# S1C17F57

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## Low Power 16-bit Single Chip Microcontroller

- Low power MCU (100nA/SLEEP, 210nA/RTC, 550nA/HALT)
- Flash memory (32K bytes)、RAM (2K bytes)
- Built-in EPD driver (voltage booster circuit)
- EPD driving waveform generator circuit
- Real-time clock
- Built-in temperature sensor
- Compact codes optimized for C, and high throughput of an instruction/clock. Support serial ICE, and comes equipped with RISC CPU core S1C17.

## ■ DESCRIPTIONS

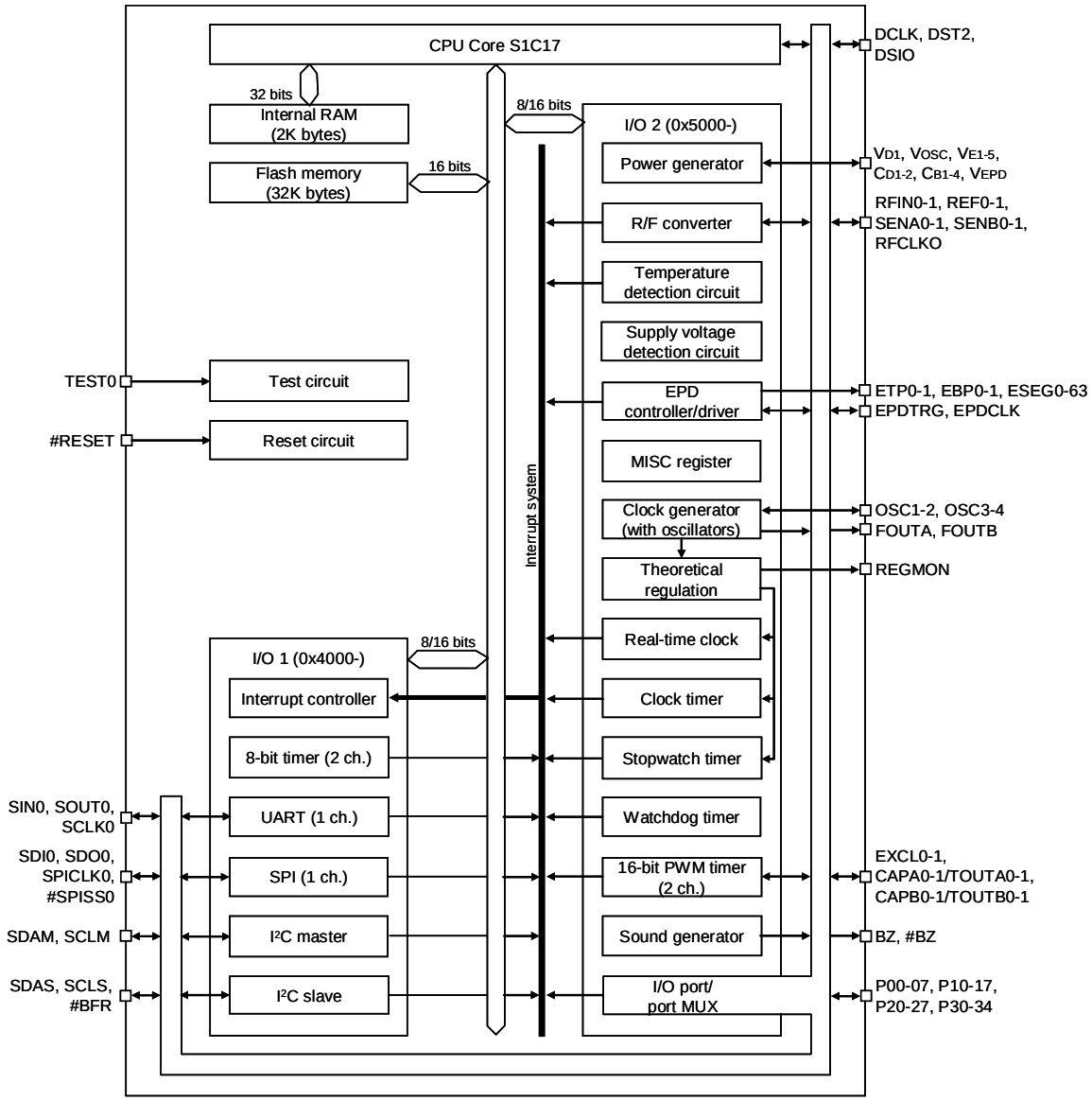
S1C17F57 is a 16-bit MCU that has achieved high processing speeds with low voltage operation, compact size, wide address space and on-chip ICE. It consists of a 16-bit core CPU S1C17 as the core CPU, 32K bytes flash memory, 2K bytes RAM, Serial I/F such as UART/SPI/I2C, timers, real-time clock, multiplier circuit. In addition, it has 64 segment EPD driver, EPD driving waveform generator circuit, temperature sensor. It can drive E-paper display by 1chip.
S1C17F57 is suitable for battery driven and E-paper application like smartcard, watch, and tags.

