

**To Be Discontinued**

**W-LAN Module Data Sheet**

**Cypress WLAN Chipset CYW4390**

**Sample P/N : LBWB1ZZ1AD-ATEMP-AYLA**

**MP P/N : LBWB1ZZ1AD-812**

Preliminary  
< Specification may be changed by Murata without notice >  
Murata Manufacturing Co., Ltd.

## The revision history of the product specification

Issued Date	Revision Code	Revision Page	Changed Items	Change Reason
Jul.2, 2015			First Issue	
Sep.11, 2015	A	P.7 P.12	5.3. Terminal Configurations 6. Alternate functions table 13. Packing	Addition Correction
Jan.11, 2016	B	P17	APPENDIX	Addition

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Please be aware that an important notice concerning availability, standard warranty and use in critical applications of Murata products and disclaimers thereto appears at the end of this specification sheet.

## 1. Scope

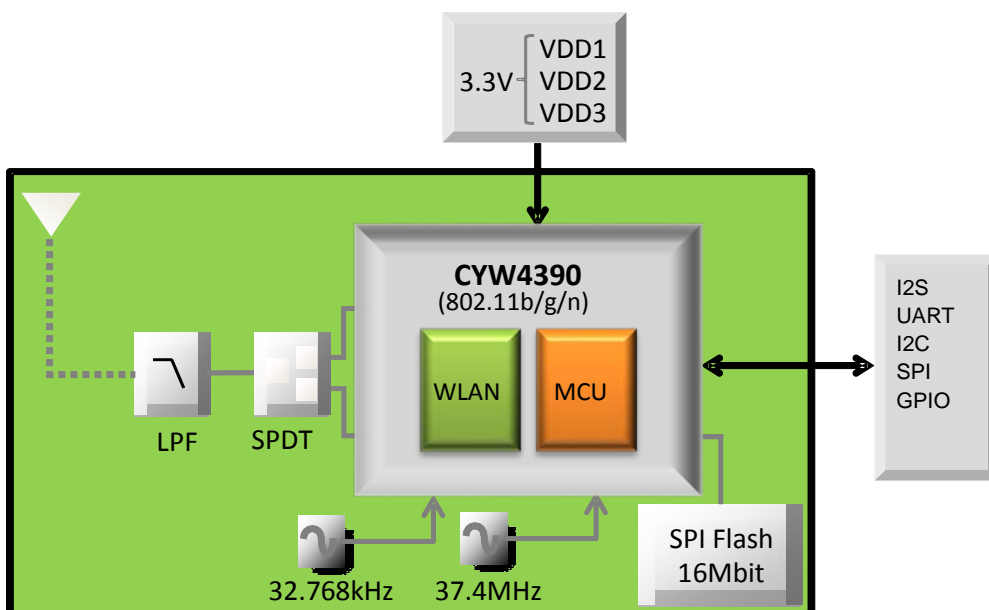
This specification is for the LBWB1ZZ1AD smart module that provides connectivity to the internet via WiFi with embedded OS that works with the Ayla cloud service.

- IC : Cypress/CYW4390 (IEEE802.11b/g/n)
- Reference Clock : Reference clock is embedded.
- RoHS : This module is compliant with the RoHS directive.

## 2. Part Number

Sample Part Number	MP Part Number
LBWB1ZZ1AD-TEMP	LBWB1ZZ1AD-812

## 3. Block Diagram



## 4. Certification Information

### 4.1. FCC/IC

FCC ID is VPYLB1AD. And IC ID is 772C-LB1AD..  
FCC/IC ID is not marked on the module. (TBD)

### 4.2. TELEC

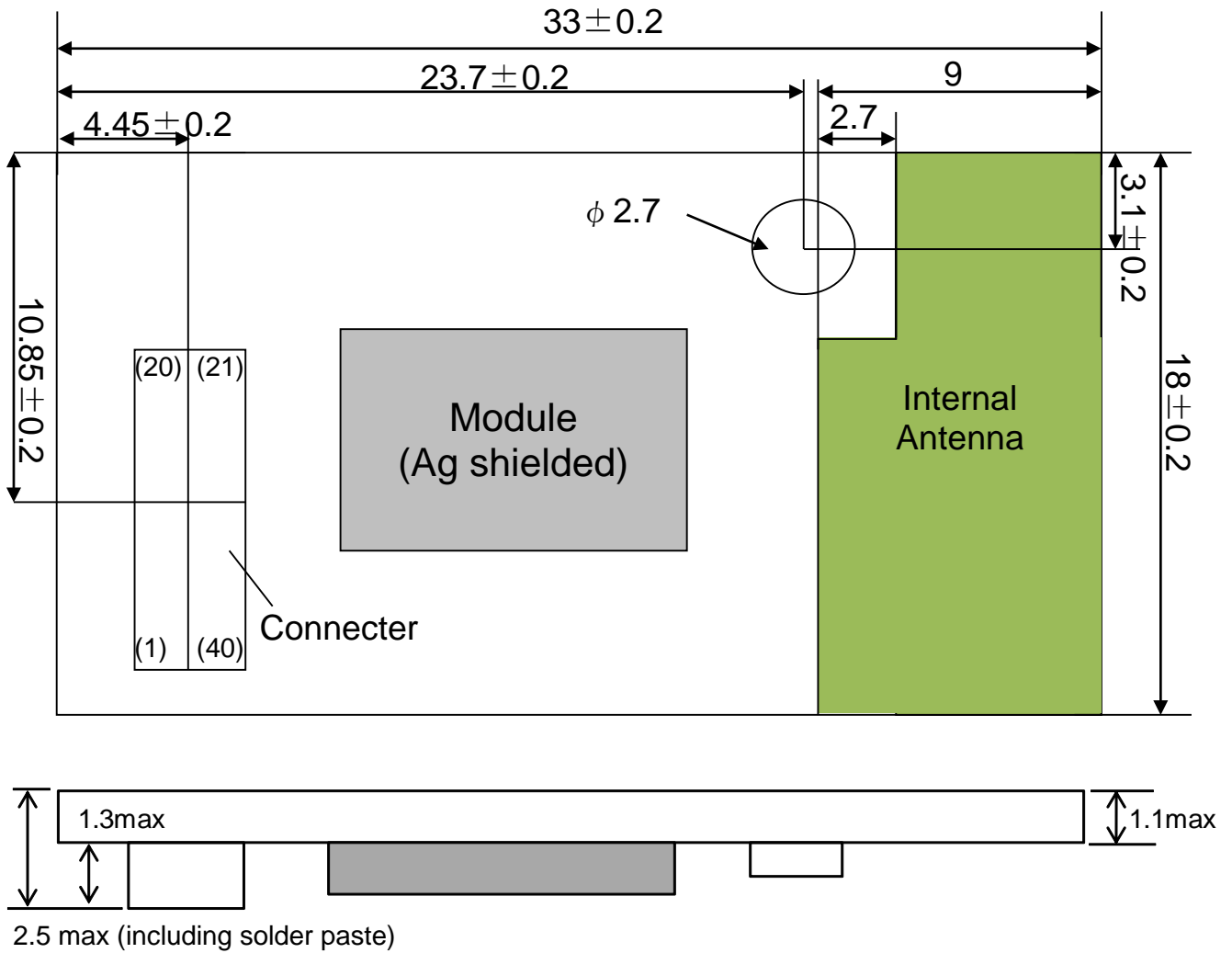
TELEC ID is 007-AD0001.  
TELEC ID is not marked on the module. (TBD)

