Panasonic

PAN1762

Bluetooth Low Energy Module

Product Specification

Rev. 0.1



Wireless Modules

Overview

The PAN1762 is a Panasonic Bluetooth 5.0 Low Energy module based on the Toshiba TC35680 single-chip controller.

Features

- Small 15.6 mm x 8.7 mm x 1.9 mm SMD module
- Same form factor and pinout as PAN1026A and PAN1760A
- Bluetooth Low Energy 5.0 compliant
- 128 kB flash memory and 144 kB internal RAM
- Bluetooth stack in ROM, flash memory available for application
- Max. 51 kB RAM for application code and ROM patches
- AT Command mode, host mode, and stand-alone mode
- Standard SIG BLE profiles as well as SPPoverBLE profile
- 2·SPI, 2·I²C,UART, PWM, Wake-Up inputs, general purpose ADC, 18 programmable I/O
- Toshiba TC35680 featuring ARM® Cortex®-M0 with SWD interface

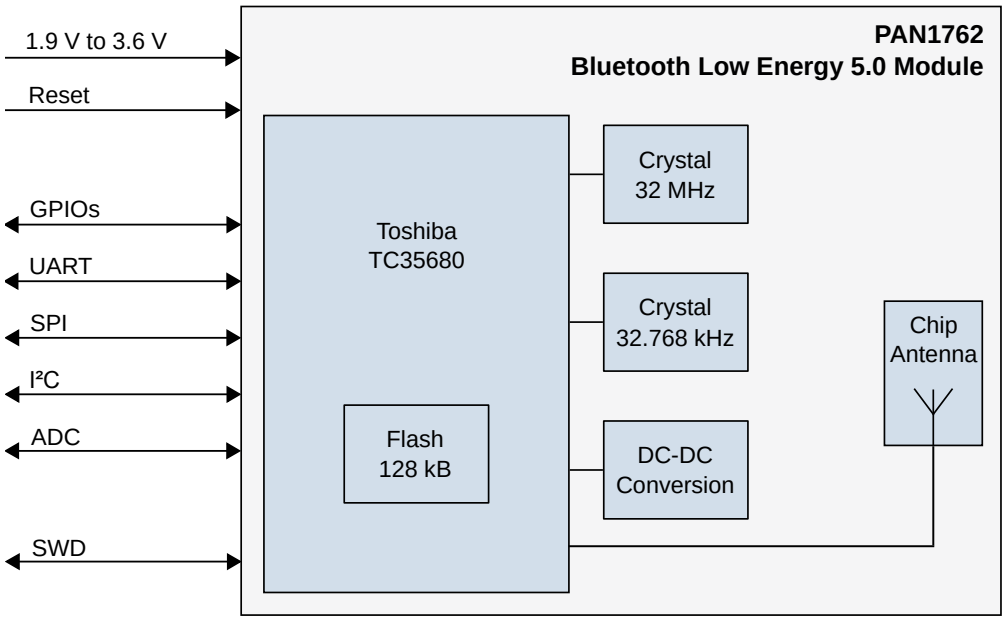
Bluetooth

- 2 Mbps high-speed PHY, LE long range coded PHY
- LE advertising extensions (advertising on 40 channels)
- Channel selection algorithm #2
- LE secure connections
- Advertising function without CPU Wake-Up and interaction
- Bluetooth SIG certified Mesh stack

Characteristics

- Target sensitivity -94 dBm @ 1 Mb/s and -105 dBm @ 125 kb/s
- Target max. output power 8 dBm
- Target typical current consumption of 11 mA in TX (@ 8 dBm) and 5.1 mA in RX mode
- Voltage range: 1.9 V to 3.6 V
- Temperature range: -40 °C to 85 °C

Block Diagram



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1 About This Document

1.1 Purpose and Audience

This Product Specification provides details on the functional, operational, and electrical characteristics of the Panasonic PAN1762 module.

It is intended for hardware design, application, and Original Equipment Manufacturers (OEM) engineers.

The product is referred to as “the PAN1762” or “the module” within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
0.1	31.08.2018	1st preliminary version

1.3 Use of Symbols

Symbol	Description
	**Note** Indicates important information for the proper use of the product. Non-observance can lead to errors.
	**Attention** Indicates important notes that, if not observed, can put the product’s functionality at risk.
⇨ [chapter number] [chapter title]	**Cross reference** Indicates cross references within the document. **Example:** Description of the symbols used in this document ⇨ 1.3 Use of Symbols.

1.4 Related Documents

Please refer to the Panasonic website for related documents ⇨ 7.2.2 Product Information.

2 Overview

The PAN1762 is a Panasonic Bluetooth 5.0 Low Energy module based on the Toshiba TC35680 single-chip controller.

The new Bluetooth 5.0 features enable a higher symbol rate of 2 Mbps using the high-speed 2 M PHY or a significantly longer range using the LE coded PHY at 500 kb/s or 125 kb/s. The new channel selection algorithm improves the performance in environments which are busy at 2.4 GHz. Furthermore, the new LE advertising extensions allow for much larger amounts of data to be broadcast in connectionless scenarios and are therefore favorable for beacon and mesh applications.

A high output power of up to 8 dBm (target value) and the industry leading sensitivity of the TC35680 in combination with the LE coded PHY make the module very attractive in applications, where a long range is required.

The ultra-low current consumption of the PAN1762 makes the module an ideal choice for battery powered devices. Various sleep modes can be used to minimize power consumption and prolong battery life time.

To provide maximum flexibility, the module can be operated in hosted as well as standalone mode.

In standalone mode no external processor is necessary, which saves complexity, space, and cost. The built-in 128 kB flash memory is completely free for application use.

