



DesignNews

Getting Hands-On With the M5Stack Core Platform

DAY 1: Introduction to the M5Stack Core

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Webinar Logistics

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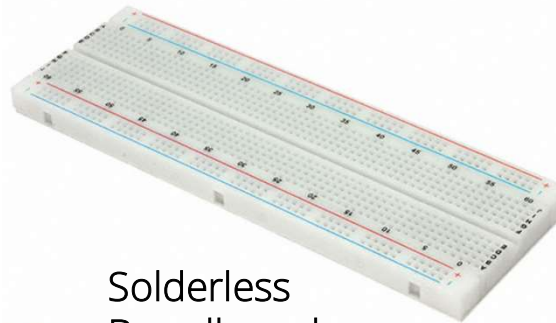
Dr. Don Wilcher

Visit 'Lecturer Profile' in your console for more details.

M5Go IoT Starter Kit V2.6



Course Kit and Materials

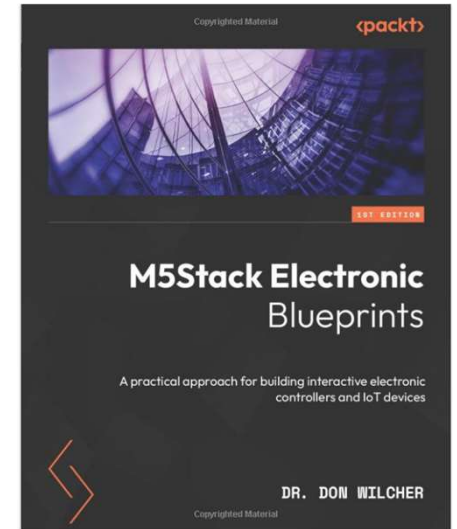


Solderless Breadboard



Adafruit Parts Pal Kit

2 Channel SPST Relay Unit



Agenda:

- M5Stack Core Overview
 - a) The Internal System Architecture
 - b) ESP32 microcontroller
- UIFlow Software Overview
 - a) Download Site
 - b) Communications Setup
- Lab: Hello World

M5Stack Core UIs



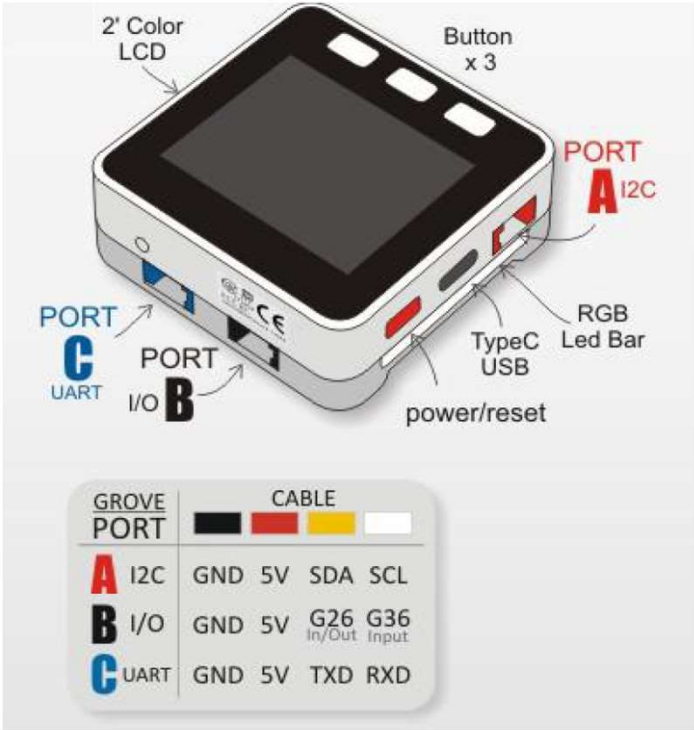
“An important note in designing and developing M5Stack Core UIs is simplicity. Simplicity is the design consideration consisting of using the important UI elements for communicating features and functions of your M5Stack Core device. (Wilcher, 2023, p. 24).”

M5Stack Core Overview



- The M5Stack Core is a small and powerful microcontroller development platform.
 - a) Uses the Espressif ESP32 microcontroller
 - b) Allows Wi-Fi-operated devices, wearables, robots, and portable electronics to be created.
- Software applications can be created using
 - a) Arduino IDE- C++
 - b) MicroPython
 - c) UI Flow Blockly code
- Visually appealing graphics and creative sounds effects can be developed with the M5Stack Core
 - a) A Thin Film Transistor (TFT) LCD provides visually appealing graphics.
 - b) A powerful audio speaker to provide creative sound effects.

M5Stack Core Overview. . .



M5Stack Ports

Images courtesy of M5Stack

Question 1

What port on the M5Stack Core supports I2C?

- a)Port B**
- b)Port C**
- c)Port A**
- d)Port D**



M5Stack Core Overview. . .



Visually appealing graphics:
Primary Flight Display



Project Link:

<https://www.digikey.com/en/maker/projects/m5stack-based-pfd-primary-flight-display/ebaacbaec862484ca9d5fb8fa59f5786>

Images courtesy of M5Stack

M5Stack Core Overview. . .

Creative Sound Effects:
Speaker Icon and Sound
Effects



Image courtesy of the author

Project:

Programming the M5Stack Core to produce a sound:

Wilcher, D. (2023, pp. 84-88). *M5Stack Electronic Blueprints*. Packt.



M5Stack Core Overview. . .

A Key User Interface Design Basic: Visibility Factors



Visibility Factors:
UI elements that allow
multiple representations
to aid the user in
interacting with a UI
based on styles of
learning and
comprehension.



UI elements
for the
M5Stack Core

Image courtesy of M5Stack

M5Stack Core Overview. . .



