

Highly accurate, temperature-compensated serial real-time clock (RTC) with embedded crystal

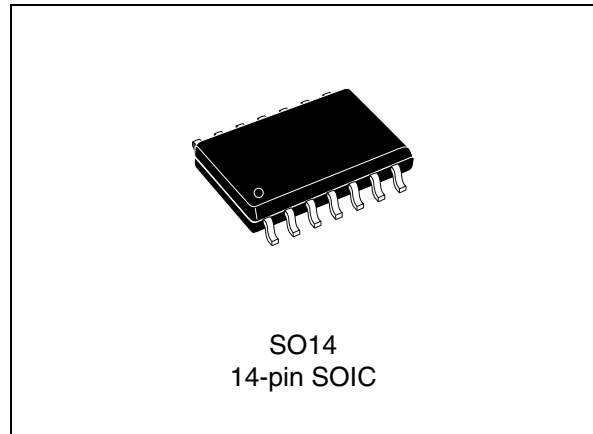
Data brief

Features

- Embedded high-stability 32 KHz DTCXO
- Temperature-compensated serial real-time clock
 - ± 5.0 ppm max from -40 to 85 °C
 - ± 3.8 ppm max from 0 to 50 °C
- Supply voltage
 - Clock operating & timekeeping: 1.6 to 5.5 V
 - I²C interface operating: 1.8 to 5.5 V
 - Temperature compensation: 2.2 to 5.5 V
- 0.8 μ A typical current at 3.0 V supply voltage
- 400 kHz I²C interface
- Time-of-day alarm (with interrupt)
- Fixed-cycle timer interrupt function
- Time update interrupt function
- Programmable frequency output
 - FOUT = 1 Hz, 1 KHz and 32 KHz
- Registers for seconds, minutes, hours, day-of-week, date (day of month), month and year with automatic leap year compensation
- Programmable temperature compensation intervals (0.5 s, 2 s default, 10 s, 30 s)

Applications

- Power meters
- Industrial applications



Description

The M41TC8025 is a serial I²C real-time clock (RTC) incorporating temperature compensation to maintain accurate timekeeping over the industrial temperature range of -40 to $+85$ °C. In addition to providing date and time (seconds, minutes, hours, day-of-week, date (day of month), month and year), the device also provides an alarm function, fixed-cycle timer, time update interrupt and programmable frequency outputs (1 Hz, 1 KHz and 32 KHz).

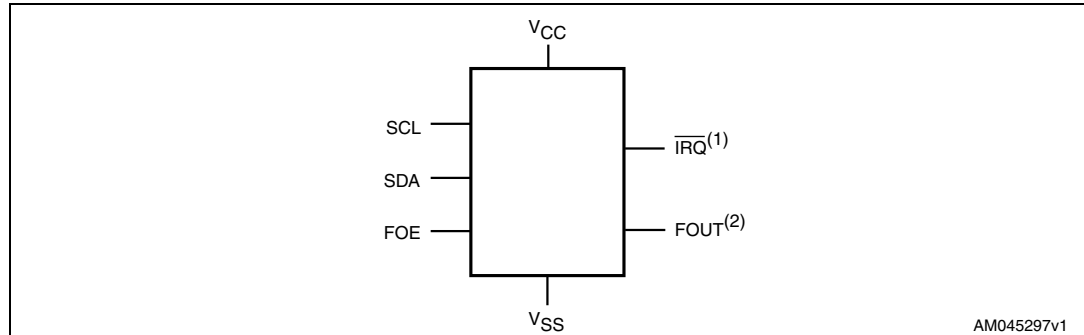
The M41TC8025 is provided in a 200 mil, 14 -pin SOIC package.

