User's Manual

RA6T2 Group

MCB-RA6T2 User's Manual

Renesas RA Family
RA6 Series

Renesas Electronics
www.renesas.com

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General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Renesas RA Family

MCB-RA6T2 User's Manual

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1. Overview

MCB-RA6T2 is a CPU board for motor control evaluation. By using this product in combination with an inverter board, motor control using RA6T2 can be easily performed.

1.1 Presupposition and precautions of this document

1. Experience of using tools: This document assumes that the user has used terminal emulation program of Integrated Development Environment (IDE) such as e2 studio before.
2. Knowledge about the development subject: This document assumes that the user has a basic knowledge to modify the sample project regarding MCU and embedded system.
3. Before using this product, wear an antistatic wrist strap. If you touch this product with static charge on your body, a device failure may occur, or operation may become unstable
4. All screen shots provided in this document is for reference. Actual screen displays may differ depending on the software and development tool version which you use.

2. Product Contents

This kit consists of the following parts.

1. CPU Board (RTK0EMA270C00000BJ) x1
2. USB Cable x1
3. Screw x4
4. Standoff x4

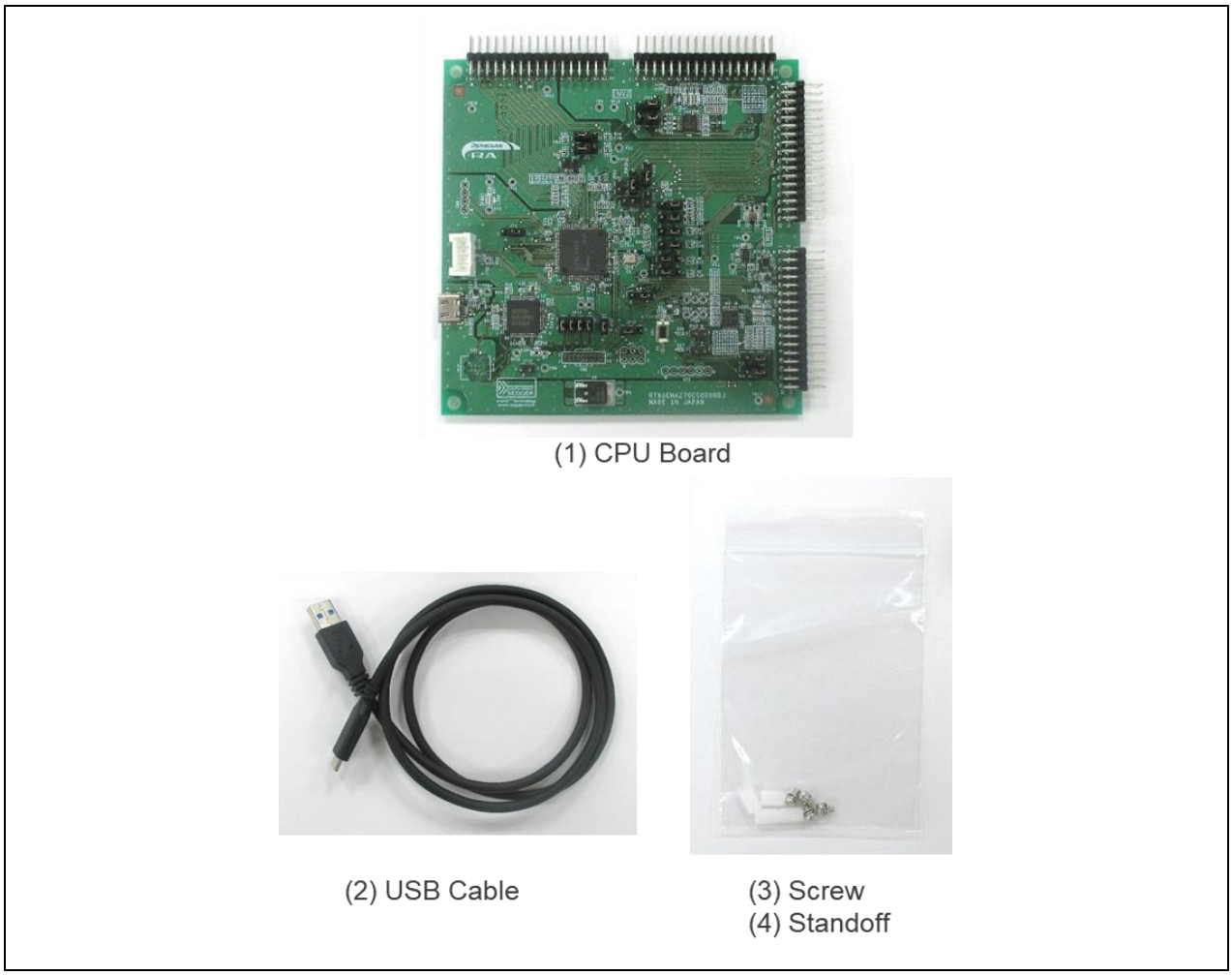

Figure 2-1 Product contents

3. Product Order Information

Product No. to order MCB-RA6T2 : RTK0EMA270C00000BJ

4. Hardware Configuration and Default Setting

4.1 Hardware configuration

The specifications of the CPU board are shown below.

Table 4-1 CPU Board Specification

item		Specification
Product name		CPU Board
Board part No.		RTK0EMA270C00000BJ
Compatible inverter board		RTK0EM0000B12020BJ
External view		 Note: The actual product may differ from this photo.
Mounted MCU	Product group	RA6T2 group
	Product No.	R7FA6T2BD3CFP
	CPU maximum operating frequency	240MHz
	Bit count	32 bit
	Package / Pin number	LFQFP / 100 pin
	RAM	64K byte
MCU input clock		10MHz (Generate with external crystal oscillator)
Input power supply voltage		DC 5V Select one from the below • Power is supplied from compatible inverter board • Power is supplied from USB connector
Debugger		J-Link-OB (Onboard debugger circuit)
Connector		• Inverter board connector (2 sets) • USB connector for J-Link OB • SCI connector for Renesas Motor Workbench communication • Through hole for CAN communication • Through hole for SPI communication • 20 pin through hole for Arm debugger
Switch		MCU reset switch
LED		User-controllable LED x6, Power LED x1
Board size		109mm (W) x 109mm (L)
Operating temperature		Room temperature
Operating humidity		No condensation allowed
EMC Directive		Europe：EN61326-1：2013 Class A