### 4.3. R&TTE

TBD

## 5. Dimensions, Marking and Terminal Configurations

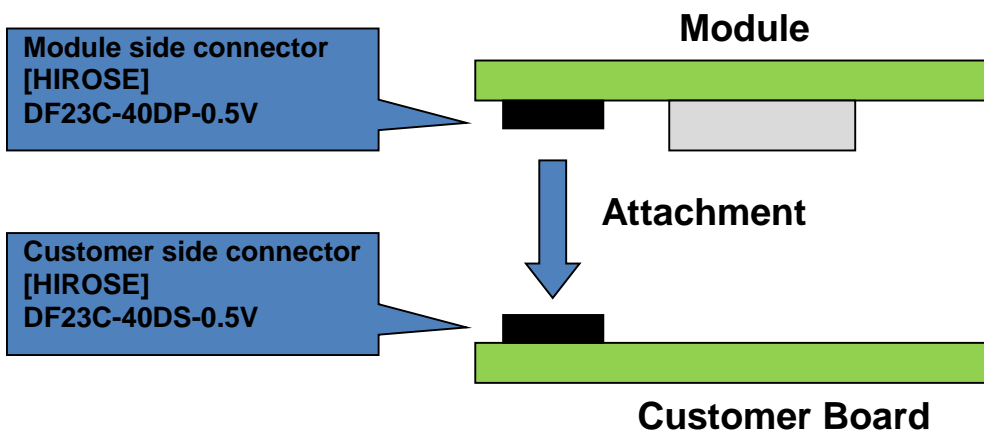
### 5.1. Dimension



(unit : mm)

### 5.2. Connector

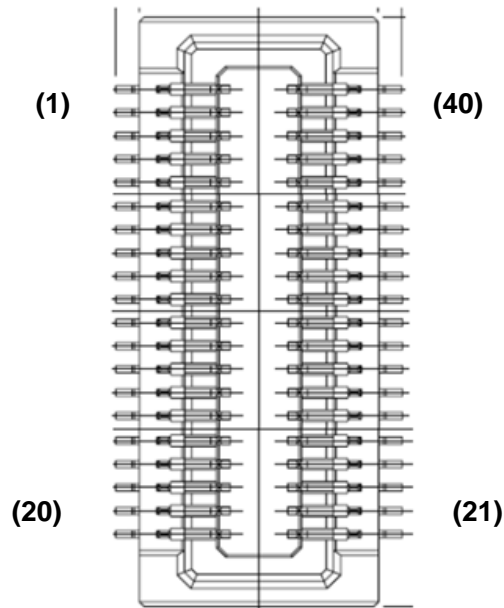
P/N: DF23C-40DP-0.5V (mounted on Murata module)  
P/N: DF23C-40DS-0.5V (need to place on Customer board)  
Maker: HIROSE Electric



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### 5.3. Terminal Configurations

Terminal Configuration looked from a board implementation side of the customer



No.	Terminal Name	Type	Connection to IC Terminal	Description
1	GND	-	GND	Ground
2	RESET_N	I	APPS_REG_ON	Reset for MCU at low input ( Internal 200kohm pull-down) (Ayla : RESET_N)
3	GPIO_B9	I/O	GPIO_B9	Programmable Bank B GPIO pin
4	WL_JTAG_TMS	I	GPIO_B3	JTAG Test Mode Select for WLAN core
5	WL_JTAG_TDO	O	GPIO_B5	JTAG Test Data Output for WLAN core
6	GND	-	GND	Ground
7	WL_JTAG_TRST_N	I	GPIO_B6	JTAG Test Reset Negative for WLAN core
8	WL_JTAG_TDI	I	GPIO_B4	JTAG Test Data Input for WLAN core
9	WL_JTAG_TCK	I	GPIO_B2	JTAG Test Clock for WLAN core
10	GND	-	GND	Ground
11	UART1_TXD	O	APPS_UART_1_TXD	UART1 serial output
12	UART1_RXD	I	APPS_UART_1_RXD	UART1 serial input
13	UART4_TX	O	RF_SW_CTRL_9	UART4 serial output
14	UART4_RX	I	RF_SW_CTRL_8	UART4 serial input
15	JTAG_TMS	I	APPS_JTAG_TMS	JTAG Test Mode. NC if not in use.

16	SPI_IRQ	I	APPS_SPI_IRQ	SPI interface interrupt input. NC if not in use.
17	JTAG_TDO	O	APPS_JTAG_TDO	JTAG Test data Out. NC if not in use.
18	JTAG_TDI	I	APPS_JTAG_TDI	JTAG Test data In. NC if not in use.
19	JTAG_TCK	I	APPS_JTAG_TCK	JTAG Test Clock. NC if not in use.
20	VDD2	PI	APPS_VDDO SR_VDDBATP5V LDO_VDDBAT5V PMU_VDDIO	Power supply input (With SPI Flash VCC)
21	VDD3	PI	WRF_PA_VBAT_V DD3P3WRF_PAD RV_VBAT_VDD3P3	Power supply input
22	VDD3	PI	WRF_SYNTH_VB AT_VDD3P3	
23	VDD1	PI	SDIO_PADVDDIO VDDIO_RF VDDIO VDDIO_SD OTP_VDD33	Power supply input
24	WAKE	I	APPS_WAKE	MCU wakes from sleep signal
25	UART1_CTS	I	APPS_UART_1_C TS_N	UART1 clear-to-send (Active-low) (Ayla : READY_N)
26	UART1_RTS	O	APPS_UART_1_R TS_N	UART1 request-to-send (Active-low) (Ayla : LINK_N)
27	GND	-	GND	Ground
28	GND	-	GND	Ground
29	GND	-	GND	Ground
30	GPIO_B0	I/O	GPIO_B0	Programmable Bank B GPIO pin
31	GPIO_B1	I/O	GPIO_B1	Programmable Bank B GPIO pin
32	GPIO_B10	I/O	GPIO_B10	Programmable Bank B GPIO pin
33	GPIO_B7	I/O	GPIO_B7	Programmable Bank B GPIO pin
34	GPIO_B8	I/O	GPIO_B8	Programmable Bank B GPIO pin
35	I2S_DI	I	APPS_I2S_DI	I2S data input (Ayla : UART_CTS)
36	I2S_CLK	I/O	APPS_I2S_CLK	I2S clock, can be master (output) or slave (input) (Ayla : UART_TX)
37	I2S_WS	I/O	APPS_I2S_WS	I2S word select (WS) (Ayla : UART_RX)
38	I2S_DO	O	APPS_I2S_DO	I2S data output (Ayla : UART_RTS)
39	GND	-	GND	Ground
40	GND	-	GND	Ground