Table 1. Device summary

| Order code | Accuracy | Package |
|----------------|--|---------|
| M41TC8025AMC6F | ± 5.0 ppm (-40 to 85 °C) ± 3.8 ppm (0 to 50 °C) | SO14 |

1 Device overview

Figure 1. Logic diagram



- 1. \overline{IRQ} is an open-drain output
- 2. FOUT is a CMOS output

Figure 2. Pinout

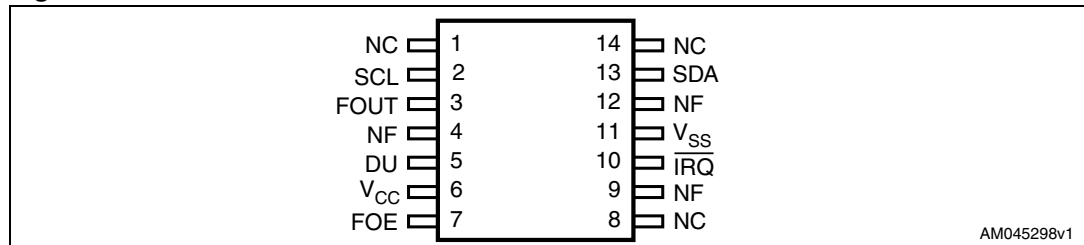
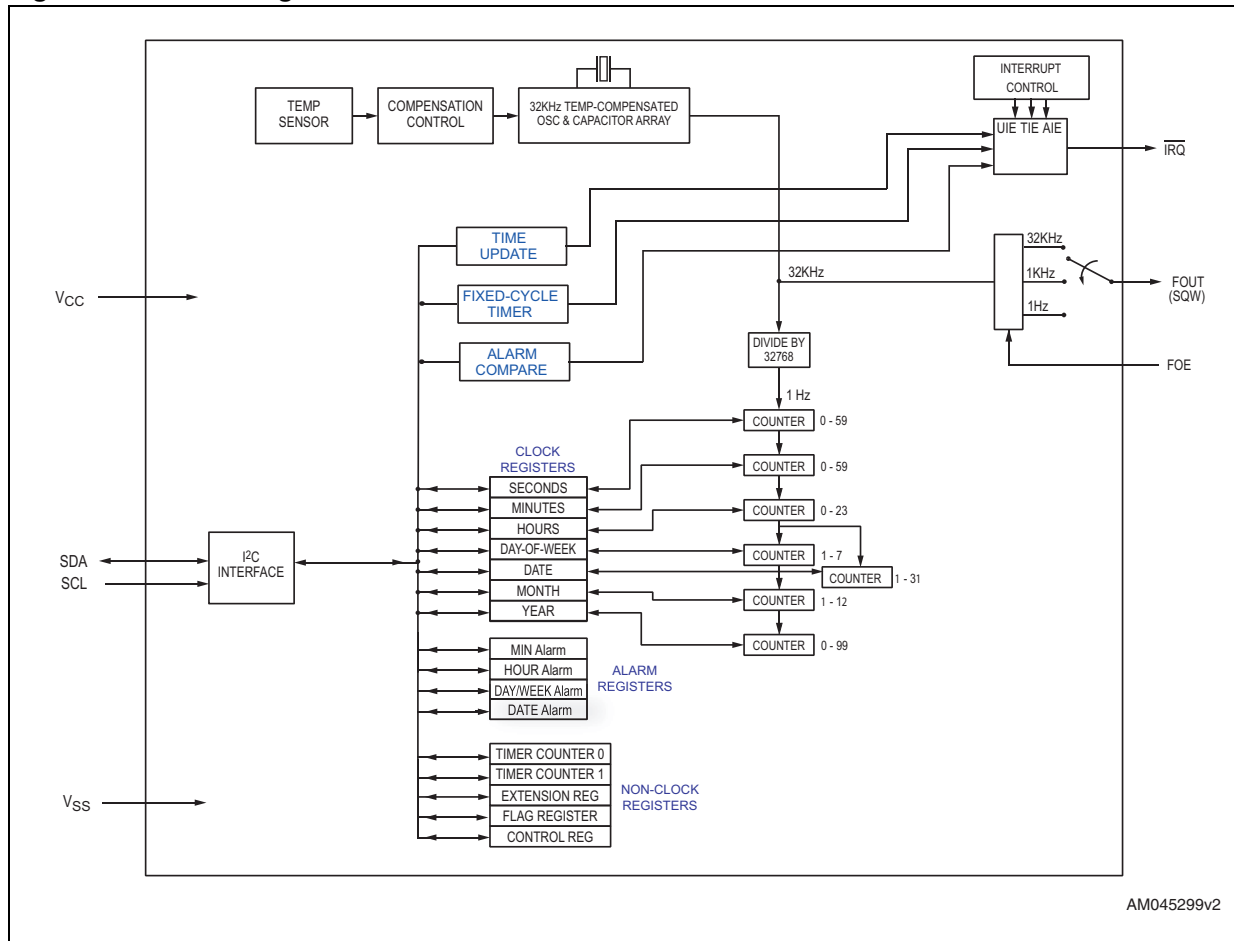


