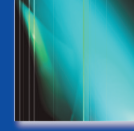
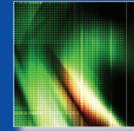
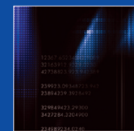
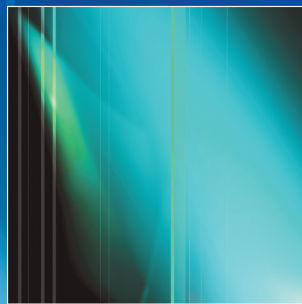
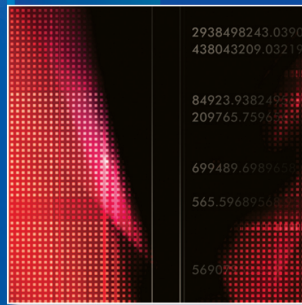
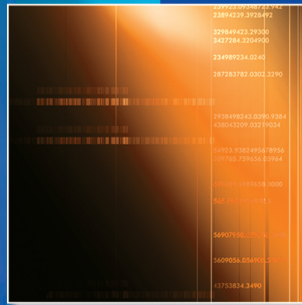
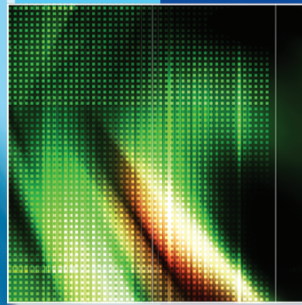
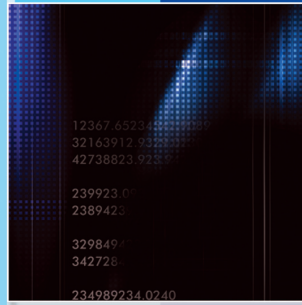


CMOS LSIs

Product Catalog 2025



Business Concept

The widespread of smartphones and tablets make improvements of broadband and wireless communications, then the advanced information and telecommunications network society has become a reality. In particular, semiconductors for use in portable devices, information terminals, in-vehicle devices and FA devices are expected to provide higher performance in terms of thinner structure, lighter weight, and longer operation with limited power supply. We have been focusing on the creation of compact, low-power semiconductors since we started the development of CMOS LSI for watches in 1969. Since then, we have steadily built up our expertise in energy-saving, space-saving, and time-saving designs. This has enabled us to quickly obtain the semiconductor development technology needed to meet the demands of the new era of the advanced information and telecommunications network society. Our concept is to develop "saving technologies" to reduce power consumption, development times, and implementation space. Our goal is to be a true partner for you, providing you with strategic advantages, enhancing your customer value based on our "saving technologies" and mixed analog/digital technologies that we have cultivated, as well as our design capabilities, manufacturing capabilities and stable supply that can satisfy your detailed requirements.

Environmental Responsibility

Epson semiconductor technology provides environmental value to customers by creating and manufacturing eco-friendly products.

- 1) We Epson's products are surely complying with the Eu-RoHS (2011/65/EU) Directive.
- 2) We are releasing information about the containing chemical substances of products at web-site.
Product of QFP & BGA are described in the following URL.
global.epson.com/products_and_drivers/semicon/information/package_lineup.html *Some products are excluded.

Type of certification: ISO 14001: 2015, JIS Q 14001: 2015
Awarded to: TOHOKU EPSON CORPORATION,
SEIKO EPSON CORPORATION (Fujimi Plant, Suwa Minami Plant)
Certified by: Bureau Veritas Certification
Date of certification: April 3, 1999



Type of certification: ISO 14001: 2015
Awarded to: Singapore Epson Industrial Pte. Ltd.
Certified by: SGS
Date of certification: Jan 12, 1999



Epson's Quality Policy

Keeping the customer in mind at all times, we make the quality of our products and services our highest priority. In order to continue to create products and services that please our customers and earn their trust.

Epson's Semiconductor Business has acquired ISO9001 and IATF16949 certifications with its IC, module and their application products.

ISO9001:
Type of Certification: ISO9001: 2015, JIS Q 9001: 2015
Awarded to: TOHOKU EPSON CORPORATION,
SEIKO EPSON CORPORATION (Fujimi Plant, Suwa Minami Plant, Tokyo Office, Hirooka Office)
Certified by: Bureau Veritas Certification
Initial Date of Certification: October 10, 1993



Type of Certification: ISO9001: 2015
Awarded to: Singapore Epson Industrial Pte. Ltd.
Certified by: SGS
Initial Date of Certification: February 4, 2003

IATF16949
Type of Certification: IATF16949: 2016
Awarded to: TOHOKU EPSON CORPORATION,
SEIKO EPSON CORPORATION (Fujimi Plant, Tokyo Office, Hirooka Office)
Epson Europe Electronics GmbH, Epson America Inc.,
Epson Canada Ltd. (Vancouver Design Center),
Epson (China) Co., Ltd., Epson Hong Kong Ltd.
Certified by: Bureau Veritas Certification
Initial Date of Certification: Dec 9, 2017



Type of Certification: IATF16949: 2016
Awarded to: Singapore Epson Industrial Pte. Ltd.
Certified by: SGS
Initial Date of Certification: May 2, 2018



Epson's LSI

With our three core technologies - low current leakage process technology that dramatically reduces standby current, system algorithms for highly efficient power utilization, and analog IPs optimally designed for low power consumption - Epson presents solutions for you to develop applications that exceed your expectations.

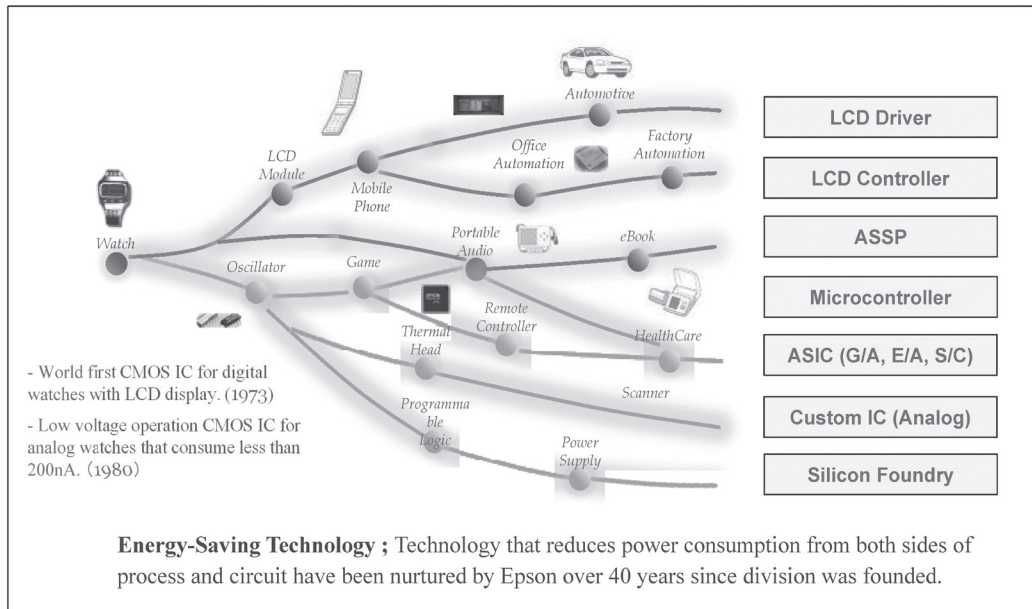
We offer optimally-designed products, information and services in a most timely manner from the very beginning of your product development to volume production. We believe our support throughout all stages of your product cycle will lead to the adoption of Epson devices for your next products.

CMOS LSIs Contents 2025

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History of Epson Semiconductor's Technology

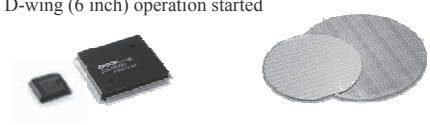
As the semiconductor division of "worldwide watch maker Seiko", semiconductor business has expanded into LCD Drivers, ASICs and MCUs from IC for Watches. These businesses are all based on Epson's energy-saving technology.



Epson Semiconductor's History

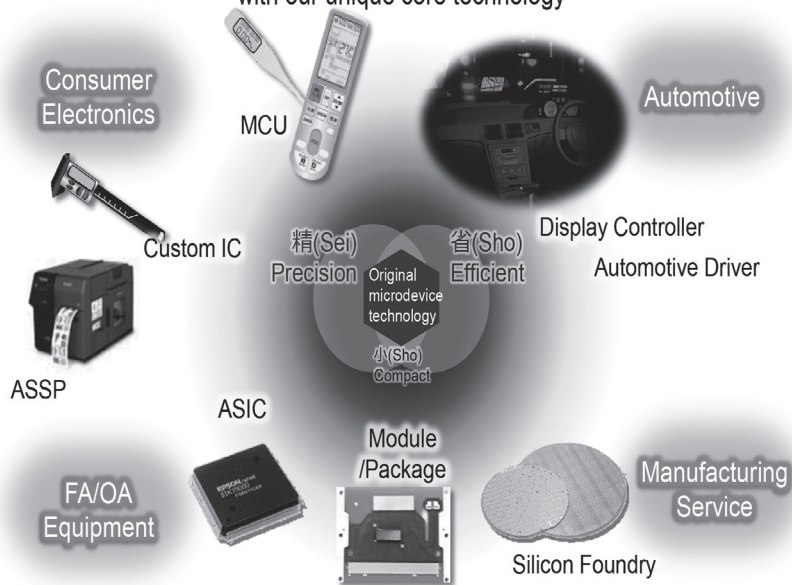


- 1969 Development of CMOS IC for watches started
- 1973 CMOS IC production started in Headquarter
- 1980 Fujimi plant (B-wing, 4 inch) operation started
- 1984 A-wing (5 inch) operation started
- 1985 D-wing (6 inch) operation started
- 1991 Sakata plant (S-wing, 6 inch) operation started
- 1993 ISO9000 series certified
- 1994 Singapore assembly plant (SEP) operation started
- 1997 T-wing (8 inch, Sakata) operation started
ISO14001 certified
- 2001 T-wing manufacturing line expanded
- 2006 ISO/TS16949 certified
- 2010 Microdevices Operations Division started
- 2017 IATF16949 certified



Vision and Target Application

Epson aspires to be a device maker that contributes customers' business by valuable products with our unique core technology



Epson Product Line-up

Microcontroller

- Low power consumption and Long life battery
- Support various LCD

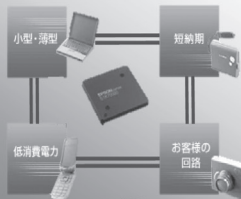


LCD Driver/LCD Controller

- Automotive experience
- Advanced function embedded



**Epson
Semiconductor**



- Since year 1982
- Supplying products to many customers'

ASIC



USB-HUB



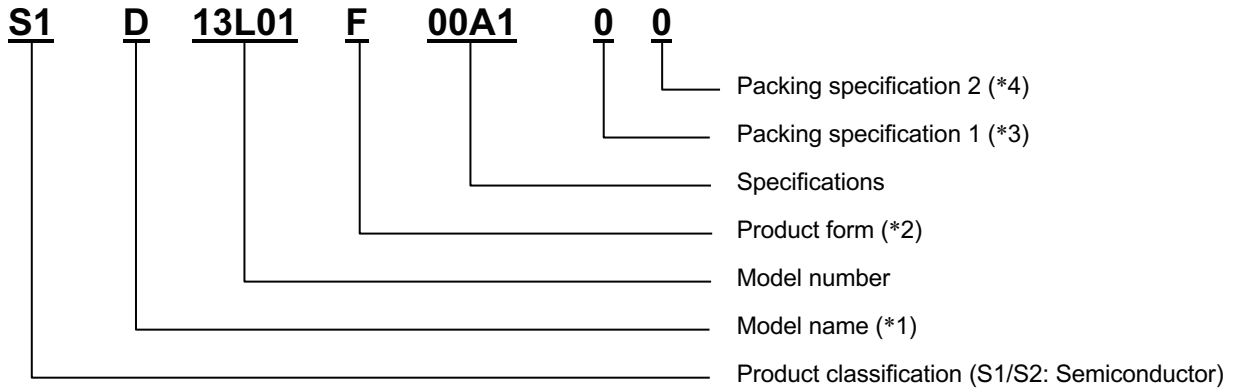
Non-contact charge IC

- Provide Epson unique core technology

Valuable Products

Configuration of product number

● Devices



*1: Model name

3rd	Model name
C	Microcontroller
D	Driver IC, Display Controller
K	Standard Cell
L	Gate Array
R	USB Controller
V	Speech & Audio IC
X	Embedded Array

*3: Packing specification 1

14th	Packing specification
0	Tape & reel (non-heatproof)
1	Tape & reel (heatproof)

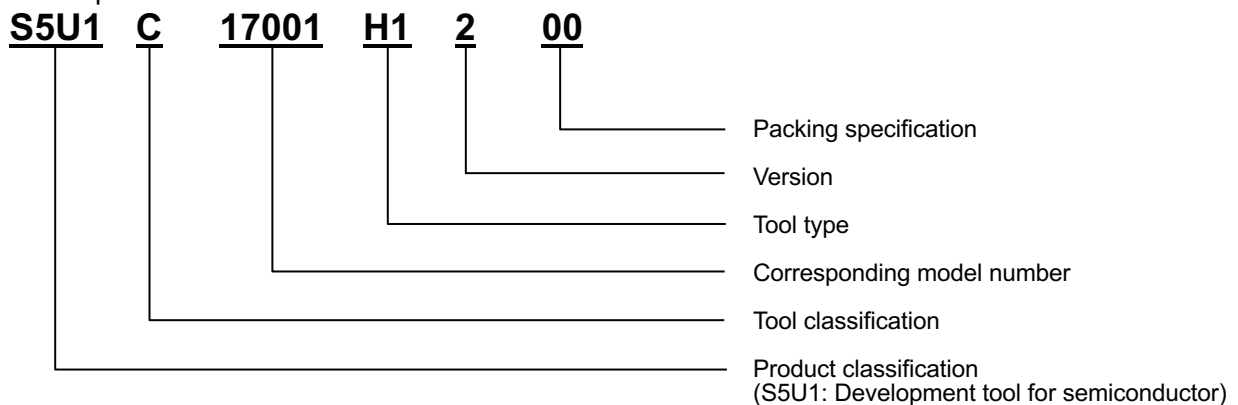
*2: Product form

9th	Product form
B	BGA, WCSP
D	Bare Chip
F	QFP, QFN
M	SOP

*4: Packing specification 2

15th	Packing specifications
0	Tray
B	Tape & reel (BACK)
F	Tape & reel (FRONT)
L	Tape & reel (LEFT)
R	Tape & reel (RIGHT)

● Development tools



When place an order please ask the detail product number to Epson sales representative.

ASICs

1

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Gate arrays	S1L60000 Series 8
	S1L50000 Series 8
	S1L5V000 Series 9
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1-1 Gate Arrays

Epson's Gate Array is a suitable solution for replacing existing devices because this Gate Array option gives flexibility to adapt the power supply and layouts of other various signals. Furthermore Epson has invested on the new Gate Array series called "S1L5V000" which supports 5V single power supply with 0.35µm process. Since it is a new series, it is also suitable for long life time applications.

