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|----------------------------|----------------------------------------------------|-------------------------|-------------|
| CLASSIFICATION             | PRODUCT SPECIFICATION                              | No.<br>DS-1760-2400-102 | REV.<br>0.1 |
| SUBJECT                    | CLASS 2 BLUETOOTH LOW ENERGY<br>SINGLE MODE MODULE | PAGE                    | 1 of 33     |
| CUSTOMER'S CODE<br>PAN1760 | PANASONIC'S CODE<br>ENW89847A1KF                   | DATE                    | 12.01.2015  |

# Product Specification

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

Applicant / Manufacturer      Toshiba  
Software

Software Version                      Please refer to chapter 21

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|                                                                                                   |                       |                    |                      |
|---------------------------------------------------------------------------------------------------|-----------------------|--------------------|----------------------|
| Power Electronics R&D Center<br>Wireless Connectivity<br>Panasonic Industrial Devices Europe GmbH | APPROVED<br>genehmigt | CHECKED<br>geprüft | DESIGNED<br>erstellt |
|---------------------------------------------------------------------------------------------------|-----------------------|--------------------|----------------------|

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## 1. SCOPE OF THIS DOCUMENT

This product specification applies to Panasonic's, Class 2, Bluetooth®<sup>1</sup> low energy single mode module, series number: PAN1760

## 2. KEY FEATURES

- Same form factor and footprint as PAN1026
- Bluetooth 4.0 (LE) embedded GATT profile with high level API commands, compatible to Toshiba reference BLE profiles
- Surface mount type 15.6 x 8.7 x 1.8 mm<sup>3</sup>
- Tx power 0 dBm, Rx sensitivity -91 dBm
- Compliant to BT 4.0 (extension to 4.1 under development)
- 32kB on-chip RAM for application software and driver
- 512kBit eeprom to download user program during start up
- Operation with external host or as host-less ( stand alone)
- Standard SIG BLE and "SPP over BLE" profiles available
- Temperature Range from -40°C to +85°C
- 2 UART, I2C , SPI, GPIO (10 in/out), Wake-Up control pins, ADC(4 CH)

<sup>1</sup> Bluetooth is a registered trademark of the Bluetooth Special Interest Group.

|                            |                                                    |                         |             |
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### 3. BLUETOOTH LOW ENERGY

Bluetooth Low Energy (BLE), part of Bluetooth Ver. 4.0, specifies two types of implementation: Single mode and dual mode. Single mode devices implement the low energy specification and consume just a fraction of the power of classic Bluetooth, allowing the short-range wireless standard to extend to coin cell battery applications for the first time. Dual mode devices combine Bluetooth Low Energy and 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 classic standards. Dual mode Bluetooth 4.0 is backwards compatible to Bluetooth classic and well suited for gateway applications, but is not practical for low power devices.

BLE single mode devices are called "Bluetooth Smart".



### 4. APPLICATIONS FOR THE MODULE

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

### 5. DESCRIPTION FOR THE MODULE

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

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

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

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

[www.panasonic.com/rfmodules](http://www.panasonic.com/rfmodules) for the US,

[http://industrial.panasonic.com/eu/i/29606/wireless\\_modules/wireless\\_modules.html](http://industrial.panasonic.com/eu/i/29606/wireless_modules/wireless_modules.html) for EU

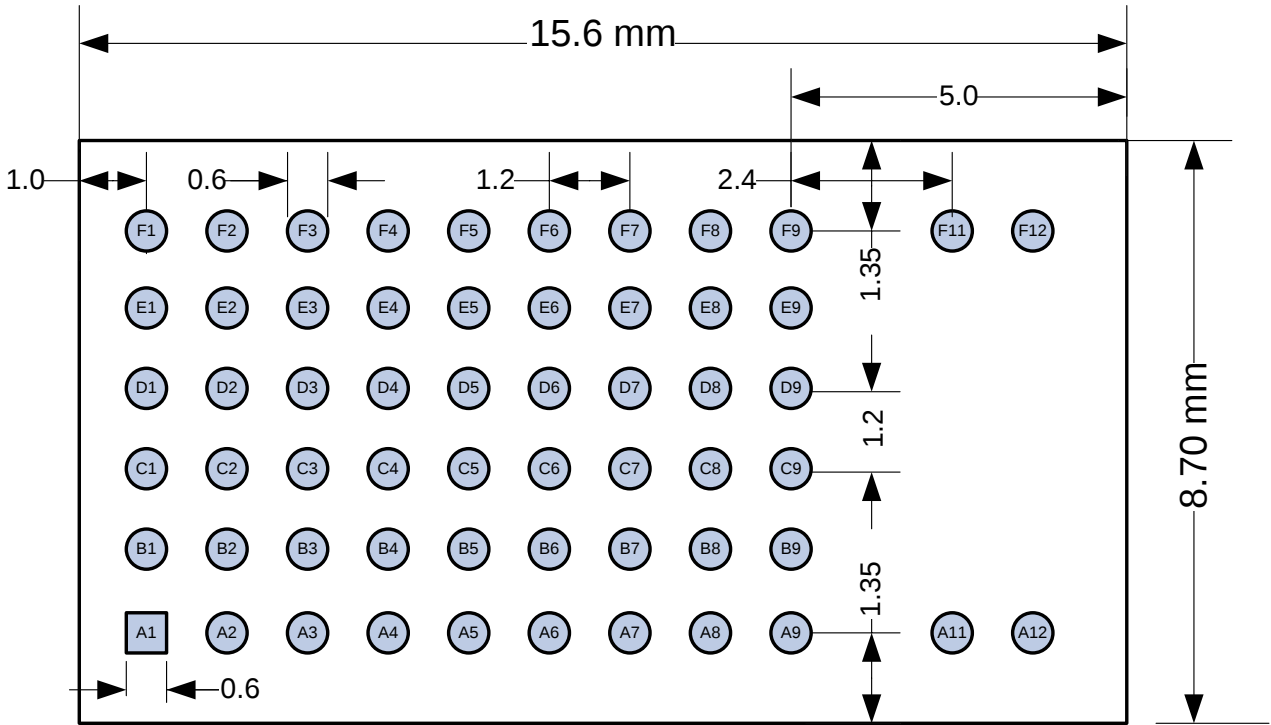
or write an e-mail to [wireless@eu.panasonic.com](mailto:wireless@eu.panasonic.com).

|                            |                                                    |                         |             |
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## 6. DETAILED DESCRIPTION

