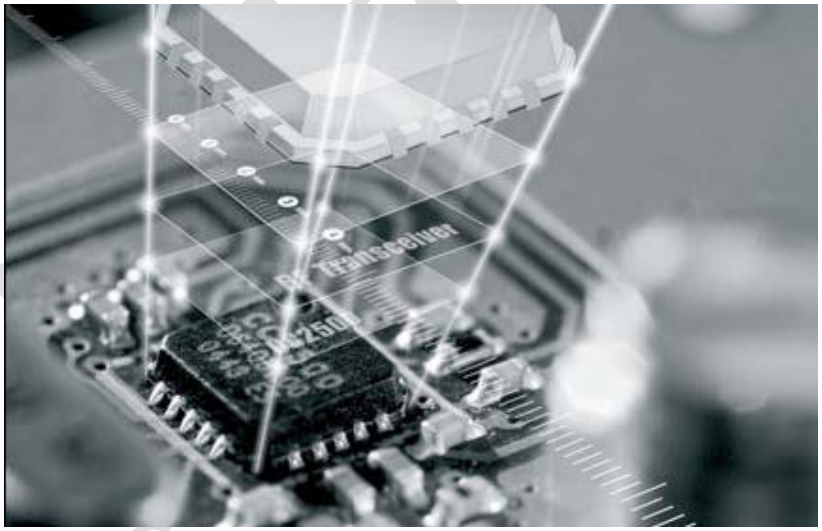
SPECIFICATION

Low Power, High performance
RF Transceiver for UART Interface

UART CMD Control user guide

V-3.2



Model : Sub. 1GHz RF Module

Part No : AUC1200Sx-ATRXy

Version : V3.2

Date : 2023.10.22

■ Selection Guide

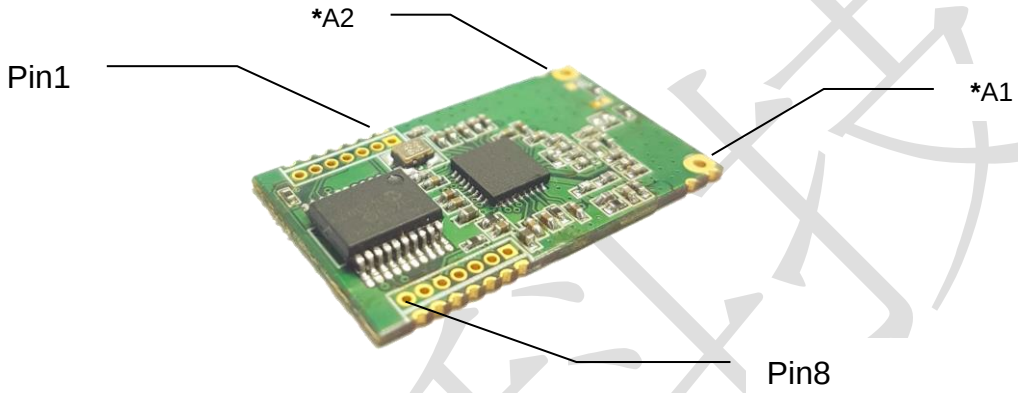
Denomination ：Sub. 1GHz Transceiver Module

