

UHF Wireless Audio Module **WA-TX-01/WA-RX-01A**



Operation Guide

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CIRCUIT DESIGN, INC.,

7557-1 Hotaka, Hotaka-machi,
Minamiazumi, Nagano 399-8303 JAPAN

Tel: + +81-(0)263-82-1024

Fax: + +81-(0)263-82-1016

e-mail: cdint@circuitdesign.jp

<http://www.circuitdesign.jp>

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GENERAL DESCRIPTION & FEATURES

Features

- 100 dB wide dynamic range with noise reduction system
- Frequency response from 50 Hz to 15 kHz
- Fixed frequency in 863-865 MHz European audio band
- Low current for longer battery life (TX-01: 25 mA Max.)
- Low voltage operation (from 3 V)
- Single UM4 (1.5 V) battery operation with DC/DC converter
- Built-in mute circuit
- All functions in a compact case (TX: 27X19X5.5 mm)
- Easy installation in user systems
- Conforms to EN 300 422 and EN 301 489

Applications

- Wireless microphone systems
- Wireless portable sound systems
- Audio guidance systems (Museum tour guide etc.)
- Wireless conference systems
- Hall sound reinforcement systems
- Sound/voice monitors

General description

The WA-TX-01 transmitter and WA-RX-01A receiver are RF modules designed to send or receive audio signals. All necessary circuits including the RF core circuits and noise reduction circuits are enclosed in a compact package for easy installation. To achieve a wide dynamic range within the frequency deviation requirements specified in the radio regulations, WA-TX-01 uses a compander/expander noise reduction system. The whole frequency range of the system is compressed by half at a ratio of 2:1 by a compressor in the WA-TX-01 and then, in exactly the opposite way, is doubled at a 1:2 ratio by an expander in the WA-RX-01A. These functions are already integrated in the modules.

The user can enjoy the advantages of a noise reduction system that is specifically required for high quality wireless audio transmission.

SPECIFICATIONS

Common

Frequency range	863.125 MHz, 863.625 MHz, 864.500 MHz, 864.875 MHz
Number of RF channels	Single (Fixed)
Frequency type	F3E
Distance	50 m (Line-of-sight)
S/N ratio	90 dB (W/IHF-A Filter)
Audio frequency response	50 Hz-15 kHz +/-3.5 dB
T.H.D	2 % (@AF 1 kHz, at f=15 kHz or 7.5 kHz)
Emphasis	50 u/sec
Operating temperature	0 to 50 degree C

Transmitter (WA-TX-01)

Oscillation type	SAW oscillator crystal based
RF power	2 mW (e.r.p.)
Modulation	Variable reactance modulation
Frequency stability	+/-10 kHz
Pre-emphasis	50 μ s
Noise reduction	Compondor (1/2 logarithm compression)
Spurious emission	1 μ W MAX
Deviation	15 kHz (1 kHz at -25 dBv)
Audio input level	-115dBv to -15dBv (1 kHz)
Maximum DC input voltage	0 V DC max
Audio input impedance	5 k Ω
I/O connector	4P connector
Supply voltage	3 to 9 V
Current consumption	25 mA MAX
Dimensions	W27 x D19 x H5.5 mm
Weight	5 g

Receiver(WA-RX-01A)

Receiving method	Single super heterodyne
Local oscillator type	Crystal controlled
Oscillation frequency	(f ₀ -10.7 MHz)/10
IF frequency	10.7 MHz
Noise reduction type	Expander
Sensitivity	21 dB μ V (at THD2 %)
Squelch sensitivity	17 dB μ V+/-4 dB
Audio output level	-20 dBv (Dev.15 kHz), Max -10 dBv (Dev. 30 kHz)
Audio output impedance	10 K Ω (Unbalanced output)
I/O connector	6P connector
Supply voltage	3 V to 12 V
Current consumption	30 mA
Dimensions	W36 x D26 x H8 mm
Weight	15 g

*0 dBv=0.775 V

*The data was taken at 25 C unless otherwise specified

PIN DESCRIPTION

WA-TX-01 transmitter module

Pin No.	Pin name	I/O	Description
1	A	O	Antenna terminal 50 Ω impedance An antenna is not provided with the module. The recommended antenna is 1/4 lambda antenna (7.8 cm for 860 MHz) (SWR= less than 1.5). Keep the antenna away from objects which have a high dielectric constant and/or that possess electrical conductivity.
2	G	I	Power supply minus (-) terminal
3	V	I	Power supply plus (+) terminal Voltage range is DC 3 to 9 V A battery or regulated power source without ripple noise should be used. Make sure to connect it with the correct polarity. To maintain a lower voltage, no protection diode is provided in the circuit.
4	I	I	Audio input terminal Audio input level range is -115 dBv to -15 dBv. Higher input signal level more than 0 dBv and DC voltage input are prohibited.

