Everestek
Wireless Module
EW21TPV
5GHz 2.1CH Module
Data Sheet

Everestek Inc.

Version: 0.1

Subject to change without further notice.

2021/09/01

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1. Features

The EW21TPV is a module based on Everestek ETK52 to provide 3-channel audio for 2.1 channel (L+R+subwoofer) application.

The modules can operate in either 5.8GHz or 5.2GHz

- **Radio Frequency: 5.8G and 5.2G unlicensed bands**
- **Short Audio Latency: 19 ms (I2S to I2S @ 48K Fs)**
- **Delay Time Variation + audio jitter is only +/- 6.5μ sec.**
  (Total delay time variation is less than +/-2.5 degree @ 1K sine tone.)
- **Link Distance: up to 20 Meters**
- **Advanced RF Selection Algorithm**
- **Small RF Foot Print**
- **Best Coexistence with Wi-Fi/Bluetooth**
- **Highly Integrated SoC: RF/PA/CPU/Flash Embedded**
- **Wide-Band Antenna on Module**
- **Short RBOM List**
- **RF Modulation: FSK**
- **Digital I2S (master or slave) Audio Interface, 24bit , 32/44.1/48KHz Sampling Rate**
- **Low Power Consumption**
- **Supply Voltage: 2.7~3.6V**
- **Support I2C master/slave mode and UART**
- **Compliant with EMC Regulations (FCC/CE)**

2. Application

- **Wireless 2.1 Channels Audio**
- **Dolby Digital 5.1**
- **Dolby ATMOS 5.1.2 / 5.1.4**

3. Electrical Specifications

RF Specification

Item	Min	Typ	Max	Unit	Note
RF Carrier Frequency	5725	—	5850	MHz	For 5.8GHz
	5135	—	5260	MHz	For 5.2GHz
-20dB bandwidth	—	2	—	MHz	
Output Power		7		dBm	
RF Sensitivity	—	-85		dBm	

Operation Condition

Item	Min	Typ	Max	Unit	Note
VDD	2.7	3.3	3.6	V	Power Supply Voltage
Operating Temperature	-5	25	60	˚C	Ambient temperature

Electrical Specification (MCU+RF)

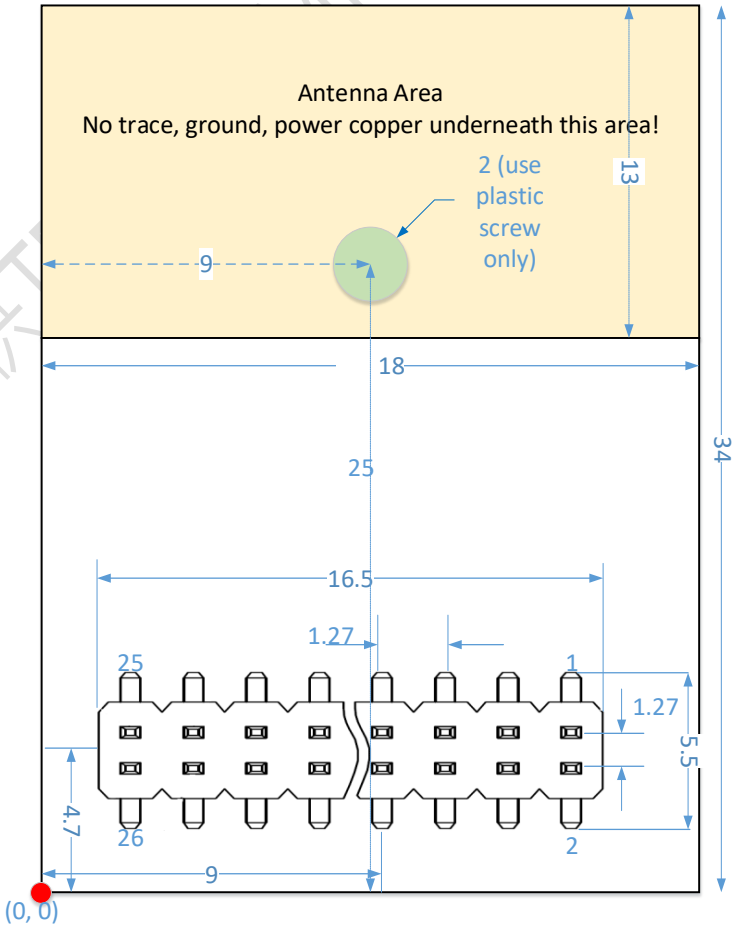
Digital interface

Item	Min	Typ	Max	Unit	Note
VIH	0.7VDD		VDD+0.2	V	Input High Threshold
VIL	VSS		0.3VDD	V	Input Low Threshold
VOH	VDD-0.3		VDD	V	Output High Threshold
VOL	0		0.3	V	Output Low Threshold

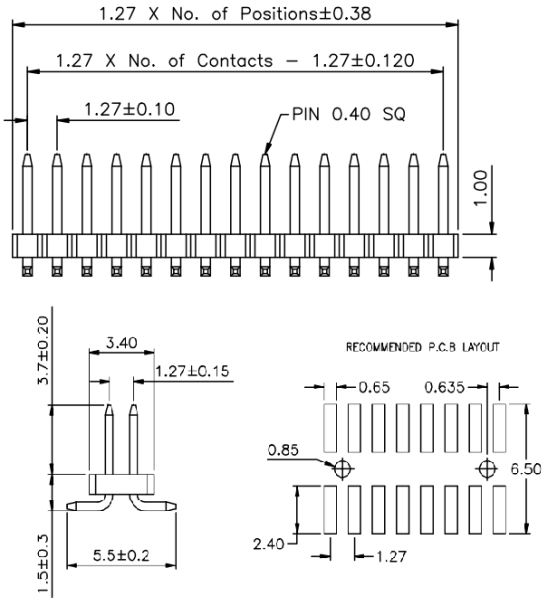
4. Mechanical Specification

Different labels and part numbers are used to distinguish Tx and Rx.

