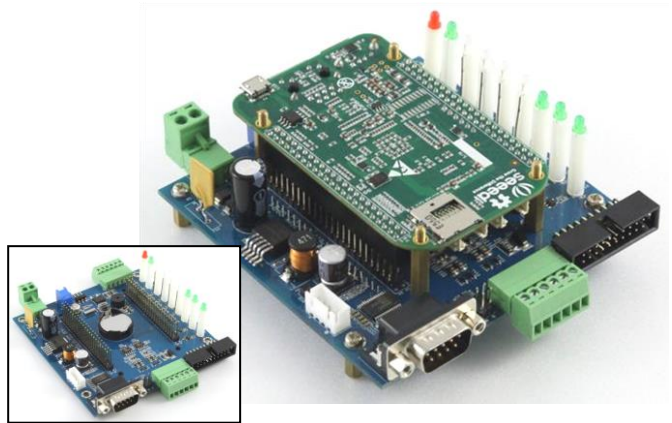


LLD-AIO-004 BeagleBone Green Industrial-Application Module

- ✓ **Specific Cape for Industrial communication and Application control**
- ✓ **9~24VDC Input Working Power**
- ✓ **1-Channel RS-232 serial equipment data transmission communication**
- ✓ **2-Channel RS-485 serial equipment data transmission communication**
- ✓ **2-Channel 3.3V UART serial equipment data transmission communication**
- ✓ **16 Digital Control Points (GPIO)**
- ✓ **Specific embedded Linux Operating System**
- ✓ **Demo Program for transmission communication and control interface**



Product Feature

☒ **Specific Cape for BeagleBone Green**

LLD-AIO-004 is a tailor-made cape for BeagleBone Green(BBG) design by LLD technology. Through the signal conversion function on LLD-AIO-004, BBG developers can connect all kinds of target device to BBG easily. Complete the development and testing of industrial automation, common data communication monitoring and state control application.

☒ **Specific embedded Linux operating System**

LLD technology optimize the BBG official Linux operating system. Not only optimize the LLD-AIO-004's drivers of RTC, network and serial communication, GPIO control interface, but also use lighttp Web Server to improve the application efficiency of monitoring equipment. Database MySQL services are integrated into the system, to help developers complete the preparation work in the storage of data or the application of the cloud.

The optimized Linux operating system still maintain the standard C API function. With no other definition of dedicated API to avoid other learning costs of the system development.

☒ **Simple and Easy Demo Program**

The UART, RS-232, RS-485 and GPIO interface of the LLD-AIO-004 has a corresponding Demo program. Only need to run the program in the optimized Linux operating system. The developer can easily get started to achieve the purpose of familiar with the product and executive function. Then accelerate the development of the system or program.

LLD technology also provides a cross platform programming environment that can be used in development or test in Windows operating system. Developer who is used to Windows operating system can easily develop software on LLD-AIO-004.

☒ **Stable DC power conversion and protection function**

LLD-AIO-004 has direct current (DC) 9~24V working voltage input function. Not only let developer can use the power easily, but also match with the actual application of the power supply. The simple box header of the Digital I/O interface provide DC 5V power supply, Make LLD-AIO-004 easy to connect to other I/O signal conversion module for development and use.

☒ **Serial transmission interface**

RS-232 and RS-485 are still the main communication interface of card, thermometer, meter and other small equipment or instrument. UART interface is mainly used in connecting the 3G mobile communication, Zigbee, BlueTooth and WiFi wireless module. LLD-AIO-004 converted BBG's 5 high speed serial port (UART) signals into 1 channel RS-232, 2 channel of half duplex RS-485 and 2 channel of UART. The 5 sets of signals are converted and extended to a dedicated connection, allowing users to connect to the target device for development and testing.

☒ **Digital I/O Control Interface**

LLD-AIO-004 extend the BBG's 16 GPIO points to the 20 pins simple box header, the Digital Input and Output can control through the program. Can also match with LLD-M01 Digital I/O control module (8 sets of Relay control and 8 point optional dry contact input (Input Dry/Web) detection) to develop switches or sensors for physical connections. Reach the goal of monitoring application development and testing.