WA-RX-01A receiver module

Pin No.	Pin name	I/O	Description
1	AF	O	Audio output terminal Output impedance is 10 k Ω . Lower impedance interface will decrease the output level. Maximum output level is -10 dBv. When an audio amplifier is used, connect the terminal to the MIC.IN of the amplifier. Insert an attenuator when the amplified output is distorted as shown in the example circuit.
2	GND1	I	Audio GND terminal Power supply minus (-) terminal
3	LED	O	LED terminal Open collector, Low active The LED control circuit works with the internal mute circuit. The LED terminal becomes low when a signal is received. Current drain should be designed to be less than 20mA. For battery-powered use, choose a high intensity LED to save current consumption.
4	Vcc	I	Power supply plus (+) terminal Voltage range is DC 3 V-12V. A low-drop regulator of 2.7 V is used for the internal circuit to ensure 3 V operation. Ensure that the power supply does not exceed 12 V. A battery or regulated power source without ripple noise should be used. Make sure to connect it with the correct polarity. To maintain a lower voltage, no protection diode is provided in the circuit.
5	GND2	I	RF GND terminal
6	ANT	I	Antenna terminal 50 Ω impedance An antenna is not provided with the module. The recommended antenna is 1/4 lambda antenna (7.8 cm for 860 MHz).

Remarks for integration of the receiver antenna

Please pay due attention to the design of the antenna ground plane based on the general design theory. Locate the antenna in a place where there are no objects between TX and RX and that is visible from the transmitter antenna. If a PCB pattern line is used for connection between the antenna terminal and the antenna you choose, please secure the following pattern width.

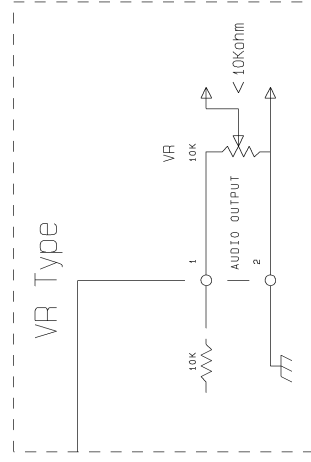
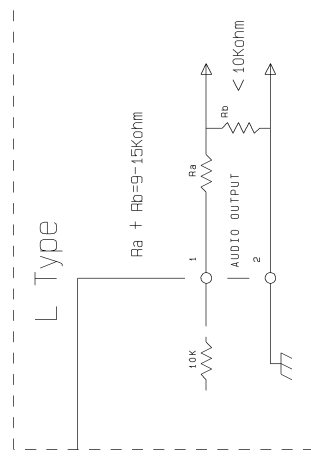
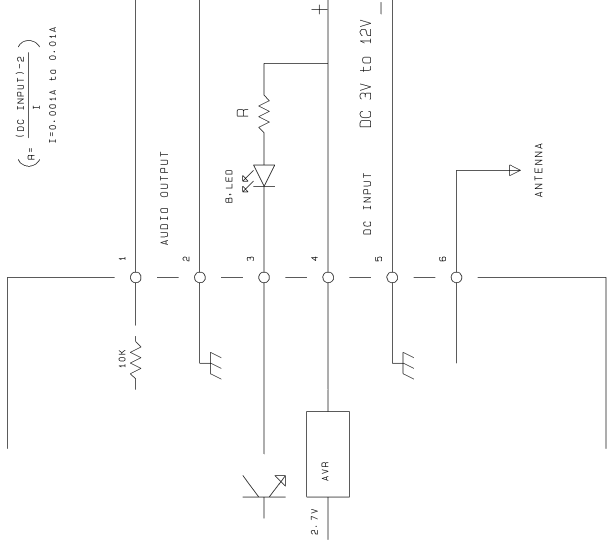
PCB thickness (mm)	0.8	1	1.2	1.6
Pattern width (mm)	1.3	1.4	1.7	2.7

