Notes and Precautions for Use

When you are using this product, you will need to accept the following:

- This reference board is intended for implementation study of safety remote I/O function and initial performance evaluation using Renesas RZ MPU. It is not intended to be built-in to or provided with finished products. Do not use the reference board for purposes other than those for which it is intended.

- The specifications of and information on this board do not guarantee the acquisition of a certificate of meeting functional safety standards. This board is designed for various preliminary studies and functional safety evaluation; some parts of it have redundant functions and it includes structures such as jumper blocks, so it is not suitable for functional safety applications.

- Please note that the power supply is not included in this product. Please prepare it separately.

- The CE mark on this product indicates conformance with the EMC Directive "2014/30/EU" and certified as "EN 55032: 2015+A11:2020" and "EN 55035: 2017+A11:2020". The UKCA mark on this product indicates conformance with the Electromagnetic Compatibility Regulations "2016 No.1091" and certified as "BS EN 55032: 2015+A11:2020" and "BS EN 55035: 2017+A11:2020". All connection cables used must be 3 meters maximum to compliant with the standard.

- The product is classified as Class-A (CE：EN 55032: 2015+A11:2020, UKCA：BS EN 55032: 2015+A11:2020). Operation of this product in a residential area is likely to cause radio frequency interferences. Customer is responsible for correctly and safely handling this board in accordance with the law of your country (region).

- Unlike consumer electronic products, this product does not have a protective housing because it has been developed for engineering applications. Steps must be taken against generation of static electricity. The connectors and devices must not be touched by bare hands. This board must be used by people who have a good knowledge of the risks involved in handling devices.

- In no event, Renesas Electronics Corporation will be liable for any problems resulting from use of this product.

- All descriptions in this document are information at the time it is issued, and are subject to change without notice.

-

Table of Contents

1. Introduction

1.1 Package Contents

This product contains the following items (as shown in Figure 1.1.1). Please contact your sales retailer if something is missing.

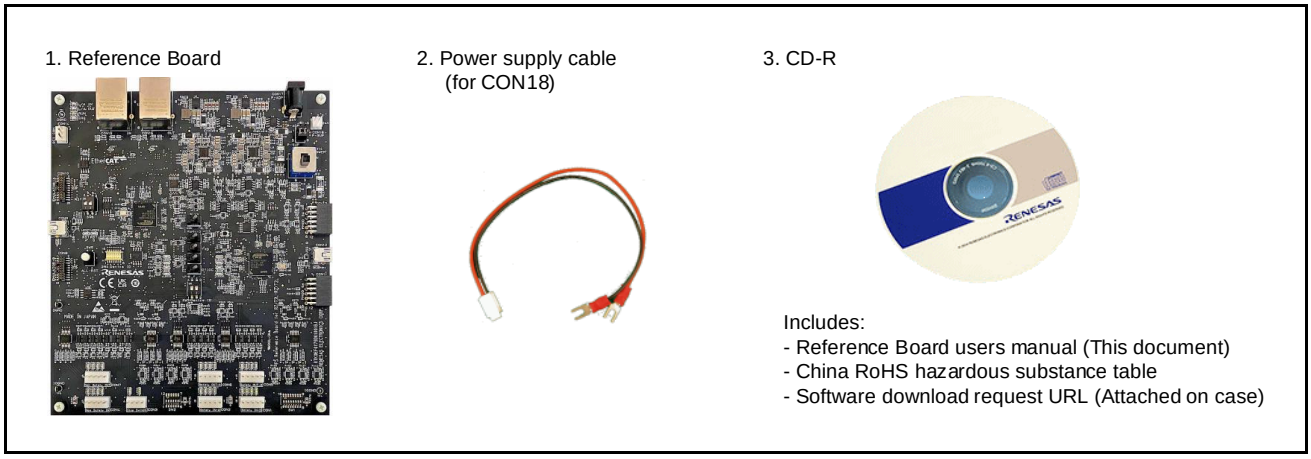


Figure 1.1.1 Package Contents

1.2 Preparing RZ Safety Network Reference Software

Before using this reference board, you need to prepare RZ Safety Network reference software which is available only via online download. To download software, scan the QR code attached outside the CD-R case, go to Renesas website and fill in the download request form. You will be required to sign in to your My Renesas account for making download request.

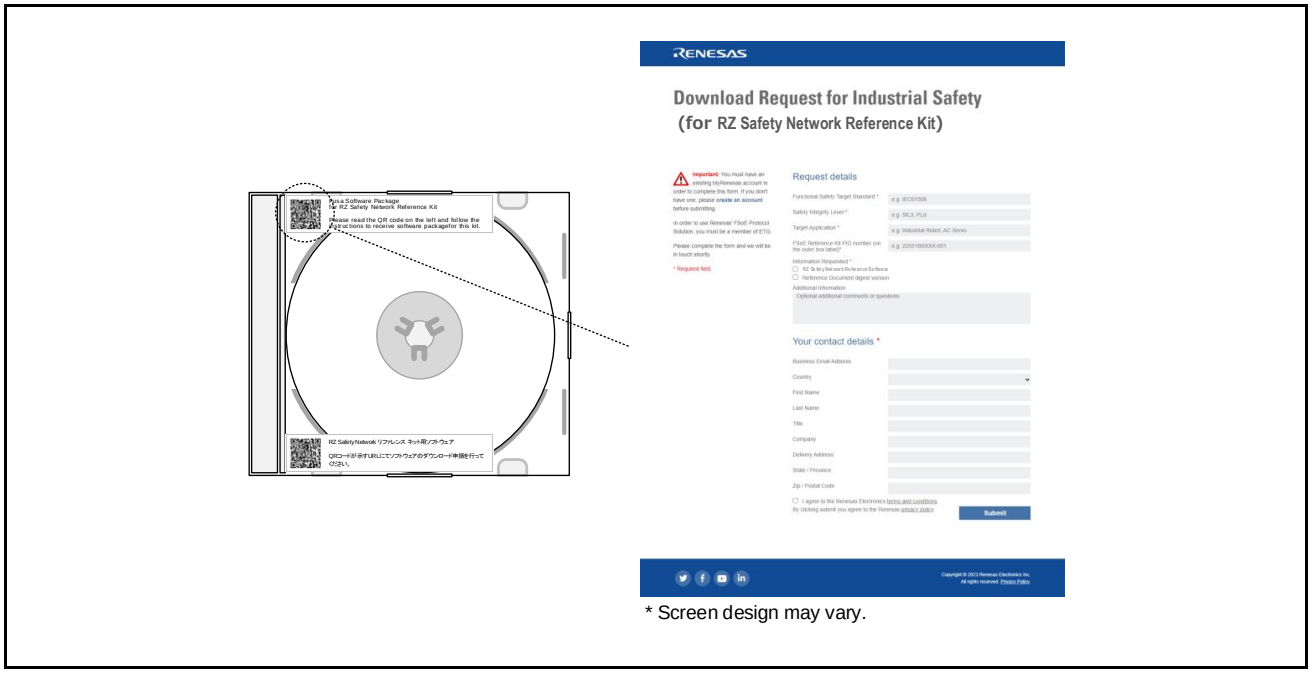


Figure 1.2.1 Download Request Form

1.3 Power Supply

This product contains no power supply. Please prepare it separately. Although power lines on the board are filtered, please be careful about the noise coming from power source and not to propagate it to the power supply section of the microprocessor.

Figure 1.3.1 shows specifications of DC jack and power supply connector.

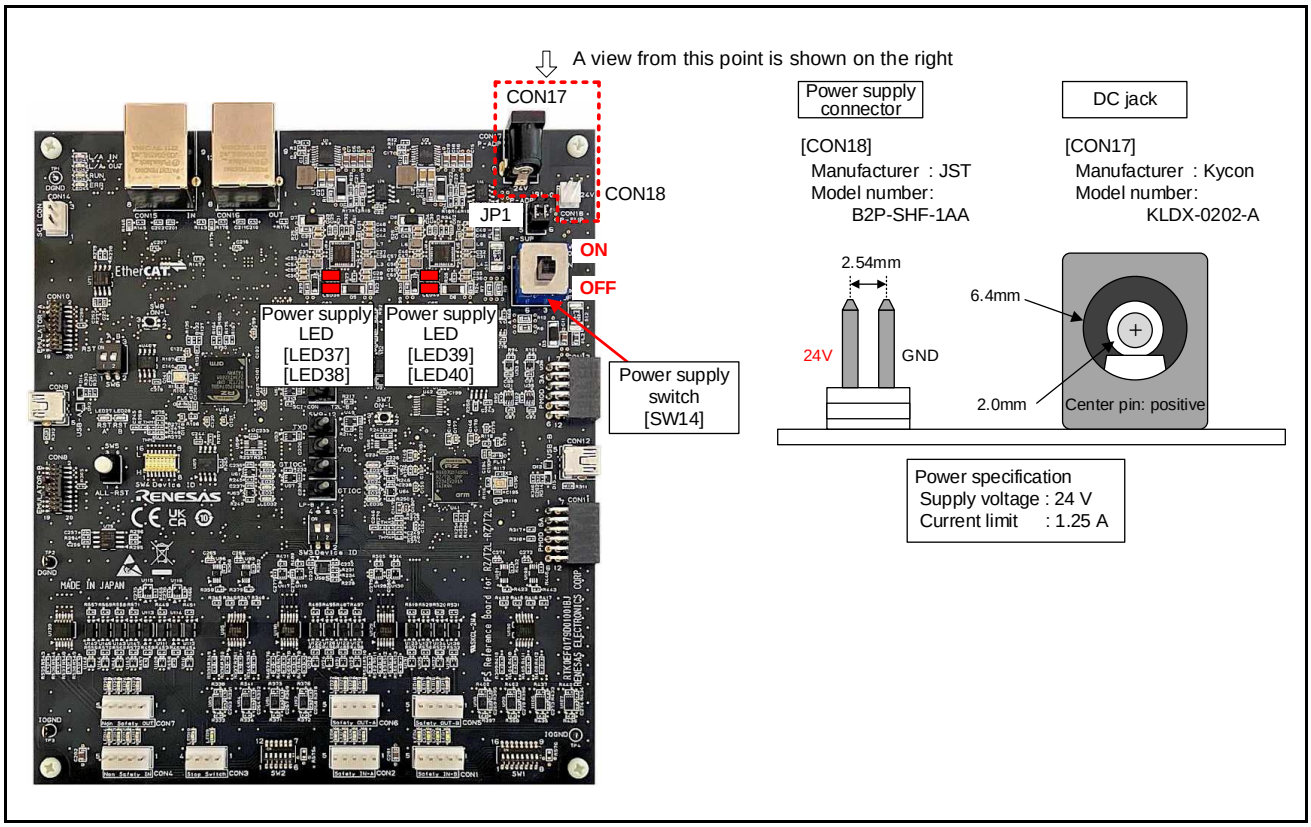


Figure 1.3.1 DC Jack and Power Supply Connector

Figure 1.3.2 shows setting options for power supply routing selector jumper (JP1). Setting shall be made according to power supply to use.

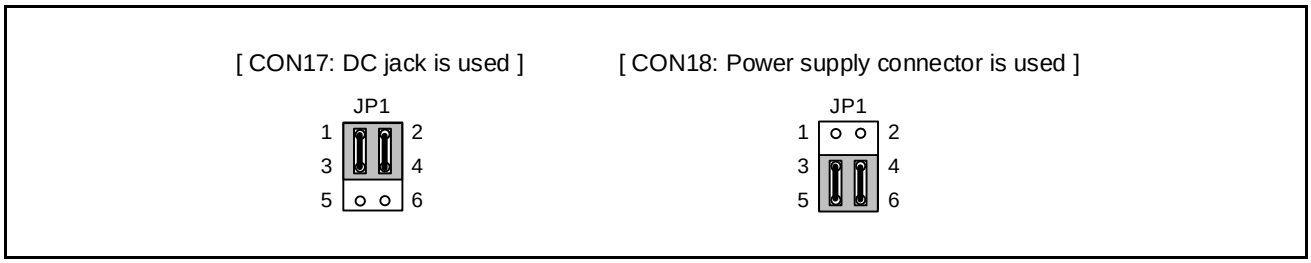


Figure 1.3.2 Setting Options for Power Supply Routing Selector Jumper (JP1)

[Power up procedures when DC jack is used]

1. Turn the power supply switch (SW14) to the OFF position.
2. On the jumper (JP1), set the short circuit socket so that pins 1-3 and 2-4 are shorted (See Figure 1.3.2).
3. Connect an AC adapter (24 V output) to the DC jack (CON17).
4. Turn the power supply switch (SW14) to the ON position.
5. Make sure that all 4 LEDs (LED37 - 40) are lit. *

[Power up procedures when power supply connector is used]

1. Turn the power supply switch (SW14) to the OFF position.
2. On the jumper (JP1), set the short circuit socket so that pins 3-5 and 4-6 are shorted (See Figure 1.3.2).
3. Connect power supply connector (CON18) to regulated power supply.
4. Set the voltage output of regulated power supply to 24 V and turn on the power supply output.
5. Turn the power supply switch (SW14) to the ON position.
6. Make sure that all 4 LEDs (LED37 - 40) are lit. *

* If any of the LEDs does not illuminate, turn the power off immediately.

2. Reference Board Overview

This reference board is intended for implementation study of safety remote I/O function and initial performance evaluation using Renesas RZ MPU.

2.1 Key Features

This reference board has the following features:

- Two units of Renesas RZ MPU (RZ/T2L) that achieve HFT (Hardware Fault Tolerance) = 1 architecture to perform functional safety processing
- Dual-channel RJ45 connector, 10Base-T/100Base-TX Ethernet PHY for EtherCAT communication
- Serial connector allows connection with network communication PCB for non-EtherCAT communication
- Safety input and output circuits compliant with HFT=1 for realization of safety remote I/O
- JTAG connector allows connection with emulator for software development
- On-board LEDs show status of power supply, reset, software control

2.2 Appearance

Figure 2.2.1 shows appearance of the board.

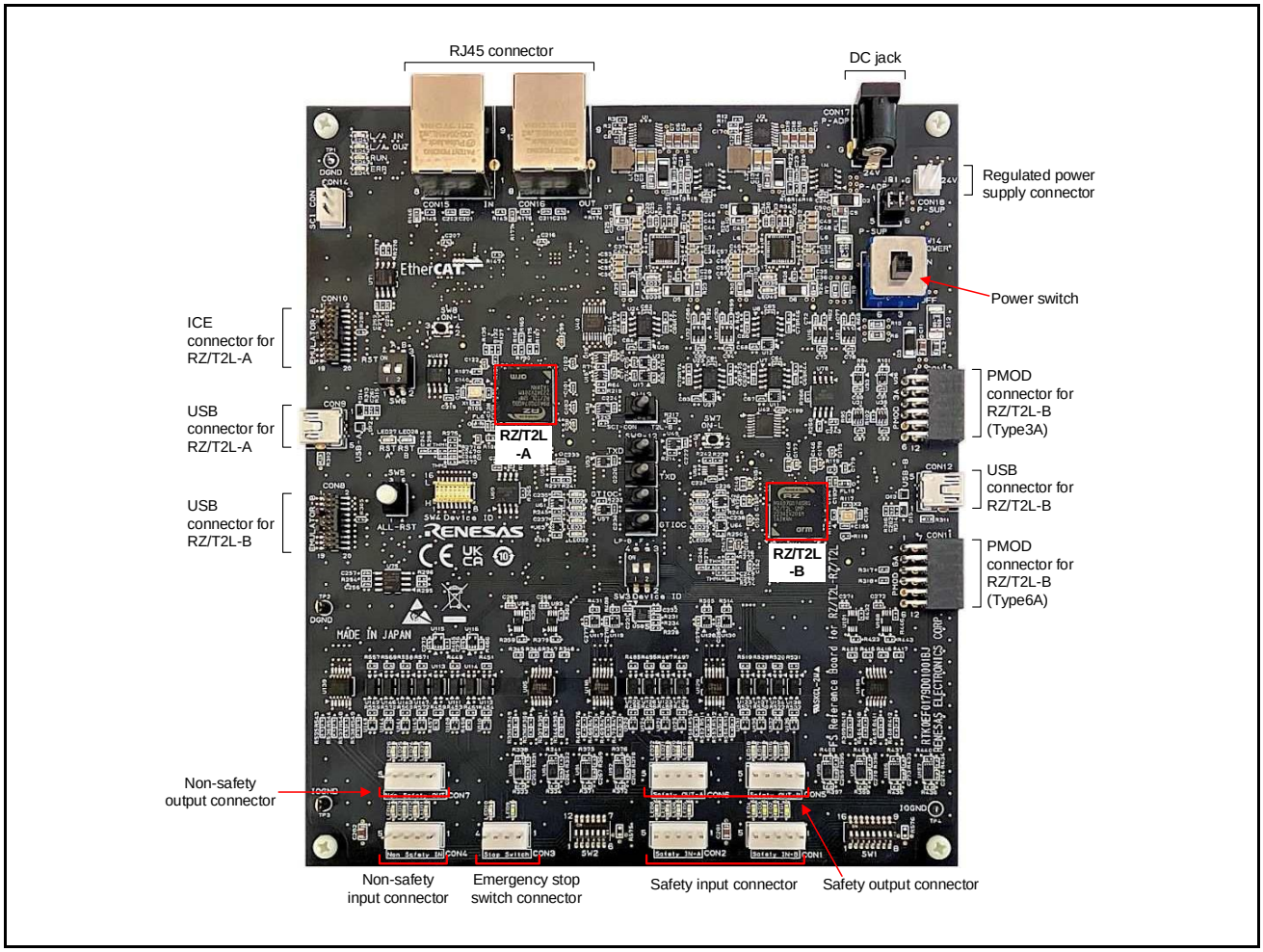


Figure 2.2.1 RZ/T2L Functional Safety Reference Board (C Side Up)

2.3 Configuration Example

Figure 2.3.1 shows configuration example for software development.

- Both RZ/T2Ls provide JTAG connector which allows connection with I-Jet emulator.
- Two RZ/T2Ls can be reset at once or individually. Power supplied to two RZ/T2Ls cannot be turn on and off individually. If you want to use either of RZ/T2L only, reset the other RZ/T2L individually and maintain the reset state.
- LED allows user to monitor the level of safety/non-safety input/output port.
- Safety/non-safety input port can be pulled up to "H" using quick test switch.

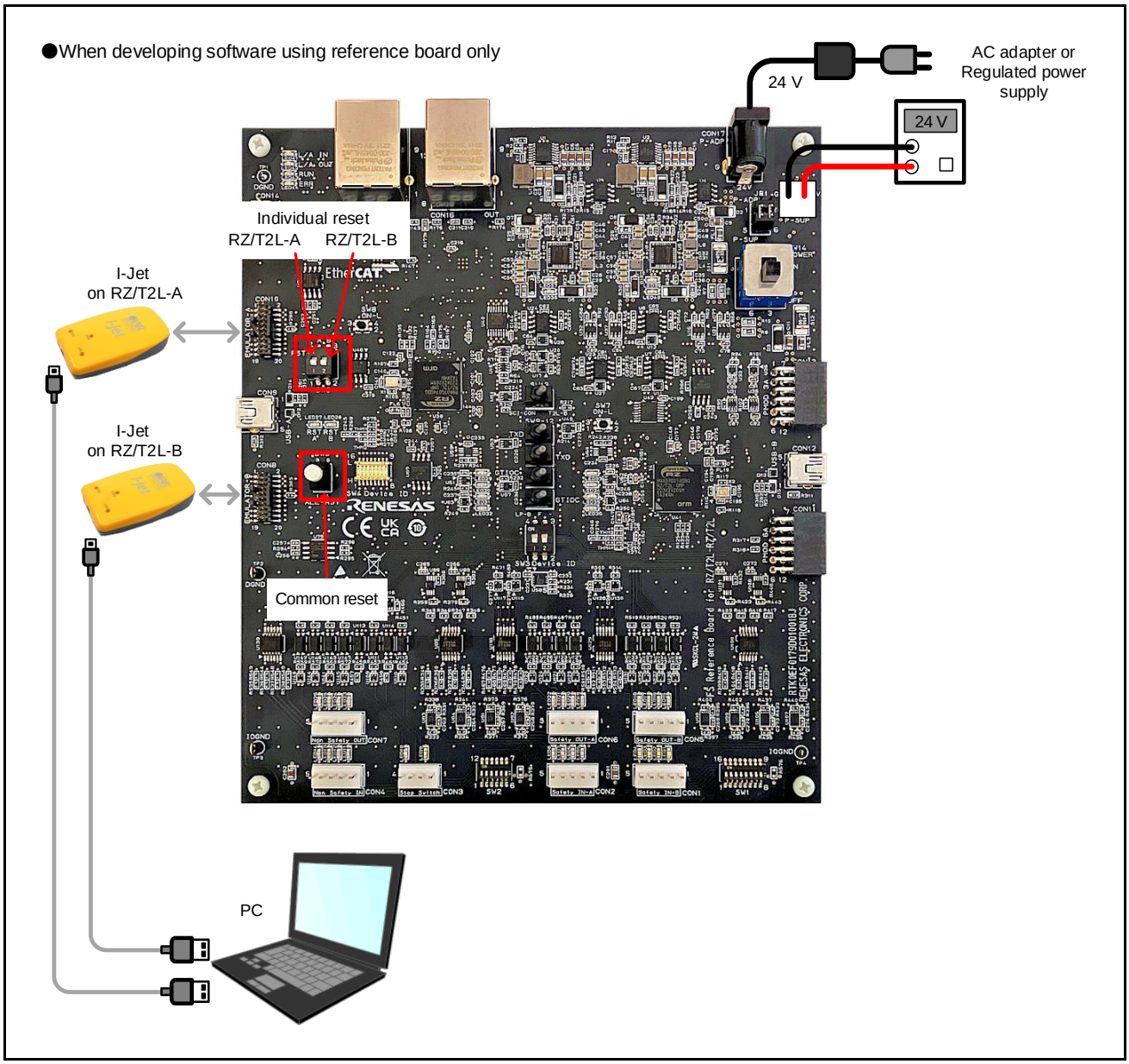


Figure 2.3.1 Configuration Example

Figure 2.3.2 shows system configuration example in which this reference board is used for FSoE reference purpose. EtherCAT communication and safety protocol processing are handled by RZ/T2L on the reference board. Please refer to Software Developer's Handbook included in RZ Safety Network Reference Software for required master device and further details.

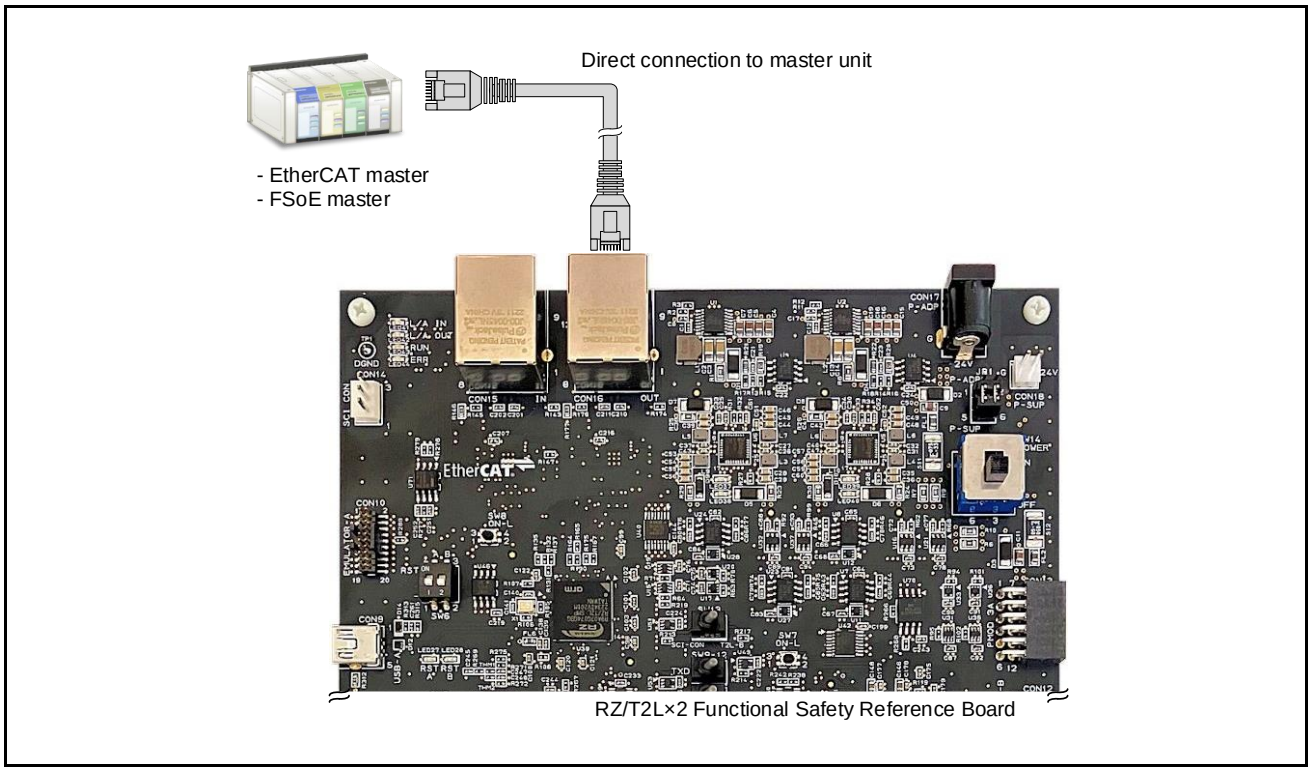


Figure 2.3.2 System Configuration Example for FSoE Reference Purpose

Figure 2.3.3 shows system configuration example in which this reference board is used for PROFIsafe or CIP Safety reference purpose. Please note that network communication PCB must be prepared separately by the user. RZ/T2L on this reference board receives protocol data from network for processing. Please refer to Software Developer's Handbook included in RZ Safety Network Reference Software for required master device and further details.

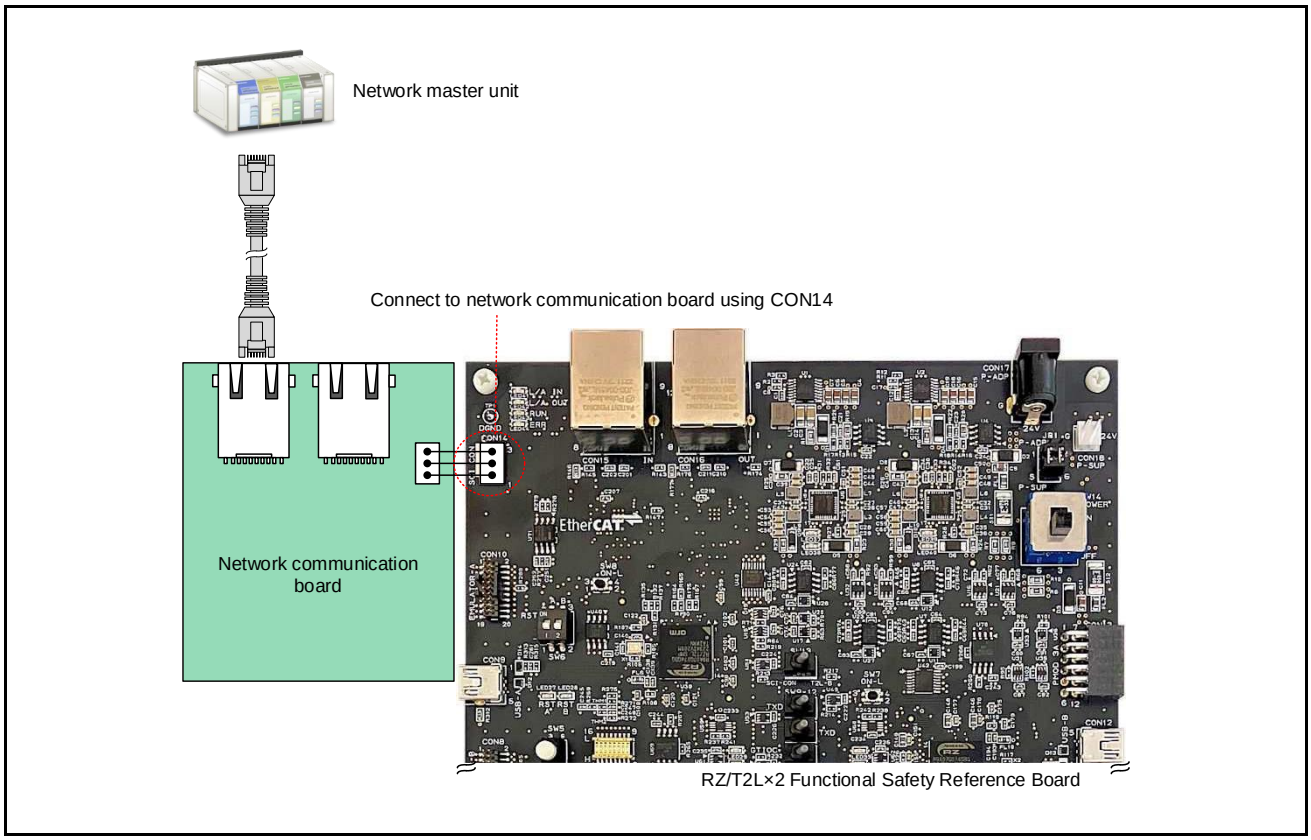


Figure 2.3.3 System Configuration Example for PROFIsafe/CIP Safety Reference Purpose

2.4 Reference Board Specifications

Figure 2.4.1 shows block diagram of this reference board. Table 2.4.1 - Table 2.4.3 show specifications of this reference board. Please note that the block diagram is intended to show connection between parts on the board and not to reflect actual layout.

