

Wireless LAN + Bluetooth[®] Module

WK8887

User Manual

Please note that this user manual should not be provided to end-users.

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ATTENTION: This module requires device drivers that are under Japan export control. Depending on the customer's country and application (e.g. weapons), KAGA FEI may not be able to provide these drivers to all customers. Please contact your local KAGA FEI sales office for additional information.

To contact your local sales office and for additional product information, please visit <https://www.kagafei.com/jp/eng/>.

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Control No. KM-AG-A223020	Control name General Items
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Scope

This specification ("Specification") applies to the Wireless LAN and **Bluetooth®** module ("Product") manufactured by KAGA FEI Co., Ltd. ("KAGA FEI")

1. Product Number: WK8887
2. Function: Radio frequency transceiver Module. (**IEEE802.11ac/a/b/g/n** and **Bluetooth®4.2** standard)
3. Application: Tablets, Home audio/Video systems, Mobile routers, Handy Terminal, Game, Audio-visual equipment, Digital home electrical appliance, Mobile printer.
4. This product conforms to RoHS Directive.
5. Outline: 56pin leadless chip carrier.
6. Marking: Part number and Lot number.
7. Features:
 - IEEE802.11ac/a/b/g/n** and **Bluetooth®4.2** standard
 - Interface: SDIO3.0, PCM
 - Embedded MPU for reducing loads on host processor
8. Security: TKIP, WEP, AES, CCMP, CMAC, WAPI, WPA/WPA2(64bit/128bit)
9. Packing: Packaging method: Reel
 - Packaging unit: TBD pieces/Reel
 - Package Material: PPE/ PET/AL/NY/PE
10. Mount: SMD Type
11. Note
 - a. This Product is not designed to be radiation-resistant. Please do not expose Product to radiation.
 - b. The operating conditions of this Product are as shown in this Specification. KAGA FEI shall not be liable for any failure and/or abnormality caused by using this Product beyond its specified operating conditions.
 - c. The Product mentioned in this Specification is manufactured for use in consumer products. Before using this Product in any special equipment (e.g. medical, space, aircraft, disaster prevention) where higher safety and reliability are required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safe operation of those special equipment. If this Product is used in general electronics equipment, the safety function must also be thoroughly evaluated at the customer's sole risk, and when necessary, a protective circuit shall be added during the design stage.
 - d. i) Even though KAGA FEI sufficiently inspects and verifies the quality of the firmware incorporated in this Product ("Incorporated Software"), it is recommended that customers fully check and confirm by the start of mass production that (1) no bugs, defects or other failures are included in the Incorporated Software, (2) no bugs, defects or other failures are caused by installing this Product with the Incorporated Software into the customer's product, (3) the Incorporated Software fully meets customer's intended use.
 - ii) Please note that KAGA FEI is not responsible for any failure from bugs or defects in the Incorporated Software.
 - e. Depending on the radio environment and operating conditions, communication between this Product and others devices may not be established or maintained.

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- f. This Product operates at 2.4GHz and 5GHz unlicensed ISM band. If this Product is used around the other wireless devices that operate in same frequency band, there is a possibility that interference may occur. If interference occurs, please stop operation of the other devices, or relocate this Product, or do not use this Product around the other wireless devices.
- g. If this Product is incorporated into your device, please thoroughly evaluate its operation before mass production.
- h. Caution for Export Control
 This Product may be subject to governmental approvals, consents, licenses, authorizations, declarations, filings, and registrations for export or re-export as required by *Japanese Foreign Exchange and Foreign Trade Law (including related laws and regulations)* and/or any other country's applicable laws or regulations related to export control.
 If this Product will be exported or re-exported, it is strongly recommended that customers check and confirm the necessary procedures to export or re-export this Product as required by applicable laws and regulations, and if necessary, customers must obtain the necessary and appropriate approvals or licenses from governmental authority at their own risk and expense.

Control No. KM-AG-A223020	(3/6)	Control name General Items
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FCC Regulatory Information

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.

- a) Please use the specified supply voltage in "Recommendation operating range" when installing this product. The final products must contain a power supply regulator and must ensure the applied voltage to this product is adjusted to always be within the operating voltage range.
- b) Please ensure and control your host product not to transmit on channels 12 and 13.
- c) Data transmission is inevitably initiated by software of host devices with the exception that several special packets are transmitted by the MAC. However, data transmission is terminated by end of packets in any cases. Therefore, it is RF transmitted only while packets are being transmitted. This modular transmitter automatically discontinues transmission in case of either absence of information to transmit or operational failure because RF parts will not be ON in neither cases.
- d) The device driver/firmware for this product is downloaded from a limited access web site provided by the device manufacturer and is implemented specifically for this product. The ID/password required to access the web site can be obtained after the conclusion of a contract with the device manufacturer.
- e) The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- f) Frequency Tolerance: 2.4GHz Band ± 25 ppm, 5GHz Band ± 20 ppm
- g) The device is designed to use the antennas listed below. Do not modify the antenna or any other part of the module. Any modifications will invalidate the modular certifications and require new approvals for the host system.

Model No.	Antenna Type	Frequency	Antenna Gain	Impedance
AH104N2450D1	Monopole	2402 - 2480 MHz	2.1 dBi	50 Ω
		5180-5825 MHz	2.4 dBi	

- h) CAUTION:
- Changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment

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-To maintain compliance with FCC's RF exposure guidelines, use only the supplied antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations.

-To maintain compliance with FCC's RF exposure guidelines, this equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

-This product is authorized under the following conditions in USA and Canada. Please do not use this equipment outside the approval range.