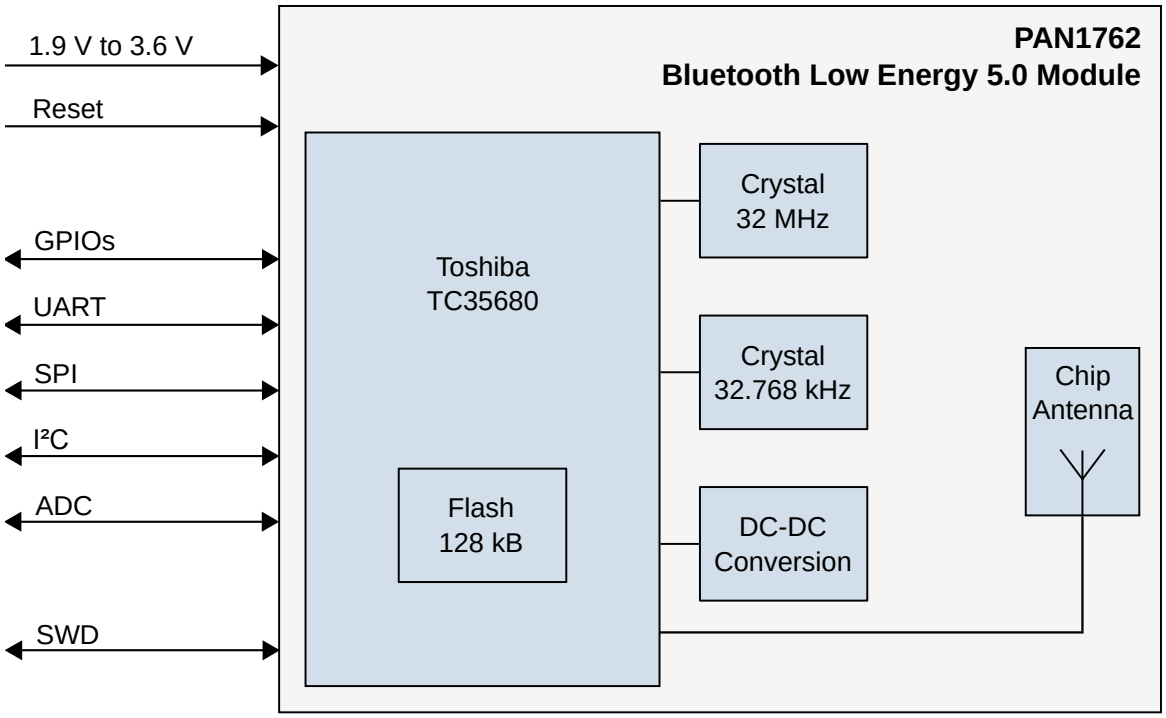
PAN1762 shares the same small form factor and footprint as PAN1026A and PAN1760A. When migrating from PAN1760A or PAN1760 only minor code changes are required. Previously developed software, such as Bluetooth Low Energy profiles and applications, can be easily migrated with a minimal effort.

FCC, IC, and CE approval are in preparation.

Please refer to the Panasonic website for related documents ⇨ 7.2.2 Product Information.

Further information on the variants and versions ⇨ 7.1 Ordering Information.

2.1 Block Diagram

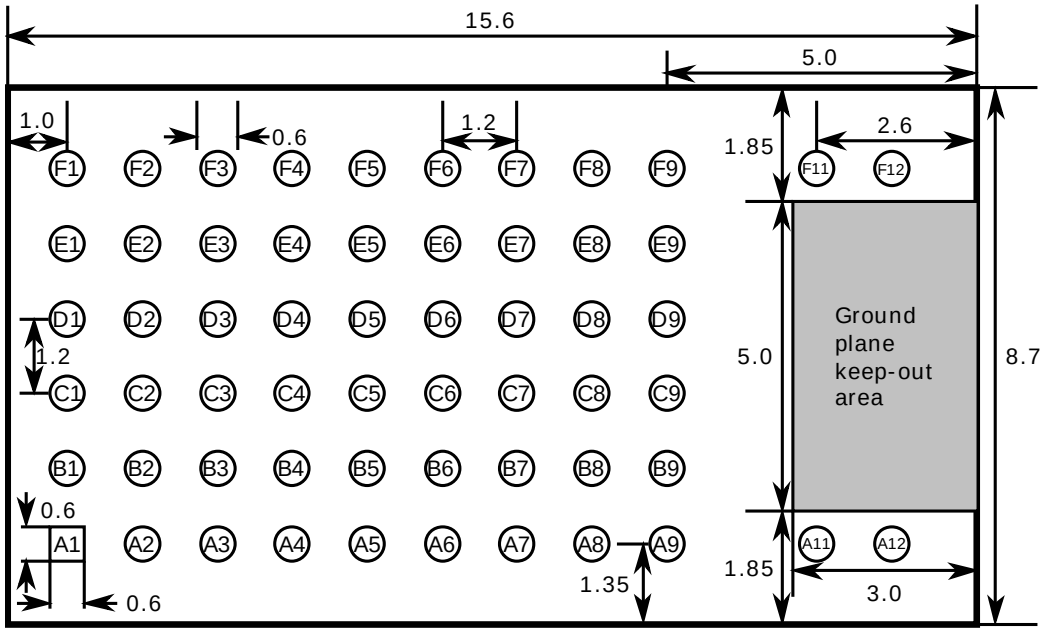


2.2 Pin Configuration

Pin Assignment

Top View

All dimensions are in millimeters.



