

# S1C17W15 (rev 1.00)

New series

## 16-bit Single Chip Microcontroller

- Low power operation from 1.2V with a single alkaline or silver oxide button battery.
- Low power consumption standby driving at HALT 0.5  $\mu$ A (TBD) .  
\*super economy mode
- Built-in LCD Driver: 30 SEG x 8 COM (max.)
- Internal 4ch R/F converters enable to realize various sensing.

### ■ DESCRIPTIONS

The S1C17W15 is a 16-bit MCU that features low-voltage operation from 1.2 V even though the Flash memory is included. The embedded high-efficiency DC-DC converter generates the constant-voltage to drive the IC with lower power consumption than 4-bit MCUs. This IC 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 and timers.

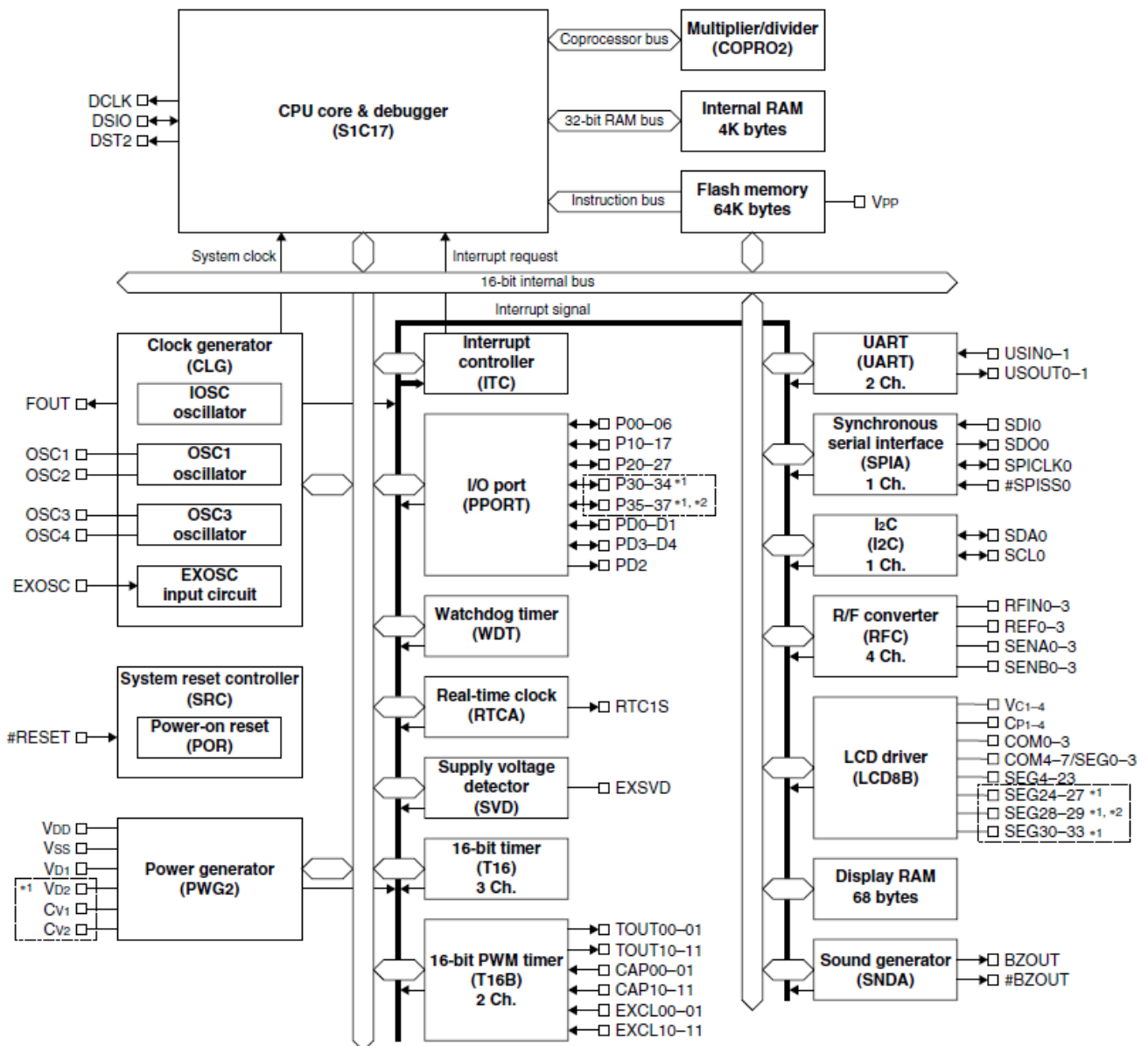
### ■ FEATURES

| Model                                                           | S1C17W15                                                                                                                                                                                                |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CPU</b>                                                      |                                                                                                                                                                                                         |
| CPU Core                                                        | Seiko Epson original 16-bit RISC CPU Core S1C17                                                                                                                                                         |
| Other                                                           | On-chip debugger                                                                                                                                                                                        |
| <b>Embedded Flash memory</b>                                    |                                                                                                                                                                                                         |
| Capacity                                                        | 64K bytes (for both instructions and data)                                                                                                                                                              |
| Erase/program count                                             | 50 times (min.) * Programming by the debugging tool ICDmini                                                                                                                                             |
| Other                                                           | Security function to protect from reading/programming by ICDmini<br>On-board programming function using ICDmini                                                                                         |
| <b>Embedded RAM</b>                                             |                                                                                                                                                                                                         |
| Capacity                                                        | 4K bytes                                                                                                                                                                                                |
| <b>Embedded display RAM</b>                                     |                                                                                                                                                                                                         |
| Capacity                                                        | 68 bytes                                                                                                                                                                                                |
| <b>Clock generator (CLG)</b>                                    |                                                                                                                                                                                                         |
| System clock source                                             | 4 sources (IOSC/OSC1/OSC3/EXOSC)                                                                                                                                                                        |
| System clock frequency (operating frequency)                    | 1.1 MHz (max.) VDD = 1.2 to 1.6 V<br>4.2 MHz (max.) VDD = 1.6 to 3.6 V                                                                                                                                  |
