Not Recommended for New Design: PAN1026, PAN1760, PAN1760A Series Bluetooth RF Modules and Evaluation Kits

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About This Notice:	The PAN1026, PAN1760 and PAN1760A Series Wireless Connectivity RF Modules and Evaluation Kits are now Not Recommended For New Design by Panasonic due to the discontinuation of internal module components.
Features:	
Effective Date:	Immediate.
Affected Parts and/or Replacements:	See Attached.
Datasheet(s):	See Attached.
Notes:	

Product Specification

Applicant/Manufacturer Hardware	Panasonic Industrial Devices Europe GmbH Zeppelinstrasse 19 21337 Lüneburg Germany
Applicant/Manufacturer Software	Toshiba
Software Version	Please refer to chapter 21

By purchase of any of the products described in this document the customer accepts the document's validity and declares their agreement and understanding of its contents and recommendations. Panasonic reserves the right to make changes as required without notification.

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1. SCOPE OF THIS DOCUMENT

This Product Specification applies to Panasonic's Class 2 Bluetooth®[1] low energy single mode module, series number: PAN1760.

2. KEY FEATURES

- Same form factor and footprint as PAN1026
- Bluetooth 4.0 (LE) embedded GATT profile with high level API commands, compatible to Toshiba reference BLE profiles
- Surface mount type 15.6 x 8.7 x 1.8 mm³
- Tx power 0 dBm, Rx sensitivity -90 dBm
- Compliant to BT 4.0 (extension to 4.1 under development)
- 32kB on-chip RAM for application software and driver
- 512kBit eeprom to download user program during start up
- Operation with external host or as host-less (stand alone)
- Standard SIG BLE and "SPP over BLE" profiles available
- Temperature Range from -40°C to +85°C
- 2 UART, I2C , SPI, GPIO (10 in/out), Wake-Up control pins, ADC(4 CH)

3. BLUETOOTH

The Bluetooth® SIG specifies two types of implementation: Bluetooth® Low Energy (LE) and Bluetooth® Basic Datarate (BR). Bluetooth low energy specification consumes just a fraction of the power of Basic Datarate devices, allowing the short-range wireless standard to extend to coin cell battery applications.

Note:

"The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Panasonic is under license. Other trademarks and trade names are those of their respective owners."

4. APPLICATIONS FOR THE MODULE

- All Embedded Wireless Applications
- Wearable Devices
- Health Care, Medical Diagnostic Systems
- Mobile phone accessories
- Industrial Measurement and Diagnostics
- Devices where Power Consumption is critical

[1] Bluetooth is a registered trademark of the Bluetooth Special Interest Group.

5. DESCRIPTION OF THE MODULE

The PAN1760 is a short-range, Class 2, BLE single mode module for implementing Bluetooth functionality into various electronic devices. A block diagram can be found in chapter 7.

The PAN1760 is a cost-effective, low-power, true system-on-chip (SoC) for Bluetooth low energy applications. It enables robust BLE central and peripheral nodes to be built with very low total bill-of-material costs. The PAN1760 combines an excellent RF transceiver programmable EEPROM memory, 32-KB RAM, and many other powerful supporting features and peripherals. The PAN1760 is suitable for systems where very low power consumption is required. Very low-power sleep modes are available. Short transition times between operating modes further enable low power consumption.

Panasonic PAN1760 offers an embedded and certified Bluetooth low energy protocol stack and BLE GATT profile inside the silicon device from Toshiba. The Bluetooth low energy protocol stack from Toshiba is a flexible and cost-effective single-mode Bluetooth low energy solution. Standard BLE or proprietary profiles are available for seamless integration into the application code.

Please contact your local sales office for further details on additional options and services:

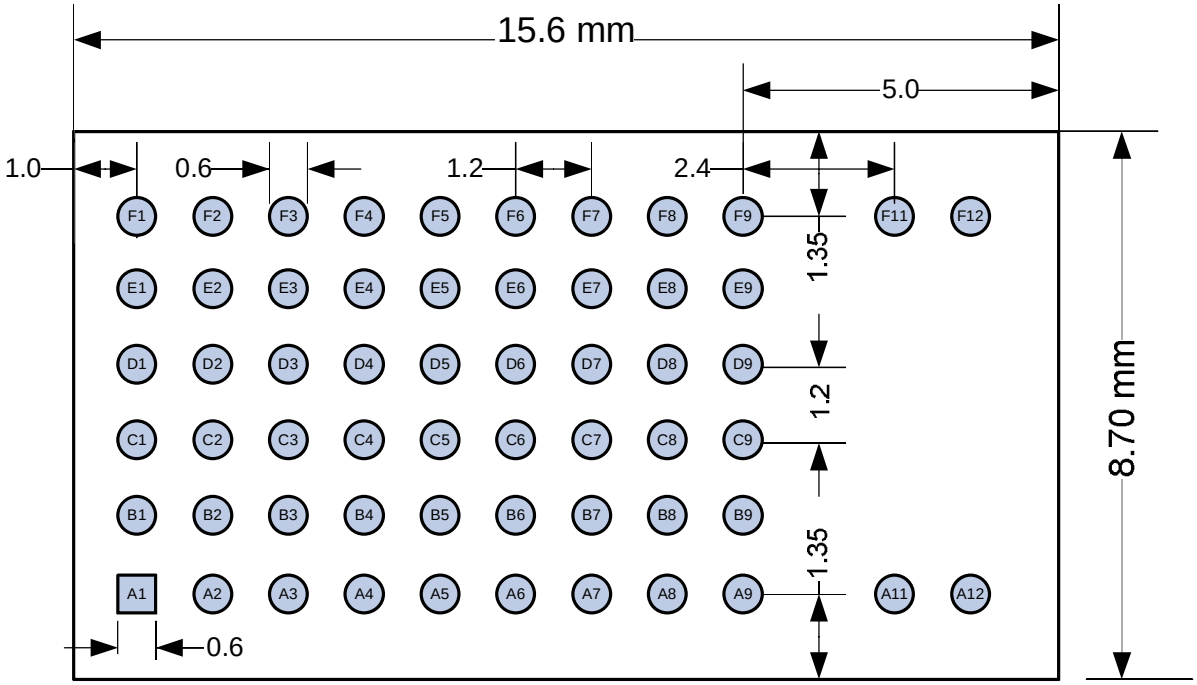
www.panasonic.com/rfmodules for the US,
http://industrial.panasonic.com/eu/i/29606/wireless_modules/wireless_modules.html for EU,

or write an e-mail to wireless@eu.panasonic.com.

6. DETAILED DESCRIPTION

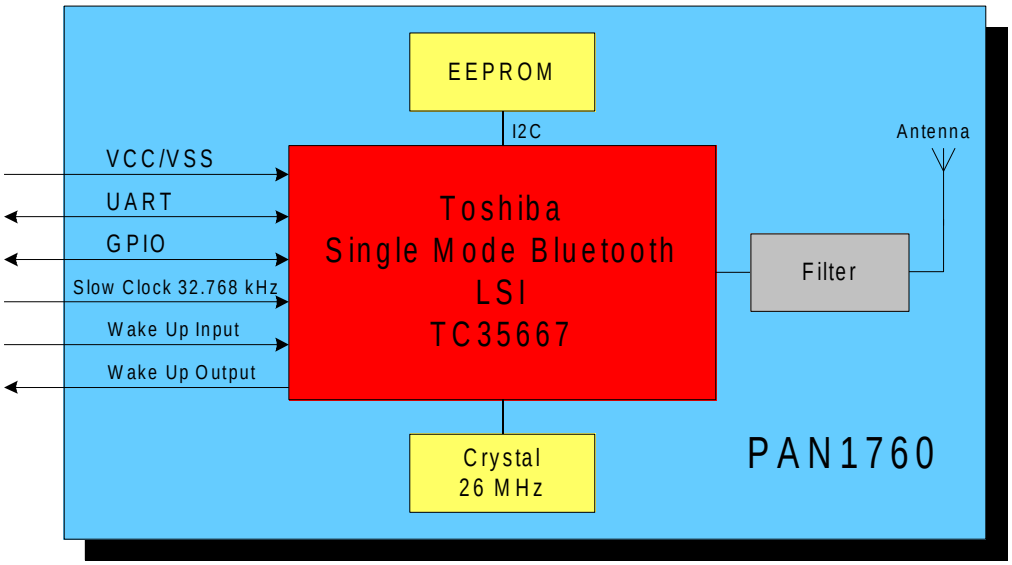
6.1. PAN1760 TERMINAL LAYOUT

Top View, Application PCB



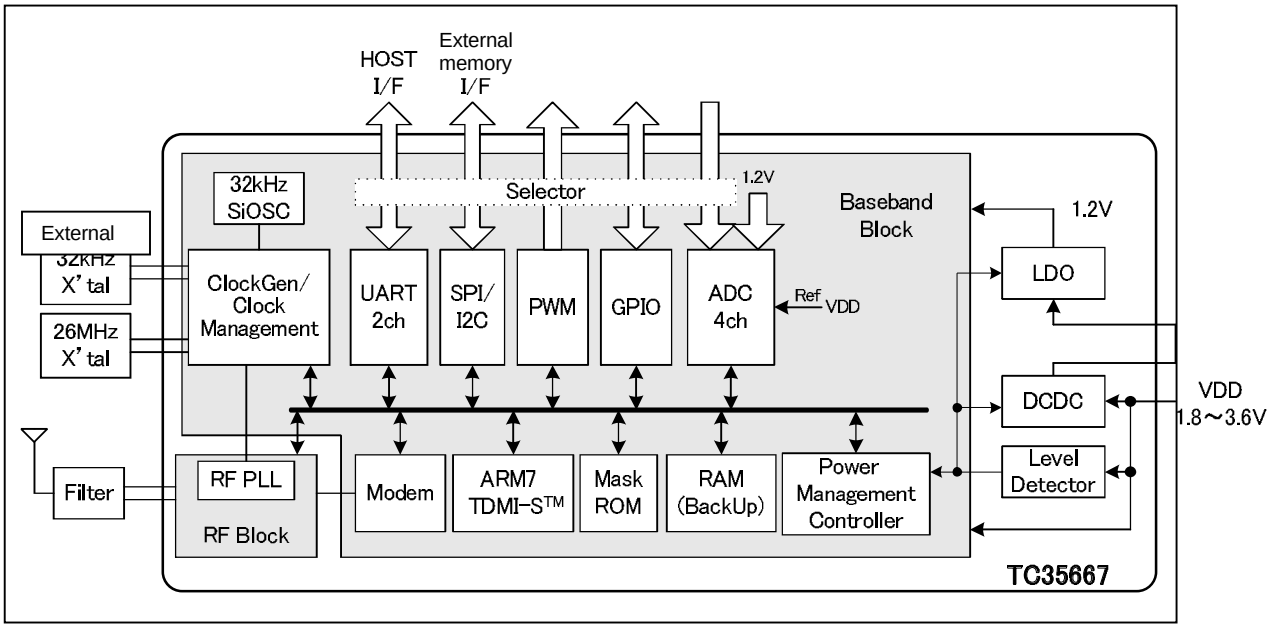
No	PIN Name	Alternative PIN	Pin Type	Description
A1	GND		Ground Pin	Connect to Ground
A2	NC			Not Connected
A3	Reset		Digital Input	Reset, active-low
A4	VCC		Power	2V – 3.6V analog/digital power supply connection
A5	VCC		Power	2V – 3.6V analog/digital power supply connection
A6	VCC		Power	2V – 3.6V analog/digital power supply connection
A7	GND		Ground Pin	Connect to Ground
A8	NC			Not Connected
A9	GND		Ground Pin	Connect to Ground
A11	GND		Ground Pin	Connect to Ground
A12	GND		Ground Pin	Connect to Ground
B1	NC			Not Connected
B2	GPIO14		Digital I/O	
B3	GPIO11		Digital I/O	
B4	NC			Not Connected
B5	NC			Not Connected
B6	NC			Not Connected
B7	NC			Not Connected
B8	NC			Not Connected
B9	NC			Not Connected
C1	NC			Not Connected
C2	GPIO15	AIN2	Digital I/O	
C3	GPIO12		Digital I/O	
C4	NC			Not Connected
C5	NC			Not Connected
C6	GPIO9	PWM1	Digital I/O	
C7	GPIO10	PWM2	Digital I/O	
C8	GND		Ground Pin	Connect to Ground
C9	GND		Ground Pin	Connect to Ground
D1	NC			Not Connected
D2	NC			Not Connected
D3	GPIO1	AIN0	Digital I/O	
D4	Wakup	GPIO0	Digital I/O	
D5	NC			Not Connected
D6	GPIO13		Digital I/O	
D7	GND		Ground Pin	Connect to Ground
D8	GND		Ground Pin	Connect to Ground
D9	NC			PAN1760 Not Connected/Placeholder for Antenna
E1	GPIO8	SDA	Digital I/O	Connected to internal EEPROM
E2	GPIO7	SCL	Digital I/O	Connected to internal EEPROM
E3	NC			Not Connected
E4	NC			Not Connected
E5	SLPXOIN		Clock In	32.768 KHz sleep clock input
E6	UART_RXD	GPIO4	Digital In	
E7	GPIO2	PWM0/AIN1	Digital I/O	
E8	GND		Ground Pin	Connect to Ground
E9	GND		Ground Pin	Connect to Ground
F1	GND		Ground Pin	Connect to Ground
F2	EEPROM_WP		Digital In	EEPROM write protect /active low
F3	NC			Not Connected
F4	NC			Not Connected
F5	GPIO6	UART_1-CTS/ UART2-RX	Digital In	Can be configured to UART2_RXD
F6	SLPXOOUT		Clock Out	32.768 KHz sleep clock output
F7	UART_TXD	GPIO3	Digital Out	
F8	GPIO5	UART1_RTS/ UART2-TX	Digital I/O	Can be configured to UART2_TXD
F9	GND		Ground Pin	Connect to Ground
F11	GND		Ground Pin	Connect to Ground
F12	GND		Ground Pin	Connect to Ground

7. PAN1760 BLOCK DIAGRAM



7.1. ENW89847A2KF

This model version does not contain an EEPROM. There is no Panasonic IEEE MAC address in the module. This version cannot be used for stand-alone operation until there will be connected an external memory.



8. GPIO FUNCTION LIST

GPIO pins are assigned to UART or serial memory. Please refer to the firmware specification for further details.

Pin	Analog input	Function 1	Function 2	Function 3	Function 4	Function 5
GPIO0	-	GPIO1 Digital I/O	WakeUp Input	-	-	-
GPIO1	ADC0 Input	GPIO Digital I/O	-	-	-	-
GPIO2	ADC1 Input	GPIO Digital I/O	PWM0 Output	-	-	-
GPIO3_TEST	-	GPIO Digital I/O	UART1-TX Output	-	SPI-DOUT Output	UART2-TX Output
GPIO4	-	GPIO Digital I/O	UART1-RX Input	-	SPI-DIN Input	UART2-RX Input
GPIO5_Bmode	-	GPIO Digital I/O	UART1-RTSX Output	UART2-TX Output	SPI-SCS Output	UART1-TX Output
GPIO6	-	GPIO Digital I/O	UART1-CTSX Input	UART2-RX Input	SPI-SCLK Output	UART1-RX Input
GPIO7	-	GPIO Digital I/O	-	I2C-SCL Output	SPI-DOUT Output	-
GPIO8	-	GPIO Digital I/O	-	I2C-SDA I/O	SPI-DIN Input	-
GPIO9	-	GPIO Digital I/O	PWM1 Output	I2C-SCL Output	-	-
GPIO10	-	GPIO Digital I/O	PWM2 Output	I2C-SDA I/O	-	-
GPIO11～14	-	GPIO Digital I/O	-	-	-	-
GPIO15	ADC2 Input	GPIO Digital I/O	-	-	-	-

Pin name	Basic example	Example of UART1 + UART2 + I2C	Example of SPI + I2C	Example of UART + SPI + I2C
GPIO0	Wake Up	Wake Up	Wake Up	Wake Up
GPIO1	ADC- AIN0	ADC- AIN0	ADC- AIN0	ADC- AIN0
GPIO2	ADC-AIN1 / PWM0	ADC-AIN1 / PWM0	ADC-AIN1 / PWM0	ADC-AIN1 / PWM0
GPIO3	UART1-TX	UART1-TX	SPI-DOUT	UART1-TX
GPIO4	UART1-RX	UART1-RX	SPI-DIN	UART1-RX
GPIO5	UART1-RTSX	UART2-TX	SPI-SCS	SPI-SCS
GPIO6	UART1-CTSX	UART2-RX	SPI-SCLK	SPI-SCLK
GPIO7	I2C-SCL	I2C-SCL	I2C-SCL	SPI-DOUT
GPIO8	I2C-SDA	I2C-SDA	I2C-SDA	SPI-DIN
GPIO9	PWM1	PWM1	PWM1	I2C-SCL
GPIO10	PWM2	PWM2	PWM2	I2C-SDA
GPIO11-14	-	-	-	-
GPIO15	ADC-AIN2	ADC-AIN2	ADC-AIN2	ADC-AIN2

9. Test Conditions

Measurements shall be made under operating free-air temperature range unless otherwise specified.

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

10. GENERAL DEVICE REQUIREMENTS AND OPERATION

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

10.1. ABSOLUTE MAXIMUM RATINGS

No	See [2]	Value	Unit
Ratings Over Operating Free-Air Temperature Range			
1	Voltage on any digital pin	-0.3 to VDD+0.3	V
2	Operating ambient temperature range	-40 to 85	°C
3	Storage temperature range	-40 to 125	°C
4	Bluetooth RF inputs	10	dBm
5	ESD: All pads, according to human-body model, JEDEC STD 22, method A114 According to charged-device model, JEDEC STD 22, method C101	 1000 500	V

10.2. RECOMMENDED OPERATING CONDITIONS

No	Rating	Min	Typ	Max	Unit
1	Power supply voltage	2.0	3.3	3.6	V
2	Maximum ambient operating temperature	-40		85	°C

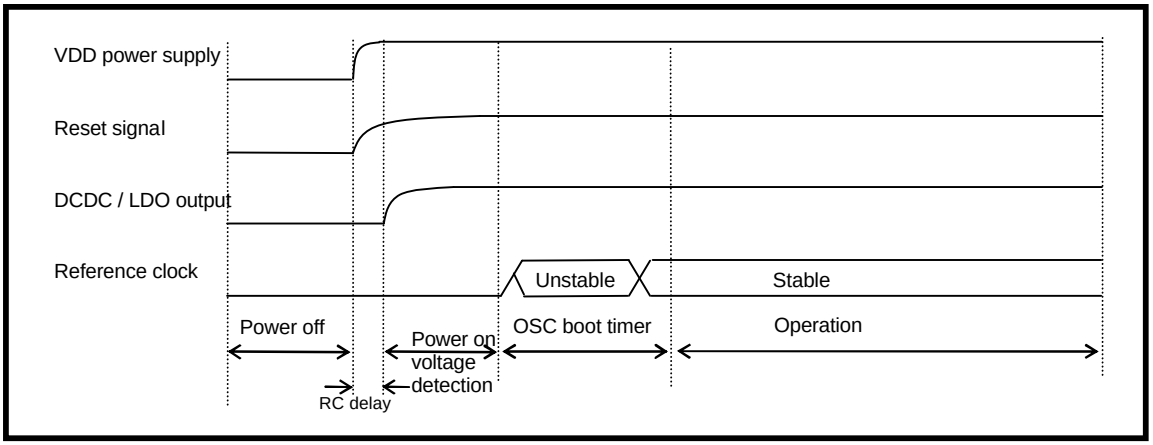
[2] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

10.3. POWER UP SEQUENCE

When the power is turned on, set reset signal to low (RESET=Low). After OSC is stable, release reset (RESET=High).

