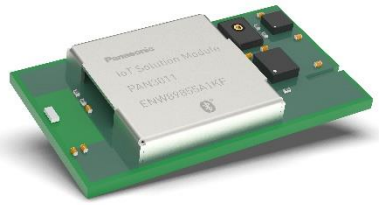
Panasonic
INDUSTRY

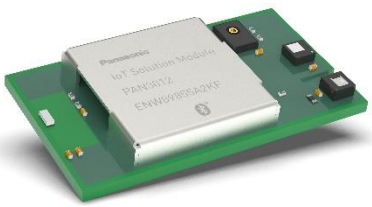
PAN301x

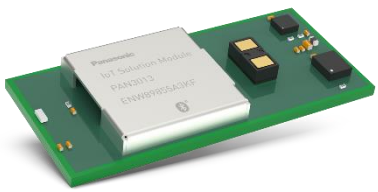
Bluetooth® Low Energy Module

Product Specification

Rev. 1.0







Wireless Connectivity

Overview

The PAN301x is a Bluetooth 5 Low Energy (LE) module based on ST's BlueNRG-2 Bluetooth LE single mode system-on-chip.

Features

- Surface mount type (SMT) dimensions
  - PAN3011/3012: 25 mm x 14 mm x 3 mm
  - PAN3013: 31 mm x 14 mm x 3 mm
- PAN3011 and PAN3012 have same form factor and pinning
- ARM® Cortex®-M0 microcontroller
- Embedded 256 kB flash memory and 24 kB internal RAM
- Interfaces: I²C, UART, PDM, GPIO, ADC, SWD
- Internal chip antenna

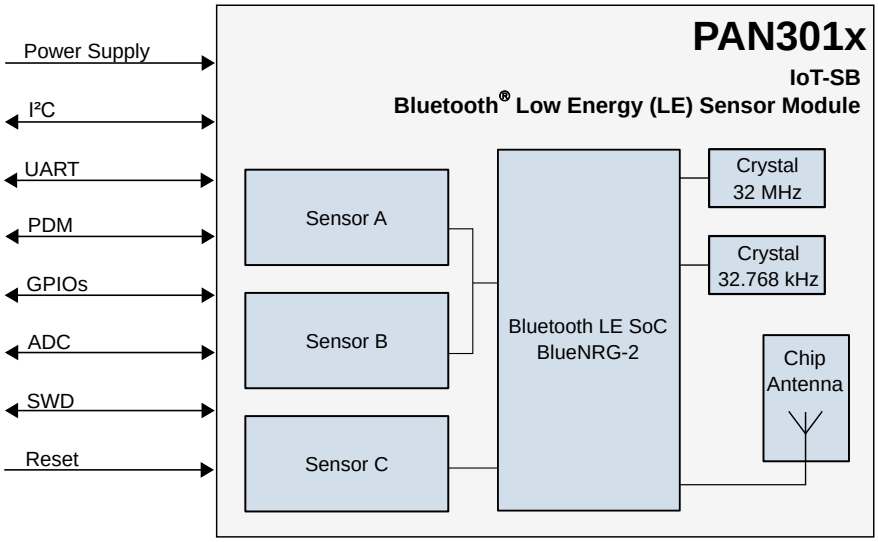
Characteristics

- Typical sensitivity: -88 dBm
- Typical max. output power: 8 dBm
- Typical current consumption: 16 mA in Tx and 9 mA in Rx mode
- Typical current consumption in sleep-mode: 10 µA
- Voltage range
  - PAN3011/3012: 1.7 V to 3.6 V
  - PAN3013: 2.6 V to 3.5 V
- Temperature range
  - PAN3011/3012: -40 °C to 85 °C
  - PAN3013: -20 °C to 85 °C

Sensor Application

- PAN3011
  - LSM6DSO: 3D accelerometer and 3D gyroscope
  - LIS2MDL: magnetometer
  - MP34DT05-A: digital microphone
- PAN3012
  - HTS221: humidity and temperature
  - LPS22HH: pressure sensor
  - MP34DT05-A: digital microphone
- PAN3013
  - VL53L1X: time of flight (ToF) sensor
  - LSM6DSO: 3D accelerometer and 3D gyroscope
  - LIS2MDL: magnetometer

Block Diagram



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

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By signing the Product Specification, you acknowledge that you are a legal representative for your company and that you understand and accept the validity of the contents herein.

If the signed version of the Product Specification has not been returned to Panasonic within 30 days after receipt of the product, the specification or approval sheet shall be deemed to be accepted by you.

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Table of Contents

1 About This Document

1.1 Purpose and Audience

This Product Specification provides details on the functional, operational, and electrical characteristics of the Panasonic PAN301x modules. It is intended for hardware design, application, and Original Equipment Manufacturers (OEM) engineers. The product is referred to as “the PAN301x” or “the module” within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	2021-04-28	First version

1.3 Use of Symbols

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

1.4 Related Documents

For related documents please refer to the Panasonic website ⇨ 7.2.2 Product Information.

2 Overview

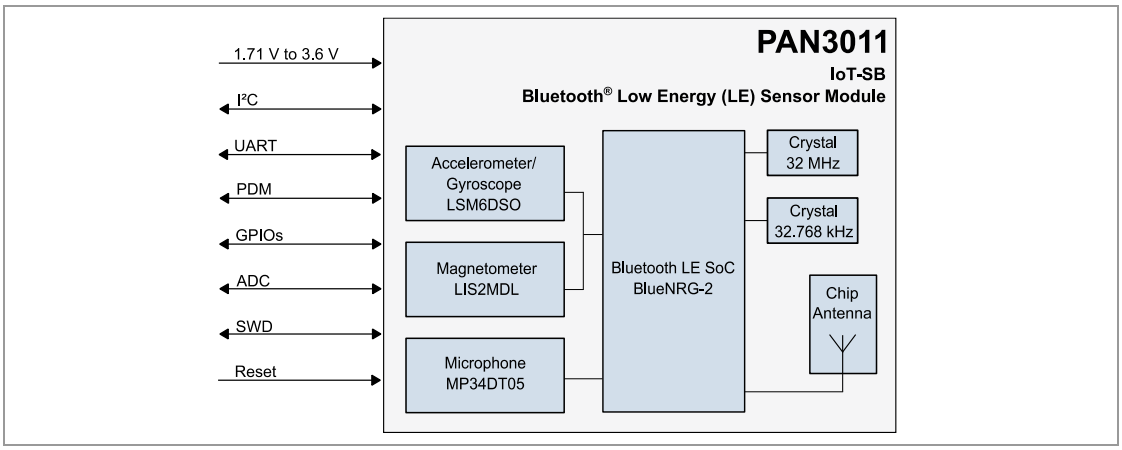
Creating IoT Solution Modules like the PAN3011, PAN3012, and PAN3013, that clearly contribute to cutting down time-to-market in development processes in these rather fast paced times of innovation and automatization, has been the clear priority for Panasonic Industry. Being based on and inspired by the ST BlueTile (STEVAL-BCN002V1B) multi-sensor development kit, customers are now able to test and evaluate their ideas easily and bring new IoT products appropriately fast and at a reduced BOM to the markets.

For related documents please refer to ⇨ 7.2.2 Product Information.

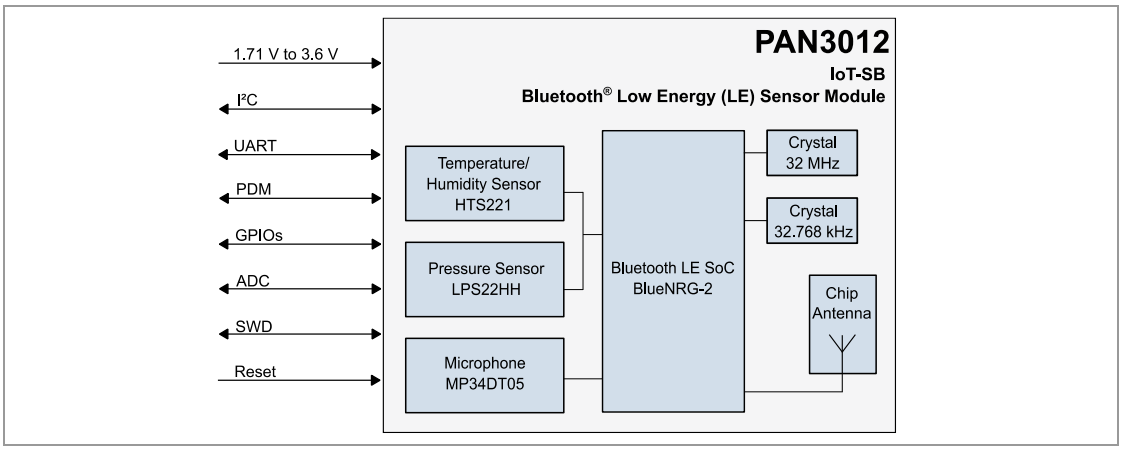
For further information on the variants and versions please refer to ⇨ 7.1 Ordering Information.

