

Datasheet

Sona™ MT320

Version 1.2

Revision History

Version	Date	Notes	Contributors	Approver
0.1	22 Sept. 2023	Initial version	Various	Andy Ross
0.2	5 Feb 2024	Update BT standard to 5.4	Andrew Chen	Andy Ross
1.0	2 April 2024	Updated with new Ezurio format and removed Regulatory statements from 16 Regulatory .	Olivia Chang	Dave Drogowski
1.1	13 Sep 2024	Added RIG links to Regulatory section	Olivia Chang	Dave Drogowski
1.2	30 Oct 2024	Updated Bluetooth Qualification process	Dave Drogowski	Jonathan Kaye

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1 Scope

This document describes key hardware aspects of the Ezurio Sona™ MT320 series wireless modules providing SDIO 3.0 interface for WLAN connection and Bluetooth® connection. This document is intended to assist device manufacturers and related parties with the integration of this radio into their host devices. Data in this document is drawn from several sources and includes information found in the Mediatek MT7921LSN data sheet issued on September 07, 2021, along with other documents provided by Mediatek.

Note: The information in this document is subject to change. Please contact Ezurio to obtain the most recent version of this document.

2 Introduction

2.1 General Description

The Sona MT320 series wireless module is an integrated, small form factor 802.11 a/b/g/n/ac/ax dual-band Wi-Fi and a Bluetooth v5.4 system in SDIO 3.0 interface. Sona MT320 integrates MediaTek MT7921LSN SoC with a 32-bit RISC MCU that handles Wi-fi and Bluetooth protocols that provide easy to use for platform integration.

There are two physical sizes for Ezurio Sona MT320 M.2 module. One (M.2 2230) is following the standard M.2 2230, the other one (M.2 1420) is footprint compatible to the standard M.2 1216 but **with module PCB size extended to 14X20mm**.

This device is pre-calibrated and integrates the complete transmit/receive RF paths including bandpass filter, diplexer, switches, reference crystal oscillator, and power management units (PMU). Both variants support two RF output ports, one (ANT0) for WLAN only and the other (ANT1) is shared between WLAN and Bluetooth.

The M.2 1420 solder down module also supports an RF trace pin option for use with external antenna solutions. For a list of certified antennas see in the datasheet.

The Sona MT320 series device supports IEEE 802.11ax 2x2 MIMO with data rates up to MCS11. The device's low power consumption, radio architecture and power management unit (PMU) proprietary power save technologies allow for extended battery life.

The Sona MT320 series wireless modules include three product SKUs which have different RF paths. Please contact Ezurio Sales/FAE for further information. Ordering information is listed in [Table 1](#).

Table 1: Product ordering information

Part Number	Product Description
453-00176R	Module, Sona MT320, M.2 1420, MHF4, Tape and Reel
453-00176C	Module, Sona MT320, M.2 1420, MHF4, Cut Tape
453-00177R	Module, Sona MT320, M.2 1420, Trace Pin, Tape and Reel
453-00177C	Module, Sona MT320, M.2 1420, Trace Pin, Cut Tape
453-00178	Module, Sona MT320, M.2 2230, Key E, SDIO

2.2 Sona MT320 Series Features Summary

The Ezurio Sona MT320 series device features are described in [Table 2](#).

Table 2: Sona MT320 series wireless module features

Feature	Description
Radio Front End	- Integrates the complete transmit/receive RF paths including bandpass filter, diplexer, switches, reference crystal oscillator, and power manage unit (PMU) - Supports dual band (2.4/5 GHz) - Supports 20/40/80 MHz channel bandwidth. - Supports 2x2 MIMO, one antenna dedicates for WLAN, the other is shared with BT.
Power Management	Two buck regulator, multiple LDO regulators, and a power management unit (PMU) are integrated into the MT7921LSN. All regulators are programmable via the PMU. These blocks simplify power supply design for Bluetooth and WLAN functions in embedded designs.
Pre-Calibration	RF system tested and calibrated in production
Host Interface	SDIO 3.0 for WLAN and BT.
Advanced WLAN	- IEEE 802.11a/b/g/n/ac/ax compliant, dual-band capable (2.4/5 GHz) 2x2 MIMO, supports 20, 40, and 80 MHz channels with optional SGI (1024-QAM modulation) - DFS radar detection. - On-chip power amplifiers and low-noise amplifiers for both bands. - Security support for WFA WPA/WPA2/WPA3 personal, WPS2.0, WAPI
Advanced Bluetooth	- Bluetooth 5.4 (BDR + EDR + Bluetooth LE) - Bluetooth Class 1 or Class 2 transmitter operation - Support data rate: 1 Mbps (GFSK), 2 Mbps ($\pi/4$-DQPSK), 3 Mbps (8-DPSK), LE-1 Mbps, LE-2 Mbps - Fully functional Bluetooth baseband: AFH, forward error correction, header error control, access code correlation, CRC, whitening. - Single-ended, RF port with integrated Balun and T/R switch, Integrated high efficiency PA and TSSI

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2.3 Specifications

Table 3: Specifications

Feature	Description	
Physical Interface	M.2 2230 E-Key standard form factor M.2 1420 108-pin LGA package (including 8 thermal ground pads under the package)	
Wi-Fi/BT Interface	Secure Digital I/O 2.0/3.0	
Main Chipset	Mediatek MT7921LSN	
Input Voltage Requirements	Typical DC 3.3 V, operating range from DC 3.13V to 3.6V	
I/O Signalling Voltage	Compliant with M.2 standard Typical DC 1.8 V $\pm$ 10%	
Operating Temperature	-40° to +85°C (-40° to +185°F)	
Operating Humidity	10 to 90% (non-condensing)	
Storage Temperature	-40° to +85°C (-40° to +185°F)	
Storage Humidity	10 to 90% (non-condensing)	
MSL (Moisture Sensitivity Level)	4	
Maximum Electrostatic Discharge	Conductive 4KV; Air coupled 8KV (follows EN61000-4-2)	
Size	M.2 1420 - Length: 20 mm - Width: 14 mm - Thickness: 2.42 mm	M.2 E-Key - Length: 30 mm - Width: 22 mm - Thickness: 2.3 mm
Weight – g (oz.)	M.2 1420 ~1.0	M.2 E-Key 2.5
Wi-Fi Media	Direct Sequence-Spread Spectrum (DSSS) Complementary Code Keying (CCK) Orthogonal Frequency Division Multiplexing (OFDM) Orthogonal Frequency Division Multiple Access (OFDMA)	
Bluetooth Media	Frequency Hopping Spread Spectrum (FHSS)	
Wi-Fi Multimedia	WMM Wi-Fi Multimedia - PowerSave (WMM-PS)	
Network Architecture Types	Infrastructure (client operation)	
Wi-Fi Standards	IEEE 802.11ax, 11ac, 11a/b/g/n, 11d/h, 11i, 11r, 11w, 11e, 11k, 11j, 11v	
Bluetooth Standards	Bluetooth 2.1 + EDR, 3.0, 4.2, 5.0, 5.1, 5.2, 5.3	
Wi-Fi Data Rates Supported	Support 802.11 ax/ac/a/b/g/n 2x2 MU-MIMO. 802.11b (DSSS, CCK) 1, 2, 5.5, 11 Mbps 802.11a/g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (OFDM, HT20/HT40, MCS0-15) 802.11ac (OFDM, VHT20, MCS0-8; OFDM, VHT40/HT80, MCS0-9) 802.11ax (2.4 GHz / OFDM / HE20 / MCS0-11; 2.4 GHz / OFDMA / HE20 / MCS0-11) 802.11ax (5 GHz / OFDM / HE20, HE40, HE80 / MCS0-11; 5 GHz / OFDMA / HE20, HE40, HE80 / MCS0-11)	
Modulation Table	BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM	

Modulation Type					OFDM (IEEE 802.11n/ac)												OFDM (IEEE 802.11ax)											
MCS Index			Spatial Stream	Modulation	Coding	20MHz		40MHz		80MHz		20MHz			40MHz			80MHz										
HT	VHT	HE				0.8us GI	0.4us GI	0.8us GI	0.4us GI	0.8us GI	0.4us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI								
0	0	0	1	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	65	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6							
1	1	1	1	QPSK	1/2	13	14.4	27	30	58.5	65	129	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3							
2	2	2	1	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	195	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9							
3	3	3	1	16-QAM	1/2	26	28.9	54	60	117	130	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5							
4	4	4	1	16-QAM	3/4	39	43.3	81	90	175.5	195	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8							
5	5	5	1	64-QAM	2/3	52	57.8	108	120	234	260	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245							
6	6	6	1	64-QAM	3/4	78	86.7	162	180	351	390	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5							
7	7	7	1	64-QAM	5/6	65	72.2	135	150	292.5	325	650	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3							
8	8	8	1	256-QAM	3/4	78	86.7	162	180	351	390	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5							
9	9	9	1	256-QAM	5/6	N/A	N/A	180	200	390	433.3	866.7	114	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3							
10	10	10	1	1024-QAM	3/4	N/A	N/A	180	200	390	433.3	866.7	114	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3							
11	11	11	1	1024-QAM	5/6	N/A	N/A	180	200	390	433.3	866.7	114	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3							
8	0	0	2	BPSK	1/2	13	14.4	27	30	58.5	65	129	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3							
9	1	1	2	QPSK	1/2	26	28.9	54	60	117	130	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5							
10	2	2	2	QPSK	3/4	39	43.3	81	90	175.5	195	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8							
11	3	3	2	16-QAM	1/2	52	57.8	108	120	234	260	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245							
12	4	4	2	16-QAM	3/4	78	86.7	162	180	351	390	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5							
13	5	5	2	64-QAM	2/3	104	115.6	216	240	468	520	1040	137.6	130	117	275.3	260	234	576.5	544.4	490							
14	6	6	2	64-QAM	3/4	156	173.3	324	360	702	780	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735							
15	7	7	2	64-QAM	5/6	130	144.4	270	300	585	650	1300	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5							
8	8	8	2	256-QAM	3/4	156	173.3	324	360	702	780	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735							
9	9	9	2	256-QAM	5/6	N/A	N/A	360	400	780	866.7	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7							
10	10	10	2	1024-QAM	3/4	N/A	N/A	360	400	780	866.7	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7							
11	11	11	2	1024-QAM	5/6	N/A	N/A	360	400	780	866.7	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7							

OFDMA (IEEE 802.11ax)					26-tone RU			52-tone RU			106-tone RU			242-tone RU			484-tone RU			996-tone RU		
MCS Index	Spatial Stream	Modulation	Coding		0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI	0.8us GI	1.6us GI	3.2us GI
0	1	BPSK	1/2	0.9	0.8	0.8	1.8	1.7	1.5	3.8	3.5	3.2	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6	
1	1	QPSK	1/2	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	
2	1	QPSK	3/4	2.6	2.5	2.3	5.3	5	4.5	11.3	10.6	9.6	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	
3	1	16-QAM	1/2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	
4	1	16-QAM	3/4	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	
5	1	64-QAM	2/3	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	
6	1	64-QAM	3/4	7.9	7.5	6.8	15.9	15	13.5	33.8	31.9	28.7	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	
7	1	64-QAM	5/6	8.8	8.3	7.5	17.6	16.7	15	37.5	35.4	31.9	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	
8	1	256-QAM	3/4	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	
9	1	256-QAM	5/6	11.8	11.1	10	23.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	
10	1	1024-QAM	3/4	13.2	12.5	11.3	26.5	25	22.5	56.3	53.1	47.8	129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	
11	1	1024-QAM	5/6	14.7	13.9	12.5	29.4	27.8	25	62.5	59	53.1	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	
0	2	BPSK	1/2	1.8	1.7	1.5	3.5	3.3	3	7.5	7.1	6.4	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	
1	2	QPSK	1/2	3.5	3.3	3	7.1	6.7	6	15	14.2	12.8	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	
2	2	QPSK	3/4	5.3	5	4.5	10.6	10	9	22.5	21.3	19.1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	
3	2	16-QAM	1/2	7.1	6.7	6	14.1	13.3	12	30	28.3	25.5	68.8	65	58.5	137.6	130	117	288.2	272.2	245	
4	2	16-QAM	3/4	10.6	10	9	21.2	20	18	45	42.5	38.3	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	
5	2	64-QAM	2/3	14.1	13.3	12	28.2	26.7	24	60	56.7	51	137.6	130	117	275.3	260	234	576.5	544.4	490	
6	2	64-QAM	3/4	15.9	15	13.5	31.8	30	27	67.5	63.8	57.4	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	
7	2	64-QAM	5/6	17.6	16.7	15	35.3	33.3	30	75	70.8	63.8	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	
8	2	256-QAM	3/4	21.2	20	18	42.4	40	36	90	85	76.5	206.5	195	175.5	412.9	390	351	864.7	816.7	735	
9	2	256-QAM	5/6	23.5	22.2	20	47.1	44.4	40	100	94.4	85	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	
10	2	1024-QAM	3/4	26.5	25	22.5	52.9	50	45	112.5	106.3	95.6	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	
11	2	1024-QAM	5/6	29.4	27.8	25	58.8	55.6	50	125	118.1	106.3	286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	

802.11ax/ac/n Spatial Streams

2 (2x2 MU-MIMO)

Bluetooth Data Rates Supported

1, 2, 3 Mbps

Bluetooth Modulation

GFSK @ 1 Mbps

PI/4-DQPSK @ 2 Mbps

8-DPSK @ 3 Mbps

Bluetooth LE Data Rates Supported

1, 2 Mbps, 500 Kbps (S=2), 125 Kbps (S=8)

Bluetooth LE Modulation

GFSK @ 1, 2 Mbps

GFSK @ 125, 500 Kbps

Regulatory Certifications

United States (FCC)

EU - Member countries of European Union (ETSI)

Great Britain (UKCA)

Canada (ISED)

Australia (RCM): **To be added in the feature.**

Japan (MIC): **To be added in the feature.**

2.4 GHz Frequency Bands

EU: 2.4 GHz to 2.483 GHz

FCC/ISED: 2.4 GHz to 2.473 GHz

UKCA: 2.4 GHz to 2.483 GHz

MIC: 2.4 GHz to 2.483 GHz

RCM: 2.4 GHz to 2.483 GHz

2.4 GHz Operating Channels

(Wi-Fi)

EU: 13 (3 non-overlapping)

FCC/ISED: 11 (3 non-overlapping)

UKCA: 13 (3 non-overlapping)

MIC: 13 (4 non-overlapping)

RCM: 13 (3 non-overlapping)

5 GHz Frequency Bands
EU

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.725 GHz (Ch 100/104/108/112/116/120/124/128/132/136/140)
 5.725 GHz to 5.85 GHz (Ch 149/153/157/161/165)

FCC

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.725 GHz (Ch 100/104/108/112/116/120/124/128/132/136/140/144)
 5.725 GHz to 5.85 GHz (Ch 149/153/157/161/165)

ISED

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.725 GHz (Ch 100/104/108/112/116/132/136/140/144)
 5.725 GHz to 5.85 GHz (Ch 149/153/157/161/165)

UKCA

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.730 GHz (Ch 100/104/108/112/116/120/124/128/132/136/140/144)
 5.725 GHz to 5.850 GHz (Ch 149/153/157/161/165)

MIC

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.725 GHz (Ch 100/104/108/112/116/120/124/128/132/136/140)

RCM

5.15 GHz to 5.35 GHz (Ch 36/40/44/48/52/56/60/64)
 5.47 GHz to 5.725 GHz (Ch 100/104/108/112/116/132/136/140)
 5.725 GHz to 5.85 GHz (Ch 149/153/157/161/165)

5 GHz Operating Channels (Wi-Fi)

EU: 24 non-overlapping; FCC: 25 non-overlapping
 ISD: 22 non-overlapping; MIC: 19 non-overlapping
 RCM: 21 non-overlapping; UKCA: 25 non-overlapping

Transmit Power
802.11a

Note: Transmit power on each channel varies per individual country regulations. All values are nominal with +/-2 dBm tolerance at room temperature.

Tolerance could be up to +/-2.5 dBm across operating temperature.

