

## Bluetooth Low Energy Module



### Key Features

- Bluetooth 4.0 single-mode compliant
- Support master and slave modes, 3+ simultaneous connections in master mode
- Integrated Bluetooth Low Energy stack, no external MCU needed
- RF performance
  - TX power: -23dBm to 0dBm
  - RX sensitivity: up to -94dBm
- Communication range: 100m (LOS)
- Ultra low power 8051 microcontroller core
  - 8K RAM with retention
  - 256K in-system-programming flash
  - 23 GPIOs (21x4mA, 2x20mA)
  - 12-bit ADC with eight channels and configurable resolution
  - Data interfaces: I2C x 1, USART x 2
  - Integrate high-performance comparator

## MBLE-2501

- Ultra low power consumption: [14.3mA@Transmit](#), [0.5uA@PowerMode3](#)
- Antenna: PCB antenna
- Size: 16.55mm x10.88mm x 1.5mm (Without Shielding)  
16.55mm x10.88mm x 2.2mm (With Shielding)
- BQB certification
- FCC ID: 2ABRUBDLEM201P
- CE 2200 compliant, RoHs compliant

### Descriptions

MBLE- 2501 is a Bluetooth 4.0 single-mode compliant Bluetooth low energy module targeted at low power sensors and PC/Phone accessories.

MBLE- 2501 highly integrates Bluetooth Low Energy radio, stack, profile and applications in a SoC, without the need of using an external MCU. The module also offers flexible hardware interfaces for the sensor application.

It enables ultra low power connectivity and data transfer for the applications that are sensitive to power consumption, size and cost.

### Applications

- Medical devices
- Sports and fitness equipments
- Home electronics
- Mobile and PC accessories
- Industry automation



### Block Diagram

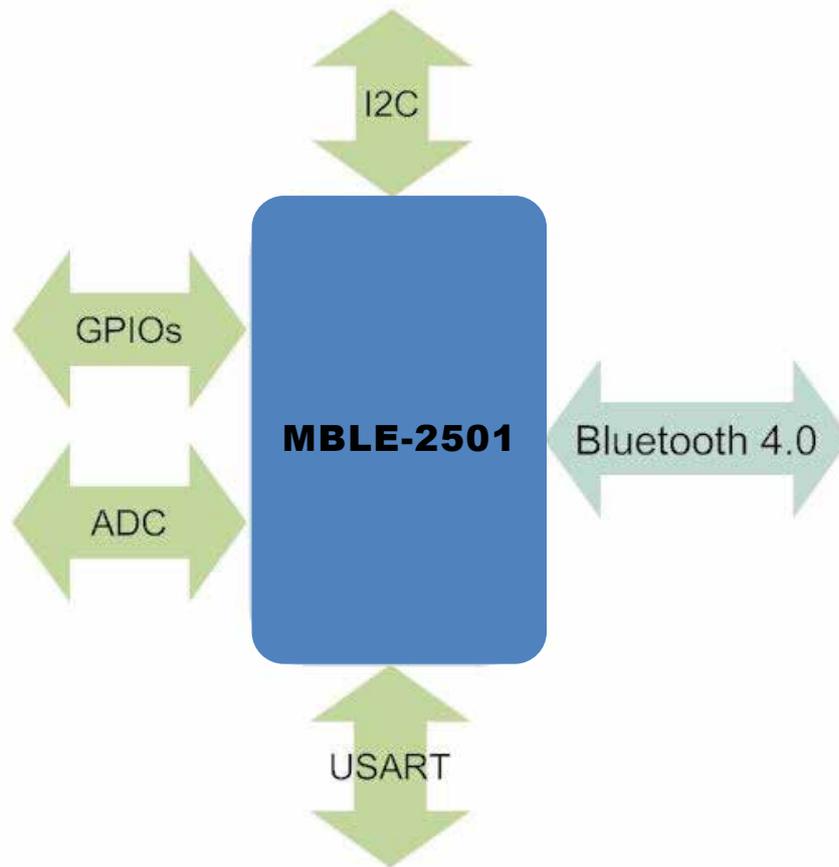


Fig. 1: Block diagram of MBLE-2501

### Electrical Characteristics

- Absolute maximum rating

Rating	Min	Typ	Max	Unit
Storage Temperature	-40	-	125	
VDD	-0.3	-	3.9	V
Other Terminals	-0.2	-	$VDD+0.3 \leq 3.9$	V



