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CMOS 16-BIT SINGLE CHIP MICROCOMPUTER

# S5U1C17702T1100

# Hardware Manual

(Software Evaluation Tool for S1C17702)

SEIKO EPSON CORPORATION

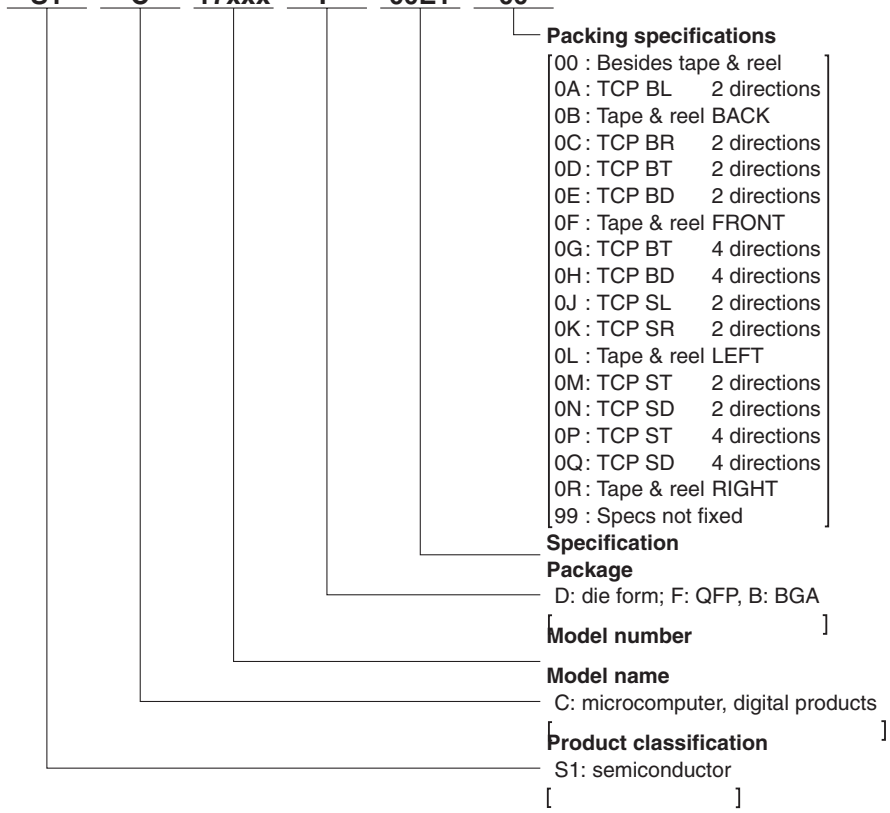
## Evaluation board/kit and Development tool important notice

1. This evaluation board/kit or development tool is designed for use for engineering evaluation, demonstration, or development purposes only. Do not use it for other purpose. It is not intended to meet the requirement of design for finished product.
2. This evaluation board/kit or development tool is intended for use by an electronics engineer, and it is not the product for consumer. The user should use this goods properly and safely. Seiko Epson dose not assume any responsibility and liability of any kind of damage and/or fire coursed by usage of it. User should cease to use it when any abnormal issue occurs even during proper and safe use.
3. The part used for this evaluation board/kit or development tool is changed without any notice.

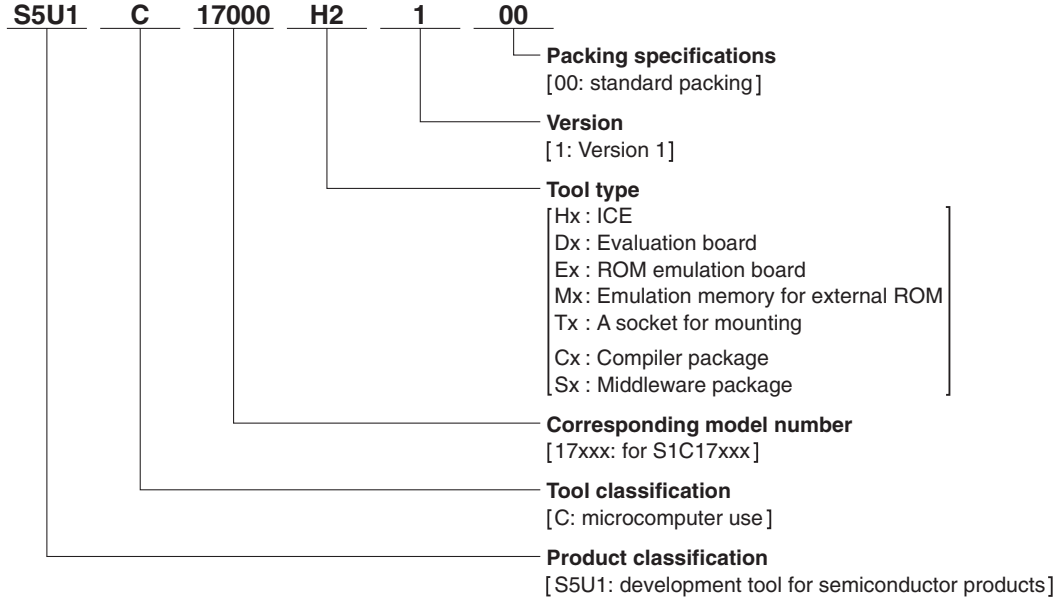
## NOTICE

## Configuration of product number

### Devices




### Development tools



## - Table of Contents -

# 1 Features

S5U1C17702T1100 (Software evaluation Tool for S1C17801. Hereafter referred to as SVT17702)is an evaluation board for S1C17702 manufactured by SEIKO EPSON.
The SVT17702 consists of two circuit boards: CPU and LCD boards. By connecting these boards, the SVT17702 allows the user to debug the application software without an ICD or other debugging tools.
In addition, it provides extended interfaces such as serial ports, allowing you to connect your own expansion boards to the SVT17702.

**<CPU Board>**

| | |
|---|---|
| CPU | S1C17702 |
| Input power voltage | +3.3 VDC (supplied through the ICD interface or CR2032 coin cell battery) |
| CPU input clock | OSC1: 32.768 kHz<br>OSC3: 6 MHz |
| On-board functions/devices | • Reset switch<br>• Expansion interface connectors (GPIO, UART, I2C and SPI)<br>• ICD board connector<br>• Key input circuit (4 keys)<br>• Rotary encoder with switch<br>• Infrared transmitter LED/Receiver module<br>• STN LCD panel (display size: 32 commons x 128 segments, black & white)(32 commons and 72 segments can be driven) |

**<ICD Board>**

| | |
|---|---|
| PC interface | USB 1.1 |
| Power supply voltage | USB bus power (On-board regulator output voltage of 3.3 V) |
| On-board functions/devices | • Tri-color status LED<br>• Reset switch<br>• CPU board connector |

# 2 Components Included in the Package

The S5U1C17702T1100 package contains:

(1) SVT17702 CPU board (evaluation board) ..... 1
(2) SVT17702 ICD board ..... 1
(3) USB cable ..... 1
(4) Coin cell battery (CR2032/3V) ..... 1
(5) Warranty Registration Card ..... 1 each for English/Japanese
(6) Warranty Card ..... 1 each for English/Japanese
(7) Precautions in Use ..... 1 each for English/Japanese
(8) Manual Download Guide ..... 1 each for English/Japanese

# 3 Name and Functions of Each Part

## 3.1 Name of Each Part

The following describes name and functions of each part:

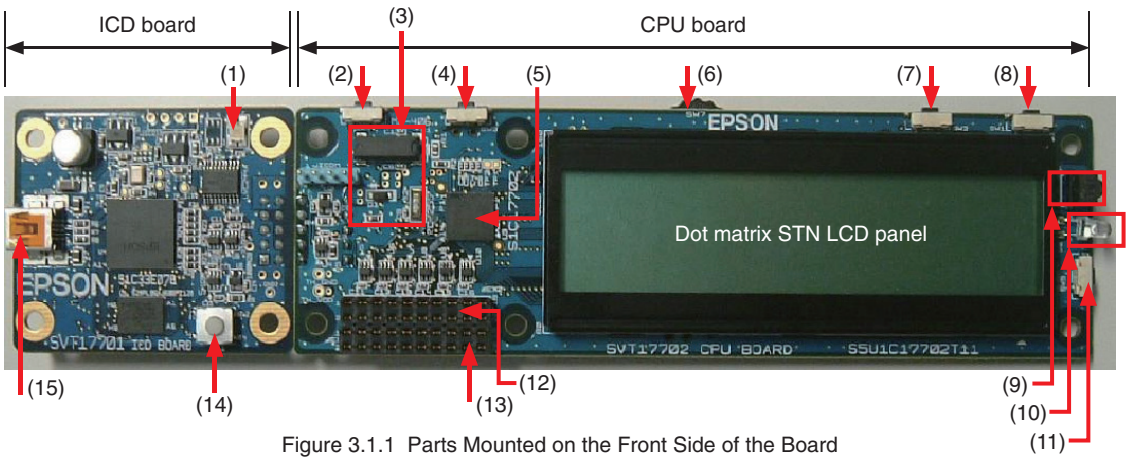



Figure 3.1.1 Parts Mounted on the Front Side of the Board

(1) LED(RGB)
(2) SW4
(3) Crystal oscillator (6MHz/32kHz)
(4) SW3
(5) S1C17702
(6) Rotary encoder
(7) SW2
(8) SW1
(9) Infrared receiver module
(10) Infrared transmitter module
(11) CPU board reset switch
(12) Expansion board connector (JEX2)
(13) Expansion board connector (JEX)
(14) ICD board reset switch (SW1)
(15) miniB USB connector

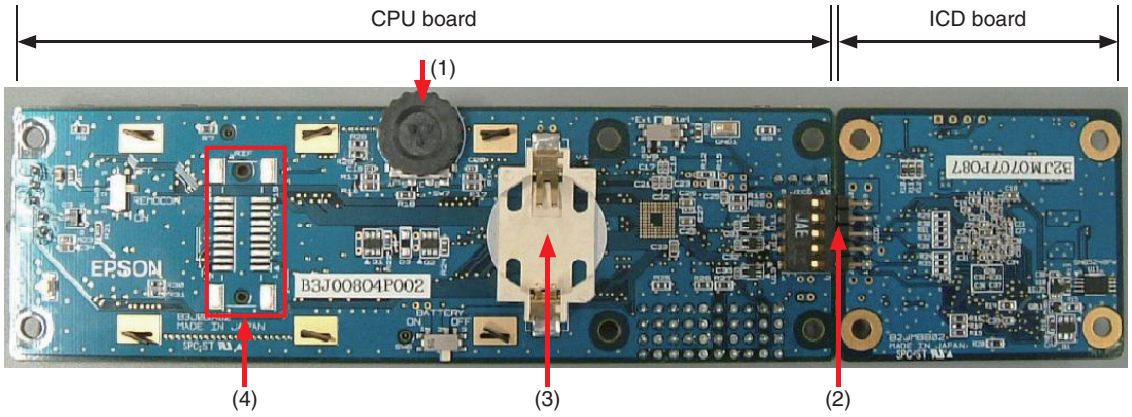



Figure 3.1.2 Parts Mounted on the Back Side of the Board

(1) Rotary encoder
(2) ICD board to CPU board connector (JICD)
(3) Battery socket
(4) Expansion board connector (JRIF) (Not mounted)

# 3.2 Dimensions of the Boards

## 3.2.1 Dimensions of the CPU Board

The following drawings show the dimensions of the CPU board.

