

Type ABR mikroBUS™ EVB Quick Start Guide

Quick Start Guide - Rev. 2.0

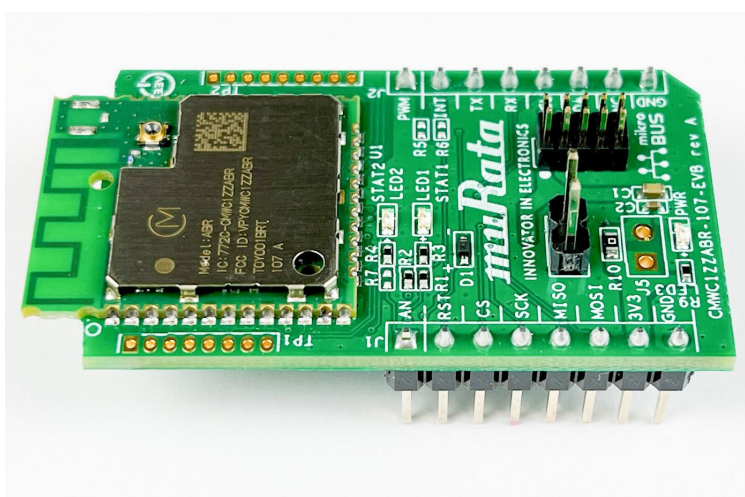


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About This Document

Murata has partnered closely with [Embedded Artists AB](#) to provide a flexible evaluation board solution for Murata's Type ABR module (based on NXP's 88MW320 chipset). Murata's Type ABR EVB is designed with mikroBUS™ interconnect. Type ABR EVB connects directly with NXP's LPC EVKs like LPCXpresso55S69 Development Board ([LPC55S69-EVK](#)). It can also connect to NXP's i.MX RT EVK family (like [MIMXRT1010-EVK](#)) with an Arduino adapter - see MIKROE's Arduino UNO click shield ([MIKROE-1581](#)).

Type ABR is a small module (integrated PCB antenna) based on NXP 88MW320 (wireless microcontroller), supporting Wi-Fi 802.11 b/g/n up to 72.2 Mbps PHY data rate; with an integrated 200 MHz ARM Cortex-M4F MCU for host-side applications. For more information on Type ABR, please refer to [this link](#).

Audience & Purpose

This document details the process of getting started with Murata's Type ABR mikroBUS™ EVB with the LPCXpresso55S69 Development Board.

