

EPSON MCU Introduction for Industry

May 2022



- Introduction of EPSON Semiconductor
- EPSON MCU overview
- MCU features
- MCU family introduction
 - S1C31 family (32-bit ARM[®] Cortex[®] M0+)
 - S1C17 family (16-bit RISC CPU)
- Development tools

- APPENDIX
 - Comparison table

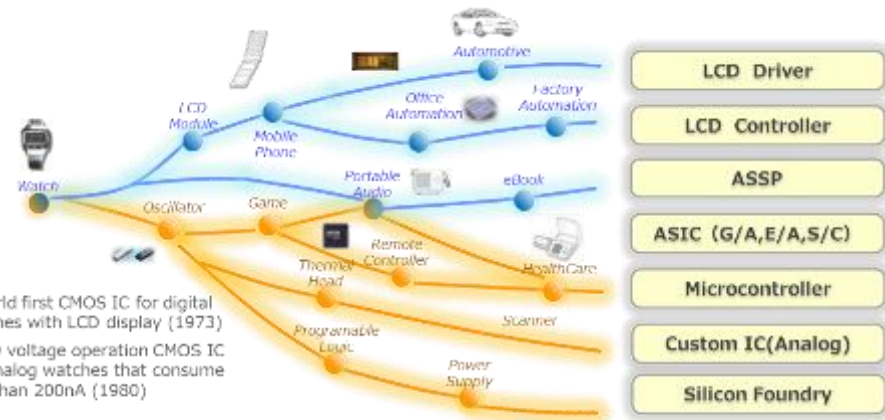
History

In 1969, development of CMOS IC for watch was started in Suwa area, and the history of Epson semiconductor.

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.



- 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



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.



— Core Line-up

Epson 16-bit CPU S1C17 Family

- Low power consumption
- Wide voltage range from 1.2V to 5.5V
- Int. LCD / LED / EPD driver

Arm® Cortex® –M0+ S1C31 Family

- Low power consumption
- High Performance
- Support 5V operation
- Large capacity Flash memory
- Unique peripherals with MDC / Voice

— Application example

Consumer products

Watch, Clock
Remote controller
Label writer
White goods



Industrial products (FA)

Time switch
Thermostat
Temperature monitor
Digital Multimeter
HCA
Heat meter



Healthcare / Medical

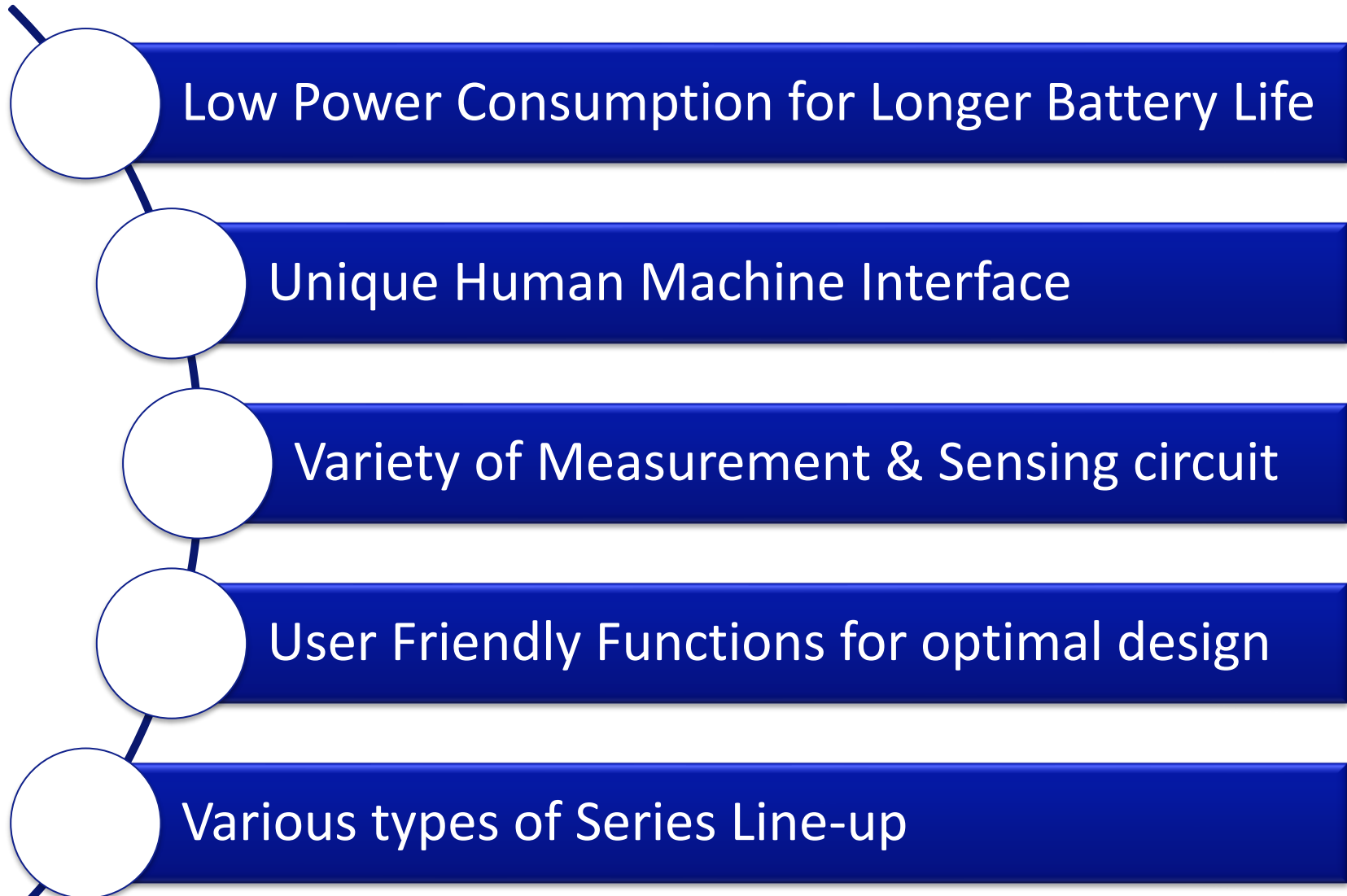
Pedometer
Active monitor
Thermometer
Insulin pen



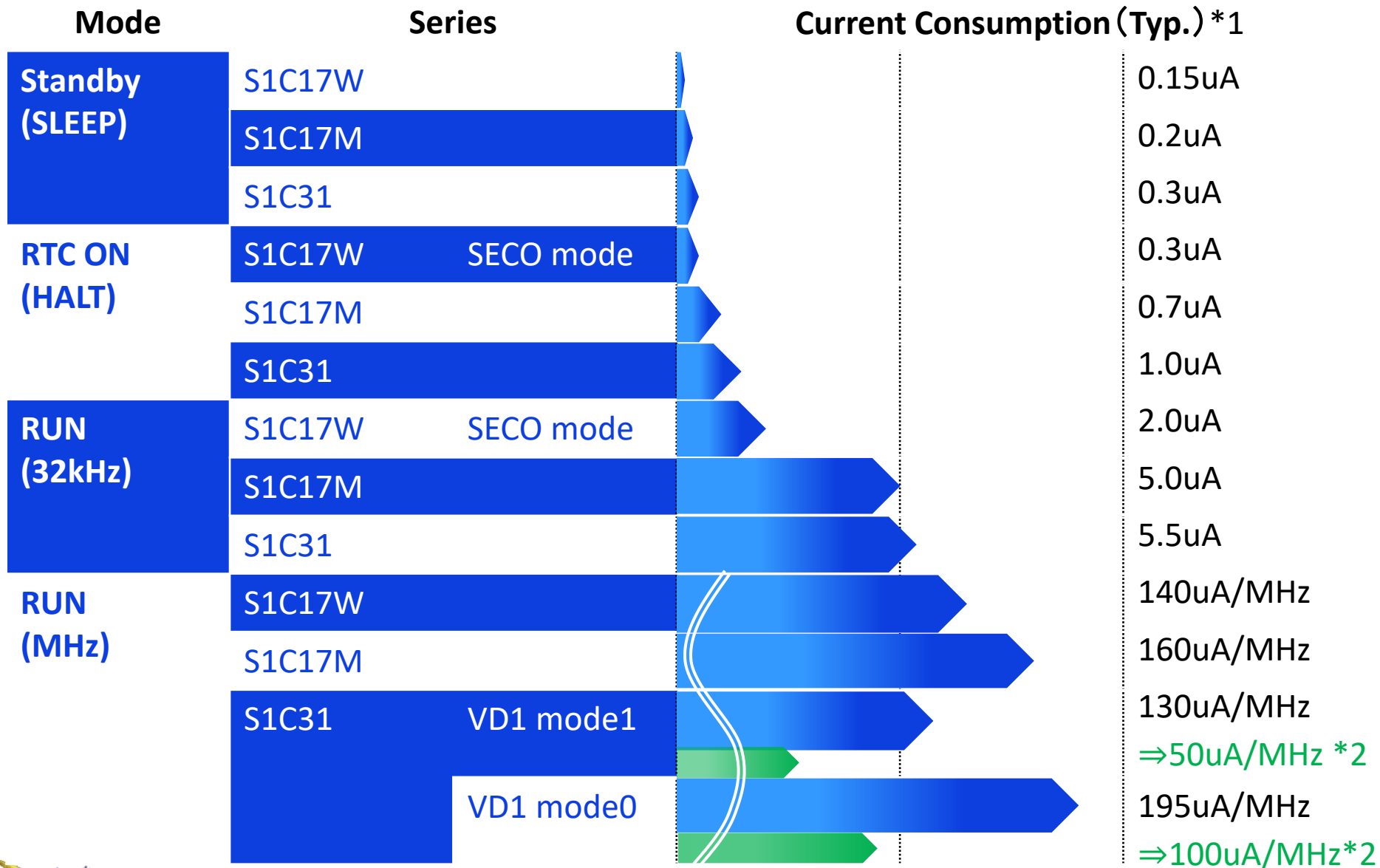
Security products

Smart card
E-Token
Card reader
Logistics Tag





Feature – Low Current Consumption



*1 These values are in typical case *2 Under Development



B/W LCD driver

Segment LCD driver

- 12 ~ 88SEG x 4/8COM
- 1/3bias booster power circuit

Dot matrix LCD driver

- 56 ~ 128SEG x 16/24/32/64COM
- 1/4, 1/5bias booster power circuit
- 32-levels contrast by SW

LCD controller

STN/TFT LCD controller

- 320x240 B/W / 320x240(QVGA)16GS

Memory display controller

- 300 x 300 6bit color / 640x640 B/W
- SHARP / JDI MIP LCD panel
- Graphic Engine Function

Segment EPD driver

- 42~256SEG+TP/BP
- Built-in power circuit

Segment LED driver

- 8SEGx5COM 5V

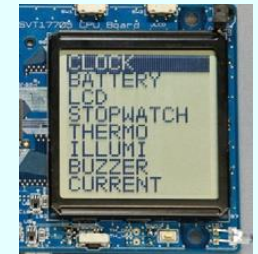
Segment LCD



STN LCD controller



Dot matrix LCD



MIP(Memory In Pixel) LCD



GE: Drawing function



GE: Image/bitmap copy



Segment EPD

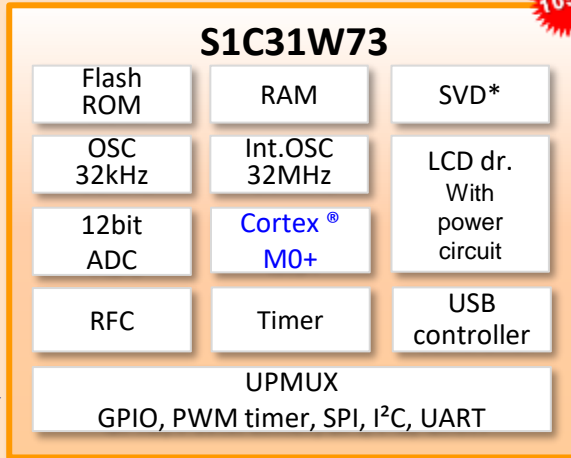


Segment LED

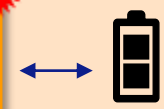


Feature – Variety of HMI (Display)

arm



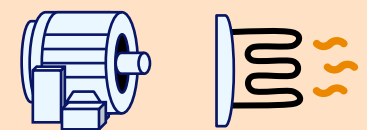
5V direct input



Battery monitor

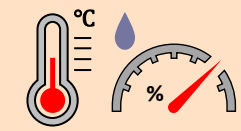


LCD panel
4/8/16/32com

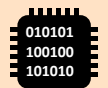


Motor, Heating system control

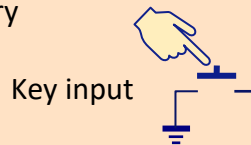
* SVD: Supply Voltage Detector



Sensing



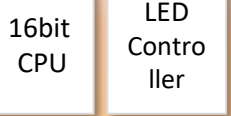
External memory



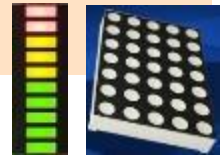
Key input

S1C17M13

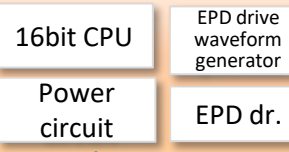
**Direct drive !
No transistors !**



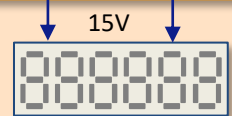
LED Display



S1C17F63

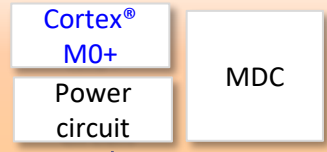


Direct drive !



EPD Display

arm **S1C31D01**

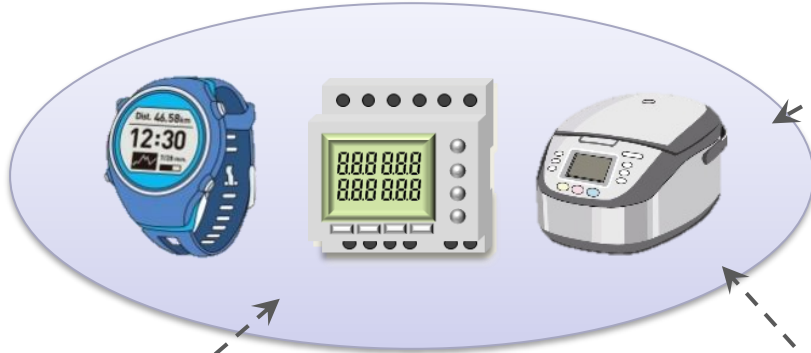


Direct drive !



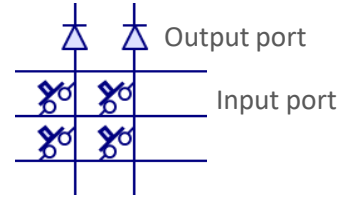
Memory Display





Key, Button Input, Resistive Touch I/F

- Key input by GPIO
- Chattering Filter
- Capacitive Touch by GPIO and Timer



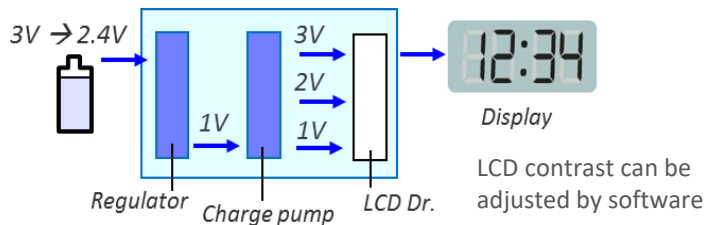
Display Drive / Control

Built-in display driver / controller

- LCD segment
- LCD dot matrix
- LED, EPD
- TFT, Memory display



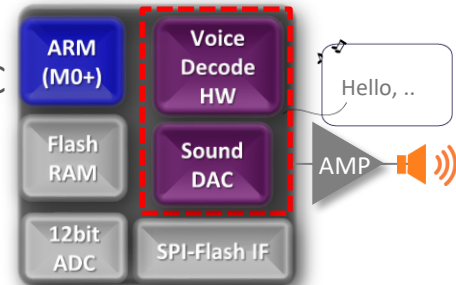
High quality display with internal booster circuit regardless of battery voltage by internal booster circuit



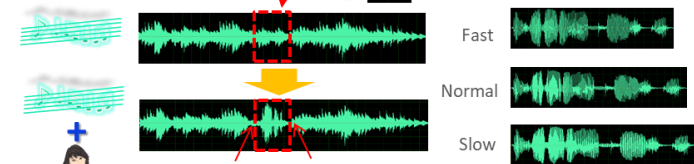
Voice Audio Function

H/W processor & Sound DAC

- Easy voice data creation
- Multi-language support
- 2ch mixing play
- Voice speed conversion