4.2 Block diagram

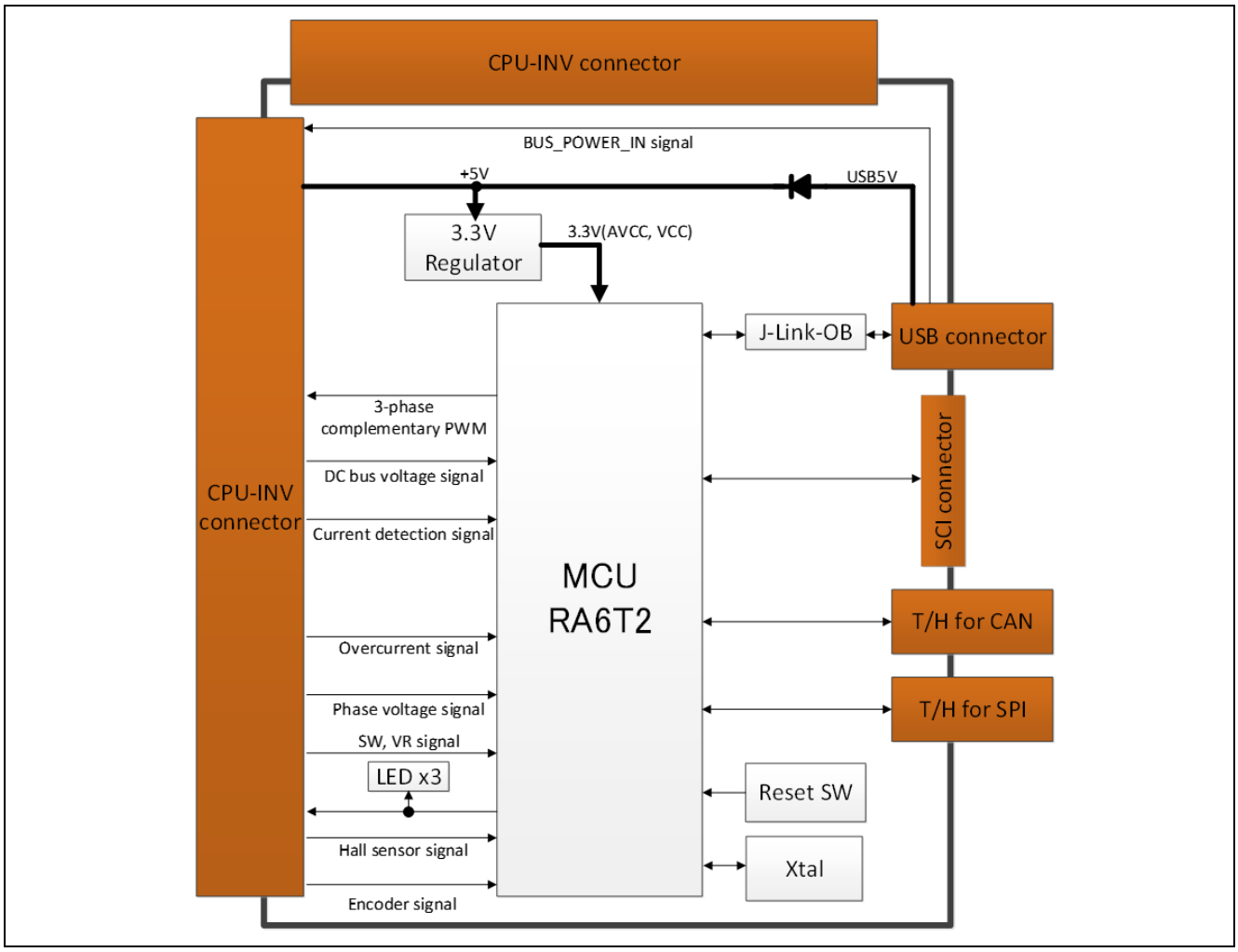

Figure 4-1 Block Diagram of CPU Board

4.3 Board Layout

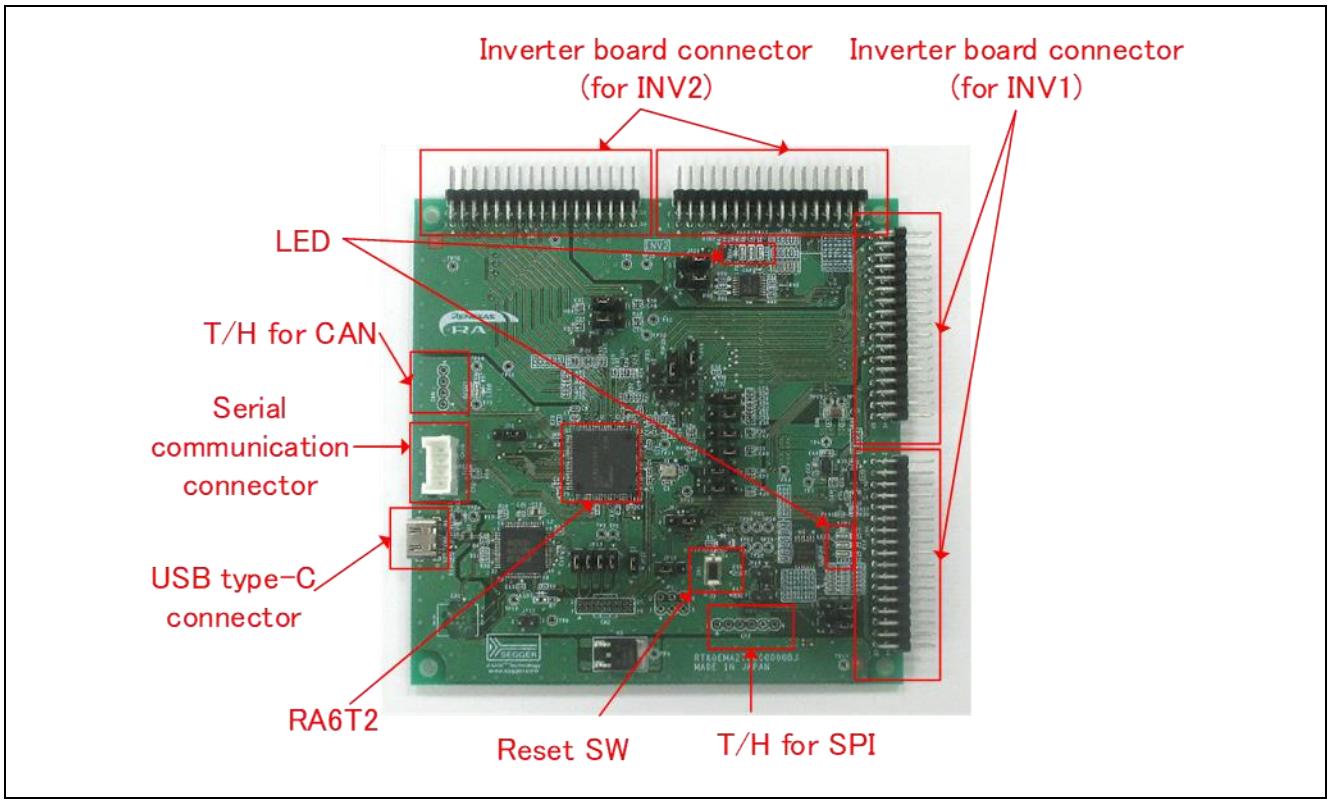

Figure 4-2 CPU Board Layout

4.4 Standoffs and Screws

Before using this product, assemble the included standoffs and screws as shown below.