- Dimension：34 mm x 18 mm, ± 2 mm
- Height (without connector)：2.5 ± 0.2 mm
- PCB 4 Layers
- Mechanical Drawing:
  Bottom view

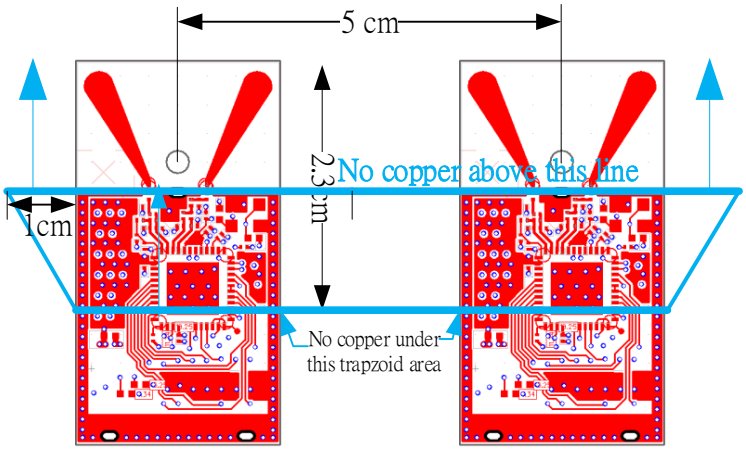


- Connector Drawing:

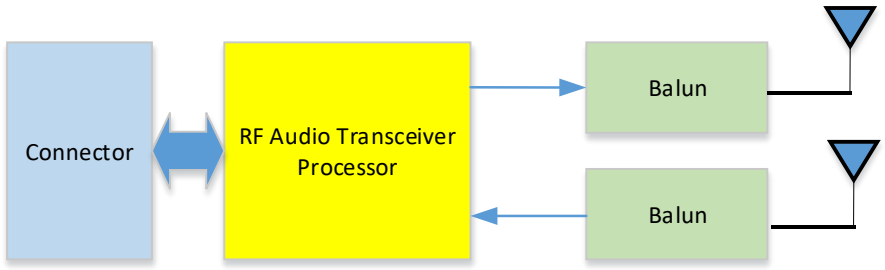


The no copper area is showed below in pink color. The main board layout should no copper, no trace underneath this area.

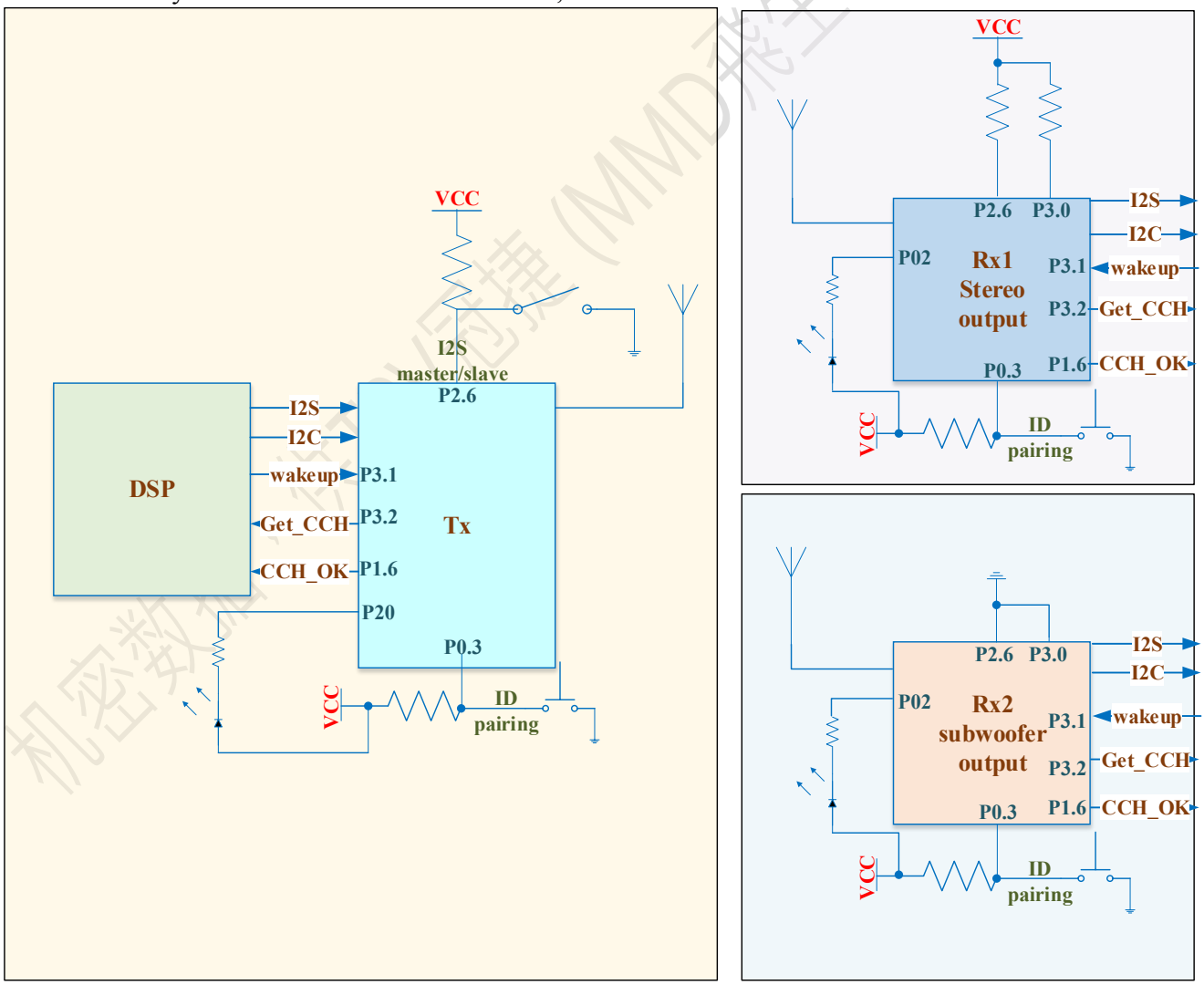
If application is 2T mode (2T3R, 2T5R), the module placement as followed,



