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S1C17001

CMOS 16-bit Single Chip Microcontroller

- **Low Power MCU (operating voltage 1.8 V, 0.5 µA/SLEEP, 2.5 µA/HALT)**
- **S1C17 High Performance 16-bit RISC CPU Core with C Optimized Compact Code and Serial ICE Support**
- **Infrared Remote Controller with Carrier Generator**
- **32K-Byte ROM and 2K-Byte RAM**

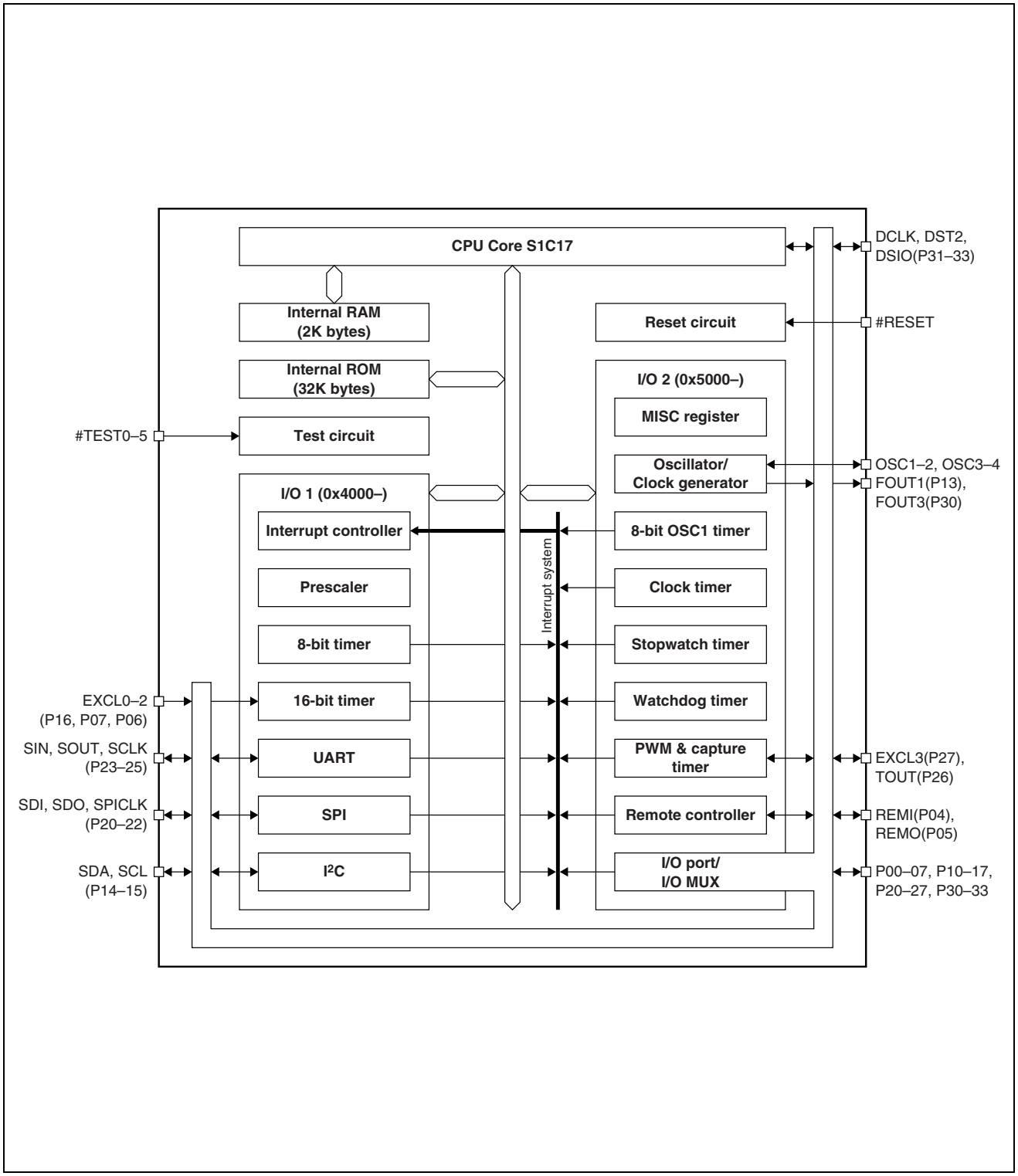
■ DESCRIPTIONS

The S1C17001 is a 16-bit MCU that features high-speed operation, low power consumption, small size, large address space, and on-chip ICE. The S1C17001 consists of an S1C17 CPU Core, a 32K-byte ROM, a 2K-byte RAM, serial interface modules (UART that supports high bit rate and IrDA 1.0, SPI and I^2C) for connecting various sensor modules, 8-bit timers, 16-bit timers, a PWM & capture timer, a clock timer, a stopwatch timer, a watchdog timer and 28 GPIO ports. The S1C17001 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 one clock cycle. The S1C17001 also provides an on-chip ICE function that allows on-board debugging and evaluating the program by connecting the S1C17001 to the ICD Mini (S5U1C17001H) or ICD board with only three wires.

■ FEATURES

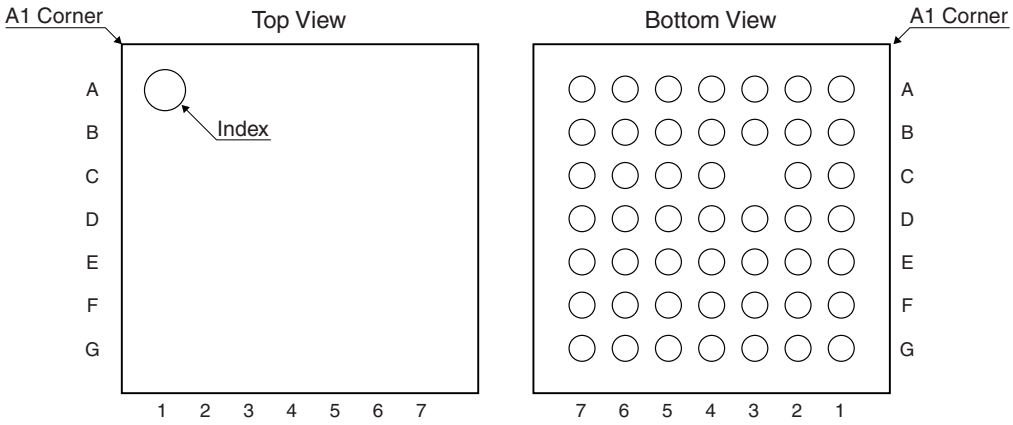
- CPU ..... • Seiko Epson original 16-bit RISC CPU core S1C17
- Main (OSC3) oscillator ..... • Crystal/ceramic oscillator or external clock input 8.2 MHz (max.)