2ch mixing play function

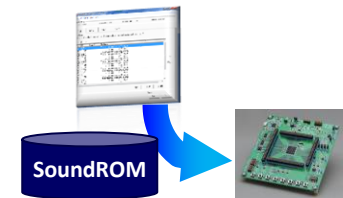


Music Volume down

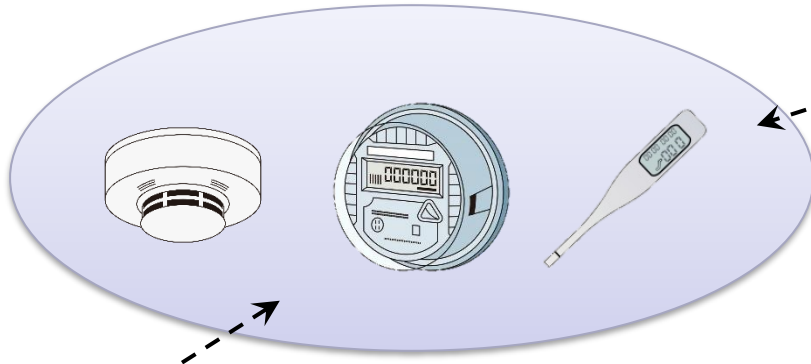
Music Volume return



No studio recording

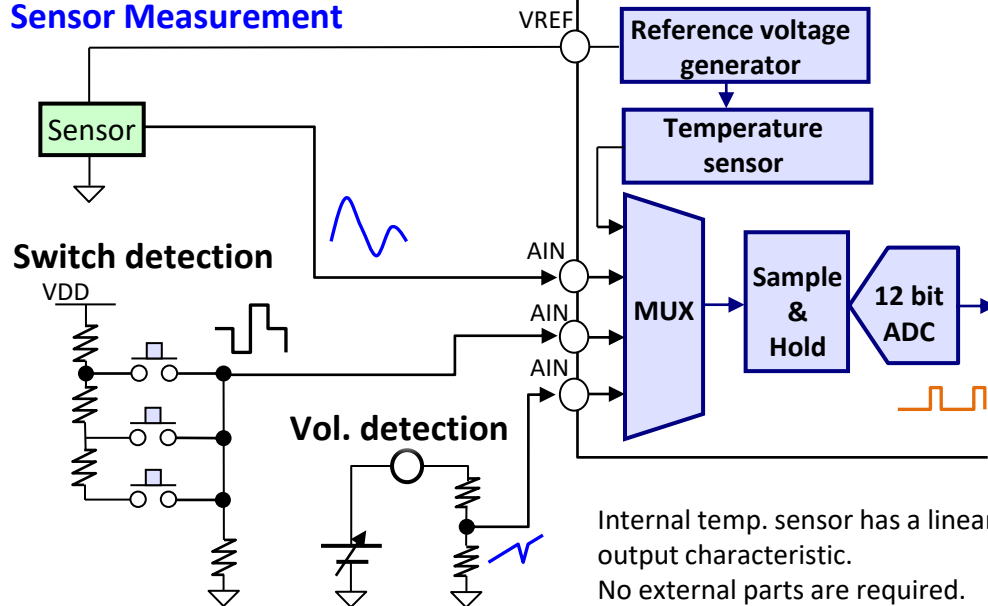


Voice data creation PC tool



12bit A/D converter + Temp. Sensor / Ref. voltage generator

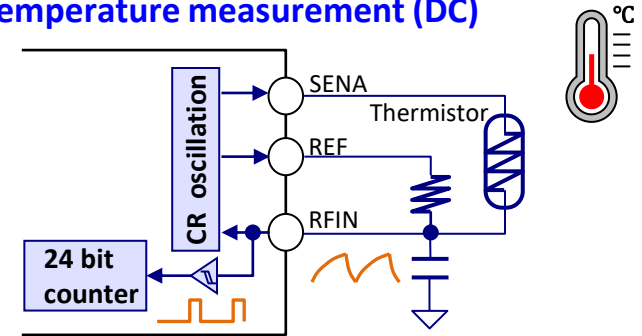
Sensor Measurement



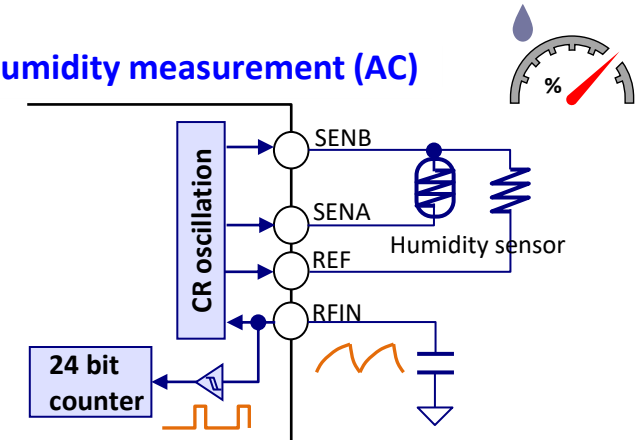
24bit R/F converter (RFC)

Resistance to Frequency converter for high accuracy temperature / humidity measurement

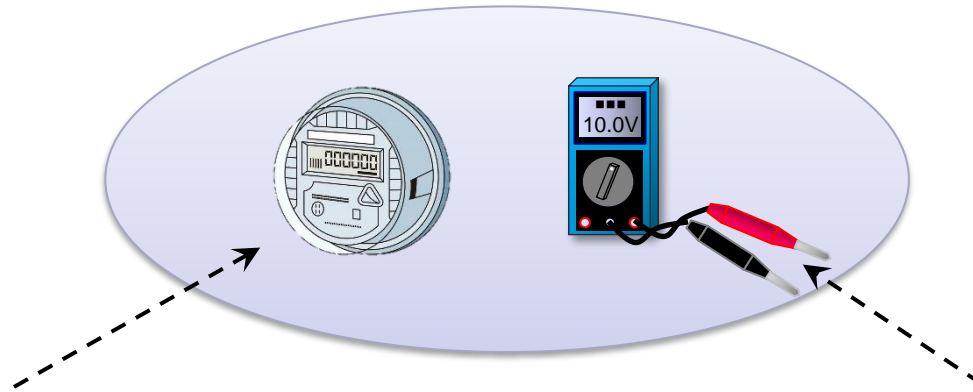
Temperature measurement (DC)



Humidity measurement (AC)



To use relative value by reference and sensor oscillation enables high accuracy measurement without affect by external environment.

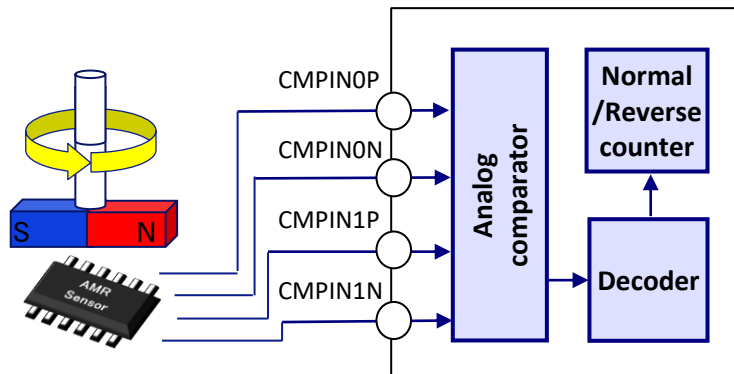


Flow measurement circuit (AMRC)

Circuit to detect rotation without contact by connecting AMR (Anisotropic-Magneto-Resistive) sensor

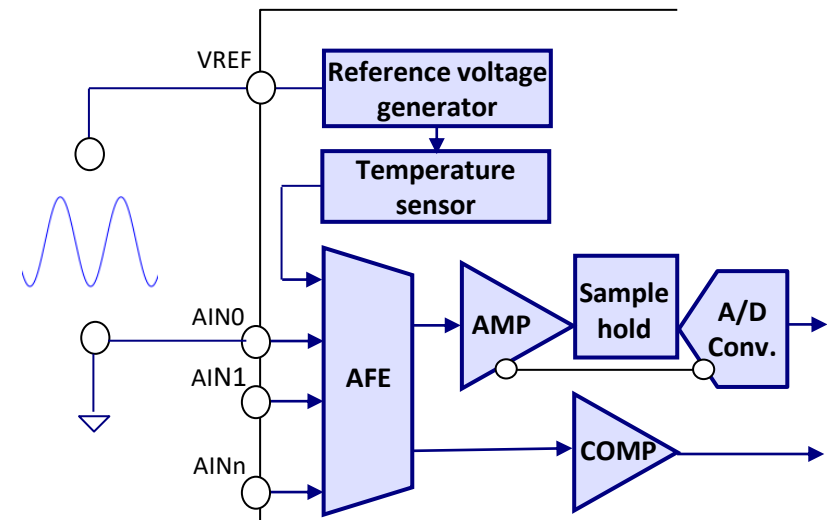
Easy flow count measurement

Rotation measurement



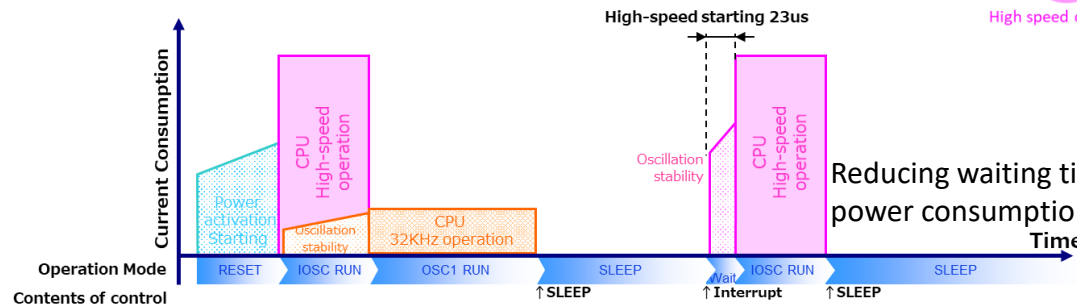
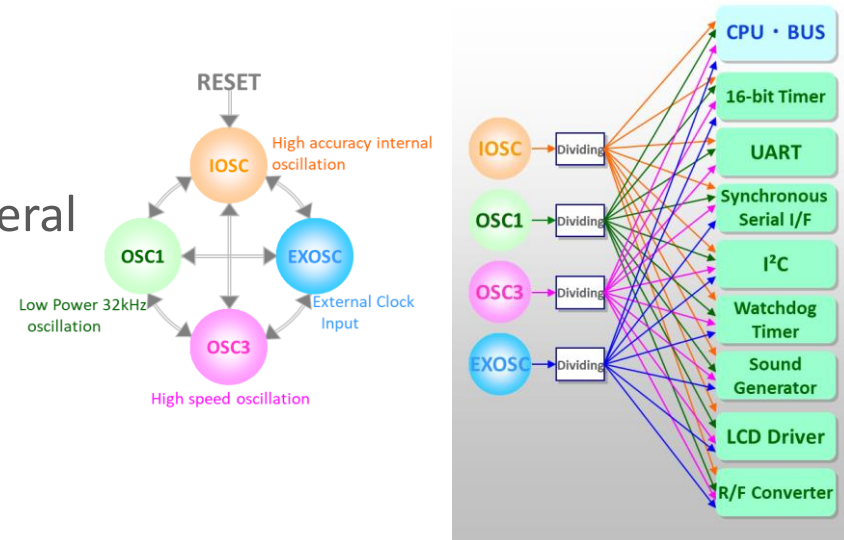
16bit A/D converter ($\Delta\Sigma$ ADC)

Analog signal



– Flexible Clock Generator

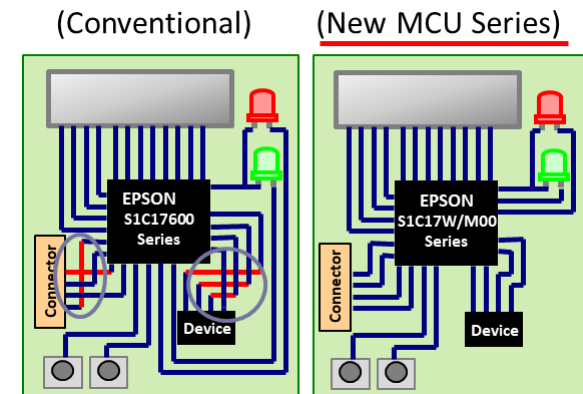
- 4 types of clock sources
- Free clock selection of each peripheral
- Any clock source can be chosen as wake-up clock from standby



Reducing waiting time when switching clocks reduce power consumption and increase battery lifetime

– Universal Port Multiplexer (UPMUX)

- SPI, I²C, UART and 16-bit PWM can be freely allocated
- Platform concept support (same PCB can be used for different designs)
- Reducing PCB layer (cost down)
- Easy wiring
- PCB and product size can be smaller



Arm® Cortex®—M0+ S1C31 Family

- Low power
- High Performance **up to 32MHz**
- **5V operation**
- Large memory
- Unique peripherals

S1C31W series “LCD driver”

S1C31W74

Flash:512KB
LCD: 80x16/72x32
Max.20MHz
(Up to 3.6V)

S1C31W73

Flash:384KB
LCD: 96x16/80x32
Max.32MHz

S1C31W65

Flash:128KB
LCD: 56x4/52x8
Max.32MHz

S1C31W6-n-aes

Flash:128KB
LCD: 44x16 / 48x8
NFC, AES
Max.32MHz

S1C31W7-b

Flash:128KB
LCD: 56x4 / 52x8
NFC, AES
Max.32MHz

S1C31D6-a

Flash:512KB
Voice
Max.32MHz

S1C31D41

Flash:96KB
Voice,Audio
Max.16MHz

S1C31D51

Flash:192KB
Voice, Audio
Max.20MHz

S1C31D50

Flash:192KB
Voice, Audio
Max.20MHz

S1C312-b

Flash:32KB
LED dr.5x8
Max. 32MHz

S1C312-a

Flash:64KB
DTCXO
Max. 32MHz

S1C312-n-aes

Flash:64KB
NFC, AES, RSA
Max. 32MHz

S1D13C00

Display controller
without CPU
MDC: 300x300x6bit

S1C31D series “Unique HMI”

S1C31D01

Flash:256KB
Memory disp. I/F
2D Graphic
Max.20MHz

S1C312 series “Small pin”

Epson 16-bit CPU S1C17 Family

- Low power
- Wide voltage operation
- LCD / LED / EPD driver

S1C17M series “5V operation”

S1C17W3 Group

Flash:128KB-384KB
LCD: 80x16/72x24/64x32

S1C17W2 Group

Flash:64KB-96KB
LCD: 72x8/64x16/56x24

S1C17W1 Group

Flash:32KB-128KB
LCD: 26x4-60x4/56x8

S1C17W0 Group

Flash:16KB-32KB
32-48 small pin PKG

S1C17W series “Low power”

S1C17M2 Group

Flash:16KB-32KB
Max.16MHz
24-48 small pin PKG

S1C17M1 Group

Flash:16KB-32KB
LED dr.
Max.16MHz

S1C17M0 Group

Flash:32KB-64KB
LCD: 16x4-32x4
EEPROM
16bit ΔΣADC

S1C17M4 Group

Flash:48KB
LCD: 28x4-40x4/24x8-36x8
EEPROM
Max.16MHz ±1% high accuracy

S1C17M3 Group

Flash:48KB-96KB
LCD: 26x4-50x4/22x8-46x8
Max.16MHz

S1C17F series “EPD driver”

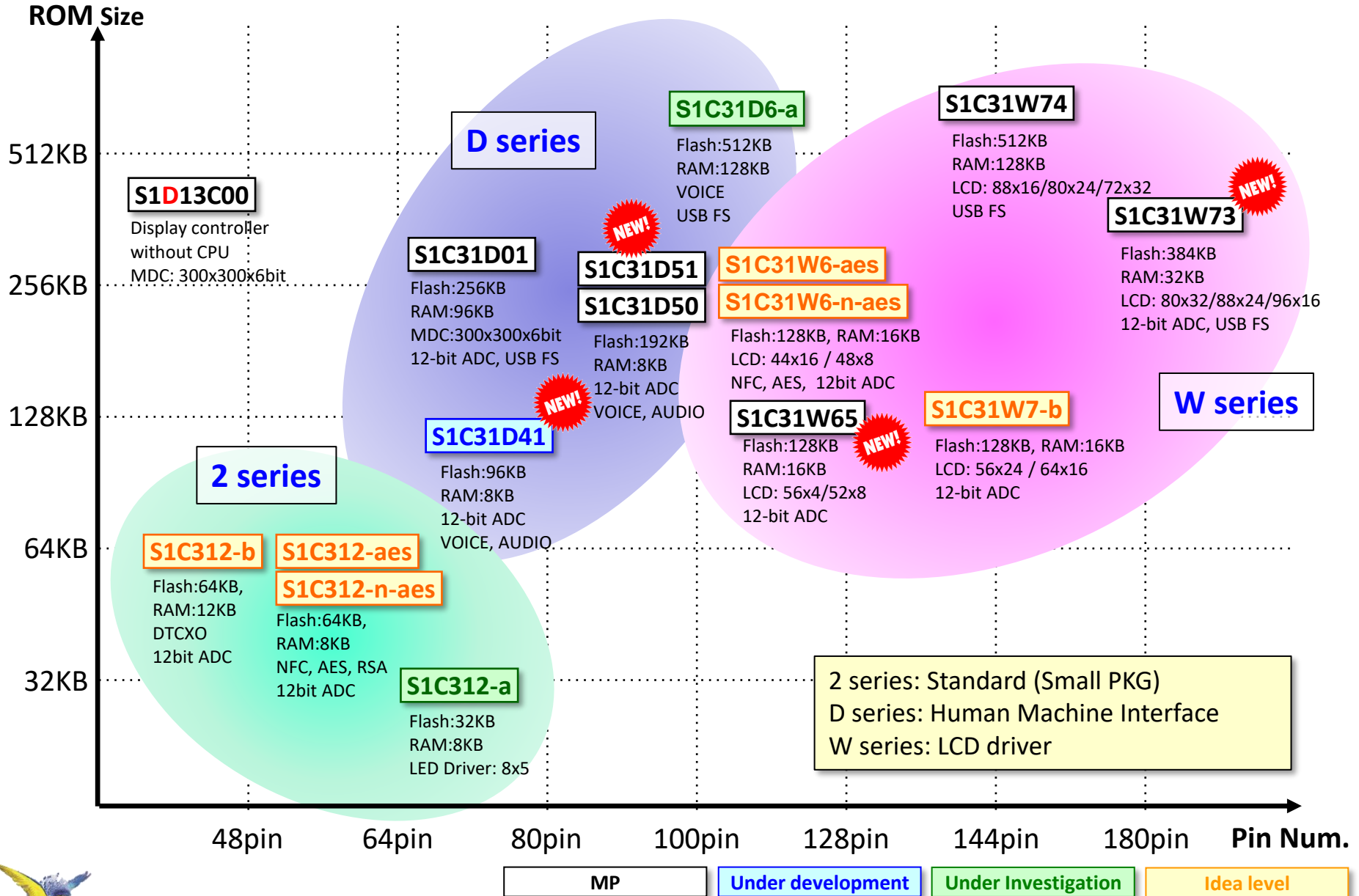
S1C17F63

Flash:32KB
EEPROM
EPD: 42segment
Max.16MHz
110nA RTC

S1C17F57

Flash:32KB
EPD: 64segment
210nA RTC

S1C31 Family – Lineup



– S1C31200 Series: **Standard MCU**

- Up to 5.5V operation, 105° C operation
- Built-in DC/DC converter boosting 1.8V to 5V for LED drive
- Small pin package line-up (24pin – 32pin)
- Suitable for smart door lock or remote controller that need high performance calculation or encryption or measurement equipment



– S1C31W00 Series: **LCD driver MCU**

- Up to 5.5V operation, 105° C operation
- STN/TN LCD driver 4 to 32 common
- Easy to develop battery driven sensing system using reference voltage, Op-amp, ADC, temperature sensor
- Suitable for timer, counter, time switch, thermostat, meter, tag or activity monitor

