
Trial series Standard CPU card Users Manual

T5101/A	(RL78G14 64pin)
T5102	(RL78F14 80pin)
T5103	(RL78G1F 64pin)
T5104	(RL78G1G 32pin)
T5105	(RL78G14 32pin)
T5108	(RL78G1M 20pin)
T5201/A	(RX62T 100pin)
T5205	(RX23T 64pin)
T5206	(RX24T 100pin)
T5210	(RX71M 144pin)
T5216	(RX13T 48pin)
T5301/A	(RX111 64pin)

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1. Introduction

1.1. Introduction

This users' manual is for Trial series standard CPU card.

This CPU card is for DTL Trial series inverter.

1.2. Suitable user

This CPU card is suitable for research or development stage.

1.3. Notice

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1.4. Warning



- There is a risk of fire.

If you find inverter firing, Fuming, abnormal sounding, or other abnormal conditions, stop the inverter immediately. After you stop the inverter, you should disconnect all wiring connected to the inverter.



- There is a risk of electrical shock.

There is a high voltage parts inside the inverter. Do not touch directly on working or after you stopped the inverter, while there is a charge in the capacitor. If you don't keep this warning, by electric shock, there is a risk of serious injury or death.



- There is a risk of blindness.

This inverter has an enclosure. If the inverter ruptured while opening the lid of the enclosure, there is a possibility the liquid contained in the internal capacitor, such as damaged parts enters the eyes, and it would make you blindness. Please do not open the lid of the enclosure after stopped the inverter immediately, even during the operation. If you open the lid, please be sure to wear goggles for protection such as in the photo below.



Caution

- There is a risk of burns

While driving or after stopped, this inverter gets hot such as more than 100 degree. If you touch the inverter, please pay attention to the temperature.



Caution

- Please do not block the air vents of the enclosure. (only for T2000B)

In this inverter there is a vent for cooling the inside. If you block the air vent, cooling capacity is reduced. And it may cause the inverter damage or fire.



Caution

- Please drive the FAN while driving the inverter. (only for T2000B)

In this inverter there is a FAN to cooling the inverter. If you do not drive the FAN while driving the inverter, the temperature of the inverter will rise, it may cause the inverter damage or fire.



Caution

- If you want to create a software, please create the protection routine first, such as over-current protection, over-heat protection and so on.

In this inverter, there is no mechanism to protect the inverter hardware alone. Please make the protection software first, or you may break the inverter.



Caution

- Do not drive the inverter when the ambient is very high or very high humidity.

This inverter is designed for experimental use. So this inverter won't work under below conditions. Do not use under the environment that is out of the operation environment of this manual.

- Environment where there is vibration and shock.
- Environment where there is saprophagous gas, combustible gas, humidity over 90%
- Very High or very low temperature environment



Caution

- This product handling high voltage. Please use a person who is aware of the danger of high voltage.

The wiring materials are enclosed in this inverter for reference. But they do not necessarily mean that they are appropriate for your application. Please use it before check the applications.



Caution

- Rating of this product is measured under certain conditions.

Maximum power capacity would be affected by input voltage output voltage, output current, load conditions, operations conditions and ambient temperature. To prevent the inverter broken, please watch the temperature, current, voltage, and external sensors for to protect inverter.

2. CPU card overview

2.1. Feature

* This CPU card for Trial series inverter is designed for a research or development of the consumer inverter products use.

* Unused CPU pin can be used freely by the user.

2.2. Common specifications

Item	Specifications	Note
Operation temperature	0°C~35°C	
Operation humidity	Below 90% (No dew condensation)	
Size	79 x56 x20 mm	
Weight	25g	

3. DTL standard CPU card specifications

3.1. Inverter connector (CN-A, CN-B)

3.1.1. CN-A Standard connector pin assign

Pin	Dir	STD Pin name	
1	To INV	(LED1)	LED1 control signal. This signal is only valid for T2001 / T2002 inverter board.
2	To INV	(LED2)	LED1 control signal. This signal is only valid for T2001 / T2002 inverter board.
3	To INV	PFCG1	PFC gate signal. This signal is LED3 for T2001 / T2002 inverter board.
4	To INV	VRL	In rush current protection circuit control signal. Switch on by High level.
5	To CPU	/FO	Over current detection signal on Low level.
6	To INV	/INVRES	Reserved for future use (Reset inverter error)
7	To INV	WN	Three phase PWM signal
8	To INV	VN	Three phase PWM signal
9	To INV	UN	Three phase PWM signal
10	To INV	WP	Three phase PWM signal
11	To INV	VP	Three phase PWM signal
12	To INV	UP	Three phase PWM signal
13	To CPU	(/SW1)	Switch input signal. This signal is only valid for T2001 / T2002 inverter board.
14	To CPU	(/SW2)	Switch input signal. This signal is only valid for T2001 / T2002 inverter board.
15	To CPU	5V	Power supply pin
16	To CPU	5V	Power supply pin
17	To CPU	GND	Power supply pin
18	To CPU	GND	Power supply pin
19	To CPU	3.3V	Power supply pin
20	To CPU	3.3V	Power supply pin

3.1.2. CN-A connector pin assign for each CPU card

Pin	T5101 RL78 G14 64pin	T5102 RL78 F14 80pin	T5103 RL78 G1F 64pin	T5104 RL78 G1G 32pin	T5105 RL78 G14 32pin	T5106 RL78 G1F 32pin	T5201 RX62T 100pin	T5204 RX64M 144pin	T5205 RX23T 64pin	T5206 RX24T 100pin	T5210 RX71M 144pin	T5301 RX111 64pin
1	P52	P44	P141	P60	P60	P31	PA2	P82	P00	PA2	P82	P32
2	P53	P47	P140	P61	P61	P74	PA3	PC5	P01	PA1	PC5	PB0
3	P54	P41	P04	-	-	-	PD0	P83	P31	PD7	P83	PA1
4	P55	P42	P55	-	-	-	PB3	PC6	PB4	PB3	PC6	PA0
5	P137	P137	P137	P137	P137	P137	P70	PC4	P70	P70	PC4	PB5
6										P55		
7	P10	P30	P10	P10	P10	P10	P76	P86	P76	P76	P86	P55
8	P11	P16	P11	P11	P11	P11	P75	P87	P75	P75	P87	PB1
9	P14	P120	P14	P14	P14	P14	P74	P23	P74	P74	P23	PB6
10	P12	P17	P12	P12	P12	P12	P73	P17	P73	P73	P17	P54
11	P13	P15	P13	P13	P13	P13	P72	P21	P72	P72	P21	PB3
12	P15	P125	P15	P15	P15	P15	P71	P22	P71	P71	P22	PB7
13	P05	P46	P05	P70	P70	P70	P91	P50	P91	P80	P50	P35
14	P06	P45	P06	P17	P17	P17	P92	P51	P92	P81	P51	P31
15	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V
16	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V	5V
17	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
18	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
19	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V
20	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V	3.3V

3.1.3. CN-B Standard connector pin assign

pin	Dir	STD Pin name	
1	To INV	AVCC	Power supply pin for inverter analog circuits.
2	To INV	AVCC	Power supply pin for inverter analog circuits.
3	To CPU	reserve	Reserved for future use
4	To CPU	reserve	Reserved for future use
5	To CPU	IU	U phase current signal
6	To CPU	IV	V phase current signal
7	To CPU	IW	W phase current signal
8	To CPU	VPN	DC link voltage signal
9	To CPU	(Vot)	Main circuits temperature signal
10	To CPU	VU	U phase voltage signal
11	To CPU	VV	V phase voltage signal
12	To CPU	VW	W phase voltage signal
13	To CPU	(VAC)	AC voltage signal
14	To CPU	(IPFC)	PFC current signal
15	To CPU	(VR1)	Variable resister signal. This signal is only valid for T2001 / T2002 inverter board.
16	To CPU	reserve	Reserved for future use.
17	To INV	VCCIO	Power supply pin for inverter digital circuits.
18	To INV	VCCIO	Power supply pin for inverter digital circuits.
19	To CPU	GND	GND
20	To CPU	GND	GND

