

Overview

The ZLG600A Series Card Reader Module developed by Guangzhou ZHIYUAN Electronics Co., Ltd. These modules have the characteristics of low cost, easy to use, reliable, diverse and small size. They can also be applied in various fields such as finance, software encryption, medical and health care, transportation ticketing, leisure and entertainment management. They can fully take the place of ZLG600SP Series modules.

Applications

- ◆ Finance
- ◆ Software encryption
- ◆ Medical and health care
- ◆ Transportation ticketing

Features

- ◆ Up to ISO14443A, ISO14443B, ISO7816-3 Standard;
- ◆ Integrated TypeB, Mifare UltraLight, Mifare1 S50/S70, PLUS CPU, SAM Cards' operation command;
- ◆ Providing ISO14443-4 half duplex transportation protocol interface, which supports ISO14443-4A CPU cards and ISO14443-4B TypeB cards;
- ◆ Support serial port & IIC communication;
- ◆ Actively detect cards entry and generate interrupt signal through a serial port or IIC;
- ◆ Hardware interface and communication protocol can be fully compatible with earlier ZLG522S/ZLG600SP series modules.

Ordering Infomation

Module Name	Operating Temperature	Voltage Supply
ZLG600A	-20 ℃ ~ +80 ℃	3.3 or 5V

Module Image

ZLG600A Series Datasheet

Integrated Circuit Card Reader

DataSheet

Revision History

Version	Date	Description
V1.0.00	2016/07/15	Created the document.
V1.0.10	2020/12/21	Modified the document template.
V1.0.20	2023/1/11	Update the document template. Update Figure 3.1.
V1.0.30	2023/6/12	Update Tolerances for dimensional drawings.

Content

1. Introduction.....	1
1.1 Function Introduction.....	1
1.2 Technical Parameters.....	1
1.3 Absolute Parameters.....	2
1.4 DC Parameters	2
2. Operation Instruction	4
2.1 I/O Settings	4
2.1.1 Communication mode	4
2.1.2 Antenna interface setup (J2).....	6
2.1.3 Contact IC Card and Power Control Interface Settings (J3)	6
2.1.4 Serial Port (J6).....	7
2.2 Typical Applications.....	7
2.2.1 UART Interface Applications	7
2.2.2 I2C Interface Application	8
2.2.3 Multi-slave Solution Application	9
2.2.4 DF Control Board Application	9
3. Mechanical Dimension	11
4. Disclaimer	12

1. Introduction

The ZLG600A Series Card Reader Module developed by Guangzhou ZHIYUAN Electronics Co., Ltd. These modules have the characteristics of low cost, easy to use, reliable, diverse and small size. They can also be applied in various fields such as finance, software encryption, medical and health care, transportation ticketing, leisure and entertainment management. They can fully take the place of ZLG600SP Series modules.

Notice: The picture is for reference only.

1.1 Function Introduction

- Up to ISO14443A, ISO14443B, ISO7816-3 Standard;
- Integrated TypeB, Mifare UltraLight, Mifare1 S50/S70, PLUS CPU, SAM Cards' operation command;
- Providing ISO14443-4 half duplex transportation protocol interface, which supports ISO14443-4A CPU cards and ISO14443-4B TypeB cards;
- Support serial port & IIC communication;
- Actively detect cards entry and generate interrupt signal through a serial port or IIC;
- Hardware interface and communication protocol can be fully compatible with earlier ZLG522S/ZLG600SP series modules.

1.2 Technical Parameters

Table 1 ZLG600A series technical parameters

Model	ZLG600A
Power consumption	Average Current: 5V DC supply/73mA; 3.3V DC supply/79mA; Peak Current: Less than 150mA
Frequency Range	13.56MHz

