

# **BDE-SG1311P3 USER GUIDE**

### 1. Introduction

This user guide is for BDE-SG1311P3, a Wireless Module based on TI CC1311P3. It is a quick start guide for how to connect the module with the evaluation board BDE-EVB07, and how to build the first application. It also shows a demo for how BDE-SG1311P3 receives a data packet that is sent from another BDE-SG1311P3.

### 2. Get Ready

The following tools are recommended to develop with BDE-SG1311P3.

Hardware tools:

- Two modules of BDE-SG1311P3(<u>BDE-SG1311P3-BDE Technology Inc. (bdecomm.com)</u>)
- PC or Laptop
- Two Evaluation boards of BDE-EVB07 (BDE-EVB07-BDE Technology Inc. (bdecomm.com))
- USB cable for power supply and debugging

Software tools:

- Terminal software such as CCS, IAR.
- <u>CCS download</u>
- <u>Software Development Kit (SDK)</u>

### **3.** Build Your First Application

Once have the Hardware and Software tools in place, please following the following steps.

#### **3.1. Connect the Hardware**

Connect the EVB07 to a PC or laptop using a USB cable. As shown in Figure 1, plug BDE-SG1311P3 with adapter board into the development board and connect all pins with jumper caps. Note that TXD and RXD need to be connected to DIO13 and DIO12 with jumpers. Users can connect according to the mapping in Table 1.



#### Sub-1G Wireless Module with PA



Figure 1. Diagram of pin connection

Table 1. Pin mapping between	BDE-EVB07 and BDE-SG1311P3
Connection Designator	BDE-SG1311P3
3V3 Power	VDD
Ground	GND
RXD	DIO12
TXD	DIO13
RST	RST
TMS	TMS
ТСК	ТСК
TDO	DIO16
TDI	DIO17

### **3.2.** Download and install the CCS and SDK

From the above links, follow the instructions in the following steps to download and install the CCS and SDK.

#### CCS Installation

Step 1: Click the "Download options" option

CCSTUDIO	Downloads
Overview Downloads	Technical documentation Related design resources Support & training
Downloads	
()	IDE, CONFIGURATION, COMPILER OR DEBUGGER  CCSTUDIO - Code Composer Studio <sup>™</sup> integrated development environment (IDE)  Download options Supported products & hardware





## Sub-1G Wireless Module with PA

Step 2: Select an option to download CCS

Version: 11.0.0.00012 Release date: 11 Oct 2021	
Release notes     View software details	
Downloads Supported products & hardware	
$ \underline{\Psi} $ Windows single file installer for CCS IDE – 1105996 K	Link to Windows single file (offline) installer for Code Composer Studio IDE (all features, devices)
	MD5 checksum 3fc1fabe5645715e0f90d27ed92c8b15
$ m \pm$ Linux single file installer for CCS IDE $-$ 1072049 K	Link to Linux single file (offline) installer for Code Composer Studio IDE (all features, devices)
	MD5 checksum 8d0d4d77d83bc357ae704f062efb3ea5
$ m \pm$ macOS single file installer for CCS IDE $-$ 1070739 K	Link to macOS single file (offline) installer for Code Composer Studio IDE (all features, devices)
	MD5 checksum fc3f8582e2ada4c74904bfe16a18e35c
$\pm$ Windows on-demand installer for CCS IDE $-$ 39204 K	Link to Windows on-demand (web) installer for Code Composer Studio IDE (all features, devices)
	MD5 checksum 73f4131c31dc663a6c10eaabb9e8939d

Figure 3. Download the appropriate version for CCS

#### Step 3: Unzip the package to a local disc





#### Step 4: Double-click the setup of CCS





#### Sub-1G Wireless Module with PA

Step 5: Click "Next"



Figure6. Welcome screen for setup CCS

### Step 6: Select the default option

🍄 Setup		— 🗆 X
License Agreement		Û
Please read the following License Agreement. You must accept the terms	of this agreement before continuing wit	h the installation.
TECHNOLOGY SOFTWARE FUBLICLY AVAILABLE		^
Copyright (c) 2016 Texas Instruments Incorporated		
All rights reserved not granted herein.		
Limited License Agreement.		
This Limited License Agreement ("Agreement") is a legal agreem entity) and Texas Instruments Incorporated ("II"). The "Softw the materials identified as II proprietary software programs i subject to the terms herein, and any "on-line" or electronic of any portion thereof (the "Licensed Materials"), and (b) the ma third party proprietary software in the software manifest for Software"). For clarification, your use of the Licensed Mater contained in this Agreement and your use of the Public Softwar specified in the applicable software manifest and/or identifie used in this Agreement and the public Software to the software tother software to the software tothet software to the sof	ent between you (either an indivi 'are" consists of the following ma n the software manifest for the s locumentation associated with thes tterials identified as open source the Software, or any portion ther rials is subject to the licensing is is subject to the separate lice d or included with the materials	dual or terials: (a) software e programs, or materials or reof ("Public terms to which they o liconce
Step 1		
Do you accept this license? I do not accept the agreement		
VMware InstallBuilder	Step	2
	< Back Next	> Cancel