Part No. ：**AUC1200Sx-ATRXy**

x **1**: One antenna / **2**: Two antenna

y **4**: 4xx MHz / **8**:8xx MHz / **9**:9xxMHz

■ AUC1200Sx-ATRXy RF Module Pin Configuration

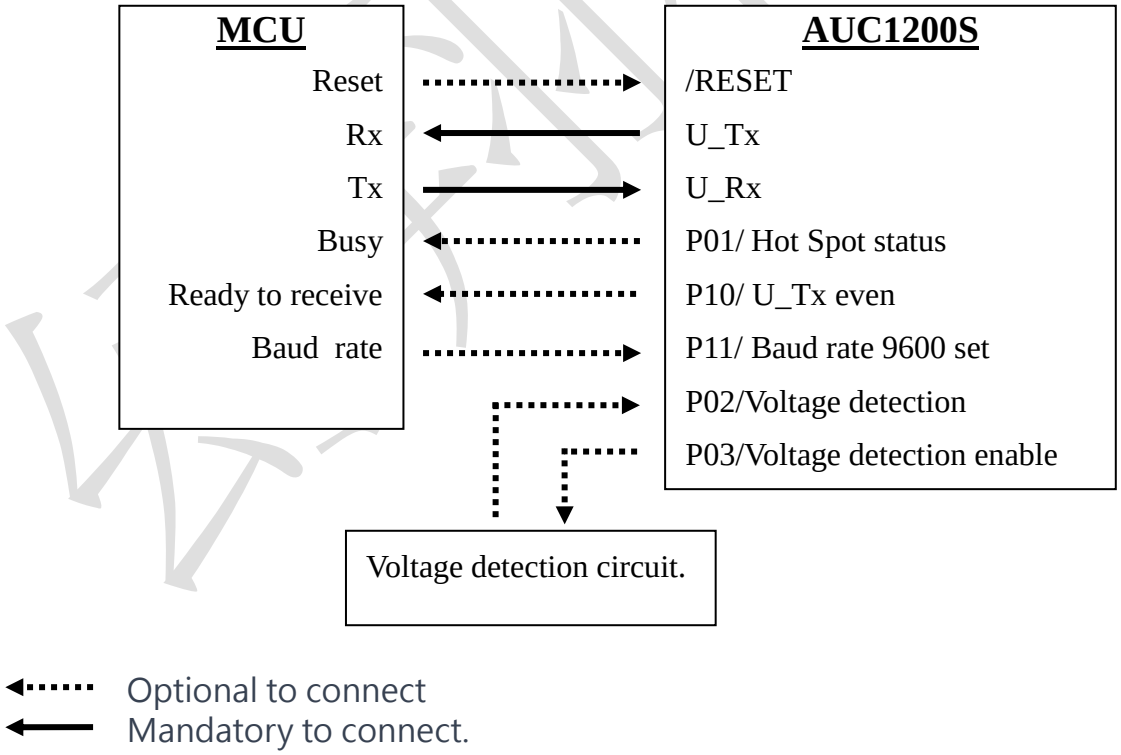


Pin #	Pin name	Pin type	Description
1	GND	Ground	Ground
2	GDO2	Digital Output	RF module Tx/Rx status pin
3	P01 / Busy	Digital I/O	Device is busy.(Hot-Spot mode)
4	P02	Digital I/O	Voltage detection
5	U_RX	Digital Input	**MCU Transmitted Data** – The AUC1200Sx-ATRXy module gets a signal from the data set.
6	P03	Digital I/O	Voltage detection enable
7	GND	Ground	Ground
8	GND	Ground	Ground
9	GND	Ground	Ground
10	P11 / PGC	Digital I/O	A negative is applied to set baud rate 9600 for UART.
11	/RESET	Digital I	Module reset
12	P10 / PGD	Digital I/O	A positive voltage is applied to the data set ready line, which ensures the serial communications between an AUC1200SXy module and a data set can be completed.
13	U_TX	Digital Output	**MCU Received Data** – The data set receives the UART CMD signal via the receive data line.
14	VCC	Power (Digital)	Power supply 3.3V.
*A2	Ant1	Analog	Connect antenna pin
*A1	GND	Ground	Ground

■ General Characteristics

Parameter	Min	Type	Max	Unit	Condition
Voltage Supply Range	2.0		3.6	V	
Temperature Range	- 40		85	℃	
RF Data Rate	0		1250	kbps	Packet mode
	0		625	kbps	Transparent mode
Frequency Bands	820		950	MHz	
	410		475	MHz	
RF Output power			+14	dBm	At 433/868/915 MHz with VDD=3.0V
			+15	dBm	At 433/868/915 MHz with VDD=3.6V
Sensitivity		-122		dBm	RX performance in 1.2 kbps 2-FSK, DEV=4 kHz CHF=11 kHz
		-110		dBm	RX performance in Low Power Mode. 1.2 kbps 2-FSK, DEV=4 kHz CHF=11 kHz
UART baud rate	9600		115200	bps	
Voltage detector range	0		2	V	8-bit resolution

■ UART Signal Application for AUC1200Sx-ATRXy



Optional to connect
Mandatory to connect.

■ P01/P02/P03/P10/P11 Interrupt I/O Define

(1) P01/Busy pin

1-1 Hot-spot state event (when iW / iR mode)

The module enters 'Hot-spot' mode (refer to MODE TYPES DESCRIPTION), applying a positive voltage (High) to the MCU line from AUC1200Sx-ATRXy, indicating a busy status.

1-2 Receiving state event

When receiving command packets or data packets, while the module is in the process of receiving a command packet, the P01 (Busy) pin is set to ”High“; once the reception is complete and the module responds with a command acknowledgment (Response) to the external MCU, the P01 (Busy) pin returns to ”Low“.

(2) P02 // Voltage detect pin

When the EEPROM DBF [ADC function enable] is set to enable status, it detects voltage values whenever data is transmitted and records them in packets for simultaneous transmission. P02 can detect voltage in the range of 0V to 2.048V, with an ADC resolution of 10 bits.

(3) P03 // Voltage detect circuit enable

When Port 6 (P03) pin is set to “High“, Port 4 (P02) initiates voltage detection; when P03 pin is set to “Low“, P02 ceases detection. Refer to the application of P02 and P03 in the battery level detection circuit. (Refer to Figure-1)