5180 – 5240 MHz : Master / Client device

5260 – 5320 MHz : Client device

5500 – 5700 MHz : Client device

5745 – 5825 MHz : Master / Client device

The following channels are available for this equipment:

For 2402-2480MHz (Bluetooth BDR/EDR, Bluetooth Low Energy)

79 channels are provided for Bluetooth BDR/EDR : 0–78ch

40 channels are provided for Bluetooth Low Energy : 0–39ch

For 2412-2462MHz (IEEE802.11b/g/n-20)

11 channels are provided for 802.11b/g/n(HT20) : 1-11ch

For 2422-2452MHz (IEEE802.11n-40)

7 channels are provided for 802.11n(HT40) : 3-9ch

For 5180-5240MHz

4 channels are provided for 802.11a, 802.11n(HT20), 802.11ac(VHT20) : 36ch, 40ch, 44ch, 48ch

2 channels are provided for 802.11n(HT40), 802.11ac(VHT40) : 38ch, 46ch

1 channel is provided for 802.11ac(VHT80) : 42ch

For 5260-5320MHz

4 channels are provided for 802.11a, 802.11n(HT20), 802.11ac(VHT20) : 52ch, 56ch, 60ch, 64ch

2 channels are provided for 802.11n(HT40), 802.11ac(VHT40) : 54ch, 62ch

1 channel is provided for 802.11ac(VHT80) : 58ch

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For 5500-5700MHz

11 channels are provided for 802.11a, 802.11n(HT20), 802.11ac(VHT20) : 100ch, 104ch, 108ch, 112ch, 116ch, 120ch, 124ch, 128ch, 132ch, 136ch, 140ch

5 channels are provided for 802.11n(HT40), 802.11ac(VHT40) : 102ch, 110ch, 118ch, 126ch, 134ch

2 channels are provided for 802.11ac(VHT80) : 106ch, 122ch

For 5745-5825MHz

5 channels are provided for 802.11a, 802.11n(HT20), 802.11ac(VHT20) : 149ch, 153ch, 157ch, 161ch, 165ch

2 channels are provided for 802.11n(HT40), 802.11ac(VHT40) : 151ch, 159ch

1 channel is provided for 802.11ac(VHT80) : 155ch

i) Please label FCC ID at any location on the exterior of your product. Please indicate FCC ID by either one of the following method.

-Contains Transmitter Module FCC ID: 2A6NFWK8887

-Contains FCC ID: 2A6NFWK8887

j) Please include the following statements in the user manual of the host device of this module;

FCC CAUTION

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

Compliance with FCC requirement 15.407(c)

Data transmission is always initiated by software, which is passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet.

Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

Frequency Tolerance: ± 25 ppm (2.4GHz)

Frequency Tolerance: ± 20 ppm (5GHz)

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

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Jan.18th.2023
KAGA FEI Co., Ltd.
FCC ID : 2A6NFWK8887

Control No. KM-AG-A223020	(6/6)	Control name General Items
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This device complies with below part 15 of the FCC Rules.

Part 15 Subpart C

Part 15 Subpart E

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant (FCC Part 15.247), and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

KAGA FEI Co., Ltd.

WK8887Jan.18th.2023
KAGA FEI Co., Ltd.
FCC ID : 2A6NFWK8887

Control No. KM-AM-A223020 (1/1)	Control name Absolute maximum ratings
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Absolute maximum ratings

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Supply voltage 1	VBAT	-	3.3	4.5	V	
Supply voltage 2	VDD33	-	3.3	4.0	V	
Supply voltage 3	VIO	-	1.8	2.2	V	
		-	2.5	3.0	V	
		-	3.3	4.0	V	
Supply voltage 4	VIO_SD	-	1.8	2.2	V	
		-	3.3	4.0	V	
Supply voltage 5	VIO_RF	-	3.3	4.0	V	

Recommendation operating range

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Supply voltage 1	VBAT	2.7	3.3	4.5	V	
Supply voltage 2	VDD33	3.0	3.3	3.6	V	
Supply voltage 3	VIO	1.62	1.8	1.98	V	
		2.25	2.5	2.75	V	
		3.0	3.3	3.6	V	
Supply voltage 4	VIO_SD	1.62	1.8	1.98	V	
		3.0	3.3	3.6	V	
Supply voltage 5	VIO_RF	3.0	3.3	3.6	V	
Operation temperature range	Taopr	-30	25	85	Degrees C	
Storage temperature range	Tstg	-40		85	Degrees C	

KAGA FEI Co., Ltd.

Control No. KM-AE-A223020 (1/6)	Control name Electrical characteristics
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Power consumption

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Power consumption1	Tx: 12dBm 11b, 11Mbps	Pc1		488		mW	Duty=46.8%
2	Power consumption2	Rx 11b, 11Mbps	Pc2		201		mW	
3	Power consumption3	Tx: 12dBm 11g, 54Mbps	Pc3		297		mW	Duty=25.4%
4	Power consumption4	Rx 11g, 54Mbps	Pc4		211		mW	
5	Power consumption5	Tx: 10dBm, 40MHz BW 11n, MCS7, 2.4GHz	Pc5		211		mW	Duty=2.2%
6	Power consumption6	Rx, 40MHz BW 11n, MCS7, 2.4GHz	Pc6		251		mW	
7	Power consumption7	Tx: 12dBm 11a, 54Mbps	Pc9		363		mW	Duty=25.4%
8	Power consumption8	Rx 11a, 54Mbps	Pc10		244		mW	
9	Power consumption9	Tx: 10dBm , 40MHz BW 11n, MCS7, 5GHz	Pc11		244		mW	Duty=2.4%
10	Power consumption10	Rx, 40MHz BW 11n, MCS7, 5GHz	Pc12		286		mW	
11	Power consumption11	Tx: 8dBm, 80MHz BW 11ac, MCS9, 5GHz	Pc13		321		mW	Duty=1.4%
12	Power consumption12	Rx, 80MHz BW 11ac, MCS9, 5GHz	Pc14		358		mW	
13	Power consumption13	Power save mode (DTIM=1, Beacon_interval =100ms)	Pc15		5.0		mW	
14	Power consumption14	Deep Sleep	Pc16		1.8		mW	

*The power consumption might fluctuate with the condition of radio communication, host performance and test circuit.

*The Typ. is a reference value. The value may change depending on the evaluation.