Figure 7. Accept the agreement for CCS





#### Sub-1G Wireless Module with PA

Step 7: Click "Next"

😚 Setup		Ħ.	×
Please read the information carefully to determine if you need to take any action prior to continuing.		Í	P
Operating System Check -> OK			
Installer Path Check -> OK			
Unicode Character Check -> OK			
Anti-virus Check -> We have detected you are running anti-virus software on this computer. Anti-virus real-time interfere with installation and it is recommended you temporarily disable this feature. Anti-virus software may a downloading of files that occurs during installation. If you cannot disable the anti-virus software, we recommen which has less interference.	file scanr Iso block d the offli	ning ma the ine insta	y ller,
Pending Reboot Check -> OK			
VMware InstallBuilder	.t >	Canc	el

Figure8. Check the installation for CCS

### Step 8: Select the Installation Directory (Usually by default)

😚 Setup					<u>t1</u> .	×
Installation Directory					1	Ŷ
Please specify the directory where C	ode Composer Studio 11.0.0.0	0012 will be installed.				
Installation Directory C:\ti\ccs1100		<b>1</b>				
	Step 1					
VMware InstallBuilder				Step 2		
		[	< Back	Next >	Car	ncel

Figure9. Specify the directory for CCS



## Sub-1G Wireless Module with PA

Step 9: Select the default	option
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😚 Setup	– 🗆 🗙
Setup type	Ŷ
Choose the installation type that you priver Step 1	
Custom Installation (Recommended)	
This selection allows for selecting which device families and debug probes the amount of disk space used and improve performance. It is possible to installer again.	will be supported. A custom installation can reduce o modify selections in the future by running the
O Full Installation	
not all device families and debug probes are supported on Linux and mac	OS.
VMware InstallBuilder	Step 2
	< Back Next > Cancel

Figure 10. Choose the installation type for CCS

#### Step 10: Select the component 😚 Setup Select Components Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue. MSP430 ultra-low power MCUs Step 1 Click on a component to get a detailed SimpleLink™ MSP432™ low power + perform e MCUs description SimpleLink<sup>™</sup> CC13xx and CC26xx Wireless MCUs SimpleLink<sup>™</sup> Wi-Fi® CC32xx Wireless MCUs CC2538 IEEE 802.15.4 Wireless MCUs C2000 real-time MCUs TM4C12x ARM® Cortex®-M4F core-based MCUs ☐ Hercules<sup>™</sup> Safety MCUs Sitara<sup>™</sup> AM3x, AM4x, AM5x and AM6x MPUs Sitara<sup>™</sup> AM2x MCUs OMAP-L1x DSP + ARM9® Processor DaVinci (DM) Video Processors OMAP Processors TDAx Driver Assistance SoCs & Jacinto DRAx Infotainment SoCs C55x ultra-low-power DSP G6AK2x multicore DSP + ARM® Processors & C66x KeyStone™ multicor mmWave Sensors C64x multicore DSP UCD Digital Power Controllers PGA Sensor Signal Conditioners < > Step 2 VMware InstallBuilder < Back Next > Cancel

#### Figure11. Select the components for CCS



## Sub-1G Wireless Module with PA

Step 11: Select the default option

😚 Setup			×
Install debug probes		ĺ	Ŷ
Select the debug probes you want installed.			
Step 1			
Blackhawk Debug Probes			
SEGGER J-Link			
<u> </u>			
VMware InstallBuilder	Step 2		
< Back	Next >	Can	cel

Figure12. Select the debug probes for CCS

Setup			
Unsupported Boards			
Please note, the following debug probes and bo	oards with onboard debug p	robes are not supported:	
XDS510 Debug Probes			
C6x1x DSP Starter Kit			
C5510 DSP Starter Kit			
C5509 DSP Starter Kit			
VMware InstallBuilder			

#### Figure 13. Unsupported boards for CCS





Step 13: Click "Next"

