WiFi + BT/BLE combo module Type1DX (CYW4343W)

Application note

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Revision history

Rev No.	Date	Note	
1.0	2015/07/21	First Issue	
2.0	2015/08/06	Header/Footer	Revised the description
3.0	2017/01/10	P6:Reference BOM	Revised Inductor P/N(4)
4.0	2018/01/04	Changed IC PN from BCM4343W to CYW4343W	
5.0	2019/04/05	P6.Reference BOM : Revised Inductor P/N(4) LQM18PN2R2MGH L->LQM18PN2R2MGH	

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1.0 Type1DX Introduction

Type1DX (1x1) is WiFI+BT/BLE combo SIP module with Broadcom CYW4343W, which is Single-Chip 2.4GHz WLAN IEEE 802.11 b/g/n MAC/Baseband/Radio, Bluetooth 4.1 support chip. (See CYW4343W datasheet).
There are LPF and matching circuit in front of CYW4343W chipset. Ant port is tuned as 50 ohm output. Fast clock (X'tal) is also embedded. Some external components will be required to complete WiFi/BT/BLE circuit. This module is covered with resin molding and fully shielded with metal. The package type is LGA (SMD type).

2.0 Module block diagram

Figure-1 shows module internal block diagram.

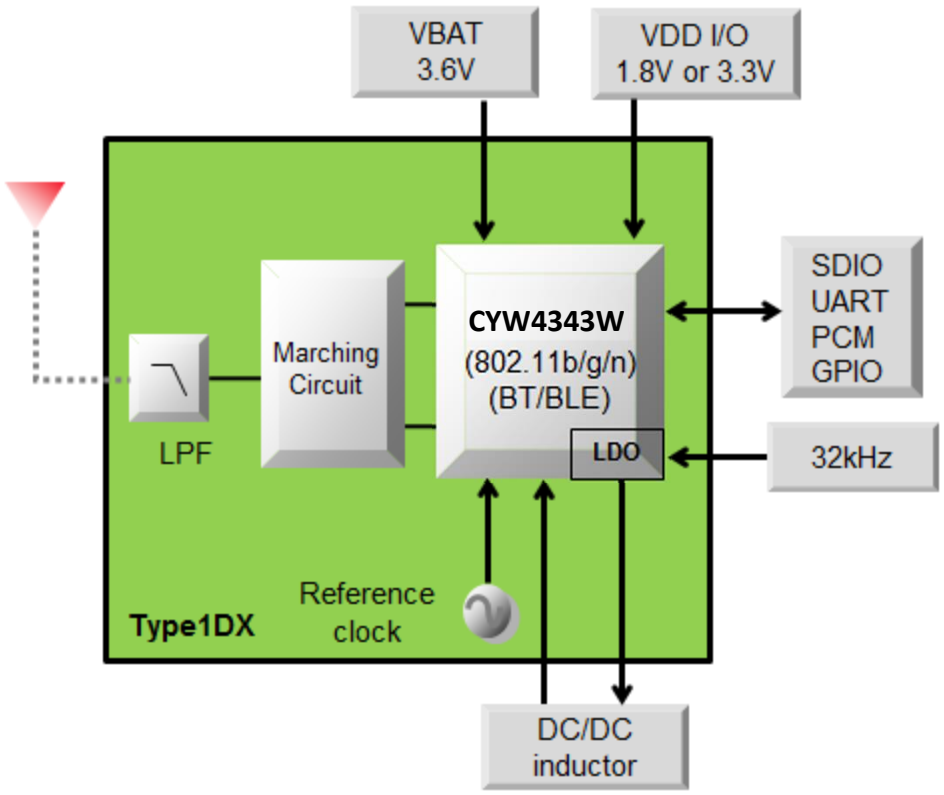

Figure-1, Block diagram

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3.0 Reference Circuit

Figure-2 shows the reference circuit of Type1DX module.