DC Specifications

Digital Pad Ratings (SDIO, PCM, GPIO) (VIO=1.8/ 2.5/ 3.3V)

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
1	Input High Voltage		VIH	0.7xVIO		VIO+0.3	V	
2	Input Low Voltage		VIL	-0.3		0.3xVIO	V	
3	Output High Voltage		VOH	VIO-0.4		-	V	
4	Output Low Voltage		VOL	-		0.4	V	

Control No. KM-AE-A223020	(2/6)	Control name Electrical characteristics
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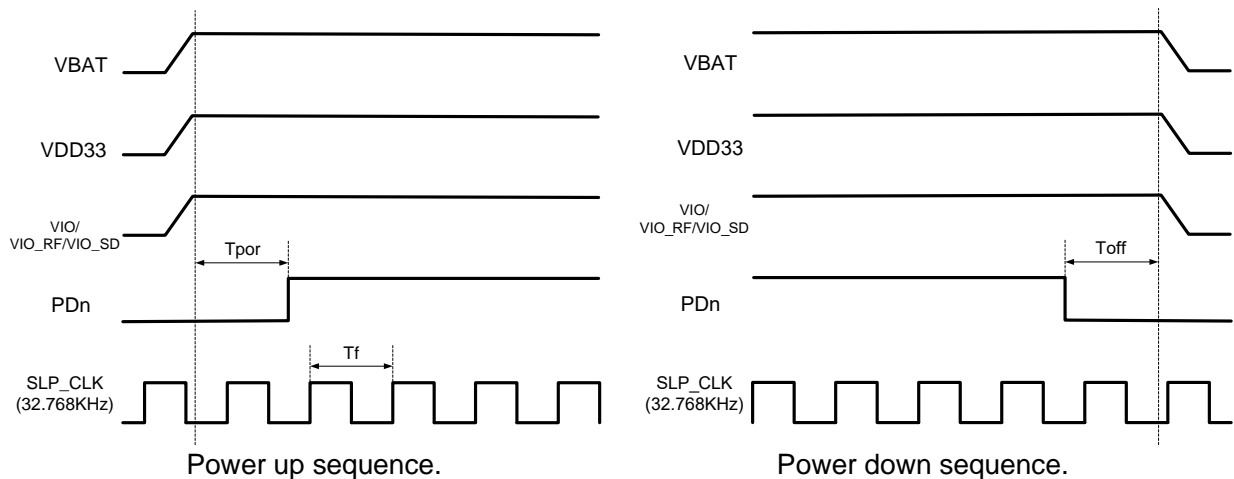
AC Specifications

Power-on timing / External sleep clock

	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	Valid Power/ Clock to PDn de-asserted		T _{por}	300			ms	
2	Input SLP_CLK frequency		T _f	-	32.768	-	KHz	
3	Input SLP_CLK high voltage	V=1.8V	V _{IH}	0.7*V	-	V+0.4	V	
4	Input SLP_CLK low voltage		V _{IL}	-0.4		0.3*V	V	
5	Input SLP_CLK phase noise requirement		PN	-	-125	-	dBc/Hz	@100KHz
6	Input SLP_CLK slew rate limit (10-90%)		SR	-	-	100	ns	
7	Input SLP_CLK duty cycle tolerance		DC	20	-	80	%	
8	PDN down to Power off		T _{off}	0			ms	

<Power-on sequence>

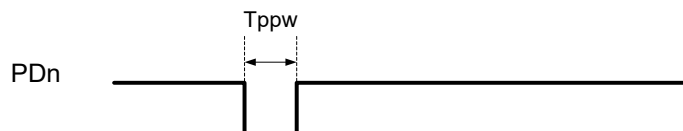
PDn must remain asserted for minimum of T_{por} after VBAT/VDD33/VIO/VIO_RF/VIO_SD and SLP_CLK are stable.



External power down(PDn)

	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	PDn pulse width		T _{ppw}	300			ms	

1. PDn should be asserted while VBAT/VDD33/VIO/VIO_RF/VIO_SD are stable.

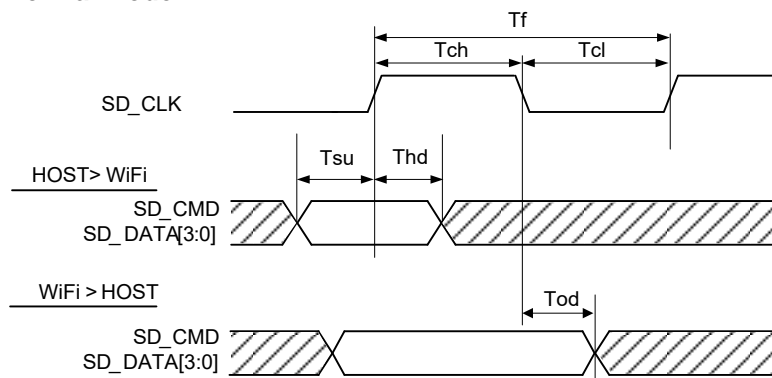
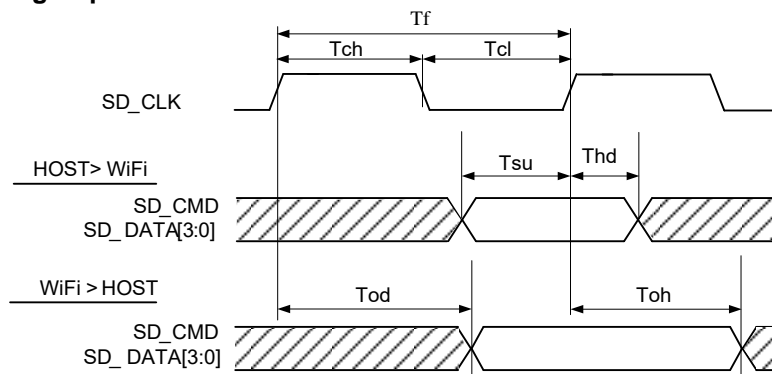


Control No. KM-AE-A223020	(3/6)	Control name Electrical characteristics
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SDIO Interface Specifications

The Specification applies for Topr.= 25 degrees C , Supply voltage=Typical voltage.

	Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
1	Input SDIO_CLK Frequency	Tf	Normal	0	-	25	MHz	
			High Speed	0	-	50		
2	Input SDIO_CLK High Time	Tch	Normal	10	-	-	ns	
			High Speed	7	-	-		
3	Input SDIO_CLK Low Time	Tcl	Normal	10	-	-	ns	
			High Speed	7	-	-		
4	Input SDIO_CMD, DATA[3:0] Setup time	Tsu	Normal	5	-	-	ns	
			High Speed	6	-	-		
5	Input SDIO_CMD, DATA[3:0] Hold time	Thd	Normal	5	-	-	ns	
			High Speed	2	-	-		
6	Output SDIO_CMD, DATA[3:0] Delay time	Tod	Normal	-	-	14	ns	CL<40pF (1card)
			High-Speed	-	-	14	ns	
7	Output SDIO_CMD, DATA[3:0] Hold time	Toh	High Speed	2.5	-	-	ns	

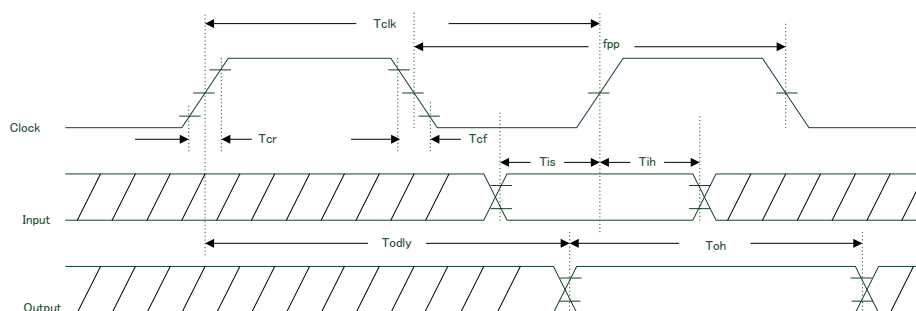
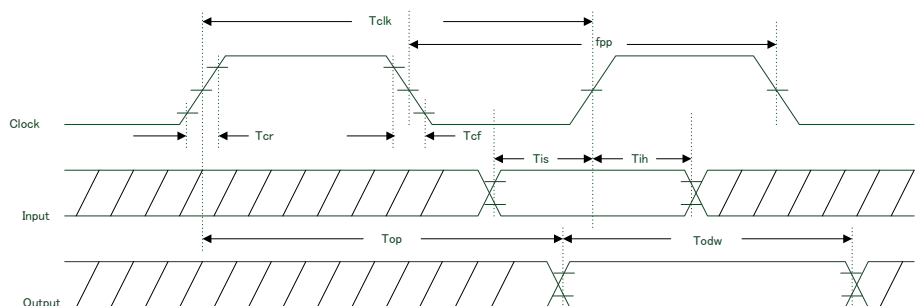
Normal Mode**High Speed Mode**

Control No. KM-AE-A223020	(4/6)	Control name Electrical characteristics
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SDIO Interface Specifications

The Specification applies for Topr.= 25 degrees C , Supply voltage=Typical voltage.

	Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
1	Clock Frequency	fpp	SDR12/25/50	25	-	100	MHz	
			SDR104	0	-	150		
2	Input setup time	Tis	SDR12/25/50	3	-	-	ns	
			SDR104	1.4	-	-		
3	Input hold time	Tih	SDR12/25/50	0.8	-	-	ns	
			SDR104	0.8	-	-		
4	Clock time	Tclk	SDR12/25/50	10	-	40	ns	
			SDR104	4.8	-	-		
5	Rise time,fall time Tcr,Tcfs < 2ns(max)at100MHz Ccard=10pF	Tcr,Tcf	SDR12/25/50	-	-	0.2*Tclk	ns	
			SDR104	-	-	0.2*Tclk		
6	Output delay time Cl≤30pF	Todly	SDR12/25/50	-	-	7.5	ns	
7	Output hold time Cl=15pF	Toh	SDR12/25/50	1.5	-	-	ns	
8	Card output phase	Top	SDR104	0	-	10	ns	
9	Output timing of variable data window	Todw	SDR104	2.88	-	-	ns	

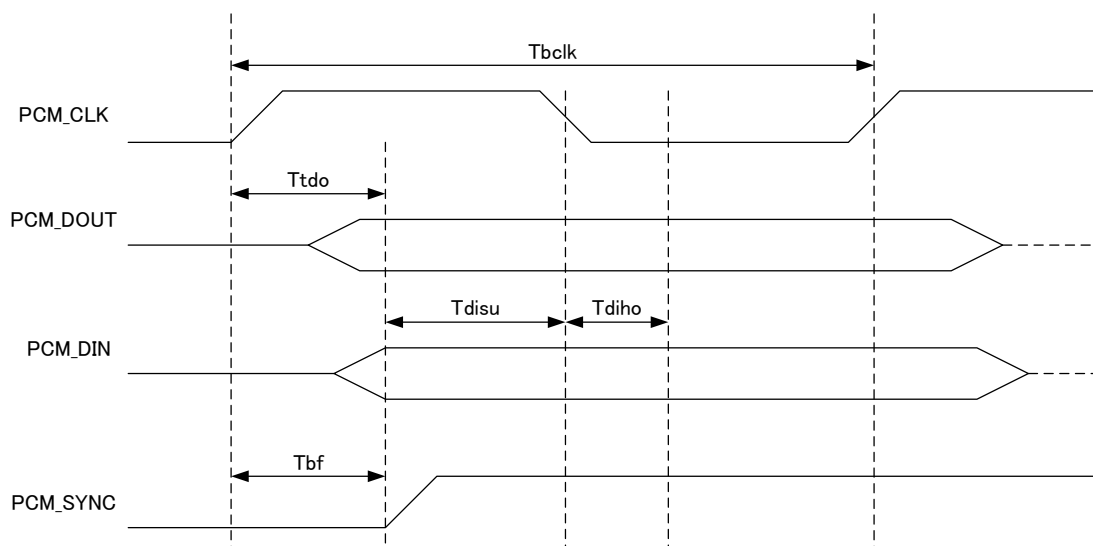
SDIO Protocol Timing Diagram-SDR12,SDR25,SDR50**SDIO Protocol Timing Diagram-SDR104**

Control No. KM-AE-A223020	Control name Electrical characteristics
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PCM Interface

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage.