Pin Functions

No	Pin Name	Pin Type	Description
A1	GND	Ground Pin	Connect to ground
A2	GPIO3	Digital I/O	
A3	RESET	Digital Input	Reset, active low
A4	NC	NC	Not connected
A5	VCC	Power	Analog/digital power supply connection
A6	VCC	Power	Analog/digital power supply connection
A7	GND	Ground Pin	Connect to ground
A8	GPIO16	Digital I/O	
A9	GND	Ground Pin	Connect to ground
A11	GND	Ground Pin	Connect to ground
A12	GND	Ground Pin	Connect to ground
B1	GPIO9	Digital I/O	
B2	GPIO4	Digital I/O	

No	Pin Name	Pin Type	Description
B3	NC	NC	Not connected, leave open
B4	NC	NC	Not connected, leave open
B5	GPIO7/UART RTS	Digital I/O	UART RTS
B6	GPIO8/UART CTS	Digital I/O	UART CTS
B7	GPIO17	Digital I/O	
B8	NC	NC	Not connected, leave open
B9	NC	NC	Not connected, leave open
C1	NC	NC	Not connected, leave open
C2	NC	NC	Not connected, leave open
C3	GPIO10	Digital I/O	
C4	SWDIO	SWD	
C5	SWDCLK	SWD	
C6	GPIO1	Digital I/O	
C7	NC	NC	Not connected, leave open
C8	GND	Ground Pin	Connect to ground
C9	GND	Ground Pin	Connect to ground
D1	NC	NC	Not connected, leave open
D2	NC	NC	Not connected, leave open
D3	NC	NC	Not connected, leave open
D4	GPIO0/WakeUp0	Digital I/O	
D5	NC	NC	Not connected, leave open
D6	GPIO15/WakeUp1	Digital I/O	
D7	GND	Ground Pin	Connect to ground
D8	GND	Ground Pin	Connect to ground
D9	ANT	RF-Signal	Antenna pin (not connected for standard module version)
E1	GPIO12/SDA	Digital I/O	I2C interface
E2	GPIO11/SCL	Digital I/O	I2C interface
E3	NC	NC	Not connected, leave open
E4	NC	NC	Not connected, leave open
E5	NC	SLPXOIN	Not connected for standard version (32 kHz clock input)
E6	GPIO6/UARTRXD	Digital Input	UART RXD

No	Pin Name	Pin Type	Description
E7	NC	NC	Not connected, leave open
E8	GND	Ground Pin	Connect to ground
E9	GND	Ground Pin	Connect to ground
F1	GND	Ground Pin	Connect to ground
F2	NC	NC	Not connected, leave open
F3	NC	NC	Not connected, leave open
F4	NC	NC	Not connected, leave open
F5	GPIO14	Digital Input	
F6	GPIO2	Digital I/O	
F7	GPIO5/UARTTXD	Digital Output	UART TX
F8	GPIO13	Digital Output	
F9	GND	Ground Pin	Connect to ground
F11	GND	Ground Pin	Connect to ground
F12	GND	Ground Pin	Connect to ground

Minimal configuration:

- VCC
- GND
- UART Rx, Tx, no flow control

2.3 UART Interface

- Default baud rate: 115 200
- Data format: 8, Stop: 1, Parity: none, LSB first
- Rx, Tx, no flow control

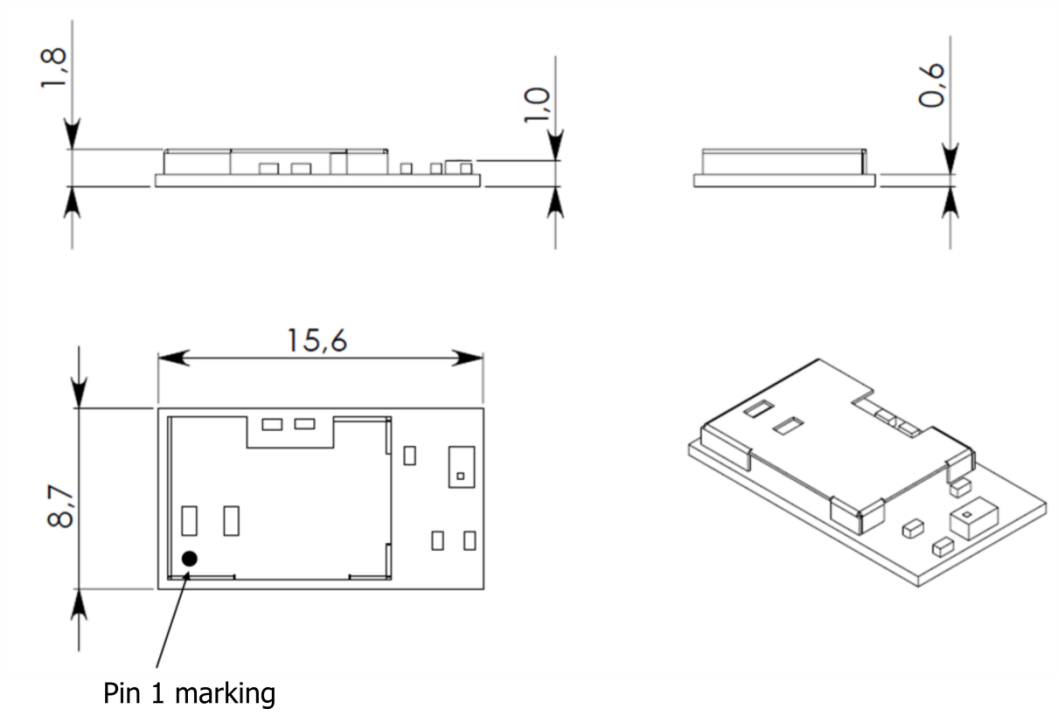
2.4 Bluetooth Features

- 2 Mbps high-speed PHY, LE long range coded PHY
- LE advertising extensions (advertising on 40 channels total)
- Channel selection algorithm #2
- LE secure connections
- Advertising function without CPU Wake-Up and interaction
- Bluetooth SIG certified Mesh stack

3 Detailed Description

3.1 Dimensions

All dimensions are in millimeters.



