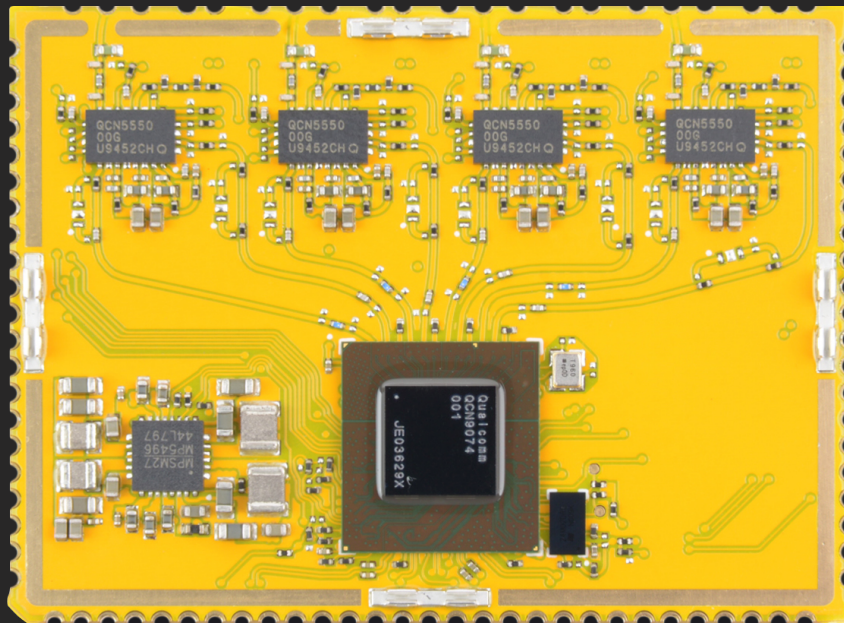




Pineapple PCIe card is based on QCN9074 Radio chip from Qualcomm, which is highly integrated wireless local area network (LAN) for 2.4/5/6 GHz IEEE802.11ax/ac/n/g/b/a applications. It performs AP and STA functionality with 4x4 MIMO and 4 spatial streams. QCN9074 is a dual-synthesizer WLAN radio with native 160 MHz support. The module is in a surface mountable form. Commercial temperature range: 0-65°C, industrial temperature range: -40-85°C.

Quick specs

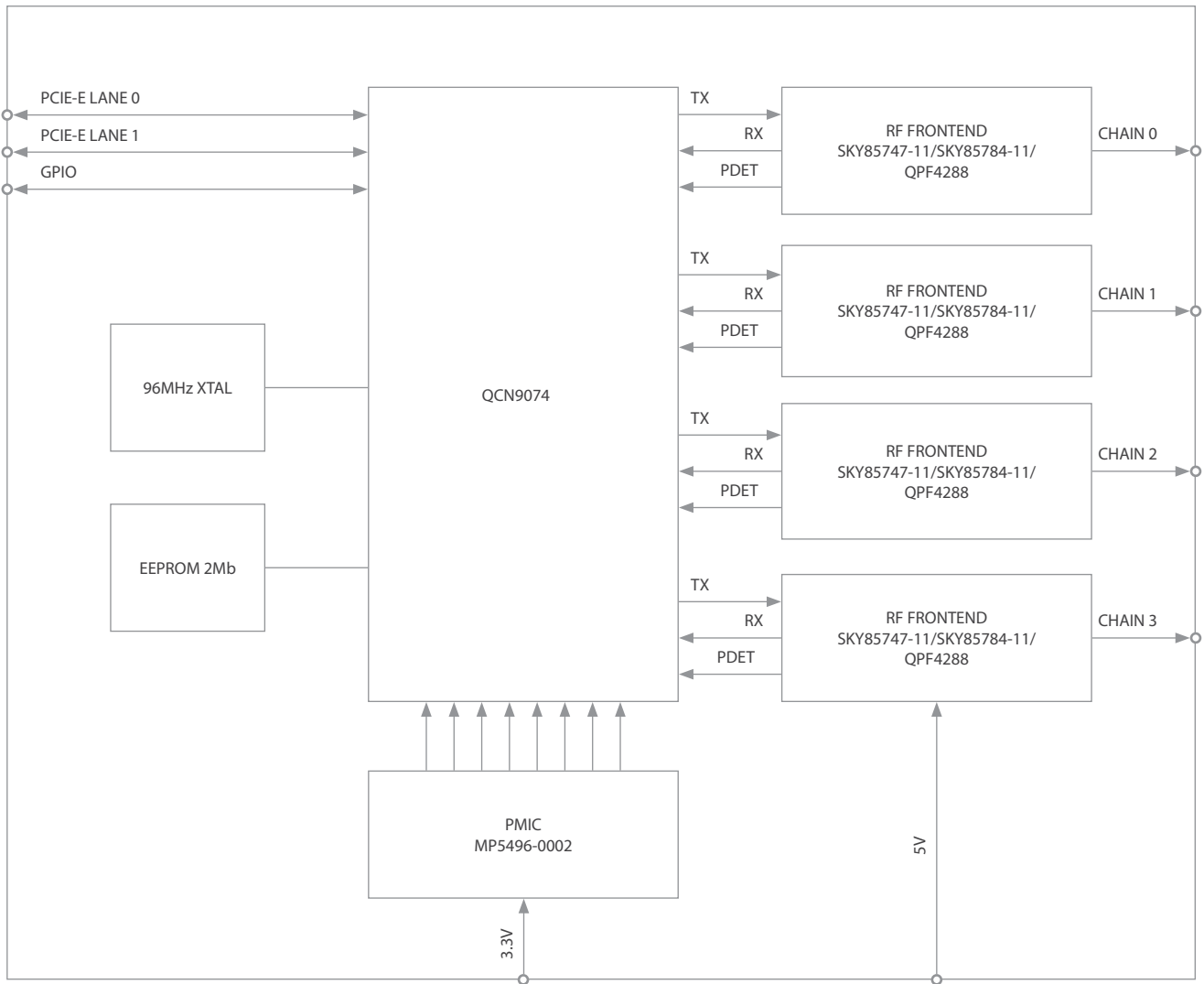
- Wi-Fi 6 (802.11a/g/n/ac/ax) 5 GHz with 4x4 MU-MIMO 1024 QAM (4SS) and 4096 QAM (2SS), 20/40/80/160 MHz, 4804 Mbps data-rate
- Based on QCN9074
- 30 dBm per chain RF output power
- Size – 35 by 47 mm
- Maximum power consumption - 15W
- EEPROM memory
- Available interfaces – dual lane PCIe 3.0, UART, JTAG for debugging, GPIOs

Table of Contents

1. Quick specs	1
2. Block diagram	3
3. Module pin out and Pin description	4
4. Electrical characteristics	8
5. Power management	8
6. Radio characteristics	9
7. Mechanical characteristics	12
8. PCB footprint	13
9. Thermal considerations	14
10. PCIe card	16
11. Laminate Conditions	18
12. Ordering information	19
12.1 Part number guide	20
12.2 Pineapple modules order numbers and descriptions	20
12.3 Pineapple radio cards order numbers and descriptions	21
13. Document Revision History	22

