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CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	1 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

Product Specification

Applicant / Manufacturer Panasonic Industrial Devices Europe GmbH
Hardware Zeppelinstrasse 19
 21337 Lüneburg
 Germany

Applicant / Manufacturer Please refer to chapter 24 / 24.1 Information regarding
Software Software Versions

Software Version Please refer to chapter 24 / 24.1 Information regarding
 Software Versions

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Power Electronics R&D Center Wireless Connectivity Panasonic Industrial Devices Europe GmbH	APPROVED genehmigt	CHECKED geprüft	DESIGNED erstellt
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CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	2 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

TABLE OF CONTENTS

1.	Scope of this Document	4
2.	Difference PAN1720 / PAN1721	4
3.	Difference PAN172x / PAN171x	4
4.	Key Features	4
	Bluetooth Low Energy	5
5.	Applications for the Module	5
6.	Description for the Module	5
7.	Detailed Description	6
	7.1. PAN172x Terminal Layout	6
	7.2. Crossreference GPIO PAN-Module to BlueRadios-Module	8
8.	Bluetooth Features	9
9.	PAN172x Block Diagram	9
10.	Test Conditions	10
11.	General Device Requirements and Operation	10
	11.1. Absolute Maximum Ratings	10
	11.2. Recommended Operating Conditions	10
	11.3. PAN1720 Current Consumption	11
12.	Bluetooth RF Performance	12
	12.1. PAN1720 Bluetooth Characteristics	12
	12.2. PAN1721 Bluetooth Characteristics	12
	12.3. PAN17XX Spurious Emission	12
13.	Soldering Temperature-Time Profile (for reflow soldering)	13
	13.1. For lead solder	13
	13.2. For leadfree solder	13
14.	PAN172x Module Dimension	14
15.	PAN171x Module Dimension	15
16.	PAN172x FootPrint of the Module	16
17.	PAN171x FootPrint of the Module	17
18.	Case Marking	18
	18.1. Example for Marking	18
	18.2. Marking Definition	18
19.	Mechanical Requirements	18
20.	Development of Applications	19
21.	Reliability Tests	19
22.	Cautions	19
	22.1. Design Notes	19
	22.2. Installation Notes	20
	22.3. Usage Conditions Notes	20
	22.4. Storage Notes	21

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	3 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

22.5. Safety Cautions.....	21
22.6. Other cautions.....	21
23. Packaging	23
23.1. PAN172x Tape Dimension	23
23.2. PAN171x Tape Dimension	24
23.3. Packing in Tape	25
23.4. Component Direction	25
23.5. Reel Dimension.....	26
23.6. Label for Package	27
23.7. Total Package	27
24. Ordering Information	28
24.1. Information regarding Software Versions	28
25. RoHS and REACH Declaration	29
26. Data Sheet Status	30
27. History for this Document	30
28. Related Documents.....	31
29. Radiation Pattern of Antenna	32
30. General Information.....	33
31. Regulatory Information	33
31.1. FCC Notice	33
31.2. Caution	33
31.3. Labeling Requirements	34
31.4. Antenna Warning	34
31.5. Approved Antenna List.....	34
31.6. RF Exposure PAN17xx	34
32. Industry Canada Certification	35
32.1. IC Notice	35
32.2. Labeling Requirements	35
33. Bluetooth Certification	35
34. European R&TTE Declaration of Conformity	36
35. Life Support Policy	37

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	4 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

1. SCOPE OF THIS DOCUMENT

This product specification applies to Panasonic's, Class 2, Bluetooth¹ low energy single mode module, series number: PAN1720 ([CC2540 from Texas Instruments](#)) and PAN1721 ([CC2541 from Texas Instruments](#)).

2. DIFFERENCE PAN1720 / PAN1721

Both the PAN1720 and PAN1721 are referred to as the PAN172x in this document.

The PAN1721 is pin-compatible with the PAN1720, with the exception that USB is the hardware communication interface on the PAN1720 and I2C is the hardware communication interface on the PAN1721. Compared to the PAN1720, the PAN1721 provides lower RF current consumption. The PAN1721 does not have the USB interface found on the PAN1720, and provides lower maximum output power in TX mode.

Additional details, which have an impact on the module can be found in the datasheets from Texas Instruments.

[CC2540 from Texas Instruments](#)

[CC2541 from Texas Instruments](#)

Both ICs the CC2540 as well as the CC2541 come with an internal 256 KB flash memory.

3. DIFFERENCE PAN172X / PAN171X

The PAN171x are the non antenna version where the PAN172x are the versions with antenna.

4. KEY FEATURES

- Bluetooth Low Energy Single 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
- CC2541 has typically 0dBm Tx power
- High sensitivity (-94 dBm typ.)
- Texas Instrument's CC2540/CC2541 Single Chip BLE Solution inside
- High performance low power 8051 Microcontroller core
- No external components needed
- Fast Connection Setup
- Internal crystal oscillator (32MHz)
- Internal 32khz crystal oscillator for Sleep Timer
- Two powerful USARTs
- UART, USB or I2C interface
- Powerful five channel DMA
- Latest Profiles included e.g. Battery Monitor and Temperature sensor
- Integrated shielding to resist EMI
- Manufactured in conformance with RoHS

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

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	5 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

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.



5. 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

6. DESCRIPTION FOR THE MODULE

The PAN172x 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 9.