| IOSC oscillator circuit (boot clock source)                     | 700 kHz (typ.) embedded oscillator<br>23 $\mu$ 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<br>Oscillation stop detection circuit included                                                                                                                     |
| OSC3 oscillator circuit                                         | 4.2 MHz (max.) crystal/ceramic oscillator<br>500 kHz, 1, 2, and 4 MHz-switchable embedded oscillator<br>500 Hz to 2 MHz CR oscillator (an external R is required)                                       |
| EXOSC clock input                                               | 4.2 MHz (max.) square or sine wave input                                                                                                                                                                |
| Other                                                           | Configurable system clock division ratio<br>Configurable system clock used at wake up from SLEEP state<br>Operating clock frequency for the CPU and all peripheral circuits is selectable.              |
| <b>I/O port (PPORT)</b>                                         |                                                                                                                                                                                                         |
| Number of general-purpose I/O ports                             | Input/output port: 35 bits (max., 100-pin package or chip)<br>32 bits (max., 80-pin package)<br>27 bits (max., 64-pin package)<br>Output port: 1 bit (max.)<br>Pins are shared with the peripheral I/O. |
| Number of input interrupt ports                                 | 31 bits (max., 100-pin package or chip)<br>28 bits (max., 80-pin package)<br>23 bits (max., 64-pin package)                                                                                             |
| Number of ports that support universal port multiplexer (UPMUX) | 23 bits<br>A peripheral circuit I/O function selected via software can be assigned to each port.                                                                                                        |
| <b>Timers</b>                                                   |                                                                                                                                                                                                         |
| Watchdog timer (WDT)                                            | Generates NMI or watchdog timer reset.                                                                                                                                                                  |
| Real-time clock (RTCA)                                          | 128–1 Hz counter, second/minute/hour/day/day of the week/month/year counters<br>Theoretical regulation function for 1-second correction<br>Alarm and stopwatch functions                                |
| 16-bit timer (T16)                                              | 3 channels<br>Generates the SPIA master clock.                                                                                                                                                          |
| 16-bit PWM timer (T16B)                                         | 2 channels<br>Event counter/capture function<br>PWM waveform generation function<br>Number of PWM output or capture input ports: 2 ports/channel                                                        |
| <b>Supply voltage detector (SVD)</b>                            |                                                                                                                                                                                                         |
| Detection level                                                 | 30 levels (1.2 to 3.6 V)                                                                                                                                                                                |
| Detection accuracy                                              | $\pm 3\%$                                                                                                                                                                                               |
| Other                                                           | Intermittent operation mode                                                                                                                                                                             |