Creative Sound Effects:
Speaker Icon and Sound
Effects

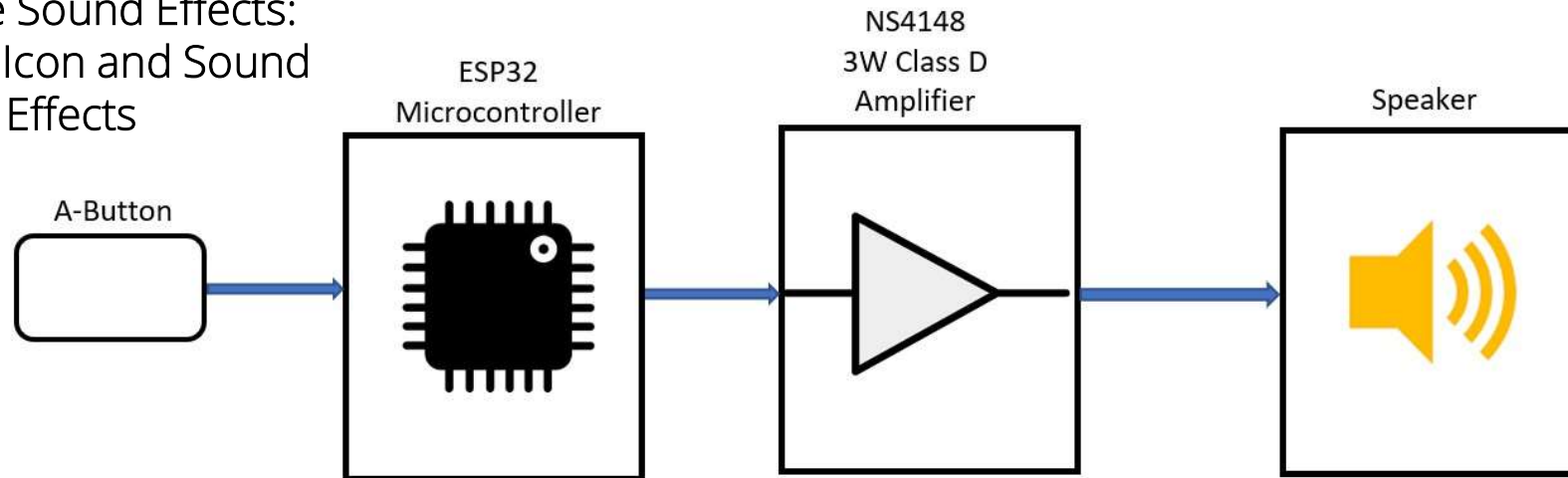


Image courtesy of the author

Project:

Programming the M5Stack Core to produce a sound:
Wilcher, D. (2023, pp. 84-88). *M5Stack Electronic Blueprints*. Packt.

M5Stack Core Overview. . .



The M5Stack Core Hardware Architecture consists of the following electronic subcircuits.

- Power management
- Audio amplifier
- ESP32 subsystem
- USB-UART and accessories

Question 2

Multiple representations and assisted by _____

- a) Pushbuttons
- b) Human Input Devices
- c) UI elements
- d) none of the above



M5Stack Core Overview...



M5Stack Core Hardware Architecture System Block Diagram

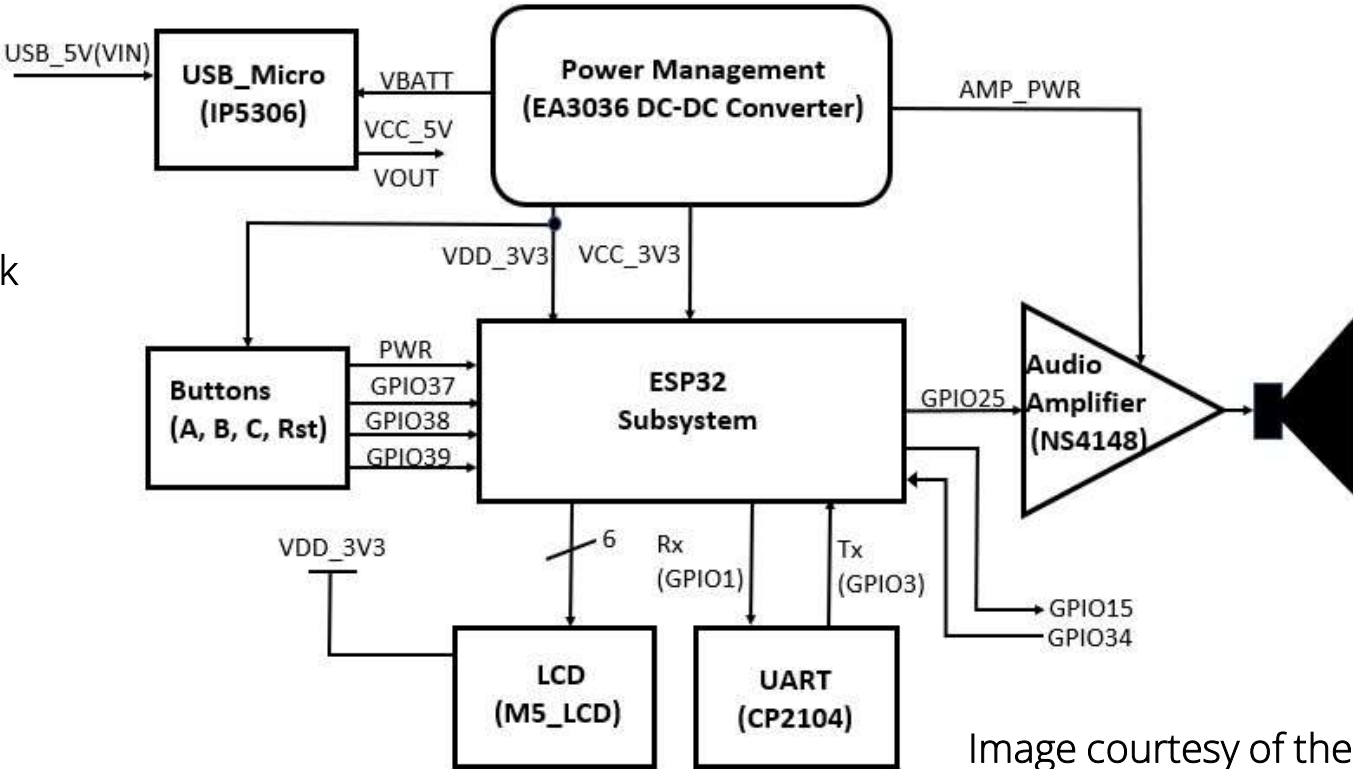
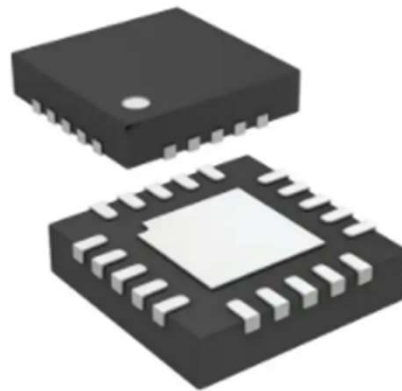
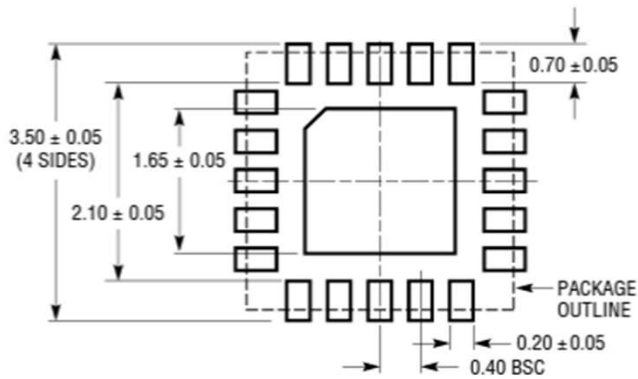


