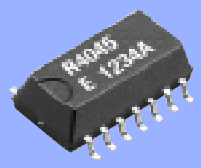
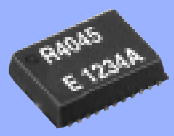
High-Stability Frequency
SERIAL-INTERFACE REAL TIME CLOCK MODULE

RX - 4045 SA / NB

- •Built-in 32.768 kHz quartz oscillator : Frequency adjusted for high accuracy. (±5 ×10^{-6} / Ta = +25 °C)
- •Interface Type : 4 wire high accuracy 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 µA / 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.

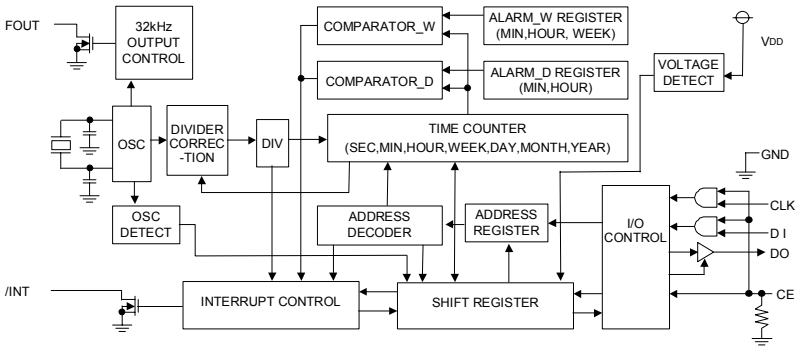



Actual size

RX-4045SA 

RX-4045NB 

Block diagram



Overview

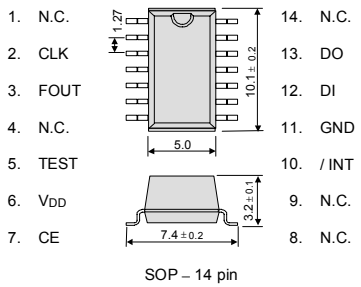
- **Features built-in 32.768 kHz quartz oscillator**
  - ▪Frequency adjusted for high precision (±5×10^{-6} /Ta = +25 °C) (Equivalent to 13 seconds of monthly deviation)
- **The various detection Function**
  - ▪Power supply voltage monitoring function (with selectable detection threshold)
  - ▪Stop 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.

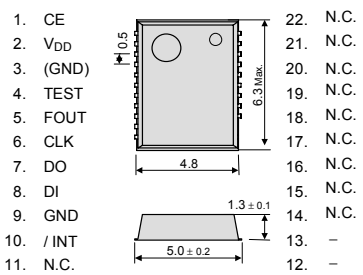
Terminal connection / External dimensions (Unit:mm)

RX – 4045 SA



SOP – 14 pin

RX – 4045 NB



SON – 22 pin

Metal may be exposed on the top or bottom of this product. This will not affect any quality, reliability or electrical spec.

Specifications (characteristics)

＊ Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Condition	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	Condition	Rating	Unit
Frequency tolerance	Δf / f	Ta = +25°C VDD = 3.0 V	AA: 5 ± 5 *1) AC: 0 ± 5 *2)	×10^{-6}
Oscillation start-up time	tSTA	Ta = +25 °C VDD = 2.0 V	1 Max.	s
Frequency / voltage characteristics	f / V	Ta = +25 °C VDD = 2.0 V to 5.5 V	± 1 Max.	×10^{-6}

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

■ DC characteristics Ta = –40 °C to +85 °C

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Current Consumption	IBK	CE = GND FOUT ;output OFF (Hi-z)	VDD = 5 V		0.60	1.80	µA
			VDD = 3 V		0.48	1.20	
	I32k	CE = GND FOUT ;32.768 kHz output ON	VDD = 3 V		0.65	2.00	µA

■ Power supply detection voltage Ta = –30 °C to +70 °C

Item	Symbol	Condition	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

“3D STRATEGY” EPSON TOYOCOM

In order to meet customer needs in a rapidly advancing digital, broadband and ubiquitous society, we are committed to offering products that are one step ahead of the market and a rank above the rest in quality. To achieve our goals, we follow a “3D (three device) strategy” designed to drive both horizontal and vertical growth. We will to grow our three device categories of “Timing Devices”, ”Sensing Devices” and “Optical Devices”, and expand vertical growth through a combination of products from these categories.

Quartz devices have become crucial in the network environment where products are increasingly intended for broadband, ubiquitous applications and where various types of terminals can transfer information almost immediately via LAN and WAN on a global scale. Epson Toyocom Corporation addresses every single aspect within a network environment. The new corporation offers “Digital Convergence” solutions to problems arising with products for consumer use, such as, core network systems and automotive systems.

PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Epson Toyocom, 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.
In the future, new group companies will be expected to acquire the certification around the third year of operations.

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.

WORKING FOR HIGH QUALITY

Epson Toyocom quickly began working to acquire company-wide ISO 9000 series certification, and has acquired ISO 9001 or ISO 9002 certification for all targeted products manufactured in Japanese and overseas plants.
Epson Toyocom has acquired QS-9000 certification, which is of a higher level.
Also, TS 16949 certification, which is also of a higher level, has been acquired.

QS-9000 is an enhanced standard for quality assurance systems formulated by leading U.S.automobile manufacturers based on the international ISO 9000 series.

ISO/TS 16949 is a global standard based on QS-9000, a severe standard corresponding to the requirements from the automobile industry.

Notice

- This material is subject to change without notice.
- Any part of this material may not be reproduced or duplicated in any form or any means without the written permission of Epson Toyocom.
- The information, applied circuitry, programming, usage, etc., written in this material is intended for reference only. Epson Toyocom does not assume any liability for the occurrence of infringing on any patent or copyright of a third party. This material does not authorize the licensing on for any patent or intellectual copyrights.
- Any product described in this material may contain technology or the subject relating to strategic products under the control of the Foreign Exchange and Foreign Trade Law of Japan and may require an export license from the Ministry of International Trade and Industry or other approval from another government agency.
- These products are intended for general use in electronic equipment. When using them in specific applications that require extremely high reliability, such as the applications stated below, you must obtain permission from Epson Toyocom in advance.
  / Space equipment (artificial satellites, rockets, etc.) / Transportation vehicles and related (automobiles, aircraft, trains, vessels, etc.)
  / Medical instruments to sustain life / Submarine transmitters / Power stations and related / Fire work equipment and security equipment
  / traffic control equipment / and others requiring equivalent reliability.
- In this new crystal master for Epson Toyocom, product codes and markings will remain as previously identified prior to the merger.
  Due to the on-going strategy of gradual unification of part numbers, please review product codes and markings, as they will change during the course of the coming months.
  We apologize for the inconvenience, but we will eventually have a unified part numbering system for Epson Toyocom that will be user friendly.