Crystal oscillator stabilizing time is about 2 msec, so define release time after sufficient evaluation.

When the power is turned off, set reset signal to low (RESET=Low).



10.4. PAN1760 CURRENT CONSUMPTION

The current consumption is dependent on the user scenario and the setup and timing in the low power modes. The total power consumption can be optimized by adjusting advertising and connection intervals. It also depends on the system configuration of the central device (typically mobile phone or BLE hub).

11. BLUETOOTH RF PERFORMANCE

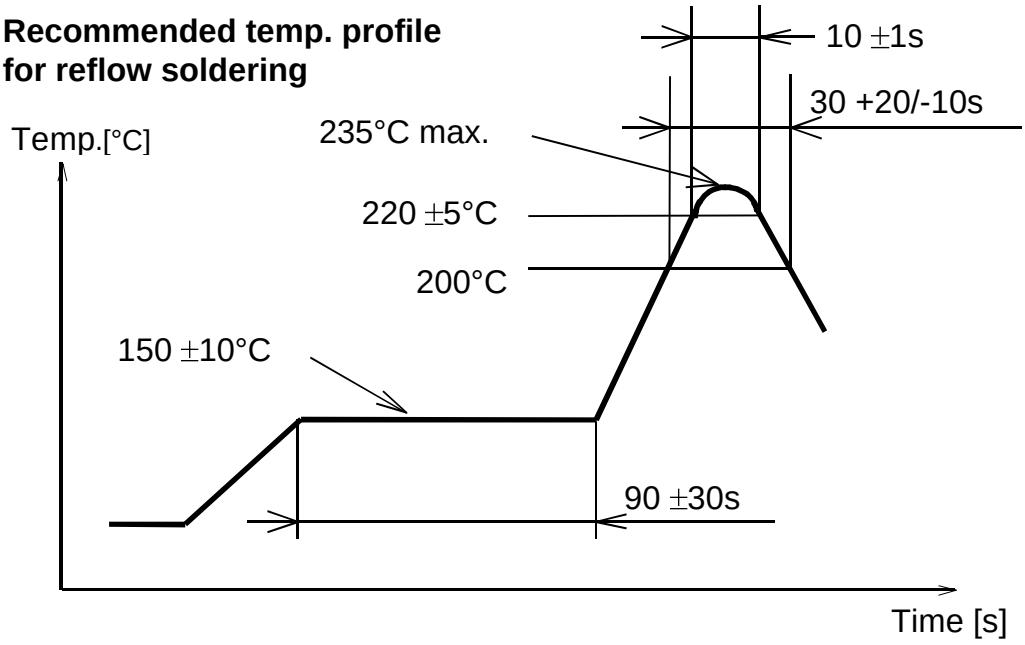
11.1. PAN1760 BLUETOOTH CHARACTERISTICS

No	Characteristics	Condition	Min	Typ	Max	Unit
1	Operation frequency range		2402		2480	MHz
2	Channel spacing			2		MHz
3	Output Power	Maximum setting, measured at single ended 50ohm.		0		dBm
4	Sensitivity, High Gain Mode	High-gain mode, measured at single ended 50ohm.		-90.0		dBm

12. SOLDERING TEMPERATURE-TIME PROFILE (FOR REFLOW SOLDERING)

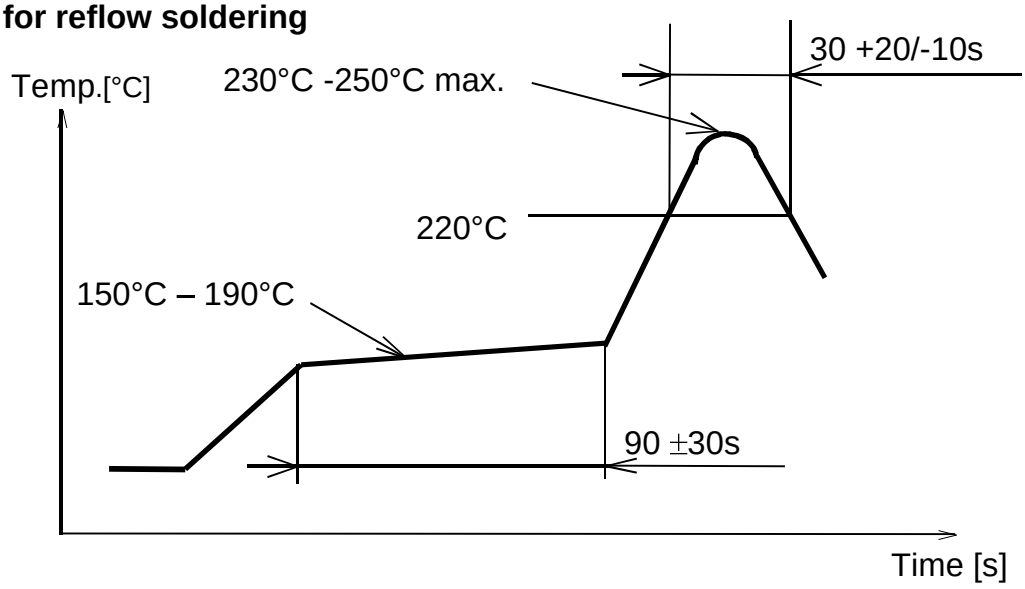
12.1. FOR LEAD SOLDER

Recommended temp. profile for reflow soldering



12.2. FOR LEADFREE SOLDER

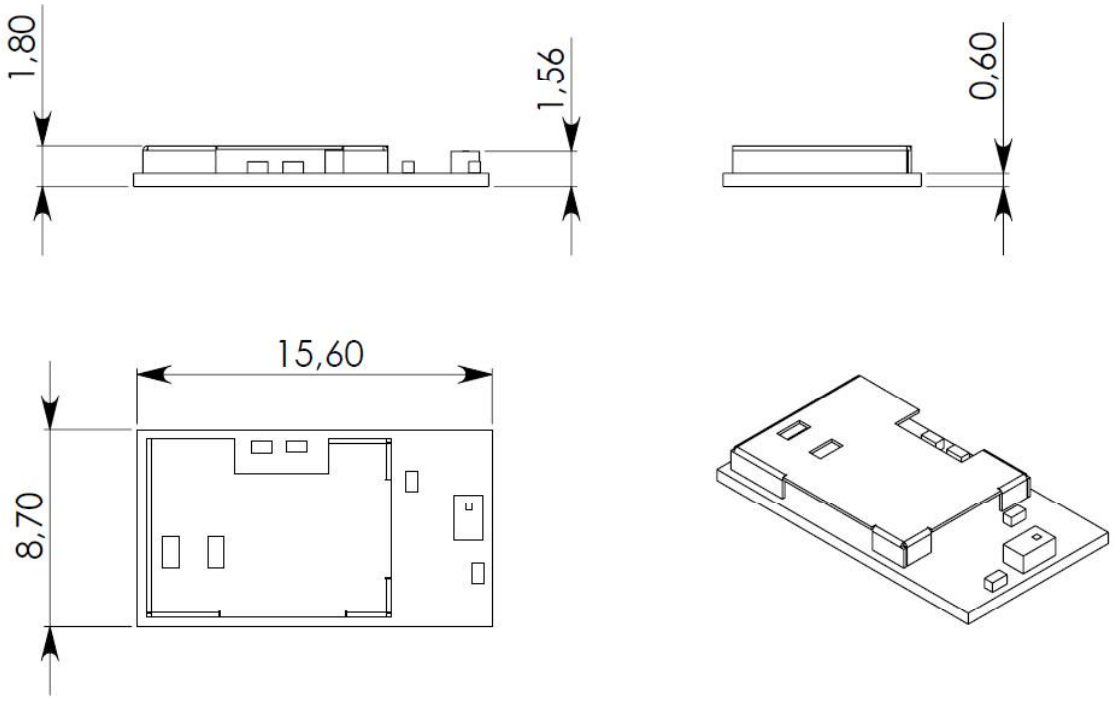
Our used temp. profile for reflow soldering



Reflow permissible cycle: 2
Opposite side reflow is prohibited due to module weight.

13. PAN1760 MODULE DIMENSION

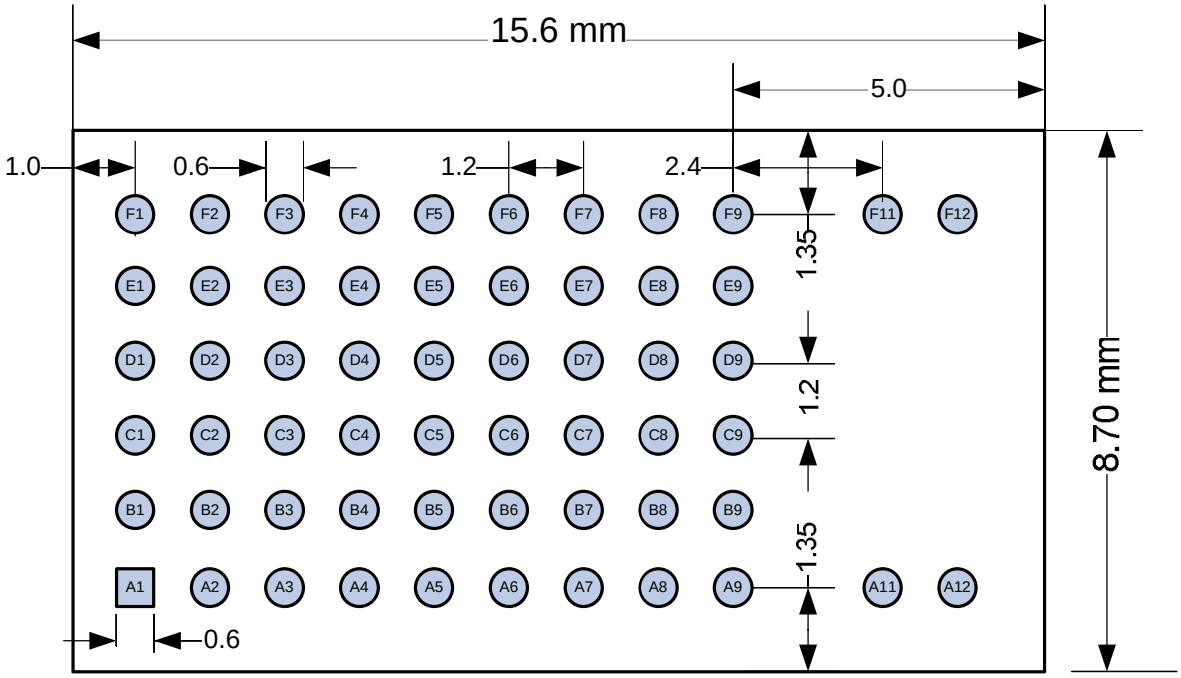
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.30	
2	Length	15.60	± 0.30	
3	Height	1.80	± 0.20	With case



14. PAN1760 FOOTPRINT OF THE MODULE

All dimensions are in millimeters.
The outer dimensions have a tolerance of ± 0.3mm.

Top view, Application PCB



15. CASE MARKING

No.	Remark
1	Marking for Pin 1 (Circle 0,15 mm)
2	2D-Code, for internal usage only and can be change without any notice
3	Marking definition see below

15.1. EXAMPLE FOR MARKING

P	A	N	1	7	6	0			H	W	/	S	W			
E	N	W	8	9	8	4	7	A	x	K	F					
Y	Y	W	W	D	L	L										
F	C	C	I	D	:		T	7	V	1	7	6	0			
I	C	:		Q	2	1	6	-	1	7	6	0				

15.2. MARKING DEFINITION

(1) Pin1 marking

(2) 2D code (Serial number)

(3) Marking:

- PAN1760 (Model Name), HW/SW (Hardware/Software version)
- ENW89847A1KF (Part Number, refer to chapter 21 Ordering Information)
- Lot code (YearYear, WeekWeek, Day, LotLot)
- ES (Engineering Sample marking)

Note: For available Software Versions, refer to [1] PAN1760ETU Design-Guide and chapter 21 Ordering Information.

16. MECHANICAL REQUIREMENTS

No.	Item	Limit	Condition
1	Solderability	More than 75% of the soldering area shall be coated by solder	Reflow soldering with recommendable temperature profile
2	Resistance to soldering heat	It shall be satisfied electrical requirements and not be mechanical damage	See chapter 12.2

17. DEVELOPMENT OF APPLICATIONS

For development support please refer to [1] PAN1760ETU Design-Guide.

18. RELIABILITY TESTS

The measurement should be done after being exposed to room temperature and humidity for 1 hour.

No.	Item	Limit	Condition
1	Vibration test	Electrical parameter should be in specification	a) Freq.:10~50Hz,Amplitude:1.5mm 20min. / cycle,1hrs. each of XYZ axis b) Freq.:30~100Hz, 6G 20min. / cycle,1hrs. each of XYZ axis
2	Shock test	the same as above	Dropped onto hard wood from height of 50cm for 3 times
3	Heat cycle test	the same as above	-40°C for 30min. And +85°C for 30min.; each temperature 300 cycles
4	Moisture test	the same as above	+60°C, 90% RH, 300h
5	Low temp. test	the same as above	-40°C, 300h
6	High temp. test	the same as above	+85°C, 300h

19. CAUTIONS

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

19.1. DESIGN NOTES

(1) Follow the conditions written in this specification, especially the control signals of this module.
(2) The supply voltage has to 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 47uF directly at the module).
(3) This product should not be mechanically stressed when installed.
(4) Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
(5) Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum tolerance.
(6) The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
(7) Keep this product away from other high frequency circuits.

19.2. INSTALLATION NOTES

(1) Reflow soldering is possible twice based on the conditions in chapter 15. Set up the temperature at the soldering portion of this product according to this reflow profile.
(2) Carefully position the products so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
(3) Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.
(4) If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
(5) This product 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) Refer to the recommended pattern when designing a board.
(9) Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the unit.
(10) For more details on LGA (Land Grid Arrey) soldering processes refer to the application note.

19.3. USAGE CONDITIONS NOTES

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

19.4. STORAGE NOTES

(1) The module should not be stressed mechanically during storage.
(2) Do not store these products in the following conditions or the performance characteristics of the product, 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 Cl2, H2S, NH3, SO2, or NOX
- Storage in direct sunlight
- Storage in an environment where the temperature may be outside the range of 5°C

to 35°C range, or where the humidity may be outside the 45 to 85% range.
- Storage of the products 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 product away from water, poisonous gas and corrosive gas.
(4) This product should not be stressed or shocked when transported.
(5) Follow the specification when stacking packed crates (max. 10).

19.5. 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, then 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.

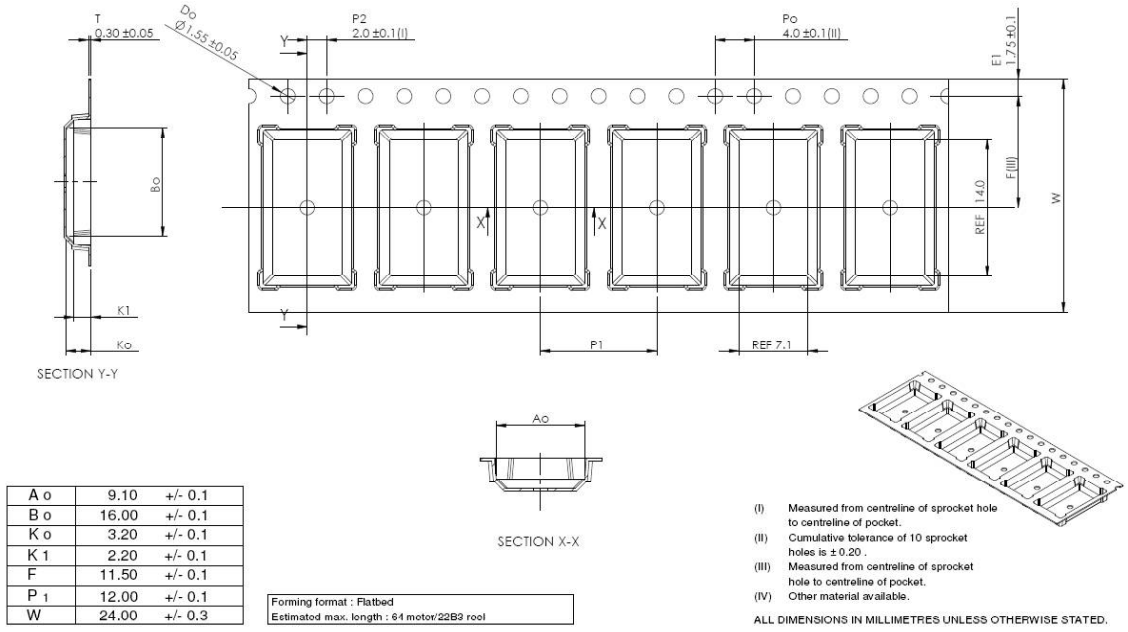
19.6. OTHER CAUTIONS

(1) This specification sheet is copyrighted. Please do not disclose it to a third party.
(2) Please do not use the products for other purposes than those listed.
(3) Be sure to provide an appropriate fail-safe function on your product to prevent an additional damage that may be caused by the abnormal function or the failure of the product.
(4) This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.
(5) 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.
   - 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, Cl2, SO2, H2S, NH3, and NOX)
(6) 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.
(7) When you have any question or uncertainty, contact Panasonic.

20. PACKAGING

If the product has mass production status, indicated in chapter 23, we will deliver the module in the package which are described below.

