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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 / 21

By purchase of any of 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.

TABLE OF CONTENTS

1 SCOPE OF THIS DOCUMENT

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

2 KEY FEATURES

- Bluetooth Classic and Low Energy Dual Mode 4.0
- Surface mount type 15.6 x 8.7 x 1.8 mm³
- Up to 4.0 dBm Tx power (typical) with transmit power control
- High sensitivity (-88 dBm typ.)
- Toshibas TC35661SBG-2xx Bluetooth Dual Mode SPP and GATT profiles inside
- No external components needed
- Fast Connection Setup in BLE mode
- Internal crystal oscillator (26MHz)
- Integrated shielding to resist EMI
- Manufactured in conformance with RoHS

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

3 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 and may consume just a fraction of the power of classic Bluetooth, allowing the short-range wireless standard to extend to coin cell battery applications Dual mode chips 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,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

4 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

5 DESCRIPTION FOR 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.

Available now: Bluetooth 2.1 SPP embedded.

Available Q2/13: Bluetooth 2.1 SPP embedded – Bluetooth 4.0 LE GATT/GAP will be available Q2/2013

All HW versions 05 and above will support Bluetooth 2.1 SPP embedded – Bluetooth 4.0 LE GATT/GAP. See chapter 15 about details for case marking.

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.