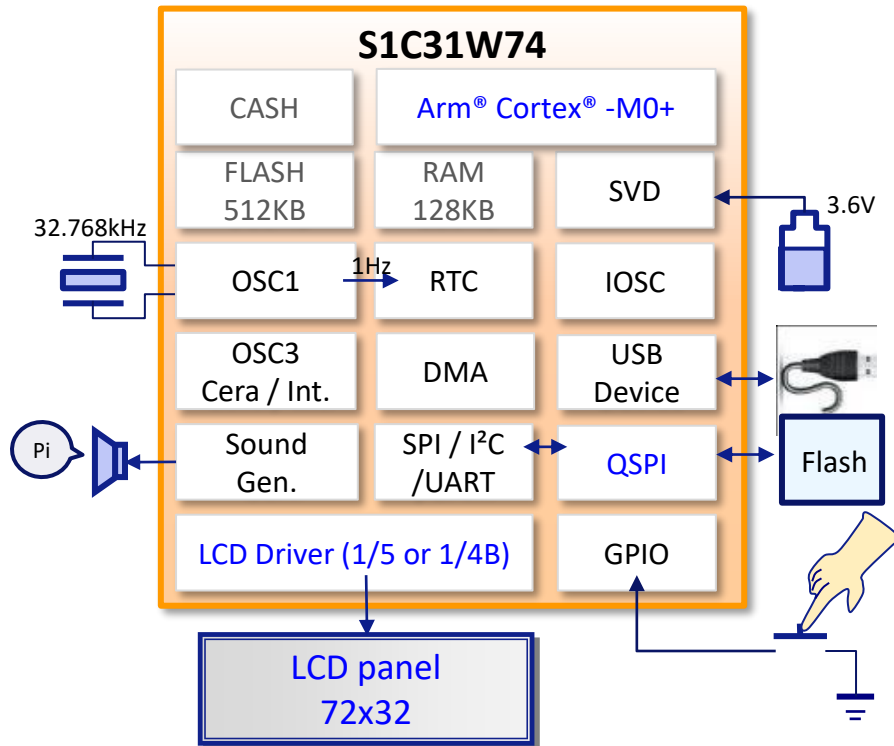


– S1C31D00 Series: **Human Machine Interface MCU**

- Controller and power source for memory in pixel (MIP), high-resolution STN/TFT LCD and EPD
- Voice function, Touch sensor I/F
- Suitable for sport watch, operation panel



Arm® MCU built-in Dot matrix LCD driver



• Features

- Operating frequency: max. 21.7MHz
- Flash 512kB, RAM 128kB
- Operating voltage 1.8V-3.6V
- Embedded high voltage generator for self-programming
- QSPI I/F
- Built-in Dot Matrix Driver 72x32 with internal booster circuit
- USB Full-speed device controller

• Power Consumption

- SLEEP: 0.4µA
- SLEEP (RTC=ON): 0.9µA
- HALT: 1.7µA
- RUN (1MHz operation): 150µA

• Shipping forms

- VFBGA8HX-181 (P-VFBGA-181-0808-0.50)
- Bare Die Chip (Al-pad)

• Schedule

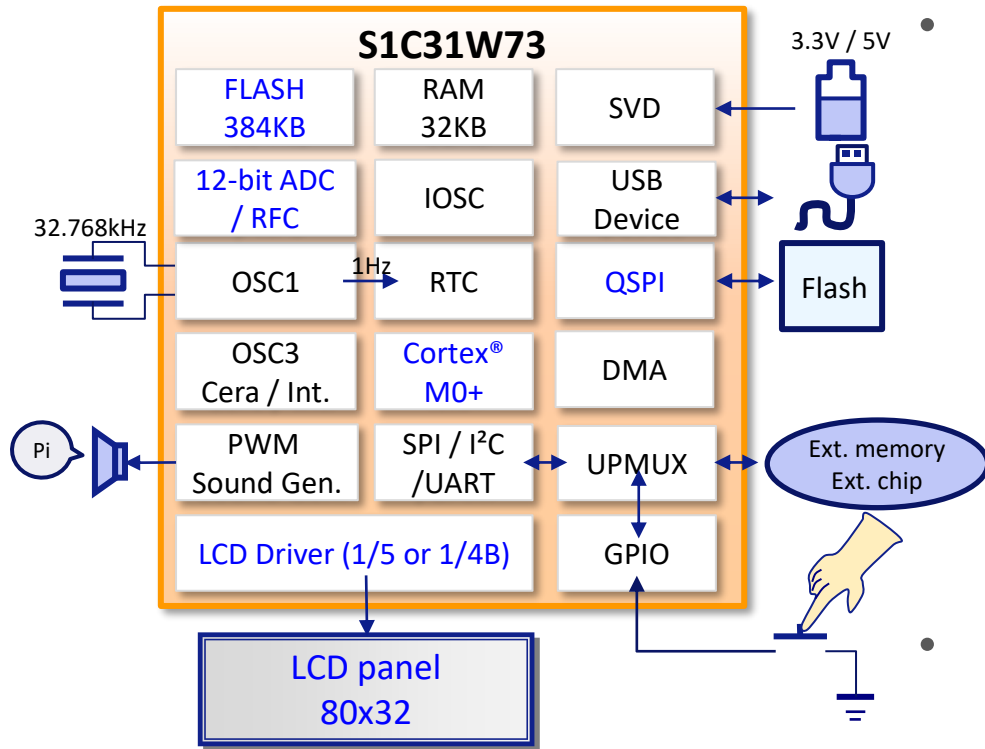
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Demo / Evaluation board



Arm®MCU built-in Dot matrix LCD driver



• Features

- Operating frequency: max. 32MHz
- 5V operation 1.8V to 5.5V
- Max. 105°C operation temperature
- Flash 384kB, RAM 32kB
- Embedded flash programming generator
- QSPI, SPI, UART, I²C I/F
- Built-in Dot Matrix LCD Driver 80x32 with internal booster circuit
- USB Full-speed device controller

• Power Consumption

- SLEEP: 0.7µA
- SLEEP (RTC=ON): 1.2µA
- HALT: 2.0µA
- RUN (2MHz operation): 150µA/MHz

• Shipping forms

- QFP21-216 (P-LQFP216-2424-0.40)
- Bare Die Chip (Al-pad)

• Schedule

- MP: ✓
- Manual: ✓
- Evaluation Board: ✓

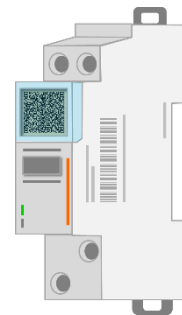
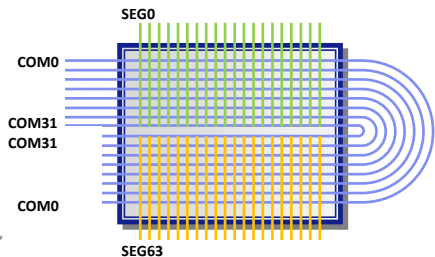
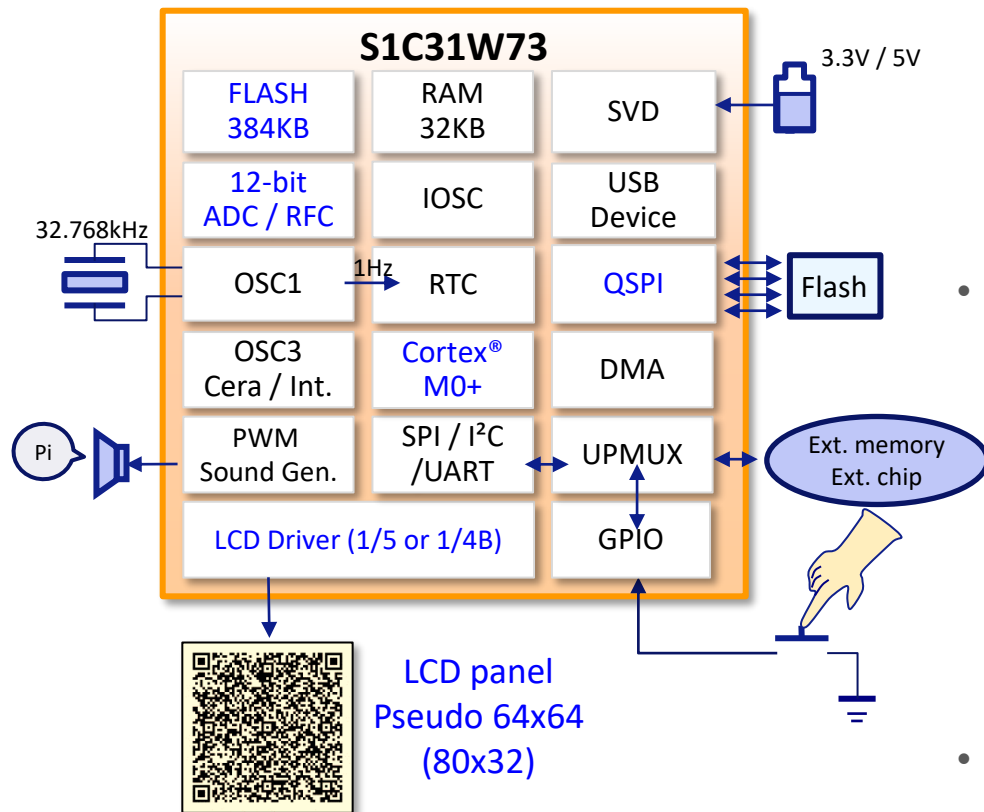


Evaluation board



S1C31W73 for QR code

Arm® MCU build-in Large dot matrix LCD driver



Web site,
App

Q&A /
Manual /
Data Upload



• Features

- Operating frequency: max. 32MHz
- 5V operation 1.8V to 5.5V
- Max. 105°C operation temperature
- Flash 384kB, RAM 32kB
- Embedded flash programming generator
- QSPI, SPI, UART, I²C I/F
- Built-in Dot Matrix LCD Driver 80x32 with internal booster circuit
- USB Full-speed device controller

• Power Consumption

- SLEEP: 0.7µA
- SLEEP (RTC=ON): 1.2µA
- HALT: 2.0µA
- RUN (2MHz operation): 150µA/MHz

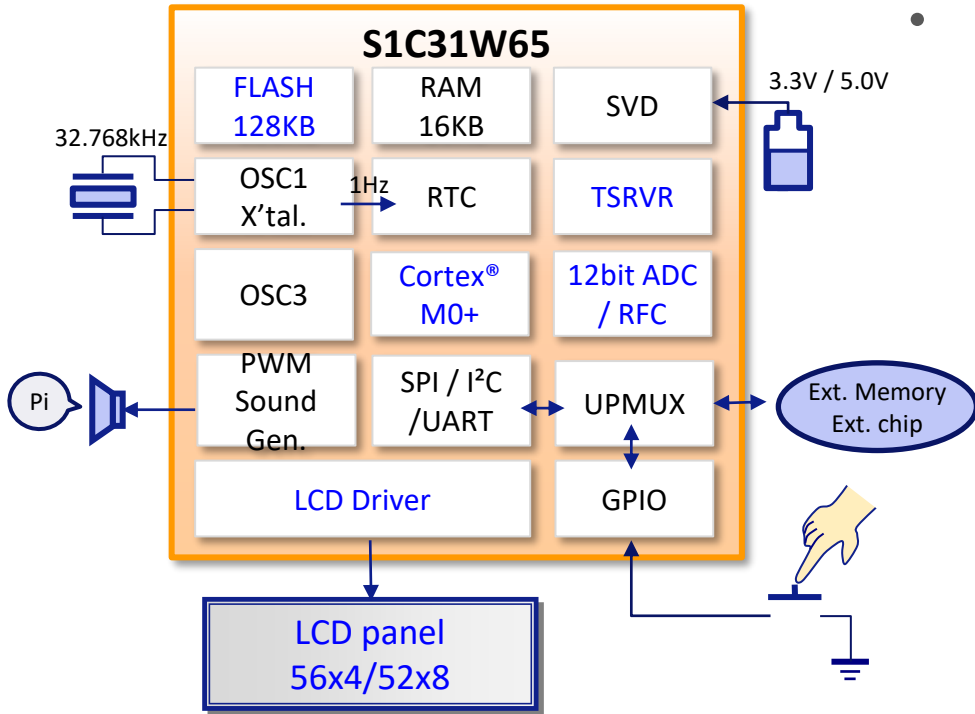
• Shipping forms

- QFP21-216 (P-LQFP216-2424-0.40)
- Bare Die Chip (Al-pad)





Arm® MCU built-in SEG LCD driver



• Features

- Operating frequency: max. 32MHz
- 5V operation 1.8V-5.5V
- Max. 105°C operation temperature
- Flash 128kB, RAM 16kB
- Embedded flash programming generator
- Temperature Sensor/ Reference Voltage Generator (TSRVR)
- 12-bit ADC, 24-bit RFC
- SPI, UART, I²C I/F
- Built-in LCD Driver 56x4/52x8 with internal booster circuit

• Power Consumption

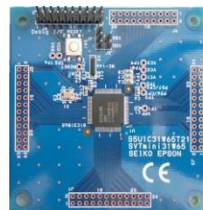
- SLEEP: 0.3µA
- SLEEP (RTC=ON): 0.8µA
- HALT: 1.5µA
- RUN (2MHz operation): 130µA/MHz

• Shipping forms

- TQFP14-100 (P-TQFP100-1212-0.40) 19

• Schedule

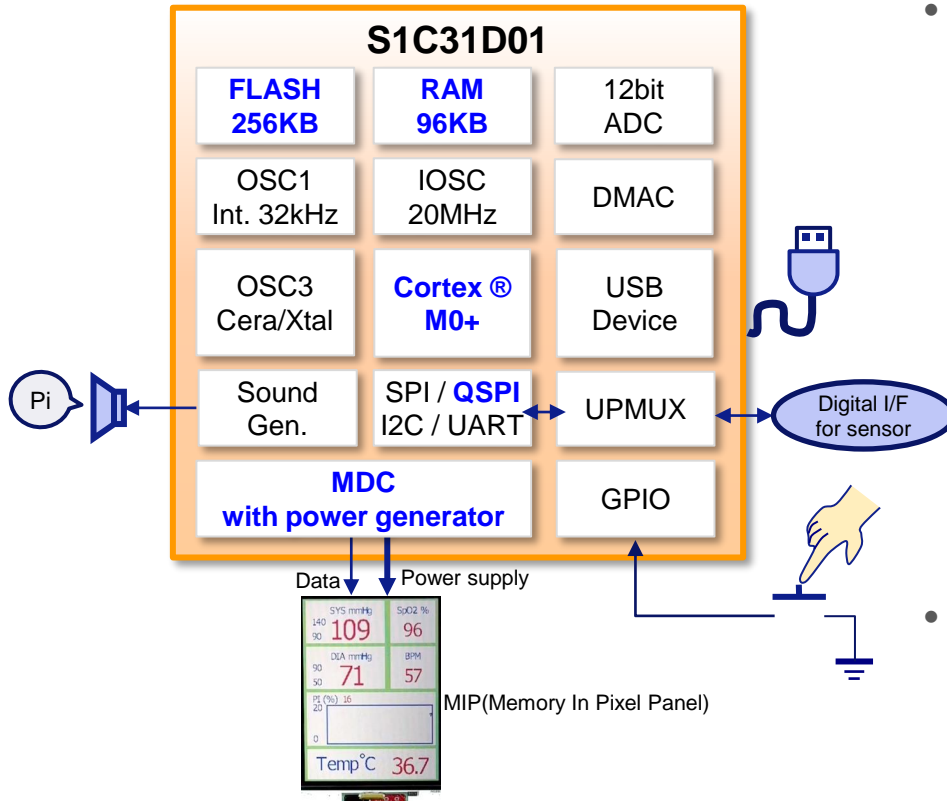
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Evaluation board



Arm® MCU built-in Memory Display Controller



Features

- Operating frequency: max. 20MHz
- 5V operation 1.8V to 5.5V
- Large Memory Flash: 256KB / RAM: 96KB
- 12bit ADC + Reference voltage generator
- Memory display controller (MDC)
 - 6-bit color, SPI panel interface
 - Power supply for MIP panel
 - Graphic hardware acceleration
- Timers, Serial interfaces, QSPI
- USB controller

Power Consumption

- SLEEP: 0.46µA
- SLEEP (RTC=ON): 0.95µA
- HALT: 1.7µA
- RUN (2MHz operation): 155µA/MHz

Shipping forms

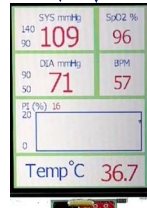
- TQFP14-80 (P-TQFP080-1212-0.50)
- VFBGA5H-81 (P-VFBGA-081-0505-0.50)
- WCSP96 (4.44 mm □)
- Bare Die Chip (Al-pad)

Schedule

- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Evaluation board

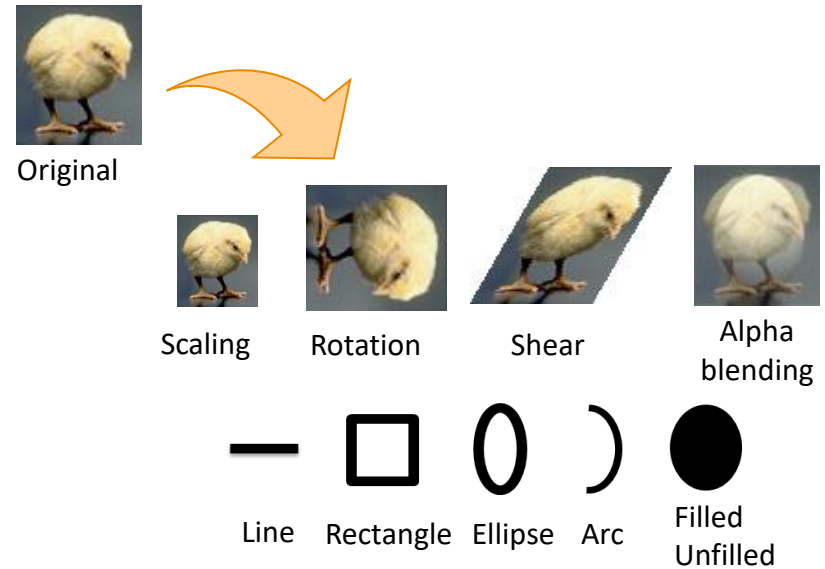


MIP (Memory In Pixel Panel)



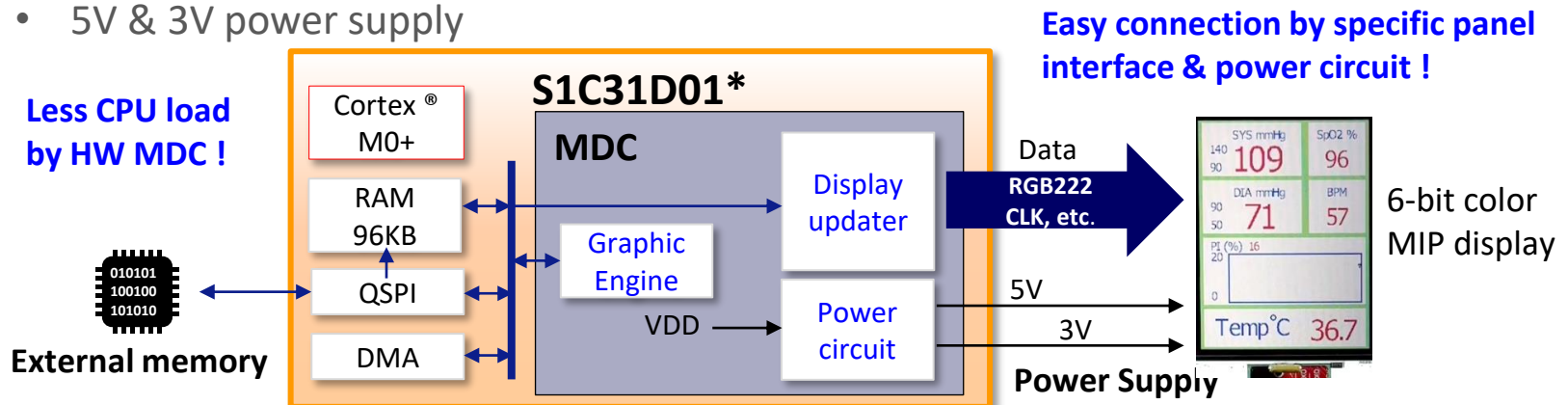
– Hardware Graphics Engine

- Copy Engine
 - Scaling and Rotation
 - Horizontal and Vertical Shear
 - Alpha-blending
- Draw Engine
 - Line, Rectangle, Ellipse, Arc drawing
 - Thickness, filled or unfilled



