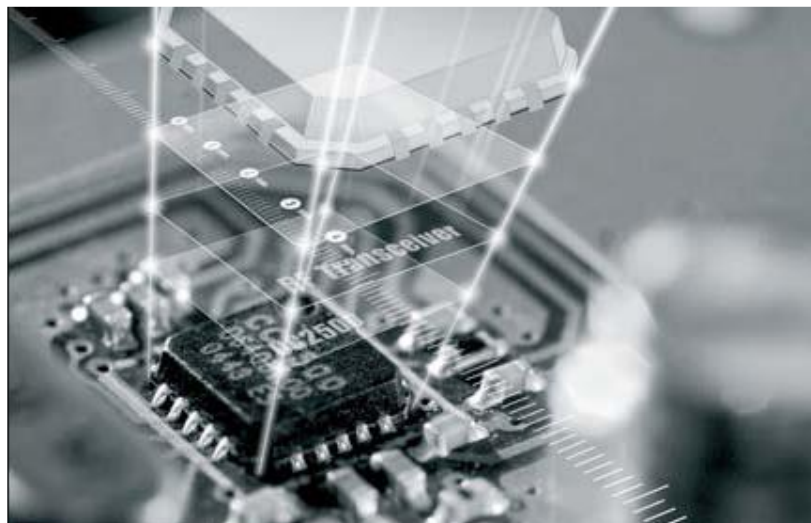




SPECIFICATION

Low Power, High performance
RF Transceiver for UART Interface



Model : Sub. 1GHz RF Module
Part No : AUC1200Sx-ATR_xy
Version : V1.1
Date : 2021.4.15

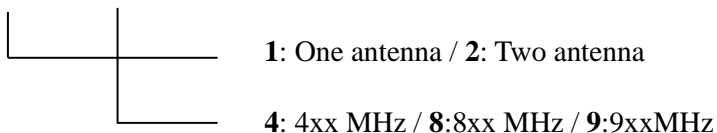
■ Applications

- Low power, high performance, wireless system with up to 1250 kbit/s data rate
- Home and building automation
- Wireless alarm and security system
- Industrial monitoring and control
- Wireless healthcare applications
- Wireless sensor networks and Active RFID
- Wireless M-Bus, all modes

■ Selection Guide

Denomination : Sub. 1GHz Transceiver Module

Part No. : AUC1200S_x-ATR_{Xy}



◆ Note: Antenna Design is should be considered and based on the mechanism design. We can be your Consultant and we also provide customized antenna solution.

Absolute Maximum Ratings

Under no circumstances must the absolute maximum ratings given in Table 1 be violated. Stress exceeding one or more of the limiting values may cause permanent damage to the device.



Caution! ESD sensitive device.
Precaution should be used when handling the device in order to prevent permanent damage.

Parameter	Min	Max	Units	Condition
Supply voltage	-0.3	3.9	V	All supply pins must have the same voltage
Voltage on any digital pin	-0.3	VDD + 0.3, max 3.9	V	
Voltage on the pins	-0.3	2.0	V	
Input RF level		+10	dBm	
Storage temperature range	-40	125	°C	

Operating Conditions

Parameter	Min	Max	Units	Condition
Operating temperature	-40	85	°C	
Operating supply voltage	2.3	3.6	V	All supply pins must have the same voltage

General Characteristics

Parameter	Min	Typ	Max	Units	Condition/Note
Frequency Bands	820		950	MHz	
	410		475	MHz	
Frequency Resolution		30		Hz	In 820-950 MHz Band
		15		Hz	In 410-475 MHz Band
Data Rate	0		1250	Kbps	Packet Mode
	0		625	Kbps	Transparent Mode
UART Baud rate	9600		115200	bps	

Electrical Specifications

Current Consumption

T_A= 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition
Power Down with Retention		0.6	1	uA	Sleep mode (P11=0)
		0.8		uA	Low-Power RC oscillator running
XOFF Mode		180		uA	Crystal Oscillator/TCXO disable
Idle Mode		8.1		mA	Clock running. System waiting with no radio activity

Transition mode for 868/915/920 MHz Bands

T_A= 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition
TX Current Consumption +14 dBm		49.3		mA	
TX Current Consumption +10dBm		39.3		mA	