Document Conventions

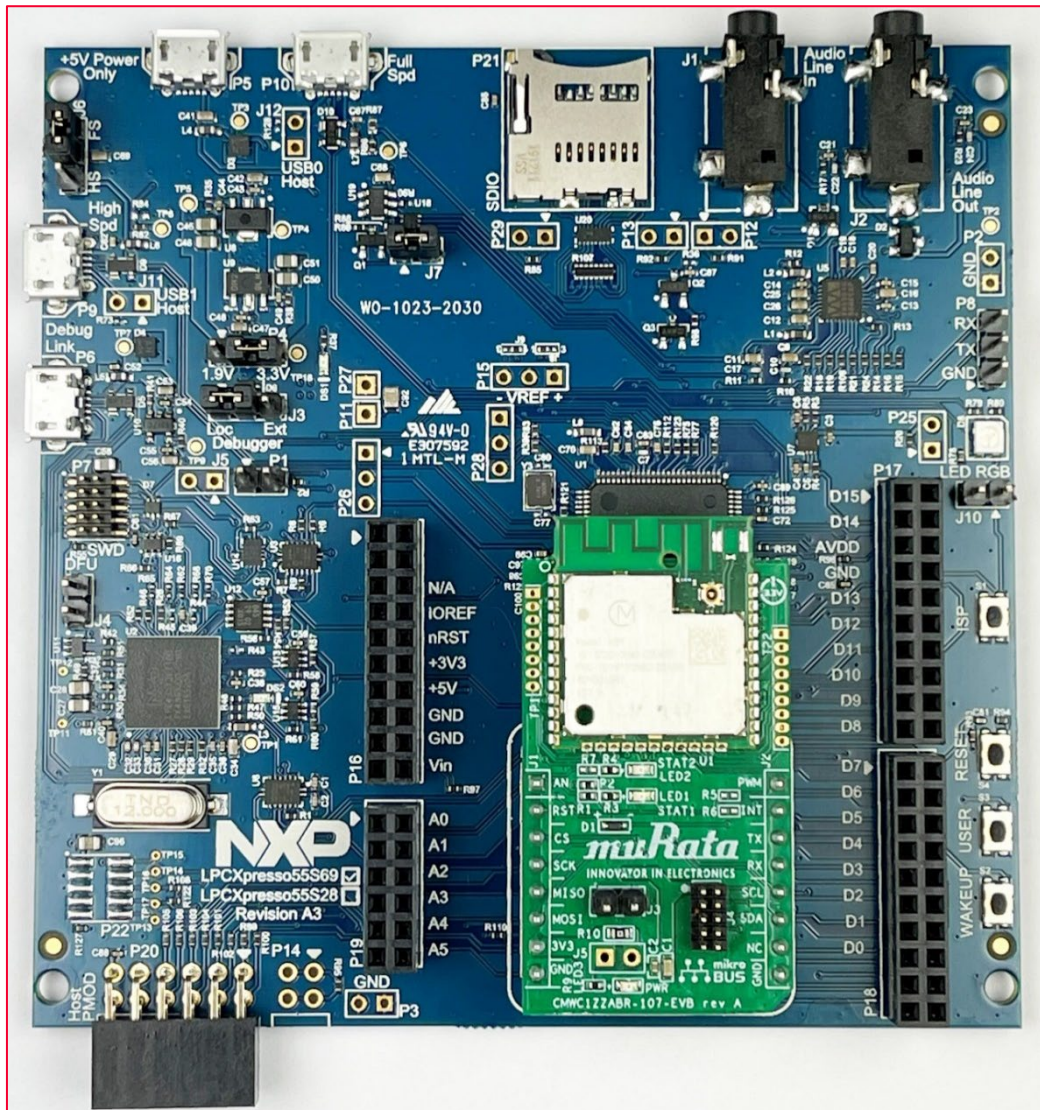
Table 1: Document Conventions

Conventions	Description
	Warning Note Indicates very important note. Users are strongly recommended to review.
	Info Note Intended for informational purposes. Users should review.
	Menu Reference Indicates menu navigation instructions. Example: Insert → Tables → Quick Tables → Save Selection to Gallery 
	External Hyperlink This symbol indicates a hyperlink to an external document or website. Example: Embedded Artists AB Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. Example: Introduction Click on the text to open the link.
<code>Console input/output or code snippet</code>	Console I/O or Code Snippet This text Style denotes console input/output or a code snippet.
<code># Console I/O comment // Code snippet comment</code>	Console I/O or Code Snippet Comment This text Style denotes a console input/output or code snippet comment. - Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. - Code Snippet comment (preceded by "//") may exist in the original code.

1 Introduction

This document steps the user through configuring and running an iPerf example in the MCUXpresso SDK for NXP's LPCXpresso55S69 Development Board with Murata's Type ABR mikroBUS™ EVB. The hardware configuration is shown in **Figure 1**. Murata's Type ABR EVB comes pre-flashed with a customized version of NXP's WMSDKA "serial_mwm_demo" image. This customized WMSDKA firmware interface allows the LPC55 MCU to configure Type ABR into various wireless modes. The ones of immediate relevance include Wi-Fi® Client/Station, and Access Point.

Figure 1: NXP LPC55S69-EVK and Murata Type ABR EVB



Although this document details steps using the [LPCXpresso55S69](#) Development Board, the same steps apply to [LPCXpresso55S16](#), and [LPCXpresso55S28](#). However, the MCUXpresso SDK (version 2.9.1) imported into the MCUXpresso IDE (version 11.3) is specific to each of these platforms

Table 2 lists the different LPCXpresso boards currently supported with links to the MCUXpresso 2.9.1 SDK. The MCUXpresso IDE currently supported is version 11.3. User must be registered on NXP website to download both the MCUXpresso IDE and SDK's.

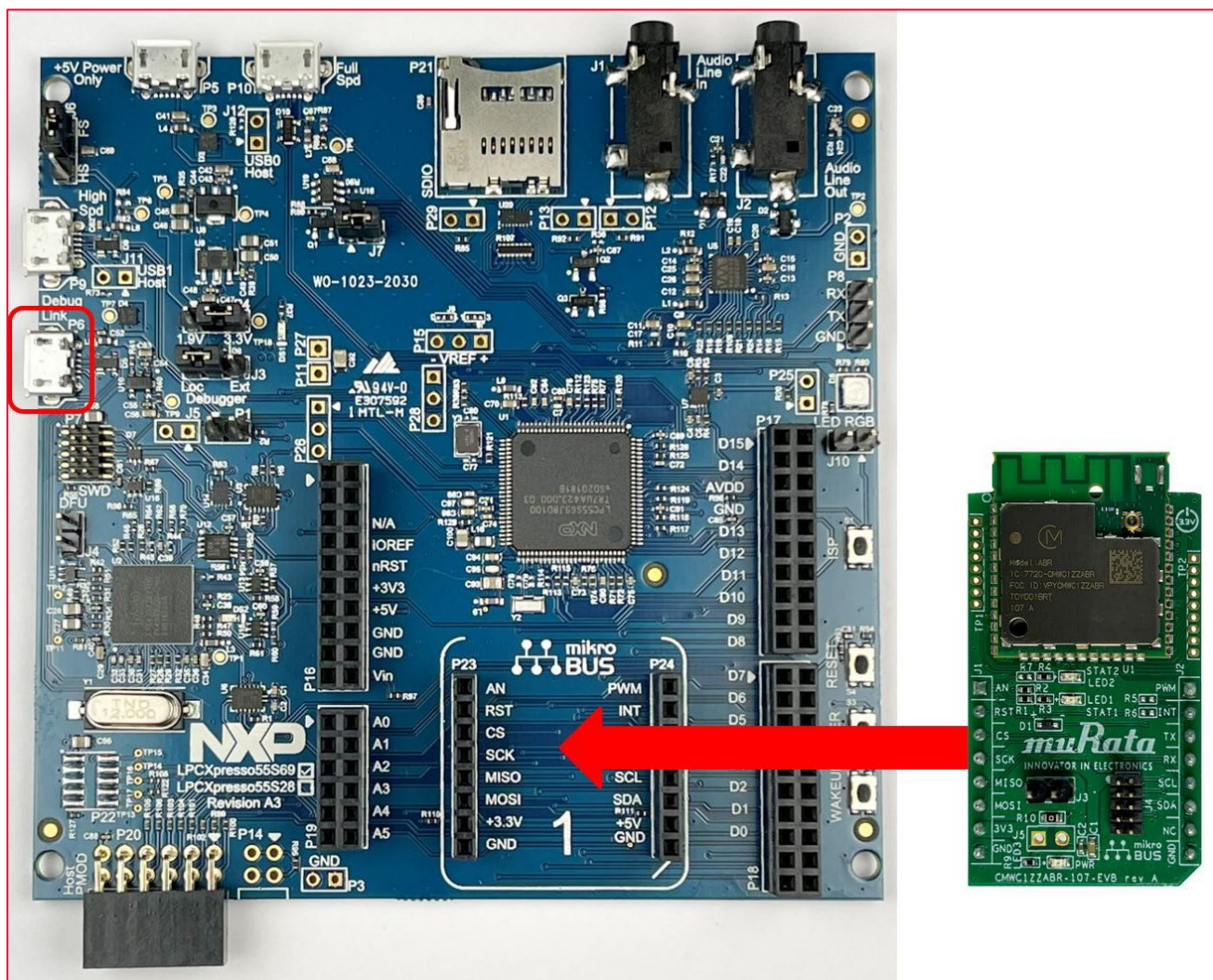
Table 2: NXP LPC Dev Kits Supported with links to MCUXpresso SDK

