Datasheet

Sona™ IF573

Version 1.2

Revision History

Version	Date	Notes	Contributors	Approver
0.1	8 June 2023	Preliminary release	Various	Andy Ross
0.2	13 July 2023	Updates to Table 37: M.2 2230 E-Key pin definitions – WL_DEV_WAKE and BT_DEV_WAKE voltage	Jacky Kuo	Andrew Chen
0.3	8 Aug 2023	Added Transmit Power to Table 3: Specifications	Jacky Kuo	Andrew Chen
0.4	11 Aug 2023	Updated 7.1 M.2 1318 Solder-down	Jacky Kuo	Connie Lin
0.5	20 Oct 2023	Updated Table 12 through Table 21 in 8.5 WLAN Transmitter Characteristics	Jacky Kuo	Andy Ross
1.0	23 Oct 2023	Initial release	Andrew Chen Connie Lin Dean Ramsier Jacky Kuo Kris Sidle Peter Scharpf Andrew Dobbing	Andy Ross
1.1	5 Dec 2023	Updates to Table 36: M.2 1318 pin definitions and Table 37: M.2 2230 E-Key pin definitions. Removed channel sets as duplicated in Regulatory Information Guide.	Dean Ramsier Jacky Kuo Andrew Chen	Andy Ross
1.2	11 Dec 2023	Updated 19.1Certified Antennas section	Connie Lin	Andy Ross

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1 SCOPE

This document describes key hardware aspects of the Laird Connectivity Sona™ IF573 series wireless modules providing either PCIe v3.0 Gen2 or SDIO 3.0 interface for WLAN connection and high-speed 4-wire UART interface for 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 Infineon CYW55573MIWBGT data sheet issued on March 23, 2023, along with other documents provided by Infineon.

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

2 INTRODUCTION

2.1 General Description

The Sona IF573 series wireless module is an integrated, small form factor Wi-Fi/Bluetooth module that is optimized for low-power mobile devices, featuring:

- Wi-Fi 6E: Tri-band 2x2 MIMO IEEE 802.11a/b/g/n/ac/ax WLAN
- Bluetooth® 5.4: Dual Mode

The integration of all WLAN and Bluetooth functionality in a single package supports low cost and simple implementation along with flexibility for platform-specific customization. It is available in both M.2 2230 E-Key and M.2 1318 solder-down form factor.

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 three integrated MHF4 connectors, with two ports for WLAN and one dedicated for Bluetooth. The M.2 1318 solder down module also supports an RF trace pin option for use with external antenna solutions. For a list of certified antennas see Certified Antennas in the datasheet.

The Sona IF573 series device supports IEEE 802.11ax tri-band (2.4/5/6 GHz) 2x2 MIMO with data rates up to MCS11 (287 Mbps PHY data rate for 2.4 GHz band and 1.2 Gbps PHY data rate for 5/6 GHz). The device has a dedicated Bluetooth port for best Wi-Fi + Bluetooth coexistence performance. The device's low power consumption, radio architecture and power management unit (PMU) proprietary power save technologies allow for extended battery life.

In addition, its tri-band IEEE 802.11ax and Bluetooth radio includes full digital MAC and baseband engines that handle all 802.11 CCK/OFDM/OFDMA® 2.4/5/6 GHz and Bluetooth 5.4 (Basic Rate, Enhanced Data Rate, and Bluetooth Low Energy) baseband and protocol processing.

The Sona IF573 series wireless modules include two product SKUs which have different RF paths. Please contact Laird Connectivity Sales/FAE for further information. Ordering information is listed in Table 1.

Table 1: Product ordering information

Part Number	Description
453-00117R	Sona IF573 1318 Module, MHF4, Tape and Reel
453-00117C	Sona IF573 1318 Module, MHF4, Cut Tape
453-00118R	Sona IF573 1318 Module, RF Trace Pin, Tape and Reel
453-00118C	Sona IF573 1318 Module, RF Trace Pin, Cut Tape
453-00119	Sona IF573 M.2 2230 Module, Key E, SDIO/UART
453-00120	Sona IF573 M.2 2230 Module, Key E, PCIe/UART
453-00119-K1	Sona IF573 M.2 2230 Module Development Kit, SDIO/UART
453-00120-K1	Sona IF573 M.2 2230 Module Development Kit, PCIe/UART

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3 SONA IF573 SERIES FEATURES SUMMARY

The Laird Connectivity Sona IF573 series device features are described in Table 2.

Table 2: Sona IF573 series wireless module features

<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td>Radio Front End</td><td>▪ Integrates the complete transmit/receive RF paths including bandpass filter, diplexer, switches, reference crystal oscillator, and power manage unit (PMU)
▪ Supports tri-band (2.4/5/6 GHz)
▪ Supports 20/40/80 MHz channel bandwidth
▪ Supports 2x2 WLAN antenna configuration with dedicated Bluetooth antenna port</td></tr>
<tr><td colspan="2">The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. Any use of such marks by Laird Connectivity is under license. Other trademarks and trade names are those of their respective owners.</td></tr>
<tr><td>Power Management</td><td>Two buck regulator, multiple LDO regulators, and a power management unit (PMU) are integrated into the CYW55573MIWBGT. All regulators are programmable via the PMU. These blocks simplify power supply design for Bluetooth and WLAN functions in embedded designs.</td></tr>
<tr><td>Pre-Calibration</td><td>RF system tested and calibrated in production</td></tr>
<tr><td>Sleep Clock</td><td>An external sleep clock of 32.768 kHz is required. The external 32.768 kHz precision oscillator which meets the requirements listed following table must be used.
<table>
<tr><th>Parameter</th><th>LPO Clock</th><th>Unit</th></tr>
<tr><td>Nominal input frequency</td><td>32.768</td><td>kHz</td></tr>
<tr><td>Frequency accuracy</td><td>±250</td><td>ppm</td></tr>
<tr><td>Duty cycle</td><td>30 – 70</td><td>%</td></tr>
<tr><td>Input signal amplitude</td><td>200 – 1800</td><td>mV, p-p</td></tr>
<tr><td>Signal type</td><td>Square-wave or sine-wave</td><td>-</td></tr>
<tr><td rowspan="2">Input impedance</td><td>> 100k</td><td>Ω</td></tr>
<tr><td>< 5</td><td>pF</td></tr>
<tr><td>Clock jitter (during initial startup)</td><td>< 10,000</td><td>ppm</td></tr>
</table></td></tr>
<tr><td>Host Interface</td><td>The Sona IF573 M.2 card provides two interfaces for customers to choose:
1. SDIO/UART, Wi-Fi section provides support for SDIO v3.0 and also is backward compatible with SDIO v2.0. Bluetooth section supports a high-speed 4-wire UART interface.
2. PCIe/UART, Wi-Fi section provides support for PCIe Gen2 (3.0 Compliant). Bluetooth section supports a high-speed 4-wire UART interface.</td></tr>
<tr><td>Advanced WLAN</td><td>▪ IEEE 802.11a/b/g/n/ac/ax compliant, tri-band capable (2.4/5/6 GHz)
▪ 2x2 MIMO providing up to 1.2 Gbps PHY data rate for 5/6 GHz (1024-QAM modulation)
▪ 2x2 MIMO providing up to 287 Mbps PHY data rate for 2.4 GHz (1024-QAM modulation)
▪ Supports 20, 40, and 80 MHz channels with optional SGI (1024-QAM modulation)
▪ Background channel availability check (CAC) scan for immediate switch to candidate DFS channel
▪ On-chip power amplifiers and low-noise amplifiers for both bands
▪ Support wide variety of WLAN encryption: WPA/WPA2/WPA3/TKIP/AES and IEEE 802.11i compatibility</td></tr>
<tr><td>Advanced Bluetooth</td><td>▪ Bluetooth 5.4 (BDR + EDR + Bluetooth LE)
▪ Dedicated Bluetooth RF path port
▪ Bluetooth Class 1 or Class 2 transmitter operation
▪ Support data rate: 1 Mbps (GFSK), 2 Mbps (π/4-DQPSK), 3 Mbps (8-DPSK), LE-1 Mbps, LE-2 Mbps, LE-LR-500K (S=2) and LE-LR-125K (S=8)</td></tr>
</table>

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Feature	Description
	▪ Supports extended synchronous connections (eSCO) for enhanced voice quality by allowing for retransmission of dropped packets ▪ Adaptive frequency hopping (AFH) for reducing radio frequency interference ▪ Host controller interface (HCI) using a highspeed UART and PCM/I2S for audio data ▪ Low power consumption improves battery life of IoT and embedded devices ▪ Supports multiple simultaneous Advanced Audio Distribution Profiles (A2DP) for stereo sound ▪ On-chip memory includes 512 KB SRAM and 2 MB ROM

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4 SPECIFICATIONS

Table 3: Specifications

Feature	Description
Physical Interface	M.2 2230 E-Key standard form factor M.2 1318 108-pin LGA package (including 8 thermal ground pads under the package)
Wi-Fi Interface	PCIe v3.0 Gen2 Secure Digital I/O 2.0/3.0
Bluetooth/BLE Interface	Host Controller Interface (HCI) using high speed UART
Main Chipset	Infineon AIROC™ CYW55573MIWBGT
Input Voltage Requirements	Typical DC 3.3 V, operating range from DC 3.13V to 3.5V
I/O Signalling Voltage	Compliant with M.2 standard Typical DC 1.8 V ± 5%
Operating Temperature	-40° to +85°C (-40° to +185°F) **Note**: Absolute junction temperature 125 °C limit is maintained through active thermal monitoring, throttling, and turning off one of the TX chains or both.
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 8KV; Air coupled 12KV (follows EN61000-4-2)
Size	M.2 1318 ▪ Length: 18 mm ▪ Width: 13 mm ▪ Thickness: 0.43 mm M.2 E-Key ▪ Length: 30 mm ▪ Width: 22 mm Thickness: 3.1 mm
Weight – g (oz.)	M.2 1318 ▪ ~0.7 M.2 E-Key ▪ 3
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 with U-APSD) WMM-Sequential Access (WMM-SA)
Network Architecture Types	Infrastructure (client operation)
Wi-Fi Standards	IEEE 802.11ax, 11ac, 11a/b/g/n, 11d/h, 11i, 11r, 11w, 11e, 11k, 11ai, 11v
Bluetooth Standards	Bluetooth 2.1 + EDR, 3.0, 4.2, 5.0, 5.1, 5.2, 5.3, 5.4

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Feature	Description
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, 6 GHz / OFDM / HE20, HE40, HE80 / MCS0-11; 5 GHz, 6 GHz / OFDMA / HE20, HE40, HE80 / MCS0-11)
Modulation Table	BPSK, QPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM

Modulation Type

MCS Index			Spatial Stream	Modulation	Coding	OFDM (IEEE 802.11n/ac)						OFDM (IEEE 802.11ax)								
						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	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	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	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	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	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	68.8	65	58.5	137.6	130	117	288.2	272.2	245
6	6	6	1	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6
7	7	7	1	64-QAM	5/6	65	72.2	135	150	292.5	325	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3
	8	8	1	256-QAM	3/4	78	86.7	162	180	351	390	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5
	9	9	1	256-QAM	5/6	N/A	N/A	180	200	390	433.3	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3
		10	1	1024-QAM	3/4							129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4
		11	1	1024-QAM	5/6							143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4
8	0	0	2	BPSK	1/2	13	14.4	27	30	58.5	65	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	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	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	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	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	137.6	130	117	275.3	260	234	576.5	544.4	490
14	6	6	2	64-QAM	3/4	117	130	243	270	526.5	585	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3
15	7	7	2	64-QAM	5/6	130	144.4	270	300	585	650	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5
	8	8	2	256-QAM	3/4	156	173.3	324	360	702	780	206.5	195	175.5	412.9	390	351	864.7	816.7	735
	9	9	2	256-QAM	5/6	N/A	N/A	360	400	780	866.7	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7
		10	2	1024-QAM	3/4							258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8
		11	2	1024-QAM	5/6							286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8

OFDMA (IEEE 802.11ax)

MCS Index	Spatial Stream	Modualtion	Coding	26-tone RU			52-tone RU			106-tone RU			242-tone RU			484-tone RU			996-tone RU		
HE				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	3.9	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	8.3	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	3.5	22.2	20	50	47.2	42.5	114.7	108.3	97.5	229.4	216.7	195	480.4	53.7	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	1097	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

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Feature	Description
Regulatory Certifications	United States (FCC) EU - Member countries of European Union (ETSI) Great Britain (UKCA) Canada (ISED) Australia/New Zealand (RCM) Japan (MIC)
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
5 GHz Frequency Bands	**EU** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.85 GHz **FCC** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.85 GHz **ISED** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.85 GHz **UKCA** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.730 GHz 5.725 GHz to 5.850 GHz **MIC** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz **RCM** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.85 GHz
6 GHz Frequency Bands	**FCC / ISED** UNII-5, 5.925 GHz to 6.415 GHz UNII-6, 6.435 GHz to 6.515 GHz UNII-7, 6.535 GHz to 6.875 GHz UNII-8, 6.895 GHz to 7.115 GHz **EU** UNII-5, 5.945 GHz to 6.425 GHz **UKCA** UNII-5, 5.945 GHz to 6.425 GHz **MIC** UNII-5, 5.945 GHz to 6.425 GHz **RCM** UNII-5, 5.945 GHz to 6.425 GHz

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Transmit Power

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.*

Note:
HT20/VHT20/HE20 – 20 MHz-wide channels
HT40/VHT40/HE40 – 40 MHz-wide channels
HT80/VHT80/HE80 – 80 MHz-wide channels

802.11a	
6 Mbps	16.5 dBm (44.66 mW)
54 Mbps	16 dBm (39.81 mW)
802.11b	
1 Mbps	17 dBm (50.11 mW)
11 Mbps	17 dBm (50.11 mW)
802.11g	
6 Mbps	16.5 dBm (44.66 mW)
54 Mbps	16 dBm (39.81 mW)
802.11n (2.4 GHz)	
HT20; MCS0-4, MCS8-12	16 dBm (39.81 mW)
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	12.5 dBm (17.78 mW)
HE20; MCS10-11	10.5 dBm (11.22 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	15 dBm (31.62 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 (25.12 mW)
VHT40; MCS0-4	16 dBm (39.81 mW)
VHT40; MCS5-7	15 dBm (31.62 mW)
VHT40; MCS8-9	12 dBm (15.85 mW)
VHT80; MCS0-4	16 dBm (39.81 mW)
VHT80; MCS5-7	15 dBm (31.62 mW)
VHT80; MCS8-9	12 dBm (15.85 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	12 dBm (15.85 mW)
HE40; MC10-11	11.5 dBm (14.13 mW)
HE80; MCS0-4	16 dBm (39.81 mW)
HE80; MCS5-7	15 dBm (31.62 mW)
HE80; MCS8-9	12 dBm (15.85 mW)

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Feature	Description	
	HE80; MCS10-11	11 dBm (12.59 mW)
	802.11ax (6 Hz, UNII-5 / 6)	
	11a; 6M-24M	15.5 dBm (35.48 mW)
	HE20; MCS0-6	15.5 dBm (35.48 mW
	HE20; MCS7	15 dBm (31.62 mW)
	HE20; MCS8	14.5 dBm (28.18 mW)
	HE20; MCS9-11	12 dBm (15.85 mW)
	HE40; MCS0-6	15.5 dBm (35.48 mW)
	HE40; MCS7	14 dBm (25.12 mW)
	HE40; MCS8	12.5 dBm (17.78 mW)
	HE40; MCS9	12 dBm (15.85 mW)
	HE40; MCS10-11	11 dBm (12.59 mW)
	HE80; MCS0-6	15 dBm (31.62 mW)
	HE80; MCS7	14 dBm (25.12 mW)
	HE80; MCS8	12 dBm (15.85 mW)
	HE80; MCS9	11 dBm (12.59 mW)
	HE80; MCS10-11	10 dBm (10 mW)
	802.11ax (6 Hz, UNII-7 / 8)	
	11a; 6M-24M	15 dBm (31.62 mW)
	HE20; MCS0-6	15 dBm (31.62 mW)
	HE20; MCS7	13 dBm (19.95 mW)
	HE20; MCS8	12 dBm (15.85 mW)
	HE20; MCS9-11	10.5 dBm (11.22 mW)
	HE40; MCS0-6	15 dBm (31.62 mW)
	HE40; MCS7	12 dBm (15.85 mW)
	HE40; MCS8	11 dBm (12.59 mW)
	HE40; MCS9	10 dBm (10 mW)
	HE40; MCS10-11	8.5 dBm (7.08 mW)
	HE80; MCS0-6	14.5 dBm (28.18 mW)
	HE80; MCS7	11 dBm (12.59 mW)
	HE80; MCS8	10 dBm (10 mW)
	HE80; MCS9-11	8.5 dBm (7.08 mW)
	Bluetooth	
	1 Mbps (1DH1 3, 5)	7 dBm (5 mW), Maximum
	2 Mbps (2DH1, 3, 5)	3 dBm (1.99 mW), Maximum
	3 Mbps (3DH1, 3, 5)	3 dBm (1.99 mW), Maximum
	LE (1 Mbps, 2 Mbps)	7 dBm (5 mW), Maximum
	LE-LR (S=2, S=8)	7 dBm (5 mW), Maximum

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Feature	Description	
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	-90 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)	-75 dBm
	802.11ax (2.4 GHz)	
	7.3 Mbps (MCS0; HE20)	-93 dBm
	121.9 Mbps (MCS11; HE20)	-62 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-93 dBm
	802.11n (5 GHz)	
	6.5 Mbps (MCS0; HT20)	-93 dBm
	65 Mbps (MCS7; HT20)	-73 dBm
	13.5Mbps (MCS0; HT40)	-90 dBm
	135Mbps (MCS7; HT40)	-71 dBm
	802.11ac (5 GHz)	
	6.5 Mbps (MCS0; VHT20)	-93 dBm
	78 Mbps (MCS8; VHT20)	-70 dBm
	13.5 Mbps (MCS0; VHT40)	-90 dBm
	180 Mbps (MCS9; VHT40)	-65 dBm
	29.3 Mbps (MCS0; VHT80)	-87 dBm
	390 Mbps (MCS9; VHT80)	-62 dBm
	802.11ax (5 GHz)	
	7.3 Mbps (MCS0; HE20)	-90 dBm
	121.9 Mbps (MCS11; HE20)	-60 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-90 dBm
	14.6 Mbps (MCS0; HE40)	-88 dBm
	243.8 Mbps (MCS11; HE40)	-58 dBm
	14.6 Mbps (MCS0; HE40/RU484)	-88 dBm
	30.6 Mbps (MCS0; HE80)	-87dBm
	510.4 Mbps (MCS11; HE80)	-55 dBm
	30.6 Mbps (MCS0; HE80/RU996)	-87 dBm
	802.11ax (6 GHz, UNII-5)	
	6 Mbps	-90 dBm
	24 Mbps	-83 dBm
	7.3 Mbps (MCS0; HE20)	-90 dBm
	121.9 Mbps (MCS11; HE20)	-60 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-90 dBm
	14.6 Mbps (MCS0; HE40)	-89 dBm
	243.8 Mbps (MCS11; HE40)	-56 dBm
	14.6 Mbps (MCS0; HE40/RU484)	-89 dBm
	30.6 Mbps (MCS0; HE80)	-87 dBm
	510.4 Mbps (MCS11; HE80)	-54 dBm
	30.6 Mbps (MCS0; HE80/RU996)	-87 dBm

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Feature	Description	
	802.11ax (6 GHz, UNII-6)	
	6 Mbps	-89 dBm
	24 Mbps	-82 dBm
	7.3 Mbps (MCS0; HE20)	-89 dBm
	121.9 Mbps (MCS11; HE20)	-59 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-89 dBm
	14.6 Mbps (MCS0; HE40)	-88 dBm
	243.8 Mbps (MCS11; HE40)	-55 dBm
	14.6 Mbps (MCS0; HE40/RU484)	-88 dBm
	30.6 Mbps (MCS0; HE80)	-85 dBm
	510.4 Mbps (MCS11; HE80)	-54 dBm
	30.6 Mbps (MCS0; HE80/RU996)	-85 dBm
	802.11ax (6GHz, UNII-7)	
	6 Mbps	-86 dBm
	24 Mbps	-81 dBm
	7.3 Mbps (MCS0; HE20)	-86 dBm
	121.9 Mbps (MCS11; HE20)	-58 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-86 dBm
	14.6 Mbps (MCS0; HE40)	-85 dBm
	243.8 Mbps (MCS11; HE40)	-55 dBm
	14.6 Mbps (MCS0; HE40/RU484)	-85 dBm
	30.6 Mbps (MCS0; HE80)	-84 dBm
	510.4 Mbps (MCS11; HE80)	-52 dBm
	30.6 Mbps (MCS0; HE80/RU996)	-84 dBm
	802.11ax (6 GHz, UNII-8)	
	6 Mbps	-85 dBm
	24 Mbps	-79 dBm
	7.3 Mbps (MCS0; HE20)	-85 dBm
	121.9 Mbps (MCS11; HE20)	-56 dBm
	7.3 Mbps (MCS0; HE20/RU242)	-85 dBm
	14.6 Mbps (MCS0; HE40)	-84 dBm
	243.8 Mbps (MCS11; HE40)	-53 dBm
	14.6 Mbps (MCS0; HE40/RU484)	-84 dBm
	30.6 Mbps (MCS0; HE80)	-83 dBm
	510.4 Mbps (MCS11; HE80)	-51 dBm
	30.6 Mbps (MCS0; HE80/RU996)	-83 dBm
	Bluetooth:	
	1 Mbps (1DH5)	-91 dBm
	2Mbps (2DH5)	-93 dBm
	3 Mbps (3DH5)	-87 dBm
	LE-1 Mbps	-95 dBm
	LE-2 Mbps	-92 dBm
	LE-LR (S=2)	-102 dBm
	LE-LR (S=8)	-107 dBm
Operating Systems Supported	Linux Android	
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)	

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Feature	Description	
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) Article 2 Paragraph 1 of Item 80 : LPI (ZR), 6 GHz
Certifications	***Bluetooth*® SIG Qualification** D063147	
Warranty	One Year Warranty	
	All specifications are subject to change without notice	

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5 WLAN Functional Description

5.1 Overview

The Sona IF573 series wireless module is designed based on the Infineon AIROC CYW55573MIWBGT Wi-Fi 6E chipset (dual-core 2x2 MIMO). It is optimized for high speed, reliability, and low-power embedded applications. It is integrated with tri-band WLAN (2.4/5/6 GHz) and Bluetooth 5.4. Its functionality is listed in Table 4.