2.1 Block Diagrams

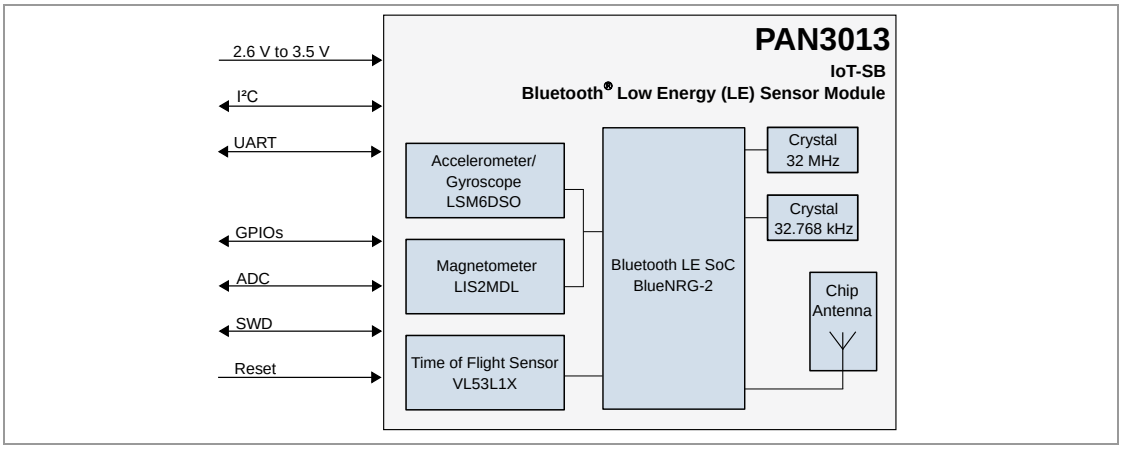
PAN3011



PAN3012



PAN3013

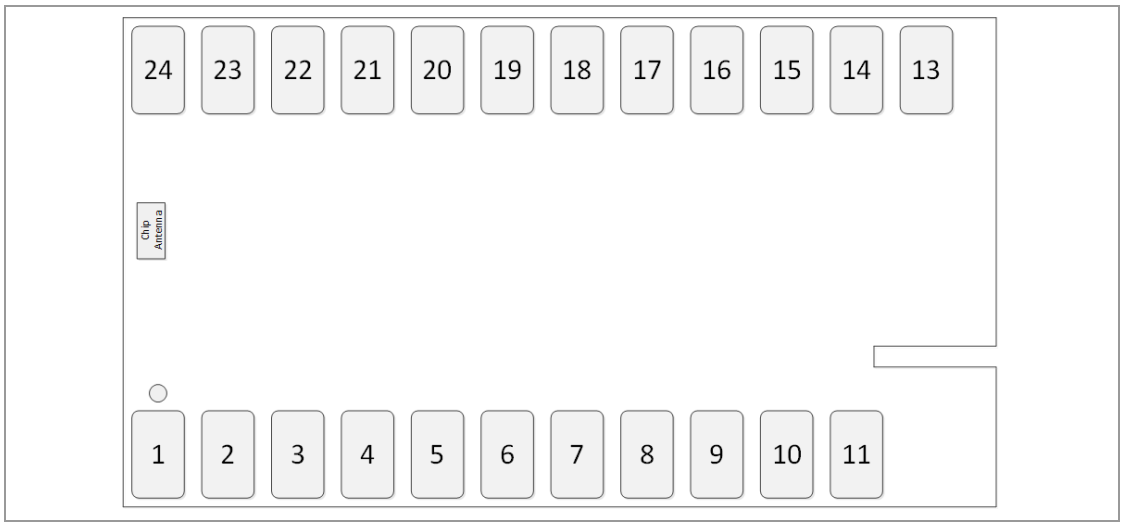


2.2 Pin Configuration

Pin Assignment

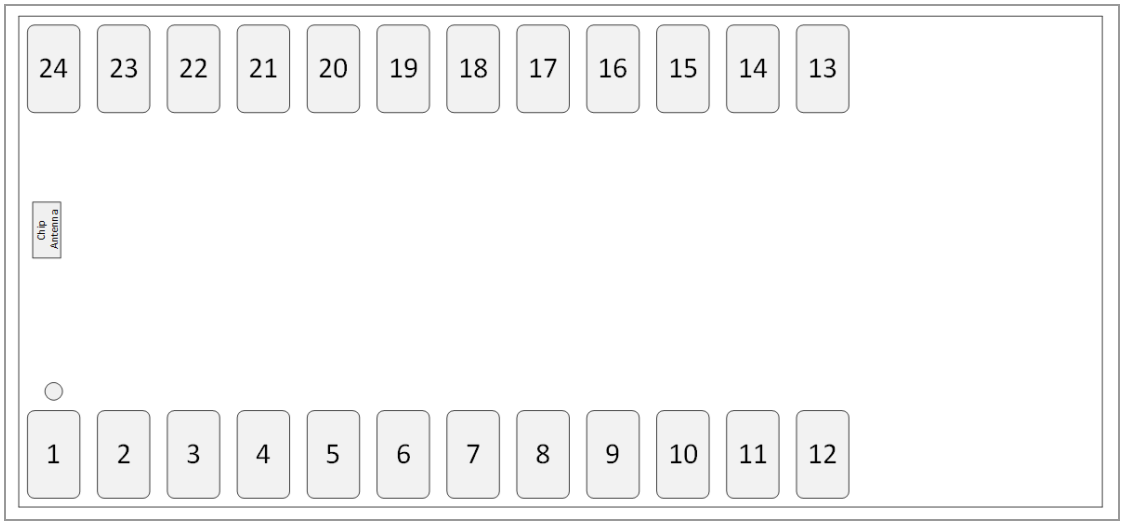
PAN3011/PAN3012

Top View



PAN3013

Top View



Pin Functions

No.	Pin Name	GPIO No.	Pin Type	Description
1	GND	-	Ground	Connect to ground
2	NRST	-	Digital In	Reset, active low
3	INT_COM	13	Digital I/O	PAN3011: Programmable interrupt from Accelerometer/Gyroscope
				PAN3012: GPIO 13
				PAN3013: Programmable interrupt from Accelerometer/Gyroscope
4	INT_3X	12	Digital I/O	PAN3011: Programmable interrupt from magnetometer
				PAN3012: GPIO 12
				PAN3013: Programmable interrupt from magnetometer
5	SWDCLK	9	Digital In	Serial Wire Debug clock signal
6	SWDIO	10	Digital I/O	Serial Wire Debug data signal
7	UART_RX	11	Digital In	Rx data for UART
8	UART_TX	8	Digital Out	Tx data for UART
9	BOOT	7	Digital In	Boot, active high
10	GND	-	Ground	Connect to ground
11	VCC	-	Supply Voltage	PAN3011: 1.71 V to 3.6 V
				PAN3012: 1.7 V to 3.6 V
				PAN3013: 2.6 V to 3.5 V
12	(GND)	-	(Ground)	PAN3011: no pad
				PAN3012: no pad
				PAN3013: GND
13	^{I2C}_SDA	5	Digital I/O	I²C bus data
14	I2C_SCL	4	Digital Out	I²C bus clock
15	DIO_6	6	Digital I/O	GPIO 6
16	DIO_3	3	Digital I/O	GPIO 3/Red LED at STEVAL-BCN002V1B
17	PDM_CLK	2	Digital Out	PAN3011: PDM-clock from Digital Microphone
				PAN3012: PDM-clock from Digital Microphone
				PAN3013: GPIO 2
18	PDM_DATA	1	Digital Out	PAN3011: PDM-data from Digital Microphone
				PAN3012: PDM-data from Digital Microphone
				PAN3013: GPIO 1
19	DIO_0	0	Digital I/O	GPIO 0/Blue LED at STEVAL-BCN002V1B
20	DIO_14	14	Digital I/O	GPIO 14/Green LED at STEVAL-BCN002V1B

No.	Pin Name	GPIO No.	Pin Type	Description
21	ATEST	-	Digital Out	Tx/Rx event alert
22	ADC1	-	Digital In	Analog to digital converter 1
23	ADC2	-	Digital In	Analog to digital converter 2
24	GND	-	32 kHz	Connect to ground

2.3 Peripherals

- UART
- I^2C
- SWD flash and debug interface
- Programmable interrupt signals
- PWM
- 2 channel 10-bit ADC
- Up to 6 GPIO's
- PDM output
- Watchdog and RTC
- Integrated 32 kHz crystal

2.4 Bluetooth Features

- Bluetooth 5 LE
- Master, slave, and multiple simultaneous roles
- LE data packet length extension

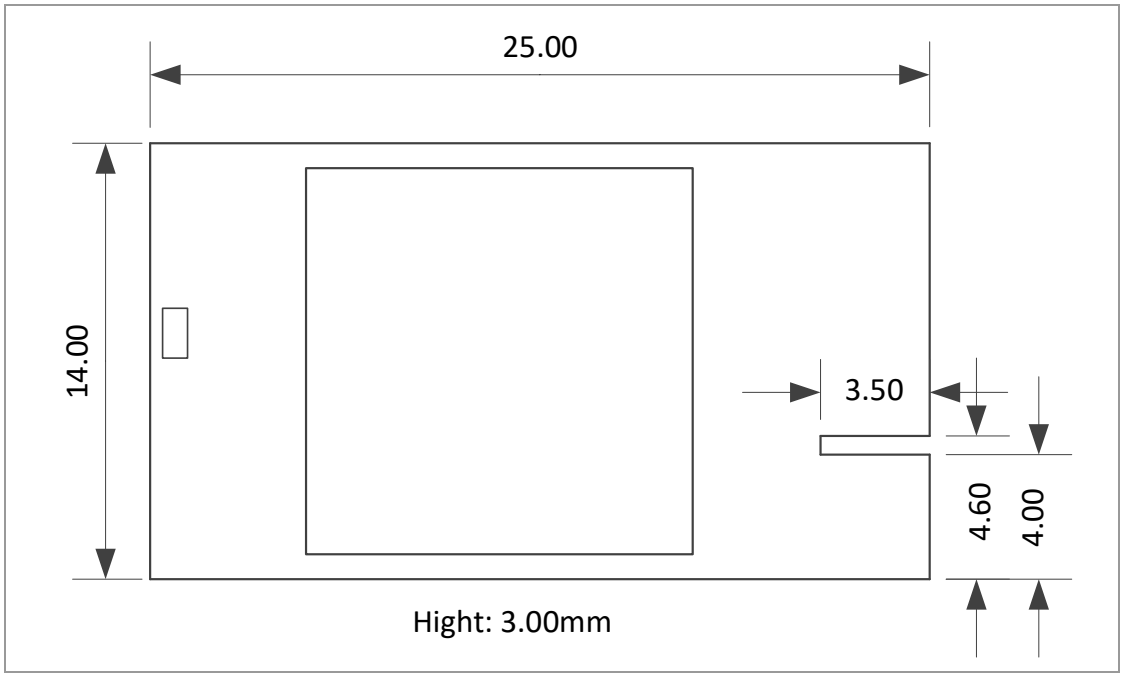
3 Detailed Description

3.1 Dimensions

All dimensions are in millimeters.