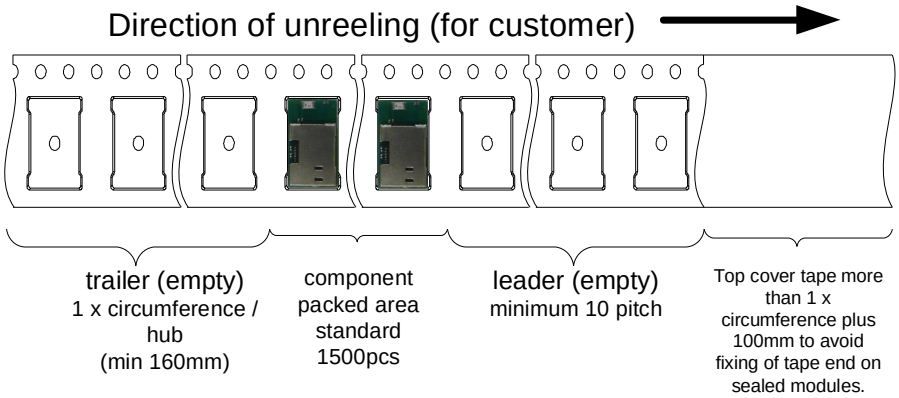
20.1. PAN1760 TAPE DIMENSION



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 motor/22B3 reel

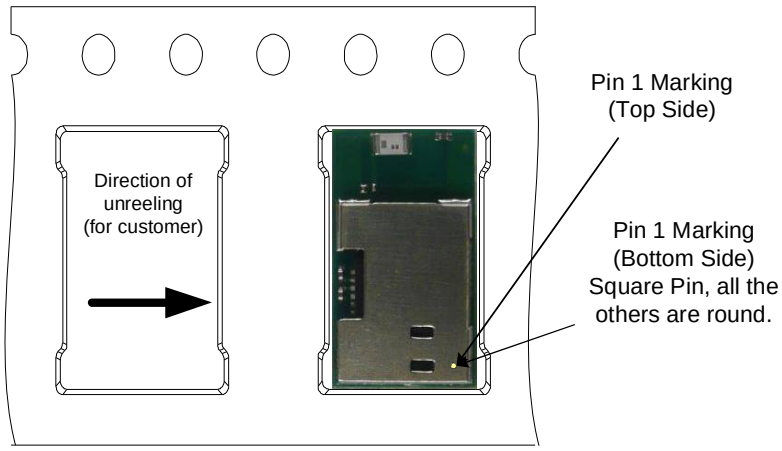
20.2. PACKING IN TAPE



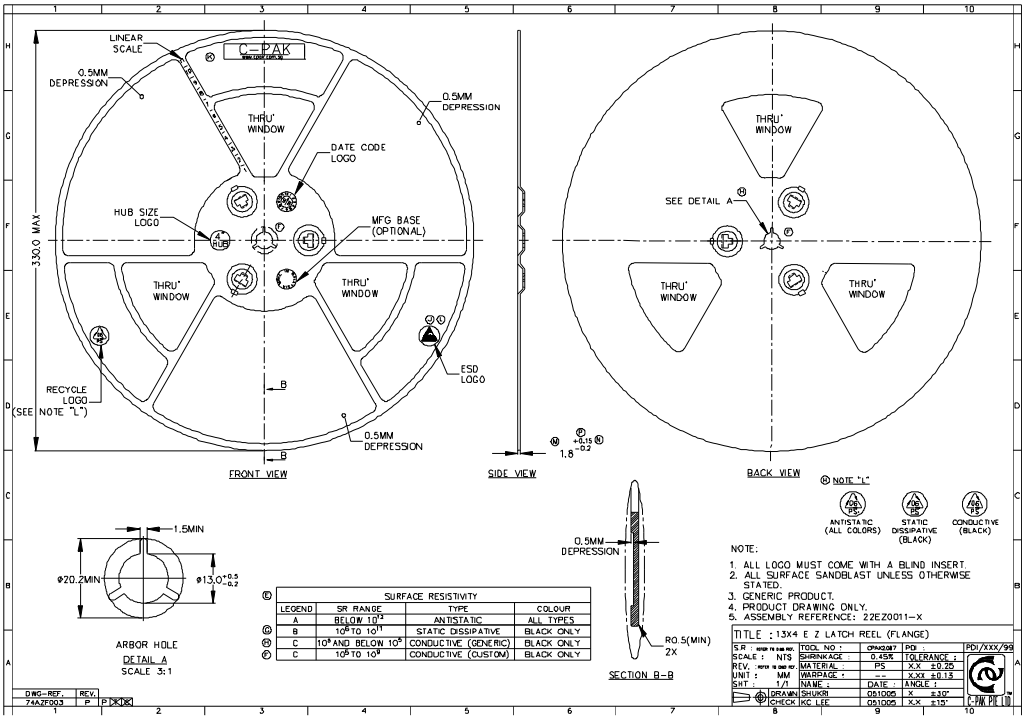
Empty spaces in component packed area shall be less than two per reel and those spaces shall not be consecutive.

Top cover tape shall not be found on reel holes and shall not stick out from reel.

20.3. COMPONENT DIRECTION

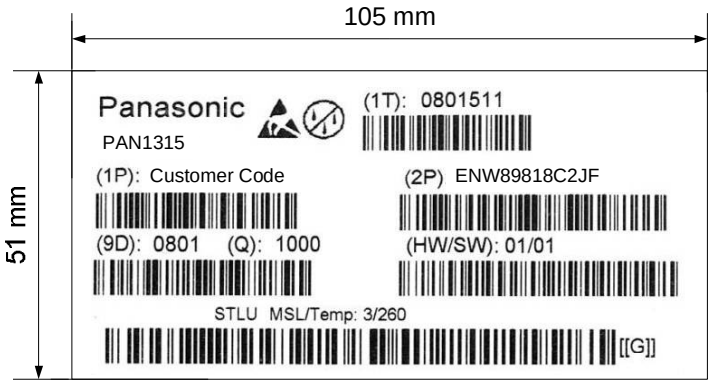


20.4. REEL DIMENSION



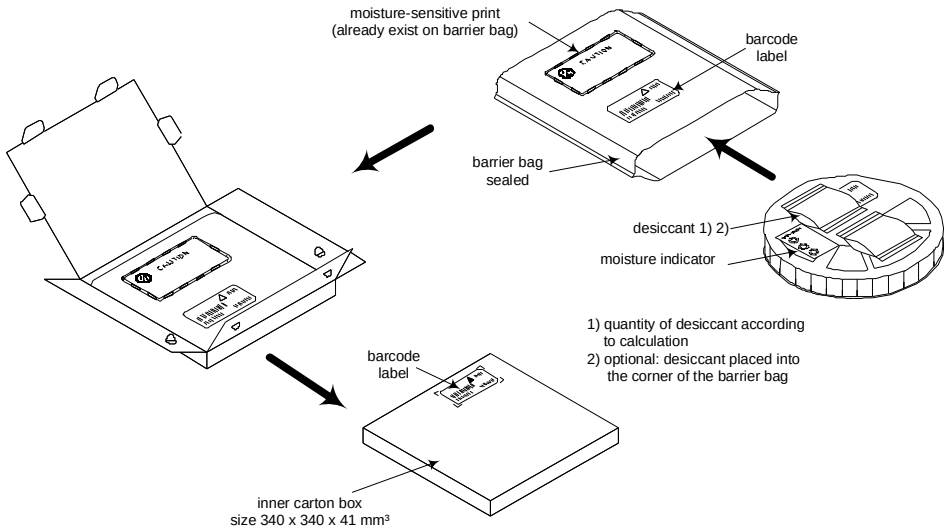
20.5. LABEL FOR PACKAGE

The picture shows an example from similar product.



(1T)	Lot code [YYWWDLL]		Example from above:	
	YY	year	printed	08
	WW	normal calendar week	printed	01
	D	day	printed	5 (Friday)
	L	line identifier, if more as one	printed	1
	L	lot identifier per day	printed	1
(1P)	Customer Order Code, if any, otherwise company name will be printed			
(2P)	Panasonic Order Code: ENW89847A1KF			
(9D)	Date code as [YYWW]			
(Q)	Quantity [XXXX], variable max. 1500			
(HW/SW)	Hardware /Software Release			
	Hardware 01	Indicates the HW revision.		
	Software 01	Indicates the SW revision.		

20.6. TOTAL PACKAGE



21. ORDERING INFORMATION

Ordering part number	Description	MOQ Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.
ENW89847A1KF	PAN1760 CLASS 2 Bluetooth single mode Module according BT-4.1. *Bluetooth*® smart device Software version 006	1500

Notes:

1) Abbreviation for Minimum Order Quantity (MOQ). The standard MOQ for mass production is 1500 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.

22. ROHS AND REACH DECLARATION

Hereby we declare to our best present knowledge based on declaration of our suppliers that this product follows th elatest official RoHS and REACH Directive.

RoHS and REACH Directive

23. PRODUCT SPECIFICATION STATUS

This Product Specification contains the final specification.

Panasonic reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

Please consult the most recently issued Product Specification before initiating or completing a design.

24. HISTORY FOR THIS DOCUMENT

Revision	Date	Modification / Remarks
0.1	January 2015	1st preliminary version.
0.2	June 2015	Added IC ID.
0.3	December 2015	Added alternative PINs in PIN table. Added ENW89847A2KF (without EEPROM).
0.4	August 2016	Added Bluetooth QD ID.
1.1	November 2016	Change in sensitivity level and power supply voltage.
1.2	June 2017	Change in the EU regulatory chapter for RED.

25. RELATED DOCUMENTS

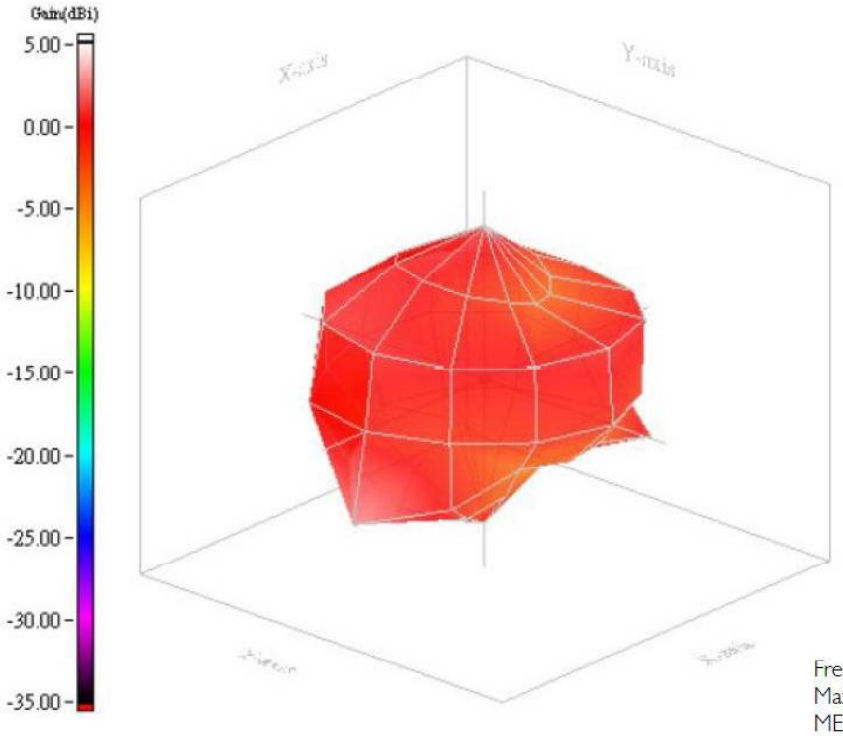
For an update, please consult the relevant website:

[1] PAN1760ETU Design-Guide
http://www.pideu.panasonic.de

[2] Application Note Land Grid Array
http://www.pideu.panasonic.de/pdf/184ext.pdf

[3] REACH and RoHS Certificate
http://www.pideu.panasonic.de/pdf/182ext2.jpg

26. RADIATION PATTERN OF ANTENNA



Frequency= 2.45 GHz
Max gain = 2.72dBi, at (120,0)
MEG (mean effective gain)= -0.69 dBi
Directivity (dB) = 3.88
Efficiency = -1.16dB, 76.56 %

27. GENERAL INFORMATION

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All rights reserved.
This product description does not lodge the claim to be complete and free of mistakes.
Please contact the related product manager in every case.

If we deliver ES samples to the customer, these samples have the status Engineering Samples. This means, the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and there may be differences to be published Product Specification. Engineering Samples are not qualified and are not to be used for reliability testing or series production.

Disclaimer:
Customer acknowledges that samples may deviate from the Product Specification and may bear defects due to their status of development and the lack of qualification mentioned above.
Panasonic rejects any liability or product warranty for Engineering Samples. In particular, Panasonic disclaims liability for damages caused by

- the use of the Engineering Sample other than for Evaluation Purposes, particularly the installation or integration in another product to be sold by Customer,
- deviation or lapse in function of Engineering Sample,
- improper use of Engineering Samples.

Panasonic disclaimes any liability for consequential and incidental damages.
In case of any questions, please contact your local sales partner or the related product manager.

28. REGULATORY INFORMATION

28.1. FCC NOTICE

The devices PAN1760, for details refer to Chapter 21, including the antennas, which are listed in 28.5, complies with Part 15 of the FCC Rules. The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.transmitter 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.

28.2. CAUTION

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Panasonic Industrial Devices Europe GmbH may void the user's authority to operate the equipment.

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

28.3. LABELING REQUIREMENTS

The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic FCC identifier for this product as well as the FCC Notice above. The FCC identifier is **FCC ID: T7V1760**. This FCC identifier is valid for all PAN1760 modules, for details, see the Chapter 21. Ordering Information.

In any case the end product must be labelled exterior with
"Contains FCC ID: T7V1670"

28.4. ANTENNA WARNING

For the related part number of PAN1760 refer to Chapter 21. Ordering Information.

These devices are tested with a standard SMA connector and with the antennas listed below. When integrated in the OEMs product, these fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions. The FCC identifier for this device with the antenna listed in item 1 is the same (FCC ID: T7V1760).

28.5. APPROVED ANTENNA LIST

Note: We are able to qualify your antenna and will add to this list as that process is completed.

Item	Part Number	Manufacturer	Frequency Band	Type	Gain (dBi)
2	ANT2012	Yageo	2.4GHz	Chip-Antenna	+ 0.9

28.6. RF EXPOSURE PAN1760

To comply with FCC RF Exposure requirements, the Original Equipment Manufacturer (OEM) must ensure that the approved antenna in the previous table must be installed.

The preceding statement must be included as a CAUTION statement in manuals for products operating with the approved antennas in the previous table to alert users on FCC RF Exposure compliance.

Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of PAN1760 with mounted ceramic antenna **(FCC ID: T7V1760)** is far below the FCC radio frequency exposure limits. Nevertheless, the PAN1760 shall be used in such a manner that the potential for human contact during normal operation is minimized.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

29. INDUSTRY CANADA CERTIFICATION

PAN1760 is licensed to meet the regulatory requirements of Industry Canada (IC),

license: IC: 216Q-1760.

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from www.ic.gc.ca.

This device has been designed to operate with the antennas listed in Table 20 above, having a maximum gain of 0.9 dBi. Antennas not included in this list or having a gain greater than 0.9 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Due to the model size the IC identifier is displayed in the installation instruction only and cannot be displayed on the modules label due to the limited size (8.7x15.6mm).

29.1. IC NOTICE

The devices PAN1760, for details refer to Chapter 21, including the antennas, which are listed in 28.5, complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-GEN.
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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

PAN1760 est garanti conforme aux dispositions règlementaires d'Industry Canada (IC), licences: **IC: 216Q-1760**

Il est recommandé aux fabricants d'appareils fixes, mobiles ou portables de consulter la réglementation en vigueur et de vérifier la conformité de leurs produits relativement aux limites d'exposition aux rayonnements radiofréquence ainsi qu'au débit d'absorption spécifique maximum autorisé.

Des informations pour les utilisateurs sur la réglementation Canadienne concernant l'exposition aux rayonnements RF sont disponibles sur le site www.ic.gc.ca.

Ce produit a été développé pour fonctionner spécifiquement avec les antennes listées dans le tableau ci-dessus, présentant un gain maximum de 0.9dBi. Des antennes autres que celles listées ici, ou présentant un gain supérieur à 0.9dBi ne doivent en aucune circonstance être utilises en combinaison avec ce produit. L'impédance des antennes compatibles est 50Ohm. L'antenne utilisée avec ce produit ne doit ni être située à proximité d'une autre antenne ou d'un autre émetteur, ni être utilisée conjointement avec une autre antenne ou un autre émetteur. En raison de la taille du produit, l'identifiant IC est fourni dans le manuel d'installation.

29.2. LABELING REQUIREMENTS

The Original Equipment Manufacturer (OEM) must ensure that IC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic IC identifier for this product as well as the IC Notice above. The IC identifier is 216Q-1760. This IC identifier is valid for all PAN1760 modules, for details, see the Chapter 21. Ordering Information.

In any case the end product must be labelled exterior with
"Contains IC: 216Q-1760"

Obligations d'étiquetage

Les fabricants d'équipements (OEM) doivent s'assurer que les obligations d'étiquetage du produit final sont remplies. Ces obligations incluent une étiquette clairement visible à l'extérieur de l'emballage externe, comportant l'identifiant IC du module Panasonic inclus, ainsi que la notification ci-dessus.

Les identifiants IC sont: **IC: 216Q-1760**

Ces identifiants sont valides pour tous les modules PAN1760 (Chapter 21. Ordering Information). Dans tous les cas les produits finaux doivent indiquer sur leur emballage externe une des mentions suivantes: "**Contient IC: 216Q-1760**"

30. BLUETOOTH CERTIFICATION

The End Product QD ID is 81039.

Declaration ID is D028290.

31. EUROPEAN CONFORMITY ACCORDING TO RED (2014/53/EU)

All modules described in this Product Specification comply with the standards according to the following LVD (2014/35/EU), EMC-D (2014/30/EU) together with the RED (2014/53/EU) articles:

3.1a Safety/Health:	EN60950-1:2006+A11:2009+A1:2010+A12:2011+AC:2011+A2:2013 EN62311:2008
3.1b EMC:	EN 301 489-1 V2.1.1:2017-02 EN 301 489-17 V3.1.1:2017-02
3.2 Radio:	EN 300 328 V2.1.1:2016-11

As a result of the conformity assessment procedure described in the 2014/53/EU Directive, the end customer equipment should be labelled as follows:

CE

PAN1760 in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States [Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra and Turkey.

32. LIFE SUPPORT POLICY

This Panasonic 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 for any damages resulting.

Product Specification

Applicant/Manufacturer Hardware	Panasonic Industrial Devices Europe GmbH Zeppelinstrasse 19 21337 Lüneburg Germany
Applicant/Manufacturer Software	TOSHIBA Electronics Europe GmbH Hansaallee 181 40549 Düsseldorf Germany
Software Version	Please refer to chapter 20/22

By purchase of any of the products described in this document the customer accepts the document's validity and declares their agreement and understanding of its contents and recommendations. Panasonic reserves the right to make changes as required at any time without notification. Please consult the most recently issued Product Specification before initiating or completing a design.

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This Product Specification does not lodge the claim to be complete and free of mistakes.

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1 ABOUT THIS DOCUMENT

1.1 PURPOSE

This Product Specification applies to Panasonic's Class 2 Bluetooth®[1] classic and low energy dual mode module, series number: PAN1026.

1.2 REVISION HISTORY

Revision	Date	Modification / Remarks
0.1	November 2012	1st preliminary version.
0.2	January 2013	Update chapter 21 with the latest declaration. Correct chapter 10.3 with the latest current values measured on the reference design. Made the description for the USB ports in chapter 6.2 more precised.
0.3	October 2013	Editoral changes.
0.4	October 2013	Add IC notice in French.
0.5	December 2013	Added current consumption for BLE and LPM modes.
1.0	February 2014	Updated Bluetooth chapter and changed datasheet status.
1.1	March 2014	Corrected Pin Table with IO support.
1.2	June 2014	Corrected VCC voltage in Pin Table.
1.3	September 25, 2014	Added DoC.
1.4	May 2015	Added missing Bluetooth QDIDs to chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**.
1.5	January 2016	Added information about the C, L, R values below block diagram.
1.6	November 2016	Deleted low power supply voltage.
1.7	November 2016	Added MIC ID.
1.8	June 2017	Changed EU regulatory information for RED.
1.9	June 2017	Editorial changes.

1.3 RELATED DOCUMENTS

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

[1] Bluetooth is a registered trademark of the Bluetooth Special Interest Group.

1.4 GENERAL INFORMATION

This document may contain errors. Panasonic reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its literature at any time. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to Panasonic's terms and conditions of sale supplied at the time of order acknowledgment.

Engineering Samples (ES)

If Engineering Samples are delivered to the customer, these samples have the status "Engineering Samples". This means that the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and they may differ from the published Product Specification.

Engineering Samples are not qualified and they are not to be used for reliability testing or series production.

Disclaimer

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- The use of the Engineering Sample other than for evaluation purposes, particularly the installation or integration in another product to be sold by the customer,
- Deviation or lapse in function of the Engineering Sample,
- Improper use of the Engineering Sample.

Panasonic Industrial Devices Europe GmbH disclaims any liability for consequential and incidental damages. In case of any queries regarding the Engineering Samples, please contact your local sales partner or the related product manager.

