

W-LAN Module Data Sheet

Cypress WLAN Chipset CYW43907
for 802.11a/b/g/n

Tentative P/N : LBWA1UZ1GC-958

This Datasheet is preliminary version, and subject to change without notice.

The revision history of the product specification

Issued Date	Revision Code	Revision Page	Changed Items	Change Reason
Apr.17, 2015			First Issue	
Apr.30, 2015	A	P5,6,7 P.4 P.17	Pin name #7, #78 and #113 Dimensions Land pattern	Correction
Jun.12, 2015	B	P.4 P.5 P.9 P.17	Dimensions Terminal Configurations Absolute Maximum Rating, Operating Condition Land pattern	Follow JEDEC Pin Numbering Correction Addition
Sep.17, 2015	C	P.4	Dimensions	Added solder bump
Oct.14, 2015	D	P.4 P.18	Dimensions Land pattern	Pin numbering Correction of Rev.C Addition
Dec.25, 2015	E	P.4 P.9 P.11 P.11 P.13,14,15,16,17 P.22	Dimensions Power Supply Segments Absolute Maximum Rating Operating Condition RF Characteristics Tape and Reel Packing	Addition Addition Correction Update Update Addition
Feb.24, 2016	F	P.3 P.10 P.12,13,14,15,16,17	Dimensions Certification Information Operating Condition RF Characteristics	Correction Update Update Update
Mar.8.2016	G	P5 P6 P13 P14~19 P21	structure pin layout DC characteristic VBAT condition Reference circuit	Addition Addition Addition Update Addition
Apr.1.2016	H	P21	Reference circuit	Improved
Jul.4.2016	I	P11	7. Operating Condition	Update
Nov.25.2016	J	P3	4.Certification information	Update
Dec.7.2016	K	P20	12. Land pattern (Top View)	Correction
Dec. 14. 2016	L	P28	APPENDIX	Addition
Feb. 7. 2017	M	P21	Reference circuit	Correction
Mar.3.2017	O	Cover, P3, P9, P12	Changed IC Part Number	
Oct.30.2017	P	P21	Reference circuit	Update
Sep.24.2018	Q	P4	Certification information	Updated
Dec.28.2018	R	P21 P26	Reference Circuit Soldering conditions Cleaning	Updated

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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

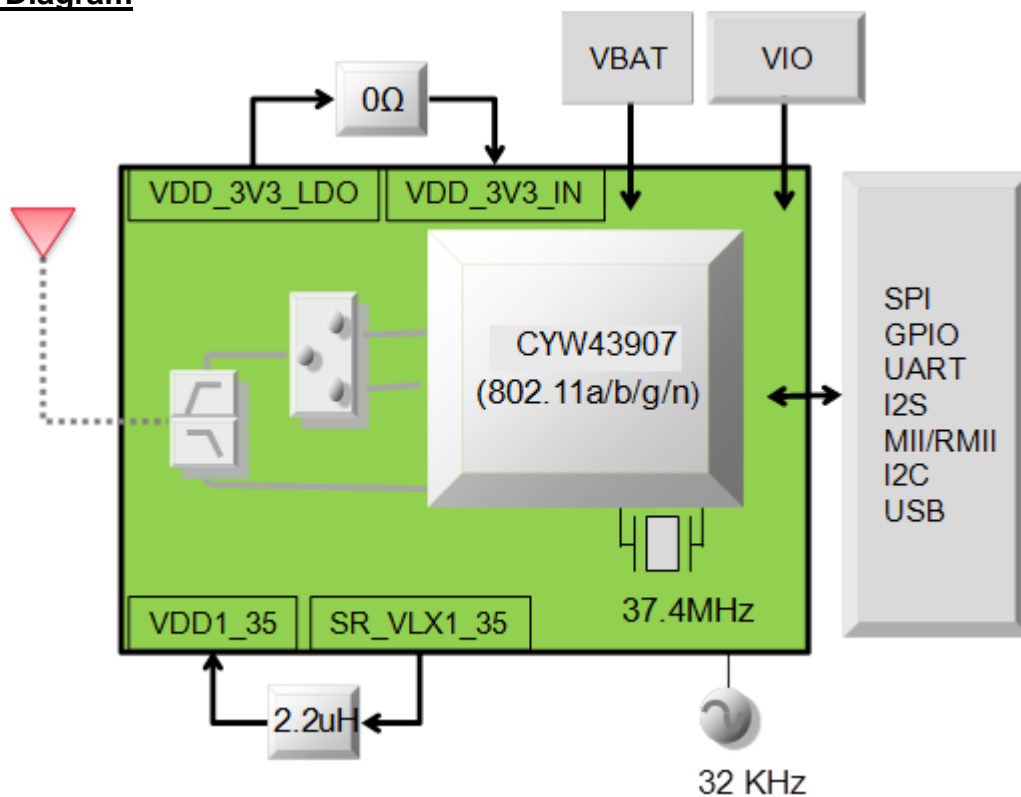
This specification is applied to the IEEE802.11a/b/g/n W-LAN complete module (WLAN smart module).

- IC : Cypress/CYW43907
- Reference Clock : 37.4MHz reference clock is embedded.
- RoHS : This module is compliant with the RoHS directive.

2. Part Number

Sample Part Number
LBWA1UZ1GC-958

3. Block Diagram



- i. 2.2μH Inductor (Murata, LQM2MPN2R2NG0) is needed to stabilize the output of internal switching regulator. It connects SR_VLX (Output of the internal switching regulator) to VDD1_35 (Input of internal 1.2V LDO)
- ii. 0 Ω Resistor (100mW, 0603 Min case Size) is needed to connect VDD_3V3_LDO to (Output of Internal 3.3V LDO) to VDD_3V3_IN (Radio Supply of CYW43907)

4. Certification Information

4.1. Radio Certification

USA/Canada

FCC ID : VPYLB1GC

IC : 772C-LB1GC

*Please follow installation manual of Appendix

Country Code : XX/17

Europe

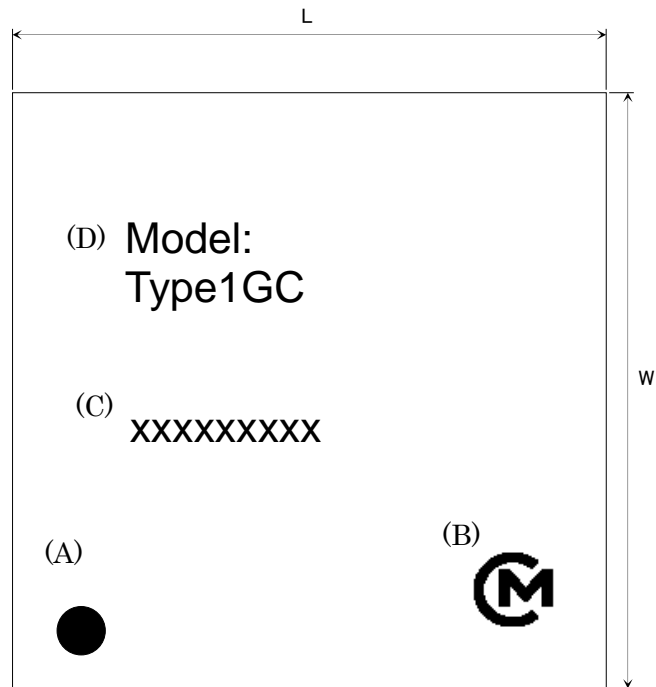
EN300328 v2.1.1 (2.4GHz) conducted test report and EN301893 v2.1.0 (5GHz) conducted test/DFS report are prepared.

Country Code : DE/7

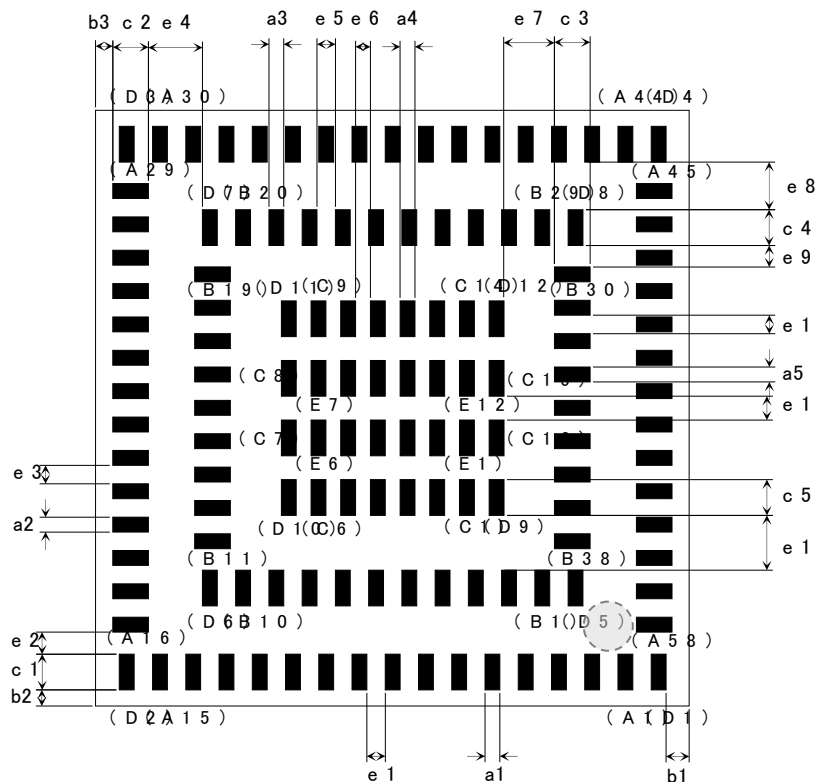
5. Dimensions, Marking and Terminal Configurations