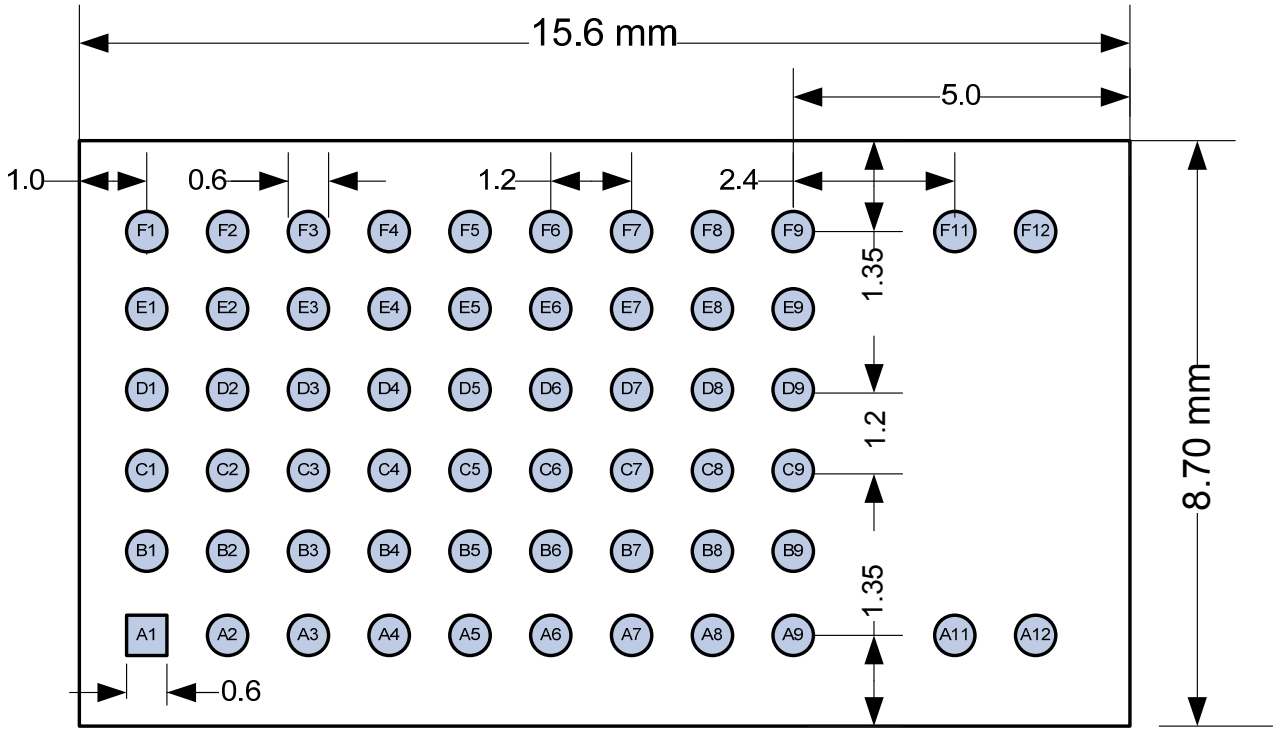
6 DETAILED DESCRIPTION

6.1 PAN1026 TERMINAL LAYOUT

Top view, Application PCB

	Pin	HW Function	After Reset	Input/OutPut (Internal Pull register)	After TCU_MNG_INIT_REQ	Input/OutPut (Internal Pull register)
USB	GPIO0	RequestWakeUp	No function	Input(No Pull up)	RequestWakeUp(Note1)	Input (No pull)
SLEEP	GPIO1	NotifyWakeup	No function	Input(Pull up)	NotifyWakeup (Note1)	OutPut (No pull)
Codec IF	GPIO2	PCMOUT	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO3	PCMIN	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO4	PCMCLK	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO5	FSYNC	Not support	Input(Pull up)	Not support	Input(Pull up)
UART	GPIO6	UART TX	UART TX	OutPut(No pull)	UART TX	OutPut (No pull)
	GPIO7	UART RX	UART RX	Input(No pull)	UART RX	Input (No pull)
	GPIO8	UART RTS	UART RTS	OutPut(No pull)	UART RTS	OutPut (No pull)
	GPIO9	UART CTS	UART CTS	Input(No pull)	UART CTS	Input (No pull)
BT-WiFi CoEx	GPIO10	BtActivity	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO11	BtState	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO12	WlActivity	Not support	Input(Pull up)	Not support	Input(Pull up)
	GPIO13	BtinBand	Not support	Input(Pull up)	Not support	Input(Pull up)
I2C / SPI	GPIO14	I2C CLK / SPI CLK	No function	Input(Pull up)	I2C CLK / SPI CLK (Note2)	OutPut (No pull)
	GPIO15	I2C DATA / SPI DOUT	No function	Input(Pull up)	I2C DATA / SPI DOUT (Note2)	OutPut (No pull)
	GPIO16	SPI DIN	No function	Input(Pull up)	Not support	Input(Pull up)
	GPIO17	SPI CS0X	No function	Input(Pull up)	Not support	Input(Pull up)
	GPIO18	SPI CS1X	No function	Input(Pull up)	Not support	Input(Pull up)

(Note1) M2_BTL_SET_DEEP_SLEEP command control GPIO0 and GPIO1 for sleep function.