Table 2. Pin description

| Pin | Name | Description |
|-----|------------------|--|
| 1 | NC | No connect. The NC pin can be connected to V_{CC} , GND or left floating. |
| 2 | SCL | Serial clock input |
| 3 | FOUT | Programmable frequency output (CMOS). The FOUT pin is Hi-Z if FOE is low. |
| 4 | NF | No function. The NF pin can be connected to V_{CC} , GND or left floating. |
| 5 | DU | Do not use externally. The DU pin must be left floating. |
| 6 | V_{CC} | Power supply |
| 7 | FOE | Frequency output enable, controls the frequency output on FOUT pin |
| 8 | NC | No connect. The NC pin can be connected to V_{CC} , GND or left floating. |
| 9 | NF | No function. The NF pin can be connected to V_{CC} , GND or left floating. |
| 10 | \overline{IRQ} | Interrupt output (open drain) |
| 11 | V_{SS} | Ground supply |
| 12 | NF | No function. The NF pin can be connected to V_{CC} , GND or left floating. |
| 13 | SDA | Serial data input/output |
| 14 | NC | No connect. The NC pin can be connected to V_{CC} , GND or left floating. |

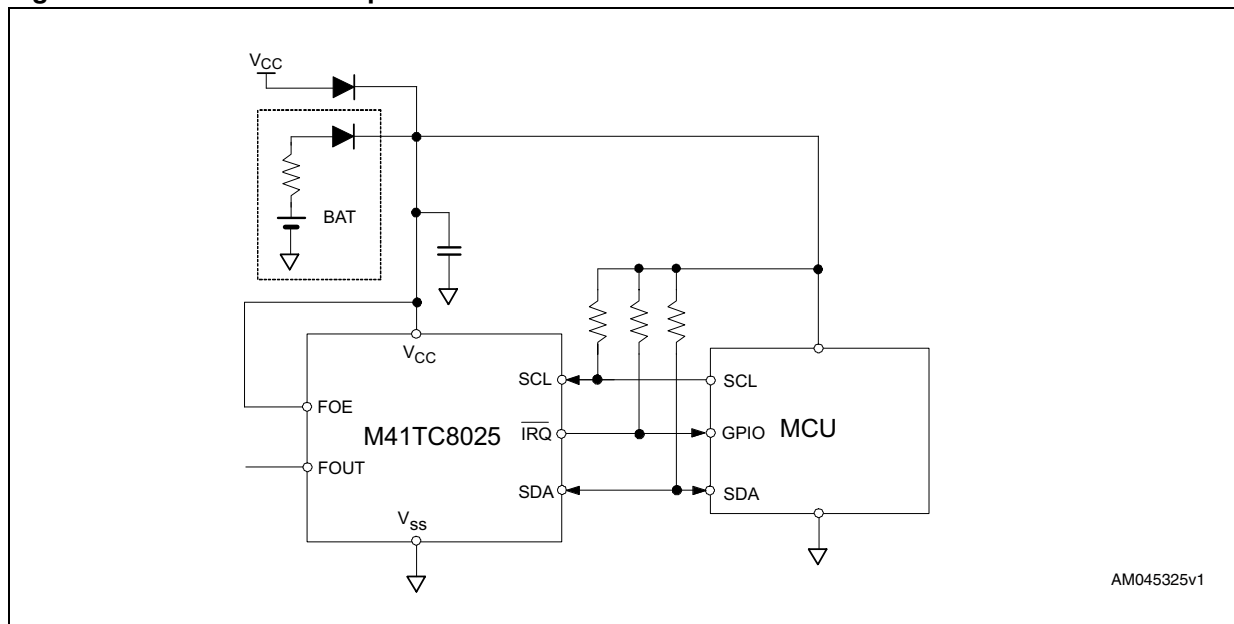
Note: Be sure to connect a 0.1 μF to 1 μF bypass capacitor between V_{CC} and V_{SS} .

