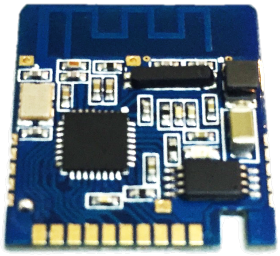
BGMS Bluetooth LE GPIO Module

BGMS_P1



BGMS

(BLE GPIO Master SMD)

Product Specifications
and
Design Guidelines

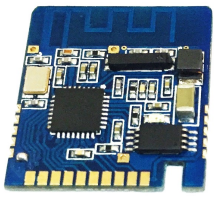
Version 1.0

Make Your Product Smart and IoT Ready… Faster

General Description

@Nodus-BGMS Module, is a state of art modular BLE PCBA. It is an equipment based member component of the @NodusNET Ecosystem. The BGMS Module is the End Device Node of an IoT Solution that performs application specific tasks by providing a widely used consumer standard wireless connectivity - Bluetooth 4.1 Technology. @Nodus-BGMS Module aims to be integrated into any new or existing electrical or electronics automation systems. Furthermore it provides users with immediate control, monitoring status, data transfer via direct wireless Bluetooth Smart connectivity to our common daily used Smartphones, Tablet computers and Personal computers from both leading global operating systems namely Apple's iOS and Android.

@Nodus-BGMS Module when utilized as a group (more than 1 device), will form a MESH network that links all the 'nodes' together hence creating an applications rich network directly accessible by a Smartphone.



TOP VIEW

BOTTOM VIEW

Base Core Features

- Based on **Qualcomm CSR µEnergy CSR1010 QFN Core** Bluetooth Smart IC
- Bluetooth v4.1 specification compliant
- 128KB memory: 64KB RAM and 64KB ROM
- 512KB EEPROM Application firmware space
- Support for Bluetooth v4.1 specification host stack including ATT, GATT, SMP, L2CAP, GAP
- RSSI monitoring for proximity applications
- Low power hibernate: <900nA
- 16MHz and 32.76kHz clocking frequency
- 3x Configurable AIOs with 10-bit ADC resolution
- 11x Configurable DIOs
- 1x UART, 4x PWM
- Wake-up interrupt and watchdog timer
- PCBA Dimensions: 21.8mm (L) x 20.0mm (W) x 3.0mm (T)
- PCB Material: FR4, Blue masking
- Weight: 1.3g

