



ITM-1197AM

**IEEE 802.11b/g/n 2T2R Wi-Fi Router
Module Datasheet**

(Preliminary)

Revision History

Date	Revision Content	Revised By	Version
2019/02/25	- Initial released (Preliminary)	Issac Chen	0.1
2019/05/07	- Add Reference Design	Issac Chen	0.2

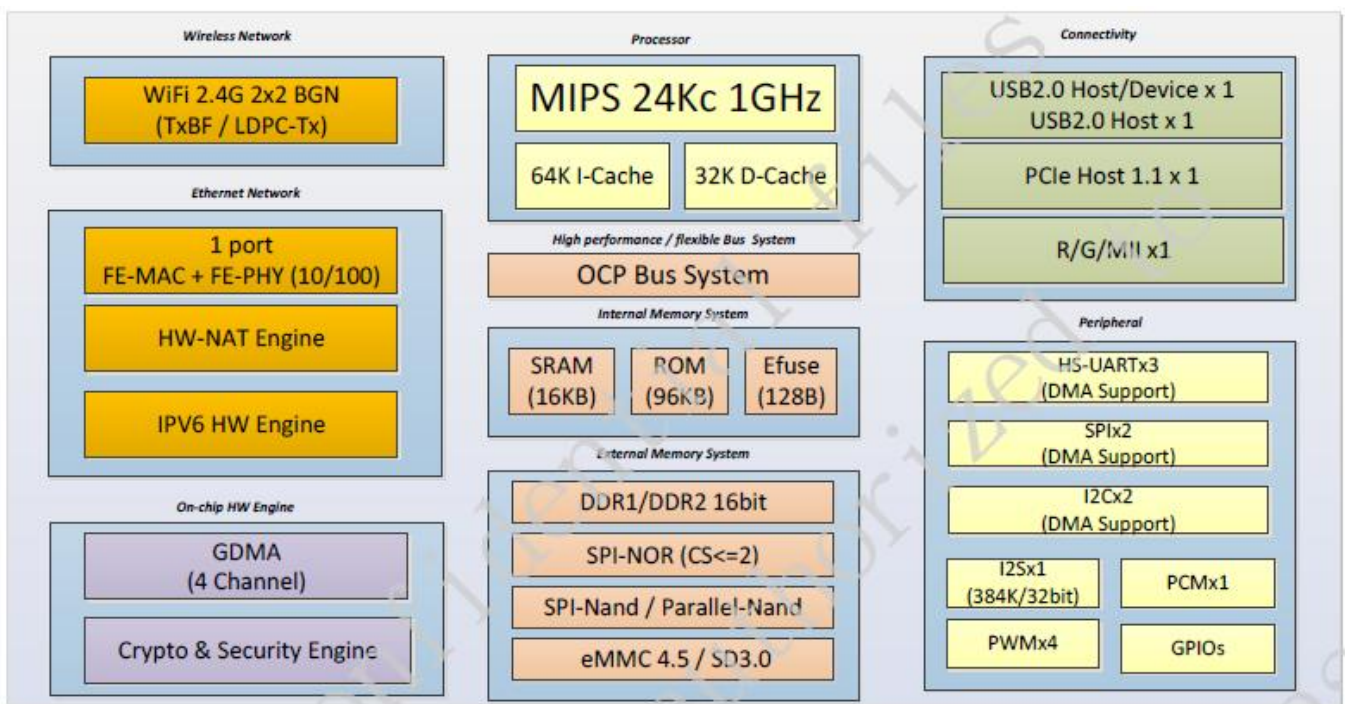
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1. General Description

ITM-1197AM is a WIFI module using Realtek RTL8197FS Wi-Fi router SoC, which integrates 802.11bgn 2T2R WIFI AP hardware, 2-port 10/100M LAN switch (1 FE PHY and 1 RGMII) , MIPS 24Kc core processor up to 1GHz, 64Mb/128Mb DDR memory, and variety of I/O interfaces for product applications.

The block diagram for RTL8197FS is shown as below.



2. Features

- Processors
 - MIPS 24Kc up to 1GHz clock rate
 - I-cache 64KB + D-cache 32KB
- Memories
 - 94KB ROM + 16KB SRAM
 - 16MB DDR2
 - 16MB SPI flash (optional 16MB/32MB)
- Wi-Fi
 - 2.4GHz 2x2 11b/g/n AP router solution
 - TxBF/STBC/LDPC-Tx/MRC support
- Ethernet
 - 2 port 10/100M switch : 1 FE PHY + 1 RGMII
- Engine
 - Security engine
 - GDMA 4 channel
- Peripheral interface
 - PCIE
 - USB
 - SDXC/eMMC
 - SPI
 - I2S
 - I2C
 - UART
 - PCM
 - PWM / GTimer

3. General Specification

3.1 Voltages

3.1.1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VDD3V3	Input 3.3V supply Voltage	-0.3	3.6	V
VDD1V8	Input 1.8V supply Voltage	-0.3	2.0	V
VDD1V1	Input 1.05V supply Voltage	-0.3	1.2	V

3.1.2 Recommended Operating Ratings

Test conditions: At room temperature				
Symbol	Min.	Typ.	Max.	Unit
VDD3V3	3.1	3.3	3.5	V
VDD1V8	1.7	1.8	1.9	V
VDD1V1	1.0	1.1	1.2	V

Test conditions: At operating temperature 0°C ~70°C				
Symbol	Min.	Typ.	Max.	Unit
VDD3V3	3.1	3.3	3.5	V
VDD1V8	1.7	1.8	1.9	V
VDD1V1	1.0	1.1	1.2	V