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	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		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		Not supported
B3	BTA	GPIO 10		Not supported
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

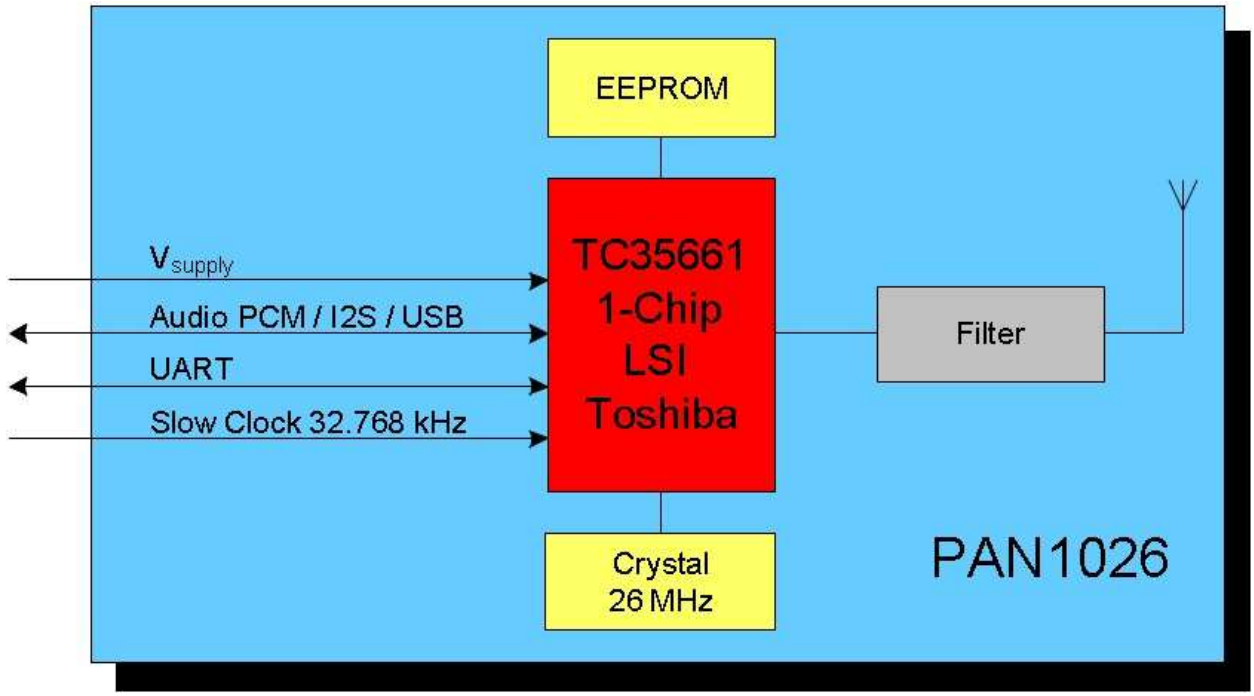
No	Pin Name	GPIO Number	Pin Type	Description
B8	NC		NC	Not connected, leave open
B9	NC		NC	Not connected, leave open
C1	CS0X	GPIO 17		Not supported
C2	BTI	GPIO 13		Not supported
C3	WIA	GPIO 12		Not supported
C4	NC		NC	Not connected, leave open
C5	NC		NC	Not connected, leave open
C6	PCMCLK	GPIO 04	Digital 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		Not supported
D2	DIN	GPIO 16		Not supported
D3	GPIO1	GPIO 01	Digital I/O	Not supported
D4	USB*/GPIO0		Digital I/O	USB direct is not yet supported by the IC and therefore you can use this pin as normal GPIO0. If USB will be supported in the next revision, pin would be → Select USB (Connect to PIN E4) Check also [1]
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)
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 yet supported by the IC and therefore put to GND. If USB will be supported in the next revision, connect to VCC. Check also [1]
E4	USB*			USB direct is not yet supported by the IC and therefore please left open. If USB will be supported in the next revision, pin would be → Select USB (Connect to PIN D4). Check also [1]
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
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 yet supported by the IC and therefore put to GND. If USB will be supported in the next revision, pin would be → USB Data In/Out Check also [1]
F4	USB_M		Digital I/O	USB direct is not yet supported by the IC and therefore put to GND. If USB will be supported in the next revision, pin would be

