TABLE OF CONTENTS

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 -91 dBm
- Compliant to BT 4.0 (extension to 4.1 under development)
- 32kB on-chip RAM for applications
- 512kBit eeprom to download user program during start up
- Operation as host-less, stand alone
- Standard SIG BLE and "SPP over BLE" profiles available
- Temperature Range from -40°C to +85°C
- UART, I2C , GPIO (10 in/out), Wake-Up control pins, ADC(4 CH)

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

3. BLUETOOTH LOW ENERGY

Bluetooth Low Energy (BLE), part of Bluetooth Ver. 4.0, specifies two types of implementation: Single mode and dual mode. Single mode devices implement the low energy specification and consume just a fraction of the power of classic Bluetooth, allowing the short-range wireless standard to extend to coin cell battery applications for the first time. Dual mode devices combine 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 and computers.

Single mode Bluetooth 4.0 Low Energy is not backwards compatible with previous Bluetooth standards. Dual mode Bluetooth 4.0 Low Energy is backwards compatible and well suited for gateway applications, but is not practical for low power devices.

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

5. DESCRIPTION FOR 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 master or slave 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 offers Bluetooth low energy protocol stacks and applications from Toshiba. The Bluetooth low energy protocol stack from Toshiba, is a flexible and cost-effective single-mode Bluetooth low energy solution.

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

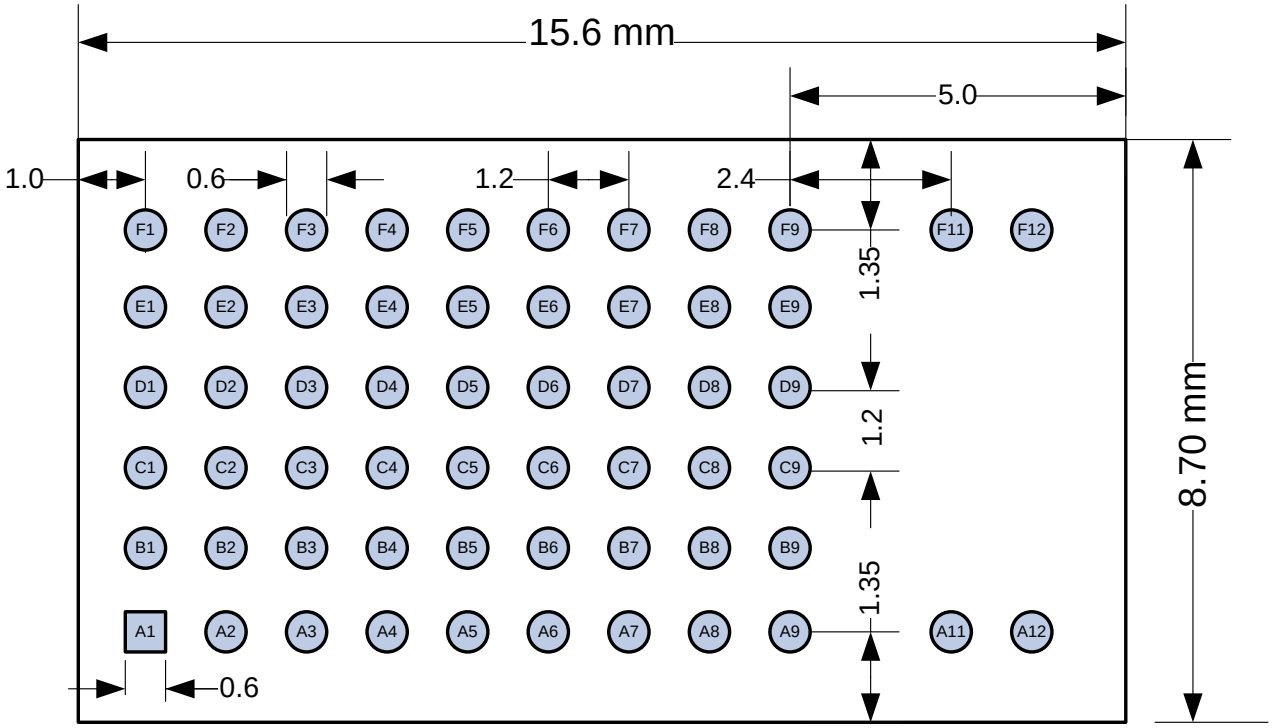
www.panasonic.com/rfmodules for the US,
http://industrial.panasonic.com/eu/i/29606/wireless_modules/wireless_modules.html for EU