6 Mbps	16.5 dBm (44.66mW)
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54 Mbps	16 dBm (39.81mW)
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802.11b

1 Mbps	17 dBm (50.11 mW)
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11 Mbps	17 dBm (50.11mW)
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802.11g
Note:

HT20/VHT20/HE20 –

20 MHz-wide channels

HT40/VHT40/HE40 –

40 MHz-wide channels

HT80/VHT80/HE80 –

80 MHz-wide channels

6 Mbps	16.5 dBm (44.66 mW)
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54 Mbps	16 dBm (39.81 mW)
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802.11n (2.4 GHz)

HT20; MCS0-4, MCS8-12	16 dBm (39.81 mW)
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HT20; MCS5-7, MCS13-15	15 dBm (31.62 mW)
------------------------	-------------------

802.11ax (2.4 GHz)

HE20; MCS0-4	16 dBm (39.81 mW)
--------------	-------------------

HE20; MCS5-7	15 dBm (31.62 mW)
--------------	-------------------

HE20; MCS8-9	14 dBm (25.12 mW)
--------------	-------------------

HE20; MCS10-11	14 dBm (25.12 mW)
----------------	-------------------

802.11n (5 GHz)

HT20; MCS0-4, MCS8-12	16.5 dBm (44.66 mW)
-----------------------	---------------------

HT20; MCS5-7, MCS13-15	16 dBm (39.81 mW)
------------------------	-------------------

HT40; MCS0-4, MCS8-12	16 dBm (39.81 mW)
-----------------------	-------------------

HT40; MCS5-7, MCS13-15	16 dBm (39.81 mW)
------------------------	-------------------

802.11ac (5 GHz)

VHT20; MCS0-4	16.5 dBm (44.66 mW)
VHT20; MCS5-7	16 dBm (39.81 mW)
VHT20; MCS8	14 dBm (25.12mW)
VHT40; MCS0-4	16 dBm (39.81 mW)
VHT40; MCS5-7	15 dBm (31.62 mW)
VHT40; MCS8-9	14 dBm (25.12 mW)
VHT80; MCS0-4	16 dBm (39.81 mW)
VHT80; MCS5-7	15 dBm (31.62 mW)
VHT80; MCS8-9	14 dBm (25.12 mW)

802.11ax (5 GHz)

HE20; MCS0-4	16.5 dBm (44.66 mW)
HE20; MCS5-7	16 dBm (39.81 mW)
HE20; MCS8-9	14 dBm (25.12 mW)
HE20; MC10-11	13 dBm (19.95 mW)
HE40; MCS0-4	16 dBm (39.81 mW)
HE40; MCS5-7	15 dBm (31.62 mW)
HE40; MCS8-9	14 dBm (25.12 mW)
HE40; MC10-11	12 dBm (15.85mW)
HE80; MCS0-4	16 dBm (39.81 mW)
HE80; MCS5-7	15 dBm (31.62 mW)
HE80; MCS8-9	14 dBm (15.85 mW)
HE80; MCS10-11	12 dBm (12.59 mW)

Bluetooth

1 Mbps (1DH1 3, 5)	7 dBm (5 mW), Maximum
2 Mbps (2DH1, 3, 5)	7dBm (5 mW), Maximum
3 Mbps (3DH1, 3, 5)	7dBm (5 mW), Maximum
LE (1 Mbps, 2 Mbps)	7 dBm (5 mW), Maximum
LE-LR (S=2, S=8)	7 dBm (5 mW), Maximum

Typical Receiver Sensitivity

(PER <= 10%)

Note: All values nominal, +/-3 dBm.
802.11a:

6 Mbps	-92 dBm
54 Mbps	-75 dBm

802.11b:

1 Mbps	-96 dBm (PER < 8%)
11 Mbps	-89 dBm (PER < 8%)

802.11g:

6 Mbps	-93 dBm
54 Mbps	-76 dBm

802.11n (2.4 GHz)

6.5 Mbps (MCS0; HT20)	-93 dBm
65 Mbps (MCS7; HT20)	-74.5 dBm

802.11ax (2.4 GHz)

7.3 Mbps (MCS0; HE20)	-93 dBm
121.9 Mbps (MCS11; HE20)	-63 dBm
7.3 Mbps (MCS0; HE20/RU242)	-93 dBm

802.11n (5 GHz)

6.5 Mbps (MCS0; HT20)	-92 dBm
65 Mbps (MCS7; HT20)	-73 dBm
13.5Mbps (MCS0; HT40)	-89 dBm
135Mbps (MCS7; HT40)	-70 dBm

802.11ac (5 GHz)

6.5 Mbps (MCS0; VHT20)	-92 dBm
78 Mbps (MCS8; VHT20)	-69 dBm
13.5 Mbps (MCS0; VHT40)	-89 dBm
180 Mbps (MCS9; VHT40)	-64 dBm
29.3 Mbps (MCS0; VHT80)	-86 dBm
390 Mbps (MCS9; VHT80)	-61 dBm

802.11ax (5 GHz)

7.3 Mbps (MCS0; HE20)	-91 dBm
121.9 Mbps (MCS11; HE20)	-62 dBm
7.3 Mbps (MCS0; HE20/RU242)	-92 dBm
14.6 Mbps (MCS0; HE40)	-89 dBm
243.8 Mbps (MCS11; HE40)	-59 dBm
14.6 Mbps (MCS0; HE40/RU484)	-89 dBm
30.6 Mbps (MCS0; HE80)	-86 dBm
510.4 Mbps (MCS11; HE80)	-55 dBm
30.6 Mbps (MCS0; HE80/RU996)	-86 dBm

Bluetooth:

1 Mbps (1DH5)	-94 dBm
2Mbps (2DH5)	-93 dBm
3 Mbps (3DH5)	-88 dBm
LE-1 Mbps	-96 dBm
LE-2 Mbps	-93 dBm
LE-LR (S=2)	-101 dBm
LE-LR (S=8)	-104 dBm

Operating Systems Supported

Linux

Security

- WPA, WPA2 (Enterprise) and WPA3 (Enterprise) support for powerful encryption and authentication
- AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
- Reference WLAN subsystem provides Wi-Fi Protected Setup (WPS)

Compliance	EU	
	EN 300 328	EN 62368-1:2014
	EN 301 489-1	EN 300 440
	EN 301 489-17	EN 303 687
	EN 301 893	2011/65/EU (RoHS)
	FCC	ISED Canada
	47 CFR FCC Part 15.247	RSS-247
	47 CFR FCC Part 15.407	RSS-248
	47 CFR FCC Part 2.1091	
	AS/NZS	MIC
	AS/NZS 4268:2017	ARIB STD-T66/RCR STD-33 (2.4 GHz)
		ARIB STD-T71 (5 GHz)
Certifications	Bluetooth® SIG Qualification D067610	
Warranty	One Year Warranty	
All specifications are subject to change without notice		

3 WLAN Functional Description

3.1 Overview

The Sona MT320 series wireless module is designed based on the MediaTek MT7921LSN SoC chipset (2x2 MIMO). It is optimized for high speed, reliability, and low-power embedded applications. It is integrated with dual-band WLAN (2.4/5 GHz) and Bluetooth 5.4. Its functionality is listed in Table 4.

Table 4: WLAN functions

Feature	Description
WLAN MAC	• Support all data rates of 802.11a/g including 6, 9, 12, 18, 24, 36, 48, and 54 Mbps. • Support short GI and all data rates of 802.11n including MCS0 to MCS7 • Support 802.11ac MCS0 to MCS9 • Support 802.11ax MCS0 to MCS11 • AMPDU/AMSDU RX (de-aggregation) and TX (aggregation) support • TX rate adaptation • TX power control • Security – 64-bit WEP (WEP-40) and 128-bit WEP (WEP-104) encryption with hardware TKIP and CKIP processing – AES-CCMP hardware processing – GCMP hardware processing – SMS4-WPI (WAPI) hardware processing • Low power beacon filtering • Management/control frame filtering
WLAN Security	• WLAN Encryption features supported include: – Temporal Key Integrity Protocol (TKIP)/Wired Equivalent Privacy (WEP) – Advanced Encryption Standard (AES)/Wi-Fi Multi-Media (WMM) – WLAN Authentication and Private Infrastructure (WPAI)

WLAN
Channel

Channel frequency supported.

2.4 GHz / 20 MHz		5 GHz / 20 MHz		5 GHz / 40 MHz		5 GHz / 80 MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	36	5180	38	5190	42	5210
2	2417	40	5200	46	5230	58	5290
3	2422	44	5220	54	5270	106	5530
4	2427	48	5240	62	5310	122	5610
5	2432	52	5260	102	5510	138	5690
6	2437	56	5280	110	5550	155	5775
7	2442	60	5300	118	5590		
8	2447	64	5320	126	5630		
9	2452	100	5500	134	5670		
10	2457	104	5520	142	5710		
11	2462	108	5540	151	5755		
12	2467	112	5560	159	5795		
13	2472	116	5580				
		120	5600				
		124	5620				
		128	5640				
		132	5660				
		136	5680				
		140	5700				
		144	5720				
		149	5745				
		153	5765				
		157	5785				
		161	5805				
		165	5825				

4 Bluetooth Functional Description

The Sona MT320 series wireless module includes a fully integrated Bluetooth baseband/radio. Several features and functions are listed in [Table 5](#).

Table 5: Bluetooth functions

Feature	Description
	- Voice interface: PCM/I2S - SDIO interface
Bluetooth Features	- Bluetooth 5.4 - LE 2M PHY and LE Coded PHY - LE Extended Advertising and Periodic Advertising - LE high duty cycle non-connectable ADV - Channel Selection Algorithm #2 - Angle of Arrival (AoA) and Angle of Departure (AoD) - Connected Isochronous Stream master and slave. - Isochronous Broadcaster and Synchronized Receiver - Compatible Bluetooth 4.2 - LE privacy 1.2 - LE Data Packet Length Extension - LE security connection - Single-ended, RF port with integrated Balun and T/R switch - Integrated high efficiency PA and TSSI - Baseband and radio BDR and EDR packet types: 1Mbps (GFSK), 2Mbps ($\pi/4$-DQPSK), and 3Mbps (8PSK). - Fully functional Bluetooth baseband: AFH, forward error correction, header error control, access code correlation, CRC, whitening. - Standard pairing, authentication, link key, and encryption operation. - Standard power saving mechanisms: sniff mode and sniff-subrating.

- Interlaced scan for faster connection setup
- Up to 7 simultaneous active ACL connections with background inquiry and page scan
- Up to 16 BLE links
- Scatternet support
- Channel quality driven data rate control
- WB RSSI support. Monitor environment air condition to select good channel for AFH

5 Block Diagrams

5.1 M.2 1420

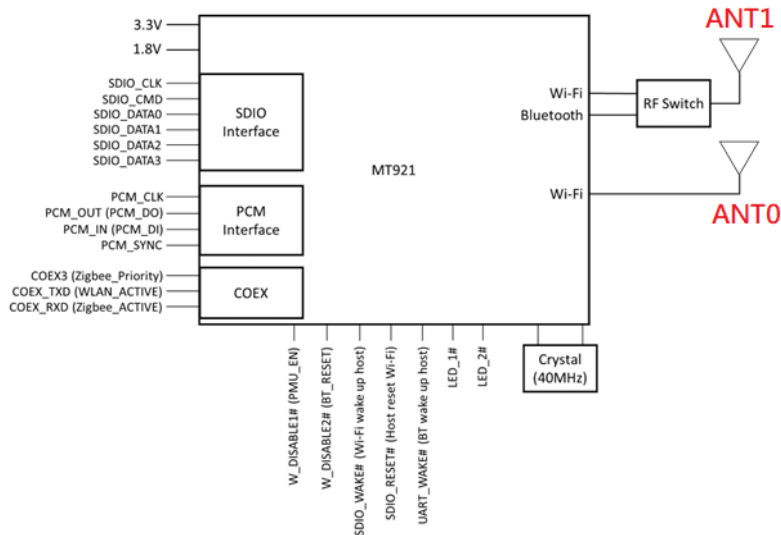


Figure 1: Block Diagram for M.2 1420 module.

5.2 M.2 2230 E-Key

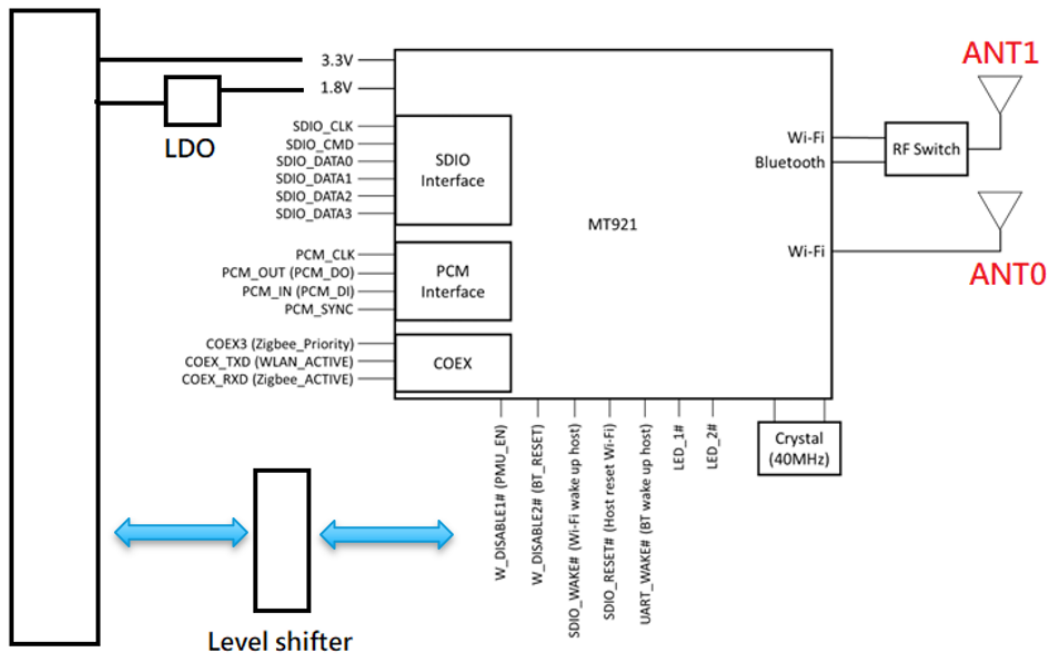


Figure 2: M.2 2230 E-Key

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

Table 6 summarizes the absolute maximum ratings and Table 7 lists the recommended operating conditions for the Sona MT320 series wireless module. Absolute maximum ratings are those values beyond which damage to the device can occur. Functional operation under these conditions, or at any other condition beyond those indicated in the operational sections of this document, is not recommended.

Note: Maximum rating for signals follows the supply domain of the signals.

Table 6: Absolute maximum ratings

Symbol (Domain)	Description	Max Rating	Unit
3V3	External 3.3V power supply (M.2 2230 E-Key)	-0.3 to 3.63	V
VIO_1.8V	DC supply voltage for digital I/O (M.2 1318)	-0.3 to 1.98	V
Storage	Storage temperature	-40 to +125	°C
Antenna	Maximum RF input (reference to 50-Ω input)	+10	dBm
ESD	Electrostatic discharge tolerance	2000	V

6.2 Recommended Operating Conditions

Table 7: Recommended operating conditions

Symbol (Domain)	Parameter	Min	Typ	Max	Unit
3.3V	External DC power supply	3.13	3.30	3.6	V
VIO_1.8V	DC supply voltage for digital I/O	1.71	1.8	1.89	V
T-ambient	Ambient temperature	-40	25	+85	°C

6.3 DC Electrical Characteristics

Table 8 lists the general DC electrical characteristics over recommended operating conditions (unless otherwise specified).

Table 8: General DC electrical characteristics (For VIO_1.8V=1.8V operation)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIH	High Level Input Voltage	—	1.27	—	VIO_1.8V+0.3	V
VIL	Low Level Input Voltage	—	-0.3	—	0.58	V
VOH	Output high Voltage	—	1.4	—	VIO_1.8V+0.3	V
VOL	Output low Voltage	—	-0.3	—	0.45	V

6.4 WLAN Radio Receiver Characteristics

Table 9 and Table 10 summarize the Sona MT320 series wireless module receiver characteristics.

