

16-bit Single Chip Microcontroller

- Low voltage operation from 1.2 V with a single alkaline or silver oxide button battery.
- Ultra low standby power consumption (0.3 μ A during HALT state in super economy mode)
- Equipped with an LCD driver capable of driving an 18–26 SEG \times 4 COM LCD panel.
- Various kinds of serial interfaces (UART, SPI, I²C)

■ DESCRIPTIONS

The S1C17W12/W13 is a 16-bit MCU that features low-voltage operation from 1.2 V even though Flash memory is included. This IC has realized an excellent low power operation that is better than Seiko Epson's 4-bit MCUs by adopting a high-efficiency DC-DC converter that generates a constant voltage to drive internal circuits. It includes a real-time clock, a stopwatch, an LCD driver, and a PWM timer capable of being used to generate drive waveforms for a motor driver as well as a high-performance 16-bit CPU. It is suitable for battery-driven applications that require an LCD display.

■ FEATURES

| Model | S1C17W12 | | S1C17W13 | | |
|--|---|---|--------------|-------------|--|
| | SQFN7-48pin | Chip | TQFP12-48pin | SQFN7-48pin | QFP13-64pin or chip |
| CPU | | | | | |
| CPU core | Seiko Epson original 16-bit RISC CPU core S1C17 | | | | |
| Other | On-chip debugger | | | | |
| Embedded Flash memory | | | | | |
| Capacity | 48K bytes (for both instructions and data) | | | | |
| Erase/program count | 1,000 times (min.) * Programming by the debugging tool ICDmini | | | | |
| Other | Security function to protect from reading/programming by ICDmini On-board programming function using ICDmini * An external smoothing capacitor is required. | | | | |
| Embedded RAM | | | | | |
| Capacity | 2K bytes | | | | |
| Embedded display RAM | | | | | |
| Capacity | 26 bytes | | | | |
| Clock generator (CLG) | | | | | |
| System clock source | 4 sources (IOSC/OSC1/OSC3/EXOSC) | | | | |
| System clock frequency (operating frequency) | 1.1 MHz (max.) V _{DD} = 1.2 to 1.6 V 4.2 MHz (max.) V _{DD} = 1.6 to 3.6 V | | | | |
| IOSC oscillator circuit (boot clock source) | 700 kHz (typ.) embedded oscillator 23 μ s (max.) starting time (time from cancelation of SLEEP state to vector table read by the CPU) | | | | |
| OSC1 oscillator circuit | – | 32.768 kHz (typ.) crystal oscillator | | | |
| | – | 32 kHz (typ.) embedded oscillator | | | |
| OSC3 oscillator circuit | – | Oscillation stop detection circuit included | | | – |
| | – | 4.2 MHz (max.) crystal/ceramic oscillator | | – | 4.2 MHz (max.) crystal/ceramic oscillator |
| | – | 250, 384, 500 kHz, 1, 2, and 4 MHz-switchable embedded oscillator | | | |
| EXOSC clock input | – | 2.1 MHz (max.) CR oscillator (an external R is required) | | – | 2.1 MHz (max.) CR oscillator (an external R is required) |
| Other | 4.2 MHz (max.) square or sine wave input | | | | |
| Other | Configurable system clock division ratio | | | | |
| | Configurable system clock used at wake up from SLEEP state | | | | |
| | Operating clock frequency for the CPU and all peripheral circuits is selectable. | | | | |

S1C17W12/W13

| Model | S1C17W12 | | S1C17W13 | | |
|---|--|--|-------------------------|---|--|
| | SQFN7-48pin | Chip | TQFP12-48pin | SQFN7-48pin | QFP13-64pin or chip |
| I/O port (PPORT) | | | | | |
| Number of general-purpose ports | I/O ports | 25 bits (max.) | 31 bits (max.) | 25 bits (max.) | |
| | Output ports | 1 bit (max.) | | | |
| | Other | Pins are shared with the peripheral I/O. | | | |
| Number of input interrupt ports | 23 bits (max.) | 27 bits (max.) | 21 bits (max.) | 23 bits (max.) | 27 bits (max.) |
| Number of ports that support universal port multiplexer (UPMUX) | 23 bits | | 21 bits | 23 bits | |
| | A peripheral circuit I/O function selected via software can be assigned to each port. | | | | |
| LED drive pin | 2 bits, Nch open drain, output current 5 mA (max.) | | - | | 2 bits, Nch open drain, output current 5 mA (max.) |
| Timers | | | | | |
| Watchdog timer (WDT2) | Generates NMI or watchdog timer reset. Programmable NMI/reset generation cycle | | | | |
| Real-time clock (RTCA) | 128–1 Hz counter, second/minute/hour/day/day of the week/month/year counters Theoretical regulation function for 1-second correction Alarm and stopwatch functions | | | | |
| 16-bit timer (T16) | 3 channels Generates the SPIA master clock. | | | | |
| 16-bit PWM timer (T16B) | 2 channels Event counter/capture function PWM waveform generation function Number of PWM output or capture input ports: 2 ports/channel | | | | |
| Supply voltage detector (SVD) | | | | | |
| Detection level | 30 levels (1.2 to 3.6 V) | | | | |
| Detection accuracy | ±3 % | | | | |
| Other | Intermittent operation mode Generates an interrupt or reset according to the detection level evaluation. | | | | |
| Serial interfaces | | | | | |
| UART (UART2) | 2 channels Baud-rate generator included, IrDA1.0 supported Open drain output, signal polarity, and baud rate division ratio are configurable. | | | | |
| Synchronous serial interface (SPIA) | 1 channel 2 to 16-bit variable data length The 16-bit timer (T16) can be used for the baud-rate generator in master mode. | | | | |
| I ² C (I2C) | 1 channel Baud-rate generator included | | | | |
| Sound generator (SNDA) | | | | | |
| Buzzer output function | 512 Hz to 16 kHz output frequencies One-shot output function | | | | |
| Melody generation function | Pitch: 128 Hz to 16 kHz ≈ C3 to C6 Duration: 7 notes/rests (Half note/rest to thirty-second note/rest) Tempo: 16 tempos (30 to 480) Tie/slur may be specified. | | | | |
| IR remote controller (REMC2) | | | | | |
| Number of transmitter channels | 1 channel | | | | |
| Other | EL lamp drive waveform can be generated for an application example. | | | | |
| LCD driver (LCD4A) | | | | | |
| LCD output | 18 SEG × 1–4 COM (max.) | 26 SEG × 1–4 COM (max.) | 20 SEG × 1–4 COM (max.) | 18 SEG × 1–4 COM (max.) | 26 SEG × 1–4 COM (max.) |
| LCD contrast | 16 levels | | - | 16 levels | |
| LCD drive power supply | 1/3 bias power supply included (External voltage can be applied.) | | External power supply | 1/3 bias power supply included (External voltage can be applied.) | |
| R/F converter (RFC) | | | | | |
| Conversion method | CR oscillation type with 24-bit counters | | - | CR oscillation type with 24-bit counters | |
| Number of conversion channels | 1 channel (Up to two sensors can be connected.) | | | 1 channel (Up to two sensors can be connected.) | |
| Supported sensors | DC-bias resistive sensors, AC-bias resistive sensors | | | DC-bias resistive sensors, AC-bias resistive sensors | |
| Other | Low power consumption type | | | - | |

