RIO-2015PG

FreeRTOS Programmable Remote I/O Module

Hardware Guide

Version 1.01

Artila

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1. Introduction

RIO-2015PG is a FreeRTOS Programmable Remote I/O Module.   It features A/D, D/A and DIO in a single unit and is C programmable with embedded web server.   Software developer can use powerful Atmel Studio to program to compile and debug their applications.   Lots of example programs are included for users to jump start their applications.   A Manager utility is included to discover RIO-2015PG and upgrade its application firmware.

1.1   Features

- Atmel SAM4E16E ARM Cortex-M4 120MHz
- 1MB on-chip flash and 128KB on-chip SRAM.   2MB flash and 128KB SRAM via spi expansion
- One four wire RS-232 and one isolated RS-485 serial port
- One 10/100Mbps Ethernet port
- Four 16-bit analog input channels
- Two 16-bit analog output channels
- Two relay output and four isolated digital input
- One Maxim 1-wire channel
- One serial console port
- Support lwIP and BSD socket library
- Support tiny web server
- Windows configuration utility included
- Toolchain: Atmel Studio

1.2   Specification

- **CPU:** Atmel SAM4E16E Cortex-M4 120MHz
- **Serial port:**
    - Port1: RS-485 1500Vrms isolated
    - Port2: One full modem RS-232
    - Console: RS-232 three wires
    - Baud rate: 1200 to 921600bps
    - Flow control: None / Hardware / Xon_Xoff
    - Data bit: 5 to 8
    - Stop bit: 1 to 2
    - Protection: 15KV ESD
- **Ethernet:**
    - 10/100Mbps, RJ45
    - Protection: 1500V Magnetic isolation
- **Mass Storage:**
    - microSD socket inside x 1

- **Isolation analog input:**
  - Channel number: 4
  - Resolution: 16-bit
  - Input range:
    - Unipolar: 0~150mV, 0~500mV, 0~1V, 0~5V, 0~10V
    - Bipolar: +/-150mV, +/-500mV, +/-1V, +/-5V, +/-10V
    - Current: 0~20mA
    - Input impedance: 20M Ohm (voltage), 120 Ohm (resistor)
  - Accuracy: +/-0.1% FSR
  - Isolation: 1500Vrms
- **Isolated analog output:**
  - No of channel: 2
  - Output mode: Voltage / current
  - Resolution: 16-bit
  - Output range:
    - Unipolar: 0~5V, 0~10V
    - Bipolar: +/-5V, +/-10V
    - Current: 0~20mA, 4~20mA, 0~24mA
  - Accuracy: +/-0.25% FSR (Voltage), +/-0.2% FSR (Current)
  - Load resistance: 0~1K Ohm
  - Isolation: 1500Vrms
- **Isolation digital input:**
  - Channel number: 4
  - Photo isolation (AC in): 2500Vrms
  - Logical High: 5~24Vdc
  - Logical Low: 0~1.5Vdc
  - Input type: AC input
  - Input resistance: 1.2K Ohms@0.5W
- **Relay output:**
  - Channel number: 2
  - Contact rating: 30VDC@1A or 125VAC@0.5A
- **1-Wire port:** Three-pin terminals x 3 (Maxim 1-Wire)
- **Power:** 9~48VDC power jack and terminal block
- **Dimension** (W x L x H)**:** 115.7 x 121.5 x 43.0mm (4.56 x 4.78 x 1.69in)
- **Weight:** 242g (0.53lb)
- **Operating Temperature:** 0~70°C
- **Storage Temperature:** -20~85°C

1.3 Packing List

- RIO-2015PG: Programmable remote I/O module

- Software toolchain (download from Atmel web support)

- Manager Utility (download from Artila web)

1.4 Optional Accessory

- CBL-F10M9-20 (91-0P9M9-001): Serial Console Cable (10Pin Header to DB9 male, 20cm)

