EPSON

Microcontrollers

2024

SEIKO EPSON CORPORATION

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.

Environmental management system third party certification status
ISO14001
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

ISO 14001
BUREAU VERITAS
Certification

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 oder to continue to creating products and services that please our customers and earn their trust. Epson's Semiconductor Business has acquired ISO9001 and IATF16949 certification with its IC, module and their application products.

Quality Management system third party certification status
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
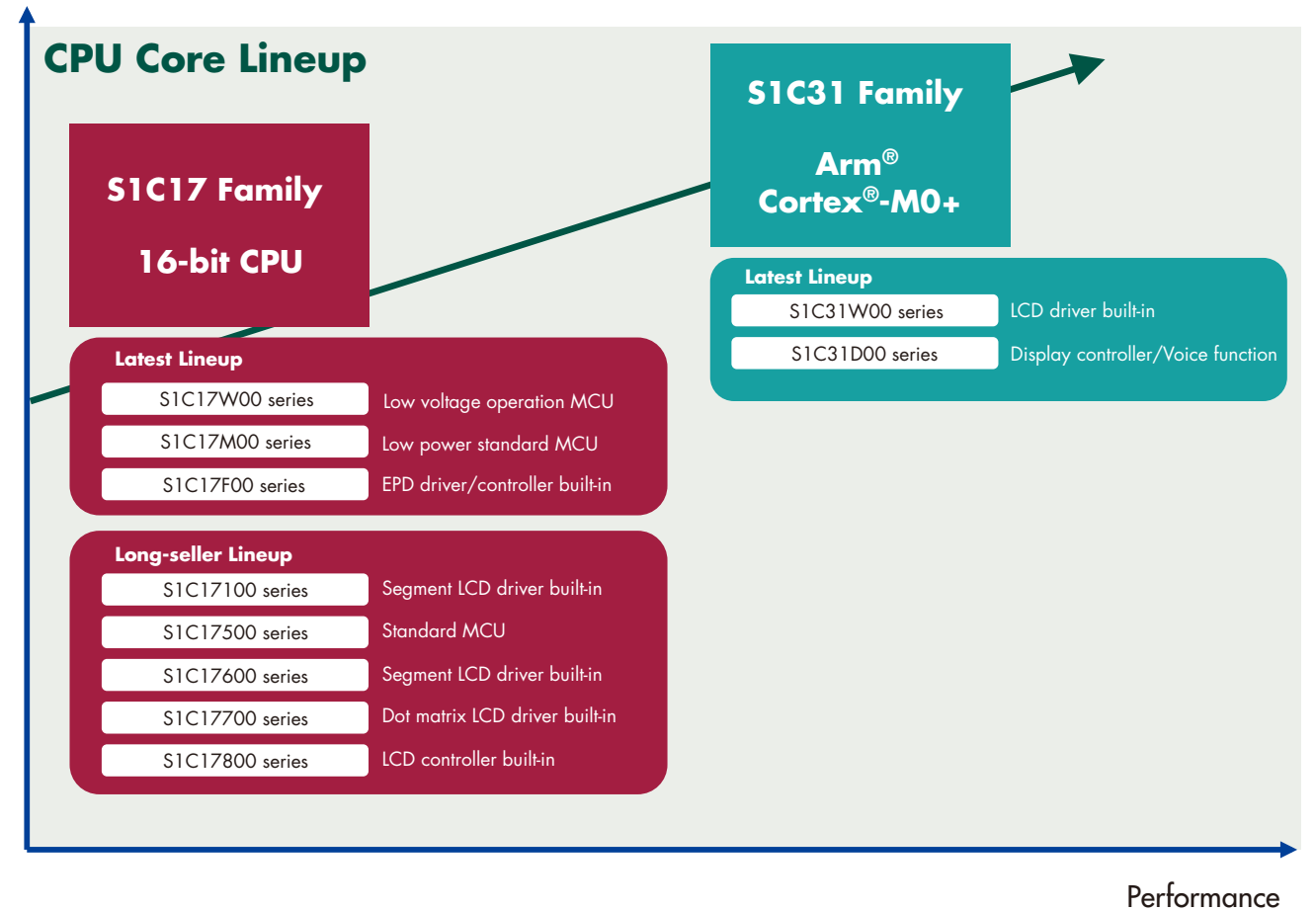Initial Date of Certification : October 10, 1993

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

ISO 9001
IATF16949
BUREAU VERITAS
Certification

CPU Core Lineup

S1C31 Family
Arm®
Cortex®-M0+

Latest Lineup
| S1C31W00 series | LCD driver built-in |
| S1C31D00 series | Display controller/Voice function |

S1C17 Family
16-bit CPU

Latest Lineup
S1C17W00 series	Low voltage operation MCU
S1C17M00 series	Low power standard MCU
S1C17F00 series	EPD driver/controller built-in

Long-seller Lineup
S1C17100 series	Segment LCD driver built-in
S1C17500 series	Standard MCU
S1C17600 series	Segment LCD driver built-in
S1C17700 series	Dot matrix LCD driver built-in
S1C17800 series	LCD controller built-in

Performance

C O N T E N T S

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.

LCD Driver
LCD Controller
ASSP
Microcontroller
ASIC (G/A, E/A, S/C)
Custom IC (Analog)
Silicon Foundry

Automotive
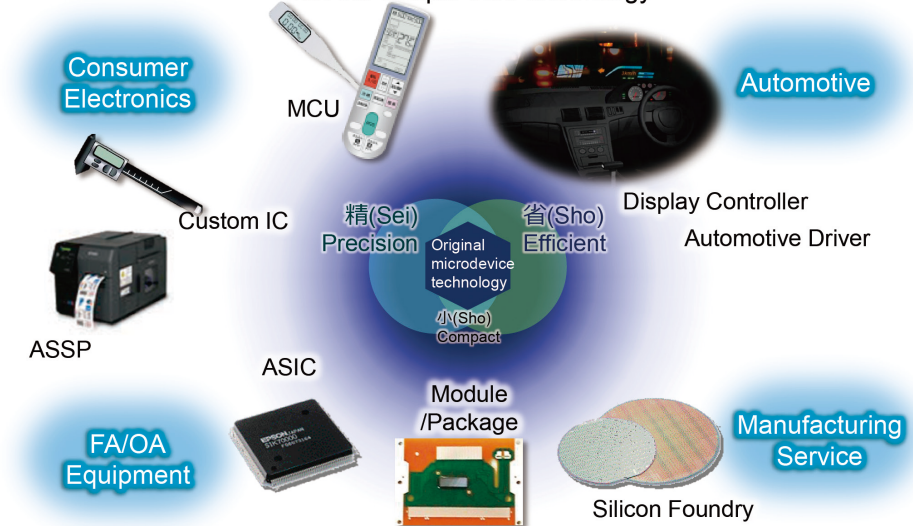Office Automation
Factory Automation
LCD Module
Mobile Phone
Portable Audio
eBook
Watch
Oscillator
Game
Thermal Head
Remote Controller
HealthCare
Scanner
Programmable Logic
Power Supply

- World first CMOS IC for digital watches with LCD display. (1973)
- Low voltage operation CMOS IC for analog watches that consume less than 200nA. (1980)

Energy-Saving Technology ; Technology that reduces power consumption from both sides of process and circuit have been nurtured by Epson over 40 years since division was founded.

Epson Semiconductor's History

富士見事業所

- 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

Automated Wafer Process

Vision and Target Application

Epson aspires to be a device maker that contributes customers' business by valuable products with our unique core technology
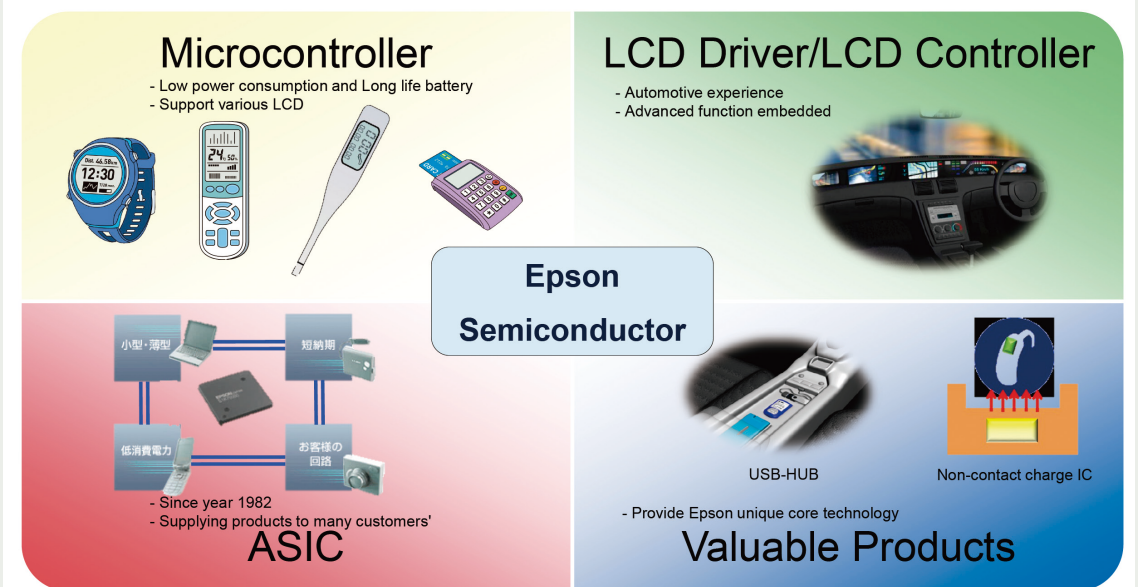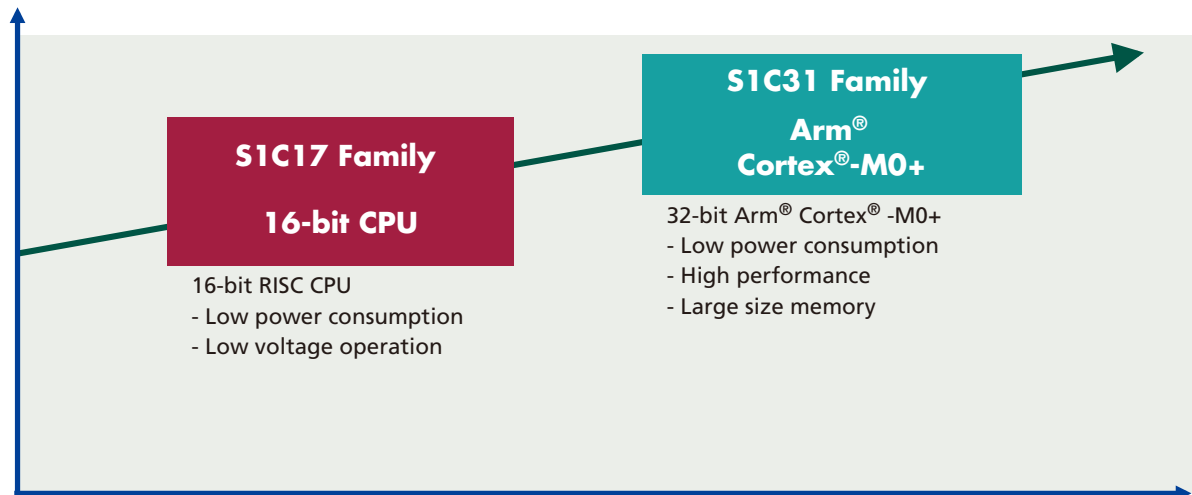
Consumer Electronics
MCU
Automotive
Custom IC
Display Controller
Automotive Driver
精(Sei) Precision
省(Sho) Efficient
Original microdevice technology
ASSP
ASIC
小(Sho) Compact
Module /Package
FA/OA Equipment
Manufacturing Service
Silicon Foundry

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

ASIC
- Since year 1982
- Supplying products to many customers'

小型・薄型
短納期
低消費電力
お客様の回路

Valuable Products
- Provide Epson unique core technology
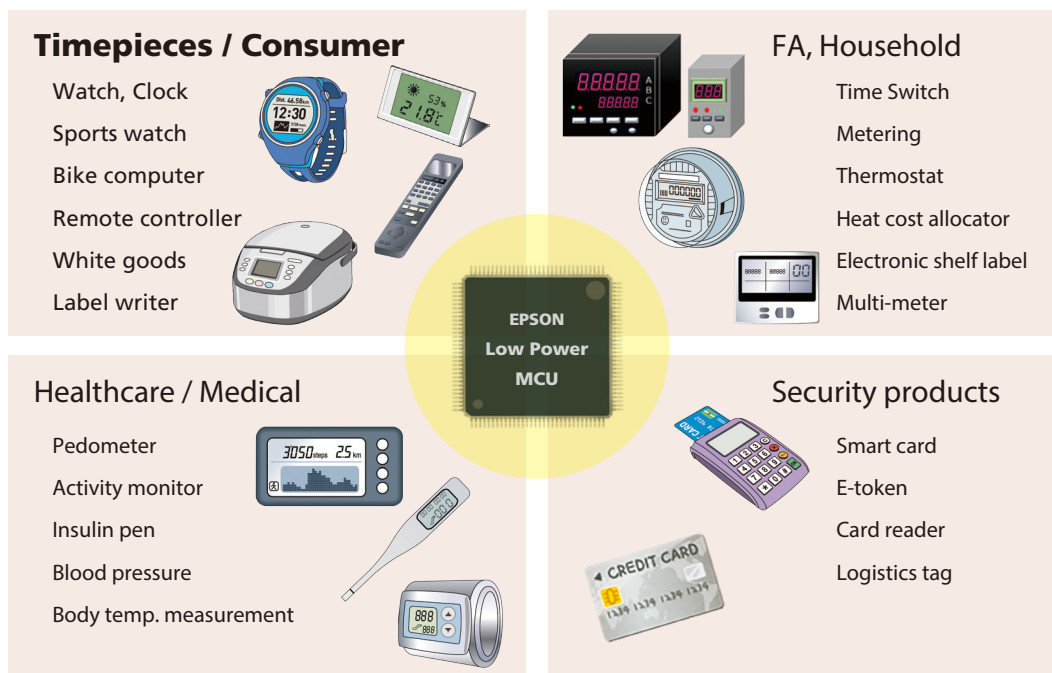
USB-HUB
Non-contact charge IC

