Qualcomm Technologies, Inc.

QCA4020 Module (M20)

Product Specification

80-YA501-121 Rev. B

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Revision history

Revision	Date	Description
A	February 2018	Initial release
B	March 2018	Updated the following: ▪ Figure 2-1 M20 front view ▪ Figure 2-2 M20 back view ▪ Section 2.4.2, M20 2.4 GHz power measurements ▪ Section 2.4.3, M20 5 GHz power measurements ▪ Section 2.4.4, BLE power measurements ▪ Section 2.4.5, 15.4 power measurements

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1 Introduction

The M20 module provides a highly-integrated and flexible platform for developing and evaluating products and applications based on the QCA4020 SoC. The M20 module can be either used with CDB20 development kit for software development or incorporated into OEM products to enable rapid deployment of Wi-Fi connected systems.

The M20 module includes the following components:

- QCA4020 chip (WLAN/BLE/15.4)
- A printed antenna
- 32 Mb NOR flash memory

The QCA4020 is a dual band 1x1 802.11 a/b/g/n device optimized for low-power embedded applications with single-stream capability for both Tx and Rx. It has an integrated network processor with a large set of TCP/IP with IPv4/IPv6-based services.

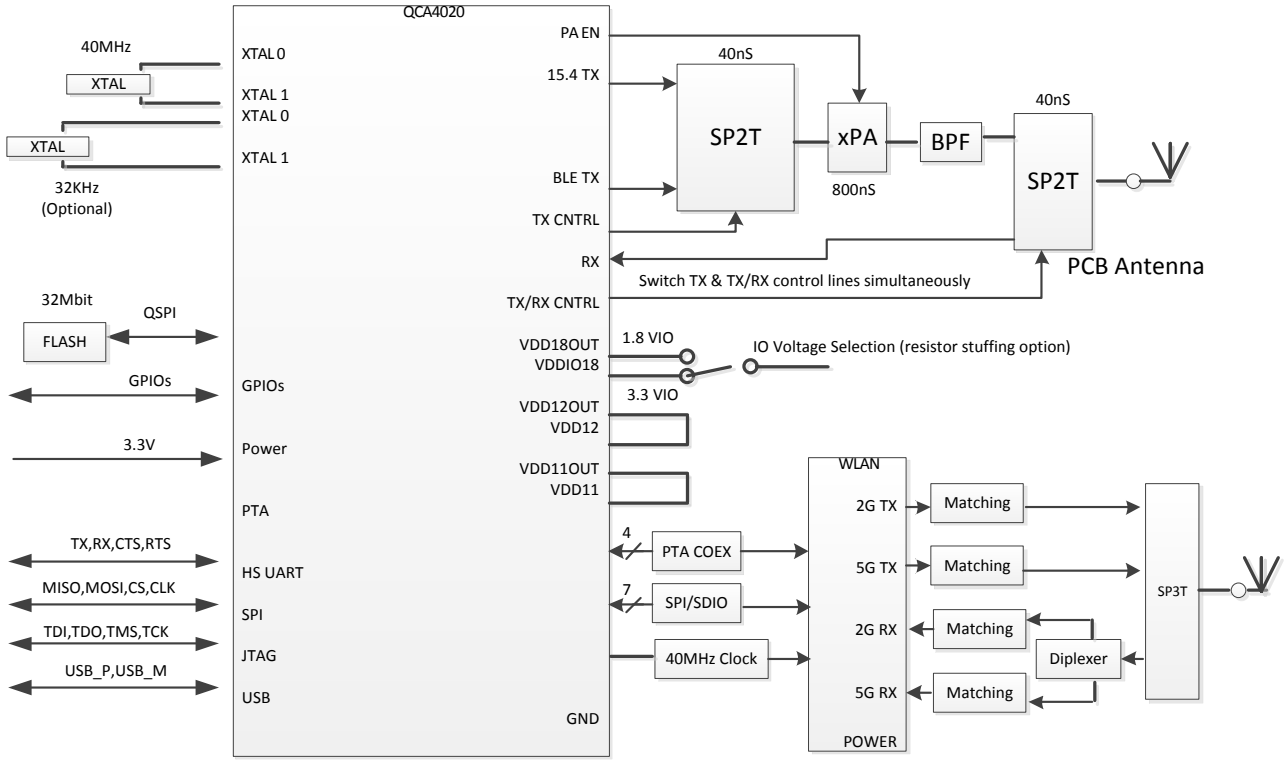

Figure 1-1 M20 block diagram

M20 Wi-Fi module features

- Dual-Band IEEE 802.11 a/b/g/n, single stream 1x1
- BLE 5.0
- ZigBee 15.4
- Green Tx power saving mode
- Low -power listen mode
- Four-layer PCB design
- Rich set of GPIO(s) and interfaces: I2C, HSUART, UART, SPI, QSPI, SDIO 2.0, I2S, JTAG, Sensor ADC (up to 8 channels, 12bit, 1Msps). Up to 8 PWM optimized for LED lighting applications.
- Secure boot and support for application-level AES encryption and image authentication hash function (SHA256)
- Advancement power management scheme to minimize power dissipation for each use case