😚 Setup			×
Ready to Install		Í	Ŷ
Setup is now ready to begin installing Code Composer Studio 11.0.0.00012 o	n your computer.		
N Aurona (anta 110), ilidan		 	
wware installoulder			

Figure14. Ready to install CCS

Step 14: Waiting for installation to complete

B Setup	1771	×
Installing		
Please wait while Setup installs Code Composer Studio 11.0.0.00012 on your computer.		
Installing Unpacking C:\ti\ccs11[]fileanalysis_4.1.0.202106281057\uninstall.xml		





Step 15: Finish

😚 Setup				$\times$
co	mpleting the Code Composer Studio 11.0.0.00012 Setup Wizard			
Set	tup has finished installing Code Composer Studio on your computer. Create Desktop Shortcut Launch Code Composer Studio			
s T U D I O				
~~	Step	2		
	< Back Finish		Cano	el

Figure 16. Completing the CCS Setup Wizard

### Software Development Kit (SDK) installation

#### Step 1: Click on this option

SIMPLELINK-CC1	3XX-CC26XX-SDK	Downloads
Overview Downloads	Technical documentation Related design resources Support & training	
Downloads		
ĽĘ į	SOFTWARE DEVELOPMENT KIT (SDK) SIMPLELINK-MATTER — SimpleLink™ family of devices Matter software Supported products & hardware	Download
SDK	software development кit (sbk) SIMPLELINK-CC13XX-CC26XX-SDK — SimpleLink™ CC13xx and CC26xx software development kit (SDK) Supported products & hardware	Evaluate in the cloud Download options

Figure 17. Download SDK

Step 2: Select an option you need to download SDK



#### Sub-1G Wireless Module with PA

/ersion: 6.10.00.29 Release date: 08 Apr 2022			
☑ Release notes ☑ View software details			
Downloads Supported products & hardware			
Windows Installer for Simplelink CC13XX CC26XX SDK - 915801 K	MD5 checksum	7a04cc7521babf522edd981b4142566c	6
Linux Installer for SimpleLink CC13XX CC26XX SDK - 904718 K	MD5 checksum	4e4d9de7814dde87113581f7ae81ddef	-
Mac OS Installer for SimpleLink CC13XX CC26XX SDK — 989889 K	MD5 checksum	5e93f026fd425f2ea57ef536da987a90	

Figure 18. Download the appropriate version for SDK

Step 3: Login to your TI account. If you are a new user, please register a TI account first

Log in Step1 Input your count	Log in Step 3 Input your password
	Cha
	Password
Forgot password? Step 2	
Next	Forgot password? Step 4
Don't have an account? Register now	Log in
If you don't have an count	
Need help logging in?   myTI FAQs	Need help logging in?   myTI FAQs
De la paire in concerte Tile terrer ef concerte d'active a site	By logging in you agree to TI's terms of use and privacy policy

Figure 19. Login TI count

Step 4: Select "civil" if your application is for civil use



#### Sub-1G Wireless Module with PA

U.S. Governmen	export	approva	I:
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All fields are Required. Incomplete information will be DENIED.

First name:	
Last name:	
Your email address:	
Your full company/university name:	
Country this file will be used in:	

What end-equipment/application will you use this file for:



Figure 20. Choose application

#### Step 5: Select "Yes" and submit

- I / We hereby certify that we will adhere to the conditions above.
- I / We do not know of any additional facts different from the above.
- I / We take responsibility to comply with these terms.
- I / We understand we are responsible to abide by the most current, versions of the Export Administration Regulations and other U.S. export and sanctions laws.





Step 6: Download SDK

#### Sub-1G Wireless Module with PA



TI Home

## **TI Request**

You have been approved to receive this file. Click "Download" to proceed.

In a few moments, you will also receive an email with the link to this file.

Download	
Having trouble de	ownloading? Try www.ti.com/software-help
Thank you, Texas Instrument	S

Figure 22. Download the installer

#### Step 7: Installation



#### Step 8: Click "Next"



Figure 24. Welcome screen for setup SDK



Step 9: Select the default option

💰 Setup					×
License Agreement	🦊 1	èxas In	STR	UME	NTS
Please read the following License A agreement before continuing with t	greement. You he installation	u must accept	the te	erms of t	this
					^
Texas Evaluatio	Instruments n Software 1	Incorporate License Agre	d ement		
IMPORTANT - DIRASE CAREFULLY	READ THIS	GREEMENT W	HICH	step1	
DISPLAYED FOR YOU TO READ PRIO (DEFINED BELOW). YOU WILL BE A	R TO USING T	THE LICENSED	MNTE	RIALS AGREE	ro 🗸
	accept the agr	eement	4	Step	2
	do not accept	the agreemen	t		
InstallBuilder			-		
	< Back	Next >		Cano	el