PAN3011/PAN3012

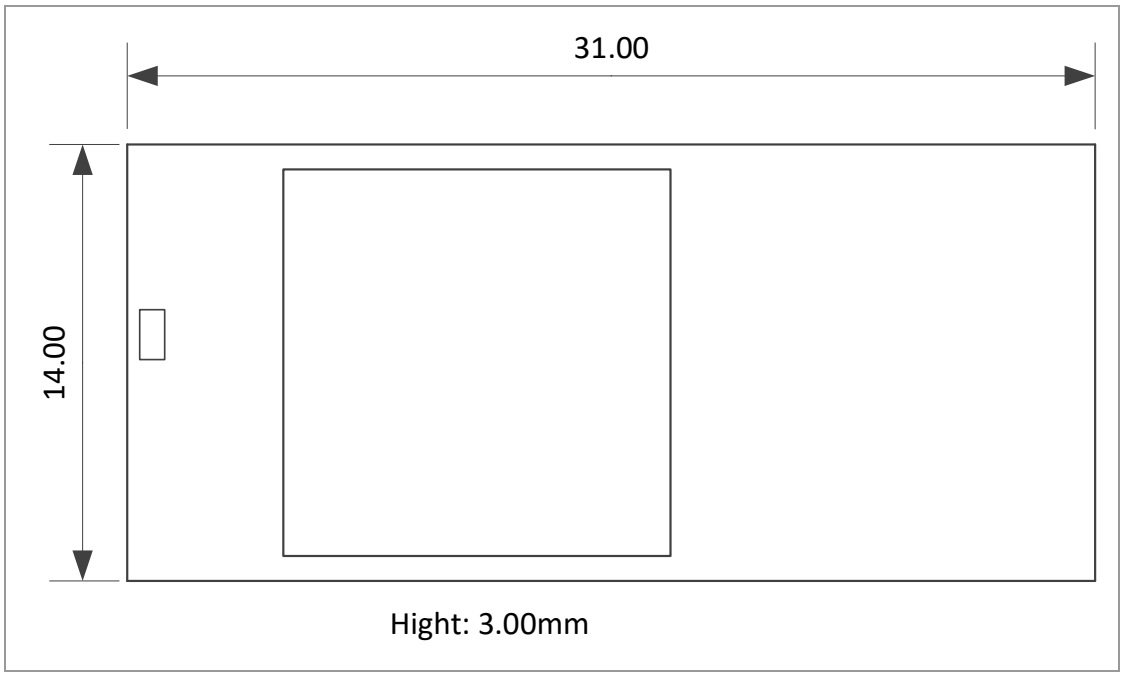
Top View



No.	Item	Dimension	Tolerance	Remark
1	Width	25.00	±0.30	
2	Length	14.00	±0.30	
3	Height	3.00	±0.30	With case

PAN3013

Top View



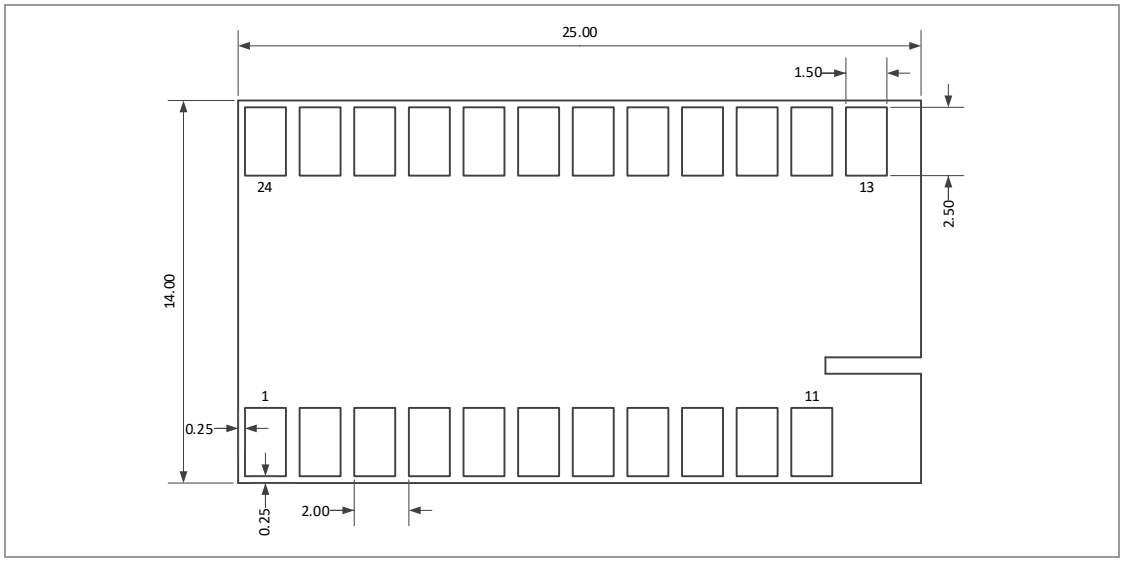
No.	Item	Dimension	Tolerance	Remark
1	Width	31.00	±0.30	
2	Length	14.00	±0.30	
3	Height	3.00	±0.30	With case

3.2 Footprint

All dimensions are in millimeters.