The PAN172x 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 PAN172x combines an excellent RF transceiver with an industry-standard enhanced 8051 MCU, in-system programmable flash memory, 8-KB RAM, and many other powerful supporting features and peripherals. The PAN172x 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 Texas Instruments and BlueRadios. The Bluetooth low energy protocol stack from Texas Instruments, is a flexible and cost-effective single-mode Bluetooth low energy solution.

The BlueRadios stack enables rapid and low cost development using an AT command set without the need for a compiler. Additional advantages include UART programming, over-the-air-updates, easy integration "C" library framework, serial streaming of data, and smart phone libraries and applications.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	6 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

Refer to [1] PAN172xETU Design-Guide and chapter 24 Ordering Information.

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

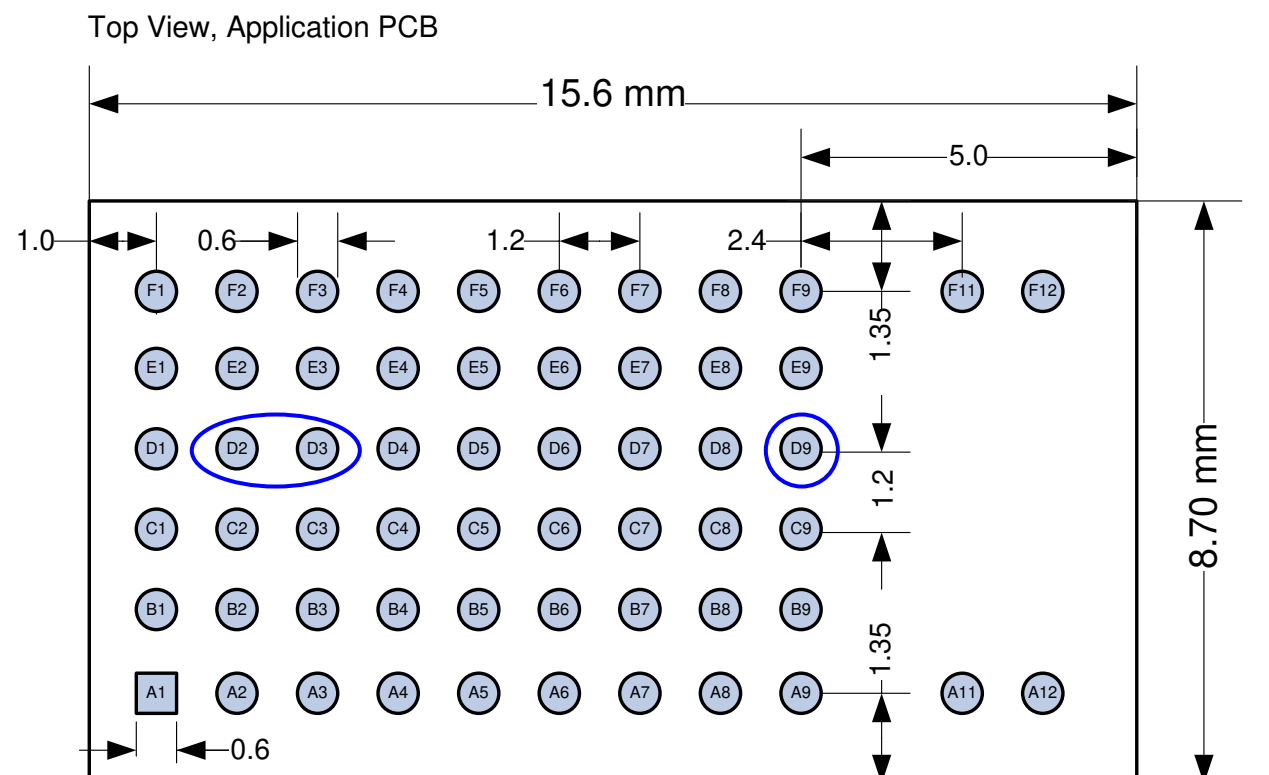
or write an e-mail to wireless@eu.panasonic.com.

7. DETAILED DESCRIPTION

7.1. PAN172X TERMINAL LAYOUT

PAN17x1 I2C pins are marked with a blue circle.

PAN171x antenna pin is marked with a blue circle.



CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	7 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

