

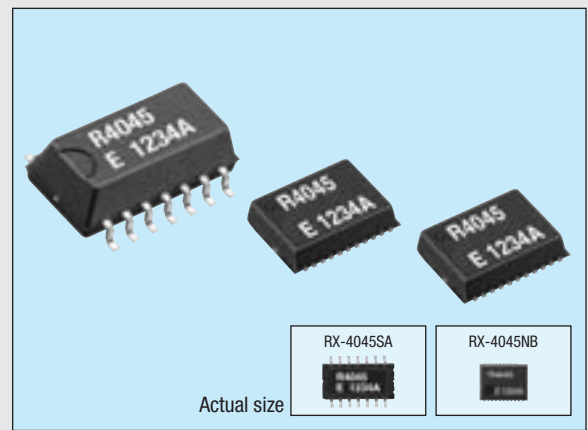
4 WIRE HIGH ACCURACY SERIAL INTERFACE REAL TIME CLOCK MODULE

RX-4045SA / NB

Product number (please refer to page 5)

Q4140455xxxxx00**Q4140459xxxxx00**

- Built-in 32.768 kHz crystal oscillator with high accuracy.
- Dual Alarm and Timer IRQ function are Available.
- 32.768 kHz clock frequency output. (Nch open drain)
- Low backup current : 0.48 μ A / 3 V (Typ.)
- Wide operating voltage range : 1.7 V to 5.5 V
- Wide timekeeper voltage range : 1.15 V to 5.5 V
- CPU interrupt generation function (cycle time range : 1 month to 0.5 seconds, includes interrupt flags and interrupt stop function)
- Oscillation stop detection function (used to determine presence of internal data)
- Power supply voltage monitoring function (with selectable detection threshold)
- Available for lead (Pb) - free soldering.
- Available for lead (Pb) - free terminal.



The details are mentioned in the application manual.

<http://www.epsondevice.com>**Specifications (characteristics)****Absolute Max. rating**

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V _{DD}	V _{DD} to GND	-0.3	+6.5	V
Input voltage	V _I	CE, CLK, DI pins	GND -0.3	+6.5	
Output voltage	V _{O1}	FOUT, INT pins	GND -0.3	+6.5	
	V _{O2}	DO pin	GND -0.3	V _{DD} +0.3	
Storage temperature	T _{STG}	Stored as bare product after unpacking	-55	+125	°C

Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Power voltage	V _{DD}	—	1.7	5.5	V
Clock voltage	V _{CLK}	—	1.15		
Operating temperature	T _{OPR}	No condensation	-40	+85	°C

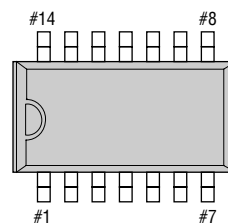
Frequency characteristics

Item	Symbol	Condition	Range	Unit
Frequency tolerance	$\Delta f/f$	T _a = +25 °C, V _{DD} = 3.0 V	AA: 5 \pm 1	$\times 10^{-6}$
Oscillation start up time	t _{STA}	T _a = +25 °C, V _{DD} = 2.0 V	1 Max.	s
Frequency temperature characteristics	T _{OP}	T _a = -20 °C to +70 °C Reference at +25 °C	+10 -120	$\times 10^{-6}$
Frequency voltage characteristics	f/V	T _a = +25 °C, V _{DD} = 2.0 V to 5.5 V	± 1 Max.	$\times 10^{-6}$
Aging	f _a	T _a = +25 °C, V _{DD} = 3.0 V, first year	± 5 Max.	$\times 10^{-5}$ / year

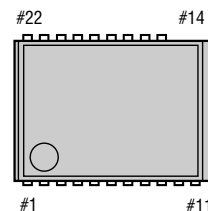
*1 Equivalent to 13 seconds of monthly deviation (excluding offset.)