Table 9: WLAN receiver characteristics for 2.4 GHz operation

Item	Parameter	Conditions	Min	Typ	Max	Unit
Frequency Range	Receive input frequency range	—	2.412	—	2.484	GHz
Modulation Type	Sensitivity					
	CCK, 1 Mbps	See Note ¹	—	-96	—	dBm
	CCK, 11 Mbps		—	-89	—	
	OFDM, 6 Mbps		—	-93	—	
	OFDM, 54 Mbps		—	-76	—	
	HT20, MCS0		—	-93	—	
	HT20, MCS7		—	-74	—	
	HE20, MCS0		—	-93	—	
	HE20, MCS11		—	-63	—	
Receive Adjacent channel rejection.	OFDM, 6 Mbps	See Note ¹	—	41	—	dB
	OFDM, 54 Mbps		—	25	—	
Receive Adjacent channel rejection. (HT20)	HT20, MCS0		—	36	—	
	HT20, MCS7		—	13	—	
Receive Adjacent channel rejection. (HT40)	HE20, MCS0		—	27	—	
	HE20, MCS7		—	7	—	

Table 10: WLAN receiver characteristics for 5 GHz operation

Item	Parameter	Conditions	Min	Typ	Max	Unit
Frequency Range	Receive input frequency range	—	5.15	—	5.825	GHz
Modulation Type	Sensitivity					
	OFDM, 6 Mbps	See Note ¹	—	-92	—	dBm
	OFDM, 54 Mbps		—	-75	—	
	HT20, MCS0		—	-92	—	
	HT20, MCS7		—	-73	—	
	HT40, MCS0		—	-89	—	
	HT40, MCS7		—	-70	—	
	VHT20, MCS0		—	-92	—	
	VHT20, MCS8		—	-69	—	
	VHT40, MCS0		—	-89	—	
	VHT40, MCS9		—	-64	—	
	VHT80, MCS0		—	-86	—	
	VHT80, MCS9		—	-61	—	
	HE20, MCS0		—	-91	—	
	HE20, MCS11		—	-62	—	
	HE40, MCS0		—	-89	—	
	HE40, MCS11		—	-59	—	
	HE80, MCS0		—	-86	—	
	HE80, MCS11		—	-55	—	
	MCS0		—	27	—	dB

Adjacent channel rejection (VHT20)	MCS8	See Note ¹	–	0	–	
Adjacent channel rejection (VHT40)	MCS0		–	27	–	dB
	MCS9	See Note ¹	–	0	–	
Adjacent channel rejection (VHT80)	MCS0		–	31	–	dB
	MCS9	See Note ¹	–	12	–	

Note 1: Receiver sensitivity is measured at antenna port with 3.3V voltage within +/-5% of the typical values.

6.5 WLAN Transmitter Characteristics

Table 11 through Table 14 summarize the Sona MT320 series wireless module transmitter characteristics.

Table 11: WLAN transmitter characteristics for 2.4 GHz operation (3.3V, VIO_1.8V = 1.8V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Ftx	Transmit output frequency range	—	2.402	—	2.484	GHz
Pout	Output power	See Note ²	—	—	—	—
	11b mask compliant	1-11Mbps	—	17	—	dBm
	11g mask compliant	6-24Mbps	—	16.5	—	
	11g mask compliant	36-48Mbps	—	16.5	—	
	11g EVM compliant	54Mbps	—	16	—	
	11n HT20 mask compliant	MCS0-4	—	16	—	
	11n HT20 mask compliant	MCS5-6	—	15	—	
	11n HT20 EVM compliant	MCS7	—	15	—	
	11ax HE20 mask compliant	MCS0-4	—	16	—	
	11ax HE20 mask compliant	MCS5-6	—	15	—	
	11ax HE20 EVM compliant	MCS7	—	15	—	
	11ax HE20 EVM compliant	MCS8	—	14	—	
	11ax HE20 EVM compliant	MCS9	—	14	—	
	11ax HE20 EVM compliant	MCS10-11	—	14	—	
ATx	Transmit power accuracy at 25 °C	—	-2.0	—	+2.0	dB

Table 12: WLAN current consumption on 2.4 GHz (3.3V, VIO_1.8V = 1.8V)

Modulation	Data Rate	Spatial Stream	Output Power (dBm)	3.3V Current Consumption (mA)	VIO_1.8V Current Consumption (mA)
CCK	1 Mbps	2	19.64	426	<1
BPSK	6 Mbps	2	19.75	430	<1
64-QAM	HT20 MCS7	2	19.53	346	<1
64-QAM	HT20 MCS15	2	19.51	282	<1
256-QAM	HE20 MCS9	2	19.75	356	<1
1024-QAM	HE20 MCS11	2	18.99	234	<1

Table 13: WLAN transmitter characteristics for 5 GHz operation (3.3V, VIO_1.8V = 1.8V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Ftx	Transmit output frequency range	—	5.15	—	5.925	GHz
Pout	Output power	See Note ²	—	—	—	—
	11a mask compliant	6-48Mbps	—	16.5	—	dBm
	11a EVM compliant	54Mbps	—	16	—	
	11n HT20 mask compliant	MCS0-5	—	16.5	—	
	11n HT20 EVM compliant	MCS6-7	—	16	—	
	11n HT40 mask compliant	MCS0-5	—	16	—	
	11n HT40 EVM compliant	MCS6-7	—	16	—	
	11ac VHT20 mask compliant	MCS0-5	—	16.5	—	
	11ac VHT20 EVM compliant	MCS6-7	—	16	—	
	11ac VHT20 EVM compliant	MCS8	—	14	—	
	11ac VHT40 mask compliant	MCS0-5	—	16	—	
	11ac VHT40 EVM compliant	MCS6-7	—	15	—	
	11ac VHT40 EVM compliant	MCS8-9	—	14	—	
	11ac VHT80 mask compliant	MCS0-5	—	16	—	
	11ac VHT80 EVM compliant	MCS6-7	—	15	—	
	11ac VHT80 EVM compliant	MCS8-9	—	14	—	
	11ax HE20 mask compliant	MCS0-5	—	16.5	—	
	11ax HE20 EVM compliant	MCS6-7	—	16	—	
	11ax HE20 EVM compliant	MCS8-9	—	14	—	
	11ax HE20 EVM compliant	MCS10-11	—	13	—	
	11ax HE40 mask compliant	MCS0-5	—	16	—	
	11ax HE40 EVM compliant	MCS6-7	—	15	—	
	11ax HE40 EVM compliant	MCS8-9	—	14	—	
	11ax HE40 EVM compliant	MCS10-11	—	12	—	
	11ax HE80 mask compliant	MCS0-5	—	16	—	
	11ax HE80 EVM compliant	MCS6-7	—	15	—	
	11ax HE80 EVM compliant	MCS8-9	—	14	—	
	11ax HE80 EVM compliant	MCS10-11	—	12	—	
ATx	Transmit power accuracy at 25 °C	—	-2.0	—	+2.0	dB

Table 14: WLAN current consumption on 5 GHz (3.3V, VIO_1.8V = 1.8V)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	3.3V Current Consumption (mA)	VIO_1.8V Current Consumption (mA)
BPSK	20	6 Mbps	2	21.66	682	<1
64-QAM	20	54 Mbps	2	21.39	604	<1
BPSK	20	HE20 MCS0	2	20.27	642	<1
64-QAM	20	HE20 MCS7	2	21.08	608	<1
256-QAM	20	HE20 MCS9	2	20.09	632	<1
1024-QAM	20	HE20 MCS11	2	17.7	522	<1
BPSK	40	HE40 MCS0	2	21.01	790	<1
64-QAM	40	HE40 MCS7	2	21.72	450	<1
256-QAM	40	HE40 MCS9	2	20.48	390	<1
1024-QAM	40	HE40 MCS11	2	17.96	350	<1
BPSK	80	HE 80 MCS0	2	18.87	622	<1
64-QAM	80	HE 80 MCS7	2	20.02	330	<1
256-QAM	80	HE 80 MCS9	2	20.01	330	<1
1024-QAM	80	HE 80 MCS11	2	17.18	244	<1

Note 2: TX power is measured at 3.3V within 5% at antenna port. Temperature us at 25 degree C.

7 Bluetooth Radio Characteristics

Table 15 through Table 19 the performance of the Bluetooth transmitter and receiver and the current consumption at 25°C.

Table 15: BR / EDR transmitter performance (3.3V, VIO_1.8V = 1.8V)

Test Parameter		Min	Typ	Max	BT Spec.	Unit
Maximum RF Output Power	GFSK	—	—	7	0 ~ +20	dBm
	$\pi/4$ -DQPSK	—	—	7		
	8-DPSK	—	—	7		
Frequency Range		2.4	—	2.4835	$2.4 \leq f \leq 2.4835$	GHz
20 dB Bandwidth		—	922	—	≤ 1000	KHz
Δf_{1avg} Maximum Modulation		140	157	175	$140 < \Delta f_{1avg} < 175$	KHz
Δf_{2max} Minimum Modulation		115	145	—	≥ 115	KHz
$\Delta f_{2avg}/\Delta f_{1avg}$		—	0.98	—	≥ 0.80	—
Initial Carrier Frequency		—	± 18	± 75	$\leq \pm 75$	KHz
Frequency Drift (DH1 packet)		—	± 10	± 25	± 25	KHz
Frequency Drift (DH3 packet)		—	± 10	± 40	± 40	KHz
Frequency Drift (DH5 packet)		—	± 10	± 40	± 40	KHz
Drift rate		—	10	20	20	KHz/50us
EDR ω_i		—	—	± 75	$\leq \pm 75$	KHz
EDR ω_0		—	—	± 10	$\leq \pm 10$	KHz
EDR ($\omega_i + \omega_0$)		—	—	± 75	$\leq \pm 75$	KHz
RMS DEVM for $\pi/4$ -DQPSK		—	—	≤ 8	≤ 20	%
RMS DEVM for 8-DPSK		—	—	≤ 8	≤ 13	%
Peak DEVM for $\pi/4$ -DQPSK		—	—	≤ 15	≤ 35	%
Peak DEVM for 8-DPSK		—	—	≤ 15	≤ 25	%
99% DEVM for $\pi/4$ -DQPSK		—	—	≤ 11	—	—
99% DEVM for 8-DPSK		—	—	≤ 11	—	—
EDR In-Band Spurious Emission	IM-NI ≥ 2.5 MHz	—	-40	-40	< -40	dBm
	1.5 MHz $<$ IM-NI $<$ 2.5 MHz	—	-23	-20	≤ -20	dBm
	1.0 MHz $<$ IM-NI $<$ 1.5 MHz	—	-29	-26	≤ -26	dBm

Table 16: Basic Rate receiver performance (3.3V, VIO_1.8V = 1.8V)

Test Parameter		Min	Typ	Max	Bluetooth Spec.	Unit
Sensitivity (1DH5)	BER ≤ 0.1%	—	-94	—	≤ -70	dBm
Maximum Input	BER ≤ 0.1%	—	—	-20	≥ -20	dBm
Interference Performance	Co-Channel	—	6	11	11	dB
	C/I 1 MHz adjacent channel	—	-7	0	0	dB
	C/I 2 MHz adjacent channel	—	-40	-30	-30	dB
	C/I ≥ 3 MHz adjacent channel	—	-43	-40	-40	dB
	C/I image channel	—	-20	-9	-9	dB
	C/I 1-MHz adjacent to image channel	—	-35	-20	-20	dB
Out-of-Band Blocking Performance (CW)	30-2000MHz	—	-10	—	—	dBm
	2-2.399GHz	—	-27	—	—	dBm
	2.484-3GHz	—	-27	—	—	dBm
	3-12.75GHz	—	-10	—	—	dBm

Table 17: Enhanced Data Rate receiver performance (3.3V, VIO_1.8V = 1.8V)

Test Parameter		Min	Typ	Max	Bluetooth Spec.	Unit
Sensitivity (BER ≤ 0.01%)	π/4-DQPSK	—	-93	—	≤ -70	dBm
	8-DPSK	—	-88	—	≤ -70	dBm
Maximum Input (BER ≤ 0.1%)	π/4-DQPSK	—	—	-20	≥ -20	dBm
	8-DPSK	—	—	-20	≥ -20	dBm
C/I Co-Channel (BER ≤ 0.1%)	π/4-DQPSK	—	9	13	≤ ±13	dB
	8-DPSK	—	15	21	≤ ±21	dB
C/I 1 MHz adjacent Channel	π/4-DQPSK	—	-12	0	≤ 0	dB
	8-DPSK	—	-6	5	≤ 5	dB
C/I 2 MHz adjacent Channel	π/4-DQPSK	—	-40	-30	≤ -30	dB
	8-DPSK	—	-36	-25	≤ -25	dB
C/I ≥ 3 MHz adjacent Channel	π/4-DQPSK	—	-43	-40	≤ -40	dB
	8-DPSK	—	-40	-33	≤ -33	dB
C/I image channel	π/4-DQPSK	—	-20	-7	≤ -7	dB
	8-DPSK	—	-15	0	≤ 0	dB
C/I 1 MHz adjacent to image channel	π/4-DQPSK	—	-40	-20	≤ -20	dB
	8-DPSK	—	-30	-13	≤ -13	dB

Table 18: BLE RF Specifications (3.3V, VIO_1.8V = 1.8V)

Parameter	Conditions	Min	Typ	Max	Unit
Frequency range	—	2402	—	2480	MHz
Rx sensitivity ¹	GFSK, PER ≤ 30.8%	1 Mbps	—	-96	dBm
		2 Mbps	—	-93	dBm
Tx power ²	—	—	—	7	dBm
Max. Usable Signal	BLE 1Mbps(PER < 30.8%)	-10	-	-	dBm
	BLE 2Mbps(PER < 30.8%)	-10	-	-	KHz
C/I Co-channel	BLE 1Mbps(PER < 30.8%)	-	6	21	dB
C/I 1MHz		-	-7	15	dB
C/I 2MHz		-	-30	-17	dB

Parameter	Conditions	Min	Typ	Max	Unit
C/I ≥ 3 MHz		-	-33	-27	dB
C/I Image channel		-	-20	-9	dB
C/I Image 1MHz		-	-30	-15	dB
C/I Co-channel		-	9	21	dB
C/I 1MHz		-	-4	15	dB
C/I 2MHz		-	-27	-17	dB
C/I ≥ 3 MHz		-	-30	-27	dB
C/I Image channel	BLE 2Mbps (PER < 30.8%)	-	-17	-9	dB
C/I Image 1MHz		-	-27	-15	dB
Out-of-band Blocking	30MHz to 2000MHz	-30	-	-	dBm
	2001MHz to 2339MHz	-35	-	-	dBm
	2501MHz to 3000MHz	-35	-	-	dBm
	3001MHz to 12.75GHz	-30	-	-	dBm

Table 19: Bluetooth transmitter current consumption (3.3V, VIO_1.8V = 1.8V)

Operation Mode	Data Rate	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
Basic Data Rate	1DH5	94	<1
Enhanced Data Rate	2DH5	93.2	<1
	3DH5	92.4	<1
Low-Energy	1 Mbps	108	<1
	2 Mbps	92	<1
	500 Kbps	94	<1
	125 Kbps	93.2	<1

Notes: [1] Dirty Tx is Off.

[2] The Bluetooth LE TX power cannot exceed 10 dBm EIRP specification limit. The front-end losses and antenna gain/loss must be factored in so as not to exceed the limit.

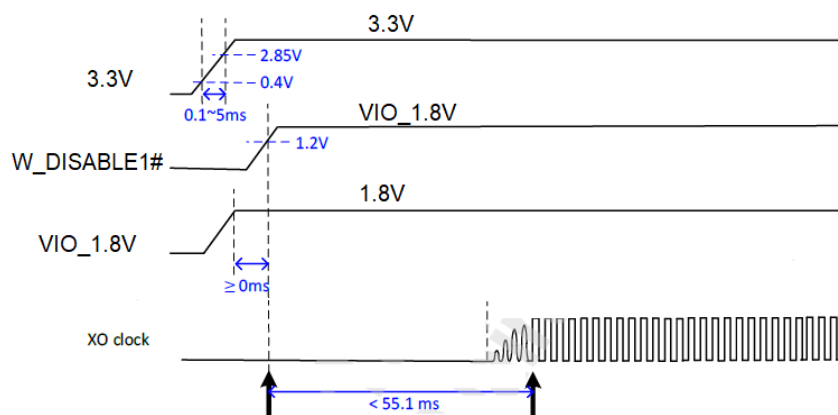
[3] At least 99.9% of all Δf_2 maximum frequency values recorded over 10 packets must be greater than 185 KHz.

8 Power-Up Sequence and Timing

The Sona IF573 has two signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN, and internal regulator block.

