Datasheet

Corewav M6000U0 SOM

Qualcomm IPQ60xx Based IEEE 802.11ax 2.4/5GHz 2x2 Dual Band Dual Concurrent SOM (System On Module)

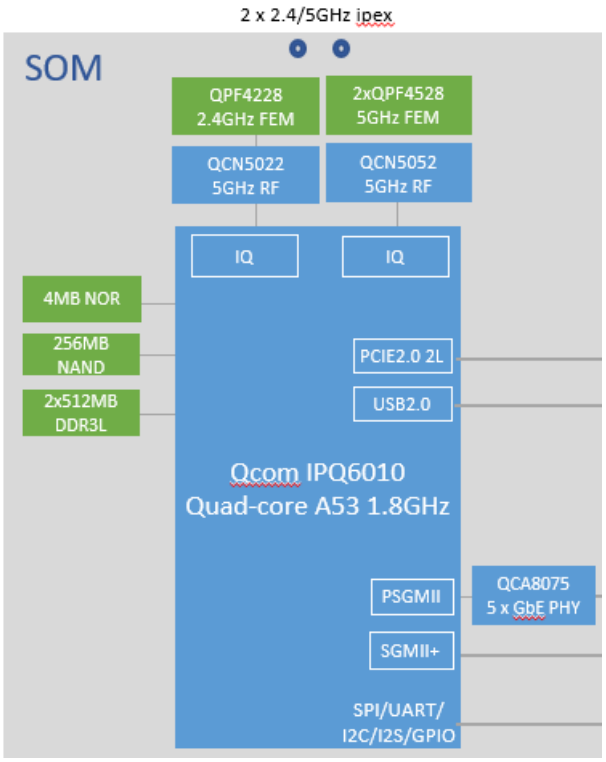
CONFIDENTIALITY STATEMENT

The M6000U0 is an IEEE 802.11ax compliant radio module with Qualcomm IPQ60xx Cypress series SoC based solder down stamp SOM(System on Module). It can deliver up to 24dBm (2 streams) high output power, but still keep a very compact dimension of 57mm(Length) x 57mm(Width) x 3mm (Hight), making it a perfect WiFi solution for IOT(Internet Of Things) applications.
The M6000U0 provides multiple interfaces including PCIE gen3 x 1, USB3.0 x 1, SGMII x 1, 5-port GbE switch x 1, SDC x 1, GPIOs, UART and etc. The SOM supports flexible memory combination, makes it easy to support various types of applications, including WiFi AP/Router, IOT, SDWAN, VPN and etc.

Features

- Wi-Fi6/6E IEEE 802.11a/b/g/n/ac/ax 2.4/5GHz dual band dual concurrent applications
- Supports MIMO 2x2(2.4GHz) and 2x2(5GHz) WiFi operations
- Supports WiFi PHY rate of 573.5Mbps for 2.4Ghz(40MHz) and 1,200Mbps for 5GHz(80MHz)
- CPU: Qualcomm IPQ6000(Cypress) Quad core A53 1.8GHz, optional IPQ6010/6018 per request
- RF IC: Qualcomm QCN5021 + QCN5022 802.11ax WiFi6 2.4/5GHz 2x2 radios
- Ethernet: Qualcomm QCA8075 5-port GbE Ethernet switch IC
- Memory: 2 x 512MB DDR3L (Max.3GB DDR), 256MB NAND, 4MB NOR
- Ethernet Interface: 1 x SGMII + 5-port GbE
- Interfaces: PCIE3.0 1L, USB3.0, SDC, UART, GPIO
- Connector: Solder down stamp
- Dimension: 57 x 57mm

Block Diagram



1 Product Specifications

1 Solutions/Proposals

Spec	Description
Model	2.4GHz 2X2 40MHz+ 5GHz 2x2 80MHz 802.11ax Wi-Fi6 SOM
WLAN standard	IEEE 802.11 a/b/g/n/ac/ax
SoC/CPU	Qualcomm IPQ6000(Cypress) Quad core A53 1.8GHz

