

CMOS 16-bit Single Chip Microcontroller

- Low Power MCU (operating voltage 1.8 V, 1 μ A/SLEEP, 2.6 μ A/HALT)
- S1C17 High Performance 16-bit RISC CPU Core with C Optimized Compact Code and Serial ICE Support
- High Quality and Stable Display LCD Driver with Voltage Booster (56 SEG $\times$ 32 COM, supports grayscale)
- Infrared Remote Controller with Carrier Generator
- 64K-Byte Flash Memory and 4K-Byte RAM

■ DESCRIPTIONS

The S1C17701 is a 16-bit MCU that features high-speed operation, low power consumption, small size, large address space, and on-chip ICE. The S1C17701 consists of an S1C17 CPU Core, a 64K-byte Flash memory, a 4K-byte RAM, serial interface modules (UART that supports high bit rate and IrDA 1.0, SPI and I²C) for connecting various sensor modules, 8-bit timers, 16-bit timers, a PWM & capture timer, a clock timer, a stopwatch timer, a watchdog timer, 28 GPIO ports, an LCD driver with 56-segment $\times$ 32-common outputs and a voltage booster, a supply voltage detector, 32 kHz (typ.) and 8.2 MHz (max.) oscillators, and a voltage regulator for generating the 1.8 V internal voltage. The S1C17701 is capable of high-speed operation (8.2 MHz) with low operating voltage (1.8 V). Its 16-bit RISC processor executes one instruction in 1.5 clock cycles. The S1C17701 also provides an on-chip ICE function that allows on-board erasing/programming of the embedded Flash memory, on-board debugging and evaluating the program by connecting the S1C17701 to the serial ICD Mini (S5U1C17001H) with only three wires.

The S1C17701 is suitable for battery driven applications with sensor interfaces and up to 56 $\times$ 32-dot LCD display, such as remote controllers and sports watches.

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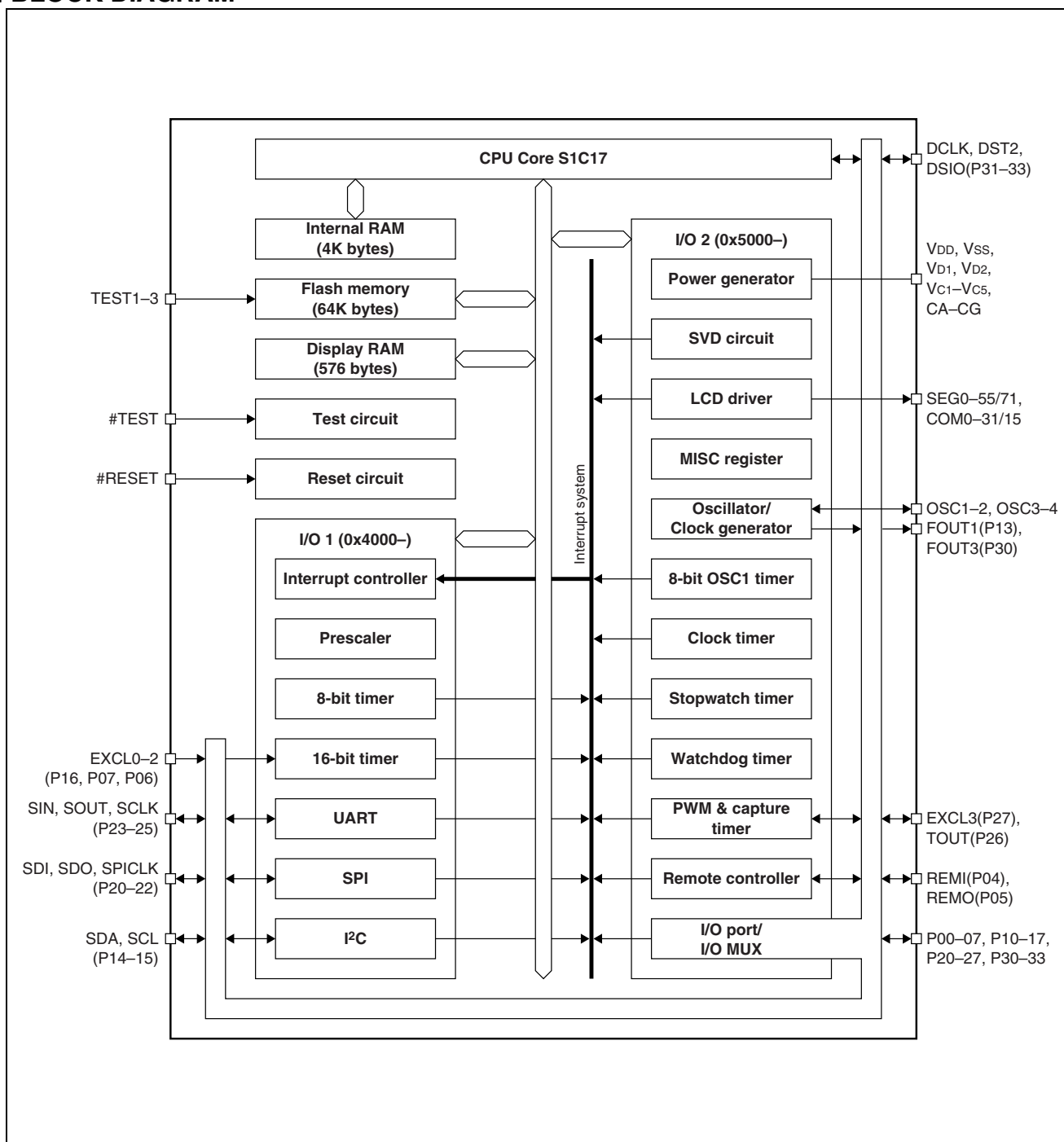
■ FEATURES