No	Pin Name	Pin Type	Description
A1	GND	Ground Pin	Connect to Ground
A2	P1.0	Digital I/O	Port 1.0 – 20mA drive capability
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	P1.3	Digital I/O	Port 1.3
B2	P1.2	Digital I/O	Port 1.2
B3	P1.1	Digital I/O	Port 1.1 – 20mA drive capability
B4	P0.6	Digital I/O	Port 0.6
B5	NC		Not Connected
B6	P0.1	Digital I/O	Port 0.1
B7	P0.0	Digital I/O	Port 0.0
B8	NC		Not Connected
B9	NC		Not Connected
C1	NC		Not Connected
C2	P1.4	Digital I/O	Port 1.4 / BR-SW UART CTS
C3	P1.5	Digital I/O	Port 1.5 / BR-SW UART RTS
C4	P0.7	Digital I/O	Port 0.7
C5	NC		Not Connected
C6	NC		Not Connected
C7	NC		Not Connected
C8	GND	Ground Pin	Connect to Ground
C9	GND	Ground Pin	Connect to Ground
D1	DVDD_USB	Power (digital)	2V – 3.6V digital power supply connection
D2	USB_N	Digital I/O	USB N / PAN17x1 I2C SDA // Leave floating if not used.
D3	USB_P	Digital I/O	USB P / PAN17x1 I2C SCL // Leave floating if not used.
D4	NC		Not Connected
D5	NC		Not Connected
D6	NC		Not Connected
D7	GND	Ground Pin	Connect to Ground
D8	GND	Ground Pin	Connect to Ground
D9	NC/RF		PAN172x Not Connected/50 ohm RF_Out PAN171x
E1	P2.1/DD	Digital I/O	Port 2.1 / Programming Interface DD
E2	P2.2/DC	Digital I/O	Port 2.2 / Programming Interface DC
E3	DGND_USB	Ground Pin	Connect to Ground
E4	NC		Not Connected
E5	NC		Not Connected
E6	P0.2/RX/MISO	Digital I/O	Port 0.2 / TI-SW UART RX / SPI MISO
E7	NC		Not Connected
E8	GND	Ground Pin	Connect to Ground
E9	GND	Ground Pin	Connect to Ground
F1	GND	Ground Pin	Connect to Ground
F2	P1.6	Digital I/O	Port 1.6 / BR-SW UART TX
F3	P1.7	Digital I/O	Port 1.7 / BR-SW UART RX
F4	P2.0	Digital I/O	Port 2.0
F5	P0.4/CTS/CS	Digital I/O	Port 0.4 / TI-SW UART CTS / SPI CS
F6	NC		Not Connected
F7	P0.3/TX/MOSI	Digital I/O	Port 0.3 / TI-SW UART TX /SPI MOSI
F8	P0.5/RTS/CLK	Digital I/O	Port 0.5 / TI-SW UART RTS /SPI CLK
F9	GND	Ground Pin	Connect to Ground
F11	GND	Ground Pin	Connect to Ground
F12	GND	Ground Pin	Connect to Ground

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	8 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

7.2. CROSSREFERENCE GPIO PAN-MODULE TO BLUERADIOS-MODULE

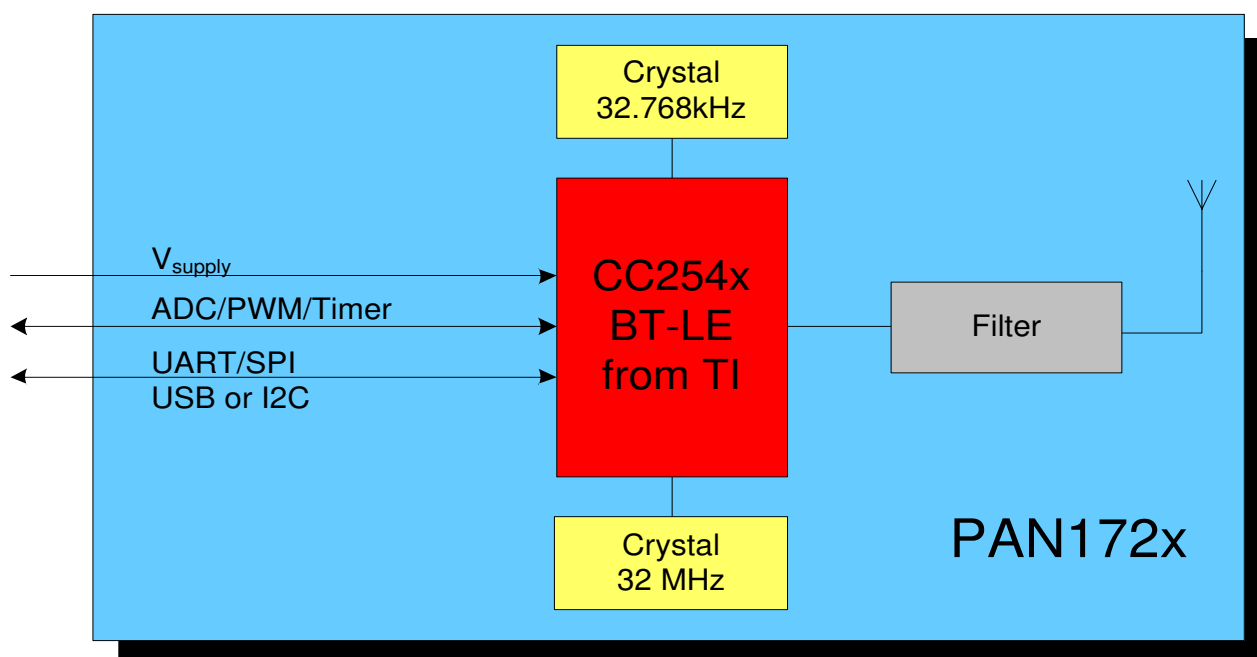
PAN17xx-BR		BlueRadios	
No	Pin Name	No	Pin Name
B7	P0.0	21	ADC_0
B6	P0.1	4	ADC_1
E6	P0.2 / MISO	5	SPI_MISO
F7	P0.3 / MOSI	8	SPI_MOSI
F5	P0.4 / CS	6	SPI_CSB
F8	P0.5 / CLK	7	SPI_CLK
B4	P0.6	26	PIO_3
C4	P0.7	25	PIO_6
A2	P1.0 GPIO	23	PIO_2
B3	P1.1 GPIO	24	PIO_5
B2	P1.2 GPIO	27	PIO_8
B1	P1.3 GPIO	22	PIO_9
C2	P1.4 / UART CTS	11	UART_CTS
C3	P1.5 / UART RTS	12	UART_RTS
F2	P1.6 GPIO / UART TXD	13	UART_TX
F3	P1.7 GPIO / UART RXD	14	UART_RX
F4	P2.0 GPIO	19	PIO_14
E1	P2.1 / DD	28	PIO_4
E2	P2.2 / DC	29	PIO_7

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	9 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

8. BLUETOOTH FEATURES

- Bluetooth 4.0 single mode low energy technology.
- Class 2 TX power w/o external PA, improving link robustness.
- Excellent link budget (up to 96 dB), enabling long-range applications.
- Accurate digital received signal-strength indicator (RSSI)
- Integrates the new low power profiles and services
- Embedded BT-Stack available

9. PAN172X BLOCK DIAGRAM



CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	10 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

10. 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

11. GENERAL DEVICE REQUIREMENTS AND OPERATION

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

11.1. 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

11.2. 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.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	11 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

11.3. PAN1720 CURRENT CONSUMPTION

The current consumption is dependant 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.