– Specific Panel Interface for memory display

- 6-bit color (RGB222) panel interface
- 5V & 3V power supply



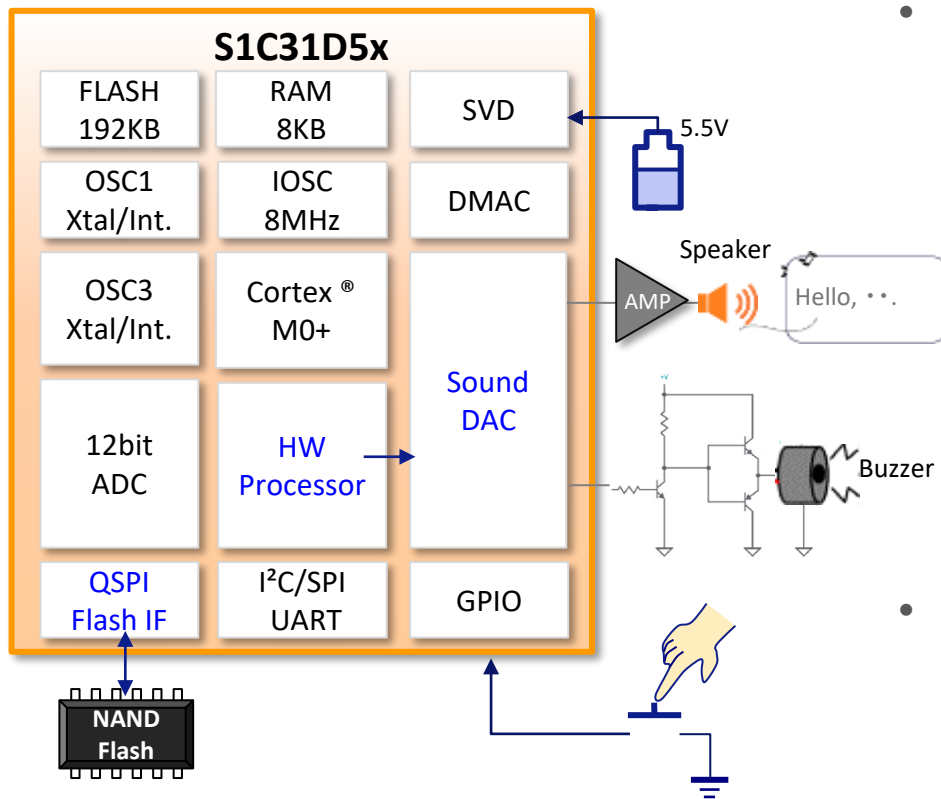
*CPU less display controller S1D13C00 is also available





Arm® Voice MCU supporting AMP+Speaker or Buzzer

Voice/Audio support also by dedicated Speech IC



Features

- Operating frequency: max. 16MHz
- 5V operation 1.8V to 5.5V
- Flash 192kB
- Voice/Sound output by buzzer (D51)
- Voice/Sound output by AMP+speaker (D50/D51)
- Voice speed conversion
- HW processor manage sound output, enables CPU full-operation under sound play
- Voice data creation by ESPER2 PC tool
- 2ch mixing play (Voice & Background Music)

Power Consumption

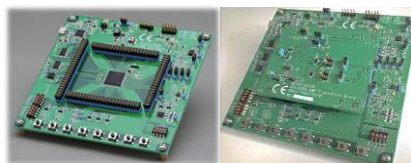
- SLEEP: 0.46µA
- SLEEP (RTC=ON): 0.95µA
- HALT: 1.8µA
- RUN (2MHz operation): 155µA/MHz

Shipping forms

- TQFP12-48 (P-TQFP048-0707-0.50)
- TQFP13-64 (P-TQFP064-1010-0.50)
- TQFP14-80 (P-TQFP080-1212-0.50)
- TQFP15-100 (P-TQFP100-1414-0.50)

Schedule

- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



S1C31D50 S1C31D51
Evaluation boards



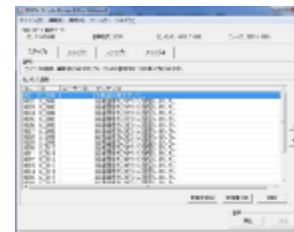
– Easy Voice/Audio Data Creation

- PC tool for voice data creation
- No studio recording required
- Multi-language support

Japanese, Chinese, Korean
US English, US Spanish, Canadian French
UK English, German, French, Spanish, Italian, Russian

- Small data size by high compression, high quality algorithm
- 2ch mixing play, voice speed conversion

Easy voice creation !

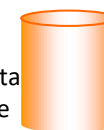


PC tool

1. Input text
2. Import wave file
3. Alignment
4. Create sound ROM

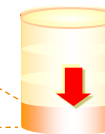
ADPCM

Sound data
ROM size



Epson EOV

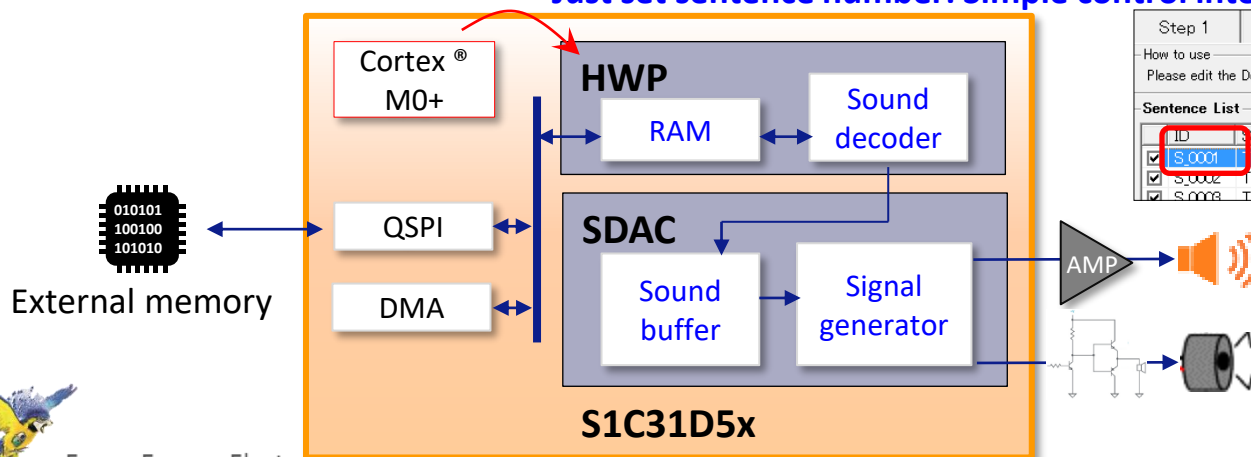
Sound data
ROM size



– Integrated HW Processor (HWP), Sound DAC (SDAC)

- No CPU resource required during voice play
- Simple firmware development

Just set sentence number: Simple control interface



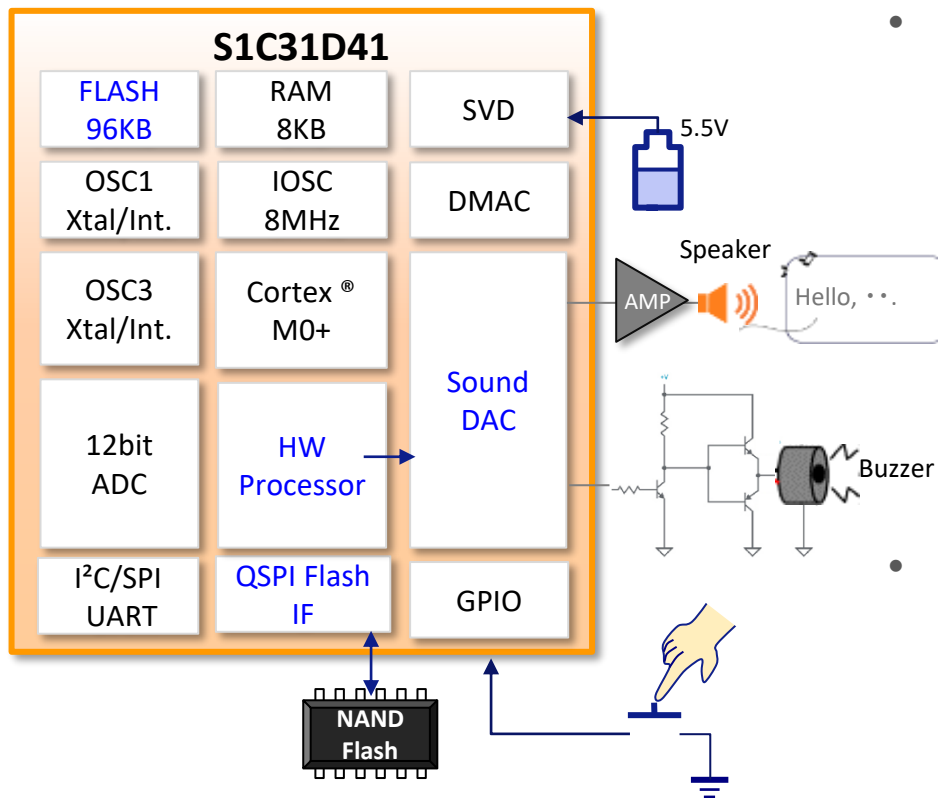
| Step 1 | Step 2 | Step 3 | Step 4 |
|---|--|-----------------|-------------------------------|
| How to use | | | |
| Please edit the Delay value and substitution of the phrase confirm it's pronunciation, replace composition phrase | | | |
| Sentence List | | Sentence number | |
| ID | Sentence | Delay [ms] | Edit Composed Phrase [S_0001] |
| <input checked="" type="checkbox"/> | S_0001 The temperature is set at/30 d. | 0 | PS_0001 The temperat... |
| <input checked="" type="checkbox"/> | S_0002 The temperature is set at/31 d. | 100 | PS_0002 30 degree. |
| <input checked="" type="checkbox"/> | S_0003 The temperature is set at/32 d. | | |

Stable sound/voice !



Arm® Voice MCU supporting AMP+Speaker or Buzzer

Voice/Audio support also by dedicated Speech IC



• Features

- Operating frequency: max. 16MHz
- 5V operation 1.8V to 5.5V
- Flash 96kB
- Voice/Sound output by AMP+speaker or buzzer
- Voice speed conversion
- HW processor manage sound output, enables CPU full-operation under sound play
- Voice data creation by ESPER2 PC tool
- 2ch mixing play (Voice & Background Music)

• Power Consumption

- SLEEP: 0.46µA (T.B.D.)
- SLEEP (RTC=ON): 0.95µA (T.B.D.)
- HALT: 1.8µA (T.B.D.)
- RUN (2MHz operation): 155µA/MHz (T.B.D.)

• Shipping forms

- TQFP12-32 (P-TQFP048-0707-0.80)
- TQFP12-48 (P-TQFP048-0707-0.50)
- TQFP13-64 (P-TQFP064-1010-0.50)

• Schedule

- ES samples: ✓
- MP: Jun 2022
- Datasheet: Rev.0.5
- Evaluation Board: ✓



Evaluation board



S1C17M Series: **Standard** MCU (VDD=1.8V~5.5V, 16MHz)

S1C17M00/M10 group: **LCD/LED Driver + Measurement function**



S1C17M20 group: **Small-PKG** MCU



S1C17M30/M40 group: **Segment** LCD driver MCU



S1C17W Series: **Low power** MCU (VDD=1.2~3.6V, 4MHz)

S1C17W00 group: **Standard(non-LCD)** MCU



S1C17W10 group: **Segment** LCD driver MCU



S1C17W20/W30 group: **Dot Matrix** LCD driver MCU

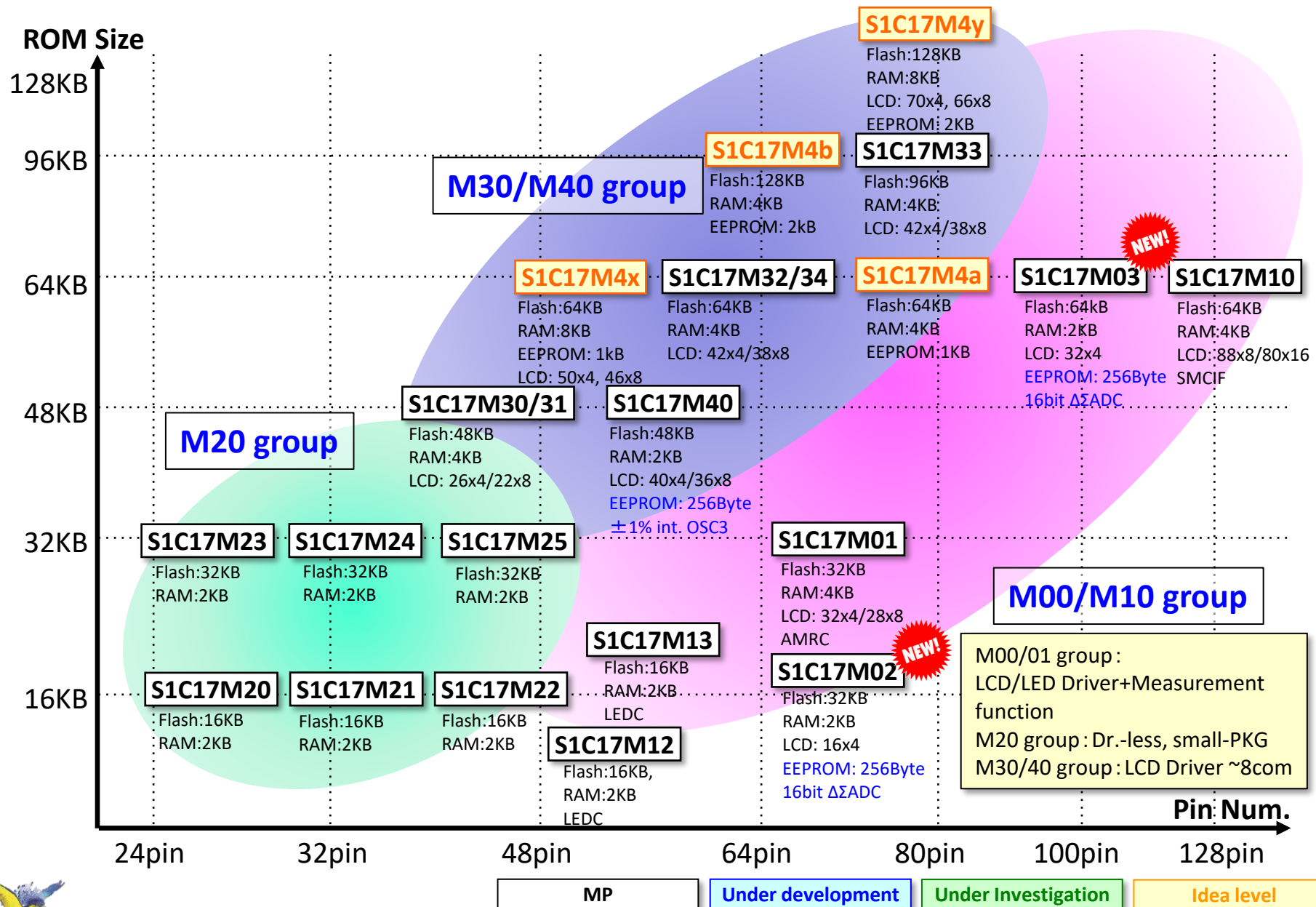


S1C17F Series: **EPD Driver/Controller** MCU

S1C17F50/F60 group: **Segment EPD Driver** MCU

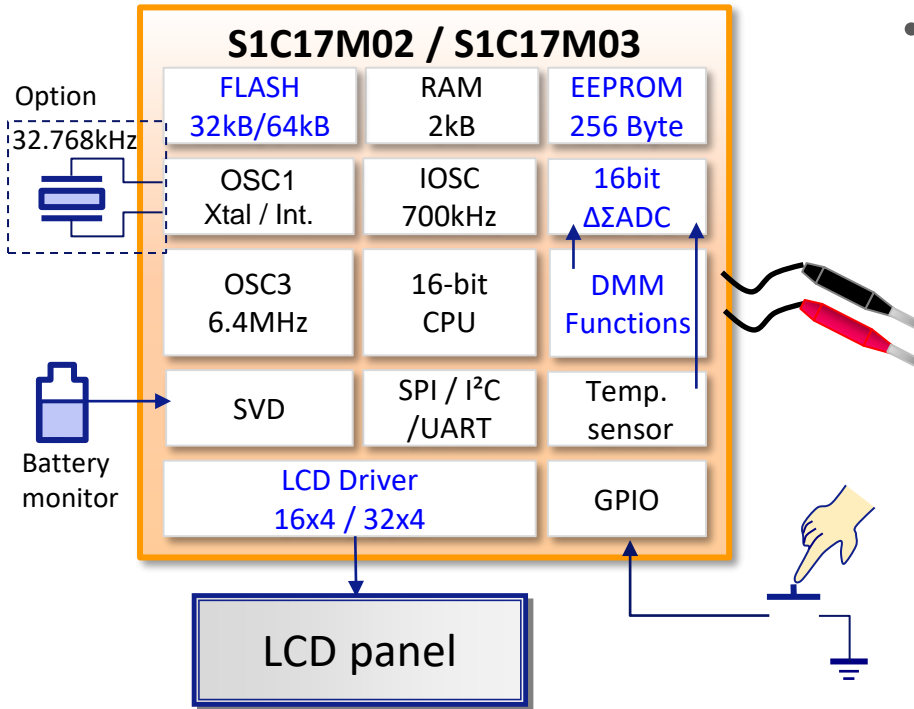


S1C17M Series - Lineup



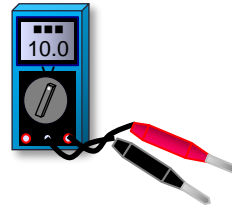


All-in-One single chip 16-bit RISC core MCU for DMM



• Features

- Measurement function for DMM
 - ✓ DC/AC voltage
 - ✓ DC/AC current
 - ✓ Resistance / Capacitance / Diode
 - ✓ Frequency / Conduction check
- 16bit $\Delta\Sigma$ ADC
- Flash ROM 32kB(M02) – 64kB(M03)
- EEPROM 256 byte
- LCD driver 16x4(M02) – 32x4(M03)
- Supply Voltage Detection (SVD)
- Low speed (32kHz) internal oscillator



• Power Consumption

- SLEEP: 0.24 μ A (typ.)
- HALT: 1.8 μ A (typ.)
- RUN (3.2MHz operation): 540 μ A (typ.)