### 6.1. PAN1760 TERMINAL LAYOUT

Top View, Application PCB

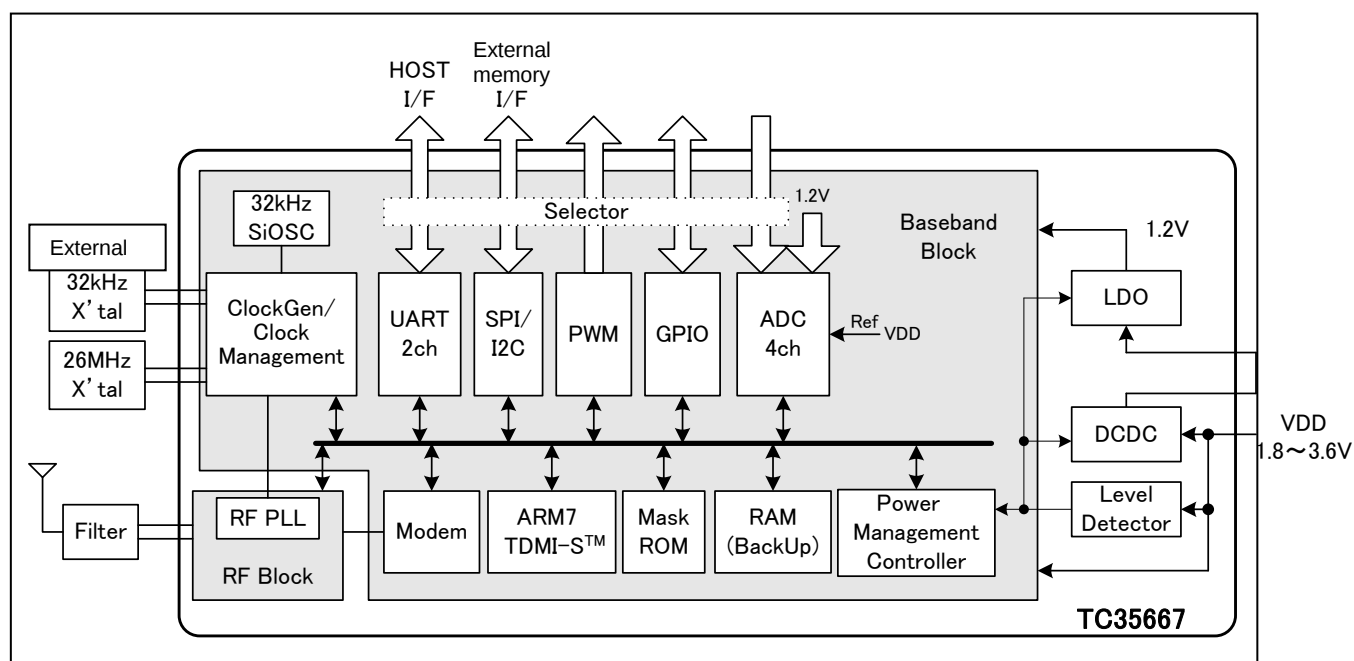
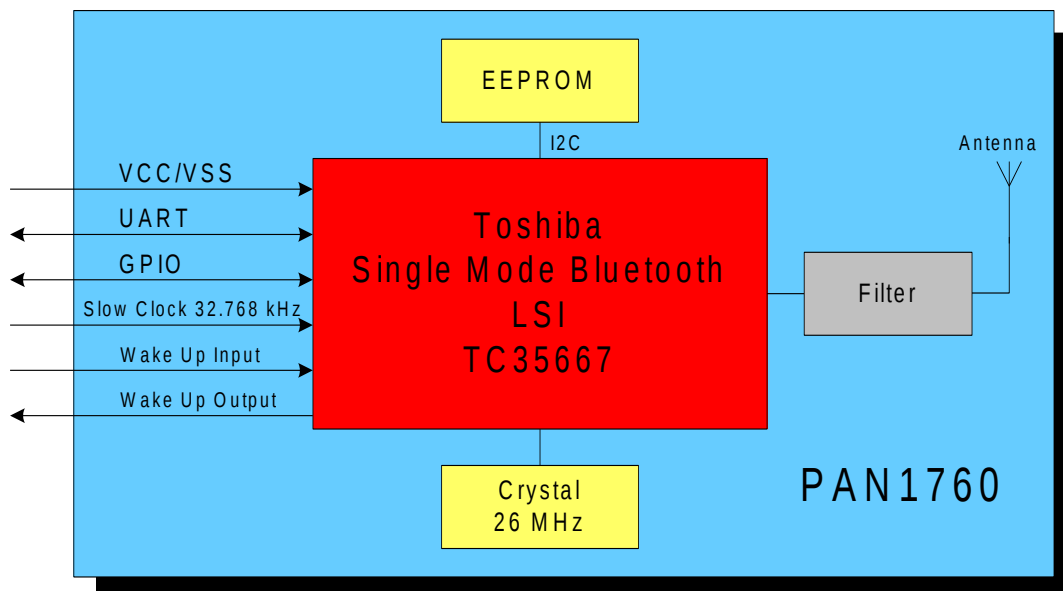


