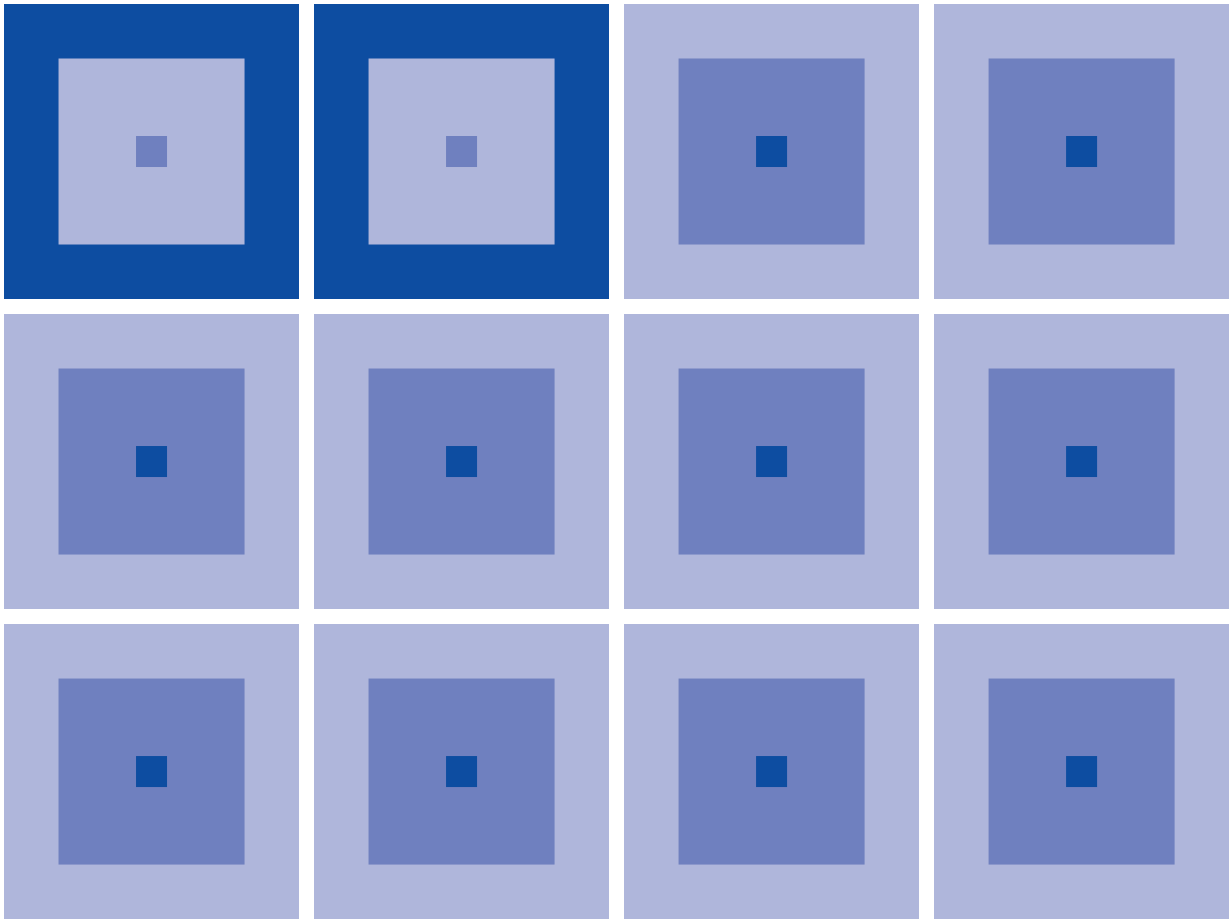
MF830-03

EPSON

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER

S5U1C621C0E Manual

(Evaluation Board for S1C621C0/62920)



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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

S1 C 60N01 F 0A01 00

- 00 — Packing specification
- 0A01 — Specification
- F — Package (D: die form; F: QFP)
- 60N01 — Model number
- C — Model name (C: microcomputer, digital products)
- S1 — Product classification (S1: semiconductor)

Development tools

S5U1 C 60R08 D1 1 00

- 00 — Packing specification
- 1 — Version (1: Version 1 *2)
- D1 — Tool type (D1: Development Tool *1)
- 60R08 — Corresponding model number (60R08: for S1C60R08)
- C — Tool classification (C: microcomputer use)
- S5U1 — Product classification (S5U1: development tool for semiconductor products)

*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

S1C60 Family processors

Previous No.	New No.
E0C6001	S1C60N01
E0C6002	S1C60N02
E0C6003	S1C60N03
E0C6004	S1C60N04
E0C6005	S1C60N05
E0C6006	S1C60N06
E0C6007	S1C60N07
E0C6008	S1C60N08
E0C6009	S1C60N09
E0C6011	S1C60N11
E0C6013	S1C60N13
E0C6014	S1C60140
E0C60R08	S1C60R08

S1C62 Family processors

Previous No.	New No.
E0C621A	S1C621A0
E0C6215	S1C62150
E0C621C	S1C621C0
E0C6S27	S1C6S2N7
E0C6S37	S1C6S3N7
E0C623A	S1C6N3A0
E0C623E	S1C6N3E0
E0C6S32	S1C6S3N2
E0C6233	S1C62N33
E0C6235	S1C62N35
E0C623B	S1C6N3B0
E0C6244	S1C62440
E0C624A	S1C624A0
E0C6S46	S1C6S460

Previous No.	New No.
E0C6247	S1C62470
E0C6248	S1C62480
E0C6S48	S1C6S480
E0C624C	S1C624C0
E0C6251	S1C62N51
E0C6256	S1C62560
E0C6292	S1C62920
E0C6262	S1C62N62
E0C6266	S1C62660
E0C6274	S1C62740
E0C6281	S1C62N81
E0C6282	S1C62N82
E0C62M2	S1C62M20
E0C62T3	S1C62T30

Comparison table between new and previous number of development tools

Development tools for the S1C60/62 Family

Previous No.	New No.
ASM62	S5U1C62000A
DEV6001	S5U1C60N01D
DEV6002	S5U1C60N02D
DEV6003	S5U1C60N03D
DEV6004	S5U1C60N04D
DEV6005	S5U1C60N05D
DEV6006	S5U1C60N06D
DEV6007	S5U1C60N07D
DEV6008	S5U1C60N08D
DEV6009	S5U1C60N09D
DEV6011	S5U1C60N11D
DEV60R08	S5U1C60R08D
DEV621A	S5U1C621A0D
DEV621C	S5U1C621C0D
DEV623B	S5U1C623B0D
DEV6244	S5U1C62440D
DEV624A	S5U1C624A0D
DEV624C	S5U1C624C0D
DEV6248	S5U1C62480D
DEV6247	S5U1C62470D

Previous No.	New No.
DEV6262	S5U1C62620D
DEV6266	S5U1C62660D
DEV6274	S5U1C62740D
DEV6292	S5U1C62920D
DEV62M2	S5U1C62M20D
DEV6233	S5U1C62N33D
DEV6235	S5U1C62N35D
DEV6251	S5U1C62N51D
DEV6256	S5U1C62560D
DEV6281	S5U1C62N81D
DEV6282	S5U1C62N82D
DEV6S27	S5U1C6S2N7D
DEV6S32	S5U1C6S3N2D
DEV6S37	S5U1C6S3N7D
EVA6008	S5U1C60N08E
EVA6011	S5U1C60N11E
EVA621AR	S5U1C621A0E2
EVA621C	S5U1C621C0E
EVA6237	S5U1C62N37E
EVA623A	S5U1C623A0E