5.1. Dimensions

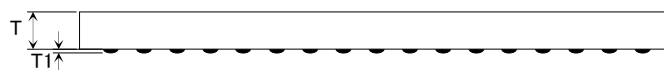
< Top View >



< Bottom View >



< Side View >



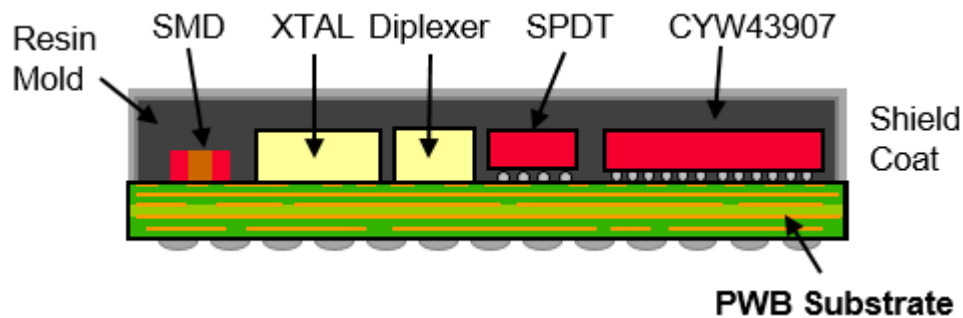
Mark	Dimensions	Mark	Dimensions	Mark	Dimensions
L	10.0 +/- 0.2	W	10.0 +/- 0.2		
T	1.20 max.	T1	0.07 typ.		
a1	0.25 +/- 0.1	a2	0.25 +/- 0.1	a3	0.25 +/- 0.1
a4	0.25 +/- 0.1	a5	0.25 +/- 0.1		
b1	0.395 +/- 0.2	b2	0.293 +/- 0.2	b3	0.313 +/- 0.2
c1	0.55 +/- 0.1	c2	0.55 +/- 0.1	c3	0.55 +/- 0.1
c4	0.55 +/- 0.1	c5	0.55 +/- 0.1		
e1	0.31 +/- 0.1	e2	0.392 +/- 0.1	e3	0.31 +/- 0.1
e4	0.932 +/- 0.1	e5	0.31 +/- 0.1	e6	0.25 +/- 0.1
e7	0.882 +/- 0.1	e8	0.858 +/- 0.1	e9	0.384 +/- 0.1
e10	0.31 +/- 0.1	e11	0.45 +/- 0.1	e12	0.974 +/- 0.1

(unit : mm)

Marking

Marking	Meaning
(A)	Pin 1 Marking
(B)	Murata Logo
(C)	Inspection Number
(D)	Module Type

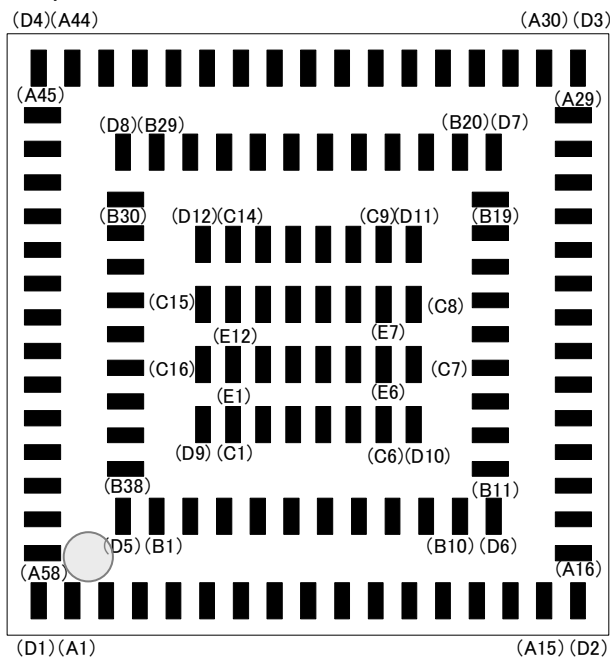
Structure



5.2. Terminal Configurations

Pin Layout

< Top View >



Pin#	Terminal Name	Pin#	Terminal Name	Pin#	Terminal Name
D1	SFLASH_MISO_3	A44	SR_VLX1_35	B28	GPIO_13_SDIO_MODE
A1	SFLASH_CLK	D4	GND	B29	GND
A2	SFLASH_MOSI_0	A45	GPIO_10	D8	GPIO_14
A3	SFLASH_MISO_2	A46	I2C_0_SDA	B30	SPI_1_MOSI
A4	SFLASH_CSN	A47	I2C_0_SCL	B31	SPI_1_MISO
A5	GND	A48	I2S0_SD_OUT	B32	SPI_1_CLK
A6	RF_ANT0	A49	I2S1_WS_LRCLK	B33	SPI_1_CS
A7	GND	A50	I2S0_SD_IN	B34	GND
A8	GPIO_7_WCPU_BOOT_MODE	A51	I2S0_WS_LRCLK	B35	I2S0_SCK_BCLK
A9	SPI_0_MOSI	A52	UART0_RXD_IN	B36	I2S0_MCK
A10	SPI_0_CS	A53	UART0_RTS_OUT	B37	I2S1_SD_OUT
A11	SPI_0_CLK	A54	UART0_CTS_IN	B38	I2S1_SD_IN
A12	SPI_0_MISO	A55	UART0_TXD_OUT	D9	GND
A13	MII_RMII_TXEN	A56	VDDIO	C1	I2C_1_SDA
A14	MII_RXDV_RMII CRS_DV	A57	VDDIO_RMII	C2	GPIO_6_JTAG_TRST_L
A15	MII_RMII_MDC	A58	SFLASH_MISO_1	C3	GPIO_4_JTAG_TDI
D2	MII_RMII_TXD0	D5	I2S1_MCK	C4	GPIO_11_ACPU_BOOT_MODE
A16	MII_RMII_RXD0	B1	I2S1_SCK_BCLK	C5	HIB_REG_ON_IN
A17	MII_TXC_RMII_REF_CLK	B2	I2C_1_SCL	C6	HIB_LPO_SEL
A18	MII_RMII_RXD1	B3	GND	D10	GND
A19	MII_RMII_TXD1	B4	GPIO_5_JTAG_TDO	C7	RF_SW_CTRL_9_HIB_LPO_SEL_UART2_TX
A20	MII_RMII_MDIO	B5	MII_RXD2	C8	GND
A21	ANT1_DIV_RF_SW_CTRL_5_DAP_CLK_SEL	B6	MII_RXD3	D11	GND
A22	VDD_3V3_IN	B7	MII_COL	C9	PWM_1
A23	HIB_XTAL_IN	B8	MII_RXC	C10	PWM_0
A24	HIB_XTAL_OUT	B9	MII_CRS	C11	GPIO_0
A25	ANT0_DIV_RF_SW_CTRL_4	B10	MII_TXD2	C12	VDDIO_SD
A26	PWM_3	D6	MII_TXD3	C13	GPIO_2_JTAG_TCK
A27	PWM_2	B11	GND	C14	GPIO_12
A28	USB2_DN	B12	RESET_N	D12	GND
A29	USB2_DP	B13	HIB_WAKE	C15	GPIO_9_USB_SEL
D3	GND	B14	RF_SW_CTRL_8_UART2_RX	C16	GPIO_8_TAP_SEL
A30	GPIO_1_GSPI_MODE	B15	RF_SW_CTRL_7_RSRC_INIT_MODE_UART1_TX_OUT	E1	GND
A31	PWM_4	B16	RF_GPAIO_OUT	E2	GND
A32	USB2_HOST_DEV_SEL	B17	JTAG_SEL	E3	GND
A33	GND	B18	RF_SW_CTRL_6_UART1_RX_IN	E4	GND
A34	USB_VDD_3V3	B19	GPIO_16	E5	GND
A35	VDD_3V3_IN_2	D7	PWM_5	E6	GND
A36	GND	B20	GPIO_3_JTAG_TMS	E7	GND
A37	VDDIO_AUDIO	B21	SDIO_DATA2	E8	GND
A38	GND	B22	SDIO_DATA1	E9	GND
A39	VDD_3V3_LDO	B23	SDIO_DATA0	E10	GND
A40	GND	B24	SDIO_CMD	E11	GND
A41	VDD1_35	B25	SDIO_CLK	E12	GND
A42	GND	B26	GPIO_15		
A43	VDD_VBAT	B27	SDIO_DATA3		