	*optional IPQ6010/6018 per request
Memory	DDR4 16bits-2133: 2x 512MB (2 x 16bits) NOR: 4MB NAND: 256MB
Radio mode	MIMO 2.4GHz 2x2 + 5GHz 2x2
Radio frequency band	2412 MHz ~2472MHz, 5180 MHz ~5825MHz
Transmit power	2.4GHz: Max. 21dBm/MCS0 5GHz: Max. 21dBm/MCS0
Receive sensitivity	Varying between -96 and -58 dBm depending on modulation
Channel size	20/40/80 MHz
Modulation	BPSK, QPSK, 64/256/1024 QAM
Data rates	2.4GHz 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: up to 300Mbps-2x2 MIMO 802.11ax: up to 573.5Mbps – 2x2 MIMO 5GHz 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: up to 300Mbps – 2x2 MIMO (40MHz channel) 802.11ac: up to 867Mbps – 2x2 MIMO (80MHz channel) 802.11ax: up to 1,201Mbps – 2x2 MIMO (80MHz channel)
Security	AES/SHA/3DES/CCM and GCM/FIPS level2
Power Consumption	Typical 13W with Tx/Rx
Operating Temperature	-0°C ~ +70°C
Storage Temperature	-40°C ~ +90°C
Operating Humidify	5%-95%(Non-condensing)
Dimension	57 X 57 X 3.0mm
Weight	20g (preliminary)
Antenna	2 x 2/4/5GHz Ipex connectors
Power Supply	+3.3V
Interfaces	1 x PCIE3.0 1 x 5-port GBE switch 1 x SGMII 1 x USB3.0 Host 2 x UART (1 x 2-pin + 1 x 4-pins) Shared GPIOs
Software	Qualcomm QSDK 11.x

2 Interfaces Definition

- Trace Impedance

Signals	Impedance
All signal ended signals	50 Ω signal ended
USB differential signals	85 Ω differential
Differential signals including GbE, SGMII, clock and etc.	100 Ω differential

- 5-Port GbE Switch

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
A1	P0_TRX1_P	TRXP0[0]	I/O		QCA8075 PHY0 MDI pair 0
A2	P0_TRX1_N	TRXN0[0]	I/O		QCA8075 PHY0 MDI pair 0
A3	P0_TRX2_P	TRXP0[1]	I/O		QCA8075 PHY0 MDI pair 1
A4	P0_TRX2_N	TRXN0[1]	I/O		QCA8075 PHY0 MDI pair 1
A5	P0_TRX3_P	TRXP0[2]	I/O		QCA8075 PHY0 MDI pair 2
A6	P0_TRX3_N	TRXN0[2]	I/O		QCA8075 PHY0 MDI pair 2
D41	P0_TRX0_P	TRXP0[3]	I/O		QCA8075 PHY0 MDI pair 3
D42	P0_TRX0_N	TRXN0[3]	I/O		QCA8075 PHY0 MDI pair 3
A8	P1_TRX0_P	TRXP1[0]	I/O		QCA8075 PHY1 MDI pair 0
A9	P1_TRX0_N	TRXN1[0]	I/O		QCA8075 PHY1 MDI pair 0
A10	P1_TRX1_P	TRXP1[1]	I/O		QCA8075 PHY1 MDI pair 1
A11	P1_TRX1_N	TRXN1[1]	I/O		QCA8075 PHY1 MDI pair 1
A12	P1_TRX2_P	TRXP1[2]	I/O		QCA8075 PHY1 MDI pair 2
A13	P1_TRX2_N	TRXN1[2]	I/O		QCA8075 PHY1 MDI pair 2
A14	P1_TRX3_P	TRXP1[3]	I/O		QCA8075 PHY1 MDI pair 3
A15	P1_TRX3_N	TRXN1[3]	I/O		QCA8075 PHY1 MDI pair 3
A17	P2_TRX0_P	TRXP2[0]	I/O		QCA8075 PHY2 MDI pair 0
A18	P2_TRX0_N	TRXN2[0]	I/O		QCA8075 PHY2 MDI pair 0
A19	P2_TRX1_P	TRXP2[1]	I/O		QCA8075 PHY2 MDI pair 1
A20	P2_TRX1_N	TRXN2[1]	I/O		QCA8075 PHY2 MDI pair 1
A21	P2_TRX2_P	TRXP2[2]	I/O		QCA8075 PHY2 MDI pair 2
A22	P2_TRX2_N	TRXN2[2]	I/O		QCA8075 PHY2 MDI pair 2
A23	P2_TRX3_P	TRXP2[3]	I/O		QCA8075 PHY2 MDI pair 3
A24	P2_TRX3_N	TRXN2[3]	I/O		QCA8075 PHY2 MDI pair 3
A26	P3_TRX0_P	TRXP3[0]	I/O		QCA8075 PHY3 MDI pair 0
A27	P3_TRX0_N	TRXN3[0]	I/O		QCA8075 PHY3 MDI pair 0
A28	P3_TRX1_P	TRXP3[1]	I/O		QCA8075 PHY3 MDI pair 1
A29	P3_TRX1_N	TRXN3[1]	I/O		QCA8075 PHY3 MDI pair 1
A30	P3_TRX2_P	TRXP3[2]	I/O		QCA8075 PHY3 MDI pair 2
A31	P3_TRX2_N	TRXN3[2]	I/O		QCA8075 PHY3 MDI pair 2
A32	P3_TRX3_P	TRXP3[3]	I/O		QCA8075 PHY3 MDI pair 3
A33	P3_TRX3_N	TRXN3[3]	I/O		QCA8075 PHY3 MDI pair 3
A35	P4_TRX0_P	TRXP4[0]	I/O		QCA8075 PHY4 MDI pair 0
A36	P4_TRX0_N	TRXN4[0]	I/O		QCA8075 PHY4 MDI pair 0
A37	P4_TRX1_P	TRXP4[1]	I/O		QCA8075 PHY4 MDI pair 1
A38	P4_TRX1_N	TRXN4[1]	I/O		QCA8075 PHY4 MDI pair 1
A39	P4_TRX2_P	TRXP4[2]	I/O		QCA8075 PHY4 MDI pair 2
A40	P4_TRX2_N	TRXN4[2]	I/O		QCA8075 PHY4 MDI pair 2
A41	P4_TRX3_P	TRXP4[3]	I/O		QCA8075 PHY4 MDI pair 3
A42	P4_TRX3_N	TRXN4[3]	I/O		QCA8075 PHY4 MDI pair 3