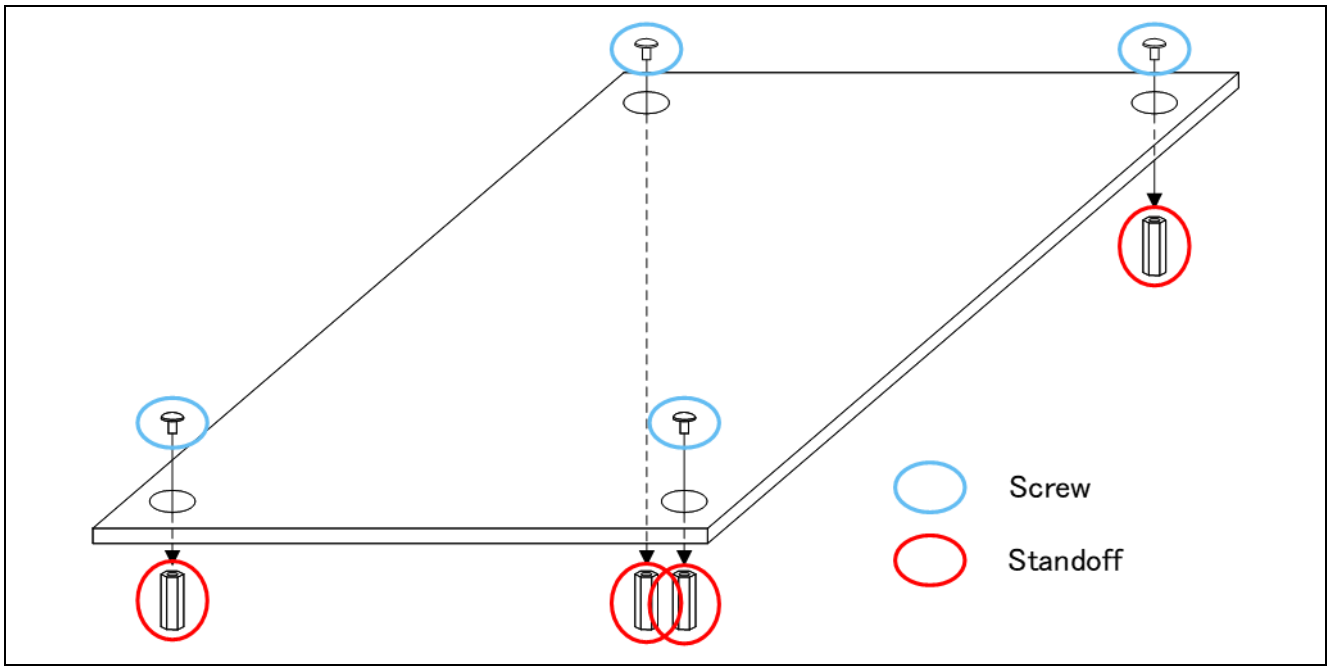

Figure 4-3 Standoffs and Screws assembly

4.5 Jumper pin setting

Default settings and functions of the jumper pins (JP1~JP25) are as follows.

Table 4-2 Jumper pin setting

Jumper pin	Default setting	Function
JP1	2-3pin short	1-2pin short : INV1 IPS CSNIRQN 2-3pin short : INV1 Encoder Z
JP2	2-3pin short	1-2pin short : INV2 PFC current detection (for HV INV) 2-3pin short : INV2 IPS A
JP3	2-3pin short	1-2pin short : INV2 AC input voltage detection (for HV INV) 2-3pin short : INV2 IPS A#/Encoder A#
JP4	1-2pin short	1-2pin short : INV1 HALL U 2-3pin short : INV1 IPS A
JP5	1-2pin short	1-2pin short : INV1 HALL V 2-3pin short : INV1 IPS A#/Encoder A#
JP6	1-2pin short	1-2pin short : INV2 V-phase voltage detection 2-3pin short : INV2 IPS B
JP7	2-3pin short	1-2pin short : INV1 PFC current detection (for HV INV) 2-3pin short : INV1 IPS B#
JP8	2-3pin short	1-2pin short : INV2 IPS CSNIRQN 2-3pin short : INV2 Encoder Z
JP9	1-2pin short	1-2pin short : INV2 W-phase voltage detection 2-3pin short : INV2 IPS B#/Encoder B#
JP10	2-3pin short	1-2pin short : INV1 AC input voltage detection (for HV INV) 2-3pin short : INV1 IPS B#/Encoder B#
JP11	1-2pin open 3-4pin open 5-6pin open	
JP12	1-2pin open	1-2pin short : Disable J-Link OB 1-2pin open : Enable J-Link OB
JP13	1-2pin short 3-4pin short 5-6pin short 7-8pin short	
JP14	1-2pin short	1-2pin short : Enable RA6T2 2-3pin short : Disable RA6T2
JP15, JP16	1-2pin open	1-2pin short : Enable pull-up for I2C 1-2pin open : Disable pull-up for I2C
JP17	2-3pin short	1-2pin short : INV1 IPS A 2-3pin short : INV1 Encoder A
JP18	2-3pin short	1-2pin short : INV1 IPS B 2-3pin short : INV1 Encoder B
JP19	1-2pin short	1-2pin short : INV1 W-phase voltage detection 2-3pin short : INV1 W-phase current detection (PGAVSS)
JP20	1-2pin short	1-2pin short : INV1 V-phase voltage detection 2-3pin short : INV1 V-phase current detection (PGAVSS)
JP21	2-3pin short	1-2pin short : INV2 IPS A 2-3pin short : INV2 Encoder A
JP22	2-3pin short	1-2pin short : INV2 IPS B 2-3pin short : INV2 Encoder B
JP23, JP24, JP25	1-2pin open	1-2pin open : Enable LPF for current sensing 1-2pin short : Disable LPF for current sensing

