May 17,2006

Classification			Issue No.
SPECIFICATIONS			151-ENW-0357
Part Name	Customer Part No.	Panasonic Part No.	
LR-WPAN module	PAN802154HARx0	ENWC6101A	0 — 14

PRODUCT SPECIFICATION

Product Description	:	2.4GHz band LR-WPAN module
Panasonic Product Part Number	:	ENWC6101A
Customer Product Part Number	:	PAN802154HARx0
	:	
Country of Origin	:	JAPAN
Applications	:	Standard electric/electronic equipment

Panasonic Electronic Devices Co.,Ltd.

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Prepared by : Engineering Section

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Signature _____

Name (Print)

Title :

Authorized by :

Signature _____

Name (Print)

Title :

Revision

Revision	Revised	Date	Approved by:
1.0	Initial Release	Mar. 18, 2005	R.B. Nguyen
2.0	To add customer's comments, Industrial Temp. Version and modify Connectors nomenclatures.	August 31, 2005	R.B. Nguyen
3.0	Change factory site to Japan. Panasonic logo and 'ASSEMBLED IN MEXICO' are deleted. (p.6) Panasonic logo and 'MADE IN JAPAN' are described on the label. (p.7) Transmitting power tolerance by temperature is changed.(p.8) Product warranty is described. (p.13)	May 17 , 2006	Y.Takahashi

Contents

1. General

Applicable Laws and Regulations

This product specification forms an integral part of the agreement executed between Panasonic Electronic Devices Co. Ltd. and the customer.

This product has been manufactured without using any ozone-depleting chemical (ODC's) controlled under the Montreal Protocol.

All the materials that are used for this product are registered under " Known Chemicals " in the Japanese act "Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances"

All the materials used in this product contain no brominated materials of Polybromobiphenyl ($PBBO_S$) or Polybromobiphenyl Ether (PBB_S) as the flame-retardant.

When this product is exported directly from Japan to any other country as an individual component, customer must follow the procedure provided in the U.S. or relevant any country's Foreign Exchange and Trade Law and regional wireless rules, and obtain confirmation of such certification at Customs.

1.2. Restriction on Applications

The product is designed and manufactured for use in all general purposes for home, office, building and industrial settings as set forth within the detailed parameter specification. It is not intended for usage in critical life support or life sustaining systems, which will be governed by the FDA (Federal Drug Administration); or in critical transportation applications which will be governed by the FAA (Federal Aviation Agency), and the Federal Highway Administration.

If such application arises, the mutually agreeable quality program must be separately discussed, which will be specifically required for such system.

1.3. Manufacturing Site

Location (Country): JAPAN

Panasonic Electronic Devices Co.,Ltd.

1.4. Conforming to: RF specifications are compliant to IEEE802.15.4 (LR-WPAN)

Any modification to this product may violate the rules of Federal Communications Commission and make the operation of the product unlawful

47 C.F.R. Sec. 15.21

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 following measures:

• 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.

47 C.F.R. Sec.15.105(b)

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this equipment must be installed to provide a separation distance of at least 8 inches (20cm) from all persons.

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.

2. This device must accept any interference received, including interference that may cause undesired operation.

2. Scope

2.1. Applications

2.2. Product Description

The Panasonic LR-WPAN module ENWC6101A is a 3V, 2.4GHz, medium range, low rate and low power consumption personal wireless networking module for general purpose such as battery operated remote sensor applications based on the 802.15.4 IEEE standard.

The application designer has the flexibility to use up 8 programmable digital ports, two analog inputs to DAC and one RS-232 communication port as an interface to the computer. Additionally it also incorporates a programmable switch and a LED indicator.

