IOT-GATE-RPI4

Reference Guide

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Contents

Table 1 Document Revision Notes

Date	Description
October 2021	• First release
January 2022	• Fixed connector information in section 5.4 • Added digital I/O mapping in section 3.10
February 2023	• Added typical power consumption in section 7.3 • Added digital I/O operating conditions in section 3.10.4
November 2023	• Updated available configuration options

1 INTRODUCTION

1.1 About This Document

This document is part of a set of documents providing information necessary to operate and program Compulab IOT-GATE-RPI4.

1.2 Related Documents

For additional information not covered in this manual, please refer to the documents listed in Table 2.

Table 2 Related Documents

Document	Location
IOT-GATE-RPI4 resources	https://www.compulab.com/products/iot-gateways/iot-gate-rpi4-industrial-raspberry-pi-iot-gateway/#devres

2 OVERVIEW

2.1 Highlights

- Powered by Raspberry Pi 4 Compute module
- Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- 4GB RAM, 32GB eMMC, up-to 256GB NVME
- LTE/4G, WiFi 802.11ac, Bluetooth 5.0
- 2x Ethernet, 3x USB2.0 and 2x USB3.0
- Up-to 4x isolated RS485 | RS232 | CAN-FD ports
- Hardware Watchdog and TPM 2.0
- Fanless design in an aluminum, rugged housing
- Designed for reliability and 24/7 operation
- Wide temperature range of -40C to 80C
- Input voltage range of 8V to 36V and PoE client
- Supports DIN-rail and wall / VESA mounting
- Fully compatible with Raspberry Pi OS images

2.2 Specifications

Table 3 CPU, GPU, RAM, and Storage

Feature	Specifications
CPU	Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
GPU	Broadcom VideoCore VI H.265 (4Kp60 decode), H.264 (1080p60 decode, 1080p30 encode)
RAM	4GB, LPDDR4
Primary storage	32GB eMMC flash, soldered on-board
Secondary Storage	64GB - 256GB NVME flash, optional module

Table 4 Network

Feature	Specifications
LAN	1x 1000Mbps Ethernet port, RJ45 connector + POE enabled
	1x 100Mbs Ethernet port, RJ45 connector
WiFi	2.4GHz and 5.0GHz 802.11ac WiFi
Bluetooth	Bluetooth 5.0, BLE
Cellular	4G/LTE CAT4 cellular module, Quectel EC25-E/A * via mini-PCIe socket
	SIM card socket

Table 4 I/O and System

Feature	Specifications
USB	3x USB2.0 ports, type-A connectors
	2x USB3.0 ports, type-A connectors Implemented with an optional expansion add-on board * cannot be combined with NVME storage
RS485 CAN bus RS232	Up-to 4x RS485 (half-duplex) | RS232 | CAN-FD ports Isolated, terminal-block connector
Digital I/O	Up-to 2x I/O modules each supporting 4x digital outputs + 4x digital inputs Isolated, terminal-block connector, compliant with EN 61131-2
Debug	1x serial console via UART-to-USB bridge, micro-USB connector
Expansion	Expansion connector for add-on boards PCIe, USB, SPI, GPIOs
Security	On board TPM 2.0 implemented with Infineon SLB9670 IC
RTC	Real time clock operated from on-board coin-cell battery
Watchdog	Hardware watchdog
PoE	Support for PoE (powered device)

Table 5 Electrical, Mechanical and Environmental

Supply Voltage	Unregulated 8V to 36V
Power Consumption	3W – 10W, depending on system load and configuration
Dimensions	132 x 84 x 25mm
Enclosure Material	Aluminum housing
Cooling	Passive cooling, fanless design
Weight	550 gram
MTTF	2000,000 hours
Operation temperature	Commercial: 0° to 60° C Extended: -20° to 60° C Industrial: -40° to 80° C

3 CORE SYSTEM COMPONENTS

3.1 Raspberry Pi 4 module

IOT-GATE-RPI4 is built around the Raspberry Pi 4 module (CM4), which provides the following key features:

- Broadcom BCM2711 quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- 4GB LPDDR4
- Wireless LAN, 2.4GHz and 5.0GHz IEEE 802.11b/g/n/ac and Bluetooth 5.0, BLE
- Onboard Gigabit Ethernet PHY
- display interface (up to 4Kp60 supported)
- H.265 (4Kp60 decode); H.264 (1080p60 decode, 1080p30 encode); OpenGL ES 3.0 graphics

3.2 System Memory

3.2.1 DRAM

IOT-GATE-RPI4 is available with 4GB of on-board LPDDR4 memory.

3.2.2 Primary Storage

IOT-GATE-RPI4 features 32GB of soldered on-board eMMC memory for storing the bootloader and operating system (Kernel and root filesystem). The remaining eMMC space is used to store general-purpose (user) data.

