

# ASR6601

# Development Board Test Guide

Version 1.2.0

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## About This Document

This document introduces how to test ASR6601 development board to facilitate the developers to better understand the performance of LPWAN SoC ASR6601.

## Intended Readers

This document is mainly for engineers who use this chip to develop their own platform and products, for instance:

- PCB Hardware Development Engineer
- Software Engineer
- Technical Support Engineer

## Included Chip Models

The product models corresponding to this document are as follows.

| Model | Flash | SRAM | Core | Package | Frequency |
|---|---|---|---|---|---|
| ASR6601SE | 256 KB | 64 KB | 32-bit 48 MHz ARM STAR | QFN68, 8*8 mm | 150 ~ 960 MHz |
| ASR6601CB | 128 KB | 16 KB | 32-bit 48 MHz ARM STAR | QFN48, 6*6 mm | 150 ~ 960 MHz |



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## Revision History

| Date | Version | Release Notes |
|---|---|---|
| 2020.08 | V0.1.0 | First release. |
| 2020.09 | V0.2.0 | Updated some pictures. |
| 2020.10 | V0.3.0 | Updated the pictures of ASR6601SE development board v2.0. |
| 2021.01 | V1.1.0 | Deleted Chapter 1, and move the contents to “About This Document”. |
| 2021.05 | V1.2.0 | Updated Section 1.3. |

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# 1. Preparation

## 1.1 Hardware

LoRa nodes hardware requirements:

(1) 1 ASR6601 development board

(2) 1 antenna

(3) 1 USB cable

(4) 1 PC

### 1.1.1 ASR6601 Development Board

ASR6601SE development board v2.0 front and back photos are as follows:

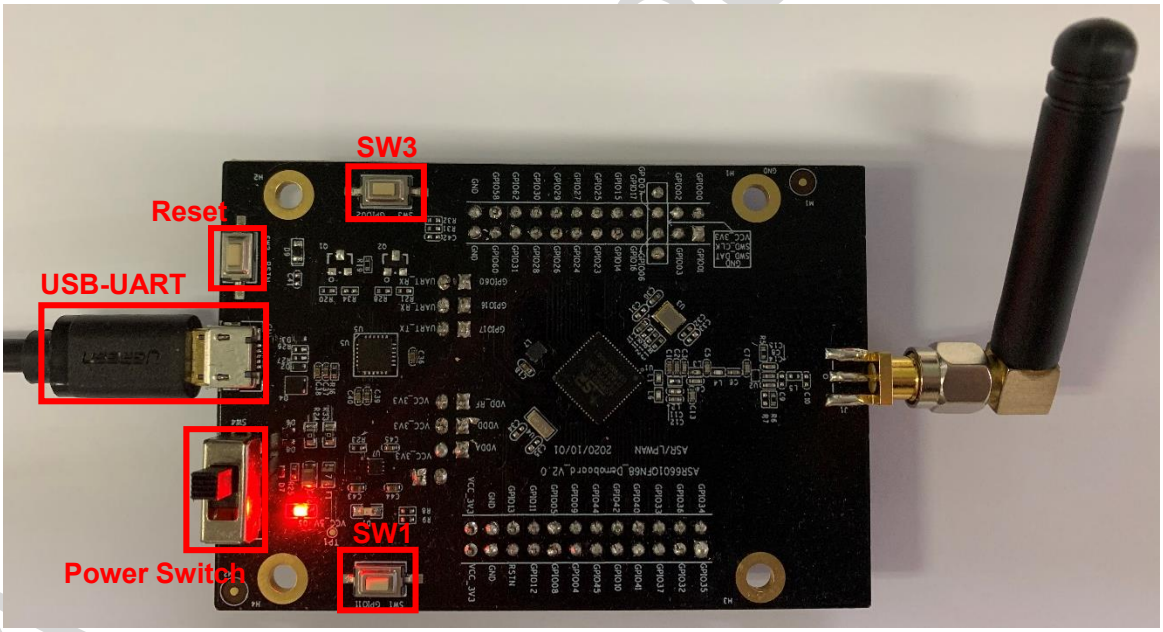


**Figure 1-1 The Front View of ASR6601SE Development Board v2.0**

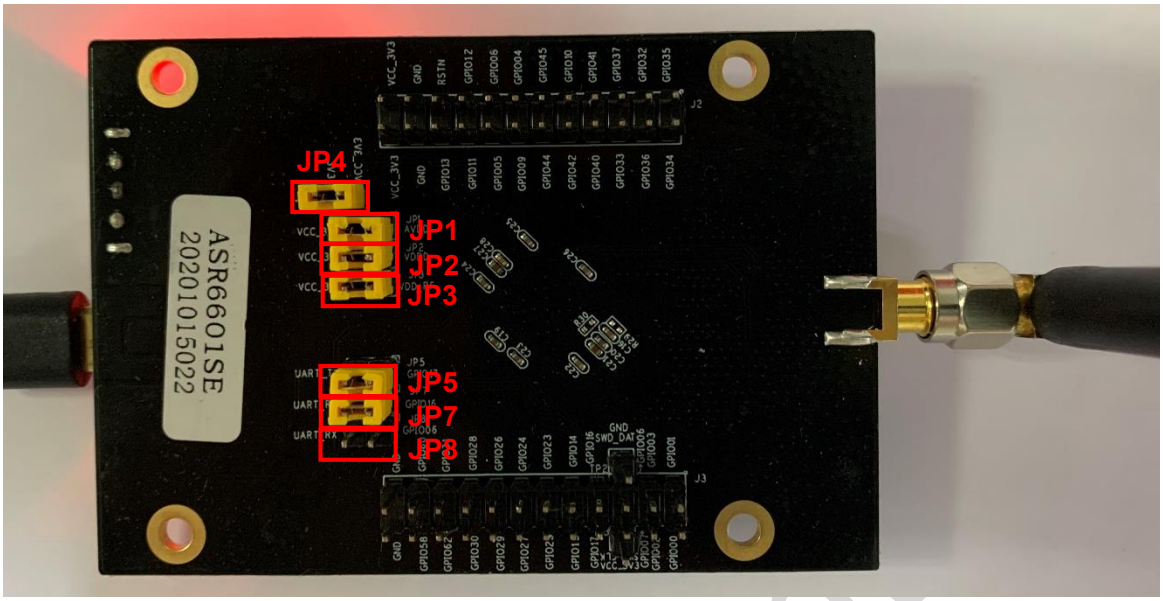


**Figure 1-2 The Back View of ASR6601SE Development Board v2.0**

**Table 1-1 ASR6601SE Development Board v2.0 Interface**

| Interface | Description |
|---|---|
| USB-UART | USB |
| Power Switch | Power switch |
| Reset | Reset button |
| SW3 | It's the Download button pressed to pull up GPIO02 |
| SW1 | It's the User button pressed to pull down GPIO11 |
| JP1 | Jumper1 |
| JP2 | Jumper2 |
| JP3 | Jumper3 |
| JP4 | Jumper4, which can be used to test the board's total power consumption |
| JP5 | Connect UART_TX jumper, then select UART0_TX.<br>Reference: Schematics |
| JP6 (only used in ASR6601CB development board) | Connect UART_TX jumper, then select LPUART_TX.<br>Reference: Schematics |
| JP7 | Connect UART_TX jumper, then select UART0_RX.<br>Reference: Schematics |
| JP8 | Connect UART_TX jumper, then select LPUART_RX.<br>Reference: Schematics |

### 1.1.2 Jumper Connection

When testing ASR6601 development board, please make sure the following jumpers' state is set correctly.

**Table 1-2 Jumper Connection State**

| Jumper | Connection State |
|---|---|
| JP1 | Connected |
| JP2 | Connected |
| JP3 | Connected |
| JP4 | Connected |
| JP5 | Connected |
| JP6 (only used in ASR6601CB development board) | Not connected |
| JP7 | Connected |
| JP8 | Not connected |



  

## 1.2 Software

### 1.2.1 Development Environment

Customers can use KEIL to develop ASR6601. Makefile also can be used for compilation and download. For further details, please refer to *ASR6601_Quick Start Guide.*

### 1.2.2 Test Codes

Test codes can be found in the directory of *projects\${DEMO_BOARD}\examples\lora\lora_test* in SDK. *${DEMO_BOARD}* is the corresponding board name. For example, ASR6601SE-EVAL stands for ASR6601SE development board, and ASR6601CB-EVAL stands for ASR6601CB development board.

## 1.3 Compilation and Download

Please refer to *ASR6601_Quick Start Guide* for compilation and download introductions.

# 2. Tests

There are some AT commands built in test codes, which can be used to test part of functions.

## 2.1 Power Test

**Test Command:** With one serial port tool, and run AT command *AT+CTXCW= 490000000,22* to test the power. Please refer to *Section 3.2.6* for parameter descriptions.

**Reference Result:** 21 dbm

## 2.2 Sensitivity Test

**Test Command:** With one serial port tool, and run AT command *AT+CRXS=490000000,0,0,2,0* to test the sensitivity. Please refer to *Section 3.2.3* for parameter descriptions.

**Reference Result:** -138 dbm

## 2.3 Power Consumption Test

Unplug the JP4 jumper. Connect the multimeter. Please see Figure 2-1 for reference.