■ Low power microcontrollers

The technologies of low voltage operation and low power consumption acquired over the years through the development of 4-bit microcontrollers for watches and electronic shelf labels (ESL) are inherited by 16- and 32-bit microcontrollers today. The product lineup has been expanded, while achieving better throughputs. The display functions range from small-sized segment LDC drive to QVGA color display. A wide array of sensor interfaces recently attracting attention are also available. In addition to digital SIO such as SPI, UART, and I²C and the low power ADCs, the Epson original frequency conversion type ADC is capable of supporting measurements by resistance thermometer sensors and humidity sensors. A variety of these functions, low power technology and a highly efficient processor are all built into a single chip. With this one-chip solution, Epson continues to offer optimum products for small-sized battery-driven equipment, operation panel controllers, and sensor built-in healthcare products and housing equipment.
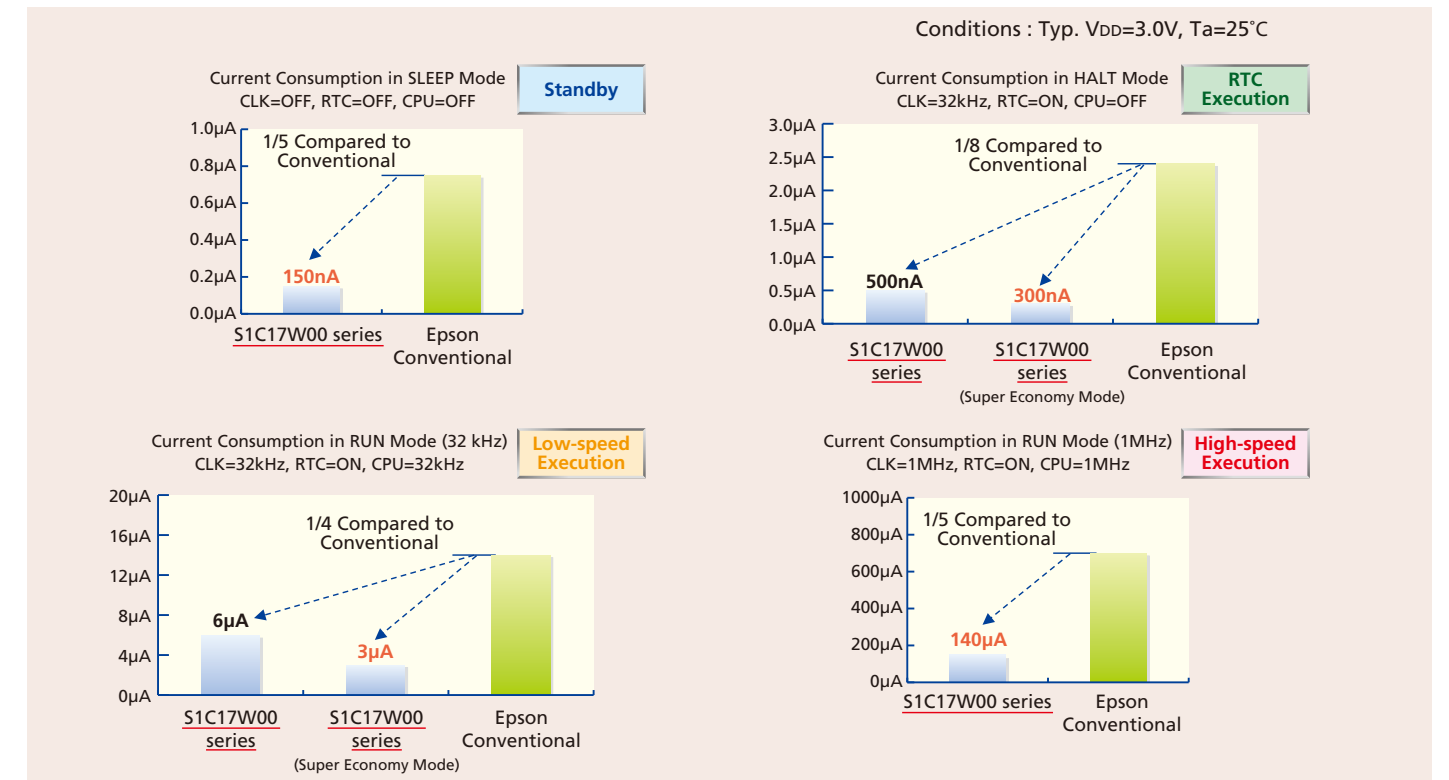
■ CPU Core Lineup

S1C17 Family
16-bit CPU

16-bit RISC CPU
- Low power consumption
- Low voltage operation

S1C31 Family
Arm® Cortex®-M0+

32-bit Arm® Cortex® -M0+
- Low power consumption
- High performance
- Large size memory

■ Application Example

Timepieces / Consumer
Watch, Clock
Sports watch
Bike computer
Remote controller
White goods
Label writer

FA, Household
Time Switch
Metering
Thermostat
Heat cost allocator
Electronic shelf label
Multi-meter

Healthcare / Medical
Pedometer
Activity monitor
Insulin pen
Blood pressure
Body temp. measurement

Security products
Smart card
E-token
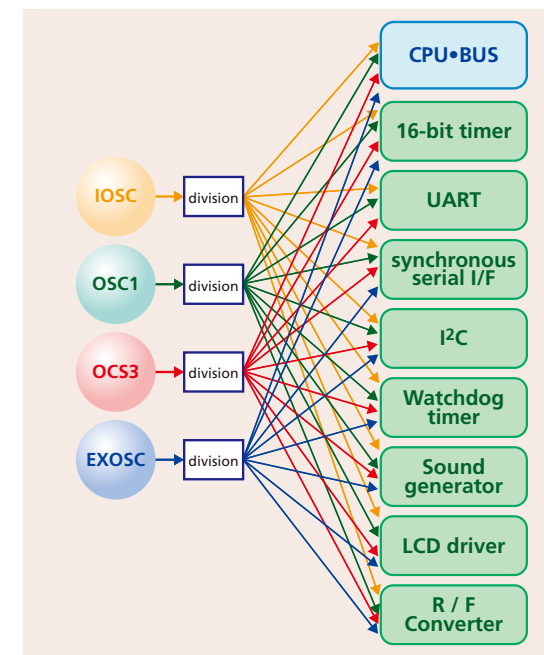Card reader
Logistics tag

EPSON Low Power MCU

■ Lowest Current Consumption (16-bit microcontrollers)

In most cases, the S1C17 Family of products will allow customers currently using 8-bit microcontrollers to enjoy higher performance with the same power consumption. In addition, it will enable customers already using 16-bit/32-bit microcontrollers to benefit from longer battery life as a result of low operating voltage.

Conditions : Typ. V_{DD}=3.0V, Ta=25°C

Current Consumption in SLEEP Mode — Standby — 150nA — 1/5 Compared to Conventional

Current Consumption in HALT Mode — RTC Execution — 500nA / 300nA — 1/8 Compared to Conventional

Current Consumption in RUN Mode (32 kHz) — Low-speed Execution — 6µA / 3µA — 1/4 Compared to Conventional

Current Consumption in RUN Mode (1MHz) — High-speed Execution — 140µA — 1/5 Compared to Conventional

■ Four types of clock sources

Four types of characteristic clock sources can be freely selected for each circuit.

IOSC, OSC1, OCS3, EXOSC → division → CPU•BUS, 16-bit timer, UART, synchronous serial I/F, I²C, Watchdog timer, Sound generator, LCD driver, R / F Converter

■ Terminals can be allocated freely (Universal Port Multiplexers)

SPI, I²C, UART, 16-bit PWM, and other terminals can be freely allocated as individual UPMUX terminals using software.
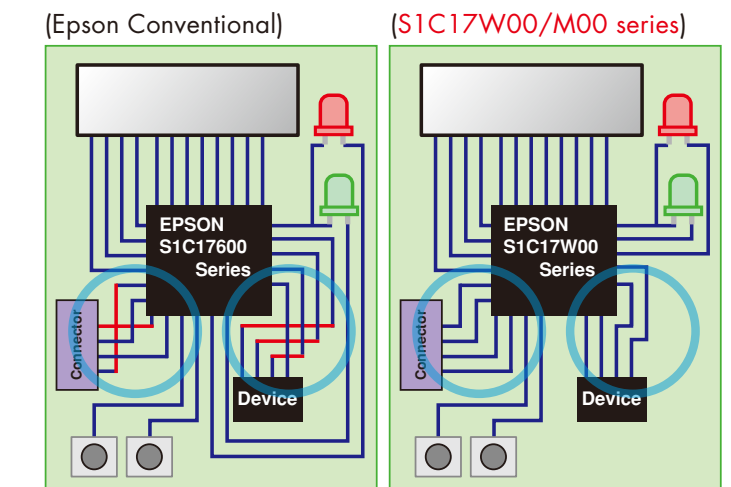
(Epson Conventional) — EPSON S1C17600 Series
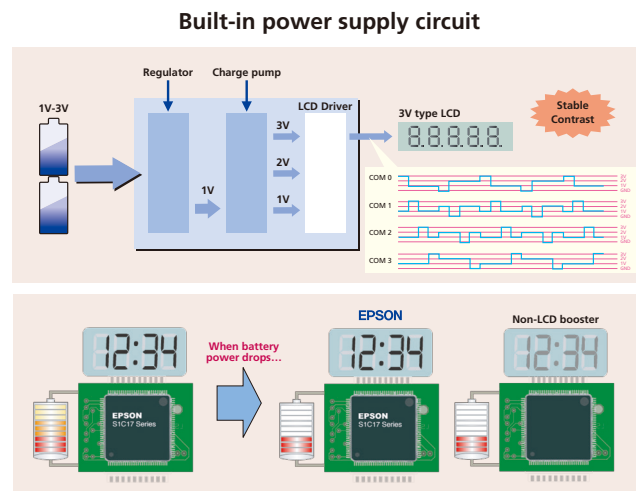(S1C17W00/M00 series) — EPSON S1C17W00 Series

■ Supporting various types of LCD

• Black & White LCD driver

- Segment LCD driver

  - 12 to 88seg x 4/8com
  - 1/3 bias LCD voltage booster built-in

- Dot Matrix LCD driver

  - 56 to 128seg x 16/24/32/64com
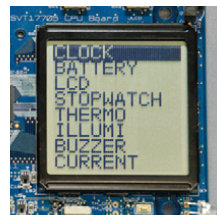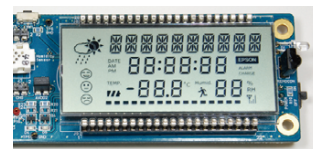 - 1/4,1/5 bias LCD voltage booster built-in

Models containing Black & White LCD driver :

  - S1C17W10 group
  - S1C17W20 group
  - S1C17W30 group
  - S1C17M30 group
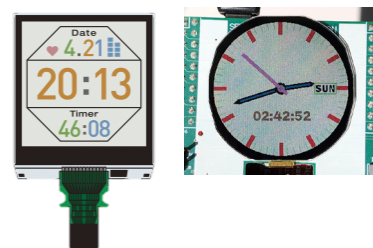 - S1C17M40 group
  - S1C31W00 series

• LCD controller

- STN/TFT LCD controller

  - 320 x 240monochrome / 320 x 240 (QVGA)16gradations

- Memory display controller

  - 300 x 300 6-bit color / 640 x 640 Black & White
  - Supporting graphic engine function

Models containing LCD controller :

  - S1C17800 series
  - S1C31D00 series

• Segment EPD driver

  - 42 to 256seg + TP/BP
  - Voltage booster built-in

Models containing EPD driver :

