REAL
TIME
CLOCKS

STANDALONE RTC HIGHLIGHTS

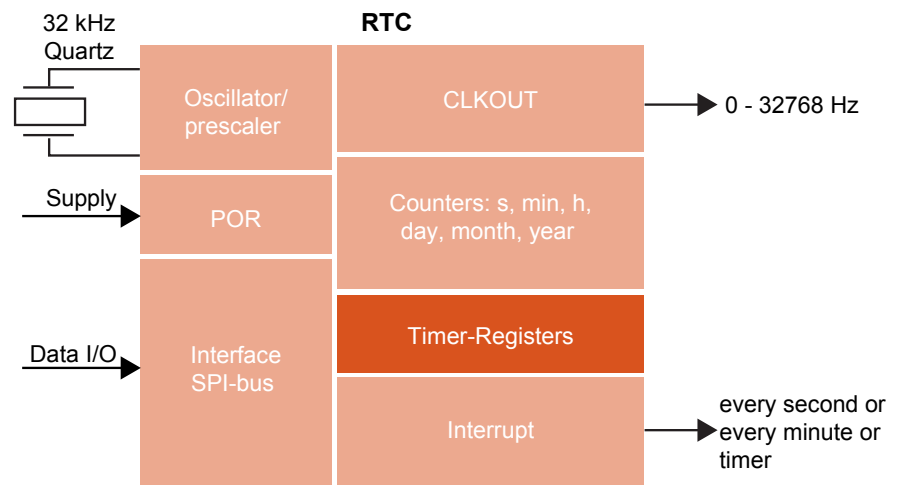| RTC Families:		
Ultra-low Power RTC Family	PCF8523, PCF2123	Ultra-low power, I²C or SPI Interface
Low Cost, Low Power RTC Family	PCF85063, PCF85063A, PCF85063B	Low power, I²C or SPI Interface
	PCF85263A	Low power, time-stamp and battery switchover
	PCF85363A	Low power, 64-Byte RAM
Accurate RTC Family	PCF2131TF	Highly accurate RTC, I²C and SPI Interface
Automotive RTC Family	PCA8565, PCA2115T/Q900/1, PCA85073ADP/Q900	High temp. up to 125 °C, I²C or SPI Interface
Accurate/Automotive RTC Family	PCA2131TF/Q900	Highly accurate and AEC-Q100 compliant High temp. up to 105 °C
Application specific	PCF85053A	Dual I²C interface, 128-byte SRAM, battery switchover

KEY FEATURES

- Time keeping
- Low power; 64 nA I_{CC} (PCF2131)
- Large voltage range; 1.5 V to 5.5 V
- Clock from seconds to 99 years
- Programmable timer
- Frequency output
- Small packages (TSSOP8, HVSON10, etc.)

VALUE PROPOSITION

- Time keeping
- For highly accurate time-keeping, choose NXP RTCs with as low as ±3 ppm accuracy
- For long battery life, choose NXP RTCs with low current consumption of less than 64 nA
- For rugged environment applications, choose NXP RTCs with extended temperature range up to 125 °C and AEC-Q100 automotive compliant qualification

RTC BLOCK DIAGRAM

KEY RTC PRODUCTS

Type	Interface	Package	Status	Key features
Industry Standard				
PCF8563	I²C-bus	SO8, TSSOP8, HVSON10	Production	Industry standard
Tiny				
PCF85063 PCF85063A	I²C-bus	HWSON8	Production	Tiny footprint, cost effective (PCF85063A with alarm)
		HXSON10, SO8, TSSOP8, Die		
PCF85063B	SPI bus	HXSON10, Die	Production	Tiny footprint, cost effective, alarm
Latest Generation				
PCF85263A	I²C-bus	SO8, TSSOP8/10 HXSON10, WLCSP12	Production	Two alarms, watchdog, electronic tuning, battery management, time stamp (PCF85363A also features 64 byte of RAM)
PCF85363A		TSSOP8/10, HXSON10		
Low Power				
PCF2123	SPI bus	TSSOP14, HVQFN16, Die	Production	Low power (100 nA), electronic tuning
PCF8523	I²C-bus	SO8, TSSOP14 HVSON8, Die	Production	Low power (100 nA), electronic tuning battery management
Precise				
PCF2129A PCF2127A	I²C-bus/ SPI bus	SO20	NRND	High accuracy ±3 ppm, -25° to +65 °C Battery management, time stamp, metal can quartz (PCF2127A also features 512 byte RAM)
PCF2129 PCF2127	I²C-bus/ SPI bus	SO16	NRND	High accuracy ±3 ppm, -40° to +85 °C battery management, time stamp, ceramic quartz (PCF2127 also features 512 byte RAM)
PCF2131	I²C-bus/ SPI bus	HLSON16	Production	High accuracy ±3ppm, Lowest power (64 nA), battery management, time stamp (TS), ceramic quartz: up to 85 °C
Automotive				
PCA8565	I²C-bus	TSSOP8, Die	Production	Robustness: up to 125 °C
PCA21125	SPI bus	TSSOP14	Production	Robustness: up to 125 °C
PCA2129	I²C-bus/ SPI bus	SO16	NRND	High accuracy ±3 ppm, battery management, time stamp, ceramic quartz for automotive, up to 85 °C
PCA85073A	I²C-bus	TSSOP8	Production	Replacement for PCA85063A, tiny footprint, alarm, up to 105 °C
PCA2131	I²C-bus/ SPI bus	HLSON16	Production	High accuracy ±3ppm, Lowest power (106nA), battery management, time stamp (TS), ceramic quartz for automotive: up to 105 °C (AEC-Q100 – Grade 2)
Application specific				
PCF85053A	I²C-bus	HVSON10	Production	Dual I²C interface with 128-byte SRAM memory

NRND — Not recommended for new designs

RTC SELECTOR GUIDE

RTC Portfolio	PCF85053	PCF8563	PCF85063A/B	PCF85263	PCF85363	PCF8523	PCF2123	PCF2127	PCF2129	PCA21125	PCF2131
Time	√	√	√	√	√	√	√	√	√	√	√
Alarm	√	√	√	√ 2x	√ 2x	√	√	√	√	√	√
Timer/ Watchdog	√	√	√	√	√	√	√	√	√	√	√
Interrupt	√	√	√	√ 2x	√ 2x	√ 2x	√	√	√	√	√
Stop watch				√	√						
Time stamp				√ 3x	√ 3x			√	√		√
Time stamp/ Tamper input				√	√			√	√		√
Battery backup	√			√	√	√		√	√		√
Tuning register	√		√	√	√	√	√	√	√		√
Temperature compensation								√	√		√
Factory calibration								√	√		√
Quartz crystal	√							√	√		√
RAM integration					√			√			
High temperature		PCA8565	PCA85073A							√	PCA2131
AEC-Q100 automotive		PCA8565	PCA85073A						PCA2129	√	PCA2131
Interface	I²C-bus	I²C-bus	I²C-bus, SPI	I²C-bus, SPI	I²C-bus, SPI	I²C-bus	SPI	I²C-bus, SPI	I²C-bus, SPI	SPI	I²C-bus, SPI