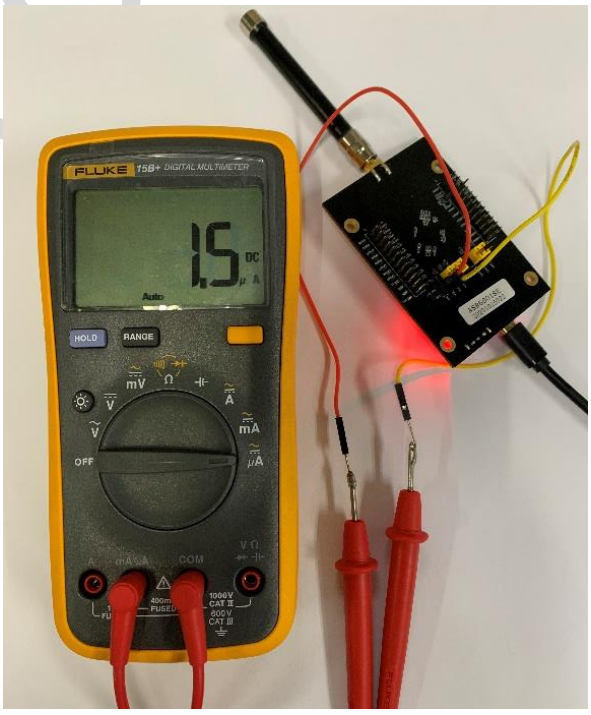


**Figure 2-1 Power Consumption Test Reference Result**

### 2.3.1 TX Power Consumption Test

**Test Commands:** AT+CTXCW=490000000,22

**Reference Result:** 110 mA

### 2.3.2 RX Power Consumption Test

**Test Commands:** AT+CRX=490000000,0,0,1

**Reference Result:** 8.9 mA

### 2.3.3 DeepSleep Power Consumption Test

**Test Commands:** AT+CSLEEP=0

**Reference Result:** 1.5 uA

# 3. Basic AT Commands

## 3.1 Overview

**Table 3-1 AT Commands Summary**

| Commands | Description |
|---|---|
| AT+CTXCW | Send one sustained wave |
| AT+CTX | Send one LoRa package in every other second |
| AT+CRXS | Receive commands. Sensitivity test applicable |
| AT+CRX | Receive commands. Distance test applicable |
| AT+CSLEEP | Low-power test commands |
| AT+CSTDBY | Sx1262 Standby mode test commands |

## 3.2 Commands

### 3.2.1 Low-power Test Commands +CSLEEP

| | |
|---|---|
| Execute Command | AT+CSLEEP=<sleep_mode> |
| Parameters | This command is executed to enter DeepSleep mode.<br>**<sleep_mode>**: mainly about the settings in sx1262<br>● 0: Warm start<br>● 1: Cold start |
| Example | AT+CSLEEP=0 |

### 3.2.2 Lower-power Test Commands +CSTDBY

| | |
|---|---|
| Execute Command | AT+CSTDBY=<standby_mode> |
| Parameters | The execution of this command will make SX1262 be in Standby mode, and make MCU be in Stop3 mode<br>**<standby_mode>**:<br>● 0: STDBY_RC mode<br>● 1: STDBY_XOSC mode |
| Example | AT+CSTDBY=0 |



  

### 3.2.3 Test Commands +CRXS

| | |
|---|---|
| Execute Command | AT+CRXS=<freq>,<data_rate>,<bandwidth>,<code_rate>,<ldo> |
| Parameters | This command is maninly used to test sensitivity.<br>**freq**: 150000000-960000000<br>**data_rate**: 8 levels from DR0 to DR7 and the corrsponding spreading factors are from SF12 to SF5.<br>● 0: SF12<br>● 1: SF11<br>● 2: SF10<br>● 3: SF9<br>● 4: SF8<br>● 5: SF7<br>● 6: SF6<br>● 7: SF5<br>**bandwidth**: 0~9<br>● 0: 125 KHz<br>● 1: 250 KHz<br>● 2: 500 KHz<br>● 3: 62.5 KHz<br>● 4: 41.67 KHz<br>● 5: 31.25 KHz<br>● 6: 20.83 KHz<br>● 7: 15.63 KHz<br>● 8: 10.42 KHz<br>● 9: 7.81 KHz<br>**code_rate**: 1~4<br>● 1: 4/5<br>● 2: 4/6<br>● 3: 4/7<br>● 4: 4/8<br>**ldo**: 0 or 1<br>● 1: start low-bitrate optimizing<br>● 0: close low-bitrate optimizing |
| Example | AT+CRXS=490000000,0,0,2,0<br>start to recv package (freq: 490000000, dr:0, bw: 0, cr: 2, ldo: 0) |
| Notes | When the user types in CRXS test commands, the system will enter infinite loop, in order to keep testing. Users can restart the system to start the next round of test. |