Transition mode for 434 MHz Bands

T_A= 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition
TX Current Consumption +14 dBm		49.3		mA	
TX Current Consumption +10dBm		38.3		mA	

Receive mode for 868MHz Band

T_A= 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition
RX Wait for Sync					
1.2K bps, 3 Byte Preamble		6.7		mA	Using RX Sniffer Mode, where the receiver wakes up at regular intervals looking for an incoming packet
38.4Kbps, 12Byte Preamble		6.7		mA	Sniffer Mode configured to terminate on Carrier Sense, and is measured using RSSI_VALID_COUNT =1
38.4Kbps, 4 Byte Preamble		14.1		mA	
50Kbps, 24Byte Preamble		5.4		mA	
RX Packet Current 1.2Kbps		26.9		mA	

● RF Receive Section

General Receive Parameter(High Performance mode)

T_A = 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition/Note
Saturation		10		dBm	
IIP3		-14		dBm	At maximum gain
Optimum Source Impedance					(Differential / Single Ended RX configuration)
868/915/920 MHz bands		60+j60 / 30+j30		ohm	
434 MHz bands		100+j60 / 50+j30		ohm	
169 MHz bands		140+j40 / 70+j20		ohm	

RX Performance in 868/915/920MHz

T_A = 25°C, VDD = 3.0 V if nothing else stated.

Parameter	Min	Typ	Max	Units	Condition/Note
Receiver sensitivity		-120		dBm	1.2Kbps 2-FSK, DEV=4KHz CHF=11KHz
		-109		dBm	38.4Kbps 2-GFSK, DEV=20KHz CHF=104KHz
		-96		dBm	500Kbps 2-GFSK, CHF=833KHz
		-96		dBm	1Mbps 4-GFSK, DEV=400KHz CHF=1.66MHz
Blocking and Selectivity 1.2 kbps 2-FSK, 12.5 kHz channel separation, 4 kHz deviation, 11 kHz channel filter		54		dB	+/- 12.5KHz (adjacent channel)
		55		dB	+/- 25KHz(alternate channel)
		77		dB	+/- 2MHz
		82		dB	+/- 10MHz
Blocking and Selectivity 38.4 kbps 2-GFSK, 100 kHz channel separation, 20 kHz deviation, 104 kHz channel filter		44		dB	+/- 100KHz (adjacent channel)
		44		dB	+/- 200KHz(alternate channel)
		64		dB	+/- 2MHz
		72		dB	+/- 10MHz
Blocking and Selectivity 500 kbps GMSK, 833 kHz channel filter		42		dB	+/- 1MHz (adjacent channel)
		42		dB	+/- 2MHz(alternate channel)
		57		dB	+/- 10MHz
Blocking and Selectivity 1 Mbps 4-GFSK, 400kHz deviation, 1.6MHz channel filter		46		dB	+/- 2MHz (adjacent channel)
		52		dB	+/- 4MHz(alternate channel)
		59		dB	+/- 10MHz

RX Performance in 434MHz

TA = 25°C, VDD = 3.0 V if nothing else stated.