Table 4: WLAN functions

Feature	Description
WLAN MAC	▪ Enhanced MAC for supporting IEEE 802.11a/b/g/n/ac/ax features ▪ Transmission and reception of HE-SU and HE-ER-SU PPDU ▪ Reception of HE-MU PPD -OFDMA/MU-MIMO frame ▪ Transmission of HE-TB PPDU (Uplink MU OFDMA) ▪ Transmission and reception of A-MPDUs/AMSDUs for very high throughput (VHT) ▪ Support for power management schemes, including WMM power-save, programmable state machine (PSM) operation ▪ Support for all ACK and Block-ACK policies as per standard ▪ Interframe space timing support, including RIFS ▪ Support for RTS/CTS and CTS-to-nowhere frame sequences for protecting frame exchanges ▪ Timing synchronization function (TSF), network allocation vector (NAV) maintenance, and target beacon transmission time (TBTT) generation in hardware and capturing the TSF timer on an external time synchronization pulse ▪ Hardware offload for cipher suites/encryption types WEP, TKIP(WPA), AES(WPA2), support for WPA3-SAE and key management ▪ Support for coexistence with Bluetooth ▪ RTS-CTS based BW signaling mechanism support
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)

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Feature	Description
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				

6 GHz / UNII-5					
20 MHz		40 MHz		80 MHz	
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
1	5955	3	5965	7	5985
5	5975	11	6005	23	6065
9	5995	19	6045	39	6145
13	6015	27	6085	55	6225
17	6035	35	6125	71	6305
21	6055	43	6165	87	6385
25	6075	51	6205		
29	6095	59	6245		
33	6115	67	6285		
37	6135	75	6325		
41	6155	83	6365		
45	6175	91	6405		
49	6195				
53	6215				
57	6235				
61	6255				
65	6275				
69	6295				
73	6315				
77	6335				
81	6355				
85	6375				
89	6395				
93	6415				

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Feature	Description

6 GHz / UNII-6					
20 MHz		40 MHz		80 MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
97	6435	99	6445	103	6465
101	6455	107	6485	119	6545
105	6475	115	6525		
109	6495				
113	6515				

6 GHz / UNII-7					
20 MHz		40 MHz		80 MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
117	6535	123	6565	135	6625
121	6555	131	6605	151	6705
125	6575	139	6645	167	6785
129	6595	147	6685	183	6865
133	6615	155	6725		
137	6635	163	6765		
141	6655	171	6805		
145	6675	179	6845		
149	6695	187	6885		
153	6715				
157	6735				
161	6755				
165	6775				
169	6795				
173	6815				
177	6835				
181	6855				
185	6875				

6 GHz / UNII-8					
20 MHz		40 MHz		80 MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
189	6895	195	6925	199	6945
193	6915	203	6965	215	7025
197	6935	211	7005		
201	6955	219	7045		
205	6975	227	7085		
209	6995				
213	7015				
217	7035				
221	7055				
225	7075				
229	7095				
233	7115				

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6 Bluetooth Functional Description

The Sona IF573 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
Bluetooth Interface	▪ Voice interface: – Supported by PCM transports and bi-directional operations. – Sample rates 8k for NBS and 16k for WBS supported. – Sample width is limited to 16-bits. – Synchronization clock width of 1 or 3 (short or long) – Bit clocks of 128k, 256k, 512k, 1024k and 2024k, the only difference being the number of 16bit slots. – HFP samples can be taken from any available slot. Slot 0 is the default slot. ▪ High-Speed UART interface
Bluetooth Core functionality	▪ Supports all Bluetooth 5.3 and 4.2 features ▪ Dual-mode Bluetooth low energy ▪ Bluetooth LE LE-2Mbps mode, LE-Long Range mode, Advertising Extensions, Slot Availability Masks ▪ Extended inquiry response (EIR): Shortens the time to retrieve the device name, specific profile, and operating mode ▪ Encryption pause resume (EPR): Enables the us of Bluetooth technology in a much more secure environment ▪ Sniff subrating (SSR): Optimizes power consumption for low duty cycle asymmetric data flow, which subsequently extends battery life. ▪ Secure simple pairing (SSP): Reduces the number of steps for connecting two devices, with minimal or no user interaction required. ▪ Link supervision time out (LSTO): Additional commands added to HCI and link management protocol (LMP) for improved link time-out supervision. ▪ QoS enhancements: Changes to data traffic control, which results in better link performance. Audio, human interface device (HID), bulk traffic. SCO, and enhanced SCO (eSCO) are improved with the erroneous data (ED) and packet boundary flag (PBF) enhancements.
Bluetooth Features	▪ Supports features of Bluetooth Core Specification version 5.2: – LE Isochronous Channels – LE Power Control ▪ Supports features of Bluetooth Core Specification version 5.1: – Direction Finding (AoA/AoD) – Additional Advertising Channels – Periodic Advertising Sync Transfer (PAST) – GATT Caching ▪ Supports features of Bluetooth Core Specification version 5.0: – LE 2Mbps – LE Long Range (LE-LR) – Stable Modulation Index for LE – LE Advertising Extension – Slot Availability Masks (SAM) – Channel Selection Algorithm – High Duty Cycle Non-Connectable Advertising ▪ Supports features of Bluetooth Core Specification version 4.0 + EDR – Adaptive frequency hopping (AFH) – Quality of service (QoS) – Extended synchronous connections (eSCO) – Voice Connections – Fast connect (interlaced page and inquiry scans)

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Feature	Description
	– Secure simple pairing (SSP) – Sniff subrating (SSR) – Encryption pause resume (EPR) – Extended inquiry response (EIR) – Link supervision timeout (LST) ▪ Multipoint operation with up to seven active slaves – Maximum of seven simultaneous active ACL links – Maximum of three simultaneous active SCO and eSCO connections with scattement support ▪ High-speed HCI UART transport support with low-power out-of-band BT_DEV_WAKE and BT_HOST_WAKE signaling.

7 Block Diagrams

7.1 M.2 1318 Solder-down

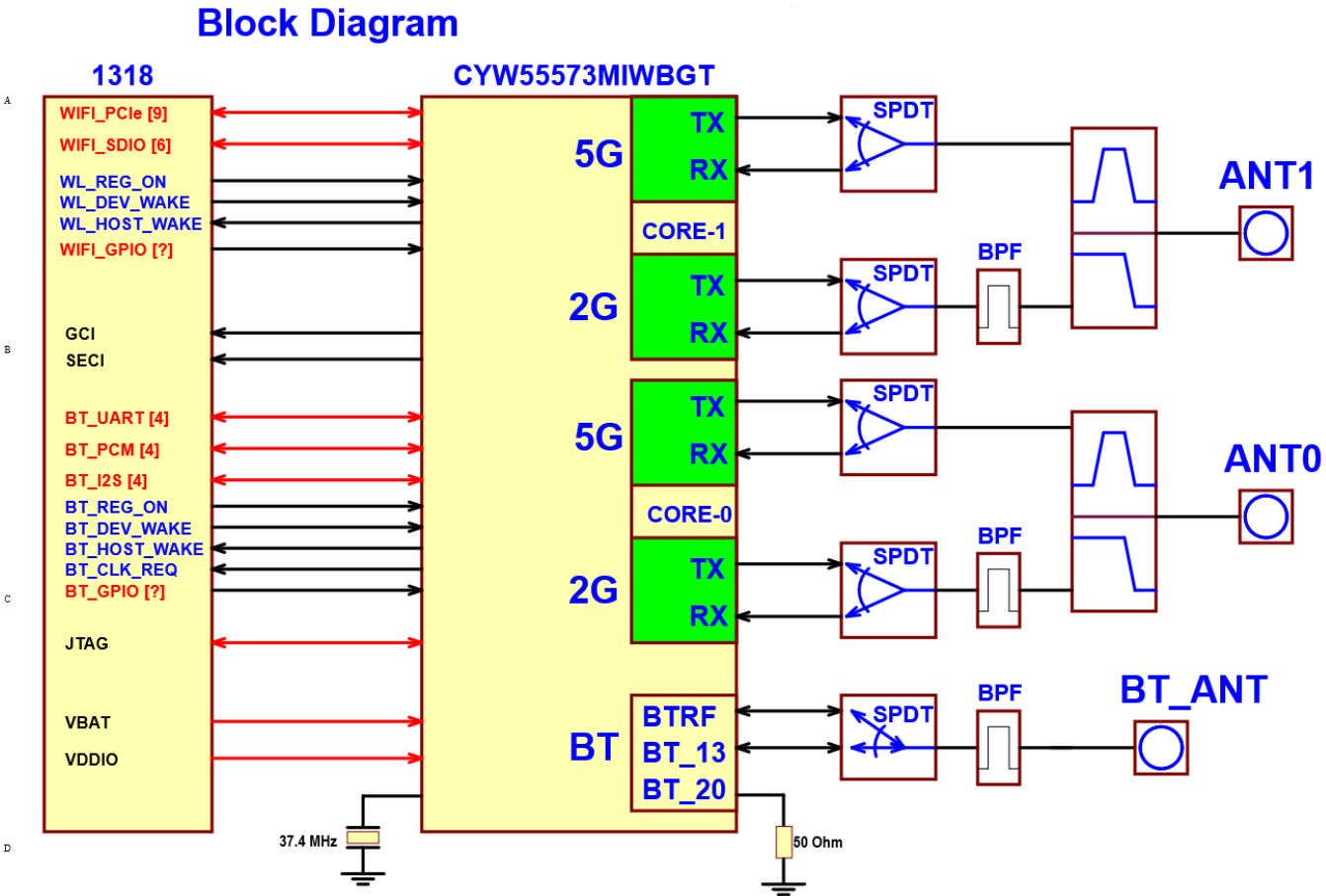

Figure 1: M.2 1318

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7.2 M.2 2230 E-Key

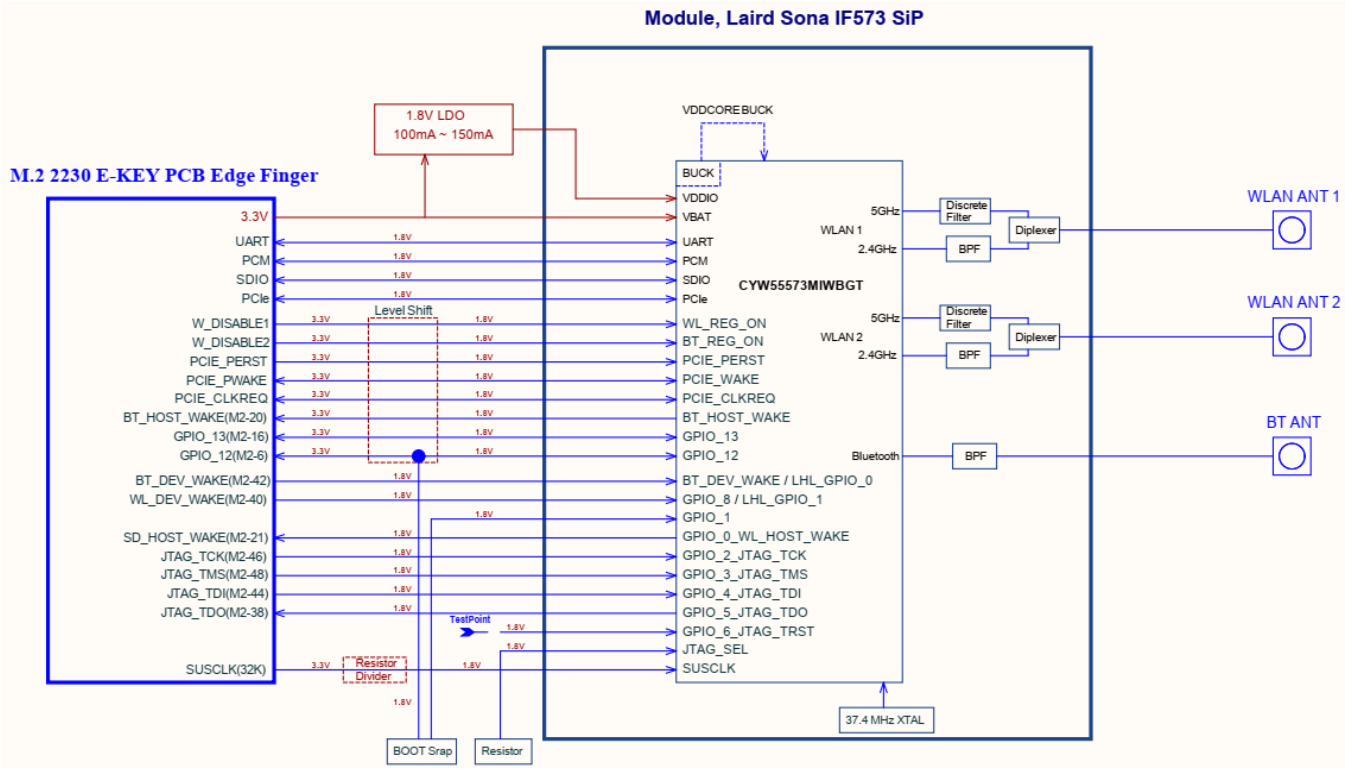

Figure 2: M.2 2230 E-Key

8 Electrical Characteristics

8.1 Absolute Maximum Ratings

Table 6 summarizes the absolute maximum ratings and Table 7 lists the recommended operating conditions for the Sona IF573 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
VBAT	External DC power supply (M.2 1318)	+6.0	V
VDDIO	DC supply voltage for digital I/O (M.2 1318)	2.2	V
3V3	External 3.3V power supply (M.2 2230 E-Key)	4.0	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

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8.2 Recommended Operating Conditions

Table 7: Recommended operating conditions

Symbol (Domain)	Parameter	Min	Typ	Max	Unit
VBAT	External DC power supply	3.13	3.3	3.47	V
VDDIO	DC supply voltage for digital I/O	1.71	1.8	1.89	V
T-ambient	Ambient temperature	-40	25	+85	°C

8.3 DC Electrical Characteristics

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

Table 8: General DC electrical characteristics (For 1.8V operation VDDIO)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIH	High Level Input Voltage	—	0.65 x VDDIO	—	—	V
VIL	Low Level Input Voltage	—	—	—	0.35 x VDDIO	V
VOH	Output high Voltage	—	VDDIO – 0.4	—	—	V
VOL	Output low Voltage	—	—	—	0.45	V

8.4 WLAN Radio Receiver Characteristics

Table 9, Table 10, and Table 11 summarize the Sona IF573 series wireless module receiver characteristics.

Table 9: WLAN receiver characteristics for 2.4 GHz single chain 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		—	-90	—	
	OFDM, 6 Mbps		—	-93	—	
	OFDM, 54 Mbps		—	-76	—	
	HT20, MCS0		—	-93	—	
	HT20, MCS7		—	-75	—	
	HE20, MCS0		—	-93	—	
	HE20, MCS11		—	-62	—	
ACI - OFDM [Difference between interfering and desired signal (25 MHz apart)]	Adjacent channel rejection					
	OFDM, 6 Mbps	See Note[1]	—	30	—	dB
	OFDM, 54 Mbps		—	15	—	
ACI – 11n MCS0-7 [Difference between interfering and desired signal (25 MHz apart)]	HT20, MCS0		—	30	—	`
	HT20, MCS7		—	10	—	
ACI – 11ax MCS0-11 [Difference between interfering and desired signal (25 MHz apart)]	HE20, MCS0		—	30	—	
	HE20, MCS7		—	10	—	
	HE20, MCS11		—	TBD	—	

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Table 10: WLAN receiver characteristics for 5 GHz single chain 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		—	-93	—	
	HT20, MCS7		—	-73	—	
	HT40, MCS0		—	-90	—	
	HT40, MCS7		—	-71	—	
	VHT20, MCS0		—	-93	—	
	VHT20, MCS8		—	-70	—	
	VHT40, MCS0		—	-90	—	
	VHT40, MCS9		—	-65	—	
	VHT80, MCS0		—	-87	—	
	VHT80, MCS9		—	-62	—	
	HE20, MCS0		—	-92	—	
	HE20, MCS11		—	-60	—	
	HE40, MCS0		—	-90	—	
	HE40, MCS11		—	-58	—	
	HE80, MCS0		—	-87	—	
	HE80, MCS11		—	-55	—	
ACI - OFDM	Adjacent channel rejection					
[Difference between interfering and desired signal (20 MHz apart)]	OFDM, 6 Mbps	See Note[1]	—	25	—	dB
	OFDM, 54 Mbps		—	5	—	
ACI – MCS0-11	MCS0	See Note[1]	—	25	—	dB
[Difference between interfering and desired signal (20 MHz apart)]	MCS7		—	5	—	
	MCS11		—	TBD	—	
ACI – MCS0-11	MCS0	See Note[1]	—	24	—	dB
[Difference between interfering and desired signal (40 MHz apart)]	MCS7		—	5	—	
	MCS11		—	TBD	—	
ACI – MCS0-11	MCS0	See Note[1]	—	TBD	—	dB
[Difference between interfering and desired signal (80 MHz apart)]	MCS7		—	TBD	—	
	MCS11		—	TBD	—	

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Table 11: WLAN receiver characteristics for 6 GHz single chain operation

Item	Parameter	Conditions	Typical (Sensitivity)				Unit
			UNII-5	UNII-6	UNII-7	UNII-8	
Frequency Range	Receive input frequency range	—	5950 - 6415	6435 - 6515	6535 - 6875	6895 - 7115	MHz
Modulation Type	OFDM, 6Mbps	See Note[1]	-92	-91	-90	-88	dBm
	OFDM, 24Mbps		-83	-82	-81	-79	
	HE20, MCS0		-92	-91	-90	-89	
	HE20, MCS7		-74	-73	-72	-70	
	HE20, MCS8		-69	-68	-67	-66	
	HE20, MCS9		-68	-67	-66	-64	
	HE20, MCS11		-60	-59	-58	-56	
	HE40, MCS0		-90	-89	-88	-86	
	HE40, MCS7		-71	-70	-69	-67	
	HE40, MCS8		-67	-66	-65	-63	
	HE40, MCS9		-65	-64	-63	-61	
	HE40, MCS11		-56	-55	-55	-53	
	HE80, MCS0		-87	-85	-84	-83	
	HE80, MCS7		-68	-67	-65	-64	
	HE80, MCS8		-64	-63	-62	-60	
	HE80, MCS9		-62	-61	-60	-58	
	HE80, MCS11		-54	-54	-52	-51	
ACI - OFDM [Difference between interfering and desired signal (20 MHz apart)]	6 Mbps	See Note[1]	25	25	25	25	dB
ACI – MCS0-11 [Difference between interfering and desired signal (20 MHz apart)]	MCS0	See Note[1]	25	25	25	25	
	MCS7		5	5	5	5	
	MCS9		TBD	TBD	TBD	TBD	
	MCS11		TBD	TBD	TBD	TBD	
ACI – MCS0-11 [Difference between interfering and desired signal (40 MHz apart)]	MCS0	See Note[1]	24	24	24	24	
	MCS7		5	5	5	5	
	MCS9		TBD	TBD	TBD	TBD	
	MCS11		TBD	TBD	TBD	TBD	

Note 1: Performance data are measured in single chain operation.

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8.5 WLAN Transmitter Characteristics

Table 12 through Table 21 summarize the Sona IF573 series wireless module transmitter characteristics.

Table 12: WLAN transmitter characteristics for 2.4 GHz operation (VBAT = 3.3V, VDDIO = 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	6-48Mbps	—		16.5	—	
	11g EVM compliant	54Mbps	—		16	—	
	11n HT20 mask compliant	MCS0-4	—		16	—	
	11n HT20 EVM compliant	MCS5-7	—		15	—	
	11ax HE20 mask compliant	MCS0-4	—		16	—	
	11ax HE20 EVM compliant	MCS5-7	—		15	—	
	11ax HE20 EVM compliant	MCS8-9	—		12.5	—	
	11ax HE20 EVM compliant	MCS10-11	—		10.5	—	
ATx	Transmit power accuracy at 25 ℃	—	-2.0		—	+2.0	dB

Table 13: WLAN current consumption on 2.4 GHz (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
CCK	1 Mbps	1	19	272	5.6
BPSK	6 Mbps	1	18.5	261	3.6
64-QAM	HT20 MCS7	1	17	244	4.1
64-QAM	HT20 MCS15	2	17	439	5.0
256-QAM	HE20 MCS9	2	14.5	393	5.4
1024-QAM	HE20 MCS11	2	12.5	358	4.9

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Table 14: WLAN transmitter characteristics for 5 GHz operation (VBAT=3.3V, VDDIO=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	6-36Mbps	—	16.5	—	dBm
	11a EVM compliant	48-54Mbps	—	16	—	
	11n HT20 mask compliant	MCS0-4	—	16.5	—	
	11n HT20 EVM compliant	MCS5-7	—	16	—	
	11n HT40 mask compliant	MCS0-4	—	16	—	
	11n HT40 EVM compliant	MCS5-7	—	15	—	
	11ac VHT20 mask compliant	MCS0-4	—	16.5	—	
	11ac VHT20 EVM compliant	MCS5-7	—	16	—	
	11ac VHT20 EVM compliant	MCS8	—	14	—	
	11ac VHT40 mask compliant	MCS0-4	—	16	—	
	11ac VHT40 EVM compliant	MCS5-7	—	15	—	
	11ac VHT40 EVM compliant	MCS8-9	—	12	—	
	11ac VHT80 mask compliant	MCS0-4	—	16	—	
	11ac VHT80 EVM compliant	MCS5-7	—	15	—	
	11ac VHT80 EVM compliant	MCS8-9	—	12	—	
	11ax HE20 mask compliant	MCS0-4	—	16.5	—	
	11ax HE20 EVM compliant	MCS5-7	—	16	—	
	11ax HE20 EVM compliant	MCS8-9	—	14	—	
	11ax HE20 EVM compliant	MCS10-11	—	13	—	
	11ax HE40 mask compliant	MCS0-4	—	16	—	
	11ax HE40 EVM compliant	MCS5-7	—	15	—	
	11ax HE40 EVM compliant	MCS8-9	—	12	—	
	11ax HE40 EVM compliant	MCS10-11	—	11.5	—	
	11ax HE80 mask compliant	MCS0-4	—	16	—	
	11ax HE80 EVM compliant	MCS5-7	—	15	—	
	11ax HE80 EVM compliant	MCS8-9	—	12	—	
	11ax HE80 EVM compliant	MCS10-11	—	11	—	
ATx	Transmit power accuracy at 25 ℃	—	-2.0	—	+2.0	dB

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Table 15: WLAN current consumption on 5 GHz (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
BPSK	20	6 Mbps	1	18.5	401	3.6
64-QAM	20	54 Mbps	1	18	384	3.3
BPSK	20	MCS0	2	18.5	715	6.3
64-QAM	20	MCS7	2	18	720	5.8
256-QAM	20	MCS9	2	16	655	6.9
1024-QAM	20	MCS11	2	15	631	7.2
BPSK	40	MCS0	2	18	715	5.0
64-QAM	40	MCS7	2	17	700	4.5
256-QAM	40	MCS9	2	14	604	5.5
1024-QAM	40	MCS11	2	13.5	595	5.9
BPSK	80	MCS0	2	18	761	4.0
64-QAM	80	MCS7	2	17	730	3.7
256-QAM	80	MCS9	2	14	656	4.3
1024-QAM	80	MCS11	2	13	635	4.6

Table 16: WLAN transmitter characteristics for UNII-5 and UNII-6 operation (VBAT = 3.3V, VDDIO = 1.8V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Ftx	Transmit output frequency range	—	5.925	—	6.53	GHz
Pout	Output power	See Note[2]	—	—	—	—
	11a mask compliant	6-24Mbps	—	15.5	—	dBm
	11ax HE20 mask compliant	MCS0-6	—	15.5	—	
	11ax HE20 EVM compliant	MCS7	—	15	—	
	11ax HE20 EVM compliant	MCS8	—	14.5	—	
	11ax HE20 EVM compliant	MCS9-11	—	12	—	
	11ax HE40 mask compliant	MCS0-6	—	15.5	—	
	11ax HE40 EVM compliant	MCS7	—	14	—	
	11ax HE40 EVM compliant	MCS8	—	12.5	—	
	11ax HE40 EVM compliant	MCS9	—	12	—	
	11ax HE40 EVM compliant	MCS10-11	—	11	—	
	11ax HE80 mask compliant	MCS0-6	—	15	—	
	11ax HE80 EVM compliant	MCS7	—	14	—	
	11ax HE80 EVM compliant	MCS8	—	12	—	
	11ax HE80 EVM compliant	MCS9	—	11	—	
	11ax HE80 EVM compliant	MCS10-11	—	10	—	
ATx	Transmit power accuracy at 25 ℃	—	-2.0	—	+2.0	dB