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|                                              |                                                                                                                                                                                                                                                                |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | Generates an interrupt or reset according to the detection level evaluation.                                                                                                                                                                                   |
| <b>Serial interfaces</b>                     |                                                                                                                                                                                                                                                                |
| UART (UART)                                  | 2 channel<br>Baud-rate generator included, IrDA1.0 supported                                                                                                                                                                                                   |
| Synchronous Serial Interface (SPIA)          | 1 channel<br>2 to 16-bit variable data length<br>The 16-bit timer (T16) can be used for the baud-rate generator in master mode.                                                                                                                                |
| I <sup>2</sup> C (I2C)                       | 1 channel<br>Baud-rate generator included                                                                                                                                                                                                                      |
| <b>Sound generator (SNDA)</b>                |                                                                                                                                                                                                                                                                |
| Buzzer output function                       | 512 Hz to 16 kHz output frequencies<br>One-shot output function                                                                                                                                                                                                |
| Melody generation function                   | Pitch: 128 Hz to 16 kHz $\approx$ C3 to C6<br>Duration: 7 notes/rests (Half note/rest to thirty-second note/rest)<br>Tempo: 16 tempos (30 to 480)<br>Tie may be specified.                                                                                     |
| <b>LCD driver (LCD24A)</b>                   |                                                                                                                                                                                                                                                                |
| LCD output                                   | 30 SEG $\times$ 5–8 COM (max.), 34 SEG $\times$ 1–4 COM (max.) (100-pin package or chip)<br>28 SEG $\times$ 5–8 COM (max.), 32 SEG $\times$ 1–4 COM (max.) (80-pin package)<br>20 SEG $\times$ 5–8 COM (max.), 24 SEG $\times$ 1–4 COM (max.) (64-pin package) |
| LCD contrast                                 | 32 levels                                                                                                                                                                                                                                                      |
| Other                                        | 1/4 or 1/3 bias power supply included, external voltage can be applied.                                                                                                                                                                                        |
| <b>R/F converter (RFC)</b>                   |                                                                                                                                                                                                                                                                |
| Conversion method                            | CR oscillation type with 24-bit counters                                                                                                                                                                                                                       |
| Number of conversion channels                | 4 channels (Up to two sensors can be connected to each channel.)                                                                                                                                                                                               |
| Supported sensors                            | DC-bias resistive sensors, AC-bias resistive sensors (Ch.0 only)                                                                                                                                                                                               |
| <b>Multiplier/divider (COPRO2)</b>           |                                                                                                                                                                                                                                                                |
| Arithmetic functions                         | 16-bit $\times$ 16-bit multiplier<br>16-bit $\times$ 16-bit + 32-bit multiply and accumulation unit<br>32-bit $\div$ 32-bit divider                                                                                                                            |
| <b>Reset</b>                                 |                                                                                                                                                                                                                                                                |
| #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).                                                                                                                                               |
|                                              |                                                                                                                                                                                                                                                                |
| Non-maskable interrupt                       | 4 systems (Reset, address misaligned interrupt, debug, NMI)                                                                                                                                                                                                    |
| Programmable interrupt                       | External interrupt: 1 system (8 levels)<br>Internal interrupt: 20 systems (8 levels)                                                                                                                                                                           |
| <b>Power supply voltage</b>                  |                                                                                                                                                                                                                                                                |
| VDD operating voltage                        | 1.2 to 3.6 V                                                                                                                                                                                                                                                   |
| VDD operating voltage for Flash programming  | 1.8 to 3.6 V ( $V_{PP} = 7.5$ V external power supply is required.)                                                                                                                                                                                            |
| VDD operating voltage for super economy mode | 2.5 to 3.6 V (100-pin/80-pin package or chip)                                                                                                                                                                                                                  |
| <b>Operating temperature</b>                 |                                                                                                                                                                                                                                                                |
| Operating temperature range                  | -40 to 85 °C                                                                                                                                                                                                                                                   |
| <b>Current consumption</b>                   |                                                                                                                                                                                                                                                                |
| SLEEP mode                                   | 0.15 $\mu$ A<br>I <sub>OSC</sub> =OFF, OSC1=OFF, OSC3=OFF                                                                                                                                                                                                      |
| HALT mode                                    | 0.5 $\mu$ A<br>OSC1=32 kHz, RTC=ON                                                                                                                                                                                                                             |
|                                              | 0.3 $\mu$ A<br>OSC1=32 kHz, RTC=ON, Super economy mode (100-pin/80-pin package or chip)                                                                                                                                                                        |
|                                              | 1.2 $\mu$ A<br>OSC1=32 kHz, RTC=ON, CPU=OSC1, LCD=ON (no panel load, Vc2 reference, 1/3bias), Super economy mode (100-pin/80-pin package or chip)                                                                                                              |
| RUN mode                                     | 8 $\mu$ A<br>OSC1=32 kHz, RTC=ON, CPU=OSC1                                                                                                                                                                                                                     |
|                                              | 4 $\mu$ A<br>OSC1=32 kHz, RTC=ON, CPU=OSC1, Super economy mode (100-pin/80-pin package or chip)                                                                                                                                                                |
|                                              | 250 $\mu$ A<br>OSC3=1MHz (ceramic oscillator), OSC1=32kHz, RTC=ON, CPU=OSC3                                                                                                                                                                                    |
| <b>Shipping form</b>                         |                                                                                                                                                                                                                                                                |
| 1                                            | SQFN9-64pin                                                                                                                                                                                                                                                    |
| 2                                            | TQFP13-64pin                                                                                                                                                                                                                                                   |
| 3                                            | TQFP14-80pin                                                                                                                                                                                                                                                   |
| 4                                            | QFP15-100pin                                                                                                                                                                                                                                                   |
| 5                                            | Die form (Pad pitch: 80 $\mu$ m (min.))                                                                                                                                                                                                                        |