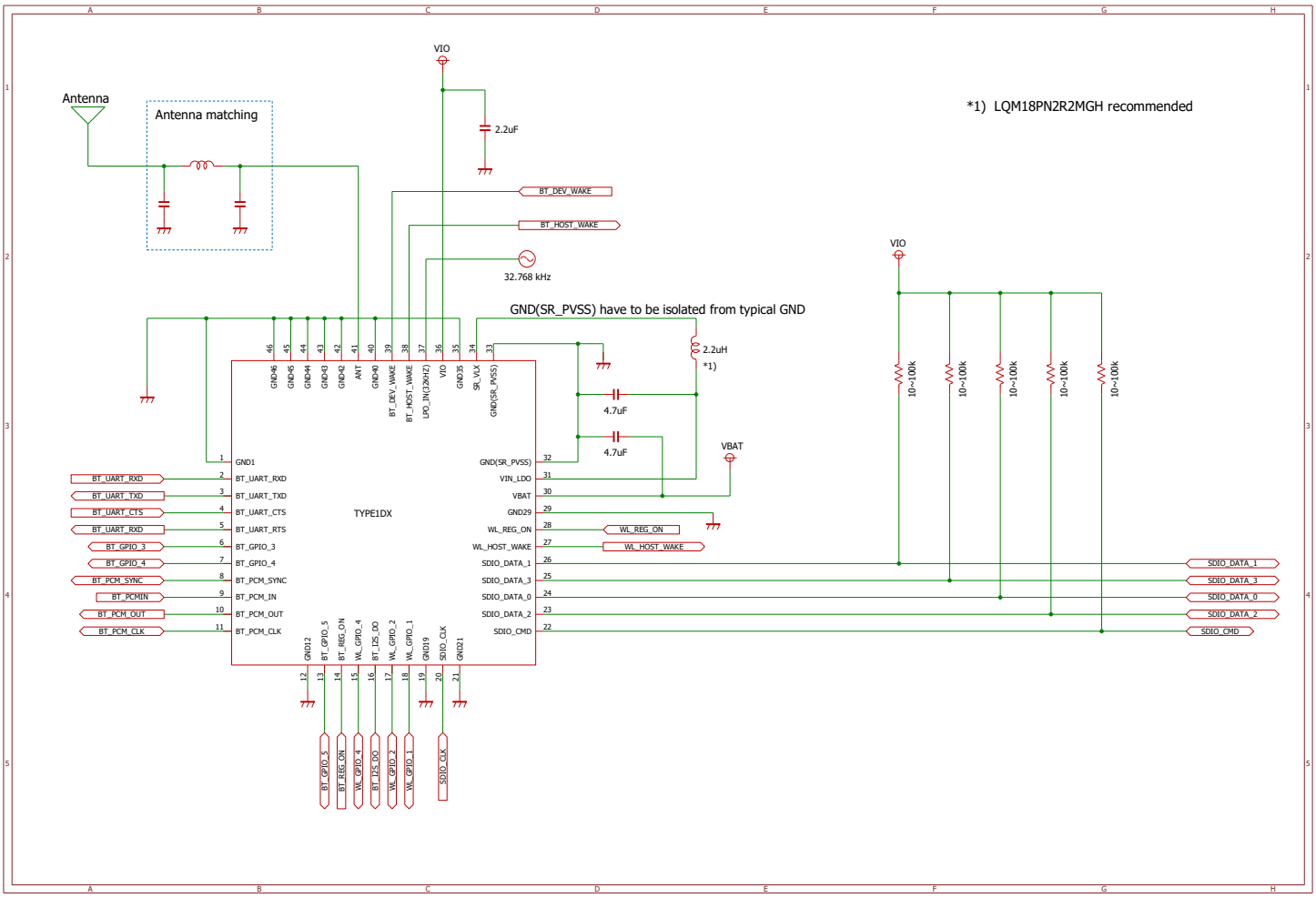

Figure-2, Reference circuit

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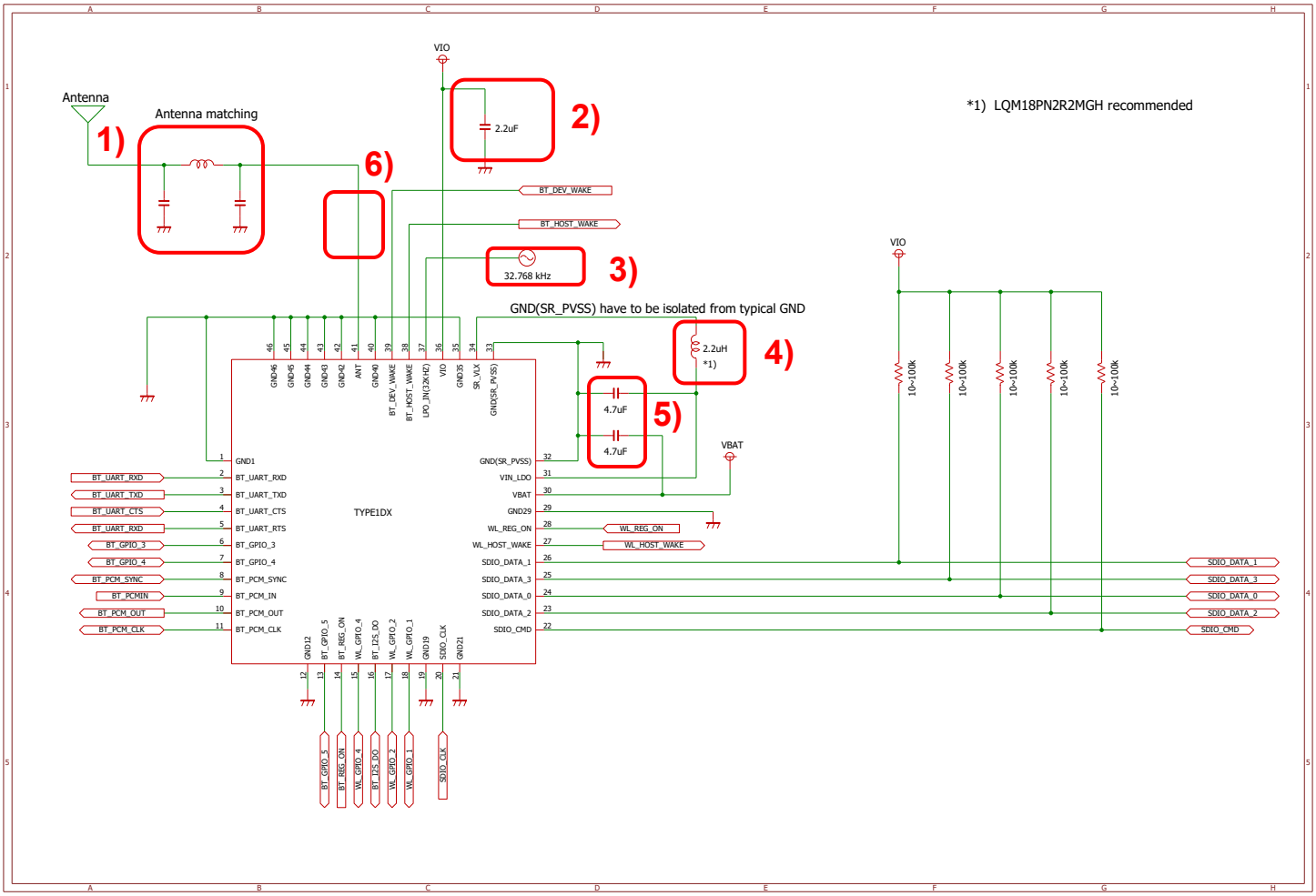
4.0 External BOM list (Reference)

Table-1 shows the list of external component.

Table-1, External BOM list (Reference)

Block	Components	Value	pcs	Note
1)	L or C	TBD	3	Depend on PCB structure / design (for Antenna matching)
2)	C	2.2 uF	1	-
3)	LPO	32.768kHz	1	Pls see the required spec on the module datasheet
4)	L	2.2uH	1	LQM18PN2R2MGH recommended. (1.05 A, DCR=0.25 ohm)
5)	C	4.7uF	2	4.7uF
6)	Connector	-	1	In case of testing RF conductive performance. (right next to the module)