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Table 17: WLAN current consumption on UNII-5 band (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
BPSK	20	6 Mbps	1	17.5	326	4.3
64-QAM	20	24 Mbps	1	17.5	336	3.6
BPSK	20	MCS0	2	17.5	631	6.5
64-QAM	20	MCS7	2	17	645	5.8
256-QAM	20	MCS9	2	14	548	5.1
1024-QAM	20	MCS11	2	14	536	4.8
BPSK	40	MCS0	2	17.5	638	4.9
64-QAM	40	MCS7	2	16	587	4.5
256-QAM	40	MCS9	2	14	534	4.1
1024-QAM	40	MCS11	2	13	518	3.8
BPSK	80	MCS0	2	17	691	4.1
64-QAM	80	MCS7	2	16	659	3.8
256-QAM	80	MCS9	2	13	571	4.5
1024-QAM	80	MCS11	2	12	558	4.2

Table 18: WLAN current consumption on UNII-6 band (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
BPSK	20	6 Mbps	1	17.5	341	4.4
64-QAM	20	24 Mbps	1	17.5	343	3.6
BPSK	20	MCS0	2	17.5	631	6.3
64-QAM	20	MCS7	2	17	637	5.9
256-QAM	20	MCS9	2	14	535	5.3
1024-QAM	20	MCS11	2	14	534	4.9
BPSK	40	MCS0	2	17.5	634	5.1
64-QAM	40	MCS7	2	16	581	4.6
256-QAM	40	MCS9	2	14	530	5.8
1024-QAM	40	MCS11	2	13	511	5.4
BPSK	80	MCS0	2	17	695	4.1
64-QAM	80	MCS7	2	16	666	5.0
256-QAM	80	MCS9	2	13	578	4.6
1024-QAM	80	MCS11	2	12	555	4.2

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Table 19: WLAN transmitter characteristics for UNII-7 and UNII-8 operation (VBAT = 3.3V, VDDIO = 1.8V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Ftx	Transmit output frequency range	—	6.53	—	7.125	GHz
Pout	Output power	See Note[2]	—	—	—	—
	11a mask compliant	6-24Mbps	—	15	—	dBm
	11ax HE20 mask compliant	MCS0-6	—	15	—	
	11ax HE20 EVM compliant	MCS7	—	13	—	
	11ax HE20 EVM compliant	MCS8	—	12	—	
	11ax HE20 EVM compliant	MCS9-11	—	10.5	—	
	11ax HE40 mask compliant	MCS0-6	—	15	—	
	11ax HE40 EVM compliant	MCS7	—	12	—	
	11ax HE40 EVM compliant	MCS8	—	11	—	
	11ax HE40 EVM compliant	MCS9	—	10	—	
	11ax HE40 EVM compliant	MCS10-11	—	8.5	—	
	11ax HE80 mask compliant	MCS0-6	—	14.5	—	
	11ax HE80 EVM compliant	MCS7	—	11	—	
	11ax HE80 EVM compliant	MCS8	—	10	—	
	11ax HE80 EVM compliant	MCS9-11	—	8.5	—	
ATx	Transmit power accuracy at 25 ℃	—	-2.0	—	+2.0	dB

Table 20: WLAN current consumption on UNII-7 band (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
BPSK	20	6 Mbps	1	17	321	4.4
64-QAM	20	24 Mbps	1	17	322	3.7
BPSK	20	MCS0	2	17	615	6.4
64-QAM	20	MCS7	2	15	576	5.9
256-QAM	20	MCS9	2	12.5	518	5.3
1024-QAM	20	MCS11	2	12.5	504	4.9
BPSK	40	MCS0	2	17	643	5.1
64-QAM	40	MCS7	2	14	552	4.7
256-QAM	40	MCS9	2	12	512	4.3
1024-QAM	40	MCS11	2	10.5	483	5.4
BPSK	80	MCS0	2	16.5	681	4.2
64-QAM	80	MCS7	2	13	590	5.0
256-QAM	80	MCS9	2	12	571	4.5
1024-QAM	80	MCS11	2	10.5	540	4.7

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Table 21: WLAN current consumption on UNII-8 band (VBAT = 3.3V, VDDIO = 1.8V, BT_REG_ON = Low)

Modulation	Bandwidth (MHz)	Data Rate	Spatial Stream	Output Power (dBm)	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
BPSK	20	6 Mbps	1	17	335	4.4
64-QAM	20	24 Mbps	1	17	333	3.7
BPSK	20	MCS0	2	17	630	6.3
64-QAM	20	MCS7	2	15	585	5.8
256-QAM	20	MCS9	2	12.5	521	5.2
1024-QAM	20	MCS11	2	12.5	526	6.7
BPSK	40	MCS0	2	17	637	5.0
64-QAM	40	MCS7	2	14	544	4.6
256-QAM	40	MCS9	2	12	516	4.4
1024-QAM	40	MCS11	2	10.5	480	5.5
BPSK	80	MCS0	2	16.5	661	4.1
64-QAM	80	MCS7	2	13	582	4.9
256-QAM	80	MCS9	2	12	569	4.5
1024-QAM	80	MCS11	2	10.5	541	4.7

Note 2: Final TX power values on each channel are limited by regulatory requirements.

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9 Bluetooth Radio Characteristics

Table 22 through Table 26 describe the performance of the Bluetooth transmitter and receiver and the current consumption at 25°C.

Table 22: BR / EDR transmitter performance (VBAT = 3.3V, VDDIO = 1.8V)

Test Parameter		Min	Typ	Max	BT Spec.	Unit
Maximum RF Output Power	GFSK	—	—	7	0 ~ +20	dBm
	π/4-DQPSK	—	3	—		
	8-DPSK	—	3	—		
Frequency Range		2.4	—	2.4835	2.4 ≤ f ≤ 2.4835	GHz
20 dB Bandwidth		—	914.5	—	≤ 1000	KHz
Δf1avg Maximum Modulation		140	154	175	140 < Δf1avg < 175	KHz
Δf2max Minimum Modulation		115	147	—	≥ 115	KHz
Δf2avg/Δf1avg		—	0.95	—	≥ 0.80	—
Initial Carrier Frequency		—	± 25	± 75	≤ ± 75	KHz
Frequency Drift (DH1 packet)		—	± 8	± 25	± 25	KHz
Frequency Drift (DH3 packet)		—	± 8	± 40	± 40	KHz
Frequency Drift (DH5 packet)		—	± 8	± 40	± 40	KHz
Drift rate		—	5	20	20	KHz/50us
EDR ωi		—	—	± 75	≤ ± 75	KHz
EDR ω0		—	—	± 10	≤ ± 10	KHz
EDR (ωi + ω0)		—	—	± 75	≤ ± 75	KHz
RMS DEVM for π/4-DQPSK		—	—	≤ 0.2	≤ 0.2	—
RMS DEVM for 8-DPSK		—	—	≤ 0.13	≤ 0.13	—
Peak DEVM for π/4-DQPSK		—	—	≤ 0.35	≤ 0.35	—
Peak DEVM for 8-DPSK		—	—	≤ 0.25	≤ 0.25	—
99% DEVM for π/4-DQPSK		—	—	≤ 0.30	≤ 0.30	—
99% DEVM for 8-DPSK		—	—	≤ 0.20	≤ 0.20	—
EDR In-Band Spurious Emission	|M-N| ≥ 2.5 MHz	—	-43	-40	< -40	dBm
	1.5 MHz < |M-N| < 2.5 MHz	—	-31	-20	≤ -20	dBm
	1.0 MHz < |M-N| < 1.5 MHz	—	-38	-26	≤ -26	dBm

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Table 23: Basic Rate receiver performance (VBAT = 3.3V, VDDIO = 1.8V)

Test Parameter		Min	Typ	Max	Bluetooth Spec.	Unit
Sensitivity (1DH5)	BER ≤ 0.1%	—	-91	—	≤ -70	dBm
Maximum Input	BER ≤ 0.1%	—	—	-20	≥ -20	dBm
Interference Performance	Co-Channel	—	8.5	11	11	dB
	C/I 1 MHz adjacent channel	—	-1.4	0	0	dB
	C/I 2 MHz adjacent channel	—	-41	-30	-30	dB
	C/I ≥ 3 MHz adjacent channel	—	-42.5	-40	-40	dB
	C/I image channel	—	-31.5	-9	-9	dB
	C/I 1-MHz adjacent to image channel	—	-44.5	-20	-20	dB

Table 24: Enhanced Data Rate receiver performance (VBAT = 3.3V, VDDIO = 1.8V)

Test Parameter		Min	Typ	Max	Bluetooth Spec.	Unit
Sensitivity (BER ≤ 0.01%)	π/4-DQPSK	—	-93	—	≤ -70	dBm
	8-DPSK	—	-87	—	≤ -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	—	10.5	13	≤ ±13	dB
	8-DPSK	—	18	21	≤ ±21	dB
C/I 1 MHz adjacent Channel	π/4-DQPSK	—	-6.5	0	≤ 0	dB
	8-DPSK	—	-1	5	≤5	dB
C/I 2 MHz adjacent Channel	π/4-DQPSK	—	-38.5	-30	≤ -30	dB
	8-DPSK	—	-36.5	-25	≤ -25	dB
C/I ≥ 3 MHz adjacent Channel	π/4-DQPSK	—	-42.5	-40	≤ -40	dB
	8-DPSK	—	-41.5	-33	≤ -33	dB
C/I image channel	π/4-DQPSK	—	-30	-7	≤ -7	dB
	8-DPSK	—	-22.5	0	≤ 0	dB
C/I 1 MHz adjacent to image channel	π/4-DQPSK	—	-47.5	-20	≤ -20	dB
	8-DPSK	—	-41.5	-13	≤ -13	dB
Out-of-Band Blocking Performance (CW) BER ≤ 0.1%	30-2000MHz	—	-10	—	—	dBm
	2-2.399GHz	—	-27	—	—	dBm
	2.484-3GHz	—	-27	—	—	dBm
	3-12.75GHz	—	-10	—	—	dBm

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Table 25: BLE RF Specifications (VBAT = 3.3V, VDDIO = 1.8V)

Parameter	Conditions		Min	Typ	Max	Unit
Frequency range	—		2402	—	2480	MHz
Rx sensitivity[1]	GFSK, PER ≤ 30.8%	1 Mbps	—	-95	—	dBm
		2 Mbps	—	-92	—	dBm
		500 Kbps	—	-102	—	dBm
		125 Kbps	—	-107	—	dBm
Tx power[2]	—		—	—	7	dBm
Δf1 average	1 Mbps		225	255	275.5	KHz
	2 Mbps		450	500	550	KHz
	125 Kbps		225	255	275	KHz
Δf2 average	1 Mbps		185	230	—	KHz
Δf2 maximum[3]	2 Mbps		370	450	—	KHz
Δf1 average (Stable Modulation)	1 Mbps		247.5	250	252.5	KHz
	2 Mbps		495	500	550	KHz
	125 Kbps		247.5	250	252.5	KHz
$\frac{\Delta f2\ avg}{\Delta f1\ avg}$ ratio	1 Mbps		0.8	1.0	—	%
	2 Mbps		0.8	1.0	—	%

Table 26: Bluetooth transmitter current consumption (VBAT = 3.3V, VDDIO = 1.8V, WL_REG_ON = OFF)

Operation Mode	Data Rate	VBAT Current Consumption (mA)	VIO Current Consumption (mA)
Basic Data Rate	1DH5	18.9	0.76
Enhanced Data Rate	2DH5	18.4	0.77
	3DH5	18.3	0.77
Low-Energy	1 Mbps	20.3	0.76
	2 Mbps	13.4	0.71
	500 Kbps	17.9	0.75
	125 Kbps	23.6	0.78

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 Δf2 maximum frequency values recorded over 10 packets must be greater than 185 KHz.

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10 Host Interface Specifications

10.1 SDIO Specifications

The Sona IF573 series wireless module SDIO host interface pins are powered from the VDDIO voltage supply, which is set internally at 1.8V on the M.2 module. The SDIO electrical specifications are identical for the 1-bit SDIO and 4-bit SDIO modes.

Note: The SDIO host signals must be 1.8V at all times as defined by the M.2 standard.

10.1.1 Default Speed, High-Speed Modes

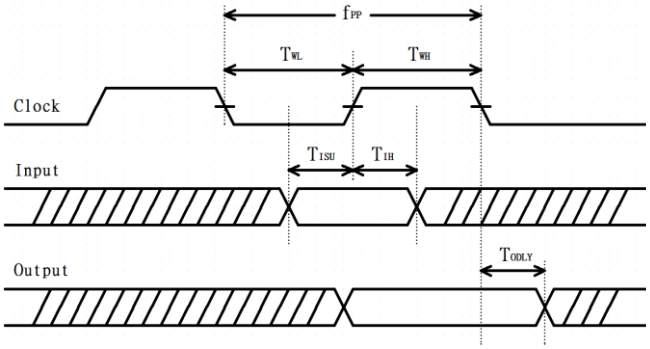

Figure 3: SDIO protocol timing diagram - Default mode (1.8V)

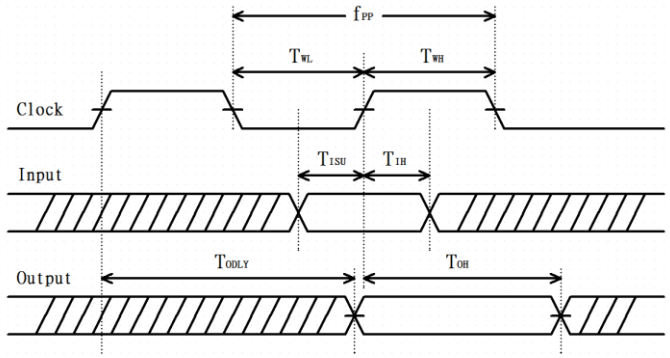

Figure 4: SDIO protocol timing diagram – High-Speed mode (1.8V)

Note: Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Table 27: SDIO timing requirements

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
fPP	Clock Frequency	Default Speed	0	-	25	MHz
		High-Speed	0	-	50	
TWL	Clock low time	Default Speed	10	-	-	ns
		High-Speed	7	-	-	
TWH	Clock high time	Default Speed	10	-	-	ns
		High-Speed	7	-	-	
TISU	Input Setup time	Default Speed	5	-	-	ns
		High-Speed	6	-	-	
TIH	Input Hold time	Default Speed	5	-	-	ns
		High-Speed	2	-	-	
TODLY	Output delay time	Default Speed	-	-	14	ns
	CL≦40pF (1 card)	High-Speed	-	-	14	
TOH	Output hold time	High-Speed	0	-	-	ns

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10.1.2 SDR12, SDR25, SDR50 Modes (up to 100 MHz) (1.8V)

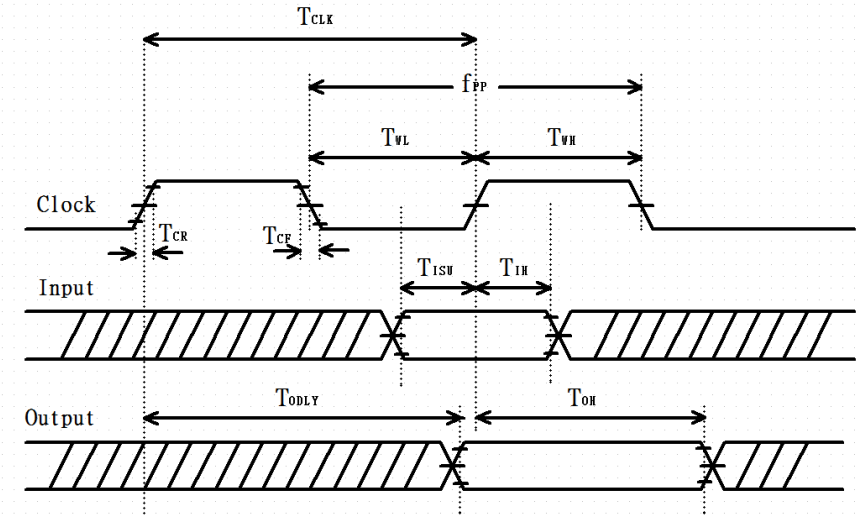

Figure 5: SDIO protocol timing Diagram – SDR12, SDR25, SDR50 modes (up to 100 MHz) (1.8V)

Note: Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Table 28: SDIO timing requirements - SDR12, SDR25, SDR50 modes (up to 100 MHz) (1.8V)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
fPP	Clock Frequency	SDR12/25/50	25	-	100	MHz
TISU	Input setup time	SDR12/25/50	3	--	-	ns
TIH	Input Hold time	SDR12/25/50	0.8	-	-	ns
TCLK	Clock Time	SDR12/25/50	10	-	40	ns
TCR, TCF	Raise time, Fall time TCR, TCF <2ns (max) at 100MHz CCARD=10pF	SDR12/25/50	-	-	0.2*TCLK	ns
TODLY	Output delay time CL≦30pF	SDR12/25/50	-	-	7.5	ns
TOH	Output hold time CL=15pF	SDR12/25/50	1.5	-	-	ns

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10.1.3 SDR104 Mode (208 MHz) (1.8V)

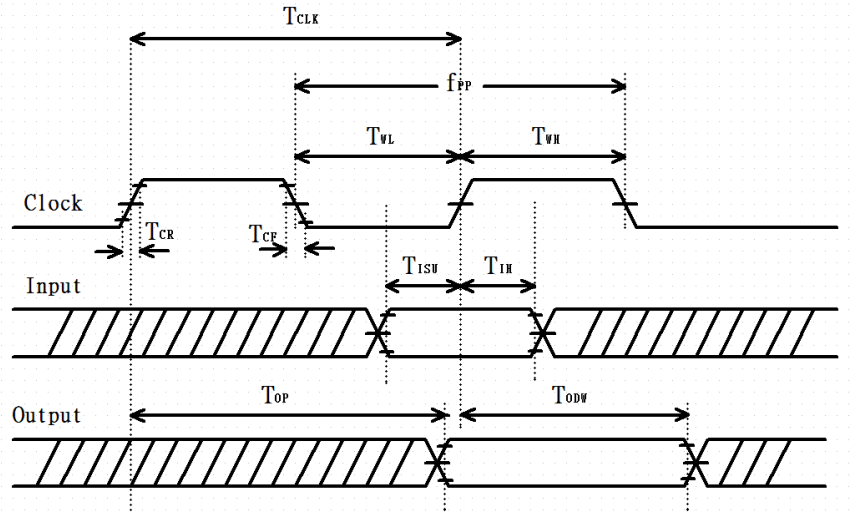

Figure 6: SDIO protocol timing Diagram - SDR104 mode (up to 208 MHz) (1.8V)

Note: Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Table 29: SDIO timing requirements - SDR104 mode (up to 208MHz) (1.8V)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
fPP	Clock Frequency	SDR104	0	-	208	MHz
TISU	Input setup time	SDR104	1.4	--	-	ns
TIH	Input Hold time	SDR104	0.8	-	-	ns
TCLK	Clock Time	SDR104	4.8	-	-	ns
TCR, TCF	Raise time, Fall time TCR, TCF <0.96ns (max) at 208MHz CCARD=10pF	SDR104	-	-	0.2*TCLK	ns
TOP	Card Output phase	SDR104	0	-	10	ns
TODW	Output timing pf variable data window	SDR12/25/50	2.88	-	-	ns

10.2 PCI Express Interface

The Sona IF573 series wireless module supports the PCIe interface, which provides high-performance serial I/O interconnects and is also protocol compliant and electrically compatible with the PCI Express Base Specification v3.0 running at Gen2 speeds.

Organization of the PCIe core is in logical layers: Transaction Layer, Data Link Layer, and Physical Layer, as shown in Figure 1Figure 7. A configuration or link management block is provided for enumerating the PCIe configuration space and supporting generation and reception of System Management Messages by communicating with PCIe layers.

Each layer is partitioned into dedicated transmit and receive units that allow point-to-point communication between the host and Sona IF573 device. The transmit side processes outbound packets whereas the receive side processes inbound packets. Packets are formed and generated in the Transaction and Data Link Layer for transmission onto the high-speed links and onto the receiving device. A header is added at the beginning to indicate the packet type and any other optional fields.

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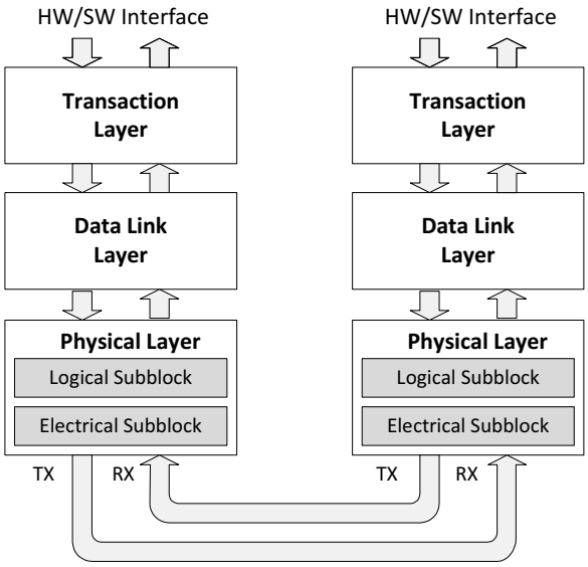

Figure 7: PCI Express Layer Model

10.3 PCM Interface Specifications

10.3.1 PCM Interface

The Sona IF573 series wireless module supports a PCM interface. The PCM interface on the Sona IF573 series wireless module can connect to linear PCM codec devices in Master/Slave mode. In Master mode, the Sona IF573 generates the BT_PCM_CLK and BT_PCM_SYNC signals, and in Slave mode, these signals are provided by another master on the PCM interface and are input to the Sona IF573 module.

The configuration of the PCM interface may be adjusted by the host through the use of vendor-specific HCI commands.

