NXP aRTCs PCF2127, PCA2129 & PCF2129

High-precision aRTCs with embedded quartz crystal

These aRTCs integrate a temperature-compensated quartz oscillator, a time stamp, alarms, and advanced power back-up.

KEY FEATURES

▸ Time keeping with accuracy of ±3 ppm (typ) or 0.25 s deviation/day
▸ Fully integrated quartz oscillator
▸ Time-stamp function
▸ Battery back-up circuit
▸ System reset generation
▸ 512 Bytes of RAM (PCF2127)
▸ Factory calibrated
▸ Clock operation down to 1.8 V
▸ Low supply current: 650 nA at 3.3 V
▸ Fast-mode I²C-bus and 6.5 MHz SPI interface

APPLICATIONS

▸ Very accurate time references
▸ Utility meters
▸ Industrial applications
▸ Automotive reference time
▸ Climate control, HVAC equipment
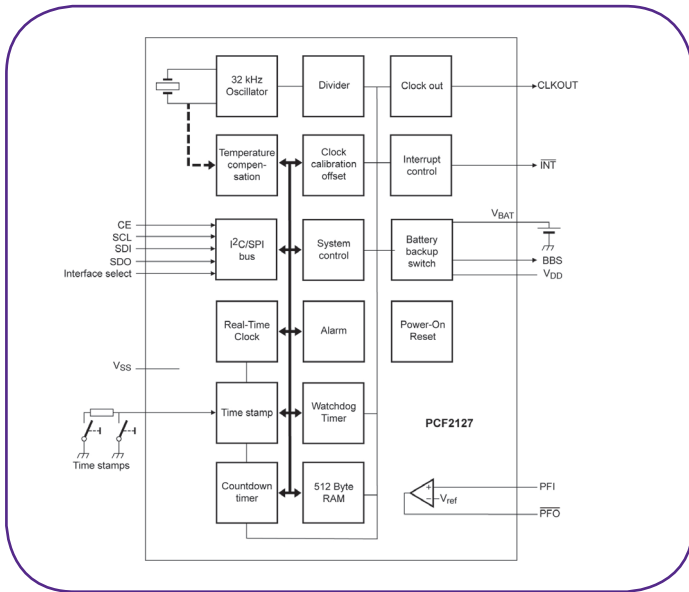▸ Gambling and gaming machines
▸ Alarm systems

The NXP PCF2127, PCA2129, and PCF2129 are highly accurate real-time clock/calendars (known as aRTCs). They 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 I²C-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 PCF2127 includes 512 bytes of general-purpose SRAM. The rich functionality and low overall power consumption of these aRTCs allow the usage of smaller batteries and let the microcontroller stay in hibernation mode longer.

The backup battery switch-over circuit ensures a constant supply of power to the RTC. In standard mode, the oscillator supply is switched over to the battery as soon as the supply voltage drops below the battery voltage.
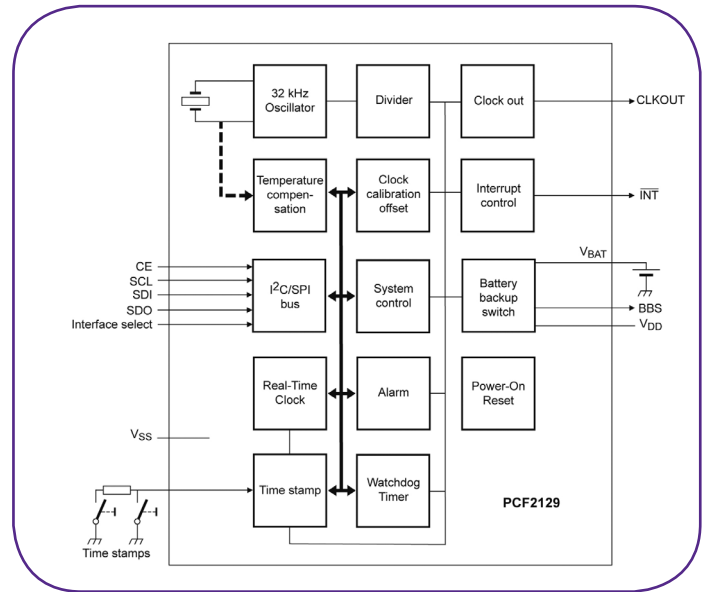
Alternatively, a smart mode allows the usage of a back-up battery with a voltage that is higher or lower than the main supply V_{DD}. The aRTC continues to run on V_{DD} until it drops below 2.5 V, then switches over to the connected battery (e.g. a Lithium battery of 4.2 V). The uninterrupted power supply is also available on a device pin and therefore can be used to buffer external circuitry, including RAM memory.
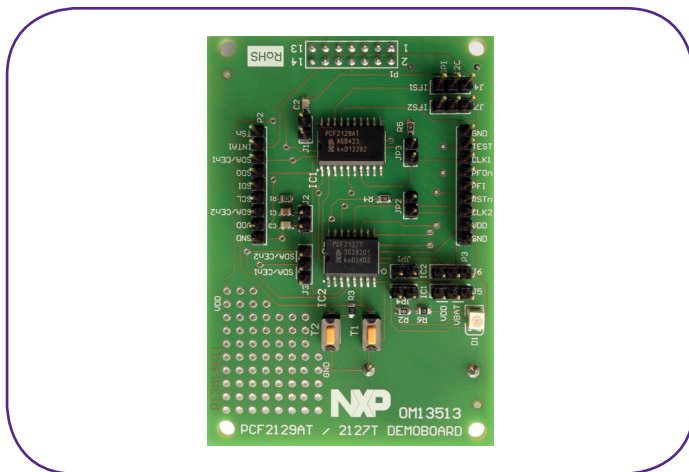
Two different external switches can be monitored and are time-stamped in case their state gets changed. This enables intrusion detection with no external circuitry: In an e-meter application, for example, the time is stamped when the cover of the electronics or the terminals is opened. It is also possible to monitor the time of battery switch-over, too.

The PCF2127T and PCF2129T have a temperature-compensated oscillator that covers the whole industrial temperature range. The PCF2127AT and PCF2129AT offer higher precision over a slightly narrower temperature range. The PCA2129T/Q900/2 is qualified for use in automotive applications.

PCF2127 block diagram

PCF2129A block diagram

Evaluation board OM13513 for PCF2127 and PCF2129A, including back-up battery

Selection guide

Feature	PCF2127T	PCF2127AT	PCF2129T	PCF2129AT	PCA2129T/Q900
Temperature range of frequency compensation	-40 to +85 °C	-25 to +65 °C	-40 to +85 °C	-25 to +65 °C	-40 to +85 °C
Typical accuracy: 3ppm over temp range of	-30 to + 80 °C	-15 to + 60 °C	-30 to + 80 °C	-15 to + 60 °C	-30 to + 80 °C
Watchdog and count-down timer	Yes	Yes	Watchdog only	Watchdog only	Watchdog only
RAM	512 Byte	512 Byte	-	-	-
Quality grade	Industrial	Industrial	Industrial	Industrial	Automotive AEC-Q100
Package	SO16	SO20	SO16	SO20	SO16