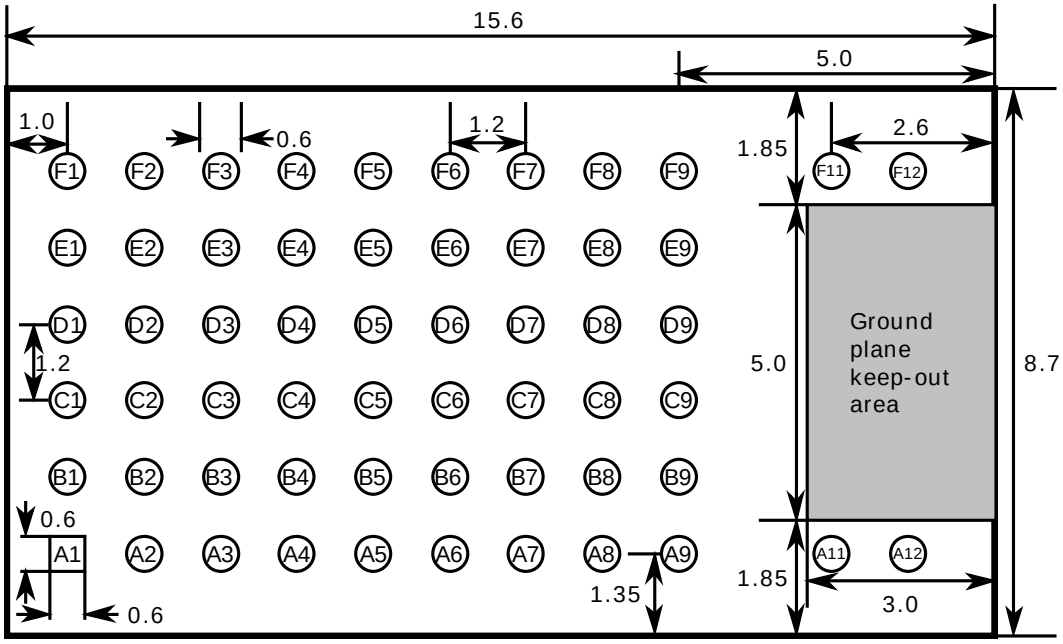
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.35	
2	Length	15.60	± 0.35	
3	Height	1.80	± 0.35	With case

3.2 Footprint

The outer dimensions have a tolerance of ±0.35 mm.

All dimensions are in millimeters.

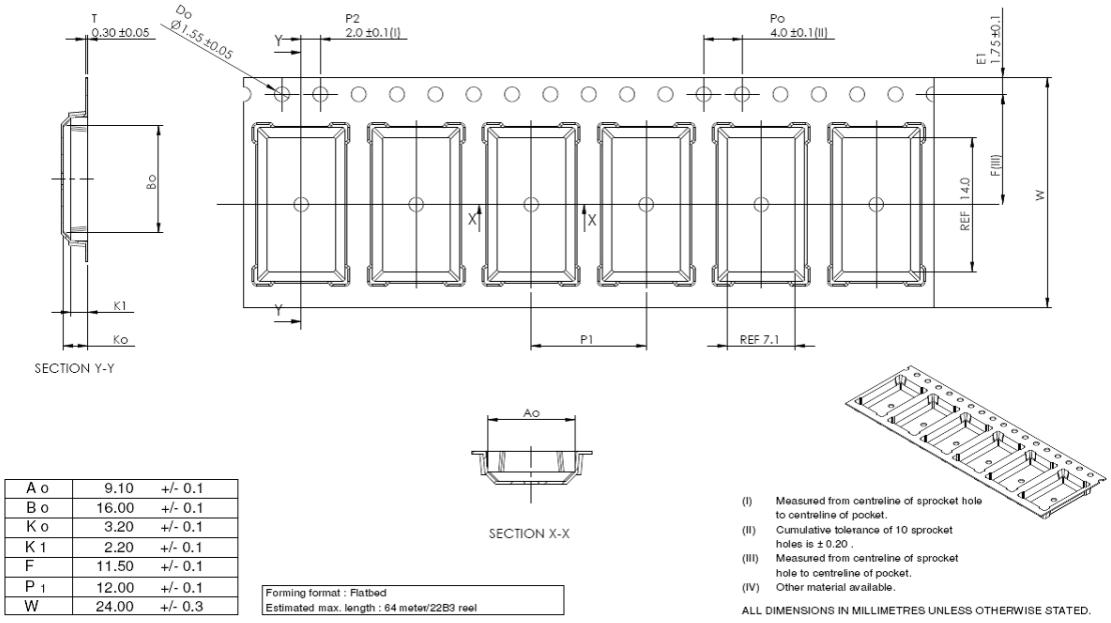
Top View



3.3 Packaging

The product is an ES status product and will be delivered in the package described below.

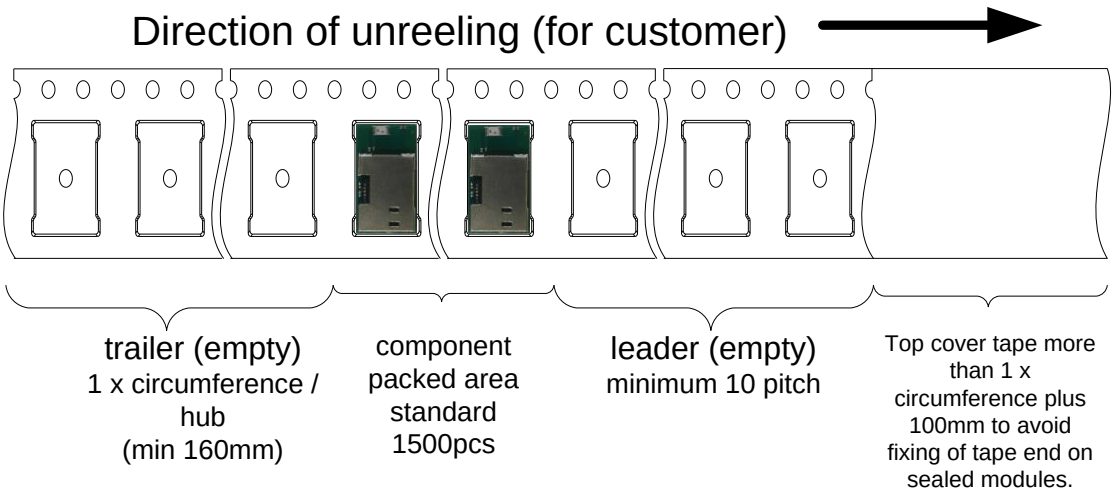
3.3.1 Tape Dimensions



A o	9.10	+/- 0.1
B o	16.00	+/- 0.1
K o	3.20	+/- 0.1
K 1	2.20	+/- 0.1
F	11.50	+/- 0.1
P 1	12.00	+/- 0.1
W	24.00	+/- 0.3

