Datasheet

DATASHEET

WAC Low-power Wi-Fi video encode series module

WAC0001: 802.11n 2.4GHz single band AI video module

Document Revision: 1.0a

DISCLAIMER

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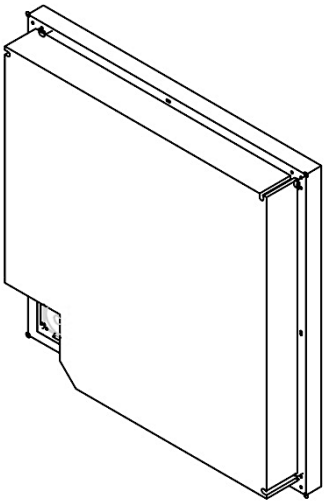
REVISION HISTORY

Revision	Date	Remark
Version 1.0a	2022/12/02	Initialed version

TABLE OF CONTENT

PRODUCT DESCRIPTION

WAC series modules are the highly integrated Wi-Fi camera kernel module, the best solution providing both high performance and cost-effective value for customers' applications. The miniature module design can not only quickly help customer design in wireless camera product lineup but satisfy variety streaming vision applications.



Start your product design with the industry's best all-in-one WAC0001 module which is designed on base of Blaitek Semiconductor state-of-the-art BL808 family platform, combining all outstanding features including dual RISC-V processors, high speed DRAM, Wireless RF, H264 encoder, audio codec and NPU in a single chip to perform quick system response and low power consumption.

The WAC0001 module brings customers with high-efficient video encoding、audio encode/decode processor、Wi-Fi/Bluetooth/Zigbee network、edge AI/ML and smart power management unit in single compact module. It is the best solution to allow customers to develop their entire camera applications with this tiny module; no prior Wi-Fi experience is required and no professional Wi-Fi production process for easier and faster development.

SELLING FEATURES

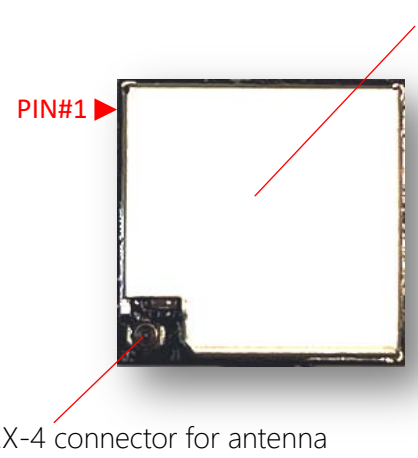
- Standard, miniature SoC module for customers' quick and easy product deployment
- Blaitek BL808 all-in-one system on chip including H264 encoding, ISP, memory, Wireless RF, audio codec and smart power management unit
  - Dual RISC-V cores up to 480MHz clock rate
  - Built-in 256Mb DRAM
  - Support MIPI low power CSI image signal input
  - Powerful ISP supporting variety of pro-grade CIS
- 1080p30 + 480p max. video with dual streaming capability
  - Adjustable video resolution, frame/s and bitrate
  - H.264 high-efficient compression
  - CBR / VBR rate supported
- JPEG / MJPEG supported
- PCM compression, full-duplex audio communication with AEC (Auto Echo Cancellation)
- Built-in low-power 2.4GHz main-stream wireless
  - 802.11b/g/n Wi-Fi compatible
  - BT-BLE 5 dual mode Bluetooth
  - 802.15.4 Zigbee
  - One Transmit and one Receive path (1T1R)
  - Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
  - Wi-Fi STANDBY STATE MODE keeps ultra-low power consumption with AP association
  - Smart power saving mechanism
- RTOS ultra-fast system response for event handling
- Built-in high speed and rich peripheral interfaces
- Advanced power management unit providing market lowest power consumption
  - <800mW on system full operation
  - 1mW at system sleep mode (Wi-Fi keepalive ON)
- HW security engine built-in
- Dual-image OTA supported
- Tailor-made battery camera firmware performing low-power, instant response smart vision application
- Brand cloud services high integrated – AWS and mores (contact sales representative for detail)
- Well pre- test and calibration before shipping customers

APPLICATIONS

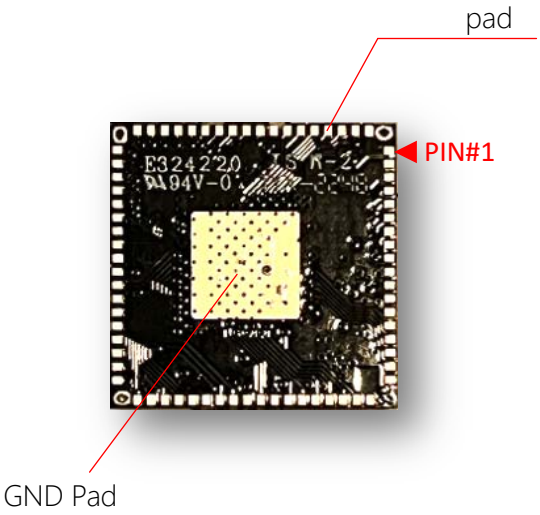
Battery camera
Smart video doorbell camera
Smart video door lock camera
Hidden spy camera
Ear-Nose-Throat monitor camera
Baby camera / Baby monitor
Pet camera
Remote camera
Smart camera
Body camera
Wearable camera
Wi-Fi camera with light AI