NXP LPC Dev Kit	MCUXpresso SDK Link
LPCXpresso55S16 ↗	https://mcuxpresso.nxp.com/en/builder?hw=LPCXpresso55S16 ↗
LPCXpresso55S28 ↗	https://mcuxpresso.nxp.com/en/builder?hw=LPCXpresso55S28 ↗
LPCXpresso55S69 ↗	https://mcuxpresso.nxp.com/en/builder?hw=LPCXpresso55S69 ↗

2 Hardware Setup

The Murata Type ABR mikroBUS™ module plugs directly into the LPC55S69-EVK as shown in **Figure 2**. No additional cabling is required. Note the orientation of the ABR EVB with the slanted key on both LPC55S69-EVK's silkscreen and Murata ABR EVB (bottom-right of EVB as shown).

Figure 2: Connecting Type ABR EVB to NXP LPC55S69-EVK



Now, plug one end of the USB cable to laptop and the other end into LPC55S69-EVK's P6: USB connector (Debug Probe) – see red rectangle in **Figure 2**. In addition to this USB connection powering both the LPC55 EVK and the Murata ABR EVB, it provides two FTDI COM ports to the LPC55 EVK.

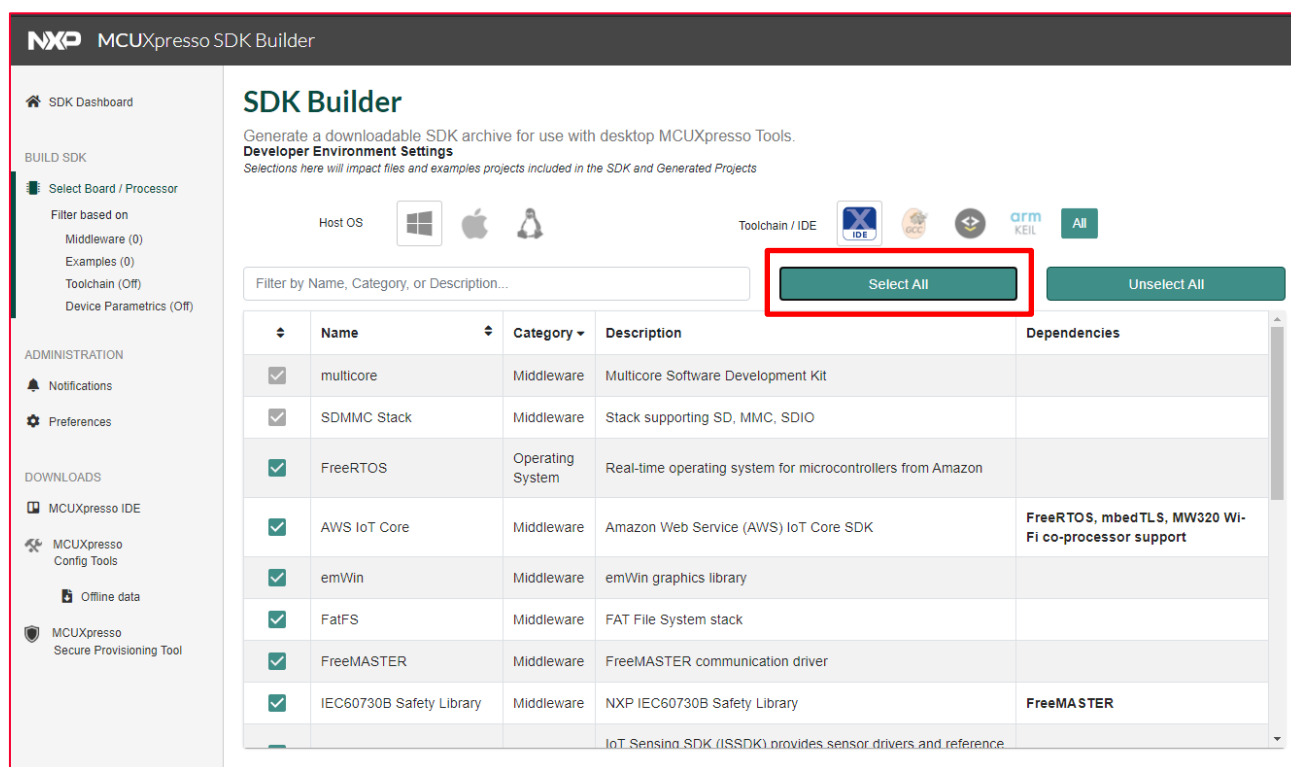


The orientation of Type ABR EVB is same for [LPCXpresso55S28](#). However, it is rotated 180 degrees on the [LPCXpresso55S16](#), thereby allowing better RF reception.