S1L60000 series											
Series		S1L60000 Series									
Features		<ul style="list-style-type: none"> ● 0.25µm CMOS, using 3-, 4-layer interconnect process ● 107 ps internal gate delay at 2.5V, 2-input NAND Typ. ● Low power consumption (Internal cell: 2.5V 0.18µW/MHz/BC) ● Drive capacity (I_{OL}=0.1, 1, 3, 6, 12, 24mA at 3.3V, I_{OL}=0.1, 1, 3, 6, 9, 18mA at 2.5V, I_{OL}=0.05, 0.3, 1, 2, 3, 6mA at 2.0V, I_{OL}=0.045, 0.27, 0.9, 1.8, 2.7, 5.4mA at 1.8V) ● RAM (synchronous type, asynchronous type) can be implemented. 									
Model Name	3-layer Metallization	S1L60093	S1L60173	S1L60283	S1L60403	S1L60593	S1L60833	S1L61233	S1L61583	S1L61903	S1L62513
	4-layer Metallization	S1L60094	S1L60174	S1L60284	S1L60404	S1L60594	S1L60834	S1L61234	S1L61584	S1L61904	S1L62514
Total BC (Raw Gates)		99.2k	171.8k	284.4k	400.3k	595.4k	831.6k	1,234.9k	1,587.8k	1,903.0k	2,519.6k
Usable Gates	3-layer Metallization	59.6k	103.1k	142.2k	200.2k	297.7k	332.7k	494.0k	635.1k	761.2k	1,007.9k
	4-layer Metallization	69.5k	120.2k	184.9k	260.2k	387.0k	415.8k	617.5k	793.9k	951.5k	1,259.8k
Total Lead Count Micro Lead Pitch	80µm	—	—	—	—	—	284	344	388	424	488
	70µm	112	148	188	224	272	—	—	—	—	—
Delay Time	Internal Gates	t _{pd} =107ps (2.5V operation, F/O=1, typical wiring load)									
	Input Buffer	t _{pd} =270ps (2.5V operation, F/O=2, typical wiring load)									
	Output Buffer	t _{pd} =1600ps (2.5V operation, C _L =15pF)									
I/O Levels		CMOS, LVTTTL, PCI-3.3V									
Input Modes		LVTTTL, CMOS, Pull-up/Pull-down, Schmitt, Fail safe, Gated									
Output Modes		Normal, Open-drain, 3-state, Bidirectional, Fail safe, Gated									

Core	I/O
1.8V	1.8V
	3.3V
2.0V	2.0V
	3.3V
2.5V	2.5V
	3.3V

S1L50000 series															
Series		S1L50000 Series													
Features		<ul style="list-style-type: none"> ● 0.35µm CMOS, using 2-, 3- or 4-layer interconnect process ● 0.14 ns internal gate delay at 3.3V, 2-input power NAND Typ. ● Low power consumption (Internal cell: 3.3V 0.7µW/MHz/BC) ● Drive capacity (I_{OL}=0.1, 1, 3, 8, 12, 24mA at 5.0V, I_{OL}=0.1, 1, 2, 6, 12mA at 3.3V, I_{OL}=0.1, 0.5, 1, 3, 6mA at 2.5V, I_{OL}=0.05, 0.3, 0.6, 2, 4mA at 2.0V) ● RAM (asynchronous type) can be implemented. 													
Model Name	2-layer Metallization	S1L50062	S1L50122	S1L50282	S1L50552	S1L50752	S1L50992	S1L51252	S1L51772	S1L52502	S1L53352	S1L54422	S1L55062	S1L56682	S1L58152
	3-layer Metallization	S1L50063	S1L50123	S1L50283	S1L50553	S1L50753	S1L50993	S1L51253	S1L51773	S1L52503	S1L53353	S1L54423	S1L55063	S1L56683	S1L58153
	4-layer Metallization	S1L50064	S1L50124	S1L50284	S1L50554	S1L50754	S1L50994	S1L51254	S1L51774	S1L52504	S1L53354	S1L54424	S1L55064	S1L56684	S1L58154
Total BC (Raw Gates)		5.8k	12.0k	28.8k	55.5k	75.8k	99.2k	125.8k	177.1k	250.2k	335.9k	442.2k	506.7k	668.6k	815.5k
Usable Gates	2-layer Metallization	2.9k	6.0k	14.4k	26.1k	35.7k	46.7k	56.6k	79.7k	112.6k	144.5k	176.9k	202.7k	267.5k	326.2k
	3-layer Metallization	5.1k	10.6k	25.3k	47.2k	64.4k	84.4k	100.7k	132.8k	187.7k	251.9k	309.5k	354.7k	468.0k	570.9k
	4-layer Metallization	5.5k	11.4k	27.3k	52.8k	72.0k	94.3k	119.5k	168.2k	237.7k	319.1k	397.9k	456.1k	601.7k	734.0k
Total Lead Count Micro Lead Pitch	80µm	—	56	88	124	144	168	188	224	264	308	352	376	432	480
	70µm	48	64	104	144	168	192	216	—	—	—	—	—	—	—
Delay Time	Internal Gates	t _{pd} =0.14ns (3.3V operation, F/O=2, typical wiring load), 0.21ns (2.0V operation, F/O=2, typical wiring load)													
	Input Buffer	t _{pd} =0.38ns (5.0V operation, F/O=2, typical wiring load), 0.4ns (3.3V operation, F/O=2, typical wiring load), 1.3ns (2.0V operation, F/O=2, typical wiring load)													
	Output Buffer	t _{pd} =2.12ns (5.0V operation, C _L =15pF), 2.02ns (3.3V operation, C _L =15pF), 3.9ns (2.0V operation, C _L =15pF)													
I/O Levels		CMOS, LVTTTL, PCI-5V, PCI-3.3V													
Input Modes		LVTTTL, CMOS, Pull-up/Pull-down, Schmitt, Fail safe, Gated													
Output Modes		Normal, Open-drain, 3-state, Bidirectional, Fail safe, Gated													

Core	I/O
2.0V	2.0V
	3.3V
2.5V	2.5V
	3.3V
3.3V	3.3V
	5.0V

Note: Figures shown for usable gates are approximations. The actual number of usable gates varies according to the implemented circuitry.

S1L5V000 Series

Series		S1L5V000 Series							
Features		<ul style="list-style-type: none"> ● 0.35µm CMOS, using 2-,3-,4-layer interconnect process ● Internal gate delay: 0.19 ns at 5 V, 0.29 ns/ at 3.3V, 2-input power NAND Typ. ● Low power consumption (Internal cell: 5V 1.3µW/MHz/BC, 3.3V 0.54µW/MHz/BC) ● Drive capacity (I_{OL}=0.1, 1, 3, 8, 12mA at 5.0V, I_{OL}=0.1, 1, 2, 6, 10mA at 3.3V) ● RAM (asynchronous type) can be implemented 							
Model Name	2-layer Metallization	S1L5V012	S1L5V042	—	S1L5V112	—	S1L5V252	—	S1L5V482
	3-layer Metallization	S1L5V013	S1L5V043	S1X5V513*	S1L5V113	S1X5V523*	S1L5V253	S1X5V533*	S1L5V483
	4-layer Metallization	S1L5V014	S1L5V044	S1X5V514*	S1L5V114	S1X5V524*	S1L5V254	S1X5V534*	S1L5V484
Total BC (Raw Gates)		8.8k	42.0k	26.0k	109.2k	90.3k	254.3k	235.0k	479.9k
Usable Gates	2-layer Metallization	2.6k	12.6k	—	32.7k	—	63.5k	—	119.9k
	3-layer Metallization	5.3k	25.2k	14.3k	65.5k	49.7k	139.8k	129.3k	239.9k
	4-layer Metallization	6.1k	29.4k	16.9k	76.4k	58.7k	165.3k	152.8k	287.9k
Total Lead Count		48	104		168		256		308
Delay Time	Internal Gates	t _{pd} =0.19ns (5.0V operation, F/O=2, typical wiring load), 0.29ns(3.3V operation, F/O=2, typical wiring load)							
	Input Buffer	t _{pd} =0.45ns (5.0V operation, F/O=2, typical wiring load), 0.55ns(3.3V operation, F/O=2, typical wiring load)							
	Output Buffer	t _{pd} =2.07ns (5.0V operation, C _L =15pF), 2.95ns (3.3V operation, C _L =15pF)							
I/O Levels		CMOS, TTL, LVTTTL							
Input Modes		TTL, LVTTTL, CMOS, Pull-up/Pull-down, Schmitt, Fail-safe, Gated							
Output Modes		Normal, Open-drain, 3-state, Bidirectional, Fail-safe, Gated							

*: Analog PLL built in master.

Note: Figures shown for usable gates are approximations. The actual number of usable gates varies according to the implemented circuitry.

1-2 Embedded Arrays

An embedded array is an ASIC under a new method featuring consolidation of “Sea of gates” of a gate array and hard-macros installed in standard cells for specific applications. With this product, the concept of system-on-chip has been realized by consolidation of hard-macro cells for specific applications and a shorter gate array development period has become available, thanks to adoption of the “Sea of Gates” for the logic portion.

■ Designing the embedded arrays

When designing embedded arrays, execute system design first and determine the number of gates for the logic section and select the macro-cell to be used before starting manufacture of base bulks. The base bulks, placing necessary hard-macro cells and the Sea of Gates for the logic portion, are manufactured up to just before the routing process. In parallel with this manufacturing processes, processes from the circuit designing of the logic portion through post-simulation fix should be executed, similar to the cases of ordinary gate arrays, to go into sample production process after sign-off.

After the sign-off, samples can be shipped with the same delivery leadtime as that of the gate arrays. Also, when making logic circuit modifications or ROM data changes, developing cost and leadtime can be reduced to a level similar to that of the gate arrays.

■ Embedded arrays lineup

S1X80000 series		Core	I/O
Series	S1X80000 Series	1.8V	3.3V
Features	<ul style="list-style-type: none"> ● Based on 0.15μm CMOS process technology using 4/5-layer interconnect process ● Internal gate delay: 34.5ps/1.8V, 2-input NAND Typ. ● Low power consumption (Internal cell: 0.063μW /MHz/gate 2-input NAND Typ.) ● Drive performance (I_{OL}=2,4,8,12mA at 3.3V) 	1.8V	5.0V
		LDO	3.3V
		Macro Cells	RAM, ROM, LVDS, RSDS, various types of macro cells
Package	48 to 256 pin QFP, PBGA, PFBGA, SQFN		

S1X60000 series		Core	I/O
Series	S1X60000 Series	2.0V	2.0V
Features	<ul style="list-style-type: none"> ● Based on 0.25μm CMOS process technology and 3/4/5-layer wiring technology, number of raw gates: 2,500,000 Max. ● Internal gate delay: 107ps/2.5V, 2-input NAND Typ. ● Low power consumption (Internal cell: 0.18μW/MHz/gate, 2.5V, Typ.) ● Drive performance (I_{OL}=0.1, 1, 3, 6, 12, 24mA at 3.3V, I_{OL}=0.1, 1, 3, 6, 12, 24mA at 2.5V, I_{OL}=0.05, 0.3, 1, 2, 4, 8mA at 2.0V) 		3.3V
			2.5V
			2.5V
Macro Cells	RAM, ROM, various types of macro cells		
Package	48 to 256 pin QFP, PBGA, PFBGA, SQFN		

S1X50000 series		Core	I/O
Series	S1X50000 Series	2.0V	2.0V
Features	<ul style="list-style-type: none"> ● Based on 0.35μm CMOS process technology and 3/4-layer wiring technology ● Internal gate delay: 150ps/3.3V, 2-input power NAND Typ. ● Low power consumption (Internal cell: 0.37μW/MHz/gate, 3.3V, Typ.) ● Drive performance (I_{OL}=0.1, 1, 3, 8, 12, 24mA at 5.0V, I_{OL}=0.1, 1, 2, 6, 12mA at 3.3V, I_{OL}=0.1, 0.5, 1, 3, 6mA at 2.5V, I_{OL}=0.05, 0.3, 0.6, 2, 4mA at 2.0V) 		3.3V
			2.5V
			3.3V
Macro Cells	RAM, ROM, various types of macro cells		
Package	48 to 256 pin QFP, PBGA, PFBGA, SQFN		

S1X5V000 series		Core	I/O
Series	S1X5V000 Series	3.3V	3.3V
Features	<ul style="list-style-type: none"> ● Based on 0.35μm CMOS process technology and 2/3/4-layer wiring technology ● Internal gate delay: 190ps/5.0V, 290ps/3.3V, 2-input power NAND Typ. ● Low power consumption (Internal cell: 1.3μW/MHz/gate, 5.0V, 0.54μW/MHz/gate, 3.3V, Typ.) ● Drive performance (I_{OL}=0.1, 1, 3, 8, 12mA at 5.0V, I_{OL}=0.1, 1, 2, 6, 10mA at 3.3V) 		5.0V
		Macro Cells	RAM, PLL
Package	48 to 256 pin QFP, PBGA, PFBGA, SQFN		

1-3 Standard Cells

The standard cells are semi-custom ICs that incorporates a well-designed internal logic cell and RAM/ROM, CPU peripheral circuits or analog circuits into a single chip. Compared to the gate arrays, they boast higher design flexibility, functionality and integration capabilities, providing system LSI chips optimized to the customer needs. These features greatly help electronic device manufacturers design products with a compact body, lower power consumption, and a lower cost.

S1K80000 series

		Core	I/O
			1.8V
		1.8V	5.0V
		LDO	3.3V
Series	S1K80000 Series		
Features	<ul style="list-style-type: none"> ● Based on 0.15um CMOS process technology using 4/5-layer interconnect process ● Internal gate delay: 42.9ps/1.8V, 2-input NAND Typ. ● Low power consumption (Internal cell: 0.039μW /MHz/gate 2-input NAND Typ.) ● Drive performance (I_{OL}=2,4,8,12mA at 3.3V) 		
Macro Cells	RAM, ROM, LVDS, RSDS, various types of macro cells		
Packages	48 to 256 pin QFP, PBGA, PFBGA, SQFN		

1-4 Development of ASICs

ASICs are developed you to collaborate with Epson. We are preparing design libraries for various ASIC development tools

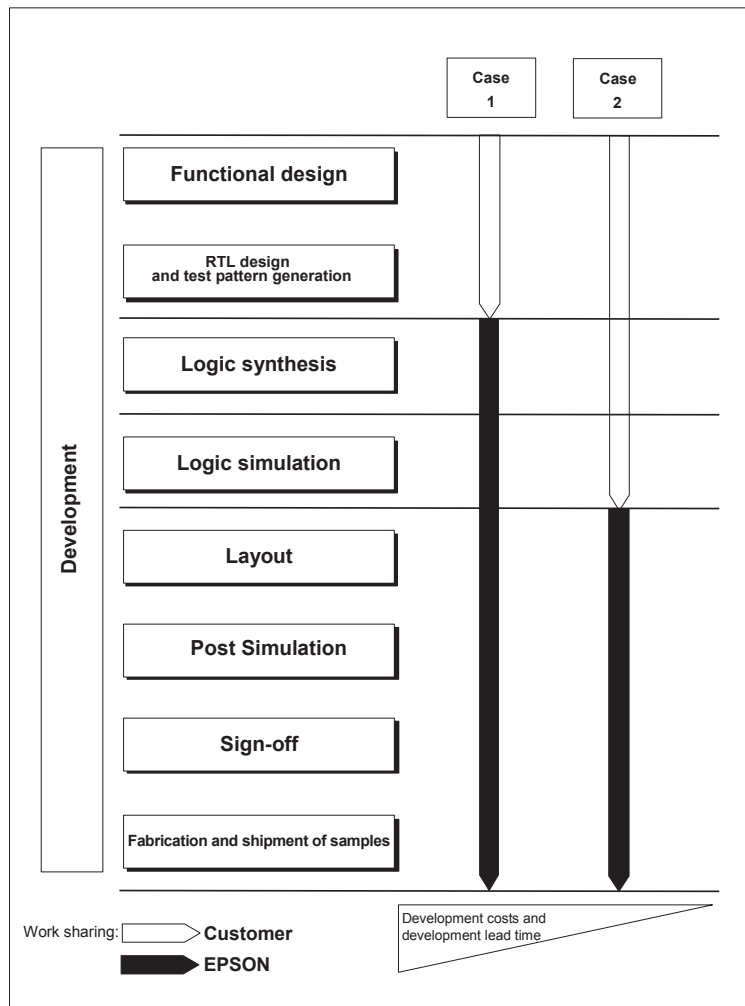
Case1. RTL Interface

After taking development as far as the function simulation stage, customers can send their Verilog-HDL or VHDL source files and test patterns to Epson via an HDL interface, so that Epson can perform logic synthesis.