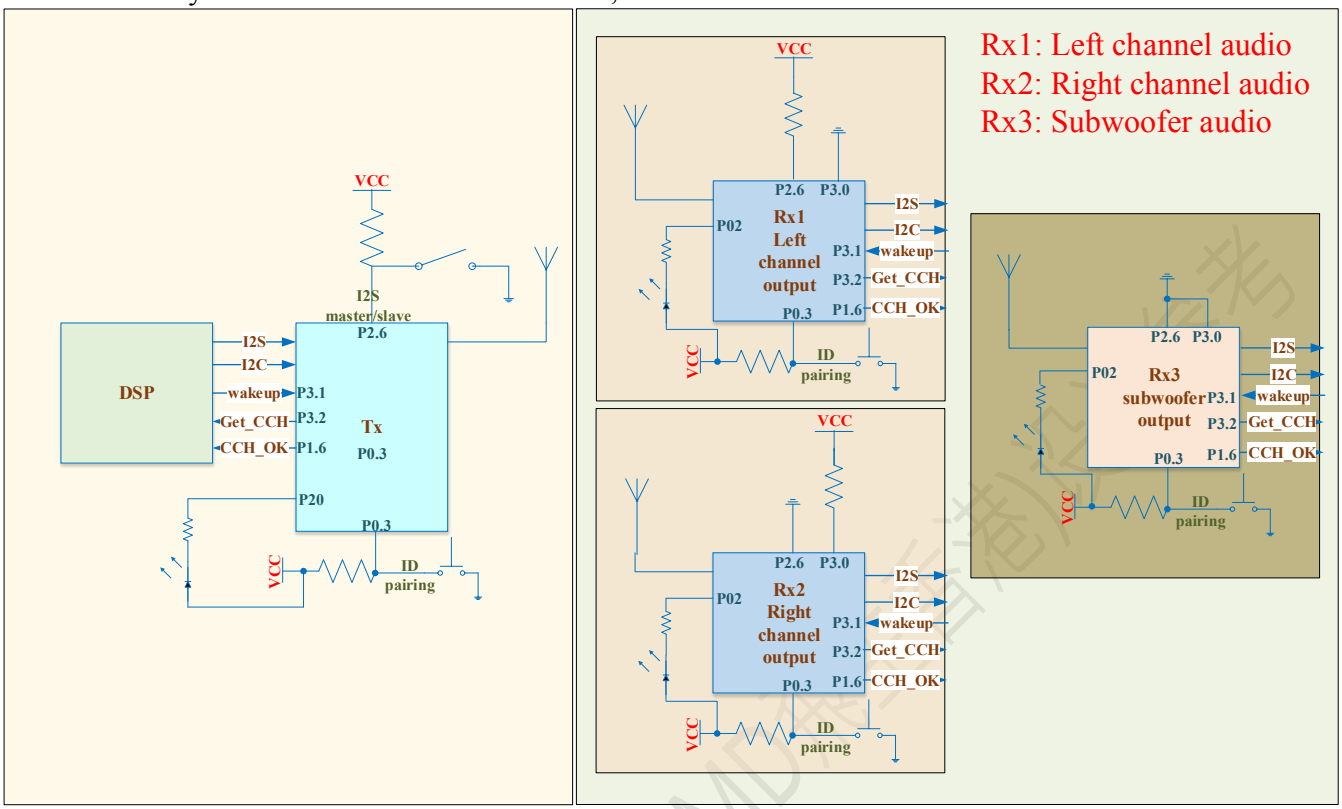
5. Block Diagram and Typical Application