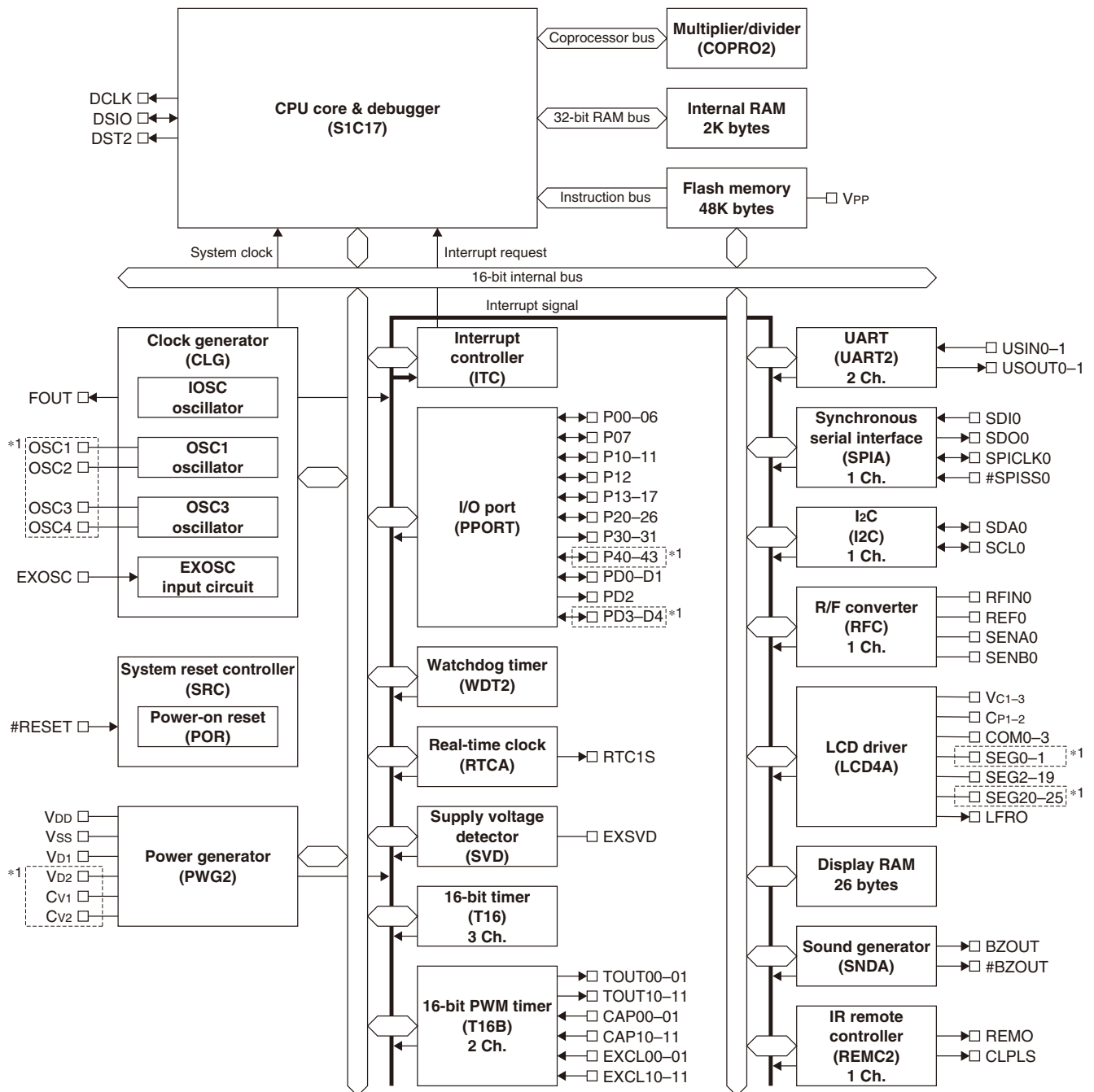
S1C17W12/W13

| Model | S1C17W12 | | S1C17W13 | | |
|--|--|--|-----------------------------------|--------------------------|--|
| | SQFN7-48pin | Chip | TQFP12-48pin | SQFN7-48pin | QFP13-64pin or chip |
| Multiplier/divider (COPRO2) | | | | | |
| Arithmetic functions | 16-bit × 16-bit multiplier | | | | |
| | 16-bit × 16-bit + 32-bit multiply and accumulation unit | | | | |
| | 32-bit ÷ 32-bit divider | | | | |
| Reset | | | | | |
| #RESET pin | Reset when the reset pin is set to low. | | | | |
| Power-on reset | Reset at power on. | | | | |
| Key entry reset | Reset when the P00 to P01/P02/P03 keys are pressed simultaneously (can be enabled/disabled using a register). | | | | |
| Watchdog timer reset | Reset when the watchdog timer overflows (can be enabled/disabled using a register). | | | | |
| Supply voltage detector reset | Reset when the supply voltage detector detects the set voltage level (can be enabled/disabled using a register). | | | | |
| Interrupt | | | | | |
| Non-maskable interrupt | 4 systems (Reset, address misaligned interrupt, debug, NMI) | | | | |
| Programmable external interrupt | 1 system (8 levels) | | | | |
| Programmable internal interrupt | 18 systems (8 levels) | | 17 systems (8 levels) | 18 systems (8 levels) | |
| Power supply voltage | | | | | |
| V _{DD} operating voltage | 1.2 to 3.6 V | | | | |
| V _{DD} operating voltage for Flash programming | 2.4 to 3.6 V (V _{PP} = 7.5 V external power supply is required.) | | | | |
| V _{DD} operating voltage for super economy mode | – | 2.5 to 3.6 V | | – | 2.5 to 3.6 V |
| Operating temperature | | | | | |
| Operating temperature range | -40 to 85 °C | | | | |
| Current consumption (Typ. value) | | | | | |
| SLEEP mode | 0.15 μA IOSC = OFF, OSC1 = OFF, OSC3 = OFF | | | | |
| HALT mode | 1.5 μA OSC1 = 32 kHz (internal oscillator), RTC = ON | 0.5 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON | | | |
| | – | 0.3 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, super economy mode | – | | 0.3 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, super economy mode |
| RUN mode | 5 μA OSC1 = 32 kHz (internal oscillator), RTC = ON, CPU = OSC1 | 4 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, CPU = OSC1 | | | |
| | – | 2 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, CPU = OSC1, super economy mode | – | | 2 μA OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, CPU = OSC1, super economy mode |
| | 140 μA OSC3 = 1 MHz (ceramic oscillator), OSC1 = 32.768 kHz (crystal oscillator), RTC = ON, CPU = OSC3 | | | | |
| Shipping form | | | | | |
| 1 | SQFN7-48pin (Lead pitch: 0.5 mm) | | | | |
| 2 | Die form (Pad pitch: 80 μm (min.)) | | | | |
| 3 | – | | QFP13-64pin (Lead pitch: 0.5 mm) | | |
| 4 | – | | TQFP12-48pin (Lead pitch: 0.5 mm) | | |