No	Pin Name	GPIO Number	Pin Type	Description
				→ USB Data In/Out Check also [1]
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

7 BLUETOOTH FEATURES

- Bluetooth 4.0 dual mode technology.
- Class 2 TX power w/o external PA, improving link robustness.
- Excellent link budget (up to 91 dB), enabling long-range applications.
- Embedded SPP- and BLE Gatt profiles

8 BLOCK DIAGRAM



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	1.7	1.8	1.9	V
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 dependant on the user scenario and the setup and timing in the low power modes.

No	Characteristics	Condition	Min	Typ	Max	Unit
1	Idle Current	After reset was pulled down.		7.8		mA
2	During Connection	Sending 3-DH5 packets. Max. output power.		62		mA
3	During Connection	Sending DH5 packets. Max. output power.		62		mA
4	During Connection	Sending DH3 packets. Max. output power.		61		mA
5	During Connection	Sending DH1 packets. Max. output power.		55		mA

11 BLUETOOTH RF PERFORMANCE

11.1 BLUETOOTH CHARACTERISTICS

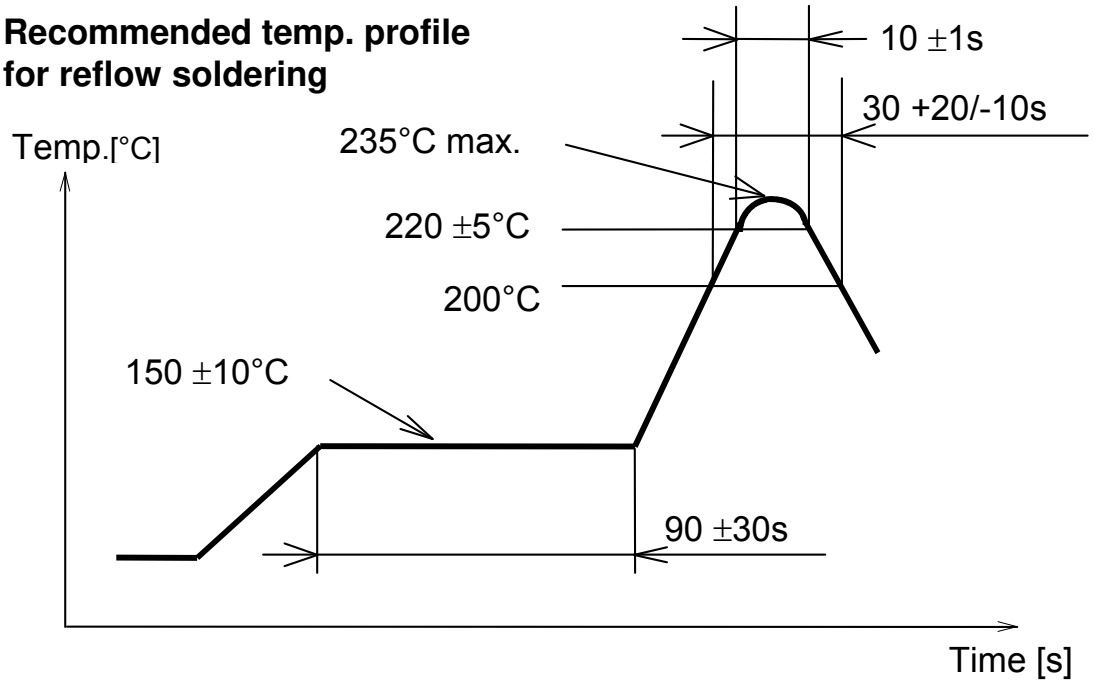
No	Characteristics	Condition	Min	Typ	Max	BT Spec	Unit
1	Operation frequency range		2402		2480		MHz
2	Channel spacing	BT-Classic/BLE		1/2			MHz
3	Output Power	Maximum setting, measured at dual ended 50ohm.		4			dBm
4	Sensitivity			-87			dBm