Figure 25. Accept the agreement for SDK

Step 10: Select the Installation directory (Usually by default)

🛃 Setup				$\times$
Installation Directory	Texas	Inste	RUME	NTS
Please specify the directory where simplelink_cc installed.	13xx_cc26	ax_sdk 6.1	0.00.29 v	vill be
The following directories will be created in this o	directory:			
simplelink_cc13xx_cc26xx_sdk_6_10_00_29		Step	1	
xdctools_3_62_01_15_core				
Installation Directory C:\ti		<b>1</b> 2		
nstallBuilder		1	Step	2
< Back	N	ext >	Cano	el





#### Sub-1G Wireless Module with PA

Step 11: Click "Next"

Setup					×
Ready to Install	-44	Texas	INSTR	RUME	NTS
Setup is now ready to begin insta your computer.	alling simplelin	k_cc13xx_c	c26xx_sdk	6.10.00.2	29 on
InstallBuilder	< Back	c N	lext >	Cano	cel

Figure 27. Ready to install SDK

Step 12: Waiting for installation to complete

🕤 Setup			
Installing	🐺 Ti	exas Instr	RUMENT
Please wait while Setup computer.	installs simplelink_cc13xx_c	c26xx_sdk 6.10.00	).29 on your
	Installing		
Creating director	y C:[]LP_CC1352P7_1\driver	rs\watchdog\ <mark>tirt</mark> o	s\ticlang
stallBuilder			

Figure 28. Waiting for the SDK installation to complete



### Sub-1G Wireless Module with PA

### 3.3. Run an example/demo code

Step 1: For the first module, select a directory as workspace

😚 Code Composer Studio Launcher	×
Select a directory as workspace	Step 1
Code Composer Studio uses the workspace directory to store it	s preferences and development artifacts.
Workspace:	Y Browse
Use this as the default and do not ask again	Step 2
Recent Workspaces	
	Launch Cancel

Figure 29. Select a directory as workspace

Step 2: Find the option named "Import CCS project..."



Figure30. Import CCS Projects



Step 3: Click "Browse" and find the following path to import the project: C:\ti\simplelink\_cc13xx\_cc26xx\_sdk\_6\_10\_00\_29\examples\rtos\LP\_CC1311P3\prop\_rf\ rfEchoTx\tirtos7\ccs

📦 Import CCS Projects			
Import CCS Projects		Step 1	1-00
Import existing CCS Project	s or example CCS Projects.		
Select search-directory:	C:\ti\simplelink_cc13xx_cc26xx_sdk_6_10	_00_29\exam	Browse
○ Select archive file:			Browse
Discovered projects:			
🗹 🗟 rfEchoTx_LP_CC13	811P3_tirtos7_ccs_rfEchoTx_LP_CC1311P	3_tirtos7_ccs.	Select All
		[	Deselect All
	Step 2		<b>Refresh</b>
<	vanzad projects found in same coverb.d	>	
Copy projects into works	pace	rectory	
Open <u>Resource Explorer</u> to	browse a wide selection of example pro	ojects	Step 3
?		Finish	Cancel

Figure 31. Find the following path to import the project

Step 4: Click the "Build" icon to build the project



Figure32. Build project



#### Sub-1G Wireless Module with PA

Step 5: Click the "Debug" icon to download



Figure33. Download

#### Step 6: Click on this option to start debugging



Figure 34. start debugging

By far you should have built your first application successfully. Now you should build your second application and download in another module to communicate between the two modules.

For another module, refer to Step 1 to find the discovered items according to the following path:

C:\ti\simplelink\_cc13xx\_cc26xx\_sdk\_6\_10\_00\_29\examples\rtos\LP\_CC1311P3\prop\_rf\ rfEchoRx\tirtos7\ccs

Follow steps 4 to 6 to complete the compilation and debug of the application.



#### Sub-1G Wireless Module with PA

You can see that the green LED and red LED in the first development board are flashing alternately, which indicates that the module is switching between TX and RX. The green LED means sending the data packet, and the red LED means not receiving the data packet from the other module.



Figure 35. The module send the packet



Figure 36. The module did not receive the packet

The second module will not have any action on the two LEDs of the evaluation board when no packet is received. When a packet is received, the modules enables the red LED. Then the second module switches from RX state to TX state and sends the data it just received.