S1C17W12/W13

■ BLOCK DIAGRAMS

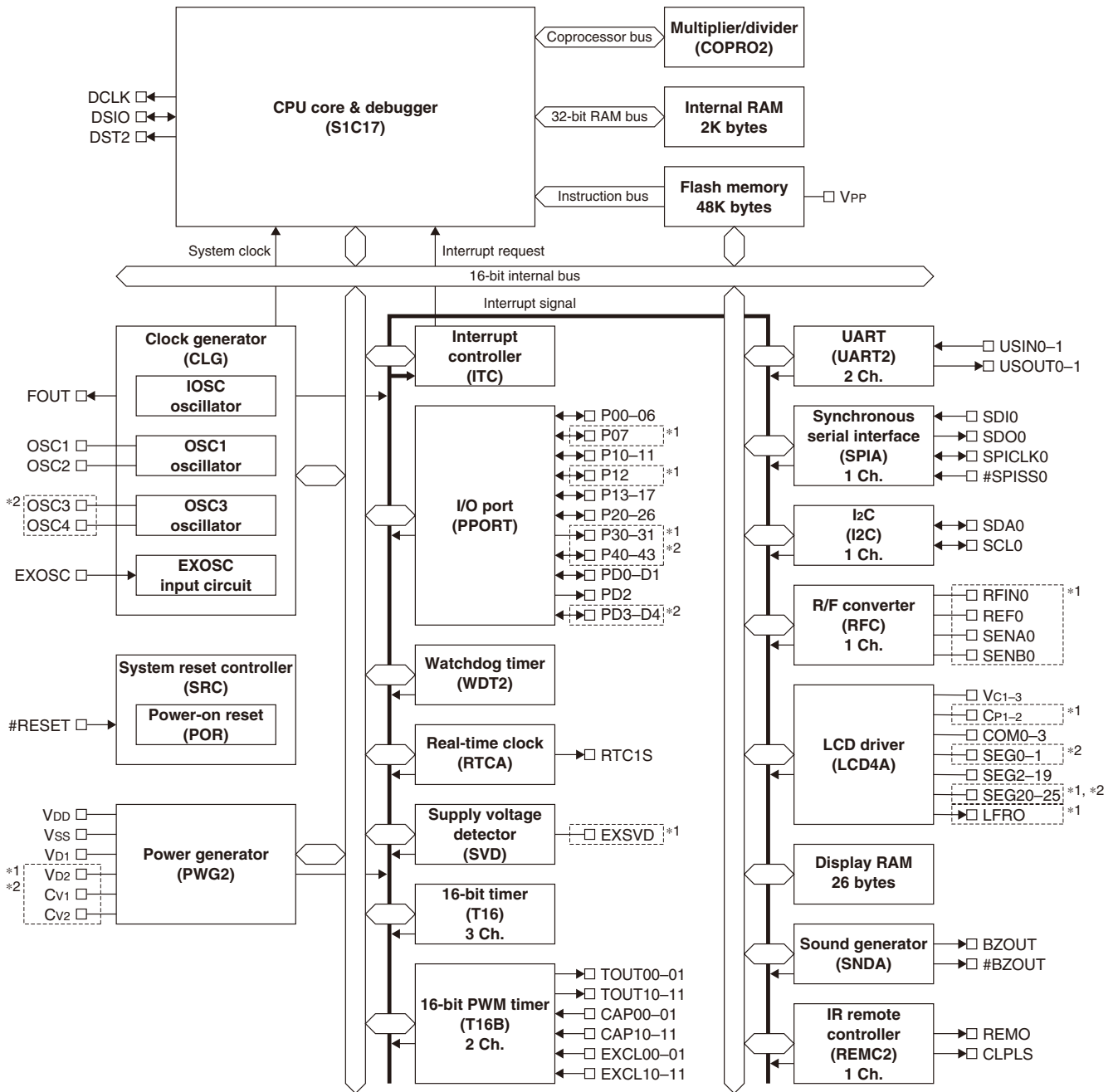
S1C17W12



*1 These pins do not exist in the SQFN7-48pin package.