2. Block diagram

FIGURE 2. BLOCK DIAGRAM



3. Module pin out and Pin description



TABLE 3-1. I/O DESCRIPTION (PIN TYPE) PARAMETERS

Description	Parameter
AI	Analog input
AO	Analog output
GND	Ground
RF In/Out	RF input/output
I	Digital input signal
O	Digital output signal
IO	Digital bidirectional signal

TABLE 3-2. POWER AND GROUND

Pin ID	Pin name	Type	Description
PAD2	+3V3	I	3.3V digital power
PAD75, PAD76	+5V_XPA	AI	5V analog power for RF
PAD1, PAD7, PAD10, PAD13, PAD16, PAD19, PAD22, PAD29, PAD37, PAD41, PAD42, PAD43, PAD44, PAD45, PAD46, PAD47, PAD48, PAD49, PAD50, PAD51, PAD52, PAD53, PAD54, PAD56, PAD57, PAD58, PAD59, PAD61, PAD62, PAD63, PAD64, PAD66, PAD67, PAD68, PAD69, PAD71, PAD72, PAD73, PAD74, PAD77, PAD78, PAD79, PAD80, PAD81, PAD82, PAD83, PAD84, PAD85, PAD86, PAD87, PAD88, PAD89, PAD90, PAD91, PAD92	GND	GND	Ground

TABLE 3-3. RADIO

Pin ID	Pin name	Type	Description
PAD55	5G_CH0_ANT	RF In/Out	Signal line for antenna
PAD60	5G_CH1_ANT	RF In/Out	Signal line for antenna
PAD65	5G_CH2_ANT	RF In/Out	Signal line for antenna
PAD70	5G_CH3_ANT	RF In/Out	Signal line for antenna

TABLE 3-4. PCIE GEN3

Pin ID	Pin name	Type	Description
PAD28	PCIE_CLKREQ_N_GPIO39	IO	PCle clock request
PAD6	PCIE0_RST_N_GPIO37	I	PCle reset
PAD27	PCIE0_WAKE_N_GPIO38	I	PCle wake
PAD8	PCIE0_TX1_N	AO	PCle transmitter differential signal
PAD9	PCIE0_TX1_P	AO	
PAD12	PCIE0_RX1_P	AI	PCle receiver differential signal
PAD11	PCIE0_RX1_N	AI	
PAD14	PCIE0_REFCLK_N	AI	Reference clock
PAD15	PCIE0_REFCLK_P	AI	
PAD17	PCIE0_TX0_N	AO	PCle transmitter differential signal
PAD18	PCIE0_TX0_P	AO	
PAD21	PCIE0_RX0_P	AI	PCle receiver differential signal
PAD20	PCIE0_RX0_N	AI	

TABLE 3-6. GPIO

Pin ID	Pin name	Type	Description
PAD3	GPIO48_DEBUG_UART_TXD	O	Debug UART TxD
PAD4	GPIO49_DEBUG_UART_RXD	I	Debug UART RxD
PAD23	WL_RF_KILL_GPIO51	I	An external 32.768 kHz sleep clock input pin. Can use either external (32.768 kHz) or internal (32 kHz) sleep clock, but external sleep clock provides better sleep clock accuracy. If not used, a pull-down resistor is required.
PAD24	PTA1_WL_ACT_GPIO42	O	WLAN active signal PTA1
PAD25	PTA1_BT_ACT_GPIO40	I	Wi-Fi coexistence with Bluetooth active signal PTA1
PAD26	PTA1_BT_PRIO_GPIO41	I	Wi-Fi coexistence with Bluetooth priority signal PTA1
PAD30	GPIO47_WCI_UART_TXD	I	Wireless coexistence interface (WCI) UART asynchronous.
PAD31	GPIO46_WCI_UART_RXD	O	Wireless coexistence interface (WCI) UART asynchronous; WSI data.
PAD38	GPIO35_SW_LED2	O	LED interface 1
PAD39	GPIO27_RFA_DEBUG_LED0	O	LED interface 0 for RFA debug

TABLE 3-7. JTAG

Pin ID	Pin name	Type	Description
PAD32	JTAG_TDI	I	Test data In
PAD33	JTAG_TDO	O	Test data Out
PAD34	JTAG_TCK	I	Test clock
PAD35	JTAG_TMS	I	Test mode select
PAD36	JTAG_TRST	I	Test reset

TABLE 3-8. PIN STATUS ON BOOT

Pin #	Pin name and/or function	Pin name or alt function	Voltage	Internal Pull-down(PD)/ Pull-up(PU)	Type	Description
PAD5	PBRST_IN_N	-	-	-	I	Logic input pin to start up or shut down the device
PAD40	+VDD_1V8_PX3	-	+1V8	-	O	1.8 V power supply for bootstrap pins
PAD3	GPIO48	GPIO48_DEBUG_UART_TXD	+1V8	PD	I	Check if authentication needed: 0: PBL skips authentication. 1: PBL performs RSA authentication
PAD24	GPIO42	PTA1_WL_ACT_GPIO42	+1V8	PU	I	Boot at different Q6 core speeds: 00: 408 MHz 01: 200 MHz
PAD31	GPIO46	GPIO46_WCI_UART_RXD	+1V8	PD	I	Watch Dog enable/disable: 0: WDOG boot disabled 1: WDOG boot enabled
PAD33	JTAG	JTAG_TDO	+1V8	-	I	Burnin mode enable: 0: Burnin Mode 1: Normal Mode

NOTE: These pins are for booting the device, use them cautiously.

4. Electrical characteristics

TABLE 4-1. POWER SUPPLY DC CHARACTERISTICS

Symbol	Parameter	Minimum	Typical	Maximum	Units
+3V3	3.3 V Supply voltage	3	3.3	3.6	V
	3.3 V Supply current			0.7	A
+5V_XPA	5 V Supply voltage for radios	4.3	5	5.25	V
	5 V Supply current			2.5	A

TABLE 4-2. TEMPERATURE LIMIT RATINGS

Parameter	Minimum	Maximum	Units
Storage Temperature (Commercial)	0	+110	°C
Storage Temperature (Industrial)	-40	+110	°C
Commercial Operating Temperature	0	+65	°C
Industrial Operating Temperature	-40	+85	°C
Humidity	30	60	%RH
Storage humidity	15	70	%RH

5. Power management

TABLE 5-1. POWER CONSUMPTION

DBS			Voltage V	Current A	Total power W
TX	4x4	MCS0	5	2.5	12.5
		MCS11	5	1.62	8.1
RX	4x4	MCS0	5	0.07	0.36
		MCS11	5	0.07	0.36

6. Radio characteristics

TABLE 6-3. 5GHZ 802.11AX 20MHZ

MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9	MCS 10	MCS 11
Data rate (Mbps)											
34.4	68.8	103.2	137.6	206.5	275.3	309.7	344.1	412.9	458.8	516.2	573.5
TX power (dBm)											
26	26	26	25	24	24	23	22	21	21	20	20
RX sensitivity (dB)											
-94	-93	-91	-88	-85	-81	-79	-78	-74	-72	-69	-67

TABLE 6-4. 5GHZ 802.11AX 40MHZ

MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9	MCS 10	MCS 11
Data rate (Mbps)											
68.8	137.6	206.5	275.3	412.9	550.6	619.4	688.2	825.9	917.6	1032.4	1147.1
TX power (dBm)											
25	25	25	25	24	24	23	22	21	21	20	20
RX sensitivity (dB)											
-90	-90	-88	-85	-82	-78	-77	-75	-71	-69	-67	-64

