

## 16-bit Single Chip Microcontroller

- 16KB MTP ROM(Three times): Read/program protection function, 2KB RAM  
\*A programming power supply ( $V_{PP}$ ) is required.
- Generates the operating clocks with the built-in oscillators.
  - OSC3B oscillator circuit: 2 MHz/1 MHz/500 kHz (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
- LCD driver Number of driver outputs: 32Seg. x 4Com.
- Shipping form: TQFP14-80PIN(12 × 12 × 1mm), Die
- RISC CPU core S1C17: the compact code optimized for C, and high throughput of an instruction/clock, supports serial ICE

### ■ DESCRIPTIONS

The S1C17653 is suitable for battery driven applications with up to 80-seg LCD, such as OTP (One Time Password) products, Price TAG, and watches.

### ■ FEATURES

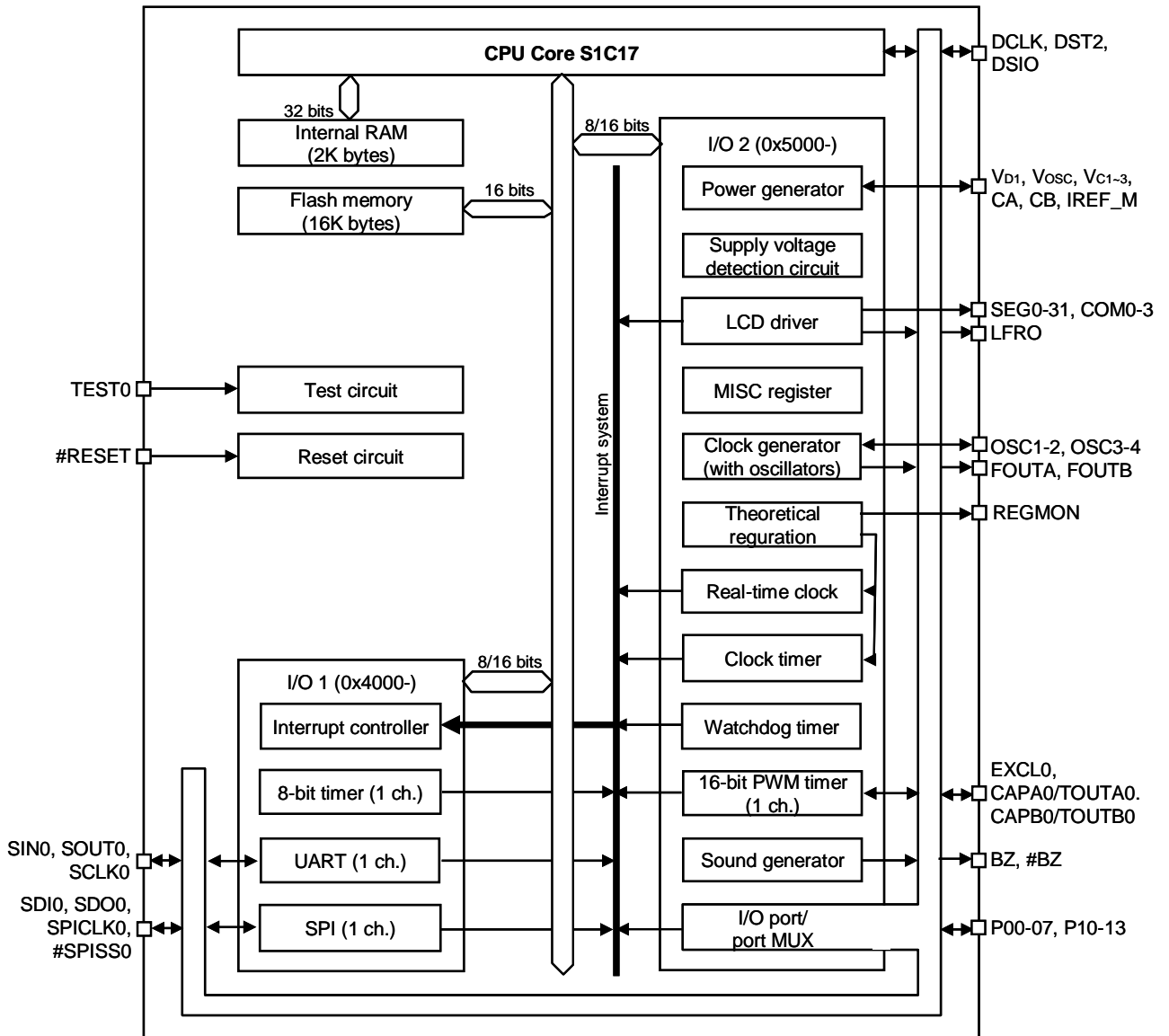
The main features of the S1C17653 are listed below.