S1C17W12/W13

S1C17W13



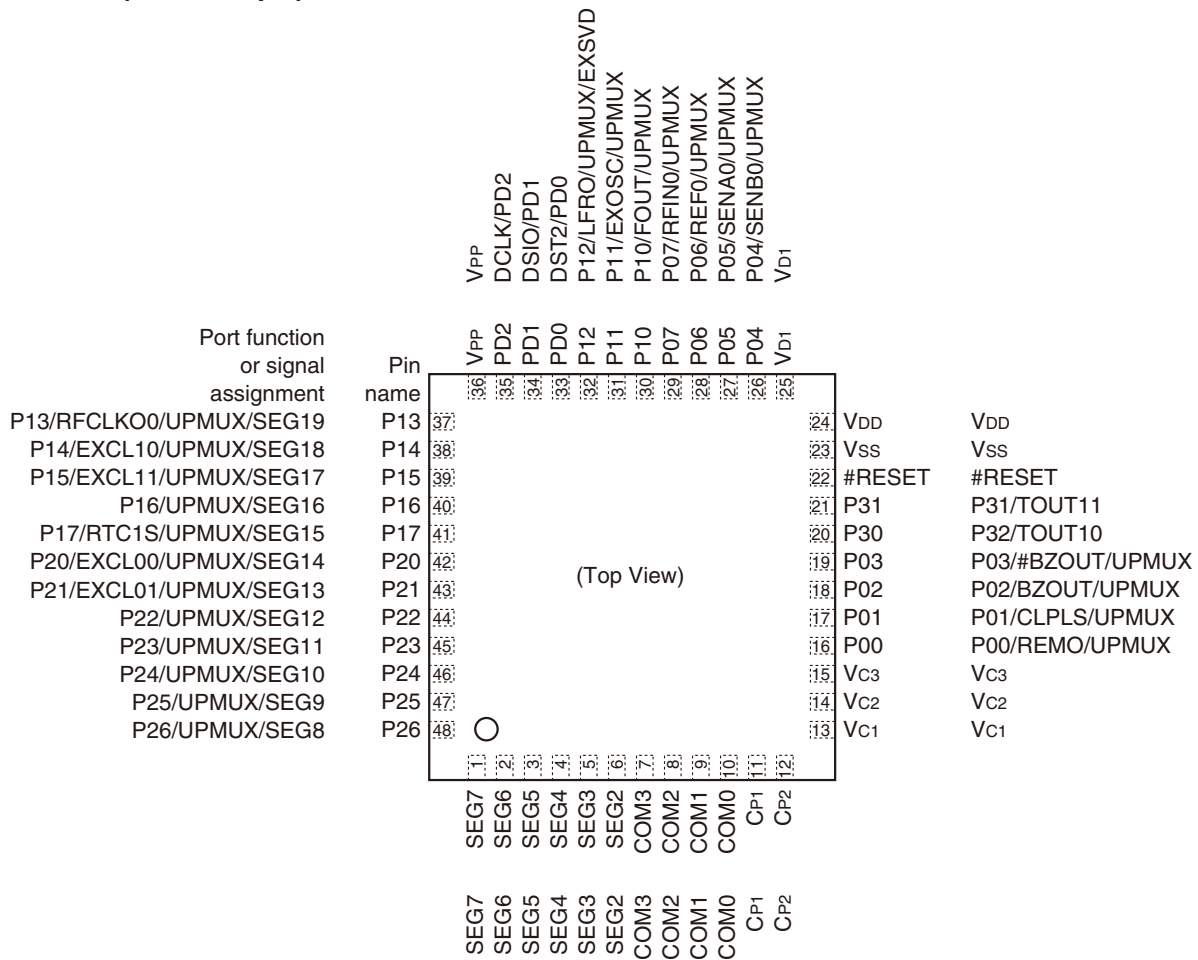
*1 These pins do not exist in the TQFP12-48pin package.

*2 These pins do not exist in the SQFN7-48pin package.

S1C17W12/W13

■ PIN CONFIGURATION DIAGRAMS

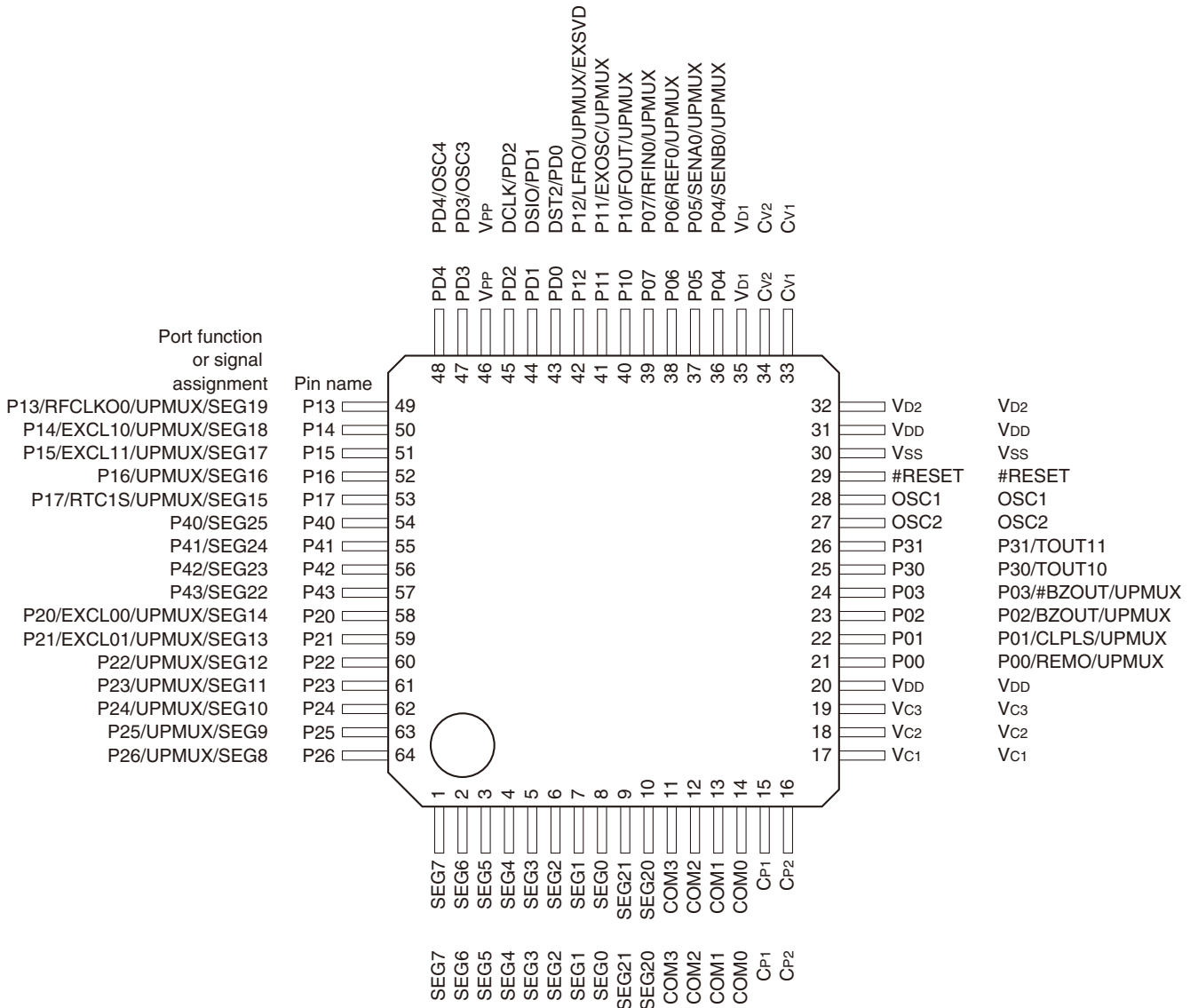
S1C17W12 (SQFN7-48pin)



Note: The model in this package cannot be placed into super economy mode, as it does not have the V_{b2}, C_{v1}, and C_{v2} pins.

