MIPI Controller Basic User Guide

Introduction to USB MIPI Stick Controller

Abstract

This paper illustrates USB MIPI Stick use guidelines with Infineon RF Products such as LNAs, RF Switches and Antenna Tuners etc.

Table of contents

Abstract **1**
Table of contents **2**
1 USB MIPI Stick **3**
1.1 Introduction 3
1.1.1 Connection through Ribbon Cable 3
1.1.2 Connection through Jumper Wires 4
1.2 Setup 5
1.3 Application Overview 6
1.4 First Steps 7
1.4.1 The DUT is detected and recognized 7
1.4.2 The device is detected but unknown 8
1.4.3 The device is not detected 9
1.5 GPIO Control Panel 10

1 USB MIPI Stick

The MIPI Stick is used to power and control RFFE compliant devices via USB:

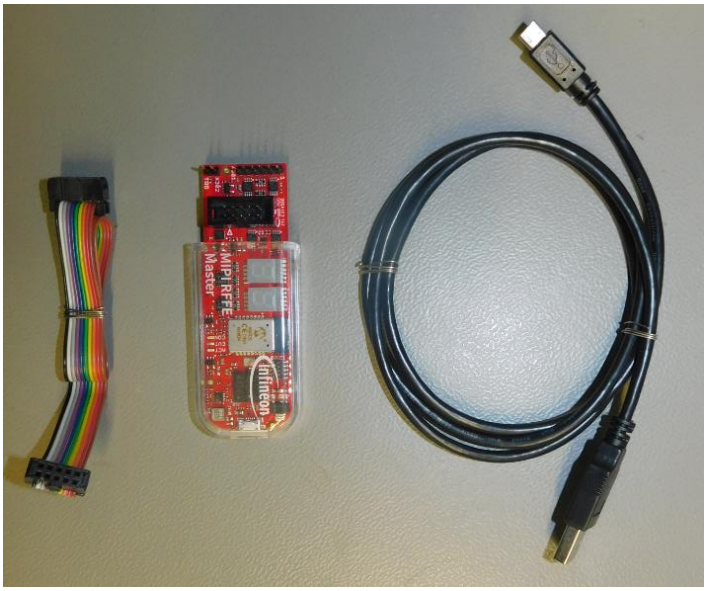


Figure 1 From the left: Ribbon Cable, MIPI Stick, and USB 2.0 cable (USB Type-B Micro to USB Type-A)

1.1 Introduction

This document will explain how to use a MIPI Stick for monitoring and controlling Infineon MIPI RFFE 2.0 compliant devices. The provided hardware package consists of a MIPI Stick board, a USB 2.0 cable (USB Type-B Micro to USB Type-A) and a Ribbon Cable.

1.1.1 Connection through Ribbon Cable

The USB cable connects the PC to the MIPI Stick and the 10-pin bus (Ribbon Cable) connects the MIPI Stick to the Device Under Test (DUT). This is the standard procedure for testing most DUTs, as the following image demonstrates:

