EPSON

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Vol. 2

LCD Controllers

An LCD controller is an LSI that performs control for displaying data such as text or graphics processed by a CPU on an LCD panel. The data processed by the CPU is stored in VRAM (Video RAM, normally composed of SRAM or DRAM). The LCD controller reads this stored display data from VRAM and transmits them to the LCD driver, and then they are displayed on the LCD panel (see Figure 1).

The LCD controller is an important device for LCD displays. Our Semiconductor Operations Division, thinking of "displays" as one business concept itself, is focusing efforts on it as a key device.

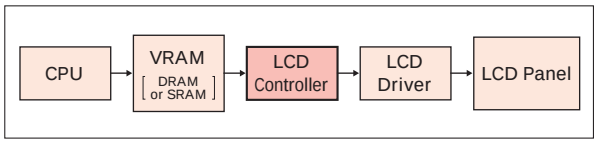


Figure 1 Flow of Display Data for LCD Display

Our LCD controllers use our own original architecture, with a product line including products for medium and small capacity LCD panels and for high resolution as shown in the road map (see Figure 2). VRAM for medium and small capacity LCD controller supports SRAM to reduce power consumption, and that for high resolution LCD controller supports DRAM to match CPU memory. With the high resolution products, it is possible to display not only on LCDs but also CRTs.

■ Medium and Small Capacity LCD Controllers

Medium and small capacity LCD controllers are widely used for LCDs in FA equipment and OA equipment. This series has built-in VRAM (SRAM) that stores display data, and has achieved reductions in power consumption and mounting area. The already released SED1374 has a 40KB SRAM, and the SED1375 released in June has an 80KB SRAM built-in. With the next LCD controller, we plan to incorporate a 160KB SRAM.

With built-in SRAM, compared to the current SED1353 with externally mounted SRAM, the power consumption is halved. This means that applications from FA equipment and OA equipment to palm top PCs as well as compact portable equipment such as the next generation cellular phones that have larger capacity display data are covered.