M20 manufacturing interface

- USB 2.0 interface with integrated controller and PHY for manufacturing test and configuration

M20 host interfaces

- UART host interface to a remote microcontroller with an AT style command set

2 Hardware specification

2.1 M20 module pinout

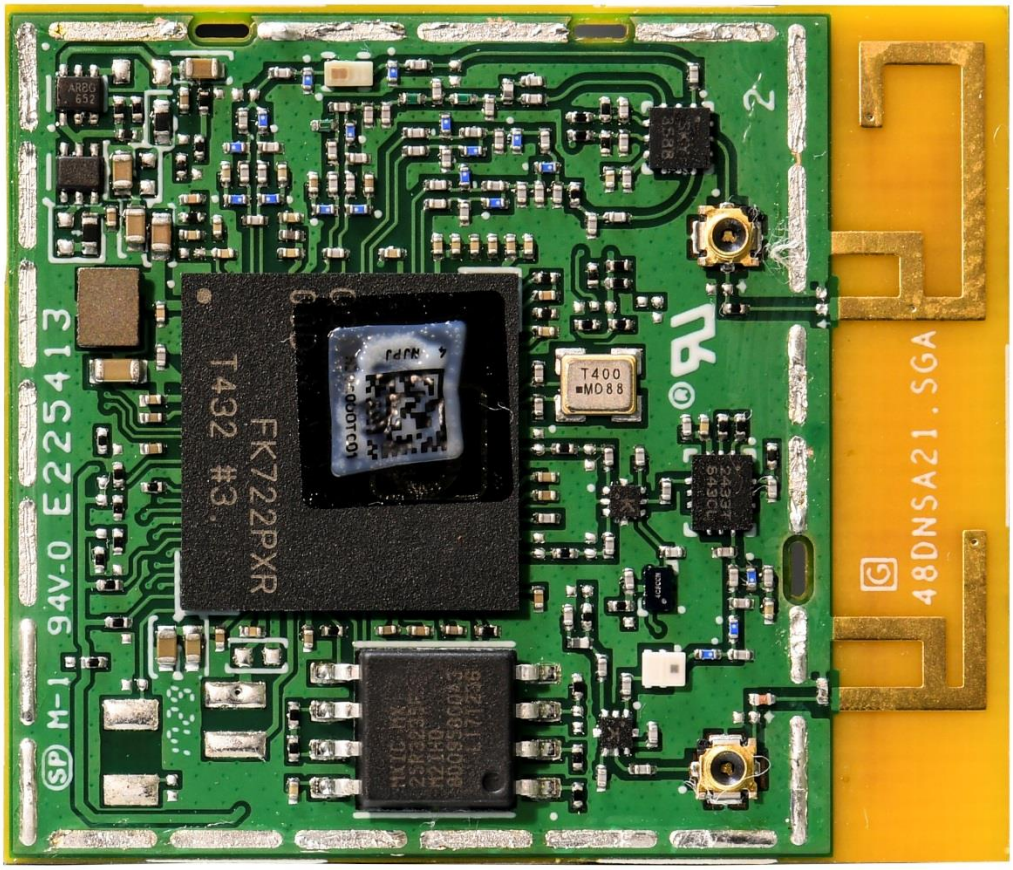

Figure 2-1 M20 front view

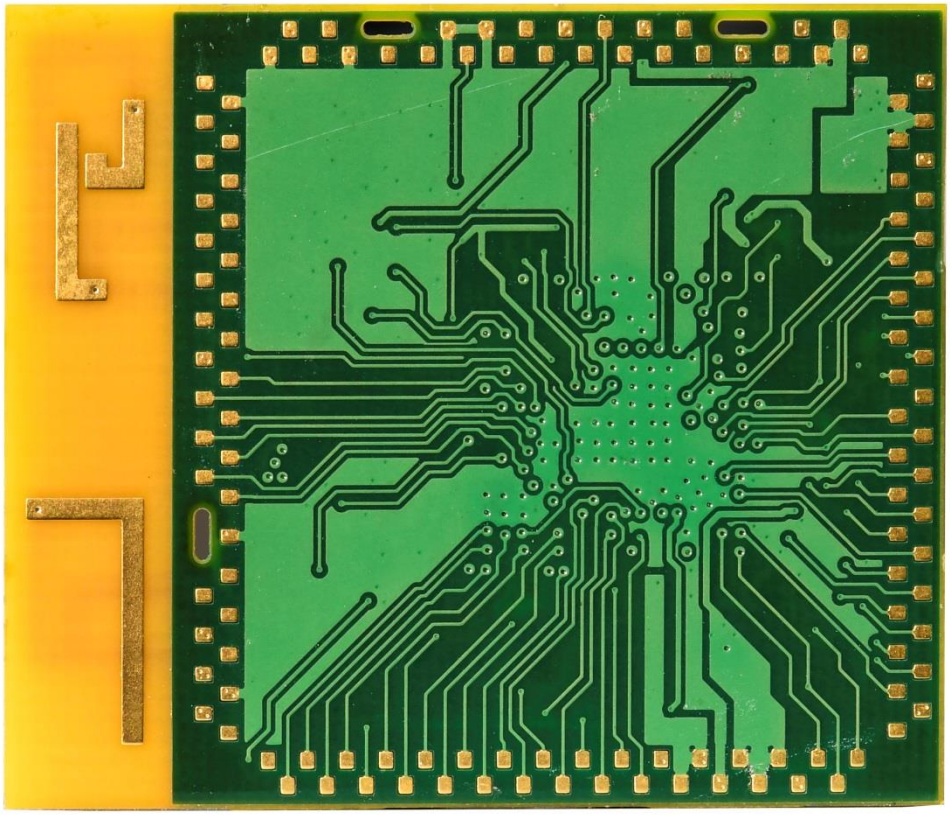

Figure 2-2 M20 back view

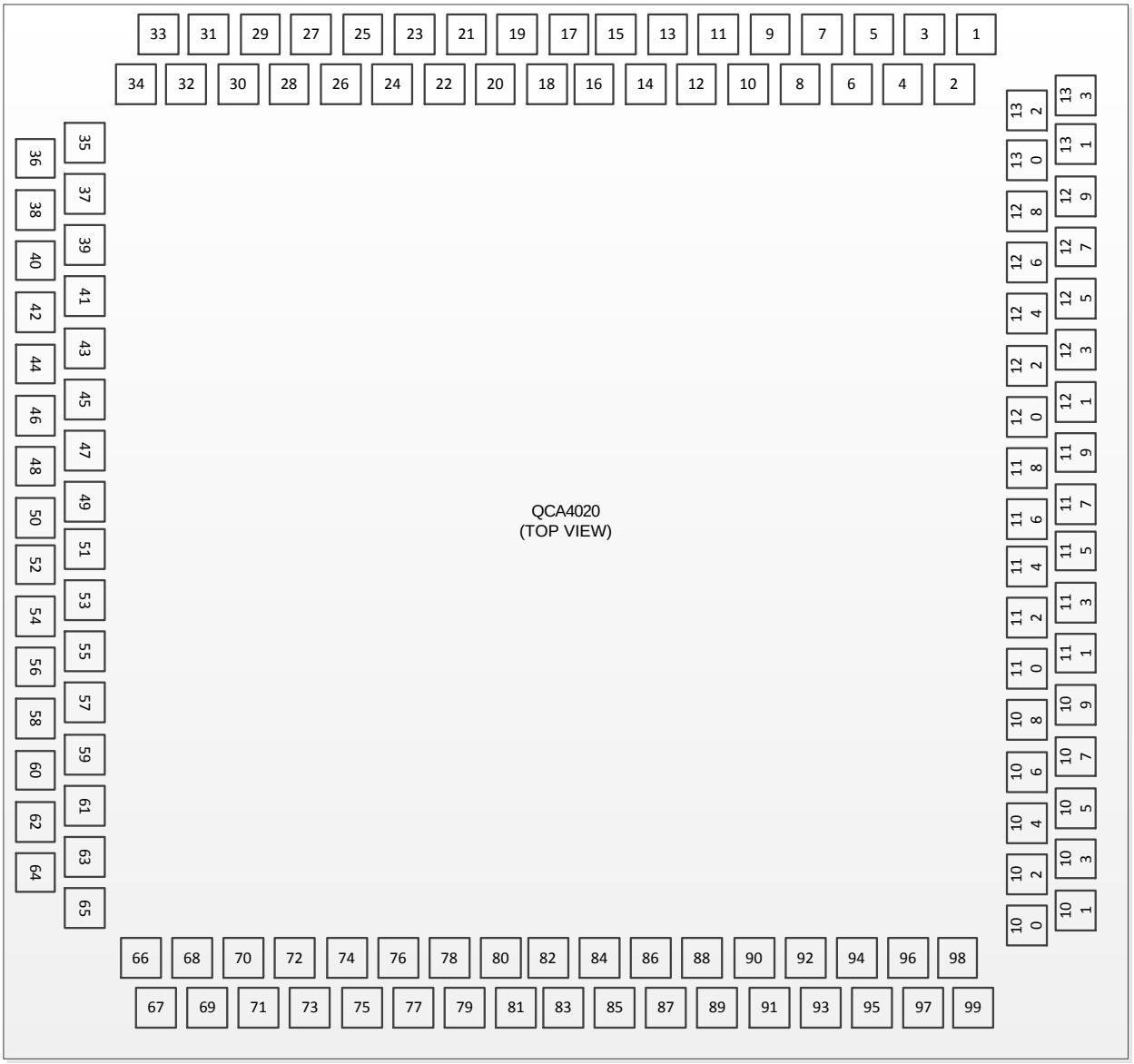

Figure 2-3 M20 pinout definition

Table 2-1 M20 module non-GPIO pinout definition

Pin #	Pin Name	Description
Power		
2-4	VBATT_BE	3.3V Input Power
Input Signals		
22	USB20_DM_BE	USB Differential Negative