Previous No.	New No.
EVA623B	S5U1C623B0E
EVA623E	S5U1C623E0E
EVA6247	S5U1C62470E
EVA6248	S5U1C62480E
EVA6251R	S5U1C62N51E1
EVA6256	S5U1C62N56E
EVA6262	S5U1C62620E
EVA6266	S5U1C62660E
EVA6274	S5U1C62740E
EVA6281	S5U1C62N81E
EVA6282	S5U1C62N82E
EVA62M1	S5U1C62M10E
EVA62T3	S5U1C62T30E
EVA6S27	S5U1C6S2N7E
EVA6S32R	S5U1C6S3N2E2
ICE62R	S5U1C62000H
KIT6003	S5U1C60N03K
KIT6004	S5U1C60N04K
KIT6007	S5U1C60N07K

S5U1C621C0E Manual (Evaluation Board for S1C621C0/62920)

This manual describes the components of the S5U1C621C0E, a debugging tool for the S1C621C0 and the S1C62920 4-bit, single-chip microcomputer, and explains how to test its operation.

Refer to the "Technical Manual" of the S1C621C0 or the S1C62920 for details of the S1C621C0 or the S1C62920, and the "S5U1C62000A Manual" and the "S5U1C62xxxD Manual" for the development procedure and other information.

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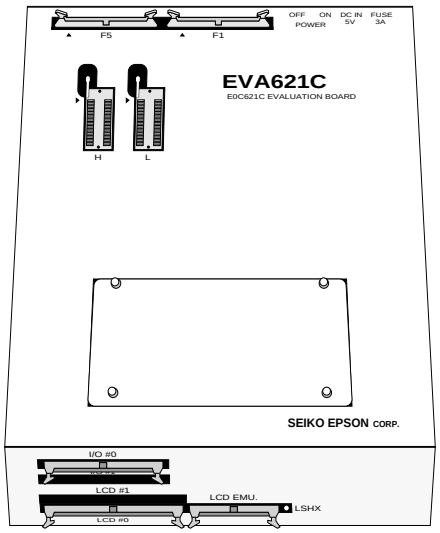
1 INTRODUCTION

1.1 S5U1C621C0E Outline

The S5U1C621C0E is a development tool for the S1C621C0 and the S1C62920.
Almost the same functions that the actual IC (S1C621C0 / S1C62920) has can be implemented by writing application programs created with the ASM621C / ASM6292 and function option data created with the FOG621C / FOG6292 into EPROM, and installing it in the S5U1C621C0E.
Application programs and option data can also be downloaded in the S5U1C621C0E using the ICE (S5U1C62000H).

The S5U1C621C0E has a free-running function, so the S5U1C621C0E itself can execute programs.
In addition, the S5U1C621C0E can interface with the ICE in-circuit emulator, and so perform a higher level of debugging.

Note: The S5U1C621C0E can be used as an Evaluation Board for the S1C621C0 by using function option data created with the FOG621C, and for the S1C62920 by using one created with the FOG6292. Therefore, if the function option data for another model is mounted, the S5U1C621C0E does not work correctly because it cannot judge the model. Take care especially when developing for both models.



* The name 'EVA621C' on the development tool is the old name of the product.

1.2 S5U1C621C0E Components

When unpacking the S5U1C621C0E, check that the following goods are present:

(1)	S5U1C621C0E main unit	1
(2)	LCD connection cable and connector (60-pin flat type)	1 set
(3)	I / O connection cable and connector (50-pin flat type)	1 set
(4)	Power cable (3-pin)	1 set
(5)	Diagnostic ROMs (two)	1 set
(6)	Fuse (3 A)	1
(7)	S5U1C621C0E Manual (Evaluation Board for S1C621C0 / 62920) (this manual)	1
(8)	Warranty registration card	1
(9)	Warranty certificate	1
(10)	Notes for using	1

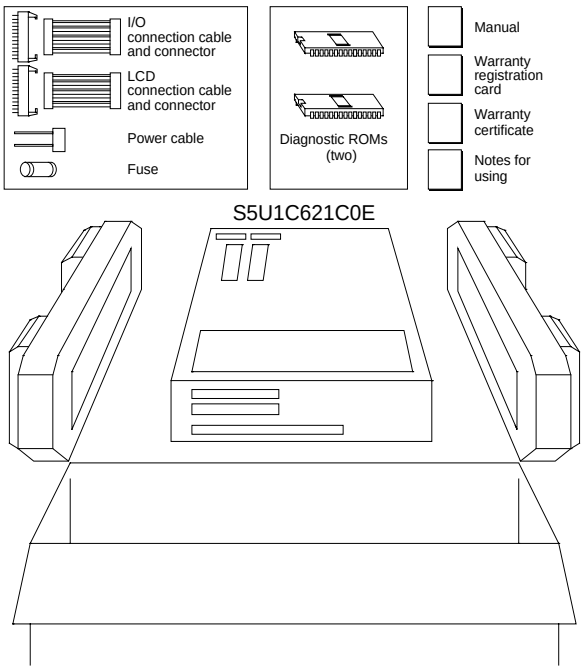


Fig. 1.2.1 S5U1C621C0E package

2 PRECAUTIONS

Take the following precautions when using the S5U1C621C0E:

2.1 Precautions for Operation

- Turn the power of all equipment off before connecting or disconnecting cables.
- To turn the POWER switch of the S5U1C621C0E off, then on again, wait for at least 10 seconds after turning off before turning on.
- When ROMs are inserted into the L and H ROM sockets, lock the lever securely by positioning it horizontally. After the ROMs have been removed from the sockets, lock the lever at the same position above. If the lever is left upright, poor contact may result.
- Confirm that the following ROMs have been installed correctly, then operate the S5U1C621C0E.

(Top panel)	Program ROM	2	L.HEX, H.HEX
(Under top cover)	Function option ROM	1	F.HEX
	Segment option ROM	1	S.HEX

- If the S5U1C621C0E does not operate normally, perform the operation test (Chapter 6).

2.2 Differences from Actual IC

There are some differences in functions and characteristics between the S5U1C621C0E and the actual IC, so be careful when using the S5U1C621C0E.
(The S5U1C621C0E is designed to be used only for checking functions of programs. It does not guarantee the AC/DC characteristics of the actual IC.)

■ Differences on operating voltage and electrical characteristics

The S5U1C621C0E operating voltage is fixed at 5 V. Therefore the DC characteristics (input/output current, input voltage, current consumption, etc.), the AC characteristics (response time, oscillation start time, etc.) and the analog characteristics (SVD circuit, R/F converter characteristics, etc.) are different from those of the actual IC.

■ I/O differences

- The response time (*) of the input ports is different from the actual IC caused by the differences in logic level (5 V supply voltage), output drive capability, and pull-up resistance. (* The rise of the waveform is delayed on account of the time constant of the pull-up resistance and load capacitance on the input terminal when the input port is changed from a low level to a high level.) When using the input ports or the I/O ports for key scanning, create the waiting routine according to the actual IC and the system configuration.
- The pull-up resistance of the actual IC can be calculated from the Min./Max. values of the low level input current (with pull-up resistor) described in the "Technical Manual" of the S1C621C0 or the S1C62920. For the S5U1C621C0E, 330 kΩ resistors are built-in.
- The logic level of the S5U1C621C0E is fixed at 5 V. Therefore use a level shifter or something similar to interface with the target system if it is necessary.