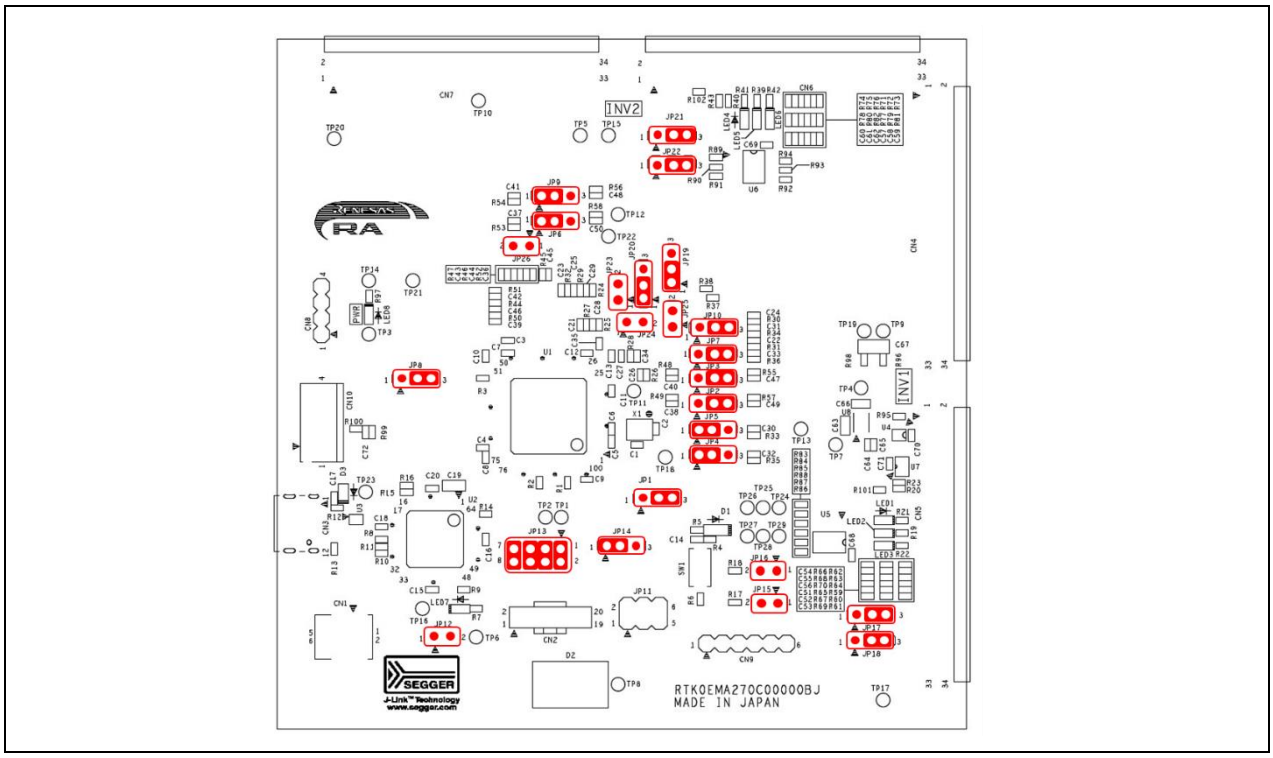

Figure 4-4 Default jumper pin setting

4.6 Connection Example

Figure 4-5 shows a connection example when using this product in combination with a Renesas inverter board kit (MCI-LV-1, P/N: RTK0EM0000S04020BJ) and a communication board (MC-COM, P/N: RTK0EMXC90S00000BJ).

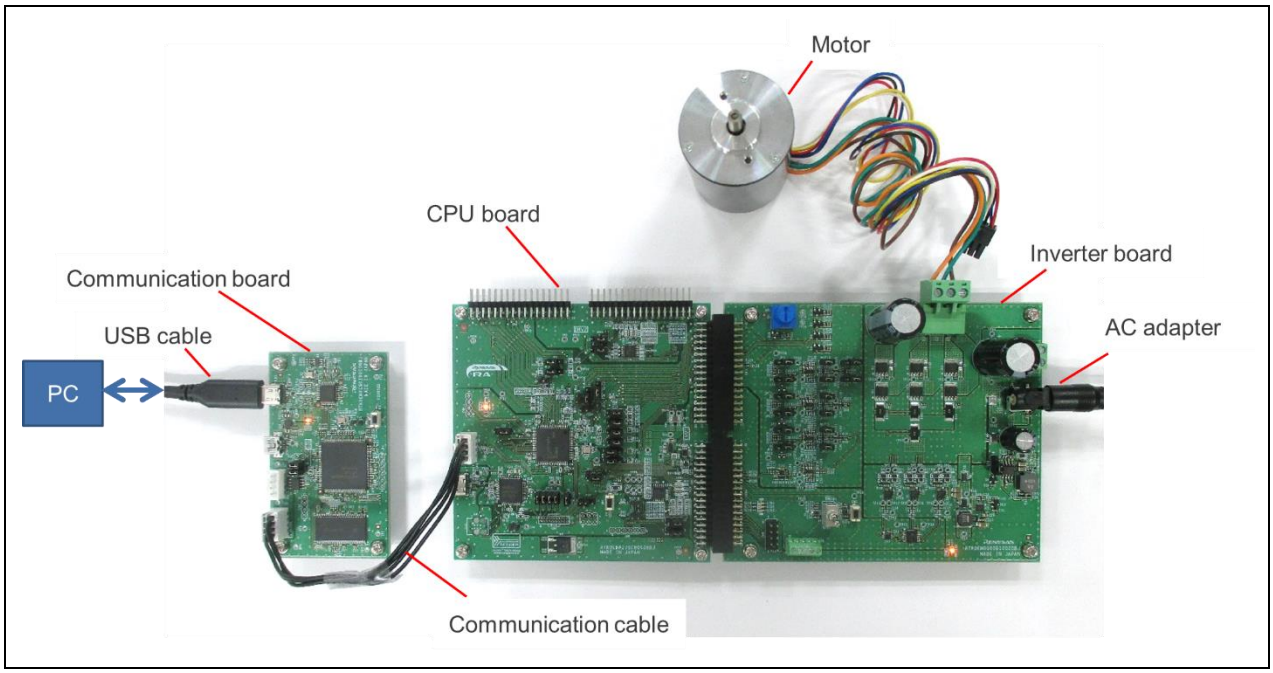

Figure 4-5 Connection Example

5. CPU Board Specification

This section describes the specification of the CPU Board.

5.1 Functions

5.1.1 Power supply

When not connected to the inverter board, power should be supplied from the USB connector. When connecting to the inverter board, power supply from the USB connector or from the inverter board will be automatically selected. USB power supply has priority.