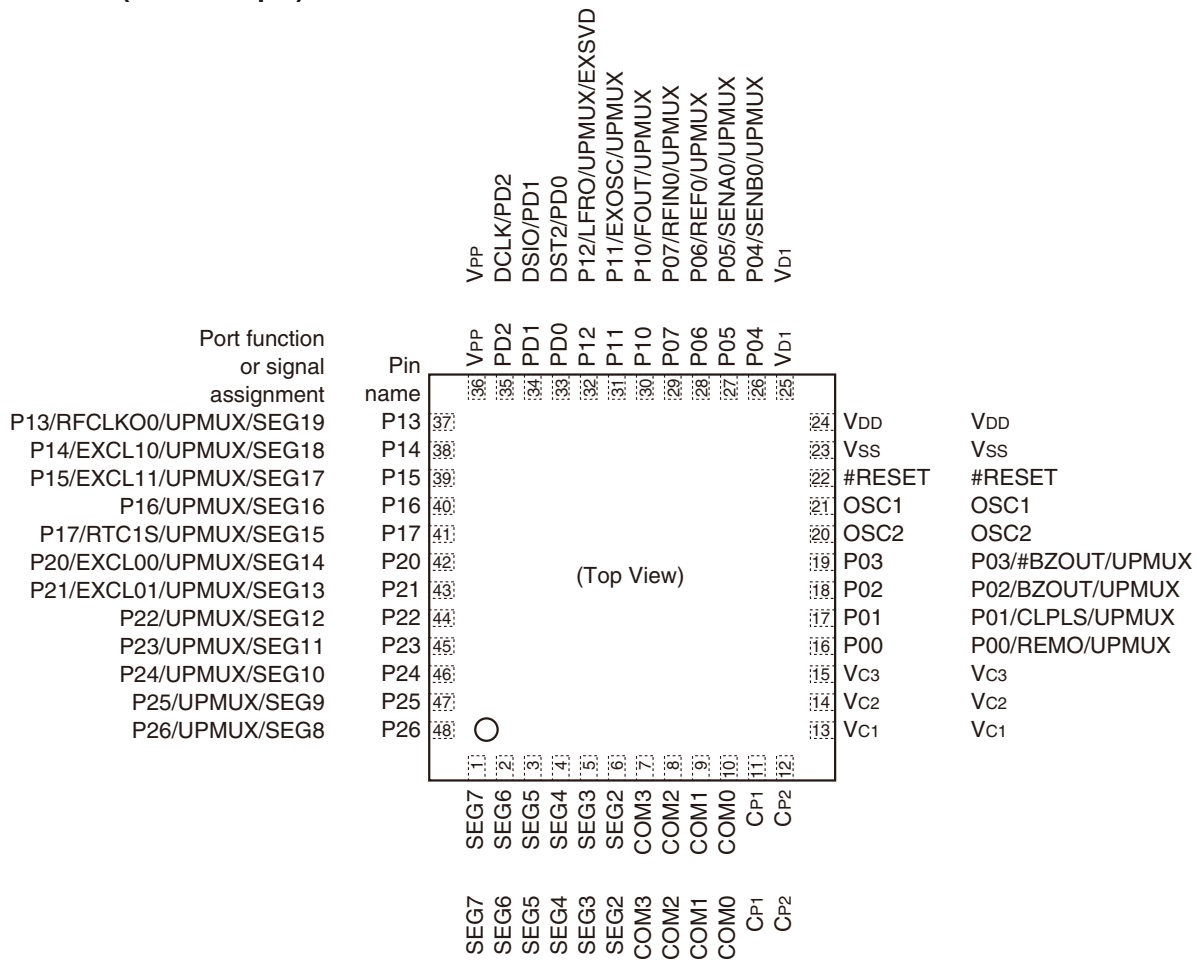
S1C17W12/W13

S1C17W13 (QFP13-64pin)



S1C17W12/W13

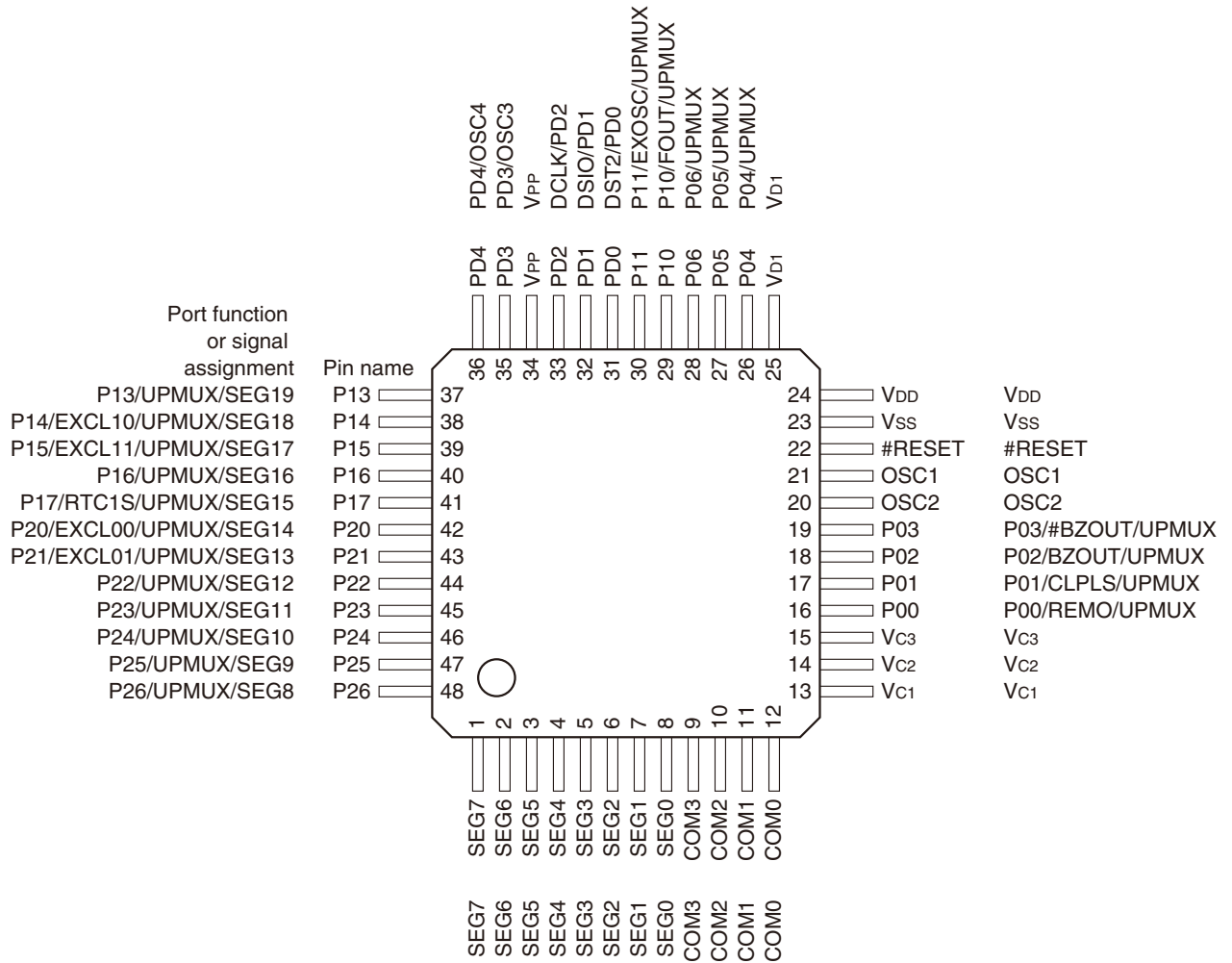
S1C17W13 (SQFN7-48pin)



Note: The model in this package cannot be placed into super economy mode, as it does not have the Vd2, Cv1, and Cv2 pins.