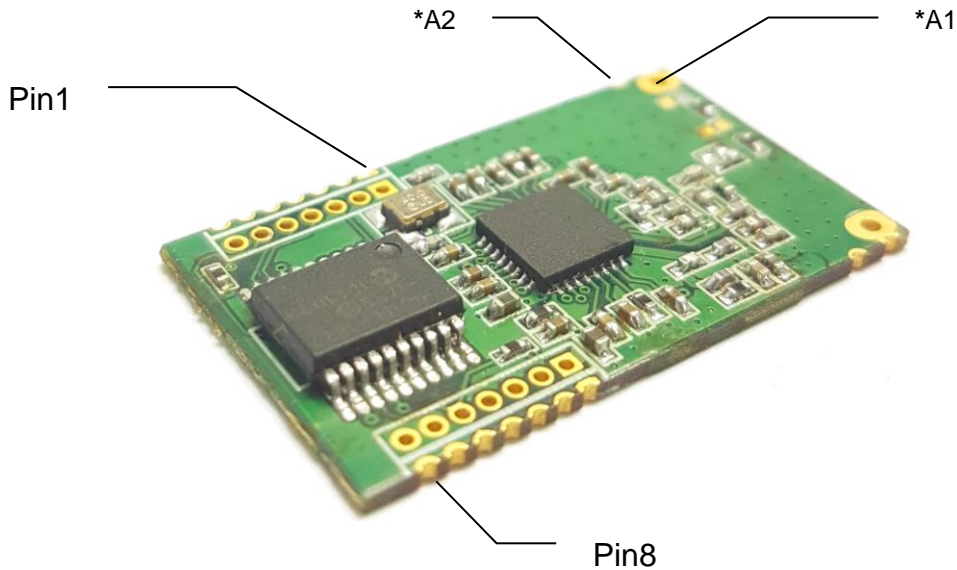
Parameter	Min	Typ	Max	Units	Condition/Note
Receiver sensitivity		-122		dBm	1.2 kbps 2-FSK, DEV=4 kHz CHF=11 kHz
		-110		dBm	38.4 kbps 2-GFSK, DEV=20 kHz CHF=104 kHz
Blocking and Selectivity 1.2 kbps 2-FSK, 12.5 kHz channel separation, 4 kHz deviation, 11 kHz channel filter		60		dB	+/- 12.5KHz (adjacent channel)
		61		dB	+/- 25KHz(alternate channel)
		82		dB	+/- 2MHz
		85		dB	+/- 10MHz
Blocking and Selectivity 38.4 kbps 2-GFSK, 100 kHz channel separation, 20 kHz deviation, 104 kHz channel filter		49		dB	+/- 100KHz (adjacent channel)
		48		dB	+/- 200KHz(alternate channel)
		66		dB	+/- 2MHz
		74		dB	+/- 10MHz

● **RF Transmit Section****General Receive Parameter (High Performance mode)**

TA = 25°C, VDD = 3.0 V if nothing else stated.

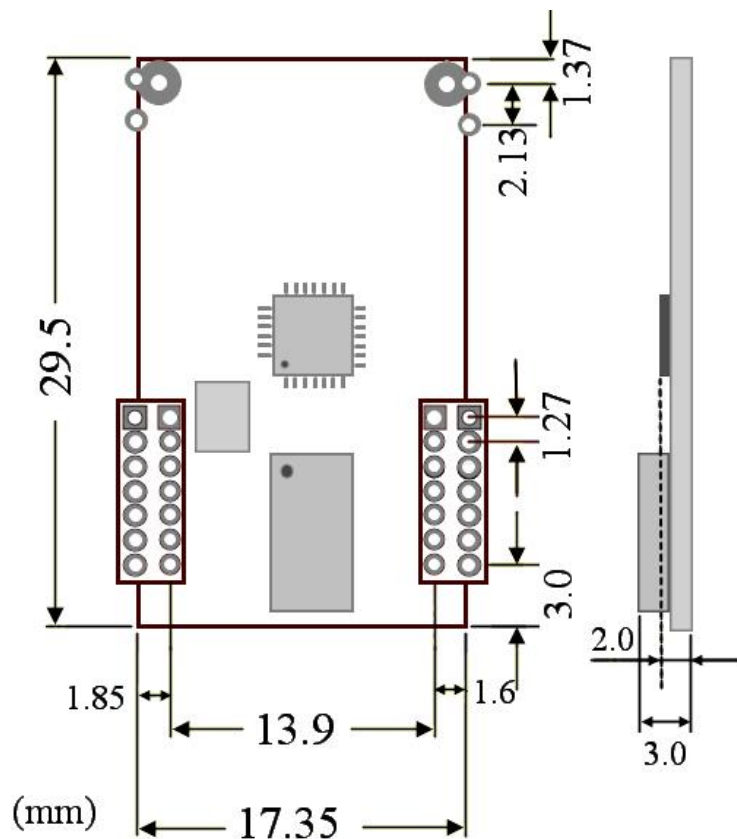
Parameter	Min	Typ	Max	Units	Condition/Note
Max Output Power		+14		dBm	At 915/920 MHz
		+14		dBm	At 868 MHz
		+14		dBm	At 433 MHz
Mini Output Power		-12		dBm	Within fine step size range
		-38		dBm	With coarse step size range
Harmonics					Transmission at +14 dBm
2 nd Harm, 433 MHz		-59		dBm	Suitable for systems targeting compliance with ETSI EN 300-220, FCC Part 15, FCC Part 90, ARIB STD-T108, ARIB STD-T67, ARIB STD-30
3 rd Harm, 433 MHz		-51		dBm	
4 th Harm, 433 MHz		-63		dBm	
2 nd Harm, 868 MHz		-50		dBm	
3 rd Harm, 868 MHz		-44		dBm	
4 th Harm, 868 MHz		-56		dBm	
2 nd Harm, 915 MHz		-58		dBm	
3 rd Harm, 915 MHz		-46		dBm	
4 th Harm, 915 MHz		-62		dBm	

