz oscillator
- ▶ Time-stamp function
- ▶ Battery switch-over circuit
- ▶ System reset generation
- ▶ 512 bytes of RAM (PCF2127)
- ▶ Factory calibrated
- ▶ Clock operating down to 1.2 V
- ▶ Low supply current: 650 nA at 3 V
- ▶ 1-MHz Fast-mode Plus I<sup>2</sup>C-bus and 6-MHz SPI interface

These highly accurate real-time clock/calendars (known as aRTCs) integrate a temperature-compensated crystal oscillator (TCXO) that uses a 32.768-kHz quartz crystal for very high precision with very low power consumption. Manufactured in a CMOS process, they support access via the I<sup>2</sup>C-bus or the SPI bus, and offer special support features like a backup battery switch-over circuit, a programmable Watchdog timer, a time-stamp function, and more. The PCF2127A add 512 bytes of general-purpose SRAM. The rich functionality and low overall power consumption of these aRTCs let the system use smaller batteries and let the microcontroller stay in hibernation longer.

### Key applications

- ▶ Very accurate time references
- ▶ Accurate switching
- ▶ Utility meters
- ▶ Industrial applications
- ▶ HVAC equipment
- ▶ GPS, shorter cold start-up time (TTFF)
- ▶ Gaming machines
- ▶ Alarm systems
- ▶ Token for access control
- ▶ Cellular infrastructure

The backup battery switch-over circuit ensures a constant supply of power. In standard mode, the oscillator supply is switched over to the battery as soon as the supply voltage drops below the battery voltage. The smart mode is used to keep the aRTC running while preserving battery back-up time. With a Lithium battery of up to 4.2 V connected as a back-up source, the aRTC continues to run even with a VDD as low as 3.3 or 2.5 V. The battery is only switched on if the VDD drops below 2.2 V. The uninterrupted voltage is also made available on a device pin and can be used to buffer external circuitry, including RAM memory.

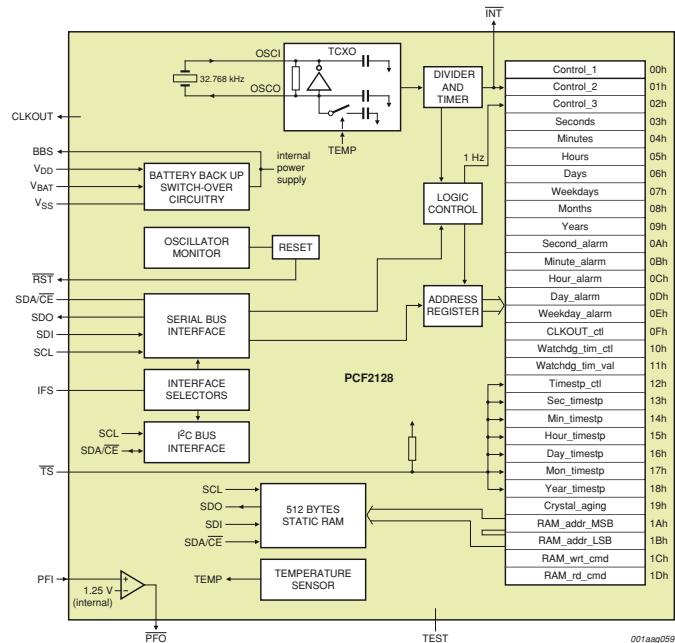
Having an on-chip TCXO eliminates the need for a discrete quartz and improves accuracy, since external quartzes are often subject to strong temperature dependencies and can impact performance. The circuit doesn't have to be calibrated, either. Every aRTC is calibrated at the factory during a final test sequence. All the designer needs to do is set the clock for the appropriate time zone.

The time-stamp function makes it possible to log the exact time of external events. The stamp can be configured to latch the

first or last event and can record the time when the back-up battery was switched in.

The precise Watchdog function can be used to wake the microcontroller from hibernation mode or for independent monitoring of microcontroller tasks. The calendar functions track year, month, date, and day with built-in Leap Year flags. There is a freely programmable alarm and timer function, so designers have the option to generate a wake-up signal on an interrupt pin.

### Block diagram PCF2127A



### Comparison of PCF2127A and PCF2129A

Characteristics	PCF2127A	PCF2129A
Supply voltage range	1.8 – 4.2 V	1.8 – 4.2 V
Battery supply voltage range	1.8 – 4.2 V	1.8 – 4.2 V
Watchdog & countdown timer	Yes	Watchdog only
System reset	Yes	No
RAM	512 Byte	No
Accuracy within temperature range -20 ... +70° C min	± 5ppm	± 5ppm

### Ordering Information

Type	Package tape and reel	Qualification	Version
PCF2127AT/1	SO20, plastic small outline package, body width 7.5 mm	Industrial	1
PCF2129AT/1	SO20, plastic small outline package, body width 7.5 mm	Industrial	1
PCA2129T/Q900/1	SO20, plastic small outline package, body width 7.5 mm	AEC-Q100 compliant	1