E2.08 CLICK SENSOR HUB

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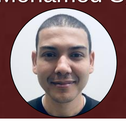



TEXAS STATE
INGRAM SCHOOL OF ENGINEERING

Click Sensor Hub

PROJECT DESCRIPTION

Click Sensor Hub is an IoT development Kit, like the Hexiwear docking station. Except our project utilizes NXP's FDRM-KL46Z development platform. The FRDM-KL46Z is interfaced to our designed PCB which contains four mikroBUS sockets.

PROJECT REQUIREMENTS

I. Connectivity between the FRDM-KL46Z and four mikroBUS sockets.

II. Each socket provides both 3.3V and 5V power supplies

III. Successfully communicate SPI, UART, PWM, I2C, AN. Establish connectivity with any of the four PCB sockets to the FRDM-KL46Z.

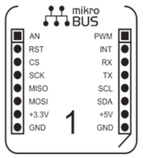
IV. Write code for selection of clicks.

WHY USE CLICKS?

Major chip vendors are endorsing it

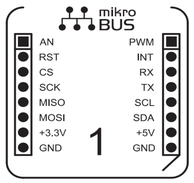
MICROCHIP NXP QUECTEL Wireless Module Expert

It's an open standard



mikroBUS™ - the add-on board standard that offers maximum expandability with the smallest number of pins. Integrate it into your design and open the doors of thousands of possibilities.

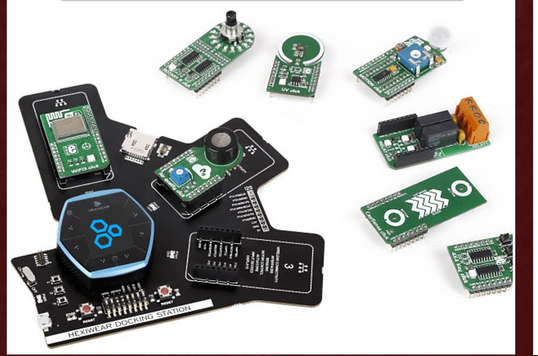
Pinout specification



Analog - **AN**
Reset - **RST**
SPI Chip Select - **CS**
SPI Clock - **SCK**
SPI Master Input Slave Output - **MISO**
SPI Master Output Slave Input - **MOSI**
VCC-3.3V power - **+3.3V**
Reference Ground - **GND**

PWM - PWM output
INT - Hardware Interrupt
RX - UART Receive
TX - UART Transmit
SCL - I²C Clock
SDA - I²C Data
+5V - VCC-5V power
GND - Reference Ground