PAN802154 Features

- Fully supports ZigBee™, IEEE802.15.4, or Simple MAC Application
- 2.4 GHz ISM, ZigBee™
- 16 Channels, 5MHz channel spacing, Full Spectrum Encode and Decode (IEEE Standard 802.15.4); up to 250 Kbps bit rate.
- RS-232 port; 2 Analog Inputs selectable to 10bit A/D Converter; and up to 8 Digital I/O ports on easy to connect header connector
- Background Debug Feature for SW loading or debugging during development phase
- 1 Switch and 1 LED for control and monitoring
- Output power: 0dBm typical
- RX Sensitivity: -92dBm typical at 1.0% Packet Error Rate.
- Shielded RF Section for improved performance

- On board printed antenna
- Commercial and Industrial Operating Temperature Range
- Power Supply Range:

  2.2VDC to 3.4 VDC without using RS-232 capability

  3.0VDC to 3.4 VDC with using RS-232 capability

2.3 Product Part Number:

PAN802154HAR00 for Commercial Temperature, -20 degree C to 70 degree C

PAN802154HARI0 for Industrial Temperature, -40 degree C to 85 degree C

2.4 Use Application : Low rate wireless communication

2.5 Recommended Applications

1) Software development kit for 802.15.4 / ZigBee Stack Application
2) Embedded use for Home / Commercial equipment

3. Composition of part number

RF module（example only）

P	A	N	8	0	2	1	5	4	H	A	R	0	0
(1)			(2)						(3)				(4)

(1) Product Code

(2) Product Series

(3) Product Type

H: Header Connector

A: On Board Antenna

R: RS-232C interface

0: Commercial Temperature Range; I: Industrial Temperature Range.

(4) Design version number

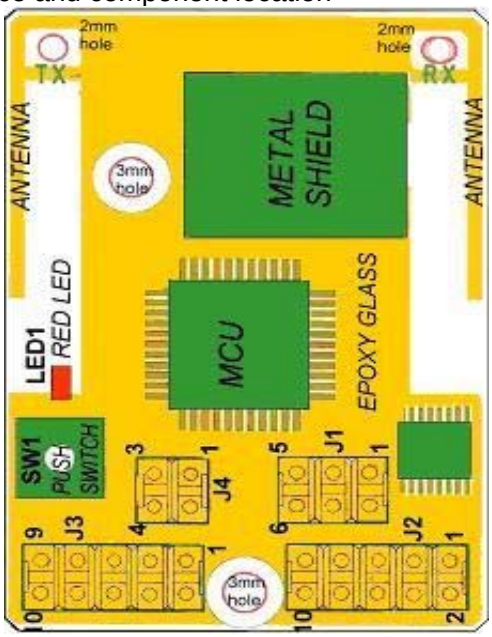
4. Dimensions, Appearance and Marking

4.1. Marking

Notes: final marking spec will be determined according to customer requirement before starting shipment of production quantity.

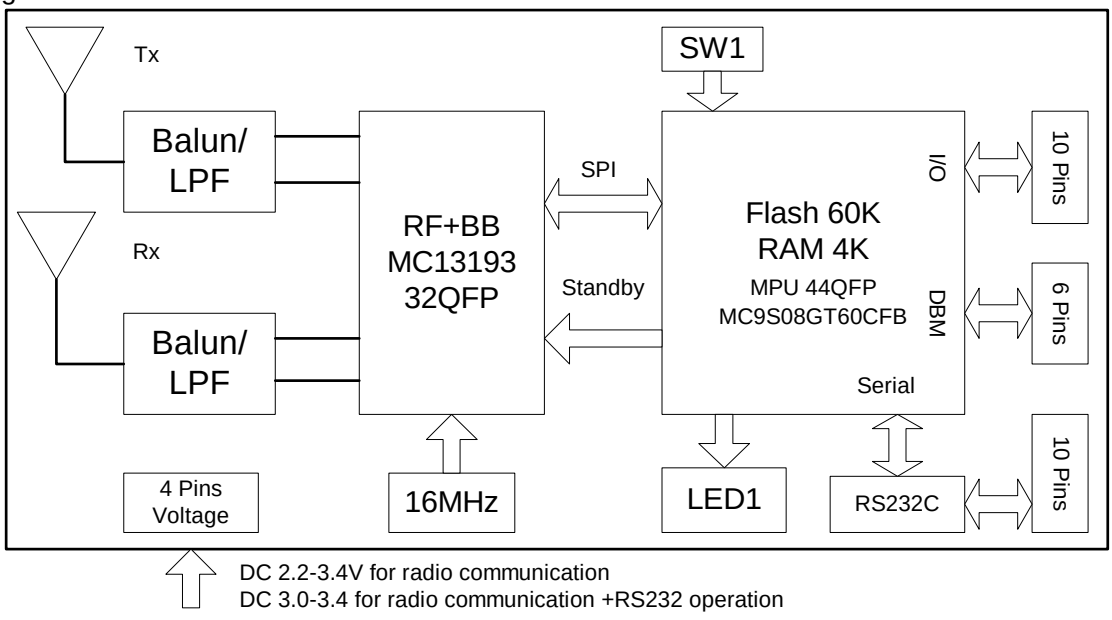
Lot number which includes information of produced year and month is indicated on the PCB

