ALPINE　AFT-RW404
WI-FI　Module

Hardware Specification

CONFIDENTIALITY NOTES:

This document contains confidential information, which shall not be provided to any third parties without agreement notice.

CAUTION:

- This product (or technology) is subject to the Japanese Foreign Exchange and Foreign Trade law ,and is required to obtain an export license of the Japanese governmental agency , when exported from Japan.
- Do not use the product that is dropped in your process.
- Do not leave and treat the product in a place where it is subjected to strong magnetism or static electricity.
- The BLUETOOTH trademarks are owned by Bluetooth SIG, Inc., U.S.A.
- The Wi-Fi and Wi-Fi Direct trademarks are owned by Wi-Fi Alliance.
- IEEE and 802 trademarks are owned by the Institute of Electrical and Electronics Engineers, Incorporated.
- Nozzle pressure for module mounting must be a 1N to 3N static load.

Contents

1. GENERAL

1-1. General Description

This document contains the specification pertinent to the 2.4GHz Band Wi-Fi™ module.

1-2. Features

1-2-1. Product Overview

This product is a radio frequency transceiver module compatible for IEEE Std 802.11b™, IEEE Std 802.11g™, IEEE802.11n™ system

This product is compatible to Wi-Fi Direct™ system in software.

This product supports a SDIO host interface for connecting the Wi-Fi™ to the host processor. Either one is selected.

- **SDIO Host Interface**

  4-bit Data Transfer Mode [Basic]
  1-bit Data Transfer Mode [Optional]

This product supports a co-existence interface for connecting the external Bluetooth™ module to the Wi-Fi™ part. Either one is selected.

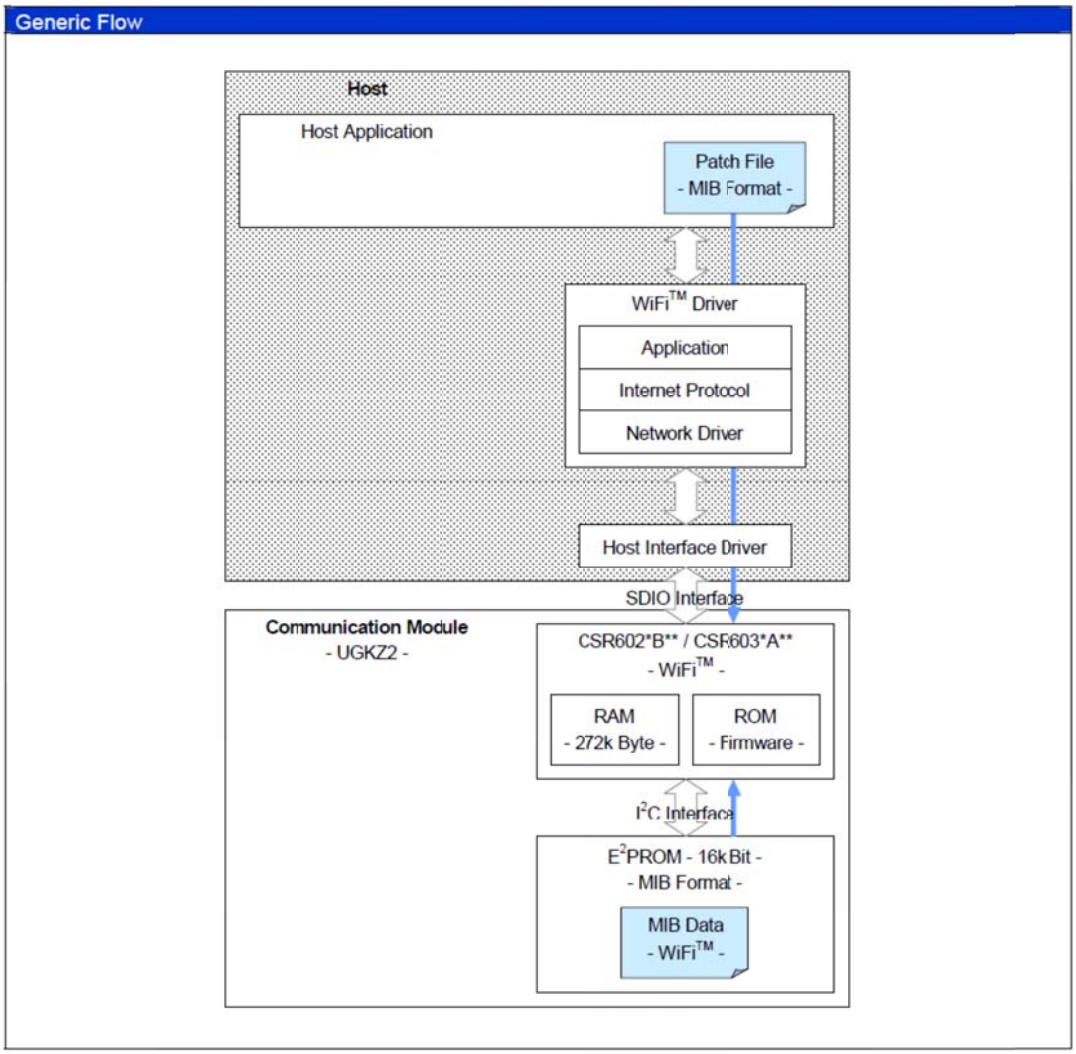
- **Unity-3 Co-existence [Basic]**
- Unity+ Co-existence [Optional]

This product supports a SPI test interface for system debug the Wi-Fi™ part. However, because these use the terminal of bottom PADs, these doesn't connect (not be used) usually. Refer of "UGKZ2_TestInterfaceInformation" for detail.

- SPI Test Interface [Optional]

1-2-3-1. Applying Stored Data

After the firmware is loaded within Wi-Fi™, the MIB data written in E^2PROM is loaded and applied automatically. Afterwards, individual up-loading/overwriting from Wi-Fi™ Host Interface is possible by using the MIB file.



1-3. Abbreviations

For the purposes of this document, the following abbreviations apply:

Abbre-viation	Definition
A	Ampere
AIO	Analog Input / Output
BALUN	Balance Un-balance circuit
BB	Base Band
BCSP	BlueCore™ Serial Protocol
BDR	Basic Data Rates
BPF	Band Pass Filter
bps	Bit Per Second
BPSK	Binary Phase Shift keying
BT	Bluetooth™
CCK	Complimentary Code Keying
Co-ex	Co-existence
CPU	Central Processing Unit
CTS	Clear to Send
dBc	Electric power ratio to career
dBm	dB relative to 1 mW. *(1 mW = 0 dBm)*
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quaternary Phase Shift Keying
DSSS	Direct Sequence Spread Spectrum
EDR	Enhanced Data Rates
ESD	Electrostatic Discharge
E^2PROM	Electrically Erasable Programmable Read Only Memory
FEC	Front End Control
FER	Frame Error Ratio
GI	Guard Interval
GND	Ground
PIO	Programmable Input / Output
CSPI	CSR Serial Peripheral Interface
HCI	Host Controller Interface
Hz	Hertz
H4DS	H4 Deep Sleep
I^2C	Inter-Integrated Circuit Interface
I^2S	Inter-IC Sound interface
IC	Integrated Circuit
IEEE	Institute of Electronic and Electrical Engineers
I/O LAN	Input / Output Local Area Network
LDO	Low Drop Out regulator IC
LED	Light Emitting Diode
MAC	Media Access Control
Max.	Maximum

Abbre-viation	Definition
MCS	Modulation and Coding Scheme
MIB	Management Information Base
Min.	Minimum
NC	Non Connection
OFDM	Orthogonal Frequency Division Multiplexing
PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PER	Packet Error Ratio
ppm	Parts Per Million
PSKey	Persistent Store Key
PTA	Packet Traffic Arbitration
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RAM	Random Access Memory
RF	Radio Frequency
RH	Relative humidity
ROM	Read Only Memory
RSSI	Received Signal Strength Indication
RTS	Request To Send
RX	Receive
s	second
SCO	Synchronous Connection-Oriented
SDIO	Secure Digital Input / Output
SoC	System on Chip
SPI	Serial Peripheral Interface
Typ.	Typical
TX	Transmit
UART	Universal Asynchronous Receiver / Transmitter
V	Volt
WCS	Wireless Coexistence System
Wi-Fi™	Wireless Fidelity
WLAN	Wireless Local Area Network
X'tal	Crystal
XO	Crystal Oscillator
°C	degrees Celsius

2. ELECTRICAL CHARACTERISTICS

2-1. Absolute Maximum Ratings

Items	Conditions
Storage Temperature	-40 ~ +85 [°C]
Storage Humidity	~ 90 [%] RH (no-condensing)

Pin No. / Pin Name	Conditions
33. WL_3V3	-0.3 ~ 5.0 [V]
38. WL_1V8_3V3	-0.3 ~ 5.0 [V]
32. WL_VIO_1	-0.3 ~ 3.6 [V]
39. WL_VIO_2	-0.3 ~ 3.6 [V]
--. Digital Input Pins	V_{SS}-0.3 ~ V_{DD}+0.3 [V] *1)

Note 1: The input maximum voltage must not exceed the VDD absolute maximum voltage.