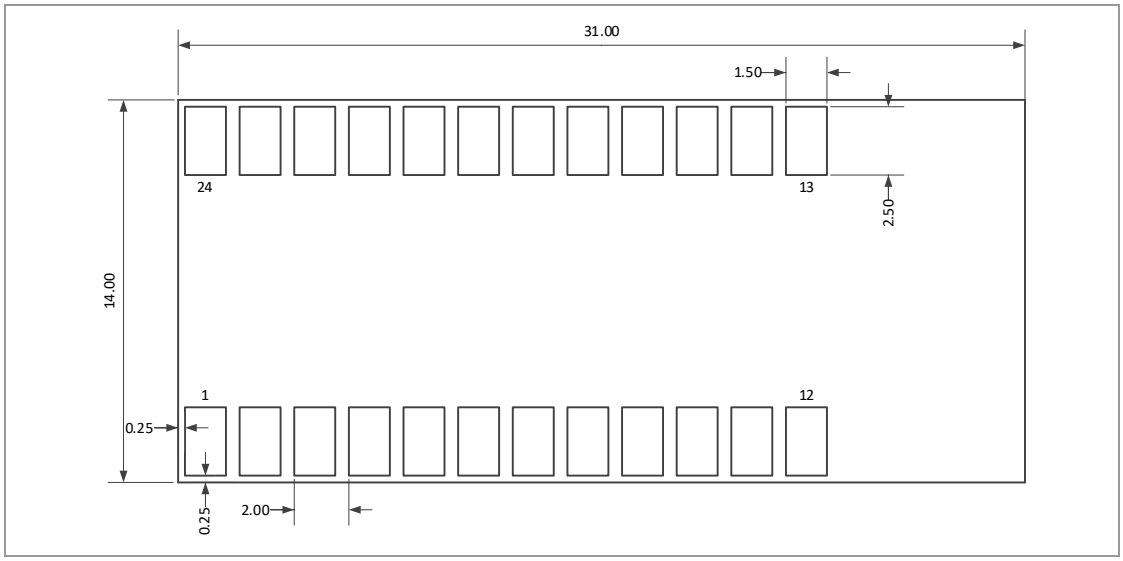
PAN3011/PAN3012

Top View



PAN3013

Top View

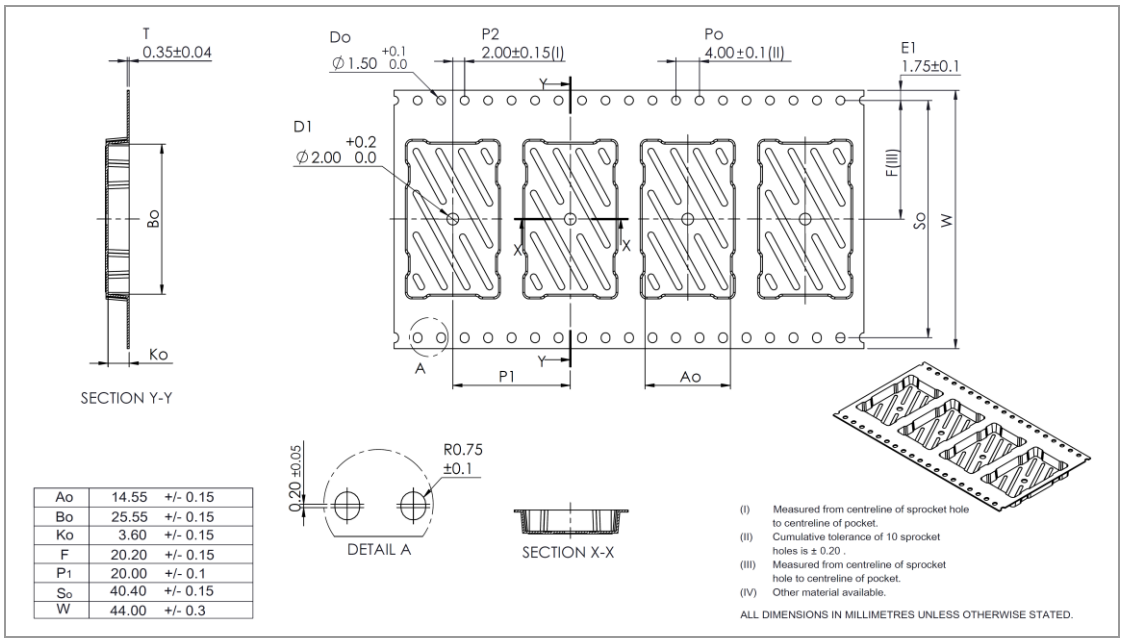


3.3 Packaging

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

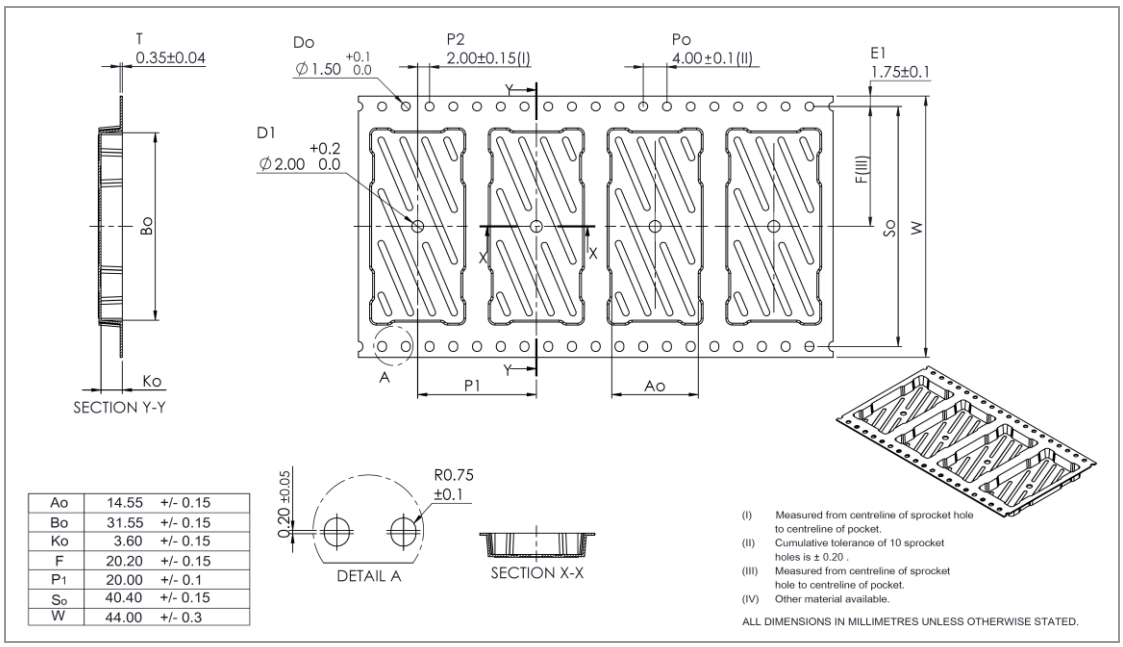
3.3.1 Tape Dimensions

PAN3011/PAN3012



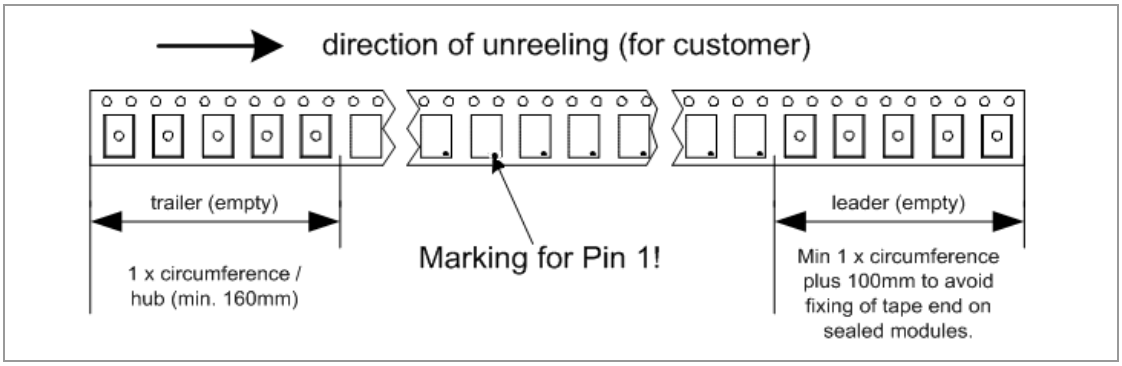
Ao	14.55	+/- 0.15
Bo	25.55	+/- 0.15
Ko	3.60	+/- 0.15
F	20.20	+/- 0.15
P1	20.00	+/- 0.1
So	40.40	+/- 0.15
W	44.00	+/- 0.3

PAN3013



Ao	14.55	+/- 0.15
Bo	31.55	+/- 0.15
Ko	3.60	+/- 0.15
F	20.20	+/- 0.15
P1	20.00	+/- 0.1
So	40.40	+/- 0.15
W	44.00	+/- 0.3

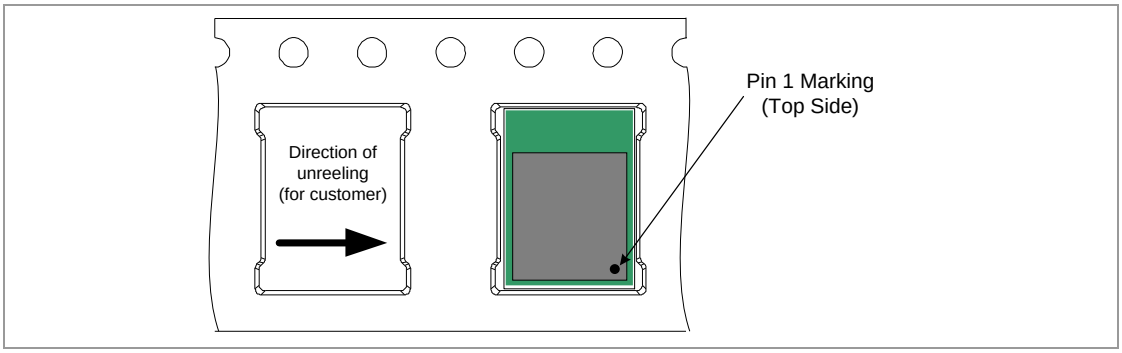
3.3.2 Packing in Tape



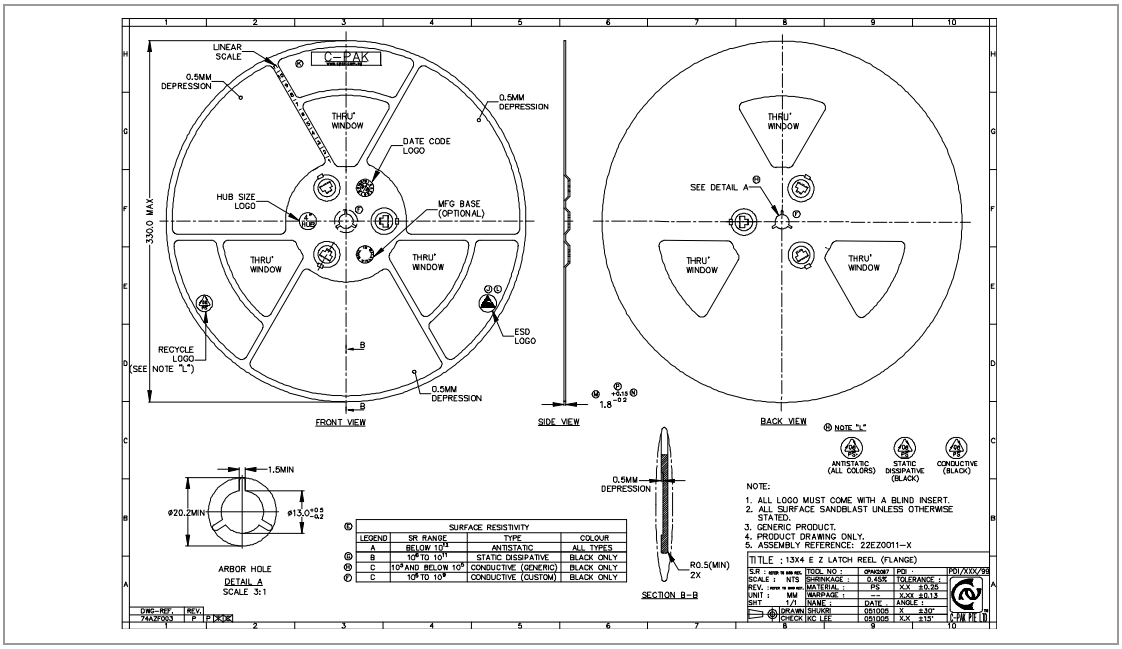
Empty spaces in the component packed area shall be less than two per reel and those spaces shall not be consecutive.

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

3.3.3 Component Direction

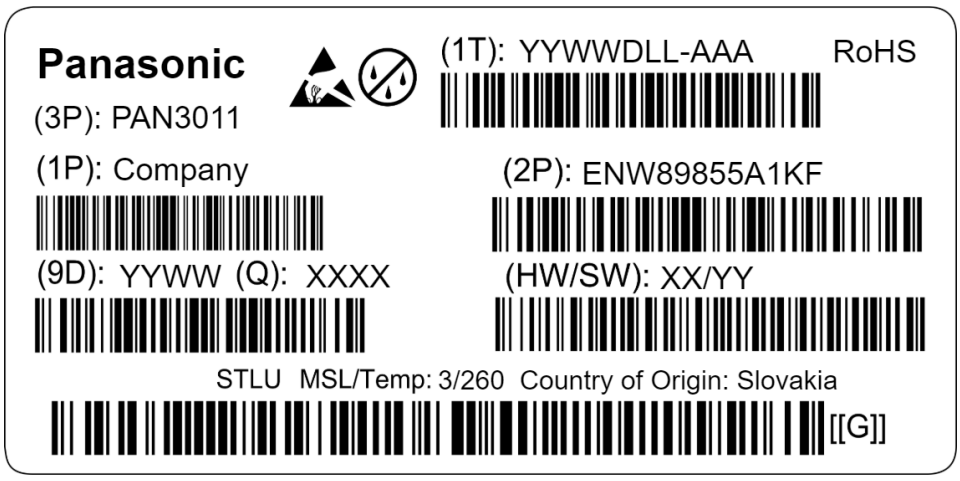


3.3.4 Reel Dimension



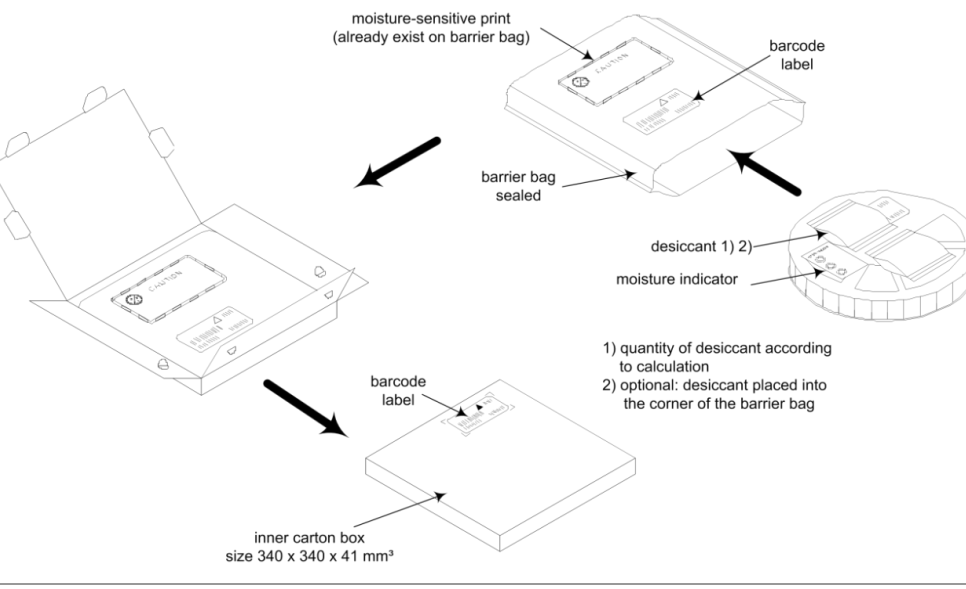
3.3.5 Package Label

Example



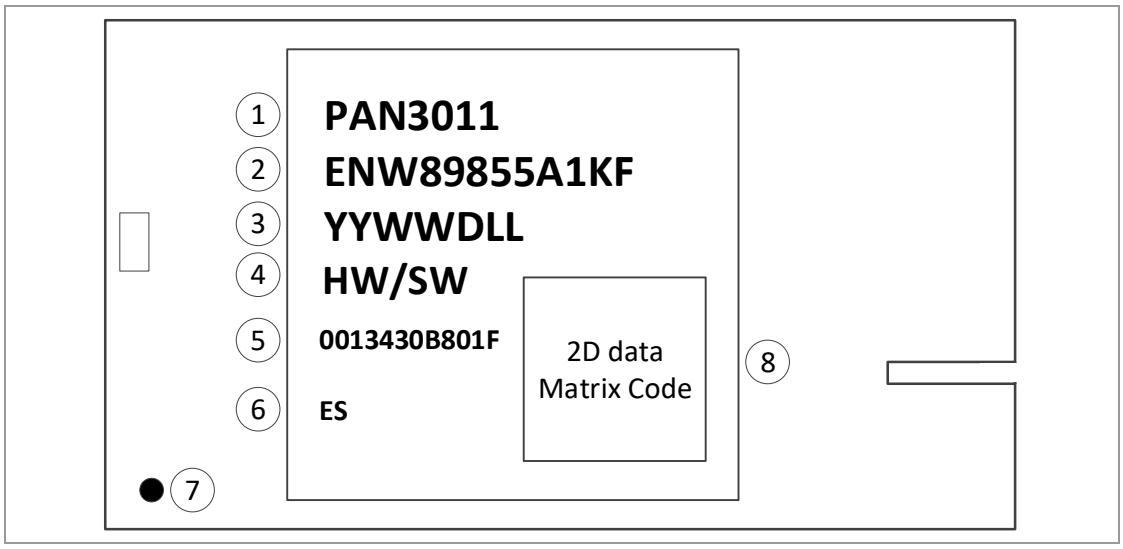
(1T)	Lot code
(1P)	Customer order number, if applicable
(2P)	Order number
(3P)	Brand name
(9D)	Date code
(Q)	Quantity
(HW/SW)	Hardware/software version

3.3.6 Total Package



3.4 Case Marking

Example:



1	Brand name
2	Order number
3	Lot code
4	Hardware/software version
5	BD address
6	Status: ES or empty for MP
7	Marking for pin 1
8	2D barcode, for internal usage only

3.5 Bluetooth Device Address

The Bluetooth Core Specification specifies that all Bluetooth devices shall have a Bluetooth Device Address that uniquely identifies the device to another Bluetooth device[1].