## 6. Alternate functions table

This module provides I/O interfaces as below alternate functions.

### GPIO\_A

Pin No	Pin Name	Alternate Functions							
		UART1	UART2	UART3	SPI	I2C	I2S	GPIO	DEBUG
11	UART1_TXD	UART1_TXD	-	UART3_TX/RX	SPI_MOSI	I2C_SCL	-	GPIO_A4	-
12	UART1_RXD	UART1_RXD	-	UART3_TX/RX	SPI_MISO	I2C_SDA	-	GPIO_A5	-
15	JTAG_TMS	-	-	UART3_TX/RX	-	-	I2S_DO	GPIO_A2	JTAG_TMS
16	SPI_IRQ	-	-	UART3_TX/RX	SPI_IRQ	-	-	GPIO_A11	-
17	JTAG_TDO	-	-	UART3_TX/RX	-	-	I2S_WS	GPIO_A5	JTAG_TDO
18	JTAG_TDI	-	-	UART3_TX/RX	-	-	I2S_CLK	GPIO_A4	JTAG_TDI
19	JTAG_TCK	-	-	UART3_TX/RX	-	-	I2S_DI	GPIO_A3	JTAG_TCK
24	WAKE	-	-	UART3_TX/RX	-	-	-	GPIO_A10	-
25	UART1_CTS	UART1_CTS	-	UART3_TX/RX	SPI_CLK	-	-	GPIO_A1	-
26	UART1_RTS	UART1_RTS	-	UART3_TX/RX	SPI_CS_N	-	-	GPIO_A0	-
35	I2S_DI	-	UART2_RTS	UART3_TX/RX	-	-	I2S_DI	GPIO_A6	-
36	I2S_CLK	-	UART2_RXD	UART3_TX/RX	-	-	I2S_CLK	GPIO_A9	-
37	I2S_WS	-	UART2_TXD	UART3_TX/RX	-	-	I2S_WS	GPIO_A7	-
38	I2S_DO	-	UART2_CTS	UART3_TX/RX	-	-	I2S_DO	GPIO_A8	-

### GPIO\_B

Pin No	Pin Name	Alternate Functions	
		GPIO	Test Function
3	GPIO_B9	GPIO_B9	-
4	WL_JTAG_TMS	GPIO_B3	WL_JTAG_TMS
5	WL_JTAG_TDO	GPIO_B5	WL_JTAG_TDO
7	WL_JTAG_TRST_N	GPIO_B6	WL_JTAG_TRST_N
8	WL_JTAG_TDI	GPIO_B4	WL_JTAG_TDI
9	WL_JTAG_TCK	GPIO_B2	WL_JTAG_TCK
30	GPIO_B0	GPIO_B0	-
31	GPIO_B1	GPIO_B1	-
32	GPIO_B10	GPIO_B10	-
33	GPIO_B7	GPIO_B7	-
34	GPIO_B8	GPIO_B8	-

## 7. Absolute Maximum Rating

		min.	max.	unit
Storage Temperature		-40	85	deg.C
Supply Voltage	VDD1	-0.5	3.9	V
	VDD2	-0.5	4.0	V
	VDD3	-0.5	6.0	V

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability. No damage assuming only one parameter is set at limit at a time with all other parameters is set within operating condition.



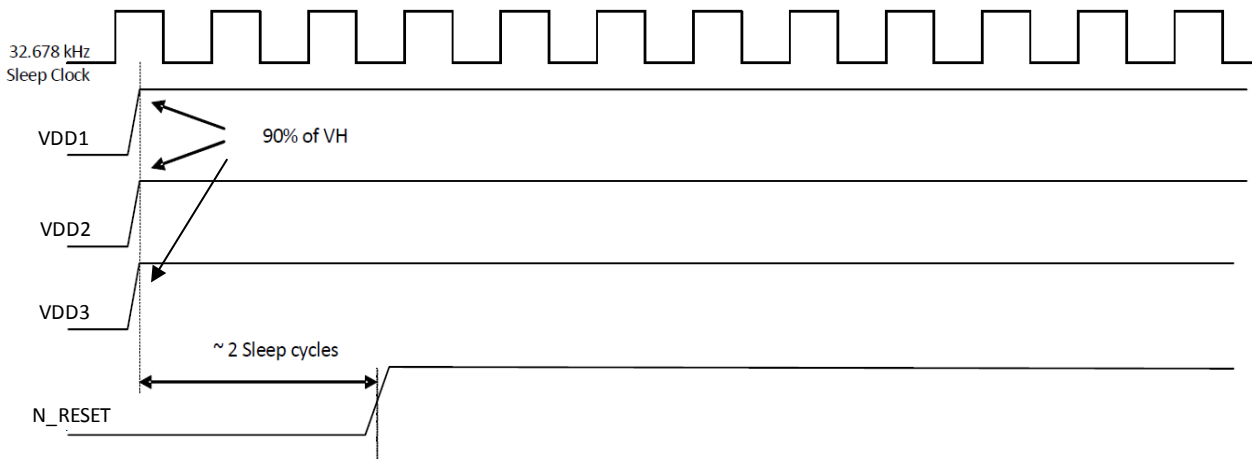
## 8. Operating Condition

		min.	typ.	max.	unit
Operating Temperature Range		-30		85	deg.C
Specification Temperature Range		-20		70	deg.C
Supply Voltage	VDD1	3.13	3.3	3.46	V
	VDD2	3.13	3.3	3.6	V
	VDD3	3.13	3.3	3.6	V

[Note] All RF characteristics in this datasheet are defined by Specification Temperature Range

## 9. Power Up Sequence

Following timing diagram explain module power up sequence.