- DS18B20 (91-6DS18-001): Programmable Resolution 1-wire Digital Thermometer

- PWR-12V-1A (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor

2. Layout
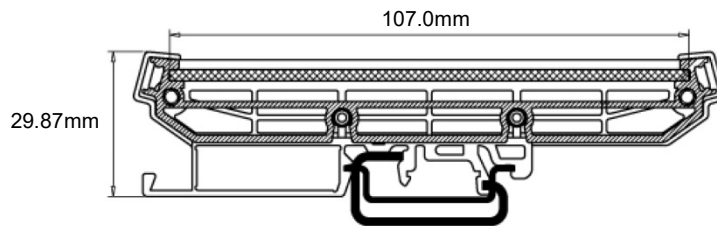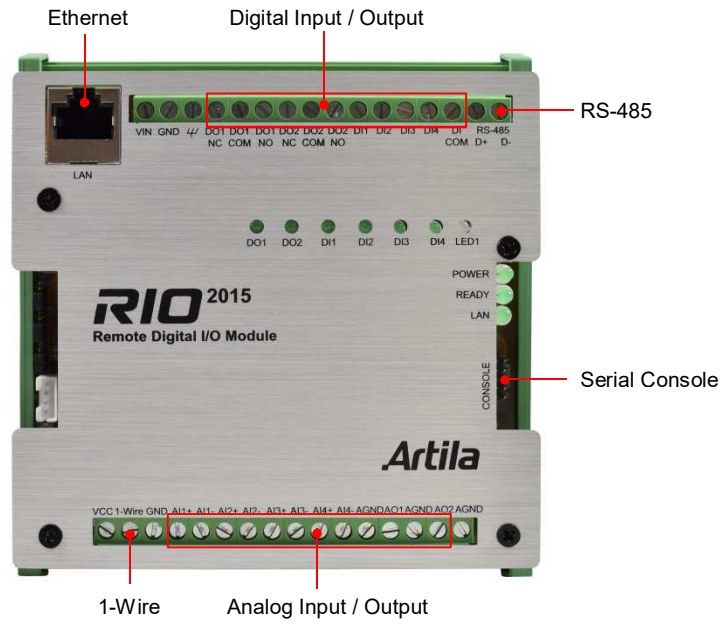
3. Pin Assignment and Definition

3.1 Power In: (CN1: P1~P3)

Vin (P1): DC power + in

Gnd (P2): power ground

⎏ (P3): Chassis ground

Connecting 9~48VDC power to Vin and Gnd.   If the power is properly supplied, the Power LED will keep solid green color and a beep will be heard.   The chassis ground is to connected to chassis or earth ground if needed.

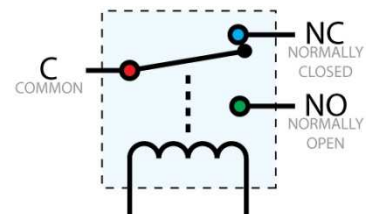## 3.2 Relay Output (CN1: P4~P9)

DO1_NC (P4): Relay one normal close

DO1_COM (P5): Relay one common

DO1_NO (P6): Relay one normal open

DO2_NC (P7): Relay two normal close

DO2_COM (P8): Relay two common

DO2_NO (P9): Relay two normal open
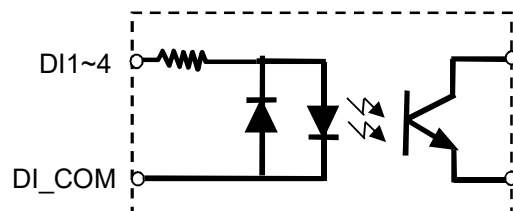

3.3 Isolated Digital Input (CN1: P10~P14)

DI1 (P10): Digital input 1

DI2 (P11): Digital input 2

DI3 (P12): Digital input 3

DI4 (P13): Digital input 4

DI_COM (P14): Common pin of DI1~DI4

3.4 Isolated RS-485 (CN1: P15~P16)

D+ (P15): Data+

D- (P16): Data-

3.5 1-Wire (CN2: P1~P3)