* Remark: P: Power, D: Digital: In; O: Out; A: Analog

- SGMII

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
B2	USGMII1_TXP	USGMII0_TXP	I/O		Transmitter differential signal
B3	USGMII1_TXN	USGMII0_TXN	I/O		Transmitter differential signal
B5	USGMII1_RXP	USGMII0_RXP	I/O		Receiver differential signal

B6	USGMII1_RXN	USGMII0_RXN	I/O		Receiver differential signal

- USB

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
B8	USB0_DP	USB0_HS_DP	I/O		USB3.0 SS -
B9	USB0_DN	USB0_HS_DM	I/O		USB3.0 SS +
B11	USB0_TXP	USB0_SS_TXP	I/O		USB3.0 SS transmit data +
B12	USB0_TXN	USB0_SS_TXN	I/O		USB3.0 SS transmit data -
B14	USB0_RXP	USB0_SS_RXP	I/O		USB3.0 SS receive data +
B15	USB0_RXN	USB0_SS_RXN	I/O		USB3.0 SS receive data -
B17	USB1_DP	USB1_HS_DP	I/O		USB2.0 SS -
B18	USB1_DN	USB1_HS_DM	I/O		USB2.0 SS +

- PCIE3.0

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
B20	PCIE0_CLK_P	PCIE30_PHY0_REFCLK_P	DO		PCIe reference clock +
B21	PCIE0_CLK_N	PCIE30_PHY0_REFCLK_N	DO		PCIe reference clock -
B22	GND		PI		Ground
B23	PCIE0_RXP	PCIE0_PHY0_RXP	DI		PCIe receiver signal pad +
B24	PCIE0_RXN	PCIE0_PHY0_RXM	DI		PCIe receiver signal pad -
B25	GND		PI		Ground
B26	PCIE0_TXP	PCIE0_PHY0_TXP	DO		PCIe transmitter pad +
B27	PCIE0_TXN	PCIE0_PHY0_TXM	DO		PCIe transmitter pad -