■ LCD differences

- The S5U1C621C0E has the VADJ control to adjust the LCD drive voltage exactly. In the S1C621C0, the LCD drive voltage can be adjusted using the VADJ terminal. However, the S1C62920 cannot adjust the LCD drive voltage since that of the actual IC is fixed.
- The segment drive capability is different from the actual IC. It is different when the segment output terminals are used as the DC output.
- When the LCD power is turned ON by setting the LCD power control register (LPWR: C1H•D0) from "0" to "1", at least 100 msec are needed until the LCD drive voltage (V_{C1}, V_{C2} and V_{C3}) stabilizes in the actual IC (S1C621C0 or S1C62920). In the S5U1C621C0E, the LCD drive voltage stabilizes immediately after turning ON. Be aware of the stabilization time when turning the LCD display ON or OFF.

■ Power-on sequence differences

The S5U1C621C0E performs configuration of the FPGA (LCA) on the board and determines the internal state when the power is turned on. Then, it loads the function option data generated by the FOG621C or the FOG6292 and works as the actual IC does. Therefore, the I/O state of the S5U1C621C0E is unstable until configuration and function option loading is completed. This affects the power-on reset time.

■ Unused data memory area

In the S5U1C621C0E, values that are read or written from/to memory areas other than defined on the memory map of the data memory will be undefined. However, the undefined status differs from the actual IC, therefore pay attention to the memory area when creating programs. (Refer to the "Technical Manual" of the S1C621C0 or the S1C62920 for the memory map.)
Be aware that the ICE cannot detect accessing to unused areas, especially if the used and unused addresses are intermingled within the 256 word memory space.

■ Differences on current consumption

It is impossible to evaluate current consumption using the S5U1C621C0E.

■ Function differences

<SVD circuit>

- The SVD function is implemented by varying the apparent power supply voltage with the VSVD control. It does not detect the actual supply voltage.
- At least 100 µsec stabilization time is needed until the detection result stabilizes after turning the SVD circuit ON in the actual IC. However the time of the S5U1C621C0E is shorter than the actual IC, therefore, be sure to secure the stabilization time according to the actual IC. Refer to the SVDERR LED and the "Technical manual" of the S1C621C0 or the S1C62920 to set the stabilization time.

<Oscillation circuit>

- The crystal oscillation frequency of the OSC1 oscillation circuit is fixed at 32.768 kHz.
- Either ceramic oscillation or CR oscillation can be set for the OSC3 oscillation circuit by setting the function option.
  Using the SW2 switch sets the ceramic oscillation frequency as follows:
  when the SW2 is set to 629 side: 1 MHz
  when the SW2 is set to 621 side: 455 kHz
  This switch has to be set when the power is OFF. Do not set the switch after turning the power ON.
  When CR oscillation is used, adjust CR oscillation frequency within the range of approximately 300 kHz to 1 MHz using the OSC3ADJ control.
- At least 5 msec stabilization time is needed for the oscillation to stabilize after turning the OSC3 oscillation circuit ON in the actual IC. However that time of the S5U1C621C0E is shorter than the actual IC, therefore, be sure to secure the stabilization time according to the actual IC. Refer to the OSCERR LED and the "Technical Manual" of the S1C621C0 or the S1C62920 to set the stabilization time.
- When switching the CPU clock from OSC1 to OSC3 or the opposite, use separate instructions to turn the OSC3 oscillation ON or OFF and to switch the CPU clock. In the actual IC, simultaneous processing with a single instruction may cause malfunction, but the S5U1C621C0E operates properly.
- The oscillation start time and stop time are different from the actual IC because the logic level (5 V supply voltage) is higher than the actual IC.

<Wait time>

It is necessary to wait for operation stabilization after setting the following registers on the I/O space of the S1C621C0 or the S1C62920, but the S5U1C621C0E may operate properly without any waiting routine. Therefore, some programs may not operate properly even if they operate on the S5U1C621C0E. Follow the programming notes described in the "Technical Manual" of the S1C621C0 or the S1C62920 when setting these registers.

SVDON	(80H•D0)
CLKCHG	(81H•D1)
OSCC	(81H•D0)
LPWR	(C1H•D0)

<R/F converter>

- There are three sensor connection terminals "SEN0", "SEN1" and "SEN2" on the S5U1C621C0E. The SEN0 and SEN1 terminals can be used for both the S1C621C0 and the S1C62920, but the SEN2 terminal can be used only for the S1C62920.
- The oscillation frequency is different from the actual IC, therefore, pay attention to the measurement counter setting so that the measurement counter or the time base counter do not overflow. See "Differences on characteristics" for the oscillation frequency characteristics.

■ Differences on characteristics

The oscillation frequency of the R/F converter is different from the actual IC. Figure 2.2.1 shows the oscillation frequency characteristics of the S5U1C621C0E. The oscillation frequency characteristics in temperature measurement by a thermistor (channel 0/channel 1/channel 2) is the same as shown in Figure 2.2.1.