  

### 3.2.4 Test Commands +CRX

| | |
|---|---|
| Execute Command | AT+CRX=<freq>,<data_rate>,<bandwidth>,<code_rate> |
| Parameters | This command is executed to enter RX continously receiving mode.<br>**freq**: 150000000-960000000<br>**data_rate**: 8 levels from DR0 to DR7 and the corrsponding spreading factors are from SF12 to SF5.<br>● 0: SF12<br>● 1: SF11<br>● 2: SF10<br>● 3: SF9<br>● 4: SF8<br>● 5: SF7<br>● 6: SF6<br>● 7: SF5<br>**bandwidth**: 0~9<br>● 0: 125 KHz<br>● 1: 250 KHz<br>● 2: 500 KHz<br>● 3: 62.5 KHz<br>● 4: 41.67 KHz<br>● 5: 31.25 KHz<br>● 6: 20.83 Hz<br>● 7: 15.63 Hz<br>● 8: 10.42 KHz<br>● 9: 7.81 KHz<br>**code_rate**: 1~4<br>● 1: 4/5<br>● 2: 4/6<br>● 3: 4/7<br>● 4: 4/8 |
| Example | AT+CRX=490000000,0,0,1<br>start to recv package (freq: 490000000, dr:0, bw: 0, cr: 1) |
| Notes | When the user types in CRS test commands, the system will enter infinite loop, in order to keep testing. Users can restart the system to start the next round of test. |



  

### 3.2.5 Test Commands +CTX

| | |
|---|---|
| Execute Command | AT+CTX=<freq>,<data_rate>,<bandwidth>,<code_rate>,<pwr>[,tx_len] |
| Parameters | This command is executed to send data in loop at the interval of one second.<br>**freq**: 150000000-960000000<br>**data_rate**: 8 levels from DR0 to DR7 and the corrsponding spreading factors are from SF12 to SF5.<br>● 0: SF12<br>● 1: SF11<br>● 2: SF10<br>● 3: SF9<br>● 4: SF8<br>● 5: SF7<br>● 6: SF6<br>● 7: SF5<br>**bandwidth**: 0~9<br>● 0: 125 KHz<br>● 1: 250 KHz<br>● 2: 500 KHz<br>● 3: 62.5 KHz<br>● 4: 41.67 KHz<br>● 5: 31.25 KHz<br>● 6: 20.83 Hz<br>● 7: 15.63 Hz<br>● 8: 10.42 KHz<br>● 9: 7.81 KHz<br>**code_rate**: 1~4<br>● 1: 4/5<br>● 2: 4/6<br>● 3: 4/7<br>● 4: 4/8<br>**pwr**: The transmitting power of SX1262 will value from 0 to 22<br>**tx_len**: It means the length of Tx packets. The Tx packets will use sending seriel numbers by default, the rest will be filled in with 0x00 |
| Example | AT+CTX=490000000,0,0,1,22<br>start to tx data(freq: 490000000, dr: 0, bw:0, cr: 1, power: 22): 1 |
| Notes | When the user types in CTX test commands, the system will enter infinite loop, in order to keep testing. Users can restart the system to start the next round of test. |

### 3.2.6 Test Commands +CTXCW

| | |
|---|---|
| Execute Command | AT+CTXCW=<freq>,<pwr>[,opt] |
| Parameters | This command is executed to send the continous wave.<br>**freq**: 150000000-960000000<br>**pwr**: The transmitting power of SX1262 will value from 0 to 22<br>**opt**: The PA Optimal setting of SX1262 will value from 0 to 3, and default value is 0.<br>● 0: [0x04,0x07,0x00,0x01]<br>● 1: [0x03,0x05,0x00,0x01]<br>● 2: [0x02,0x03,0x00,0x01]<br>● 3: [0x02,0x02,0x00,0x01]<br>Please refer to Chapter PA Optimal Setting in *SX1262 Datasheet* for the details regarding opt. |
| Example | AT+CTXCW=490000000,22<br>Start to txcw (freq: 490000000, power: 22db, opt: 0)<br><br>AT+CTXCW=490000000,22,2<br>Start to txcw (freq: 490000000, power: 22db, opt: 2) |
| Notes | When the user types in CTXCW test commands, the system will enter infinite loop, in order to keep testing. Users can restart the system to start the next round of test. |

# A. Appendix - Reference

Summaries of the reference information mentioned in this document:

1. Please refer to *ASR6601_Quick Start Guide* for compilation and download introductions.
2. Please refer to Chapter PA Optimal Setting in *SX1262 Datasheet* for details regarding opt.