## ■ BLOCK DIAGRAM



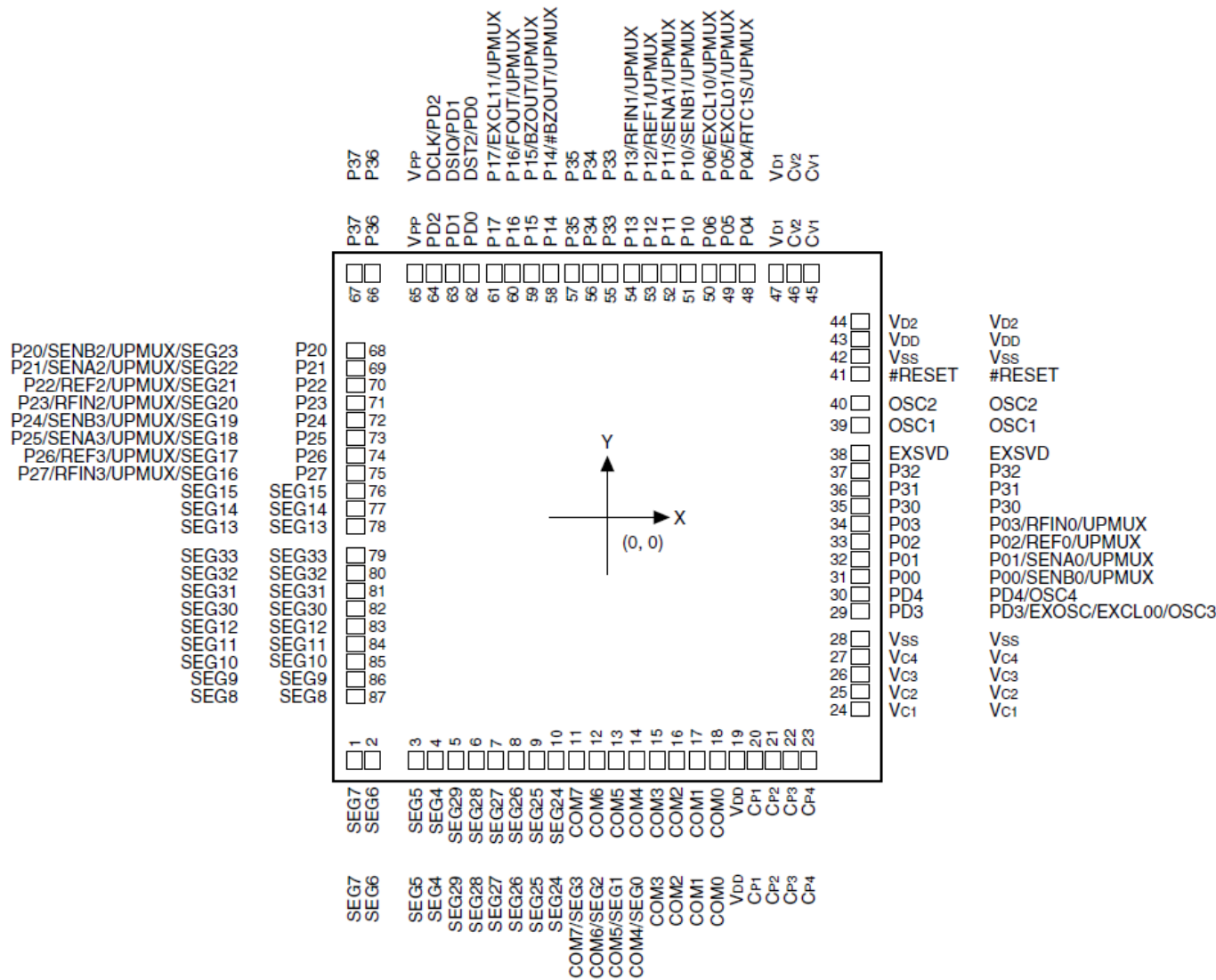
\*1 These pins do not exist in the 64-pin package.

\*2 These pins do not exist in the 80-pin package.

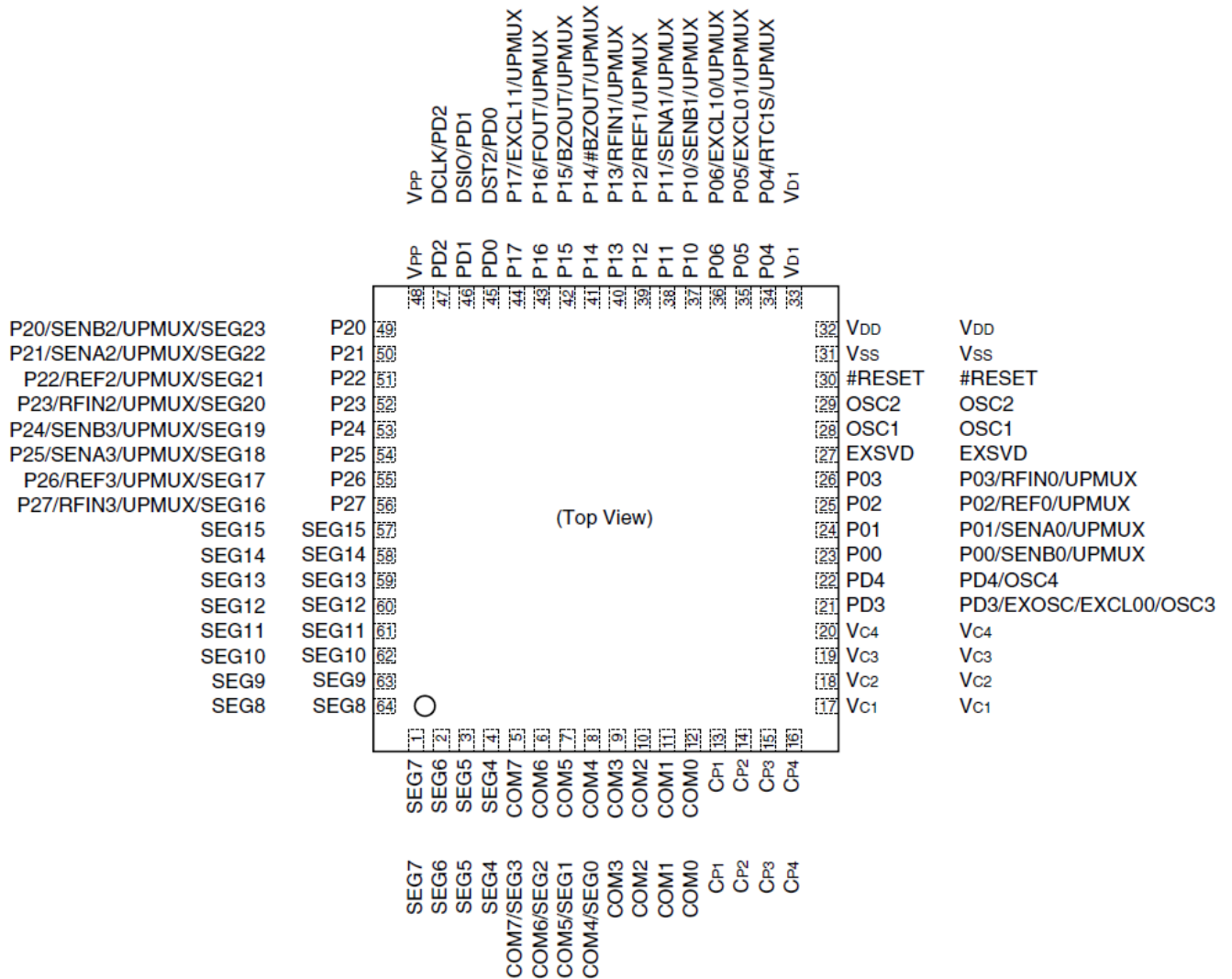
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## PIN CONFIGURATION DIAGRAM