Case2. Pre-Sim Interface

Customers can use this interface to send Epson gate-level netlists and test patterns for Verilog-HDL or VHDL code that has completed the logic simulation stage.

Epson will then perform the subsequent tasks beginning with interconnect layout.



MCUs

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2-1 16-bit Microcontrollers

16-bit RISC Microcontrollers S1C17 Family Application-oriented microcontroller

The S1C17 Family, 16-bit RISC microcontrollers integrate a wide variety of peripheral circuits such as various interfaces that meet various types of sensors and the EPD Driver/controller, LCD driver/controller that covers the wide display area into a single chip design. They can realize both high-speed operation and low power consumption, and provide the products suitable to portable gears. Also, various flash ROM built-in products are lined up. The flexible development environment and on-chip ICE functions can shorten the product development period.

S1C17W00 series W00 group (Ultra Low Power)

This is an ultra-low power consumption 16-bit MCU compatible to low voltage operations from 1.2V, even with built-in flash memory. The embedded highly efficient DC-DC converter generates an internal constant voltage, to drive an IC with a low power consumption operation beyond Seiko Epson's 4-bit MCUs. This product is equipped with a built-in RTC, stopwatch, high-performance PWM, external bus I/F and improved analog functions, combined with the powerful processing capacity of the 16-bit CPU, suitable for battery driven applications.

Products	Display		Operation clock			Supply current		Supply voltage [V]	Memory		I/O				Timer				SIO				Package (Form of delivery)						
	LCD Driver segxcom	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/ Halt/ operating (32K)/ operating (1M) [μ A] (Typ.)	Flash ROM [Byte]	RAM [Byte]		I/O port \times 6	16-bit	16-bit PWM	WDT	Clock	Real Time Clock \times 5	UART	SPI	I ² C master	I ² C slave	Remote control circuit	Sound generator	R/F converter, 24-bit	A/D converter, 12-bit		Multiplier/Divider	SVD \times 3				
S1C17W03	—	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.3/4/250	16K \times 2	2K	1.2 to 3.6 \times 1	35	24	35	4	2x2	1	—	1 \times 5	2	2	1	1	1	1	1	1	2 \times 4	6	1	1	Chip TQFP12-48
S1C17W04	—	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.3/4/250	32K \times 2	2K	1.2 to 3.6 \times 1	35	24	35	4	2x2	1	—	1 \times 5	2	2	1	1	1	1	1	1	2 \times 4	6	1	1	Chip TQFP12-48

\times 1: During erasing / programming in flash memory (V_{DD}): 1.8 to 3.6V
 \times 2: During erasing / programming in voltage flash memory(V_{FP}): The external applying 7.5V / 7.5V(Typ.) is needed.
 \times 3: SVD is an abbreviation for Supply Voltage Detector.
 \times 4: Independent operation for each channel.
 \times 5: Stopwatch function.
 \times 6: Including Input port and Output port.

S1C17W00 series W10/W20/W30 group (Ultra Low Power)

This is an ultra-low power consumption 16-bit MCU compatible to low voltage operations from 1.2V, even with built-in flash memory. The embedded highly efficient DC-DC converter generates an internal constant voltage, to drive an IC with a low power consumption operation beyond Seiko Epson's 4-bit MCUs. This product is equipped with a built-in RTC, stopwatch, LCD driver, high-performance PWM and improved analog functions, combined with the powerful processing capacity of the 16-bit CPU, suitable for battery driven applications that require a LCD and clock function.

Products	Display		Operation clock			Supply current		Supply voltage [V]	Memory		I/O				Timer				SIO				Other functions, Package (Form of delivery)					
	LCD Driver segxcom	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/ Halt/ operating (32K)/ operating (1M) [μ A] (Typ.)	Flash ROM [Byte]	EEPROM [Byte]		RAM [Byte]	I/O port \times 9	16-bit	16-bit PWM	WDT	Real Time Clock \times 5	UART	SPI	QSPI	I ² C	Remote control circuit	Sound generator	R/F converter, 24-bit	A/D converter, 12-bit		Multiplier/Divider	SVD \times 7			
S1C17W11 (Under development)	20 x 4	—	—	32k/250k/384k/500k/700k/1M/2M/4M	0.15(TBD)/1.5(TBD)/5(TBD)	48K (\times 4)	128	2K	22	3	22	3	2x2	1	—	1	1	—	1	1	1	—	1	1	—	1	1	LED pin x 2 Buzzer/ LED power circuit
S1C17W12	26 x 4 18 x 4	4.2M	32.768k	32k/250k/384k/500k/700k/1M/2M/4M	0.15/0.3/2/140	48K \times 4	—	2K	32	26	32	3	2x2	1	1	2	1	—	1	1	1	1	1	—	1	1	LED pin x 2 Chip SQFN7-48	
S1C17W13	26 x 4 18 x 4 20 x 4 \times 8	4.2M	32.768k	32k/250k/384k/500k/700k/1M/2M/4M	0.15/0.3/2/140	48K \times 4	—	2K	32	26	32	3	2x2	1	1	2	1	—	1	1	1	1	1	—	1	1	LED pin x 2 Chip QFP13-64 SQFN7-48 TQFP12-48	
S1C17W14	54 x 4 50 x 8	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.3/3/200	48K \times 4	—	4K	33	3	33	3	2x2	1	1	2	2	—	1	1	1	1	1	—	1	1	Chip QFP15-100	
S1C17W15	34 x 4 30 x 8 32 x 4 28 x 8 24 x 4 20 x 8	4.2M	32.768k	500k/700k/1M/2M/4M	0.15/0.3/4/250	64K \times 4	—	4K	33	3	33	3	2x2	1	1	2	1	—	1	1	1	4 \times 6	—	1	1	1	Chip QFP15-100 QFP14-80 SQFN9-64 TQFP13-64	
S1C17W16	60 x 4 56 x 8	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.3/3/200	64K \times 4	—	8K	40	5	40	5	2x2	1	1	2	3	—	1	1	1	2 \times 6	4	1	1	1	Chip TQFP15-128	
S1C17W18	48 x 4 44 x 8 32 x 4 28 x 8 24 x 4 20 x 8	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.3/2/140	128K (\times 4)	—	8K	68	57	68	4	3x2	1	1	2	2	—	1	1	1	2 \times 6	7	1	1	1	Temperature sensor, Chip TQFP15-128 QFP14-80 SQFN9-64	
S1C17W22	72 x 4/8 64 x 16 56 x 24	4.2M	32.768k	500k/700k/1M/2M/4M	0.15/0.3/4/250	64K \times 4	—	4K	42	2	42	2	2x2	1	1	1	1	—	1	1	1	2 \times 6	—	1	1	1	Chip TQFP15-128	
S1C17W23	72 x 4/8 64 x 16 56 x 24	4.2M	32.768k	500k/700k/1M/2M/4M	0.15/0.3/4/250	96K \times 4	—	8K	42	4	42	4	3x2	1	1	2	2	—	1	1	1	2 \times 6	6	1	1	1	Chip TQFP15-128	
S1C17W34	80 x 16 64 x 32	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.4/3/150	128K (\times 4)	—	12K	53	4	53	4	3x2	1	3	2	2	—	1	1	1	2 \times 6	7	1	1	1	Temperature sensor, Chip QFP21-176	
S1C17W35	80 x 16 64 x 32	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.4/3/150	256K (\times 4)	—	12K	53	4	53	4	3x2	1	3	2	2	—	1	1	1	2 \times 6	7	1	1	1	Temperature sensor, Chip QFP21-176	
S1C17W36	80 x 16 64 x 32	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15/0.4/3/150	384K (\times 4)	—	16K	53	4	53	4	3x2	1	3	2	2	—	1	1	1	2 \times 6	7	1	1	1	Temperature sensor, Chip QFP21-176	

\times 1: During erasing / programming in flash memory (V_{DD}): 1.8 to 3.6V
 \times 2: During erasing / programming in flash memory (V_{DD}): 2.4 to 3.6V
 \times 3: LCD Operation (V_{DD}): 2.5 to 3.6V
 \times 4: During erasing / programming in voltage flash memory(V_{FP}): The external applying 7.5V / 7.5V(Typ.) is needed. Regarding to (\times 4), Flash memory could be erased/programmed by internal power as well.
 \times 5: With stopwatch function.
 \times 6: Independent operation for each channel.
 \times 7: SVD is an abbreviation for Supply Voltage Detector.
 \times 8: External voltage application mode only.
 \times 9: Including Input port and Output port.
 \times 10: During erasing / programming in flash memory (V_{DD}): 1.8 to 3.6V (When V_{FP} is supplied from an external 7.5V power supply), 2.2 to 3.6V (When V_{FP} is generated by the internal voltage booster)

S1C17M00 series (For specific use with Low Power)

This series is an application-specific type.

This is a 16-bit MCU with built-in flash memory, which realizes high-speed processing at low power consumption and supports the power supply voltage from 1.8V to 5.5V.

Products	Display Display Driver	Operation clock			Supply current Sleep/ Halt/ Operating (32K)/ Operating (1M) [μA] (Typ.)	Supply voltage [V]	Memory			I/O I/O port ※8	Timer				SIO				Other functions, Package (Form of delivery)						
		High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)			Flash ROM [Byte]	EEPROM [Byte]	RAM [Byte]		16-bit	16-bit PWM	WDT	Real Time Clock ※5	UART	SPI	QSPI	I ² C		Remote control circuit	Sound generator	R/F converter, 24-bit	A/D converter, 12-bit	Multiplier/Divider	SVD ※6
S1C17M01	32 x 4 (LCD) 28 x 8 (LCD)	16.3M	32.768k	7.37M	0.35/0.8/ 12.5/210	1.8 to 5.5 ※1	32K ※4	—	4K	19	5	—	1	1	1	2	—	1	—	—	1	—	—	1	AMRC, Chip TQFP13-64
S1C17M02	16 x 4 (LCD)	6.4M	32.768k	32k/700k/ 3.2M/6.4M	0.24/0.9/ 5/—	2.1 to 3.6 ※2	32K ※4	256	2K	19	1	—	1	—	1	1	—	1	—	—	1	—	—	1	Measurement function for DMM, QFP13-64
S1C17M03	32 x 4 (LCD)	6.4M	32.768k	32k/700k/ 3.2M/6.4M	0.24/0.9/ 5/—	2.1 to 3.6 ※2	64K ※4	256	2K	43	1	—	1	—	1	1	—	1	—	—	1	—	—	1	Measurement function for DMM, QFP15-100
S1C17M10	88 x 8 (LCD) 80 x 16 (LCD)	16.8M	32.768k	32k/ 4M/8M/ 12M/16M	0.16/0.6/ 4/145	1.8 to 5.5 ※3	64K ※4	—	4K	33	5	1 x 2	1	1	1	1	—	1	—	—	—	—	—	1	SMCIF, Chip TQFP15-128
S1C17M12	8 x 5 (LED)	16.8M	—	4M/8M/ 12M/16M	0.35/40/ —/150	1.8 to 5.5 ※3	16K ※4	—	2K	39	4	1 x 2	1	—	1	2	—	1	1	—	—	—	—	1	Heavy current Port, Chip TQFP12-48
S1C17M13	8 x 5 (LED)	16.8M	—	4M/8M/ 12M/16M	0.35/40/ —/150	1.8 to 5.5 ※3	16K ※4	—	2K	39	4	1 x 2	1	—	1	2	—	1	1	—	—	—	8	1	Heavy current Port, Chip TQFP12-48
S1C17M20	—	21M	—	32k/700k/ 12M/16M/ 20M	0.36/1.5/ 5.5/160	1.8 to 5.5 ※3	16K ※4	—	2K	18 24	4	2 x 2	1	1	2	2	—	1	1	1	—	4 6	1	1	SQFN4-24
			32.768k		0.36/0.7/ 5/160																				SQFN5-32
S1C17M21	—	21M	32.768k	32k/700k/ 12M/16M/ 20M	0.36/0.7/ 5/160	1.8 to 5.5 ※3	16K ※4	—	2K	24	4	2 x 2	1	1	2	2	—	1	1	1	—	6	1	1	TQFP12-32
S1C17M22	—	21M	32.768k	32k/700k/ 12M/16M/ 20M	0.36/0.7/ 5/160	1.8 to 5.5 ※3	16K ※4	—	2K	40	4	2 x 2	1	1	2	2	—	1	1	1	2	8	1	1	TQFP12-48
S1C17M23	—	21M	—	32k/700k/ 12M/16M/ 20M	0.36/1.5/ 5.5/160	1.8 to 5.5 ※3	32K ※4	—	2K	18 24	4	2 x 2	1	1	2	2	—	1	1	1	—	4 6	1	1	SQFN4-24
			32.768k		0.36/0.7/ 5/160																				SQFN5-32
S1C17M24	—	21M	32.768k	32k/700k/ 12M/16M/ 20M	0.36/0.7/ 5/160	1.8 to 5.5 ※3	32K ※4	—	2K	24	4	2 x 2	1	1	2	2	—	1	1	1	—	6	1	1	TQFP12-32
S1C17M25	—	21M	32.768k	32k/700k/ 12M/16M/ 20M	0.36/0.7/ 5/160	1.8 to 5.5 ※3	32K ※4	—	2K	40	4	2 x 2	1	1	2	2	—	1	1	1	2	8	1	1	TQFP12-48
S1C17M30	26 x 4 (LCD) 22 x 8 (LCD) ※7	16.8M	32.768k	32k/700k/ 12M/16M	0.2/0.7/ 5/160	1.8 to 5.5 ※3	48K ※4	—	4K	38	4	3 x 2	1	1	2	2	—	1	1	1	2	2	1	1	TQFP12-48
S1C17M31	26 x 4 (LCD) 22 x 8 (LCD)	16.8M	—	32k/700k/ 12M/16M	0.2/1.4/ 5.5/160	1.8 to 5.5 ※3	48K ※4	—	4K	38	4	3 x 2	1	1	2	2	—	1	1	1	2	2	1	1	TQFP12-48
S1C17M32	42 x 4 (LCD) 38 x 8 (LCD) ※7	16.8M	32.768k	32k/700k/ 12M/16M	0.2/0.7/ 5/160	1.8 to 5.5 ※3	64K ※4	—	4K	54	4	3 x 2	1	1	2	2	—	1	1	1	2	2	1	1	TQFP13-64
S1C17M33	50 x 4 (LCD) 46 x 8 (LCD)	16.8M	32.768k	32k/700k/ 12M/16M	0.2/0.7/ 5/160	1.8 to 5.5 ※3	96K ※4	—	4K	66	4	3 x 2	1	1	2	2	—	1	1	1	2	5	1	1	Chip QFP14-80
S1C17M34	37 x 4 (LCD) 33 x 8 (LCD)	16.8M	32.768k	32k/700k/ 12M/16M	0.2/0.7/ 5/160	1.8 to 5.5 ※3	64K ※4	—	4K	52	4	3 x 2	1	1	2	2	—	1	1	1	2	5	1	1	TQFP13-64
S1C17M40	40 x 4(LCD) 36 x 8(LCD) 28 x 4(LCD) 24 x 8(LCD)	16.8M	32.768k	32k/ 700k/ 16M	0.25/0.7/ 5/—	1.8 to 5.5 ※9,10	48K ※4	256	2K	55 41	4	3 x 2	1	1	3	2	—	1	1	1	—	4 3	1	1	QFP13-64pin
			—		0.25/1.4/ 5.5/—																				TQFP12-48pin

※1: AMRC (MR sensor controller) Operation (V_{DD}): 2.0V to 5.5V
 ※2: During erasing / programming in flash memory / EEPROM programming / Analog circuit operation (V_{DD}): 2.2V to 3.6V
 ※3: During erasing / programming in flash memory (V_{DD}): 2.4V to 5.5V
 ※4: During erasing / programming voltage in flash memory (V_{PP}): The external applying of 7.5V / 7.5V(Typ.) is needed. Regarding to (※4), Flash memory could be erased/programmed by internal power as well.
 ※5: With stopwatch function.
 ※6: SVD is an abbreviation for Supply Voltage Detector.(power supply voltage detector circuit)
 ※7: External voltage application mode only.
 ※8: Including Input port and Output port.
 ※9: During erasing / programming in flash memory(V_{DD}): 2.2V to 5.5V
 ※10: During programming in EEPROM(V_{DD}): 2.2V to 5.5V

S1C17100/600/700 series (Low Power)

This 16-bit MCU has improved the throughput and the development environment while maintaining low power consumption just like 4/8-bit Epson MCU. This 16-bit MCU incorporates an LCD driver, power circuit, clock function and various types of I/F. It enables to realize applications with 1 chip. This MCU is the most suitable for portable terminals such as clock, watch and remote controller.