- CPU • Seiko Epson original 16-bit RISC CPU core S1C17
- Main (OSC3) oscillator • Crystal/ceramic oscillator 8.2 MHz (max.) or CR oscillator 2.2 MHz (max.)
- Sub (OSC1) oscillator..... • Crystal oscillator 32.768 kHz (typ.)
- On-chip Flash memory • 64K bytes (for instructions and data)
 - 1,000 erase/program cycles
 - Read/program protection
 - On-board programming by a debugging tool such as ICD Mini (S5U1C17701H) and self-programming by software control
- On-chip RAM • 4K bytes
- On-chip display RAM..... • 576 bytes
- I/O ports • Max. 28 general-purpose I/O ports (Pins are shared with the peripheral I/O.)
- Serial interfaces..... • SPI (master/slave) 1 ch.
 - I²C (master) 1 ch.
 - UART (115200 bps, IrDA 1.0) 1 ch.
 - Remote controller (REMC) 1 ch.
- Timers • 8-bit timer (T8F) 1 ch.
 - 16-bit timer (T16) 3 ch.
 - PWM & capture timer (T16E) 1 ch.
 - Clock timer (CT) 1 ch.
 - Stopwatch timer (SWT) 1 ch.
 - Watchdog timer (WDT) 1 ch.
 - 8-bit OSC1 timer (T8OSC1) 1 ch.
- LCD driver..... • 56 SEG $\times$ 32 COM or 72 SEG $\times$ 16 COM (1/5 bias)
 - Built-in voltage booster
- Supply voltage detector (SVD)..... • 13 programmable detection levels (1.8 V to 2.7 V)
- Interrupts • Reset
 - NMI
 - 16 programmable interrupts (8 levels)