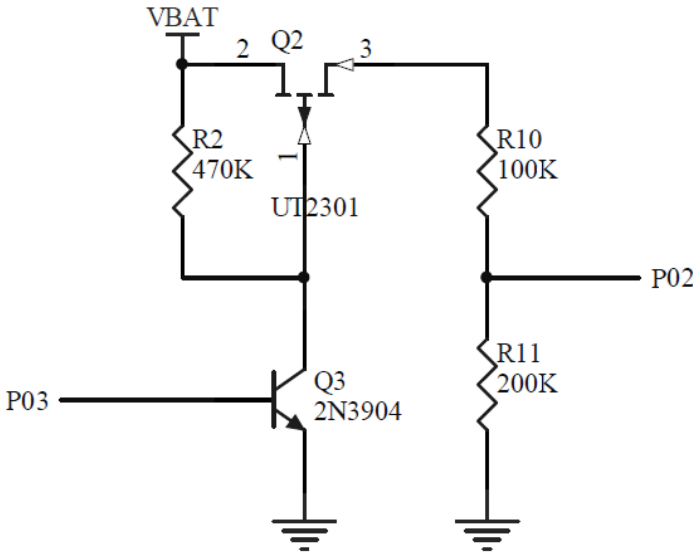
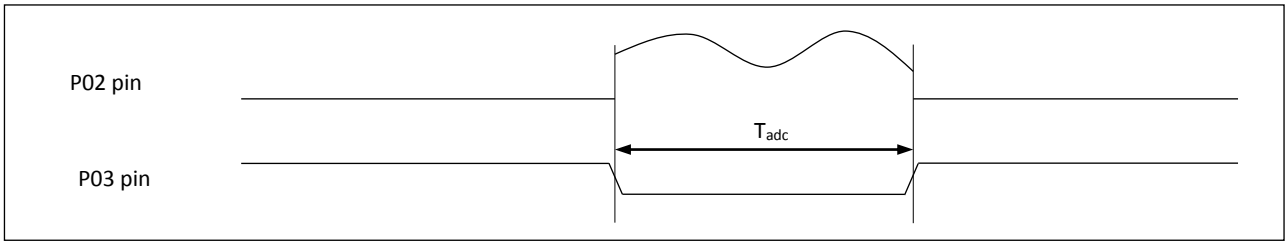
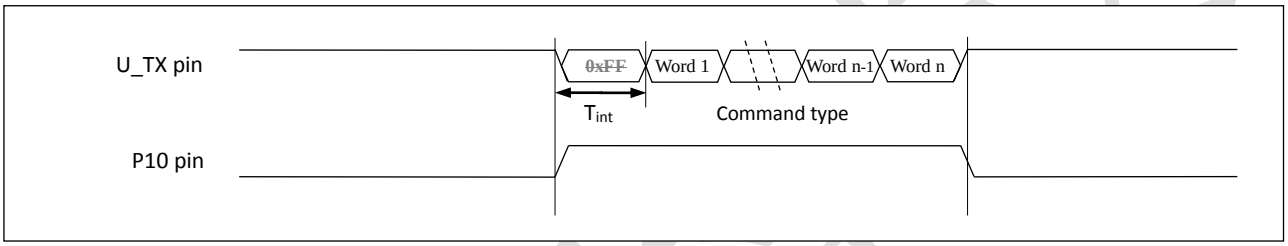


Figure-1 Detect battery power reference circuit



(4) P10 // Ready to send

When the AUC1200Sx-ATRXy module outputs a command string, the P10 (Busy) pin will output [High], indicating readiness for MCU reception.



(5) P11 // Hardware set UART baud rate

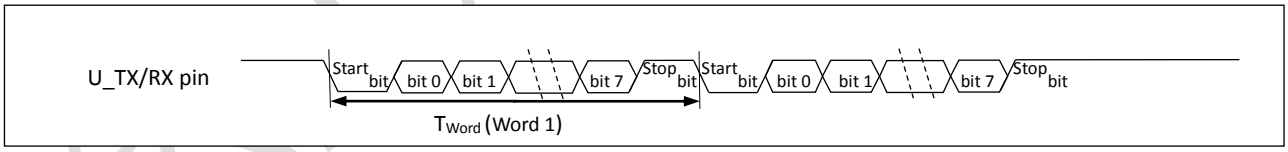
When the MCU applies a negative voltage to P02 of AUC1200Sx-ATRXy, the UART baud rate is forcibly set to 9600.

■ The basic elements of UART commands

A. Basic structure of commands

A-1 UART Baud:

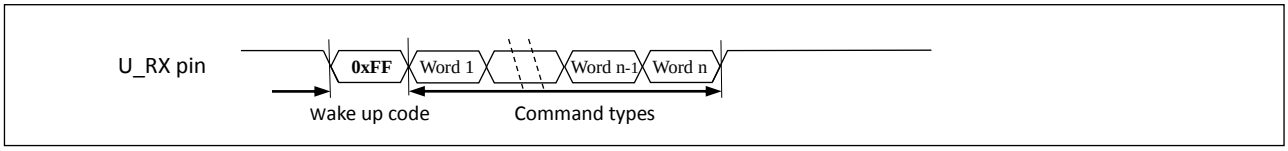
The UART transmits data asynchronously, with one bit transmission comprising 10 bits (Word): 2 bits (Start bit + Stop bit) and 8 bits (data [7:0]). The end-to-end transmission time (T_{Word}) is dependent on the baud rate.



Note: The end stop input time (T_{Word}) depends on the baud rate.

A-2 UART command string transmission start:

A-2-1 When sending a UART command, Wake up code (hex=0xFF) must be added at the beginning of the command string.

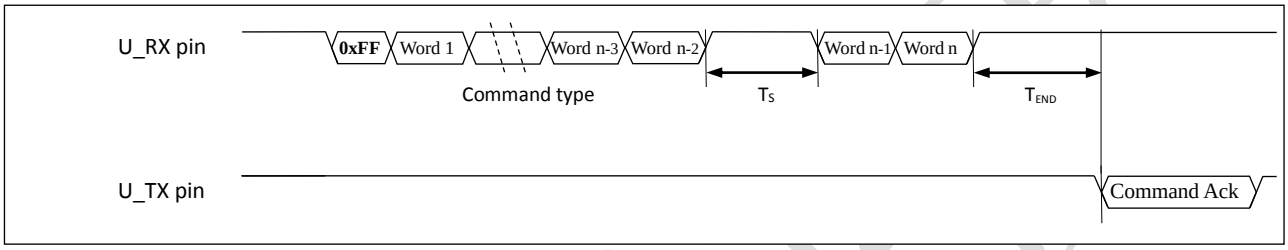


A-2-2 When receiving UART data or commands such as status commands, setting the DBF register (0x0F) to [Wake up code enable] as 'enable' will prepend a Wake up code (hex=0xFF) before each command string sent to the external MCU.