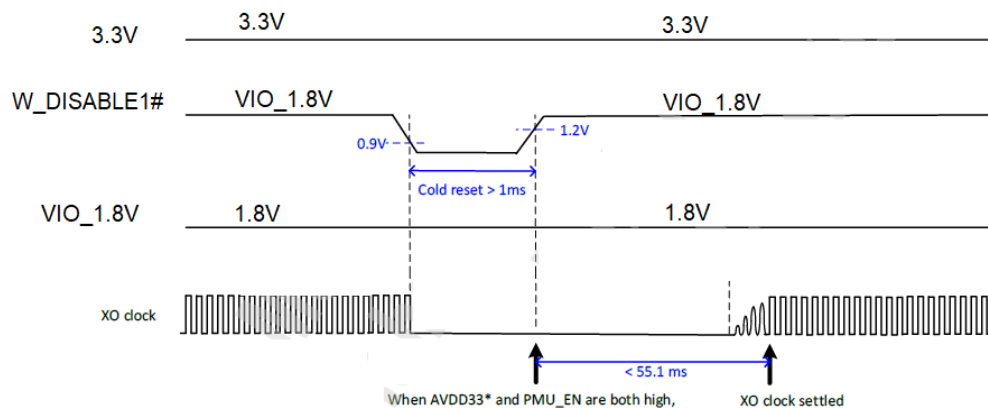
8.1 Power On Sequence

The 3.3V voltage and W_DISABLE1# are in high state, chip will start power-on sequence.



Note: Please keep the 3.3V and VIO_1.8V power at the same time.

8.2 Global Cold Reset



9 Pin Definitions

9.1 M.2 1420 Solder-down

Table 20: M.2 1420 pin definitions

Pin #	Name	Type	Voltage Ref.	Function	If Not Used
1	-	-	-	NC	NC
2	-	-	-	NC	NC
3	-	-	-	NC	NC
4	3.3V	PWR	3.3V	Power Supply Input	-
5	3.3V	PWR	3.3V	Power Supply Input	-
6	GND	-	-	Ground	GND
7	-	-	-	NC	NC
8	-	-	-	NC	NC
9	-	-	-	NC	NC
10	-	-	-	NC	NC
11	COEX_RXD	I	VIO_1.8V	3-wire coexistence for Zigbee; Zigbee_ACTIVE	NC
12	COEX_TXD	O	VIO_1.8V	3-wire coexistence for Zigbee; WLAN_ACTIVE	NC
13	COEX3	I	VIO_1.8V	3-wire coexistence for Zigbee; Zigbee_Priority	NC
14	-	-	-	NC	NC
15	-	-	-	NC	NC
16	-	-	-	NC	NC
17	GND	-	-	Ground	GND
18	-	-	-	NC	NC
19	-	-	-	NC	NC
20	GND	-	-	Ground	GND
21	-	-	-	NC	NC
22	-	-	-	NC	NC
23	GND	-	-	Ground	GND
24	-	-	-	NC	NC
25	-	-	-	NC	NC
26	GND	-	-	Ground	GND
27	-	-	-	NC	NC
28	W_DISABLE1#	I	VIO_1.8V	External 10K PU is needed for normal operation. Active low to disable the Sona MT320 module. W_DISABLE1# should be managed by an actual signal from the Host to have correct global reset. Please see detail timing on section 8.5	-
29	-	-	-	NC	NC
30	-	-	-	NC	NC

Pin #	Name	Type	Voltage Ref.	Function	If Not Used
31	-	-	-	NC	NC
32	GND	-	-	Ground	GND
33	-	-	-	NC	NC
34	-	-	-	NC	NC
35	GND	-	-	Ground	GND
36	-	-	-	NC	NC
37	-	-	-	NC	NC
38	GND	-	-	Ground	GND
39	-	-	-	NC	NC
40	-	-	-	NC	NC
41	GND	-	-	Ground	GND
42	-	-	-	NC	NC
43	-	-	-	NC	NC
44	-	-	-	NC	NC
45	SDIO_RESET#	I	VIO_1.8V	Host to reset Sona MT320 module, Active Low. External 10K PU is needed for normal operation.	10K;PU
46	SDIO_WAKE#	O	VIO_1.8V	Wi-Fi to Wake up Host; Active Low. Required pull up on the host side (recommended 15 kΩ to 100 kΩ).	NC
47	SDIO_DATA3	I/O	VIO_1.8V	SDIO Data line 3	NC
48	SDIO_DATA2	I/O	VIO_1.8V	SDIO Data line 2	NC
49	SDIO_DATA1	I/O	VIO_1.8V	SDIO Data line 1	NC
50	SDIO_DATA0	I/O	VIO_1.8V	SDIO Data line 0	NC
51	SDIO_CMD	I/O	VIO_1.8V	SDIO command line	NC
52	SDIO_CLK	I	VIO_1.8V	SDIO Clock Input	NC
53	UART_WAKE#	O	VIO_1.8V	Bluetooth to Wake up Host. Active Low. Required pull up on the host side (recommended 15 kΩ to 100 kΩ).	NC
54	-	-	-	NC	NC
55	-	-	-	NC	NC
56	-	-	-	NC	NC
57	-	-	-	NC	NC
58	PCM_SYNC	I/O	VIO_1.8V	BT_PCM Sync. In Master mode, SONA MT320 generates the BT_PCM_SYNC signal. In Slave mode, the signal is provided by another master on the PCM interface.	NC
59	PCM_IN	I	VIO_1.8V	BT_PCM data input.	NC
60	PCM_OUT	O	VIO_1.8V	BT_PCM data output	NC
61	PCM_CLK	I/O		BT_PCM Clock.	NC

Pin #	Name	Type	Voltage Ref.	Function	If Not Used
			VIO_1.8V	In Master mode, SONA MT320 generates the BT_PCM_CLK signal. In Slave mode, the signal is provided by another master on the PCM interface.	
62	GND	-	-	Ground	GND
63	W_DISABLE2#	I	VIO_1.8V	Signal to reset the Bluetooth. Active Low. External 10K PU for normal operation.	10K;PU
64	LED_2#	O	VIO_1.8V	LED indicator.	NC
65	LED_1#	O	VIO_1.8V	LED indicator.	NC
66	VIO_1.8V	PWR	1.8V	1.8V power supply input for Sona MT320 module. Maximum current sink could up to 150mA.	-
67	-	-	-	NC	NC
68	GND	-	-	Ground	GND
69	-	-	-	NC	NC
70	-	-	-	NC	NC
71	GND	-	-	Ground	GND
72	3.3V	PWR	3.3V	Power Supply Input	-
73	3.3V	PWR	3.3V	Power Supply Input	-
74~ 75	GND	-	-	Ground	GND
76	VIO_CFG	O	-	M.2 sideband IO voltage indication output pin. This pin is NC on the module that allow host to use the 1.8V sideband signal from the module.	-
77~ 100	GND	-	-	Ground	GND
101~ 108	GND	-	-	Ground	GND
109	ANT0	-	-	WLAN RF Antenna 0 pin for SONA MT320 M.2 1420 trace pin variant, Wi-Fi only.	
110~ 112	GND	-	-	Ground	GND
113	ANT1	-	-	WLAN RF Antenna 1 pin for SONA MT320 M.2 1420 trace pin variant, Wi-Fi and BT sharing.	
114~ 116	GND	-	-	Ground	GND

9.2 M.2 2230 E-Key

Table 21: M.2 2230 E-Key pin definitions

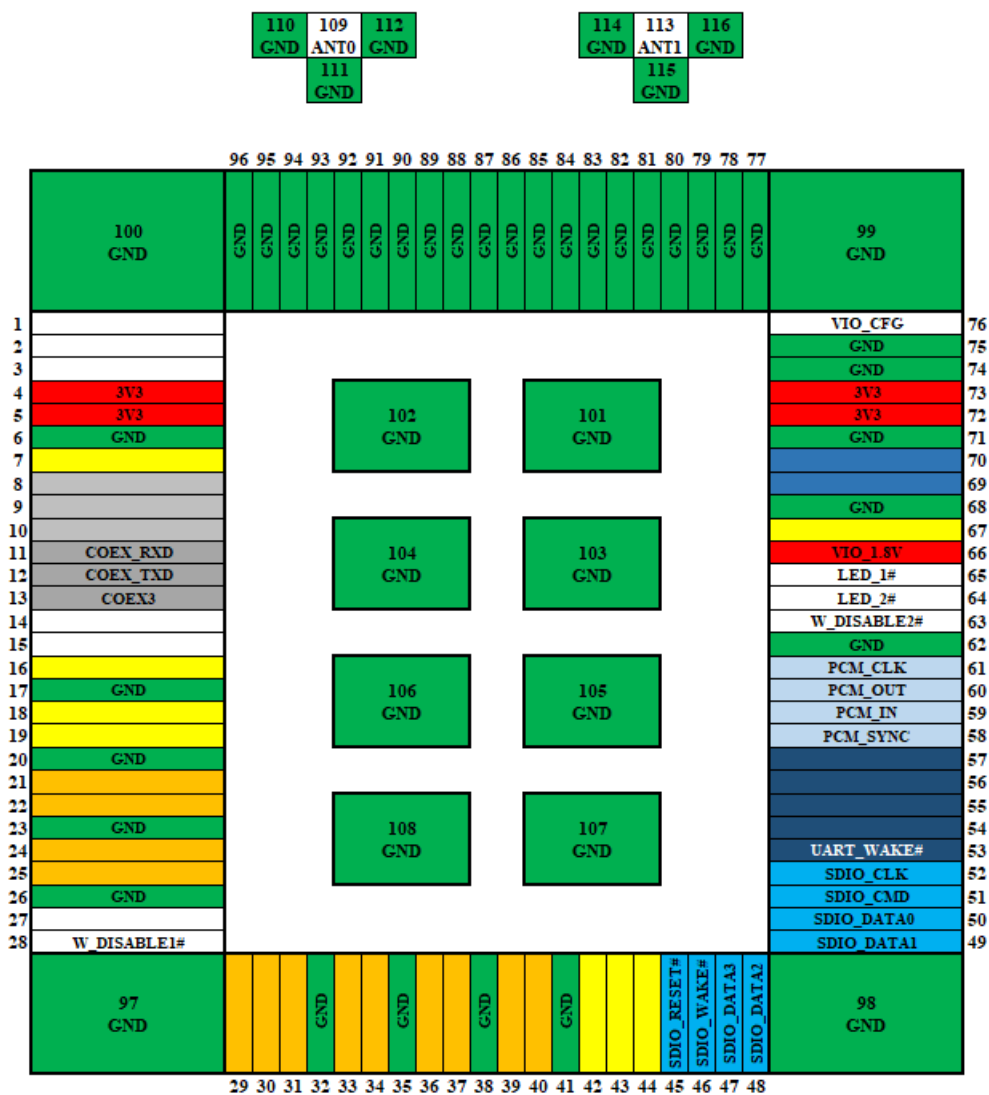
Pin #	Name	Type	Volt. Ref.	Function	If Not Used
1	GND	-	-	Ground	GND
2	3.3V	PWR	3.3V	DC supply voltage input for module.	-
3	-	-	-	NC	NC
4	3.3V	PWR	3.3V	DC supply voltage input for module.	-
5	-	-	-	NC	NC
6	LED1#	O	3.3V	LED indicator	NC
7	GND	-	-	Ground	GND
8	PCM_CLK	I/O	1.8V	PCM clock. Can be master (Output) or slave (Input)	NC
9	SDIO_CLK	I	1.8V	SDIO clock input	NC
10	PCM_SYNC	I/O	1.8V	PCM Sync. Can be master (Output) or slave (Input);	NC
11	SDIO_CMD	I/O	1.8V	SDIO command line	NC
12	PCM_OUT	O	1.8V	PCM data output.	NC
13	SDIO_DATA0	I/O	1.8V	SDIO data line 0	NC
14	PCM_IN	I	1.8V	PCM data input.	NC
15	SDIO_DATA1	I/O	1.8V	SDIO data line 1	NC
16	LED2#	O	3.3V	LED indicator	NC
17	SDIO_DATA2	I/O	1.8V	SDIO data line 2	NC
18	GND	-	-	Ground	GND
19	SDIO_DATA3	I/O	1.8V	SDIO data line3	NC
20	UART_WAKE#	O	3.3V	Bluetooth to Wake up Host. Active Low. Required pull up on the host side (recommended 15 kΩ to 100 kΩ).	NC
21	SDIO_WAKE#	O	1.8V	Wi-Fi to Wake up Host; Active Low. Required pull up on the host side (recommended 15 kΩ to 100 kΩ).	NC
22	-	-	-	NC	NC
23	SDIO_RESET#	I	1.8V	Host to reset Sona MT320; Active low. External 10K PU is needed for normal operation.	10K;PU
32	-	-	-	NC	NC
33	GND	-	-	Ground	GND
34	-	-	-	NC	NC
35	-	-	-	NC	NC
36	-	-	-	NC	NC
37	-	-	-	NC	NC
38	-	-	-	NC	NC
39	GND	-	-	Ground	GND
40	-	-	-	NC	NC
41	-	-	-	NC	NC

Pin #	Name	Type	Volt. Ref.	Function	If Not Used
42	-	-	-	NC	NC
43	-	-	-	NC	NC
44	COEX3	I	1.8V	3-wire coexistence for Zigbee; Zigbee_Priority	NC
45	GND	-	-	Ground	GND
46	COEX_TX	O	1.8V	3-wire coexistence for Zigbee; WLAN_ACTIVE	NC
47	-	-	-	NC	NC
48	COEX_RX	I	1.8V	3-wire coexistence for Zigbee; Zigbee_ACTIVE	NC
49	-	-	-	NC	NC
50	-	-	-	NC	-
51	GND	-	-	Ground	GND
52	-	-	-	NC	NC
53	-	-	-	NC	NC
54	W_DISABLE2#	I	3.3V	Signal to reset the Bluetooth. Active Low. External 10K PU is needed for normal operation.	10K;PU
55	-	-	-	NC	NC
56	W_DISABLE1#	I	3.3 V	External 10K PU is must for normal operation. Active low to disable the module. W_DISABLE1# should be managed by an actual signal from the Host to have correct global reset. Please see detail timing on section 8.5	-
57	GND	-	-	Ground	GND
58	-	-	-	NC	NC
59	-	-	-	NC	NC
60	-	-	-	NC	NC
61	-	-	-	NC	NC
62	-	-	-	NC	NC
63	GND	-	-	Ground	GND
64	VIO_1.8V	-	-	NC	NC
65	-	-	-	NC	NC
66	-	-	-	NC	NC
67	-	-	-	NC	NC
68	-	-	-	NC	NC
69	GND	-	-	Ground	GND
70	-	-	-	NC	NC
71	-	-	-	NC	NC
72	3.3V	PWR	3.3V	DC supply voltage input for module.	-
73	-	-	-	NC	NC
74	3.3V	PWR	3.3V	DC supply voltage input for module.	-
75	GND	-	-	Ground	GND

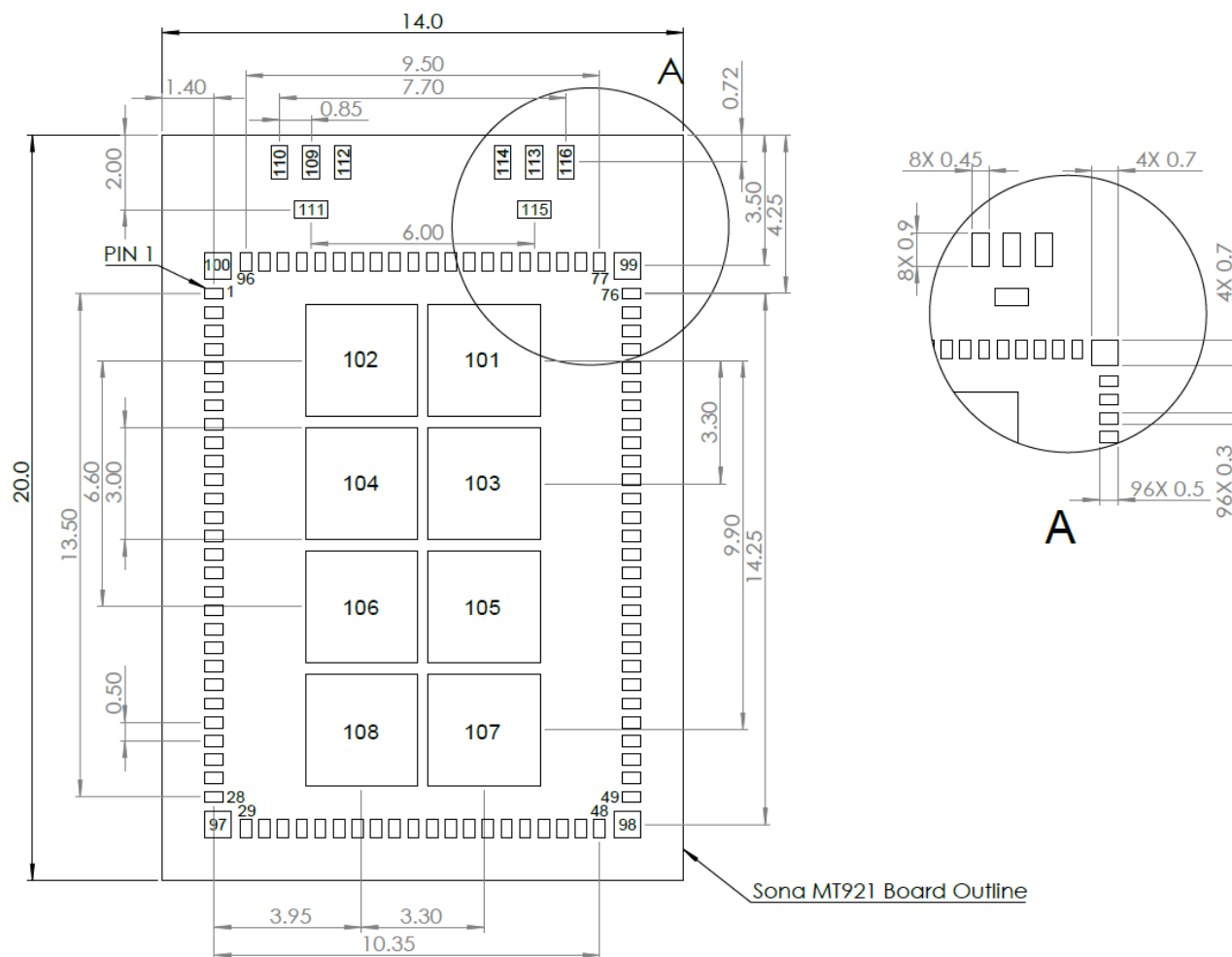
10 Mechanical Specifications

10.1 M.2 1420

Detail PCB footprint for the Sona MT320 M.2 1420 is shown below.