4.2. Appearance and component location

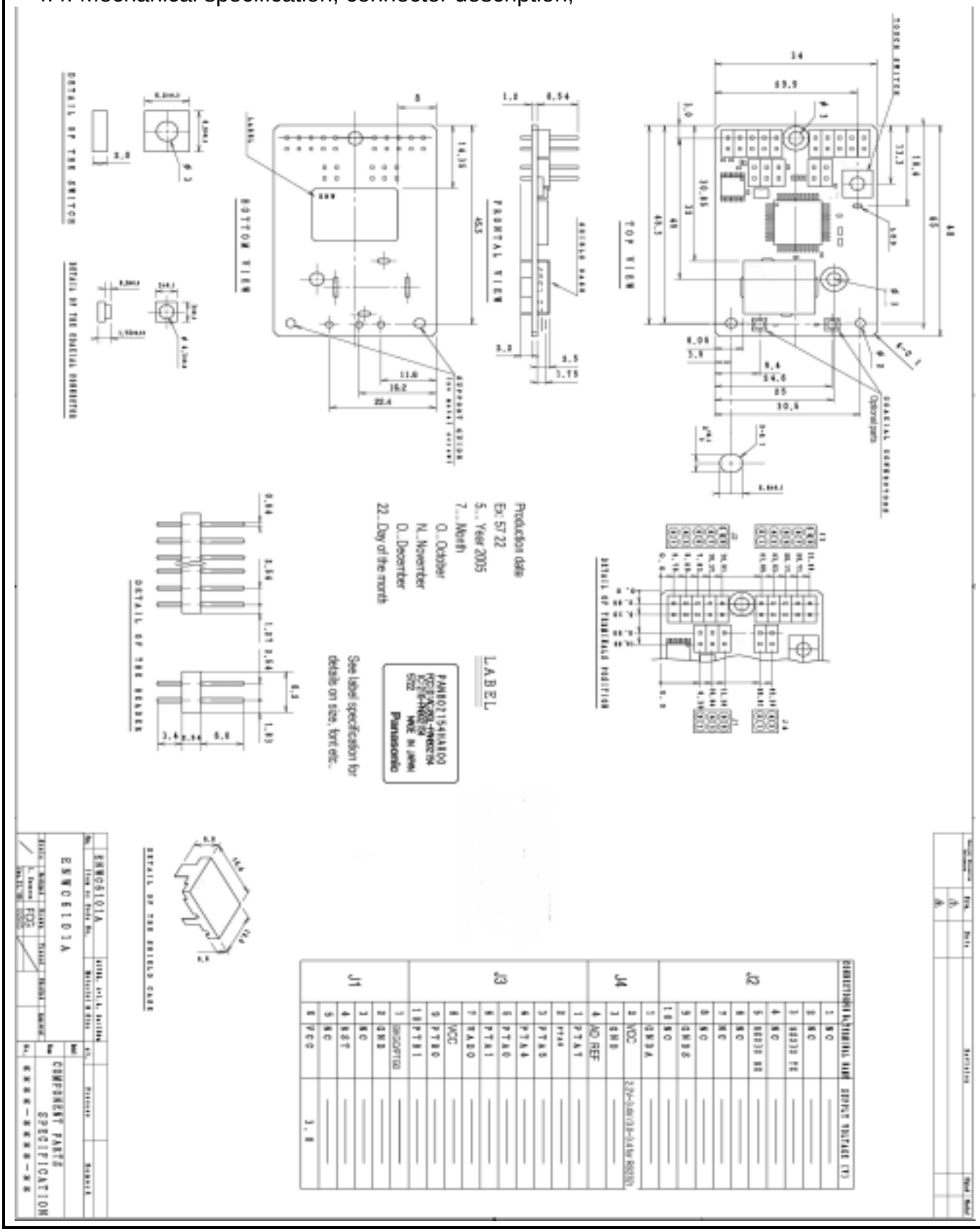


1) Connectors J1, J2, J3 & J4 straight 2.54" pitch, Contact material Zn
2) Substrate Glass Epoxy t=1.2mm
3) Push switch and red LED used as application required
4) Metal cover to meet FCC rules
5) 3mm and 2mm holes for mounting using non- conductive spacer

4.3 Block Diagram



4.4. Mechanical specification, connector description,



5. Rating

5.1. Absolute maximum ratings

Item	Rated value	Explanation
DC power supply	2.2V - +3.4V for radio communication 3.0V - +3.4V for RS-232 Operation	
Maximum Signal Input Level	-0.3V - +3.4V	At condition of –40 to +85 deg. C range
Rated DC current	100 mA	At condition of –40 to +85 deg. C range

6. Performance Characteristics

6.1. Electrical Characteristics

6.1.1 RF performance

No	Item	Specification						802.15.4	Unit	condition
		-20 to +70 Deg C			-40 to +85 Deg C					
		Min	typ	Max	Min	typ	Max			
1	Transmitting Power	-3	0*	6*	-3	0*	6*	-3	dBm	*Register 12 set to (default, CC)
2	Frequency tolelance	-25		25	-40		40	+/-40	ppm	
3	6dB Bandwidth	0.5			0.5			0.5	MHz	FCC15.247
4	Receiver jamming resistance:Adjacent Channel rejection	0	23		0	23		0	dBr	+/-1 channel Selected channel –82dBm
5	Receiver jamming resistance Alternate Channel rejection	-30	-35		-30	-35		-30	dBr	+/-2 channel Selected channel –82dBm
6	Spurious Emission			-20			-20	-20	dBr	
7	Receiver sensitivity		-92			-92		-85	dBm	1% PER
