Epson Electronics America Inc-Semiconductor Div - S1C17W15F003100-260 Datasheet

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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	S1C17
Core Size	16-Bit
Speed	4.2MHz
Connectivity	I²C, IrDA, SPI, UART/USART
Peripherals	LCD, POR, PWM, RFC, SNDA, WDT
Number of I/O	32
Program Memory Size	64KB (64K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	4K x 8
Voltage - Supply (Vcc/Vdd)	1.2V ~ 3.6V
Data Converters	-
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	80-TQFP
Supplier Device Package	80-TQFP14 (12x12)
Purchase URL	https://www.e-xfl.com/product-detail/epson/s1c17w15f003100-260

S1C17W15 (rev 1.00)

EPSON
EXCEED YOUR VISION

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 µA (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

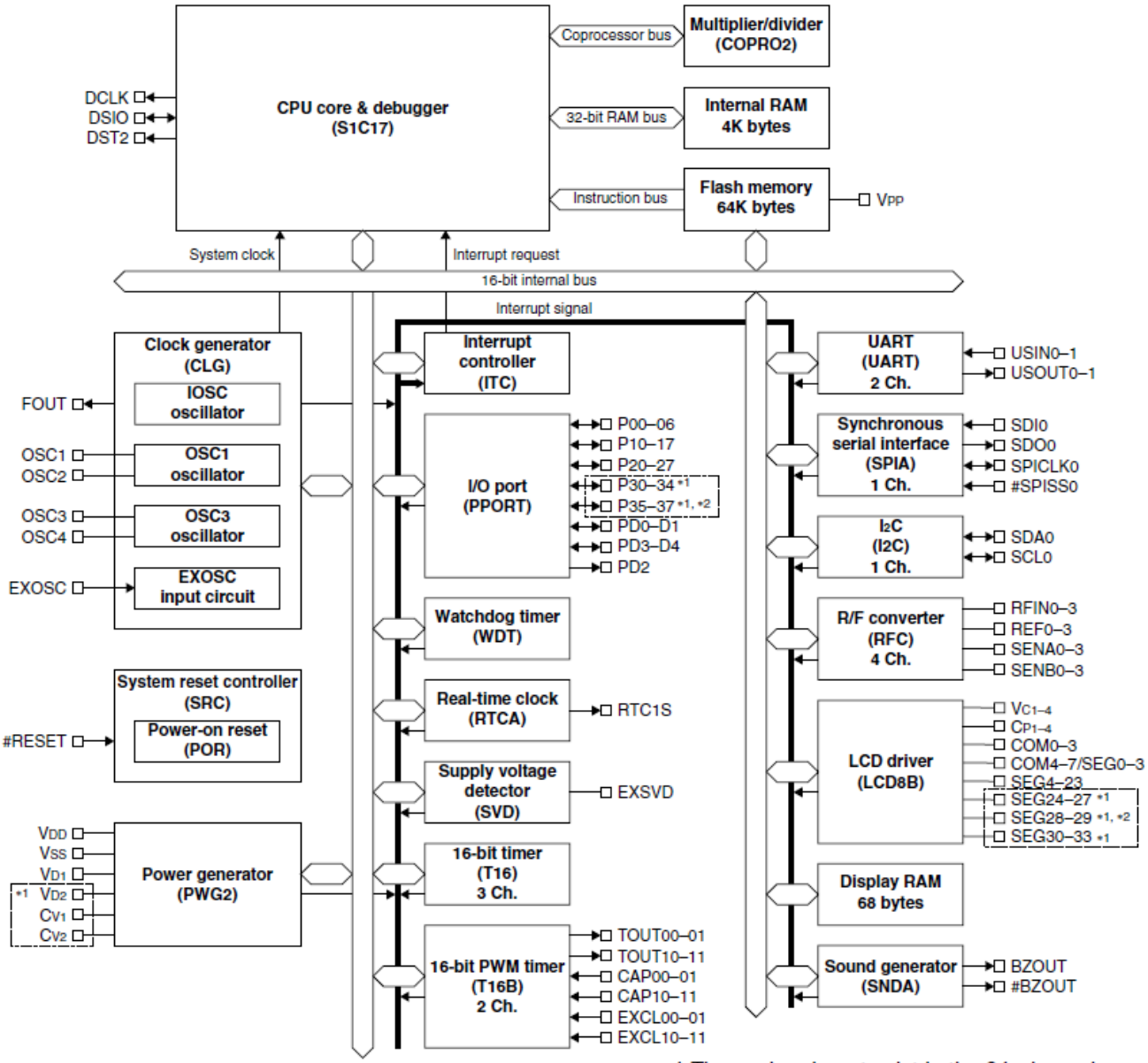
The S1C17W15 is a 16-bit MCU that features low-voltage operation from 1.2 V even though the Flash memory is included. The embedded high-efficiency DC-DC converter generates the constant-voltage to drive the IC with lower power consumption than 4-bit MCUs. This IC includes a real-time clock, a stopwatch, 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
CPU	
CPU Core	Seiko Epson original 16-bit RISC CPU Core S1C17
Other	On-chip debugger
Embedded Flash memory	
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
	On-board programming function using ICDmini
Embedded RAM	
Capacity	4K bytes
Embedded display RAM	
Capacity	68 bytes
Clock generator (CLG)	
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 4.2 MHz (max.) VDD = 1.6 to 3.6 V
IOSC oscillator circuit (boot clock source)	700 kHz (typ.) embedded oscillator
	23 µs (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
	Oscillation stop detection circuit included
OSC3 oscillator circuit	4.2 MHz (max.) crystal/ceramic oscillator
	500 kHz, 1, 2, and 4 MHz-switchable embedded oscillator
	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
	Configurable system clock used at wake up from SLEEP state
	Operating clock frequency for the CPU and all peripheral circuits is selectable.
I/O port (PPORT)	