A-3 Completion of UART command string transmission:

A-3-1 TS refers to the timeout between individual characters when transmitting UART command strings.

A-3-2 When the last Byte (Word n) of the command string is input, after the timeout TEND, the command mode automatically terminates, and the module responds with a command acknowledgment (Ack/Response) to confirm to the external MCU.



B. Various wake-up and timing parameters

Sym.	Characteristic	Min.	Typ	Max	Unit	Conditions
Tadc	Enable/Disable controller		1.855		mS	EBF<ADC function enable> = enable.
Tint	Command send interruption	0.92	1.0	1.17	mS	
Tword	Time to send a word					Depends on baude rate.
TS	Send command timeout			0.8	mS	The longest distance between words.
TEND	Time of closing the sent command	1.0			mS	The effective completion of issuing orders

■ MODE TYPES DESCRIPTION

1-1 DS Mode

When the register STAD [addr=10] is set to DS mode, the module enters 'Deep Sleep' in standby mode, deactivating all functions. Upon a command occurrence, the module automatically wakes up to process the command. After completing the command-related tasks, it automatically re-enters deep sleep.

1-2 iW Mode

When the register STAD [addr=10] is set to iW(01) mode and iWT[addr=09] is set to 8's (04), the module in 'Standby' mode operates in a sleep state. Every 8 seconds, it monitors for command packets. If no command packet is received, it enters sleep mode. Upon receiving a command packet, it automatically wakes up to process the command.

1-3 TR Mode

When the register STAD [addr=10] is set to TR (02) mode, the 'Standby' state maintains a receiving mode, constantly monitoring for incoming command packets to process. Upon receiving a command to send data, the module switches to transmission mode. After completion, it automatically returns to the receiving state, ready for further commands.

1-4 iR Mode

When the register STAD [addr=10] is set to iR (03) mode, the module's 'Standby' state mirrors the behavior of the TR mode. Additionally, it is compatible with the iW mode, allowing simultaneous transmission of command packets in both iW and TR modes.

1-5 Hot-spot Mode

In iW/iR modes, when RNTD <Hot-Spot mode enable> is activated, within the same group, it releases its own node to provide hotspot sharing services, aiding in the transmission of data among other devices within the group.

1-6 Test Mode

The commands SR/T initiate the system into a test mode, allowing for testing of RF transmission power or for use in RF certification modes.

■ HEAD CODE & SYMBOL TYPES

C. COMMAND SYMBOL

Symbol	Command Type Define	Write / Read
'#'	Goal Serial ID	W/R
'+'	Send/Receive Data	W/R
'@'	EEPROM/Register Address	W/R
'!'	EEPROM/Register Data/Checksum	W/R
'/'	Reset type	W
'-'	Source Serial ID	R
'~'	Current	R
'$'	RF Power set	R
'<'	Rx RSSI	R
'&'	Packet Number	R
'^'	Status/Mode	R
<LF>	Stop code, express hex [0x0A]	R

D. Head Code Instruction Set

Register(EEPROM) Write/Read		
Head code	Define	Write / Read
"RR"	**R**ead **R**egister data	W
"RW"	**W**rite **R**egister data	W
"ER"	**R**ead **E**EPROM data	W
"EW"	**W**rite **E**EPROM data	W
"RV"	**R**egister data checksum **V**erify	R
"EV"	**E**EPROM data checksum **V**erify	R
Send Data /Receive Data		
Head code	Define	Write / Read
"DO"	Not Target serial number transmission	W/R
"TO"	Target serial number transmission	W/R
"BO"	Broadcast data transmission	W
"CS"	Checksum verify, when send data.	R
"FR"	Read (Clear) the last received data	W
System status CMD		
Head code	Define	Write / Read
"SR"	Chip reset	W
"MD"	Mode type	R
"ST"	Status type	R

■ UART Command Format < COMMAND STRUCTURAL DESCRIPTION >

1. Set/Read CMD

Type	Syntax	Parameter		Description
Read	*<store>*R@*<addr>*	<store>	E : EEPROM [N.1] R : Register	Read the value from the register address.
		<addr>	Storage address [N.2]	
Set	*<store>*W@*<addr>*!*<data>*	<store>	E : EEPROM R : Register	Set the value at the register address.
		<addr>	Storage address	
		<data>	Storage data	

Note :

1. Set or read the EEPROM/Register, head code refer to 『D.COMMAND HEAD CODE DESCRIPTION』.
2. Storage address refer to 『5.EEPROM Description』or 『6.Register Description』.

Example

/Read command/	/Response/	
ER@00	&09EV@00!AE *<LF>*	// Read master address ID, MAID[data] ="AE"
EW@01!F3	&09EV@01!F3 *<LF>*	// Set master group ID=F3, Respond to verification data.

2. Send /Receive CMD

Type	Syntax	Parameter		Description
Send	DO+*<data n>*	<data n>	Data to send [N.3]	Send data to every serial ID device.
	TO#*<SERIn>*+*<data n>*	<SERIn> <data n>	Serial ID Data to sent	Send data to serial ID [N.4] device.
	BO+*<data n>*	<data n>	Data to send	Add the data following a broadcast packet.
	BO-			Clear the data following a broadcast packet.
Receive	-*<RSERIn>*$*<pa>*~*<adc>* < *<rssi>*&*<length><data n>* *<LF>*	<RSERIn> <pa> <adc> <rssi> <length> <data n> <LF>	Serial ID [N.5] RF Power setting Voltage value RSSI value Receive data length Receive data hex code 0x0A	Receive Rx packet information.