PCF85063: SMALL FOOTPRINT, LOW-POWER RTC

Function	PCF85063TP	PCF85063A	PCF85063B
Electronic tuning	Yes	Yes	Yes
I²C-bus SPI interface	√	√	 √
1 min interrupt	No	Yes	Yes
Alarm facility Timer	No No	Yes Yes	Yes Yes
CLK out CLK enable Interrupt output	Yes No Yes	Yes Yes Yes	Yes Yes Yes
Package SOT number	HWSON-8 [1]	SO8, TSSOP8, HXSON-10, Die	HXSON-10, Die

[1] 0.5 mm pitch

AVAILABLE VERSIONS:

- **PCF85063TP:** I²C-bus, Limited feature set, 8-pin package

- **PCF85063A:** I²C-bus, Full feature set, 8 and 10-pin package

- **PCF85063B:** SPI-bus, Full feature set + CLKOUT, 10-pin package

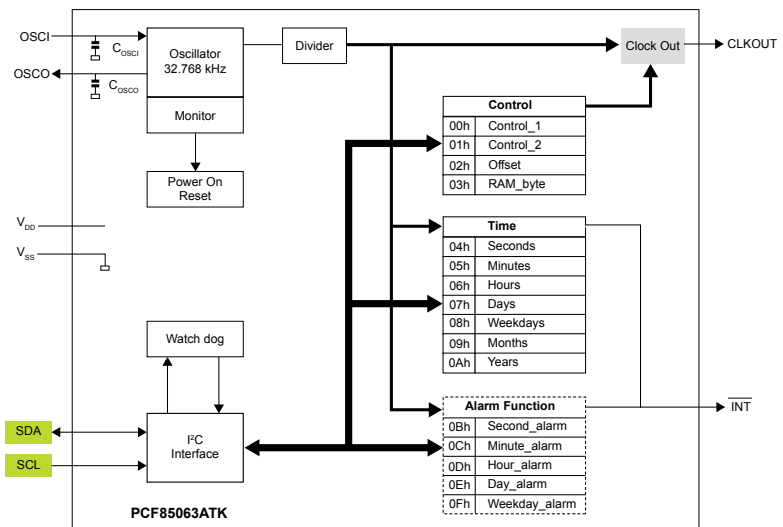- **PCA85073A:** I²C-bus, Full feature set, Automotive Qualified

KEY FEATURES

- Cost optimized

- Low-power consumption; At V_{DD}= 2.0 V, T_{amb}=25 °C, no bus activity and CLKOUT active, I_{DD}=260 nA (typ)

- Very small footprint packages

  – HWSON8 (2 x 3 x 0.8 mm)

  – HXSON10 (2.6 x 2.6 x 0.5 mm)

  – SO8

  – TSSOP8

- Two interfaces supported; I²C and SPI

- Two integrated programmable oscillator capacitors

  – For 7 pF load

  – For 12.5 pF load

- Electronic Tuning

TARGET APPLICATIONS

- Printers

- Copy Machines

- Digital Still Cameras

- Digital Video Cameras

PCF85063: SMALL FOOTPRINT, LOW-POWER RTC BLOCK DIAGRAM

PCA85073A: AUTOMOTIVE, SMALL FOOTPRINT, LOW-POWER RTC

KEY FEATURES

- Low-power consumption; At V_{DD}= 3.0 V, T_{amb}=25 °C, no bus activity and CLKOUT inactive, I_{DD}=250 nA (typ)

- Operating temperature range from -40 °C to 105 °C

- Small package footprint
    - TSSOP8, 5.1 x 3.1 x 1.1 mm; 0.65-mm pitch

- I^{2}C-bus interface supported

- Two integrated programmable oscillator capacitors
    - For 7 pF load
    - For 12.5 pF load

- Offset register for fine tuning the clock for accuracy, aging adjustment or temperature compensation

- Interrupt output supports counter timer, alarm, minute and half-minute interrupt
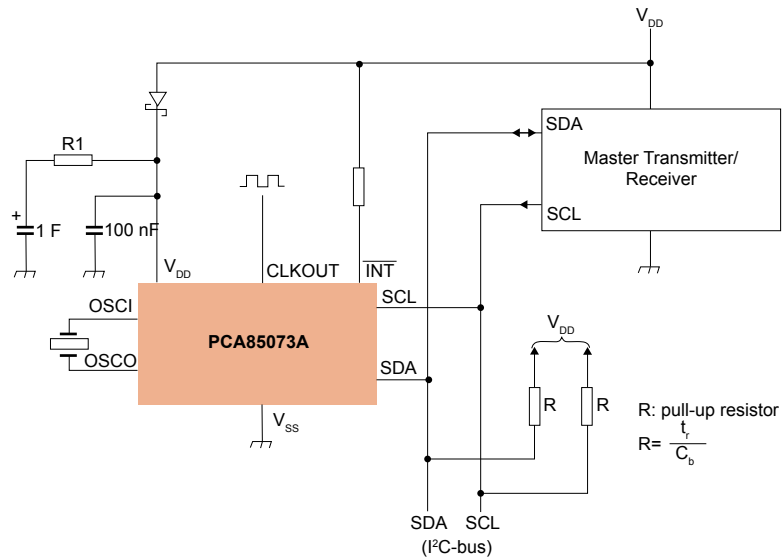
- Push-pull CLKOUT output

TARGET APPLICATIONS

- Electric Car Battery Management

- Charging Stations

- Body Control Module

AVAILABLE VERSION:

- PCA85073ADP/Q900:I^{2}C-bus, full feature set, TSSOP-8 package

- Improved package drop in replacement for PCA85063ATT which is no longer recommended for new designs

PCA85073A BLOCK DIAGRAM

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COMPARISON: PCF8563, PCF85063, PCF85063A, AND PCF85063B

Parameter/Feature	PCF8563	PCF85063	PCF85063A	PCF85063B
Interface	I^{2}C-bus, 400 kHz	I^{2}C-bus, 400 kHz	I^{2}C-bus, 400 kHz	SPI bus, 7 MHz
Operating supply voltage	1.0 V to 5.5 V	0.9 V to 5.5 V	0.9 V to 5.5 V	0.9 V to 5.5 V
Interface active supply voltage	1.8 V to 5.5 V	1.8 V to 5.5 V	1.8 V to 5.5 V	1.6 V to 5.5 V
CLKOUT output	Open-drain	Push-pull	Push-pull (with CLKOE)	Push-pull (with CLKOE)
Programmable CLKOUT frequency	32.768 kHz, 1.024 kHz, 32Hz, 1Hz, Off (CLKOUT=High-Z)	32.768 kHz, 16.3484 kHz, 8.192 kHz, 4.096 kHz, 2.048 kHz, 1.024 kHz, 1 Hz, Off (CLKOUT=Low)	32.768 kHz, 16.3484 kHz, 8.192 kHz, 4.096 kHz, 2.048 kHz, 1.024 kHz, 1Hz, Off (CLKOUT=Low)	32.768 kHz, 16.3484 kHz, 8.192 kHz, 4.096 kHz, 2.048 kHz, 1.024 kHz, 1Hz, Off (CLKOUT=High-Z)
Alarm/timer	Yes	No	Yes	Yes
Selectable quartz CL tuning capacitance	12.5 pF (typical); 1 internal and 1 external	7 pF or 12.5 pF (both internal)	7 pF or 12.5 pF (both internal)	7 pF or 12.5 pF (both internal)
Automatic interrupt (30 sec or 1 min)	No	Yes; Can also be disabled	Yes; Can also be disabled	Yes; Can also be disabled
Electronic tuning	No	Programmable offset register for frequency adjustment	Programmable offset register for frequency adjustment	Programmable offset register for frequency adjustment
RAM	No	1 Byte	1 Byte	1 Byte
Packages	TSSOP8, SO8, HVSON10	HWSON8	HXSON10, SO8, TSSOP8, Die	HXSON10, Die