WAC0001 MODULE OVERVIEW

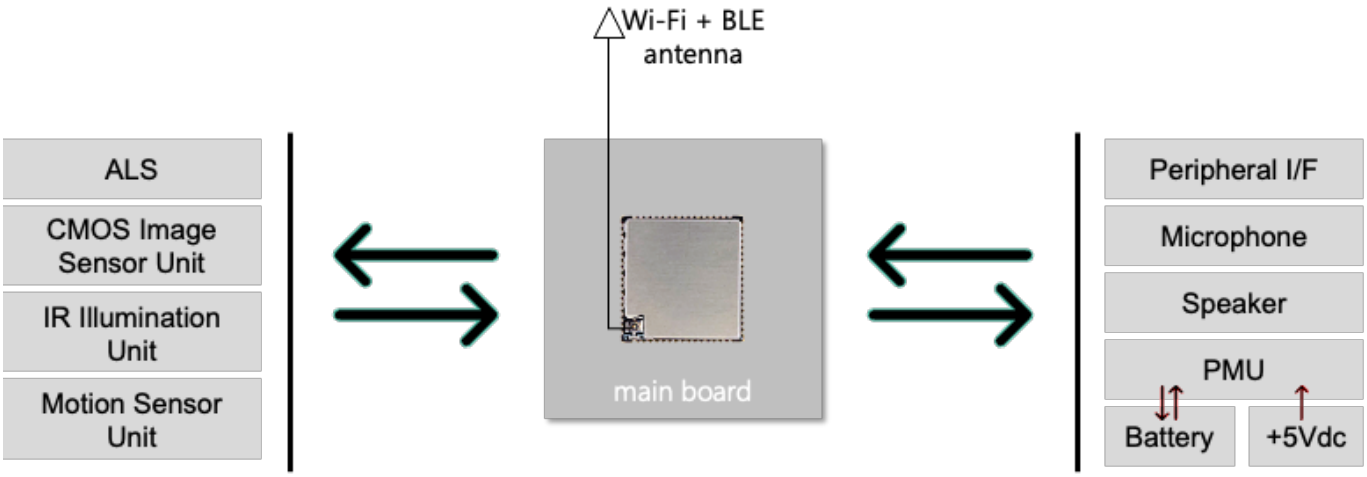
TOP VIEW



BOTTOM VIEW

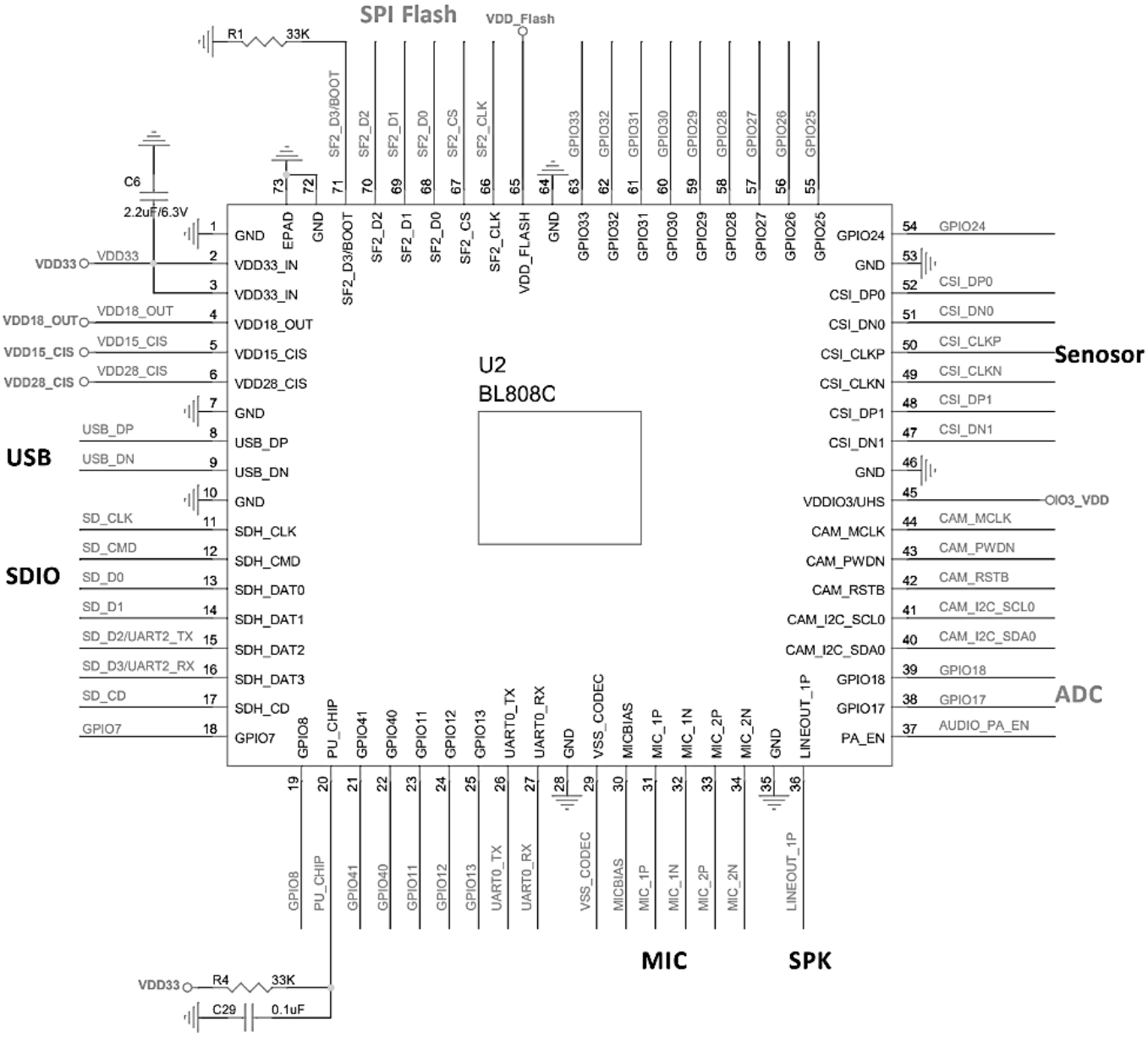


Typical application block diagram



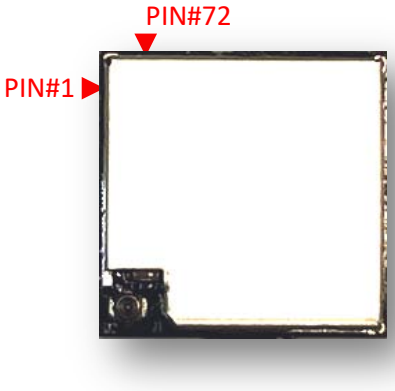
PIN DEFINITION

WAC0001 mini module PIN DEFINE



The following signal type codes are used in the table

CODE	TYPE DESCRIPTION
I	Input
O	Output
IO	Input/Output
P	Power pin
G	Ground



PIN NO.	SYMBOL	TYPE	DESCRIPTION
1	GND	G	Power GROUND
2	VDD33_IN	P	3.3VDC power source for BL808 voltage level is from 3.0V to 3.6V
3	VDD33_IN	P	3.3VDC power source for BL808 voltage level is from 3.0V to 3.6V
4	VDD18_OUT	P	1.8V power output
5	VDD15_OUT (CIS)	P	1.5V power output for external CIS
6	VDD28_OUT (CIS)	P	2.8V power output for external CIS
7	GND	G	GROUND
8	USB_DP	IO	USB D+
9	USB_DN	IO	USB D-
10	GND	G	GROUND
11	SDHC_CLK	IO	SD/MMC SDIO clock signal
12	SDHC_CMD	IO	SD/MMC SDIO command/response signal
13	SDHC_DATA0	IO	SD/MMC SDIO DATA 0
14	SDHC_DATA1	IO	SD/MMC SDIO DATA 1
15	SDHC_DATA2	IO	SD/MMC SDIO DATA 2
16	SDHC_DATA3	IO	SD/MMC SDIO DATA 3
17	SDHC_CD	IO	SD/MMC card detection
18	GPIO7	IO	Digital GPIO pin
19	GPIO8	IO	Digital GPIO pin
20	PU_CHIP	IO	BL808 CHIP enable
21	GPIO41	IO	Digital GPIO pin
22	GPIO40	IO	Digital GPIO pin
23	GPIO11	IO	Digital GPIO pin
24	GPIO12	IO	Digital GPIO pin

25	GPIO13	IO	Digital GPIO pin
26	UART0_TX	IO	Sys UART TX pin
27	UART0_RX	IO	Sys UART RX pin
28	GND	G	GROUND
29	VSS_CODEC	G	Codec GROUND
30	MIC_BIAS	IO	Microphone bias voltage
31	MIC1_P	I	MIC input Diff+
32	MIC1_N	I	MIC input Diff-
33	-	-	Internal use
34	-	-	Internal use
35	GND	G	GROUND
36	LINEOUT_P	O	Line output Diff+
37	AUDIO_PA_EN	IO	Audio PA enable pin
38	GPIO17 (for L.S. ADC)	IO	ADC I/O (for ALS)
39	GPIO18 (for L.S. ADC)	IO	ADC I/O (for ALS)
40	CAM_I2C_SDA0	IO	CIS I2C: SDA
41	CAM_I2C_SCL0	IO	CIS I2C: SCL
42	CAM_RSTB	IO	CIS Reset
43	CAM_PWDN	IO	CIS Power ON
44	CAM_MCLK	IO	CIS MCLK
45	IO3_VDD	P	VDDIO3
46	GND	G	GROUND