5.1.2 Onboard debugger

This product has the onboard debugger circuit, J-Link On-Board (hereinafter called “J-Link-OB”). You can write a program (firmware) of RA6T2 with it. When you write a program, connect the CPU board to PC with USB cable. J-Link-OB operates as debugger equivalent to J-Link. If connecting from Integrated Development Environment or flash programming tool (e.g. J-Flash Lite by SEGGER), set the type of debugger (tool) to “J-Link”.

5.1.3 Inverter board connector

Two inverter boards can be connected to this board: the 1st inverter board is connected with CN4 and CN5, and the 2nd inverter board is connected with CN6 and CN7. The pin assignments of the connectors are shown in Table 5-1, Table 5-2, Table 5-3 and Table 5-4. Note that these tables show default connection setting for the ports with jumper switches.

Table 5-1 1st Inverter board connector (CN4) pin assignment

Pin No	Pin Function	RA6T2 Pin	Pin No	Pin Function	RA6T2 Pin
1	SPARE1	-	2	AGND	- (AVSS)
3	VPN	PA06/AN006	4	AGND	- (AVSS)
5	IU	PA04/AN004	6	PGAVSSU	PA05/PGAVSS2
7	IV	PA02/AN002	8	PGAVSSV	PA03/AN003
9	IW	PA00/AN000	10	PGAVSSW	PA01/AN001
11	VU	PA07/AN007	12	VV	PA03/AN003
13	VW	PA01/AN001	14	AGND	- (AVSS)
15	VAC	PB10/AN028	16	IPFC	PE15/AN027
17	VR	PB00/AN008	18	AGND	- (AVSS)
19	AVCC	- (AVCC)	20	AVCC	- (AVCC)
21	AGND	- (AVSS)	22	AGND	- (AVSS)
23	VCC	- (VCC)	24	VCC	- (VCC)
25	GND	- (VSS)	26	GND	- (VSS)
27	UN	PB05/GTIOC4B_B	28	GND	- (VSS)
29	UP	PB04/GTIOC4A_B	30	GND	- (VSS)
31	VN	PB07/GTIOC5B_B	32	GND	- (VSS)
33	VP	PB06/GTIOC5A_B	34	GND	- (VSS)

Table 5-2 1st Inverter board connector (CN5) pin assignment

Pin No	Pin Function	RA6T2 Pin	Pin No	Pin Function	RA6T2 Pin
1	WN	PB09/GTIOC6B_B	2	GND	- (VSS)
3	WP	PB08/GTIOC6A_B	4	GND	- (VSS)
5	SPARE2	-	6	SPARE3	-
7	SPARE4	-	8	SPARE5	-
9	BUS_POWER_IN	-	10	INV_CONNECTED	-
11	SAFE_LOCK	-	12	OC#	PC13/GTETRGD
13	PFCERROR	P001/IRQ2	14	PFCPWM	PB14/GTIOC1A
15	VRL	PE01	16	SW1	PD04
17	SW2	PD07	18	LED1	PD01
19	LED2	PD02	20	LED3	PD03
21	HALL_U	PC04/IRQ10_B	22	HALL_V	PC05/IRQ11_B
23	HALL_W	PB01/IRQ1_B	24	MISO0/SIO_SDA	PC11/MISOB_B
25	SCK0/SCK_SCL	PC10	26	CSN_IRQN/ENC_Z	PE00/GTETRGA
27	IPS_A ENC_A	PC04 PC14/GTIOC3A_D	28	IPS_A#/ENC_A#	PC05/IRQ11_B
29	IPS_B ENC_B	PE15 PC15/GTIOC3B_D	30	IPS_B#//ENC_B#	PB10/AN028
31	GND	- (VSS)	32	GND	- (VSS)
33	+5V	-	34	+5V	-

Table 5-3 2nd Inverter board connector (CN7) pin assignment

Pin No	Pin Function	RA6T2 Pin	Pin No	Pin Function	RA6T2 Pin
1	SPARE1	-	2	AGND	- (AVSS)
3	VPN	PE13/AN025	4	AGND	- (AVSS)
5	IU	PB02/AN018	6	PGAVSSU	P002/PGAVSS3
7	IV	PE08/AN020	8	PGAVSSV	-
9	IW	PE09/AN021	10	PGAVSSW	-
11	VU	PE10/AN022	12	VV	PE11/AN023
13	VW	PE12/AN024	14	AGND	- (AVSS)
15	VAC	PC03/AN015	16	IPFC	PC02/AN014
17	VR	PE14/AN026	18	AGND	- (AVSS)
19	AVCC	- (AVCC)	20	AVCC	- (AVCC)
21	AGND	- (AVSS)	22	AGND	- (AVSS)
23	VCC	- (VCC)	24	VCC	- (VCC)
25	GND	- (VSS)	26	GND	- (VSS)
27	UN	PC09/GTIOC7B_A	28	GND	- (VSS)
29	UP	PC08/GTIOC7A_A	30	GND	- (VSS)
31	VN	PA09/GTIOC8B_A	32	GND	- (VSS)
33	VP	PA08/GTIOC8A_A	34	GND	- (VSS)

Table 5-4 2nd Inverter board connector (CN6) pin assignment

Pin No	Pin Function	RA6T2 Pin	Pin No	Pin Function	RA6T2 Pin
1	WN	PA11/GTIOC9B_A	2	GND	- (VSS)
3	WP	PA10/GTIOC9A_A	4	GND	- (VSS)
5	SPARE2	-	6	SPARE3	-
7	SPARE4	-	8	SPARE5	-
9	BUS_POWER_IN	-	10	INV_CONNECTED	-
11	SAFE_LOCK	-	12	OC#	PA12/GTETRGB
13	PFCERROR	P000/IRQ0	14	PFCPWM	PB15/GTIOC1B_A
15	VRL	PD11	16	SW1	PC00
17	SW2	PC01	18	LED1	PD15
19	LED2	PC06	20	LED3	PC07
21	HALL_U	PD12/IRQ12_B	22	HALL_V	PD13/IRQ13_B
23	HALL_W	PD14/IRQ13_B	24	MISO0/SIO_SDA	PC11/MISOB_B
25	SCK0/SCK_SCL	PC10	26	CSN_IRQN/ENC_Z	PD10/GTETRGC
27	IPS_A ENC_A	PC02 PD08/GTIOC2A_A	28	IPS_A#/ENC_A#	PC03/AN015
29	IPS_B ENC_B	PE11 PD09/GTIOC2B_A	30	IPS_B#//ENC_B#	PE12/AN024
31	GND	- (VSS)	32	GND	- (VSS)
33	+5V	-	34	+5V	-

The connection for CPU board and inverter board is shown in Figure 5-1.

Figure 5-1 Connection for CPU board and inverter board

5.1.4 Serial communication

For serial communication using Renesas Motor Workbench, the CPU board has SCI connector. Pin assignment for SCI connector is listed in Table 5-5.

