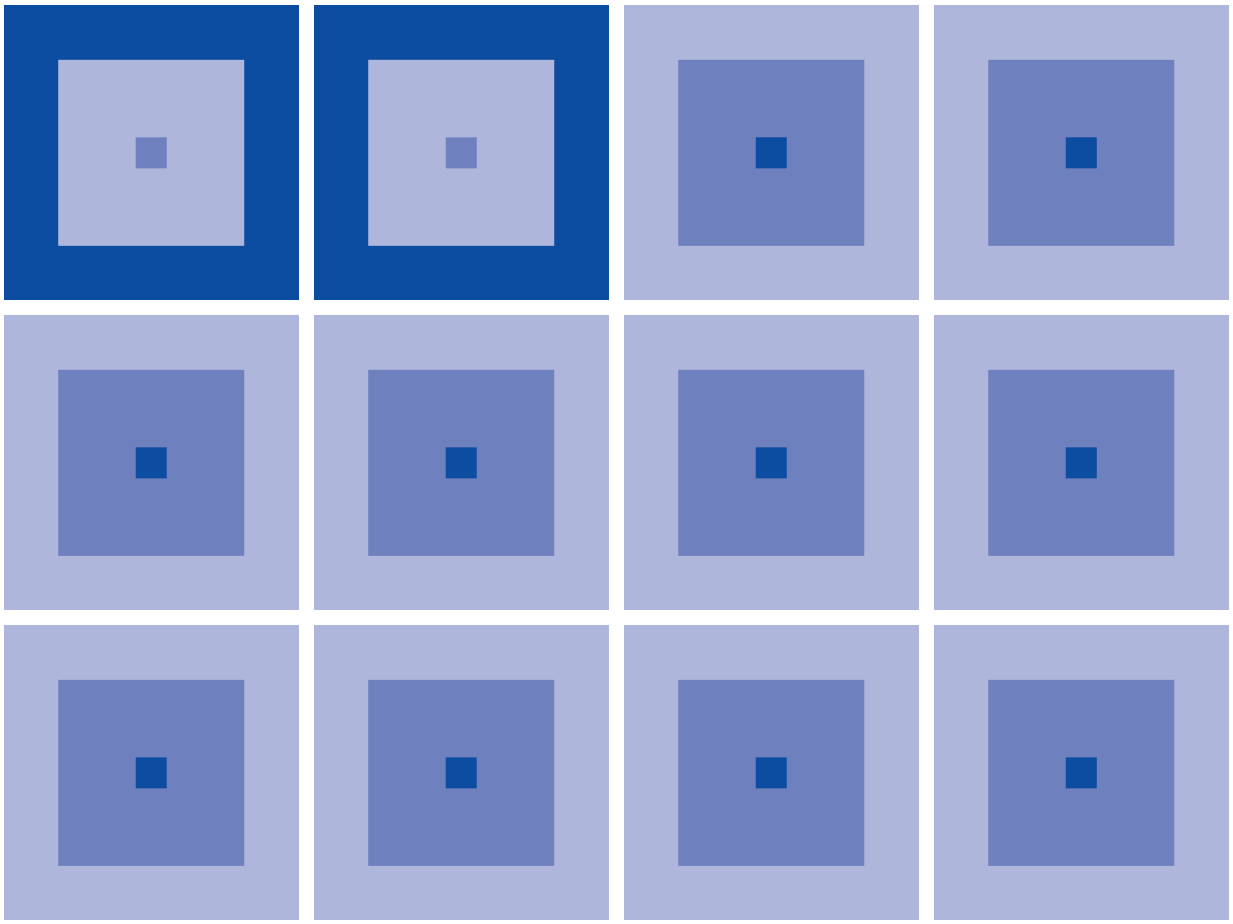
MF1017-02

EPSON

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER

S5U1C63002P Manual

(Peripheral Circuit Board for S1C63158/63358)