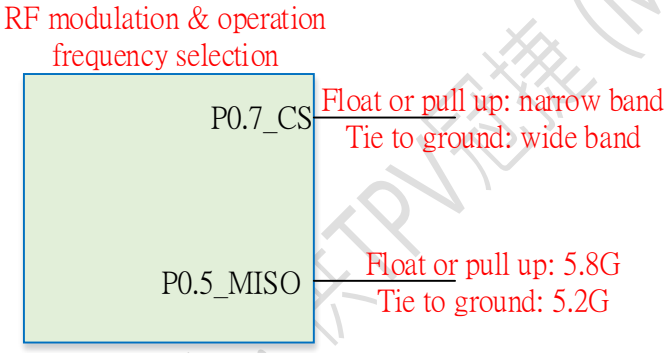
EW21TPV typical application is a 1Tx-2Rx or 1Tx-3Rx system. External DSP feed in "stereo + subwoofer " data through two I2S-data signal. Rx can output stereo/left channel/right channel/subwoofer audio by setting GPIO2.6 and 3.0.
If system is 1Tx-2Rx, Rx#1 will output stereo audio, Rx#2 will output subwoofer.
If system is 1Tx-3Rx, Rx#1 will output left channel audio, Rx2 will output right channel audio, Rx#3 will output subwoofer. System function is determined by two GPIO.
The 1Tx-2Rx system architecture is shown below,



The 1Tx-3Rx system architecture is shown below,



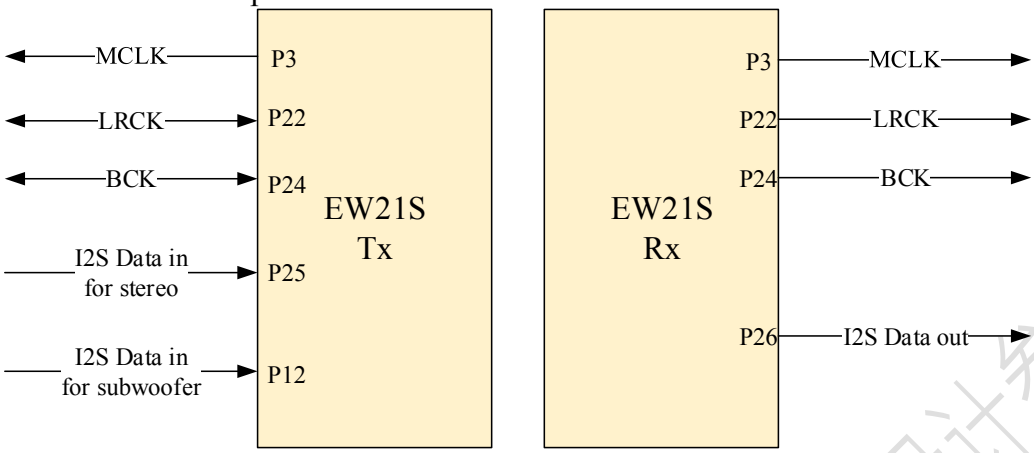
RF operating frequency and RF modulation can be set by GPIO as the chart showed,



Note: detail operation please refer to “Everestek_EW21S_2.1_I2C Command Description.pdf” document.

I2S signals connection is shown below, (pin number is 26-pin connector)

2.1 Channel I2S pins connections



Note: Subwoofer I2S output, L-channel data will be the original data from Tx, R-channel will be the inverse data of L-channel.

6. I2S Format

ETK51 I2S data in and data out share the same LRCK and BCK pins. ETK51 can work in master mode and slave mode. The audio sampling rate can be 32/44.1/48K.

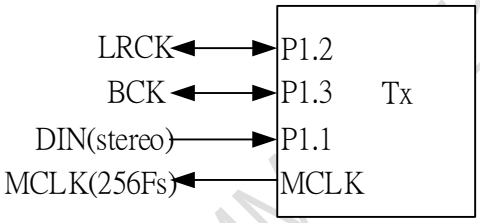
In master mode, ETK51 will generate I2S_MCLK/LRCK/BCK for external audio codec. In slave mode, ETK51 will receive external LRCK/BCK signal.

ETK51 has a digital controlled PLL, so the clock jitter noise will not be a problem in Rx.

During operate in slave mode, ETK51 will tracking external audio clock to make Tx and Rx work in the same frequency.

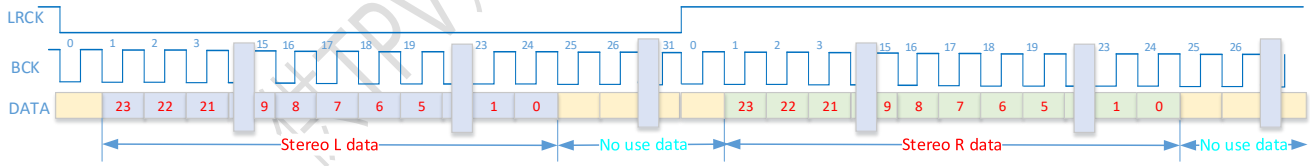
Mono channel data can feed through left channel (Lch) or right channel (Rch).

If 2(stereo) or 1(mono) channel application, Tx I2S signal connection as followed,



Note: if module is operated in I2S slave mode, module don't need MCLK signal. Only need BCK, LRCK, DIN signals.