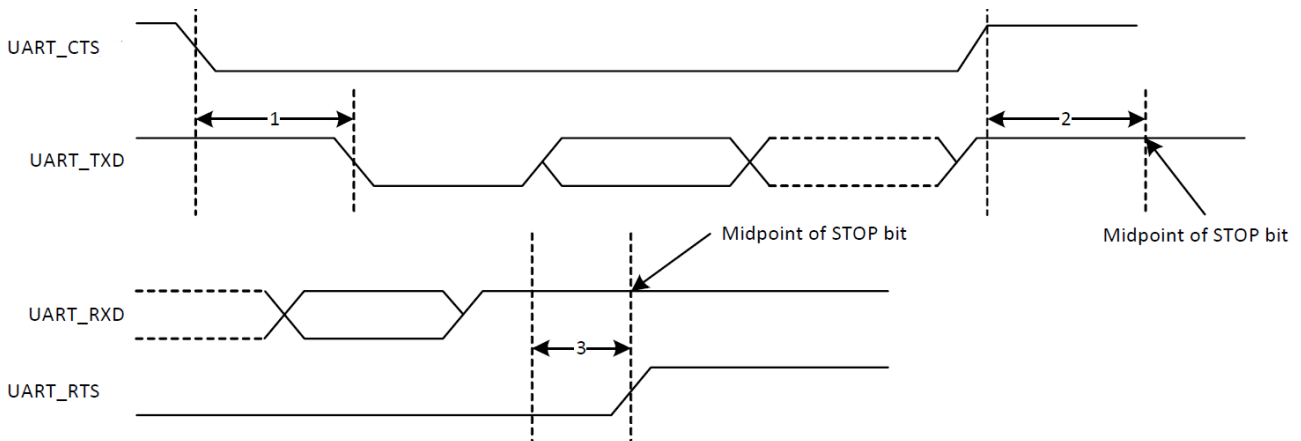


\*Power down sequence is opposite sequence of power up.

## 10. I/F Timing

### 10.1. UART I/F Signal Timing

This module has UART I/F to for communication with internal application.



Ref Number	Characteristic	Min.	Typ.	Max.	unit
1	Delay Time, UART_CTS Low to UART_TXD Valid			1.5	Bit periods
2	Setup Time, UART CTS High before Midpoint of Stop Bit			0.5	Bit periods
3	Delay Time, Midpoint of Stop Bit to UART_RTS High			0.5	Bit periods

## 11. RF Characteristics

### 11.1. RF Characteristics for IEEE802.11b (11Mbps mode unless otherwise specified.)

Conditions: 25deg.C, VDD1= VDD2=VDD3=3.3V

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS / CCK			
Frequency	2400 - 2483.5MHz			
Data rate	1, 2, 5.5, 11Mbps			
Target Max Output Power	17.0dBm			
- DC Characteristics -	min.	Typ.	max.	Unit
1. DC current				
1) Tx mode (1024byte, 20usec interval)	-	240	310	mA
2) Rx mode	-	60	110	mA
- Tx Characteristics -	min.	Typ.	max.	Unit
2. Power Levels	15.0	17.0	19.0	dBm
3. Spectrum Mask				
1) 1st side lobes	-	-40	-30	dBr
2) 2nd side lobes	-	-55	-50	dBr
4. Power-on and Power-down ramp	-		2.0	usec
5. RF Carrier Suppression	15	23	-	dB
6. Modulation Accuracy (EVM)	-	23	35	%
7. Outband Spurious Emissions				
1) 30MHz to 1GHz (BW=100kHz)	-	-	-36	dBm
2) 1GHz to 12.75GHz (BW=100kHz)	-	-	-30	dBm
3) 1.8GHz to 1.9GHz (BW=100kHz)	-	-	-47	dBm
4) 5.15GHz to 5.3GHz (BW=100kHz)	-	-	-47	dBm
- Rx Characteristics -	min.	typ.	max.	Unit
8. Minimum Input Level Sensitivity				
1) 11Mbps (FER ≤ 8%)	-	-88	-76	dBm
9. Maximum Input Level (FER ≤ 8%)	-10	-	-	dBm
10. Adjacent Channel Rejection (FER ≤ 8%)	35	-	-	dB

### 11.2. RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified.)

Conditions: 25deg.C, VDD1= VDD2=VDD3=3.3V

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Frequency	2400 - 2483.5MHz			
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps			
Target Max Output Power	13.0dBm			
- DC Characteristics -	min.	Typ.	max.	Unit
1. DC current				
1) Tx mode (1024byte, 20usec interval)	-	200	270	mA
2) Rx mode	-	60	110	mA
- Tx Characteristics -	min.	typ.	max.	unit
2. Power Levels	11.0	13.0	15.0	dBm
3. Spectrum Mask				
1) 9MHz to 11MHz (0dB ~ -20dB)		-33	-20	dBr
2) 11MHz to 20MHz (-20dB ~ -28dB)		-43	-28	dBr
3) 20MHz to 30MHz (-28dB ~ -40dB)		-52	-40	dBr
4) 30MHz to 33MHz (-40dB)		-51	-40	dBr
4. Constellation Error (EVM)	-	-34	-25	dB
5. Outband Spurious Emissions				
1) 30MHz to 1GHz (BW=100kHz)	-	-	-36	dBm
2) 1GHz to 12.75GHz (BW=100kHz)	-	-	-30	dBm
3) 1.8GHz to 1.9GHz (BW=100kHz)	-	-	-47	dBm
4) 5.15GHz to 5.3GHz (BW=100kHz)	-	-	-47	dBm
- Rx Characteristics -	min.	typ.	max.	Unit
6. Minimum Input Level Sensitivity				
1) 54Mbps (PER ≤ 10%)	-	-75	-65	dBm
7. Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm
8. Adjacent Channel Rejection (PER ≤ 10%)	-1	-	-	dB