1.5 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 Tool 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

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

2 KEY FEATURES

- Bluetooth Classic and BLE (Dual Mode) support
- Bluetooth Classic 2.1 embedded SPP profile with high level API commands
- Bluetooth 4.0 (LE) embedded GATT profile with high level API commands, compatible to Toshiba reference BLE profiles
- Operational Temperature Range -40 / 85 degree C
- Dimension 15.6mm x 8.7m x 1.9mm
- Internal crystal oscillator (26MHz)
- Integrated shielding to resist EMI
- No external components needed
- High sensitivity (-88 dBm typ.)
- Tx power control up to a maximum of 4.0 dBm (typical)

3 APPLICATIONS FOR THE MODULE

All Embedded Wireless Applications

- Access Points
- Industrial Control
- Medical
- Scanners
- Wireless Sensors
- Low Power
- Proximity
- Smart Phone
- Access Points
- Temperature
- Wellness
- Sports

4 BLUETOOTH LOW ENERGY

Bluetooth Low Energy (BLE) is a part of Bluetooth Ver. 4.0, BT 4.0 covers both BLE as well as BT classic 2.1 and 3.0. If both are implemented in one device it is called dual mode. Dual mode chips implement the low energy specification,providing connectivity to coin cell battery applications. Dual mode combines low energy with the power of classic Bluetooth and are likely to become a de facto feature in almost all new Bluetooth enabled cellular phones,computers or portable communication nodes.

Bluetooth Low Energy (BLE) is not backwards compatible with previous Bluetooth classic standards (2.1+EDR or 3.0). Dual mode Bluetooth 4.0 is backwards compatible but is not practical for low power devices but targeted to gateway products

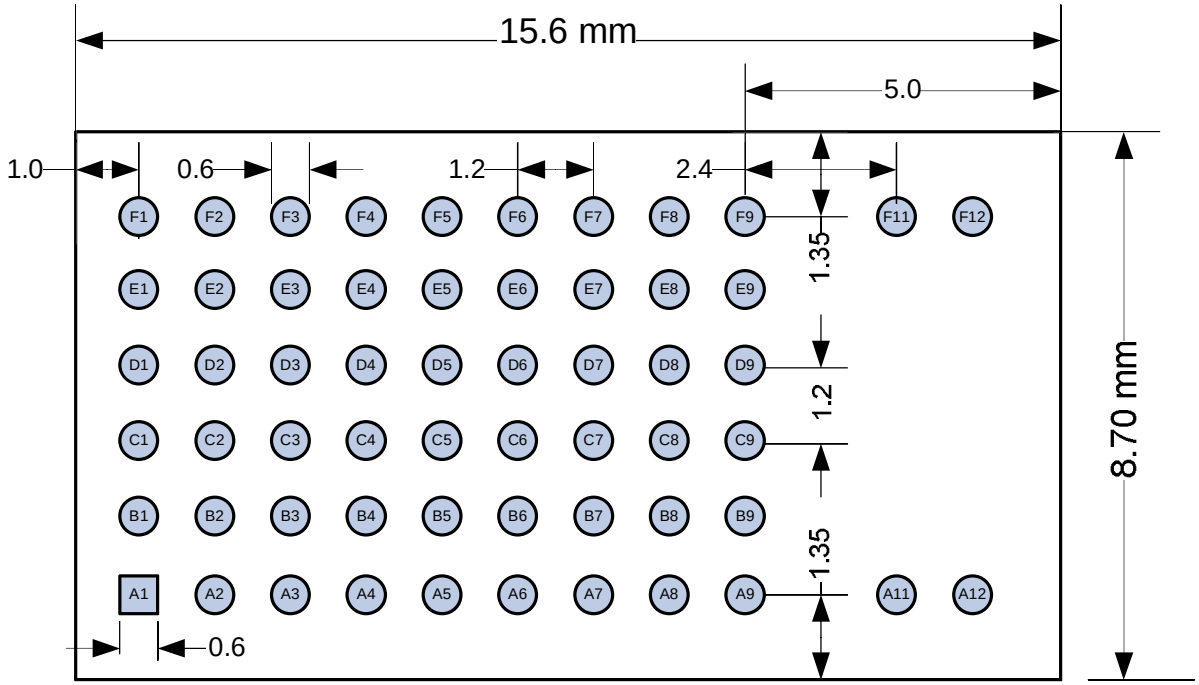
5 DESCRIPTION OF THE MODULE

The PAN1026 is a short-range Class 2 BLE dual mode module for implementing Bluetooth functionality into various electronic devices. A block diagram can be found in chapter 8.

6 DETAILED DESCRIPTION

6.1 PAN1026 TERMINAL LAYOUT

Top view, Application PCB



6.2 PAN1026 TERMINAL DESCRIPTION

No	Pin Name	GPIO Number	Pin Type	Description
A1	GND		Ground Pin	Connect to Ground
A2	NC		NC	Not connected, leave open
A3	Reset		Digital Input	Reset, active-low
A4	VCC		Power	analog/digital power supply connection
A5	VCC		Power	analog/digital power supply connection
A6	VCC		Power	analog/digital power supply connection
A7	GND		Ground Pin	Connect to Ground
A8	NC		NC	Not Connected
A9	GND		Ground Pin	Connect to Ground
A11	GND		Ground Pin	Connect to Ground
A12	GND		Ground Pin	Connect to Ground
B1	NC		NC	Not connected, leave open
B2	BTS	GPIO 11		
B3	BTA	GPIO 10		
B4	NC		NC	Not connected, leave open
B5	NC		NC	Not connected, leave open
B6	NC		NC	Not connected, leave open
B7	NC		NC	Not connected, leave open
B8	NC		NC	Not connected, leave open
B9	NC		NC	Not connected, leave open
C1	CS0X	GPIO 17		
C2	BTI	GPIO 13		
C3	WIA	GPIO 12		
C4	NC		NC	Not connected, leave open
C5	NC		NC	Not connected, leave open
C6	PCMCLK	GPIO 04	Digital I/O	PCM Clock
C7	FSYNC	GPIO 05	Digital I/O	PCM Syncronisation
C8	GND		Ground Pin	Connect to Ground
C9	GND		Ground Pin	Connect to Ground
D1	CS1X	GPIO 18		
D2	DIN	GPIO 16		
D3	GPIO1	GPIO 01	Digital I/O	
D4	USB*/GPIO0		Digital I/O	USB direct is not currently supported by the IC and therefore you may use this pin as normal GPIO0. When USB is supported the, pin will be → Select USB (Connect to PIN E4)
D5	NC		NC	Not connected, leave open
D6	PCMIN	GPIO 03	Digital Input	PCM In Not supported
D7	GND		Ground Pin	Connect to Ground
D8	GND		Ground Pin	Connect to Ground
D9	ANT		RF - Signal	Antenna Pin (Not connected for standard version)

No	Pin Name	GPIO Number	Pin Type	Description
E1	SDA	GPIO 15	Digital I/O	I2C Interface (Only Internal) Connect to Testpin
E2	SCL	GPIO 14	Digital I/O	I2C Interface (Only Internal) Connect to Testpin
E3	VDD_USB		Power	USB direct is not currently supported by the IC therefore put this pin to to GND. If USB will be supported in the next revision, connect to VCC.
E4	USB*			USB direct is not currently supported by the IC Leave this pin open.. Whjen USB is supported the pin would be → Select USB (Connect to PIN D4).
E5	CLKREQ		Digital Output	Active High once crystal frequency is stable
E6	UART RXD		Digital Input	UART RXD
E7	PCMOUT	GPIO 02	Digital Output	PCM Output Not supported
E8	GND		Ground Pin	Connect to Ground
E9	GND		Ground Pin	Connect to Ground
F1	GND		Ground Pin	Connect to Ground
F2	EEPROM_WP		Digital Input	Internal EEPROM Write Protect (Active High)
F3	USB_P		Digital I/O	USB direct is not currently supported by the IC therefore put this pin to GND. Whjen USB is supported the pin would be → USB Data In/Out
F4	USB_M		Digital I/O	USB direct is not currently supported by the IC therefore put this pin to GND. Whjen USB is supported the pin would be → USB Data In/Out
F5	UART CTS		Digital Input	UART CTS
F6	SLEEPCLK		Digital Input	Input Clock for 32.768KHz
F7	UARTTXD		Digital Output	UART TX
F8	UARTRTS		Digital Output	UART RTS
F9	GND		Ground Pin	Connect to Ground
F11	GND		Ground Pin	Connect to Ground
F12	GND		Ground Pin	Connect to Ground

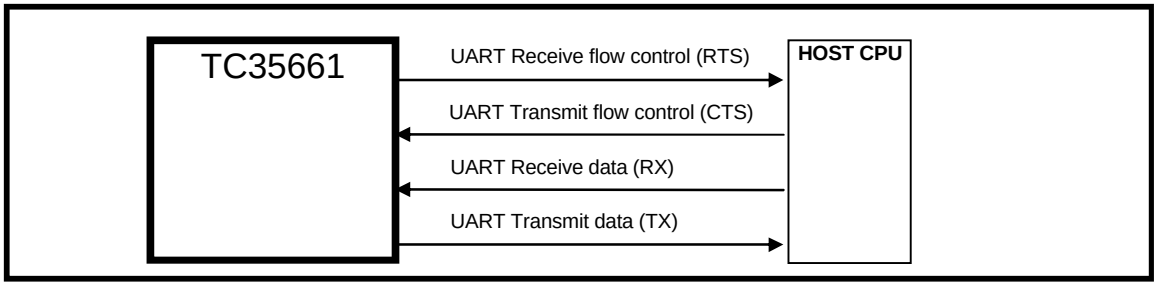
6.3 UART INTERFACE

6.3.1 Features

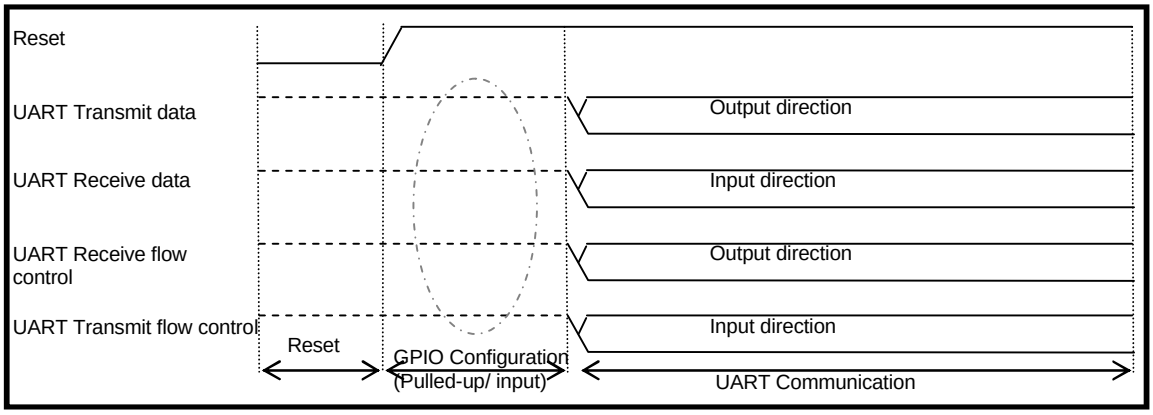
- Full-duplex 4-wire data transfer: RX, TX, RTS, CTS
- Programmable baud rate: 2400bps to 4.33 Mbps
- Data format (No parity bit): LSB first
- Start bit (1-bit)
- Data bit (8-bit):
- Stop bit (1-bit)
- Error detection: Character timeout, Overrun error, Framing error

TC35661 UART interface is used to transfer control command and data and is multiplexed with GPIO pin. After the release reset state, TC35661 firmware sets UART interface mode to the related GPIO pins. The default bit rate depends on the selection ROM version. (E.g. TC35661-501: 115,2kbps)

6.3.2 Connection Example



UART connection example

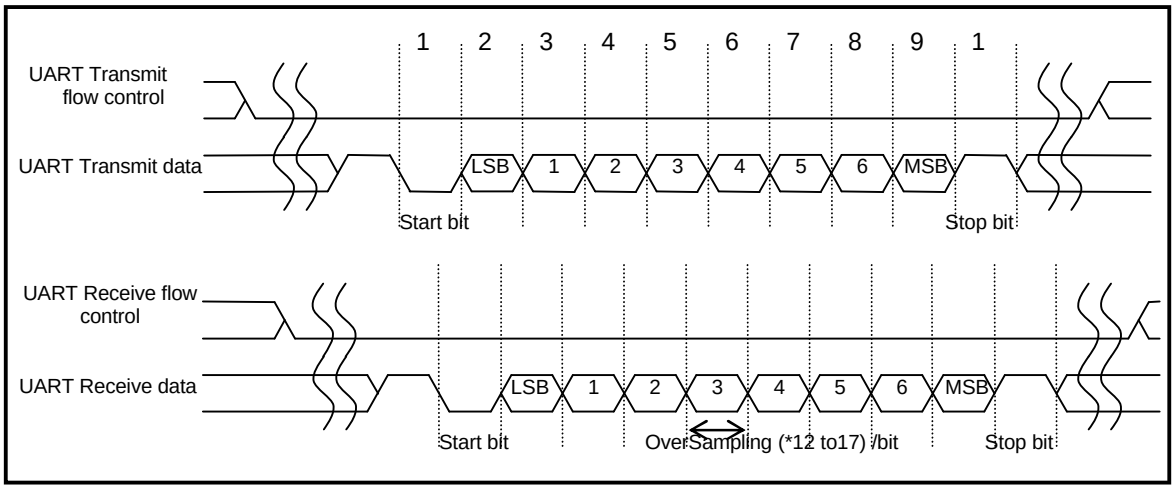


Power-up sequence for UART configuration

6.3.3 Frame Format

TC35661 supporting format is as follows.

- Number of data bits: 8 bits
- Parity bit: no parity
- Stop bit: 1 stop bit
- Flow control: RTS/CTS



UART data frame

6.3.4 Flow Control Function

TC35661 UART interface uses flow control function by hardware signal, Transmit flow control (CTSX) and receive flow control (RTSX). Above Figure shows signals input and output direction.

CTSX input signal is used for UART transmitting. Low input indicates close of the preparation of the other party to receive data and TC35661 executes UART transmitting data if there is data for transmission. In case of input high level, TC35661 stops transmitting by UART frame.

RTSX input signal is used for UART receiving. Low output indicates request data transmission to UART transmit side device of the other party. TC35661 outputs Low level from RTSX when being able to receive data and prepares to receive data.

Response time of UART transmitting and receiving for flow control signal depends on baud rate and internal process status of frame. It is from 1 frame to 4 frames.

6.3.5 UART Baud Rate Setting

TC35661 UART interface has a programmable baud rate setting function. The UART baud rate can be set according to the following equation. The baud rate generating clock frequency is set to either 39 MHz or 52 MHz. The over-sampling number is set to an integer that ranges from 12 to 17. The dividing ratio is set to an integer that ranges from 1 to 65,535.

$$UART\,BaudRate = \frac{Baud\,Rate\,Generating\,Clock\,Frequency}{Over\,Sampling\,Number \times Dividing\,Ratio}$$

Table 6-1 shows examples of UART Baud rate setting. The maximum of the actual baud rate is 4,333,333 [bps]. If other target baud rates are required, please contact our engineering department.

Table 6-1 UART Baud rate setting

Target baud rate [bps]	Actual baud rate [bps]	Baud rate generating clock frequency [MHz]	Over-sampling number	Dividing ratio	Deviation [%]
115,200	116,071	39	12	28	+0.7564
115,200	116,071	52	14	32	+0.7564
921,600	928,571	39	14	3	+0.7564
921,600	928,571	52	14	4	+0.7564
1,843,200	1,875,143	52	14	2	+0.7564
2,764,800	2,785,714	39	14	1	+0.7564
4,329,600	4,333,333	52	12	1	+0.0862

6.3.6 Error Detect Function

TC35661 UART interface has 3 kinds of error functions.

- Receiver timeout error
- Receiver over run error
- Receiver frame error

Receiver timeout error reports as an error if the receiver frame interval counted by TC35661 internal timer is equal to or greater than a predetermined time

Receiver over run error is reported if UART internal receive frame buffer TC35661 is overflowed.

Receiver frame error is reported if it fails to recognize the unit frame.

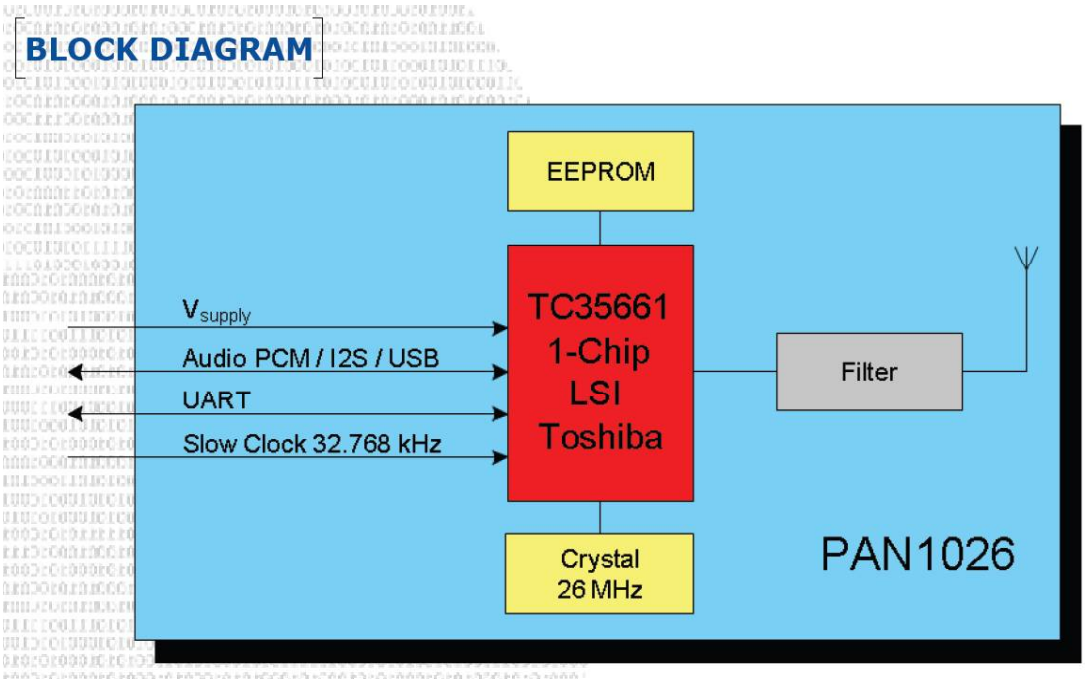
7 BLUETOOTH FEATURES

- Bluetooth 4.0 with SPP & GATT
- GAP support for SPP
- GATT Server and Client Mode are supported for LE
- Class 2 TX power w/o external PA, improving link robustness.
- Excellent link budget (up to 91 dB), enabling long-range applications.
- GAP peripheral support for LE

Note:

- For GAP Broadcaster and Peripheral role are supported
- Observer and Central is not supported on GAP
- For GATT Server and Client Mode are supported

8 BLOCK DIAGRAM



The total Capacitor value is 6.7µF +/-10%.

The total Inductance is 2nH +/-10%.

The total Resistance is 220kΩ +/-10%.

9 TEST CONDITIONS

Measurements shall be made under operating free-air temperature range unless otherwise specified.

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

10 GENERAL DEVICE REQUIREMENTS AND OPERATION

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

10.1 ABSOLUTE MAXIMUM RATINGS

No	See [2]	Value	Unit
Ratings Over Operating Free-Air Temperature Range			
1	Voltage on any digital pin	-0.3 to VDD+0.3	V
2	Operating ambient temperature range	-40 to 85	°C
3	Storage temperature range	-40 to 125	°C
4	Bluetooth RF inputs	10	dBm
5	ESD: All pads, according to human-body model, JEDEC STD 22, method A114 According to charged-device model, JEDEC STD 22, method C101	 1000 500	V

10.2 RECOMMENDED OPERATING CONDITIONS

No	Rating	Min	Typ	Max	Unit
1	Power supply voltage	2.7	3.3	3.6	V
2	Maximum ambient operating temperature		-40	85	°C

[2] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

10.3 CURRENT CONSUMPTION

The current consumption is dependent on the user scenario and the setup and timing in the low power modes.