### <Top view>

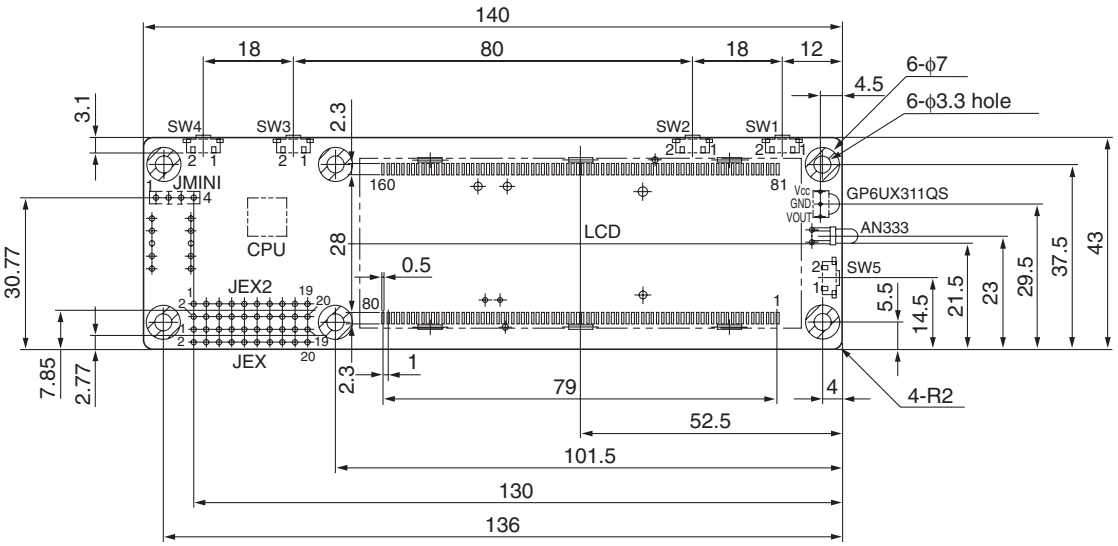



Figure 3.2.1.1 Dimensions of the CPU Board (Front)

### <Bottom view>

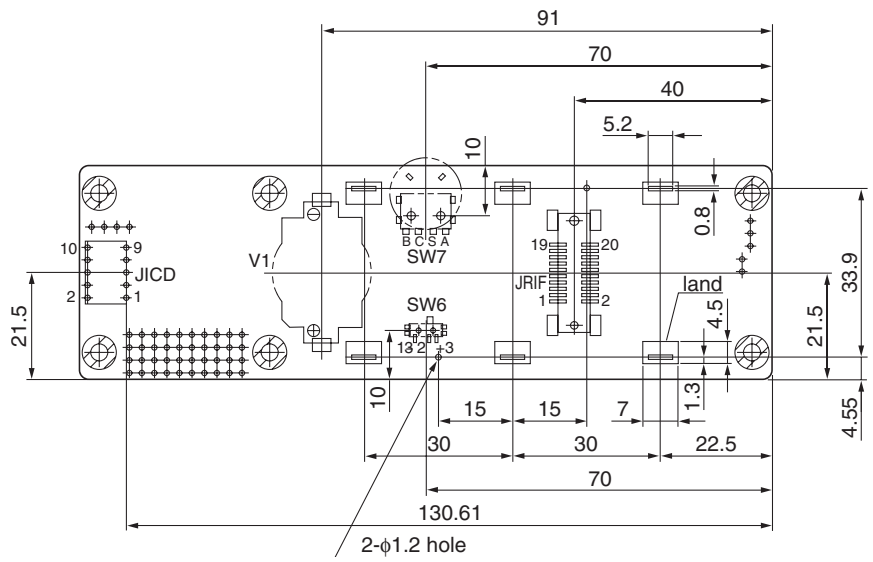



Figure 3.2.1.2 Dimensions of the CPU Board

∗ Precautions
- All dimensions are in millimeters (mm).
- Board thickness: 1.6 mm.

## 3.2.2 Dimensions of the ICD Board

The following drawings show the dimensions of the ICD board.

### <Top view>

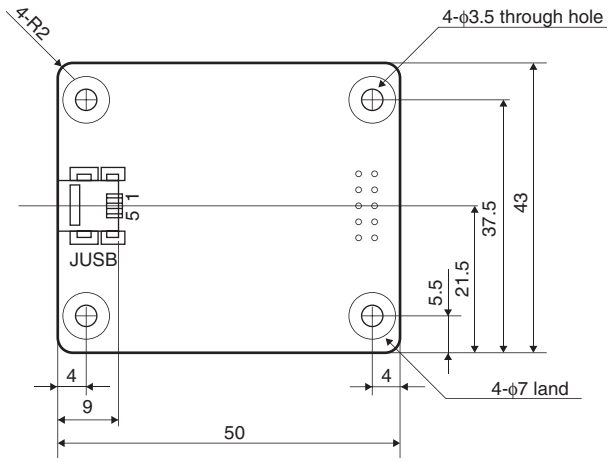



Figure 3.2.2.1 Dimensions of the ICD Board (Front)

### <Bottom view>

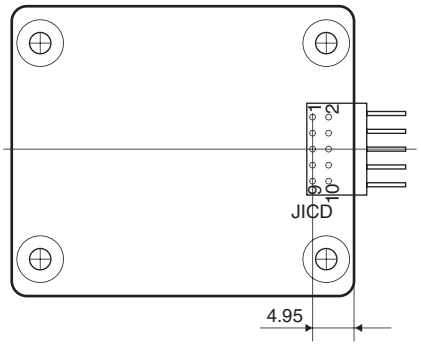



Figure 3.2.2.2 Dimensions of the ICD Board (Back)

∗ Precautions
- All dimensions are in millimeters (mm).
- Material: FR4, Board thickness: 1.6 mm

## 3.2.3 Dimensions of the LCD Panel Board

The following drawings show the dimensions of the LCD panel OPTO0569NG manufactured by Casil Optoelectronic Product Development Ltd.) that is to be mounted on the LCD board.
(Excerpts from the Specifications of Casil's OPTO0569NG)

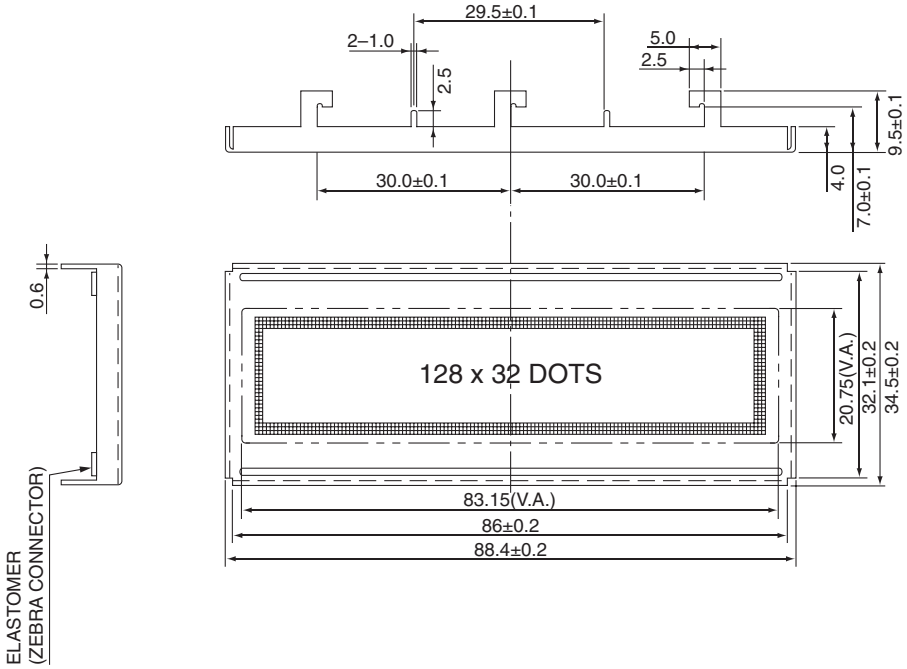



Figure 3.2.3.1 LCD Panel Dimensions of LCD, Bezel and Zebra (Elastomer Connector)

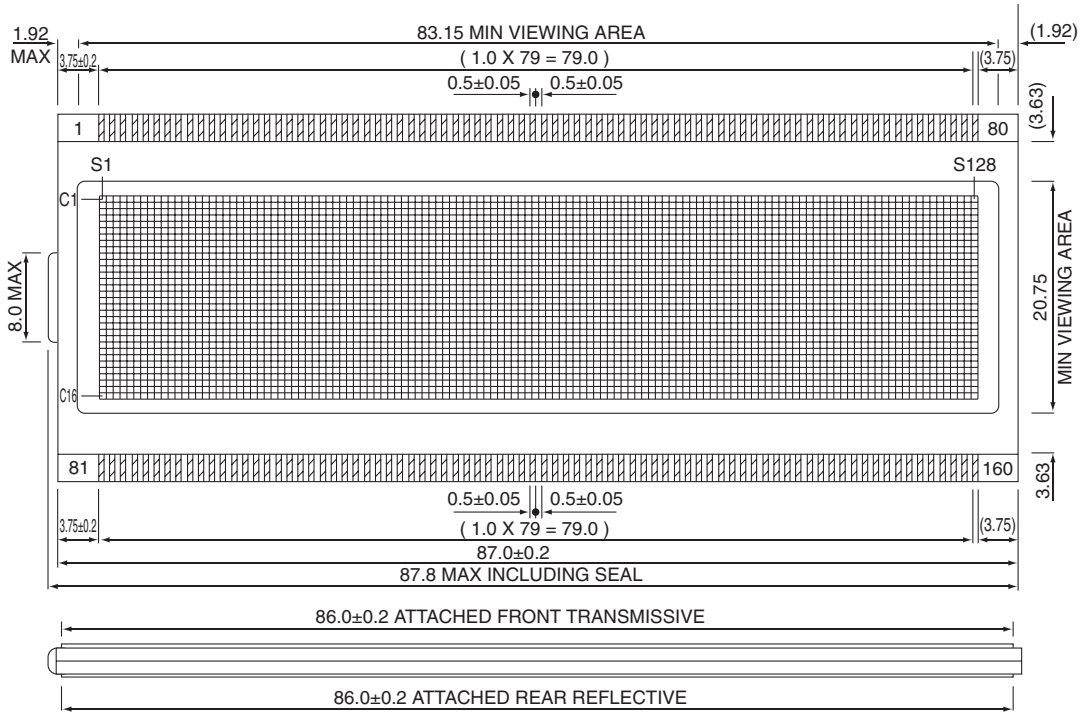



Figure 3.2.4.2 Dimensions of the LCD Panel

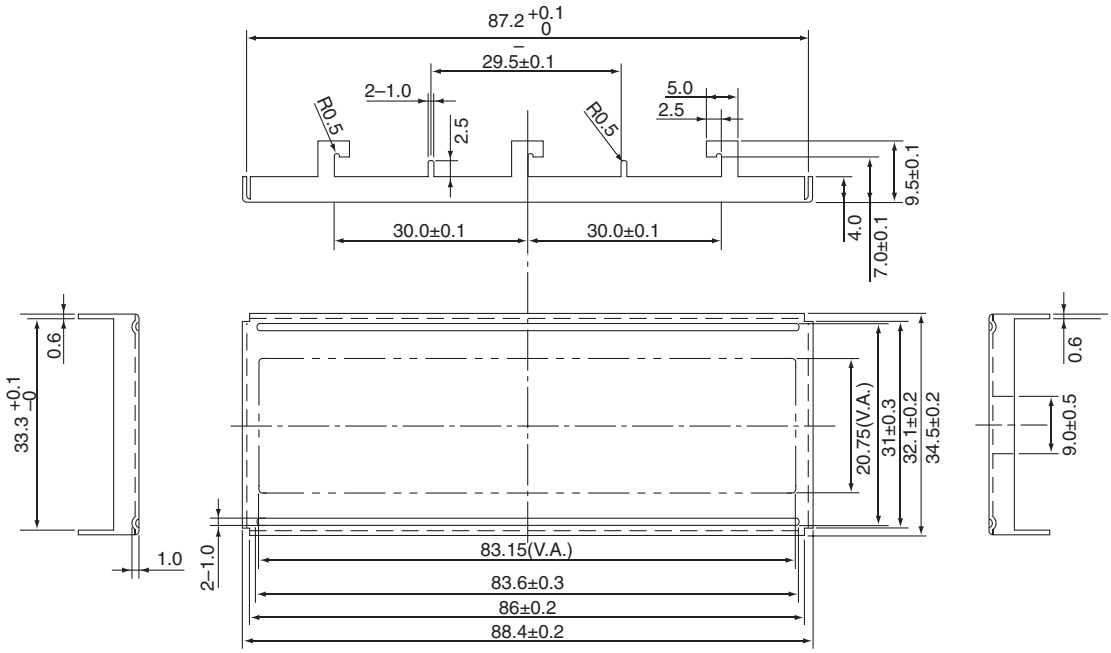



Figure 3.2.4.3 Dimensions of the Bezel

# 3.3 Main Parts

### <CPU Board>

| | | |
|---|---|---|
| CPU (U3) | S1C17702 | SEIKO EPSON CORP. |
| Crystal oscillator(32.768kHz) (X1) | FC-255 | EPSON TOYOCOM CORP. |
| Crystal oscillator(6MHz) (X2) | MA-406 | EPSON TOYOCOM CORP. |
| Reset switch (RESET SW) (SW5) | SKQTLCE010 | ALPS |
| LCD panel | Customized product | CASIL OPTOELECTRONIC PRODUCT DEVELOPMENT LTD |
| Expansion board connector (JEX) | SLW-110-01-G-D | SAMTEC |
| Expansion board connector (JEX2) | SLW-110-01-G-D | SAMTEC |
| Expansion board connector (JICD) | PS-10SD-D4T1-1 | JAE |
| Expansion board connector (JRIF) (not mounted) | | |
| | 8913-020-178MS-A-F | KEL |
| Key switches (SW1 - SW4) | SKRAAKE010 | ALPS |
| Rotary encoder with switch (SW7) | SIQ-02FVS3 | MITSUMI |
| Infrared transmitter module (D2) | AN333 | STANLEY |
| Infrared receiver module (U1) | GP6UX311QS | SHARP |
| Infrared receiver module (replacement for U1) | | |
| | PNA4702M | Panasonic |
| Battery holder (V1) | 1060 | KEYSTONE |
| Coin cell battery | CR2032(3V) | maxell |

### <ICD Board>

| | | |
|---|---|---|
| USB miniB connector | 54819-0572 | molex |
| LED (RGB) | 598-9920-307F | Dialight |
| Reset switch (RESET SW) (SW1) | SKRAAKE010 | ALPS |

# 3.4 Functional Description of Each Part

## 3.4.1 ICD board

The ICD board is a hardware tool (emulator) to facilitate the development of software for the S1C17702. It controls communication between your PC and the target IC (S1C17702) on the CPU board, providing a simple software development environment for S1C17702. For information about its functional differences from the ICD Mini (S5U1C17001H), a development tool supporting all S1C17 core product models, see Chapter 6.

