

# CMOS 4-BIT SINGLE CHIP MICROCOMPUTER **S5U1C62N51E1 Manual** (Evaluation Board for S1C60N01/60N02/60N05/62N51/6S3N7)

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## Configuration of product number



\*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

51	S1C60 Family processors S1C62 Family processors							
	Previous No.	New No.		Previous No.	New No.	[	Previous No.	New No.
	E0C6001	S1C60N01		E0C621A	S1C621A0		E0C6247	S1C62470
	E0C6002	S1C60N02		E0C6215	S1C62150		E0C6248	S1C62480
	E0C6003	S1C60N03		E0C621C	S1C621C0		E0C6S48	S1C6S480
	E0C6004	S1C60N04		E0C6S27	S1C6S2N7		E0C624C	S1C624C0
	E0C6005	S1C60N05		E0C6S37	S1C6S3N7		E0C6251	S1C62N51
	E0C6006	S1C60N06		E0C623A	S1C6N3A0		E0C6256	S1C62560
	E0C6007	S1C60N07		E0C623E	S1C6N3E0		E0C6292	S1C62920
	E0C6008	S1C60N08		E0C6S32	S1C6S3N2		E0C6262	S1C62N62
	E0C6009	S1C60N09		E0C6233	S1C62N33		E0C6266	S1C62660
	E0C6011	S1C60N11		E0C6235	S1C62N35		E0C6274	S1C62740
	E0C6013	S1C60N13		E0C623B	S1C6N3B0		E0C6281	S1C62N81
	E0C6014	S1C60140		E0C6244	S1C62440		E0C6282	S1C62N82
	E0C60R08	S1C60R08		E0C624A	S1C624A0		E0C62M2	S1C62M20
				E0C6S46	S1C6S460		E0C62T3	S1C62T30

## Comparison table between new and previous number of development tools

Development tools for the S1C60/62 Family

Previous No.	New No.	Previous No.	New No.	Previous No.	New No.
ASM62	S5U1C62000A	DEV6262	S5U1C62620D	EVA623B	S5U1C623B0E
DEV6001	S5U1C60N01D	DEV6266	S5U1C62660D	EVA623E	S5U1C623E0E
DEV6002	S5U1C60N02D	DEV6274	S5U1C62740D	EVA6247	S5U1C62470E
DEV6003	S5U1C60N03D	DEV6292	S5U1C62920D	EVA6248	S5U1C62480E
DEV6004	S5U1C60N04D	DEV62M2	S5U1C62M20D	EVA6251R	S5U1C62N51E1
DEV6005	S5U1C60N05D	DEV6233	S5U1C62N33D	EVA6256	S5U1C62N56E
DEV6006	S5U1C60N06D	DEV6235	S5U1C62N35D	EVA6262	S5U1C62620E
DEV6007	S5U1C60N07D	DEV6251	S5U1C62N51D	EVA6266	S5U1C62660E
DEV6008	S5U1C60N08D	DEV6256	S5U1C62560D	EVA6274	S5U1C62740E
DEV6009	S5U1C60N09D	DEV6281	S5U1C62N81D	EVA6281	S5U1C62N81E
DEV6011	S5U1C60N11D	DEV6282	S5U1C62N82D	EVA6282	S5U1C62N82E
DEV60R08	S5U1C60R08D	DEV6S27	S5U1C6S2N7D	EVA62M1	S5U1C62M10E
DEV621A	S5U1C621A0D	DEV6S32	S5U1C6S3N2D	EVA62T3	S5U1C62T30E
DEV621C	S5U1C621C0D	DEV6S37	S5U1C6S3N7D	EVA6S27	S5U1C6S2N7E
DEV623B	S5U1C623B0D	EVA6008	S5U1C60N08E	EVA6S32R	S5U1C6S3N2E2
DEV6244	S5U1C62440D	EVA6011	S5U1C60N11E	ICE62R	S5U1C62000H
DEV624A	S5U1C624A0D	EVA621AR	S5U1C621A0E2	KIT6003	S5U1C60N03K
DEV624C	S5U1C624C0D	EVA621C	S5U1C621C0E	KIT6004	S5U1C60N04K
DEV6248	S5U1C62480D	EVA6237	S5U1C62N37E	KIT6007	S5U1C60N07K
DEV6247	S5U1C62470D	EVA623A	S5U1C623A0E		

## **S5U1C62N51E1** Manual (Evaluation Board for S1C60N01/60N02/60N05/62N51/6S3N7)

This manual describes how to operate the S5U1C62N51E1, a debugging tool for the S1C62N51, S1C6S3N7, S1C60N01, S1C60N02 and S1C60N05 4-bit single-chip microcomputer.