Image courtesy of the author

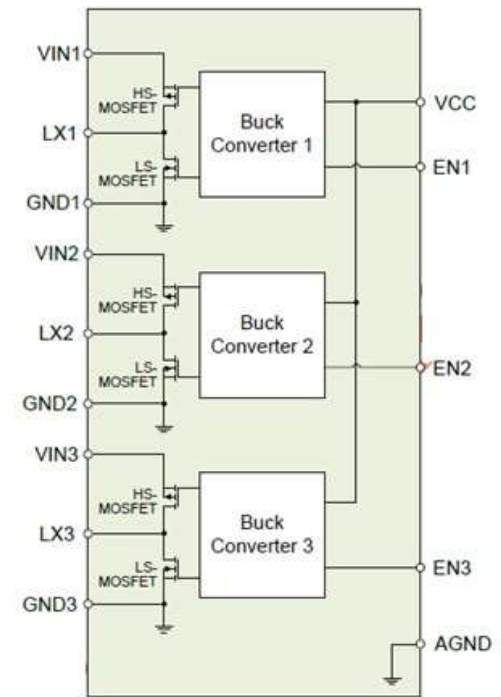
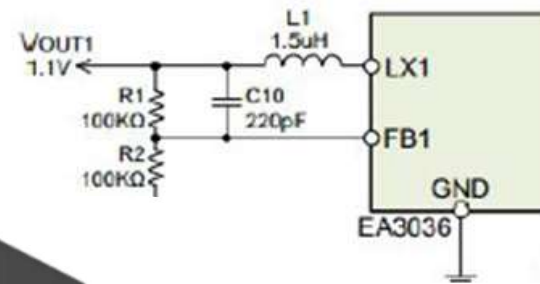
Wilcher, D. (2023, p12). *M5Stack Electronic Blueprints*. Packt.

Power Management:
EA3036 DC-DC Converter subcircuit:
Provides 3.3V to operate the ESP32
and support electronic circuit
peripherals.

M5Stack Core Overview. . .