Each Bluetooth device shall be allocated a unique 48-bit public Device Address. The Device Address shall be a 48-bit extended unique identifier (EUI-48) created in accordance with the IEEE 802-2014 standard[2] in section “Universal addresses”.

Alternatively, a 48-bit random Device Address may be used which must follow a few requirements and shall not change once initialized until the device is power cycled[3].

PAN301x is pre-programmed and comes with both a public Bluetooth Device Address and a random Bluetooth Device Address. Both can be easily used depending on the device’s use case.

[1] Bluetooth Specification Version 5.0|Vol 3, Part C, 15.1 Bluetooth Device Address

[2] Bluetooth Specification Version 5.0|Vol 2, Part B, 1.2 Bluetooth Device Addressing

[3] Bluetooth Specification Version 5.0|Vol 6, Part B, 1.3.2.1 Static Device Address

3.5.1 Random Bluetooth Device Address

A random Bluetooth Device Address is generated at the first boot of the device and programmed to a dedicated flash memory area starting at address “0x1007f800”. This is the last block of the flash memory which is reserved for SDK usage.

If the user performs a mass-erase of the flash memory, a new, but different random Bluetooth Device Address is generated on the next start.

All applications from the SDK automatically use the built-in random Bluetooth Device Address.

3.5.2 Public Bluetooth Device Address

A public Bluetooth Device Address is pre-programmed to a dedicated flash memory area at address “0x1007ff00” during production. This is inside the last block of the flash memory which is reserved for SDK usage.

Beware of Accidental Erase!

Do not erase the pre-programmed public Device Address during usage.

As already explained all applications from the SDK automatically use the built-in random Bluetooth Device Address and must be modified when the public Bluetooth Device Address shall be used.

```
  {
    uint8_t bdaddr[CONFIG_DATA_PUBADDR_LEN];
    for (int i = 0; i < sizeof(bdaddr); i++) {
#define PANASONIC_BLUETOOTH_ADDRESS_BASE 0x1007ff00
      bdaddr[i] = FLASH_ReadByte(PANASONIC_BLUETOOTH_ADDRESS_BASE+i);
    }
    int ret = aci_hal_write_config_data(CONFIG_DATA_PUBADDR_OFFSET,
                CONFIG_DATA_PUBADDR_LEN, bdaddr);
    if (ret) {
      /* error handling */
    }
  }
```

A call to the function `aci_hal_write_config_data()` must be used to configure the SDK to use the public Bluetooth Device Address.

Afterwards the call to the function `aci_gap_set_discoverable()` has to be modified so that: the parameter `PUBLIC_ADDR` is used to instruct the SDK to use the public Bluetooth Device Address instead of the random Bluetooth Device Address.

4 Specification

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

4.1 Default Test Conditions

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

4.2 Absolute Maximum Ratings

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

Shock Damage

Sensor modules house numerous internal components that are susceptible to shock damage. If a unit is subject to excessive shock, is dropped on the floor, or a tray/reel of units is dropped on the floor, it must be rejected, even if no apparent damage is visible.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD}	Normal Supply Voltage	PAN3011/PAN3012	-0.3		+3.9	V
V_{DD}	Normal Supply Voltage	PAN3013	-0.3		+3.6	
ESD	ESD Robustness	HBM 1C			±2 000	
P_{RF}	RF Input Level				+10	dBm
T_{STOR}	Storage Temperature		-40		+85	°C
M_{EF}	Maximum exposed field	PAN3011/PAN3013			10 000	gauss
P	Overpressure	PAN3012			2	MPa
S_G	Acceleration g for 0.2 ms	PAN3011/PAN3013			20 000	g

4.3 Recommended Operating Conditions

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

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage	PAN3011	1.71	3	3.6	V
		PAN3012	1.7	3	3.6	
		PAN3013	2.6	3	3.5	
$V_{I/O}$	Max I/O Pin Voltage		-0.3		V_{DD} + 0.3	
TA	Operating Temperature	PAN3011/PAN3012	-40	25	85	°C
		PAN3013	-20	25	85	

4.4 Current Consumption

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

Assume V_{DD} = 3 V, T_{amb} = 25 °C, if nothing else stated, DC/DC enabled.

Parameter	Condition	Model	Min.	Typ.	Max.	Unit
Supply current	Reset (Pin 2 (NRST) in low status)	PAN3011		42		µA
		PAN3012		38		
		PAN3013		45		
	Sleep Mode (All IC's in sleep mode)	PAN3011		10		µA
		PAN3012		7		
		PAN3013		11		
	Rx mode (Average current with BT-IC in receive-mode and sensor IC's in idle-mode)	PAN3011		8.5		mA
		PAN3012		8.5		
		PAN3013		8.5		
	Tx mode, -14 dBm output level (Average current with BT-IC in transmit-mode (PRBS9) and sensor IC's in idle-mode)	PAN3011		3.8		mA
		PAN3012		4		
		PAN3013		3.9		
	Tx current, +8 dBm output level (Average current with BT-IC in transmit-mode (PRBS9) and sensor IC's in idle-mode)	PAN3011		5.3		mA
		PAN3012		5.3		
		PAN3013		5.4		

Parameter	Condition	Model	Min.	Typ.	Max.	Unit
	Peak current	PAN3011		18.5		mA
		PAN3012		17.7		
		PAN3013		35.8		

4.5 Digital I/O Specifications

Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{IL}				0.3*V_{DD}	V
V_{IH}		0.65*V_{DD}			
V_{OL}	IOL=3 mA			0.4	
V_{OH}	IOH=3 mA	0.70*V_{DD}			

4.6 Bluetooth

4.6.1 RF General Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
FREQ	Frequency range		2 400	-	2 483.5	MHz
FCH	Channel spacing		-	2	-	MHz
RFch	RF channel center frequency		2 401	-	2 480	MHz

4.6.2 RF Transmitter Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
MOD	Modulation scheme		GFSK			
BT	Bandwidth-bit period product		-	0.5	-	
Mindex	Modulation index		-	0.5	-	
DR	Air data rate		-	1	-	Mbps
PMAX	Maximum output power		-	+8	+10	dBm
PRFC	Minimum output power		-	-16.5	-	dBm
PBW1M	6 dB bandwidth for modulated carrier (1 Mbps)	Resolution bandwidth: 100 kHz	500	-	-	kHz
PRF1	1st adjacent channel transmit power 2 MHz	Resolution bandwidth: 100 kHz (average detector)	-	-35	-	dBm
PRF2	2nd adjacent channel transmit power >3 MHz	Resolution bandwidth: 100 kHz (average detector)	-	-40	-	dBm

4.6.3 RF Receiver Characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
RXSENS	Sensitivity	BER < 0.1 %		-87		dBm
PSAT	Saturation	BER < 0.1 %		11		dBm
RF Selectivity with Bluetooth LE Equal Modulation on Interfering Signal						
C/ICO-channel	Co-channel interference	Wanted signal = -67 dBm, BER ≤ 0.1%		6		dBc
C/I1 MHz	Adjacent (+1 MHz) interference	Wanted signal = -67 dBm, BER ≤ 0.1%		0		dBc
C/I2 MHz	Adjacent (+2 MHz) interference	Wanted signal = -67 dBm, BER ≤ 0.1%		-40		dBc
C/I3 MHz	Adjacent (+3 MHz) interference	Wanted signal = -67 dBm, BER ≤ 0.1%		-47		dBc
C/I ≥ 4 MHz	Adjacent (≥ ±4 MHz) interference	Wanted signal = -67 dBm, BER ≤ 0.1%		-46		dBc
C/I ≥ 6 MHz	Adjacent (≥ ±6 MHz) interference	Wanted signal= -67 dBm BER ≤ 0.1 %		-48		dBc
C/I ≥ 25 MHz	Adjacent (≥ ±25 MHz) interference	Wanted signal = -67 dBm, BER ≤ 0.1%		-70		dBc
C/I Image	Image frequency interference -2 MHz	Wanted signal = -67 dBm, BER ≤ 0.1%		-16		dBc
C/I Image ± 1 MHz	Adjacent (±1 MHz) interference to inband image frequency -1 MHz	Wanted signal = -67 dBm, BER ≤ 0.1%		0		dBc
C/I Image ± 1 MHz	Adjacent (±1 MHz) interference to inband image frequency -3 MHz	Wanted signal = -67 dBm, BER ≤ 0.1%		-23		dBc
Intermodulation Characteristics (CW Signal at f1, Bluetooth LE Interfering Signal at f2)						
P_IM(3)	Input power of IM interferes at 3 MHz and 6 MHz distance from wanted signal	Wanted signal = -64 dBm, BER ≤ 0.1 %		-34		dBm
P_IM(-3)	Input power of IM interferes at -3 MHz and -6 MHz distance from wanted signal	Wanted signal = -64 dBm, BER ≤ 0.1 %		-48		dBm
P_IM(4)	Input power of IM interferes at ±4 MHz and ±8 MHz distance from wanted signal	Wanted signal = -64 dBm, BER ≤ 0.1 %		-34		dBm
P_IM(5)	Input power of IM interferes at ±5 MHz and ±10 MHz distance from wanted signal	Wanted signal = -64 dBm, BER ≤ 0.1 %		-34		dBm

4.7 Time of Flight Sensor (VL53L1X)

4.7.1 Description

The VL53L1X is a state-of-the-art, time of flight (ToF), laser-ranging sensor, enhancing the ST FlightSense™ product family. It is the fastest miniature ToF sensor on the market with accurate ranging up to 4 m and fast ranging frequency up to 50 Hz

Housed in a miniature and reflowable package, it integrates a SPAD receiving array, a 940 nm invisible Class 1 laser emitter, physical infrared filters, and optics to achieve the best ranging performance in various ambient lighting conditions with a range of cover window options.