Refer to the Technical Manual of each model for details of the S1C62N51, S1C6S3N7, S1C60N01, S1C60N02 and S1C60N0, and the "S5U1C62000A Manual" and the "S5U1C62xxxD Manual" for the development procedure and other information.

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## 1. INTRODUCTION

## 1.1 S5U1C62N51E1 Outline

The S5U1C62N51E1 is a development tool for the S1C62N51, 6S3N7, 60N01, 60N02 and 60N05. Almost the same functions that the S1C62N51/ 6S3N7/60N01/60N02/60N05 CPU has can be implemented by writing application program and option data created by the option generator into EPROM, and installing it in the S5U1C62N51E1.

In addition, the S5U1C62N51E1 can interface with the in-circuit emulator ICE (S5U1C62000H), and so perform a higher level of debugging.



\* The name 'EVA6251R' on the development tool is the old name of the product.

## 1.2 S5U1C62N51E1 Components

When unpacking the S5U1C62N51E1, check that the following goods are present:

(1)	S5U1C62N51E1 main unit	l
(2)	LCD connection cable and connector (60-pin flat type)	l set
(3)	I/O connection cable and connector (50-pin flat type)	l set
(4)	Power cable (3-pin)	l set
(5)	Fuse (3 A)	l
(6)	S5U1C62N51E1 Manual (Evaluation Board	
	for S1C60N01/60N02/60N05/62N51/6S3N7) (this manual)	l
(7)	Warranty registration card	l
(8)	Warranty certificate	l
(9)	Notes on use	[



## 2. PRODUCT SPECIFICATIONS

The components specifications of the S5U1C62N51E1 are listed below.

## ■ S5U1C62N51E1

Dimensions:	$203 \text{ mm} (\text{width}) \times 275 \text{ mm}$	$(depth) \times 65 mm$ (height	nt) (Including rubber feet)
Weight:	About 2.04 kg	(main un	it only)
Color:	Cygnus white		
Power supply:	5 V (±10%) DC, 3 A or mo	ore (from ex	ternal power supply)
	When connected to the IC	E, power is supplied b	by the ICE.
Board:	Main board $\times$ 1		-
	Sub board $\times 1$		
Operating conditions:	Operating temperature	5°C to 40°C	
	Storage temperature	$-20^{\circ}$ C to $+60^{\circ}$ C	
	Operating humidity	35% to 80%	
	Storage humidity	20% to 90%	
	Resistance to vibration	Operating	0.25G Max.
		Transportation	2G Max.
	Resistance to impulse	Operating	1G Max.
		Standby	2G Max.

## ■ LCD connection cable

## ■ I/O cable

S5U1C62N51E1 connector:	J3433-P302VE or equivalent
Cable connector:	7950-6500SC
Cable:	50-pin flat cable $\times$ 1
Interface:	CMOS interface (5 V)
Length:	About 50 cm

## Power cable

S5U1C62N51E1 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

## 3. NAMES AND FUNCTIONS OF PARTS

This section describes the names and functions of the parts of the S5U1C62N51E1.

## 3.1 Basic Functions

The S5U1C62N51E1 has the following basic functions:

#### Program execution (Run function)

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

#### Interface with ICE

The S5U1C62N51E1 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.

Note: Be sure to use option data created by the function and segment option generators compatible with the S5U1C62N51E1 to make the EPROMs. Data created by the old function and segment option generators cannot be used.

## 3.2 Functions of Parts

#### 3.2.1 Front panel



#### 3.2.3 Board (under top cover)



Fig. 3.2.3.1 Layout on the board

## ROM sockets

## • L.HEX, H.HEX

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.HEX socket, and the ROM (H.HEX) containing the 4 high-order bits (IB to I8) into the H.HEX socket.

#### • F.HEX

This is the IC socket into which the ROM (F.HEX) is inserted. This ROM includes the function options generated by the function option generator (FOG62N51, 6S3N7, 60N01, 60N02, 60N05) for the S5U1C62N51E1.