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

6. DETAILED DESCRIPTION

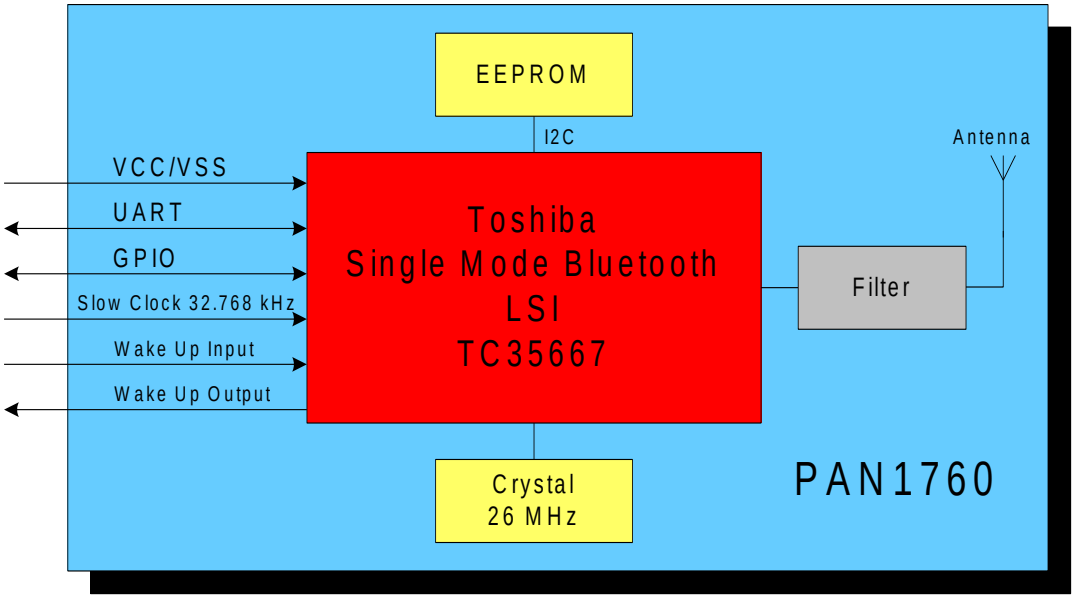
6.1. PAN1760 TERMINAL LAYOUT

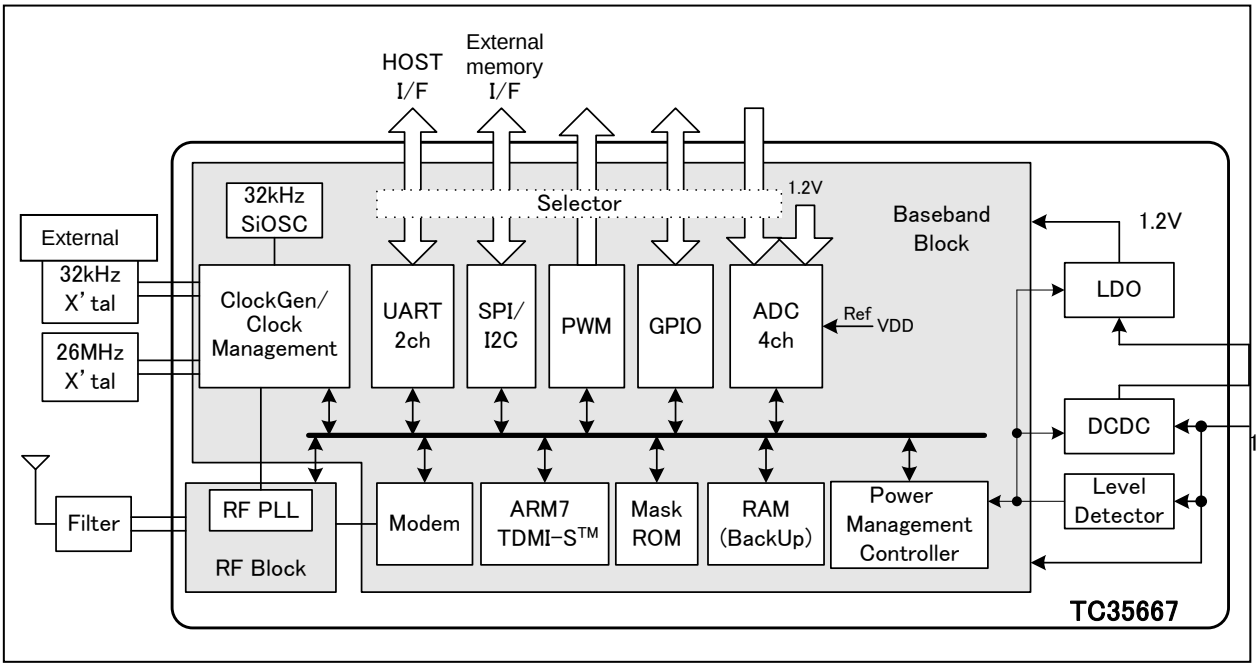
Top View, Application PCB



No	Pin Name	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	Digital I/O	
C3	GPIO12	Digital I/O	
C4	NC		Not Connected
C5	NC		Not Connected
C6	GPIO9	Digital I/O	
C7	GPIO10	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	Digital I/O	
D4	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	SDA	Digital I/O	Connected to internal EEPROM
E2	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	Digital In	
E7	GPIO2	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	UART_CTS	Digital In	Can be configured to UART2_RXD
F6	SLPXOOUT	Clock Out	32.768 KHz sleep clock output
F7	UART_TXD	Digital Out	
F8	UART_RTS	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





8. GPIO FUNCTION LIST

GPIO pins are assigned to UART or serial memory. About the details refer to firmware specification.

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	3.3V

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	Supply voltage	All supply pins must have the same voltage	–0.3 to 3.9	V
2	Voltage on any digital pin		–0.3 to VDD+0.3 <3,9	V
3	Operating ambient temperature range		–40 to 85	°C
4	Storage temperature range		–40 to 125	°C
5	Bluetooth RF inputs		10	dBm
6	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	Max	Unit
1	Power supply voltage	2	3.6	V
2	Maximum ambient operating temperature	-40	85	°C

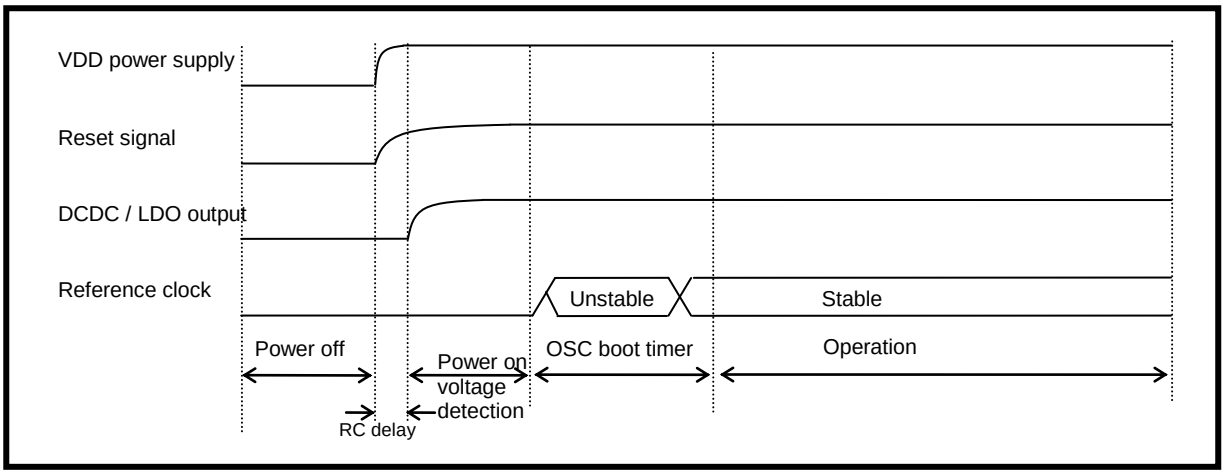
[2] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to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

