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SOFTWARE EVALUATION TOOL FOR S1C17602

S5U1C17602T1100
Hardware Manual

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

S1 C 17xxx F 00E1 00

- **00** — **Packing specifications**
  - 00 : Besides tape & reel
  - 0A : TCP BL 2 directions
  - 0B : Tape & reel BACK
  - 0C : TCP BR 2 directions
  - 0D : TCP BT 2 directions
  - 0E : TCP BD 2 directions
  - 0F : Tape & reel FRONT
  - 0G : TCP BT 4 directions
  - 0H : TCP BD 4 directions
  - 0J : TCP SL 2 directions
  - 0K : TCP SR 2 directions
  - 0L : Tape & reel LEFT
  - 0M : TCP ST 2 directions
  - 0N : TCP SD 2 directions
  - 0P : TCP ST 4 directions
  - 0Q : TCP SD 4 directions
  - 0R : Tape & reel RIGHT
  - 99 : Specs not fixed
- **00E1** — **Specification**
- **F** — **Package**
  [D: die form; F: QFP, B: BGA]
- **17xxx** — **Model number**
- **C** — **Model name**
  [C: microcomputer, digital products]
- **S1** — **Product classification**
  [S1: semiconductor]

Development tools

S5U1 C 17000 H2 1 00

- **00** — **Packing specifications**
  [00: standard packing]
- **1** — **Version**
  [1: Version 1]
- **H2** — **Tool type**
  - Hx : ICE
  - Dx : Evaluation board
  - Ex : ROM emulation board
  - Mx : Emulation memory for external ROM
  - Tx : A socket for mounting
  - Cx : Compiler package
  - Sx : Middleware package
- **17000** — **Corresponding model number**
  [17xxx: for S1C17xxx]
- **C** — **Tool classification**
  [C: microcomputer use]
- **S5U1** — **Product classification**
  [S5U1: development tool for semiconductor products]

Table of Contents

1. Features

The S5U1C17602T1100 (SVT17602: Software Evaluation Tool for S1C17602) is an evaluation board for the S1C17602 MCU made by Seiko Epson.

The SVT17602 consists of a CPU board and an ICD board connected for software debugging, eliminating the need to connect a separate ICD debugging tool.

It also incorporates serial expansion ports to let users connect their own expansion boards.

<CPU board>

CPU	S1C17602
Input power supply voltage	+3.3 V DC (supplied through the ICD interface or by a CR2032 button cell)
CPU input clock	OSC1: 32.768 kHz
	OSC3: 6 MHz
Functions/devices	• Reset switch
	• Expansion interface connectors (P, UART, I2C, SPI)
	• ICD board connector
	• Thermistor
	• Humidity sensor
	• Illuminance sensor
	• Key input (2 keys)
	• Lever and push-switch
	• Infrared emitters/photo-receiver module
	• STN LCD panel (display size: 36 segments x 8 common B/W)

<ICD board>

PC interface	USB 1.1
Power supply voltage	USB bus power (onboard regulator output voltage: 3.3 V)
Functions/devices	• Status display LED (3-color)
	• Reset switch
	• CPU board connector

2. Package Contents

The S5U1C17602T1100 package contains the following items.

(1) SVT17602 CPU board (main unit).. 1

(2) SVT17602 ICD board 1

(3) USB cable 1

(4) Coin cell (CR2032/3V) 1

(5) Warranty card.. 1 in English & 1 in Japanese

(6) Precautions.. 1 in English & 1 in Japanese

(7) Manual downloading instructions .... 1 in English & 1 in Japanese

3. Part Names and Functions

3.1 Part names

The part names and functions are as shown below.

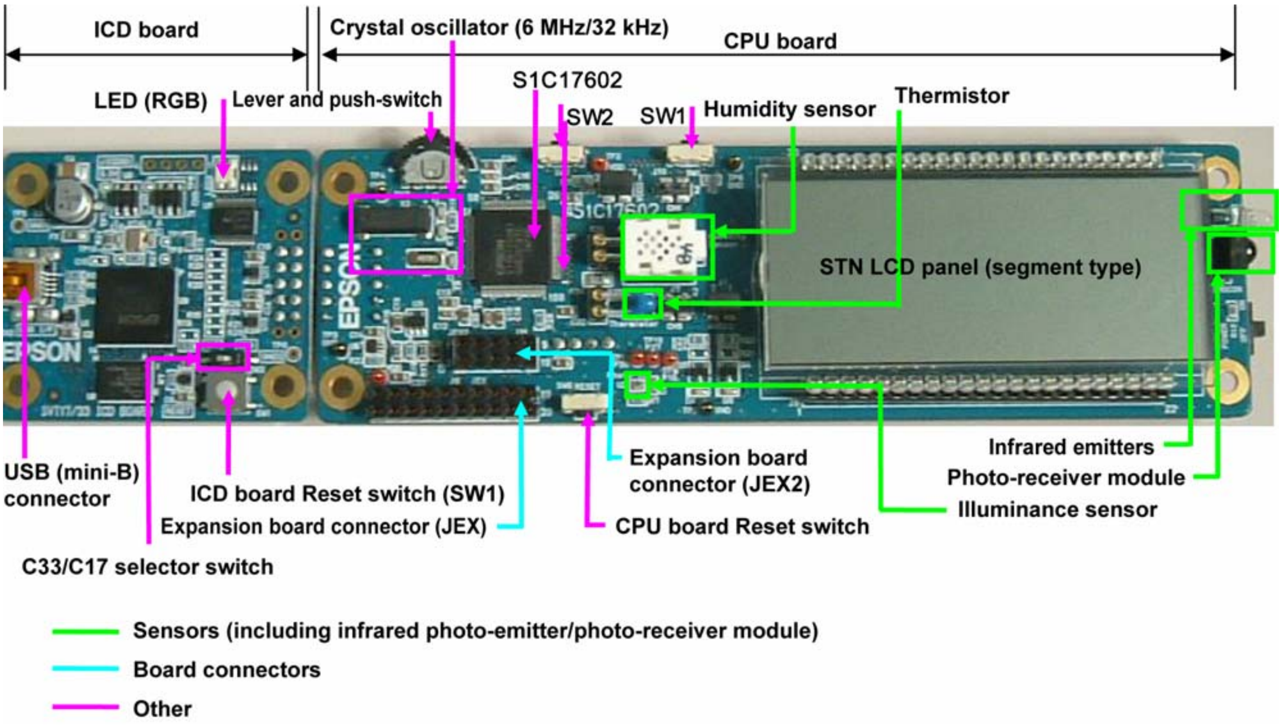


Figure 3.1 Upper side component names

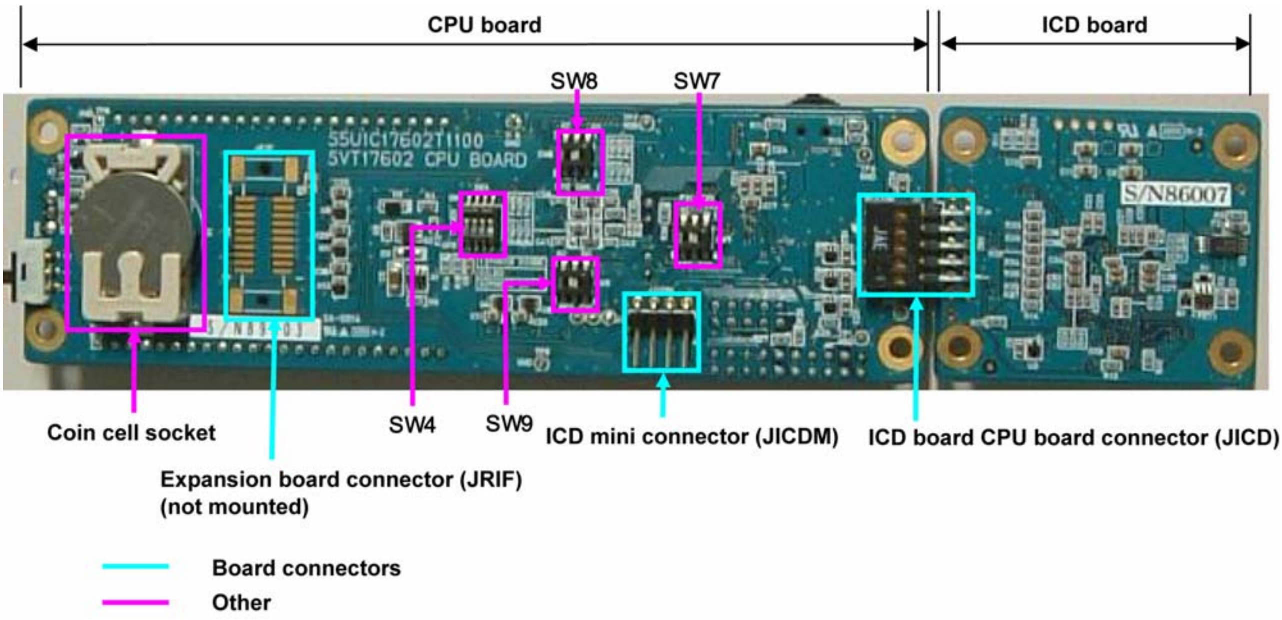


Figure 3.2 Underside component names

3.2 Board dimensional diagram

3.2.1 CPU board dimensional diagram

The CPU board dimensional diagram is shown below.

<Upper side>

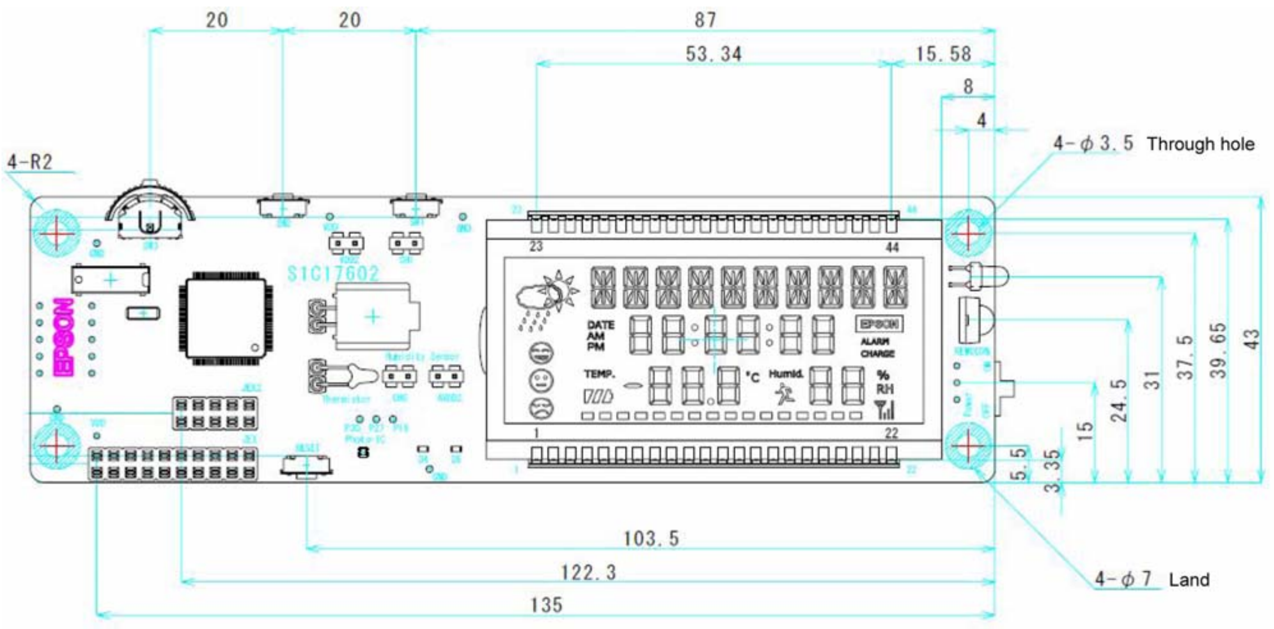


Figure 3.3 CPU board dimensional diagram (upper side)

<Underside>

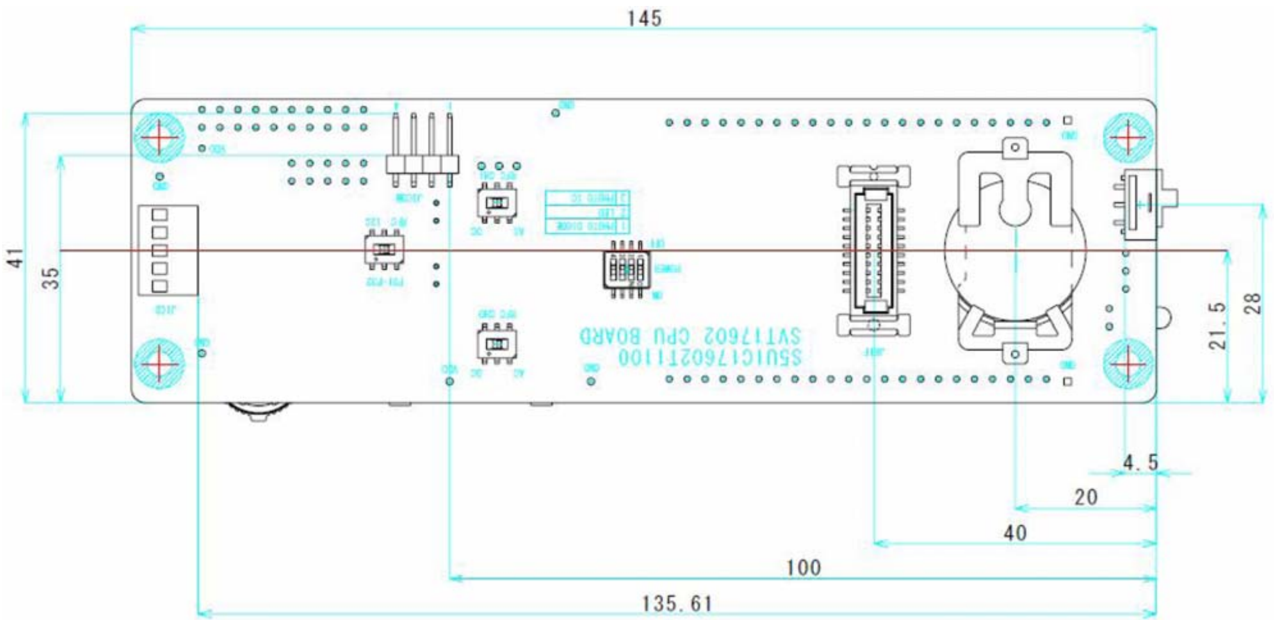


Figure 3.4 CPU board dimensional diagram (underside)

3.2.2 ICD board dimensional diagram

The ICD board dimensional diagram is shown below.

<Upper side>

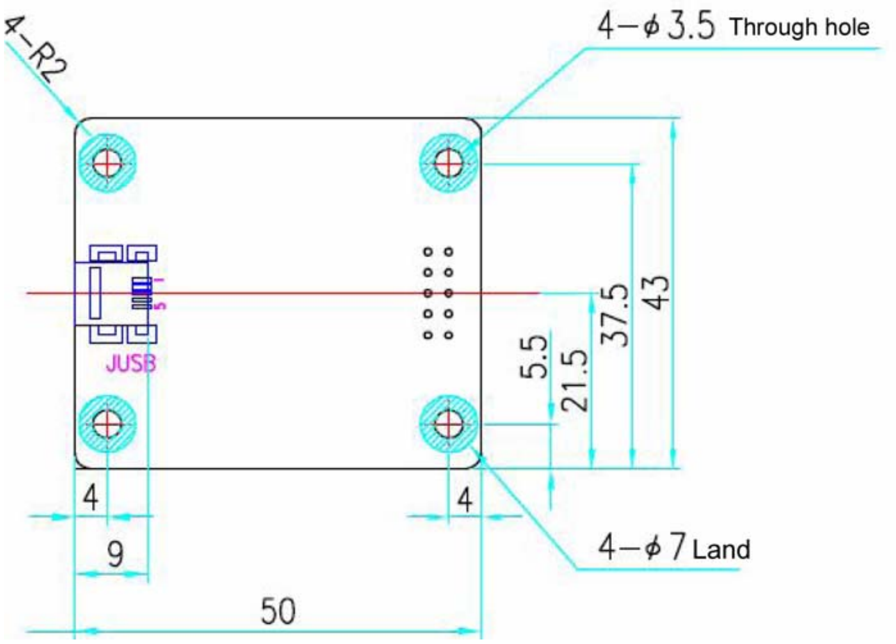


Figure 3.5 ICD board dimensional diagram (upper side)

<Underside>

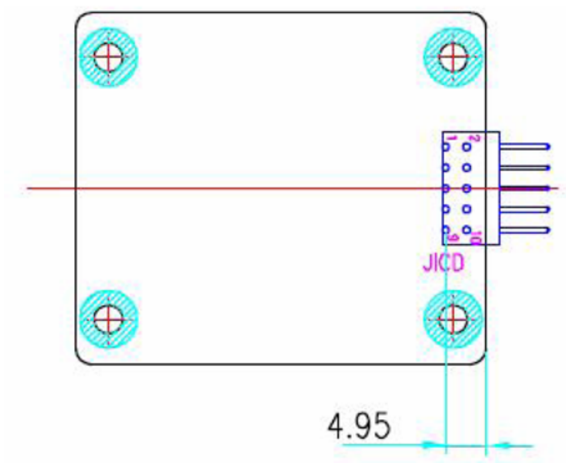


Figure 3.6 ICD board dimensional diagram (underside)

3.3 Main components

<CPU board>

CPU (U7) .... S1C17602 .... SEIKO EPSON CORP.

Crystal oscillator (32.768 kHz) (X1) .... FC-255 .... EPSON TOYOCOM CORP.

Crystal oscillator (6 MHz) (X2) .... MA-406 .... EPSON TOYOCOM CORP.

Reset switch (SW6) .... SKQTLCE010 .... ALPS

LCD panel .... Custom-made .... Epson custom-made component

Thermistor (R32) .... 103AP-2 .... Ishizuka

Humidity sensor (R31) .... C10-M53R .... SHINYEI TECHNOROGY

Illuminance sensor (U2) .... TPS856 .... TOSHIBA

Expansion board connector (JEX) .... SLW-110-01-G-D .... SAMTEC

Expansion board connector (JEX2) .... SLW-105-01-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 switch (SW1, SW2) .... SKRAAKE010 .... ALPS

Lever and push-switch (SW3) .... SLLB5 .... ALPS

Infrared emitters (D1) .... AN333 .... STANLEY

Infrared photo-receiver module (U1) .... PNA4702M .... Panasonic

Battery holder (V1) .... BA2032SM .... TAKACHI

Coin cell .... CR2032(3V)

<ICD board>

USB mini-B connector .... 54819-0572 .... molex

LED(RGB) .... 598-9920-307F .... Dialight

Reset switch (SW1) .... SKRAAKE010 .... ALPS

3.4 Individual component functions

3.4.1 ICD board

The ICD board is a hardware tool (emulator) designed to make S1C17602 software development more efficient. It provides a simple S1C17602 software development configuration by controlling communications between the PC and the target IC (S1C17602) on the CPU board. Refer to Section 6 for detailed information on functional differences from the S5U1C17001H development tool ICD Mini, which supports all S1C17 core products.