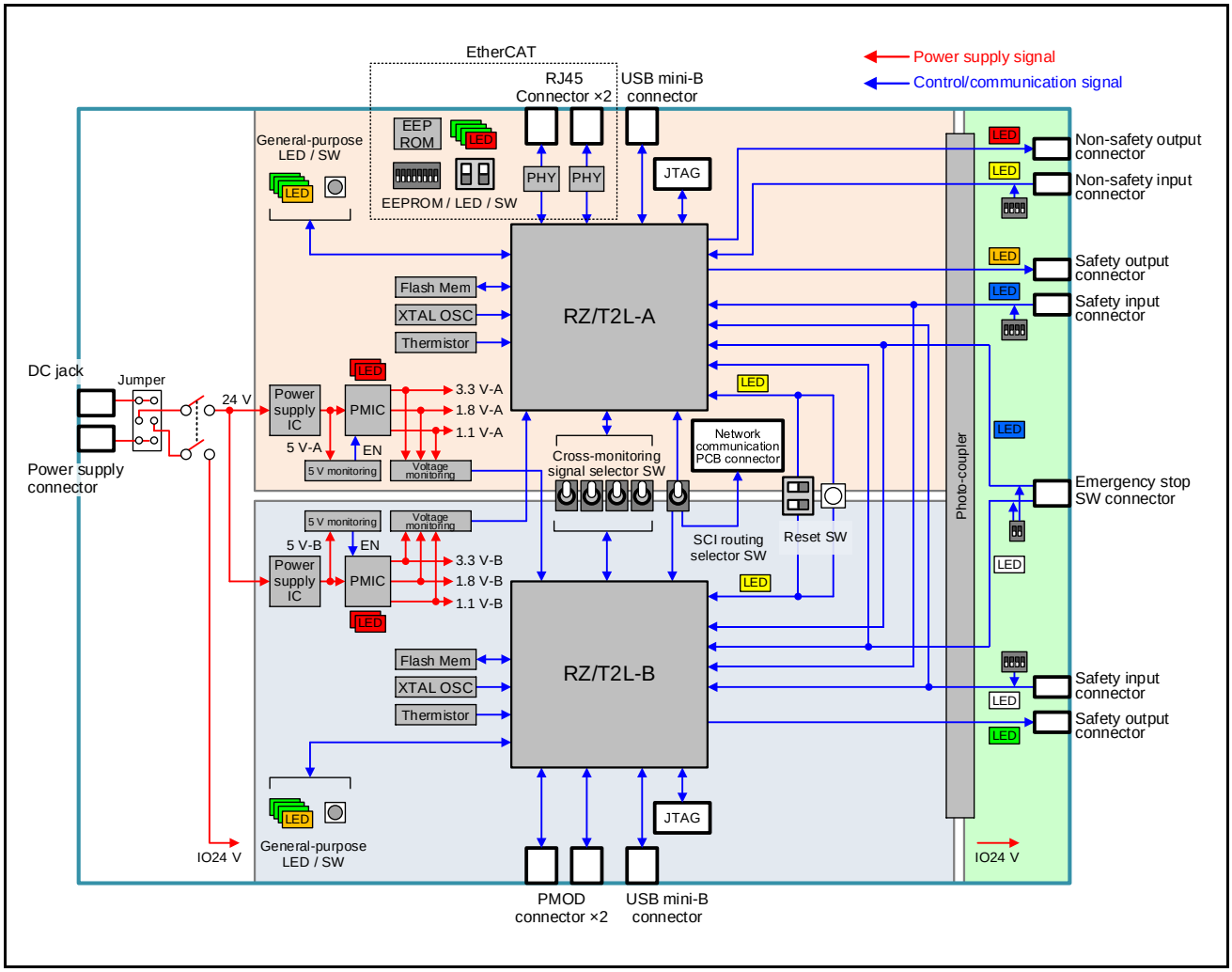


Figure 2.4.1 Block Diagram of Functional Safety Reference Board

Table 2.4.1 Functional Safety Reference Board Specifications (1)

Category	Description	
MPU	Renesas Electronics RZ/T2L (x 2)	
	●Type name : R9A07G074M04GBG (Security function not supported) ●CPU maximum operation frequency : 800 MHz ●Package : 196 pin FBGA (12 x 12mm) ●Memory size : ATCM 512 KBytes, BTCM 64 KBytes, System SRAM 1 MByte ●Boot mode : xSPI0 boot mode (x1 boot serial flash) only	
Flash memory	Renesas Electronics' serial flash memory	
	●Type name : AT25SF128A ●Memory size : 128 Mbits ●Package : 8-lead, 208-mil Wide Plastic Gull Wing Small Outline Package EIAJ SOIC	
Power supply to MPU and peripheral circuit	Renesas Electronics' DC/DC converter and PMIC	
	●Generates dual 5 V power supply from 24 V input using dual DC/DC converters (RAA211250GSP) ●Generates dual power supply for redundant system (3.3 V, 1.8 V, 1.1 V) using dual PMCIs (DA9080-61FCB2) ●Implements circuit that shuts off DC/DC converter output when 24 V DC falls below approximately 19 V ●Implements circuit that shuts off PMIC output when voltage generated by DC/DC converter falls below approximately 4.5 V ●Implements IC that monitors voltage generated by PMIC (3.3 V, 1.8 V, 1.1 V) ●Implements test circuit that changes reference voltage of voltage monitoring IC	
EtherCAT slave communication *	●EtherCAT slave controller on RZ/T2L (A) realizes the EtherCAT slave communication. ●RJ45 connector, 10Base-T/100Base-TX Ethernet PHY are available in 2ch.	
I/O circuit	Safety input	●Channels : 4 ●Signal voltage : 24 V ●HFT = 1 compliant input circuit ●Signal path fault detection function
	Emergency stop switch input	●Channels : 1 ●Signal voltage : 24 V ●HFT = 1 compliant input circuit ●Signal path fault detection function
	Safety output	●Channels : 4 ●Signal voltage : 24 V ●HFT = 1 compliant output circuit ●Signal path fault detection function
	Non-safety input	●Channels : 4 ●Signal voltage : 24 V
	Non-safety output	●Channels : 4 ●Signal voltage : 24 V

*: EtherCAT is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Table 2.4.2 Functional Safety Reference Board Specifications (2)

Category	Description
Temperature sensor	●Measurement point: 2 (One on RZ/T2L-A and RZ/T2L-B for each) ●Two thermistors (TDK NTCG104BF473FT1X) placed side by side at each measurement point ●Output from RZ/T2L built-in A/D converter is converted into temperature
Switch	This reference board implements the following switches: ●Power ON / OFF : Turns on and off the power supply from DC jack/power supply connector ●Common reset : Resets both RZ/T2Ls at once ●Individual reset : Performs reset and maintains reset state for individual RZ/T2L ●General-purpose (Push) : Switch connected to RZ/T2L general-purpose/external interrupt port (one for each RZ/T2L). ●General-purpose (Slide x 8) : Switch connected to general-purpose port of RZ/T2L-A (Intended for use in EtherCAT ID setting) ●General-purpose (Slide x 2) : Switch signal divided into two and connected to both RZ/T2L general-purpose port (Intended for FSoE slave address setting switch) ●Cross-monitoring signal selector : Switch to change destination of communication signal and timer signal connected between RZ/T2Ls (For evaluation purpose only) ●SCI routing selector : Switch to change destination of serial signal (SCI ch3) on RZ/T2L-A (Either SCI ch3 on RZ/T2L-B or network communication PCB connector) ●Quick test : Switch to enable/disable to pull up the safety/non-safety input signal and emergency stop switch input signal (for evaluation purpose only)
LED	This reference board implements the following LEDs: ●Power supply : Red x 4 (Two for each RZ/T2L-A and RZ/T2L-B) ●Reset : Yellow x 2 (One for each RZ/T2L-A and RZ/T2L-B) ●General-purpose : Green x 6 (Three for each RZ/T2L-A and RZ/T2L-B) Orange x 2 (One for each RZ/T2L-A and RZ/T2L-B) ●Safety input : White x 4 (for CON1 2~5 pins) Blue x 4 (for CON2 2~5 pins) ●Emergency stop switch : White x 1 (for CON3 2 pin) Blue x 1 (for CON3 4 pin) ●Safety output : Green x 4 (for CON5 2~5 pins) Orange x 4 (for CON6 2~5 pins) ●Non-safety input : Yellow x 4 (for CON4 2~5 pins) ●Non-safety output : Red x 4 (for CON7 2~5 pins) ●EtherCAT : Green x 3 (for EtherCAT-IN, OUT, RUN on RZ/T2L-A) Red x 1 (for EtherCAT-ERR on RZ/T2L-A)
Jumper	This reference board implements the following jumper: ●Power supply routing selector : Select source for 24 VDC input (DC jack or power supply connector)

Table 2.4.3 Functional Safety Reference Board Specifications (3)

Category	Description	
Connector	Power supply	●DC jack x 1 ●2-pin power supply connector x 1
	I/O circuit	●For safety input signal x 2 ●For emergency stop switch x 1 ●For safety output signal x 2 ●For non-safety input signal x 1 ●For non-safety output signal x 1
	EtherCAT communication	●RJ45 connector x 2 ●Connected to EtherCAT slave controller module on RZ/T2L-A
	USB (Mini-B)	●Mini-B for RZ/T2L-A x 1 ●Mini-B for RZ/T2L-B x 1 ●Connected to USB module on each RZ/T2L
	PMOD	●Type 3A for RZ/T2L-B x 1 ●Type 6A for RZ/T2L-B x 1
	Network communication PCB	●3-pin connector x 1 ●For data exchange between network communication PCB and RZ/T2L-A
	JTAG	●MIPI-20pin for RZ/T2L-A x 1 ●MIPI-20pin for RZ/T2L-B x 1 ●For connecting I-Jet available from IAR Systems
Input power supply	●Voltage : 24 VDC input ●Current : max 1.25 A ●Supplied by : DC jack or power supply connector ●Operating ambient temperature : 0-50 °C	

2.5 RZ/T2L General-Purpose Port Usage

Table 2.5.1 shows general-purpose port usage of RZ/T2L-A,

Table 2.5.2 shows general-purpose port usage of RZ/T2L-B.

: Not available on RZ/T2L

NC: Not used (Not connected)

SW: Switch

Table 2.5.1 General-Purpose Port Usage of RZ/T2L-A

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
P00		General-purpose LED: Green			Non-safety input (CON4)			
P01	Safety input (CON1)				Safety input (CON2)			
P02	JTAG (Emulator connection)				Low voltage monitoring	Cross-monitoring	Voltage monitoring circuit test	High voltage monitoring
P03								
P04							Voltage monitoring circuit test	
P05	EtherCAT							
P06	EtherCAT							
P07				USB	EtherCAT			
P08	EtherCAT							
P09	EtherCAT							
P10				EtherCAT				
P11								
P12								
P13	SW4-6	SW4-7	SW4-8	EtherCAT				
P14	External Flash		SW4-4	SW4-5	Non-safety output (CON7)			
P15	External Flash	Emergency stop switch (CON3)		SW8	Emergency stop switch circuit test	External Flash		
P16					Safety input circuit test		Data exchange between RZ/T2Ls	
P17	*1	Safety output circuit test	General-purpose LED: Orange	Safety output circuit test	SW3-1			SW3-2
P18		Data exchange between RZ/T2Ls	Cross-monitoring	Cross-monitoring	General-purpose LED: Green	Data exchange between RZ/T2Ls	General-purpose LED: Green	*1
P19								
P20				EtherCAT				
P21	EtherCAT			SW4-1	EtherCAT	SW4-2	SW4-3	
P22					Safety output (CON6)			
P23	Voltage monitoring circuit test							
P24						Safety input circuit test		Cross-monitoring

*1: [Network communication PCB] or [Data exchange between RZ/T2L] depending on SW13

Table 2.5.2 General-Purpose Port Usage of RZ/T2L-B

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
P00		General-purpose LED: Green			NC	NC	NC	NC
P01	Safety input (CON2)				Safety input (CON1)			
P02	JTAG (Emulator connection)				Low voltage monitoring	Cross-monitoring	Voltage monitoring circuit test	High voltage monitoring
P03								
P04							Voltage monitoring circuit test	
P05	MD2 *1	NC	NC					
P06	NC	NC	NC	NC	MD0 *1	MD1 *1	NC	NC
P07				USB	PMOD type 3A (CON13)			
P08	NC	NC	NC	NC				
P09	NC	NC	NC	NC	NC	NC	NC	NC
P10				NC	NC	NC	NC	NC
P11								
P12								
P13	PMOD type 6A (CON11)							
P14	External Flash		NC	NC	NC	NC	NC	NC
P15	External Flash	Emergency stop switch (CON3)		SW7	Emergency stop switch circuit test	External Flash		
P16					Safety input circuit test		Data exchange between RZ/T2Ls	
P17	Data exchange between RZ/T2Ls	Safety output circuit test	General-purpose LED: Orange	Safety output circuit test	SW3-1			SW3-2
P18		Data exchange between RZ/T2Ls	Cross-monitoring	Cross-monitoring	General-purpose LED: Green	Data exchange between RZ/T2Ls	General-purpose LED: Green	Data exchange between RZ/T2Ls
P19								
P20				MDV3	MDV2			
P21	NC	NC	PMOD type 3A (CON13)				NC	
P22					Safety output (CON5)			
P23	Voltage monitoring circuit test							
P24						Safety input circuit test		Cross-monitoring

*1: Specifies RZ/T2L operation mode

3. Reference Board Features Description

3.1 Power Supply Configuration

Figure 3.1.1 shows power supply configuration of this reference board.

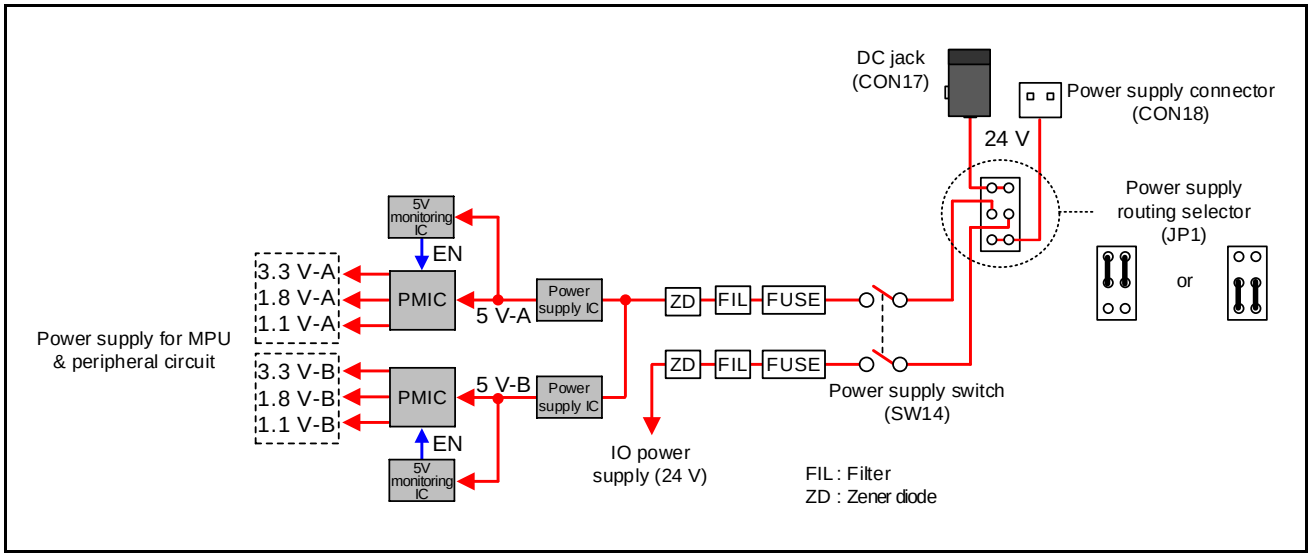


Figure 3.1.1 Functional Safety Reference Board - Power Supply Configuration

Power is supplied to the board either from the DC jack (CON17) or power supply connector (CON18). Power supply connector is specified by the jumper (JP1). Power supply is protected by fuse, filter and Zener diode. Dual 5V power supply is generated from 24V input. Dual power supply for MPU and peripheral circuit (3.3 V, 1.8 V, 1.1 V) is generated from dual 5V.

3.2 5 V Power Supply Monitoring

This reference board has a function to monitor 5 V power supply (5V-A / 5V-B) consumed by MPU and peripheral circuits. Power supply to MPU and peripheral circuit is terminated if voltage falls below 4.5 V and power supply monitoring IC finds it. When the voltage rises above 4.7 V, power supply to MPU and peripheral circuit starts again.

3.3 MPU Power Supply

This reference board has a function to monitor voltages consumed by two RZ/T2Ls (3.3V, 1.8V, 1.1V), using power supply monitoring IC. Both high and low voltage thresholds are monitored.

Figure 3.3.1 shows configuration of MPU power supply monitoring.

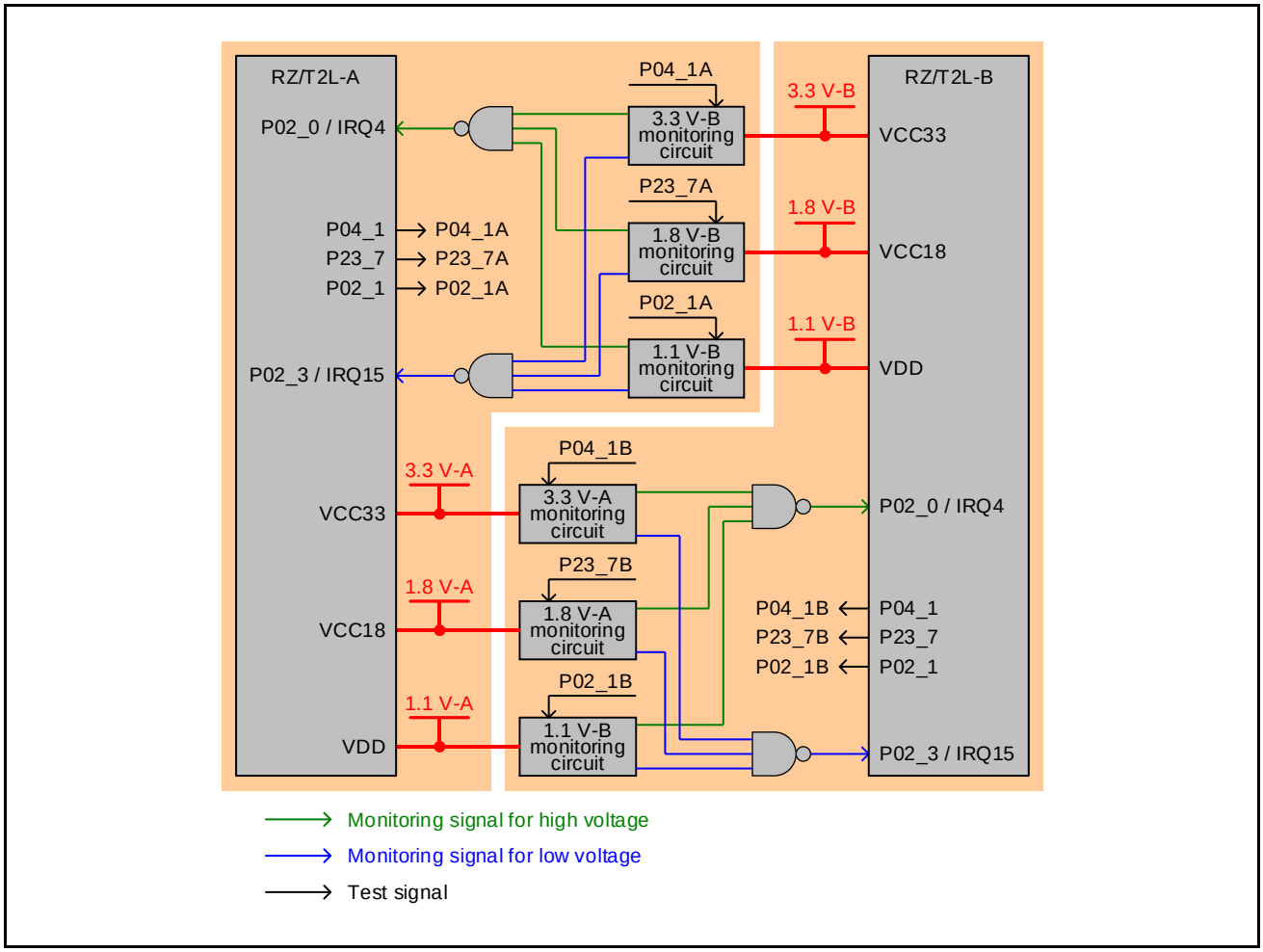


Figure 3.3.1 Configuration of MPU Power Supply Monitoring

Signal level is "H" when output voltage is normal, "L" when abnormal. As monitoring signal is processed at NAND gate, when the voltage is abnormal, "H" level is input to voltage monitoring port (P02_0, P02_3).

This board has a function to change the voltage to be monitored via RZ/T2L general-purpose ports (P04_1 / P23_7 / P02_1) to cause output signal from voltage monitoring circuit to change to "L" level. This allows user to detect output signal fault (i.e. stuck-at and short). Table 3.3.1 to Table 3.3.3 shows output values of voltage monitoring circuit.

Table 3.3.1 3.3 V Voltage Monitoring Circuit Output Values

	電圧値	3.3 V power supply monitoring circuit output value	
		During Normal operation (P04_1 = "L")	During test (P04_1 = "H")
High voltage monitoring signal	3.55 V	L	L
	3.40 V	L or H *	L
	: Normal range :	H	L
Low voltage monitoring signal	: Normal range :	H	L
	3.20 V	L or H *	L
	3.05 V	L	L

*: Output may vary depending on part precision and environmental conditions (e.g. temperature).

Table 3.3.2 1.8 V Voltage Monitoring Circuit Output Values

	電圧値	1.8 V power supply monitoring circuit output value	
		During normal operation (P23_7 = "L")	During test (P23_7 = "H")
High voltage monitoring signal	2.00 V	L	L
	1.90 V	L or H *	L
	: Normal range :	H	L
Low voltage monitoring signal	: Normal range :	H	L
	1.75 V	L or H *	L
	1.65 V	L	L

*: Output may vary depending on part precision and environmental conditions (e.g. temperature).

Table 3.3.3 1.1 V Voltage Monitoring Circuit Output Values

	電圧値	1.1 V power supply monitoring circuit output value	
		During normal operation (P02_1 = "L")	During test (P02_1 = "H")
High voltage monitoring signal	1.25 V	L	L
	1.15 V	L or H *	L
	: Normal range :	H	L
Low voltage monitoring signal	: Normal range :	H	L
	1.05 V	L or H *	L
	0.95 V	L	L

*: Output may vary depending on part precision and environmental conditions (e.g. temperature).

3.4 Temperature Sensor

This reference board has a function to monitor board temperature using thermistor (TDK NTCG104BF473FT1X).
Figure 3.4.1 shows the configuration of temperature sensor circuit.

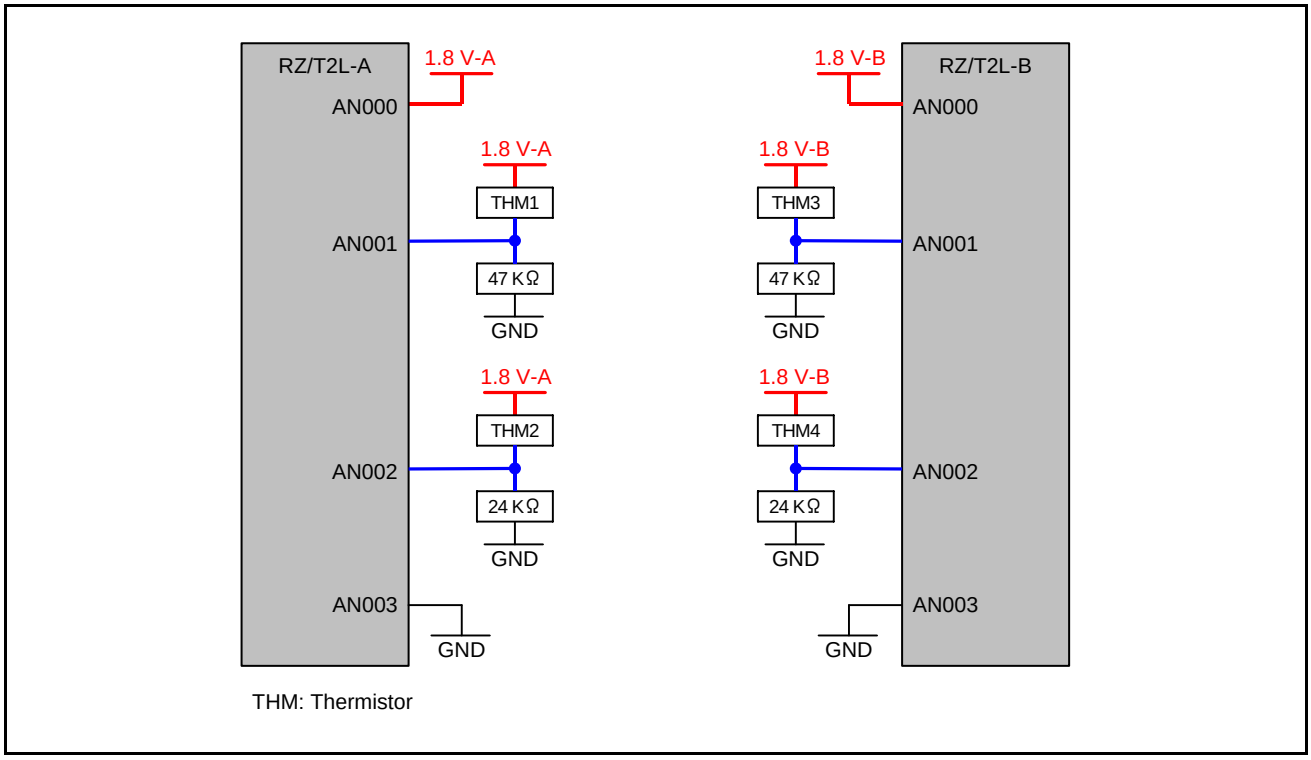


Figure 3.4.1 Temperature Sensor Circuit Configuration

AN000 and AN003 pins on RZ/T2L connect with 1.8 V power supply and GND respectively. The 1.8 V power supply is processed at division circuit (i.e. thermistor and resistor) and then input to AN001 and AN002 pins.

Please refer to data sheet of corresponding product for relationship between thermistor temperature and resistance.

Thermistors connected to RZ/T2L-A (THM1, THM2) are placed side by side on the board to ensure accurate temperature measurement, and the same is applied to thermistors connected to RZ/T2L-B (THM3, THM4).
Given that division circuits on AN001 and AN002 have different resistance, we can detect fault in thermistor and ADC multiplexer circuit by comparing A/D converted temperature of AN001 and AN002.
As AN000 is connected to power supply and AN003 is connected to GND, we can also detect fault in A/D conversion circuit by comparing A/D converted values.

3.5 Signal Connection between RZ/T2Ls

Figure 3.5.1 shows signal connection between RZ/T2Ls on this reference board.

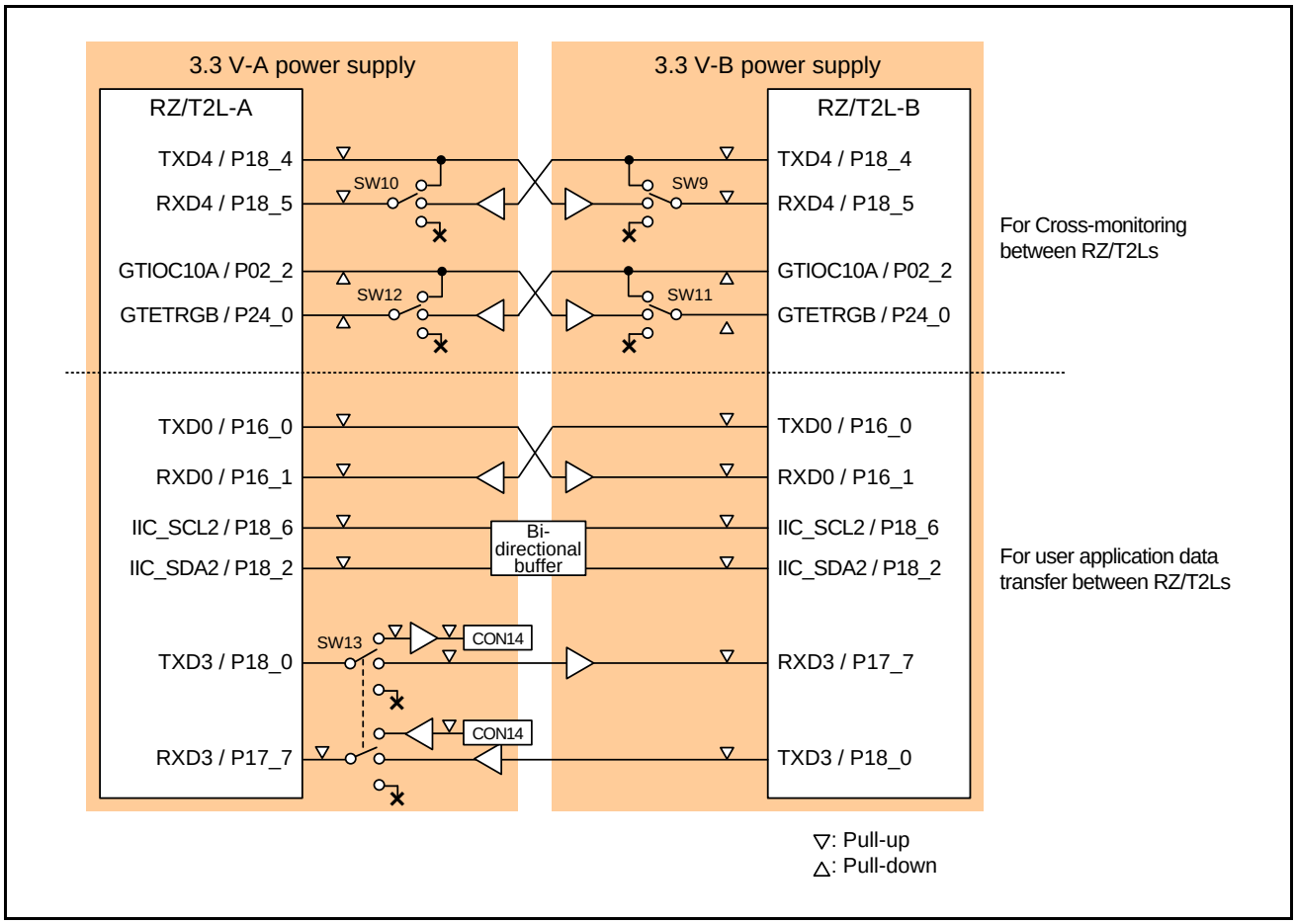


Figure 3.5.1 Signal Connection between RZ/T2L

[Cross-monitoring signal between RZ/T2Ls]

- The following signals are connected between RZ/T2Ls.
  - SCI 1ch. (TxD4, RxD4)
  - GPT output (GTIOC10A)
  - GPT input (GTETRGB)
- The following setting options can be selected via switching.
  - Normal: Cross-monitoring signal connected between two RZ/T2Ls
  - Loop-back: Looping back the cross-monitoring signal for software development/evaluation purpose
  - Stack-at: Un-connecting cross-monitoring signal for testing purpose

[User application data transfer signal between RZ/T2Ls]

- The following signals are connected for user application data transfer between RZ/T2Ls.
  - SCI 2ch. (TxD0, RxD0, TxD3, RxD3)
  - I2C 1ch. (IIC_SCL2, IIC_SDA2)
- SCI ch.0 is for safety network protocol processing.
- SCI ch.3 on RZ/T2L-A allows connection with network communication PCB connector via switching.

3.6 Safety Input Circuit

This reference board has a 4-channel safety input circuit compliant with HFT=1 configuration.

Figure 3.6.1 shows the configuration of safety input circuit.