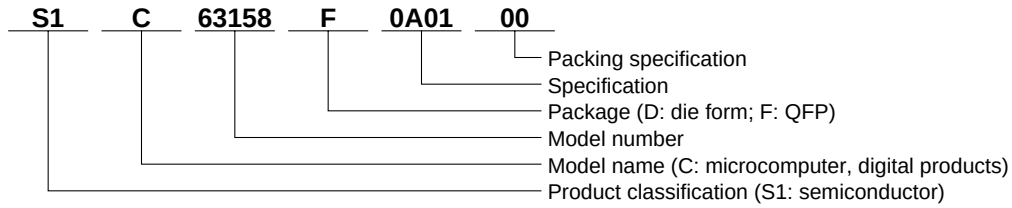
SEIKO EPSON CORPORATION

The information of the product number change

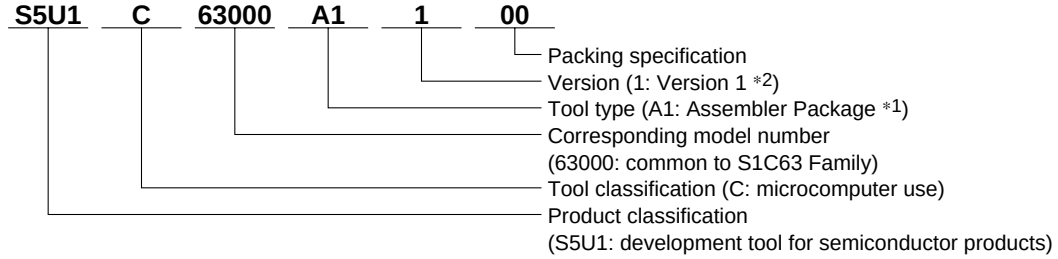
Starting April 1, 2001, the product number will be changed as listed below. To order from April 1, 2001 please use the new product number. For further information, please contact Epson sales representative.

Configuration of product number

Devices



Development tools



*1: For details about tool types, see the tables below. (In some manuals, tool types are represented by one digit.)
*2: Actual versions are not written in the manuals.

Comparison table between new and previous number

S1C63 Family processors

Previous No.	New No.
E0C63158	S1C63158
E0C63256	S1C63256
E0C63358	S1C63358
E0C63P366	S1C6P366
E0C63404	S1C63404
E0C63406	S1C63406
E0C63408	S1C63408
E0C63F408	S1C6F408
E0C63454	S1C63454
E0C63455	S1C63455
E0C63458	S1C63458
E0C63466	S1C63466
E0C63P466	S1C6P466

Previous No.	New No.
E0C63467	S1C63467
E0C63557	S1C63557
E0C63558	S1C63558
E0C63567	S1C63567
E0C63F567	S1C6F567
E0C63658	S1C63658
E0C63666	S1C63666
E0C63F666	S1C6F666
E0C63A08	S1C63A08
E0C63B07	S1C63B07
E0C63B08	S1C63B08
E0C63B58	S1C63B58

S1C63 Family peripheral products

Previous No.	New No.
E0C5250	S1C05250
E0C5251	S1C05251

Comparison table between new and previous number of development tools

Development tools for the S1C63 Family

Previous No.	New No.
ADP63366	S5U1C63366X
ADP63466	S5U1C63466X
ASM63	S5U1C63000A
GAM63001	S5U1C63000G
ICE63	S5U1C63000H1
PRC63001	S5U1C63001P
PRC63002	S5U1C63002P
PRC63004	S5U1C63004P
PRC63005	S5U1C63005P
PRC63006	S5U1C63006P
PRC63007	S5U1C63007P
URS63366	S5U1C63366Y

Development tools for the S1C63/88 Family

Previous No.	New No.
ADS00002	S5U1C88000X1
GWH00002	S5U1C88000W2
URM00002	S5U1C88000W1

S5U1C63002P Manual (Peripheral Circuit Board for S1C63158/63358)

This manual describes how to use the S1C63 Family Peripheral Circuit Board (S5U1C63002P). This circuit board is used to provide emulation functions when it is installed in the ICE (S5U1C63000H1), a debugging tool for the 4-bit Single Chip Microcomputer S1C63 Family.
For details on ICE functions and how to operate the debugger, refer to the separately prepared manuals.

Contents

CHAPTER 1 INTRODUCTION

1.1 Outline of S5U1C63002P

The S5U1C63002P provides on a board all the peripheral circuits of S1C63 Family microcomputers other than the core CPU. By installing this board in the ICE (S5U1C63000H1) you can use it to emulate each model in the S1C63 Family. For the models that can be supported by this board, refer to "Precautions on Using the S5U1C63002P Peripheral Circuit Board" included in this package.
Note that this board can be set to your intended model by loading mask option data (generated by "FOG63XXX" software tool) into the ICE using the debugger command.

1.2 Components of S5U1C63002P

After unpacking your S5U1C63002P package, check to see that all of the following components are included.