Figure 3. Block diagram



AM045299v2

Figure 4. Hardware hookup



AM045325v1

2 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Figure 5. SO14 - 14-lead small outline (200 mils body width) package mechanical drawing

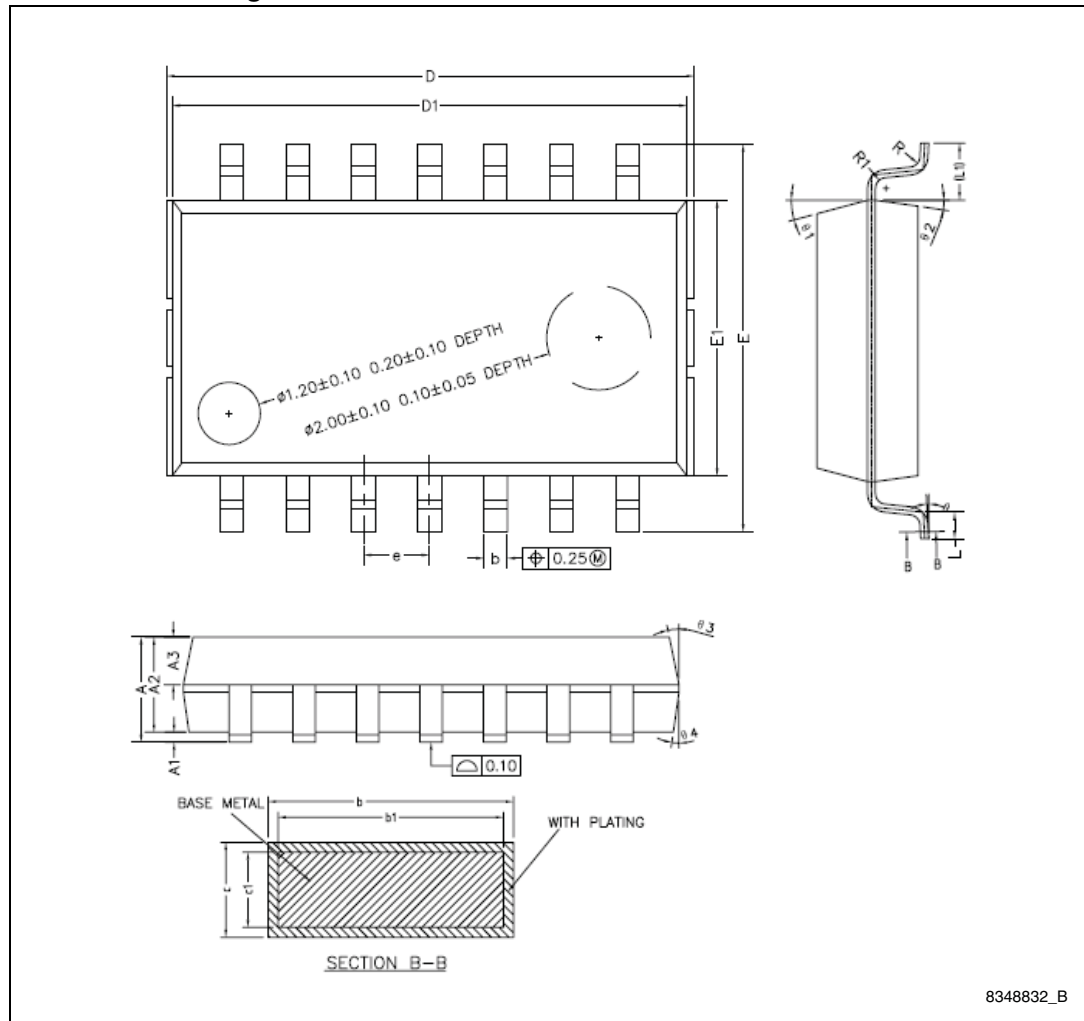


Table 3. SO14 - 14-lead small outline (200 mils body width) package mechanical data

| Symbol | mm | | | in | | |
|------------------|-----------|-------|-------|------------|-------|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | - | - | 2.25 | - | - | 0.089 |
| A1 | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| A2 | 1.80 | 1.90 | 2.00 | 0.071 | 0.075 | 0.079 |
| A3 | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 |
| b | 0.41 | - | 0.54 | 0.016 | - | 0.021 |
| b1 | 0.40 | 0.45 | 0.50 | 0.016 | 0.018 | 0.020 |
| c | 0.14 | - | 0.21 | 0.006 | - | 0.008 |
| c1 | 0.13 | 0.15 | 0.17 | 0.005 | 0.006 | 0.007 |
| D1 | 9.80 | 9.90 | 10.00 | 0.386 | 0.390 | 0.394 |
| D ⁽¹⁾ | 10.05 | 10.15 | 10.25 | 0.396 | 0.400 | 0.404 |
| E | 7.30 | 7.45 | 7.60 | 0.287 | 0.293 | 0.299 |
| E1 | 5.20 | 5.30 | 5.40 | 0.205 | 0.209 | 0.213 |
| e | 1.27 | | | 0.050 | | |
| L | 0.30 | 0.50 | 0.70 | 0.012 | 0.020 | 0.028 |