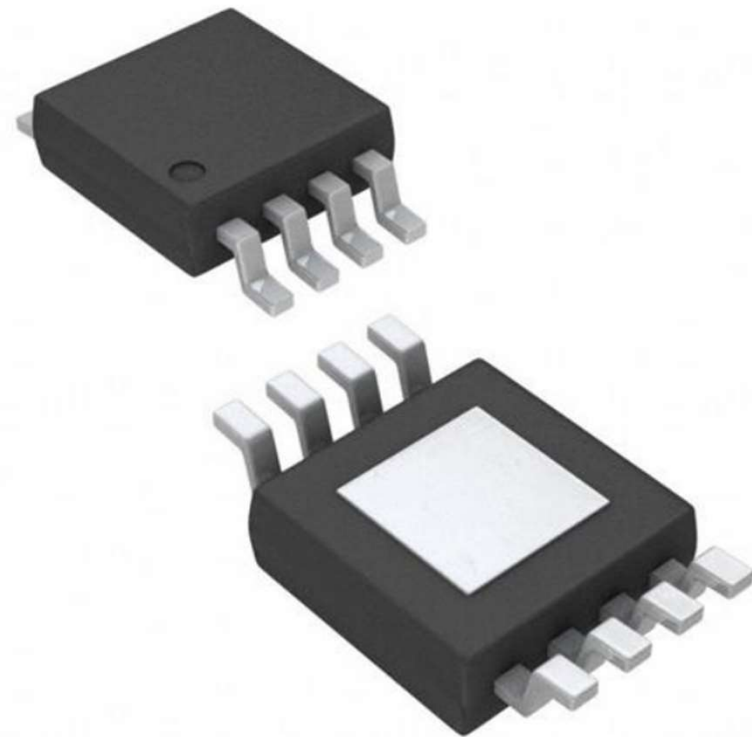
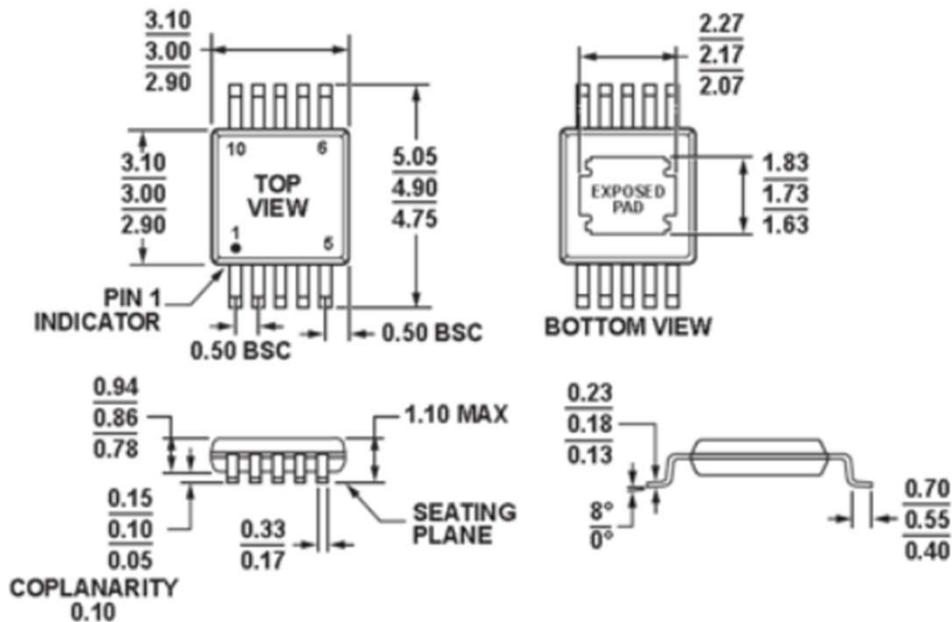


Images courtesy INJOINIC Technology



Audio Amplifier:
The NS4148 is a 3-Watt (W) Class D
audio power amplifier IC package.

M5Stack Core Overview. . .

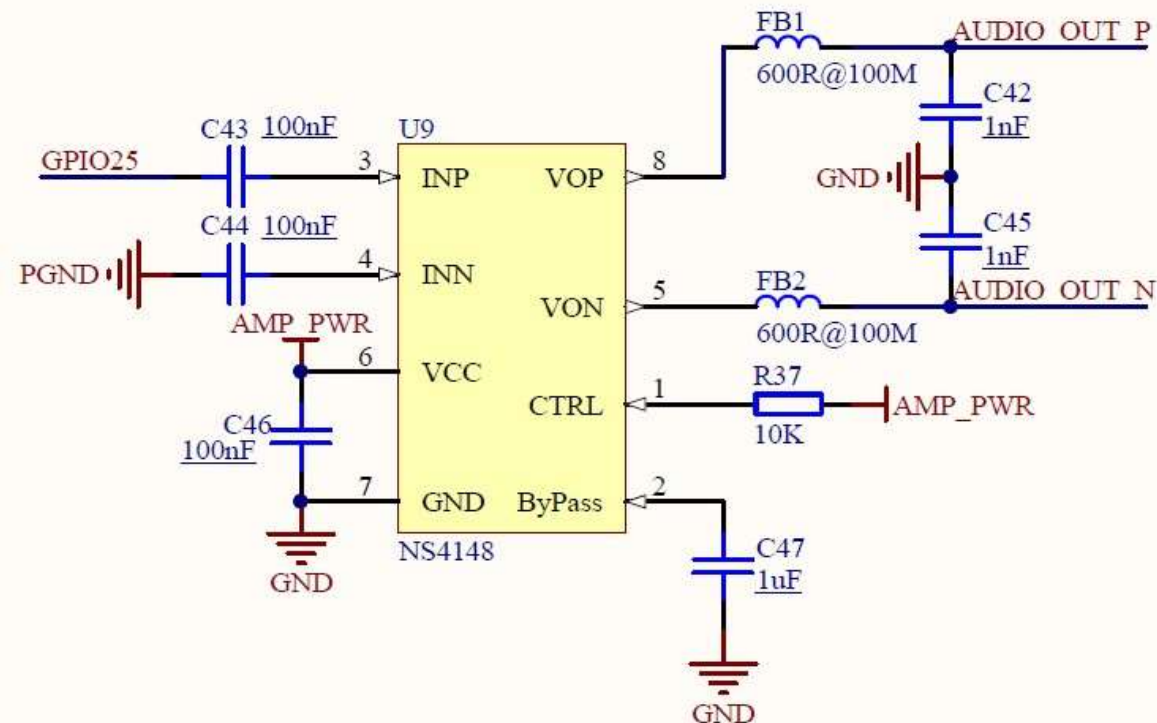


Wilcher, D. (2023, p15). *M5Stack Electronic Blueprints*. Packt.

Images courtesy of ChipSourceTek Technology Co⁸

Audio Amplifier:
The NS4148 is a 3-Watt (W) Class D
audio power amplifier electronic
circuit schematic diagram.

M5Stack Core Overview. . .



Question 3

Reviewing slide 19, what type of circuit is used at Audio OUT P and Audio OUT N connected to the NS4148 Class D audio power amplifier?