Please refer for the latest information for different power modes to the chapter "Electrical Characteristics" in Texas Instruments datasheet, refer to [2]. As indication below are typical values from CC2540 datasheet.

For PAN1721 refer to CC2541 datasheet.

ELECTRICAL CHARACTERISTICS

Measured on Texas Instruments CC2540 EM reference design with $T_A = 25^\circ\text{C}$ and $V_{DD} = 3\text{ V}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{core} Core current consumption	Power mode 1. Digital regulator on; 16-MHz RCOSC and 32-MHz crystal oscillator off; 32.768-kHz XOSC, POR, BOD and sleep timer active; RAM and register retention		235		μA
	Power mode 2. Digital regulator off; 16-MHz RCOSC and 32-MHz crystal oscillator off; 32.768-kHz XOSC, POR, and sleep timer active; RAM and register retention		0.9		
	Power mode 3. Digital regulator off; no clocks; POR active; RAM and register retention		0.4		
	Low MCU activity: 32-MHz XOSC running. No radio or peripherals. No flash access, no RAM access.		6.7		mA
I_{peri} Peripheral current consumption (Adds to core current I_{core} for each peripheral unit activated)	Timer 1. Timer running, 32-MHz XOSC used		90		μA
	Timer 2. Timer running, 32-MHz XOSC used		90		μA
	Timer 3. Timer running, 32-MHz XOSC used		60		μA
	Timer 4. Timer running, 32-MHz XOSC used		70		μA
	Sleep timer, including 32.753-kHz RCOSC		0.6		μA
	ADC, when converting		1.2		mA

GENERAL CHARACTERISTICS

Measured on Texas Instruments CC2540 EM reference design with $T_A = 25^\circ\text{C}$ and $V_{DD} = 3\text{ V}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
WAKE-UP AND TIMING					
Power mode 1 → Active	Digital regulator on, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of 16-MHz RCOSC		4		μs
Power mode 2 or 3 → Active	Digital regulator off, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of regulator and 16-MHz RCOSC		120		μs
Active → TX or RX	Crystal ESR = 16 Ω . Initially running on 16-MHz RCOSC, with 32-MHz XOSC OFF		410		μs
	With 32-MHz XOSC initially on		160		μs
RX/TX turnaround			150		μs
RADIO PART					
RF frequency range	Programmable in 2-MHz steps	2402		2480	MHz
Data rate and modulation format	1 Mbps, GFSK, 250 kHz deviation				

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	12 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

12. BLUETOOTH RF PERFORMANCE

12.1. PAN1720 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	

12.2. PAN1721 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.		0			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	

12.3. PAN17XX SPURIOUS EMISSION

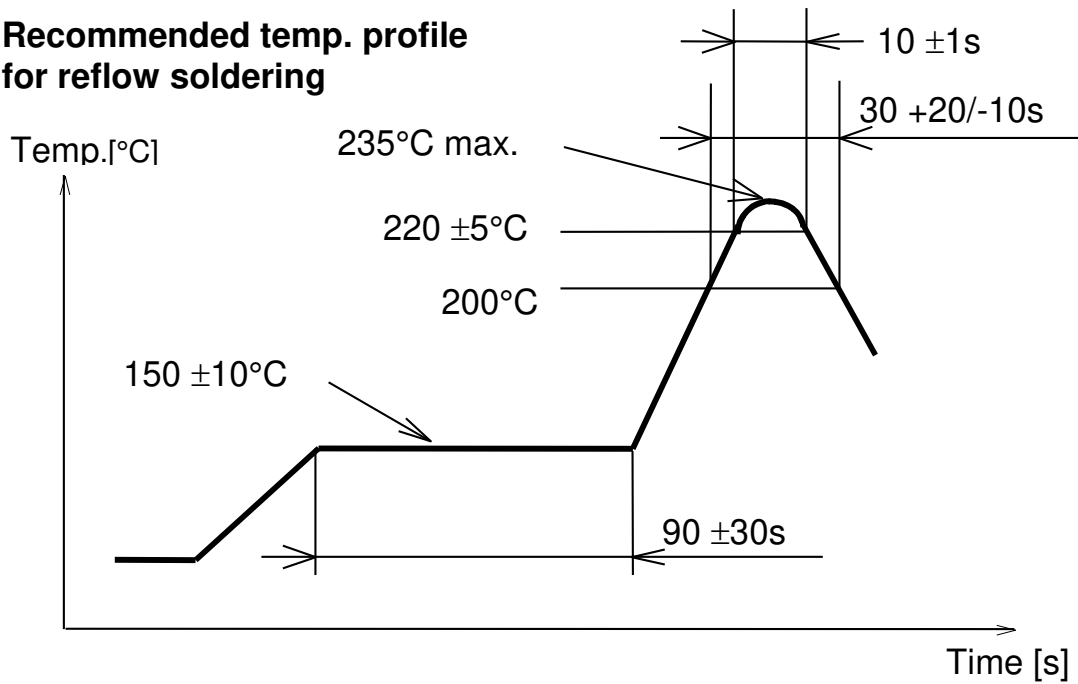
No	Characteristics	Condition	Typ	Max	Unit
1	Spurious emissions	Conducted measurement with a 50-Ω single-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66		-41	dBm