INTRODUCING PCF85263 AND PCF85363 FULL FEATURED REAL TIME CLOCKS

| Type / Function	PCF8563	PCF85063	PCF85063A PCF85063B	PCF85263A	PCF85363A
RTC, resolution Elapsed time counter	1s… years no	1s… years no	1s… years no	1/100s… years yes	1/100s… years yes
Alarm facility Timer, Watchdog	1 Alarm Timer, counter	None	1 Alarm 1 Timer	2 Alarms and Watch dog	2 Alarms and Watch dog
Time stamp	No	No	No	Yes X2	Yes X2
Battery backup input	No	No	No	Yes	Yes
RAM	No	1 Byte	1 Byte	1 Byte	64 Byte
Interrupts Interrupt pins	Universal 1	30 s,1 min 1	30 s,1 min, universal 1	universal 2, 1 in SO8	universal 2, 1 in SO8
Interface	I²C-bus 400 kHz	I²C-bus 400 kHz	A = I²C-bus 400 kHz B = SPI 7 MHz	I²C-bus 400 kHz	I²C-bus 400 kHz
RTC electronic tuning Quartz, load capacity CL =	No with external C	Yes 7 pF / 12.5 pF	Yes 7 pF / 12.5 pF	Yes 6 pF/ 7 pF / 12.5 pF	Yes 6 pF/ 7 pF / 12.5 pF
Package	SO8, TSSOP8, HVSON10	HWSON 8 2 x 3 x 0.8 mm Tiny package	HXSON 10 2.6 x 2.6 x 0.5 mm, Die with SO8, TSSOP8 for PCF85063A only	HXSON 10 2.6 x 2.6 x 0.5 mm, SO8, TSSOP8/10, WLCSP12	HXSON 10 2.6 x 2.6 x 0.5 mm, TSSOP8/10

KEY FEATURES

- Low-power consumption; At V_{DD}= 3.0 V, T_{amb}=25 °C, No bus activity and CLKOUT inactive, I_{DD}<300 nA (typ)
- Additional integrated features
  - 1/100 s resolution RTC, stop-watch or elapsed time counter
  - Battery backup input
  - Time stamps for tamper detection and battery switchover
  - Watchdog
  - Elapsed time counter
  - Battery backup RAM

TARGET APPLICATIONS

- Consumer
- Industrial
- Computing/Networking
- Medical Equipment
- Power Supplies

## PCF85263A/363A BLOCK DIAGRAM
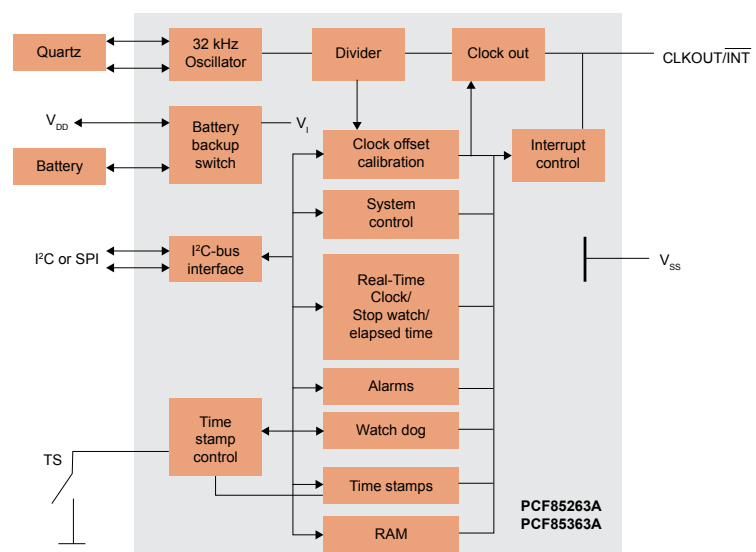
PART NUMBERS:

- PCF85263A:I²C-bus (1-Byte RAM)
- PCF85363A:I²C-bus (64-Byte RAM)

PCF2123: ULTRA-LOW POWER RTC WITH SPI INTERFACE

KEY FEATURES

- Ultra-low power 100 nA at 2 V (typ.)

- Large voltage range 1.5 to 5.5 V

- SPI bus up to 6 MHz

- Clock from seconds to 99 years

- Programmable countdown timer

- Programmable output clock frequency with output enable pin

- Electronic tuning

- Small packages TSSOP14, HVQFN16 and U (die)

- Supply current as low as 100nA (typ.) at V_{DD} = 2.0 V and T_{amb} = 25 °C

PCF2123 BLOCK DIAGRAM
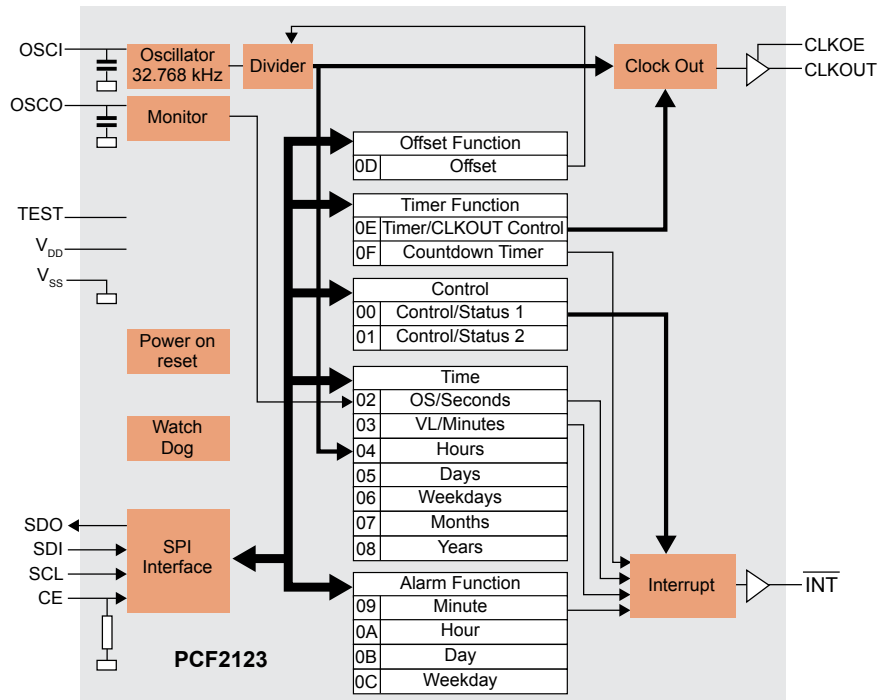
PCF85053A: DUAL I2C INTERFACE, 128-BYTE SRAM

KEY FEATURES

- Battery-backed 128-byte SRAM

- SRAM clear through RTC_CLR pin.