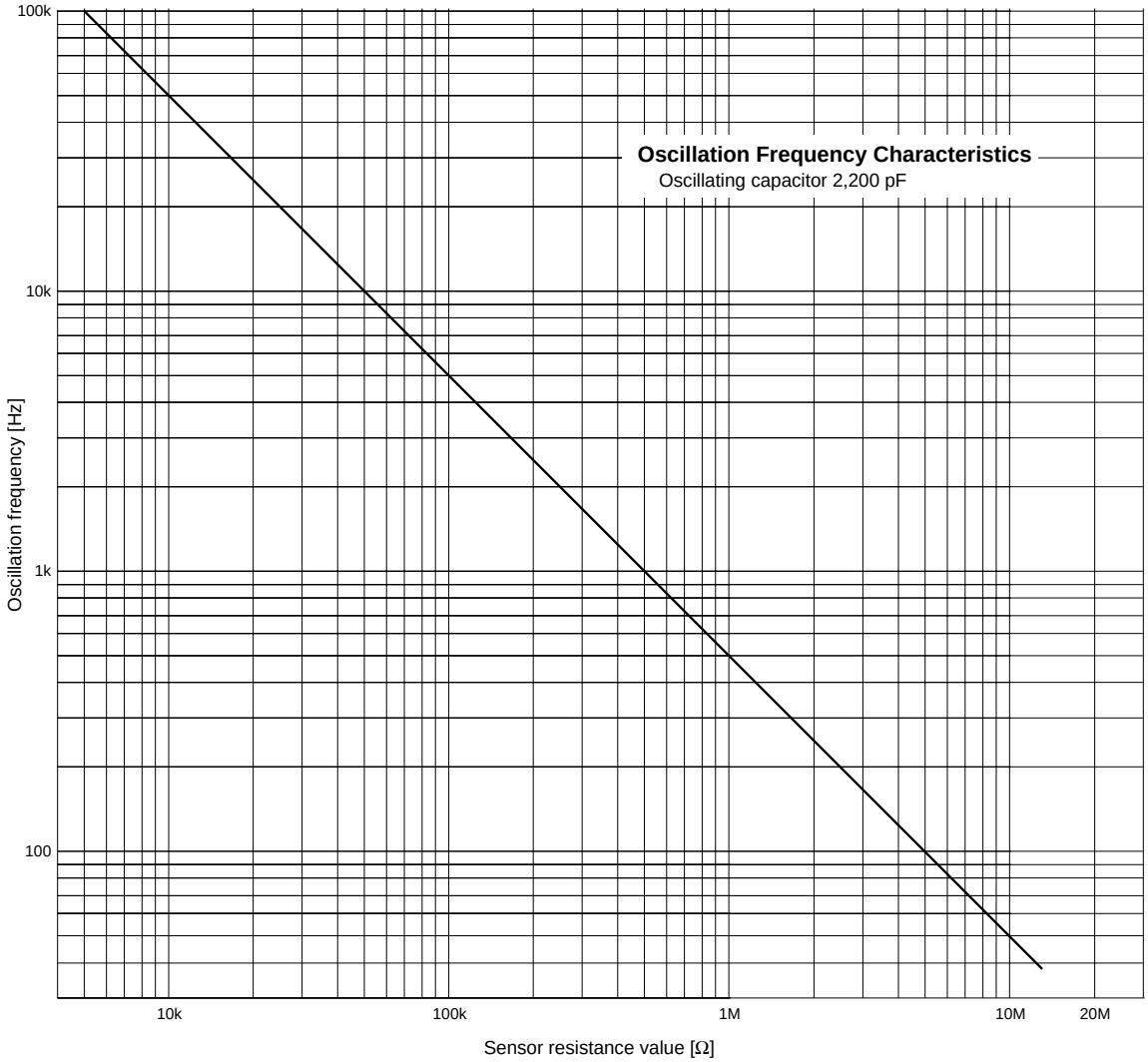


Fig. 2.2.1 Oscillation frequency characteristics

3 NAMES AND FUNCTIONS OF PARTS

This section describes the names and functions of the parts of the S5U1C621C0E.

3.1 Basic Functions

The S5U1C621C0E has the following basic functions:

■ Program execution (Run function)

Install the EPROM containing the application program and execute the program.

■ Interface with ICE

The S5U1C621C0E can interface with the ICE so that a higher level debugging environment may be established.

■ Setting hardware options by installing function option and segment option ROMs

Hardware options, i.e., I/O ports and segments, can be specified by writing option data for the function option created by the function option generator and the segment option created by the segment option generator into EPROM, and installing the EPROM.

3.2 Panel (Top view)

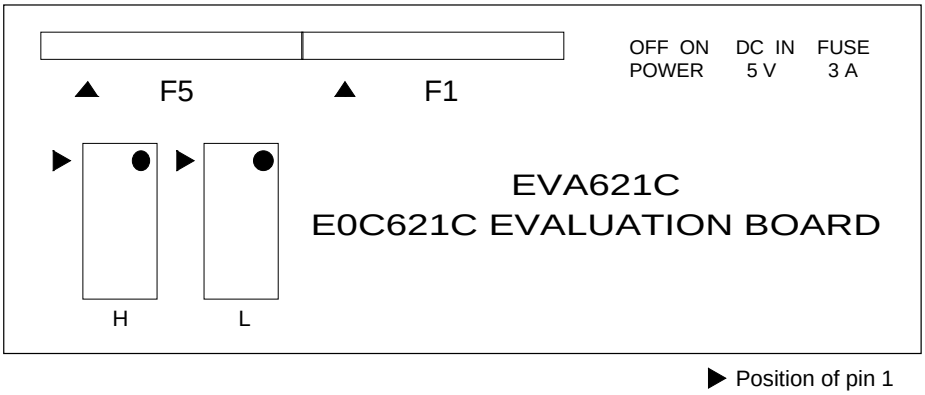


Fig. 3.2.1 Panel

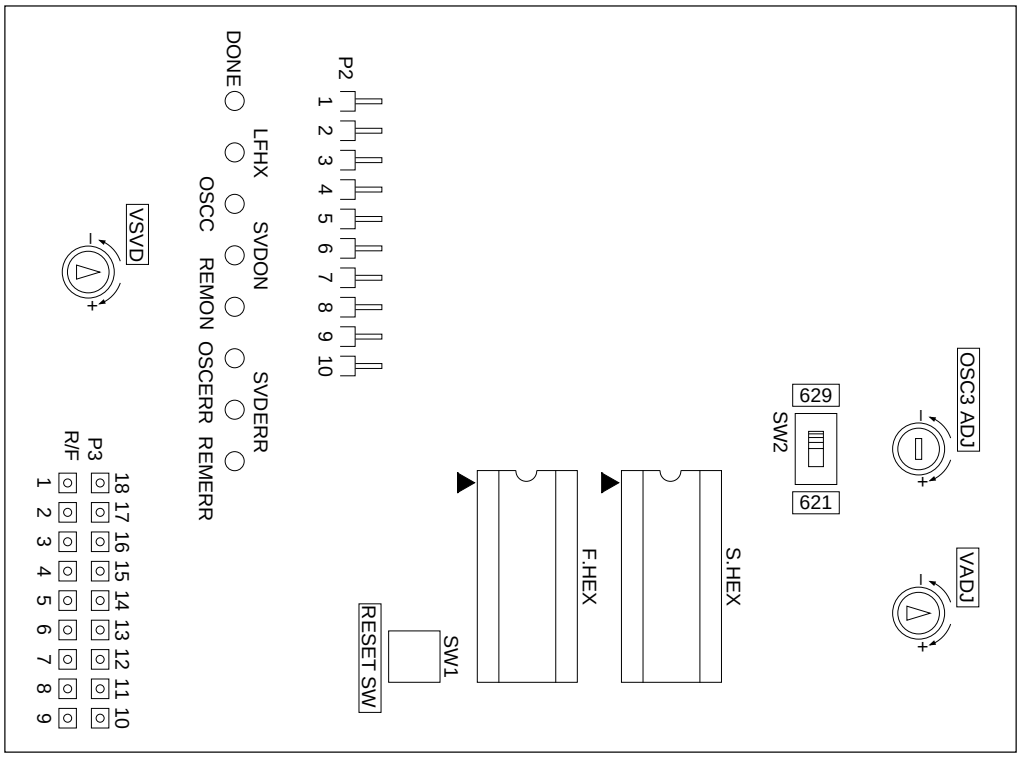
■ ROM sockets

- L (low) and H (high)
  These are IC sockets for target program ROMs. Insert the ROM (L.HEX) containing the 8 low-order bits (I7 to I0) of the machine code into the L socket, and the ROM (H.HEX) containing the 4 high-order bits (IB to I8) into the H socket. Insert the diagnostic ROM into a socket when an operation test is performed.

■ Connectors

- F1 and F5
  Connectors for the ICE interface cable.

3.3 Under Top Cover



▶ Position of pin 1

Fig. 3.3.1 Under top cover

- Switch and Control

(1) RESET switch
Resets the CPU and starts the target program from page 01H, step 00H.

(2) SW2
Switches the OSC3 ceramic oscillation frequency.
When the SW2 is set to 629 side: 1 MHz
When the SW2 is set to 621 side: 455 kHz
This switch has to be set when the power is OFF. Do not set the switch after turning the power ON.

