

Title: Blinking an LED Using STM32 Bluepill (Arduino Framework)

Introduction:

In this lab, I implemented a simple LED blinking circuit using the BluepillF103C8 microcontroller, which is based on the STM32F103C8T6 chip. The purpose was to understand GPIO control, code deployment using PlatformIO, and simulate the behavior in both real and virtual environments.

Circuit Diagram and Description:

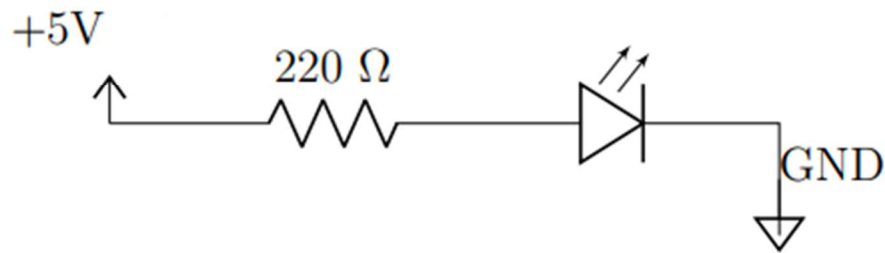


Figure 1: Simple LED Circuit Diagram

Connections:

Bluepill Pin	Component	Description
PC13	LED (+)	PWM Output to LED
GND	LED (-)	Ground connection
2200Ω Resistor	In series with LED	Limits current to protect LED

Diagram Description:

- One leg of the LED (longer) is connected to PC13.
- The shorter leg goes through a 220Ω resistor to GND.
- An external +3.3V supply or USB powers the Bluepill.

Procedure(Virtual part,Hardware setup is explained above):

1. Opened PlatformIO in VSCode.
2. Created a new project:
 - Board: Bluepill F103C8

- Framework: Arduino

3. In platformio.ini, ensure the following settings:

```
[env:bluepill_f103c8]  
platform = ststm32  
board = bluepill_f103c8  
framework = arduino  
upload_protocol = stlink
```

4. Written the following code inside src/main.cpp

5. Build and Uploaded the code on Board.

Code:

Turning on LED :

```
#include <Arduino.h>
```

```
const int LED=PC13; // Define LED for pin PC13
```

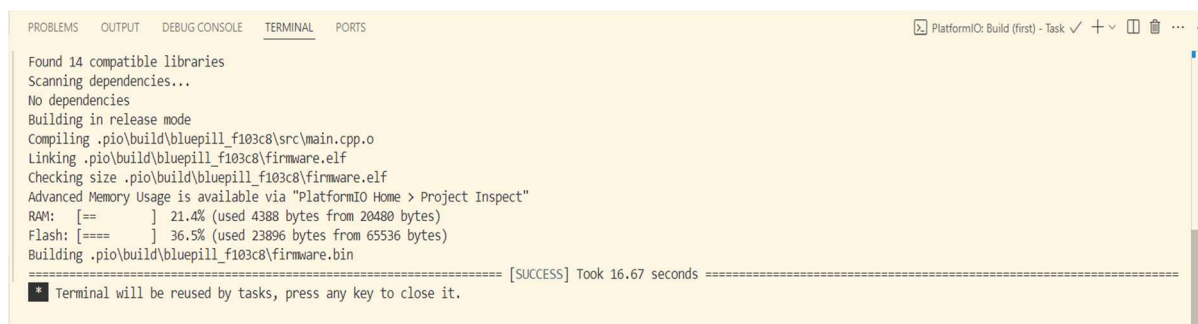
```
void setup(){
```

```
    pinMode (LED, OUTPUT); // Set the LED pin as an output
```

```
    digitalWrite(LED, HIGH); // Set the LED pin high }
```

```
void loop(){
```

```
    // We are not doing anything in the loop! }
```



```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  
PlatformIO: Build (first) - Task ✓ + ▢ ⌵ ...  
Found 14 compatible libraries  
Scanning dependencies...  
No dependencies  
Building in release mode  
Compiling .pio\build\bluepill_f103c8\src\main.cpp.o  
Linking .pio\build\bluepill_f103c8\firmware.elf  
Checking size .pio\build\bluepill_f103c8\firmware.elf  
Advanced Memory Usage is available via "PlatformIO Home > Project Inspect"  
RAM: [==] 21.4% (used 4388 bytes from 20480 bytes)  
Flash: [====] 36.5% (used 23896 bytes from 65536 bytes)  
Building .pio\build\bluepill_f103c8\firmware.bin  
===== [SUCCESS] Took 16.67 seconds =====  
* Terminal will be reused by tasks, press any key to close it.
```