3.2.3 Secondary Storage

IOT-GATE-RPI4 features an optional NVME SSD storage on-board M.2 connector (cannot be used as boot media), allowing to expand the system's non-volatile memory for storing additional data or back-up of the primary storage.

3.3 WiFi and Bluetooth

IOT-GATE-RPI4 is assembled with on-board 802.11b/g/n/ac WiFi and Bluetooth 5.0 BLE interfaces.

WiFi / Bluetooth antenna connection is available via RP-SMA connector on the IOT-GATE-RPI4 side panel.

3.4 Cellular

IOT-GATE-RPI4 cellular interface is implemented with a mini-PCIe cellular modem module and a nano-SIM socket. To set up IOT-GATE-RPI4 for cellular functionality, install an active SIM card into nano-SIM socket U20. The cellular module should be installed into mini-PCIe socket P9.

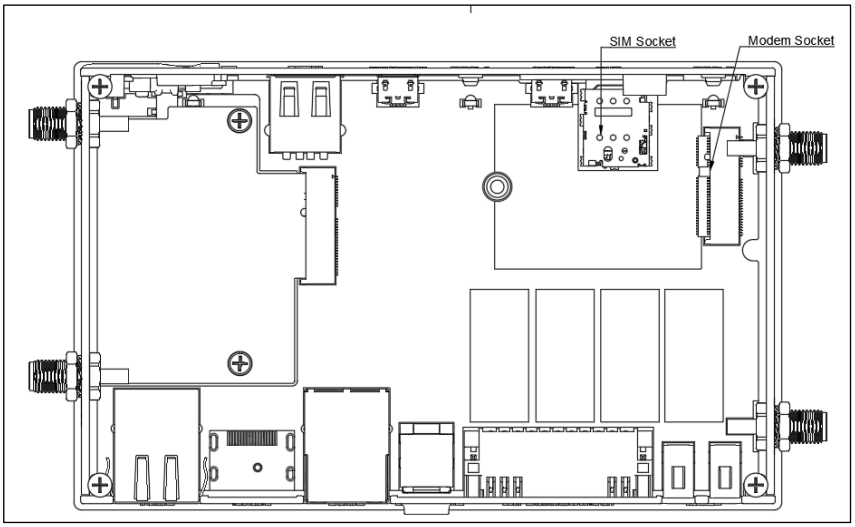
A secure lock panel is protecting the SIM card from external unauthorized tampering or extraction.

Modem antenna connections are available via SMA connectors on the IOT-GATE-RPI4 side panel.

CompuLab supplies IOT-GATE-RPI4 with the following cellular modem options:

- 4G/LTE CAT4 cellular module, Quectel EC25-E (EU bands)
- 4G/LTE CAT4 cellular module, Quectel EC25-A (US bands)

Figure 1 service bay - cellular modem



3.5 Ethernet

IOT-GATE-RPI4 incorporates two Ethernet ports:

- ETH1 – 100Mbps port implemented with Microchip LAN9514 controller
- ETH2 – 1000Mbps port implemented with Broadcom BCM54210PE
  - Optionally supports POE (powered device)
  - IEEE 1588-2008 compliant
  - Detection and correction of swapped pairs
  - MDI crossover, pair skew, and pair polarity correction

ETH1 is available on connector P7; ETH2 is available on connector P8

3.6 USB 2.0

IOT-GATE-RPI4 features three external USB2.0 host ports. The ports are routed to USB connectors P3, P4 and P5. An additional USB2 port is available on extension connector P12. All USB ports are implemented with MicroChip LAN9514 USB hub.

3.7 Serial Debug Console

IOT-GATE-RPI4 features a serial debug console via UART-to-USB bridge over micro USB connector. CP2104 UART-to-USB bridge is interfaced with CM4 UART1. CP2104 USB signals are routed to micro USB connector P11, located on the front panel.

3.8 USB Programming Port

IOT-GATE-RPI4 features a USB programming interface that allows to access the on-board primary eMMC storage using the RPI boot utility.
For USB programming please refer to the following documentation:
https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md
USB programming interface is routed to the front panel connector P6. The connector can be optionally protected from unauthorized access with a secure screw panel.
When a USB cable is connected to the USB programming connector, the IOT-GATE-RPI4 USB sub-system (internal USB hub and ETH1 port) are disabled.

3.9 I/O Expansion Socket

IOT-GATE-RPI4 expansion interface is available on M.2 Key-E socket P12. The expansion connector allows integration of custom I/O add-on boards into IOT-GATE-RPI4. The expansion connector features embedded interfaces such as I2C, SPI, USB, MIPI display and PCIe.
PCIe is routed via an on-board PCIe mux that selects the interface between NVME socket (P10) and expansion connector (P12).
To enable PCIe to the expansion, I2C GPIO expander #1 should be programmed accordingly.