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)

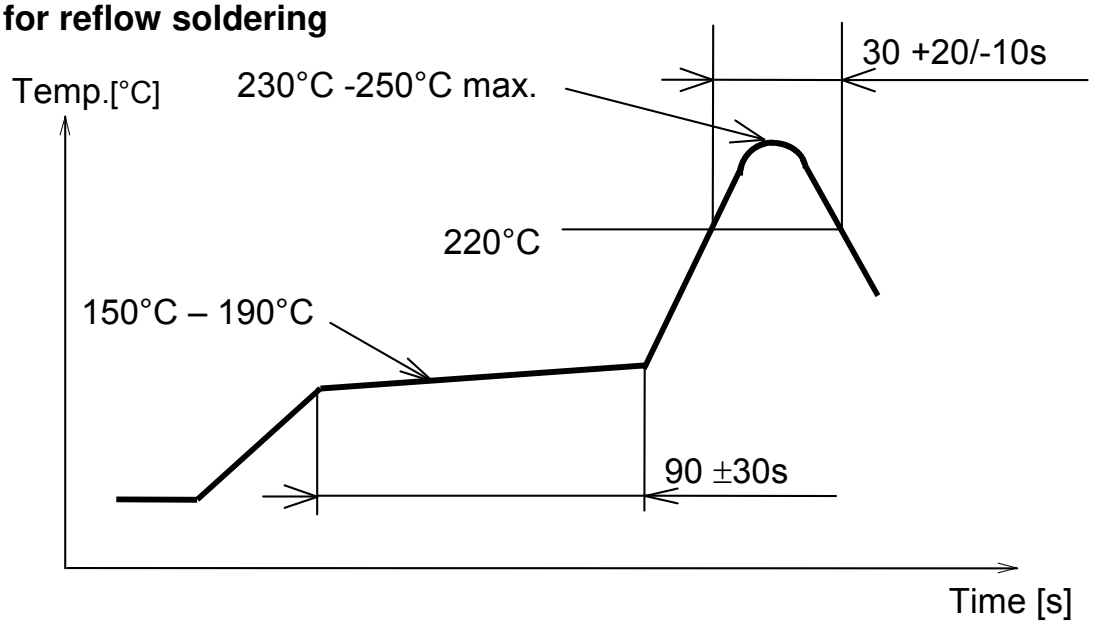
12.1 FOR LEAD SOLDER

Recommended temp. profile for reflow soldering



12.2 FOR LEADFREE SOLDER

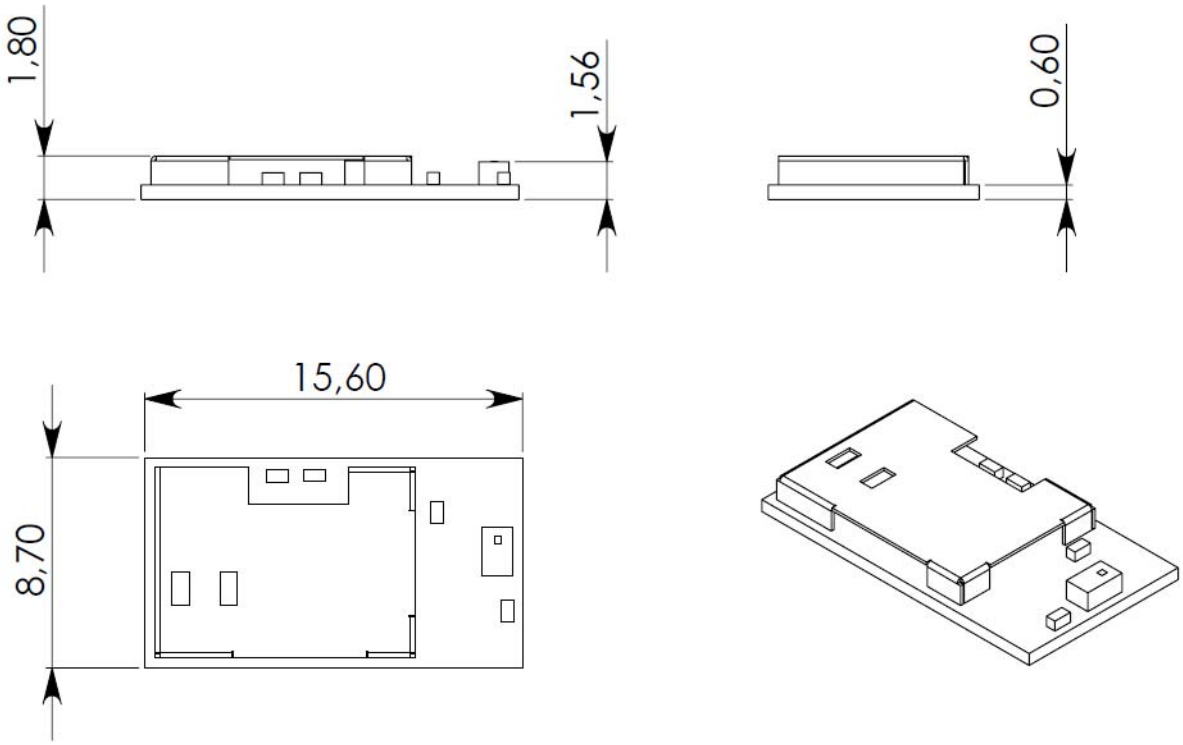
Our used temp. profile for reflow soldering



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

13 MODULE DIMENSION

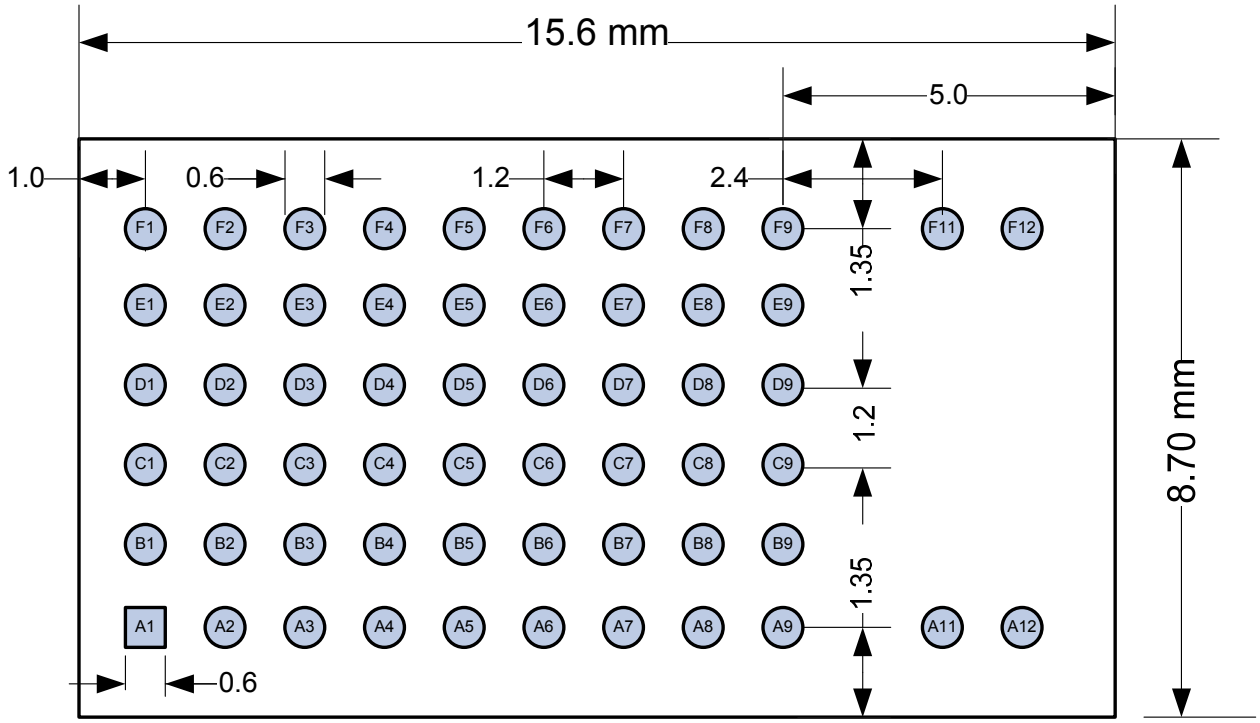
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.20	
2	Length	15.60	± 0.20	
3	Height	1.80	± 0.20	With case