8	DC Tx/Rx current		35	60**		35	60**	-	mA	**for Cordinator FFD
9	DC idle current Without RS-232C With RS-232C		 4.8 8.6	 17 20		 4.8 8.6	 18 21		 mA mA	depend on running SMAC and ZB stack
10	DC doze current		80			80		-	uA	Xtal ON, Clock out off

6.1.2 Host interface

Inteface level : RS232C interface operation

Driver Section: Voh min = Vcc ; Voh typ = Vcc+.4V

Vol min = -Vcc ; Vol typ = -Vcc-.4V

Receiver Section: Voh min = Vcc-.6V ; Voh typ = Vcc-.1V

Vol max = .4V

J2 connector (RS232C)

No	Signal name	Function / comment	No	Signal name	Function / comment
1	NC		6	NC	
2	NC		7	NC	
3	RS232C-TxD		8	NC	
4	NC		9	GND	
5	Rs232C-RxD		10	NC	

J4 connector (Power Supply)

No	Signal name	Function / comment	No	Signal name	Function / comment
1	GND		3	GND	
2	Vcc	Tied to J1-pin6	4	AD_ref_2.5	DAC Reference

J1 connector (BDM port)

No	Signal name	Function / comment	No	Signal name	Function / comment
1	BKGO / PTG0	Background debug	4	/RESET	Low reset input
2	GND		5	N.C.	Internally open
3	N.C.	Internally open	6	Vcc	Tied to J4-pin2

J3 connector (GPIO)

No	Signal name	Function / comment	No	Signal name	Function / comment
1	PTA7	Digital I/O	6	PTA1	Digital I/O
2	PTA6	Digital I/O	7	Vcc	Provide Power out
3	PTA5	Digital I/O	8	GND	
4	PTA4	Digital I/O	9	PTB0	Analog input
5	PTA0	Digital I/O	10	PTB1	Analog input

6.1.3 Other Function

1. Push switch; SW1 – general purpose; dependent upon the application

   Tied to MPU pin 34 , port A2 (PTA2)