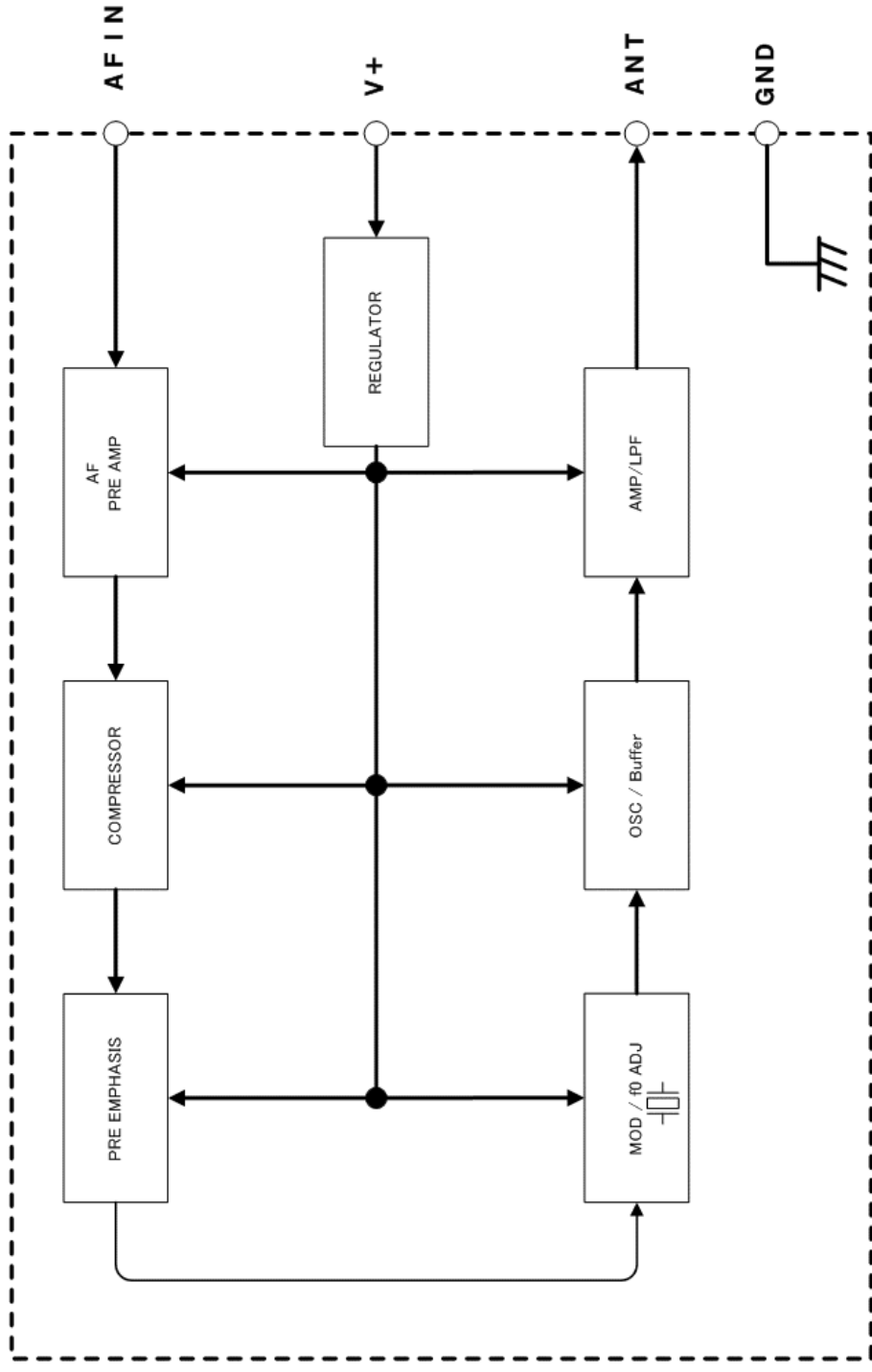
(the example above shows a case where a G10 double sided PCB is used.)

PIN CONNECTION
WA-RX-01A

WA-RX-01A

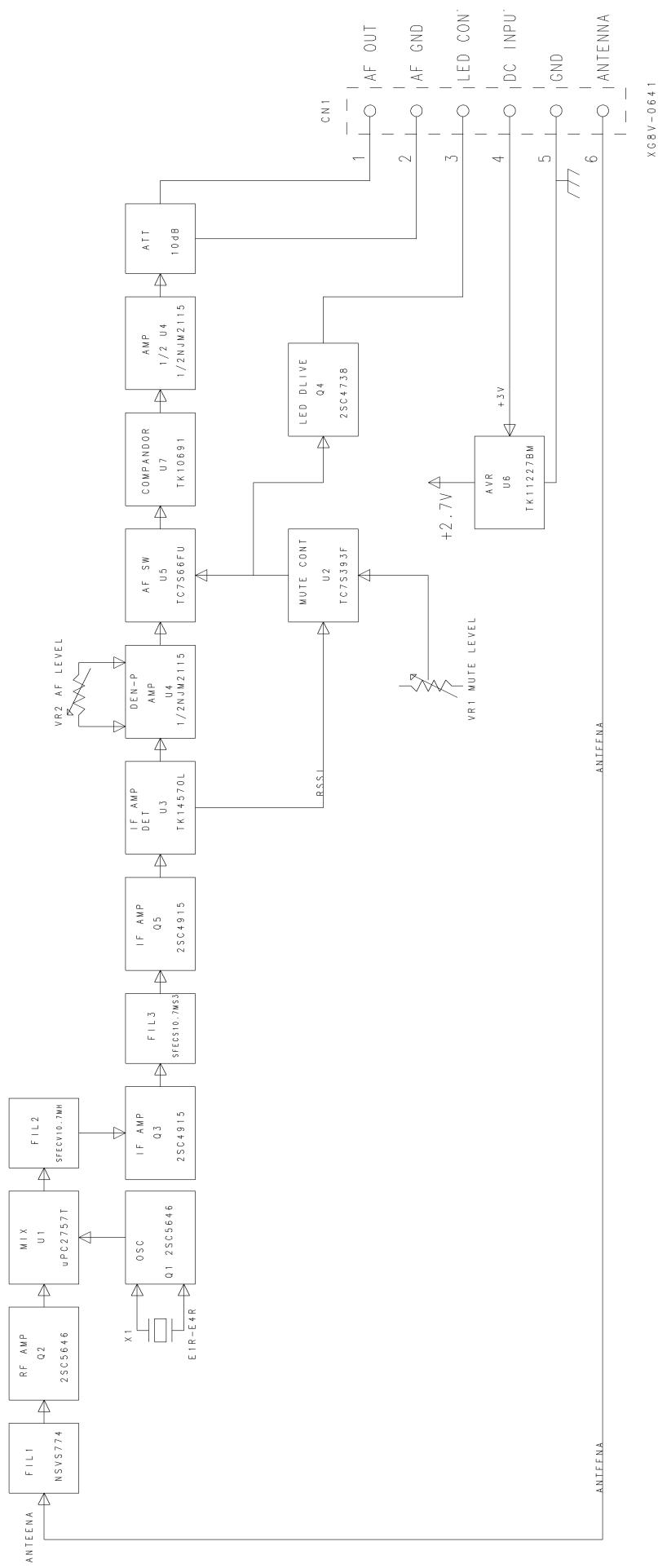
1PIN	AUDIO OUTPUT	IMPEDANCE 10K
2PIN	AUDIO GND	
3PIN	LED CONTROL	OPEN COLLECTOR LOW ACTIVE
4PIN	DC INPUT +	DC 3V to 12V
5PIN	RF GND	
6PIN	ANTENNA	50 Ohm