LCD Controller Road Map

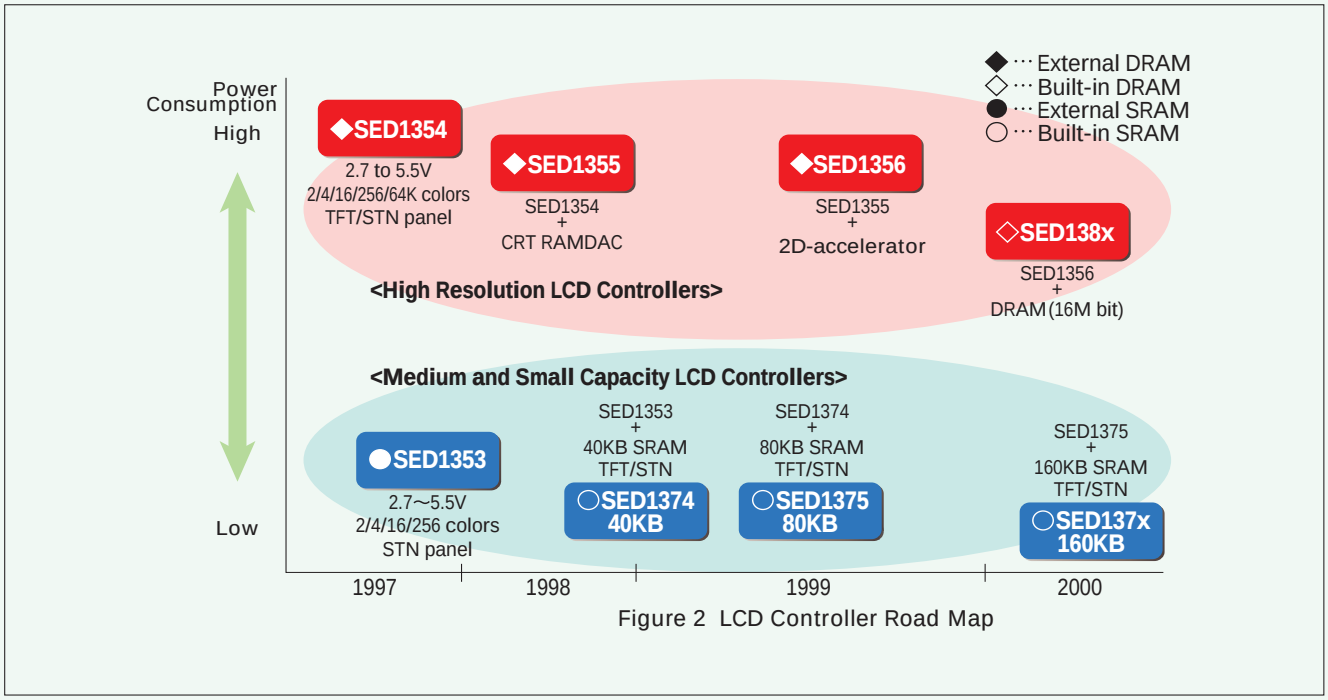


Figure 2 LCD Controller Road Map

High Resolution LCD Controllers

The SED1354 is an LCD controller that targets Windows CE applications. It received approval from Microsoft Corp. to be the standard LCD controller for Windows CE 2.0, and it is recommended as an external LCD controller by various RISC manufacturers that support Windows CE.

We are moving forward with expansion of functions using SED1354 as a base (see Figure 3). The SED1355 that can also display simultaniously on a CRT and supports a Hardware rotate by 90° has already been released. In September we plan to release the SED1356 that has an additional built-in 2D-accelerator, a 90°, 180° and 270° Hardware rotate function and is capable to generate a TV output signal (PAL, NTSC). The SED1386 is also the first Graphic Controller which is able to handle two different images on the outputs (Ghost Mode). Also in the future, we will develop the SED138x with built-in VRAM (SDRAM) to reduce consumption power even further and to be independent from the memory market.

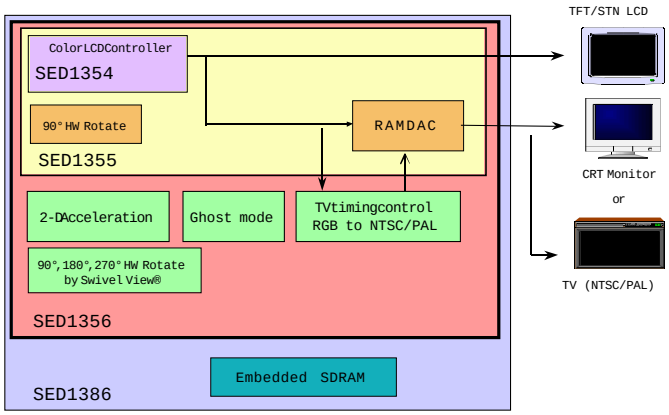


Figure 3 Functional Expansion of High Resolution LCD Controllers

High Integration Low Power Standard Cell

Along with higher level functions and higher performance levels of electronic equipment, there has been increased demand for high integration and lower power consumption for ASIC. To meet these demands, we have released the SCB50000 Series of 0.35 µm process standard cells (cell based ICs). Therefore we have three ways of gate arrays, embedded arrays, and standard cells to handle a wide variety of your needs.

The SCB50000 Series

Standard cells have the most of flexibility by customizing the overall process. Utilizing this, we optimize gate size for all logic cells used within an LSI. As result of it, compared to gate arrays of the same process, approximately 40% of the chip area and approximately 30% of the power consumption are realized.

Series Name	Internal Gate Power Consumption (µW) *1	Chip Area Ratio (%)
SLA50000H Series (gate arrays)	0.765	100
SSL50000 Series (embedded arrays)	0.451	73
SCB5000 Series	0.222	40

*1: Power consumption when operating the basic circuit (FF) at 3.3 V, 1 MHz

List of Functional Cells for SCB50000

The following functional cells are available for SCB50000 (also used for SSL50000) to shorten customer development time.

