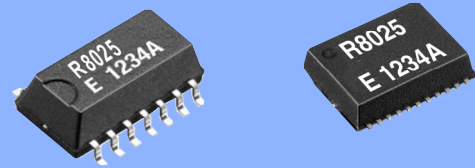


# High-Stability I<sup>2</sup>C-Bus INTERFACE REAL TIME CLOCK MODULE

## RX - 8025 SA / NB

- Built-in 32.768 kHz quartz oscillator : Frequency adjusted for high accuracy ( $\pm 5 \times 10^{-6}$  / Ta = +25 °C)
  - Interface Type : I<sup>2</sup>C-Bus Interface (400 kHz)
  - Operating voltage range : 1.70 V to 5.5 V
  - Wide Timekeeper voltage range : 1.15 V to 5.5 V
  - Various detection Functions : Ex. Oscillation stop detection function
  - Low backup current : 0.48  $\mu$ A / 3 V (Typ.)
  - 32.768 kHz frequency output function : C-MOS output With Control Pin
  - The various functions include full calendar, alarm, timer.
  - Lead(Pb)-free : Contains high melting temperature type solder (Pb85 %) exempted by RoHS directive.
- \* The I<sup>2</sup>C-Bus is a trademark of Philips Electronics N.V.



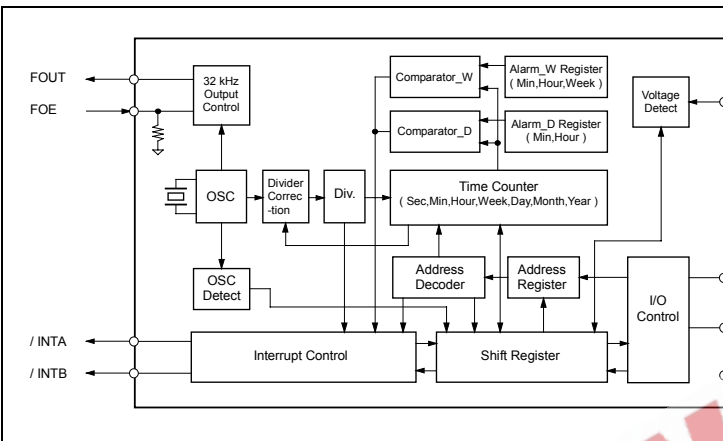
Actual size

RX-8025SA

RX-8025NB



### Block diagram



### Overview

#### • Features built-in 32.768 kHz quartz oscillator

- Frequency adjusted for high accuracy. ( $\pm 5 \times 10^{-6}$  / 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

#### • Alarm function and Timer function

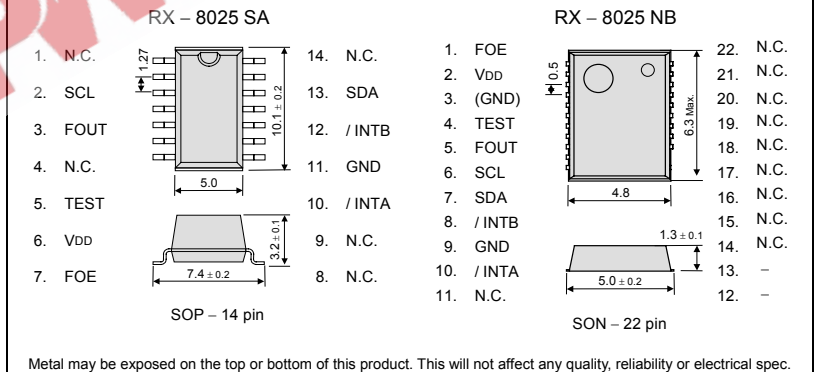
- Timer function produces a periodic interruption signal. As for the Alarm function an optional combination is produced. (Date of the week, time, minute)