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	13 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

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

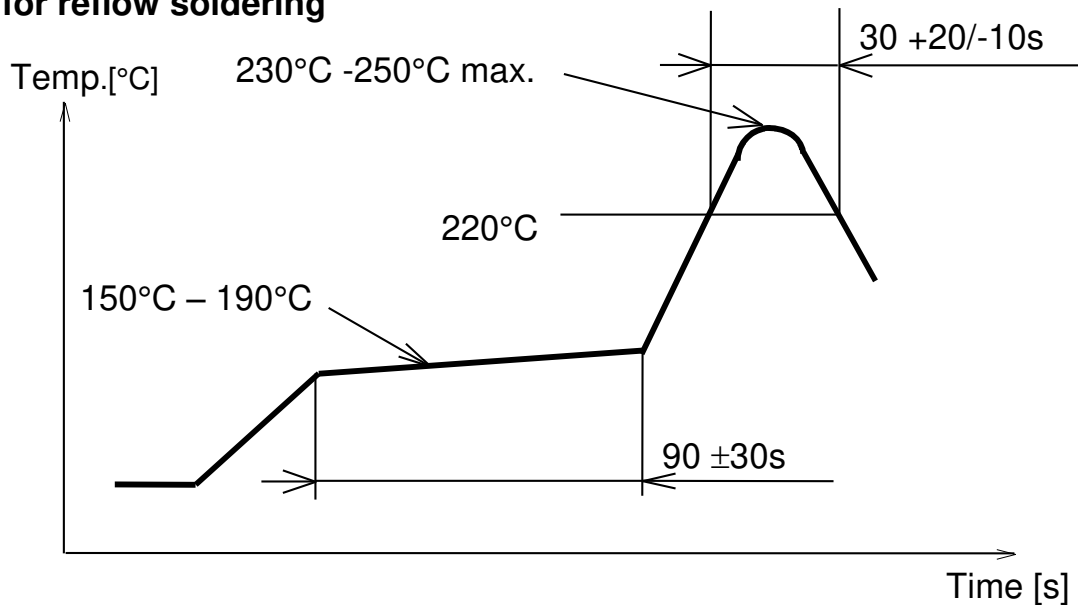
13.1. FOR LEAD SOLDER

Recommended temp. profile for reflow soldering



13.2. FOR LEADFREE SOLDER

Our used temp. profile for reflow soldering

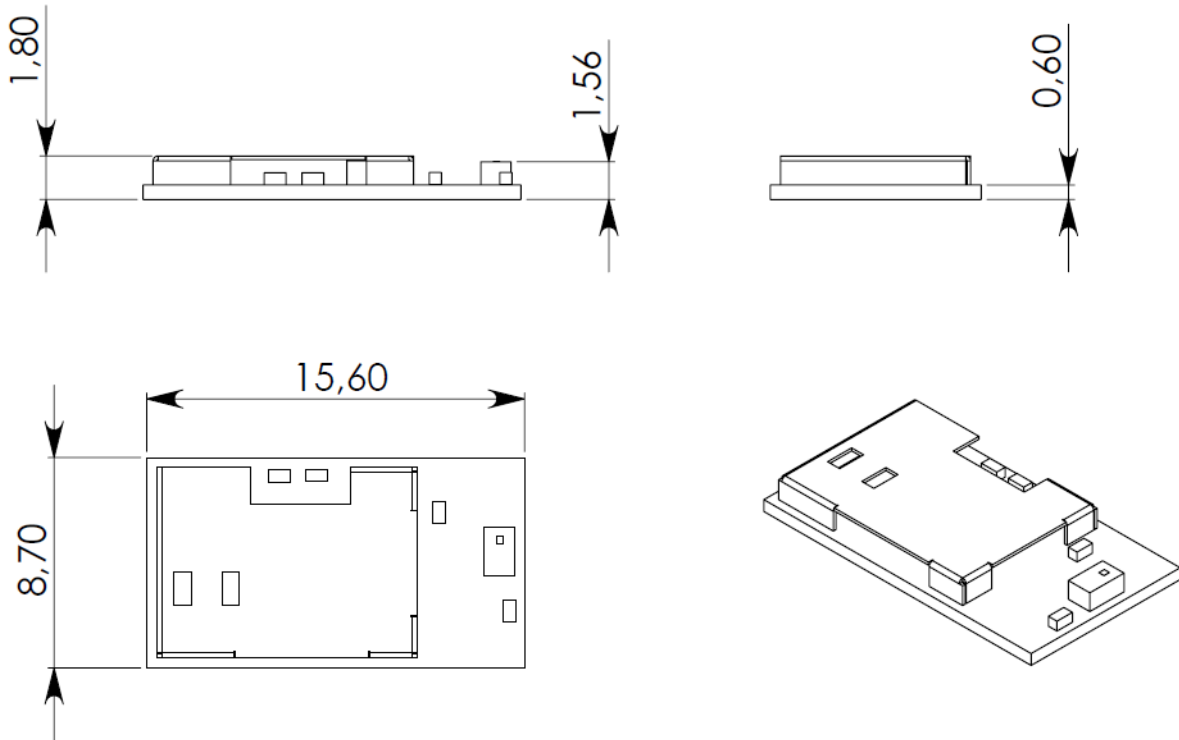


Reflow permissible cycle: 2
 Opposite side reflow is prohibited due to module weight.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	14 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