(1) S5U1C63002P main unit (S5U1C63002P board, S5U1C63003P board) ..... 1 pair
(2) I/O cable (80-pin+40-pin/40-pin × 2 flat type)..... 1 pair
(3) Target system I/O connector (40-pin) ..... 2 pcs.
(4) S5U1C63002P Manual (Peripheral Circuit Board for S1C63158/63358)..... 1 copy
(5) Warranty card ..... 1 card
(6) User registration card ..... 1 card
(7) Precautions on Using the S5U1C63002P Peripheral Circuit Board ..... 1 sheet

1.3 External View of S5U1C63002P

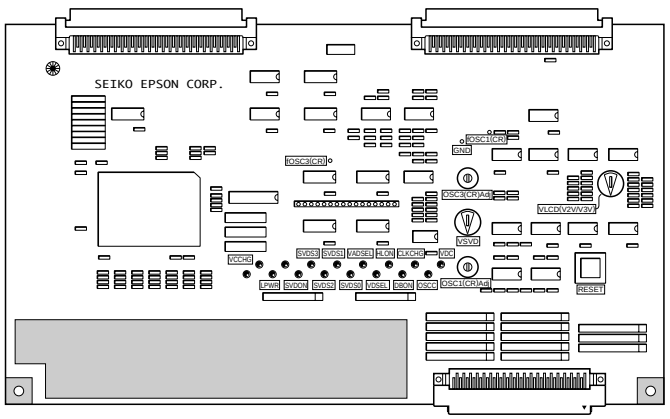
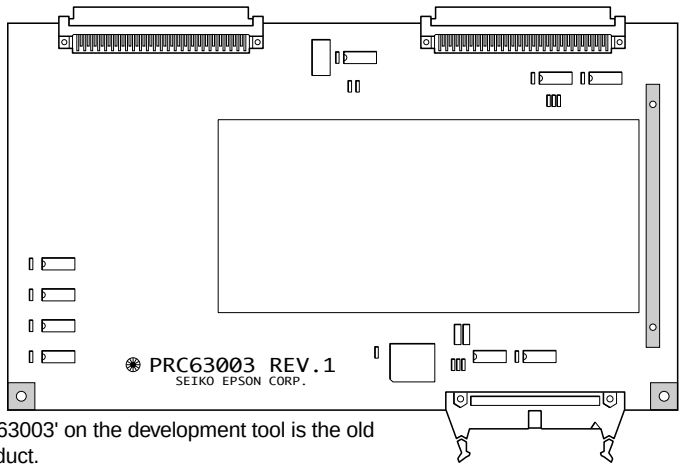


Fig. 1.3.1 External view of S5U1C63002P



* The name 'PRC63003' on the development tool is the old name of the product.

Fig. 1.3.2 External view of S5U1C63003P

CHAPTER 2 INSTALLING S5U1C63002P

2.1 Installing the S5U1C63002P in the ICE (S5U1C63000H1)

(1) Unfasten the screws located on the left and right sides of the front panel of the ICE by turning them counterclockwise, then remove the front panel.

(2) Insert the S5U1C63002P board into the ICE along the 2nd guide rails (lower slot) until the tip of the board touches the back of the ICE. If some other board is mounted on the guide rails, remove that board by using the jig supplied with the ICE before you insert the S5U1C63002P board (see Figure 2.1.3).

(3) Once the S5U1C63002P board has been inserted almost fully into the ICE, secure it in position by using the jig supplied with the ICE (see Figure 2.1.2).

(4) In a similar fashion to Step (2), insert the S5U1C63003P board into the ICE along the uppermost guide rails (upper slot).

(5) In a similar fashion to Step (3), secure it in position.

(6) When the above is done, replace the front panel.