Note: The pin-109 to pin-116 are used for RF trace out when using Sona MT320 M.2 1420 trace pin variant.



TOP VIEW

(This is the recommended PCB footprint)

11 Sona MT320 Mechanical Dimension

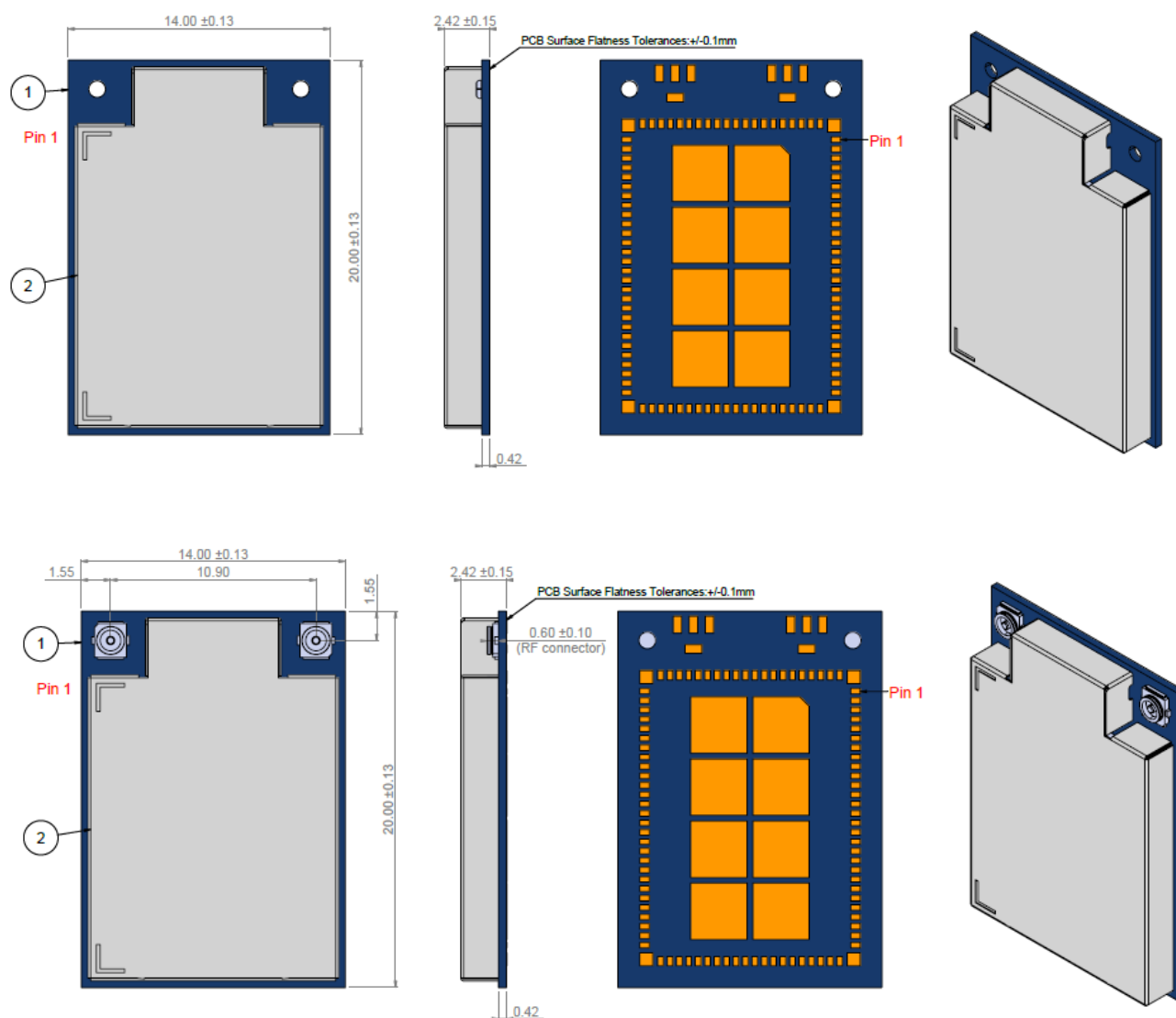


Figure 3: Mechanical dimensions for the Sona MT320 M.2 1420 module

11.1 M.2 2230 E-Key

Module dimensions of Sona MT320 M.2 2230 E-Key module is 22 x 30 x 2.3 mm. Detailed drawings are shown in [Figure 4](#).

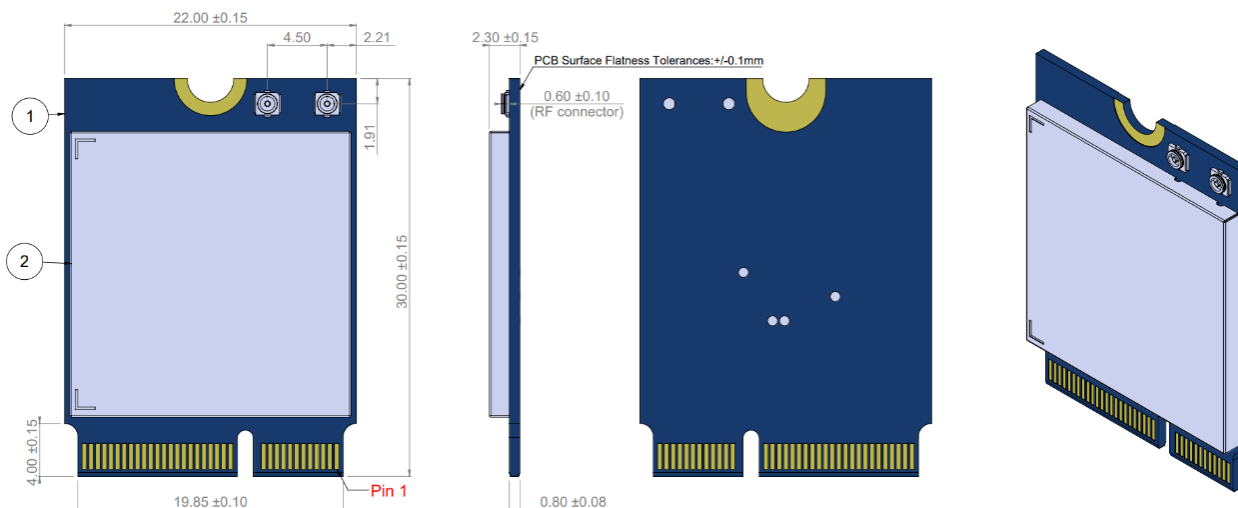


Figure 4: Sona MT320 M.2 2230

Note: The Wi-Fi MAC address is located on the product label.
The BT MAC address is the Wi-Fi MAC address plus 1.

11.2 M.2 2230 E-Key Mounting

The Sona MT320 M.2 2230 E-Key module connects to the host via a standard PCI EXPRESS M2 connector.

Kyocera's 6411 series provides 1.8mm, 2.3mm and 3.2mm connector heights. JAE's SM3 series provides 1.2mm, 2.15mm, 3.1mm and 4.1mm connector heights.

The Sona MT320 M.2 2230 E-Key module is a single-sided component module so we recommend the connectors listed in [Table 22](#).

Table 22: Recommended M.2 2230 E-Key Connectors

M.2 Key-E Connector	Connector Height
KYOCERA 24-6411-067-101-894E	2.3 mm
JAE SM3ZS067U310AERxxxx	3.1 mm

The corresponding standoffs are listed in [Table 23](#).

Table 23: Recommended M.2 E-Key Standoffs

M.2 Key-E Connector	Stand-off
KYOCERA 24-6411-067-101-894E	EMI STOP F50M16-041525P1D4M
JAE SM3ZS067U310AERxxxx	JAE SM3ZS067U310-NUT1-Rxxxx

Detailed layout and stencil opening are shown in [Figure 5](#).

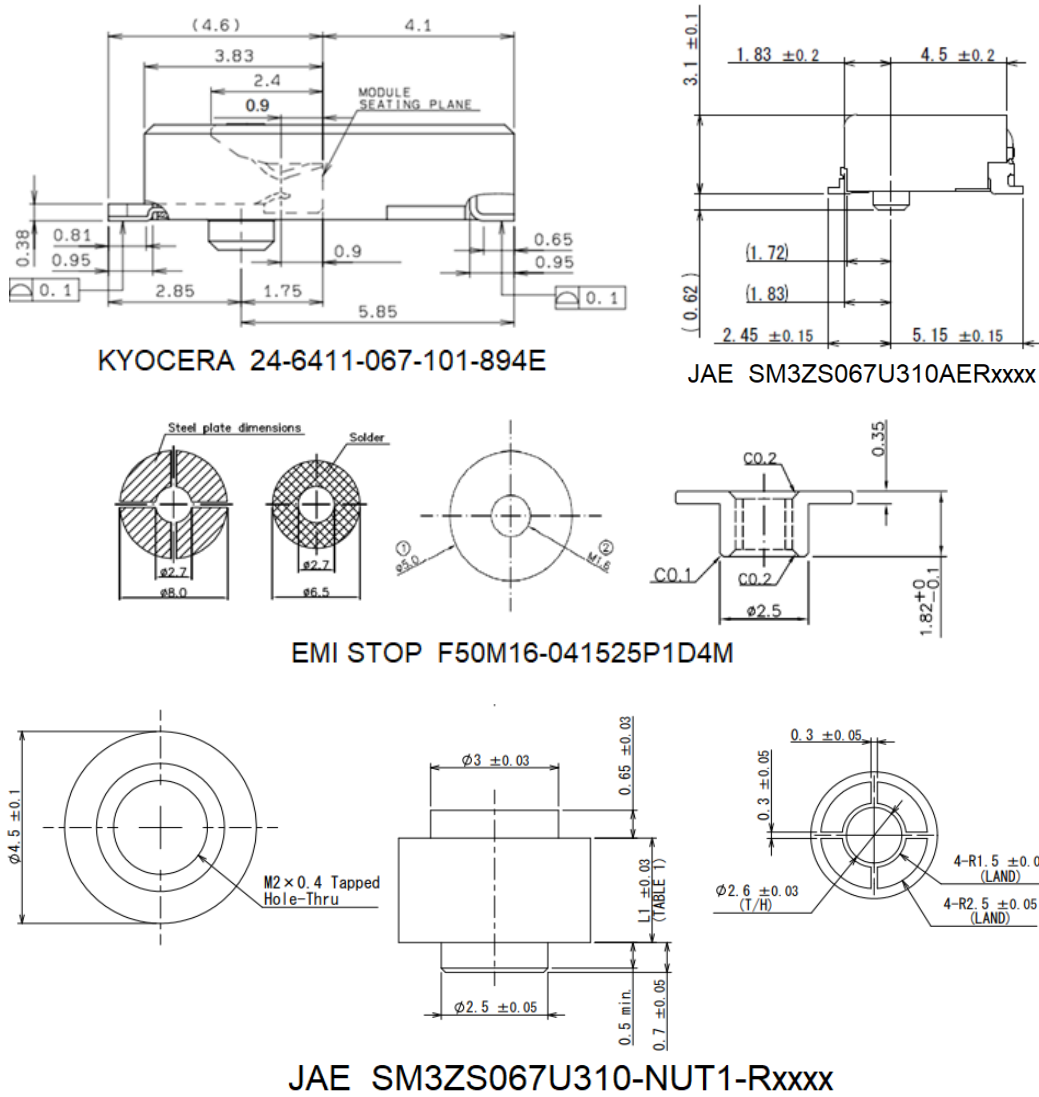
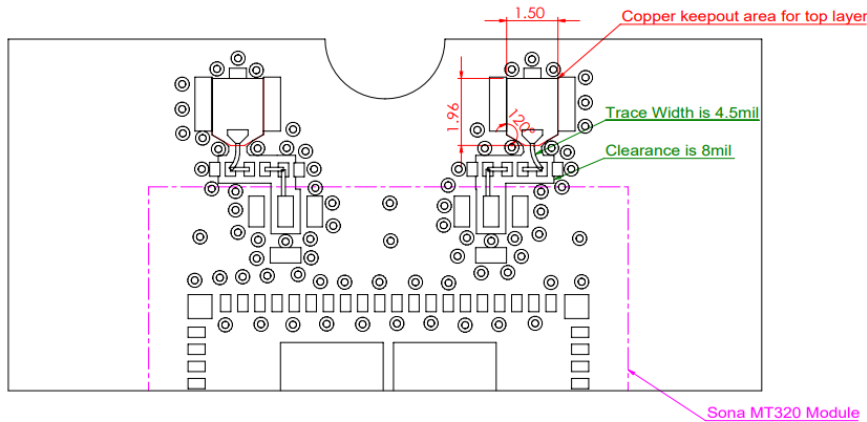


Figure 5: M.2 2230 E-Key connector/standoff mounting

12 RF Layout Design Guidelines

The following is a list of RF layout design guidelines and recommendations when installing an Ezurio radio into your device.

- Do not run antenna cables directly above or directly below the radio.
- Do not place any parts or run any high-speed digital lines below the radio.
- Ensure that there is the maximum allowable spacing separating the antenna connectors on the radio from the antenna. In addition, do not place antennas directly above or directly below the radio.
- Ezurio recommends the use of a double-shielded cable for the connection between the radio and the antenna elements.
- Be sure to put a 10uF/16V/0603 capacitor on EACH 3.3V power pin. Place the capacitor as close as possible to the pin to ensure correct PMU operation.
- Use proper electro-static-discharge (ESD) procedures when installing the Ezurio radio module. To avoid negatively impacting Tx power and receiver sensitivity, do not cover the antennas with metallic objects or components.
- In order to use Ezurio MT320 1420 module certification, please follow exactly the same layout and board stack as shown below.