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| No  | Pin Name  | Pin Type      | Description                                      |
|-----|-----------|---------------|--------------------------------------------------|
| A1  | GND       | Ground Pin    | Connect to Ground                                |
| A2  | NC        |               | Not Connected                                    |
| A3  | Reset     | Digital Input | Reset, active-low                                |
| A4  | VCC       | Power         | 2V – 3.6V analog/digital power supply connection |
| A5  | VCC       | Power         | 2V – 3.6V analog/digital power supply connection |
| A6  | VCC       | Power         | 2V – 3.6V analog/digital power supply connection |
| A7  | GND       | Ground Pin    | Connect to Ground                                |
| A8  | NC        |               | Not Connected                                    |
| A9  | GND       | Ground Pin    | Connect to Ground                                |
| A11 | GND       | Ground Pin    | Connect to Ground                                |
| A12 | GND       | Ground Pin    | Connect to Ground                                |
| B1  | NC        |               | Not Connected                                    |
| B2  | GPIO14    | Digital I/O   |                                                  |
| B3  | GPIO11    | Digital I/O   |                                                  |
| B4  | NC        |               | Not Connected                                    |
| B5  | NC        |               | Not Connected                                    |
| B6  | NC        |               | Not Connected                                    |
| B7  | NC        |               | Not Connected                                    |
| B8  | NC        |               | Not Connected                                    |
| B9  | NC        |               | Not Connected                                    |
| C1  | NC        |               | Not Connected                                    |
| C2  | GPIO15    | Digital I/O   |                                                  |
| C3  | GPIO12    | Digital I/O   |                                                  |
| C4  | NC        |               | Not Connected                                    |
| C5  | NC        |               | Not Connected                                    |
| C6  | GPIO9     | Digital I/O   |                                                  |
| C7  | GPIO10    | Digital I/O   |                                                  |
| C8  | GND       | Ground Pin    | Connect to Ground                                |
| C9  | GND       | Ground Pin    | Connect to Ground                                |
| D1  | NC        |               | Not Connected                                    |
| D2  | NC        |               | Not Connected                                    |
| D3  | GPIO1     | Digital I/O   |                                                  |
| D4  | GPIO0     | Digital I/O   |                                                  |
| D5  | NC        |               | Not Connected                                    |
| D6  | GPIO13    | Digital I/O   |                                                  |
| D7  | GND       | Ground Pin    | Connect to Ground                                |
| D8  | GND       | Ground Pin    | Connect to Ground                                |
| D9  | NC        |               | PAN1760 Not Connected/Placeholder for Antenna    |
| E1  | SDA       | Digital I/O   | Connected to internal EEPROM                     |
| E2  | SCL       | Digital I/O   | Connected to internal EEPROM                     |
| E3  | NC        |               | Not Connected                                    |
| E4  | NC        |               | Not Connected                                    |
| E5  | SLPX0IN   | Clock In      | 32.768 KHz sleep clock input                     |
| E6  | UART_RXD  | Digital In    |                                                  |
| E7  | GPIO2     | Digital I/O   |                                                  |
| E8  | GND       | Ground Pin    | Connect to Ground                                |
| E9  | GND       | Ground Pin    | Connect to Ground                                |
| F1  | GND       | Ground Pin    | Connect to Ground                                |
| F2  | EEPROM_WP | Digital In    | EEPROM write protect /active low                 |
| F3  | NC        |               | Not Connected                                    |
| F4  | NC        |               | Not Connected                                    |
| F5  | UART_CTS  | Digital In    | Can be configured to UART2_RXD                   |
| F6  | SLPX0OUT  | Clock Out     | 32.768 KHz sleep clock output                    |
| F7  | UART_TXD  | Digital Out   |                                                  |
| F8  | UART_RTS  | Digital I/O   | Can be configured to UART2_TXD                   |
| F9  | GND       | Ground Pin    | Connect to Ground                                |
| F11 | GND       | Ground Pin    | Connect to Ground                                |
| F12 | GND       | Ground Pin    | Connect to Ground                                |

|                            |                                                    |                         |             |
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## 7. PAN1760 BLOCK DIAGRAM



|                            |                                                    |                         |             |
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## 8. GPIO FUNCTION LIST

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

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

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

|                            |                                                    |                         |             |
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## 9. Test Conditions

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

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

## 10. GENERAL DEVICE REQUIREMENTS AND OPERATION

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

### 10.1. ABSOLUTE MAXIMUM RATINGS

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

### 10.2. RECOMMENDED OPERATING CONDITIONS

| No | Rating                                | Min | Typ | Max | Unit |
|----|---------------------------------------|-----|-----|-----|------|
| 1  | Power supply voltage                  | 1.7 | 1.8 | 1.9 | V    |
| 1  | Power supply voltage                  | 2.7 | 3.3 | 3.6 | V    |
| 2  | Maximum ambient operating temperature |     | −40 | 85  | °C   |

<sup>2</sup> 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.

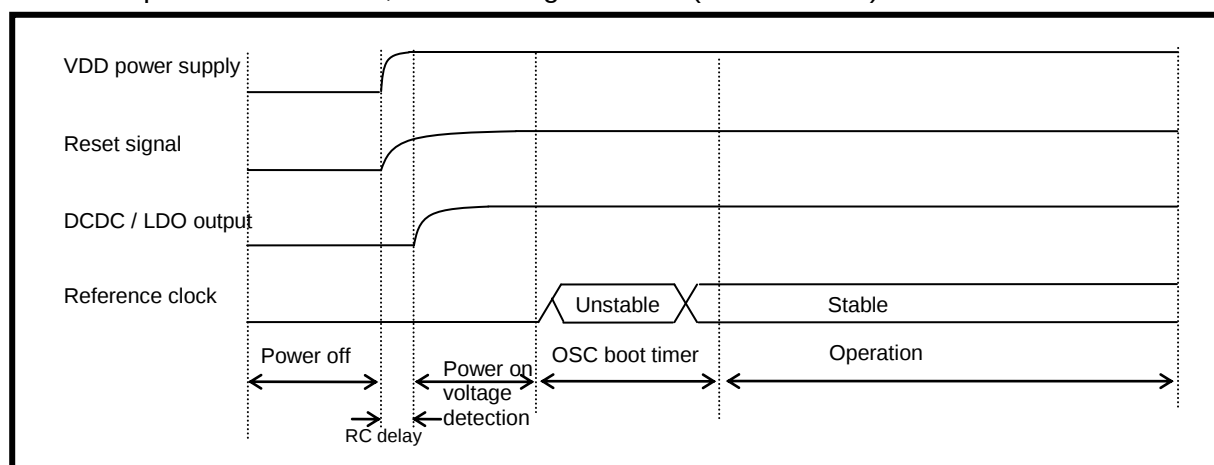
|                            |                                                    |                         |             |
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### 10.3. POWER UP SEQUENCE

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

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

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



### 10.4. PAN1760 CURRENT CONSUMPTION

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

|                            |                                                    |                         |             |
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## 11. BLUETOOTH RF PERFORMANCE

### 11.1. PAN1760 BLUETOOTH CHARACTERISTICS

| No | Characteristics             | Condition                                        | Min  | Typ   | Max  | Unit |
|----|-----------------------------|--------------------------------------------------|------|-------|------|------|
| 1  | Operation frequency range   |                                                  | 2402 |       | 2480 | MHz  |
| 2  | Channel spacing             |                                                  |      | 2     |      | MHz  |
| 3  | Output Power                | Maximum setting, measured at single ended 50ohm. |      | 0     |      | dBm  |
| 4  | Sensitivity, High Gain Mode | High-gain mode                                   |      | -93.0 |      | dBm  |