SN	Pin#	Name	Type	Description
1	D1	SFLASH_MISO_3	I/O	Flash data bit 4
2	A1	SFLASH_CLK	O	Flash clock
3	A2	SFLASH_MOSI_0	I/O	Flash data bit 1
4	A3	SFLASH_MISO_2	I/O	Flash data bit 3
5	A4	SFLASH_CSN	O	Flash slave select
6	A5	GND	GND	
7	A6	RF_ANT0	I/O	Antenna port 0
8	A7	GND	GND	
9	A8	GPIO_7_WCPU_BOOT_MODE	I/O	Boot from SoC SROM or SOC SRAM
10	A9	SPI_0_MOSI	O	SPI data master out
11	A10	SPI_0_CS	O	SPI slave select
12	A11	SPI_0_CLK	O	SPI clock
13	A12	SPI_0_MISO	I	SPI data master in
14	A13	MII_RMII_TXEN	O	MII/RMII Transmit Enable
15	A14	MII_RXDV_RMII_CRS_DV	I	Receive Data Valid
16	A15	MII_RMII_MDC	O	Management Data Clock
17	D2	MII_RMII_TXD0	O	MII/RMII Transmit Data Output
18	A16	MII_RMII_RXD0	I	MII/RMII Receive Data Input
19	A17	MII_TXC_RMII_REF_CLK	I	Transmit Clock
20	A18	MII_RMII_RXD1	I	MII/RMII Receive Data Input
21	A19	MII_RMII_TXD1	O	MII/RMII Transmit Data Output
22	A20	MII_RMII_MDIO	I/O	Management Data I/O
23	A21	ANT1_DIV_RF_SW_CTRL_5_D AP_CLK_SEL	O	ANT1 Diversity RF switch control
24	A22	VDD_3V3_IN	PWR	3.3V input
25	A23	HIB_XTAL_IN	I	XTAL input for hibernation block
26	A24	HIB_XTAL_OUT	O	XTAL output for hibernation block
27	A25	ANT0_DIV_RF_SW_CTRL_4	O	ANT0 Diversity RF switch control
28	A26	PWM_3	O	Pulse width modulation bit 3
29	A27	PWM_2	O	Pulse width modulation bit 2
30	A28	USB2_DN	I/O	USB Data
31	A29	USB2_DP	I/O	USB Data
32	D3	GND	GND	
33	A30	GPIO_1_GSPI_MODE	I/O	Enable gSPI interface
34	A31	PWM_4	O	Pulse width modulation bit 4
35	A32	USB2_HOST_DEV_SEL	I	USB HOST/DEV select
36	A33	GND	GND	
37	A34	USB_VDD_3V3	PWR	3.3V supply for USB
38	A35	VDD_3V3_IN_2	PWR	3.3V input
39	A36	GND	GND	
40	A37	VDDIO_AUDIO	PWR	I/O supply for audio
41	A38	GND	GND	
42	A39	VDD_3V3_LDO	PWR	3.3V output of internal LDO

43	A40	GND	GND	
44	A41	VDD1_35	PWR	Input to internal PMU LDO
45	A42	GND	GND	
46	A43	VDD_VBAT	PWR	VBAT input
47	A44	SR_VLX1_35	PWR	PMU CBUCK Switching Regulator Out
48	D4	GND	GND	
49	A45	GPIO_10	I/O	Programmable GPIO pin
50	A46	I2C_0_SDA	I/O	BSC serial data
51	A47	I2C_0_SCL	O	BSC master clock
52	A48	I2S0_SD_OUT	O	I ² S data output
53	A49	I2S1_WS_LRCLK	I/O	LR clock
54	A50	I2S0_SD_IN	I	I ² S data input
55	A51	I2S0_WS_LRCLK	I/O	LR clock
56	A52	UART0_RXD_IN	I	UART serial input
57	A53	UART0_RTS_OUT	O	UART request-to-send
58	A54	UART0_CTS_IN	I	UART clear-to-send
59	A55	UART0_TXD_OUT	O	UART serial output
60	A56	VDDIO	PWR	Power I/O supply
61	A57	VDDIO_RMII	PWR	I/O supply for RMII
62	A58	SFLASH_MISO_1	I/O	Flash data bit 2
63	D5	I2S1_MCK	I/O	I ² S Master Clock
64	B1	I2S1_SCK_BCLK	I/O	S clock
65	B2	I2C_1_SCL	O	BSC master clock
66	B3	GND	GND	
67	B4	GPIO_5_JTAG_TDO	I/O	JTAG/ Programmable GPIO pin
68	B5	MII_RXD2	I	MII Receive Data Input
69	B6	MII_RXD3	I	MII Receive Data Input
70	B7	MII_COL	I	Collision Detect
71	B8	MII_RXC	I	MII Receive Clock
72	B9	MII_CRS	I	MII carrier Sense
73	B10	MII_TXD2	O	MII Transmit Data Output
74	D6	MII_TXD3	O	MII Transmit Data Output
75	B11	GND	GND	
76	B12	RESET_N	I	Reset
77	B13	HIB_WAKE	I	Wake up chip from hibernation mode
78	B14	RF_SW_CTRL_8_UART2_RX	I/O	RF switch control/UART_RX
79	B15	RF_SW_CTRL_7_RSRC_INIT_MODE_UART1_TX_OUT	I/O	RF switch control/UART_TX
80	B16	RF_GPAIO_OUT	I/O	Analog GPIO
81	B17	JTAG_SEL	I	JTAG enable
82	B18	RF_SW_CTRL_6_UART1_RX_I_N	I	RF switch control/UART_RX
83	B19	GPIO_16	I/O	Programmable GPIO pin
84	D7	PWM_5	O	Pulse width modulation bit 5
85	B20	GPIO_3_JTAG_TMS	I/O	JTAG/ Programmable GPIO pin

86	B21	SDIO_DATA2	I/O	SDIO data line 2
87	B22	SDIO_DATA1	I/O	SDIO data line 1
88	B23	SDIO_DATA0	I/O	SDIO data line 0
89	B24	SDIO_CMD	I/O	SDIO command line
90	B25	SDIO_CLK	I/O	SDIO clock
91	B26	GPIO_15	I/O	Programmable GPIO pin
92	B27	SDIO_DATA3	I/O	SDIO data line 3
93	B28	GPIO_13_SDIO_MODE	I/O	Programmable GPIO pin/SDIO mode select
94	B29	GND	GND	
95	D8	GPIO_14	I/O	Programmable GPIO pin
96	B30	SPI_1_MOSI	O	SPI data master out
97	B31	SPI_1_MISO	I	SPI data master in
98	B32	SPI_1_CLK	O	SPI clock
99	B33	SPI_1_CS	O	SPI slave select
100	B34	GND	GND	
101	B35	I2S0_SCK_BCLK	I/O	Bit clock
102	B36	I2S0_MCK	I/O	M clock
103	B37	I2S1_SD_OUT	O	I ² S data output
104	B38	I2S1_SD_IN	I	I ² S data input
105	D9	GND	GND	
106	C1	I2C_1_SDA	I/O	BSC serial data
107	C2	GPIO_6_JTAG_TRST_L	I/O	Programmable GPIO pin/JTAG
108	C3	GPIO_4_JTAG_TDI	I/O	Programmable GPIO pin/JTAG
109	C4	GPIO_11_ACPU_BOOT_MODE	I/O	Boot from tightly coupled memory (TCM) ROM or TCM RAM
110	C5	HIB_REG_ON_IN	I	Used by the hibernation block to power up or power down the internal CYW43907 regulators
111	C6	HIB_LPO_SEL	I	Select precise or coarse 32 kHz clock
112	D10	GND	GND	
113	C7	RF_SW_CTRL_9_HIB_LPO_SEL_UART2_TX	I/O	RF switch control/UART_TX
114	C8	GND	GND	
115	D11	GND	GND	
116	C9	PWM_1	O	Pulse width modulation bit 1
117	C10	PWM_0	O	Pulse width modulation bit 0
118	C11	GPIO_0	I/O	Programmable GPIO pin
119	C12	VDDIO_SD	PWR	I/O supply for SDIO
120	C13	GPIO_2_JTAG_TCK	I/O	Programmable GPIO/JTAG
121	C14	GPIO_12	I/O	Programmable GPIO pin
122	D12	GND	GND	
123	C15	GPIO_9_USB_SEL	I/O	Select USB Mode
124	C16	GPIO_8_TAP_SEL	I/O	Programmable GPIO/ JTAG strap
125	E1	GND	GND	
126	E2	GND	GND	

127	E3	GND	GND	
128	E4	GND	GND	
129	E5	GND	GND	
130	E6	GND	GND	
131	E7	GND	GND	
132	E8	GND	GND	
133	E9	GND	GND	
134	E10	GND	GND	
135	E11	GND	GND	
136	E12	GND	GND	