23	USB20_DP_BE	USB Differential Positive
35	32K_XTALI	Optional external 32 KHz crystal
36	32K_XTALO	Optional external 32 KHz crystal
110	EXT_CLKOUT_BE	40MHz system clock output

Pin #	Pin Name	Description
27	SENSEADC_0_BE	12bit ADC, ADC 0 input
24	SENSEADC_1_BE	12bit ADC, ADC 1 input
37	CHIP_PWD_L_BE	BLE/15.4 Reset Pin
Ground		
1, 5, 33, 38, 42, 45, 67-69, 71, 76, 85, 98-101, 104, 109, 111, 115, 119, 124, 127, 130	GND	Ground
No Connect		
43,44	VDDIO18_BE	Not used, NC
39-41	VDD11_SWREG_OUT	Not used, NC
128, 129	VDDIO18_WL	Not used, NC
117	PWRDWN_OUT_N	Not used, NC
17	BYPASS_INT_PMU_MSK	Not used, NC
126	IOT_MODE_EN_WL	Not used, NC
7	WAKEUP_N	Not used, NC
13	USB_DPOS	USB Differential Positive, WLAN interface, Not used, NC
14	USB_DNEG	USB Differential Negative, WLAN interface, Not used, NC

Table 2-2 M20 module pinout definition and QCA4024 GPIO assignment

Pin #	Pin Name	Primary Function	SPI or I2C or QSPI	SDIO	*SD Memory Card*	UART	JTAG	PWMADC or SenseADC	PTA	Codec
84	GPIO4_BE	WL_WKUP_BE								
83	GPIO5_BE	GPIO_5							BT_ACTIVE	
81	GPIO6_BE	GPIO_6							WLAN_ACTIVE	
79	GPIO7_BE	GPIO_7							BT_PRIORITY	
61	GPIO8_BE	GPIO_8				M0&M4_UART0_RX	JTAG1_BE_TCK			
58	GPIO9_BE	GPIO_9				M0&M4_UART0_TX	JTAG1_BE_TDO			
59	GPIO10_BE	GPIO_10	I2C0_Master_SCL				JTAG1_BE_TMS			
56	GPIO11_BE	GPIO_11	I2C0_Master_SDA				JTAG1_BE_TDI			
32	GPIO12_BE	GPIO_12						pwm_out_0		