Number of general-purpose I/O ports	Input/output port: 35 bits (max., 100-pin package or chip) 32 bits (max., 80-pin package) 27 bits (max., 64-pin package)
	Output port: 1 bit (max.)
	Pins are shared with the peripheral I/O.
Number of input interrupt ports	31 bits (max., 100-pin package or chip) 28 bits (max., 80-pin package) 23 bits (max., 64-pin package)
Number of ports that support universal port multiplexer (UPMUX)	23 bits A peripheral circuit I/O function selected via software can be assigned to each port.
Timers	
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
	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 (UART)	2 channel
	Baud-rate generator included, IrDA1.0 supported
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^2C (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 may be specified.
LCD driver (LCD24A)	
LCD output	30 SEG × 5–8 COM (max.), 34 SEG × 1–4 COM (max.) (100-pin package or chip) 28 SEG × 5–8 COM (max.), 32 SEG × 1–4 COM (max.) (80-pin package) 20 SEG × 5–8 COM (max.), 24 SEG × 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.
R/F converter (RFC)	
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)
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).
Non-maskable interrupt	4 systems (Reset, address misaligned interrupt, debug, NMI)
Programmable interrupt	External interrupt: 1 system (8 levels)
	Internal interrupt: 20 systems (8 levels)
Power supply voltage	
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.)
V_{DD} operating voltage for super economy mode	2.5 to 3.6 V (100-pin/80-pin package or chip)
Operating temperature	
Operating temperature range	-40 to 85 °C
Current consumption	
SLEEP mode	0.15 µA IOSC=OFF, OSC1=OFF, OSC3=OFF
HALT mode	0.5 µA OSC1=32 kHz, RTC=ON
	0.3 µA OSC1=32 kHz, RTC=ON, Super economy mode (100-pin/80-pin package or chip)
	1.2 µA 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 µA OSC1=32 kHz, RTC=ON, CPU=OSC1
	4 µA OSC1=32 kHz, RTC=ON, CPU=OSC1, Super economy mode (100-pin/80-pin package or chip)
	250 µA OSC3=1MHz（ceramic oscillator), OSC1=32kHz,　RTC=ON, CPU=OSC3
Shipping form	
1	SQFN9-64pin
2	TQFP13-64pin
3	TQFP14-80pin
4	QFP15-100pin
5	Die form (Pad pitch: 80 µm (min.))