ETK51 work in 64 Fs mode. This means total 64 BCK pulse in one LRCK cycle. The I2S signal as the chart followed,

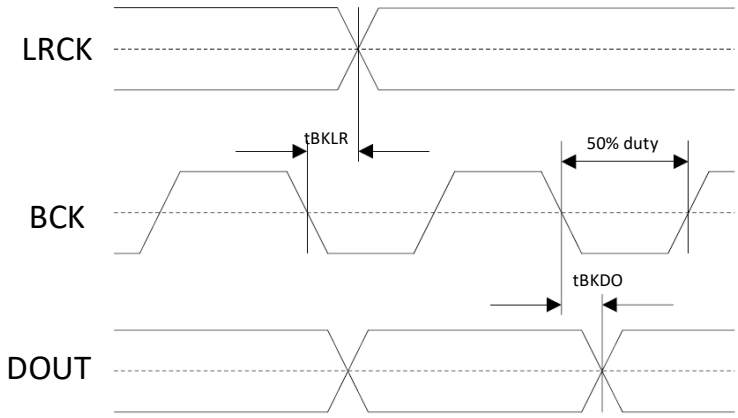


I2S master mode (Tx and Rx site) switching characteristics

Symbol	Min	Typ	Max	Unit
MCLK		256fs		Hz
BCK		64fs		Hz
Duty (MCLK, BCK)		50		%

Symbol	Min	Typ	Max	Unit	Note
tBKLR	-1		+1	ns	
tBKDO (Rx only)	-1		+1	ns	BCK falling edge to DOUT transient

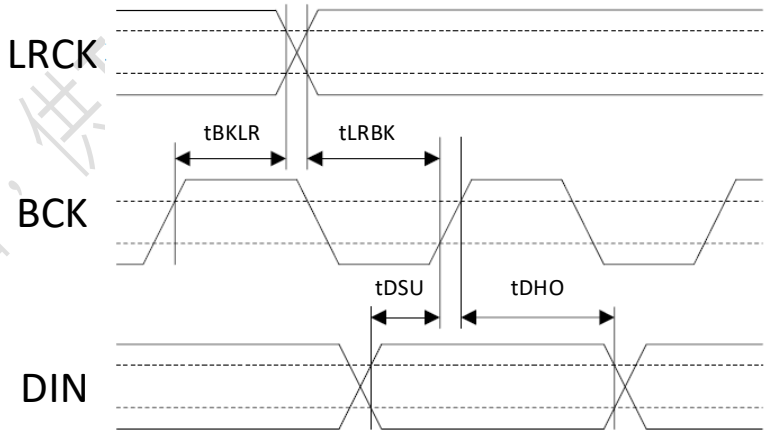
Note: DIN setup time and hold time timing in master mode is same as slave mode.



I2S slave mode (Tx site) switching characteristics

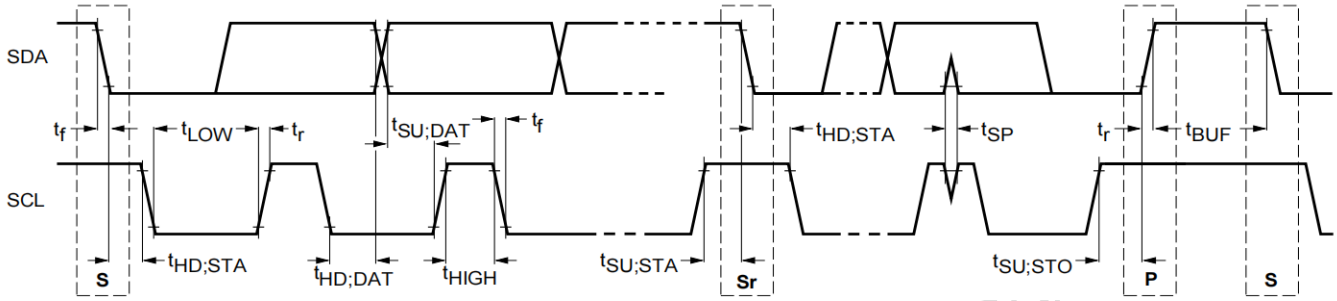
Symbol	Min	Typ	Max	Unit
BCK		64fs		Hz

Symbol	Min	Typ	Max	Unit	Note
tBKLR	10			ns	BCK rising to LRCK edge
tLRBK	10			ns	LRCK edge to BCK rising
tDSU	20			ns	DIN setup time
tDHO	20			ns	DIN hold time



Second I2S data input please refer to manual “2.1_Second_I2S_AppNote v1.0 for client.pdf”.

7. I2C Timing



Parameter	Symbol	Min	Max	unit
SCL clock frequency	F_{SCL}		200	KHz
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD;STA}$	4		us
LOW period of the SCL clock	t_{LOW}	2.2		us
HIGH period of the SCL clock	t_{HIGH}	2.2		us
Set-up time for a repeated START condition	$t_{SU;STA}$	4		us
Data hold time:	$t_{HD;DAT}$	0		us
Data set-up time	$t_{SU;DAT}$	100		ns
Rise time of both SDA and SCL signals	t_r		500	ns
Fall time of both SDA and SCL signals	t_f		300	ns
Set-up time for STOP condition	$t_{SU;STO}$	4		us
Bus free time between a STOP and START condition	T_{BUF}	10		us

Please also refer to “Everestek_I2C_200KHz_and_USB_HID_desciption.pdf” for detail.