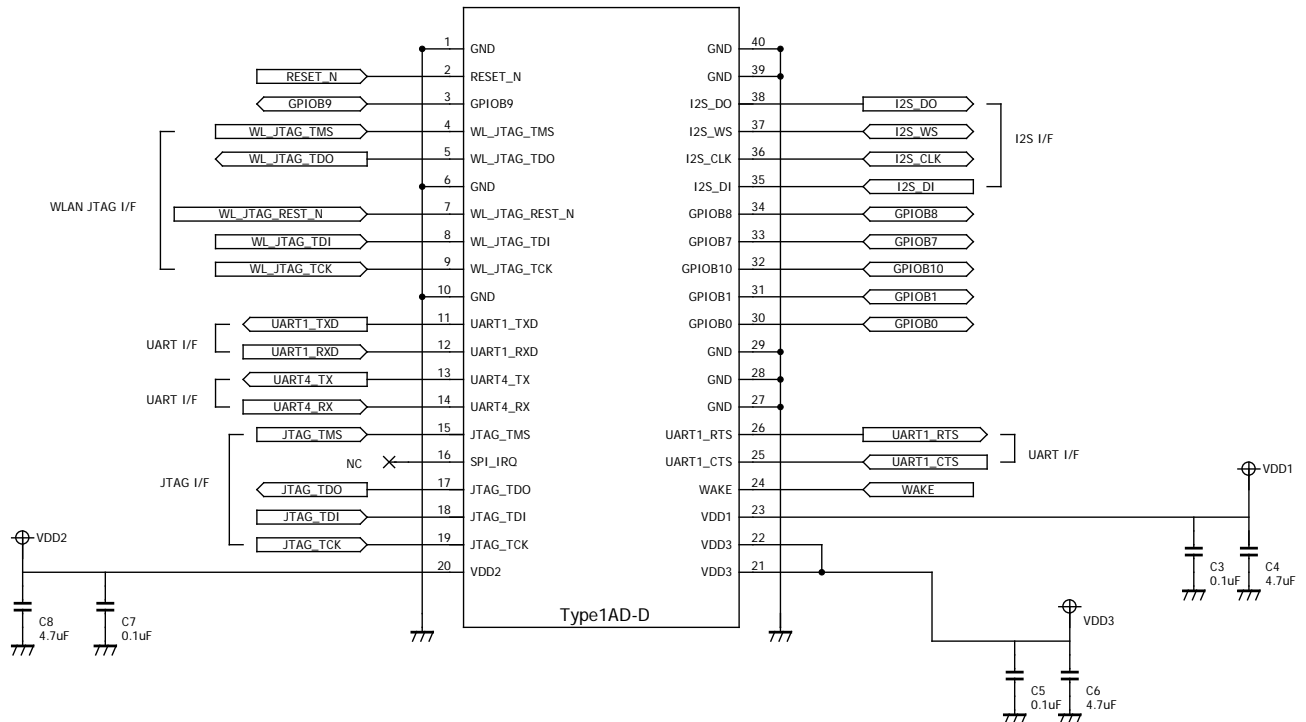
**11.3. RF Characteristics for IEEE802.11n (65Mbps(MCS7) mode unless otherwise specified.)**

Conditions: 25deg.C, VDD1= VDD2=VDD3=3.3V

Items	Contents			
Specification	IEEE802.11n			
Mode	OFDM			
Frequency	2400 - 2483.5MHz			
Data rate	6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps			
Target Max Output Power	12.0dBm			
- DC Characteristics -	min.	Typ.	max.	Unit
1. DC current				
1) Tx mode (1024byte, 20usec interval)	-	200	270	mA
2) Rx mode	-	60	110	mA
- Tx Characteristics -	min.	typ.	max.	Unit
2. Power Levels	10.0	12.0	14.0	dBm
3. Spectrum Mask				
1) 9MHz to 11MHz (0dB ~ -20dB)		-33	-20	dBr
2) 11MHz to 20MHz (-20dB ~ -28dB)		-53	-28	dBr
3) 20MHz to 30MHz (-28dB ~ -45dB)		-52	-45	dBr
4) 30MHz to 33MHz (-45dB)		-51	-45	dBr
4. Constellation Error (EVM)	-	-36	-27	dB
5. Outband Spurious Emissions				
1) 30MHz to 1GHz	-	-	-36	dBm
2) 1GHz to 12.75GHz	-	-	-30	dBm
3) 1.8GHz to 1.9GHz	-	-	-47	dBm
4) 5.15GHz to 5.3GHz	-	-	-47	dBm
- Rx Characteristics -	min.	typ.	max.	Unit
6. Minimum Input Level Sensitivity				
1) 65Mbps (PER ≤ 10%)	-	-73	-64	dBm
7. Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm
8. Adjacent Channel Rejection (PER ≤ 10%)	-2	-	-	dB

## 12. Reference Circuit

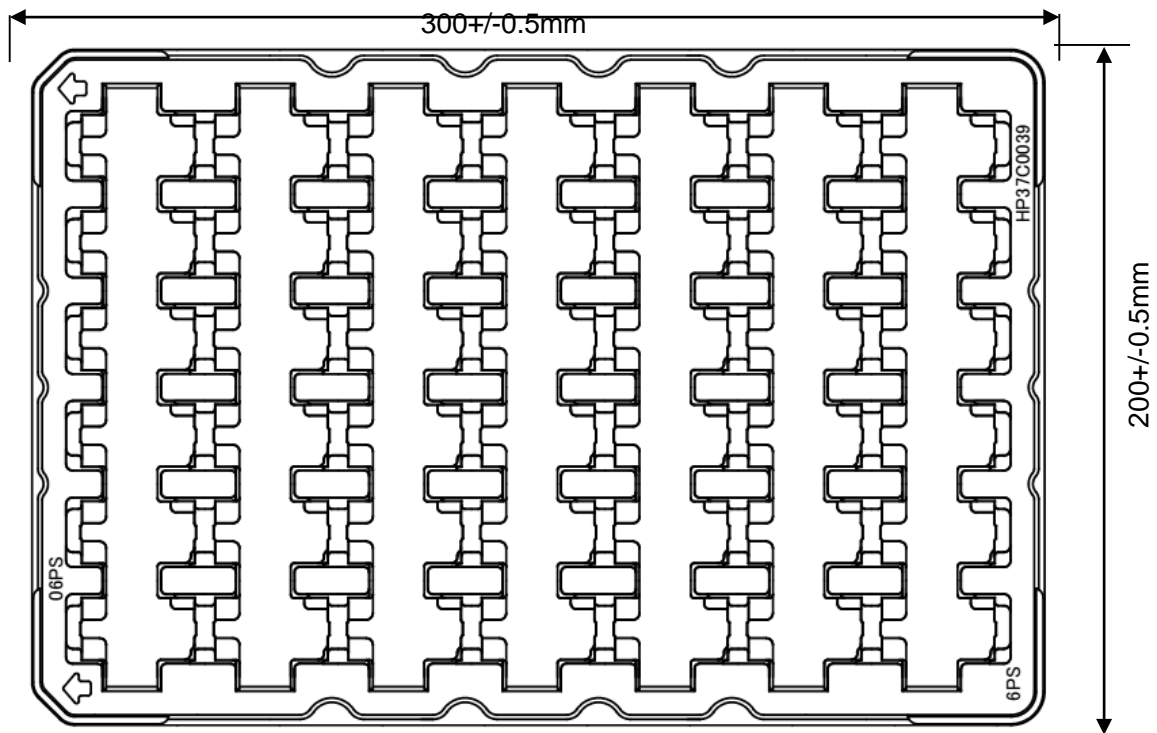
### 12.1. Schematic



The Pin Names, the connections, and I/O array directions are changed with the setting of Alternate Functions.