## ■ FEATURES

| | |
|---|---|
| **CPU** | |
| CPU core | Seiko Epson original 16-bit RISC CPU core S1C17 |
| Multiplier/Divider (COPRO) | - 16-bit × 16-bit multiplier<br>- 16-bit × 16-bit + 32-bit multiply and accumulation unit<br>- 16-bit ÷ 16-bit divider |
| **Embedded Flash memory** | |
| Capacity | 32K bytes (for both instructions and data) |
| Erase/program count | Three times |
| Other | - Read/program protection function<br>- A programming power supply (VPP) is required.<br>- Allows on-board programming using a debugging tool such as ICDmini. |
| **Embedded RAM** | |
| Capacity | 2K bytes |
| **Clock generator** | |
| System clock source | 3 sources (OSC3B/OSC3A/OSC1) |
| OSC3B oscillator circuit | 2M/1M/500k Hz (typ.) internal oscillator circuit |
| OSC3A oscillator circuit | 4.2 MHz (max.) crystal or ceramic oscillator circuit |
| OSC1B oscillator circuit | 32 kHz (typ.) internal oscillator circuit |
| OSC1A oscillator circuit | 32.768 kHz (typ.) crystal oscillator circuit |
| | Oscillation adjustment by theoretical regulation |
| Other | - Core clock frequency control<br>- Peripheral module clock supply control |
| **EPD controller/driver** | |
| Number of driver outputs | Segment output: 64 pins<br>Top plane output: 2 pins<br>Back plane output: 2 pins |
| Drive voltage | 0 V/15 V ($V_{SS}$/$V_{EPD}$) |
| Other | - Includes a drive power supply.<br>- Includes a display data memory.<br>- Output drive waveforms can be programmed.<br>- Supports pin output direct control. |
| **I/O ports** | |
| Number of general-purpose I/O ports | Max. 29 bits (Pins are shared with the peripheral I/O.) |
| Other | - Schmitt input<br>- Pull-up control function<br>- Port input interrupt: 8 bits × 2 channels |
| **Serial interfaces** | |
| SPI | 1 channel |
| $I^2C$ master (I2CM) | 1 channel |
| $I^2C$ slave (I2CS) | 1 channel |
| UART | 1 channel (IrDA1.0 supported) |
| **Timers/Counters** | |
| 8-bit timer (T8) | 2 channels (Generates the SPI Ch.0 and I2CM clocks.) |

| | |
|---|---|
| 16-bit PWM timer (T16A2) | 2 channels (PWM output, event counter, and count capture functions) |
| Watchdog timer (WDT) | 1 channel (Generates NMI/reset.) |
| **Clock functions** | |
| Real-time clock (RTC) | 1 channel<br>(Hour, minute, and second counters) with theoretical regulation support |
| Clock timer (CT) | 1 channel (128 Hz to 1 Hz counters) with theoretical regulation support |
| Stopwatch timer (SWT) | 1 channel<br>(1/100 second and 1/10 second counters) with theoretical regulation support |
| Theoretical regulation function (TR) | Time adjustment function in +16/32768 to -15/32768 second units |
| **Sound generator** | |
| Buzzer frequency | 8 frequencies selectable |
| Volume control | 8 steps adjustable |
| Other | - One-shot buzzer<br>- Auto envelope function |
| **Analog circuits** | |
| R/F converter (RFC) | 2 channels (24-bit CR oscillation type. Supports DC-bias resistive sensors and AC-bias resistive sensors.) |
| Temperature detection circuit (TEM) | 1 channel (Measurement range: 0°C to 50°C) |
| Supply voltage detection circuit (SVD) | 1 channel (Detection voltage: 13 levels) |
| **Interrupts** | |
| Reset interrupt | #RESET pin/watchdog timer |
| NMI | Watchdog timer |
| Programmable interrupts | 16 systems (8 levels) |
| **Power supply voltage** | |
| Operating voltage ($V_{DD}$) | 2.0 V to 3.6 V |
| Flash programming/erasing voltage ($V_{PP}$) | 7 V/7.5 V |
| **Operating temperature** | |
| Operating temperature range | -40°C to 85°C |
| **Current consumption (Typ value, VDD = 2.0 V to 3.6 V)** | |
| SLEEP state | 100 nA (OSC1 = Off, RTC = Off, OSC3B = Off, OSC3A = Off) |
| HALT state | 0.55 µA (OSC1 = 32 kHz (OSC1A), RTC = Off, OSC3B = Off, OSC3A = Off) |
| | 0.5 µA (OSC1 = 32 kHz (OSC1A), RTC = On, OSC3B = Off, OSC3A = Off) |
| Run state | 12 µA (OSC1 = 32 kHz (OSC1A), RTC = Off, OSC3B = Off, OSC3A = Off) |
| | 1440 µA (OSC1 = Off, RTC = Off, OSC3B = Off, OSC3A = 4 MHz ceramic) |
| | 770 µA (OSC1 = Off, RTC = Off, OSC3B = 2 MHz, OSC3A = Off) |
| **Shipping form** | |
| 1 | QFP15-128pin (14 mm × 14 mm × 1.4 mm, lead pitch: 0.4 mm) |
| 2 | Aluminum pad chip |
| 3 | Gold bump chip |

## ■ BLOCK DIAGRAM




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