  - S1C17F00 series

• Segment LED driver

  - 8seg x 5com supporting 5V
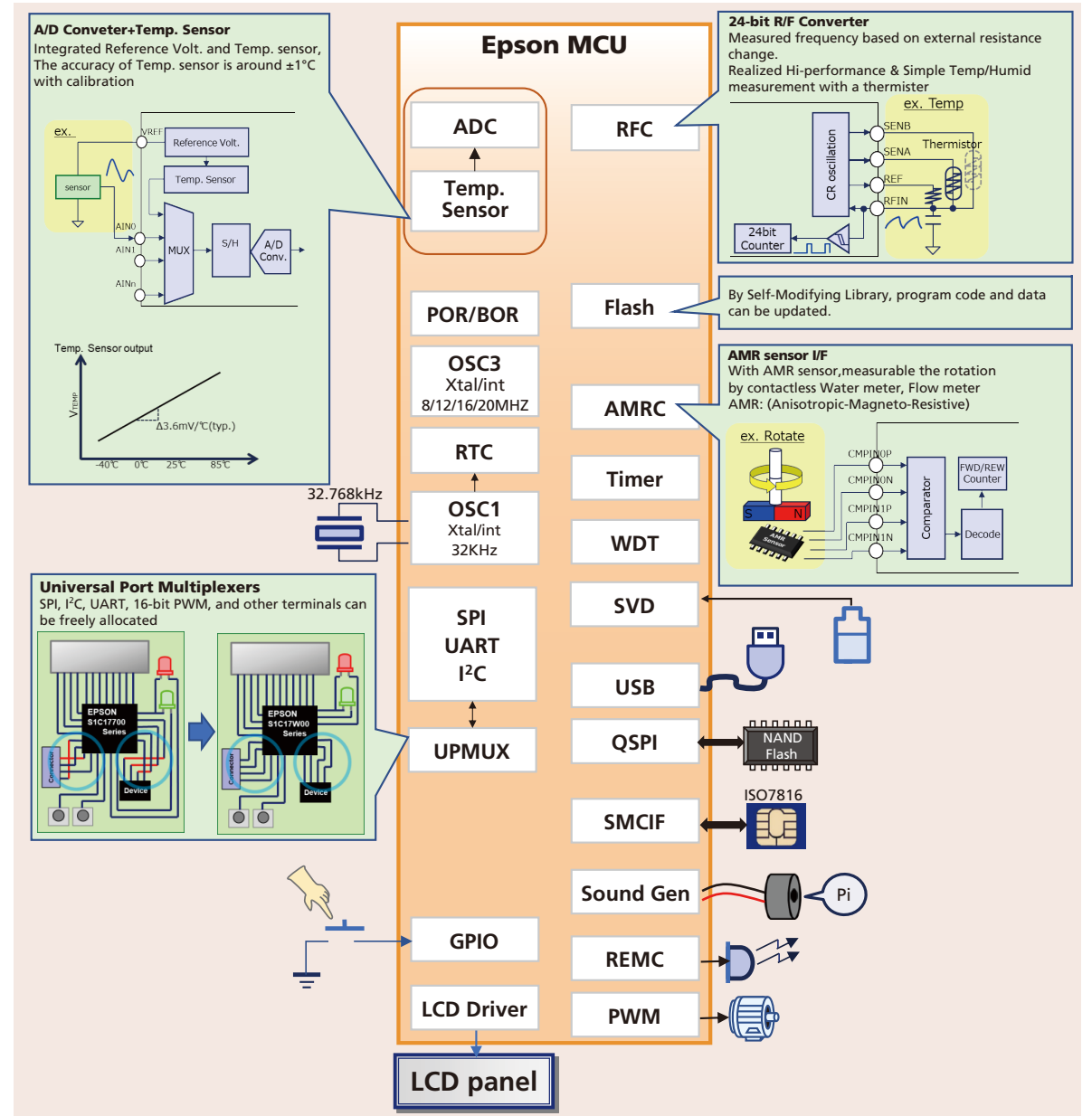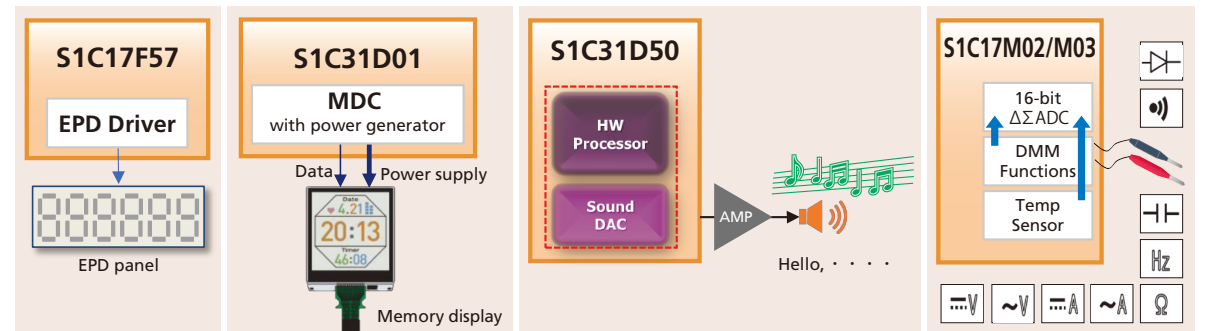
Models containing LED driver :

  - S1C17M12/M13

Built-in power supply circuit

Regulator   Charge pump   LCD Driver   3V type LCD   Stable Contrast

1V-3V   3V / 2V / 1V   COM 0 / COM 1 / COM 2 / COM 3

EPSON   When battery power drops....   Non-LCD booster

Segment LCD

Dot matrix LCD

Memory display

Date 4.21   20:13   Timer 46:08   02:42:52

Segment EPD

345671890

Segment LED

22222

■ A large number of different types of interfaces are included

A/D Conveter+Temp. Sensor
Integrated Reference Volt. and Temp. sensor, The accuracy of Temp. sensor is around ±1°C with calibration

ex.   VREF   Reference Volt.   Temp. Sensor
sensor   AIN0 / AIN1 / AINn   MUX   S/H   A/D Conv.

Temp. Sensor output

VTemp   Δ3.6mV/°C(typ.)   -40°C 0°C 25°C 85°C

Epson MCU

- ADC
- Temp. Sensor
- POR/BOR
- OSC3 Xtal/int 8/12/16/20MHZ
- RTC
- OSC1 Xtal/int 32KHz
- SPI UART I²C
- UPMUX
- GPIO
- LCD Driver

- RFC
- Flash
- AMRC
- Timer
- WDT
- SVD
- USB
- QSPI
- SMCIF
- Sound Gen
- REMC
- PWM

32.768kHz

Universal Port Multiplexers
SPI, I²C, UART, 16-bit PWM, and other terminals can be freely allocated

EPSON S1C1700 Series   EPSON S1C17W00 Series
Controller / Device

24-bit R/F Converter
Measured frequency based on external resistance change.
Realized Hi-performance & Simple Temp/Humid measurement with a thermister

CR oscillation   ex. Temp   SENB / SENA Thermistor / REF / RFIN

24bit Counter

By Self-Modifying Library, program code and data can be updated.

AMR sensor I/F
With AMR sensor,measurable the rotation by contactless Water meter, Flow meter
AMR: (Anisotropic-Magneto-Resistive)

ex. Rotate   CMPINOP / CMPINON / CMPIN1P / CMPIN1N   Comparator   FWD/REW Counter   Decode

NAND Flash

ISO7816

Pi

LCD panel

■ Product Dedicated Unique Peripherals

S1C17F57	S1C31D01	S1C31D50	S1C17M02/M03
EPD Driver	MDC with power generator	HW Processor / Sound DAC	16-bit ΔΣADC / DMM Functions / Temp Sensor
EPD panel	Data / Power supply — 4.21 20:13 46:08 — Memory display	AMP — Hello, · · · · ·	

∗: Peripheral circuits configured by products are different.

Suitable for wearable and industrial control devices
Guaranteed 105°C operation Arm® microcontroller with LCD driver S1C31W00 Series *1

Suitable for battery-driven wearable products
Arm® microcontroller with a memory display controller "S1C31D01"

*1 : S1C31W74 is -40°C to 85°C operation guarantee

■ General

The S1C31W00 series is 32-bit MCU with an Arm® Cortex®-M0+ processor included that features low-power operation. It has a guaranteed operating temperature up to 105°C, suitable for industrial applications. In addition, it integrates LCD driver (MAX.2,560-dot) and a lot of serial interface circuits.

Large capacity memory

Large capacity memory corresponding to market trend of multi functionality is integrated on a single chip. It is possible to store and operate user programs that size is increasing by complicated software design.

Suitable for diverse product environments

Considering the operating environment of industrial equipment, it guarantees operation from -40°C to 105°C without frequency or supply voltage limitations.

Built-in high resolution LCD driver

S1C31W series can drive dot-matrix or 7-segment LCD by built-in LCD driver. It equips internal constant voltage circuit that has been cultivated over the Epson traditional products, and can maintain display quality that is not affected by the remaining battery level. The contrast can be adjusted by software. It offers optimum and flexible design for user's product development.

Wide variety of interface

In addition to UART, SPI and I2C, it supports Quad-SPI (QSPI) which can communicate with external serial flash memory at high speed. An R/F converter for temperature and humidity measurement, USB FS 2.0 device controller, Universal port multiplexers that increase board layout design flexibility are also supported.
* It depends on the product which interface are supported.

■ Application example: Industrial controll device

S1C31W73

FLASH 384KB | RAM 32KB | 12bit ADC (SVD)
OSC1 X'tal. | RTC | USB
OSC3 | Cortex® M0+ | 12bit ADC / RFC
PWM Sound gen. | SPI / QSPI I2C / UART | UPMUX
LCD Driver 80x32 / 88x16 / 96x8 | GPIO
32.768kHz · 3.3V / 5.0V · Pi · NAND Flash
105°C

■ Application example: Industrial control device

S1C31W65

FLASH 128KB | RAM 16KB | SVD
OSC1 X'tal. | RTC | Reference voltage gen.
OSC3 Xtal/Int. | Cortex® M0+ | 12-bit ADC / RFC
PWM Sound gen. | SPI / I2C /UART | UPMUX
LCD Driver 52x8 / 56x4 | GPIO
32.768kHz · 5.0V · Pi · Sensor · Memory Ext.chip
105°C

LCD panel
888888

■ General

The S1C31D01 is a 32-bit MCU with an Arm® Cortex®-M0+ processor included that features low-power operation.
It integrates a lot of serial interface circuit, a memory display controller, and a voltage booster.

Memory Display Controller (MDC)

MDC supports several panel interfaces for each memory display. It includes graphics hardware acceleration functions such as rotation of frame buffer image to panel, Image/bitmap copy with scaling/rotation/ horizontal and vertical shearing/alpha-blending*, Line/Rectangle/Ellipse/ Arc drawing with filled and unfilled.
It can contributs to reduce software load by dedicated hardware.

Power booster circuit

The S1C31D01 generates supply voltages for memory display (VMDH/ VMDL) with programmable power booster curcuit. It is possible to reduce external components.

Small size package

Wafer level Chip Size Package (WCSP) is supported as same size with chip. It is suitable for various applications which have limited mounting area on the print circuit board.
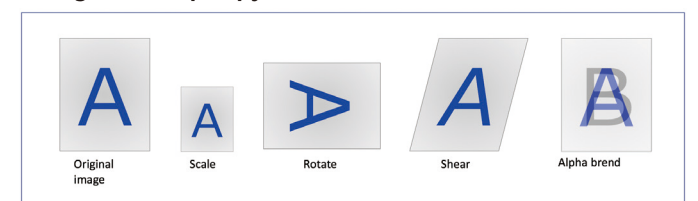
Lineup

Epson prepares CPU-less dedicated memory display controller "S1D13C00" for the customers who already have Host CPU. It supports same features with S1C31D01 about graphic accereration function and power booster circuit. There is a variety of products that can be selected according to your system.
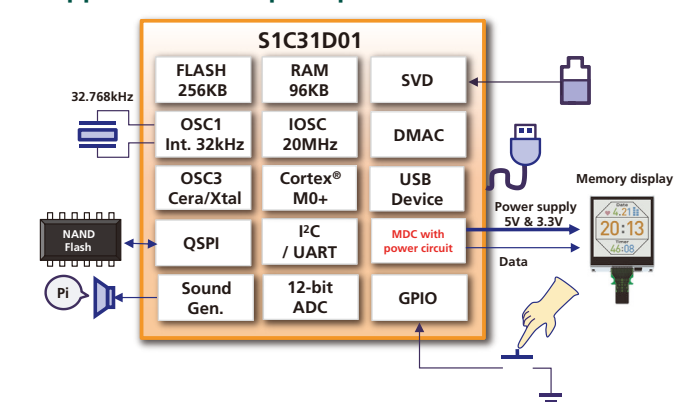
■ Examples of Graphic Acceleration

Drawing Engine

Imge / Bitmap copy

A (Original image) | A (Scale) | A (Rotate) | A (Shear) | A (Alpha brend)

■ Application Example: Sport watch

S1C31D01

FLASH 256KB | RAM 96KB | SVD
OSC1 Int. 32kHz | IOSC 20MHz | DMAC
OSC3 Cera/Xtal | Cortex® M0+ | USB Device
QSPI | I2C / UART | MDC with power circuit
Sound Gen. | 12-bit ADC | GPIO
32.768kHz · NAND Flash · Pi · Power supply 5V & 3.3V · Memory display · Data

* Alpha-blending: supported at 6-bit color only.

■ S1C31W00 Series Products overview

| Products | Display | Operation clock | | | Supply current | | | | Power supply | | Memory | | | I/O | Timer | | | | SIO | | | | | Analog | | | Reset | | Others | | Form of delivery | |
	LCD Driver segxcom	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [µA] (Typ.)	Halt [µA] (Typ.)	mode0 Operating [µA/MHz] (Typ.)	mode1 Operating [µA/MHz] (Typ.)	Normal Operation [V]	Flash Programming [V]	Flash ROM [Byte]	Display RAM [Byte]	RAM [Byte]	I/O port	16-bit timer	16-bit PWM timer	Watchdog timer	Real-time clock	UART	SPI	Quad SPI	I²C	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (12-bit)	SVD	POR	BOR	Sound generator	USB	Special function	Package	Chip
S1C31W65	52 x 8 56 x 4	33M	32.768k	32k/1M/2M/ 8M/12M/16M/ 24M/32M	0.3	1.5	195	130	1.8 to 5.5	2.2 to 5.5	128K	112	16K	64	8	3 x 4	1	1	2	2	–	2	1	1	7	1	○	○	1	–	DMA	TQFP15-100	–
S1C31W73	96 x 16 88 x 24 80 x 32	33M	32.768k	32k/1M/2M/ 8M/12M/16M/ 24M/32M	0.7	2.0	214	150	1.8 to 5.5	2.2 to 5.5	384K	768	32K	73	8	2 x 4	1	1	2	2	1	2	1	1	7	1	○	○	1	1	DMA	QFP21-216	○
S1C31W74	88 x 16 80 x 24 72 x 32	21M	32.768k	1M/2M/8M/ 12M/16M/20M	0.4	1.7	250	150	1.8 to 3.6	2.4 to 3.6	512K	704	128K	71	4	2 x 2	1	1	2	1	1	2	1		1	–	2	○	○	1	1	–	VFBGA8H-181	○

■ S1C31D01/S1C31D00 Products overview

| Products | Display | Operation clock | | | Supply current | | | | Power supply | | Memory | | I/O | Timer | | | | SIO | | | | | Analog | | | Reset | | Others | | Form of delivery | |
	Display controller	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [µA] (Typ.)	Halt [µA] (Typ.)	mode0 Operating [µA/MHz] (Typ.)	mode1 Operating [µA/MHz] (Typ.)	Normal Operation [V]	Flash Programming [V]	Flash ROM [Byte]	RAM [Byte]	I/O port	16-bit timer	16-bit PWM timer	Watchdog timer	Real-time clock	UART	SPI	Quad SPI	I²C	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (12-bit)	SVD	POR	BOR	Sound generator	USB	Special function	Package	Chip
S1C31D01	MDC	21M	32.768k	32k/1M/2M/ 8M/12M/16M/20M	0.46	1.7	250	155	1.8 to 5.5	2.4 to 5.5	256K	96K	57	8	2 x 6	1	1	3	2	1	2	1	–	7	1	○	○	1	1	DMA	WCSP96 QFP14-80 VFBGA5H-81	○

■ S1D13C00 Products overview

Products	CPU Interface Support	Panel Interface Support	Color Depth (Max.)	Internal Memory Capacity	Supply Voltage	Additional Features	Packege
S1D13C00F00C B00C	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, I2C, DMAC, Sound Generator IR remote control transmitter	TQFP13-64 WCSP64

ideal sound solution for home appliances and electronics
Arm® microcontroller with Dedicated Sound Hardware "S1C31D50/51/41"

User-Friendly Substantial Development Environment
Voice Creation PC Tool, Simple sound play interface, easy sound data update in market

■ General

The S1C31D50/51/41 is a 32-bit Arm® Cortex®-M0+ MCU which integrates a specific hardware block called the HW Processor.