ZLG600A Series Datasheet

Integrated Circuit Card Reader

DataSheet

Operating Distance	TypeA Cards: $\geq 5\text{cm}$
External Interface	I ² C, UART
Data rate	I ² C: 300K UART: 9600~230400bit/s
Card Type	Contact Card: SAM card Contactless Card: Mifare 1 S50, Mifare 1 S70, Mifare UltraLight, Mifare Desfire, PLUS CPU card, ISO14443A logical encrypt card and CPU card, ISO14443B card
Physical Characteristics	Dimension: Integrated Antenna 54mm×34.5mm×1.6mm
Operating Environment	Operating temperature: -20 to 80 °C Humidity: Relative humidity 5%~95%

1.3 Absolute Parameters

Table 2 Absolute parameters

Symbol	Parameters	Minimum	Maximum	Units
Top	Operating temperature	-20	+80	°C
Tstg	Storage temperature	-40	+85	°C
Vn1	J1 pins to GND voltage	-0.3	+5.5	V
Iol1	J1 I/O low voltage input current	—	20	mA

1.4 DC Parameters

Table 3 DC parameters

Symbol	Parameters	Conditions	Minimum	Typical	Maximum	Units
Icc51	Supply current, normal operation	Vcc=5V, after powering on or running config()	—	73	150	mA
Icc52	Supply current, sleep mode	Vcc=5V, after running close()	—	15	20	mA
Icc31	Supply current, normal operation	Vcc=3.3V, after powering on or running config()	—	79	150	mA
Icc32	Supply current, sleep mode	Vcc=3.3V, after running close()	—	15	20	mA

ZLG600A Series Datasheet

Integrated Circuit Card Reader

DataSheet

Vil1	Input low voltage	Only SCL, SDA	—	—	1.5	V
Vil2	Input low voltage	Except SCL, SDA	—	—	0.99	V
Vih	Input high voltage	—	2.31	—	5.5	V
Vol	Low voltage output	Iol=20mA	—	0.6	1.0	V
		Iol=3.2mA	—	0.2	0.3	V
Voh	High voltage output	Ioh=20μA	3	3.3	—	V
Iil	Logical 0 input current	Vin=0.4V	—	—	-80	μA

2. Operation Instruction

2.1 I/O Settings

2.1.1 Communication mode

The communication interface is J1. This module has two communication interfaces that cannot be used at the same time: UART and I2C interface. The module has three communication modes, namely: automatic detection mode, UART communication mode and I2C communication mode. The automatic detection mode belongs to the factory configuration of the module. After the module is powered on (or reset), it takes about 7ms for the module to enter the Working Mode detection state. The communication mode of the module is determined in the sequence of software configuration - hardware configuration - automatic detection mode.

1. Detect software configuration

The detection software configuration means that the communication mode of the module is fixed to UART or I2C according to the configuration result of Set the Device Working Mode in the device control instruction. This setting is not lost when the module is powered on. If the mode is set to I2C, the module enters the I2C mode directly. If the UART mode is configured, the module enters the UART mode directly. The UART baud rate is the baud rate saved in the module. The baud rate can be changed by the Set Baud Rate command in the control class instruction.

2. Detect hardware configuration

When the working mode of the software configuration is automatic detection mode, the module does not enter a specific communication mode, but further detects the hardware configuration. The detection principle is to determine which communication mode should be used according to the pin level state of the module. J1-6, J1-7, and J1-8 pin level checks take precedence over J1-2 and J1-3. The specific definition of J1 port is shown in Table 4.

When any pin of J1-6, J1-7 and J1-8 is at low level, the module reads the level state every 1ms for 50 consecutive times, and the level of J1-6, J1-7 and J1-8 does not change, then it enters the I2C mode.

When any pin of J1-2 and J1-3 is at low power level, the module reads the level state every 1ms for 50 consecutive times, and the J1-2 and J1-3 levels do not change, then it enters the UART working mode.