3.10 Industrial I/O (IE modules)

IOT-GATE-RPI4 features 4 industrial I/O (IE) slots that can be fitted with up-to 4 different I/O modules. Each IE slot is isolated from IOT-GATE-RPI4.

Table 6 Industrial I/O – functions and ordering codes

	I/O slot A	I/O slot B	I/O slot C	I/O slot D
RS-232 (2-wire)	FARS2	FBRS2	FCRS2	FDRS2
RS-485 (half-duplex)	FARS4	FBRS4	FCRS4	FDRS4
CAN-FD	FACAN	FBCAN	FCCAN	FDCAN
Digital I/O(4x DI, 4x DO)	FABIO*		FCDIO*	

* Each digital I/O(4x DI, 4x DO) module uses two IE slots.

Combination examples:

- For 2x RS485 the ordering code will be IOT-GATE-RPI4-…-FARS4-FBRS4-…
- For 1x RS232 + 1x CAN + digital I/O the ordering code will be IOT-GATE-RPI4-…-FARS2-FBCAN-FCDIO-…

Certain I/O combinations may also be implemented with on-board SMT components.

Indutrial I/O signals are routed to a 2x11 terminal block on the IOT-GATE-RPI4 back panel. For connector pin-out please refer to section 5.4.

The following table shows which CM4 ports are used to implement various functions in each I/O slot.

Table 7 Industrial I/O – CM4 port mapping

	I/O slot A	I/O slot B	I/O slot C	I/O slot D
RS-232	UART2	UART3	UART4	UART5
RS-485	UART2	UART3	UART4	UART5
CAN-FD	SPI3	SPI4	SPI0	SPI1
Digital I/O(4x DI, 4x DO)	IN0 – GPIO4	OUT0 – GPIO0	IN0 – GPIO18	OUT0 – GPIO8
	IN1 – GPIO5	OUT1 – GPIO1	IN1 – GPIO19	OUT1 – GPIO9
	IN2 – GPIO6	OUT2 – GPIO2	IN2 – GPIO20	OUT2 – GPIO10
	IN3 – GPIO7	OUT3 – GPIO3	IN3 – GPIO21	OUT3 – GPIO11

3.10.1 IE-RS485

RS485 function is implemented with MAX13488 transceiver interfaced with CM4 UART ports. Key characteristics:

- 2-wire, half-duplex
- Galvanic isolation from the main unit
- Programmable baud rate of up to 3Mbps
- Software controlled 120ohm termination resistor

3.10.2 IE-CAN

CAN function is implemented with MCP2518FD controller interfaced with CM4 SPI ports. Key characteristics:

- Supports both CAN 2.0B and CAN FD modes
- Galvanic isolation from the main unit
- Data rate of up to 8Mbps

3.10.3 IE-RS232

RS232 function is implemented with MAX3221 (or compatible) transceiver interfaced with CM4 UART ports. Key characteristics:

- RX/TX only
- Galvanic isolation from the main unit
- Programmable baud rate of up to 250kbps

3.10.4 Digital inputs and outputs

Four digital inputs are implemented with the CLT3-4B digital termination following EN 61131-2. Four digital outputs are implemented with the VNI4140K solid-state relay following EN 61131-2. Key characteristics:

- Designed for 24V PLC applicaitons
- Galvanic isolation from the main unit and other I/O modules
- Digital outputs maximal output current – 200mA per channel

Table 8 Digital I/O Operating Conditions

Parameter	Description	Min	Typ.	Max	Unit
24V_IN	External power supply voltage	12	24	30	V
VIN Low	Maximal input voltage recongnized as LOW			4	V
VIN High	Minimal input voltage recognized as HIGH	6			V

Figure 2 Digital output – typical wiring example

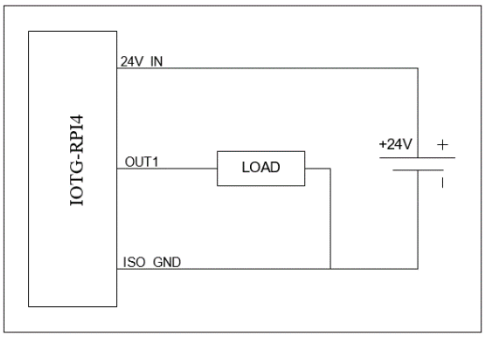
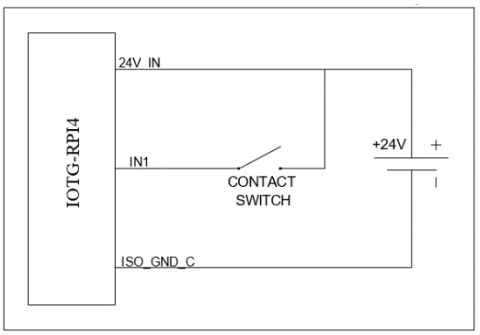


Figure 3 Digital input – typical wiring example



4 SYSTEM LOGIC

4.1 Power Subsystem

4.1.1 Power Rails

IOT-GATE-RPI4 is powered with a single power rail with an input voltage range of 8V to 36V.

