

I2C-BUS INTERFACE REAL TIME CLOCK MODULE

# RTC-8564JE / NB RX-8564CF

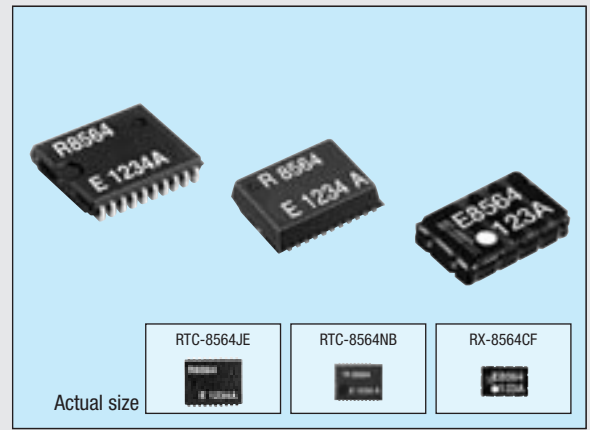
Product number (please refer to page 5)

**Q4185647x000100**

**Q4185649x0000200**

**Q418564Ax000100**

- Built-in crystal unit allows adjustment-free efficient operation.
- Compliant with I2C high-speed bus specifications. (400 kHz)
- Equipped with alarm, timer, and frequency output (32.768 kHz, 1024 Hz, 32 Hz, 1 Hz) features.
- Operating in wide voltage range from 1.8 V to 5.5 V, and in wide range of clock voltage from 1.0 V to 5.5 V. (RTC-8564JE / NB : -20 °C to +70 °C / RX-8564CF: +25 °C)
- Low power consumption at 275 nA / 3.0 V. (Typ.)
- Available for lead (Pb) - free soldering.
- Lead (Pb) - free terminal (RX-8564CF), Available for lead (Pb) - free terminal. (RTC-8564JE / NB)



The details are mentioned in the application manual.

<http://www.epsondevice.com>

The I<sup>2</sup>C-Bus is a trademark of Philips Electronics N.V.

## Specifications (characteristics)

### Absolute Max. rating

| Item                | Symbol           | Condition                              | Min.     | Max.                 | Unit |
|---------------------|------------------|--|----------|----------------------|------|
| Supply voltage      | V <sub>DD</sub>  | V <sub>DD</sub> to GND                 | -0.5     | +6.5                 | V    |
| Input voltage       | V <sub>I</sub>   | Input pin                              | GND -0.5 | V <sub>DD</sub> +0.5 | V    |
| Output voltage      | V <sub>O</sub>   | INT pins                               |          |                      |      |
| DC Input current    | I <sub>I</sub>   | —                                      | -10      | 10                   | mA   |
| DC Output current   | I <sub>O</sub>   | —                                      | -10      | 10                   | mA   |
| Storage temperature | T <sub>STG</sub> | Stored as bare product after unpacking | -55      | +125                 | °C   |

### Operating range

| Item                  | Symbol           | Condition                              | Min.             | Max. | Unit |
|-----------------------|------------------|--|------------------|------|------|
| Power voltage         | V <sub>DD</sub>  | I <sup>2</sup> C-BUS access at 400 kHz | 1.8              | 5.5  | V    |
| Clock voltage         | V <sub>CLK</sub> | —                                      | V <sub>LOW</sub> | —    | —    |
| Operating temperature | T <sub>OPR</sub> | No condensation                        | -40              | +85  | °C   |