2-2. Operating Conditions

Items	Conditions	
Operating Temperature	Nominal: Extreme:	+15 ~ +35 [°C] -40 ~ +85 [°C]

Pin No. / Pin Name	Conditions	
33. WL_3V3 38. WL_1V8_3V3	Nominal: Extreme:	3.3 [V] 3.3 ± 3 [%]
32. WL_VIO_1	Nominal: Extreme:	3.3 [V] 3.3 ± 0.1 [V]
39. WL_VIO_2	Nominal: Extreme:	3.3 [V] 3.3 ± 0.1 [V]

2-2-1. Digital Input / Output Operating Conditions

Pin No. / Pin Name	Conditions			
Powered from WL_VIO_1 supply voltage 26. WL_SD_DAT[1] 27. WL_SD_DAT[0] 28. WL_SD_CMD 29. WL_SD_CLK 30. WL_SD_DAT[3] 31. WL_SD_DAT[2]	V_{IN_Low}: V_{IN_High}: V_{OUT_Low} *1) : V_{OUT_High} *2): Note1: I_{OUT_Low} = +8.0 [mA] Note2: I_{OUT_High} = -8.0 [mA]	-0.3 0.625 * V_{DD} 0.75 * V_{DD}	~ 0.25 * V_{DD} ~ V_{DD} + 0.3 ~ 0.4 ~ V_{DD}	[V] [V] [V] [V]
Powered from internal LDO 3.0V 20. WL_SD_IRQn	V_{OUT_Low} *1): V_{OUT_High} *2): Note1: I_{OUT_Low} = +8.0 [mA] Note2: I_{OUT_High} = -8.0 [mA]	 2.0	~ 0.45 ~ 3.1	[V] [V]
Powered from WL_VIO_2 supply voltage 19. WL_RESETn	V_{IN_Low}: V_{IN_High}:	-0.3 0.625 * V_{DD}	~ 0.25 * V_{DD} ~ V_{DD} + 0.3	[V] [V]

2-2-2. Optional Function Operating Conditions

Pin No. / Pin Name	Conditions			
Powered from WL_VIO_2 supply voltage 24. WL_I^{2}C_WP (option)	V_{IN_Low}: V_{IN_High}:	-0.3 0.7 * V_{DD}	~ 0.3 * V_{DD} ~ V_{DD} + 0.3	[V] [V]
Powered from WL_VIO_2 supply voltage 41. WL_SLEEP_CLK (option)	V_{IN_Low}: V_{IN_High}: Nominal: Extreme: T_{RISE}: T_{FALL}:	-0.3 0.625 * V_{DD} 32.768 [kHz] ± 20 [ppm] 32.768 [kHz] ± 150 [ppm] Max. 50 [ns] Max. 50 [ns]	~ 0.25 * V_{DD} ~ V_{DD} + 0.3	[V] [V]
Powered from WL_VIO_1 supply voltage 35. COEX_WL_DENY (option) 36. COEX_BT_ACTIVE (option) 37. COEX_BT_STATUS (option) 40. COEX_BT_PERIODIC (option)	V_{IN_Low}: V_{IN_High}: V_{OUT_Low} *1) : V_{OUT_High} *2): Note1: I_{OUT_Low} = +8.0 [mA] Note2: I_{OUT_High} = -8.0 [mA]	-0.3 0.625 * V_{DD} 0.75 * V_{DD}	~ 0.25 * V_{DD} ~ V_{DD} + 0.3 ~ 0.4 ~ V_{DD}	[V] [V] [V] [V]

2-2-3. Pull-up / Pull-down Conditions

Pin Type	Min. [µA]	Typ. [µA]	Max. [µA]
Strong pull-up	-150	-40	-10
Strong pull-down	10	40	150
Weak pull-up	-5.00	-1.00	-0.33
Weak pull-down	0.33	1.00	5.00

Pin Type	Min. [kΩ]	Typ. [kΩ]	Max. [kΩ]
Strong pull-up	22	82.5	330
Strong pull-down	22	82.5	330
Weak pull-up	660	3,300	10,000
Weak pull-down	660	3,300	10,000

Note: V_{DD} voltage is typical 3.3 [V].

2-3. DC Characteristics

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwis specified. The limiting current of the power supply needs a steady design with the margin from the maximum of th current consumption.

2-3-1. IEEE Std 802.11b™ / 802.11g™ / 802.11n™

2-3-1-1. Receiver Current Consumptions

Data Rate	V_{CC}=3.3V [mA] *1)		
	Min.	Typ.	Max.
11 Mbps *2)	-	113	155
54 Mbps *2)	-	137	185
65 Mbps *2)	-	137	185

Note: This is applied at extreme conditions.

Note 1: Total current of WL_1V8_3V3, WL_3V3, WL_VIO_1 and WL_VIO_2.
Note 2: Input power level is typical -60dBm.

2-3-1-2. Transmitter Current Consumptions

Data Rate	V_{CC}=3.3V [mA] *1)		
	Min.	Typ.	Max.
11 Mbps *2)	-	239	325
54 Mbps *3)	-	227	310
39 Mbps *3)	-	227	310
65 Mbps *4)	-	221	300

Note: This is applied at extreme conditions.

Note 1: Total current of WL_1V8_3V3, WL_3V3, WL_VIO_1 and WL_VIO_2.
Note 2: Output power level is typical +15dBm.
Note 3: Output power level is typical +13dBm.
Note 4: Output power level is typical +11dBm.

3. RADIO CHARACTERISTICS

3-1. Common Physical Layer Characteristics

3-1-1. IEEE Std 802.11b™

Items	Conditions
Operating Frequency [MHz]	2412 ~ 2472 *1)
Operating channel spacing [MHz]	5
Number of channels	13 *1)
Modulation	DSSS *2)

Note 1: The frequency and number of channels follows the regulatory domain.
However, channel number 14 / 2484 [MHz] of Japan regulations is not supported.

Note 2: Data Rate, Modulation

Data Rate	Modulation
1 Mbps	BPSK
2 Mbps	QPSK
5.5 Mbps	CCK
11 Mbps	CCK

3-1-2. IEEE Std 802.11g™

Items	Conditions
Operating Frequency [MHz]	2412 ~ 2472 *1)
Operating channel spacing [MHz]	5
Number of channels	13 *1)
Modulation	OFDM *2)

Note 1: The frequency and number of channels follows the regulatory domain.

Note 2: Data Rate, Modulation, and Coding Rate

Data Rate	Modulation	Coding Rate
6 Mbps	BPSK	1/2
9 Mbps	BPSK	3/4
12 Mbps	QPSK	1/2
18 Mbps	QPSK	3/4
24 Mbps	16QAM	1/2
36 Mbps	16QAM	3/4
48 Mbps	64QAM	2/3
54 Mbps	64QAM	3/4

3-1-3. IEEE Std 802.11n™

Items	Conditions
Operating Frequency [MHz]	2412 ~ 2472 *1)
Operating channel spacing [MHz]	5
Number of channels	13 *1)
Modulation	OFDM *2)
Channel width [MHz]	20
Number of spatial streams	1
Number of BCC encoders for the data field	1
Guard interval (GI) [ns]	800 [Basic] 400 [Optional]

Note 1: The frequency and number of channels follows the regulatory domain.

Note 2: Data Rate, Modulation, and Coding Rate

MCS	Data Rate		Modulation	Coding Rate
	GI = 800 [ns]	GI = 400 [ns]		
0	6.5 Mbps	7.2 Mbps	BPSK	1/2
1	13.0 Mbps	14.4 Mbps	QPSK	1/2
2	19.5 Mbps	21.7 Mbps	QPSK	3/4
3	26.0 Mbps	28.9 Mbps	16QAM	1/2
4	39.0 Mbps	43.3 Mbps	16QAM	3/4
5	52.0 Mbps	57.8 Mbps	64QAM	2/3
6	58.5 Mbps	65.0 Mbps	64QAM	3/4
7	65.0 Mbps	72.2 Mbps	64QAM	5/6

3-2. Receiver Characteristics

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwise specified.

3-2-1. IEEE Std 802.11b™

Tested by UnifiTools (SPI).

3-2-1-1. Minimum Input Level Sensitivity

Data Rate	Min.	Typ.	Max.	Units
1 Mbps	-	-98	-80	dBm
2 Mbps	-	-95	-80	
5.5Mbps	-	-93	-76	
11Mbps	-	-90	-76	

Note: FER < 8% at PSDU length of 1024 bytes.

3-2-1-2. Maximum Input Level

Data Rate	Min.	Typ.	Max.	Units
11 Mbps	-10	-8 < *1)	-	dBm

Note: FER < 8% at PSDU length of 1024 bytes.

Note 1: Measuring limit value by limitation of performance of measuring instrument

3-2-1-3. Receiver Adjacent Channel Rejection

Data Rate	Min.	Typ.	Max.	Units
11 Mbps	35	47	-	dB

Note: FER < 8% at PSDU length of 1024 bytes.
Input a wanted signal at 6dB greater than minimum input level sensitivity specification.
Input the modulated interference signal to 25MHz that is adjacent to the wanted signal.

3-2-1-4. Out-of-band Spurious Emission

Data Rate	Frequency Range	Min.	Typ.	Max.	Units
11 Mbps	30 MHz ~ 1 GHz	-	-70 < *1)	-57	dBm/100kHz
	1 GHz ~ 2387 MHz	-	-70 < *1)	-47	
	2387 MHz ~ 2400 MHz	-	-70 < *1)	-47	
	2483.5 MHz ~ 2496.5 MHz	-	-70 < *1)	-47	
	2496.5 MHz ~ 12.5 GHz	-	-70 < *1)	-47	

Note 1: Measuring limit value by limitation of performance of measuring instrument.