11. BLUETOOTH RF PERFORMANCE

11.1. PAN1760 BLUETOOTH CHARACTERISTICS

No	Characteristics	Condition	Min	Typ	Max	BT Spec	Unit
1	Operation frequency range		2402		2480		MHz
2	Channel spacing			2			MHz
3	Output Power	Maximum setting, measured at single ended 50ohm.		4			dBm
		Minimum setting, measured at single ended 50ohm.		-24			dBm
4	Sensitivity, High Gain Mode	High-gain mode		-93.0		-70	dBm
		Standard mode		-92.5		-70	

11.2. PAN1760 BLUETOOTH CHARACTERISTICS

No	Characteristics	Condition	Min	Typ	Max	BT Spec	Unit
1	Operation frequency range		2402		2480		MHz
2	Channel spacing			2			MHz
3	Output power			0			dBm
4	Sensitivity, High Gain Mode	High-gain mode		-93.0		-70	dBm
4	Sensitivity, High Gain Mode	Standard mode		-92.5		-70	dBm

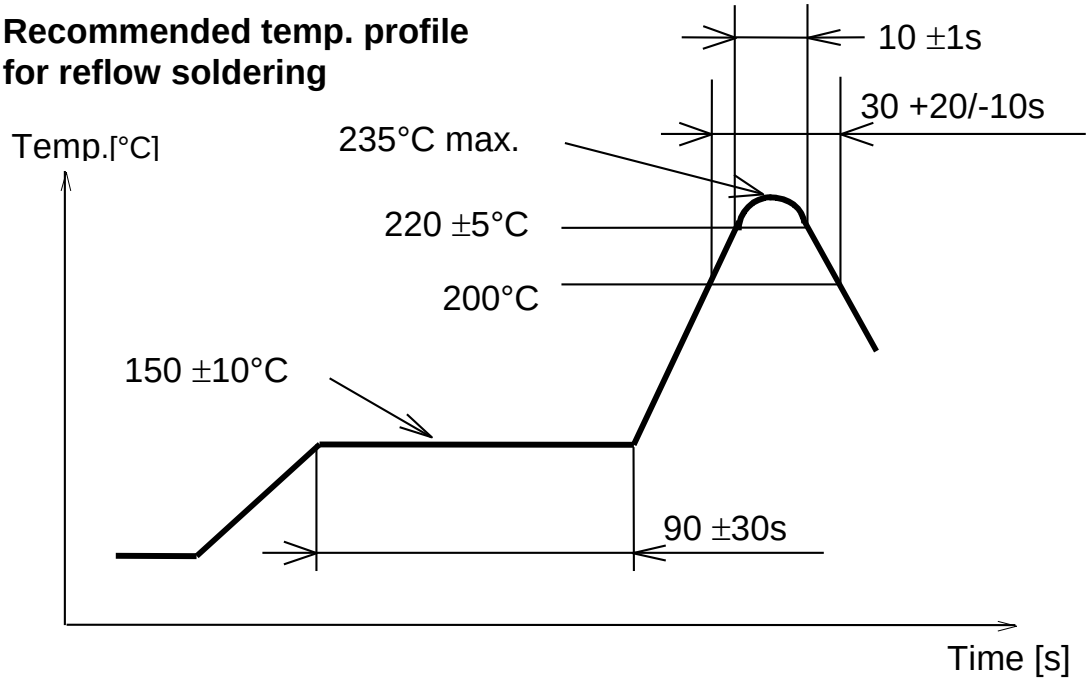
11.3. PAN1760 SPURIOUS EMISSION

No	Characteristics	Condition	Typ	Max	Unit
1	Spurious emissions	Conducted measurement with a 50-Ω single-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66		-41	dBm