(3) OSC3ADJ
This is the control for adjusting the OSC3 CR oscillation frequency from 300 kHz to 1 MHz. The OSC3 oscillation clock is output to the CHK (P2) 10-pin. By using it, the oscillation frequency can be adjusted. (Refer to Section 2.2, "Differences from Actual IC".)

(4) VADJ
This is the control for fine tuning the LCD contrast (LCD drive voltage). (Refer to Section 2.2, "Differences from Actual IC".)

(5) VSVD
This is the control for adjusting the supply voltage in simulation to check SVD operation. (Refer to Section 2.2, "Differences from Actual IC".)

- LED

(1) OSCC, SVDON
These LEDs indicate the values ("1" or "0") of the OSCC and SVDON registers, respectively. They light when "1" is set in the register, and go off when "0" is set in the register.

OSCC ..... OSCC register (address 81H•D0)
SVDON ..... SVDON register (address 80H•D0)

(2) REMON (S1C621C0 only)

This LED lights when either the REMCR or REMDC registers or both are set to "1", and goes off when both registers are set to "0".

REMON ..... REMCR register (address E0H • D0)
and
REMDC register (address E0H • D1)

(3) OSCERR, SVDERR

These LEDs indicate a control sequence error when the CPU clock is switched from OSC1 to OSC3 or when the SVD data is read, respectively.

OSCERR

To change the CPU clock from OSC1 to OSC3, write "1" to the OSCC register (81H • D0) to turn the OSC3 oscillation on, wait for 5 msec and then write "1" to the CLKCHG register (81H • D1). This LED lights when the CPU clock is switched if at least 5 msec wait time have not passed.

SVDERR

To detect whether the supply voltage is low or normal, write "1" to the SVDON register (80H • D0), wait for 100 µsec and write "0" to the SVDON register, then read the SVDDT latch (80H • D1). This LED lights when reading if at least 100 µsec wait time have not passed.

Note: These LED statuses do not guarantee the operation in the actual IC. When setting the wait time, allow ample margin according to the actual IC's characteristics and the target system. (Refer to Section 2.2, "Differences from Actual IC".)

(4) REMERR (S1C621C0 only)

When the REM circuit is operating, writing to the RIC3–RIC0 register (E2H) and ROUT3–ROUT0 register (E3H) is prohibited while the τ waveform is HIGH level. This LED lights if the writing is done in that period.

(5) LFHX

It lights when function option data from a personal computer is loaded using the in-circuit emulator ICE. As a result, it can differentiate whether the currently specified function option is due to the EPROM (F.HEX) or has been loaded from a personal computer. Refer to the "S5U1C62xxxD Manual" in regard to the loading of the function option using the ICE.

(6) DONE

This LED lights when the S5U1C621C0E has completed configuration of the FPGA (LCA) on the board at power-on and is ready for debugging. If this LED is not lit several seconds after power-on, turn the power off and then on again.

- ROM sockets (F.HEX, S.HEX)

(1) F.HEX

This is the IC socket into which the EPROM (F.HEX) is inserted.
This EPROM includes the function options generated by the function option generator (FOG621C or FOG6292).

S1C621C0 (Create data using the FOG621C)
S1C62920 (Create data using the FOG6292)

(2) S.HEX

This is the IC socket into which the EPROM (S.HEX) is inserted.
This EPROM includes the the assignment of LCD segment generated by the segment option generator (SOG621C or SOG6292).

S1C621C0 (Create data using the SOG621C)
S1C62920 (Create data using the SOG6292)

- CHK pins (P2)

  The following signals, LED statuses, register statuses, OSC3 oscillation frequency and R/F converter oscillation frequency can be checked by an oscilloscope or other instrument.
  RFOUT pin is also provided on the I/O #0 connector (for target system connection).

[S1C621C0]

Pin 1	DONE	Pin 2	LFHX	Pin 3	OSCC
Pin 4	SVDON	Pin 5	REMON	Pin 6	OSCERR
Pin 7	SVDERR	Pin 8	REMERR	Pin 9	RFOUT
Pin 10	OSC3				

[S1C62920]

Pin 1	DONE	Pin 2	LFHX	Pin 3	OSCC
Pin 4	SVDON	Pin 5	Cannot be connected	Pin 6	OSCERR
Pin 7	SVDERR	Pin 8	Cannot be connected	Pin 9	RFOUT
Pin 10	OSC3				

- R/F converter pins (P3)

  These pins are used to connect external parts, resistors, sensors and capacitors, for R/F conversion.

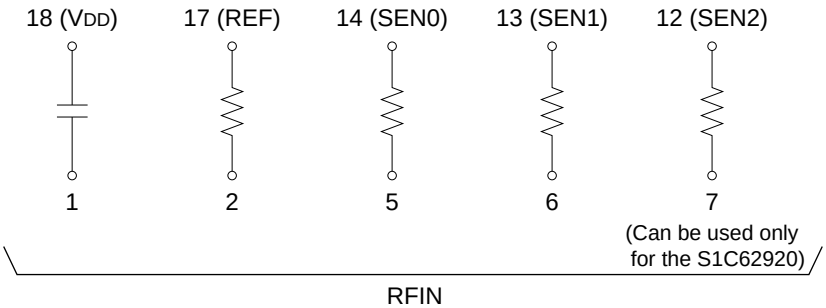
RFIN	R/F converter CR oscillation input pin
SEN0, SEN1, SEN2 (Note)	R/F converter sensor connection pins
REF	R/F converter reference resistor connection pin

[S1C621C0]

Pins 1 to 8	RFIN
Pins 9 to 12	Cannot be connected
Pin 13	SEN1
Pin 14	SEN0
Pins 15 and 16	Cannot be connected
Pin 17	REF
Pin 18	V_{DD}

[S1C62920]

Pins 1 to 8	RFIN
Pins 9 to 11	Cannot be connected
Pin 12	SEN2
Pin 13	SEN1
Pin 14	SEN0
Pins 15 and 16	Cannot be connected
Pin 17	REF
Pin 18	V_{DD}



Note: Pin 12 (SEN2) can be used only for the S1C62920.
Do not use pins that cannot be connected.

3.4 Front Panel

There are several connectors on the front panel for connecting the S5U1C621C0E to the target system.

- I/O #0, I/O #1
  Connector for the I/O cable. The I/O cable is used to connect the S5U1C621C0E to the target system. I/O #1 cannot be used (reserved connector).
- LCD #0, LCD #1
  Connector for the LCD cable. The LCD cable is used to connect the S5U1C621C0E to the target system. LCD #1 cannot be used (reserved connector).
- LCD EMU.
  Connector for the LCD emulator cable.
- LSHX
  It lights when segment option data from a personal computer is loaded using the in-circuit emulator ICE. As result, it can differentiate whether the currently specified segment option is due to the ROM (F.HEX) or has been loaded from a personal computer. Refer to the "S5U1C62xxxD Manual" in regard to the loading of the segment option using the ICE.

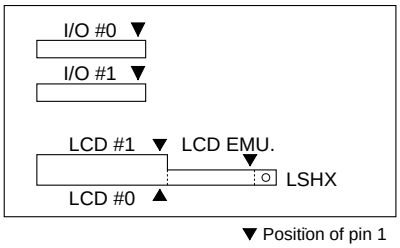


Fig. 3.4.1 Front panel

3.5 Rear Panel

The external power input section is on the rear panel.