Die form

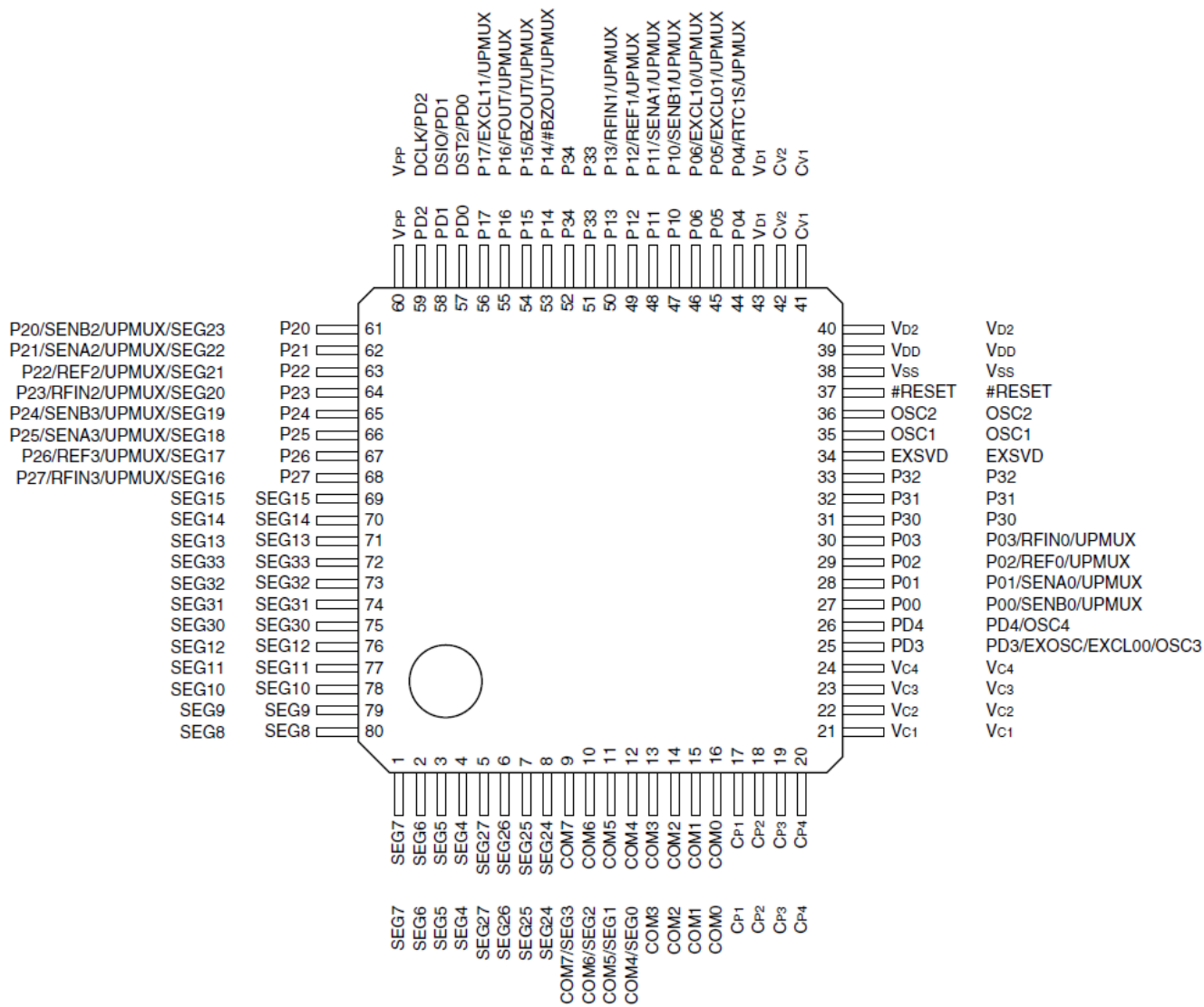


SQFN9-64pin, TQFP13-64pin

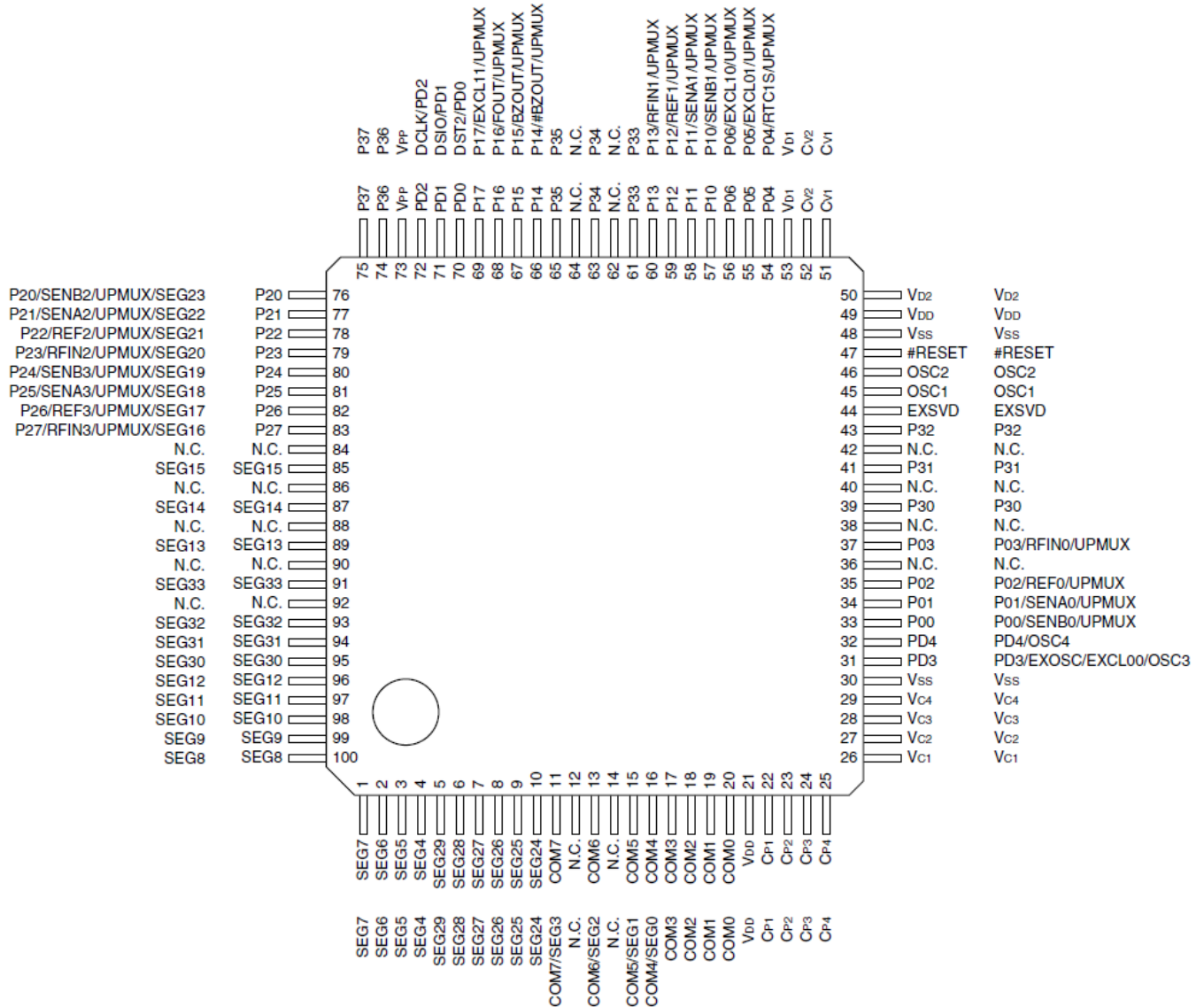


**S1C17W15**

## TQFP14-80pin



## QFP15-100pin



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## PIN DESCRIPTIONS

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)