S1C17701

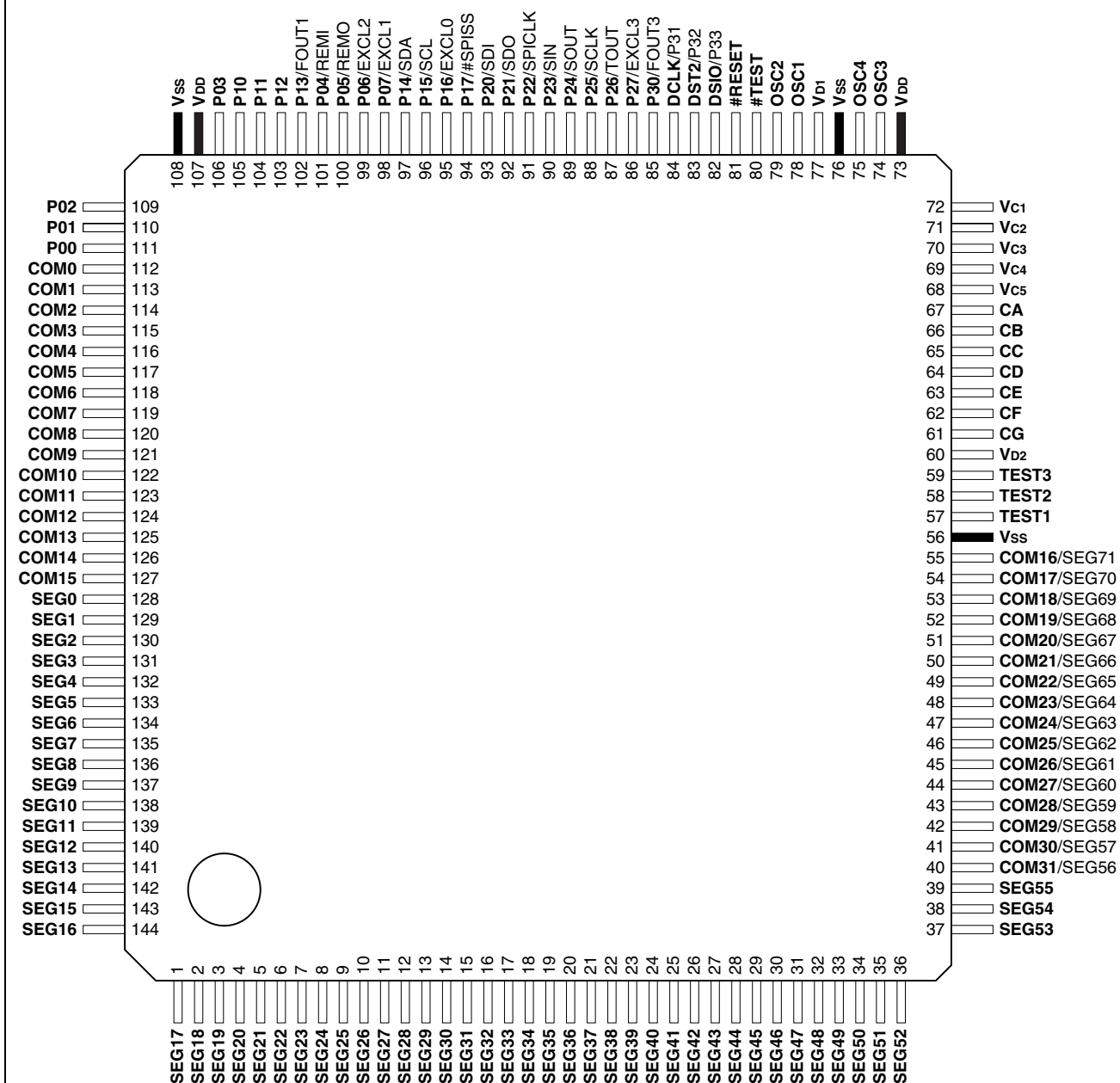
- Power supply voltage.....
 - 1.8 V to 3.6 V (for normal (low-power) operation with the 1.8 V internal voltage)
 - 2.7 V to 3.6 V (for Flash erasing/programming with the 2.5 V internal voltage)
- Operating temperature..... -20°C to 70°C
- Current consumption (typ.)
 - SLEEP state: 1 μ A
 - HALT state: 2.6 μ A (32 kHz OSC1 crystal oscillator, LCD off)
 - Run state: 14 μ A (32 kHz OSC1 crystal oscillator, LCD off)
 - 1800 μ A (8 MHz OSC3 ceramic oscillator, LCD off)
- Shipping form.....
 - TQFP24-144pin plastic package (16 mm $\times$ 16 mm $\times$ 1.0 mm, lead pitch: 0.4 mm)
 - Chip