■ AUC1200S_x-ATR_x_y RF Module Pin Configuration

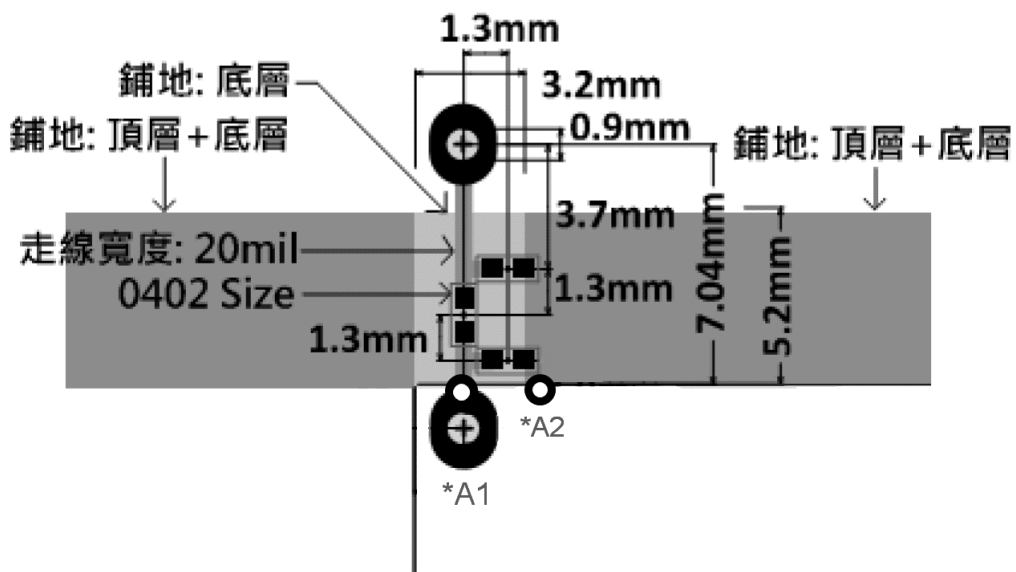


Pin #	Pin name	Pin type	Description
1	GND	Ground	Ground
2	GDO2	Digital Output	
3	P01 , Busy	Digital I/O	Device is Busy
4	P02	Digital I/O	
5	U_RX	Digital Input	
6	P03	Digital I/O	
7	GND	Ground	Ground
8	GND	Ground	Ground
9	GND	Ground	Ground
10	P11 , MSleep	Digital I/O	Sleep mode
11	/RESET	Digital I	Module reset
12	P10 , Bset	Digital I/O	Set Configuration
13	U_TX	Digital Output	
14	VCC	Power (Digital)	Power supply 3.3V
*A1	Ant1	Analog	Antenna
*A2	GND	Ground	Ground

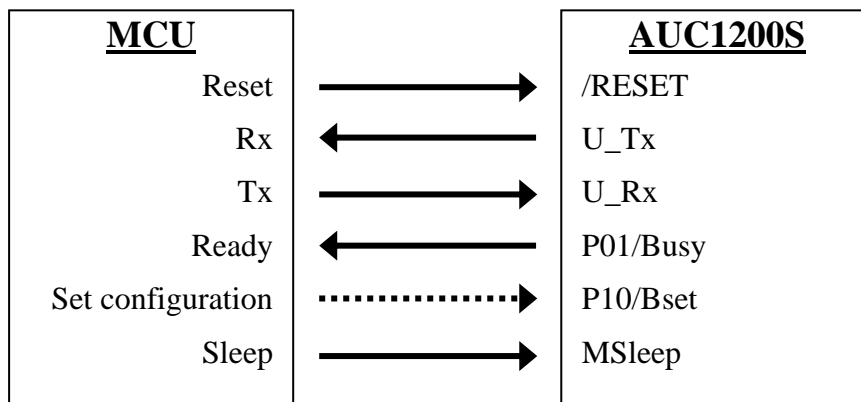
■ AUC1200S_x-ATR_{Xy} RF Module Description