   Usage : PUSH = ‘LOW’ input

2. Red Surface mount LED – general purpose, dependant upon the application
   Location : close to SW1
   Tied to MPU:pin 18 , port D0 (PTD0)
   Usage : LED ON = 'HIGH' output, OFF = 'LOW' output

6.2. Mechanical Characteristics

Item	Specification	Test Method *
Bending strength	Normal function	Bending distance: 1mm, 10 seconds
Resistance to vibration (Low frequency)	RF performance degradation within range of FCC part15.247,249	Product shall be subjected to a single vibration having as double amplitude of 1.5 mm in 3 directions perpendicular to one another four hours each.

6.3. Environmental Characteristics

Item	Specification	Test Methods*
Low temperature exposure	Normal Function	Product shall be exposed at –40 deg.C +/-3 deg.C with no load for 240 hours +48/-0 hours.
High temperature exposure	Normal Function	Product shall be exposed at 85 deg.C +/-3 deg.C with no load for 240 hours +48/-0 hours.
Thermal Shock	Normal Function	Product shall be tested for 500 cycles continuously in accordance with the following duty cycle.
Humidity (Steady state)	Normal Function	Product shall be exposed at 60 deg.C +/-2 deg.C and 90% relative hummidity in a humidity test chamber for 240 hours +48/-0 hours.