CPU	E0C33*2, ARM7TDMI
Interface	LVDS*, USB*, IrDA, PCMCIA
Memory	RAM (1MB Max.), ROM (2MB Max.), Flash (4MB Max.)
Peripheral	DMAC, RTC, USART, PIT, PPI, PIC, UART
LCD Controller	SED1352, SED1354*
Multiplier	4 x 4 bit through 32 x 32 bit
Analog	A/D converter, D/A converter, PLL

* : Under development *2: Seiko Epson original CPU

Applications

- Portable equipment requiring super low power consumption (Data banks, cellular phones, digital still cameras, etc.)

Windows® CE development kit for CARD-PC

Windows ® CE development kit for CARD-PC is the ideal and easy software development kit for quick and cost saving development of Windows® CE system. Windows® CE development kit for CARD-PC includes device drivers for CARD-PC, Platform builder and EPSON original utilities which makes easy for OEMs to build up and optimize Windows ® CE for their own system. It enables OEMs to develop and optimize the Windows® CE system without knowledge of Windows ® CE expertise.

Windows ® CE development kit is available in two versions. One is for CARD-586 which is EASI compatible card. OEMs can easily introduce Windows® CE system into existing CARD-586 system. Also OEMs can make use of many tools and peripherals for x86 architecture system. Another one is for CARD-E09 (SH-CARD). CARD-E09 is suitable for low-power/ low cost Windows ® CE based embedded system.

(continued from page 2)

Contents of Windows® CE Development Kit

- Development kit CD — LOADER, OAL service code, dedicated BIOS (CARD-586)
- Device drivers for CARD-PC — Video, PCMCIA, LAN, HDD, Serial, Parallel, etc.
- Platform builder 2.11 — Development tool from Microsoft®
- Debugging tool — PPSH cable, Serial cable (SH-CARD), Debugging tool
- Utility software — Software to build the Windows® CE for the target system
- Licences: The Development Kit doesn't include any license, prototype licences up to 10 pcs can be obtained for development. For Massproduction the Minimum order Quantity is 1000 licenses/project!

EPSON Original Functions in Development Kit

- Adaptations for LCDs (TFT, STN) — Changing LCDs and resolutions are done without Rebuild WCE
- Data store when the power is off — RAM contents can be saved to a storage device when power is off
- LOGO display function — Your company LOGO is displayed when Windows ® CE is boot up
- Monitoring function in boot up
- Multiple boot function

Model No:
- DIO51L3 is the Development Kit applicable to Card-586
- SCE88J4X01 is applicable for CARD-E09A (SH-CARD)

Microcontroller

E0C63 Family:

The high performance 4 bit E0C63 family, upper version of the proven E0C62 core, is dedicated to offer a cheap 4 bit solution regarding 8 bit application. An unique ROM structure by 13bit and a wide range of technical features underline the high performance description. Flexible instruction code, short cycle operation speed and wide ROM access range, based on EPSON´s low power consumption technology are only some highlights of this E0C63 family. To satisfy the most telecommunication requirements, EPSON offers a complete solution with the E0C63500 Series including DTMF/DP modulator and FSK indicator.

Model	Power Voltage (V)	Supply Current Operating	Supply Current Halt	Clock frequency (Hz)	Memory (bit) ROM (code)	Memory (bit) RAM	I/O Port (bit) I	I/O Port (bit) O	I/O Port (bit) I/O	Interrupts Ext.	Interrupts Int.	LCD Drivers Com.	LCD Drivers Seg.	Features	Package
E0C63A08	0.9to3.6	10µA 300µA	1.5µA	32.768K 1M	8,192x13	2,048x4	8	20	20	2	6	8,16,17	72	GateArray Melody IC	208QFP Die
E0C63B08		5.3µA 87.5µA	1.2µA	32.768K 400K		1,024x4		8	12		5	2,3,4	32	GateArray	100QFP Die
E0C63B07		3.5µA 85µA	1.2µA	32,768 400K							6		60	GateArray/Melody IC Dot-Matrix	160QFP Die
E0C63557	2.2to5.5	10µA 1mA	1.5µA	32.768K 3.58M	8,192x13	5,120x4	8	12	16	2	4	8,16,17	40	DTMF/DT	128QFP Die
E0C63558		10µA 1.8mA	1.5µA	32.768K 3.58M										DTMF/DT, FSK	
E0C63404 [1]	1.8to6.4	10µA 270µA	0.8µA	32.768K 1M	4,096x13	2,688x4	8	12	12	2	4	8,16,17	40	Multiple Timers 2,048x4 Data ROM Sound Generator Serial Interface Dot-Matrix	128QFP Die 144QFP
E0C63454 [1]		10µA 1mA	1µA	32.768K 4M	4,096x13	1,024x4	4	4	8	1					
E0C63455 [1]		4µA 1mA		32.768K 4M	4,096x13	1,024x4						8			
E0C63458 [1]		10µA 1mA		32.768K 4M	8,129x13	5,120x4	8		12			8,16,17	60		
E0C63466 [1]		10µA 1.2mA		32.768K 4M	16,384x13	1,792x4		12		2					
E0C63358 [3]	0.9to3.6	6µA 900µA	2µA	32.768K 4.5M	8,192x13	512x4	9	12	20	2	4	2,3,4	32	A/D Converter LCD Driver	64QFP Die
E0C63256	2.7to5.5	1.2mA 1.5mA	740µA 620µA	2M 4.194M	6,144x13	256x4	4	4	8	1			20	A/D Converter Sleep Mode	
E0C63158 [3]	0.9to3.6	4µA 900µA	2µA	32.768K 4M	8,192x13	512x4	9	12	20	2		-	-	A/D Converter SVD	