3 Software Setup

1. Ensure that Type ABR EVB is flashed with Murata's "serial_mwm_demo" binary. Typically, ABR EVB ships pre-flashed with this customized image. Refer to [Murata Type ABR mikroBUS™ flashing guide](#) for more specifics.
2. Download and install NXP's MCUXpresso IDE 11.3 [from this link](#).
3. Obtain NXP's LPC55S69 MCUXpresso 2.9.1 SDK [from this link](#). Click "Select All" button (or click on "MW320 Wi-Fi co-processor support") to ensure the Wi-Fi examples are included. Refer to **Figure 3**.
4. Drag and drop the downloaded SDK in the IDE to install. Refer to **Figure 4**.

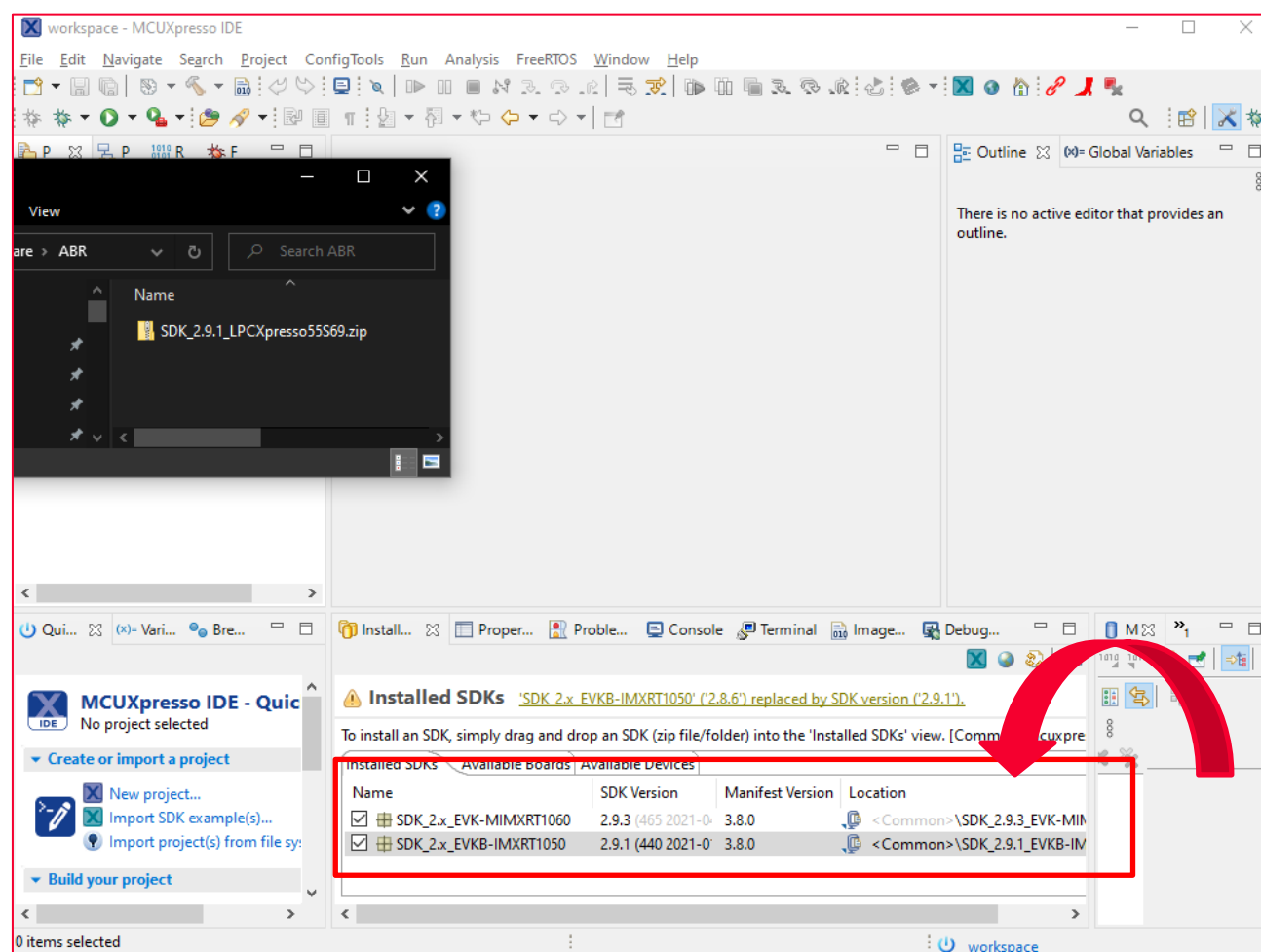
Figure 3: Download SDK



The screenshot shows the NXP MCUXpresso SDK Builder web interface. The left sidebar contains navigation links for SDK Dashboard, BUILD SDK, Select Board / Processor, and ADMINISTRATION. The main area is titled 'SDK Builder' and includes a 'Developer Environment Settings' section with 'Host OS' (Windows, macOS, Linux) and 'Toolchain / IDE' (MCUXpresso IDE, GCC, Keil, ARM Keil, All) dropdowns. A 'Filter by Name, Category, or Description...' search bar is present. Below the search bar, a table lists available SDK components. The 'Select All' button is highlighted with a red box.