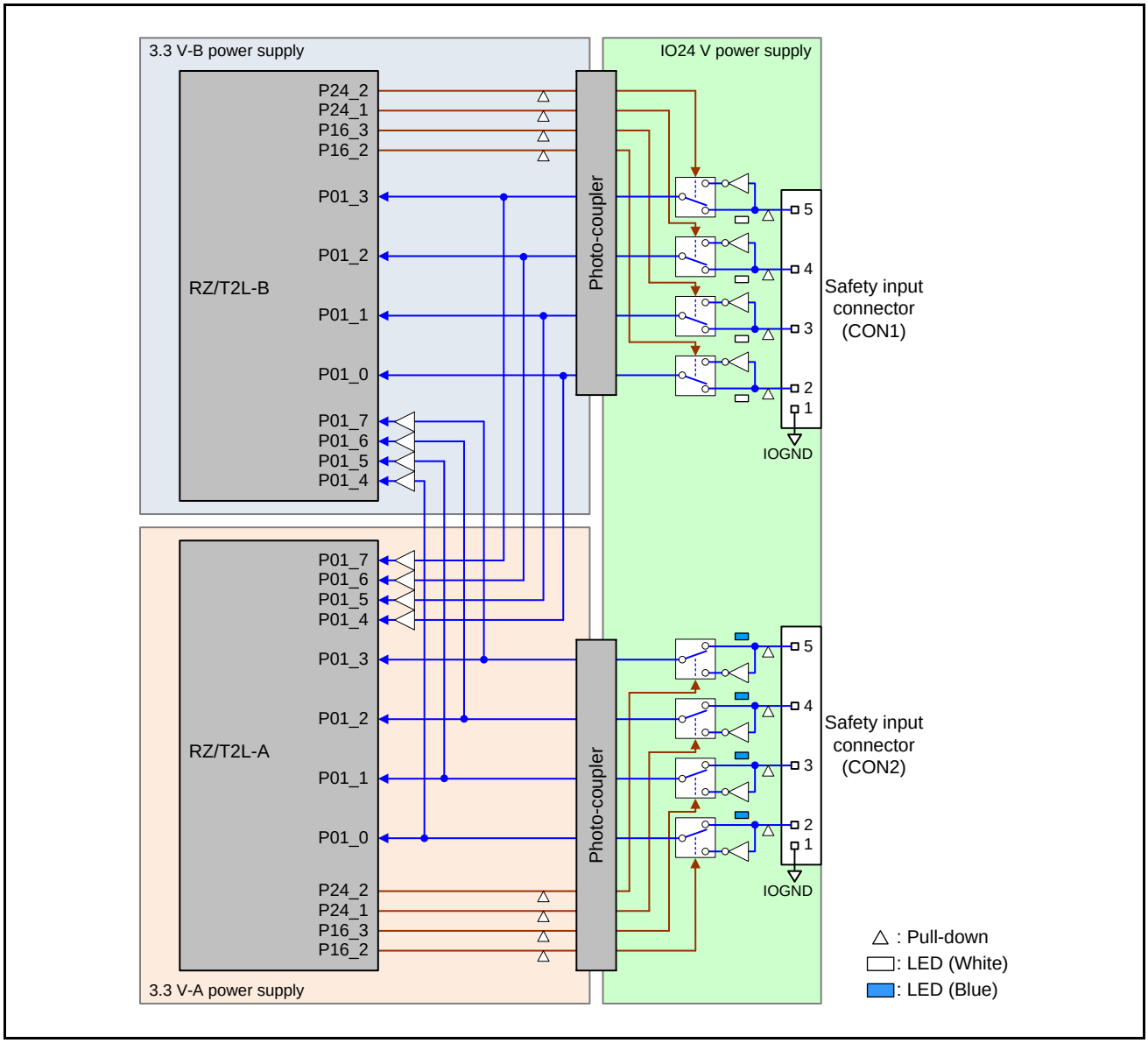


Figure 3.6.1 Safety Input Circuit Configuration

Signal input from the connector is connected to both RZ/T2Ls through photo-coupler. Users can monitor the level of signal input from the connector (H or L) by LED.

During normal operation, outputs of general-purpose ports on RZ/T2L (P24_2 / P24_1 / P16_3 / P16_2) shall be "L" level. Changing output of these ports to "H" inverses the signal input to photo-coupler. This feature allows users to detect safety input signal fault (i.e. stuck-at and short). Note that the connector input level LED stays the same when signal input to photo-coupler is inverted.

Table 3.6.1 shows RZ/T2L port mapping for safety input connector.

Table 3.6.1 RZ/T2L Ports Mapping for Safety Input Connector

Connector		Input port		Output port for testing During normal operation : "L" During test : "H"
		RZ/T2L-A	RZ/T2L-B	
CON1	5-pin	P01_7	P01_3	RZ/T2L-B: P24_2
	4-pin	P01_6	P01_2	RZ/T2L-B: P24_1
	3-pin	P01_5	P01_1	RZ/T2L-B: P16_3
	2-pin	P01_4	P01_0	RZ/T2L-B: P16_2
CON2	5-pin	P01_3	P01_7	RZ/T2L-A: P24_2
	4-pin	P01_2	P01_6	RZ/T2L-A: P24_1
	3-pin	P01_1	P01_5	RZ/T2L-A: P16_3
	2-pin	P01_0	P01_4	RZ/T2L-A: P16_2

[About quick test switch]

Safety input circuit contains switch to pull-up the connector input pin. Using this switch allows input level to be changed when no external sensor or other device is connected to connector. See section 4.2 for detailed specifications of quick test switch.

3.7 Emergency Stop Switch Input Circuit

This reference board provides a 1-ch emergency stop switch input circuit compliant with HFT=1.

Figure 3.7.1 shows configuration of emergency stop switch input circuit.

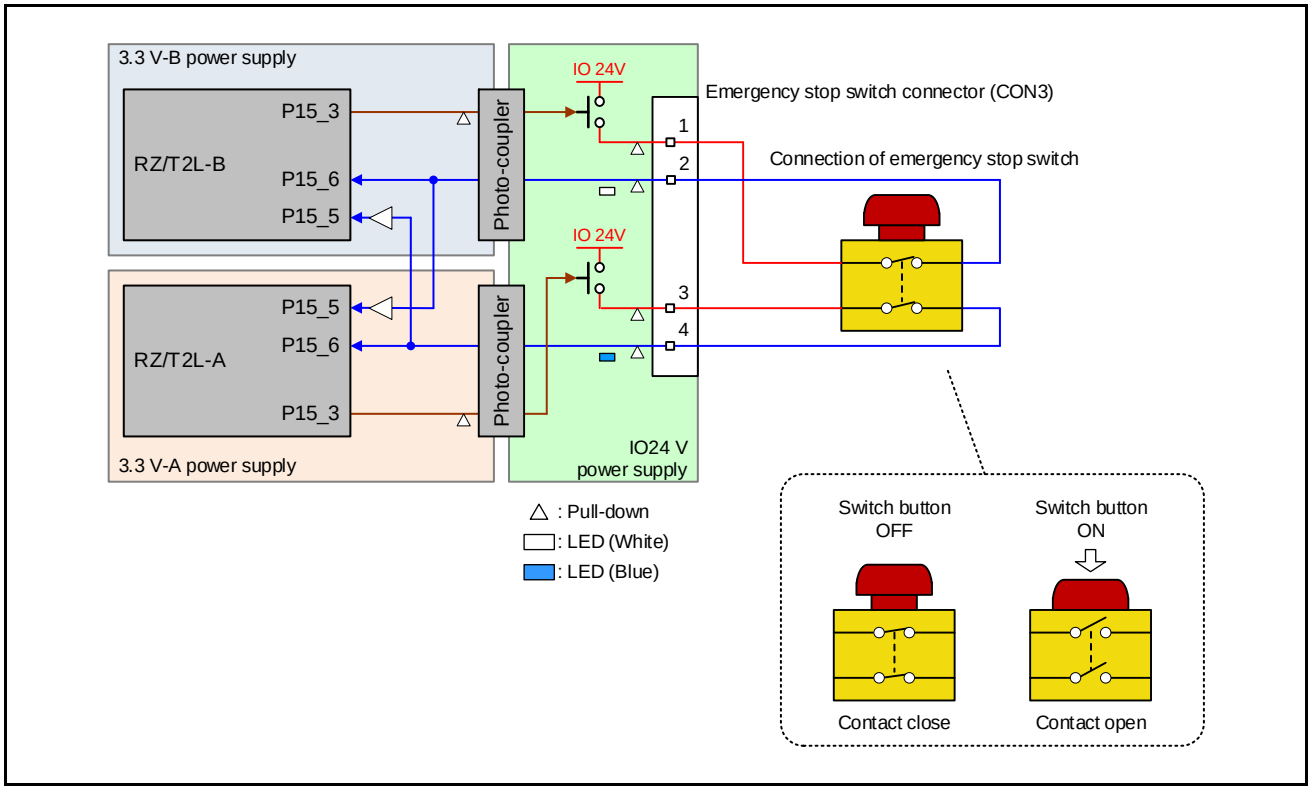


Figure 3.7.1 Configuration of Emergency Stop Switch Input Circuit

When emergency stop switch is turned OFF, "H" level signal output from connector is looped-back and returned to the same connector. When emergency stop switch is turned ON, loop-back is halted and connector input level turns "L".

Signal input from the connector is connected to both RZ/T2Ls through photo-coupler. Users can monitor the level of signal input from the connector (H or L) by LED.

During normal operation, output of general-purpose port on RZ/T2L (P15_3) shall be "H" level. The "H" level signal output from the connector can be stopped by changing output of this port to "L". This feature allows users to detect safety input signal fault of emergency stop switch (i.e. stuck-at and short). Note that the general-purpose port state LED changes along with actual output level of general-purpose port on RZ/T2L (P15_3).

Table 3.7.1 shows RZ/T2L port mapping for emergency stop switch connector.

Table 3.7.1 RZ/T2L Port Mapping for Emergency Stop Switch Connector

Connector		Input port		Output port for testing During normal operation : "H" During test : "L"
		RZ/T2L-A	RZ/T2L-B	
CON3	4-pin	P15_6	P15_5	RZ/T2L-A: P15_3
	2-pin	P15_5	P15_6	RZ/T2L-B: P15_3

[About quick test switch]

Emergency stop switch input circuit contains switch to pull-up the connector input pin. Using this switch allows input level to be changed when no emergency stop switch is connected to connector. See section 4.2 for detailed specifications of quick test switch.

3.8 Safety Output Circuit

The reference board has a 4-channel safety output circuit compliant with HFT=1 configuration.

Figure 3.8.1 shows the configuration of safety output circuit.

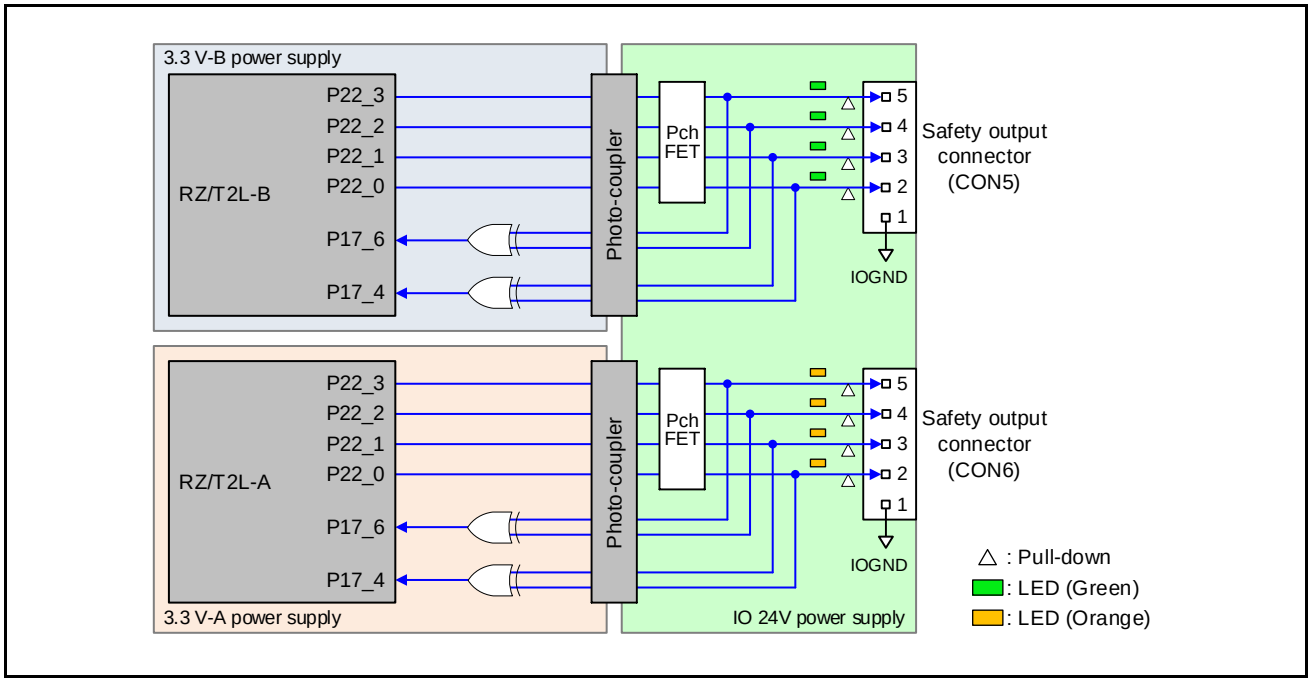


Figure 3.8.1 Safety Output Circuit Configuration

Port output on RZ/T2L is connected to safety output connector through photo-coupler. Users can monitor the level of signal output from the connector (H or L) by LED.

Signals to safety output connector are combined into two pairs, passed through XOR gate, and looped-back to RZ/T2L general-purpose ports (P17_6 / P17_4). This feature allows users to detect safety output signal fault (i.e. stuck-at and short).

Table 3.8.1 shows RZ/T2L port mapping for safety output connector.

Table 3.8.1 RZ/T2L Ports Mapping for Safety Output Connector

Connector		Output port		Input port for testing
		RZ/T2L-A	RZ/T2L-B	
CON5	5-pin	-	P22_3	RZ/T2L-B: P17_6
	4-pin	-	P22_2	
	3-pin	-	P22_1	RZ/T2L-B: P17_4
	2-pin	-	P22_0	
CON6	5-pin	P22_3	-	RZ/T2L-A: P17_6
	4-pin	P22_2	-	
	3-pin	P22_1	-	RZ/T2L-A: P17_4
	2-pin	P22_0	-	

3.9 Non-Safety Input Circuit

This reference board has a 4-channel non-safety input circuit.

Figure 3.9.1 shows the configuration of non-safety input circuit.

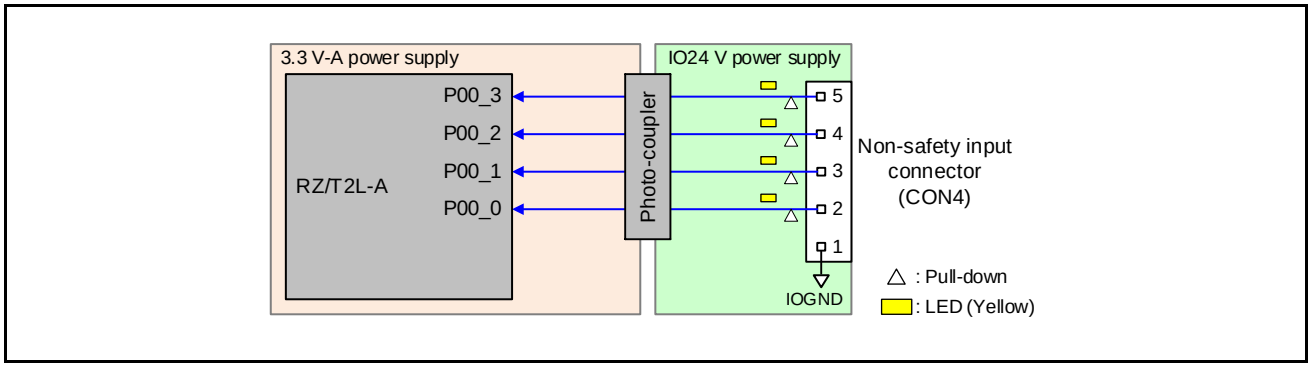


Figure 3.9.1 Non-Safety Input Circuit Configuration

Singal input from the connector is connected to RZ/T2L through photo-coupler. Users can monitor the level of signal input from the connector (H or L) by LED.

Table 3.9.1 shows RZ/T2L port mapping for non-safety output connector.

Table 3.9.1 RZ/T2L Port Mapping for Non-Safety Input Connector

Connector		Input port	
		RZ/T2L-A	RZ/T2L-B
CON4	5-pin	P00_3	-
	4-pin	P00_2	-
	3-pin	P00_1	-
	2-pin	P00_0	-

[About quick test switch]

Non-safety input circuit contains switch to pull-up the connector input pin. Using this switch allows input level to be changed when no external sensor or other device is connected to connector. See section 4.2 for detailed specifications of quick test switch.

3.10 Non-Safety Output Circuit

This reference board has a 4-channel non-safety output circuit.

Figure 3.10.1 shows the configuration of non-safety output circuit.

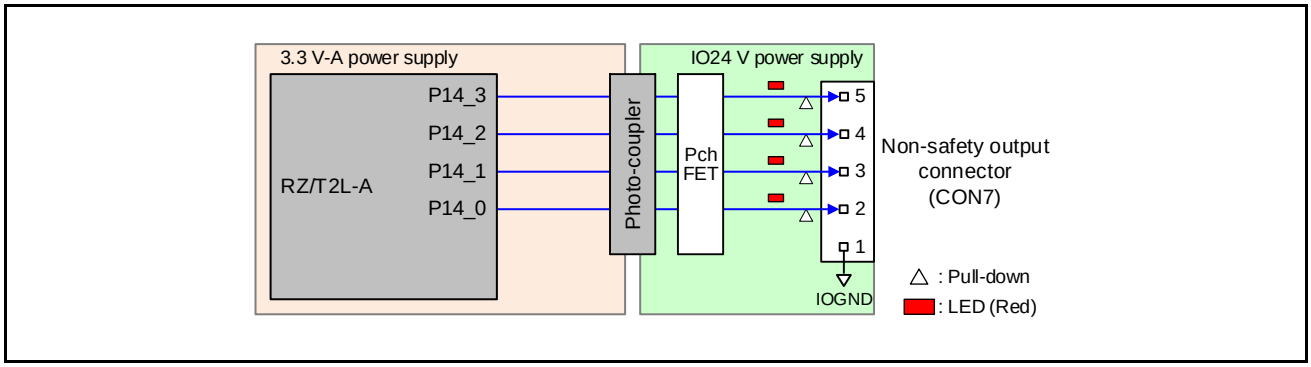


Figure 3.10.1 Non-Safety Output Circuit Configuration

Port output on RZ/T2L is connected to non-safety output connector through photo-coupler. Users can monitor the level of signal output from the connector (H or L) by LED.

Table 3.10.1 shows RZ/T2L port mapping for non-safety output connector.

Table 3.10.1 RZ/T2L Port Mapping for Non-Safety Output Connector

Connector		Output port	
		RZ/T2L-A	RZ/T2L-B
CON7	5-pin	P14_3	-
	4-pin	P14_2	-
	3-pin	P14_1	-
	2-pin	P14_0	-

3.11 EtherCAT

This reference board has a EtherCAT slave communication circuit using RZ/T2L built-in ESC (EtherCAT Slave Controller).

Figure 3.11.1 shows outline of EtherCAT slave communication circuit.

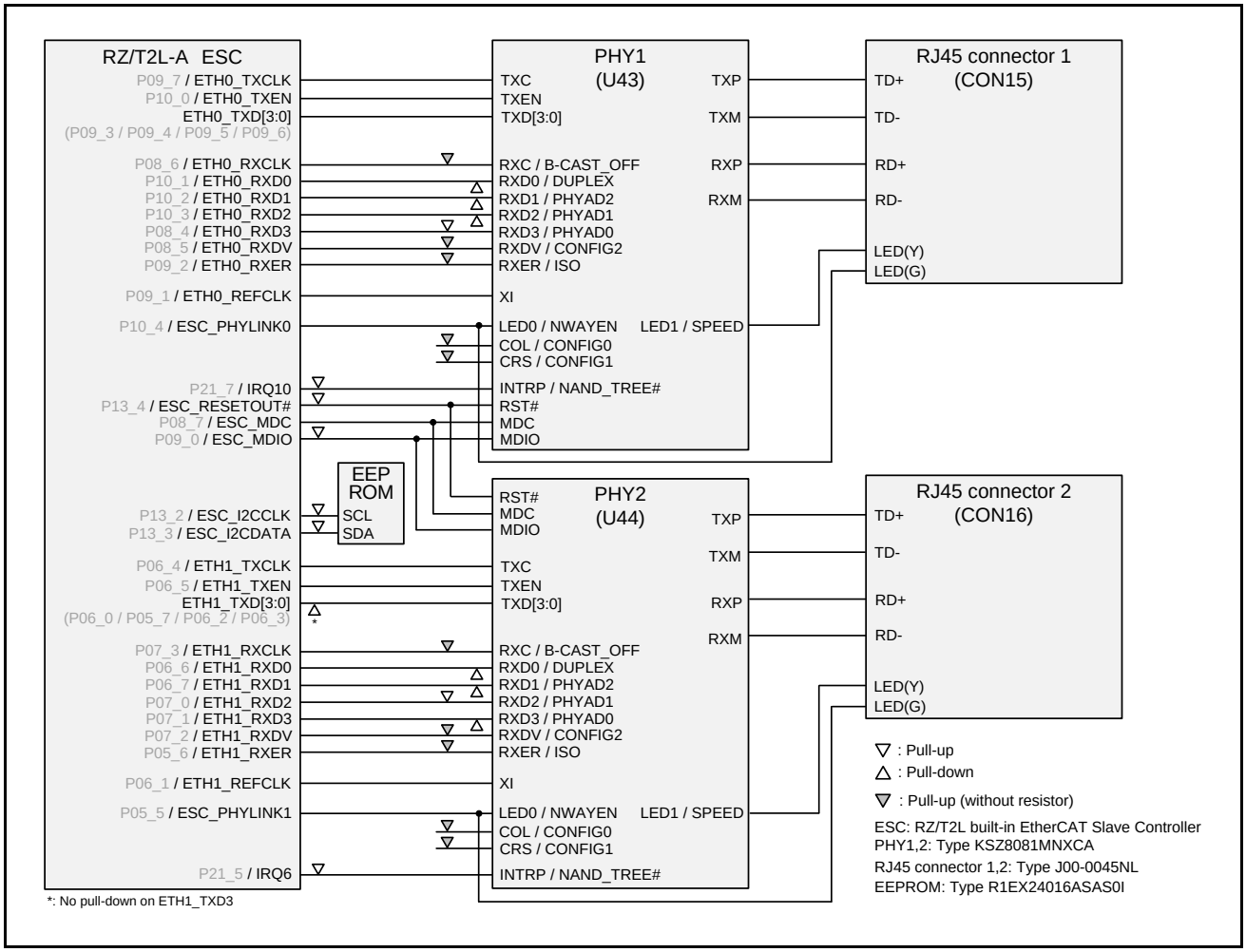


Figure 3.11.1 EtherCAT Slave Communication Circuit

[PHY default setting]

PHY address	: PHY1→1, PHY2→2 (Not changeable from default)
Interface	: MII
ISOLATE mode	: Disable
Transfer rate	: 100 Mbps
Duplexity	: Full-duplex mode
Auto-Negotiation	: Enable

4. Board Components (Connectors/Test Pins/Switches/Jumpers/LEDs)

4.1 Connectors and Test Pins

Figure 4.1.1 shows placement of connectors and test pins on the board.

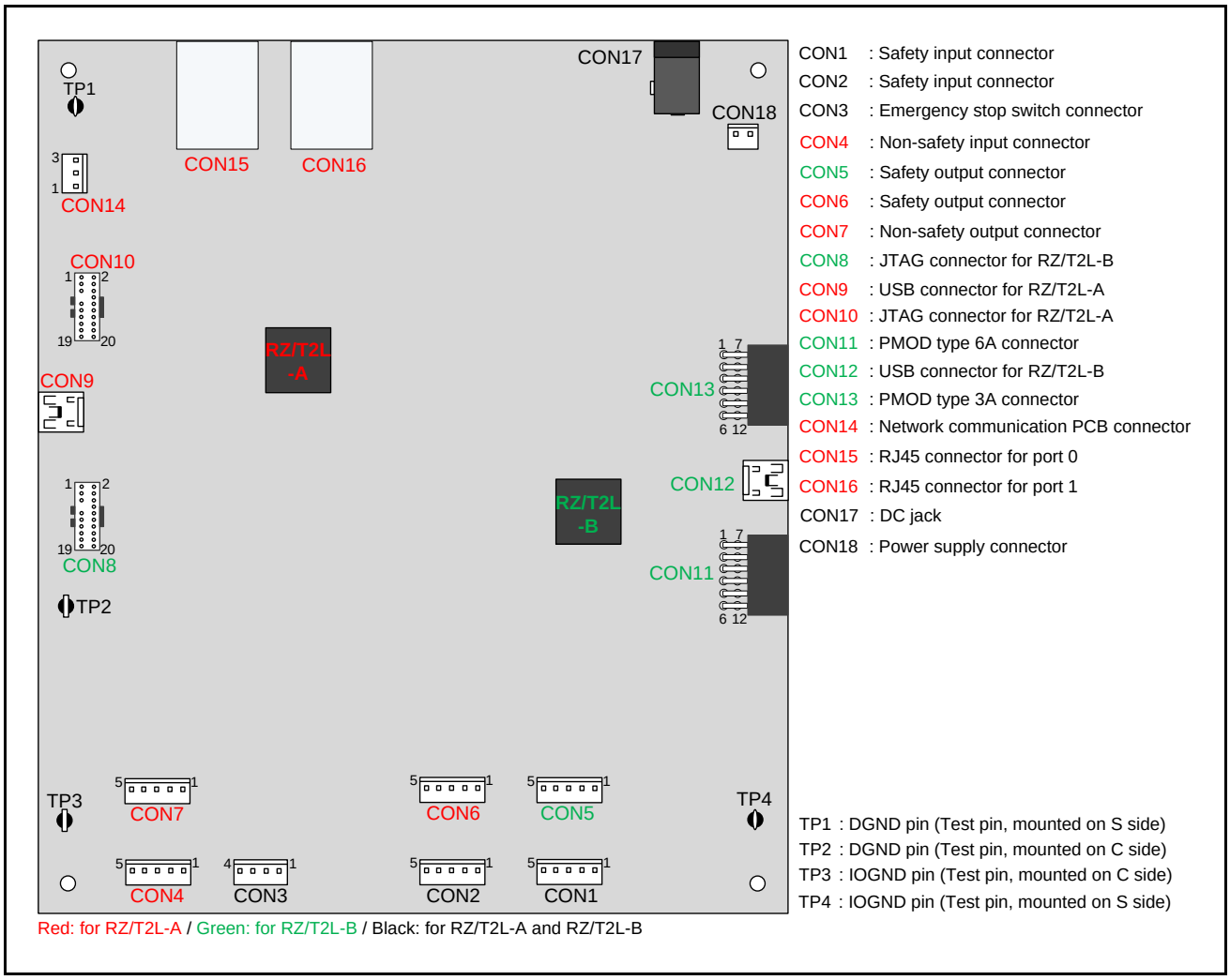


Figure 4.1.1 Functional Safety Reference Board - Connectors and Test Pins (C Side Up)

[Notes on connectors]

1. Do not plug in/out the cables to/from the connectors while power is applied to the reference board.
2. Do not supply the power from IAR Systems I-Jet Emulator to the reference board when connecting I-Jet to CON8 and CON10.
3. When connecting USB cable to CON9 and CON12, plug the cable into the connector on the board first, apply the power to the board, and then plug the cable into PC. When disconnecting USB cable, detach the cable from the PC first, turn the board OFF, and then detach the cable from the board.

Table 4.1.1 to Table 4.1.10 show connector - pin mapping.

- "I" or "O" in the "Direction" column means signal direction on the basis of the reference board (I = input, O = output)
- "I/O" in the "Direction" column shows signal direction differs depending on the board usage or application programs.
- "P.U." and "P.D." in the table stands for pull-up and pull-down respectively. The "-" means no processing is performed.

Table 4.1.1 Pin Mapping for Safety Input Connector (CON1)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	SAFETY_IN4_B	P01_7	P01_3	I	P.D
4	SAFETY_IN3_B	P01_6	P01_2	I	P.D
3	SAFETY_IN2_B	P01_5	P01_1	I	P.D
2	SAFETY_IN1_B	P01_4	P01_0	I	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.2 Pin Mapping for Safety Input Connector (CON2)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	SAFETY_IN4_A	P01_3	P01_7	I	P.D
4	SAFETY_IN3_A	P01_2	P01_6	I	P.D
3	SAFETY_IN2_A	P01_1	P01_5	I	P.D
2	SAFETY_IN1_A	P01_0	P01_4	I	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.3 Pin Mapping for Emergency Stop Switch Connector (CON3)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
4	STOP_SWITCH4_A	P15_6	P15_5	I	P.D
3	STOP_SWITCH3_24V_A	(IO24V)	(IO24V)	O	P.D
2	STOP_SWITCH2_B	P15_5	P15_6	I	P.D
1	STOP_SWITCH1_24V_B	(IO24V)	(IO24V)	O	P.D

Table 4.1.4 Pin Mapping for Non-Safety Input Connector (CON4)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	NSAFETY_IN4_A	P00_3	-	I	P.D
4	NSAFETY_IN3_A	P00_2	-	I	P.D
3	NSAFETY_IN2_A	P00_1	-	I	P.D
2	NSAFETY_IN1_A	P00_0	-	I	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.5 Pin Mapping for Safety Output Connector (CON5)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	SAFETY_OUT4_B	-	P22_3	O	P.D
4	SAFETY_OUT3_B	-	P22_2	O	P.D
3	SAFETY_OUT2_B	-	P22_1	O	P.D
2	SAFETY_OUT1_B	-	P22_0	O	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.6 Pin Mapping for Safety Output Connector (CON6)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	SAFETY_OUT4_A	P22_3	-	O	P.D
4	SAFETY_OUT3_A	P22_2	-	O	P.D
3	SAFETY_OUT2_A	P22_1	-	O	P.D
2	SAFETY_OUT1_A	P22_0	-	O	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.7 Pin Mapping for Non-Safety Output Connector (CON7)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
5	NSAFETY_OUT4_A	P14_3	-	O	P.D
4	NSAFETY_OUT3_A	P14_2	-	O	P.D
3	NSAFETY_OUT2_A	P14_1	-	O	P.D
2	NSAFETY_OUT1_A	P14_0	-	O	P.D
1	IOGND	(IOGND)	(IOGND)	-	-

Table 4.1.8 Pin Mapping for PMOD Type 6A Connector (CON11)

No.	Connector pin	Pin on RZ/T2L-B	Direction	P.U./P.D.	No.	Connector pin	Pin on RZ/T2L-B	Direction	P.U./P.D.
1	NC	-	-	-	7	P13_7_B	P13_7	I/O	-
2	NC	-	-	-	8	P13_6_B	P13_6	I/O	-
3	IIC_SCL0_B	P13_2 (IIC_SCL0)	I/O	P.U	9	P13_5_B	P13_5	I/O	-
4	IIC_SDA0_B	P13_3 (IIC_SDA0)	I/O	P.U	10	P13_4_B	P13_4	I/O	-
5	DGND	-	-	-	11	DGND	-	-	-
6	VDD3.3V_B	-	O	-	12	VDD3.3V_B	-	O	-

Table 4.1.9 Pin Mapping for PMOD Type 3A Connector (CON13)

No.	Connector pin	Pin on RZ/T2L-B	Direction	P.U./P.D.	No.	Connector pin	Pin on RZ/T2L-B	Direction	P.U./P.D.
1	CTS5#_B	P21_5 (CTS5#)	I/O	-	7	P07_3_B	P07_3	I/O	-
2	TXD5_B	P21_3 (TXD5)	I/O	-	8	P07_2_B	P07_2	I/O	-
3	RXD5_B	P21_2 (RXD5)	I/O	-	9	P07_1_B	P07_1	I/O	-
4	RTS5#_B	P21_4 (RTS5#)	I/O	-	10	P07_0_B	P07_0	I/O	-
5	DGND	-	-	-	11	DGND	-	-	-
6	VDD3.3V_B	-	O	-	12	VDD3.3V_B	-	O	-

Table 4.1.10 Pin Mapping for Network Communication PCB Connector (CON14)

No.	Connector pin	Pin on RZ/T2L-A	Pin on RZ/T2L-B	Direction	P.U./P.D.
3	CON_TXD_A	P18_0 (TXD3)	-	O	P.U
2	CON_RXD_A	P17_7 (RXD3)	-	I	P.U
1	DGND	(DGND)	-	-	-

[Notes on cables]

This product contains power supply cable to be connected to power supply connector (CON18). No other cables are included.