- Sub (OSC1) oscillator..... • Crystal oscillator or external clock input 32.768 kHz (typ.)
- On-chip ROM..... • 32K bytes
- On-chip RAM ..... • 2K 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.
  - I^2C (master) 1 ch.
  - UART (with 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.
- Interrupts ..... • Reset
  - NMI
  - 14 hardware interrupts (8 levels)
- Power supply voltage..... • Core voltage (LV_{DD}) 1.65 V to 2.7 V
  - I/O voltage (HV_{DD}) 1.65 V to 3.6 V
- Operating temperature ..... • -40°C to 85°C
- Current consumption (typ.)..... • SLEEP state: 0.5 µA
  - HALT state: 2.5 µA (32 kHz)
  - Run state: 10 µA (32 kHz)
    1800 µA (8 MHz)
- Shipping form ..... • WCSP-48pin plastic package
- Flash memory model for developing mask ROM code..... • S1C17704

■ BLOCK DIAGRAM



■ PIN LAYOUT DIAGRAM

WCSP-48pin



Top View

	1	2	3	4	5	6	7
A	**#TEST2**	**P05** REMO	**VSS**	**P02**	**HVDD**	**P11**	**#TEST3**
B	**P07** EXCL1	**P06** EXCL2	**P04** REMI	**P03**	**P12**	**#RESET**	**VSS**
C	**P15** SCL	**P16** EXCL0		**P01**	**P10**	**P27** EXCL3	**P26** TOUT
D	**LVDD**	**VSS**	**P14** SDA	**P00**	**P13** FOUT1	**LVDD**	**P30** FOUT3
E	**DSIO** P33	**DST2** P32	**DCLK** P31	**P22** SPICLK	**P25** SCLK	**VSS**	**OSC1**
F	**#TEST0**	**P17** #SPISS	**P20** SDI	**P23** SIN	**VSS**	**#TEST4**	**OSC2**
G	**#TEST1**	**P21** SDO	**HVDD**	**P24** SOUT	**OSC4**	**OSC3**	**#TEST5**