Products	Display	Operation clock			Supply current		Memory			I/O		Timer							SIO					Package (Form of delivery)				
	LCD Driver segxcom	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/Halt/operating (32K)/operating (1M) [μ A] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	Mask ROM [Byte]	RAM [Byte]	I/O port *7	8-bit	16-bit	16-bit PWM	Stopwatch	WDT	Clock	Real Time Clock	UART	SPI	I ² C master	I ² C slave	Remote control circuit	Sound generator		R/F converter, 24-bit	A/D converter, 10-bit	Multiplier/Divider	SVD *5
S1C17153	32 x 4	—	32.768k	500K/1M/2M	0.13/0.42/4.0/160	2.0 to 3.6	—	16K	2K	12	1	—	1	—	1	1	1	1	1	—	—	—	1	—	—	1	1	Chip
S1C17651	20 x 4	4.2M	32.768k	32K/500K/1M/2M	0.09/0.42/10.0/350	2.0 to 3.6	16K *3	—	2K	12	1	—	1	—	1	1	1	1	1	—	—	—	1	—	—	1	1	Chip TQFP13-64
S1C17653	32 x 4	4.2M	32.768k	32K/500K/1M/2M	0.09/0.42/10.0/350	2.0 to 3.6	16K *3	—	2K	12	1	—	1	—	1	1	1	1	1	—	—	—	1	—	—	1	1	Chip QFP14-80
S1C17656	32 x 4	—	32.768k	500K/1M/2M/4M	0.13/0.5/7.3/280	1.8 to 3.6	24K *4	—	2K	20	1	—	1	—	1	1	1	1	1	—	—	—	1	1	—	1	1	Chip QFP14-80
S1C17601	20 x 4 16 x 8	8.2M	32.768k	2.7M	0.6/2.0/12.0/340	1.8 to 3.6 *1	32K *6	—	2K	24	2	3	2	1	1	1	—	1	1	1	1	—	—	1	4	1	1	Chip TQFP13-64
S1C17621	40 x 4 36 x 8	8.2M	32.768k	2.7M	0.75/2.5/15.0/410	1.8 to 3.6 *1	32K *6	—	2K	36	3	3	1	1	1	1	—	2	1	1	1	1	—	2	8	1	1	Chip QFP14-100
S1C17602	40 x 4 36 x 8	8.2M	32.768k	2.7M	0.75/2.5/15.0/410	1.8 to 3.6 *1	64K *6	—	4K	36	3	3	1	1	1	1	—	2	1	1	1	1	—	2	8	1	1	Chip QFP14-100
S1C17622	56 x 4 52 x 8	8.2M	32.768k	2.7M	0.75/2.3/14.0/400	1.8 to 3.6 *1	64K *6	—	4K	47	3	3	1	1	1	1	—	2	1	1	1	1	—	2	8	1	1	Chip TQFP15-128
S1C17604	40 x 4 36 x 8	8.2M	32.768k	2.7M	0.75/2.3/14.0/400	1.8 to 3.6 *1	128K *6	—	8K	36	3	3	3	1	1	1	1	2	1	1	1	1	—	2	8	1	1	Chip QFP14-100
S1C17624	56 x 4 52 x 8	8.2M	32.768k	2.7M	0.75/2.3/14.0/400	1.8 to 3.6 *1	128K *6	—	8K	47	3	3	3	1	1	1	1	2	1	1	1	1	—	2	8	1	1	Chip TQFP15-128
S1C17702	88 x 16 72 x 32	8.2M	32.768k	2.7M	1.0/2.5/16.0/450	1.8 to 3.6 *1	128K *6	—	12K	28	3	3	2	1	1	1	—	1	1	1	—	1	—	—	—	1	1	Chip QFP21-176 VF8GA10H-180 VF8GA8H-181
S1C17703	120 x 16/24/32 60 x 64	8.2M	32.768k	2.7M	1.0/2.5/15.0/450	1.8 to 3.6 *2	256K *6	—	12K	34	—	5	4	1	1	1	—	2	3	1	1	1	—	2	8	1	1	Chip VF8GA10H-240
S1C17705	128 x 16/24/32 64 x 64	8.2M	32.768k	2.7M	1.2/2.7/18.0/550	1.8 to 3.6 *2	512K *6	—	12K	35	—	5	4	1	1	1	—	2	3	1	1	1	—	2	8	1	1	Chip VF8GA10H-240

*1: During erasing / programming in flash memory (V_{DD}): 2.7 to 3.6V
 *2: During erasing / programming in flash memory (V_{DD}): 2.5 to 3.6V
 *3: During erasing / programming in voltage flash memory (V_{FP}): The external applying 7.5V / 7.0V(Typ.) is needed.
 *4: During erasing / programming in voltage flash memory (V_{FP}): The external applying 7.5V / 7.5V(Typ.) is needed.
 *5: SVD is an abbreviation for Supply Voltage Detector. (power supply voltage detector circuit)
 *6: This product uses SuperFlash[®] technology licensed from SST UK Ltd. in U.K.
 *7: Including Input port and Output port.

S1C17500 series (Low Power)

This is a 16-bit MCU with built-in flash memory, which realizes high-speed processing at low power consumption. This product is equipped with various features, such as general-purpose I/O ports, A/D converter input and serial I/F. It's suitable for controlling various sensor built-in devices and household appliances.

Products	Display	Operation clock			Supply current		Memory			I/O		Timer							SIO					Package (Form of delivery)					
	LCD Driver segxcom	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/Halt/operating (32K)/operating (1M) [μ A] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	Mask ROM [Byte]	RAM [Byte]	I/O port *5	8-bit	16-bit	16-bit PWM	Stopwatch	WDT	Clock	Real Time Clock	UART	SPI	I ² C master	I ² C slave	Remote control circuit	Sound generator		R/F converter, 24-bit	A/D converter, 10-bit	Multiplier/Divider	SVD *3	
S1C17589	—	16.8M	32.768k	4M/ 8M/ 12M/ 16M	0.2/0.6/9.0/ 280	1.8 to 5.5	128K *2	—	16K	88	—	6	4x6	—	1	—	1 *4	2	2	1	1	1	—	—	16	11	1	1	Chip QFP15-100 QFP14-80 QFP13-64
										68							7												
										52							7												

*1: During erasing / programming voltage in flash memory (V_{FP}): The external applying of 7.5V / 7.0V(Typ.) is needed.
 *2: During erasing / programming voltage in flash memory (V_{FP}): The external applying of 7.5V / 7.5V(Typ.) is needed.
 *3: SVD is an abbreviation for Supply Voltage Detector.
 *4: With stopwatch function
 *5: Including Input port and Output port.

S1C17F00 series F50/F60 group (EPD application)

Specific to electronic paper (EPD) applications

The product also includes embedded features such as a real-time clock, theoretical regulation, a driver capable of wringing the maximum performance from segmented EPDs and a temperature sensor. As a result, the device does not simply drive the display, but also corrects temperature effects that could harm display quality making it possible to maximize the characteristics of an e-paper display with a single chip.

Products	Display	Operation clock			Supply current Sleep/ RTC/ operating(32K) / operating(1M) [μA] (Typ.)	Supply voltage [V]	Memory			I/O							Timer				SIO				Other functions, Package (Form of delivery)			
		EPD Driver segment (TP/BP)	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)			Built-in oscillator [Hz] (Typ.)	Flash ROM [Byte]	EEPROM [Byte]	RAM [Byte]	I/O port ※4	8-bit	16-bit	16-bit PWM	Stopwatch	WDT	Clock	Real Time Clock	UART(I2DA1.0)	SPI	I ² C	Sound generator	R/F converter, 24-bit	Temperature detection		A/D converter, 12-bit	Multiplier/Divider	SVD ※1
S1C17F57	64 (2TP/2BP)	4.2M	32.768k	32k/500k/ 1M/2M	0.10/0.21/ 12/410	2.0 to 3.6	32K ※2	—	2K	29	2	—	2	1	1	1	1	1	1	1	1	1	—	1	1	1	Chip ※3	
S1C17F63	42 (1TP/1BP)	16.8M	32.768k	500k/700k/ 1M/2M/4M/ 8M/16M	0.45/0.11/ 5/305	1.8 to 5.5 ※5,6	32K (※2)	256	2K	17	—	4	2×2	—	1	—	1	—	1	2	1	1	—	1	7	1	1	SMCIF, Chip※3, QFP15-100

※1: SVD is an abbreviation for Supply Voltage Detector

※2: During erasing / programming voltage in flash memory (V_{PP}): The external applying of 7.0V / 7.5V(Typ.) is needed. Regarding to (※2), Flash memory could be erased/programmed by internal power as well.

※3: Au bump is available.

※4: Including Input port and Output port.

※5: During erasing / programming in flash memory(V_{DD}): 2.2V to 5.5V

※6: During programming in EEPROM(V_{DD}): 2.2V to 5.5V

※7: With stopwatchfunction

Products	EPD Driver segment (TP/BP)	Supply voltage [V]	EPD Drive voltage [V]	Memory		command interface		Operation clock		Tempera ture sensor	Power on reset	Boosting circuit	Package (Form of delivery)
				Flash ROM [Byte]	I ² C Slave	SPI slave	Built-in oscillator [Hz]						
S1D14F57	256 (2TP/2BP)	1.75 to 5.5	9.15 /12.30 /15.45	16K ※1	1	1	2M	1	1	1	1	1	Chip ※2

※1: During erasing / programming voltage in flash memory (V_{PP}): The external applying of 7.0V / 7.0V(Typ.) is needed.

※2: Au bump is available.

S1C17800 series (High-performance models)

The 16-bit RISC MCUs allowing the 32-bit level sophisticated processing to perform. The device having the LCDC can display the 1-bpp maximum VGA monochrome images. Also, the device integrates a wide variety of interfaces such as USB, UART, SPI, I²C, I²S, A/D converter, and remote control interfaces, and it can improve the user interface of various home appliances (for example, the washing machines, rice cookers, and coffee makers) that use the display, music, voice, touch panel and other interfaces.

Products	Display	Operation clock			Supply current Sleep/ Halt/ operating (32K)/ operating (1M) [μA] (Typ.)	Supply voltage [V]	Memory			I/O							Timer				SIO				Other functions, Package (Form of delivery)			
		LCD Driver segxcom	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)			Built-in oscillator [Hz] (Typ.)	Flash ROM [Byte]	Mask ROM [Byte]	RAM [Byte]	I/O port ※6	8-bit	16-bit	16-bit PWM	Stopwatch	WDT	Clock	Real Time Clock	UART	SPI	I ² C master	I ² C slave	Remote control circuit	Sound generator		R/F converter, 24-bit	A/D converter, 10-bit	Multiplier/Divider
S1C17803	LCD controller	33M	32.768k	—	1.3※2/ 5 /—/ 6500	2.7 to 5.5	128K ※4	—	16K	I: 4 I/O :93	4	1	2	—	1	—	1	—	1	—	1	—	—	—	4	1	—	Supported bus, TQFP15-128
										I: 3 I/O :66																	QFP14-100	

※1: The battery backed up operation is supported.

※2: Unmounted OSC1.

※3: Universal Serial Interface (One is selected from UART/SPI/I²C).

※4: This product uses SuperFlash® technology licensed from SST UK Ltd.

※5: SVD is an abbreviation for Supply Voltage Detector.

※6: Including Input port and Output port.

2-2 Arm® Cortex®-M0+ 32-bit Microcontrollers

■ 32-bit RISC Microcontrollers S1C31 Family Arm® Cortex®-M0+ microcontroller

The S1C31 Family is a 32-bit microcontroller that adopts the Arm® Cortex®-M0+ processor for the CPU core with several built-in features, such as various timers, serial interface functions, LCD driver, memory display controller, USB controller, Hardware Processor for voice guidance, and Flash memory in one chip. The S1C31 Family constructed and manufactured with the exceedingly energy efficient Cortex®-M0+ processor, Epson's original super-low leak process and circuit technology, contributes to exceptional performance of various mobile devices and sensor node terminals which perform environmental measurements over a long period while extending battery life.

S1C31D00 series

This series is a 32-bit MCU with an Arm® Cortex®-M0+ processor included that features low-power operation. It incorporates a lot of serial interface circuits, human interfaces such as a memory display controller, and a HW processor for audio playback. This MCU is suitable for improving the convenience of a variety of devices, including battery-powered products.