DC characteristics (GND = 0 V, V_{DD} = 1.8 V to 5.5 V, T_a = -40 °C to +85 °C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Standby current	I _{DD2}	CE = OPEN (or GND) INT = V _{DD} FOUT = OPEN		0.6	1.8	μ A
		V _{DD} = 5 V		0.48	1.20	
		V _{DD} = 3 V				
"H" input voltage	V _{IH}	CE, CLK, DI pins	0.8 V _{DD}		5.5	V
"L" input voltage	V _{IL}	V _{DD} = 1.7 V to 5.5 V	GND -0.3		0.2 V _{DD}	
"H" output current	I _{OH}	FOUT pins, V _{OH} = V _{DD} - 0.5V			-0.5	mA
"L" output current	I _{OL1}	FOUT pins, V _{OL} = 0.4V	0.5			
	I _{OL2}	INT pins, V _{OL} = 0.4 V	2.0			
Pull down	RDNCE	CE pin	40		400	k Ω
Output leakage current	I _{OZ1}	DO pin V _O = 5.5 V or GND V _{DD} = 5.5	-1		1	μ A
	I _{OZ2}	FOUT, INT pins V _O = 5.5 V	-1		1	

Terminal connection**● RX-4045SA**

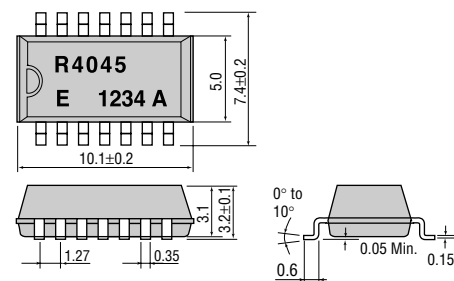
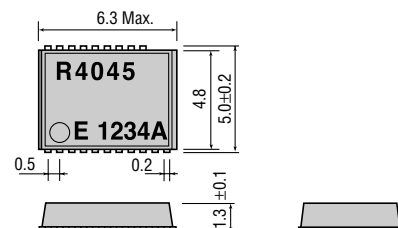
No.	Pin terminal	No.	Pin terminal
1	N.C	14	N.C
2	CLK	13	DO
3	FOUT	12	DI
4	N.C	11	GND
5	TEST	10	INT
6	V _{DD}	9	N.C
7	CE	8	N.C

● RX-4045NB

No.	Pin terminal	No.	Pin terminal
1	CE	22	N.C
2	V _{DD}	21	N.C
3	(GND)	20	N.C
4	TEST	19	N.C
5	FOUT	18	N.C
6	CLK	17	N.C
7	DO	16	N.C
8	DI	15	N.C
9	GND	14	N.C
10	INT	13	—
11	N.C	12	—

External dimensions

(Unit: mm)