#### • S.HEX

This is the IC socket into which the ROM (S.HEX) is inserted. This ROM includes the segment options generated by the segment option generator (SOG62N51, 6S3N7, 60N01, 60N02, 60N05) for the S5U1C62N51E1.

Note: Do not use the option data generated by the function and segment option generators for an Evaluation Board other than the S5U1C62N51E1. Data created by the old function and segment option generators cannot be used. It will cause a malfunction.

## Switch

## • RESET switch

This switch resets the CPU and starts the target program from page 01H, step 00H.

## Controls

## OSC1 ADJ

This is the control for varying the CR oscillation frequency. This control is effective only when CR oscillation is selected for the OSC1 oscillator type by mask option. The CR oscillation frequency can be checked with an oscilloscope or other instrument by connecting to the test pin "CR-FREQ".

#### VSVD

This is the control for varying the power supply voltage in simulation to check SVD operation. (Refer to Section 6.2, "Differences from Actual IC".

## FUSE

## • FUSE1

This is 3 A tubular fuse for external power supply, and is blown off by current of 3 A or more.

## LEDs

## • POWER

This LED lights when the S5U1C62N51E1 turns on.

• HLT/SLP

This LED lights when the CPU enters HALT or SLEEP status. (The S5U1C62N51E1 does not support SLEEP mode.)

• AD0

This LED indicates the status of the address 0 (AD0) signal. It can be used to check whether or not the S5U1C62N51E1 works.

#### • SHEXLD

This LED 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 (S.HEX) or has been loaded from a personal computer. Refer to the development tool manual for the S1C62N51, 6S3N7, 60N01, 60N02 or 60N05 in regard to the loading of the segment option using the ICE.

Note: Be sure to use S.HEX created by the segment option generator compatible with the S5U1C62N51E1. Data created by the old segment option generator cannot be used.

#### • LFHX

This LED lights when function option data from a personal computer is loaded using the in-circuit emulator ICE. As result, it can differentiate whether the currently specified function option is due to the ROM (F.HEX) or has been loaded from a personal computer. Refer to the development tool manual for the S1C62N51, 6S3N7, 60N01, 60N02 or 60N05 in regard to the loading of the function option using the ICE.

Note: Be sure to use F.HEX created by the function option generator compatible with the S5U1C62N51E1. Data created by the old function option generator cannot be used.

#### • CSDC, SWRUN

These LEDs indicate the values ("1" or "0") of the following registers. LED lights when "1" is set in the register, and it goes off when "0" is set in the register.

CSDC CSDC register (address 0FBH•D3)

SWRUN SWRUN register (address 0F9H•D1) (Available only when S5U1C62N51E1 is set for the S1C6S3N7.)

#### • OSC1XT

This LED lights when the OSC1 oscillation circuit is set to crystal oscillation by function option.

#### • OSC1CR

This LED lights when the OSC1 oscillation circuit is set to CR oscillation by function option.

#### • HVLD, SVDON

These LEDs indicate the values ("1" or "0") of the following registers. LED lights when "1" is set in the register, and it goes off when "0" is set in the register.

HVLD HLMOD register (address 0FAH•D3)

SVDON SVDON register (address 0FAH•D0)

In the actual IC, power saving needs to stop the HVLD and SVD functions when they are unnecessary.

## Test pins

## • RS, TH1, TH2, CS pins (sockets)

These pins (or the socket) are used to connect external parts, such as resistors, thermistors and capacitors, when using the R/F converter (available only when S5U1C62N51E1 is set for the S1C62N51, 60N02 or 60N05).

When using the connecting pins, pay attention to the stray capacitance of the connecting cable and noise. When using the socket, insert the parts in the correct position (TH1: between pins 1 and 16, TH2: between pins 3 and 14, RS: between pins 5 and 12, CS: between pins 7 and 10).

The connecting pins and socket pins have approximatelys 10 pF stray capacitance. Furthermore, the measurement results may differ from those of the actual IC because the characteristics of the parts used for R/F conversion are different. In particular, pay attention when the software uses an MSB or LSB area in the measurement counter.

## • ADOUT

This pin is used for monitoring the signal (analog waveform) input to the CS pins while the R/F converter is operating. (The R/F converter function is available when the S5U1C62N51E1 is set for S1C62N51, 60N02 or 60N05.) The frequency in each mode can be measured without affecting the R/F conversion accuracy.