- POWER switch (on/off)
  This is a switch to turn on or off the external power supply to S5U1C621C0E. (Please turn off the POWER switch when ICE is connected.)
- FUSE
  This is 3 A of the 3 A tubular fuse for external power supply, and is blown off by current of 3 A or more.
- DC IN 5 V
  This is a connector with external power supply source. The external power supply should be in direct current of 5 V for 3 A or more.

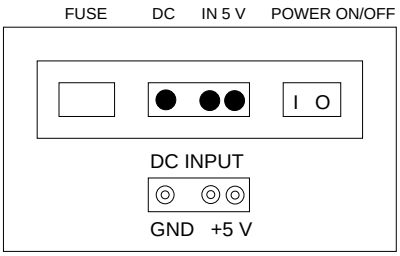


Fig. 3.5.1 Rear panel

Note: Be sure to disconnect external power source before connection with ICE, because power is supplied from ICE when you connect S5U1C621C0E to ICE.

4 CABLE CONNECTION

This section describes how to connect the power cable to the S5U1C621C0E, and the S5U1C621C0E to the ICE and the target system.

Note: Turn the power of all equipment off before connecting or disconnecting cables.

4.1 Connection to ICE

The S5U1C621C0E is connected to the ICE by connecting the two interface cables (F1 and F5). Use S5U1C621C0E connectors F1 and F5 with the projections facing outwards. Use ICE connectors F1 and F5 with the projections facing inwards (cable side).
Figures 4.1.1 and 4.1.2 show the external view and connection diagram of the ICE interface cable.

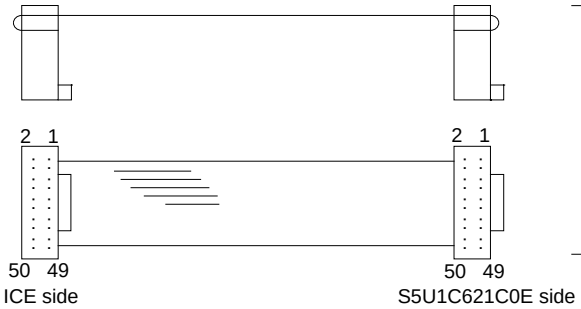


Fig. 4.1.1 External view of the ICE interface cable

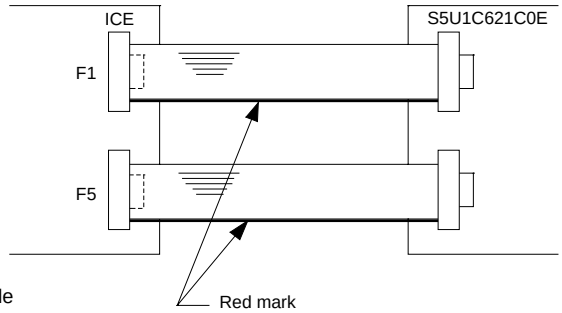


Fig. 4.1.2 Connection diagram

Note: The S5U1C621C0E has an external power input connector for +5 V (V_{DD}) and GND (V_{SS}). Leave these connectors unconnected when the S5U1C621C0E is connected to the ICE.

4.2 Power Cable Connection

When using the S5U1C621C0E on its own, it must be supplied with power (5 V DC, 3 A or more) from an external source through the power cable.
When the S5U1C621C0E is connected to the ICE, power is supplied by the ICE; therefore, the power cable is not necessary. Disconnect the power cable if it is already connected.
Figure 4.2.1 shows the connection of the power cable pins.

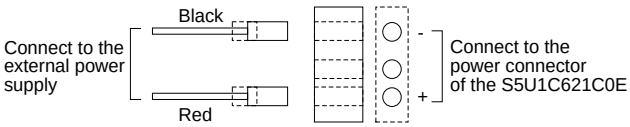


Fig. 4.2.1 Connection of power cable pins

4.3 Connection to Target System

The I/O #0 and LCD #0 connectors are used to connect the S5U1C621C0E to the target system.

The signal output from the LCD #0 connector is the same as those of the actual IC at the function level. Therefore, the S5U1C621C0E may be connected to the LCD of the target system without any changes. The LCD contrast (LCD drive voltage) is adjusted by the VADJ control. (Refer to Section 2.2, "Differences from Actual IC".)

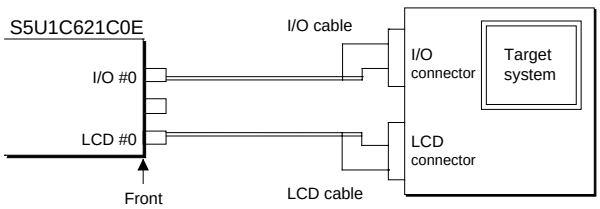


Fig. 4.3.1 Connection of target system

Table 4.3.1 S1C621C0 I/O #0 connector pins

Pin No.	Signal name	Pin No.	Signal name
1	VDD (+ 5 V)	2	VDD (+ 5 V)
3	VDD (+ 5 V)	4	VDD (+ 5 V)
5	Cannot be connected	6	Cannot be connected
7	K00	8	K01
9	K02	10	K03
11	K10	12	K11
13	K12	14	K13
15	P00	16	P01
17	P02	18	P03
19	Cannot be connected	20	Cannot be connected
21	Cannot be connected	22	Cannot be connected
23	R00	24	R01
25	R02	26	R03
27	Cannot be connected	28	Cannot be connected
29	Cannot be connected	30	Cannot be connected
31	Cannot be connected	32	Cannot be connected
33	Cannot be connected	34	Cannot be connected
35	Cannot be connected	36	Cannot be connected
37	Cannot be connected	38	Cannot be connected
39	Cannot be connected	40	RFOUT
41	$\overline{\text{TEST}}$	42	$\overline{\text{RESET}}$
43	Cannot be connected	44	Cannot be connected
45	Cannot be connected	46	Cannot be connected
47	VSS (GND)	48	VSS (GND)
49	VSS (GND)	50	VSS (GND)

Note: Do not use pins that cannot be connected.

Table 4.3.2 S1C621C0 LCD #0 connector pins

Pin No.	Signal name	Pin No.	Signal name
1	COM0	2	COM1
3	COM2	4	COM3
5	Cannot be connected	6	Cannot be connected
7	Cannot be connected	8	Cannot be connected
9	SEG0	10	SEG1
11	SEG2	12	SEG3
13	SEG4	14	SEG5
15	SEG6	16	SEG7
17	SEG8	18	SEG9
19	SEG10	20	SEG11
21	SEG12	22	SEG13
23	SEG14	24	SEG15
25	SEG16	26	SEG17
27	SEG18	28	SEG19
29	SEG20	30	SEG21
31	SEG22	32	SEG23
33	SEG24	34	SEG25
35	SEG26	36	SEG27
37	SEG28	38	SEG29
39	SEG30	40	SEG31
41	SEG32	42	SEG33
43	Cannot be connected	44	Cannot be connected
45	Cannot be connected	46	Cannot be connected
47	Cannot be connected	48	Cannot be connected
49	Cannot be connected	50	Cannot be connected
51	Cannot be connected	52	Cannot be connected
53	Cannot be connected	54	Cannot be connected
55	Cannot be connected	56	Cannot be connected
57	Cannot be connected	58	Cannot be connected
59	Cannot be connected	60	Cannot be connected