### 11.2. PAN1760 SPURIOUS EMISSION

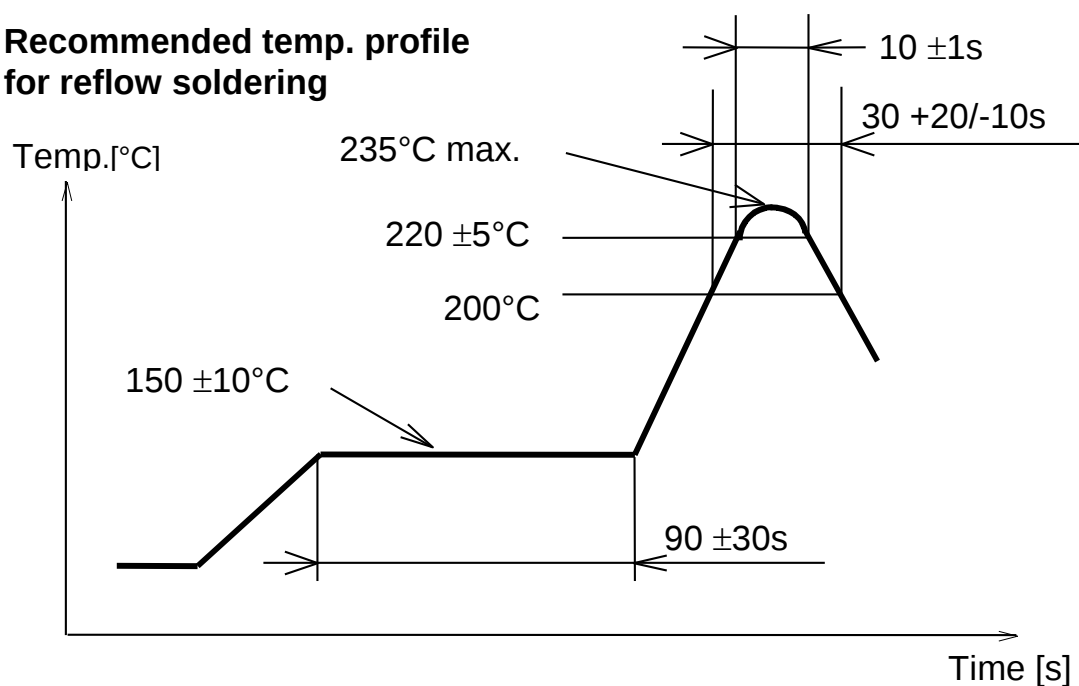
| No | Characteristics    | Condition                                                                                                                               | Typ | Max | Unit |
|----|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--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

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

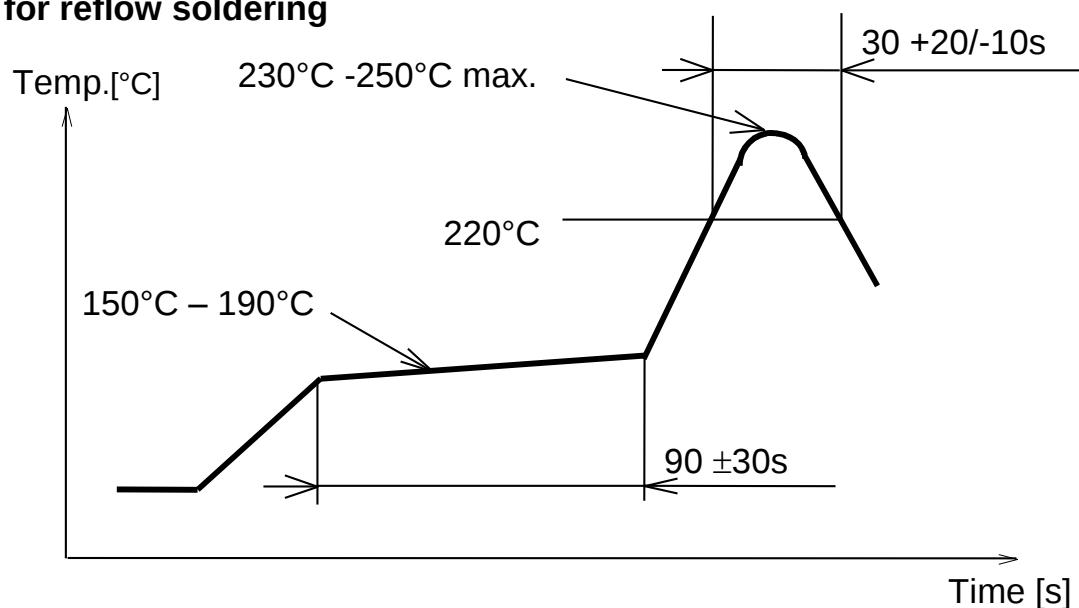
### 12.1. FOR LEAD SOLDER

#### Recommended temp. profile for reflow soldering



### 12.2. FOR LEADFREE SOLDER

#### Our used temp. profile for reflow soldering

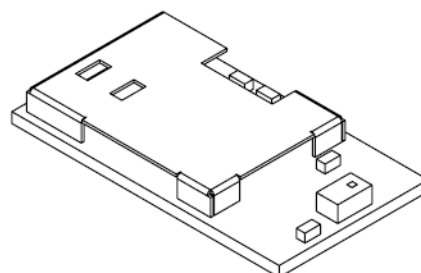
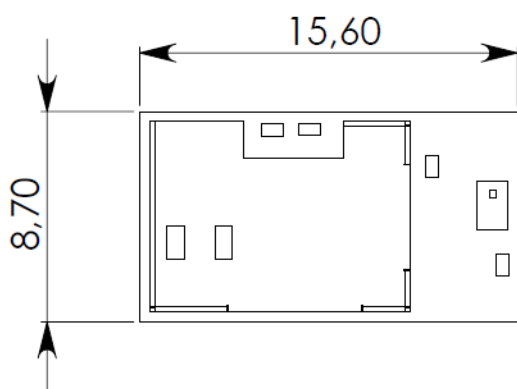
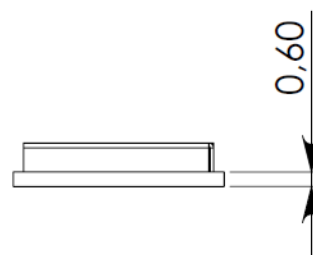
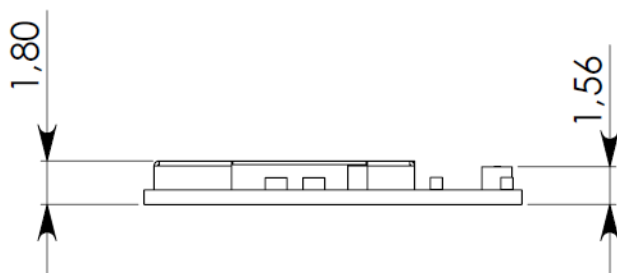


Reflow permissible cycle: 2  
Opposite side reflow is prohibited due to module weight.