Products	Display	Voice	Operation clock			Supply current	Supply voltage [V]	Memory		I/O	Timer				SIO					Package (Form of delivery)								
	Controller	HWP ※8	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/Halt/operating (32K)/operating (1M) [μA] (Typ.)		Flash ROM [Byte]	RAM [Byte]	I/O port ※6	16-bit	16-bit PWM	WDT	Real Time Clock	UART	SPI	QSPI	I ² C	IR remote control circuit		Sound generator	R/F converter, 24-bit	A/D converter, 12-bit	DMA	USB	SVD ※5	Temperature sensor	
S1C31D01	MDC ※1	—	21M	32.768k	32k/1M/2M/8M/12M/16M/20M	0.46/1.7/10/250	1.8 to 5.5 ※2,3	256K ※4	96K	57	8	2x6	1	1	3	2	1	2	1	1	—	7	4	2.0FS Dev	1	1	Chip WCP96 QFP14-80	
S1C31D50/51	—	1	16M	32.768k	32k/4M/8M/16M	0.46/1.8/10/250	1.8 to 5.5 ※2	192K ※4	8K	39	8	2x4	1	1	3	3	1	3	1	—	5	1	7	4	—	1	—	TQFP12-48
										71											7							QFP13-64
										91											8							QFP14-80
										25											8							QFP15-100
S1C31D41	—	1	16M	32.768k	32k/4M/8M/16M	0.34/1.5/5/215	1.8 to 5.5 ※7	96K ※4	8K	39	8	2x4	1	1	3	3	1	3	1	—	6	1	7	5	—	1	1	TQFP12-32
										55											7							TQFP12-48
										55											8							TQFP13-64

- ※1: MDC is an abbreviation for Memory Display Controller.
- ※2: During erasing / programming in flash memory (V_{DD}): 2.4 to 5.5V
- ※3: During generating MDC drive voltage (V_{DD}): 2.0 to 5.5V
- ※4: Flash memory could be erased/programmed by internal power as well.
- ※5: SVD is an abbreviation for Supply Voltage Detector.
- ※6: Including Input port and Output port.
- ※7: During erasing / programming in Flash memory (V_{DD}): 2.2 to 5.5V
- ※8: HWP is an abbreviation for HardWare Processor.

S1C31W00 series

This series is a 32-bit MCU with an Arm® Cortex®-M0+ processor included that features low-power operation. It has a guaranteed operating temperature of up to 105°C. It incorporates a lot of serial interface circuits and an LCD driver. It is suitable for various kinds of battery-driven controller applications.

Products	Display	Operation clock			Supply current	Supply voltage [V]	Memory		I/O	Timer				SIO					Other specification, Package (Form of delivery)							
	LCD Driver seg x com	High speed [Hz] (Max.)	Low speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep/Halt/operating (32K)/operating (1M) [μA] (Typ.)		Flash ROM [Byte]	RAM [Byte]	I/O port ※6	16-bit	16-bit PWM	WDT	Real Time Clock	UART	SPI	QSPI	I ² C	IR remote control circuit		Sound generator	R/F converter, 24-bit	A/D converter, 12-bit	DMA	USB	SVD ※4	Temperature sensor
S1C31W65	52 x 8 56 x 4	33M	32.768k	1M/2M/8M/12M/16M/24M/32M/32k	0.3/1.5/195	1.8 to 5.5 ※6	128K ※3	16K	64	8	3x4	1	1	2	2	—	2	1	1	1	7	4	—	1	1	Maximum operating temperature 105°C, TQFP15-100
S1C31W73	96 x 16 88 x 24 80 x 32	33M	32.768k	1M/2M/8M/12M/16M/24M/32M/32k	0.7/2.0/214	1.8 to 5.5 ※6	384K ※3	32K	73	8	2x4	1	1	2	2	1	2	1	1	1	7	4	2.0FS Dev	1	1	Maximum operating temperature 105°C, QFP21-216, Chip
S1C31W74	88 x 16 80 x 24 72 x 32	21M	32.768k	1M/2M/8M/12M/16M/20M	0.4/1.7/10/250	1.8 to 3.6 ※1,2	512K ※3	128K	71	4	2x2	1	1	2	1	—	2	1	1	1	—	4	2.0FS Dev	2	—	Chip, VFBGA8H-181

- ※1: During erasing / programming in flash memory (V_{DD}): 2.4 to 3.6V
- ※2: LCD operation (V_{DD}): 2.5 to 3.6V
- ※3: Flash memory could be erased/programmed by internal power as well.
- ※4: SVD is an abbreviation for Supply Voltage Detector.
- ※5: Including Input port and Output port.
- ※6: During erasing / programming in flash memory (V_{DD}): 2.2V to 5.5V.

ASSPs

3

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3-1 Display Controllers

Our LCD controllers feature high performance, low power consumption which was achieved by applying an original architecture based on our own “saving technology”. These LCD controllers can be used on a variety of CPUs. Since the product line-up listed below allows to support a wide range of LCD panels, including those from small to large scale and those from monochrome to color, these controllers are best suited to mobile devices, OA devices, FA devices and vehicle-mounted devices.

■ LCD controller

Products	CPU Interface Support	LCD Interface Support				Color Depth (Max.)	Internal Memory Capacity	External Memory Capacity	Supply Voltage		Additional features	Package
		Mono-chrome STN	Color STN	TFT	Typical resolution				Core	IO		
S1D13700F02A	8-bit I/F, Direct addressing Indirect addressing	4-bit	n/a	n/a	QVGA	16 grayscale	32KB, SRAM	n/a	3.0V to 3.6V	3.0V to 5.5V	3 overlay screens	TQFP13-64
S1D13705F00A	8-bit I/F (with external logic) 16-bit I/F, Direct addressing	4-bit / 8-bit	4-bit / 8-bit	9-bit / 12-bit	QVGA	MSTN: 16 grayscale CSTN: 256K colors TFT: 256K colors	80KB, SRAM	n/a	2.7V to 3.6V	2.7V to 5.5V	SwivelView	QFP14-80
S1D13706F00A	8-bit I/F (with external logic), 16-bit I/F, Direct addressing	4-bit / 8-bit	4-bit / 8-bit / 16-bit	9-bit / 12-bit / 18-bit	QVGA	MSTN: 64 grayscale CSTN: 64K colors TFT: 64K colors	80KB, SRAM	n/a	1.8V to 3.6V	1.8V to 3.6V	SwivelView, Picture in picture	TQFP15-100
S1D13709F00A	8-bit I/F Direct addressing Indirect addressing	4-bit	n/a	4-bit mono/ 6-bit color	QVGA	MSTN: 16 grayscale TFT: 64 colors	32KB, SRAM	n/a	3.0V to 5.5V	3.0V to 5.5V	3 overlay screens	QFP14-80
S1D13742F01A	8-bit /16-bit I/F Indirect addressing	n/a	n/a	18-bit	VGA	256K colors	768KB, SRAM	n/a	1.4V to 1.6V	1.65V to 3.60V	SwivelView	QFP20-144
S1D13743F00A	8-bit /16-bit I/F Indirect addressing	n/a	n/a	18-bit / 24-bit	WQVGA	16M colors	464KB, SRAM	n/a	1.4V to 1.6V	1.65V to 3.60V	SwivelView	QFP20-144
S1D13748F00A	16-bit I/F, Indirect addressing	n/a	n/a	18-bit / 24-bit	WVGA	64K colors	1024KB, SRAM	n/a	1.35V to 1.65V	1.62V to 3.60V	Picture in picture	QFP20-144
S1D13748B00B	16-bit I/F, Indirect addressing	n/a	n/a	18-bit / 24-bit	WVGA	64K colors	1024KB, SRAM	n/a	1.35V to 1.65V	1.62V to 3.60V	Picture in picture	PFBGA10U-121
S1D13781F00A	8-bit / 16-bit I/F, Direct addressing Indirect addressing, SPI	4-bit / 8-bit	8-bit / 16-bit	16-bit / 18-bit / 24-bit	WQVGA	MSTN: 64 grayscale CSTN: 64K colors TFT: 16M colors	384KB, SRAM	n/a	1.35V to 1.65V	1.62V to 3.60V	PinP, α-Blend, 2D BitBLT	QFP15-100
S1D13A04F00A	8-bit I/F (with external logic) 16-bit I/F, Direct addressing	4-bit / 8-bit	4-bit / 8-bit / 16-bit	9-bit / 12-bit / 18-bit	QVGA	MSTN: 64 grayscale CSTN: 64K colors TFT: 64K colors	160KB, SRAM	n/a	1.8V to 2.75V	3.0V to 3.6V	2D BitBLT, SwivelView, USB client 1.1	TQFP15-128
S1D13A05B00B	8-bit I/F (with external logic) 16-bit I/F, Direct addressing	4-bit / 8-bit	4-bit / 8-bit / 16-bit	9-bit / 12-bit / 18-bit	QVGA	MSTN: 64 grayscale CSTN: 64K colors TFT: 64K colors	256KB, SRAM	n/a	1.8V to 2.75V	3.0V to 3.6V	2D BitBLT, SwivelView, USB client 1.1	PFBGA10U-121
S1D13513F01A	16-bit I/F, Direct addressing, Indirect addressing, Serial I/F	8-bit	8-bit	18-bit	XGA	MSTN: 64 grayscale CSTN: 256K colors TFT: 256K colors	n/a	Up to 16MB SDRAM	1.65V to 1.95V	3.0V to 3.6V	2D Sprite, 2D BitBLT	QFP22-208
S1D13513B01B	16-bit I/F, Direct addressing, Indirect addressing, Serial I/F	8-bit	8-bit	18-bit / 24-bit	XGA	MSTN: 64 grayscale CSTN: 256K colors TFT: 16M colors	n/a	Up to 64MB SDRAM	1.65V to 1.95V	3.0V to 3.6V	2D Sprite, 2D BitBLT	PBGA1U-256
S1D13517F00A	8-bit /16-bit I/F, Indirect addressing	n/a	n/a	18-bit / 24-bit	SVGA	16M colors	n/a	Up to 16MB SDRAM	2.3V to 2.7V	3.0V to 3.6V	Picture in picture α-Blend	QFP15-128
S1D13U11F00A	USB2.0 HS	n/a	n/a	18-bit / 24-bit	SVGA	16M colors	n/a	Up to 16MB SDRAM	1.65V to 1.95V	3.0V to 3.6V	PinP α-Blend	QFP20-144

■ Simple LCD controller

Products	CPU Interface Support	LCD Interface Support				Color Depth (Max.)	Internal Memory Capacity	External Memory Capacity	Supply Voltage		Additional features	Package
		Mono-chrome STN	Color STN	TFT	Typical Resolution				Core	IO		
S1D13L01F00A	8-bit / 16-bit I/F, Direct Addressing, Indirect Addressing, SPI	n/a	n/a	16-bit / 18-bit / 24-bit	WQVGA	16M colors	384KB SRAM	n/a	1.35V to 1.65V	1.62V to 3.6V	Picture in Picture	QFP15-128
S1D13L02F00A	16-bit I/F, Indirect Addressing	n/a	n/a	18-bit / 24-bit	WVGA	16M colors	1024KB, SRAM	n/a	1.35V to 1.65V	1.62V to 3.6V	Picture in Picture	QFP22-208
S1D13L03F00A	8-bit / 16-bit I/F, Indirect Addressing	n/a	n/a	18-bit	WVGA	256K colors	768KB SRAM	n/a	1.4V to 1.6V	1.65V to 3.6V	n/a	QFP21-176
S1D13L04F00A	16-bit I/F, Direct Addressing, Indirect Addressing, Serial I/F	n/a	n/a	18-bit	XGA	256K colors	n/a	Up to 16MB, SDRAM	1.65V to 1.95V	3.0V to 3.6V	Picture in Picture, Alpha Blend	QFP22-208

■ LCD controller with camera I/F

Products	CPU Interface Support	LCD Interface Support				Color Depth (Max.)	Internal Memory Capacity	External Memory Capacity	Camera (pixel)	JPEG Codec	Supply Voltage		Additional features	Package
		Mono-chrome STN	Color STN	TFT	Typical resolution						Core	IO		
S1D13515F00A	16-bit I/F, Direct addressing, Indirect addressing, Serial I/F	n/a	n/a	18-bit / 24-bit	XGA	16M colors	n/a	Up to 64MB SDRAM	0.3MP	n/a	1.65V to 1.95V	3.0V to 3.6V	Prewarping Embedded RISC CPU	QFP22-256
S1D13719B00B	16-bit I/F, Direct addressing, Indirect addressing	n/a	n/a	18-bit / 24-bit	QVGA	16M colors	512KB, SRAM	n/a	2.0MP	Encode/Decode	1.65V to 1.95V	2.30V to 3.25V	2D BitBLT, SwivelView, SD memory card I/F	PFBGA10U-180

■ Memory display controller

Products	CPU Interface Support	Panel Interface Support	Color Depth (Max.)	Internal Memory Capacity	Supply Voltage	Additional Features	Package
S1D13C00F00C S1D13C00B00C	SPI, QSPI, Indirect 8-bit	6-bit color MIP, 3-bit or 1-bit Memory LCD with SPI	64 colors	96KB	1.8V to 5.5V	RTC, SPI, QSPI, I ² C, DMAC, Sound Generator, IR remote control transmitter	TQFP13-64 WCSP64

■ LCD controller for automotive

Products	CPU Interface Support	LCD Interface Support				Color Depth (Max.)	Internal Memory Capacity	External Memory Capacity	Camera (pixel)	JPEG Codec	Supply Voltage		Temp. Range	Additional features	Package
		Mono-chrome STN	Color STN	TFT	Typical resolution						Core	IO			
S2D13719F00A	16-bit I/F, Direct addressing, Indirect addressing	n/a	n/a	18-bit / 24-bit	QVGA	16M colors	512KB, SRAM	n/a	2.0MP	Encode/Decode	1.65V to 1.95V	2.3V to 3.6V	-40 to 105°C	2D BitBLT, SwivelView, SD memory card I/F	QFP22-208

■ In-vehicle multi-camera interface IC

Products	Supported CPU interface	Function	Operating temperature range	Supply voltage			Package
				Core	IO	Analog signals	
S2D13P04F00A	I ² C SPI	Including four channels of NTSC/PAL decoders 8-bit digital output (supporting ITU-R BT656) Equipped with multi-image synthesis mode Distortion correction function	-40°C to +85°C	1.65V to 1.95V	3.0V to 3.6V	3.0V to 3.6V	QFP15-100
S2D13P04B00B							PFBGA10U-121
S2S65P10F00A	I ² C	8-bit digital output (supporting ITU-R BT656) Equipped with multi-image synthesis mode	-40°C to +105°C	1.8V±0.15V	2.4V to 3.6V	—	QFP15-100

3-2 Speech & Audio

■ Speech & Audio

Products	Sound Processing Function	Sound Flash	external SPI-Flash	Host Interface	Standalone Mode	Internal Oscillator	Supply Voltage	Temperature Range	Package
S1V3F351	2ch Mixing Play Realtime Voice Speed Conversion Realtime Voice Pitch Conversion Epson High Quality High Compress Format/PCM Sampling Frequency 15.625kHz Bitrate 24/16kbps Buzzer Voice/Melody	Approx 30sec	Support (Up to 16MB)	SPI/I2C/ UART	Support	Support	Sound Play: 2.2~5.5v Flash Write: 2.2~5.5v	-40°C~85°C	TQFP12-48
S1V3F352	2ch Mixing Play Realtime Voice Speed Conversion Epson High Quality High Compress Format/PCM Sampling Frequency 15.625kHz Bitrate 40/32/24/16kbps Buzzer Voice/Melody	Approx 80 sec					Sound Play: 2.2~5.5v Flash Write: 2.4~5.5v		TQFP12-48
S1V3G340F00A S1V3G340F01A S1V3G340F02A	Epson High Quality High Compress Format/PCM Sampling Frequency 16kHz Bitrate 40/32/24/16kbps	—					—		—