Pin #	Pin Name	Primary Function	SPI or I2C or QSPI	SDIO	*SD Memory Card*	UART	JTAG	PWMADC or SenseADC	PTA	Codec
54	GPIO13_BE	GPIO_13						pwm_out_7		
52	GPIO14_BE	GPIO_14				HS_UART0_DM_CTS				
55	GPIO15_BE	GPIO_15				HS_UART0_DM_TXD				
53	GPIO16_BE	SPI0_CS2_N	I2C1_Master_SCL			HS_UART0_DM_RFR			BT_ACTIVE	
51	GPIO17_BE	SPI0_CS1_N	I2C1_Master_SDA			HS_UART0_DM_RXD			WLAN_ACTIVE	
16	GPIO18_BE	GPIO_18	SPI_Slave_CLK	SDIO_Slave_CLK	SD_Master_CLK (O)	HS_UART1_DM_CTS		pwm_out_6		
11	GPIO19_BE	GPIO_19	SPI_Slave_CS_N	SDIO_Slave_CMD	SD_Master_CMD (B)	HS_UART1_DM_TXD		pwm_out_1		
15	GPIO20_BE	GPIO_20	SPI_SLAVE_MISO	SDIO_Slave_DATA_0	SD_Master_DATA_0 (B)	HS_UART1_DM_RXD		pwm_out_2		
19	GPIO21_BE	GPIO_21		SDIO_Slave_DATA_1	SD_Master_DATA_1 (B)			pwm_out_4		
26	GPIO22_BE	GPIO_22		SDIO_Slave_DATA_2	SD_Master_DATA_2 (B)			pwm_out_3		
21	GPIO23_BE	GPIO_23	SPI_SLAVE_MOSI	SDIO_Slave_DATA_3	SD_Master_DATA_3 (B)	HS_UART1_DM_RFR		pwm_out_5		
29	GPIO24_BE	GPIO_24	SPI0_Master_CS_N			M0&M4_UART2_RX	JTAG2_BE_TCK			
31	GPIO25_BE	GPIO_25	SPI0_Master_CLK			M0&M4_UART2_TX	JTAG2_BE_TDO			
28	GPIO26_BE	GPIO_26	SPI0_Master_MOSI				JTAG2_BE_TMS			
30	GPIO27_BE	GPIO_27	SPI0_Master_MISO				JTAG2_BE_TDI			
46	GPIO28_BE	GPIO_28								I2S_BCLK
47	GPIO29_BE	GPIO_29								I2S_RXD
48	GPIO30_BE	GPIO_30								I2S_TXD
50	GPIO31_BE	GPIO_31								I2S_FSYNC

Pin #	Pin Name	Primary Function	SPI or I2C or QSPI	SDIO	*SD Memory Card*	UART	JTAG	PWMADC or SenseADC	PTA	Codec
49	GPIO32_BE	GPIO_32								I2S_MCLK
10	GPIO33_BE	CHIP_PWD_L_WL								
80	GPIO41_BE	PWR_STATUS								
57	GPIO48_BE	Ext_32K_IN								
64	GPIO49_BE	GPIO_49								
78	GPIO50_BE	GPIO_50					JTAG3_BE_TCK			
63	GPIO51_BE	GPIO_51					JTAG3_BE_TDO			
62	GPIO52_BE	GPIO_52					JTAG3_BE_TMS			
60	GPIO53_BE	GPIO_53					JTAG3_BE_TDI			
25	GPIO54_BE	GPIO_54						SENSEADC2		
20	GPIO55_BE	GPIO_55						SENSEADC3		
18	GPIO56_BE	GPIO_56						SENSEADC4		
12	GPIO57_BE	GPIO_57						SENSEADC5		
9	GPIO58_BE	GPIO_58						SENSEADC6		
8	GPIO59_BE	GPIO_59				HS_UART2_DM_CTS(I)		SENSEADC7		
82	GPIO60_BE	GPIO_60				HS_UART2_DM_TXD(O)			BT_PRIORITY	

2.2 M20 interface summary

- 2x I2C Master Interface
- 1x High speed UART
  - Up to 3Mbps data rate
- 1x UART
  - Up to 115200 kbps data rate

- 1x I2S
- 1x JTAG
- 1x ADC Sense
- 1x USB2.0 interface
- 1x SPI Interface

2.3 Bootstrap signals

Table 2-3 Bootstrap mode

GPIO9_BE	GPIO22_BE	Description
0	0	Force M4 to load image from flash memory (Default)
0	1	Force M4 to boot in EDL (Emergency Download Mode).