Forming format : Flatbed
Estimated max. length : 64 meter/22B3 reel

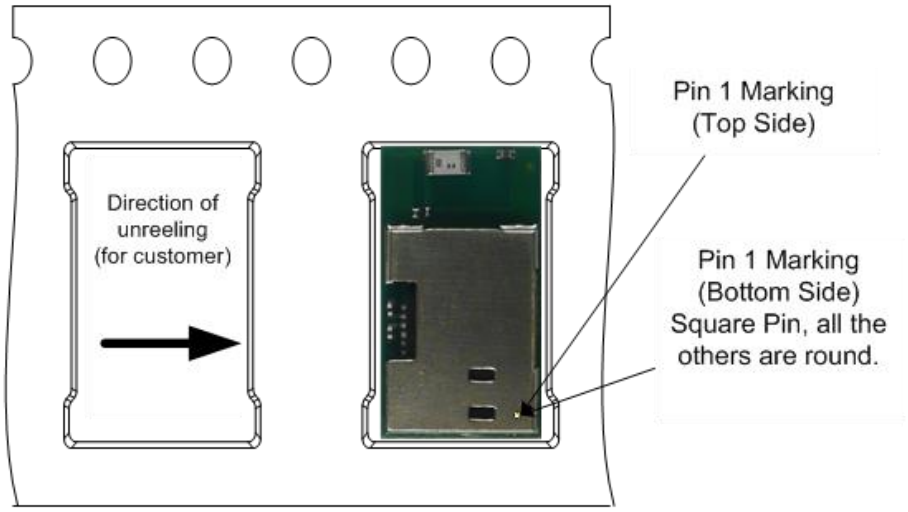
3.3.2 Packing in Tape



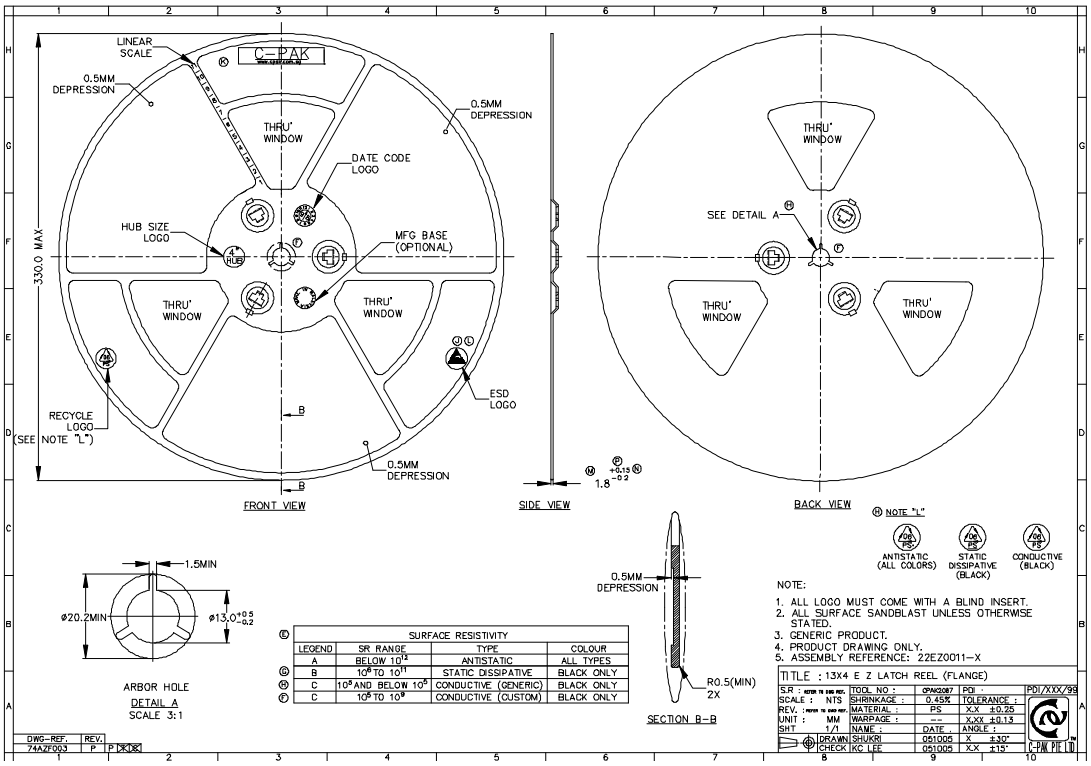
Empty spaces in the component packed area shall be less than two per reel and those spaces shall not be consecutive.

The top cover tape shall not be found on reel holes and it shall not stick out from the reel.