|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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### 13. PAN1760 MODULE DIMENSION

| No. | Item   | Dimension | Tolerance  | Remark    |
|-----|--------|-----------|------------|-----------|
| 1   | Width  | 8.70      | $\pm 0.30$ |           |
| 2   | Length | 15.60     | $\pm 0.30$ |           |
| 3   | Height | 1.80      | $\pm 0.20$ | With case |

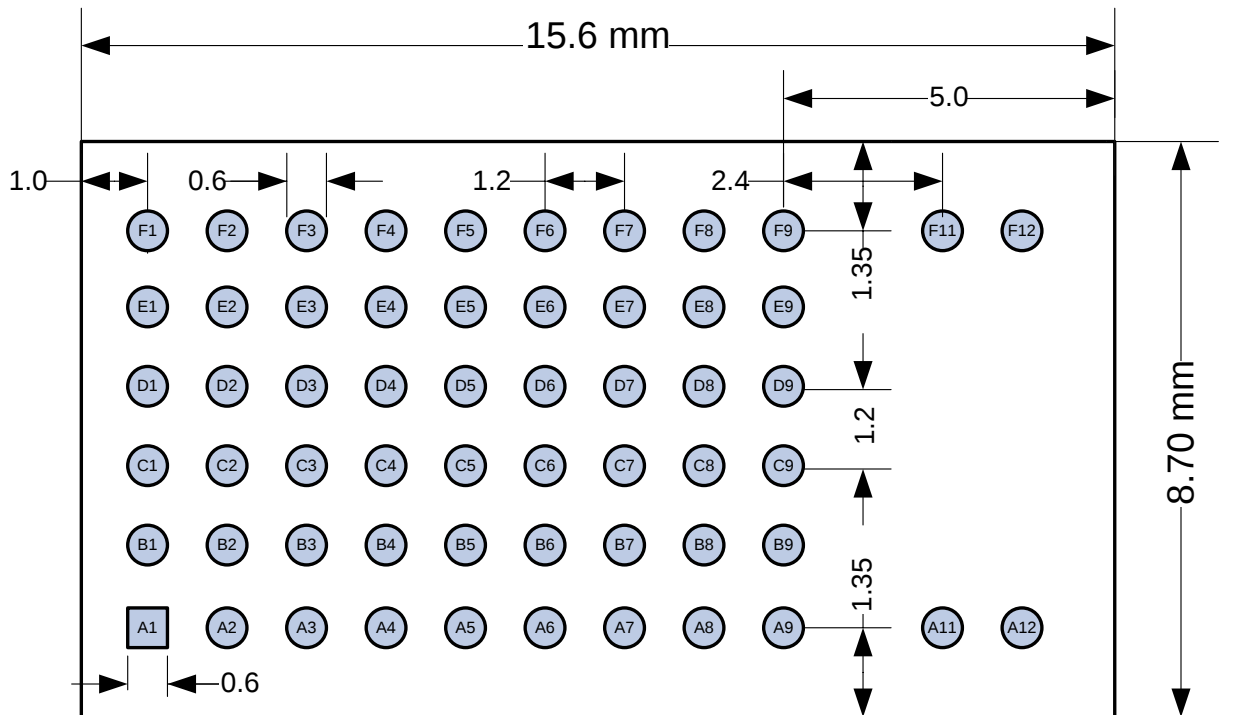


|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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#### 14. PAN1760 FOOTPRINT OF THE MODULE

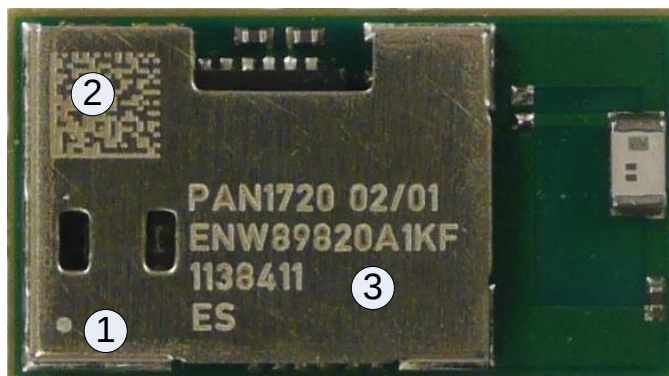
All dimensions are in millimeters.  
The outer dimensions have a tolerance of  $\pm 0.3\text{mm}$ .

Top view, Application PCB



|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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## 15. CASE MARKING



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

### 15.1. EXAMPLE FOR MARKING

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

### 15.2. MARKING DEFINITION

(1) Pin1 marking

(2) 2D code (Serial number)

(3) Marking:

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

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

## 16. MECHANICAL REQUIREMENTS

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

|                            |                                                    |                         |             |
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## 17. DEVELOPMENT OF APPLICATIONS

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

## 18. RELIABILITY TESTS

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

| No. | Item            | Limit                                           | Condition                                                                                                                                         |
|-----|-----------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Vibration test  | Electrical parameter should be in specification | a) Freq.:10~50Hz,Amplitude:1.5mm<br>a) 20min. / cycle,1hrs. each of XYZ axis<br>b) Freq.:30~100Hz, 6G<br>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.;<br>each temperature 300 cycles                                                                             |
| 4   | Moisture test   | the same as above                               | +60°C, 90% RH, 300h                                                                                                                               |
| 5   | Low temp. test  | the same as above                               | -40°C, 300h                                                                                                                                       |
| 6   | High temp. test | the same as above                               | +85°C, 300h                                                                                                                                       |

## 19. CAUTIONS

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

### 19.1. DESIGN NOTES

- (1) Follow the conditions written in this specification, especially the control signals of this module.
- (2) The supply voltage has to be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47uF directly at the module).
- (3) This product should not be mechanically stressed when installed.
- (4) Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
- (5) Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum tolerance.
- (6) The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
- (7) Keep this product away from other high frequency circuits.

|                            |                                                    |                         |             |
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## 19.2. INSTALLATION NOTES

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

## 19.3. USAGE CONDITIONS NOTES

- (1) Take measures to protect the unit against static electricity. If pulses or other transient loads (a large load applied in a short time) are applied to the products, check and evaluate their operation 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.

|                            |                                                    |                         |             |
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#### 19.4. STORAGE NOTES

- (1) The module should not be stressed mechanically during storage.
- (2) Do not store these products in the following conditions or the performance characteristics of the product, such as RF performance will be adversely affected:
  - Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub>
  - Storage in direct sunlight
  - Storage in an environment where the temperature may be outside the range of 5°C to 35°C range, or where the humidity may be outside the 45 to 85% range.
  - Storage of the products for more than one year after the date of delivery Storage period: Please check the adhesive strength of the embossed tape and soldering after 6 months of storage.
- (3) Keep this product away from water, poisonous gas and corrosive gas.
- (4) This product should not be stressed or shocked when transported.
- (5) Follow the specification when stacking packed crates (max. 10).

