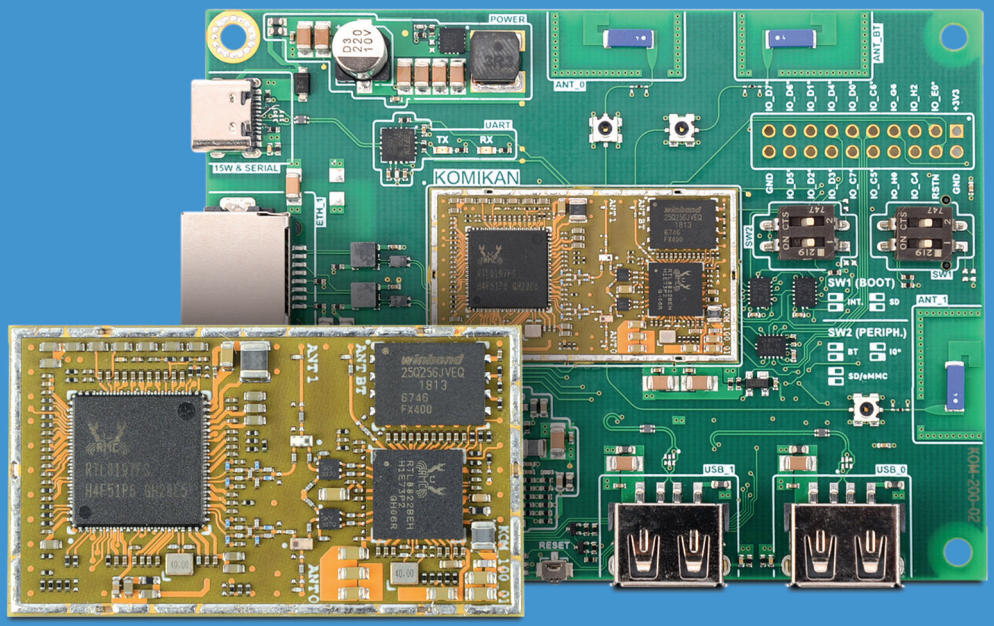

Komikan is a dual-band 802.11ac Wave2 module with BT v4.1 support. Two integrated radios (2.4 and 5GHz) can achieve up to 1.166Gbps data rates and are backed by a powerful 1GHz MIPS24Kc CPU. The module is in LGA (land grid array) form and is ideal for designs restricted by space. Komikan does not require heat-sink like other 802.11ac Wave2 modules and has low power consumption specs. It has multiple I/O interfaces to connect peripherals and comes with OpenWRT Linux operating system.

Quick specs

- Wi-Fi 5 (802.11a/n/ac Wave2) 5GHz with 2x2 MU-MiMo, 866.7Mbps data-rate
- Wi-Fi 4 (802.11b/g/n) 2.4GHz, 300Mbps data-rate
- Bluetooth 2.1/3.0/4.1
- 32 MB FLASH, 128 MB RAM
- OpenWRT Linux flash image and source code are available for download on www.8devices.com/wiki_komikan
- CPU – RTL8197FS (1 GHz CPU based on MIPS 24Kc core) + RTL8822BEH
- 22 dBm per chain RF output power
- Small form factor – 37.5 by 21.3mm
- Surface mountable (LGA form), single side design
- Available interfaces – 44 x GPIO, 2 x USB 2.0 host, 4 x UART (one for BT), RGMII, 2 x SPI, PWM, MDIO, eMMC, JTAG, 2 x I2S, PCM, 2 x I2C, P-NAND, 100 Base-T