Power Supply Segments

VDDIO	GPIO_0, GPIO_1_GSPI_MODE, GPIO_2_JTAG_TCK, GPIO_3_JTAG_TMS, GPIO_4_JTAG_TDI, GPIO_5_JTAG_TDO, GPIO_6_JTAG_TRST_L, GPIO_7_WCPU_BOOT_MODE, GPIO_8_TAP_SEL, GPIO_9_USB_HSIC_SEL, GPIO_10, GPIO_11_ACPU_BOOT_MODE, GPIO_12, GPIO_13_SDIO_MODE, GPIO_14, GPIO_15_HOST_VTRIM, GPIO_16, I2C_0_SCL, I2C_0_SDA, I2C_1_SCL, I2C_1_SDA, JTAG_SEL, PWM_0, PWM_1, PWM_2, PWM_3, PWM_4, PWM_5, SFLASH_CLK, SFLASH_CSN, SFLASH_MOSI_0, SFLASH_MISO_1, SFLASH_MISO_2, SFLASH_MISO_3, SPI_0_CLK, SPI_0_CS, SPI_0_MISO, SPI_0_MOSI, SPI_1_CLK, SPI_1_CS, SPI_1_MISO, SPI_1_MOSI, RESET_N, UART0_CTS_IN, UART0_RTS_OUT, UART0_RXD_IN, UART0_TXD_OUT, USB2_HOST_DEV_SEL
VDDIO_AUDIO	I2S0_WS_LRCLK, I2S1_WS_LRCLK, I2S0_MCK, I2S1_MCK, I2S0_SCK_BCLK, I2S1_SCK_BCLK, I2S0_SD_IN, I2S1_SD_IN, I2S0_SD_OUT, I2S1_SD_OUT
VDD_3V3_IN_2	TX_5G_RF_SW_CTRL_2, RX_5G_RF_SW_CTRL_3, ANT0_DIV_RF_SW_CTRL_4, ANT1_DIV_RF_SW_CTRL_5_DAP_CLK_SEL, RF_SW_CTRL_6_UART1_RX_IN, RF_SW_CTRL_7_RSRC_INIT_MODE_UART1_TX_OUT, RF_SW_CTRL_8_UART2_RX, RF_SW_CTRL_9_HIB_LPO_SEL_UART2_TX
VDDIO_RMII	MII_COL, MII_CRS, MII_RXC, MII_RMII_RXD0, MII_RMII_RXD1, MII_RXD2, MII_RXD3, MII_RXDV_RMII_CRS_DV, MII_TXC_RMII_REF_CLK, MII_RMII_TXD0, MII_RMII_TXD1, MII_TXD2, MII_TXD3, MII_RMII_TXEN, MII_RMII_MDC, MII_RMII_MDIO

6. Absolute Maximum Rating

		min.	max.	unit
Storage Temperature		-40	85	deg.C
Supply Voltage	VDD_VBAT	-0.5	5.5	V
	VDD1_35	-0.5	1.5	V
	USB_VDD_3V3	-0.5	3.9	V
	VDDIO	-0.5	3.9	V
	VDDIO_AUDIO	-0.5	3.9	V
	VDDIO_RMII	-0.5	3.9	V
	VDDIO_SD	-0.5	3.9	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.

7. Operating Condition

		min.	typ.	max.	unit
Operating Temperature Range ^(*)		-30		85	deg.C
Specification Temperature Range		-20		70	deg.C
Supply Voltage	VDD_VBAT	3.13		4.8	V
	VDD1_35	1.3	1.35	1.5	V
	USB_VDD_3V3	2.97	3.3	3.63	V
	VDDIO	2.97	3.3	3.63	V
	VDDIO_AUDIO	1.71		3.63	V
	VDDIO_RMII	1.71		3.63	V
	VDDIO_SD	1.71		3.63	V

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

Default configuration of VDD_3V3_IN and VDD_3V3_IN2 is to connect with VDD_3V3_LDO.
 Specifications require derating at extreme temperatures.

8. External 32.768 kHz Low-Power Oscillator

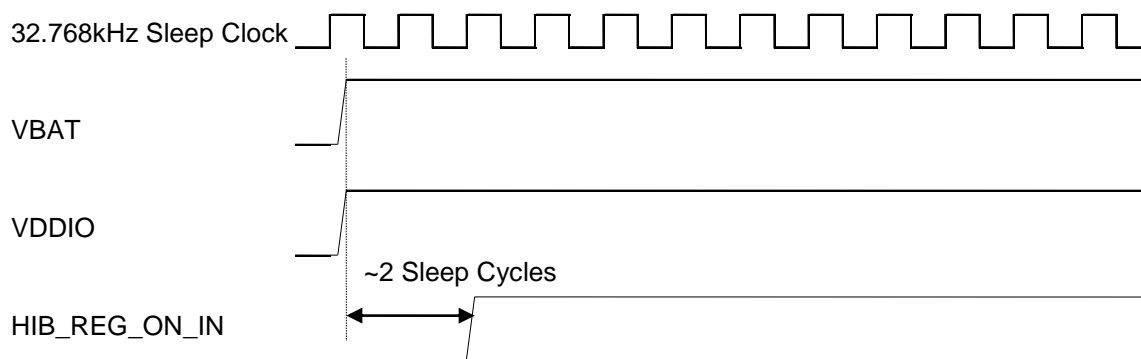
This module uses a secondary low frequency clock for low-power mode timing.

Parameter	LPO Clock	unit
Normal Input Frequency	32.768	kHz
Frequency Accuracy	+/-200	ppm
Duty Cycle	30 – 70	%
Input Signal Amplitude	200 – 3300	mVp-p
Signal Type	Square-wave, or Sine-wave	-
Input Impedance ¹⁾	>100k <5	Ohm pF
Clock Jitter (During Initial Start-up)	< 10,000	ppm

1) When power is applied or switched off.

9. Power Up Sequence

Following timing diagram explain module power up sequence.



*Power down sequence is opposite sequence of power up.

Note: The CYW43907 has an internal power-on-reset (POR) circuit. The device will be held in reset for a maximum of 110 ms after VDDC (internal LDO output) and VDDIO have both passed the POR threshold.

Note: The 10% - 90% VBAT rise time should not be faster than 40 microseconds. VBAT should be up before or at the same time as VDDIO. VDDIO should not be present first or be held high before VBAT is high.

10. Digital I/O Requirements

SDIO Interface I/O Pins	Sym	min.	typ.	max.	unit
For VDDIO_SD=1.8V:					
Input high voltage	VIH	1.27	–	–	V
Input low voltage	VIL	–	–	0.58	V
Output high voltage@2mA	VOH	1.40	–	–	V
Output low voltage@2mA	VOL	–	–	0.45	V
For VDDIO_SD=3.3V:					
Input high voltage	VIH	0.625xVDDIO	–	–	V
Input low voltage	VIL	–	–	0.25xVDDIO	V
Output high voltage@2mA	VOH	0.75xVDDIO	–	–	V
Output low voltage@2mA	VOL	–	–	0.125xVDDIO	V
Other Digital I/O Pins	Sym	min.	typ.	max.	unit
For VDDIO_SD=1.8V:					
Input high voltage	VIH	0.65xVDDIO	–	–	V
Input low voltage	VIL	–	–	0.35xVDDIO	V
Output high voltage@2mA	VOH	VDDIO–0.45	–	–	V
Output low voltage@2mA	VOL	–	–	0.45	V
For VDDIO_SD=3.3V:					
Input high voltage	VIH	2.00	–	–	V
Input low voltage	VIL	–	–	0.80	V
Output high voltage@2mA	VOH	VDDIO–0.4	–	–	V
Output low voltage@2mA	VOL	–	–	0.40	V
RF Switch control Output Pins	Sym	min.	typ.	max.	unit
For VDD_3V3_IN_2=3.3V:					
Output high voltage@2mA	VOH	VDDIO–0.4	–	–	V
Output low voltage@2mA	VOL	–	–	0.4	V
Input capacitance	CIN	–	–	5	pF

GPIO, UART, and JTAG Interfaces

Parameter	Sym	min.	typ.	max.	unit
For VDDIO=3.3V:					
Input high voltage	VIH	2.0	–	VDDIO+0.5	V
Input low voltage	VIL	–0.5	–	0.8	V
Output high voltage@2mA	VOH	2.4	–	–	V
Output low voltage@2mA	VOL	–	–	0.4	V

11. RF Characteristics

11.1. DC/RF Characteristics for IEEE802.11b

Conditions: 25deg.C, VBAT=3.3V

(11Mbps mode unless otherwise specified.)