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

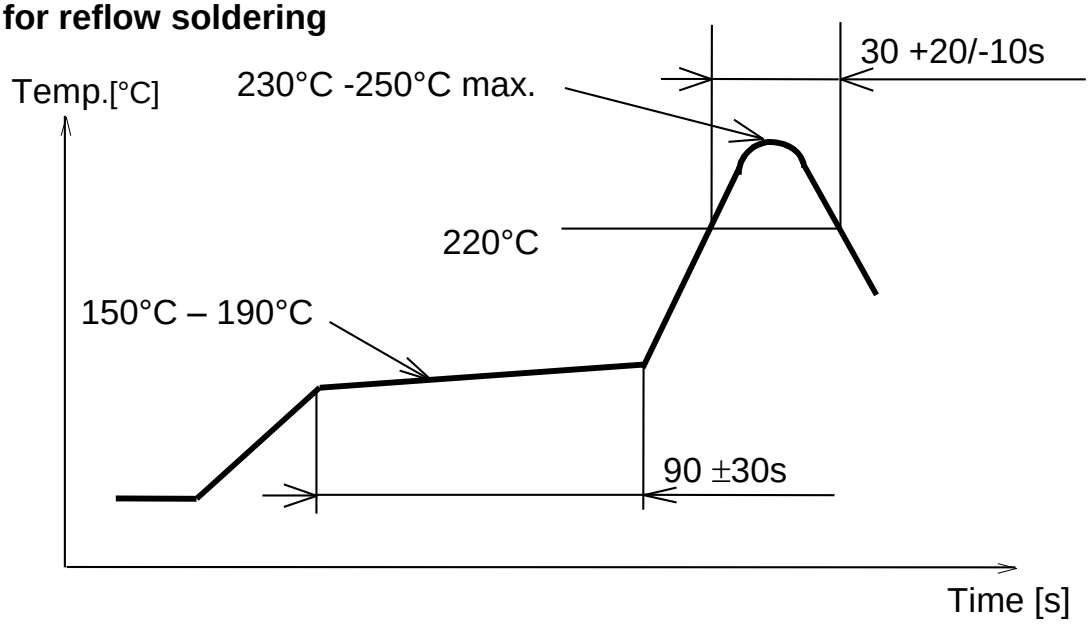
12.1. FOR LEAD SOLDER

Recommended temp. profile for reflow soldering



12.2. FOR LEADFREE SOLDER

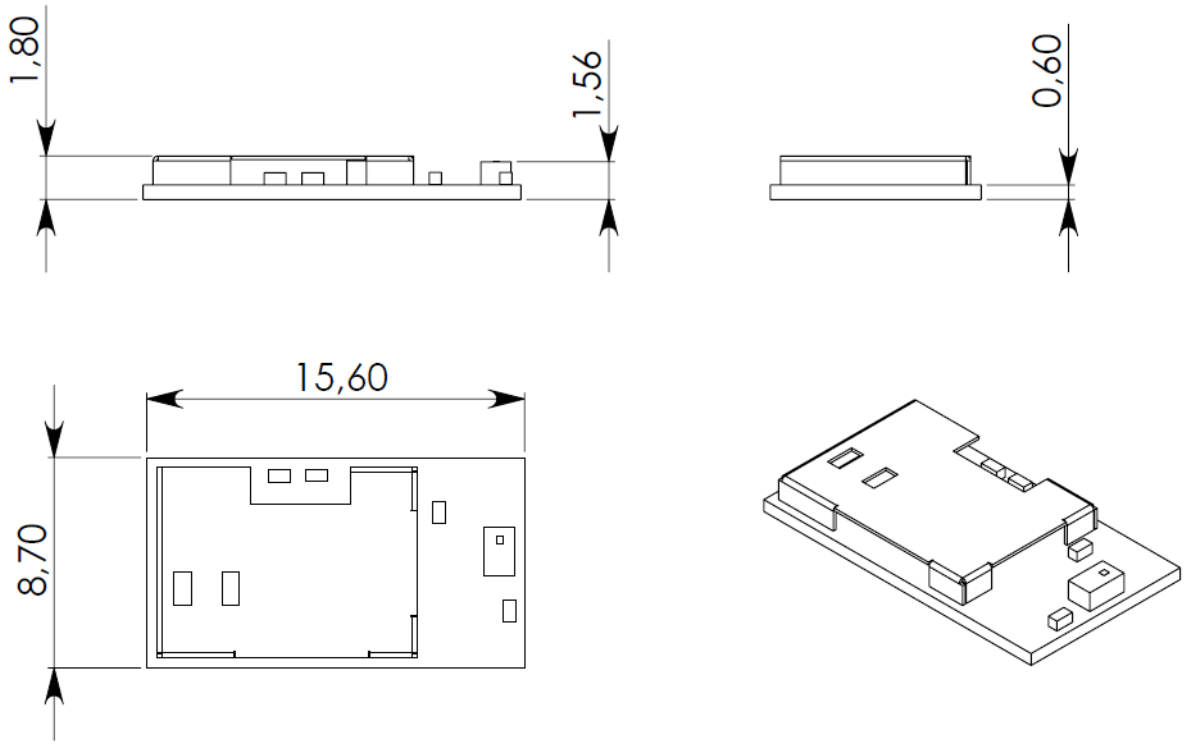
Our used temp. profile for reflow soldering



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

13. PAN1760 MODULE DIMENSION

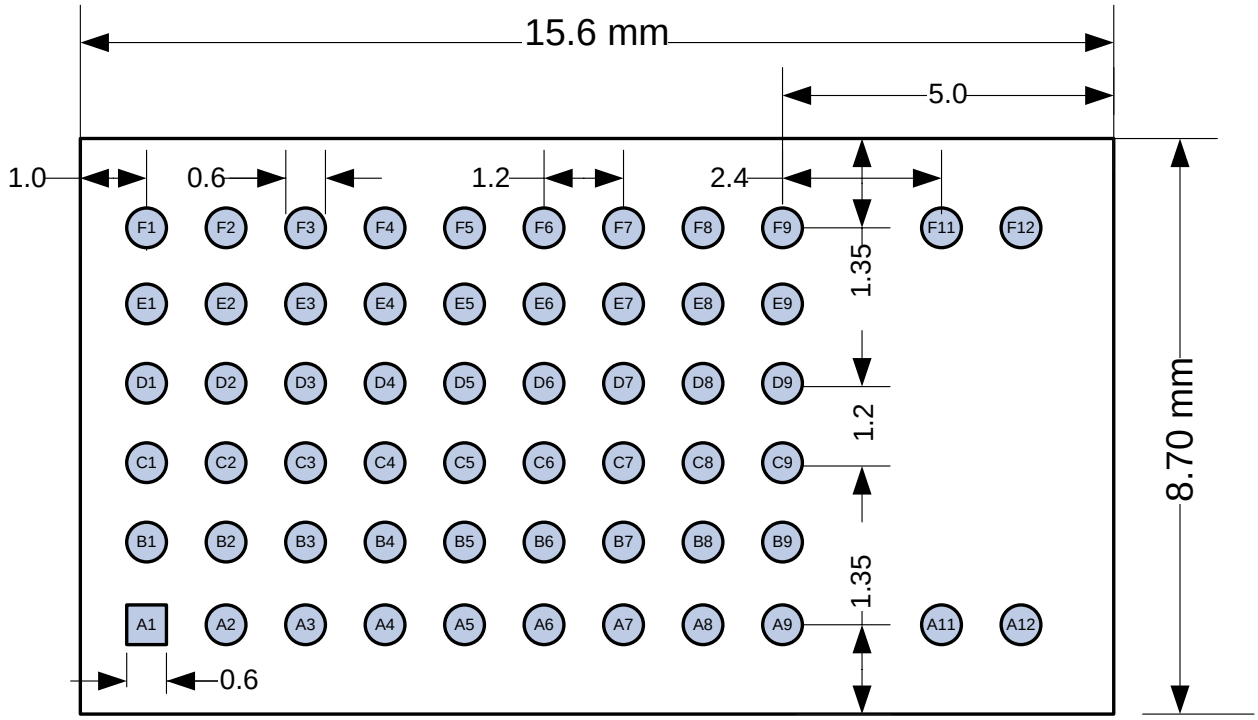
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.30	
2	Length	15.60	± 0.30	
3	Height	1.80	± 0.20	With case



