Seeed Studio BeagleBone® Green Gateway

Ultimate Gateway for Your Industrial Needs

Reference Guide

Revision A
July 6, 2020

seeed studio

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Overview

Description

Seeed Studio BeagleBone® Green Gateway is a low-cost, open-source, community-supported development platform for developers and hobbyists. It is a joint effort by BeagleBoard.org and Seeed Studio. It is based on the classical open-source hardware design of BeagleBone® Black and developed into this differentiated version. It is powered by a Sitara™ AM3358 Arm® Cortex® A8 operating at up to 1GHz with 512MB DDR3 RAM, 4GB eMMC Flash and has rich I/O peripherals such as USB Ports, 10/100M Ethernet Port, Grove connectors and much more.

The Seeed Studio BeagleBone® Green Gateway is a combination of Seeed Studio BeagleBone® Green and Seeed Studio BeagleBone® Green Wireless, equipped with both Ethernet and Wireless connectivity.

You can easily boot Linux under 10 seconds, and it is very easy to get started on the Sitara™ AM3358 Arm® Cortex® A8 Processor development with just a single USB cable.

The capabilities on the BeagleBone® Green Gateway can be further extended by using expansion boards called "Capes" that can be plugged into it's two 46-pin dual-row expansion headers. Capes are available for, VGA, LCD, motor control, prototyping, battery power and various other functionalities.

Features

- Fully Compatible with BeagleBone® Black and Seeed Studio BeagleBone® Green
- Compact Size for Convenient Deployment
- Powerful Sitara™ AM3358 Arm® Cortex® A8 Processor
- Rich I/O Peripherals
- PRUs for Real-Time Capabilites
- Cape Support for Expandability
- Open-Source
- Support from fast-growing community

Applications

- Internet of Things
- Smart House
- Industrial
- Automation & Process Control
- Human Machine Interface
- Sensor Hub
- Robotics

Specifications

AM3358 1GHz ARM® Cortex-A8 Processor

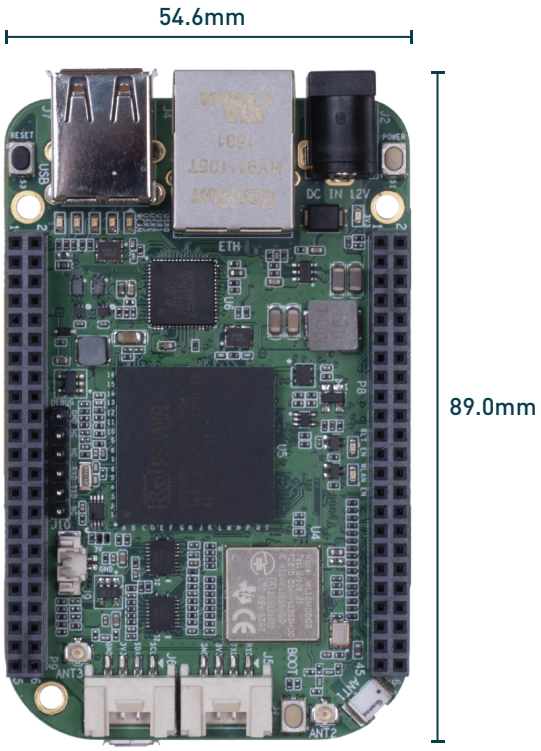
- 2 x 32-bit 200MHz PRU (Programmable Real-Time Unit)
- 3D Graphics Accelerator
- NEON Floating-Point Accelerator

On-Board Chips

- 4GB, 8-bit eMMC Onboard Flash Storage
- 512MB DDR3 RAM
- 4KB EEPROM

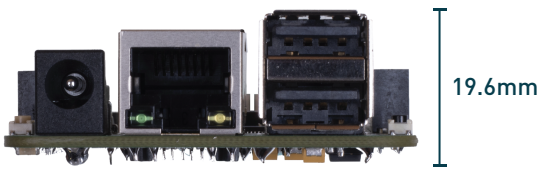
Connectivity

- Ethernet 10/100Mbit
- Wi-Fi 802.11 b/g/n 2.4GHz
- USB Client for Power & Communications
- USB Host
- SD/MMC Connector for Micro-SD
- Bluetooth 4.1 with BLE
- 2 x 46 Pin Headers
- 2 x Grove Connectors (I2C and UART)
- DC Jack for Power, 12V