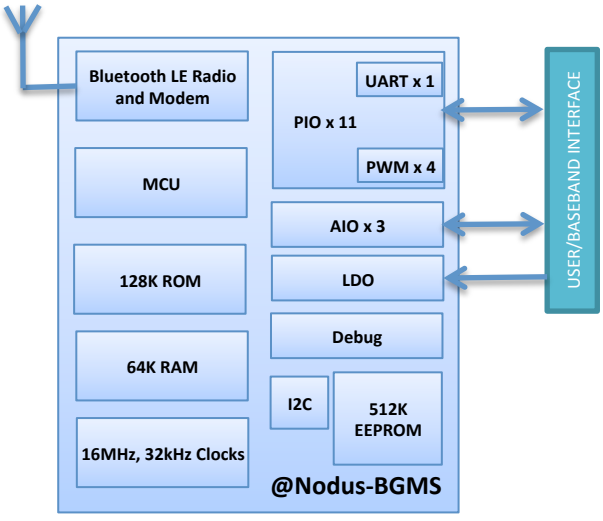


Fig. 1 Functional Block Diagram of @Nodus-BGMS Module

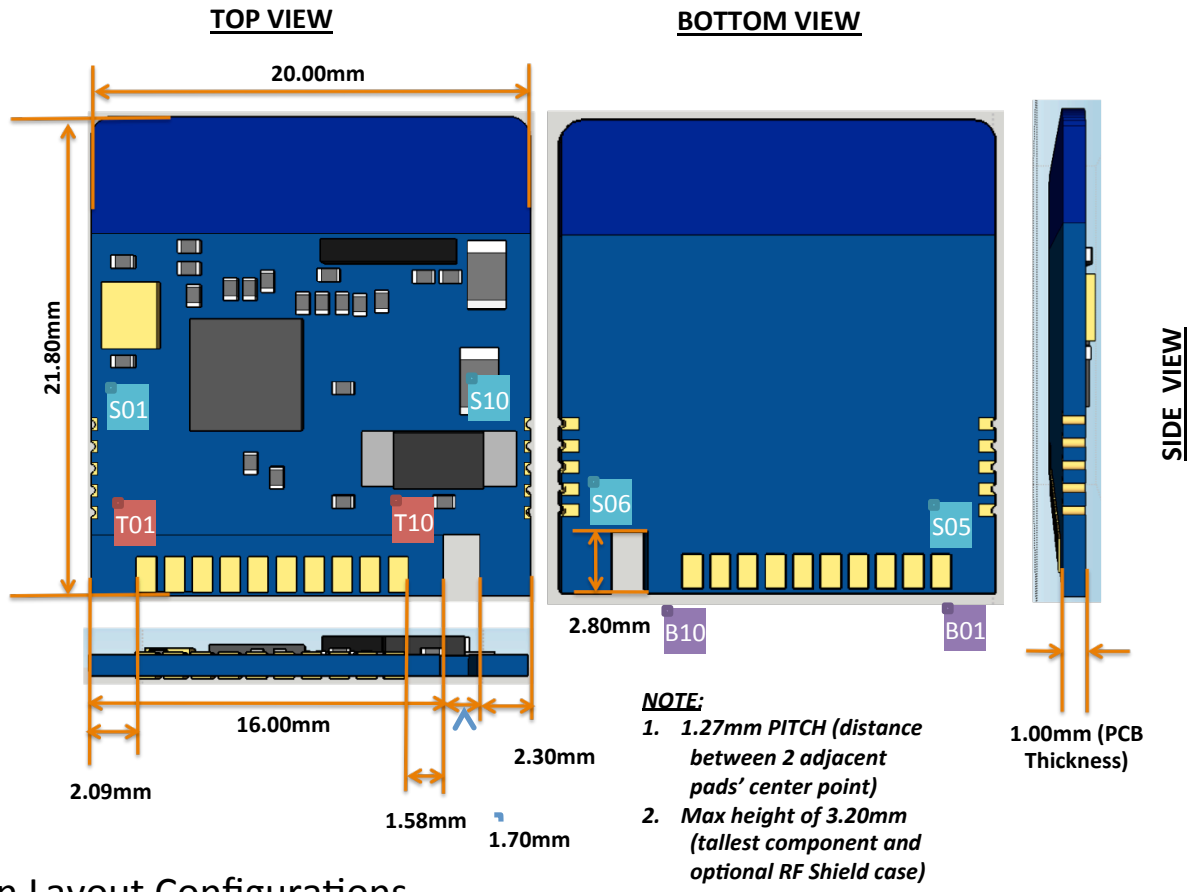
Advanced Embedded Applications

@Nodus-BGMS can be ***optionally*** pre-loaded with LDMS' proprietary base application firmware that is compatible with the @NodusNET MESH network, which carries built-in intelligence required to perform an IoT End Device or Node's role extensively covering Smart Sensors, Switches, Lighting, Air-conditioners, Fans of a potential 'Connected' Smart Home and Smart Buildings.