#### OSC1CR

This pin outputs high level when the CR oscillator is selected for the OSC1 oscillation circuit.

• LFHX

This pin outputs high level when function option data has been loaded from personal computer through the ICE.

## SVDON

This pin outputs high level when the SVDON register (address 0FAH, bit D0) is set to "1" and outputs low level when the register is set to "0".

## 3.3 S5U1C62N51E1 I/O and LCD Connectors

Table 3.3.1 I/O #0 connector pins

Pin No.	Signal name	Pin No.	Signal name
1	Vdd (+5 V)	2	Vdd (+5V)
3	Vdd (+5 V)	4	Vdd (+5V)
5	Cannot be connected	6	K00
7	K01	8	K02
9	K03	10	Cannot be connected
11	Cannot be connected	12	Cannot be connected
13	P00	14	P01
15	P02	16	P03
17	Cannot be connected	18	Cannot be connected
19	Cannot be connected	20	Cannot be connected
21	Cannot be connected	22	Cannot be connected
23	Cannot be connected	24	Cannot be connected
25	Cannot be connected	26	Cannot be connected
27	Cannot be connected	28	Cannot be connected
29	Cannot be connected	30	R00
31	R01	32	R02
33	R03	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	RESET	46	Cannot be connected
47	Vss (GND)	48	Vss (GND)
49	Vss (GND)	50	Vss (GND)

\* R02 and R03 are not available when the S5U1C62N51E1 is set for the S1C60N01.

Table 3.3.2		connector	nins
	LUD #0	CONTRECTOR	pills

			-
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	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

\* When set for S1C62N51 or 6S3N7, SEG0 to SEG25 are available.

When set for S1C60N01, 60N02 or 60N05, only SEG0 to SEG19 are available.

## 4. CABLE CONNECTION

This section describes how to connect the power cable to the S5U1C62N51E1, and the S5U1C62N51E1 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 S5U1C62N51E1 is connected to the ICE by connecting the two interface cables (F1 and F5). Use S5U1C62N51E1 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 S5U1C62N51E1 has an external power input connector for +5 V (VDD) and GND (Vss). Leave these connectors unconnected when the S5U1C62N51E1 is connected to the ICE.

## 4.2 Power Cable Connection

When using the S5U1C62N51E1 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 S5U1C62N51E1 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.

## 4.3 Connection to Target System

The I/O #0 and LCD #0 connectors are used to connect the S5U1C62N51E1 to the target system. The signals output from the LCD #0 connector are the same as those of the actual IC at the function level. Therefore, the S5U1C62N51E1 may be connected to the LCD of the target system without any changes.



Fig. 4.2.1 Connection of power cable pins



Fig. 4.3.1 Connection of target system

## 5. OPERATION METHOD OF S5U1C62N51E1

## 5.1 Preparation

This section describes the common preparation work necessary when the S5U1C62N51E1 is used by itself and when it is connected to the ICE.

Before doing the following, be sure to turn the POWER switch of the S5U1C62N51E1 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 connector supplied with the S5U1C62N51E1 to connect the S5U1C62N51E1 to the target system. (For the pin layout of each connector, refer to Section 3.3, "S5U1C62N51E1 I/O and LCD Connectors".)

Note: There is some difference in specifications between the S5U1C62N51E1 and the actual CPU. Refer to Section 6.2, "Differences from Actual IC" when building a target system.

#### 5.1.2 Creation and installation of ROMs

Create the program ROMs, function option ROM and segment option ROM, and insert them into the sockets of the S5U1C62N51E1.

## • Program ROMs (two)

The program ROMs contain the application program machine code. Write the HEX files output by the ASM62N51, 6S3N7, 60N01, 60N02, 60N05 cross-assembler for S5U1C62N51E1 into EPROMs to create program ROMs. Since two HEX files containing the high-order section (C251XXXH.HEX\*) and the low-order section (C251XXXL.HEX\*) of the machine code are output, two ROMs are created. Insert them into the socket

H.HEX and L.HEX under the top cover, respectively. These ROMs are not necessary when connecting the S5U1C62N51E1 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

EPROM type	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 (C251XXXF.HEX\*) output by the function option generator, and insert it into the F.HEX socket under 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 segment ROM from the segment option HEX file (C251XXXS.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)

\* "C2<u>51</u>XXX" is an example when set for the S1C62N51.