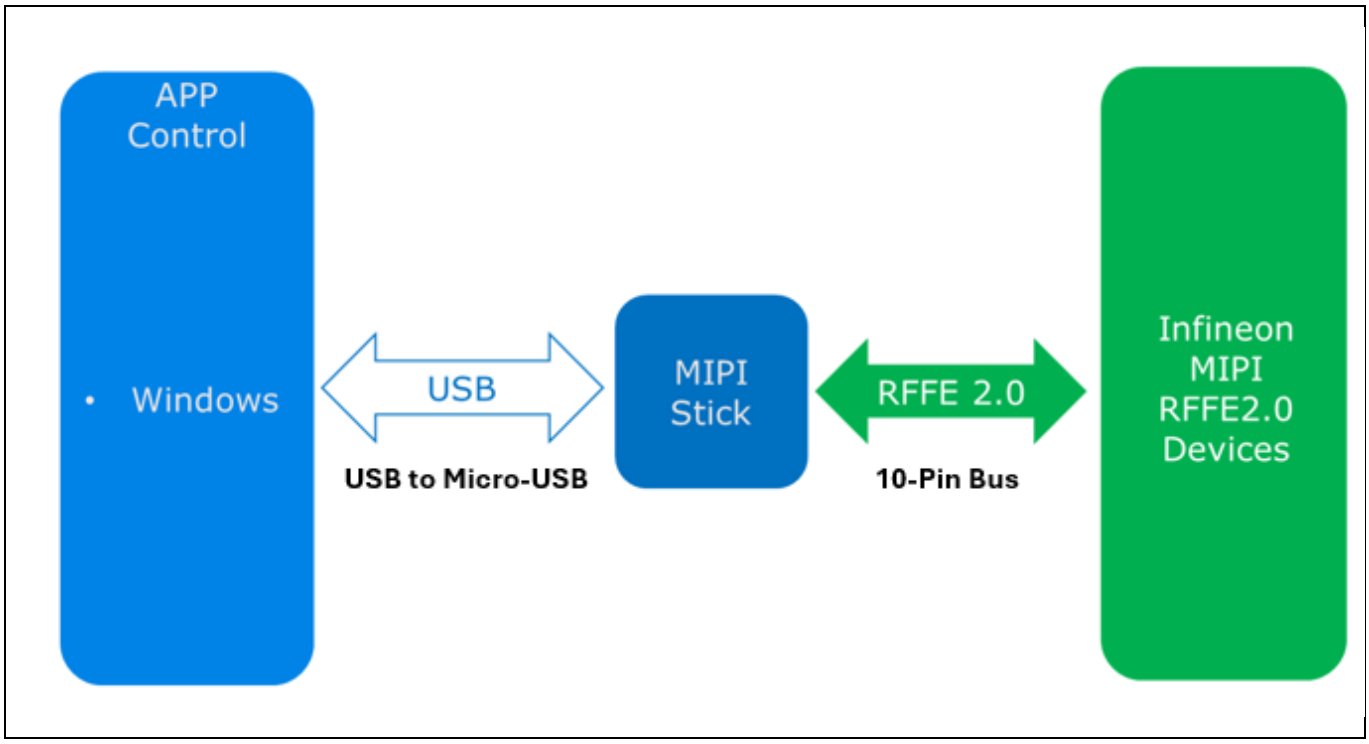


Figure 2 Interfaces of the MIPI Stick

1.1.2 Connection through Jumper Wires

Alternatively, instead of using the ribbon cable, sometimes a pin-to-pin connection between the MIPI Stick and the DUT is desired. This makes it possible to do additional measurements (e.g. current consumption) while operating the DUT. For this cause, it is necessary to attach individual jumper wires to certain pins on the connector of the MIPI Stick as well as to the DUT. The following pictures label the individual MIPI Stick connector pins. Please note that there are four identical ground pins on the connector:

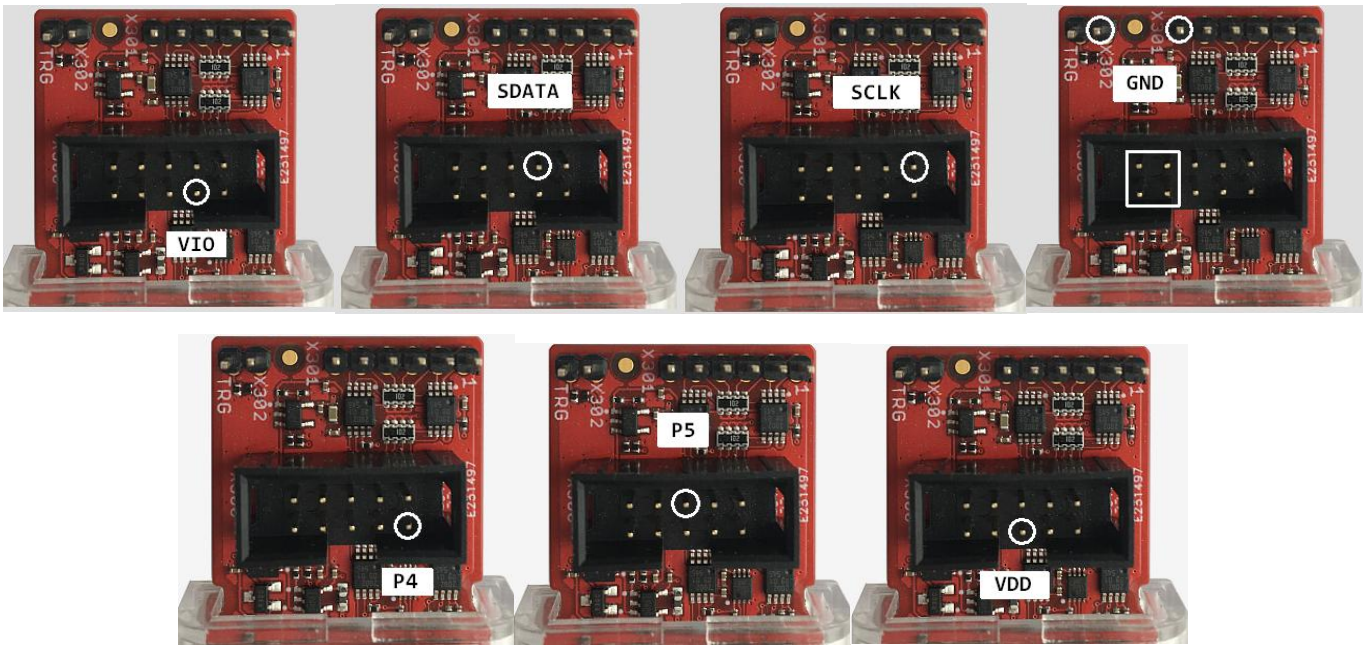


Figure 3 Pins of the MIPI Stick for MIPI communication

To know which Pins are necessary for a specific DUT, please see its datasheet and connect those specific pins only. As an example, the image below illustrates a case where all jumper wires are being used.