When IOT-GATE-RPI4 is assembled with the “POE” option it can also be powered through ETH2 connector from a 802.3at Type 1 PoE source.

4.1.2 Power Modes

IOT-GATE-RPI4 supports two hardware power modes.

Table 9 Power modes

Power Mode	Description
ON	All internal power rails are enabled. Mode entered automatically when the main power supply is connected.
OFF	Compute module4 core power rails are off. Most of the peripheral's power rails are off.

4.1.3 RTC Back-Up Battery

IOT-GATE-RPI4 features a 120mAh coin cell lithium battery, which maintains the on-board RTC whenever the main power supply is not present.

4.2 Real-Time Clock

IOT-GATE-RPI4 RTC is implemented with the AM1805 real-time clock (RTC) chip. The RTC is connected to the CM4 using I2C interface at address 0xD2/D3. IOT-GATE-RPI4 back-up battery keeps the RTC running to maintain clock and time information whenever the main power supply is not present.

4.3 Hardware Watchdog

IOT-GATE-RPI4 watchdog function is implemented with the AM1805 real-time clock (RTC) chip.

4.4 Trusted Platform Module

IOT-GATE-RPI4 features an optional on-board TPM implemented with Infineon SLB9670XQ2.0.

4.5 I2C GPIO expanders

IOT-GATE-RPI4 has two I2C GPIO expander GPIO Expander #2 (U32) primary purposes: identifying and configuring the correct I/O interfaces for the IE expansion boards. GPIO expander #1 primary purpose is to serve as an additional GPIO source that control some of the optional reset signal on the board peripherals and general purpose LEDs.

GPIO expander #1 – U30 – 0x4E

GPIO expander #2 – U32 – 0x42

Please follow software documentation regarding uses and implementation. Please note that some pins are listed as not connected. These are usually routed via a 0R unpopulated resistor.

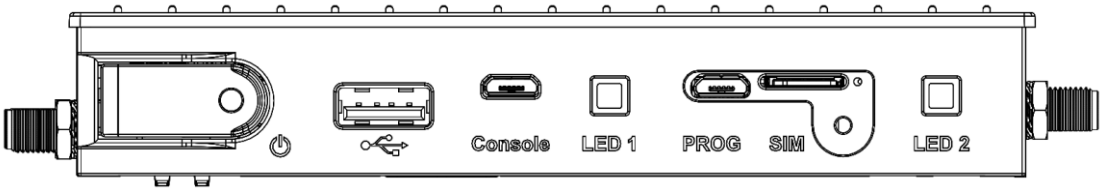
Table 9 I2C GPIO expander routing

IC I/O pin	Pin Name	Function description
I2C GPIO Expander #2 (U30) 0x4E		
I/O 0.0	MODEM_RESET_MR	Routed To P7 GPRS Modem Reset signal (P9 L22)
I/O 0.1	RF_KILL#	Routed To P7 GPRS Modem RF Kill (P9 L20)
I/O 0.2	PCIE_SELECT	Routed to U46 PCIe Select Normal operation, High selects PCIe to NVME Card(P10) Low state force the PCIe to expander connector P12
I/O 0.3	TPM_RST_MR	Routed to Reset controller(U50) for a manual reset to TPM(U31)
I/O 0.4	TPM_PIRQn	Routed directly to TMP(U31) PIRQn pin
I/O 0.5	EXT_EN_GPIO	Routed to P12 L44
I/O 0.6	EXT_IRQ_GPIO	Routed to P12 L46
I/O 0.7	USBSERIAL_nRST	Routed directly to UART To USB controller(U27) Reset signal
I/O 1.0	USB_OC_EN_RST	Routed to USB OC EN pin (Not Connected) U12
I/O 1.1	eMMC_RST_EXP	Routed to eMMC RST signal (Not connected) U10
I/O 1.2	USB1_RST_MR	Routed to USB HUB RST (Not connected)
I/O 1.3	HUB_B_RESET_MR	Routed to Reset controller(U47) for a manual reset to USB HUB(U6)
I/O 1.4	LED1_RED	User LED1 (DS1) Red
I/O 1.5	LED1_GREEN	User LED1 (DS1) Green
I/O 1.6	LED2_RED	User LED2 (DS3) Red
I/O 1.7	LED2_GREEN	User LED2 (DS3) Green
I2C GPIO Expander #2 (U32) 0x42		
I/O 0.0	POD1_DET1	IE1 Configuration Input pin
I/O 0.1	POD1_DET2	IE1 Configuration Input pin
I/O 0.2	POD1_DET3	IE1 Configuration Input pin
I/O 0.3	POD2_DET1	IE2 Configuration Input pin
I/O 0.4	POD2_DET2	IE2 Configuration Input pin
I/O 0.5	POD2_DET3	IE2 Configuration Input pin
I/O 0.6	POD3_DET1	IE3 Configuration Input pin
I/O 0.7	POD3_DET2	IE3 Configuration Input pin
I/O 1.0	POD3_DET3	IE3 Configuration Input pin
I/O 1.1	POD4_DET1	IE4 Configuration Input pin
I/O 1.2	POD4_DET2	IE4 Configuration Input pin
I/O 1.3	POD4_DET3	IE4 Configuration Input pin
I/O 1.4	BT_nDIS	Routed to Raspberry Pi4 for Bluetooth disable (if available)
I/O 1.5	WL_nDIS	Routed to Raspberry Pi4 for WiFi disable (If available)
I/O 1.6	NC	
I/O 1.7	NC	