3-2-2. IEEE Std 802.11g™

Tested by UnifiTools (SPI).

3-2-2-1. Minimum Input Level Sensitivity

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	-	-93	-82	dBm
9 Mbps	-	-92	-81	
12Mbps	-	-91	-79	
18Mbps	-	-88	-77	
24Mbps	-	-84	-74	
36Mbps	-	-82	-70	
48Mbps	-	-76	-66	
54Mbps	-	-74	-65	

Note: PER < 10% at PSDU length of 1000 bytes.

3-2-2-2. Maximum Input Level

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	-20	-8 < *1)	-	dBm
9 Mbps	-20	-8 < *1)	-	
12Mbps	-20	-8 < *1)	-	
18Mbps	-20	-8 < *1)	-	
24Mbps	-20	-8 < *1)	-	
36Mbps	-20	-9	-	
48Mbps	-20	-12	-	
54Mbps	-20	-14	-	

Note: PER < 10% at PSDU length of 1000 bytes.

Note 1: Measuring limit value by limitation of performance of measuring instrument

3-2-2-3. Receiver Adjacent Channel Rejection

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	16	27	-	dB
9 Mbps	15	24	-	
12Mbps	13	24	-	
18Mbps	11	22	-	
24Mbps	8	21	-	
36Mbps	4	16	-	
48Mbps	0	12	-	
54Mbps	-1	10	-	

Note: PER < 10% at PSDU length of 1000 bytes.
Input a wanted signal at 6dB greater than minimum input level sensitivity specification.
Input the modulated interference signal to 25MHz that is adjacent to the wanted signal.

3-2-3. IEEE Std 802.11n™

Tested by UnifiTools (SPI).

3-2-3-1. Minimum Input Level Sensitivity

MCS *1)	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	-	-94	-82	dBm
1	13.0 Mbps	-	-91	-79	
2	19.5 Mbps	-	-88	-77	
3	26.0 Mbps	-	-85	-74	
4	39.0 Mbps	-	-81	-70	
5	52.0 Mbps	-	-77	-66	
6	58.5 Mbps	-	-74	-65	
7	65.0 Mbps	-	-73	-64	

Note: PER < 10% at PSDU length of 4096 bytes with non-STBC.
Guard interval is 800 us.

3-2-3-2. Maximum Input Level

MCS *1)	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	-20	-8 < *2)	-	dBm
1	13.0 Mbps	-20	-8 < *2)	-	
2	19.5 Mbps	-20	-8 < *2)	-	
3	26.0 Mbps	-20	-8 < *2)	-	
4	39.0 Mbps	-20	-8 < *2)	-	
5	52.0 Mbps	-20	-10	-	
6	58.5 Mbps	-20	-13	-	
7	65.0 Mbps	-20	-15	-	

Note: PER < 10% at PSDU length of 4096 bytes.
Guard interval is 800 us.

Note 2: Measuring limit value by limitation of performance of measuring instrument

3-2-3-3. Receiver Adjacent Channel Rejection

MCS *1)	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	16	27	-	dB
1	13.0 Mbps	13	23	-	
2	19.5 Mbps	11	19	-	
3	26.0 Mbps	8	17	-	
4	39.0 Mbps	4	16	-	
5	52.0 Mbps	0	12	-	
6	58.5 Mbps	-1	10	-	
7	65.0 Mbps	-2	8	-	

Note: PER < 10% at PSDU length of 4096 bytes.
Guard interval is 800 us.
Input a wanted signal at 3dB greater than minimum input level sensitivity specification.
Input the modulated interference signal to ±25MHz that is adjacent to the wanted signal.

3-3. Transmitter Characteristics

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwise specified.

3-3-1. IEEE Std 802.11b™

Tested by UnifiTools (SPI).

3-3-1-1. Power Levels

Data Rate	Min.	Typ.	Max.	Units
1 Mbps	+11.0	+15.0	+17.0	dBm/22MHz
2 Mbps				
5.5Mbps				
11Mbps				

3-3-1-2. Center Frequency Tolerance

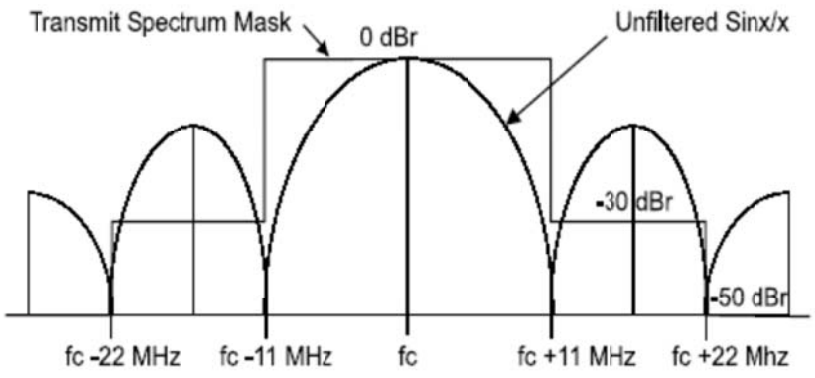
Data Rate	Min.	Typ.	Max.	Units
1 Mbps	-	±4	±25	ppm
2 Mbps				
5.5Mbps				
11Mbps				

3-3-1-3. Modulation Accuracy (EVM)

Data Rate	Min.	Typ.	Max.	Units
1 Mbps	-	2	35	%
2 Mbps	-	6	35	
5.5 Mbps	-	7	35	
11 Mbps	-	7	35	

3-3-1-4. Spectrum Mask

Spectrum Mask



3-3-1-5. Power-On and Power-Down Ramp

Data Rate	Items	Min.	Typ.	Max.	Units
1 Mbps	Ramp Down	-	0.1	2.0	µsec
2 Mbps					
5.5Mbps					
11Mbps					

Data Rate	Items	Min.	Typ.	Max.	Units
1 Mbps	Ramp Up	-	0.3	2.0	µsec
2 Mbps					
5.5Mbps					
11Mbps					

3-3-1-6. RF Carrier Suppression

Data Rate	Min.	Typ.	Max.	Units
1 Mbps	-	-30	-15	dBc
2 Mbps				
5.5Mbps				
11Mbps				

3-3-1-7. Out-of-band Spurious Emission

Data Rate	Frequency Range	Min.	Typ.	Max.	Units
11 Mbps	30 MHz ~ 1 GHz	-	-70 < *1)	-36	dBm/100kHz
	1 GHz ~ 2387 MHz 2 GHz < f_C - 843 MHz	-	-70 < *1) -49 -46	-30	
	2387 MHz ~ 2400 MHz	-	-37	-26	
	2483.5 MHz ~ 2496.5 MHz	-	-37	-26	
	2496.5 MHz ~ 12.5 GHz > 3 GHz f_C * 2 f_C * 3 f_C * 4 f_C * 5	-	-70 < *1) -44 -55 -70 < *1) -58 -70 < *1)	-30	
	1.8 GHz ~ 1.9 GHz	-	-70 < *1)	-47	
	5.15 GHz ~ 5.3 GHz	-	-70 < *1)	-47	

Note: Output power level is typical +15dBm.

Note 1: Measuring limit value by limitation of performance of measuring instrument.

3-3-2. IEEE Std 802.11g™

Tested by UnifiTools (SPI).

3-3-2-1. Power Levels

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	+9.0	+13.0	+15.0	dBm/20MHz
9 Mbps				
12Mbps				
18Mbps				
24Mbps				
36Mbps				
48Mbps				
54Mbps				

3-3-2-2. Center Frequency Tolerance

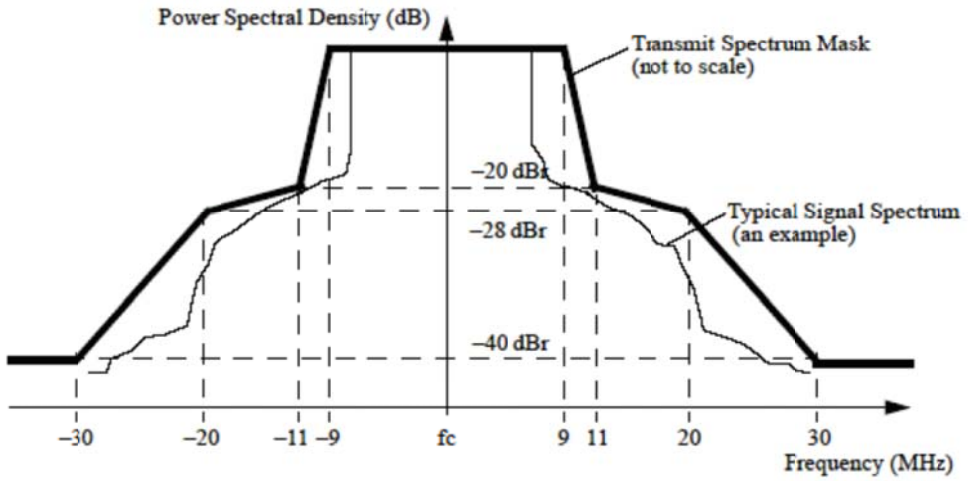
Data Rate	Min.	Typ.	Max.	Units
6 Mbps	-	±4	±25	ppm
9 Mbps				
12Mbps				
18Mbps				
24Mbps				
36Mbps				
48Mbps				
54Mbps				

3-3-2-3. Modulation Accuracy (EVM)

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	-	-33	-5	dB
9 Mbps	-	-33	-8	
12Mbps	-	-33	-10	
18Mbps	-	-33	-13	
24Mbps	-	-33	-16	
36Mbps	-	-33	-19	
48Mbps	-	-33	-22	
54Mbps	-	-33	-25	

3-3-2-4. Spectrum Mask

Spectrum Mask



3-3-2-5. Center Frequency Leakage

Data Rate	Min.	Typ.	Max.	Units
6 Mbps	-	-35	-15	dBc
9 Mbps				
12Mbps				
18Mbps				
24Mbps				
36Mbps				
48Mbps				
54Mbps				

3-3-3. IEEE Std 802.11n™

Tested by UnifiTools (SPI).