3.1.4. CN-B connector pin assign for each CPU card

pin	T5101 RL78 G14 64pin	T5102 RL78 F14 80pin	T5103 RL78 G1F 64pin	T5104 RL78 G1G 32pin	T5105 RL78 G14 32pin	T5106 RL78 G1F 32pin	T5201 RX62T 100pin *1	T5204 RX64M 144pin	T5205 RX23T 64pin	T5206 RX24T 100pin	T5204 RX64M 144pin	T5301 RX111 64pin
1	5V	5V	5V	5V	5V	5V	5V	3.3V	5V	5V	3.3V	3.3V
2	5V	5V	5V	5V	5V	5V	5V	3.3V	5V	5V	3.3V	3.3V
3										P42 AN002		
4										P43 AN003		
5	ANI 0	ANI 2	ANI 2	ANI0	ANI0	ANI0	ANI000	AN000	AN000	AN100	AN000	ANI 0
6		ANI 4	-	ANI1	ANI1	ANI1	ANI001	AN001	AN001	AN101	AN001	ANI 1
7	ANI 1	ANI 3	ANI 3	ANI2	ANI2	ANI2	ANI002	AN002	AN002	AN102	AN002	ANI 2
8	ANI 2	ANI 8	ANI4	ANI3	ANI3	ANI3	ANI003	AN003	AN003	AN204	AN003	ANI 3
9	ANI 7	ANI 10	ANI 7	-	-	-	ANI 0	AN103	AN007	AN205	AN103	ANI 4
10	ANI 3	ANI 5	ANI16	ANI17	ANI17	ANI17	ANI101	AN005	AN004	AN201	AN005	ANI 6
11	ANI 4	ANI 6	ANI 0	ANI18	ANI18	ANI18	ANI102	AN006	AN005	AN202	AN006	ANI 8
12	ANI 5	ANI 7	ANI 1	ANI19	ANI19	ANI19	ANI103	AN007	AN006	AN203	AN007	ANI 11
13	ANI 16	ANI 9	ANI 5	-	-	-	ANI 1	AN100	AN016	AN207	AN100	ANI 12
14	ANI 17	ANI 13	ANI18	-	-	-	ANI100	AN004	(AN01 7)	AN208	AN004	ANI 13
15	ANI 6	ANI 11	ANI 6	ANI10	ANI10	ANI10	ANI 2	AN101	AN017	AN209	AN101	ANI 14
16	ANI 19	ANI 12	ANI17	-	-	-	ANI 3	AN102	-	AN210	AN102	ANI 15
17	5V	5V	5V	5V	5V	5V	5V	3.3V	5V	5V	3.3V	3.3V
18	5V	5V	5V	5V	5V	5V	5V	3.3V	5V	5V	3.3V	3.3V
19	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND
20	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND

3.2. Connection with E1 emulator

When you use this CPU card with E1 emulator, please be careful.

*Caution 1: **We strongly recommend not using E1 emulator when you drive the inverter. We strongly recommend not applying main power while connecting E1 emulator.** Please use ICS when you debug the inverter software. ICS can isolate between inverter side and the PC side. So when the inverter is broken, you can avoid the electric shock and PC damage.

*Caution 2: An inverter generates very high level noise. Because of this noise, E1 emulator sometimes cannot control inverter software.

*Caution 3: This Trial series inverter does not isolate between control side and the high voltage inverter main circuits side. Do not power on for inverter main circuits when you are using E1 emulator, there is a possibility of receiving an electric shock, if you touched in this situation.

*Caution 4: If you want to power on when you are using E1 emulator,

RX series:

Please use E1 isolator <R0E000010ACB10> delivered from RENESAS ELECTRONICS. But the withstand voltage of this equipment is only 60V DC.

RL78 series:

Please use E1 isolator <A1001> delivered from Desk Top Laboratories Inc. Withstand voltage of this equipment is 1500VAC.

4. T5101 RL78G14 64pin

4.1. T5101/T5101A overview

Item	Specication	Note
CPU	R5F104LEAFP	RL78G14 series
Clock	32MHz	
Power supply voltage	5V	
ROM size	64kB	
RAM size	5.5kB	
Emulator	E1	
Emulator isolator	DTL A1001	We strongly recommend to use emulator isolator when you use E1emulator.

4.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN1, CN3 and CN4. And some SCI ports are assigned to two or more pins. So this CPU board can change the assignment by installing or not installing resisters. If you want to use default setting pins, please follow below table.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN1	SCI1	Non	Non	Install R16, R17 Not install R2, R3	Default
		P02	P03	Remove R16, R17 Install R2, R3	Planning from ICS Lib R5F104Lx Ver.1.5
CN3	SCI0	P51	P50	Install R18, R20 Not install R19, R21	Default connection Planning to support from ICS Lib R5F104Lx Ver.1.5
		P17	P16	Remove R18, R20 Install R19, R21	Planning from ICS Lib R5F104Lx V er.2.0
CN4	SCI2	P77	P76	Install R27, R29 Not install R26, R28	Default connection Planning to support from ICS Lib R5F104Lx Ver.1.5

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

4.3. External connection

4.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P52/LED1	
2	P53/LED2	
3	P54 (PFC_G1)	Gate signal output for software PFC
4	P55 (VRL)	Rush current protection pin
5	P137 /FO	Inverter fault input
6	NC	
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P05/ SW1	
14	P06/ SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

4.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	AN0
6	Iv	
7	Iw	AN1
8	Vpn	AN2
9	TEMP (Vot)	AN7
10	UV	AN3
11	VV	AN4
12	VW	AN5
13	VAC	AN16
14	Ipf _c	AN17
15	VR1	AN6
16	RSVIN1	AN19
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

4.3.3. E1 connector CN5

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	T ₀ CPU /RESET
11	--	
12	GND	
13	/RESET	T ₀ CPU /RESET
14	GND	

4.3.4. CPU pin connector CN2

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	GND	
4	GND	
5	P130	
6	P04	
7	P01(B)	
8	P00(A)	
9	P141	
10	P140(W)	
11	P43	
12	P42	
13	P41	
14	--	
15	P147	
16	P146	
17	P16	
18	P17	
19	P30	
20	P70	
21	P71	
22	P72	
23	P73	
24	P74	
25	P75	
26	P31	
27	P63	
28	P62	
29	P61	
30	P60	
31	Vio out	
32	Vio out	
33	GND	
34	GND	

4.3.5. ICS/UART connector CN1

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD1 out	TXD1
3	RXD1 in	RXD1
4	GND	GND

4.3.6. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD0 out	TXD0
3	RXD0 in	RXD0
4	GND	GND

4.3.7. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD2 out	TXD2
3	RXD2 in	RXD2
4	GND	GND

4.4. Difference between T5101 and T5101A

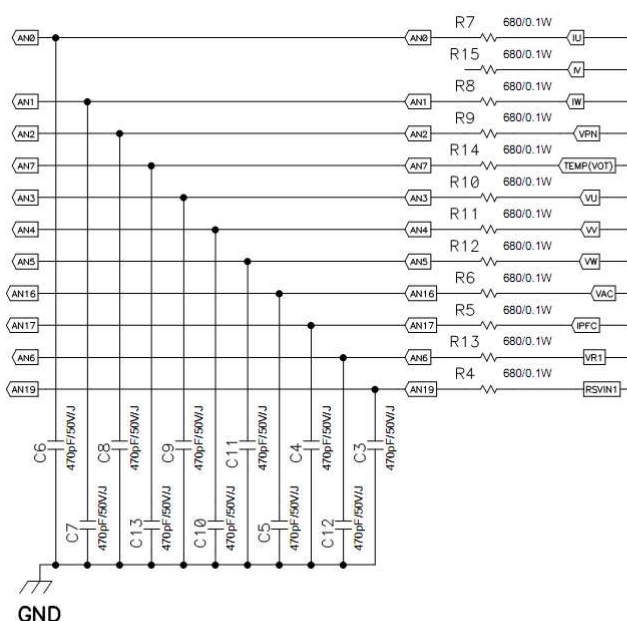
4.4.1. How to distinguish between T5101 and T5101A

There are two way to distinguish two type of boards.