47	CSI_DN1	IO	MIPI CSI DATA LANE1 Diff-
48	CSI_DP1	IO	MIPI CSI DATA LANE1 Diff+
49	CSI_CLKN	IO	MIPI CSI clock LANE Diff-
50	CSI_CLKP	IO	MIPI CSI clock LANE Diff+
51	CSI_DN0	IO	MIPI CSI DATA LANE0 Diff-
52	CSI_DP0	IO	MIPI CSI DATA LANE0 Diff+
53	GND	G	GROUND
54	GPIO24	IO	Digital GPIO pin
55	GPIO25	IO	Digital GPIO pin
56	GPIO26	IO	Digital GPIO pin
57	GPIO27	IO	Digital GPIO pin
58	GPIO28	IO	Digital GPIO pin
59	GPIO29	IO	Digital GPIO pin

60	GPIO30	IO	Digital GPIO pin
61	GPIO31	IO	Digital GPIO pin
62	GPIO32	IO	Digital GPIO pin
63	GPIO33	IO	Digital GPIO pin
64	GND	G	GROUND
65	VDD_Flash	P	Flash power pin
66	SF2_CLK	IO	SPI: clock signal (NOR Flash)
67	SF2_CS	IO	SPI: Chip select (NOR Flash)
68	SF2_D0	IO	SPI Data0 (NOR Flash)
69	SF2_D1	IO	SPI Data1 (NOR Flash)
70	SF2_D2	IO	SPI Data2 (NOR Flash)
71	SF2_D3 / BOOT	IO	SPI Data3 (NOR Flash) / System BOOT
72	GND	G	GROUND
73	GND	G	GROUND PAD

ELECTRICAL CHARACTERISTICS

1. Absolute ratings

PARAMETER	DESCRIPTION	MINIMUM	MAXIMUM	UNIT
Ts	storage temperature	-40	+125	℃
VCC	supply voltage	-0.3	+3.63	V

2. Operation criteria

PARAMETER	DESCRIPTION	MINIMUM	TYPICAL	MAXIMUM	UNIT
Ta	operation temperature	-20	-	+85	℃
VCC	Main voltage IN	+3.0	+3.3	+3.63	V

3. System operation power consumption (Condition: VCC=+3.3V / temperature: 25℃)

MODE	DESCRIPTION	TYPICAL	UNIT
Full operation	1080p30 encode + Wi-Fi streaming + ISP handling + CIS consumption (not include speaker)	250	mA

4. Wi-Fi transmit power consumption (Condition: VCC=+3.3V / temperature: 25℃)

MODE	PARAMETER			TYPICAL	UNIT
	mode	speed	TX power		
TX	RF ONLY (99% duty) 2.4GHz 802.11b	11Mbps	+21dBm	295	mA

5. Wi-Fi receive power consumption (Condition: VCC=+3.3V / temperature: 25℃)

MODE	PARAMETER		TYPICAL	UNIT
	mode	speed		
RX	RF ONLY	-	13	mA

6. Wi-Fi low-power standby mode consumption

MODE	DESCRIPTION	TYPICAL	UNIT
Wi-Fi standby	Low-power Wi-Fi standby mode; keep association with AP under DTIM 10 keepalive	<300	uA
Hibernate		14.3	uA