Note :

3. n = Data length. Max length: n = 28 bytes, if "DO+" command.
   Max length: n = 14 bytes, if "BO+" command.
   Max length: n = 25 bytes, if "TO#--+" command.
4. Send to the specified device ID, Refer to the other party's EEPROM (SERI2 and SERI1).
5. Send the ID of the source device.

Example

/Send command/	/Response/	
DO+TEST	CS!40<*LF*>	// Send 'TEST' to every serial ID device.
TO#B2+Key-On	CS!13<*LF*> -B2$7F~00<2D&05CO!13<*LF*>	// Send 'Key-On' to serial ID=B2 device. // If the serial ID device receives data, it will send a confirmation packet.
BO+12.33	CS!F7<*LF*>	// Add the '12.33' following a broadcast packet.

/Receive command/

-A2$7F~00<41&06DO+123<*LF*>	// Receive broadcast data '123' for each serial ID device.
-A1$7F~00<41&09TO#A2+AAA<*LF*>	// Received data 'AAA' for my own serial ID (A2).

3. System Mode/Status CMD

Type	Syntax	Parameter		Description
Mode	MD^*<mode>* <*LF*>	<mode>	DS : Deep sleep mode iW : WOR mode TR : Rx/Tx mode iR : iW+TR mode Hot-spot : Relay mode RF-Test : Test mode	What is the current operational mode of the module's operating system?
		<LF>	hex[0x0A]	
Status	ST^*<status>* <*LF*>	<status>	Reset Busy Error Timeout Empty Full Not used Protect T-CF [N.6]	What is the current state of the module's operating system?
		<LF>	hex[0x0A]	

Note :

6. 'ST^T-CF' only occurs in test mode.

Example

/Mode command/

MD^DS <*LF*> // System mode is deep sleep (DS mode).

/Status command/

ST^Error <*LF*> // Send CMD or Data is error.

ST^Hot-spot <*LF*> // Into hot spot mode.

4. System other function CMD

Type	Syntax	Parameter	Description
Reset	SR/?		System reset.
Return	SR/R		Return from 'Hot-Spot mode'.
Test	SR/T		Set RF Test mode.
Reread	FR+		Reread receive last packets.
Clear	FR-		Clear receive packet buffer.

Example

/Send command/	/Response/	
SR/?	ST^Reset <*LF*>	// System reset.
	AUC-UART(V31) <*LF*>	// Firmware name and version
	MD^iW <*LF*>	// System mode
FR+	-B2$7F~00<2D&05CO!13<*LF*>	// Last receive packet data.
FR-	ST^Emtpty<*LF*>	// Clear receive packet buffer.

5. Test mode CMD

Type	Syntax	Parameter	Description
RF set	RF$ <*power*>	<power> Set CC1200 power [N.7]	Test RF power.
Return	RF-		Return from Test mode.

Note :

7. Refers to EEPROM address '0E' (TXPA).

■ EEOROM/Register Description

1. EEPROM Description

addr	Name / Description
00	MAID - Master Address ID configuration
	Master address ID. IF DBF<Role type>= Master, system AID=MAID.
01	MGID - Master Group ID configuration
	Master group ID. IF DBF<Role type>= Master, system GID=MGID.
02	MSID - Master System ID configuration
	Master system ID. IF DBF<Role type>= Master, system SID=MSID.
03	SAID - Slave Address ID configuration
	Slave address ID. IF DBF<Role type>= Slave, system AID=SAID.
04	SGID - Slave Group ID configuration
	Slave group ID. IF DBF<Role type>= Slave. IF DBF<Role type>= Slave, system GID=SGID.
05	SSID - Slave System ID configuration
	Slave system ID. IF DBF<Role type>= Slave, system SID=SSID.
06	SERI2 - Serial ID configuration
	Serial ID 2 is high byte. Bit[15:8]
07	SERI1 - Serial ID configuration
	Serial ID 1 is low byte. Bit[7:0]
08	UBR - UART Baud rate configuration
	Set UART bit baud rate "00" : 9600 bps <default> "01" : 19200 bps "02" : 57600 bps "03" : 115200 bps
09	iWT - WOR timer configuration
	Set WOR termination timer "00" : 0.51 s "05" : 16.0 s "01" : 1.02 s "06" : 32.0 s "02" : 2.04 s "07" : 64.0 s "03" : 4.08 s "08" : 128.0 s "04" : 8.16 s <default> "09" : 256.0 s
0A	FRQ2 - Basic Frequency configuration
	[FREQ2] reference CC1200 SMARTRF_SETTING_FREQ2 register address [0x2F0C]. <default> = "56"
0B	FRQ1 - Basic Frequency configuration
	[FREQ1] reference CC1200 SMARTRF_SETTING_FREQ1 register address [0x2F0D]. <default> = "66"

0C	FRQ0 - Basic Frequency configuration
	[FREQ0] reference CC1200 SMARTRF_SETTING_FREQ0 register address [0x2F0E]. <default> = "66"
0D	CN1 - Frequency Channel configuration