3.2 Wi-Fi RF Specification (RX)

Parameters	Conditions	Min.	Typ.	Max.	Unit
Frequency Range		2412		2484	MHz
RX Sensitivity 11b @ 8% PER	- 1Mbps		-91	-83	dBm
	- 2Mbps		-89	-80	dBm
	- 5.5Mbps		-87	-79	dBm
	- 11Mbps		-85	-76	dBm
RX Sensitivity 11g @ 10% PER	- 6Mbps		-87	-82	dBm
	- 9Mbps		-86	-81	dBm
	- 12Mbps		-84	-79	dBm
	- 18Mbps		-82	-77	dBm
	- 24Mbps		-79	-74	dBm
	- 36Mbps		-75	-70	dBm
	- 48Mbps		-71	-66	dBm
Receive Sensitivity (11n,20MHz) @10% PER	- MCS0		-87	-82	dBm
	- MCS=1		-84	-79	dBm
	- MCS=2		-82	-77	dBm
	- MCS=3		-79	-74	dBm
	- MCS=4		-75	-70	dBm
	- MCS=5		-71	-66	dBm
	- MCS=6		-70	-65	dBm
	- MCS=7		-69	-64	dBm
Receive Sensitivity (11n,40MHz) @10% PER	- MCS0		-84	-79	dBm
	- MCS=1		-81	-76	dBm
	- MCS=2		-79	-74	dBm
	- MCS=3		-76	-71	dBm
	- MCS=4		-72	-67	dBm
	- MCS=5		-68	-63	dBm
	- MCS=6		-67	-62	dBm
	- MCS=7		-66	-61	dBm
Maximum Receive Level	802.11b	-20	0		dBm
	802.11g	-20	0		dBm
	802.11n	-20	0		dBm

3.3 Wi-Fi RF Specification (TX)

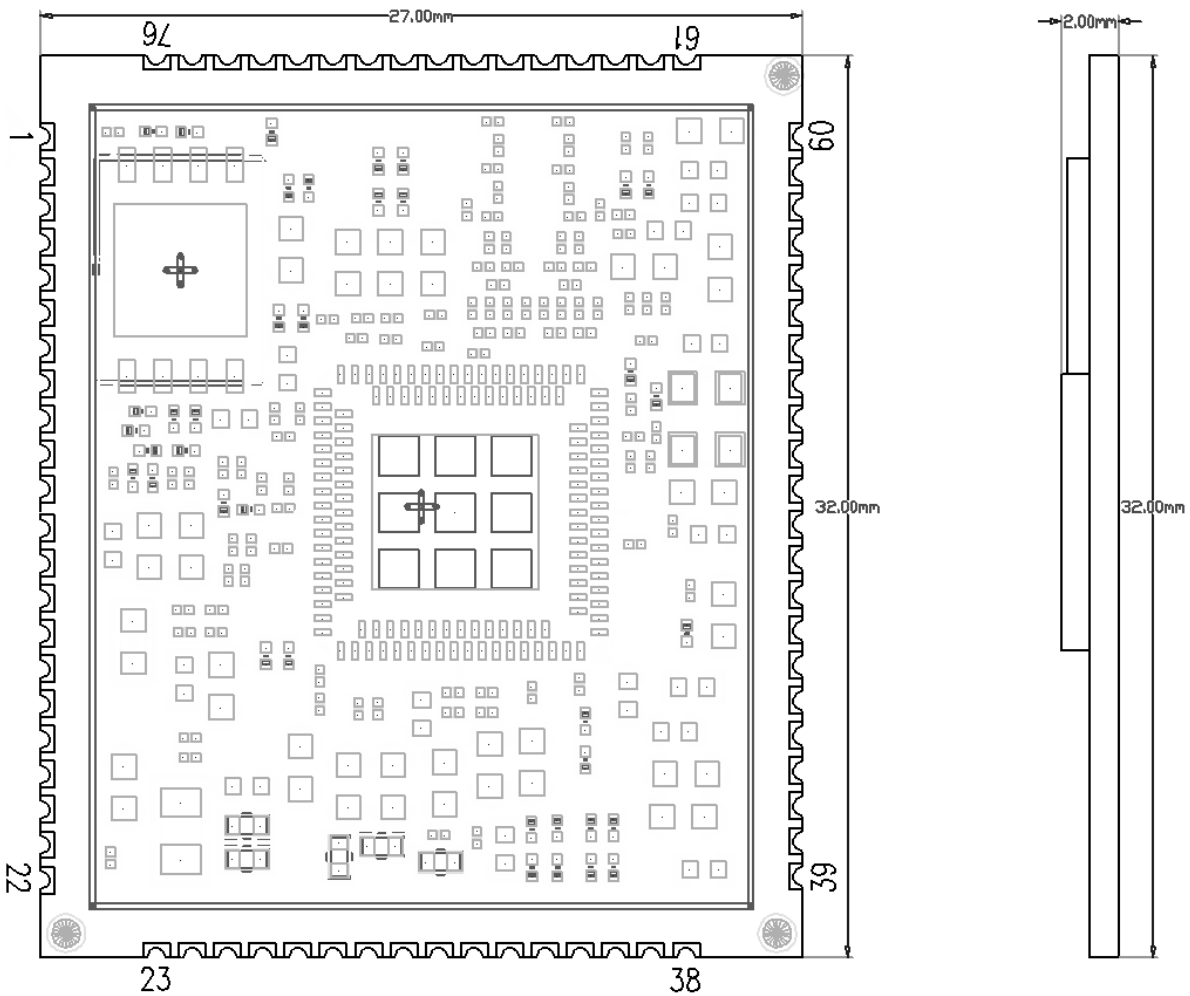
Parameters	Conditions	Min.	Typ.	Max.	Unit
Frequency Range		2412		2484	MHz
Output Power	802.11b	16	17	18	dBm
	802.11g	14	15	16	dBm
	802.11n	13	14	15	dBm
@EVM	802.11b / 11Mbps	--	-22	-10	dB
	802.11g / 54Mbps	--	-31	-25	dB
	802.11n / MCS7	--	-31	-28	dB