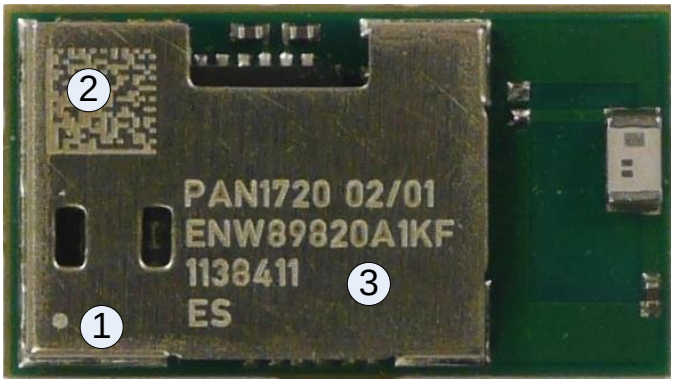
14. PAN1760 FOOTPRINT OF THE MODULE

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			

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 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

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)

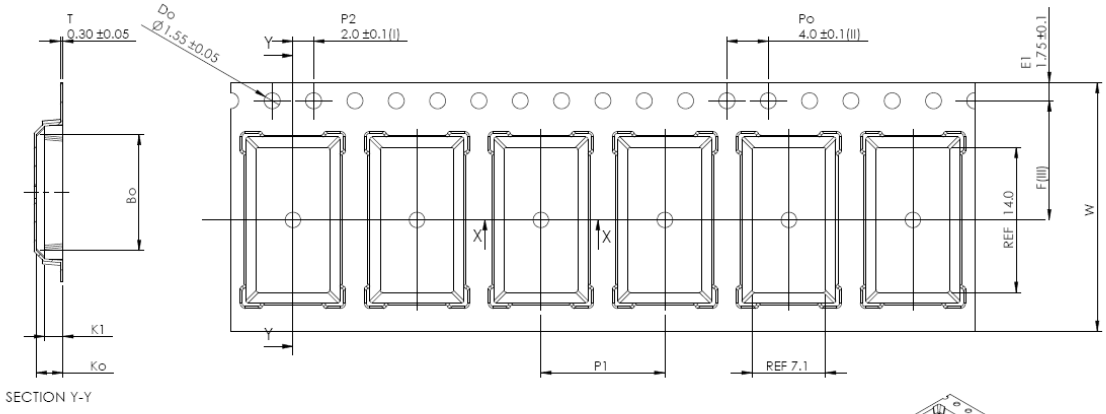
(6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.

(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



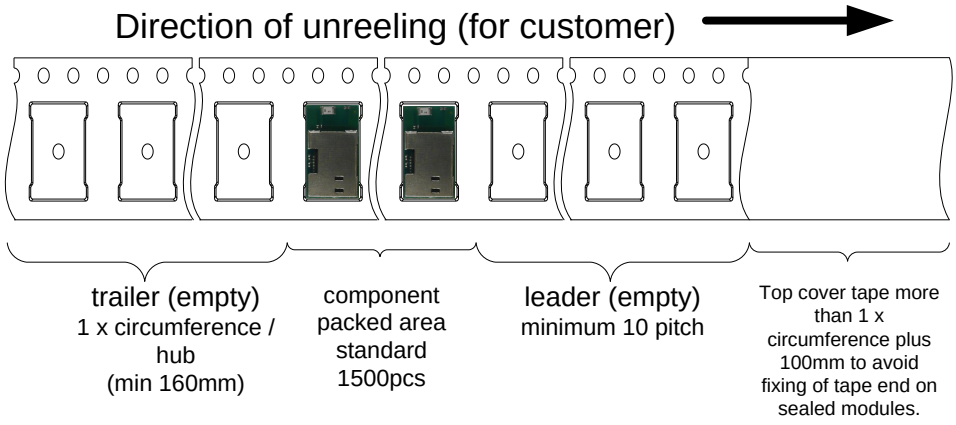
A o	9.10	+/- 0.1
B o	16.00	+/- 0.1
K o	3.20	+/- 0.1
K 1	2.20	+/- 0.1
F	11.50	+/- 0.1
P 1	12.00	+/- 0.1
W	24.00	+/- 0.3