## 13. Packing

### 13.1. Tray

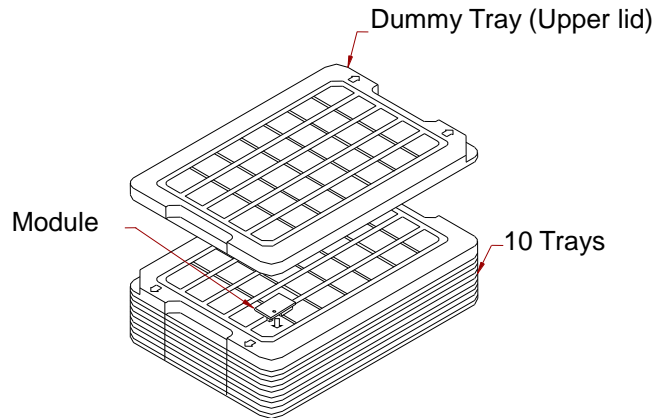


The module is placed in a pocket of the above tray with following rules.

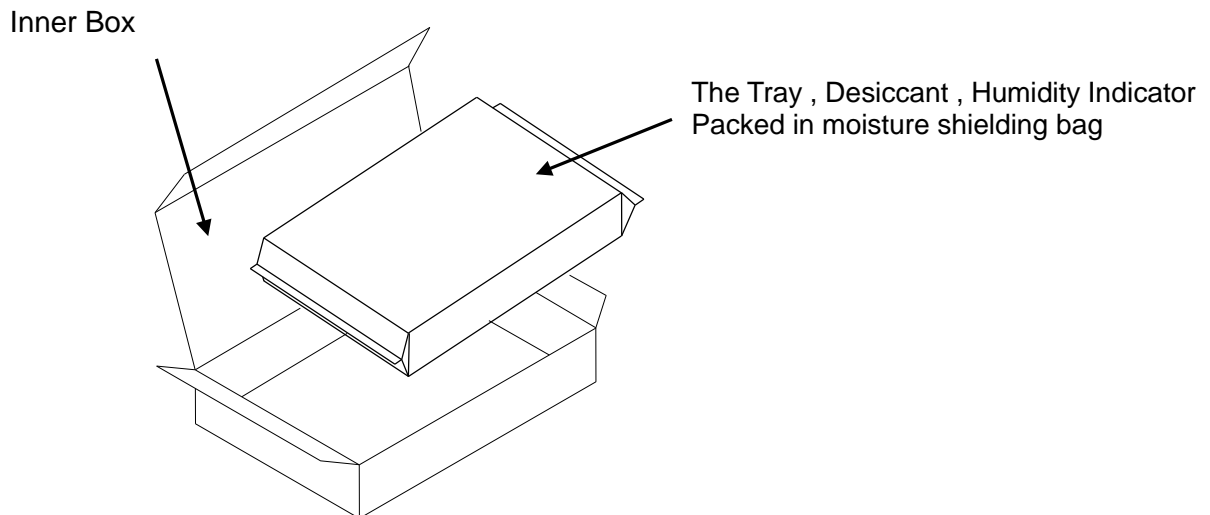
- The module's metal shield contacts a tray' indentation
- Its chip antenna on the module is directing to an arrow on a tray.

### Packing in a inner box

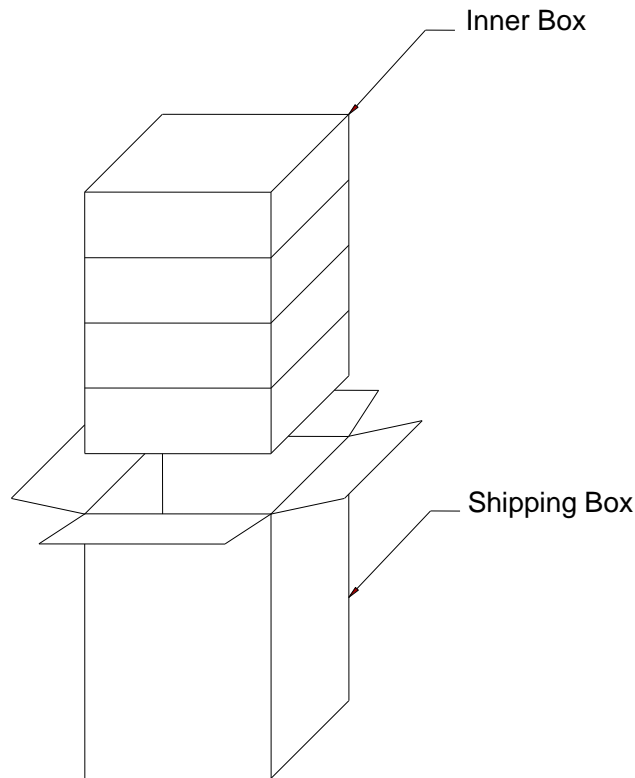
There are 42 pcs of module per tray and 10 trays are piled. A dummy tray is put on the topmost part of trays.



11 trays, desiccant and humidity indicator are packed into a moisture shielding bag. Inner box contains one bag.



### 13.2. Shipping box



- Please keep any packaging below 40 deg.C until using it up, because a tray is potentially deformed with storage over the temperature.
- Please don't stack the shipping box over 1.5m height to avoid any physical problem.
- Four inner boxes is general number in a shipping box, but it may be dummy for some of inner boxes.
- One inner box has 420pcs as standard q'ty.
- MOQ is 1680pcs, which are constructed four inner boxes.

## 14. NOTICE

### 14.1. Storage Conditions:

- The product shall be stored in non corrosive gas (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>, etc.).
- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.
- The product shall be stored without opening the packing under the ambient temperature from 5 to 35 °C and humidity from 20 ~ 70 %RH.  
(Packing materials, in particular, may be deformed at the temperature over 40 °C)

### 14.2. Handling Conditions:

- Be careful in handling or transporting products because excessive stress or mechanical shock may break products.
- Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bare hands that may result in poor solderability.

### 14.3. Operational Environment Conditions:

- Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur.
  - In an atmosphere containing corrosive gas ( Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>x</sub>, NO<sub>x</sub> etc.).
  - In an atmosphere containing combustible and volatile gases.