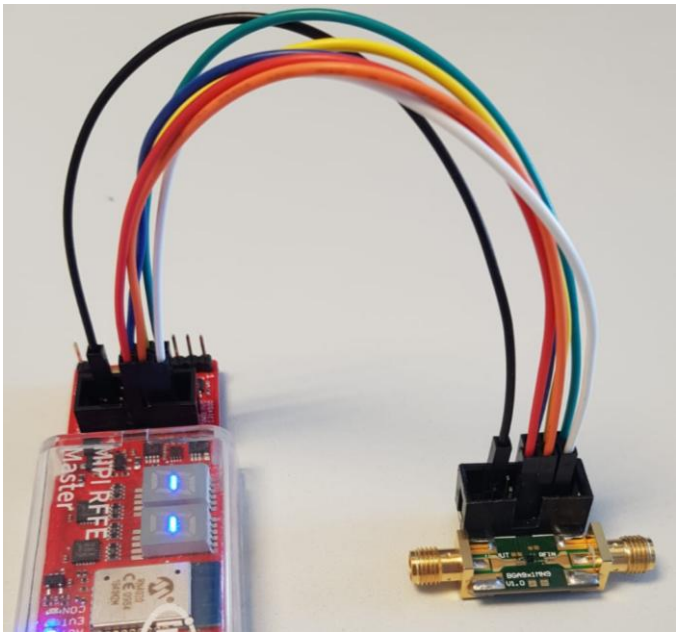


Figure 4 MIPI Stick connection using single cables

1.2 Setup

At first run ”Mipistick.exe” file in the computer. The application will place a green icon in the icon tray. The MIPI Stick can now be plugged into any USB port on the computer. In most cases, the MIPI application c immediately can detect the MIPI Stick, and a local web page will pop-up automatically in a new browser window (or in a new tab, if the default browser is already open). The address will show up as “http://localhost:30100/”.

In case nothing happens after connecting the MIPI Stick to a USB Port, you can try to navigate to the above mentioned address. If the problem still persists, disconnect the MIPI Stick and close the Mipistick application (right-click the green icon in the icon tray and select “Exit”) and restart the process from the beginning.

Supported platform:

- Operating System: Win7 and newer versions.
- Browser: Firefox, Chrome, Internet Explorer 10+

* This software can be provided by Infineon on demand. New versions of this software are released from time to time (as of 28.04.2021 the latest version is 2.11).

1.3 Application Overview

When the web application is launched, a control layout page is displayed. It is divided into the following sections (the colors in parentheses are only intended for clear assignment of the sections and do not appear on the application web page):

1. MIPI Manager (purple frame)
2. RFFE Device View (green frame)
3. RFFE Control Panel (orange frame)
4. GPIO Control Panel (red frame)