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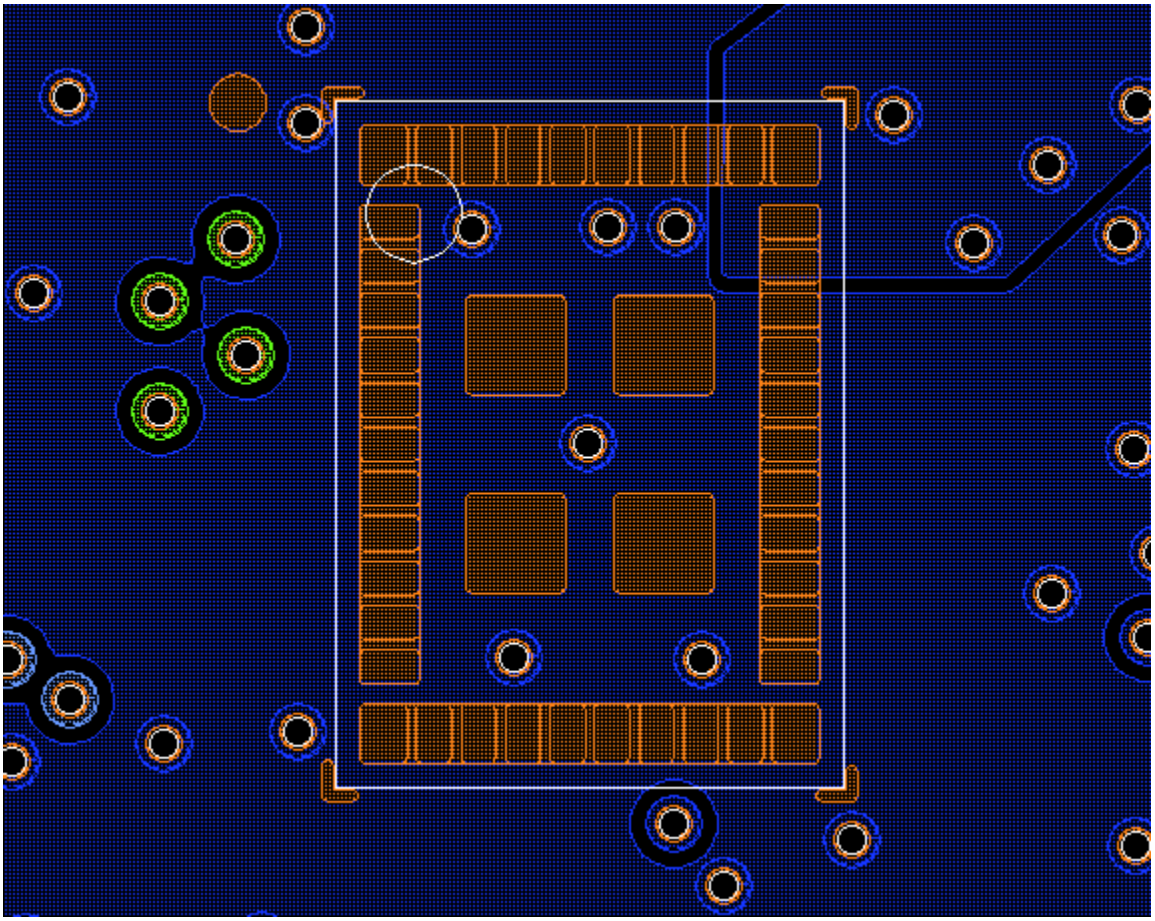
5.0 HW Design Guideline

5.1 Underneath of module

Do not arrange any lines under the module to avoid deteriorations of RF performance. (all GND plane)