3-3-3-1. Power Levels

MCS	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	+9.0	+13.0	+15.0	dBm/20MHz
1	13.0 Mbps				
2	19.5 Mbps				
3	26.0 Mbps				
4	39.0 Mbps				
5	52.0 Mbps	+7.0	+11.0	+13.0	
6	58.5 Mbps				
7	65.0 Mbps				

Note: Guard interval is 800 us.

3-3-3-2. Center Frequency Tolerance

MCS	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	-	±4	±25	ppm
1	13.0 Mbps				
2	19.5 Mbps				
3	26.0 Mbps				
4	39.0 Mbps				
5	52.0 Mbps				
6	58.5 Mbps				
7	65.0 Mbps				

Note: Guard interval is 800 us.

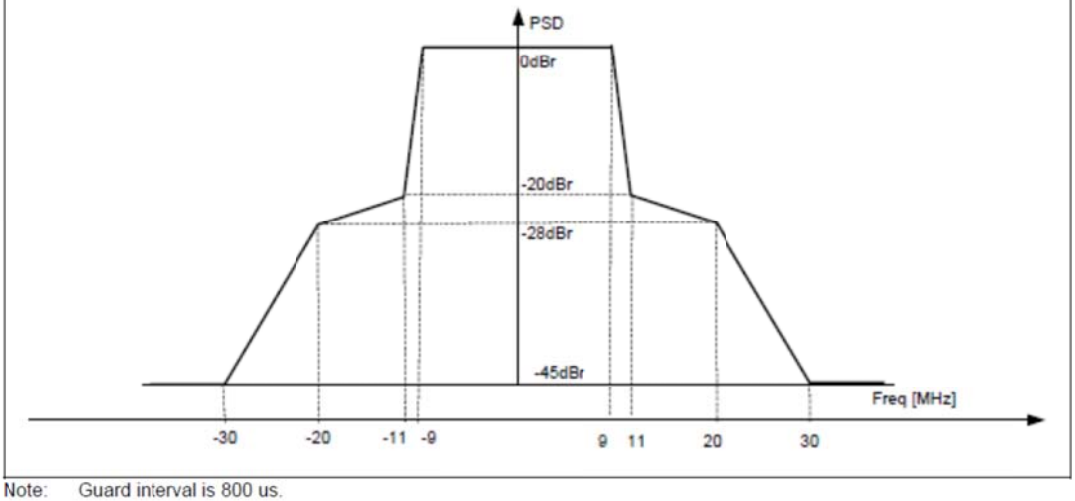
3-3-3-3. Modulation Accuracy (EVM)

MCS	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	-	-32	-5	dB
1	13.0 Mbps	-	-32	-10	
2	19.5 Mbps	-	-32	-13	
3	26.0 Mbps	-	-32	-16	
4	39.0 Mbps	-	-32	-19	
5	52.0 Mbps	-	-32	-22	
6	58.5 Mbps	-	-32	-25	
7	65.0 Mbps	-	-32	-28	

Note: Guard interval is 800 us.

3-3-3-4. Spectrum Mask

Spectrum Mask



Note: Guard interval is 800 us.

3-3-3-5. Center Frequency Leakage

MCS	Data Rate	Min.	Typ.	Max.	Units
0	6.5 Mbps	-	-35	-15	dBc
1	13.0 Mbps				
2	19.5 Mbps				
3	26.0 Mbps				
4	39.0 Mbps				
5	52.0 Mbps				
6	58.5 Mbps				
7	65.0 Mbps				

Note: Guard interval is 800 us.

4. RESET CONFIGURATION

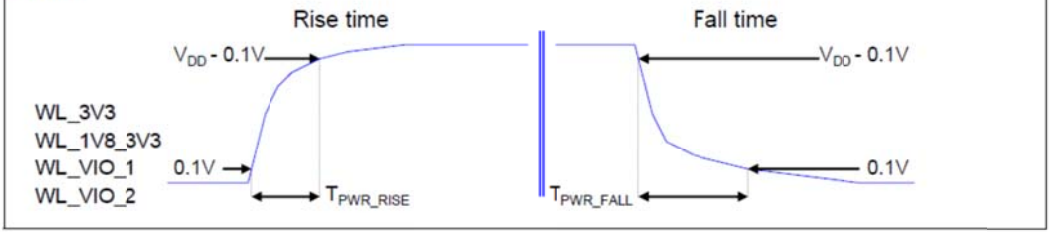
The product is reset to its default operating state under the following conditions:

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwise specified.

4-1. Rise Time and Fall Time

4-1-1. Power Supply

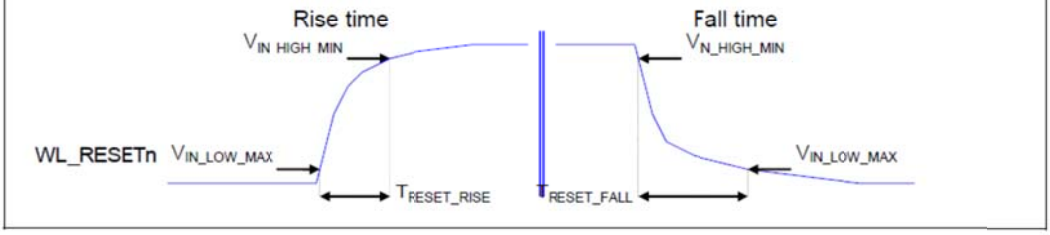
Timing



Symbol	Parameter	Min.	Typ.	Max.	Units
T_{PWR_RISE}	Rise time	-	-	1	ms
T_{PWR_FALL}	Fall time	0 ≤	-	-	ms

4-1-2. Reset Signal

Timing



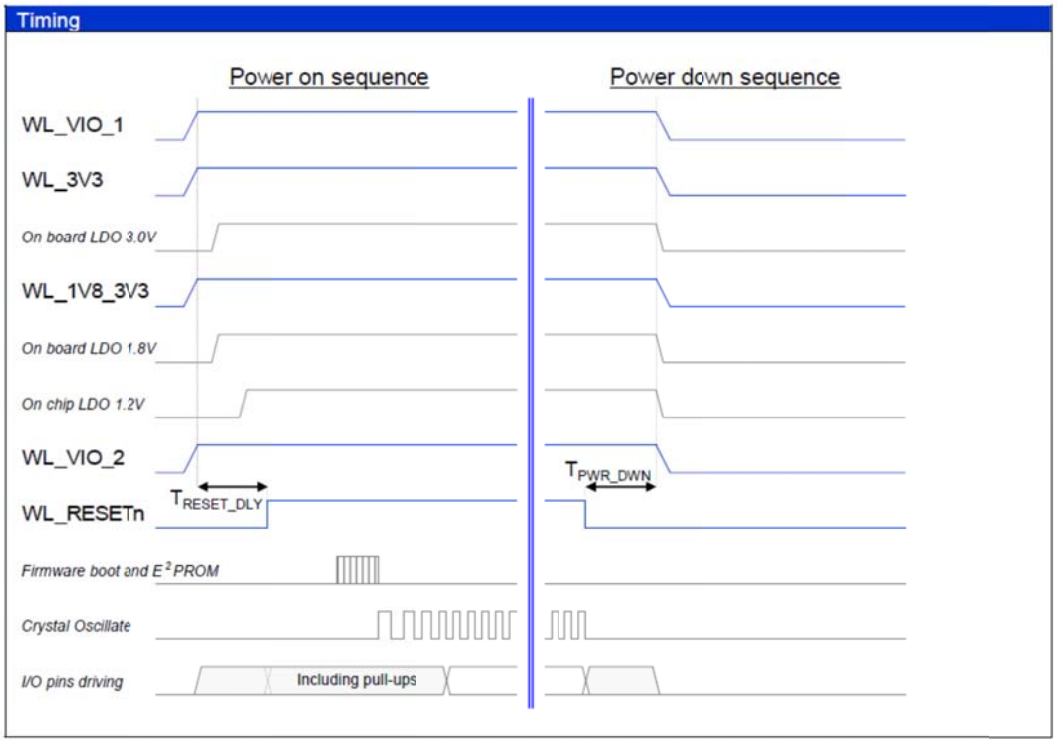
Symbol	Parameter	Min.	Typ.	Max.	Units
T_{RESET_RISE}	Rise time	-	-	1	ms
T_{RESET_FALL}	Fall time	0 ≤	-	-	ms