10.3.2 PCM Interface Timing

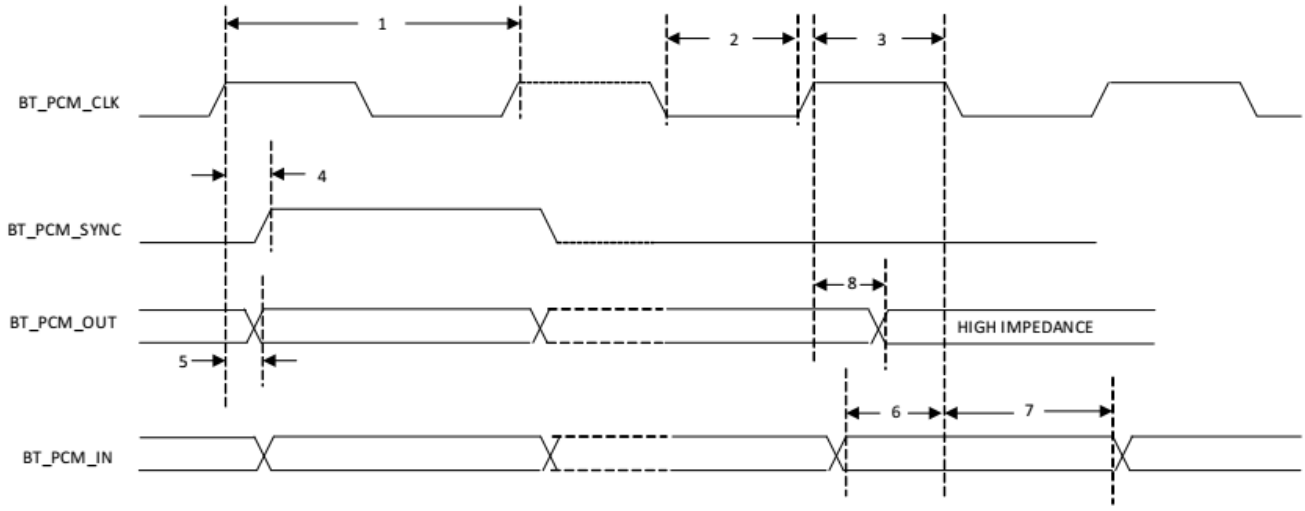

Figure 8: PCM timing specification – Short Frames Sync, Master Mode

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Table 30: PCM timing specification – Short Frames Sync, Master Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	12.0	MHz
2	PCM bit clock LOW	41.0	-	-	ns
3	PCM bit clock HIGH	41.0	-	-	ns
4	BT_PCM_SYNC delay	0	-	25.0	ns
5	BT_PCM_OUT delay	0	-	25.0	ns
6	BT_PCM_IN setup	8.0	-	-	ns
7	BT_PCM_IN hold	8.0	-	-	ns
8	Delay from rising edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	0	-	25.0	ns

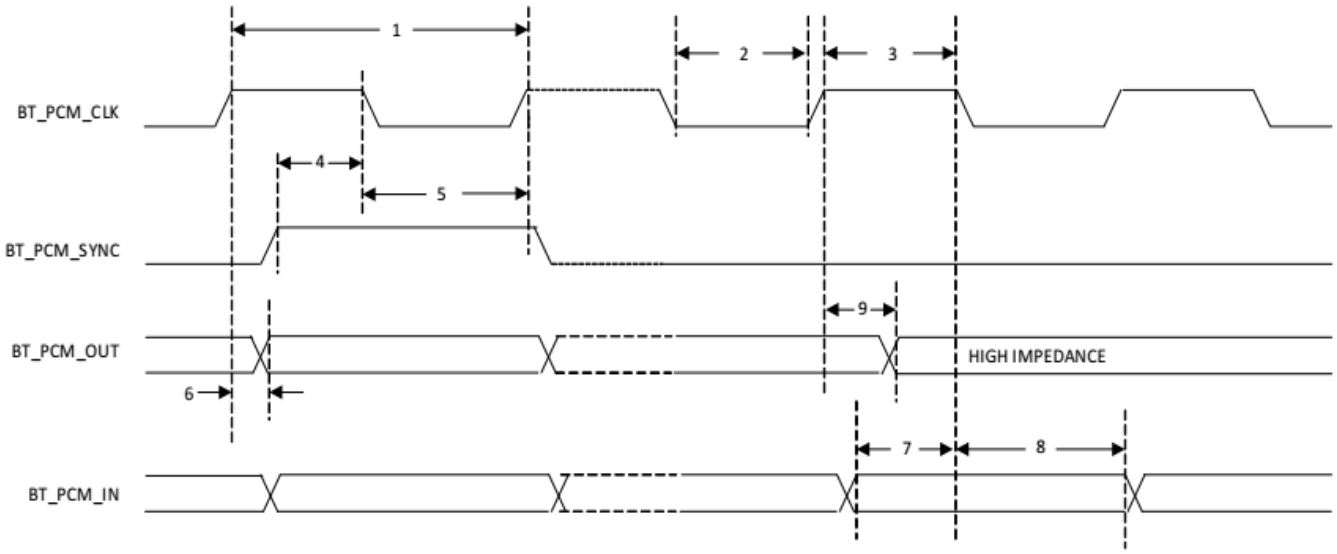

Figure 9: PCM timing specification – Short Frame Sync, Slave Mode

Table 31: PCM timing specification – Short Frame Sync, Slave Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	12.0	MHz
2	PCM bit clock LOW	41.0	-	-	ns
3	PCM bit clock HIGH	41.0	-	-	ns
4	BT_PCM_SYNC setup	8.0	-	-	ns
5	BT_PCM_SYNC hold	8.0	-	-	ns
6	BT_PCM_OUT delay	0	-	25.0	ns
7	BT_PCM_IN setup	8.0	-	-	ns
8	BT_PCM_IN hold	8.0	-	-	ns
9	Delay from rising edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	0	-	25.0	ns

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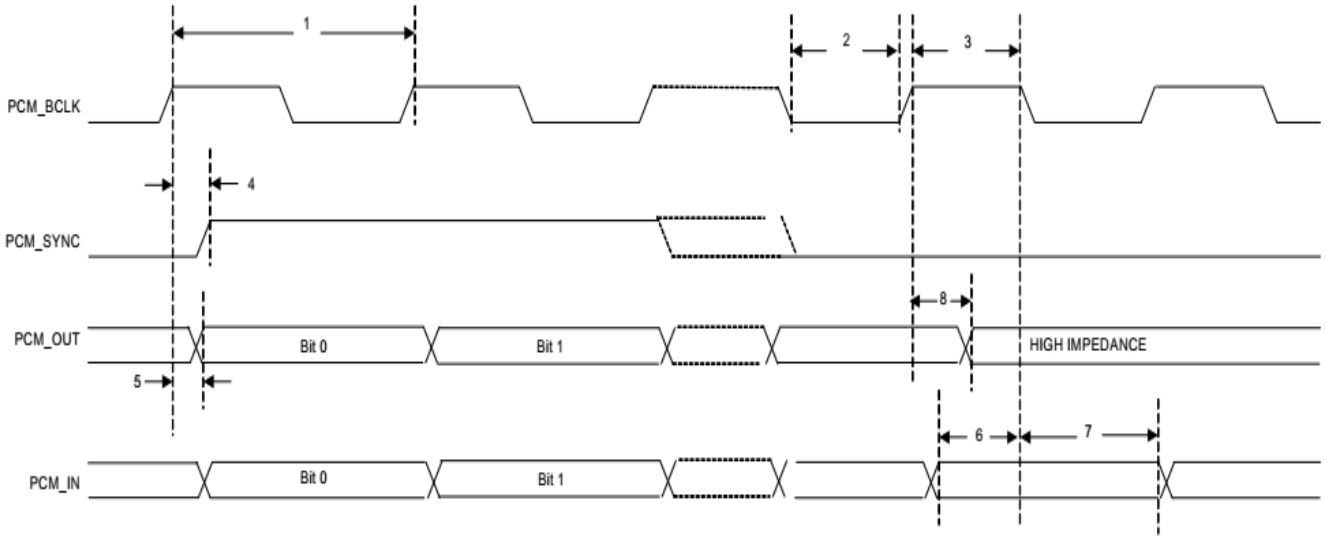

Figure 10: PCM timing specification – Long Frame Sync, Master Mode

Table 32: PCM timing specification – Long Frame Sync, Master Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	12.0	MHz
2	PCM bit clock LOW	41.0	-	-	ns
3	PCM bit clock HIGH	41.0	-	-	ns
4	BT_PCM_SYNC delay	0	-	25.0	ns
5	BT_PCM_OUT delay	0	-	25.0	ns
6	BT_PCM_IN setup	8.0	-	-	ns
7	BT_PCM_IN hold	8.0	-	-	ns
8	Delay from rising edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	0	-	25.0	ns

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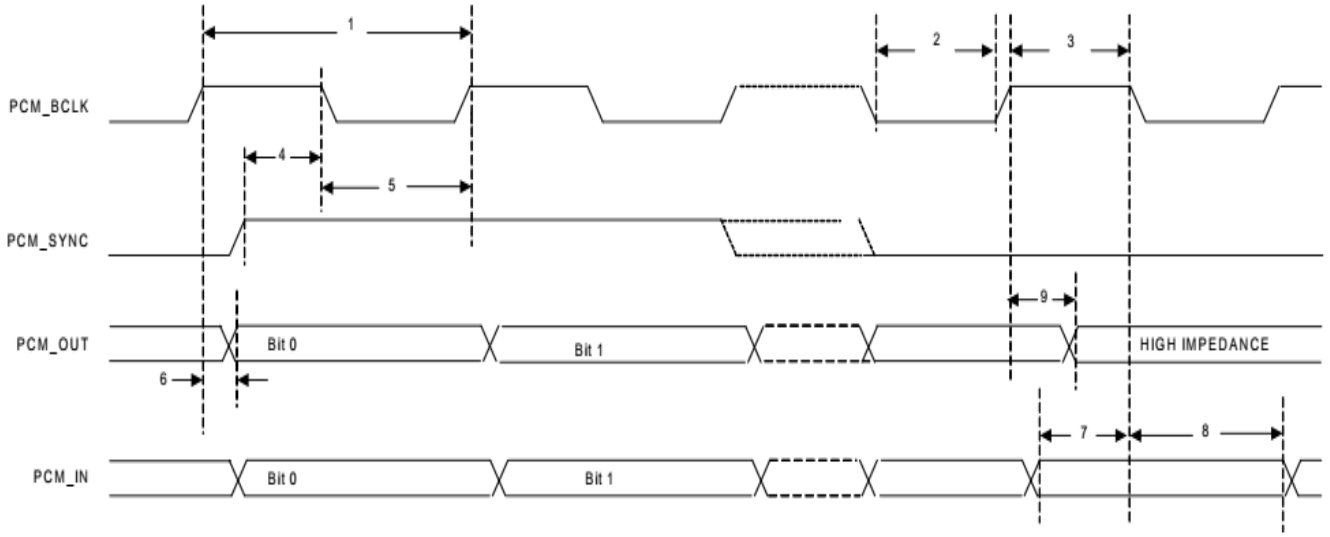

Figure 11: PCM timing specification – Long Frame Sync, Slave Mode

Table 33: PCM timing specification – Long Frame Sync, Slave Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	12.0	MHz
2	PCM bit clock LOW	41.0	-	-	ns
3	PCM bit clock HIGH	41.0	-	-	ns
4	BT_PCM_SYNC setup	8.0	-	-	ns
5	BT_PCM_SYNC hold	8.0	-	-	ns
6	BT_PCM_OUT delay	0	-	25.0	ns
7	BT_PCM_IN setup	8.0	-	-	ns
8	BT_PCM_IN hold	8.0	-	-	ns
9	Delay from rising edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	0	-	25.0	ns

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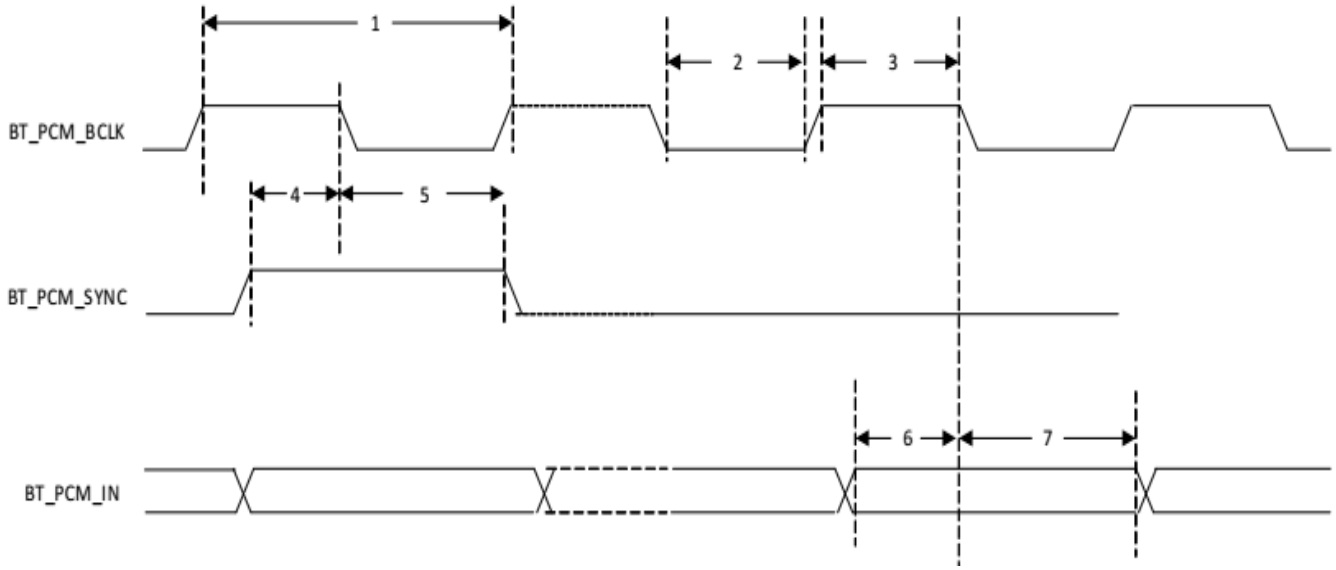

Figure 12: PCM timing specification – Short Frame Sync, Receive Only, Burst Mode

Table 34: PCM timing specification – Short Frame Sync, Receive Only, Burst Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	24.0	MHz
2	PCM bit clock LOW	20.8	-	-	ns
3	PCM bit clock HIGH	20.8	-	-	ns
4	BT_PCM_SYNC setup	8.0	-	-	ns
5	BT_PCM_SYNC hold	8.0	-	-	ns
6	BT_PCM_IN setup	8.0	-	-	ns
7	BT_PCM_IN hold	8.0	-	-	ns

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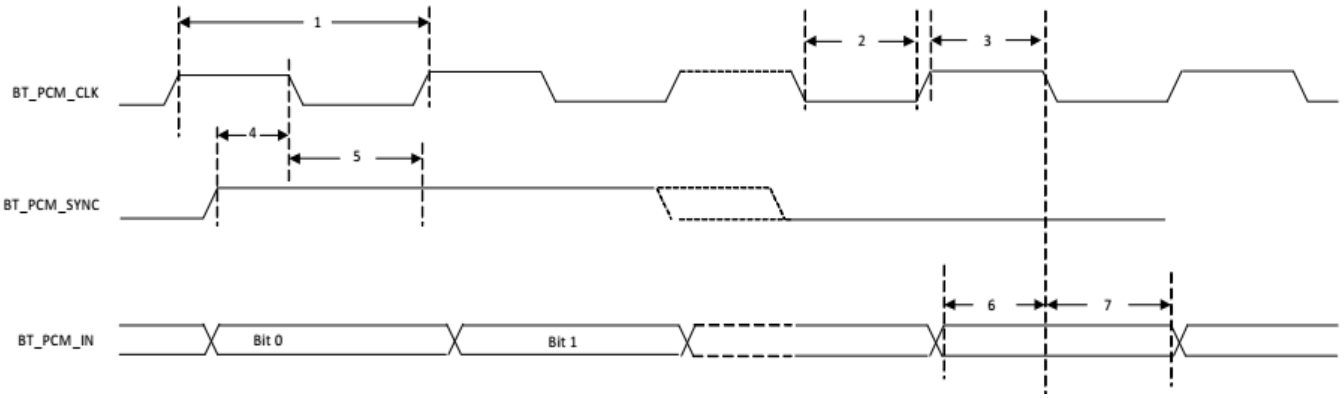

Figure 13: PCM timing specification – Long Frame Sync, Receive Only, Burst Mode

Table 35: PCM timing specification – Long Frame Sync, Receive Only, Burst Mode

Reference	Characteristics	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	-	-	24.0	MHz
2	PCM bit clock LOW	20.8	-	-	ns
3	PCM bit clock HIGH	20.8	-	-	ns
4	BT_PCM_SYNC setup	8.0	-	-	ns
5	BT_PCM_SYNC hold	8.0	-	-	ns
6	BT_PCM_IN setup	8.0	-	-	ns
7	BT_PCM_IN hold	8.0	-	-	ns

10.4 JTAG Interface

The Sona IF573 supports the JTAG interface for use with proprietary debug and characterization test tools during board bring-up.

Note: The JTAG interface is disabled by default and not exposed on the M.2 2230 E-Key interface.

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11 Power-Up Sequence and Timing

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

11.1 Description of Control Signals

- WL_REG_ON: Used to power up the WLAN. When this pin is high, the internal regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset. This signal is connected to the W_DISABLE1# pin on the M.2 interface.
- BT_REG_ON: Used to power up the Bluetooth section. If both the BT_REG_ON and WL_REG_ON pins are low, the regulators are disabled. When this pin is low and WL_REG_ON is high, the Bluetooth section is in reset. This signal is connected to the W_DISABLE2# pin on the M.2 interface.
- **M.2 1318** - VBAT and VDDIO should not rise 10% - 90% faster than 40 microseconds.
- **M.2 1318** - VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.
- Do not access the digital interface for at least 150 milliseconds after VDDC and VDDIO are available.

11.2 Control Signal Timing Diagrams

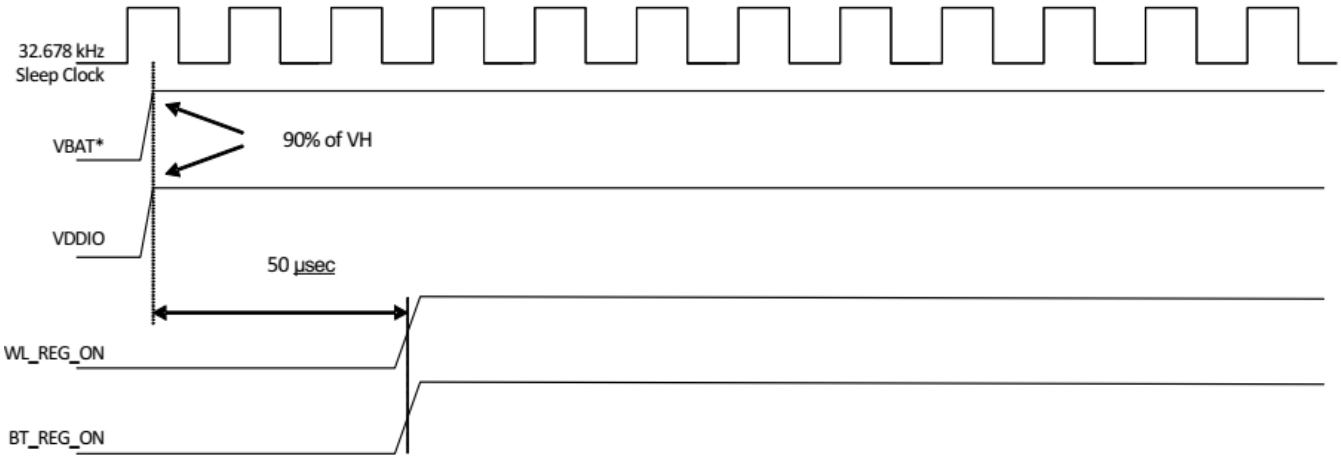

Figure 14: WL_REG_ON = ON, BT_REG_ON = ON

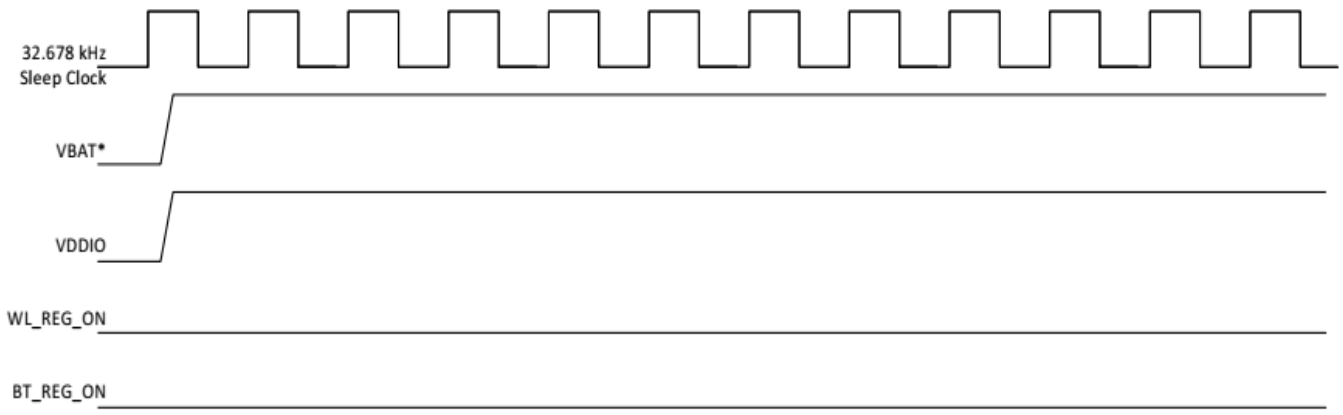

Figure 15: WL_REG_ON = OFF, BT_REG_ON = OFF

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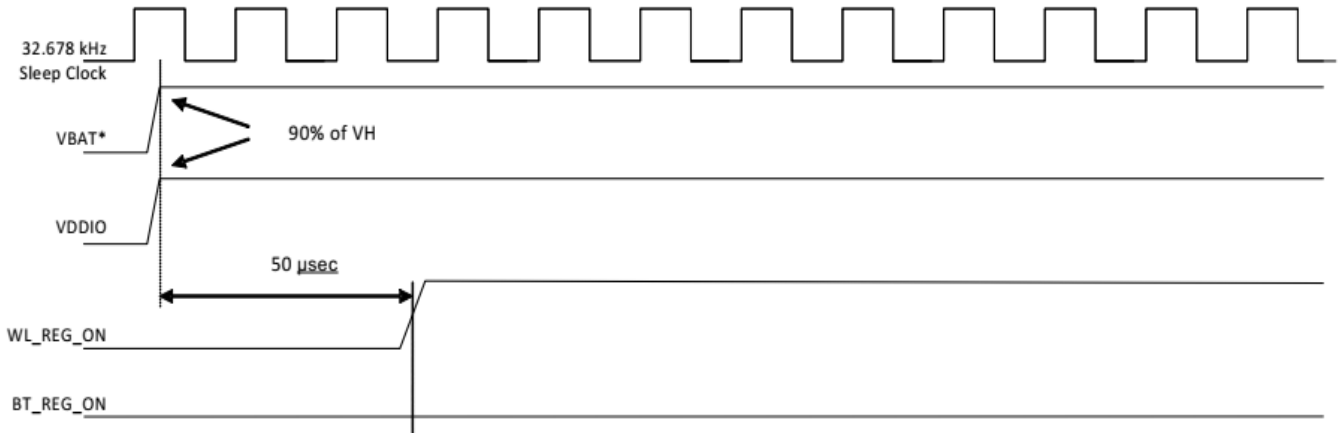