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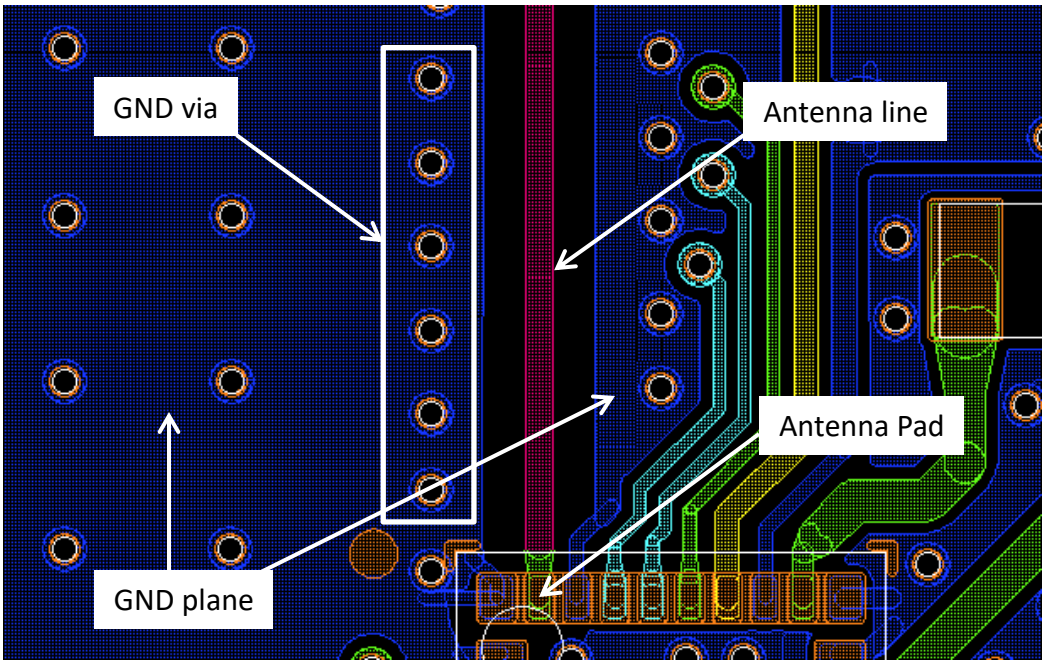
5.2 Antenna line

Antenna line should be 50ohm (*). There should be enough GND via along with Antenna line. Make sure that pi matching circuit is located right before the wifi antenna on the main board.



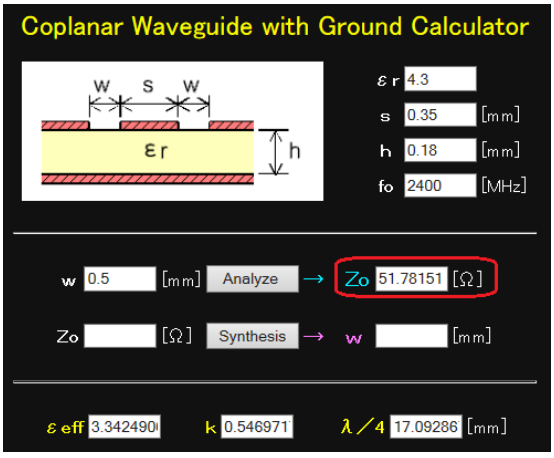
(*) How to make 50ohm line?

http://www17.plala.or.jp/i-lab/index_e.htm

Here are the conditions of 50ohm lines of evaluation board. (One of example)

- Epsilon : 4.3
- RF trace width(s) : 0.35mm
- GND gap(h) : 0.18mm
- GND gap(w) : 0.5mm

The line impedance is Z0 = **51.8ohm**.



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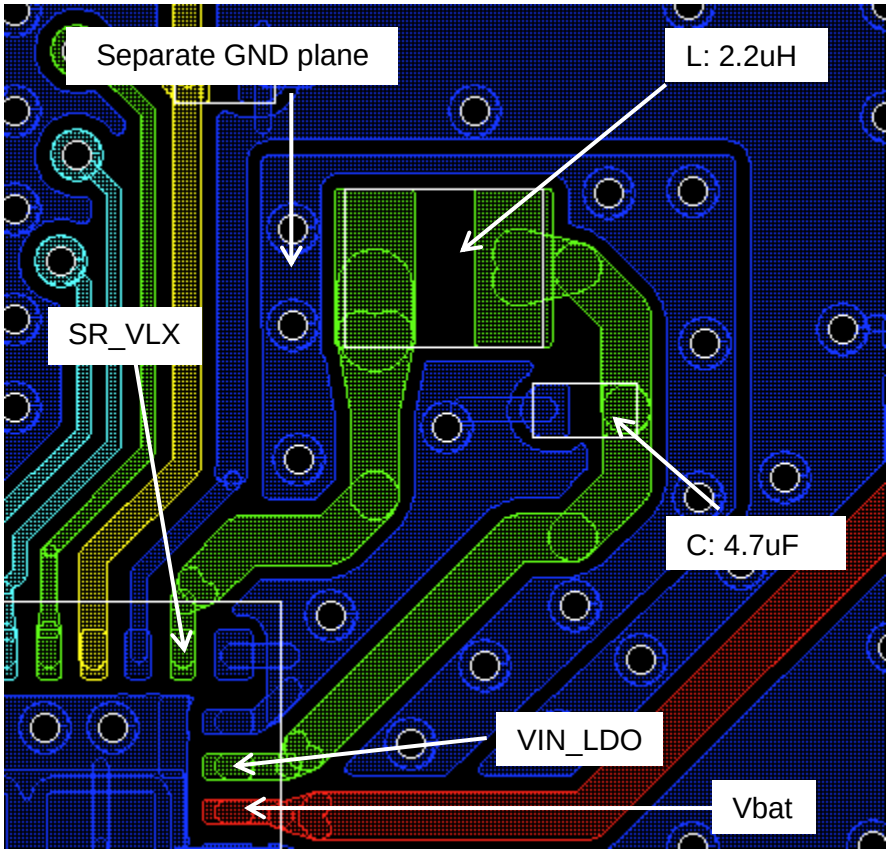
5.3 VBAT/CBUCK line