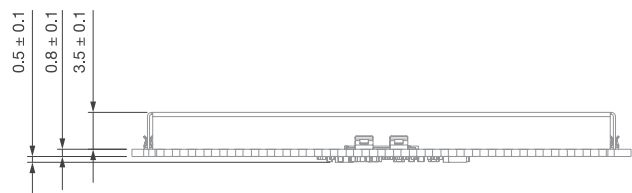
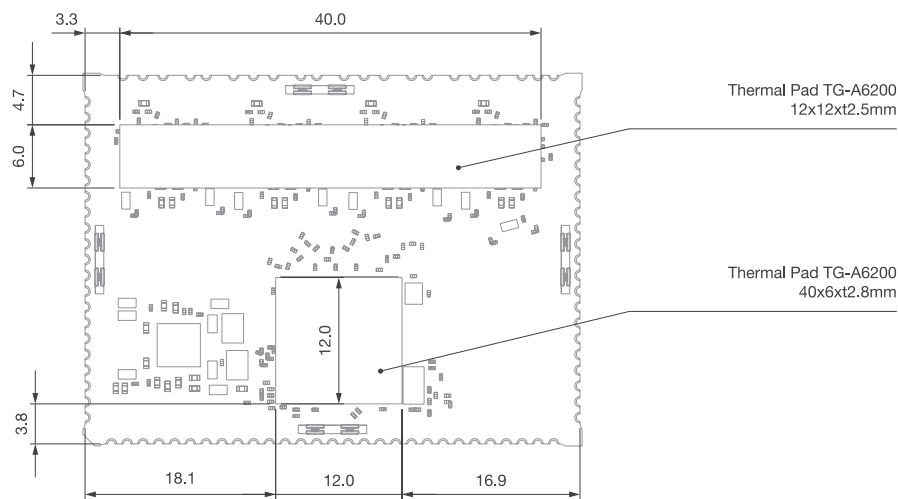
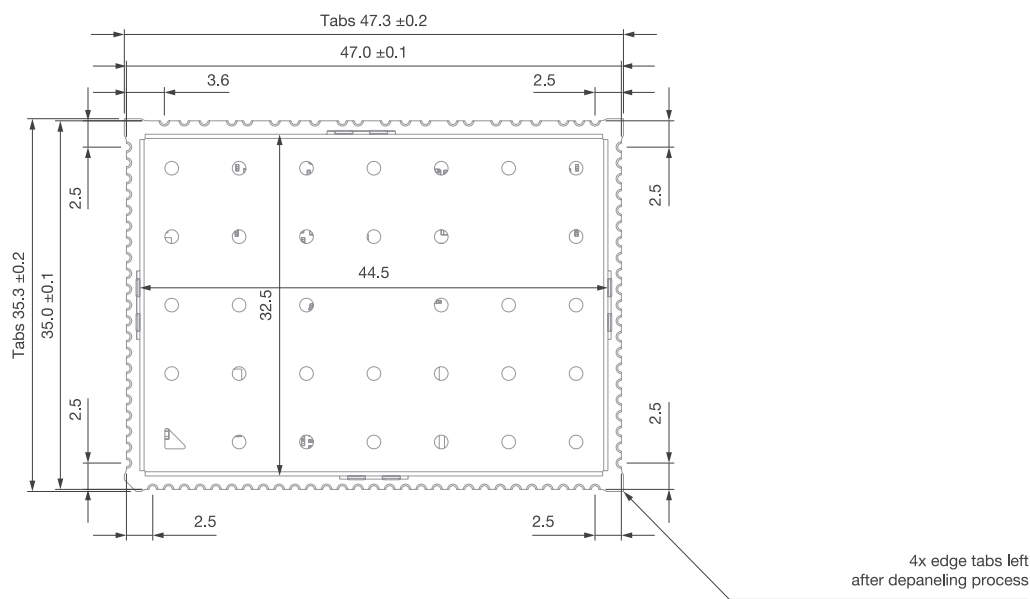
TABLE 6-5. 5GHZ 802.11AX 80MHZ

MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9	MCS 10	MCS 11
Data rate (Mbps)											
144.4	288.2	432.4	576.5	864.7	1152.9	1297.1	1441.2	1729.4	1921.6	2161.8	2402
TX power (dBm)											
25	25	25	25	24	24	23	22	21	21	20	20
RX sensitivity (dB)											
-88	-87	-85	-82	-79	-75	-74	-72	-68	-67	-64	-61

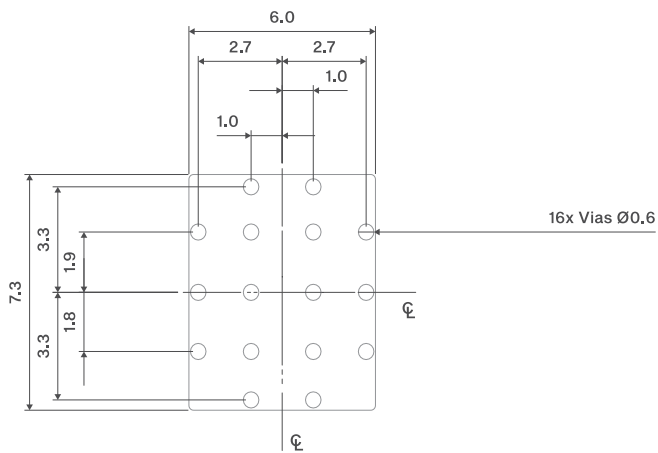
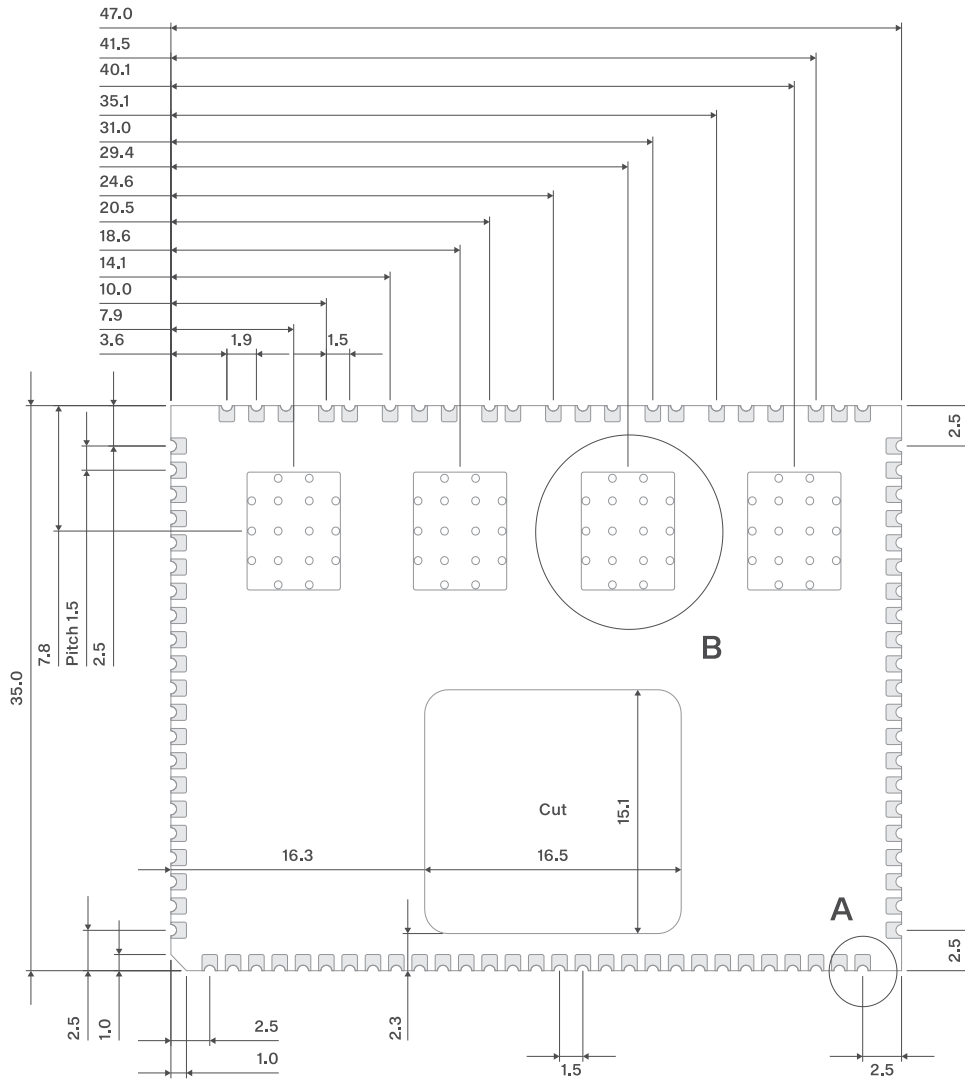
TABLE 6-6. 5GHZ 802.11AX 160MHZ