Blinking LED:

```
#include <Arduino.h>
```

```
const int LED=PC13; // Define LED for pin PC13
```

```
void setup() {
```

```

pinMode (LED, OUTPUT); // Set the LED pin as an output }

void loop() {

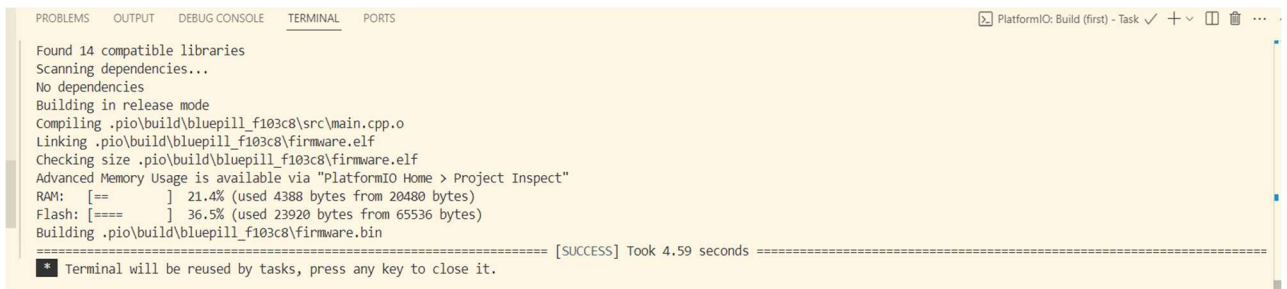
    digitalWrite(LED, HIGH);

    delay(1000); // Time in milliseconds

    digitalWrite(LED, LOW);

    delay(1000); }

```



The screenshot shows the PlatformIO IDE interface with the 'TERMINAL' tab selected. The terminal output displays the following information:

```

Found 14 compatible libraries
Scanning dependencies...
No dependencies
Building in release mode
Compiling .pio\build\bluepill_f103c8\src\main.cpp.o
Linking .pio\build\bluepill_f103c8\firmware.elf
Checking size .pio\build\bluepill_f103c8\firmware.elf
Advanced Memory Usage is available via "PlatformIO Home > Project Inspect"
RAM: [==      ] 21.4% (used 4388 bytes from 20480 bytes)
Flash: [=====] 36.5% (used 23920 bytes from 65536 bytes)
Building .pio\build\bluepill_f103c8\firmware.bin
===== [SUCCESS] Took 4.59 seconds =====
Terminal will be reused by tasks, press any key to close it.

```

LED with changing blink rate:

```

#include <Arduino.h>

const int LED=PC13; // Define LED for pin PC13

void setup(){

    pinMode (LED, OUTPUT);

    // Set the LED pin as an output }

void loop() {

    for (int i=100; i<=1000; i=i+100) {

        digitalWrite(LED, HIGH);

        delay(i);

        digitalWrite(LED, LOW);

        delay(i);

    }

}

```

```
no dependencies
Building in release mode
Compiling .pio\build\bluepill_f103c8\src\main.cpp.o
Linking .pio\build\bluepill_f103c8\firmware.elf
Checking size .pio\build\bluepill_f103c8\firmware.elf
Advanced Memory Usage is available via "PlatformIO Home > Project Inspect"
RAM: [==      ] 21.4% (used 4388 bytes from 20480 bytes)
Flash: [====   ] 36.5% (used 23924 bytes from 65536 bytes)
Building .pio\build\bluepill_f103c8\firmware.bin
===== [SUCCESS] Took 4.45 seconds =====
Terminal will be reused by tasks, press any key to close it.
```

Discussion:

Through this lab, I learned how to:

- control LED brightness.
 - Set up and build STM32 code using PlatformIO.
 - Interface hardware (LEDs) with GPIO pins.
 - Work with alternative frameworks (Arduino for STM32).
- I became familiar with functions like pinMode,digitalWrite and delay.

The hardware behaviour matched expectations.Both real and virtual implementations confirmed correct logic and execution.