- Dusty place.
  - Direct sunlight place.
  - Water splashing place.
  - Humid place where water condenses.
  - Freezing place.
- If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.
- As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

#### **14.4. Input Power Capacity:**

- Products shall be used in the input power capacity as specified in this specifications.
- Inform Murata beforehand, in case that the components are used beyond such input power capacity range.



## 15. PRECONDITION TO USE OUR PRODUCTS

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.

All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.

Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

WE HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.

The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements.

Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment
- Undersea equipment.
- Power plant control equipment
- Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment.
- Disaster prevention / crime prevention equipment.
- Burning / explosion control equipment
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

We expressly prohibit you from analyzing, breaking, Reverse-Engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.

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Please do not use our products, our technical information and other data provided by us for the purpose of developing of mass-destruction weapons and the purpose of military use.

Moreover, you must comply with "foreign exchange and foreign trade law", the "U.S. export administration regulations", etc.

Please note that we may discontinue the manufacture of our products, due to reasons such as end of supply of materials and/or components from our suppliers.

Customer acknowledges that Murata will, if requested by you, conduct a failure analysis for defect or alleged defect of Products only at the level required for consumer grade Products, and thus such analysis may not always be available or be in accordance with your request (for example, in cases where the defect was caused by components in Products supplied to Murata from a third party).

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Customer acknowledges that engineering samples may deviate from specifications and may contain defects due to their development status.

We reject any liability or product warranty for engineering samples.

In particular we disclaim liability for damages caused by

- the use of the engineering sample other than for evaluation purposes, particularly the installation or integration in the product to be sold by you,
- deviation or lapse in function of engineering sample,
- improper use of engineering samples.

We disclaims any liability for consequential and incidental damages.

If you can't agree the above contents, you should inquire our sales.

# APPENDIX

## 1AD Installation Manual (FCC)

FCC ID of this product is as follows.

FCC ID:VPYLB1AD

Contents

1. Antenna

### 1. Antenna

■ Please perform the antenna design that followed the specifications of the antenna.

■ About the signal line between an antenna and a module

It is a 50-ohm line design.

Fine tuning of return loss etc. can be performed using a matching network.

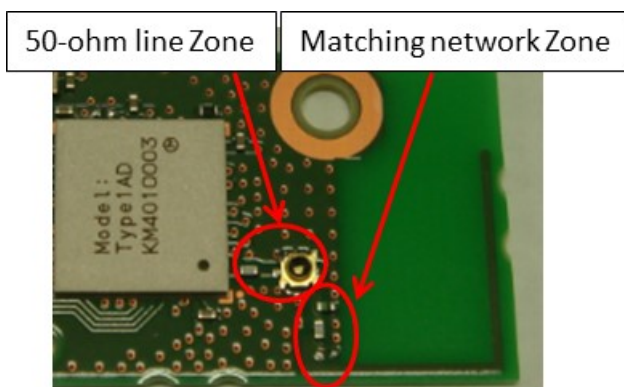
However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

- 1) It is the same type as the antenna type of antenna specifications.
- 2) An antenna gain is lower than a gain given in antenna specifications.
- 3) The emission level is not getting worse.

■ 50-ohm line(microstrip line length)

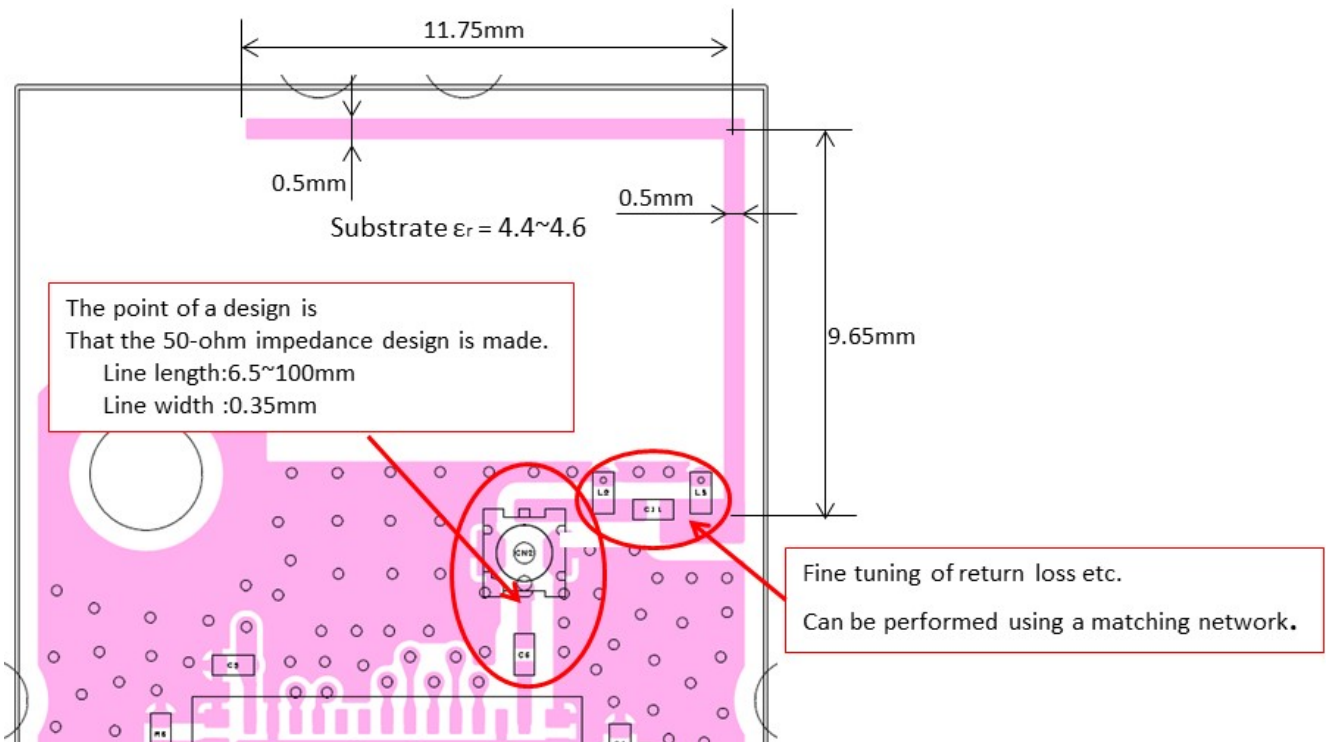
	Antenna
Antenna type	Monopole Antenna
Common name	Pattern Antenna
50-ohm line length	6.5~100mm We test it at 6.5mm as a representative
50-ohm coaxial cable length	---



Preliminary

< Specification may be changed by Murata without notice >  
Murata Manufacturing Co., Ltd.