	Name	Category	Description	Dependencies
☒	multicore	Middleware	Multicore Software Development Kit	
☒	SDMMC Stack	Middleware	Stack supporting SD, MMC, SDIO	
☒	FreeRTOS	Operating System	Real-time operating system for microcontrollers from Amazon	
☒	AWS IoT Core	Middleware	Amazon Web Service (AWS) IoT Core SDK	FreeRTOS, mbedTLS, MW320 Wi-Fi co-processor support
☒	emWin	Middleware	emWin graphics library	
☒	FatFS	Middleware	FAT File System stack	
☒	FreeMASTER	Middleware	FreeMASTER communication driver	
☒	IEC60730B Safety Library	Middleware	NXP IEC60730B Safety Library	FreeMASTER
			IoT Sensing SDK (ISSDK) provides sensor drivers and reference	

Figure 4: Install SDK



4 Sample Demo Description

4.1 wifi_serial_iperf3 from LPCXpresso

The iperf3 example provides basic commands to measure performance of network stack. Results will be shown on your iPerf server. In the case of 'R' mode, server shows the amount of sent data, check the terminal output in this case for the total amount of payload in bytes received over UDP, which marks the device's throughput.

4.2 serial_mwm_demo on the module

Type ABR module initially starts as a micro-AP before starting provisioning service. During provisioning, module authenticates the client for the security and passphrase. Once provisioning is completed, the module switches to Wi-Fi® station mode, it connects to a Wi-Fi® network in the vicinity.

5 Run wifi_serial_iperf3 example

1. The testing for the ABR is done using the example “wifi_serial_iperf3” provided in the SDK. Import example wifi_serial_iperf3 under the wifi_examples. Refer to **Figure 5**.
2. Open a terminal application (e.g., [Tera Term](#) ) on the appropriate COM port (the port number can be checked in Windows Device Manager, under Ports (COM & LPT)). Configure port for 115200 bps, 8 bits data, no parity, and 1 stop bit (115200/8/N/1).
3. Run debug in the IDE. Then click on resume debug. You will see below logs in the terminal window. Refer to **Figure 6**.
4. Run server in another laptop and enter the IP address of server in the terminal window. Refer to **Figure 7**.
5. Use your mobile phone to connect to the SSID (i.e., Serial2Wifi). Please use password “npx12345” to connect to the SSID.
6. Open address <http://192.168.10.1> in web browser, select "Provisioning". Refer to **Figure 8**.
7. Select WLAN (i.e., “TC2_2G” in this example) for connection. Refer to **Figure 9**.
8. Hit return in Tera Term to see logs. Refer to **Figure 10**.
9. Select one of the options to run iPerf. Select TCP TX mode first in this example. Refer to **Figure 11**.
10. Select UDP RX mode for second test. Refer to **Figure 12**.
11. If you are running the same example (wifi_serial_iperf3) second time, it might start with already associated with WLAN (i.e., “TC2_2G”) without giving you option to join the AP SSID. If you want to repeat same process from connecting to AP SSID from phone and then connecting to WLAN via browser, please follow the steps below shown in **Figure 13**.
12. Connect to the WLAN SSID (i.e., “TC2_2G” in this example) from your phone. Open address <http://192.168.2.125> in web browser, select "Reset to Provisioning". Refer to **Figure 14**.
13. Run the example (wifi_serial_iperf3) again. You will see the option to connect to Wi-Fi AP this time.