Figure 16: WL_REG_ON = ON, BT_REG_ON = OFF

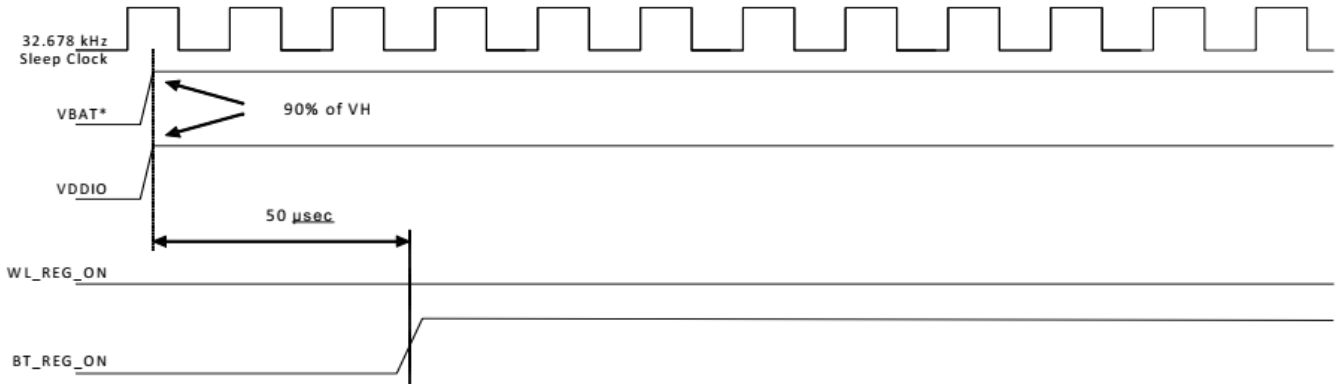

Figure 17: WL_REG_ON = OFF, BT_REG_ON = ON

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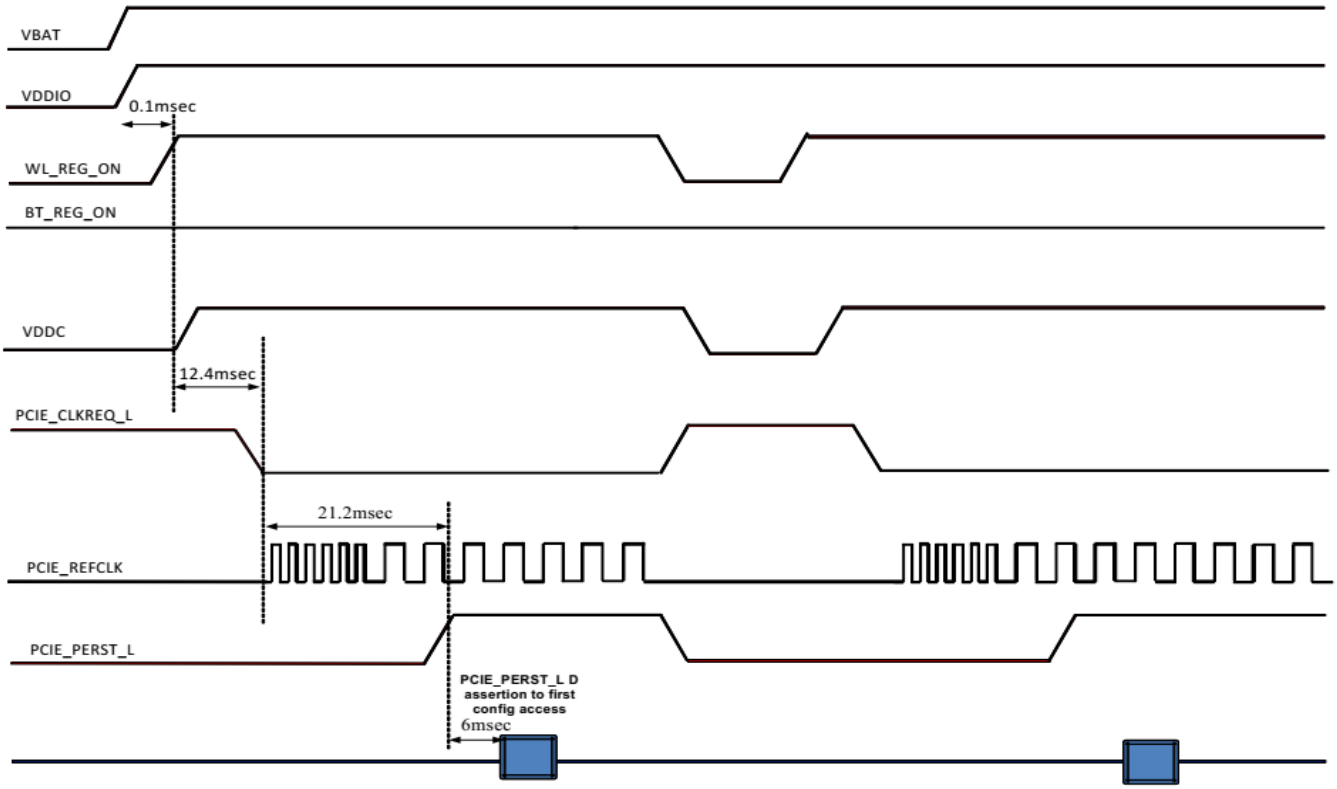

Figure 18: WLAN Power-Up Sequence for PCIe Host

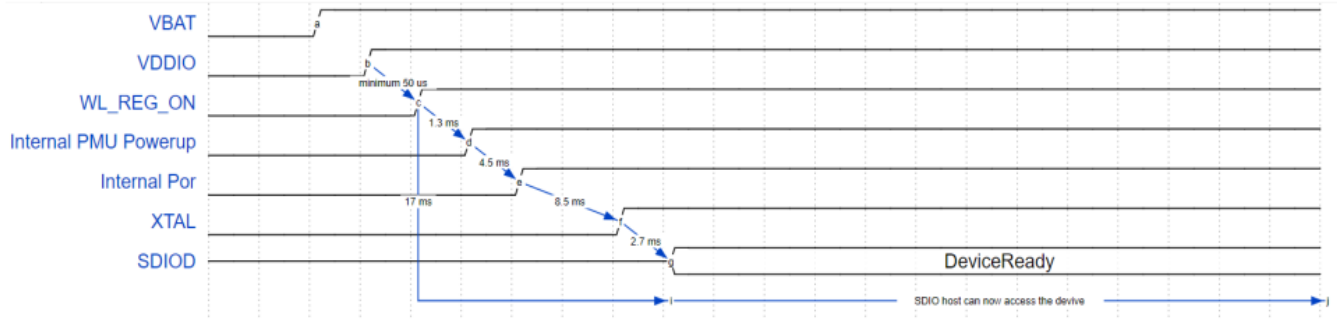

Figure 19: WLAN Boot-Up Sequence for SDIO Host

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12 Pin Definitions

12.1 M.2 1318 Solder-down

Table 36: M.2 1318 pin definitions

Pin #	Name	Type	Voltage Ref.	Function	If Not Used
1	UIM_POWER_SRC/GPIO1	-	-	NA	-
2	UIM_POWER_SNK	-	-	NA	-
3	UIM_SWP	-	-	NA	-
4	3.3V	PWR	3.3V	Power Supply Input	-
5	3.3V	PWR	3.3V	Power Supply Input	-
6	GND	-	-	Ground	GND
7	RESERVED	-	-	NA	-
8	ALERT	-	-	NA	-
9	I2C_CLK	-	-	NA	-
10	I2C_DATA	-	-	NA	-
11	COEX_RXD	I	VDDIO	WLAN_JTAG_TMS	NC
12	COEX_TXD	I	VDDIO	WLAN_JTAG_TCK	NC
13	COEX3	I	VDDIO	WLAN_JTAG_TDI	NC
14	SYSCLK/GNSS_0	-	-	NA	-
15	TX_BLANKING/GNSS_1	-	-	NA	-
16	RESERVED	-	-	NA	-
17	GND	-	-	Ground	GND
18	RESERVED	I	VDDIO	▪ SDIO mode: WL_DEV_WAKE ▪ PCIe mode: Reserved	NC
19	RESERVED	O	VDDIO	WLAN_JTAG_TDO	NC
20	GND	-	-	Ground	GND
21	RESERVED	I	VDDIO	Reserved	NC
22	RESERVED	I	VDDIO	▪ PCIe mode: WL_DEV_WAKE ▪ SDIO mode: Reserved	NC
23	GND	-	-	Ground	GND
24	GPIO_1	I	VDDIO	WLAN Interface Select ▪ Pull to VDDIO for PCIe ▪ Pull to GND for SDIO	-
25	RESERVED	I	VDDIO	JTAG_SEL Reserved **Must be pulled to GND for normal operation**	GND
26	GND	-	-	Ground	GND
27	SUSCLK(32kHz)	I	VDDIO	External Sleep Clock (32.768 kHz) **This clock must be provided**	-

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Pin #	Name	Type	Voltage Ref.	Function	If Not Used
28	W_DISABLE1#	I	VDDIO	This pin controls the internal WL_REG_ON signal and has an internal 200K pull-down. **This pin must be driven/pulled high to enable WLAN** Recommend controlling this signal via host GPIO for optimal power control.	NC
29	PEWAKE#	O	VDDIO	PCI power management event output. Used to request a change in the device or system power state. The assertion and de-assertion of this signal are asynchronous to the PCIe reference clock.	NC
30	CLKREQ#	O	VDDIO	PCIe clock request signal which indicates when the REFCLK to the PCIe interface can be gated. ▪ 1 = the clock can be gated. ▪ 0 = the clock is required.	NC
31	PERST#	I	VDDIO	PCIe System Reset	NC
32	GND	-	-	Ground	GND
33	REFCLKn0	I	-	PCIE Differential Pair Clock Source (100 MHz) Negative Input.	NC
34	REFCLKp0	I	-	PCIE Differential Pair Clock Source (100 MHz) Positive Input.	NC
35	GND	-	-	Ground	GND
36	PETn0	O	-	PCIE Transmitter Differential Pair Negative Output	NC
37	PETp0	O	-	PCIE Transmitter Differential Pair Positive Output	NC
38	GND	-	-	Ground	GND
39	PERn0	I	-	PCIE Receiver Differential Pair Negative Input	NC
40	PERp0	I	-	PCIE Receiver Differential Pair Positive Input	NC
41	GND	-	-	Ground	GND
42	VENDOR DEFINED	PWR	VDDIO	1.8V IO Supply for all digital I/O	-
43	VENDOR DEFINED	-	-	NA	-
44	VENDOR DEFINED	-	-	NA	-
45	SDIO RESET#	-	-	NA	-
46	SDIO WAKE#	O	VDDIO	WL_HOST_WAKE Reserved	NC
47	SDIO DATA3	I/O	VDDIO	SDIO Data line 3	NC
48	SDIO DATA2	I/O	VDDIO	SDIO Data line 2	NC
49	SDIO DATA1	I/O	VDDIO	SDIO Data line 1	NC
50	SDIO DATA0	I/O	VDDIO	SDIO Data line 0	NC
51	SDIO CMD	I/O	VDDIO	SDIO command line	NC
52	SDIO CLK	I	VDDIO	SDIO Clock Input	NC
53	UART WAKE#	O	VDDIO	BT_HOST_WAKE Reserved	NC

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Pin #	Name	Type	Voltage Ref.	Function	If Not Used
54	UART CTS	I	VDDIO	BT UART CTS **Hardware handshake is required**	-
55	UART_Tx	O	VDDIO	BT UART Transmit	-
56	UART_Rx	I	VDDIO	BT UART Receive	-
57	UART_RTS	O	VDDIO	BT UART RTS **Hardware handshake is required**	-
58	PCMFR1	I/O	VDDIO	BT_PCM Sync. Master mode: Generated by radio Slave mode: Generated by external host	NC
59	PCMIN	I	VDDIO	BT_PCM data input.	NC
60	PCMOUT	O	VDDIO	BT_PCM data output	NC
61	PCMCLK	I/O	VDDIO	BT_PCM Clock Master mode: Generated by radio Save mode: Generated by external host	NC
62	GND	-	-	Ground	GND
63	W_DISABLE2#	I	VDDIO	This pin controls the internal BT_REG_ON signal and has an internal 200K pull-down. **This pin must be controlled by host GPIO**	NC
64	LED_2#	I/O	VDDIO	Reserved	NC
65	LED_1#	I/O	VDDIO	BT Interface Select/GPIO_12 **This pin must be pulled high**	-
66	RESERVED	I	VDDIO	BT_DEV_WAKE Reserved	NC
67	RESERVED	I	VDDIO	WLAN_JTAG_TRST Reserved	NC
68	GND	-	-	Ground	GND
69	USB_D-	-	-	NA	NC
70	USB_D+	-	-	NA	NC
71	GND	-	-	Ground	GND
72	3.3V	PWR	3.3V	Power Supply Input	-
73	3.3V	PWR	3.3V	Power Supply Input	-
74~78	GND	-	-	Ground	GND
79	BT_S	-	-	Bluetooth RF for trace antenna variant Unused for MHF4 antenna connector variant	-
80~85	GND	-	-	Ground	GND
86	WL_C0	-	-	WLAN RF Antenna 0 for trace antenna variant Unused for MHF4 antenna connector variant	
87~93	GND	-	-	Ground	GND
94	WL_C1	-	-	WLAN RF Antenna 1 for trace antenna variant Unused for MHF4 antenna connector variant	

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Pin #	Name	Type	Voltage Ref.	Function	If Not Used
95~96	GND	-	-	Ground	GND
G1~G10	GND	-	-	Ground	GND

12.2 M.2 2230 E-Key

Table 37: M.2 2230 E-Key pin definitions

Pin #	Name	Type	Voltage Ref.	Function	If Not Used
1	GND	-	-	Ground	GND
2	3.3V	PWR I/P	3.3V	DC supply voltage for module. Operational is 3.13V to 3.6V	-
3	USB_D+	-	-	NA	NC
4	3.3V	PWR I/P	3.3V	DC supply voltage for module. Operational is 3.13V to 3.6V	-
5	USB_D-	-	-	NA	NC
6	LED1#	I/O	3.3V	GPIO_12 Reserved	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 lin0	NC
14	PCM_IN	I	1.8V	PCM data input.	NC
15	SDIO DATA1	I/O	1.8V	SDIO data lin1	NC
16	LED2#	I/O	3.3V	GPIO_13 Reserved	NC
17	SDIO DATA2	I/O	1.8V	SDIO data lin2	NC
18	GND	-	-	Ground	GND
19	SDIO DATA3	I/O	1.8V	SDIO data lin3	NC
20	UART WAKE#	O	3.3V	BT_HOST_WAKE Reserved	NC
21	SDIO WAKE#	O	1.8V	WL_HOST_WAKE Reserved	NC
22	UART_TXD	O	1.8V	BT UART Transmit	NC
23	SDIO RESET#	-	-	NC	NC
32	UART_RXD	I	1.8V	BT UART Receive	NC
33	GND	-	-	Ground	GND

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Pin #	Name	Type	Voltage Ref.	Function	If Not Used
34	UART_RTS	O	1.8V	BT UART RTS **Hardware handshake is required**	NC
35	PERp0	I	-	PCIE Receiver Differential Pair Positive Input	NC
36	UART_CTS	I	1.8V	BT UART CTS **Hardware handshake is required**	NC
37	PERn0	I	-	PCIE Receiver Differential Pair Negative Input	NC
38	VENDER DEFINED38	O	1.8V	WLAN_JTAG_TDO Reserved	NC
39	GND	-	-	Ground	GND
40	VENDER DEFINED40	I	1.8V	WL_DEV_WAKE Reserved	NC
41	PETp0	O	-	PCIE Transmitter Differential Pair Positive Output	NC
42	VENDER DEFINED42	I	1.8V	BT_DEV_WAKE Reserved	NC
43	PETn0	O	-	PCIE Transmitter Differential Pair Negative Output	NC
44	COEX3	I	1.8V	WLAN_JTAG_TDI Reserved	NC
45	GND	-	-	Ground	GND
46	COEX2	I	1.8V	WLAN_JTAG_TCK Reserved	NC
47	REFCLKp0	I	-	PCIE Differential Pair Clock Source (100 MHz) Positive Input.	NC
48	COEX1	I	1.8V	WLAN_JTAG_TMS Reserved	NC
49	REFCLKn0	I	-	PCIE Differential Pair Clock Source (100 MHz) Negative Input.	NC
50	SUSCLK	I	3.3V	External Sleep Clock (32.768 kHz) **This clock must be provided**	-
51	GND	-	-	Ground	GND
52	PERST0#	I	3.3V	PCIe System Reset	NC
53	CLKREQ0#	O	3.3V	PCIe clock request signal which indicates when the REFCLK to the PCIe interface can be gated.	NC
54	W_DISABLE2#	I	3.3V	This pin controls the internal BT_REG_ON signal and has a 10K pull-up on the M.2 2230 module. **This pin must be controlled by host GPIO**	NC
55	PEWAKE0#	O	3.3V	PCI power management event output. Used to request a change in the device or system power state. The assertion and deassertion of this signal is asynchronous to the PCIe reference clock.	NC
56	W_DISABLE1#	I	3.3 V	This pin controls the internal WL_REG_ON signal and has a 10K pull-up on the M.2 2230 module. Recommend controlling this signal via host GPIO for optimal power control.	NC

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Pin #	Name	Type	Voltage Ref.	Function	If Not Used
57	GND	-	-	Ground	GND
58	I2C DATA	-	-	NC	NC
59	RESERVED	-	-	NC	NC
60	I2C CLK	-	-	NC	NC
61	RESERVED	-	-	NC	NC
62	ALERT#	-	-	NC	NC
63	GND	-	-	Ground	GND
64	RESERVED	-	-	NC	NC
65	RESERVED	-	-	NC	NC
66	UIM_SWP	-	-	NC	NC
67	RESERVED	-	-	NC	NC
68	UIM_POWER_SNK	-	-	NC	NC
69	GND	-	-	Ground	GND
70	UIM_POWER_SRC	-	-	NC	NC
71	RESERVED	-	-	NC	NC
72	3.3V	PWR I/P	3.3V	DC supply voltage for module. Operational is 3.13V to 3.6V	--
73	RESERVED	-	-	NC	NC
74	3.3V	PWR I/P	3.3V	DC supply voltage for module. Operational is 3.13V to 3.6V	--
75	GND	-	-	Ground	GND

Note The transmit/receive differential pairs of the PCIe bus include "PERp0", "PERn0", "PETp0" and "PETn0", which have a built-in decoupling capacitor.

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13 Host Platform Implementation Details

13.1 M.2 1318 WLAN Interface Selection

The Sona IF573 M.2 1318 module must be configured for either PCIe or SDIO WLAN interface. Configuration is done with resistor strapping as specified in Table 38.

Table 38: Wi-Fi host interface configuration table

WLAN/Bluetooth Interface	GPIO_1 (Pin24)	LED_1# (Pin 65)
PCIe / UART	H	H
SDIO /UART	L	H

Note: The M.2 2230 E-Key module strapping is implemented on the M.2 carrier board.

13.2 Bluetooth Interface Requirements

The CYW55573 Bluetooth CPU core requires the UART_CTS input to be held low at the point the BT_REG_ON (W_DISABLE2#) signal goes high to enable secure firmware download. In addition, the HCI interface uses the standard H4 protocol which requires four-wire hardware handshaking.

This requires that the host implement GPIO control over BT_REG_ON/W_DISABLE2# and implement full RTS/CTS handshaking.

13.3 Low Power Clock

The Sona IF573 requires a 32KHz clock on the SUSCLK input. This clock drives various internal state machines and must be provided by the host even if low power operation is not needed.

13.4 M.2 1318 WL_DEV_WAKE Mapping

The WL_DEV_WAKE feature is mapped to different pins on the M.2 1318 module depending on the WLAN interface selection. See Table 39 for details.

Table 39: M.2 1318 WL_DEV_WAKE Mapping

WLAN Interface	M.2 1318 Pin	Internal GPIO
PCIe	22	GPIO_8
SDIO	18	LHL_GPIO1

Note: This feature is subject to software support and not currently implemented.

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14 Mechanical Specifications

14.1 M.2 1318

Module dimensions of Sona IF573 M.2 1318 package is 18 x 13 x 1.9 mm. Detailed drawings are shown in Figure 20

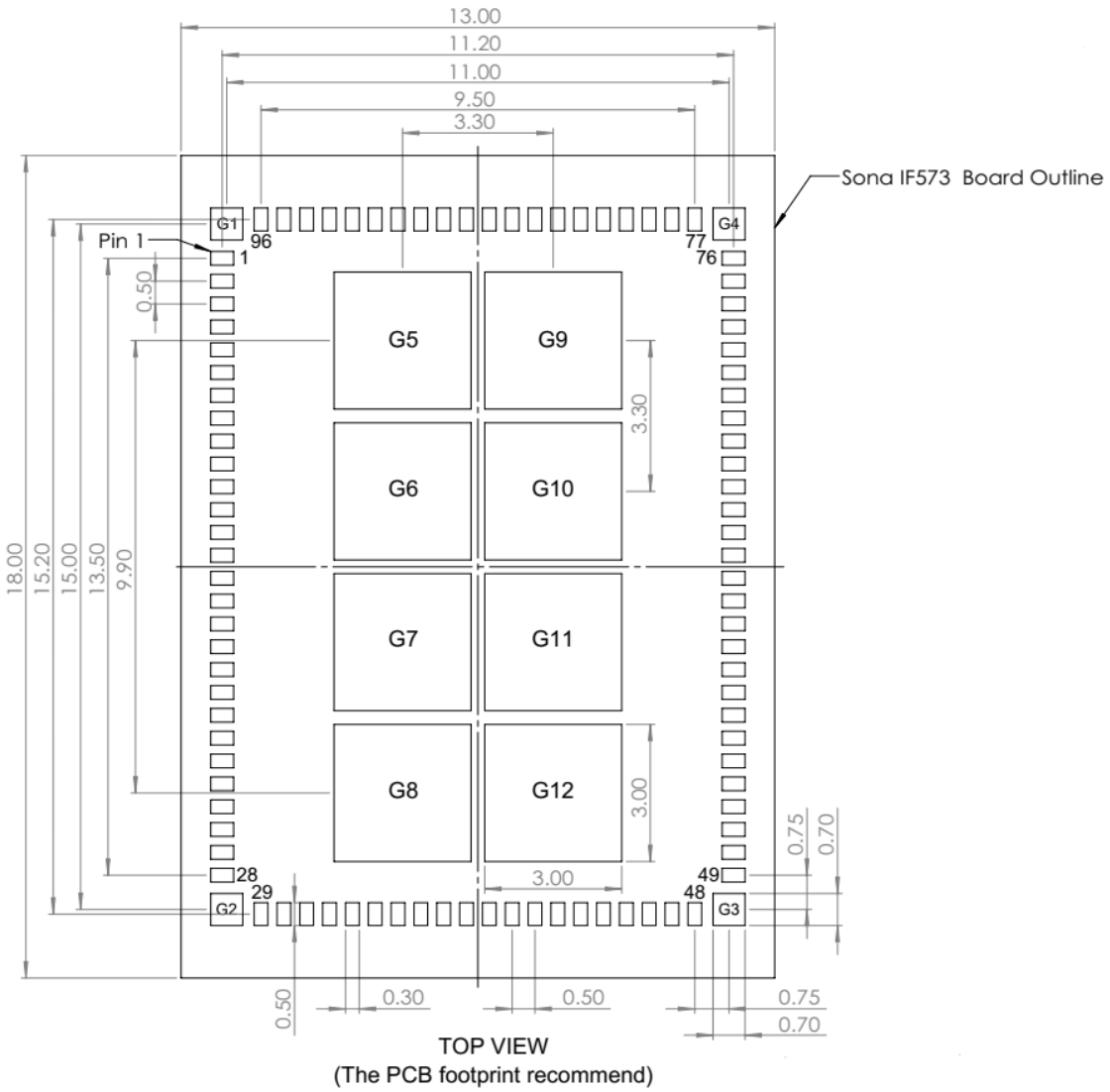

Figure 20: M.2 1318

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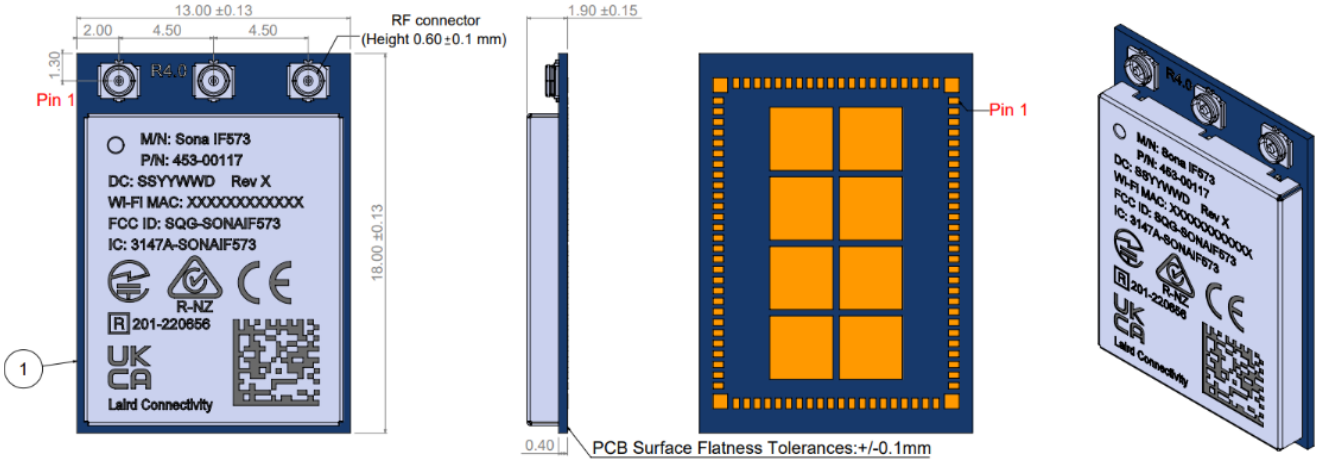