- **Automation Control**
  - Up to 3-Channels of Digital ON/OFF
  - Dimming control: PWM
  - Read back status
- **Built-in Real Time Clock with Calendar Functions**
- **5x Timer/Scheduler User Configurable Profiles**
  - Time, Day(s) of Week, On Duration
  - Day or Night Mode or 24Hrs Operations
- **Built-in Operations Modes**
  - Auto-OFF mode
  - Random ON&OFF mode
  - Pre-stored user modes
- **Usage data for Post Statistical analytics**
  - Node Power consumption
- **Customized Serial Communications (MCU to MCU)**
  - High efficiency UART
  - Commands, Settings, automation equipment diagnostic data and general data transfer
  - Customization options to Client's Proprietary Protocol
- **Wireless Networking and Connectivity**
  - BLE MESH Bridge connection to leading smartphones, tablets and personal computing devices
  - Network Security ID
  - Simple Pairing & Unpairing Process
- **Mobile Applications (APP) Support**
  - Compatible to @Nodus-APP available on Apple's iOS and Android platforms
  - Multiple smartphones control and monitoring
  - Firmware Over-the-Air Update

Mechanical Dimensions

@Nodus-BGMS Module uses TOP, BOTTOM pads and SIDE LCC Pads to external interfaces for programming, debug, serial communications (UART) and user Analog or Digital I/O interfaces. All pads are designed to have **1.27mm PITCH**



Pin Layout Configurations

@Nodus-BGMS Module can be integrated: Vertical Assembly which uses TOP and BOTTOM Pads or SMD laid Assembly which uses BOTTOM Pads and SIDE LCC

T	TOP Pad Name
T01	VSS
T02	VSS
T03	PIO0 / UART-Tx
T04	PIO1 / UART-Rx
T05	PIO5 / CLK
T06	PIO6 / CS
T07	PIO7 / MOSI
T08	PIO8 / MISO
T09	SPI_PIO
T10	VBAT

B	BOTTOM Pad Name
B01	*NC*
B02	AIO2
B03	AIO1
B04	AIO0
B05	PIO3
B06	PIO4
B07	PIO9
B08	PIO10
B09	PIO11
B10	VSS

S	SIDE LCC Name
S01	VBAT
S02	VBAT
S03	PIO8 / MISO
S04	VSS
S05	VSS
S06	PIO7 /MOSI
S07	PIO6 / CS
S08	PIO5 / CLK
S09	PIO1 / UART-Rx
S10	PIO0 / UART-Tx

Table 1.0: Pin out definitions of the @Nodus-BGMS Module

Mounting Options

@Nodus-BGMS Module has 2 assembly mounting onto Client's baseband or motherboard for different applications:

a. Vertical 90^0 Slot-In Standing Mounting
b. Flat SMD Lay-down Mounting

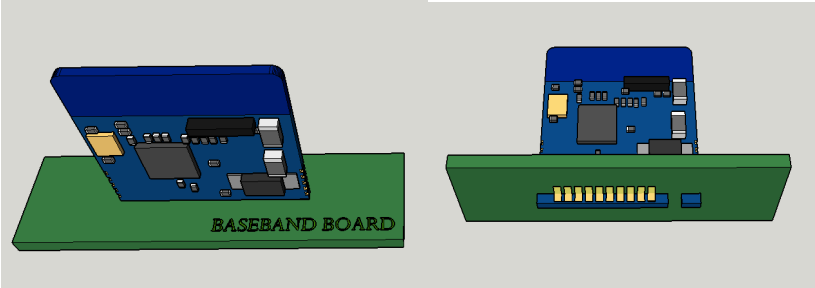


Fig. 3a: Vertical 90^0 Slot-In Standing Mounting

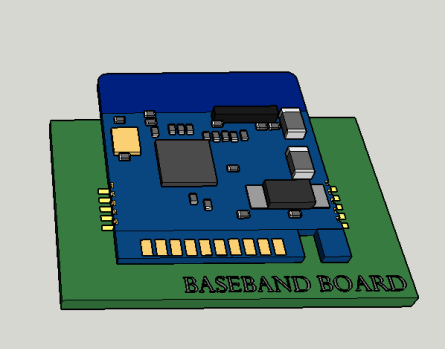


Fig. 3b: Flat SMD Lay-down Mounting

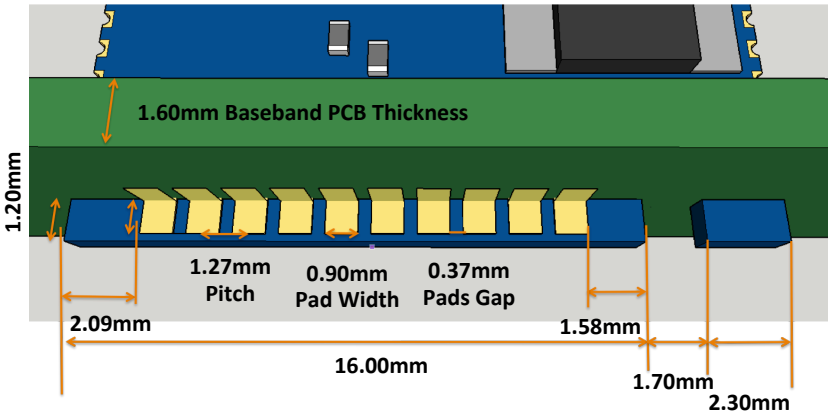


Fig. 3c: Dimensions of BGMS' TOP and BOTTOM pads when applying Slot-In Mounting

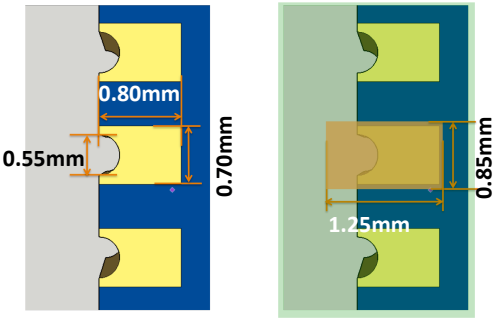


Fig. 3d: Dimension of SIDE LCC half-holes and recommended user client mounting pads

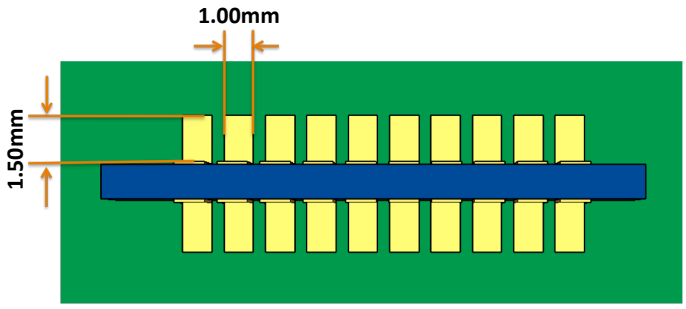


Fig. 3e: Recommended user mounting pads to mate with BGMS' TOP and BOTTOM LGA Slot-In mounting type of Client baseband or motherboard

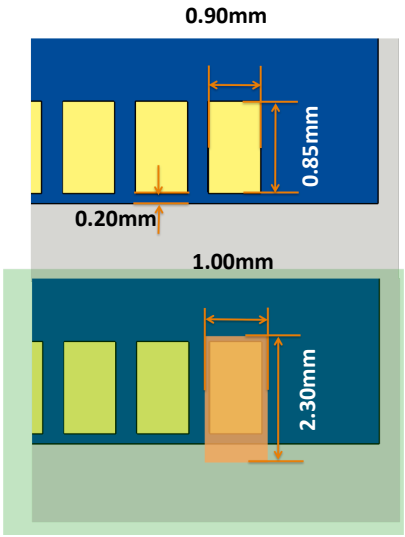


Fig. 3f: Dimension of BGMS BOTTOM LGA pads and recommended user client mounting pads

Electrical Characteristics

Absolute Maximum Ratings

Rating	Min	Max	Unit
Storage temperature	-40	85	°C
Battery (VDD_BAT) operation	1.8	3.6	V
I/O supply voltage	-0.4	3.6	V
Other terminal voltage	Vss-0.4	Vdd+0.4	V