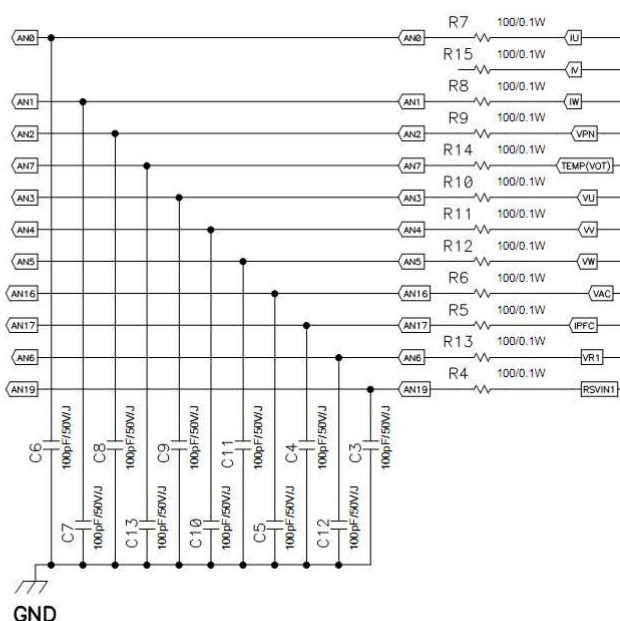
- 1) T5101A written in printed letter or Labeled T5101A. These are T5101A. Others are T5101.
- 2) If the serial number is SN01xxx, this board is T5101. If the second numeric number is not '1', this board is T5101A.

4.4.2. Difference 1 Filter constants of the AD converter inputs

On the T5101 AD input filters are 680Ω and 470pF . But on the T5101A AD input filter are 100Ω and 100pF . It may affect the current sampling timing.



T5101 AD入力回路



T5101A AD入力回路

4.4.3. Difference 2 P137 / INTP0 over current input circuits

There is no filter for FO input on T5101, but there is a low pass filter for T5101A. These value are 100pF and 100Ω .

5. T5102 RL78F14 80pin

5.1. T5102 overview

Item	Specifications	Note
CPU	R5F10PMFK	RL78F14 series
Clock	32MHz	
Power supply voltage	5V	
ROM size	96kB	
RAM size	8kB	
Emulator	E1	
Emulator isolator	DTL A1001	We strongly recommend to use emulator isolator when you use E1emulator.

5.2. Connection with In Circuit Scope

This CPU card can connect with ICS through CN4 and CN5. And some SCI ports are assigned to two or more pins. So this CPU board can change the assignment by installing or not installing resisters. If you want to use default setting pins, please follow below table.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN4	SCI0	P62	P61		Default
CN5	SCI1	P74	P75	Install R39, R30 Not install R41, R32	Default
		P12	P11	Remove R39, R30 Install R41, R32	

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

5.3. External connection

5.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P44	
2	P47	
3	P41 (PFC_G1)	Gate signal output for software PFC
4	P42 (VRL)	Rush current protection pin
5	P137 /FO	Inverter fault input
6	NC	
7	P30 / WN	3 phase gate signal WN
8	P16 / VN	3 phase gate signal VN
9	P120 / UN	3 phase gate signal UN
10	P17 / WP	3 phase gate signal WP
11	P15 / VP	3 phase gate signal VP
12	P125 / UP	3 phase gate signal UP
13	P46 / SW1	
14	P45 / SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

5.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	AN2
6	Iv	AN4
7	Iw	AN3
8	Vpn	AN8
9	TEMP (Vot)	AN10
10	UV	AN5
11	VV	AN6
12	VW	AN7
13	VAC	AN9
14	Ipf	AN13
15	VR1	AN11
16	RSVIN1	AN12
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

5.3.3. E1 connector CN2

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	To CPU /RESET
11	--	
12	GND	
13	/RESET	To CPU /RESET
14	GND	

5.3.4. CPU pin connector CN1

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	GND	
4	GND	
5	AN14	
6	AN15	
7	P126	
8	P01	
9	P60	
10	P63	
11	P64	
12	P65	
13	P66	
14	P67	
15	P00	
16	P140	
17	P130	
18	P77	
19	P76	
20	P71	
21	P70	
22	P32	
23	P31	
24	P50	
25	P51	
26	P52	
27	Vio	
28	Vio	
29	GND	
30	GND	

5.3.5. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD0 out	TXD0
3	RXD0 in	RXD0
4	GND	GND

5.3.6. ICS/UART connector CN5

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD1 out	TXD1
3	RXD1 in	RXD1
4	GND	GND

5.3.7. UART/LIN connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	LTXD0 out	LTXD0
3	LRXD0 in	LRXD0
4	GND	GND

5.3.1. CAN connector CN6

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	CAN	CTRXD
3	GND	GND

5.4. How to distinguish T5102 Ver.1.00 and T5102 Ver.2.00

After 2015 all CPU cards are T5102 Ver.2.00 CPU cards.

If the silk on the CPU Card is “P05701-D1-009 Ver.2.00” This card is Ver.2.00 CPU.
But if the silk on the CPU card is “P05701-D1-009 Ver.1.00”. This card is Ver.1.00 CPU.

5.5. Difference between T5102 Ver.1.00 and T5102 Ver.2.00

Ver.1.00 CPU card has on board CAN driver. But Ver.2.00 CPU card does not have on board CAN driver.

6. T5103 RL78G1F 64pin

6.1. T5102 overview

Item	Specifications	Note
CPU	R5F11BLEAJFB	RL78F14 series
Clock	32MHz	
Power supply voltage	5V	
ROM size	64kB	
RAM size	5.5kB	
Emulator	E1	
Emulator isolator	DTL A1001	We strongly recommend to use emulator isolator when you use E1emulator.

6.2. Connection with In Circuit Scope

This CPU card can connect with ICS through CN4, CN6 and CN7.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN4	SCI0	P17	P16	None	When the user uses this mode, ICS library modifies PIOR0 register. So this port setting affects other pin functions.
CN4	SCI0	P51	P50	None	Default
CN5	SCI1	P77	P76	None	When the user uses this mode, ICS library modifies PIOR0 register. So this port setting affects other pin functions.

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

6.3. External connection

6.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P141	
2	P140	
3	P04 (PFC_G1)	Gate signal output for software PFC
4	P55 (VRL)	Rush current protection pin
5	P137 /FO	Inverter fault input
6	NC	
7	P10 / WN	3 phase gate signal WN
8	P11 / VN	3 phase gate signal VN
9	P14 / UN	3 phase gate signal UN
10	P12 / WP	3 phase gate signal WP
11	P13 / VP	3 phase gate signal VP
12	P15 / UP	3 phase gate signal UP
13	P05 / SW1	
14	P06 / SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

6.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	AN2
6	Iv	--
7	Iw	AN3
8	Vpn	AN4
9	TEMP (Vot)	AN7
10	UV	AN16
11	VV	AN0
12	VW	AN1
13	VAC	AN5
14	Ipf	AN18
15	VR1	AN6
16	RSVIN1	AN17
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

6.3.3. E1 connector CN2

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	To CPU /RESET
11	--	
12	GND	
13	/RESET	To CPU /RESET
14	GND	

6.3.4. CPU pin connector CN1

This connector is not installed.

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	GND	
4	GND	
5	P43	
6	P42	
7	P41	
8	NC	
9	NC	
10	NC	
11	NC	
12	NC	
13	P31	
14	P75	
15	P74	
16	P73	
17	P72	
18	P71	
19	P70	
20	P30	
21	P147	
22	P130	
23	VCC	
24	VCC	
25	GND	
26	GND	

6.3.1. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD0 out	TXD0 P17
3	RXD0 in	RXD0 P16
4	GND	GND

6.3.2. ICS/UART connector CN6

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD0out	TXD0 P51
3	RXD0in	RXD0 P50
4	GND	GND

6.3.3. ICS/UART connector CN7

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD2 out	TXD2 P77
3	RXD2 in	RXD2 P76
4	GND	GND

6.3.4. ABZ connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	GND	GND
3	A input	P00 / TGRCLKA
4	B input	P01 / TGRCLKB
5	Z input	P50 / TRGIOA

※ Z input is connected to P50 pin. This input is also used as a SCI0-A. On default setting P50 is assigned as a ICS-A (RXD0). When the user uses Z input function, remove R28 and install R29 (0Ω).