Figure 21: M.2 1318 (MHF4 variant) – Top View

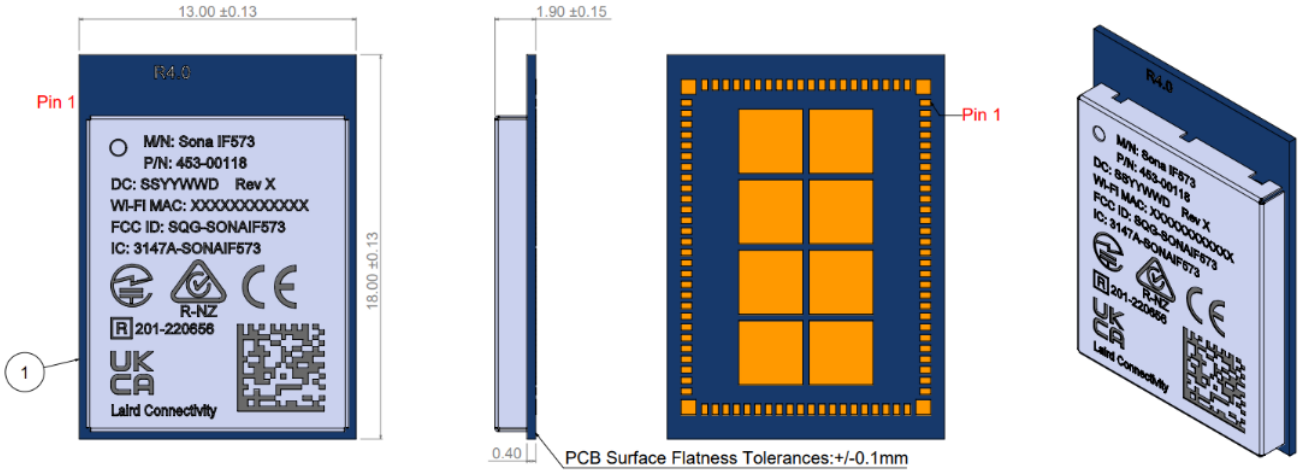

Figure 22: M.2 1318 (trace antenna variant) – Top View

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14.2 M.2 2230 E-Key

Module dimensions of Sona IF573 M.2 2230 E-Key module is 22 x 30 x 2.7 mm. Detailed drawings are shown in Figure 23.

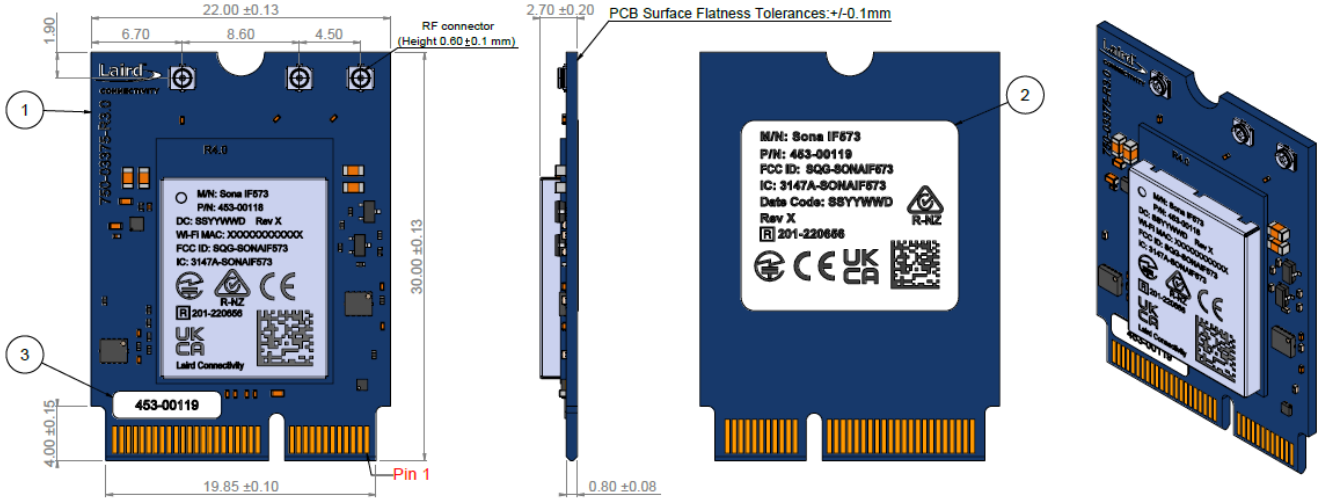

Figure 23: Sona IF573 M.2 2230

Note: The Wi-Fi MAC address is located on the product label.
The last digit of Wi-Fi MAC address is assigned to either *0, 2, 4, 6, 8, A, C, E.*
The BT MAC address is the Wi-Fi MAC address plus 1.

14.3 M.2 2230 E-Key Mounting

The Sona IF573 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 IF573 M.2 2230 E-Key module is a single-sided component module so we recommend the connectors listed in Table 40.

Table 40: 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 41.

Table 41: 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 show in Figure 24.

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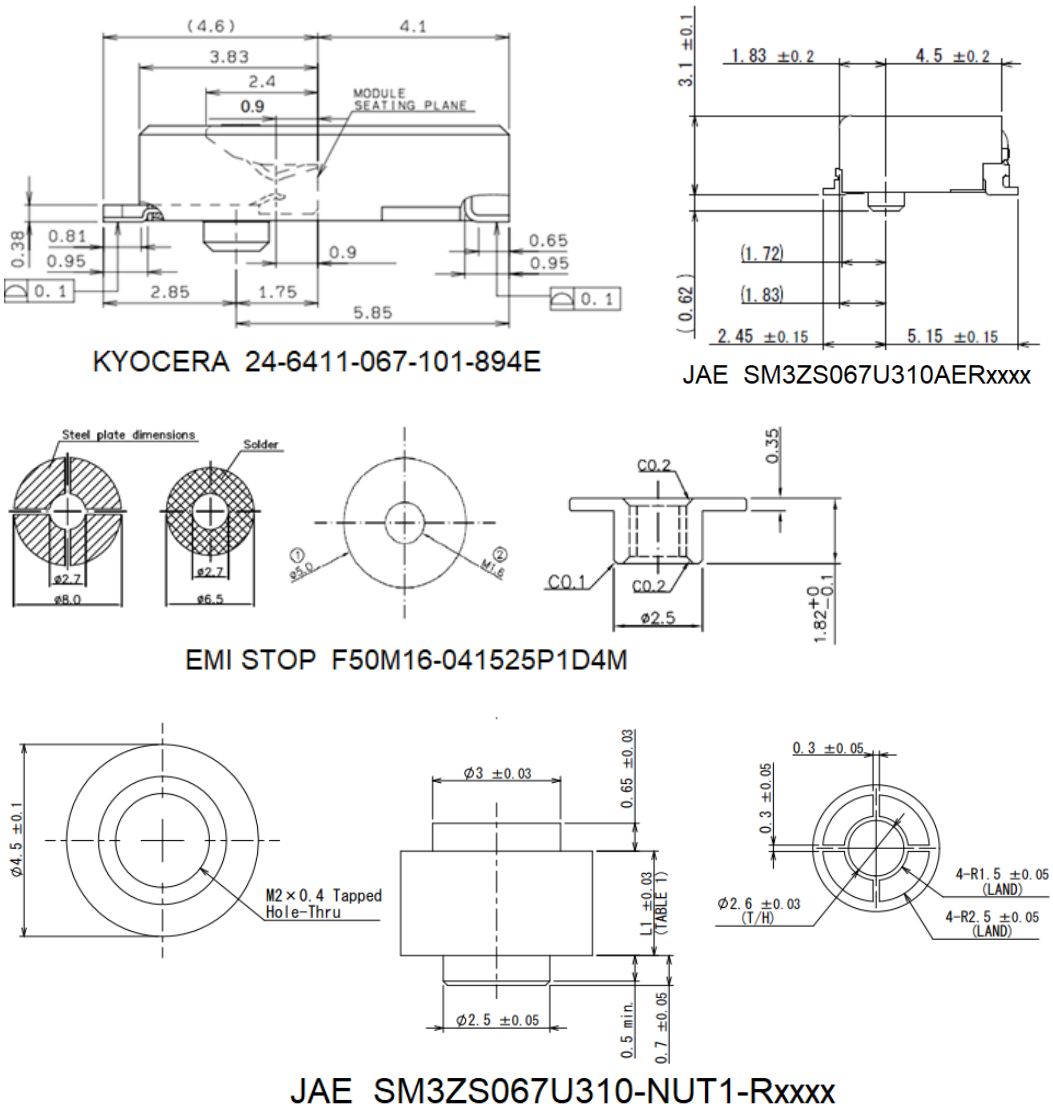

Figure 24: M.2 2230 E-Key connector/standoff mounting

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15 RF Layout Design Guidelines

The following is a list of RF layout design guidelines and recommendation when installing a Laird Connectivity 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 Laird Connectivity radio from the antenna. In addition, do not place antennas directly above or directly below the radio.
- Laird Connectivity 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 Laird Connectivity radio module. To avoid negatively impacting Tx power and receiver sensitivity, do not cover the antennas with metallic objects or components.

16 Application Notes

16.1 Introduction

Laird Connectivity's surface mount modules are designed to conform to all major manufacturing guidelines. This application note is intended to provide additional guidance beyond the information that is presented in the user manual. This application note is considered a living document and will be updated as new information is presented.

The modules are designed to meet the needs of several commercial and industrial applications. They are easy to manufacture and conform to current automated manufacturing processes.

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16.2 Shipping and Labelling

16.2.1 M.2 1218 Solder-Down

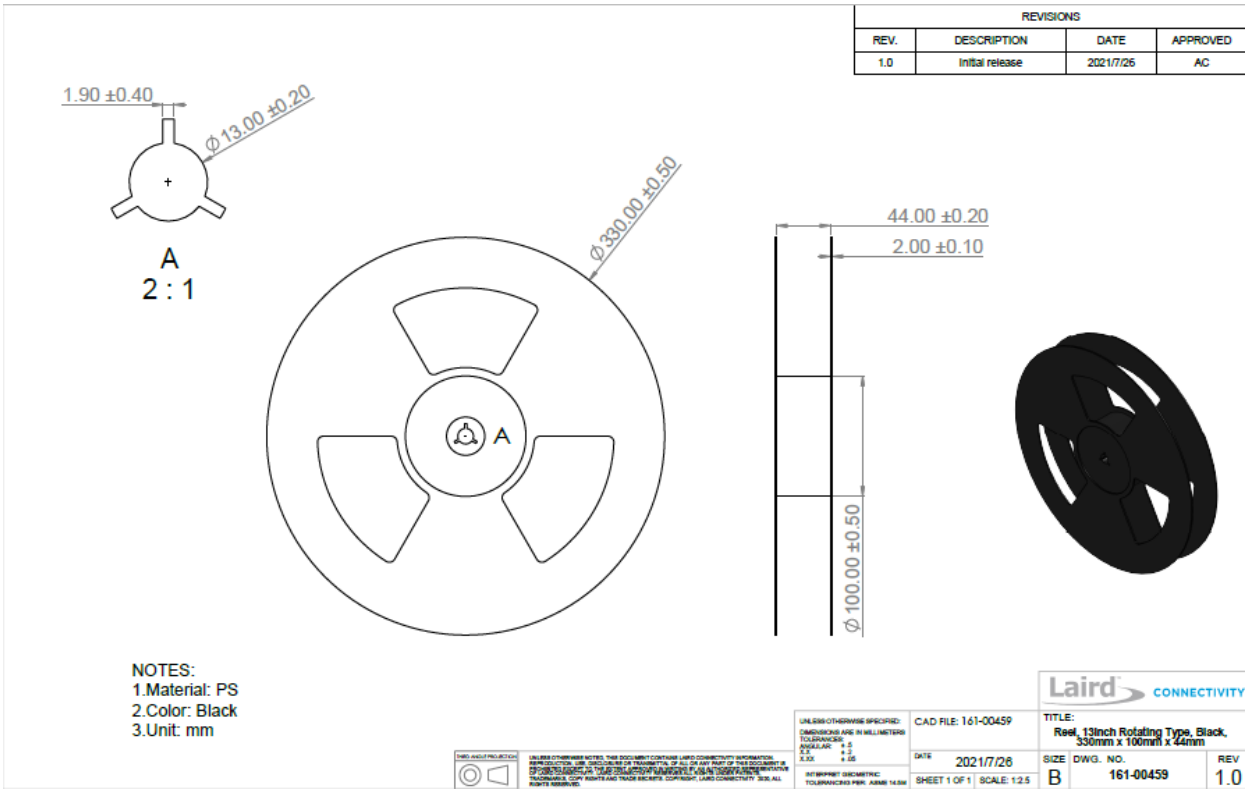

Figure 25: Sona IF573 Reel specifications, 161-00459: Sona IF573 Reel specifications, 161-00459

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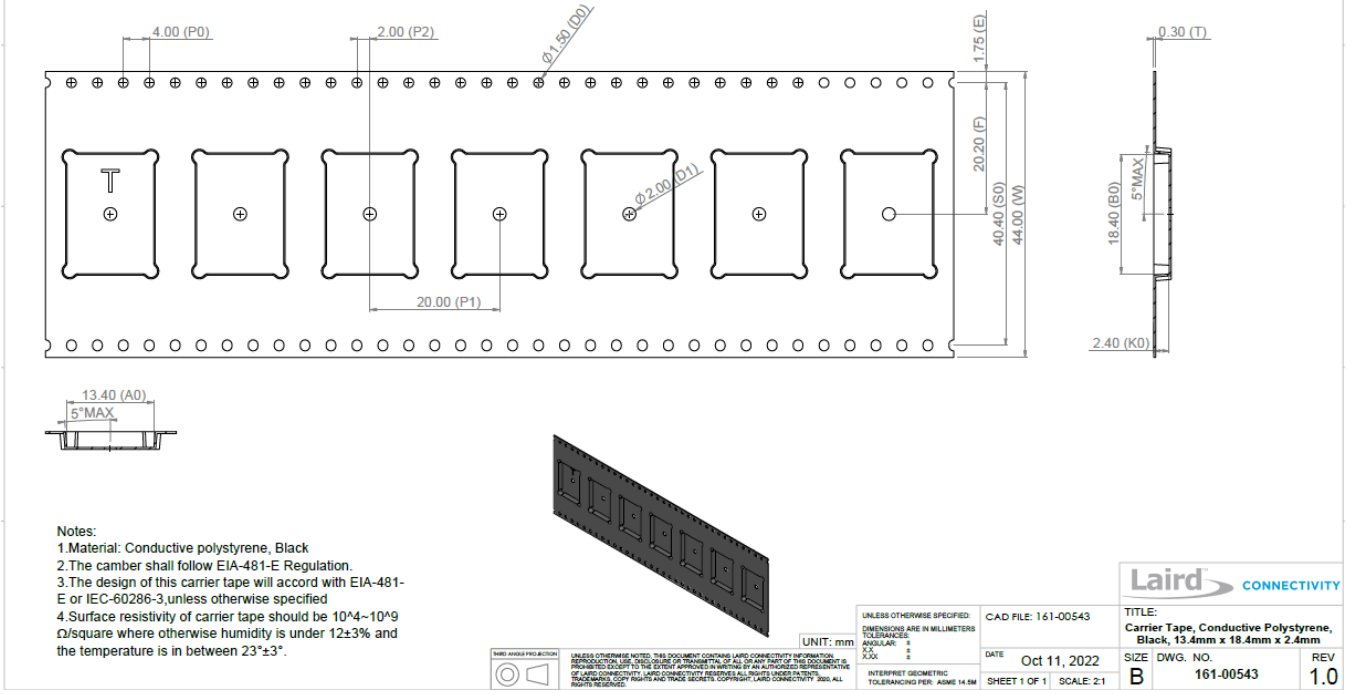
Hong Kong: +852-2762-4823

ITRM	A0	B0	K0	P0	P1	P2	T	E	F	D0	D1	W	10P0	S0
DIM	13.40	18.40	2.40	4.00	20.00	2.00	0.30	1.75	20.20	1.50	2.00	44.00	40.00	40.40
TOLE	±0.10	±0.10	±0.10	±0.10	±0.10	±0.15	±0.05	±0.10	±0.15	+0.10 -0.00	±0.10	±0.30	±0.20	±0.10

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
1.0	Initial release	Oct 11, 2022	AC



Notes:
1.Material: Conductive polystyrene, Black
2.The camber shall follow EIA-481-E Regulation.
3.The design of this carrier tape will accord with EIA-481-E or IEC-60286-3,unless otherwise specified
4.Surface resistivity of carrier tape should be 10^4~10^9 Ω/square where otherwise humidity is under 12±3% and the temperature is in between 23°±3°.

UNIT: mm

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: ANGULAR: ± X.X ± XXX ± INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M

CAD FILE: 161-00543

DATE: Oct 11, 2022

SHEET 1 OF 1 SCALE: 2:1

TITLE: Carrier Tape, Conductive Polystyrene, Black, 13.4mm x 18.4mm x 2.4mm

SIZE: B DWG. NO.: 161-00543 REV: 1.0

Figure 26: Sona IF573 Tape specifications, 161-00543

There are 1,000 Sona IF573 modules taped in a reel (and packaged in a pizza box) and three boxes per carton (3,000 modules per carton). Reel, boxes, and carton are labeled with the appropriate labels. See Figure 27 for more information.

Americas: +1-800-492-2320
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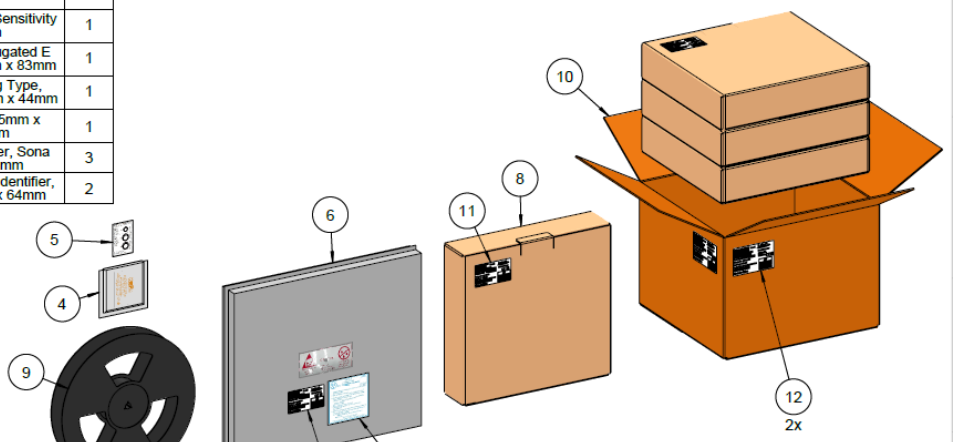
ITEM NO.	PART NUMBER	REV.	DESCRIPTION	QTY.
1	453-00117	1.0	Module, Sona IF573, MIMO, MHF4	1000
2	161-00543	1.0	Carrier Tape, Conductive Polystyrene, Black, 13.4mm x 18.4mm x 2.4mm	1
3	161-00528	1.0	Cover Tape, Anti-static Polyester, 37.5mm x 0.05mm	1
4	161-00506	1.0	Desiccant, Silica Gel, 66g, 110mm x 120mm	1
5	161-00510	1.0	Humidity Indicator Card, Minimum 60% RH, Three Spot Indication, 75mm x 50mm, J-STD-033 Rev D	1
6	161-00544	1.0	Bag, ESD and Moisture Barrier, Silver, 420mm x 475mm x 0.15mm	1
7	160-02008	1.1	Label, Blank Moisture Sensitivity Level, 4in x 4in	1
8	161-00507	1.0	Box, Single-Wall Corrugated E Flute, 362mm x 344mm x 83mm	1
9	161-00459	1.0	Reel, 13inch Rotating Type, Black, 330mm x 100mm x 44mm	1
10	161-00508	1.0	Carton, AB Flute, 365mm x 383mm x 279mm	1
11	160-02371	1.0	Label, Product Identifier, Sona IF573, 89mm x 51mm	3
12	160-02372	1.0	Label, Carton Product Identifier, Sona IF573, 101mm x 64mm	2

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
1.0	Initial release	Oct 19, 2022	AC



Notes:
1.Put the Module in the carrier tape and cover the tape.
2.Put the Reel, Desiccant and Humidity Indicator Card in the ESD bag.
3.Put the packed ESD bag (vacuum) in the box.
4.Module packaging quantity:
Per Reel: 1000 PCS

UNIT: mm
CAD FILE: 453-00117R
DATE: Oct 19, 2022
SHEET 1 OF 1
SCALE: 1:7
TITLE: Module, Sona IF573, MIMO, MHF4, Tape and Reel
SIZE: B
DWG. NO.: 453-00117R
REV: 1.0

Figure 27: Sona IF573 packaging processes, 453-00117R

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

The following labels are located on the antistatic bag.