S1C17W12/W13

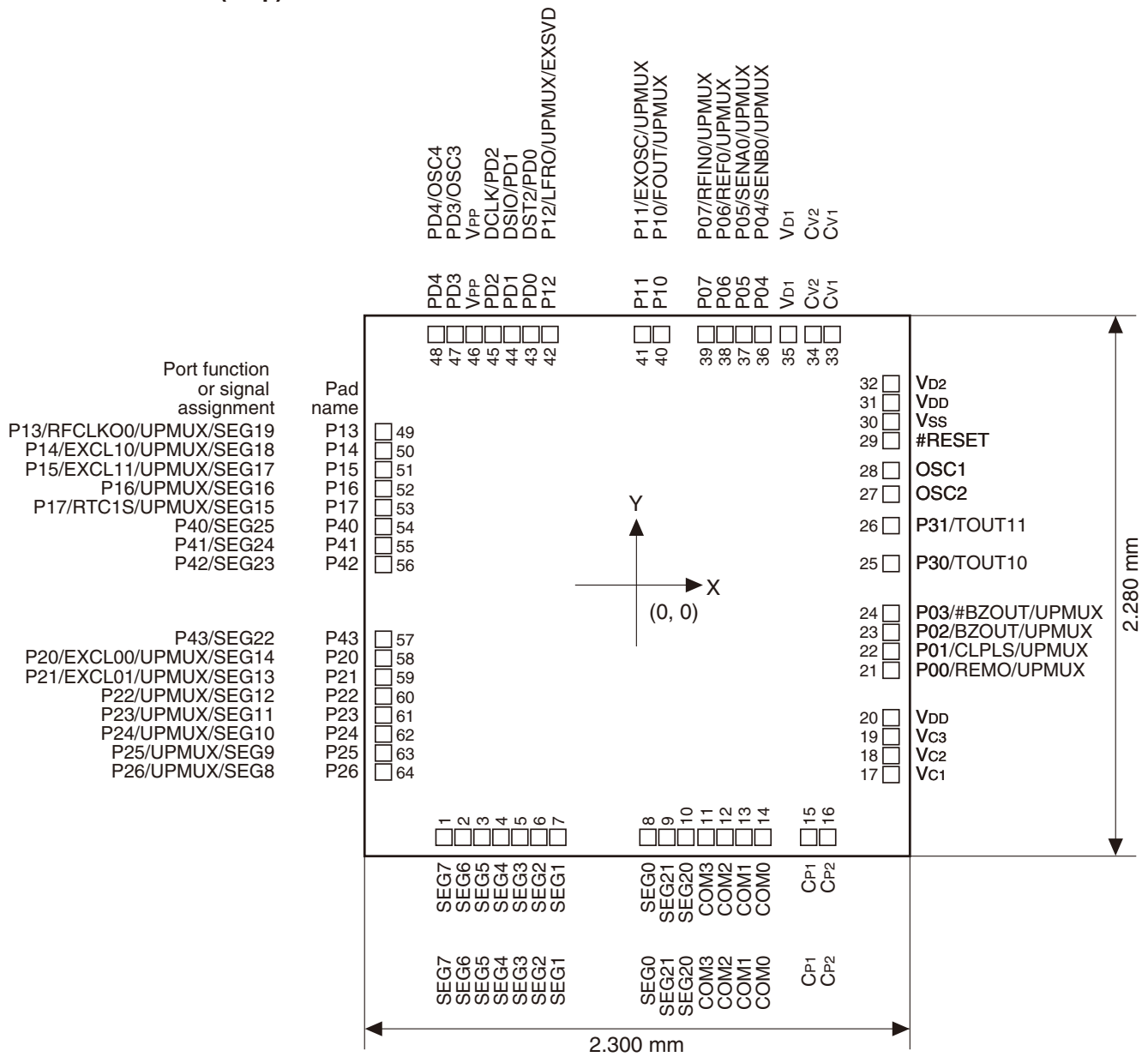
S1C17W13 (TQFP12-48pin)



Note: The model in this package cannot be placed into super economy mode, as it does not have the V_{D2}, C_{V1}, and C_{V2} pins.

S1C17W12/W13

S1C17W12/W13 (Chip)



■ PIN DESCRIPTIONS

Symbol meanings

Assigned signal: The signal listed at the top of each pin is assigned in the initial state. The pin function must be switched via software to assign another signal (see the “I/O Ports” chapter).

| | | |
|----------------|---------------|--------------------------|
| I/O: | I | = Input |
| | O | = Output |
| | I/O | = Input/output |
| | P | = Power supply |
| | A | = Analog signal |
| | Hi-Z | = High impedance state |
| Initial state: | I (Pull-up) | = Input with pulled up |
| | I (Pull-down) | = Input with pulled down |
| | Hi-Z | = High impedance state |
| | O (H) | = High level output |
| | O (L) | = Low level output |

Tolerant fail-safe structure:

| | |
|---|--|
| ✓ | = Over voltage tolerant fail-safe type I/O cell included (see the “I/O Ports” chapter) |
| | The over voltage tolerant fail-safe type I/O cell allows interfacing without passing unnecessary current even if a voltage exceeding V _{DD} is applied to the port. Also unnecessary current is not consumed when the port is externally biased without supplying V _{DD} . |