Table 4.1.11 provides reference type numbers for sockets and pin headers for corresponding connectors.

Table 4.1.11 Sockets and Pin Headers

CON	Connector	Socket / pin header	
		Type number	Manufacturer
1, 2	Safety input connector	H5P-SHF-AA	JST
3	Emergency stop switch connector	H4P-SHF-AA	JST
4	Non-safety input connector	H5P-SHF-AA	JST
5, 6	Safety output connector	H5P-SHF-AA	JST
7	Non-safety output connector	H5P-SHF-AA	JST
8, 10	JTAG connector	IAR Systems I-jet MIPI-20pin	
9, 12	USB connector	Mini-B standard product	
11, 13	PMOD connector	TSW-106-08-L-D-RA	Samtec
14	Network communication PCB connector	H3P-SHF-AA	JST
15, 16	RJ45 connector	RJ45 (Plug) standard product	
17	DC jack	See Figure 1.3.1	

[Notes on test pins]

GND test pins (TP1 / TP2) are placed on the left end of the PCB. TP2 is implemented on C side and TP1 on S side. IOGND test pins (TP3 / TP4) are placed on the right and left ends of the PCB. TP3 is implemented on C side, and TP4 on S side.

4.2 Switch

Figure 4.2.1 shows placement of switches on the board.

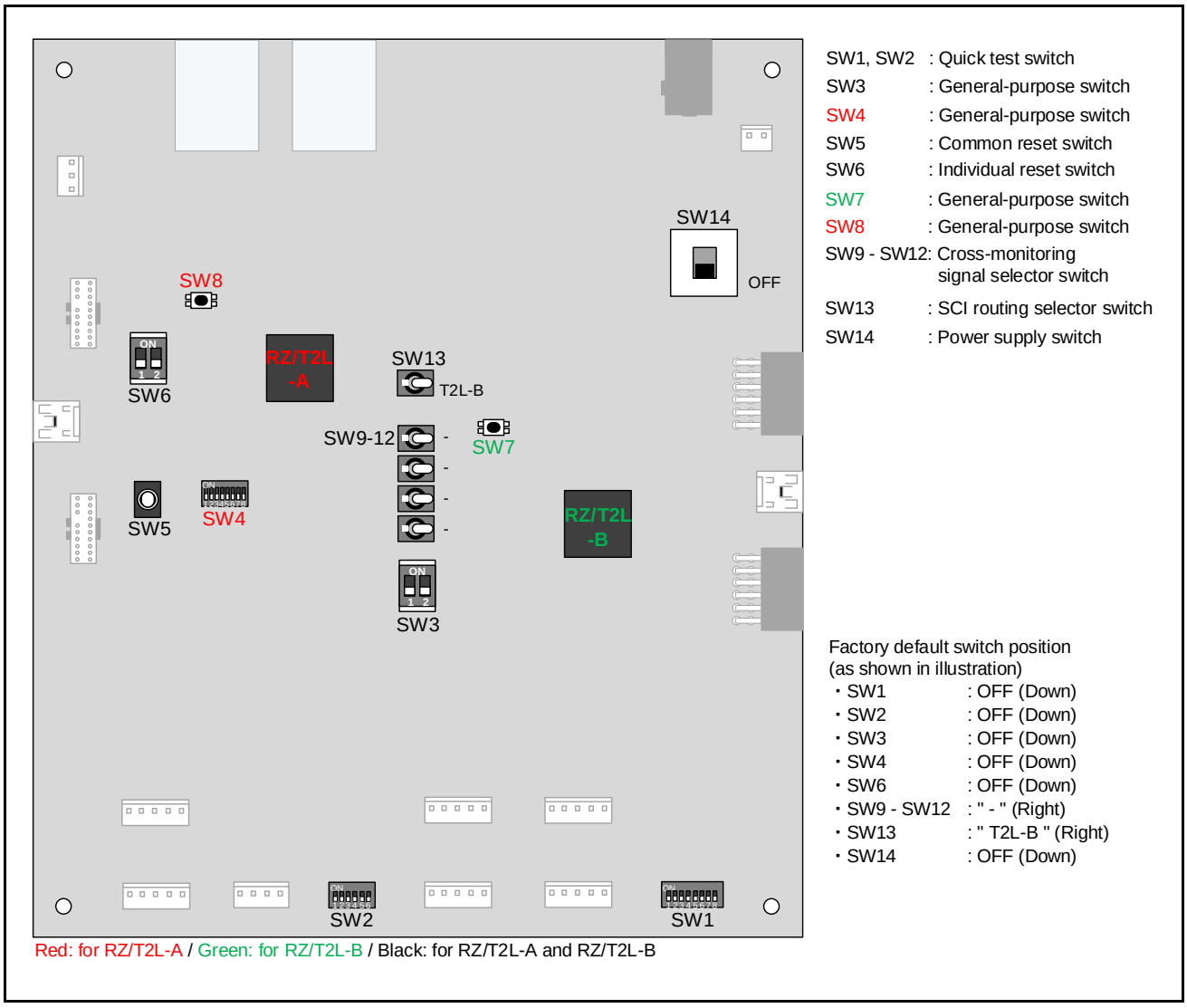


Figure 4.2.1 Functional Safety Reference Board - Switches (C Side Up)

[Power supply switch: SW14]

The power supply switch (SW14) turns on/off the power supplied from DC jack (CON17) or power supply connector (CON18) to the reference board.

[Reset: SW5, SW6]

This reference board has synchronous and individual reset switches. Synchronous reset switch resets both RZ/T2Ls at once while each individual reset switch resets the corresponding RZ/T2L separately.

Pressing down SW5 resets both RZ/T2Ls at once. After releasing the pressing, the reset state will be released in a given time.

SW6-1 resets RZ/T2L-A and SW6-2 resets RZ/T2L-B. Turning the switch ON resets the corresponding RZ/T2L. SW6 is slider dip switch, so reset state can be maintained.

Reset LED (LED27 and LED28) illuminate when synchronous and individual resets are performed.

[General-purpose switch: SW3, SW4]

SW3 is a 2-bit slide switch assumed to be used for FSoE slave address setting. The state of SW3 can be monitored on input ports on both RZ/T2L.

SW4 is an 8-bit slide switch assumed to be used as EtherCAT ID setting switch. The state of SW4 can be monitored on input port of RZ/T2L-A.

Table 4.2.1 shows RZ/T2L input port mapping for SW3 and SW4.

Table 4.2.1 RZ/T2L Input Port Mapping for SW3 and SW4

Switch		Input port		Input signal level
		RZ/T2L-A	RZ/T2L-B	
SW3	1	P17_3	P17_3	Switch OFF = "H" Switch ON = "L"
	2	P17_0	P17_0	
SW4	1	P21_4	-	
	2	P21_2	-	
	3	P21_1	-	
	4	P14_5	-	
	5	P14_4	-	
	6	P13_7	-	
	7	P13_6	-	
	8	P13_5	-	

[General-purpose switch: SW7, SW8]

SW7 and SW8 are push buttons assumed to be used as external interrupt switch for RZ/T2L.

Table 4.2.2 shows RZ/T2L input port mapping for SW7 and SW8.

Table 4.2.2 RZ/T2L Input Port Mapping for SW7 and SW8

Switch	Input port		Input signal level
	RZ/T2L-A	RZ/T2L-B	
SW7	-	P15_4 (IRQ3)	Switch OFF = "H" Switch ON = "L"
SW8	P15_4 (IRQ3)	-	

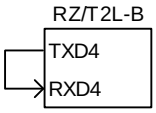
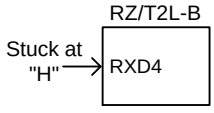
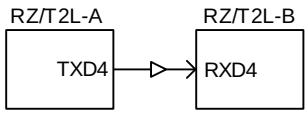
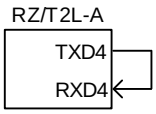
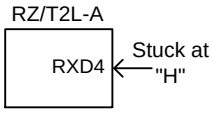
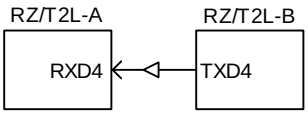
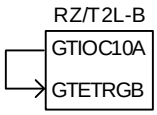
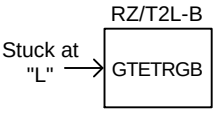
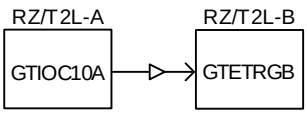
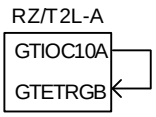
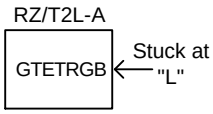
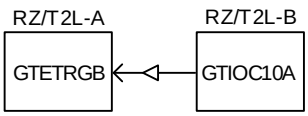
[Cross-monitoring signal selector switch: SW9 - SW12]

SW9 - SW12 allow user to select connection between RZ/T2Ls. The following connection types are available.

- Normal connection
- Pseudo stuck-at fault
- Loop-back connection

Table 4.2.3 shows settings options of cross-monitoring signal select switches.

Table 4.2.3 Cross-Monitoring Signal Select Switch Setting Options

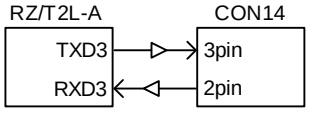
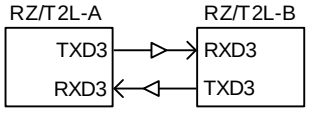
Switch	 Left Silkscreen: "LP-B"	 Center Silkscreen: "F"	 Right Silkscreen: "-"
	Loop-back connection	Pseudo stuck-at fault	Normal connection
SW9			
SW10			
SW11			
SW12			

[SCI routing selector: SW13]

SW13 allows user to select routing of serial port (TXD3, RXD3) on RZ/T2L-A.

Table 4.2.4 shows setting options of SCI routing selector switch.

Table 4.2.4 SCI Routing Selector Switch Setting Options

Switch	 Left Silkscreen: SCI-CON	 Center	 Right Silkscreen: T2L-B
	Connected to: CON14	Connected to: None	Connected to: RZ/T2L-B
SW13		Setting not allowed	

[Quick test switch: SW1, SW2]

SW1 and SW2 allow user to change the level of safety/non-safety input connector (CON1 / CON2 / CON4) and emergency stop switch connector (CON3) to "H" (24 V). These switches enable user to perform quick operation test with different values, without connection. When using this switch, 0 Ω resistor shall be implemented to R575 and R576.

NOTE:
Do not change the switch from "OFF (Down)" for pin in which any signal is input to the connector from outside. If changed, the power supply may short-circuit and permanently damage the reference board.

Table 4.2.5 shows RZ/T2L pins to be connected to SW1 and SW2.

Table 4.2.5 RZ/T2L Pins to Connected to SW1 and SW2

Switch		Connector		Connector description	Input signal level
SW1	1	CON2	5-pin	Safety input connector	Switch OFF = Not applied Switch ON = Apply "H"
	2		4-pin		
	3		3-pin		
	4		2-pin		
	5	CON1	5-pin		
	6		4-pin		
	7		3-pin		
	8		2-pin		
SW2	1	CON4	5-pin	Non-safety input connector	
	2		4-pin		
	3		3-pin		
	4		2-pin		
	5	CON3	4-pin	Emergency stop switch connector	
	6		2-pin		

4.3 Jumper

Figure 4.3.1 shows placement of jumpers on the reference board.

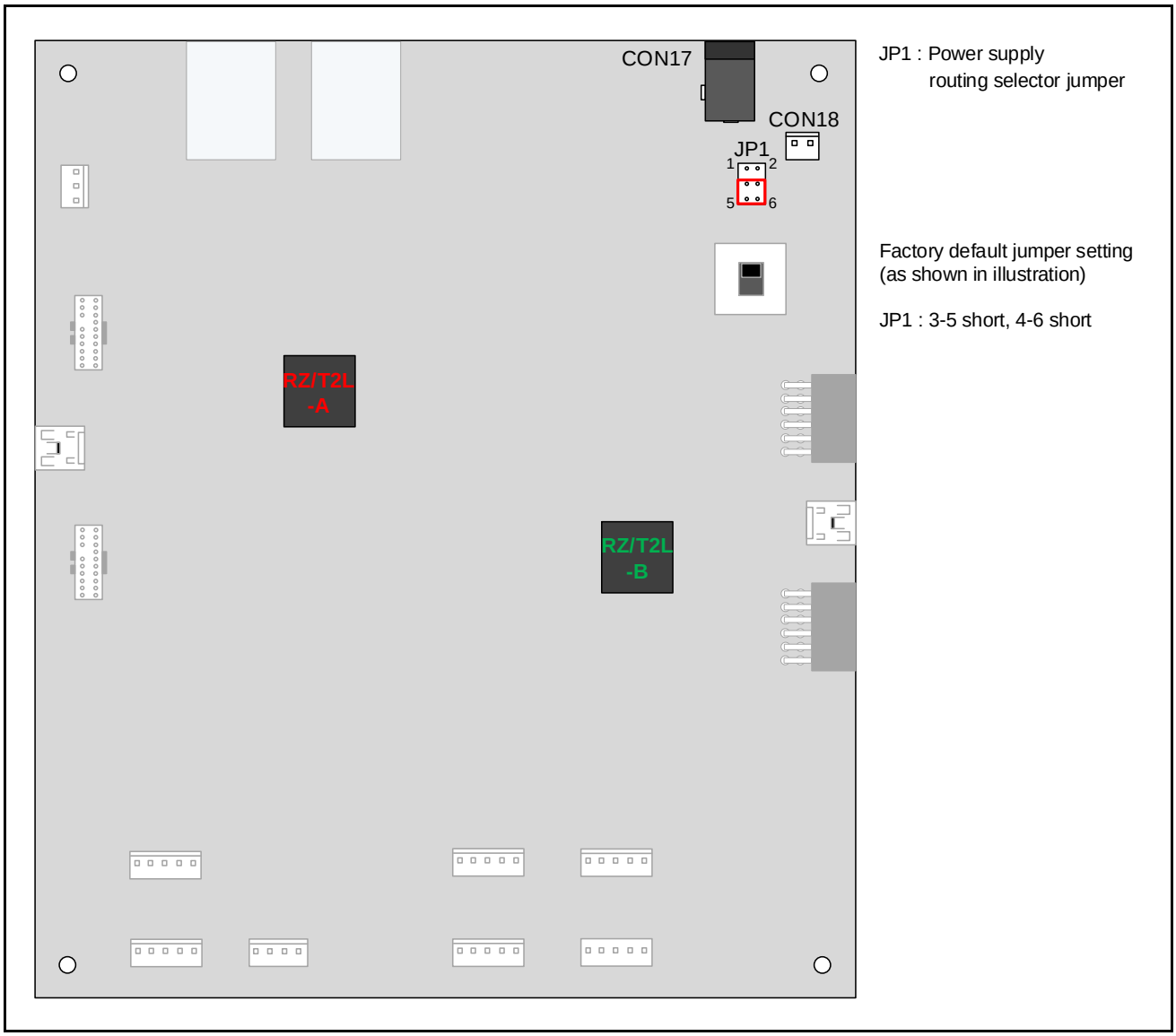


Figure 4.3.1 Functional Safety Reference Board - Jumper Position (C side Up)

[Power supply routing selector jumper: JP1]

JP1 allows user to select method to supply 24 V power.

Table 4.3.1 shows setting options of JP1.

Table 4.3.1 JP1 Setting Options

Setting	Description
1-3 short, 2-4 short	Supplies 24 V from the DC jack (CON17)
3-5 short, 4-6 short	Supplies 24 V from power supply connector (CON18)

4.4 LED

Figure 4.4.1 shows placement of LEDs on the reference board.

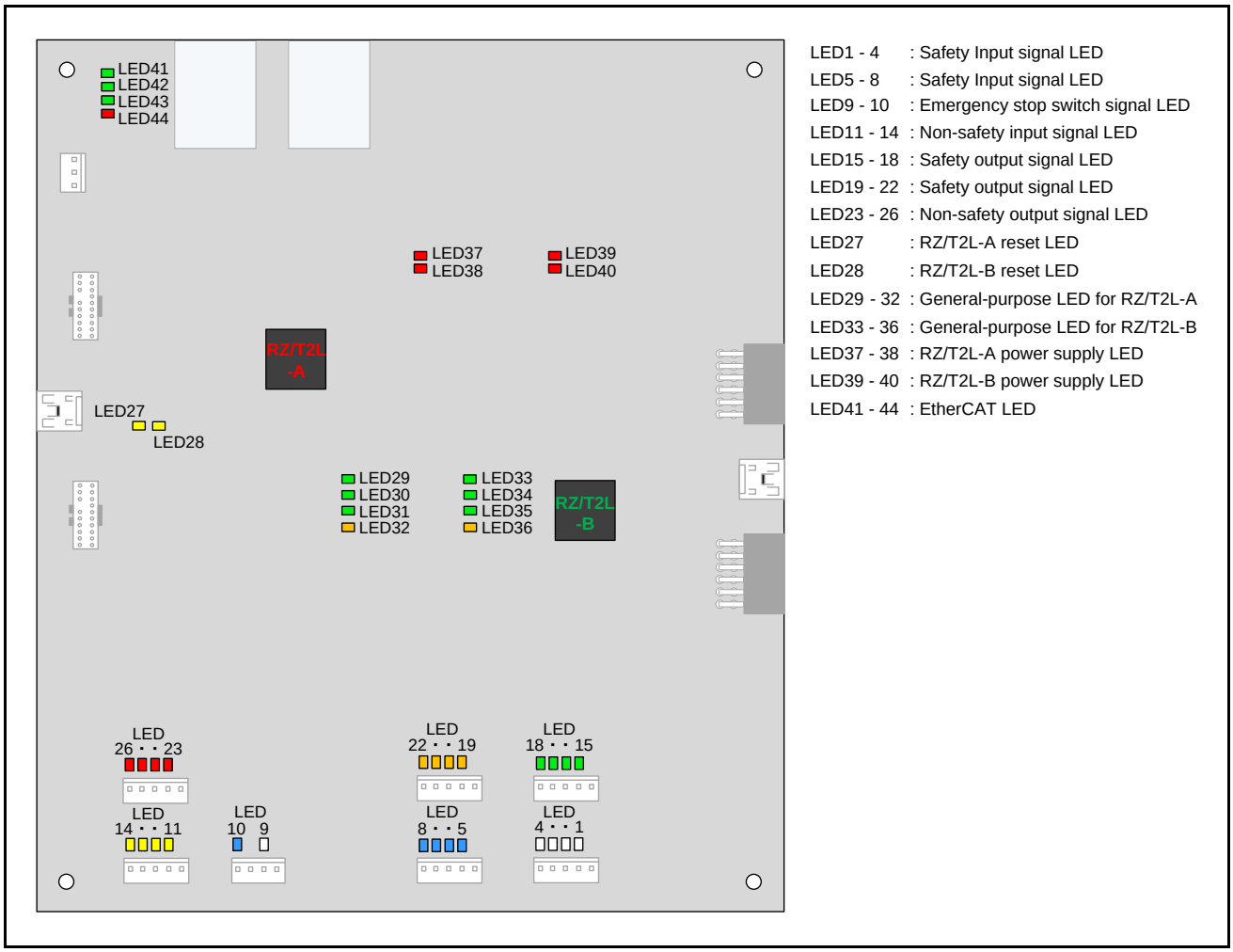


Figure 4.4.1 Functional Safety Reference Board - LED Positions (C Side Up)

Table 4.4.1 shows LED state conditions.

Table 4.4.1 LED Indication on the Reference Board

Application	#	Color	Illuminates when	#	Color	Illuminates when
Safety input signal	LED1	White	24 V applied to CON1: pin 2	LED5	Blue	24 V applied to CON2: pin2
	LED2	White	24 V applied to CON1: pin 3	LED6	Blue	24 V applied to CON2: pin 3
	LED3	White	24 V applied to CON1: pin 4	LED7	Blue	24 V applied to CON2: pin 4
	LED4	White	24 V applied to CON1: pin 5	LED8	Blue	24 V applied to CON2: pin 5
Emergency stop switch signal	LED9	White	24 V applied to CON3: pin 2	LED10	Blue	24 V applied to CON3: pin 4
Non-safety input signal				LED11	Yellow	24 V applied to CON4: pin 2
				LED12	Yellow	24 V applied to CON4: pin 3
				LED13	Yellow	24 V applied to CON4: pin 4
				LED14	Yellow	24 V applied to CON4: pin 5
Safety output signal	LED15	Green	RZ/T2L-B: P22_0 = "H"	LED19	Orange	RZ/T2L-A: P22_0 = "H"
	LED16	Green	RZ/T2L-B: P22_1 = "H"	LED20	Orange	RZ/T2L-A: P22_1 = "H"
	LED17	Green	RZ/T2L-B: P22_2 = "H"	LED21	Orange	RZ/T2L-A: P22_2 = "H"
	LED18	Green	RZ/T2L-B: P22_3 = "H"	LED22	Orange	RZ/T2L-A: P22_3 = "H"
Non-safety output signal				LED23	Red	RZ/T2L-A: P14_0 = "H"
				LED24	Red	RZ/T2L-A: P14_1 = "H"
				LED25	Red	RZ/T2L-A: P14_2 = "H"
				LED26	Red	RZ/T2L-A: P14_3 = "H"
Reset	LED28	Yellow	RZ/T2L-B reset	LED27	Yellow	RZ/T2L-A reset
General-purpose *1	LED33	Green	RZ/T2L-B: P18_1 = "H"	LED29	Green	RZ/T2L-A: P18_1 = "H"
	LED34	Green	RZ/T2L-B: P18_3 = "H"	LED30	Green	RZ/T2L-A: P18_3 = "H"
	LED35	Green	RZ/T2L-B: P00_6 = "H"	LED31	Green	RZ/T2L-A: P00_6 = "H"
	LED36	Orange	RZ/T2L-B: P17_5 = "L"	LED32	Orange	RZ/T2L-A: P17_5 = "L"
Power supply	LED39	Red	Three power supplies output from PMIC on RZ/T2L-B are valid	LED37	Red	Three power supplies output from PMIC on RZ/T2L-A are valid
	LED40	Red		LED38	Red	
EtherCAT *2				LED41	Green	RZ/T2L-A: ESC_LINKACT0 = "H"
				LED42	Green	RZ/T2L-A: ESC_LINKACT1 = "H"
				LED43	Green	RZ/T2L-A: ESC_LEDRUN = "H"
				LED44	Red	RZ/T2L-A: ESC_LEDERR = "H"

*1: LED32 lights on when RZ/T2L-A is in reset state. LED36 lights on when RZ/T2L-B is in reset state.

*2: LED41 - LED44 are controlled by RZ/T2L-A built-in EtherCAT slave controller.

5. Reference Board Data

5.1 Connection Diagrams

- Connection diagrams

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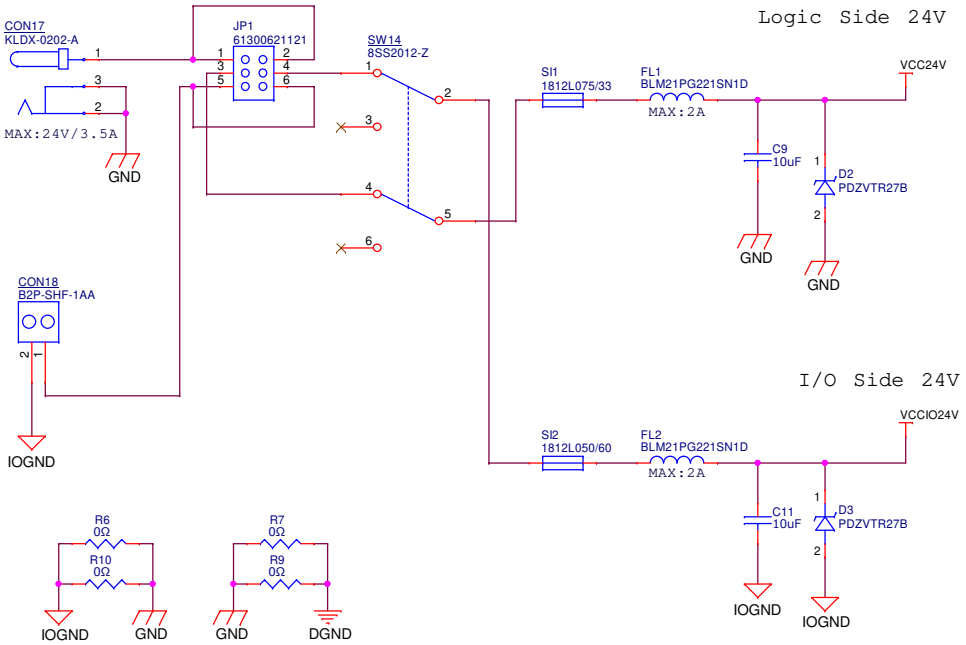
24V POWER SUPPLY



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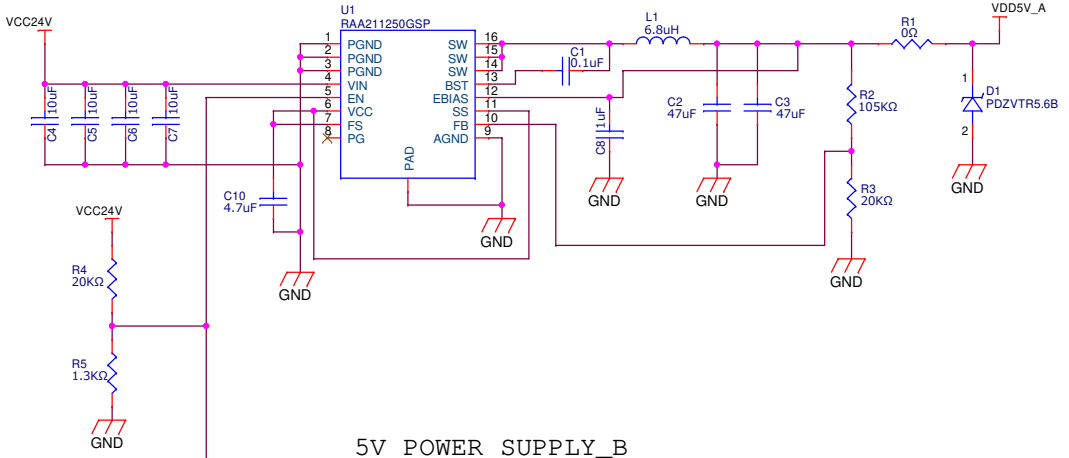

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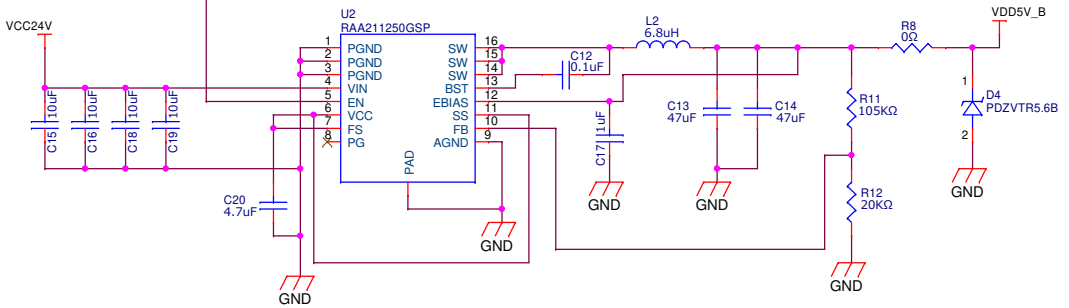
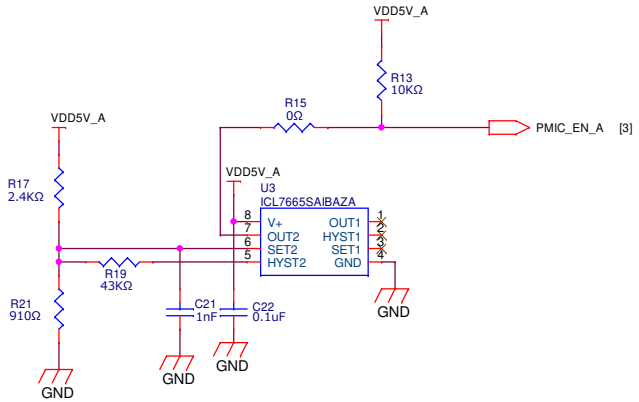


5V MONITOR A



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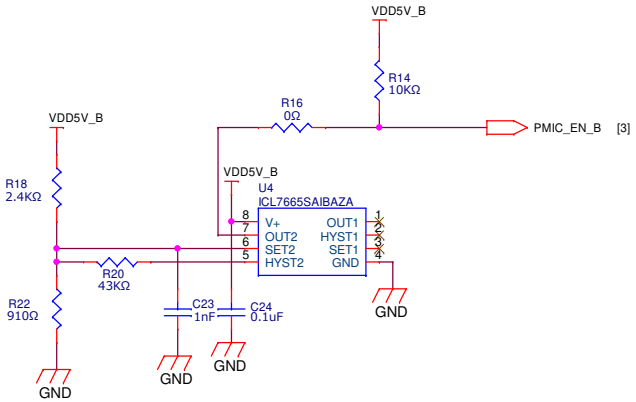