Table 5-5 SCI connector (CN10) pin assignment

Pin No.	Pin Function	RA6T2 Connection Pin
1	GND	-
2	MCU RXD	PD06/RXD9_A
3	MCU TXD	PD05/TXD9_A
4	VCC	-

5.1.5 Reset circuit

This product has a reset circuit to enable power-on reset or external reset on MCU. Push the tact switch (SW1) to externally reset MCU.

5.1.6 LED

This product has six ports and LEDs, so that they can be used for program debug and the system. LED switches on when output from the corresponding port is “LOW” and switches off when output is “HIGH”. Pin assignment for corresponding LEDs is listed in Table 5-6.

Table 5-6 LED pin assignment

RA6T2 port		LED1	LED2	LED3	LED4	LED5	LED6
PD01	Output HIGH	OFF	-	-	-	-	-
	Output LOW	ON	-	-	-	-	-
PD02	Output HIGH	-	OFF	-	-	-	-
	Output LOW	-	ON	-	-	-	-
PD03	Output HIGH	-	-	OFF	-	-	-
	Output LOW	-	-	ON	-	-	-
PD15	Output HIGH	-	-	-	OFF	-	-
	Output LOW	-	-	-	ON	-	-
PC06	Output HIGH	-	-	-	-	OFF	-
	Output LOW	-	-	-	-	ON	-
PC07	Output HIGH	-	-	-	-	-	OFF
	Output LOW	-	-	-	-	-	ON

5.1.7 CAN Communication

This product has through holes for CAN communication. Note that CAN driver is not equipped. Pin assignment for CAN communication connector is listed in Table 5-7.

Table 5-7 CAN communication pin assignment (CN8)

Pin No	RA6T2 pin
1	VCC
2	PB13/CTX0_E
3	PB12/CRX0_E
4	VSS

5.1.8 SPI communication

This product has through holes for SPI communication. Pin Assignment for SPI communication connector is listed in Table 5-8.

Table 5-8 SPI communication pin assignment (CN9)

Pin No	RA6T2 pin
1	PD00_SS0
2	PC12_MOSI0
3	PC11_MISO0/SIO_SDA
4	PC10_SCK0/SCK_SCL
5	VSS
6	VCC

5.2 RA6T2 pin function list

Table 5-9 RA6T2 pin function list

Pin number	RA6T2 pin function	Signal function
1	PE02/TRCLK/CMPOUT0_C/GTOVLO_C/GTIOC7B_B/GTIOC8A_E/GTCPPO8/SCK0_B/DE0_D/SCK3_A/DE3_A/RSPCKB_C/CLKOUT_C	ARM debugger
2	PE03/TRDATA0/CMPOUT1_C/GTOWLO_C/GTIOC8A_B/GTIOC9A_E/GTCPPO6/RXD0_B/CTS3_A/SSLB0_C/GTODFMA	ARM debugger
3	PE04/TRDATA1/CMPOUT2_C/GTOUUP_C/GTIOC8B_B/GTIOC7B_E/GTCPPO9/TXD0_B/SS_CTS_RTS3_A/DE3_A/SSLB1_C/GTODFMB	ARM debugger
4	PE05/TRDATA2/CMPOUT3_C/GTOVUP_C/GTIOC9A_B/GTIOC8B_E/GTCPPO2/SS_CTS_RTS0_B/DE0_B/RXD3_A/MISOB_C/GTODFMC	ARM debugger
5	PE06/TRDATA3/GTOWUP_C/GTIOC9B_B/GTCPPO3/CTS0_B/TXD3_A/MOSIB_C/GTODFMD	ARM debugger
6	VCC	Power
7	PC13/GTETRGD/NMI	INV1 over current
8	PC14/ADTRG0_C/CMPOUT012_B/AGTWIO0_C/GTETRGA/GTIOC3A_D/GTCPPO0/GTADSM0/GTCPPO4/IRQ14_A/GTODFMC	INV1 Encoder_A
9	PC15/ADTRG1_C/CMPOUT345_B/AGTWIO1_C/GTETRGB/GTIOC3B_D/GTCPPO1/GTADSM1/GTCPPO7/IRQ15_A/GTODFMD	INV1 Encoder_B
10	VSS	Power
11	VCC	Power
12	P212/EXTAL	Xtal
13	P213/XTAL/IRQ0_C	Xtal
14	RES	ARM debugger
15	PC00/AN012 (AN012)/PGAOUT0/IVCMP00/IRQ11DS	INV2 SW1
16	PC01/AN013 (AN013)/PGAOUT1/IVCMP10/IRQ12DS	INV2 SW2
17	PC02/AN014 (AN014)/PGAOUT2/IVCMP20/IRQ13DS	INV2 PFC current detection/IPS_A
18	PC03/AN015 (AN015)/PGAOUT3/IVCMP30/IRQ14DS	INV2 PFC current detection/IPS_A #
19	P000/AN016 (AN016)/IVREF0/IRQ0_D	INV2 PFC over current detection
20	VREFL0	Power
21	VREFH0	Power
22	P001/AN017 (AN017)/IVREF1/IRQ2_C	INV1 PFC over current detection
23	PA00/AN000 (AN000)/PGAIN0/IVCMP02 / IVCMP03/IRQ0DS	INV1 W-phase current detection
24	PA01/AN001 (AN001)/PGAVSS0/IRQ1_A	INV1 W-phase voltage detection/PGAVSS_W
25	PA02/AN002 (AN002)/PGAIN1/IVCMP12 / IVCMP13/IRQ2_A	INV1 V-phase current detection
26	PA03/AN003 (AN003)/PGAVSS1/IRQ3_A	INV1 V-phase voltage detection/PGAVSS_V
27	AVSS0	Power
28	AVCC0	Power
29	PA04/AN004 (AN004)/PGAIN2/IVCMP22 / IVCMP23/IRQ4_A	INV1 U-phase current detection
30	PA05/AN005 (AN005)/PGAVSS2/IRQ5_A	INV1 PGAVSS_U
31	PA06/AN006 (AN106)/DA0/IRQ6_A	INV1 bus voltage detection
32	PA07/AN007 (AN107)/DA1/IRQ7_A	INV1 W-phase voltage detection
33	PC04/AN010 (AN110)/DA2/IRQ10_B	INV1 HALL_U/IPS_A
34	PC05/AN011 (AN111)/DA3/IRQ11_B	INV1 HALL_V/IPS_A#
35	PB00/AN008 (AN108)/PGAOUT0 / PGAOUT2/IRQ0_A	INV1 VR1 voltage detection
36	PB01/AN009 (AN109)/PGAOUT1 / PGAOUT3/IRQ1_B	INV1 HALL_W