4-2. Sequence

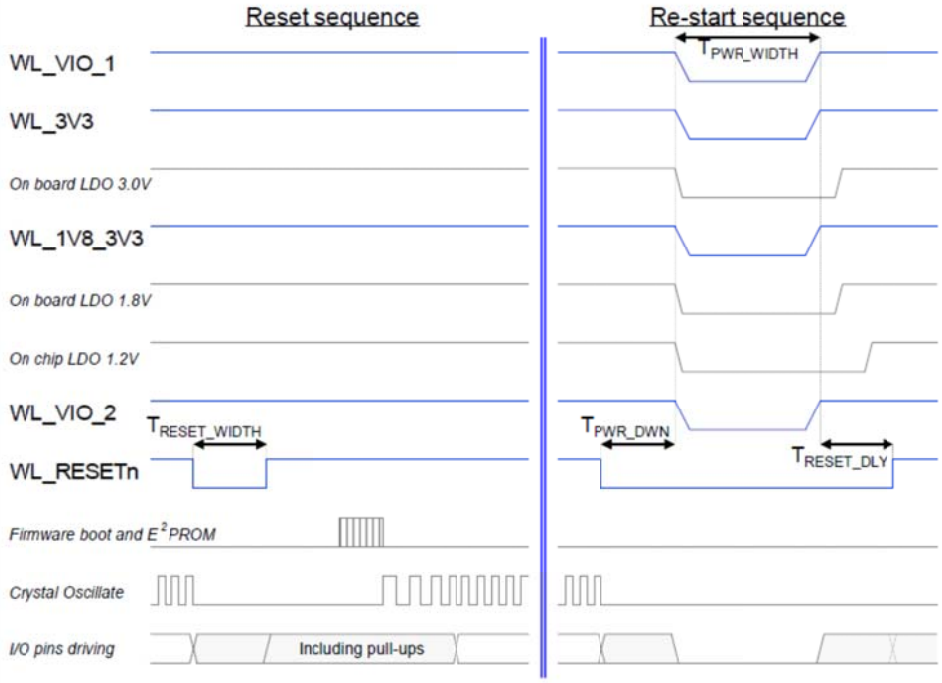
The recommends the following power sequences:

- Provide the power supply to power supply pins (VIO_1, VIO_2 and 3V3) before driving any I/O pins (including pull-ups).

After reset, the firmware is booted from on-chip ROM and downloads the MIB file from E^2PROM. MIB file include the MAC address, I/O interface settings and WLAN calibration data etc. After initializing, the device driver is possible to access from the Host Interface. The host may download a suitable firmware patch and additional MIB data.



Timing



Note: When the voltage drop is detected, this reset sequence is used.

Symbol	Parameter	Min.	Typ.	Max.	Units
T_{RESET_DLY}	Valid power to RESETn de-asserted	5	10	-	ms
T_{PWR_DWN}	RESETn assert to power off	0 ≤	-	-	ms
T_{RESET_WIDTH}	RESETn pulse width	5	50	-	ms
T_{PWR_WIDTH}	Power down width (less than 0.1V) *1)	-	-	-	ms
T_{READY} *2)	RESETn de-assert to SDIO active	-	-	100	ms

Note 1: Wait until the voltage of the power supply line falls enough.
Note 2: This is time to the state that NOP can be returned against CMD'5' after CMD'0' of SDIO.

5. HOST INTERFACE CHARACTERISTICS

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwise specified.

5-1. Host Interface

5-1-1. SDIO Interface

The Wi-Fi™ part implements a SDIO interface in accordance with the SD Physical Layer Specification version 1.10 and the SDIO Specification version 2.00. The three modes operate according to the SD Card specifications. All modes support the clock speeds of up to 50 [MHz]. The maximum burst rate is 200 [Mbps] in 4-bit mode. The host interface starts in SDIO 1-bit mode and may be switched into any of the alternative modes via SDIO commands.

- Two functions are supported.
  - Function 0 is the mandatory function used for card configuration. This includes the CCCR, FBR and CIS. Vendor-defined registers within the CCCR support sleep and wake-up signalling.
  - Function 1 provides access to the IEEE 802.11™ functionality. IO_RW_DIRECT (CMD52) reads and writes on-chip registers and memory locations directly. IO_RW_EXTENDED (CMD53) transfers blocks of data to or from the on-chip MMU buffers.
- The SDIO interface implements a subset of optional features.
  - Continuous SPI interrupt (SCSI)
  - Direct Commands during data transfer (SDC)
  - Multi-block (SMB)
  - Read wait (SRW)

5-1-1-1. Signal Description

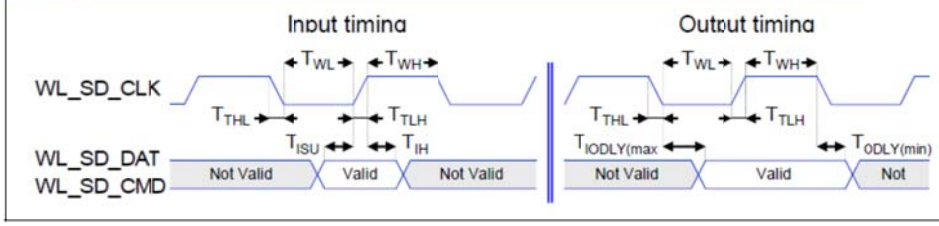
Pin No. / Pin Name	I/O	Description		Signal
19. WL_RESETn	I		Reset input (active low)	RSTn
20. WL_SD_IRQn *1)	O	[SDIO 4bit]	Interrupt output (active low)	IRQn
26. WL_SD_DAT[1]	B	[SDIO 4bit]	Data line bit[1] / Interrupt (optional)	DAT[1]
		[SDIO 1bit]	Interrupt output (active low)	IRQn
27. WL_SD_DAT[0]	B	[SDIO 4bit]	Data line bit[0]	DAT[0]
		[SDIO 1bit]	Data line	DATA
28. WL_SD_CMD	B	[SDIO 4bit]	Command line	CMD
		[SDIO 1bit]	Command line	CMD
29. WL_SD_CLK	I	[SDIO 4bit]	Clock input	CLK
		[SDIO 1bit]	Clock input	CLK
30. WL_SD_DAT[3]	B	[SDIO 4bit]	Data line bit[3]	DAT[3]
		[SDIO 1bit]	-	-
31. WL_SD_DAT[2]	B	[SDIO 4bit]	Data line bit[2] / Read wait (optional)	DAT[2]
		[SDIO 1bit]	Read wait	RW

Note: I/O status : I = input / O = output / B = bi-directional / P = power supply.

Note 1: The WL_SD_IRQn setting stored in on-board E^2PROM is ENABLE. If WL_SD_IRQn is not used, after the firmware is loaded within Wi-Fi™, the modification (to DISENABLE) of RAM from Wi-Fi™ Host Interface is possible by using the MIB file.

5-1-1-2. Timing of Default Speed Mode [Max.25MHz]

Timing

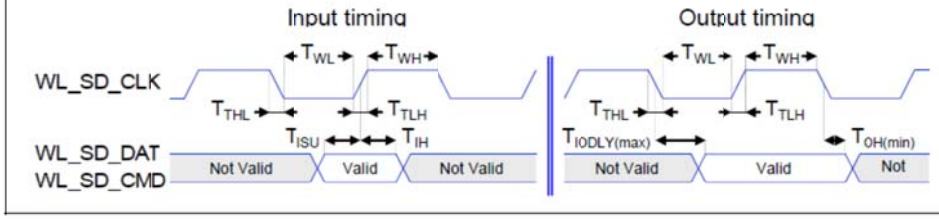


Symbol	Parameter	Min.	Typ.	Max.	Units
f_{PP}	Clock frequency of data transfer mode	0<	-	25	MHz
f_{OD}	Clock frequency identification mode	0 *1) / 100	-	400	kHz
T_{WL}	Clock low time	10	-	-	ns
T_{WH}	Clock high time	10	-	-	ns
T_{TLH}	Clock rise time	-	-	10	ns
T_{THL}	Clock fall time	-	-	10	ns
T_{ISU}	Input setup time	5	-	-	ns
T_{IH}	Input hold time	5	-	-	ns
T_{ODLY}	Output delay time during data transfer mode	0<	-	14	ns

Note 1: 0[Hz] means to stop the clock.

5-1-1-3. Timing of High Speed Mode [Max.50MHz]

Timing



Symbol	Parameter	Min.	Typ.	Max.	Units
f_{PP}	Clock frequency of data transfer mode	0<	-	50	MHz
T_{WL}	Clock low time	7	-	-	ns
T_{WH}	Clock high time	7	-	-	ns
T_{TLH}	Clock rise time	-	-	3	ns
T_{THL}	Clock fall time	-	-	3	ns
T_{ISU}	Input setup time	6	-	-	ns
T_{IH}	Input hold time	2	-	-	ns
T_{OH}	Output hold time	2.5	-	-	ns
T_{ODLY}	Output delay time during data transfer mode	0<	-	14	ns

5-1-1-4. CCCR Values

The static information available via the CCCR.