* The C17/C33 core selector switch (SW2) in Figure 3.7 should be set to "C17" at all times. Note that operation is not possible if this switch is set to "C33."

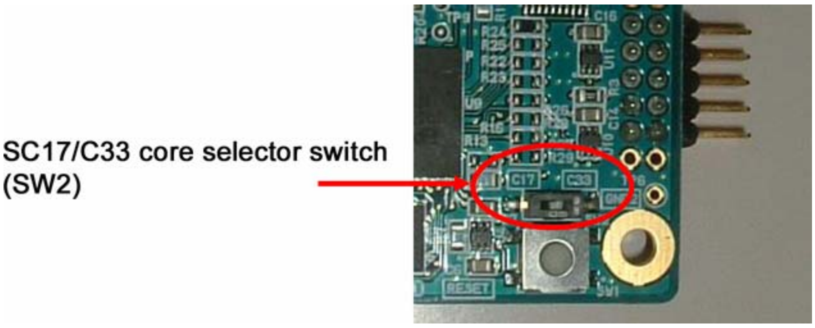


Figure 3.7 C17/C33 core selector switch

ICD board Reset switch

Pressing the ICD board Reset switch (SW1) reboots the ICD board firmware and outputs a target reset signal (#RESET_OUT) to the CPU board. The connection required for communications is complete once the ICD board is physically connected to the CPU board. A wait status remains until this physical connection is made.

ICD board LED

This LED displays different colors to indicate the ICD board and target status.

● (blue)	Power on (before target and initial connection is established)
● (green)	Target is in debugging mode.
● (red)	Target is not connected or is not connected correctly. Target is running a user program.

3.4.2 CPU board

The CPU board is a simple target evaluation board on which the target CPU (S1C17602) is mounted. It also includes peripheral components and circuits such as an LCD panel, temperature/humidity/illuminance sensors, and infrared emitters/photo-receiver module and can be used to develop and evaluate control software for these components.

CPU board Reset switch

Press the CPU board Reset switch (SW6) to reset the CPU board.

Coin cell

The underside of the CPU board features a coin cell (CR2032) holder. Power is supplied by a coin cell if the CPU board is used on its own. When used connected to the ICD board, power is automatically supplied from the ICD board by the switching circuit on the CPU board, in which case power from the coin cell is automatically switched off.

4. Block Diagram

The block diagrams for the SVT17602 CPU and ICD boards are shown below.

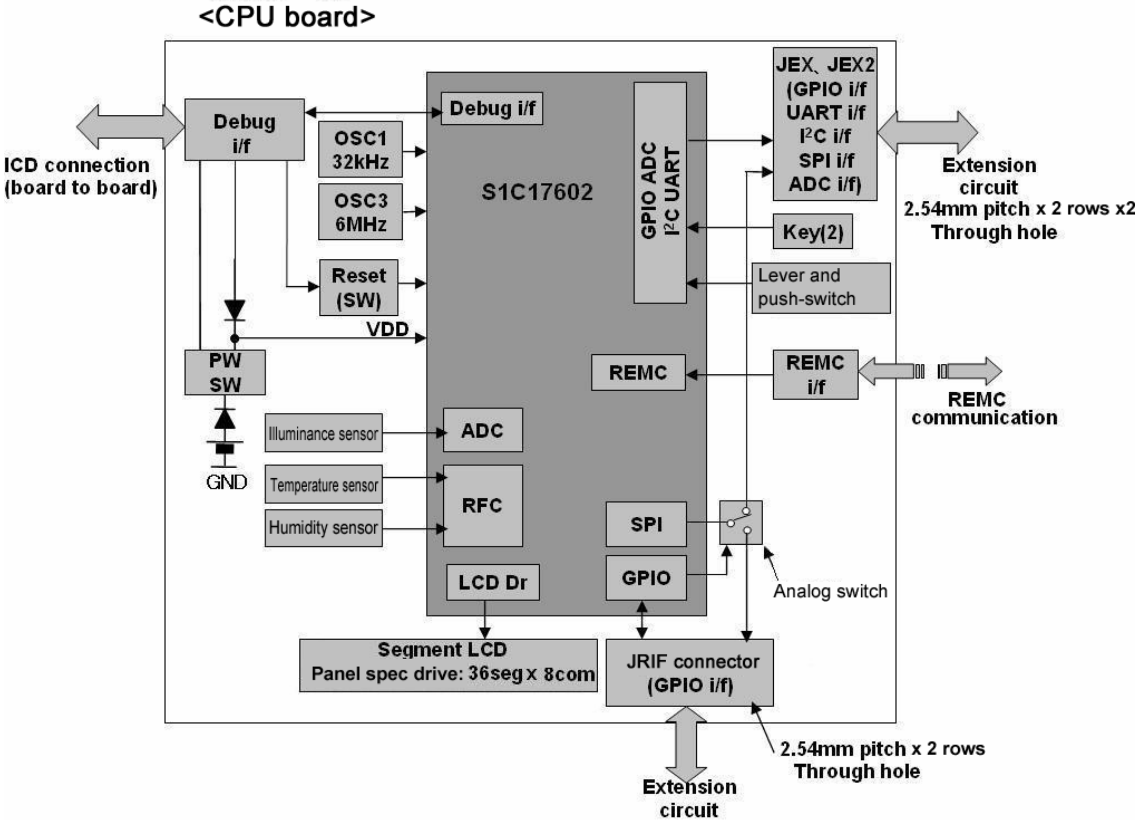


Figure 4.1 CPU board block diagram

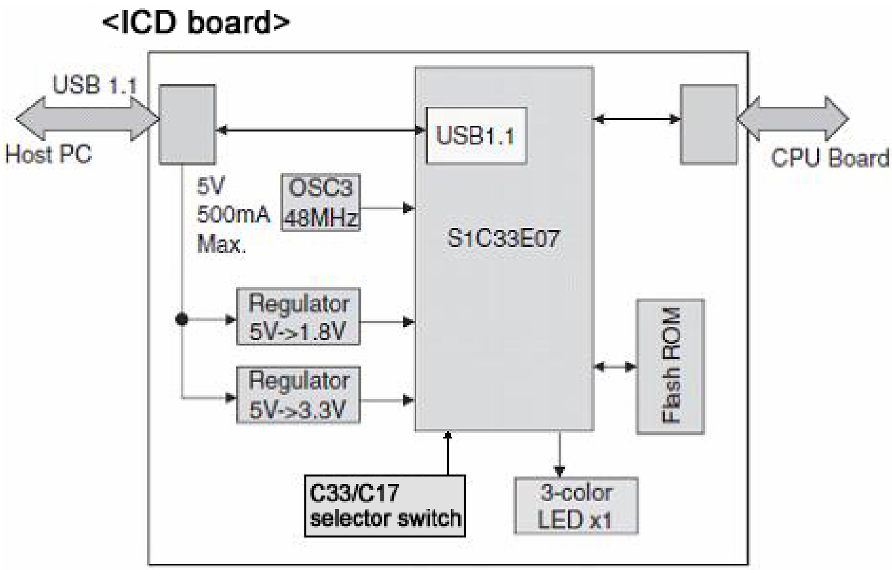


Figure 4.2 ICD board block diagram

5. Operating Configuration and Startup Procedure

The SVT17602 can be operated in accordance with commands executed on a PC debugger by connecting to a PC via the ICD board. The CPU board can also be used on its own without the ICD board or a PC. The corresponding connection configurations and startup procedures are described below.

5.1 Simple software development configuration

The SVT17602 provides a simple S1C17602 software development configuration for the CPU board as a target by connecting to a PC via the ICD board and using in conjunction with the S1C17 development tools on the PC (e.g., GNU17 IDE, compiler, and debugger provided as part of the S5U1C17001C package).

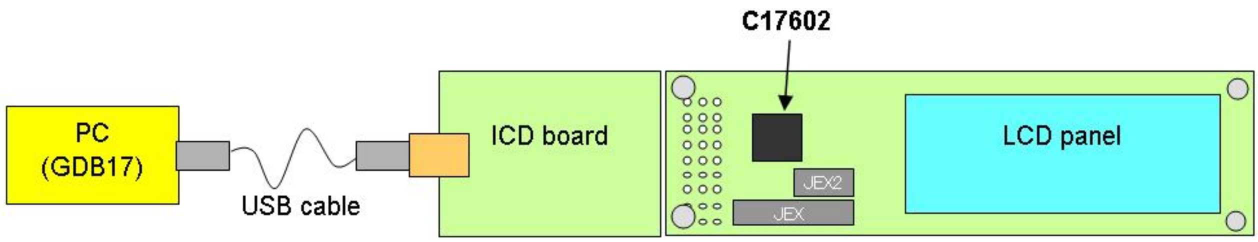


Figure 5.1 Simple software development configuration

Simple software development configuration

In this operating configuration, the target CPU (S1C17602 on the CPU board) is controlled by commands executed on the debugger in the PC connected to the IC board. Commands issued by the debugger are sent via USB to the ICD board, where they are analyzed, then converted to S1C17602 debugging signals and sent to the CPU board. Programs and data can be downloaded from the PC debugger to the CPU board for debugging by starting and stopping program execution.

CPU operation mode

The target CPU (S1C17602 on CPU board) halts target program operations following a brk command or debug interrupt (e.g., forced break operations on the debugger) from the ICD board, then switches to debug mode (break state). This state allows commands to be executed from the PC debugger. The ICD board LED illuminates in green for debug mode. The target program is executed by the target CPU in a state called normal mode. The ICD board LED illuminates in red for normal mode.

Connections and startup

The connection and startup procedures for the simple software development configuration are described below.

(1) Connect the CPU board to the ICD board. (Connect the two JICD 10-pin connectors. Refer to Section 2 for the connection diagram.)

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

(3) Install the appropriate USB driver from the driver install screen that appears on the PC monitor. (This step is performed for first-time use only and is not repeated for subsequent connections.) Refer to the following "Installing the USB driver" section for installation procedure specifics.

(4) Confirm that the ICD board LED changes from blue to green (indicating target debug mode).

(5) Launch IDE on the PC and run the program using GDB launched by IDE. Confirm that the LED changes to red (target in normal mode) while the program is running.

For detailed information on using the debugger and debugging commands, refer to the *S5U1C17001C Manual (S1C17 Family C Compiler Package)*.

Note: Never disconnect the USB cable between the PC and ICD board while the debugger is running.

Installing the USB driver

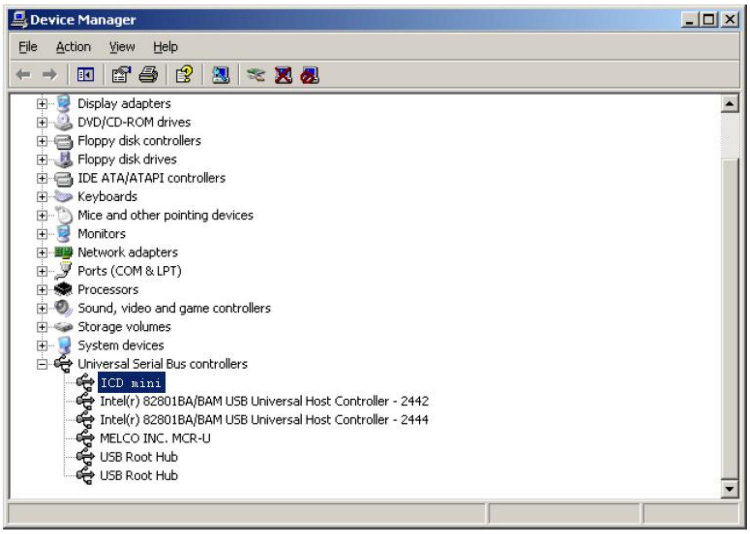
(1) The following screen appears when the SVT17602 is connected to the host computer via a USB cable.

(2) Install the USB driver according to directions provided by the install wizard.

Specify "C:\EPSON\GNU17\utility\drv_usb" for the USB driver directory.

* This path specifies the path at which the IDE is installed.

The Device Manager appears as shown below once the USB driver is successfully installed.



Note: If the screen does not appear as shown above, re-install the USB driver.

5.2 SVT17602 independent operation

The SVT17602 can be used as a CPU board by itself, without the ICD board or PC.

Independent operation

In this operating configuration, the S1C17602 on the CPU board operates in normal mode and runs the program written to internal flash memory. This means the user program must be downloaded to S1C17602 internal flash memory beforehand. (The SVT17602 is shipped with demo programs stored on internal flash memory.) For instructions on downloading user programs to internal flash memory, refer to the *S5U1C17001C Manual (S1C17Family C Compiler Package)*.

Connections and startup

The procedures for operating the SVT17602 by itself are given below.

(1) Turn on the PC (only if turned off).

(2) With the CPU board connected to the ICD board, connect the PC to the ICD board using a USB cable.

(3) Launch the PC debugger and download the user program to S1C17602 internal flash memory. For instructions on downloading programs, refer to the *S5U1C17001C Manual (S1C17Family C Compiler Package)*.

(4) Once the debugger has finished running, disconnect the USB cable to separate the ICD board from the PC.

(5) Remove the ICD board from the CPU board and insert the coin cell.

(6) Turn on the power control switch (SW5).

(7) Press the CPU board Reset switch. The S1C17602 on the CPU board executes the user program downloaded to flash memory.

5.3 ICD board firmware update procedures

The SVT17602 allows the ICD board firmware to be updated using the PC debugger. The ICD board firmware is available from Seiko Epson, as required. (The update file has the file extension ".sa.")

The firmware update procedure is described below.

Note: The USB driver must be installed before updating the firmware.

(1) Using a USB cable, connect the SVT17602 ICD board to the PC.

(2) Press the ICD board Reset switch (SW1).

(3) Launch the debugger from the command prompt.

>cd c:\EPSON\gnu17 (Specifies the path at which the gnu17 tool was installed.)

>gdb

(4) Enter the following commands once the debugger is running.

(gdb) target icd usb

(gdb) c17 firmupdate path\filename.sa

(For "path\filename.sa," specify the name of the file to be updated.)

(5) The process is complete when the ICD board LED illuminates in green (●).

(6) Press the ICD board Reset switch to restart the firmware.

6. Differences between the ICD Board and ICD Mini

Table 6.1 compares specifications for the S5U1C17001H (ICD Mini) S1C17 Family development tool and the SVT17602 ICD board. The SVT17602 includes an ICD Mini interface, however, note that the ICD board and ICD Mini cannot be connected at the same time. For detailed information on using the ICD Mini, refer to the *S5U1C17001H User Manual*.

Table 6.1 Comparison of ICD Board and ICD Mini Functions

Product	S5U1C17000H (ICD Mini)	S5U1C17602T1100(SVT17602) ICD board
Core supported	S1C17 core	
Host interface	USB1.1	
Communication frequency with target (DCLK frequency)	4 kHz to 40 MHz	
Independent flash writing function	**Yes**	**No**
Firmware update function	Yes	
Flash write power supply	**Yes**	**No**
Reset signal output to target	Yes	
Target system I/O compatible voltage	**3.3 V, 1.8 V, voltage input from target (1.0 V to 5.0 V)**	**3.3 V**
Target connector	**4-pin**	**10-pin (including reset signal) *1**
Flash write power supply connector *2	**4-pin**	—

*1 For connection to the CPU board only.

*2 The S1C17602 does not require a separate power supply for flash writing.

7. I/O Ports

Table 7.1 lists S1C17602 ports and SVT17602 connection targets.

For detailed information on expansion interfaces and connectors, refer to Section 17.

Table 7.1 I/O port function list

Port	Direction	Multiplex	Signal	Connected to
P00	I/O	REMC	P00/REMO	Infrared emitters (D1)
P01	I/O	REMC	P01/REMI	Infrared photo-receiver module (U1)
P02	I/O	Timer	P02/EXCL0	Key input (SW1)
P03	I/O	ADTRG	P03/#ADTRG	Lever & push-switch and expansion I/F (connector: JEX2)
P04	I/O	SPI	P04/SPICLK	Switch IC (U13) → Expansion I/F (connector: JEX) or expansion I/F (connector: JRIF)
P05	I/O	SPI	P05/SDO	Switch IC (U11) → Expansion I/F (connector: JEX) or expansion I/F (connector: JRIF)
P06	I/O	SPI	P06/SDI	Switch IC (U9) → Expansion I/F (connector: JEX) or expansion I/F (connector: JRIF)
P07	I/O	SPI	P07/#SPISS	Expansion I/F (connector: JEX2) and expansion I/F (connector: JRIF)
P10	I/O	UART	P10/SCLK0	Expansion I/F (connector: JEX)
P11	I/O	UART	P11/SOUT0	Expansion I/F (connector: JEX) and expansion I/F (connector: JRIF)
P12	I/O	UART	P12/SIN0	Expansion I/F (connector: JEX) and expansion I/F (connector: JRIF)
P13	I/O	Timer/ADC	P13/EXCL1/AIN7	Expansion I/F (connector: JEX2) and switch IC (U4) → LED (D5)
P14	I/O	Timer/ADC	P14/EXCL2/AIN6	Expansion I/F (connector: JEX)
P15	I/O	Timer/ADC	P15/EXCL3/AIN5	Key input (SW2) and expansion I/F (connector: JEX)
P16	I/O	UART/ADC	P16/SCLK1/AIN4	Switch IC
P17	I/O	ADC	P17/AIN3	Expansion I/F (connector: JEX)
P20	I/O	ADC	P20/AIN2	Expansion I/F (connector: JEX)
P21	I/O	ADC	P21/AIN1	Illuminance sensor (U2) and expansion I/F (connector: JEX)
P22	I/O	ADC	P22/AIN0	Expansion I/F (connector: JEX)
P23	I/O	RFC	P23/SENB0	Thermistor
P24	I/O	RFC	P24/SENA0	Thermistor
P25	I/O	RFC	P25/REF0	Thermistor
P26	I/O	RFC	P26/RFIN0	Thermistor
P27	I/O	UART/RFC	P27/SOUT1/RFIN1	Humidity sensor
P30	I/O	UART/RFC	P30/SIN1/REF1	Humidity sensor
P31	I/O	I2C/RFC	P31/SCL0/SENA1	Humidity sensor or expansion I/F (connector: JEX2)
P32	I/O	I2C/RFC	P32/SDA0/SENB1	Humidity sensor or expansion I/F (connector: JEX2)
P33	I/O	I2C/RFC	P33/SCL1/SCL0	Expansion I/F (connector: JEX)
P34	I/O	I2C/RFC	P34/SDA1/SDA0	Expansion I/F (connector: JEX)
P35	I/O	FOUT/Memory	P35/FOUT1/#BFR	Expansion I/F (connector: JEX)

Port	Direction	Multiplex	Signal	Connected to
P36	I/O	TOUT/RFC	P36/TOUT3 /RFCLKO	Lever & push-switch and expansion I/F (connector: JEX2)
P37	I/O	TOUTN /LFRO/TOUT	P37/TOUTN3 /LFRO/TOUT4	Lever & push-switch and expansion I/F (connector: JEX2)
P40	I/O	FOUT	P40/FOUTH	Expansion I/F (connector: JEX2) and switch IC (U4) → LED (D4)
P41	I/O	Debugger	P41/DSIO	Expansion I/F (connector: JICD and JICDM)
P42	I/O	Debugger	P42/DST2	Expansion I/F (connector: JICD and JICDM)
P43	I/O	Debugger	P43/DCLK	Expansion I/F (connector: JICD and JICDM)

8. Switch Settings

The underside of the SVT17602 has one side slide switch (SW5) and four DIP switches (SW4, SW7, SW8, SW9), as shown in Figure 8.1. The various switch settings are described below.