4. Pin Assignments

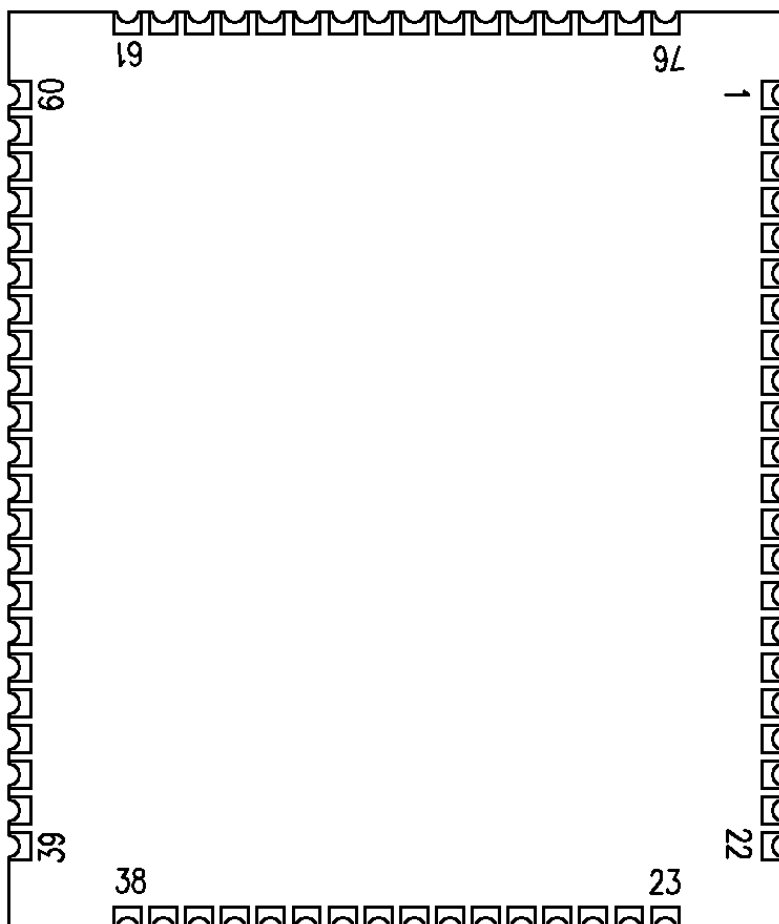
4.1 PCB Pin Outline

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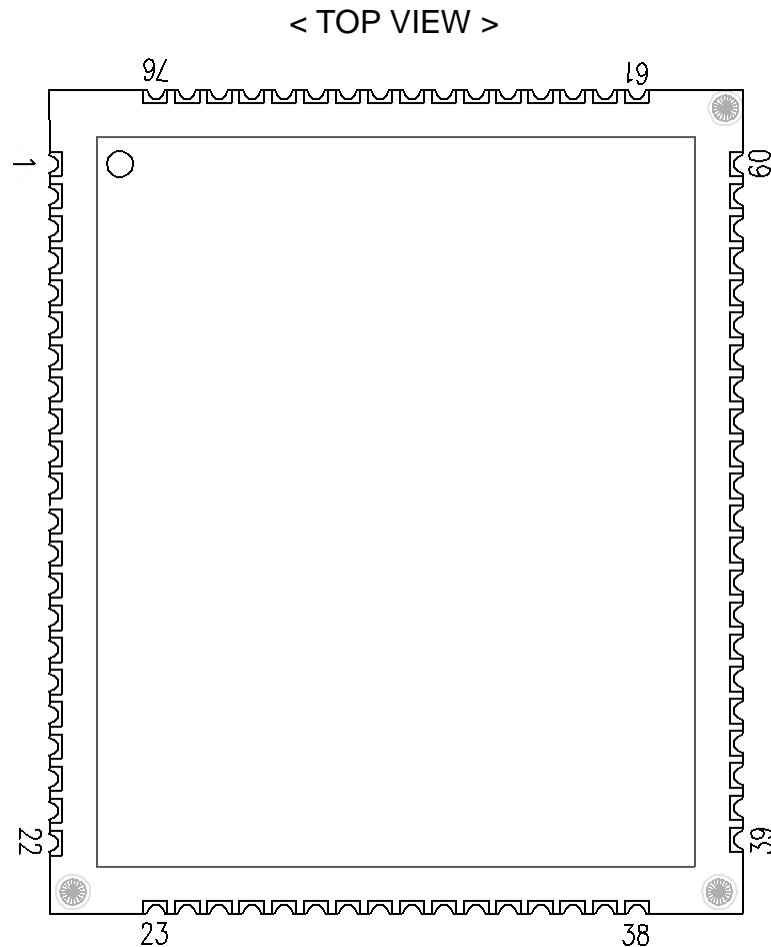
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4.2 Pin Definition



Pin No.	Pin-Define	Type	Description
1	GPIO_A3 / MF_RSTN	I/O	General Purpose IO A3 / SPI Serial Flash Reset (39)
2	GPIO_A1 / MF_D0	I/O	General Purpose IO A1 / SPI Serial Flash Data Line 0 (102)
3	GPIO_A4 / MF_CS0N	O	General Purpose Output A4 / SPI Serial Flash Chip Select 0 (41)
4	GPIO_H2 / LED_PORT4	I/O	General Purpose IO H2 / LED Port4 (42)
5	GPIO_G6 / LED_PORT0	I/O	General Purpose IO G6 / LED Port0 (43)
6	GPIO_H1 / LED_PORT3	I/O	General Purpose IO H1 / LED Port3 (106)
7	GPIO_H5 /	O	General Purpose IO H5 /