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1. Features

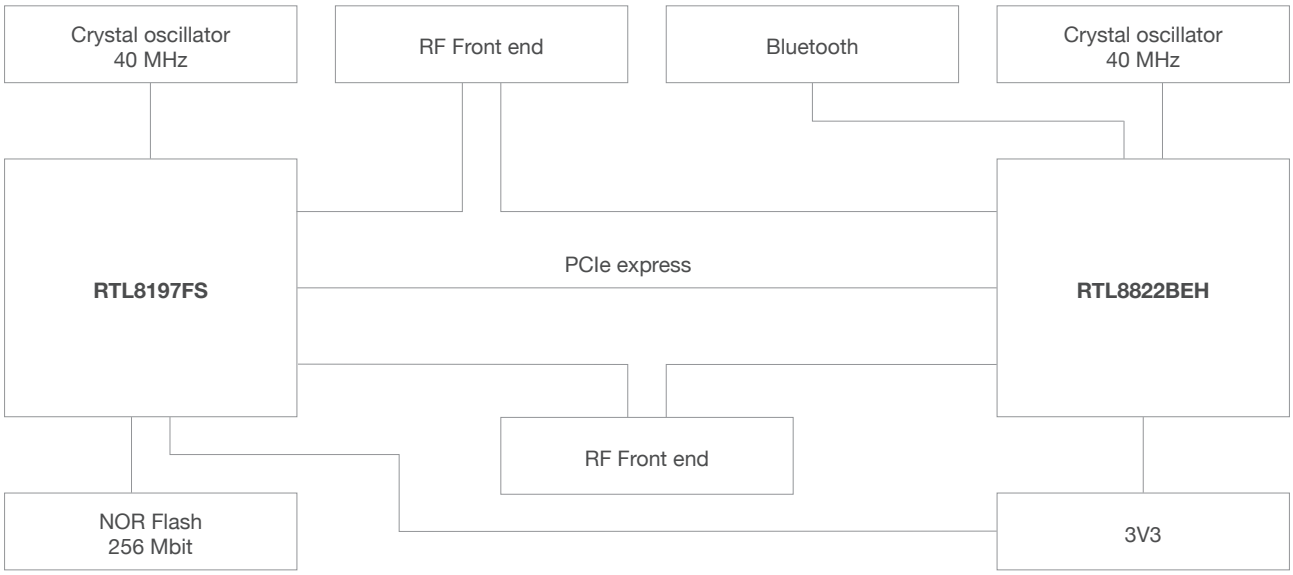
TABLE 1-1. KOMIKAN FEATURES

Feature list	
Integrated core	MIPS 24Kc core with 1000MHz maximum clock frequency
Memory	DRAM 128MB, NOR SPI FLASH 32MB
Wi-Fi	Wi-Fi 4 (802.11 b/g/n) 2.4GHz 20/40 MHz (2x2), Wi-Fi 5 (802.11 b/g/n/acWave2) 5GHZ 20/40/80MHz with 2x2 MU-MiMo Bluetooth 2.1/3.0/4.1
Power supply	3.3V
Peripherals	44 x GPIO, 2 x USB 2.0 host, 1 x UART (console), 2 x HS UART, 1 x HS UART (Bluetooth), 1 x RGMII
	2 x SPI, 1 x PWM, 1 x MDIO, 1 x eMMC, 1 x JTAG, 1 x I2S, 1 x PCM, 2 x I2C, 1 x P-NAND, 100 Base-T

2. Block diagram

The following figure provides a basic overview of the Komikan module.

FIGURE 2-1. KOMIKAN MODULE BLOCK DIAGRAM



3. Module pinout and pin description

FIGURE 3-1. PIN ASSIGNMENTS

TABLE 3-1. RF PINS

Pin number	Symbol	Type	Description
A12	ANT_1	I/O	2.4/5 G WiFi pin
A14	ANT_BT	I/O	2.4/5 G WiFi pin
L12	ANT_0	I/O	Bluetooth pin

TABLE 3-2. POWER PINS

Pin number	Symbol	Type	Description
K15	3V3	I	Power supply 3.3V
L15			
L18			

TABLE 3-3. PIN DETAILS

This table shows additional features that pins have.

Pin number	Symbol	Type	Description
A3	GPIO_C4	O	GPIO_C4
			EMMC_RSTN
			SPI0_CS1N
A5	GPIO_E0	I/O	GPIO_E0
			PCM_RXD
			EMMC_DAT7
			SPI1_TRCD
			SPI1_RXD
A6	GPIO_D7	I/O	GPIO_D7
			PCM_TXD
			EMMC_DAT6
			SPI1_TXD
A7	GPIO_H1	I/O	GPIO_H1
			LED_PORT3
			RESETn
A8	GPIO_G6	I/O	GPIO_G6
			P0_MDC_GPIO
			LED_PORT0
A10	UART0_TX	O	GPIO_H3
			U0_TX
A16	GPIO_F1	O	GPIO_F1
			WBB8
			boot_sel[2]
A17	GPIO_F0	O	GPIO_F0
			WBB7
			boot_sel[1]