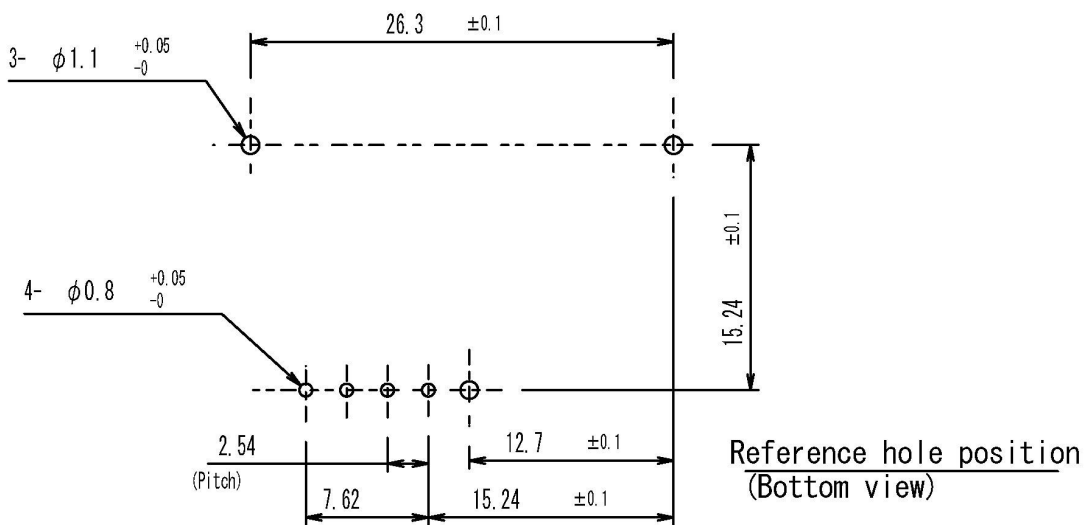
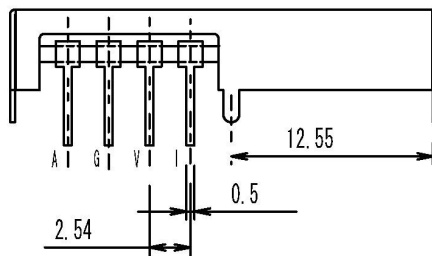
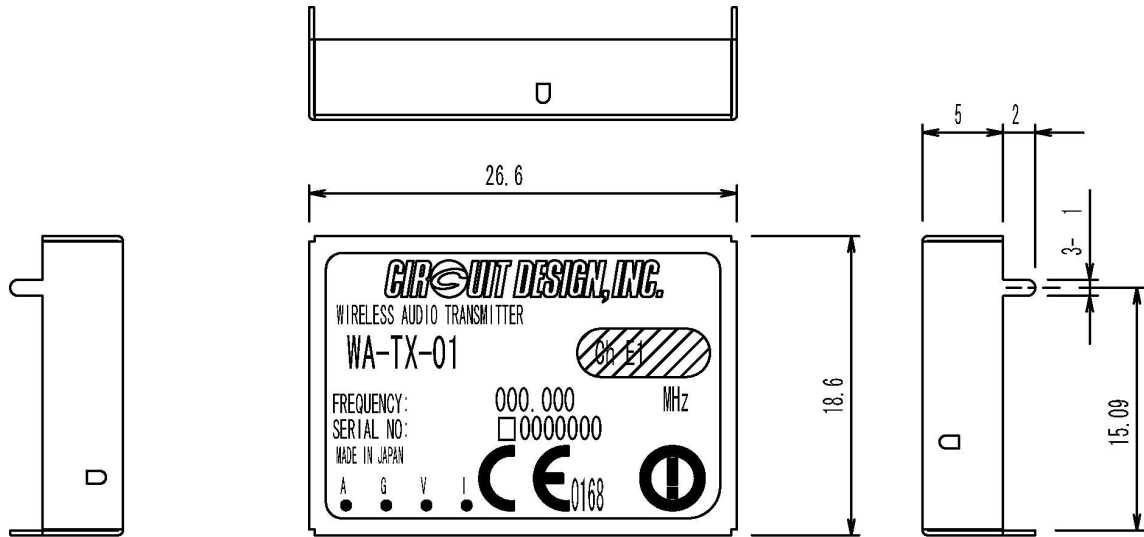
BLOCK DIAGRAM
WA-TX-01