● RX-4045SA (SOP 14-pin)**● RX-4045NB (SON 22-pin)**

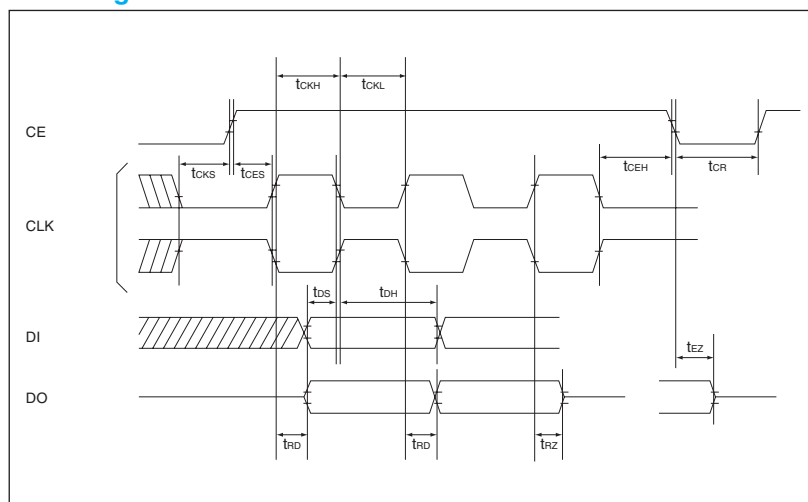
■ Register table

Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	Seconds	O	S40	S20	S10	S8	S4	S2	S1
1	Minutes	O	M40	M20	M10	M8	M4	M2	M1
2	Hours	O	O	H20 P, A	H10	H8	H4	H2	H1
3	Weekdays	O	O	O	O	O	W4	W1	W0
4	Days	O	O	D20	D10	D8	D4	D2	D1
5	Months	O	O	O	M010	M08	M04	M02	M01
6	Years	Y80	Y40	Y20	Y10	Y8	Y4	Y2	Y1
7	Digital Offset	O	F6	F5	F4	F3	F2	F1	F0
8	Alarm_W ; Minutes	O	WM40	WM20	WM10	WM8	WM4	WM2	WM1
9	Alarm_W ; Hour	O	O	WH20 WP, A	WH10	WH8	WH4	WH2	WH1
A	Alarm_W ; Weekday	O	WW6	WW5	WW4	WW3	WW2	WW1	WW0
B	Alarm_D ; Minutes	O	DM40	DM20	DM10	DM8	DM4	DM2	DM1
C	Alarm_D ; Hour	O	O	DH20 DP, A	DH10	DH8	DH4	DH2	DH1
D	Reserved	Reserved							
E	Control 1	WALE	DALE	12, 24	CLEN2	TEST	CT2	CT1	CT0
F	Control 2	VDL	VDL	XST	PON	CLEN1	CTFG	WAFG	DAFG