6.3.5. UVW connector CN5

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	GND	GND
3	U input	P52 (INTP1)
4	V input	P53 (INTP2)
5	W input	P54 (INTP3)

7. T5104 RL78G1G 32pin

7.1. T5104 overview

項目	仕様	備考
CPU type	R5F11EBAAFP	RL78G1G series
Clock	24MHz	
Power supply voltage	5V	
ROM size	16kB	
RAM size	1.5kB	
Emulator	E1	
Emulator isolatoer	DTL A1001	We strongly recommend to use emulator isolator when you use E1 emulator.

7.2. Connection with ICS++

This CPU does not support ICS++ debug tool.

7.3. External connector

7.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P60/LED1	
2	P61/LED2	
3	NC	Software PFC gate output
4	NC	In rush current control terminal
5	P137 /FO	Inverter fault input
6	NC	
7	P10	3 phase gate signal WN
8	P11	3 phase gate signal VN
9	P14	3 phase gate signal UN
10	P12	3 phase gate signal WP
11	P13	3 phase gate signal VP
12	P15	3 phase gate signal UP
13	P70SW1	
14	P17SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

7.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	ANI0
6	Iv	ANI1
7	Iw	ANI2
8	Vpn	ANI3
9	TEMP (Vot)	--
10	UV	ANI17
11	VV	ANI18
12	VW	ANI19
13	VAC	--
14	Ipf _c	--
15	VR1	ANI10
16	RSVIN1	--
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

7.3.3. E1 connector CN1

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	T ₀ CPU /RESET
11	--	
12	GND	
13	/RESET	T ₀ CPU /RESET
14	GND	

7.3.4. UART connector CN2

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD0 out	TXD0 / P51
3	RXD0 in	RXD0 / P50
4	GND	GND

7.4. Caution when you use T5104

T5104 does not have VRL control terminal, so this CPU board does not control “In rush current control”. **So this CPU can not use on T1102, T1001.** This CPU board can be used on T1003, T2001, T2002B, T2003, T2004, T2005.

7.5. Debug for T5104 / RL78G1G

T5104/RL78G1G does not support ICS++ function. It is not easy for T5104/RL78G1G to debug the software. Making easy to debug your software, we recommend to use T5105/RL78G14, when you start to develop software for RL78G1G CPU. These CPU board are same and the only difference is CPU. But CPU on T5105 can use ICS++. It is helpful for you to debug your software.

8. T5105 RL78G14 32pin

8.1. T5105 overview

項目	仕様	備考
CPU type	R5F104BEAFP	RL78G14 series
Clock	32MHz	
Power supply voltage	5V	
ROM size	64kB	
RAM size	5.5kB	
Emulator	E1	
Emulator isolatoer	DTL A1001	We strongly recommend to use emulator isolator when you use E1 emulator.

8.2. Connection with In Circuit Scope

This CPU card can connect with ICS++ through CN2.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN2	SCI0	P51	P50	--	--

8.3. External connection

8.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P60/LED1	
2	P61/LED2	
3	NC	Software PFC gate output
4	NC	In rush current control terminal
5	P137 /FO	Inverter fault input
6	NC	
7	P10	3 phase gate signal WN
8	P11	3 phase gate signal VN
9	P14	3 phase gate signal UN
10	P12	3 phase gate signal WP
11	P13	3 phase gate signal VP
12	P15	3 phase gate signal UP
13	P70SW1	
14	P17SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

8.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	ANI0
6	Iv	ANI1
7	Iw	ANI2
8	Vpn	ANI3
9	TEMP (Vot)	--
10	UV	ANI17
11	VV	ANI18
12	VW	ANI19
13	VAC	--
14	Ipf	--
15	VR1	ANI10
16	RSVIN1	--
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

8.3.3. E1 connector CN1

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	To CPU /RESET
11	--	
12	GND	
13	/RESET	To CPU /RESET
14	GND	

8.3.4. UART connector CN2

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD0 out	TXD0 / P51
3	RXD0 in	RXD0 / P50
4	GND	GND

8.4. Caution when you use T5105

T5104 does not have VRL control terminal, so this CPU board does not control “In rush current control”. **So this CPU can not use on T1102, T1001.** This CPU board can be used on T1003, T2001, T2002B, T2003, T2004, T2005.

9. T5108 RL78G1M 20pin

9.1. T5108 overview

項目	仕様	備考
CPU type	R5F11W68ASM	RL78G1M series
Clock	20MHz	
Power supply voltage	5V	
ROM size	8kB	
RAM size	1kB	
Emulator	E1 / E2 Lite	
Emulator isolatoer	DTL A1001	We strongly recommend to use emulator isolator when you use E1 emulator.

9.2. Connection with In Circuit Scope

This CPU card can connect with ICS++ through CN1

Connector	SCI number	TX pin	RX pin	Settings	Note
CN1	SCI0	P06	P07	--	--

9.3. External connection

9.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P40	
2	NC	
3	NC	Software PFC gate output
4	NC	In rush current control terminal
5	P137 /FO	Inverter fault input
6	NC	
7	P05	3 phase gate signal WN
8	P04	3 phase gate signal VN
9	P03	3 phase gate signal UN
10	P02	3 phase gate signal WP
11	P01	3 phase gate signal VP
12	P00	3 phase gate signal UP
13	P125/SW1	
14	P137/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

9.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	ANI1
6	Iv	ANI2
7	NC	
8	Vpn	ANI6
9	NC	--
10	UV	ANI3
11	VV	ANI4
12	VW	ANI5
13	NC	--
14	NC	--
15	VR1	ANI7
16	RSVIN1	--
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

9.3.3. E1 connector CN3

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TOOL0	
6	/RESETIN	
7	--	
8	VCC	
9	VCC	
10	/RESET	To CPU /RESET
11	--	
12	GND	
13	/RESET	To CPU /RESET
14	GND	

9.3.4. UART connector CN1

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD0 out	TXD0 / P06
3	RXD0 in	RXD0 / P07
4	GND	GND

9.4. Caution when you use T5108

T5104 does not have VRL control terminal, so this CPU board does not control “In rush current control”. **So this CPU can not use on T1102, T1001.** This CPU board can be used on T1003, T2001, T2002B, T2003, T2004, T2005.

10. T5201 RX62T 100pin

10.1. T5201 / T5201A overview

Item	Specifications	Note
CPU	R5F562TAADFP	RX62Tseries
Clock	96MHz	
Power supply voltage	5V	
ROM size	256kB	
RAM size	16kB	
emulator	E1	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

10.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN1, CN3 and CN4. And some SCI ports are assigned to two or more pins. So this CPU board can change the assignment by installing or not installing resistors. If you want to use default setting pins, please follow below table.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN4	SCI0	PB2	PB1		Default These pins are supported from ICS Lib RX62T Ver.2.0 library
		Non	Non		
CN3	SCI1	PD3	PD5	Install R23, R25	Default These pins are supported from ICS Lib RX62T Ver.2.0 library Since it is using with E1 in common, you can use this port while not using E1 emulator.
		Non	Non		
CN1	SCI2	PB5	PB6	Install R4, R20 Remove R2 R19	Default These pins are supported from ICS Lib RX62T Ver.2.0 library
		P81	P80	Remove R4, R20 Install R2, R19	Default These pins are supported from ICS Lib RX62T Ver.2.0 library

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

10.3. External connection

10.3.1. Inverter connector CNA

Pin number	Pin name	function
1	PA2/LED1	
2	PA3/LED2	
3	PD0/GTIOC3B (PFC_G1)	Gate signal output for software PFC
4	PB3 (VRL)	Rush current protection pin
5	/FO	Inverter fault input
6	NC	
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P91/SW1	
14	P92/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

10.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	AN000
6	Iv	AN001
7	Iw	AN002
8	Vpn	AN003
9	TEMP (Vot)	AN0
10	UV	AN101
11	VV	AN102
12	VW	AN103
13	VAC	AN1
14	Ipf _c	AN100
15	VR1	AN2
16	RSVIN1	AN3
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

10.3.3. E1 connector CN5

Pin number	Pin name	function
1	TCK	
2	GND	
3	/TRST	
4	EMLE	
5	TDO	
6		
7	MD1	
8	VCC	
9	TMS	
10	MD0	
11	TDI	
12	GND	
13	/RESET	
14	GND	