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

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

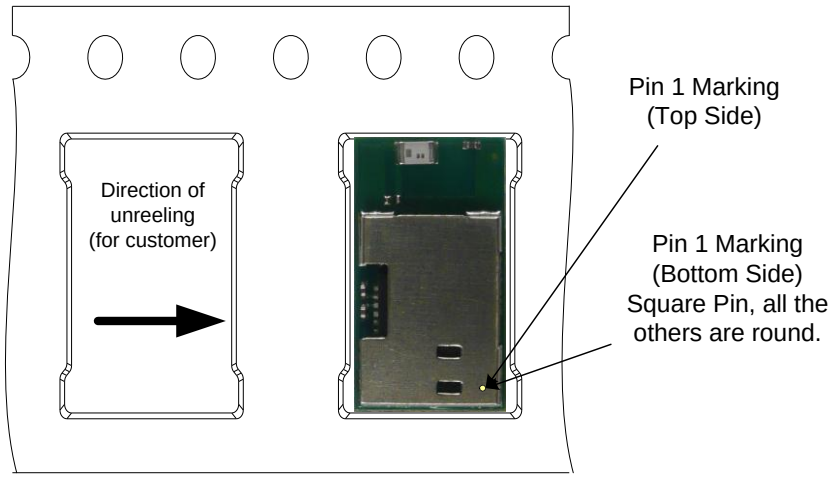
20.2. PACKING IN TAPE



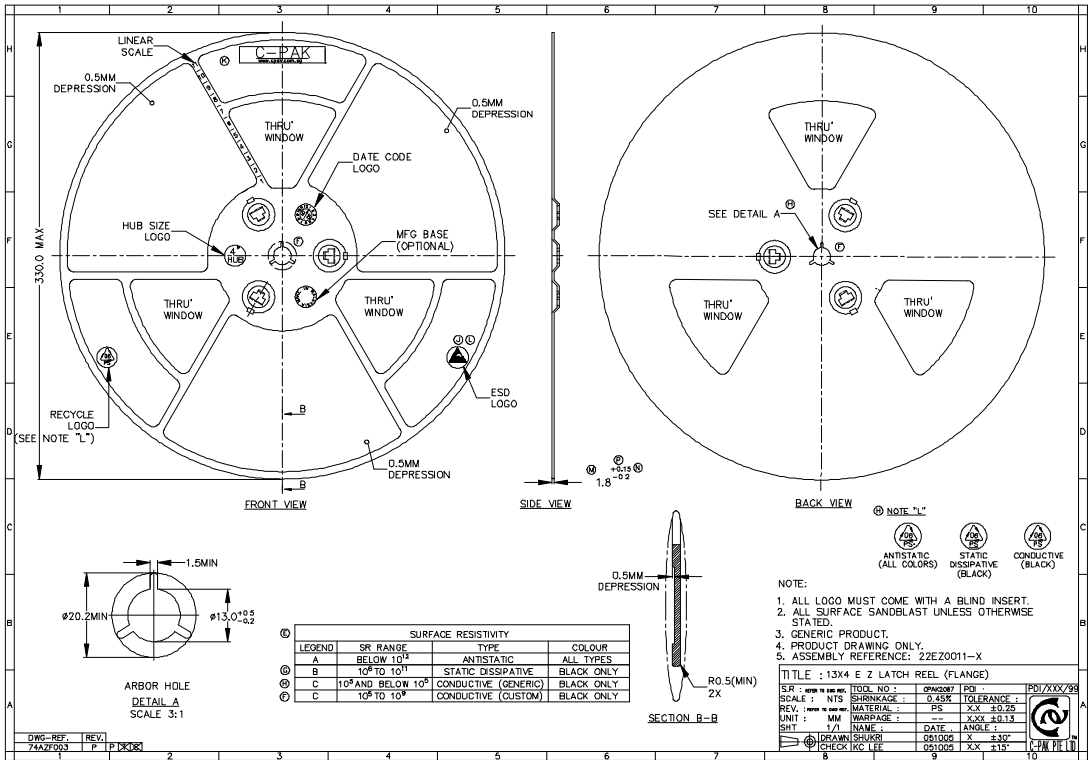
Empty spaces in component packed area shall be less than two per reel and those spaces shall not be consecutive.

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

20.3. COMPONENT DIRECTION



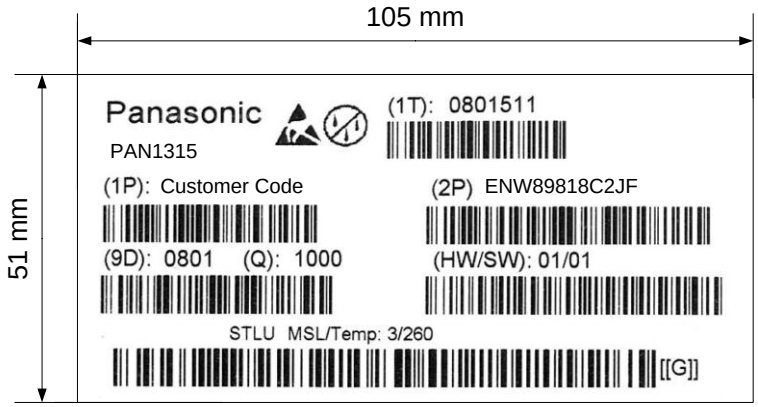
20.4. REEL DIMENSION



LEGEND	SR RANGE	TYPE	COLOUR
A	BELOW 10^{12}	ANTISTATIC	ALL TYPES
B	10^{8} TO 10^{11}	STATIC DISSIPATIVE	BLACK ONLY
C	10^{5} AND BELOW 10^{5}	CONDUCTIVE (GENERIC)	BLACK ONLY
C	10^{5} TO 10^{9}	CONDUCTIVE (CUSTOM)	BLACK ONLY