| Pin/pad name | Assigned signal | I/O | Initial state | Tolerant fail-safe structure | Function | W12 | | W13 | | |
|-----------------|-----------------|-----|---------------|------------------------------|---|------|-------------|------------|-------------|--------------|
| | | | | | | Chip | SQFN7-48pin | 64pin/Chip | SQFN7-48pin | TQFP12-48pin |
| V _{DD} | V _{DD} | P | – | – | Power supply (+) | ✓ | ✓ | ✓ | ✓ | ✓ |
| V _{SS} | V _{SS} | P | – | – | GND | ✓ | ✓ | ✓ | ✓ | ✓ |
| V _{PP} | V _{PP} | P | – | – | Power supply for Flash programming | ✓ | ✓ | ✓ | ✓ | ✓ |
| V _{D1} | V _{D1} | A | – | – | DC-DC converter output | ✓ | ✓ | ✓ | ✓ | ✓ |
| V _{D2} | V _{D2} | A | – | – | DC-DC converter stabilization capacitor connect pin | ✓ | – | ✓ | – | – |
| CV1-2 | CV1-2 | A | – | – | DC-DC converter charge pump capacitor connect pins | ✓ | – | ✓ | – | – |
| VC1-3 | VC1-3 | P | – | – | LCD panel driver power supply | ✓ | ✓ | ✓ | ✓ | ✓ |
| CP1-2 | CP1-2 | A | – | – | LCD power supply booster capacitor connect pins | ✓ | ✓ | ✓ | ✓ | – |
| OSC1 | OSC1 | A | – | – | OSC1 oscillator circuit input | ✓ | – | ✓ | ✓ | ✓ |
| OSC2 | OSC2 | A | – | – | OSC1 oscillator circuit output | ✓ | – | ✓ | ✓ | ✓ |
| #RESET | #RESET | I | I (Pull-up) | – | Reset input | ✓ | ✓ | ✓ | ✓ | ✓ |
| P00 | P00 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | REMO | O | | | IR remote controller transmit data output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P01 | P01 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | CLPLS | O | | | IR remote controller clear pulse output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P02 | P02 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | BZOUT | O | | | Sound generator output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P03 | P03 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | #BZOUT | O | | | Sound generator inverted output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P04 | P04 | I/O | Hi-Z | – | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | SENB0 | A | | | R/F converter Ch.0 sensor B oscillator pin | ✓ | ✓ | ✓ | ✓ | – |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P05 | P05 | I/O | Hi-Z | – | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | SENA0 | A | | | R/F converter Ch.0 sensor A oscillator pin | ✓ | ✓ | ✓ | ✓ | – |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |
| P06 | P06 | I/O | Hi-Z | – | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| | REF0 | A | | | R/F converter Ch.0 reference oscillator pin | ✓ | ✓ | ✓ | ✓ | – |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ | ✓ |

S1C17W12/W13

| Pin/pad name | Assigned signal | I/O | Initial state | Tolerant fail-safe structure | Function | W12 | | W13 | |
|--------------|-----------------|-----|---------------|------------------------------|--|------|-------------|------------|-------------|
| | | | | | | Chip | SQFN7-48pin | 64pin/Chip | SQFN7-48pin |
| P07 | P07 | I/O | Hi-Z | - | I/O port | ✓ | ✓ | ✓ | - |
| | RFIN0 | A | | | R/F converter Ch.0 oscillation input | ✓ | ✓ | ✓ | - |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | - |
| P10 | P10 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | FOUT | O | | | Clock external output | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| P11 | P11 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | EXOSC | I | | | Clock generator external clock input | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| P12 | P12 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | - |
| | LFRO | O | | | LCD frame signal monitor output | ✓ | ✓ | ✓ | - |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | - |
| | EXSVD | A | | | External power supply voltage detection input | ✓ | ✓ | ✓ | - |
| P13 | P13 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | RFCLK00 | O | | | R/F converter Ch.0 clock monitor output | ✓ | ✓ | ✓ | - |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG19 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P14 | P14 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | EXCL10 | I | | | 16-bit PWM timer Ch.1 event counter input 0 | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG18 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P15 | P15 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | EXCL11 | I | | | 16-bit PWM timer Ch.1 event counter input 1 | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG17 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P16 | P16 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG16 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P17 | P17 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | RTC1S | O | | | Real-time clock 1-second cycle pulse output | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG15 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P20 | P20 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | EXCL00 | I | | | 16-bit PWM timer Ch.0 event counter input 0 | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG14 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P21 | P21 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | EXCL01 | I | | | 16-bit PWM timer Ch.0 event counter input 1 | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG13 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P22 | P22 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG12 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P23 | P23 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG11 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P24 | P24 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG10 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P25 | P25 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG9 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P26 | P26 | I/O | Hi-Z | ✓ | I/O port | ✓ | ✓ | ✓ | ✓ |
| | UPMUX | I/O | | | User-selected I/O (universal port multiplexer) | ✓ | ✓ | ✓ | ✓ |
| | SEG8 | A | | | LCD segment output | ✓ | ✓ | ✓ | ✓ |
| P30 | P30 | O | Hi-Z | - | LED drive port | ✓ | ✓ | ✓ | - |
| | TOUT10 | O | | | 16-bit PWM timer Ch.1 PWM output 0 | ✓ | ✓ | ✓ | - |

S1C17W12/W13

| Pin/pad name | Assigned signal | I/O | Initial state | Tolerant fail-safe structure | Function | W12 | | W13 | | |
|--------------|-----------------|-----|---------------|------------------------------|------------------------------------|------|-------------|------------|-------------|--------------|
| | | | | | | Chip | SQFN7-48pin | 64pin/Chip | SQFN7-48pin | TQFP12-48pin |
| P31 | P31 | O | Hi-Z | - | LED drive port | ✓ | ✓ | ✓ | - | - |
| | TOUT11 | O | | | 16-bit PWM timer Ch.1 PWM output 1 | ✓ | ✓ | ✓ | - | - |
| P40 | P40 | I/O | Hi-Z | ✓ | I/O port | ✓ | - | ✓ | - | - |
| | SEG25 | A | | | LCD segment output | ✓ | - | ✓ | - | - |
| P41 | P41 | I/O | Hi-Z | ✓ | I/O port | ✓ | - | ✓ | - | - |
| | SEG24 | A | | | LCD segment output | ✓ | - | ✓ | - | - |
| P42 | P42 | I/O | Hi-Z | ✓ | I/O port | ✓ | - | ✓ | - | - |
| | SEG23 | A | | | LCD segment output | ✓ | - | ✓ | - | - |
| P43 | P43 | I/O | Hi-Z | ✓ | I/O port | ✓ | - | ✓ | - | - |
| | SEG22 | A | | | LCD segment output | ✓ | - | ✓ | - | - |
| PD0 | DST2 | O | O (L) | ✓ | On-chip debugger status output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | PD0 | I/O | | | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| PD1 | DSIO | I/O | I (Pull-up) | ✓ | On-chip debugger data input/output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | PD1 | I/O | | | I/O port | ✓ | ✓ | ✓ | ✓ | ✓ |
| PD2 | DCLK | O | O (H) | - | On-chip debugger clock output | ✓ | ✓ | ✓ | ✓ | ✓ |
| | PD2 | O | | | Output port | ✓ | ✓ | ✓ | ✓ | ✓ |
| PD3 | PD3 | I/O | Hi-Z | - | I/O port | ✓ | - | ✓ | - | ✓ |
| | OSC3 | A | | | OSC3 oscillator circuit input | ✓ | - | ✓ | - | ✓ |
| PD4 | PD4 | I/O | Hi-Z | - | I/O port | ✓ | - | ✓ | - | ✓ |
| | OSC4 | A | | | OSC3 oscillator circuit output | ✓ | - | ✓ | - | ✓ |
| COM0-3 | COM0-3 | A | Hi-Z | - | LCD common output | ✓ | ✓ | ✓ | ✓ | ✓ |
| SEG0-1 | SEG0-1 | A | Hi-Z | - | LCD segment output | ✓ | - | ✓ | - | ✓ |
| SEG2-7 | SEG2-7 | A | Hi-Z | - | LCD segment output | ✓ | ✓ | ✓ | ✓ | ✓ |
| SEG20-21 | SEG20-21 | A | Hi-Z | - | LCD segment output | ✓ | - | ✓ | - | - |