Address	Bits	Field Name	Value	Comments
0x00	[3:0]	CCRx: CCCR Format version number	0x2 *1)	CCCR/FBR Version 1.20
	[7:4]	SDIOx: SDIO Specification revision number	0x3 *1)	SDIO Specification Version 2.00
0x01	[3:0]	SDx: SD Format Version number	0x1	SD Physical Specification 1.10
0x07	[6]	SCSI: Support continuous SPI interrupt supported	0x1	Continuous SPI interrupt is supported
0x08	[0]	SDC: Card supports direct commands during data transfer	0x1	IO_RW_DIRECT (CMD52) can be executed (in SD bus modes) while data transfer is in progress
	[1]	SMB: Card supports multi block	0x1	IO_RW_EXTENDED (CMD53) can be executed in block mode
	[2]	SRW: Card supports read wait	0x1	Wait signal is supported (in SD bus mdoes) on SDIO_DAT[2]
	[3]	SBS: Card supports suspend / resume	0x0	Operations can not be suspended
	[4]	S4MI: Supports interrupt between blocks of data in 4-bit SD mode	0x0	Interrupts can not be generated during a 4-bit multi-block data transfer
	[6]	LSC: Card is a low-speed card	0x0	Full-speed card
	[7]	4BLS: 4-bit support for lowspeed cards	0x0	Full-speed card
0x09 ~ 0x0b	[23:0]	Pointer to card's common CIS	0x001000	Pointer to the start of the card's common card information structure
0x12	[0]	SMPC: Support master power control	0x1	The total card current may exceed 200 [mA] (EMPC, SPS and EPS are available)
0x13	[0]	SHS: Support high-speed	0x1 *1)	The card supports high-speed mode (enabled by the host via the EHS bit)

Note 1: These are defaults that can be modified by software (if supported by the firmware version being used).

5-1-1-5. FBR Values for Function 1

The read-only values advertised in the FBR for function 1. These values cannot be modified by software.

Address	Bits	Field Name	Value	Comments
0x100	[3:0]	Standard SDIO Function interface code	0x0	No SDIO standard interface supported by this function (there is no defined interface for IEEE 802.11™)
	[6]	Supports CSA	0x0	No Code Storage Area
0x101	[7:0]	Extended Standard SDIO Function interface	0x00	No SDIO standard interface supported by this function
0x102	[0]	SPS	0x1	This function has two power modes which are selected by EPS
0x109 ~ 0x10b	[23:0]	Pointer to standard Function 1 CIS	0x002000	Pointer to the start of the CIS for this function

5-1-1-6. CIS Values for Function 0

The CIS tuples presented for functions 0 and 1 respectively.

Address	Bits	Field Name	Value	Comments
0x00	-	TPL_CODE	0x21	CISTPL_FUNCID: Function identification tuple
0x01	-	TPL_LINK	0x02	Link to next tuple
0x02	-	TPLFID_FUNCTION	0x0c	Card function code
0x03	-	TPLFID_SYSINIT	0x00	System initialisation bit mask (not used)
0x04	-	TPL_CODE	0x22	CISTPL_FUNCE: Function extension tuple
0x05	-	TPL_LINK	0x05	Link to next tuple
0x06	-	TPLFE_TYPE	0x00	Type of extended data = Function 0
0x07 ~ 0x08	-	TPLFE_FN0_BLK_SIZE	0x0200	Maximum block size and byte count = 512
0x09	-	TPLFE_MAX_TRAN_SPEED	0x5a *1)	Maximum transfer rate per data line during transfer = 50 [Mbps]
0x0a	-	TPL_CODE	0x20	CISTPL_MANFID: Manufacturer identification string tuple
0x0b	-	TPL_LINK	0x04	Link to next tuple
0x0c ~ 0x0d	-	TPLMID_MANF_CODE	0x032a *1)	Card manufacturer code = CSR
0x0e ~ 0x0f	-	TPLMID_CARD	0x0007 *1)	Manufacturer information = Unifi CSR60xx QFN Automotive
0x10	-	TPL_CODE	0xff	CISTPL_END: End-of-chain tuple

Note 1: These are defaults that can be modified by software (if supported by the firmware version being used).

5-1-1-7. CIS Values for Function 1

Address	Bits	Field Name	Value	Comments
0x00	-	TPL_CODE	0x21	CISTPL_FUNCID: Function identification tuple
0x01	-	TPL_LINK	0x02	Link to next tuple
0x02	-	TPLFID_FUNCTION	0x0c	Card function code
0x03	-	TPLFID_SYSINIT	0x00	System initialisation bit mask (not used)
0x04	-	TPL_CODE	0x22	CISTPL_FUNCE: Function extension tuple
0x05	-	TPL_LINK	0x05	Link to next tuple
0x06	-	TPLFE_TYPE	0x00	Type of extended data = Function 1 to 7
0x07	-	TPLFE_FUNCTION_INFO	0x01 *1)	FNWUS: Wake up support = 1 (card can wake host with SDIO clock stopped)
0x08	-	TPLFE_STD_IO_REV	0x00	No SDIO standard function supported
0x09 ~ 0x0c	-	TPLFE_CARD_PSN	0x00000000 *1)	Product serial number
0x0d ~ 0x10	-	TPLFE_CSA_SIZE	0x00000000	No code storage area

Address	Bits	Field Name	Value	Comments
0x11	-	TPLFE_CSA_PROPERTY	0x00	No code storage area
0x12 ~ 0x13	-	TPLFE_MAX_BLOCK_SIZE	0x0200	Maximum block size and byte count = 512
0x14 ~ 0x17	-	TPLFE_OCR	0x00ff8000 *1)	2.7 ~ 3.6 [V] operation supported (CSR60xx QFN Automotive can operate at lower voltages, but external RF components typically require supplies within this range)
0x18	-	TPLFE_OP_MIN_PWR	0x14 *1) *2)	Minimum current when operating = 20 [mA]
0x19	-	TPLFE_OP_AVG_PWR	0x32 *1) *2)	Average current when operating = 50 [mA]
0x1a	-	TPLFE_OP_MAX_PWR	0xc8 *1) *2)	Maximum current when operating = 500 [mA]
0x1b	-	TPLFE_SB_MIN_PWR	0x05 *1) *2)	Minimum current in standby = 5 [mA]
0x1c	-	TPLFE_SB_AVG_PWR	0x07 *1) *2)	Average current in standby = 7 [mA]
0x1d	-	TPLFE_SB_MAX_PWR	0x0a *1) *2)	Maximum current in standby = 10 [mA]
0x1e ~ 0x1f	-	TPLFE_MIN_BW	0x0bb8 *1)	Minimum data transfer bandwidth = 3000 [k Byte/s] (24 [Mbps])
0x20 ~ 0x21	-	TPLFE_OPT_BW	0x1b58 *1)	Optimum data transfer bandwidth = 7000 [k Byte/s] (56 [Mbps])
0x22 ~ 0x23	-	TPLFE_ENABLE_TIMEOUT_VAL	0x001f4	Function's time-out after being enabled = 5 [s]
0x24 ~ 0x25	-	TPLFE_SP_AVG_PWR_3.3V	0x0032 *1) *2)	Average current when operating = 50 [mA] (duplicate of TPLFE_OP_AVG_PWR)
0x26 ~ 0x27	-	TPLFE_SP_MAX_PWR_3.3V	0x00c8 *1) *2)	Maximum current when operating = 200 [mA] (duplicate of TPLFE_OP_MAX_PWR)
0x28 ~ 0x29	-	TPLFE_HP_AVG_PWR_3.3V	0x00c8 *1) *2)	Average current when operating in higher current mode = 200 [mA]
0x2a ~ 0x2b	-	TPLFE_HP_MAX_PWR_3.3V	0x015e *1) *2)	Maximum current when operating in higher current mode = 350 [mA]
0x2c ~ 0x2d	-	TPLFE_LP_AVG_PWR_3.3V	0x0078 *1) *2)	Average current when operating in lower current mode = 120 [mA]
0x2e ~ 0x2f	-	TPLFE_LP_MAX_PWR_3.3V	0x00c8 *1) *2)	Maximum current when operating in lower current mode = 200 [mA]
0x30	-	TPL_CODE	0xff	CISTPL_END: End-of-chain tuple

Note 1: These are defaults that can be modified by software (if supported by the firmware version being used).

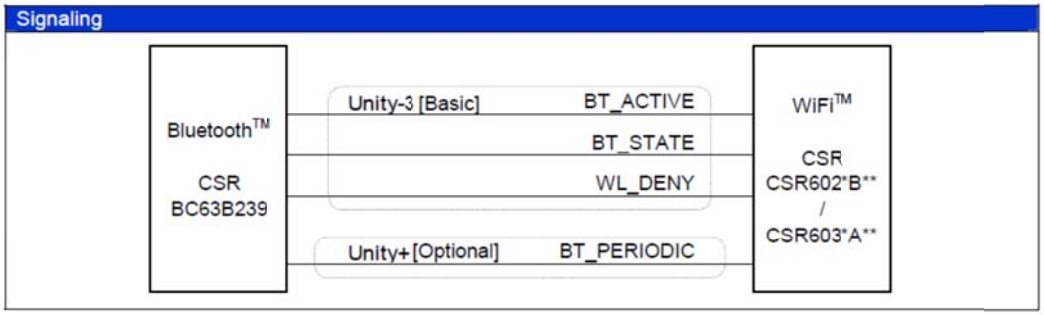
Note 2: Current consumption figures (within CISTPL_FUNCE for function 1) are conservative values that incorporate estimates for the external circuitry that would be required for a stand-alone SDIO card; they may be overridden by more accurate figures once the performance of a particular design has been established.

6. CO-EXISTENCE INTERFACE CHARACTERISTICS

The following specifications are guaranteed for nominal supply voltage and nominal temperature, unless otherwise specified.

6-1. Wi-Fi™ and Bluetooth™ Co-existence Interface

Collocated Wi-Fi™ and Bluetooth™ radios usually suffer from performance degradation caused by mutual interference. To mitigate these effects the co-existence interface incorporates comprehensive support for coexistence with collocated Wi-Fi™ and Bluetooth™ radios.