Items	Contents			
Specification	IEEE802.11b			
Mode	CCK			
Frequency	2400 - 2483.5MHz			
Output Power setting	17.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		380	480	mA
2) Rx mode		100	150	mA
- Tx Characteristics *1-	min.	Typ.	max.	unit
2. Output Power	15.0	17.0	19.0	dBm
3. Spectrum Mask Margin				
1) 1st side lobes(-30dBr)	0	10	-	dB
2) 2nd side lobes(-50dBr)	0	10	-	dB
4. Power-on and Power-down ramp	-		2.0	μsec
5. RF Carrier Suppression	15	-	-	dB
6. Modulation Accuracy (EVM)	-	23	35	%
7. Frequency tolerance	-20	-5	20	ppm
8. Out band Spurious Emissions				
1) 30MHz to 1GHz (BW=100kHz)	-	-	-36	dBm
2) 1GHz to 12.75GHz (BW=1MHz)	-	-	-30	dBm
3) 1.8GHz to 1.9GHz (BW=1MHz)	-	-	-47	dBm
4) 5.15GHz to 5.3GHz (BW=1MHz)	-	-	-47	dBm
- Rx Characteristics -	min.	typ.	max.	unit
9. Minimum Input Level Sensitivity (FER ≤ 8%)	-	-89	-76	dBm
10. Maximum Input Level (FER ≤ 8%)	-10	-	-	dBm
11. Adjacent Channel Rejection (FER ≤ 8%)	35	-	-	dB

*1: Defined when output power setting is 17dBm at Murata module antenna pad

*2: Datarate is 1Mbps

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

11.2. DC/RF Characteristics for IEEE802.11g

Conditions: 25deg.C, VBAT=3.3V

(54Mbps mode unless otherwise specified.)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM			
Frequency	2400 - 2483.5MHz			
Output Power setting	13.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		320	420	mA
2) Rx mode		100	150	mA
- Tx Characteristics*1 -	min.	typ.	max.	unit
2. Output Power	11.0	13.0	15.0	dBm
3. Spectrum Mask Margin				
1) 9MHz to 11MHz (0~ -20dBr)	0	13	-	dB
2) 11MHz to 20MHz (-20~ -28dBr)	0	13	-	dB
3) 20MHz to 30MHz (-28~ -40dBr)	0	14	-	dB
4) 30MHz to 33MHz (-40dBr)	0	14	-	dB
4. Constellation Error (EVM)	-	-36	-25	dB
5. Frequency tolerance	-20	-5	20	ppm
6. Out band Spurious Emissions				
1) 30MHz to 1GHz (BW=100kHz)	-	-	-36	dBm
2) 1GHz to 12.75GHz (BW=1MHz)	-	-	-30	dBm
3) 1.8GHz to 1.9GHz (BW=1MHz)	-	-	-47	dBm
4) 5.15GHz to 5.3GHz (BW=1MHz)	-	-	-47	dBm
- Rx Characteristics -	min.	typ.	max.	unit
7. Minimum Input Level Sensitivity (PER ≤ 10%)	-	-77	-65	dBm
8. Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm
9. Adjacent Channel Rejection (PER ≤ 10%)	-1	-	-	dB

*1: Defined when output power setting is 13dBm at Murata module antenna pad

*2: Datarate is 6Mbps

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

11.3. DC/RF Characteristics for IEEE802.11n

Conditions: 25deg.C, VBAT=3.3V

(65Mbps(MCS7) mode unless otherwise specified.)

Items	Contents			
Specification	IEEE802.11n			
Mode	OFDM			
Frequency	2400 - 2483.5MHz			
Output Power setting	12.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		310	410	mA
2) Rx mode		100	150	mA
- Tx Characteristics -	min.	typ.	max.	unit
2. Output Power	10.0	12.0	14.0	dBm
3. Spectrum Mask Margin				
1) 9MHz to 11MHz (0 ~ -20dBr)	0	13	-	dB
2) 11MHz to 20MHz (-20 ~ -28dBr)	0	13	-	dB
3) 20MHz to 30MHz (-28 ~ -45dBr)	0	9	-	dB
4) 30MHz to 33MHz (-45dBr)	0	9	-	dB
4. Constellation Error (EVM)	-	-38	-27	dB
5. Frequency tolerance	-20	-5	20	ppm
6. Out band 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
7. Minimum Input Level Sensitivity				
1) 65Mbps (PER ≤ 10%)	-	-74	-64	dBm
8. Maximum Input Level (PER ≤ 10%)	-20	-	-	dBm
9. Adjacent Channel Rejection (PER ≤ 10%)	-2	-	-	dB

*1: Defined when output power setting is 12dBm at Murata module antenna pad

*2: Datarate is 6.5Mbps(MCS0)

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

11.4. DC/RF Characteristics for IEEE802.11a - 5GHz

Conditions : 25deg.C, VBAT =3.3V.

(54Mbps mode unless otherwise specified.)

Items	Contents			
Specification	IEEE802.11a			
Mode	OFDM			
Frequency	5180 - 5825MHz			
Output Power setting	13.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		330	430	mA
2) Rx mode		100	150	mA
- Tx Characteristics*1 -	min.	typ.	max.	unit
2. Output Power	11.0	13.0	15.0	dBm
3. Spectrum Mask Margin				
1) 9MHz to 11MHz (0~ -20dBr)	0	12	-	dB
2) 11MHz to 20MHz (-20~ -28dBr)	0	13	-	dB
3) 20MHz to 30MHz (-28~ -40dBr)	0	12	-	dB
4) 30MHz to 33MHz (-40dBr)	0	11	-	dB
4. Constellation Error (EVM)	-	-34	-25	dB
5. Frequency tolerance	-20	0	20	ppm
- Rx Characteristics -	min.	typ.	max.	unit
6. Minimum Input Level Sensitivity (PER ≤ 10%)	-	-74	-65	dBm
7. Maximum Input Level (PER ≤ 10%)	-30	-	-	dBm
8. Adjacent Channel Rejection (PER ≤ 10%)	-1	-	-	dB

*1: Defined when output power setting is 13dBm at Murata module antenna pad

*2: Datarate is 6Mbps

Note The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

11.5. DC/RF Characteristics for IEEE802.11n - 5GHz

Conditions : 25deg.C, VBAT =3.3V.

(65Mbps (MCS7) mode unless otherwise specified.)

Items	Contents			
Specification	IEEE802.11n			
Mode	OFDM			
Frequency	5180 - 5825MHz			
Output Power setting	12.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		320	420	mA
2) Rx mode		100	150	mA
- Tx Characteristics*1 -	min.	typ.	max.	unit
2. Output Power	10.0	12.0	14.0	dBm
3. Spectrum Mask Margin				
1) 9MHz to 11MHz (0~ -20dBr)	0	12	-	dB
2) 11MHz to 20MHz (-20~ -28dBr)	0	13	-	dB
3) 20MHz to 30MHz (-28~ -45dBr)	0	12	-	dB
4) 30MHz to 33MHz (-45dBr)	0	11	-	dB
4. Constellation Error (EVM)	-	-36	-27	dB
5. Frequency tolerance	-20	0	20	ppm
- Rx Characteristics -	min.	typ.	max.	unit
6. Minimum Input Level Sensitivity (PER ≤ 10%)	-	-73	-64	dBm
7. Maximum Input Level (PER ≤ 10%)	-30	-	-	dBm
8. Adjacent Channel Rejection (PER ≤ 10%)	-1	-	-	dB

*1: Defined when output power setting is 12dBm at Murata module antenna pad

*2: Datarate is 6.5Mbps(MCS0)

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

Conditions: 25deg.C, VBAT=3.3V
(135Mbps(MCS7_HT40) mode unless otherwise specified.)

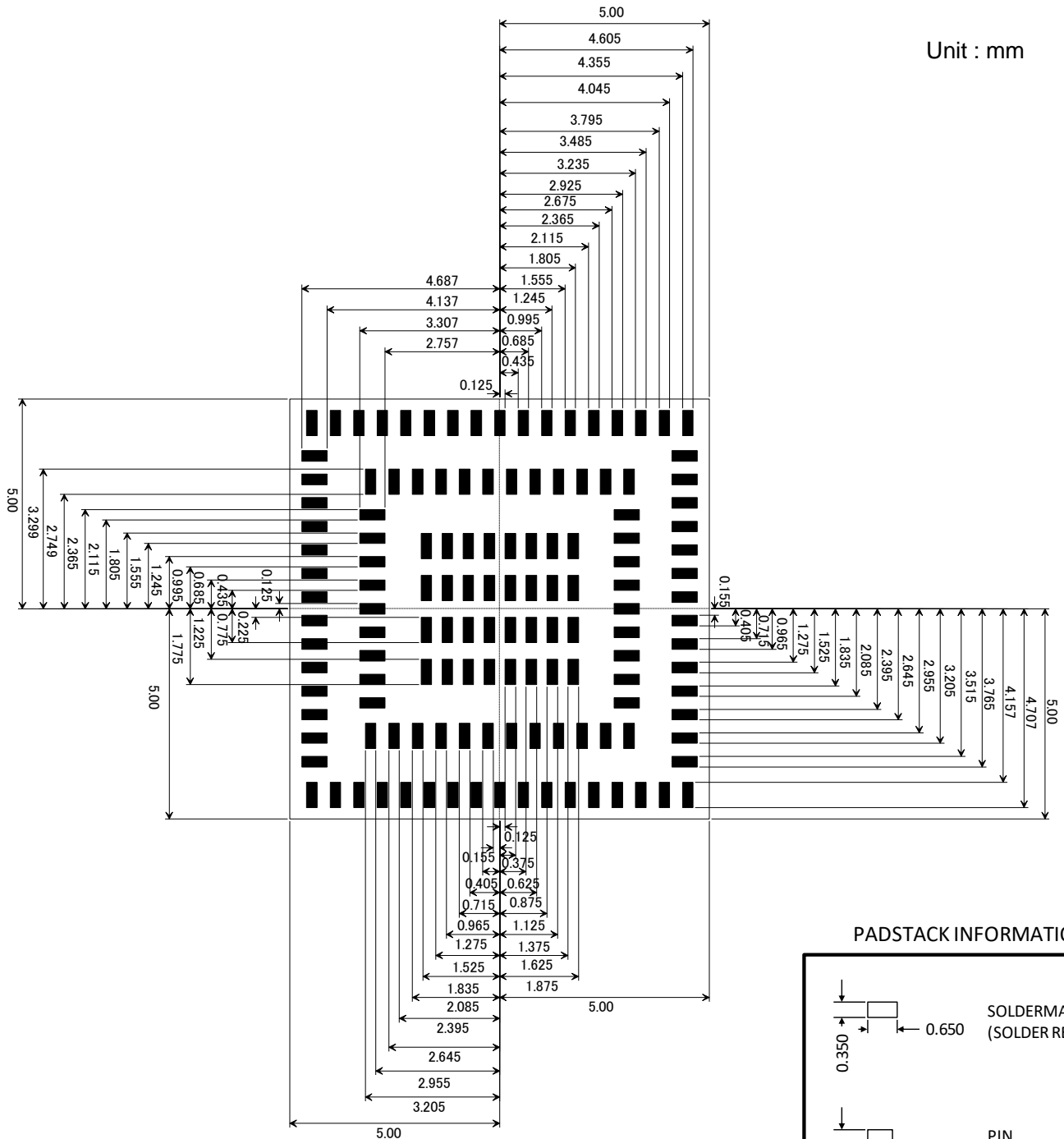
Items	Contents			
Specification	IEEE802.11n			
Mode	OFDM			
Frequency	5190 - 5795MHz			
Output Power setting	12.0dBm			
- DC Characteristics -	min.	typ.	max.	unit
1. DC current				
1) Tx mode (1024byte, 20usec interval) *1*2		330	430	mA
2) Rx mode		100	150	mA
- Tx Characteristics*1 -	min.	typ.	max.	unit
2. Output Power	10.0	12.0	14.0	dBm
3. Spectrum Mask Margin				
1) 19MHz to 21MHz (0~ -20dBr)	0	18	-	dB
2) 21MHz to 40MHz (-20~ -28dBr)	0	10	-	dB
3) 40MHz to 60MHz (-28~ -45dBr)	0	9	-	dB
4) 60MHz to 80MHz (-45dBr)	0	9	-	dB
4. Constellation Error (EVM)	-	-33	-27	dB
5. Frequency tolerance	-20	0	20	ppm
- Rx Characteristics -	min.	typ.	max.	unit
6. Minimum Input Level Sensitivity (PER ≤ 10%)	-	-69	-61	dBm