- SDC/EMMC

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
B29	SDC1_D0	SDC1_DATA_0	I/O		Data0 for EMMC/SD
B30	SDC1_CLK	SDC1_CLK	I/O		SDC clock
B31	SDC1_D1	SDC1_DATA_1	I/O		Data1 for EMMC/SD
B32	SDC1_D2	SDC1_DATA_2	I/O		Data2 for EMMC/SD
B33	SDC1_D3	SDC1_DATA_3	I/O		Data3 for EMMC/SD
B34	SDC1_D5	SDC1_DATA_5	I/O		Data5 for EMMC/SD
B35	SDC1_D7	SDC1_DATA_7	I/O		Data7 for EMMC/SD
B36	SDC1_CMD	SDC1_CMD	I/O		SDC command
B37	SDC1_D6	SDC1_DATA_6	I/O		Data6 for EMMC/SD
B38	SDC1_D4	SDC1_DATA_4	I/O		Data4 for EMMC/SD

- MISC

Pin#	Pin Name	MTK Pin Name	I/O	GPIO#	Description
C36	PMIC_PWD_N		DI		Power management signal
C37	SYS_RSTOUT_N	RESOUT_N	DI		Reset output when chip is in reset

- Boot Configuration

Pin Name	Strapping Name	Description
GPIO3 GPIO10 GPIO17	Book Mode	Fast boot (boot interface select): 0: SPI-NOR 1: EMMC 2: Para NAND

		3: USB2.0 4: SPI-NOR-GPT

2 WiFi RF Specifications

		2.4GHz		5GHz	
BW	Data Rate	Tx Power	Rx Sensitivity	Tx Power	Rx Sensitivity
11b	1M	19	-93	NA	NA
	11M	17	-88	NA	NA
11g/a	6M	19	-93	19	-92
	54M	17	-86	16	-82
11n HT20	MCS0	19	-93	19	-92
	MCS7	14	-72	14	-73
11n HT40	MCS0	19	-90	19	-89
	MCS7	13	-70	14	-70
11ac VHT20	MCS0	19	-93	19	-92
	MCS9	12	-72	13	-68
11ac VHT40	MCS0	19	-90	19	-89
	MCS9	11	-64	13	-67
11ac VHT80	MCS0	NA	NA	19	-86
	MCS9	NA	NA	12	-61
11ax HE20	MCS0	19	-92	19	-88
	MCS11	11	-64	12	-68
11ax HE40	MCS0	19	-90	19	-86
	MCS11	11	-62	12	-60
11ax HE80	MCS0	NA	NA	19	-84
	MCS11	NA	NA	12	-56
11ax HE160	MCS0	NA	NA	19	-84
	MCS11	NA	NA	11	-54

3 Electronical Characteristics

3 Absolute Maximum Ratings

TBD

Pin Def	Min	Typical	Max	Unit	Remark
VIN	3.1	3.3	3.5	V	
GPIO	1.65	1.8	1.85	V	

4 Power Consumption

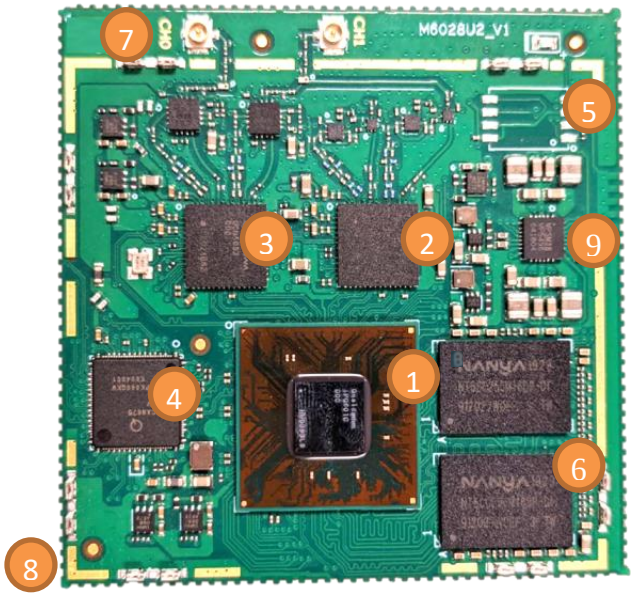
TBD

Mode	Voltage	Current	Power consumption	Condition
2.4GHz/5GHz + Tx/Rx 50%/50%				Both WiFi 2.4/5GHz clients are connected, iperf is running
2.4GHz only + Tx/Rx 50%/50%				WiFi 2.4Hz clients only are connected, iperf is running