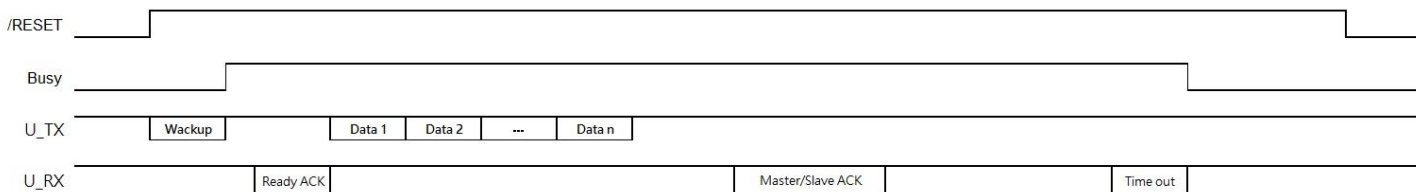
■ Recommended PCB layout for Module



■ UART Signal Application for AUC1200S_x-ATR_{Xy}

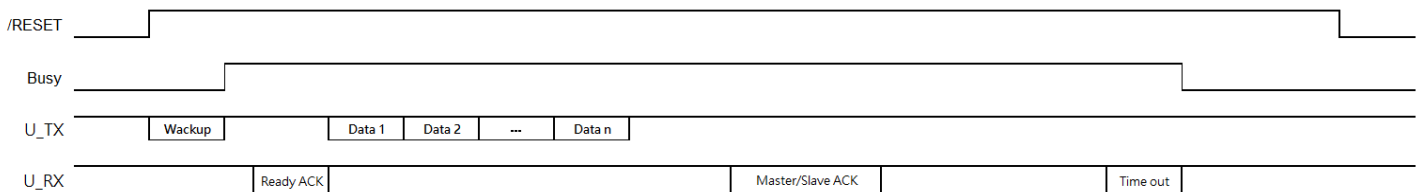


1. Data Transceiver : Transmit



- ◆ ACK : If ACK mode is enable
- ◆ Bset pin : Always is high
- ◆ MSleep pin : Always is high

2. Data Transceiver : Receive



- ◆ Bset pin : Always is high
- ◆ MSleep pin : Always is high

■ UART data format

A. Command set table:

▶ AUC1200Sx-ATRxY ENHANCED INSTRUCTION SET

Define	ASCII	16 Hex	W/R
System information			
IP/Frequency	RF<IP-AB.CD.EF.MN.XY-11> LF	52 46 3c 49 50 2d aa bb 2e cc dd 2e ee ff 2e mm nn 2e xx yy 2d 31 31 3e 0a	R
Status return			
『Busy』 Status	RF+Busy LF	52 46 2b 42 75 73 79 0a	R
『Timeout』 Status	RF+Timeout LF	52 46 2b 54 69 6d 65 6f 75 74 0a	R
『Error』 Status	RF +Error LF	52 46 2b 45 72 72 6f 72 0a	R
『Tx data empty』 Status	RF+? LF	52 46 2b 3f 0a	R
『Tx data check sum』 Status	RF+!AB LF	52 46 2b 21 aa bb 0a	R
『Tx ACK』 Status	06RF+ack LF	30 36 52 46 2b 61 63 6b 0a	R
System mode return			
『Set register mode』 Status	RF<SR-M> LF	52 46 3c 53 52 2d 4d 3e 0a	R
『IP Scanner mode』 Status	RF<PR-M> LF	52 46 3c 50 52 2d 4d 3e 0a	R
『Sleep mode』 Status	RF<SP-M> LF	52 46 3c 53 50 2d 4d 3e 0a	R
『Rx mode』 Status	RF<RX-M> LF	52 46 3c 52 58 2d 4d 3e 0a	R
Rx packet format			
Rx Data	MNDO+AB...	mm nn 44 4f 2b aa bb ... 0a	R
Rx Serial number +Data	MNSDOAB+CD...	mm nn 53 44 4f aa bb 2b cc dd ... 0a	R

Note 1. A/B/C...is word, aa/bb/cc...is byte. Example: A (1 word) = aa (2 byte).