### ICD Board Reset Switch

Pressing the reset switch (SW1) on the ICD board reboots firmware on the ICD board and outputs the target reset signal (#RESET_OUT) to the CPU board. This establishes the communication connection between the CPU board and the ICD board if they are physically connected. If the CPU board and the ICD board are not connected physically, the ICD board waits for a connection for communication.

### ICD Board LED

The LED indicates ICD board and target statuses in different colors.

- (Blue) Power on (before the initial connection with the target is established.)
- (Green) The target is currently in debug mode.
- (Red) The target is not connected, or not properly connected.
  The target is currently executing a user program.

## 3.4.2 CPU board

The CPU board is a simple target evaluation board equipped with the target CPU (S1C17702). It also contains various peripheral functions and circuits, such as LCD panel and remote control transmitter/receiver module. It can be used to develop and evaluate software for controlling these components.

### CPU Board Reset Switch

Pressing the CPU board reset switch (SW5) resets the CPU board.

### Coin cell battery

A holder for the coin cell battery (CR2032) is mounted on the back side of the CPU board. If the CPU board is used alone, power is supplied from the coin cell battery.If the SVT17702 is used with the ICD board connected, the switch circuit on the CPU board automatically supply power to the SV17702 from the ICD board.Power supply from the coin cell battery is then automatically turned off.

∗ Inserting and removing coin cell battery

Insert the coin cell battery inside the battery holder on the back side of the CPU board with the (+) plus side facing up.

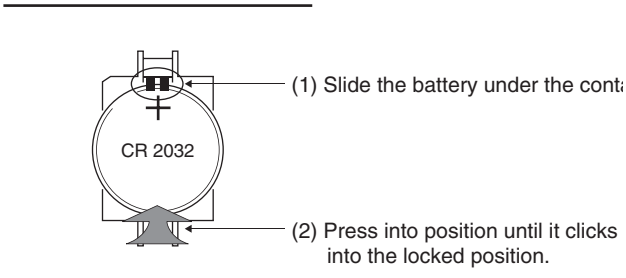



Figure 3.4.2.1 Installing Coin Cell Battery

If the battery cannot be easily removed, insert a thin rod or any other appropriate tool between the battery and the battery holder and lift it out of the holder. Use care not to damage any contact of the holder and any part mounted on the board.

# 4 Block Diagrams

Figure 4.1 shows a block diagram for the CPU board of the SVT17702 and Figure 4.2 shows a block diagram for the ICD board on the SVT17702.

### <CPU board>

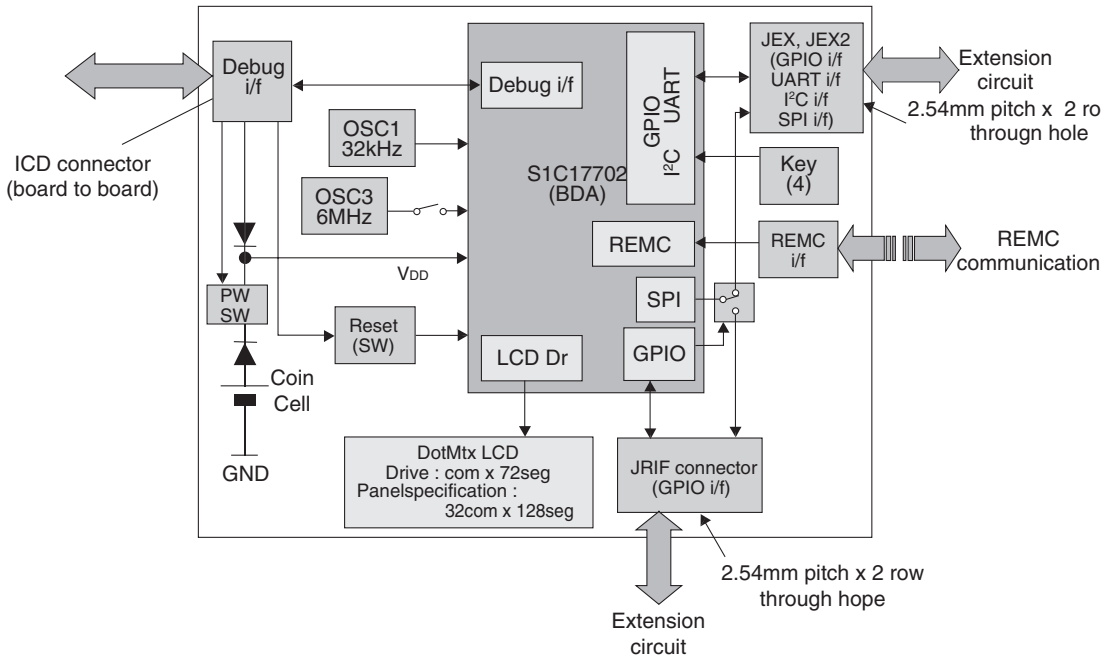



Figure 4.1 Block Diagram for CPU Board

### <ICD board>

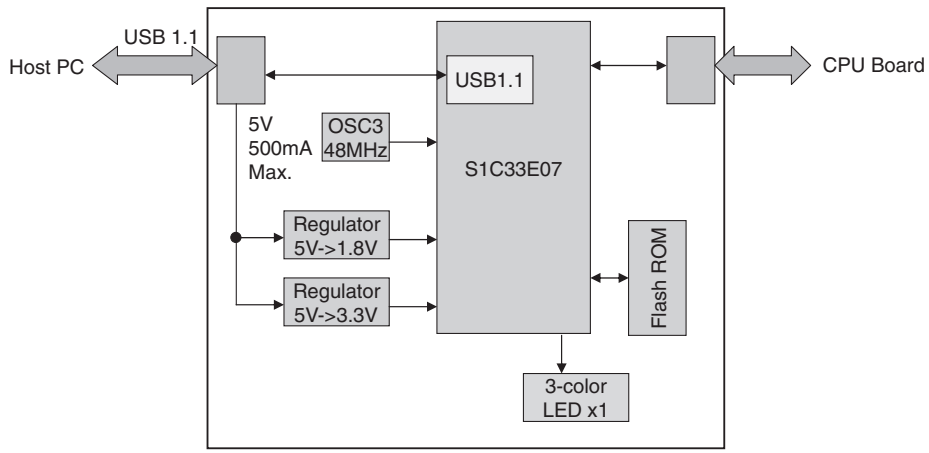



Figure 4.2 Block Diagram for ICD Board

# 5 Operating Environment and Start-Up Procedures

By connecting with your PC via the ICD board, the SVT17702 can be operated in accordance with commands executed from a debugger on the PC. The SVT17801 is capable of operating the CPU board alone without using the ICD board and PC. The following sections describe the connection and startup procedures to perform each respective operation.

## 5.1 Simple Software Development Environments

The SVT17702 provides a simple development environment of S1C17702 software using the CPU board as a target. This can be achieved by connecting the SVT17202 to your PC via the ICD board and using it with an S1C17 development tool on the PC (such as GNU17 IDE, compiler and debugger included in the S5U1C17001C package).

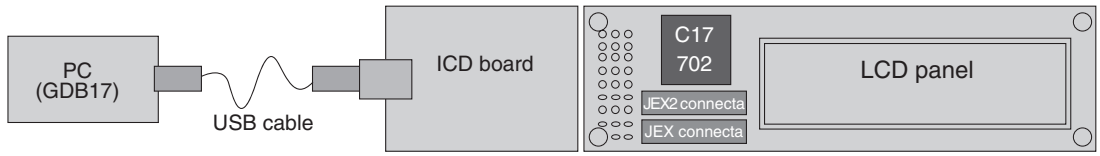



Figure 5.1.1 Simple Software Development Environment

### Operations under simple software development environment

Under this operating environment,the target CPU (the S1C17702 on the CPU board) operates according to commands executed from a debugger on your PC connected with the ICD board.A command executed from the debugger is sent to the ICD board via USB and, when it has been analyzed, converted into an S1C17702 debug signal, after which it is sent to the CPU board.The debugger on your PC can be used to download programs or data to the CPU board, or debug programs by controlling their execution and stop.

### CPU operating mode

A BRK instruction or debug interrupt (such as forcible break with the debugger) from the ICD board causes the target CPU (the S1C17702 on the CPU board) to stop executing the target program and enter into debug mode (or break state).In this state, commands can be executed from the debugger on your PC.The LED on the ICD board lights in green during debug mode.The state in which the target CPU is executing a target program is called normal mode.The LED on the ICD board lights in red during normal mode.

### Connection and start-up

The procedures for making connections and for starting up the SVT17702 to implement a simple software development environment are described below.

(1) Connect the ICD board with the CPU board. (Connect the 10-pin connector on the JICD board to the matching connector on the CPU board as shown in the connection diagram in Chapter 14.)

(2) Connect the ICD board to your PC via a USB cable.

(3) When the USB Driver Installation Wizard appears on your PC, install an appropriate driver.(This step is required only for the first connection. It is not required for the second connection and afterward.)For the installation procedure, see the later section "Installing USB driver".

(4) Make sure that the color of the LED on the ICD board changes from blue to green (the target is in debug mode).

(5) Start the IDE on you PC. When the GDB is automatically started by the IDE, have it run the program. Make sure that the color of the LED on the ICD board changes to red (the target is in normal mode).

For details on the operation of the debugger and debugging commands, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)."

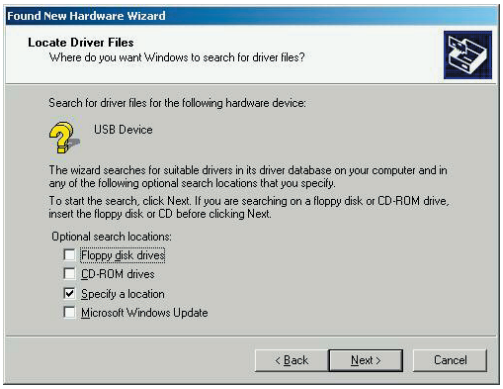
**Note**: Be sure NOT never to disconnect the USB cable between PC and ICD board while the debugger is running.

## Installing the USB driver

(1) When the SVT17702 is connected with the host computer via USB cable, the following screen appears.

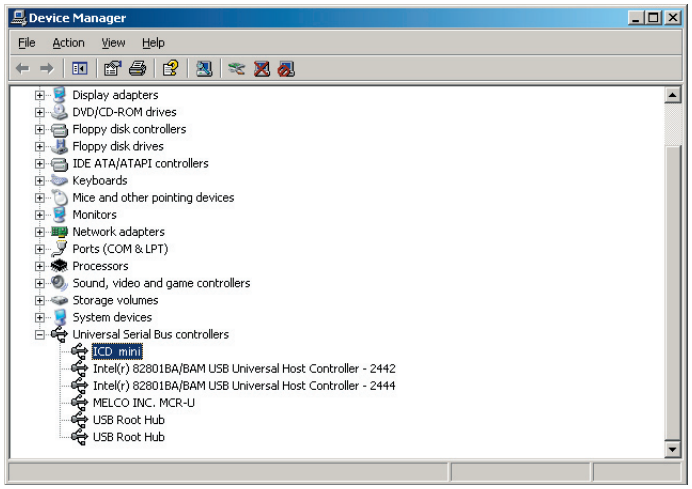

(2) Follow the wizard to install the USB driver.
Press the Browse button and select "C:\EPSON\GNU17\utility\drv_usb" as the directory that contains the USB driver.