| Pin/pad name | Assigned signal | I/O   | Initial state | Tolerant fail-safe structure | Function                                            | Package |       |              |
|--------------|-----------------|-------|---------------|------------------------------|-----------------------------------------------------|---------|-------|--------------|
|              |                 |       |               |                              |                                                     | 64pin   | 80pin | 100pin /Chip |
| VDD          | VDD             | P     | -             | -                            | Power supply (+)                                    | ✓       | ✓     | ✓            |
| VSS          | VSS             | P     | -             | -                            | GND                                                 | ✓       | ✓     | ✓            |
| VPP          | VPP             | P     | -             | -                            | Power supply for Flash programming                  | ✓       | ✓     | ✓            |
| VD1          | VD1             | A     | -             | -                            | DC-DC converter output                              | ✓       | ✓     | ✓            |
| VD2          | VD2             | A     | -             | -                            | DC-DC converter stabilization capacitor connect pin | -       | ✓     | ✓            |
| CV1-2        | CV1-2           | A     | -             | -                            | DC-DC converter charge pump capacitor connect pins  | -       | ✓     | ✓            |
| VC1-4        | VC1-4           | P     | -             | -                            | LCD panel driver power supply                       | ✓       | ✓     | ✓            |
| CP1-4        | CP1-4           | 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                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | SENB0           | I/O/A |               |                              | R/F converter Ch.0 sensor B oscillator pin          | ✓       | ✓     | ✓            |
| P01          | P01             | I/O   | Hi-Z          | -                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | SENA0           | I/O/A |               |                              | R/F converter Ch.0 sensor A oscillator pin          | ✓       | ✓     | ✓            |
| P02          | P02             | I/O   | Hi-Z          | -                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | REF0            | I/O/A |               |                              | R/F converter Ch.0 reference oscillator pin         | ✓       | ✓     | ✓            |
| P03          | P03             | I/O   | Hi-Z          | -                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | RFIN0           | I/O/A |               |                              | R/F converter Ch.0 oscillation input                | ✓       | ✓     | ✓            |
| P04          | P04             | 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)      | ✓       | ✓     | ✓            |
| P05          | P05             | I/O   | Hi-Z          | -                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | EXCL01          | I     |               |                              | 16-bit PWM timer Ch.0 event counter input 1         | ✓       | ✓     | ✓            |
| P06          | P06             | I/O   | Hi-Z          | -                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | EXCL10          | I     |               |                              | 16-bit PWM timer Ch.1 event counter input 0         | ✓       | ✓     | ✓            |
| P10          | P10             | I/O   | Hi-Z          | ✓                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | SENB1           | I/O   |               |                              | R/F converter Ch.1 sensor B oscillator pin          | ✓       | ✓     | ✓            |
| P11          | P11             | I/O   | Hi-Z          | ✓                            | I/O port                                            | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O   |               |                              | User-selected I/O (universal port multiplexer)      | ✓       | ✓     | ✓            |
|              | SENA1           | I/O   |               |                              | R/F converter Ch.1 sensor A oscillator pin          | ✓       | ✓     | ✓            |



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| Pin/pad name | Assigned signal | I/O | Initial state | Tolerant fail-safe structure | Function                                       | Package |       |              |
|--------------|-----------------|-----|---------------|------------------------------|------------------------------------------------|---------|-------|--------------|
|              |                 |     |               |                              |                                                | 64pin   | 80pin | 100pin /Chip |
| P12          | P12             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | REF1            | I/O |               |                              | R/F converter Ch.1 reference oscillator pin    | ✓       | ✓     | ✓            |
| P13          | P13             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | RFIN1           | O   |               |                              | R/F converter Ch.1 oscillation input           | ✓       | ✓     | ✓            |
| P14          | P14             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | #BZOUT          | O   |               |                              | Sound generator inverted output                | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
| P15          | P15             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | BZOUT           | O   |               |                              | Sound generator output                         | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
| P16          | P16             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | FOUT            | O   |               |                              | Clock external output                          | ✓       | ✓     | ✓            |
| P17          | P17             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | EXCL11          | A   |               |                              | 16-bit PWM timer Ch.1 event counter input 1    | ✓       | ✓     | ✓            |
| P20          | P20             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | SENB2           | I/O |               |                              | R/F converter Ch.2 sensor B oscillator pin     | ✓       | ✓     | ✓            |
|              | SEG23           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P21          | P21             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | SENA2           | I/O |               |                              | R/F converter Ch.2 sensor A oscillator pin     | ✓       | ✓     | ✓            |
|              | SEG22           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P22          | P22             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | REF2            | I/O |               |                              | R/F converter Ch.2 reference oscillator pin    | ✓       | ✓     | ✓            |
|              | SEG21           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P23          | P23             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | RFIN2           | I/O |               |                              | R/F converter Ch.2 oscillation input           | ✓       | ✓     | ✓            |
|              | SEG20           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P24          | P24             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | SENB3           | I/O |               |                              | R/F converter Ch.3 sensor B oscillator pin     | ✓       | ✓     | ✓            |
|              | SEG19           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P25          | P25             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | SENA3           | I/O |               |                              | R/F converter Ch.3 sensor A oscillator pin     | ✓       | ✓     | ✓            |
|              | SEG18           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P26          | P26             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | REF3            | A   |               |                              | R/F converter Ch.3 reference oscillator pin    | ✓       | ✓     | ✓            |
|              | SEG17           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |
| P27          | P27             | I/O | Hi-Z          | ✓                            | I/O port                                       | ✓       | ✓     | ✓            |
|              | UPMUX           | I/O |               |                              | User-selected I/O (universal port multiplexer) | ✓       | ✓     | ✓            |
|              | RFIN3           | I/O |               |                              | R/F converter Ch.3 oscillation input           | ✓       | ✓     | ✓            |
|              | SEG16           | A   |               |                              | LCD segment output                             | ✓       | ✓     | ✓            |