Table 4.3.3 S1C62920 I/O #0 connector pins

Pin No.	Signal name	Pin No.	Signal name
1	VDD (+ 5 V)	2	VDD (+ 5 V)
3	VDD (+ 5 V)	4	VDD (+ 5 V)
5	Cannot be connected	6	Cannot be connected
7	K00	8	K01
9	K02	10	K03
11	Cannot be connected	12	Cannot be connected
13	Cannot be connected	14	Cannot be connected
15	P00	16	P01
17	P02	18	P03
19	P10	20	P11
21	P12	22	P13
23	R00	24	R01
25	R02	26	R03
27	Cannot be connected	28	Cannot be connected
29	Cannot be connected	30	Cannot be connected
31	Cannot be connected	32	Cannot be connected
33	Cannot be connected	34	Cannot be connected
35	Cannot be connected	36	Cannot be connected
37	Cannot be connected	38	Cannot be connected
39	Cannot be connected	40	RFOUT
41	$\overline{\text{TEST}}$	42	$\overline{\text{RESET}}$
43	Cannot be connected	44	Cannot be connected
45	Cannot be connected	46	Cannot be connected
47	VSS (GND)	48	VSS (GND)
49	VSS (GND)	50	VSS (GND)

Note: Do not use pins that cannot be connected.

Table 4.3.4 S1C62920 LCD #0 connector pins

Pin No.	Signal name	Pin No.	Signal name
1	COM0	2	COM1
3	COM2	4	COM3
5	Cannot be connected	6	Cannot be connected
7	Cannot be connected	8	Cannot be connected
9	SEG0	10	SEG1
11	SEG2	12	SEG3
13	SEG4	14	SEG5
15	SEG6	16	SEG7
17	SEG8	18	SEG9
19	SEG10	20	SEG11
21	SEG12	22	SEG13
23	SEG14	24	SEG15
25	SEG16	26	SEG17
27	SEG18	28	SEG19
29	SEG20	30	SEG21
31	Cannot be connected	32	Cannot be connected
33	Cannot be connected	34	Cannot be connected
35	Cannot be connected	36	Cannot be connected
37	Cannot be connected	38	Cannot be connected
39	Cannot be connected	40	Cannot be connected
41	Cannot be connected	42	Cannot be connected
43	Cannot be connected	44	Cannot be connected
45	Cannot be connected	46	Cannot be connected
47	Cannot be connected	48	Cannot be connected
49	Cannot be connected	50	Cannot be connected
51	Cannot be connected	52	Cannot be connected
53	Cannot be connected	54	Cannot be connected
55	Cannot be connected	56	Cannot be connected
57	Cannot be connected	58	Cannot be connected
59	Cannot be connected	60	Cannot be connected

5 OPERATION METHOD OF S5U1C621C0E

5.1 Preparation

This section describes the common preparation work necessary when the S5U1C621C0E is used by itself and when it is connected to the ICE. Connection method, refer to Chapter 4, "CABLE CONNECTION". Check the S5U1C621C0E operation by mounting the supplied diagnostic ROMs as instructed in Chapter 6. It is recommended that this test be performed periodically.
Before doing the following, be sure to turn the POWER switch of the S5U1C621C0E off.

5.1.1 Creation of target system

Mount the LCD panel, keys, and switches on the board to build a target system. Use the I/O connector and LCD connectors supplied with the S5U1C621C0E to connect the S5U1C621C0E to the target system. (For the pin layout of each connector, see Tables 4.3.1–4.3.4 in Chapter 4.)

Note: That there is some difference in specifications between the S5U1C621C0E and the actual IC. Refer to Section 2.2, "Differences from Actual IC" when building a target system.

5.1.2 Creation and installation of ROMs

Create the program ROMs, option ROMs, and insert them into the sockets of the S5U1C621C0E. When the S5U1C621C0E is delivered, the function option ROM and segment option ROM for a diagnostic program are already installed. Replace them with the created ROMs.

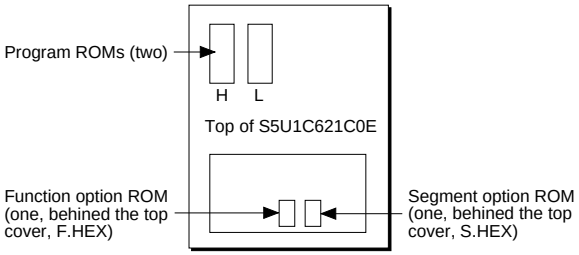


Fig. 5.1.2.1 Installation of ROMs

- Program ROMs (two)
  The program ROMs contain the application program machine code. Write the HEX files output by the ASM621C or the ASM6292 cross-assembler into EPROMs to create program ROMs. Since two HEX files containing the high-order section (C21CXXXH.HEX or C292XXXH.HEX) and the low-order section (C21CXXXL.HEX or C292XXXL.HEX) of the machine code are output, two ROMs are created. Insert H.HEX into socket H and L.HEX into socket L on the top panel.

  These ROMs are not necessary when connecting the S5U1C621C0E to the ICE. In addition, it is necessary to write the object data into the EPROM attaching the offset address as Table 5.1.2.1 according to the type of EPROM that is used.

Table 5.1.2.1 Offset address

Type of EPROM	Offset value
27C64	0000H (without offset)
27C128	0000H (without offset)
27C256	4000H
27C512	C000H

- Function option ROM (one)
  The function option ROM is used to specify function options, such as I/O ports. Create the option ROM from the function option HEX file (C21CXXXF.HEX or C292XXXF.HEX) output by the function option generator, and insert it into the socket (F.HEX) in the top cover. This ROM is effective even when the ICE is connected, however, this ROM is disregarded due to the loading of the data from the ICE.

- Segment option ROM (one)
  The segment option ROM is used to specify segment output port. Create the option ROM from the segment option HEX file (C21CXXXS.HEX or C292XXXS.HEX) output by the segment option generator, and insert it into the S.HEX socket in the top cover. This ROM is effective even when the ICE is connected, however, this ROM is disregarded due to the loading of the data from the ICE.

- EPROM specifications
  Use EPROMs with the following specifications:

Program ROM:	27C64 to 27C512	(250 ns or less access time)
Function option ROM:	27C64 to 27C512	(250 ns or less access time)
Segment option ROM:	27C64 to 27C512	(250 ns or less access time)

5.2 Independent Use of S5U1C621C0E

This section describes operation when using the S5U1C621C0E by itself.
The S5U1C621C0E may be used independently by connecting a power supply to it. Use a 5 V DC regulator (more than 3 A) as an external power supply. Connect it with the correct polarity (+ and -).
(Refer to Section 4.2, "Power Cable Connection".)

5.2.1 Power on/off

Before turning the POWER switch of the S5U1C621C0E on, confirm the following:

(1) The power cable is connected correctly.
(2) The target system is connected correctly.
(3) The ROMs have been installed correctly.

After confirming the above items, turn the POWER switch of the S5U1C621C0E on using the following procedure:

(1) Turn the regulator on. If the regulator is of the variable-voltage type, set the output voltage to 5 V.
(2) Turn the POWER switch of the S5U1C621C0E on.