• Shipping forms

- QFP13-64 (P-LQFP064-1010-0.50)
- QFP15-100 (P-LQFP100-1414-0.50)

• Schedule

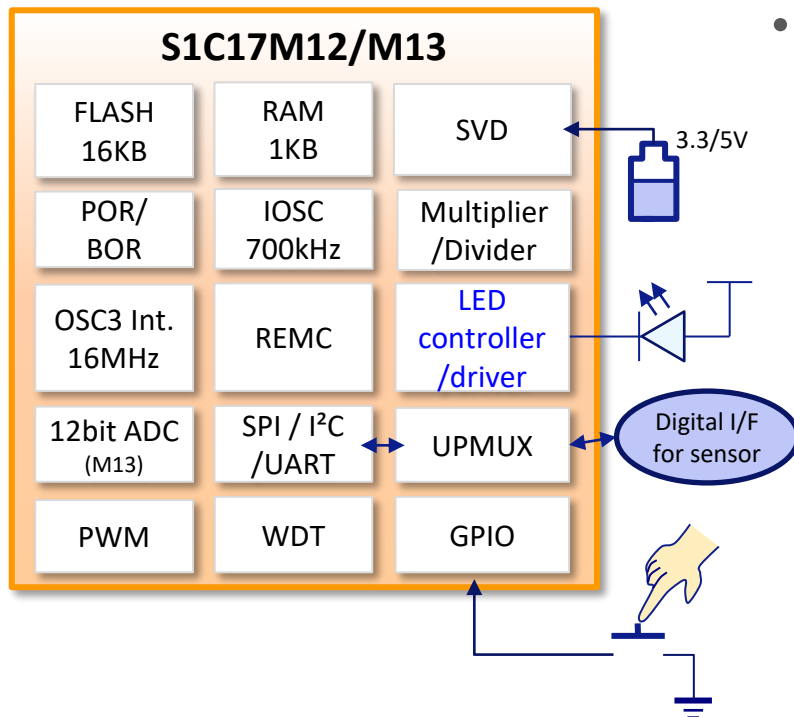
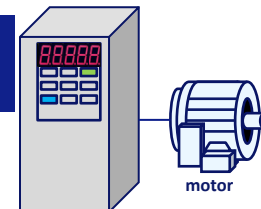
- ES samples: ✓
- Datasheet: Rev.1.0
- Manual: Rev.1.0
- MP: ✓
- SVT17M03: E/May 2022



Evaluation board
SVT17M03



5V tolerant 16-bit MCU with built-in LED controller/driver



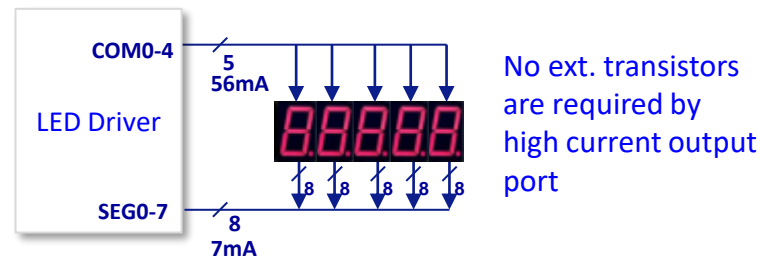
Demo/Evaluation board



Evaluation board

Features

- 5V operation 1.8V-5.5V
- High speed operation: max. 16.8MHz
- LED controller/driver: 8SEG x 5COM
Dynamic drive control
4 level brightness adjustment
- I/O pins for LED (@VDD2≥4.5V)
SEG x 8 (7mA), COM x 5 (56mA)



- High accuracy internal oscillation $\pm 2\%$

Power Consumption

- SLEEP: 0.35 μ A (5.5V)
- RUN (1MHz operation): 145 μ A

Shipping forms

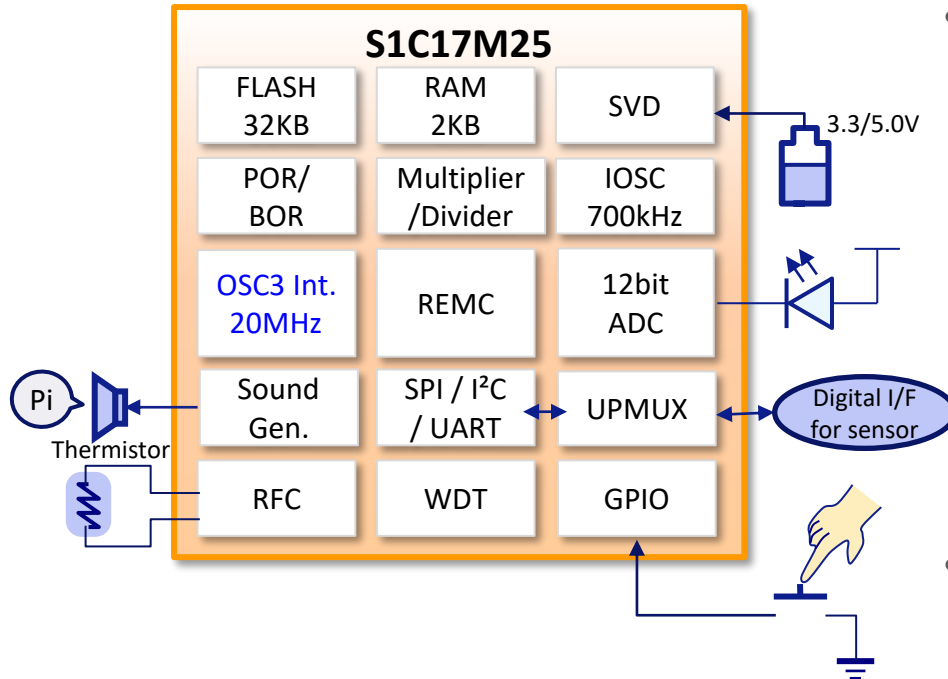
- TQFP12-48 (P-TQFP048-0707-0.50)

Schedule

- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



5V tolerant and small package standard 16-bit MCU family



• Features

- 5V operation 1.8V-5.5V
- Operating frequency: 21MHz
- High speed internal oscillator (max. 20MHz)
Accuracy: 12MHz $\pm 2\%$ @ -10~60°C
- Flash: 16kB/32kB, RAM: 2kB
- 12-bit ADC, Sound Generator
- 24-bit RFC*¹ *1: only S1C17M22/M25

• Power Consumption

- SLEEP: 0.36 μ A
- HALT (RTC=ON): 0.7 μ A
- RUN (1MHz operation): 160 μ A

• Shipping forms

- TQFP12-48 (P-TQFP048-0707-0.50)_(M22/M25)
- TQFP12-32 (P-TQFP032-0707-0.80)_(M21/M24)
- SQFN5-32 (P-VQFN032-0505-0.50) _(M20/M23)
- SQFN4-24 (P-VQFN024-0404-0.50) _(M20/M23)

• Schedule

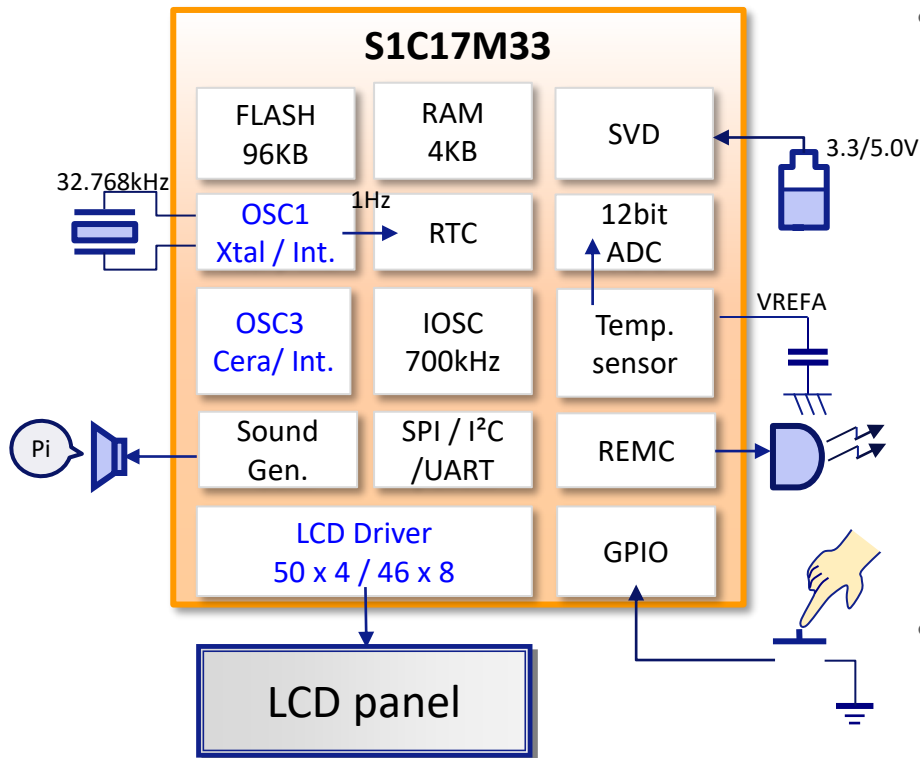
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Evaluation board



5V tolerant 16-bit MCU with built-in Seg LCD driver



• Features

- 5V operation 1.8V–5.5V
- Operating frequency: max. 16.8MHz
- Low speed (32kHz) internal oscillator
- High speed internal (12/16MHz) oscillator
Accuracy: 12MHz $\pm 2\%$ @-10~60°C
- Flash: 48kB/64kB/96kB, RAM: 4kB
- 12-bit ADC, Sound Generator
- 24-bit RFC
- All LCD pins are shared with GPIO pins

• Power Consumption

- SLEEP: 0.2 μ A
- HALT (RTC=ON): 0.7 μ A
- RUN (1MHz operation): 160 μ A

• Shipping forms

- TQFP12-48 (P-TQFP048-0707-0.50)(M30/M31)
- TQFP13-64 (P-TQFP064-1010-0.50) (M32)
- TQFP14-80 (P-LQFP080-1212-0.50) (M33)
- Bare Die Chip (Al-pad) (M33)

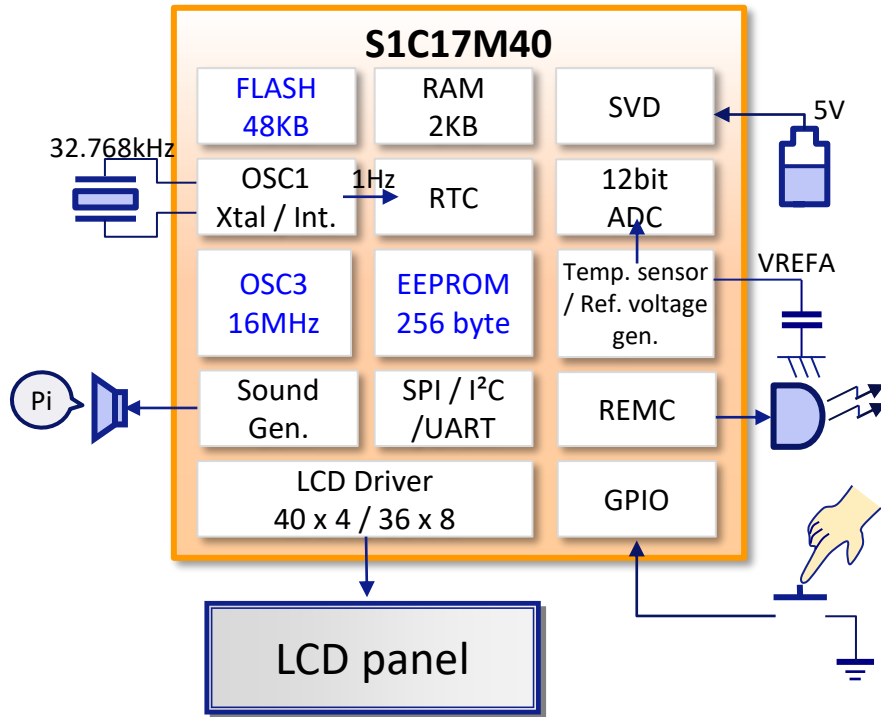
• Schedule

- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Evaluation board

5V tolerant 16-bit MCU built-in high accuracy OSC3 and EEPROM



• Features

- 5V operation 1.8V-5.5V
- **EEPROM 256 byte (min. 100k times)**
- Operation frequency 16MHz (max.)
- **High speed internal oscillator**
Accuracy: 16MHz ± 1% @ 0~85°C
- 12bit ADC
- **VDD for Flash Programming: 2.2V~**
- Low speed (32kHz) internal oscillator
- All pins are shared with GPIO pins

• Power Consumption

- SLEEP: **0.25µA**
- SLEEP (RTC=ON): **0.7µA**
- HALT: **0.7µA *1** *1: only 64pin
- RUN (16MHz operation): **1.85mA**

• Shipping forms

- TQFP12-48 (P-TQFP048-0707-0.50)
- TQFP13-64 (P-TQFP064-1010-0.50)

• Schedule

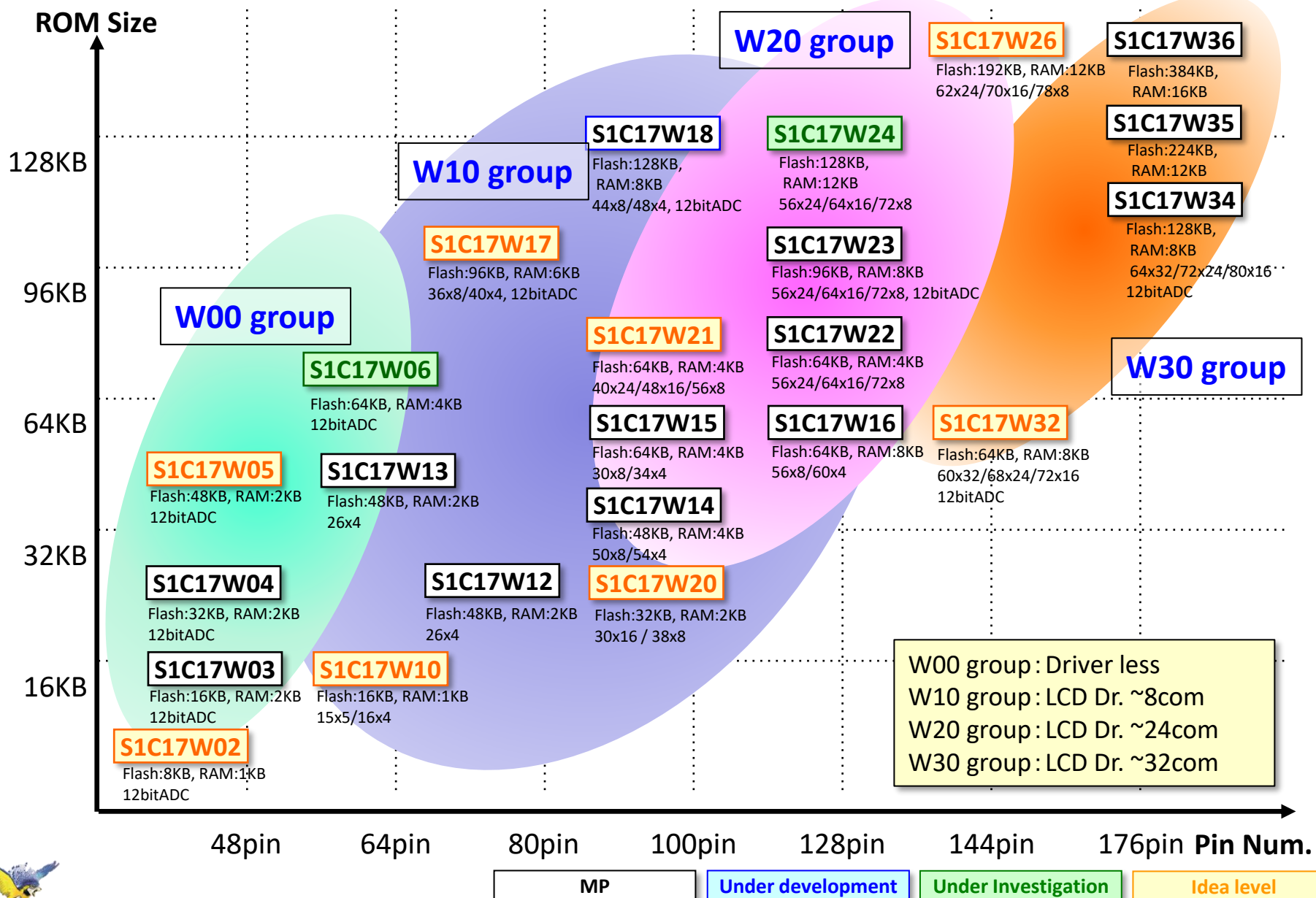
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



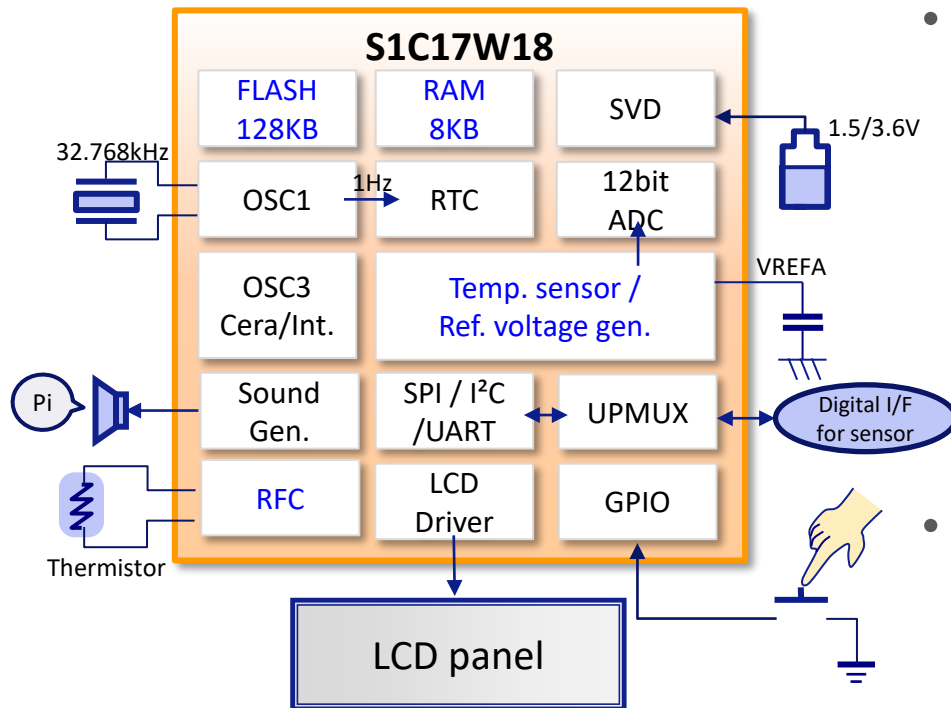
Evaluation board



S1C17W Series (Low Power MCU) - Lineup



Multiple Purpose & Low Power & Low voltage 16-bit MCU



• Features

- Low voltage operation 1.2V-3.6V
- Flash: 16kB to 384kB, RAM: 2kB to 8kB
- Operation frequency max. 4MHz
- Temperature Sensor/ Ref. voltage gen.
- Support EEPROM emulation library
- 12-bit ADC / 24-bit RFC
- LCD driver with booster circuit