8. Module Pin Definition

Pin	Name	I/O	Function Definition
1	VDD	P	VDD (2.7V~3.6V)
2	DGND	P	System ground
3	CODEC_12M	O	For audio codec system clock 12.288MHz for Fs 48K and 32K, 11.2896MHz for 44.1K
4	P2.0	I/O	GPIO
5	D-	A	USB D-
6	P2.6_PWM	I/O	GPIO or PWM
7	D+	I/O	USB D+
8	P0.2_TXD	I/O	GPIO or UART TXD
9	P0.7_CS	I/O, C	GPIO and SPI chip select for programming internal flash mode, or Arm Debug port
10	P0.3_RXD	I/O	GPIO or UART RXD, ARM debug port
11	P1.6	I/O	GPIO
12	P1.5_I2S_DataIn2	I/O	GPIO or 2nd I2S data input for subwoofer
13	P0.6_SCK	I/O	GPIO and SPI SCK for SPI in programming internal flash mode, or Arm Debug port
14	P3.2_ADC_IN	I/O, A	GPIO or ADC input
15	P0.5_MISO	I/O, C	General I/O and SPI MISO for SPI in programming internal flash mode, or Arm Debug port
16	FLASH_PROG	C	Program mode select, active high, default pull low For programming internal flash memory Please leave this pin float for normal operation.
17	P0.4_MOSI	I/O, C	GPIO and SPI MOSI for SPI in programming internal flash mode, or Arm Debug port
18	P0.0_I2C_SCL	I/O	GPIO, I2C clock
19	P0.1_I2C_SDA	I/O	GPIO, I2C data
20	P3.1	I/O	GPIO
21	P3.0	I/O, A	GPIO or ADC input
22	P1.2_I2S_LRCK	I/O	I2S LRCK(input for I2S slave, output for I2S master)
23	DGND	P	Power ground
24	P1.3_I2S_BCK	I/O	I2S BCK(input for I2S slave, output for I2S master)
25	P1.1_I2S_DIN	I/O	I2S Data in(from audio codec, or from ADC I2S DATA out)
26	P1.0_I2S_DOUT	I/O	I2S Data out(to audio codec, or to DAC I2S DATA in)

Note: P:Power, I/O:GPIO, S:System use only, A:DAC/ADC, C:control

9. Audio Specifications

Audio (Stereo) Specifications (I2S to I2S) @ Sampling Rate 48K Hz

Item	Min	Typ	Max	Unit	Note
SNR		142		dB	@1kHz
THD + N		-103		dB	@1kHz
Frequency response		23		KHz	
Dynamic range		-140		dB	@1kHz

Audio (Stereo) Specifications (I2S to I2S) @ Sampling Rate 44.1K Hz

Item	Min	Typ	Max	Unit	Note
SNR		142		dB	@1kHz
THD + N		-103		dB	@1kHz
Frequency response		21		KHz	
Dynamic range		-140		dB	@1kHz

Audio (Stereo) Specifications (I2S to I2S) @ Sampling Rate 32K Hz

Item	Min	Typ	Max	Unit	Note
SNR		142		dB	@1kHz
THD + N		-101		dB	@1kHz
Frequency response		15		KHz	
Dynamic range		-140		dB	@1kHz

Audio (Subwoofer) Specifications (I2S to I2S) @ Sampling Rate 48K Hz

Item	Min	Typ	Max	Unit	Note
SNR		140		dB	@1kHz
THD + N		-97		dB	@1kHz
Frequency response		2		KHz	
Dynamic range		-139		dB	@1kHz

Audio (Subwoofer) Specifications (I2S to I2S) @ Sampling Rate 44.1K Hz

Item	Min	Typ	Max	Unit	Note
SNR		140		dB	@1kHz
THD + N		-97		dB	@1kHz

Frequency response		1.8		KHz	
Dynamic range		-139		dB	@1kHz

Audio (Subwoofer) Specifications (I2S to I2S) @ Sampling Rate 32K Hz

Item	Min	Typ	Max	Unit	Note
SNR		140		dB	@1kHz
THD + N		-97		dB	@1kHz
Frequency response		1.3		KHz	
Dynamic range		-139		dB	@1kHz

10. Audio Latency

Audio Latency (I2S to I2S)

Item	Min	Typ	Max	Unit	Note
Stereo		19.31		ms	
Subwoofer		20.31		ms	

11. Power Consumption

Electrical Specification (MCU+RF)

Item	Min	Typ	Max	Unit	Note
Tx module		83		mA	Output power 7dBm
Rx module		51.5		mA	
Tx module in sleep		0.5			Tx can only be waked up by GPIO low pulse when in deep sleep mode.
Rx module in sleep/wake	1.5		51.5	mA	When Rx loses sync with Tx, Rx will change modes between sleep and work mode. Sleep: 1.5mA Work: 51.5mA

Note: power consumption varies on different applications.

