3Egreen technology Inc.

BM01 Series

2.4GHz BLE 4.1 (Bluetooth Low Energy) Module
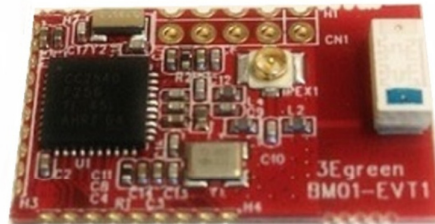
Product Brief

BM01-00

Revision: 0.3

Released Date: 2015/01/05

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http://3Egreen.com   Tel:886 2 27362529

BM01 BLE 4.1
with Chip Antenna Module

BM01-EVT1

Applications

- BLE4.1 Applications
- Home/Building/Factory Automation Systems
- Smart Lighting Control Systems
- Wireless Sensor Network
- Automatic Meter Reading (AMR)
- Factory Auto-Motor Control
- Replacement for legacy wired UART
- Voice Applications
- Energy Management
- Remote Keyless Entry with Acknowledgement
- Low Power Telemetry monitor
- Health-care equipments
- Toy

Product Features

- 2.4GHz Bluetooth low energy compliant and proprietary RF system-on-module
- Supports 250-kbps, 500-kbps, 1-Mbps, 2-Mbps data rate
- High-performance and low-power 8051 Microcontroller core with code prefetch
- In-system-programmable flash 256-KB
- 8-KB RAM with retention in all power modes
- Support USB/UART/SPI/ADC/IR/PWM interfaces
- Bluetooth v4.1 compliant protocol stack for single-mode BLE solution

Introduction

   BM01 is a low cost, small form factor module that provides reliable wireless data communication over BLE4.1 networks. It enables robust BLE master or slave nodes to be built with very low total bill-of-material costs. BM01combines an excellent RF transceiver with an industry-standard enhanced 8051 MCU, in-system programmable flash memory, 8-KB RAM, and many other powerful supporting features and peripherals. BM01 is suitable for systems where very low power consumption is required.Short transition times between operating modes further enable low power consumption.BM01 combined with the *Bluetooth* low energy protocol stack for the market's most flexible and cost-effective single-mode *Bluetooth* low energy solution.

   BM01 supports different networks and/or self-organizing/self-healing mesh networks topologies. It offers network scalability and is ideal for applications for the rapidly growing energy management systems, home/building automation, lighting control, automated meter reading and security system. BM01 comes with plenty of peripherals such as GPIO, ADC, clock counter and PWMs for control and sensor network applications. It also supports UART, SPI and USB interface for data communication.

Module Pin Assignments : H1 − H4
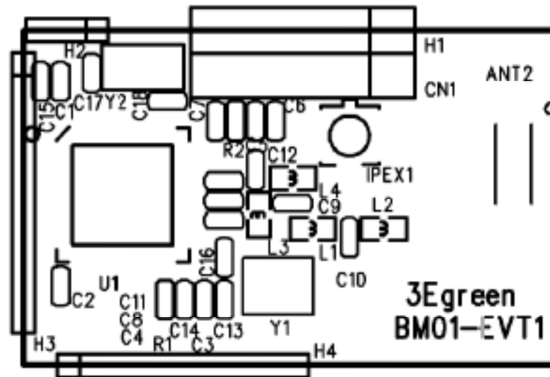
H1

Pin	Symbol	Description
1	VCC_3.3V	System Power
2	GND	System GND
3	DD	Debug/Programming Data
4	DC	Debug/Programming Clock
5	RESET_N	External Reset Pin to MCU

H2

Pin	Symbol	Description
6	P2_0	Digital I/O Port 2.0
7	P1_7	Digital I/O Port 1.7
8	P1_6	Digital I/O Port 1.6/PWM0

H3

Pin	Symbol	Description
9	USB_GND	USB Ground
10	USB_P	USB P
11	USB_N	USB N
12	DVDD_USB	USB VDD Power
13	P1_5	Digital I/O Port P1.5
14	P1_4	Digital I/O Port P1.4
15	P1_3	Digital I/O Port P1.3
16	P1_2	Digital I/O Port P1.2
17	P1_1/LED	Digital I/O Port P1.1/PWM1
18	VCC3.3V	System Power

