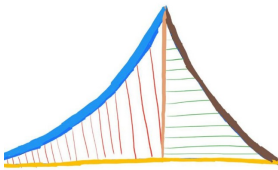


Embedd Systems Through Vaman



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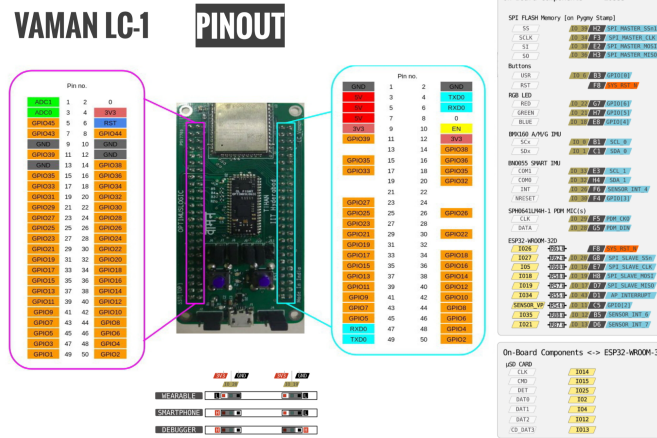


Fig. 1.1: Vaman pins. Right side represents ESP32 and left side M4-FPGA.

1 BLINK

1.1 ESP

Here we show how to program the ESP32 on the Vaman using the Arduino framework.

1. Make sure that Vaman board does not power any devices.
2. Make connections as shown in Table 1.1.
3. The Vaman pin diagram is available in Figure 1.1.

VAMAN-ESP	UART PINS
5V	5V
GND	GND
TXD0	TXD
RXD0	RXD
0	GND

TABLE 1.1

4. Connect the Arduino-UART to raspberry pi through USB.
5. Connect the Vaman-ESP pins to the seven segment display according to Table 1.2

ESP	SEVEN SEGMENT DISPLAY
5V	COM
2	DOT

TABLE 1.2

6. On termux on your phone,

```
cd vaman/esp32/codes/ide/blink
pio run
```

7. Transfer the ini and bin files to the rpi

```
scp platformio.ini pi@192.168.50.252:~/hi/platformio.ini
scp .pio/build/esp32doit-devkit-v1/firmware.bin
pi@192.168.50.252:~/hi/.pio/build/esp32doit-devkit
-v1/firmware.bin
```

8. On rpi,

```
cd /home/pi/hi
pio run -t nobuild -t upload
```

9. On your phone, open

```
src/main.cpp
```

and change the delay to

```
delay(100);
```

and execute the code by following the steps above.

10. Flash the following code.

```
vaman/esp32/codes/ide/ota/setup
```

after entering your wifi username and password (in quotes below)

```
#define STASSID "... " // Add your network credentials
#define STAPSK "... "
```

in src/main.cpp file

11. You should be able to find the ip address of your vaman-esp using

```
ifconfig
nmap -sn 192.168.231.1/24
```

where your computer's ip address is the output of ifconfig and given by 192.168.231.x

12. Assuming that the username is gvv and password is abcd, flash the following code wirelessly

```
vaman/esp32/codes/ide/ota/blink
```

through

```
pio run
pio run -t nobuild -t upload --upload-port
192.168.231.245
```

where you may replace the above ip address with the ip address of your vaman-esp.

13. Connect pin 2 to an LED to see it blinking.
14. Connect the pins between Vaman-ESP32 and Vaman-PYGMY as per Table 1.3

ESP32	Vaman
GPIO2	GPIO18
GPIO4	GPIO21
GPIO5	GPIO22

TABLE 1.3

15. Flash the following code OTA

```
vaman/esp32/codes/ide/ota/blinkt
```

You should see the onboard LEDs blinking.

16. Change the blink duration to 100 ms.

1.2 FPGA

We show how to program the Vaman FPGA/microcontroller board.

1. Follow the instructions available in the video at

```
https://github.com/whyakari/
TermuxDisableProcces?tab=
readme-ov-file
```

to ensure that termux is not killed during the following installation process.

2. On termux-debian,

```
wget https://raw.githubusercontent.com/gadepall/fwc-1/
main/scripts/setup.sh
bash setup.sh
```

1.3 Frequency

- 1.3.1. In the following verilog program,

```
codes/blink/helloworldfpga.v
```

pay attention to the following lines

```
delay = delay+1;
if(delay > 20000000)
begin
delay=27'b0;
led=!led;
end
```

It may be deduced from the above that the blink frequency is 20 MHz.

- 1.3.2. In instruction 1.3.1, replace

```
if(delay > 20000000)
```

with

```
if(delay==27'b1001100010010110100000000)
```

Type	Vaman Pin	Connection
Input	IO_28	GND
Output	IO_11	LED

TABLE 1.3.8.1: Vaman Input/Output.

and execute the verilog code.

- 1.3.3. Since the delay is 20 MHz, the blink period is 1 second. Modify the verilog code so that the blink period becomes 0.5s.

- 1.3.4. Find the bit length of 20 MHz.

Solution:

$$\log_2(20000000) \approx 27 \quad (1.3.4.1)$$

- 1.3.5. Obtain the above answer using a Python code.

Solution: Execute the following code and compare with instruction 1.3.2.

```
codes/blink/freq_count.py
```

- 1.3.6. Replace the following line in the code in instruction 1.3.1

```
assign redled = led; //If you want to change led colour
to red,
```

with

```
assign blueled = led;
```

and execute the code.

- 1.3.7. Ensure that the LED stays on in green colour.

Solution: Execute the following code

```
vaman/setup/codes/blink/onoff.v
```

- 1.3.8. Using Table 1.3.8.1 and Fig. ??, control the onboard LED through an external input. Connect an external LED and control it using an output pin as well.

Solution: Execute the following code and take out the input pin connect to GND. Plug it again. Do this repeatedly.

```
vaman/setup/codes/input/blink_ip.v
vaman/setup/codes/input/pygmy.pcf
```