Unlike conventional IR sensors, the VL53L1X uses ST's latest generation ToF technology which allows absolute distance measurement whatever the target color and reflectance.

It is also possible to program the size of the ROI on the receiving array, allowing the sensor FoV to be reduced.

4.7.2 Technical Specification

Feature	Detail
Package	Optical LGA12
Size	4.9 mm × 2.5 mm × 1.56 mm
Operating voltage	2.6 V to 3.5 V
Operating temperature	-20 °C to 85 °C
Receiver field of view (FoV, diagonal)	Programmable from 15 °C to 27 °C
Infrared emitter	940 nm
I^2C	Up to 400 kHz (fast mode) serial bus Programmable address. Default is "0x52"

4.7.3 Key Parameters

4.7.3.1 Distance Mode

The VL53L1X has three distance modes (DM): short, medium, and long.

Long distance mode allows the longest possible ranging distance of 4 m to be reached. However, this maximum ranging distance is impacted by ambient light.

Short distance mode is more immune to ambient light, but its maximum ranging distance is typically limited to 1.3 m.

Maximum Distance vs. Distance Mode under Ambient Light

Test conditions:

- Timing budget = 100 ms
- White target = 88 %
- Dark = no IR ambient
- Ambient light = 200 kcps/SPAD

Distance Mode	Max. Distance in Dark (cm)	Max. Distance under Strong Ambient Light (cm)
Short	136	135
Medium	290	76
Long	360	73

4.7.3.2 Timing Budget (TB)

The VL53L1X timing budget can be set from 20 ms up to 1 000 ms.

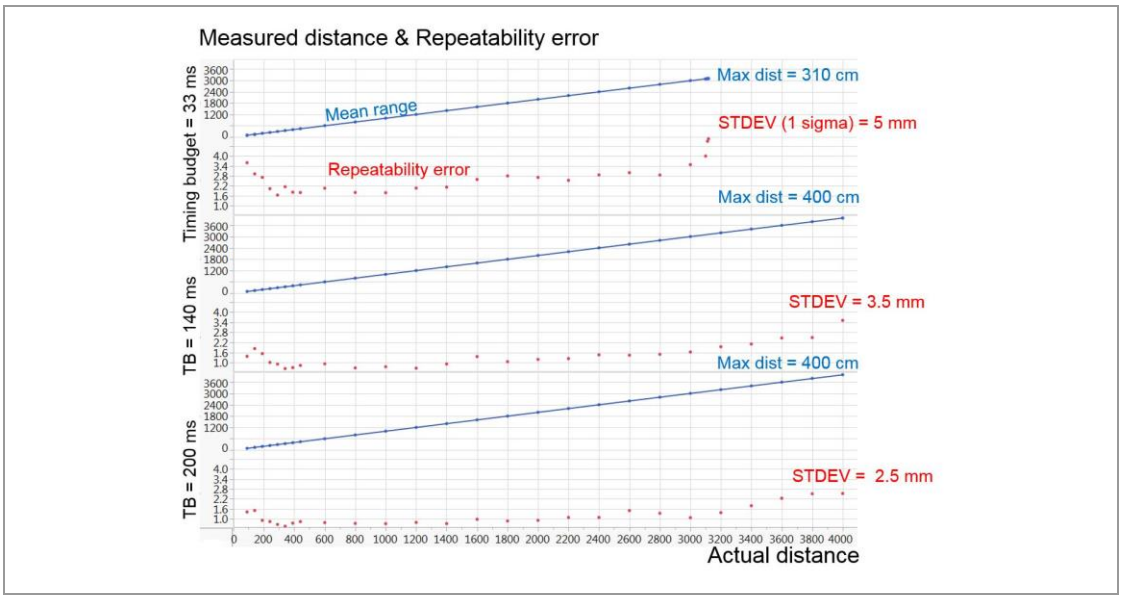
- 20 ms is the minimum timing budget and can be used only in Short distance mode.
- 33 ms is the minimum timing budget which can work for all distance modes.
- 140 ms is the timing budget which allows the maximum distance of 4 m (in the dark on a white chart) to be reached under long distance mode.

Increasing the timing budget increases the maximum distance the device can range and improves the repeatability error. Average power consumption augments accordingly.

Maximum Distance and Repeatability Error vs. Timing Budget

Test conditions:

- Timing budget = 33 ms,140 ms, and 200 ms
- Grey target 54 %
- Ambient light = dark



4.7.4 Ranging performances

The minimum ranging distance is 4 cm. Under this minimum distance, the sensor will detect a target, but the measurement will not be accurate.

Typical Performances in Dark Conditions

Test conditions:

- Ambient light = dark
- Timing budget = 100 ms unless mentioned
- Distance mode = long

Parameter	Target Reflectance	Min. Value	Typ. Value
Max distance (cm)	White 88 %	260	360 (400 with TB = 140 ms)
	Grey 54 %	220	340
	Grey 17 %	80	170
Ranging error (mm)			±20

Typical Performance in Ambient Light Conditions, Long Distance Mode

Test conditions:

- Ambient light = dark
- 50 kcps/SPAD, 200 kcps/SPAD
- Distance mode = long

Parameter	Target Reflectance	Dark	50 kcps/SPAD	200 kcps/SPAD
Max distance (cm)	White 88 %	360	166	73
	Grey 54 %	340	154	69
	Grey 17 %	170	114	68
Ranging error (mm)		±20	±25	±25

Typical Performances in Ambient Light Conditions, Short Distance Mode

Test conditions:

- Ambient light = dark
- 200 kcps/SPAD, 200 kcps/SPAD
- Distance mode = short

Parameter	Target Reflectance	Dark	200 kcps/SPAD
Max distance (cm)	White 88 %	130	130
	Grey 54 %	130	130
	Grey 17 %	130	120
Ranging error (mm)		± 20	±25

Typical Performances in Partial ROI in Dark Conditions

Test conditions:

- Ambient light = dark
- Target covers partial FoV
- ROI centered on optical center
- Distance mode = long

Parameter	Target Reflectance	Dark	50 kcps/SPAD	200 kcps/SPAD
Max distance (cm)	White 88 %	360	308	170
	Grey 54 %	340	254	143
	Grey 17 %	170	119	45
Diagonal FoV (degrees)		27	20	15
Ranging error (mm)		±20	±25	±20

4.7.5 Laser Safety Considerations

Laser Output Power

The laser output power must not be increased by any means and no optics should be used with the intention of focusing the laser beam

Radiation Exposure

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

The VL53L1X contains a laser emitter and corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonably foreseeable conditions including single faults in compliance with IEC 60825-1:2014 (third edition).

The laser output remains within Class 1 limits as long as the STMicroelectronics' recommended device settings (driver settings) are used and the operating conditions specified are respected.

The laser output remains within Class 1 limits as long as the STMicroelectronic's recommended device settings are used and the operating conditions specified are respected (particularly the maximum timing budget, as described in the "UM2356 VL53L1X API user manual").

Class 1 Laser Product Label

4.8 MEMS Audio Sensor Digital Microphone (MP34DT05-A)

4.8.1 Description

The MP34DT05-A is an ultra compact, low power, omnidirectional, digital MEMS microphone, built with a capacitive sensing element and an IC interface.

The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process dedicated to producing audio sensors.

The IC interface is manufactured using a CMOS process that allows designing a dedicated circuit able to provide a digital signal externally in PDM format.

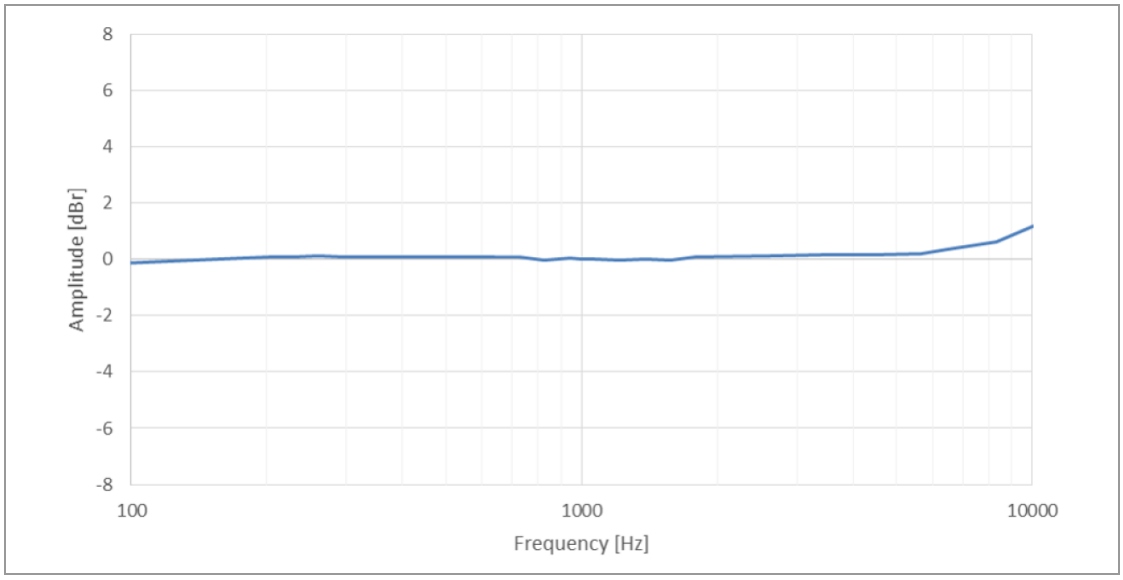
The MP34DT05-A is a low distortion digital microphone with a 64 dB signal to noise ratio and -26 dBFS ±3 dB sensitivity.

4.8.2 Acoustic and Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
AOP	Acoustic overload point			122.5		dBSPL
So	Sensitivity		-29	-26	-23	dBFS
SNR	Signal-to-noise ratio	A-weighted at 1 kHz, 94 dB SPL		64		dB(A)
f_{CLK}	Input clock frequency[4]		1.2	2.4	3.25	MHz
T_{on}	Turn-on time[5]				10	ms
D_{94}	Distortion	94 dBSPL		0.2 %		THD+N
D_{110}	Distortion	110 dBSPL		0.7 %		THD+N
D_{120}	Distortion	120 dBSPL		6 %		THD+N

4.8.3 Frequency Response

Typical Frequency Response Normalized to 1 kHz



4.9 MEMS Pressure Sensor (LPS22HH)

4.9.1 Description

The LPS22HH is an ultra compact piezoresistive absolute pressure sensor which functions as a digital output barometer. The device comprises a sensing element and an IC interface which communicates through I²C, MIPI I3CSM, or SPI from the sensing element to the application.