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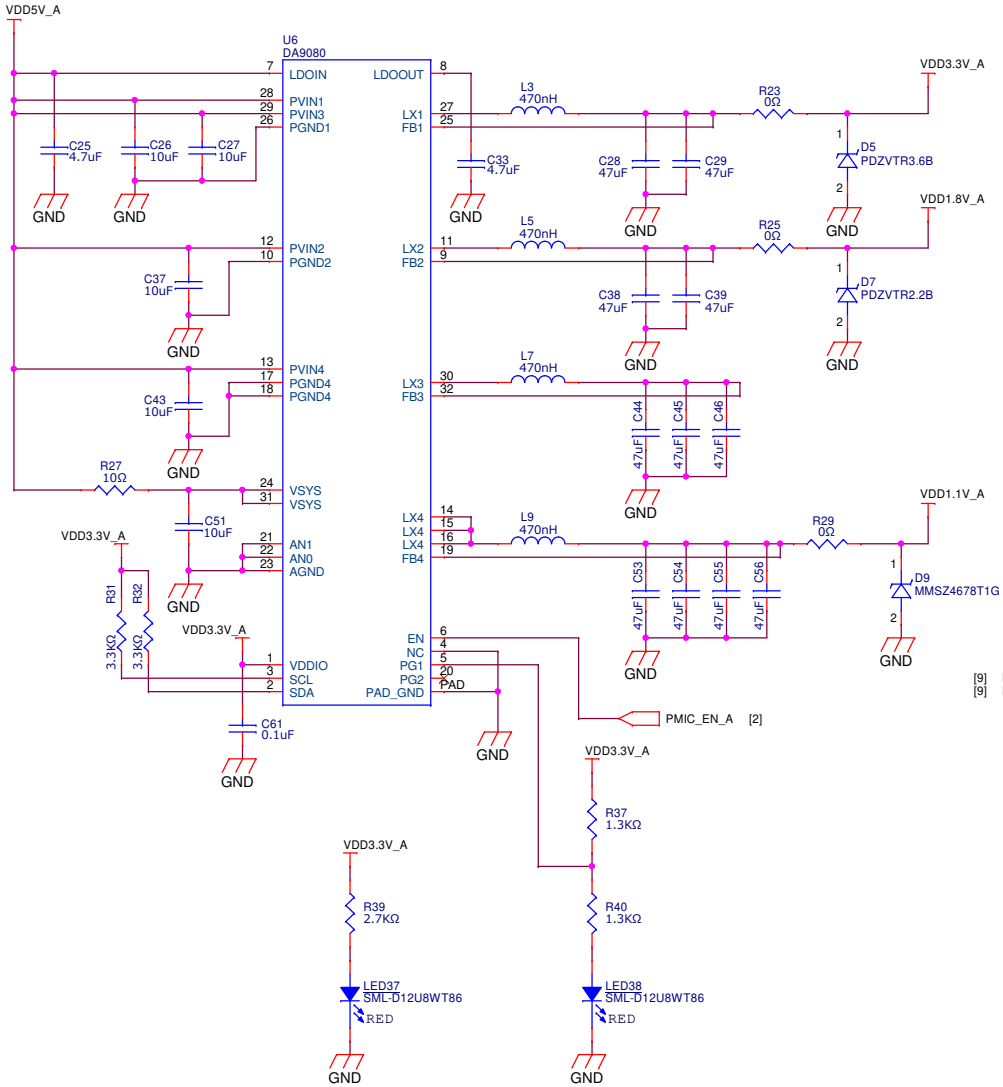

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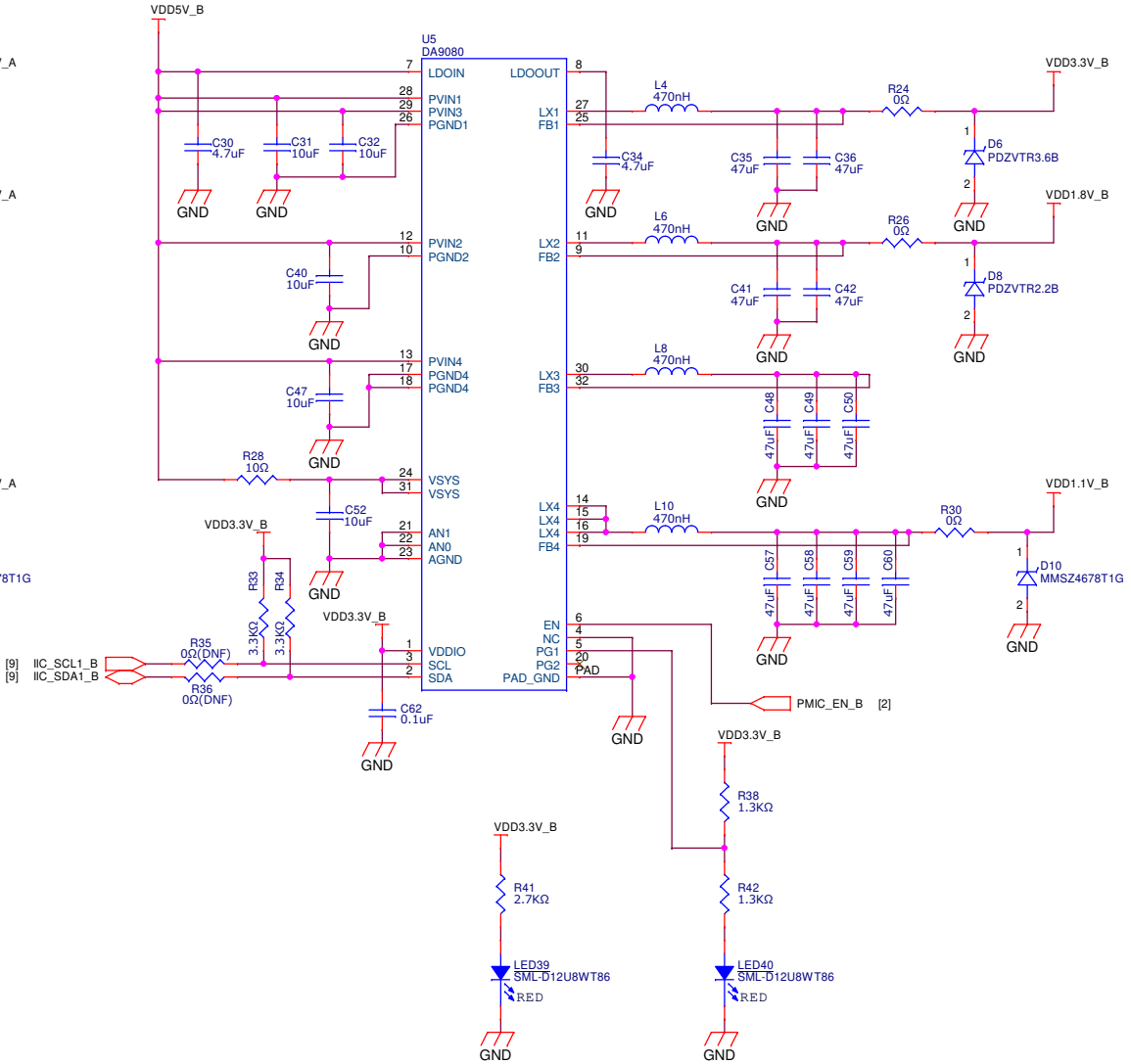

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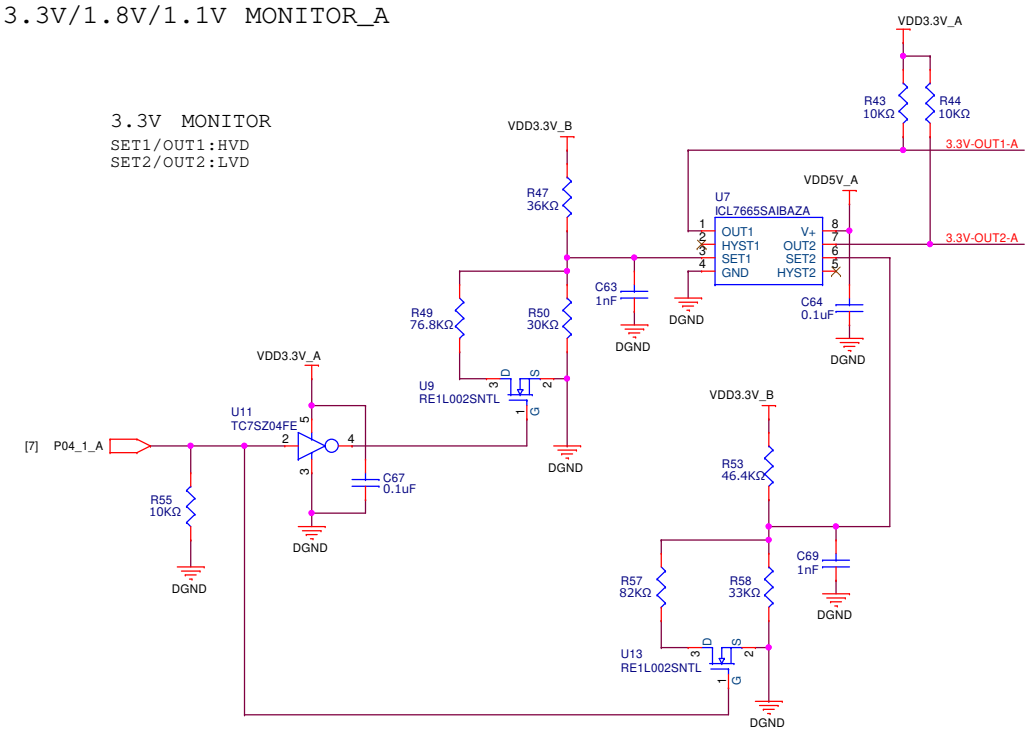

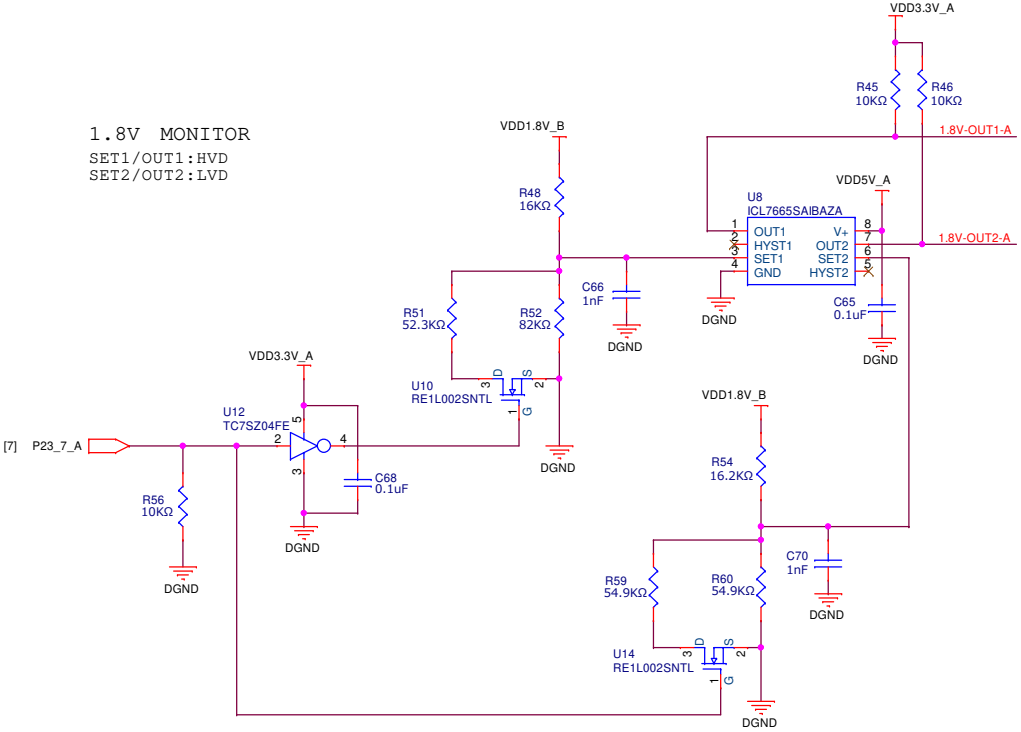

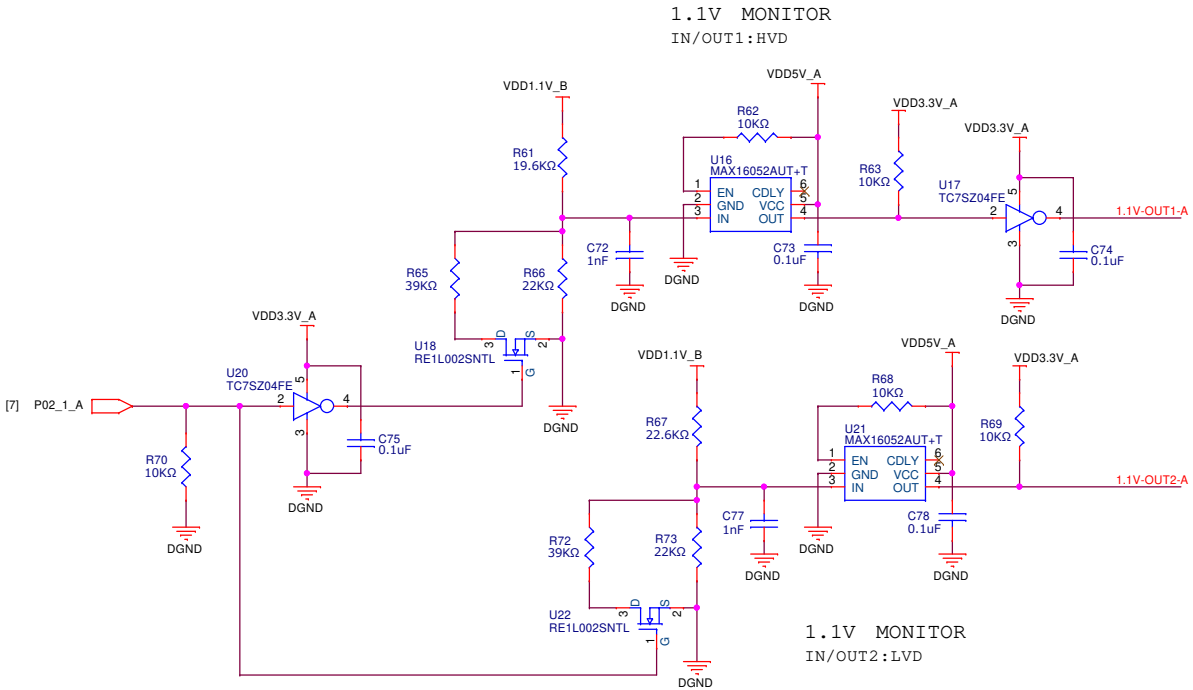

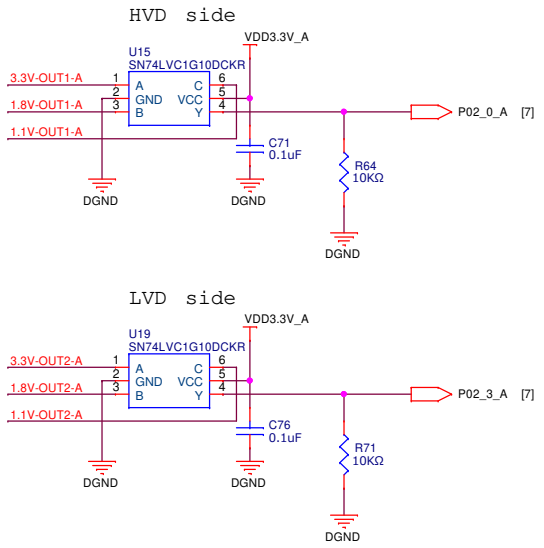

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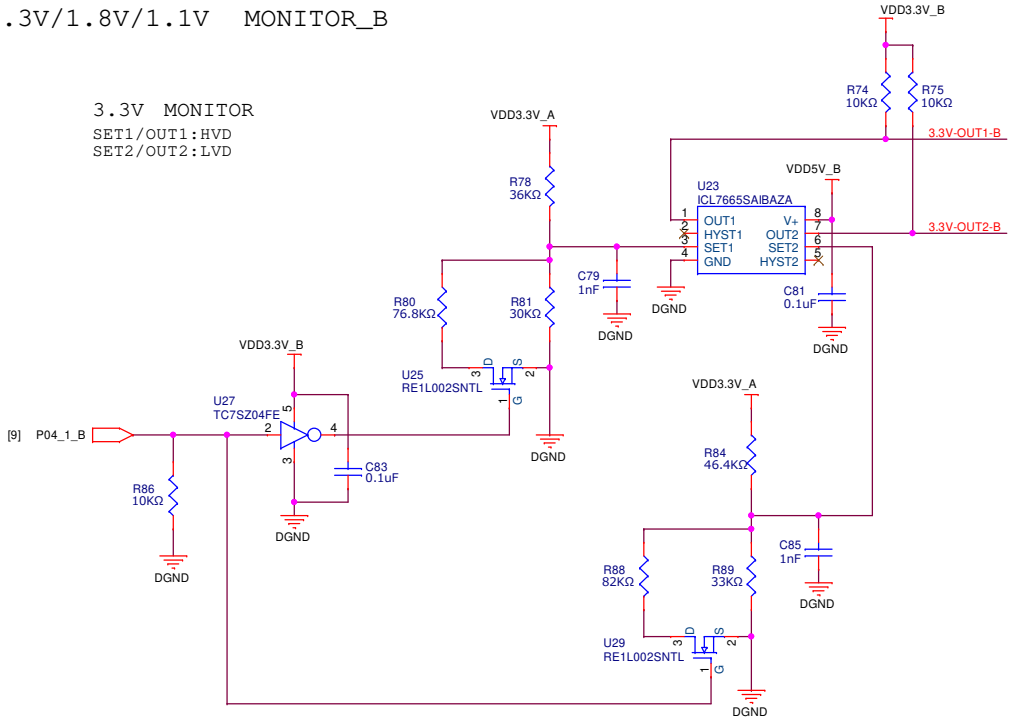

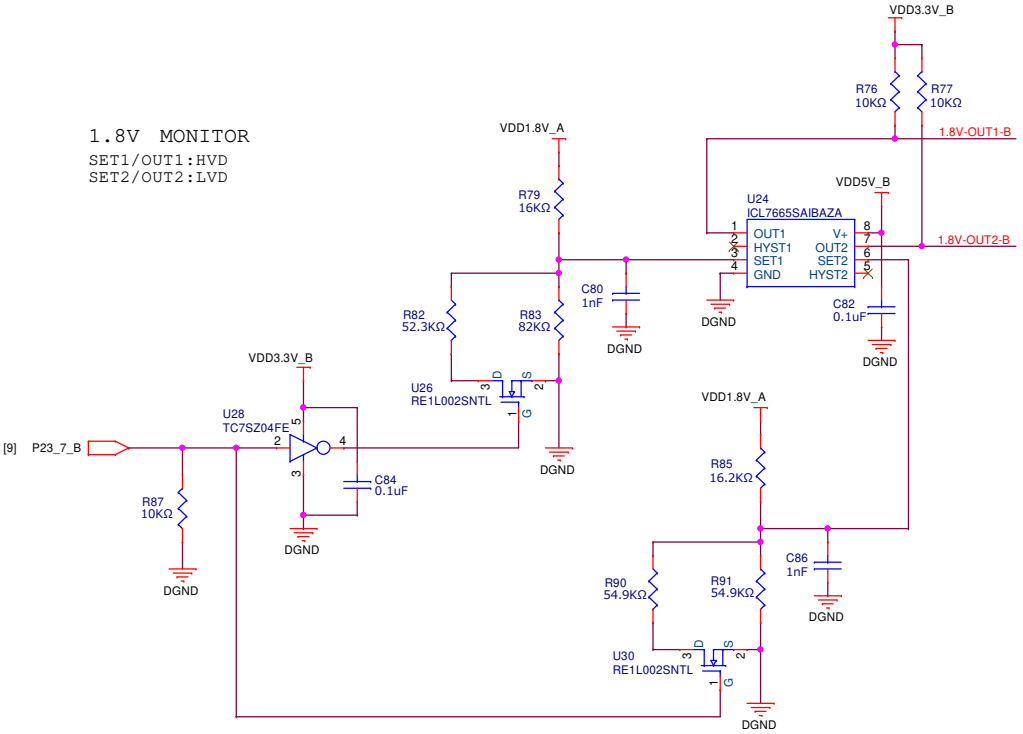

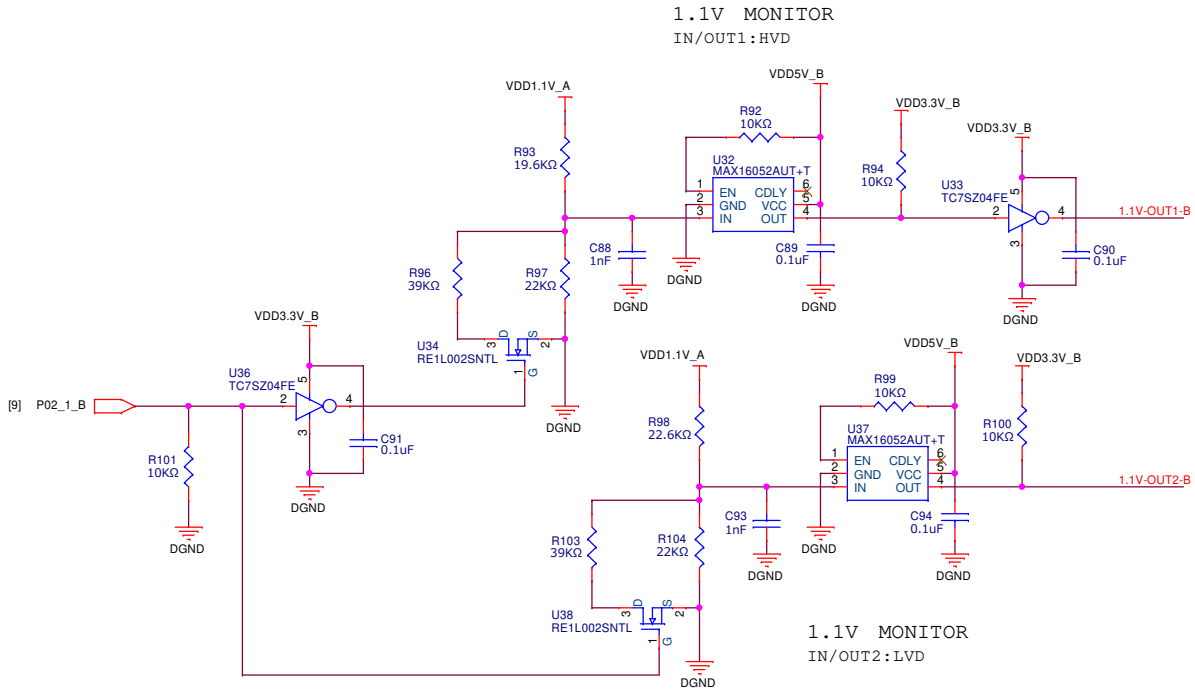

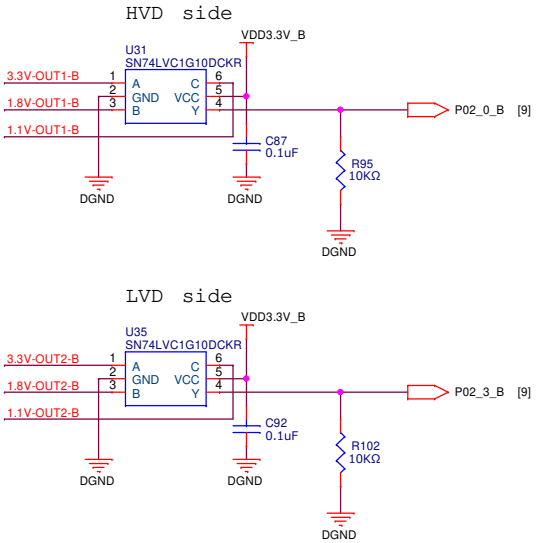

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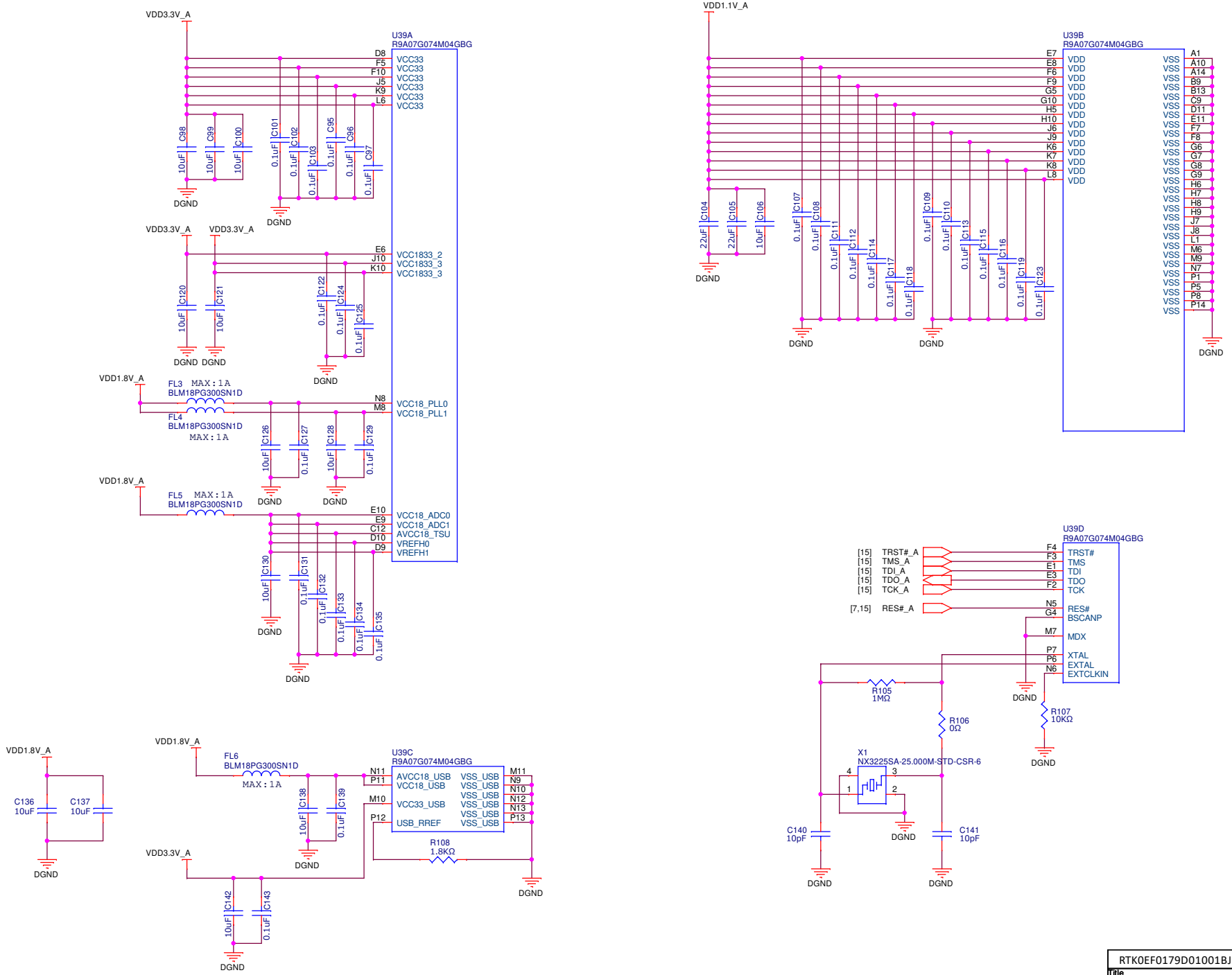
RZ/T2L_A POWER



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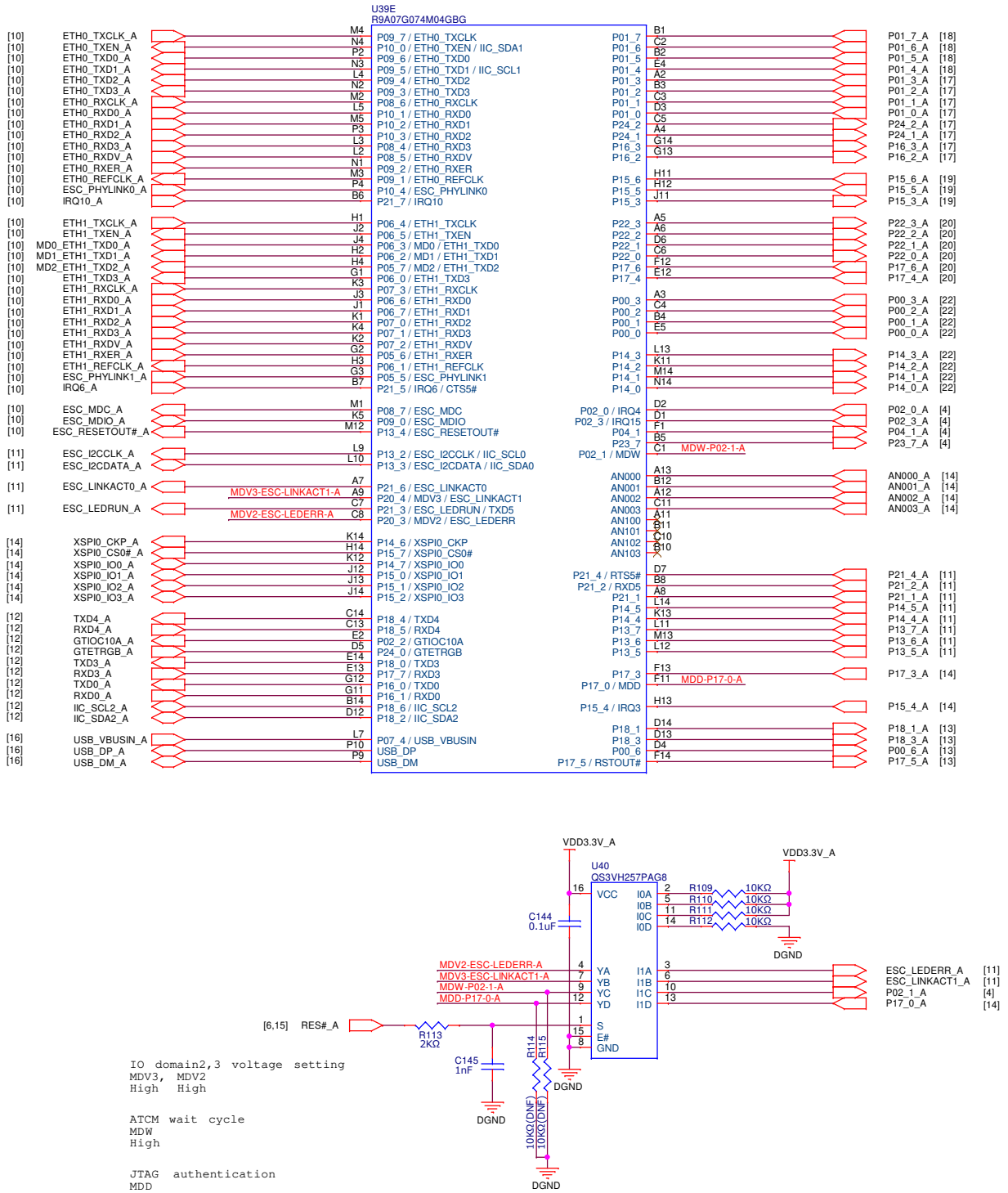