Table 2-4 JTAG mode

GPIO9_BE	GPIO25_BE	GPIO18_BE	Description
0	0	0	No JTAG enabled
0	0	1	JTAG Pins on GPIO[53:50]_BE
0	1	0	JTAG Pins on GPIO[11:8]_BE
0	1	1	JTAG Pins on GPIO[27:24]_BE
1	X	X	Not Allowed

Table 2-5 XTAL mode

GPIO23_BE	Description
0	40MHz Xtal
1	Not Allowed

Table 2-6 32.768KHz Sleep Clock Mode

GPIO21_BE	GPIO20_BE	Description
0	0	Chip Internal LPO
0	1	External Crystal 32.768KHz
1	0	External 32.768KHz TCXO Clock connected to GPIO_48_BE
1	1	Not Allowed

2.4 Electrical characteristics

2.4.1 General DC electrical characteristics

These conditions apply to all DC characteristics unless otherwise specified: T_{amb} = 25 °C, VBATT BE = 3.3 V

Table 2-7 DC electrical characteristics for digital I/Os

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High level I voltage	–	2.4	–	3.6	V
V_{IL}	Low level I voltage	–	-0.3	–	0.3	V
V_{OH}	High level O voltage	–	3.0	–	3.3	V
V_{OL}	Low level O voltage	–	-0.3	–	0.4	V

2.4.2 M20 2.4 GHz power measurements

Table 2-8 2.4 GHz power measurements at antenna port at 25°C, 3.3V nominal

Standard	Modulation	Index	Typical Tx Compliant Power[1]	Rx Sensitivity	Unit
802.11b	BPSK	1 Mbps	17	-94	dBm
	QPSK	2 Mbps	17	-91.5	dBm
	CCK	5.5 Mbps	17	n/a	dBm
	CCK	11 Mbps	17	-87	dBm
802.11g	BPSK	6Mbps	17	-91.5	dBm
	64 QAM	54Mbps	13	-75	dBm
802.11n HT20	BPSK	MCS0_40	17	-92	dBm
	64 QAM	MCS7_20	12	-71.5	dBm
802.11n HT40	BPSK	MCS0_40	14	-89.5	dBm
	64 QAM	MCS7_40	11	-69.5	dBm

2.4.3 M20 5 GHz power measurements

Table 2-9 5 GHz power measurements at antenna port at 25°C, 3.3V nominal

Standard	Modulation	Index	Typical Tx Compliant Power[2]	Rx Sensitivity	Unit
802.11a	BPSK	6 Mbps	12	-89.5	dBm
	64 QAM	54 Mbps	7	-72.5	dBm
802.11n HT20	BPSK	MCS0_20	11	-89.5	dBm
	64 QAM	MCS7_20	6	-69.5	dBm
802.11n HT40	BPSK	MCS0_40	11	-86.5	dBm
	64 QAM	MCS7_40	5	-65	dBm

[1] Numbers shown based on OLPC per board calibration
[2] Numbers shown based on OLPC per board calibration

2.4.4 BLE power measurements

Table 2-10 BLE power measurements at antenna port at 25°C, 3.3V nominal with external PA

Parameter	Description	Typical	Unit
Tx Power	BT LE 1M	7	dBm
	BT LE 2M	7	dBm
Rx Sensitivity	BT LE 1M	-93	dBm
	BT LE 2M	-93	dBm

2.4.5 15.4 power measurements

Table 2-11 15.4 power measurements at antenna port at 25°C, 3.3V nominal with external PA

Parameter	Description	Typical	Unit
Tx power	O-QPSK DSSS	17	dBm
Rx Sensitivity	O-QPSK DSSS	-101	dBm