HW Processor

The HW Processor can perform 2ch Voice/Audio Play, Voice Speed Conversion, and Self Memory Check without using any CPU resources.

2ch mixing play

A dedicated HW Processor provides 2-channel sound on a single MCU chip. The use of two channels enables music and voice to be played simultaneously. The audio guidance becomes more elegant and warmer.

Voice Speed Conversion

The speed of the easy-to-hear voice depends on the end user. This functuion enable to adjust the speed by the end user.

Buzzer Voice play(D51/D41)

By making it possible to output voice guidance sound like error and warning messages on a buzzer instead of a speaker, the usability of the MCU is increased. Common buzzer sound output performance is often very poor because of low volume and limited bandwidth. Epson improved buzzer performance by using new development algorithm.
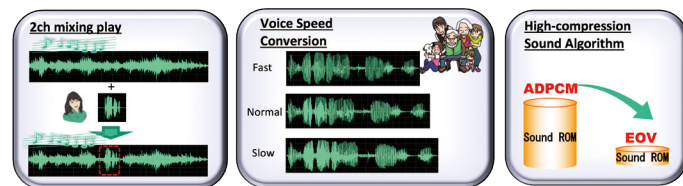
Pitch conversion(D41)

The pitch of the comfortable-to-hear voice depends on the end user. This functuion enable to adjust the speed by the end user.

High-compression Sound Algorithm

Epson high-compression algorithm(EOV) cultivated in Epson LSI business is inherited. For example, the data size of 1min voice at 15.625kHz sampling frequency is about 120KB. It is 1/4 size of the data created by ADPCM.

Self-Memory Check

HW processor can detect failures in built-in RAM, built-in Flash, and external SPI-Flash memories without using CPU resources.

■ Block Diagram

S1C31D50

FLASH 192KB | RAM 8KB | SVD
OSC1 Xta/Int. | IOSC 8MHz | DMAC
OSC3 Xtal/Int. | Cortex® M0+ | Sound DAC
12-bit ADC | HW Processor
NAND Flash | QSPI-Flash IF | I²C/SPI / UART | GPIO

AMP — Hello,・・・・

5.5V
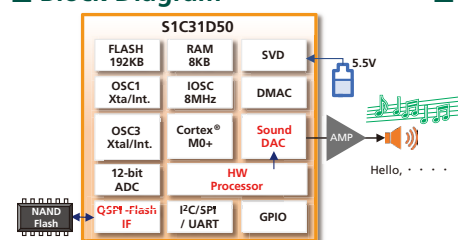
■ Applications

Boiler Remote Controller
Fire/Smoke Alarm

■ Main Features

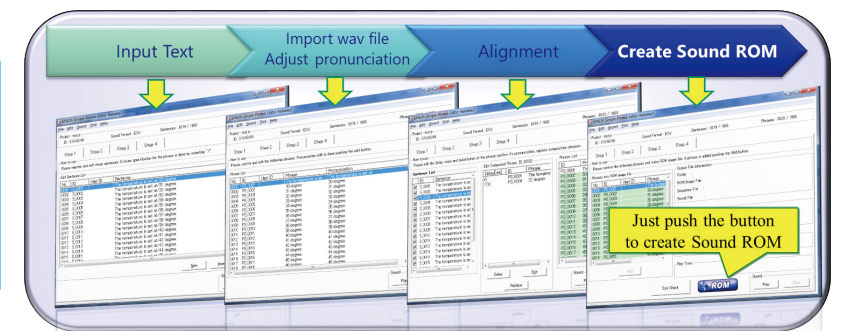|	S1C31D50	S1C31D51	S1C31D41
Flash	192KB(For Program and Sound)		96KB(For Program and Sound)
RAM	8KB +14KB HW Processor not active	10KB +12KB HW Processor not active	8KB +18KB HW Processor not active
HW Processor	2ch mixing play(ch0 and ch1) Voice Speed Conversion(only ch0) Voice Pitch Conversion(D41) Self Memory Check(On Chip RAM, On Chip Flash, External SPI-Flash)		
Sound DAC	Sampling Frequency: 15.625kHz		
Serial Interface	SPI(3ch), UART(3ch), I²C(3ch), QSPI(1ch)		
Sound Play Method	AMP + Speaker		AMP + Speaker Simple circuit + Speaker Simple circuit + Buzzer
ADC	12-bit (Max. 8-port)		12-bit (Max. 8-port, 1-port for temperature sensor
SVD	V_DD: 28 levels (1.8V to 5.0V)/External voltage: 32 lavels (1.2V to 5.0V)		
DMA	4ch (Memory ⇔ Memory, Memory ⇔ Peripheral)		
RFC	CR oscillation type 24-bit counters		
Timers	16-bit Timer (8ch), 16-bit PWM (2ch), WDT, RTC		
Power Supply	1.8V to 5.5V V_DD 3.3V SPI-Flash Interface Power Supply		
Flash Programming	2.4V to 5.5V		2.2V to 5.5V
Clock Frequency	Max. 16MHz (internal power: 1.8V) Max. 1.8MHz (internal power: 1.2V)		
Power Consumption	Standard Mode RUN: 250µA/MHz (internal power: 1.8V) Low Power Mode RUN: 155µA/MHz (internal power: 1.2V) Max. 1.8MHz SLEEP: 0.46µA, RTC mode: 0.95µA		Standard Mode RUN: 215µA/MHz (internal power: 1.8V) Low Power Mode RUN: 130µA/MHz (internal power: 1.2V) Max. 1.8MHz SLEEP: 0.34µA, RTC mode: 0.9µA
Package	P-TQFP048-0707-0.50 P-LQFP064-1010-0.50 P-LQFP080-1212-0.50 P-LQFP100-1414-0.50		P-TQFP032-0707-0.80 P-TQFP048-0707-0.50 P-LQFP064-1010-0.50
IEC-60730	supported by Sample SW		

S1C31D50/51/41 Development Environment provides User-Friendly Substantial Development, this makes it easy to create natural voice data and play the sound.

■ Epson Voice Creation PC Tool

Using Epson Voice Creation PC Tool, natural voice data can be created by just PC, so no need to struggle studio recording, announce arrangement and additional cost. Typically only text input to the tool is enough to create the voice data. The tool also supports phrase combination, pronunciation adjust and importing existing WAV file a customer already has.
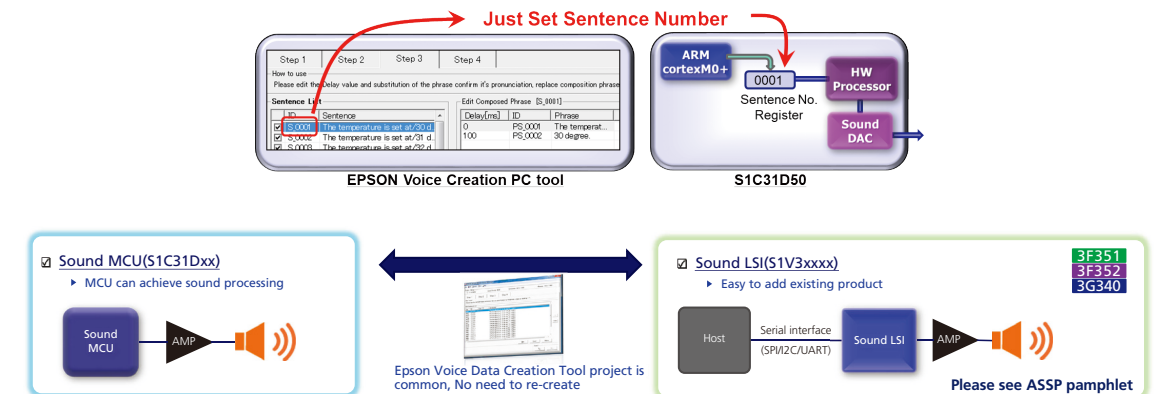
[Supported Languages]
Asia : Japanese, Chinese (Mandarin), Korean
America : American English, American Spanish, Canadian French
Europe : British English, German, French, Spanish, Italian, Russian

Input Text → Import wav file Adjust pronunciation → Alignment → Create Sound ROM

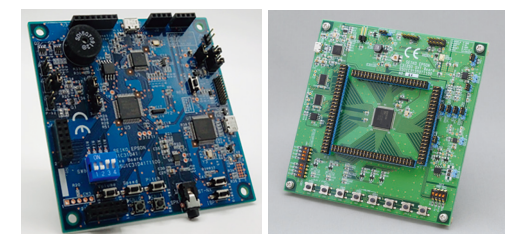Just push the button to create Sound ROM

■ Link between Voice creation Tool and IC

Epson Voice Creation PC tool also makes it easy to develop firmware. A firmware engineer does not need to care phrase combination and delay among phrases etc, because all information is included in Sound ROM and Hardware Processor. By just setting the Sentence Number on the tool to IC register, the sound can be played.

Just Set Sentence Number

EPSON Voice Creation PC tool | S1C31D50

☑ Sound MCU(S1C31Dxx)
▸ MCU can achieve sound processing

Sound MCU — AMP

Epson Voice Data Creation Tool project is common, No need to re-create

☑ Sound LSI(S1V3xxxx)
▸ Easy to add existing product

Host — Serial interface (SPI/I2C/UART) — Sound LSI — AMP

3F351 3F352 3G340

Please see ASSP pamphlet

■ Evaluation Board

4 languages sound demo with melody is preset. Pushing the button on the evaluation board, 2ch mixing sound can be played.
Also customers can write new sound ROM Data from PC to this board and play own sound easily.
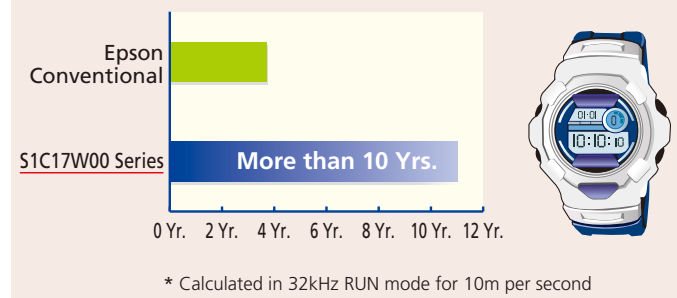
S1C31D41   S1C31D50

■ Sound HW MCUs

Products	Display		Operation clock			Supply current				Power supply			Memory		I/O	Timer				SIO						Analog			Reset			Others		Form of delivery	
	Display controller	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [µA] (Typ.)	Halt [µA] (Typ.)	mode0 Operating [µA/MHz] (Typ.)	mode1 Operating [µA/MHz] (Typ.)	Normal Operation [V]	Flash Programming [V]	Flash ROM [Byte]	RAM [Byte]	I/O port	16-bit timer	16-bit PWM timer	Watchdog timer	Real-time clock	UART	SPI	Quad SPI	I²C	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (12-bit)	SVD	POR	BOR	Sound generator	USB	Special function	Package	Chip
S1C31D50 / 51	–	16M	32.768k	32k/4M/8M/16M	0.46	1.8	250	155	1.8 to 5.5	2.4 to 5.5	192K	8K	39 55 71 91	8	2 × 4	1	1	3	3	1	3	1	1	5 7 8 8	1	○	○	–	–	DMA Sound HW	TQFP12-48 QFP13-64 QFP14-80 QFP15-100	–
S1C31D41	–	16M	32.768k	32k/4M/8M/16M	0.34	1.5	215	130	1.8 to 5.5	2.2 to 5.5	96K	8K	25 39 55	8	2 × 4	1	1	3	3	1	3	1	1	6 7 8	1	○	○	–	–	DMA Sound HW	TQFP12-32 TQFP12-48 TQFP13-64	–

■ World realized by low power consumption of the S1C17W00 Series

Case of Digital Watch

Conditions: Continuous LCD watch display using LR44 battery (1.5 V)

Epson Conventional

S1C17W00 Series — **More than 10 Yrs.**

0 Yr. 2 Yr. 4 Yr. 6 Yr. 8 Yr. 10 Yr. 12 Yr.

* Calculated in 32kHz RUN mode for 10m per second

Case of Pedometer

Conditions: LCD display and acceleration sensing for several hours per day using the CR2032 battery (3V)

Epson Conventional

S1C17W00 Series — **More than 12 Mons.**

0 Mon. 3 Mon. 6 Mon. 9 Mon. 12 Mon. 15 Mon.

* Calculated in 2MHz RUN mode for 1 hour per day

■ S1C17W00 Series Application examples

Example of an application using the S1C17W13: Remote controller

S1C17W13

S1C17 CORE

REMC	Flash ROM	LCD driver
SVD	Timer	I/O port
R/F converter	Oscillation circuit	SPI