☒ **Simple and easy human machine interface**

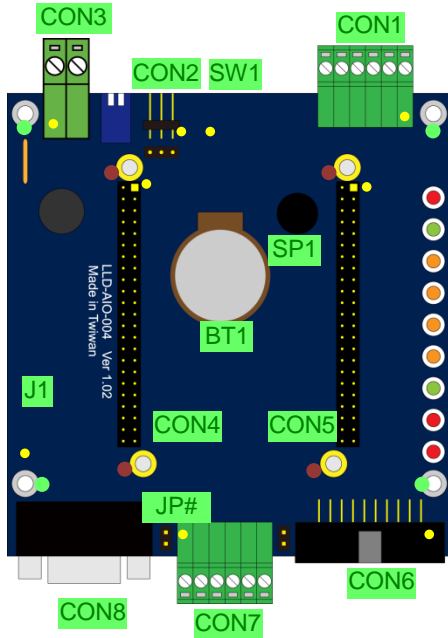
LLD-AIO-004 extended and converted part of the BBG's GPIO to human-computer interface. 2 points of DIP Switch can be used as a manual switching application mode input judgment. A number of LED lights and 1 set of buzzer can be used as LLD-AIO-004 machine status display or alert function. The judgment or control of these States can be compared to the control of GPIO software development.

☒ **Terminal block for easy connection**

In addition to the original configuration of BBG's standard RJ45 network interface, USB and SD Micro interface. LLD-AIO-004 converted the power input, extended serial communication and Digital I/O interface to a more convenient to connecting wire and stable connector.

The power input, RS-485 and UART interface use industrial pluggable terminal block. RS-232 is using standard DB9 male and standard pin definition. Digital I/O is using a needle type simple block header. Besides convenient to test, also easy to make cable and connect with other I/O signal conversion modules.

Product exterior and PIN definition



• : the position of the first contact

Fixed hole description

- : install 16mm Copper PillarBBG module pad and fixed
- : install 10mm Copper Pillar, LLD-AIO-004 bottom pad

Other

Function	Part No.
Beeper corresponding to BBG GPIO x 1	SP1
RTC Dedicated battery(Seat)	BT1
Enable RS-485 120Ω Terminal Resistance	JP1, JP2

Contact

Function	Part No.
LLD-AIO-004 and BBG working power input terminal block	CON3
BBG connect PIN block (CON4 Corresponding to BBG P8, CON5 Corresponding to BBG P9)	CON4, CON5
RS-232 DB9 male (TxD, RxD, GND)	CON8
RS-485 x 2 3.50 terminal block (2 sets/ D+, D-, GND)	CON7
UART x 2, provide 3.3V and 5V DC	CON1
BBG Console (J1 Corresponding to BBG J1, need to connect through the transit line)	CON2, J1
20-pin simple block header GPIO x 16, provide 5VDC	CON6
DIP Switch corresponding to BBG GPIO x 2	SW1

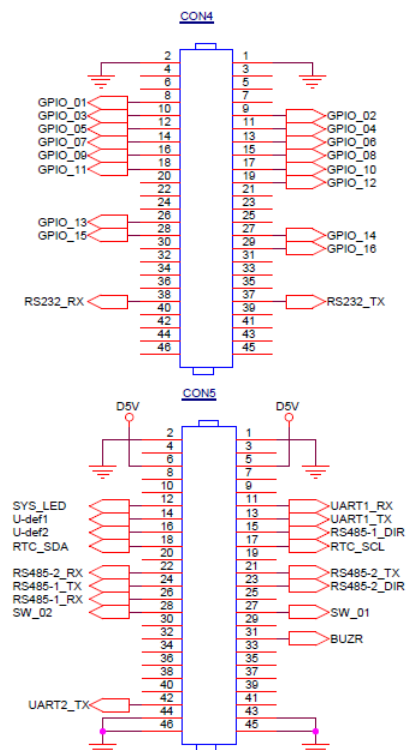
LED description (Left picture from top to down)

Color	Part No.	Description
Red	D1	power *
Green	D3	Sys_LED
Double	D4	RS-232 status *
Double	D6	RS-485-1 status *
Double	D7	RS-485-2 status *
Double	D8	UART-1 status *
Green	D9	UART-2 status *
Red	D11	U-def1
Red	D12	U-def2

Double : Double color LED(Red+Green)
* : can't control through software

BBG Signal conversion and extension function definition

Part No.	Function	Corresponding signal of BBG PIN position (CON4/BBF-P8, CON5/BBG-P9)
CON1	UART	UART1_RX, UART1_TX, UART2_TX
CON6	GPIO	GPIO_01~GPIO_16
CON7	RS-485	RS485-1_TX, RS485-1_RX, RS485-1_DIR RS485-2_TX, RS485-2_RX, RS485-2_DIR
CON8	RS-232	RS232-TX, RS232-RX
RTC	RTC	RTC_SDA, RTC_SCL
SP1	Beeper	BUZR
SW1	Dip Switch	SW_01, SW_02
LED	LED	SYS_LED, U-def1, U_def2