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	PCM_CLK Frequency		Tbclk	-	2 / 2.048	-	MHz	
2	Delay time from PCM_CLK High to valid PCM_OUT		Tdo	-	-	15	ns	
4	Setup time for PCM_IN valid to PCM_CLK Low		Tdisu	20	-	-	ns	
5	Hold time for PCM_CLK Low to PCM_IN valid		Tdiho	15	-	-	ns	
6	Delay time from PCM_CLK High to PCM_SYNC High		Tbf	-	-	15	ns	

Master Mode

Control No. KM-AE-A223020	(6/6)	Control name Electrical characteristics
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2.4GHz Band RF Specifications

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	TX Power	11Mbps, 11b	Po2-1	10	12	14	dBm	
		54Mbps, 11g	Po2-2	10	12	14		
		MCS7, 20MHz BW, 11n	Po2-3	10	12	14		
		MCS7, 40MHz BW, 11n	Po2-4	8	10	12		
2	Rx sensitivity	11Mbps, 11b	SEN2-1		-87	-76	dBm	
		54Mbps, 11g	SEN2-2		-73	-65		
		MCS7, 20MHz BW, 11n	SEN2-3		-69	-64		
		MCS7, 40MHz BW, 11n	SEN2-4		-66	-61		

5GHz Band RF Specifications

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	TX Power	54Mbps, 11a	Po5-1	10	12	14	dBm	
		MCS7, 20MHz BW, 11n	Po5-2	10	12	14		
		MCS7, 40MHz BW, 11n	Po5-3	8	10	12		
		MCS9, 80MHz BW, 11ac	Po5-4	6	8	10		
2	Rx sensitivity	54Mbps, OFDM	SEN5-1		-71	-65	dBm	
		MCS7, 20MHz BW, OFDM	SEN5-2		-68	-64		
		MCS7, 40MHz BW, OFDM	SEN5-3		-65	-61		
		MCS9, 80MHz BW, OFDM	SEN5-4		-57	-51		

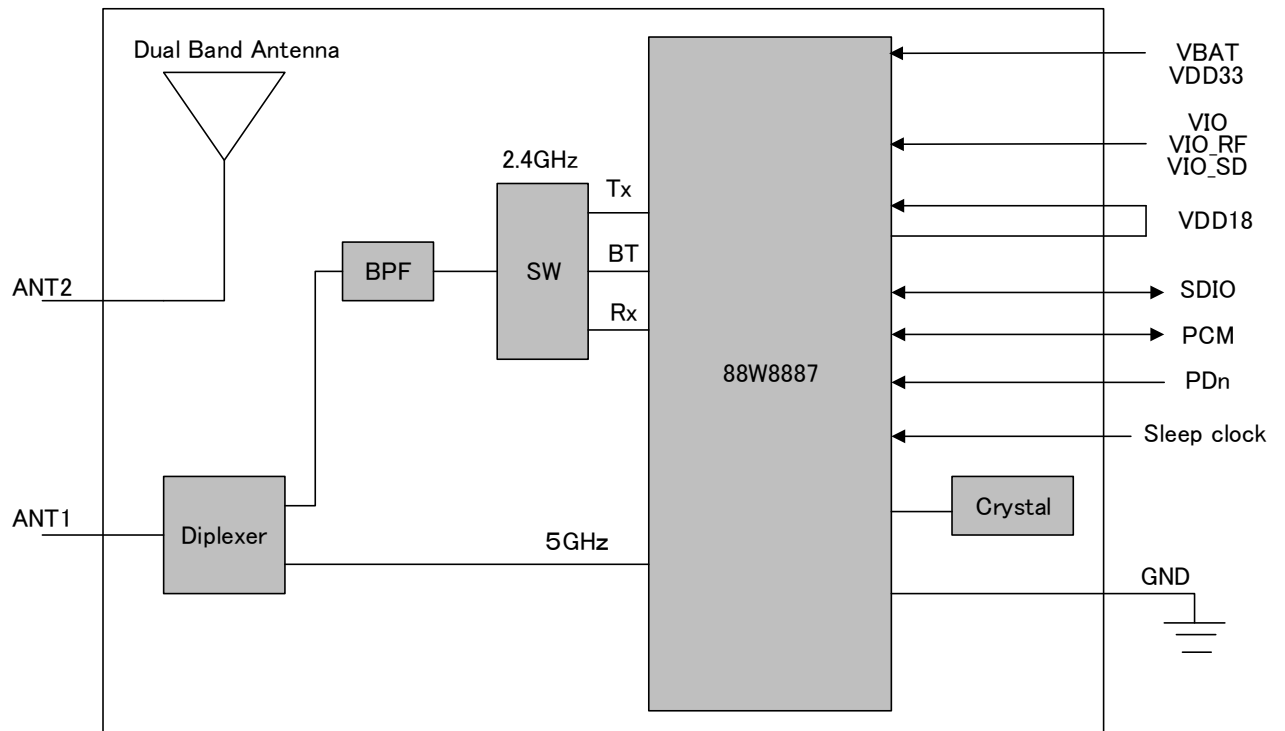
RF Specifications (Bluetooth®)

The Specification applies for Topr.= 25 degrees C, Supply voltage =Typical voltage.

No.	Parameter	Condition	Sym	Min	Typ	Max	Unit	Remark
1	Tx Power	Basic	Pob-2	-6	0	2	dBm	Class2
2	Sensitivity	Basic	SENB		-86	-70	dBm	

Control No. KM-MC-A223020	Control name Circuit Schematic
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Block Diagram