Make the line from SR_VLX to VIN_LDO as short as possible. 4.7uF capacitor should be as close to VIN_LDO as possible.

If the main board is multilayer PCB type, it's better to separate the GND place for this area on the top later, then connect it to the main GND thru the via hole on the lower layer.

On VBAT line, 4.7uF bypass capacitor should be located as close to the module as possible.



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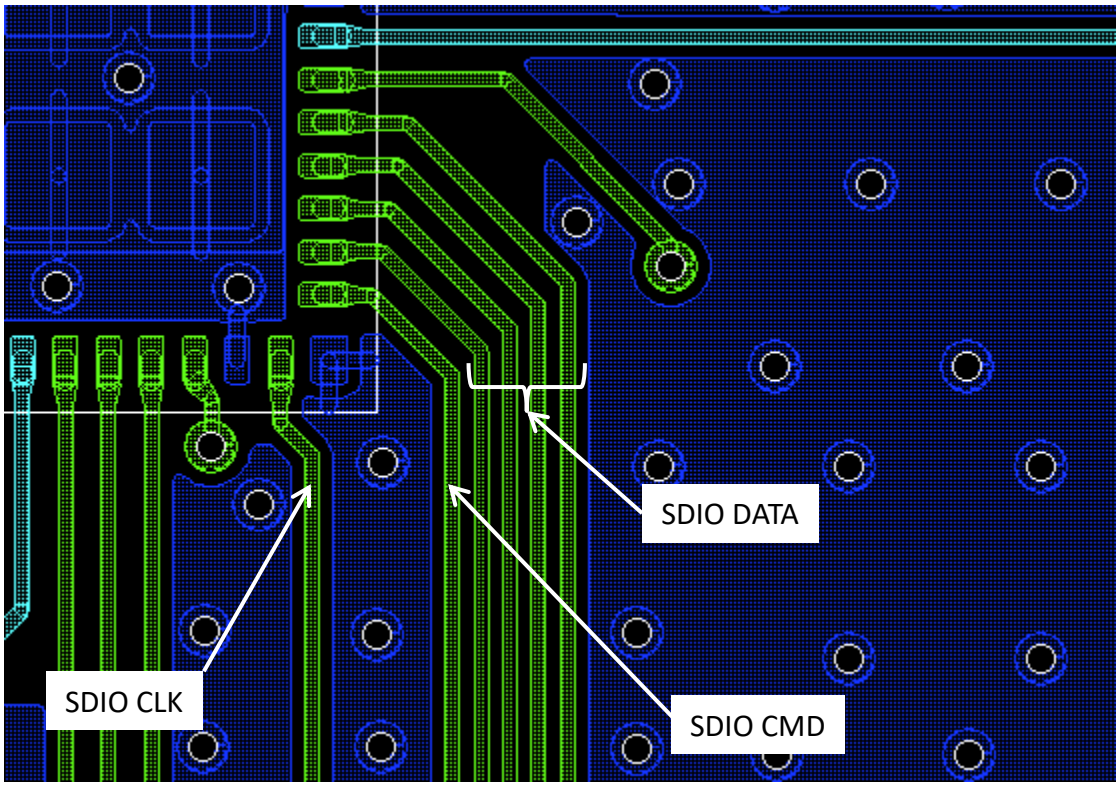
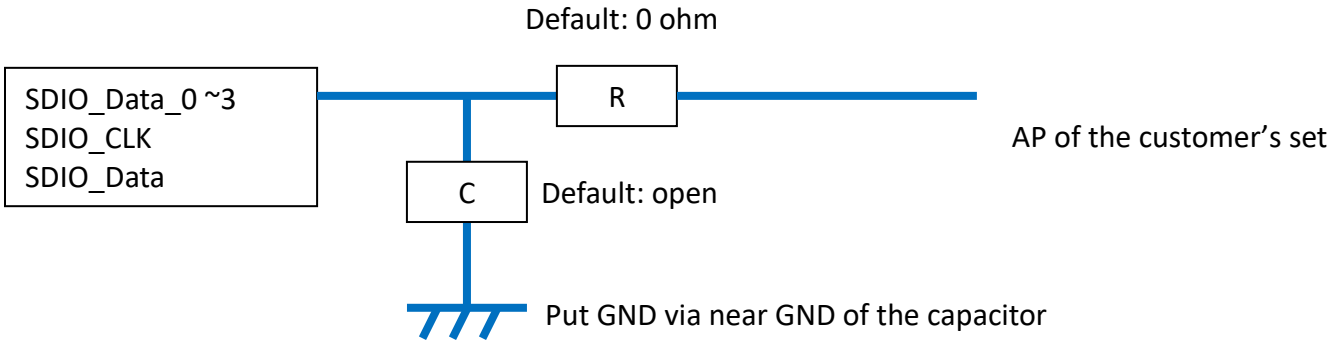
5.4 SDIO line - 1