Recommended Operations Conditions

Operating Condition	Min	Typical	Max	Unit
Operating temperature range	-30	25	85	°C
Battery (VDD_BAT) operation	2.7	-	3.6	V
I/O supply voltage	1.2	-	3.6	V

Current Consumption

Power Consumption (V_{BAT} = 3.0V, T=25°C)	Typical	Unit
BGMS – Dormant Mode (All OFF, Wake-up Trigger)	900	nA
BGMS – Sleep Mode	5	uA
BGMS – Peak (Tx/Rx) Mode	~18	mA
BGMS – Active CSRMesh Mode	~30	mA

Certifications

Certification	Test/Approval Laboratory	Certificate ID
Federal Communications Commission. FCC Part 15(b)		FCC ID:2AIACLDMSB1
CE: R&TTE		*TBA*

Qualifications

Qualification	Qualification Body	Qualification ID
Bluetooth SIG Qualification Declaration ID (BQB)	Bluetooth SIG Org www.bluetooth.org	D029702
IEEE Registration for MA-L Assignment	IEEE Org www.ieee.org	OUI Assigned

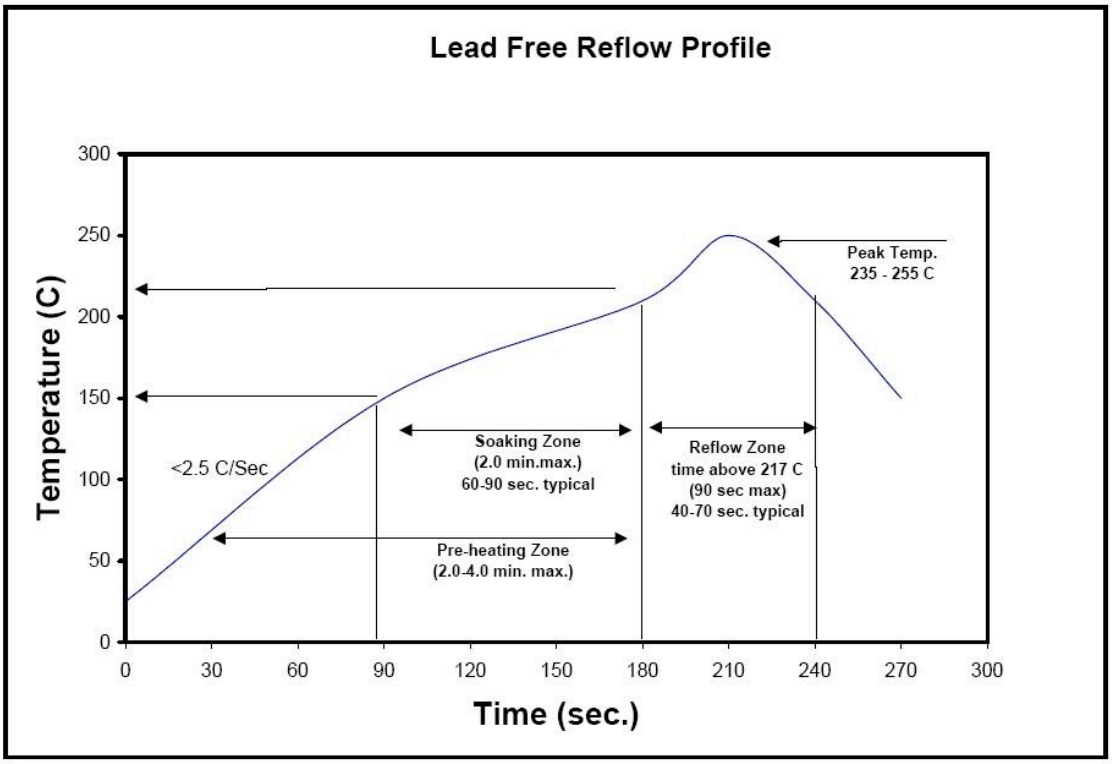
Declarations

Qualification	Test Laboratory	Status
RoHS	Rictek Laboratory www.rictek.com.cn	Declared Compliant
REACH	Rictek Laboratory www.rictek.com.cn	Declared Compliant

Manufacturing Guides

Demonstrated below based on the recommended SMD reflow temperature profile when choosing the Flat SMD Lay-down Mounting Option.