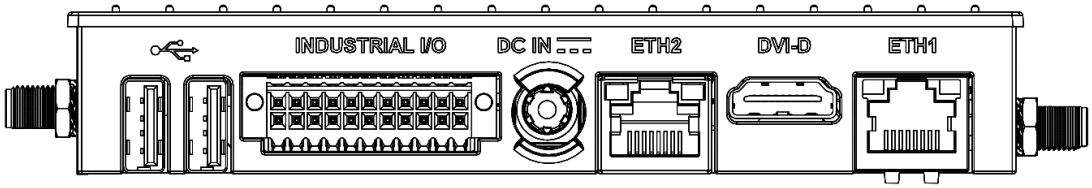
5 INTERFACES AND CONNECTORS

5.1 Connector Locations

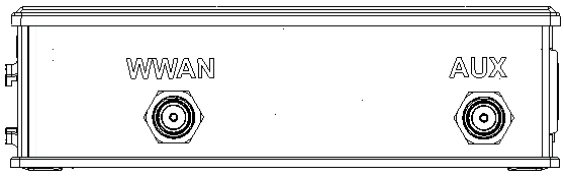
5.1.1 Front Panel



5.1.2 Back Panel

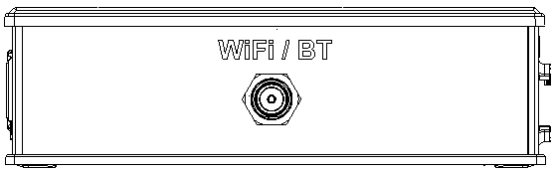


5.1.3 Left Side Panel

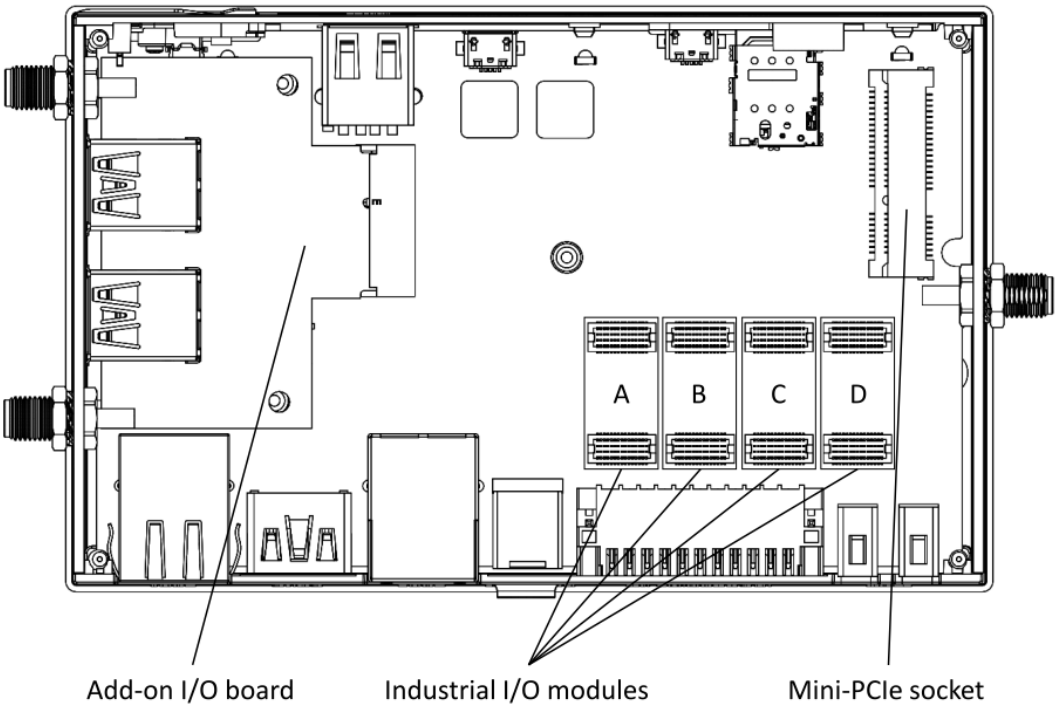


* The IOT-GATE-RPI4 left side panel is also used for the connector(s) of the optional expansion add-on boards. The picture above depicts the default panel without expansion add-on.

5.1.4 Right Side Panel



5.1.5 Service Bay



5.2 DC Power Jack (J1)

DC power input connector.

Table 10 DC jack connector pin-out

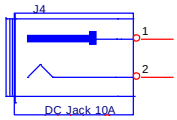
Pin	Signal Name	
1	DC IN	
2	GND	

Table 11 DC jack connector data

Manufacturer	Mfg. P/N
Contact Technology	DC-081HS(-2.5)

The connector is compatible with the IOT-GATE-RPI4 power supply unit available from CompuLab.

5.3 USB Host Connectors (P3, P4, P5)

The IOT-GATE-RPI4 external USB2.0 host ports are available through three standard type-A USB connectors (P3, P4, P5). For additional details, please refer to section 3.6 of this document.

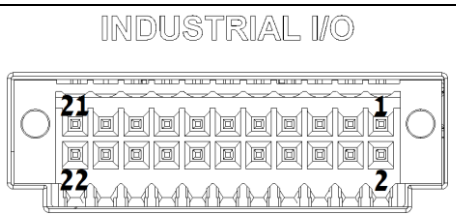
5.4 Industrial I/O Connector (P17)

IOT-GATE-RPI4 industrial I/O signals are routed to terminal block P17.

Table 12 Industrial I/O connector pin-out

I/O slot	Pin	FxRS2 (RS232)	FxRS4 (RS485)	FxCAN (CAN bus)	FxxIO (digital I/O)	Isolation Power Domain