∗ This path specifies where the IDE is installed.




When the USB driver has been installed successfully,you should see a list on the device manager similar to the one shown below.




**Note**: If the USB driver is not listed as shown above, the driver should be reinstalled.

# 5.2 Standalone Operation of SVT17702

The SVT17702 allows the CPU board to operate standalone without using the ICD board or PC.

### Standalone operation

In this operation environment, the S1C17702 on the CPU board operates in normal mode to execute a program written in the built-in flash memory.Therefore, a user program must be downloaded into the flash memory contained in the S1C17702 in advance.(The SVT17702 is shipped with a demo program preloaded into on-chip flash memory.)(For information about how to download a user program to the on-chip flash memory, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)".

### Connection and start-up

The procedure for operating the SVT17702 in a standalone mode is described below.

(1) Turn on the PC(if it is turned off).

(2) While the ICD board is connected with the CPU board, connect your PC to the ICD board via USB cable.

(3) Start the debugger on your PC and download a user program to the on-chip flash memory on the S1C17702. For information about downloading a program, see the "S5U1C17001C Manual (S1C17 Family C Compiler Package)."

(4) After exiting the debugger, remove the USB cable to disconnect the ICD board from your PC.

(5) Disconnect the ICD board from the CPU board, and install a coin cell battery.

(6) Press the reset switch on the CPU board.Then the S1C17702 on the CPU board starts executing a user program downloaded to the flash memory.

# 5.3 ICD Board Firmware Update Procedures

The SVT17702 can update the firmware of the ICD board using a debugger on your PC.The ICD board firmware will be provided by EPSON if necessary.(An update file has an ".sa" extension.)
The procedure for updating firmware is described below.

**Note**: USB driver must be installed before starting firmware update.

(1) Connect the ICD board of the SVT17702 to your PC via USB cable.

(2) Press the reset switch on the ICD board (SW1).

(3) Start the debugger from the command prompt.
```
>cd c:¥EPSON¥gnu17
```
(Specify the directory path where the gnu17 is installed.)
```
>gdb
```

(4) When the debugger starts, enter the following commands.
```
(gdb) target icd usb
(gdb) c17 firmupdate path¥filename.sa
```
(where "*path*¥*filename*.sa" is the update file name.)

(5) When the update process is complete, the LED on the ICD board lights up green(●).

(6) Press the reset switch on the ICD board to reboot the firmware.

# 6 Differences between ICD Board and ICD Mini

Table 6.1 shows a comparison of specifications between the S5U1C17001H (ICD Mini) board, a development tool for the S1C17 family, and the SVT17702 ICD board.While the SVT17702 contains the ICD mini interface (connector not yet mounted), the ICD board and the ICD mini cannot be simultaneously connected. For information about how to use the ICD mini, refer to the S5U1C17001H User Manual.

Table 6.1 Comparison of Functions between ICD Board and ICD mini

| Product name | S5U1C17000H (ICD Mini) | S5U1C17702T1100(SVT17702) ICD board |
|---|---|---|
| Core supported | S1C17 core | |
| Host interface | USB 1.1 | |
| Frequency to communicate with the target (DCLK frequency) | 4kHz to 40MHz | |
| Standalone flash programming capability | Available | Not available |
| Firmware update capability | Available | |
| Power supply for writing to flash ROM | Available | Not available |
| Reset signal output to target | Available | |
| Voltage associated with target system I/O | 3.3V, 1.8V, and voltage input from target (1.0 to 5.0V) | 3.3V |
| Connector for target | 4ピン | 10 pins (including reset signal) *2 |
| Power supply connector for writing to flash ROM *3 | 4ピン | – |

*1 Frequency supported when I/O interface voltage = 3.3V. Depending on ambient noise, temperature conditions, and types and variations of products, the maximum frequency may become lower than the specification value.
*2 Can be connected to the CPU board only.
*3 A separate power supply is not required for the S1C17702 to write to flash ROM.

# 7 I/O Ports

Table 7.1 lists the ports of the S1C17702 and their destinations on the S1C17702.
For information about expansion interfaces and connectors, see Chapter 14.

Table 7.1 I/O Ports

| Port | Direction | Multiplex | Signal Name | Connected to |
|---|---|---|---|---|
| P00 | I/O | Timer | P00/EXCL3 | Key input (SW1) and expansion interface (JEX2 connector) |
| P01 | I/O | Timer | P01/EXCL4 | Key input (SW2) and expansion interface (JEX2 connector) |
| P02 | I/O | REMC | P02/REMI | Remote control receiver (U1) and expansion interface (JEX2 connector) |
| P03 | I/O | REMC | P03/REMO | Remote control transmitter (D2) and expansion interface (JEX2 connector) |
| P04 | I/O | PWM OUT | P04/TOUT4 | Key input (SW3) and expansion interface (JEX2 connector) |
| P05 | I/O | PWM OUT | P05/TOUTN4 | Key input (SW4) and expansion interface (JEX2 connector) |
| P06 | I/O | Timer | P06/EXCL2 | Expansion interface (JEX connector) |
| P07 | I/O | Timer | P07/EXCL1 | Expansion interface (JEX connector) |
| P10 | I/O | UART | P10/SIN1 | Expansion interface (JEX connector) |
| P11 | I/O | UART | P11/SOUT1 | Expansion interface (JEX connector) |
| P12 | I/O | UART | P12/SCKL1 | Expansion interface (JEX connector) |
| P13 | I/O | OSC1 OUT | P13/FOUT1 | Expansion interface (JEX connector) |
| P14 | I/O | $I^2C$ | P14/SDA | Expansion interface (JEX connector) |
| P15 | I/O | $I^2C$ | P15/SCL | Expansion interface (JEX connector) |
| P16 | I/O | Timer | P16/EXCL0 | Expansion interface (JEX connector) and analog switches (U5, U6, U7, U8, U9 and U10) |
| P17 | I/O | SPI | P17/#SPISS | Expansion interface (JEX2 connector) and analog switch (U5)<br>→Expansion interface (JEX connector) or<br>rotary encoder (SW7) |
| P20 | I/O | SPI | P20/SDI | Expansion interface (JEX2 connector) and analog switch (U6)<br>→Expansion interface (JEX connector) or<br>Expansion interface (JRIF connector) |
| P21 | I/O | SPI | P21/SDO | Expansion interface (JEX2 connector) and analog switch (U7)<br>→Expansion interface (JEX2 connector) or<br>Expansion interface (JRIF connector) |
| P22 | I/O | SPI | P22/SPICLK | Expansion interface (JEX2 connector) and analog switch (U8)<br>→Expansion interface (JEX2 connector) or<br>Expansion interface (JRIF connector) |
| P23 | I/O | UART | P23/SIN0 | Expansion interface (JEX connector) |
| P24 | I/O | UART | P24/SOUT0 | Expansion interface (JEX connector) |
| P25 | I/O | UART | P25/SCLK0 | Expansion interface (JEX connector) |
| P26 | I/O | PWM OUT | P26/TOUT3 | Expansion interface (JEX2 connector) and analog switch (U9)<br>→Expansion interface (JRIF connector) or<br>rotary encoder (SW7) |
| P27 | I/O | PWM OUT | P27/TOUTN3 | Expansion interface (JEX2 connector) and analog switch (U10)<br>→Expansion interface (JRIF connector) or<br>rotary encoder (SW7) |
| P30 | I/O | OSC3 OUT | P30/FOUTH | Expansion interface (JEX connector) |
| P31 | I/O | Debugger | DCLK/P31 | Expansion interface (JEX connector) and expansion interface (JICD connector) |
| P32 | I/O | Debugger | DST2/P32 | Expansion interface (JEX connector) and expansion interface (JICD connector) |
| P33 | I/O | Debugger | DSIO/P33 | Expansion interface (JEX connector) and expansion interface (JICD connector) |

# 8 Setting Switches

Three side sliding switches (SW6, SW8, and SW9) are mounted on the back of the SVT17702. The features of these switches are described below.

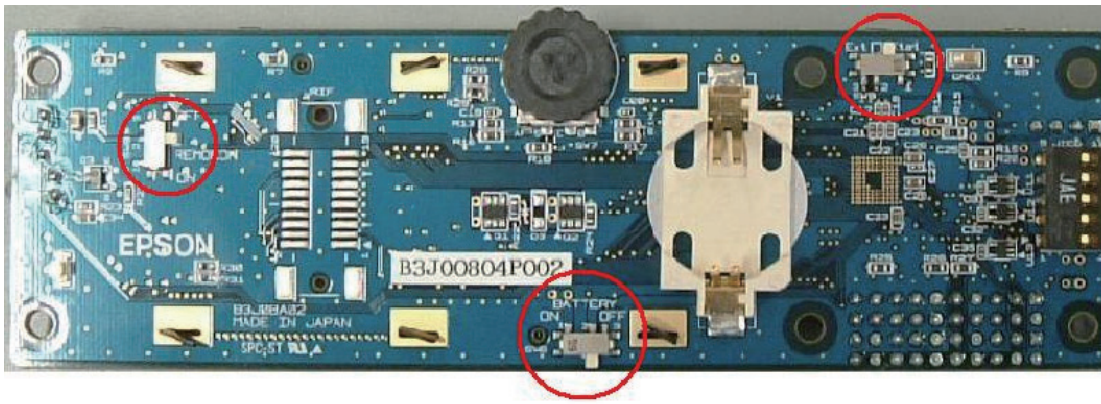



Figure 8.1 Locations of Side Sliding Switches (Back of the CPU Board)

## 8.1 Setting for SW6

SW6 turns on and off power supplied from CR2032 coin cell battery to the board. Controlling power supplied from the coin cell battery (for example, turning off power whenever the board is not in use) using the circuit shown in Figure 8.1.1 helps to prevent any unnecessary current consumed by the battery. (This switch is disabled when power is supplied using the VDD_ICD from the JICD in Figure 8.1.1.)

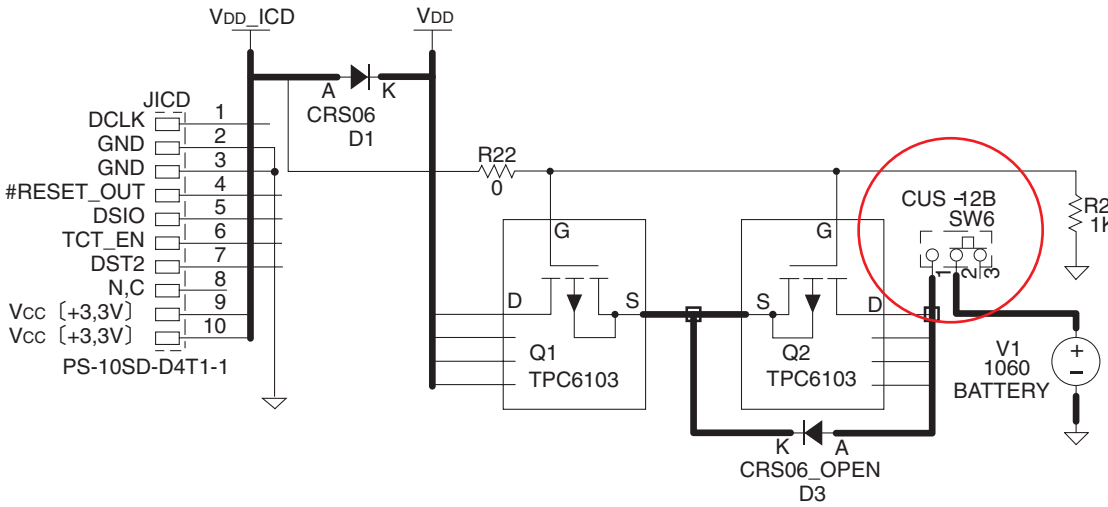



Figure 8.1.1 Coin Cell Battery Control Switch Circuit

## 8.2 Setting for SW8

SW8 controls power supplied to an infrared receiver module (GP6UX311QS or PNA4702M). Controlling power supplied to an infrared receiver module (for example, turning off power whenever the module not in use) using the circuit shown in Figure 8.2.1 helps to prevent any unnecessary overall current consumption on the board.