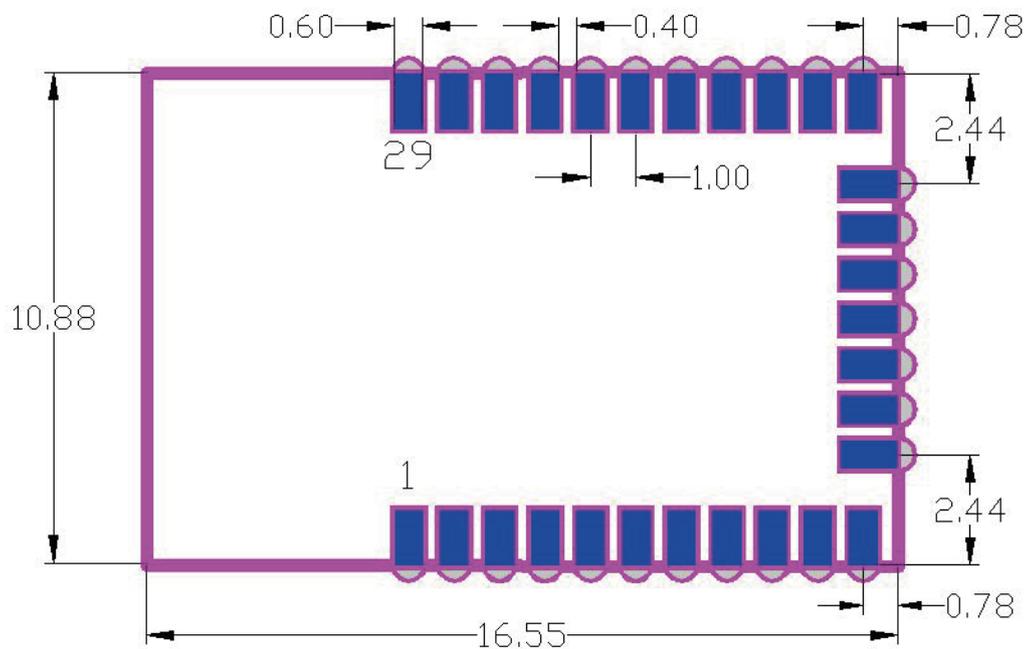
## MBLE-2501

### Recommended operating conditions

Rating	Min	Typ	Max	Unit
Operating Temperature	-40	-	85	
VDD	2	3.3	3.6	V

### Overall Dimensions

Fig. 2 shows the overall dimensions of MBLE-2501. The module measures 16.55mm long by 10.88mm wide by 1.5mm high without board level shield.