14. PAN172X MODULE DIMENSION

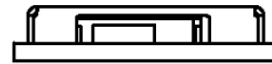
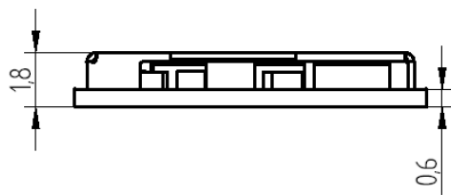
No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.20	
2	Length	15.60	± 0.20	
3	Height	1.80	± 0.20	With case



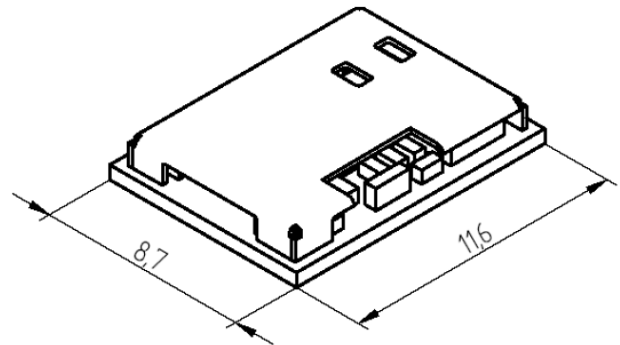
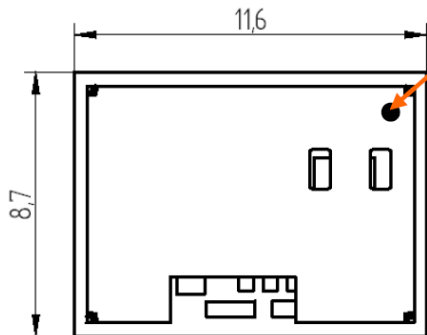
CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	15 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

15. PAN171X MODULE DIMENSION

No.	Item	Dimension	Tolerance	Remark
1	Width	8.70	± 0.20	
2	Length	11.60	± 0.20	
3	Height	1.80	± 0.20	With case



First Pin marking
(made by Laser)



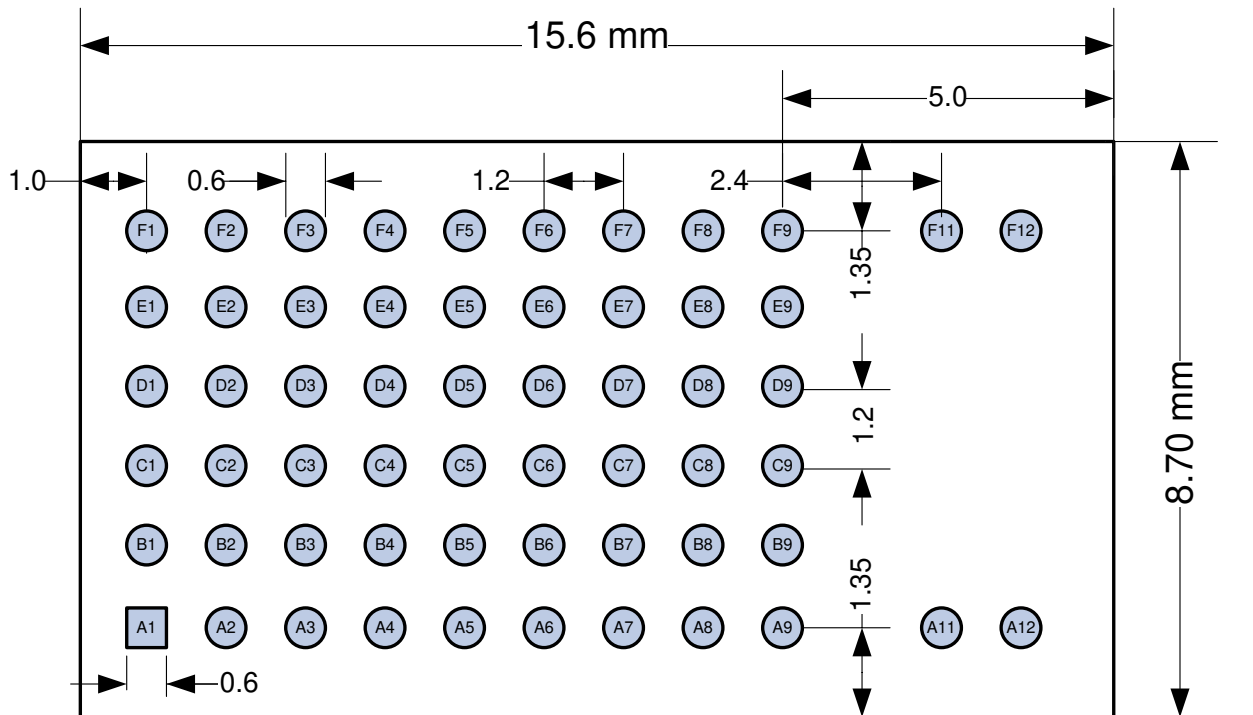
CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	16 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

16. PAN172X FOOTPRINT OF THE MODULE

All dimensions are in millimeters.