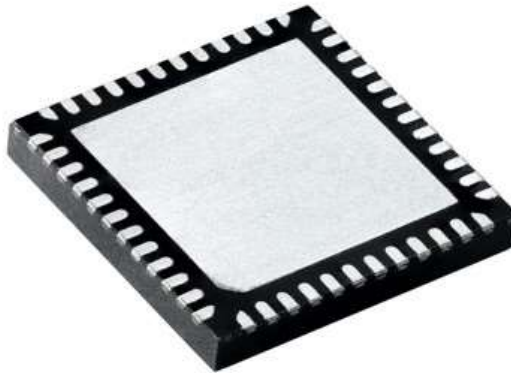
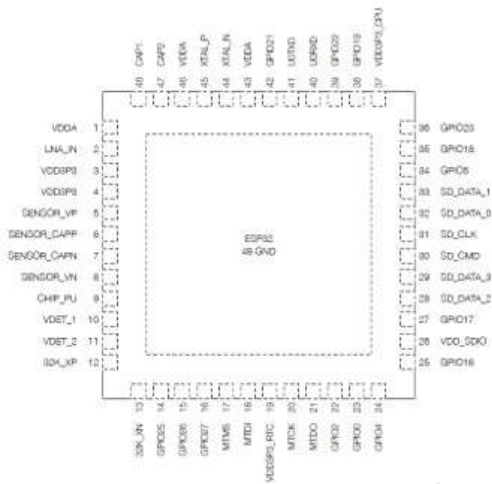
- a) Voltage Divider**
- b) High Pass Filter**
- c) Low Pass Filter**
- d) Pi Filter**



ESP32 microcontroller subsystem:
A 2.4 gigahertz (GHz) Wi-Fi and Bluetooth combination chip.

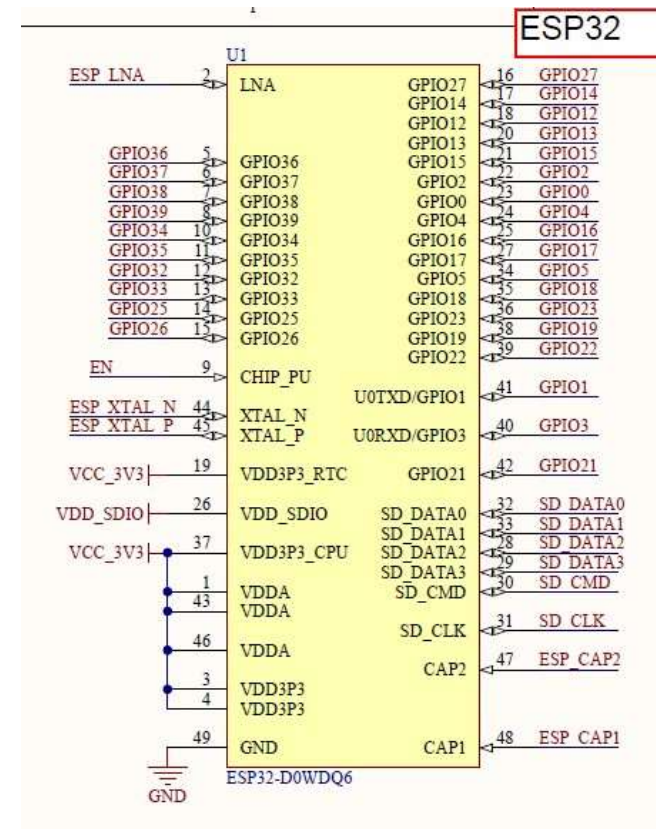
M5Stack Core Overview. . .

Electronic Circuit Schematic Diagram



QFN48 package

Images courtesy of Espressif and M5Stack



The IP53306 USB-I2C Communication Electronic Circuit Schematic Diagram

Port A allows inter-
integrated circuit
capabilities to
communicate with
M5Stack Units

M5Stack Core Overview. . .

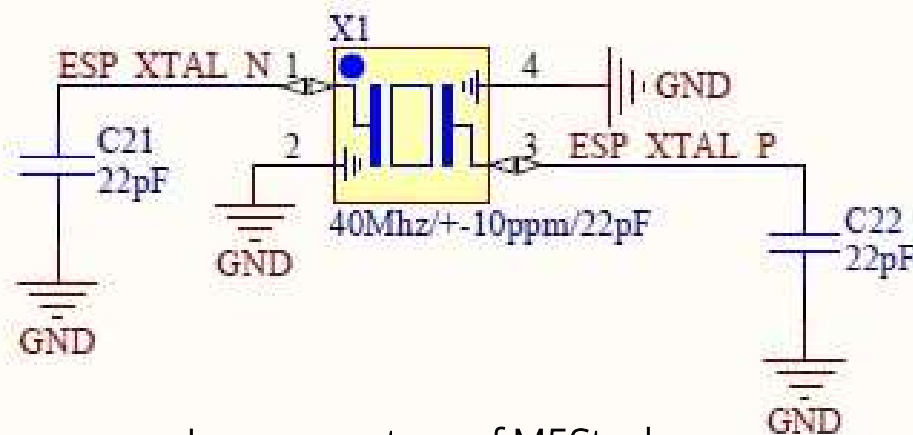
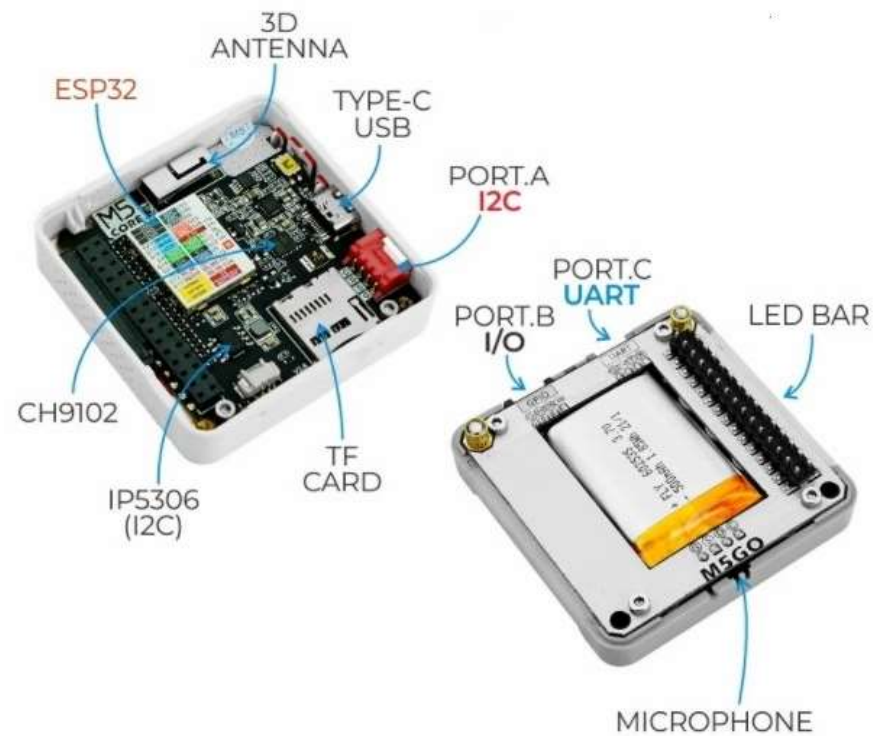