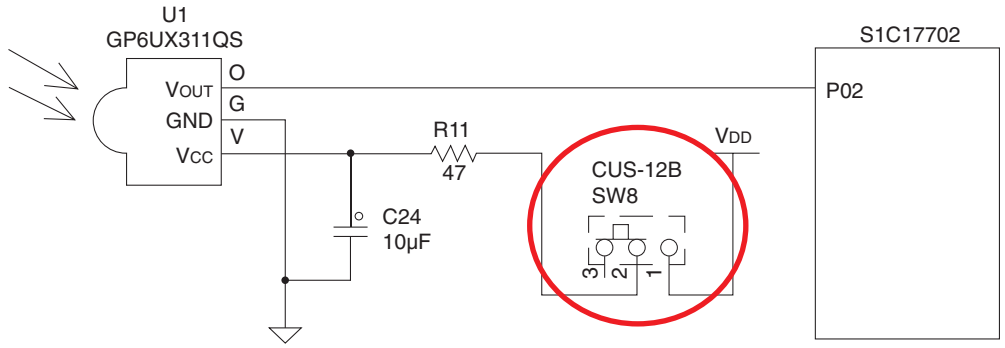



Figure 8.2.1 Infrared Receiver Module Power Supply Switch Circuit

## 8.3 Setting for SW9

SW9 is provided to select the clock source for the OSC3: Xtal (crystal oscillator clock source) or Ext (external clock source). To drive the OSC3 with an external clock source, select Ext and apply desired clock signal from pin 17 of JEX2.

For the S1C17702, just after reset release, the OSC3 will be driven by IOSC internal oscillator circuit. Note that this selection feature is disabled if the OSC3 is operated with the IOSC.

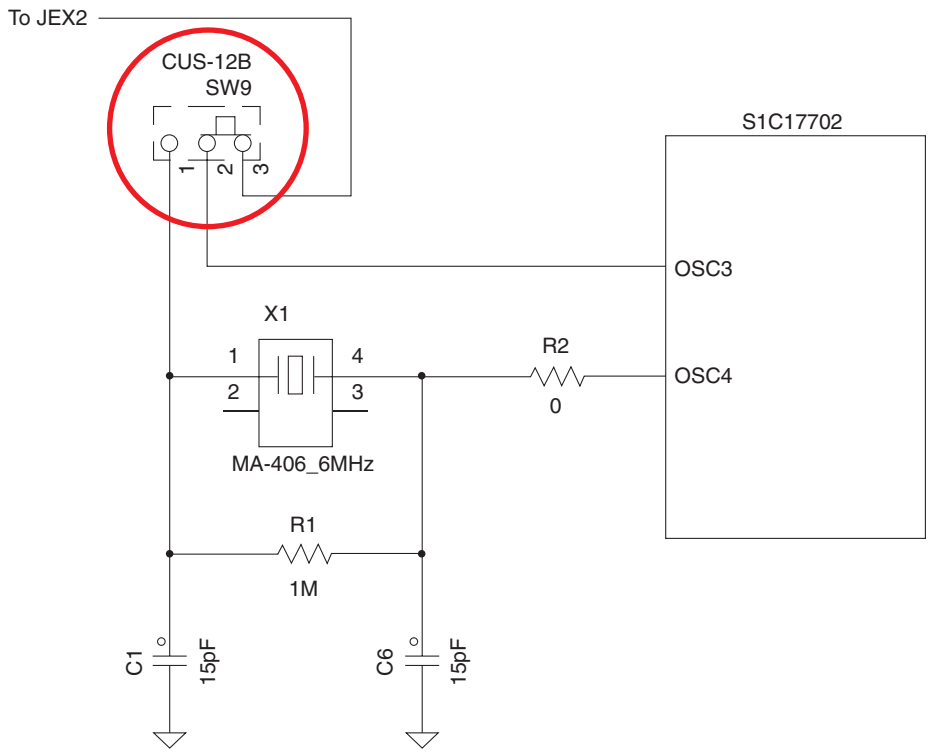



Figure 8.3.1 Circuit for Switch Providing Clock to OSC3

# 9 Key Input Circuit on the CPU Board

Switches, SW1 through SW4, mounted on the SVT17702 CPU board are connected to ports, P00, P01, P04, and P05, on the S1C17702 as shown in Figure 9.1.

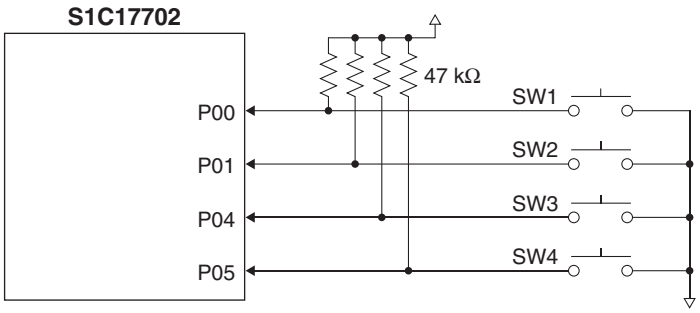



Figure 9.1 Key Input Connection Circuit on CPU Board

Input ports (P00, P01, P04 and P05) are pulled up through a 47kΩ resistor. The port input level is normally HIGH (input = 1). When the relevant switch is pressed, the port goes LOW (input = 0).

# 10 Infrared Emitting Diode/ Receiver Module

The infrared emitting diode (AN333)/infrared receiver module (GP6UX311QS or PNA4702M) mounted on the SVT17702 CPU board are connected to the remote controller for the S1C17702 as shown in Figure 10.1.

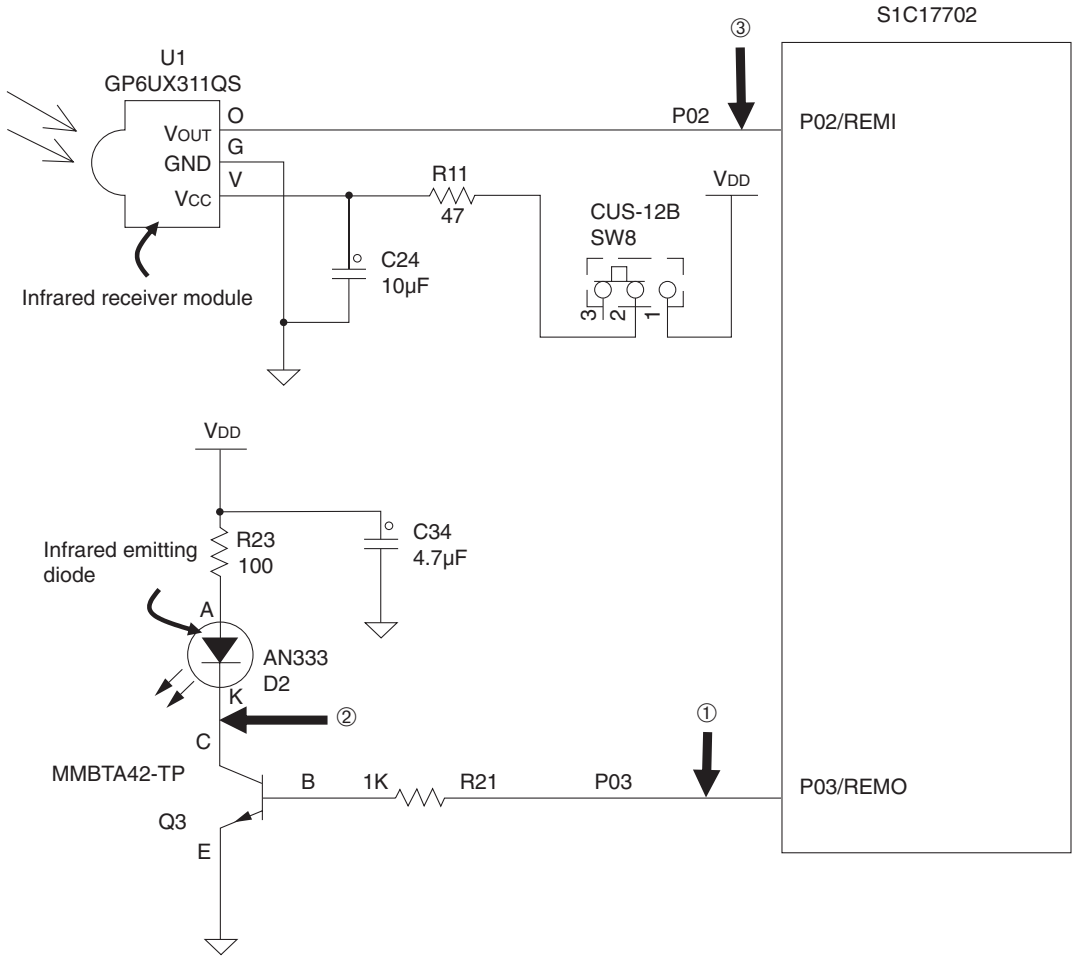
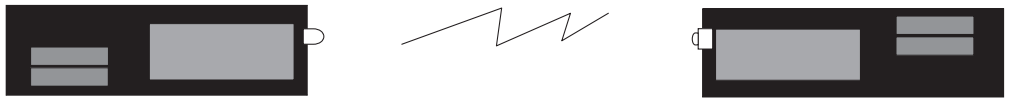



Figure 10.1 Infrared Transmitter/Receiver Module Transmission Circuit

# 10.1 Emitting and Receiving Light at Infrared Area

As shown in Figure 10.1.1, using two SVT17702s allows remote control waveforms transmitted by either of them to be received by the other.

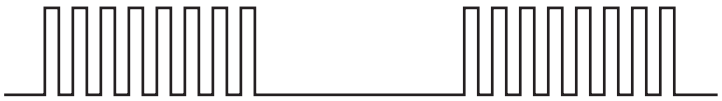


**<Transmitter side>** **<Receiver side>**

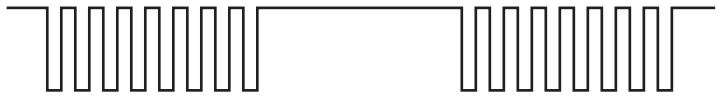
Figure 10.1.1 Transmission Using Two SVT17702s

* Infrared communication in this case covers approximately 3 meters by our measurement with the transmitter and receiving modules being placed opposing each other with no obstacle between them. Please use this value only for your reference.
  Figure 10.1.2 shows the transmission waveforms (observed waveforms ① to ③ in Figure 10.1) for the above example.

**<Waveform for ①>**



**<Waveform for ②>**



**<Waveform for ③>**

Figure 10.1.2 Infrared Remote Control Transmission Waveforms

# 10.2 Power Supply Switch for Infrared Transmitter Module

It is possible to use the switch to turn on or off power supplied to the infrared emitting diode (AN333) that is mounted on the SVT17702. By turning the switch off, it is possible to prevent any unnecessary overall current consumption on the board when the infrared receiver module is not in use.

# 11 LCD Panel

The S1C17702 contains a dot-matrix LCD driver that is capable of driving a monochrome LCD panel with up to 32 commons (COM) and 72 segments (SEG).The CPU board contains an LCD panel fro evaluating the driver. The LCD panel is connected to the COM and SEG pins of the S1C17702 as shown in Figure 11.1.

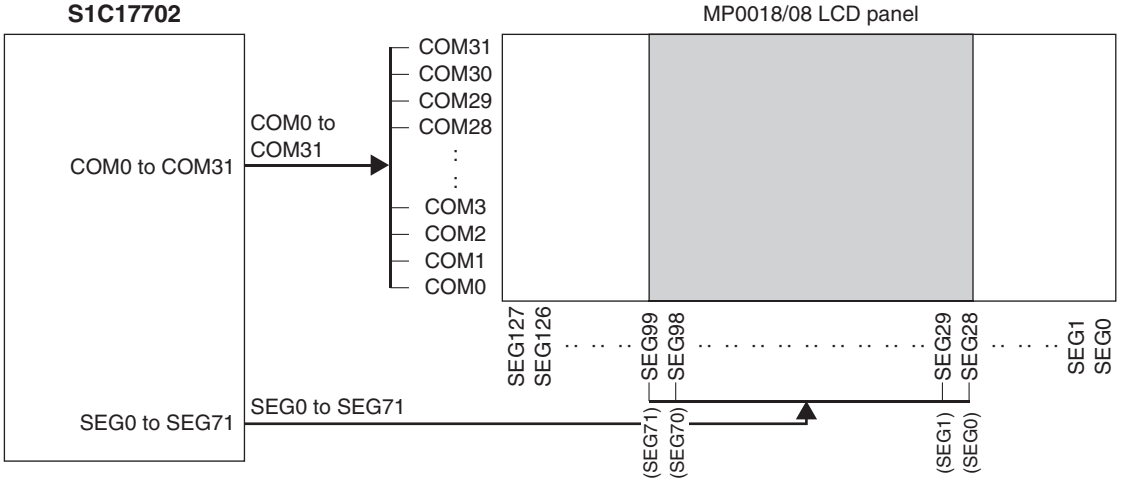



Figure 11.1 Connections of the LCD Panel

## 11.1 Segments and Commons of the LCD Panel

The direction of Common (COM) and Segment (SEG) for the SVT17702 is shown in Figure 11.1.1. (For COMREV=1 (default) and SEGREV=1 (default)) The LCD panel that is to be mounted on the LCD board contains 32 commons (COM) and 128 segments (SEG), whereas the S1C17702 can drive up to 32 commons (COM) and 72 segments (SEG). Accordingly, the SVT17702 has been adjusted to place the display surface to a location near the center as shown below.