#### 19.5. SAFETY CAUTIONS

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

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

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

#### 19.6. OTHER CAUTIONS

- (1) This specification sheet is copyrighted. Please do not disclose it to a third party.
- (2) Please do not use the products for other purposes than those listed.
- (3) Be sure to provide an appropriate fail-safe function on your product to prevent an additional damage that may be caused by the abnormal function or the failure of the product.
- (4) This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.
- (5) These products are not intended for other uses, other than under the special conditions shown below. Before using these products under such special conditions, check their performance and reliability under the said special conditions carefully to determine whether or not they can be used in such a manner.
  - In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash.
  - In direct sunlight, outdoors, or in a dusty environment
  - In an environment where condensation occurs.
  - In an environment with a high concentration of harmful gas (e.g. salty air, HCl,

|                            |                                                    |                         |             |
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Cl<sub>2</sub>, SO<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, and NO<sub>x</sub>)

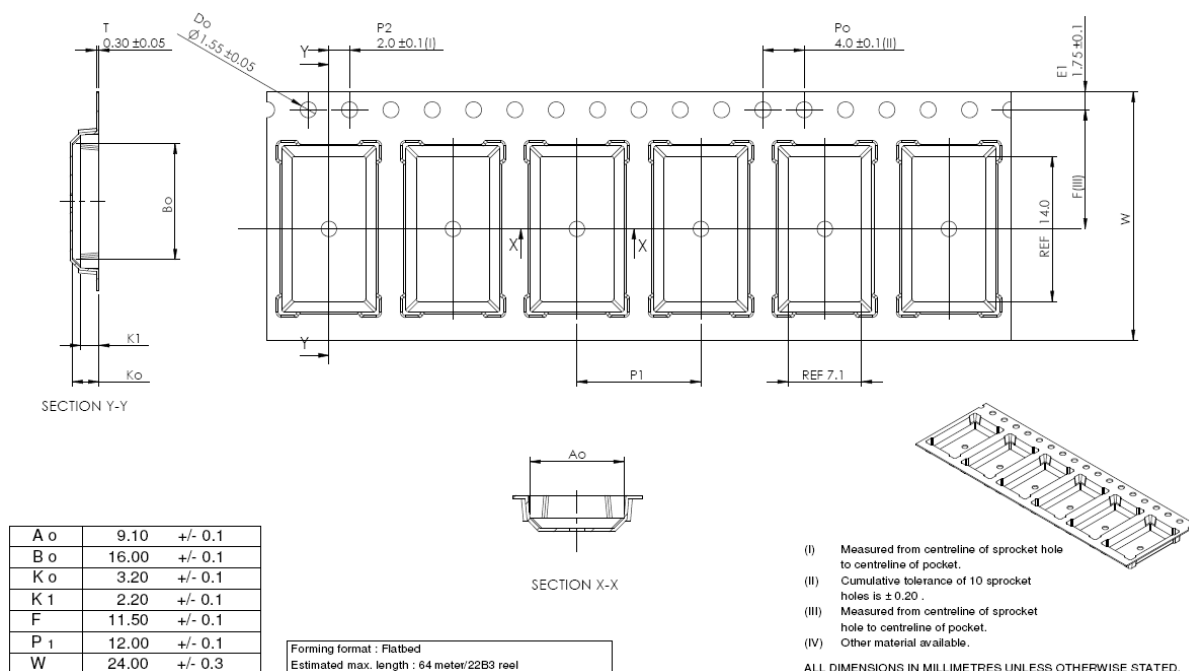
- (6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.
- (7) When you have any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

|                            |                                                    |                         |             |
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## 20. PACKAGING

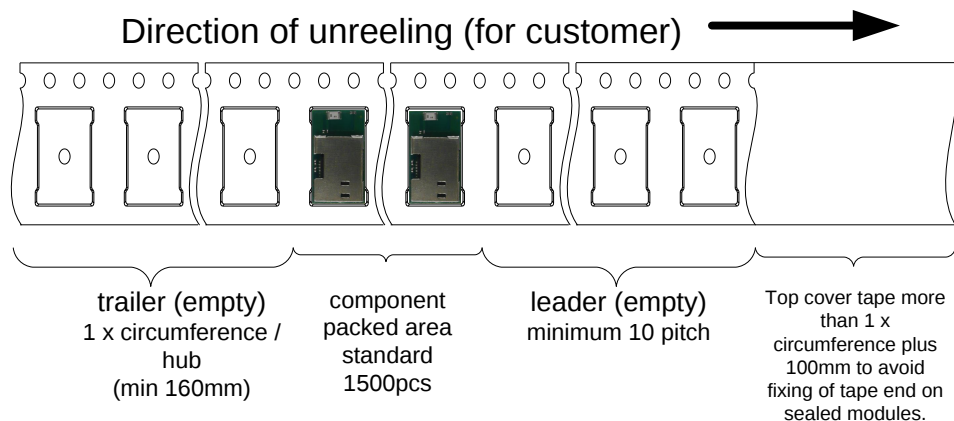
If the product has mass production status, indicated in chapter 23, we will deliver the module in the package which are described below.

### 20.1. PAN1760 TAPE DIMENSION



|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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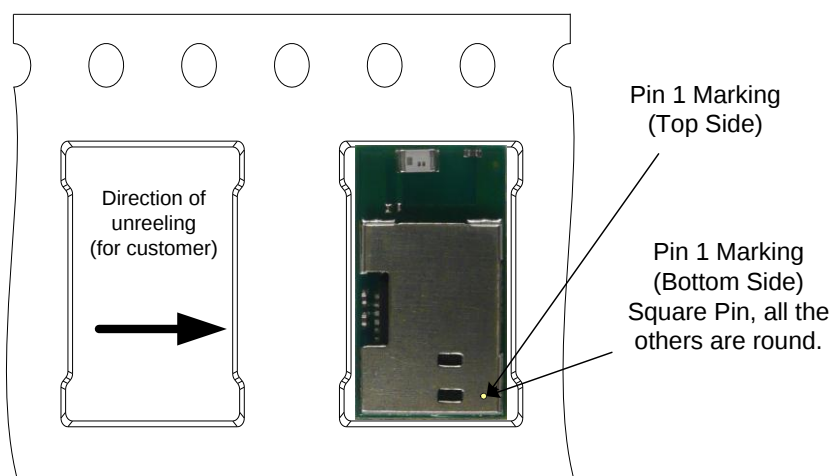
## 20.2. PACKING IN TAPE