- Two independent I^{2}C interfaces (400kHz max. clock frequency)

  - Primary: RTC and SRAM Read/ Write registers capability

  - Secondary: RTC and SRAM Read/ Write registers capability enabled by Primary I^{2}C interface

- Register definition aligned to MC146818B

- Programable offset register

- Configurable oscillator circuit for a wide variety of quartzes: CL = 6 pF, CL = 7 pF, and CL = 12.5 pF
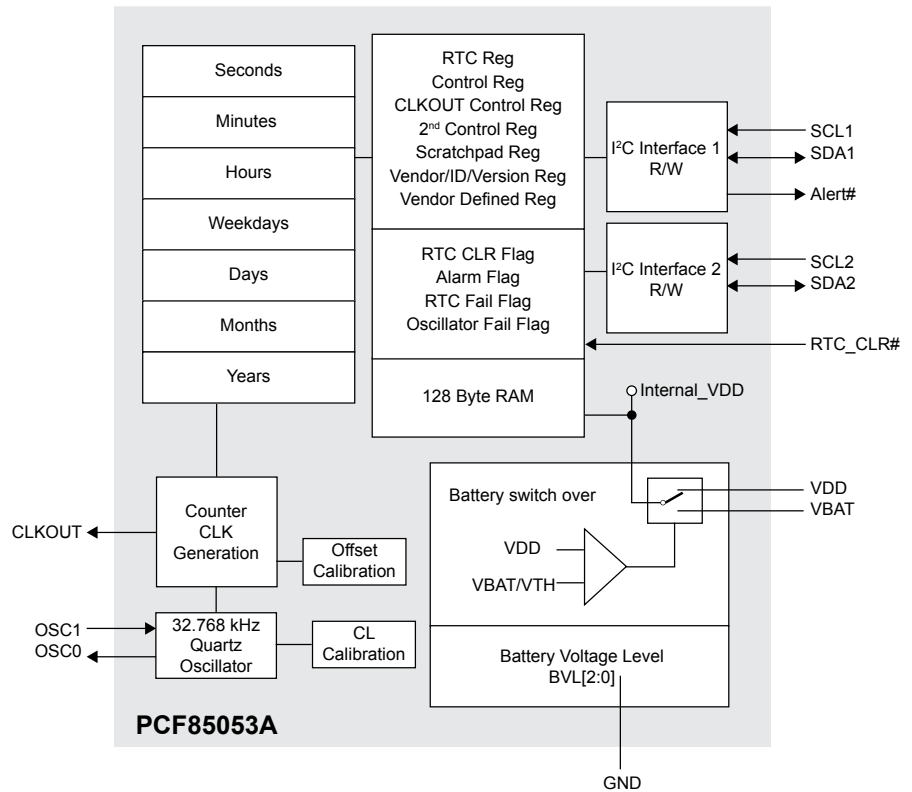
- HVSON12 package (3mm x 3mm x 0.85 mm body)

TARGET APPLICATIONS

- Servers and computing

- Network-powered and industrial electronics

- Point-of-Sales

- White Goods

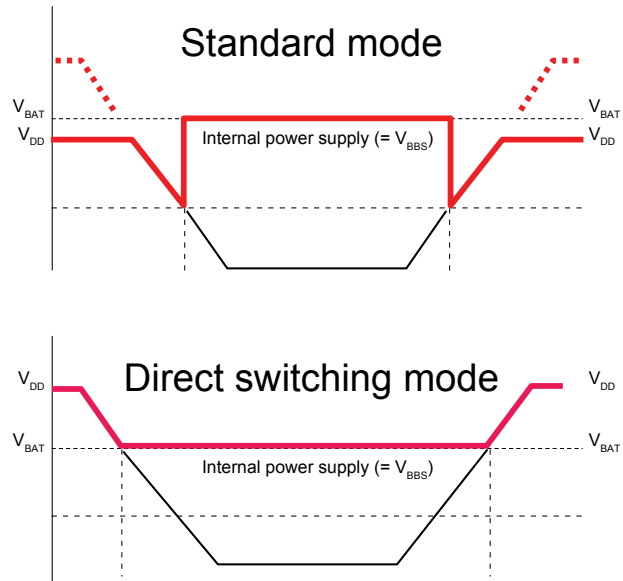## TYPICAL APPLICATION
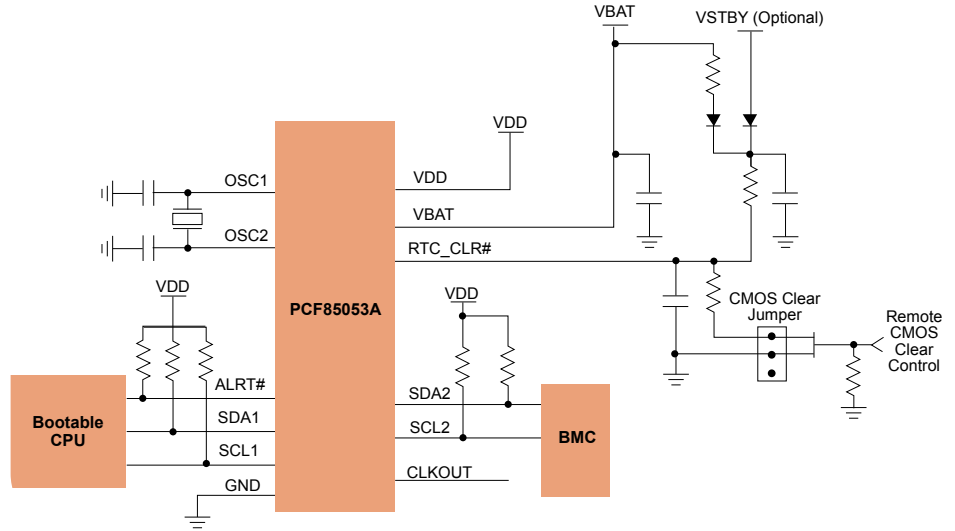
BLOCK DIAGRAM

PCF8523: LOW POWER RTC WITH I²C INTERFACE

KEY FEATURES

- Ultra-low power 150 nA @ 3 V (typ.)

- Large voltage range 1.6 to 5.5 V

- 1 MHz Fast-mode Plus (Fm+) I²C interface

- Clock from seconds to 99 years

- Programmable countdown timer

- Programmable output clock

- Power fail detection function

- Battery switch-over function

- Battery low detection function

- Electronic tuning

- Packages: SO8, TSSOP14, HVSON8 and U (die)

- Supply current as low as 150 nA (typ.) at V_{DD} = 3.0 V and T_{amb} = 25 °C

PCF8523 BATTERY BACKUP

Standard mode

V_{BAT}
V_{DD}

Internal power supply (= V_{BBS})