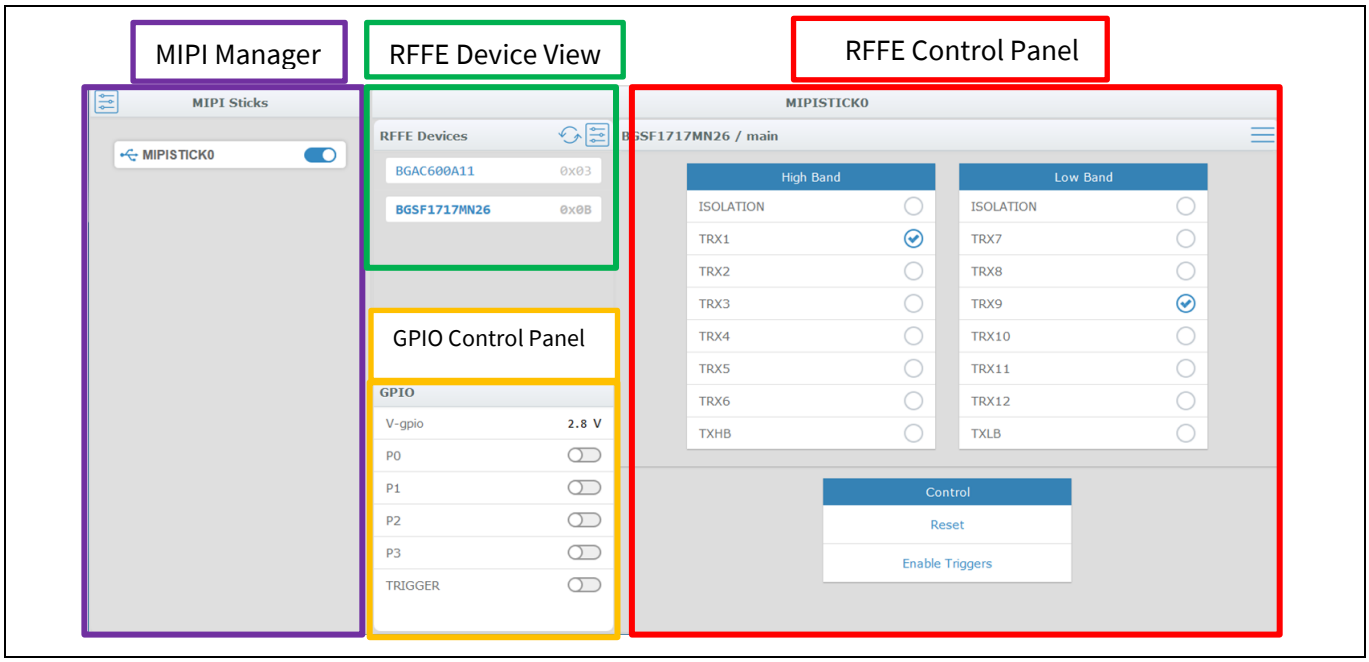


Figure 5 MIPI Stick Web Application Sections

The “MIPI Manager” contains a list of detected MIPI Sticks connected to the computer. To activate a MIPI Stick, simply toggle its control switch to the ON mode. It is possible to activate multiple MIPI Sticks simultaneously. Clicking on a MIPI Stick will open its corresponding “RFFE Device View” (green frame).

The “RFFE Device View” contains a list of RFFE Devices connected to a single MIPI Stick. For example, in Figure 3 it can be seen that the devices BGAC600A11 and BGSF1717MN26 are connected to MIPISTICK0. By clicking on a device the “RFFE Control Panel” will display the states available for that particular device in the “RFFE Control Panel” (red frame).

By clicking one of the available states in the “RFFE Control Panel”, the MIPI Stick will send a command to the connected device to switch to that state. For further information on the states of a particular device, please refer to the section “MIPI RFFE Specification” in the datasheet of that respective device.

The “GPIO Control Panel” (orange frame) is used to monitor and control the GPIO Pins on the USB MIPI Stick. This section is explained in detail in chapter 1.5.

1.4 First Steps

As mentioned before, after plugging in the MIPI Stick, the web application will pop-up. At this point it will only show the “MIPI Manager” section with the detected MIPI Stick(s). A DUT can now be connected to the MIPI Stick via the 10-pin bus (see image below). By activating the corresponding MIPI Stick (toggle switch to ON), the “RFFE Device View” will appear. Three possible outcomes appear:

a. The DUT is detected and shown with the proper name. In the example below, it is BGSA14WMA9

b. The DUT device is detected but labeled as “Unknown”

c. The DUT is not detected at all, in which case the “RFFE Device View” section displays the text ‘no devices found’

Based on these possibilities, we will elaborate on further steps for each case.