NOTES:

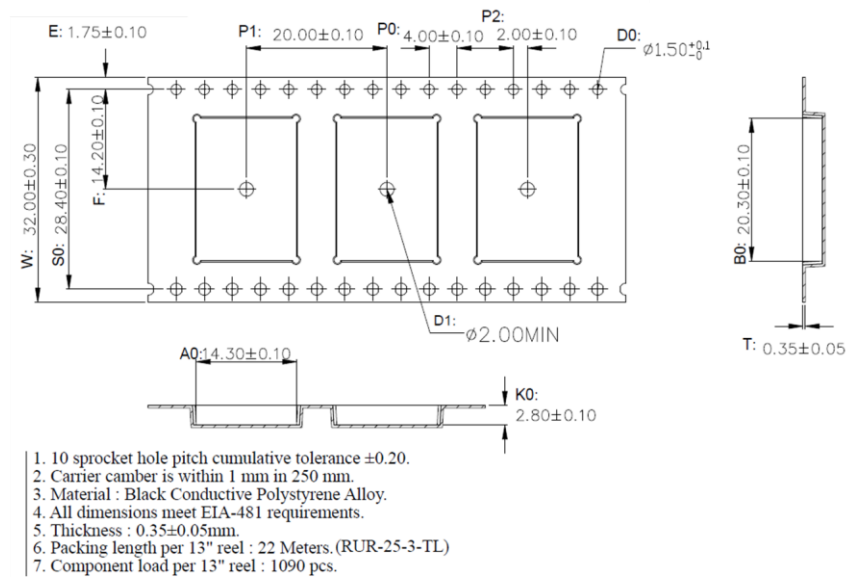
1. Component size is 0201.
2. Via size is drill 8mil, pad 16mil.

Layer	Layer Type	Layer Structure	Thickness (mil)	DK	Single-Coplanar (mil) (TraceWidth/ Clearance) 50ohm+/-10
	Top Solder Mask		0.9	3.5	
L1	Top	1 oz	1.4	4.1	4.5/8
		PP	3		
L2	Plane (GND)	1 oz	1.4	4.1	
		Core	18		
L3	Plane	1 oz	1.4	4.1	
		PP	3		
L4	Bottom	1 oz	1.4	3.5	
	Bottom Solder Mask		0.9	3.5	



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UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: ANGULAR: 2° - 5° XX: 2° - 5° XXX: 2° - 5°	CAD FILE:
DATE: Oct 17, 2023	
INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M	SHEET 1 OF 1 SCALE: 2:1



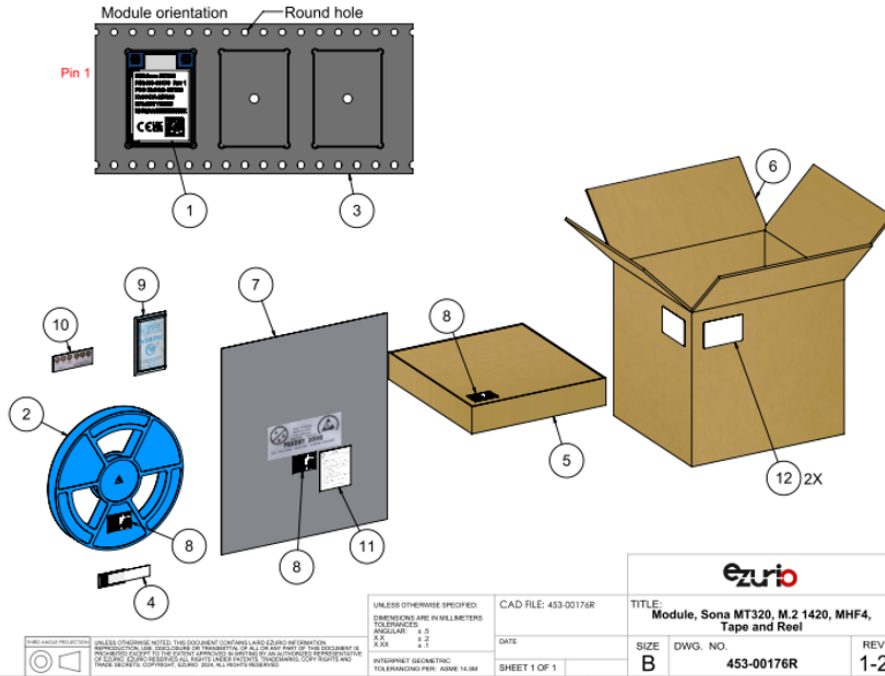
weight

Figure 7: Sona MT320 M.2 1420 Tape specifications

There are 1,000 Sona MT320 M.2 1420 modules taped in a reel (and packaged in a pizza box) and five boxes per carton (5,000 modules per carton). Reel, boxes, and carton are labeled with the appropriate labels. See Figure 8 for more information.

NO.	ITEM NUMBER	REV.	DESCRIPTION	QTY.
1	453-00176	1-2	Module, Sona MT320, M.2 1420, MHF4	1000
2	161-00002	1-1	Reel, 13inch Rotating Type, Blue, 330mm x 100mm x 30mm	1
3	161-00003	1-1	Carrier Tape, Conductive Polyethylene, Black, 14.3mm x 20.3mm x 2.8mm	1
4	161-00565	1.0	Cover Tape, Anti-static Polyester, 26.5mm x 0.05mm	1
5	161-00283	1.0	Box, Single-Wall Corrugated B Flute, 378mm x 347mm x 65mm	1
6	161-00284	1.0	Carton, Double-Wall, Brown, 395mm x 353mm x 374mm	1
7	161-00280	1.0	Bag, ESD and Moisture Barrier, Silver, 430mm x 500mm x 0.15mm	1
8	160-00004	1-1	Label, Product Identifier, Sona MT320, 80mm x 40mm	3
9	161-00282	1.0	Desiccant, Silica Gel, 80g, 140mm x 80mm	1
10	161-00281	1.0	Humidity Indicator Card, Minimum 60% RH, Six Spot Indication, 38mm x 102mm	1
11	160-01816	1.0	Label, Blank Moisture Sensitivity Level, 95mm x 90mm	1
12	160-02053	3.3	Label, Standard Shipping Box, CE Mark, Pictogram, 4in x 2.5in	2

REVISIONS			
REV.	REVISION NOTE	RELEASE DATE	REVISED BY
1-1	Initial release	Dec 5, 2023	IT
1-2	Logo change	Feb 27, 2024	IT



NO.	ITEM NUMBER	REV.	DESCRIPTION	QTY.
1	453-00177	1-2	Module, Sona MT320, M.2 1420, Trace Pin	1000
2	161-00002	1-1	Reel, 13inch Rotating Type, Blue, 330mm x 100mm x 30mm	1
3	161-00003	1-1	Carrier Tape, Conductive Polyethylene, Black, 14.3mm x 20.3mm x 2.8mm	1
4	161-00565	1.0	Cover Tape, Anti-static Polyester, 26.5mm x 0.05mm	1
5	161-00283	1.0	Box, Single-Wall Corrugated B Flute, 378mm x 347mm x 65mm	1
6	161-00284	1.0	Carton, Double-Wall, Brown, 395mm x 353mm x 374mm	1
7	161-00280	1.0	Bag, ESD and Moisture Barrier, Silver, 430mm x 500mm x 0.15mm	1
8	160-00004	1-1	Label, Product Identifier, Sona MT320, 80mm x 40mm	3
9	161-00282	1.0	Desiccant, Silica Gel, 80g, 140mm x 80mm	1
10	161-00281	1.0	Humidity Indicator Card, Minimum 60% RH, Six Spot Indication, 38mm x 102mm	1
11	160-01816	1.0	Label, Blank Moisture Sensitivity Level, 95mm x 90mm	1
12	160-02053	3.3	Label, Standard Shipping Box, CE Mark, Pictogram, 4in x 2.5in	2

REVISIONS			
REV.	REVISION NOTE	RELEASE DATE	REVISED BY
1-1	Initial release	Dec 5, 2023	IT
1-2	Logo change	Feb 29, 2024	IT

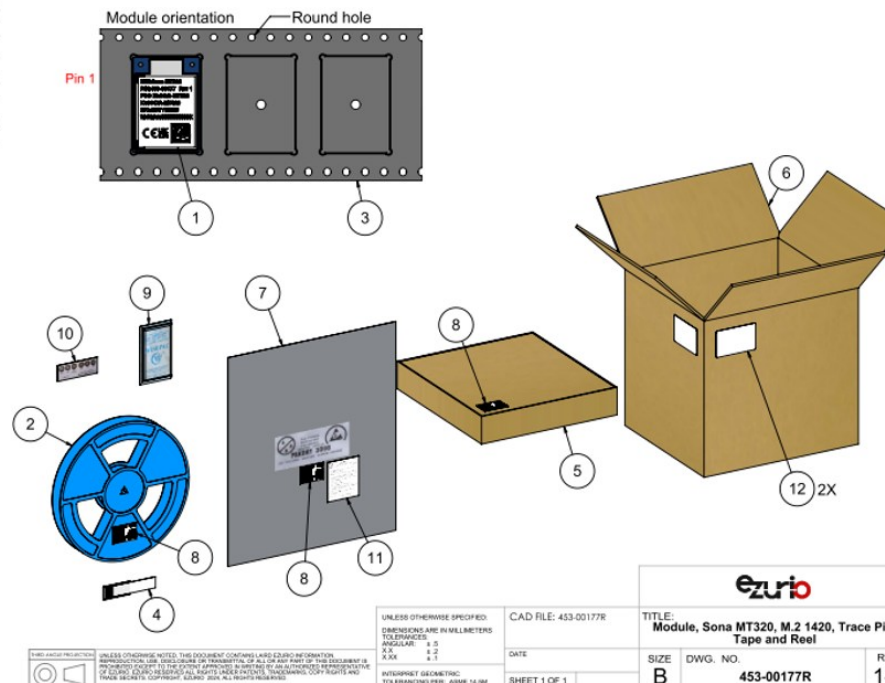


Figure 8: Sona MT320 M.2 1420 packaging processes

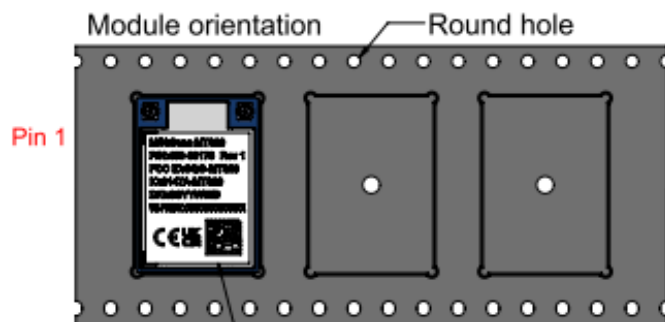


Figure 9: Module Orientation in Carrier Tape Pocket, MHF4 Variant

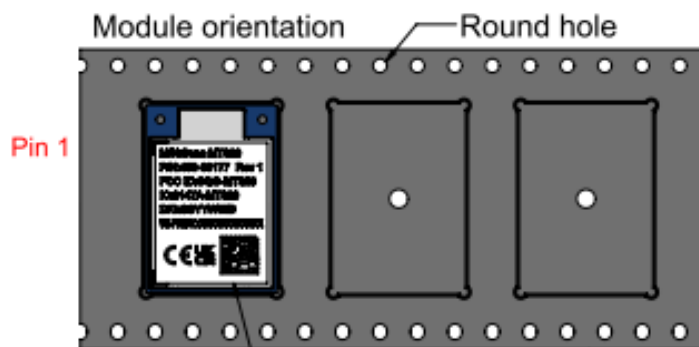


Figure 10: Module Orientation in Carrier Tape Pocket, Trace Pin Variant

The following labels are located on the boards.

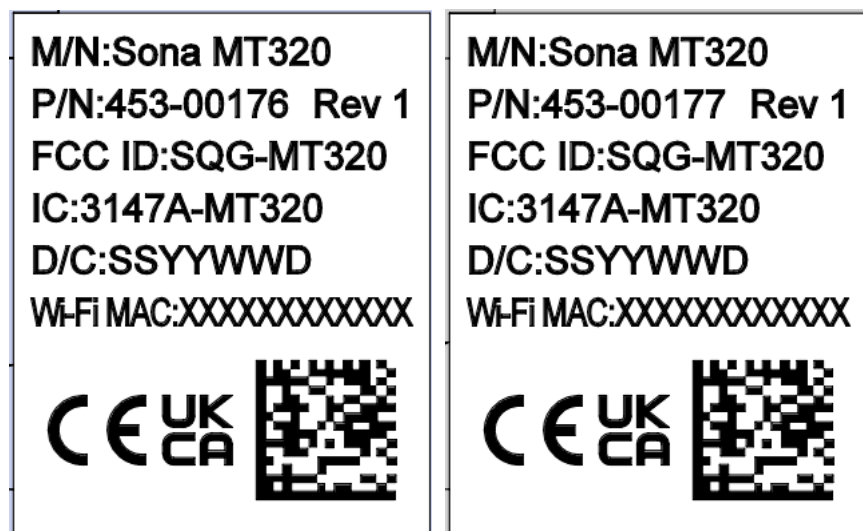


Figure 11: Sona MT320 M.2 1420 Product Label

The following labels are located on the antistatic bag. The Sona MT320 solder-down modules are classified as MSL4 devices.

Caution
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL

If blank, see adjacent
bar code label

1. Calculated shelf life in sealed bag : 12 months at <40°C and <90% relative humidity (RH)
2. Peak package body temperature: _____ °C
If blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
 - a) Mounted within: _____ hours of factory conditions
If blank, see adjacent bar code label
≤30°C/60% RH, or
 - b) Stored per J-STD-033
4. Devices require bake, before mounting, if:
 - a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at 23 ± 5 °C
 - b) 3a or 3b are not met.
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure.

Bag Seal Date: _____
If blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

Figure 12: Sona MT320 M.2 1420 Moisture Sensitivity Level Label

The following label is placed on the anti-static bag and on the pizza box.

M/N:Sona MT320 Rev1

P/N:453-00176R

D/C:SSYYWWD

Q'TY:XXXXPCS

BOX_ID:BXXXXXYMDXXXXXX

BE	BG	CZ	NL	AT	PL
DK	DE	EE	PT	RO	SI
IE	EL	ES	SK	FI	SE
FR	HR	IT	UK(N)	LI	IS
CY	LV	LT	NO	TR	CH
LU	HU	MT			

M/N:Sona MT320 Rev1

P/N:453-00177R

D/C:SSYYWWD

Q'TY:XXXXPCS

BOX_ID:BXXXXXYMDXXXXXX

BE	BG	CZ	NL	AT	PL
DK	DE	EE	PT	RO	SI
IE	EL	ES	SK	FI	SE
FR	HR	IT	UK(N)	LI	IS
CY	LV	LT	NO	TR	CH
LU	HU	MT			

Figure 13: Sona MT320 M.2 1420 Bag and Box Product Identifier Label

The following labels are placed on the master shipping carton.