* For information about the COMREV, refer to the Technical Manual.

For information about controlling the LCD panel, see the Application Note.

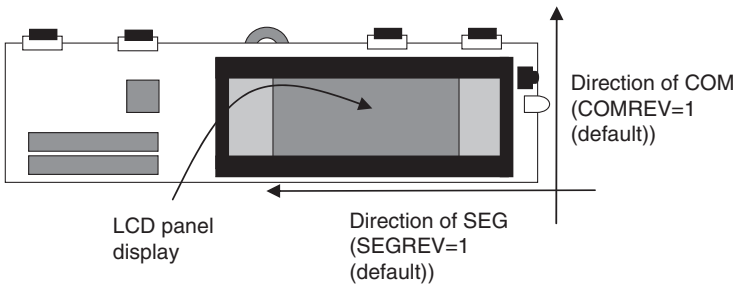



Figure 11.1.1 Direction of Commons and Segments of LCD Panel

# 12 Serial Ports

For the SVT17702, three types of S1C17702 on-chip serial interfaces (2-channel UART, 1-channel SPI, and 1-channel I²C) are available.Since the general-purpose I/O port pins of the S1C17702 serve as serial port pins, the port functions must be switched with software to use for serial ports. The I/O signals of the serial ports are connected to the expansion interface connector.

Table 12.1 Serial Ports

| Interface | Signal Name (Port Pin)I/O | I/O | Connected to |
|---|---|---|---|
| SPI | SDI (P20) | I | Expansion interface (pin 9 of JEX2) and expansion interface (pin 11 of JEX or pin 3 of JRIF) |
| | SDO (P21) | O | Expansion interface (pin 10 of JEX2) and expansion interface (pin 12 of JEX or pin 4 of JRIF) |
| | SPICLK (P22) | I/O | Expansion interface (pin 11 of JEX2) and expansion interface (pin 13 of JEX or pin 8 of JRIF) |
| | #SPISS (P17) | I | Expansion interface (pin 8 of JEX2) and expansion interface (pin 6 of JRIF) or rotary encoder |
| UART ch.0 | SIN0 (P23) | I | Expansion interface (pin 14 of JEX) |
| | SOUT0 (P24) | O | Expansion interface (pin 16 of JEX) |
| | SCLK0 (P25) | I | Expansion interface (pin 17 of JEX) |
| UART ch.1 | SIN1 (P10) | I | Expansion interface (pin 4 of JEX) |
| | SOUT1 (P11) | O | Expansion interface (pin 5 of JEX) |
| | SCLK1 (P12) | I | Expansion interface (pin 7 of JEX) |
| I²C | SDA (P14) | I/O | Expansion interface (pin 9 of JEX) |
| | SCL (P15) | I/O | Expansion interface (pin 10 of JEX) |

# 13 External Input for OSC3

The S1C1770 is capable of externally supplying a clock to the OSC3 pin. The OSC3 circuit of the SVT17702 is as shown in Figure 13.1. To selecd a clock input from X1 using SW9, connect pins 1-2 of SW9 (select "Xtal" for SVT). To selecd a clock input from the expansion connector (JEX2), connect pins 2-3 of SW9 (select "Ext" for SVT).
For input characteristics of the clock to be input, refer to the S1C17702 Technical Manual.

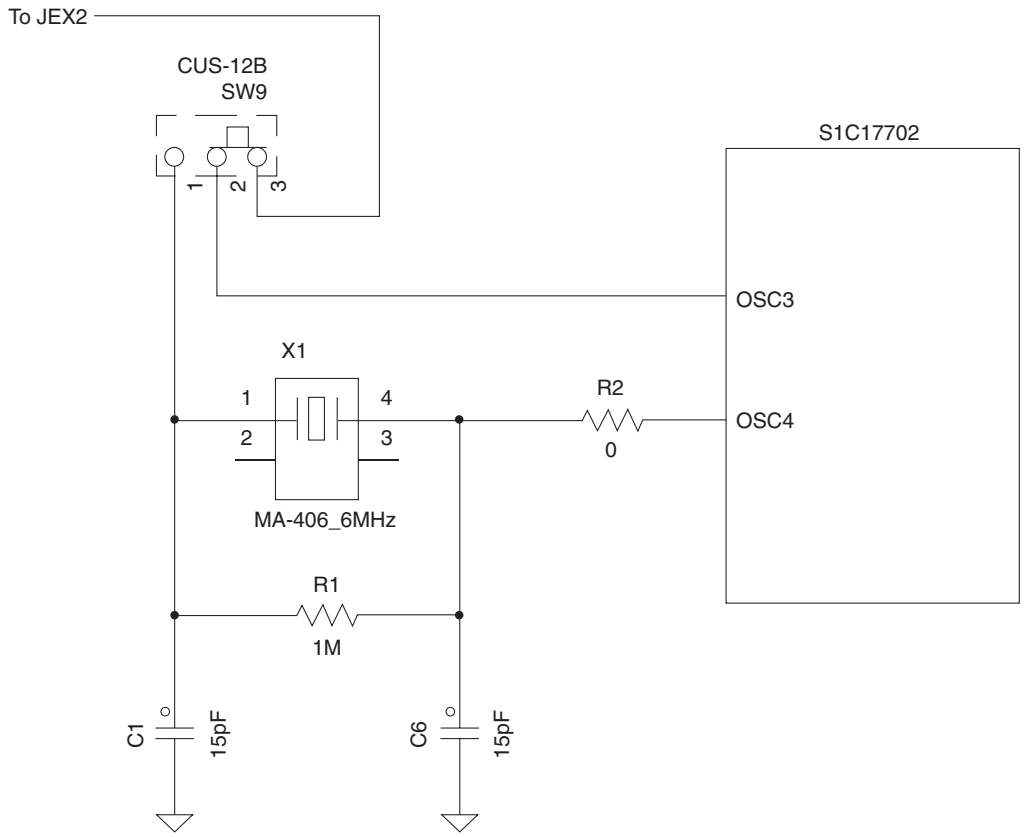



Figure 13.1 OSC3 Peripheral Circuit

* The S1C17702 contains an ICSC (2.5MHz CR oscillator). When it has started up, it is driven by the IOSC. The selection of SW9 is disabled with the S1C17702 is driven by the ICSC (it is always driven by the ISOC regardless of which switch is selecte).

# 14 Expansion Interface

The CPU board has expansion interface connectors (JICD, JEX and JEX2) and pattern for mounting expansion connector (JRIF), allow for connection of the ICD board or user's own expansion boards.

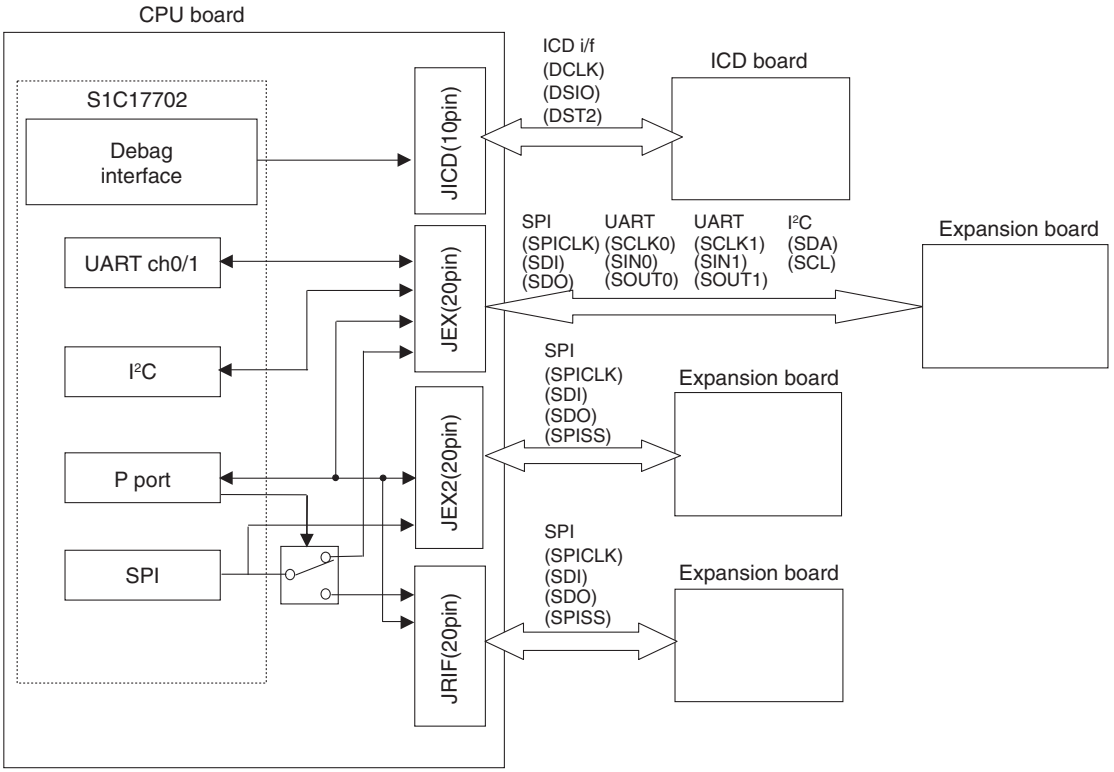



Figure 14.1 Expansion Interface Connectors

# 14.1 JICD Connector

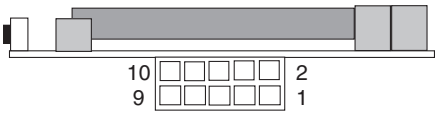
JThe JICD connector is used to connect the ICD board.
The specifications and pin assignment for the connector are as follows:

Table 14.1.1 JICD Connector Pin Assignment

JICD Connector

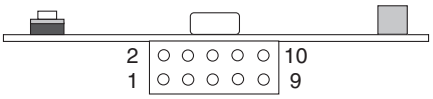
(The right figures show the side view)
Maker: Japan Aviation Electronics Industry, Limited (JAE)
Model number: PS-10SD-D4T1-1 (female)

<Side view of the CPU board>




(ICD board side)
Maker: Tyco
Model number: 9-103801-0 (male)

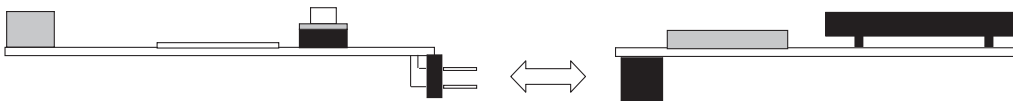
<Side view of the ICD board>




| No. | Name | I/O | Description |
|---|---|---|---|
| 1 | DCLK | O | On-chip debugger clock output port |
| 2 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 3 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 4 | #RESET_OUT | I | Target reset signal input port |
| 5 | DSIO | I/O | On-chip debugger data I/O port |
| 6 | TGT_EN | I | Target enable signal input port |
| 7 | DST2 | O | On-chip debugger status signal output port |
| 8 | N.C | – | – |
| 9 | $V_{CC}$ (+3.3V) | – | +3.3V power pin |
| 10 | $V_{CC}$ (+3.3V) | – | +3.3V power pin |

**Note**: Be sure to connect one end of the JICD connector to the CPU board with the LCD panel side up and the other end to the ICD board side having the USB connector up. Inserting the connector upside down may damage the both boards.