Pin number	RA6T2 pin function	Signal function
37	PB02/AN018 (AN118)/PGAIN3/IVCMP32 / IVCMP33/IRQ15DS	INV2 U-phase current detection
38	P002/AN019 (AN119)/PGAVSS3	INV2 PGAVSS_U
39	PE08/AN020/AN120/ADTRG0_E/CMPOUT012_C/GTIV_B/GTIOC3A_B/GTETRGC/GTADSM0/SSLA3_C/KR00_E/GTODFMON	INV2 V-phase current detection
40	PE09/AN021/AN121/ADTRG1_E/CMPOUT345_C/GTIW_B/GTIOC3B_B/GTETRGD/GTADSM1/CACREF_F/SSLA2_C/KR01_E	INV2 W-phase current detection
41	PE10/AN022/AN122/GTOULO_B/GTIOC2A_B/GTIOC4A_C/GTIOC7A_D/SSLA1_C/KR02_E	INV2 U-phase voltage detection
42	PE11/AN023/AN123/GTOUUP_B/GTIOC2B_B/GTIOC5A_C/GTIOC8A_D/SSLA0_C/KR03_E	INV2 V-phase voltage detection /IPS_B
43	PE12/AN024/AN124/GTOVLO_B/GTIOC1A_B/GTIOC6A_C/GTIOC9A_D/RSPCKA_C/KR04_E	INV2 V-phase voltage detection/IPS_B#
44	PE13/AN025/AN125/GTOVUP_B/GTIOC1B_B/GTIOC4B_C/GTIOC7B_D/MISOA_C/KR05_E	INV2 bus voltage detection
45	PE14/AN026/AN126/GTOWLO_B/GTIOC0A_B/GTIOC5B_C/GTIOC8B_D/MOSIA_C/KR06_E	INV2 VR1 voltage detection
46	PE15/AN027/AN127/GTOWUP_B/GTIOC0B_B/GTIOC6B_C/GTIOC9B_D/RXD4_A/KR07_E	INV1 PFC current detection/IPS_B
47	PB10/AN028/AN128/GTIU_C/GTETRGA/GTETRGB/GTCPPO4/GTCPPO7/CACREF_C/TXD4_A/CTS3_B/IRQ10DS/VCOUT	INV1 PFC voltage detection/IPS_B#
48	VCL1	Power
49	VSS	Power
50	VCC	Power
51	PB12/ADTRG0_B/GTETRGA/GTIOC0A_A/GTIOC4A_F/CRX0_E/SCK4_A/DE4_A/RXD3_B/SSLB0_A/IRQ2_B	CAN_RX
52	PB13/GTOULO_A/GTIOC0B_A/GTIOC7A_C/GTIOC5A_F/CTX0_E/CTS4_A/TXD3_B/RSPCKB_A/IRQ3_B	CAN_TX
53	PB14/GTOVLO_A/GTIOC1A_A/GTIOC8A_C/GTIOC6A_F/SS_CTS_RTS4_A/DE4_A/SCK3_B/DE3_B/SDA0_C/MISOB_A/IRQ4_B	INV2 PFCPWM1
54	PB15/GTOWLO_A/GTIOC1B_A/GTIOC9A_C/GTIOC4B_F/RXD4_A/SS_CTS_RTS3_B/DE3_B/SCL0_C/MOSIB_A/IRQ5_B	INV1 PFCPWM2
55	PD08/GTIOC2A_A/CTS2_B/TXD1_A/SSLB1_A/KR00_D	INV2 Encoder_A
56	PD09/GTIOC2B_A/SS_CTS_RTS2_B/DE2_B/RXD1_A/SSLB2_A/KR01_D	INV2 Encoder_B
57	PD10/GTETRGC/GTIOC3A_A/SCK2_C/DE2_C/SCK1_A/DE1_A/SSLB3_A/KR02_D	INV2 Encoder_Z
58	PD11/GTIOC3B_A/RXD2_C/CTS1_A/KR03_D	INV2 Relay control
59	PD12/GTIOC4A_A/TXD2_C/SS_CTS_RTS1_A/DE1_A/SCL1_D/KR04_D/IRQ12_B/GTODFMA	INV2 HALL_U
60	PD13/GTIOC4B_A/SCK4_C/DE4_C/SCK9_C/DE9_C/SDA1_D/KR05_D/IRQ13_B/GTODFMB	INV2 HALL_V
61	PD14/GTIOC5A_A/RXD4_C/RXD9_C/SCL0_F/KR06_D/IRQ14_B/GTODFMC	INV2 HALL_W
62	PD15/GTIOC5B_A/TXD4_C/TXD9_C/DE9_C/SDA0_F/KR07_D/IRQ15_B/GTODFMD	INV2 LED1
63	PC06/AGTWO0_B/GTETRGD/GTIOC6A_A/GTIOC5B_F/TXD2_B/SS_CTS_RTS9_C/DE9_C/SCL1_E/IRQ6_B	INV2 LED2
64	PC07/AGTWEE0_B/GTETRGA/GTIOC6B_A/RXD2_B/CTS9_C/SDA1_E/IRQ7_B	INV2 LED3
65	PC08/AGTWOA0_B/GTIV_C/GTIOC7A_A/CACREF_D/SCK2_B/DE2_B/SS_CTS_RTS3_C/DE3_C/SCL0_D (SCL0_E)/SSLA3_B/IRQ8_B	INV2 PWM U-phase (Upper)
66	PC09/AGTWOB0_B/GTIW_C/GTIOC7B_A/GTIOC8A_F/SS_CTS_RTS2_B/DE2_B/CTS3_C/SDA0_D (SDA0_E)/SSLA2_B/IRQ9_B/CLKOUT_B	INV2 PWM U-phase (Lower)
67	PA08/CMPOUT2_A/AGTWIO0_B/GTOUUP_A/GTIOC8A_A/GTIOC7B_C/GTIOC2A_C/GTIOC9A_F/SCK0_A/DE0_A/SCK1_C/DE1_C/SCL0_D/SSLA1_B/KR00_B/IRQ8_A/CLKOUT_A	INV2 PWM V-phase (Upper)
68	PA09/CMPOUT3_A/GTOVUP_A/GTIOC8B_A/GTIOC8B_C/GTIOC2B_C/GTIOC7B_F/TXD0_A/SCL1_C/SSLA0_B/KR01_B/IRQ9_A	INV2 PWM V-phase (Lower)
69	PA10/CMPOUT0_A/GTOWUP_A/GTIOC9A_A/GTIOC9B_C/GTIOC3A	INV2 PWM W-phase