10.3.4. CPU pin connector CN2

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	AUX_AIN6	
4	AUX_AIN7	
5	AUX_AIN8	
6	AUX_AIN9	
7	AUX_AIN10	
8	AUX_AIN11	
9	GND	
10	GND	
11	P11	
12	P10	
13	P64	
14	P65	
15	P20	
16	P21	
17	P22	
18	P23	
19	P24	
20	P30	
21	P31	
22	P32/ENC_B	
23	P33/ENC_A	
24	P90	
25	P93	
26	P94	
27	P95	
28	P96	
29	PA0	
30	PA1	
31	PA4	
32	PA5/ENC_Z	
33	PB0	
34	PB4	
35	PD2/GTI0C2B	
36	PB7	
37	Vio out	
38	Vio out	
39	GND	
40	GND	

10.3.5. ICS/UART connector CN1

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD2 out	TXD2
3	RXD2 in	RXD2
4	GND	GND

10.3.6. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD1 out	TXD1
3	RXD1 in	RXD1
4	GND	GND

10.3.7. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD0 out	TXD0 (PB2)
3	RXD0 in	RXD0 (PB1)
4	GND	GND

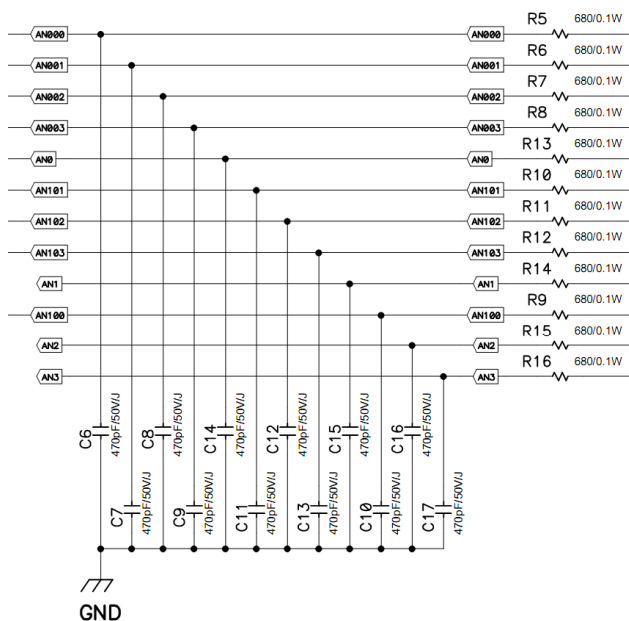
10.4. Difference between T5201 and T5201A

10.4.1. Distinction method for T5201 and T5201A

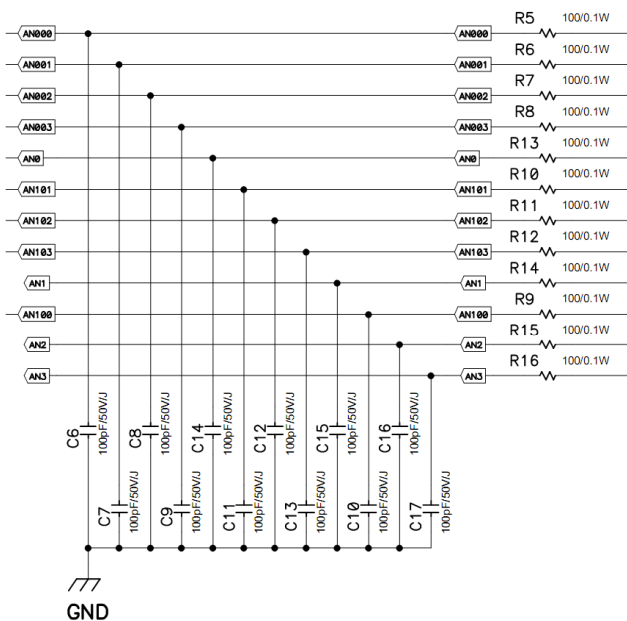
Please distinct from the serial number. It is T5201 when the bottom fourth column of the serial number is “1”. And it is T5201 when the bottom fourth column is “2”.

10.4.2. Difference 1 Low pass filter parameter for AD converter inputs

AD input filter circuits of the T5201 consist of resistor 680 Ω and capacitor 470pF. But the filter circuits of the T5201A are resistor 100 Ω and capacitor 100pF. It may affect the current sampling timing.



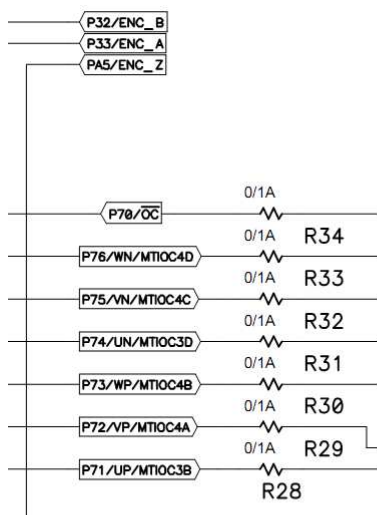
T5201 AD入力部



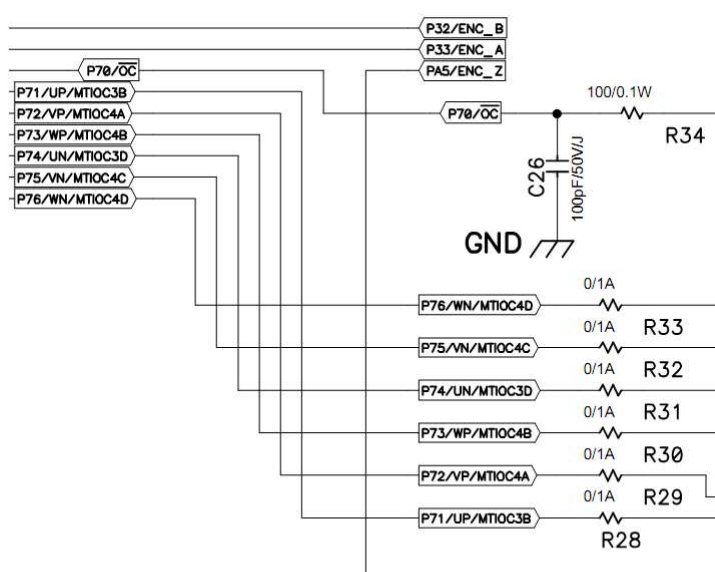
T5201A AD入力部

10.4.3. Difference 2 input circuits of P70 / POE0#

There is no filter for POE input of T5201, but there is a filter for POE input of T5201A.



T5201 POE入力回路



T5201A POE入力回路

11. T5205 RX23T 64pin

11.1. T5205 overview

Item	Specifications	Note
CPU	R5F523T5ADFM	RX23Tseries
Clock	32MHz internal / 40MHz ext	
Power supply voltage	5V	
ROM size	128kB	
RAM size	12kB	
emulator	E1	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

11.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN2, CN3 and CN4.

You cannot use SCI5-1 and SCI5-2 simultaneously.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN2	SCI1	PD3	PD5	なし	
CN3	SCI5-1	PB5	PB6	なし	
CN4	SCI5-2	PB2	PB1	なし	

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

11.3. External connection

11.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P00/LED1	
2	P01/LED2	
3	P31/PFC_G1	Gate signal output for software PFC
4	PB4 (VRL)	Rush current protection pin
5	P70 / /FO	Inverter fault input
6	NC	
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P91/SW1	
14	P92/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

11.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	NC	
4	NC	
5	Iu	AN000
6	Iv	AN001
7	Iw	AN002
8	Vpn	AN003
9	TEMP (Vot)	AN007
10	UV	AN004
11	VV	AN005
12	VW	AN006
13	VAC	AN016
14	Ipf _c	(AN017)
15	VR1	AN017
16	RSVIN1	
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

11.3.3. E1 connector CN5

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TXD1	
6	--	
7	FINED	
8	VCC	
9	--	
10	--	
11	RXD1	
12	GND	
13	/RESET	
14	GND	

11.3.4. CPU pin connector CN5

Pin number	Pin name	function
1	+AV _{cc}	
2	+AV _{cc}	
3	GND	
4	GND	
5	P22	
6	P23	
7	P24	
8	P30	
9	PA4	
10	P02	
11	P93	
12	P94	
13	PA2	
14	PA3	
15	PB0	
16	PB3	
17	PB7	
18	PD4	
19	PD6	
20	PD7	
21	PE2	
22	--	
23	Vio out	
24	Vio out	
25	GND	
26	GND	

11.3.5. ICS/UART connector CN2

TXD1 and RXD1 is also used by the E1 interface.