## 5.2 Independent Use of S5U1C62N51E1

This section describes operation when using the S5U1C62N51E1 by itself. The S5U1C62N51E1 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 S5U1C62N51E1 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 S5U1C62N51E1 on using the following procedure:

(1) Turn the regulator on. If the regulator is a variable-voltage type, set the output voltage to 5 V  $\pm 10\%$ .

(2) Turn the POWER switch of the S5U1C62N51E1 on.

#### 5.2.2 Debugging

When the S5U1C62N51E1 is used alone, it provides the following debugging function. The method of operation is given below.

#### • Program free run

When the RESET switch (under the top cover) is pressed, the S5U1C62N51E1 enters the program run state, and executes the application program from page 1, step 0.

## 5.3 Operation When ICE is Connected

This section explains the operation and use of the S5U1C62N51E1 when it is connected to the ICE. Set up the S5U1C62N51E1 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 S5U1C62N51E1 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 S5U1C62N51E1 off.

#### 5.3.2 Debugging

Debugging is done with the host computer, and the S5U1C62N51E1 is controlled by the ICE. For the method of operation, refer to the development tool manual for the S1C62N51, 6S3N7, 60N01, 60N02 or 60N05. The S5U1C62N51E1 can control the following two functions:

(1) RESET switch

(2) OSC1 CR oscillation frequency adjustment

## **6. PRECAUTIONS**

Take the following precautions when using the S5U1C62N51E1:

## 6.1 Precautions for Operation

- Be sure to use the Development Tool that supports the S5U1C62N51E1. Development Tools for the EVA6251, 6S37, 6001, 6002 and 6005 must never been used.
- Turn the power of all equipment off before connecting or disconnecting cables.
- To turn the POWER switch of the S5U1C62N51E1 off, then on again, wait for at least 10 seconds after turning off before turning on.
- When ROMs are inserted into the 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 S5U1C62N51E1. (Top panel) Program ROM 2 L HEX H HEX

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

• When developing and debugging the program by connecting the S5U1C62N51E1 to the ICE, the S5U1C62N51E1 reset switch and the target board cannot reset the CPU while the ICE is in monitor status. In this case, reset the CPU by executing the "I" command from the ICE. In Run status, resetting by the S5U1C62N51E1 or target board will be accepted.

## 6.2 Differences from Actual IC

There are some differences in functions between the S5U1C62N51E1 and the actual IC.

## I/O

- The response time has been changed by the differences in logic level, output drive capability, and pull-down resistance. The minimum operating voltage is also different from the actual IC.
- When the segment terminals are set to DC output, the output signals are delivered with 0 V and +5 V  $\pm 10\%$ .

## 

- The output drive capability is different.
- When the S5U1C62N51E1 is set for the S1C62N51, the LCD drive voltages are set at  $V_{L1} = 1.0 \text{ V}$ ,  $V_{L2} = 2.0 \text{ V}$  and  $V_{L3} = 3.0 \text{ V}$ .

When the S5U1C62N51E1 is set for the S1C6S3N7, 60N01, 60N02 or 60N05, the LCD drive voltages can be selected from the following three types by function option:

1)  $V_{L1} = 1.0 V$ ,  $V_{L2} = 2.0 V$ ,  $V_{L3} = 3.0 V$ 

- 2)  $V_{L1} = 1.5 V$ ,  $V_{L2} = 3.0 V$ ,  $V_{L3} = 4.5 V$
- 3)  $V_{L1} = V_{L2} = 1.5 V$ ,  $V_{L3} = 3.0 V$

However, external voltage cannot be supplied from outside of the S5U1C62N51E1 even when "external power" is selected for the LCD power supply. The S5U1C62N51E1 generates the LCD drive voltage inside and outputs it to the LCD panel.

## Oscillation circuit

• The type of OSC1 oscillation circuit can be set by function option as follows:

32.768 kHz crystal oscillation or 30 kHz to 90 kHz CR oscillation

The CR oscillation clock frequency can be adjusted using the OSC1 ADJ control mounted on the board.

• The oscillation start and stop times are different from those of the IC. Because the logic level of S5U1C62N51E1 is higher than it of the actual IC.

## **R/F converter** (when set for the S1C62N51, 60N02 or 60N05 is selected by function option)

• The CR oscillation characteristics are different from those of the actual IC because the operating voltage and parts of the oscillation circuit are different.

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