SIMILAR TO HEXIWEAR



SELECTION OF CLICKS

MIKROE

Temp&Hum2click

Alcohol click

Air quality click

BarGraph2click

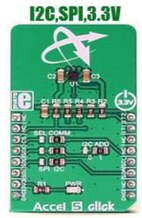
Color 5 click

LightRanger3click

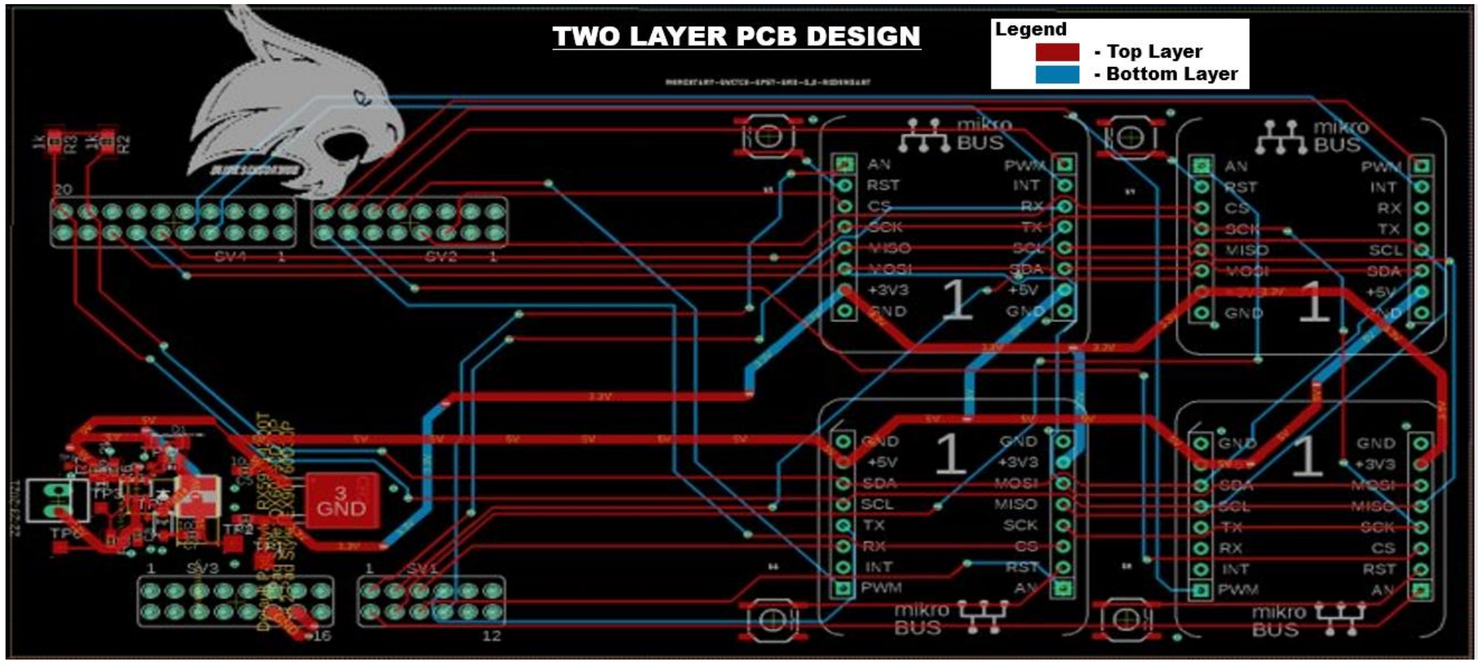
microSD click

USB UART3click

Gaussmeter click



Accel 5 click

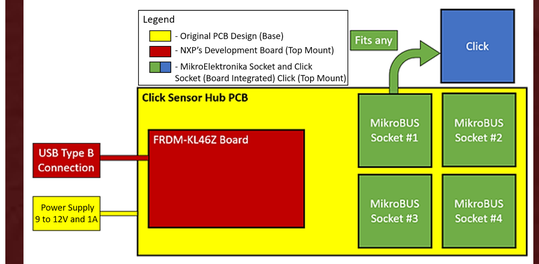


CLICK TEST RESULTS

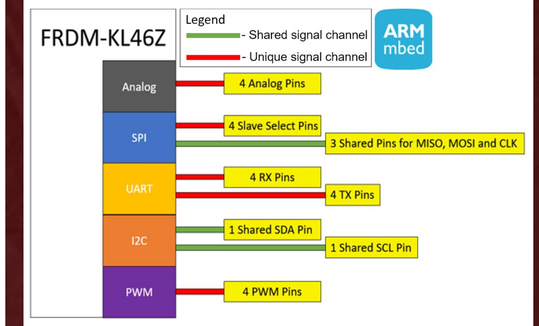
A total of ten clicks were selected for testing. During the selection process we took into consideration the type of signal interfaces and voltage requirements. The selection of clicks we purchased allowed for us to thoroughly test all the signal interfaces available on a mikroBUS socket. Tested both the 3.3V and 5V sources