■ Antenna Pattern & the example of the test jig which carried out the certification test



## User Manual (FCC)

For OEM integration only – device cannot be sold to general public.  
Therefore we will ask OEM to include the following statements required by FCC on the product and in the Installation manual Notice.

Please describe the following warning on the final product which contains this module.

Contains Transmitter Module FCC ID:VPYLB1AD

or

Contains FCC ID:VPYLB1AD

This device complies with part 15 of the FCC Rules. 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.

\*When a product is small, as for these words mentioned above, the posting to a manual is possible.

Please describe the following warning to the manual.

### FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

When installing it in a mobile equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

When installing it in a portable equipment.

\*It is necessary to take a SAR test with your set mounting this module.  
Class II permissive change application is necessary using the SAR report.  
Please contact Murata.

Note)

Portable equipment : Equipment for which the spaces between human body and antenna are used within 20cm.

Mobile equipment : Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

## 1AD Installation Manual (IC)

IC No. of this product is as follows.

IC : 772C-LB1AD00A

Contents

1. Antenna

### 1. Antenna

■ Please perform the antenna design that followed the specifications of the antenna.

■ About the signal line between an antenna and a module

It is a 50-ohm line design.

Fine tuning of return loss etc. can be performed using a matching network.

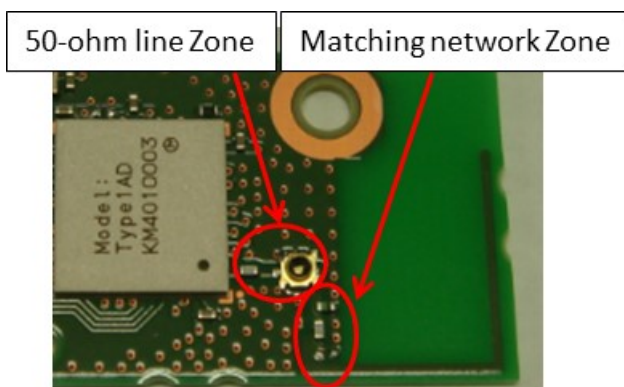
However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

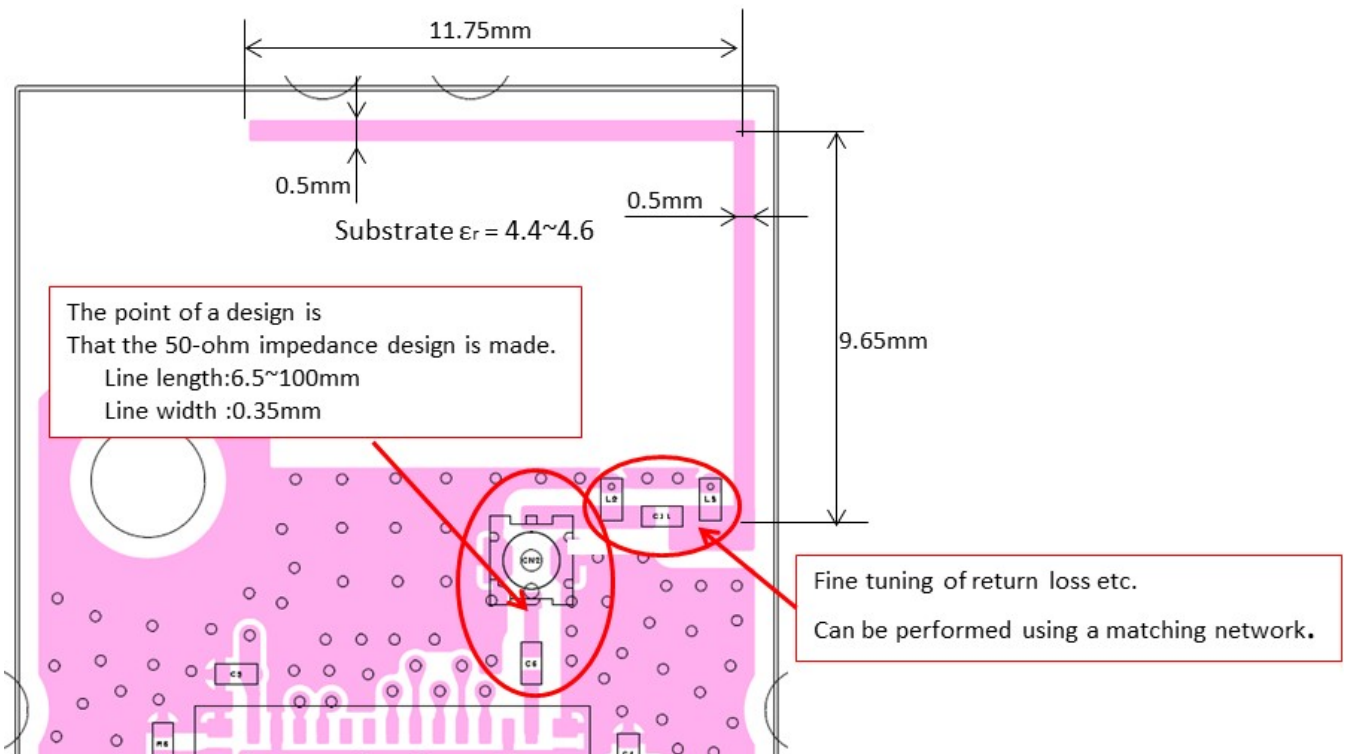
- 1) It is the same type as the antenna type of antenna specifications.
- 2) An antenna gain is lower than a gain given in antenna specifications.
- 3) The emission level is not getting worse.

■ 50-ohm line(microstrip line length)

	Antenna
Antenna type	Monopole Antenna
Common name	Pattern Antenna
50-ohm line length	6.5~100mm We test it at 6.5mm as a representative
50-ohm coaxial cable length	---



■ Antenna Pattern & the example of the test jig which carried out the certification test



## User Manual (IC)

For OEM integration only – device cannot be sold to general public.  
Therefore we will ask OEM to include the following statements required by IC on the product and in the Installation manual Notice.

Please describe the following warning on the final product which contains this module.

Contains IC: 772C-LB1AD00A

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR 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; 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

\* When a product is small, as for these words mentioned above, the posting to a manual is possible.

Please describe the following warning to the manual.

When installing it in a mobile equipment.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

When installing it in a portable equipment.

\*It is necessary to take a SAR test with your set mounting this module.  
Class II permissive change application is necessary using the SAR report.  
Please contact Murata.

Note)

Portable equipment : Equipment for which the spaces between human body and antenna are used within 20cm.

Mobile equipment : Equipment used at position in which the spaces between human body and antenna exceeded 20cm.