Initial basic frequency = 432 MHz ,when [FRQ2:FRQ1:FRQ0] set [56:66:66]
Set Frequency channel

"00"	:	431.999969	MHz (Basic frequency)	/	f = [FRQ2]/[FRQ1]/[FRQ0] 設定的基礎頻率(f)		
"01"	:	432.199951	MHz	/	F01 =	f + 200	(KHz)
"02"	:	432.399902	MHz	/	F02 =	f + 400	(KHz)
"03"	:	432.599854	MHz	/	F03 =	f + 600	(KHz)
"04"	:	432.799835	MHz	/	F04 =	f + 800	(KHz)
"05"	:	432.999817	MHz	/	F05 =	f + 1000	(KHz)
"06"	:	433.199768	MHz	/	F06 =	f + 1200	(KHz)
"07"	:	433.399719	MHz	/	F07 =	f + 1400	(KHz)
"08"	:	433.599701	MHz	/	F08 =	f + 1600	(KHz)
"09"	:	433.799683	MHz	/	F09 =	f + 1800	(KHz)
"0A"	:	433.999634	MHz <default>	/	F0A =	f + 2000	(KHz)
"0B"	:	434.199585	MHz	/	F0B =	f + 2200	(KHz)
"0C"	:	434.399567	MHz	/	F0C =	f + 2400	(KHz)
"0D"	:	434.599548	MHz	/	F0D =	f + 2600	(KHz)
"0E"	:	434.799500	MHz	/	F0E =	f + 2800	(KHz)
"0F"	:	434.999451	MHz	/	F0F =	f + 3000	(KHz)

0E	TXPA - Power Amplifier configuration

Set output RF power amplifier

"7F"	:	+14	dBm < default >	"66"	:	+ 3	dBm
"7C"	:	+13	dBm	"63"	:	+ 2	dBm
"7A"	:	+12	dBm	"61"	:	+ 1	dBm
"78"	:	+11	dBm	"5F"	:	+ 0	dBm
"76"	:	+10	dBm	"58"	:	− 3	dBm
"73"	:	+ 9	dBm	"51"	:	− 6	dBm
"71"	:	+ 8	dBm	"46"	:	−11	dBm
"6E"	:	+ 7	dBm	"44"	:	−12	dBm
"6C"	:	+ 6	dBm	"42"	:	−24	dBm
"6A"	:	+ 5	dBm	"41"	:	−40	dBm
"68"	:	+ 4	dBm				

0F	DBF–Device Basic function configuration

Format : <UART Input data acknowledge enable>+<ADC function enable>+<Wake up code enable>+<Role type>
<UART Input data acknowledge enable>
0 : Input data acknowledge disable
40 : Input data acknowledge ("CS!xx")enable <default>
<ADC function enable>
0 : ADC disable <default>
20 : ADC enable
<Wake up code enable>
0 : Wake up code disable <default>
10 : Wake up code enable
<Role type>
0 : Master <default>
01 : Slave
Explain
If <UART Input data acknowledge enable>set enable &<ADC function enable>set enable &<Wake up code enable>set disable &<Role type>set slave,
then [Device basic function] = 40 + 20 + 00 + 01 = 61 , [set]="61"

10	STAD - System Standby mode configuration

Standby mode selection
"00" : DS mode
"01" : iW mode
"02" : TR mode <default>
"03" : iR mode

11	RNTD - Relay Node Type configuration

Format : <Sends acknowledge enable>+< Hot-Spot mode enable>+< Relay node function enable>
<Sends acknowledge enable> : Automatically sends a confirmation packet after receiving the RF packet
0 : disable
04 : enable <default>
< Hot-Spot mode enable>
0 : disable
02 : enable <default>
< Relay node function enable>
0 : disable
01 : enable <default>
Explain
If <Sends acknowledge enable>set enable &<Hot-Spot mode enable>set enable &<Relay node function enable>set disable,
then [Device basic function] = 04 + 02 + 0 = 06 , [set]="06"

12	RFPF - RF Packet function configuration

Format : <Rx packet function>+<Tx packet function>
Table 1 : <Rx packet function>

	RF information format decoding	RF information display	
00 :	✘ disable	✗ disable	
10 :	✓ enable	✗ disable	
30 :	✓ enable	✓ enable	<default>

Table 2 : <Tx packet function>
00 : Tx packet include information disable
01 : Tx packet include information enable <default>
Explain
If <Rx packet function> Set 30 & <Tx packet function> Set 01
Then [Packet function] = 30 + 01 =31 , [set] = "31"