H4

Pin	Symbol	Description
19	P1_0/LED	Digital I/O Port P1.0
20	P0_7	Digital I/O Port P0.7
21	P0_6	Digital I/O Port P0.6
22	P0_5/RTS	P0.5/UART Request to Send Output
23	P0_4/CTS	P0.4/UART Clear to Send Input
24	P0_3/TX	Digital I/O Port P0.3/UART Transmit Output
25	P0_2/RX	Digital I/O Port P0.2/UART Receive Input
26	P0_1_ADVER	Digital I/O Port P0.1
27	P0_0	Digital I/O Port P0.0

Multi-fuction I/O Pin Mapping for P0_x /P1_x/P2_x

Table 7-1. Peripheral I/O Pin Mapping

Periphery/ Function	P0								P1								P2				
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	4	3	2	1	0
ADC	A7	A6	A5	A4	A3	A2	A1	A0													T
Operational amplifier						O	–	+													
Analog comparator			+	–																	
USART 0 SPI			C	SS	MO	MI															
Alt. 2											M0	MI	C	SS							
USART 0 UART			RT	CT	TX	RX															
Alt. 2												TX	RX	RT	CT						
USART 1 SPI			MI	M0	C	SS															
Alt. 2									MI	M0	C	SS									
USART 1 UART			RX	TX	RT	CT															
Alt. 2									RX	TX	RT	CT									
TIMER 1		4	3	2	1	0															
Alt. 2	3	4												0	1	2					
TIMER 3												1	0								
Alt. 2									1	0											
TIMER 4															1	0					
Alt. 2																		1			0
32-kHz XOSC																	Q1	Q2			
DEBUG																			DC	DD	
OBSSEL											5	4	3	2	1	0					

BM01 Dimension :
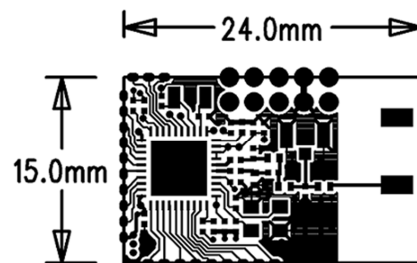
Electrical Characteristics

Absolute Maximum Ratings

Parameters	Min	Max	Unit
Storage temperature	-40	+120	°C
Supply voltage VCC pin to the ground	-0.5	+3.8	V
Voltage applied to inputs	-0.5	+3.8	V

Recommended Operating Conditions

Test conditions: VCC = 3.3V

Parameters	Min	Typ	Max	Unit
Ambient Operating Temperature	-20	+40	+70	°C
Supply Voltage for VCC3.3V	2.4	3.3	3.6	V
Logical high input voltage	0.8 x VCC3.3V		VCC3.3V	V
Logical low input voltage	0		0.2 x VCC3.3V	V

DC Characteristics

Test conditions: T_A = 25°C, VCC = 3.3V, Frequency= 2445MHz

Mode	Parameters	Min	Typ	Max	Unit
ACTIVE: TX	At -23 dBm output power		21.1		mA
	At 4 dBm output power		31.6		
ACTIVE: RX	Normal Mode (250 Kbps)		19.6		mA
	High Gain Mode (250Kbps)		22.1		
Deep Sleep	MCU: STOP mode, RFIC: Deep Sleep mode		5		uA

RF Characteristics

Conditions: TA = 25°C, VCC = 3.3 V

| Parameters	Condition	Min	Typ	Max	Unit
RF frequency	BLE 2.4G	2045	2400	2480	Mhz
RF frequency spacing	At antenna input, 250 Kbps		2		Mhz
RF sensitivity (high gain)	At antenna input, 250 Kbps		-90		dBm
Maximum RF input				10	dBm
Adjacent channel rejection	@+/-1 MHz, 250 Kbps		-5		dBm
Alternate channel rejection	@+/-2 MHz, 250 Kbps		50		dBm
RSSI range	High gain mode, 250 Kbps	-90		-45	dB
	Standard mode	-87		-35	
Maximum RF output power	At 4 dBm output power setting		4		dBm
RF output power control range		-23		4	dBm
TX gain control resolution		1			dB
TX EVM			15		%