### Pin Function

| Signal Name | Input / output | Function   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
|-------------|----------------|--|-------------|------------|------------|-------------|---|---|---|-----------|--|---|---|------------|--|---|---|------------|--|---|---|------------|--|---|---|-----------|
| SCL         | Input          | Serial clock input pin   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| SDA         | Bi-directional | Data input and output pin  |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| FOUT        | Output         | FOUT pin is 32.768 kHz clock output pin (C-MOS) that output control is possible.   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| FOE         | Input          | <table border="1"> <thead> <tr> <th>FOE input</th> <th>/CLEN1 bit</th> <th>/CLEN2 bit</th> <th>FOUT output</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>X</td> <td>X</td> <td>OFF (LOW)</td> </tr> <tr> <td></td> <td>0</td> <td>0</td> <td>32.768 kHz</td> </tr> <tr> <td></td> <td>0</td> <td>1</td> <td>32.768 kHz</td> </tr> <tr> <td></td> <td>1</td> <td>0</td> <td>32.768 kHz</td> </tr> <tr> <td></td> <td>1</td> <td>1</td> <td>OFF (LOW)</td> </tr> </tbody> </table> | FOE input   | /CLEN1 bit | /CLEN2 bit | FOUT output | L | X | X | OFF (LOW) |  | 0 | 0 | 32.768 kHz |  | 0 | 1 | 32.768 kHz |  | 1 | 0 | 32.768 kHz |  | 1 | 1 | OFF (LOW) |
| FOE input   | /CLEN1 bit     | /CLEN2 bit   | FOUT output |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| L           | X              | X  | OFF (LOW)   |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
|             | 0              | 0  | 32.768 kHz  |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
|             | 0              | 1  | 32.768 kHz  |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
|             | 1              | 0  | 32.768 kHz  |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
|             | 1              | 1  | OFF (LOW)   |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| /INTA       | Output         | Interrupt output A pin (N-ch open drain)   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| /INTB       | Output         | Interrupt output B pin (N-ch open drain)   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| TEST        | —              | * Used by the manufacture for testing. (Do not connect externally.)  |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| VDD         | —              | Connected to a positive power supply.  |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |
| GND         | —              | Connected to a ground.   |             |            |            |             |   |   |   |           |  |   |   |            |  |   |   |            |  |   |   |            |  |   |   |           |

### Terminal connection / External dimensions

(Unit:mm)



### 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                           | Range  | Unit             |
|-----------------------------------|------------------|-------------------------------------|--|------------------|
| Frequency tolerance               | $\Delta f / f$   | Ta = +25 °C<br>VDD = 3.0 V          | AA: $5 \pm 5$ <sup>*1)</sup><br>AC: $0 \pm 5$ <sup>*2)</sup> | $\times 10^{-6}$ |
| Oscillation start-up time         | t <sub>STA</sub> | Ta = +25 °C<br>VDD = 2.0 V          | 1 Max.   | s                |
| Frequency voltage characteristics | f / V            | Ta = +25 °C<br>VDD = 2.0 V to 5.5 V | $\pm 1$ Max.   | $\times 10^{-6}$ |

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

#### ■ DC characteristics

| Item                | Symbol           | Condition   | Ta = -40 °C to +85 °C |      |      |         |
|---------------------|------------------|---|-----------------------|------|------|---------|
|                     |                  |   | Min.                  | Typ. | Max. | Unit    |
| Current Consumption | I <sub>BK</sub>  | f <sub>SCL</sub> = 0Hz<br>FOE = GND<br>FOUT ; output OFF (LOW)                          | VDD = 5 V             | 0.60 | 1.80 | $\mu$ A |
|                     |                  | VDD = 3 V   | 0.48                  | 1.20 |      |         |
| Current Consumption | I <sub>32k</sub> | f <sub>SCL</sub> = 0Hz<br>VDD, FOE = 5.5 V<br>FOUT ; output ON (Output=OPEN; CL = 0 pF) | VDD = 5.5 V           | 3.0  | 6.5  | $\mu$ A |
|                     |                  | VDD = 3 V   | 3.0                   | 6.5  |      |         |

#### ■ Power supply detection voltage

| Item              | Symbol | Condition | Ta = -30 °C to +70 °C |      |      |      |
|-------------------|--------|-----------|-----------------------|------|------|------|
|                   |        |           | 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    |