All Dimensions are in millimeter

Fig. 2: Overall Dimensions of MBLE-2501



### Pin Definitions

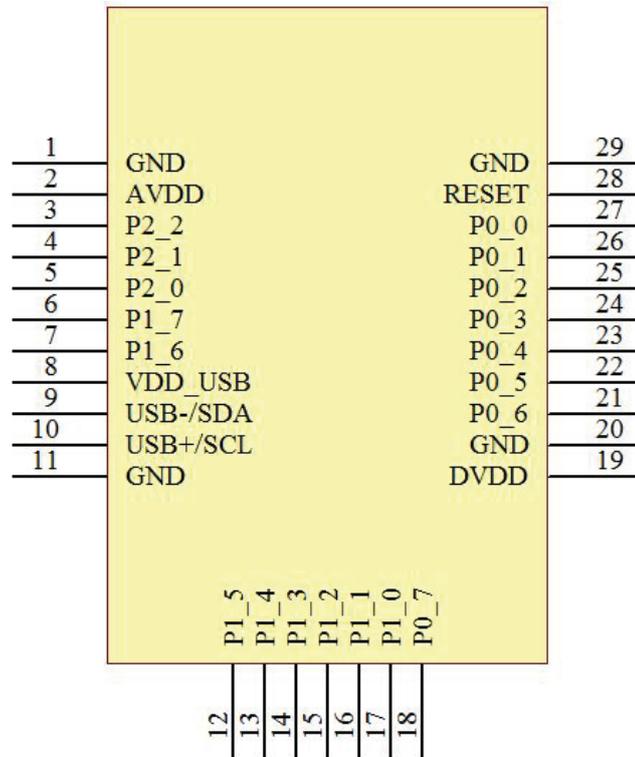


Fig. 3: The pinout of MBLE-2501 (TOP)

Table 2: Pin definitions of MBLE-2501

Pin Number	Pin Name	Definitions
1	GND	Power ground
2	AVDD	Power supply for analog circuit
3	P2.2	GPIO
4	P2.1	GPIO
5	P2.0	GPIO
6	P1.7	GPIO
7	P1.6	GPIO
8	NC	NC
9	SDA	Serial clock of I2C
10	SCL	Serial data of I2C
11	GND	Power ground



## MBLE-2501

12	P1.5	GPIO
13	P1.4	GPIO
14	P1.3	GPIO
15	P1.2	GPIO
16	P1.1	GPIO
17	P1.0	GPIO
18	P0.7	GPIO
19	DVDD	Power supply of digital circuit
20	GND	Power ground
21	P0.6	GPIO
22	P0.5	GPIO
23	P0.4	GPIO
24	P0.3	GPIO
25	P0.2	GPIO
26	P0.1	GPIO
27	P0.0	GPIO
28	RESET	Reset pin, active low
29	GND	Power ground
30	RF GND	RF ground
31	RF	Power port
32	RF GND	RF ground

Table 3: Peripheral IO pin mapping

PERIPHERAL / FUNCTION	P0								P1								P2		
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	2	1	0
ADC	A7	A6	A5	A4	A3	A2	A1	A0											
Operational amplifier						O	-	+											
Analog comparator			+	-															
USART 0 SPI			C	SS	MO	MI													
Alt.2											MO	MI	C	SS					
USART 0 UART			RT	CT	TX	RX													
Alt.2											TX	RX	RT	CT					
USART 1 SPI			MI	MO	C	SS													
Alt.2											MI	MO	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																			0
DEBUG																	DC	DD	
OBSSSEL											5	4	3	2	1	0			