V_{BAT}
V_{DD}

Direct switching mode

V_{DD}

V_{BAT}

Internal power supply (= V_{BBS})
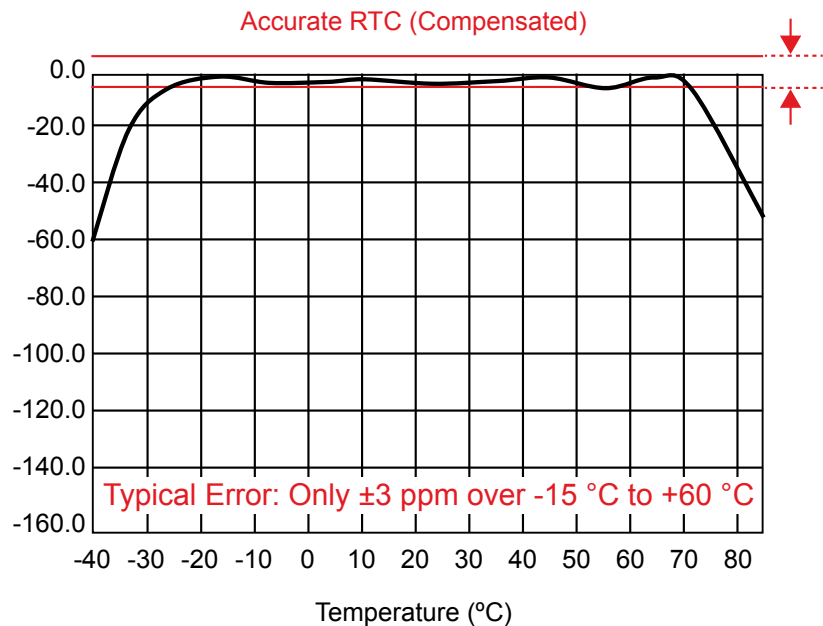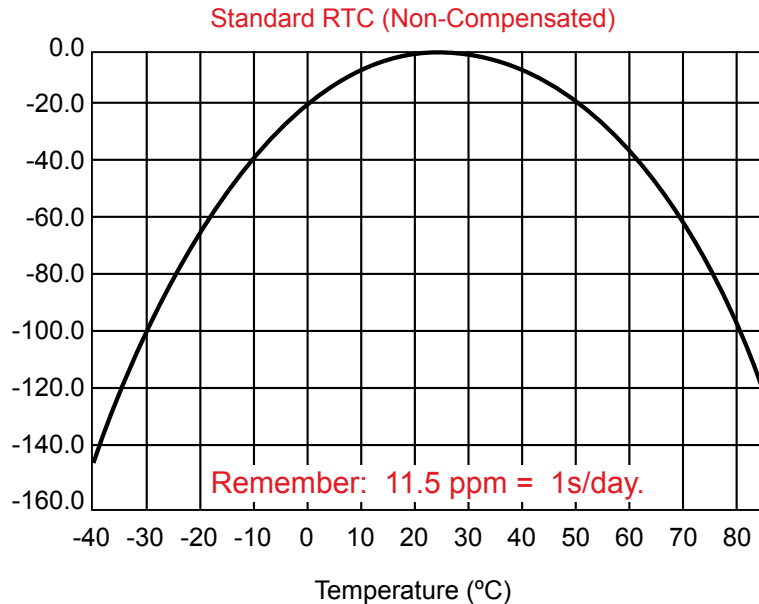
V_{DD}

V_{BAT}

Not recommended for new designs — please use PCF2131TF for new designs

PCF2127A / 29A: LOW-POWER ACCURATE REAL TIME CLOCK (RTC)

KEY FEATURES AND BENEFITS

- High accuracy (±3 ppm; typ.) for accurate time reference

- Ultra-low power consumption enables long battery life
  - ~500 nA @ V_{DD}=2.0 V and T_{AMB}=25°C

- Integrated quartz crystal requires no external quartz

- Integrated TCXO with temperature compensation circuit requires no external temperature sensor and no temperature dependent tuning

- Battery backup and switchover functionality ensures reference timekeeping during power down

- Factory calibrated and ready at very first power up

- No external capacitors required and no recalibration required to compensate for aging

- Integrated 512-byte RAM (PCF2127A) for retaining critical data during power down

- SPI and I²C-bus interface (selectable)

- SO20 Package

ACCURACY OVER TEMPERATURE

Standard RTC (Non-Compensated)

Remember: 11.5 ppm = 1s/day.

Accurate RTC (Compensated)

Typical Error: Only ±3 ppm over -15 °C to +60 °C

Not recommended for new designs — please use PCF2131TF for new designs

PCF2127A / 29A: LOW-POWER ACCURATE REAL TIME CLOCK (RTC)

PCF2127A AND PCF2129A FEATURE LIST

Type	PCF2127A	PCF2129A
Operating temp. range	-40 °C, to +85 °C	-40 °C, to +85 °C
Accuracy (typ)	±3 ppm; from -15 °C to 60 °C ±5 ppm; from -25 °C to -15 °C ±5 ppm; from +60 °C to +65 °C	±3 ppm; from -15 °C to 60 °C ±5 ppm; from -25 °C to -15 °C ±5 ppm; from +60 °C to +65 °C
Interface	I²C and SPI	I²C and SPI
RAM	512 Byte	–
Package	SO20	SO20
Supply voltage range V_{DD}	1.8 V to 4.2 V	1.8 V to 4.2 V
Battery supply voltage range V_{BAT}	1.8 V to 4.2 V	1.8 V to 4.2 V
Supply current (typ.)	500 nA @ 2.0 V and T_{amb}=25 °C	500 nA at 2.0 V and T_{amb}=25 °C
Battery switch over function	Yes	Yes
Battery low-detection function	Yes	Yes
Extra power fail detection function	Yes	No
Battery backed output voltage pin	Yes	Yes
Reset output pin	Yes	No
Countdown timer and watch dog function	Yes	Watchdog only
Time stamp function	Yes	Yes

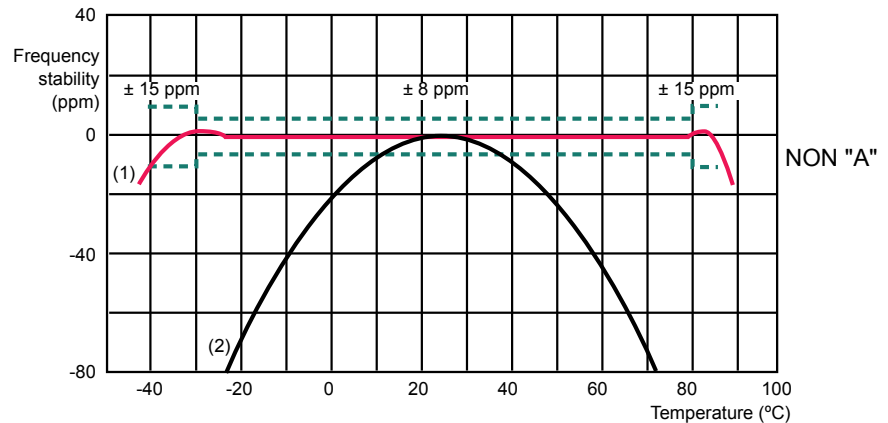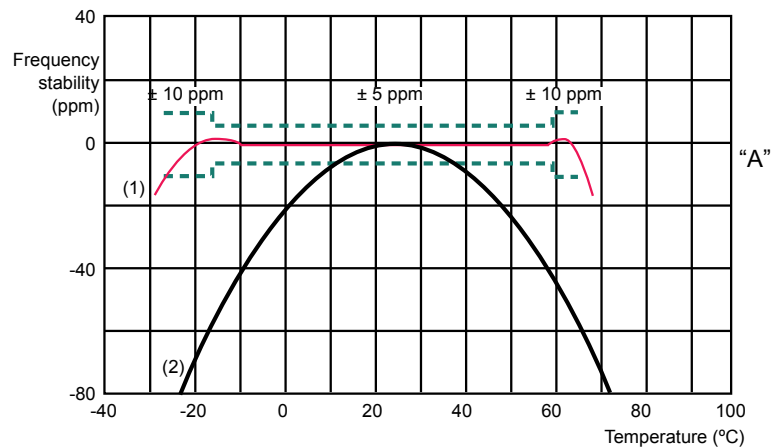Not recommended for new designs — please use PCF2131TF for new designs

PCF212XA VS PCF212X: DIFFERENCES IN ACCURACY

Type number	PCF2127AT/2, 2129AT/2	PCF2127T/2, 2129T/2
Version	Industrial	Industrial
Grade	General Qquality spec	General quality spec
	GQS	GQS
Frequency accuracy	+/- 5 ppm -15 °C to +60 °C +/-10 ppm -25 °C to -15 °C, 60 °C to +65 °C	+/- 8 ppm -30 °C to +80 °C +/-15 ppm <-30 °C, >80 °C
Construction	Metal can quartz	Ceramic quartz
Silicon foundry	TSMC Taiwan	TSMC Taiwan
Assembly fab	APB Bangkok Thailand	APB Bangkok Thailand
Wafer and final test	APB Bangkok Thailand	APB Bangkok Thailand
Package	SO20	SO16 drop in to SO20 PCB footprint since SO20 has four NC pins
Quartz type	Metal can package	Ceramic package

KEY FEATURES

- The PCF212XC comprises a Real Time Clock (RTC) and a temperature compensated quartz oscillator (TCXO). The quartz crystal itself is integrated into the package.