Pin number	Symbol	Type	Description
A18	SF_CS0_N	O	GPIO_A4
			SPI0_CS0N
			PWM1
			P0_TXD2
			NF_CLE
A19	GPIO_A5	I/O	GPIO_A5
			I2S_SD3_0
			MF_CS1N
			SPI_NAND_CS0N
			I2C1_SDA
A20	SF_IO1	I/O	GPIO_A2
			SPIF_SIO1
B1	USB0_N	I/O	USB Port0 Host Device Data plus pin
B3	GPIO_D6	I/O	GPIO_D6
			SPI1_CS0N
			EMMC_DAT5 PWM1
			PCM_FS
B6	GPIO_D5	I/O	GPIO_D5
			PCM_CLK
			EMMC_DAT4 PWM0
			SPI1_CLK
B7	GPIO_H0	I/O	GPIO_H0
			PWM2
			LED_PORT2
B8	GPIO_H2	I/O	GPIO_H2
			LED_PORT4
B10	UART0_RX	I/O	GPIO_H3
			U0_RX
B18	WL_ACT	O	boot_sel[0]
			WBB4
B20	SF_RSTN	O	GPIO_A3
			SPIF_RST
			SPI_NAND
C1	USB0_P	I/O	USB Port Host Device Data Plus Pin
C20	SF_SCK	O	GPIO_A0
			MF_CK
			SPI_NAND_CK
			SPI0_CLK
			I2C0_SCL
D1	USB1_N	I/O	USB Port1 Host Device Data Minus Pin
D20	BT_UART_RX	I/O	HSDM
			Bluetooth connection
			eMMC Rx
E1	USB1_P	I/O	USB Port1 Host Device Data Plus Pin

Pin number	Symbol	Type	Description
E20	BT_UART_TX	O	Bluetooth connection
			eMMC Tx
F20	BT_UART_RTS	O	RREF
			eMMC Reset
			Bluetooth reset
G1	MDI_RXI4_P	O	MDIO RX Positive data line
G20	BT_UART_CTS	O	HSDP
			UART_CTS
H1	MDI_RXI4_N	I	MDIO RX Negative data line
J1	MDI_TXO4_P	O	MDIO TX Positive data line
K1	MDI_TXO4_N	I	MDIO TX Negative data line
K3	P0_TXD3	O	GPIO_A6
			P0_TXD3
			NF_ALE
			I2S_MCLK
			PWM0
K4	P0_TXD1	O	GPIO_B0
			P0_TXD1
			NF_CLE
			I2S_WS
			I2S_SD2_O
			PWM3
			JTAG_TCK
			SPI0_RXD
			SPI0_TRXD
			I2C1_SDA
K5	P0_TXD0	O	GPIO_B6
			P0_TXD0
			NF_WP
			PWM0
			JTAG_TDO
			SPI1_CLK
			U1_RTS
			I2C1_SCL

Pin number	Symbol	Type	Description
K6	P0_TXC	I/O	GPIO_B7
			P0_TXC
			I2S_SD1_I
			PWM1
			SPI1_CS0N
			U1_RX
			I2C1_SDA
			I2C0_SLV
K7	P0_RXD3	I/O	GPIO_B2
			PCM_CLK
			P0_RXD3
			NF_D1
			I2S_SCLK
			JTAG_TMS
			SPI0_RXD_SLV
			U2_TX
K8	P0_RXD1	I/O	GPIO_B4
			PCM_TXD
			P0_RXD1
			NF_D3
			I2S_WS
			JTAG_TDI
			SPI0_CLCK_SLV
			U2_RX
K9	P0_RXCTL	I/O	GPIO_C1
			P0_RXCTL
			NF_R/B
			PWM3
			SPI1_RXD
			SPI1_TRXD
			U1_RTS
			I2C0_SCL
			I2C0_SCL
K10	P0_MDC	I/O	GPIO_C2
			P0_MDC
			SPI0_CS0N
			SPI1_CS0N
			U1_TX
			I2C0_SDA
			I2C1_SDA
L3	P0_TXD2	O	GPIO_A7
			P0_TXD2
			NF_CLE
			I2S_SCLK
			PWM1
			SPI0_CS0N

Pin number	Symbol	Type	Description
L5	P0_TXCTL	O	GPIO_C0
			P0_TXCTL
			NF_WE
			PWM2
			SPI1_TXD
			U1_TX
			I2C0_SCL
L7	P0_RXD1	I/O	GBIO_B3
			PCM_TXD
			P0_DXD1
			NF_D2
			I2S_WS
			JTAG_TDI
			SPI0_CLK_SLV
			U2_RX
L8	P0_RXD0	I/O	GPIO_B5
			PCM_RXD
			P0_RXD0
			NF_D3
			I2S_SD1_O
			SPI0_CS0N_SLV
			U2_CTS
L9	P0_RXC	I/O	GPIO_B1
			P0_RXC
			NF_CE0
			I2S_SD1_O
			I2S_SD1_I
			I2S_SD3_O
			PWM3
			JTAG_TCK
			SPI0_RXD
			SPI0_TRXD
			I2C1_SDA
L10	P0_MDIO	I/O	GPIO_C5
			P0_MDIO
			SPI0_CS0N
			SPI1_CS0N
			U1_TX
			I2C0_SDA
			I2C1_SDA

NOTE: For RGMII RX interfaces, external 33ohm resistors needed (P0_RXD*), and 50ohm resistor on P0_RXCTL.