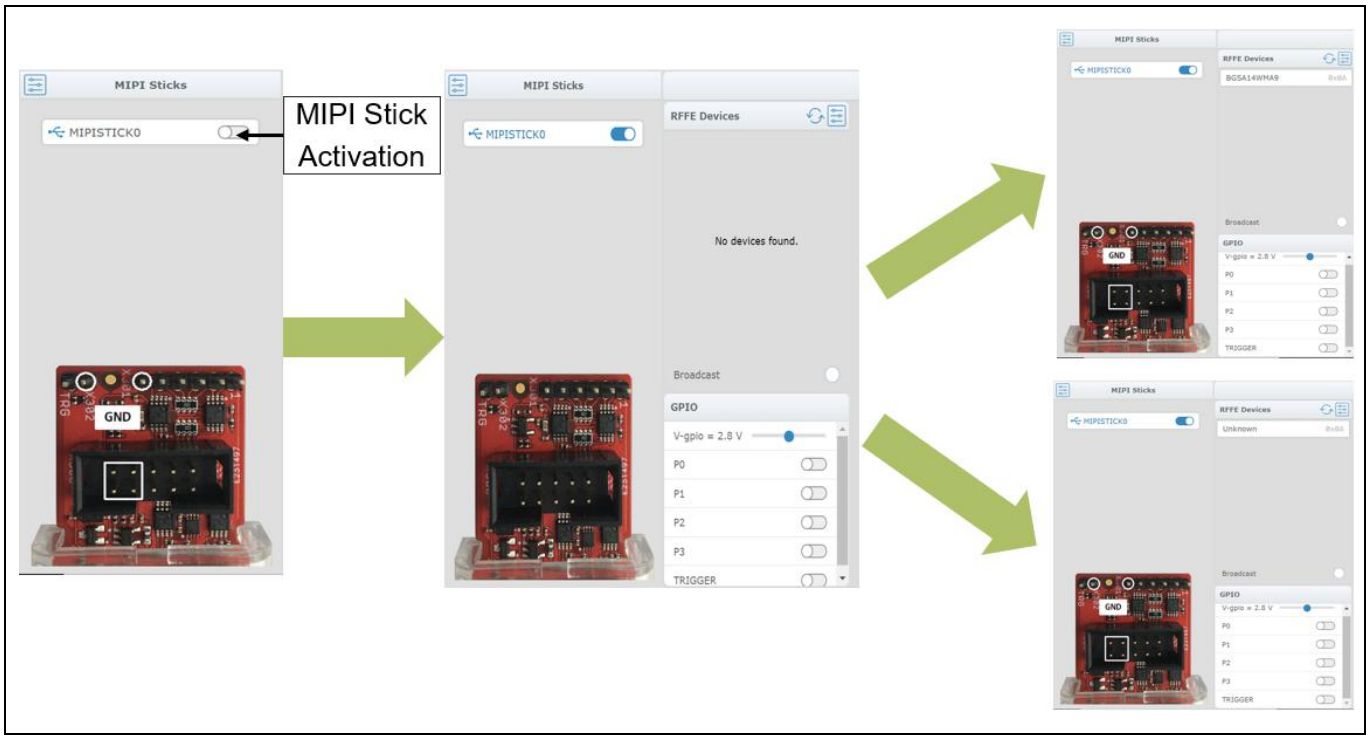


Figure 6 MIPI Manager Flow

1.4.1 The DUT is detected and recognized

In this case, it is only necessary to click on the device name in order to access the “RFFE Control Panel” section which is now available (see image below). Please refer to the datasheet for further details on the states for the device in question.

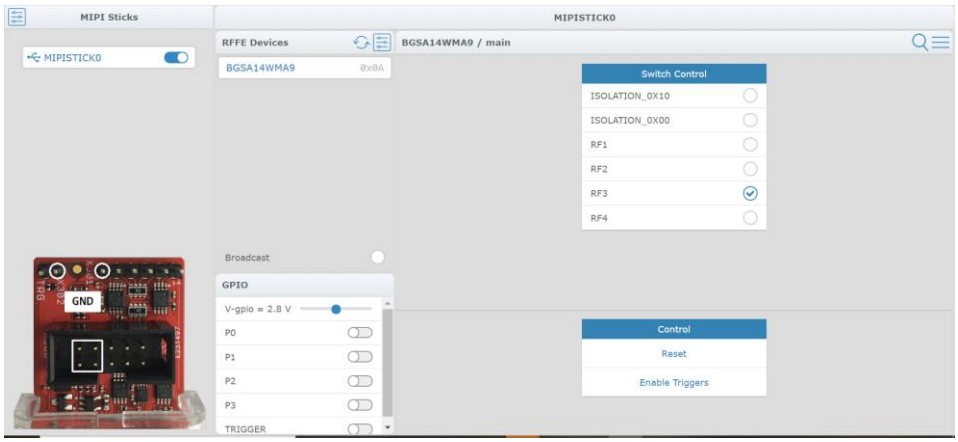


Figure 7 MIPI Manager View with RFFE Control Panel section

1.4.2 The device is detected but unknown

If the device is detected but is labeled “Unknown”, it is necessary to verify that the computer has an active internet connection and that the MIPI Stick is “Online”. To do this, access the “MIPI Stick Settings” menu in the top left corner and check that the switch for “Online” is toggled ON (see image below).

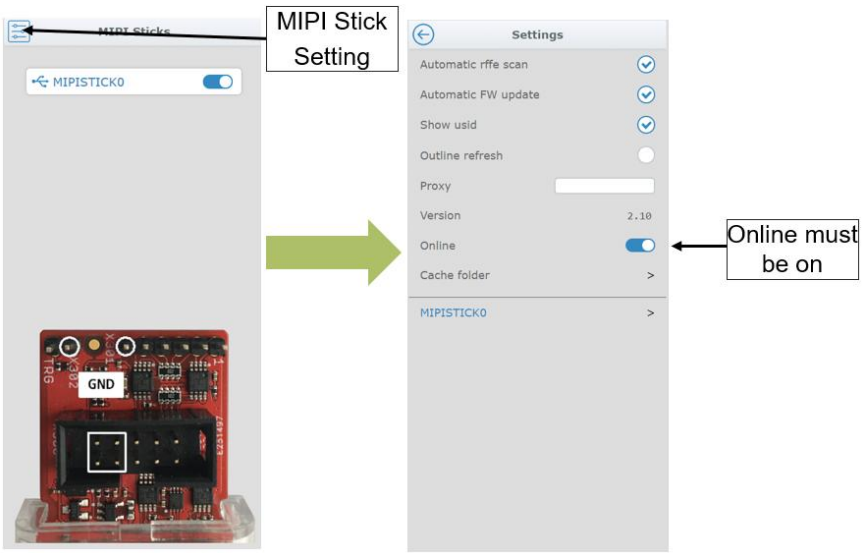


Figure 8 MIPI Manager View

If the “Unknown” label is still visible, please report it to Infineon so that it can be fixed. It is still possible however, to control a device labeled “Unknown”. This can be done by writing directly into its registers. To do that, the “Unknown” device should be selected, like any other device, and then the three bars icon in the top right corner have to be clicked on (see image below).