MCS 0	MCS 1	MCS 2	MCS 3	MCS 4	MCS 5	MCS 6	MCS 7	MCS 8	MCS 9	MCS 10	MCS 11
Data rate (Mbps)											
288.8	576.5	864.7	1152.9	1729.4	2305.9	2594.1	2882.4	3458.8	3843.1	4323.5	4803.9
TX power (dBm)											
25	25	25	25	24	23	23	21	20	20	19	19
RX sensitivity (dB)											
-85	-84	-82	-79	-76	-72	-71	-69	-65	-63	-60	-57

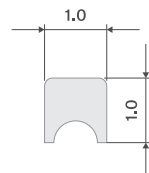
7. Mechanical characteristics



8. PCB footprint



Detail B

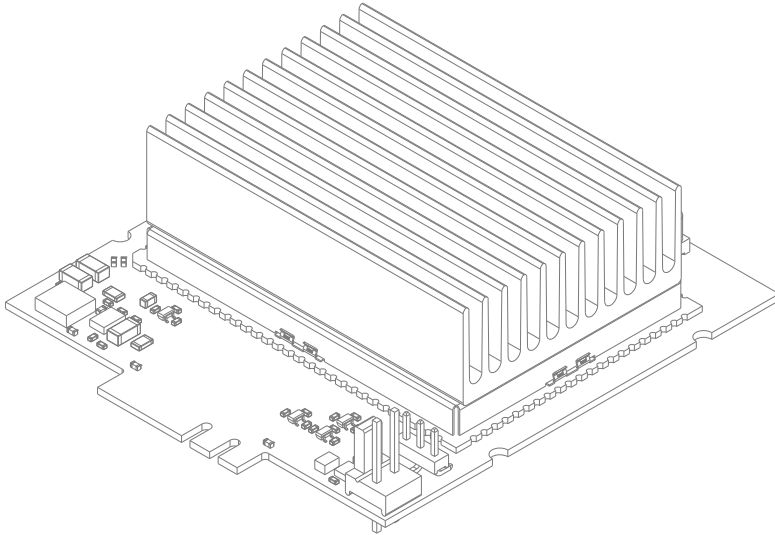


Detail A

9. Thermal considerations

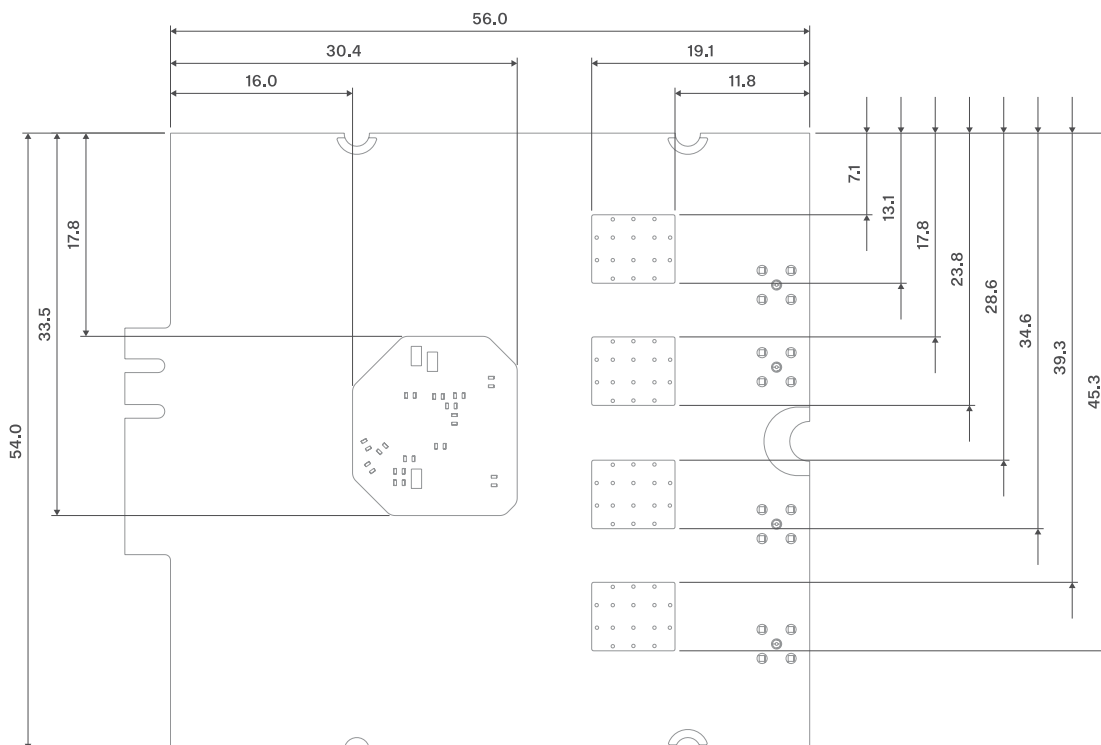
Pineapple PCIe cards comes out with a heatsink (9-1. Picture.)

9-1. PICTURE. PINEAPPLE CARD 3D VIEW WITH AN INCLUDED HEATSINK.