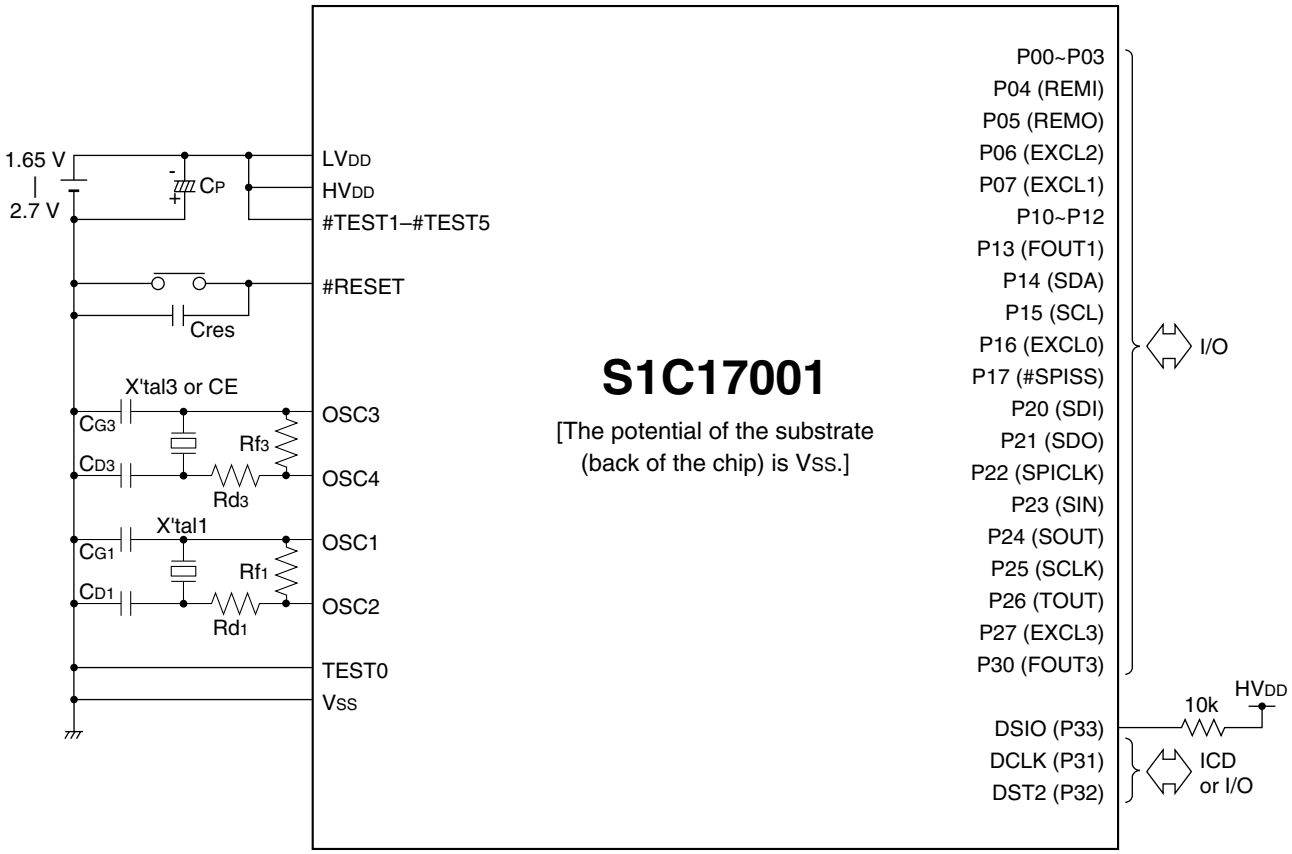
■ PIN DESCRIPTION

No.	Pin name	I/O	Initial	Function
1	**VSS**	–	–	Power supply pin (GND)
2	**#TEST1**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
3	**#TEST2**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
4	**#TEST3**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
5	**#TEST4**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
6	**#TEST5**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
7	**OSC3**	I	I	OSC3 oscillation input pin (external clock may be input)
8	**OSC4**	O	O	OSC3 oscillation output pin
9	**OSC1**	I	I	OSC1 oscillation input pin (external clock may be input)
10	**OSC2**	O	O	OSC1 oscillation output pin
11	**HVDD**	–	–	Power supply pin (HVDD+)
12	**VSS**	–	–	Power supply pin (GND)
13	**#TEST0**	I	I (Pull-UP)	Test pin (fix at high during normal operation)
14	**#RESET**	I	I (Pull-UP)	Initial reset input pin
15	**DSIO**/P33	I/O	I (Pull-UP)	On-chip debugger data I/O pin* or I/O port pin
16	**DST2**/P32	I/O	O (L)	On-chip debugger status output pin* or I/O port pin
17	**DCLK**/P31	I/O	O (H)	On-chip debugger clock output pin* or I/O port pin
18	**P30**/FOUT3	I/O	I (Pull-UP)	I/O port pin* or OSC3 divider clock output pin
19	**P27**/EXCL3	I/O	I (Pull-UP)	I/O port pin* or T16E external clock input pin
20	**P26**/TOUT	I/O	I (Pull-UP)	I/O port pin* or T16E PWM signal output pin
21	**P25**/SCLK	I/O	I (Pull-UP)	I/O port pin* or UART clock input pin
22	**P24**/SOUT	I/O	I (Pull-UP)	I/O port pin* or UART data output pin
23	**P23**/SIN	I/O	I (Pull-UP)	I/O port pin* or UART data input pin
24	**P22**/SPICLK	I/O	I (Pull-UP)	I/O port pin* or SPI clock I/O pin
25	**P21**/SDO	I/O	I (Pull-UP)	I/O port pin* or SPI data output pin
26	**P20**/SDI	I/O	I (Pull-UP)	I/O port pin* or SPI data input pin