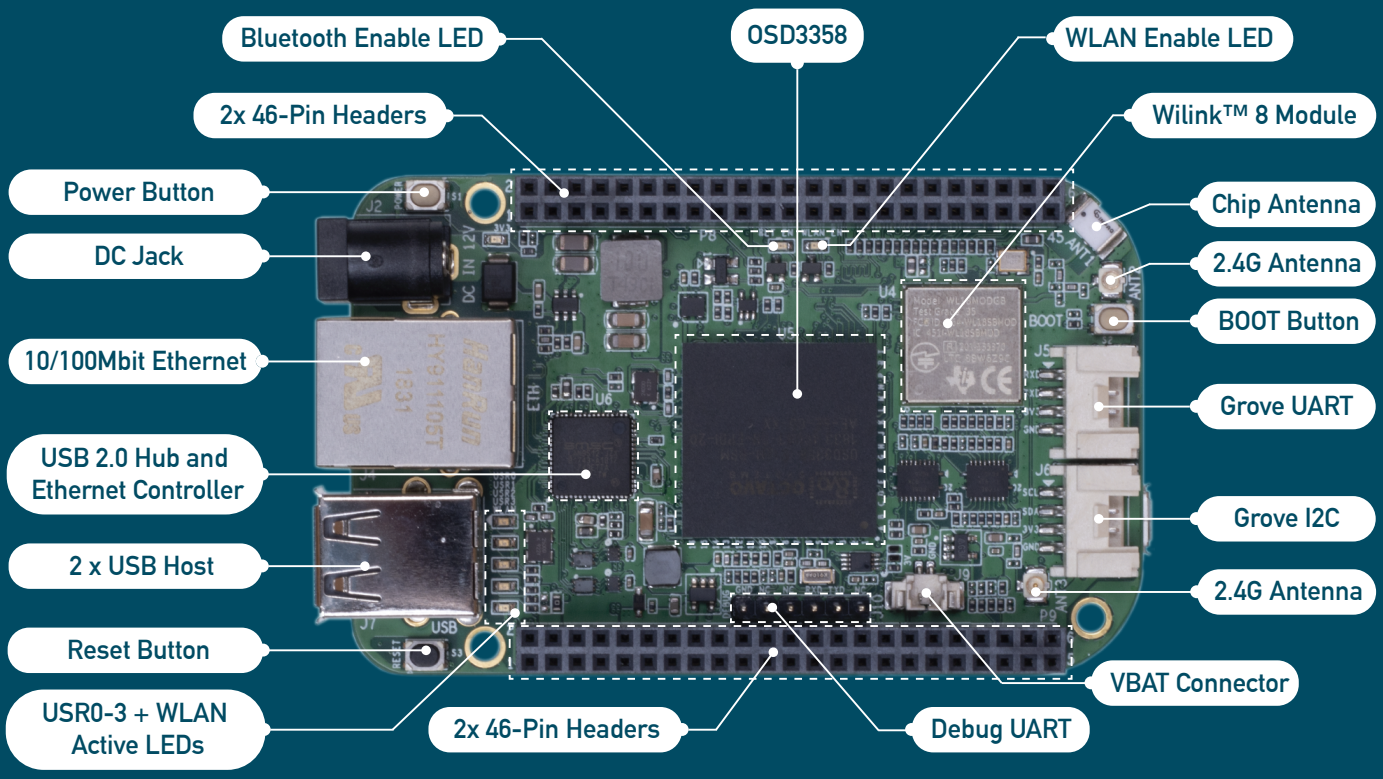
Software Compatibility

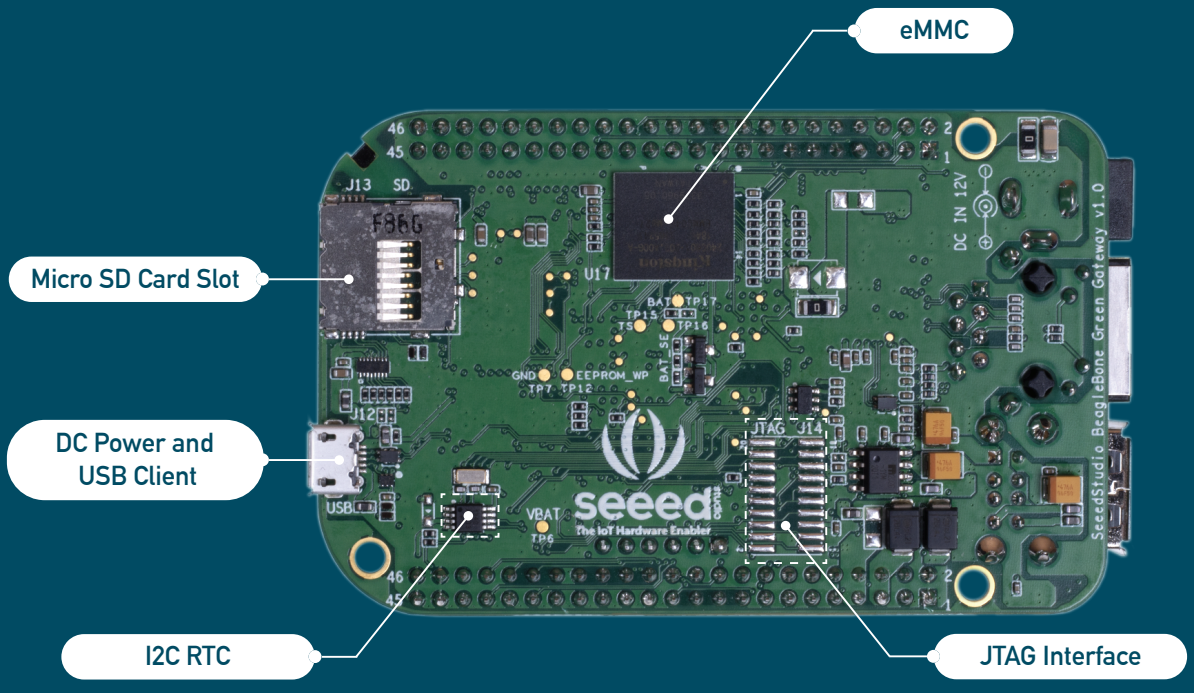
- Debian
- Android
- Ubuntu
- Cloud9 IDE on Node.js w/ BoneScript library



Hardware Overview

Board Overview





Pin Map

Each digital I/O pin has 8 different modes that can be selected, including GPIO.

65 Possible Digital I/Os

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
GPIO_5	17	18	GPIO_4	GPIO_27	17	18	GPIO_65
I2C2_CAL	19	20	I2C2_SDA	GPIO_22	19	20	GPIO_63
GPIO_3	21	22	GPIO_2	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	GPIO_15	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	GPIO_14	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	GPIO_123	GPIO_86	27	28	GPIO_88
GPIO_121	29	30	GPIO_122	GPIO_87	29	30	GPIO_89
GPIO_120	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	GPIO_81
AIN6	35	36	AIN5	GPIO_8	35	36	GPIO_80
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

Note:
In GPIO mode, each digital I/O can produce interrupts.

PWMs and Timers

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	TIMER4	7	8	TIMER7
PWR_BUT	9	10	SYS_RESETN	TIMER5	9	10	TIMER6
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	EHRPWM1A	EHRPWM2B	13	14	GPIO_26
GPIO_48	15	16	EHRPWM1B	GPIO_47	15	16	GPIO_46
GPIO_5	17	18	GPIO_4	GPIO_27	17	18	GPIO_65
I2C2_CAL	19	20	I2C2_SDA	EHRPWM2A	19	20	GPIO_63