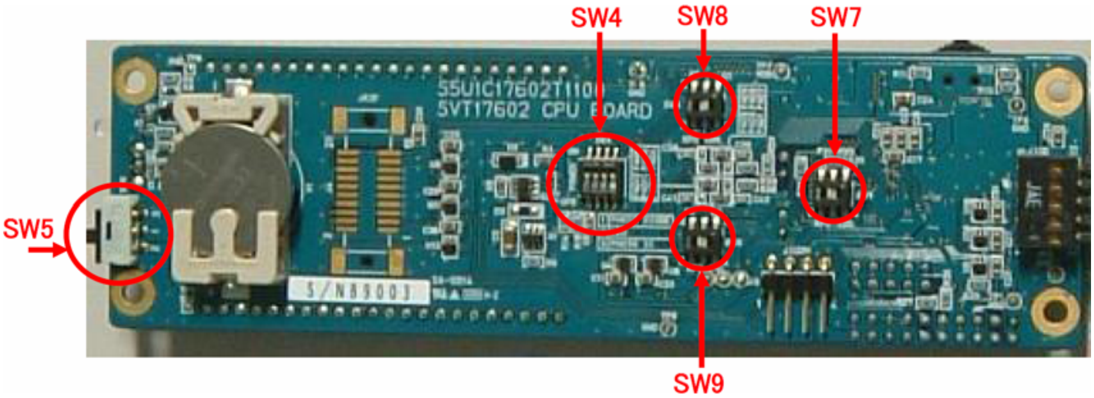


Figure 8.1 Switch locations (CPU board underside)

8.1 SW5 settings

The SW5 switch is used to turn the power supply from the coin cell (CR2032) to the board on or off. The power supply from the coin cell is controlled via the circuit shown in Figure 8.2. This circuit helps minimize unnecessary battery power consumption by switching off the power supply when the board is not in use. (This switch is disabled when power is supplied by VDD_ICD from JICD as shown in Figure 8.2.)

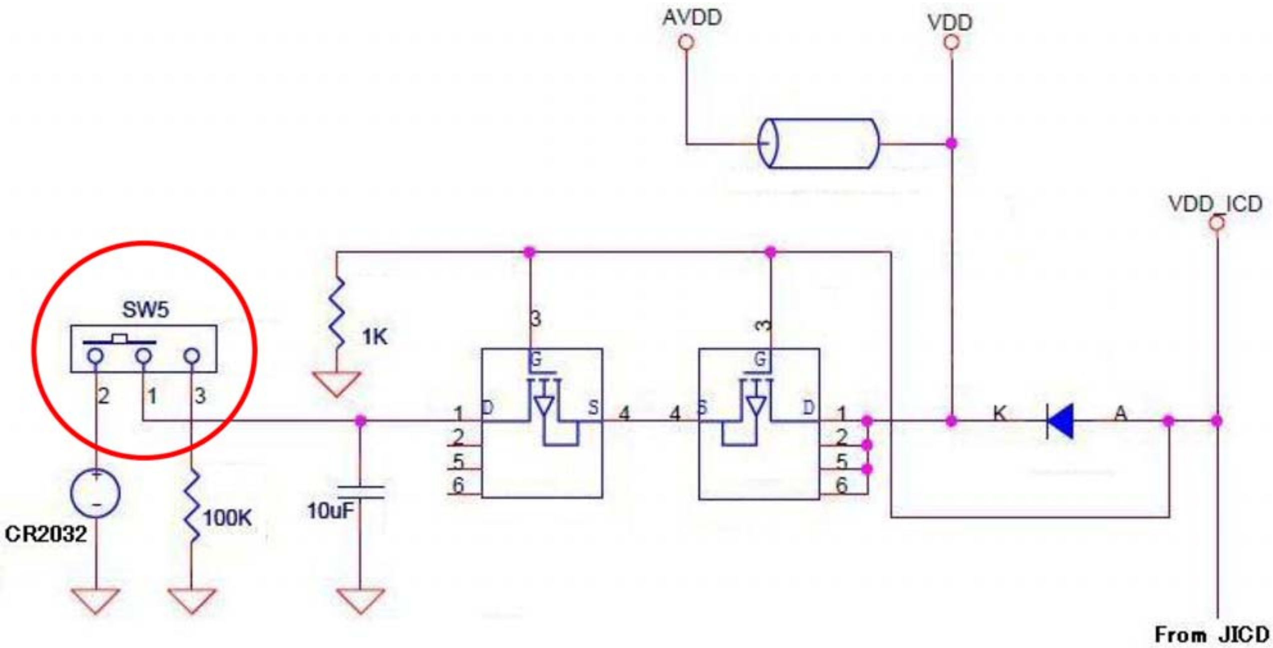


Figure 8.2 Coin cell control switch circuit

8.2 SW4 settings

The SW4 switch is used to control the power supply to the infrared photo-receiver module (U1: PNA4702M), LED (D4, D5: SML-D12P8W, SML-D12V8W), and illuminance sensor (U2: TPS856). The power supply for the infrared photo-receiver module, LED, and illuminance sensor can be controlled via the circuit shown in Figure 8.3. This circuit minimizes unnecessary power consumption by switching off the power supply when the board is not in use.

* The infrared photo-receiver module is socket-mounted to permit removal if it is not needed.

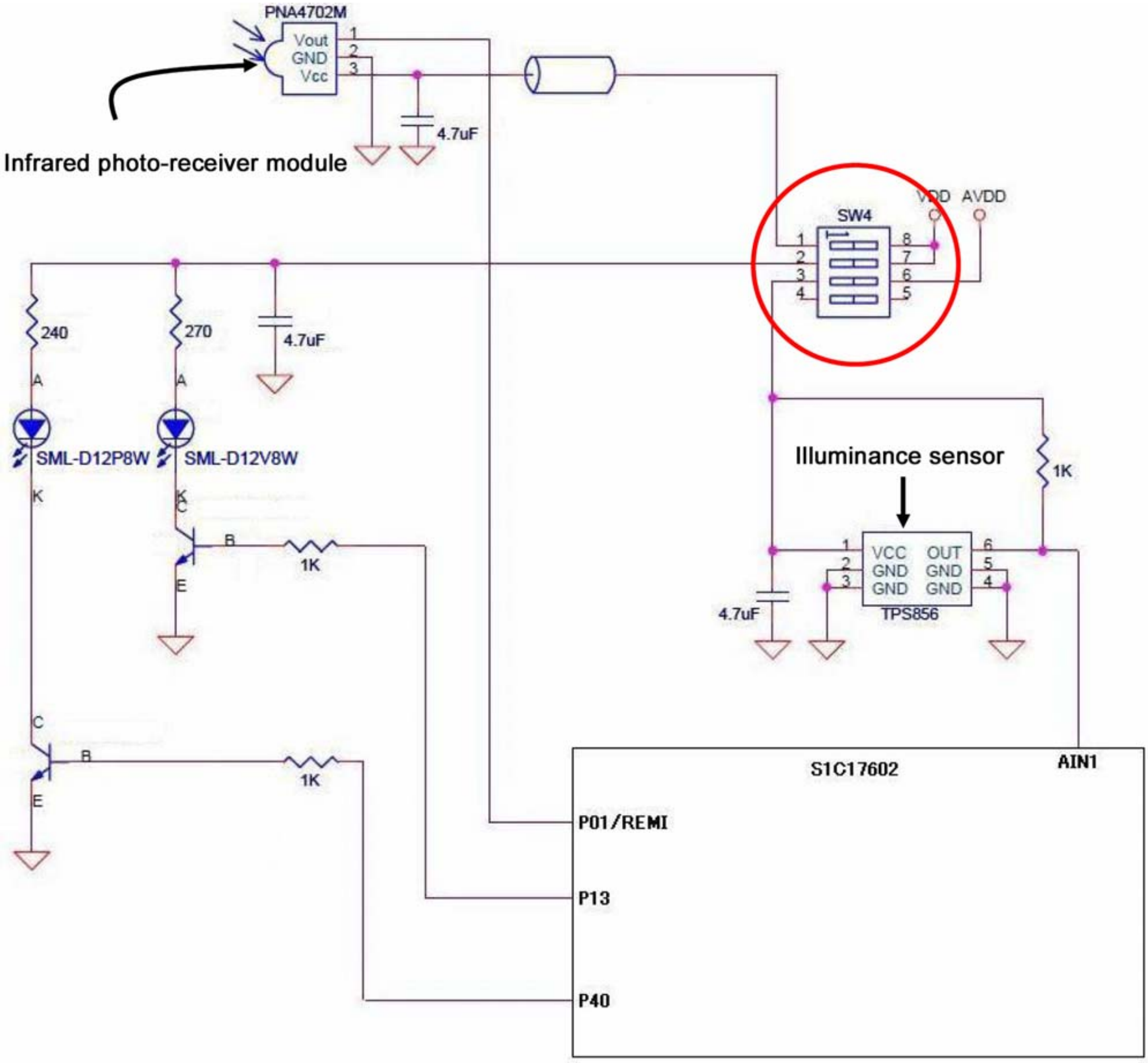


Figure 8.3 Power supply switch (SW4) peripheral circuit

8.3 SW7/SW8/SW9 (PAD1 to 12) settings

The SW7, SW8, and SW9 switches are used to select external connections to allow enabling/disabling of the R/F converter (RFC) incorporated into the S1C17602 as well as differing RFC drive methods (DC/AC drive). Lands (PAD1 to 6) are also provided for inserting/removing the 0-Ω resistor between the pads for external connections linked to the RFC drive method selected by the switches. Lands (PAD7 to 12) also enable setting of the standard capacitance to 100 pF or 1,000 pF by inserting or removing the 0-Ω resistor between the pads.

Tables 8.1 and 8.2 give the RFC drive methods and standard capacitance for the various switch (SW7 to 9) and land (PAD1 to 12) settings. (The factory default settings are indicated in bold text in the tables below.)

* For detailed information on RFC drive method selection, refer to Sections 13 and 14 .

Table 8.1 RFC drive methods for SW7 to 9 settings

	SW7		SW8		SW9	
	RFC	I2C	DC	AC	DC	AC
RFC Ch.0			**DC drive**	AC drive		
RFC Ch.1	**RFC**	I2C			DC drive (when SW7=RFC)	**AC drive (when SW7=RFC)**

Table 8.2 RFC drive methods and standard capacitance for PAD1 to 12 settings (when SW7=RFC)

	PAD1 to 3 0-Ω resistor		PAD4 to 6 0-Ω resistor		PAD7 to 9 0-Ω resistor		PAD10 to 12 0-Ω resistor	
	1 to 2	2 to 3	4 to 5	5 to 6	7 to 8	8 to 9	10 to 11	11 to 12
RFC Ch.0	AC drive	**DC drive**			**Std capacitance 1,000 pF**	Std capacitance 100 pF		
RFC Ch.1			DC drive	**AC drive**			**Std capacitance 1,000 pF**	Std capacitance 100 pF

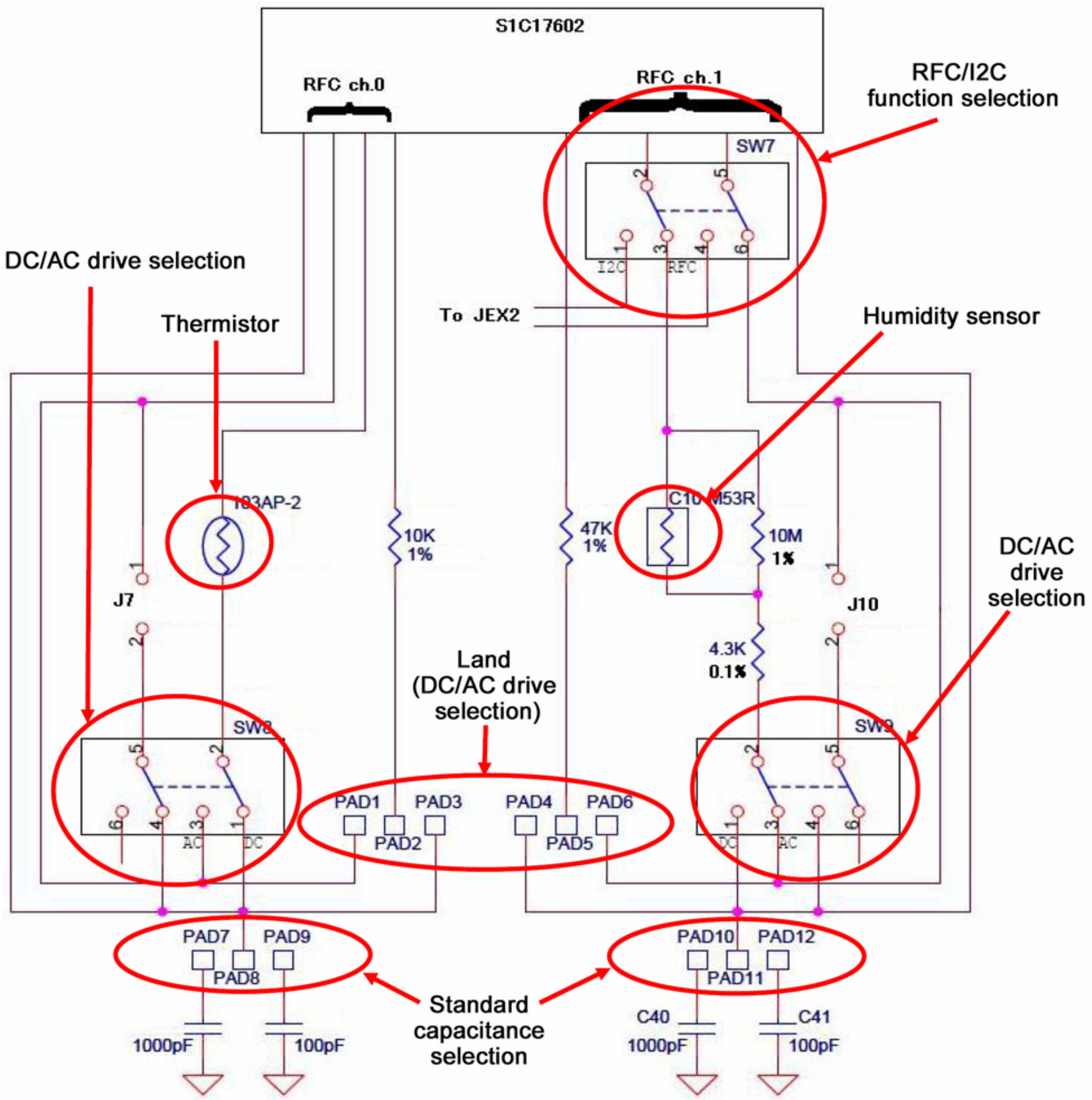


Figure 8.4 RFC function selector switch (SW7) and drive method selector switches (SW8, SW9) and PAD1 to 12

9. CPU Board Key Input Circuit

Switches SW1 and SW2 on the SVT17602 CPU board are connected to the S1C17602 ports P02 and P15 as shown in Figure 9.1 below.

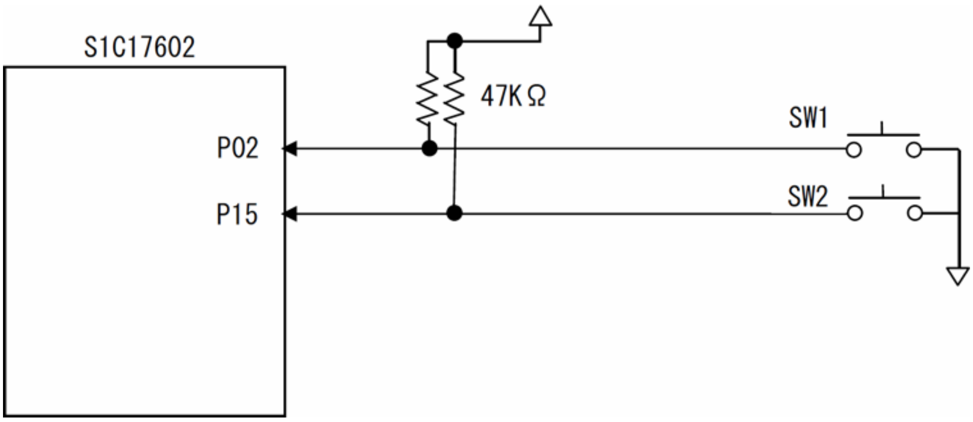


Figure 9.1 CPU board key input circuit

The input ports P02 and P15 are pulled up via a 47 kΩ resistance and normally maintained at High level (input = 1). Pressing the switch switches the port to Low level (input = 0).

10. Infrared emitter LED/Photo-receiver Module

The infrared emitters (AN333) and infrared photo-receiver module (PNA4702M) mounted on the SVT17602 CPU board are connected to the S1C17602 remote controller pins (P01/REMI and P00/REMO) as shown in Figure 10.1 below.