NOTE 2: Pins E20,D20, F20, G20 might be used as Bluetooth UART, or eMMC data lines.

4. Electrical characteristics

TABLE 4-1. POWER SUPPLY DC CHARACTERISTICS

Symbol	Parameter	Minimum	Typical	Maximum	Units
3V3	3.3V Supply Voltage	3.0	3.3	3.6	V

TABLE 4-2. TEMPERATURE LIMIT RATINGS

Parameter	Minimum	Maximum	Units
Storage Temperature	-50	+70	°C
Ambient Operating Temperature	0	55	°C

5. Power management

5.1. Power consumption

TABLE 5-1. POWER CONSUMPTION

Power mode	Power Consumption	
	Value	Units
Boot	2.5	W
Idle	4	W
Highest data rate transmit	5	W
Lowest data rate transmit	6	W

6. Radio characteristics

TABLE 6-1. RECEIVER SENSITIVITY

2.4 GHz									
Receiver sensitivity (dBm)	802.11n (20 MHz)	MCS0 (14.4 Mbps)	MCS1 (28.9 Mbps)	MCS2 (43.3 Mbps)	MCS3 (57.8 Mbps)	MCS4 (86.7 Mbps)	MCS5 (115.6 Mbps)	MCS6 (130.3 Mbps)	MCS7 (144.4 Mbps)
		-88	-86	-84	-81	-77	-74	-72	-71
	802.11N (40 MHz)	30 Mbps	60 Mbps	90 Mbps	120 Mbps	180 Mbps	240 Mbps	270 Mbps	300 Mbps
		-88	-86	-84	-81	-77	-74	-72	-71

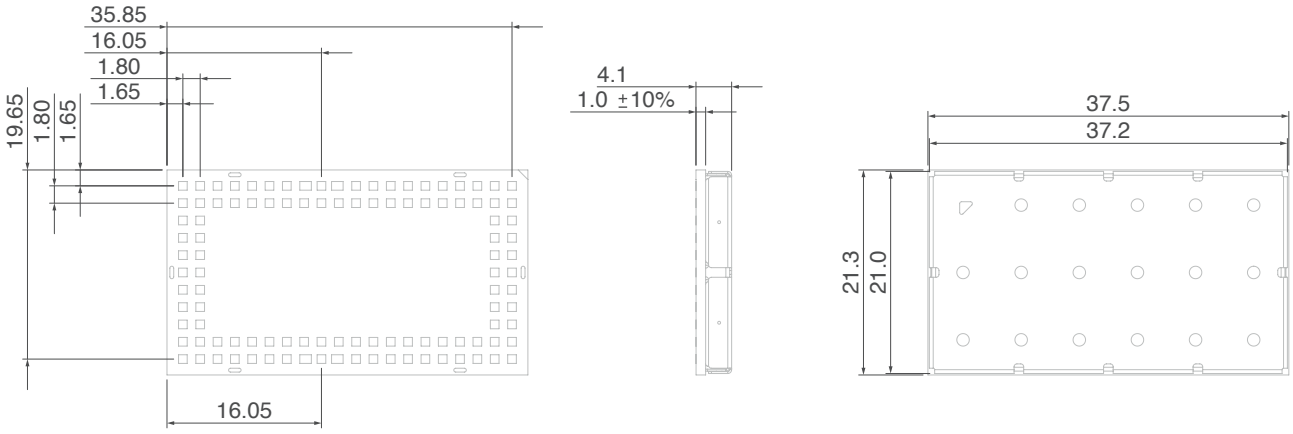
5 GHz											
Receiver sensitivity (dBm)	802.11n (20 MHz)	MCS0 (14.4 Mbps)	MCS1 (28.9 Mbps)	MCS2 (43.3 Mbps)	MCS3 (57.8 Mbps)	MCS4 (86.7 Mbps)	MCS5 (115.6 Mbps)	MCS6 (130.3 Mbps)	MCS7 (144.4 Mbps)	MCS 8 (780 Mbps)	MCS 9 (866 Mbps)
		-83	-82	-79	-76	-73	-69	-67	-67	n/a	n/a
	802.11ac (80 MHz)	30 Mbps	60 Mbps	90 Mbps	120 Mbps	180 Mbps	240 Mbps	270 Mbps	300 Mbps	780 Mbps	866 Mbps
		-82	-80	-78	-75	-72	-68	-66	-65	-63	-57