BLOCK DIAGRAM

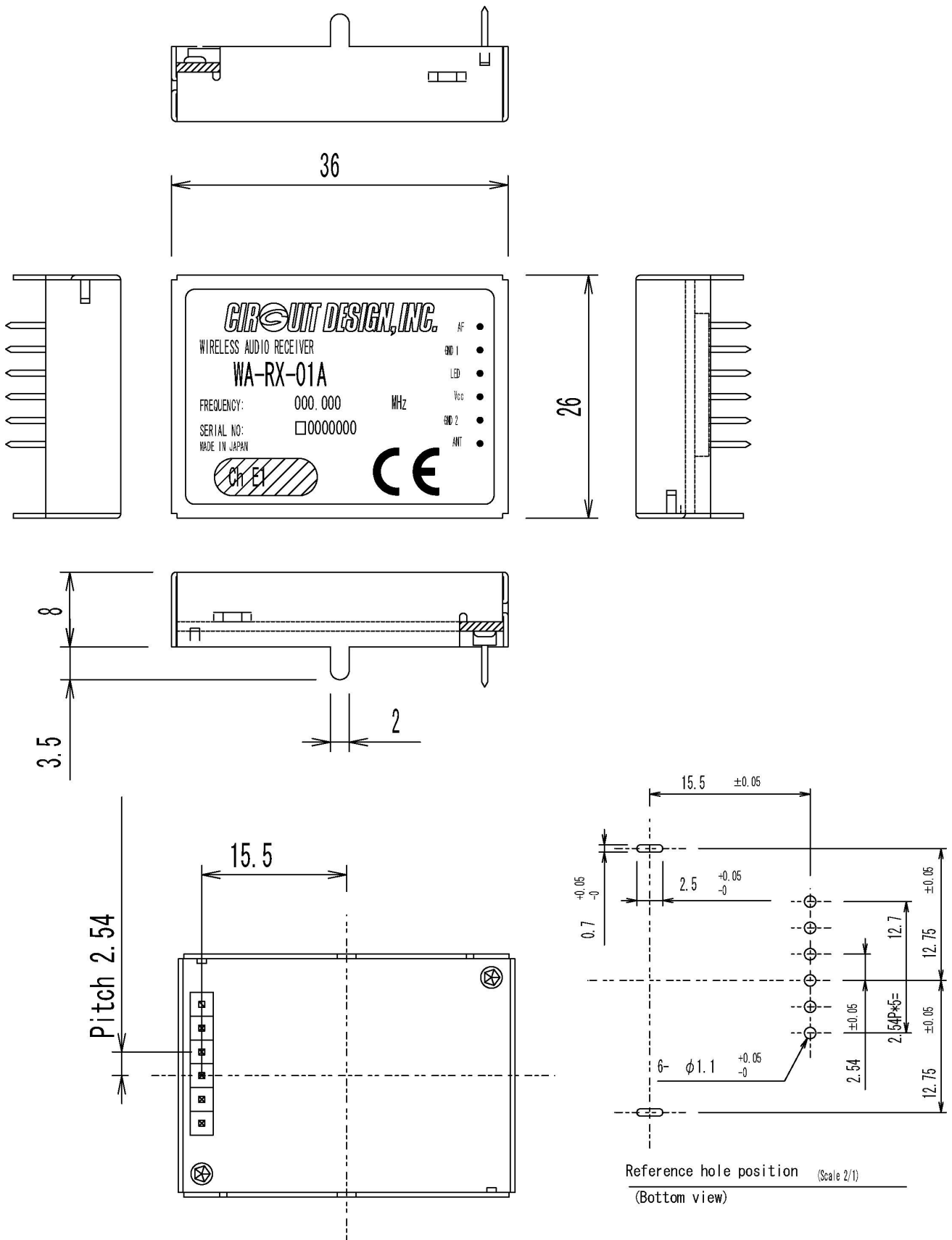
WA-RX-01A



DIMENSIONS
WA-TX-01



WA-RX-01A



CHANNEL PLAN

The WA-TX/RX-01 is a fixed frequency channel module and has been adjusted to one of the following 4 frequency channels in the factory.

Channel	Ch E1	Ch E2	Ch E3	Ch E4
Frequency	863.125 MHz	863.625 MHz	864.500 MHz	864.875 MHz

The channel number and frequency are indicated on the label of the module. Make sure the channel of the TX and the RX are identical.

The 4-frequency channel plan is made to avoid third inter-modulation, making it possible to operate maximum 4 systems in the same area.

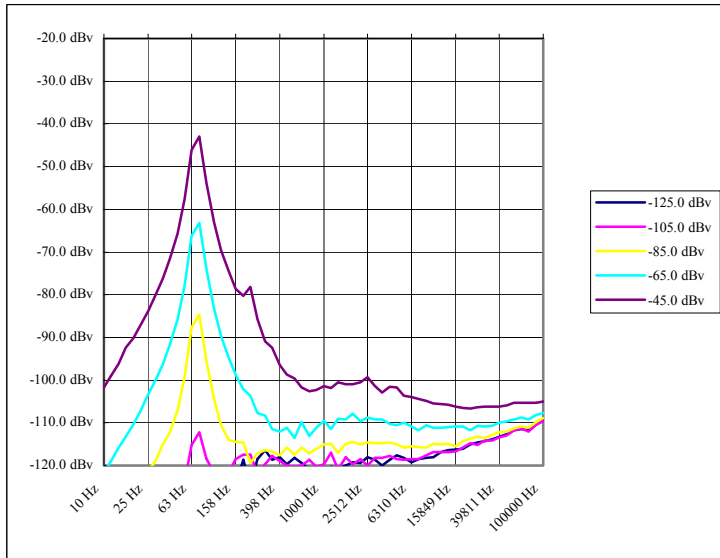
DC/DC CONVERTER WA-DC-01

A low noise miniature DC/DC converter WA-DC-01 is available as an accessory. It allows the WA-TX-01 and WA-RX-01A (3 V transmitter and receiver modules) each to run from a single UM4 (1.5 V) battery. Battery size is a key factor for integration of the system in a small space.