5GHz only + Tx/Rx 50%/50%				WiFi 5GH clients only are connected, iperf is running
Standby				Memory retention mode WiFi is not associated with clients
WiFi is off				All power rails are Off, only Internal SOC RTC is powered

4 Mechanical

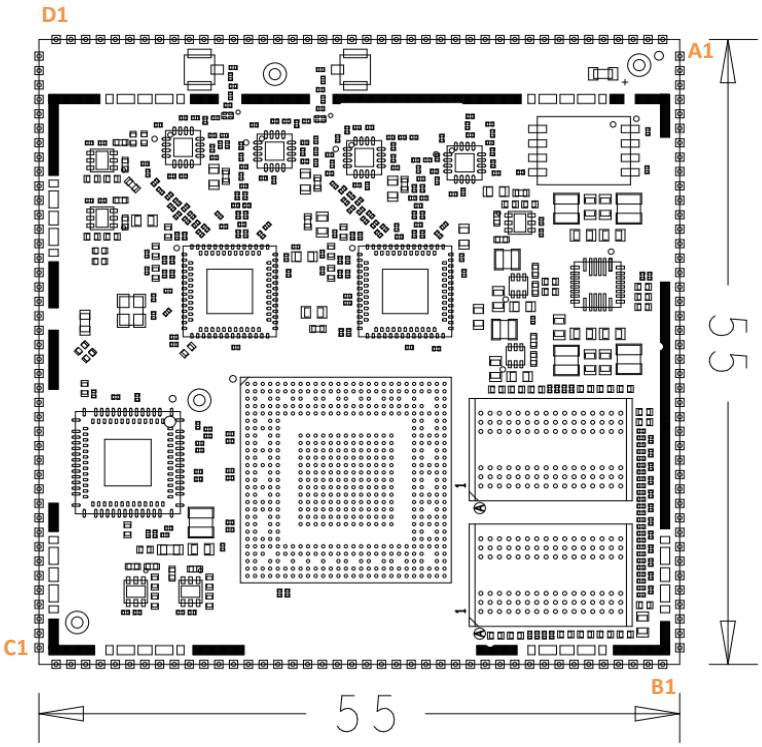
5 Key Components Location



1	IPQ6000
2	QCN5021
3	QCN5052
4	QCA8075
5	NOR Flash (reserved)

6	DDR3L
7	U.FL connectors
8	Solder down pads
9	PMIC IC MP5496GR
10	NAND Flash (back side)

6 Dimension



7 Pin Definition

Pin	Definition	I/O
A1	P0_TRX1_P	I/O
A2	P0_TRX1_N	I/O
A3	P0_TRX2_P	I/O
A4	P0_TRX2_N	I/O
A5	P0_TRX3_P	I/O
A6	P0_TRX3_N	I/O
A7	GND	PI
A8	P1_TRX0_P	I/O
A9	P1_TRX0_N	I/O
A10	P1_TRX1_P	I/O
A11	P1_TRX1_N	I/O
A12	P1_TRX2_P	I/O
A13	P1_TRX2_N	I/O
A14	P1_TRX3_P	I/O
A15	P1_TRX3_N	I/O
A16	GND	PI
A17	P2_TRX0_P	I/O
A18	P2_TRX0_N	I/O
A19	P2_TRX1_P	I/O
A20	P2_TRX1_N	I/O
A21	P2_TRX2_P	I/O
A22	P2_TRX2_N	I/O
A23	P2_TRX3_P	I/O
A24	P2_TRX3_N	I/O
A25	GND	PI

Pin	Definition	I/O
B1	GND	PI
B2	USGMII1_TXP	I/O
B3	USGMII1_TXN	I/O
B4	GND	PI
B5	USGMII1_RXP	I/O
B6	USGMII1_RXN	I/O
B7	GND	PI
B8	USB0_DP	I/O
B9	USB0_DN	I/O
B10	GND	PI
B11	USB0_TXP	I/O
B12	USB0_TXN	I/O
B13	GND	PI
B14	USB0_RXP	I/O
B15	USB0_RXN	I/O
B16	GND	PI
B17	USB1_DP	I/O
B18	USB1_DN	I/O
B19	GND	PI
B20	PCIE0_CLK_P	DO
B21	PCIE0_CLK_N	DO
B22	GND	PI
B23	PCIE0_RXP	DI
B24	PCIE0_RXN	DI
B25	GND	PI