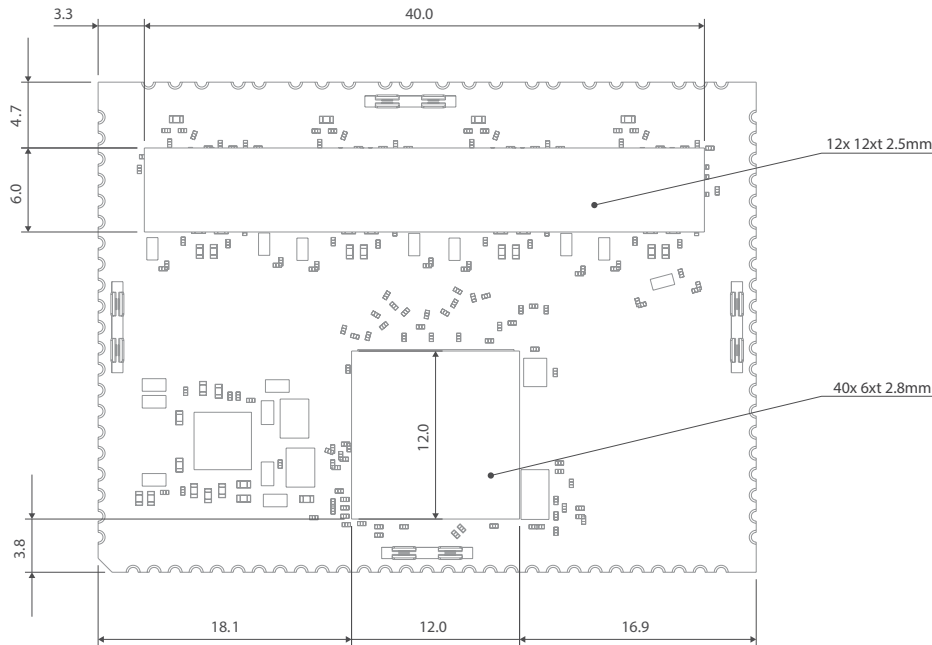
This heatsink has a 133cm^2 area. There are thermal pads under the RF shield. It is enough for Pineapple to not overheat. But to reach the maximum performance with the lowest possible temperature it is recommended to use around 200cm^2 heatsink. To achieve that it is possible to use Pineapple card with a dual heatsink, one from the top and second on the bottom. To use a second heatsink on the bottom it is necessary to use thermal pads (9-2. Picture.).

9-2. PICTURE. LOCATIONS OF WHERE THERMAL PADS ARE NECESSARY IF BOTTOM HEATSINK IS USED.



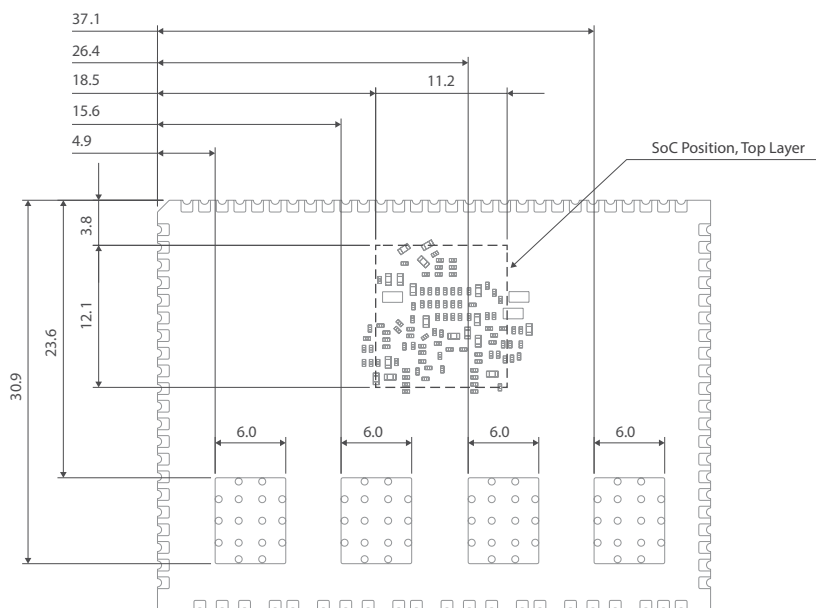
Pineapple modules does not have thermal pads assembled. Thermal pads can be assembled ONLY after SMT process, when module is soldered on a carrier board. If thermal pads are assembled before SMT process, irreversible damage may be done to the module. Depending on carrier board design, heatsink can be used on the bottom or on the top. If heatsink must be used on the top of the module, thermal pads must be put under the RF shield (9.3. Picture.).

9-3. PICTURE. LOCATIONS ON MODULE OF WHERE THERMAL PADS ARE NECESSARY IF TOP HEATSINK IS USED.



If the heatsink must be used on the bottom of the module, thermal pads must be used between module and the heatsink. (9.4. Picture.).

9-4. PICTURE. LOCATIONS ON THE MODULE OF WHERE THERMAL PADS ARE NECESSARY IF BOTTOM HEATSINK IS USED.



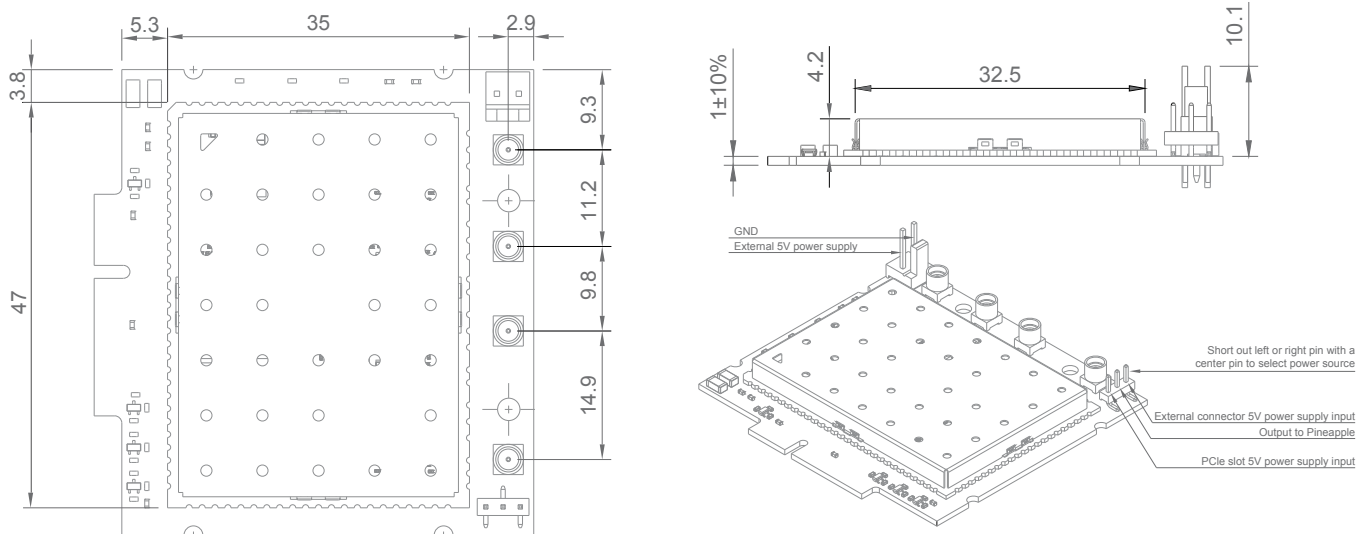
Heatsink size depends on the output power of the card.

- If card is used for the low throughput, low data rate and high RF power (28dBm), it is needed to dissipate around 10W of power. To do that at least 230cm² heatsink is necessary.
- If card is used for the max throughput, high data rate and medium RF power (18 dBm), it is needed to dissipate around 8W of power. To do that at least 180cm² heatsink is necessary.