2. MN is the number of bytes, in hexadecimal.

3. IP-AB.CD.EF.MN.XY-11,AB/CD/EF is IP address, MN/XY is frequency, -11 means version.

▶ AUC1200Sx-ATRxY ENHANCED INSTRUCTION SET (CONTINUED)

Define	ASCII	16 Hex	W/R
Set register Command*Note4			
Set CC1200 register	0x00AB 0xCD 0x2FAB 0xCD	7c 30 78 30 30 aa bb 7c 30 78 cc dd 7c 7c 30 78 32 46 aa bb 7c 30 78 cc dd 7c	W
Set Function register	0x8FAB 0xCD	7c 30 78 38 46 aa bb 7c 30 78 cc dd 7c	W
Set RF test mode	0xCF6B 0xAB	7c 30 78 43 46 36 42 7c 30 78 aa bb 7c	W
Return to the normal mode	0xCFFF 0xA5	7c 30 78 43 46 46 46 7c 30 78 41 35 7c	W

Set mode Command			
Set 『Wake up Mode』	*Note 5	--	W
Set 『Reset Mode』	CI+RS	43 49 2b 52 53	W
Set 『Sleep Mode』	CI+SP	43 49 2b 53 50	W
Set 『IP List Generator Mode』	CI+PH	43 49 2b 50 48	W
Set 『IP Scanner Mode』	CI+PS	43 49 2b 50 53	W
Set 『Rx packet Mode』	CI+RX	43 49 2b 52 58	W
Tx packet format			
Tx packet	DI+ABCD	44 49 2b aa bb cc dd ...	W
Serial number +Tx packet	SDIXX+ABCD	53 44 49 xx yy 2b aa bb cc dd	W

Note 4. Set register, Module must enter 『IP Scanner』 mode.

5. When setting "Wake up Mode", just input any value. It is worth noting that this value is invalid.

B. System information:

Define	ASCII	16 Hex	W/R
IP/Frequency	RF<IP-AB.CD.EF.MN.XY-11> LF	52 46 3c 49 50 2d aa bb 2e cc dd 2e ee ff 2e mm nn 2e xx yy 2d 31 31 3e 0a	R

AB.CD.EF IP Address. /ASCII (word).
 MN.XY AUC1200Sx Frequency,*Note 3
 -11 AUC1200Sz Version:

C. Set register command:

Define	ASCII	16 Hex	W/R
Set CC1200 register	0x00AB 0xCD 0x2FAB 0xCD	7c 30 78 30 30 aa bb 7c 30 78 cc dd 7c 7c 30 78 32 46 aa bb 7c 30 78 cc dd 7c	W

0x00AB/0x2FAB CC1200 Register address.*Note 3
 0xCD Register data

Note 6. CC1200 register/CC120X_FREQ1/CC120X_FREQ0.

7. CC1200 datasheet.

Define	ASCII	16 Hex	W/R
Set Function register	0x8FAB 0xCD	7c 30 78 38 46 aa bb 7c 30 78 cc dd 7c	W

0x8FAB AUC1200S_x function address.
0xCD function register data

Define	ASCII	16 Hex	W/R
Set RF test mode	0xCF6B 0xAB	7c 30 78 43 46 36 42 7c 30 78 aa bb 7c	W

0xAB CC1200 Power set. Reference CC1200 spec.

Define	ASCII	16 Hex	W/R
Return to the normal mode	0xCFFF 0xA5	7c 30 78 43 46 46 46 7c 30 78 41 35 7c	W

AUCC1200S_x module return to the normal mode, When the module is 『IP Scanner Mode』.

D. Transmission data mode:

Define	ASCII	16 Hex	W/R
Tx packet	DI+ABCD	44 49 2b aa bb cc dd ...	W

A,B,C,D Transmission data
Command format : DI+ data1 data2 data3...
Transmission data is broadcast packet mode.

Define	ASCII	16 Hex	W/R
Serial number +Tx packet	SDI XX +ABCD	53 44 49 xx yy 2b aa bb cc dd	W

Command format: SDI serial number + data1 data2 data3...
Data send the specified serial number to the device.