3-3 USB Controllers

■ USB HUB controller

Products	Supply voltage (V)	Features	Package
S2R72A42F12C S2R72A43F12C S2R72A44F12C	3.3/1.8	<ul style="list-style-type: none"> ●S2R72A42 · · High Speed x 2 Down Stream Port ●S2R72A43 · · High Speed x 2 Down Stream Port + Full Speed x 1 Down Stream Port ●S2R72A44 · · High Speed x 2 Down Stream Port + Full Speed x 2 Down Stream Port ●Operating temperature range -40°C to + 105°C ●For automotive applications. AEC-Q100 compliant (QFP12-48) 	QFP12-48 SQFN7-48
S2R72A54F12E	3.0 to 3.6	<ul style="list-style-type: none"> ●High Speed x 4 Down Stream Port ●Operating temperature range -40°C to + 105°C ●For automotive applications. AEC-Q100 compliant 	QFP12-48 SQFN6-36

■ USB re-synchronization IC

Products	Supply voltage (V)	Features	Package
S2R72A21F05E	3.3 to 3.6	<ul style="list-style-type: none"> ●Excellent data communication characteristics of HS (480Mbps) ●Automatic USB line monitor and control function ●Operating temperature range -40°C to + 105°C ●For automotive applications. AEC-Q100 compliant 	SQFN5-32

3-4 Thermal-head Drivers

■ Thermal-head driver

Products	Logic supply voltage range V	Output withstand voltage V (Max.)	Output current mA (Max.)	Clock frequency MHz (Max.) [#]	Number of driver outputs	Description	Package
S1D53230D0A0	3.3 / 5 ±10%	50	10 / 13	35[12 / 16]	128	One side output 400dpi	Bare Chip
S1D56200D0A0	5±10%	32	70	7 [6]	64	One side output 200dpi	
S1D56220D0A0	3 / 3.3 / 5 ±10%	9	60	7[5] / 7[5] / 10[8]	64	One side output 200dpi, Battery Use	
S1D56240D0A0	3.3 / 5 ±10%	10	60	4[3] / 10[8]	64	One side output 200dpi, Battery Use	
S1D56520D0A0	3.3 / 5 ±10%	32	10 / 13.5	30	128	One side output 300dpi	
S1D56540D0A0			50	16[12 / 16]			
S1D56570D0A0	3.3 / 5 ±10%	32	50	12/16[12 / 16]	64	One side output 300dpi	
S1D56580D0A0				16/20[12 / 16]	96		
S1D56700D0A0	5±10%	32	50	10 [8]	64	300dpi 3-step latch Heat history control	
S1D56710D0A0						300dpi 5-step latch Heat history control	
S1D56730D0A0						600dpi 5-step latch Heat history control	
S1D56730D0A0			15	16 [16]	128		

: In case of cascade connection

3-5 EPD Drivers

■ Segment type EPD driver

The S1D14F00 series is EPD driver ICs that is good for a segment type E-paper with small display capacity. These driver ICs can expand the segment display domain when coupled with the S1C17F00 that is 16-bit MCU embedded EPD drivers. This combination has high efficiency of battery power to meet E-paper characteristics.

S1D14F00 series

Products	Supply voltage range (V)	EPD voltage range (V)	Driver output Segment (TP/BP)	Flash (bit)	Command Interface	Built-in oscillator [MHz]	Package	Remarks
S1D14F57	1.75 to 5.5	9.15/12.30/15.45	256 (2TP/2BP)	16k (Note1)	I ² C Slave SPI Slave	2	Bare Chip	Built-in power circuit for EPD Temperature Sensor Power on Reset

Note1: During programming in flash memory 7.0V(Typ)

Real Time Clock Modules

4

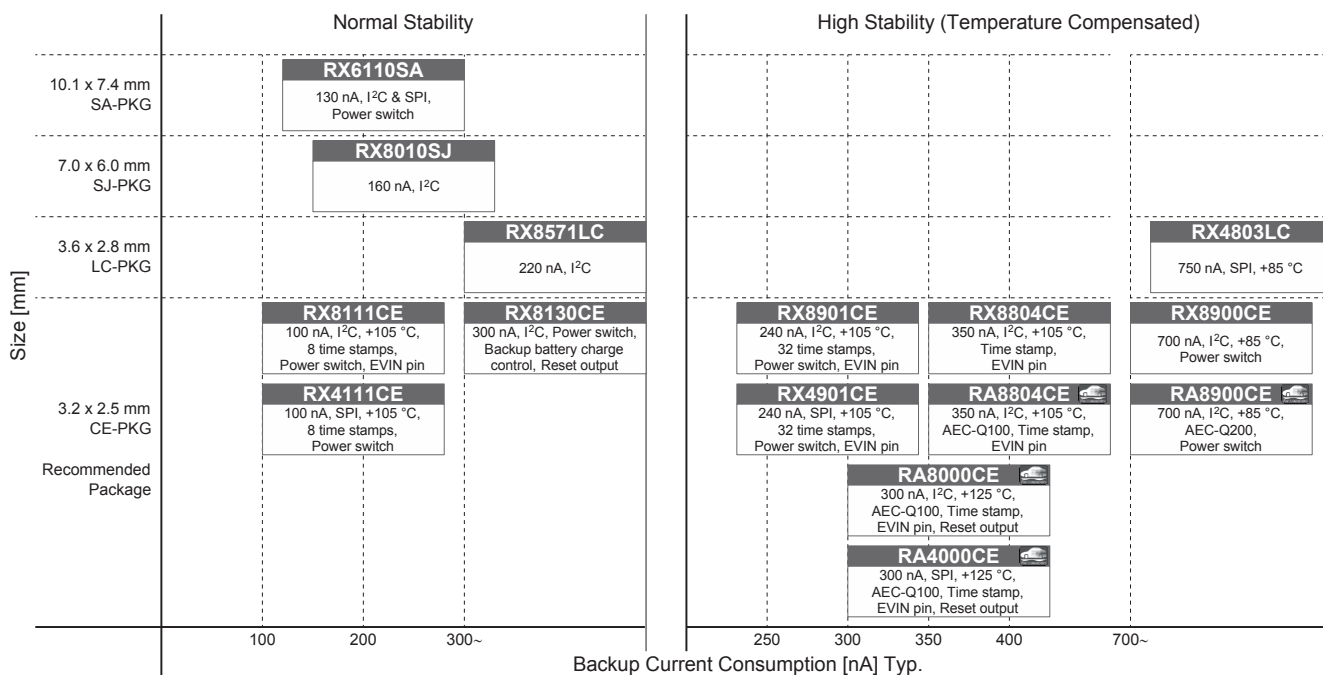
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4-1 Real Time Clock Modules (RTC modules)

Epson's crystal integrated RTC modules offer variety of features such as lower power, accurate clock/date information, Wake-up Timer, Power Switch, and Time-Stamp function. This will help your system lower power with multi-functionality.

Features

- Our lower power design enables our RTC modules to store abnormality on system and time errors even when the main MCU is not in operation
- Tuning Fork Crystal unit and DTCXO (Some products only) integrated RTC modules can assure and manage time information with higher accuracy



Features and Functions

Category	Summary	Use case recommendations, etc
Frequency Tolerance	The variance based on 32.768 kHz under the operating temperature on the integrated crystal inside. For an RTC module, $\pm 23 \times 10^{-6}$ approximately equals to 1 minute per month. Crystal unit inside has a quadratic curve whose peak temperature stays at a room temperature. Therefore, time accuracy varies depending on the external temperature. Epson also offers temperature compensated RTC modules whose clock accuracy has been already adjusted within the operating temperature. (DTCXO)	Temperature compensated models are suitable when.. -your system will be installed outside or a hotter place where the temperature may change drastically. -your system needs time accuracy with a standalone condition (Best accuracy option: $\pm 3.4 \times 10^{-6} \approx 9$ seconds per month)
Backup current consumption	Consumption value when RTC module is individually in operation, whereas the system's main MCU is on sleep mode. " Max." shows the maximum value within the operating temperature (Ta).	Lower power RTC modules are suitable for - your system that operates with a battery. - your system that goes to sleep-mode for a long period Our low power RTC modules can manage time information or system behavior for a long term.
Time-Stamp function	This stores the time data when an event occurs. Time-stamp functions followed by several triggers. For products with EVIN pin, triggers interlock with EVIN pin inputs. For products without EVIN pin, triggers interlock with RTC module's internal operation or Bus access.	RTC modules with time-stamp are suitable for applications such as - anti-tampering for smart meters or security systems - abnormality detection for factory automation
Power Switch	This monitors the main power condition, and this will automatically change the power source to back-up mode when the voltage on the main power reduces. Please refer to application manuals for details since functions vary depending on each product.	By simplifying Diode-OR circuit, it will help reduce a leak current, as well as utilize an engineering resource and PCB area.

3.2 x 2.5 x 1.0t (CE package) Recommendation package

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [µA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	+85 °C to +105 °C	+105 °C to +125 °C	Typ. (25 °C)	Max. (Ta = Max.)						
RX8901CE	I ² C	-40	+105	-	± 3.0 ± 5.0	± 5.0 ± 8.0	-	0.24	1.5	32 times	✓	2 or 3	256 bit	24 bit x 1 ch. to 32 years	
RX4901CE	SPI	-40	+105	-	± 3.0 ± 5.0	± 5.0 ± 8.0	-	0.24	1.5	32 times	✓	0 to 2	256 bit	24 bit x 1 ch. to 32 years	
RA8000CE (AEC-Q100)	I ² C	-40	+125	-	± 5.0	± 8.0	± 50.0	0.3	1.7	2 times	-	0 or 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin
RA4000CE (AEC-Q100)	SPI	-40	+125	-	± 5.0	± 8.0	± 50.0	0.3	1.7	2 times	-	0 to 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin

3.2 x 2.5 x 1.0t (CE package) Recommendation package

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	+85 °C to +105 °C	+105 °C to +125 °C	Typ. (25 °C)	Max. (Ta=Max.)						
RX8111CE	I ² C	-40	+105	±11.5 ±23.0	-	-	-	0.1	0.45	8 times	✓	1	512 bit	24 bit x 1 ch. to 32 years	
RX4111CE	SPI	-40	+105					0.1	0.45	8 times	✓	-	512 bit	24 bit x 1 ch. to 32 years	
RX8804CE	I ² C	-40	+105	-	±3.4 ±5.0	±8.0	-	0.35	1.5	1 time	-	1	-	16 bit x 1 ch. to 7.5 years	SOUT pin
RX8130CE	I ² C	-40	+85	5±23	-	-	-	0.3	0.5	-	✓	-	-	16 bit x 1 ch. to 7.5 years	Backup battery charge control, Reset output with Delay
RX8900CE	I ² C	-40	+85					0.7	1.4	-	✓	-	-	12 bit x 1 ch. to 2.8 days	Built-in Temp. Sensor
RA8804CE (AEC-Q100)	I ² C	-40	+105		±3.4 ±5.0	±8.0	-	0.35	1.5	1 time	-	1	-	16 bit x 1 ch. to 7.5 years	SOUT pin
RA8900CE (AEC-Q200)	I ² C	-40	+85					0.7	1.4	-	✓	-	-	12 bit x 1 ch. to 2.8 days	Built-in Temp. Sensor

3.6 x 2.8 x 1.2t (LC package / VSOJ-12 pin)

Model	Interface	Specifications								Functions						
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others	
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta=Max.)								
RX-8803LC	I ² C	-40	+85		±3.4 ±5.0			0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS	
RX-4803LC	SPI						0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS		
RX-8035LC	I ² C			5±23 5±5 0±5			0.4	1.2	1 time	✓	1	-	-	-	-	-
RX-4035LC	SPI						0.4	1.2								
RX-8731LC	I ² C								0.35	1.4	-	-	-	EEPROM: 80 bit ID-ROM: 48 bit	to 2.8 days	
RX-8571LC	I ² C			5±23					0.22	0.4	-	-	-	128 bit	to 7.5 years	DAS pin
RX-4571LC	SPI								0.32	0.95	-	-	-	-	to 2.8 days	
RX-8564LC	I ² C								0.275	0.7	-	-	-	-	to 255 min.	

6.3 x 5.2 x 1.4t (NB package / SON-22 pin)

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta=Max.)							
RX-8025NB	I ² C	-40	+85	5±5 0±5				0.48	1.2	-	-	-	-	-	
RX-4045NB	SPI						0.48	1.2	-	-	-	-	-		
RX-8571NB	I ² C			5±23			0.2	0.4	-	-	-	-	128 bit	to 7.5 years	DAS pin
RX-4571NB	SPI						0.32	0.95	-	-	-	-	-	to 2.8 days	

7.0 x 6.0 x 2.65t (SJ package / SOP-8 pin)

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta=Max.)							
RX8010SJ	I ² C	-40	+85	5±23	-	-		0.16	0.32	-	-	-	128 bit	to 7.5 years	Common pin connection with SOP-8

10.1 x 7.4 x 3.3t (SA package / SOP-14 pin)

Model	Interface	Specifications						Functions									
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]			Backup current consumption [µA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others			
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta=Max.)									
RX6110SA	SPI & I ² C	-40	+85	5±23	-	-	0.16	0.32	-	✓	-	128 bit	to 7.5 years				
RX8900SA	I ² C			-			0.7	1.4	-	✓	-	-	-	to 2.8 days	Built-in Temp. Sensor		
RX-8803SA	I ² C						0.75	2.1	-	-	1	-	-	to 2.8 days	Time sync. with 1 PPS		
RX-4803SA	SPI						0.75	2.1	-	-	1	-	-	to 2.8 days	Time sync. with 1 PPS		
RX-8035SA	I ² C						5±23 5±5 0±5			0.35	1.2	1 time	✓	2	-	-	
RX-4035SA	SPI						0.35	1.2	1 time	✓	2	-	-	-	-		
RX-8025SA	I ² C						0.48	1.2	-	-	-	-	-	-	-		
RX-4045SA	SPI						0.48	1.2	-	-	-	-	-	-	-		
RX-8571SA	I ² C						5±5 0±5			0.2	0.4	-	-	-	128 bit	to 7.5 years	DAS pin
RX-4571SA	SPI						5±23			0.32	0.95	-	-	-	-	to 2.8 days	
RA8803SA (AEC-Q200)	I ² C									0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS
RA4803SA (AEC-Q200)	SPI									0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS
RA-4565SA (AEC-Q200)	SPI						5±23	-		0.8	1.6	-	-	-	-	to 255 min.	

Package Information

5

QFP, QFN, BGA

WCSP

COF, TCM

Resin-core bump packaging
technology

Package Lineup

Package Externals

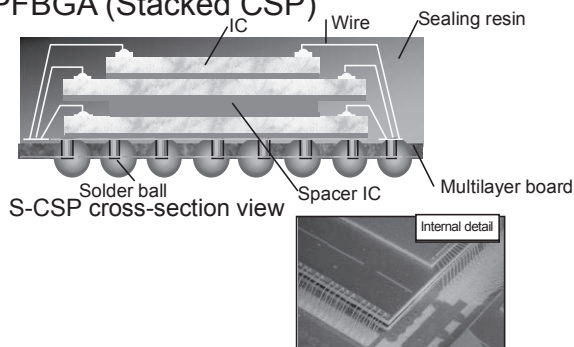
5-1 Introduction of Typical Package with High-Density Assembly

This package allows you to develop lightweight and compact products friendly to the environment by integrating the low power CMOS LSI, that is a key device, with the high density assembly, that is a key technology.

Seiko Epson has pursued the particular assembly technology by integrating miniaturization technology (cultivated by watch manufacturing) with low power technology, including CMOS LSI technology.

Seiko Epson intends to proceed reinforcing the global and speedy technical development power and exposing information for IT and digital network society that will continue to evolve further today. Seiko Epson will timely propose the thin, light-weight, and high-density assembly technology as the total solution, which enhances the commercial value when you envisage the development of products.