12. Ordering Information

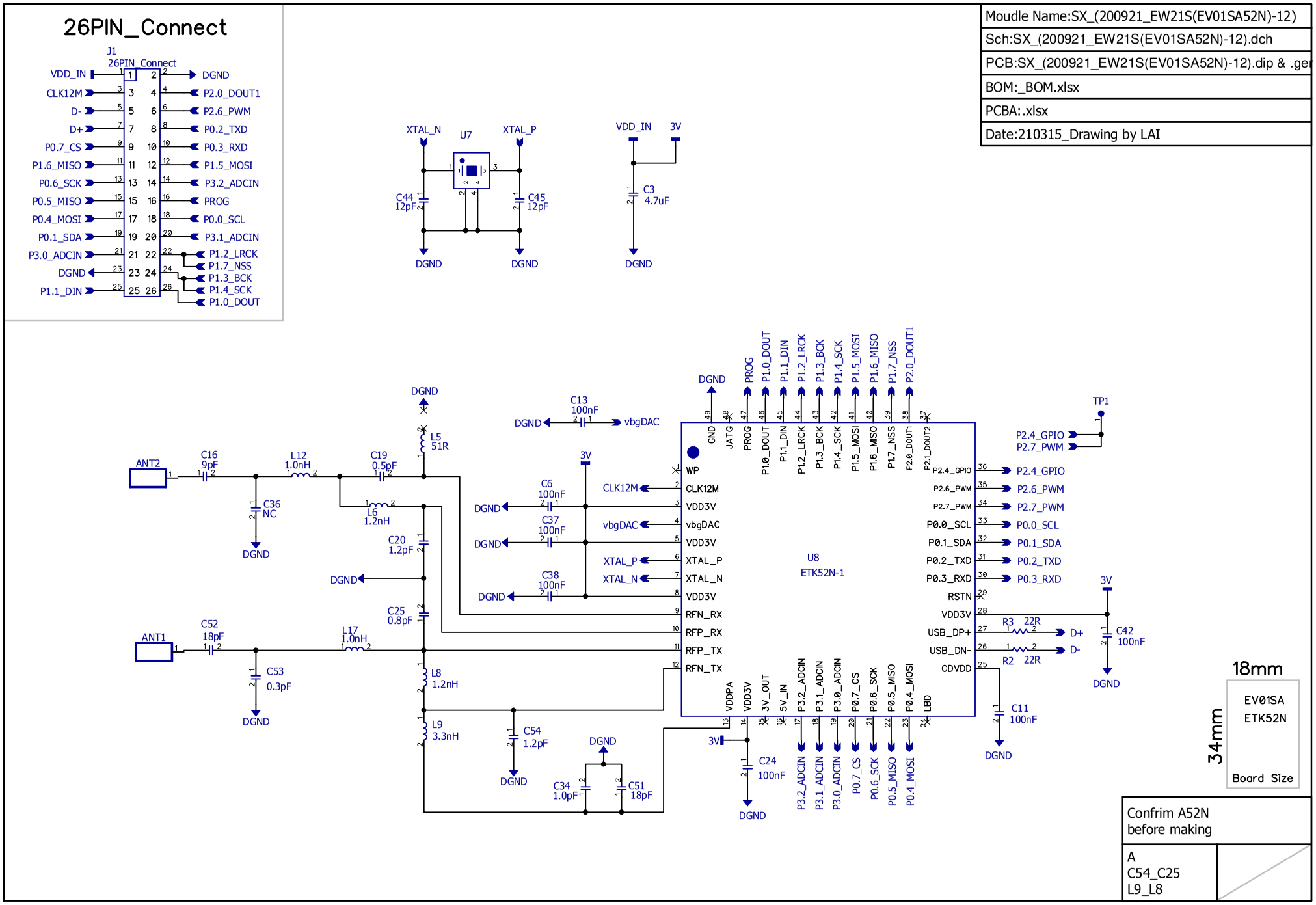
Module Model No.:

EW21TPV-TX	EW21TPV-RX

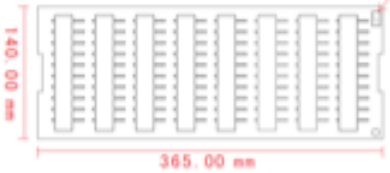
13. Revision History

Date	Revision	Descriptions
2021/08/31	0.1	Initial version

#	Quantity	RefDes	Value	Name
1	1	C53	0.3pF	C_0201
2	1	C19	0.5pF	C_0201
3	1	C25	0.8pF	C_0201
4	1	C34	1.0pF	C_0201
5	2	C20, C54	1.2pF	C_0201
6	1	C16	9pF	C_0201
7	2	C51, C52	18pF	C_0201
8	7	C6, C11, C13, C24, C37, C38, C42	100nF	C_0201
9	2	C44, C45	12pF	C_0402
10	1	C3	4.7uF	C_0402
11	2	L12, L17	1.0nH	L_0201
12	2	L6, L8	1.2nH	L_0201
13	1	L9	3.3nH	L_0201
14	2	R2, R3	22R	R_0402
15	1	L5	51R	L_0201
16	1	J1	PIN_2X13_1.27_SMD 26PIN_Connect	
17	1	U7	XTAL_3.2X2.5MM	XTAL
18	1	U8	QFN48_0.5_7X7	ETK52N
---NC---				
NC	1	C36	NC	C_0201
NC	2	ANT1, ANT2		Rabbit ANT-4
NC	1	TP1		TP_0.6mm