Infrared LED

Battery — Residual quantity detection

Thermistor

EEPROM

LCD Panel 24seg x 4com

Buzzer/Alarm

Key matrix

■ S1C17W00 Series Products overview

Products	Display	Operation clock			Supply current				Power supply	Memory		I/O	Timer				SIO					Analog				Others			Form of delivery	
	LCD Driver seg×com	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [μA] (Typ.)	Halt [μA] (Typ.)	32kHz Operating [μA] (Typ.)	1MHz Operating [μA] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	RAM [Byte]	I/O port *8	16-bit timer	16-bit PWM timer	Watchdog timer	Real-time clock	UART	SPI	QSPI	I²C	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (12-bit)	SVD *4	Sound generator	Multiplier/Divider	Special function	Package	Chip
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 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.																													
S1C17W03	–	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15	0.3	4	250	1.2 to 3.6 *1	16K *3	2K	35 / 24	4	2 x 2	1	1	2	2	–	1	1	2*5 / 1	6 / 5	1	1	1	–	TQFP12-48 / SQFN5-32	○ / –
S1C17W04	–	4.2M	32.768k	250k/384k/500k/700k/1M/2M/4M	0.15	0.3	4	250	1.2 to 3.6 *1	32K *3	2K	35 / 24	4	2 x 2	1	1	2	2	–	1	1	2*5 / 1	6 / 5	1	1	1	–	TQFP12-48 / SQFN5-32	○ / –
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 4-bit MCUs. This product is equipped with a built-in RTC, 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.																													
S1C17W12	26 x 4 / 18 x 4	4.2M	32.768k / –	32k/250k/384k/500k/700k/1M/2M/4M	0.15	0.3 / 1.5	2 / 5	140	1.2 to 3.6 *6	48K *3	2K	32 / 26	3	2 x 2	1	1	2	1	–	1	1	2*5	–	1	1	1	LED pin x 2	– / SQFN7-48	○ / –
S1C17W13	26 x 4 / 18 x 4 / 20 x 4 *7	4.2M	32.768k	32k/250k/384k/500k/700k/1M/2M/4M	0.15	0.3	2 / 4	140	1.2 to 3.6 *6	48K *3	2K	32 / 26	3	2 x 2	1	1	2	1	–	1	1	2*5	–	1	1	1	LED pin x 2	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	1.2 to 3.6 *1	48K *3	4K	33	3	2 x 2	1	1	2	2	–	1	1	1	–	1	1	1	–	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 / 0.5	4 / 8	250	1.2 to 3.6 *1	64K *3	4K	36 / 33 / 28	3	2 x 2	1	1	2	1	–	1	–	4*5	–	1	1	1	–	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	1.2 to 3.6 *1	64K *3	8K	40	5	2 x 2	1	1	2	3	–	1	1	2*5	4	1	1	1	–	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 / 0.5	2 / 4	140	1.2 to 3.6 *6	128K (*3)	8K	68 / 59 / 49	4	3 x 2	1	1	2	2	–	1	1	2*5	7	1	1	1	Temperature sensor	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	1.2 to 3.6 *1	64K *3	4K	42	2	2 x 2	1	1	1	1	–	1	1	2*5	–	1	1	1	–	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	1.2 to 3.6 *1	96K *3	8K	42	4	3 x 2	1	1	2	2	–	1	1	2*5	6	1	1	1	–	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	1.2 to 3.6 *2, *6	128K (*3)	12K	53	4	3 x 2	1	3	2	2	–	1	1	2*5	7	1	1	1	Temperature sensor	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	1.2 to 3.6 *2, *6	256K (*3)	12K	53	4	3 x 2	1	3	2	2	–	1	1	2*5	7	1	1	1	Temperature sensor	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	1.2 to 3.6 *2, *6	384K (*3)	16K	53	4	3 x 2	1	3	2	2	–	1	1	2*5	7	1	1	1	Temperature sensor	QFP21-176	○

*1: During erasing / programming in flash memory (V_{DD}): 1.8V to 3.6 V
*2: During operations LCD (V_{DD})**:** 2.5V to 3.6V
*3: During erasing / programming voltage in flash memory (V_{PP}): The external applying of 7.5V / 7.5V (Typ.) is needed. (*3) can be rewritten even with internal power supply.
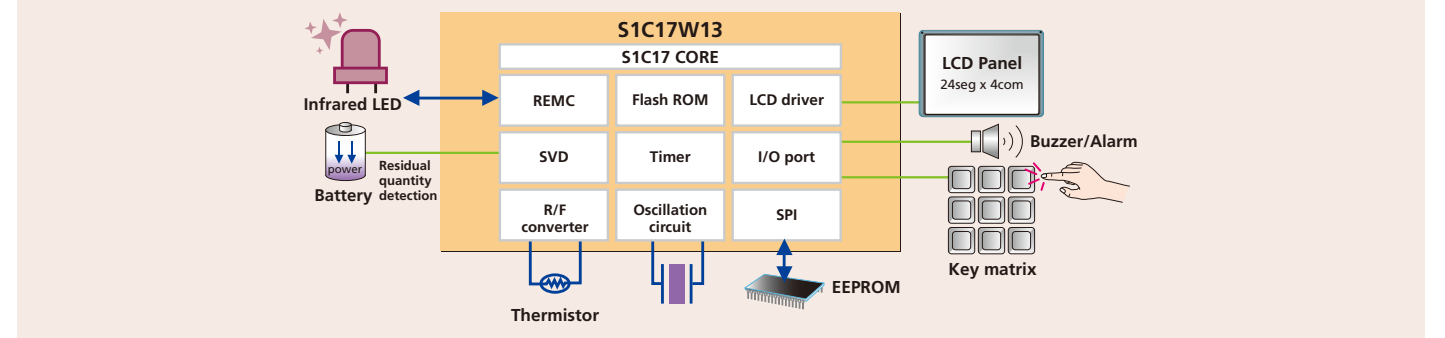*4: SVD is an abbreviation for Supply Voltage Detector.
*5: Independent operation for each channel.
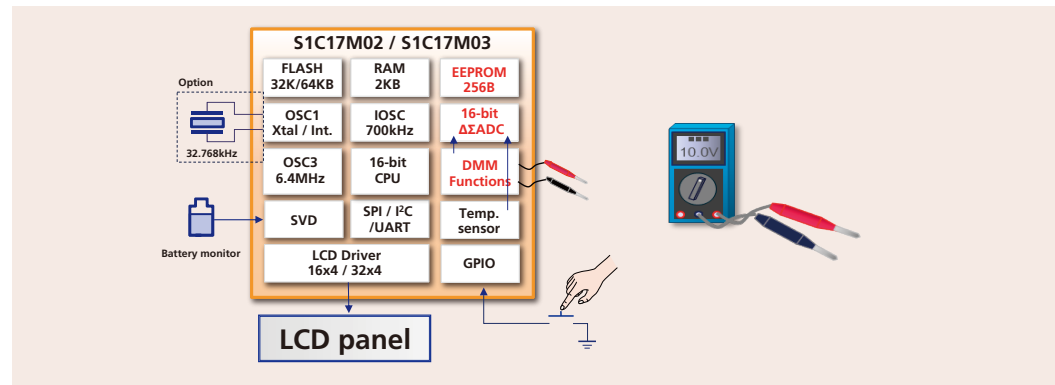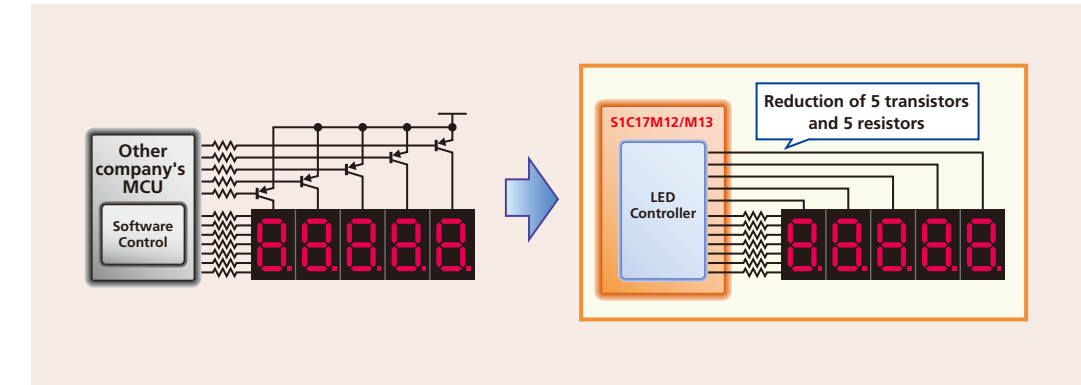*6: During erasing / programming in flash memory (V_{DD}): 2.4V to 3.6V
*7: External voltage application mode only.
*8: Including Input port and Output port.

■ S1C17M00 Series Application examples

Example of an application using the S1C17M02/03: Digital Multimeter

S1C17M02 / S1C17M03

FLASH 32K/64KB	RAM 2KB	EEPROM 256B
OSC1 Xtal / Int.	IOSC 700kHz	16-bit ΔΣADC
OSC3 6.4MHz	16-bit CPU	DMM Functions
SVD	SPI / I²C /UART	Temp. sensor
LCD Driver 16x4 / 32x4	GPIO	

Option — 32.768kHz — Battery monitor — LCD panel — 10.0V

■ S1C17M00 Series Function introduction

Example of 7 seg LED lighting up using the S1C17M12/M13

Other company's MCU — Software Control
S1C17M12/M13 — LED Controller — Reduction of 5 transistors and 5 resistors

■ S1C17M00 Series Products overview

S1C17M00 series: It is an application specialized series. It is a 16-bit MCU with Flash memory compatible with high processing while achieving low power consumption, supporting power supply voltages from 1.8 V to 5.5 V. (S1C17M02/M03 are excluded)

Products	LCD Driver seg×com	Display controller	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [μA] (Typ.)	Halt [μA] (Typ.)	32kHz Operating [μA] (Typ.)	1MHz Operating [μA] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	EEPROM [Byte]	RAM [Byte]	I/O port *5	16-bit timer	16-bit PWM timer	Watchdog timer	Real-time clock	UART	SPI	Quad SPI	I²C	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (12-bit)	SVD *4	POR	BOR	Sound generator	Multiplier/Divider	Special function	Package	Chip
S1C17M01	32 x 4 / 28 x 8	–	16.3M	32.768k	7.37M	0.35	0.8	12.5	210	1.8 to 5.5 *7	32K *3	–	4K	19	5	–	1	1	1	2	–	1	–	1	–	1	○	–	–	–	AMRC	TQFP13-64	○
S1C17M02	16 x 4	–	6.4M	32.768k	32k/700k/3.2M/6.4M	0.24	0.9	5	–	2.1 to 3.6 *2	32K (*3)	256	2K	19	4	–	1	–	1	1	–	1	–	–	1	1	○	○	1	1	Measurement function for DMM (Sigma delta type AD converter)	QFP13-64	–
S1C17M03	32 x 4	–	6.4M	32.768k	32k/700k/3.2M/6.4M	0.24	0.9	5	–	2.1 to 3.6 *2	64K (*3)	256	2K	43	4	–	1	–	1	1	–	1	–	–	1	1	○	○	1	1	Measurement function for DMM (Sigma delta type AD converter)	QFP15-100	–
S1C17M10	88 x 8 / 80 x 16	–	16M	32.768k	32k/4M/8M/12M/16M	0.16	0.6	4	145	1.8 to 5.5 *9	64K (*3)	–	4K	33	5	1 x 2	1	1	1	1	–	1	–	–	–	1	○	–	–	1	SMCIF	TQFP15-128	○
S1C17M12	–	LED controller 8x5	16.8M	–	4M/8M/12M/16M	0.35	40	–	150	1.8 to 5.5 *9	16K *3	–	2K	39	4	1 x 2	1	–	1	2	–	1	1	–	–	1	○	○	–	1	High current port x 5	TQFP12-48	○
S1C17M13	–	LED controller 8x5	16.8M	–	4M/8M/12M/16M	0.35	40	–	150	1.8 to 5.5 *9	16K *3	–	2K	39	4	1 x 2	1	–	1	2	–	1	1	–	8	1	○	○	–	1	High current port x 5	TQFP12-48	○
S1C17M20	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	1.5 / 0.7	5.5 / 5	160	1.8 to 5.5 *9	16K (*3)	–	2K	18 / 24	4	2 x 2	1	1	2	2	–	1	1	–	4 / 6	1	○	○	1	1	–	SQFN4-24 / SQFN5-32	–
S1C17M21	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	0.7	5	160	1.8 to 5.5 *9	16K (*3)	–	2K	24	4	2 x 2	1	1	2	2	–	1	1	–	6	1	○	○	1	1	–	TQFP12-32	–
S1C17M22	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	0.7	5	160	1.8 to 5.5 *9	16K (*3)	–	2K	40	4	2 x 2	1	1	2	2	–	1	2	–	8	1	○	○	1	1	–	TQFP12-48	–
S1C17M23	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	1.5 / 0.7	5.5 / 5	160	1.8 to 5.5 *9	32K (*3)	–	2K	18 / 24	4	2 x 2	1	1	2	2	–	1	1	–	4 / 6	1	○	○	1	1	–	SQFN4-24 / SQFN5-32	–
S1C17M24	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	0.7	5	160	1.8 to 5.5 *9	32K (*3)	–	2K	24	4	2 x 2	1	1	2	2	–	1	1	–	6	1	○	○	1	1	–	TQFP12-32	–
S1C17M25	–	–	21M	32.768k	32k/700k/12M/16M/20M	0.36	0.7	5	160	1.8 to 5.5 *9	32K (*3)	–	2K	40	4	2 x 2	1	1	2	2	–	1	2	–	8	1	○	○	1	1	–	TQFP12-48	–
S1C17M30	26 x 4 / 22 x 8 *6	–	16.8M	32.768k	32k/700k/12M/16M	0.2	0.7	5	160	1.8 to 5.5 *9	48K (*3)	256 *8	4K	38	4	3 x 2	1	1	2	2	–	1	2	–	2	1	○	○	1	1	–	TQFP12-48	–
S1C17M31	26 x 4 / 22 x 8	–	16.8M	–	32k/700k/12M/16M	0.2	1.4	5.5	160	1.8 to 5.5 *9	48K (*3)	256 *8	4K	38	4	3 x 2	1	1	2	2	–	1	2	–	2	1	○	○	1	1	–	TQFP12-48	–
S1C17M32	42 x 4 / 38 x 8 *6	–	16.8M	32.768k	32k/700k/12M/16M	0.2	0.7	5	160	1.8 to 5.5 *9	64K (*3)	256 *8	4K	54	4	3 x 2	1	1	2	2	–	1	2	–	2	1	○	○	1	1	–	TQFP13-64	–
S1C17M33	50 x 4 / 46 x 8	–	16.8M	32.768k	32k/700k/12M/16M	0.2	0.7	5	160	1.8 to 5.5 *9	96K (*3)	32 to 512 *8	4K	66	4	3 x 2	1	1	2	2	–	1	2	–	5	1	○	○	1	1	–	QFP14-80	○
S1C17M34	37 x 4 / 33 x 8	–	16.8M	32.768k	32k/700k/12M/16M	0.2	0.7	5	160	1.8 to 5.5 *9	64K (*3)	256 *8	4K	52	4	3 x 2	1	1	2	2	–	1	2	–	5	1	○	○	1	1	–	TQFP13-64	–
S1C17M40	40 x 4 / 36 x 8	–	16.8M	32.768k	32k/700k/16M	0.25	0.7	5	–	1.8 to 5.5 *1	48K (*3)	256	2K	55	4	3 x 2	1	1	3	2	–	1	1	–	4	1	○	○	1	1	–	QFP13-64	○
S1C17M40	28 x 4 / 24 x 8	–	16.8M	32.768k	32k/700k/16M	0.25	1.4	5.5	–	1.8 to 5.5 *1	48K (*3)	256	2K	41	4	3 x 2	1	1	3	2	–	1	1	–	3	1	○	○	1	1	–	TQFP12-48	–