Table 4 J1 pins function

Pin	Symbol	Type	Power on status	Description
J1-1	/INT	O	High voltage	Interrupt the output pin, open collector; In I2C communication mode, after the command is executed, the pin outputs low level; This pin outputs a low level when a card is detected when the automatic detection command is responded to and the output is interrupted

ZLG600A Series Datasheet

Integrated Circuit Card Reader

DataSheet

J1-2	SCL	O	High voltage	I2C clock input pin, 4.7K pull-up inside the module
J1-3	SDA	I/O	High voltage	I ² C data input/output pin, 4.7K pull-up inside the module
J1-4	GND	PWR	—	Power negative pin
J1-5	VCC	PWR	—	Power positive pin
J1-6	RXD	I	High voltage	UART receiver, TTL voltage
J1-7	TXD	O	High voltage	UART transmitter, TTL voltage
J1-8	CON	I	High voltage	Control pin for RS-485 communication (0: input; 1: output), module automatic control, TTL voltage

Notes: Square pad is the first pin. 3.3V module J1-5 is connected to 3.3V power supply, and 5V module J1-5 is connected to 5V power supply.

3. Automatic detection mode

When the software configuration and hardware configuration do not set the module to UART communication mode or I2C communication mode, the module will enter the automatic detection mode. In this mode, both UART and I2C interfaces are in the receiving state. If the module detects an effective baud rate from the UART communication line, the module will use UART communication. If the module receives an SLA from the I2C bus (the factory default SLA is 0xB2), the module communicates using I2C. As long as one of the interfaces receives valid data first, the module will affirm to communicate with the outside world in this way and close the other interface.

In automatic detection mode, the UART needs to receive 0x20 twice before entering the UART communication mode. The first 0x20 is used to calculate the baud rate. The principle is to calculate the baud rate by capturing the two falling edges of 0x20 bytes and obtaining the time between the two falling edges. The second 0x20 is used to determine whether the calculated baud rate is correct. The module will return 0x06 after successfully receiving 0x20 twice. Because this detection mechanism is susceptible to interference, it cannot send data content other than 0x20 to the module before the module calculates the correct baud rate, otherwise it is easy to calculate the wrong baud rate, resulting in no response to the command sent to the module with the current baud rate.

To ensure that the module can successfully switch to the fixed baud UART communication mode through the automatic detection mode, the recommended operation method is: In addition to the necessary communication interface, an additional I/O port is connected to the EN reset pin of the module, and the module is reset before sending 0x20 twice each time. After the reset, there must be at least 7ms delay before the module can enter the automatic detection mode and receive 0x20 normally.

4. UART communication mode

By using "Set Baud rate" and "Set device working mode" in the device control class name, the module can be set to use UART communication after power-on. This method belongs to software configuration, and the specific commands are introduced in Chapter 4. Hardware configuration For details about the UART communication mode, see Checking Hardware Configurations. In UART communication mode, after the module is powered on, it reads the serial port Settings (such as module address and baud rate) saved in the module to initialize the communication interface. The host can directly communicate with the module through serial port as long as the baud rate is the same as that of the module.

5. I²C communication mode

The same as the UART communication mode, you can also use the "Set device working mode" command to set the module to enter the I2C communication mode automatically after power-on. In this mode, the host can directly use the I2C interface to communicate with the module, and the communication address is 0xB2 by default. Of course, you can also use the "Set device working mode" command to change to other values.

For the method of hardware configuration of I2C communication mode, refer to the description in "Detecting Hardware Configuration". Different from the software configuration, when J1-8 is in high power mode, the module adopts the default address 0xB2 (which can be modified by software), and J1-8 is in low power mode, the module address will be jointly determined by the level of J1-6 and J1-7. The address byte is 1011 0 (J1-6) (J1-7)x, where x is the read/write bit. For example, if J1-6 and J1-7 are both connected to high levels, the device address is 1011 011x (0xB6).

Special notes: After the module address is modified in I2C communication mode, the host needs to read the original address and return the command frame before the module can enable the new address, or after modifying the address, the module can also enable the new address after power off and restart.

2.1.2 Antenna interface setup (J2)

Table 5 Antenna interface J2 pins function

Pin	Symbol	Type	Description
J2-1	TX1	O	ANT output driver 1
J2-2	GND	GND	ANT GND
J2-3	TX2	O	ANT output driver 2
J2-4	RX	I	In dual-antenna applications, the pin needs to be shorted with TX2; If TX1 and TX2 drive one antenna at the same time, this pin cannot be short-circuited with TX2
J2-5	GND	GND	ANT GND
J2-6	NC	—	NC

Notes: Square pad is the first pin.