TABLE 6-2. TRANSMITTER POWER

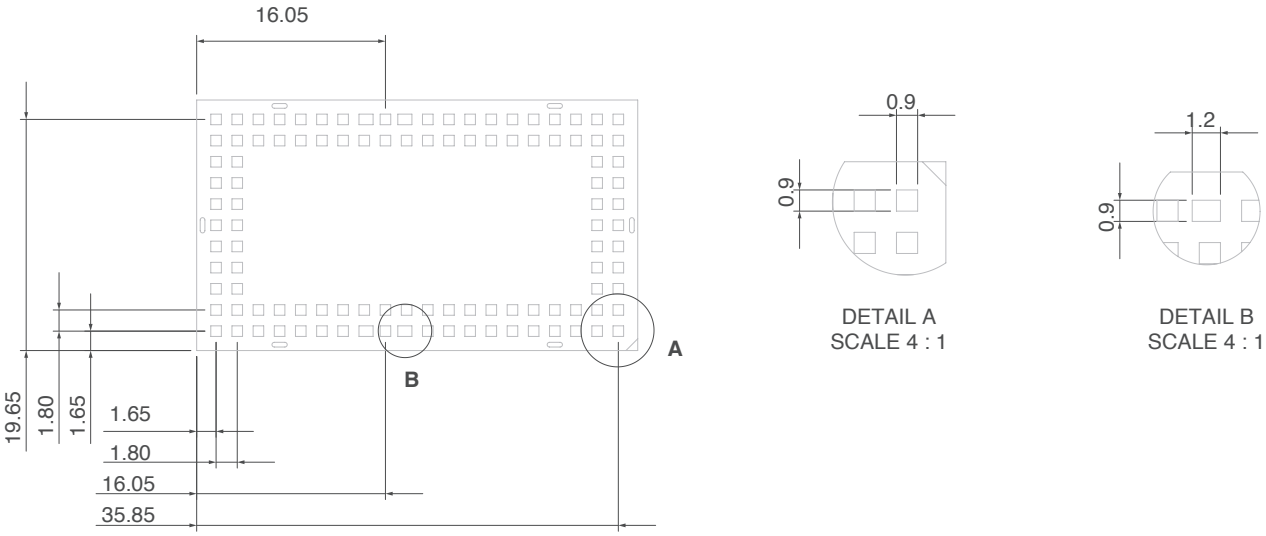
2.4 GHz									
Transmitter power (dBm)	802.11n (20 MHz)	MCS0 (14.4 Mbps)	MCS1 (28.9 Mbps)	MCS2 (43.3 Mbps)	MCS3 (57.8 Mbps)	MCS4 (86.7 Mbps)	MCS5 (115.6 Mbps)	MCS6 (130.3 Mbps)	MCS7 (144.4 Mbps)
		22	22	21	20	19	18	17	15
	802.11n (40 MHz)	30 Mbps	60 Mbps	90 Mbps	120 Mbps	180 Mbps	240 Mbps	270 Mbps	300 Mbps
		22	22	21	20	19	17	17	15

5 GHz											
Transmitter power (dBm)	802.11n (20 MHz)	MCS0 (14.4 Mbps)	MCS1 (28.9 Mbps)	MCS2 (43.3 Mbps)	MCS3 (57.8 Mbps)	MCS4 (86.7 Mbps)	MCS5 (115.6 Mbps)	MCS6 (130.3 Mbps)	MCS7 (144.4 Mbps)	MCS 8 (780 Mbps)	MCS 9 (866 Mbps)
		18	18	18	18	16	15	14	12	n/a	n/a
	802.11ac (80 MHz)	65 Mbps	130 Mbps	195 Mbps	260 Mbps	390 Mbps	520 Mbps	585 Mbps	650 Mbps	780 Mbps	866 Mbps
		18	18	18	17	16	14	13	12	11	8