Product specifications

Hardware

System Core

- ▶ BeagleBone Green Module
(LLD-AIO-004 Cape not include)

Digital I/O Control (GPIO)

- ▶ Quantity : 22 points
- ▶ Signal Type : 3.3V CMOS
- ▶ 2.54mm simple box header x 16 GPIO
- ▶ DIP Switch x 2 GPIO
- ▶ LED x 3 GPIO
- ▶ Buzzer x 1 GPIO

RS-232 Serial Port Interface

- ▶ Quantity : 1 set
- ▶ Signal : Tx, Rx, GND
- ▶ Protection : 15KV ESD Static · 400W Surge Protection
- ▶ Connector : DB9 Male

RS-485 Serial Port Interface

- ▶ Quantity : 2 sets
- ▶ RS-485 Signal : Data+, Data-, GND
- ▶ Multi-Drop Nodes : 256 (1/8 Load)
- ▶ Built-in Terminal Resistor : 120Ω · By Jumper
- ▶ Protection : 2KV ESD Static, 400W Surge Protection
- ▶ Connector : 3.50mm pluggable terminal block

UART Serial Port Interface

- ▶ Quantity : 2 sets
- ▶ UART(A) Signal : Tx, Rx, GND
- ▶ UART(B) Signal : Tx, GND
- ▶ Connector : 3.50mm pluggable terminal block

BBG RS-232 Console Interface

- ▶ Quantity : 1 set
- ▶ Signal : RS-232 Tx, Rx, GND
- ▶ Connector : 3-pin 2.54 mm PIN block

Power

- ▶ Working Voltage : DC 9-24VDC
- ▶ Power Connector : 5.00mm pluggable terminal block
- ▶ Power Consumption : <5W (not include USB device)
- ▶ Power Output : 3.3V & 5V DC (1A max.)
- ▶ Power Output contact : merge with GPIO simple block header and UART terminal block

Purchase information

- ▶ **LLD-AIO-004** BeagleBone Green Industrial-Application Module

Contains: BeagleBone Green x 1, LLD-AIO-004 Cape x 1, Simple manual x 1, LLD-AIO-004 Specific BBG Console wire x 1, 16mm Copper Pillars x 4(for BBG) · 10mm Copper Pillars x 4 · 3x5mm Screw x 8

- ▶ **LLD-AIO-004 Cape** BeagleBone Green Industrial-Application Cape

Contains: LLD-AIO-004 Cape x 1, Simple manual x 1, LLD-AIO-004 Specific BBG Console wire x 1, 16mm Copper Pillars x 4(for BBG) · 10mm Copper Pillars x 4 · 3x5mm Screw x 8

Optional Accessories

- ▶ **LLD-M01** 8-ch Isolated Digital Input (Dry/Wet selectable) and 8-ch Relay Output I/O Expanding Module
- ▶ **CD12V** 100~240V AC to 12VDC Power Adapter (US Type)

Others

- ▶ Real Time Clock (RTC) : 1 set
- ▶ Buzzer : 1 set
- ▶ LED indicator : power, network, serial port, control signal, user defined
- ▶ PCB Size : 98 x 102
- ▶ Fixing hole : Φ3.50mm x 8 (Fix BBG x4 · PCB padx4)
- ▶ Applicable temperature : 0~50°C
- ▶ Applicable humidity : 20%~80% RHG

Software

- ▶ OS : Linux (LLD technology optimized)
- ▶ Common drivers : Ethernet, UART, RS-232, RS-485, GPIO, RTC
- ▶ Common services : SSH · lighttpd web server · MySQL
- ▶ Demo program : serial transmission communication (RS-232 · RS-485 · UART) · GPIO control(GPIO · DIP Switch · LED · LLD-M01 I/O module)
- ▶ Development environment : C Language, in Linux or Windows OS

Connect with BBG

Connection Interface

- ▶ 2x23 2.54 PIN block 2 sets
VDC working voltage
UART 5 sets
GPIO 22 sets
RTC (I2C) 1 set
- ▶ 1x4 2.54 wafer 1 set
BBG Console 1 set

BeagleBone Green Built-in communication function

- ▶ Ethernet : 100Mbps, RJ45 x 1
- ▶ USB Host : USB 2.0, Type A x 1
- ▶ USB Client : microUSB, Type B x 1
(can't be the LLD-AIO-004 working power supply)
- ▶ SD : MicroSD socket x 1



LLD-M01