Figure 5: Select Example

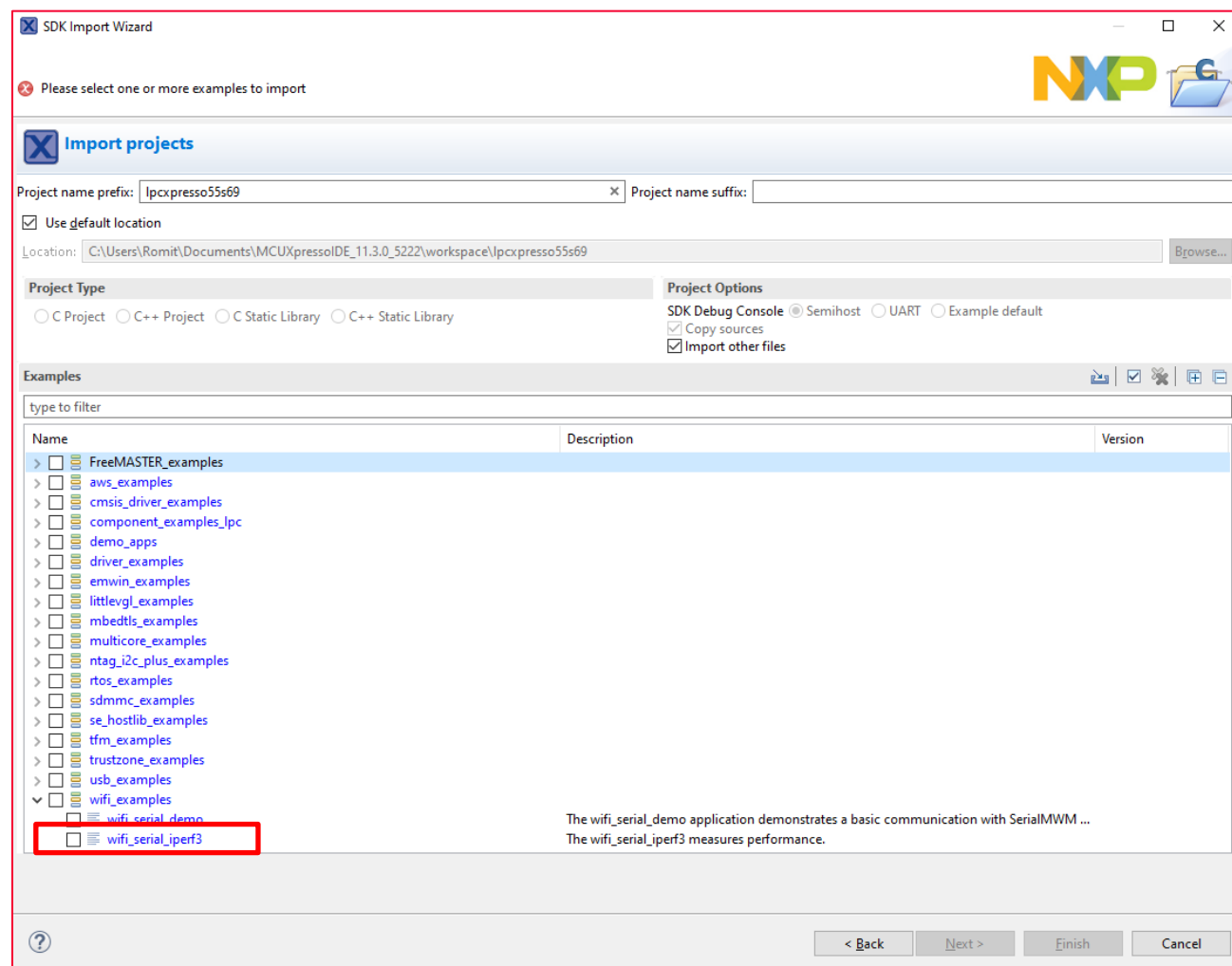


Figure 6: Example lpcpresso55s69_wifi_serial_iperf3 - Example Output

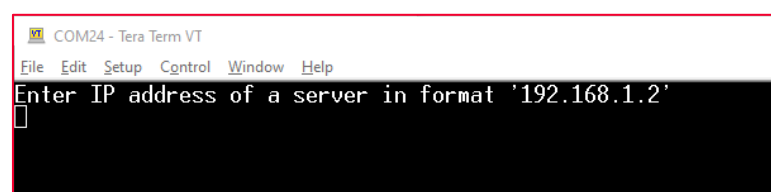


Figure 7: Example lpcpresso55s69_wifi_serial_iperf3 - Enter IP Address



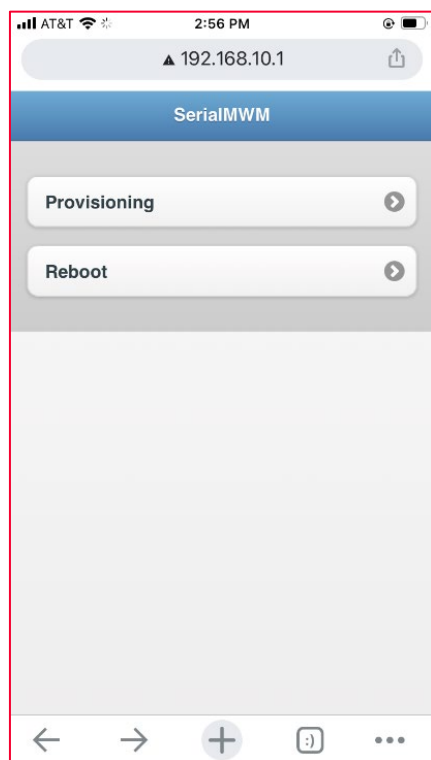
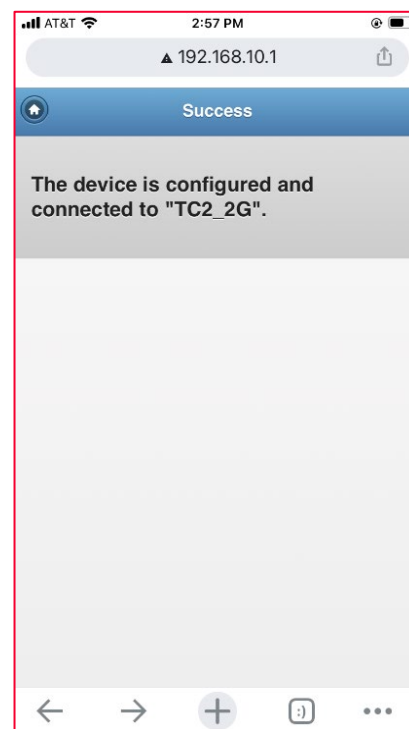
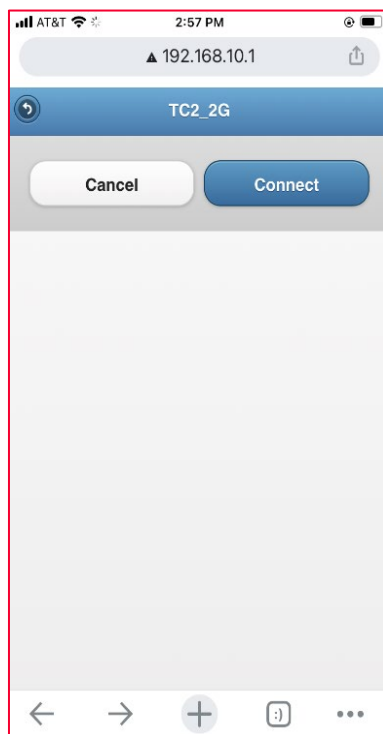
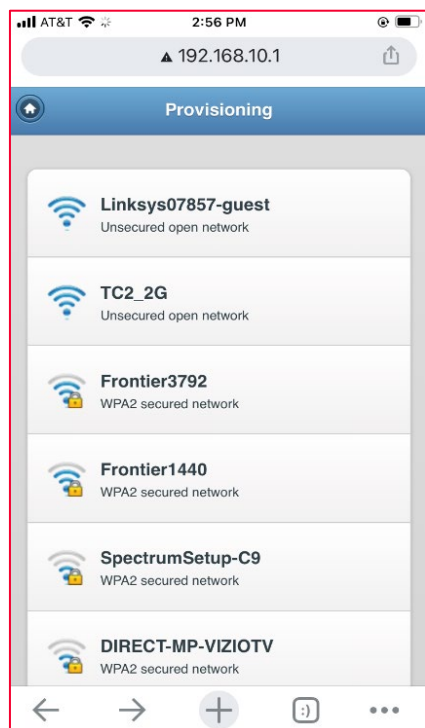
Figure 8: Example Ipcxpresso55s69_wifi_serial_iperf3 - Select Provisioning**Figure 9: Example Ipcxpresso55s69_wifi_serial_iperf3 - Select WLAN**