SMD Reflow Process Recommendations



Ordering Information

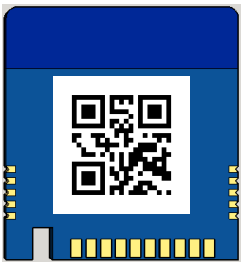
Part Numbering – **Device Hardware**

Description	Order Code
@Nodus BGMS Module V1_0 PCB Assembly	**@NODUS-EQP-PCBA-BGMS-V01**

Part Numbering – **Device Firmware Applications *(Optional)***

Description	Order Code
@Nodus BGMS FW Kernel (BootloaderV1_1, @NodusNET Protocol2_3) base firmware custom operating system for client subscription and customization	**@NODUS-FWK-BGMS-V11_23**

Unit Labeling



or

Customer ID **CC TT NNnnnn**

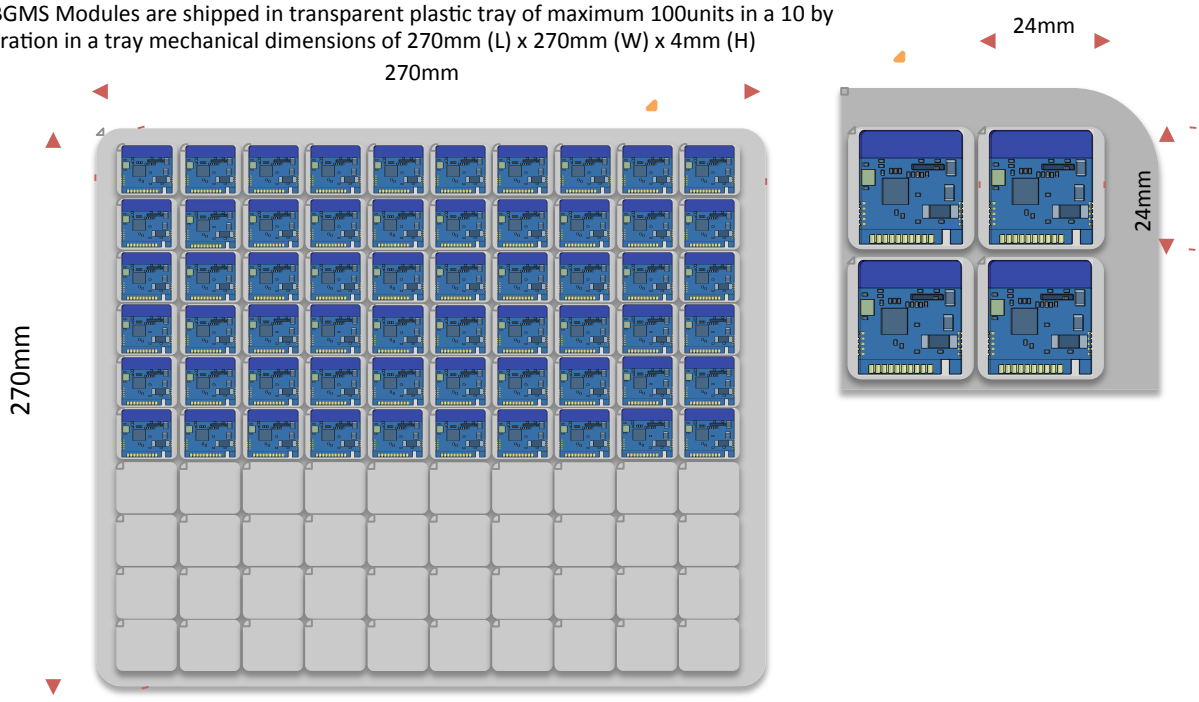
ID block
NN:nnnn

Device Type

a1 53 02 0001

Shipping Package

@Nodus-BGMS Modules are shipped in transparent plastic tray of maximum 100units in a 10 by 10 configuration in a tray mechanical dimensions of 270mm (L) x 270mm (W) x 4mm (H)