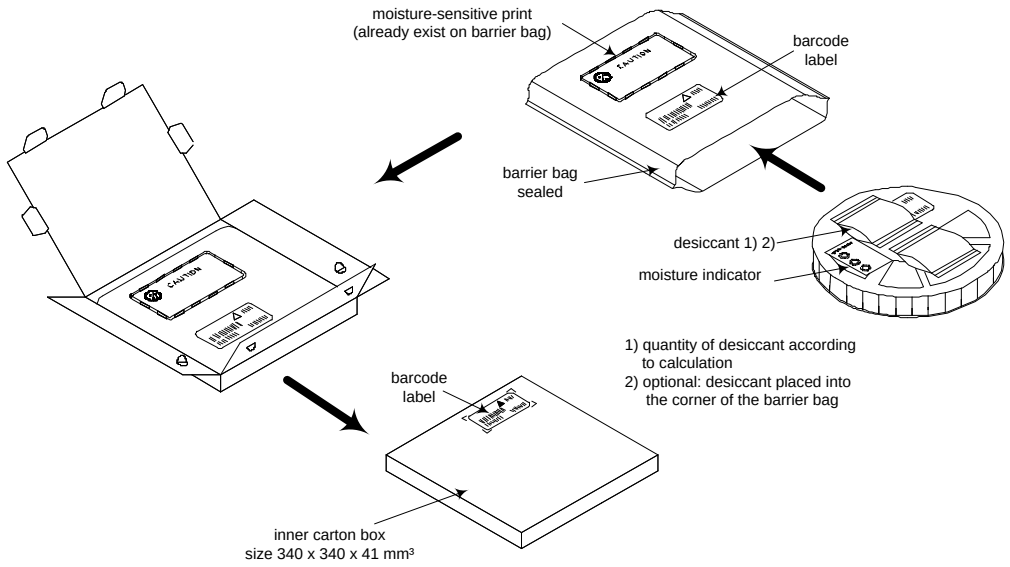
20.5. LABEL FOR PACKAGE

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 (1)
ENW89847A1KF (2)	PAN1760 CLASS 2 Bluetooth single mode Module according BT-4.0. *Bluetooth*® smart 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

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.

Panasonic
Panasonic Industrial Devices Slovakia s.r.o
Oravicka 616, 028 01 TRSTENA

Tel: +421(0)43 5303 200
Fax: +421(0)43 5303 207

Dear Customer, **Date: 20.11.2012**

Panasonic Industrial Devices Slovakia s.r.o., guarantee that:

Directive 1907/2006 (REACH)

Substances from the candidate lists of so called "substances of very high concern" **(SVHC)** published by **ECHA** are regular monitored if SVHC substances are contained in our products above **0.1% (w/w).**
Due to the high complexity of these substance investigations covering all of our global suppliers, this process required some time. We will provide you with all substance information regarding our products base on information collected from our suppliers.

Panasonic Industrial Devices Slovakia s.r.o. hereby declares that all products manufactured and delivered to your company have SVHC substances **< 0.1% (w/w).**

SVHC Substances:

SVHC Candidate list 1	(28/10/2008)	[15 Substances]
SVHC Candidate list 2	(13/01/2010)	[12 Substances]
SVHC Candidate list 2	(30/03/2010)	[1 Substance]
SVHC Candidate list 3	(18/06/2010)	[8 Substances]
SVHC Candidate list 4	(15/12/2010)	[8 Substances]
SVHC Candidate list 5	(20/06/2011)	[7 Substances]
SVHC Candidate list 6	(19/12/2011)	[20 Substances]
SVHC Candidate list 7	(18/06/2012)	[13 Substances]

Directive 2011/65/EC (RoHS)

We confirm that all products supplied to you including package do not contain the following substances which are banned by Directive 2002/95/EC (RoHS) or if contain a maximum concentration of 0.1% by weight in homogeneous materials for:

- **Lead** and lead compounds,
- **Mercury** and mercury compounds,
- **Chromium (VI),**
- **PBB** (polybrominated biphenyl) category, **PBDE** (polybrominated biphenyl ether) category and a maximum concentration of 0.01% by weight in homogeneous materials for:
- **Cadmium** and cadmium compounds.

Wireless Modules (ENW898*series*; ENW596*series*; ENWC9A*series*)

Create:	Kostalikova Alena	Check:	Firmentova Viera	Approval:	Kashiwaya Shinichi
EQ		QA&QC		Managing Director	

For the most updated one, please refer to [3].

23. DATA SHEET STATUS

This data sheet contains the preliminary 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 data sheet before initiating or completing a design.

24. HISTORY FOR THIS DOCUMENT

Revision	Date	Modification / Remarks
0.1	January 2015	1st preliminary version.