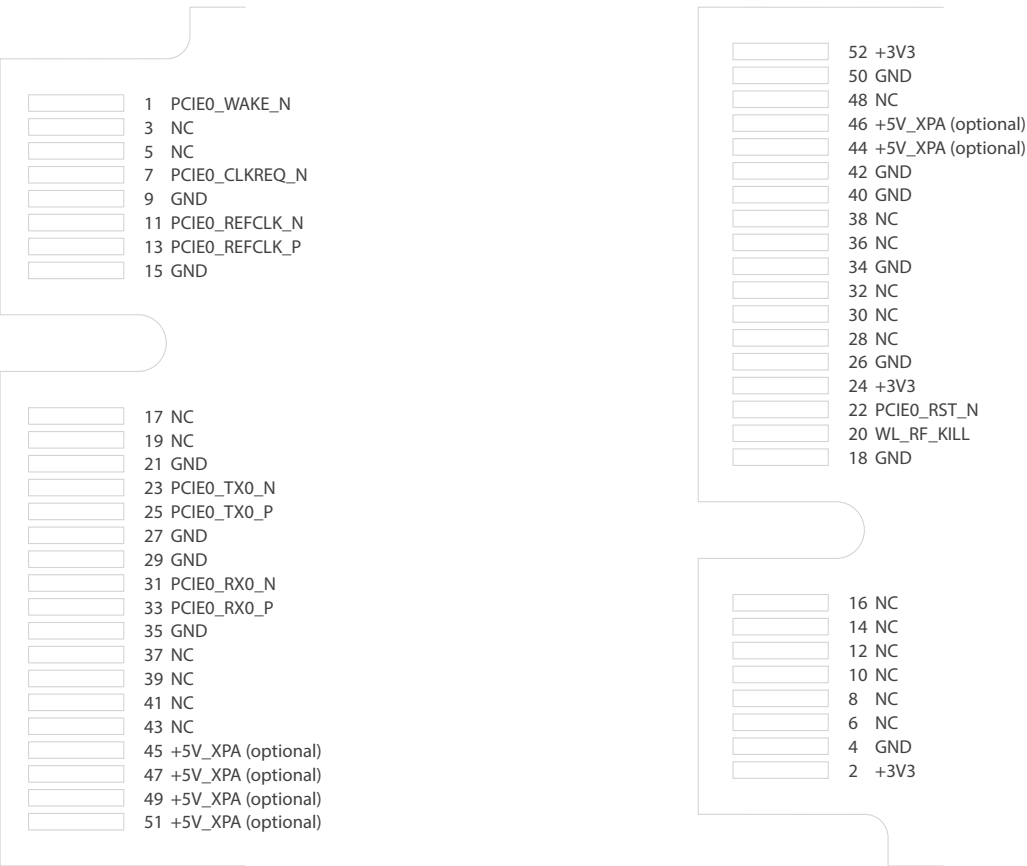
10. PCIe card

Pineapple has three types of PCIe cards. All types uses MMCX connectors.

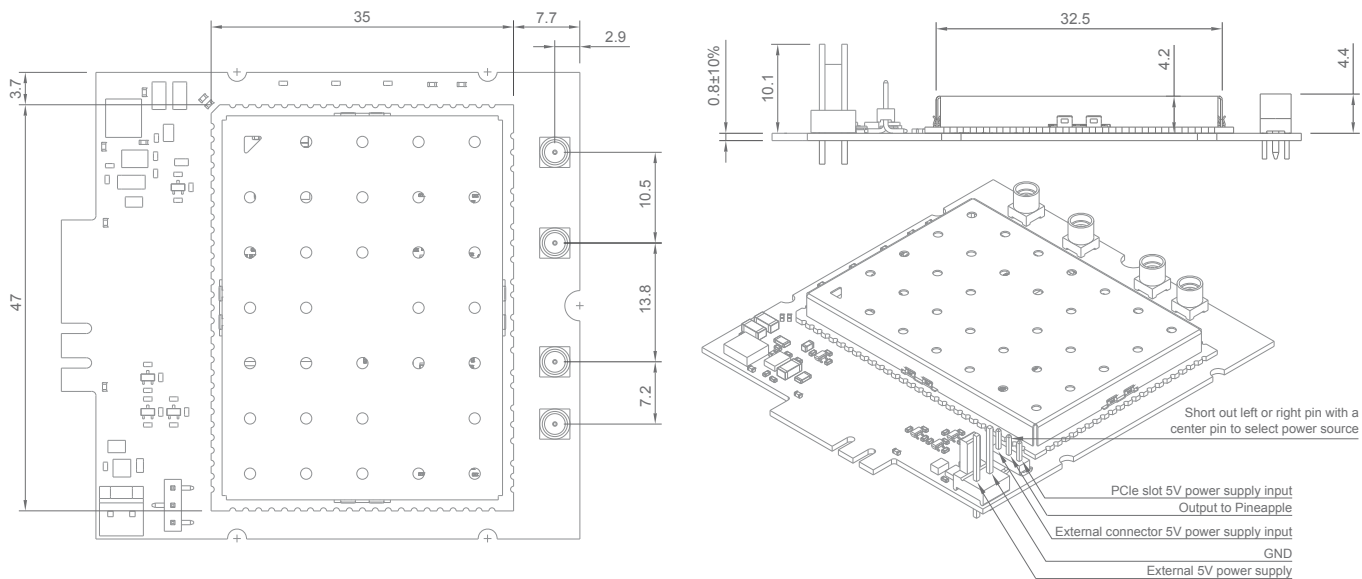
1. Pineapple with Mini PCIe card.



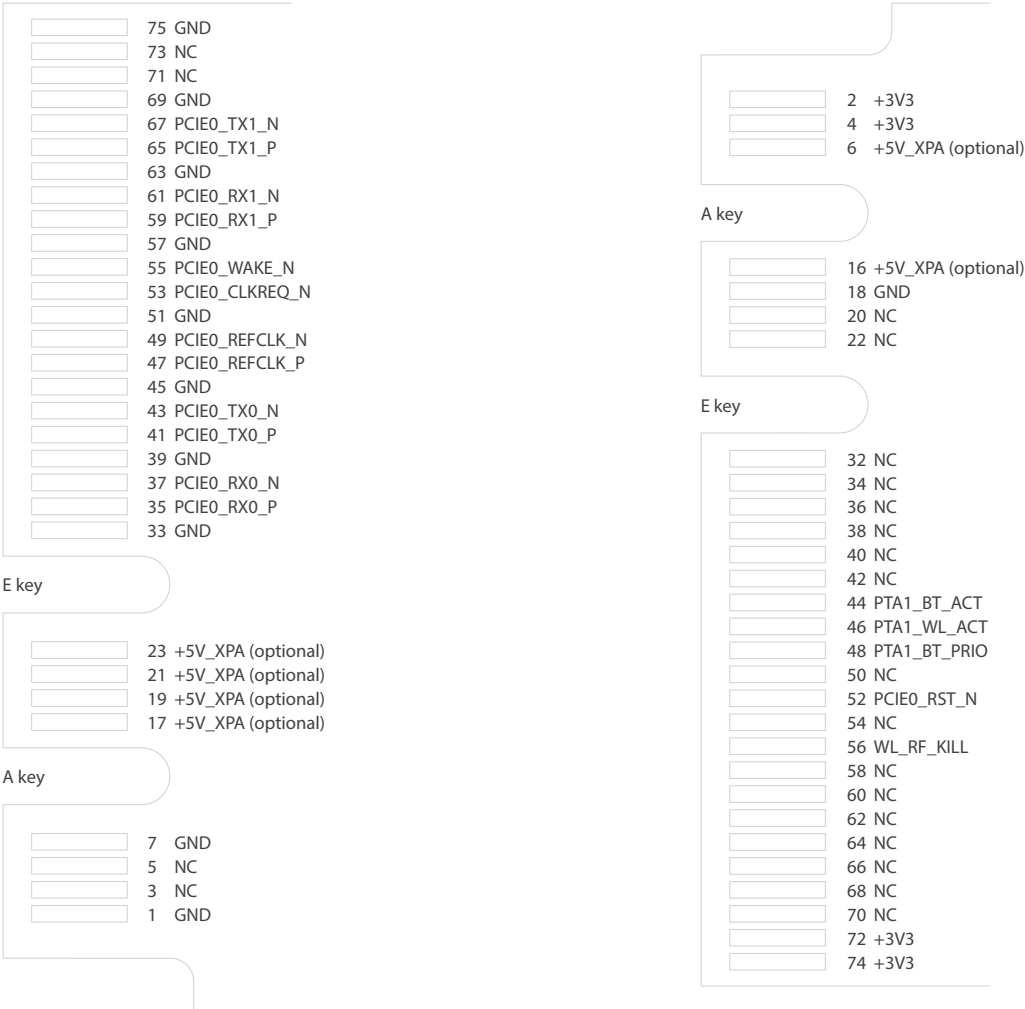
1.1 Pineapple with Mini PCIe card pin out.