The sensing element, which detects absolute pressure, consists of a suspended membrane.

The package is holed to allow external pressure to reach the sensing element.

[4] Duty cycle: min. = 40 % max. = 60 %

[5] Time from the first clock edge to valid output data

4.9.2 Pressure and Temperature Sensor Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Pressure Sensor Characteristics						
P_{op}	Operating pressure range		260		1 260	hPa
P_{bits}	Pressure output data			24		bits
P_{sens}	Pressure sensitivity			4 096		LSB/hPa
P_{AccRel}	Relative accuracy over pressure	P = 800 to 1 100 hPa T = 25 °C		±0.025		hPa
P_{AccT}	Absolute accuracy over temperature	P = 260 to 1 260 hPa T = -20 to 80°C		±0.5		hPa
P_{noise}	RMS pressure sensing noise	with embedded filter T = 25 °C		0.0065		hPa RMS
ODR_{Pres}	Pressure output data rate			1 10 25 50 75 100 200		Hz
TCO	Temperature coefficient offset	P = 660 hPa to 1 160 hPa, T = -20 °C to +65 °C		±0.65		Pa/°C
P_longterm	Pressure accuracy, long-term stability			±0.33		hPa/year
P_drift	Soldering drift			±0.5		hPa
Temperature Sensor Characteristics						
T_{sens}	Temperature sensitivity			100		LSB/°C
T_{acc}	Temperature absolute accuracy	T = 0 °C to 80 °C		±1.5		°C
ODR_T	Output temperature data rate			1 10 25 50 75 100 200		Hz

4.10 3D Accelerometer and 3D Gyroscope (LSM6DSO)

4.10.1 Description

The LSM6DSO is a system-in-package featuring a 3D digital accelerometer and a 3D digital gyroscope boosting performance at 0.55 mA in high performance mode and enabling always on low power features for an optimal motion experience for the consumer.

The LSM6DSO supports main OS requirements, offering real, virtual and batch sensors with 9 kbytes for dynamic data batching. The various sensing elements are manufactured using specialized micromachining processes, while the IC interfaces are developed using CMOS technology that allows the design of a dedicated circuit which is trimmed to better match the characteristics of the sensing element.

The LSM6DSO has a full-scale acceleration range of ±2/±4/±8/±16 g and an angular rate range of ±125/±250/±500/±1 000/±2 000 dps.

The event detection interrupts enable efficient and reliable motion tracking and contextual awareness, implementing hardware recognition of free-fall events, 6D orientation, click and double-click sensing, activity or inactivity, stationary/motion detection, and wakeup events.

4.10.2 Mechanical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
LA_FS	Linear acceleration measurement range			±2 ±4 ±8 ±16		g
G_FS	Angular rate measurement range			±125 ±250 ±500 ±1 000 ±2 000		dps
LA_So	Linear acceleration sensitivity[6]	FS = ±2 g		0.061		mg/LSB
		FS = ±4 g		0.122		
		FS = ±8 g		0.244		
		FS = ±16 g		0.488		
G_So	Angular rate sensitivity	FS = ±125 dps		4.375		mdps/ LSB
		FS = ±250 dps		8.75		
		FS = ±500 dps		17.5		
		FS = ±1 000 dps		35		
		FS = ±2 000 dps		70		
G_So%	Sensitivity tolerance	At component level		±1		%

[6] Sensitivity values after factory calibration test and trimming

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
LA_SoDr	Linear acceleration sensitivity change vs. temperature	-40°C to +85°C		±0.01		%/°C
G_SoDr	Angular rate sensitivity change vs. temperature	-40°C to +85°C		±0.007		%/°C
LA_TyOff	Linear acceleration zero-g level offset accuracy[7]			±20		mg
G_TyOff	Angular rate zero-rate level[7]			±1		dps
LA_OffDr	Linear acceleration zero-g level change vs. temperature			±0.1		mg/°C
G_OffDr	Angular rate typical zero-rate level change vs. temperature			±0.01		dps/°C
Rn	Rate noise density in high-performance mode			3.8		mdps/√Hz
RnRMS	Gyroscope RMS noise in normal/low-power mode			75		mdps
An	Acceleration noise density in high-performance mode	FS = ±2 g		70		µg/√Hz
		FS = ±4 g		75		
		FS = ±8 g		80		
		FS = ±16 g		110		
RMS	Acceleration RMS noise in normal/low-power mode	FS = ±2 g		1.8		Mg (RMS)
		FS = ±4 g		2		
		FS = ±8 g		2.4		
		FS = ±16 g		3.0		
	Acceleration RMS noise in ultra-low-power mode	FS = ±2 g		5.5		
LA_ODR	Linear acceleration output data rate			1.6[8]		Hz
				12.5		
				26		
				52		
				104		
				208		
				416		
				833		
				1 666		
				3 332		
				6 664		

[7] Values after factory calibration test and trimming

[8] This ODR is available when the accelerometer is in low-power mode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
G_ODR	Angular rate output data rate			12.5		
				26		
				52		
				104		
				208		
				416		
				833		
				1 666		
				3 332		
				6 664		
Vst	Linear acceleration self-test output change		50		1 700	mg
	Angular rate self-test output change	FS = 250 dps	20		80	dps
		FS = 2 000 dps	150		700	dps

4.11 Digital Output Magnetic Sensor (LIS2MDL)

4.11.1 Description

The LIS2MDL is an ultra low power, high-performance 3-axis digital magnetic sensor. It has a magnetic field dynamic range of ±50 gauss.

The device can be configured to generate an interrupt signal for magnetic field detection.

4.11.2 Sensor Characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
FS	Magnetic dynamic range			±49.152		gauss
So	Sensitivity[9]		-7%	1.5	+7%	mgauss/LSB
TCSo	Sensitivity change vs. temperature			±0.03		%/°C
TyOff	Magnetic sensor offset	With offset cancellation[10]	-60		+60	mgauss
TCOff	Magnetic sensor offset change vs. temperature	With offset cancellation	-0.3		+0.3	mgauss/°C

[9] Values after factory calibration test and trimming

[10] Excluding drift due to magnetic shock

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
RMS	RMS noise[11]	High-resolution mode		3		mgauss (RMS)
ST	Self-test[12]		15		500	mgauss

4.12 Capacitive Digital Sensor for Relative Humidity and Temperature (HTS221)

4.12.1 Description

The HTS221 is an ultra compact sensor for relative humidity and temperature. It includes a sensing element and a mixed signal ASIC to provide the measurement information through digital serial interfaces.

The sensing element consists of a polymer dielectric planar capacitor structure capable of detecting relative humidity.

4.12.2 Humidity and Temperature Parameter Specifications

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Hop	Operating humidity range		0	-	100	% rH
Hbit	Humidity output data			16		bit
Hs	Humidity sensitivity			0.004		%rH/LSB
				256		LSB/%rH
Hacc	Humidity accuracy[13]	20 % to 80 % rH		±3.5		% rH
		0 % to 100% rH		±5		
Hnoise	Humidity noise[14]			0.03		RMS
Hhys	Humidity hysteresis			±1		% rH
Hstep	Humidity response time[15]	t at 63 %		10		s
Hdrift	Humidity long-term drift	20 % to 80 % rH		0.5		% rH/year
Top	Operating temperature range		-40		120	°C
Tbit	Temperature output data		-	16	-	bit
Ts	Temperature sensitivity			0.016		°C/LSB
				64		LSB/°C
Tacc	Temperature accuracy	15 °C to 40 °C		±0.5		°C
		0 °C to 60 °C		±1		

[11] With low-pass filter or offset cancellation enabled

[12] "Self-test" is defined as: OUTPUT[gauss](Self-test enabled) - OUTPUT[gauss](Self-test disabled).

[13] Accuracy in non condensing environment including hysteresis

[14] Default value; noise value can be modified by *AV_CONF (10h)*

[15] Valid at 25 °C and 1 m/s airflow

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Tnoise	Temperature noise[14]			0.007		RMS
Tstep	Temperature response time	t at 63 %		15		s
Tdrift	Temperature long term drift	T = 0 °C to 80 °C			0.05	°C/year
ODR	Humidity and temperature digital output data rate			1		Hz
				7		
				12.5		

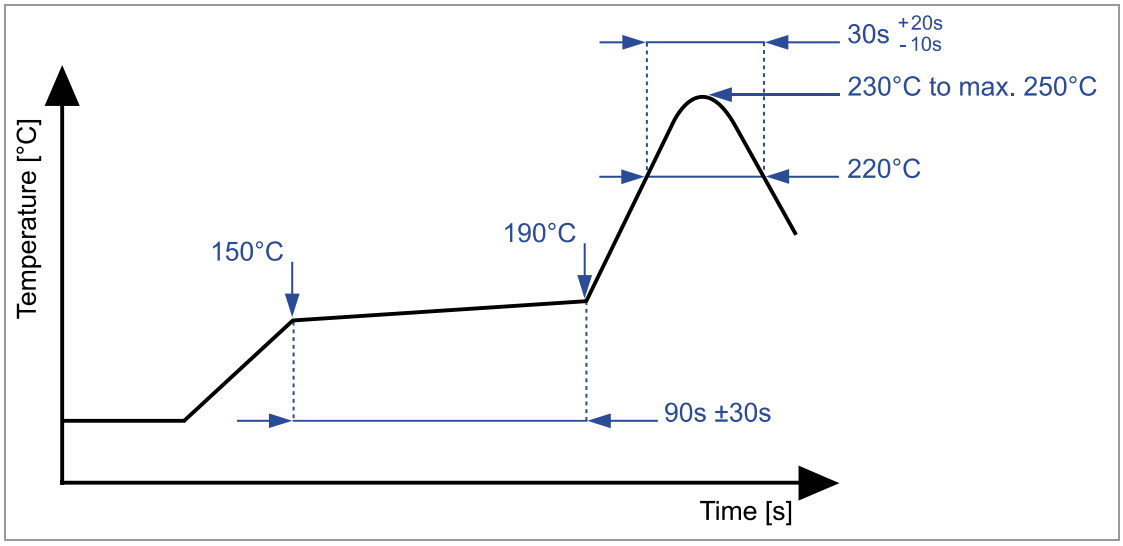
4.13 Reliability Tests

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

No.	Item	Limit	Condition
1	Variable Vibration Test	Electrical parameters should be within specification	Freq.: 20~2 000 Hz, Acc.: 17-50 G, Sweep: 8 min, 2 hours, For: XYZ axis
2	Shock Drop Test		Drop parts on concrete from a height of 1 m for 3 times
3	Heat-Shock/ Temperature Cycling Test		At -40 °C and 85 °C for 1 h/cycle Total = 300 cycles
4	Temperature Humidity Bias Test		At 60 °C, 85 % r.H., 300 h
5	Low Temperature Storage Life Test		At -40 °C, 300 h
6	High Temperature Storage Life Test		At 85 °C, 300 h

4.14 Recommended Soldering Profile

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



5 Cautions

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

5.1 Design Notes

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

5.2 Installation Notes

1. Reflow soldering is possible twice based on the conditions set forth in ⇨ 4.14 Recommended Soldering Profile. Set up the temperature at the soldering portion of this module according to this reflow profile.
2. Carefully position the module so that the heat will not burn into printed circuit boards or affect other components that are susceptible to heat.
3. Carefully locate the module, to avoid an increased temperature caused by heat generated by neighboring components.
4. If a vinyl-covered wire comes into contact with the module, the wire cover will melt and generate toxic gas, damaging the insulation. Never allow contact between a vinyl cover and these modules to occur.
5. This module should not be mechanically stressed or vibrated when reflowed.
6. To repair the board by hand soldering, follow the conditions set forth in this chapter.
7. Do not wash this product.
8. Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the module.