*1: Defined when output power setting is 12dBm at Murata module antenna pad

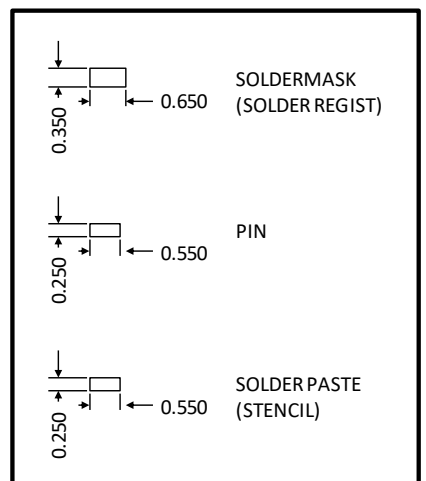
*2: Datarate is 13.5Mbps(MCS0)

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

12. Land pattern (Top View)

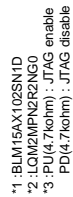


PADSTACK INFORMATION



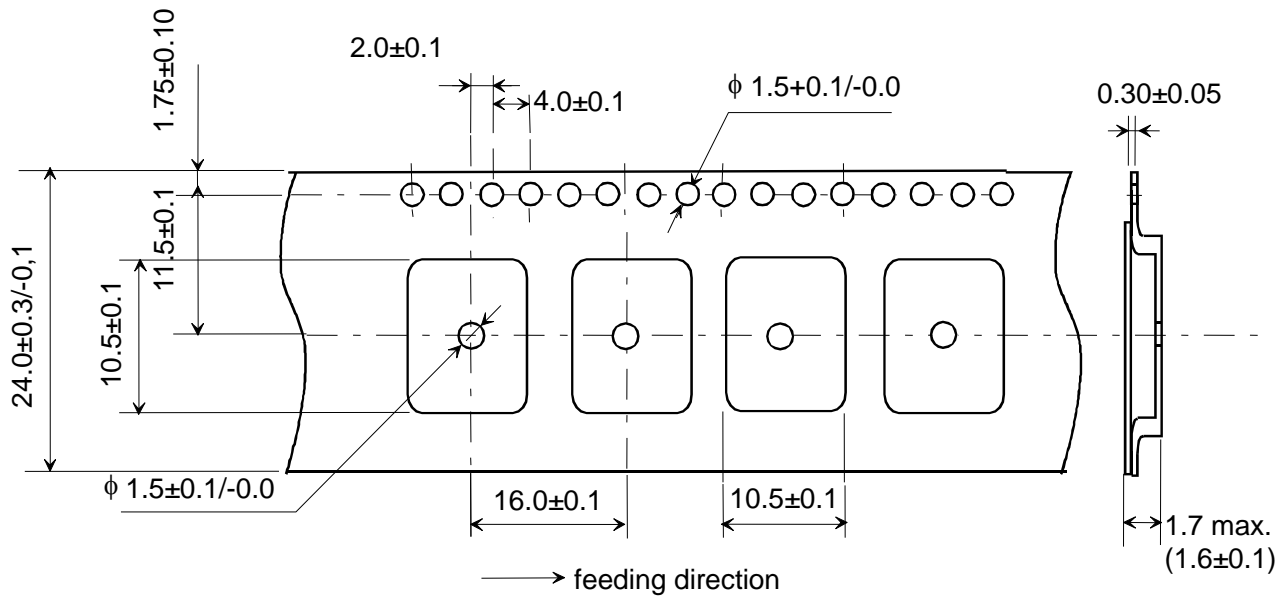
Note: For PINs on the board that have a copper pour (flood) associated with it, usually the case with Ground PINs, please assure that the Land Pattern (PCB Footprint) for these PINs becomes Solder Mask Defined (SMD). In other words, the SOLDERMASK (SOLDER REGIST) for these Ground (GND) pins should be 0.550 mm x 0.250 mm (basically SODLERMASK (SOLDER REGIST) becomes same size as the PIN).

13. Reference Circuit



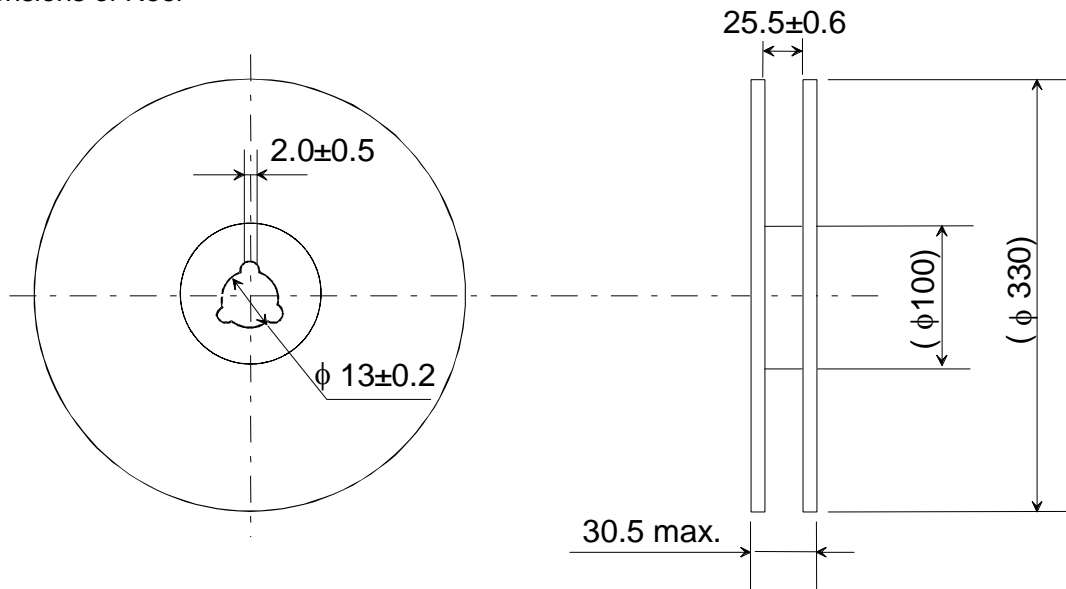
14. Tape and Reel Packing

(1) Dimensions of Tape (Plastic tape)



- 1) The corner and ridge radiuses (R) of inside cavity are 0.3mm max.
- 2) Cumulative tolerance of 10 pitches of the sprocket hole is ± 0.2 mm
- 3) Measuring of cavity positioning is based on cavity center in accordance with JIS/IES standard.