A	2	RS232_TX	RS485_POS	CAN_H	IN0	1
	4	RS232_RX	RS485_NEG	CAN_L	IN1	1
	6	NC	NC	NC	IN2	1
	8	NC	NC	NC	IN3	1
B	1	RS232_TX	RS485_POS	CAN_H	OUT0	1
	3	RS232_RX	RS485_NEG	CAN_L	OUT1	1
	5	NC	NC	NC	OUT2	1
	7	NC	NC	NC	OUT3	1
A/B	9	ISO_GND_AB	ISO_GND_AB	ISO_GND_AB	ISO_GND_AB	1
	10	ISO_GND_AB	ISO_GND_AB	ISO_GND_AB	ISO_GND_AB	1
A/B	12	NC	NC	NC	24V_IN_AB	1
C	14	RS232_TX	RS485_POS	CAN_H	IN0	2
	16	RS232_RX	RS485_NEG	CAN_L	IN1	2
	18	NC	NC	NC	IN2	2
	20	NC	NC	NC	IN3	2
D	11	RS232_TX	RS485_POS	CAN_H	OUT0	2
	13	RS232_RX	RS485_NEG	CAN_L	OUT1	2
	15	NC	NC	NC	OUT2	2
	17	NC	NC	NC	OUT3	2
C/D	21	ISO_GND_CD	ISO_GND_CD	ISO_GND_CD	ISO_GND_CD	2
	22	ISO_GND_CD	ISO_GND_CD	ISO_GND_CD	ISO_GND_CD	2
C/D	19	NC	NC	NC	24V_IN_CD	2

Table 13 Industrial I/O add-on connector data

Connector type	Pin numbering
22-pin dual-raw plug with push-in spring connections Locking: screw flange Pitch: 2.54 mm Wire cross-section: AWG 20 – AWG 30	

5.5 Serial Debug Console (P5)

IOT-GATE-RPI4 serial debug console interface is routed to micro USB connector P11. For more information, please refer to section 3.7 of this documents.

5.6 RJ45 Ethernet Connectors (P7, P8)

IOT-GATE-RPI4 Gigabit Ethernet port ETH2 is routed to RJ45 connector P8. IOT-GATE-RPI4 100Mb Ethernet port ETH1 is routed to RJ45 connector P7. For additional details, please refer to section 3.5 of this document.