■ BLOCK DIAGRAM



PIN LAYOUT DIAGRAM

TQFP24-144pin



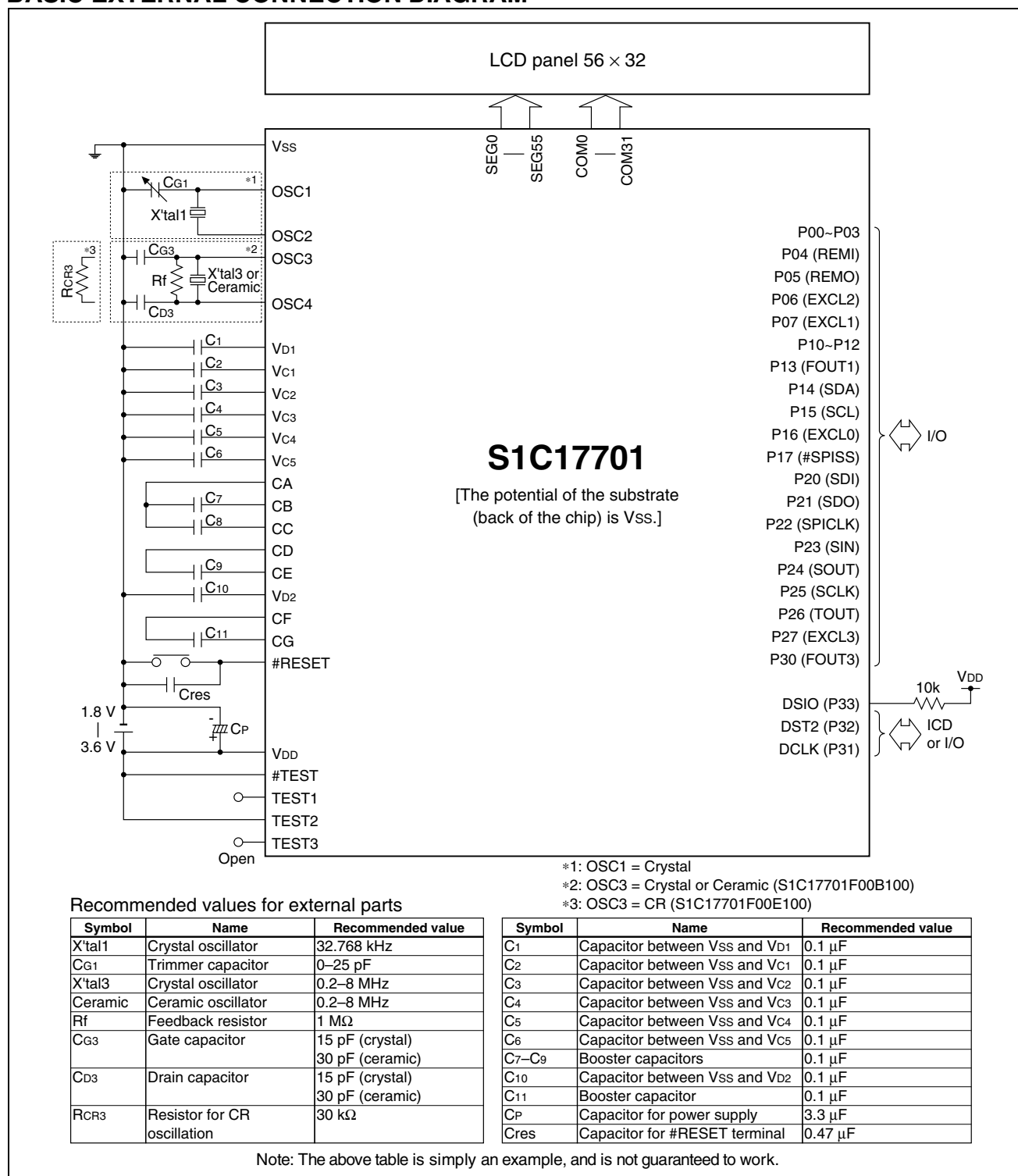
■ PIN DESCRIPTION

Pin No.	Pin name	I/O	Initial	Function
1–39	SEG17–55	O	O (L)	LCD segment output pins
40–55	COM31–16/ SEG56–71	O	O (L)	LCD common output pins* or LCD segment output pins
56	Vss	–	–	Power supply pin (GND)
57	TEST1	–	–	Test pin (open during normal operation)
58	TEST2	–	–	Test pin (fix at high during normal operation)
59	TEST3	–	–	Test pin (open during normal operation)
60	Vb2	–	–	LCD power voltage booster output pin
61	CG	–	–	Power voltage boosting capacitor connect pin
62	CF	–	–	Power voltage boosting capacitor connect pin
63	CE	–	–	LCD voltage boosting capacitor connect pin
64	CD	–	–	LCD voltage boosting capacitor connect pin
65	CC	–	–	LCD voltage boosting capacitor connect pin
66	CB	–	–	LCD voltage boosting capacitor connect pin
67	CA	–	–	LCD voltage boosting capacitor connect pin
68	Vc5	–	–	LCD drive voltage output pin
69	Vc4	–	–	LCD drive voltage output pin
70	Vc3	–	–	LCD drive voltage output pin
71	Vc2	–	–	LCD drive voltage output pin
72	Vc1	–	–	LCD drive voltage output pin
73	Vdd	–	–	Power supply pin (+)
74	OSC3	I	I	OSC3 oscillation input pin
75	OSC4	O	O	OSC3 oscillation output pin
76	Vss	–	–	Power supply pin (GND)
77	Vd1	–	–	Internal logic and oscillation system voltage regulator output pin
78	OSC1	I	I	OSC1 oscillation input pin
79	OSC2	O	O	OSC1 oscillation output pin
80	#TEST	I	I (Pull-up)	Test pin (fix at high during normal operation)
81	#RESET	I	I (Pull-up)	Initial reset input pin
82	DSIO/P33	I/O	I (Pull-up)	On-chip debugger data I/O pin* or I/O port pin
83	DST2/P32	I/O	O (L)	On-chip debugger status output pin* or I/O port pin
84	DCLK/P31	I/O	O (L)	On-chip debugger clock output pin* or I/O port pin
85	P30/FOUT3	I/O	I (Pull-up)	I/O port pin* or OSC3 divider clock output pin
86	P27/EXCL3	I/O	I (Pull-up)	I/O port pin* or T16E external clock input pin
87	P26/TOUT	I/O	I (Pull-up)	I/O port pin* or T16E PWM signal output pin