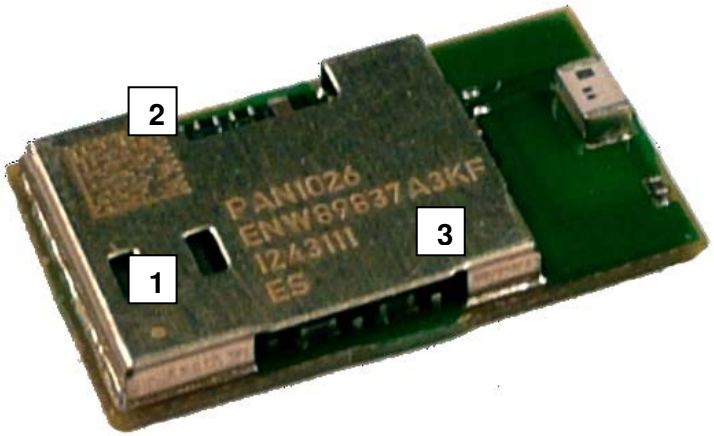
14 PAN1026 FOOTPRINT OF THE MODULE

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)

ENW89837A3KF (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	See chapter 12.2

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 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) 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. 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)

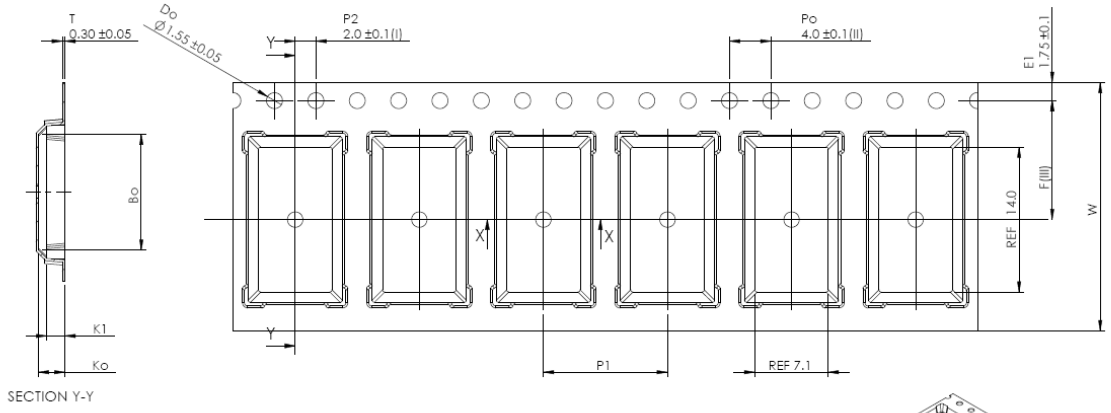
(6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.

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

19 PACKAGING

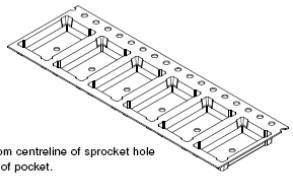
If the product has mass production status, indicated in chapter 25, we will deliver the module in the package which are described below.

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

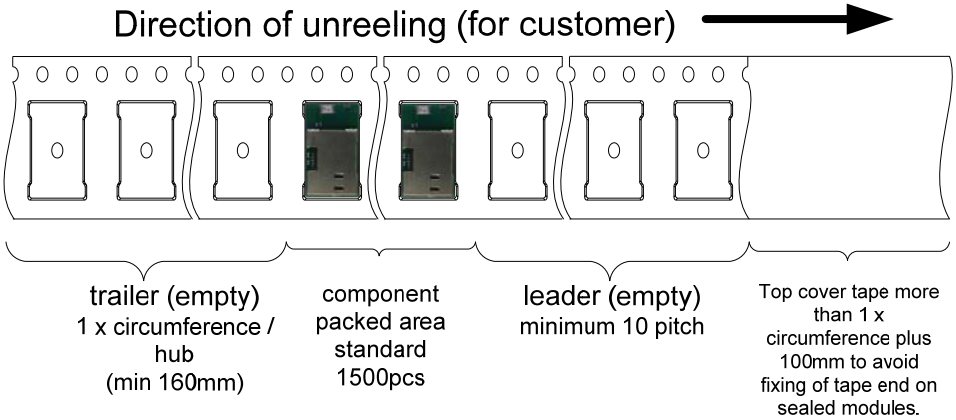
Forming format : Flatbed
Estimated max. length : 64 meter/22B3 reel