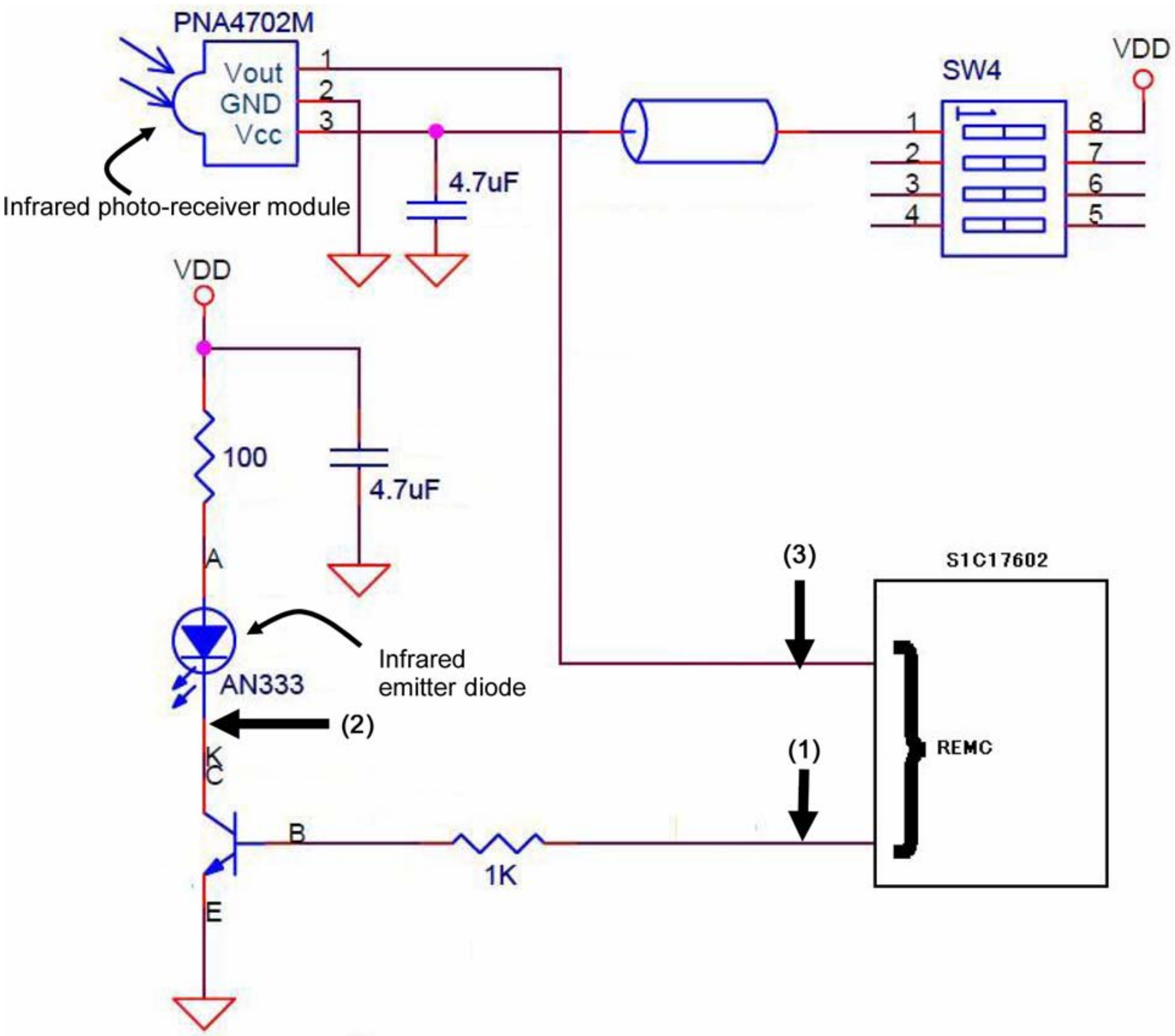


Figure 10.1 Infrared emitters/infrared photo-receiver module

Refer to the application note for detailed information on infrared emitters and infrared photo-receiver module control.

10.1 Infrared unit emitting/receiving

Two SVT17602 units can be used as shown in Figure 10.2 to transmit and receive remote control signals.

Figure 10.2 Transmitting and receiving using two units

* As a guide, the maximum separation allowing transmission in this case is approximately 3 m with the photo-emitter LED and photo-receiver module facing each other with no intervening obstructions.
Figure 10.3 shows the waveforms observed for transmitted/received waveforms (1) to (3) in Figure 10.1 in this case.

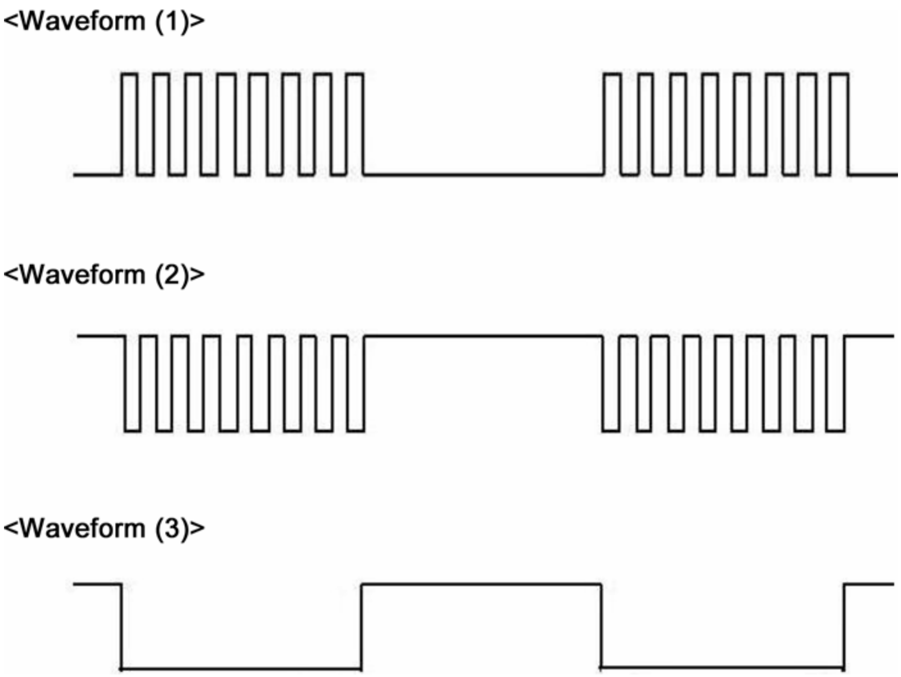


Figure 10.3 Infrared remote controller transmission waveforms

10.2 Infrared photo-receiver module power supply switch

The power supply for the infrared photo-receiver module (PNA4702M) mounted on the SVT17602 can be turned on and off using switch SW4-1. Turning off this switch reduces unnecessary current consumption for the entire board when the infrared photo-receiver module is not in use.

* The infrared photo-receiver module is socket-mounted to permit removal if it is not needed.

11. LCD Panel

The S1C17602 features a segment LCD driver capable of driving a monochrome LCD panel of up to 288 segments (36 segments (SEG) x 8 common (COM)). The CPU board includes a segment-type LCD panel for evaluating functions of the LCD driver on the S1C17602 and is connected to the S1C17602 SEG/COM pins as shown in the diagram below.

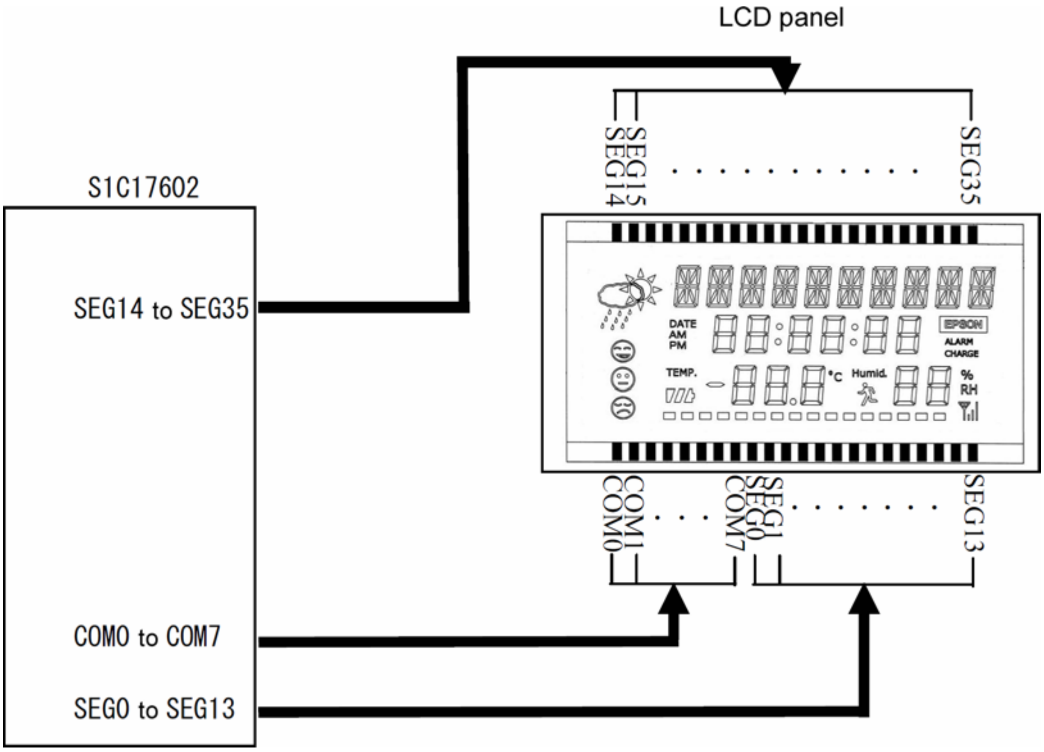


Figure 11.1 LCD panel connection

11.1 LCD panel segment allocation

The segment allocation diagram for the SVT17602 LCD panel is shown below, together with the segment/common allocation chart for the LCD panel pin arrangement.

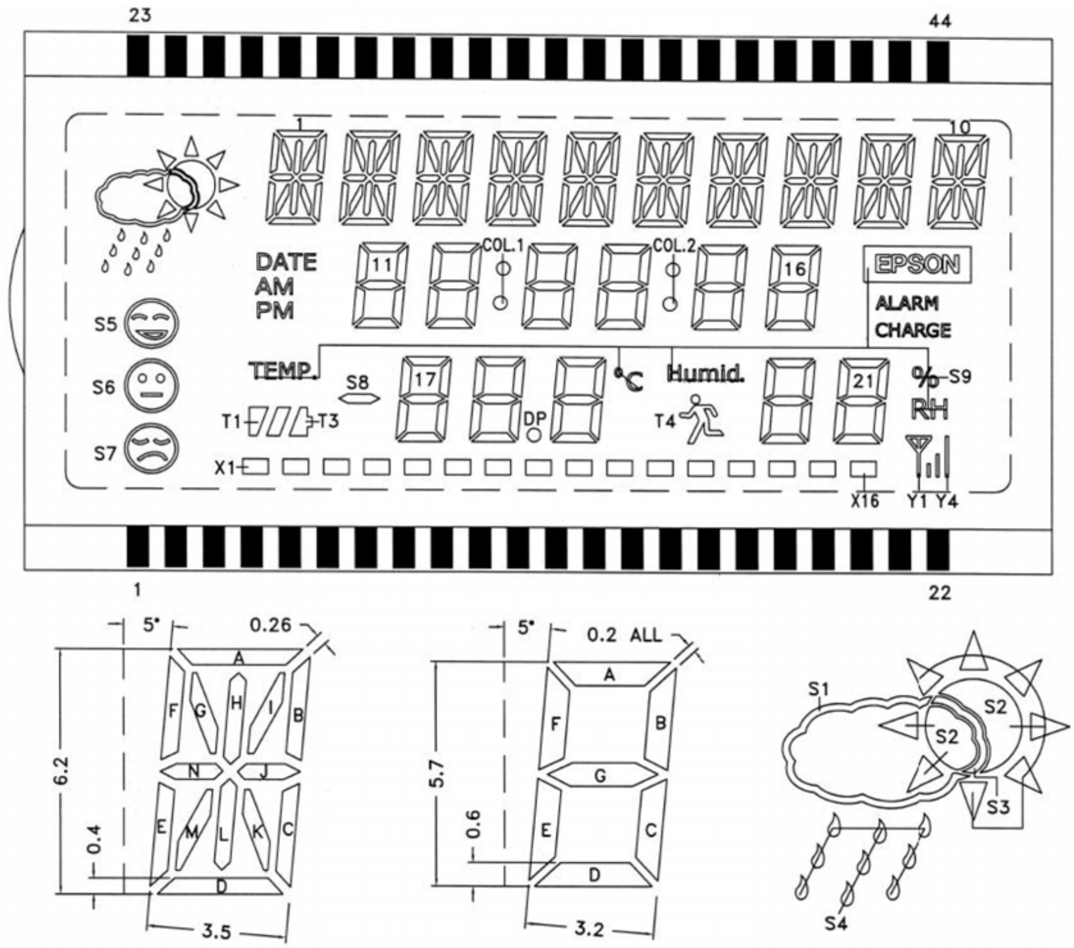


Figure 11.2 LCD panel segment allocation diagram

PIN	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8	PIN	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8
1	COM1	/	/	/	/	/	/	/	23	3A	3G	3F	3N	3E	11F	11E	/
2	/	COM2	/	/	/	/	/	/	24	/	3I	3H	3L	3M	11A	11G	11D
3	/	/	COM3	/	/	/	/	/	25	3B	3J	3C	3K	3D	11B	11C	/
4	/	/	/	COM4	/	/	/	/	26	4A	4G	4F	4N	4E	12F	12E	/
5	/	/	/	/	COM5	/	/	/	27	/	4I	4H	4L	4M	12A	12G	12D
6	/	/	/	/	/	COM6	/	/	28	4B	4J	4C	4K	4D	12B	12C	/
7	/	/	/	/	/	/	COM7	/	29	5A	5G	5F	5N	5E	13F	13E	COL.1
8	/	/	/	/	/	/	/	COM8	30	/	5I	5H	5L	5M	13A	13G	13D
9	S3	S4	S7	X1	X2	X3	X4	X5	31	5B	5J	5C	5K	5D	13B	13C	/
10	S2	S1	S5	S6	S8	17F	17E	X6	32	6A	6G	6F	6N	6E	14F	14E	/
11	/	/	AM	T1	T2	17A	17G	17D	33	/	6I	6H	6L	6M	14A	14G	14D
12	/	/	DATE	PM	T3	17B	17C	X7	34	6B	6J	6C	6K	6D	14B	14C	/
13	1A	1G	1F	1N	1E	18F	18E	X8	35	7A	7G	7F	7N	7E	15F	15E	COL.2
14	/	1I	1H	1L	1M	18A	18G	18D	36	/	7I	7H	7L	7M	15A	15G	15D
15	1B	1J	1C	1K	1D	18B	18C	DP	37	7B	7J	7C	7K	7D	15B	15C	X12
16	2A	2G	2F	2N	2E	19F	19E	X9	38	8A	8G	8F	8N	8E	16F	16E	T4
17	/	2I	2H	2L	2M	19A	19G	19D	39	/	8I	8H	8L	8M	16A	16G	16D
18	2B	2J	2C	2K	2D	19B	19C	X10	40	8B	8J	8C	8K	8D	16B	16C	/
19	/	/	/	/	ALARM	CHARGE	S9	X11	41	9A	9G	9F	9N	9E	20F	20E	X13
20	Y4	/	/	/	Y3	/	Y2	Y1	42	/	9I	9H	9L	9M	20A	20G	20D
21	10B	10J	10C	10K	10D	21B	21C	X16	43	9B	9J	9C	9K	9D	20B	20C	X14
22	/	10I	10H	10L	10M	21A	21G	21D	44	10A	10G	10F	10N	10E	21F	21E	X15

Figure 11.3 LCD panel segment/common allocation chart

Refer to the application note for detailed information on LCD panel control.

12. Serial Interfaces

The SVT17602 allows the use of three serial interfaces (UART x 2ch, SPI x 1ch, I2C x 2ch (1 master/1 slave)) incorporated into the S1C17602. The general input/output port pins on the S1C17602 double as serial port pins. Functions must be selected by selecting the analog switch via software and the DIP switch when they are used as serial ports.

The serial port input/output signals are shown in the table below.

Table 12.1 Serial port

Interface	Signal (Port pin)	I/O	Connected to
SPI	SPICLK (P04)	I/O	Expansion I/F (JEX pin 13 or JRIF pin 8)
	SDO (P05)	O	Expansion I/F (JEX pin 12 or JRIF pin 4)
	SDI (P06)	I	Expansion I/F (JEX pin 11 or JRIF pin 3)
	#SPISS (P07)	I	Expansion I/F (JEX2 pin 3 and JRIF pin 6)
UART ch.0	SCLK0 (P10)	I	Expansion I/F (JEX pin 2)
	SOUT0 (P11)	O	Expansion I/F (JEX pin 3 and JRIF pin 16)
	SIN0 (P12)	I	Expansion I/F (JEX pin 4 and JRIF pin 17)
UART ch.1	SCLK1 (P16)	I	Check pin (TP9) and analog switch (U4, U6, U9, U11, U13) control
	SOUT1 (P27)	O	Check pin (TP10) and humidity sensor control circuit (PAD4, PAD11)
	SIN1 (P30)	I	Check pin (TP11) and humidity sensor control circuit (PAD5)
I2C (Master only) *1	SDL0 (P31)	I/O	SW7 → Expansion I/F (JEX2 pin 5)
	SDA0 (P32)	I/O	SW7 → Expansion I/F (JEX2 pin 6)
I2C (Master/Slave) *1	SDL1/SDL0 (P33)	I/O	Expansion I/F (JEX pin 10)
	SDA1/SDA0 (P34)	I/O	Expansion I/F (JEX pin 9)

*1. The S1C17602 includes two I2C channels, one for the master function and one for the slave function. Master functions cannot be used for P33/P34 when the I2C master is used for P31/P32. Likewise, the master functions cannot be used for P31/P32 when the master is used for P33/P34.

13. Thermistor (RFC ch.0)

The thermistor mounted on the SVT17602 CPU board is connected to the S1C17602 R/F converter (RFC) ch.0, as shown in Figure 13.1 below.

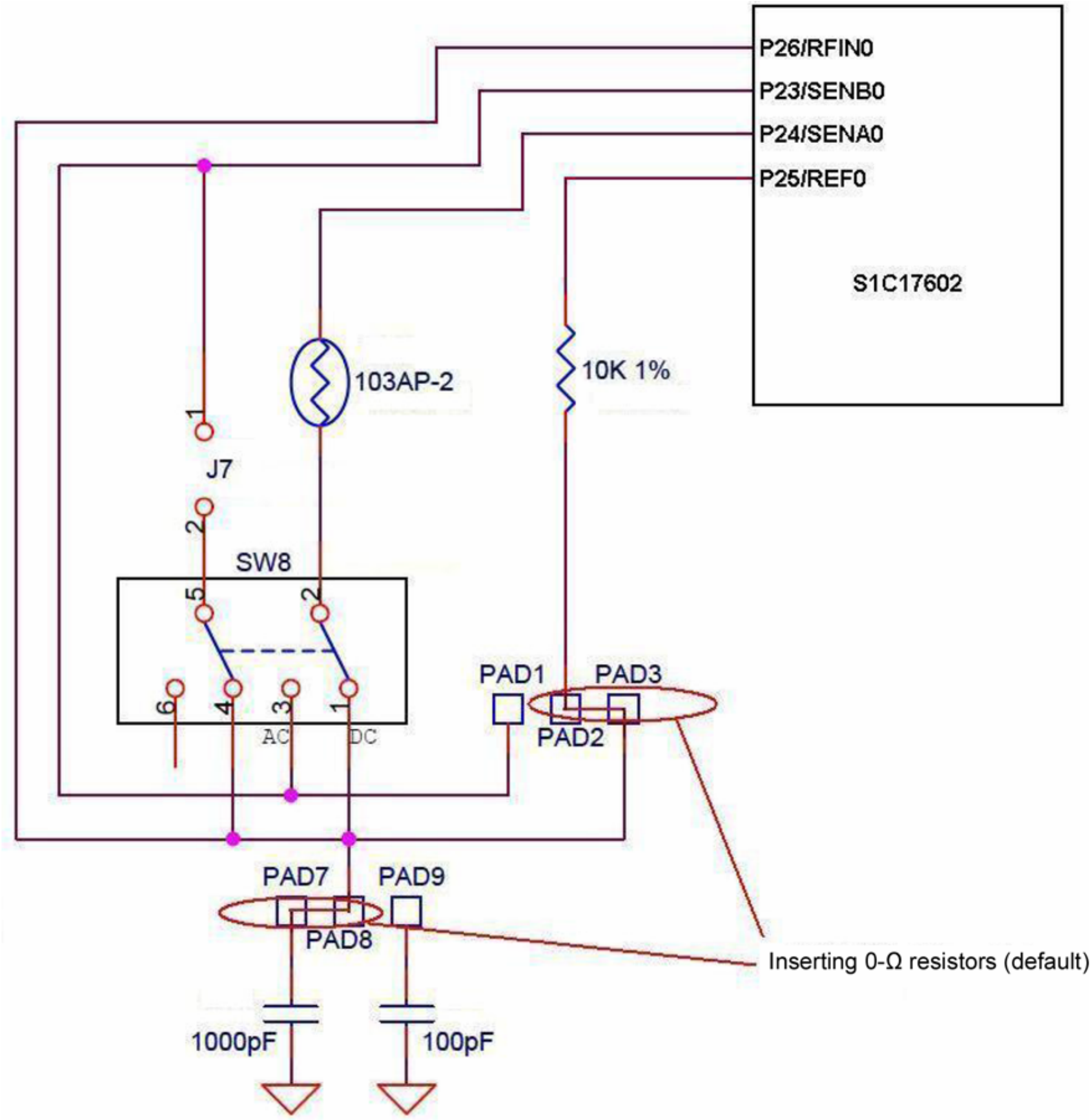


Figure 13.1 Thermistor (resistance sensor measurement DC oscillation mode) peripheral circuit

13.1 Resistance sensor measurement DC oscillation mode

Figure 13.1 shows the default wiring configuration for the thermistor (103AP-2) mounted on the SVT17602 CPU board. This sensor is connected in resistance sensor measurement DC oscillation mode. (See Table 8.1 & 8.2 ⇒ “DC drive.”)

Up to two resistance sensors can be connected in resistance sensor measurement DC oscillation mode. In addition to the thermistor shown in Figure 13.1, a second resistance sensor can be connected at the J7 position. The default thermistor connected is socket-mounted to permit removal. The 103AP-2 connected in the default configuration can be removed to enable connection of another sensor for evaluation.

The default standard capacitance is 1,000 pF.

The standard capacitance affects the R/F conversion rate and accuracy. Increasing the standard capacitance increases conversion accuracy, while reducing capacitance increases conversion rate.

Refer to the application note for detailed information on controlling the thermistor connected in resistance sensor measurement DC oscillation mode.

* Refer to the S1C17602 technical manual for detailed information on resistance sensor measurement DC oscillation mode.

13.2 Resistance sensor measurement AC oscillation mode

The SVT17602 RFC ch.0 can also be connected to a sensor in resistance sensor measurement AC oscillation mode, as shown in the circuit illustrated in Figure 13.2. (See Table 8.1 & 8.2 ⇒ "AC drive.")

* Refer to the S1C17602 technical manual for detailed information on resistance sensor measurement AC oscillation mode.

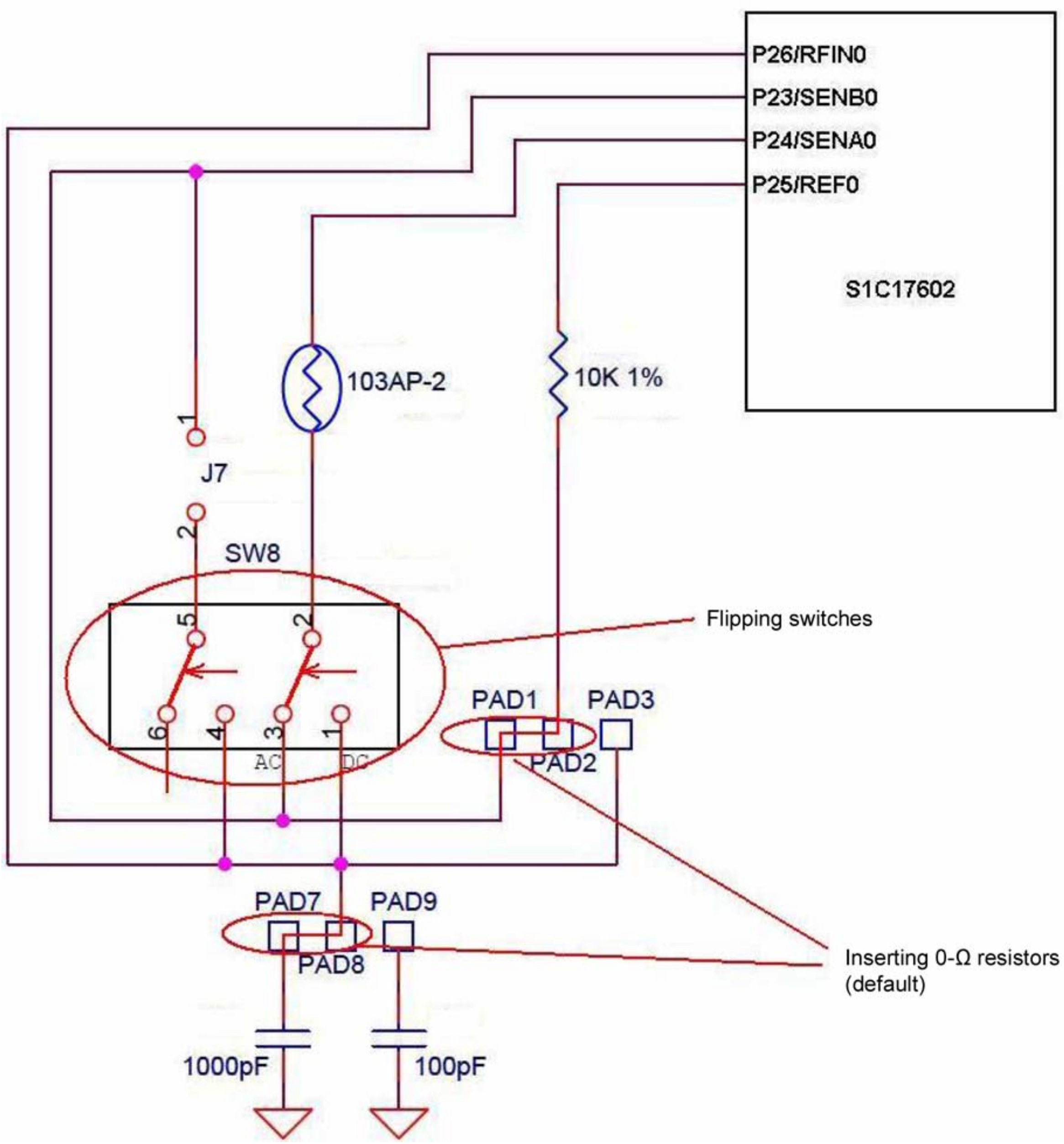


Figure 13.2 Resistance sensor measurement AC oscillation mode peripheral circuit

14. Humidity Sensor (RFC ch.1)

The humidity sensor mounted on the SVT17602 CPU board is connected to the S1C17602 R/F converter (RFC) ch.1 as shown in Figure 14.1 below.

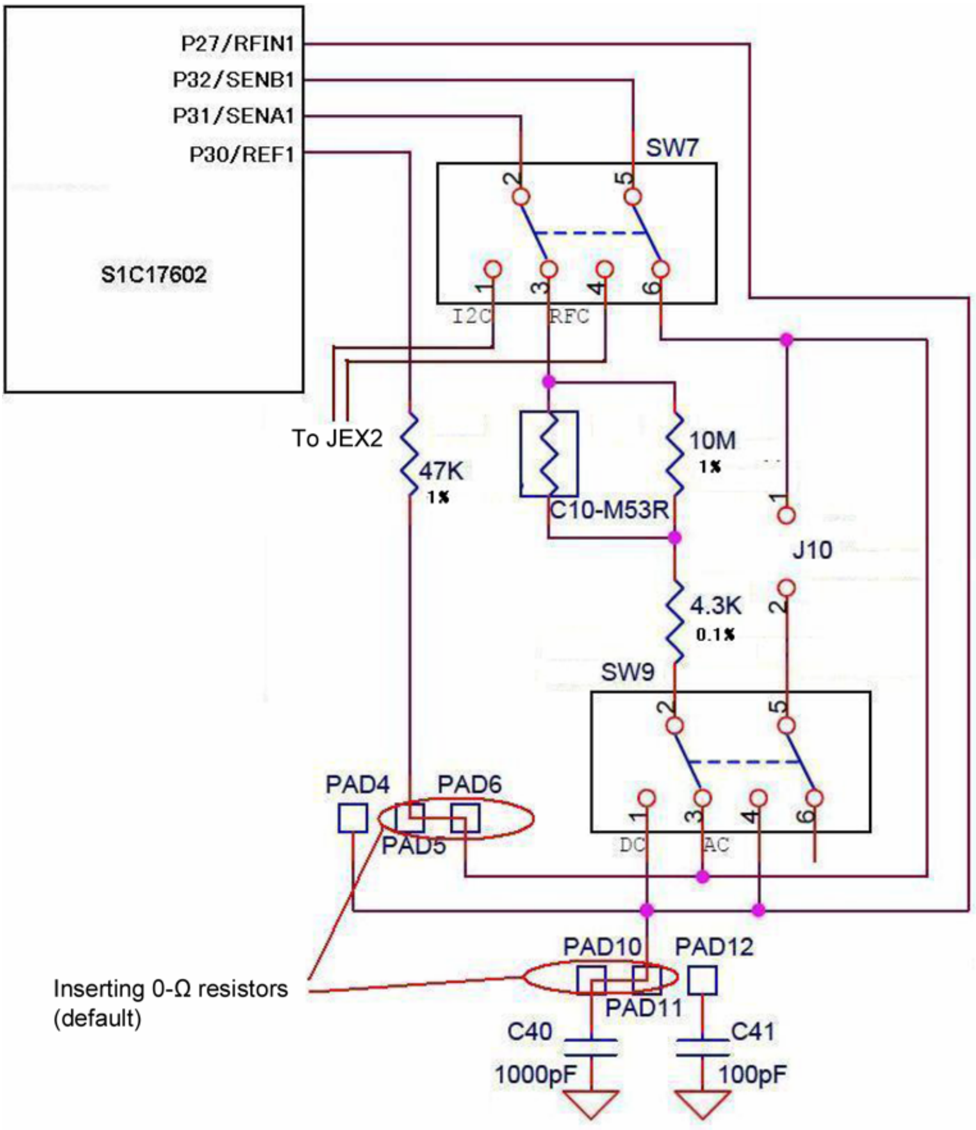


Figure 14.1 Humidity sensor (resistance sensor measurement AC oscillation mode) peripheral circuit

14.1 Resistance sensor measurement AC oscillation mode

Figure 14.1 shows the default wiring configuration for the humidity sensor (C10-M53R) mounted on the SVT17602 CPU board. This sensor is connected in resistance sensor measurement AC oscillation mode. (See Table 8.1 & 8.2 ⇒ “AC drive.”)

* SENA1 and SENB1 for RFC ch.1 of the S1C17602 are multiplexed with I2C. SW7 must be switched to “RFC” when using RFC. (See Table 8.1.)

The default humidity sensor (R31) connected is socket-mounted to permit removal. The C10-M53R connected in the default configuration can be removed to enable connection of another sensor for evaluation.

The default standard capacitance is 1,000 pF.

The standard capacitance affects the R/F conversion rate and accuracy. Increasing the standard capacitance increases conversion accuracy, while reducing capacitance increases conversion rate.

Refer to the application note for detailed information on controlling the humidity sensor connected in resistance sensor measurement AC oscillation mode.

* Refer to the S1C17602 technical manual for detailed information on resistance sensor measurement AC oscillation mode.

14.2 Resistance sensor measurement DC oscillation mode

SVT17602 RFC ch.1 can also be connected to a sensor in resistance sensor measurement DC oscillation mode, as shown in the circuit illustrated in Figure 14.2. (See Table 8.1 & 8.2 ⇒ "DC drive.")

* Refer to the S1C17602 technical manual for detailed information on resistance sensor measurement DC oscillation mode.

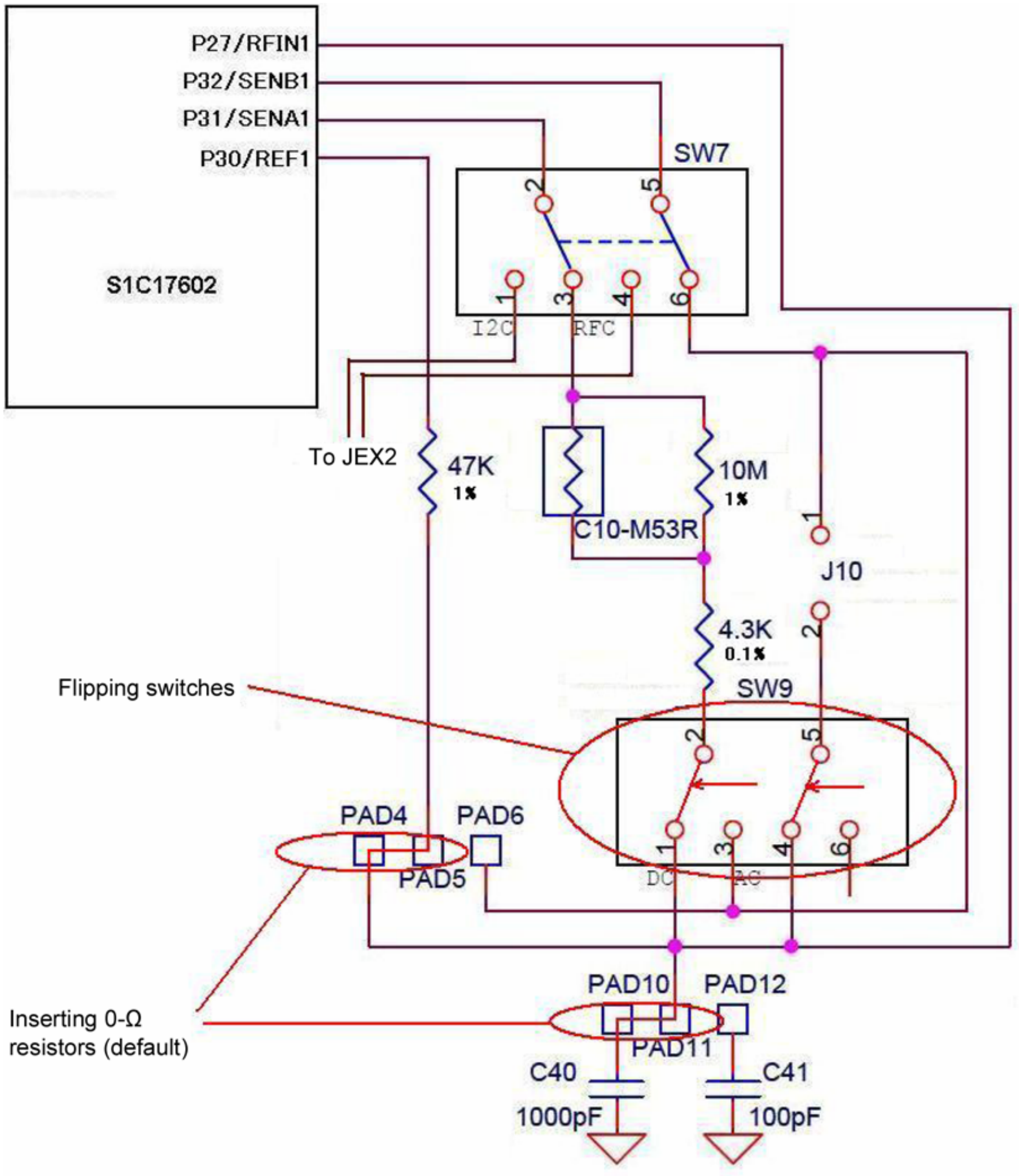


Figure 14.2 Resistance sensor measurement DC oscillation mode peripheral circuit

15. Illuminance Sensor

The illuminance sensor mounted on the SVT17602 CPU board is connected to the S1C17602 AD converter as shown in Figure 15.1 below.

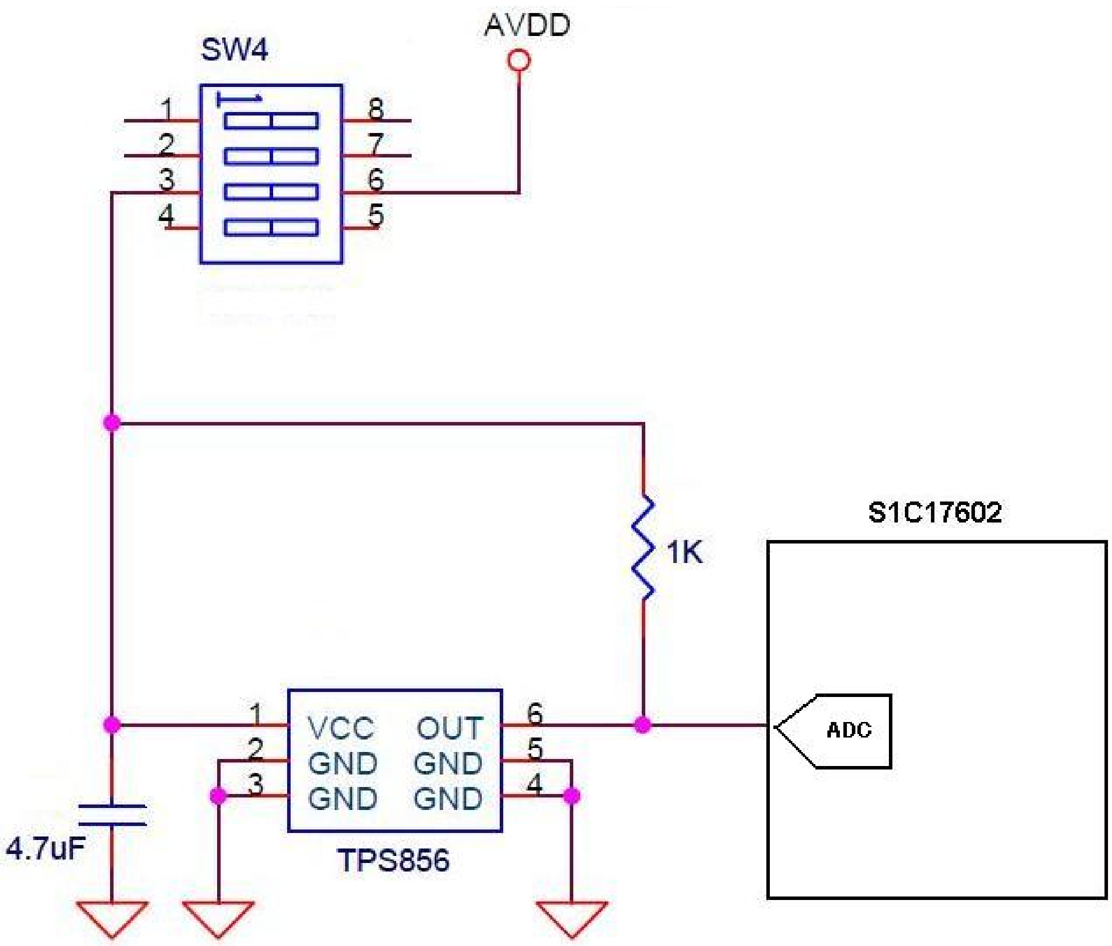


Figure 15.1 Illuminance sensor peripheral circuit

Refer to the application note for detailed information on illuminance sensor control.

15.1 Illuminance sensor power supply switch

The power supply for the illuminance sensor (TPS856) mounted on the SVT17602 can be turned on and off using switch SW4-3. Turning off this switch reduces unnecessary current consumption for the entire board when the illuminance sensor is not in use.

16. LEDs

The SVT17602 CPU board includes a red LED (SML-D12V8W) and green LED (SML-D12P8W), as shown in Figure 16.1, which are controlled via the S1C17602 ports (P13, P16, P40).

SW4-2 is used on the SVT17602 to control the VDD supplied to the LEDs. SW4-2 must be turned on to use the LEDs.

The S1C17602 LED control ports (P13, P40) are connected to the LEDs via an analog switch IC, as shown in Figure 16.1. The analog switch IC is controlled by port P16 on the S1C17602.

Table 16.1 shows the LED status for the various port settings when SW4-2 is on.

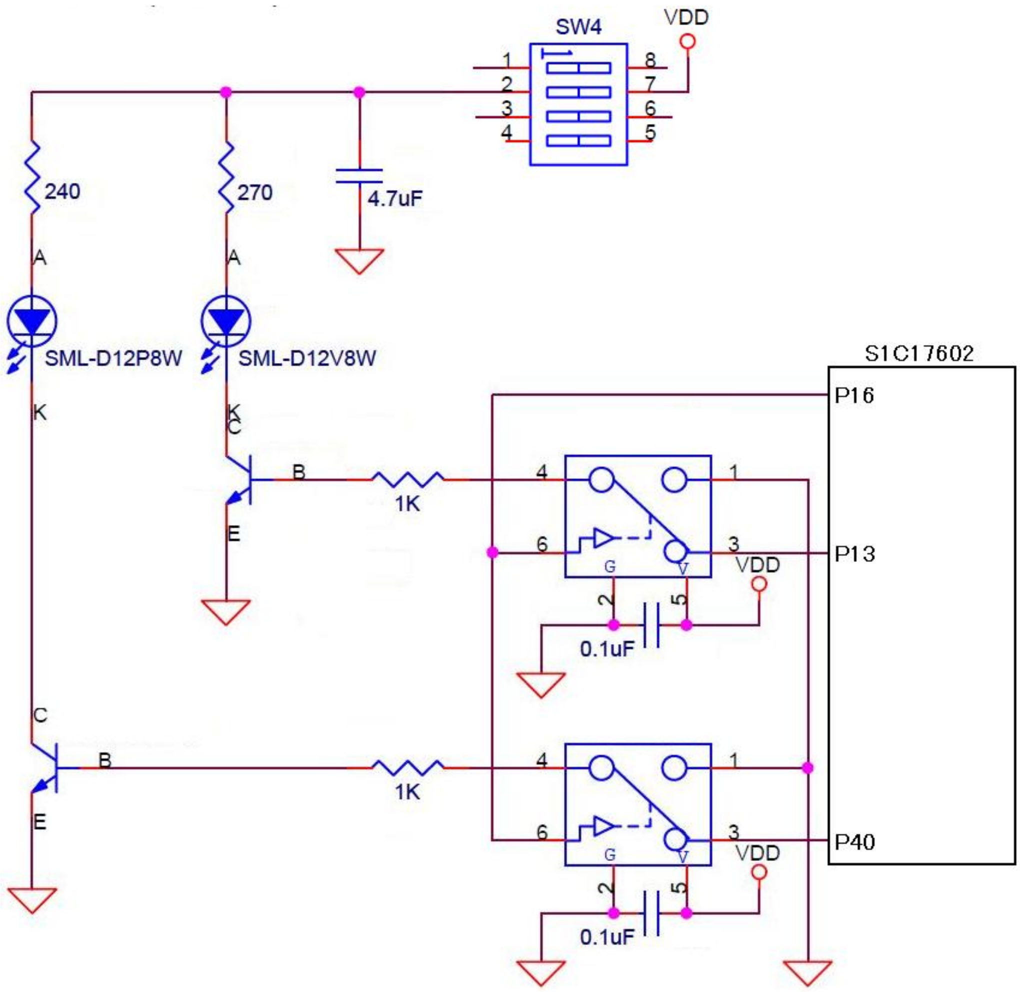


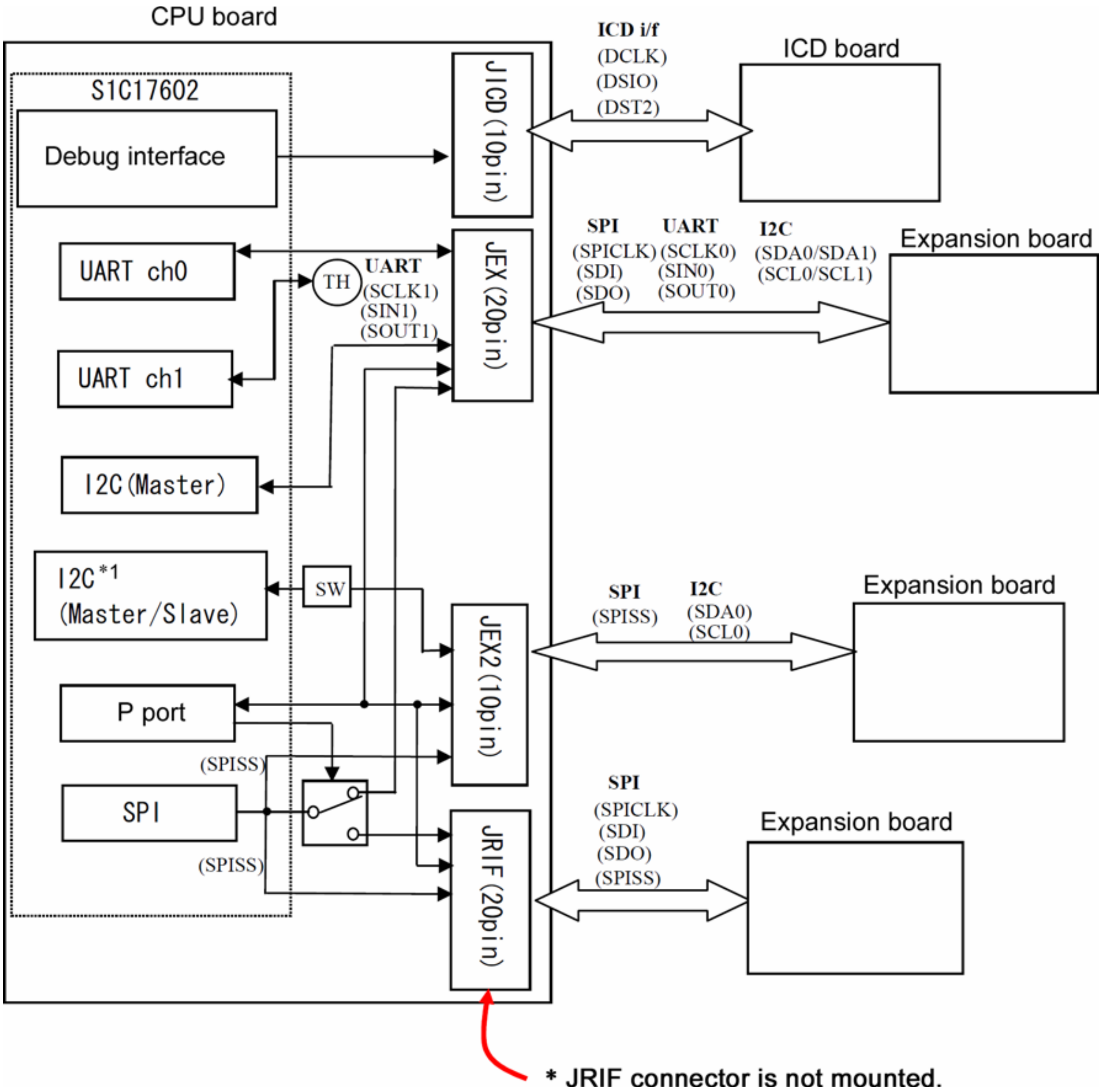
Figure 16.1 LED peripheral circuit

Table 16.1 LED status chart for different port settings (when SW4-2 is on)

	P16=High				P16=Low			
	P13=High	P13=Low	P40=High	P40=Low	P13=High	P13=Low	P40=High	P40=Low
Red LED (SML-D12V8W)	**On (illuminated)**	OFF	-	-	OFF	OFF	-	-
Green LED (SML-D12P8W)	-	-	**On (illuminated)**	OFF	-	-	OFF	OFF

17. Expansion Interfaces

The CPU board includes expansion interface connectors (JICD, JEX, JEX2) and an expansion connector mounting pattern (JRIF) to enable connection of an ICD board or user expansion boards.



*1: The S1C17602 includes two I2C channels, one for the master function and one for the slave function. The I2C from JEX cannot be used as master when the I2C (master only) from JEX2 is used. Likewise, the I2C (master only) from JEX2 cannot be used when the I2C from JEX is used as master.

Figure 17.1 Expansion interface connectors

17.1 JICD connector

The JICD connector is used to connect the ICD board.

The connector specifications and pin layout are shown below.

Table 17.1 JICD connector pin layout and connector diagram

JICD connector

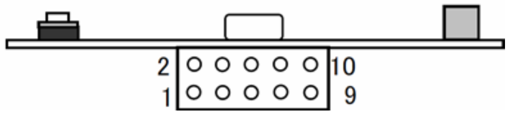
(Diagram on the right shows a connector side view.)

Manufacturer: Japan Aviation Electronics Industry, Ltd. (JAE)
Code: PS-10SD-D4T1-1 (female)

<ICD board side>
Manufacturer: Tyco
Code: 9-103801-0 (male)

<CPU board side view>

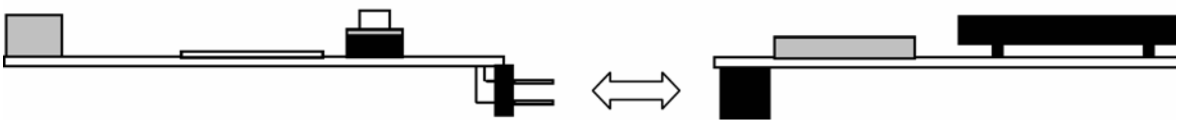
<ICD board side view>



No.	Name	I/O	Function
1	DCLK	O	On-chip debugger clock output port
2	GND	-	Power supply ground (Connecting to all pins is recommended.)
3	GND	-	Power supply ground (Connecting to all pins is recommended.)
4	#RESET_OUT	I	Target reset signal input port
5	DSIO	I/O	On-chip debugger data input/output port
6	TGT_EN	I	Target enable signal input/output port
7	DST2	O	On-chip debugger status signal output port
8	N.C	-	-
9	VCC (+3.3V)	-	+3.3 V power supply pin
10	VCC (+3.3V)	-	+3.3 V power supply pin

Note: Make the connection so that the CPU board LCD panel surface and ICD board USB connector mounting surface face up. Note that connecting this connector incorrectly may damage both boards.

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



17.2 JEX connector

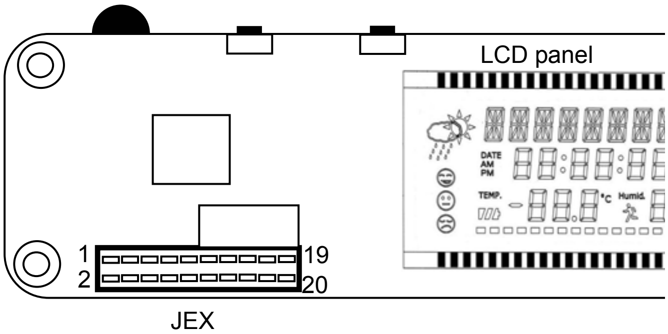
The JEX connector is used to connect a user expansion board.

The connector specifications and pin layout are shown below.

Table 17.2 JEX connector pin layout and connector diagram

JEX connector

Manufacturer: SAMTEC
Code: SLW-110-01-G-D



No.	Name	I/O	Function
1	GND	-	Power supply ground (Connecting to all pins is recommended.)
2	P10/SCLK0	I/O | I	General input/output port | UART ch0 clock input port
3	P11/SOUT0	I/O | O	General input/output port | UART ch0 data output port
4	P12/SIN0	I/O | I	General input/output port | UART ch0 data input port
5	P17/AIN3	I/O | I	General input/output port | Analog input port
6	VCC (+3.3V)	-	+3.3 V power supply pin
7	P20/AIN2	I/O | I	General input/output port | Analog input port
8	P21/AIN1	I/O | I	General input/output port | Analog input port
9	P34/SDA1/SDA0	I/O | I/O | I/O	General input/output port | I2C (slave) data input/output port | I2C (master) data input/output port
10	P33/SCL1/SCL0	I/O | I/O | I/O	General input/output port | I2C (slave) clock input/output port | I2C (master) clock input/output port
11	P06/SDI	I/O | I	General input/output port | SPI data input port
12	P05/SDO	I/O | O	General input/output port | SPI data output port
13	P04/SPICLK	I/O | I/O	General input/output port | SPI clock input/output port
14	P22/AIN0	I/O | I	General input/output port | Analog input port
15	GND	-	Power supply ground (Connecting to all pins is recommended.)
16	P35/FOUT1/#BFR	I/O | O | I	General input/output port | OSC1 external clock output | I2C bus open
17	P15/EXCL3/AIN5	I/O | I	General input/output port | T16E ch0 external clock input | Analog input port
18	P14/EXCL2/AIN6	I/O | O	General input/output port | T16 ch2 external clock input | Analog input port
19	N.C	-	-
20	VCC (+3.3V)	-	+3.3 V power supply pin

17.3 JEX2 connector

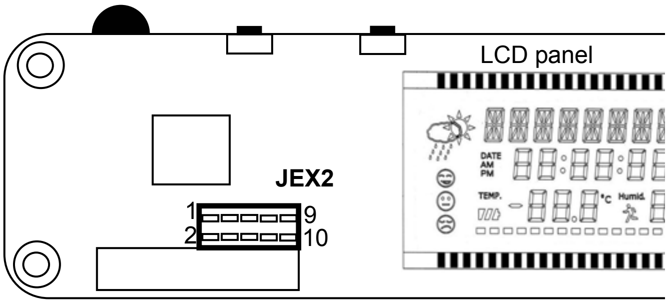
The JEX2 connector is used to connect a user expansion board.

The connector specifications and pin layout are shown below.

Table 17.3 JEX2 connector pin layout and connector diagram

JEX2 connector

Manufacturer: SAMTEC
Code: SLW-105-01-G-D



No.	Name	I/O	Function
1	GND	-	Power supply ground (Connecting to all pins is recommended.)
2	P03/#ADTRG	I/O | I	General input/output port | A/D converter external trigger
3	P07/#SPISS	I/O | I	General input/output port | SPI slave select input
4	P13/EXCL1/AIN7	I/O | O	General input/output port | T16 ch0 external clock input | Analog input port
5	P31/SCL0	I/O | I/O	General input/output port | I2C (master) clock input/output port
6	P32/SDA0	I/O | I/O	General input/output port | I2C (master) data input/output port
7	P36/TOUT3/RFCLK0	I/O | O | O	General input/output port | T16E ch0 PWM signal output (non-inverted) | R/F clock output pin
8	P37/TOUTN3/LFRO/TOUT4	I/O | O | O | O	General input/output port | T16E ch0 PWM signal output (inverted) | LCD frame output | T8 OSC1 PWM signal output pin
9	P40/FOUTH	I/O | O	General input/output port | HSCLK clock output
10	VDD(+3.3V)	-	+3.3 V power supply pin

17.4 JEX/JEX2 connector dimensional diagram

The dimensional diagram for the JEX and JEX2 connectors described above is shown below.

(While JEX is 20-pin and JEX2 is 10-pin, the dimensions shown below are common to both JEX and JEX2 connectors.)

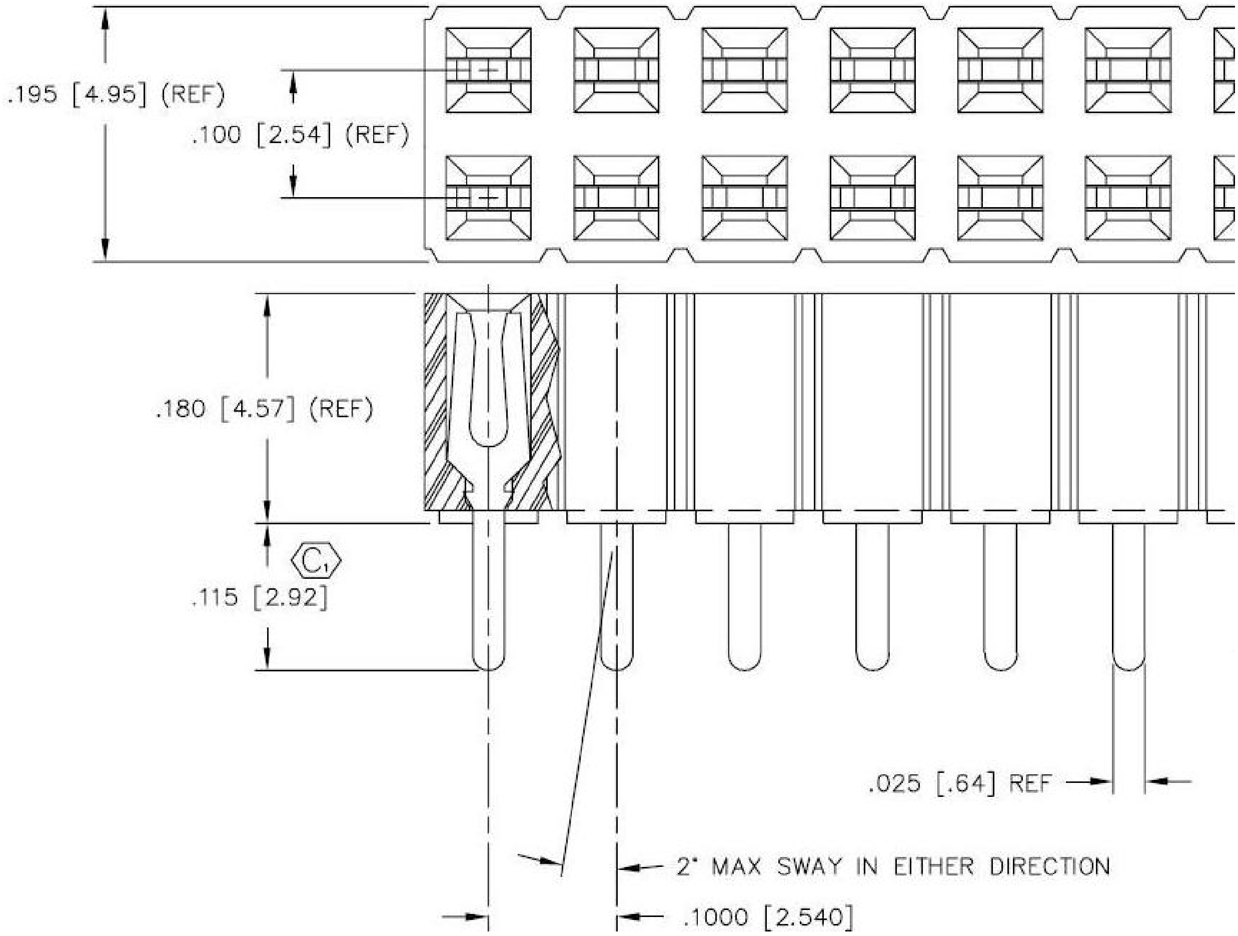


Figure 17.2 JEX/JEX2 connector dimensional diagram

17.5 JRIF connector

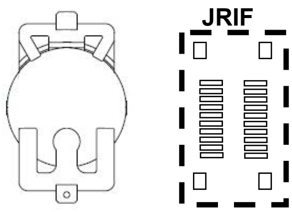
The JRIF connector is used to connect a user expansion board.

The connector specifications and pin layout are shown below.

Table 17.4 JRIF connector pin layout and connector diagram

JRIF connector

Manufacturer: KEL Corporation
Code: 8913-020-178MS-A-F (not mounted)



No.	Name	I/O	Function
1	N.C	-	-
2	N.C	-	-
3	P06/SDI	I/O | I	General input/output port | SPI data input port
4	P05/SDO	I/O | O	General input/output port | SPI data output port
5	GND	-	Power supply ground (Connecting to all pins is recommended.)
6	P07/#SPISS	I/O | I	General input/output port | SPI slave select input
7	GND	-	Power supply ground (Connecting to all pins is recommended.)
8	P04/SPICLK	I/O | I/O	General input/output port | SPI external clock input/output port
9	GND	-	Power supply ground (Connecting to all pins is recommended.)
10	N.C	-	-
11	GND	-	Power supply ground (Connecting to all pins is recommended.)
12	N.C	-	-
13	GND	-	Power supply ground (Connecting to all pins is recommended.)
14	N.C	-	-
15	GND	-	Power supply ground (Connecting to all pins is recommended.)
16	P11/SOUT0	I/O | O	General input/output port | UART ch0 data output port
17	P12/SIN0	I/O | I	General input/output port | UART ch0 data input port
18	N.C	-	-
19	VDD (+3.3V)	-	+3.3 V power supply pin
20	VDD (+3.3V)	-	+3.3 V power supply pin

17.6 JRIF mounting diagram

The mounting diagram for the JRIF connector described above is shown below.

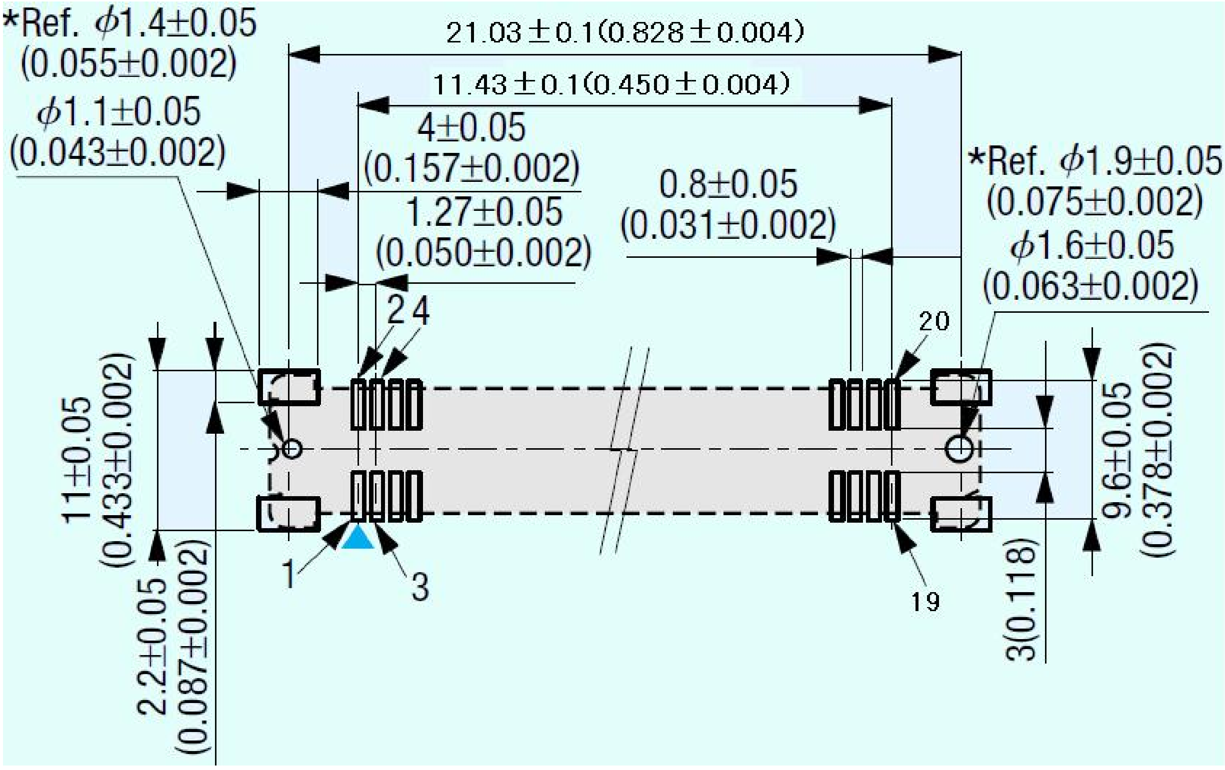


Figure 17.3 JRIF mounting diagram

17.7 SPI port connector selection using analog switch

The S1C17602 SPI input/output signal is connected to both the JEX2 connector and the JEX or JRIF connector via the analog switch, as shown in Figure 17.4. The analog switch IC is controlled by the S1C17602 P16 port and is connected to JRIF when the P16 output is "High" and to JEX when "Low."

The #SPISS signal is also connected to both the JEX2 and JRIF connectors.

Table 17.5 shows the correlation between SPI signals and expansion connectors for various analog switch control port (P16) statuses.

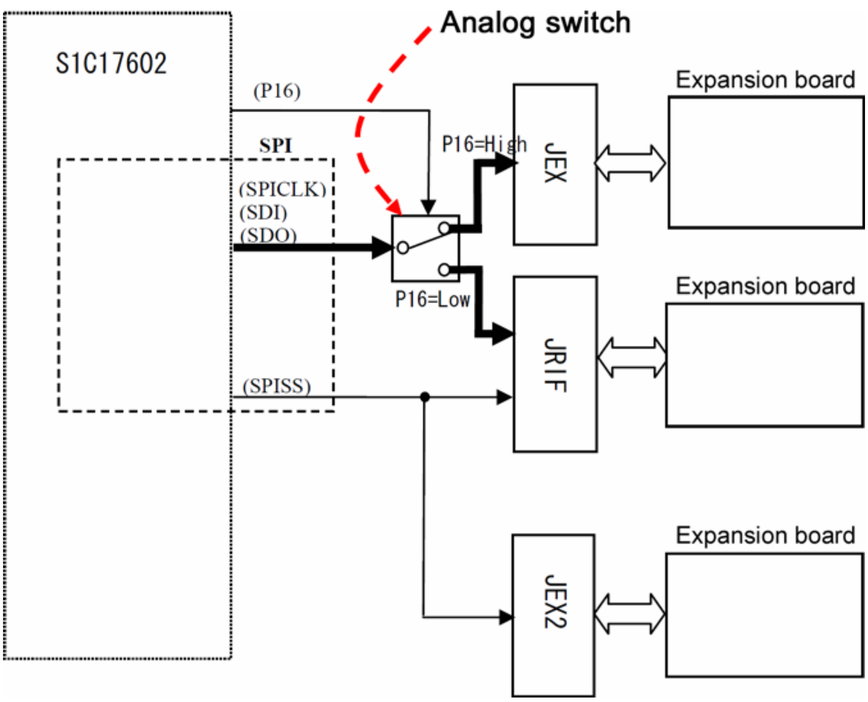


Figure 17.4 SPI port connector selection circuit

Table 17.5 SPI signal and expansion connector correlation according to analog switch control port (P16) statuses

	P16 = High output			P16 = Low output		
	JEX	JRIF	JEX2	JEX	JRIF	JEX2
SPICLK	Enabled	**Disabled**	-	**Disabled**	Enabled	-
SDI	Enabled	**Disabled**	-	**Disabled**	Enabled	-
SDO	Enabled	**Disabled**	-	**Disabled**	Enabled	-
SPISS	-	Enabled	Enabled	-	Enabled	Enabled

Appendix A Consumption Current Measurement Method for Individual IC

The SVT17602 CPU board enables measurement of current consumed for just the S1C17602.

The current consumed by the S1C17602 itself can be measured by removing the jumper (J2) for VDD and VDD2 on the SVT17602 CPU board and inserting an ammeter between them, as shown in the circuit layout diagram in Figure A.1. The various S1C17602 ports must be set appropriately for the peripheral circuits.

Refer to the S1C17602 IC current consumed measuring application note for detailed information on the sampling software (software flow) used to set these ports and to measure the current consumed.

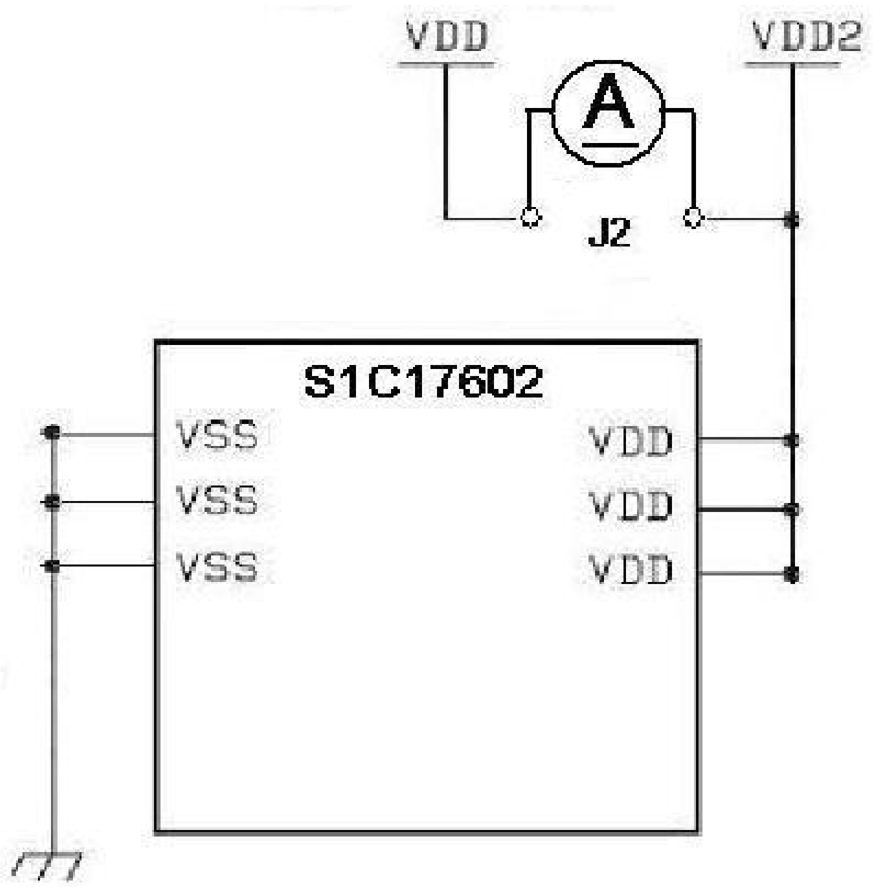


Figure A.1 Consumption current measurement circuit for individual SVT17602 IC

Appendix B Consumption Current Measurement Method for Entire SVT17602 Board

The SVT17602 CPU board enables measurement of current consumed for the entire SVT17602 board while powered by the coin cell.

Figure B.1 shows the SVT17602 CPU board coin cell peripheral circuit. To measure current consumed for the entire SVT17602 board, remove the resistor (R4) and replace with an ammeter.

(Note that the current through FET (Q1, Q2) shown in Figure B-1 may not reflect the current measured by this method.)

When seeking to reduce overall current consumption for the board, consider the current that flows through the external components listed below.

(1) Current through infrared photo-receiver module

(2) Current through sensors

You can eliminate the current (1) through the infrared photo-receiver module by removing the module from its socket when it is not being used.

You can eliminate the current (2) through the illuminance sensor by turning off the power supply switch (SW4-3) when the illuminance sensor is not being used. Just as for the infrared photo-receiver module, the current through the temperature and humidity sensors can be eliminated by removing the sensors from their sockets when they are not being used.

Refer to the SVT board current consumed measuring application note for detailed information on measuring overall current consumed by the board and for software examples that reduce overall board current consumption.