*1: During erasing / programming in flash memory /EEPROM programming (VDD): 2.2V to 5.5V
*2: During erasing / programming in flash memory / EEPROM programming / Analog circuit operation (VDD): 2.2V to 3.6V
*3: During erasing / programming voltage in flash memory (VPP): The external applying of 7.5V / 7.5V (Typ.) is needed. (*3) can be rewritten even with internal power supply.
*4: SVD is an abbreviation for Supply Voltage Detector.
*5: Output dedicated port 1 included.
*6: External voltage application mode only. to 5.5V
*7: (MR sensor controller) Operation (VDD) : 2.0V to 5.5V
*8: AMRC Flash area is used.
*9: During erasing / programming in flash memory (VDD): 2.4V to 5.5V

■ S1C17 Long-running Series

Products	Display LCD Driver seg×com	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [µA] (Typ.)	Halt [µA] (Typ.)	32kHz Operating [µA] (Typ.)	1MHz Operating [µA] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	Mask ROM [Byte]	RAM [Byte]	I/O port *9	8-bit timer	16-bit timer	16-bit PWM timer	Stopwatch	Watchdog timer	Clock	Real-time clock	UART	SPI	I²C master	I²C slave	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter (10-bit)	SVD *5	Sound generator	Multiplier /Divider	Special function	Package	Chip
S1C17100/600 series	[Low Power] This is a 16-bit MCU with improved processing capacity and development environment, while maintaining low power consumption equivalent to Epson's 4/8-bit MCUs. This product is equipped with a built-in segment LCD driver, power circuit, clock function and various I/F, suitable for watches, clocks, remote controllers and healthcare devices.																																
S1C17153	32 x 4	–	32.768k	500k/1M/2M	0.13	0.42	4	160	2.0 to 3.6	–	16K	2K	12	1	–	1	–	1	1	1	1	1	–	–	–	–	–	1	1	1	–	–	○
S1C17651	20 x 4	4.2M	32.768k	32k/500k/1M/2M	0.09	0.42	10	350	2.0 to 3.6	16K *3	–	2K	12	1	–	1	–	1	1	1	1	1	–	–	–	–	–	1	1	1	–	TQFP13-64	○
S1C17653	32 x 4	4.2M	32.768k	32k/500k/1M/2M	0.09	0.42	10	350	2.0 to 3.6	16K *3	–	2K	12	1	–	1	–	1	1	1	1	1	–	–	–	–	–	1	1	1	–	QFP14-80	○ *7
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	–	QFP14-80	○
S1C17601	20 x 4 / 16 x 8	8.2M	32.768k	2.7M	0.6	2.0	12	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	–	TQFP13-64	○
S1C17621	40 x 4 / 36 x 8	8.2M	32.768k	2.7M	0.75	2.5	15	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	–	QFP14-100	○
S1C17602	40 x 4 / 36 x 8	8.2M	32.768k	2.7M	0.75	2.5	15	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	–	QFP14-100	○
S1C17622	56 x 4 / 52 x 8	8.2M	32.768k	2.7M	0.75	2.3	14	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	–	TQFP15-128	○
S1C17604	40 x 4 / 36 x 8	8.2M	32.768k	2.7M	0.75	2.3	14	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	–	QFP14-100	○
S1C17624	56 x 4 / 52 x 8	8.2M	32.768k	2.7M	0.75	2.3	14	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	–	TQFP15-128	○
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 a general-purpose I/O port, A/D converter input and serial I/F, and is suitable for controlling various sensor built-in devices, including household appliances.																																
S1C17589	–	16.8M	32.768k	4M/8M/12M/16M	0.2	0.6	9	280	1.8 to 5.5	128K *4	–	16K	88 / 68 / 52	–	6	4 x 6	1	1	–	1	3	2	1	1	1	–	16 / 11 / 7	1	1	–	–	QFP15-100 / QFP14-80 / QFP13-64	○ / – / –
S1C17700 series	It is an application specialized series. It is a 16-bit MCU with Flash memory compatible with high processing while achieving low power consumption, supporting power supply voltages from 1.8 V to 5.5 V.																																
S1C17711	64 x 16 / 56 x 24	8.2M	32.768k	2.7M	1.0	2.0	12	400	1.8 to 3.6 *1	64K *6	–	4K	29	–	4	4	1	1	1	1	1	1	1	1	1	2	8	1	–	1	–	TQFP15-128	○
S1C17702	88 x 16 / 72 x 32	8.2M	32.768k	2.7M	1.0	2.5	16	450	1.8 to 3.6 *1	128K *6	–	12K	28	3	3	2	1	1	1	–	1	1	1	1	–	1	–	–	1	–	1	–	QFP21-176 / VFBGA10H-180 / VFBGA8H-181	○
S1C17703	120 x 16/24/32 / 60 x 64	8.2M	32.768k	2.7M	1.0	2.5	15	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	–	QFP21-216 / VFBGA10H-240	○
S1C17705	128 x 16/24/32 / 64 x 64	8.2M	32.768k	2.7M	1.2	2.7	18	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	–	VFBGA10H-240	○
S1C17800 series	[High Performance] This 16-bit MCU realized advanced processing equivalent to 32-bit. The built-in LCD controller provides maximum VGA monochrome displays. This product is equipped with abundant built-in I/F, such as USB, various serial interfaces and A/D converters, suitable for operation panel control of white home appliances and various products, with improved user interface utilizing displays, music, sound, touch panels and etc.																																
S1C17803	LCD Controllers	33M	32.768k	–	1.3 *10	–	5	6500	2.7 to 5.5	128K *6	–	16K	97 / 69	4	1	2	–	1	–	1 *11	1	2 *12	1	1	1	–	4	–	1	–	BUS supported	TQFP15-128 / QFP14-100	–

*1: During erasing / programming in flash memory (VDD): 2.7V to 3.6 V
*2: During erasing / programming in flash memory (VDD): 2.5V to 3.6 V
*3: During erasing / programming voltage in flash memory (VPP): The external applying of 7.5V / 7.0V (Typ.) is needed.
*4: During erasing / programming voltage in flash memory (VPP): The external applying of 7.5V / 7.5V (Typ.) is needed.
*5: SVD is an abbreviation for Supply Voltage Detector.
*6: This product uses SuperFlash® technology licensed from SST UK Ltd.
*7: Al pad, Au bump
*8: Including Input port and Output port.
*9: Resolution: 12-bit
*10: Unmounted OSC1
*11: The battery backed up operation is supported.
*12: Universal serial interface (Any of UART, SPI and I²C functions can be selected.)

Products	Display EPD Driver seg (TP/BP)	High-speed [Hz] (Max.)	Low-speed [Hz] (Typ.)	Built-in oscillator [Hz] (Typ.)	Sleep [µA] (Typ.)	RTC [µA] (Typ.)	32kHz Operating [µA] (Typ.)	1MHz operating [µA] (Typ.)	Supply voltage [V]	Flash ROM [Byte]	EEPROM [Byte]	RAM [Byte]	I/O port *4	8-bit timer	16-bit timer	16bit-PWM timer	Stopwatch	Watchdog timer	Clock	Real-time clock	UART	SPI	I²C master	I²C slave	Remote controller transmission and reception	R/F converter (24-bit)	A/D converter	SVD*1	Multiplier/Divider	Temperature detection circuit	Package	Chip
S1C17F50 series	[Medium and small segment EPD] 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.																															
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	–	○ *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	32K(*2)	256	2K	17	–	4	2 x 2	–	1	–	1	1	2	1	–	–	7	1	1	1	1	QFP15-100	○ *3

*1: SVD is an abbreviation for Supply Voltage Detector.
*2: During erasing / programming voltage in flash memory (Vpp) : The external applying of 7.0V / 7.5V (Typ.) is needed. (*2) can be rewritten even with internal power supply.
*3: Al pad, Au bump
*4: Including Input port and Output port.
*5: During erasing / programming in flash memory /EEPROM programming (VDD) : 2.2V to 5.5V

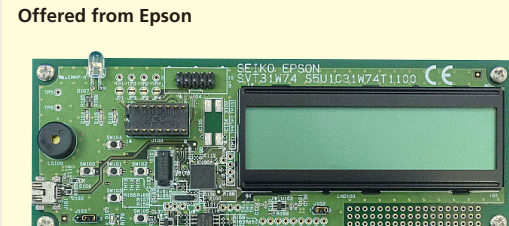## ■ Overall development environment

Things prepared by customers

*The screen is an integrated development environment
"IAR Embedded Workbench for Arm" manufactured by IAR Systems

Debug Probe
Supported products
 - IAR Systems I-jet
 - SEGGER J-LINK
   etc.

Target board for product development

Integrated development environment
Supported products
 - IAR Systems IAR Embedded Workbench for Arm
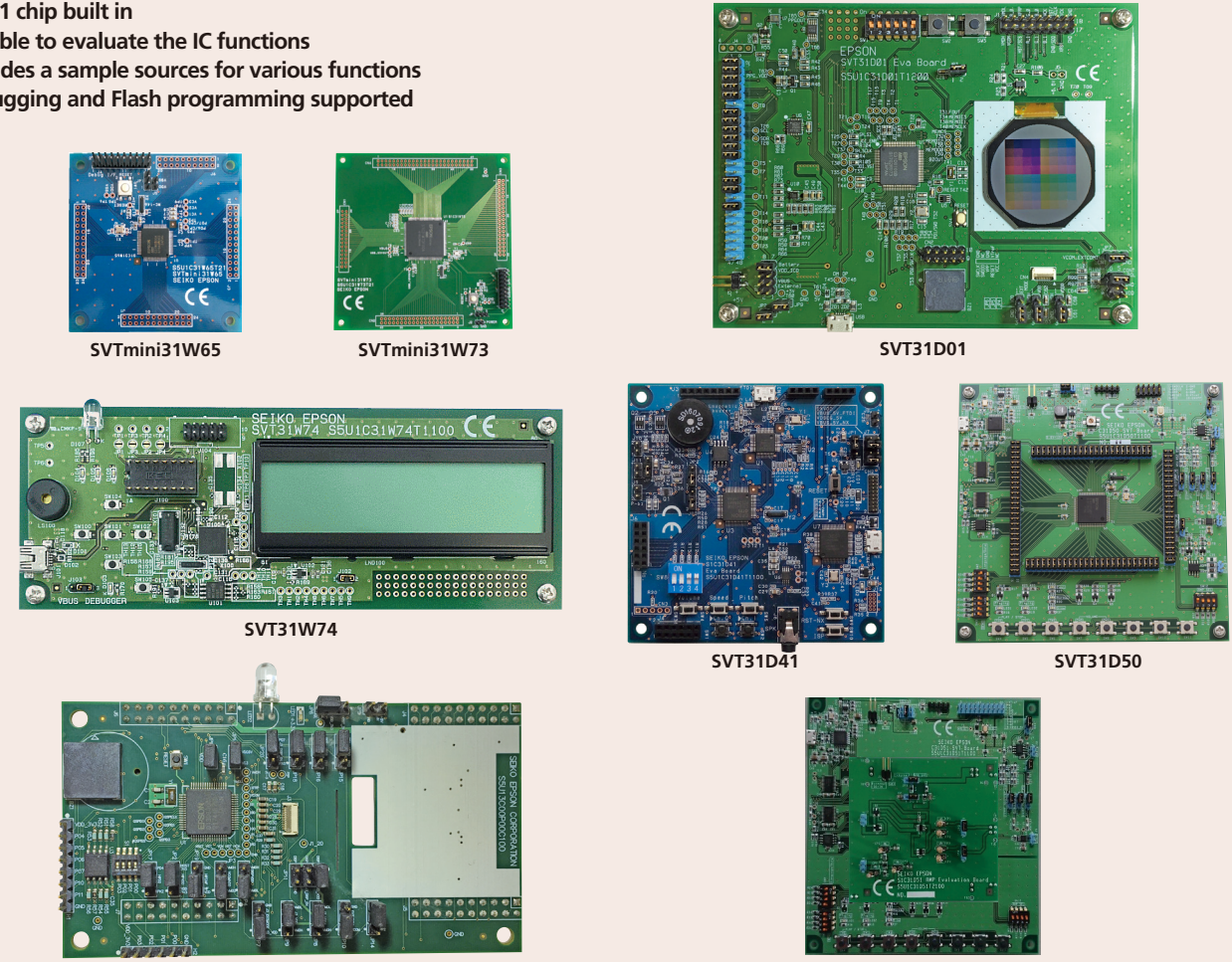 - Arm MDK-Arm
   etc.