■PFBGA (Stacked CSP)

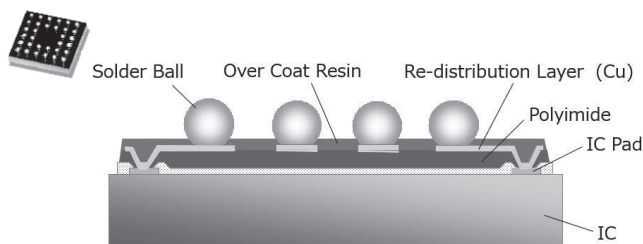


PFBGA allows you to greatly reduce the mounting area by mix and layer-stacking IC chips in one package, and to mix-load memory, microcomputer, sound source ICs and so on according to your system requirements.

Outline specifications

Connection method: Wire bonding connection
 Package height : 1.4mm Max.
 (3chips Max. + Spacer)
 1.2mm Max.
 (Max. 2chips)
 Ball pitch : Min. 0.5mm

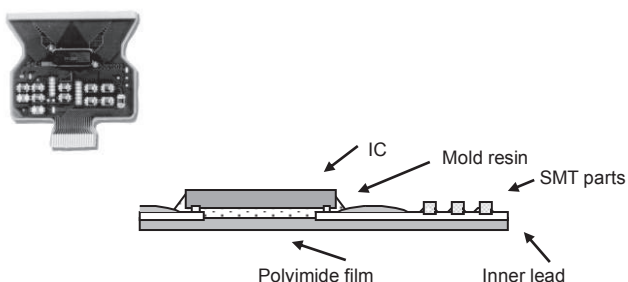
■WCSP



The Wafer Level Chip Size Package (WCSP) is optimum as a light weight, compact and thin package of portable devices that require high-density packaging. The WCSP is available in RTC, PLL and other medium and small pin device applications.

- Space saving package with full real chip size
- Ball pitch: 0.65/0.5/0.4mm pitch
- Under-filling is not required because this package provides a stress reduction structure at secondary mounting.
- This package facilitates changing from a conventional interposer-type package; so, it enables you to replace bare-chip mounting (wire bonding or face-down bonding) with SMT mounting.

■COF, TCM (Tape Carrier Module)



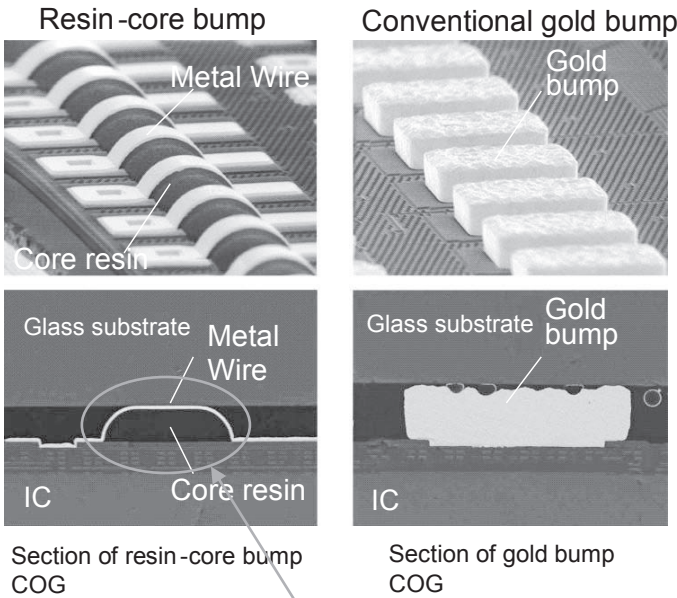
IC chips and SMT parts are mounted on a film substrate to realize not only a thin packaging but also a lightweight, compact and high-density package of high degree of freedom.

Also, gold or tin-plated lead can be bonded to gold bumps, and this inner lead bonding method has a characteristic of low impedance. This package is applicable mainly to LCD drivers and composite modules loaded with a driver and peripheral devices and customizable with them.

- Gold or tin -plated outer lead
- Package thickness : Less than 1mm
- Ease of multi-pin use

■ Resin-Core Bump COG Mounting technology

The resin core bump technology allows bonding to an elastic resin as the core (having almost the same height as the conventional bump) and metal wirings on the core. This technology replaces the conventional gold bump, forms the bump on IC pins and allows direct bonding of bump wiring and the wiring on the substrate (ITO coating and others) without using ACF particles while maintaining the resin's elastic characteristics.

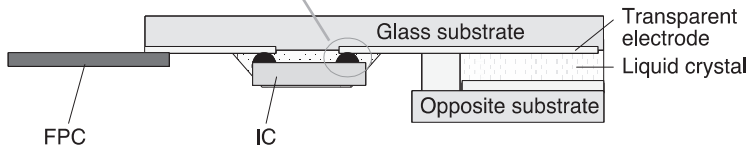


Because the resin is much more elastic than ACF particles (several $\mu\text{m}\phi$), the traceability (or connection stability) to the variation of substrate or IC thickness and others can be significantly improved.

This technology can go a long way to solving the problems of conventional COG technology, such as the poor connection stability (point connection) due to the use of low-elastic ACF particle collection, and poor insulation between bumps.

Although the current application of this technology is COG-packaging LCD drivers and other devices, it is anticipated that it will be applicable to other packaging designs in the future.

- Significantly improves connection reliability.
- Allows fine bump pitch through photolithography technology.
- Allows highly flexible bump layout through relocation wiring technology.
- Minimizes environmental load because the soldering process is not used.



5-2 Package Lineup

■PFBGA (Plastic Fine-pitch Ball Grid Array)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Ball pitch	Storage rank
48	PFBGA7U-48	P-TFBGA-048-0707-0.80	7 X 7	1.2	0.8	MSL2a
60	PFBGA5U-60	P-TFBGA-060-0505-0.50	5 X 5	1.2	0.5	MSL2a
81	PFBGA8U-81	P-TFBGA-081-0808-0.80	8 X 8	1.2	0.8	MSL2a
96	PFBGA6U-96	P-TFBGA-096-0606-0.50	6 X 6	1.2	0.5	MSL2a
100	PFBGA7U-100	P-TFBGA-100-0707-0.65	7 X 7	1.2	0.65	MSL2a
112	PFBGA8U-112	P-TFBGA-112-0808-0.65	8 X 8	1.2	0.65	MSL2a
121	PFBGA8U-121	P-TFBGA-121-0808-0.65	8 X 8	1.2	0.65	MSL2a
121	PFBGA10U-121	P-TFBGA-121-1010-0.80	10 X 10	1.2	0.8	MSL2a
144	PFBGA7U-144	P-TFBGA-144-0707-0.50	7 X 7	1.2	0.5	MSL2a
144	PFBGA10U-144	P-TFBGA-144-1010-0.80	10 X 10	1.2	0.8	MSL2a
160	PFBGA10U-160	P-TFBGA-160-1010-0.65	10 X 10	1.2	0.65	MSL2a
161	PFBGA8U-161	P-TFBGA-161-0808-0.50	8 X 8	1.2	0.5	MSL2a
177	PFBGA13U-177	P-TFBGA-177-1313-0.80	13 X 13	1.2	0.8	MSL2a
180	PFBGA10U-180	P-TFBGA-180-1010-0.65	10 X 10	1.2	0.65	MSL2a
180	PFBGA12U-180	P-TFBGA-180-1212-0.80	12 X 12	1.2	0.8	MSL2a
181	PFBGA8U-181	P-TFBGA-181-0808-0.50	8 X 8	1.2	0.50	MSL2a
208	PFBGA12U-208	P-TFBGA-208-1212-0.65	12 X 12	1.2	0.65	MSL2a
220	PFBGA14U-220	P-TFBGA-220-1414-0.80	14 X 14	1.2	0.8	MSL2a
256	PFBGA14U-256	P-TFBGA-256-1414-0.80	14 X 14	1.2	0.8	MSL2a
280	PFBGA16U-280	P-TFBGA-280-1616-0.80	16 X 16	1.2	0.8	MSL2a

■VFBGA (Very Thin Fine-pitch Ball Grid Array)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Ball pitch	Storage rank
49	VFBGA4H-49	P-VFBGA-049-0404-0.50	4 X 4	1.0	0.5	MSL2a
81	VFBGA5H-81	P-VFBGA-081-0505-0.50	5 X 5	1.0	0.5	MSL2a
81	VFBGA8H-81	P-VFBGA-081-0808-0.80	8 X 8	1.0	0.8	MSL2a
96	VFBGA6H-96	P-VFBGA-096-0606-0.50	6 X 6	1.0	0.5	MSL2a
121	VFBGA6H-121	P-VFBGA-121-0606-0.50	6 X 6	1.0	0.5	MSL2a
121	VFBGA10H-121	P-VFBGA-121-1010-0.80	10 X 10	1.0	0.8	MSL2a
144	VFBGA7H-144	P-VFBGA-144-0707-0.50	7 X 7	1.0	0.5	MSL2a
144	VFBGA10H-144	P-VFBGA-144-1010-0.80	10 X 10	1.0	0.8	MSL2a
161	VFBGA7H-161	P-VFBGA-161-0707-0.50	7 X 7	1.0	0.5	MSL2a
180	VFBGA10H-180	P-VFBGA-180-1010-0.65	10 X 10	1.0	0.65	MSL2a
181	VFBGA8H-181	P-VFBGA-181-0808-0.50	8 X 8	1.0	0.5	MSL2a
240	VFBGA10H-240	P-VFBGA-240-1010-0.50	10 X 10	1.0	0.5	MSL2a

■PBGA (Plastic Ball Grid Array)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Ball pitch	Storage rank
256	PBGA1UE256	P-LBGA-0256-1717-1.00	17 X 17	1.7	1.0	MSL3

■LQFP (Low profile Quad Flat Package)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Lead pitch	Lead shape	Storage rank
48	QFP12-48PIN	P-LQFP048-0707-0.50	7 X 7	1.7	0.5	STD	MSL2a
64	QFP13-64PIN	P-LQFP064-1010-0.50	10 X 10	1.7	0.5	STD	MSL3
80	QFP14-80PIN	P-LQFP080-1212-0.50	12 X 12	1.7	0.5	STD	MSL3
100	QFP15-100PIN	P-LQFP100-1414-0.50	14 X 14	1.7	0.5	STD	MSL3
128	QFP15-128PIN	P-LQFP128-1414-0.40	14 X 14	1.7	0.4	STD	MSL3
144	QFP20-144PIN	P-LQFP144-2020-0.50	20 X 20	1.7	0.5	STD	MSL3 *
176	QFP21-176PIN	P-LQFP176-2424-0.50	24 X 24	1.7	0.5	STD	MSL3 *
208	QFP22-208PIN	P-LQFP208-2828-0.50	28 X 28	1.7	0.5	STD	MSL3 *
216	QFP21-216PIN	P-LQFP216-2424-0.40	24 X 24	1.7	0.4	STD	MSL3 *
256	QFP22-256PIN	P-LQFP256-2828-0.40	28 X 28	1.7	0.4	STD	MSL3 *

* Some products must be stored under different conditions. Contact Epson for details.

■TQFP (Tin Quad Flat Package)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Lead pitch	Lead shape	Storage rank
48	TQFP12-48PIN	P-TQFP048-0707-0.50	7 X 7	1.2	0.5	STD	MSL2a
64	TQFP12-64PIN	P-TQFP064-0707-0.40	7 X 7	1.2	0.4	STD	MSL2a
64	TQFP13-64PIN	P-TQFP064-1010-0.50	10 X 10	1.2	0.5	STD	MSL2a *
100	TQFP15-100PIN	P-TQFP100-1414-0.50	14 X 14	1.2	0.5	STD	MSL3 *
128	TQFP15-128PIN	P-TQFP128-1414-0.40	14 X 14	1.2	0.4	STD	MSL3 *

* Some products must be stored under different conditions. Contact Epson for details.

■ QFN (Quad Flat Non-leaded Package)

Unit: mm

Number of pins	Epson package name	JEITA package name	Body size (Nom.)	Mounting height (Max.)	Lead pitch	Lead shape	Storage rank
16	SQFN4-16PIN	P-VQFN016-0404-0.65	4 X 4	1.0	0.65	STD	MSL2a
24	SQFN4-24PIN	P-VQFN024-0404-0.50	4 X 4	1.0	0.5	STD	MSL2a
32	SQFN4-32PIN	P-VQFN032-0404-0.40	4 X 4	1.0	0.4	STD	MSL2a
32	SQFN5-32PIN	P-VQFN032-0505-0.50	5 X 5	1.0	0.5	STD	MSL2a
36	SQFN6-36PIN	P-VQFN036-0606-0.50	6 X 6	1.0	0.5	STD	MSL2a
48	SQFN7-48PIN	P-VQFN048-0707-0.50	7 X 7	1.0	0.5	STD	MSL2a
64	SQFN9-64PIN	P-VQFN064-0909-0.50	9 X 9	1.0	0.5	STD	MSL2a
76	SQFN9-76PIN	P-VQFN076-0909-0.40	9 X 9	1.0	0.4	STD	MSL2a
80	SQFN9-80PIN	P-VQFN080-0909-0.40	9 X 9	1.0	0.4	STD	MSL2a

■ PLP (Plating Lead Package)

Unit: mm

Number of pins	Epson package name	Package name	Body size (Nom.)	Mounting height (Max.)	Lead pitch	Lead shape	Storage rank
8	PLP061616B-8PIN	(P-UPLP008-01.60x01.60-0.50)	1.6 X 1.6	0.65	0.5	STD	MSL2a
10	PLP062725A-10PIN	(P-UPLP010-02.50x02.70-0.50)	2.7 X 2.5	0.65	0.5	STD	MSL2a

■ Package diagrams, storage rank documents, and various environment-related information

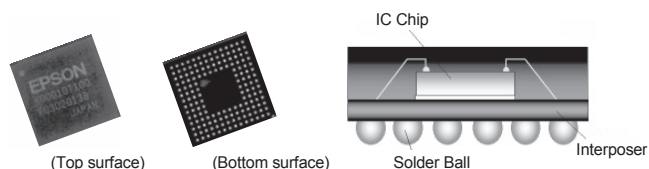
Available on the following Web page.

global.epson.com/products_and_drivers/semicon/

Information > Technical Information > Package Lineup

5-3 Package Externals

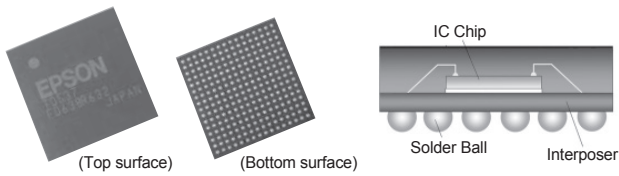
VFPGA (Very Thin Fine-pitch Ball Grid Array) &
PFPGA (Plastic Fine-pitch Ball Grid Array)



PKG Type		Body Size (mm)	Ball Pitch (mm)
VFPGA4H-49		4 x 4 x 1.0	0.5
PFPGA5U-60		5 x 5 x 1.2	0.5
VFPGA5H-81		5 x 5 x 1.0	0.5
VFPGA6H-96 PFPGA6U-96		6 x 6 x 1.0 6 x 6 x 1.2	0.5
VFPGA6H-121		6 x 6 x 1.0	0.5
VFPGA7H-144 PFPGA7U-144		7 x 7 x 1.0 7 x 7 x 1.2	0.5
VFPGA7H-161		7 x 7 x 1.0	0.5
PFPGA8U-161		8 x 8 x 1.2	0.5
VFPGA8H-181 PFPGA8U-181		8 x 8 x 1.0 8 x 8 x 1.2	0.5
VFPGA10H-240		10 x 10 x 1.0	0.5
PFPGA7U-100		7 x 7 x 1.2	0.65
PFPGA8U-112		8 x 8 x 1.2	0.65
PFPGA8U-121		8 x 8 x 1.2	0.65
PFPGA10U-160		10 x 10 x 1.2	0.65