3 Mechanical interface specification

3.1 M20 module dimensions

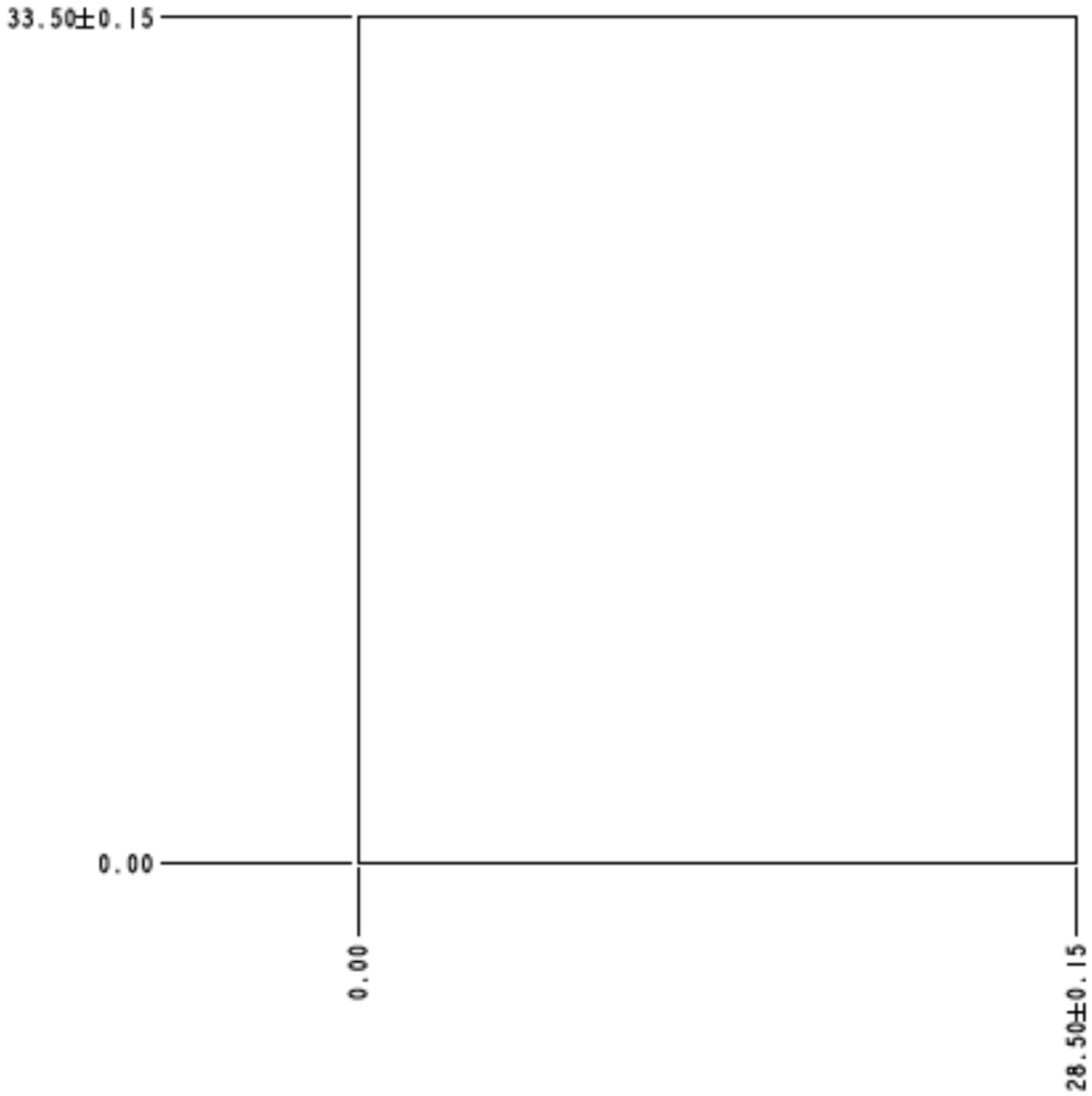

Figure 3-1 M20 module dimensions

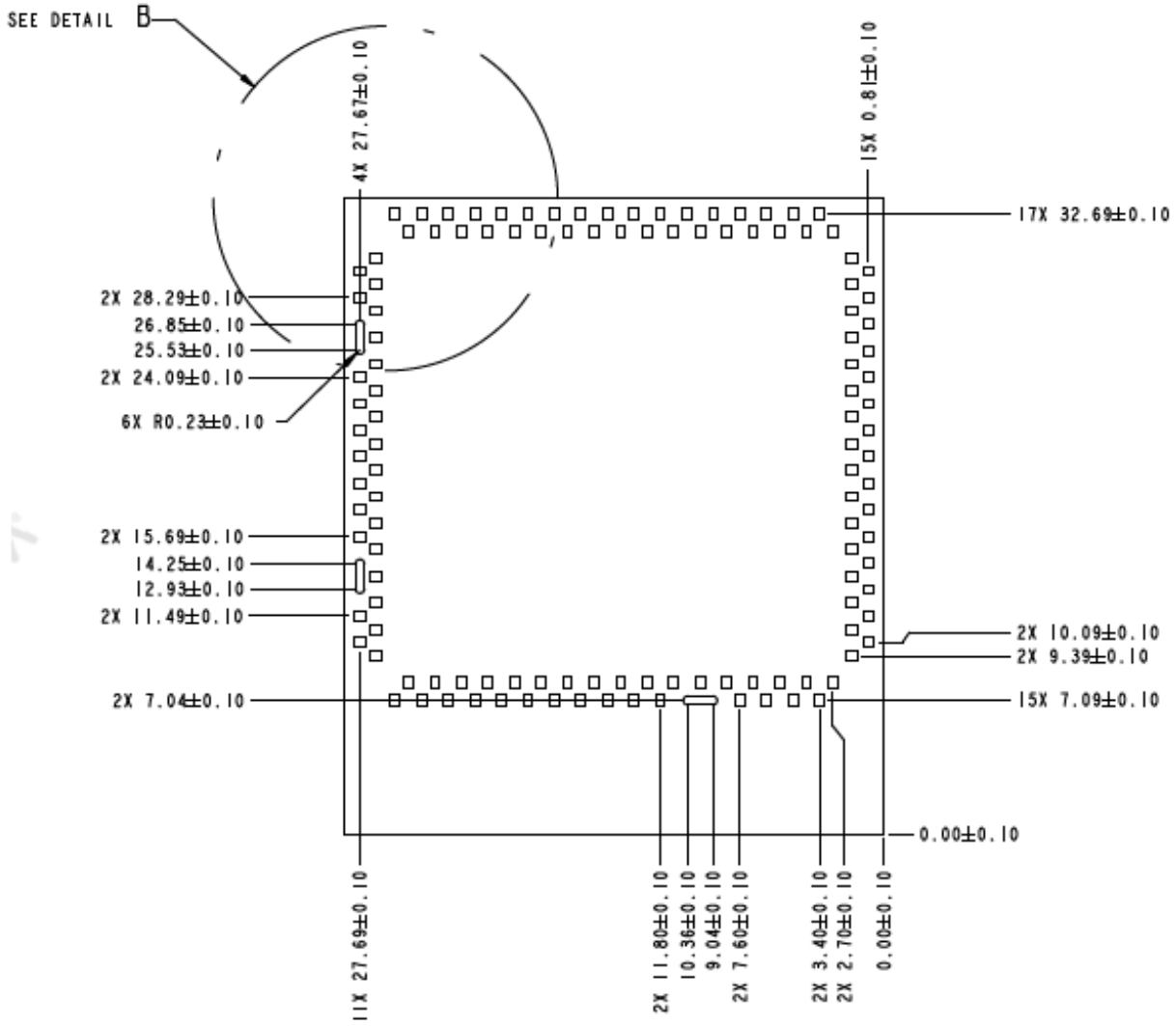