Image courtesy of M5Stack

Physical location of key electronic components and M5 Communication bus of the M5Stack Core

M5Stack Core Overview. . .



UIFlow Software Overview



- There are several design approaches to designing UIs to provide interaction for your M5Stack Core prototype or application.
- The design basics provide suggested guidelines for developing uncluttered UI layouts.
- The design basics can be considered the developmental theory to assist in creating UIs with the following attributes for the M5Stack Core.
 - a) purposeful
 - b) engaging
 - c) interactive

UIFlow Software



| UIFLOW SOFTWARES

NO	Name	Download
1	UIFlow Web IDE	
2	Desktop IDE Win10 x64 (update is terminated)	
3	Desktop IDE MacOS (update is terminated)	
4	Desktop IDE Linux (update is terminated)	

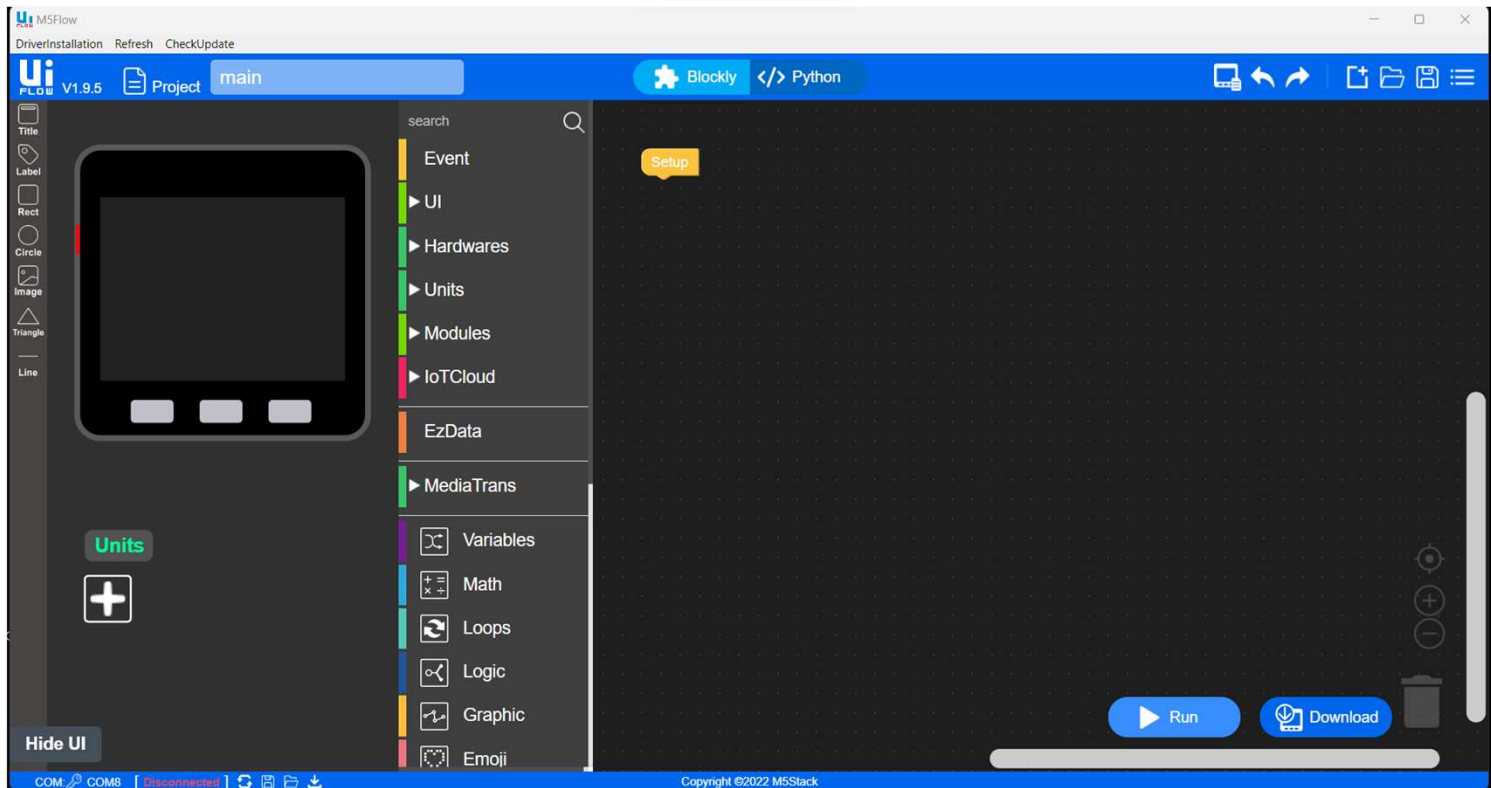
*A software driver may be needed and can be found under this software packages listings.