13	RxAT - Hot spot time Set
	◆ reference p15『Set timer table』 <default> = "1E" (30's)

2. Register Description

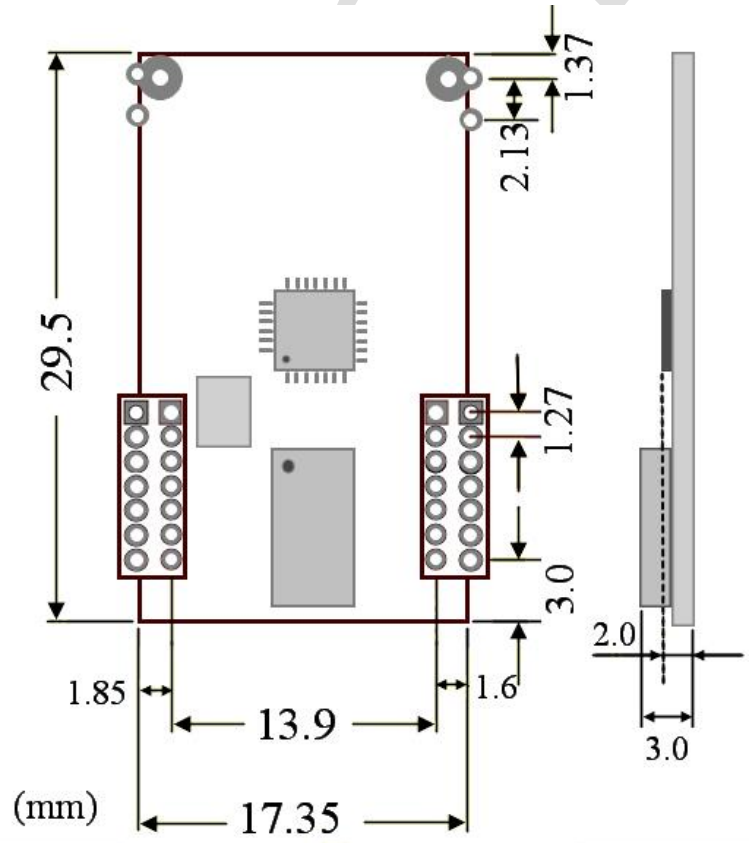
Addr	Name / Description
30	STADR - System Standby mode (Register) configuration
	◆ reference EEPROM address=10
31	RNTDR - Relay Node Type (Register) configuration
	◆ reference EEPROM address=11
32	RFPFR - RF Packet function (Register) configuration
	◆ reference EEPROM address=12
33	HSTxATR - Hot Spot Time Set (Register)
	◆ reference EEPROM address=13
36	RSERI2 - Rx Serial ID 2
	Receive packet Serial ID[15:8]
37	RSERI1 - Rx Serial ID 1
	Receive packet Serial ID[7:0]
38	RXPA - Receive Packet Power set
	Receive PA setting value for sending source.
39	RXADC - Receive Packet analog to digital converter
	Receive voltage value for the sending source.
3A	RXRSSI - Receive Packet RSSI
	Received signal strength indication

■ CURRENT CONSUMPTION

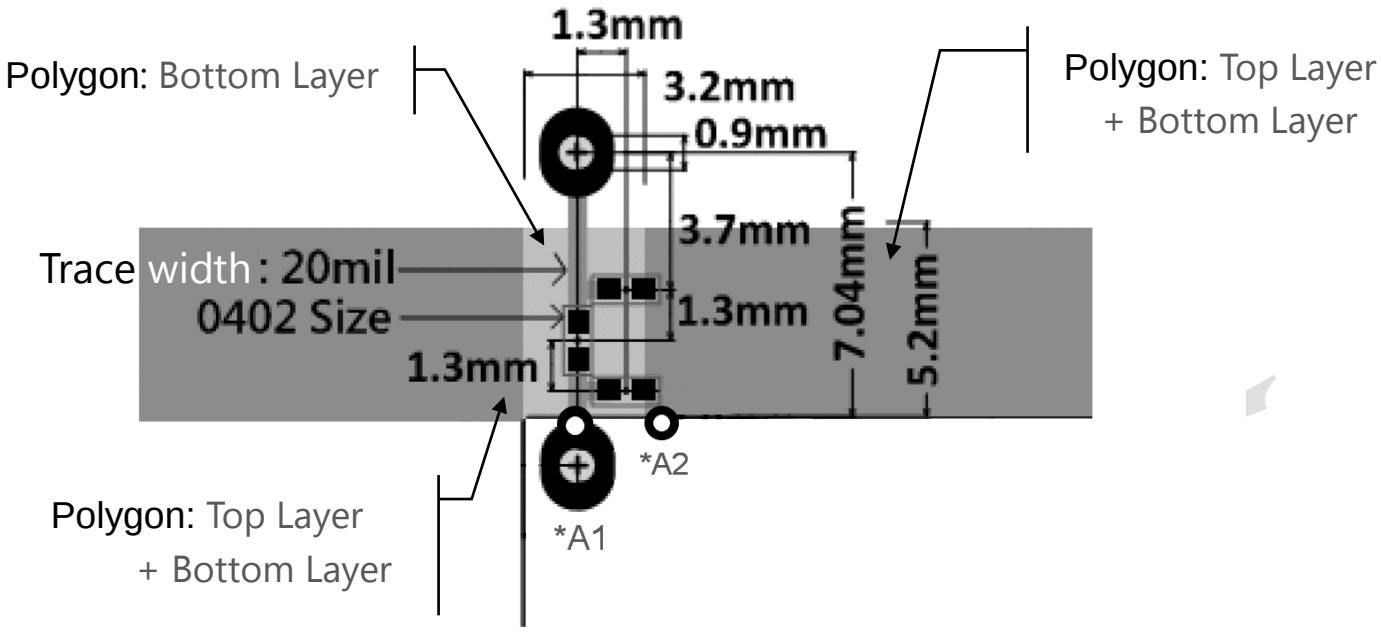
TA=25℃ ,VDD = 3.0 V ,RF output power = +14 dBm , if nothing else stated