- There are two major versions: SO20 package, and SO16 package. They feature different accuracy due to the use of different types of crystal.

- "A" has higher accuracy

- Non "A" has wider temperature range.

"A" VS NON "A" ACCURACY OVER TEMPERATURE

Not recommended for new designs — please use PCA2131TF/Q900 for new designs

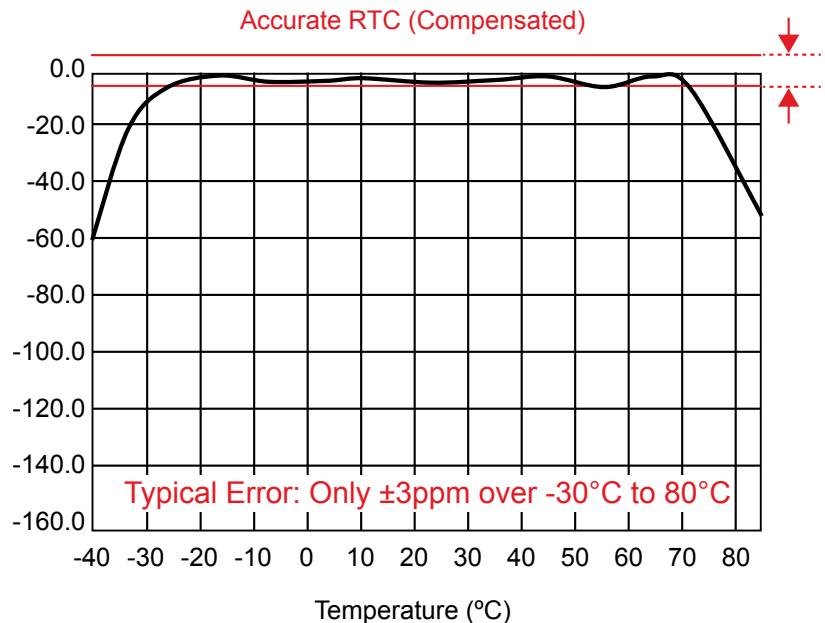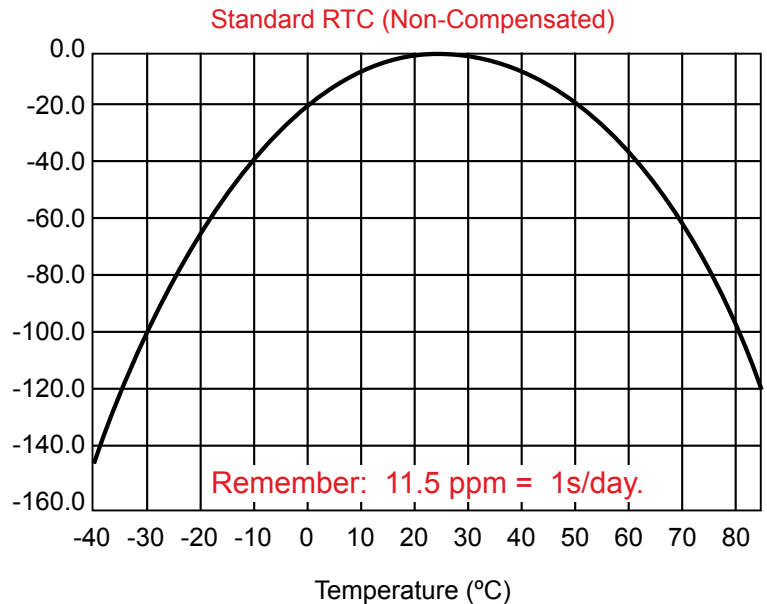# PCA2129: AUTOMOTIVE QUALIFIED ACCURATE REAL TIME CLOCK (ARTC)

KEY FEATURES AND BENEFITS

- High accuracy (±3 ppm; typ.) for accurate time reference
  - ±3 ppm accuracy -30 °C to +80 °C
  - ±5 ppm -40 °C to -30 °C
  - ±5 ppm +80 °C to +85 °C
- Temperature range from –40 °C to +85 °C
- Voltage supply from 1.8 V to 4.2 V
- Ultra-low power consumption enables long battery life
  - ~500 nA @ V_{DD}=2.0 V and T_{amb}=25 °C
- Integrated quartz crystal requires no external quartz
- Integrated TCXO with temperature compensation circuit requires no external temperature sensor and no temperature dependent tuning
- Factory calibrated and ready at very first power up
- SPI and I²C-bus interface (selectable)
- SO16 package
- AEC Q100 compliant

TARGET APPLICATIONS:

- Electric Car Battery Management
- Charging Stations
- Body Control Module

TEMPERATURE RESPONSE COMPARISON

Standard RTC (Non-Compensated)

Remember: 11.5 ppm = 1s/day.

Temperature (ºC)

Accurate RTC (Compensated)

Typical Error: Only ±3ppm over -30°C to 80°C

Temperature (ºC)

Not recommended for new design — please use PCA2131TF/Q900 for new designs

COMPARISON: NXP ACCURATE REAL TIME CLOCKS

Type number	PCF212xAT/2	PCF212xT/2	PCA2129T/ Q900/2	PCF2131TF	PCA2131TF/ Q900
Version	Industrial	Industrial	Automotive	Industrial	Automotive
Grade	General quality spec GQS	General quality spec GQS	AEC-Q100 Grade 3	General quality spec GQS	AEC-Q100 Grade 2
Package	SO20	SO16 drop-in compliant to SO20	SO16	HLSON16	HLSON16
Frequency accuracy	+/- 5 ppm -15 °C to +60 °C +/- 10 ppm -25 °C to -15 °C, 60 °C to 65 °C	+/- 8 ppm -30 °C to +80 °C +/- 15 ppm <-30 °C, >80 °C	+/- 8 ppm -30 °C to +80 °C +/- 15 ppm <-30 °C, >80 °C	+/- 3 ppm -40 °C to +85 °C (typical)	+/- 3 ppm -40 °C to +85 °C (typical); +/- 8 ppm +85 °C to +105 °C (typical).
Construction	Metal can quartz	Ceramic quartz	Ceramic quartz	Ceramic Quartz	Ceramic Quartz
Silicon foundry	TSMC Taiwan	TSMC Taiwan	TSMC Taiwan	TSMC Taiwan	TSMC Taiwan
Assembly fab	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand
Wafer and final test	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand	APB Bangkok Thailand
	2129 extra features: 512 Byte RAM count down timer reset output pin	2129 extra features: 512 Byte RAM count down timer reset output pin		4x Time Stamp input; 2x Interrupt Outputs	4x Time Stamp input; 2x Interrupt Outputs
	UL Certified	UL Certified	UL Certified	Nano-power consumption (64nA)	Nano-power consumption (106nA)

KEY FEATURES

- The RTC comprises a Real Time Clock (RTC) and a temperature compensated quartz oscillator (TCXO).