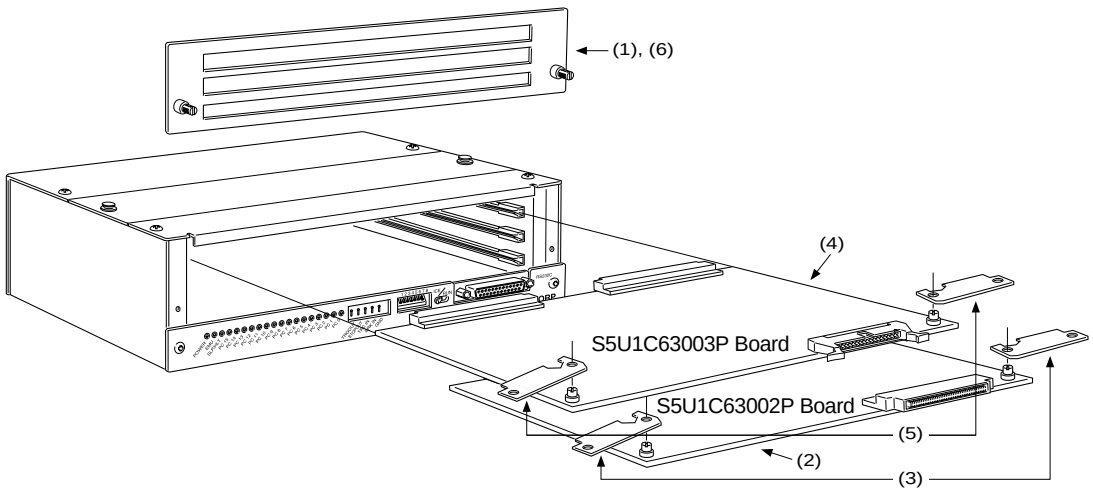


Fig. 2.1.1 Installing the S5U1C63002P board in the ICE

- **Installing the Peripheral Circuit Board**

  Set the jig included with the ICE into position as shown below. Using this jig as a lever, push it toward the inside of the board evenly on the left and right sides. After confirming that the Peripheral Circuit Board has been firmly fitted into the internal slot of the ICE, remove the jig.

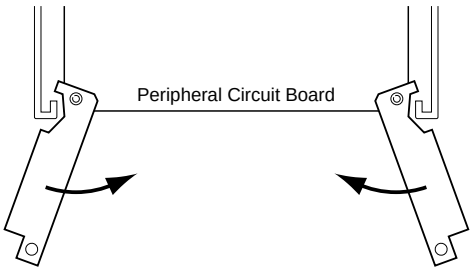


Fig. 2.1.2 Installing the Peripheral Circuit Board

- **Dismounting the Peripheral Circuit Board**

  Set the jig included with the ICE into position as shown below. Using this jig as a lever, push it toward the outside of the board evenly on the left and right sides. After confirming that the Peripheral Circuit Board has been dismounted from the backboard connector, pull the Peripheral Circuit Board out of the ICE.

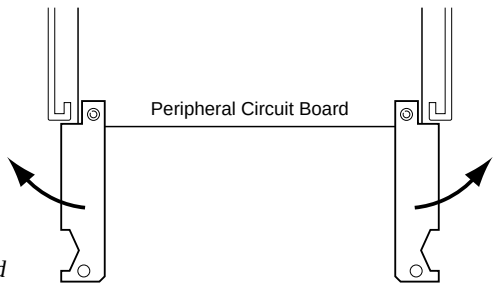


Fig. 2.1.3 Dismounting the Peripheral Circuit Board

CHAPTER 3 PRECAUTIONS ON USING THE S5U1C63002P PERIPHERAL CIRCUIT BOARD

Follow the precautions described below to ensure that your S5U1C63002P board is used properly. Note, however, that some functions described here may not be available with some models. For details, refer to the technical hardware manual for each model.

3.1 Operation Precautions

(1) Always be sure to power off all connected equipment before connecting or disconnecting the cable.

(2) Do not turn the power on and do not load any mask option data while the input ports (K00–K03) are all set to low level. It may cause a simultaneous key input reset.

3.2 Differences from an Actual IC

The S5U1C63002P emulation board differs in terms of functionality and characteristics from an actual IC, a fact with requires your attention. If these differences are ignored, there is a possibility that your circuit will not operate properly on an actual IC even though it might have performed well on the ICE.

(1) Difference in I/O

<Interface voltage>

The interface voltage between the S5U1C63002P board and the target system is fixed at +5 V. Therefore, if your emulation requires using the same interface voltage as that of an actual IC, add a level shifter circuit or some other appropriate circuit to the target system to satisfy this requirement.

<Output port drive capability>

The drive capability of each output port on the S5U1C63002P board is somewhat higher than that of an actual IC. Check the drive capacity of each output terminal on the model by referring to its technical hardware manual before you design the system and software.

<Protective diode at each port>

The S5U1C63002P board contains V_{DD} and V_{SS} protective diodes at all I/O ports and the interface voltage with the target is fixed at +5 V. Therefore, you cannot set the output ports on the S5U1C63002P board for open-drain output and interface them with a voltage level exceeding V_{DD}.

<Pull-up resistance>

The pull-up resistors on the S5U1C63002P board are fixed to a resistance value of about 220 kΩ which is different from that of an actual IC. Consult the technical hardware manual to check the pull-up resistance of the actual IC.

When turning input terminals high with pull-up resistors, note that there is a difference in the time it takes to set up the high level. For example, if you configure a key matrix circuit using a combination of output and input ports, and pull the configuration high with pull-up resistors at the input ports, a difference may result in a rise time delay.