5.7 Mini-PCIe socket (P9)

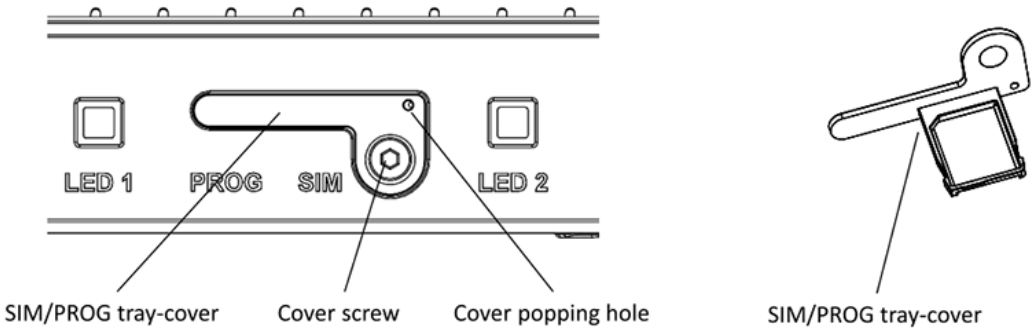
IOT-GATE-RPI4 features one mini-PCIe socket P9 mainly intended for cellular modem modules. P9 implements USB and SIM interfaces. Socket P9 does not implement PCIe signals.

5.8 Nano-SIM socket (U20)

The nano-uSIM socket (U20) is connected to mini-PCIe socket P9.

SIM card installation instructions:

- Remove the screw from the SIM/PROG tray-cover
- Insert a SIM removal tool into the cover popping hole to pop the tray-cover
- Place the SIM into the tray
- Carefully push the tray-cover back in
- Close the SIM/PROG cover screw (optional)RX/TX only



5.9 M.2 NVME socket (P10)

IOT-GATE-RPI4 features M.2 Key-E socket P10 intended for the NVME storage disk.

PCIe signals are multiplexed between NVME socket P10 and expansion connector P12. PCIe multiplexing is controlled by GPIO expander # 1 (I2C Address 0x4E).

5.10 Expansion Connector (P12)

IOT-GATE-RPI4 expansion interafce is available on M.2 Key-E socket with a custom pin-out P12. The expansion connector allows to integrate custom I/O add-on boards into IOT-GATE-RPI4. The following table outlines the connector pin-out and available pin functions.

Table 14 Expansion connector pin-out

Pin	Singal name	Description	Pin	Signal name	Description
2	VCC_3.3V	Power out 3.3V	1	GND	
4	VCC_3.3V	Power out 3.3V	3	USB_A3_DP	USB2 from USB Hub

6	VCC_5V	Power out 5V	5	USB_A3_DN	USB2 from USB Hub
8	VCC_5V	Power out 5V	7	GND	
10	VBATA_IN	Power In (8v-36v)	9	DSIO_D0_N	MIPI serial display Data 0_N
12	VBATA_IN	Power In (8v-36v)	11	DSIO_D0_P	MIPI serial display Data 0_P
14	VBATA_IN	Power In (8v-36v)	13	GND	
16	EXP_nRST	PCIe nRST (Input)	15	DSIO_D1_N	MIPI serial display Data 1_N
18	GND		17	DSIO_D1_P	MIPI serial display Data 2_P
20	AIN1	Analog in 0	19	GND	
22	AIN0	Analog in 1	21	DSIO_C_N	MIPI serial display Clock_N
24	NC	Key E notch	23	DSIO_C_P	MIPI serial display Clock_P
26	NC	Key E notch	25	NC	Key E notch
28	NC	Key E notch	27	NC	Key E notch
30	NC	Key E notch	29	NC	Key E notch
32	GND		31	NC	Key E notch
34	I2C6_SDA	I2C_6 Data from RPI4	33	GND	
36	I2C6_SCL	I2C_6 Clock from RPI4	35	EXP_CLK_P	PCIe Clock P
38	GND		37	EXP_CLK_N	PCIe Clock N
40	EXP_CLK_nREQ	PCIE CLK nREQ	39	GND	
42	GND		41	EXP_RX_P	PCIe Recieve 0 P
44	EXT_EN_GPIO	I2C GPIO, I/O 5	43	EXP_RX_N	PCIe Recieve 0 N
46	EXT_IRQ_GPIO	I2C GPIO, I/O 6	45	GND	
48	IE4/SPI4_MISO	SPI4 MISO (Also routed IE4)	47	EXP_TX_P	PCIe Transmit 0 P
50	IE4/SPI1_MOSI	SPI4 MOSI (Also routed IE4)	49	EXP_TX_N	PCIe Transmit 0 N
52	IE4/SPI1_CLK	SPI4 CLK (Also routed IE4)	51	GND	
54	SPI1_CE2_N	SPI1 CS	53	HDMI1_D2_P	HDMI1 Data 2 P
56	GND		55	HDMI1_D2_N	HDMI1 Data 2 N
58	HDMI1_SDA	HDMI I2C Data	57	GND	
60	HDMI1_SCL	HDMI I2C Clock	59	HDMI1_D1_P	HDMI1 Data 1 P
62	GND		61	HDMI1_D1_N	HDMI1 Data 1 N
64	HDMI1_HOTPLUG	HDMI1 Plug detection	63	GND	
66	GND		65	HDMI1_D0_P	HDMI1 Data 0 P
68	HDMI1_CEC	HDMI1 CEC line interface	67	HDMI1_D0_N	HDMI1 Data 0 N
70	NC		69	GND	
72	VCC_3.3V	Power out 3.3V	71	HDMI1_CK_P	HDMI1 Clock P
74	VCC_3.3V	Power out 3.3V	73	HDMI1_CK_N	HDMI1 Clock N
			75	GND	