Document Revision History

Date	Version	Related Pages	Description
Dec 2015	1.0		First Initial Release
Jan 2016	1.1	6	Added IEEE MA-L Assignment Listing, Bluetooth SIG Declaration Listing, REACH and RoHS compliant declaration

Document References

Reference	URL
Bluetooth SIG Bluetooth 4.x Specifications	https://www.bluetooth.com/what-is-bluetooth-technology/bluetooth-technology-basics/low-energy
Qualcomm CSR1010 QFN Data Sheet	https://www.csrsupport.com/download/39359/CSR1010%20Data%20Sheet%20CS-231985-DS.pdf

Important Notices

Warning, Personal Injury

Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please refer to **Linear DMS Solutions (LDMS)**. Failure to comply with these instructions could result in death or serious injury.

If the Buyer shall purchase or use LDMS products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless LDMS and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if LDMS shall be allegedly negligent with respect to the design or the manufacture of the product.

ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.

Warranty

LDMS warrants solely to the original purchaser of this product for a standard period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in LDMS' published specifications of the product. Within such period, if proven to be defective, LDMS shall repair and/or replace this product, in LDMS's discretion, free of charge to the Buyer, provided that:

• notice in writing describing the defects shall be given to LDMS within fourteen (14) days after their appearance;

Headquarters and Subsidiaries

• such defects shall be found, to LDMS's reasonable satisfaction, to have arisen from LDMS's faulty design, material, or workmanship;

• the defective product shall be returned to LDMS's factory at the Buyer's expense; and

• the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

This warranty does not apply to any equipment which has not been installed and used within the specifications recommended by LDMS for the intended and proper use of the equipment. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH HEREIN, LDMS MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED AND DECLINED. LDMS is only liable for defects of this product arising under the conditions of operation provided for in the data sheet and proper use of the goods. LDMS explicitly disclaims all warranties, express or implied, for any period during which the goods are operated or stored not in accordance with the technical specifications.

LDMS does not assume any liability arising out of any application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. All operating parameters, including without limitation recommended parameters, must be validated for each customer's applications by customer's technical experts. Recommended parameters can and do vary in different applications.

LDMS reserves the right, without further notice, (i) to change the product specifications and/or the information in this document and (ii) to improve reliability, functions and design of this product.

Contact Information

Linear DMS Solutions Sdn. Bhd. (1058898-W)
135, Jalan Utara,
Bukit Gelugor,
11700 PENANG,
Malaysia
Tel: +60-4-6607 666
Fax: +60-4-6607 667
Email: info@lineardms.com.my
URL: www.lineardms.com.my

DECLARATION OF CONFORMITY

Hereby， LINEAR DMS SOLUTIONS SDN BHD declares that this BGMS Bluetooth LE GPIO Module product in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

A copy of the Declaration of Conformity can be found an Website: www.lineardms.com.my

CE Logo:

CE 0700

ETSI EN 300 328 V1.8.1 (2012-06)
ETSI EN 301 489-1 V1.9.2(2011-09)
ETSI EN 301 489-17 V2.2.1(2012-09)
EN 62479:2010
EN 60950-1: 2006+ A11: 2009+ A1: 2010+ A12:2011+ A2: 2013

(Title(s) of regulations, standards, etc.)

All essential radio test suites have been carried out.

1. The EUT maximum working temperature -30°C and 85°C

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the followingmeasures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference and
(2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: 2AIACLDMSB1 ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.