

## Flow meter controller with AFE

### ■ DESCRIPTIONS

The S1C17M01 is an ultra low-power MCU equipped with an MR (magneto resistive) sensor controller that allows an MR sensor array optimized for flow measurement (recommended sensor: KG1205-61 manufactured by KOHDEN Co., Ltd.) to be connected directly. This IC includes an LCD driver to display the flow count and the readouts on the indicator, and the synchronous serial interface, UART, and I<sup>2</sup>C interface for wireless communication with a remote meter reading system. This IC allows measurement of various environmental conditions such as a temperature and humidity measurement using the R/F converter, and a supply voltage measurement using the supply voltage detection circuit.

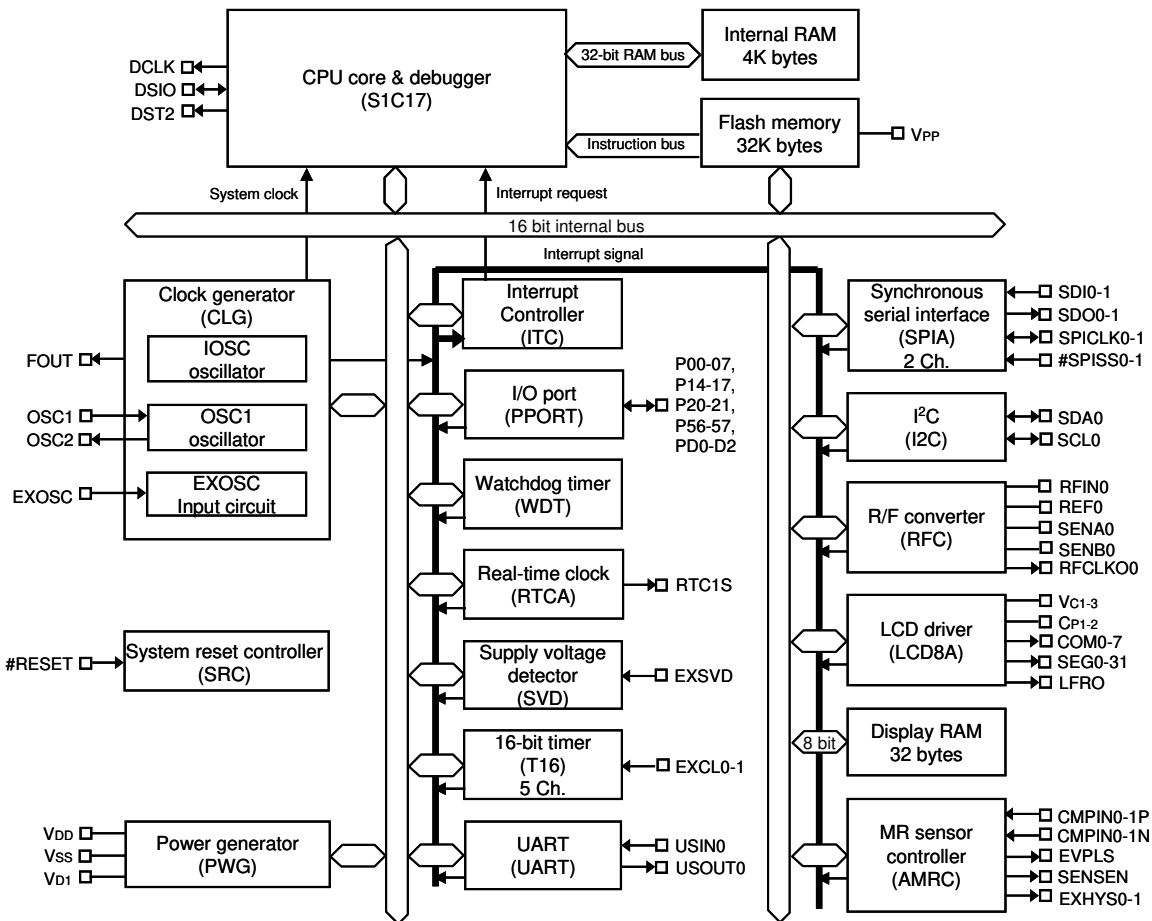
### ■ FEATURES

Model	S1C17M01
<b>CPU</b>	
CPU core	Seiko Epson original 16-bit RISC CPU core S1C17
Other	On-chip debugger
<b>Embedded Flash memory</b>	
Capacity	32K bytes (for both instructions and data)
Erase/program count	50 times (min.) *Programming by the debugging tool ICDmini
Other	Security function to protect from reading/programming by ICDmini On-board programming function using ICDmini
<b>Embedded RAM</b>	
Capacity	4K bytes
<b>Embedded display RAM</b>	
Capacity	32 bytes
<b>Clock generator (CLG)</b>	
System clock source	3 sources (IOSC/OSC1/EXOSC)
System clock frequency (Operating frequency)	16.3 MHz (max.)
IOSC oscillator circuit (boot clock source)	7.37 MHz (typ.) embedded oscillator
	5 us (max.) starting time (time from cancelation of SLEEP state to vector table read by the CPU)
OSC1 oscillator circuit	32.768 kHz(typ.) crystal oscillator Oscillation stop detection circuit included
EXOSC clock input	16.3 MHz (max.) square or sine wave input
Other	Configurable system clock division ratio
	Configurable system clock used at wake up from SLEEP state
	Operating clock frequency for the CPU and all peripheral circuits is selectable.
<b>I/O port (PPORT)</b>	
Number of general-purpose I/O ports	19 bits (max.) (Pins are shared with the peripheral I/O.)
Number of input interrupt ports	8 bits
<b>Timers</b>	
Watchdog timer (WDT)	Generates NMI or watchdog timer reset.
Real-time clock (RTCA)	128 – 1 Hz counter, second/minute/hour/day/day of the week/month/year counters
	Theoretical regulation function for 1-second correction
	Alarm and stopwatch functions
16-bit timer (T16)	5 channels
	2 channels can generate the SPIA master clock.
<b>Supply voltage detection circuit (SVD)</b>	
Detection level	20 levels (1.8 to 3.7 V)
Other	Intermittent operation mode
	Generates an interrupt or hardware reset according to the detection level evaluation.
<b>Serial interfaces</b>	
UART (UART)	1 channel
	Baud-rate generator included, IrDA1.0 supported