2.1.3 Contact IC Card and Power Control Interface Settings (J3)

Table 6 Contact IC card and power control interface settings (J3)

Pin	Symbol	Type	Description
J3-1	SAM_VCC	PWR	The positive end of the power supply of the contact IC card
J3-2	SAM_RST	O	Contact IC card control RST pin
J3-3	SAM_GND	PWR	The negative end of the power supply of the contact IC card
J3-4	SAM_CLK	O	CLK pin controlled by contact IC card
J3-5	SAM_I/O	I/O	Data input/output pins controlled by contact IC card
J3-6	RUN	I	Communication/operation indication, low active
J3-7	3.3V	O	Power supply 3.3V output, can provide 100mA current output
J3-8	EN	I	Module reset control pin, internal 10K resistor pull up to VCC, set low, will reset the entire module, effective low time $T_{min}=50ns$

Notes: Square pad is the first pin. The entire module can be reset by controlling the level of the EN pin.

2.1.4 Serial Port (J6)

Table 7 J6 pin function

Pin	Symbol	Type	Description
J6-1	VCC	PWR	Positive end of the power supply, connected to J1-5
J6-2	RXD	I	Serial port receiving pin
J6-3	TXD	O	Serial port sending pin
J6-4	GND	PWR	Power negative pin

2.2 Typical Applications

2.2.1 UART Interface Applications

The J1.6/J6-2 and J1.7/J6-3 interfaces of the module can be used for UART communication with the host, as long as the host provides a UART interface.

1. Automatic detection mode UART application

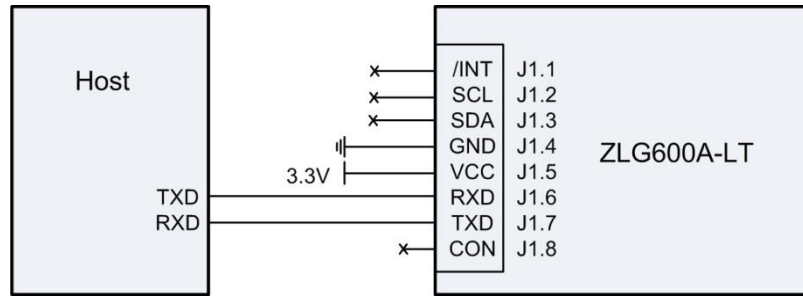


Figure 2 Automatic detection mode Typical application of UART

As shown in Figure 2, in this application, the host only needs to provide the UART interface to connect to the module, and the other communication interfaces of the module can be suspended. After the module is powered on, the host command can be executed only after the baud rate is checked. If the baud rate is checked twice, the module determines the communication baud rate and responds to the command 0x06. If you do not perform this step first, the module does not respond to any command sent by the host. Figure 3 shows the flowchart of baud rate setting:

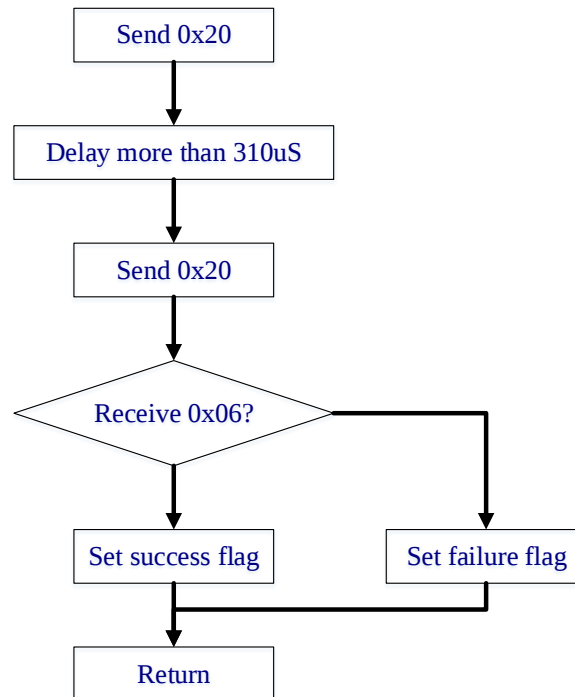


Figure 3 Determine the communication baud rate

2.2.2 I2C Interface Application

The J1.1 ~ J1.3 interface of the module can be used for I2C communication with the host, as long as the host provides any three I/O ports.