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	PCIE_RSTN		PCI Express Reset (44)
8	GPIO_E5 / WBB4	O	General Purpose Output H5 / WBB4 (108)
9	GPIO_E3 / WBB2	I/O	General Purpose IO E3 / WBB2 (46)
10	GPIO_E1 / WBB0	I/O	General Purpose IO E1 / WBB0 (47)
11	GPIO_E4 / WBB3	I/O	General Purpose IO E4 / WBB3 (110)
12	GPIO_C3	I/O	General Purpose IO [C3] (48)
13	PCIE_HSIP	AI	PCIE Receiver Differential Pair (53)
14	PCIE_H SIN	AI	PCIE Receiver Differential Pair (54)
15	PCIE_REFCLK_P	AO	PCIE Reference Clock Differential Pair (114)
16	PCIE_REFCLK_N	AO	PCIE Reference Clock Differential Pair (52)
17	PCIE_HSOP	AO	PCIE Transmitter Differential Pair (113)
18	PCIE_HSON	AO	PCIE Transmitter Differential Pair (51)
19	GND	P	Ground Connections
20	USB_HSDP0	AIO	USB Port0 Host Device Data Plus Pin (116)
21	USB_HSDM0	AIO	USB Port0 Host Device Data Minus Pin (57)
22	GND	P	Ground Connections
23	USB_HSDP1	AIO	USB Port1 Host Device Data Plus Pin (59)
24	USB_HSDM1	AIO	USB Port1 Host Device Data Plus Pin (117)
25	GND	P	Ground Connections
26	TXOP4	AO	10/100M Ethernet Transmission Pair (122)
27	TXON4	AO	10/100M Ethernet Transmission Pair (64)
28	RXIP4	AI	10/100M Ethernet Receiving Pair (123)
29	RXIN4	AI	10/100M Ethernet Receiving Pair (65)
30	GND	P	Ground Connections
31	VDD1V8	P	1.8V Power Supply Pin
32	VDD1V8	P	1.8V Power Supply Pin
33	VDD1V1	P	1.1V Power Supply Pin
34	VDD1V1	P	1.1V Power Supply Pin
35	VDD1V1	P	1.1V Power Supply Pin
36	VDD3V3	P	3.3V Power Supply Pin
37	VDD3V3	P	3.3V Power Supply Pin
38	VDD3V3	P	3.3V Power Supply Pin
39	GPIO_C0 / P0_TXCTL	O	General Purpose Output C0 / RGMII P0_TXCTL (2)
40	GPIO_B7 / P0_TXC	IO	General Purpose IO B7 / RGMII P0_TXC (73)
41	GPIO_B1 /	I/O	General Purpose IO B1 /

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	P0_RXC		RGMII P0_RXC (3)
42	GPIO_C1 / P0_RXCTL	I/O	General Purpose Output C1 / RGMII P0_RXCTL (74)
43	GPIO_B5 / P0_RXD0	I/O	General Purpose IO B5 / RGMII P0_RXD0 (4)
44	GPIO_B4 / P0_RXD1	I/O	General Purpose IO B4 / RGMII P0_RXD1 (75)
45	GPIO_B3 / P0_RXD2	I/O	General Purpose IO B3 / RGMII P0_RXD2 (5)
46	GPIO_B2 / P0_RXD3	I/O	General Purpose IO B2 / RGMII P0_RXD3 (76)
47	GPIO_C2 / P0_MDC	I/O	General Purpose IO C2 / RGMII P0_MDC (77)
48	GPIO_E0 / I2C_SDA	I/O	General Purpose IO E0 / I2C SDA (79)
49	GPIO_D7 / I2C_SCL	I/O	General Purpose IO D7 / I2C SCL (9)
50	GPIO_C5	I/O	General Purpose IO C5 (67)
51	GPIO_C4	I/O	General Purpose IO C4 (127)
52	GPIO_C6	I/O	General Purpose IO C6 (69)
53	GPIO_C7	I/O	General Purpose IO C7 (10)
54	GPIO_D6	I/O	General Purpose IO D6 (81)
55	GPIO_D0	I/O	General Purpose IO D0 (11)
56	GPIO_D5	I/O	General Purpose IO D5 (82)
57	GPIO_D2 / UART1_CTS	I/O	General Purpose IO D2 / UART1 CTS (78)
58	GPIO_D1 / UART1_RX	I/O	General Purpose IO D2 / UART1 RX (8)
59	GPIO_D4 / UART1_TX	I/O	General Purpose IO D2 / UART1 TX (12)
60	GPIO_D3 / UART1_RTS	I/O	General Purpose IO D2 / UART1 RTS (83)
61	GND	P	Ground Connections
62	GND	P	Ground Connections
63	GND	P	Ground Connections
64	RF_0	AIO	WIFI Antenna A Output
65	GND	P	Ground Connections

66	GND	P	Ground Connections
67	RF_1	P	WIFI Antenna B Output
68	GND	P	Ground Connections
69	GPIO_F0	I/O	General Purpose IO F0 (93)
70	GPIO_E2	I/O	General Purpose IO E2 (92)
71	GPIO_H0 / LED_PORT2	O	General Purpose IO H0 / LED Port2 (28)
72	GPIO_A0 / MF_CK	O	General Purpose Output A0 / SPI Serial Flash Clock Output (29)
73	GPIO_A2 / MF_D1	I/O	General Purpose IO A2 / SPI Serial Flash Data Line 1 (96)
74	GPIO_A5 / MF_CS1N	I/O	General Purpose IO A5 / SPI Serial Flash Chip Select 1 (30)
75	GPIO_H3 / UART0_RX	I/O	General Purpose IO H3 / UART0 TX (38)
76	GPIO_H4 / UART0_TX	O	General Purpose Output A0 / UART0 TX (101)

The number with yellow background in the table above indicates the number of RTL8197FS IC pin linked to the corresponding module pin. The table below shows RTL8197FS shared I/O pin mapping. For details of pin function, please refer to RTL8197FS datasheet.