6-1-1. Unity-3 Interface [Basic]

The Unity-3 signaling schemes use three or four wires respectively. The Bluetooth™ issues requests to perform a transaction and then receives a response from the Wi-Fi™ indicating whether the activity is allowed or denied. Details of the transaction are also used internally within the Wi-Fi™ to arbitrate IEEE 802.11™ activity.

6-1-1-1. Signal Description

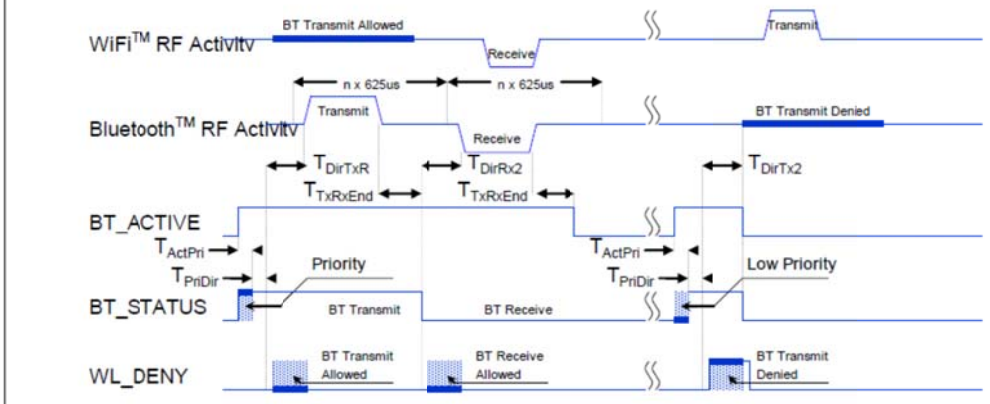
Pin Name	I/O	Description		Signal
35. COEX_WL_DENY	O	[Co-ex]	The Bluetooth™ within Wi-Fi™ drives this signal in response to a transaction being indicated via the other signals. It is asserted to prevent the Bluetooth™ from initiating a transmission. It may also optionally be used to abort a Bluetooth™ transmission that is already in progress if supported by the Bluetooth™.	WL_DENY
36. COEX_BT_ACTIVE	I	[Co-ex]	This signal is asserted by the Bluetooth™ for the duration of a transaction. The rising edge of this signal provides the timing reference from which Bluetooth™ slots and all subsequent timings are derived.	BT_ACTIVE
37. COEX_BT_STATUS	I	[Co-ex]	For a short period following the rising edge of BT_ACTIVE the Bluetooth™ either asserts this signal to indicate a high-priority transaction or keeps it de-asserted for a low-priority transaction. Thereafter this signal is asserted if the next slot will be used for a transmission or de-asserted for a reception. The end of the first activity is indicated by this signal toggling, with the second activity assumed to start a fixed interval afterwards (or optionally for the case of receiving after transmitting at the next slot boundary).	BT_STATUS

Note: I/O status : I = input / O = output / B = bi-directional / P = power supply.

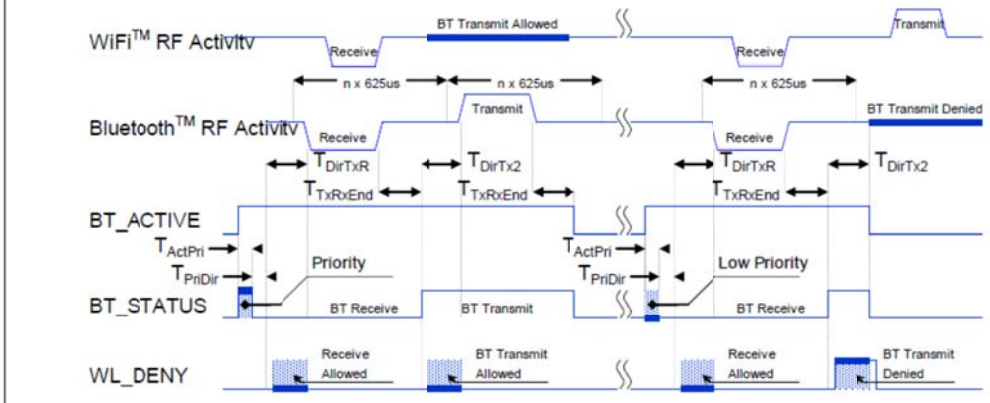
6-1-1-2. Typical Timing

Each figure shows an allowed transaction followed by a transaction that has its transmission denied.

Bluetooth™ Master Mode



Bluetooth™ Slave Mode



Symbol	Parameter	Min.	Max.	Units
T_{ActPri}	Delay time between the rising edge of BT_ACTIVE and BT_STATUS being sampled to read the priority.	1	15	us
T_{PriDir}	Delay from BT_STATUS being sampled for the priority until it is sampled to read the direction.	1	15	us
$T_{DirTxRx}$	Time from BT_STATUS being sampled for the direction (and BT_INBAND being sampled for the overlap status) until the start of the first transmit or receive in the transaction.	1	255	us
T_{DirTx2}	Time from the rising edge of BT_STATUS until the start of transmit following receive within the same transaction.	1	255	us
T_{DirRx2}	Time from the falling edge of BT_STATUS until the start of receive following transmit within the same transaction.	1	- *1)	us
$T_{TxRxEnd}$	Time from end of transmit or receive until either the edge on BT_STATUS indicating a change of direction or a falling edge on BT_ACTIVE signaling the end of the transaction.	0 *2)	-	us

Note 1: The Wi-Fi™ can treat a reception following a transmission as starting either at a fixed offset from the falling edge of BT_STATUS or at the next slot boundary. In the former case the value of T_{DirTx2} is used for the offset.

Note 2: The Bluetooth™ should not change the BT_STATUS signals to indicate the use of the next slot until after transmission or reception has completed for the current slot.

6-1-2. Unity+ Interface [Optional]

This Wi-Fi™ supports Unity+ coexistence in conjunction with Bluetooth™ (orly BlueCore™). This uses an extra signal to support scheduling of IEEE 802.11™ traffic around periodic Bluetooth™ activity.

6-1-2-1. Signal Description

Pin Name	I/O	Description		Signal
40. COEX_BT_PERIODIC	O	[Co-ex]	The Bluetooth™ drives this signal to indicate the timing and optionally the duration of periodic transmit and receive activity. It is preferably asserted at the start of transmit or receive activity for SCO reserved slots and de-asserted at the end of the transmit or receive activity for those slots. However, the only essential requirement is that one edge of this signal has a fixed offset with respect to the periodic activity	BT_PERIODIC

Note: I/O status : I = input / O = output / B = bi-directional / P = power supply.

IEEE 802.11™ power-save protocol mechanisms are utilised to synchronise downlink traffic from an access point to fit in the gap between Bluetooth™ activities.

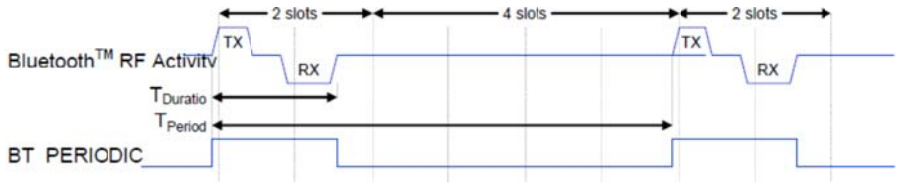
6-1-2-2. Typical Timing

The preferred mode of operation for Bluetooth™ HV3 SCO, with the BT_PERIODIC signal accurately indicating the timing and duration of Bluetooth™ transmit and receive activity.

An alternative implementation that utilises Wi-Fi™ configurable offsets.

In this particular example the falling edge of a pulse occurring after the slave's HV3 packet is used with a negative offset to indicate the timing of the start of the reserved slot pair.

Preferred Master Mode



Alternative Master Mode

Symbol	Parameter	Min.	Max.	Units
$T_{Duration}$	The duration of each burst of Bluetooth™ activity.	0	65535	us
T_{Period}	The repeat period of the Bluetooth™ activity.	0	16777215	us
T_{Offset}	Time from an edge (confgurable positive or negative) on BT_PERIODIC to the start of the Bluetooth™ activity.	-65536	65535	us

Note: The typical $T_{Duration}$ quoted assumes a 40us gain ramp prior to transmission, use of HV3 SCO packets, and 10us for possible errors in the measurement of the BT_PERIODIC signal.

Alternative Master Mode

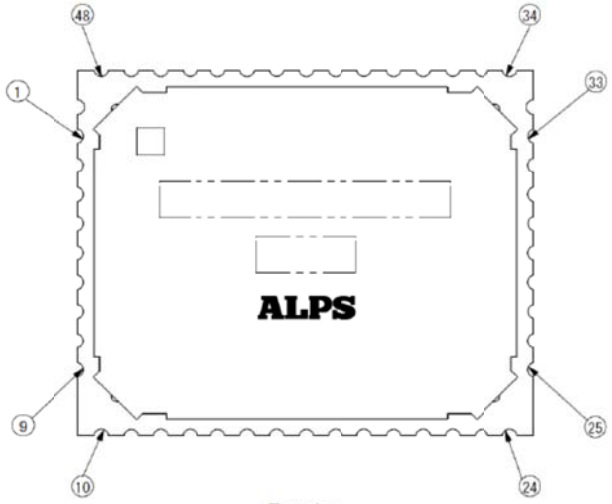
Symbol	Parameter	Min.	Max.	Units
$T_{Duration}$	The duration of each burst of Bluetooth™ activity.	0	65535	us
T_{Period}	The repeat period of the Bluetooth™ activity.	0	16777215	us
T_{Offset}	Time from an edge (confgurable positive or negative) on BT_PERIODIC to the start of the Bluetooth™ activity.	-65536	65535	us

Note: The typical $T_{Duration}$ quoted assumes a 40us gain ramp prior to transmission, use of HV3 SCO packets, and 10us for possible errors in the measurement of the BT_PERIODIC signal.