(2) Difference in current consumption

Current consumption in the S5U1C63002P board greatly differs from that in an actual IC. Check the LEDs on the S5U1C63002P board to estimate the approximate current consumption of the board. The following lists the items that greatly affect the amount of current consumption:

- Those that can be estimated by checking LEDs and monitor pins
  a) Run and Halt execution ratio (check the LED on the ICE)
  b) CPU operating voltage switching circuit (VDC)
  c) OSC3 oscillation ON/OFF circuit (OSCC)
  d) CPU clock switching circuit (CLKCHG)
  e) Voltage doubler ON/OFF circuit (DBON)

f) Voltage halver ON / OFF circuit (HLON)
g) Oscillation system voltage regulator power supply select circuit (VDSEL)
h) A / D converter power supply select circuit (VADSEL)
i) SVD ON / OFF circuit (SVDON)
j) LCD power supply ON / OFF circuit (LPWR)
k) LCD constant-voltage switching circuit (VCCHG)

- Those that require attention during system and software design
l) Currents consumed by internal pull-up resistors
m) Input ports in a floating state

(3) Functional difference

<LCD power supply circuit>

- There is a delay between the time the LCD power supply circuit (LPWR) is turned on and the time the LCD drive waveform is output. This delay on the S5U1C63002P board is set to 107 msec. The delay on an actual IC is different, however. Consult the technical hardware manual.

- Turning the LPWR register off in the external power mode stops outputting the LCD drive waveform. At this time, the output voltage of this board is different from the actual IC as shown below.

1/2 bias

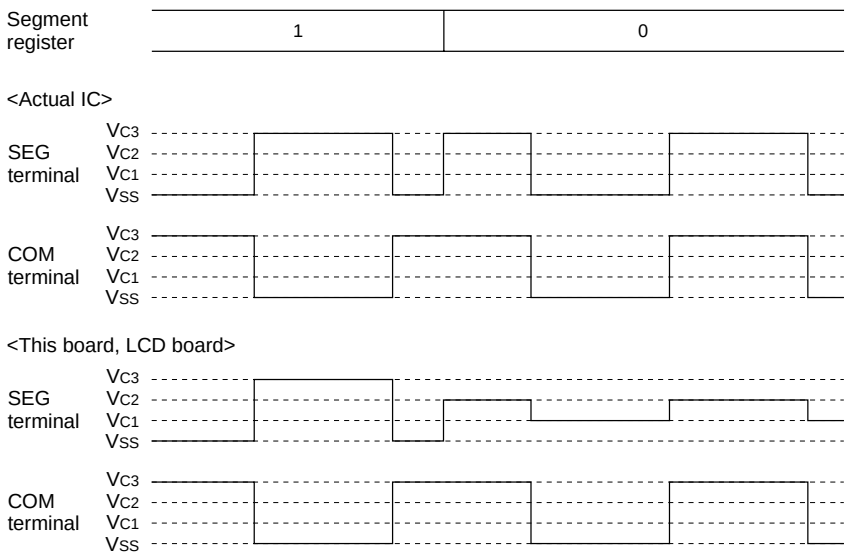
	Actual IC	S5U1C63002P
SEG terminal	V_{SS}	V_{C3}
COM terminal	V_{C1}, V_{C2}	V_{C1}, V_{C2}

1/3 bias

	Actual IC	S5U1C63002P
SEG terminal	V_{C1}	V_{C2}
COM terminal	V_{C1}	V_{C1}

<LCD drive waveform>

Pay attention when using this board for the model that can control static drive waveform output, because the output waveform is different from the actual IC. (Only for 1 / 3 bias with V_{SS}, V_{C1}, V_{C2}, V_{C3}.)



<SVD circuit>

- Some models have a built-in SVD circuit that detects the voltage supplied from outside the terminal, but this Peripheral Circuit Board cannot directly detect the supply voltage. The SVD function is evaluated by artificially changing the power-supply voltage using the VSVD control on the S5U1C63002P board.

- There is a delay between the time the power to the SVD circuit is turned on and the time the SVD data is detected. This delay on the S5U1C63002P board is set to between 61 and 92 µsec. For the delay on an actual IC, consult the technical hardware manual to ensure that there is a sufficient delay before the output voltage is detected.