ESD IMMUNITY

Electrostatic discharge (ESD) events can happen anywhere such as fabrication and assembly process areas, production testing environments, transportation, and field applications. WEM module is designed with including ESD protection circuitry to match immunity level as per JEDEC standards as following:

DESCRIPTION	REFERENCE	RATING	UNIT
Human Body Mode (HBM)	JEDEC EIA/JESD22- A114-B, Class 2	±2,000	V
Machine Mode (MM)	JEDEC EIA/JESD22- A115-A, Class B	±200	V
Charged Device Mode (CDM)	JEDEC EIA/JESD22- C101-D, Class-III	±500	V

RF CHARACTERISTICS

1. Basic RF characters
   - Working frequency
     - 2.4GHz：2.412 ~ 2.484 GHz
   - Wi-Fi standard
     - IEEE 802.11b/g/n
   - BT/BLE standard
     - Bluetooth 5
   - Wi-Fi data transmission rate
     - 11b: 1, 2, 5.5, 11 Mbps
     - 11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
     - 11n HT20_MCS7: 65 Mbps
   - Antenna type
     - Onboard IPEX-4 connector for external antenna

2. Wi-Fi TX RF characteristics (@3.3V, 25°C)

MODE		NOTE	TYPICAL PWR	UNIT
TX power	11b – 1Mbps		21	dBm
	11b – 11Mbps		21	dBm
	11g – 6Mbps		19	dBm
	11g – 54Mbps		18	dBm
	11n – MCS0		19	dBm
	11n – MCS7		17	dBm

3. Wi-Fi RX RF characteristics (@3.3V, 25°C)

MODE		NOTE	TYPICAL SENSITIVITY	UNIT
RX sensitivity	11b – 1Mbps		-96	dBm
	11b – 11Mbps		-89	dBm
	11g – 6Mbps		-91	dBm
	11g – 54Mbps		-75	dBm
	11n – MCS0		-90	dBm
	11n – MCS7		-71	dBm

4. BLE TX RF characteristics (@3.3V, 25°C)

MODE	NOTE	TYPICAL PWR	UNIT

TX power		10	dBm
		(MAX. 20)	dBm

5. BLE RX RF characteristics (@3.3V, 25°C)

MODE		NOTE	TYPICAL SENSITIVITY	UNIT
RX sensitivity	1Mbps		-98	dBm
	2Mbps		-95	dBm

6. BT TX RF characteristics (@3.3V, 25°C)

MODE		NOTE	TYPICAL PWR	UNIT
TX power	BR output		10	dBm
	EDR output		8	dBm

7. BLE RX RF characteristics (@3.3V, 25°C)

MODE		NOTE	TYPICAL SENSITIVITY	UNIT
RX sensitivity (max. reception level)	BR 1Mbps	0.1% BER, Duty Off	-92	dBm
	EDR 2Mbps		-93	dBm
	EDR 3Mbps		-87	dBm

ANTENNA DESIGN

The IPEX-4 connector male-type is mounted on WAC0001 module

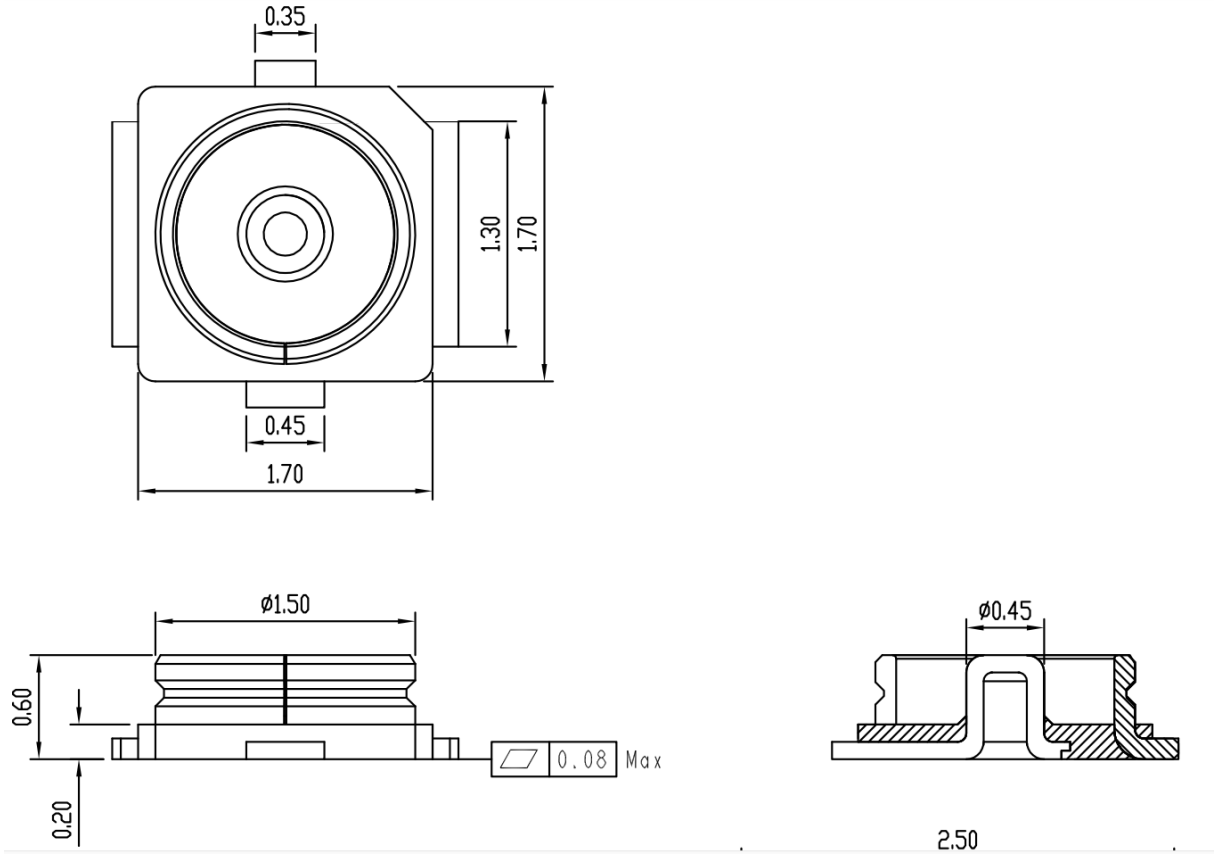
1. Material
   - Housing
     - LCP
   - Contact of plating
     - Center contact plating on contact area: Gold
     - Other area: Nickel
   - Grounded of plating
     - Shell contact plating on contact area: Gold
     - Other area: Nickel