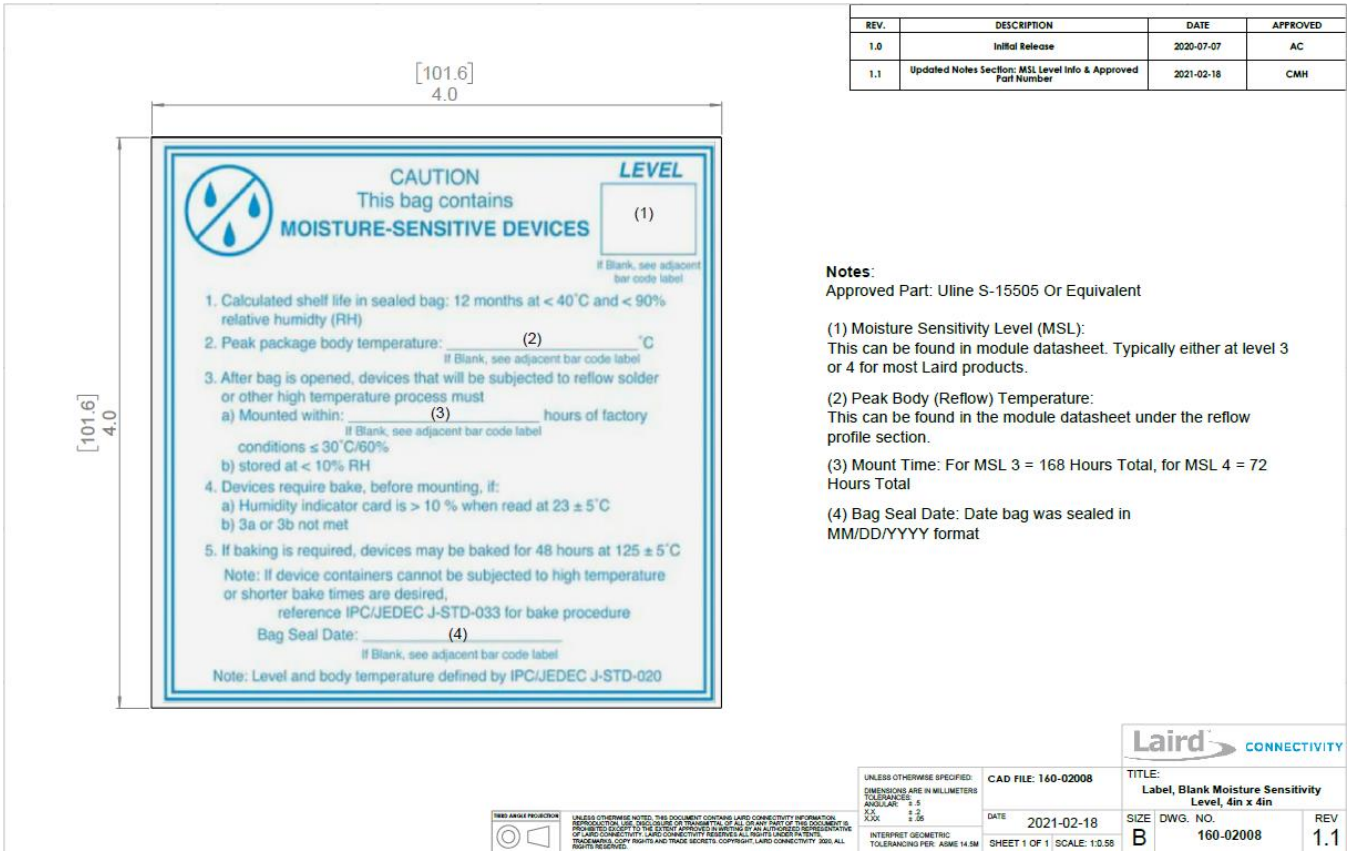


Figure 28: Sona IF573 Moisture Sensitivity Level Label, 160-02008

Americas: +1-800-492-2320
Europe: +44-1628-858-940
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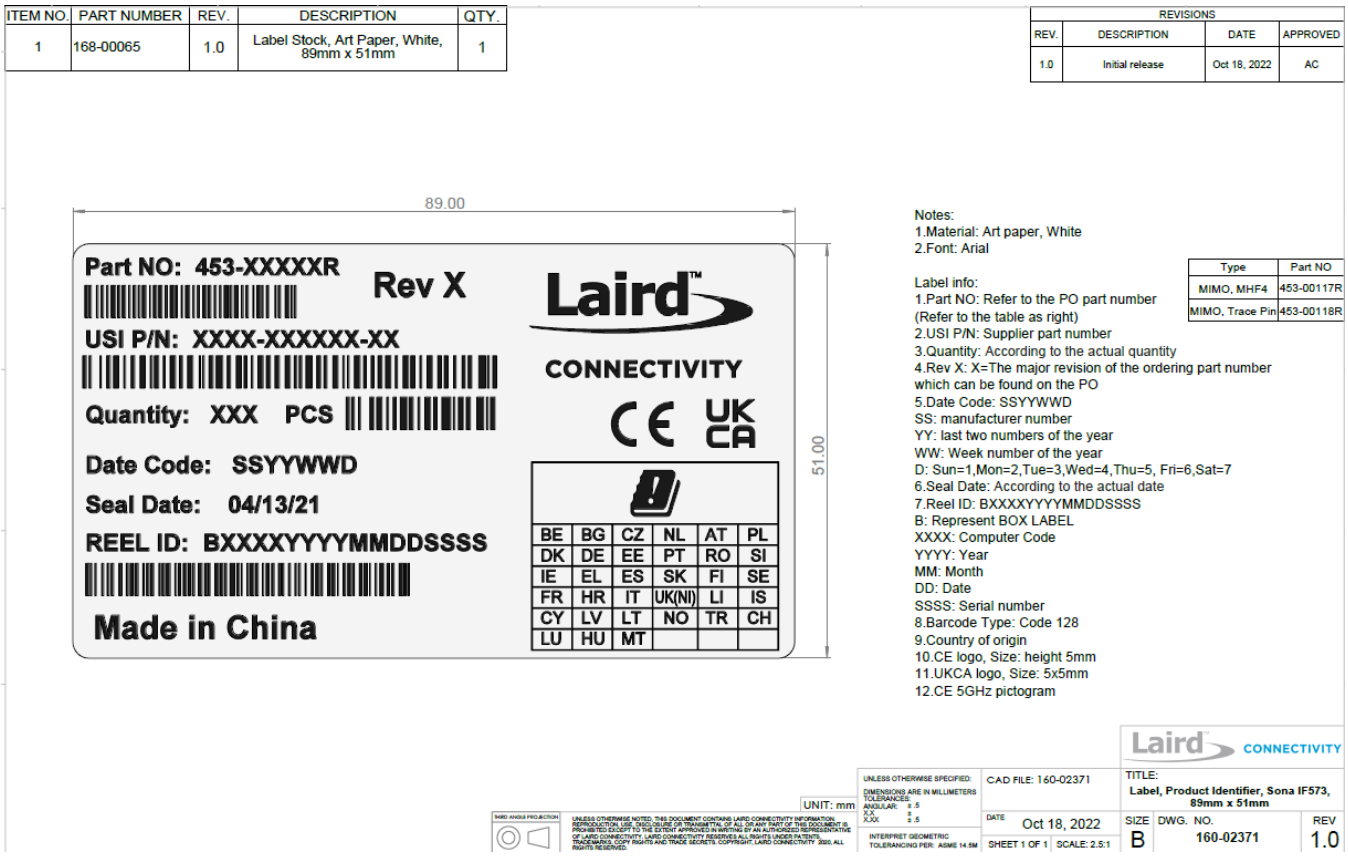


Figure 29: Sona IF573 Bag and Box Product Identifier Label, 160-02371

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

The following label is located on the pizza box.

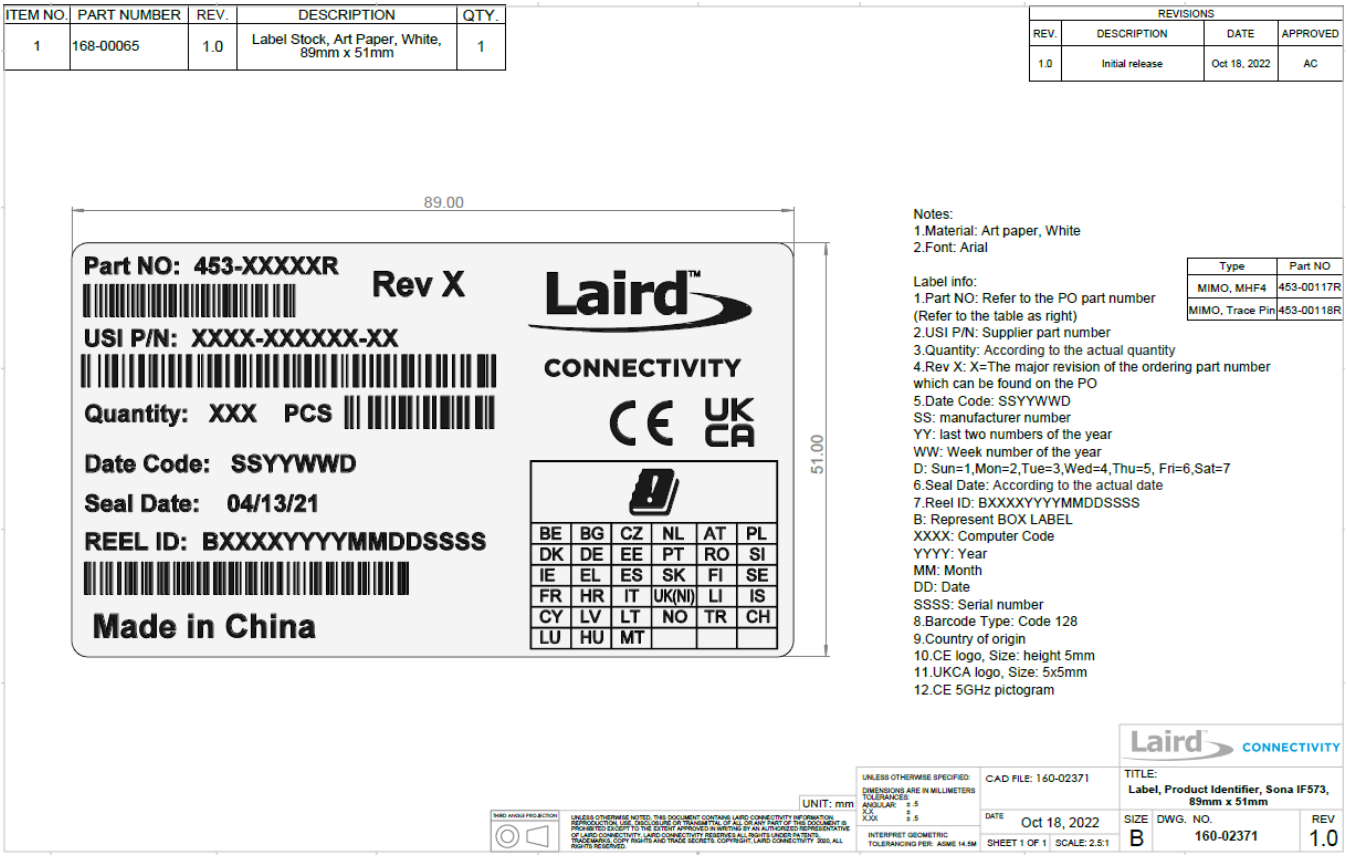


Figure 30: Sona IF573 Bag and Box Product Identifier Label, 160-02371

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

The following package label is located on adjacent sides of the master carton.

ITEM NO.	PART NUMBER	REV.	DESCRIPTION	QTY.
1	168-00066	1.0	Label Stock, Art Paper, White, 101mm x 64mm	1

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
1.0	Initial release	Oct 18, 2022	AC

Notes:
1.Material: Art paper, White
2.Font: Arial

Label info:
1.Part NO: Refer to the PO part number (Refer to the table as right)
2.USI P/N: Supplier part number
3.Quantity: According to the actual quantity
4.Rev X: X=The major revision of the ordering part number which can be found on the PO
5.Date Code: SSYYWWD
SS: manufacturer number
YY: last two numbers of the year
WW: Week number of the year
D: Sun=1,Mon=2,Tue=3,Wed=4,Thu=5, Fri=6,Sat=7
6.Seal Date: According to the actual date
7.Carton NO: CXXXXYYYYMMDDSSSS
C: Represent Carton LABEL
XXXX: Computer Code
YYYY: Year
MM: Month
DD: Date
SSSS: Serial number
8.Barcode Type: Code 128
9.Country of origin
10.CE logo, Size: height 5mm
11.UKCA logo, Size: 5x5mm
12.CE 5GHz pictogram
13.Laird connectivity address

Type	Part NO
MIMO, MHF4	453-00117R
MIMO, Trace Pin	453-00118R

Laird CONNECTIVITY

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: ANGULAR: ± .5, X.X ± .5, X.XX ± .5
INTERPRET GEOMETRIC TOLERANCING PER: ASME 14.5M
UNIT: mm
CAD FILE: 160-02372
DATE: Oct 18, 2022
SHEET 1 OF 1
SCALE: 2:1
TITLE: **Label, Carton Product Identifier, Sona IF573, 101mm x 64mm**
SIZE: B
DWG. NO.: 160-02372
REV: 1.0

Figure 31: Sona IF573 Carton Product Identifier Label, 160-0273

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

16.2.2 M.2 2230 E-Key Module

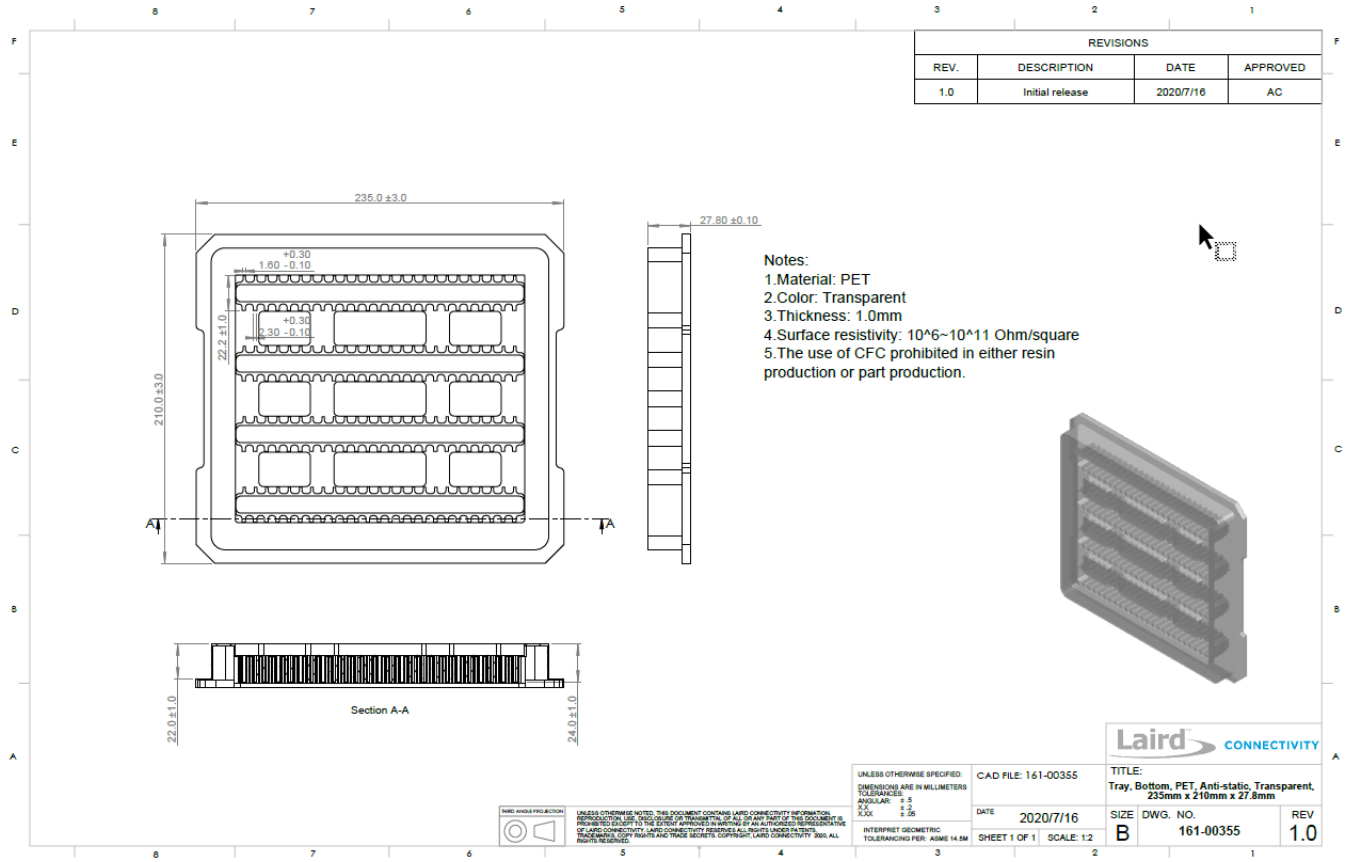


Figure 32: Sona IF573 M.2 2230 Shipping Tray, Bottom, 161-00355

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

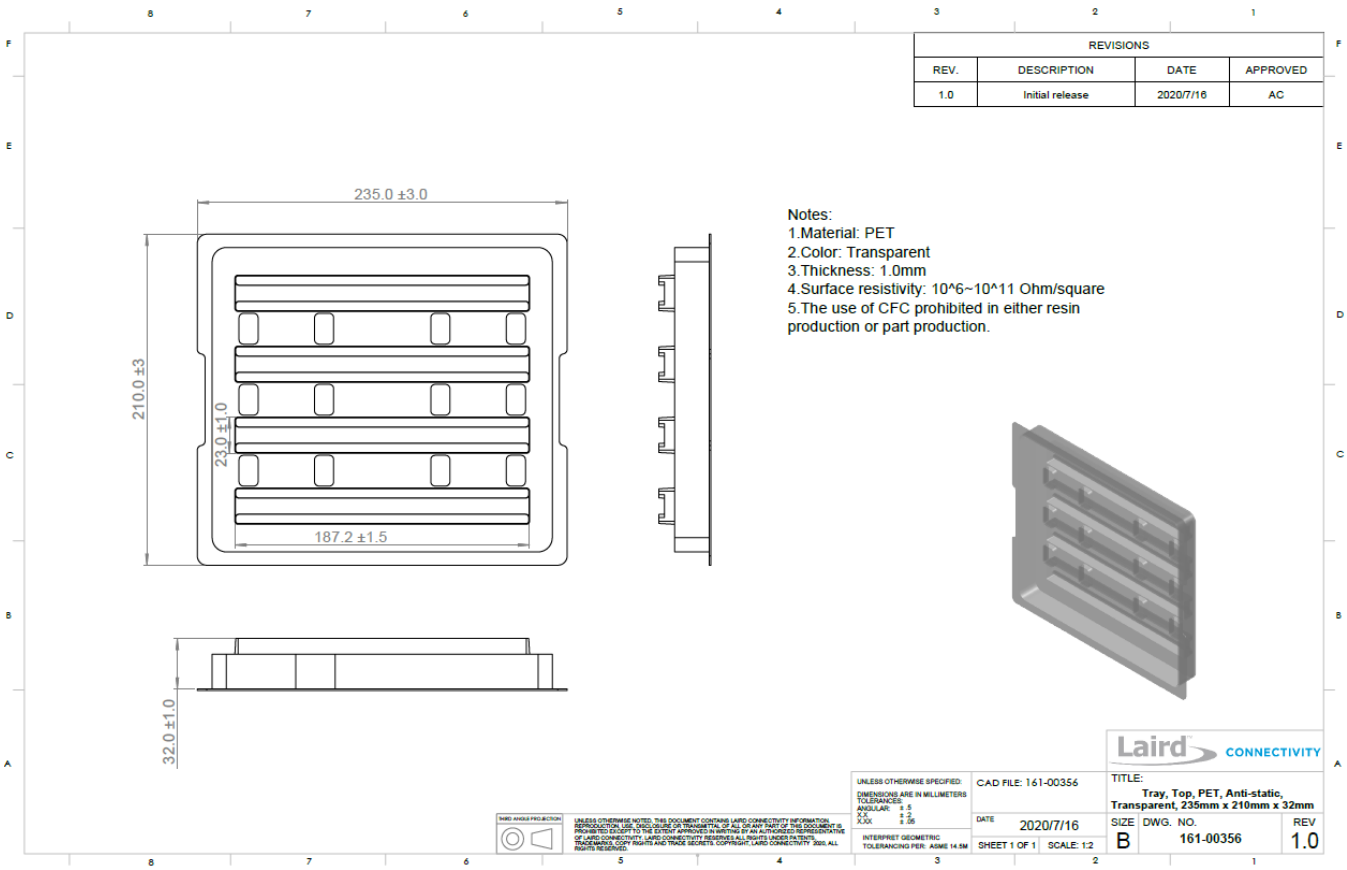


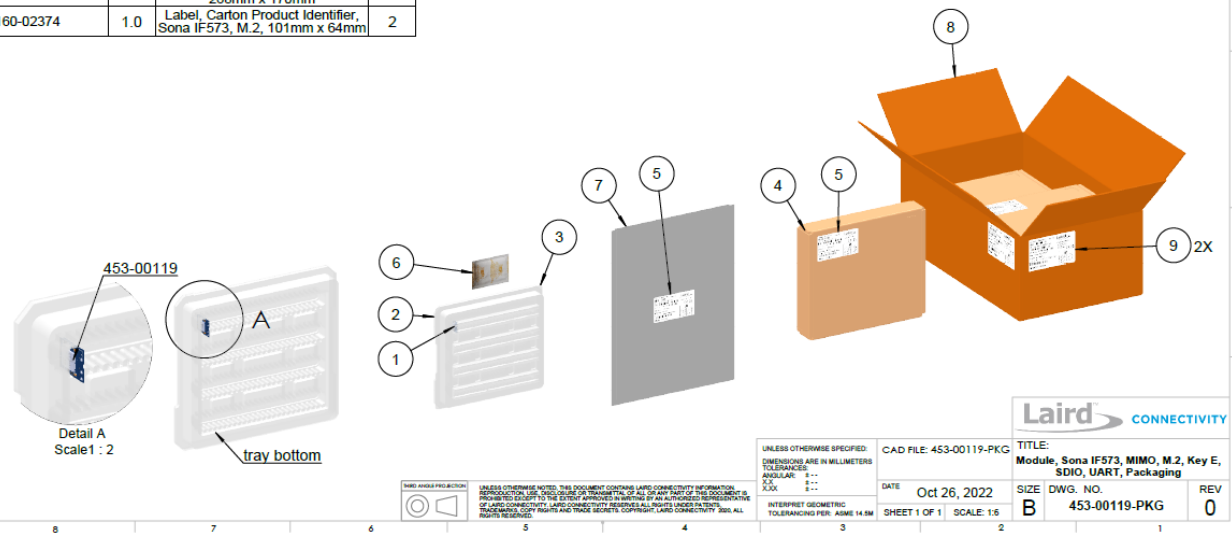
Figure 33: Sona IF573 M.2 2230 Shipping Tray, Top, 161-00356

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

ITEM NO.	PART NUMBER	REV.	DESCRIPTION	QTY.
1	453-00119	1.0	Module, Sona IF573, MIMO, M.2, Key E, SDIO, UART	600
2	161-00355	1.0	Tray, Bottom, PET, Anti-static, Transparent, 235mm x 210mm x 27.8mm	6
3	161-00356	1.0	Tray, Top, PET, Anti-static, Transparent, 235mm x 210mm x 32mm	6
4	161-00357	1.0	Box, Kraft, B Flute, 255mm x 215mm x 43mm	6
5	160-02373	1.0	Label, Box Product Identifier, Sona IF573, M.2, 89mm x 51mm	12
6	161-00361	1.0	Desiccant, Silica Gel, 10g, 58mm x 80mm	6
7	161-00358	1.0	Bag, ESD and Moisture Barrier, Silver, 270mm x 360mm x 0.09mm	6
8	161-00359	1.0	Carton, Kraft, AB Flute, 455mm x 268mm x 170mm	1
9	160-02374	1.0	Label, Carton Product Identifier, Sona IF573, M.2, 101mm x 64mm	2

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
0	Initial release	Oct 26, 2022	AC

Notes:
1.Put the Module in the bottom tray.
2.Cover the top tray.
3.Put the 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