Figure 3-2 M20 module pinout dimensions (in mm)

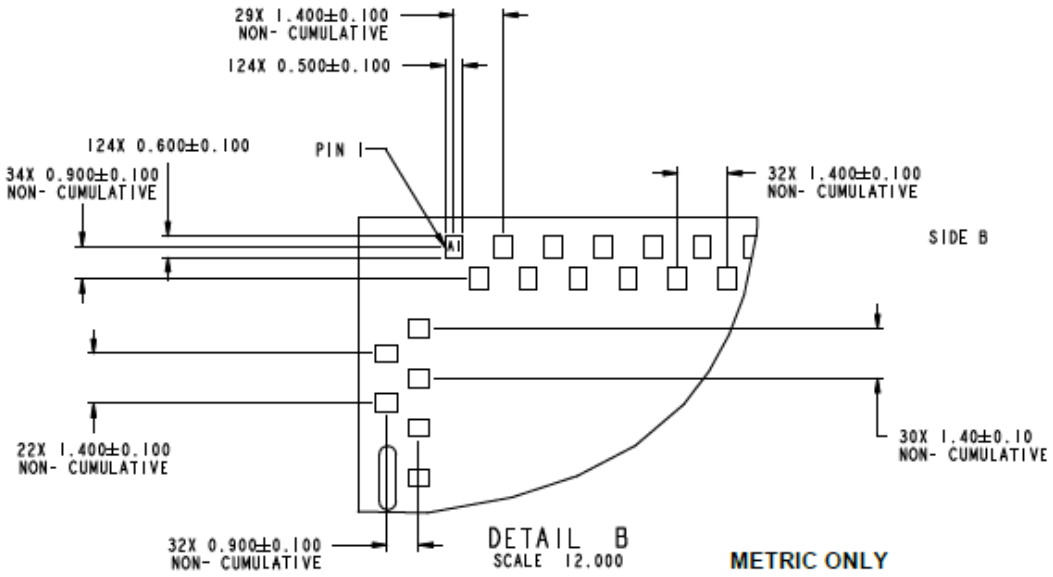

Figure 3-3 M20 module pinout dimensions-Detail B (in mm)