### Frequency characteristics

| Item                                  | Symbol           | Condition  | Range       | Unit                     |
|---------------------------------------|------------------|--|-------------|--------------------------|
| Frequency tolerance                   | Δf/f             | T <sub>a</sub> = +25 °C, V <sub>DD</sub> = 3.0 V   | B: 5 ±23*   | x 10 <sup>-6</sup>       |
| Oscillation start up time             | t <sub>STA</sub> | T <sub>a</sub> = +25 °C, V <sub>DD</sub> = 1.8 V   | 3 Max.      | s                        |
| Frequency temperature characteristics | T <sub>OP</sub>  | Reference at +25 °C, T <sub>a</sub> = -10 °C to +70 °C, V <sub>DD</sub> = 3.0 V  | +10<br>-120 | x 10 <sup>-6</sup>       |
| Frequency voltage characteristics     | f/V              | RTC-8564JE / NB: T <sub>a</sub> = +25 °C, V <sub>DD</sub> = 1.0 V to 5.5 V<br>RX-8564CF: T <sub>a</sub> = +25 °C, V <sub>DD</sub> = 1.8 V to 5.5 V | ±2 Max.     | x 10 <sup>6</sup> / V    |
| Aging                                 | f <sub>a</sub>   | T <sub>a</sub> = +25 °C, V <sub>DD</sub> = 3.0 V   | ±5          | x 10 <sup>6</sup> / year |

\* Please ask tighter tolerance

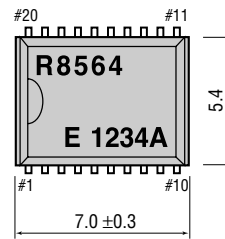
### DC characteristics (GND = 0 V, V<sub>DD</sub> = 1.8 V to 5.5 V, T<sub>a</sub> = -40 °C to +85 °C)

| Item  | Pin    | Symbol             | Condition  | Min.                | Typ.  | Max.                 | Unit |
|---|--------|--------------------|--|---------------------|-------|----------------------|------|
| Power current (not during access) (CLKOUT = 0 Hz)       | —      | I <sub>DD</sub>    | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 5.0 V | —                   | 0.33  | 0.80                 | μA   |
|   |        |                    | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 3.0 V |                     | 0.275 | 0.70                 |      |
|   |        |                    | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 2.0 V |                     | 0.25  | 0.65                 |      |
| Power current (not during access) (CLKOUT = 32.768 kHz) | —      | I <sub>DD32k</sub> | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 5.0 V | —                   | 2.5   | 3.4                  | μA   |
|   |        |                    | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 3.0 V |                     | 1.5   | 2.2                  |      |
|   |        |                    | f <sub>SCL</sub> = 0 Hz, V <sub>DD</sub> = 2.0 V |                     | 1.1   | 1.6                  |      |
| "L" input voltage                                       | —      | V <sub>IL</sub>    | —  | -0.5                | —     | 0.3 V <sub>DD</sub>  | V    |
| "H" input voltage                                       | —      | V <sub>IH</sub>    | —  | 0.7 V <sub>DD</sub> | —     | V <sub>DD</sub> +0.5 | V    |
| "L" output current                                      | SDA    | I <sub>OL</sub>    | V <sub>OL</sub> = 0.4 V, V <sub>DD</sub> = 5 V   | -3                  | —     | —                    | mA   |
| "L" output current                                      | INT    | I <sub>OL</sub>    |  | -1                  | —     | —                    |      |
|   | CLKOUT | I <sub>OL</sub>    |  | —                   | —     | —                    |      |
| "H" output current                                      | —      | I <sub>OH</sub>    |  | —                   | —     | 1                    |      |
| Low voltage detection RTC-8564JE / NB                   | —      | V <sub>LOW</sub>   | T <sub>a</sub> = -40 °C to +85 °C                | —                   | —     | 1.1                  | V    |
|   |        |                    | T <sub>a</sub> = -20 °C to +70 °C                |                     | —     | 1.0                  |      |
| Low voltage detection RX-8564CF                         | —      | V <sub>LOW</sub>   | T <sub>a</sub> = -40 °C to +85 °C                | —                   | —     | 1.2                  | V    |
|   |        |                    | T <sub>a</sub> = +25 °C                          |                     | —     | 1.0                  |      |