<b>CPU</b>	
CPU core	Seiko Epson original 16-bit RISC CPU core S1C17
Multiplier/Divider (COPRO)	<ul style="list-style-type: none"> <li>• 16-bit × 16-bit multiplier</li> <li>• 16-bit × 16-bit + 32-bit multiply and accumulation unit</li> <li>• 16-bit ÷ 16-bit divider</li> </ul>
<b>Embedded Flash memory</b>	
Capacity	16K bytes (for both instructions and data)
Erase/program count	Three times
Other	<ul style="list-style-type: none"> <li>• Read/program protection function</li> <li>• A programming power supply (<math>V_{PP}</math>) is required.</li> <li>• Allows on-board programming using a debugging tool such as ICDmini.</li> </ul>
<b>Embedded RAM</b>	
Capacity	2K bytes
<b>Clock generator</b>	
System clock source	System clock source
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
Other	<ul style="list-style-type: none"> <li>• Core clock frequency control</li> <li>• Peripheral module clock supply control</li> </ul>
<b>LCD driver</b>	
Number of driver outputs	Segment output: 32 pins, Common output: 4 pins
Other	<ul style="list-style-type: none"> <li>• Includes a power supply voltage booster/reducer.</li> <li>• Includes a display data memory.</li> </ul>
<b>I/O ports</b>	
Number of general-purpose I/O ports	Max. 12 bits (Pins are shared with the peripheral I/O.)
Other	<ul style="list-style-type: none"> <li>• Schmitt input</li> <li>• Pull-up control function</li> <li>• Port input interrupt: 8 bits</li> </ul>
<b>Serial interfaces</b>	
SPI	1 channel
UART	1 channel (IrDA1.0 supported)
<b>Timers/Counters</b>	
8-bit timer (T8)	1 channel (Generates the SPI clock.)
16-bit PWM timer (T16A2)	1 channel (PWM output, event counter, and count capture functions)
Watchdog timer (WDT)	1 channel (Generates NMI/reset.)
<b>Clock functions</b>	

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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
Theoretical regulation function (TR)	Time adjustment function in +16/32768 to -15/32768 second units
<b>Sound generator</b>	
Buzzer frequency	8 frequencies selectable
Volume control	8 steps adjustable
Other	<ul style="list-style-type: none"> <li>• One-shot buzzer</li> <li>• Auto envelope function</li> </ul>
<b>Analog circuits</b>	
Supply voltage detection circuit (SVD)	1 channel (Detection voltage: 13 levels)
<b>Interrupts</b>	
Reset interrupt	#RESET pin/watchdog timer
NMI	Watchdog timer
Programmable interrupts	8 systems (8 levels)
<b>Power supply voltage</b>	
Operating voltage ( $V_{DD}$ )	2.0 V to 3.6 V
Flash programming/erasing voltage ( $V_{PP}$ )	7V/7.5V
<b>Operating temperature</b>	
Operating temperature range	-40°C to 85°C
<b>Current consumption (Typ value, <math>V_{DD} = 2.0</math> V to 3.6 V)</b>	
SLEEP state	90 nA (OSC1 = Off, RTC = Off, OSC3B = Off, OSC3A = Off)
HALT state	0.42 $\mu$ A (OSC1 = 32 kHz (OSC1A), RTC = Off, OSC3B = Off, OSC3A = Off) 0.42 $\mu$ A (OSC1 = 32 kHz (OSC1A), RTC = On, OSC3B = Off, OSC3A = Off)
Run state	10 $\mu$ A (OSC1 = 32 kHz (OSC1A), RTC = Off, OSC3B = Off, OSC3A = Off) 1200 $\mu$ A (OSC1 = Off, RTC = Off, OSC3B = Off, OSC3A = 4 MHz ceramic) 650 $\mu$ A (OSC1 = Off, RTC = Off, OSC3B = 2 MHz, OSC3A = Off)
<b>Shipping form</b>	
1	TQFP14-80pin (12 mm $\times$ 12 mm $\times$ 1 mm, lead pitch: 0.5 mm)
2	Die

## ■ BLOCK DIAGRAM



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Document code: 412275100  
First issue April, 2012 in Japan