27	**P17**/#SPISS	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or SPI slave select input pin
28	**P16**/EXCL0	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or T16 Ch.0 external clock input pin
29	**P15**/SCL	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or I^2C clock output pin
30	**P14**/SDA	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or I^2C data I/O pin
31	**P13**/FOUT1	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or OSC1 clock output pin
32	**P12**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
33	**P11**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
34	**P10**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
35	**P07**/EXCL1	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or T16 Ch.1 external clock input pin
36	**P06**/EXCL2	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or T16 Ch.2 external clock input pin
37	**P05**/REMO	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or Remote control signal output pin
38	**P04**/REMI	I/O	I (Pull-UP)	I/O port pin (with interrupt)* or Remote control signal input pin
39	**P03**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
40	**HVDD**	–	–	Power supply pin (HVDD+)
41	**VSS**	–	–	Power supply pin (GND)
42	**P02**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
43	**P01**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
44	**P00**	I/O	I (Pull-UP)	I/O port pin (with interrupt)
45	**LVDD**	–	–	Power supply pin (LVDD+)
46	**VSS**	–	–	Power supply pin (GND)
47	**LVDD**	–	–	Power supply pin (LVDD+)
48	**VSS**	–	–	Power supply pin (GND)

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

■ BASIC EXTERNAL CONNECTION DIAGRAM

Single power supply system (LV_{DD} = HV_{DD})