Keep the space between SDIO_CMD line and SDIO_CLK line as much as possible to avoid coupling.



5.5 SDIO line - 2

Arrange SDIO lines with 50 ohm and put R, C parts, just in case, to reject the noise as follows if the space is allowed. These lands can be used as test pad for the debug purpose as well.



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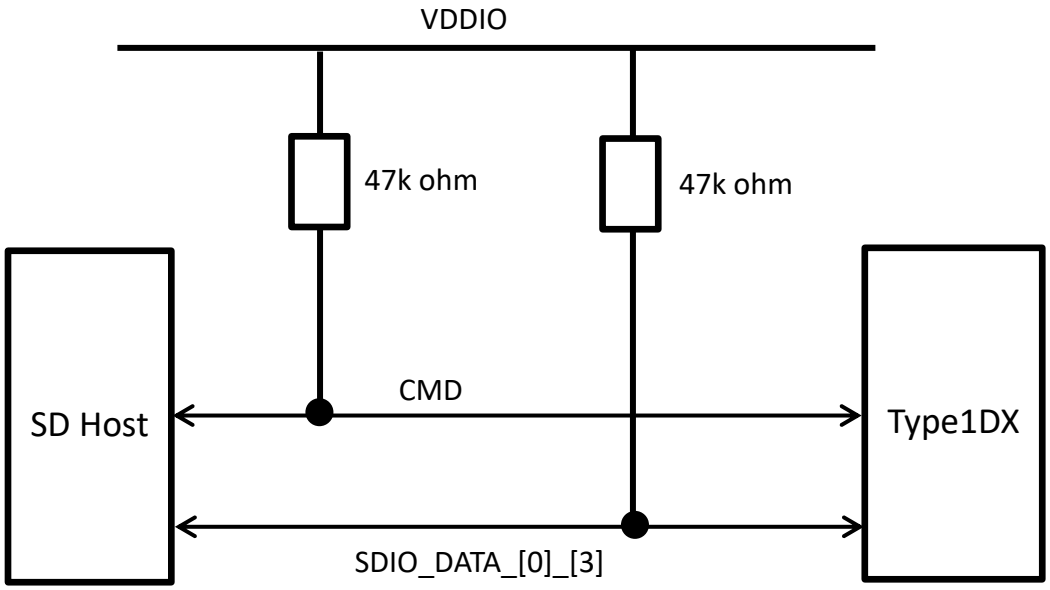
5.6 SDIO line - 3

10 to 100k ohm pull-ups are required on the four DATA lines and the CMD line. This requirement must be met during all operating states by using external pull-up resisters or properly programming internal SDIO Host pull-ups. This module (Type1DX) does not have internal pull-ups on these lines inside module.



