

# REAL TIME CLOCK MODULE (SPI-Bus)

High-Stability Frequency

## RX-4045 SA/NB

- Built-in 32.768 kHz crystal unit: Frequency adjusted for high accuracy. ( $\pm 5 \times 10^{-6} / T_a = +25^\circ\text{C}$ )
- Interface Type : 4-wire serial interface
- Operating voltage range : 1.7 V to 5.5 V
- Wide Timekeeper voltage range : 1.15 V to 5.5 V
- Various detection Functions : Oscillation stop detection function etc.
- Low backup current : 0.48  $\mu\text{A}$  / 3 V (Typ.)
- 32.768 kHz clock frequency output : N-ch open drain output
- Function of time and calendar, the various detection function, and interrupt function etc.



Product Number (Please contact us)  
 RX-4045SA : Q41404552xxxx00  
 RX-4045NB : Q41404592xxxx00



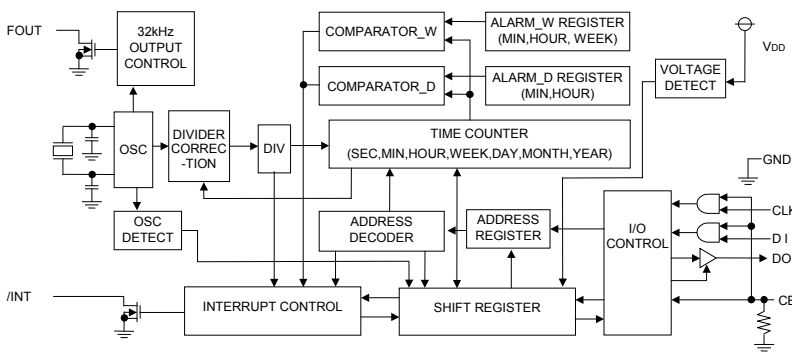
Actual size

RX-4045SA

RX-4045NB



### Block diagram



### Overview

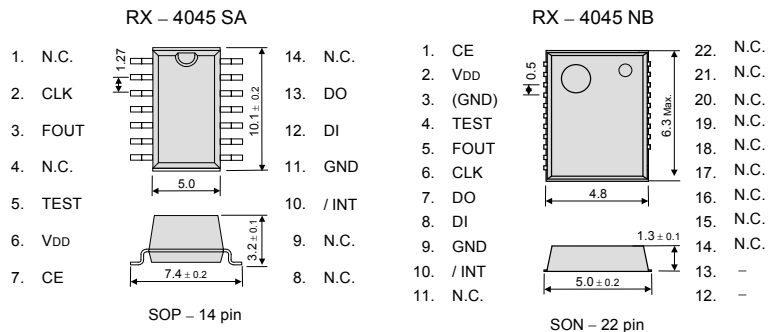
- **Features built-in 32.768 kHz crystal unit**
  - Frequency adjusted for high accuracy ( $\pm 5 \times 10^{-6} / T_a = +25^\circ\text{C}$ ) (Equivalent to 13 seconds of monthly deviation)
- **The various detection Function**
  - Power supply voltage monitoring function (with selectable detection threshold)
  - Stop detection function
  - Power-on reset detection function
- **Equipped with alarm and timer**
  - Timer function produces a periodic interruption signal. As for the Alarm function an optional combination is produced. (Date of the week, time, minute)

### Pin function

Signal Name	Input / Output	Function
CE	Input	The chip enabled input pin. (built-in pull-down resistance) At the "H" level, access becomes possible.
CLK	Input	The shift clock input pin for serial data transfer.
DI	Input	The data input pin for serial data transfer.
DO	Output	The data output pin for serial data transfer.
FOUT	Output	32.768 kHz clock output pin with the output control function (N-ch open drain) High impedance at the time of output off.
/INT	Output	Interrupt output (N-ch open drain)
TEST	—	* Used by the manufacturer for testing. (Do not connect externally.)
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

### Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

### Specifications (characteristics)

\* Refer to application manual for details.

#### Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.7	3.0	5.5	V
Clock voltage	VCLK	—	1.15	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

#### Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	$T_a = +25^\circ\text{C}$ $V_{DD} = 3.0\text{ V}$	AA: $5 \pm 5$ *1) AC: $0 \pm 5$ *2)	$\times 10^{-6}$
Oscillation start-up time	tSTA	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.0\text{ V}$	1 Max.	s
Frequency / voltage characteristics	f/V	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.0\text{ V to } 5.5\text{ V}$	$\pm 1$ Max.	$\times 10^{-6}$

\*1) \*2) Equivalent to 13 seconds of monthly deviation (excluding offset.)

#### Current consumption characteristics

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Current Consumption	I <sub>BK</sub>	CE = GND FOUT ; output OFF (Hi-Z)	$V_{DD} = 5\text{ V}$	-	0.60	1.80	$\mu\text{A}$
			$V_{DD} = 3\text{ V}$	-	0.48	1.20	
	I <sub>32k</sub>	CE = GND FOUT ; 32.768 kHz output ON	$V_{DD} = 3\text{ V}$	-	0.65	2.00	$\mu\text{A}$

#### Power supply detection voltage

$T_a = -30^\circ\text{C to } +70^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
High-voltage mode	VDETH	VDD pin	1.90	2.10	2.30	V
Low-voltage mode	VDETL	VDD pin	1.15	1.30	1.45	V

## PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Seiko Epson, all environmental initiatives operate under the Plan-Do-Check-Action (PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification.

ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

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ISO/TS16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

### ► Explanation of the mark that are using it for the catalog

	► Pb free.
	► Complies with EU RoHS directive. *About the products without the Pb-free mark. Contains Pb in products exempted by EU RoHS directive. (Contains Pb in sealing glass, high melting temperature type solder or other.)
	► Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.
	► Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc.)

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