Characteristics	Condition	Min	Typ	Max	Unit
Idle Current	After reset was pulled down.		7.8		mA
Connected Peak Power	Sending DH5 packets. Max. output power.			62	mA
Connected Peak Power	Sending DH3 packets. Max. output power.			61	mA
Connected Peak Power	Sending DH1 packets. Max. output power.			55	mA
Sniff Mode	Sniff Interval =1280ms Attempt =4 Timeout=0		0.18		mA
Sniff Mode	Sniff Interval =500ms Attempt =4 Timeout=0		0.41		mA
Paging	PageScan interval=1280ms window=11ms		0.33		mA
Inquiry	InquiryScan interval=1280ms window=11ms		0.33		mA
BLE Advertising (1 Packet)	Advertising interval=30ms		5.8		mA
BLE Advertising (1 Packet)	Advertising interval=1280ms		0.165		mA
BLE Connected (1 Packet)	Connection interval=105ms		0.913		mA
BLE Connected (1 Packet)	Connection interval=1000ms		0.123		mA

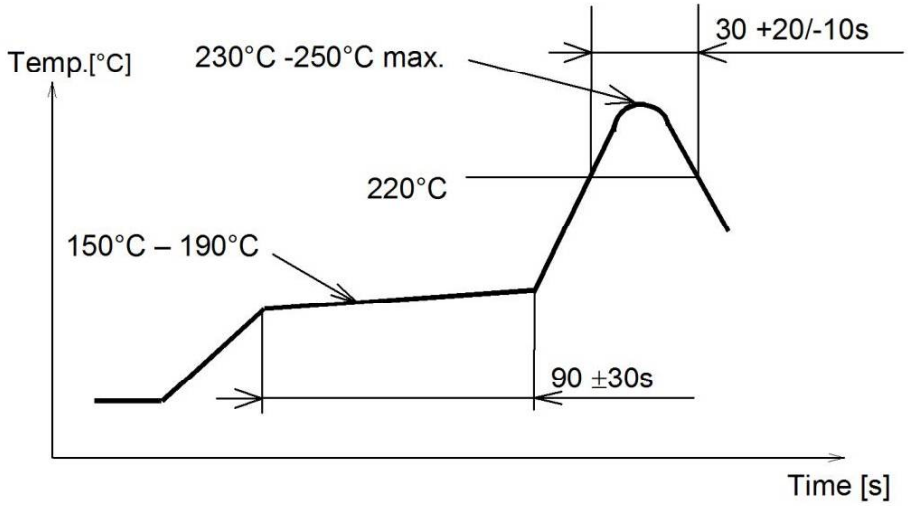
11 BLUETOOTH RF PERFORMANCE

11.1 BLUETOOTH CHARACTERISTICS

No	Characteristics	Condition	Min	Typ	Max	BT Spec	Unit
1	Operation frequency range		2402		2480		MHz
2	Channel spacing	BT-Classic/BLE		1/2			MHz
3	Output Power	Maximum setting, measured at dual ended 50ohm.		4			dBm
4	Sensitivity			-88			dBm

No	Characteristics	Condition	Typ	Max	Unit
1	Spurious emissions	Conducted measurement with a 50-Ω dual-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66	<-30		dBm

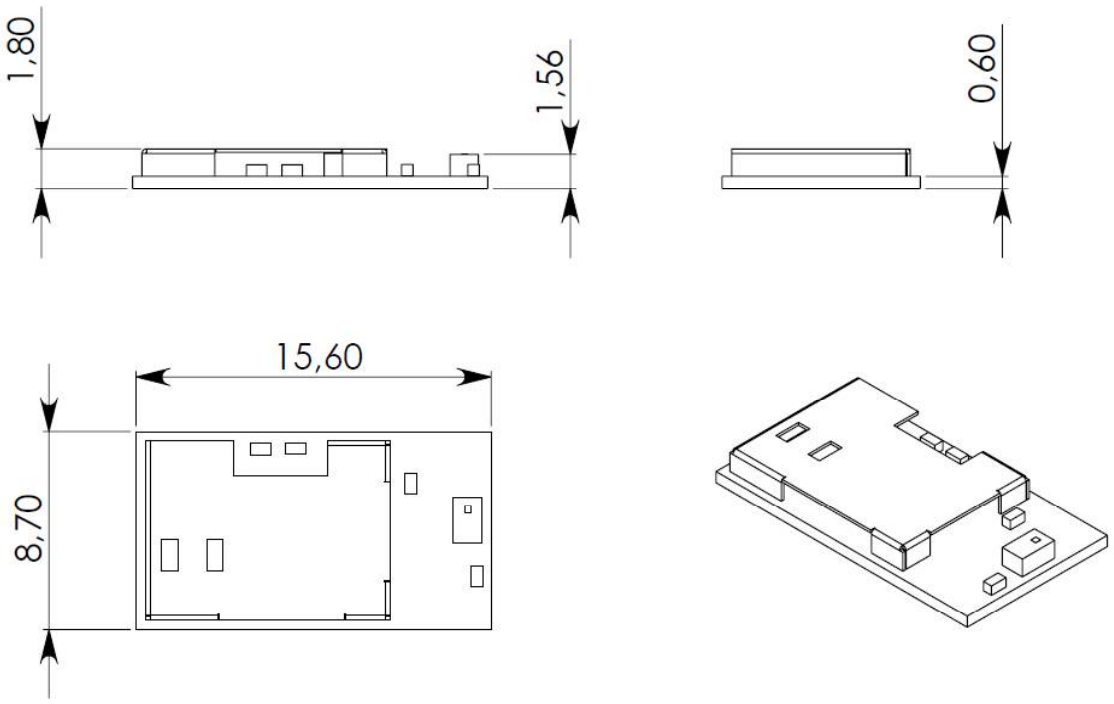
12 SOLDERING TEMPERATURE-TIME PROFILE (FOR REFLOW SOLDERING)



Reflow permissible cycle: 2
Opposite side reflow is prohibited due to module weight.

13 MODULE DIMENSION

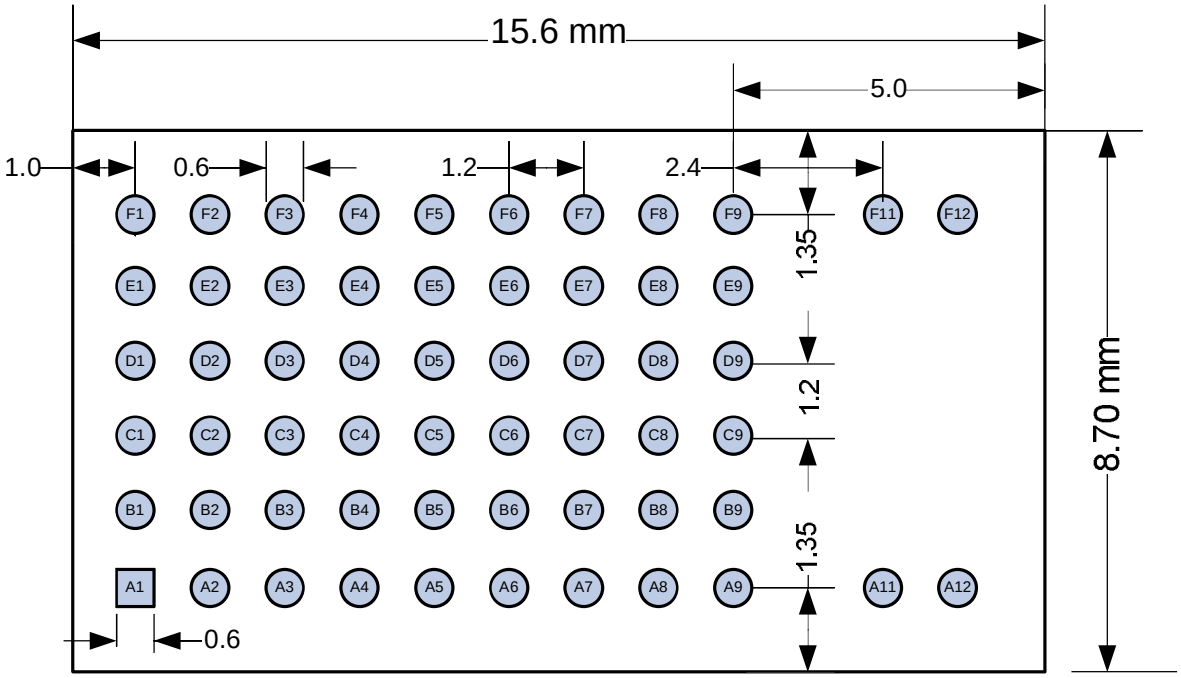
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.20	
2	Length	15.60	± 0.20	
3	Height	1.80	± 0.20	With case



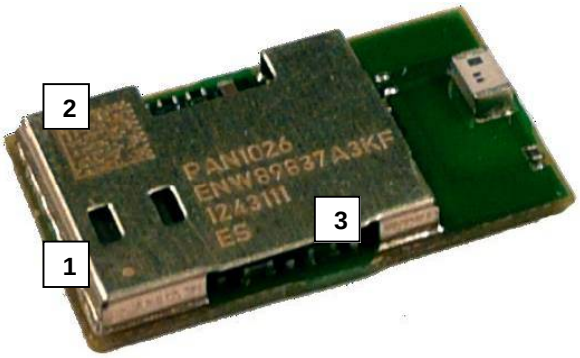
14 PAN1026 FOOTPRINT OF THE MODULE

All dimensions are in millimeters.
The outer dimensions have a tolerance of ± 0.2mm.

Top view, Application PCB



15 CASE MARKING



No.	Remark
1	Marking for Pin 1 (Circle 0,15 mm)
2	2D-Code, for internal usage only and can be change without any notice
3	Marking definition see chapter 15.1

15.1 EXAMPLE FOR MARKING

P	A	N	1	0	2	6			H	W	/	S	W			
E	N	W	8	9	8	3	7	A	3	K	F					
Y	Y	W	W	D	L	L										
F	C	C	I	D	:		T	7	V	P	A	N	1	0		

15.2 MARKING DEFINITION

(1) Pin1 marking

(2) 2D code (Serial number)

(3) Marking:

PAN1026 (Model Name), HW/SW (Hardware/Software version)

ENW89837AxKF (Part Number, refer to chapter 20 Ordering Information)

Lot code (YearYear, WeekWeek, Day, LotLot)

ES (Engineering Sample marking)

16 MECHANICAL REQUIREMENTS

No.	Item	Limit	Condition
1	Solderability	More than 75% of the soldering area shall be coated by solder	Reflow soldering with recommendable temperature profile
2	Resistance to soldering heat	It shall be satisfied electrical requirements and not be mechanical damage	

17 RELIABILITY TESTS

The measurement should be done after being exposed to room temperature and humidity for 1 hour.

No.	Item	Limit	Condition
1	Vibration test	Electrical parameter should be in specification	a) Freq.:10~50Hz,Amplitude:1.5mm a) 20min. / cycle,1hrs. each of XYZ axis b) Freq.:30~100Hz, 6G b) 20min. / cycle,1hrs. each of XYZ axis
2	Shock test	the same as above	Dropped onto hard wood from height of 50cm for 3 times
3	Heat cycle test	the same as above	-40°C for 30min. and +85°C for 30min.; each temperature 300 cycles
4	Moisture test	the same as above	+60°C, 90% RH, 300h
5	Low temp. test	the same as above	-40°C, 300h
6	High temp. test	the same as above	+85°C, 300h

18 CAUTIONS

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

18.1 DESIGN NOTES

(1) Follow the conditions written in this specification, especially the control signals of this module.
(2) The supply voltage has to 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 47uF directly at the module).
(3) This product should not be mechanically stressed when installed.
(4) Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
(5) Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum tolerance.
(6) The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
(7) Keep this product away from other high frequency circuits.

18.2 INSTALLATION NOTES

(1) Reflow soldering is possible twice based on the conditions in chapter 12.
Set up the temperature at the soldering portion of this product according to this reflow profile.
(2) Carefully position the products so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
(3) Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.
(4) If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
(5) This product should not be mechanically stressed or vibrated when reflowed.
(6) If you want to repair your board by hand soldering, please keep the conditions of this chapter.
(7) Do not wash this product.
(8) Refer to the recommended pattern when designing a board.
(9) Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the unit.
(10) For more details on LGA (Land Grid Arrey) soldering processes refer to the application note.

18.3 USAGE CONDITIONS NOTES

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

18.4 STORAGE NOTES

(1) The module should not be stressed mechanically during storage.
(2) Do not store these products in the following conditions or the performance characteristics of the product, 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 Cl2, H2S, NH3, SO2, or NOX
- Storage in direct sunlight
- Storage in an environment where the temperature may be outside the range of 5°C to 35°C range, or where the humidity may be outside the 45 to 85% range.
- Storage of the products 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 product away from water, poisonous gas and corrosive gas.
(4) This product should not be stressed or shocked when transported.
(5) Follow the specification when stacking packed crates (max. 10).

18.5 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, then 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 dual fault causing an unsafe status.

18.6 OTHER CAUTIONS

(1) This specification sheet is copyrighted. Reproduction of this data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices.

(2) Do not use the products for other purposes than those listed.

(3) Be sure to provide an appropriate fail-safe function on your product to prevent an additional damage that may be caused by the abnormal function or the failure of the product.

(4) This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.

(5) 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.

- 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, Cl2, SO2, H2S, NH3, and NOX)

(6) 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.

(7) When you have any question or uncertainty, contact Panasonic.

18.7 LIFE SUPPORT POLICY

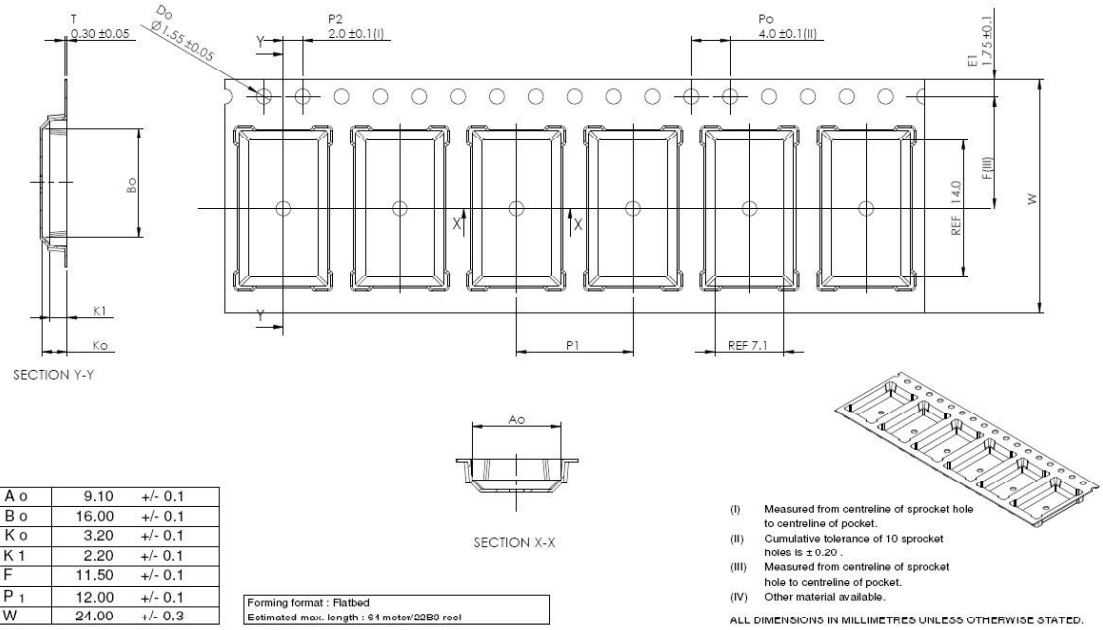
This Panasonic Industrial Devices Europe GmbH product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure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

19 PACKAGING

If the product has mass production status, we will deliver the module in the package which is described below.

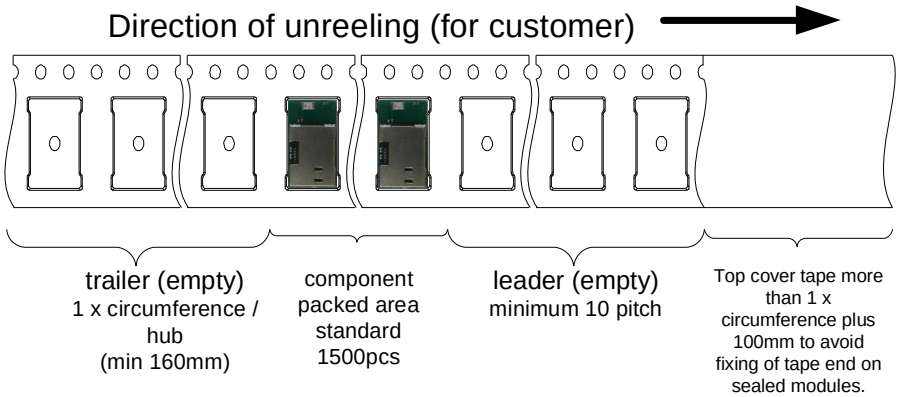
19.1 TAPE DIMENSION



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 : 84 meter/22B9 reel

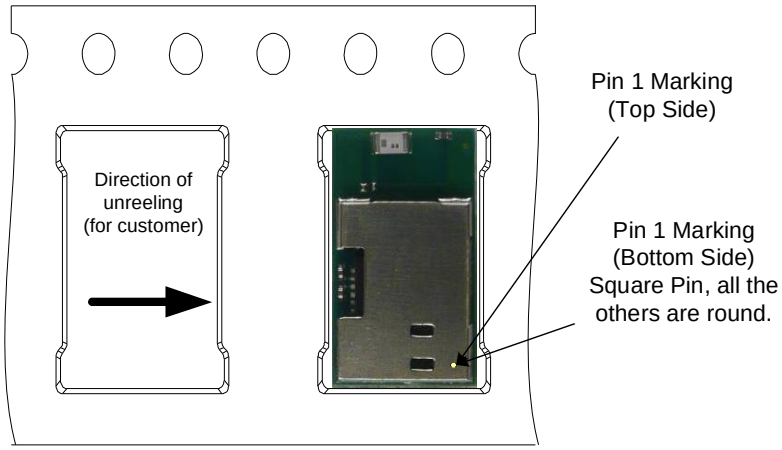
19.2 PACKING IN TAPE



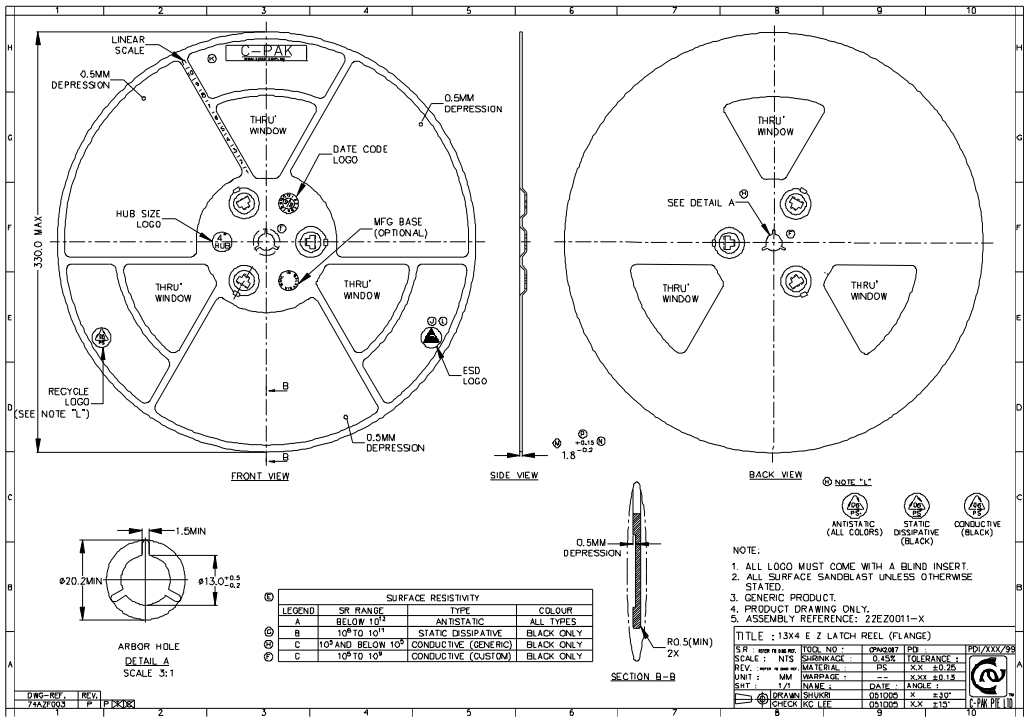
Empty spaces in component packed area shall be less than two per reel and those spaces shall not be consecutive.