Offered from Epson

Initial evaluation target board

Offered from Epson

Model-specific information tool
and Flash loader for integrated
development environment

Sample program

Configuration tool for
factory ROM write

■ Development support tool (Evaluation board)

- S1C31 chip built in
- Possible to evaluate the IC functions
- Provides a sample sources for various functions
- Debugging and Flash programming supported

SVTmini31W65   **SVTmini31W73**   **SVT31D01**

SVT31W74

SVT31D41   **SVT31D50**

SVT13C00   **SVT31D51**

Model Name	Product Name	Mounted Microcontroller Name	Remarks
SVTmini31W65	S5U1C31W65T2	S1C31W65	
SVTmini31W73	S5U1C31W73T2	S1C31W73	
SVT31W74	S5U1C31W74T1	S1C31W74	Dot matrix liquid crystal panel, Infrared LED, USB connector, Bridge Board
SVT31D01	S5U1C31D01T1	S1C31D01	Color memory display, Acceleration gyro sensor, Pulse sensor, Bridge Board
SVT31D50	S5U1C31D50T1	S1C31D50	AMP (class AB, class D), SPI-Flash (8MB)
SVT13C00	S5U13C00K00C	S1D13C00	Color memory display, Bridge Board for connecting to Host CPU
SVT31D51	S5U1C31D51T1 (Mother Board)	S1C31D51	AMP (class AB, class D), SPI-Flash (8MB)
	S5U1C31D51T2 (Daughter Board)	–	Buzzer drive circuit
SVT31D41	S5U1C31D41T1	S1C31D41	Debugger function (DAPLink), AMP (class D), Buzzer drive circuit, Electromagnetic buzzer, Direct sensor module plug-in socket

■ 3rd Party tool inquiries

Integrated Development Environment, Debug Probe

iar
IAR Systems K.K.
www.iar.com

Debug & Trace Probes, Flasher / In-Circuit Programmers

SEGGER
The Embedded Experts

SEGGER Microcontroller GmbH
www.segger.com

GNU17 package

Optimized C compiler supporting 16MB space
Assembler, linker and ANSI library
GUI-based debugger
Eclipse integrated environment
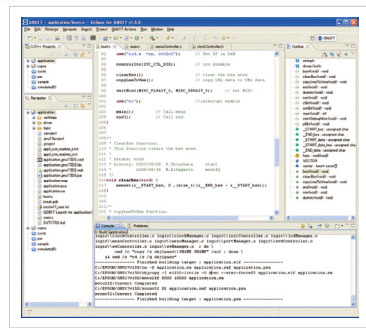
ICD mini

On-chip ICE, S1C17 Family products are supported.
Connect with the target board with 4 pins at minimum (3 signal pins and 1 GND pin).
Includes execution time measurement function.
Uses USB bus power.
Can be used as a Multi Programmer.
Includes firmware update function.
Power supply function for target devices of 3.3V .

Ver 3.0

GNU17

USB cable

ICD mini
(S5U1C17001H)
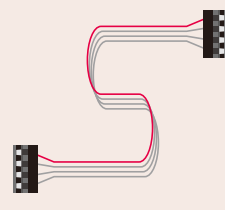
10-line cable
(DCLK, DSIO, DST2, GND)

Starter / Beginner

S1C17 SVT board
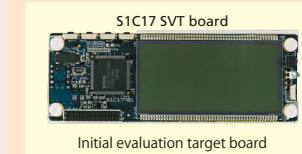
Initial evaluation target board
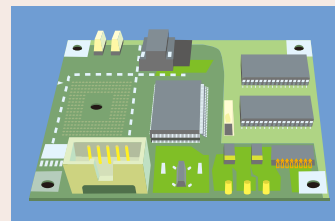
Target board for product development

■ Development support tool (Software simulator)

Port setting

Debugger window

LCD display image
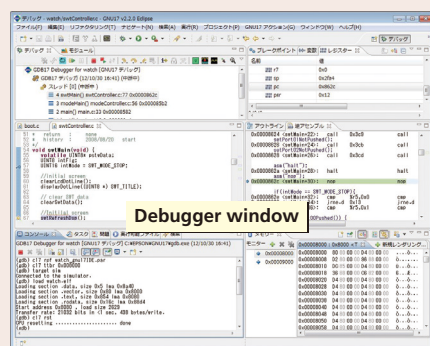
- Simulatable on PC including the LCD display, without using external debugging hardware or using an actual chip, it is possible to simulate only the LCD display (Custom-made LCD Panels can be created)
- Ability to show various data at the same time in multiple windows
- Ability to execute frequently using commands from the tool bar or menus
- Function of displaying C source, program code and symbols using disassembler
- Consecutive program execution and 3 types of step executions
- 3 types of break functions
- Trace and coverage functions
- Automatic command execution using command files

■ Development support tool (Evaluation board)

- S1C17 chip built in
- Possible to evaluate the IC functions
- Provides a sample software for various functions
- Debugging and Flash programming supported

SVTmini17M10 | SVT17M13 | SVTmini17M13 | SVTmini17M25 | SVT17M33 | SVTmini17M33

SVTmini17M40 | SVT17F57 | SVTmini17F57 | SVTmini17F63 | SVT17M01 | SVT17M03 | SVTmini17W04 | SVTmini17W12

SVTmini17W13 | SVTmini17W14 | SVTmini17W15 | SVTmini17W16 | SVTmini17W18 | SVT17W23 | SVTmini17W36

SVTmini17589 | SVT17602 | SVT17656 | SVTmini17656 | SVT17702 | SVTmini17803
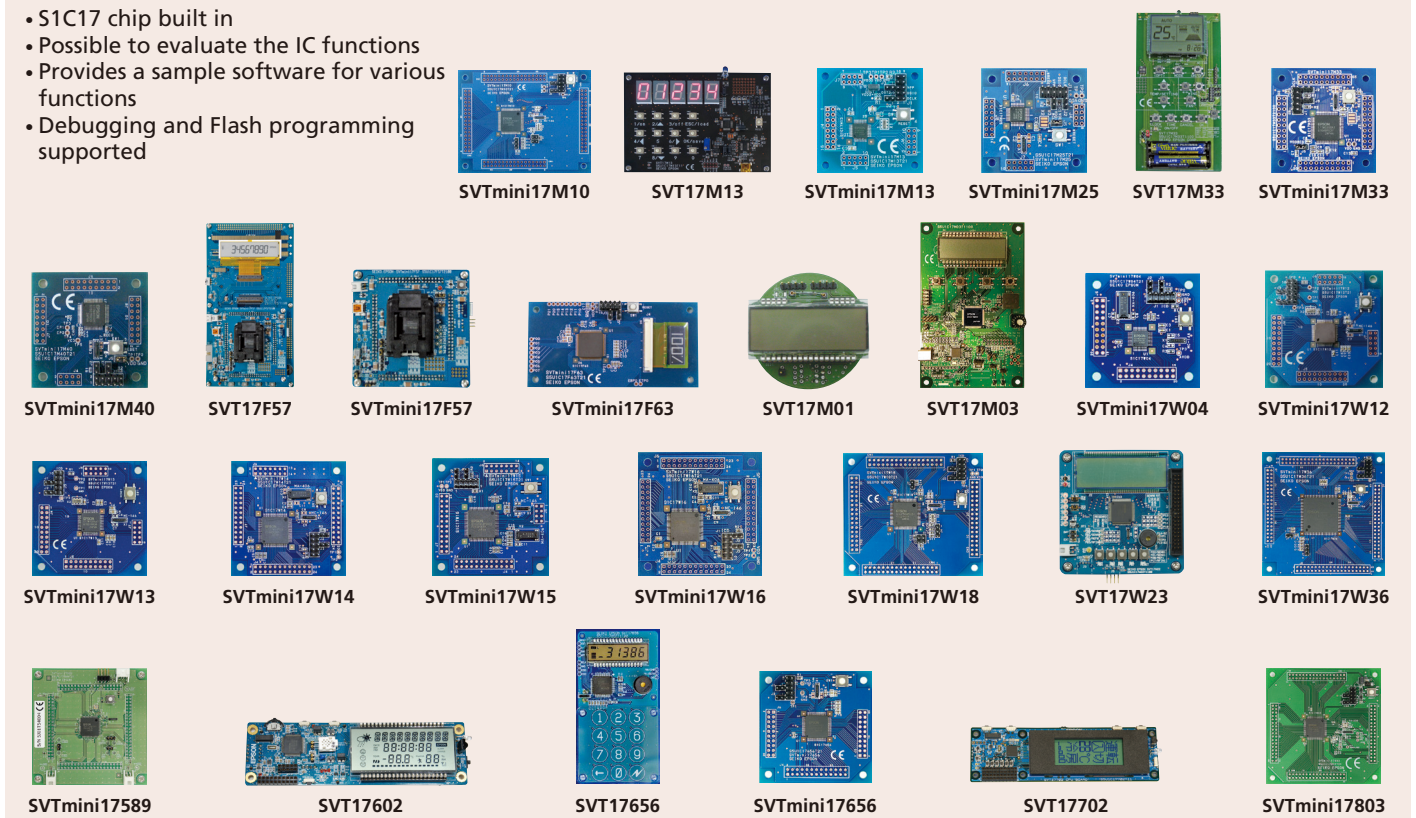
Model Name	Product Name	Mounted Microcontroller Name	Remarks
SVT17F57	S5U1C17F57T11	S1C17F57	Segment EPD panel
SVTmini17F57	S5U1C17F57T21	S1C17F57	
SVTmini17F63	S5U1C17F63T21	S1C17F63	Segment EPD panel
SVT17M01	S5U1C17M01T11	S1C17M01	LCD panel, MR Sensor with EEPROM
SVT17M03	S5U1C17M03T11	S1C17M03	Digital multimeter referrence board
SVTmini17M10	S5U1C17M10T21	S1C17M10	
SVT17M13	S5U1C17M13T11	S1C17M13	7 seg LED 5 digits, EEPROM, Infrared LED, Key matrix 3x4
SVTmini17M25	S5U1C17M25T21	S1C17M25	
SVT17M33	S5U1C17M33T11	S1C17M33	Reference board of remote controller
SVTmini17M33	S5U1C17M33T21	S1C17M33	
SVTmini17M40	S5U1C17M40T21	S1C17M40	
SVTmini17M13	S5U1C17M13T21	S1C17M13	
SVTmini17W04	S5U1C17W04T21	S1C17W04	
SVTmini17W12	S5U1C17W12T21	S1C17W12	
SVTmini17W13	S5U1C17W13T21	S1C17W13	
SVTmini17W14	S5U1C17W14T21	S1C17W14	
SVTmini17W15	S5U1C17W15T21	S1C17W15	
SVTmini17W16	S5U1C17W16T21	S1C17W16	
SVTmini17W18	S5U1C17W18T21	S1C17W18	
SVT17W23	S5U1C17W23T11	S1C17W23	LCD panel, Piezoelectric buzzer
SVTmini17W36	S5U1C17W36T21	S1C17W36	
SVTmini17589	S5U1C17589T21	S1C17589	
SVT17602	S5U1C17602T11	S1C17602	LCD panel, Remote control transmitter and receiver, Thermal/Humidity/Illuminance sensor
SVT17656	S5U1C17656T11	S1C17656	LCD panel, Capacitive touch button, Piezoelectric buzzer
SVTmini17656	S5U1C17656T21	S1C17656	
SVT17702	S5U1C17702T11	S1C17702	LCD panel, Remote control transmitter and receiver
SVTmini17803	S5U1C17803T21	S1C17803	

■ If you procure written products from a Epson dealer

Seiko Epson semiconductor plant → Written products → Customer
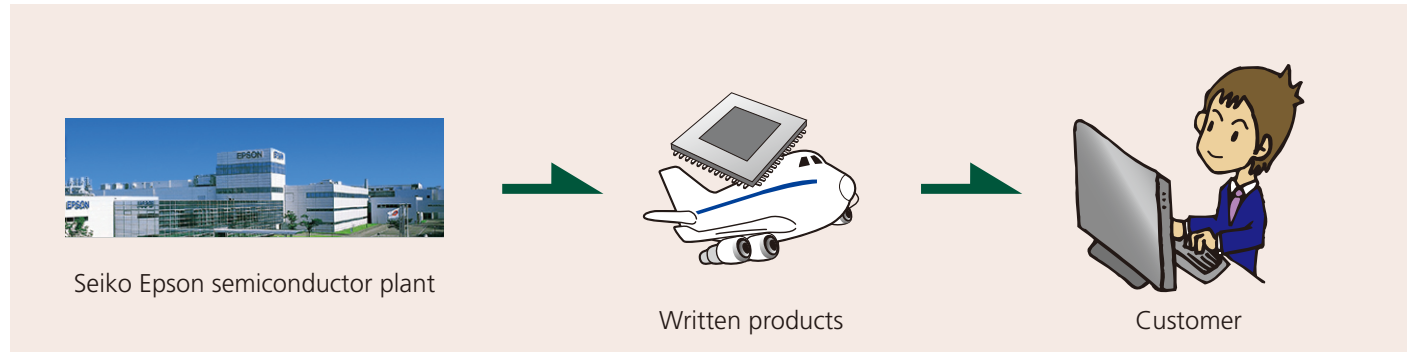
■ If you write to flash memory on your side (Single writing)

Unwritten products → Customer → Single flash writing mode

Push Button!
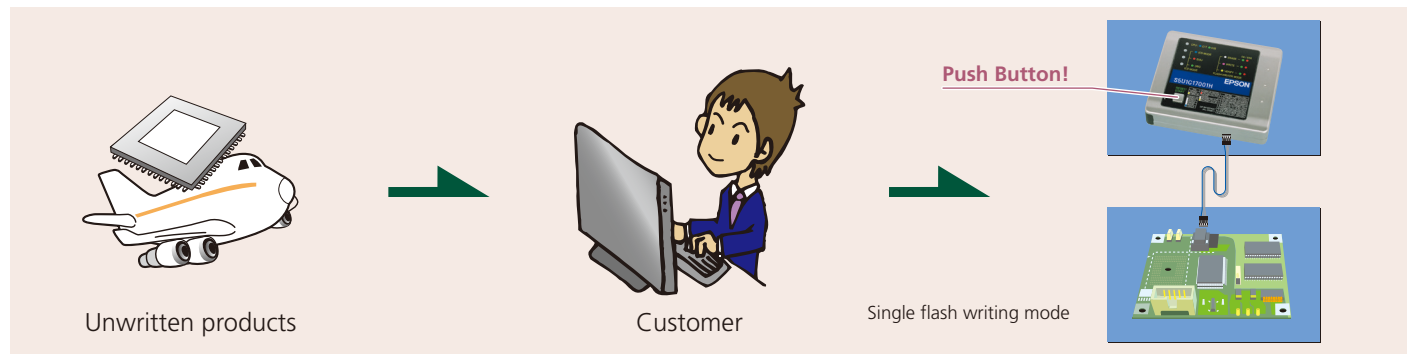
■ If you write to flash memory on your side (Simultaneous multiple writing)

Unwritten products → Customer → Multi Programmer

Push Key!