E0C88 Family:

Built around the E0C88000, EPSON`s powerful 8 bit core CPU, the E0C88 family line up integrates a wide choice of ROM and RAM sizes, LCD Controllers and drivers, touch panel controller, serial ports and other high performance peripheral circuits into a single chip design. With operation voltages down to 1.8V and clock speed up to 10 MHz, these microcontrollers feature the same ultra low power consumption as normally seen in 4bit MCU´s only.

Model	Power Voltage (V)	Supply Current Operating	Supply Current Halt	Supply Current Sleep	Clock frequency (Hz)	Memory ROM	Memory RAM	I/O Port (bit) I	I/O Port (bit) O	I/O Port (bit) I/O	Interrupts Ext.	Interrupts Int.	LCD Drivers COM x SEG	Features	Package
E0C88104	1.8to5.5	14µA 2mA	2µA	0.3µA	32.768K 4.2M	4KB	256B	10	9	8	2	4		Multiple I/O Analog Comparator Sound Generator Serial Interface	80QFP/ 100QfP Die
E0C88112		14µA 2mA	2µA	0.3µA	32.768K 4.2M	12KB							-		
E0C88308 [1]	1.8to5.5	14µA 2mA	2µA	0.3µA	32.768K 4.2M	8KB	256B	9	5	8	2	4	8/16x57; 32x41	Dot-Matrix LCD-Driver Serial Interface	160QFP Die
E0C88316 [1]		14µA 2mA	2µA	0.3µA	32.768K 4.2M	16KB	2KB	10	9	8	2	4	8/16x67; 32x51	LCD-Voltage Booster High Speed (8.2MHz)	
E0C88317 [1]		8µA 1.8mA	1µA	0.2µA	32.768K 4.2M	16KB							16x67; 32x51	High Speed Operation Analog Comparator	
E0C88348 [1]		14µA 2mA	2µA	0.3µA	32.768K 4.2M	48KB							8/16x67; 32x51	Sound Generator Display Memory	
E0C88365	2.2to5.5	14µA 1.5mA	2µA	0.3µA	32768K 2.5M	64KB	3KB	10	17	8	2	4	18x80	Analog Comparator Sound Generator	Die
E0C88832 [2]	1.8to5.5	10µA 1.3mA	2µA	0.3µA	32.768K 4.2M	32KB	1.5KB	9	5	8	2	4	8/16x57; 32x41	High Speed (8.2M) no access to ext. memory	128QFP Die
E0C88862 [2]		10µA 1.3µA	2µA	0.3µA	32.768K 4.2M	60KB			4				8/16x67; 32x51	Sound Generator Display Memory	
E0C88F360 [2]	1.8to5.5	18µA 2mA	3µA	TBD	32.768K 4.2M	32KB	2KB	10	9	8	2	5	8/16/32x51	Flash ROM, A/D converter Sound generator High Speed Operation	176QFP Die
E0C88408	1.8to5.5	15µA 2mA	3µA	0.6µA	32.768K 4.2M	8KB	3.75KB	12	3	26	2	4	LCD Controller	Sound Generator Build in VRAM	100QFP Die
E0C88409		15µA 2mA	3µA	0.6µA	32.768K 4.2M									A/D-, D/A Converter Touch-Panel Controller	