(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.

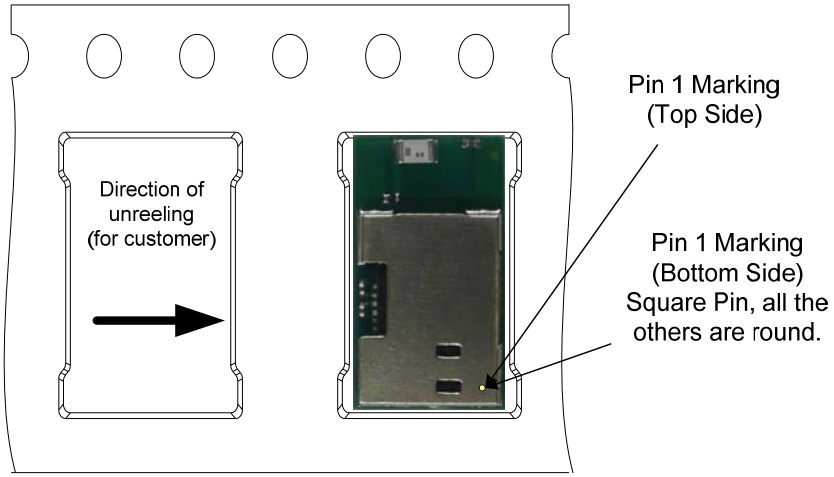
19.2 PACKING IN TAPE



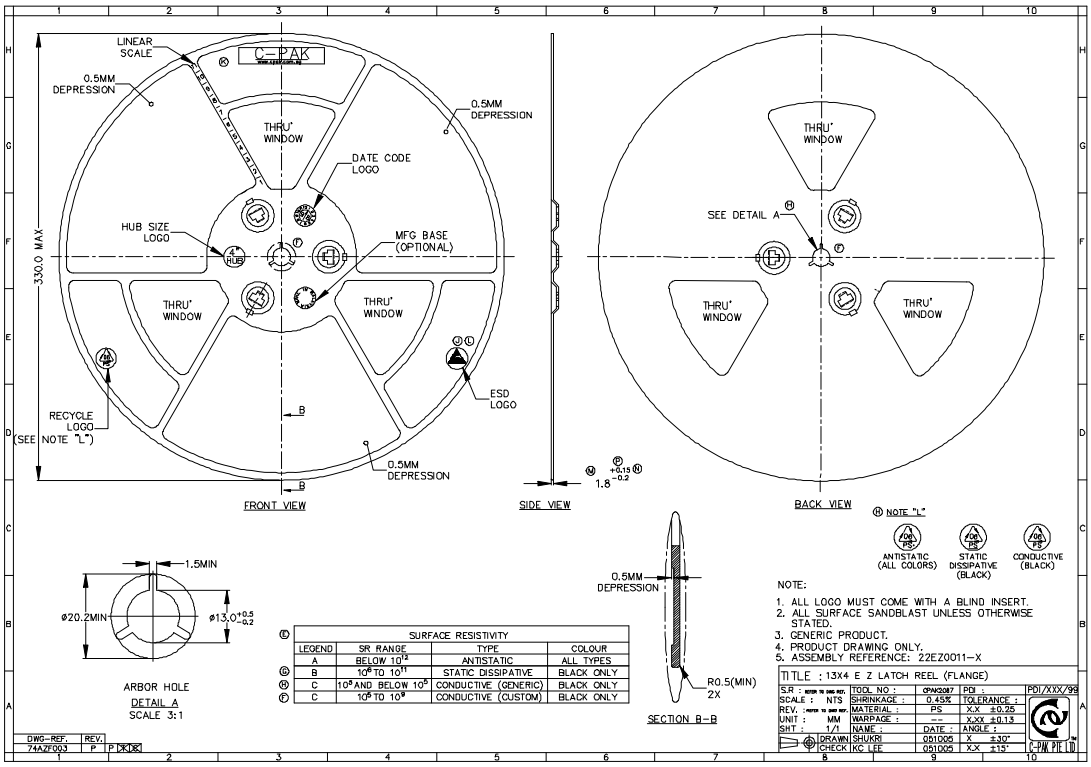
Empty spaces in component packed area shall be less than two per reel and those spaces shall not be consecutive.