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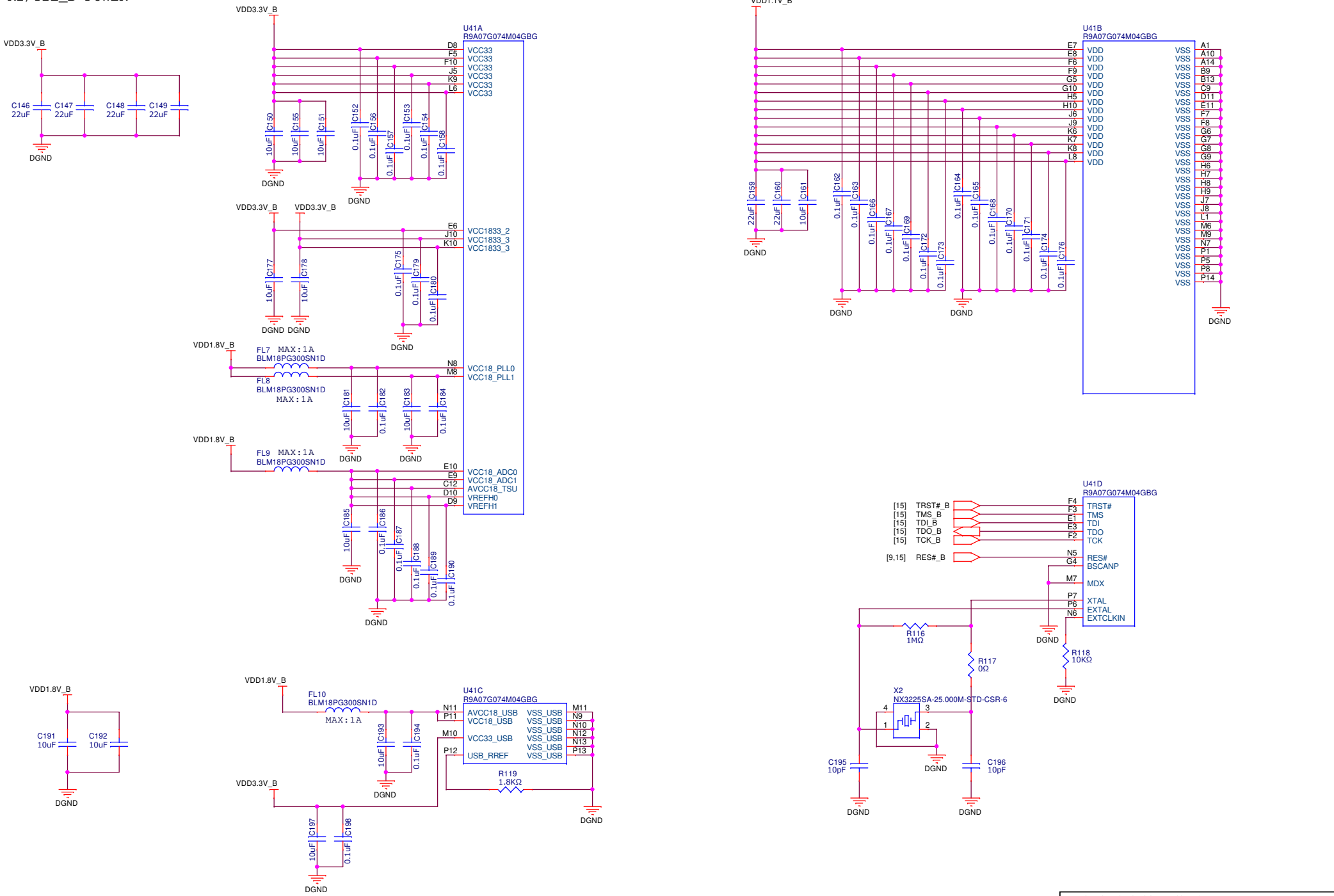

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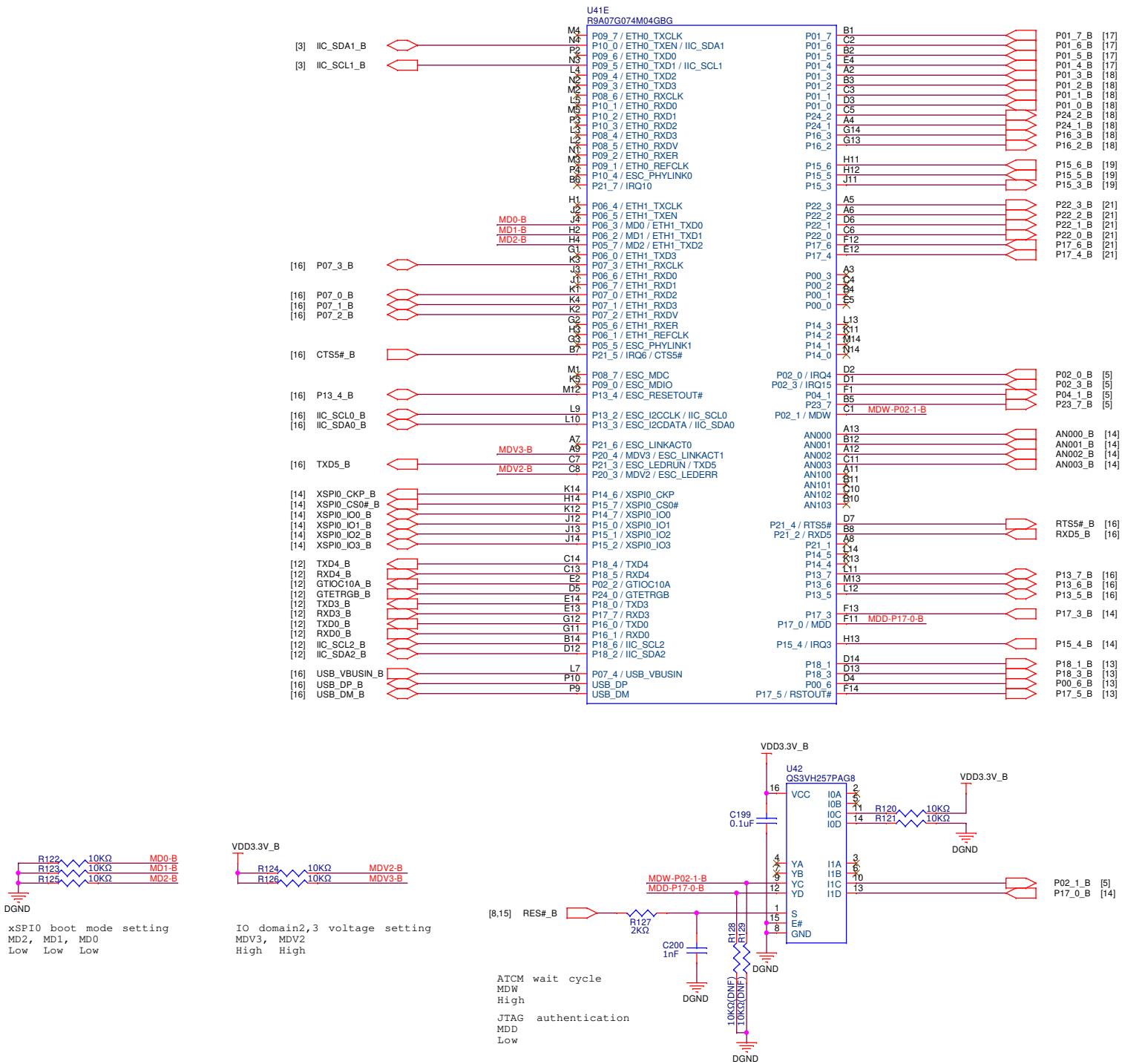

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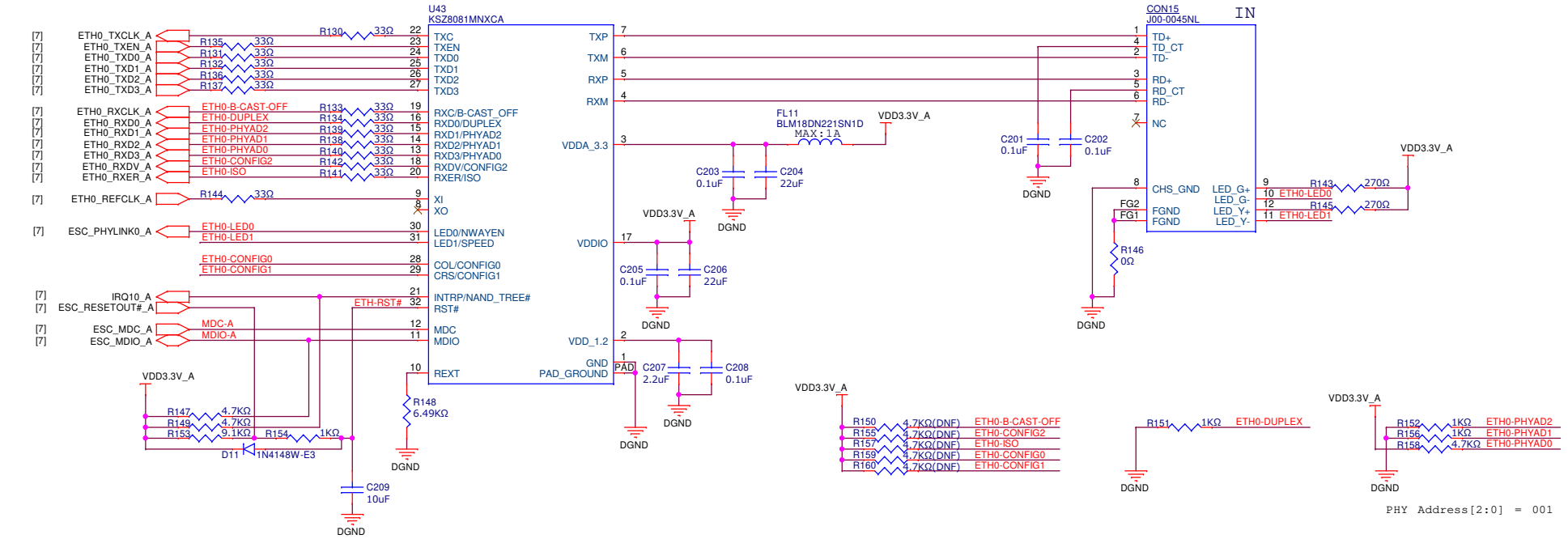

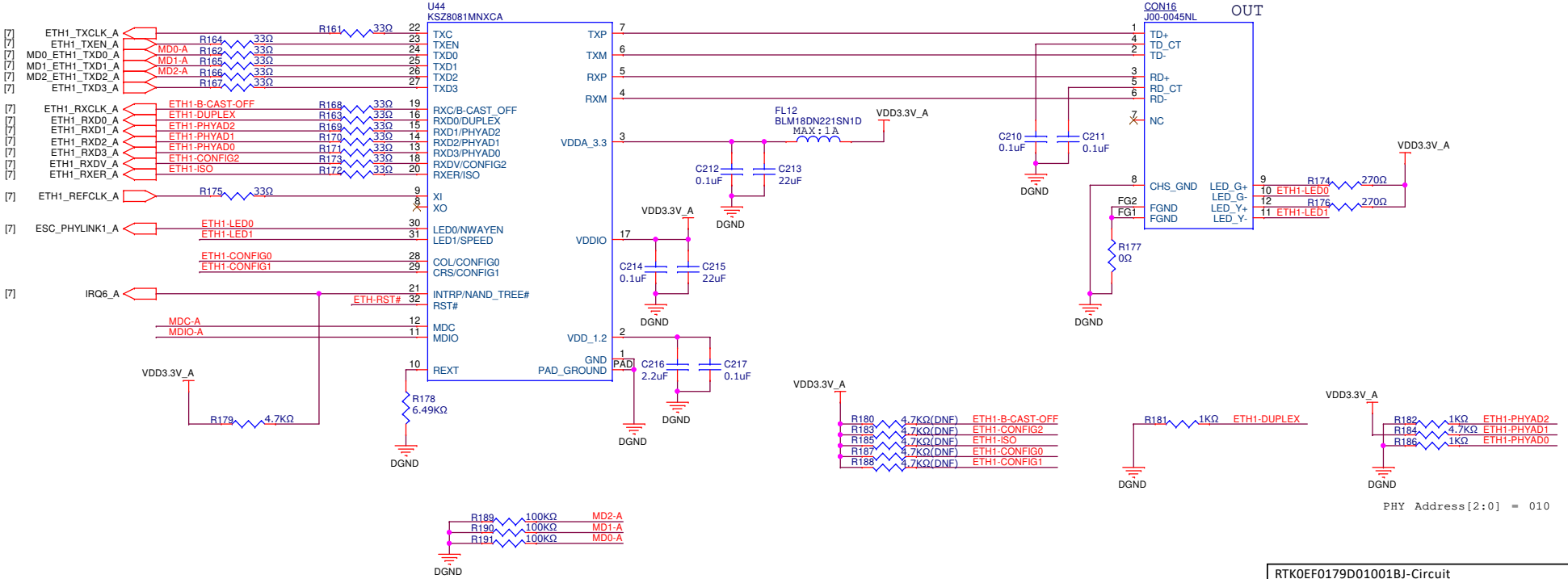

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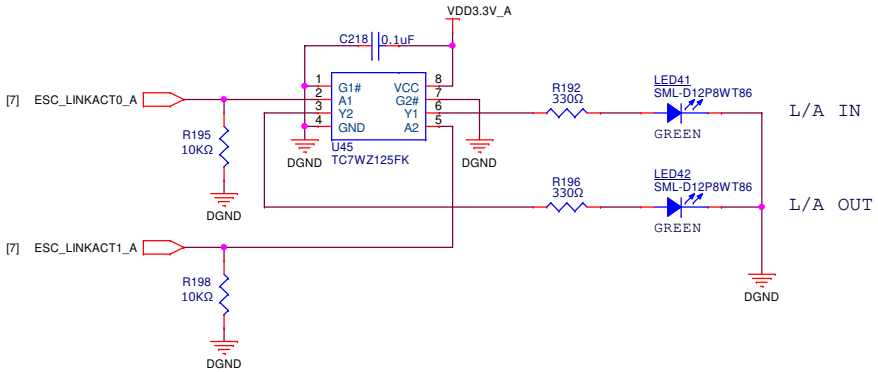
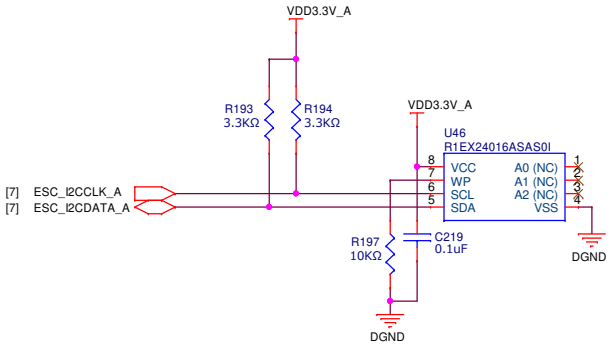
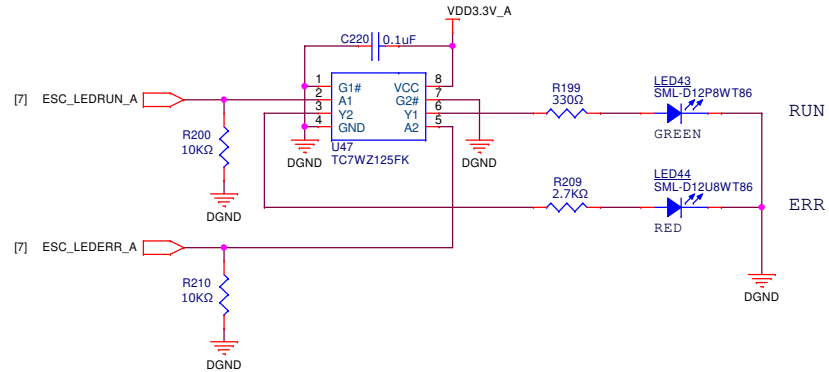
ETHERCAT LED

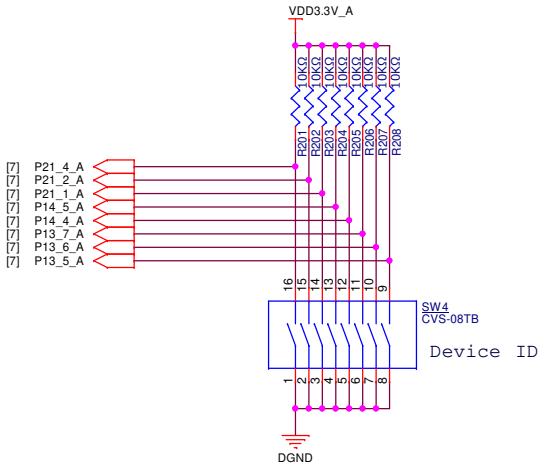


ETHERCAT EEPROM

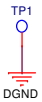




ETHERCAT ID SWITCH

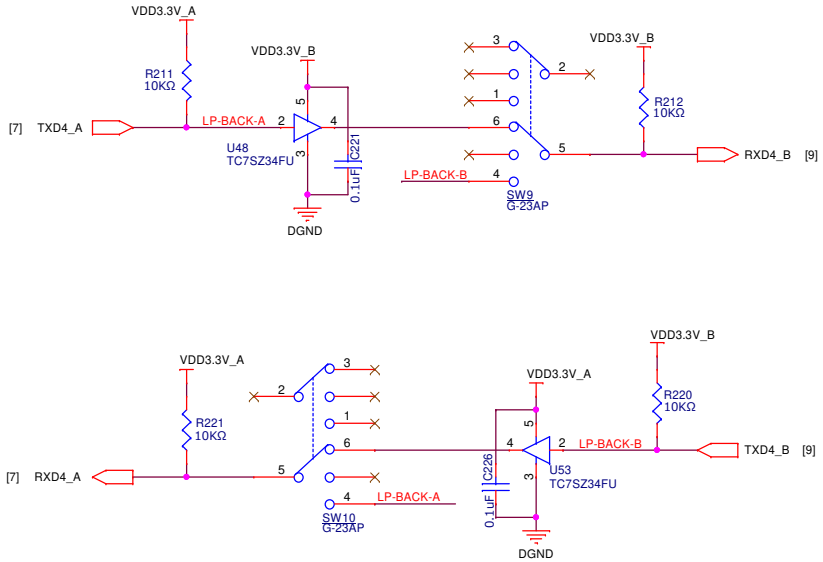


DGND TEST PIN

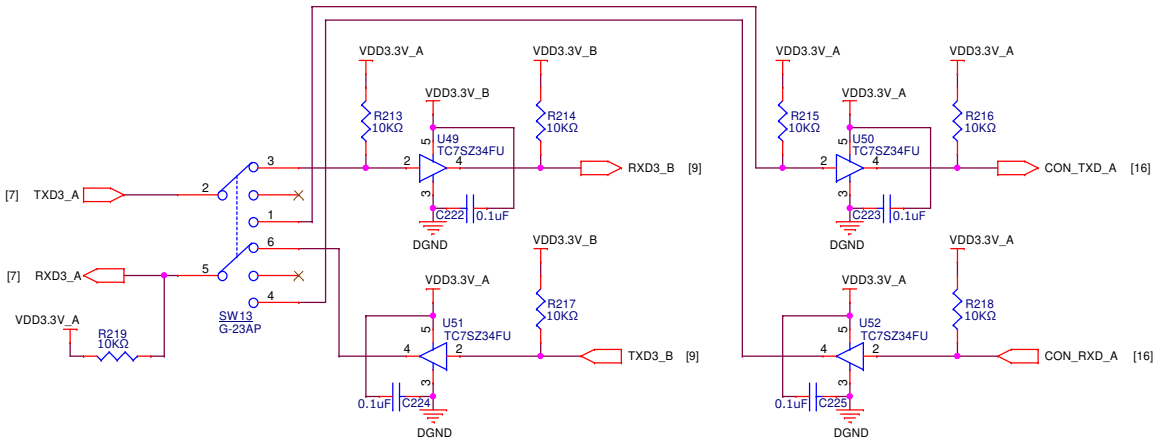


RTK0EF0179D01001BJ-Circuit		
Title <ECAT-LED, EEPROM, 8ch-SW>		
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
Date: Tuesday, January 16, 2024	Sheet 11 of 23	

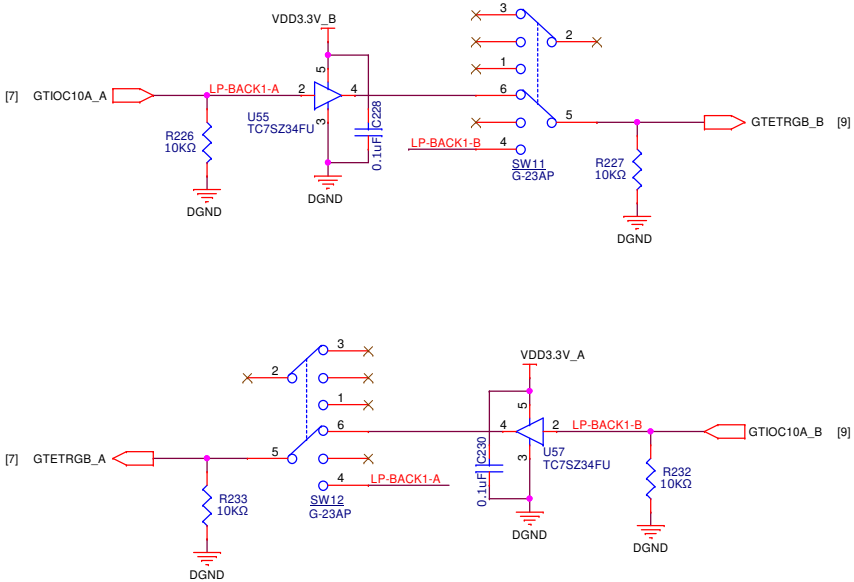
SERIAL I/F-1



SERIAL I/F-2



TIMER I/F



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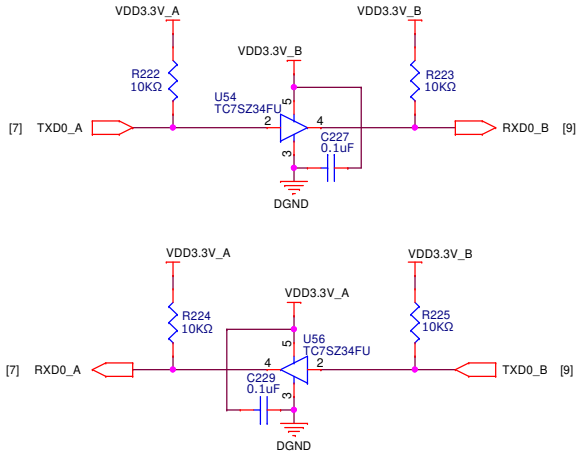
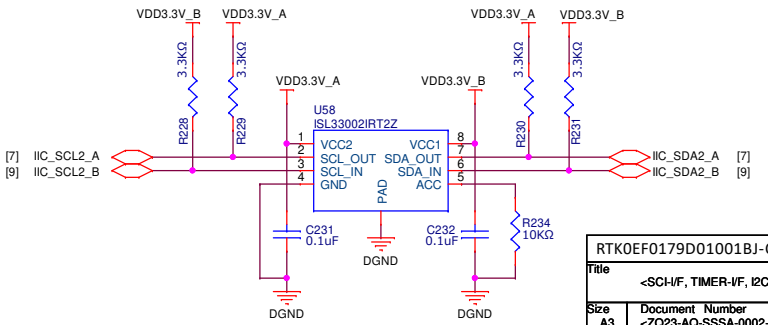
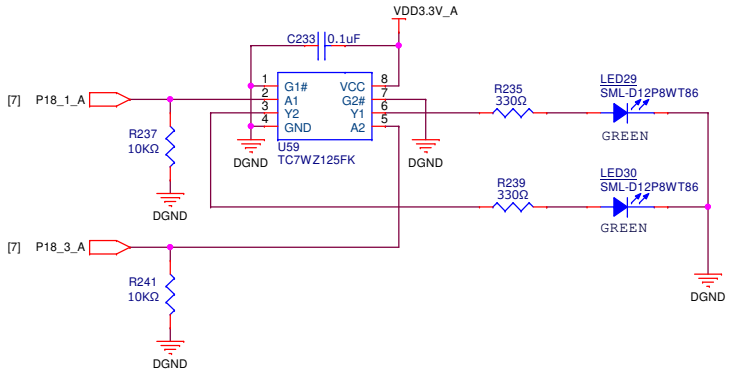


I2C I/F

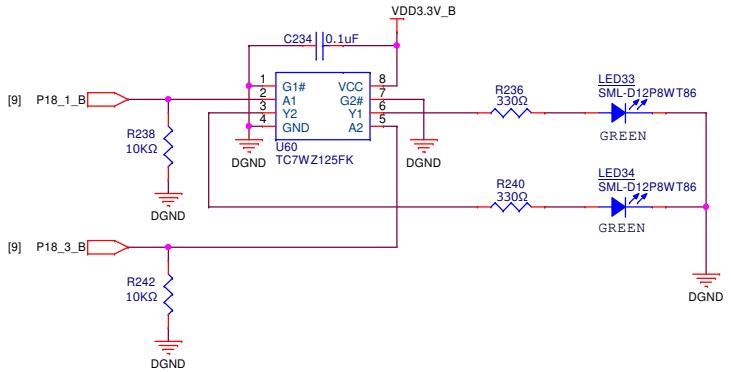


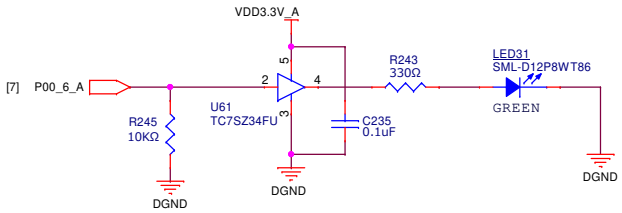
RTK0EF0179D01001BJ-Circuit		
Title	<SCI-I/F, TIMER-I/F, I2C-I/F>	
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
Date: Tuesday, January 16, 2024	Sheet 12 of 23	

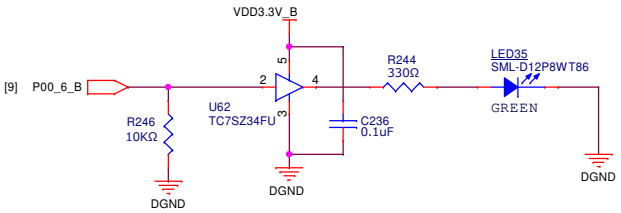
LED A

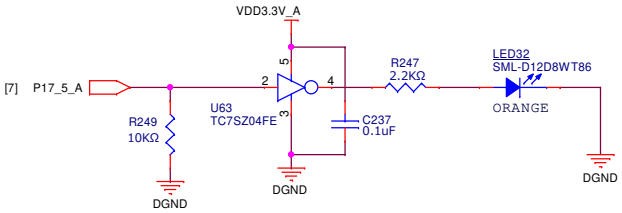


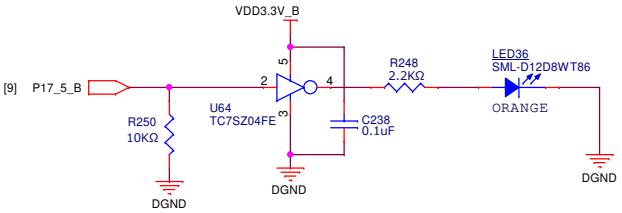
LED B



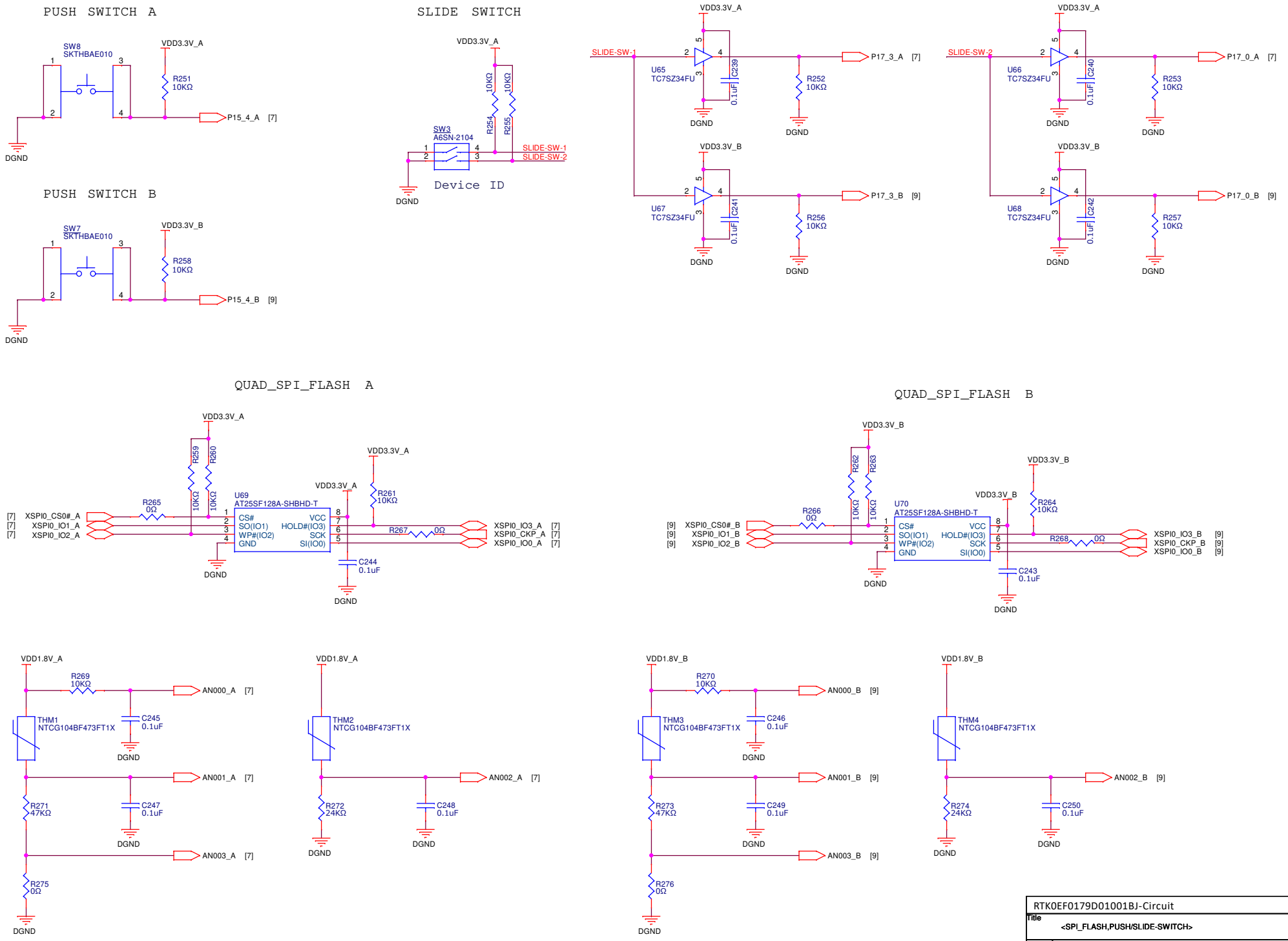








RTK0EF0179D01001BJ-Circuit		
Title <USER LED>		
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
Date: Tuesday, January 16, 2024	Sheet 13 of 23	