Notes: ZLG600S series module J1-2, J1-3 pins are not connected to the inside, in practical application, the user should be connected to the external pull, and the ZLG600A series of these two pins have been pulled up.

1. Automatic detection mode I2C application

As shown in Figure 4, in this application, the host only needs to provide an I2C interface and an I/O (for detecting the response of the module) to connect to the module, and other communication interfaces of the module are connected to pull up or hang up (it is recommended to

connect pull up). In this mode, the slave IP address of the I2C module is fixed to 0xB2.

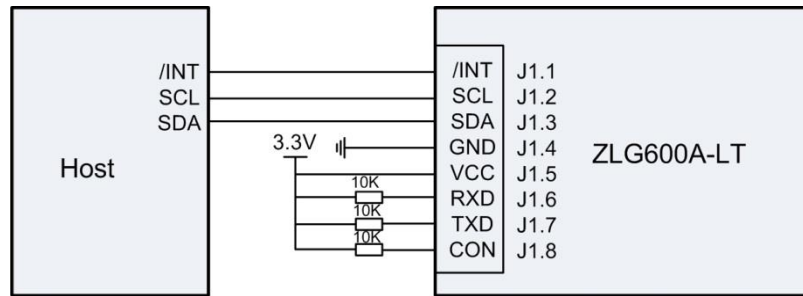


Figure 4 Typical application of automatic detection of I2C

2.2.3 Multi-slave Solution Application

In order to adapt to the application of I2C multiple slaves, the address inside the module can be set by command, the module address consists of one byte, the lowest is the read and write bit, in line with the I2C address format, so a maximum of 127 slaves can be set (0x00 is unavailable).

First, the module should be configured through commands, mainly to configure the module working mode, module address and other information, the information will not be lost after power failure, and the working mode must be re-powered to take effect. Only strictly through the operation of the first two steps, the modules can be connected together to form a multi-slave program application.

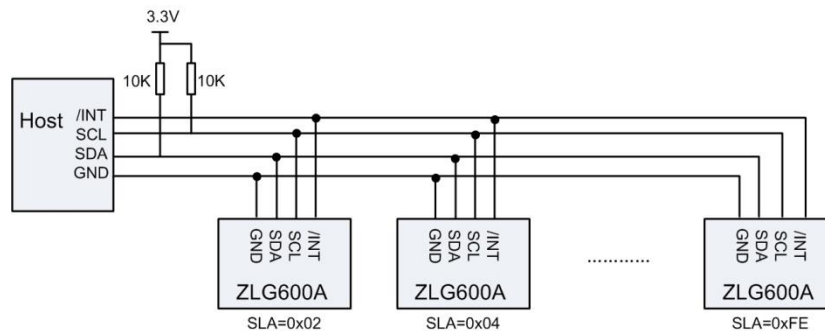


Figure 5 I2C multi-slave connection diagram

Figure 5 is a schematic diagram of I2C multi-slave connection, in which the address of the slave can be set to 0x02 ~ 0xFE, there are 127 kinds.

Before connecting each slave module, run the command to set the working mode to I2C and the module address to the desired address. For details about the command configuration, see "Device Control Command Sets the Working Mode".

Note: Under the I2C communication mode, both the new frame format and the old frame format support multi-slave connection, and the description of the two frame formats is described below.

2.2.4 DF Control Board Application

As shown in Figure 6, DF Control Board ZSL-2 is used to be a host of ZLG600A. The J6 interface of the module can be used for RS485 communication with the host, as long as the host provides RS485 ports.