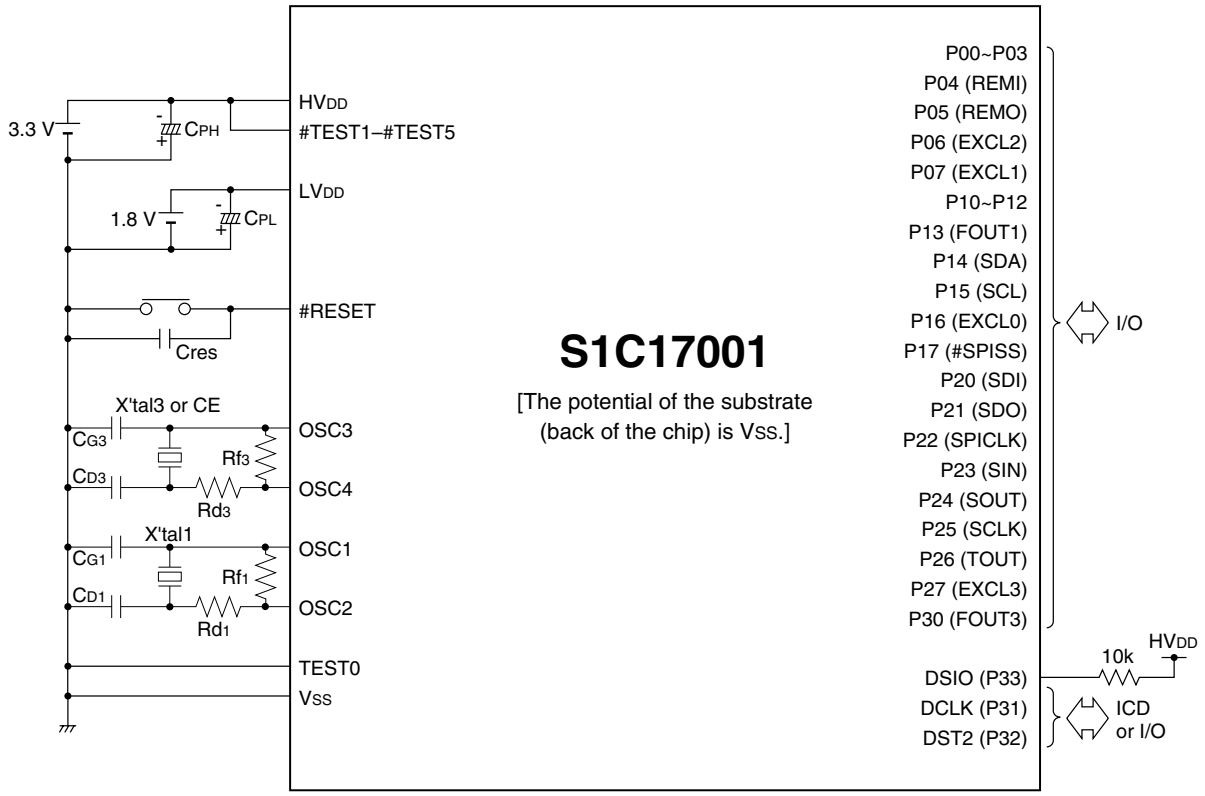


Recommended values for external parts

Symbol	Name	Recommended value
X'tal1	Crystal oscillator	32.768 kHz (MC-146, EPSON TOYOCOM)
C_{G1}	Gate capacitor	7 pF
C_{D1}	Drain capacitor	7 pF
Rf_1	Feedback resistor	10 MΩ
Rd_1	Drain resistor	0 Ω
X'tal3	Crystal oscillator	8 MHz (CA-301, EPSON TOYOCOM)
CE	Ceramic oscillator	0.2–8 MHz
C_{G3}	Gate capacitor	27 pF
C_{D3}	Drain capacitor	27 pF
Rf_3	Feedback resistor	1 MΩ
Rd_3	Drain resistor	0 Ω
C_P	Capacitor for power supply	3.3 µF
Cres	Capacitor for #RESET pin	0.47 µF

Note: The above table is simply an example, and is not guaranteed to work.

Dual-power supply system ($LV_{DD} \neq HV_{DD}$)



Recommended values for external parts

Symbol	Name	Recommended value
X'tal1	Crystal oscillator	32.768 kHz (MC-146, EPSON TOYOCOM)
C_{G1}	Gate capacitor	7 pF
C_{D1}	Drain capacitor	7 pF
Rf_1	Feedback resistor	10 MΩ
Rd_1	Drain resistor	0 Ω
X'tal3	Crystal oscillator	8 MHz (CA-301, EPSON TOYOCOM)
CE	Ceramic oscillator	0.2–8 MHz
C_{G3}	Gate capacitor	27 pF
C_{D3}	Drain capacitor	27 pF
Rf_3	Feedback resistor	1 MΩ
Rd_3	Drain resistor	0 Ω
C_P	Capacitor for power supply	3.3 µF
Cres	Capacitor for #RESET pin	0.47 µF

Note: The above table is simply an example, and is not guaranteed to work.

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Document code: 411207701
First issue September, 2007
Printed April, 2008 in Japan (L)