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD1	TXD1
3	RXD1	RXD1
4	GND	GND

11.3.6. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD5-1 out	TXD5 (PB6)
3	RXD5-1 in	RXD5 (PB5)
4	GND	GND

11.3.7. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD5-2 out	TXD5 (PB2)
3	RXD5-2 in	RXD5 (PB1)
4	GND	GND

12. T5206 RX24T 100pin

12.1. T5206 overview

Item	Specifications	Note
CPU	R5F524TAADFP	RX24Tseries
Clock	80MHz	
Power supply voltage	5V	
ROM size	256kB	
RAM size	16kB	
emulator	E1	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

12.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN2, CN3 and CN4.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN2	SCI1	PD3	PD5		
CN3	SCI5	PB5	PB6		
CN4	SCI6	PB2	PB1		

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

12.3. External connection

12.3.1. Inverter connector CNA

Pin number	Pin name	function
1	PA2/LED1	
2	PA1/LED2	
3	PD7/PFC_G1	Gate signal output for software PFC
4	PB3 (VRL)	Rush current protection pin
5	P70 / /FO	Inverter fault input
6	P55 /INV_RESET	Inerter error reset
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P80/SW1	
14	P81/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

12.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+5V)
2	+AVcc out	Analog power supply from CPU board (+5V)
3	Reserved	AN002
4	Reserved	AN003
5	Iu	AN100
6	Iv	AN101
7	Iw	AN102
8	Vpn	AN204
9	TEMP (Vot)	AN205
10	UV	AN201
11	VV	AN202
12	VW	AN203
13	VAC	AN207
14	Ipf	AN208
15	VR1	AN209
16	RSVIN1	AN210
17	+Vio out	Digital power supply from CPU board (+5V)
18	+Vio out	Digital power supply from CPU board (+5V)
19	GND	
20	GND	

12.3.3. E1 connector CN5

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	TXD1	
6	--	
7	FINED	
8	VCC	
9	--	
10	--	
11	RXD1	
12	GND	
13	/RESET	
14	GND	

12.3.4. CPU pin connector CN7

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	P60	
4	P55	
5	P50	
6	P47	
7	P43	
8	P42	
9	P41	
10	P40	
11	GND	
12	GND	
13	PE5	
14	P02	
15	P00	
16	P01	
17	PE4	
18	PE3	
19	PE1	
20	PE0	
21	PD6	
22	PD4	
23	PD2	
24	PD1	
25	PD0	
26	PB7	
27	PB4	
28	PB3/VRL	
29	PB0	
30	PA4	
31	PA3	
32	PA0	
33	P95	
34	P94	
35	P93	
36	P92	
37	P91	
38	P90	
39	P31	
40	P30	
41	P24	
42	P23	
43	P22	

44	P21	
45	P20	
46	P82	
47	P81/SW2	
48	P80/SW1	
49	GND	
50	GND	
51	NC	
52	NC	
53	NC	
54	NC	
55	NC	
56	NC	
57	UVCC	
58	UVCC	
59	GND	
60	GND	

12.3.5. ICS/UART connector CN2

TXD1 and RXD1 is also used by the E1 interface.

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD1	TXD1
3	RXD1	RXD1
4	GND	GND

12.3.6. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD5 out	TXD5 (PB6)
3	RXD5 in	RXD5 (PB5)
4	GND	GND

12.3.7. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD6 out	TXD6(PB2)
3	RXD6 in	RXD6(PB1)
4	GND	GND

12.3.1. ABZ encoder connector CN5

Pin number	Pin name	function
1	+5V	+5V power supply fromCPU board
2	GND	GND
3	A	A P33
4	B	B P32
5	Z	Z PA5

12.3.2. Hall encoder connector CN6

Pin number	Pin name	function
1	+5V	+5V power supply fromCPU board
2	GND	GND
3	HU	P10 IRQ0/HU1
4	HV	P11 IRQ1/HV1
5	HW	P96 IRQ4/HW1

13. T5210 RX71M 144pin

13.1. T5210 overview

Item	Specifcatons	Note
CPU	R5F571MFCDFB	RX71M シリーズ
Clock	240MHz	
Power supply voltage	3.3V	
ROM size	2MB	
RAM size	512kB	
emulator	E1	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

13.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN1, CN2 and CN10.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN1	SCI0	P32	P33		
CN2	SCI1	P16	P15		
CN10	SCI2	P13	P12		

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

13.3. External connection

13.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P82/LED1	
2	PC5/LED2	
3	P83/PFC_G1	Gate signal output for software PFC
4	PC6 (VRL)	Rush current protection pin
5	PC4 / /FO	Inverter fault input
6	Reserved	Inerter error reset
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P50/SW1	
14	P11/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

13.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (3.3V)
2	+AVcc out	Analog power supply from CPU board (3.3V)
3	Reserved	
4	Reserved	
5	Iu	AN000
6	Iv	AN001
7	Iw	AN002
8	Vpn	AN003
9	TEMP (Vot)	AN103
10	UV	AN005
11	VV	AN006
12	VW	AN007
13	VAC	AN100
14	Ipf	AN004
15	VR1	AN101
16	RSVIN1	AN102
17	+Vio out	Digital power supply from CPU board (+3.3V)
18	+Vio out	Digital power supply from CPU board (+3.3V)
19	GND	
20	GND	

13.3.3. ICS/UART connector CN1

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD0	TXD0
3	RXD0	RXD0
4	GND	GND

13.3.4. ICS/UART connector CN2

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD1	TXD1
3	RXD1	RXD1
4	GND	GND

13.3.5. E1 connector CN3

Pin number	Pin name	function
1	TCK	
2	GND	
3	/TRST	
4	EMLE	
5	TDO	
6		
7	MD/FINED	
8	VCC	
9	TMS	
10	UB/PC7	
11	TDI	
12	GND	
13	/RESET	
14	GND	

13.3.6. CPU pin connector CN4

Pin number	Pin name	function
1	PD4	
2	PD3	
3	PD2	
4	PD1	
5	PD0	
6	P93	
7	P92	
8	P91	
9	P90	
10	P07	

13.3.7. CPU pin connector CN5

Pin number	Pin name	function
1	P05	
2	P03	
3	P02	
4	P01	
5	P00	
6	PF5	
7	PJ5	
8	PJ3	
9	P35	
10	GND	

13.3.8. CPU pin connector CN6

Pin number	Pin name	function
1	P25	
2	P24	
3	P20	
4	P14	
5	USB0_DM	
6	USB0_DP	
7	P56	
8	P53	
9	P52	
10	GND	

13.3.9. CPU pin connector CN7

Pin number	Pin name	function
1	PE1	
2	PE0	
3	P64	
4	P63	
5	P62	
6	P61	
7	P60	
8	PD7	
9	PD6	
10	PD5	

13.3.10. CPU pin connector CN8

Pin number	Pin name	function
1	P81	
2	P80	
3		
4	P77	
5	P76	
6	PC2	
7	P75	
8	P74	
9	UVCC	
10	GND	

13.3.11. CAN connector CN9

Pin	Pin name	function
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number		
1	VCC	+5V power supply fromCPU board
2	CRXD2	
3	CTXD2	
4	GND	GND

13.3.12. ICS/UART connector CN10

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD2	TXD2
3	RXD2	RXD2
4	GND	GND

13.3.13. CAN connector CN11

Pin number	Pin name	function
1	VCC	+5V power supply fromCPU board
2	CRXD1	
3	CTXD1	
4	GND	GND

13.3.14. CPU pin connector CN12

Pin number	Pin name	function
1	PA5	
2	PA4	
3	PA3	
4	PA2	
5	PA1	
6	PA0	
7	P65	
8	PE7	
9	PE6	
10	P70	

13.3.15. CPU pin connector CN13

Pin number	Pin name	function
1	PB2	
2	PB1	
3	P72	
4	P71	
5	PB0	
6	PA7	
7	PA6	
8	UVCC	
9	UVCC	
10	GND	

13.3.16. CPU pin connector CN14

Pin number	Pin name	function
1	PC1	
2	PC0	
3	P73	
4	PB7	
5	PB6	
6	PB5	
7	PB4	
8	PB3	
9	UVCC	
10	GND	

14. T5216 RX13T 48pin

14.1. T5216 overview

Item	Specifcatons	Note
CPU	R5F513T5ADFL	RX13T シリーズ
Clock	32MHz	
Power supply voltage	5V	
ROM size	128kB	
RAM size	12kB	
emulator	E1, E2, E2 lite	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

14.2. Connection with In Circuit Scope (ICS)

This CPU card can connect with ICS through CN3, CN4, CN5, CN6 and CN8.