• Power Consumption

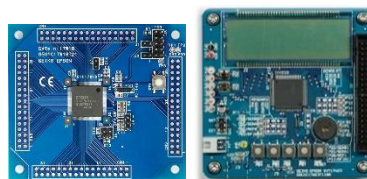
- SLEEP: 0.15µA
- SLEEP (RTC=ON): 0.3µA
- HALT: 0.3µA
- RUN (32kHz): 2µA
- RUN (1MHz operation): 140µA

• Shipping forms

- Bare Die Chip (Al-pad)
- TQFP/QFP, SQFN

• Schedule

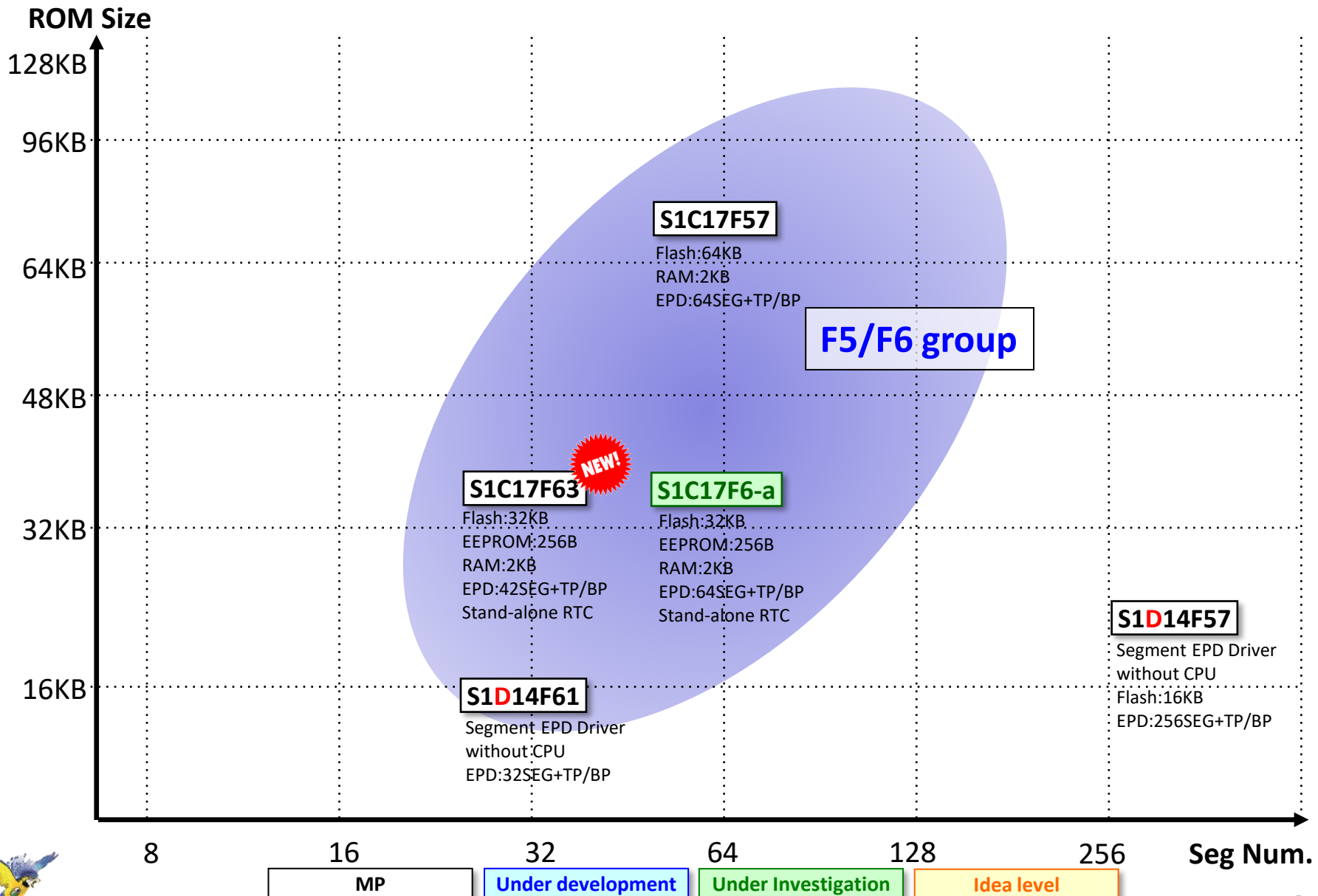
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



Evaluation board

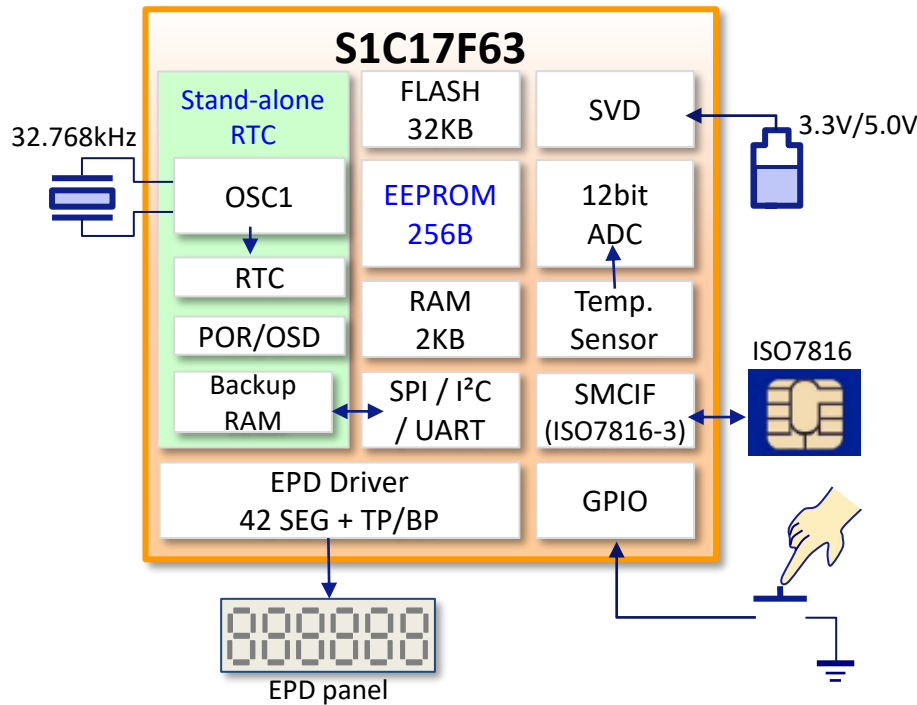


S1C17F Series - EPD Driver/Controller MCU Lineup





16-bit MCU with built-in EPD driver & Low Power RTC



• Features

- Operation voltage 1.8V – 5.5V
- EPD driver 42 SEG + 1BP, 1TP with 15V internal EPD power generator
- Stand-alone low power RTC with backup RAM 128byte
- EEPROM 256 byte (min. 100k times)
- 12-bit ADC + Temperature sensor
- VDD for flash programming: 2.2V~
- Smart Card I/F

• Power Consumption

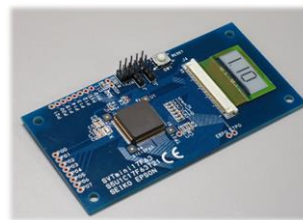
- RTC mode: 110nA
- Sleep (RTC=ON): 450nA
- RUN (32kHz): 5µA
- RUN (16MHz): 1.95mA

• Shipping forms

- Bare Die Chip (Au-bump, Al-pad)
- QFP15-100 (P-LQFP100-1414-0.50)

• Schedule

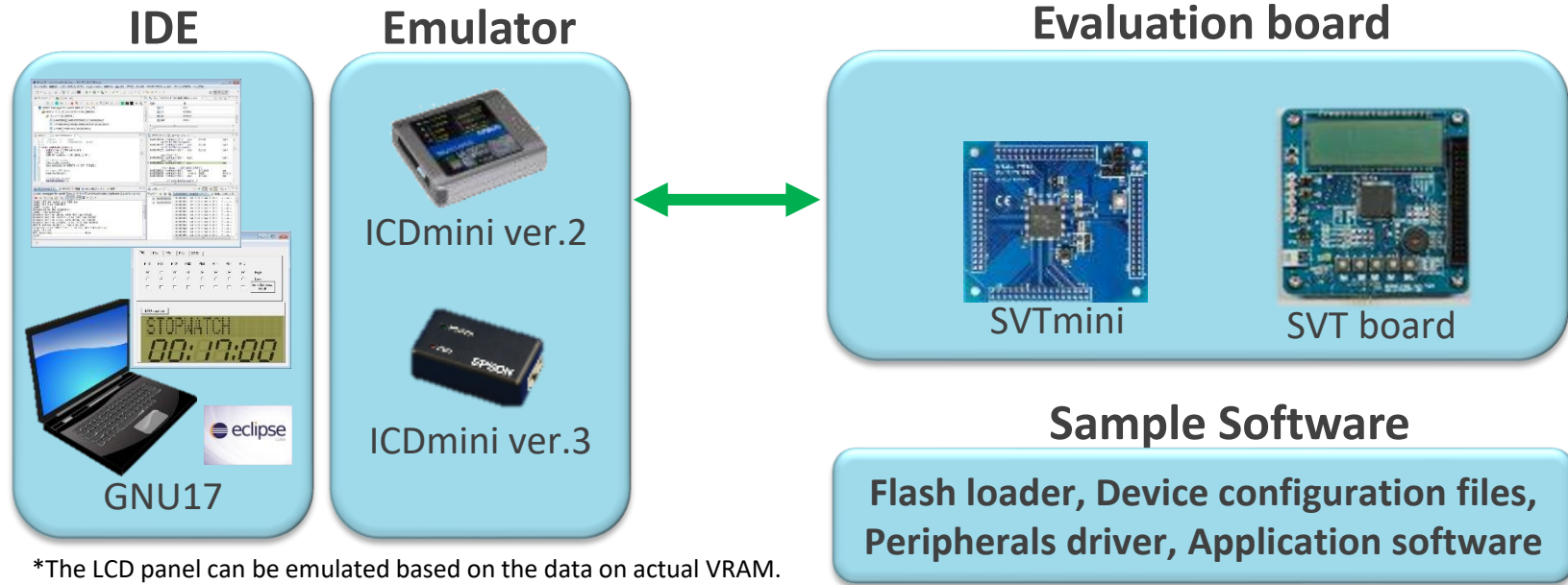
- MP: ✓
- Manual: ✓
- Evaluation Board: ✓



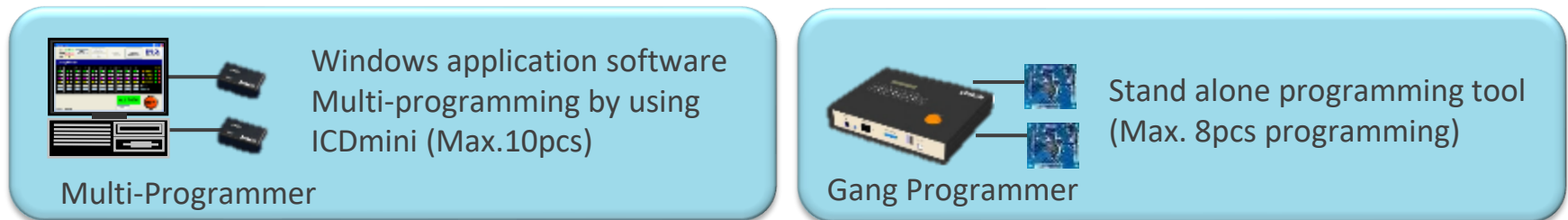
Evaluation board with EPD display mounted



– Development Tools



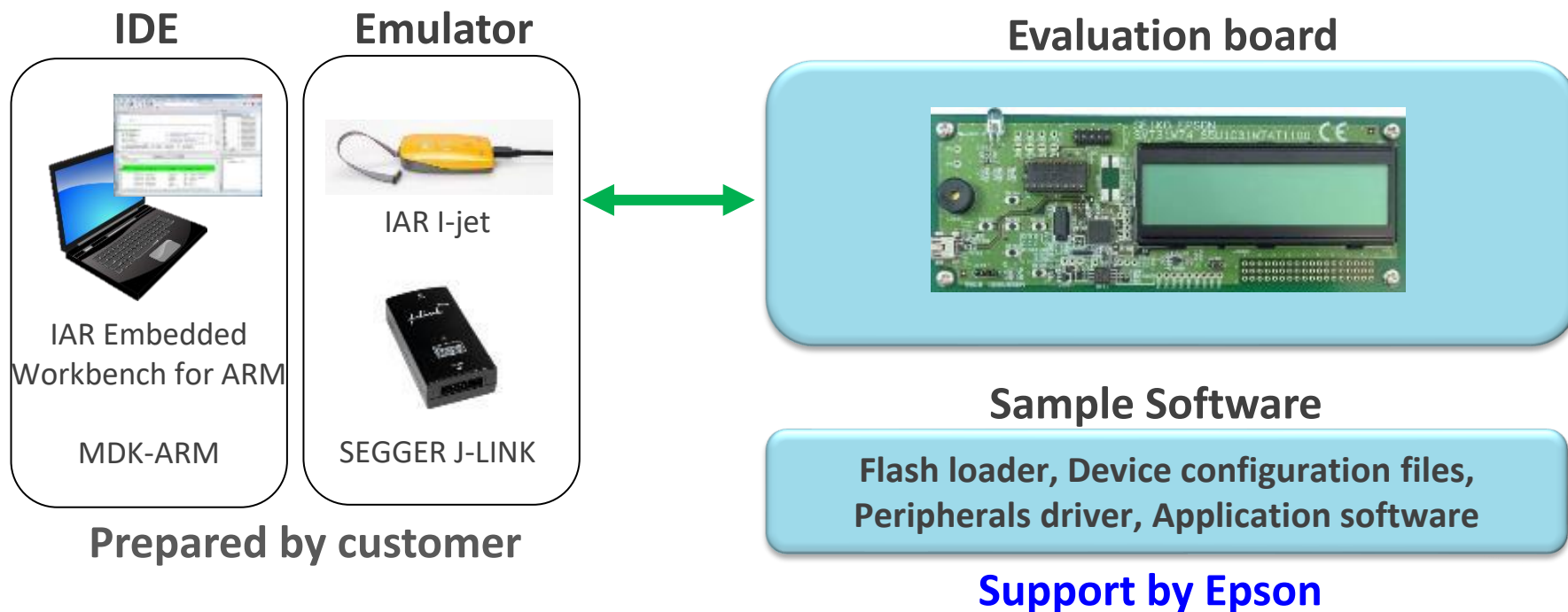
– Production tools



Support by Epson



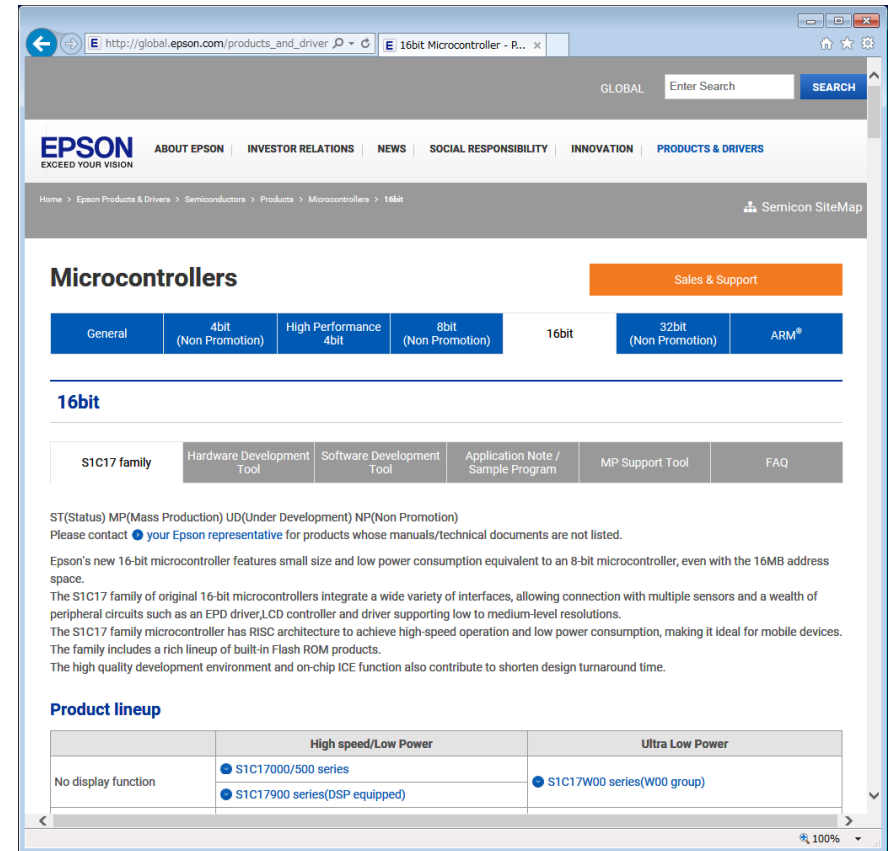
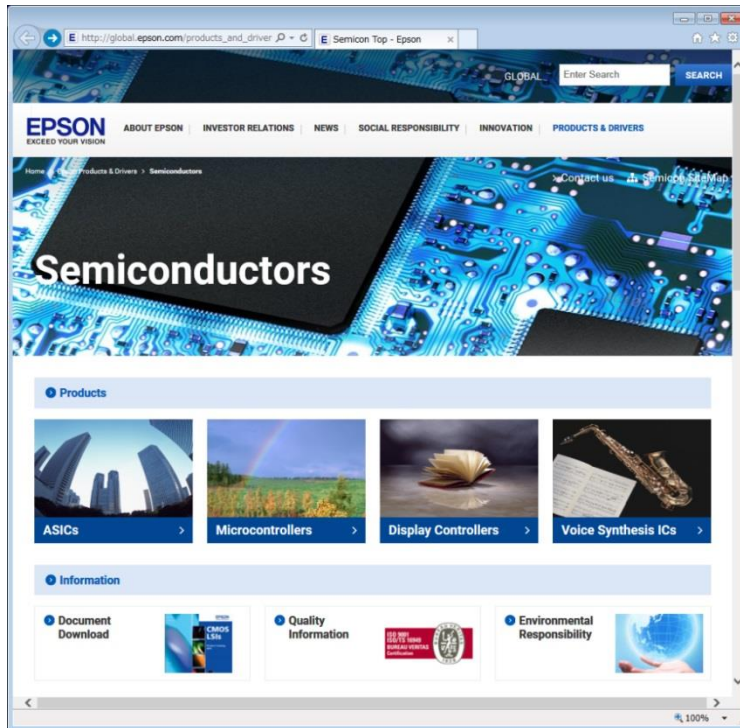
– Development tools



| | I-jet | J-LINK |
|--------------------------------|-----------|-----------|
| SEGGER Embedded Studio | - | Available |
| IAR Embedded Workbench for Arm | Available | Available |
| MDK-Arm | - | Available |



global.epson.com/products_and_drivers/semicon/



Following tools are available

- Software tools (Compiler / Assembler etc.)
- Software Simulator
- Development tools information
- Application Note
- Sample Program
- Parametric search, FAQ

Website:
[parametric search.](#)



Parametric Search

Sales & Support

If you want to set detailed numerical values with each gauge, please fill in the input field on the right of the gauge.