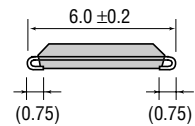
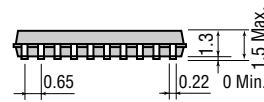
## External dimensions / Terminal connection

(Unit: mm)

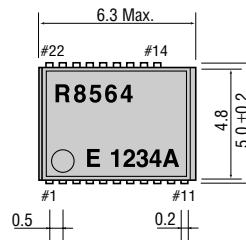
### RTC-8564JE (VSOJ 20-pin)



| No. | Pin terminal    | No. | Pin terminal |
|-----|-----------------|-----|--------------|
| 1   | N.C             | 20  | N.C          |
| 2   | N.C             | 19  | N.C          |
| 3   | CLKOE           | 18  | N.C          |
| 4   | V <sub>DD</sub> | 17  | N.C          |
| 5   | CLKOUT          | 16  | N.C          |
| 6   | SCL             | 15  | N.C          |
| 7   | SDA             | 14  | N.C          |
| 8   | (GND)           | 13  | N.C          |
| 9   | GND             | 12  | N.C          |
| 10  | INT             | 11  | N.C          |



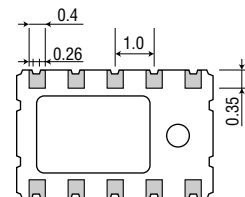
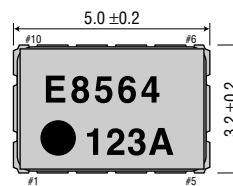
### RTC-8564NB (SON 22-pin)



| No. | Pin terminal    | No. | Pin terminal |
|-----|-----------------|-----|--------------|
| 1   | INT             | 22  | N.C          |
| 2   | GND             | 21  | N.C          |
| 3   | (GND)           | 20  | N.C          |
| 4   | N.C             | 19  | N.C          |
| 5   | SDA             | 18  | N.C          |
| 6   | SCL             | 17  | N.C          |
| 7   | CLKOUT          | 16  | N.C          |
| 8   | V <sub>DD</sub> | 15  | N.C          |
| 9   | CLKOE           | 14  | N.C          |
| 10  | N.C             | 13  | —            |
| 11  | N.C             | 12  | —            |



### RX-8564CF (SON 10-pin)



| No. | Pin terminal    | No. | Pin terminal |
|-----|-----------------|-----|--------------|
| 1   | V <sub>DD</sub> | 10  | CLKOE        |
| 2   | CLKOUT          | 9   | N.C          |
| 3   | N.C             | 8   | N.C          |
| 4   | SCL             | 7   | INT          |
| 5   | SDA             | 6   | GND          |