3.3.3 Component Direction

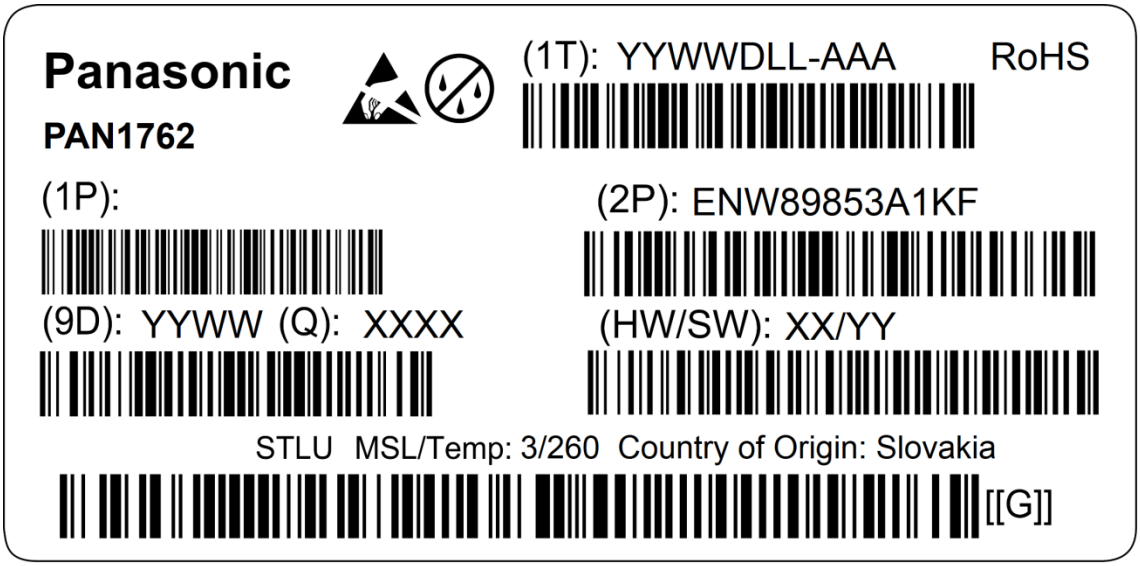


3.3.4 Reel Dimension



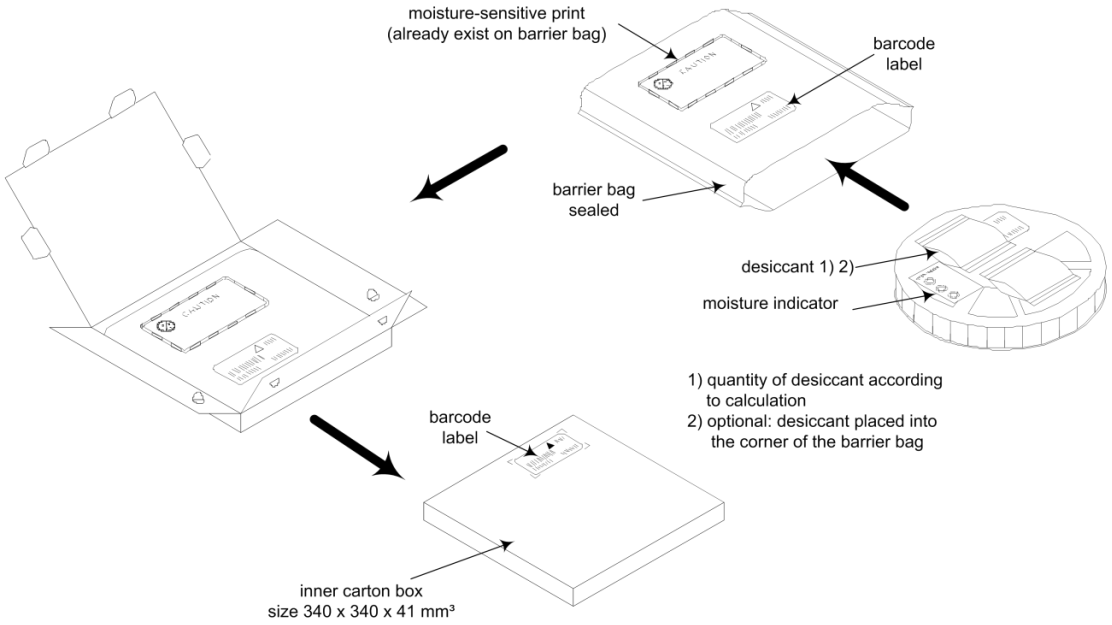
3.3.5 Package Label

Example



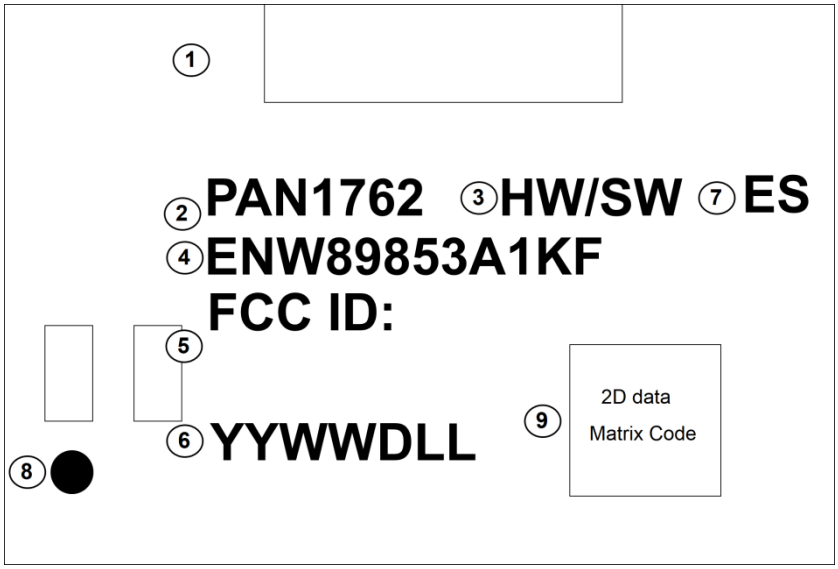
(1T)	Lot code
(1P)	Customer order number, if applicable
(2P)	Order number
(9D)	Date code
(Q)	Quantity
(HW/SW)	Hardware/software version

3.3.6 Total Package



3.4 Case Marking

Example



1	MIC ID
2	Brand name
3	Hardware/software version
4	Order number
5	FCC ID
6	Lot code
7	Engineering Sample marking, if applicable
8	Marking for Pin 1
9	2D barcode, for internal usage only

4 Specification

All specifications are over temperature and process, unless indicated otherwise.