The outer dimensions have a tolerance of $\pm 0.2\text{mm}$.

Top view, Application PCB



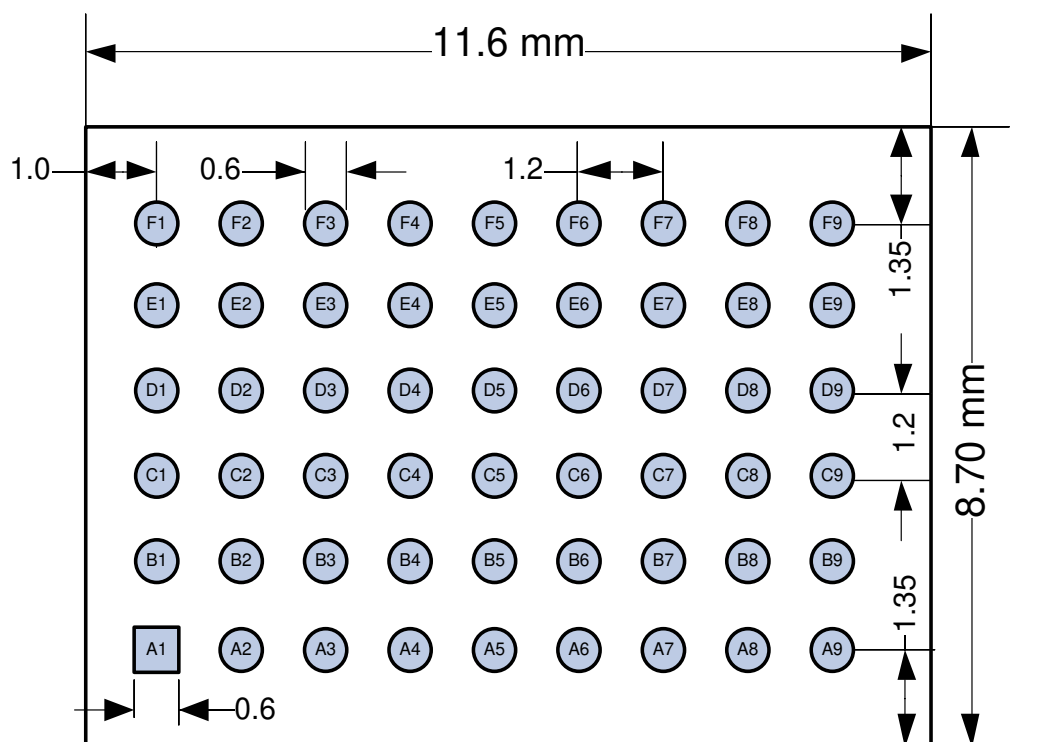
CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	17 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

17. PAN171X FOOTPRINT OF THE MODULE

All dimensions are in millimeters.

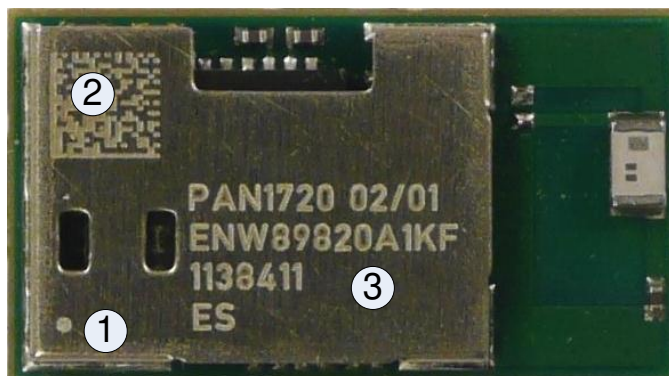
The outer dimensions have a tolerance of $\pm 0.2\text{mm}$.

Top view, Application PCB



CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	18 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

18. 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

18.1. EXAMPLE FOR MARKING

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

18.2. MARKING DEFINITION

(1) Pin1 marking

(2) 2D code (Serial number)

(3) Marking:

- PAN17xx (Model Name), HW/SW (Hardware/Software version)
- ENW89820AxKF (Part Number, refer to chapter 24 Ordering Information)
- Lot code (YearYear, WeekWeek, Day, LotLot)
- ES (Engineering Sample marking)

Note: For available Software Versions, refer to [1] PAN172xETU Design-Guide. and chapter 24 Ordering Information.

19. 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 13.2

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	19 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

20. DEVELOPMENT OF APPLICATIONS

For development support please refer to [1] PAN172xETU Design-Guide.

21. 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

22. 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.

22.1. 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.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	20 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

22.2. 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.

22.3. 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 before 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.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	21 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

22.4. 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 NO_x
 - 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).

22.5. 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.