PUSH SWITCH A
SW8
SKTHBAE010
VDD3.3V_A
R251
10KΩ
P15_4_A [7]
DGND
PUSH SWITCH B
SW7
SKTHBAE010
VDD3.3V_B
R258
10KΩ
P15_4_B [9]
DGND
SLIDE SWITCH
VDD3.3V_A
R254
10KΩ
R255
10KΩ
SW3
A6SN-2104
SLIDE-SW-1
SLIDE-SW-2
Device ID
DGND
SLIDE-SW-1
U65
TC7SZ34FU
C239
0.1uF
R252
10KΩ
P17_3_A [7]
U67
TC7SZ34FU
C241
0.1uF
R256
10KΩ
P17_3_B [9]
SLIDE-SW-2
U66
TC7SZ34FU
C240
0.1uF
R253
10KΩ
P17_0_A [7]
U68
TC7SZ34FU
C242
0.1uF
R257
10KΩ
P17_0_B [9]
QUAD_SPI_FLASH A
R259
10KΩ
R260
10KΩ
R265
0Ω
U69
AT25SF128A-SHBHD-T
CS#
SO(IO1)
WP#(IO2)
GND
VCC
HOLD#(IO3)
SCK
SI(IO0)
R261
10KΩ
R267
0Ω
C244
0.1uF
XSPI0_CS0#_A [7]
XSPI0_IO1_A [7]
XSPI0_IO2_A [7]
XSPI0_IO3_A [7]
XSPI0_CKP_A [7]
XSPI0_IO0_A [7]
QUAD_SPI_FLASH B
R262
10KΩ
R263
10KΩ
R266
0Ω
U70
AT25SF128A-SHBHD-T
R264
10KΩ
R268
0Ω
C243
0.1uF
XSPI0_CS0#_B [9]
XSPI0_IO1_B [9]
XSPI0_IO2_B [9]
XSPI0_IO3_B [9]
XSPI0_CKP_B [9]
XSPI0_IO0_B [9]
VDD1.8V_A
R269
10KΩ
THM1
NTCG104BF473FT1X
C245
0.1uF
AN000_A [7]
AN001_A [7]
R271
47KΩ
C247
0.1uF
AN003_A [7]
R275
0Ω
THM2
NTCG104BF473FT1X
R272
24KΩ
C248
0.1uF
AN002_A [7]
VDD1.8V_B
R270
10KΩ
THM3
NTCG104BF473FT1X
C246
0.1uF
AN000_B [9]
AN001_B [9]
R273
47KΩ
C249
0.1uF
AN003_B [9]
R276
0Ω
THM4
NTCG104BF473FT1X
R274
24KΩ
C250
0.1uF
AN002_B [9]
RTK0EF0179D01001BJ-Circuit
Title
<SPI_FLASH,PUSH/SLIDE-SWITCH>
Size
A3
Document Number
<ZQ23-AQ-SSSA-0002-01>
Rev
<1.00>
Date:
Tuesday, January 16, 2024
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14
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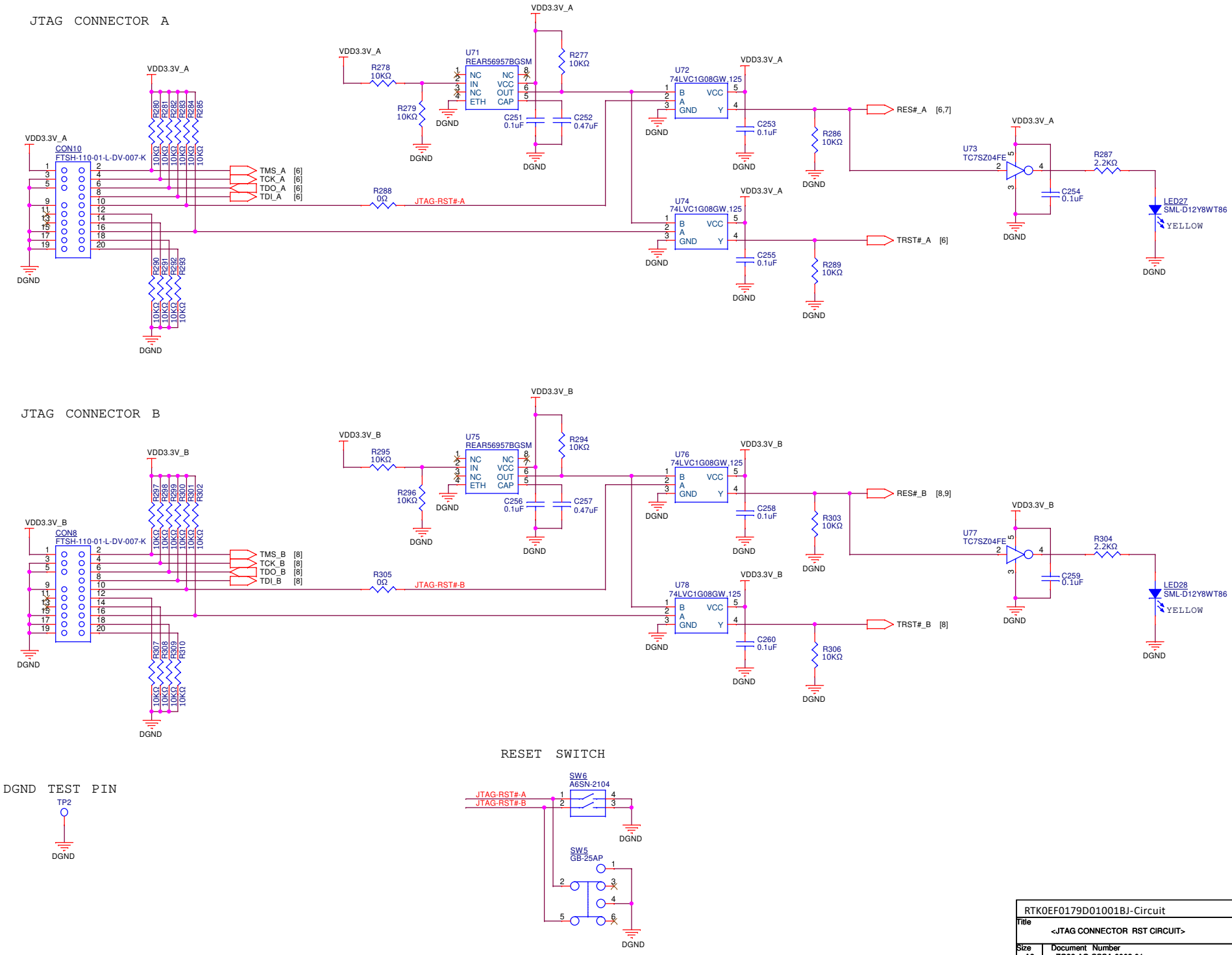
23



RTK0EF0179D01001BJ-Circuit	
Title	<JTAG CONNECTOR RST CIRCUIT>
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01> Rev <1.00>
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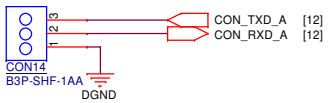
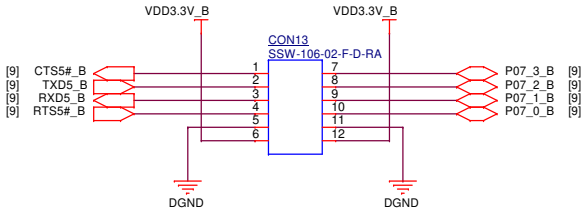
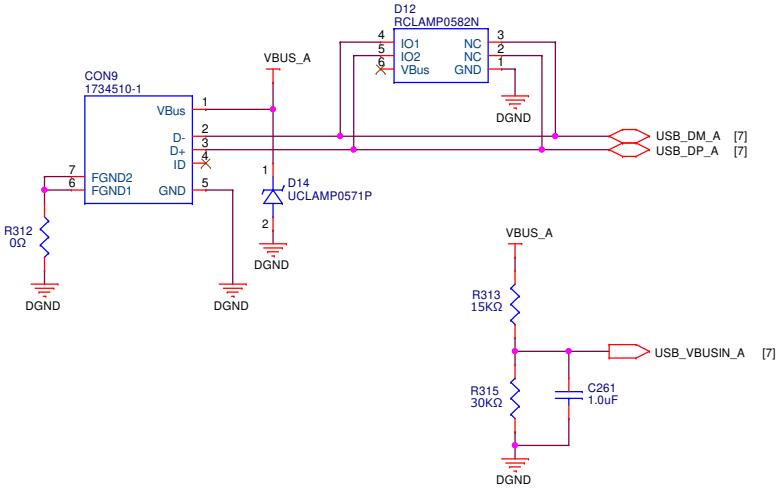
SCI CONNECTOR



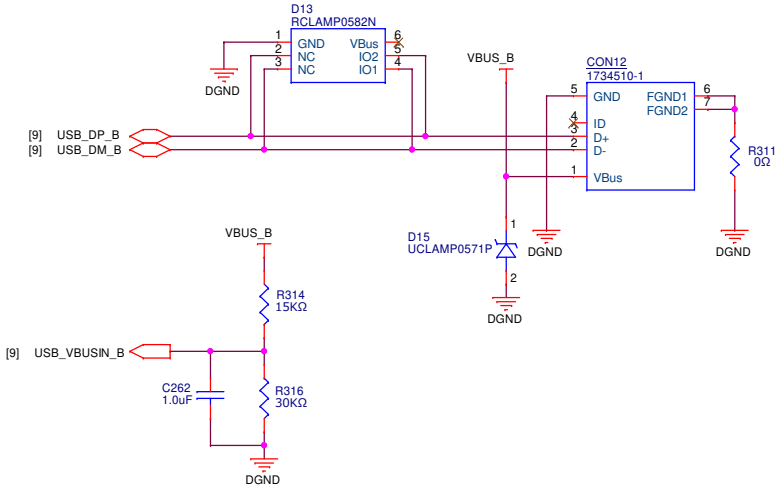
PMOD TYPE3A



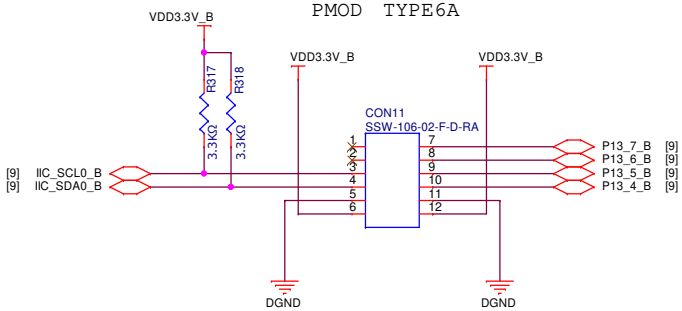
USB MINI-B A



USB MINI-B B



PMOD TYPE6A



RTK0EF0179D01001BJ-Circuit		
Title <COM CONNECTOR>		
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
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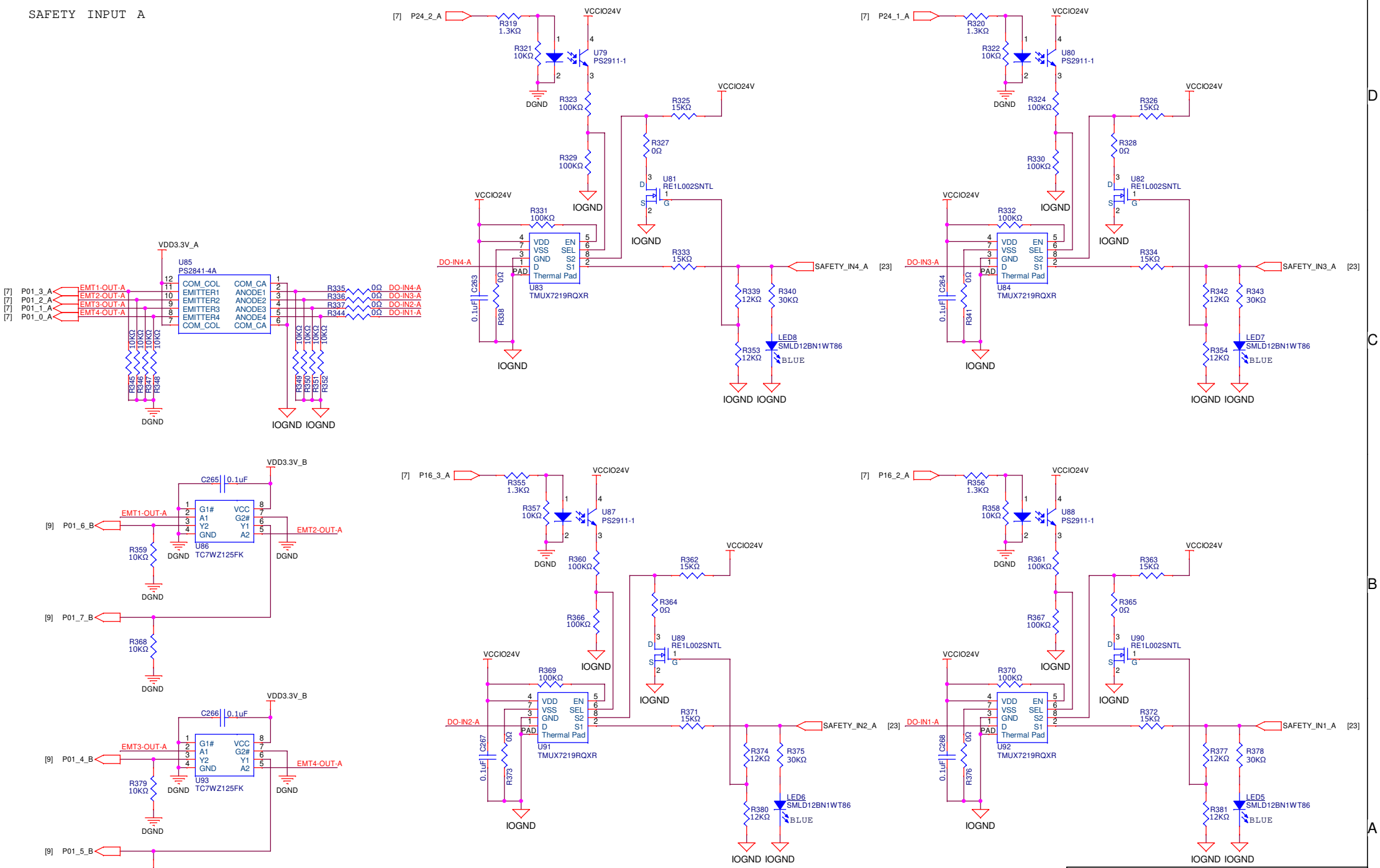
SAFETY INPUT A



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Title	<SAFETY INPUT A>	
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
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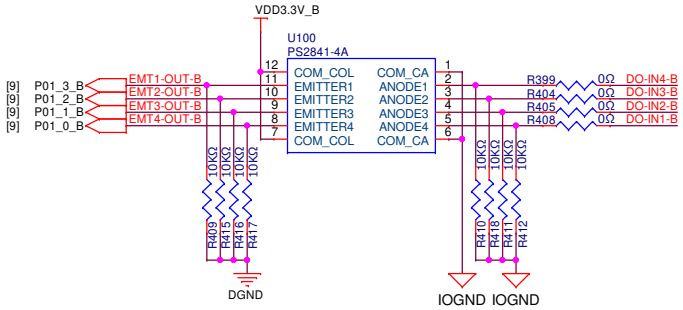
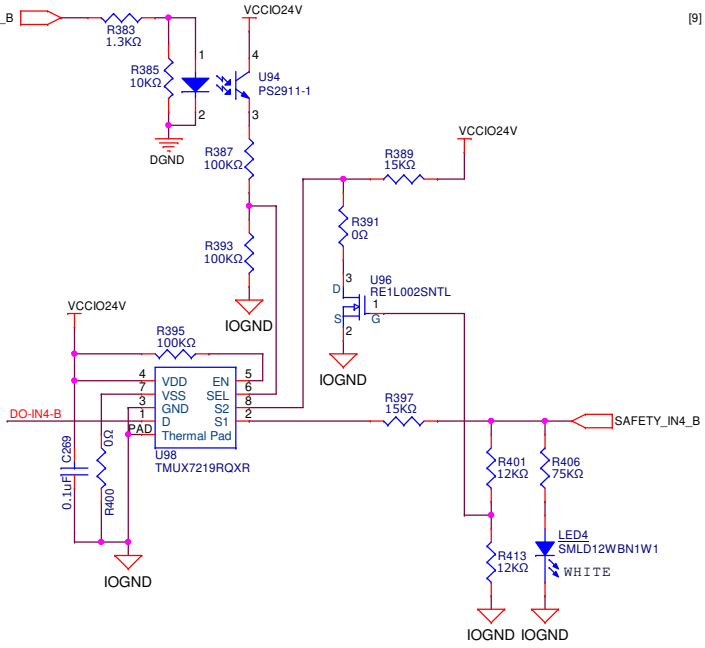
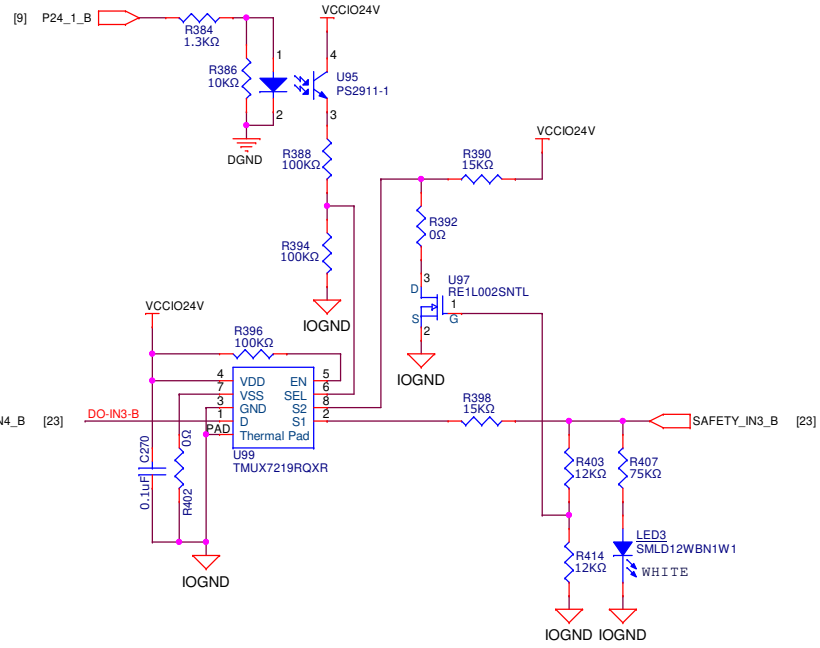
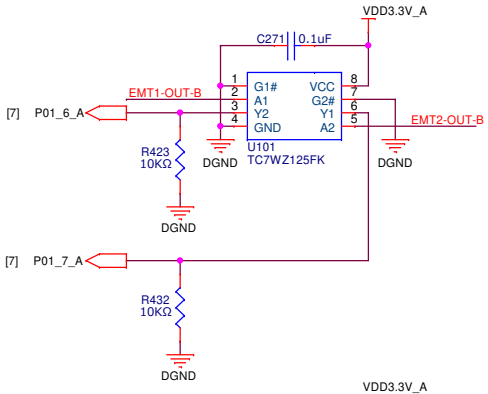
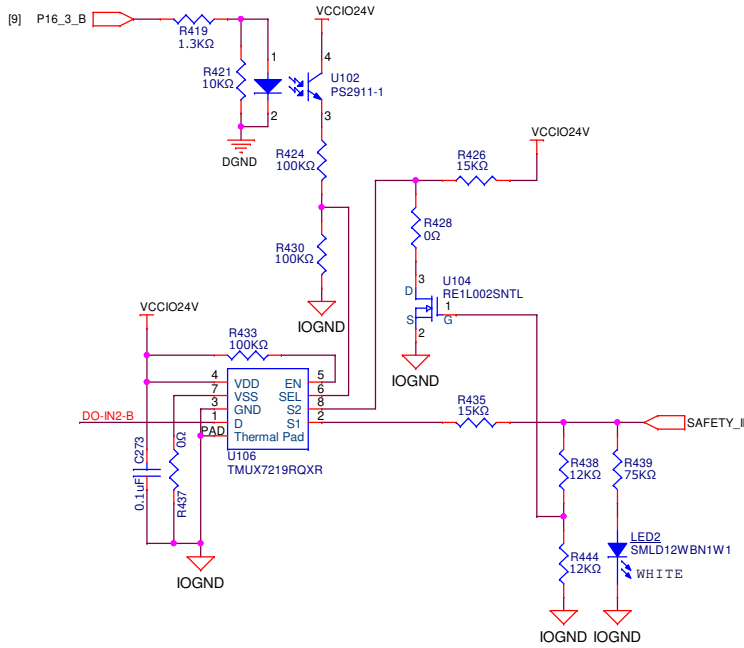
SAFETY INPUT B

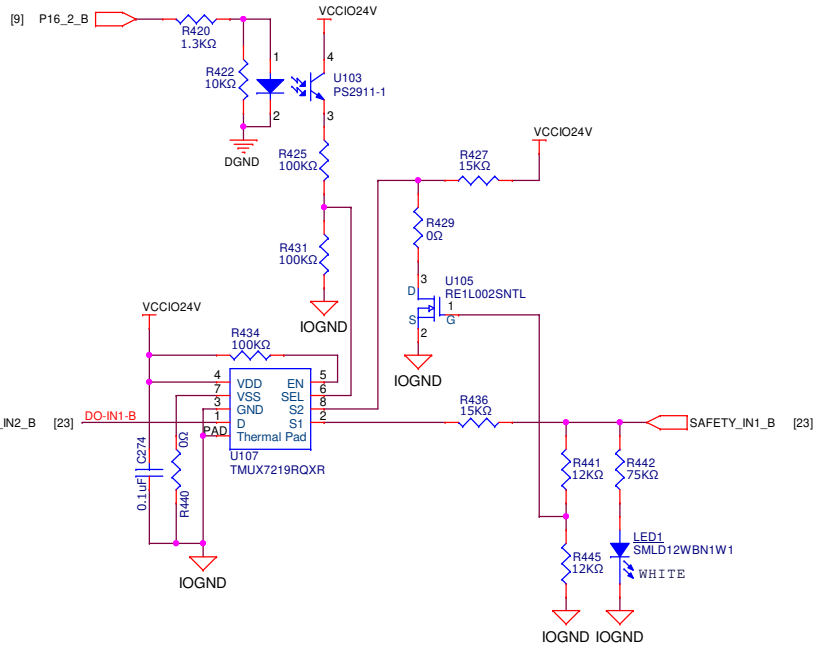












RTK0EF0179D01001BJ-Circuit		
Title	<SAFETY INPUT B>	
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
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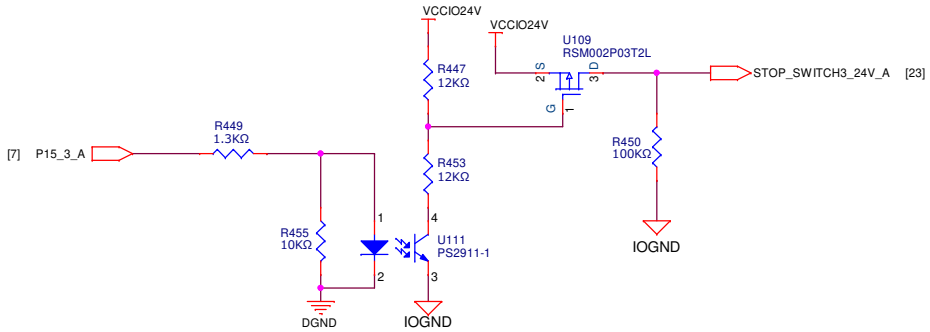
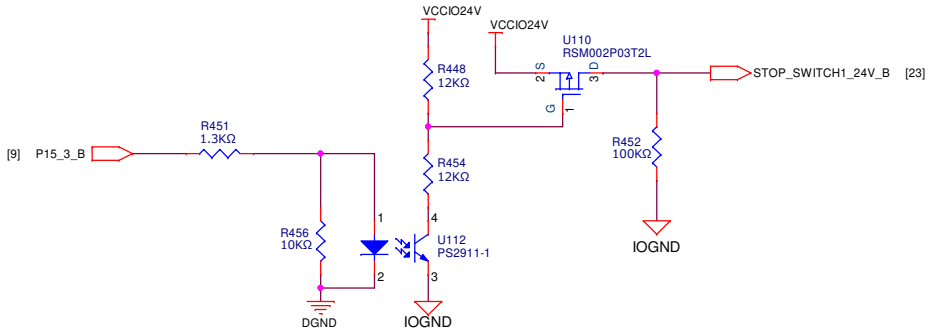
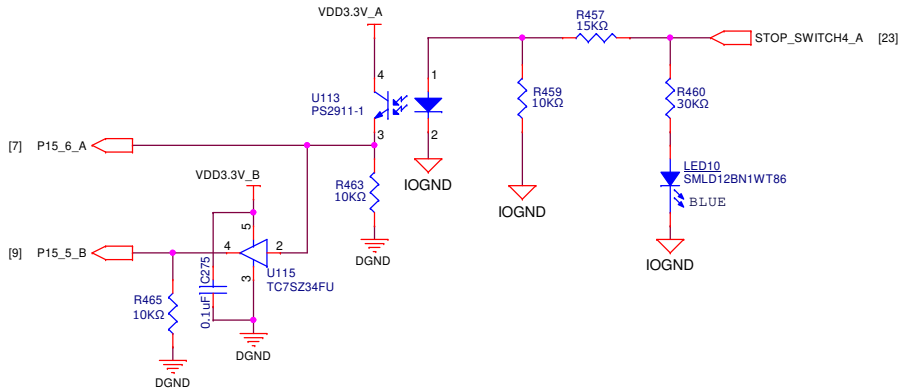
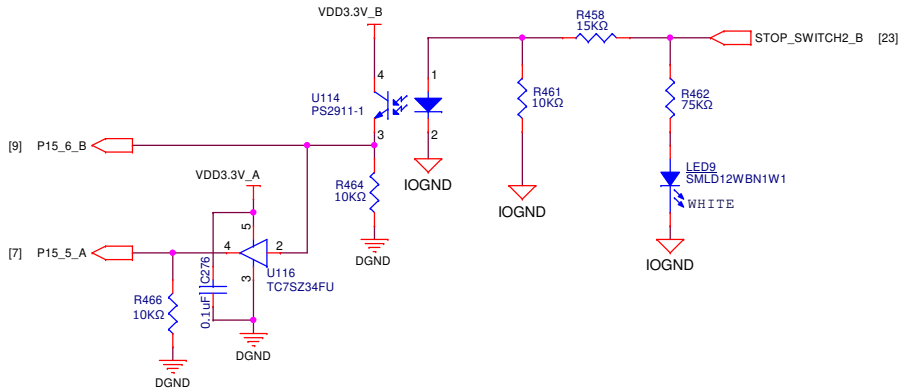
EMERGENCY STOP SWITCH INPUT