VCC (CN2: P1): +5VDC output for 1-wire sensor

1-Wire (CN2: P2): 1-wire data

GND (CN2: P3): power ground

3.6 Isolated Analog Input (CN2: P4~P12)

AIN1+ (P4): analog input + channel 1

AIN1- (P5): analog input - channel 1

AIN2+ (P6): analog input + channel 2

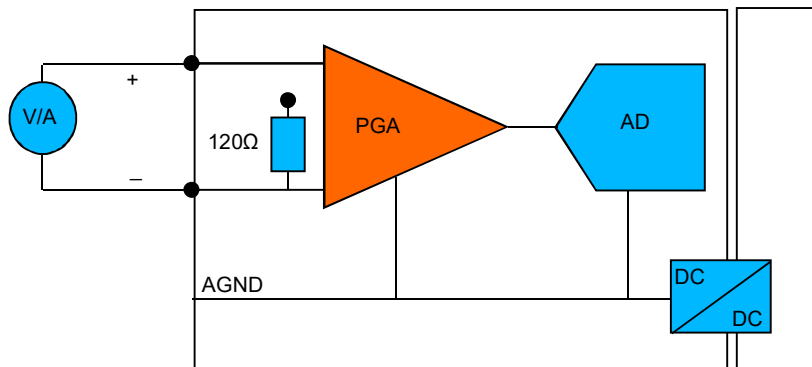**AIN2- (P7):** analog input - channel 2

AIN3+ (P8): analog input + channel 3

AIN3- (P9): analog input - channel 3

AIN4+ (P10): analog input + channel 4

AIN4- (P11): analog input - channel 4

AGND (P12): isolated ground

3.7 Isolated Analog Output (CN2: P13~P16)

AO_1 (P13): analog output + channel 1

AGND (P14): isolated ground

AO_2 (P15): analog output + channel 2

AGND (P16): isolated ground

3.8 LED Status

The LED provides the RIO-2015PG operation information.   The LED status is described as follow:

- **Power LED:** Power LED keeps ON if power (+9VDC to +48VDC) is correct.
- **Ready LED:** Ready LED keeps ON when RIO-2015PG firmware is ready for operation.
- **LAN LED:** Link and Activity LED will turn ON when the Ethernet cable is connected.   When there is network data traffic, this LED will flash.
- **LED 1:** This LED is dual color and it indicates the serial data traffic of RS-485, RS-232 and serial console respectively.   The Yellow LED stands for receiving data and Green LED means transmitting data.

- **LED DO1 / DO2:** These LEDs indicate the relay status.   When the coil of relay is energized, the LED will be ON.
- **LED DI1 / DI14:** These LEDs indicate the DI status.   When the input is high, the LED will be ON.

4. Jumper Settings

- **Analog input mode (JP2~JP 5)**

Voltage: 1-2   Current: 2-3

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☞ **Note**

JP2 and JP5 are set to position 1-2 (Voltage input) as factory default.

- **Serial / Debug selection jumper (JP6, JP7)**

Serial port (COM2) and serial console port (COM3) share the same 10-pin header.   Use jumper JP6 and JP7 to selected which port to connect to.   Please use console cable (91-09PM9-001) to convert it to DB9 male RS-232 interface.

- **Serial port selection mode (JP6~JP7)**

RS-232 (COM2): 1-2   Console: 2-3

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☞ **Note**

JP6 and JP7 are set to position 2-3 (Console) as factory default.

Pin	COM2	COM3
1	DCD	N/C
2	DSR	N/C
3	RXD	RXD
4	RTS	N/C
5	TXD	TXD
6	CTS	N/C
7	DTR	N/C
8	N/C	N/C
9	GND	GND
10	N/C	N/C

COM2: RS-232
COM3: Console