3. Pineapple with M.2 A+E key card.



3.1 Pineapple with M.2 A+E key card pin out.



11. Laminate Conditions

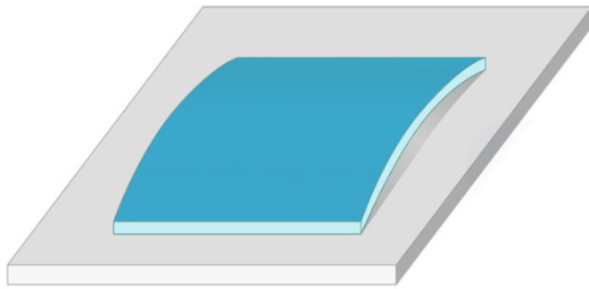
8devices modules are manufactured according to the standard IPC-A-610D Norm Class 2.

Standard states: "Bow/twist after solder should not exceed 1.5% for through-hole and 0.75% for surface mount printed board applications".

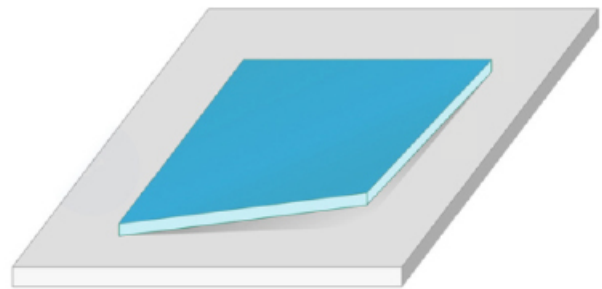
According to this statement, Pineapple module can be bowed and twisted up to 0.3525 mm.

To avoid negative effects of bow and twist we recommend to increase the paste thickness for the module pads to achieve better co-planarity.

FIGURE 11-1. EXAMPLE OF BOW AND TWIST



Bow



Twist

12. Ordering information

Pineapple modules are packaged into trays. Each tray fits 18 modules.
Every 5 trays are vacuum sealed and one standard packaging box contains 450 modules.

FIGURE 12-1. PINEAPPLE TRAY DIMENSIONS

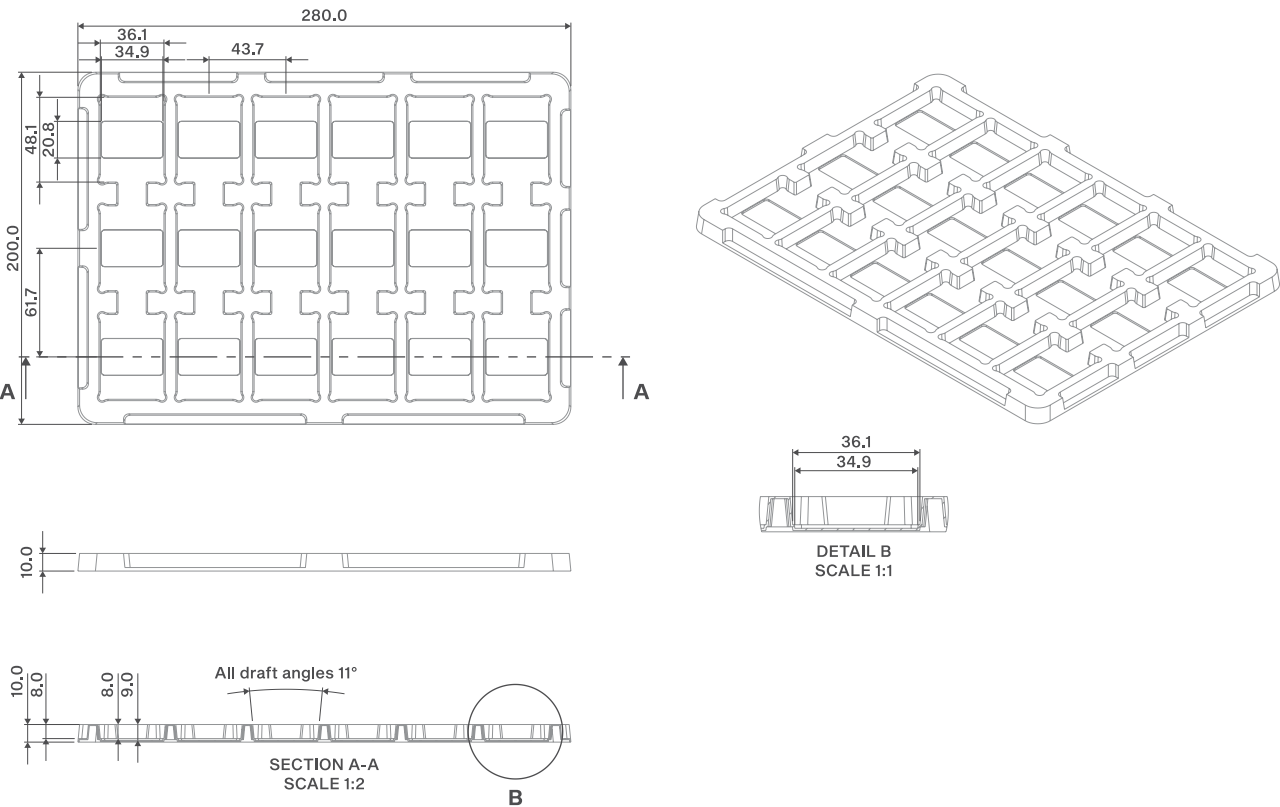
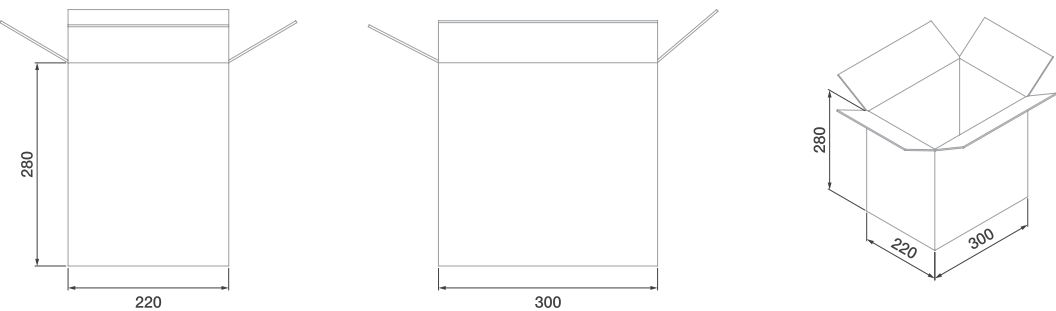
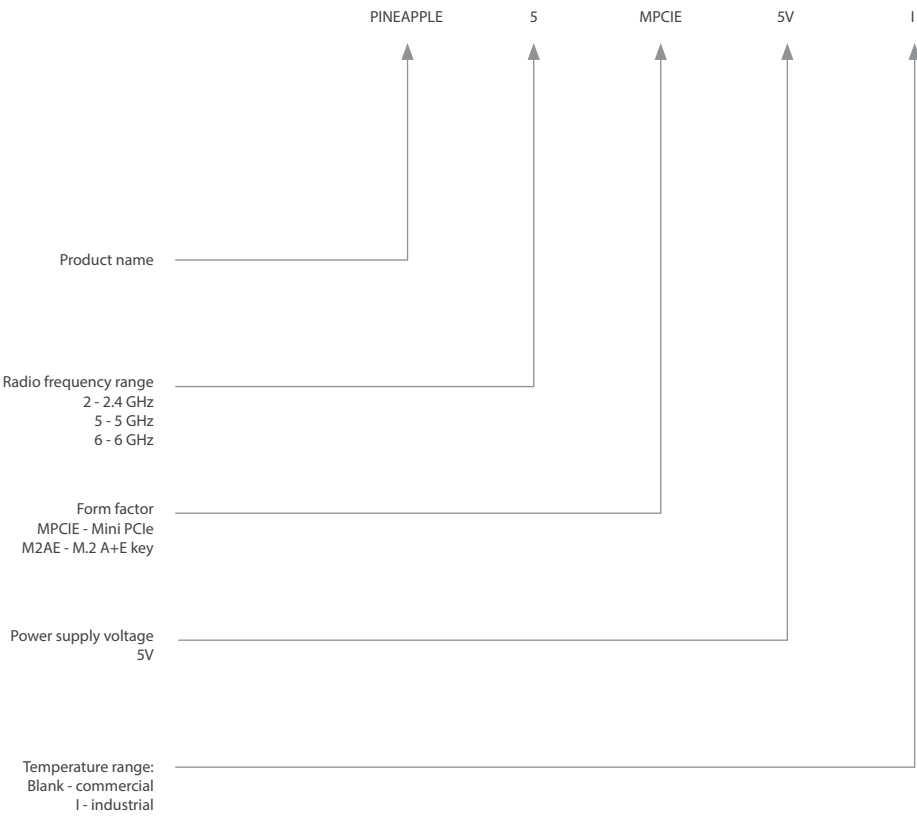