Pin	GPIO		WiFi / PCM	RGMIU/MIU	P-Nand	I2S	SPI-Nor / SD/ eMMC	EJTAG / SPI-Nand	LED / SPI	UART	I2C/ Reset
29	GPIOA[0]	O					MF_CK	SPI_NAND_CK	SPI0_CLK		I2C0_SCL
102	GPIOA[1]	B					MF_D0	SPI_NAND_D0	SPI0_TXD		I2C0_SDA
96	GPIOA[2]	B					MF_D1	SPI_NAND_D1	SPI0_RXD, SPI0_TRXD		I2C1_SCL/ I2C1_SCL_SLV
39	GPIOA[3]	B					MF_RSTN	SPI_NAND_D2	SPI0_CS0N		I2C1_SDA/ I2C1_SDA_SLV
41	GPIOA[4]	O					MF_CS0N	SPI_NAND_CS0N			I2C1_SCL
30	GPIOA[5]	B				I2S_SD3_O	MF_CS1N	SPI_NAND_D3			I2C1_SDA
66	GPIOA[6]	O		P0_TXD3	NF_ALE	I2S_MCLK			SPI0_CLK		
128	GPIOA[7]	O		P0_TXD2	NF_CLE	I2S_SCLK			SPI0_CS0N		
70	GPIOB[0]	O		P0_TXD1	NF_RD#	I2S_WS / I2S_SD2_O			SPI0_TXD		I2C1_SCL
3	GPIOB[1]	B		P0_RXC	NF_CE0#	I2S_SD1_O / I2S_SD1_I / I2S_SD3_O		JTAG_TCK	SPI0_RXD, SPI0_TRXD		I2C1_SDA
76	GPIOB[2]	B	PCM_CLK	P0_RXD3	NF_D0	I2S_MCLK		JTAG_TRSTN	SPI0_TXD_SLV	U2_RTS	
5	GPIOB[3]	B	PCM_FS	P0_RXD2	NF_D1	I2S_SCLK		JTAG_TMS	SPI0_RXD_SLV	U2_TX	
75	GPIOB[4]	B	PCM_TXD	P0_RXD1	NF_D2	I2S_WS		JTAG_TDI	SPI0_CLK_SLV	U2_RX	
4	GPIOB[5]	B	PCM_RXD	P0_RXD0	NF_D3	I2S_SD1_O			SPI0_CS0N_SLV	U2_CTS	