2. Ratings
   - Voltage rating
     - 60VAC (R.M.S.)

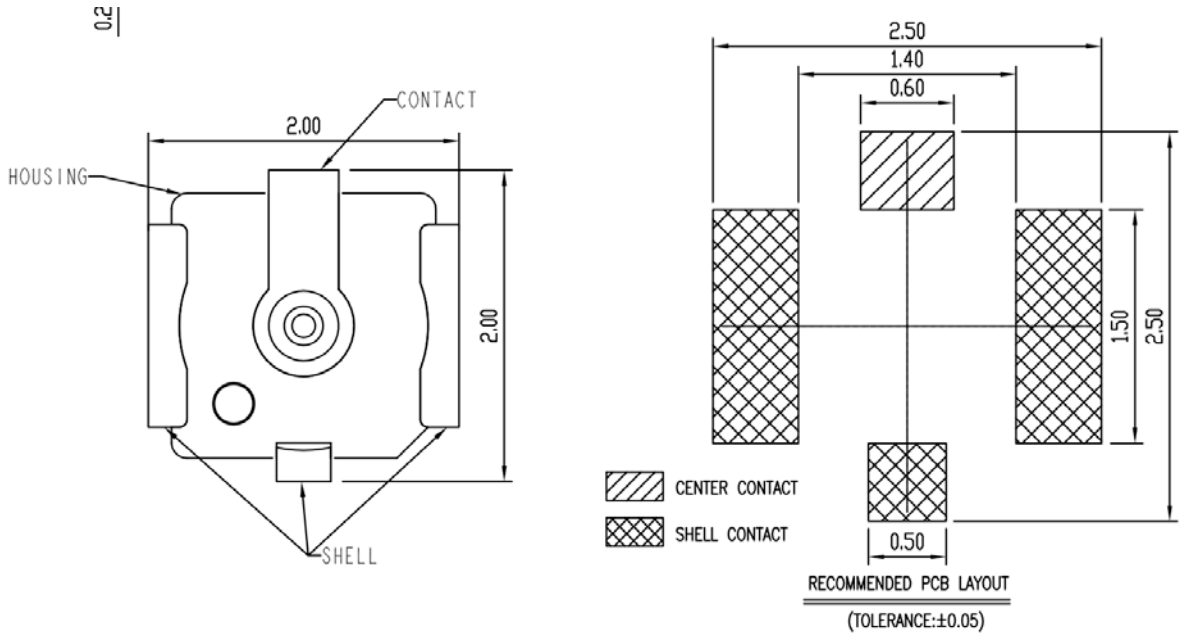
3. Electrical
   - Normal impedance
     - 50 Ω
   - Frequency range
     - DC ~ 6G Hz

4. Mechanical
   - Peeling resistance (un-mating force)
     - 10gf ~ 130gf
   - Durability
     - 20 cycles

5. Dimension
   IPEX-4 female on WAC0001 module:



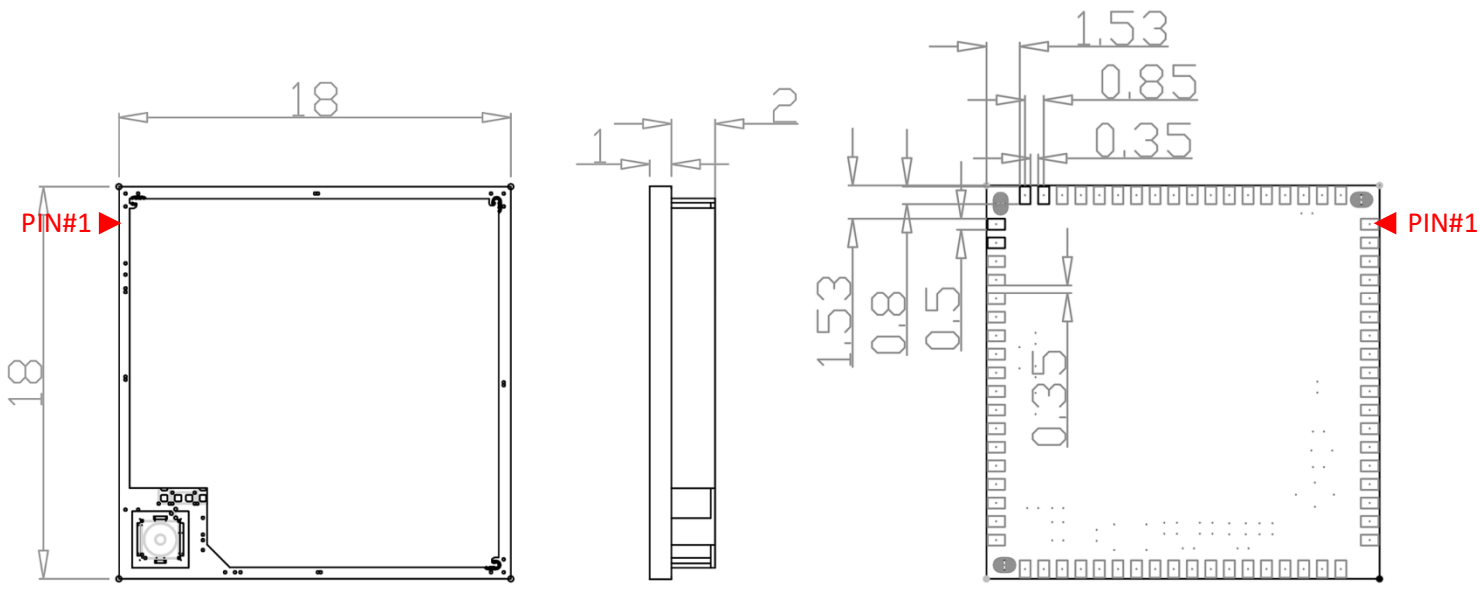
IPEX-4 male from Antenna suggestion:



MODULE PACKAGE

Mechanical dimension

TOP VIEW SIDE VIEW BOTTOM VIEW



unit: mm

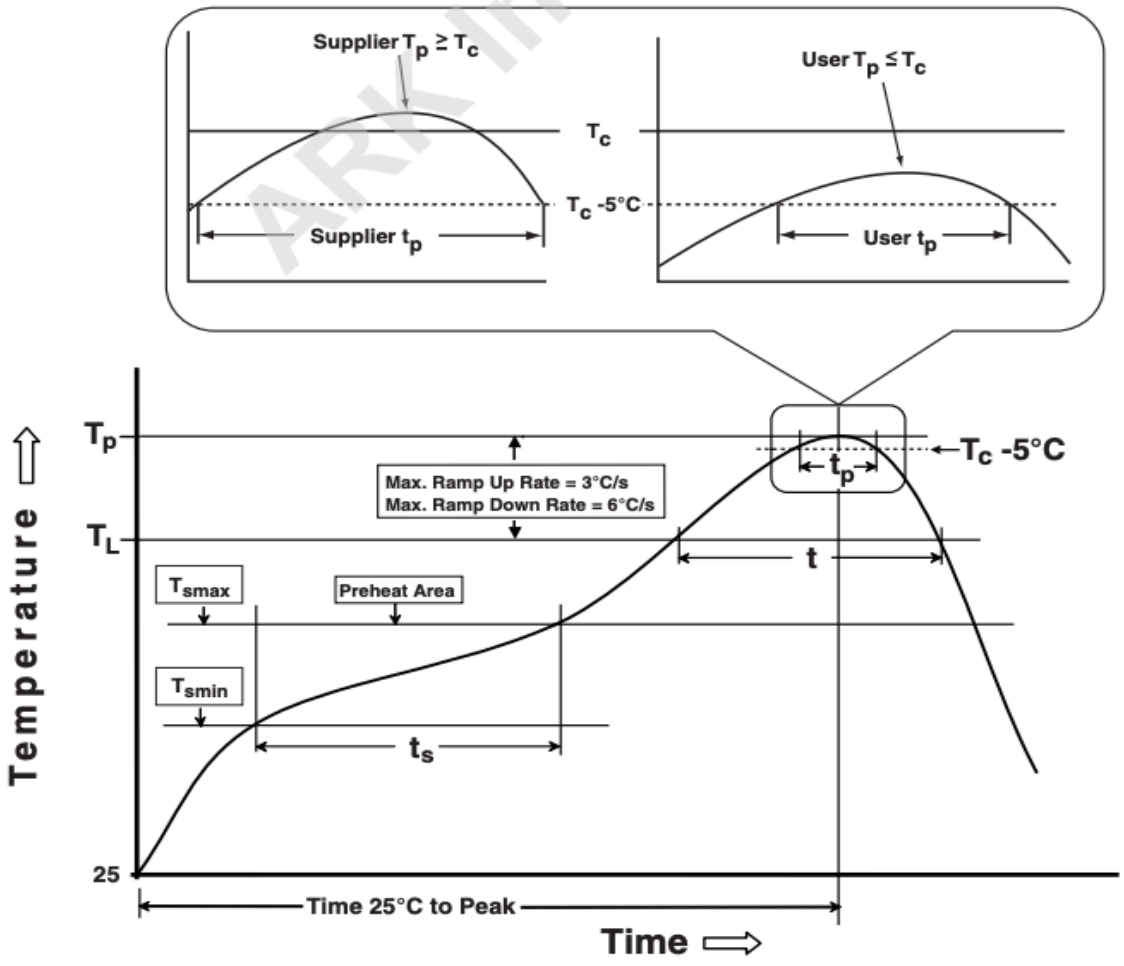
PRODUCTION GUIDELINE

The storage conditions of the WAC0001 module are as following:

1. The moisture-proof bag must be stored in an environment where the temperature is less 30℃ and the humidity is less 80%RH
2. The shelf life of fry-packaged products should be 6 months from the date of sealing the package
3. Precautions:
   - In the whole production process, all operators must wear electrostatic rings
   - During operation, strictly prevent the module from getting water or dirt

Recommended reflow furnace temperature curve

1. Referred to IPC/JEDEC J-STD-020E standard
2. Peak temperature: <250℃
3. Number of times: <= 2 times



Classification Profiles

Profile Feature	Pb-Free Assembly
Preheat/Soak Temperature Min (T_{smin}) Temperature Max (T_{smax}) Time (t_s) from (T_{smin} to T_{smax})	 150 °C 200 °C 60-120 seconds
Ramp-up rate (T_L to T_p)	3 °C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-150 seconds
Peak package body temperature (T_p)	For suppliers T_p must equal or exceed the Classification temp 245 °C
Time (t_p)* within 5 °C of the specified classification temperature (T_c), see Figure	30* seconds
Ramp-down rate (T_p to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum	

SHIELDING CAN

WAC0001 is designed with a shielding can to ensure compliance with RF specifications and expected RF performance. The shielding can uses industrial grade alloys, which has excellent toughness, good corrosion resistance, and has a bright silver-white appearance and stability

- shielding can material: Copper-Nickel Alloy (also called Cu-Ni Alloy)
- shielding can thickness: 0.2mm (+/- 0.02mm)
- shielding can fixing method: SMT welding