Connector	SCI number	TX pin	RX pin	Settings	Note
CN3	SCI1	PD3	PD5		
CN4	SCI1, SCI5	PB6	PB7		
CN5	SCI12	PB0	P94		
CN6	SCI5	PB2	PB1		
CN8	SCI5	P23	P24		

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

14.3. External connection

14.3.1. Inverter connector CNA

Pin number	Pin name	function
1	PD6/LED1	
2	PD4/LED2	
3	PB3/PFC_G1	ソフトウェア PFC 用ゲート信号出力
4	P93 (VRL)	突入防止回路制御端子
5	PE2 / /FO	Inverter fault input
6	PA3	Inerter error reset
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	PB5/SW1	
14	PB4/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

14.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+Avcc out	Analog power supply from CPU board (3.3V)
2	+Avcc out	Analog power supply from CPU board (3.3V)
3	Reserved	
4	Reserved	
5	Iu	AN000
6	Iv	AN001
7	Iw	AN002
8	Vpn	AN006
9	TEMP (Vot)	AN005 (default)
10	UV	(AN003)
11	VV	(AN004)
12	VW	(AN005)
13	VAC	AN004 (default)
14	Ipf	AN003 (default)
15	VR1	AN007
16	RSVIN1	(P11 / CVREFC0)
17	+Vio out	Digital power supply from CPU board (+3.3V)
18	+Vio out	Digital power supply from CPU board (+3.3V)
19	GND	
20	GND	

14.3.3. ABZ encoder connector CN1

Pin number	Pin name	function
1	+5V	+5V power supply from CPU board
2	GND	GND
3	A	A P11
4	B	B P10
5	Z	Z PA2

14.3.4. E1 connector CN2

このコネクタは、ルネサスエレクトロニクス製の E1 エミュレータ用のコネクタです。標準のケーブルで E1 エミュレータと接続してください。

Pin number	Pin name	function
1	--	
2	GND	
3	--	
4	--	
5	(TXD1)	
6	--	
7	MD/FINED	
8	VCC	
9	--	
10	--	
11	(RXD1)	
12	GND	
13	/RESET	
14	GND	

14.3.5. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD1	TXD1
3	RXD1	RXD1
4	GND	GND

14.3.6. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD1, TXD5	TXD1, TXD5
3	RXD1, RXD5	RXD1, RXD5
4	GND	GND

14.3.7. ICS/UART connector CN5

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD12	TXD12
3	RXD12	RXD12
4	GND	GND

14.3.8. ICS/UART connector CN6

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD5	TXD5
3	RXD5	RXD5
4	GND	GND

14.3.9. CPU pin connector CN7

Pin number	Pin name	function
1	UVCC	
2	UVCC	
3	GND	
4	GND	
5	PD6 / LED1	
6	PD5 / RXD1	
7	PD4 / LED2	
8	PD3 / TXD1	
9	PB7 / RXD1,5	
10	PB6 / TXD1,5	
11	PB5 / SW1	
12	PB4 / SW2	
13	PB3 / PFC_G1	
14	PB2 / TXD5	
15	PB1 / RXD5	
16	PB0 / TXD12	
17	PA3 / INVRES	
18	PA2 / ENC_Z	
19	P94 / RXD12	
20	P93 / VRL	
21	P70 / FO	
22	P24 / RXD5	
23	P23 / TXD5	
24	P22	
25	P11 / ENC_A	
26	P10 / ENC_B	

14.3.10. ICS/UART connector CN8

Pin number	Pin name	function
1	Vio out	+5V power supply from CPU board
2	TXD5	TXD5
3	RXD5	RXD5
4	GND	GND

15. T5301 RX111 64pin

15.1. T5301 / T5301A overview

Item	Specifications	Note
CPU	R5F51115ADFM	RX111series
Clock	32MHz	
Power supply voltage	5V	
ROM size	128kB	
RAM size	16kB	
Emulator	E1	
Emulator isolator	RENESAS 『R0E000010ACB10』	We strongly recommend to use emulator isolator when you use E1emulator.

15.2. Connection with ICS

This CPU card can connect with ICS through CN1, CN3 and CN4. And some SCI ports are assigned to two or more pins. So this CPU board can change the assignment by installing or not installing resisters. If you want to use default setting pins, please follow below table.

Connector	SCI number	TXpin	RXpin	Settings	Note
CN4	SCI1	PC7	PC6	Install R26, R30	Default
		P26	P30	Install R23, R28	
		P16	P15	Install R27, R29	
CN3	SCI5	PA4	PA3	Install R21, R20、	Default
		PC2	PC3	Install R19, R22	
CN1	SCI12	PE1	PE3	Install R2, R17	Default
		P14	P17	Install R1, R3	

Note: Please refer below ICS support pages about latest ICS document and libraries.

<http://desktoplab.co.jp>

15.3. External connection

15.3.1. Inverter connector CNA

Pin number	Pin name	function
1	P32/LED1	
2	PB0/LED2	
3	PA1 (PFC_G1)	Software PFC gate signal output
4	PA0 (VRL)	In rush current protection circuit control pin
5	PB5/FO	Inverter fault input
6	NC	
7	WN	3 phase gate signal WN
8	VN	3 phase gate signal VN
9	UN	3 phase gate signal UN
10	WP	3 phase gate signal WP
11	VP	3 phase gate signal VP
12	UP	3 phase gate signal UP
13	P35/SW1	
14	P31/SW2	
15	+5V in	
16	+5V in	
17	GND	
18	GND	
19	+3.3V in	
20	+3.3V in	

15.3.2. Inverter connector CNB

Pin number	Pin name	function
1	+AVcc out	Analog power supply from CPU board (+3.3V)
2	+AVcc out	Analog power supply from CPU board (+3.3V)
3	NC	
4	NC	
5	Iu	AN000
6	Iv	AN001
7	Iw	AN002
8	Vpn	AN003
9	TEMP (Vot)	AN004
10	UV	AN006
11	VV	AN008
12	VW	AN011
13	VAC	AN012
14	Ipf	AN013
15	VR1	AN014
16	RSVIN1	AN015
17	+Vio out	Digital power supply from CPU board (+3.3V)
18	+Vio out	Digital power supply from CPU board (+3.3V)
19	GND	
20	GND	

15.3.3. E1 connector CN5

Pin number	Pin name	function
1	FINEC	
2	GND	
3		
4		
5	TXD1(TDO)	
6		
7	FINED(MD1)	
8	VCC	3.3V
9		
10	UB(MD0)	
11	RXD1(TDI)	
12	GND	
13	/RESET	
14	GND	

15.3.4. CPU pin connector CN2

Pin number	Pin name	function
1	+AVcc	
2	+AVcc	
3	GND	
4	GND	
5	P30/RXD1	
6	P26/TXD1	
7	FINEC / Z / U	
8	P03	
9	P05	
10	PE2/RXD12	
11	PE1/TXD12	
12	PA3/RXD5	
13	PA4/TXD5	
14	PA6	
15	PC2/RXD5	
16	PC3/TXD5	
17	PC4 / A	
18	PC5 / B	
19	PC6 / RXD1	
20	PC7 / TXD1	
21	NC	
22	NC	
23	Vio out	
24	Vio out	
25	GND	
26	GND	

15.3.5. ICS/UART connector CN1

Pin number	Pin name	function
1	Vio out	+3.3V power supply fromCPU board
2	TXD12 out	TXD12
3	RXD12 in	RXD12
4	GND	GND

15.3.6. ICS/UART connector CN4

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD1 out	TXD1
3	RXD1 in	RXD1
4	GND	GND

15.3.7. ICS/UART connector CN3

Pin number	Pin name	function
1	Vio out	+5V power supply fromCPU board
2	TXD5 out	TXD5
3	RXD5 in	RXD5
4	GND	GND