<Oscillator circuit>

- There must be a waiting period between the time the OSC3 oscillation control circuit (OSCC) is turned on and the moment at which oscillation stabilizes. The oscillator on the S5U1C63002P board can operate when it is switched to OSC3 without the insertion of a waiting period. Therefore, consult the technical hardware manual to set an appropriate waiting period on the actual IC.
- Separate instructions should be used to switch the clock from OSC3 to OSC1, and to stop the OSC3 circuit from oscillating. If these operations are performed simultaneously by one instruction, care should be exercised. Although such operations are performed normally on the S5U1C63002P board, an actual IC may not perform correctly.
- When using an external clock, make sure that it is adjusted for an amplitude of 5 V ± 5% and for a duty cycle of within 50% ± 10%, and that it is input from the I/O connectors OSC1 and OSC3 with V_{SS} set for GND.
- Since the logic level on the S5U1C63002P board is high, its oscillation starting and oscillation stopping times are different from those of an actual IC.
- The S5U1C63002P board contains oscillators for the OSC1 and OSC3. If the OSC3 oscillator is not used on an actual IC, care should be exercised because operations are performed on the emulation board by using its OSC3 circuit.
- In the S5U1C63002P, the ceramic and crystal oscillation frequencies of the OSC3 oscillation circuit are fixed at 4 MHz.

<Access to undefined address space>

If undefined address space in the ROM or RAM is accessed for read or write, the read or written values become indeterminate. Furthermore, since the way these values become indeterminate is different in the S5U1C63002P board and an in actual IC, care should be exercised. Note that the ICE has a function to cause program execution to break when access to an undefined address space is attempted.

<Reset circuit>

- The S5U1C63002P board does not contain an oscillation stop detection circuit (to generate a system reset signal when the oscillation has stopped). Note that the oscillation stop detection circuit does not guarantee operation with 100% accuracy.
- The sequence of operations from when the ICE is powered on until the program starts operating is different in the S5U1C63002P board and an actual IC. The ICE enters a ready state when the user program, etc., as well as option data are loaded on the S5U1C63002P board.

<Internal power supply circuit>

- For VDC, DBON, HLON, VDSEL, and VADSEL, the S5U1C63002P board only contains registers and does not actually control the voltages. Therefore, consult the technical hardware manual to set the exact voltages. Furthermore, if the operating voltage (e.g., VDC) is switched over, consult the technical hardware manual to set a waiting period for stabilization.
- Although the S5U1C63002P board has a control (VLCD) to adjust the LCD drive voltage, an actual IC in almost all cases does not have such an adjustment facility; therefore, be careful.
- The operating frequency range that can be used depends on the internal power-supply voltage. Therefore, consult the technical hardware manual to ensure that your system will not be operated with an improper combination of operating frequency and internal power-supply voltage.

<Analog comparator circuit>

Characteristics of the analog comparator circuit on the S5U1C63002P such as response time are different from an actual IC. Consult the technical hardware manual for the analog comparator characteristics to design the system and software.

CHAPTER 4 NAME AND FUNCTION OF EACH PART

This chapter describes the name and function of each part of the S5U1C63002P board.

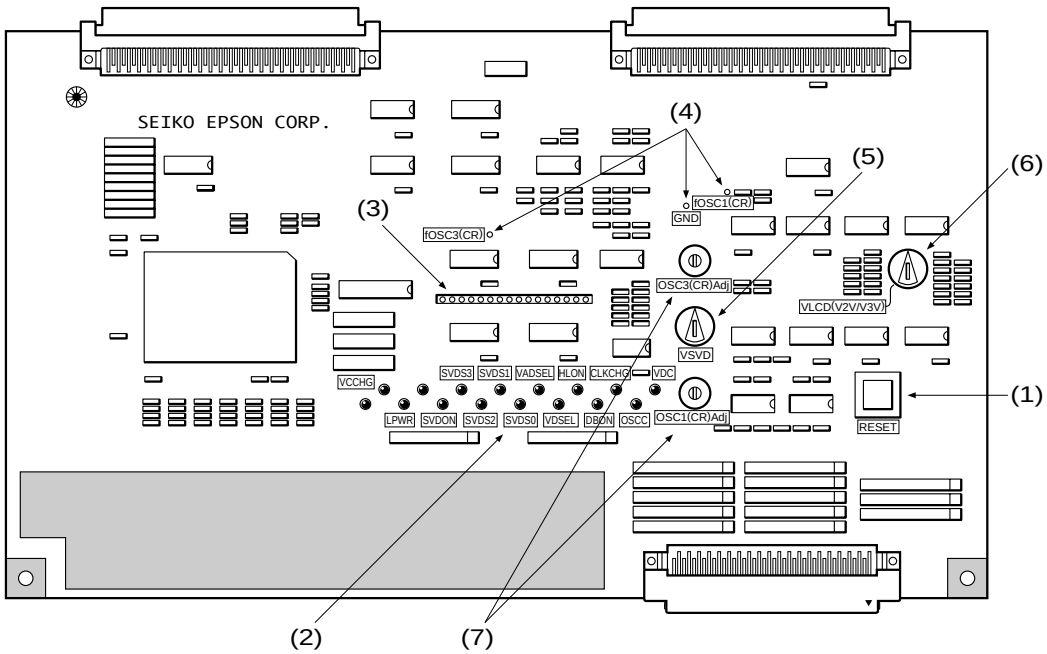


Fig. 4.1 Top view of the S5U1C63002P board

(1) RESET switch

This switch resets the internal circuits of the S5U1C63002P board, and supplies a reset signal to the ICE.