Top cover tape shall not be found on reel holes and shall not stick out from reel.

19.3 COMPONENT DIRECTION

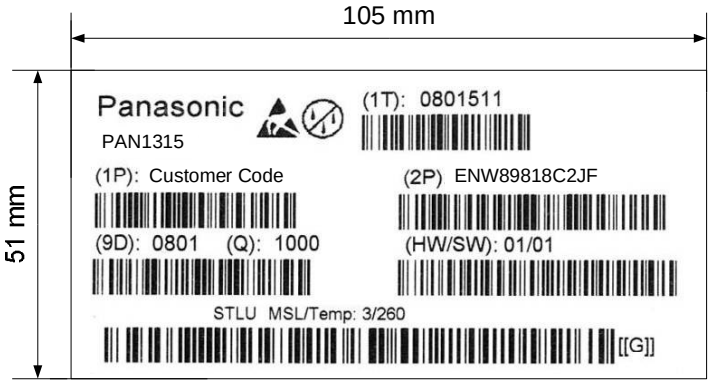


19.4 REEL DIMENSION



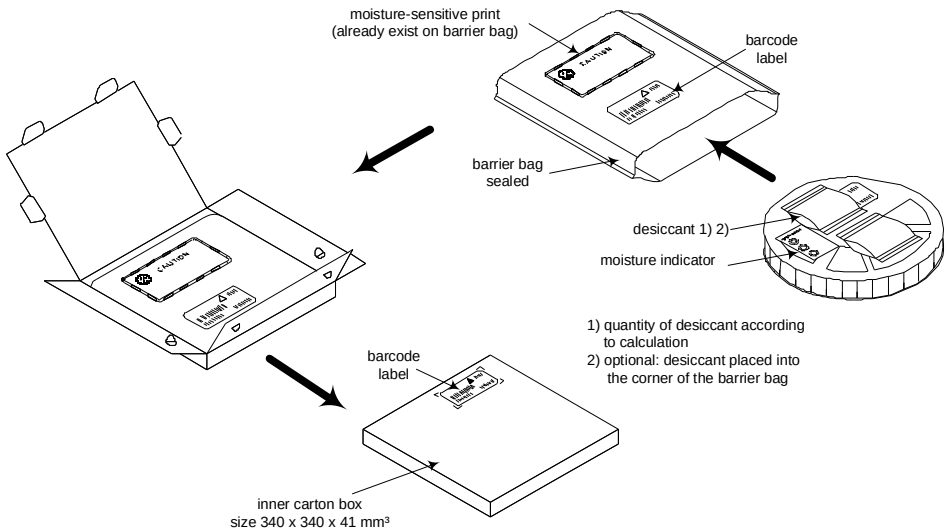
19.5 LABEL FOR PACKAGE

The picture shows an example from similar product.



(1T)	Lot code [YYWWDLL]		Example from above:	
	YY	year	printed	08
	WW	normal calendar week	printed	01
	D	day	printed	5 (Friday)
	L	line identifier, if more as one	printed	1
	L	lot identifier per day	printed	1
(1P)	Customer Order Code, if any, otherwise company name will be printed			
(2P)	Panasonic Order Code: ENW89837AxKF			
(9D)	Date code as [YYWW]			
(Q)	Quantity [XXXX], variable max. 1500			
(HW/SW)	Hardware /Software Release			
	Hardware 01	Indicates the HW revision.		
	Software 01	Indicates the SW revision.		

19.6 TOTAL PACKAGE



20 ORDERING INFORMATION

Ordering part number	Description	MOQ (1)
ENW89837A3KF (2)	PAN1026 CLASS 2 Bluetooth dual mode Module according BT-4.0. 115kBaud Standard *Bluetooth*® smart ready device	1500
ENW89837A8KF	PAN1026 CLASS 2 Bluetooth dual mode Module according BT-4.0. 9k6Baud *Bluetooth*® smart ready device	1500

Notes:

(1) Abbreviation for Minimum Order Quantity (MOQ). The standard MOQ for mass production is 1500 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

21 ROHS AND REACH DECLARATION

The latest declaration of environmental compatibility (RoHS and REACH) for supplied products can be found on the Panasonic website in the "Downloads" section of the respective product.

Please also refer to chapter 1.3.

22 SOFTWARE

22.1 SOFTWARE DESCRIPTION

The module software offers both embedded Bluetooth HCI (Host Control Interface), extended HCI and TCU (Toshiba Control Unit) Command interfaces via the embedded UART interface

a) HCI commands are standard according to Bluetooth standard specifications.

b) Extended HCI commands are available for device control, such as RF control, BD_ADDR control, firmware version control, embedded IO control, maintenance tasks etc. Please refer to the "Extension HCI Command Document".

c) The PAN1026 includes the Bluetooth LSI TC35661 incorporating Bluetooth stack and SPP profile and BLE GATT profile. The profile application interface is described in the "SPP Command Interface Document" (about 14 commands) and the "Bluetooth Basic Management Command Interface Document" (about 46 commands). The related high level commands are called "TCU" commands.
The "SPP Message Sequence Chart Document" and the "Bluetooth Management Message Sequence Chart Document" describe the logical and sequential procedure to use those commands.

d) After RESET of the module, the module starts in HCI mode. The "Bluetooth LSI TC35661 Application Note" describes how to start the device and enter into "TCU" mode thereafter.

e) The LSI Supplier (Toshiba) offers SPP drivers, that allows a further abstraction towards the application software including SPP programming examples. This is documented in the "BT SPP API Specification", the "BT SPP Driver Specification" and the "BT SPP Application Note". The "SPP API" offers a few high-level APIs for LSI initialization, connection setup and communication with a remote SPP device. The user has full control over all LSI features by utilizing the lower-level "SPP Drivers". The drivers take care for issuing commands and data to the LSI and they handle the responses from the TC36661. The "Application Note" includes a SPP programming example and shows the integration with a RTOS."

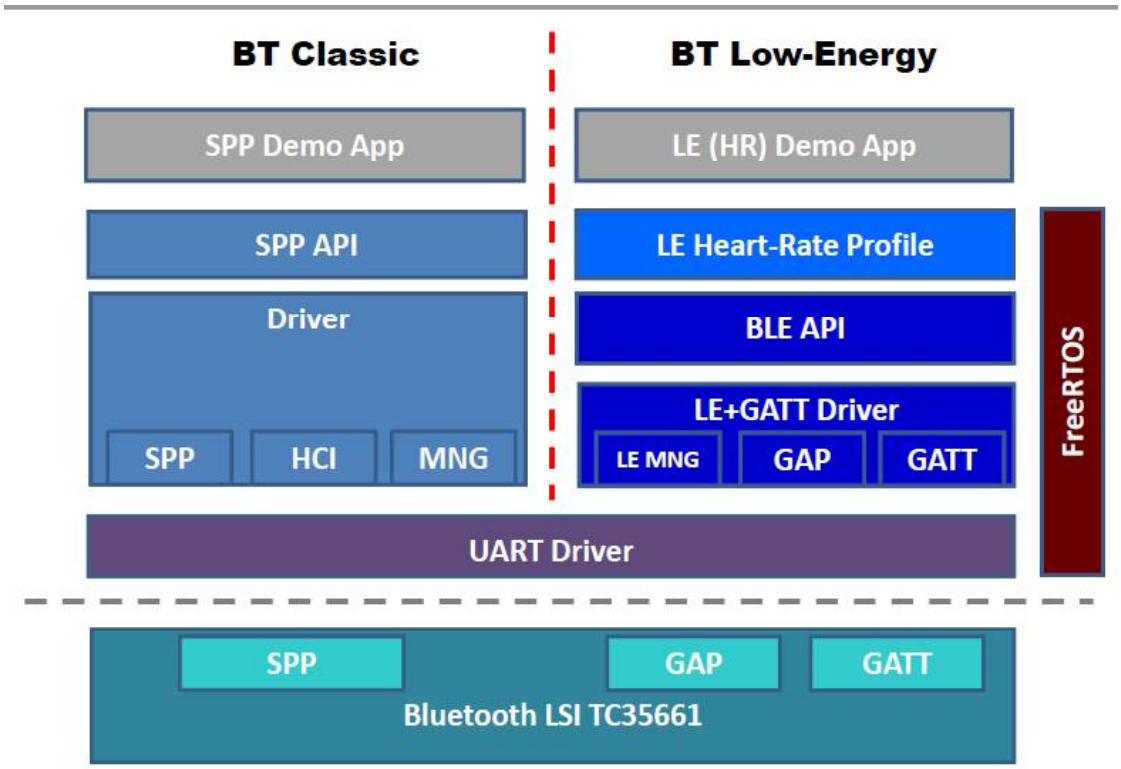
All documents are available on respective Panasonic or Toshiba websites.

22.2 SOFTWARE VERSION INFORMATION

The version number of the embedded software can be read out by an extended HCI command.

The extended HCI command class < HCI_M2_Message_Get >" allows the reading of the firmware version. Pls refer to the extended HCI command list of TC35661 LSI.

22.3 SOFTWARE BLOCK DIAGRAM



23 REGULATORY INFORMATION

23.1 FCC FOR US

23.1.1 FCC Notice

The devices PAN1026, for details refer to Chapter 20, including the antennas, which are listed in 23.1.5, complies with Part 15 of the FCC Rules. The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.transmitter
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.

23.1.2 Caution

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Panasonic Industrial Devices Europe GmbH may void the user's authority to operate the equipment.

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

23.1.3 Labeling Requirements

The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic FCC identifier for this product as well as the FCC Notice above.

The FCC identifier is **FCC ID: T7VPAN10**. This FCC identifier is valid for all PAN1026 modules, for details, see the Chapter 20 - Ordering Information.

In any case the end product must be labelled exterior with "Contains FCC ID: T7VPAN10"

23.1.4 Antenna Warning

For the related part number of PAN1026 refer to Chapter 20 - Ordering Information.

This device is tested with a standard SMA connector and with the antennas listed below. When integrated in the OEMs product, these fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions.

23.1.5 Approved Antenna List

Note: We are able to qualify your antenna and will add to this list as that process is completed.

Item	Part Number	Manufacturer	Frequency Band	Type	Gain (dBi)
1	LDA212G3110K	Murata	2.4GHz	Chip-Antenna	+0.9
2	ANT2012LL13R2400A	Yageo	2.4G	Chip-Antenna	+0.9

23.1.6 RF Exposure PAN1026

To comply with FCC RF Exposure requirements, the Original Equipment Manufacturer (OEM) must ensure that the approved antenna in the previous table must be installed.

The preceding statement must be included as a CAUTION statement in manuals for products operating with the approved antennas in the previous table to alert users on FCC RF Exposure compliance.

Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of PAN1026 with mounted ceramic antenna **(FCC ID: T7VPAN10)** is far below the FCC radio frequency exposure limits. Nevertheless, the PAN1026 shall be used in such a manner that the potential for human contact during normal operation is minimized.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

23.2 INDUSTRY CANADA CERTIFICATION

PAN1026 is licensed to meet the regulatory requirements of Industry Canada (IC),

license: IC: 216Q-PAN10

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from www.ic.gc.ca.

This device has been designed to operate with the antennas listed in Table 20 above, having a maximum gain of 0.9 dBi. Antennas not included in this list or having a gain greater than 0.9 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Due to the model size the IC identifier is displayed in the installation instruction only and cannot be displayed on the modules label due to the limited size (8.7x15.6mm).

23.2.1 IC Notice

The devices PAN1026, for details refer to Chapter 20, including the antennas, which are listed in 23.1.5, complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-GEN.
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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

PAN1016 est garanti conforme aux dispositions règlementaires d'Industry Canada (IC), licences: **IC: 216Q-PAN10**

Il est recommandé aux fabricants d'appareils fixes, mobiles ou portables de consulter la réglementation en vigueur et de vérifier la conformité de leurs produits relativement aux limites d'exposition aux rayonnements radiofréquence ainsi qu'au débit d'absorption spécifique maximum autorisé.

Des informations pour les utilisateurs sur la réglementation Canadienne concernant l'exposition aux rayonnements RF sont disponibles sur le site www.ic.gc.ca.

Ce produit a été développé pour fonctionner spécifiquement avec les antennes listées dans le tableau ci-dessus, présentant un gain maximum de 0.9dBi. Des antennes autres que celles listées ici, ou présentant un gain supérieur à 0.9dBi ne doivent en aucune circonstance être utilises en combinaison avec ce produit. L'impédance des antennes compatibles est 50Ohm. L'antenne utilisée avec ce produit ne doit ni être située à proximité d'une autre antenne ou d'un autre émetteur, ni être utilisée conjointement avec une autre antenne ou un autre émetteur. En raison de la taille du produit, l'identifiant IC est fourni dans le manuel d'installation.

23.2.2 Labeling Requirements

The Original Equipment Manufacturer (OEM) must ensure that IC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic IC identifier for this product as well as the IC Notice above.

The IC identifier is **216Q-PAN10**. This IC identifier is valid for all PAN1026 modules, for details, see the Chapter 20 - Ordering Information.

In any case the end product must be labelled exterior with "Contains **IC: 216Q-PAN10**"

Obligations d'étiquetage

Les fabricants d'équipements (OEM) doivent s'assurer que les obligations d'étiquetage du produit final sont remplies. Ces obligations incluent une étiquette clairement visible à l'extérieur de l'emballage externe, comportant l'identifiant IC du module Panasonic inclus, ainsi que la notification ci-dessus.

Les identifiants IC sont: **IC: 216Q-PAN10**

Ces identifiants sont valides pour tous les modules PAN1026 (Chapter 20. Ordering Information). Dans tous les cas les produits finaux doivent indiquer sur leur emballage externe une des mentions suivantes: "**Contient IC: 216Q-PAN10**"

23.3 EUROPEAN CONFORMITY ACCORDING TO RED (2014/53/EU)

All modules described in this Product Specification comply with the standards according to the following LVD (2014/35/EU), EMC-D (2014/30/EU) together with the RED (2014/53/EU) articles:

3.1a Safety/Health:	EN60950-1:2006+A11:2009+A1:2010+A12:2011+AC:2011+A2:2013
	EN62311:2008
3.1b EMC:	EN 301 489-1 V2.1.1:2017-02
	EN 301 489-17 V3.1.1:2017-02
3.2 Radio:	EN 300 328 V2.1.1:2016-11

As a result of the conformity assessment procedure described in 2014/53/EU Directive, the end customer equipment should be labelled as follows:

CE

PAN1026 and its model versions in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States[Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra and Turkey.

23.4 JAPANESE RADIO LAW COMPLIANCE:

This device is granted pursuant to the Japanese Radio Law (電波法).
This device should not be modified (otherwise the granted designation number will become invalid)
The following models are qualified for the Japanese market:

ENW89837AxKF MIC ID: [R]202-LSE095

24 BLUETOOTH QUALIFICATION

Bluetooth End Products integrating PAN1026 need to be created by using following IDs:

BT3.0:	**Declaration ID**	**QDID**
Profile SubSystem (SDP/SPP)	B019234	36438
Controller Subsystem	B020093	40254
Host Subsystem	B019248	38386
BT4.0:		
Profile Subsystem (Gatt)	B019935	40735
Controller Subsystem	B021165	48177
Host Subsystem	B020932	48566

Panasonic

PAN1760A

Bluetooth Low Energy Module

Product Specification

Rev. 1.7

Wireless Modules

Overview

The PAN1760A is Panasonic's next generation Bluetooth module with the industry's lowest power Bluetooth Low Energy (LE) SoC.

Features

- Small 15.6 mm x 8.7 mm x 1.9 mm SMD module
- Same form factor and pinout as PAN1026, PAN1760, and PAN1761
- Bluetooth LE 4.2 compliant
- Embedded 256 kB flash memory and 192 kB internal RAM
- 83 kB RAM available for user application
- AT Command mode, Host mode, Stand-Alone mode
- Standard SIG Bluetooth LE profiles as well as SPP over Bluetooth LE profile
- UART (2x), SPI & I2C interface, PWM output (4x), ADC (5 ext, 1 int), 17 programmable I/O
- ARM® Cortex®-M0 processor with Single Wire Debug (SWD) interface

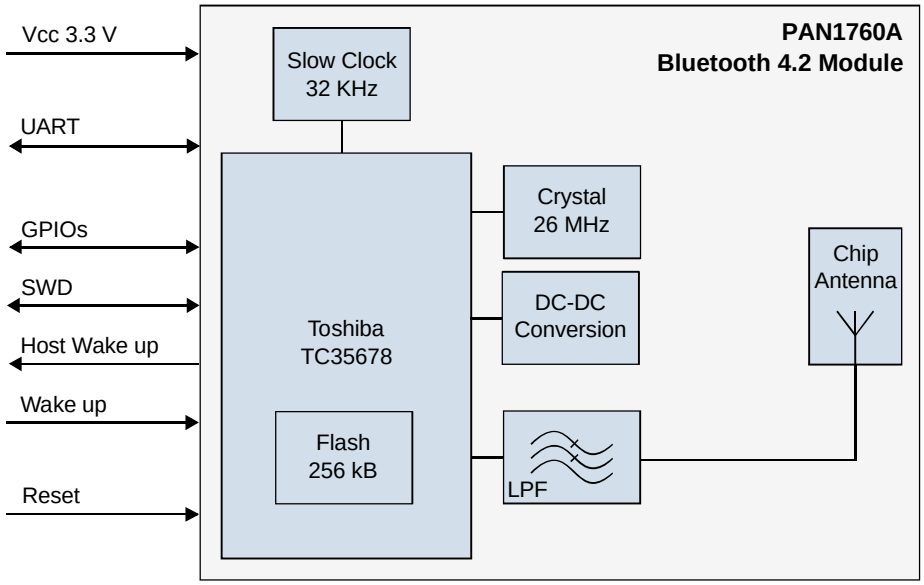
Bluetooth

- GAP central and peripheral support for LE
- GATT, SMP, and SDB support for LE
- Over-the-Air firmware update
- Support for Scatternet network
- Bluetooth 4.2 secure connections support through Elliptic-Curve-DH Cryptography
- AES128 hardware encryption (FIPS-approved)
- Frequent changing of device address (improved privacy, reduced tracking ability)
- Larger packet sizes (more efficient application and network layer security)

Characteristics

- Receiver sensitivity -93 dBm typ.
- Output power 0 dBm maximum setting
- Power supply 1.8 V to 3.6 V single operation voltage
- Transmit and receive 3.3 mA Tx/Rx peak power consumption
- Low Power 50 nA Deep Sleep mode
- Operating temperature range -40 °C to +85 °C

Block Diagram



By purchase of any of the products described in this document the customer accepts the document's validity and declares their agreement and understanding of its contents and recommendations. Panasonic reserves the right to make changes as required at any time without notification. Please consult the most recently issued Product Specification before initiating or completing a design.