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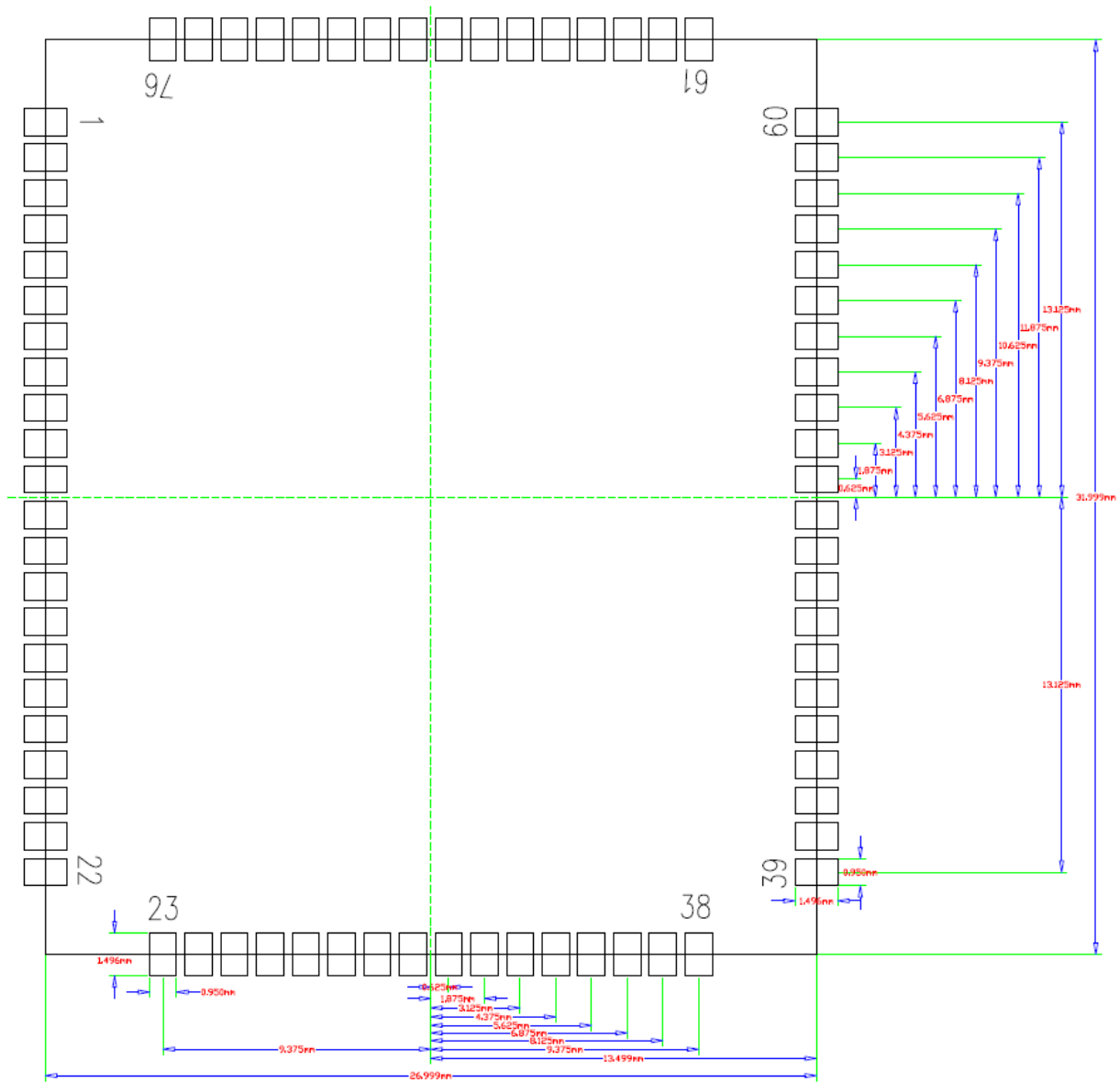
Pin	GPIO		WiFi / PCM	RGMI/MI	P-Nand	I2S	SPI-Nor / SD / eMMC	EJTAG / SPI-Nand	LED / SPI	UART	I2C / Reset
71	GPIOB[6]	O		P0_TXD0	NF_WP#			JTAG_TDO	SPI1_CLK	U1_RTS	I2C1_SCL
73	GPIOB[7]	B		P0_TXC		I2S_SD1_I			SPI1_CS0N	U1_RX	I2C1_SDA / I2C0_SCL_SLV
2	GPIOC[0]	O		P0_TXCTL	NF_WE#				SPI1_TXD	U1_TX	I2C0_SCL
74	GPIOC[1]	B		P0_RXCTL	NF_R/E#				SPI1_RXD, SPI1_TRXD	U1_CTS	I2C0_SDA / I2C0_SDA_SLV
77	GPIOC[2]	B		P0_MDC					SPI0_CLK, SPI1_CLK	U1_RTS	I2C0_SCL / I2C1_SCL
48	GPIOC[3]	B		P0_MDIO					SPI0_CS0N, SPI1_CS0N	U1_TX	I2C0_SDA / I2C1_SDA
127	GPIOC[4]	O					EMMC_RSTN		SPI0_CS1N		
67	GPIOC[5]	B				I2S_WS	SD_WP		SPI0_TXD, SPI1_TXD	U1_RX	
69	GPIOC[6]	B				I2S_SCLK	SD_CD		SPI0_RXD, SPI0_TRXD, SPI1_RXD, SPI1_TRXD	U1_CTS	
10	GPIOC[7]	B				I2S_MCLK	EMMC_CLK		SPI0_CLK, SPI1_CLK		
11	GPIOD[0]	B				I2S_SD1_O	EMMC_CMD		SPI0_CS0N, SPI1_CS0N		
8	GPIOD[1]	B			NF_D4	I2S_WS	EMMC_DAT0			U1_RX / U2_RX	
78	GPIOD[2]	B			NF_D5	I2S_SCLK	EMMC_DAT1			U1_CTS / U2_CTS	
83	GPIOD[3]	B			NF_D6	I2S_MCLK	EMMC_DAT2			U1_RTS / U2_RTS	
12	GPIOD[4]	B			NF_D7	I2S_SD1_O	EMMC_DAT3			U1_TX / U2_TX	
82	GPIOD[5]	B	PCM_CLK				EMMC_DAT4		SPI1_CLK		
81	GPIOD[6]	B	PCM_FS				EMMC_DAT5		SPI1_CS0N		
9	GPIOD[7]	B	PCM_TXD				EMMC_DAT6		SPI1_TXD		
79	GPIOE[0]	B	PCM_RXD				EMMC_DAT7		SPI1_RXD, SPI1_TRXD		
47	GPIOE[1]	B	WBB0								
92	GPIOE[2]	B	WBB1								
46	GPIOE[3]	B	WBB2								
110	GPIOE[4]	B	WBB3								
108	GPIOE[5]	O	WBB4								
	GPIOE[6]		WBB5								
	GPIOE[7]		WBB6								
93	GPIOF[0]	O	WBB7								
27	GPIOF[1]	O	WBB8								
43	GPIOG[6]	B							LED_PORT0		
	GPIOG[7]								LED_PORT1		
28	GPIOH[0]	B							LED_PORT2		
106	GPIOH[1]	B							LED_PORT3		RESETN
42	GPIOH[2]	B							LED_PORT4		
38	GPIOH[3]	B								U0_RX	
101	GPIOH[4]	O								U0_TX	
44	GPIOH[5]	O									PCI_E_RSTN