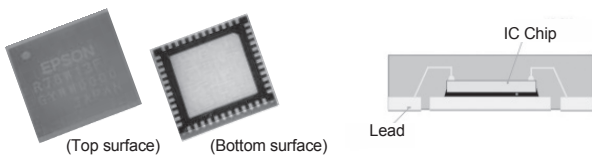
PKG Type		Body Size (mm)	Ball Pitch (mm)
PFPGA10U-180		10 x 10 x 1.2	0.65
PFPGA12U-208		12 x 12 x 1.2	0.65
PFPGA7U-48		7 x 7 x 1.2	0.8
VFPGA8H-81 PFPGA8U-81		8 x 8 x 1.0 8 x 8 x 1.2	0.8
VFPGA10H-121 PFPGA10U-121		10 x 10 x 1.0 10 x 10 x 1.2	0.8
VFPGA10H-144 PFPGA10U-144		10 x 10 x 1.0 10 x 10 x 1.2	0.8
PFPGA12U-180		12 x 12 x 1.2	0.8
PFPGA14U-220		14 x 14 x 1.2	0.8
PFPGA14U-256		14 x 14 x 1.2	0.8
PFPGA16U-280		16 x 16 x 1.2	0.8

PBGA (Plastic Ball Grid Array)



PKG Type		Body Size (mm)	Ball Pitch (mm)
PBGA1UE256		17 x 17 x 1.7	1.0

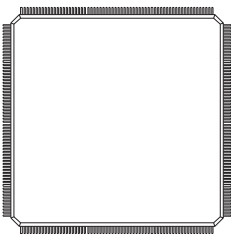
SQFN (Saw Quad Flat Non-ledged Package)



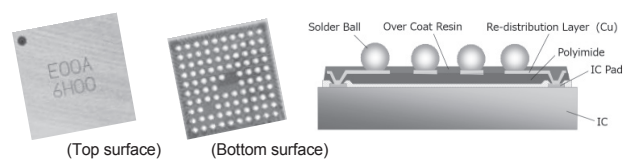
PKG Type		Body Size (mm)	Lead Pitch (mm)
SQFN4-24PIN		4 x 4 x 1.0	0.5
SQFN5-32PIN		5 x 5 x 1.0	0.5
SQFN6-36PIN		6 x 6 x 1.0	0.5
SQFN7-48PIN		7 x 7 x 1.0	0.5
SQFN9-64PIN		9 x 9 x 1.0	0.5



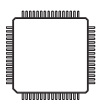
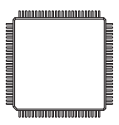
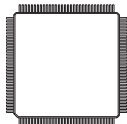
LQFP (Low profile Quad Flat Package) & TQFP (Thin Quad Flat Package)







PKG Type		Body Size (mm)	Lead Pitch (mm)
QFP12-48PIN		7 x 7 x 1.7	0.5
QFP13-64PIN		10 x 10 x 1.7	0.5
QFP14-80PIN		12 x 12 x 1.7	0.5
QFP15-100PIN		14 x 14 x 1.7	0.5
QFP15-128PIN		14 x 14 x 1.7	0.4
QFP20-144PIN		20 x 20 x 1.7	0.5
QFP21-176PIN		24 x 24 x 1.7	0.5
QFP22-208PIN		28 x 28 x 1.7	0.5

PKG Type	Body Size (mm)	Lead Pitch (mm)
QFP22-256PIN 	28 x 28 x 1.7	0.4

WCSP (Wafer level Chip Scale Package)



PKG Type	Body Size (mm)	Lead Pitch (mm)
TQFP12-48PIN 	7 x 7 x 1.2	0.5
TQFP12-64PIN 	7 x 7 x 1.2	0.4
TQFP13-64PIN 	10 x 10 x 1.2	0.5
TQFP15-100PIN 	14 x 14 x 1.2	0.5
TQFP15-128PIN 	14 x 14 x 1.2	0.4

Products	Ball Count	Body Size (mm)	Ball Pitch (mm)
WCSP-36 	36	2.5 x 2.5 x 0.34	0.35
WCSP-41 	41	3.4 x 2.6 x 0.7	0.4
WCSP-48 	48	3.9 x 3.9 x 0.9	0.5
WCSP-49 	49	3.0 x 3.0 x 0.8	0.4
WCSP-49 	49	4.2 x 4.2 x 0.8	0.5
WCSP-96 	96	4.5 x 4.5 x 0.7	0.4

1. General precautions for use of CMOS LSI devices

Epson's CMOS LSI devices are designed and manufactured to assure trouble-free operation when used under normal operating conditions. All products are subjected to stringent electrical and mechanical testing to ensure reliability, but users are strongly recommended to observe the following precautions when designing systems, handling or storing devices to minimize the chance of failure.

■ Cautions to be observed when designing

Use within the operating range

For circuits that use semiconductor products, design the circuit so that it operates within the recommended operating conditions. If the recommended operating conditions are exceeded, the specifications of the electrical characteristics of the semiconductor product cannot be guaranteed and reliability may be reduced.

The absolute maximum rating is a standard that must not exceed even one item or even temporarily. Exceeding the absolute maximum rating even temporarily may result in product deterioration or physical damage.

Therefore, design the circuit so that the absolute maximum rating is not exceeded even temporarily.

For products that generate a large amount of heat even within the operating range (if stated in the product specifications), design a circuit that takes derating into consideration for voltage, current, power, and temperature.

Handling of input/output control pins

When a noise such as spark and electrostatic is given from an input or output terminals, IC may malfunction.

Pay sufficient attention in product designing. Electromagnetic interference can cause ICs to operate erratically. Shield all interference sources in equipment that uses ICs.

Latch up phenomenon

Excessive electrical noise occurred to a power or input/output pin can cause ICs to latch up, resulting in device malfunction or damage. If this occurs, turn off the power, isolate the problem, then supply power again.

Protection against electrostatic discharge (ESD)

Although all pins are equipped with an anti-electro static circuit, electro static beyond the capacity may lead to breakage. Take appropriate countermeasures when handling ICs.

- Avoid using packing and transporting containers made of plastic. Use electrically conductive containers. Also, special care must be taken when handling ICs, by wearing an antistatic wrist strap or taking other possible measures.
- Use a soldering iron and test circuits without high voltage leakage with grounding.

■ Notes on storage

Storage condition

- Take care so that packages are not subjected to impact, vibration or water leakage.
- Do not store and use the product under conditions where moisture condensation may be formed due to rapid changes in temperature. Also, do not put load on products.
- When storing, avoid dusty locations or locations with corrosive gases.
- After a long period of storage, check to see that the pins are not discolored, solderability is not degraded, etc., before use.
- Check moisture-proof bags for tear or wear before use. Also check the silica gel in the bag has not absorbed moisture when the bag is opened.
- Storage conditions after opening a moisture proof-bag, soldering method and soldering temperature must meet the requirements specified by Epson for respective products.

■ Conditions of use environment

Precautions for use environment

Use the IC in the proper temperature and humidity. The humidity must be 85% or lower (to prevent dew condensation). In the environment where the IC is directly exposed to dust, salt, or acid gas such as SO₂, it may cause electrical leakage between leads or corrosion. In order to prevent such problems, apply corrosion-proof coatings to printed circuit boards and ICs.

Protection against excessive physical stresses and rapid temperature change

Do not expose ICs to excessive mechanical vibration, repetitive shock stress, or rapid temperature changes. These can cause the plastic package resin to crack and/or the bonding wires to break.

■ Precautions Against the Light Irradiation

Exposing semiconductor products to the light may cause malfunction, as the light affects the device characteristics. To prevent products from malfunction, please take into account the following points regarding semiconductor mounted substrates and products.

- During product design and assembly, please consider the product structure so that the bare die is shielded from light in actual use.
- In the testing process, please provide the light-shielded environment for the bare die under test.
- Please consider shielding light from the surface, back, and sides of the bare die, as bare die should be shielded from light entirely.

2. Package products

2.1 Cautions on surface mount

Mechanical stress

Minimize mechanical stress to a printed circuit board during or after soldering.

Package leads

As for a surface mount device, the pattern on a board and the lead of a package are soldered surface to surface. Although we are shipping products securing sufficient lead flatness for soldering, when handling, take care not to apply force otherwise it may result in deformation of the lead.

Signal leads on the package surface

Some packages are structured to expose a portion of the signal leads on the surface. When using these products, pay sufficient attention not to let the package be soiled. Also, handling with bare hands must be avoided.

■ Soldering precautions

Use infrared or air reflow or the combination of these methods for soldering.

Nitrogen reflow is recommended to inhibit the effects of oxidation and improve wettability.

Thermal stress to packages

Soldering process is recommended to be carried out in the shortest time at the lowest temperature to minimize thermal stress to packages. Settings of the soldering profile should be performed upon through confirmation that the state of soldering and reliability after soldering are optimized.

Solder reflow processing multiple times

If solder reflow is to be carried out multiple times, it should be performed within the allowable storage period specified as storage rank for each product. (Reflow is allowed twice.)

i. Hand soldering

Hand soldering using a soldering iron should be performed under the following conditions:

Maximum temperature of the soldering iron	Time	Times
350 °C	Within 5 sec per pin	Twice or less

Pay sufficient attention not to let a soldering iron contact any parts other than leads, such as a package body.

ii. Flow soldering

Flow soldering is not recommended.

2.2 Notes on storage

■ Moisture absorption and reliability

The resin used in surface-mount packages absorbs moisture over time even stored in room conditions. When IC packages are put into reflow ovens with much moisture absorption, the resin may have a crack or a delamination between the resin and lead frame may occur. Therefore, surface mount ICs must be kept under typical storage conditions shown below before reflow soldering.

■ Typical storage conditions and storage periods for (Surface-Mount) IC packages

● Before opening the moisture-proof packaging

Storage condition	Storage environments before opening the bag	
Before opening sealed moisture proof bag	30°C, 85% RH or less	Within 12 months (1 year)

● After opening the moisture-proof packaging Storage ranks and storage conditions

Storage rank	Storage environments after opening the bag	
MSL2	30°C, 70% RH or less	Within 12 months (1 year)
MSL2a	30°C, 70% RH or less	Within a month
MSL3	30°C, 70% RH or less	Within 168 hours(1 Week)
MSL4	30°C, 70% RH or less	Within 72 hours(3 days)

- Regarding the storage ranks of respective products (IC packages) after opening the moisture-proof bags, refer to the tables of storage ranks shown in 5-2 Package Lineup.

■ Surface-mount package baking conditions

When surface-mount IC packages before opening the moisture-proof package exceed the recommended storage periods, or their storage periods or storage conditions are unknown and therefore moisture absorption is a concern, it is recommended to dry-bake them before reflow soldering. This baking process will prevent the resin from cracking during soldering. When dry-baking, see below.

● Standard baking conditions for IC packages

Baking temperature	Baking hours	Max. Baking times
125±5°C	From 20 to 36 hours	Twice

- When surface-mount IC packages after opening the moisture-proof package exceed the recommended storage periods, or their storage periods or storage conditions are unknown and therefore moisture absorption is a concern, it is recommended to dry-bake them before reflow soldering.
- Storage conditions from the baking to the reflow soldering are the same as the above-mentioned storage conditions.

Note: If products are shipped in Tape & Reel, transfer the products into heatproof trays before baking.

3. Bare chips

■ General precautions

- Bare Die products have a higher risk of quality and reliability degrading depending on the handling method than general products.
- The passivation film applied on bare die products surface is not design to protect the die from external impact, but it is design to protect the internal metallization.
- Moisture and dust in the air and careless handling during assembly can cause defective products, so please take care adequately.
- Please perform sufficient evaluations for quality and reliability by the customer: such as testing and screening to detect failures.

■ Packing

- When bare dies are shipped, they are put in dedicated trays, and the trays are taped together so that dies are properly held in the trays during transportation. Then the trays are packed in antistatic bags. Do not open the bags more frequent than necessary to prevent foreign contamination to the dies. Also, do not leave trays open for prolonged time.

■ Bare chip storage precautions

- Allowable storage periods before and after opening the pack are maximum 12 months under the conditions mentioned below.
- If the bags are opened, assemble the products without much delay in order to prevent the bonding degradation caused by the quality change in the bonding pad surfaces.

■ Bare chip storage conditions and storage periods

State	Storage conditions	Allowable storage period
Before opening	Lower than 35°C, 80% RH point	6 months
After opening	Lower than 30°C, 80% RH point	30 days
	In dry N2 gas with dew point lower than -30°C	6 months

■ Precautions for Mounting Bare Die

- When mounting bare die, perform in a clean environment where it is not exposed to contaminated atmospheres or substances.
- Please use the bare die collet for pickup and die bonding. If foreign material adheres to the collet, process defects such as scratches on the bare die surface may occur. When using a collet with a surface that comes into contact with the bare die surface, periodic cleaning should be carried out.
- Do not clean bare dies. If bare dies have to be cleaned, extreme precaution must be carried out to ensure no residue remain on die surface.
- When mounting bare die, take sufficient countermeasures against static electricity.
- Insulate the back side of the bare dies before use (if it is stated in the product specifications, follow the description).

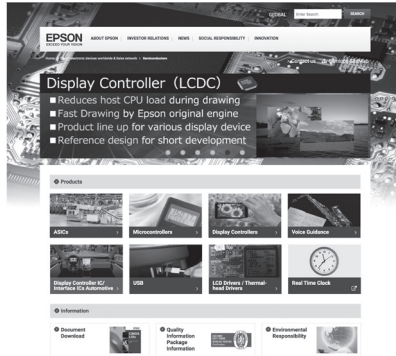
■ Material

- For sealing resins, use “semiconductor grade” products. This is recommended to prevent corrosion in bonding pads due to moisture absorption, and reduce internal stress due to temperature changes. Similar precautions must be taken for other materials to be used.

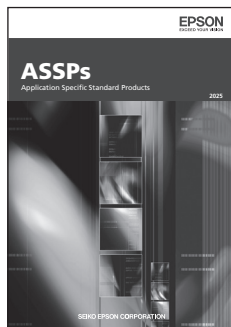
Information on CMOS LSI's

Epson provides a number of sources of information regarding its products, including catalogs, brochures, technical manuals, and software on the website.

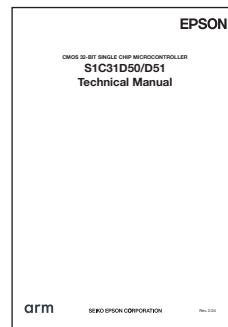
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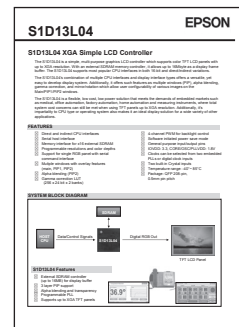
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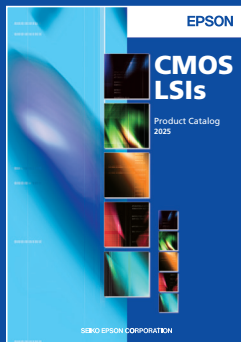
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