[1] MTP-Tool available (no mass production) [2] Released soon [3] MTP-Tool released soon (no mass production)

Crystal Products

New package standard for oscillator

In its long tradition of creating standards in designing smaller and smaller crystal oscillators, EPSON has set yet another milestone: The CE type package.

Smaller than any other oscillator in the market, the new SG-8002CE is the first to feature this ultra-miniature package. With a surface area of 2.5 x 3.2 mm², the oscillator is only 1mm in height, making it suitable in environments, where low profile is vital. The one time programmable SG-8002CE is one time frequency programmable and available from 1MHz to 135MHz in three different combinations of stability and operating temperature range.

Like the other oscillators in the SG-8002 series, the SG-8002CE applies an internal PLL frequency generation circuit and combines extremely low delivery times with versatility and reasonable prices.

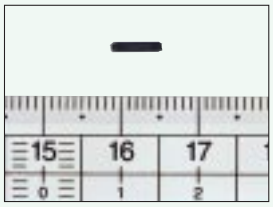
Specifications

Frequencies	1MHz to 135 MHz
Operating voltage	5V or 3.3V
Output Waveforms	TTL, HCMOS or 3.3V CMOS
Stabilities	+/- 50ppm (-20˚ to 70˚) +/- 100ppm (-20˚ to 70˚) +/- 100ppm (-40˚ to 85˚)
Aging	+/-5ppm/ 1st year
Options	Output enable or standby option
Package Size	3,2 x 2,5 x 1,0 mm

Check our website for datasheets and the other members of this industry standard oscillator family.

Ultra Compact SMD Package for Crystal Unit

The MC-146 is a compact SMD crystal unit developed for portable equipment for which smaller size is in great demand. Using a newly developed package for high density mounting, parts occupation area (including land pattern) is the smallest level in the industry, and the thickness is 0.1 mm thinner than our previous model.



Full size


Enlargement

Features

- Compact SMD plastic mold package
- The smallest level part occupation area in the industry
- High reliability cylinder type crystal unit built-in

Specifications

Frequencies	32.768k, 75k, 76.8k Hz
Operating temperature	-40 to + 85˚C
Serial resistance	65kΩ (Max. at 32.768kHz crystal)
Frequency tolerance	± 20, ± 50 ppm
Load capacity	7.0 pF
External dimensions	6.9 x 1.4 x 1.3 mm

Applications

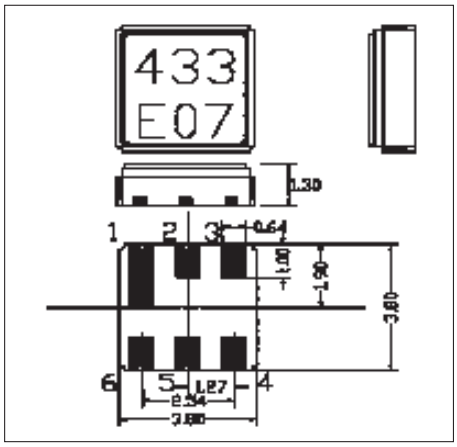
- Compact portable equipment such as cellular phones

A new miniature SAW resonator for keyless entry applications

EPSONs new ultraminiature SAW resonator FS-335 is yet another step in EPSONs aggressive strategy to develop smaller and more versatile frequency control products. With its extremely small package of 3.8 x 3.8 x 1.3 mm³ and its full automotive operating temperature range, it is ideal for handheld applications like keyless entry systems and similar remote controls. The available frequencies range from 300MHz to 900MHz, covering the frequencies most commonly used in such applications. The components will be available in August in sample quantities and by the end of this year for mass production.

Specifications

Frequencies	300MHz to 900MHz
Stabilities	+/-50ppm to +/-100ppm
Operating temperature	-40°C to +85°C



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