7. PIN CHARACTERISTICS

7-1. Pin Layout

Pin Number



Top view

7-2. Pin Assignment

Pin No.	Pin Name	I/O	Description
1	NC	-	Non-connection terminal
2	NC	-	Non-connection terminal
3	NC	-	Non-connection terminal
4	NC	-	Non-connection terminal
5	NC	-	Non-connection terminal
6	NC	-	Non-connection terminal
7	NC	-	Non-connection terminal
8	NC	-	Non-connection terminal
9	GND	-	Ground
10	GND	-	Ground
11	GND	-	Ground
12	NC	-	Non-connection terminal
13	GND	-	Ground
14	NC	-	Non-connection terminal
15	NC	-	Non-connection terminal
16	NC	-	Non-connection terminal
17	GND	-	Ground
18	NC	-	Non-connection terminal
19	WL_RESETn	I	Reset input (active low)

Pin No.	Pin Name	I/O	Description	
20	NC / WL_SD_IRQn *2)	- / O	[SDIO 4bit]	Non-connection terminal Host wake-up / Interrupt request output (active low)
21	GND	-		Ground
22	ANT[1]	B		Antenna port 1 for Wi-Fi™
23	GND	-		Ground
24	NC / WL_I²C_WP *4)	- / I	[Opton]	Non-connection terminal (protection assert) Enable for WP of E²PROM (active high)
25	GND	-		Ground
26	WL_SD_DAT[1]	B	[SDIO 4bit] [SDIO 1bit]	Data line bit[1] / Interrupt (optional) Interrupt (active low)
27	WL_SD_DAT[0]	B	[SDIO 4bit] [SDIO 1bit]	Data line bit[0] Data line
28	WL_SD_CMD	B	[SDIO 4bit] [SDIO 1bit]	Command / Response Command line
29	WL_SD_CLK	I	[SDIO 4bit] [SDIO 1bit]	Clock input Clock input
30	WL_SD_DAT[3]	B	[SDIO 4bit] [SDIO 1bit]	Data line bit[3] Reserved
31	WL_SD_DAT[2]	B	[SDIO 4bit] [SDIO 1bit]	Data line bit[2] / Read wait (optional) Read wait (optional)
32	WL_VIO_1 *1)	P	[VCC]	Power supply for Wi-Fi™ I/O controller
33	WL_3V3 *1)	P	[VCC]	Power supply for Wi-Fi™ front-end block Power supply for internal LDO regulator Power supply for Wi-Fi™ I/O controller
34	GND	-		Ground
35	NC / COEX_WL_DENY	- / O	[Co-ex]	Non-connection terminal The Wi-Fi™ this signal in response to a transaction being indicated via the other signals.
36	NC / COEX_BT_ACTIVE]	- / I	[Co-ex]	Non-connection terminal Asserted by the Bluetooth™ for the duration of a transaction.
37	NC / COEX_BT_STATUS	- / I	[Co-ex]	Non-connection terminal For a short period following the rising edge of BT_ACTIVE the Bluetooth™ either asserts to indicate a high-priority transaction or keeps it de-asserted for a low-priority transaction.
38	WL_1V8_3V3 *1)	P	[VCC]	Power supply for internal LDO regulator Power supply for Wi-Fi™ device.
39	WL_VIO_2 *1)	P	[VCC]	Power supply for Wi-Fi™ I/O controller
40	NC / COEX_BT_PERIODIC	- / I	[Co-ex]	Non-connection terminal The Bluetooth™ drives to indicate the timing and optionally the duration of periodic transmit and receive activity.
41	NC / WL_SLEEP_CLK *3)	- / I	[Opton]	Non-connection terminal Dedicated 32kHz external reference clock input.
42	NC	-		Non-connection terminal
43	NC	-		Non-connection terminal
44	NC	-		Non-connection terminal
45	NC	-		Non-connection terminal
46	NC	-		Non-connection terminal
47	NC	-		Non-connection terminal
48	GND	-		Ground

Note: I/O status : I = input / O = output / B = bi-directional / P = power supply.
As for the un-used signal pin, it processes as well as NC (non-connection).

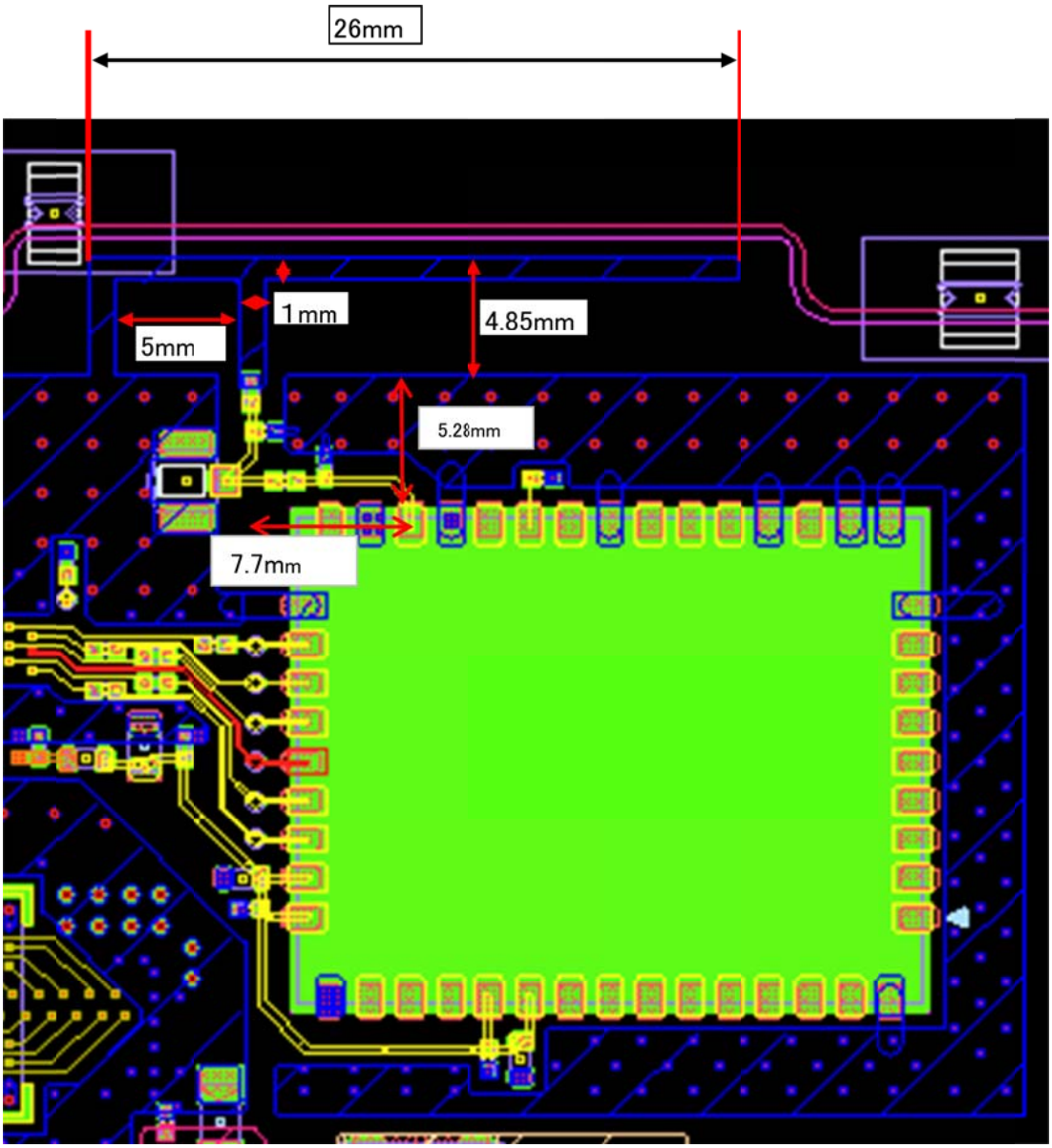
Note 1: In order to stabilize module performances, the below de-coupling capacitors would be required on application platform. 4.7μF ~ 10μF Capacitor and 100pF ~ 0.1μ F Capacitor.

Note 2: The default value of stored MIB data in E²PROM is set to "use" the WL_SD_IRQn. If this pin is not used then it needs to modify the MIB data of RAM from the host application at each power-on or Wi-Fi™ reset.

Note 3: The default value of stored MIB data in E²PROM is set to "not use" the WL_SLEEP_CLK. If this pin is used then it needs to modify the MIB data of RAM from the host application at each power-on or Wi-Fi™ reset.

Note 4: The WL_I²C_WP does not need to control from the external (NC is recommended).

Reference trace



FCC ID: A269ZUA143

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. The user is cautioned that unauthorized changes or modifications not approved could void the user's authority to operate the equipment.

IC ID: 700B-UA143

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 present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

The following label must be displayed on the outside of the device in which this module is installed:

“Contains FCC ID: A269ZUA143”

“Contains IC: 700B-UA143”

「This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated at least 20 cm from the user.

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) de l’IC. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le dispositif rayonnant et le corps.」

Note:This device will be limited to be installed to car audio device