EHRPWM0B	21	22	EHRPWM0A	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	GPIO_15	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	GPIO_14	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	ECAPPWM2	GPIO_86	27	28	GPIO_88
EHRPWM0B	29	30	GPIO_122	GPIO_87	29	30	GPIO_89
EHRPWM0A	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	EHRPWM1B
AIN6	35	36	AIN5	GPIO_8	35	36	EHRPWM1A
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	EHRPWM2A	45	46	EHRPWM2B

Note:
Up to 8 digital I/O pins can be configured with pulse-width modulators (PWM) to produce signals to control motors or create pseudo analog voltage levels, without taking up any extra CPU cycles.

Analog Inputs

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
GPIO_5	17	18	GPIO_4	GPIO_27	17	18	GPIO_65
I2C2_CAL	19	20	I2C2_SDA	GPIO_22	19	20	GPIO_63
GPIO_3	21	22	GPIO_2	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	GPIO_15	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	GPIO_14	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	GPIO_123	GPIO_86	27	28	GPIO_88
GPIO_121	29	30	GPIO_122	GPIO_87	29	30	GPIO_89
GPIO_120	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	GPIO_81
AIN6	35	36	AIN5	GPIO_8	35	36	GPIO_80
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

Note:
Make sure you don't input more than 1.8V to the analog input pins. This is a single 12-bit analog-to-digital converter with 8 channels, 7 of which are made available on the headers.