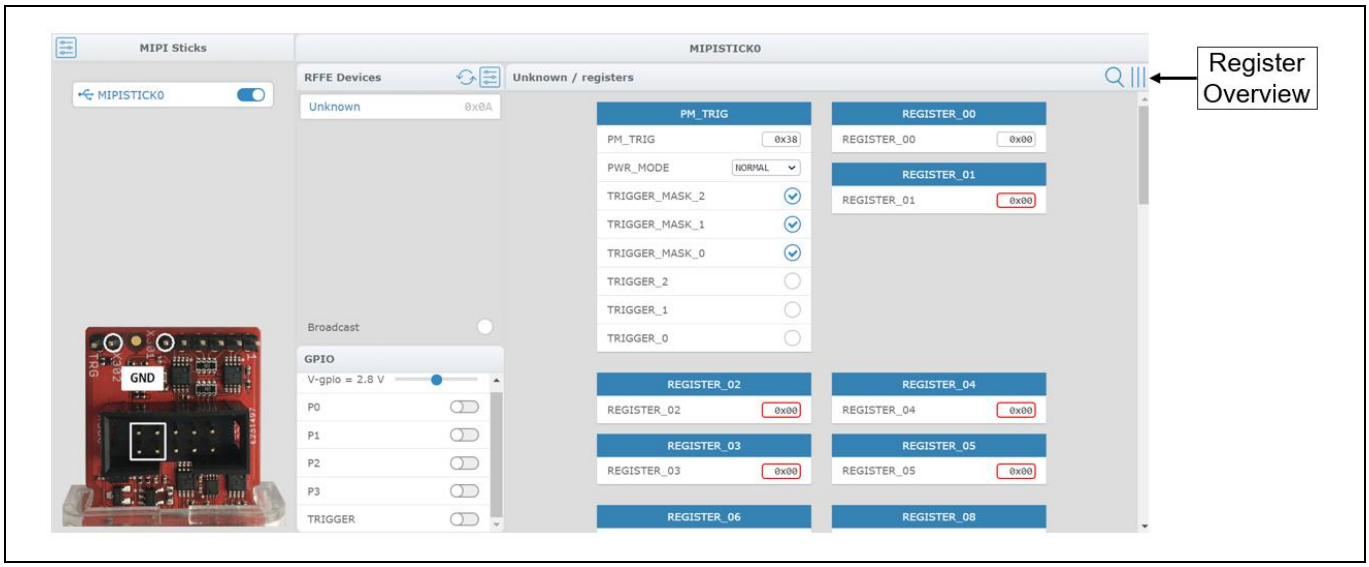


Figure 9 MIPI Manager View with Registers displayed in RFFE Control Panel

The registers of the DUT are now revealed in the “RFFE Control Panel” section. The registers that have a red square around the value section cannot be changed and should be ignored. The desired hex value can be written into the other registers. After each entry, press ENTER in order to tell the MIPI Stick to send that value to the DUT. Please see the section “MIPI RFFE Specification” in DUT datasheet for further information about its registers.

1.4.3 The device is not detected

If the device is not detected at all, we need to verify whether 10-pin bus is properly connected and the VDD and VIO voltage are set to the correct values, according to datasheet specifications. Access the “Device Setting” icon and if necessary, adjust the voltages for VDD and VIO to the specified values. After that click on “Reset” button in order to apply the changes (see image below).