Figure 10: Example Ipcxpresso55s69_wifi_serial_iperf3 - Mode Selection

```

COM24 - Tera Term VT
File Edit Setup Control Window Help
Enter IP address of a server in format '192.168.1.2'
192.168.2.120
Using IP 192.168.2.120

Wi-Fi module is not configured for WLAN connection.
Connect to Wi-Fi AP: Serial2Wifi, open address: http://192.168.10.1 in web browser and configure WLAN connection.
Press any key to continue.

Wi-Fi is connected to: TC2_2G, IP Address: 192.168.2.123

To reset Wi-Fi module to provisioning mode connect to WLAN: TC2_2G, open address: http://192.168.2.123 in web browser and select "Reset to Provisioning".
Then restart this application.

Menu:
Press 's' to start client Tx mode
Press 'r' to start client Rx mode
Press 'S' to start client Tx UDP mode
Press 'R' to start client Rx UDP mode

```

Figure 11: Example Ipcxpresso55s69_wifi_serial_iperf3 - TCP TX Mode

```

COM24 - Tera Term VT
File Edit Setup Control Window Help
Enter IP address of a server in format '192.168.1.2'
192.168.2.120
Using IP 192.168.2.120

Wi-Fi module is not configured for WLAN connection.
Connect to Wi-Fi AP: Serial2Wifi, open address: http://192.168.10.1 in web browser and configure WLAN connection.
Press any key to continue.

Wi-Fi is connected to: TC2_2G, IP Address: 192.168.2.123

To reset Wi-Fi module to provisioning mode connect to WLAN: TC2_2G, open address: http://192.168.2.123 in web browser and select "Reset to Provisioning".
Then restart this application.

Menu:
Press 's' to start client Tx mode
Press 'r' to start client Rx mode
Press 'S' to start client Tx UDP mode
Press 'R' to start client Rx UDP mode
s
Tx mode!
Connecting to the server...
Sending cookie!!...
Exchanging parameters
Creating streams
Starting test
Ending test
Exchanging results

=====
Server Results
{"cpu_util_total":0.0019242,
"cpu_util_user":0.000946247,
"cpu_util_system":0.000977953,
"sender_has_retransmits":-1,
"streams":[{"id":1,
"bytes":121856,
"retransmits":-1,
"jitter":0,
"errors":0,
"packets":0}]}
=====
IPERF finished, supposed to send 121 kB (119 KiB)(121856 bytes)!
Transmitted 121 kB (119 KiB)(121856 bytes).

=====
PRESS "F" to restart...

```


Figure 12: Example Ipcxpresso55s69_wifi_serial_iperf3 - UDP RX Mode

```

COM24 - Tera Term VT
File Edit Setup Control Window Help
Enter IP address of a server in format '192.168.1.2'
192.168.2.120
Using IP 192.168.2.120

Wi-Fi module is not configured for WLAN connection.
Connect to Wi-Fi AP: Serial2Wifi, open address: http://192.168.10.1 in web browser and configure WLAN connection.
Press any key to continue.

Wi-Fi is connected to: TC2_2G, IP Address: 192.168.2.125

To reset Wi-Fi module to provisioning mode connect to WLAN: TC2_2G, open address: http://192.168.2.125 in web browser and select "Reset to Provisioning".
Then restart this application.

Menu:
Press 's' to start client Tx mode
Press 'r' to start client Rx mode
Press 'S' to start client Tx UDP mode
Press 'R' to start client Rx UDP mode
R
Rx UDP mode!
Connecting to the server...
Sending cookie!!...
Exchanging parameters
Creating streams
Ending test
Exchanging results

=====
Server Results
{"cpu_util_total":0.00534445,
"cpu_util_user":0.00585266,
"cpu_util_system":0,
"sender_has_retransmits":0,
"streams":[{"id":1,
"bytes":126976,
"retransmits":-1,
"jitter":0,
"errors":0,
"packets":0}]}
=====
IPERF finished, Received 110 kB (108 KiB)!

=====
PRESS "F" to restart...

```

Figure 13: Example Ipcxpresso55s69_wifi_serial_iperf3 - Rerun Example

```

Enter IP address of a server in format '192.168.1.2'
192.168.2.120
Using IP 192.168.2.120
Wi-Fi is connecting...
Wi-Fi is connecting...
Wi-Fi is connecting...
Wi-Fi is connected to: TC2_2G, IP Address: 192.168.2.125

To reset Wi-Fi module to provisioning mode connect to WLAN: TC2_2G, open address: http://192.168.2.125 in web browser and select "Reset to Provisioning".
Then restart this application.

Menu:
Press 's' to start client Tx mode
Press 'r' to start client Rx mode
Press 'S' to start client Tx UDP mode
Press 'R' to start client Rx UDP mode