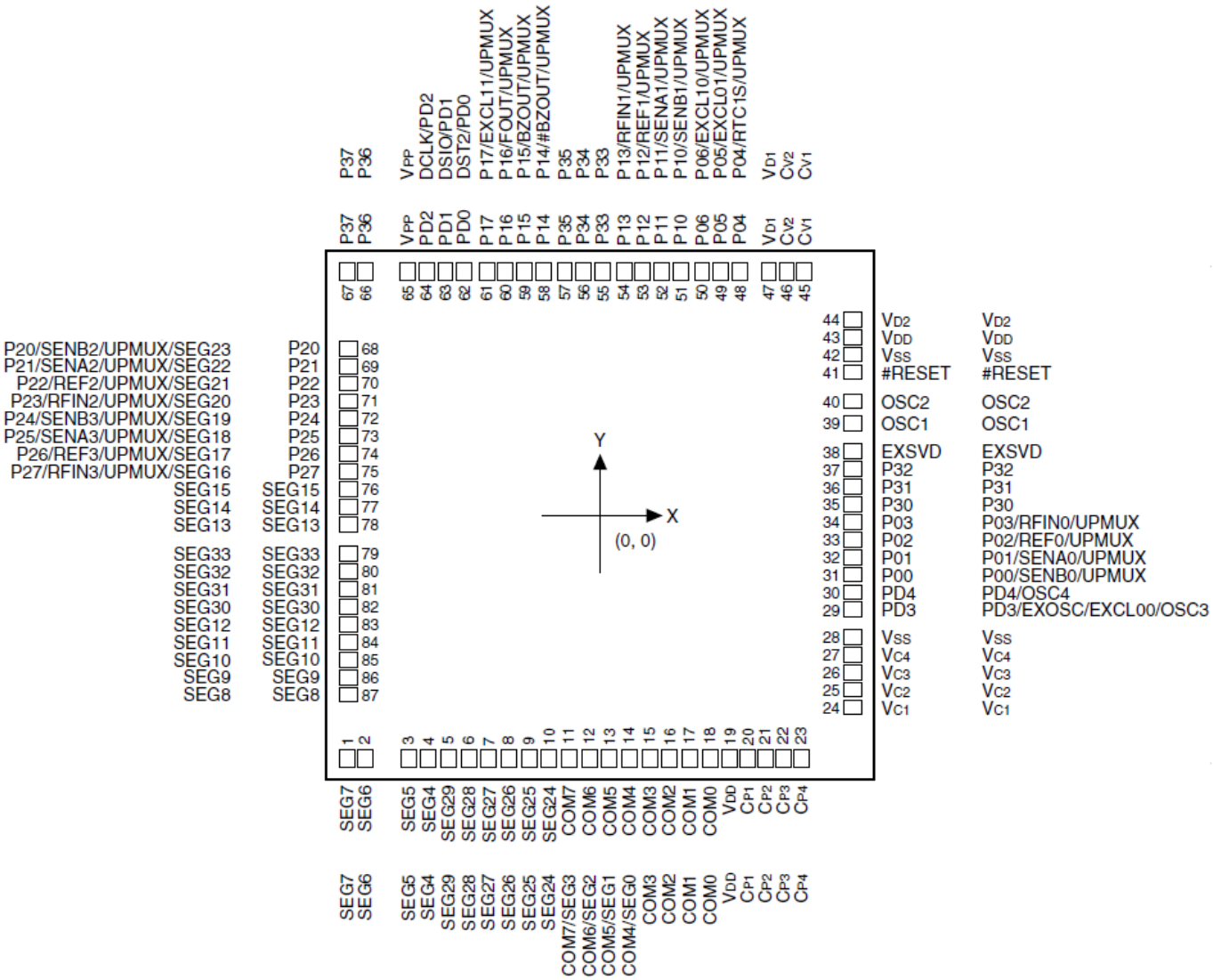
■ BLOCK DIAGRAM



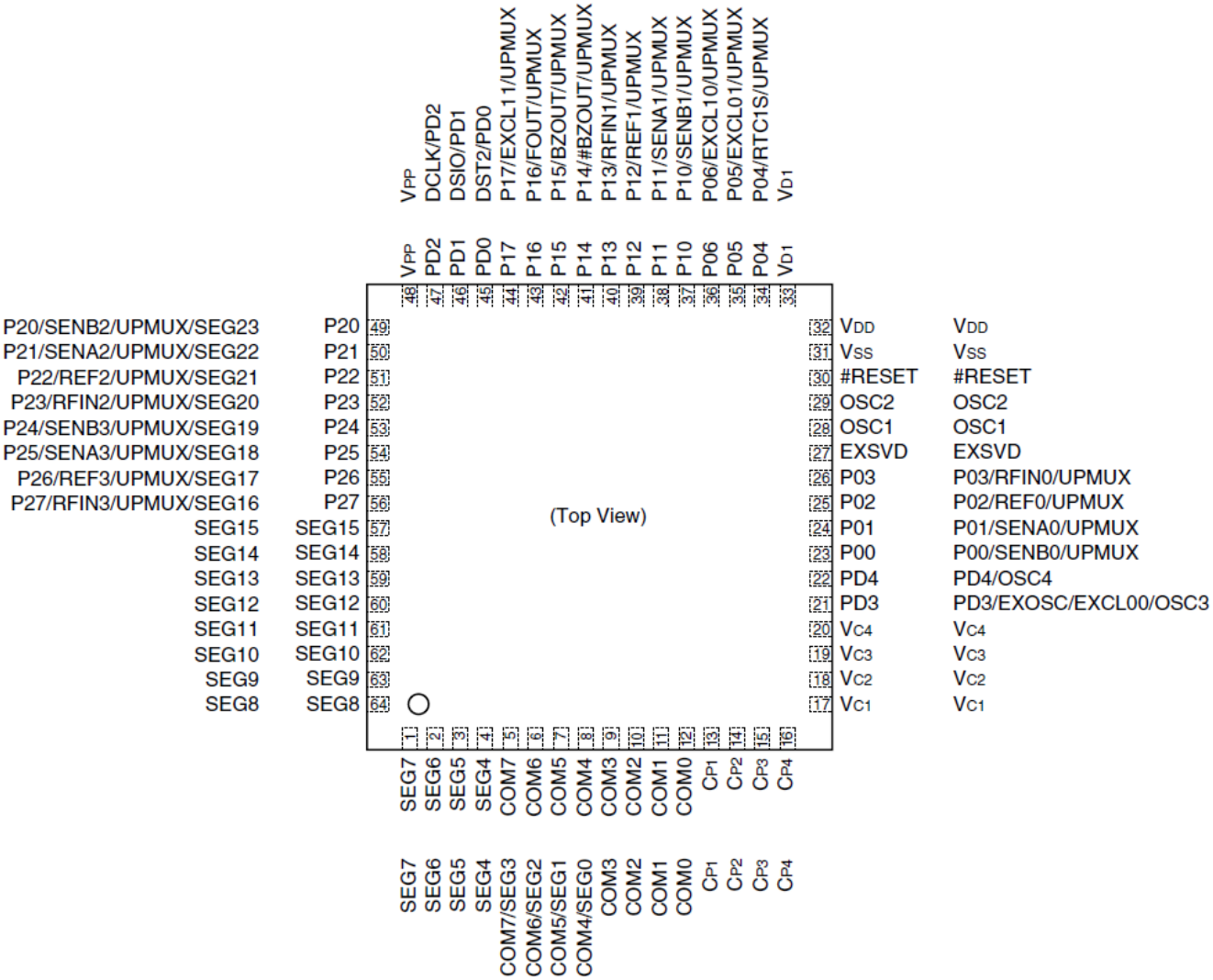
*1 These pins do not exist in the 64-pin package.
*2 These pins do not exist in the 80-pin package.