The minimum operating voltage of the DC/DC converter is 0.9 V. Secondary side voltage is 3 V and the maximum load current is 100 mA.

Refer to the 'WA-DC-01 operation guide' for a description of WA-DC-01.

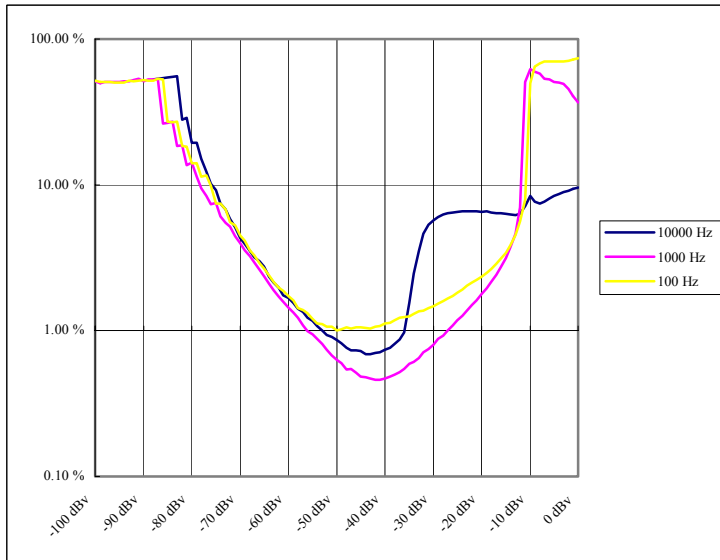
TEST DATA



SPM

Radio Noise vs. Frequency

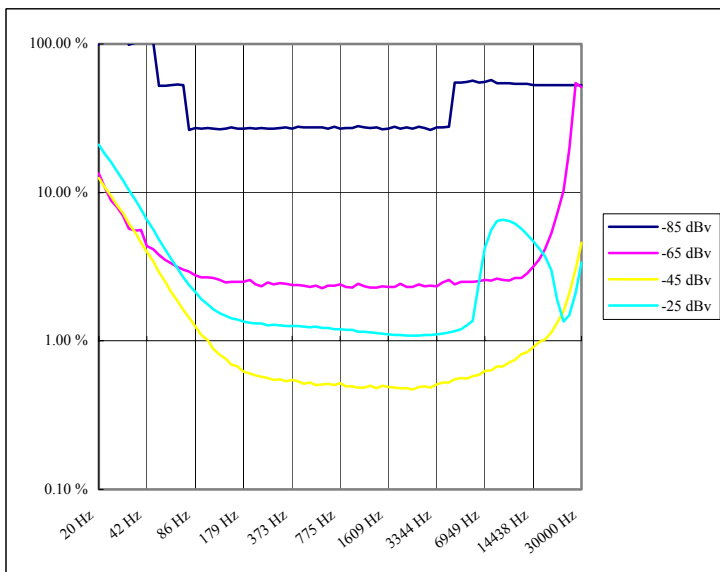
The data shows the measurement values of residual noise by frequency when a 70 Hz signal is supplied with a level from -125 dBV to -45 dBV in 20 dB steps.



LTM

Levels vs. Distortion

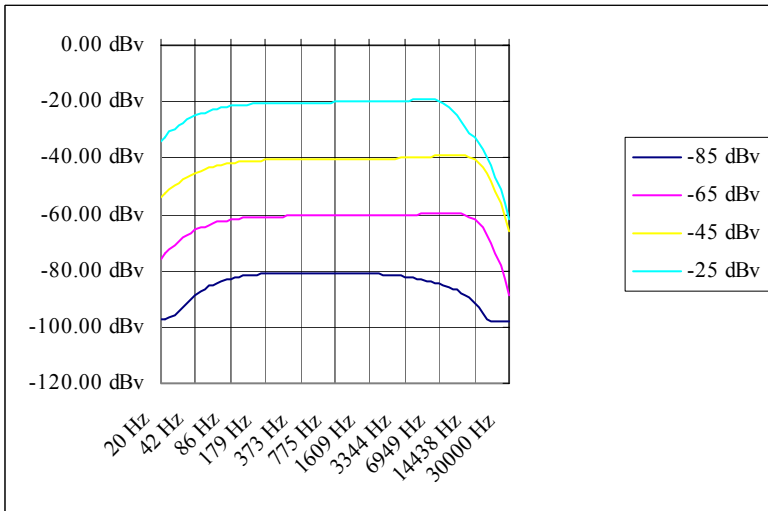
The data shows the measurement values of distortion rate at various input levels of 100 Hz, 1 kHz and 10 kHz.