(2) Register monitor LED

The LED lights up when the corresponding register contains logic 1 and goes out when the register contains logic 0.

(3) Register monitor pin

The pin is driven high when the corresponding register contains logic 1 and driven low when the register contains logic 0.

No.	Name	No.	Name	No.	Name	No.	Name
1	VDC	5	HLON	9	SVD1	13	Unused
2	OSCC	6	VDSEL	10	SVD2	14	LPWR
3	CLKCHG	7	VADSEL	11	SVD3	15	VCCHG
4	DBON	8	SVD0	12	SVDON	16	Unused

(4) CR oscillation frequency monitor pin

This pin allows you to monitor on an oscilloscope the clock waveform generated by the CR oscillation circuit. Output on this pin is always active regardless of how the oscillation circuit is controlled.

Name	Function
GND	Ground (V_{SS})
f_{OSC1} (CR)	OSC1 CR oscillation clock
f_{OSC3} (CR)	OSC3 CR oscillation clock

(5) VSVD control

This control artificially changes the power-supply voltage to check whether the power-supply voltage detection function is working properly.
Note that in a model that can detect 16 voltage levels, one position on this control indicates two voltage values. The set power-supply voltages increase when the control is turned clockwise and decrease when the control is turned counterclockwise.

SVD level	0	1	2	3	4	5	6	7
	8	9	10	11	12	13	14	15

(For example, SVD levels 0 and 8 fall on the same control position.)

(6) VLCD control

This control is used to adjust the LCD power supply voltage. Note, however, that an actual IC in almost all cases has its LCD drive voltage fixed; therefore, be careful with the LCD drive voltage. The LCD display becomes dark when the control is turned clockwise and becomes light when the control is turned counterclockwise.

(7) CR oscillation frequency adjusting control

When you choose a CR oscillator on the S5U1C63002P board, you can use this control to adjust the CR oscillation frequency by using a screwdriver, etc. The adjustment range is approx. 30 kHz to 190 kHz for the OSC1, and approx. 190 kHz to 2.6 MHz for the OSC3. Note that not all actual ICs operate in this frequency range. Therefore, consult the technical hardware manual to ensure that the oscillation frequency is adjusted within the stipulated frequency range. The oscillation frequency increases when the control is turned clockwise and decreases when the control is turned counterclockwise.

CHAPTER 5 CONNECTING THE S5U1C63002P TO THE TARGET SYSTEM

This chapter describes how to connect the S5U1C63002P board to the target system.

To connect the S5U1C63002P board to the target system, use the I/O connection cable (80-pin+40-pin/40-pin × 2, flat type) included with this package. Handle with this connector carefully as the power (V_{DD}) is supplied through this connector.