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

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

## 20.3. COMPONENT DIRECTION

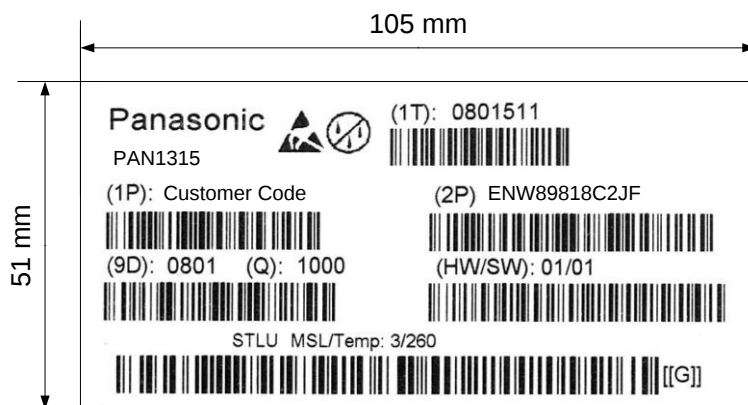




|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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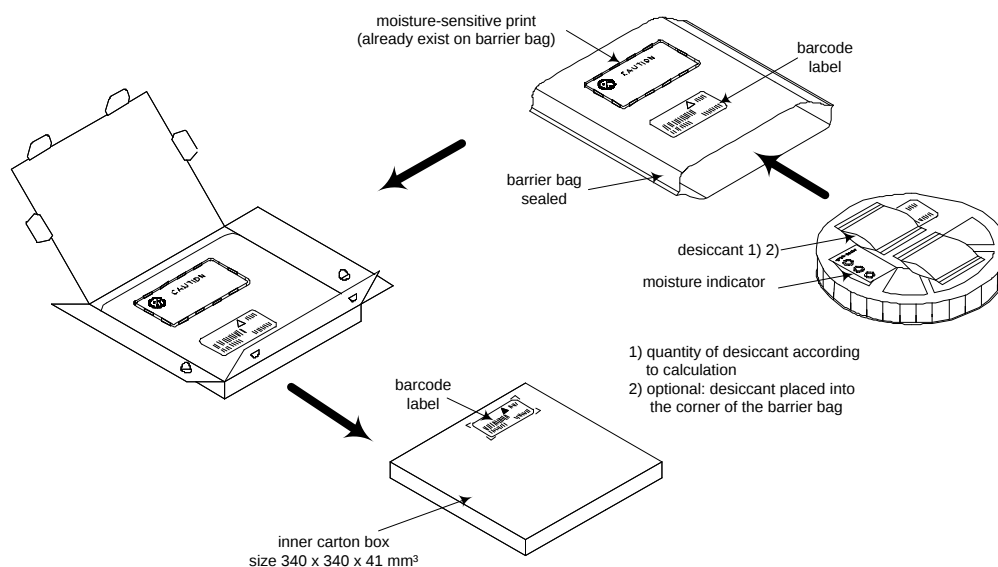
## 20.5. LABEL FOR PACKAGE

The picture shows an example from similar product.



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

## 20.6. TOTAL PACKAGE



|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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## 21. ORDERING INFORMATION

| Ordering part number        | Description                                                                                         | MOQ <sup>(1)</sup> |
|-----------------------------|-----------------------------------------------------------------------------------------------------|--------------------|
| ENW89847A1KF <sup>(2)</sup> | PAN1760<br>CLASS 2 Bluetooth single mode Module according BT-4.0.<br><i>Bluetooth®</i> smart device | 1500               |

Notes:

- (1) Abbreviation for Minimum Order Quantity (MOQ). The standard MOQ for mass production is 1500 pieces, fewer only on customer demand. Samples for evaluation can be delivered at any quantity via the distribution channels.
- (2) Samples are available on customer demand

|                            |                                                    |                         |             |
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## 22. ROHS AND REACH DECLARATION

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

### Panasonic

Panasonic Industrial Devices Slovakia s.r.o.  
Oravicka 616, 020 01 TRSTENA

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



Dear Customer,

Date: 20.11.2012

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

#### Directive 1907/2006 (REACH)

Substances from the candidate lists of so called "substances of very high concern" (SVHC) published by ECHA are regularly monitored if SVHC substances are contained in our products above 0.1% (w/w).

Due to the high complexity of these substance investigations covering all of our global suppliers, this process required some time. We will provide you with all substance information regarding our products based on information collected from our suppliers.

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

#### SVHC Substances:

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

#### Directive 2011/65/EC (RoHS)

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

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

Wireless Modules (ENW898series; ENW596series; ENWC9Aseries)

|         |                      |        |                     |                      |                       |
|---------|----------------------|--------|---------------------|----------------------|-----------------------|
| Create: | Kostalikova<br>Alena | Check: | Firmentova<br>Viera | Approval:            | Kashiwaya<br>Shinichi |
| EQ      |                      | QA&QC  |                     | Managing<br>Director |                       |

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

|                            |                                                    |                         |             |
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## 23. DATA SHEET STATUS

This data sheet contains the preliminary specification.

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

Please consult the most recently issued data sheet before initiating or completing a design.

## 24. HISTORY FOR THIS DOCUMENT

| Revision | Date         | Modification / Remarks               |
|----------|--------------|--------------------------------------|
| 0.1      | January 2015 | 1 <sup>st</sup> preliminary version. |
|          |              |                                      |
|          |              |                                      |
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|          |              |                                      |
|          |              |                                      |
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|          |              |                                      |
|          |              |                                      |

## 25. RELATED DOCUMENTS

For an update, please search in the suitable homepage.