Setting Clear Compare

| Products | Document <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E Push the icon to see the document. <input type="checkbox"/> Data sheet <input type="checkbox"/> Manual <input type="checkbox"/> Errata | CPU <input type="checkbox"/> S1C17(16bit) <input type="checkbox"/> Arm® Cortex®-M0+ | LCD Driver | | LCD Controller | Other Driver | Operation clock | | | Supply current | | | | M |
|----------|---|---|-------------------|---|--|--------------|-------------------------|---------------------------------|---|----------------------|--------------------|-------------------|---------------------|---|
| | | | Segment | segxcom | | | High-speed [MHz] (Max.) | Low-speed [Hz] (Typ.) | Built-in oscillator [kHz] (Typ.) | | | Sleep [µA] (Typ.) | Halt [µA] (Typ.) | |
| | | | Max 4096 Min 0 | <input type="checkbox"/> 0 <input type="checkbox"/> 16 <input type="checkbox"/> 4 <input type="checkbox"/> 24 <input type="checkbox"/> 8 <input type="checkbox"/> 32 <input type="checkbox"/> 64 | <input type="checkbox"/> LCD <input type="checkbox"/> LED <input type="checkbox"/> EPD | | Max 48 Min 0 | <input type="checkbox"/> 32.768 | <input type="checkbox"/> 32k <input type="checkbox"/> 500k <input type="checkbox"/> 7.37M <input type="checkbox"/> 32.768k <input type="checkbox"/> 1M <input type="checkbox"/> 8M <input type="checkbox"/> 250k <input type="checkbox"/> 2M <input type="checkbox"/> 12M <input type="checkbox"/> 384k <input type="checkbox"/> 2.7M <input type="checkbox"/> 16M <input type="checkbox"/> 500k <input type="checkbox"/> 4M <input type="checkbox"/> 20M | Max 2.25 Min 0.06 | Max 40 Min 0.11 | Max 18 Min 2 | Max 6500 Min 140 | |
| S1C17W03 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 0 | 0 | No | No | 4.2 | 32.768k | 250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 4 | 250 | |
| S1C17W03 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 0 | 0 | No | No | 4.2 | 32.768k | 250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 4 | 250 | |
| S1C17W04 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 0 | 0 | No | No | 4.2 | 32.768k | 250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 4 | 250 | |
| S1C17W04 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 0 | 0 | No | No | 4.2 | 32.768k | 250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 4 | 250 | |
| S1C17W12 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 104 | 26x4 | No | 2 | 4.2 | 32.768k | 32k/250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 2 | 140 | |
| S1C17W12 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 72 | 18x4 | No | 2 | 4.2 | 32.768k | 32k/250k/384k/500k/700k/1M/2M/4M | 0.15 | 1.5 | 5 | 140 | |
| S1C17W13 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 104 | 26x4 | No | 2 | 4.2 | 32.768k | 32k/250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 2 | 140 | |
| S1C17W13 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 72 | 18x4 | No | 2 | 4.2 | 32.768k | 32k/250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.5 | 4 | 140 | |
| S1C17W13 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 80 | 20x4 | No | 2 | 4.2 | 32.768k | 32k/250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.5 | 4 | 140 | |
| S1C17W14 | <input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> E | 16 | 400 | 54x4/50x8 | No | No | 4.2 | 32.768k | 250k/384k/500k/700k/1M/2M/4M | 0.15 | 0.3 | 3 | 200 | |



APPENDIX



S1C31D Series – Comparison Table -

| Model | | S1C312-a | S1C312-b | S1C312-aes | S1C312-n-aes | S1C31D01 | S1C31D41 | S1C31D50/51 | |
|-----------------------|--------------------------|-------------------------------|------------------------------|------------------------------|-----------------------------------|---|------------------------------------|---|-------------|
| Memory | Flash | 32KB | 64KB | 64KB | 64KB | 256KB | 96KB | 192KB | |
| | RAM | 8KB | 12KB | 8KB | 8KB | 96KB | 8KB | 8KB | |
| | EEPROM | - | - | 256B | 256B | - | - | - | |
| | Instruction cache | 512B | 512B | 512B | 512B | 512B | 512B | 512B | |
| Clock | IOSC | 1~32MHz | 1~32MHz | 1~32MHz | 1~32MHz | 1~20MHz | 1~8MHz | 1~8MHz | |
| | OSC1 | X'tal | 32.768kHz | DTCXO | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz |
| | OSC3 | X'tal / Cera | Up to 33MHz | Up to 33MHz | Up to 33MHz | Up to 33MHz | Up to 21MHz | Up to 16MHz | Up to 16MHz |
| Internal | | 16MHz | 16MHz | 16MHz | 16MHz | - | 4-16MHz | 4-16MHz | |
| GPIO (max.) | | TBD | TBD | TBD | TBD | 57 | 55 | 91 | |
| Timer | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | 16bit / PWM | 4 / 3 | 4 / 3 | 4 / 3 | 4 / 3 | 8 / 2 | 8 / 2 | 8 / 2 | |
| Serial I/F | UART | 2 | 2 | 2 | 2 | 3 | 3 | 3 | |
| | SPI / QSPI | 2 / 1 | 2 / 1 | 2 / 1 | 2 / 1 | 2 / 1 | 3 / 1 | 3 / 1 | |
| | I ² C / SMCIF | 1 / - | 1 / - | 2 / - | 2 / - | 2 / - | 3 / - | 3 / - | |
| Analog I/F | 24 bit RFC | 2 | 2 | 2 | 2 | - | 1 | 1 | |
| | 12 bit ADC | 7 inputs | 7 inputs | 7 inputs | 7 inputs | 7 inputs | 8 inputs | 8 inputs | |
| | Temp. Sensor | 1 | 1 | 1 | 1 | 1 | - | - | |
| Others | DMA | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| | USB (2.0FS Device) | 1 | 1 | 1 | 1 | 1 | - | - | |
| | POR / BOR / SVD | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | |
| | Others | LED Driver | DTCXO | SOUND IR REMC AES, RSA | SOUND IR REMC NFC, AES, RSA | SOUND MDC | VOICE | VOICE IR REMC | |
| Current Consumption | SLEEP | TBD | TBD | 0.7uA (TBD) | 0.7uA (TBD) | 0.46uA | 0.46uA (TBD) | 0.46uA | |
| | SLEEP (RTC=ON) | TBD | TBD | 1.2uA (TBD) | 1.2uA (TBD) | 0.95uA | 0.95uA (TBD) | 0.95uA | |
| | 32kHz HALT | TBD | TBD | 1.7uA (TBD) | 1.7uA (TBD) | 1.7uA | 1.8uA (TBD) | 1.8uA | |
| | 1MHz RUN | TBD | TBD | 150uA (TBD) | 150uA (TBD) | 155uA | 155uA (TBD) | 155uA | |
| Voltage | Operation | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | |
| | Programming | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.7 to 5.5V | 2.2 to 5.5V | 2.7 to 5.5V | |
| Operation Temperature | | -40 to 105°C | -40 to 105°C | -40 to 105°C | -40 to 105°C | -40 to 85°C | -40 to 85°C | -40 to 85°C | |
| Shipping form | | TQFP12-48 SQFN4-24 Chip | QFP13-64 SQFN5-32 Chip | TQFP13-64 SQFN-48 Chip | TQFP13-64 SQFN-48 Chip | VFBGA5H-81 WCSP96 TQFP14-80 Chip | QFP13-64 TQFP12-48 TQFP12-32 | QFP15-100 TQFP14-80 QFP13-64 TQFP12-48 | |

MP

Under development

Under Investigation

Idea level

S1C31W Series – Comparison Table -

| Model | | S1C31W65 | S1C31W6-aes | S1C31W6-n-aes | S1C31W73 | S1C31W74 | |
|-----------------------|--------------------------|------------------|------------------------------------|------------------------------------|-------------------|---------------------|-------------|
| Memory | Flash | 128KB | 128KB | 128KB | 384KB | 512KB | |
| | RAM | 16KB | 16KB | 16KB | 32KB | 128KB | |
| | EEPROM | - | 512B | 512B | - | - | |
| | Instruction cache | 512B | 512B | 512B | 512B | 512B | |
| Clock | IOSC | 1~32MHz | 1~32MHz | 1~32MHz | 1~32MHz | 1~20MHz | |
| | OSC1 | X'tal | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal | 32kHz | 32kHz | 32kHz | 32kHz | - |
| | OSC3 | X'tal / Cera | Up to 33MHz | Up to 33MHz | Up to 33MHz | Up to 16MHz | Up to 21MHz |
| Internal | | 16MHz | 16MHz | 16MHz | - | - | |
| LCD Driver | | 52x8, 56x4 | 52x8, 56x4 | 52x8, 56x4 | 80x32, 96x16 | 72x32, 88x16 | |
| GPIO (max.) | | 63 | 63 (TBD) | 63 (TBD) | 73 | 71 | |
| Timer | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | 16bit / PWM | 4 / 3 | 4 / 3 | 4 / 3 | 8 / 2 | 4 / 2 | |
| Serial I/F | UART | 2 | 2 | 2 | 2 | 2 | |
| | SPI / QSPI | 2 / - | 2 / 1 | 2 / 1 | 2 / 1 | 1 / 1 | |
| | I ² C / SMCIF | 2 / - | 2 / - | 2 / - | 2 / - | 2 / - | |
| Analog I/F | 24 bit RFC | 1 | 2 | 2 | 1 | 1 | |
| | 12 bit ADC | 7 inputs | 7 inputs | 7 inputs | 7 inputs | - | |
| | Temp. Sensor | 1 | 1 | 1 | 1 | - | |
| Others | DMA | 4 | 4 | 4 | 4 | 4 | |
| | USB (2.0FS Device) | - | 1 | 1 | 1 | 1 | |
| | POR / BOR / SVD | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | 1 / 1 / 1 | |
| | Others | SOUND IR REMC | SOUND IR REMC AES | SOUND IR REMC NFC, AES | SOUND IR REMC | SOUND IR REMC | |
| Current Consumption | SLEEP | 0.3uA | 0.7uA (TBD) | 0.7uA (TBD) | 0.7uA | 0.37uA | |
| | SLEEP (RTC=ON) | 0.8uA | 1.2uA (TBD) | 1.2uA (TBD) | 1.2uA | 0.9uA | |
| | 32kHz HALT | 1.5uA | 1.7uA (TBD) | 1.7uA (TBD) | 2.0uA | 1.7uA | |
| | 1MHz RUN | 130uA (2MHz) | 150uA (TBD) | 150uA (TBD) | 150uA | 150uA | |
| Voltage | Operation | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 3.6V | |
| | Programming | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.7 to 5.5V | |
| Operation Temperature | | -40 to 105°C | -40 to 105°C | -40 to 105°C | -40 to 105°C | -40 to 85°C | |
| Shipping form | | TQFP14-100 | TQFP14-100 TQFP13-64 SQFN-48 | TQFP14-100 TQFP13-64 SQFN-48 | QFP21-216 Chip | VFBGA8H-181 Chip | |

MP

Under development

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Idea level

S1C17M Series – Comparison Table M0, M1 group -

| Model | | S1C17M12 | S1C17M13 | S1C17M14 | S1C17M01 | S1C17M02 | S1C17M03 | S1C17M10 |
|---------------------|--------------------|---------------------------------------|---------------------------------------|--|---------------|------------------|------------------|--------------------|
| Memory | Flash | 16KB | 16KB | 32KB | 32KB | 32KB | 64KB | 64KB |
| | RAM | 2KB | 2KB | 4KB | 4KB | 2KB | 2KB | 4KB |
| | EEPROM | - | - | - | - | 256B | 256B | - |
| Clock | IOSC * | 700kHz | 700kHz | 700kHz | 7.37MHz | 700kHz | 700kHz | 700kHz |
| | OSC1 | Xtal | - | - | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | | Internal *1 | - | - | - | 32kHz | 32kHz |
| | OSC3 | Xtal, Cera | | - | - | - | 16.3MHz | - |
| Internal *1 | | | 4M-16MHz | 4M-16MHz | 4M-16MHz | - | 3.2MHz or 6.4MHz | 3.2MHz or 6.4MHz |
| | LCD Driver | | - | - | - | 32x4, 28x8 | 16x4 | 32x4 |
| GPIO (max.) | | 24+1(o) | 24+1(o) | 36+1(o) | 19 | 16 | 40 | 32+1(O) |
| Timer | 16bit / PWM | 4 / 1x2 | 4 / 1x2 | 4 / 2x6 | 5 / - | 4 / - | 4 / - | 5 / 1 |
| | RTC / WDT | - / 1 | - / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| SIO | UART | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| | SPI | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| | I ² C | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | SMCIF | - | - | - | - | - | - | 1 |
| | REMC | 1 | 1 | 1 | - | - | - | - |
| Analog | 24bit RFC | - | - | - | 1 | - | - | - |
| | ADC | - | 12bit x 8 | 12bit x 8 | - | 16bit ΔΣ | 16bit ΔΣ | - |
| | Others | - | - | - | AMRC*2 | DMM AFE*3 | DMM AFE*3 | - |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | - | - | - | - |
| | SVD | 1 | 1 | 1 | 1 | 1 | 1 | 1 (int., ext. x 2) |
| | Etc. | LED Cntl./Driver 8x5 | LED Cntl./Driver 8x5 | LED Cntl./Driver 8x10 | - | - | - | - |
| Current Consumption | Sleep | 0.5uA | 0.5uA | 0.5uA | 0.35uA | 0.24μA | 0.24μA | 0.16uA |
| | Halt | 40uA | 40uA | 40uA | 0.8uA | 1.8μA | 1.8μA | 0.6uA |
| | 32KHz run | - | - | - | 12.5uA | - | - | 4uA |
| | 1MHz run | 150uA | 150uA | 150uA | 210uA | 540uA(3.2MHz) | 540uA(3.2MHz) | 145uA |
| Voltage | Operation | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 2.1~3.6V | 2.1~3.6V | 1.8~5.5V |
| | Program | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V |
| Shipping form | Package | TQFP12-48 | TQFP12-48 | TQFP13-64 | TQFP13-64 | QFP13-64 | QFP15-100 | TQFP15-128 |
| | Chip | - | - | - | 100u p.p. | - | - | 80u p.p. |

*1 Internal oscillator *2 AMRC=MR sensor controller *3 Measurement circuit for Digital Multimeter



S1C17M Series – Comparison Table M2 group -

| Model | | S1C17M20 | S1C17M21 | S1C17M22 | S1C17M23 | S1C17M24 | S1C17M25 | |
|---------------------|--------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------|
| Memory | Flash | 16KB | 16KB | 16KB | 32KB | 32KB | 32KB | |
| | RAM | 4KB | 4KB | 4KB | 4KB | 4KB | 4KB | |
| Clock | IOSC * | 700k | 700k | 700k | 700k | 700k | 700k | |
| | OSC1 | Xtal | - | 32.768kHz | 32.768kHz | - | 32.768kHz | 32.768kHz |
| | | Internal * | - | 32kHz | 32kHz | - | 32kHz | 32kHz |
| | OSC3 | Xtal, Cera | 21MHz | 21MHz | 21MHz | 21MHz | 21MHz | 21MHz |
| Internal * | | 12M/16M/20MHz | 12M/16M/20MHz | 12M/16M/20MHz | 12M/16M/20MHz | 12M/16M/20MHz | 12M/16M/20MHz | |
| LCD Driver | | - | - | - | - | - | - | |
| GPIO (max.) | | 18/25 +1(O) | 25 +1(O) | 40+1(O) | 18/25 +1(O) | 25 +1(O) | 40 +1(O) | |
| Timer | 16bit / PWM | 4 / 2x2 | 4 / 2x2 | 4 / 2x2 | 4 / 2x2 | 4 / 2x2 | 4 / 2x2 | |
| | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | Stopwatch | Included RTC | Included RTC | Included RTC | Included RTC | Included RTC | Included RTC | |
| SIO | UART | 2 | 2 | 2 | 2 | 2 | 2 | |
| | SPI | 2 | 2 | 2 | 2 | 2 | 2 | |
| | I ² C | 1 | 1 | 1 | 1 | 1 | 1 | |
| | REMC | 1 | 1 | 1 | 1 | 1 | 1 | |
| Analog | 24bit RFC | - | - | 2 | - | - | 2 | |
| | 12bit ADC | 4/6 | 6 | 8 | 4/6 | 6 | 8 | |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | |
| | SVD | 1 | 1 | 1 | 1 | 1 | 1 | |
| | Etc. | POR / BOR | POR / BOR | POR / BOR | POR / BOR | POR / BOR | POR / BOR | |
| Current Consumption | Sleep | 0.36uA | 0.36uA | 0.36uA | 0.36uA | 0.36uA | 0.36uA | |
| | Halt | 0.7uA | 0.7uA | 0.7uA | 0.7uA | 0.7uA | 0.7uA | |
| | 32KHz run | 5uA | 5uA | 5uA | 5uA | 5uA | 5uA | |
| | 1MHz run | 160uA | 160uA | 160uA | 160uA | 160uA | 160uA | |
| Voltage | Operation | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | |
| | Program | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | |
| Shipping form | Package | SQFN4-24 SQFN5-32 | TQFP12-32 | TQFP12-48 | SQFN4-24 SQFN5-32 | TQFP12-32 | TQFP12-48 | |
| | Chip | - | - | - | - | - | - | |