4.1 Default Test Conditions

Temperature:	25 ± 10 °C
Humidity:	40 to 85 % RH
Supply Voltage:	3.3 V

4.2 Absolute Maximum Ratings

The maximum ratings may not be exceeded under any circumstances, not even momentarily or individually, as permanent damage to the module may result.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
T_{STOR}	Storage temperature		-40		+85	°C
V_{DD}	Power supply		-0.3		3.9	mA
V_{ESD}	ESD robustness (Target value)	All pads, according to human body model (HBM), JEDEC STD 22, method A114			1 000	V
		According to charged device model (CDM), JEDEC STD 22, method C101			500	V
P_{RF}	RF input level				+10	dBm
V_{DIG}	Voltage on any digital pins		-0.3		VDD + 0.3	V
I_{IN}	Input current for any digital pin		-10		10	mA

4.3 Recommended Operating Conditions



The maximum ratings may not be exceeded under any circumstances, not even momentarily or individually, as permanent damage to the module may result.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
T_A	Ambient operating temperature range		-40		+85	°C
V_{DD}	3V3 Supply voltage		1.8	3.3	3.6	V

4.4 Current Consumption



The current consumption depends on the user scenario, on the setup, and timing in the power modes.

Assume V_{DD} = 3.0 V, T_{amb} = 25 °C, if nothing else stated.

Parameter	Condition	Min.	Typ.	Max.	Units
Transmit peak current	Tentative target value, 1 Mbps, 0 dBm		6.0		mA
	Tentative target value, 2 Mbps, 0 dBm		6.5		mA
	Tentative target value, 1 Mbps, 8 dBm		11.0		mA
	Tentative target value, 2 Mbps, 8 dBm		11.5		mA
Receive peak current	Tentative target value, 1 Mbps		5.1		mA
	Tentative target value, 2 Mbps		5.5		mA
Deep sleep mode	Tentative target value		50		nA

4.5 Bluetooth

Parameter	Condition	Min.	Typ.	Max.	Units
Operation frequency range		2 402		2 480	MHz
Channel spacing	BLE		2		MHz
Output Power	Maximum setting, measured at module bottom pad (target value)		8		dBm
Sensitivity	Target value, 1 Mbps		-94.5		dBm
	Target value, 2 Mbps		-91.5		dBm
	Target value, 500 kbps (S = 2)		-99.0		dBm
	Target value, 125 kbps (S = 8)		-105.0		dBm

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
1	Spurious emissions	Conducted measurement at module RF bottom pad.		<-30		dBm

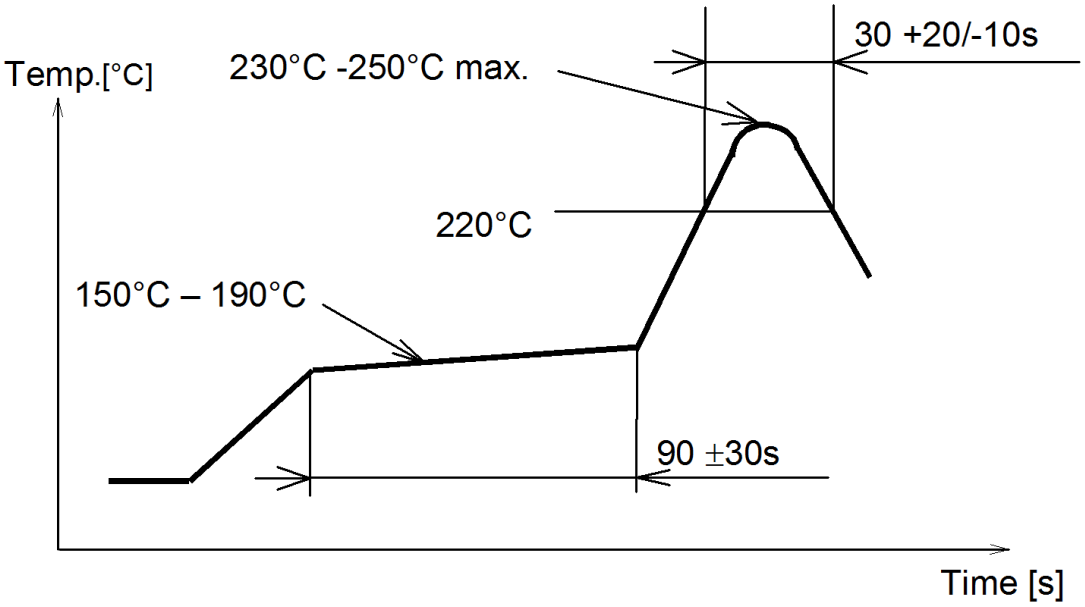
4.6 Reliability Tests

The measurement should be done after the test device has been exposed to room temperature and humidity for one hour.

No.	Item	Limit	Condition
1	Variable Vibration Test	Electrical parameters should be within specification	Freq.: 20~2000 Hz, Acc.: 17-50 G, Sweep: 8 min, 2 hours, For: XYZ axis
2	Shock Drop Test	Electrical parameters should be within specification	Drop parts on concrete from a height of 1 m for 3 times
3	Heat-Shock/ Temperature Cycling Test	Electrical parameters should be within specification	at -40 °C and +85 °C for 1 h/cycle Total = 300 cycles
4	Temperature Humidity Bias Test	Electrical parameters should be within specification	at +60 °C, 85 °% r.H., 300 h
5	Low Temperature Storage Life Test	Electrical parameters should be within specification	at -40 °C, 300 h
6	High Temperature Storage Life Test	Electrical parameters should be within specification	at +85 °C, 300 h

4.7 Recommended Soldering Profile

- Reflow permissible cycles: 2
- Due to module weight, opposite side reflow is prohibited.
- More than 75 percent of the soldering area shall be coated by solder.
- The soldering profiles should be adhered to in order to prevent electrical or mechanical damage.
- Soldering profile assumes lead-free soldering.



5 Cautions



Failure to follow the guidelines set forth in this document may result in degrading of the module functions and damage to the module.