(2) Dimensions of Reel



(unit : mm)

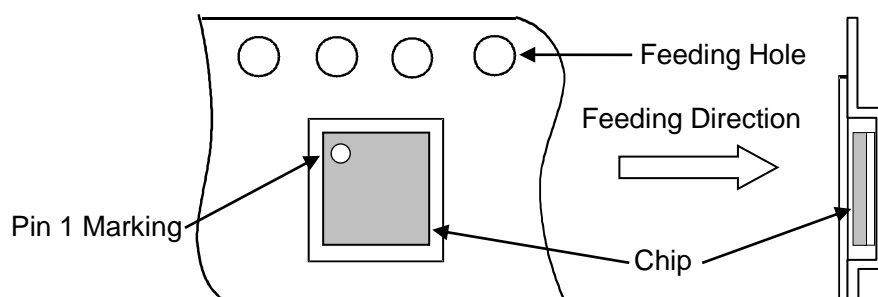
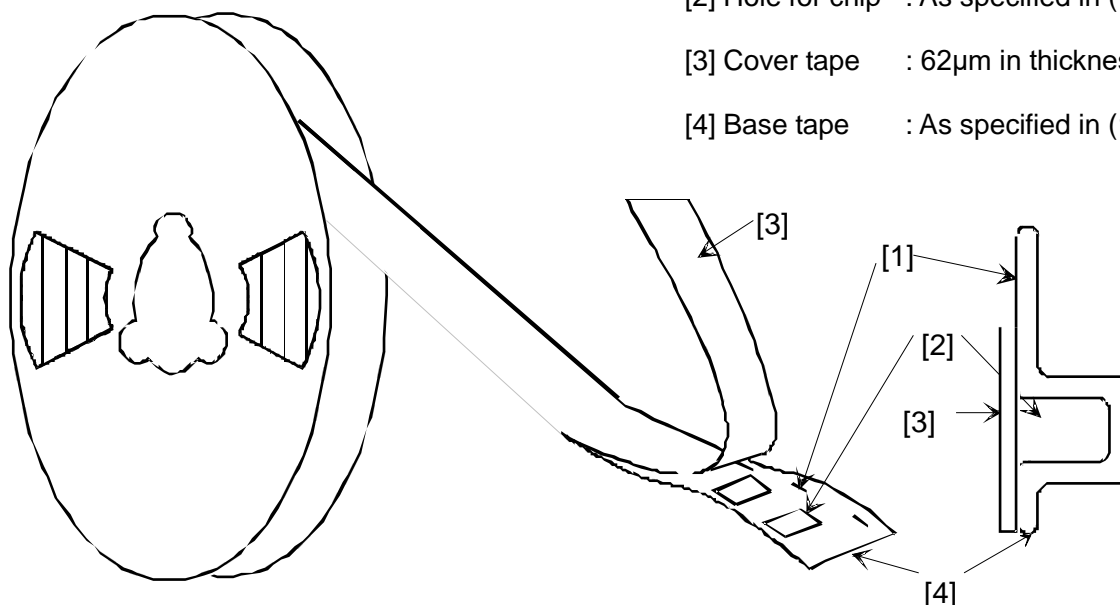
(3) Taping Diagrams

[1] Feeding Hole : As specified in (1)

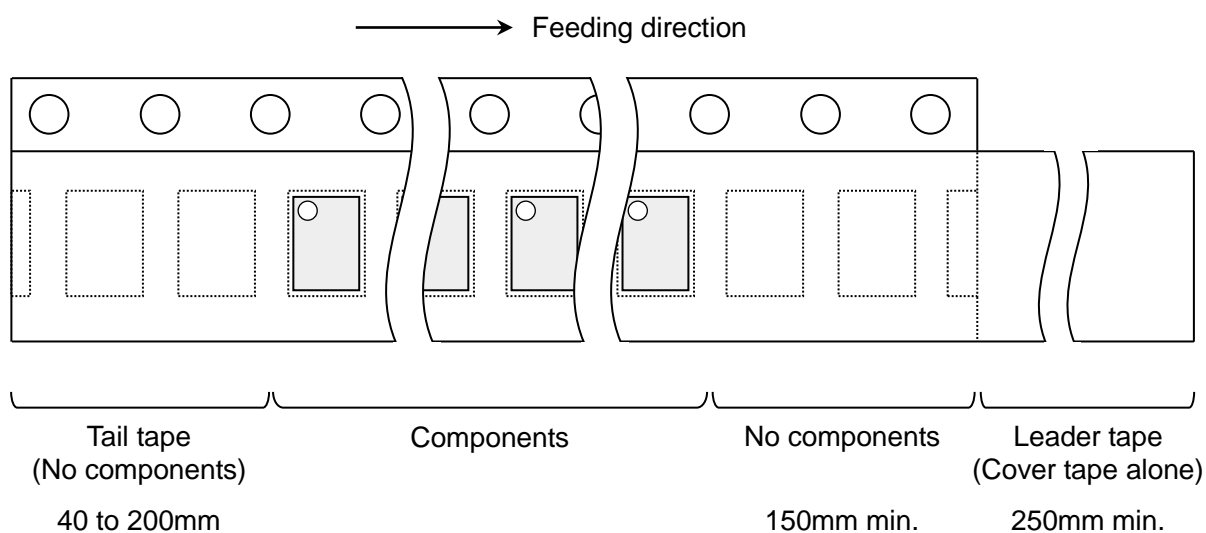
[2] Hole for chip : As specified in (1)

[3] Cover tape : 62μm in thickness

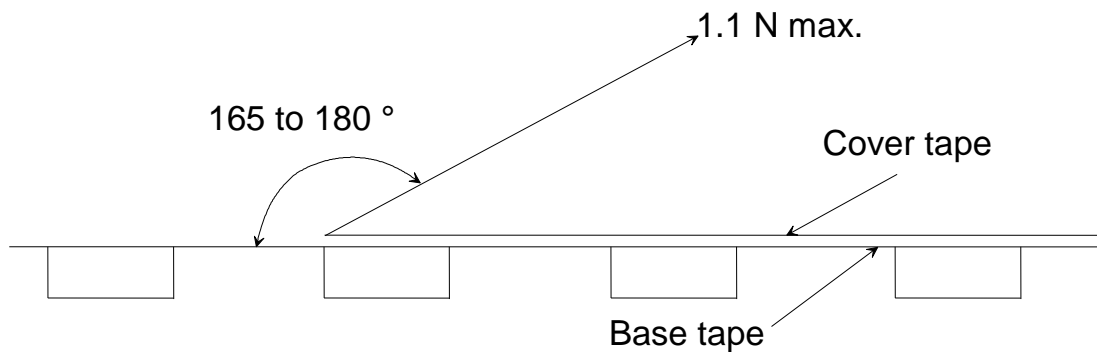
[4] Base tape : As specified in (1)



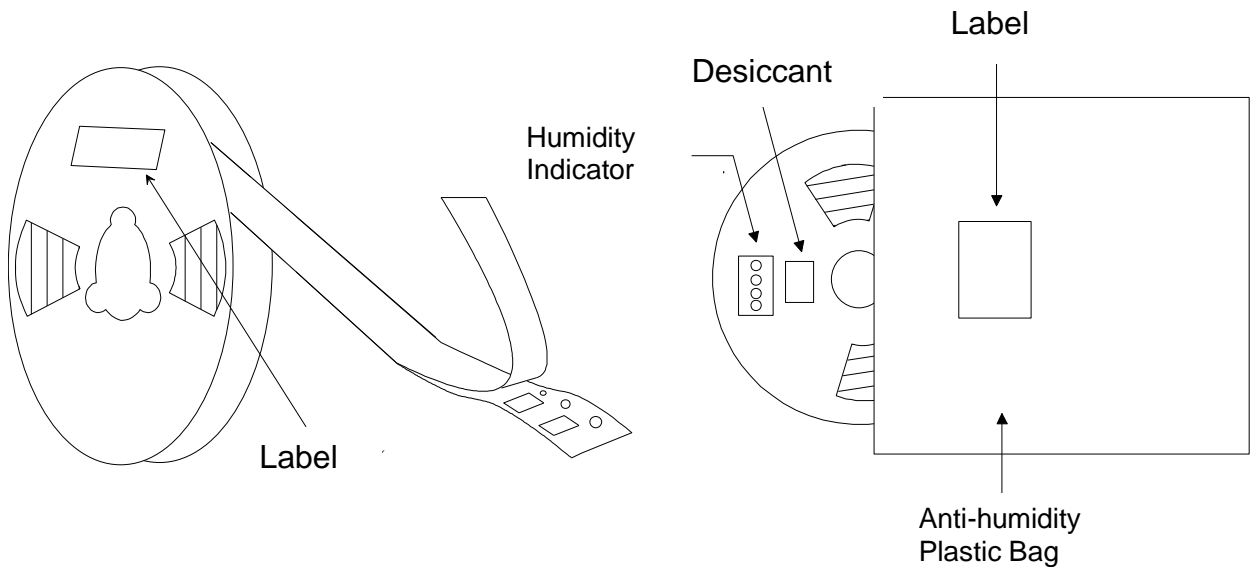
(4) Leader and Tail tape



- (5) The tape for chips are wound clockwise, the feeding holes to the right side as the tape is pulled toward the user.
- (6) The cover tape and base tape are not adhered at no components area for 250mm min.
- (7) Tear off strength against pulling of cover tape : 5N min.
- (8) Packaging unit : 1000pcs./ reel
- (9) material : Base tape : Plastic
Real : Plastic
Cover tape, cavity tape and reel are made the anti-static processing.
- (10) Peeling of force : 1.1N max. in the direction of peeling as shown below.