| L1 | 1.07 ref. | | | 0.042 ref. | | |
| R | 0.07 | - | - | 0.003 | - | - |
| R1 | 0.07 | - | - | 0.003 | - | - |
| θ1 | 0° | - | 8° | 0° | - | 8° |
| θ2 | 13° | 15° | 17° | 13° | 15° | 17° |
| θ3 | 6° | 8° | 10° | 6° | 8° | 10° |
| θ4 | 9.5° | 11.5° | 13.5° | 9.5° | 11.5° | 13.5° |
| θ5 | 6° | 8° | 10° | 6° | 8° | 10° |

1. Dimension "D" includes mold flash.

3 Part numbering

Table 4. Ordering information scheme

| Example: | M41TC | 8025 | A | MC | 6 | F |
|--------------------------|-------|------|--|-----------|---------------------|-----------------------------------|
| Device family | M41TC | | | | | |
| Device type | | 8025 | | | | |
| Accuracy | | | A = ±5.0 ppm (-40 to 85 °C) ±3.8 ppm (0 to 50 °C) | | | |
| Package | | | | MC = SO14 | | |
| Temperature range | | | | | 6 = -40 °C to 85 °C | |
| Shipping method | | | | | | F = ECOPACK® package, tape & reel |

For other options, or for more information on any aspect of this device, please contact the ST sales office nearest you.

4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 21-Aug-2012 | 1 | Initial release. |
| 21-Sep-2012 | 2 | Modified title of document; updated Figure 3: Block diagram . |

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