22.6. 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,

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	22 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

Cl₂, SO₂, H₂S, NH₃, and NO_x)

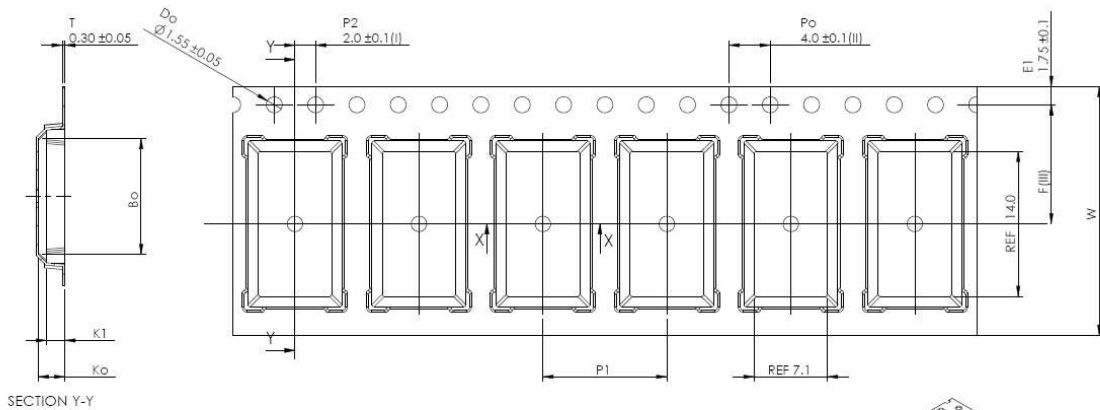
- (6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.
- (7) When you have any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

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	23 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

23. PACKAGING

If the product has mass production status, indicated in chapter 26, we will deliver the module in the package which are described below.

23.1. PAN172X TAPE DIMENSION



Ao	9.10	+/- 0.1
B0	16.00	+/- 0.1
K0	3.20	+/- 0.1
K1	2.20	+/- 0.1
F	11.50	+/- 0.1
P1	12.00	+/- 0.1
W	24.00	+/- 0.3

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

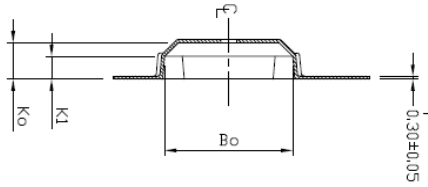
- (I) Measured from centreline of sprocket hole to centreline of pocket.
 - (II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
 - (III) Measured from centreline of sprocket hole to centreline of pocket.
 - (IV) Other material available.
- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	24 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

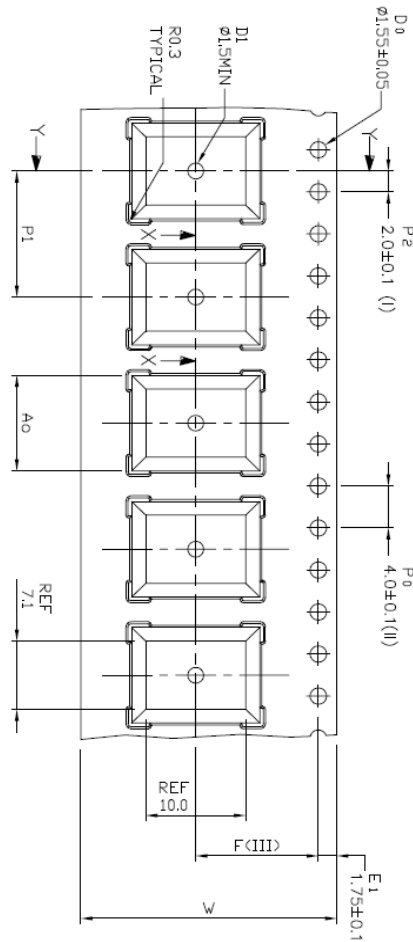
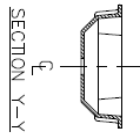
23.2. PAN171X TAPE DIMENSION

Ao	9.10	+/-	0.1
Bo	12.00	+/-	0.1
Ko	3.20	+/-	0.1
K1	2.20	+/-	0.1
F	11.50	+/-	0.1
P1	12.00	+/-	0.1
W	24.00	+/-	0.3

SECTION Y-Y



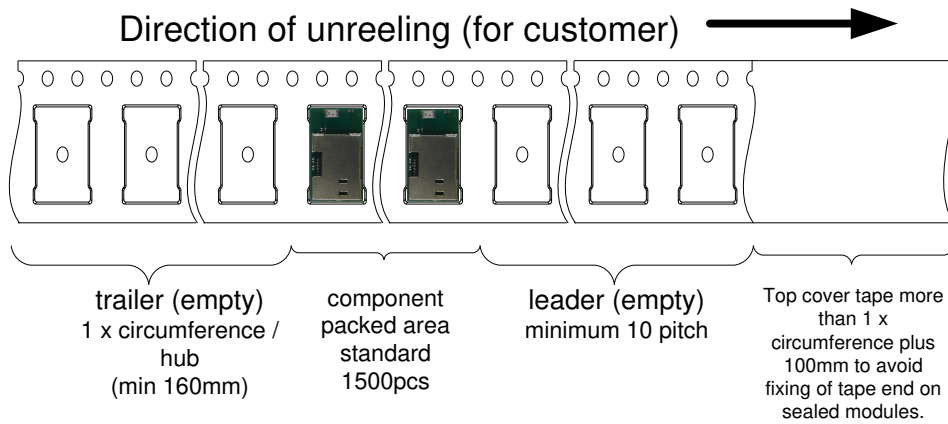
Forming format : Flatbed
Estimated max. length : 65 meter/2283 reel



- (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.

CLASSIFICATION	PRODUCT SPECIFICATION	No. DS-17xx-2400-102	REV. 2.12
SUBJECT	CLASS 2 BLUETOOTH LOW ENERGY SINGLE MODE MODULE	PAGE	25 of 37
CUSTOMER'S CODE PAN172x / PAN171x	PANASONIC'S CODE ENW89820AxKF / ENW89835AxKF	DATE	08.07.2015

23.3. 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.

23.4. COMPONENT DIRECTION