FTM

Frequency vs. Distortion

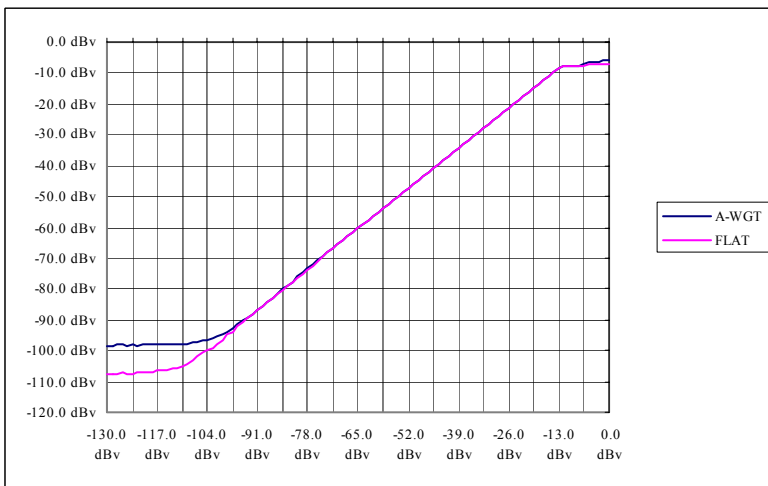
The data shows the measurement values of distortion rate at various frequencies with input levels from -85 dBV to -25 dBV in 20 dB steps.



FLM

Frequency vs. INPUT level

The data shows the measurement values of the output level at various frequencies with input levels from -85 dBv to -25 dBv in 20 dB steps.



LLM

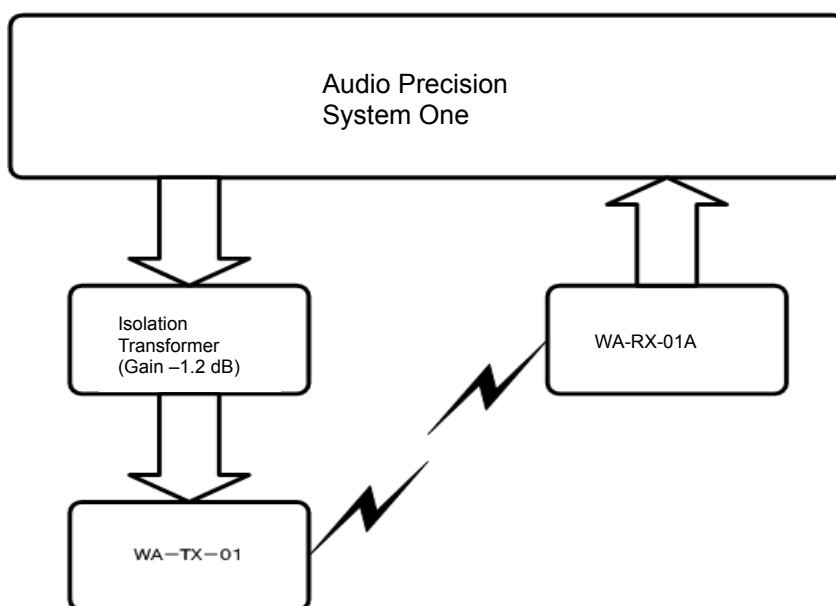
Input level vs. Output level

The data shows the measurement values of the output level at various input levels with/without a filter for hearing*.

*Filter for hearing(A-WGT)

This filter provides measurement equipment with equivalent frequency characteristics to that of human ear.

Measurement method



Regulatory compliance information

Assessment

Circuit Design, Inc. hereby declares that WA-TX-01 and WA-RX-01A (hereinafter referred to as 'RF modules') are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

WA-TX-01 and WA-RX-01A have been assessed to the following European harmonized standards.

Article 3.1 (a) 'Safety EN60950: 2000 and EN 60065: 1998'

Article 3.1 (b) 'EMC EN 301 489-9 v1.2.1: 2001-07'

Article 3.2 'Radio EN 300 422-2 v1.1.1: 2000-08'

The assessment was carried out in accordance with Annex IV of the R&TTE Directive. RF module WA-TX-01 is marked with the Notified Body's identification number '0168'. The Declaration of Conformity is attached in this Operation Guide.

Caution

The WA-TX-01 and WA-RX-01A RF modules are intended to be integrated into the host equipment. The host equipment in which the modules are installed should be assessed for compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Specific safety instructions regarding the design of the host equipment relating to:

Article 3.1 (a) 'Safety EN60950: 2000 and EN 60065: 1998'

The modules are reliant on the host equipment to provide the electrical, mechanical, and fire enclosure requirements of EN 60950: 2000 or EN 60065: 1998.

The nominal supply voltage of the RF modules is 3 V - 9 Vdc (WA-TX-01), or 3 V-12 Vdc (WA-RX-01A). The worst input current under normal operating conditions is 35 mA, 40 mA respectively. The host equipment should be capable of supplying this power requirement.

The RF modules are entirely SELV (Safety Extra Low Voltage) when the supply input from the host equipment is SELV, i.e. the RF modules are Class III (equipment in which protection against electric shock relies upon supply from SELV circuits and in which hazardous voltages are not generated).