**<ICD board>** **<CPU board>**



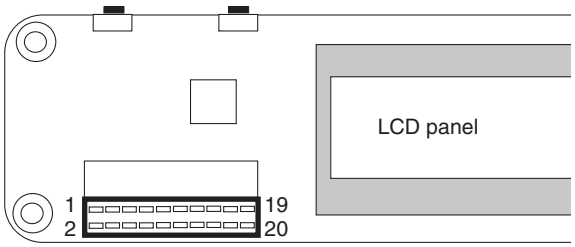
# 14.2 JEX Connector

The JEX connector is used to connect a user expansion board.
The specifications and pin assignment for the connector are as follows:

Table 14.2.1 JEX Connector Pin Assignment

JEX Connector

Maker: SAMTEC
Model number: SLW-110-01-G-D




| No. | Name | I/O | Description |
|---|---|---|---|
| 1 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 2 | P06/EXCL2 | I/O \| I | General purpose I/O port \| External clock input port |
| 3 | P07/EXCL1 | I/O \| I | General purpose I/O port \| External clock input port |
| 4 | P10/SIN1 | I/O \| I | General purpose I/O port \| UART ch 1 data input port |
| 5 | P11/SOUT1 | I/O \| O | General purpose I/O port \| UART ch. 1 data output port |
| 6 | VCC (+3.3V) | – | +3.3V power pin |
| 7 | P12/SCLK1 | I/O \| I | General purpose I/O port \| UART ch. 1 clock input port |
| 8 | P13/FOUT1 | I/O \| | General purpose I/O port \| OSC1 clock output port |
| 9 | P14/SDA | I/O \| I/O | General purpose I/O port \| $I^2C$ data I/O port |
| 10 | P15/SCL | I/O \| I/O | General purpose I/O port \| $I^2C$ clock I/O port |
| 11 | P20/SDI | I/O \| I | General purpose I/O port \| SPI data input port |
| 12 | P21/SDO | I/O \| O | General purpose I/O port \| SPI data output port |
| 13 | P22/SPICLK | I/O \| I/O | General purpose I/O port \| SPI clock I/O port |
| 14 | P23/SIN0 | I/O \| I | General purpose I/O port \| UART ch. 0 data input port |
| 15 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 16 | P24/SOUT0 | I/O \| O | General purpose I/O port \| UART ch. 0 data output port |
| 17 | P25/SCLK0 | I/O \| I | General purpose I/O port \| UART ch 0. clock input port |
| 18 | P30/FOUTH | I/O \| O | General purpose I/O port \| HSCLK clock output port |
| 19 | N.C | – | – |
| 20 | VCC (+3.3V) | – | +3.3V power pin |

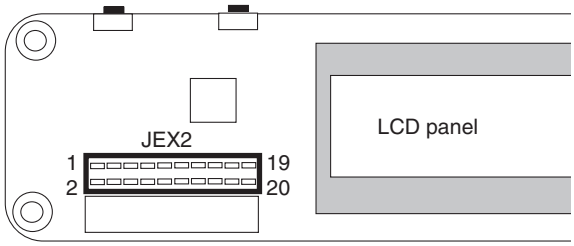
# 14.3 JEX2 Connector

The JEX2 connector is used to connect a user expansion board.
The specifications and pin assignment for the connector are as follows:

Table 14.3.1 JEX2 Connector Pin Assignment

JEX2 Connector

Maker: SAMTEC
Model number: SLW-110-01-G-D




| No. | Name | I/O | Description |
|---|---|---|---|
| 1 | P00/EXCL3 | I/O I I | General purpose I/O port I T16E Ch. 0 external clock input port |
| 2 | P01/EXCL4 | I/O I I | General purpose I/O port I T16E Ch. 1 external clock input port |
| 3 | P02/REMI | I/O I I | General purpose I/O port I Remote control input port |
| 4 | P03/REMO | I/O I O | General purpose I/O port I Remote control output port |
| 5 | P04/TOUT4 | I/O I O | General purpose I/O port I T16E Ch. 1 PWM signal output port |
| 6 | P05/TOUTN4 | I/O I O | General purpose I/O port I T16E Ch. 1 reverse PWM signal output port |
| 7 | P16/EXCL0 | I/O I I | General purpose I/O port I T16 Ch. 0 external clock input |
| 8 | P17/#SPISS | I/O I I | General purpose I/O port I SPI Slave Select input port |
| 9 | P20/SDI | I/O I I | General purpose I/O port I SPI data input port |
| 10 | P21/SDO | I/O I O | General purpose I/O port I SPI data output port |
| 11 | P22/SPICLK | I/O I I/O | General purpose I/O port I SPI clock I/O port |
| 12 | P26/TOUT3 | I/O I O | General purpose I/O port I T16E Ch. 0 PWM signal output port |
| 13 | P27/TOUTN3 | I/O I O | General purpose I/O port I T16E Ch. 0 reverse PWM signal output port |
| 14 | DCLK/P31 | O I I/O | On-chip debugger clock output port I General purpose I/O port |
| 15 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 16 | DST2/P32 | O I I/O | On-chip debugger status output port I General purpose I/O port |
| 17 | OSC3 | I | OSC3 oscillation input port |
| 18 | DSIO/P33 | I/O I I/O | On-chip debugger data I/O port I General purpose I/O port |
| 19 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 20 | GND | – | Power ground (it is recommended that it be connected to all pins) |

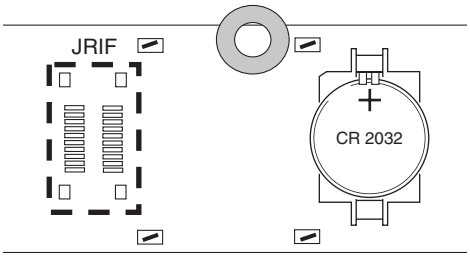
# 14.4 JRIF Connector

The JRIF connector is used to connect a user expansion board.
The specifications and pin assignment for the connector are as follows:

Table 14.4.1 JRIF Connector Pin Assignment

JRIF Connector

Maker: KEL Corporation
Model number: 8913-020-178MS-A-F
(not mounted)




| No. | Name | I/O | 機能 |
|---|---|---|---|
| 1 | N.C | – | – |
| 2 | N.C | – | – |
| 3 | P20/SDI | I/O \| I | General purpose I/O port \| SPI data input port |
| 4 | P21/SDO | I/O \| O | General purpose I/O port \| SPI data output port |
| 5 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 6 | P17/#SPISS | I/O \| I | General purpose I/O port \| SPI Slave Select input port |
| 7 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 8 | P22/SPICLK | I/O \| I/O | General purpose I/O port \| SPI external clock I/O port |
| 9 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 10 | N.C | – | – |
| 11 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 12 | N.C | – | – |
| 13 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 14 | N.C | – | – |
| 15 | GND | – | Power ground (it is recommended that it be connected to all pins) |
| 16 | P26/TOUT3 | I/O \| O | General purpose I/O port \| T16E Ch. 0 PWM signal output port |
| 17 | P27/TOUTN3 | I/O \| O | General purpose I/O port \| T16E Ch. 0 reverse PWM signal output port |
| 18 | N.C | – | – |
| 19 | $V_{DD}$ (+3.3V) | – | +3.3V power pin |
| 20 | $V_{DD}$ (+3.3V) | – | +3.3V power pin |

# 14.5 Switching the SPI Port Connector

SPI I/O signals of the S1C17702 are connected to the JEX2 connector as well as to JEX or JRIF connector via a switching IC as shown in Figure 14.5.1. The switching IC is controlled by port P16 of the S1C17702 and connected to JRIF when P16 output goes HIGH or to JEX when P16 output goes LOW.
Meanwhile, #SPISS signal is connected to JEX2 connector as well as to a different switching IC that is controlled by P16 and connected to JRIF when P16 output goes HIGH or to the rotary encoder when P16 output goes LOW.

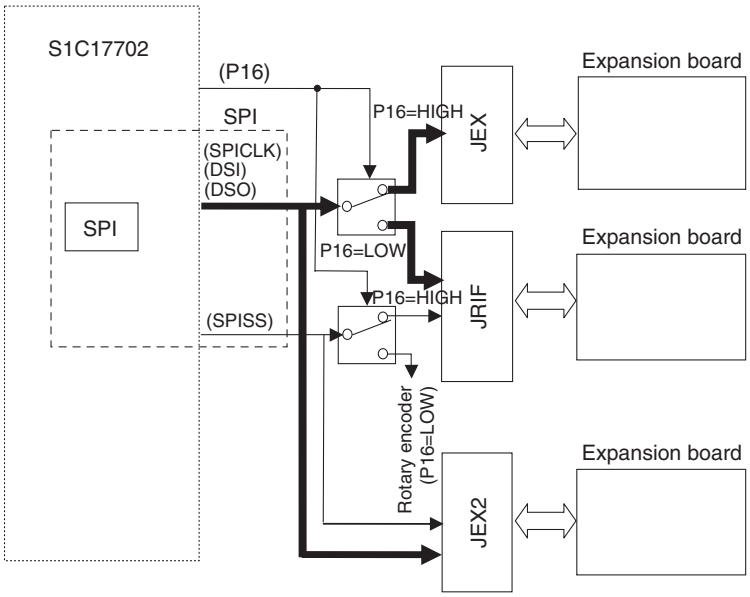



Figure 14.5.1 SPI Port Connector Selector Circuit

# Appendix A How to Measure Current Consumption

The CPU board of the SVT17702 is capable of measuring the power consumption of the S1C17702 alone.
The VDD and VDD2 of the SVT17702' CPU board has a circuit configuration as shown in Figure A.1. Removing the 0 ohm resistor (R15) and inserting an ammeter between the VDD and the VDD2 allows the measurement of current consumption of the S1C17702 alone. In that case, the ports of the S1C17702 must be appropriately set to its peripheral circuits.
For information about sample software for measuring current consumption, including settings of these ports (software flow), see the S1C17702 Current Consumption Measurement Application Note.

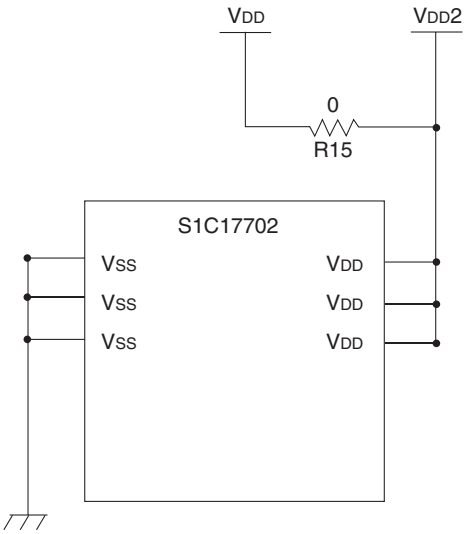
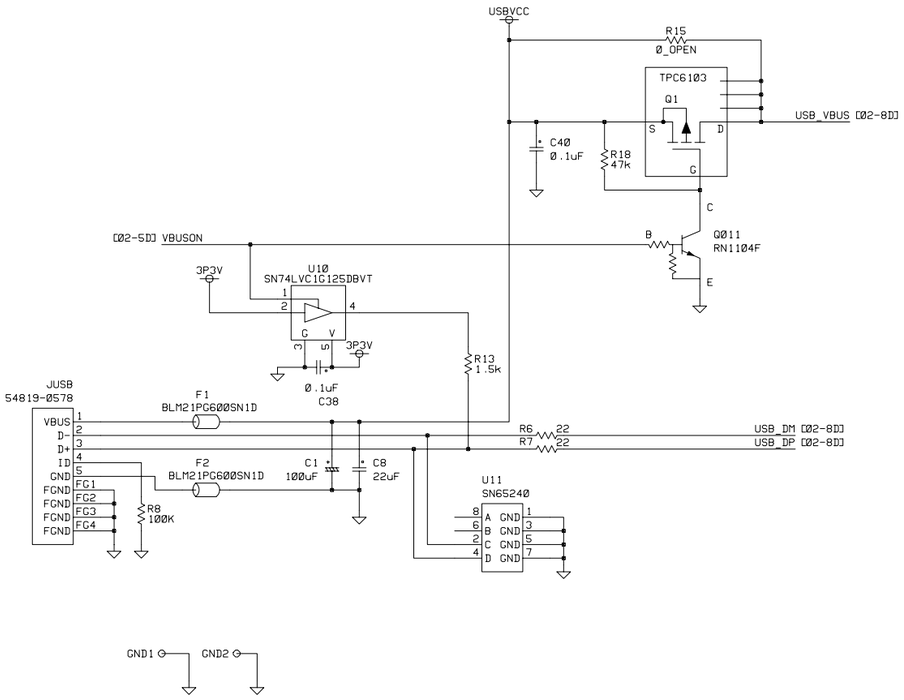
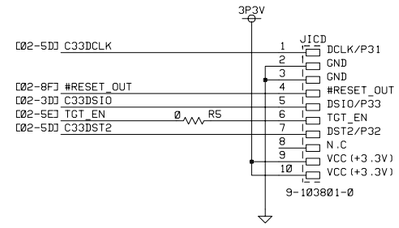
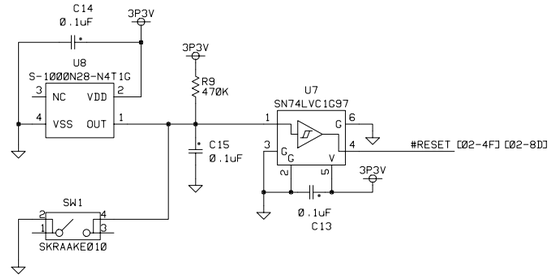