SYSTEM SPECIFICATION

The WAC0001 based system can perform following general specification (please contact sales representative if more specifications are required):

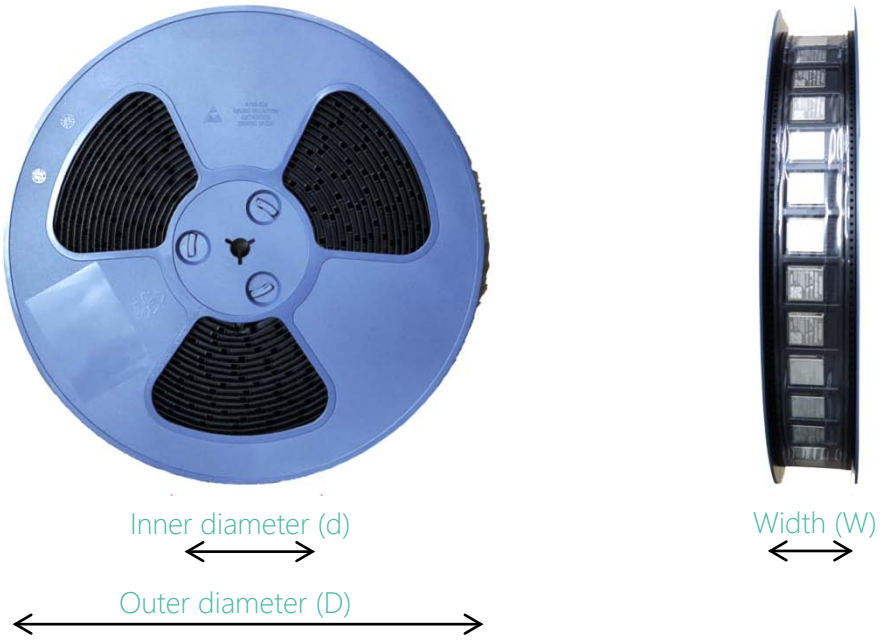
CAMERA	
CMOS Image Sensor	main stream 2MP CIS integrated with ISP optimization (*please contact sales representative for available integrated CIS listing information)
Optical Lens	variety fixed lens integrated with ISP optimization (*please contact sales representative for available integrated Lens detail information)
Image Signal Processing	built-in ISP for image handling
Image Setting	brightness / contrast / sharpness / saturation / flip / mirror
IMAGE	
Compression Format	JPEG
JPEG Quality Level	64 compression quality levels adjustable
VIDEO	
Image Processor	Blaitek BL808 SoC platform (RISC-V architecture)
Max. Resolution	HD-1080p (1920 x 1080)
Compression Format	H.264
Streaming	Up to dual streaming 1080p30 + 480p30
Bitrate	adjustable CBR bitrate or VBR
Video Stream Setting	resolution / fps (frame per second) / bitrate
AUDIO	
Compression Format	PCM
Audio Input	single channel audio input
Audio Output	single channel audio output
Streaming	full duplex 2-way audio communication
Echo Cancellation	AEC (auto echo cancellation) supported
ADVANCE	
Wireless Network	2.4GHz Wi-Fi + BT-BLE 5 + Zigbee
Wi-Fi Standard	IEEE 802.11n 2.4GHz Wi-Fi compatible
Bluetooth Standard	BT–BLE 5 dual modes
Zigbee Standard	802.15.4 Zigbee compatible

Live Streaming	RTC (Real Time Communication) live video and audio streaming (AWS KVS with WebRTC / agora RTC supported)
Wi-Fi Low Power Standby	supported
Wi-Fi Remote Wakeup	supported
Firmware Upgrade	OTA supported (dual-image design)
Instant Response	ultra-fast system bootup (cold start) in mini second ultra-fast first snapshot <0.3 sec ultra-fast Wi-Fi ready-to-transmit <2 sec
EVENT MANAGEMENT	
Event Trigger	general battery camera event type: - dingdong (ring button) - battery low voltage - motion detected - demolition - linger
Event Action	general battery camera event action: - mobile push text notification to iPhone/Android Phone - push event snapshot notification to iPhone/Android Phone - melody playback / siren - event clip recording - http push command
PERIPHERALS	
Input & Output	- MIPI (Video Input) - USB (UVC output for production purpose only) - SDHC - High-speed UART - SPI - Digital GPIO - PWM - MIC (Audio In) - SPK (Audio Out) - Antenna RF path
ENVIRONMENTAL CONDITION	
Operation Temp.	-20 degree C ~ +60 degree C (-4 degree F ~ +140 degree F)
Operation Humidity	0% ~ +90% humidity, non-condensing

PACKING

WAC0001 modules are packaged on reel; then the reel is packaged in an anti-static shielding bag in vacuum state to protect modules from absorbing moisture during transportation and storage. At last, the anti-static shielding bags are packaged into a carton box.