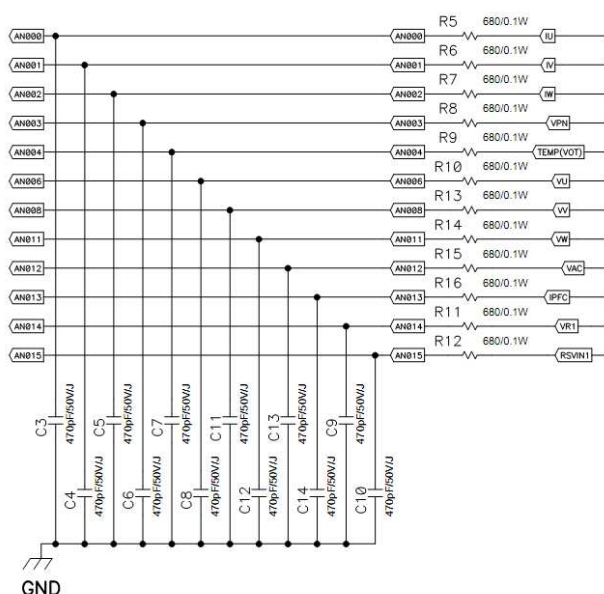
15.4. Difference between T5301 and T5301A

15.4.1. Distinction method for T5301 and T5301A

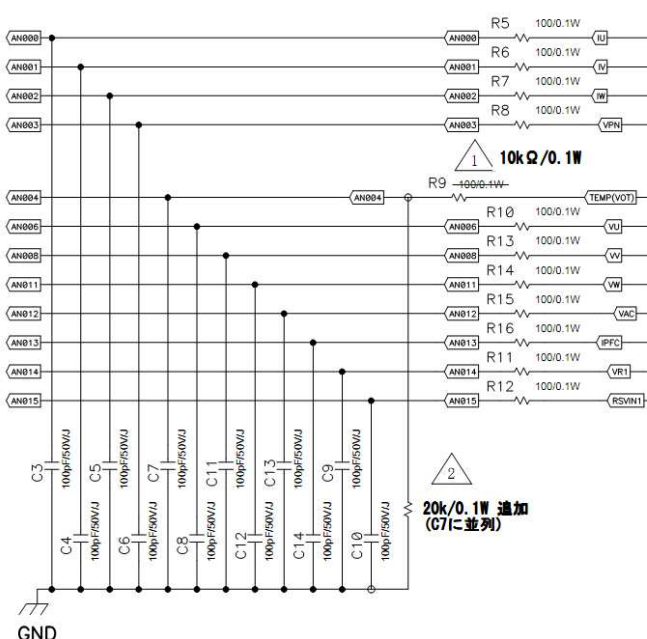
Please distinct from the serial number. It is T5301 when the bottom fourth column of the serial number is “1”. And it is T5301A when the bottom fourth column is “2”.

15.4.2. Difference 1 Low pass filter parameter for AD converter inputs

AD input filter circuits of the T5301 consist of resistor 680Ω and capacitor 470pF. But the filter circuits of the T5301A are resistor 100Ω and capacitor 100pF. It may affect the current sampling timing.



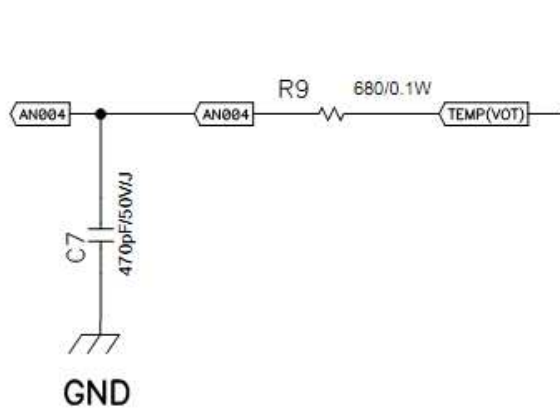
T5301 AD入力回路



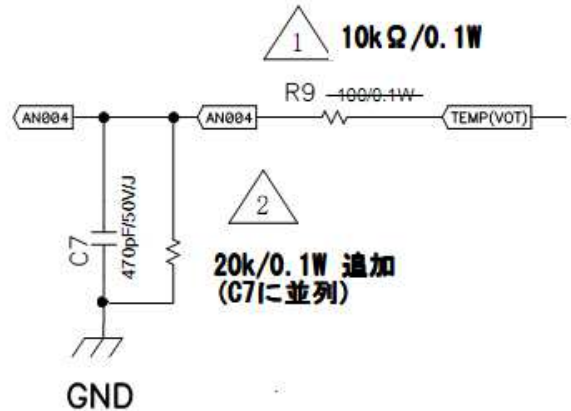
T5301A AD入力回路

15.4.3. Difference 2 AD input circuits for Vot (TEMP)

On T5301A IPM temperature AD input circuits are changed.



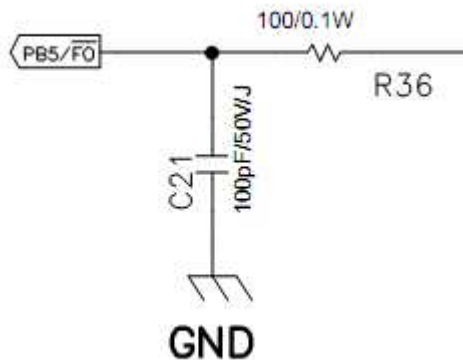
T5301
Vot AD入力回路



T5301A
Vot AD入力回路

15.4.4. Difference 3 PB5 / FO input circuits

There is no filter for POE input of T5301, but there is a filter for FO input of T5301A.



15.4.5. Difference 4 Crystal oscillator circuits

There are no crystal oscillator circuits on T5301. But on T5301A there are crystal oscillator circuits.

16. Ordering information

16.1. Part number list

Part number	
Single 3phase PWM port series (STANDARD type) 20pin x 2 type	
T5101A	RL78/G14 64pin R5F104LEAFP
T5102	RL78/F14 80pin R5F10PMFKFB
T5103	RL78/G1F 64pin R5F11BLEAFB
T5104	RL78/G1G 32pin
T5105	RL78/G14 32pin
T5106	RL78/G1F 32pin
T5107	Reserved (SD)
T5108	RL78/G1M 20pin
T5201A	RX62T 100pin R5F562TAADFP
T5202	RX62T 64pin
T5203	Reserved (U)
T5204	RX64M 144pin
T5205	RX23T 64pin
T5206	RX24T 100pin
T5210	RX71M 144pin
T5211	RX66T 100pin
T5212	RH850/F1KM-S1 64pin
T5213-TMR	RX24T (A) with TMR sensor I/F
T5216	RX13T 48pin
T5301A	RX111 64pin R5F51115ADFM
T5302	V850E2M/FJ4
T5402	Universal board for 0.5mm pitch CPU
Multi 3phase PWM port series 40pin x 2 type	
T6206	RX24T (A version) 100pin R5F524TAADFP (pin assign compatible to T5206)
T6207	RX24T (B version) 100pin R5F524TEADFP (not compatible to T5206)
T6208	RX62T 100pin
T6209	RX63T 144pin
T6211	RX66T 112pin
T6214	RX72T 144pin
T6215	RZ/T1
T6217	RH850/P1M-E 144pin
T6218	RA6M1 100pin
T6219	Reserved (T1)
T6xxx series to T5xxx series connector conversion card	
T6X5X	You can use T6xxx series CPU card connector on standard Trial series inverter

Gray part CPU cards are not sold now.

Green part CPU cards are now planning to sell.

17. Revision

Version	Date	
0.52EN	2014-12-03	・ Add RL78/G1F
0.54EN	2015-08-08	・ Add caution while connecting E1 emulator.
1.02EN	2016-07-21	・ Add RX24T, RX23T
1.03EN	2017-03-31	・ Fix spell miss ・ Change ordering information
1.04EN	2017-09-05	・ Change ordering information
1.05EN	2017-10-17	・ Add T5210 RX71M
1.06EN	2020-04-20	・ Add T5216 RX13T ・ Update ordering information
1.07EN	2020-09-01	・ Add T5108 RL78G1M ・ Update ordering information

Trial series Standard CPU card Users Manual

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