System mode	DSP mode	TR mode	iR mode	iW mode	iW mode	iW mode
Modulation format	--	--	2-FSK	4-FSK	2-FSK	2-FSK
RF Bit rate	--	--	250k bps	75k bps	1.2k bps	250k bps
Duty cycle (s)	--	--	8	8	8	8
Standby current (Average)	--	25.9 mA	26.5 mA	17 μA	930 μA	≈8 μA
RxACK mode current	--	--	25.7 mA	25.7 mA	25.7 mA	25.7 mA
Deep sleep	< 1 μA	--	--	--	--	--
Tx current	46 mA	46 mA	46 mA	46 mA	46 mA	46 mA

➲ AUC1200Sx-ATRXz RF Module Description



➲ Recommended PCB layout for antenna



■ Document History

Revision	Date	Description/Changes
1.0	2022.2.15	Initial version
1.3	2022.5.10	Update register setting
1.4	2022.5.16	Up data EEPROM/Register address
1.7	2023.4.27	1. “Rx_ACK” rename ”Hot-spot” 2. ”iRx” rename “iR” 3. Add Register DBF<ADC function enable>
2.2	2023.9.18	1. Register [0x36:0x3C] redefine. 2. Register [0x34:0x35] not used.
3.2	2023.10.22	Add “FR”: Resend last Rx data command.

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➲ Set timer table

■ RxAT : EEPROM <addr>=13

RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)	RxAT	Timer (s)
"01"	1	"21"	33	"41"	65	"61"	97	"81"	129	"A1"	161	"C1"	193	"E1"	225
"02"	2	"22"	34	"42"	66	"62"	98	"82"	130	"A2"	162	"C2"	194	"E2"	226
"03"	3	"23"	35	"43"	67	"63"	99	"83"	131	"A3"	163	"C3"	195	"E3"	227
"04"	4	"24"	36	"44"	68	"64"	100	"84"	132	"A4"	164	"C4"	196	"E4"	228
"05"	5	"25"	37	"45"	69	"65"	101	"85"	133	"A5"	165	"C5"	197	"E5"	229
"06"	6	"26"	38	"46"	70	"66"	102	"86"	134	"A6"	166	"C6"	198	"E6"	230
"07"	7	"27"	39	"47"	71	"67"	103	"87"	135	"A7"	167	"C7"	199	"E7"	231
"08"	8	"28"	40	"48"	72	"68"	104	"88"	136	"A8"	168	"C8"	200	"E8"	232
"09"	9	"29"	41	"49"	73	"69"	105	"89"	137	"A9"	169	"C9"	201	"E9"	233
"0A"	10	"2A"	42	"4A"	74	"6A"	106	"8A"	138	"AA"	170	"CA"	202	"EA"	234
"0B"	11	"2B"	43	"4B"	75	"6B"	107	"8B"	139	"AB"	171	"CB"	203	"EB"	235
"0C"	12	"2C"	44	"4C"	76	"6C"	108	"8C"	140	"AC"	172	"CC"	204	"EC"	236
"0D"	13	"2D"	45	"4D"	77	"6D"	109	"8D"	141	"AD"	173	"CD"	205	"ED"	237
"0E"	14	"2E"	46	"4E"	78	"6E"	110	"8E"	142	"AE"	174	"CE"	206	"EE"	238
"0F"	15	"2F"	47	"4F"	79	"6F"	111	"8F"	143	"AF"	175	"CF"	207	"EF"	239
"10"	16	"30"	48	"50"	80	"70"	112	"90"	144	"B0"	176	"D0"	208	"F0"	240
"11"	17	"31"	49	"51"	81	"71"	113	"91"	145	"B1"	177	"D1"	209	"F1"	241
"12"	18	"32"	50	"52"	82	"72"	114	"92"	146	"B2"	178	"D2"	210	"F2"	242
"13"	19	"33"	51	"53"	83	"73"	115	"93"	147	"B3"	179	"D3"	211	"F3"	243
"14"	20	"34"	52	"54"	84	"74"	116	"94"	148	"B4"	180	"D4"	212	"F4"	244
"15"	21	"35"	53	"55"	85	"75"	117	"95"	149	"B5"	181	"D5"	213	"F5"	245
"16"	22	"36"	54	"56"	86	"76"	118	"96"	150	"B6"	182	"D6"	214	"F6"	246
"17"	23	"37"	55	"57"	87	"77"	119	"97"	151	"B7"	183	"D7"	215	"F7"	247
"18"	24	"38"	56	"58"	88	"78"	120	"98"	152	"B8"	184	"D8"	216	"F8"	248
"19"	25	"39"	57	"59"	89	"79"	121	"99"	153	"B9"	185	"D9"	217	"F9"	249
"1A"	26	"3A"	58	"5A"	90	"7A"	122	"9A"	154	"BA"	186	"DA"	218	"FA"	250
"1B"	27	"3B"	59	"5B"	91	"7B"	123	"9B"	155	"BB"	187	"DB"	219	"FB"	251
"1C"	28	"3C"	60	"5C"	92	"7C"	124	"9C"	156	"BC"	188	"DC"	220	"FC"	252
"1D"	29	"3D"	61	"5D"	93	"7D"	125	"9D"	157	"BD"	189	"DD"	221	"FD"	253
"1E"	30	"3E"	62	"5E"	94	"7E"	126	"9E"	158	"BE"	190	"DE"	222	"FE"	254
"1F"	31	"3F"	63	"5F"	95	"7F"	127	"9F"	159	"BF"	191	"DF"	223	"FF"	255
"20"	32	"40"	64	"60"	96	"80"	128	"A0"	160	"C0"	192	"E0"	224		