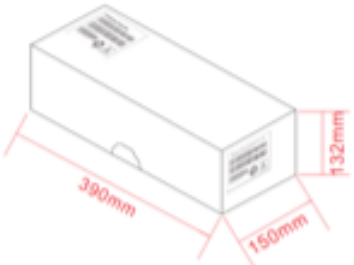

26PIN_Connect
J1
26PIN_Connect
VDD_IN
CLK12M
D-
D+
P0.7_CS
P1.6_MISO
P0.6_SCK
P0.5_MISO
P0.4_MOSI
P0.1_SDA
P3.0_ADCIN
DGND
P1.1_DIN
DGND
P2.0_DOUT1
P2.6_PWM
P0.2_TXD
P0.3_RXD
P1.5_MOSI
P3.2_ADCIN
PROG
P0.0_SCL
P3.1_ADCIN
P1.2_LRCK
P1.7_NSS
P1.3_BCK
P1.4_SCK
P1.0_DOUT
Moudle Name:SX_(200921_EW21S(EV01SA52N)-12)
Sch:SX_(200921_EW21S(EV01SA52N)-12).dch
PCB:SX_(200921_EW21S(EV01SA52N)-12).dip & .ger
BOM:_BOM.xlsx
PCBA:.xlsx
Date:210315_Drawing by LAI
XTAL_N
U7
XTAL_P
C44 12pF
C45 12pF
DGND
VDD_IN
3V
C3 4.7uF
ANT2
C16 9pF
L12 1.0nH
C19 0.5pF
L5 51R
C36 NC
L6 1.2nH
C20 1.2pF
C25 0.8pF
ANT1
C52 18pF
L17 1.0nH
C53 0.3pF
L8 1.2nH
L9 3.3nH
C54 1.2pF
C34 1.0pF
C51 18pF
C13 100nF
vbgDAC
C6 100nF
C37 100nF
C38 100nF
U8
ETK52N-1
WP
CLK12M
VDD3V
vbgDAC
XTAL_P
XTAL_N
RFN_RX
RFP_RX
RFP_TX
RFN_TX
GND
JATG
PROG
P1.0_DOUT
P1.1_DIN
P1.2_LRCK
P1.3_BCK
P1.4_SCK
P1.5_MOSI
P1.6_MISO
P1.7_NSS
P2.0_DOUT1
P2.1_DOUT2
VDDPA
3V_OUT
5V_IN
P3.2_ADCIN
P3.1_ADCIN
P3.0_ADCIN
P0.7_CS
P0.6_SCK
P0.5_MISO
P0.4_MOSI
LBD
P2.4_GPIO
P2.6_PWM
P2.7_PWM
P0.0_SCL
P0.1_SDA
P0.2_TXD
P0.3_RXD
RSTN
USB_DP+
USB_DN-
CDVDD
TP1
P2.4_GPIO
P2.7_PWM
R3 22R
R2 22R
D+
D-
C42 100nF
C11 100nF
C24 100nF
18mm
34mm
EV01SA
ETK52N
Board Size
Confrim A52N
before making
A
C54_C25
L9_L8

1.托盘一盘可装80PCS,贴上30*14mm贴纸。
托盘尺寸是365*140*25mm

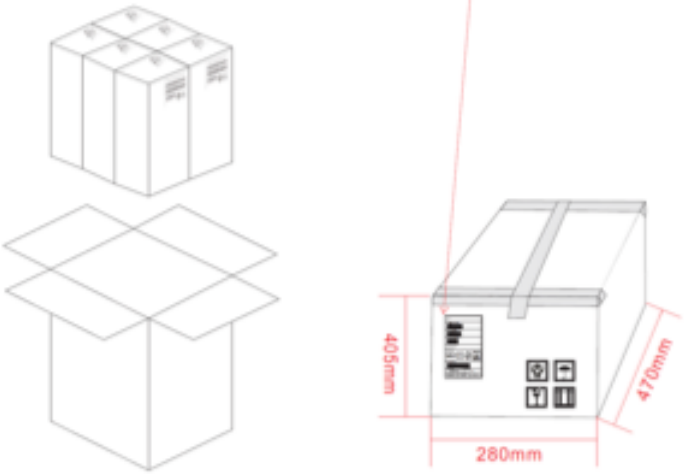


2.一盘产品装入粉红色防静电袋,封口

3. 4托盘入/内盒 80*4/320pcs盒. 内盒贴两张75*65mm内盒贴纸



4.六内盒入外箱,320*6/1920PCS/箱, 2pcs外箱标贴(100*165mm)贴外箱侧唛



Federal Communication Commission Interference Statement

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 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 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.

FCC Declaration of Conformity

We MMD Hong Kong Holding Limited declare under our sole responsibility that
Wireless Module/ EW21TPV comply with Part 15 of FCC Rules.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
This device is intended only for OEM integrators under the following conditions:
(1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
(2) The transmitter module may not be co-located with any other transmitter or antenna,

IMPORTANT NOTE:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labelled in a visible area with the following: “Contains FCC ID: 2AR2S-EW21TPV”.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

Industry Canada Statement

This device complies with license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS standard(s).

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.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

（1）l'appareil ne doit pas produire de brouillage, et

（2）l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.
Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

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 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

This radio transmitter (IC: 24589-EW21TPV) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 24589-EW21TPV)) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna Information

Model	Type	Connector	Peak gain (dBi)
EW21TPV	mono popel	N/A	0.26

Radiation Exposure Statement

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations
Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following condition:

● The transmitter module may not be co-located with any other transmitter or antenna.

As long as the condition above is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes:

● Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 1 condition ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the ISED ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

Note Importante:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID ISED ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

The final end product must be labeled in a visible area with the following: Contains IC: 24589-EW21TPV

Plaque signalétique du produit final

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC: 24589-EW21TPV

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

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.
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Caution!
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The module can be installed in mobile with 20cm that OEM shall be aware installation of the different type of the platform, such as fixed, and portable, or scenario to collocate with other transmitter requires reevaluation of RF exposure via FCC permissive change policy.
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.

In the even to modify the antenna as listed in the following, OEM integrator shall be aware to re-evaluate radiation part of the compliance scheme under FCC's permissive change policy.

Type of antenna： MONO POLE ， Antenna Gain： <0.26dBi