FIGURE 12-2. STANDARD PACKAGING BOX DIMENSIONS



12.1 PART NUMBER GUIDE



Pineapple PCIe cards uses a 640454-2 connector used for a power supply. Female matching part number: 3-640441-2.

12.2. PINEAPPLE MODULES ORDER NUMBERS AND DESCRIPTIONS

Order Number	Description
Pineapple 2	Commercial radio module with 2.4 GHz radio
Pineapple 2-I	Industrial radio module with 2.4GHz radio
Pineapple 5	Commercial radio module with 5 GHz radio
Pineapple 5-I	Industrial radio module with 5GHz radio
Pineapple 6	Commercial radio module with 6 GHz radio
Pineapple 6-I	Industrial radio module with 6GHz radio

12.3. PINEAPPLE RADIO CARDS ORDER NUMBERS AND DESCRIPTIONS

Order Number	Description
PINEAPPLE-2-MPCIE	Pineapple 2 Mini PCIe card; Commercial
PINEAPPLE-5-MPCIE	Pineapple 5 Mini PCIe card; Commercial
PINEAPPLE-6-MPCIE	Pineapple 6 Mini PCIe card; Commercial
PINEAPPLE-2-M2AE-5V	Pineapple 2 M.2 A+E key card; 5 V power supply, Commercial
PINEAPPLE-5-M2AE-5V	Pineapple 5 M.2 A+E key card; 5 V power supply, Commercial
PINEAPPLE-6-M2AE-5V	Pineapple 6 M.2 A+E key card; 5 V power supply, Commercial
PINEAPPLE-2-MPCIE-I	Pineapple 2 Mini PCIe card; 5 V power supply, Industrial
PINEAPPLE-5-MPCIE-I	Pineapple 5 Mini PCIe card; 5 V power supply, Industrial
PINEAPPLE-6-MPCIE-I	Pineapple 6 Mini PCIe card; 5 V power supply, Industrial
PINEAPPLE-2-M2AE-5V-I	Pineapple 2 M.2 A+E key card; 5 V power supply, Industrial
PINEAPPLE-5-M2AE-5V-I	Pineapple 5 M.2 A+E key card; 5 V power supply, Industrial
PINEAPPLE-6-M2AE-5V-I	Pineapple 6 M.2 A+E key card; 5 V power supply, Industrial

13. Document Revision History

Revision	Revision Date	Description
Revision: v1.0	2021 04 06	Initial Release
Revision: v1.1	2022 03 31	Card pin out changes
Revision: v1.2	2022 07 25	Block diagram update, added PAD23 description, updated 9th chapter
Revision: v1.3	2022 10 19	Removed information about B+M card, updated thermal dissipation information
Revision: v1.4	2022 12 21	Product drawings updated
Revision: v1.5	2023 09 04	Added 2.4GHz radio, power consumption data, laminated conditions, updated ordering data
Revision: v1.6	2024 02 01	Industrial Part Numbers added
Revision: v1.7	2024 10 08	TX/RX measurements updated
Revision: v1.8	2024 12 05	Updated Pineapple cards drawings, updated tables 12.1, 12.3

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.407,15.247

Device is equipped with External antenna, Antenna gain 5dBi

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer, C2PC or new certificate should be apply to get approval,if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance ,then it is illegal.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices . This modular cannot be installed in any portable device if without further certification such as C2PC with SAR. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module **FCC ID: Z9W-PIN5** Or Contains **FCC ID: Z9W-PIN5**”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
 - (1) This device may not cause harmful interference;
 - (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install the modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C :

15.407, 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.407, 15.247 and 15.209 & 15.207 ,15B Class B requirement, then the host can be sold legally.

Antenna manufacturer:RF Solutions Ltd

Antenna model: ANT-MDIP5

Antenna Gain: 5dBi

IC STATEMENT

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences

et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :

(1) Cet appareil ne doit pas causer d'interférences.

(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

IC Radiation Exposure Statement

This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 11468A-PIN5"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic

Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

2. Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation,

Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :

(1) Cet appareil ne doit pas causer d'interférences.

(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.