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

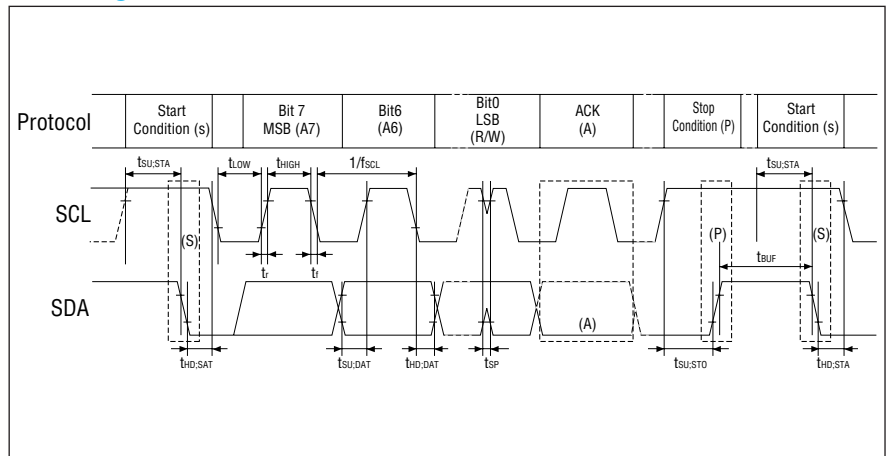
Register table

| Address | Register symbol  | bit 7   | bit 6    | bit 5    | bit 4    | bit 3   | bit 2   | bit 1   | bit 0   |
|---------|------------------|---------|----------|----------|----------|---------|---------|---------|---------|
| 0       | Control 1        | TEST    | 0        | STOP     | 0        | TEST    | 0       | 0       | 0       |
| 1       | Control 2        | 0       | 0        | 0        | TI / TP  | AF      | TF      | AIE     | TIE     |
| 2       | Sec              | VL      | S 40     | S 20     | S 10     | S 8     | S 4     | S 2     | S 1     |
| 3       | Min              | *       | Min 40   | Min 20   | Min 10   | Min 8   | Min 4   | Min 2   | Min 1   |
| 4       | Hour             | *       | *        | Hour 20  | Hour 10  | Hour 8  | Hour 4  | Hour 2  | Hour 1  |
| 5       | Day              | *       | *        | Day 20   | Day 10   | Day 8   | Day 4   | Day 2   | Day 1   |
| 6       | Day of Week      | *       | *        | *        | *        | *       | W 4     | W 2     | W 1     |
| 7       | Month / Century  | C       | *        | *        | Month 10 | Month 8 | Month 4 | Month 2 | Month 1 |
| 8       | Year             | Year 80 | Year 40  | Year 20  | Year 10  | Year 8  | Year 4  | Year 2  | Year 1  |
| 9       | Minutes Alarm    | AE      | A-Min 40 | A-Min 20 | A-Min 10 | A-Min 8 | A-Min 4 | A-Min 2 | A-Min 1 |
| A       | Hours Alarm      | AE      | *        | A-Hr 20  | A-Hr 10  | A-Hr 8  | A-Hr 4  | A-Hr 2  | A-Hr 1  |
| B       | Day Alarm        | AE      | *        | A-Day 20 | A-Day 10 | A-Day 8 | A-Day 4 | A-Day 2 | A-Day 1 |
| C       | Week Alarm       | AE      | *        | *        | *        | *       | A-W 4   | A-W 2   | A-W 1   |
| D       | CLKOUT frequency | FE      | *        | *        | *        | *       | *       | FD1     | FD0     |
| E       | Timer control    | TE      | *        | *        | *        | *       | *       | TD1     | TD0     |
| F       | Timer            | 128     | 64       | 32       | 16       | 8       | 4       | 2       | 1       |

AC characteristics (V<sub>DD</sub> = 1.8 V to 5.5 V, T<sub>a</sub> = -40 °C to +85 °C)

| Item                        | Symbol               | Min. | Max. | Unit |
|-----------------------------|----------------------|------|------|------|
| SCL clock frequency         | f <sub>SCL</sub>     | -    | 400  | kHz  |
| Tolerance spike time on bus | t <sub>SP</sub>      | -    | 50   | ns   |
| Start condition set-up time | t <sub>SU; STA</sub> | 0.6  | -    | μs   |
| Start condition Hold time   | t <sub>HD; STA</sub> | -    | -    |      |
| SCL "L" time                | t <sub>LOW</sub>     | 1.3  | -    | μs   |
| SCL "H" time                | t <sub>HIGH</sub>    | 0.6  | -    |      |
| SCL and SDA rise time       | t <sub>r</sub>       | -    | 0.3  | ns   |
| SCL and SDA fall time       | t <sub>f</sub>       | -    | -    |      |
| Data set-up time            | t <sub>SU; DAT</sub> | 100  | -    | ns   |
| Data hold time              | t <sub>HD; DAT</sub> | 0    | -    |      |
| Stop condition set-up time  | t <sub>SU; STO</sub> | 0.6  | -    | μs   |

Timing chart



Block diagram