	<table border="1"> <tr><td>BE</td><td>BG</td><td>CZ</td><td>NL</td><td>CH</td><td>TR</td></tr> <tr><td>DK</td><td>DE</td><td>EE</td><td>PT</td><td>LI</td><td>IS</td></tr> <tr><td>IE</td><td>EL</td><td>ES</td><td>SK</td><td>SE</td><td>FI</td></tr> <tr><td>FR</td><td>HR</td><td>IT</td><td>SI</td><td>RO</td><td>SI</td></tr> <tr><td>CY</td><td>LV</td><td>LT</td><td>NO</td><td>PL</td><td>AT</td></tr> <tr><td>LU</td><td>HU</td><td>MT</td><td></td><td></td><td></td></tr> </table>	BE	BG	CZ	NL	CH	TR	DK	DE	EE	PT	LI	IS	IE	EL	ES	SK	SE	FI	FR	HR	IT	SI	RO	SI	CY	LV	LT	NO	PL	AT	LU	HU	MT			
	BE	BG	CZ	NL	CH	TR																															
	DK	DE	EE	PT	LI	IS																															
	IE	EL	ES	SK	SE	FI																															
	FR	HR	IT	SI	RO	SI																															
CY	LV	LT	NO	PL	AT																																
LU	HU	MT																																			
P/N: Part Number Revision: R Description: Product Description Description: Line 2 if Needed Quantity: ## Date Code: SSYYWWD Country of Origin: TW Ezurio 50 S. Main St. Ste. 1100 Akron, OH 44308 www.ezurio.com	PO: J##### 																																				

Figure 14: Sona MT320 M.2 1420 Carton Product Identifier Label

13.2.2 Sona MT320 M.2 2230 E-Key Module

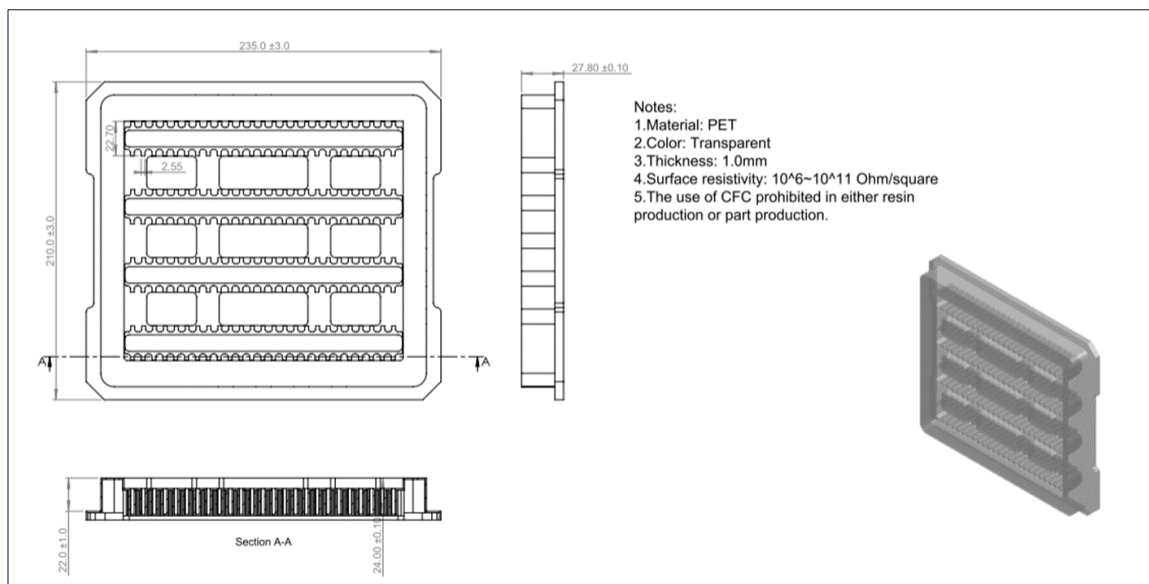


Figure 15: Sona MT320 M.2 2230 Shipping Tray, Bottom, 161-00355

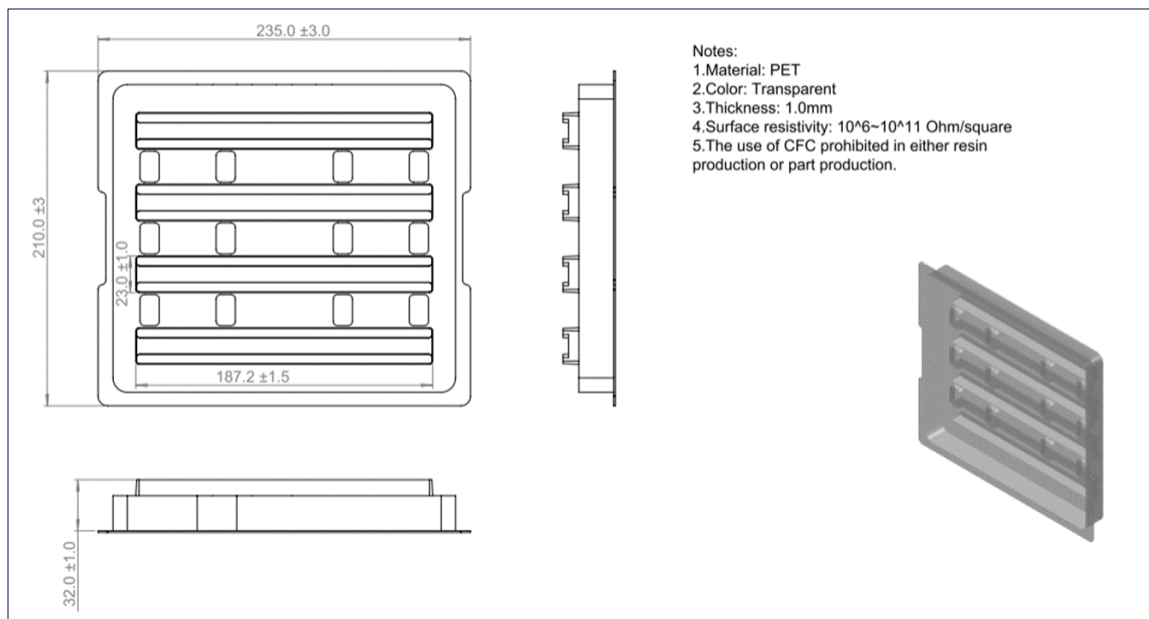


Figure 16: Sona MT320 M.2 2230 Shipping Tray, Top, 161-00356

NO.	ITEM NUMBER	REV.	DESCRIPTION	QTY.
1	453-00178	1-1	Module, Sona MT320, M.2 2230, Key E, SDIO	600
2	161-00009	1-0	Tray, Bottom, PET, Anti-static, Transparent, 235mm x 210mm x 27.8mm, inner 22.7mm x 2.55mm	6
3	161-00356	1-0	Tray, Top, PET, Anti-static, Transparent, 235mm x 210mm x 32mm	6
4	161-00007	1-0	Box, Kraft, B Flute, 265mm x 233mm x 45mm	6
5	160-00021	1-0	Label, Box Product Identifier, Sona MT320, M.2, 60mm x 45mm	12
6	161-00282	1-0	Desiccant, Silica Gel, 60g, 140mm x 80mm	6
7	161-00358	1-0	Bag, ESD and Moisture Barrier, Silver, 270mm x 360mm x 0.09mm	6
8	161-00010	1-0	Carton, Kraft, BC Flute, 486mm x 280mm x 163mm	1
9	160-02053	3-3	Label, Standard Shipping Box, CE Mark, Pictogram, 4in x 2.5in	2

REVISIONS			
REV.	REVISION NOTE	RELEASE DATE	REVISED BY
0-1	Initial release	Feb 1, 2024	IT

- Notes:
1. Put the Module in the bottom tray.
 2. Cover the top tray.
 3. Put the packed tray and Desiccant in the ESD bag.
 4. Put the packed ESD bag (vacuum) in the box.
 5. Put six boxes in the carton.
 6. Module packaging quantity:
Per Tray: 100 PCS
Per Carton: 600PCS

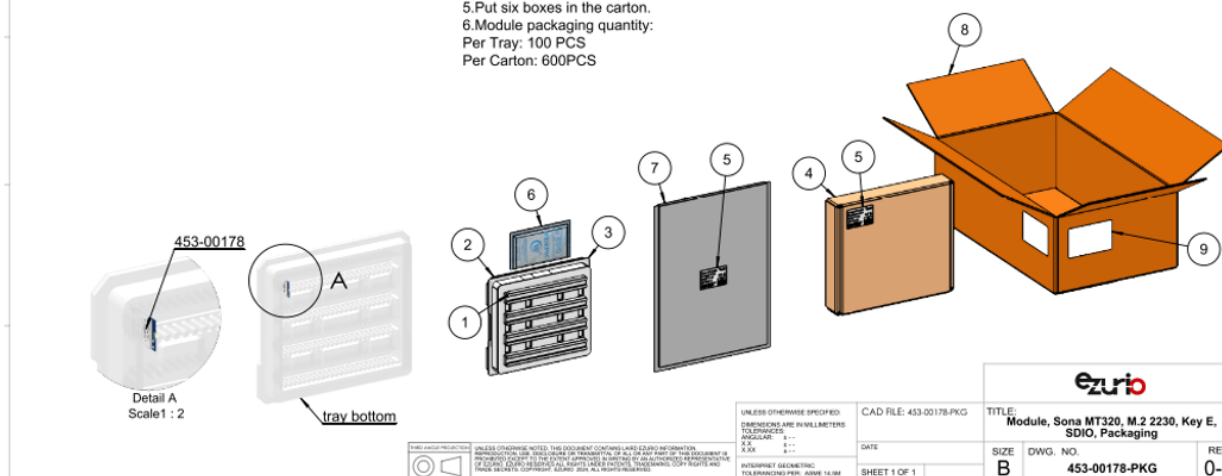


Figure 17: Sona MT320 M.2 2230 Packaging Process, 453-00178-PKG

The following label is placed on the board.



Figure 18: Sona MT320 M.2 2230 Product Identifier Label

The following label is placed on the bag and the inner box.

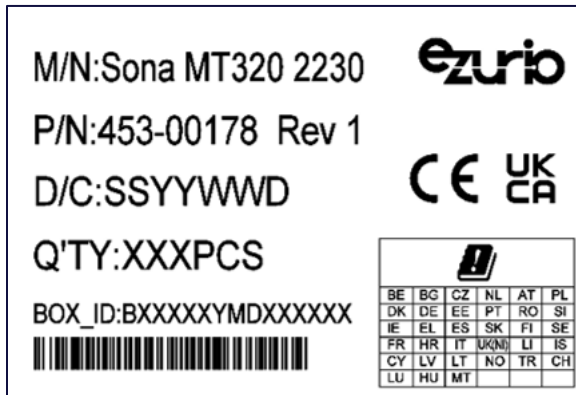


Figure 19: Sona MT320 M.2 2230 Bag and Box Product Identifier Label

The following labels are placed on the master shipping carton.



Figure 20: Sona MT320 M.2 2230 Carton Product Identifier Label

13.3 Required Storage Conditions

13.3.1 Prior to Opening the Dry Packing

The following are required storage conditions *prior to opening the dry packing*:

- Normal temperature: 5~40 °C
- Normal humidity: 80% (Relative humidity) or less
- Storage period: One year or less

Note: Humidity means relative humidity.

13.3.2 After Opening the Dry Packing

The following are required storage conditions *after opening the dry packing* (to prevent moisture absorption):

- Storage conditions for one-time soldering:
 - Temperature: 5-25°C
 - Humidity: 60% or less
 - Period: 72 hours or less after opening
- Storage conditions for two-time soldering
 - Storage conditions following opening and prior to performing the 1st reflow:
 - Temperature: 5-25°C
 - Humidity: 60% or less
 - Period: A hours or less after opening
 - Storage conditions following completion of the 1st reflow and prior to performing the 2nd reflow
 - Temperature: 5-25°C
 - Humidity: 60% or less
 - Period: B hours or less after completion of the 1st reflow

Note: Should keep A+B within 72 hours.

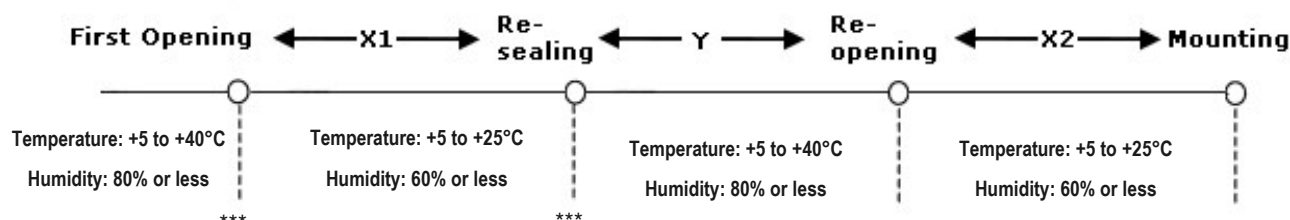
13.3.3 Temporary Storage Requirements after Opening

The following are temporary storage requirements after opening:

- Only re-store the devices once prior to soldering.
- Use a dry box or place desiccant (with a blue humidity indicator) with the devices and perform dry packing again using vacuumed heat-sealing.

The following indicate the required storage period, temperature, and humidity for this temporary storage:

- Storage temperature and humidity:



*** - External atmosphere temperature and humidity of the dry packing

- Storage period:
 - X1+X2 – Refer to After Opening the Dry Packing storage requirements. Keep is X1+X2 within 72 hours.
 - Y – Keep within two weeks or less.

13.4 Baking Conditions

Baking conditions and processes for the module follow the J-STD-033 standard which includes the following:

- The calculated shelf life in a sealed bag is 12 months at $<40^{\circ}\text{C}$ and $<80\%$ relative humidity.
- Once the packaging is opened, the SiP must be mounted (per MSL4/Moisture Sensitivity Level 4) within 72 hours at $<30^{\circ}\text{C}$ and $<60\%$ relative humidity.
- If the SiP is not mounted within 72 hours or if, when the dry pack is opened, the humidity indicator card displays $>10\%$ humidity, then the product must be baked for 48 hours at 125°C ($\pm 5^{\circ}\text{C}$).

14 Surface Mount Conditions

The following soldering conditions are recommended to ensure device quality.

14.1 Recommended Stencil Aperture

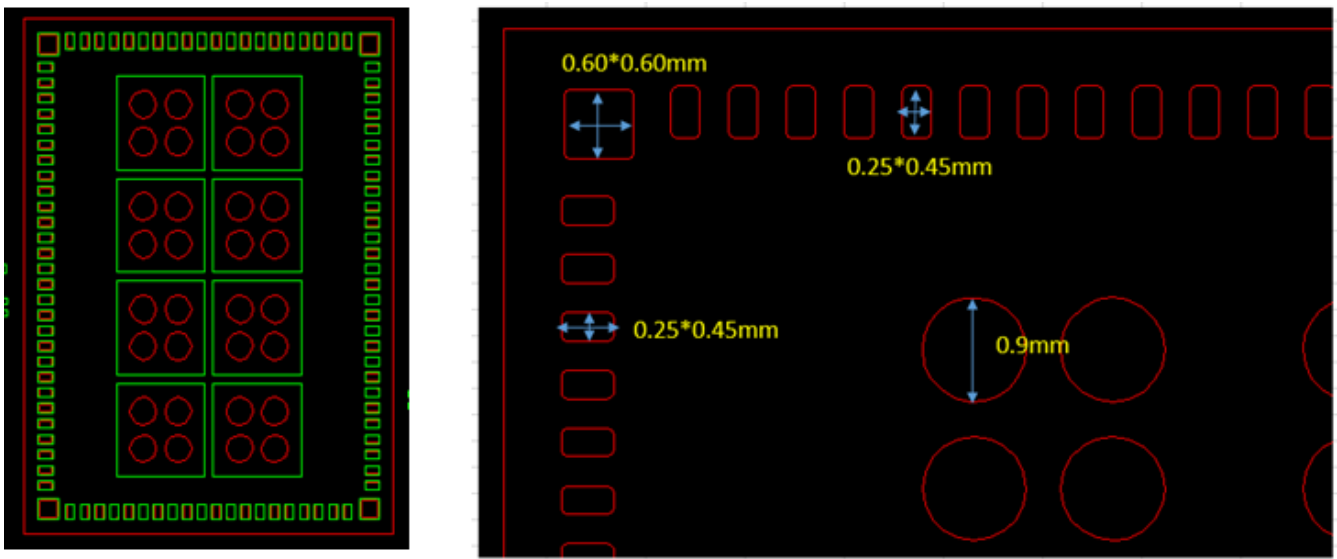
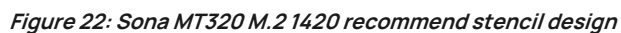


Figure 21: Sona MT320 M.2 1420 stencil aperture

Note: The stencil thickness is 0.12mm



14.2 Soldering

Note: When soldering, the stencil thickness should be 0.12 mm.