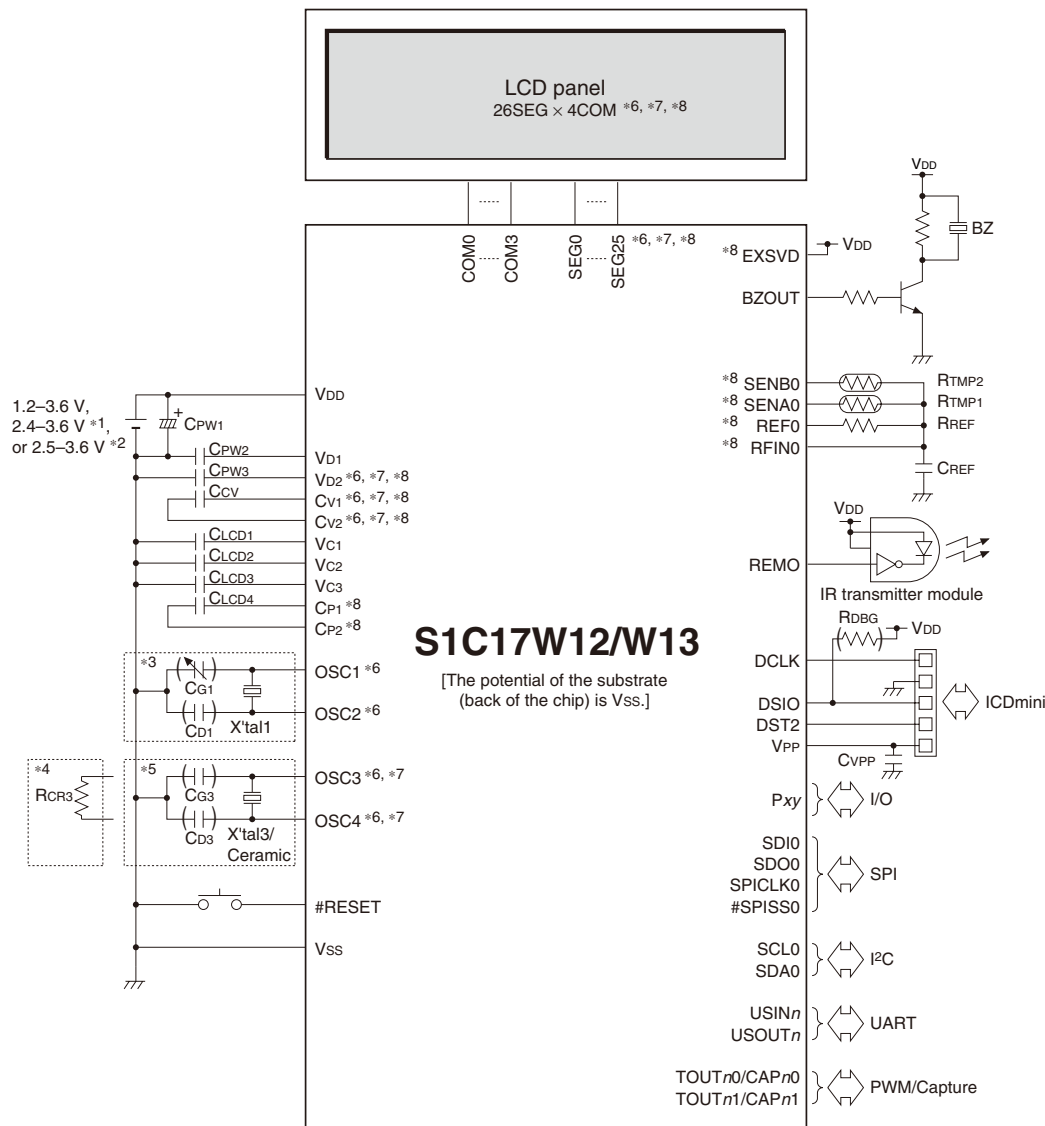
Universal port multiplexer (UPMUX)

The universal port multiplexer (UPMUX) allows software to select the peripheral circuit input/output function to be assigned to each pin from those listed below. Note, however, that a function cannot be assigned to two or more pins simultaneously.

| Peripheral circuit | Signal to be assigned | I/O | Channel number n | Function |
|-------------------------------------|-----------------------|-----|--------------------|---|
| Synchronous serial interface (SPIA) | SDIn | I | $n = 0$ | SPIA Ch. n data input |
| | SODn | O | | SPIA Ch. n data output |
| | SPICLKn | I/O | | SPIA Ch. n clock input/output |
| | #SPISSn | I | | SPIA Ch. n slave-select input |
| I ² C (I2C) | SCLn | I/O | $n = 0$ | I2C Ch. n clock input/output |
| | SDAn | I/O | | I2C Ch. n data input/output |
| UART (UART2) | USINn | I | $n = 0, 1$ | UART2 Ch. n data input |
| | USOUTn | O | | UART2 Ch. n data output |
| 16-bit PWM timer (T16B) | TOUTn0/CAPn0 | I/O | $n = 0, 1$ | T16B Ch. n PWM output/capture input 0 |
| | TOUTn1/CAPn1 | I/O | | T16B Ch. n PWM output/capture input 1 |

S1C17W12/W13

■ BASIC EXTERNAL CONNECTION DIAGRAM



- *1: For Flash programming (when VPP is supplied externally)
- *2: For Flash programming (when VPP is generated internally)
- *3: When the OSC1 crystal oscillator is used (except for the S1C17M20/M23 (24-pin package))
- *4: When the OSC3 crystal/ceramic oscillator is used (except for the S1C17M20/M23 (24-pin package))
- *5: When the R/F converter is used (available in the S1C17M22/M25)
- (): Do not mount components if unnecessary.

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