



StarFive
赛昉科技

Using an LED Dot Matrix with VisionFive

with Python

Application Note

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Legal Statements

Important legal notice before reading this documentation.

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Preface

About this guide and technical support information.

About this document

This application note provides steps to use VisionFive's GPIO pins to make a MAX7219 Serial Dot Matrix display with StarFive logo through an example program with Python.






Revision History

Table 0-1 Revision History

Version	Released	Revision
V1.1	2022-07-29	Added "cd" in the codeblock <pre>cd /usr/local/lib64/python3.9/site-packages</pre> to make it a complete command.

Notes and notices

The following notes and notices might appear in this guide:

-  **Tip:**
Suggests how to apply the information in a topic or step.
-  **Note:**
Explains a special case or expands on an important point.
-  **Important:**
Points out critical information concerning a topic or step.
-  **CAUTION:**
Indicates that an action or step can cause loss of data, security problems, or performance issues.
-  **Warning:**
Indicates that an action or step can result in physical harm or cause damage to hardware.

Contents

List of Tables.....	5
List of Figures.....	6
Legal Statements.....	ii
Preface.....	iii
1. Introduction.....	7
1.1. 40-Pin Header Definition.....	7
2. Preparation.....	8
2.1. Preparing Hardware.....	8
2.1.1. Hardware Setup.....	8
2.2. Preparing Software.....	10
3. Running Demo Code.....	11
4. Demo Source Code.....	13

List of Tables

Table 0-1 Revision History..... iii

Table 2-1 Hardware Preparation..... 8

Table 2-2 Connect MAX7219 to the 40-Pin Header.....9

List of Figures

Figure 1-1 40-Pin Definition..... 7
Figure 2-1 Connect MAX7219 to the 40-Pin Header..... 9
Figure 3-1 Example Output..... 12

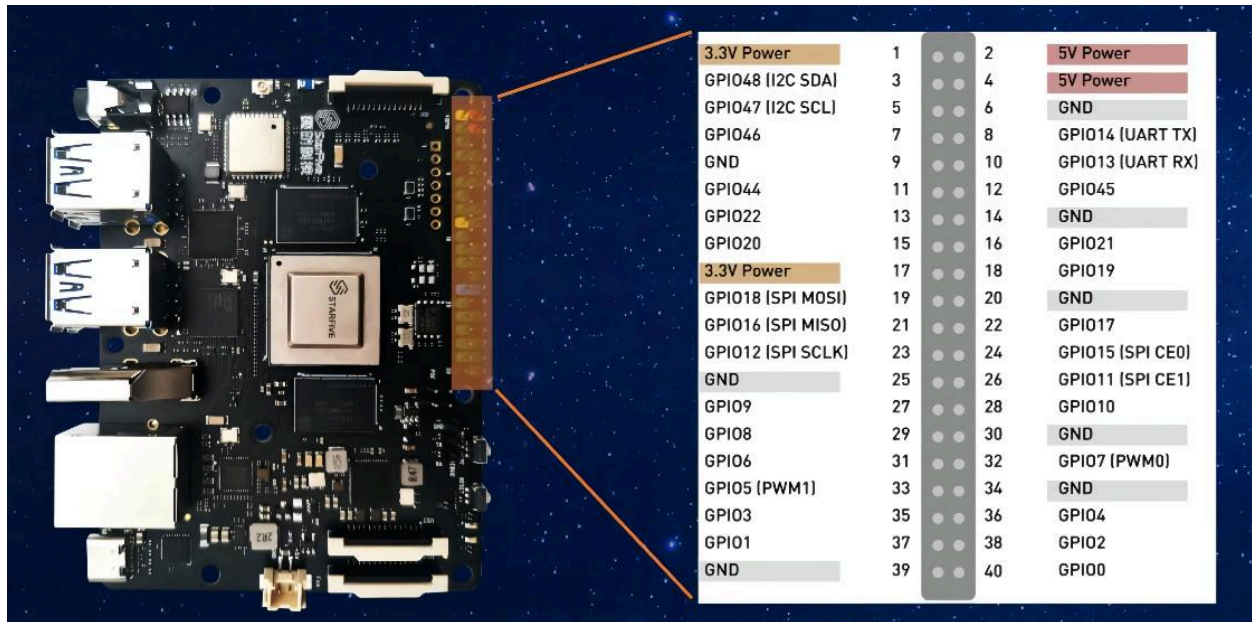
1. Introduction

This application note provides steps to use VisionFive's GPIO pins to make a MAX7219 Serial Dot Matrix display with StarFive logo through an example program with Python.

