

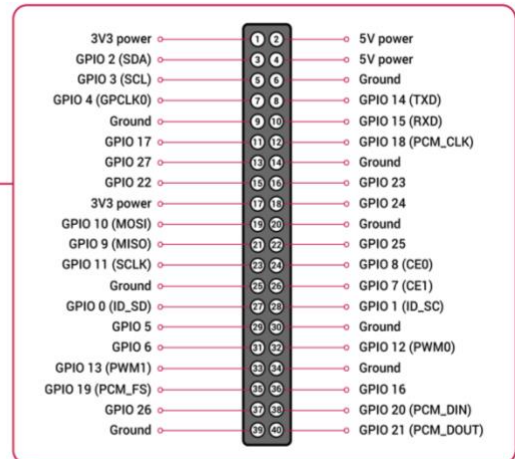
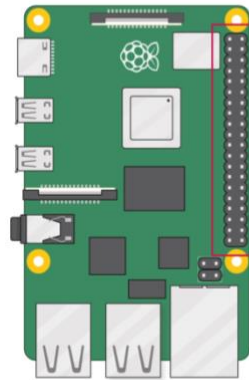
## Introduction

This documentation is based on [Mottramlabs MAX7219-7-Segment-Driver](#) but updated for a raspberry pi. The chip contains a led bar of 16 LEDs, 4 Status LEDs and a 4-digit 7 segment display as well as a speaker that this repo will not consider. This code will be using the [Serial Peripheral Interface](#) (SPI) Learn how to enable it [here](#).

## Pin setup

After enabling the SPI this is the pin setup on a raspberry pi 4:

Pin on Chip	Pin on Pi
5volt (5V)	2 (5V)
Ground (GND)	6 (GND)
Data In (DIN)	19 (MOSI)
Chip Select (CS)	24 (CEO)
Clock (CLK)	23 (CLK)
Data Out (OUT)	-
Speaker (SPK)	-



## SPI divers

The SPI communicates using the [luma.core.interface.serial](#) python module so that needs to be installed before. Additionally the [max7219 drivers](#) are needed as well.

## SPI communication

The chip is based on the [max7219](#) so it uses the same type of communication as found in the [max7219 datasheet](#).

The serial data format is 16 bits long where bit 15-12 are don't cares, 11-8 is the address of the register to edit (see table below), and 7-0 is the data to be put into the register at the given address.

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
X	X	X	X	ADDRESS				MSB	DATA						LSB

This format is used to manipulate the LEDs and the 4 7-segment digits.

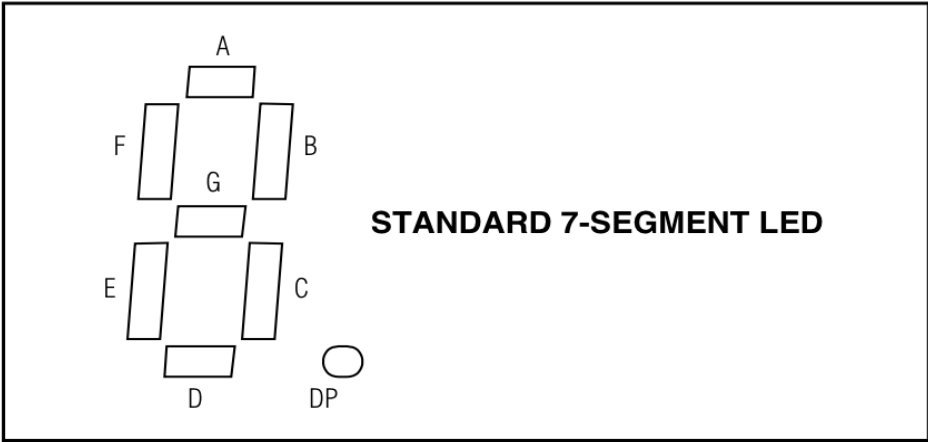
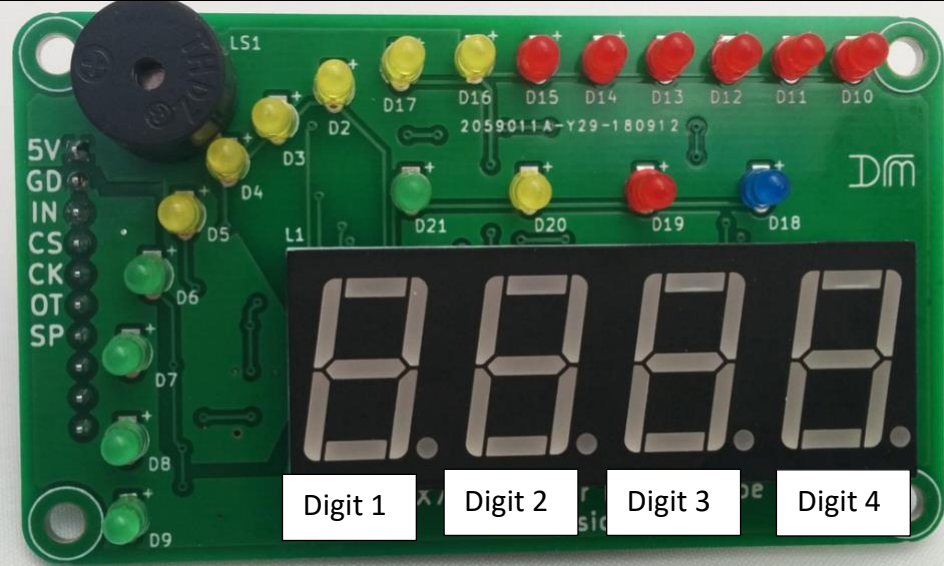
## 7 Segment digits

A single digit is based 7 segments and one decimal point. Each of which is stored as a single bit in the registers. Based on the image below, the combinations of the bits can represent a letter or number. For example, 0b01111001represents the segments ABCDG which is the same as the digit 3.

## Further information

For further information consult the official datasheet for the [max7218](#).

Register	Hex	Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0 (LSB)
Noop	0x00	X	X	X	X	X	X	X	X
Digit 1 (Left)	0x01	DP	A	B	C	D	E	F	G
Digit 2	0x02	DP	A	B	C	D	E	F	G
Digit 3	0x03	DP	A	B	C	D	E	F	G
Digit 4 (Right)	0x04	DP	A	B	C	D	E	F	G
LED bar (bot)	0x05	9	8	7	6	5	4	3	2
LED bar (top)	0x06	17	16	15	14	13	12	11	10
LED Indicators	0x07	21	20	19	18	X	X	X	X
Noop	0x08	X	X	X	X	X	X	X	X
Decode mode	0x09	X	Indicators	BAR top	BAR bot	Digit 4	Digit 3	Digit 2	Digit 1
Intensity	0x0A	X	X	X	X	0x0F = MAX		0x00 = MIN	
Scan limit	0x0B	X	X	X	X	X	Turn off register 1-7 by index		
On/Off	0x0C	X	X	X	X	X	X	X	On/Off
Noop	0x0D	X	X	X	X	X	X	X	X
Noop	0x0E	X	X	X	X	X	X	X	X
Display Test	0x0F	X	X	X	X	X	X	X	On/Off



	REGISTER DATA							
	D7	D6	D5	D4	D3	D2	D1	D0
Corresponding Segment Line	DP	A	B	C	D	E	F	G