The host equipment in which the RF modules are installed should be assessed to the requirements of EN 60950: 2000 or EN 60065: 1998.

The RF modules should be installed in the host equipment such that required creepage and clearance distances (within the host equipment) are maintained.

Specific instructions regarding the design of the host equipment relating to:**Article 3.1 (b) 'EMC EN 301 489-9 v1.2.1: 2001-07'**

ESD-test (Electro Static Discharge test) was not performed during the assessment of the RF modules. The RF modules are designed to be integrated into the host equipment and are reliant on the enclosure of the host equipment to provide the necessary protection.

The host equipment in which the RF modules are installed should be assessed to the EMC requirements of:

EN 301 489-9 v1.2.1: 2001-07 (or the relevant EMC specification applicable to the host equipment).

Specific instructions regarding the design of the host equipment relating to:**Article 3.2 'Radio EN 300 422-2 v1.1.1: 2000-08'**

It is stated in the Guidance Note Nr.1 issued by the R&TTE Compliance Association, that the assessed RF modules installed in the final products which are in compliance with the manufacturer's installation instructions require no further evaluation under Article 3.2 (radio) of the R&TTE Directive.

Therefore manufacturers of the final products, who use the assessed RF modules, are responsible for Safety & EMC requirements only.

Notification of placing in the market under article 6.4 of R&TTE Directive:**WA-TX-01 has been notified to the following countries;**

Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Spain, UK, Sweden, Liechtenstein, Switzerland, Denmark, Norway

For the latest information about notification, please see Circuit Design's web site at www.circuitdesign.jp

If you have any inquiries about regulatory compliance of this product, please contact Circuit Design, Inc.

We also recommend you to consult the authorities in each country for detailed regulatory information.

DECLARATION OF CONFORMITY

We, Circuit Design, Inc.

of 7557-1 Hotaka, Hotaka-machi
Minamiazumi
Nagano 399-8303 Japan

declare under our sole responsibility that the product

WA-TX-01 wireless audio transmitter,
WA-RX-01A wireless audio receiver and WA-RX-02 wireless audio diversity receiver


to which this declaration relates, is in conformity with the following standards and/or other normative documents.

EN 300 422-2 v1.1.1 (2000-08)
EN 301 489-9 v1.2.1 (2001-07)
EN 60065:1998, EN60950:2000

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity to all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10(5) and detailed in Annex IV of Directive 1999/5/EC has been followed with the involvement of the following Notified Body(ies):

BABT
Claremont House, 34 Molesey Road, Hersham, Walton-On-Thames, Surrey, KT12 4RQ, UK
TEL: +44 1932 254251 FAX: +44 1932 251252

Identification mark: 0168 The equipment will also carry the 
 (Notified Body number) Class 2 equipment identifier

The technical documentation relevant to the above equipment can be made available for inspection on application to:

Circuit Design, Inc.
7557-1 Hotaka, Hotaka-machi, Minamiazumi, Nagano 399-8303 Japan

Yukinaga Koike
 (name)

Vice president
 (title)

Yukinaga Koike
 (signature of authorised person)

Aug.27 2003
 (date)

Cautions

- As the radio module communicates using electronic radio waves, there are cases where transmission will be temporarily cut off due to the surrounding environment and method of usage. The manufacturer is exempt from all responsibility relating to resulting harm to personnel or equipment and other secondary damage.
- Do not use the equipment within the vicinity of devices that may malfunction as a result of electronic radio waves from the radio module.
- The manufacturer is exempt from all responsibility relating to secondary damage resulting from the operation, performance and reliability of equipment connected to the radio module.
- Communication performance will be affected by the surrounding environment, so communication tests should be carried out before actual use.
- Ensure that the power supply for the radio module is within the specified rating. Short circuits and reverse connections may result in overheating and damage and must be avoided at all costs.
- Ensure that the power supply has been switched off before attempting any wiring work.
- The case is connected to the GND terminal of the internal circuit, so do not make contact between the '+' side of the power supply terminal and the case.
- When batteries are used as the power source, avoid short circuits, recharging, dismantling, and pressure. Failure to observe this caution may result in the outbreak of fire, overheating and damage to the equipment. Remove the batteries when the equipment is not to be used for a long period of time. Failure to observe this caution may result in battery leaks and damage to the equipment.
- Do not use this equipment in vehicles with the windows closed, in locations where it is subject to direct sunlight, or in locations with extremely high humidity.
- The radio module is neither waterproof nor splash proof. Ensure that it is not splashed with dirt or water. Do not use the equipment if water or other foreign matter has entered the case.
- Do not drop the radio module or otherwise subject it to strong shocks.
- Do not subject the equipment to condensation (including moving it from cold locations to locations with a significant increase in temperature.)
- Do not use the equipment in locations where it is likely to be affected by acid, alkalis, organic agents or corrosive gas.
- Do not bend or break the antenna. Metallic objects placed in the vicinity of the antenna will have a significant effect on communication performance. As far as possible, ensure that the equipment is placed well away from metallic objects.
- The ground for the radio module will also affect communication performance. If possible, ensure that the case ground and the circuit ground are connected to a large ground pattern.

Warnings

- Do not take apart or modify the equipment.
- Do not remove the product label (the label attached to the upper surface of the module.) Using a module from which the label has been removed is prohibited.

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