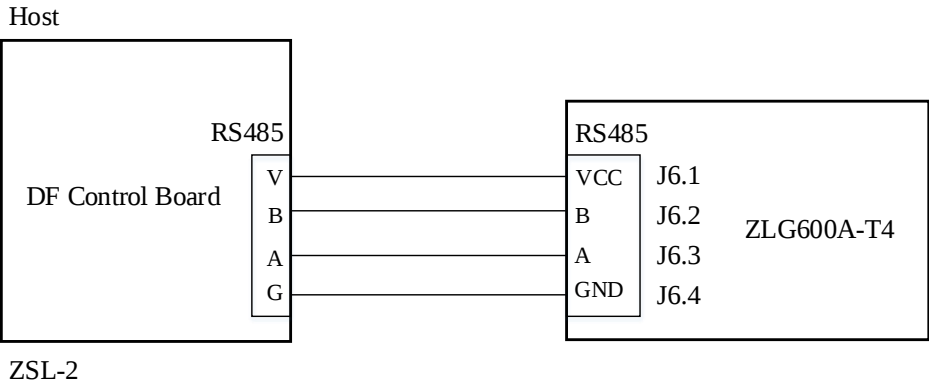


Figure 6 ZSL-2 host RS485 interface typical application

3. Mechanical Dimension

2.0mm pin joint J1, J2, J3, J4 pad aperture: 0.7mm; 2.54mm pin interface J6 pad diameter: 0.9mm. The four corner mounting holes are symmetrical in structure and have the same diameter. Refer to Figure 7 for size of ZLG600A. Unit: mm

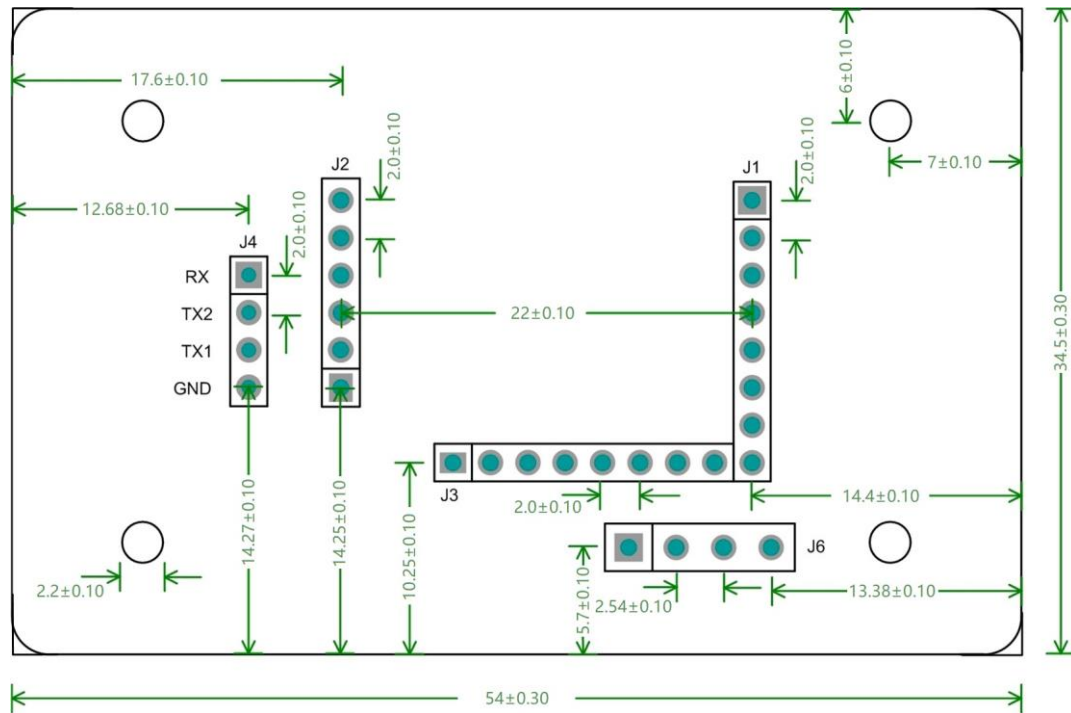


Figure 7 ZLG600A dimensions

4. Disclaimer

About application information

The application information in this document applies to the R&D of ZLG600A series Card Reader module. Users shall modify and verify it based on the characteristics of their products before product development.

