**Development Notes**

**Of OpenGameConsoleMK1**

**Set up and initialize chips of Espressif**

* Use “pip install esptool” to get installation tool for chips produced by Espressif (esp8266, esp32, …)

Use “esptool.py <arguments…>” in CMD to install micropython firmware for esp devices mentioned above.

Visit <https://docs.espressif.com/projects/esptool/en/latest/esp32/installation.html>

<http://docs.micropython.org/en/latest/esp8266/tutorial/intro.html> for more information.

* If encounter “failed to create process” when try to use esptool.py, download esptool project files on github and directly run esptool.py in project directory through command “python <absolutepath>\...\esptool.py”.

https://github.com/espressif/esptool/tags

* Use “import esp” to get hardware information of esp devices in micropython shell.

E.g. esp.flash\_size() returns the size of on-board flash in bytes.

* Use help(obj) in micropython shell to get information of functions, classes, variables and other objects in modules.

E.g. help(machine.SPI) returns names of methods and properties of SPI class in module machine.

**Serial Peripheral Interface SPI mode**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SPI mode** | **CPOL** | **CPHA** | **The level the idle clock line sits at** | **Edge of sampling data** |
| **0** | **0** | **0** | **low** | **odd** |
| **1** | **0** | **1** | **low** | **even** |
| **2** | **1** | **0** | **high** | **odd** |
| **3** | **1** | **1** | **high** | **even** |

The four modes of SPI share same principle except properties shown above.

Guidence of Micropython SPI class:

<http://docs.micropython.org/en/latest/library/machine.SPI.html?highlight=spi>

**MAX7219**

* **Load-Data Input LOAD (CS):**

The last 16 bits of serial data are latched on LOAD’s rising edge.

So before writing data, GPIO connected to LOAD should be set as low.

* **Serial-Clock Input CLK:**

10MHz maximum rate.

On CLK’s rising edge, data is shifted into the internal shift register. On CLK’s falling edge, data is clocked out of DOUT.

* **Serial-Data Input DIN:**

Data is loaded into the internal 16-bit shift register on CLK’s rising edge.

* **Serial-Data Output DOUT:**

The data into DIN is valid at DOUT 16.5 clock cycles later

* Hence, polarity and phase argument of SPI class shoule be 0 when operating this chip.
* Before writing data for LEDs, default values need to be submitted to other registers so that max7219 can run stably, including decode mode, intensity, scan limit, operation mode, display test. More detailed information are presented in the datasheet.
* Baud rate of SPI for this chip is no more than 10MHz. Stability is guaranteed when 8MHz or 9MHz baud rate is applied.
* If display test is turned on, all LEDs will be turned on regardless the state of shutdown mode.