```

Figure 14: Example Ipcxpresso55s69_wifi_serial_iperf3 - Reset to Provisioning

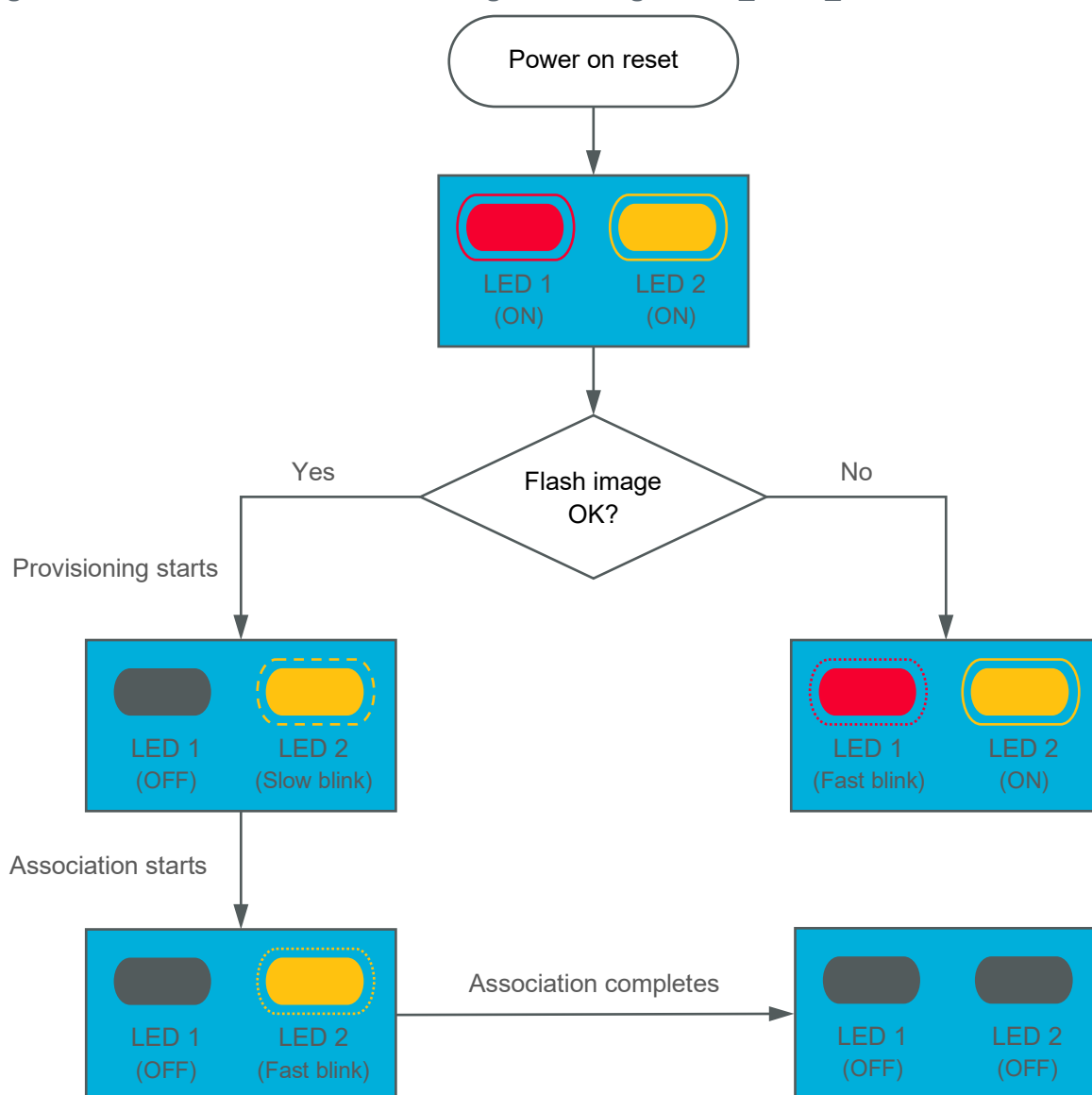
6 Type ABR EVB LED Status

Murata customizes LED1/LED2 functionality in the “serial_mwm_demo” firmware which Type ABR EVB executes. **Table 3** and **Figure 15** provide comprehensive details below.

Table 3: LED1/LED2 status during “serial_mwm_demo” execution

State	LED1 (Red) – READY	LED2 (Yellow) – LINK
Initial power on reset	ON	ON
Corrupted Flash Image	Fast Blink	ON
Provisioning Mode	OFF	Slow Blink
Associating to Access Point	OFF	Fast Blink
Associated to Access Point	OFF	OFF

Figure 15: LED1/LED2 Status Flow Diagram during “serial_mwm_demo” execution



7 References

7.1 Murata Type ABR mikroBUS™ EVB Flashing Guide

This [flashing guide](#)  provides detailed steps on how to flash Murata's Type ABR EVB using NXP's LPC-Link2 debug probe.

7.2 Murata Type ABR mikroBUS™ EVB Datasheet

This [datasheet](#)  documents the Murata Type ABR mikroBUS™ EVB including details on interconnect, features, schematics, and component layout.

7.3 Murata Type ABR Module Webpage

This [website landing page](#)  provides latest/comprehensive information on Murata's Type ABR module.

7.4 Murata Type ABR Module Datasheet

The ABR module datasheet is included on the ABR module webpage. You can also access it easily from [this link](#) .

7.5 Murata Community Forum Support

Murata's Community provides online support for Murata's Type ABR module and Type ABR mikroBUS™ EVB. Refer to [this link](#)  for all Forum threads on Type ABR.

7.6 NXP 88MW32X Landing Page

NXP provides extensive documentation and WMSDKA source code at [this link](#) .

Revision History

Revision	Date	Author	Change Description
1.0	April 23, 2021	TF	Initial Release
1.1	April 28, 2021	TF	Updated for newer MCUXpresso SDK 2.9.1 release.
1.2	April 30, 2021	TF	Updated to reflect additional LPC EVKs supported.
2.0	May 16, 2022	TF	Updated to new document format



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