25. RELATED DOCUMENTS

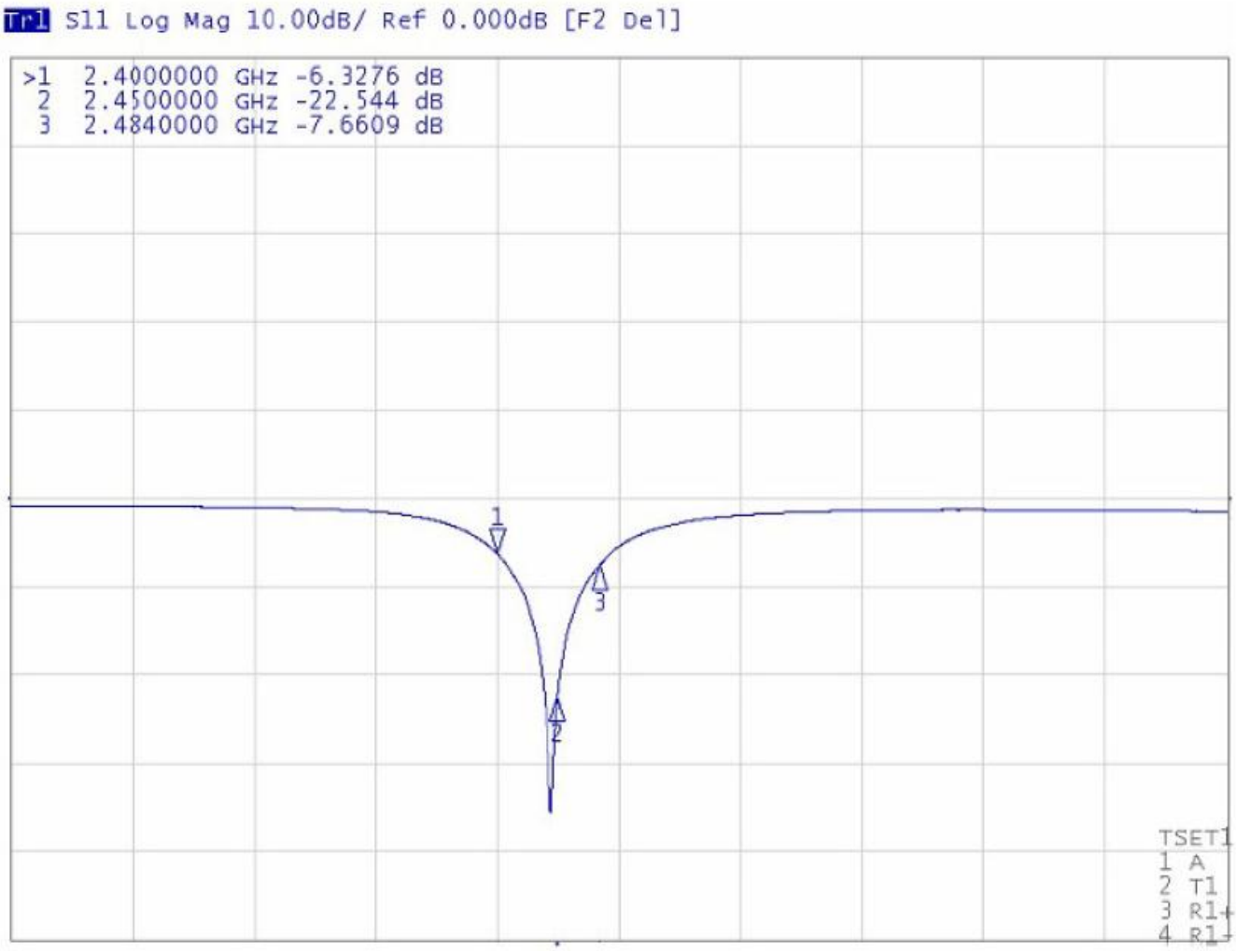
For an update, please search in the suitable homepage.

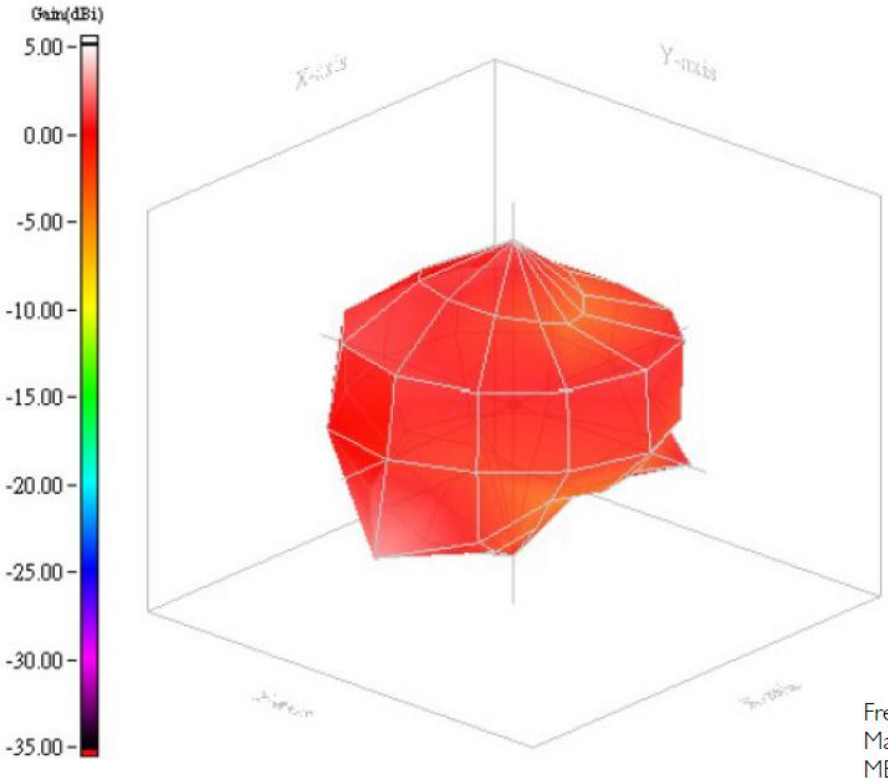
[1] PAN1760ETU Design-Guide
http://www.pideu.panasonic.de

[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

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 Data Sheet.
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 Data Sheet 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 an other 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 labeling 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.

This 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 are 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	+2.72

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 can not 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.

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"

30. BLUETOOTH CERTIFICATION

The Design is listed as Controller Subsystem with QDID:
https://www.bluetooth.org/tpg/EPL_Detail.cfm?ProductID=22941

The module is listed as EPL based on Toshibas QDID.

To create an EPL, two Subsystems e.g. QDID: and QDID: (software stack) need to be combined.

31. EUROPEAN R&TTE DECLARATION OF CONFORMITY

As a result of the conformity assessment procedure described in Annex III of the Directive 1999/5/EC, the end-customer equipment should be labelled as follows:

CE

PAN1760 and their versions in the specified reference design can be used in the following countries: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, The Netherlands, the United Kingdom, Switzerland, and Norway.

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.