Convection reflow or IR/Convection reflow (one-time soldering or two-time soldering in air or nitrogen environment)

Measuring point – IC package surface

Temperature profile:

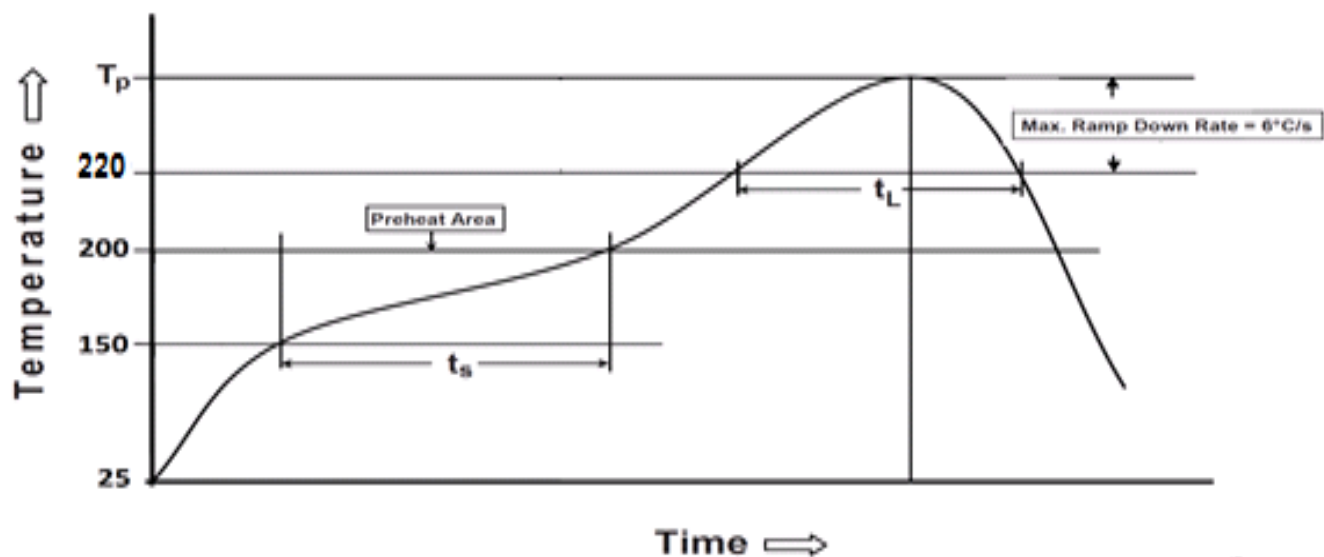


Figure 23: Temperature profile

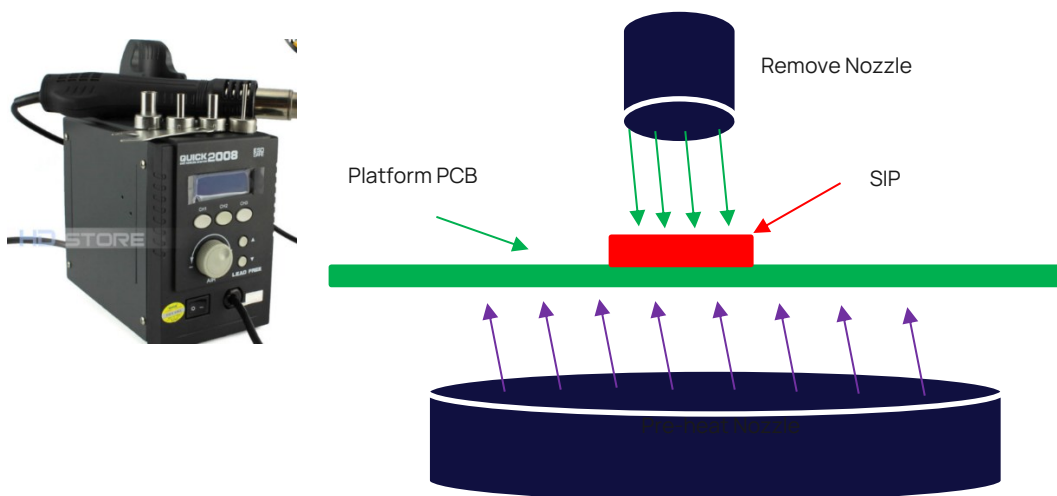
- Solder paste alloy: SAC305 (Sn96.5 / Ag3.0 / Cu 0.5)
- Pre-heat temperature: 150°C ~ 200°C; Soak time: 60 second ~ 120 second
- Peak temperature: 235°C ~ 250°C
- Time above 220°C: 40 second ~ 90 second
- Optimal cooling rate < 3°C/second
- The oxygen concentration < 2000 ppm

14.2.1 Cautions When Removing the M.2 1420 from the Platform for RMA

- Bake the platform before removing the Sona MT320 M.2 1420 module from the platform. Reference [Baking Conditions](#).
- Remove the Sona MT320 M.2 1420 module by using a hot air gun. This process should be carried out by a skilled technician.

Recommended conditions:

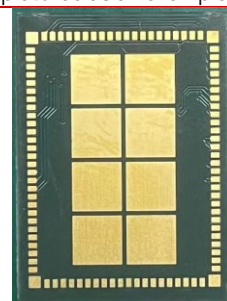
- One-side component platform:
 - Set the hot plate at 280°C.
 - Put the platform on the hot plate for 8~10 seconds.
 - Remove the device from platform.
- Two-side components platform:
 - Use two hot air guns.
 - On the bottom, use a pre-heated nozzle (temp setting of 200~250°C) at a suitable distance from the platform PCB.
 - On the top, apply a remove nozzle (temp setting of 330°C). Heat until device can be removed from platform PCB.



- Remove the residue solder under the bottom side of device. (**Note:** Alternate module pictured as an example)



(Not accepted for RMA)



(Accepted for RMA analysis)

Figure 24: Example M.2 1420 with residue solder on the bottom

Figure 25: Sona MT320 M.2 1420 module without residue solder

- Remove and clean the residue flux as needed.

14.2.2 Precautions for Use

- Opening/handling/removing must be done on an anti-ESD treated workbench. All workers must also have undergone anti-ESD treatment.
- The devices should be mounted within one year of the date of delivery.
- The Sona MT320 M.2 1420 and M.2 2230 modules are MSL level 4 rated.

15 Reliability Test

The Sona MT320 modules were tested for reliability. Test items and the corresponding standards are shown in [Table 24](#).

15.1 Environmental and Mechanical

The following are the followed reliability test procedures.

Table 24: Sona MT320 M.2 1420 Solder-down Module and Sona MT320 M.2 2230 E-Key Module Reliability Test Items and Standards

Test Item	Specification	Standard	Test Result
Thermal Shock	1. Temperature: -40 ~ 85°C 2. Ramp time: Less than 10 seconds. 3. Dwell Time: 10 minutes 4. Number of Cycles: 500 times	*JESD22-A106 *IEC 60068-2-14 for dwell time and number of cycles	PASS
Vibration Non-operating Unpackaged device	1. Vibration Wave Form: Sine Waveform 2. Vibration frequency / Displacement: 20-80 Hz/1.5mm 3. Vibration frequency / Acceleration: 80-2000 Hz/20g 4. Cycle Time: 4 min/cycle 5. Number of Cycles: 4 cycle/axis 6. Vibration Axes : X, Y and Z (Rotate each axis on vertical vibration table)	JEDEC 22-B103B (2016)	PASS
Mechanical Shock Non-operating Unpackaged device	1. Pulse shape: Half-sine waveform 2. Impact acceleration: 1500 g 3. Pulse duration: 0.5 ms 4. Number of shocks: 30 shocks (5 shocks for each face) 5. Orientation: Bottom, top, left, right, front and rear faces	JEDEC 22-B110B.01 (2019)	PASS

15.2 Reliability Prediction

Test Item	Specification	Standard
Mean Time Between Failure (MTBF)	1. Normal Operating Temperature: 45 °C 2. High Temperature: 85 °C	Telcordia SR-332 Issue 4 (2016)

Ezurio Part Number	Environment	Test Result 45 °C (Hours)
453-00176R	Ground, Fixed, Uncontrolled	5,811,765
453-00176C	Ground, Mobile	2,179,412

Ezurio Part Number	Environment	Test Result 85 °C (Hours)
453-00176R	Ground, Fixed, Uncontrolled	1,391,674
453-00176C	Ground, Mobile	521,878

Ezurio Part Number	Environment	Test Result 45 °C (Hours)
453-00177R	Ground, Fixed, Uncontrolled	7,058,202
453-00177C	Ground, Mobile	2,646,826

Ezurio Part Number	Environment	Test Result 85 °C (Hours)
453-00177R	Ground, Fixed, Uncontrolled	2,177,692
453-00177C	Ground, Mobile	816,635

Ezurio Part Number	Environment	Test Result 45 °C (Hours)
453-00178	Ground, Fixed, Uncontrolled	3,933,540
	Ground, Mobile	1,475,077

Ezurio Part Number	Environment	Test Result 85 °C (Hours)
453-00178	Ground, Fixed, Uncontrolled	867,635
	Ground, Mobile	325,363

16 Regulatory

Note: For complete regulatory information, refer to the relevant Sona MT320 Regulatory Information Guide:
[Regulatory Information - Sona MT320 M.2 1420](#)
[Regulatory Information - Sona MT320 M.2 2230](#)

The Sona MT320 holds current certifications in the following countries:

Country/Region	Regulatory ID - M.2 1420 Variant	Regulatory ID - M.2 2230 Variant
USA (FCC)	SQG-MT320	SQG-MT3202230
Canada (ISED)	3147A-MT320	3147A-MT3202230
EU	N/A	
UKCA	N/A	
Japan (MIC)	N/A	
Australia	N/A	
New Zealand	N/A	

17 Certified Antennas

Manufacturer	Model	Part Number	Type	Connector	Frequency Range	Peak Gain (dBi)
Ezurio [Laird Connectivity]	FlexMIMO 6E	EFD2471A3S-10MH4L	PIFA	MHF4L	2.4 GHz - 2.5 GHz	2.2
					4.9 GHz - 5.925 GHz	3.8
Ezurio [Laird Connectivity]	FlexPIFA 6E	EFB2471A3S-10MH4L	PIFA	MHF4L	2.4 GHz - 2.5 GHz	2.2
					4.9 GHz - 5.925 GHz	3.9
Ezurio [Laird Connectivity]	Mini NanoBlade Flex 6GHz	EMF2471A3S-10MH4L	PCB Dipole	MHF4L	2.4 GHz - 2.5 GHz	2.4
					4.9 GHz - 6.0 GHz	4.4

18 Bluetooth Qualification process

18.1 Overview

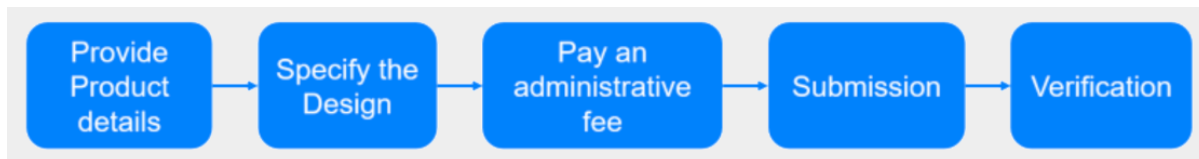
The Bluetooth Qualification Process promotes global product interoperability and reinforces the strength of the Bluetooth® brand and ecosystem to the benefit of all Bluetooth SIG members. The Bluetooth Qualification Process helps member companies ensure their products that incorporate Bluetooth technology comply with the Bluetooth Patent & Copyright License Agreement and the Bluetooth Trademark License Agreement (collectively, the Bluetooth License Agreement) and Bluetooth Specifications.

The Bluetooth Qualification Process is defined by the [Qualification Program Reference Document \(QPRD\) v3](#).

To demonstrate that a product complies with the Bluetooth Specification(s), each member must for each of its products:

- Identify the product, the design included in the product, the Bluetooth Specifications that the design implements, and the features of each implemented specification
- Complete the Bluetooth Qualification Process by submitting the required documentation for the product under a user account belonging to your company

The Bluetooth Qualification Process consists of the phases shown below:



To complete the Qualification Process the company developing a Bluetooth End Product shall be a member of the Bluetooth SIG. To start the application please use the following link: [Apply for Adopter Membership](#)

18.2 Scope

This guide is intended to provide guidance on the Bluetooth Qualification Process for End Products that reference multiple existing designs, that have not been modified, (refer to Section 3.2.2.1 of the [Qualification Program Reference Document v3](#)).

For a Product that includes a new Design created by combining two or more unmodified designs that have DNs or QDIDs into one of the permitted combinations in Table 3.1 of the QPRDv3, a Member must also provide the following information:

- DNs or QDIDs for Designs included in the new Design
- The desired Core Configuration of the new Design (if applicable, see Table 3.1 below)
- The active TCRL Package version used for checking the applicable Core Configuration (including transport compatibility) and evaluating test requirements

Any included Design must not implement any Layers using withdrawn specification(s).

When creating a new Design using Option 2a, the Inter-Layer Dependency (ILD) between Layers included in the Design will be checked based on the latest TCRL Package version used among the included Designs.

For the purposes of this document, it is assumed that the member is combining unmodified Core-Controller Configuration and Core-Host Configuration designs, to complete a Core-Complete Configuration.

18.3 Qualification Steps When Referencing multiple existing designs, (unmodified) – Option 2a in the QPRDv3

For this qualification option, follow these steps:

1. To start a listing, go to: <https://qualification.bluetooth.com/>
2. Select **Start the Bluetooth Qualification Process**.
3. Product Details to be entered:
 - Project Name (this can be the product name or the Bluetooth Design name).
 - Product Description
 - Model Number

- Product Publication Date (the product publication date may not be later than 90 days after submission)
 - Product Website (optional)
 - Internal Visibility (this will define if the product will be visible to other users prior to publication)
 - If you have multiple End Products to list then you can select 'Import Multiple Products', firstly downloading and completing the template, then by 'Upload Product List'. This will populate Qualification Workspace with all your products.
4. Specify the Design:
- Do you include any existing Design(s) in your Product? Answer Yes, I do.
 - Enter the multiple DNs or QDIDs used in your, (for Option 2a two or more DNs or QDIDs must be referenced)
 - Select 'I'm finished entering DN's
 - Once the DNs or QDIDs are selected they will appear on the left-hand side, indicating the layers covered by the design (should show Core-Controller and Core Host Layers covered).
 - What do you want to do next? Answer, 'Combine unmodified Designs'.
 - The Qualification Workspace Tool will indicate that a new Design will be created and what type of Core-Complete configuration is selected.
 - An active TCRL will be selected for the design.
 - Perform the Consistency Check, which should result in no inconsistencies
 - If there are any inconsistencies these will need to be resolved before proceeding
 - Save and go to Test Plan and Documentation
5. Test Plan and Documentation
- a. As no modifications have been made to the combined designs the tool should report the following message:
'No test plan has been generated for your new Design. Test declarations and test reports do not need to be submitted. You can continue to the next step.'
 - b. Save and go to Product Qualification fee
6. Product Qualification Fee:
- It's important to make sure a Prepaid Product Qualification fee is available as it is required at this stage to complete the Qualification Process.
 - Prepaid Product Qualification Fee's will appear in the available list so select one for the listing.
 - If one is not available select 'Pay Product Qualification Fee', payment can be done immediately via credit card, or you can pay via Invoice. Payment via credit will release the number immediately, if paying via invoice the number will not be released until the invoice is paid.
 - Once you have selected the Prepaid Qualification Fee, select 'Save and go to Submission'
7. Submission:
- Some automatic checks occur to ensure all submission requirements are complete.
 - To complete the listing any errors must be corrected
 - Once you have confirmed all design information is correct, tick all of the three check boxes and add your name to the signature page.
 - Now select 'Complete the Submission'.
 - You will be asked a final time to confirm you want to proceed with the submission, select 'Complete the Submission'.
 - Qualification Workspace will confirm the submission has been submitted. The Bluetooth SIG will email confirmation once the submission has been accepted, (normally this takes 1 working day).
8. Download Product and Design Details (SDoC):
- a. You can now download a copy of the confirmed listing from the design listing page and save a copy in your Compliance Folder

For further information, please refer to the following webpage:

<https://www.bluetooth.com/develop-with-bluetooth/qualification-listing/>

18.4 Example Design Combinations

The following gives an example of a design possible under option 2a:

Ezurio Controller Subsystem + BlueZ 5.50 Host Stack (Ezurio Sona MT320 based design)

Design Name	Owner	Declaration ID	QD ID	Link to listing on the SIG website
Sona MT320	Ezurio	D067610	207300	https://qualification.bluetooth.com/ListingDetails/210862
BlueZ 5.50 Host Stack	Ezurio	D046330	138224	https://qualification.bluetooth.com/ListingDetails/93911

18.5 Qualify More Products

If you develop further products based on the same design in the future, it is possible to add them free of charge. The new product must not modify the existing design i.e add ICS functionality, otherwise a new design listing will be required.

To add more products to your design, select 'Manage Submitted Products' in the **Getting Started** page, Actions, Qualify More Products. The tool will take you through the updating process.

19 Additional Information

Please contact your local sales representative or our support team for further assistance:

Headquarters	Ezurio 50 S. Main St. Suite 1100 Akron, OH 44308 USA
Website	http://www.ezurio.com/
Technical Support	http://www.ezurio.com/resources/support
Sales Contact	http://www.ezurio.com/contact

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