- (11) Packaging (Humidity proof Packing)



Tape and reel must be sealed with the anti-humidity plastic bag. The bag contains the desiccant and the humidity indicator.

15. NOTICE

15.1. Storage Conditions:

Please use this product within 6month after receipt.

- The product shall be stored without opening the packing under the ambient temperature from 5 to 35deg.C and humidity from 20 to 70%RH.

(Packing materials, in particular, may be deformed at the temperature over 40deg.C.)

- The product left more than 6months after reception, it needs to be confirmed the solderbility before used.

- The product shall be stored in non corrosive gas (Cl₂, NH₃, SO₂, No_x, 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.

This product is applicable to MSL3 (Based on JEDEC Standard J-STD-020)

- After the packing opened, the product shall be stored at $\leq 30\text{deg.C}$ / $\leq 60\%\text{RH}$ and the product shall be used within 168hours.

- When the color of the indicator in the packing changed, the product shall be baked before soldering.

Baking condition: 125+5/-0deg.C, 24hours, 1time

The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

15.2. 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 bear hands that may result in poor solder ability and destroy by static electrical charge.

15.3. Standard PCB Design (Land Pattern and Dimensions):

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Murata beforehand.

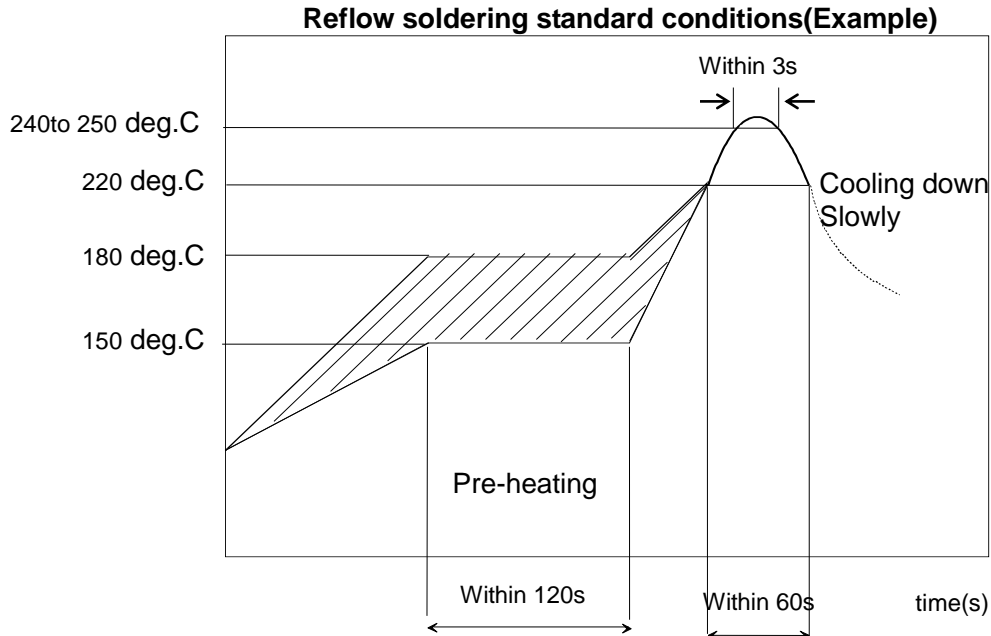
15.4. Notice for Chip Placer:

When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

15.5. Soldering Conditions:

The recommendation conditions of soldering are as in the following figure.

Soldering must be carried out by the above mentioned conditions to prevent products from damage. Set up the highest temperature of reflow within 260 °C. Contact Murata before use if concerning other soldering conditions.



Please use the reflow within 2 times.

Use rosin type flux or weakly active flux with a chlorine content of 0.2 wt % or less.

15.6. Cleaning:

Since this Product is Moisture Sensitive, any cleaning is not recommended. If any cleaning process is done the customer is responsible for any issues or failures caused by the cleaning process.

15.7. 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 (Cl₂, NH₃, SO_x, NO_x 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.

15.8. 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.

16. PRECONDITION TO USE OUR PRODUCTS

PLEASE READ THIS NOTICE BEFORE USING 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.

We do not warrant or represent that any license, either express or implied, is granted under any our patent right, copyright, mask work right, or our other intellectual property right relating to any combination, machine, or process in which our products or services are used. Information provided by us regarding third-party products or services does not constitute a license from us to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from us under our patents or other intellectual property.

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.

By signing on specification sheet or approval sheet, you acknowledge that you are the legal representative for your company and that you understand and accept the validity of the contents herein. When you are not able to return the signed version of specification sheet or approval sheet within 30 days from receiving date of specification sheet or approval sheet, it shall be deemed to be your consent on the content of specification sheet or approval sheet. 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 disclaim any liability for consequential and incidental damages.

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

APPENDIX

Type1GC Installation Manual (FCC)

FCC ID of this product is as follows.

FCC ID:VPYLB1GC

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.

Contents

- 1.Theory of operation
- 2.Antenna
- 3.Notice

1. Theory of Operation

Frequency of operation			Scan	Ad-hoc mode
2.4GHz	11b/g/n (HT20)	2412-2462MHz	Active	Yes
W52	11a/n (HT20)	5180-5240MHz	Active	Yes
	11n (HT40)	5190-5230MHz	Active	Yes
W53	11a/n (HT20)	5260-5320MHz	Passive	No
	11n (HT40)	5270-5310MHz	Passive	No
W56	11a/n (HT20)	5500-5720MHz	Passive	No
	11n (HT40)	5510-5710MHz	Passive	No
W58	11a/n (HT20)	5745-5825MHz	Active	Yes
	11n (HT40)	5755-5795MHz	Active	Yes

Compliance with FCC requirement 15.407(c)

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

Frequency Tolerance: ± 20 ppm

End users cannot modify the software because F/W & driver are installed in device.

2. Antenna

■ Please refer to KDB 996369

■ 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 feed line(microstrip line length)

	Antenna
Antenna type	2.4GHz Monopole Antenna 5GHz Monopole Antenna
50-ohm feed line length	We test it at 6.15mm as a representative

3. Notice

For OEM integration only – device cannot be sold to general public.

Therefore we will ask OEM to include the following statements required by FCC/IC 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:VPYLB1GC

or

Contains FCC ID:VPYLB1GC

● Please describe the following warning to the manual.

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.

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

●When installing it in a mobile equipment. Please describe the following warning to the manual.

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.

RF Exposure requirements are met when installed in mobile equipment.

This module cannot be installed in portable equipment without further testing and a change to FCC's grant of authorization.

Contact Murata regarding portable applications.

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.

This device is intended only for OEM integrators under the following conditions:

- 1)The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2)The transmitter module may not be co-located with any other transmitter or antenna.
- 3)The use of an antenna with gain less than 1.2 dBi(2.4GHz) and 2.5 dBi(5GHz).

As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID:VPYLB1GC". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Type1GC Installation Manual (IC)

IC No. of this product is as follows.

IC : 772C-LB1GC

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.

Contents

- 1.Theory of operation
- 2.Antenna
- 3.Notice

1. Theory of Operation

Frequency of operation			Scan	Ad-hoc mode
2.4GHz	11b/g/n (HT20)	2412-2462MHz	Active	Yes
W52	11a/n (HT20)	5180-5240MHz	Active	Yes
	11n (HT40)	5190-5230MHz	Active	Yes
W53	11a/n (HT20)	5260-5320MHz	Passive	No
	11n (HT40)	5270-5310MHz	Passive	No
W56	11a/n (HT20)	5500-5720MHz	Passive	No
	11n (HT40)	5510-5710MHz	Passive	No
W58	11a/n (HT20)	5745-5825MHz	Active	Yes
	11n (HT40)	5755-5795MHz	Active	Yes

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

End users cannot modify the software because F/W & driver are installed in device.

2. Antenna

■ Please refer to KDB 996369

■ 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 feed line(microstrip line length)

	Antenna
Antenna type	2.4GHz Monopole Antenna 5GHz Monopole Antenna
50-ohm feed line length	We test it at 6.15mm as a representative

3. Notice

For OEM integration only – device cannot be sold to general public.

Therefore we will ask OEM to include the following statements required by FCC/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-LB1GC

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

5150-5250 MHz band is restricted to indoor operation only.
La bande 5150-5250 MHz est restreinte à une utilisation à l'intérieur seulement.
High-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.
Les radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz, et ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

●When installing it in a mobile equipment. Please describe the following warning to the manual.

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.

RF Exposure requirements are met when installed in mobile equipment.

This module cannot be installed in portable equipment without further testing and a change to FCC's grant of authorization.

Contact Murata regarding portable applications.

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.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.
- 3) The use of an antenna with gain less than 1.2 dBi(2.4GHz) and 2.5 dBi(5GHz).

As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 3 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

IMPORTANT NOTE:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 772C-LB1GC".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 772C-LB1GC".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.