

## Low Power 16-bit Single Chip Microcontroller

- Low power MCU (Operating voltage 1.8V, 1.0 uA / SLEEP, 2.0 uA / HALT)
- Built in Flash memory (64K byte). 8.2MHz high-speed operation with 1.8V low voltage.
- Built-in LCD driver: 56seg x 24com / 64com x 16com (with booster circuit for power supply voltage)
- Analog I/F: 10bit A/D converter  $\pm 3$  (1.5) LSB, R/F converter
- Has compact code optimized for C, and high throughput of an instruction/clock. Supports serial ICE, and comes equipped with RISC CPU core S1C17:

### ■ DESCRIPTIONS

The S1C17711 is a 16-bit MCU featuring high-speed low-power operations, compact dimensions, wide address space, and on-chip ICE. Based on an S1C17 CPU core, this product consists of 64K bytes of Flash memory, 4K bytes of RAM, serial interface modules supporting sensors such as UART to support high-bit rate and IrDA1.0, SPI, and I2C, various timers, 29 general input/output ports, maximum 56 segment x 24 common LCD driver and a power supply voltage booster circuit, A/D converter, R/F converter, supply voltage detector, and 32 kHz and maximum 8.2 MHz oscillator circuits.

It allows 8.2 MHz high-speed operation at a minimum of 1.8 V operating voltage, and executes a basic instruction in one clock cycle with 16-bit RISC processing. The S1C17711 also includes a coprocessor supporting multiplication, division, and MAC (multiply and accumulation) operations.

The on-chip ICE function allows onboard Flash programming/erasing, program debugging, and evaluations using the ICDmini (S5U1C17001H) that can be connected with three signal wires.

The S1C17711 is ideal for applications, such as remote controllers, health care products, and sports watches, that must be driven with battery power and require sensor interfaces and a high-definition LCD display.