Synchronous Serial Interface (SPIA)	2 channels The 16-bit timer (T16) can be used for the baud-rate generator in master mode.
I <sup>2</sup> C (I2C)	1 channel
	Baud-rate generator included
<b>LCD driver (LCD8A)</b>	
LCD output	32 SEG x 1 to 4 COM (max.), 28 SEG x 5 to 8 COM (max.)
LCD contrast	16 levels (2.55 to 3.44 V)

# S1C17M01

Other	1/3 bias power supply included, external voltage can be applied.
<b>R/F converter (RFC)</b>	
Conversion method	CR oscillation type with 24-bit counters
Number of conversion channels	1 channel (Up to two sensors can be connected.)
Supported sensors	DC-bias resistive sensors and AC-bias resistive sensors
<b>MR sensor controller (AMRC)</b>	
MR sensor interface	MR sensor is directly connectable.
Measurement functions	Evaluates normal rotation, reverse rotation, stop, and phase dropout by inputting analog rotation phase signals from an MR sensor.
External interface	Pulse output function
	External hysteresis resistor control function
<b>Reset</b>	
#RESET pin	Reset when the reset pin is set to low.
Watchdog timer reset	Reset when the watchdog timer overflows (can be enabled/disabled using a register).
Supply voltage detection circuit reset	Reset when SVD detects the set voltage level (can be enabled/disabled using a register).
<b>Interrupt</b>	
Non-maskable interrupt	4 systems (Reset, address misaligned interrupt, debug, NMI)
Programmable interrupt	External interrupt: 1 system (8 levels)
	Internal interrupt: 15 systems (8 levels)
<b>Power supply voltage</b>	
VDD operating voltage	1.8 to 5.5 V
VDD operating voltage when AMRC is active	2.0 to 5.5 V
VDD operating voltage for Flash programming	1.8 to 5.5 V (VPP = 7.5 V external power supply is required.)
<b>Operating temperature</b>	
Operating temperature range	-40 to 85 °C
<b>Current consumption</b>	
SLEEP mode	0.35 $\mu$ A IOSC = OFF, OSC1 = OFF, VDD = 3.6 V
HALT mode	0.8 $\mu$ A IOSC = OFF, OSC1 = 32 kHz, RTC = ON, VDD = 3.6 V
	1.3 $\mu$ A IOSC = OFF, OSC1 = 32 kHz, RTC = ON, CPU = OSC1, LCD = ON (no panel load, Vc2 reference)
RUN mode	12.5 $\mu$ A IOSC = OFF, OSC1 = 32 kHz, RTC = ON, CPU = OSC1, LCD = ON (no panel load, Vc2 reference)
	2.5 mA @ 1/1 divided clock IOSC = ON, OSC1 = 32 kHz, RTC = ON, CPU = IOSC, LCD = OFF (no panel load)
	500 $\mu$ A @ 1/4 divided clock IOSC = ON, OSC1 = 32 kHz, RTC = ON, CPU = IOSC, LCD = OFF (no panel load)
	500 $\mu$ A @ 1/4 divided clock IOSC = ON, OSC1 = 32 kHz, RTC = ON, CPU = IOSC, LCD = OFF (no panel load)
<b>Shipping form</b>	
1	TQFP13-64pin (Lead pitch: 0.5 mm)
2	Die form (Pad pitch:100 $\mu$ m)

## ■ BLOCK DIAGRAM



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**IC Sales & Marketing Department**

421-8 Hino, Hino-shi, Tokyo 191-8501, JAPAN  
Phone: +81-42-587-5814 FAX: +81-42-587-5117

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