S1C17F57

EPSON
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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

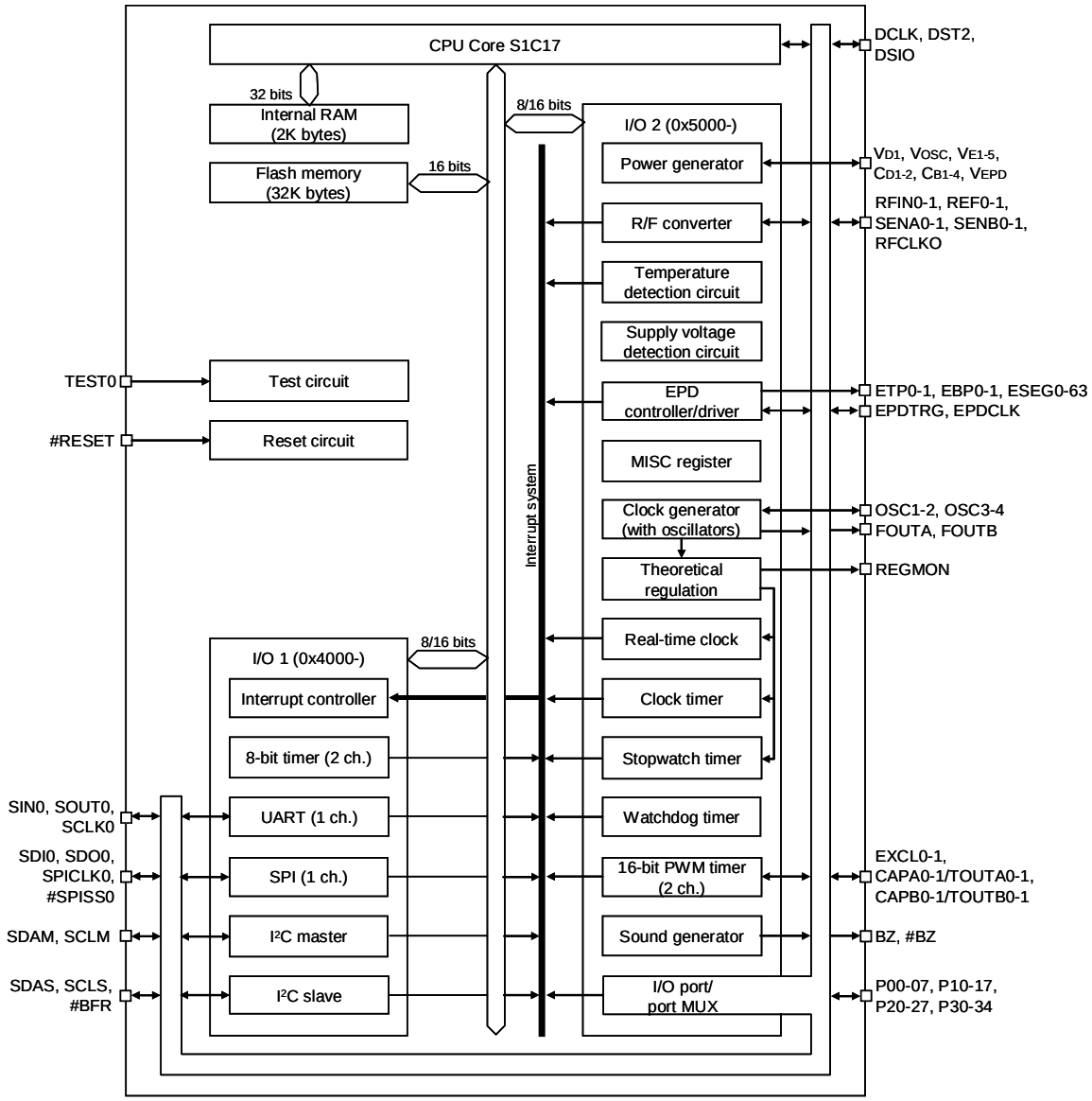
S1C17F57 is a 16-bit MCU that has achieved high processing speeds with low voltage operation, compact size, wide address space and on-chip ICE. It consists of a 16-bit core CPU S1C17 as the core CPU, 32K bytes flash memory, 2K bytes RAM, Serial I/F such as UART/SPI/I2C, timers, real-time clock, multiplier 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 - 16-bit × 16-bit + 32-bit multiply and accumulation unit - 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 - A programming power supply (VPP) is required. - 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 - Peripheral module clock supply control
EPD controller/driver	
Number of driver outputs	Segment output: 64 pins Top plane output: 2 pins Back plane output: 2 pins
Drive voltage	0 V/15 V (V_{SS}/V_{EPD})
Other	- Includes a drive power supply. - Includes a display data memory. - Output drive waveforms can be programmed. - 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 - Pull-up control function - 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 (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 (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 - 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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Document code: 412046101
First issue Dec., 2010 in Japan
Revised Nov., 2012

Mouser Electronics

Authorized Distributor

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