- The quartz crystal is integrated in the package.

- No need for further tuning over time; just set the clock time once.

PCF2131TF: NANO-POWER HIGHLY ACCURATE RTC WITH INTEGRATED QUARTZ CRYSTAL
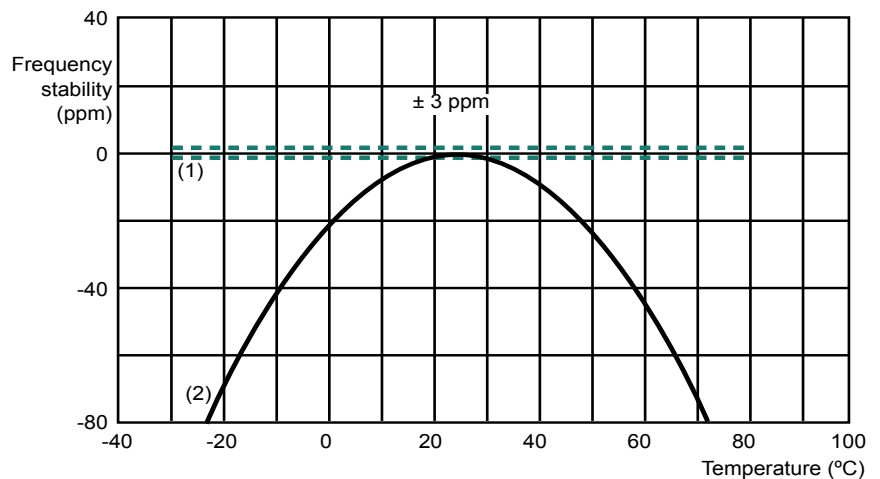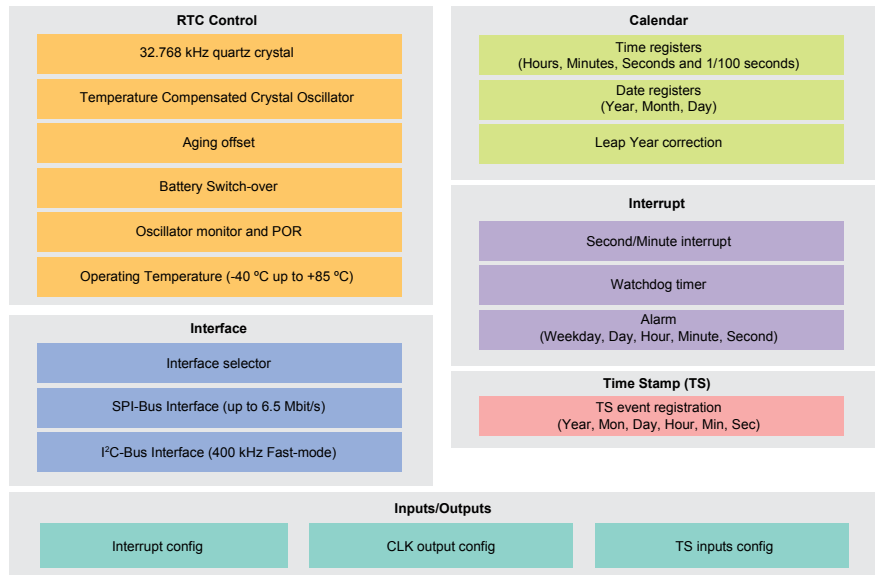
KEY FEATURES AND BENEFITS

- High accuracy for accurate time reference
  - ±3ppm accuracy -40 °C to +85 °C (typical)
  - ±8ppm accuracy -40 °C to +85 °C (max.)
- Temperature Range from –40 °C to +85 °C
- Voltage Supply from 1.2 V to 5.5 V
- Ultra-low power consumption enables long battery life
  - ~64nA @ V_{DD}=3.3V and T_{amb}=25 °C
- Integrated quartz crystal requires no external quartz.
- Integrated TCXO with temperature compensation circuit requires no external temperature sensor and no temperature dependent tuning.
- Factory calibrated and ready at very first power up

- 4x Time Stamps input pins for tampering detection with 4x individual registers to store the event time.
- 2x Interrupt output pins to wake-up the rest of the system. Output can be trigger by internal RTC alarms, watchdog or external event on TS pins.
- SPI and I²C Interface (selectable)
- HLSON16 package – 3.5 x 4.5 x 1.4 mm – pitch 0.5 mm

TARGET APPLICATIONS:

- Electronic metering for electricity, water, and gas
- Precision timekeeping
- Access to accurate time of the day
- GPS equipment to reduce time to first fix
- Applications that require an accurate process timing
- Products with long automated unattended operation time

PCF2131TF BLOCK DIAGRAM

RTC Control
- 32.768 kHz quartz crystal
- Temperature Compensated Crystal Oscillator
- Aging offset
- Battery Switch-over
- Oscillator monitor and POR
- Operating Temperature (-40 °C up to +85 °C)

Interface
- Interface selector
- SPI-Bus Interface (up to 6.5 Mbit/s)
- I²C-Bus Interface (400 kHz Fast-mode)

Calendar
- Time registers (Hours, Minutes, Seconds and 1/100 seconds)
- Date registers (Year, Month, Day)
- Leap Year correction

Interrupt
- Second/Minute interrupt
- Watchdog timer
- Alarm (Weekday, Day, Hour, Minute, Second)

Time Stamp (TS)
- TS event registration (Year, Mon, Day, Hour, Min, Sec)

Inputs/Outputs
- Interrupt config
- CLK output config
- TS inputs config

PCA2131TF/Q900: NANO-POWER HIGHLY ACCURATE RTC WITH INTEGRATED QUARTZ CRYSTAL FOR AUTOMOTIVE APPLICATIONS.

KEY FEATURES AND BENEFITS

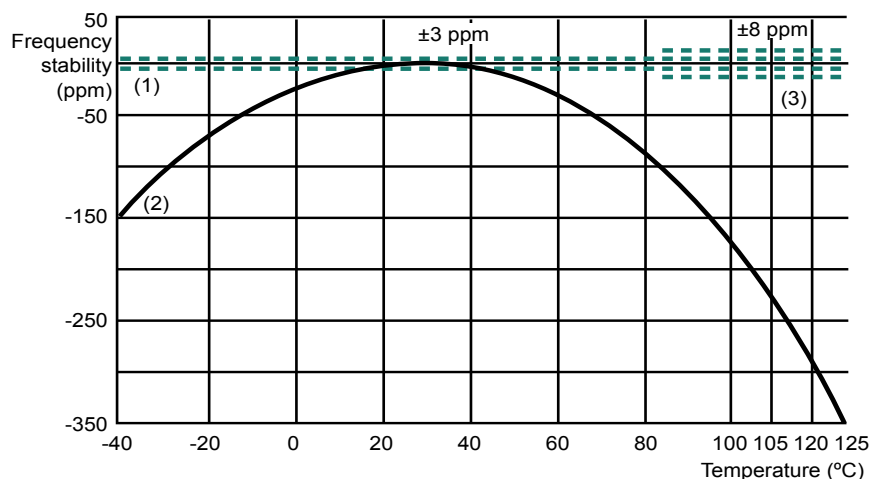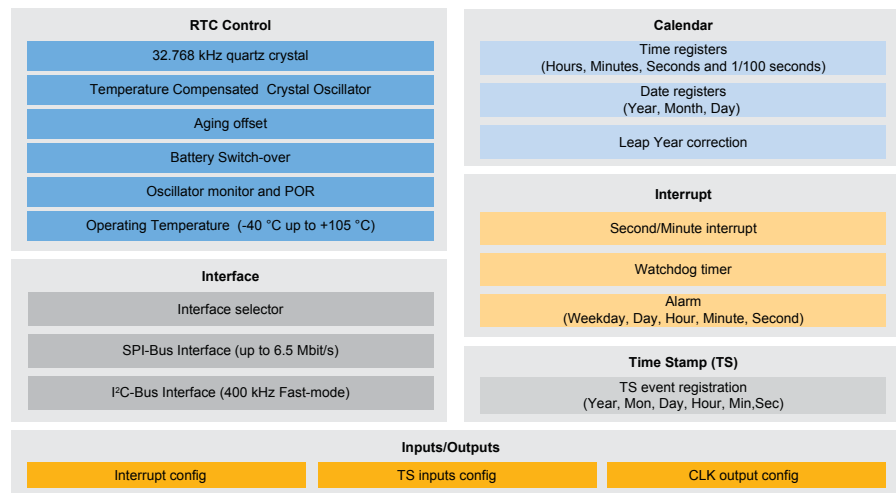- High accuracy for accurate time reference
  - ±3 ppm accuracy -40 °C to +85 °C (typical)
  - +/- 8 ppm accuracy +85 °C to +105 °C (typical)
- Temperature Range from -40 °C to 105 °C with clock operation up to 125 °C
- Voltage Supply from 1.2 V to 5.5 V
- Ultra-low power consumption enables long battery life
  - 106nA @ V_{DD}=3.3V and T_{amb}=25°C
- Integrated quartz crystal requires no external quartz.
- Integrated TCXO with temperature compensation circuit requires no external temperature sensor and no temperature dependent tuning.
- Factory calibrated and ready at very first power up

- 4x Time Stamps input pins for tampering detection with 4x individual registers to store the event time.
- 2x Interrupt output pins to wake-up the rest of the system. Output can be trigger by internal RTC alarms, watchdog or external event on TS pins.
- SPI and I²C Interface (selectable)
- HLSON16 package – 3.5 x 4.5 x 1.4 mm – pitch 0.5 mm

TARGET APPLICATIONS:

- Automotive
- Automotive High Performance Compute
- Entry Infotainment / Connected Radio
- Instrument Cluster
- Smart Car Access
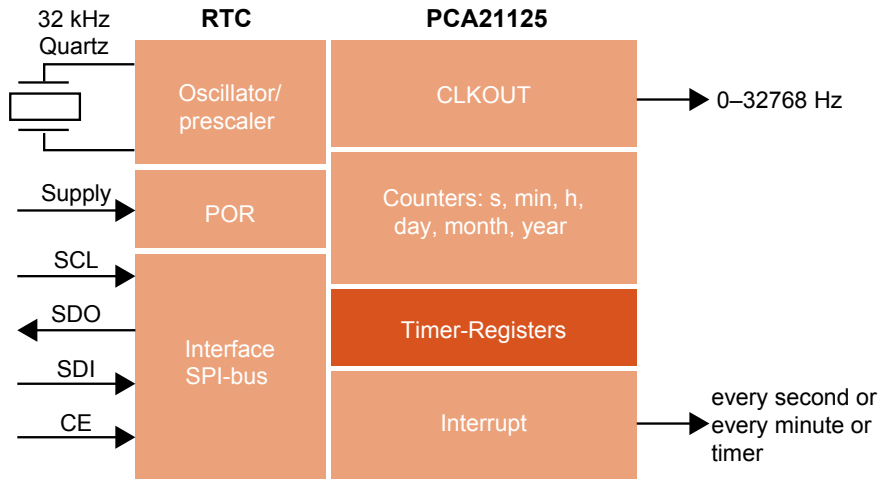- V2X Communications

PCA2131TF/Q900 BLOCK DIAGRAM

RTC Control
32.768 kHz quartz crystal
Temperature Compensated Crystal Oscillator
Aging offset
Battery Switch-over
Oscillator monitor and POR
Operating Temperature (-40 °C up to +105 °C)

Interface
Interface selector
SPI-Bus Interface (up to 6.5 Mbit/s)
I²C-Bus Interface (400 kHz Fast-mode)

Calendar
Time registers (Hours, Minutes, Seconds and 1/100 seconds)
Date registers (Year, Month, Day)
Leap Year correction

Interrupt
Second/Minute interrupt
Watchdog timer
Alarm (Weekday, Day, Hour, Minute, Second)

Time Stamp (TS)
TS event registration (Year, Mon, Day, Hour, Min,Sec)

Inputs/Outputs		
Interrupt config	TS inputs config	CLK output config

PCA21125: RTC WITH SPI BUS (T$_{AMBIENT}$ = -40 °C TO +125 °C)

KEY FEATURES AND BENEFITS

- Extended temp. range: –40 to +125 °C
- Low power < 860 nA
- Large voltage range 1.5 to 5.5 V
- SPI bus up to 6 MHz
- Clock from seconds to 99 years
- Programmable timer
- Frequency output
- Small package TSSOP14
- AEC Q100 compliant
- High-temperature variant (+125 °C)
- Allows for automotive or other high-temp applications resulting from the extended temperature range

PCA21125 BLOCK DIAGRAM

32 kHz Quartz

RTC

PCA21125

Oscillator/ prescaler

CLKOUT → 0–32768 Hz

Supply → POR

Counters: s, min, h, day, month, year

SCL →

SDO ←

Interface SPI-bus

Timer-Registers

SDI →

CE →

Interrupt → every second or every minute or timer

REAL TIME CLOCK DESIGN SUPPORT

RTC	Eval Board	User Manual
PCF2123	OM13512	UM10759
PCF8523	OM13511	UM10670
PCF2127, 29	OM13513	UM10762
PCF85063B	OM11059	UM10699
PCF85063A	OM11059A	UM10698
PCF85263A	OM13510	UM10766
PCF85363A	OM13514	UM10787
PCA21125	OM13517	N/A
PCA8565	OM13519	N/A
PCF2127A	OM11051	N/A
PCF2131/PCA2131	PCF2131-ARD	UM11597

REAL TIME CLOCK APPLICATION NOTES

AN10652:
Improved timekeeping accuracy with PCF8563 using external temperature sensor

UM10301:
User Manual for NXP Real Time Clocks PCF85x3, PCF85x63, PCA8565, PCF2123, and PCA21125

AN11120:
Application and Soldering Information for the PCA2129

AN11186:
Application soldering PCA2129 and PCF2129 TXCO

AN13203:
Application and Soldering information for PCF2131

TECHNICAL CONTACT

PRODUCT INFORMATION:

www.nxp.com

www.nxp.com/RTC