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

19.3 COMPONENT DIRECTION



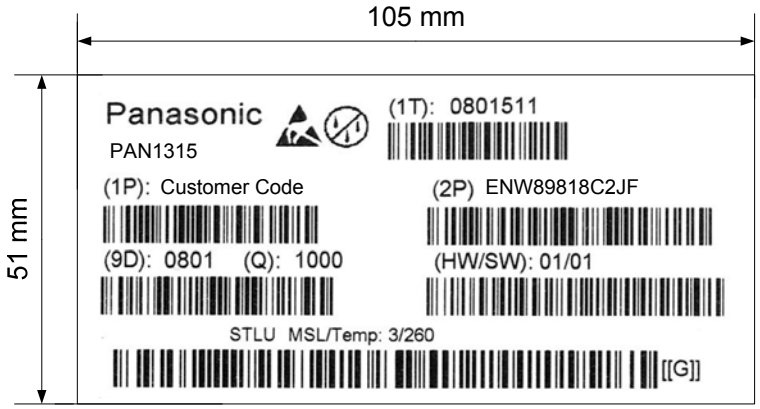
19.4 REEL DIMENSION



LEGEND	SR RANGE	TYPE	COLOUR
A	BELOW 10^{2}	ANTISTATIC	ALL TYPES
B	10^{6} TO 10^{11}	STATIC DISSIPATIVE	BLACK ONLY
C	10^{5} AND BELOW 10^{6}	CONDUCTIVE (GENERIC)	BLACK ONLY
C	10^{6} TO 10^{9}	CONDUCTIVE (CUSTOM)	BLACK ONLY

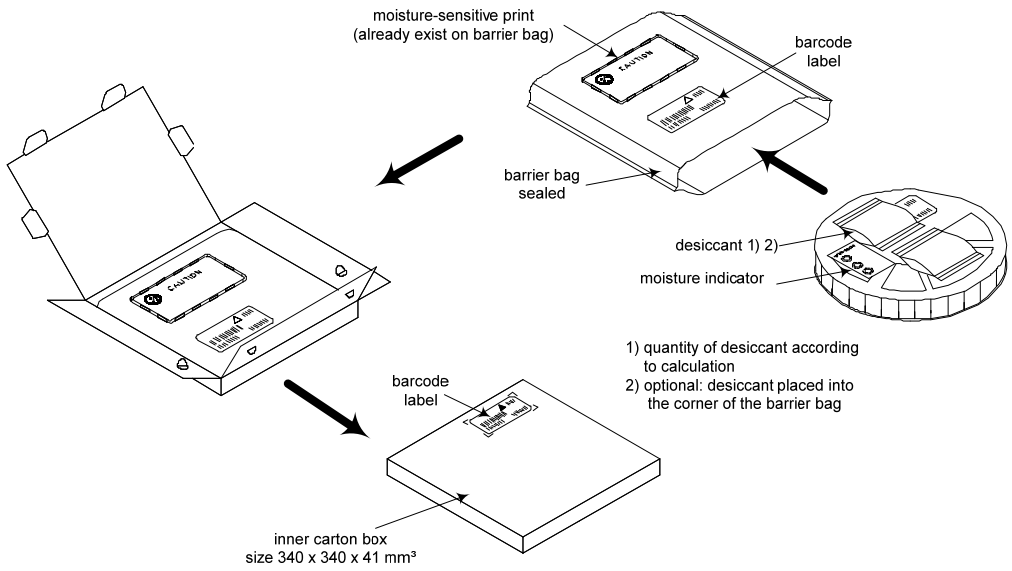
19.5 LABEL FOR PACKAGE

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: ENW89837A3KF			
(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. *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

Available now: Bluetooth 2.1 SPP embedded.

Available Q2/13: Bluetooth 2.1 SPP embedded – Bluetooth 4.0 LE GATT/GAP will be available Q2/2013

All HW versions 05 and above will support Bluetooth 2.1 SPP embedded – Bluetooth 4.0 LE GATT/GAP.
See chapter 15 about details for case marking.

21 INFORMATION REGARDING SOFTWARE VERSIONS

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.