1.1. 40-Pin Header Definition

The following figure shows the location of the 40-pin header. The VisionFive board is taken as an example:

Figure 1-1 40-Pin Definition



2. Preparation

Before executing the demo program, make sure you prepare the following:

2.1. Preparing Hardware

Prepare the following hardware items before running the demo code:

Table 2-1 Hardware Preparation

Type	M/O*	Item	Notes
General	M	StarFive single board computer	The following boards are applicable: <ul style="list-style-type: none">• StarLight• VisionFive
General	M	<ul style="list-style-type: none">• 16 GB (or more) micro-SD card• micro-SD card reader• Computer (Windows/MAC/Linux)• USB to serial converter (3.3 V I/O)• Ethernet cable• Power adapter (5 V / 3 A)• USB Type-C Cable	These items are used for flashing Fedora OS into a micro-SD card.
GPIO Demo (LED Matrix)	M	MAX7219 Serial Dot Matrix Display Module (with 5 way female to female Dupont cable)	-



Note:

*: M: Mandatory, O: Optional

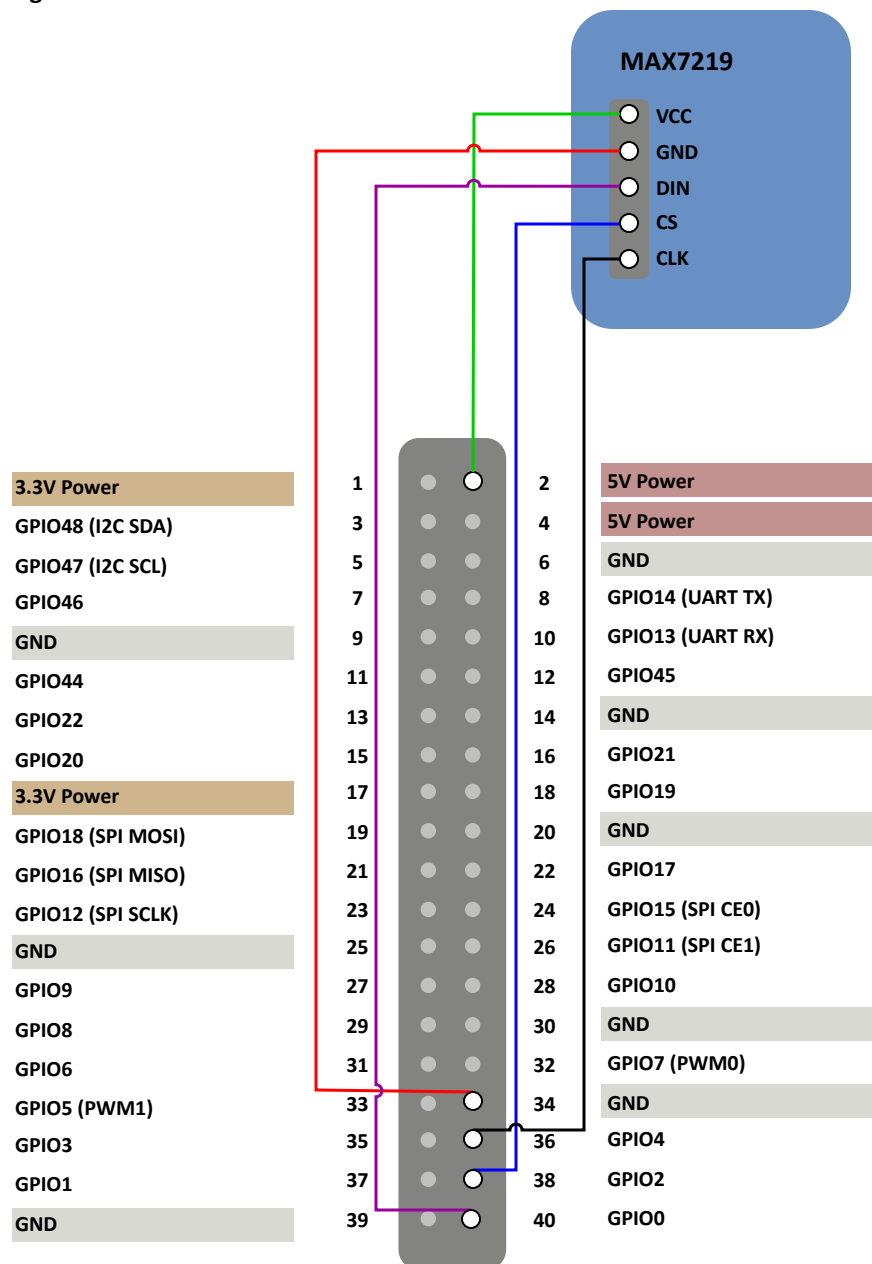
2.1.1. Hardware Setup

The following table and figure describe how to connect MAX7219 to the 40-pin header:

Table 2-2 Connect MAX7219 to the 40-Pin Header

MAX7219	40-Pin GPIO Header	
	Pin Number	Pin Name
VCC	2	5V Power
GND	34	GND
DIN	40	GPIO0
CS	38	GPIO2
CLK	36	GPIO4

Figure 2-1 Connect MAX7219 to the 40-Pin Header



2.2. Preparing Software

Make sure the following procedures are performed:

1. Flash Fedora OS into a Micro-SD card as described in the *Flashing Fedora OS to a Micro-SD Card* section in the *VisionFive Single Board Computer Quick Start Guide*.
2. Log into the Fedora and make sure VisionFive is connected to the Internet. For detailed instructions, refer to the *Using SSH over Ethernet* or *Using a USB to Serial Converter* section in the *VisionFive Single Board Computer Quick Start Guide*.
3. Execute the `pip` command on VisionFive Fedora to install the `VisionFive.gpio` package:

```
sudo pip install VisionFive.gpio
```

Alternatively, you can execute the following command:

```
sudo pip3 install VisionFive.gpio
```

4. (Optional) If you copy the source code to the local directory under VisionFive Fedora, execute the following commands under the source code directory:



Tip:

The source code can be downloaded by clicking the following link: [VisionFive.gpio](https://github.com/starfive/VisionFive.gpio).

```
sudo yum install python-devel python3-devel  
sudo python setup.py install
```

Alternatively, you can execute the following command:

```
sudo python3 setup.py install
```

3. Running Demo Code

To run the demo code, perform the following on VisionFive Fedora:

1. Locate to the directory where the test code, `LED_Matrix.py`, exists:
 - a. Execute the following command to get the directory where `VisionFive.gpio` exists:

```
pip show VisionFive.gpio
```

Example Result:

```
Location: /usr/local/lib64/python3.9/site-packages
```



Note:

The actual output depends on how the application is installed.

- b. Execute the following to enter the directory, for example, `/usr/local/lib64/python3.9/site-packages` as indicated in the previous step output:

```
cd /usr/local/lib64/python3.9/site-packages
```

- c. Execute the following command to enter the `sample-code` directory:

```
cd ./VisionFive/sample-code/
```

2. Under the `sample-code` directory, execute the following command to run the demo code:

```
sudo python LED_Matrix.py
```

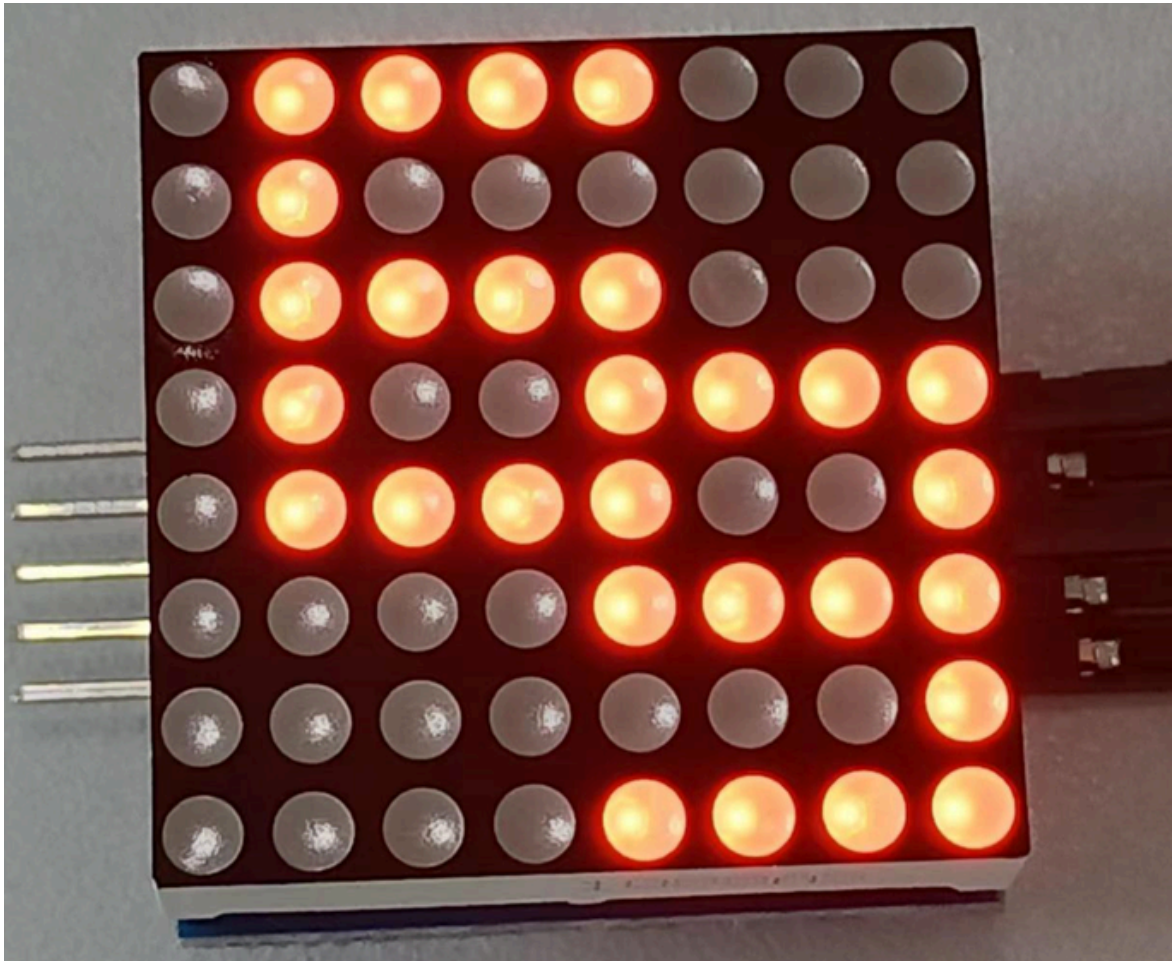
Alternatively, you can execute the following command:

```
sudo python3 LED_Matrix.py
```