When the first module receives the data packet from the second module, it compares the data packet with the previously sent data packet, and if the received data packet is the same as the previously sent data packet, it enables the green light.

When the two modules are in communication state, the first module only enables the green LED and the second module only enables the red LED.



#### Sub-1G Wireless Module with PA



Figure 37. The first module is in TX and the second module is in RX



Figure 38. The first module is in RX and the second module is in TX

## 4. Modifications regarding the use of PA

The default HIGH PA and SUB 1 GHZ pin mappings in demo are different from those of the BDE-SG1311P3 module. If HIGH PA is used, the user need to modify the setting of the antenna switch.

In the following tables, Table 2 is the truth table about antenna switch settings in demo and Table 3 is the truth table about antenna switch settings in BDE-SG1311P3 module. The settings of HIGH PA and SUB 1 GHZ in the two truth tables are diametrically opposed.



Table 2. Truth table of demo				
Path	DIO30	DIO29		
OFF	0	0		
HIGH PA	1	0		
SUB 1 GHZ	0	1		

Table 3. Truth table of BDE-SG1311P3 module

Path	DIO30	DIO29
OFF	0	0
HIGH PA	0	1
SUB 1 GHZ	1	0

If the default antenna switch setting is used, the actual transmitted power will be very low when PA function is turned on. To avoid this kind of situation, user can refer to the following code in the main program rewriting **rfDriverCallbackAntennaSwitching()** function. The prototype of the function is in **ti\_drivers\_config.c**.

```
void rfDriverCallbackAntennaSwitching(RF_Handle client, RF_GlobalEvent events, void *arg)
{
  if (events & RF GLobalEventRadioSetup) {
      GPI0_setMux(CONFIG_RF_HIGH_PA, IOC_PORT_GPIO);
      GPI0_setMux(CONFIG_RF_SUB1GHZ, IOC_PORT_GPI0);
      /* Switch off all paths. */
      GPI0_write(CONFIG_RF_HIGH_PA, 0);
      GPIO_write(CONFIG_RF_SUB1GHZ, 0);
      /* Decode the current PA configuration. */
      RF_TxPowerTable_PAType paType = (RF_TxPowerTable_PAType)RF_getTxPower(client).paType;
      if (paType == RF_TxPowerTable_HighPA) {
         /* - High PA --> HIGH PA
           * - LNA enable --> Sub-1 GHz */
         GPI0_setMux(CONFIG_RF_HIGH_PA, IOC_PORT_RFC_GPO0);
         GPI0_setMux(CONFIG_RF_SUB1GHZ, IOC_PORT_RFC_GPO3);
      } else {
          /* RF Core active --> Sub-1 GHz */
         GPI0_setMux(CONFIG_RF_HIGH_PA, IOC_PORT_GPIO);
         GPI0_setMux(CONFIG_RF_SUB1GHZ, IOC_PORT_GPI0);
         GPIO_write(CONFIG_RF_HIGH_PA, 1);
      }
  }
  else if (events & RF_GlobalEventRadioPowerDown) {
      /* Switch off all paths. */
      GPIO write(CONFIG RF HIGH PA, 0);
      GPIO_write(CONFIG_RF_SUB1GHZ, 0);
      /* Reset the IO multiplexer to GPIO functionality */
      GPI0_setMux(CONFIG_RF_HIGH_PA, IOC_PORT_GPIO);
      GPI0_setMux(CONFIG_RF_SUB1GHZ, IOC_PORT_GPIO);
  }
}
```



#### Sub-1G Wireless Module with PA

By far you should have successfully implemented communication between the two modules.

For further development, please check out the <u>CC1311P3 data sheet</u>, product information and support | <u>TI.com</u> page and download the User guide (<u>https://www.ti.com/lit/ug/swcu191f</u>)

#### **Other Resources**

Mac OS Installer for SimpleLink CC13XX 26XX SDK

Linux Installer for SimpleLink CC13XX 26XX SDK

Mac OS Installer for Code Composer Studio IDE

Linux Installer for Code Composer Studio IDE

CC1311P3 SimpleLink<sup>™</sup> High-Performance Sub-1 GHz Wireless MCU With Integrated Power Amplifier

Windows Installer for SmartRF Flash Programmer 2

### **Revision History**

Revision	Date	Description
V1.0	21-Nov-2022	Initial Released

### More Questions:

Please search existing answers on <u>TI E2E support forums</u>

Contact your local TI sales representative. Or Contact BDE Technology, Inc.

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