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## What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

## Applications of "Embedded - Microcontrollers"

### Details

| | |
|---|---|
| Product Status | Obsolete |
| Core Processor | S1C17 |
| Core Size | 16-Bit |
| Speed | 4.2MHz |
| Connectivity | I²C, IrDA, SPI, UART/USART |
| Peripherals | PWM, WDT |
| Number of I/O | 29 |
| Program Memory Size | 32KB (32K x 8) |
| Program Memory Type | FLASH |
| EEPROM Size | - |
| RAM Size | 2K x 8 |
| Voltage - Supply (Vcc/Vdd) | 2V ~ 3.6V |
| Data Converters | - |
| Oscillator Type | Internal |
| Operating Temperature | -40°C ~ 85°C (TA) |
| Mounting Type | Surface Mount |
| Package / Case | Die |
| Supplier Device Package | - |
| Purchase URL | https://www.e-xfl.com/product-detail/epson/s1c17f57d402000 |

## 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.
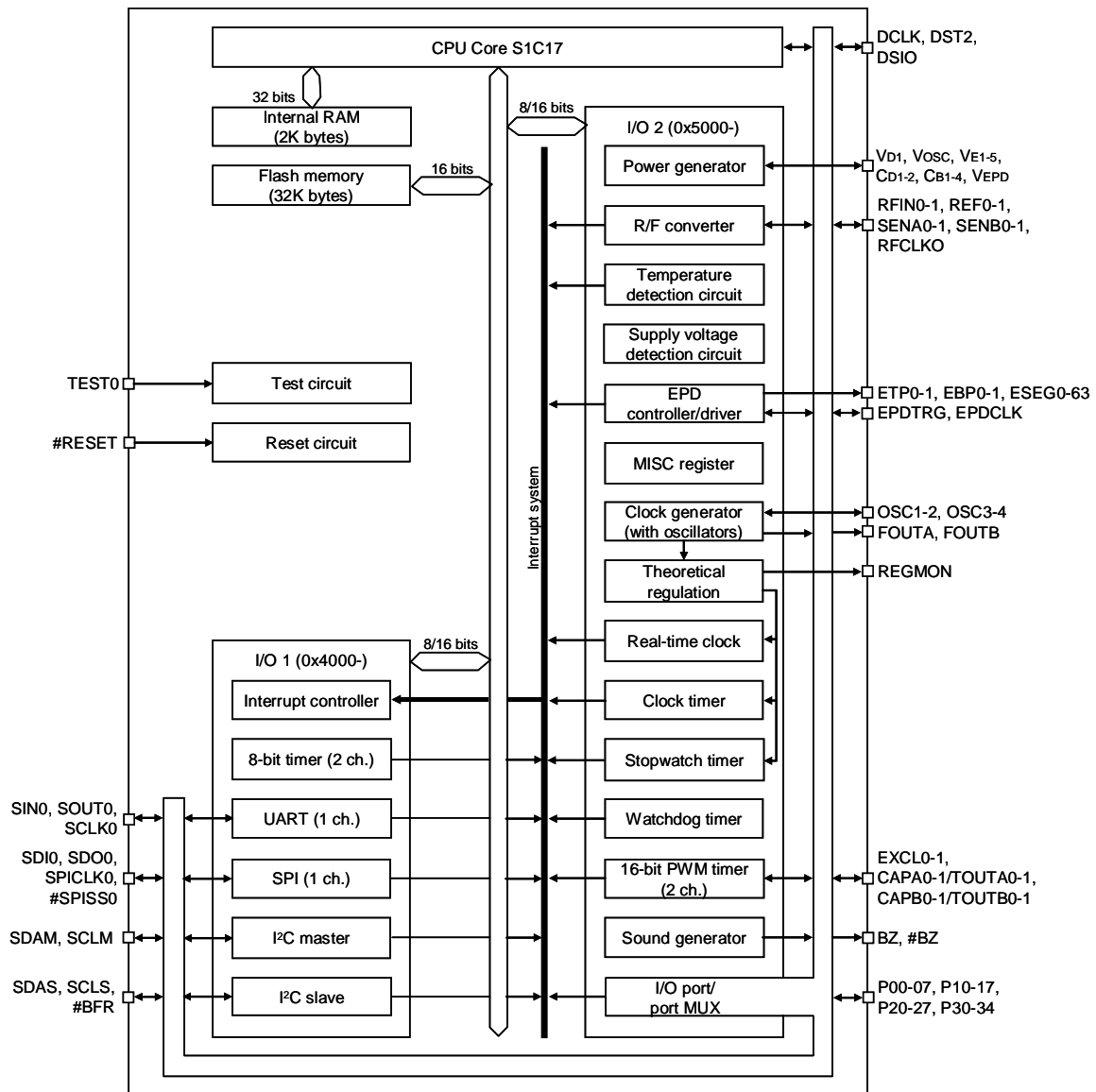
## ■ FEATURES

| 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<br>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 (VSS/VEPD) |
| 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$^2$C master (I2CM) | 1 channel |
| I$^2$C 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.) |

# S1C17F57

| 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 |

**Seiko Epson Corporation**

## ■ BLOCK DIAGRAM



NOTICE: