M34282T5-OPT

MCU Board for PC4400 Emulator System

User's Manual

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\SUPPORT\Product-name\SUPPORT.TXT

Renesas Tools Homepage http://www.renesas.com/en/tools

Contents

Preface

This instruction manual describes the specifications of the M34282T5-OPT emulator board for Renesas 4282 Group of 4-bit CMOS single-chip MCUs. The M34282T5-OPT is the MCU board for the PC4400 emulator system connected to the PC4000E emulator main unit and used with a control board and a function expansion board.

To use the product properly

Precautions for Safety:

- Both in this User's Manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.
- The icons' graphic images and meanings are given in "Chapter 1. Precautions for Safety". Be sure to read this chapter before using the product.

1. Precautions for Safety

Both in this instruction manual and on the product, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.

This chapter describes precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.

1.1 Safety Symbols and Meanings

⚠ **WARNING**	If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death.
⚠ **CAUTION**	If the requirements shown in the "CAUTION" sentences are ignored, the equipment may malfunction.
IMPORTANT	It means important information on using this product.

In addition to the three above, the following are also used as appropriate.

△ means WARNING or CAUTION.

Example:  **CAUTION AGAINST AN ELECTRIC SHOCK**

⃠ means PROHIBITION.

Example:  **DISASSEMBLY PROHIBITED**

● means A FORCIBLE ACTION.

Example:  **UNPLUG THE POWER CABLE FROM THE RECEPTACLE.**

The following pages describe the symbols "WARNING", "CAUTION", and "IMPORTANT".

⚠ WARNING

Warning for Installation:

- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the main unit can cause an unrepairable damage.

Warning for Use Environment:

- This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

⚠ CAUTION

Cautions to Be Taken for This Product:

- Do not disassemble or modify this product. Disassembling or modifying this product can cause damage.
- Use caution when handling the main unit. Be careful not to apply a mechanical shock.
- Do not pull the pod probe by the cables (40-wire half-pitch cable or 20-wire normal-pitch cable).
- Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws. When replacing screws, use same type screws as equipped before.

IMPORTANT

Notes on Difference between Actual MCU and Emulator:

- Emulator operation differs from that of a mask MCU as listed below. For details refer to "5. Precautions to Be Taken When Debugging".

  (1) Reset condition
  (2) Initial values of internal resource data at power-on
  (3) Internal memory (ROM and RAM) capacities, etc.
  (4) System clock
  (5) Operation of the watchdog timer function
  (6) Real-time capability of timer
  (7) Operation in power-down mode
  (8) Pulldown transistor control
  (9) Port I/O timing and characteristics
  (10) Low-power detection function

- Therefore, always be sure to evaluate your system with an evaluation MCU (OTP version). Also, be sure to perform board-mounted evaluation with ES (Engineering Sample) version MCU to make final confirmation of device operation before starting mask production.

Note on Target System:

- The operation voltage of the M34282T5-OPT is +3.0 V. Therefore the target's supply voltage should be in the range of +3.0 V ±10%.

Note on System Clock:

- The maximum operating frequency of the M34282T5-OPT is 4.0 MHz (STCK = f(X_{IN})/8) or 500 kHz (STCK = f(X_{IN})). When the instruction clock is set to f(X_{IN}), set the system clock frequency of the M34282T5-OPT to 500 kHz or less.

Notes on Connecting Target System:

- When connecting the target system, be sure to shut OFF the power of the emulator and target system.
- When connecting the emulator probe, be careful of its orientation.
- When connecting the emulator probe, be careful of a warp of the cable. The warp may cause a break in the wire.

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2. Handling Precautions

2.1 Handling Precautions

When using the M34282T5-OPT board, pay attention to the following:

(1) About an emulator system

To configure the emulator system with the M34282T5-OPT, the following products are required.

a. Emulator main unit (PC4000E)

This is an universal emulator main unit for the 720 Series.

b. Emulator card cage (PC4400)

This is an emulator card cage to contain the emulator main unit, control board, function extension board and M34282T5-OPT board.

c. Control board (PCA4400A)

This is an emulator control board for the PC4400 system. The PCA4400A allows the user to control program execution and reference/change contents of memory, as well as control break functions etc. of the PC4400 system.

d. Function extension board (PCA4400R)

This is used by inserting into the PC4400, and allows the user to control real-time trace, program execution time measurement, coverage analysis, etc. of the PC4400 system.

e. Power supply

As the PC4400 emulator system does not contain the power supply, the M34282T5-OPT should be powered separately by an external power supply such as a switching power supply or a stabilized power supply. For an external power supply, chose the one which suit to the specifications below.

- For +5 V: 3.0 A or over
- For +12 V: 0.1 A or over

f. Emulator debugger (RTT72)

This consists of assembler and emulator debugger for the 720 Series. The RTT72 is used with data files for 4282 Group.

For details, refer to the user's manual of RTT72.

(2) About the MCU board installation

Before installing (and removing) the MCU board, always be sure to power off the PC4000E emulator main unit and unplug its power cord from the outlet.

(3) Registers that can be operated from the RTT72

Table 2.1 lists the registers that can be operated from the RTT72. The "Yes" means that the register can be operated; "No" means that the register can not be operated.

Table 2.1 Registers that can be operated from RTT72

Register	Reference	Modify	Register	Reference	Modify
PC	Yes	Yes	V1	No	Yes
CY	Yes	Yes	V2	No	Yes
A	Yes	Yes	LO	No	Yes
B	Yes	Yes	PU0	No	Yes
D	No	Yes	PU1	No	Yes
E	Yes	Yes			
X	Yes	Yes			
Y	Yes	Yes			

*: "0" is always indicated when referencing the register Z.

MEMO

3. Contents of M34282T5-OPT Package

3.1 Package Components of M34282T5-OPT

Table 3.1 shows the package components of the M34282T5-OPT. When unpacking your package, check to see that all of these components are included.

Table 3.1 Contents of M34282T5-OPT

Item	Quantity
M34282T5-OPT	1
40-wire half-pitch cable (40 cm)	1
20-wire normal-pitch cable (10 cm)	1
2-wire cable for external trigger signal (50 cm)	1
PCA4029 pitch converter board	1
Oscillator board OSC-2 (500 kHz)	1
Oscillator board OSC-2 (only J1 connector mounted)	1
M34282T5-OPT Instruction manual (this manual)	1
M34282T5-OPT Instruction Manual (Japanese)	1

*1 The M34282T5-OPT has a 4MHz oscillator circuit board OSC-2 that is incorporated when shipped from the factory. In addition, an oscillator circuit board OSC-2 for 500 kHz and an oscillator circuit board OSC-2 on which only J1 connector mounted are included.

*2 Keep the packaging carton and cushion material of the M34282T5-OPT to transport it for repair or for other purposes in the future.

*3 If you find any item missing or faulty, or any suggestion, contact your local distributor.

3.2 Other Necessary Products

To bring forward program development on the 4282 Group of 4-bit MCUs, the products listed in Table 3.2 are necessary in addition to those contained in the package above. Get them separately to be ready when necessary.

Table 3.2 Products required for program development on the 4282 Group MCUs

Emulator system	PC4000E (emulator main unit)
	PC4400 (emulator card cage)
	PCA4400A (control board)
	PCA4400R (function expansion board)
Emulator debugger	RTT72
Serial programmer*	MSP-II
PROM & FLASH programmer*	EFP-I (PROM & FLASH programmer main unit)
	EF1SRP-01U (unit for serial writing)
	Cable for connecting the target (3-line type)
PROM programming adapters*	MS4238-20F (for 20P2N-A package)
	MS4280-20G (for 20P2E/F-A package)

* The serial programmers and PROM programming adapters in Table 3.2 are products of Suisei Electronics System Co., Ltd. For inquiries about these products, contact Suisei Electronics System Co., Ltd.

Suisei Electronics System Co., Ltd.
Tsurumi 6-5-24, Tsurumi-ku, Osaka 538-0053, JAPAN
Tel: +81-6-913-4531 Fax: +81-6-913-4534
URL: http://www.suisei.co.jp/index_e.htm

MEMO

4. M34282T5-OPT

4.1 Outline

By using with the PC4400 emulator for the 720 Series, the M34282T5-OPT can make up an emulator system which can be operated by a personal computer.

Figure 4.1 shows the emulator system configuration.

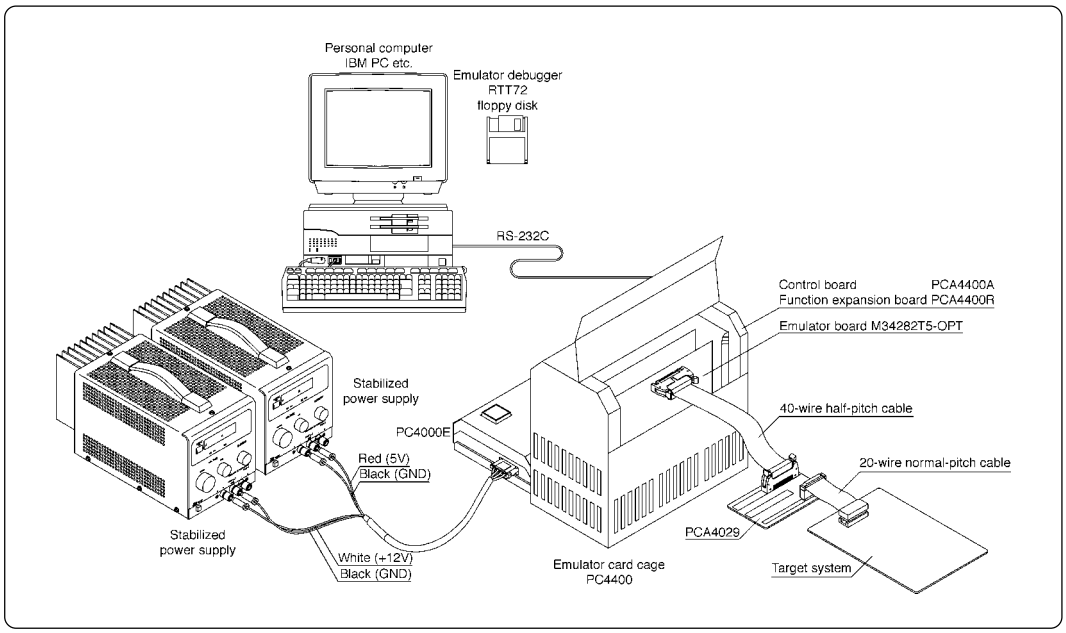

Figure 4.1 Emulator system configuration

* For how to connect to the target system, refer to "4.6 Connecting MCU Board to Target System" (page 20).

4.2 Specifications

Table 4.1 lists specifications of the M34282T5-OPT.

Table 4.1 Specifications of M34282T5-OPT

<table>
<tr><td>Applicable MCU</td><td colspan="4">4282 Group MCUs</td></tr>
<tr><td>Evaluation MCU</td><td colspan="4">M34282E2GP (on board)</td></tr>
<tr><td rowspan="3">Maximum operating clock frequency</td><td colspan="4">System clock 4 MHz (using OSC-2 [4 MHz])*</td></tr>
<tr><td rowspan="2">V_{DD} = 3 V</td><td colspan="3">4.0 MHz (STCK=f(X_{IN})/8)</td></tr>
<tr><td colspan="3">500 kHz (STCK=f(X_{IN}))</td></tr>
<tr><td>Target system supply voltage</td><td colspan="4">3 V</td></tr>
<tr><td>Power supply</td><td colspan="4">Supplied from the PC4400 (+5 V, +12 V)</td></tr>
<tr><td rowspan="9">Port emulation</td><td>Port</td><td>Output type</td><td>Direction</td><td>Device used</td></tr>
<tr><td>D_0 to D_3</td><td rowspan="5">P-channel open drain</td><td>Output</td><td rowspan="4">Input: 74HC541
Output: TD62787</td></tr>
<tr><td>D_4 to D_7</td><td rowspan="4">Input/output</td></tr>
<tr><td>G_0 to G_3</td></tr>
<tr><td>E_0</td></tr>
<tr><td>E_1</td><td rowspan="2">Input: 74HC4066
Output: 74HC4066</td></tr>
<tr><td>E_2</td><td>-</td><td>Input</td></tr>
<tr><td>CARR</td><td>CMOS</td><td>Output</td><td>Output: 74VHC08</td></tr>
<tr><td>Board dimensions</td><td colspan="4">233 mm (L) x 120 mm (W) x 26.0 mm (H)</td></tr>
<tr><td>Operating temperature</td><td colspan="4">5 to 35°C (no dew)</td></tr>
<tr><td>Product configuration</td><td colspan="4">M34282T5-OPT
40-wire half-pitch cable
20-wire normal-pitch cable
External trigger cable
PCA4029
OSC-2 x2 (for 500 kHz, for changing the frequency)</td></tr>
</table>

* The M34282T5-OPT has a 4MHz oscillator circuit board OSC-2 that is incorporated when shipped from the factory. In addition, an oscillator circuit board OSC-2 for 500 kHz and an oscillator circuit board OSC-2 on which only J1 connector mounted are included.

4.3 Switches

Figure 4.2 shows the locations of switches of the M34282T5-OPT and Tables 4.2 and 4.3 list the functions of each switch and its factory-settings.

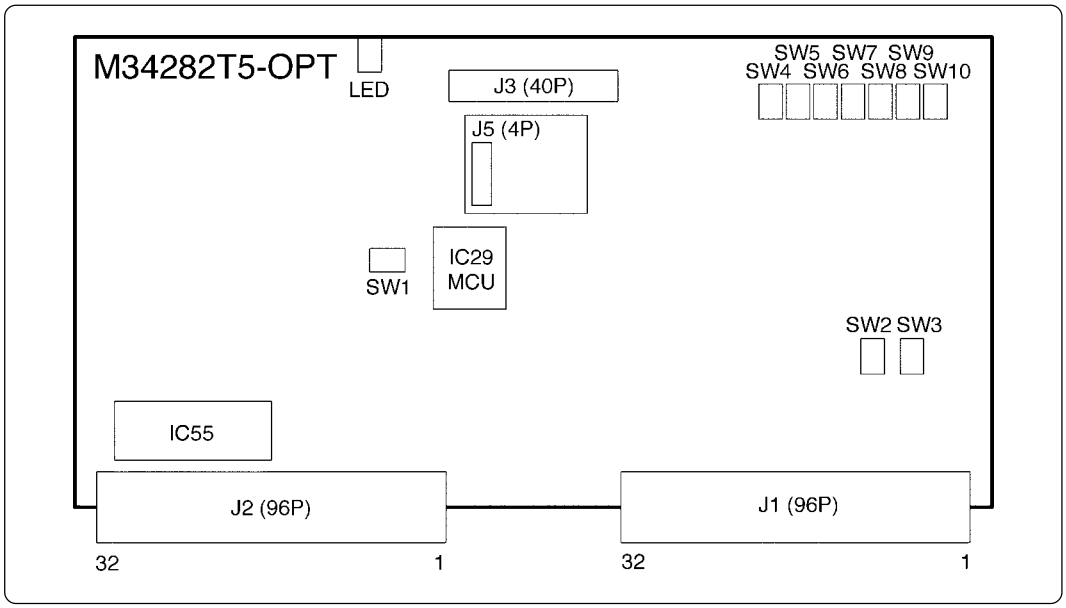

Figure 4.2 Switch locations

Table 4.2 Functions of switches (1/2)

Switch	Switch setting		Description	Factory-setting
SW1	OFF	VDD ON OFF	Does not output the V_{DD} from the M34282T5-OPT to the target system.	OFF
	ON	VDD ON OFF	Outputs the V_{DD} from the M34282T5-OPT to the target system.	
SW2	L	CPUSE0 H L	Sets the ROM type of MCU. For M1: "L" For M2: "H"	H
	H	CPUEL0 H L		
SW3	H	CPUSEL1 H L	This switch is not used. Do not change the CPUSEL1 setting.	H
SW4	OFF	OFF ON	The pulldown resistors of ports G_0 and G_1 are OFF.	OFF
	ON	OFF ON	The pulldown resistors of ports G_0 and G_1 are ON.	

Table 4.3 Functions of switches (2/2)

Switch	Switch setting		Description	Factory-setting
SW5	OFF	OFF  ON	The pulldown resistors of ports G_2 and G_3 are OFF.	 OFF
	ON	OFF  ON	The pulldown resistors of ports G_2 and G_3 are ON.	
SW6	OFF	OFF  ON	The pulldown resistor of port D_4 is OFF.	 OFF
	ON	OFF  ON	The pulldown resistor of port D_4 is ON.	
SW7	OFF	OFF  ON	The pulldown resistor of port D_5 is OFF.	 OFF
	ON	OFF  ON	The pulldown resistor of port D_5 is ON.	
SW8	OFF	OFF  ON	The pulldown resistor of port D_6 is OFF.	 OFF
	ON	OFF  ON	The pulldown resistor of port D_6 is ON.	
SW9	OFF	OFF  ON	The pulldown resistor of port D_7 is OFF.	 OFF
	ON	OFF  ON	The pulldown resistor of port D_7 is ON.	
SW10	OFF	OFF  ON	The pulldown resistor of port E_0 is OFF.	 OFF
	ON	OFF  ON	The pulldown resistor of port E_0 is ON.	

4.4 Check Pins

The M34282T5-OPT has the check pins listed in Table 4.4.

Table 4.4 Check pins

Pin		Description
TP1	V_{DD}	Outputs power voltage +3 V to the evaluation MCU.
TP2	X_{IN}	Outputs system clock input to the evaluation MCU.
TP4	WRST	Outputs "H" level when executing WRST instruction. By observing pulse width, it is possible to confirm the initializing cycle of the watchdog timer.
TP5	GND	GND

4.5 Connectors

Table 4.5 lists the functions of connectors of the M34282T5-OPT. Figure 4.3 shows the connector locations.

Table 4.5 Connector list

Connector	Description
J1	Connects the evaluation MCU bus.
J2	Connects the monitor CPU bus.
J3	Connects the target system (40-pin).
J4	Connects external trigger signal (2-pin).
J5	Connects the oscillator board (4-pin).

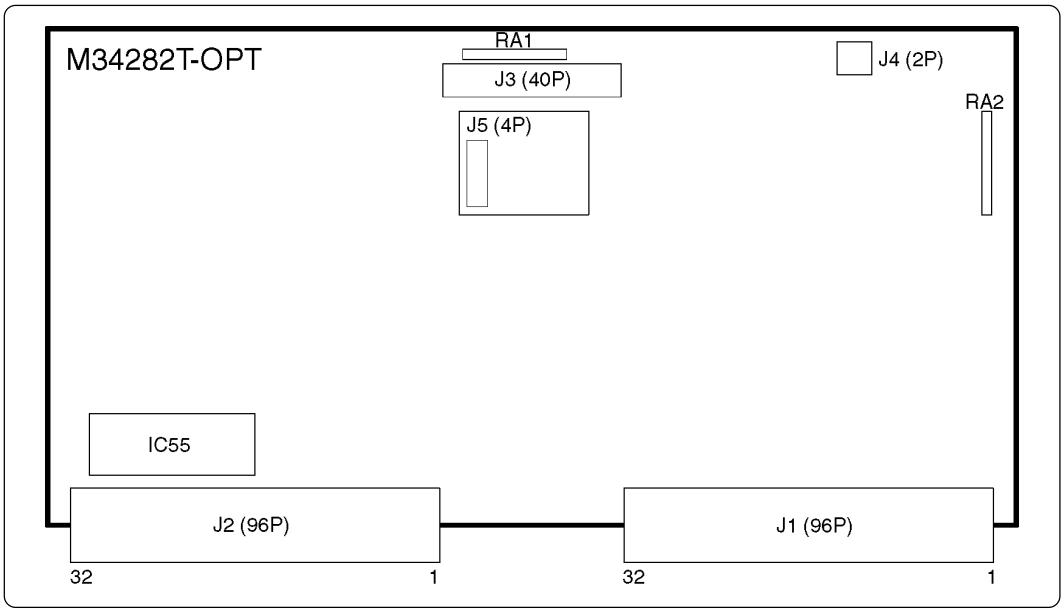

Figure 4.3 Connector locations

(1) Connector J3

Table 4.6 lists the pin assignments of 40-wire half-pitch connector (J3) for connecting the PCA4029. And Figure 4.4 shows the J3 connector pin layout.

Table 4.6 40-wire half-pitch connector (J3) for connecting PCA4029

Line A			Line B			Line C			Line D		
Pin No.	Signal	I/O	Pin No.	Signal	I/O	Pin No.	Signal	I/O	Pin No.	Signal	I/O
1	GND		1	GND		1	V_{SS}	O	1	V_{DD}	O
2	GND		2	GND		2	E_2	I	2	CARR	O
3	GND		3	GND		3	E_1	I/O	3	D_0	O
4	GND		4	GND		4	X_{IN}	-	4	D_1	O
5	GND		5	GND		5	X_{OUT}	-	5	D_2	O
6	GND		6	GND		6	E_0	I/O	6	D_3	O
7	GND		7	GND		7	G_0	I/O	7	D_4	I/O
8	GND		8	GND		8	G_1	I/O	8	D_5	I/O
9	GND		9	GND		9	G_2	I/O	9	D_6	I/O
10	GND		10	GND		10	G_3	I/O	10	D_7	I/O

* "I" in the I/O column denotes "Input"; "O" denotes "Output"; "I/O" denotes "Input/output"; "-" denotes "Not connected".

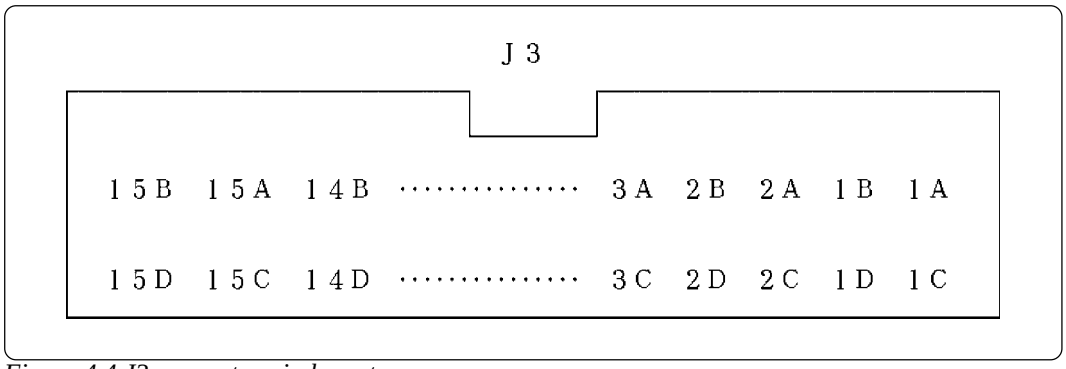

Figure 4.4 J3 connector pin layout

(2) J4 connector

For the J4 connector, use the 2-wire external trigger signal cable included with your M34282T5-OPT board. Connect the black clip to GND and the white clip to the external trigger signal input.

An external trigger signal is used to cause an external trigger break or set an external trigger-based trace point. Table 4.7 lists the pin assignments of the J4 connector.

Table 4.7 Pin assignments of J4 connector

Pin No.	Signal	Description
1	TRIG	External trigger signal input
2	GND	GND

(3) J5 connector

The J5 connector is a connector used to connect an oscillator board (OSC-2). Table 4.8 lists the pin assignments of the J5 connector. Figure 4.5 shows the pin layout of the J5 connector. For the 4.0MHz operation with the OSC-2 oscillator board, see Figure 4.6.

Table 4.8 Pin assignments of J5 connector

Pin No.	Signal	Description
1	V_{CC}	Power supply
2	GND	GND
3	CLK	Clock input
4	GND	GND

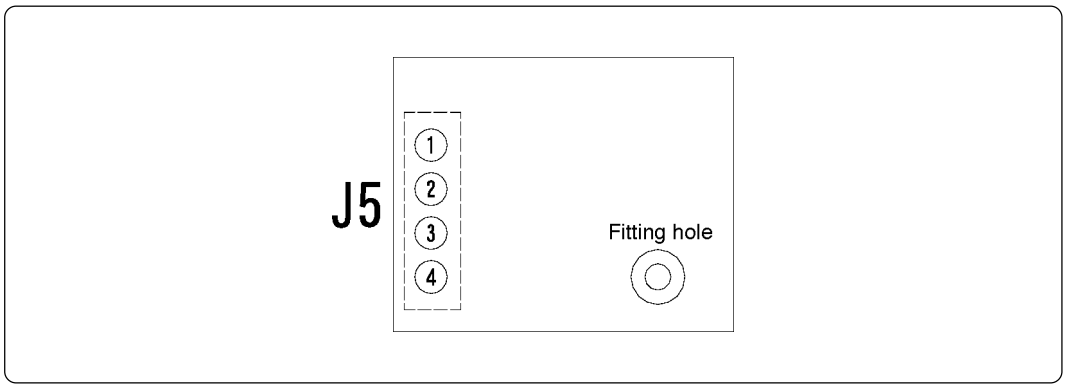

Figure 4.5 Pin layout of J5 connector

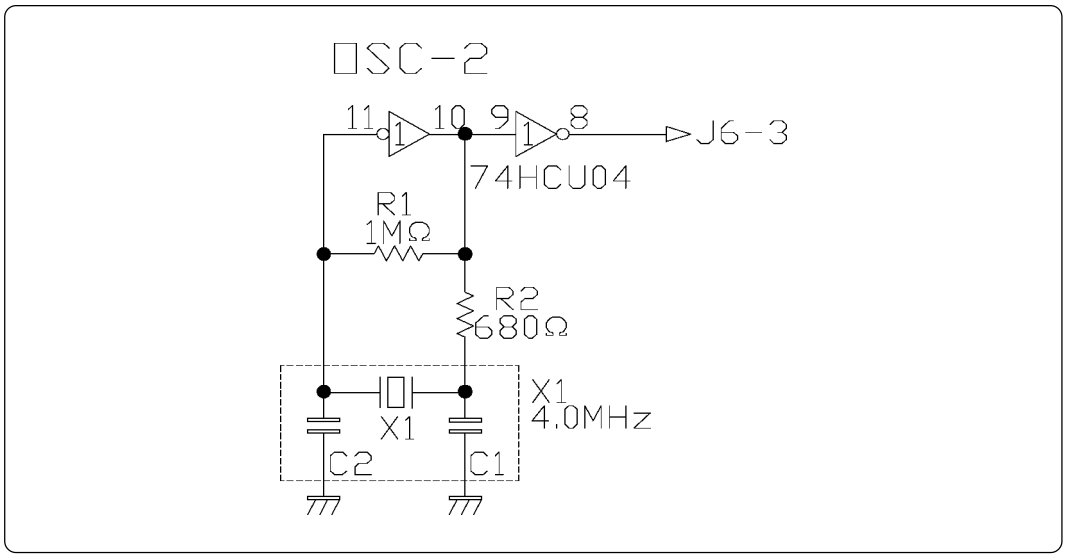

Figure 4.6 Circuit diagram of OSC-2 (4.0 MHz)

4.6 Connecting MCU Board to Target System

Figure 4.7 shows the connection to the target system using the 20-wire normal-pitch cable.

Connect the M34282T5-OPT with the IC socket for 2.54-mm-pitch 20-pin DIP (e.g. IC26-2003-GS4: made by Yamaichi Electronics Co., Ltd.) on the target system using the included 20-wire normal-pitch flat cable.

However, the M34282T5-OPT cannot be connected to the foot pattern of the MCU package (20P2N-A or 20P2E/F-A).

For this connection, you need three accessory parts listed below:

(1) 40-wire half-pitch cable (40 cm)
(2) Pitch converter board PCA4029
(3) 20-wire normal-pitch cable (10 cm)

Table 4.9 lists the connector signal assignments of the 20-wire normal-pitch cable. Figure 4.8 shows the pin layout of the 20-wire normal-pitch cable.

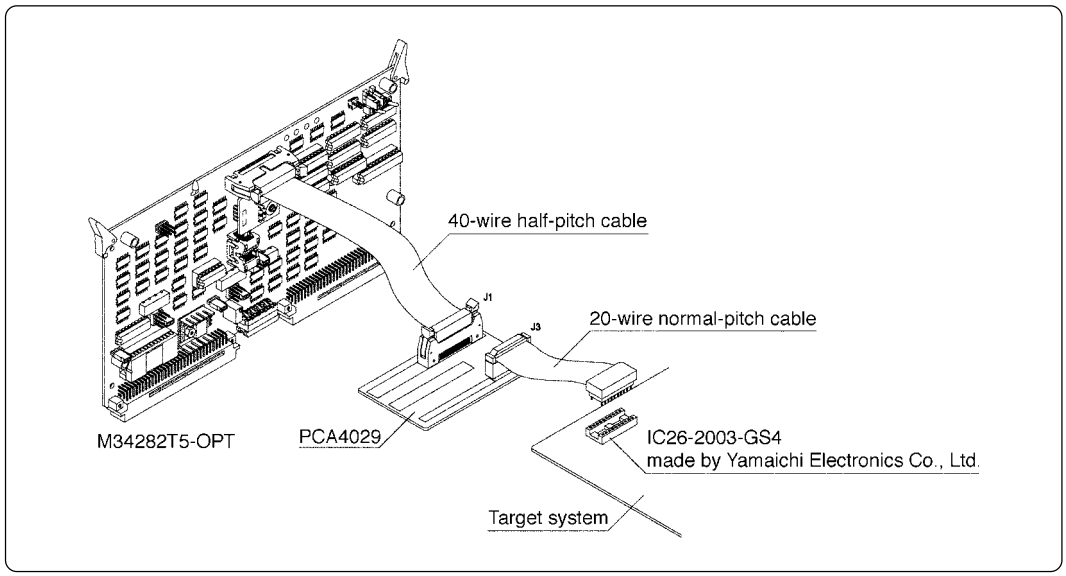

Figure 4.7 Connecting target system

Table 4.9 20-wire normal-pitch cable pin assignments

20-wire normal-pitch cable			
1	V_{SS}	20	V_{DD}
2	E_2	19	CARR
3	E_1	18	D_0
4	X_{IN} (not connected)	17	D_1
5	X_{OUT} (not connected)	16	D_2
6	E_0	15	D_3
7	G_0	14	D_4
8	G_1	13	D_5
9	G_2	12	D_6
10	G_3	11	D_7

*1 The V_{DD} does not input the power supply voltage from the target system, but outputs from the power circuit on the M34282T5-OPT to the target system.

The V_{DD} can output by setting the switch SW1. For how to set the switches, refer to "4.3 Switches" (page 15).

*2 X_{IN} is input from the oscillator circuit board OSC-2 and cannot be input from the oscillator circuit board on the target system.

When changing the system clock frequency, change the frequency of the oscillator circuit board OSC-2 to use.

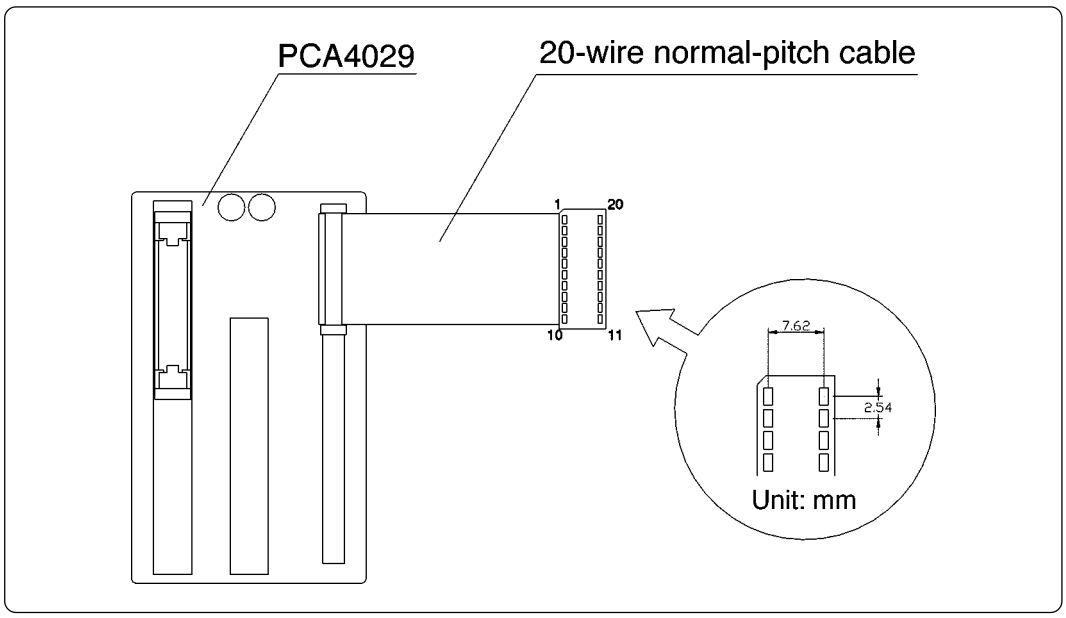

Figure 4.8 Pin layout of 20-wire normal-pitch cable

An evaluation MCU on the M34282T5-OPT and the target system are connected as shown below.

(1) Pin connected directly to the target system (1 type, 1 line)

- V_{SS}

(2) Pins connected to the target system via emulation circuits etc. (5 types, 17 lines)

- G_0 to G_3
- D_0 to D_7
- E_0 to E_2
- CARR
- V_{DD}

(3) Pins not connected to the target system (2 types, 2 lines)

- X_{IN}
- X_{OUT}

* With the M34282T5-OPT, X_{IN} and X_{OUT} pins are not connected to the target system. Therefore, when changing the system clock frequency, change the frequency of the oscillator circuit board OSC-2.

4.7 LED

Figure 4.9 shows the LED layout of M34282T5-OPT. The LED lights in green when the power is supplied to the MCU board.

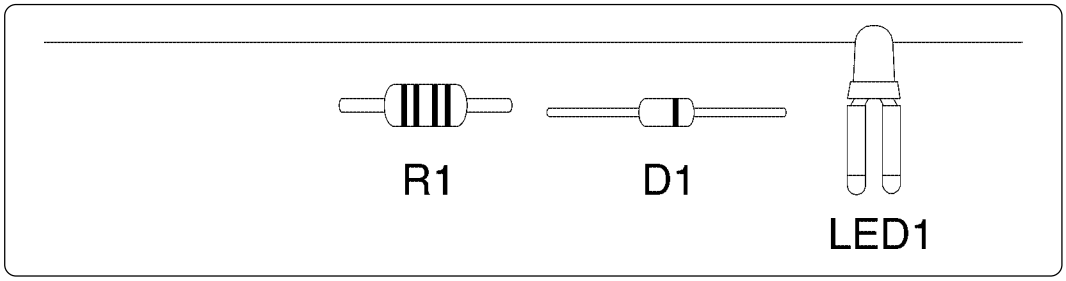

Figure 4.9 Layout of LED

5. Precautions to Be Taken When Debugging

5.1 Reset

The M34282T5-OPT can be reset by the reset command of emulator debugger RTT72, but cannot emulate device operation at power-on reset. Use an evaluation MCU (OTP version) to verify the operation associated with power-on reset.

5.2 Capacity of Internal Memory (ROM, RAM)

The M34282T5-OPT is equipped with the M34282E2GP as an evaluation MCU. The RAM and ROM areas that can be referenced by emulator debugger RTT72 are specified by switches SW2 and SW3 as listed in Table 5.1.

Table 5.1 Memory areas that can be referenced by emulator debugger RTT72

Switch setting		RAM area	ROM area
SW3	SW2		
"H"	"L"	00h - 0Bh 10h - 1Bh 20h - 2Bh 30h - 3Bh (4 bits x 48 words)	000h - 3FFh (9 bits x 1024 words)
	"H"	00h - 3Fh (4 bits x 64 words)	000h - 7FFh (9 bits x 2048 words)

* Addresses in the RAM area are shown as described below according to the data pointer registers X and Y.

Example: RAM address XXh

- Y (Y = 0 to B, or Y = 0 to F)
- X (X = 0 to 3)

5.3 Watchdog Timer

With the M34282T5-OPT, the watchdog timer cannot be operated. Therefore use an evaluation MCU (OTP version) to verify the operation associated with the watchdog timer function.

And with the M34282T5-OPT, when executing WRST instruction, the check pin TP4 outputs "H" level (see Figure 5.1), so you can check the initializing cycle of the watchdog timer by monitoring the pulse width frequency of TP4.

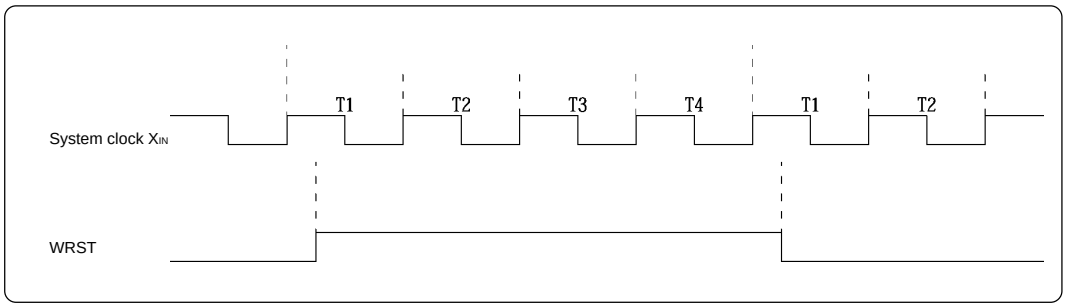

Figure 5.1 Output waveform of check pin TP4

5.4 System Clock

Depending on how the instruction clock is set, use the M34282T5-OPT in the range of frequencies listed in table 5.2.

When the instruction clock is set to STCK = f(X_{IN}) and the system clock frequency is over 500 kHz, the emulator may not work properly.

Table 5.2 Operating frequencies of the M34282T5-OPT

Voltage	Instruction clock	Frequency
3 V	STCK = f(X_{IN})/8	4.0 MHz or less
	STCK = f(X_{IN})	500 kHz or less

* To change the system clock frequency, change the clock frequency of the oscillator circuit board OSC-2. For details about the oscillation circuit constant, consult your oscillator manufacturer.

5.5 Real-time Capability of Timer

As the evaluation MCU is active even when program execution is stopped or when a command is executed, its timer values are modified.

Examples: (1) When single-stepping instructions
(2) After program execution stopped

5.6 Power-down Mode

Although the M34282T5-OPT can execute a program using the POF instruction, there are precautions and restrictions listed in Table 5.3.

Table 5.3 Precautions for power-down mode.

	Description
1	Although SAFE and ERROR LEDs of the PC4000E light up in the power-down mode, it is not an error condition.
2	Do not use the POF instruction when single-stepping a program. The POF instruction can not be executed correctly when stepped through.
3	No debug command of emulator debugger RTT72 can be executed. In the power-down mode, execute the debug command after resuming by the key-on wakeup function.
4	The real-time trace result of the area including the POF instruction cannot be displayed normally.

5.7 Program Execution (G, GB)

The PC4400 and the M34282T5-OPT's hardware are subject to the following restrictions with respect to the operation of the program execution commands (G and GB).

(1) Continuous description of instructions

Hardware break points set in a continuous description of instructions following one after another do not cause a break to occur in the continuous description of instructions. A break occurs only after fetching the address where the continuous description of instructions is discontinued. (See Program example 5.1)

However, a break does occur even in a continuous description of instructions when an external trigger break or forced break is encountered. For execution to be resumed in this case, you need to make sure that the execution start address is next to the continuous description of instructions. (See Program example 5.2)

Program example 5.1

```
            LA    0
POINT:      LA    1     ; Continuous description of instructions
            LA    2
POINT+2:    XAM   3
```

If a break is set at POINT, execution is halted immediately before the XAM instruction at address POINT+2.

Program example 5.2

```
            LA    0
POINT:      LA    1     ; Continuous description of instructions
POINT+1:    LA    2
POINT+2:    XAM   3
```

If a forced or external trigger break is applied at POINT, execution is halted at POINT+1. When resuming program execution after the break, make sure that the start address is at POINT+2, an address immediately after the continuous description of instructions is discontinued.

(2) Skip instructions (e.g. SNZP, INY, DEY, SZB, SEAM, SZC and RTS)

In cases when a skip instruction skips the next instruction, a break point set in the skipped instruction does not cause execution to halt. (See Program examples 5.3 and 5.4)

Program example 5.3

```
            LXY   0,0
            SZD
POINT:      B     jmp_adr      ; Skip when D(0) = 0
POINT_A:    TAM   0
              •
              •
```

If a break point is set at POINT,
D(0) = 0: Execution is halted immediately before the instruction at POINT.
D(0) = 1: Execution is NOT halted because the instruction at POINT is skipped.
To halt execution immediately after a skip instruction, set break points at POINT and POINT_A.

Program example 5.4

```
            RC
            INY
POINT:      TABP               ; Skip when (Y) = 0
            LA    0
              •
              •
```

If a break with pass count is set at address POINT, the count is taken and execution is halted only when the instruction at address POINT is executed.

5.8 Pulldown Transistor Control

Since ports D_4 to D_7, E_0 and G_0 to G_3 contain emulation circuits, you can not control the pulldown resistors using the pulldown control register. If you want to use the internal pulldown resistors, turn on switches SW4 to SW10 when occasion demands. With the M34282T5-OPT, the port's resistance value of the pulldown resistor is 150 kΩ.

When changing the resistance value of the pulldown resistor, replace RA1 (ports E_0, G_3 to G_0) and RA2 (ports G_7 to G_4) on the M34282T5-OPT. For the position of the pulldown resistor, see Figure 4.3.

5.9 Port I/O Timing

(1) Port input timing

Port input timings are the same as with the actual MCUs.

(2) Port output timing

When using the M34282T5-OPT, output timings are different from those of the actual MCUs for the ports D_0 to D_7, E_0 and G_0 to G_3 that are configured with port emulation circuits.

With the actual MCUs, changes occur at the beginning of the T4 state of an output instruction. With the M34282T5-OPT, changes occur at the beginning of the T2 state of the next output instruction. Figure 5.2 shows the port timings of the actual MCUs and M34282T5-OPT.

Port output timings of ports E_1, E_2 and CARR are the same as with the actual MCUs.

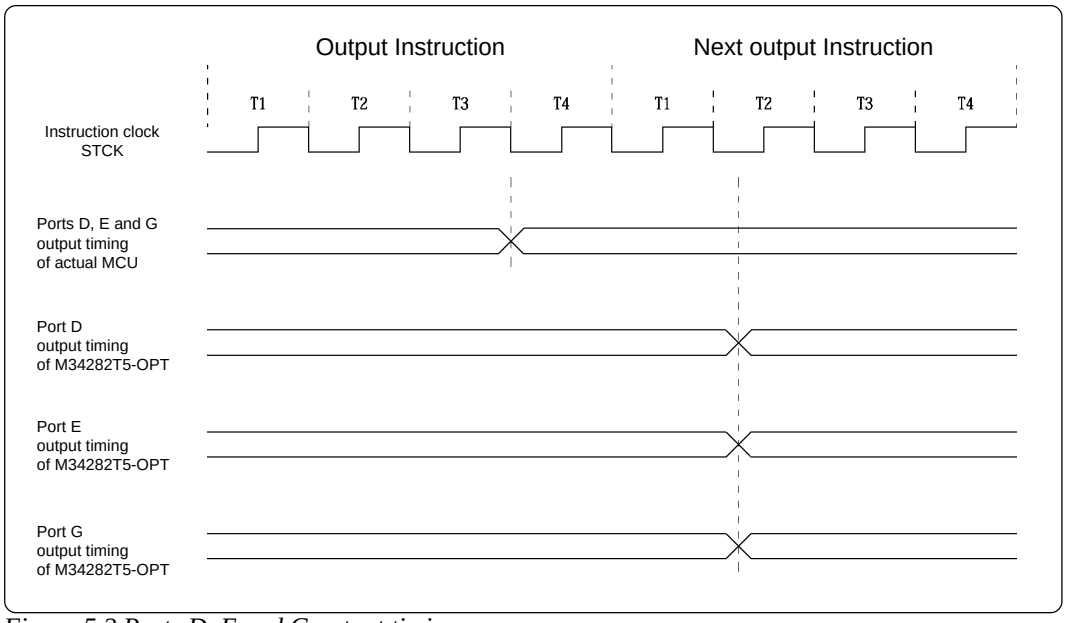

Figure 5.2 Ports D, E and G output timings

5.10 Port I/O Characteristics

With the M34282T5-OPT, port I/O characteristics are different from actual MCUs because there is an emulation circuit in ports E_0, G_0 to G_3 and D_0 to D_7. Table 5.4 lists port I/O characteristics of the M34282T5-OPT.

Table 5.4 Emulation port I/O characteristics

Port		Device	Item	Voltage	Min.	Max.	Remarks
E_0	Input	74HC541	V_{IH}	V_{CC} = 2.0 V	1.5 V	-	
				V_{CC} = 4.5 V	3.15 V	-	
			V_{IL}	V_{CC} = 2.0 V	-	0.5 V	
				V_{CC} = 4.5 V	-	1.35 V	
	Output	TD62787	I_{CEX}	-	-	-100 μA	V_{OUT} = -50 V
			$V_{CE(sat)}$	-	-	-1.8 V	V_{IN} = V_{IL}, I_{OUT} = -100 mA
						-2.0 V	V_{IN} = V_{IL}, I_{OUT} = -350 mA
G_0 to G_3	Input	74HC541	V_{IH}	V_{CC} = 2.0 V	1.5 V	-	
				V_{CC} = 4.5 V	3.15 V	-	
			V_{IL}	V_{CC} = 2.0 V	-	0.5 V	
				V_{CC} = 4.5 V	-	1.35 V	
	Output	TD62787	I_{CEX}	-	-	-100 μA	V_{OUT} = -50 V
			$V_{CE(sat)}$	-	-	-1.8 V	V_{IN} = V_{IL}, I_{OUT} = -100 mA
						-2.0 V	V_{IN} = V_{IL}, I_{OUT} = -350 mA
D_0 to D_3	Input	74HC541	V_{IH}	V_{CC} = 2.0 V	1.5 V	-	
				V_{CC} = 4.5 V	3.15 V	-	
D_4 to D_7			V_{IL}	V_{CC} = 2.0 V	-	0.5 V	
				V_{CC} = 4.5 V	-	1.35 V	
	Output	TD62787	I_{CEX}	-	-	-100 μA	V_{OUT} = -50 V
			$V_{CE(sat)}$	-	-	-1.8 V	V_{IN} = V_{IL}, I_{OUT} = -100 mA
						-2.0 V	V_{IN} = V_{IL}, I_{OUT} = -350 mA
CARR	Output	74VHC08	V_{OH}	V_{CC} = 2.0 V	1.5 V	-	I_{OH} = -50 μA
				V_{CC} = 4.5 V	3.15 V	-	I_{OH} = -8 mA
			V_{OL}	V_{CC} = 2.0 V	-	0.1 V	I_{OL} = 50 μA
				V_{CC} = 4.5 V	-	0.44 V	I_{OL} = 8 mA

5.11 External Trigger

(1) External trigger signal input timing

The latch timing of the external trigger signal is shown in Figure 5.3.

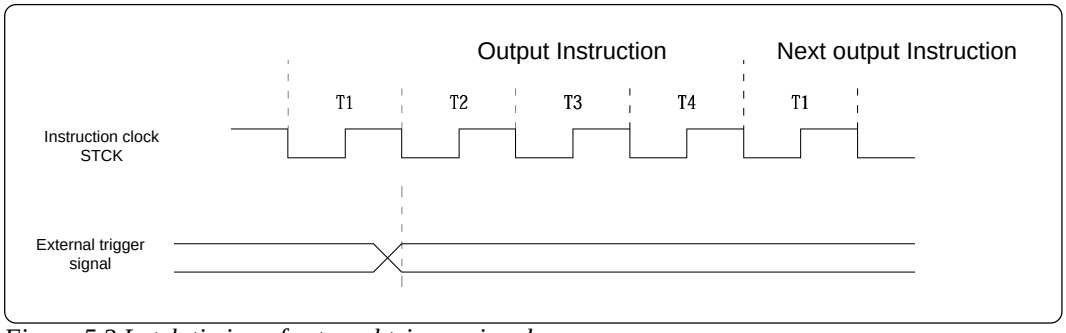

Figure 5.3 Latch timing of external trigger signal

(2) External trigger signal input characteristics

Trigger breaks work according to the condition (leading edge/trailing edge) of signals input from the external trigger cable. The external trigger signals of the trace points and the external trigger signals of the break points use the same signals.

The input characteristics of the external trigger signals are shown in Table 5.5 below. See the table before using external trigger signals.

Table 5.5 External trigger signal input characteristics

Item	Symbol	Voltage	Minimum	Maximum
H-level threshold voltage	V_{IH}	V_{CC} = 2.0 V	1.5 V	-
		V_{CC} = 4.5 V	3.15 V	-
L-level threshold voltage	V_{IL}	V_{CC} = 2.0 V	-	0.5 V
		V_{CC} = 4.5 V	-	1.35 V

5.12 Other Precautions

With the M34282T5-OPT, the system which uses the function below cannot be emulated. Therefore, always be sure to evaluate your system with an evaluation MCU (OTP version).

• Low-voltage detection function

MEMO

6. LED of PC4000E

6.1 LED Indication at Emulator Startup

The emulator checks the PC4400 system immediately after startup. During system check the PC4000E's SAFE LED flashes and the ERROR LED stays on steady. If the SAFE LED does not flash, it means that the system check program is not operating. In such a case, check whether the PC4000E, PC4400 card cage and each circuit board are fitted correctly. When the system check is completed, the emulator status is indicated by the LEDs on the PC4000E.

Table 6.1 shows the LED indications at startup of PC4400.

Table 6.1 LED indication at emulator startup

LED display		Condition of PC4000E
SAFE	ERROR	
Turned ON	Turned OFF	The emulator has started up properly.
Flash alternately		Following may be considered: • Some board in the PC4400 main unit slot is not fitted in correctly. Check whether each board is fitted correctly. • An error is detected by the PC4400's system check. The PC4400 system may be faulty. Contact your local distributor for repair.

6.2 LED Indication during Emulator Operation

It is possible to check the emulator status during operation by its LED indicators.

Table 6.2 shows the LED indications during emulator operation.

Table 6.2 LED indications during emulator operation

LED display		Condition of PC4000E
SAFE	ERROR	
Turned ON	Turned OFF	The emulator is ready to execute debug commands of emulator debugger RTT72.
Turned ON	Turned ON	The evaluation MCU is in the power-down mode or the emulator system has been reset. In this case, no debug command of emulator debugger RTT72 can be executed. In the power-down mode, execute the debug command after resuming by the key-on wakeup function.

MEMO

7. M34282T5-OPT Connection Circuit Diagram

Figure 7.1 shows the M34282T5-OPT connection circuit diagram. This circuit diagram depicts the M34282T5-OPT connection centering on circuits connected to the target system. Emulator control blocks and other similar circuits that are not connected to the target system are omitted.

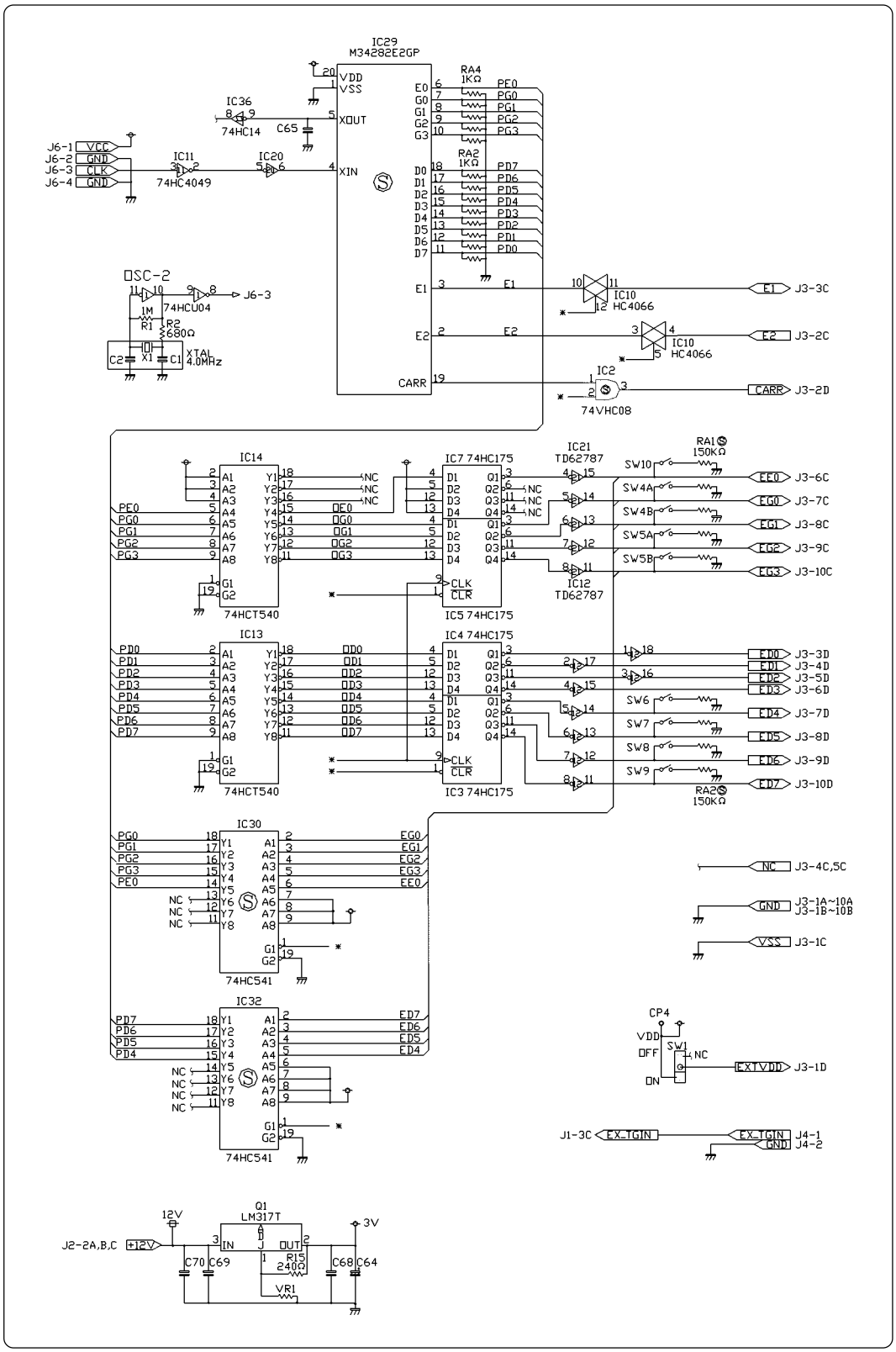

Figure 7.1 M34282T5-OPT connection circuit diagram

MEMO

8. External Dimensions of Emulator Probe

8.1 20-pin Pin Header

Figure 8.1 shows the external dimensions of the emulator probe 2.54-mm-pitch 20-pin pin header of the M34282T5-OPT.

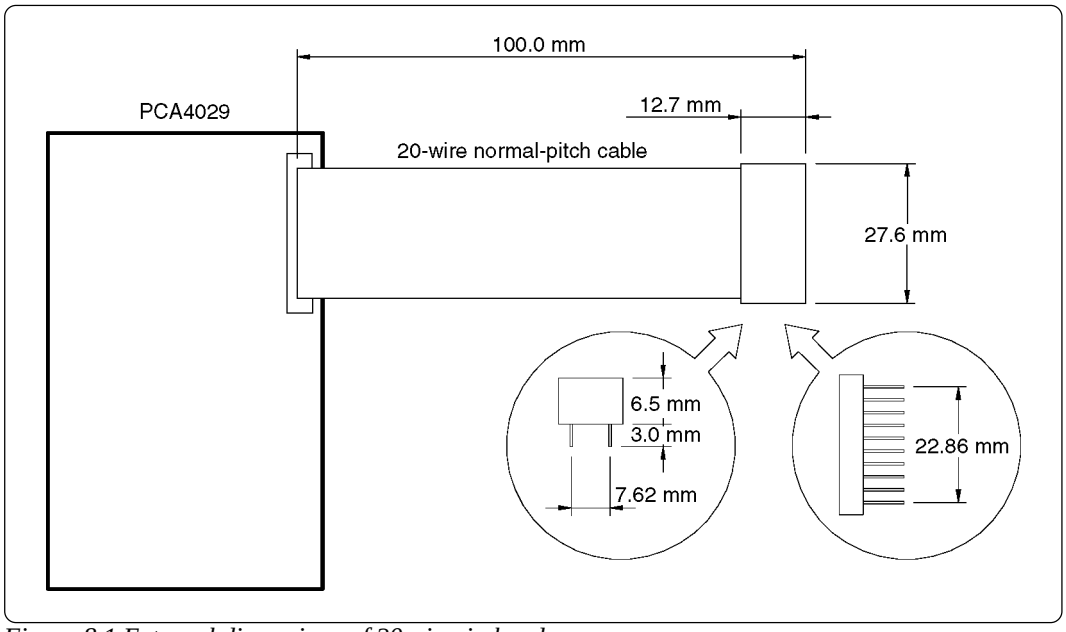

Figure 8.1 External dimensions of 20-pin pin header

Appendix A. How to Request for Repair

If your product is found faulty, follow the procedure below to send your product for repair.

Customer

Fill in the Repair Request Sheet included with this product, then send it along with this product for repair to your local distributor. Make sure that information in the Repair Request Sheet is written in as much detail as possible to facilitate repair.

Distributor

After checking the contents of fault, the distributor should please send the faulty product along with the Repair Request Sheet to Renesas Solutions Corp.

Renesas Solutions

When the faulty product is repaired, it will be returned to the customer at the earliest convenience.

⚠ CAUTION

Note on Transporting the Product:

- When sending your product for repair, use the packing box and cushion material supplied with this product when delivered to you and specify handling caution for it to be handled as precision equipment. If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use conductive polyvinyl supplied with this product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

M34282T5-OPT User's Manual

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