Result:

The Led Matrix module displays with the StarFive logo.

Figure 3-1 Example Output



4. Demo Source Code

The Python source code of this demo is provided for reference purpose only.

LED_Matrix.py:

```
'''
Please make sure the LED Dot Matrix is connected to the correct pins.
The following table describes how to connect LED Dot Matrix to the 40-pin
header.

-----
| MAX7219 | Pin Number | Pin Name |
|-----|-----|-----|
| VCC     | 2          | 5V Power|
| GND     | 34         | GND      |
| DIN     | 40         | GPIO0    |
| CS      | 38         | GPIO2    |
| CLK     | 36         | GPIO4    |
|-----|-----|-----|

'''

import VisionFive.gpio as GPIO
import sys
import time

DIN = 0
CS = 2
CLK = 4

#Configure the direction of DIN, CS, and CLK as out.
GPIO.setup(DIN, GPIO.OUT)
GPIO.setup(CS, GPIO.OUT)
GPIO.setup(CLK, GPIO.OUT)

#Display logo data.
buffer =
    ['01111000', '01000000', '01111000', '01001111', '01111001', '00001111', '0
0000001', '00001111']

#LED turn off data.
buffer_off = ['0', '0', '0', '0', '0', '0', '0', '0']

def sendbyte(bytedata):
    for bit in range(0, 8):
        if ((bytedata << bit) & 0x80):
            GPIO.output(DIN, GPIO.HIGH)
        else:
            GPIO.output(DIN, GPIO.LOW)

#Configure the voltage level of CLK as high.
```

```

GPIO.output(CLK, GPIO.HIGH)
#Configure the voltage level of CLK as low.
GPIO.output(CLK, GPIO.LOW)

def WriteToReg(regaddr, bytedata):
    #Configure the voltage level of cs as high.
    GPIO.output(CS, GPIO.HIGH)
    #Configure the voltage level of led_pin as low.
    GPIO.output(CS,GPIO.LOW)
    GPIO.output(CLK, GPIO.LOW)
    sendbyte(regaddr)
    sendbyte(bytedata)
    GPIO.output(CS, GPIO.HIGH)

def WriteALLReg():
    time.sleep(0.1)
    for i in range(0, 8):
        #Write data to register address. Finally the LED matrix displays
StarFive logo.
        WriteToReg(i+1, int(buffer[i], 2))
        time.sleep(5)

    #Display logo.
    for i in range(0, 10):
        for j in range(0, 8):
            #Write data to the register address. Finally turn off the LED
matrix.
            WriteToReg(i+1, int(buffer_off[i], 2))
            time.sleep(0.1)
        for j in range(0, 8):
            #Write data to the register address. Finally the LED matrix
displays with StarFive logo.
            WriteToReg(i+1, int(buffer[i], 2))
            time.sleep(0.1)

def initData():
    WriteToReg(0x09, 0x00) #Set the decode mode.
    WriteToReg(0x0a, 0x03) #Set the brightness.
    WriteToReg(0x0b, 0x07) #Set the scan limitation.
    WriteToReg(0x0c, 0x01) #Set the power mode.
    WriteToReg(0x0f, 0x00)

def main():
    initData()
    while True:
        WriteALLReg()

```

```
if __name__ == "__main__":  
    sys.exit(main())
```