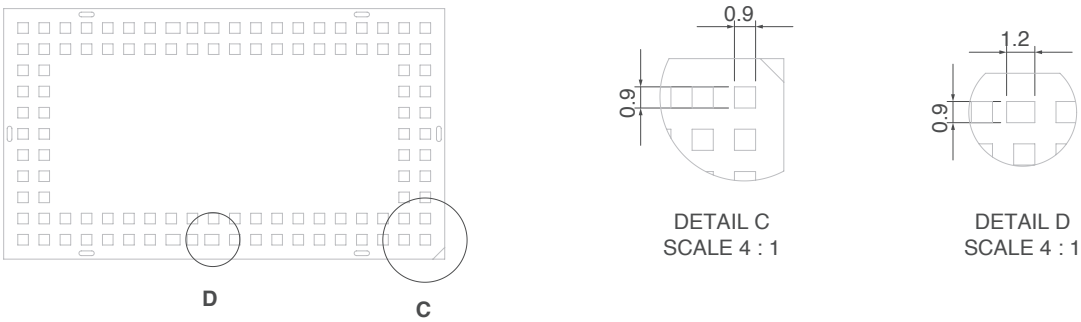
7. Mechanical characteristics



PCB footprint



Soldering paste footprint

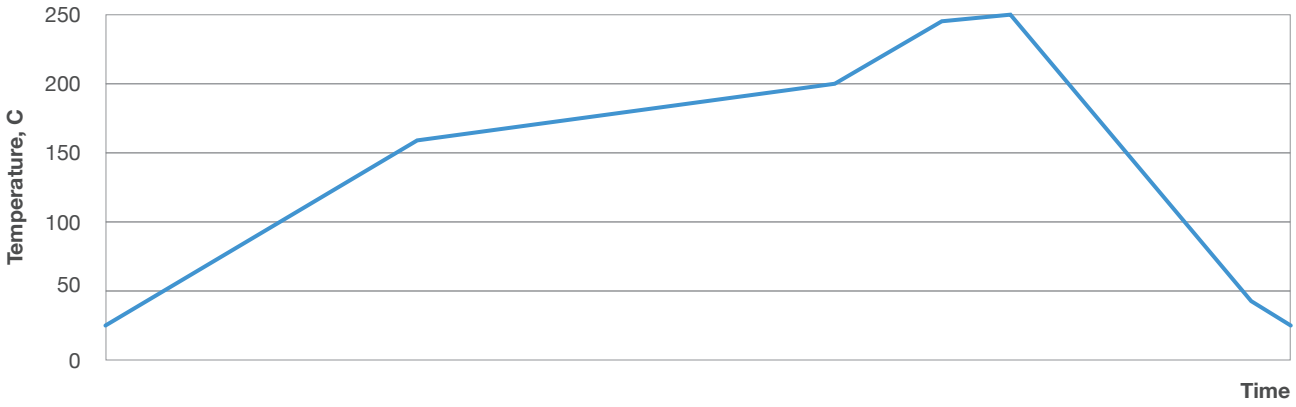


8. Reflow profile information

8.1. Reflow profile recommendation

Ramp up rate	3°C/second max
Maximum time maintained above 217°C	120 seconds
Peak temperature	250°C
Maximum time within 5°C of peak temperature	20 seconds
Ramp down rate	6°C/second max

