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## **Epson Develops 16-bit Microcontroller Containing Dot Matrix LCD Driver with Industry's Highest Resolution -Low power consumption makes it ideal for use in battery-powered devices**

Seiko Epson Corporation ("Epson") has developed the S1C17702, a 16-bit flash microcontroller that contains the [industry's highest resolution](#)<sup>\*1</sup> dot matrix LCD driver, and features low power consumption equivalent to an 8-bit microcontroller. Shipment of samples of this product will commence in March 2008, and volume production, with a monthly output of 500,000 units, is scheduled to begin in June this year.

The S1C17702, which has a 16-bit RISC CPU, achieves the high-speed processing capability of one clock cycle per instruction. This product has a wide variety of interfaces that enable connection with multiple sensors or peripheral devices. Furthermore, the large-capacity 128 KB on-chip Flash ROM of the S1C17702 has made it possible to store large volumes of display data, such as programs.

The S1C17702, which has a dot matrix LCD driver with a top-of-the-industry resolution of 72 SEG x 32 COM (2,304 dots), enables direct connection with LCD panels, making the display of such data as Japanese characters or graphs a simple matter. Because the multiple voltages required to drive the LCD panel are generated internally from the power supply voltage, a dedicated power source is not necessary.

This product also employs voltage regulator circuit technology, which enables a device to maintain the quality of the display regardless of the charge remaining in the battery. For applications involving displays, which had, up until now, required multiple chips, including dedicated external chips, the S1C17702 has made it possible to construct products with a minimal number of components. This makes the S1C17702 the ideal product for users who wish to manufacture devices that are more compact, consume less power, and cost less to make.

By integrating the low power consumption technologies accumulated over the years for its watches and other applications to achieve low current consumption, typically 1.0  $\mu$ A during standby mode, Epson has succeeded in making a product that will contribute to longer battery life for the devices made by its customers.

These capabilities make the S1C17702 ideal when considering improvements, such as lengthening the battery life, enhancing sensor interfaces, reducing the size, or improving the grayscale LCD display, for a wide range of applications, including remote controllers, sports watches, healthcare equipment, and portable games.

Epson will continue its endeavors to respond to the needs of its customers by enhancing and improving its lineup of devices that make optimal use of its Low Power Analog IP / Low Current Leak Process / Eco-friendly Power Algorithm technologies.

### **Special features of S1C17702**

#### **1. Low power consumption**

- 16-bit RISC microcontroller that achieves both high performance and low power consumption

Sleep state: 1.0  $\mu$ A (typical)  
Halt state (32.768 kHz): 2.5 $\mu$ A (typical)  
Run state (32.768 kHz): 18.0 $\mu$ A (typical)  
LCD ON state (32.768 kHz): 7.0 $\mu$ A (typical)<sup>\*2</sup>

## 2. On-chip High-resolution dot matrix LCD driver

- On-chip grayscale LCD driver with resolution of 72 SEG x 32 COM (2,304 dots)
- Dedicated voltage regulator/booster circuits ensure stable, high-quality display regardless of the charge left in the battery

## 3. Enhanced development environment

- Compact, reduced-pin serial On chip-ICE
- On-chip Flash ROM (supports self programming)
- Provides software simulators and development tools for initial evaluation
- C compiler and instruction set with high level of code efficiency
- Provides sample programs of the various functions

### Specifications

Product name	S1C17702	
Core CPU	Epson original 16-bit RISC CPU core S1C17	
Main (OSC3) oscillator circuit	Crystal/ceramic oscillator 8.2 MHz (max.) External clock input	
Sub (OSC1) oscillator circuit	Crystal oscillator 32.768 kHz (typical)	
On-chip oscillator circuit	2.5 MHz (typical)	
Instruction set	184 instructions	
On-chip ROM	128 KB Flash ROM (for instructions and data) 1,000 erase/program cycles On-board programming by debugging function Self programming by software control Read/program protection	
On-chip RAM	8 KB	
I/O Ports	Max. 28-bit general-purpose I/O ports (Terminals are shared with peripheral I/O ports)	
Serial interfaces	SPI (master/slave)	1 ch.
	I2C (master)	1 ch.
	UART (IrDA1.0)	2 ch.
	Remote controller	1 ch.
Timers	8-bit timer	1 ch.
	16-bit timer	3 ch.
	PWM & capture timer	2 ch.
	Clock timer	1 ch.
	Stopwatch timer	1 ch.
	Watchdog timer	1 ch.
	8-bit OSC1 timer	1 ch.
LCD driver	72 SEG x 32 COM / 88 SEG x 16 COM Built-in voltage booster circuit (1/5 bias)	
Supply voltage detector (SVD)	16 programmable levels (1.7 V to 3.2 V)	
Interrupts	NMI	
	P-port input interrupt	2 levels
	Serial interface interrupt	4 levels
	Timer interrupt	9 levels
	LCD interrupt	
	<u>SVD</u> <sup>*3</sup> interrupt	
Power supply voltage	1.8 V to 3.6 V (for normal operation, with 1.8 V internal voltage for low power operation by regulator) 2.7 V to 3.6 V (for Flash erasing/programming with 2.5 V internal voltage)	

Current consumption	Sleep state	1.0 $\mu$ A (typical)
	Halt state (32.768 KHz)	2.5 $\mu$ A (typical)
	Run state (32.768 KHz)	18.0 $\mu$ A (typical)
	LCD state (32.768 KHz)	<u>7.0<math>\mu</math>A (typical)</u> <sup>*4</sup>
Shipping form	QFP21-176-pin plastic package VF8GA8H-181 Bare chip	

#### Notes

\*1 As of January 31, 2008, according to research conducted by Epson

\*2 Zero panel load, Halt state

\*3 Supply Voltage Detector

\*4 Zero panel load, Halt state

#### About Epson

**Epson is a global leader in imaging products including printers, 3LCD projectors and small- and medium-sized LCDs. With an innovative and creative culture, Epson is dedicated to exceeding the vision and expectations of customers worldwide with products known for their superior quality, functionality, compactness and energy efficiency.**

**Epson is a network of 87,626 employees in 117 companies around the world, and is proud of its ongoing contributions to the global environment and to the communities in which it is located. Led by the Japan-based Seiko Epson Corp., the Group had consolidated sales of 1416 billion yen in fiscal 2006.**