Pin	Definition	I/O
C1	GPIO22	I/O
C2	GPIO52	I/O
C3	GPIO29	I/O
C4	GPIO32	I/O
C5	GPIO31	I/O
C6	GPIO35	I/O
C7	GPIO36	I/O
C8	GPIO24	I/O
C9	GPIO33	I/O
C10	GPIO26	I/O
C11	GPIO34	I/O
C12	GPIO25	I/O
C13	GPIO28	I/O
C14	GPIO27	I/O
C15	GPIO14	I/O
C16	GPIO15	I/O
C17	GPIO17	I/O
C18	GPIO12	I/O
C19	GPIO13	I/O
C20	GPIO8	I/O
C21	GPIO6	I/O
C22	GPIO4	I/O
C23	GPIO16	I/O
C24	GND	PI
C25	GND	PI

Pin	Definition	I/O
D1	GPIO53	I/O
D2	GPIO2	I/O
D3	GPIO5	I/O
D4	GPIO19	I/O
D5	GPIO1	I/O
D6	GPIO3	I/O
D7	GPIO21	I/O
D8	GPIO20	I/O
D9	GPIO18	I/O
D10	GPIO45_UART_TXD	I/O
D11	GPIO44_UART_RXD	I/O
D12	GPIO51	I/O
D13	GPIO60	I/O
D14	GPIO61	I/O
D15	GPIO59	I/O
D16	GPIO62	I/O
D17	GPIO58	I/O
D18	GND	PI
D19	GPIO63	I/O
D20	GPIO56	I/O
D21	GPIO57	I/O
D22	GPIO55	I/O
D23	GPIO54	I/O
D24	GPIO78	I/O
D25	GPIO48	I/O

A26	P3_TRX0_P	I/O	B26	PCIE0_TXP	DO	C26	GND	PI	D26	GND	PI
A27	P3_TRX0_N	I/O	B27	PCIE0_TXN	DO	C27	GND	PI	D27	GPIO74	I/O
A28	P3_TRX1_P	I/O	B28	GND	PI	C28	+3V3	PI	D28	GPIO67	I/O
A29	P3_TRX1_N	I/O	B29	SDC1_D0	I/O	C29	+3V3	PI	D29	GPIO49	I/O
A30	P3_TRX2_P	I/O	B30	SDC1_CLK	I/O	C30	+3V3	PI	D30	GPIO77	I/O
A31	P3_TRX2_N	I/O	B31	SDC1_D1	I/O	C31	+3V3	PI	D31	GPIO71	I/O
A32	P3_TRX3_P	I/O	B32	SDC1_D2	I/O	C32	GPIO11	I/O	D32	GPIO79	I/O
A33	P3_TRX3_N	I/O	B33	SDC1_D3	I/O	C33	GPIO7	I/O	D33	GPIO73	I/O
A34	GND	PI	B34	SDC1_D5	I/O	C34	GPIO0	I/O	D34	GPIO68	I/O
A35	P4_TRX0_P	I/O	B35	SDC1_D7	I/O	C35	GPIO9	I/O	D35	GPIO76	I/O
A36	P4_TRX0_N	I/O	B36	SDC1_CMD	I/O	C36	PMIC_PWD_N	DI	D36	GPIO72	I/O
A37	P4_TRX1_P	I/O	B37	SDC1_D6	I/O	C37	SYS_RSTOUT_N	DI	D37	GPIO69	I/O
A38	P4_TRX1_N	I/O	B38	SDC1_D4	I/O	C38	GPIO10	I/O	D38	GPIO70	I/O
A39	P4_TRX2_P	I/O	B39	GND	PI	C39	GPIO23	I/O	D39	GPIO66	I/O
A40	P4_TRX2_N	I/O	B40	GPIO30	I/O	C40	GPIO42	I/O	D40	GND	PI
A41	P4_TRX3_P	I/O	B41	GPIO37	I/O	C41	GPIO43	I/O	D41	P0_TRX0_P	I/O
A42	P4_TRX3_N	I/O	B42	GND	PI	C42	GND	PI	D42	P0_TRX0_N	I/O

* Remark: P: Power, D: Digital: In; O: Out; A: Analog

5 Package Information

8 Dimension

TBD

9 Reflow Profile Guideline

TBD