■ PIN CONFIGURATION DIAGRAM

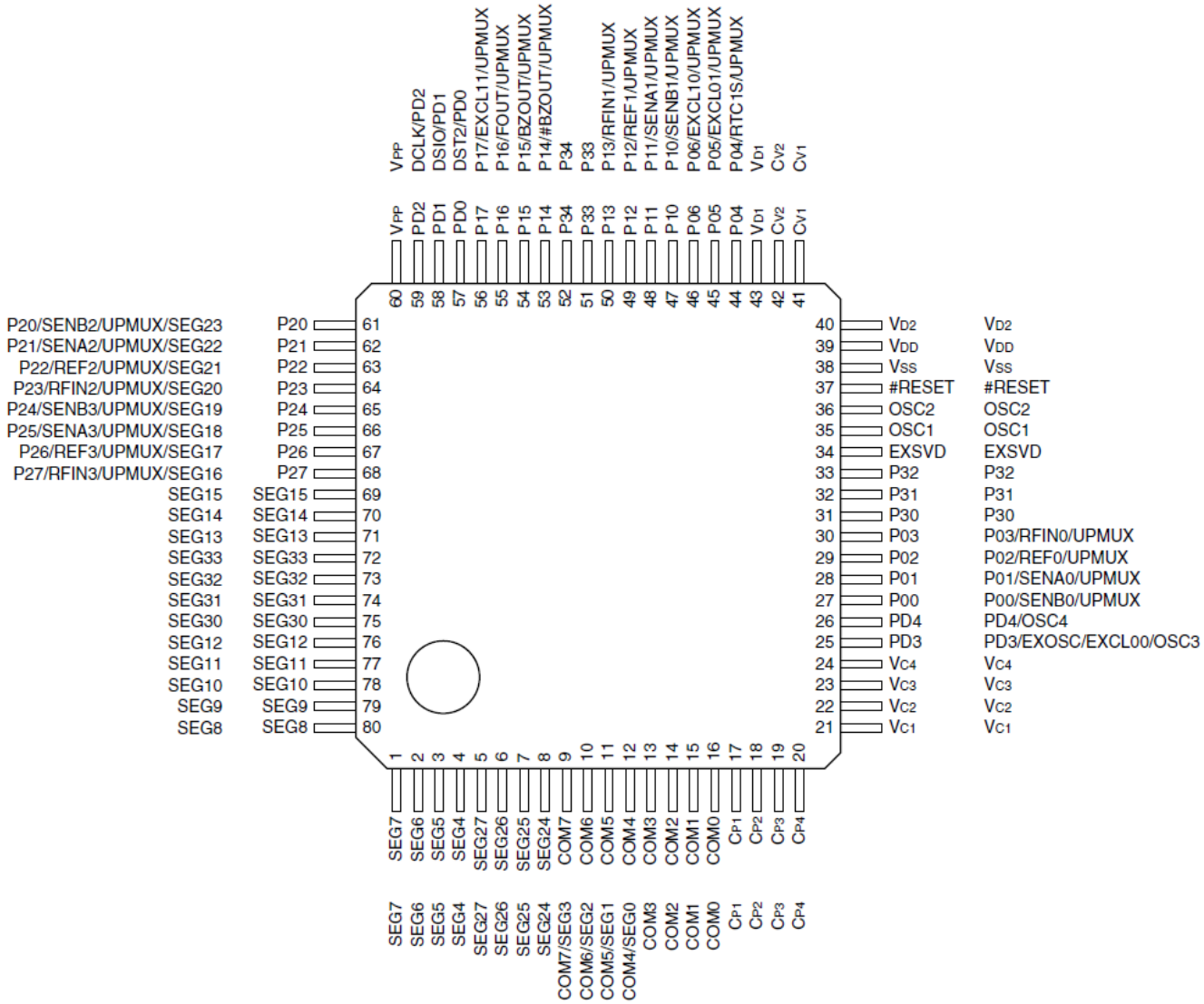
Die form



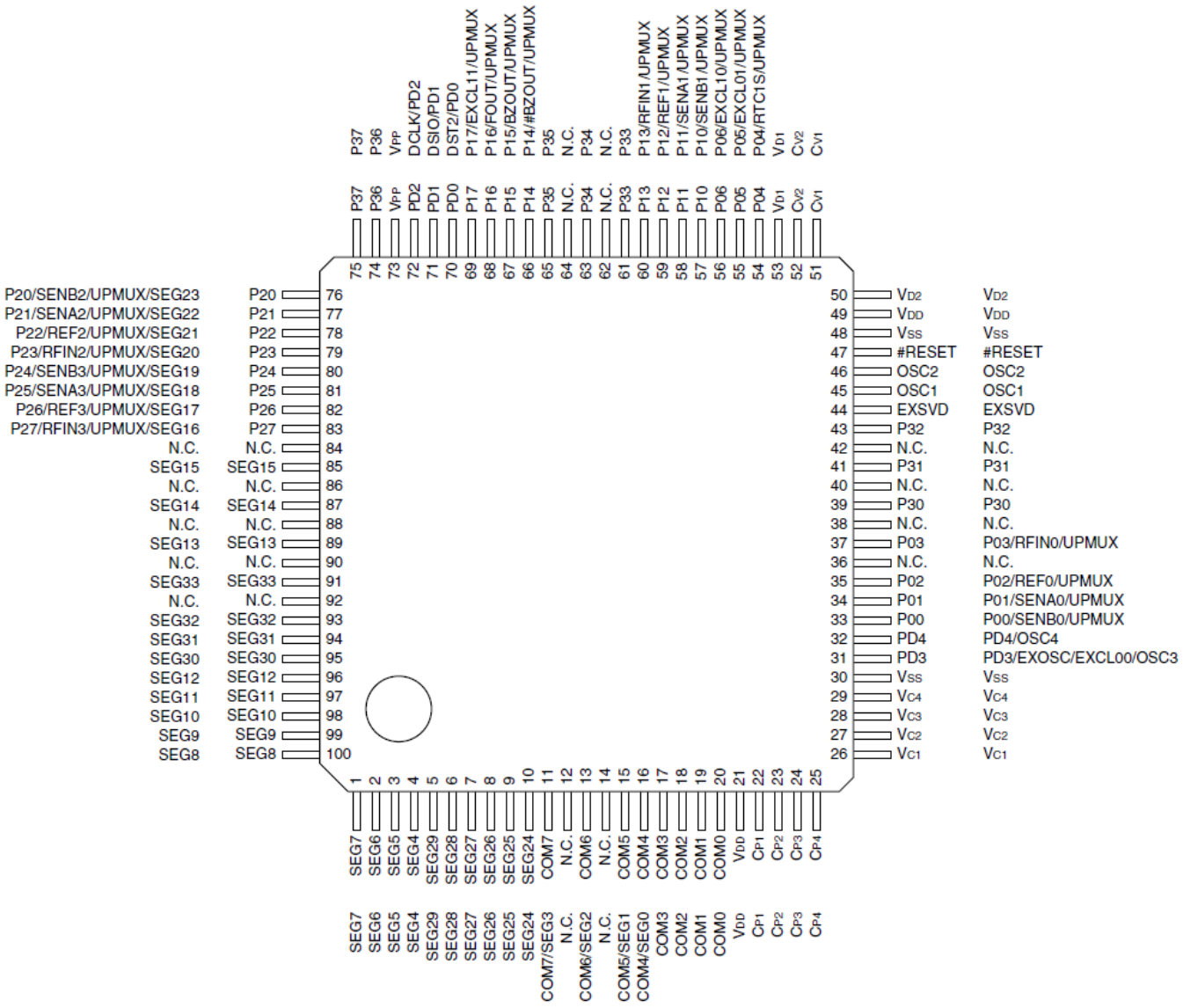
SQFN9-64pin, TQFP13-64pin



TQFP14-80pin



QFP15-100pin



■ 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	✓	✓	✓

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	✓	✓	✓

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 *n*	Function
Synchronous serial interface (SPIA)	SDI*n*	I	*n*=0	SPIA Ch.*n* data input
	SDO*n*	O		SPIA Ch.*n* data output
	SPICLK*n*	I/O		SPIA Ch.*n* clock input/output
	#SPISS*n*	I		SPIA Ch.*n* slave-select input
I^2C (I2C)	SCL*n*	I/O	*n*=0	I2C Ch.*n* clock input/output
	SDA*n*	I/O		I2C Ch.*n* data input/output
UART (UART)	USIN*n*	I	*n*=0,1	UART Ch.*n* data input
	USOUT*n*	O		UART Ch.*n* data output
16-bit PWM timer (T16B)	TOUT*n*0/CAP*n*0	I/O	*n*-0,1	T16B Ch.*n* PWM output/capture input 0
	TOUT*n*1/CAP*n*1	I/O		T16B Ch.*n* PWM output/capture input 1

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

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