Test Case	Test Specifications	Test Results	Compliance
Air Quality Click	Board powered by 3.3V and 5V connections	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get air quality level reading from Click	Non-zero reading recorded and displayed on PUTTY	Pass
microSD Click	Board powered by 3.3V connection	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get data from SD card to FRDM-KL46Z via Click board	Number value successfully read from text file	Pass
Temp & Hum 2 Click	Board powered by 3.3V connection	Connected board and checked LED light. Measured	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get temperature readings via FRDM-KL46Z code to display on PUTTY	Non-zero reading recorded and displayed on PUTTY	Invalid due to board being discontinued
USB UART 3 Click	Board powered by 3.3V and 5V connections	Connected board and checked LED light. Measured	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Successful USB connection via USB UART 3 Click to FRDM-KL46Z	Established PUTTY connection via USB UART 3 Click	Fail
Color 5 Click	Board powered by 3.3V and 5V connections	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages in respective pins measured to be below 3.3V threshold	Pass
	Get RGB readings via FRDM-KL46Z code to display on PUTTY	Non-zero reading recorded and displayed on PUTTY	Fail
Bar Graph 2 Click	Board powered by 3.3V and 5V connections	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Cycle Bar Graph Click through set pattern	Pattern set and displayed on Click	Pass
Accel 5 Click	Board powered by 3.3V connection	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get x, y, z coordinate acceleration readings from Click	Non-zero reading recorded and displayed on PUTTY	Fail
Gaussmeter Click	Board powered by 3.3V connection	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get x, y, z magnetic field readings from Click	Non-zero reading recorded and displayed on PUTTY	Pass
Light Ranger 3 Click	Board powered by 3.3V connection	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages of respective pins measured to be below 3.3V threshold	Pass
	Get distance readings from Click	Non-zero reading recorded and displayed on PUTTY	Pass
Alcohol Click	Board powered by 5V connection	Connected board and checked LED light	Pass
	Ensure safe connection to FRDM-KL46Z, no feedback voltage should be above 3.3V	Voltages measured to be unsafe. Measured at 4.2 volts peak despite tweaking variable resistor to max value.	Fail. Click not safe to use
	Get alcohol level reading from Click	Non-zero reading recorded and displayed on PUTTY using a resistor and a breadboard, not tested on Click Sensor Hub board due to damage it would cause FRDM-KL46Z	Invalid due to not being safe for board

SOCKETING LAYOUT



SIGNAL INTERFACES



SOCKET TEST RESULTS

*Socket X, symbolizes that the same tests were carried out for each of the four mikroBUS sockets. *One click at a time

Test Case	Test Specifications	Test Results	Compliance
Socket X			Pass
(AN) Analog	Test Analog Click on Socket	Putty output achieved on selected socket with Air Quality Click	Pass
(MISO/MOSI) (CS/SCK) SPI	Test SPI Click on Socket	Bar Graph Click had selected pattern displayed on selected socket	Pass
(RX/TX) UART	Test UART Click on Socket	Serial connection on computer via selected socket	Pass
(SCL/SDA) I2C	Test I2C Click on Socket	I2C connection displayed data on PUTTY terminal using Temp2Hum Click via the selected socket	Pass
PWM	Test PWM Click on Socket	Bar Graph Click had selected pattern displayed on selected socket	Pass
(+3.3V/+5V) VCC/GND	All four mikroBUS™ sockets have both an optional 3.3V and 5V channel. All four mikroBUS™ sockets are grounded	When PCB is powered with 10v and lamp. Both the +3.3V and +5V channels display proper voltage output. The GND has 0V output	Pass

SYSTEM DEFICIENCY

Deficiency	Effect	Solution	Estimated Time for Solve
System does not detect high voltage levels coming from Clicks	FRDM-KL46Z board has potential to be damaged by Clicks	Integrate a system that regulates the output of the MikroBUS sockets	3 months
Board operates with a variable power source	Difficult to people outside of a lab setting to utilize the Click Sensor Hub Board	Integrate battery or USB power to the board.	2 months
Board not fully synchronous, the code must switch between each of the sockets at a specified speed	Clicks that require constant readings or instructions unable to function if more than 2 Clicks connected to the board utilized the same shared channels	Change design to serve a fully synchronous set of Click boards operating on shared channels	12 months

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