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| Pin/pad name | Assigned signal | I/O | Initial state | Tolerant fail-safe structure | Function                                      | Package |       |              |
|--------------|-----------------|-----|---------------|------------------------------|-----------------------------------------------|---------|-------|--------------|
|              |                 |     |               |                              |                                               | 64pin   | 80pin | 100pin /Chip |
| P30          | P30             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P31          | P31             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P32          | P32             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P33          | P33             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P34          | P34             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P35          | P35             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P36          | P36             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| P37          | P37             | I/O | Hi-Z          | ✓                            | I/O port                                      | ✓       | ✓     | ✓            |
| 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            | I/O | O(H)          | ✓                            | On-chip debugger clock output                 | ✓       | ✓     | ✓            |
|              | PD2             | O   |               |                              | Output port                                   | ✓       | ✓     | ✓            |
| PD3          | PD3             | I/O | Hi-Z          | -                            | I/O port                                      | ✓       | ✓     | ✓            |
|              | EXOSC           | I   |               |                              | Clock generator external clock input          | ✓       | ✓     | ✓            |
|              | EXCL00          | I   |               |                              | 16-bit PWM timer Ch.0 event counter input 0   | ✓       | ✓     | ✓            |
|              | 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                             | ✓       | ✓     | ✓            |
| COM4         | COM4            | A   | Hi-Z          | -                            | LCD common output                             | ✓       | ✓     | ✓            |
|              | SEG0            | A   |               |                              | LCD segment output                            | ✓       | ✓     | ✓            |
| COM5         | COM5            | A   | Hi-Z          | -                            | LCD common output                             | ✓       | ✓     | ✓            |
|              | SEG1            | A   |               |                              | LCD segment output                            | ✓       | ✓     | ✓            |
| COM6         | COM6            | A   | Hi-Z          | -                            | LCD common output                             | ✓       | ✓     | ✓            |
|              | SEG2            | A   |               |                              | LCD segment output                            | ✓       | ✓     | ✓            |
| COM7         | COM7            | A   | Hi-Z          | -                            | LCD common output                             | ✓       | ✓     | ✓            |
|              | SEG3            | A   |               |                              | LCD segment output                            | ✓       | ✓     | ✓            |
| SEG4-15      | SEG4-15         | A   | Hi-Z          | -                            | LCD segment output                            | ✓       | ✓     | ✓            |
| SEG24-27     | SEG24-27        | A   | Hi-Z          | -                            | LCD segment output                            | -       | ✓     | ✓            |
| SEG28-29     | SEG28-29        | A   | Hi-Z          | -                            | LCD segment output                            | -       | -     | ✓            |
| SEG30-33     | SEG30-33        | A   | Hi-Z          | -                            | LCD segment output                            | -       | ✓     | ✓            |
| EXSVD        | EXSVD           | A   | A (I)         | -                            | External power supply voltage detection input | ✓       | ✓     | ✓            |

**Note:** In the peripheral circuit descriptions, the assigned signal name is used as the pin name.

## 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.

| Peripheral circuit                  | Signal to be assigned          | I/O | Channel number <i>n</i> | Function                                     |
|-------------------------------------|--------------------------------|-----|-------------------------|----------------------------------------------|
| Synchronous serial interface (SPIA) | SDIn                           | I   | <i>n</i> =0             | SPIA Ch. <i>n</i> data input                 |
|                                     | SDOn                           | O   |                         | SPIA Ch. <i>n</i> data output                |
|                                     | SPICLK <i>n</i>                | I/O |                         | SPIA Ch. <i>n</i> clock input/output         |
|                                     | #SPISS <i>n</i>                | I   |                         | SPIA Ch. <i>n</i> slave-select input         |
| I <sup>2</sup> C (I2C)              | SCL <i>n</i>                   | I/O | <i>n</i> =0             | I2C Ch. <i>n</i> clock input/output          |
|                                     | SDA <i>n</i>                   | I/O |                         | I2C Ch. <i>n</i> data input/output           |
| UART (UART)                         | USIN <i>n</i>                  | I   | <i>n</i> =0,1           | UART Ch. <i>n</i> data input                 |
|                                     | USOUT <i>n</i>                 | O   |                         | UART Ch. <i>n</i> data output                |
| 16-bit PWM timer (T16B)             | TOUT <i>n</i> 0/CAP <i>n</i> 0 | I/O | <i>n</i> =0,1           | T16B Ch. <i>n</i> PWM output/capture input 0 |
|                                     | TOUT <i>n</i> 1/CAP <i>n</i> 1 | I/O |                         | T16B Ch. <i>n</i> PWM output/capture input 1 |

**Note:** Do not assign a function to two or more pins simultaneously.

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Document code:412533401  
First issue Mar, 2013 in Japan  
Revised Oct, 2013 in Japan

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