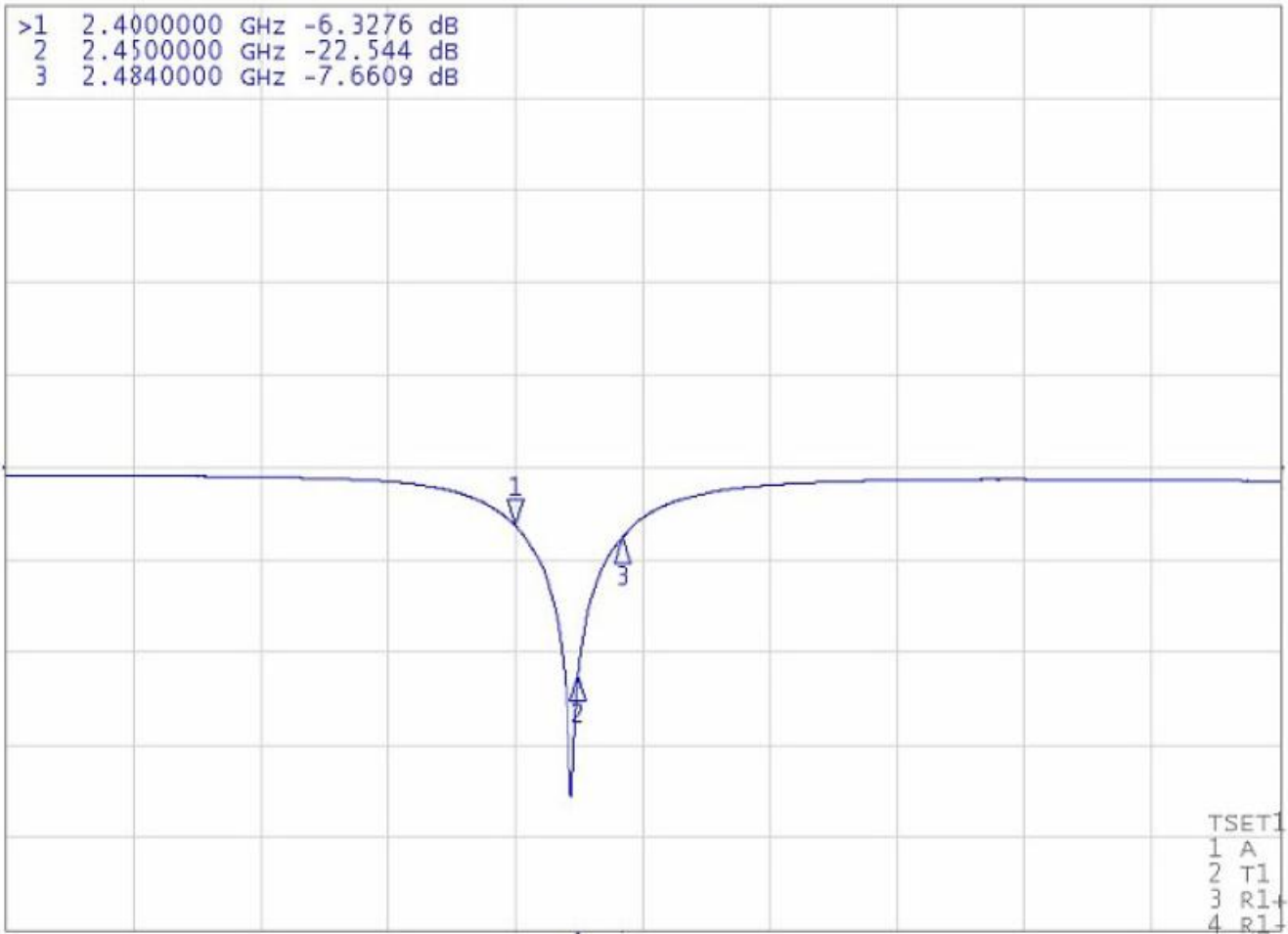
- [1] PAN1760ETU Design-Guide  
<http://www.pideu.panasonic.de>
- [2] Application Note Land Grid Array  
<http://www.pideu.panasonic.de/pdf/184ext.pdf>
- [3] REACH and RoHS Certificate  
<http://www.pideu.panasonic.de/pdf/182ext2.jpg>

SOLLTE MAN HIER NOCH EINEN HINWEIS AUF TC35667FTG Dokumente einfügen ?  
(URL link)

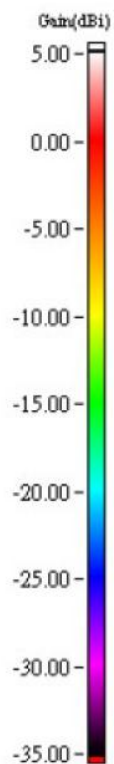
|                            |                                                    |                         |             |
|----------------------------|----------------------------------------------------|-------------------------|-------------|
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## 26. RADIATION PATTERN OF ANTENNA

Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB [F2 Del]



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

|                            |                                                    |                         |             |
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## 27. GENERAL INFORMATION

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This product description does not lodge the claim to be complete and free of mistakes.

Please contact the related product manager in every case.

If we deliver ES samples to the customer, these samples have the status Engineering Samples. This means, the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and there may be differences to be published Data Sheet.

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

### **Disclaimer:**

Customer acknowledges that samples may deviate from the Data Sheet and may bear defects due to their status of development and the lack of qualification mentioned above.

Panasonic rejects any liability or product warranty for Engineering Samples. In particular, Panasonic disclaims liability for damages caused by

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

Panasonic disclaims any liability for consequential and incidental damages.

In case of any questions, please contact your local sales partner or the related product manager.

## 28. REGULATORY INFORMATION

### 28.1. FCC NOTICE



The devices PAN1760, for details refer to Chapter 21, including the antennas, which are listed in 28.5, complies with Part 15 of the FCC Rules. The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.transmitter Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

### 28.2. CAUTION



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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

|                            |                                                    |                         |             |
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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

### 28.3. LABELING REQUIREMENTS



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

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

### 28.4. ANTENNA WARNING



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

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

### 28.5. APPROVED ANTENNA LIST

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

| Item | Part Number | Manufacturer | Frequency Band | Type         | Gain (dBi) |
|------|-------------|--------------|----------------|--------------|------------|
| 2    | ANT2012     | Yageo        | 2.4GHz         | Chip-Antenna | +2.72      |

### 28.6. RF EXPOSURE PAN1760



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

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

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

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

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

|                            |                                                    |                         |             |
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## 29. INDUSTRY CANADA CERTIFICATION

PAN1760 is licensed to meet the regulatory requirements of Industry Canada (IC),  
license: IC: 216Q-1760

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

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

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

### 29.1. IC NOTICE



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

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

### 29.2. LABELING REQUIREMENTS



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

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

## 30. BLUETOOTH CERTIFICATION

The Design is listed as Controller Subsystem with QDID:

The module is listed as EPL based on Toshiba's QDID.

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

|                            |                                                    |                         |             |
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### 31. EUROPEAN R&TTE DECLARATION OF CONFORMITY

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



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

### 32. LIFE SUPPORT POLICY

This Panasonic product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. Panasonic customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Panasonic for any damages resulting.