MP

Under development

Under Investigation

Idea level

S1C17M Series – Comparison Table M3 group -

| Model | | S1C17M30 | S1C17M31 | S1C17M32 | S1C17M34 | S1C17M33 | |
|---------------------|--------------------|---|----------------------|---|----------------------|----------------------|-----------|
| Memory | Flash | 48KB | 48KB | 64KB | 64KB | 96KB | |
| | RAM | 4KB | 4KB | 4KB | 4KB | 4KB | |
| Clock | IOSC * | | 700k | 700k | 700k | 700k | |
| | OSC1 | Xtal | 32.768kHz | - | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal * | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz |
| | OSC3 | Xtal, Cera | 16.8MHz | 16.8MHz | 16.8MHz | 16.8MHz | 16.8MHz |
| Internal * | | 12M/16MHz | 12M/16MHz | 12M/16MHz | 12M/16MHz | 12M/16MHz | |
| LCD Driver | | 22x8, 26x4 External Voltage Application Mode | 22x8, 26x4 | 38x8, 42x4 External Voltage Application Mode | 33x8, 37x4 | 46x8, 50x4 | |
| GPIO (max.) | | 37 +1(O) | 37 +1(O) | 53+1(O) | 51 +1(O) | 65 +1(O) | |
| Timer | 16bit / PWM | 4 / 3 | 4 / 3 | 4 / 3 | 4 / 3 | 4 / 3 | |
| | RTC / WDT | -1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | Stopwatch | Included RTC | Included RTC | Included RTC | Included RTC | Included RTC | |
| SIO | UART | 2 | 2 | 2 | 2 | 2 | |
| | SPI | 1 | 1 | 1 | 1 | 1 | |
| | I ² C | 1 | 1 | 1 | 1 | 1 | |
| | REMC | 1 | 1 | 1 | 1 | 1 | |
| Analog | 24bit RFC | 2 | 2 | 2 | 2 | 2 | |
| | 12bit ADC | 2 | 2 | 2 | 2 | 5 | |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | |
| | SVD | 1 | 1 | 1 | 1 | 1 | |
| | Etc. | POR / BOR | POR / BOR | POR / BOR | POR / BOR | POR / BOR | |
| Current Consumption | Sleep | 0.2uA | 0.2uA | 0.2uA | 0.2uA | 0.2uA | |
| | Halt | 0.7uA | 0.7uA | 0.7uA | 0.7uA | 0.7uA | |
| | 32KHz run | 5uA | 5uA | 5uA | 5uA | 5uA | |
| | 1MHz run | 160uA | 160uA | 160uA | 160uA | 160uA | |
| Voltage | Operation | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | 1.8~5.5V | |
| | Program | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | 2.7-5.5(vpp gene ON) | |
| Shipping form | Package | TQFP12-48 | TQFP12-48 | TQFP13-64 | TQFP13-64 | TQFP14-80 | |
| | Chip | - | - | - | - | Chip (80um pitch) | |

MP

Under development

Under Investigation

Idea level

S1C17M40 Group Comparison

| Model | | S1C17M4a | S1C17M4b | S1C17M40 | | S1C17M4x | S1C17M4y | |
|--|----------------------|--|--|----------------|----------------|--|---|-----------|
| Memory | Flash | 64KB | 128KB | 48KB | 48KB | 64KB | 128KB | |
| | RAM | 4KB | 4KB | 2KB | 2KB | 8KB | 8KB | |
| | EEPROM | 1KB | 2KB | 256B | 256B | 1KB | 2KB | |
| Clock | IOSC | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | |
| | OSC1 | Xtal | 32.768kHz | 32.768kHz | - | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal * | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz | 32kHz |
| | OSC3 | Xtal, Cera | 16.8MHz | 16.8MHz | - | - | 16.8MHz | 16.8MHz |
| Internal * | | 16MHz | 16MHz | 16MHz | 16MHz | 16MHz | 16MHz | |
| LCD Driver | | - | - | 24x8, 28x4 | 36x8, 40x4 | 64pin: 30x8, 34x4 80pin: 46x8, 50x4 | 80pin: 46x8, 50x4 100pin: 66x8, 70x4 | |
| GPIO (max.) *include only output pin 1. | | 48pin: 40bits 64pin: 56bits | 48pin: 40bits 64pin: 56bits | 41 | 55 | 64pin: 53 bits 80pin: 69bits | 80pin: 69bits 100pin: 89bits | |
| Timer | 16bit / PWM | 4 / 3 | 4 / 3 | 4 / 3 | 4 / 3 | 6 / 4 | 6 / 4 | |
| | RTC | 1 | 1 | - | 1 | 1 | 1 | |
| | WDT | 1 | 1 | 1 | 1 | 1 | 1 | |
| Serial Interface | UART | 3 | 3 | 3 | 3 | 3 | 3 | |
| | SPI | 2 | 2 | 2 | 2 | 2 | 2 | |
| | I ² C | 1 | 1 | 1 | 1 | 1 | 1 | |
| Analog | 24bit RFC | 2 | 2 | - | - | 2 | 2 | |
| | 12bit ADC | 5 | 5 | 3 | 4 | 8 | 8 | |
| | TSRVR | 1 | 1 | 1 | 1 | 1 | 1 | |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | |
| | IR Remote controller | 1 | 1 | 1 | 1 | 1 | 1 | |
| | SVD | 32 levels | 32 levels | 32 levels | 32 levels | 32 levels | 32 levels | |
| Current Consumption | Sleep | TBD | TBD | 0.25uA | 0.25uA | TBD | TBD | |
| | Halt | TBD | TBD | 1.4uA | 0.7uA | TBD | TBD | |
| | 32kHz run | TBD | TBD | 5.5uA | 5uA | TBD | TBD | |
| | IOSC run | TBD | TBD | 140uA | 140uA | TBD | TBD | |
| Voltage | Operation | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | 1.8 to 5.5V | |
| | Program | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | 2.2 to 5.5V | |
| Shipping form | Package | (TQFP12-32(0.8mm pitch) TQFP12-48 QFP13-64 | (TQFP12-32(0.8mm pitch) TQFP12-48 QFP13-64 | TQFP12-48 | QFP13-64 | QFP13-64 TQFP14-80 | TQFP14-80 TQFP14-100 | |
| | Chip | - | - | - | - | - | - | |

* Internal oscillator

MP

Under development

Under Investigation

Idea level

S1C17W Series – Comparison Table M0 group - Driver less -

| Model | | S1C17W03 | S1C17W04 | S1C17W05 | S1C17W06 | |
|-----------------------|--------------------|---|---|-----------------------------|----------------------------|-----------|
| Memory | Flash | 16KB | 32KB | 48KB | 64KB | |
| | RAM | 2KB | 2KB | 2KB | 4KB | |
| Clock | IOSC | 700kHz | 700kHz | 700kHz | 700kHz | |
| | OSC1 | X'tal | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal | - | - | 32kHz | 32kHz |
| | OSC3 | X'tal / Cera | 4MHz | 4MHz | 4MHz | 4MHz |
| Internal | | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | |
| LCD Driver | | - | - | - | - | |
| GPIO (max.) | | 34+1(O) | 34+1(O) | 34+1(O) | 52+1(O) | |
| Timer | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | 16bit / PWM | 4 / 2 (4 ports) | 4 / 2 (4 ports) | 4 / 2 (4 ports) | 3 / 2 (4 ports) | |
| Serial I/F | UART | 2 | 2 | 2 | 2 | |
| | SPI | 2 | 2 | 2 | 2 | |
| | I ² C | 1 | 1 | 1 | 1 | |
| Analog I/F | 24 bit RFC | 2 | 2 | 2 | 2 | |
| | 12 bit ADC | 1 (6 inputs) | 1 (6 inputs) | 1 (6 inputs) | 1 (8 inputs) | |
| | Temp. Sensor | - | - | 1 | - | |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | |
| | POR / SVD | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | |
| | IrREMC / Melody | 1/1 | 1/1 | 1/1 | 1 / 1 | |
| | Others | - | - | Temp. Sensor Vref Gen. | SMCIF | |
| Current Consum-ption | Sleep | 0.15uA | 0.15uA | 0.15uA | 0.15uA | |
| | Halt | 0.3uA | 0.3uA | 0.3uA | 0.3uA | |
| | 32kHz Run | 4uA | 4uA | 3uA | 3uA | |
| | 1MHz Run | 250uA | 250uA | 150uA | 150uA | |
| Voltage | Operation | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | |
| | Program (VPP) | 7.5V | 7.5V | 7.5V or Internal | 7.5V or Internal | |
| Operation Temperature | | -40 to 85°C | -40 to 85°C | -40 to 85°C | -40 to 85°C | |
| Shipping form | | SQFN5-32 TQFP12-48 Chip (80um pp) | SQFN5-32 TQFP12-48 Chip (80um pp) | TQFP12-48 Chip (80um pp) | QFP13-64 Chip (80um pp) | |

MP

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Idea level

S1C17W Series – Comparison Table W1 group - Segment -

| Model | | S1C17W10 | S1C17W12 | S1C17W13 | S1C17W14 | S1C17W15 | S1C17W16 | S1C17W17 | S1C17W18 |
|-----------------------|--------------------|-----------------------------|-----------------------------|--|-----------------------------|---|------------------------------|------------------------------|---|
| Memory | Flash | 16KB | 32KB | 48KB | 48KB | 64KB | 64KB | 96KB | 128KB |
| | RAM | 2KB | 2KB | 2KB | 4KB | 4KB | 8KB | 8KB | 8KB |
| Clock | IOSC | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz |
| | OSC1 | X'tal | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal | 32kHz | 32kHz | 32kHz | - | - | - | 32kHz |
| | OSC3 | X'tal / Cera | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz |
| Internal | | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | 0.5-4MHz | 0.25-4MHz | 0.25-4MHz | |
| LCD Driver | | 15 x 5 16 x 4 | 36 x 8 40 x 4 | 24 x 4 | 50 x 8 54 x 4 | 30 x 8 34 x 4 | 56 x 8 60 x 4 | 36 x 8 40 x 4 | 44 x 8 48 x 4 |
| GPIO (max.) | | 20+1(O) | 28+1(O) | 31+1(O) | 32+1(O) | 35+1(O) | 39+1(O) | 44+1(O) | 67+1(O) |
| Timer | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| | 16bit / PWM | 2 / 1 (2 ports) | 2 / 2 (4 ports) | 3 / 2 (4 ports) | 3 / 2 (4 ports) | 3 / 2 (4 ports) | 5 / 2 (4 ports) | 3 / 2 (4 ports) | 4 / 3 (6 ports) |
| Serial I/F | UART | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| | SPI | 1 | 1 | 1 | 2 | 1 | 3 | 2 | 2 |
| | I ² C | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Analog I/F | 24 bit RFC | 1 | 1 | 1 | 1 | 4 | 2 | 2 | 2 |
| | 12 bit ADC | - | - | - | - | - | 1 (4 inputs) | 1 (4 inputs) | 1 (7 inputs) |
| | Temp. Sensor | - | - | - | - | - | - | 1 | 1 |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. | Mul./Div./MAC. |
| | POR / SVD | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| | IrREMC / Sound | - / 1 | 1 / 1 | 1 / 1 | 1 / 1 | - / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| | Others | - | - | LED pin x 2 | - | - | - | - | Temp. Sensor Vref Gen. |
| Current Consumption | Sleep | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA |
| | Halt | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA |
| | 32kHz Run | 3uA | 2uA | 2uA | 3uA | 4uA | 3uA | 3uA | 2uA |
| | 1MHz Run | 140uA | 140uA | 140uA | 200uA | 250uA | 200uA | 150uA | 140uA |
| Voltage | Operation | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V | 1.2 to 3.6V |
| | Program(VPP) | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V | 7.5V or Internal | 7.5V or Internal |
| Operation Temperature | | -40to 85°C | -40to 85°C | -40to 85°C | -40to 85°C | -40to 85°C | -40to 85°C | -40to 85°C | -40to 85°C |
| Shipping form | | TQFP12-48 Chip (80um pp) | TQFP14-80 Chip (80um pp) | TQFP13-64 SQFN7-48 TQFP12-48 Chip (80um pp) | QFP15-100 Chip (80um pp) | SQFN9-64 TQFP13-64 TQFP14-80 QFP15-100 Chip (80um pp) | TQFP15-128 Chip (80um pp) | TQFP15-100 Chip (80um pp) | TQFP15-128 TQFP14-80 SQFN9-64 Chip (80um pp) |

MP

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S1C17W Series – Comparison Table W2/3 group - Segment & Dot Matrix -

| Model | | S1C17W20 | S1C17W21 | S1C17W22 | S1C17W23 | S1C17W24 | S1C17W26 | S1C17W32 | S1C17W34 | S1C17W35 | S1C17W36 |
|-----------------------|--------------------|--------------------------|--------------------------|------------------------------|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Memory | Flash | 32KB | 64KB | 64KB | 96KB | 128KB | 192KB | 64KB | 128KB | 256KB | 384KB |
| | RAM | 2KB | 4KB | 4KB | 8KB | 8KB | 12KB | 8KB | 12KB | 12KB | 16KB |
| Clock | IOSC * | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz | 700kHz |
| | OSC1 | X'tal | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz | 32.768kHz |
| | | Internal * | 32kHz | 32kHz | - | - | 32kHz | 32kHz | 32kHz | - | - |
| | OSC3 | X'tal/Cera | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz | 4MHz |
| Internal * | | 0.25-4MHz | 0.25-4MHz | 0.5-4MHz | 0.5-4MHz | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | 0.25-4MHz | |
| LCD Driver | | 30 x 16 38 x 8 | 48 x 16 56 x 8 | 56 x 24 64 x 16 72 x 8 | 56 x 24 64 x 16 72 x 8 | 64 x 16 72 x 8 | 70 x 16 78 x 8 | 60 x 32 72 x 16 | 64 x 32 80 x 16 | 64 x 32 80 x 16 | 64 x 32 80 x 16 |
| GPIO (max.) | | 28+1(O) | 24+1(O) | 41+1(O) | 41+1(O) | 41+1(O) | 44+1(O) | 43+1(O) | 51+1(O) | 51+1(O) | 51+1(O) |
| Timer | RTC / WDT | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 3 / 1 | 3 / 1 | 3 / 1 |
| | 16bit / PWM | 2 / 1 (2 ports) | 2 / 2 (4 ports) | 2 / 2 (4 ports) | 4 / 3 (6 ports) | 4 / 3 (6 ports) | 4 / 3 (6 ports) | 2 / 3 (6 ports) | 4 / 3 (6 ports) | 4 / 3 (6 ports) | 4 / 3 (6 ports) |
| Serial I/F | UART | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | SPI | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | I ² C | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Analog I/F | 24 bit RFC | - | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | 12 bit ADC | - | - | - | 1 (6 inputs) | 1 (6 inputs) | 1 (6 inputs) | 1 (8 inputs) | 1 (8 inputs) | 1 (8 inputs) | 1 (8 inputs) |
| | Temp. Sensor | - | - | - | - | - | 1 | 1 | 1 | 1 | 1 |
| Others | Arithmetic Circuit | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. | Mul./Div./MA C. |
| | POR / SVD | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| | IrREMC / Sound | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 | 1 / 1 |
| | Others | - | - | - | OPAMP | - | - | - | Temp. Sensor Vref Gen. | Temp. Sensor Vref Gen. | Temp. Sensor Vref Gen. |
| Current Consumption | Sleep | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA | 0.15uA |
| | Halt | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA | 0.3uA |
| | 32kHz Run | 3uA | 3uA | 4uA | 4uA | 3uA | 3uA | 3uA | 3uA | 3uA | 3uA |
| | 1MHz Run | 150uA | 150uA | 250uA | 250uA | 150uA | 150uA | 150uA | 150uA | 150uA | 150uA |
| Voltage | Operation | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V | 1.2~3.6V |
| | Program(VPP) | 7.5V or Internal | 7.5V or Internal | 7.5V | 7.5V | 7.5V or Internal | 7.5V or Internal | 7.5V or Internal | 7.5V or Internal | 7.5V or Internal | 7.5V or Internal |
| Operation Temperature | | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C | -40~85° C |
| Shipping form | | QFP14-100 Chip (80um) | QFP14-100 Chip (80um) | TQFP15-128 Chip (80um) | TQFP15-128 Chip (80um) | TQFP15-128 Chip (80um) | TQFP24-144 Chip (80um) | TQFP24-144 Chip (80um) | TQFP21-176 Chip (80um) | TQFP21-176 Chip (80um) | TQFP21-176 Chip (80um) |

MP

Under development

Under Investigation

Idea level

S1C17F Series – Comparison Table -

| Model | | S1C17F57 | S1C17F63 | |
|-------------------------|--------------------|-------------------------------------|-------------------------------------|---------------------------|
| Memory | Flash | 32KB | 32KB | |
| | RAM / VRAM | 2KB | 2KB | |
| | Backup RAM | - | 128B | |
| | EEPROM | - | 256B | |
| Clock | IOSC | - | 700kHz | |
| | OSC3 | Xtal / Ceramic | 4.2MHz | - |
| | | Internal | 2M / 1M / 500kHz | 16M / 8M / 4M / 2M / 1MHz |
| | OSC1 | Xtal | 32.768kHz | 32.768kHz |
| Internal | | 32kHz | - | |
| EPD Controller / Driver | | 64seg (15V booster built-in) | 42seg (15V booster built-in) | |
| GPIO (max.) | | 29 | 16 +1 (O) | |
| Timer | 8bit / 16bit / PWM | 2 / - / 2 | - / 4 / 2 | |
| | CT / RTC / WDT | 1 / 1 / 1 | - / 1 / 1 | |
| | Stopwatch | 1 | 1 | |
| SIO | UART | 1 | 1 | |
| | SPI | 1 | 2 | |
| | I ² C | 1 | 1 | |
| | Card interface | - | 1 | |
| Analog | 12bit ADC / RFC | - / 1 (2 channel) | 1 / - | |
| Others | Arithmetic Circuit | Mul./Div./MAC. | Mul./Div./MAC. | |
| | SVD | 13 levels (1.2V to 3.7V) | 28 levels (1.8 to 5.0V) | |
| | Temperature sensor | 1 | 1 | |
| Current Consumption | Sleep | 0.1uA | 0.45uA | |
| | RTC mode | 0.21uA | 0.11uA | |
| | 32KHz run | 12uA | 5uA | |
| | High speed run | 1.4mA (4MHz) | 1.95mA (16MHz) | |
| Voltage | Operation | 2.0 to 3.6V | 1.8 to 5.5V | |
| | Program | 7.0/7.5V | 7.5V | |
| Operation temperature | | -40 to 85°C | -40 to 85°C | |
| Shipping form | Package | QFP15-128 | QFP15-100 | |
| | Chip | 90u p.p. (Die & Au-bump) | 80u p.p. (Die & Au-bump) | |

MP

Under development

Under Investigation

Idea level

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