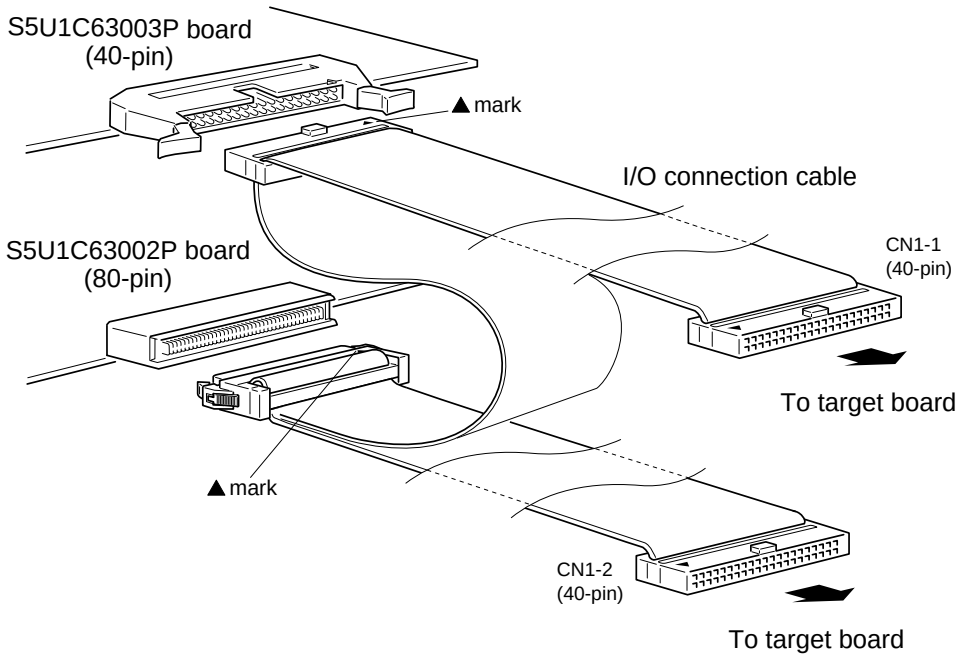


Fig. 5.1 Connecting the S5U1C63002P to the target system

Table 5.1 I/O connector pin assignment

40-pin CN1-1 connector			40-pin CN1-2 connector		
No.	Pin name	Pin function	No.	Pin name	Pin function
1	V_{DD}	Power supply (+)	1	V_{DD}	Power supply (+)
2	V_{DD}	Power supply (+)	2	V_{DD}	Power supply (+)
3	K00	K00 port	3	R00	R00 port
4	K01	K01 port	4	R01	R01 port
5	K02	K02 port	5	R02	R02 port
6	K03	K03 port	6	R03	R03 port
7	K10	K10 port	7	R10	R10 port
8	K11	K11 port	8	R11	R11 port
9	K12	K12 port	9	R12	R12 port
10	K13	K13 port	10	R13	R13 port
11	V_{SS}	Power supply (–)	11	V_{SS}	Power supply (–)
12	V_{SS}	Power supply (–)	12	V_{SS}	Power supply (–)
13	P00	P00 port	13	R20	R20 port
14	P01	P01 port	14	R21	R21 port
15	P02	P02 port	15	R22	R22 port
16	P03	P03 port	16	R23	R23 port
17	P10	P10 port	17	R30	R30 port
18	P11	P11 port	18	R31	R31 port
19	P12	P12 port	19	R32	R32 port
20	P13	P13 port	20	R33	R33 port
21	V_{DD}	Power supply (+)	21	V_{DD}	Power supply (+)
22	V_{DD}	Power supply (+)	22	V_{DD}	Power supply (+)
23	P20	P20 port	23	BZ	Buzzer output
24	P21	P21 port	24	–	Cannot be connected
25	P22	P22 port	25	–	Cannot be connected
26	P23	P23 port	26	–	Cannot be connected
27	P30	P30 port	27	–	Cannot be connected
28	P31	P31 port	28	ECLK1	External clock input (OSC1)
29	P32	P32 port	29	–	Cannot be connected
30	P33	P33 port	30	ECLK3	External clock input (OSC3)
31	V_{SS}	Power supply (–)	31	V_{SS}	Power supply (–)
32	V_{SS}	Power supply (–)	32	V_{SS}	Power supply (–)
33	P40	P40 port	33	V_{C1}	V_{C1} power supply
34	P41	P41 port	34	V_{C2}	V_{C2} power supply
35	P42	P42 port	35	V_{C3}	V_{C3} power supply
36	P43	P43 port	36	V_{C4}	V_{C4} power supply
37	V_{REF}	A/D converter reference voltage input	37	V_{C5}	V_{C5} power supply
38	K20	K20 port	38	$\overline{RESET}$	System reset input
39	V_{SS}	Power supply (–)	39	V_{SS}	Power supply (–)
40	V_{SS}	Power supply (–)	40	V_{SS}	Power supply (–)

Note that some pin names are not existed in the actual IC depending on the model.

CHAPTER 6 PRODUCT SPECIFICATIONS

The components specifications of the S5U1C63002P are listed below.

S5U1C63002P

Dimension:	254 mm (wide) × 144.8 mm (depth) × 13 mm (height) (including screws)
Weight:	Approx. 180 g
Power supply:	DC 5 V ± 5%, less than 1 A (supplied from ICE main unit)

S5U1C63003P

Dimension:	254 mm (wide) × 144.8 mm (depth) × 13 mm (height) (including screws)
Weight:	Approx. 150 g
Power supply:	DC 5 V ± 5%, less than 0.7 A (supplied from ICE main unit)

I/O connection cable

S5U1C63002P connector:	KEL8830E-80-170LD	
S5U1C63003P connector:	3M3432-5002LCSC	
Cable connector (80-pin):	KEL8822E-80-171	
Cable connector (40-pin):	3M7940-6500SC	1 pair
Cable:	40-pin flat cable	1 pair
Interface:	CMOS interface (5 V)	
Length:	Approx. 40 cm	

Accessories

40-pin connector for connecting to target system:
3M3432-6002LCSC × 2

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