5.3 Usage Condition Notes

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

5.4 Storage Notes

1. The module should not be stressed mechanically during storage.
2. Do not store these modules in the following conditions or the performance characteristics of the module, such as RF performance will be adversely affected:
   - Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX,
   - Storage in direct sunlight,
   - Storage in an environment where the temperature may be outside the range of 5 °C to 35 °C, or where the humidity may be outside the 45 % to 85 % range,
   - Storage of the modules for more than one year after the date of delivery storage period: Please check the adhesive strength of the embossed tape and soldering after 6 months of storage.
3. Keep this module away from water, poisonous gas, and corrosive gas.
4. This module should not be stressed or shocked when transported.
5. Follow the specification when stacking packed crates (max. 10).

5.5 Safety Cautions

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

Before use, check and evaluate the operation when mounted on your products. Abide by these specifications without deviation when using the products. These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, provide the following failsafe functions as a minimum:

1. Ensure the safety of the whole system by installing a protection circuit and a protection device.
2. Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a single fault causing an unsafe status.

5.6 Other Cautions

1. Do not use the module for other purposes than those listed in section ⇨ 5.3 Usage Condition Notes.
2. Be sure to provide an appropriate fail-safe function on your product to prevent any additional damage that may be caused by the abnormal function or the failure of the module.
3. This module has been manufactured without any ozone chemical controlled under the Montreal Protocol.
4. These modules are not intended for use under the special conditions shown below. Before using these modules under such special conditions, carefully check their performance and reliability under the said special conditions to determine whether or not they can be used in such a manner:
   - In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash,
   - In direct sunlight, outdoors, or in a dusty environment,
   - In an environment where condensation occurs,
   - In an environment with a high concentration of harmful gas (e. g. salty air, HCl, Cl2, SO2, H2S, NH3, and NOX).
5. If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these modules with new modules, because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.

For further information please refer to the Panasonic website ⇨ 7.2.2 Product Information.

5.7 Restricted Use

5.7.1 Life Support Policy

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

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

5.7.2 Restricted End Use

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

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

6 Regulatory and Certification Information

6.1 General Certification Information

Regulatory certifications are valid for the following radio relevant software: Stack 2.1c from STSW-BLUETILE DK 3.2.1.

6.2 Federal Communications Commission (FCC) for US

6.2.1 FCC Statement

The following FCC statement has to be printed in the OEM end product user information:

This device complies with part 15 of the FCC Rules and meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407. The transmitter operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

6.2.2 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.

6.2.3 Label Requirements

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

The FCC identifier is **FCC ID: T7V301X**.

This FCC identifier is valid for the PAN3011, PAN3012, and PAN3013. The end product must in any case be labelled on the exterior with:

"Contains FCC ID: T7V301X".

Due to the PAN301x model size, the FCC identifier is displayed in the installation instruction only and it cannot be displayed readable on the module's label due to the limited size.

6.2.4 Antenna Warning

This antenna warning refers to the test device with the model number PAN301x
⇨ 7.2.2 Product Information.

The device is tested with a standard UFL connector and with the antenna listed below. When integrated into the OEM's product, these fixed antennas require installation preventing end users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and with Section 15.247 for emissions. The FCC identifier for the device with the antenna listed in ⇨ 6.2.5 Approved Antenna List is the same (**FCC ID: T7V301X**).

6.2.5 Approved Antenna List

Item	Part Number	Manufacturer	Frequency Band	Type	Max. Gain (dBi)
1	ANT016008LCS2442MA1	TDK	2.4 GHz	Chip antenna	1.6

6.2.6 RF Exposure

To comply with FCC RF Exposure requirements, the OEM must ensure that only antennas from the Approved Antenna List are installed ⇨ 6.2.5 Approved Antenna List.

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

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

The radiated output power of the PAN3011, PAN3012, and PAN3013 with a mounted ceramic antenna (**FCC ID: T7V301X**) is below the FCC radio frequency exposure limits. Nevertheless, the PAN3011, PAN3012 and PAN3013 shall be used in such a manner that the potential for human contact during normal operation is minimized.

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

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

English

The PAN3011, PAN3012, and PAN3013 are licensed to meet the regulatory requirements of ISED.

License ID: **IC: 216Q-301X**

HVIN: **ENW89855A1KF, ENW89855A2KF, ENW89855A3KF**

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

This device has been designed to operate with the antennas listed in ⇨ 6.2.5 Approved Antenna List, having a maximum gain of 1.6 dBi. Antennas not included in this list or having a gain greater than 1.6 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 Ω. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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

The end customer has to assure that the device has a distance of more than 15 mm from the human body under all circumstances.

If the end customer application intends to use the PAN3011, PAN3012, or PAN3013 in a distance smaller 15 mm from the human body, SAR evaluation has to be repeated by the OEM.

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

French

PAN3011, PAN3012, PAN3013 est garanti conforme aux dispositions règlementaires d'Industry Canada (ISED).

License: **IC: 216Q-301X**

HVIN: **ENW89855A1KF, ENW89855A2KF, ENW89855A3KF**

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

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

Ce produit a été développé pour fonctionner spécifiquement avec les antennes listées dans le tableau ⇨ 6.2.5 Approved Antenna List, présentant un gain maximum de 1.6 dBi. Des antennes autres que celles listées ici, ou présentant un gain supérieur à 1.6 dBi ne doivent en aucune circonstance être utilisées en combinaison avec ce produit. L'impédance des antennes compatibles est 50 Ω. L'antenne utilisée avec ce produit ne doit ni être située à proximité d'une autre antenne ou d'un autre émetteur, ni être utilisée conjointement avec une autre antenne ou un autre émetteur.

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

Le client final doit s'assurer que l'appareil se trouve en toutes circonstances à une distance de plus de 15 mm du corps humain.

Si le client final envisage une application nécessitant d'utiliser le PAN3011, PAN3012, PAN3013 à une distance inférieure à 15 mm du corps humain, alors le FEO doit répéter l'évaluation DAS.

L'équipement du client final doit répondre aux exigences actuelles de sécurité et de santé selon l'ISED.

6.3.1 IC Notice

English

The following IC notice has to be printed in English and French in the OEM end product user information:

The devices PAN3011, PAN3012 and PAN3013 (⇨ 7.1 Ordering Information), including the antennas (⇨ 6.2.5 Approved Antenna List), complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-Gen.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

French

Le présent appareil PAN3011, PAN3012, PAN3013 (⇨ 7.1 Ordering Information), les antennes y compris (⇨ 6.2.5 Approved Antenna List), est conforme aux CNR-Gen d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

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

6.3.2 Labeling Requirements

English

Labeling Requirements

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

The IC identifier is **IC: 216Q-301X**.

This IC identifier is valid for all PAN301x modules ⇨ 7.1 Ordering Information. In any case, the end product must be labelled on the exterior with:

"Contains IC: 216Q-301X".

French

Obligations d'étiquetage

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

L' identifiant IC est **IC: 216Q-301X**.

Cet identifiant est valide pour tous les modules PAN301x ⇨ 7.1 Ordering Information. Dans tous les cas les produits finaux doivent indiquer sur leur emballage externe la mention suivante:

"Contient IC: 216Q-301X".

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

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

3.1a Safety/Health:	EN 62368-1: 2014/AC: 2015/A11: 2017
	EN 62479: 2010
3.1b EMC:	EN 301 489-1 V2.2.3: (2019-11)
	EN 301 489-17 V3.2.2: (2019-02)
3.2 Radio:	EN 300 328 V2.2.2: (2019-07)

Standards

- Due to the model size, the CE marking is displayed in the installation instruction and on the package label only. It cannot be displayed according to regulation (EU) No. 765/2008 in 5 mm height on the module's label due to the limited space.
- The end product OEM has to re-assess the conformity of the end product to EU regulations, but can use the PAN301x RED pre-assessment to shorten this procedure.
- The RED EU Type Examination Certificate No. **G0M-2009-9272-V01** issued by the Notified Body 0681 can be used for the OEM end product conformance assessment. If a Notified Body has been contracted for the end product conformity assessment, it should be noted that this EU Type Examination Certificate should be used for conformance assessment.

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

CE

The requirements for CE marking are described in regulation (EU) No. 765/2008 Annex II.

The end customer has to assure that the device has a distance of more than 5 mm from the human body under all circumstances.

If the end customer application intends to use the PAN3011, PAN3012, or PAN3013 in a distance smaller 5 mm from the human body, SAR evaluation has to be repeated by the OEM.

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

PAN3011, PAN3012, and PAN3013 and its model versions in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States [Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra, and Turkey.

6.5 Bluetooth

The final Bluetooth end product listing needs to be created by using the following IDs:

Bluetooth 5	Declaration ID	QDID
End Product (Bluetooth LE LR Module)	D052422	164222

Bluetooth Marks

According to the Bluetooth SIG, the PAN3011, PAN3012, and PAN3013 fulfilled the criteria to label your product as a Bluetooth device:

For further information please refer to the Bluetooth website www.bluetooth.com.

6.6 RoHS and REACH Declaration

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

7 Appendix

7.1 Ordering Information

Variants and Versions

Order Number	Brand Name	Description	MOQ[16]
ENW89855A1KF	PAN3011	• Bluetooth LE Single Mode with Antenna • Empty Flash • Sensors: accelerometer and 3D gyroscope, magnetometer, microphone	800
ENW89855A2KF	PAN3012	• Bluetooth LE Single Mode with Antenna • Empty Flash • Sensors: humidity and temperature, pressure sensor, microphone	800
ENW89855A3KF	PAN3013	• Bluetooth LE Single Mode with Antenna • Empty Flash • Sensors: accelerometer and 3D gyroscope, magnetometer, time of flight sensor	800

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

7.2 Contact Details

7.2.1 Contact Us

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

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

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

Email: wireless@eu.panasonic.com

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

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

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

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

7.2.2 Product Information

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

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

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

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

http://www.panasonic.com/rfmodules