Note: To turn the POWER switch of the S5U1C621C0E off, then on, turn it off, wait for 10 seconds or more, and then turn it on.

After the POWER switch of the S5U1C621C0E has been turned on, the DONE LED (green) on the top cover lights after several seconds to indicate that debugging may proceed. If the DONE LED is still off 10 seconds or more after the POWER switch has been turned on, do the following:

(1) Turn the POWER switch of the S5U1C621C0E off.
(2) Confirm that the ROMs have been installed properly, and the cables connected properly.
(3) Check the fuse.
(4) Turn the POWER switch of the S5U1C621C0E on.

If the DONE LED still does not light, do a self-diagnosis.
For the self-diagnosis method, refer to the Chapter 6.

5.2.2 Debugging

When the S5U1C621C0E is used alone, it provides the following debugging functions. The method of operation is given below.

- Program free run
  When the RESET switch (on the top cover) is pressed, the S5U1C621C0E enters the program run state, and executes the application program from page 1, step 0. Before pressing the RESET switch after the power to the S5U1C621C0E has been switched on, make sure that the DONE LED is lit.

- Other functions
  The operation of the SVD can be confirmed with the VSVD control.
  The LCD drive voltage can be fine tuned with the VADJ control.
  When the OSC3 CR oscillation has been selected, the oscillation frequency can be adjusted with the OSC3ADJ control.
  The following statuses can be checked with the LEDs or CHK pins; OSCC register, CLKCHG register, LPWR register and SVDON register.
  OSC, SVD and REM (S1C621C0 only) control timing errors can be checked with the LEDs.

5.3 Operation When ICE is Connected

This section explains the operation and use of the S5U1C621C0E when it is connected to the ICE.
Set up the S5U1C621C0E as follows when it is connected to the ICE:

(1) Do not connect the power supply.
(2) Keep on turning the POWER switch off.

5.3.1 Power on/off

Power to the S5U1C621C0E is supplied by the ICE, and the power is switched on and off by pressing the POWER switch of the ICE. Keep the POWER switch of the S5U1C621C0E off.

Note: To turn the POWER switch of the ICE off, then on, turn it off, wait for 10 seconds or more, and then turn it on.

After the POWER switch of the ICE has been turned on, the DONE LED (green) on the top cover of the S5U1C621C0E lights after several seconds to indicate that debugging may proceed. If the DONE LED is still off 10 seconds or more after the POWER switch has been turned on, do the following:

(1) Turn the POWER switch of the ICE off.
(2) Confirm that the circuit breaker of the ICE is on.
(3) Confirm that the ROMs have been installed properly and the cables connected properly.
(4) Turn the POWER switch of the ICE on.

If the DONE LED still does not light, do a self-diagnosis.
For the self-diagnosis method, refer to the Chapter 6.

5.3.2 Debugging

Debugging is done with the host computer, and the S5U1C621C0E is controlled by the ICE. For the method of operation, refer to the "S1C62 Family Development Tool Reference Manual" and the "S5U1C62xxxD Manual". The S5U1C621C0E can control the following six functions:

(1) Pseudo power supply voltage change with the VSVD control
(2) The VADJ control is used to fine tune LCD drive voltage.
(3) The OSC3ADJ control is used to adjust the OSC3 CR oscillation frequency.
(4) Ceramic oscillation frequency switching function
(5) OSCERR, SVDERR and REMERR (S1C621C0 only) LEDs' functions
(6) RESET switch

The others are invalid. Do not operate the S5U1C621C0E side. The program free run function does not function when the target program ROM is installed.

6 OPERATING TEST

Self-diagnosis of the S5U1C621C0E can be performed with the following operating tests. To perform these tests, one function option ROM, one segment ROM and two program ROMs (supplied) are required. If these ROMs have not been installed, insert them into the sockets. To use the S5U1C621C0E independently, connect the external power supply (5 V DC, 3 A).

This test checks the start of the S5U1C621C0E. If the S5U1C621C0E does not operate normally, check whether the ROMs have been installed correctly and whether the external power is being input correctly. Then perform the test again. If the test repeatedly fails after being retried several times, the S5U1C621C0E is faulty.

Operation

Check whether the DONE LED lights correctly.

(1) Open the top cover.

(2) Confirm that the POWER switch is off.

(3) Insert the diagnostic ROMs (H.HEX and L.HEX) into sockets H and L (the sockets into which program ROMs are normally inserted) on the panel. Confirm that the option ROM and segment ROM have been installed properly.

(4) Turn the POWER switch on. If the POWER switch has just been turned off, wait for at least 10 seconds before turning it on.

(5) Check whether the DONE LED (green) under the top cover lights correctly.

(6) If the LED does not light within 10 seconds of the power being switched on, turn the POWER switch off, and check the fuse and external power connector. Wait for at least 10 seconds, then perform the test again.

7 PRODUCT SPECIFICATIONS

The components specifications of the S5U1C621C0E are listed below.

■ S5U1C621C0E

Dimensions:	325 mm (width) × 382 mm (depth) × 105 mm (height) (Including rubber feet)	
Weight:	About 6 kg	(main unit only)
Color:	Cygnus white	
Power supply:	5 V DC, 3 A or more	(from external power supply)
	When connected to the ICE, power is supplied by the ICE.	
Board:	Main board × 1	
	Sub board × 2	

■ ICE interface cable (supplied with ICE)

S5U1C621C0E connector:	3433-6002LCSC or equivalent	
Cable connector:	3425-6500SC	
Cable:	50-pin flat cable × 2	
Interface:	CMOS interface (5 V)	
Length:	About 50 cm	(Two cables are the same)

■ LCD connection cable (supplied with S5U1C621C0E)

S5U1C621C0E connector:	J3372-P302VE or equivalent
Cable connector:	7960-6500SC
Cable:	60-pin flat cable × 1
Interface:	CMOS interface (5 V)
Length:	About 50 cm

■ LCD emulator cable (supplied with LCD emulator)

S5U1C621C0E connector:	3432-5002LCSC or equivalent
Cable connector:	7940-6500SC
Cable:	40-pin flat cable × 1
Interface:	CMOS interface (5 V)
Length:	About 50 cm

■ I/O cable (supplied with S5U1C621C0E)

S5U1C621C0E connector:	3433-5002LCSC or equivalent
Cable connector:	7950-6500SC
Cable:	50-pin flat cable × 1
Interface:	CMOS interface (5 V)
Length:	About 50 cm

■ Power cable (supplied with S5U1C621C0E)

S5U1C621C0E connector:	MOLEX 5276-03A or equivalent
Cable connector:	MOLEX 5196-03
Other side connector:	(According to power supply specifications)
Cable length:	About 80 cm
Capacity:	5 V DC, 3 A or more

■ Accessories

Fuse type / rating:	MGC-ULCSA 250V 3 A × 1	
60-pin connector:	For connecting to target system	3372-6002LCSC × 1 (For LCD cable connection)
50-pin connector:	For connecting to target system	3433-6002LCSC × 1 (For I / O cable connection)

■ EPROM

For programs:	Intel i27C64–i27C512 or equivalent	(Access time 250 ns or less)
For function options:	Intel i27C64–i27C512 or equivalent	(Access time 250 ns or less)
For segment options:	Intel i27C64–i27C512 or equivalent	(Access time 250 ns or less)

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