UART

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
UART4_RXD	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
UART4_TXD	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
GPIO_5	17	18	GPIO_4	GPIO_27	17	18	GPIO_65
UART1_RTSN	19	20	UART1_CTSN	GPIO_22	19	20	GPIO_63
UART2_TXD	21	22	UART2_RXD	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	UART1_TXD	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	UART1_RXD	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	GPIO_123	GPIO_86	27	28	GPIO_88
GPIO_121	29	30	GPIO_122	GPIO_87	29	30	GPIO_89
GPIO_120	31	32	VDD_ADC	UART5_CTSN+	31	32	UART5_RTSN
AIN4	33	34	GNDA_ADC	UART4_RTSN	33	34	UART3_RTSN
AIN6	35	36	AIN5	UART_4_CTSN	35	36	UART3_CTSN
AIN2	37	38	AIN3	UART5_TXD+	37	38	UART5_RXD+
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

Note:
There is a dedicated header for getting to the UART0 pins and connecting a debug cable. Five additional serial ports are brought to the expansion headers, but one of them only has a single direction brought to the headers.

I2C

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
I2C1_SCL	17	18	I2C1_SDA	GPIO_27	17	18	GPIO_65
I2C2_SCL	19	20	I2C2_SDA	GPIO_22	19	20	GPIO_63
I2C2_SCL	21	22	I2C2_SDA	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	I2C1_SCL	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	I2C1_SDA	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	GPIO_123	GPIO_86	27	28	GPIO_88
GPIO_121	29	30	GPIO_122	GPIO_87	29	30	GPIO_89
GPIO_120	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	GPIO_81
AIN6	35	36	AIN5	GPIO_8	35	36	GPIO_80
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	GPIO_7	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

Note:
The first I2C bus is utilized for reading EEPROMS on cape add-on boards and can't be used for other digital I/O operations without interfering with that function, but you can still use it to add other I2C devices at available addresses. The second I2C bus is available for you to configure and use.

SPI

P9				P8			
DGND	1	2	DGND	DGND	1	2	DGND
VDD_3_3	3	4	VDD_3V3	GPIO_38	3	4	GPIO_39
VDD_5V	5	6	VDD_5V	GPIO_34	5	6	GPIO_35
SYS_5V	7	8	SYS_5V	GPIO_66	7	8	GPIO_67
PWR_BUT	9	10	SYS_RESETN	GPIO_69	9	10	GPIO_68
GPIO_30	11	12	GPIO_60	GPIO_45	11	12	GPIO_44
GPIO_31	13	14	GPIO_50	GPIO_23	13	14	GPIO_26
GPIO_48	15	16	GPIO_51	GPIO_47	15	16	GPIO_46
SPI0_CS0	17	18	SPI0_D1	GPIO_27	17	18	GPIO_65
SPI1_CS1	19	20	SPI1_CS0	GPIO_22	19	20	GPIO_63
SPI0_D0	21	22	SPI0_SCLK	GPIO_62	21	22	GPIO_37
GPIO_49	23	24	GPIO_15	GPIO_36	23	24	GPIO_33
GPIO_117	25	26	GPIO_14	GPIO_32	25	26	GPIO_61
GPIO_115	27	28	SPI1_CS0	GPIO_86	27	28	GPIO_88
SPI1_D0	29	30	SPI1_D1	GPIO_87	29	30	GPIO_89
SPI1_SCLK	31	32	VDD_ADC	GPIO_10	31	32	GPIO_11
AIN4	33	34	GNDA_ADC	GPIO_9	33	34	GPIO_81
AIN6	35	36	AIN5	GPIO_8	35	36	GPIO_80
AIN2	37	38	AIN3	GPIO_78	37	38	GPIO_79
AIN0	39	40	AIN1	GPIO_76	39	40	GPIO_77
GPIO_20	41	42	SPI1_CS1	GPIO_74	41	42	GPIO_75
DGND	43	44	DGND	GPIO_72	43	44	GPIO_73
DGND	45	46	DGND	GPIO_70	45	46	GPIO_71

Note:
For shifting out data fast, you might consider using one of the SPI ports.

If you want to learn about getting started with this board such as setting up the software and other details, please visit the product wiki at **wiki.seeedstudio.com/BeagleBone-Green-Gateway**

If you still have any further questions, please visit **forum.seeedstudio.com**