6.0 RF characteristic (WiFi/BT/BLE) – Conducted test

6.1 Tx output power level (at module antenna port)

WiFi 2.4GHz – 11b: 17dBm, 11g: 13dBm, 11n: 12dBm

BT – 8dBm (typ),

BLE – 8dBm (typ)

6.2 Rx minimum sensitivity level (at module antenna port)

WiFi 2.4GHz – 11b-11Mbps: -89dBm (typ), 11g-54Mbps: -75dBm (typ), 11n-MCS7 HT20: -73dBm (typ)

BT – BDR DH5: -91dBm (typ), EDR 2DH5: -94dBm (typ), EDR 3DH5: -87dBm (typ)

BLE – -95dBm (typ)

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7.0 Power consumption

7.1 WiFi Current consumption (VBAT=3.6V, VDDIO=3.3V)

Condition: WL_REG_ON: High, BT_REG_ON: Low

		Vbat: 3.6V, VIO: 3.3V, 25deg.C		(Typ)
Mode	Rate	Vbat (mA)	VIO (uA)	
Sleep Mode				
Leakage (off)	N/A	0.005	1	
Sleep (Idle)	N/A	0.008	251	
IEEE PS DTIM3	N/A	0.7	-	
Active Mode				
Rx active (1024byte, 20usec interval)	11b 11Mbps	47	-	
	11g 54Mbps	47	-	
	11n MCS7	47	-	
Tx (1024byte, 20usec interval)	11b@ 17dBm	320	-	
	11g@ 13dBm	270	-	
	11n@ 12dBm	260	-	

7.2 Bluetooth Current consumption (VBAT=3.6V, VDDIO=3.3V)

Condition: WL_REG_ON: Low, BT_REG_ON: High

	Vbat: 3.6V, VIO: 3.3V, 25deg.C			(Typ)
Operation mode	Vbat	VIO	Unit	
Bluetooth 2.1+EDR				
BDR DH5	28	-	mA	
EDR 2DH5	25	-	mA	
EDR 3DH5	25	-	mA	
Bluetooth 4.0				
Sleep (Idle)	20	107	uA	
Inquiry scan (1.28s)	275	180	uA	
Tx @ 7.5dBm	34	-	mA	
Rx	13.4	-	mA	

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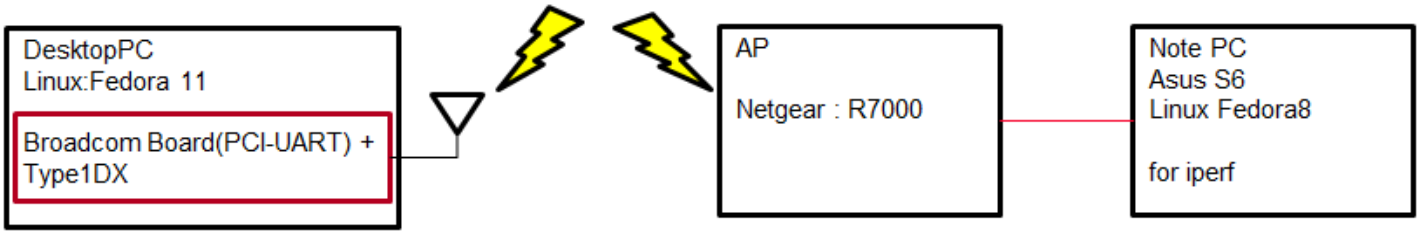
8.0 Throughput Performance

8.1 Measurement condition

- Kernel : 2.6.29.4-167
- Driver version :1.141.64.8
- FW version: 7.10.48.1
- Nvram:nvram_4343s_4343w_37M4_normal_power_1030.txt



8.2 Measurement result

		Tx [Mbps]	Rx [Mbps]	CH
2.4GHz 11n (MCS7 HT20)	HT20	46.4	51.2	7

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