Step	Temperature (deg.C)	Time (min.)
1	-40 +/-3	30
2	+85 +/-3	30

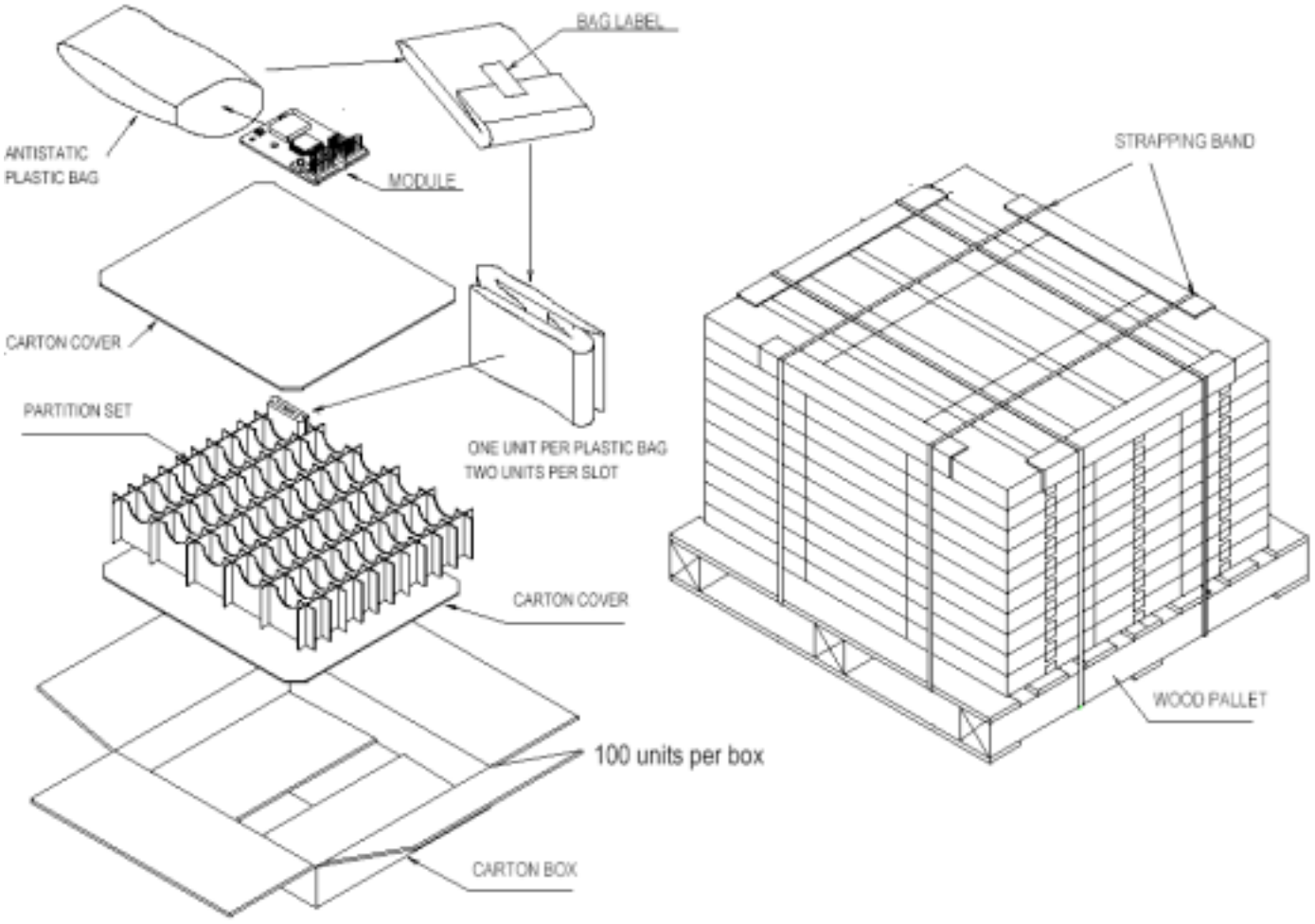
6.4. Other Characteristics

Item	Specification	Test method*
Surface Temperature Increase	Less than 15 deg.C	The environmental temperarure rise of the product shall be measured when applied the rated power. Applied voltage must not exceed maximun ratings.

7. Packaging and Marking on Package

Product is enclosed in vinyl bag.

Product in the bag is inserted in partition of Carton box.



8. Application Notes

8.1. Cautions for safety

These specifications are intended to preserve the quality assurance of products as individual components. Before use, check and evaluate their operation when installed in the finished products.

Abide by these specifications, without deviation when using the products.

These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, then at least, provide the following failsafe functions, as a minimum.

(1) Ensure the safety of the whole system by installing a protection circuit and a protection device.

(2) Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a single fault causing an unsafe status.

8.2. Design Engineering Notes

Heat is the major cause of shortening the life of this product. Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum allowable.

Failure to do so may result in degrading of the product’s functions and damage to the product.

If pulses or other transient loads (a large load applied in a short time) are applied to the products, then before use, check and evaluate their operation when installed in the finished products.

Carefully position the products so that their heat will not burn the printed circuit boards or affect the other components that are susceptible to heat.

Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.

Never allow contact between the cover a vinyl-coated wire and these products to occur. If a vinyl-covered wire comes into contact with the products, then the cover may melt and generate toxic gas, damaging the insulation.

These products are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information and communication equipment. These products are not intended for other uses, other than under the special conditions shown below. Before using these products under such special conditions, check their performance and reliability under the said special conditions carefully to determine whether or not they can be used in such a manner.

(1) In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash

(2) In direct sunlight, outdoors, or in a dusty environment

(3) In an environment where condensation occurs

(4) In an environment with a high concentration of harmful gas (e.g. salty air, HCl, Cl2, SO2, H2S, NH3, and NOx)

If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.

8.3. Storage Conditions

Do not store these products in the following conditions or the performance characteristics of the product, such as RF performance will be adversely affected:

(1) Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX

(2) Storage in direct sunlight

(3) Storage in an environment where the temperature may be outside the range of -40℃ to 85°C range, or where the humidity may be outside the 45 to 85% range.

(4) Storage of the products for more than one year after the date of delivery if all the above conditions (1) to (3) have been avoided.

8.4. Export control

This product emits radio frequency signal to be used alone or embedded in customer's device for operating in the U.S.A. or in Canada.

In case of exporting it to other countries, customer needs to apply for conforming wireless regulations in target countries.

9. Attachment : option

9.1 Parameter sheet for import/export controls

9.2 Constituent Table on Chemical Substances

9.3 Chemical Analysis Data

10.Product Warranty

The Module shall be warranted to conform to this Specification, by which only the hardware portion of IEEE 802.15.4 is defined. All intrinsic available software from the IEEE 802.15.4, the ZigBee stack, and demonstration SW are not in the scope of this warranty.