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: ANGULAR: ± -- X.X ± -- X.XX ± -- INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5M	CAD FILE: 453-00119-PKG DATE Oct 26, 2022 SHEET 1 OF 1 SCALE: 1:5	TITLE: Module, Sona IF573, MIMO, M.2, Key E, SDIO, UART, Packaging SIZE B DWG. NO. 453-00119-PKG REV 0	

Figure 34: Sona IF573 M.2 2230 Packaging Process, 453-00119-PKG

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

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

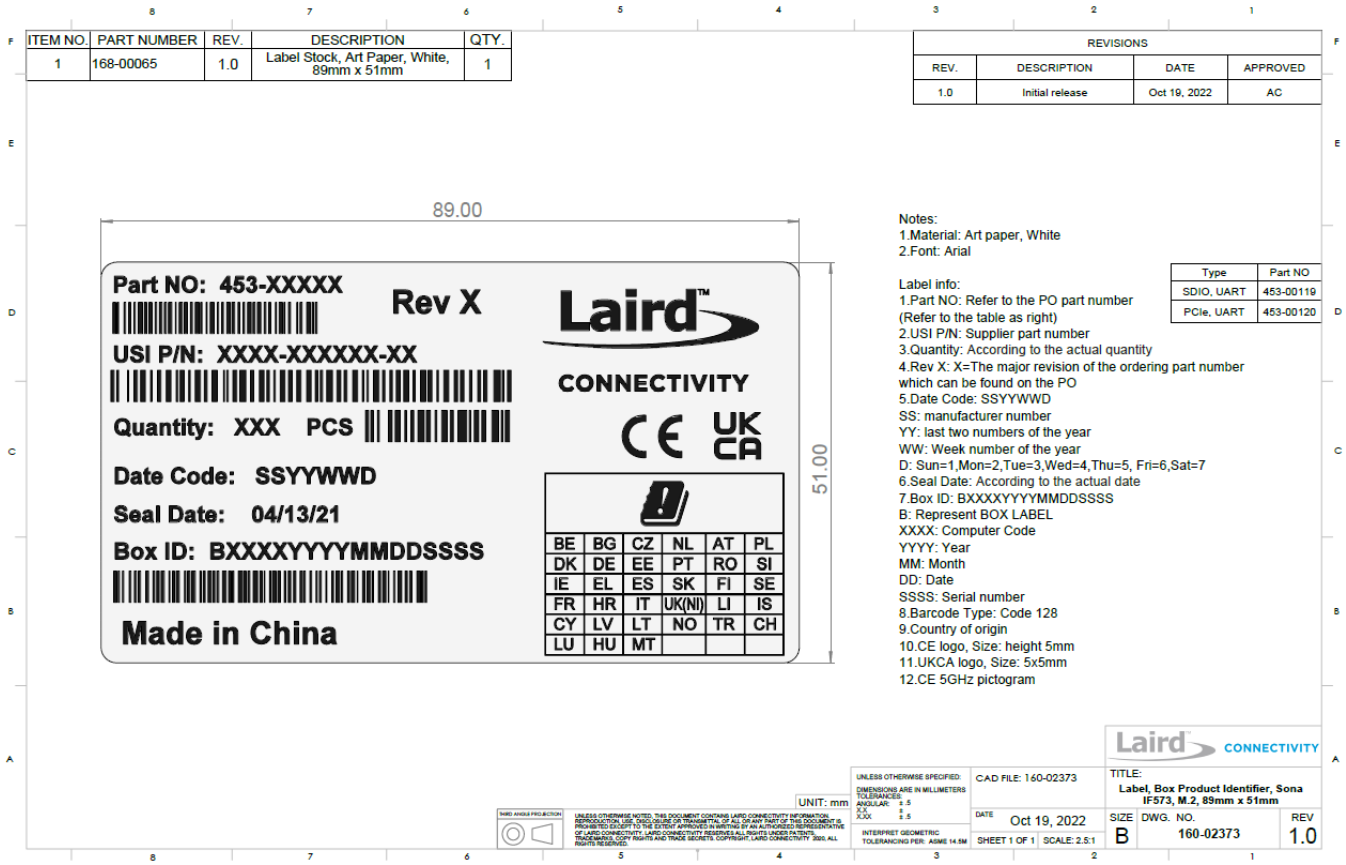


Figure 35: Sona IF573 M.2 2230 Bag and Box Product Identifier Label, 160-02373

The following label is located on the adjacent sides of the master carton.

Americas: +1-800-492-2320
Europe: +44-1628-858-940
Hong Kong: +852-2762-4823

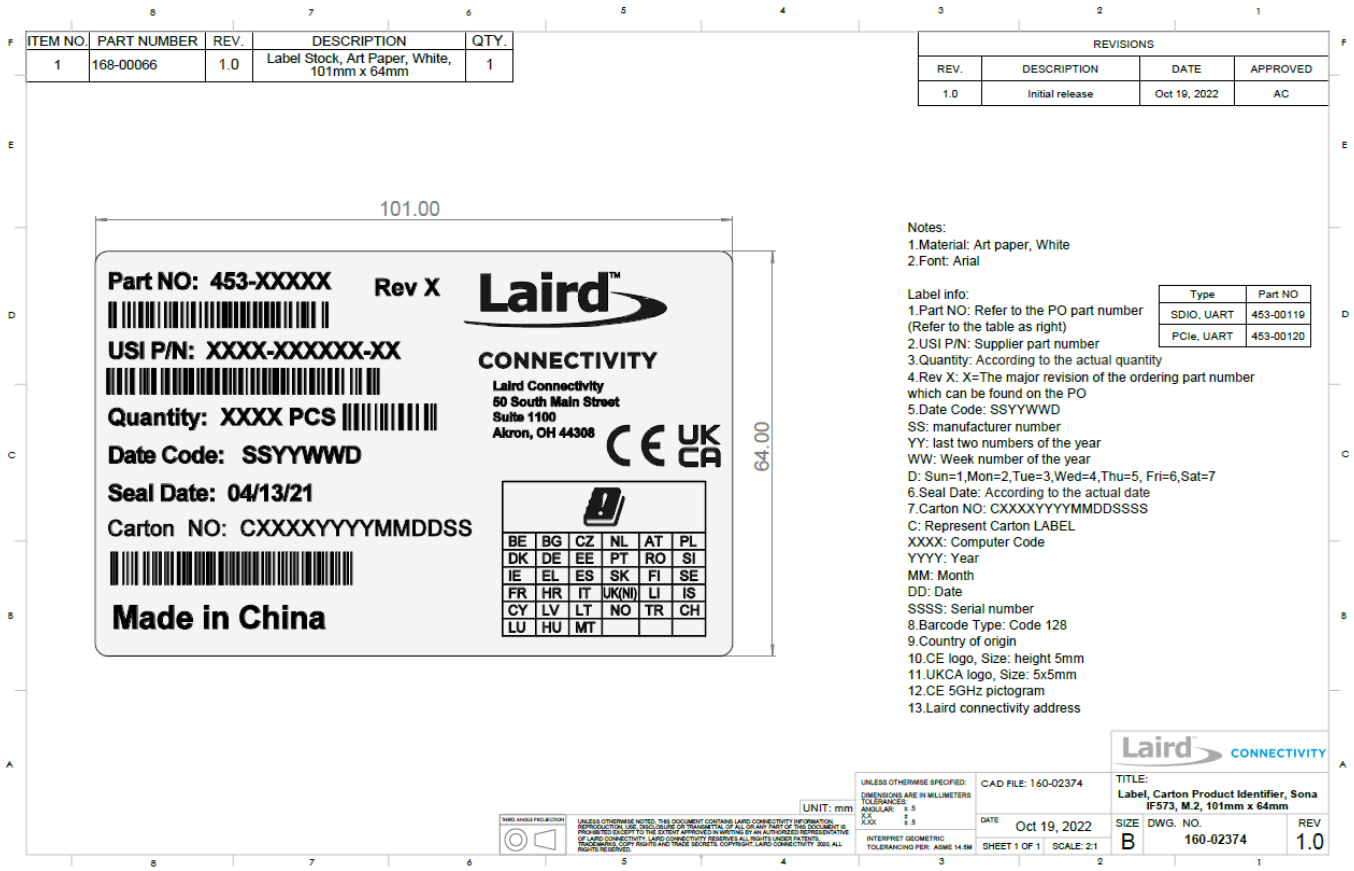


Figure 36: Sona IF573 M.2 2230 Carton Product Identifier Label, 160-02374

16.3 Required Storage Conditions

16.3.1 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.

16.3.2 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

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- 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.

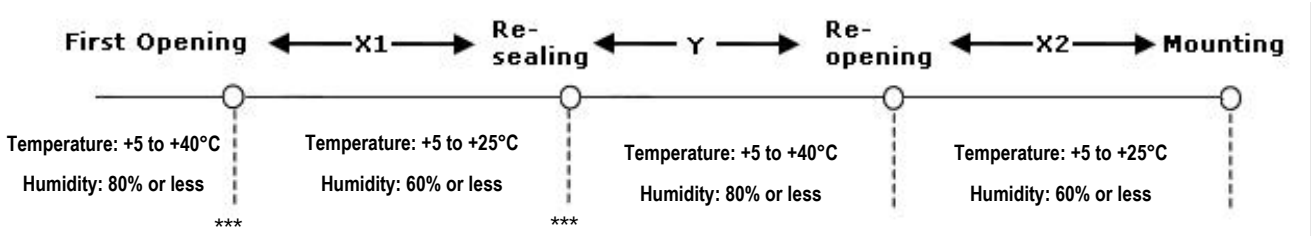
16.3.3 Temporary Storage Requirements after Opening

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.

16.4 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°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˚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 (±5 ˚C).

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17 Surface Mount Conditions

The following soldering conditions are recommended to ensure device quality.

17.1 Recommended Stencil Aperture

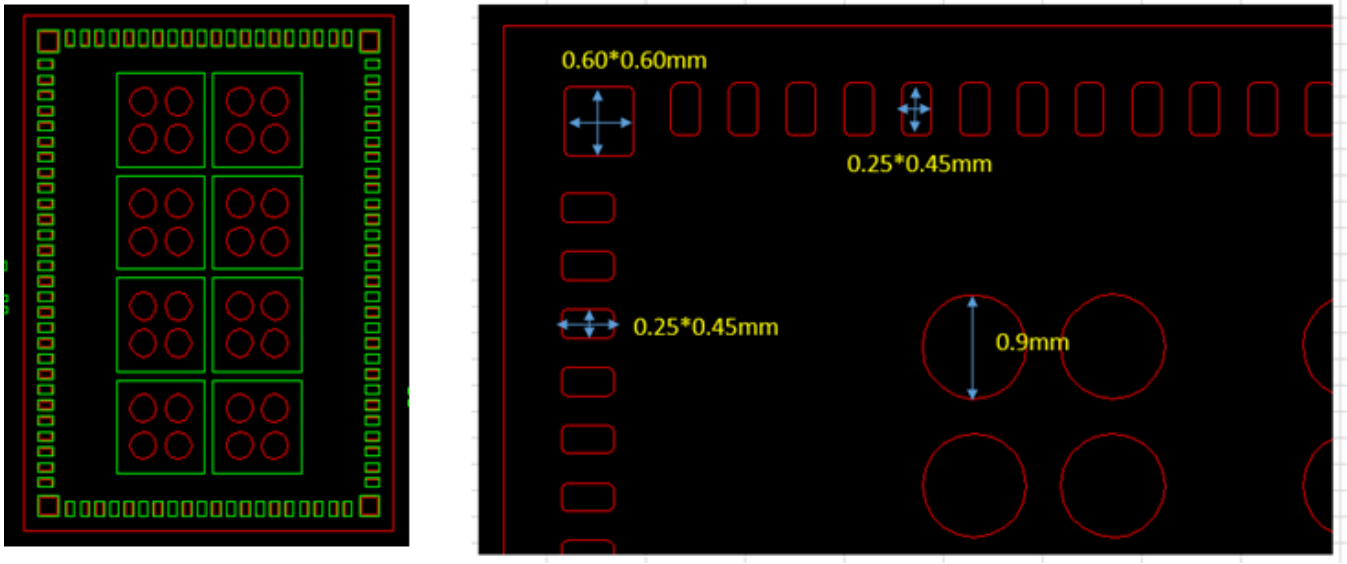

Figure 37: Sona IF573 M.2 1318 stencil aperture

Note: The stencil thickness is 0.12mm

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17.2 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:

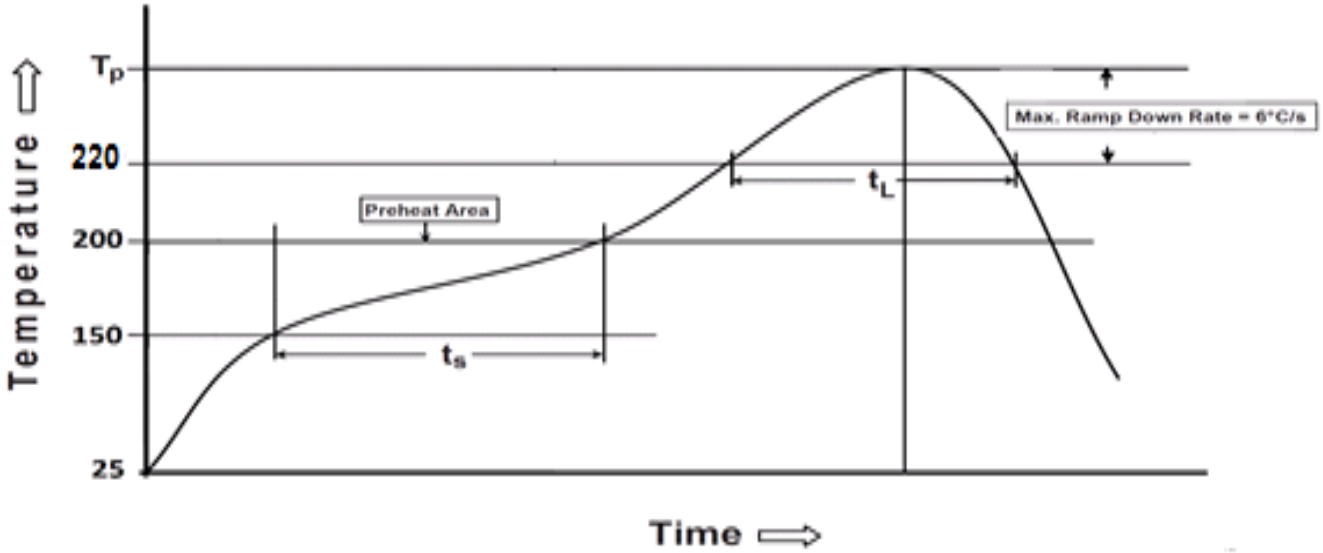

Figure 38: Temperature profile

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

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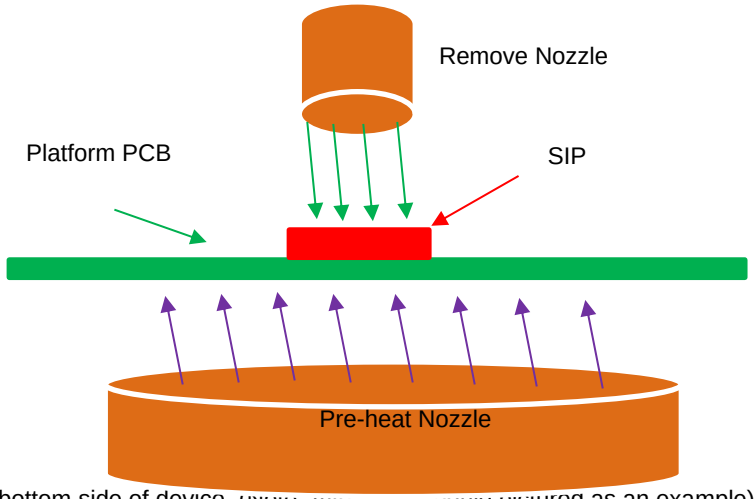
17.2.1 Cautions When Removing the M.2 1318 from the Platform for RMA

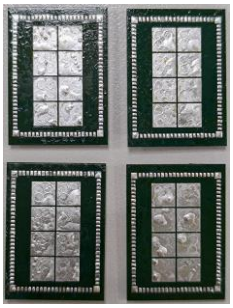
- Bake the platform before removing the Sona IF573 module from the platform. Reference Baking Conditions.
- Remove the Sona IF573 module by using a hot air gun. This process should be carried out by a skilled technician.

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)

Figure 39: Example M.2 1318 with residue solder on the bottom

(Accepted for RMA analysis)

Figure 40: Sona IF573 module without residue solder

- Remove and clean the residue flux as needed.

17.2.2 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 IF573 modules are MSL level 4 rated.

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18 Reliability Test

The Sona IF573 modules were tested for reliability. Test items and the corresponding standards are shown in Table 42.

18.1 Environmental and Mechanical

The following are the followed reliability test procedures.

Table 42: Sona IF573 M.2 1318 Solder-down Module Reliability Test Items and Standards

Test Item	Specification	Standard	Test Result
Step 1: Pre-conditioning	**Pre-check:** 1. Function check (Tools and SOP supplied by customers). 2. Mechanical check. **Pre-conditioning:** 1. Bake: 125°C for 24 hours. 2. Moisture Soak: 30°C/60% RH for 192 hours 3. Not shorter than 15 minutes and not longer than 4 hours after removal from the temperature/humidity chamber, subject the sample to 3 cycles of the reflow. **Post-check:** 1. Function check (Tools and SOP supplied by customers). 2. Mechanical check. 3. Perform inspections of short, open, delamination of DUTs by Optical Microscope (under 40X optical magnification). 4. X-RAY / CSAM (SAT) on any failed samples (Notify customers). 5. Cross-sections analysis based on X-RAY and CSAM results.	JESD22-A113	Pass
Step 2: Temperature Cycling Non-operating	1. Dwell on -40°C for 15 minutes 2. Shock to 85°C with in ramp rate 15 ℃/minute 3. Dwell on 85°C for 15 minutes 4. Shock to -40°C with in ramp rate 15 degree C/minute 5. Repeat step 1-4 and stop to check functions at 500/ 700 cycles	JESD22-A113	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

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Table 43: Sona IF573 M.2 2230 E-Key Module Reliability Test Item and Standards

Test Item	Specification	Standard	Test Result
Thermal Shock	1. Temperature: -40 ~ 85℃ 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

18.2 Reliability Prediction

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

Laird Part Number	Environment	Test Result 45 ℃ (Hours)
453-00117R 453-00117C 453-00118R 453-00118C	Ground, Fixed, Uncontrolled Ground, Mobile	13,987,080.94 10,659,368.74

Laird Part Number	Environment	Test Result 85 ℃ (Hours)
453-00117R 453-00117C 453-00118R 453-00118C	Ground, Fixed, Uncontrolled Ground, Mobile	2,751,512.41 2,095,110.62

Laird Part Number	Environment	Test Result 45 ℃ (Hours)
453-00119 453-00120	Ground, Fixed, Uncontrolled Ground, Mobile	8,861,616.79 6,713,673.22

Laird Part Number	Environment	Test Result 85 ℃ (Hours)
453-00119 453-00120	Ground, Fixed, Uncontrolled Ground, Mobile	1,752,775.15 1.327,284.04

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19 REGULATORY

Note: For complete regulatory information, refer to the Sona IF573 Regulatory Information document which is also available from the Sona IF573 product page.

The Sona IF573 holds current certifications in the following countries:

Country/Region	Regulatory ID
USA (FCC)	SQG-SONAIF573
EU	N/A
UKCA	N/A
Canada (ISED)	3147A-SONAIF573
Japan (MIC)	201-220656
Australia	N/A
New Zealand	N/A

19.1 Certified Antennas

The Sona IF573 module was tested with antennas listed in the following table. The OEM can choose a different manufacturer's antenna but must make sure it is of same type and that the gain is lesser than or equal to the antenna that is approved for use.

Manufacturer	Model	Laird Connectivity Part Number	Type	Connector	Peak Gain (dBi)		
					2.4 GHz	5 GHz	6 GHz
Laird Connectivity	FlexMIMO 6E	EFD2471A3S-10MH4L	PIFA	MHF4L	2.2	3.8	3.3
Laird Connectivity	FlexPIFA 6E	EFB2471A3S-10MH4L	PIFA	MHF4L	2.2	3.9	3.8
Laird Connectivity	Mini NanoBlade Flex 6 GHz	EMF2471A3S-10MH4L	PCB Dipole	MHF4L	2.4	4.4	5.2
Joymax Electronics	Dipole 6E	TWX-100BRSAX-2001 / TWX-100BRS3B	Dipole	RP-SMA	2	4.0	4.0

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20 BLUETOOTH SIG QUALIFICATION

20.1 Overview

The Sona IF573 Series module is listed on the Bluetooth SIG website as a qualified Controller Subsystem.

Design Name	Owner	Declaration ID	Link to listing on the SIG website
Sona IF573	Laird Connectivity	D057578	https://launchstudio.bluetooth.com/ListingDetails/158180

It is a mandatory requirement of the Bluetooth Special Interest Group (SIG) that every product implementing Bluetooth technology has a Declaration ID. Every Bluetooth design is required to go through the qualification process, even when referencing a Bluetooth Design that already has its own Declaration ID. The Qualification Process requires each company to register as a member of the Bluetooth SIG – www.bluetooth.org

The following is a link to the Bluetooth Registration page: https://www.bluetooth.org/login/register/

For each Bluetooth Design, it is necessary to purchase a Declaration ID. This can be done before starting the new qualification, either through invoicing or credit card payment. The fees for the Declaration ID will depend on your membership status, please refer to the following webpage:

https://www.bluetooth.org/en-us/test-qualification/qualification-overview/fees

For a detailed procedure of how to obtain a new Declaration ID for your design, please refer to the following SIG document, (login is required to views this document):

https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=283698&vId=317486

20.2 Qualification Steps When Referencing a Laird Connectivity Controller Subsystem Design

To qualify your product when referencing a Laird Connectivity Controller Subsystem design, follow these steps:

1. To start a listing, go to: https://www.bluetooth.org/tpg/QLI_SDoc.cfm

   Note: A user name and password are required to access this site.

2. In step 1, select the option, New Listing and Reference a Qualified Design.
3. Enter D057578 in the Controller Subsystem table entry.
4. Enter your complimentary Host Subsystem and optional Profile Subsystem QDID in the table entry.
5. Select your pre-paid Declaration ID from the drop-down menu or go to the Purchase Declaration ID page.

   Note: Unless the Declaration ID is pre-paid or purchased with a credit card, you cannot proceed until the SIG invoice is paid.

6. Once all the relevant sections of step 1 are finished, complete steps 2, 3, and 4 as described in the help document accessible from the site.

Your new design will be listed on the SIG website and you can print your Certificate and DoC.

For further information please refer to the following training material:

https://www.bluetooth.org/en-us/test-qualification/qualification-overview/listing-process-updates

If you require assistance with the qualification process please contact our recommended Bluetooth Qualification Expert (BQE), Steve Flooks, steve.flooks@eurexuk.com.

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21 Additional Information

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

Headquarters	Laird Connectivity 50 S. Main St. Suite 1100 Akron, OH 44308 USA
Phone	Americas: +1-800-492-2320 Europe: +44-1628-858-940 Hong Kong: +852-2762-4823
Website	www.lairdconnect.com/
Technical Support	www.lairdconnect.com/resources/support
Sales Contact	www.lairdconnect.com/contact

Note: Information contained in this document is subject to change.

Laird Connectivity's products are subject to standard Terms & Conditions.