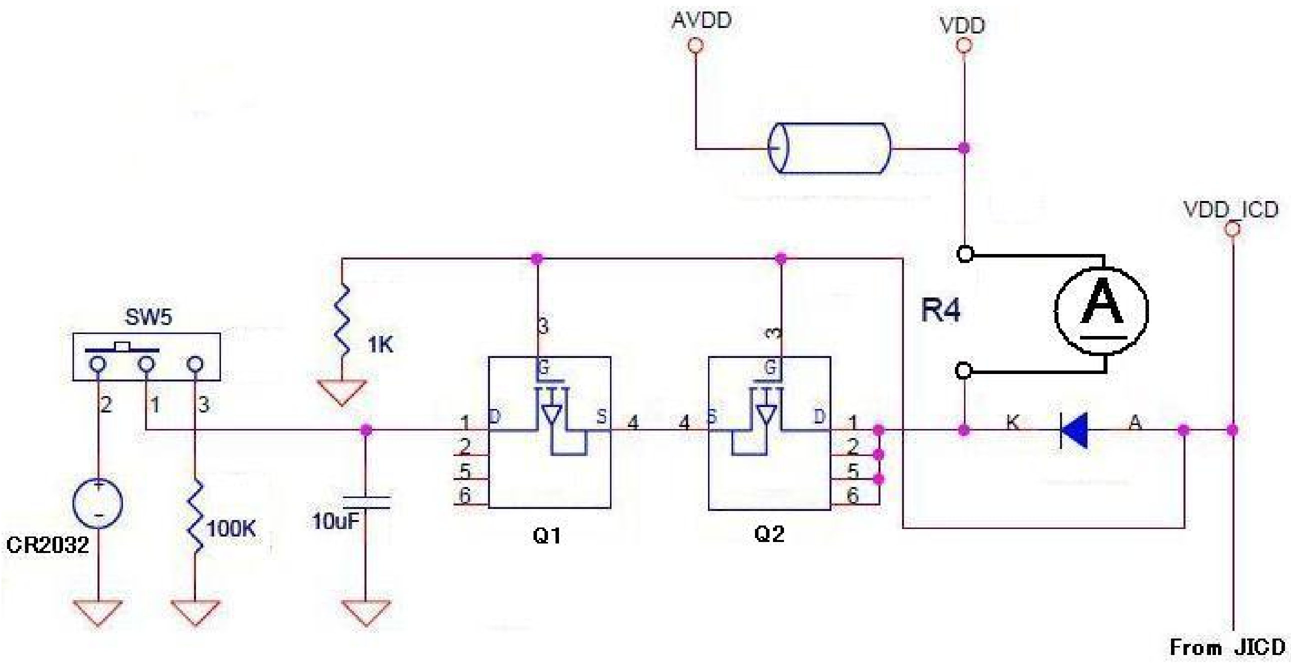
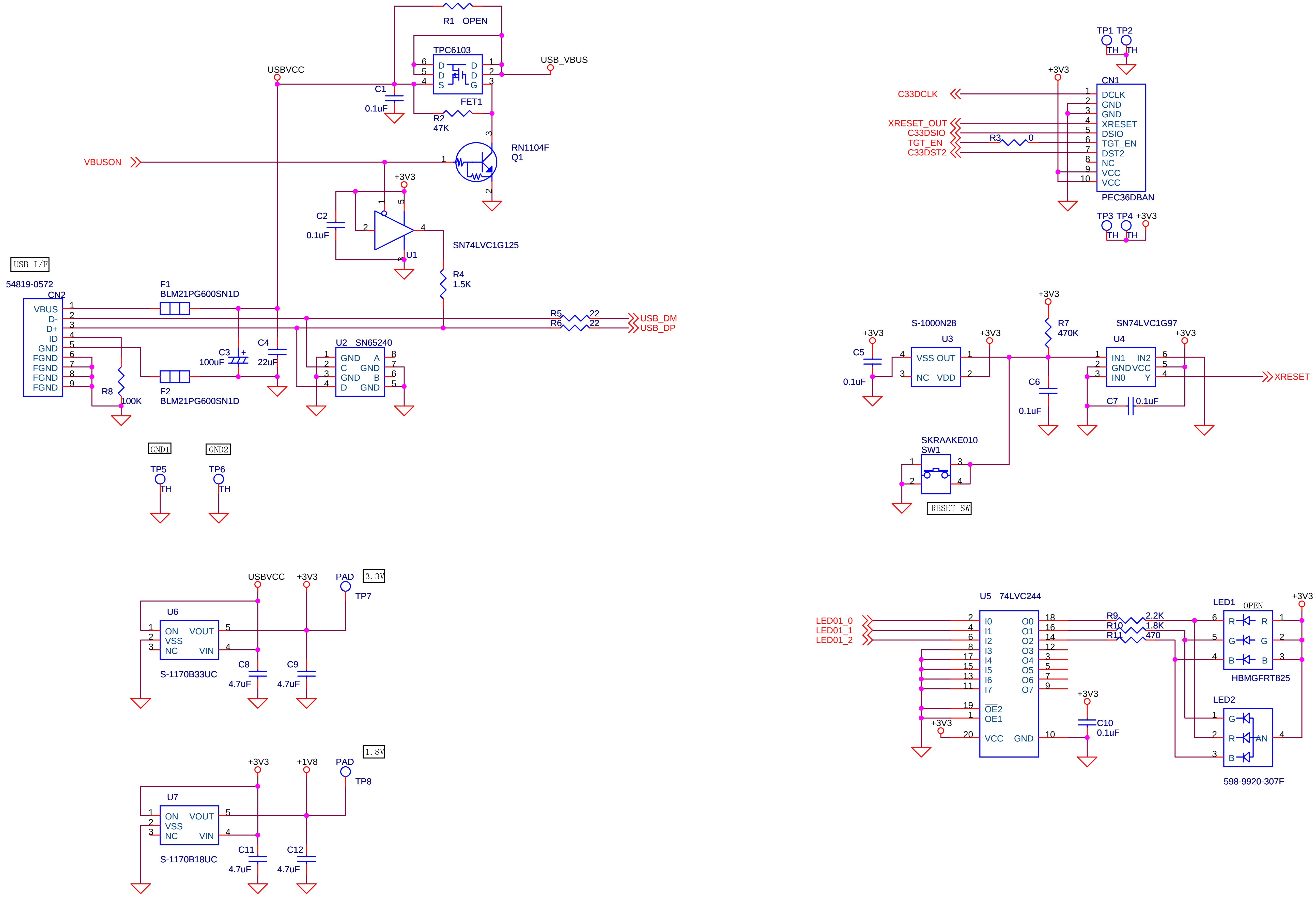


Figure B.1 Consumption current measurement circuit for entire SVT17602 board



Title
Board

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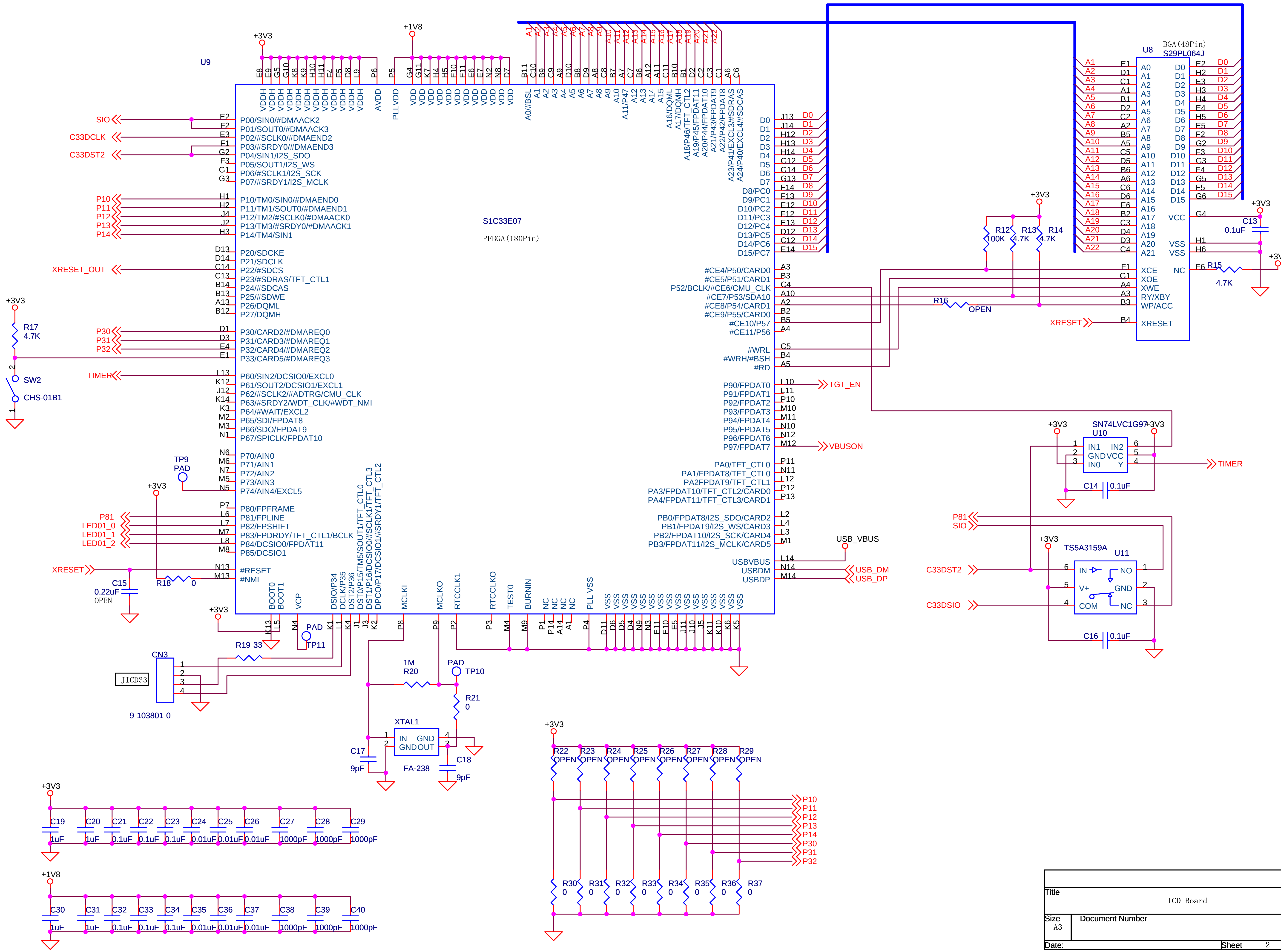

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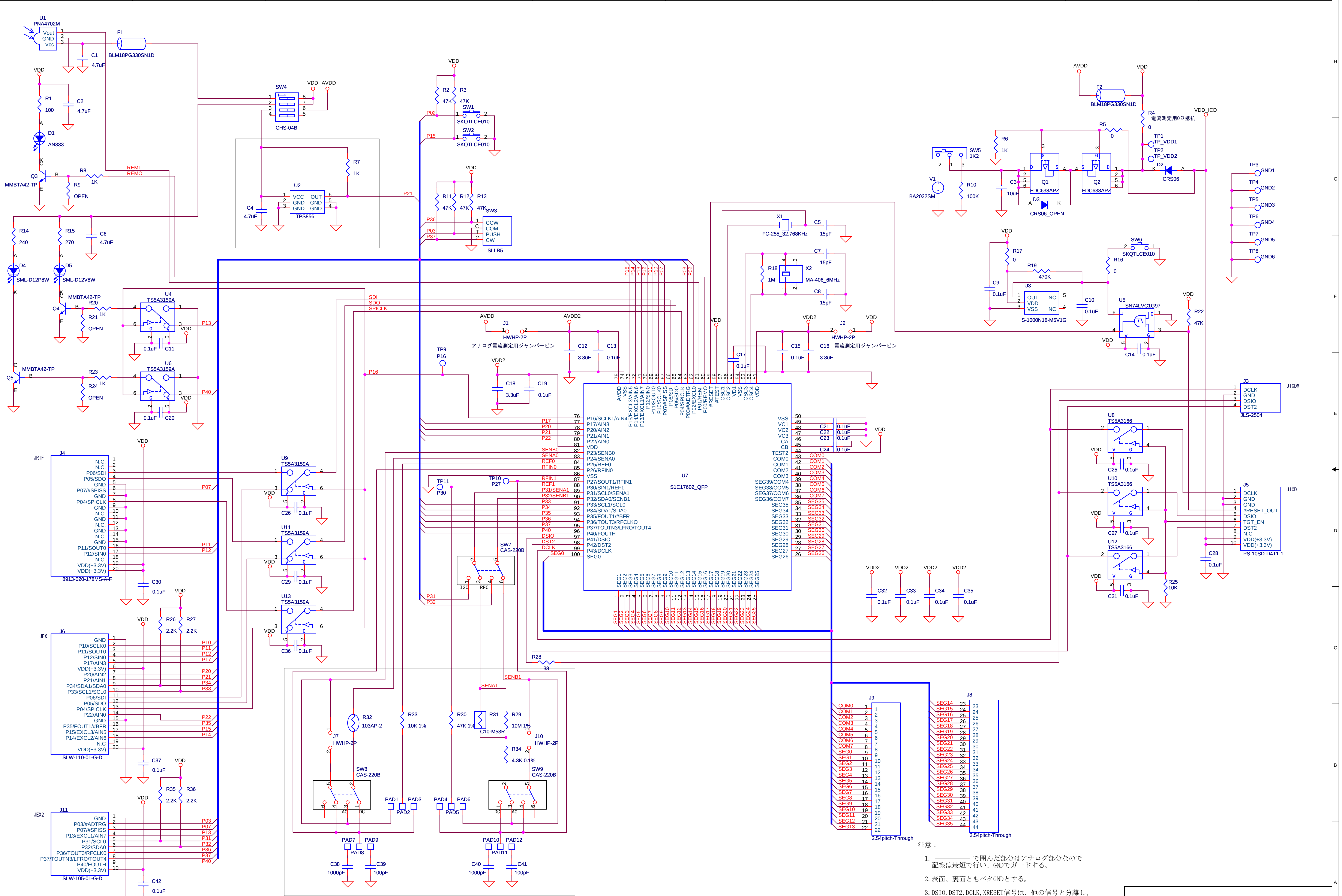

※PAD1, 2, 3間、PAD4, 5, 6間、PAD7, 8, 9間、PAD10, 11, 12間は2012の0Ω抵抗でショートさせて選択する。
PAD2-3間、PAD5-6間、PAD7-8間、PAD10-11間に0Ω抵抗を実装する。

注意：

1. ———— で囲んだ部分はアナログ部分なので配線は最短で行い、GNDでガードする。
2. 表面、裏面ともベタGNDとする。
3. DSIO, DST2, DCLK, XRESET信号は、他の信号と分離し、GNDでガードする。
4. C32〜C35はマイコンの四隅に配置する。
5. SW7はできるだけマイコンの端子の近くに配置する。

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NO.	Parts name	Location	Model number	SPEC	mfr
1	CPU	U7	S1C17602	TQFP14-100pin	EPSON
2	LCD			44pin (22pin×2column) 36SEG×8COM	
3	IC socket	J8,J9	643654-1	SIP,22pin	AMP
4	Analog switch	U8,U10,U12	TS5A3166DCKR	SC-70	Texas Instruments
5	Analog switch	U4,U6,U9,U11,U13	TS5A3159ADCKR	SC-70	Texas Instruments
6	Reset IC	U3	S-1000N18-M5V1G	SOT-23-5,1.8V detection	SII
7	Universal logic	U5	SN74LVC1G97DCKR	SC-70	Texas Instruments
8	Thermistor	R32	103-AP-2		ISHIZUKA
9	Humidity sensor	R31	C10-M53R		Shinei
10	Photo IC	U2	TPS856		TOSHIBA
11	Photodiode	U1	PNA4702M		Panasonic
12	infrared-emitting diode	D1	AN333		STANLEY
13	Transistor	Q3,Q4,Q5	MMBTA42-TP	SOT-23	MCC
14	MOS FET	Q1,Q2	FDC638APZ		FAIRCHILD
15	schottky diode	D2,D3(non-connection)	CRS06	3516,1A,20V,0.36V	TOSHIBA
16	LED	D4	SML-D12P8W	green,1608	ROHM
17	LED	D5	SML-D12V8W	red,1608	ROHM
18	filter	F1,F2	BLM18PG330SN1D	1608,33O,3A,0.025O	MURATA
19	crystal oscillator	X2	MA-406 6MHz 16pF	6MHz	EPSON TOYOCOM
20	crystal oscillator	X1	FC-255 32.768kHz ±5ppM 12.5pF	32.768kHz	EPSON TOYOCOM
21	Pin header	J3(JICDM)	JLS-2504	1-column,4-pole,right angle	Hirosugi
22	Connector	J5(JICD)	PS-10SD-D4T1-1	2-column,10-pole,right angle	JAE
23	Connector	J4(JRIF)(non-connection)	8913-020-178MS-A-F	SMT,20-pole	KEL
24	Connector	J6(JEX)	SLW-110-01-G-D	2-column,20-pole	SAMTEC
25	Connector	J11(JEX2)	SLW-105-01-G-D	2-column,10-pole	SAMTEC
26	Jumper pin	J1,J2,J7,J10	HWHP-2P	2-pole,terminal part: 6mm	MAC8
27	Jumper socket	J1,J2	MJS-0605B	black	Hirosugi
28	battery holder	V1	BA2032SM	SMT,CR2032	Takachi
29	tact switch	SW1,SW2,SW6	SKQTLCE010	side push	ALPS
30	lever & push switch	SW3	SLLB510100		ALPS
31	slide switch	SW5	1K2 09.10290.01		eao
32	DIP switch	SW4	CHS-04B	SMT,4-pole	COPAL
33	jumper switch	SW7,SW8,SW9	CAS-220B	2 circuit	COPAL
34	IC socket	R31,R32	300-032-050	2 pin	3M
35	battery		CR2032		

36	USB cable		USB-ECOM515	A-miniB,1.5m	ELECOM
37	test terminal		LC-33-G-RED	red	MAC8
38	test terminal		LC-33-G-BLACK	black	MAC8
39	laminated ceramic capacitor	C1,C2,C4,C6	C1608JB0J475K	1608,4.7uF±10%,6.3V	TDK
40	laminated ceramic capacitor	C9,C10,C11,C13, C14,C15,C17,C19, C20,C21,C22,C23, C24,C25,C26,C27, C28,C29,C30,C31, C32,C33,C34,C35, C36,C37,C42	GRM219F11H104ZA01D	2012,0.1uF+80/-20%,50V	MURATA
41	laminated ceramic capacitor	C3	EMK316F106ZL-T	3216,10uF+80/-20%,16V	Taiyo Yuden Co., Ltd.
42	laminated ceramic capacitor	C5,C7,C8	C1608CH1H150J	1608,15pF±5%,50V	TDK
43	laminated ceramic capacitor	C12,C16,C18	C1608JB0J335K	1608,3.3uF±10%,6.3V	TDK
44	film condenser	C38,C40	ECH-U1C102GX5	1608,1000pF±2%,16V	Panasonic
45	film condenser	C39,C41	ECH-U1C101GX5	1608,100pF±2%,16V	Panasonic
46	chip resistor	R2,R3,R11,R12, R13,R22,R30	RK73H2ATTD4702F	2012,47K,1%,0.125W	KOA
47	chip resistor	R4,R5,R16,R17, PAD2-3,PAD5-6, PAD7-8,PAD10-11	RK73Z2ATTD	2012,0,2A	KOA
48	chip resistor	R1	RK73H2ATTD1000F	2012,100,1%,0.125W	KOA
49	chip resistor	R6,R7,R8,R20, R23	RK73H2ATTD1001F	2012,1K,1%,0.125W	KOA
50	chip resistor	R10	RK73H2ATTD1003F	2012,100K,1%,0.125W	KOA
51	chip resistor	R18	RK73H2ATTD1004F	2012,1M,1%,0.125W	KOA
52	chip resistor	R14	RK73H2ATTD2400F	2012,240,1%,0.125W	KOA
53	chip resistor	R15	RK73H2ATTD2700F	2012,270,1%,0.125W	KOA
54	chip resistor	R19	RK73H2ATTD4703F	2012,470K,1%,0.125W	KOA
55	chip resistor	R25,R33	RK73H2ATTD1002F	2012,10K,1%,0.125W	KOA
56	chip resistor	R26,R27,R35,R36	RK73H2ATTD2201F	2012,2.2K,1%,0.125W	KOA
57	chip resistor	R28	RK73H2ATTD33R0F	2012,33,1%,0.125W	KOA
58	chip resistor	R29	RK73H2ATTD1005F	2012,10M,1%,0.125W	KOA
59	chip resistor	R34	RG2012P-432-B-T1	2012,4.3K,0.1%,0.1W	SUSUMU CO.,LTD
60	chip resistor	R9,R21,R24	-	-	-

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