E. Status return

Define	ASCII	16 Hex	W/R
『Timeout』 Status	RF+Timeout LF	52 46 2b 54 69 6d 65 6f 75 74 0a	R

When no “ACK” packet is received, if data send the specified serial number to another module.

Define	ASCII	16 Hex	W/R
『Tx ACK』 Status	06RF+ack LF	30 36 52 46 2b 61 63 6b 0a	R

When “ACK” packet is received, if data send the specified serial number to another module.

Define	ASCII	16 Hex	W/R
『Error』 Status	RF +Error LF	52 46 2b 45 72 72 6f 72 0a	R

When command packet is error.

Define	ASCII	16 Hex	W/R
『Tx data empty』 Status	RF+? LF	52 46 2b 3f 0a	R

Send data is empty, when command packet is “SDI~~XX~~” or “DI+”.

Define	ASCII	16 Hex	W/R
『Tx data check sum』 Status	RF+!AB LF	52 46 2b 21 aa bb 0a	R

When command packet is “SDI~~XX~~+data1 data2 data3…data n” or “DI+ data1 data2 data3…data n” .
 AB(Check sum) : data1+data2+…+data n.

■ CC1200 Initial set:

- Address Config = No address check
- Bit Rate = 1.2 kbps
- Carrier Frequency = 433.999939 MHz
- Deviation = 3.986359 kHz
- Device Address = 0
- Manchester Enable = false
- Modulation Format = 2-FSK
- Packet Bit Length = 0
- Packet Length Mode = Variable
- RX Filter BW = 29.761905 kHz
- Symbol rate = 1.2 kbps
- Whitening = false

Reference:

- [1] For a detailed description of the register fields, please see SmartRF Studio.
 [2] CC1200 datasheet.

■ AUC1200S_x-ATR_x function register:

1. IP address: Register address [0x00]/[0x01]/[0x0B]

Register name	Address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
IP Address_1	0x00	IP17	IP16	IP15	IP14	IP13	IP12	IP11	IP10
IP Address_2	0x01	IP27	IP26	IP25	IP24	IP23	IP22	IP21	IP20
IP Address ID	0x0B	IPD7	IPD6	IPD5	IPD4	IPD3	IPD2	IPD1	IPD0

2. Serial ID: Register address [0x04]/[0x05]

Register name	Address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Serial ID1	0x04	SID17	SID16	SID15	SID14	SID13	SID12	SID11	SID10
Serial ID2	0x05	SID27	SID26	SID25	SID24	SID23	SID22	SID21	SID20

3. UART Baud rate: Register address [0x06]

Register name	Address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
UART Baud rate	0x06	UBR7	UBR6	UBR5	UBR4	UBR3	UBR2	UBR1	UBR0

Uart_Baud_9615	UBR[7:0] =	.207	0xCF
Uart_Baud_10417	UBR[7:0] =	.191	0xBF
Uart_Baud_19200	UBR[7:0] =	.103	0x67
Uart_Baud_57600	UBR[7:0] =	.34	0x22
Uart_Baud_115200	UBR[7:0] =	.16	0x10

4. RF transmit off Type: Register address [0x09]

Register name	Address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
TX off Type	0x04	--	--	--	--	--	--	Tx_Af2	Tx_Af1

Which type is the AUC1200S_x-ATR_x module in? If transmission is complete.

Bit 7-2 Unimplemented bit.

Bit 1-0 TX off Type<1:0>

00 **Idle mode**

01 **Sleep mode**

10 **Rx mode**

5. RF frequency: Register address [0x0C]/[0x0D]

Register name	Address	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
RF frequency 1	0x0C	FQ17	FQ16	FQ15	FQ14	FQ13	FQ12	FQ11	FQ10
RF frequency 2	0x0D	FQ27	FQ26	FQ25	FQ24	FQ23	FQ22	FQ21	FQ20

Reference:

[3] For a detailed description of the register fields, please see SmartRF Studio.

■ Document History

Revision	Date	Description/Changes
1.0	2021.4.15	Initial version

24250 新北市新莊區新北大道三段 5 號 13 樓之 1
13F.-1, No.5, Sec. 3, New Taipei Blvd., Xinzhuang Dist.,
New Taipei City 24250, Taiwan (R.O.C.)

TEL : 886-2-85228250
FAX: 886-2-8522-8121
<http://www.rifo.com.tw>