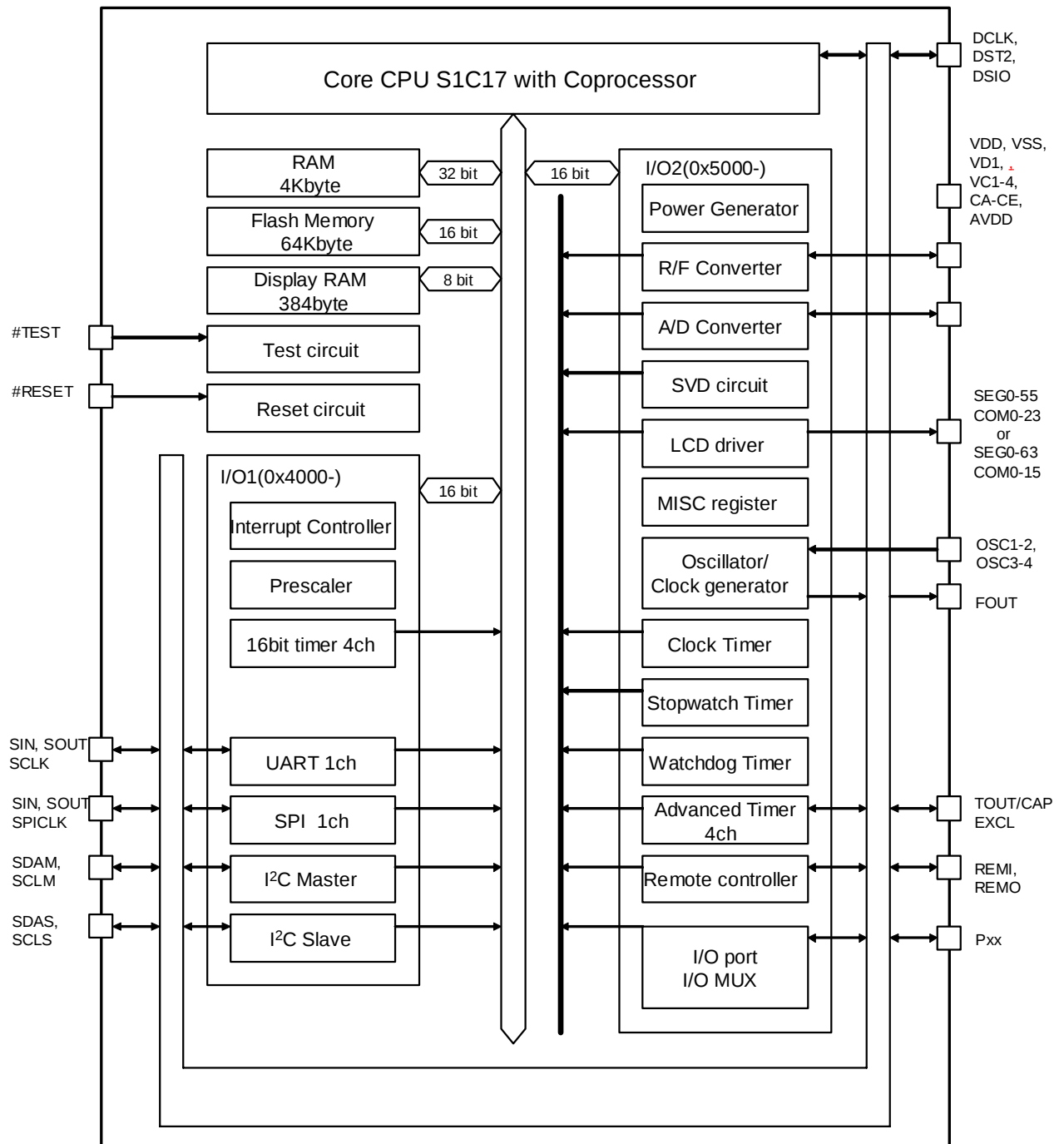
### ■ FEATURES

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU                  | <ul style="list-style-type: none"><li>• Seiko Epson original 16-bit RISC CPU core S1C17</li><li>• Multiplier/Divider (COPRO)<ul style="list-style-type: none"><li>- 16-bit x 16-bit multiplier</li><li>- 16-bit x 16-bit + 32-bit multiply and accumulation unit</li><li>- 16-bit ÷ 16-bit divider</li></ul></li></ul>                                                                                                                                                                                                                                                                                                 |
| On-chip Flash memory | <ul style="list-style-type: none"><li>• 64K bytes (for both instructions and data)</li><li>• 1,000 erase/program cycles (min.)</li><li>• Read/program protection function</li><li>• Allows on-board programming using a debugging tool such as ICDmini (S5U1C17001H) and self-programming by software control.</li></ul>                                                                                                                                                                                                                                                                                               |
| On-chip RAM          | <ul style="list-style-type: none"><li>• 4K bytes</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| On-chip display RAM  | <ul style="list-style-type: none"><li>• 384 bytes</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Clock generator      | <ul style="list-style-type: none"><li>• Three types of built-in oscillators (system clock sources)<ul style="list-style-type: none"><li>- IOSC oscillator circuit 2.7 MHz (typ.)</li><li>- OSC3 oscillator circuit 8.2 MHz (max.) crystal or ceramic oscillator circuit<ul style="list-style-type: none"><li>Supports an external clock input</li></ul></li><li>- OSC1 oscillator circuit 32.768 kHz (typ.) crystal oscillator circuit</li></ul></li><li>• Core clock frequency control</li><li>• Peripheral module clock supply control</li><li>• IOSC control for quick-restart processing from SLEEP mode</li></ul> |
| I/O ports            | <ul style="list-style-type: none"><li>• Max. 29 general-purpose I/O ports (Pins are shared with the peripheral I/O.)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Serial interfaces    | <ul style="list-style-type: none"><li>• SPI 1 channel</li><li>• I2C master (I2CM) 1 channel</li><li>• I2C slave (I2CS) 1 channel</li><li>• UART (115200 bps, IrDA 1.0) 1 channel</li><li>• IR remote controller (REMC) 1 channel</li></ul>                                                                                                                                                                                                                                                                                                                                                                             |
| Timers               | <ul style="list-style-type: none"><li>• 16-bit timer (T16) 4 channels</li><li>• 16-bit PWM timer (T16A) 4 channels</li><li>• Clock timer (CT) 1 channel</li><li>• Stopwatch timer (SWT) 1 channel</li><li>• Watchdog timer (WDT) 1 channel</li></ul>                                                                                                                                                                                                                                                                                                                                                                   |
| LCD driver           | <ul style="list-style-type: none"><li>• 56 SEG x 24 COM (1/4 bias)</li><li>• 64 SEG x 16 COM (1/4 bias)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

# S1C17711

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|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A/D converter                 | <ul style="list-style-type: none"> <li>• 64 SEG × 8 COM (1/4 bias)</li> <li>• Built-in voltage booster</li> <li>• Successive approximation type</li> <li>• Eight analog input channels (max.)</li> <li>• 10-bit resolution</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| R/F converter                 | <ul style="list-style-type: none"> <li>• Two channels, CR oscillation type</li> <li>• 24-bit counter</li> <li>• Supports DC-bias resistive/capacitive sensors and AC-bias resistive sensors.</li> <li>• Supports external input for counting pulses.</li> </ul>                                                                                                                                                                                                                                                                                                    |
| Supply voltage detector (SVD) | • 15 programmable detection levels (1.8 V to 3.2 V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Interrupts                    | <ul style="list-style-type: none"> <li>• Reset</li> <li>• NMI</li> <li>• 23 programmable interrupts (eight levels)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Power supply voltage          | <ul style="list-style-type: none"> <li>• 1.8 V to 3.6 V (for normal operation)</li> <li>• 2.7 V to 3.6 V (for Flash erasing/programming)</li> <li>• Built-in voltage regulator (two operating voltages switchable)</li> </ul>                                                                                                                                                                                                                                                                                                                                      |
| Operating temperature         | • -25°C to 70°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Current consumption           | <ul style="list-style-type: none"> <li>• SLEEP state: 1.0 µA typ. (OSC1: Off, IOSC: Off, OSC3: Off)</li> <li>• HALT state: 2.0 µA typ. (OSC1: 32 kHz, IOSC: Off, OSC3: Off, PCLK: Off, LCD: Off)</li> <li>9.0 µA typ. (OSC1: 32 kHz, IOSC: Off, OSC3: Off, PCLK: Off, LCD On (all on, maximum contrast, VC2 reference))</li> <li>• Run state: 12 µA typ. (OSC1: 32 kHz, IOSC: Off, OSC3: Off, PCLK: On, LCD: Off)</li> <li>400 µA typ. (OSC1: Off, IOSC: Off, OSC3: 1 MHz ceramic, PCLK: On, LCD: On (all on, maximum contrast, VC2 reference voltage))</li> </ul> |
| Shipping form                 | <ul style="list-style-type: none"> <li>• TQFP15-128pin package (14 mm × 14 mm, lead pitch: 0.4 mm)</li> <li>• VFBGA10H-144 package (10 mm × 10 mm, ball pitch: 0.8 mm)</li> <li>• Die form (pad pitch: 90 µm)</li> </ul>                                                                                                                                                                                                                                                                                                                                           |

## ■ Block Diagram



# S1C17711

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