Pin number	RA6T2 pin function	Signal function
	_C/GTIOC8B_F/RXD0_A/SDA1_C/RSPCKA_B/KR02_B/IRQ10_A	(Upper)
70	PA11/CMPOUT1_A/GTETRGD/GTIOC9B_A/GTETRGC/GTIOC3B_C/CTX0_A/CTS0_A/RXD1_C/MOSIA_B/KR03_B/IRQ11_A	INV2 PWM W-phase (Lower)
71	PA12/ADTRG1_A/GTETRGB/GTCPPO0/GTCPPO2/GTADSM0/GTCPPO7/CACREF_A/CRX0_A/SS_CTS_RTS0_A/DE0_A/TXD1_C/MISOA_B/KR04_B/IRQ12_A/GTODFMA	INV2 over current detection/PFC over current detection
72	PA13/TMS/SWDIO/TMS/SWDIO/AGTWO0_A/SCK0_C/DE0_C/SS_CTS_RTS1_C/DE1_C	ARM debugger
73	VCL2	Power
74	VSS	Power
75	VCC	Power
76	PA14/TCK/SWCLK/AGTWO1_A/TXD0_C/SCK9_B/DE9_B	ARM debugger
77	PA15/TDI/ADTRG0_A/CMPOUT012_A/GTETRGB/GTADSM1/GTCPPO4/RXD0_C/RXD9_B/SSLA0_A/KR02_A/IRQ1_C/GTODFMB	ARM debugger
78	PC10/CMPOUT0_B/AGTWIO1_B/TXD1_B/SCL0_B[w/5VTol]/RSPCKB_B/KR05_B/IRQ6DS	SS
79	PC11/CMPOUT1_B/AGTWOA1_B/RXD1_B/SDA0_B[w/5VTol]/MISOB_B/KR06_B/IRQ7DS	MOSI
80	PC12/CMPOUT2_B/AGTWOB1_B/GTCPPO6/GTCPPO9/TXD4_B/SCK1_B/DE1_B/MOSIB_B/KR07_B/IRQ8DS/GTODFMON	MISO/SIO_SDA
81	PD00/GTADSM0/GTCPPO4/CRX0_F/CTS2_A/RXD3_C/SSLB0_B/KR00_C	SCK0/SCK_SCL
82	PD01/GTADSM1/GTCPPO7/CTX0_F/SS_CTS_RTS2_A/DE2_A/TXD3_C/SSLB1_B/KR01_C	INV1 LED1
83	PD02/CMPOUT3_B/AGTWEE1_B/GTCPPO0/GTCPPO2/RXD4_B/SCK3_C/DE3_C/KR02_C/IRQ9DS/CLKOUT_D	INV1 LED2
84	PD03/CMPOUT0_D/GTCPPO5/GTCPPO0/SCK4_B/DE4_B/CTS9_A/SSLB2_B/KR03_C/	INV1 LED3
85	PD04/CMPOUT1_D/GTCPPO8/GTCPPO1/SS_CTS_RTS4_B/DE4_B/SS_CTS_RTS9_A/DE9_A/SSLB3_B/KR04_C	INV1 SW1
86	PD05/GTADSM0/GTCPPO3/TXD9_A/SDA1_B[w/5VTol]/SSLA3_A/KR05_C	RMW communication
87	PD06/GTCPPO4/RXD9_A/SCL1_B[w/ 5VTol]/SSLA2_A/KR06_C	RMW communication
88	PD07/GTADSM1/GTCPPO7/SCK9_A/DE9_A/SSLA1_A/KR07_C	INV1 SW2
89	PB03/TDO/TRACESWO/ADTRG1_B/CMPOUT345_A/AGTWO1_B/GTIOC4A_D/GTCPPO1/GTCPPO3/CRX0_D/TXD2_A/TXD9_B/RSPCKA_A/KR03_A/IRQ0_B/GTODFMON	ARM debugger
90	PB04/AGTWOA0_A/GTIOC4A_B/GTIOC5A_D/GTIOC0A_C/CACREF_B/CTX0_D/RXD2_A/RXD3_D/MISOA_A/KR04_A/IRQ13_A/VCOUT	INV1 PWM U-phase (Upper)
91	PB05/AGTWOB0_A/GTIU_A/GTIOC4B_B/GTIOC6A_D/GTIOC0B_C/CRX0_B/SCK2_A/DE2_A/TXD3_D/MOSIA_A/KR05_A/IRQ3DS/GTODFMON	INV1 PWM U-phase (Lower)
92	PB06/AGTWOA1_A/GTIV_A/GTIOC5A_B/GTIOC4B_D/GTIOC1A_C/CTX0_B/TXD0_D/SS_CTS_RTS3_D/DE3_D/SCL0_A[HSw/5VTol]/KR06_A/IRQ4DS/GTODFMA	INV1 PWM V-phase (Upper)
93	PB07/AGTWOB1_A/GTIW_A/GTIOC5B_B/GTETRGC/GTIOC1B_C/RXD0_D/SS_CTS_RTS1_D/DE1_D/SDA0_A[HSw/5VTol]/KR07_A/IRQ5DS/GTODFMB	INV1 PWM V-phase (Lower)
94	P201/MD	ARM debugger
95	PB08/AGTWIO0_A/GTIOC6A_B/GTIOC5B_D/GTIOC2A_D/CRX0_C/RXD4_C/RXD1_D/SCL1_A[w/5VTol]/KR00_A/IRQ1DS/GTODFMC	INV1 PWM W-phase (Upper)
96	PB09/AGTWIO1_A/GTIOC6B_B/GTIOC2B_D/CTX0_C/TXD4_C/TXD1_D/SDA1_A [w/5VTol]/KR01_A/IRQ2DS/GTODFMD	INV1 PWM W-phase (Lower)
97	PE00/ADTRG0_D/AGTWEE0_A/GTETRGA/GTIOC4A_F/GTADSM0/GTCPPO5/CACREF_E/TXD0_E/TXD9_D/SSLB3_	INV1 Encoder_Z
98	PE01/ADTRG1_D/AGTWEE1_A/GTOULO_C/GTIOC7A_B/GTIOC4B_F/GTADSM1/RXD0_E/RXD9_D/SSLB2_C/	INV1 Relay control
99	VSS	Power
100	VCC	Power

6. Design and Manufacture Information

You can obtain information on the design and manufacture of this product from renesas.com.

7. Website and Support

In order to learn, download tools and documents, apply technical support for RA family MCU and its kit, visit the below Web site.

· RA Product Information renesas.com/ra

· RA Product Support Forum renesas.com/ra/forum

· Renesas Support renesas.com/support

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		Page	Summary
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1.10	March 31, 2022	12	Modified Table 5-5
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