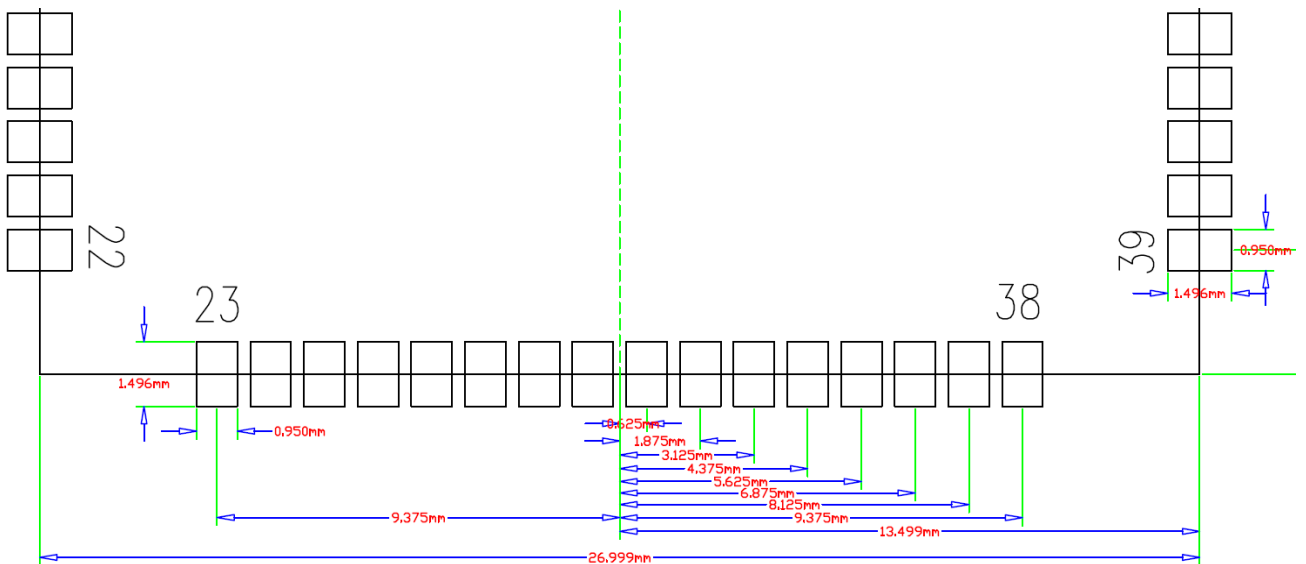
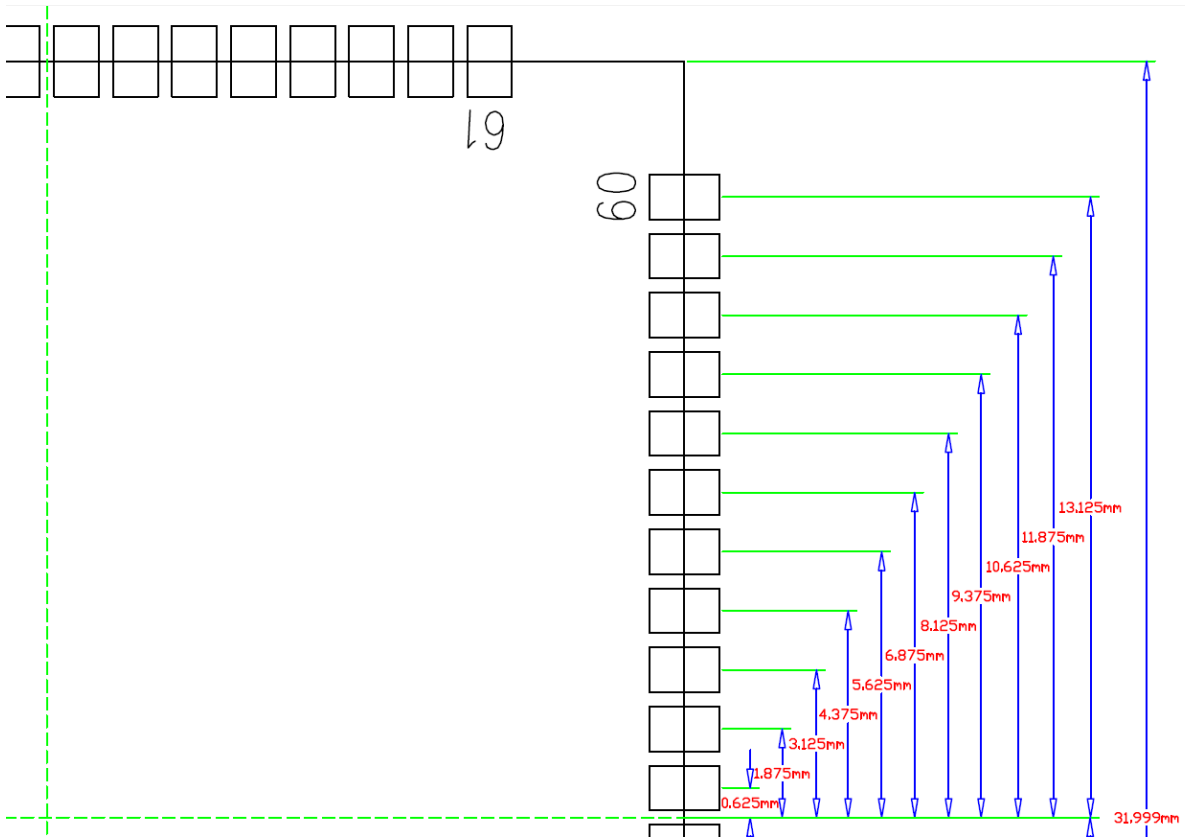
5. Dimensions