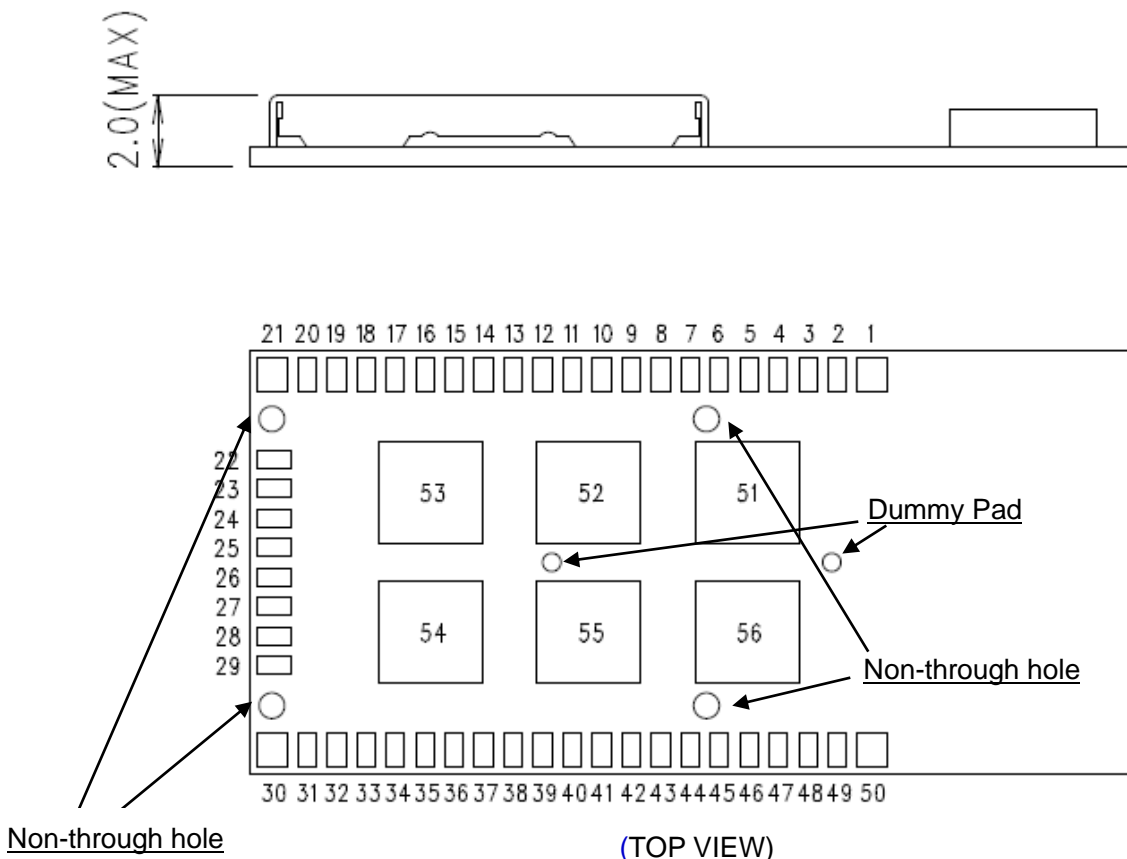
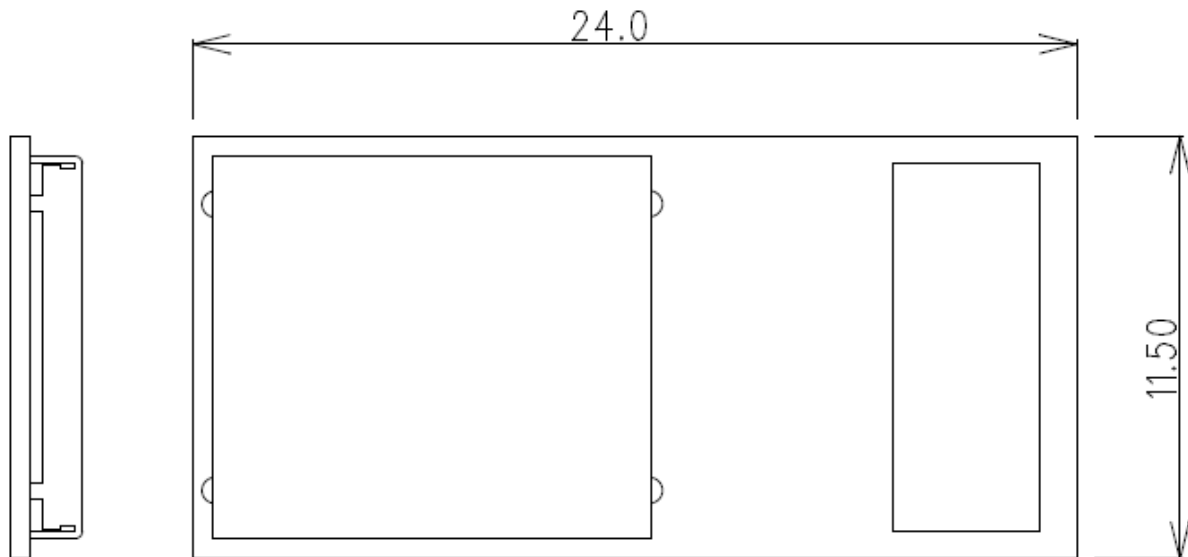
WK8887

Jan.18th.2023
KAGA FEI Co., Ltd.
FCC ID : 2A6NFWK8887

Control No. KM-AD-A223020	(1/3)	Control name Outline/Appearance
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OUTLINE

Unit: mm, Tolerances unless otherwise specified: ± 0.2 mm



(TOP VIEW)

KAGA FEI Co., Ltd.

WK8887

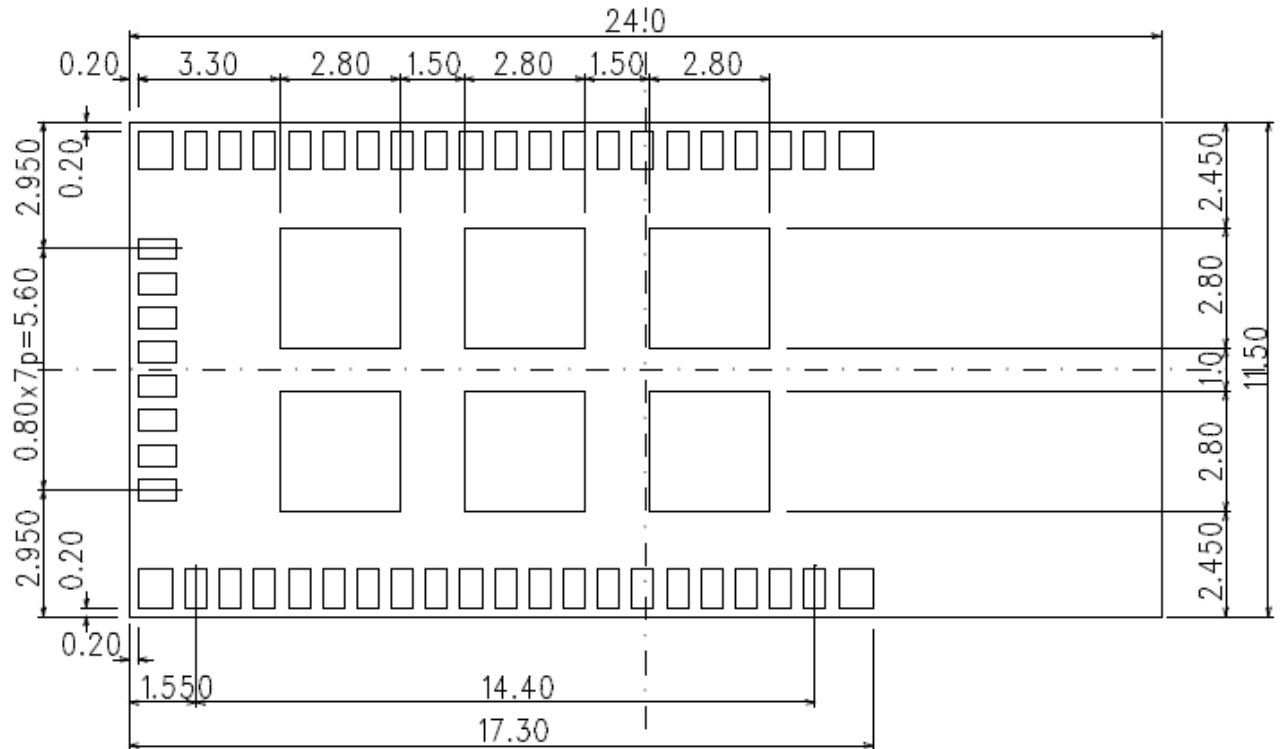
Jan.18th.2023
KAGA FEI Co., Ltd.
FCC ID : 2A6NFWK8887