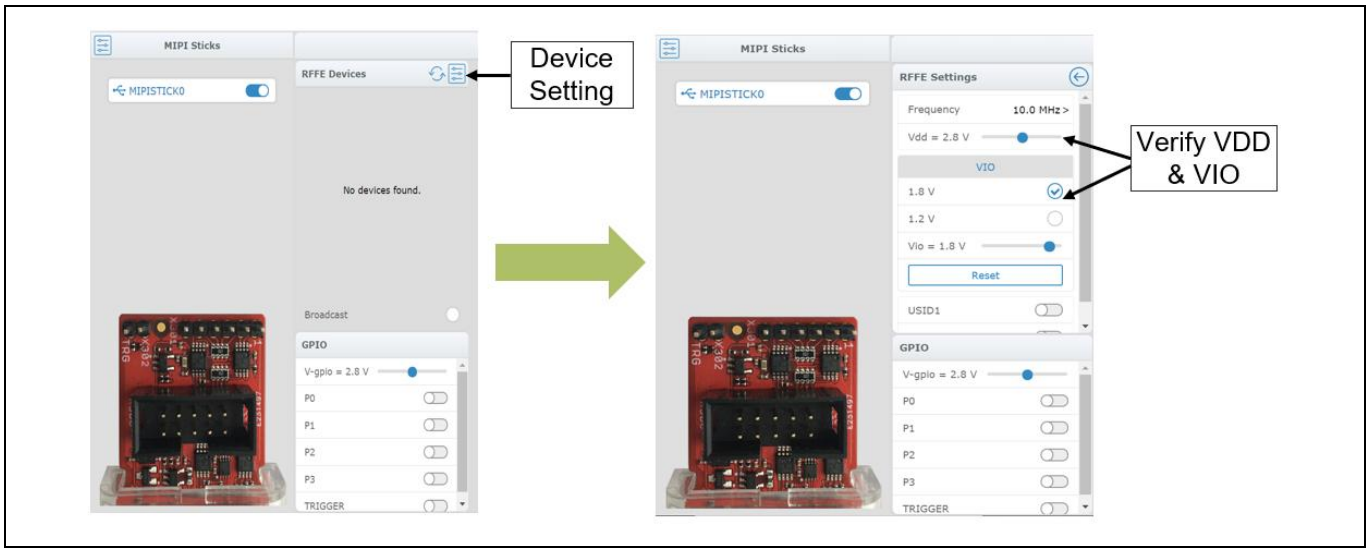


Figure 10 MIPI Manager View

After following the above procedures, if the device can still not be detected, the last option is to restart the process from the beginning. Before doing that however, it is important to close the browser window (or tab) containing the web application and stop the Mipistick.exe program (right-click the green icon in the icon tray and select “Exit”). Please also unplug the MIPI Stick and USB cable from the computer.

1.5 GPIO Control Panel

GPIO Communication system is based on Control Lines. These control lines can only have two states;

- High, when the voltage of the line is set to V-gpio.
- Low, when the voltage of the line is set to GND

In order to active the GPIO Control Panel we need to click in the GPIO Box (Pink frame). Then, the MIPI Stick allows us to control until four Control Lines called P0 (Green frame), P1 (Orange frame), P2 (Blue frame) and P3 (Purple frame), plus Vgpio (Red frame), VDD (White frame) and Ground (Black frame).