Unwritten products → Customer → Gang Programmer

Push Button!
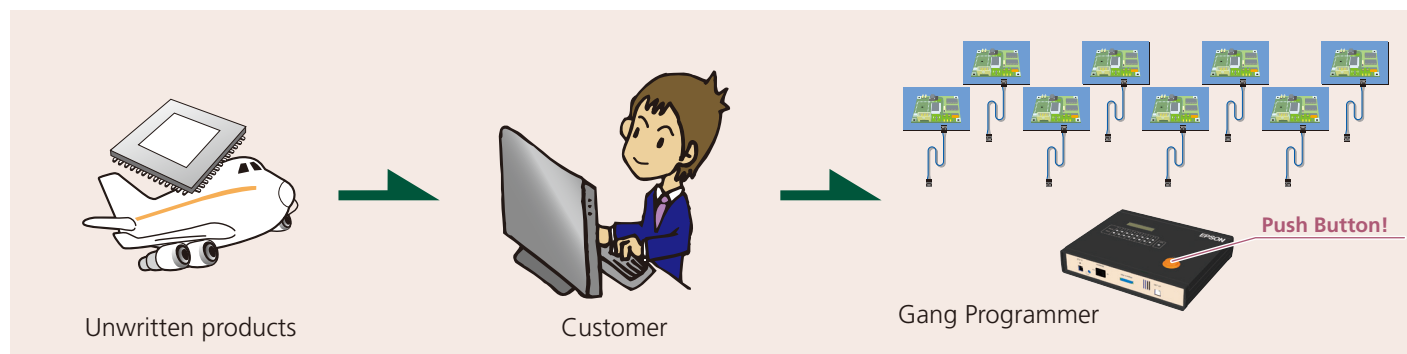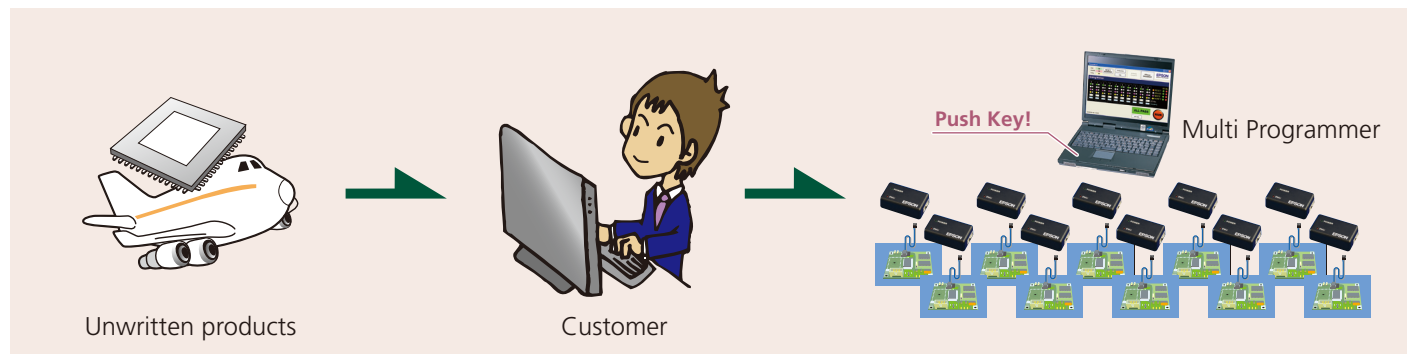
■ On-board writing tools and environments

Compatible models: S1C17Family(Single writing)

AC/DC adapter (or Battery box) — FLASH writer — Target board

S5U1C17001H2 (ICDmini)
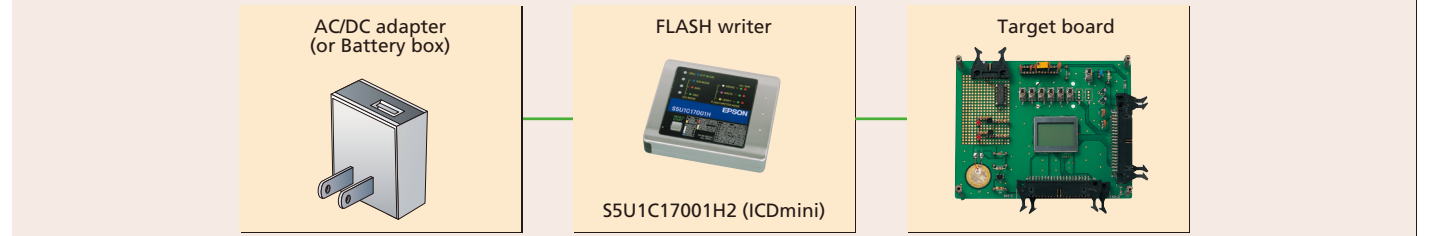
- A single S5U1C17001H2 (ICDmini) unit operates as an on-chip flash writer. Simply by pressing a button, user data previously saved in the ICDmini can be written to the internal flash ROM on the target board, or the flash ROM connected to the external bus.
- You can enjoy on-board programming easily at any location where a 5V power supply is available.
* Power supply to the target board may be required separately.
* The product does not include the target board, and AC adapter or battery box to supply power to USB terminals.

Compatible models: S1C17Family(Simultaneous multiple writing)

PC — USB HUB — FLASH writer — Target board

S5U1C17000Y (Multi Programmer)
S5U1C17001H (ICDmini) x10(max.)
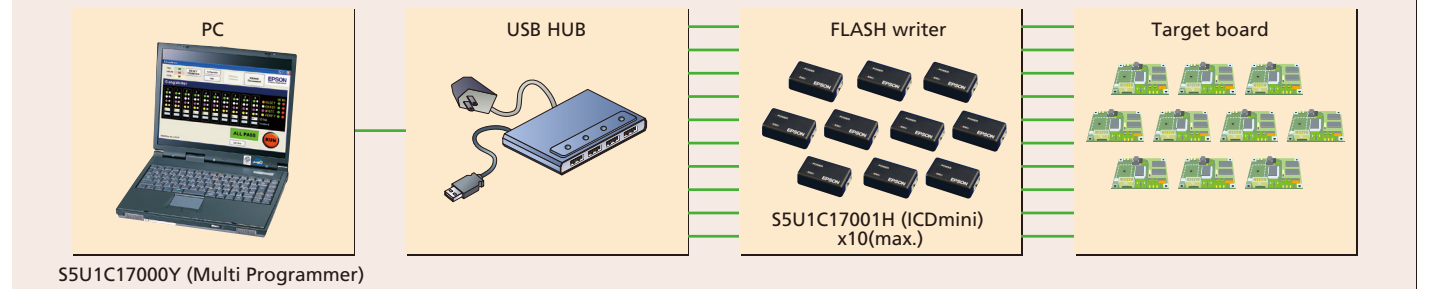
- Up to 10 units of the S5U1C17001H (ICDmini) can be used to construct an environment enabling user data to be downloaded simultaneously to multiple targets.
- The S5U1C17000Y, Multi Programmer software that controls the ICDmini, provides user-friendly screen and simple operation.
* Power supply to the target board may be required separately.
* The product does not include the target board, PC and the USB hub operating on self-power.

Compatible models: S1C17Family(Simultaneous multiple writing)

SD Card — Gang Programmer — Target board
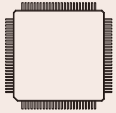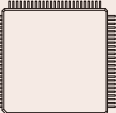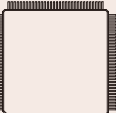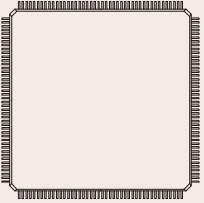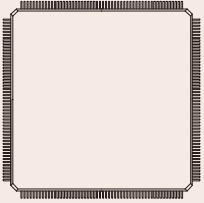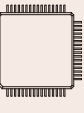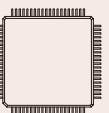
S5U1C17001W

- A single S5U1C1700W unit downloads user data simultaneously to maximum 8 targets.
- SD card is used to input user data, and the operating status can be checked by LCD, LED and buzzer.
- A serial number writing function is also built-in.

Compatible models: S1C31Family(Single writing)

AC/DC adapter (or Battery box) — FLASH writer — Target board

Flasher

- SEGGER J-Link or Flasher / Any debug probe or flash programmer that supports J-Flash software tool can be used.

■ QFP & TQFP & SQFN

PKG type/Pin count	Body size (mm)	Lead pitch (mm)
SQFN4-24 (P-VQFN024-0404-0.50)	4 X 4 X 1.0	0.5
SQFN5-32 (P-VQFN032-0505-0.50)	5 X 5 X 1.0	0.5
TQFP12-32 (P-TQFP032-0707-0.80)	7 X 7 X 1.2	0.8
QFP12-48 (P-LQFP048-0707-0.50)	7 X 7 X 1.7	0.5
SQFN7-48 (P-VQFN048-0707-0.50)	7 X 7 X 1.0	0.5
TQFP12-48 (P-TQFP048-0707-0.50)	7 X 7 X 1.2	0.5
SQFN9-64 (P-VQFN064-0909-0.50)	9 X 9 X 1.0	0.5
QFP13-64 (P-LQFP064-1010-0.50)	10 X 10 X 1.7	0.5
TQFP13-64 (P-TQFP064-1010-0.50)	10 X 10 X 1.2	0.5
QFP14-80 (P-LQFP080-1212-0.50)	12 X 12 X 1.7	0.5

PKG type/Pin count	Body size (mm)	Lead pitch (mm)
QFP14-100 (P-LQFP100-1212-0.40)	12 X 12 X 1.7	0.4
QFP15-100 (P-LQFP100-1414-0.50)	14 X 14 X 1.7	0.5
TQFP15-100 (P-TQFP100-1414-0.50)	14 X 14 X 1.2	0.5
TQFP15-128 (P-TQFP128-1414-0.40)	14 X 14 X 1.2	0.4
QFP21-176 (P-LQFP176-2424-0.50)	24 X 24 X 1.7	0.5
QFP21-216 (P-LQFP216-2424-0.40)	24 X 24 X 1.7	0.4

■ WCSP

PKG type/Pin count	Body size (mm)	Ball pitch (mm)
WCSP-96 (S1C31D01)	4.45 X 4.45 X 0.7	0.4

■ Compact BGA (PFBGA) & Thin type BGA (VFBGA)

PKG type/Pin count	Body size (mm)	Ball pitch (mm)
VFBGA5H-81 (P-VFBGA-081-0505-0.50)	5 X 5 X 1.0	0.5
VFBGA10H-180 (P-VFBGA-180-1010-0.65)	10 X 10 X 1.0	0.65
VFBGA8H-181 (P-VFBGA-181-0808-0.50)	8 X 8 X 1.0	0.5
VFBGA10H-240 (P-VFBGA-240-1010-0.50)	10 X 10 X 1.0	0.5

QFP

(Top surface) (Bottom surface) Lead / IC Chip

SQFN

(Top surface) (Bottom surface) Lead / IC Chip / Exposed Die Pad

WCSP

(Top surface) (Bottom surface) / Solder Ball / Over Coat Resin / Redistribution Circuit(Cu) / Polyimide / IC Pad / IC Chip

E00A 6H00

Thin type BGA (VFBGA)

(Top surface) (Bottom surface) / IC Chip / Solder ball / Interposer
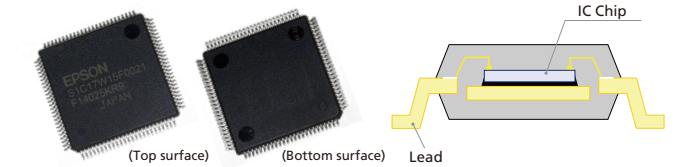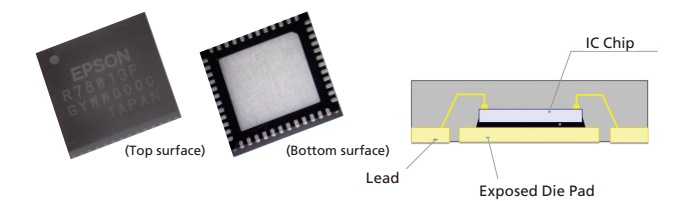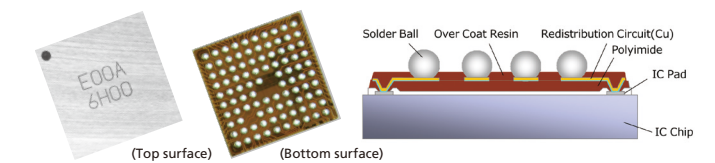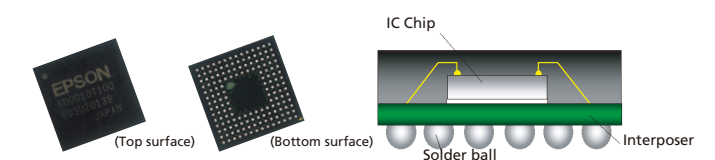
global.epson.com/products_and_drivers/semicon/products/micro_controller/

On the Epson MCU website, you can access a variety of information required for device selection and design development.

Downloadable information

- Hardware Development Tool
- Software Development Tool
- Application Note
- Sample Program
- MP Support Tool

Microcontrollers Parametric Search
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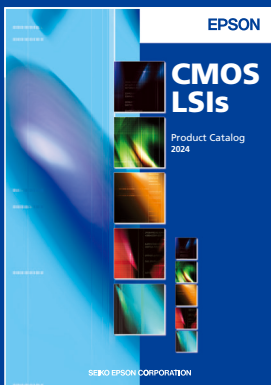NC-Verilog®   : Cadence Design Systems Inc. in U.S.A.
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