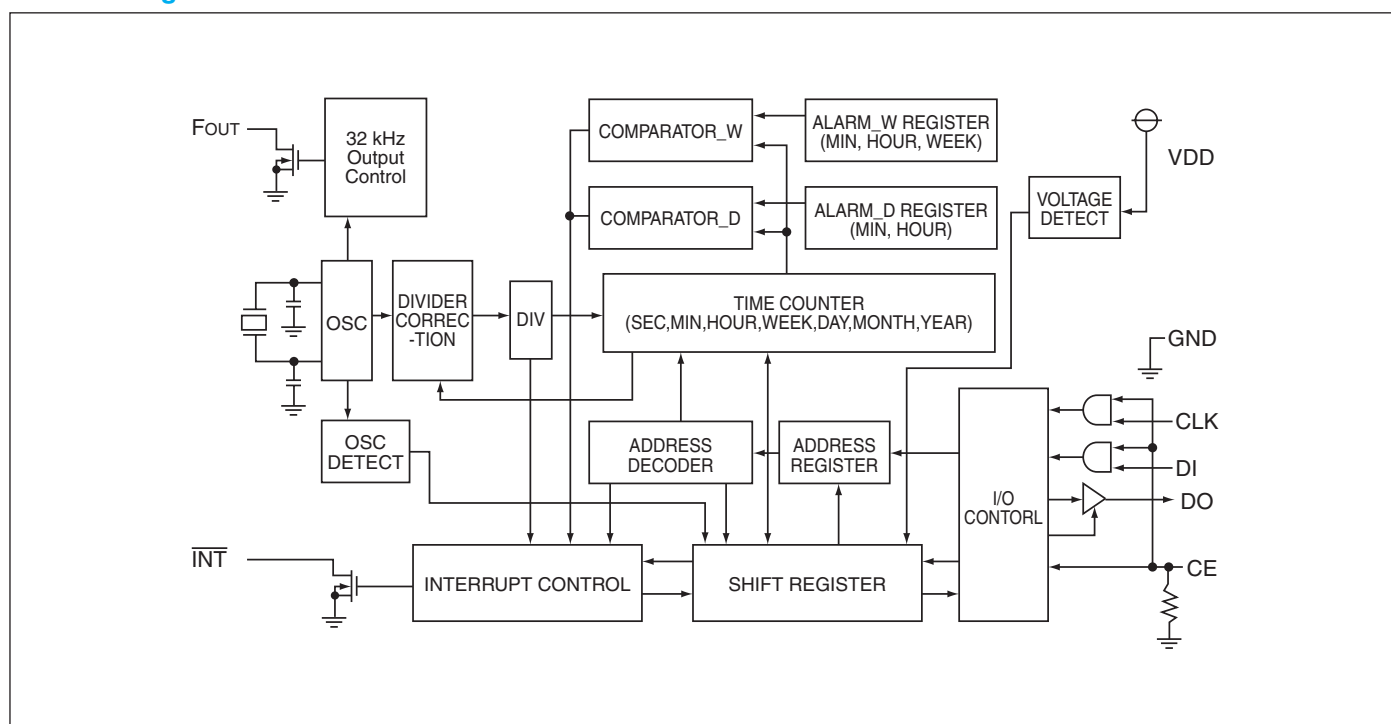
■ AC characteristics

Item	Symbol	Min.	Typ.	Max.	Unit		
CLK clock frequency	CLK	—		1.0	MHz		
CE set-up time	t _{CES}	400				ns	
CE Hold time	t _{CEH}						
Clock “L” time	t _{CKL}						
Clock “H” time	t _{CKH}						
CE recovery time	t _{CR}	61			μs		
Data set-up time	t _{DS}	200				ns	
Data hold time	t _{DH}	200					
CLK set-up time	t _{CKS}	200					
Read data delay time	t _{RD}						300
Output disable time	t _{TRZ}						300

■ Timing chart



■ Block diagram



THE CRYSTALMASTER



ENERGY SAVING EPSON

EPSON offers effective savings to its customers through a wide range of electronic devices, such as semiconductors, liquid crystal display (LCD) modules, and crystal devices. These savings are achieved through a sophisticated melding of three different efficiency technologies.

Power saving technology provides low power consumption at low voltages.

Space saving technology provides further reductions in product size and weight through super-precise processing and high-density assembly technology.

Time saving technology shortens the time required for design and development on the customer side and shortens delivery times.

Our concept of Energy Saving technology conserves resources

by blending the essence of these three efficiency technologies. The essence of these technologies is represented in each of the products that we provide to our customers.

In the industrial sector, leading priorities include measures to counter the greenhouse effect by reducing CO₂, measures to preserve the global environment, and the development of energy-efficient products. Environmental problems are of global concern, and although the contribution of energy-saving technology developed by EPSON may appear insignificant, we seek to contribute to the development of energy-saving products by our customers through the utilization of our electronic devices. EPSON is committed to the conservation of energy, both for the sake of people and of the planet on which we live.

WORKING WITH ENVIRONMENTAL ISSUES

In 1988, Seiko Epson led in working to abolish CFCs, and perfect abolition of those ozone layer-destroying substances was achieved in 1992. In 1998, the 10th year of start of the CFC-free activity, Seiko Epson set this year as the "Second Environmental Benchmark Year" and established a new corporate General Environmental Policy. Seiko Epson is tackling with environmental issues comprehensively.

At the end of Fiscal 1988, Seiko Epson succeeded in abolishing chloric solvents doubted to be harmful to human body. In fiscal 1999, Seiko Epson started the activity with a goal of abolishing lead solder pointed out possibility of environmental pollutant.

Promotion of Environment Management System conforming to International Standard

To strengthen management for environmental activities, Seiko Epson Group aims at acquisition of the ISO14001 certification for Japanese and abroad main business bases (including affiliates) for manufacturing, sales, software development and others.

As of May 25, 2001, planned 68 bases of all manufacturing bases and some non-manufacturing bases have acquired the certification.



Co-existence Mark

The environmental mark symbolizing Epson's basic stance of "Co-existence with Nature".

The design incorporates a fish, flower, and water, representing mutually supportive co-existence.



ISO14000 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

Seiko-Epson quickly began working to acquire company-wide ISO9000 series certification, and has acquired ISO9001 or ISO9002 certification with all targeted products manufactured in Japanese and overseas plants.

The Quartz Device Operations Division (Ina Japan, EPM and SZE) have acquired QS-9000 certification, which are of higher level.



QS-9000:

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

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