Rights to modify this document

The product text information and related software described in this document are all owned by Guangzhou ZHIYUAN Electronics Co., Ltd. All these property rights are protected by the national law absolutely. Without obtaining the authorization of ZHIYUAN Electronics, other companies, organizations, agencies and individuals shall not illegally copy and use the information, or else will be subject to the severe sanctions from national laws. ZHIYUAN Electronics reserves the right to modify this document at any time without any notice.

If you want to know our product and relevant information, please contact us promptly.

IC Information

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme avec Industrie Canada exempts de licence standard RSS (s). L'opération est soumise aux deux conditions suivantes:

- (1) cet appareil ne peut causer d'interférences, et*
- (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.*

The end product must be labeled to display the Industry Canada certification number of the module.

Contains transmitter module IC: 31160-ZLG600AT4

Le dispositif d'accueil doivent être étiquetés pour afficher le numéro de certification d'Industrie Canada du module.

Contient module émetteur IC: 31160-ZLG600AT4

Information for OEM Integrator

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

- 1) The antenna must be installed such that 5mm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

End product labelling

The label for end product must include "Contains IC: 31160-ZLG600AT4".

"CAUTION: Exposure to Radio Frequency Radiation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 5mm between the radiator and your body. This transmitter module is authorized only for use in device where the antenna may be installed such that 5mm may be maintained between the antenna and users."

The Host Marketing Name (HMN) must be indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

This radio transmitter [IC: 31160-ZLG600AT4] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Frequency Range	Manufacturer	Dimension	Model Number	Antenna type
13.56MHz	Guangzhou ZHIYUAN Electronics Co., Ltd.	34.5mm x 54mm x 1mm	ZLG600A-ANT	Coil Antenna

FCC MODULAR APPROVAL INFORMATION EXAMPLES for Manual

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.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 5mm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

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

The module must be installed in the host equipment such that 5mm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are 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 (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 5mm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2AR25ZLG600A-T4".

Information that must be placed in the end user manual:

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.

“CAUTION : Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.

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 also Section 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(15.225)

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 EUT has a Coil Antenna, and the antenna use a permanently attached antenna which is not replaceable.

This EUT does not have RF shielding, additional evaluation is required for any system using this radio module.

The antenna's as listed in this application must not be co-located or operating in conjunction with any other antenna or

transmitter except in accordance with FCC multi-transmitter procedures

End product should be operated with a minimum of 5mm separation distance from any human body. See

section 2.6 for additional RF Exposure detail.

2.4 Limited module procedures

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

A limited module 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 limited module 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 limited module. Any company of the host device which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C(15.225) requirement

Various factors should be avoided as far as possible to the wireless signal transmission and reception. Pay attention

to the following What time is it: 1、 Avoid using metal for the product shell surrounding the Bluetooth. When using

a part of the metal shell, try to keep the antenna part of the module away from the metal part. The metal connecting

wire or metal screw inside the product should be as far away as possible from the antenna part of the module. 2、

The antenna part of the module should be placed against the edge of the carrier board PCB or directly exposed to

the carrier board, and it is not allowed to be placed in the middle of the board, There is at least 5mm of free space

in the antenna direction, and the carrier board under the antenna is milled out. Copper and wiring are not allowed

in the direction parallel to the antenna. 3、 It is recommended to use insulating material to isolate the module

mounting position on the substrate, for example, put a whole piece of silk screen at this position (Top Over Lay)

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.

Explanation: Yes, The module with trace antenna designs, and This manual has been shown the layout

of trace design, antenna, connectors, and isolation requirements.

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 application conditions (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: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment,

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator

and your body." This module is designed to comply with the FCC statement,, FCC ID is: 2AR25ZLG600A-T4.

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 EUT has a Coil Antenna, and the antenna use a permanently attached antenna which is unique.

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: A3LWCA735M, Contains IC: 31160-ZLG600AT4 ”

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: Top band 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 circuitry), 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 circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.