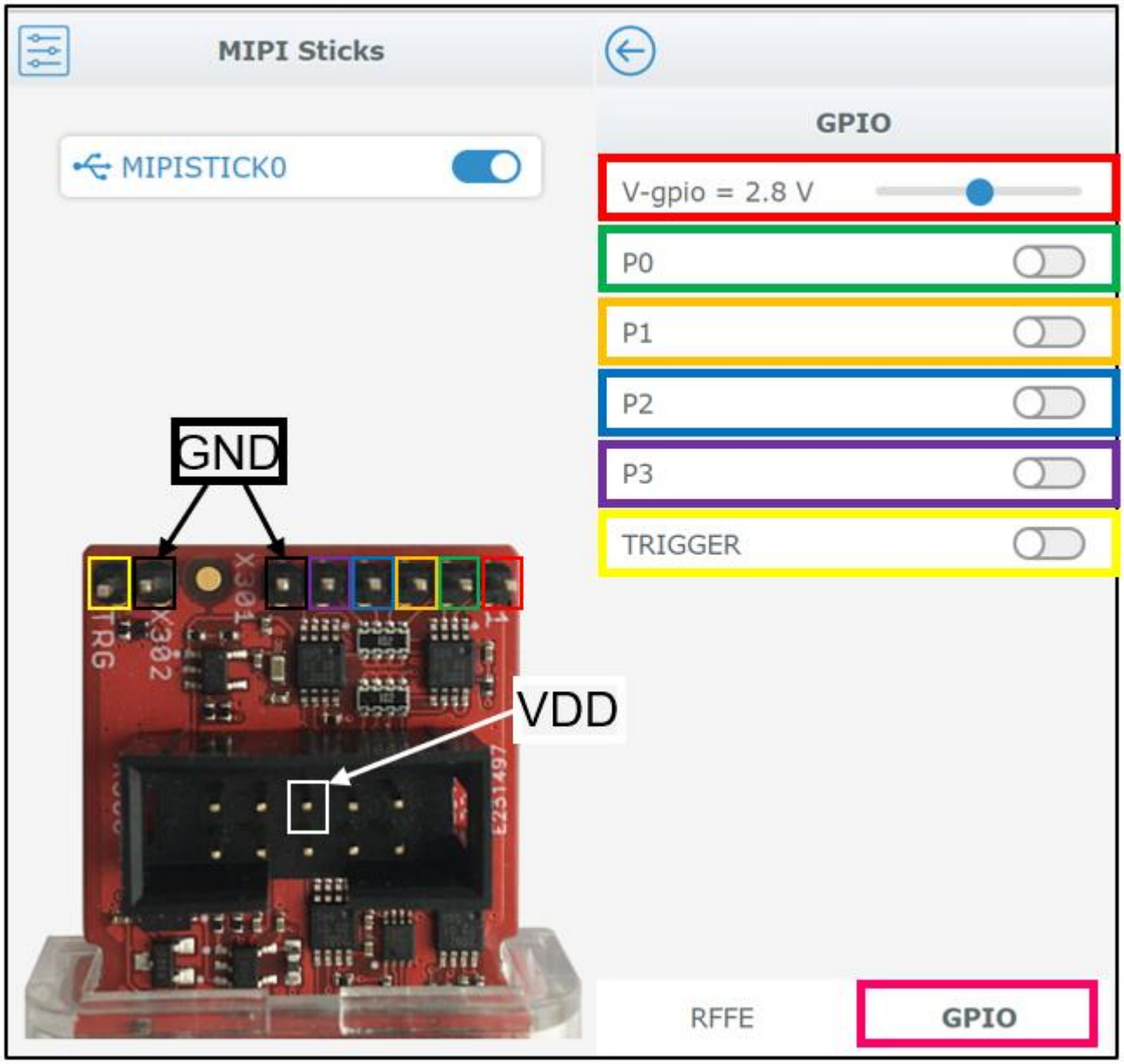


Figure 11 GPIO Control Panel

The proper voltage values for Vgpio and VDD can be found in the Operation Range table in the datasheet of each device.

Each of these signals have a dedicated pin (see image below).

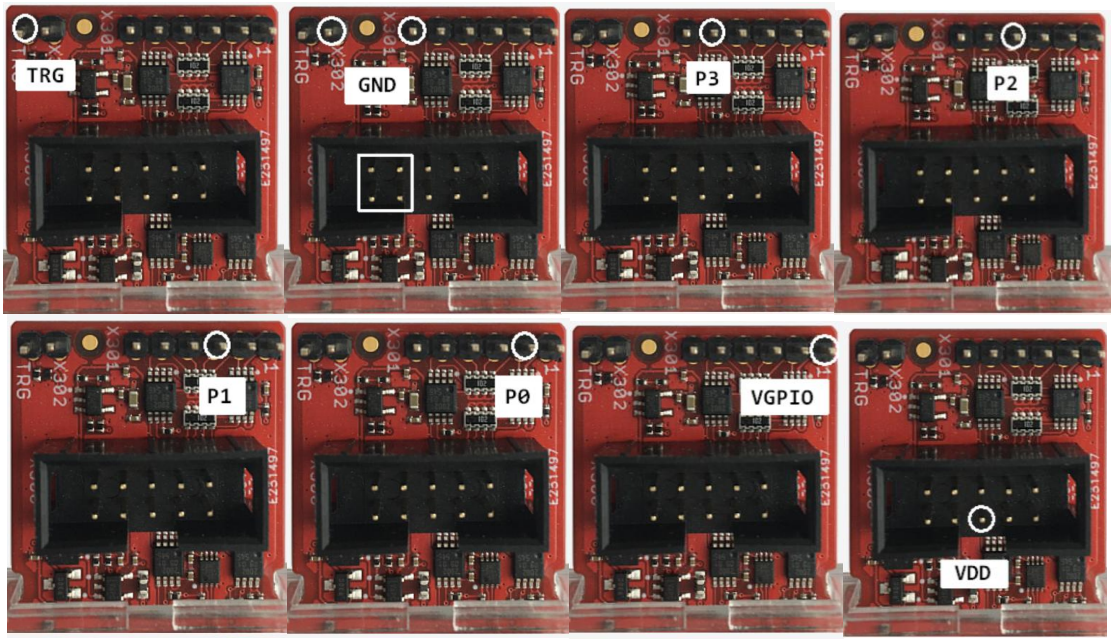


Figure 12 Pins of the MIPI Stick for GPIO communication

The VDD and the GND pins are used to power the device and the P0, P1, P2 and P3 pins are used to set the mode of operation. The Truth table that describe the different modes of operation of each device can be found in the datasheet.

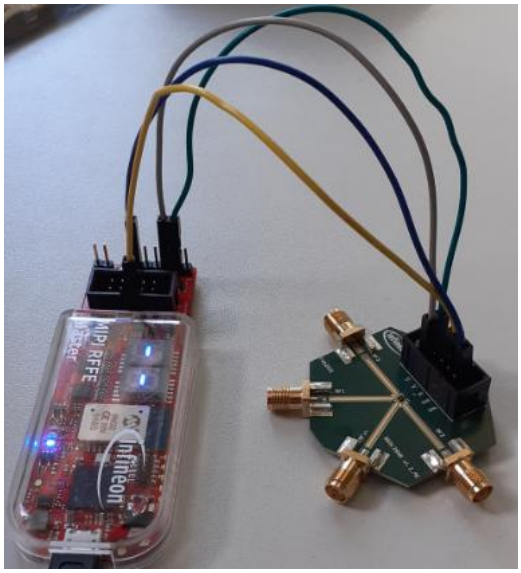


Figure 13 MIPI Stick GPIO connection