RTK0EF0179D01001BJ-Circuit		
Title <EMERGENCY STOP SWITCH INPUT>		
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
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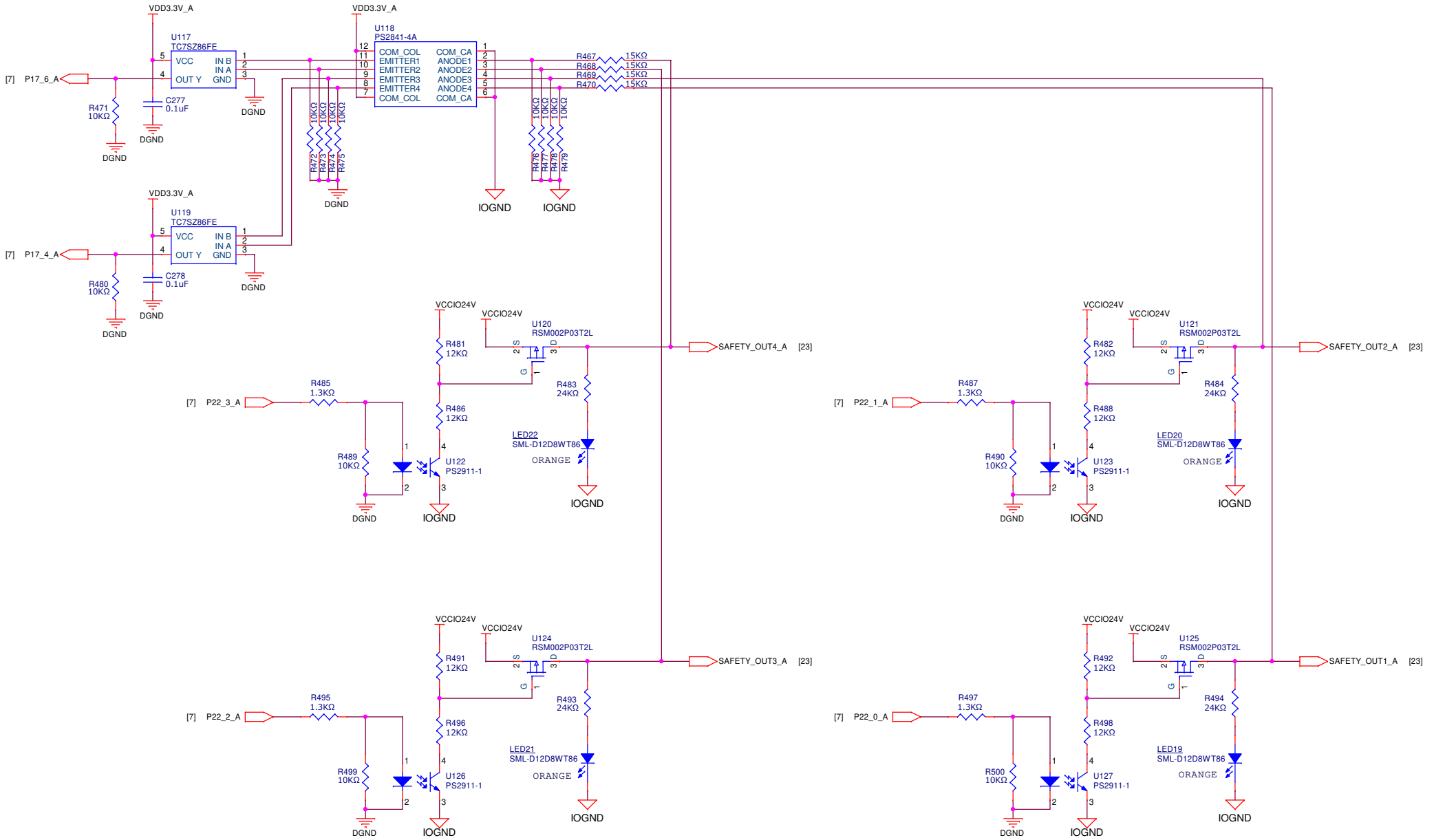
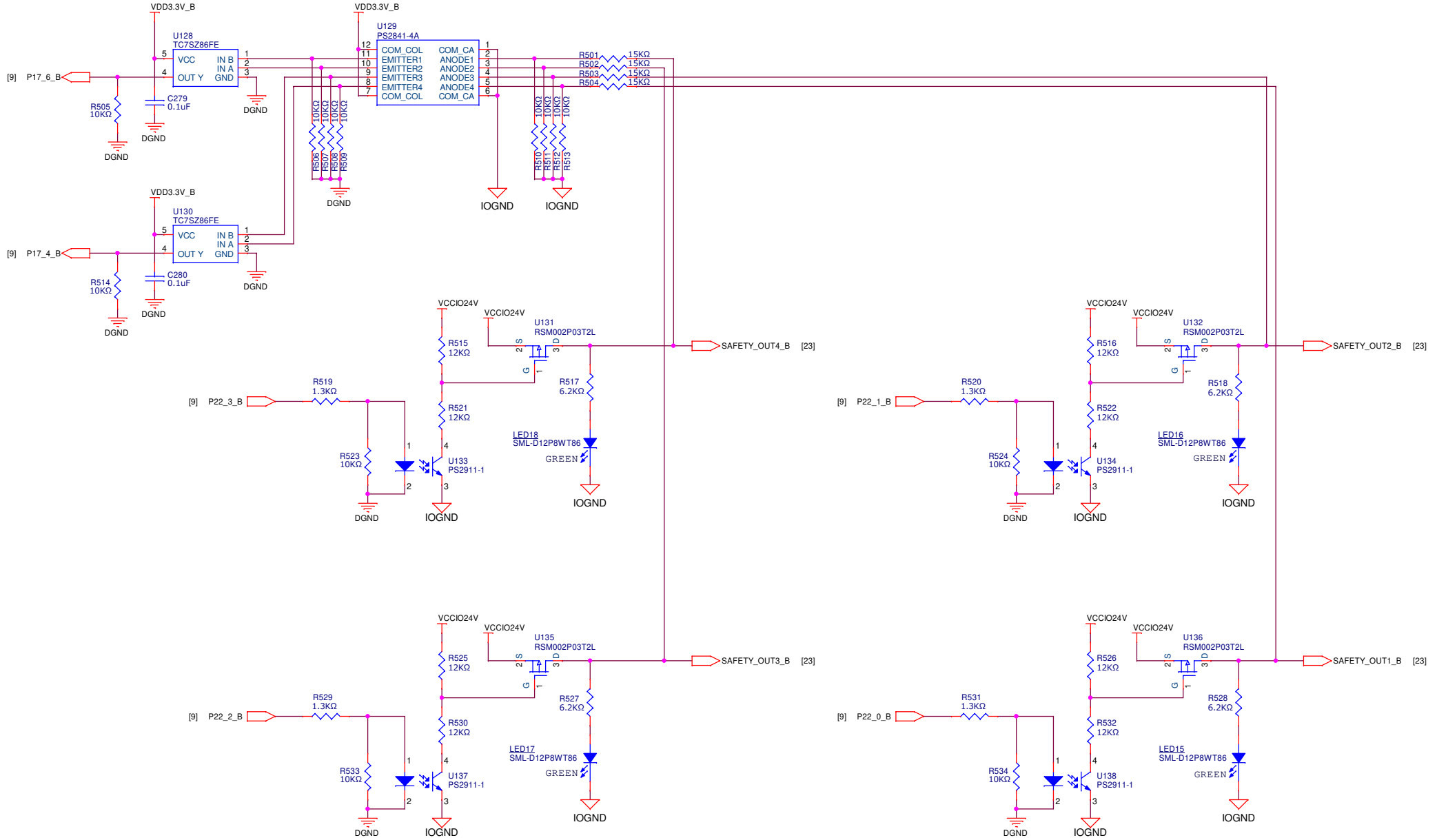
SAFETY OUTPUT A



RTK0EF0179D01001BJ-Circuit		
Title	<SAFETY OUTPUT A>	
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
Date: Tuesday, January 16, 2024	Sheet 20 of 23	

SAFETY OUTPUT B



RTK0EF0179D01001BJ-Circuit		
Title <SAFETY OUTPUT B>		
Size A3	Document Number <ZQ23-AQ-SSSA-0002-01>	Rev <1.00>
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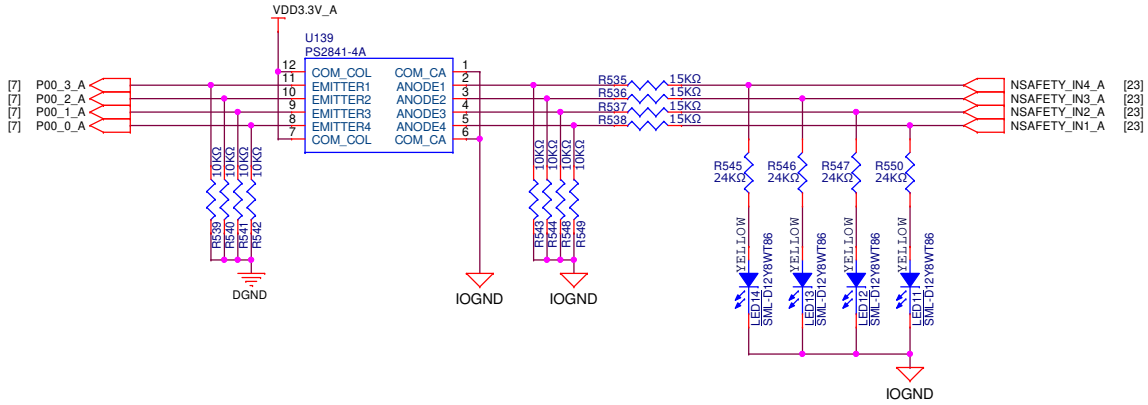
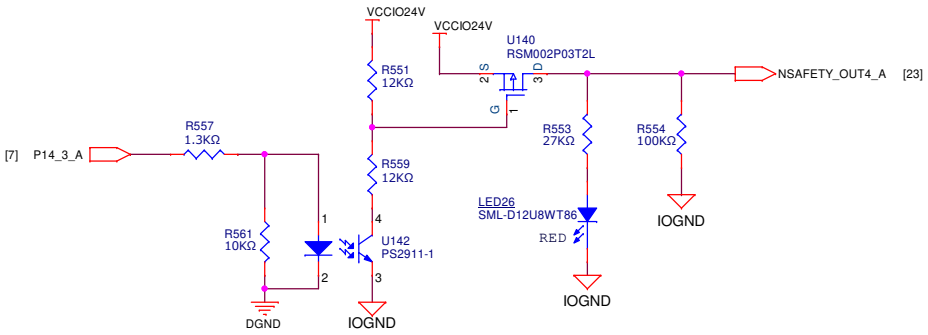
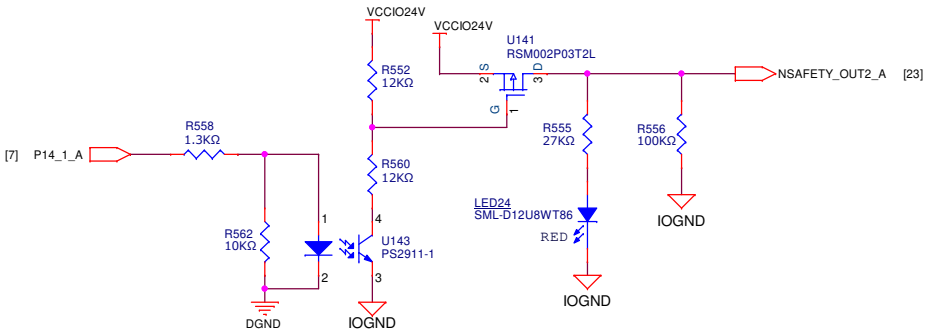
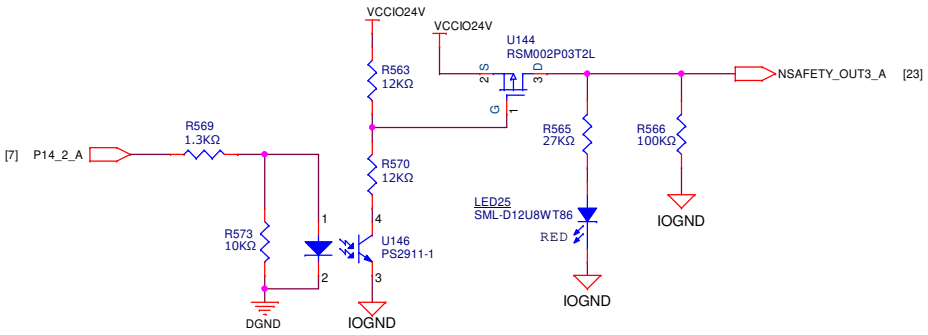
NON SAFETY INPUT A

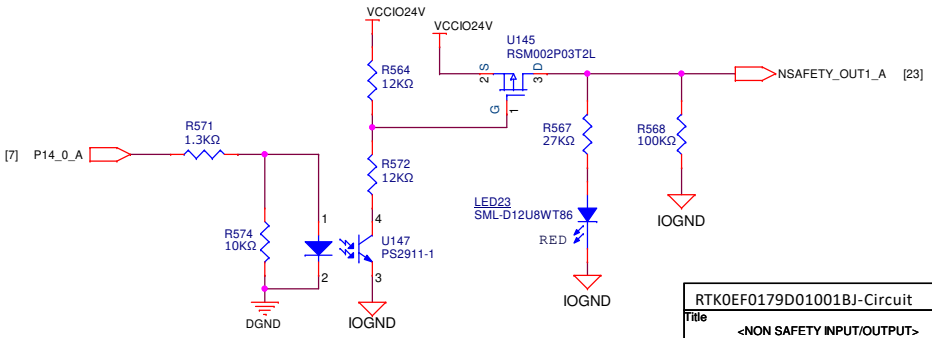


NON SAFETY OUTPUT A









RTK0EF0179D01001BJ-Circuit		
Title: <NON SAFETY INPUT/OUTPUT>		
Size: A3	Document Number: <ZQ23-AQ-SSSA-0002-01>	Rev: <1.00>
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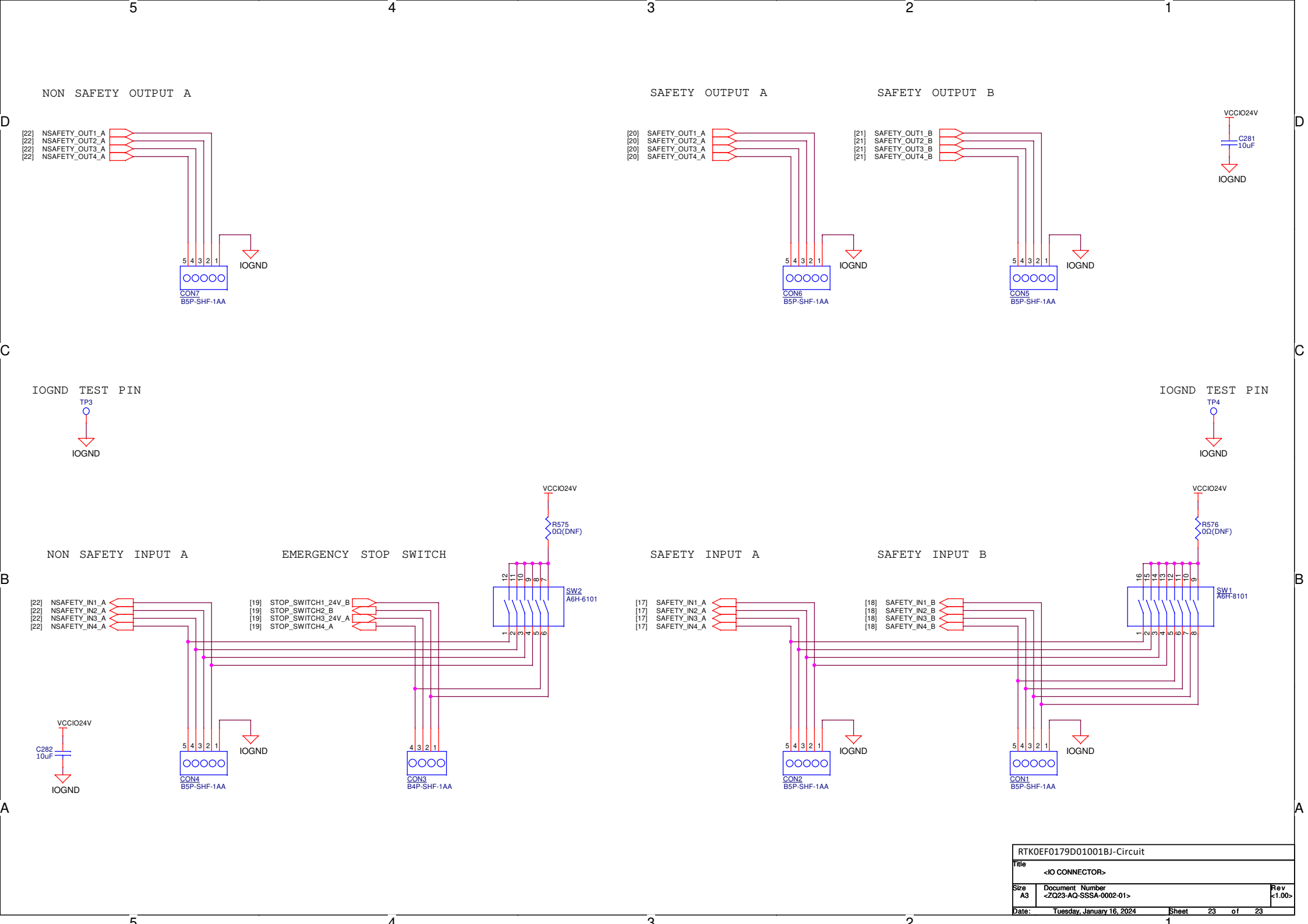
NON SAFETY OUTPUT A
[22] NSAFETY_OUT1_A
[22] NSAFETY_OUT2_A
[22] NSAFETY_OUT3_A
[22] NSAFETY_OUT4_A
5 4 3 2 1
IOGND
CON7
B5P-SHF-1AA
SAFETY OUTPUT A
[20] SAFETY_OUT1_A
[20] SAFETY_OUT2_A
[20] SAFETY_OUT3_A
[20] SAFETY_OUT4_A
5 4 3 2 1
IOGND
CON6
B5P-SHF-1AA
SAFETY OUTPUT B
[21] SAFETY_OUT1_B
[21] SAFETY_OUT2_B
[21] SAFETY_OUT3_B
[21] SAFETY_OUT4_B
5 4 3 2 1
IOGND
CON5
B5P-SHF-1AA
VCCIO24V
C281
10uF
IOGND
IOGND TEST PIN
TP3
IOGND
IOGND TEST PIN
TP4
IOGND
NON SAFETY INPUT A
[22] NSAFETY_IN1_A
[22] NSAFETY_IN2_A
[22] NSAFETY_IN3_A
[22] NSAFETY_IN4_A
5 4 3 2 1
IOGND
CON4
B5P-SHF-1AA
VCCIO24V
C282
10uF
IOGND
EMERGENCY STOP SWITCH
[19] STOP_SWITCH1_24V_B
[19] STOP_SWITCH2_B
[19] STOP_SWITCH3_24V_A
[19] STOP_SWITCH4_A
4 3 2 1
CON3
B4P-SHF-1AA
VCCIO24V
R575
0Ω(DNF)
12 11 10 9 8 7
1 2 3 4 5 6
SW2
A6H-6101
SAFETY INPUT A
[17] SAFETY_IN1_A
[17] SAFETY_IN2_A
[17] SAFETY_IN3_A
[17] SAFETY_IN4_A
5 4 3 2 1
IOGND
CON2
B5P-SHF-1AA
SAFETY INPUT B
[18] SAFETY_IN1_B
[18] SAFETY_IN2_B
[18] SAFETY_IN3_B
[18] SAFETY_IN4_B
5 4 3 2 1
IOGND
CON1
B5P-SHF-1AA
VCCIO24V
R576
0Ω(DNF)
16 15 14 13 12 11 10 9
1 2 3 4 5 6 7 8
SW1
A6H-8101
RTK0EF0179D01001BJ-Circuit
Title
<IO CONNECTOR>
Size
A3
Document Number
<ZQ23-AQ-SSSA-0002-01>
Rev
<1.00>
Date:
Tuesday, January 16, 2024
Sheet
23
of
23

5.2 Parts list

Table 5.2.1 Parts List (1/5)

No.	Part Name		Specification	
	Category	Part #	Model number	Manufacturer
1	IC	U1, U2	RAA211250GSP	Renesas
2	IC	U3, U4, U7, U8, U23, U24	ICL7665SAIBAZA	Renesas
3	IC	U5, U6	DA9080-61FCB2	Renesas
4	IC	U9, U10, U13, U14, U18, U22, U25, U26, U29, U30, U34, U38, U81, U82, U89, U90, U96 U97, U104, U105	RE1L002SNTL	ROHM
5	IC	U11, U12, U17, U20, U27, U28, U33, U36, U63, U64, U73, U77	TC7SZ04FE	Toshiba
6	IC	U15, U19, U31, U35	SN74LVC1G10DCKR	Texas Instruments
7	IC	U16, U21, U32, U37	MAX16052AUT+T	Analog Devices
8	IC	U39, U41	R9A07G074M04GBG	Renesas
9	IC	U40, U42	QS3VH257PAG8	Renesas
10	IC	U43, U44	KSZ8081MNXCA	Microchip Technology
11	IC	U45, U47, U59, U60, U86, U93, U101, U108	TC7WZ125FK	Toshiba
12	IC	U46	R1EX24016ASAS0I	Renesas
13	IC	U48~57, U61, U62, U65~68, U115, U116	TC7SZ34FU	Toshiba
14	IC	U58	ISL33002IRT2Z	Renesas
15	IC	U69, U70	AT25SF128A-SHBHD-T	Renesas
16	IC	U71, U75	REAR56957BGSM	Renesas
17	IC	U72, U74, U76, U78	74LVC1G08GW,125	Nexperia
18	IC	U79, U80, U87, U88, U94, U95, U102, U103, U111~114, U122, U123, U126, U127, U133, U134, U137, U138, U142, U143, U146, U147	PS2911-1	Renesas
19	IC	U83, U84, U91, U92, U98, U99, U106, U107	TMUX7219RQXR	Texas Instruments
20	IC	U85, U100, U118, U129, U139	PS2841-4A	Renesas
21	IC	U109, U110, U120, U121, U124, U125, U131, U132, U135, U136, U140, U141, U144, U145	RSM002P03T2L	ROHM
22	IC	U117, U119, U128, U130	TC7SZ86FE	Toshiba
23	Fuse	SI1	1812L075/33	Littelfuse
24	Fuse	SI2	1812L050/60	Littelfuse
25	Crystal oscillator	X1, X2	NX3225SA-25.000M-STD-CSR-6	NDK
26	LED	LED1~4, LED9	SMLD12WBN1W1	ROHM
27	LED	LED5~8, LED10	SMLD12BN1WT86	ROHM
28	LED	LED11~14, LED27, LED28	SML-D12Y8WT86	ROHM
29	LED	LED15~18, LED29~31, LED33~35, LED41~43	SML-D12P8WT86	ROHM
30	LED	LED19~22, LED32, LED36	SML-D12D8WT86	ROHM
31	LED	LED23~26, LED37~40, LED44	SML-D12U8WT86	ROHM
32	Diode	D1, D4	PDZVTR5.6B	ROHM
33	Diode	D2, D3	PDZVTR27B	ROHM
34	Diode	D5, D6	PDZVTR3.6B	ROHM

Note: Parts that are interchangeable (e.g. general-purpose logic, resistor, capacitor) may be replaced with equivalents from other manufacturers.

Table 5.2.2 Parts List (2/5)

No.	Part Name		Specification	
	Category	Part #	Model number	Manufacturer
35	Diode	D7, D8	PDZVTR2.2B	ROHM
36	Diode	D9, D10	MMSZ4678T1G	onsemi
37	Diode	D11	1N4148W-E3	Vishay
38	Diode	D12, D13	RCLAMP0582N	Semtech
39	Diode	D14, D15	UCLAMP0571P	Semtech
40	Connector	CON1, CON2, CON4~7	B5P-SHF-1AA	JST
41	Connector	CON3	B4P-SHF-1AA	JST
42	Connector	CON8, CON10	FTSH-110-01-L-DV-007-K	Samtec
43	Connector	CON9, CON12	1734510-1	TE Connectivity
44	Connector	CON11, CON13	SSW-106-02-F-D-RA	Samtec
45	Connector	CON14	B3P-SHF-1AA	JST
46	Connector	CON15, CON16	J00-0045NL	Pulse Electronics
47	Connector	CON17	KLDX-0202-A	Kycon
48	Connector	CON18	B2P-SHF-1AA	JST
49	Switch	SW1	A6H-8101	OMRON
50	Switch	SW2	A6H-6101	OMRON
51	Switch	SW3, SW6	A6SN-2104	OMRON
52	Switch	SW4	CVS-08TB	Nidec Components
53	Switch	SW5	GB-25AP	NKK
54	Switch	SW7, SW8	SKTHBAE010	ALPS
55	Switch	SW9~13	G-23AP	NKK
56	Switch	SW14	8SS2012-Z	Nidec Components
57	Jumper	JP1	61300621121	Würth Elektronik
58	Capacitor	C1, C12, C22, C24, C61, C62, C64, C65, C67, C68, C71, C73~76, C78, C81~84, C87, C89~92, C94~97, C101~C103, C107~119, C122~125, C127,C129, C131~135, C139, C143, C144, C152~154, C156~158, C162~176, C179, C180, C182, C184, C186~190, C194, C198, C199, C201~203, C205, C208, C210~212, C214, C217~251, C253~256, C258~260, C263~280	C1005X7R1H104K050BB	TDK
59	Capacitor	C2, C3, C13, C14	GRT31CR61A476KE13L	Murata
60	Capacitor	C4~7, C9, C11, C15, C16, C18, C19, C281, C282	GRM21BR61H106KE43L	Murata
61	Capacitor	C8, C17, C261, C262	C1005X5R1V105K050BC	TDK
62	Capacitor	C10, C20, C25, C30, C33, C34	C1005X5R1A475K050BC	TDK
63	Capacitor	C21, C23, C63, C66, C69, C70, C72, C77, C79, C80, C85, C86, C88, C93, C145, C200	C1005C0G1H102J050BA	TDK

Note: Parts that are interchangeable (e.g. general-purpose logic, resistor, capacitor) may be replaced with equivalents from other manufacturers.

Table 5.2.3 Parts List (3/5)

No.	Part Name		Specification	
	Category	Part #	Model number	Manufacturer
64	Capacitor	C26, C27, C31, C32, C37, C40, C43, C47, C51, C52, C98~100, C106, C120, C121, C126, C128, C130, C136~138, C142, C150, C151, C155, C161, C177, C178, C181, C183, C185, C191, C192, C193, C197, C209	GRM155R61A106ME11D	Murata
65	Capacitor	C28, C29, C35, C36, C38, C39, C41, C42, C44~46, C48~50, C53~60	GRM188R60J476ME15D	Murata
66	Capacitor	C104, C105, C146~149, C159, C160, C204, C206, C213, C215	C1608X5R1A226M080AC	TDK
67	Capacitor	C140, C141, C195, C196	C1005C0G1H100D050BA	TDK
68	Capacitor	C207, C216	C1005X5R1E225K050BC	TDK
69	Capacitor	C252, C257	C1005X5R1V474K050BC	TDK
70	Resistor	R15, R16, R35, R36, R106, R117, R265~268, R275, R276, R288, R305, R327, R328, R335~338, R341, R344, R364, R365, R373, R376, R391, R392, R399, R400, R402, R404, R405, R408, R428, R429, R437, R440	ERJ-2GE0R00X	Panasonic
71	Resistor	R146, R177, R311, R312, R575, R576	ERJ-3GEY0R00V	Panasonic
72	Resistor	R1, R6~10, R23~26, R29, R30	ERJ-6GEY0R00V	Panasonic
73	Resistor	R2, R11	ERJ-2RKF1053X	Panasonic
74	Resistor	R3, R4, R12	ERJ-2RKF2002X	Panasonic
75	Resistor	R5, R37, R38, R40, R42, R319, R320, R355, R356, R383, R384, R419, R420, R449, R451, R485, R487, R495, R497, R519, R520, R529, R531, R557, R558, R569, R571	ERJ-2RKF1301X	Panasonic
76	Resistor	R13, R14, R43~46, R55, R56, R62~64, R68~71, R74~77, R86, R87, R92, R94, R95, R99~102, R107, R109~112, R114, R115, R118, R120~126, R128, R129, R195, R197, R198, R200~208, R210~227, R232~234, R237, R238, R241, R242, R245, R246, R249~264, R269, R270, R277~286, R289~303, R306~310, R321, R322, R345~352, R357~359, R368, R379, R382, R385, R386, R409~412, R415~418, R421~423, R432, R443, R446, R455, R456, R459, R461, R463~466, R471~480, R489, R490, R499, R500, R505~514, R523, R524, R533, R534, R539~544, R548, R549, R561, R562, R573, R574	ERJ-2RKF1002X	Panasonic

Note1: Parts that are interchangeable (e.g. general-purpose logic, resistor, capacitor) may be replaced with equivalents from other manufacturers.

Note2: Red text indicates unmounted parts.

Table 5.2.4 Parts List (4/5)

No.	Part Name		Specification	
	Category	Part #	Model number	Manufacturer
77	Resistor	R17, R18	ERA-3AEB242V	Panasonic
78	Resistor	R19, R20	RG2012P-433-B-T5	Susumu
79	Resistor	R21, R22	ERA-3AEB911V	Panasonic
80	Resistor	R27, R28	RC0402FR-0710RL	YAGEO
81	Resistor	R31~34, R193, R194, R228~231, R317, R318	ERJ-2RKF3301X	Panasonic
82	Resistor	R39, R41, R209	ERJ-2RKF2701X	Panasonic
83	Resistor	R47, R78	ERA-3AEB363V	Panasonic
84	Resistor	R48, R79	ERA-3AEB163V	Panasonic
85	Resistor	R49, R80	ERA-3AEB7682V	Panasonic
86	Resistor	R50, R81	ERA-3AEB303V	Panasonic
87	Resistor	R51, R82	ERA-3AEB5232V	Panasonic
88	Resistor	R52, R57, R83, R88	ERA-3AEB823V	Panasonic
89	Resistor	R53, R84	ERA-3AEB4642V	Panasonic
90	Resistor	R54, R85	ERA-3AEB1622V	Panasonic
91	Resistor	R58, R89	ERA-3AEB333V	Panasonic
92	Resistor	R59, R60, R90, R91	ERA-3AEB5492V	Panasonic
93	Resistor	R61, R93	ERA-3AEB1962V	Panasonic
94	Resistor	R65, R72, R96, R103	ERA-3AEB393V	Panasonic
95	Resistor	R66, R73, R97, R104	ERA-3AEB223V	Panasonic
96	Resistor	R67, R98	ERA-3AEB2262V	Panasonic
97	Resistor	R105, R116	ERJ-2RKF1004X	Panasonic
98	Resistor	R108, R119	ERJ-2RKF1801X	Panasonic
99	Resistor	R113, R127	ERJ-2RKF2001X	Panasonic
100	Resistor	R130~142, R144, R161~173, R175	ERJ-2RKF33R0X	Panasonic
101	Resistor	R143, R145, R174, R176	ERJ-2RKF2700X	Panasonic
102	Resistor	R147, R149, R150, R155, R157, R158, R159, R160, R179, R180, R183, R184, R185, R187, R188	ERJ-2RKF4701X	Panasonic
103	Resistor	R148, R178	ERJ-2RKF6491X	Panasonic
104	Resistor	R151, R152, R154, R156, R181, R182, R186	ERJ-2RKF1001X	Panasonic
105	Resistor	R153	ERJ-2RKF9101X	Panasonic
106	Resistor	R189~191, R323, R324, R329~332, R360, R361, R366, R367, R369, R370, R387, R388, R393, R394~396, R424, R425, R430, R431, R433, R434, R450, R452, R554, R556, R566, R568	ERJ-2RKF1003X	Panasonic
107	Resistor	R192, R196, R199, R235, R236, R239, R240, R243, R244	ERJ-2RKF3300X	Panasonic
108	Resistor	R247, R248, R287, R304	ERJ-2RKF2201X	Panasonic

Note1: Parts that are interchangeable (e.g. general-purpose logic, resistor, capacitor) may be replaced with equivalents from other manufacturers.

Note2: Red text indicates unmounted parts.

Table 5.2.5 Parts List (5/5)

No.	Part Name		Specification	
	Category	Part #	Model number	Manufacturer
109	Resistor	R271, R273	ERJ-2RKF4702X	Panasonic
110	Resistor	R272, R274, R483, R484, R493, R494, R545~547, R550	ERJ-2RKF2402X	Panasonic
111	Resistor	R313, R314, R325, R326, R333, R334, R362, R363, R371, R372, R389, R390, R397, R398, R426, R427, R435, R436, R457, R458, R467~470, R501~504, R535~538	ERJ-2RKF1502X	Panasonic
112	Resistor	R315, R316, R340, R343, R375, R378, R460	ERJ-2RKF3002X	Panasonic
113	Resistor	R339, R342, R353, R354, R374, R377, R380, R381, R401, R403, R413, R414, R438, R441, R444, R445, R447, R448, R453, R454, R481, R482, R486, R488, R491, R492, R496, R498, R515, R516, R521, R522, R525, R526, R530, R532, R551, R552, R559, R560, R563, R564, R570, R572	ERJ-2RKF1202X	Panasonic
114	Resistor	R406, R407, R439, R442, R462	ERJ-2RKF7502X	Panasonic
115	Resistor	R517, R518, R527, R528	ESR01MZPF6201	ROHM
116	Resistor	R553, R555, R565, R567	ERJ-2RKF2702X	Panasonic
117	Filter	FL1, FL2	BLM21PG221SN1D	Murata
118	Filter	FL3~10	BLM18PG300SN1D	Murata
119	Filter	FL11, FL12	BLM18DN221SN1D	Murata
120	Inductor	L1, L2	SPM5015T-6R8M-LR	TDK
121	Inductor	L3~10	HMLQ25201B-R47MSR	Cyntec
122	Thermistor	THM1~4	NTCG104BF473FT1X	TDK
123	Test pin	TP1~4	LC-22-G-Black	MAC8
124	Jumper socket	for JP1	60910213421	Würth Elektronik
125	Switch cap	for SW5	AT-4063-W	NKK

Note: Parts that are interchangeable (e.g. general-purpose logic, resistor, capacitor) may be replaced with equivalents from other manufacturers.

6. Revision History

Revision History	RZ Safety Network Reference Kit (RTK0EF0179D01001BJ) RZ/T2L x2 Functional Safety Reference Board: User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Mar 10, 2024	–	First edition

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.

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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.

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