5.11 Indicator LEDs

The tables below describe IOT-GATE-RPI4 indicator LEDs.

Power LED is a dual-color LED controlled by Pi_nLED_Activity and PI_LED_nPWR signals of the Compute Module. LED functionlaity can be set according to Raspberry Pi 4 documentation.

Table 15 Power LED (DS2)

Main power connected	LED state Red
Yes	On
No	Off

During normal operation power LED with flash green to signify eMMC access. In case an error occured during boot, power LED will flash error patterns which can be decoded using the following look-up table.

Table 16 Power LED error flash codes

Long flashes	Short flashes	Status
0	3	Generic failure to boot
0	4	start*.elf not found
0	7	Kernel image not found
0	8	SDRAM failure
0	9	Insufficient SDRAM
0	10	In HALT state
2	1	Partition not FAT
2	2	Failed to read from the partition
2	3	Extended partition, not FAT
2	4	File signature/hash mismatch
3	1	SPI EEPROM error
3	2	SPI EEPROM is write-protected
4	4	Unsupported board type
4	5	Fatal firmware error
4	6	Power failure type A
4	7	Power failure type B

Table 17 User LEDs (DS1, DS3)

GPIO Expander #1 controls user LEDs 1 and 2

GPIO Expander #1	GPIO State	LED state	GPIO state	LED state
I/O 1.4 (DS1 Red)	High	Off	Low	DS1 Red On
I/O 1.5 (DS1 Green)	High	Off	Low	DS1 Green on
I/O 1.6 (DS2 Red)	High	Off	Low	DS2 Red On
I/O 1.7 (DS2 Green)	High	Off	Low	DS2 Green on

5.12 Antenna Connectors

IOT-GATE-RPI4 features up-to three connectors for external antennas.

Table 18 Default antenna connector assignment

Connector Name	Function	Connector Type
WiFi / BT	WiFi/BT MAIN antenna	RP-SMA
WWAN	GPRS MAIN antenna	SMA
AUX	Modem Aux antenna	SMA

6 MECHANICAL DRAWINGS

IOT-GATE-RPI4 3D model is available for download at:

https://www.compulab.com/products/iot-gateways/iot-gate-rpi4-industrial-raspberry-pi-iot-gateway/#devres

7 OPERATIONAL CHARACTERISTICS

7.1 Absolute Maximum Ratings

Table 19 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Main power supply voltage	-0.3	40	V

NOTE: Stress beyond Absolute Maximum Ratings may cause permanent damage to the device.

7.2 Recommended Operating Conditions

Table 20 Recommended Operating Conditions

Parameter	Min	Typ.	Max	Unit
Main power supply voltage	8	12	36	V

7.3 Typical Power Consumption

Table 21 IOT-GATE-RPI4 Typical Power Consumption

Use case	Use case description	Current	Power
O/S idle, headless	O/S running, Ethernet up, no display, no activity	200mA	2.4W
O/S idle, with display	O/S running, ethernet up, display connected, no activity	240mA	2.9W
Wi-Fi or Ethernet data transfer	Linux up, no display, active ethernet or Wi-Fi data transmission	280mA	3.3W
Cellular modem data transfer	Linux up, no display, active modem data transmission	440mA	5.3
Heavy mixed load without cellular activity	CPU and memory stress-test + Wi-Fi running + Bluetooth running + Ethernet activity + LEDs	580mA	6.9W
Heavy mixed load with active cellular modem data transfer	CPU and memory stress-test + active modem data transmission	720mA	8.6W

Power consumption has been measured with the following setup:

1. Configuration - IOTG-RPI4-D4-NA32-WB-JEC25E- FARS4-FBRS2-FDIO-POE-PS-XL
2. Standard IOT-GATE-RPI4 12VDC PSU
3. Software stack - stock IOT-GATE-RPI4 Raspberry Pi OS image release 2.0