Software Download Link:
<https://docs.m5stack.com/en/download>

UIFlow Software. . .



Version 1.9.5
Blockly Code
Editor



<https://docs.m5stack.com/en/download>

Image courtesy of M5Stack

UIFlow Software. . .



Partial Blockly Code Blocks Categories

Image courtesy of M5Stack

The screenshot displays the UIFlow software interface with a sidebar of code block categories and a main workspace. The sidebar categories include:

- Event**: Here you can find Loop and button press event blocks.
- Hardwares**: Program the internal peripherals of the M5GO such as the RGB Bar, Speaker, Accelerometer and Power management.
- Units**: Whenever you add a unit, it will appear here along with all the code blocks related to it.
- Math**: Maths is essential in programming. Here you will find all the blocks necessary to make both simple and complex calculations.
- Logic**: Every program needs logic to decide which action to take when an event occurs.
- Advanced**: Advanced blocks for experienced coders. You'll find blocks for networking, digital/ analog pin control and more here.

Other visible categories in the sidebar include Variables, Loops, Graphic, Emoji, Timer, Functions, Text, Lists, and Advanced. The main workspace shows several code blocks, including a variable '0', a 'random fraction' block, a 'random integer from to' block, and a 'round' block.

UIFlow Software. . .

UIFlow Blockly Code program sequence blocks



Setup

The setup block is essential for any program to run. It defines the first thing that will happen when the code is uploaded or the device is switched on. It will only run once.



Loop

The loop block will run any code placed inside it indefinitely. That means unless you turn off the device it will continue to run without stopping.



Wait

The wait block will delay your program for however many seconds you input. Sometimes this is necessary to see the result of some code that might have otherwise run so fast that you blinked and missed it.



UIFlow Software. . .



UIFlow Blockly Code program sequence diagram: A Mental Model for M5Stack Core code development.

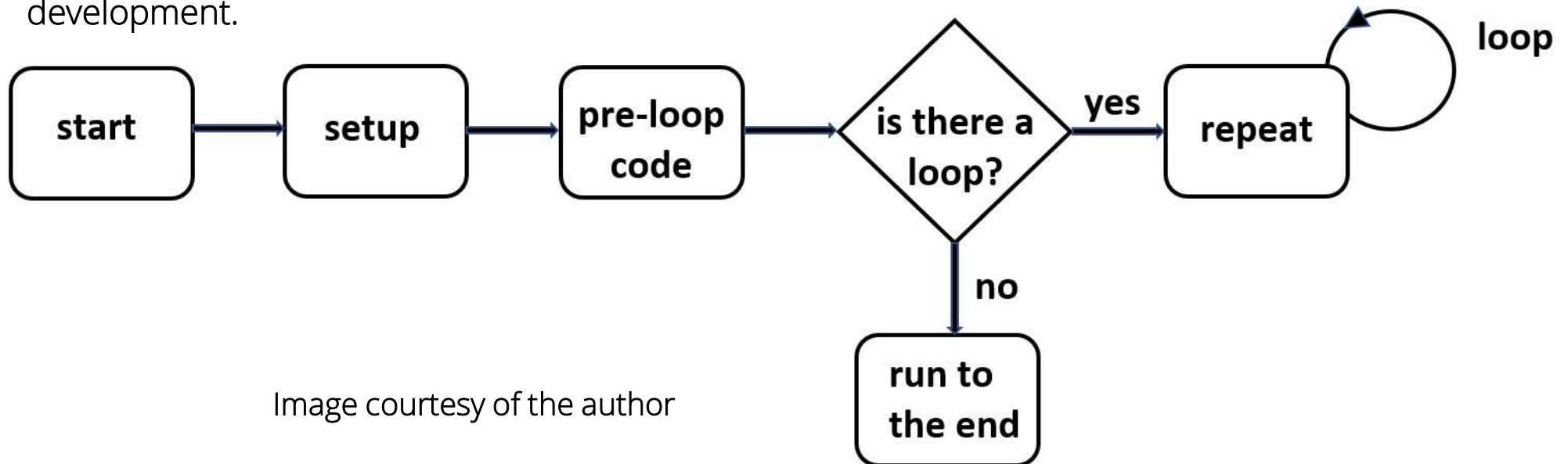


Image courtesy of the author

Question 4

In slide 30, the UIFlow Blockly Code program sequence diagram is an example of Multiple Representations.

- a) True**
- b) False**



Communication Setup

Turn On the M5Stack Core



Power ON button



Image courtesy of the author

Communication Setup. . .

Establishing USB Mode



①



②



Image courtesy of the author

Communication Setup. . .

Establishing USB Mode. . .



Image courtesy of the author

Communication Setup. . .