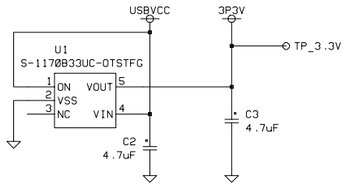

Figure A.1 Circuit for Measuring SVT17702 Current Consumption

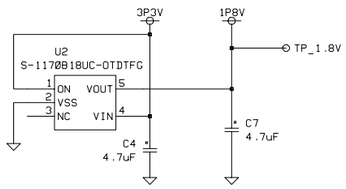
| REVISIONS | | | | | | |
|---|---|---|---|---|---|---|
| EFF | AUTHORITY | ZONE | LTR | DESCRIPTION | DATE | APPROVED |

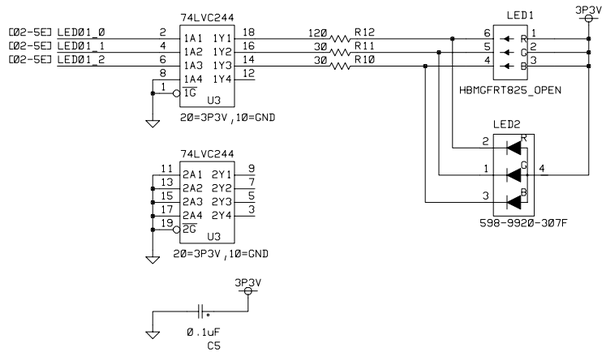



| | | | |
|---|---|---|---|
| CONTRACT<br>- | | Sophia Systems Co.,Ltd. | |
| DR T.Yasutake | 07/05/30 | SVT17 ICD Board | |
| CHK | / / | | |
| ENG | / / | | |
| APPD | / / | | |
| NEXT HIGHER ASSY.<br>- | | SIZE AØ / FSCM NO. - / DWG NO. B2JMBB02M01DWG rev1.0 | |
| 14:06:28 | 20-May-08 | 01E | SHEET 1 OF 2 |

| REVISIONS | | | | | | |
|---|---|---|---|---|---|---|
| EFF | AUTHORITY | ZONE | LTR | DESCRIPTION | DATE | APPROVED |

S1C33E07 Proccesor

Flash

CPU_DATA

CPU_ADDR

U4
S1C33E07B A

U9
S29PL064J60BFI120

U5
SN74LVC1G97

U6
TS5A3159A

JICD33
Throgh_Hole_for_XA-3-2-4P

U4
S1C33E07B B

| CONTRACT | | Sophia Systems Co.,Ltd. | |
|---|---|---|---|
| DR T.Yasutake | 07/05/30 | SVT17 ICD Board | |
| CHK | / / | | |
| ENG | / / | | |
| APPD | / / | | |
| NEXT HIGHER ASSY. | | SIZE AØ | FSCM NO. - | DWG NO. B2JMBB02M01DWG rev1.0 |
| 14:06:19 | 20-May-08 | 02E | SHEET 2 OF 2 |

| REVISIONS | | | | | | |
|---|---|---|---|---|---|---|
| EFF | AUTHORITY | ZONE | LTR | DESCRIPTION | DATE | APPROVED |

JEX2 SLW-120-01-G-D

JRIF 8913-020-178MS-A-F

U1 GPSUX311QS

SW1 SKQTLCE010

SW2 SKQTLCE010

SW3 SKQTLCE010

SW4 SKQTLCE010

SW7 SIQ-02FVS3

SW8 CUS-12B

SW9 CUS-12B

X1 MA-406_6MHz

Mount the oscillator components as close as possible to the S1C17702 pins.

JEX SLW-120-01-G-D

GND1 HK-2-G

GND2 HK-2-G

U3 S1C17702

U5 TSSA3159A

U6 TSSA3159A

U7 TSSA3159A

U8 TSSA3159A

U9 TSSA3159A

U10 TSSA3159A

U11 TSSA3159A

U12 TSSA3166

U13 TSSA3166

JICD PS-10SD-D4T1-1

JICDM FFC-4AMEP1

U2 S-1000N17-N4T1G

U4 SN74LVC1G97

X2 FC-255_32.7680KHz

Q1 TPC6103

Q2 TPC6103

D1 CRS06

D2 AN333

D3 CRS06_OPEN

Q3 MMBTA42-TP

V1 1060 BATTERY

These terminals are used when supply from external power.

JLCD MP0018/08

JLCD MP0018/08

U3 S1C17702

| CONTRACT | | Sophia Systems Co.,Ltd | |
|---|---|---|---|
| DR T.Yasutake | 08/07/09 | SVT17702 CPU Board | |
| CHK | / / | | |
| ENG | / / | | |
| APPD | / / | | |
| NEXT HIGHER ASSY. | | SIZE A0 | FSCM NO. - |
| | | DWG NO. B3J0BA02M01DWG Rev.2.0 | |
| 13:54:23 | 21-Apr-09 | 01_R20A | SHEET 1 OF 1 |

| NO. | Parts name | Location | Name | Model number | SPEC | qty. | mfr |
|---|---|---|---|---|---|---|---|
| 1 | S1C17702 | U3 | CPU | S1C17702 | VFBGA8HX181 | 1 | EPSON |
| 2 | TS5A3159A | U9,U8,U7,U6,U5,U10 | analog switch | TS5A3159ADCK | SC-70,1x1:2 | 6 | TI |
| 3 | TS5A3166 | U13,U12,U11 | analog switch | TS5A3166DCK | SC-70,1x1:1 | 3 | TI |
| 4 | S-1000N17-N4 | U2 | voltage detection IC | S-1000N17-N4T1G | SC-82AB, 1.7V detection | 1 | SII |
| 5 | SN74LVC1G97 | U4 | universal logic | SN74LVC1G97DCKR | SC-70 | 1 | TI |
| 6 | AN333 | D2 | infrared-emitting diode | AN333 | - | 1 | STANLEY |
| 7 | GP1UX311Q | U1 | infrared-light-receiving module | GP6UX311QS | - | 1 | SHARP |
| 8 | | | | or PNA4702M | - | | Panasonic |
| 9 | TPC6103 | Q2,Q1 | PMOSFET | TPC6103 | 2-3T1A | 2 | TOSHIBA |
| 10 | MMBTA4 | Q3 | transistor | MMBTA42-TP | SOT23 | 1 | MCC |
| 11 | JLCD | JLCD | LCD panel | MP0018/08 | 128X32dots | 1 | CONHUI |
| 12 | CRS06 | D1 | schottky diode | CRS06(TE85L,Q) | 1635,1A,20V,0.36V | 1 | TOSHIBA |
| 13 | CRS06 OPEN | D3 | schottky diode | CRS06(TE85L,Q) | 1635,1A,20V,0.36V | 0 | TOSHIBA |
| 14 | MA-406 8MHZ | X1 | crystal oscillator | MA-406 6MHz 16pF | SMT,11.7x4.0x3.7(h) | 1 | EPSON TOYOCOM |
| 15 | XTAL(FC-255 32.) | X2 | crystal oscillator | FC-255 32.768KHz ±20ppM 12.5p | 4.9x1.8 | 1 | EPSON TOYOCOM |
| 16 | R(100) | R23 | chip resistor | RK73B1JTTD101J | 1608,100O,5%,0.1W | 1 | KOA |
| 17 | R(10K) | R3,R19,R17,R16, | chip resistor | RK73B1JTTD103J | 1608,10KO,5%,0.1W | 7 | KOA |
| 18 | | R18,R14,R13 | | | | | |
| 19 | R(2.2K) | R27,R26 | chip resistor | RK73B1JTTD222J | 1608,2.2KO,5%,0.1W | 2 | KOA |
| 20 | R(33) | R20 | chip resistor | RK73B1JTTD330J | 1608,33O,5%,0.1W | 1 | KOA |
| 21 | R(47) | R11 | chip resistor | RK73B1JTTD470J | 1608,47O,5%,0.1W | 1 | KOA |
| 22 | R(470K) | R4 | chip resistor | RK73B1JTTD474J | 1608,470KO,5%,0.1W | 1 | KOA |
| 23 | R(47K) | R9,R7,R6,R5,R25 | chip resistor | RK73B1JTTD473J | 1608,47KO,5%,0.1W | 6 | KOA |
| 24 | | R8 | | | | | |
| 25 | R(1K) | R24,R21 | chip resistor | RK73B1JTTD102J | 1608,1KO,5%,0.1W | 2 | KOA |
| 26 | R(1M) | R1 | chip resistor | RK73B1JTTD105J | 1608,1MO,5%,0.1W | 1 | KOA |
| 27 | R(0) | R22,R2,R15,R12 | chip resistor(jumper) | RK73Z1J | 1608,0O,1A(2Amax) | 6 | KOA |
| 28 | | R31,R29 | | | | | |
| 29 | R(OPEN) | R30,R28 | chip resistor | | 1608 | 0 | |
| 30 | C(0.01UF) | C20,C19 | laminated ceramic capacitor | GRM155B11E103KA01D | 1005,0.01uF,25V,B | 2 | MURATA |
| 31 | C(0.1UF) | C8,C7,C35,C32,C27,C18, | laminated ceramic capacitor | GRM155F11E104ZA01D | 1005,0.1uF,25V,F,-20~+80% | 23 | MURATA |
| 32 | | C4,C3,C25,C23,C2, | | | | | |
| 33 | | C5,C31,C22,C21,C17, | | | | | |
| 34 | | C14,C13,C12,C10, | | | | | |
| 35 | | C16,C15,C11, | | | | | |

| NO. | Parts name | Location | Name | Model number | SPEC | qty. | mfr |
|---|---|---|---|---|---|---|---|
| 36 | C(15PF) | C9,C6,C1 | laminated ceramic capacitor | GRM1552C1H150JZ01D | 1005,15pF,50V,CH | 3 | MURATA |
| 37 | C(4.7UF) | C34,C33,C29,C26 | laminated ceramic capacitor | GRM188F11A475ZE20 | 1608,4.7uF,10V,F | 4 | MURATA |
| 38 | C(10UF) | C24 | laminated ceramic capacitor | GRM21BB30J106KE18 | 2012,10uF,6.3V,B | 1 | MURATA |
| 39 | SKQTLCE010 | SW5,SW4,SW3,SW2,SW1 | tact switch | SKQTLCE010 | 6.9x3.5, side push | 5 | ALPS |
| 40 | SW | SW9,SW8,SW6 | switch | CUS-12B | - | 3 | copal-electronics |
| 41 | SIQ-02FVS3 | SW7 | rotary encoder | SIQ-02FVS3 | 11.1 x 10, SMT | 1 | MITSUMI |
| 42 | 8913-020-178 | JRIF, | connector | 8913-020-178MS-A-F | SMT,20pin, plug | 0 | KEL |
| 43 | PS-10SD-D4T1 | JICD, | connector | PS-10SD-D4T1-1 | 2column, 10pole, right angle | 1 | JAE |
| 44 | SLW-120-01-G | JEX2,JEX, | connector | SLW-110-01-G-D | 2column, 10pole, 2.54mm pitch, t=4.57mm | 2 | SAMTEC |
| 45 | BATTERY(1060) | V1, | battery holder | 1060 | SMT, for2032 coin battery | 1 | KEYSTONE |
| 46 | XA-3-2 | JICDM, | jumper pin | FFC-4AMEP1 | 1column, 2.54mm pitch, 4pin, straight | 0 | honda-connectors |
| 47 | HK-2-G | GND2,GND1, | test terminal | HK-2-G | 3216 | 0 | mac8 |
| 48 | TH | TH_VDD,TH_GND, | - | - | f 1mm pad | 2 | ----- |
| 49 | TP | TP2,TP1, | - | - | f 1mm pad | 2 | ----- |

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# **S5U1C17702T1100** Hardware Manual
(Software Evaluation Tool for S1C17702)

**SEIKO EPSON CORPORATION**

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