## MBLE-2501

### ■ Location in Z plane

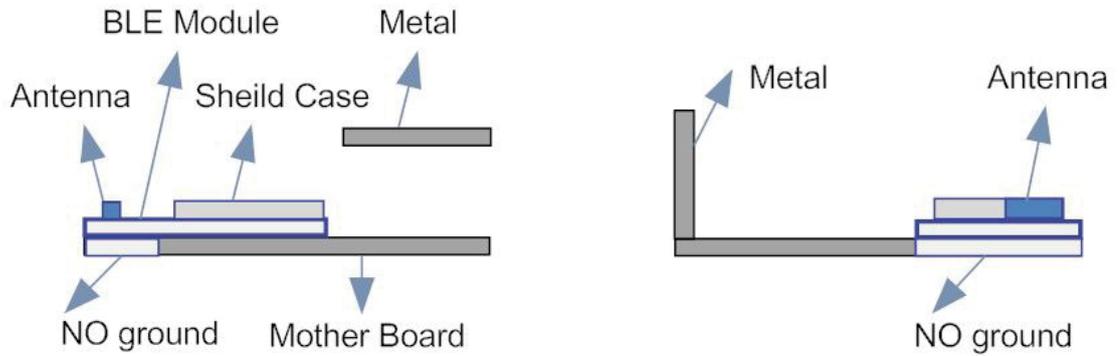


Fig. 6: Recommended location in Z plane

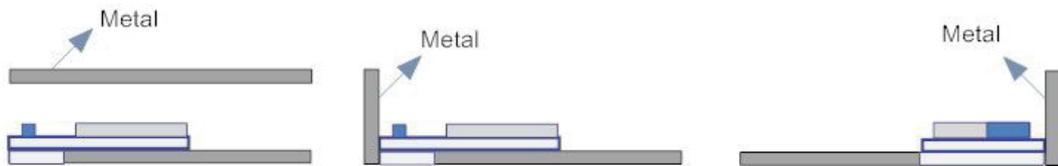


Fig. 7: Not recommended location in Z plane



### Typical Solder Reflow Profile

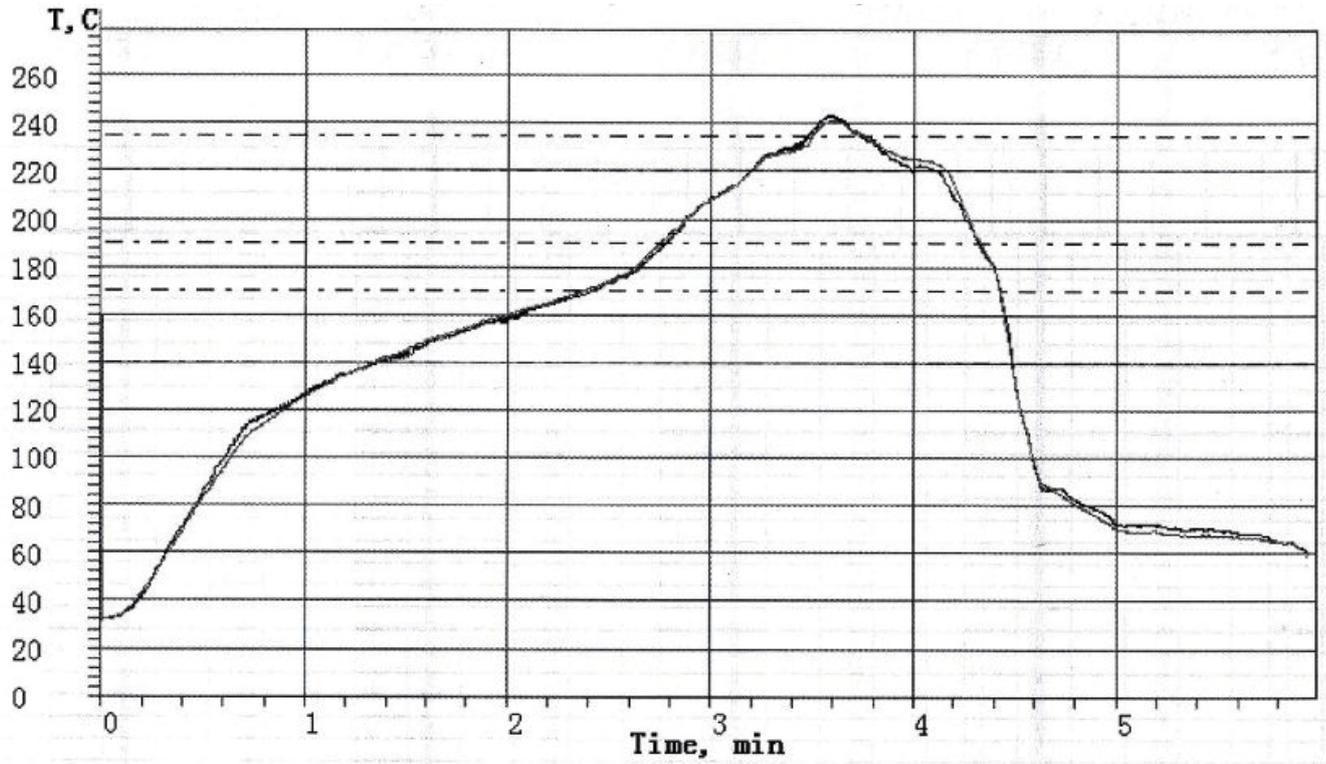


Fig. 8: Typical Solder Reflow Profile



### Package Information



Fig. 9: Package information

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