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This Product Specification does not lodge the claim to be complete and free of mistakes.

Engineering Samples (ES)

If Engineering Samples are delivered to the customer, these samples have the status “Engineering Samples”. This means that the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and they may differ from the published Product Specification.

Engineering Samples are not qualified and they are not to be used for reliability testing or series production.

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The customer acknowledges that samples may deviate from the Product Specification and may bear defects due to their status of development and the lack of qualification mentioned above.

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- Deviation or lapse in function of the Engineering Sample,
- Improper use of the Engineering Sample.

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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 PAN1760A module. It is intended for hardware design, application, and Original Equipment Manufacturers (OEM) engineers. The product is referred to as “the PAN1760A” or “the module” within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	2017-06-12	First published version
1.1	2017-11-03	Added MIC ID for Japanese Radio Law. Added Bluetooth ID for Bluetooth Certification.
1.2	2018-04-18	Added chapter “Restricted End Use”
1.3	2018-07-25	Changed the default UART CTS and RTS Pads
1.4	2018-09-17	Pad E5 now NC for standard module. Correct swapped RTS/CTS on B5/B6.
1.5	2018-11-22	Updated chapter “Revision History” remarks for revision 1.4 to include all changes
1.6	2019-02-06	Added “IC ID” in chapter “Case Marking”
1.7	2019-03-19	Deleted Mesh support. Corrected spelling.

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 crossreferences 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 PAN1760A is Panasonic's next generation Bluetooth module with the industry's lowest power Bluetooth Low Energy SoC.

The module is based on Toshiba's single chip TC35678 Bluetooth semiconductor device with embedded Toshiba Bluetooth 4.2 LE stack and embedded flash for the user application in stand-alone operation. Peak power consumption of only 3.6 mA in Tx and Rx mode allows advanced wireless functionalities in IoT, medical, and industrial applications without compromising battery life. Mandatory and optional Bluetooth 4.2 features are supported.

The PAN1760A can either be operated in AT-Command or Host mode for very simple integration of Bluetooth connectivity into existing products, or in Stand-Alone mode.

In Stand-Alone mode, with 256 kB flash memory and 83 kB RAM for user application, the PAN1760A can be used for many applications without the need for an external processor, saving cost, complexity, and space.

Older versions of the PAN1760, the PAN1761, and the PAN1026 share the same footprint.

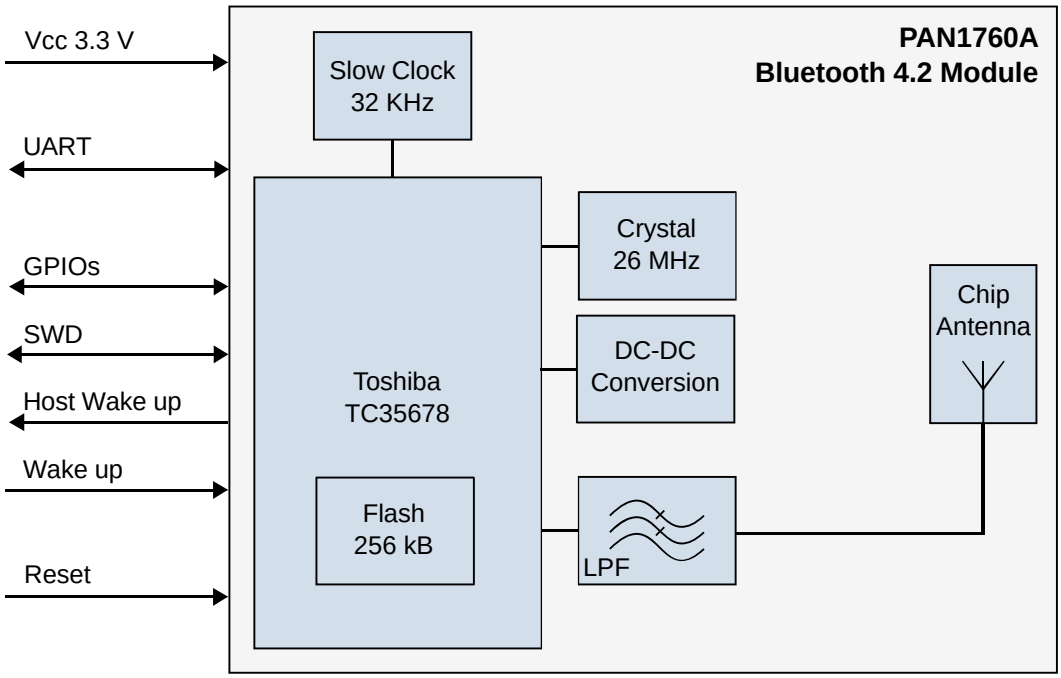
Only minor code changes are required when migrating from PAN1026 or PAN1760. Previously developed software (Bluetooth Low Energy profiles and applications) can be easily migrated with a minimal effort.

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.

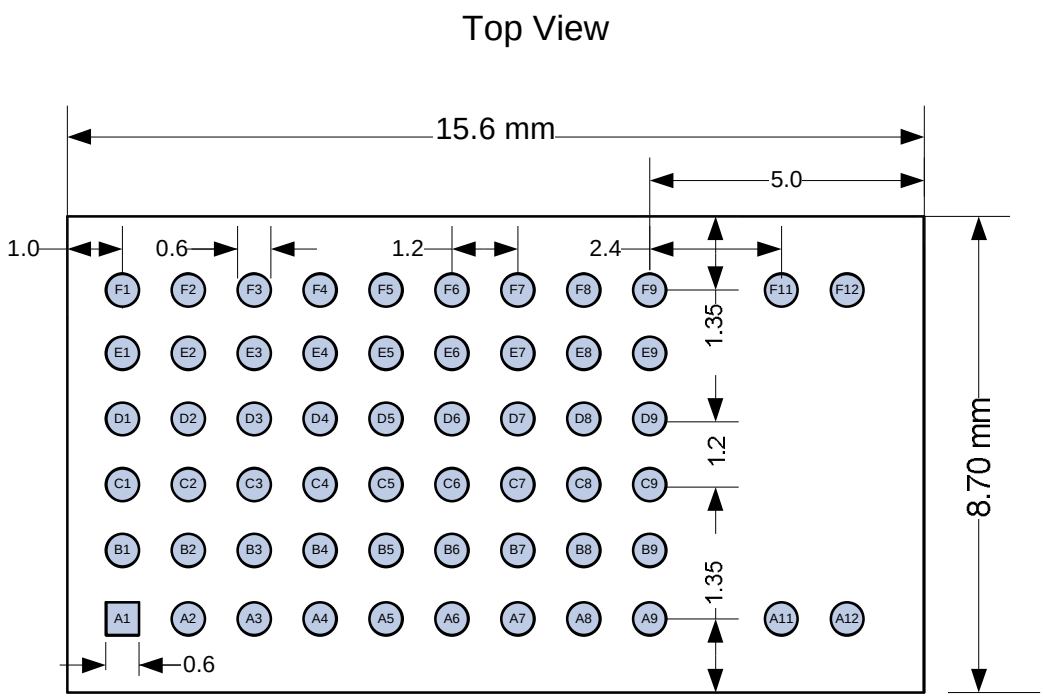
2.1 Block Diagram



Total capacitor value:	2.4 µF +/-10 %
Total inductance:	10 µH +/-10 %
Total resistance:	100 KΩ +/-10 %

2.2 Pin Configuration

Pin Assignment



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	NC	NC	Not connected
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	GPIO25	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	JTAG	
C5	SWDCLK	JTAG	
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 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, leave open
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

GPIO Functions

No	Pin Name	Pin Type	Description
D4	GPIO 00	Digital I/O	GPIO
C6	GPIO 01	Digital I/O	GPIO, PWM 0
F6	GPIO 02	Digital I/O	GPIO, PWM 1
A2	GPIO 03	Digital I/O	GPIO, PWM 2, SPI Data Out, ADC 1
B2	GPIO 04	Digital I/O	GPIO, PWM 3, SPI Data In, ADC 2
F7	GPIO 05	Digital Output	GPIO, UART TX, SPI Data Out
E6	GPIO 06	Digital Input	GPIO, UART RXD, SPI Data In
B5	GPIO 07	Digital I/O	GPIO, UART RTS, SPI Chip Select, I2C SCL, UART 2 TX
B6	GPIO 08	Digital I/O	GPIO, UART CTS, SPI Clock, I2C Data, UART 2 RX
B1	GPIO 09	Digital I/O	GPIO, ADC 3
C3	GPIO 10	Digital I/O	GPIO, ADC 4
E2	GPIO 11	Digital I/O	GPIO, SPI Data Out, I2C Clock
E1	GPIO 12	Digital I/O	GPIO, SPI Data In, I2C Data
F8	GPIO 13	Digital Output	PIO, UART RTS

No	Pin Name	Pin Type	Description
F5	GPIO 14	Digital Input	GPIO, UART CTS, ADC 5
D6	GPIO 15	Digital I/O	GPIO
B7	GPIO 25	Digital I/O	GPIO

Minimal Configuration

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

2.3 UART Interface

- Default baud rate: 115 200 bps
- Data format: 8N1, LSB first
- Rx, Tx, no flow control

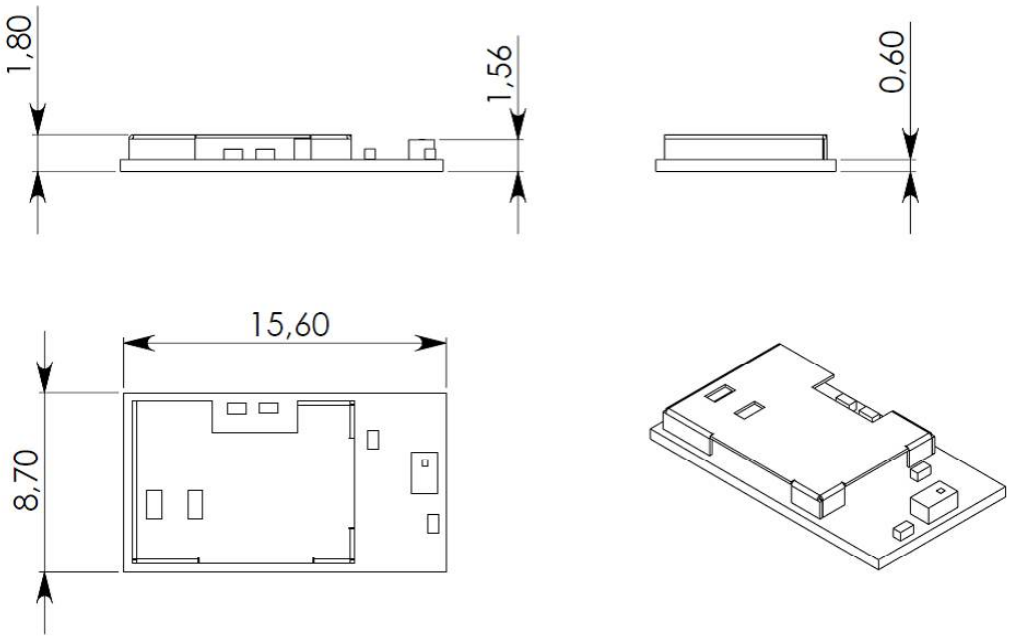
2.4 Bluetooth Features

- GAP central and peripheral support for LE
- GATT, SMP, and SDB support for LE
- Over-the-Air firmware update
- Support for Scatternet network
- Bluetooth 4.2 secure connections support through Elliptic-Curve-DH Cryptography
- AES-128 hardware encryption (FIPS-approved)
- Frequent changing of device address (improved privacy, reduced tracking ability)
- Larger packet sizes (more efficient application and network layer security)

3 Detailed Description

3.1 Dimensions

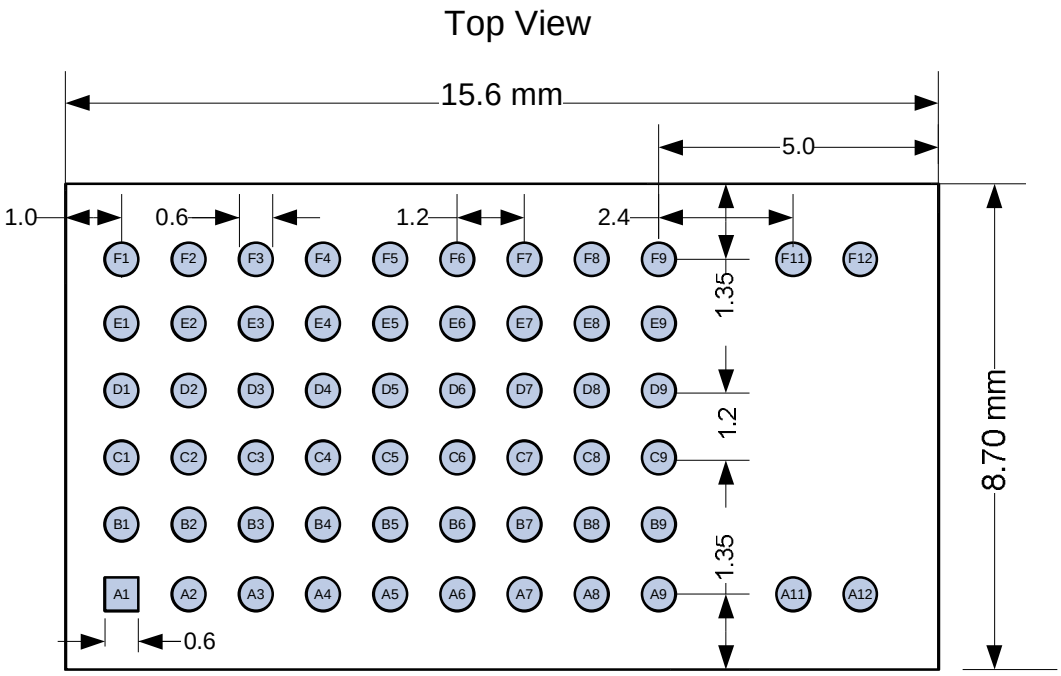
All dimensions are in millimeters.



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

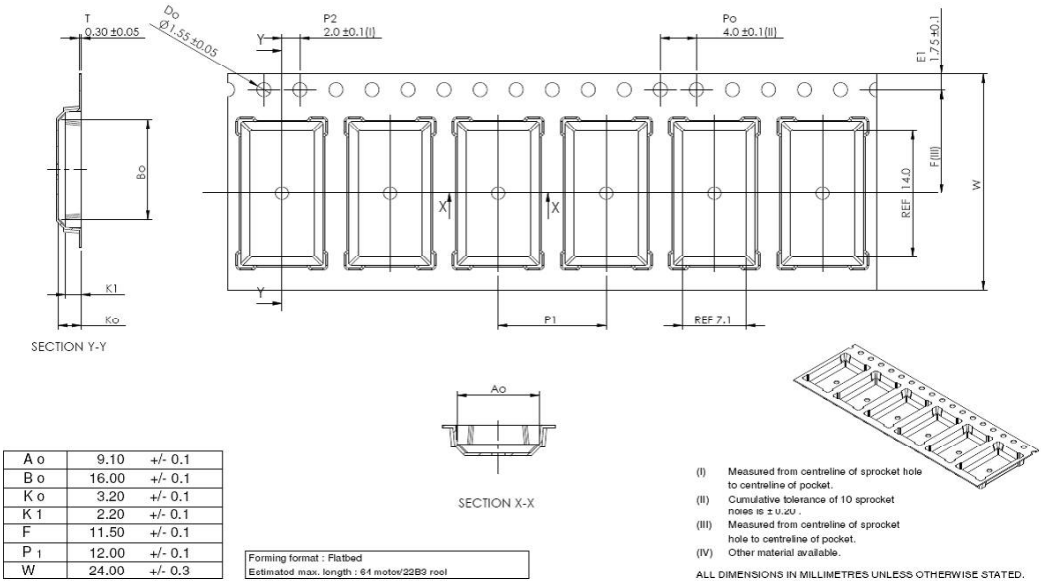
The outer dimensions have a tolerance of ±0.35 mm.



3.3 Packaging

The product is a mass production status product and will be delivered in the package described below.

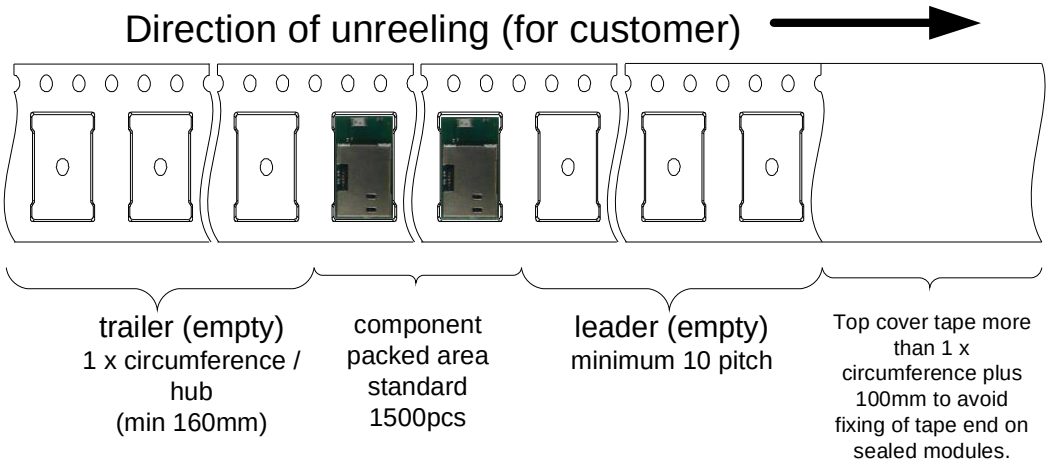
3.3.1 Tape Dimensions



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
Eetimated max. length : 64 motor/22B9 reel

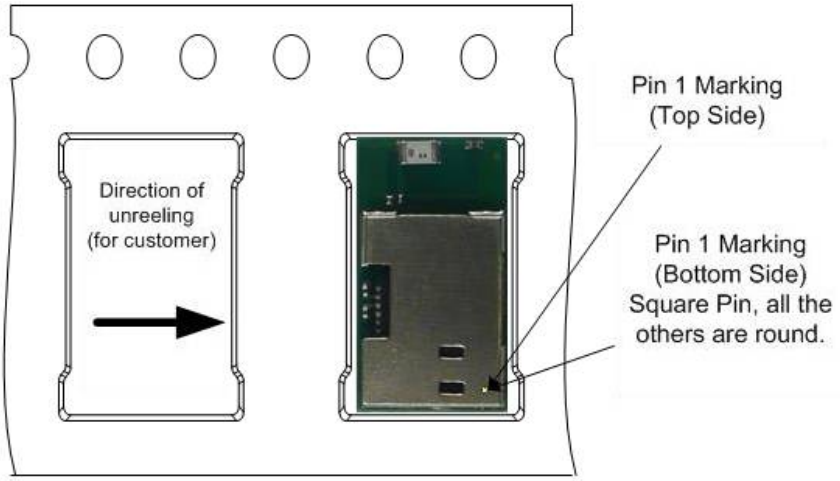
3.3.2 Packing in Tape



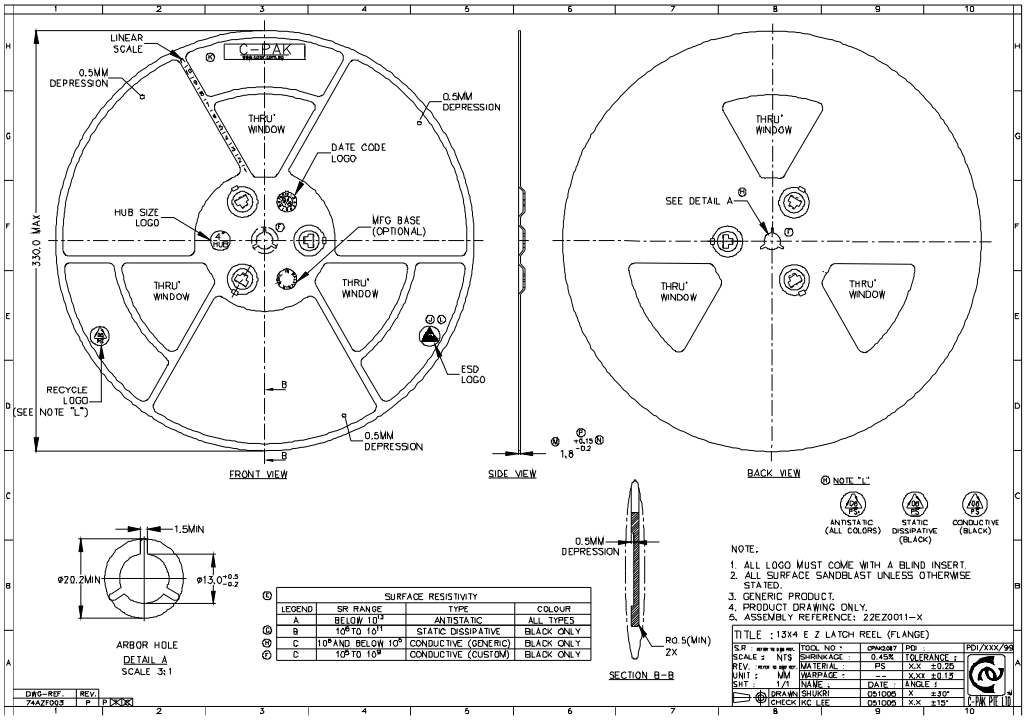
Empty spaces in the component packed area shall be less than two per reel and those spaces shall not be consecutive.