88	P25/SCLK	I/O	I (Pull-up)	I/O port pin* or UART clock input pin
89	P24/SOUT	I/O	I (Pull-up)	I/O port pin* or UART data output pin
90	P23/SIN	I/O	I (Pull-up)	I/O port pin* or UART data input pin
91	P22/SPICLK	I/O	I (Pull-up)	I/O port pin* or SPI clock I/O pin
92	P21/SDO	I/O	I (Pull-up)	I/O port pin* or SPI data output pin
93	P20/SDI	I/O	I (Pull-up)	I/O port pin* or SPI data input pin
94	P17/#SPISS	I/O	I (Pull-up)	I/O port pin (with interrupt)* or SPI slave select input pin
95	P16/EXCL0	I/O	I (Pull-up)	I/O port pin (with interrupt)* or T16 Ch.0 external clock input pin
96	P15/SCL	I/O	I (Pull-up)	I/O port pin (with interrupt)* or I ² C clock output pin
97	P14/SDA	I/O	I (Pull-up)	I/O port pin (with interrupt)* or I ² C data I/O pin
98	P07/EXCL1	I/O	I (Pull-up)	I/O port pin (with interrupt)* or T16 Ch.1 external clock input pin
99	P06/EXCL2	I/O	I (Pull-up)	I/O port pin (with interrupt)* or T16 Ch.2 external clock input pin
100	P05/REMO	I/O	I (Pull-up)	I/O port pin (with interrupt)* or Remote control signal output pin
101	P04/REMI	I/O	I (Pull-up)	I/O port pin (with interrupt)* or Remote control signal input pin
102	P13/FOUT1	I/O	I (Pull-up)	I/O port pin (with interrupt)* or OSC1 clock output pin
103	P12	I/O	I (Pull-up)	I/O port pin (with interrupt)
104	P11	I/O	I (Pull-up)	I/O port pin (with interrupt)
105	P10	I/O	I (Pull-up)	I/O port pin (with interrupt)
106	P03	I/O	I (Pull-up)	I/O port pin (with interrupt)
107	Vdd	–	–	Power supply pin (+)
108	Vss	–	–	Power supply pin (GND)

Pin No.	Pin name	I/O	Initial	Function
109	P02	I/O	I (Pull-up)	I/O port pin (with interrupt)
110	P01	I/O	I (Pull-up)	I/O port pin (with interrupt)
111	P00	I/O	I (Pull-up)	I/O port pin (with interrupt)
112–127	COM0–15	O	O (L)	LCD common output pins
128–144	SEG0–16	O	O (L)	LCD segment output pins

Note: The pin names described in boldface type and description with “*” are default settings.

BASIC EXTERNAL CONNECTION DIAGRAM



S1C17701

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