Control No. KM-AD-A223020	Control name Outline/Appearance
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Module Pad Dimension

Unit: mm.

(TOP VIEW)



46_Signal Pad : 0.50 x 0.90

4_Corner Pad : 0.80 x 0.90

6_Center Pad : □2.80

KAGA FEI Co., Ltd.

Control No. KM-AD-A223020	Control name Outline/Appearance
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Recommended Land Pattern Dimension

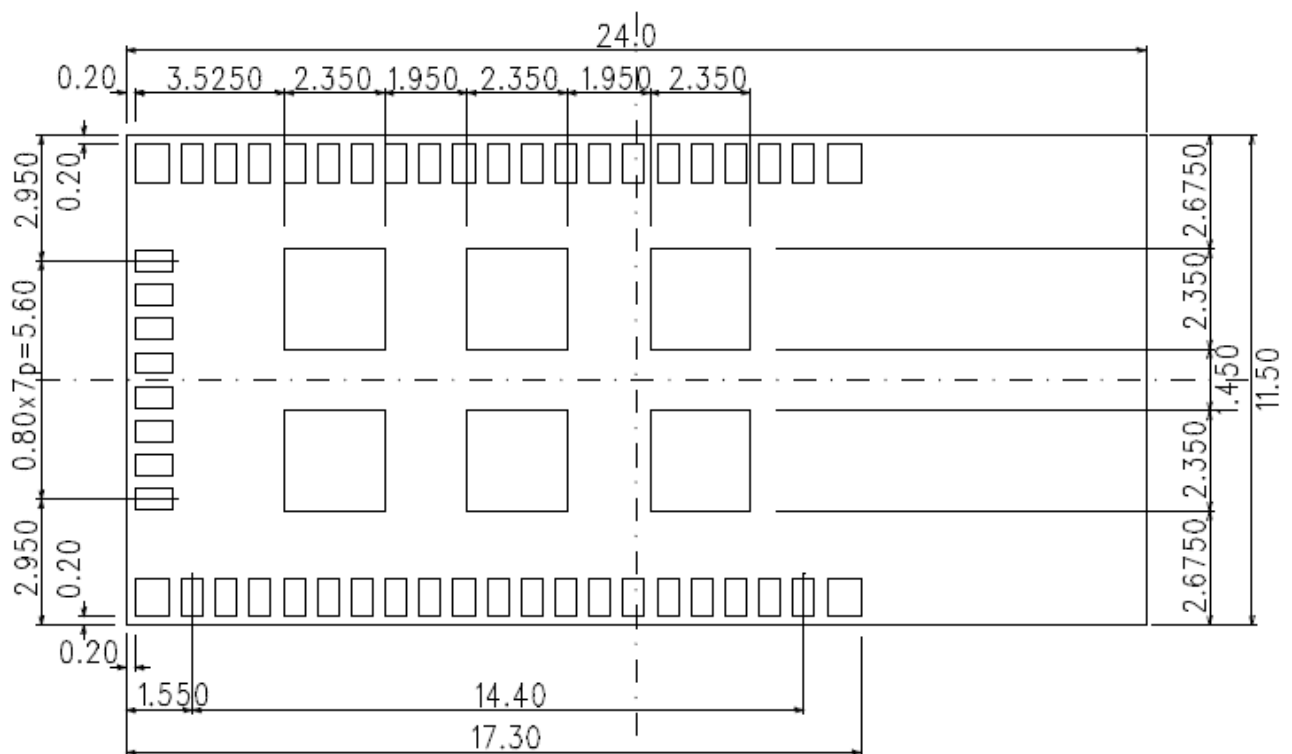
Pad sizes on the motherboard should be the same size as the module pad sizes.

Recommended Metal Mask (Solder Mask) Conditions

Mask size see below. Thickness of the Metal Mask should be in the range of 0.1 mm

Unit: mm

(TOP VIEW)



46_Signal Pad Metal Mask Opening : 0.50 x 0.90

4_Corner Pad Metal Mask Opening : 0.80 x 0.90

6_Center Pad Metal Mask Opening : □2.35

Control No. KM-BA-A223020	Control name Pin Layout
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Pin Descriptions