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

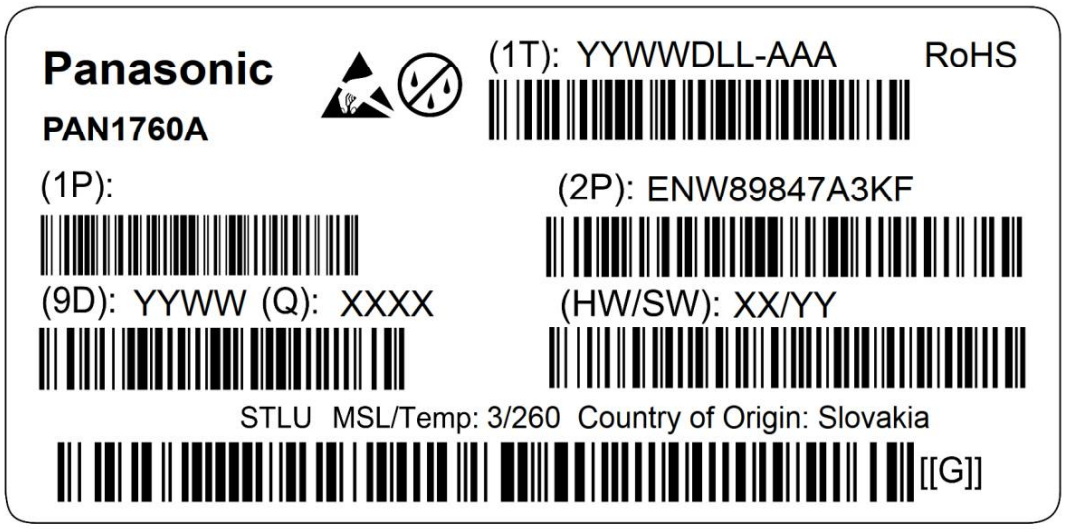


3.3.4 Reel Dimension



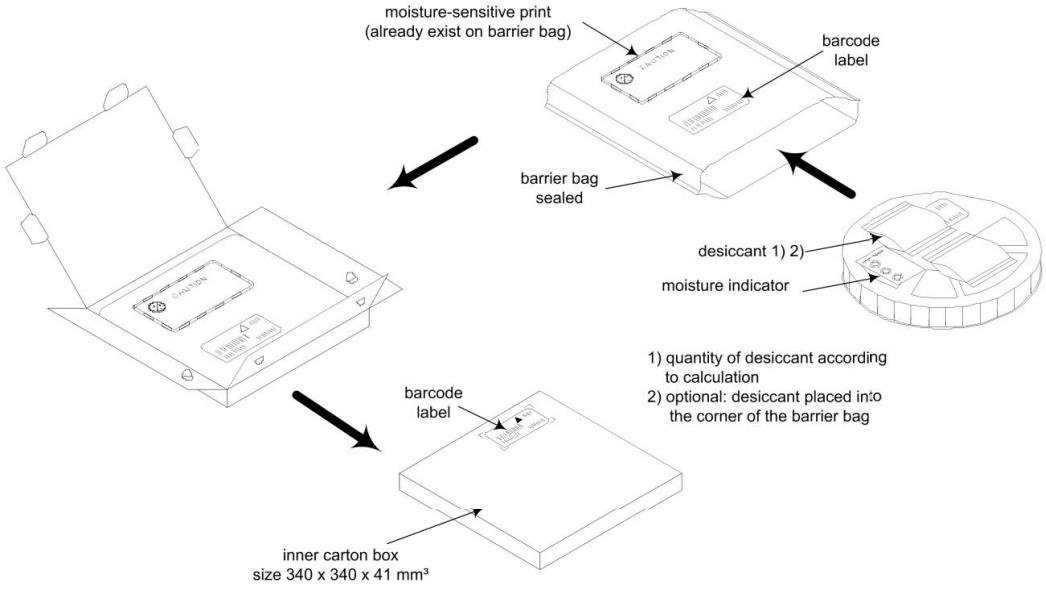
3.3.5 Package Label

Example



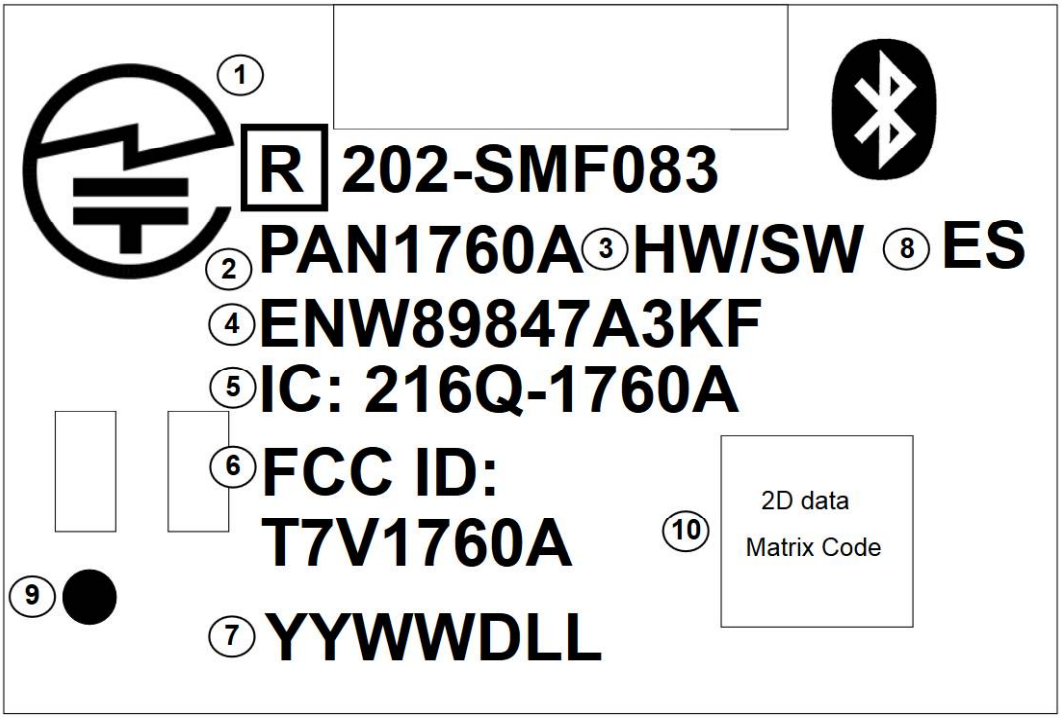
(1T)	Lot code
(1P)	Customer order number, if applicable
(2P)	Order number
(9D)	Date code
(Q)	Quantity
(HW/SW)	Hardware/software version

3.3.6 Total Package



3.4 Case Marking

Example



1	MIC ID
2	Brand name
3	Hardware/software version
4	Order number
5	IC ID
6	FCC ID
7	Lot code
8	Engineering Sample marking, if applicable
9	Marking for Pin 1
10	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		+125	°C
V_{ESD}	ESD Robustness	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

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
V_{DD}	Supply voltage	Minimum 2.0 V are required to access the internal flash ROM during booting process. This occurs in stand-alone mode.	2.0	3.3	3.6	V

4.4 Current Consumption

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

Assume V_{DD} = 3.3 V, T_{amb} = 25 °C, if nothing else stated.

Parameter	Condition	Min.	Typ.	Max.	Units
Transmit Peak Current			3.3		mA
Receive Peak Current			3.3		mA
Deep Sleep Mode			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 RF bottom pad.		0		dBm
Sensitivity			-93		dBm

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
1	Spurious Emissions	Conducted measurement at RF bottom pad. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66.		<-30		dBm

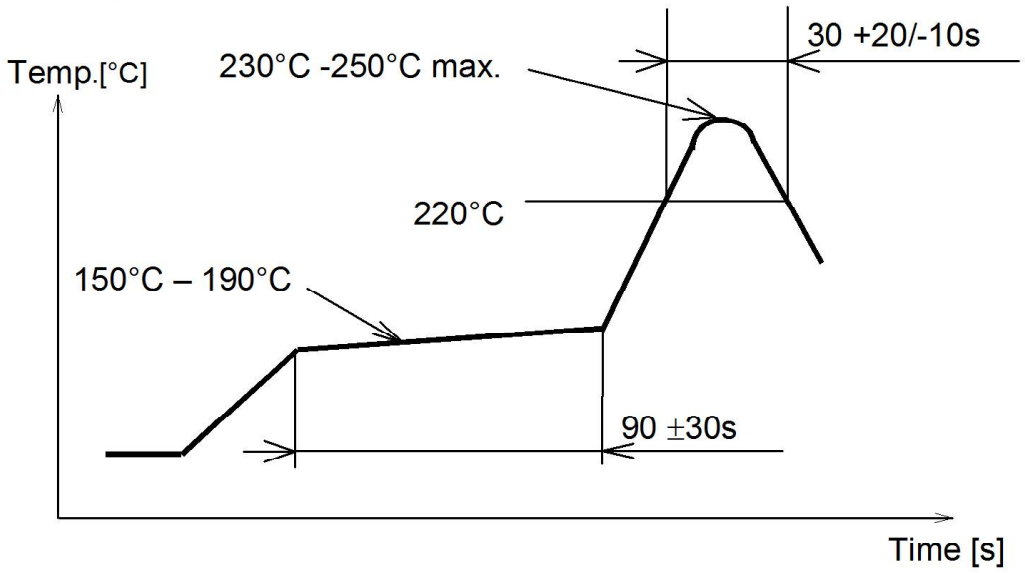
4.6 Reliability Tests

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	Vibration test	Electrical parameter should be in specification	• Freq.: 10~50 Hz; Amplitude: 1.5 mm; 20 min./cycle, 1 hrs. each of XYZ axis • Freq.: 30~100 Hz, 6G; 20 min./cycle, 1 hrs. each of XYZ axis
2	Shock test	See above	Dropped onto hard wood from a height of 50 cm for 3 times
3	Heat cycle test	See above	-40 °C for 30 min. and +85 °C for 30 min.; each temperature 300 cycles
4	Moisture test	See above	+60 °C, 90 % RH, 300 h
5	Low temperature test	See above	-40 °C, 300 h
6	High temperature test	See above	+85 °C, 300 h

4.7 Recommended Soldering Profile

- Reflow permissible cycle: 2
- Opposite side reflow is prohibited due to module weight
- 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 product's functions and damage to the product.

5.1 Design Notes

1. Follow the conditions written in this specification, especially the control signals of this module.
2. 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).
3. This product should not be mechanically stressed when installed.
4. Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
5. Avoid assembly and use of the target equipment in conditions where the product's temperature may exceed the maximum tolerance.
6. The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
7. Keep this product 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 product according to this reflow profile.
2. Carefully position the products so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
3. Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.
4. If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
5. This product 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 unit.

5.3 Usage Condition Notes

1. Take measures to protect the unit against static electricity.
   If pulses or other transient loads (a large load applied in a short time) are applied to the products, check and evaluate their operation befor assembly on the final products.
2. Do not use dropped products.
3. Do not touch, damage or soil the pins.
4. Follow the recommended condition ratings about the power supply applied to this product.
5. Electrode peeling strength: Do not add pressure of more than 4.9 N when soldered on PCB.
6. Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
7. These products 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 products in the following conditions or the performance characteristics of the product, 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 Cl2, H2S, NH3, SO2, or NOX,
   - 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 percent range,
   - Storage of the products 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 product away from water, poisonous gas, and corrosive gas.
4. This product 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 products for other purposes than those listed.
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 product.
3. This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.
4. These products are not intended for uses other than under the special conditions shown below. Before using these products 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, Cl2, SO2, H2S, NH3, and NOX).
5. 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.

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

5.7 Restricted Use

5.7.1 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 it is 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.

5.7.2 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

6.1.1 FCC Notice

The PAN1760A including the antennas, which are listed in ⇨ 6.1.5 Approved Antenna List, complies with Part 15 of the FCC Rules.

The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407. The transmitter 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.

6.1.2 Caution

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Panasonic Industrial Devices Europe GmbH may void the user's authority to operate the equipment.

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.

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.

It is recommended 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.

6.1.3 Label Requirements

The OEM must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic FCC identifier for this product as well as the FCC Notice above.

The FCC identifier is **FCC ID: T7V1760A**.

This FCC identifier is valid for the PAN1760A. The end product must in any case be labelled on the exterior with:

“Contains FCC ID: T7V1760A”.

6.1.4 Antenna Warning

This antenna warning refers to the test device with the model number PAN1760A
⇨ 7.1 Ordering Information

The device is tested with a standard SMA connector and with the antenna listed below. When integrated into the OEM’s product, these fixed antennas require installation preventing end users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and with Section 15.247 for emissions. The FCC identifier for the device with the antenna listed in ⇨ 6.1.5 Approved Antenna List is the same (**FCC ID: T7V1760A**).

6.1.5 Approved Antenna List

Item	Part Number	Manufacturer	Frequency Band	Type	Gain (dBi)
1	ANT2012	Yageo	2.	Chip Antenna	+0.9

6.1.6 RF Exposure

To comply with FCC RF Exposure requirements, the OEM must ensure that only antennas from the Approved Antenna List are installed ⇨ 6.1.5 Approved Antenna List.

The preceding statement must be included as a Caution statement in manuals for products operating with the approved antennas in the previous table to alert users on FCC RF Exposure compliance.

Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of the PAN1760A with a mounted ceramic antenna (**FCC ID: T7V1760A**) is below the FCC radio frequency exposure limits. The PAN1760A shall be used in such a manner that the potential for human contact during normal operation is minimized.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

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

English

The PAN1760A is licensed to meet the regulatory requirements of Industry Canada (IC).

License ID: **IC: 216Q-1760A**

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from www.ic.gc.ca.

This device has been designed to operate with the antennas listed in ⇨ 6.1.5 Approved Antenna List, having a maximum gain of +0.9 dBi. Antennas not included in this list or having a gain greater than +0.9 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 Ohm. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Due to the model size, the IC identifier is displayed in the installation instruction only and it cannot be displayed on the module's label due to the limited size.

French

PAN1760A est garanti conforme aux dispositions règlementaires d'Industry Canada (IC).

License: **IC: 216Q-1760A**

Il est recommandé aux fabricants d'appareils fixes, mobiles ou portables de consulter la réglementation en vigueur et de vérifier la conformité de leurs produits relativement aux limites d'exposition aux rayonnements radiofréquence ainsi qu'au débit d'absorption spécifique maximum autorisé.

Des informations pour les utilisateurs sur la réglementation Canadienne concernant l'exposition aux rayonnements RF sont disponibles sur le site www.ic.gc.ca.

Ce produit a été développé pour fonctionner spécifiquement avec les antennes listées dans le tableau ⇨ 6.1.5 Approved Antenna List, présentant un gain maximum de 0.9 dBi. Des antennes autres que celles listées ici, ou présentant un gain supérieur à 0.9 dBi ne doivent en aucune circonstance être utilisées en combinaison avec ce produit. L'impédance des antennes compatibles est 50 Ohm. L'antenne utilisée avec ce produit ne doit ni être située à proximité d'une autre antenne ou d'un autre émetteur, ni être utilisée conjointement avec une autre antenne ou un autre émetteur.

En raison de la taille du produit, l'identifiant IC est fourni dans le manuel d'installation.

6.2.1 IC Notice

English

The device PAN1760A (⇨ 7.1 Ordering Information), including the antennas (⇨ 6.1.5 Approved Antenna List), complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-Gen.

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.

French

Le présent appareil PAN1760A (⇨ 7.1 Ordering Information), les antennes y compris (⇨ 6.1.5 Approved Antenna List), est conforme aux CNR-Gen d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage, et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

6.2.2 Labeling Requirements

English

Labeling Requirements

The OEM must ensure that IC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic IC identifier for this product as well as the IC Notice above.

The IC identifier is:

IC: 216Q-1760A

This IC identifier is valid for all PAN1760A modules ⇨ 7.1 Ordering Information. In any case, the end product must be labelled on the exterior with:

"Contains IC: 216Q-1760A".

French

Obligations d'étiquetage

Les fabricants d'équipements d'origine (FEO) – en anglais Original Equipment Manufacturer (OEM) – doivent s'assurer que les obligations d'étiquetage IC du produit final sont remplies. Ces obligations incluent une étiquette clairement visible à l'extérieur de l'emballage externe, comportant l'identifiant IC du module Panasonic inclus, ainsi que la notification ci-dessus.

L' identifiant IC est:

IC: 216Q-1760A

Cet identifiant est valide pour tous les modules PAN1760A ⇨ 7.1 Ordering Information. Dans tous les cas les produits finaux doivent indiquer sur leur emballage externe la mention suivante:

"Contient IC: 216Q-1760A".

6.3 Japanese Radio Law Compliance

This device is granted pursuant to the Japanese Radio Law (電波法).

This device should not be modified (otherwise the granted designation number will become invalid).

The MIC ID is: [R]202-SMF083

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

All modules described in this Product Specification comply with the standards according to the following LVD (2014/35/EU), EMC-D (2014/30/EU) together with the RED (2014/53/EU) articles:

3.1a Safety/Health:	EN62368-1:2014
	EN62311:2008
3.1b EMC:	EN 301 489-1 V2.1.1:2017-02
	EN 301 489-17 V3.1.1:2017-02
3.2 Radio:	EN 300 328 V2.1.1:2016-11

As a result of the conformity assessment procedure described in the 2014/53/EU Directive, the end customer equipment should be labelled as follows:

CE

The end customer has to assure that the device has a distance of more than 20 cm from the human body under all circumstances.

The end customer equipment must meet the actual Safety/Health requirements according to RED.

PAN1760A in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States [Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra and Turkey.

6.5 Bluetooth

The final Bluetooth End Product listing needs to be created by using the following IDs:

	QDID	Declaration ID
End Product	100029	D036677

6.6 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]
ENW89847A3KF[2]	PAN1760A	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