Interfaces' utilization

BM01 interfaces' utilization
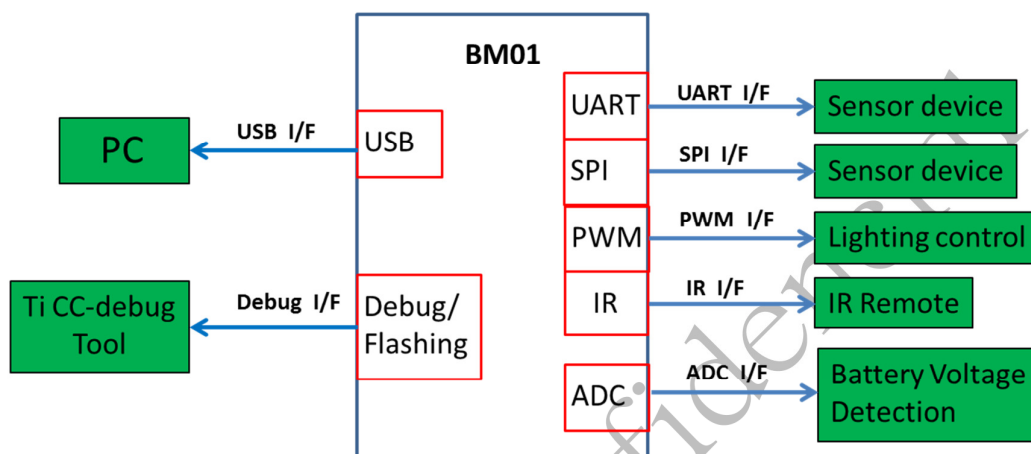
Lighting Design Guide :

Below schematic as picture1 is used to connect with PWM interface of external DC-DC controller for the lighting system application .
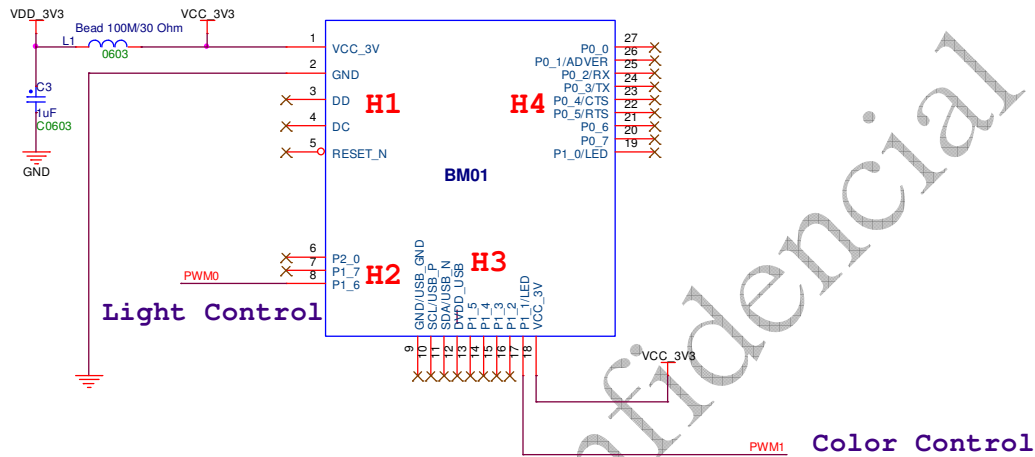
Picture1

Product Family and Ordering Information

When ordering, please specify the module configuration via the following part numbers: BM01-YY where YY denotes the pre-loaded software code desired as shown in the Table and examples below.

BM01-YY (application software code)
00: Standard
01: Gateway
02: LED light
03: Smart socket
04: On/Off plug
05: PIR (motion detector)
06: Magnetic reed
07: Smoke
08: Siren / Strobe
09: CO2 / Temperature / Humidity

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Release History

Date	Revision	Content
2014/7/8	Preliminary	Preliminary specification released
2014/9/4	0.1	Added DC spec. and PWM I/F
2014/9/10	0.2	Changed PWM0 I/O pin
2015/01/05	0.3	Added Interfaces' utillization