5.1 Design Notes

1. Follow the conditions written in this specification, especially the control signals of this module.
2. The supply voltage should abide by the maximum ratings (⇨ 4.2 Absolute Maximum Ratings).
3. The supply voltage must be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47 µF directly at the module).
4. This module should not be mechanically stressed when installed.
5. Keep this module away from heat. Heat is the major cause of decreasing the life time of these modules.
6. Avoid assembly and use of the target equipment in conditions where the module temperature may exceed the maximum tolerance.
7. Keep this module away from other high frequency circuits.
8. Refer to the recommended pattern when designing a board.

5.2 Installation Notes

1. Reflow soldering is possible twice based on the conditions set forth in ⇨ 4.7 Recommended Soldering Profile. Set up the temperature at the soldering portion of this module according to this reflow profile.
2. Carefully position the module so that the heat will not burn into printed circuit boards or affect other components that are susceptible to heat.
3. Carefully locate the module, to avoid an increased temperature caused by heat generated by neighboring components.
4. If a vinyl-covered wire comes into contact with the module, the wire cover will melt and generate toxic gas, damaging the insulation. Never allow contact between a vinyl cover and these modules to occur.
5. This module should not be mechanically stressed or vibrated when reflowed.
6. To repair the board by hand soldering, follow the conditions set forth in this chapter.
7. Do not wash this product.
8. Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the module.

5.3 Usage Condition Notes

1. Take measures to protect the module against static electricity.
   If pulses or transient loads (a large load, which is suddenly applied) are applied to the modules, check and evaluate their operation before assembly of the final products.
2. Do not use dropped modules.
3. Do not touch, damage, or soil the pins.
4. Follow the recommended condition ratings about the power supply applied to this module.
5. Electrode peeling strength: Do not apply a force of more than 4.9 N in any direction on the soldered module.
6. Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
7. These modules are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information, and communication equipment.

5.4 Storage Notes

1. The module should not be stressed mechanically during storage.
2. Do not store these modules in the following conditions or the performance characteristics of the module, such as RF performance will be adversely affected:

– Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_X,
– Storage in direct sunlight,
– Storage in an environment where the temperature may be outside the range of 5 °C to 35 °C, or where the humidity may be outside the 45 % to 85 % range,
– Storage of the modules for more than one year after the date of delivery storage period: Please check the adhesive strength of the embossed tape and soldering after 6 months of storage.

3. Keep this module away from water, poisonous gas, and corrosive gas.
4. This module should not be stressed or shocked when transported.
5. Follow the specification when stacking packed crates (max. 10).

5.5 Safety Cautions

These specifications are intended to preserve the quality assurance of products and individual components.

Before use, check and evaluate the operation when mounted on your 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, 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.

5.6 Other Cautions

1. Do not use the module for other purposes than those listed in section ⇨ 5.3 Usage Condition Notes.
2. Be sure to provide an appropriate fail-safe function on your product to prevent any additional damage that may be caused by the abnormal function or the failure of the module.
3. This module has been manufactured without any ozone chemical controlled under the Montreal Protocol.
4. These modules are not intended for use under the special conditions shown below. Before using these modules under such special conditions, carefully check their performance and reliability under the said special conditions to determine whether or not they can be used in such a manner:

– In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash,
– In direct sunlight, outdoors, or in a dusty environment,
– In an environment where condensation occurs,
– In an environment with a high concentration of harmful gas (e. g. salty air, HCl, Cl_2, SO_2, H_2S, NH_3, and NO_X).

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



Please refer to the Panasonic website for for further information
⇨ 7.2.2 Product Information.

5.7 Life Support Policy

This Panasonic Industrial Devices Europe GmbH product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Panasonic customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Panasonic Industrial Devices Europe GmbH for any damages resulting.

5.8 Restricted End Use

This Panasonic Industrial Devices Europe GmbH product is not designed for any restricted activity that supports the development, production, handling usage, maintenance, storage, inventory or proliferation of any weapons or military use.

Transfer, export, re-export, usage or reselling of this product to any destination, end user or any end use prohibited by the European Union, United States or any other applicable law is strictly prohibited.

6 Regulatory and Certification Information

6.1 Federal Communications Commission (FCC) for US

Certification is pending.

6.2 Innovation, Science, and Economic Development (ISED) for Canada

Certification is pending.

6.3 European Conformity According to RED (2014/53/EU)

Certification is pending.

6.4 Bluetooth

Certification is pending.

6.5 RoHS and REACH Declaration

The latest declaration of environmental compatibility (Restriction of Hazardous Substances, RoHS and Registration, Evaluation, Authorisation and Restriction of Chemicals, REACH) for supplied products can be found on the Panasonic website in the “Downloads” section of the respective product ⇨ 7.2.2 Product Information.

7 Appendix

7.1 Ordering Information

Variants and Versions

Order Number	Brand Name	Description	MOQ[1]
ENW89853A1KF[2]	PAN1762	Bluetooth Low Energy Module	1 500

[1] Abbreviation for Minimum Order Quantity (MOQ). The default MOQ for mass production is 1 500 pieces, fewer only on customer demand. Samples for evaluation can be delivered at any quantity via the distribution channels.

[2] Samples are available on customer demand.

7.2 Contact Details

7.2.1 Contact Us

Please contact your local Panasonic Sales office for details on additional product options and services:

For Panasonic Sales assistance in the **EU**, visit

https://eu.industrial.panasonic.com/about-us/contact-us

Email: wireless@eu.panasonic.com

For Panasonic Sales assistance in **North America**, visit the Panasonic “Sales & Support” website to find assistance near you at

https://na.industrial.panasonic.com/distributors

Please visit the **Panasonic Wireless Technical Forum** to submit a question at

https://forum.na.industrial.panasonic.com

7.2.2 Product Information

Please refer to the Panasonic Wireless Connectivity website for further information on our products and related documents:

For complete Panasonic product details in the **EU**, visit

http://pideu.panasonic.de/products/wireless-modules.html

For complete Panasonic product details in **North America**, visit

http://www.panasonic.com/rfmodules