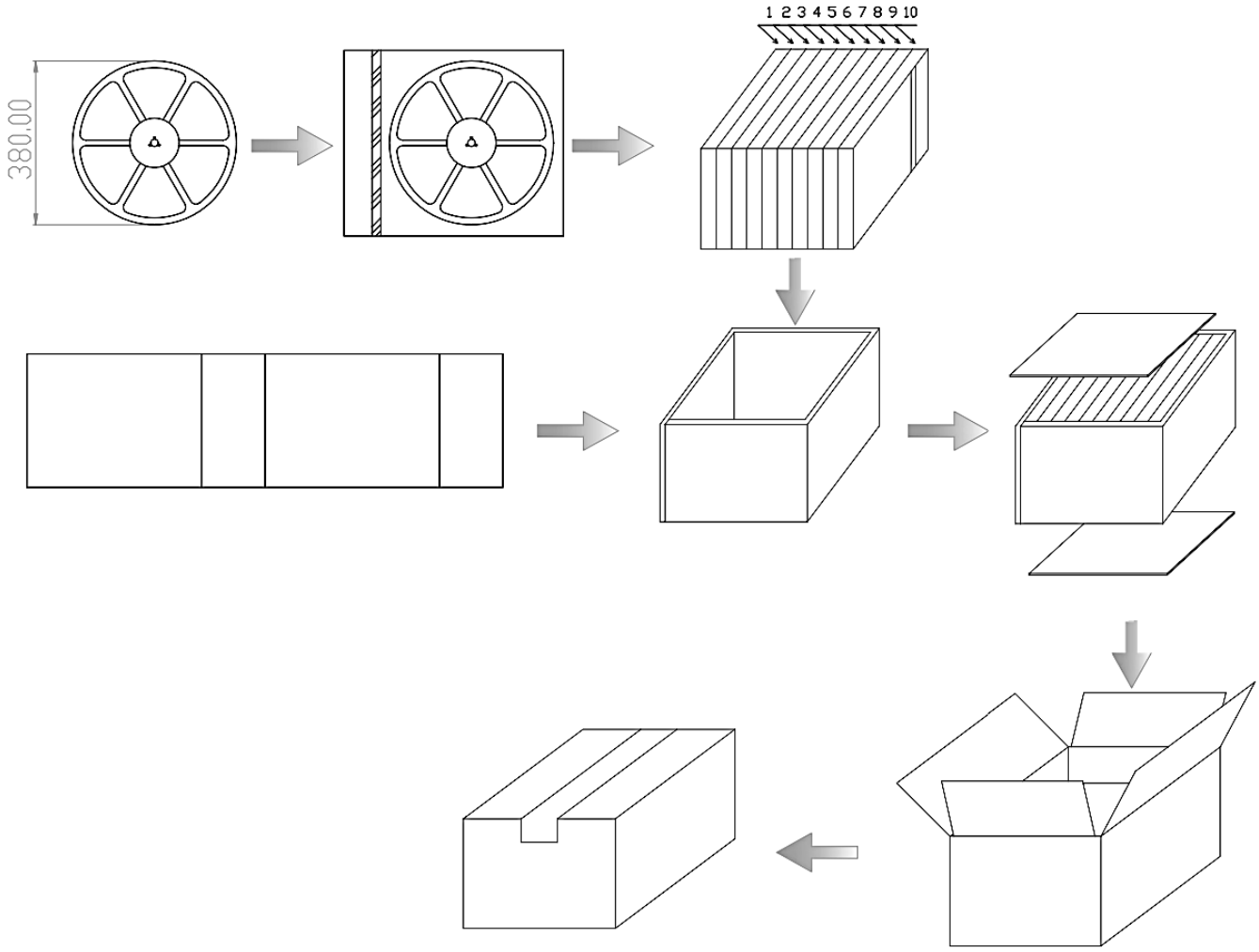
- reel specifications
  figure shows the reel specifications of WAC0001 modules



reel size	d (mm)	D (mm)	W (mm)
16″	92	380	34

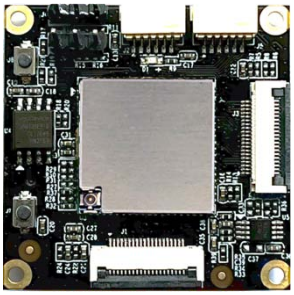
- quantity per reel
  the WAC0001 module quantity per reel is 1,000 pcs

- anti-static shielding bag and carton box
  every reel of WAC0001 modules will be properly handled in the vacuum packaging and every ten reels of vacuum-packed WAC0001 modules will be packed into single carton as following diagram


380.00
1 2 3 4 5 6 7 8 9 10

ORDERING INFORMATION

WAC series includes following part number:

Part number	Description
WAC0001 	Dual-core H264 encoder, 256Mb PSRAM, 2.4GHz single band Wi-Fi+BT-BLE, including shielding case, IPEX-4 male, RoHS
WAC0002 	Dual-core H264 encoder, 512Mb PSRAM, 2.4GHz single band Wi-Fi+BT-BLE, including shielding case, IPEX-4 male, RoHS
WAC0001-MB-001 	38x38 module main board - WAC0001 included - Kernel main board design with flash and I/O for connection with CIS board and Power board

FCC WARNING

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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 usedin 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.

This equipment complies with FCC radiation exposure limits set forth for an uncon- trolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Radiation Exposure Statement:

This equipment complies with FCC 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.
The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.
The firmware setting is not accessible by the end user.
The final end product must be labelled in a visible area with the following:
“Contains Transmitter Module “FCC ID: QUY-WAC0001”

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power,spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See alsoSection

2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C (15.247).it Specifically identified AC Power Line Conducted Emission, Radiated Spurious emissions, Band edge and RF Conducted Spurious Emissions, Conducted Peak Output Power, Bandwidth, Power Spectral Density, Antenna Requirement.

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to- point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The product antenna uses an irreplaceable antenna with a gain of 5.42dBi (Max)

2.4 Single Modular

If a modular transmitter is approved as a "Single Modular ," then the module manufacturer isresponsible for approving the host environment that the Single Modular is used with. The manufacturer of a Single Modular must describe, both in the filing and in the installation instructions, the alternative means that the Single Modular manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A Single Modular manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited

module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This Single Modular procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited

module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module. **Explanation:** The module is a single module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna); b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered); c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout; d) Appropriate parts by manufacturer and specifications; e) Test procedures for design verification; and f) Production test procedures for ensuring compliance

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application

2.6 **RF exposure considerations**

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the applicationconditions

(mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: The module complies with FCC radiofrequency radiation exposure limits for uncontrolled environments. The device is installed and operated with a distance of more than 20 cm between the radiator and your body." This module follows FCC statement design,

FCC ID: QUY-WAC0001

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The product antenna uses an irreplaceable antenna with a gain of 5.42dBi (Max)

2.8 **Label and compliance information**

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: QUY-WAC0001

2.9 **Information on test modes and additional testing requirements5** Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host. Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: Trend Electronics Co., Ltd. can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 **Additional testing, Part 15 Subpart B disclaimer**

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that 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. If the grantee markets their product

as being Part 15
Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.