8.2. Reflow profile



9. Development board

FIGURE 9-1. DEVELOPMENT BOARD BLOCK DIAGRAM

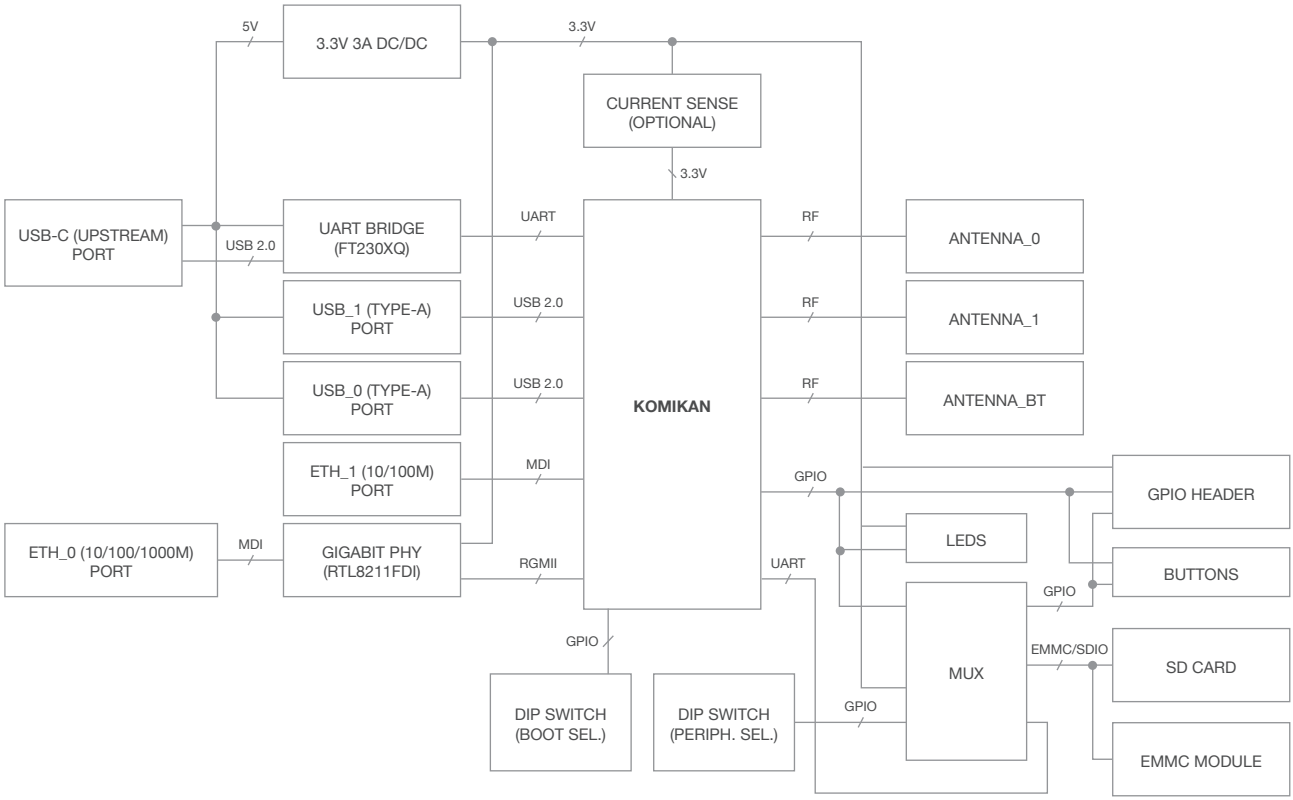


FIGURE 9-2. DEVELOPMENT BOARD TOP SIDE

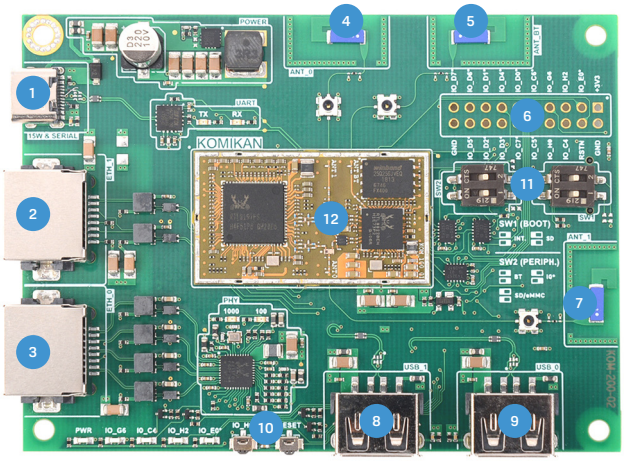


FIGURE 9-3. DEVELOPMENT BOARD BOTTOM SIDE

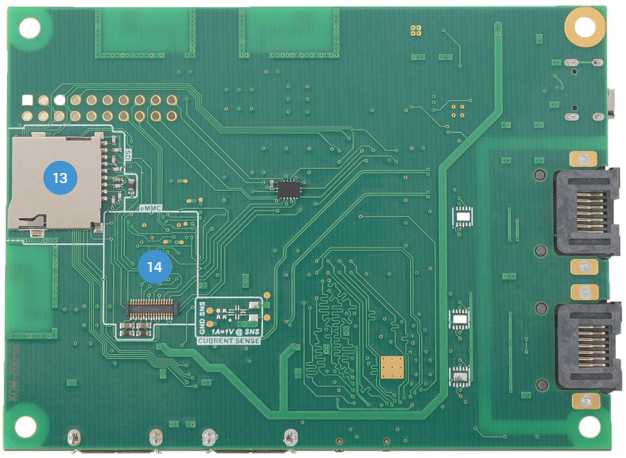


TABLE 9-4. DEVELOPMENT BOARD DETAILS

Nr	Description
1	USB – C (Power supply, UART console)
2	Ethernet port 100/10 Mbps
3	Ethernet port 1000/100/10 Mbps
4	WiFi antenna (2.4/5G)
5	Bluetooth antenna
6	GPIO header
7	WiFi antenna (2.4/5G)
8	USB type A (2.0)
9	USB type A (2.0)
10	Buttons (Reset, GPIO)
11	Dip switches (bootstrap and peripheral selection)
12	Komikan module
13	SD card reader
14	eMMC module connector

TABLE 9-5. DEVELOPMENT BOARD SWITCHES

SW1 (boot)	Position	
Internal	0	1
	0	1
SD	1	0
	1	0

SW2 (periph)	Position	
BT	0	1
	0	1
SD/eMMC	1	0
	1	0
GPIO	1	0
	0	1

10. Packaging and ordering info

Komikan modules are packed into trays. Each tray fits 36 modules. Every 5 trays are vacuum sealed and one standard packing box contains 900 modules.