Setting up the COM port

Selected Communication port

Selected M5Stack Core



Image courtesy of the author

Lab: Hello World



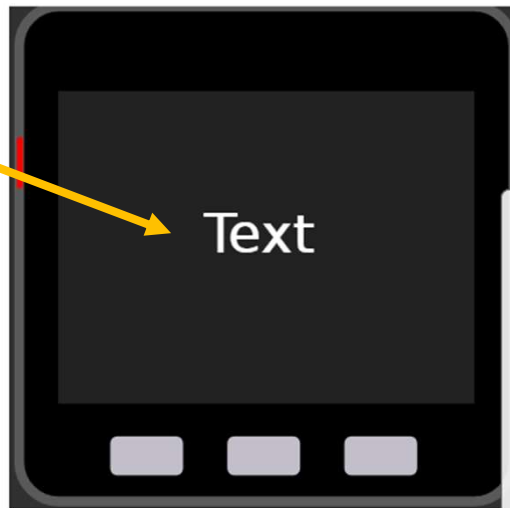
Lab: Hello World



Lab Objectives:

- Participants will learn to design a Hello World text on a M5Stack Core.
- Participants will learn to select the **Label** UI blockly code block.
- Participants will learn to modify the **Label** blockly code block to display Hello World! message on a M5Stack Core TFT LCD.
- Participants will learn to run the Blockly code blocks to display the Hello World! message on a M5Stack Core TFT LCD.

Lab: Hello World

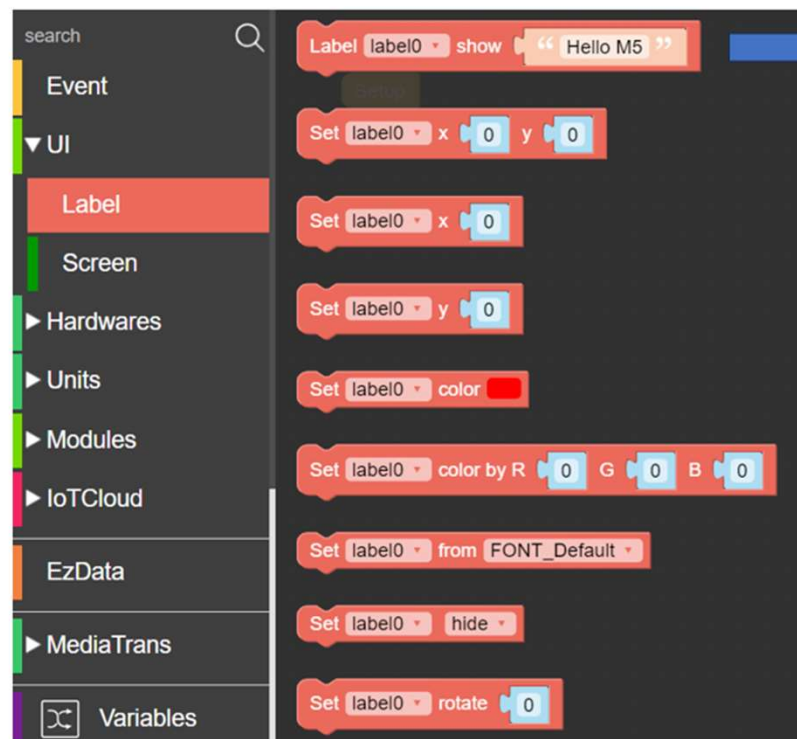


Placing Label UI on to M5Stack Core TFT

label0

Name:	label0
ModX:	111
Y:	88
Color:	
Text:	Text
Font:	DejaVuSans 40 ▾
Rotation:	0
Layer:	4

Lab: Hello World. . .



search

- Event
- UI
 - Label**
 - Screen
 - ▶ Hardwares
 - ▶ Units
 - ▶ Modules
 - ▶ IoTCloud
- EzData
- ▶ MediaTrans
- Variables

Label label0 show " Hello M5 "

Set label0 x 0 y 0

Set label0 x 0

Set label0 y 0

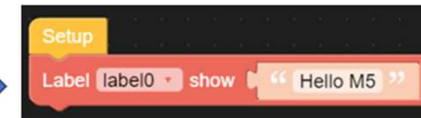
Set label0 color

Set label0 color by R 0 G 0 B 0

Set label0 from FONT_Default

Set label0 hide

Set label0 rotate 0



Place the first code
block on the editor



Lab: Hello World...



search

- Event
- UI
 - Label**
 - Screen
 - Hardware
 - Units
 - Modules
 - IoTCloud
- EzData
- MediaTrans
- Variables

Label label0 show "Hello M5"

Set label0 x 0 y 0

Set label0 x 0

Set label0 y 0

Set label0 color [red]

Set label0 color by R 0 G 0 B 0

Set label0 from FONT_Default

Set label0 hide

Set label0 rotate 0

Setup

Label label0 show "Hello M5"

Setup

Label label0 show "Hello World!"

Change text

Lab: Hello World...



The screenshot displays the MSFlow software interface. The top bar shows 'Ui FLOW V1.9.5' and 'Project main'. The main workspace is divided into three sections: a left sidebar with a 'Text' label, a central search panel with categories like 'Event', 'UI', 'Label', 'Screen', 'Hardwares', 'Units', 'Modules', 'IoTCloud', 'EzData', 'MediaTrans', 'Variables', 'Math', 'Loops', and 'Logic', and a right workspace containing a 'Setup' block with a 'Label label0 show "Hello World!"' block. At the bottom right, there are 'Run' and 'Download' buttons. A blue arrow points to the 'Run' button. The status bar at the bottom indicates 'COM1 COM5 [Connected] version: V1.9.8' and 'Copyright ©2022 M5Stack'.

Click here to run the program

Lab: Hello World. . .

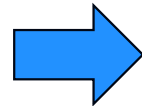


The text needs to be moved to the left!

Lab: Hello World...



Final Output



The text moved to the left!

Question 5

What UI element displays the “Hello World!” message on the M5Stack Core TFT LCD?

- a) Text**
- b) Label**
- c) Title**
- d) Rect**



Thank you for attending

Please consider the resources below:

Wilcher, D. (2023, p.32-34). *M5Stack Electronic Blueprints*. Packt.



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Thank You

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