Terminal No.	Terminal Name	I/O	Pwr Domain	Description	Function	Internal PU
1	GND	-	GND	Ground	PWR	-
2	VIO_RF	I	VIO_RF	3.3V Analog I/O RF Power Supply	PWR	
3	GPIO3, CON[1]	I	VIO_RF	Configuration Mode: CON[1], See Table-1	CTRL	Enable
4	GPIO2, CON[0]	I	VIO_RF	Configuration Mode: CON[0], See Table-1	CTRL	Enable
5	UART_RTS	O	VIO	UART_RTSN Please put out the test terminal.	UART	Enable
6	UART_CTS	I	VIO	UART_CTSN Please put out the test terminal.	UART	Enable
7	UART_SIN	I	VIO	UART_SIN Please put out the test terminal.	UART	Enable
8	UART_SOUT	O	VIO	UART_SOUT Please put out the test terminal.	UART	Enable
9	PDN	I	VIO	Power Down (no internal pull-up on this pin) (0: Full Power Down, 1: Normal Operation)	CTRL	None
10	GPIO13/BT_WAKEUP_BT_HOST	O	VIO	Bluetooth wakeup host (Output).	CTRL	
11	GND	-	GND	Ground	PWR	-
12	VDD18	I	VDD18	1.8V buck voltage output	PWR	
13	VDD33	I	VDD33	3.3V Analog Power Supply	PWR	-
14	GND	-	GND	Ground	PWR	-
15	VBAT	I	VBAT	1.1v buck/1.8v buck/3.3v LDO VBAT input	PWR	-
16	PCM_DIN/PCM_A	I	VIO	PCM Data Input Signal	PCM	Enable
17	PCM_CLK	I/O	VIO	PCM Clock Signal. (Output if PCM master. Input if PCM slave.)	PCM	Enable
18	PCM_SYNC	I/O	VIO	PCM Sync Pulse Signal. (Output if PCM master. Input if PCM slave.)	SDIO	Enable
19	PCM_DOUT/PCM_B	O	VIO	PCM Data Output Signal	PCM	Enable
20	1.1V_INT	O	VDD11	1.1V buck voltage output	PWR	-
21	GND	-	GND	Ground	PWR	-
22	SD_D2	I/O	VIO_SD	SDIO Data line Bit[2]	SDIO	Enable
23	SD_D3	I/O	VIO_SD	SDIO Data line Bit[3]	SDIO	Enable
24	SD_CMD	I/O	VIO_SD	SDIO Command/Response	SDIO	Enable
25	GND	-	GND	Ground	PWR	-
26	SD_CLK	I	VIO_SD	SDIO Clock Input	SDIO	Enable
27	GND	-	GND	Ground	PWR	-
28	SD_D0	I/O	VIO_SD	SDIO Data line Bit[0]	SDIO	Enable
29	SD_D1	I/O	VIO_SD	SDIO Data line Bit[1]	SDIO	Enable
30	GND	-	GND	Ground	PWR	-
31	VIO_SD	I	VIO_SD	1.8/3.3V Digital SDIO Power Supply.	PWR	-

Control No. KM-BA-A223020	Control name Pin Layout
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Terminal No.	Terminal Name	I/O	Pwr Domain	Description	Function	Internal PU
32	VIO	I	VIO	1.8/2.5/3.3V Digital Power Supply	PWR	-
33	GND	-	GND	Ground	PWR	-
34	SLP_CLK	I	VDD18	Sleep Clock Input	CLOCK	-
35	GPIO1/WL_HOST_WAKE	O	VIO	WLAN wakeup HOST (Output)	CTRL	
36	RES	-	-	Reserved. Do not connect this pin. Leave this pin floating.	-	
37	TMS	I	VIO	JTAG Controller Select	JTAG	Enable
38	TDI	I	VIO	JTAG Test Data Input	JTAG	Enable
39	TDO	I	VIO	JTAG Test Data Output	JTAG	Enable
40	TCK	I	VIO	JTAG Test Clock Input	JTAG	Enable
41	GND	-	GND	Ground	PWR	-
42	ANT1	I/O	-	RF I/O, should be connected to Pin 43	RF I/O	
43	ANT2	I/O	-	Internal antenna, should be connected to Pin 42	Antenna	
44	GND	-	GND	Ground	PWR	-
45	GND	-	GND	Ground	PWR	-
46	RES	-	-	Reserved. Do not connect this pin. Leave this pin floating.		
47	RES	-	-	Reserved. Do not connect this pin. Leave this pin floating.		
48	RES	-	-	Reserved. Do not connect this pin. Leave this pin floating.		
49	RES	-	-	Reserved. Do not connect this pin. Leave this pin floating.		
50	GND	-	GND	Ground	PWR	-
51	GND	-	GND	Ground	PWR	-
52	GND	-	GND	Ground	PWR	-
53	GND	-	GND	Ground	PWR	-
54	GND	-	GND	Ground	PWR	-
55	GND	-	GND	Ground	PWR	-
56	GND	-	GND	Ground	PWR	-

WK8887

Jan.18th.2023
KAGA FEI Co., Ltd.
FCC ID : 2A6NFWK8887

Control No. KM-BA-A223020 (3/3)	Control name Pin Layout
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Table-1 HOST Interface / FW down load select

CON[1]	CON[0]	WLAN	BT/BLE
0	0	00,01 reserved	
0	1		
1	0	SDIO	UART
1	1	SDIO	SDIO

Note) The 88W8887 firmware and driver does not support UART as a Bluetooth host interface. However, please add UART test points to your design because the UART terminal may be needed during Bluetooth qualification testing.

Control No. —	Control name Handling Precaution
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This specification describes the required conditions for mounting the device.

Required Conditions

(1) Use and Storage

1. If components are in the moisture barrier bag packed by KAGA FEI, store the components at **< 40deg-C/90%RH.**
2. Keep the factory ambient conditions at **< 30deg-C/60%RH.**
3. Store the components at **< 25±5deg-C/10%RH** after the bag is opened.
(This condition also applies during the manufacture process).

(2) Handling

Make sure all moisture barrier bags have no holes, cracks or damages. If an abnormality is found on the bag, its moisture level must be checked in accordance with 2 in (2).

1. All of the surface mounting process (reflow process) must be completed **within 12 months** from the bag seal date.
2. Immediately after opening the bag, use the humidity indicator included in the bag to make sure the humidity in the bag is less than **10%RH.**
3. **All** of the surface mounting process (reflow process including rework process) must be completed within **168 hours** after the bag is opened (inclusive of any other processes).
4. If any conditions in (1) or condition 2 and 3 in (2) are not met, bake the components in accordance with the conditions at **125deg-C for 24hours**
5. As a rule, baking the components in accordance with condition 4 in (2) shall only be done once.
6. These components are sensitive to static electricity discharge.(<100V) To prevent damage, use ESD protective floor mats, wrist straps, ESD protective footwear, air ionizers etc.
7. Minimize mechanical vibration and shock.

Control No. —	Control name Handling Precaution
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8. Please recognize the pad on the back side when mounting the module.
9. Washing the module is not recommended. If washing cannot be avoided, please test module functionality and performance after thoroughly drying the module. We cannot be held responsible for any failures due washing the module.
10. Please do not exceed the recommended reflow temperature profile below. These components can only be reflowed a maximum of 1 times.

Recommended Reflow Profile