FIGURE 10-1. KOMIKAN TRAY DIMENSIONS

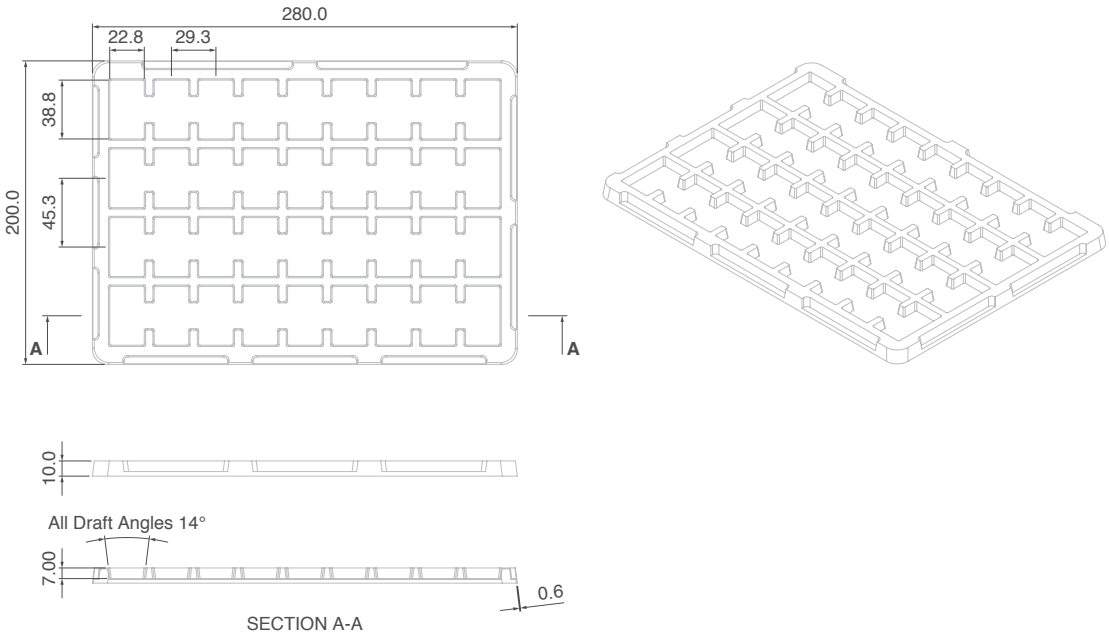


FIGURE 10-2. STANDARD PACKING BOX DIMENSIONS

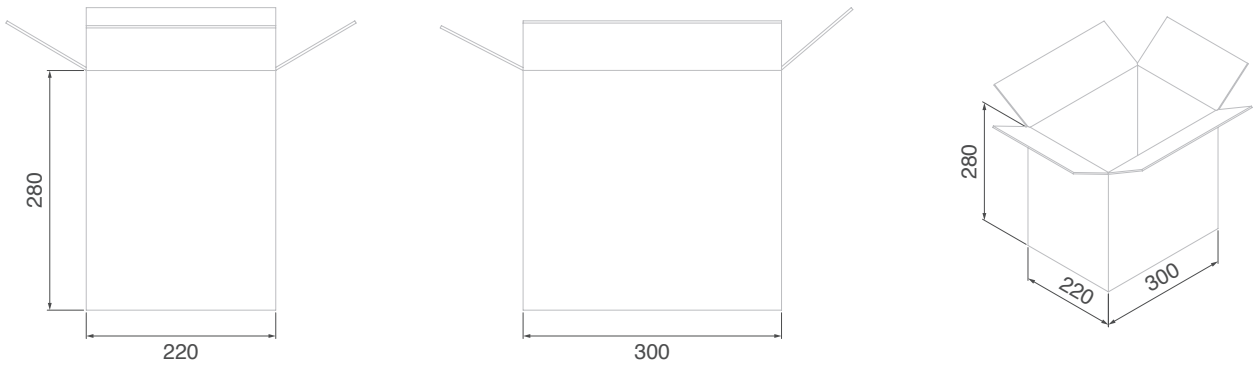


TABLE 10-3. ORDERING PART NUMBERS

KOMIKAN	Komikan module
KOMIKAN-DVK	Komikan development kit

11. Document Revision History

Revision	Revision Date	Description
1.0	2019.04.05	Initial release
1.1	2019.07.11	Added info about 100 Base-T port on page 1 and 3
1.2	2019.09.18	Updated USB info to USB 2.0 host on page 1 and 3
1.3	2020.02.06	Updated Table 3-3 Pin details

Antenna info:

1. Type: Whip antenna

   Gain:2.4G :4.0 dBi 5G: Band 1: 4.5dBi, Band 4: 5dBi

2. Type: Flex antenna

   Gain:2.4G :3.2 dBi 5G: 4.75 dBi

3. Type: Ceramic Antenna

   Gain:BT/BLE/2.4G :2.09dBi 5G: 4.32 dBi

FCC Statement

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.

FCC Radiation Exposure Statement

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.

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-MB Or Contains FCC ID: Z9W-KOM”

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 this modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission,etc. according to FCC part 15C : 15.249 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.249 and 15.209 & 15.207 ,15B Class B requirement， then the host can be sold legally.

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-KOM”

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.