5.1 Layout Recommendation

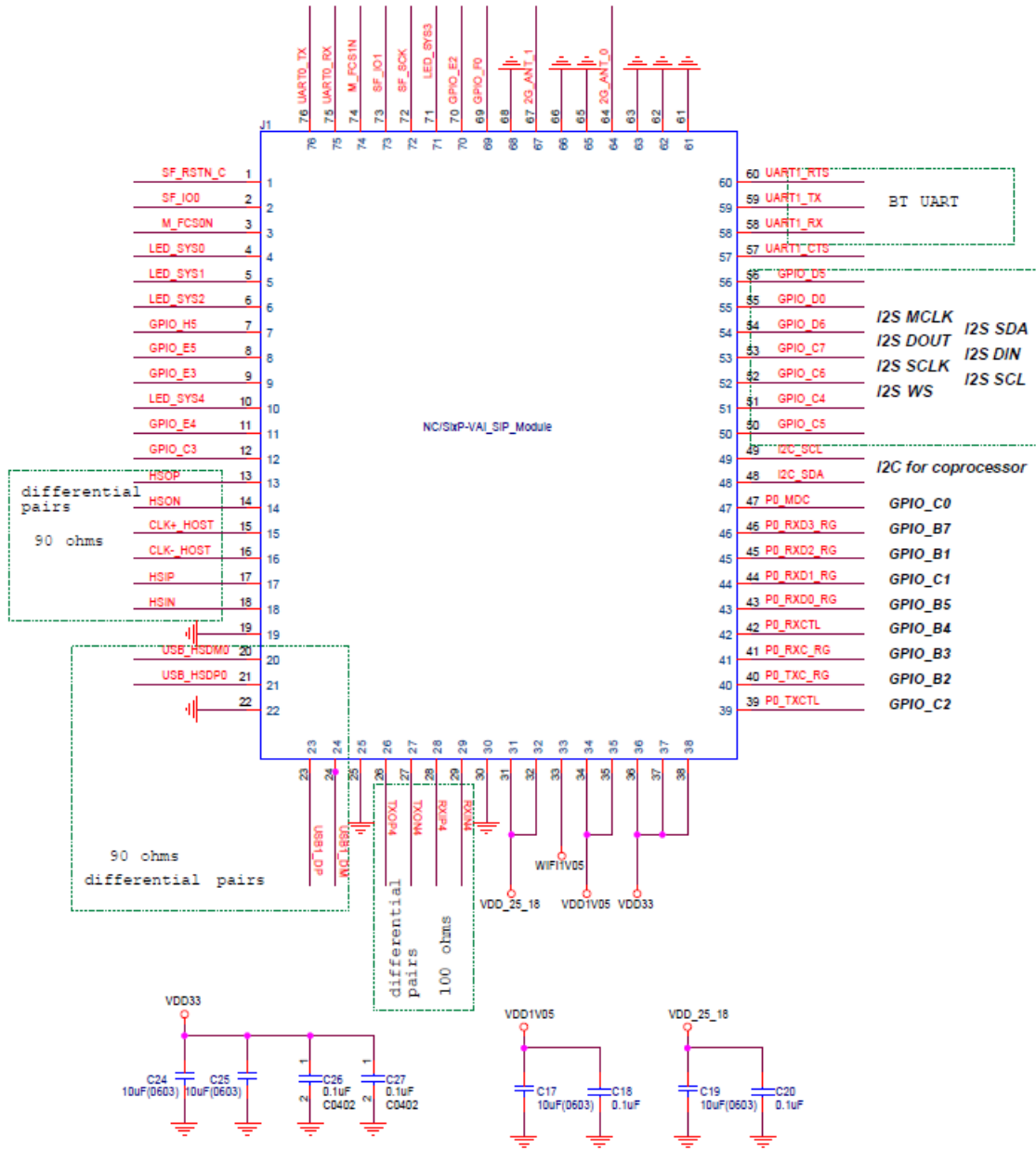
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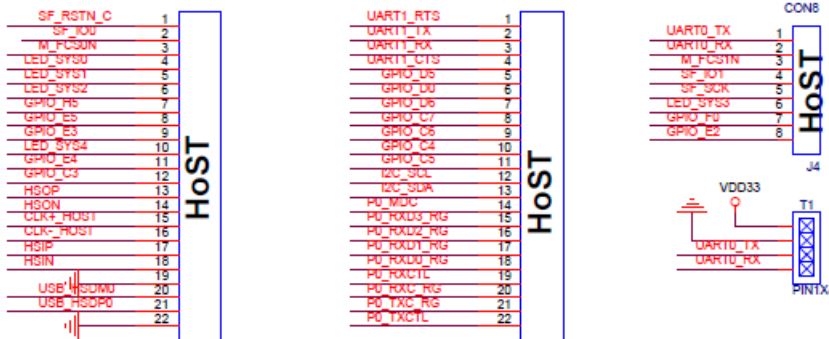
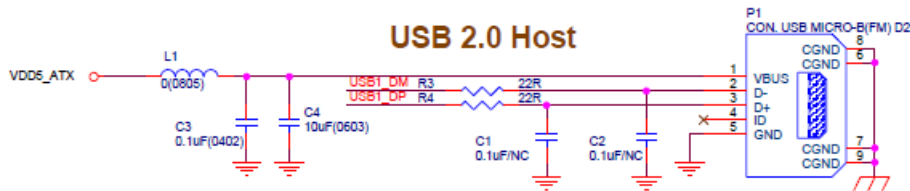
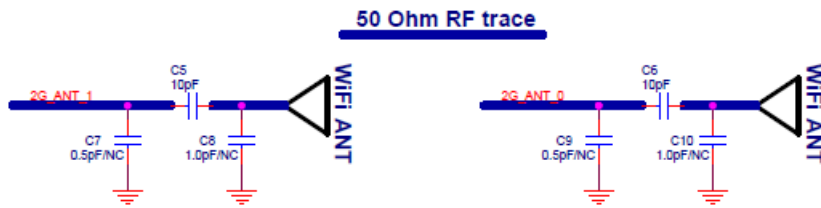
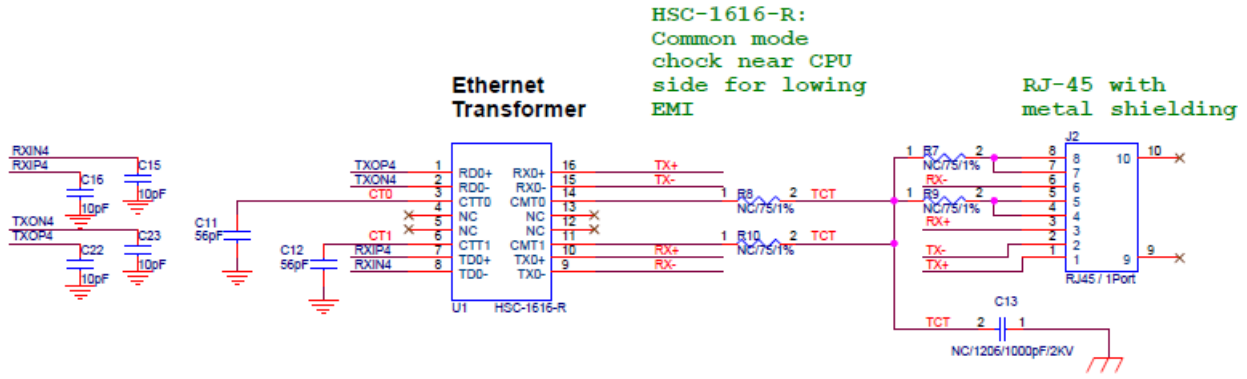
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6. Reference Design





7. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times

