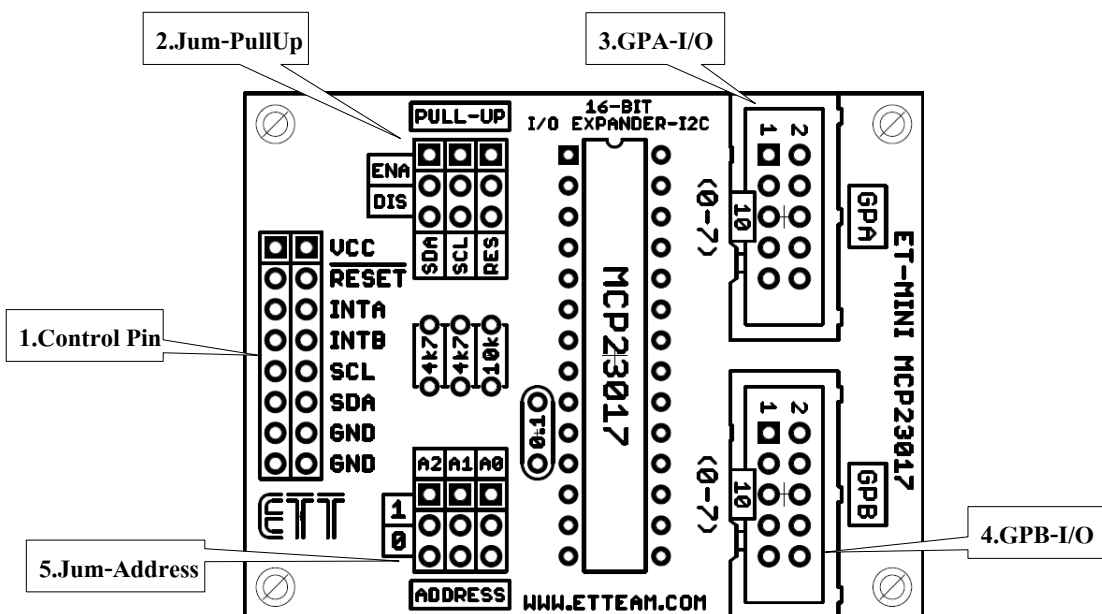


ET-MINI MCP 23017

Module ET-MINI MCP 23017 is an expansion device to expand amount of Port I/O for 16Bit MCU, it divides into 2 of 8Bit Ports (GPA, GPB); and it uses I2C BUS Interface. The specifications of this Module are listed below;

- 16-Bit Bidirectional I/O Port: I/O Pin Default is set as Input.
- Clock Frequency for I2C Interface is in the range of 100KHz, 400KHz, and 1.7MHz; it depends on the voltage level that supplies MCP23017.
- Module runs at the Voltage level 1.8V - 5.5V.
- Has PIN A0,A1,A2 to setup Address for MCP23017 from external; in this case, it can connect 8 of MCP23017 together in the same Bus.
- Can setup Interrupt Output Pin either to be Active-High, Active-Low or Open-Drain.
- Setup Pin INTA, INTB to separately run according to Port GPA, GPB; or, setup both pins to run together that gives the same Signal INT.
- Can set 2 sources of Interrupt. Firstly, it compares the change of Input Pin and the Configure in Register; secondly, it compares the change of the old Input Pin with the change of the current Input Pin.
- Can setup Signal Input Port to read Inversion value from actually incoming Input
- Consume a maximum of 1uA Current while Standby Mode

Structure of Module and Pin Positions

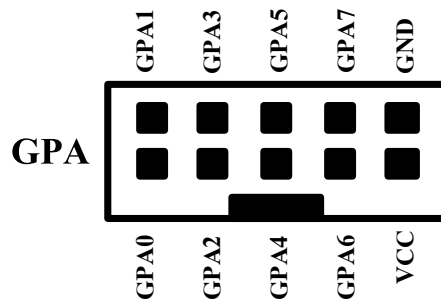


1. **Control Pin:** This connector is used for MCU to send Command to control the operation of Module in the format of I2C as described below;
 - VCC: It is Connector Power Supply 1.8V-5.5V for Module.
 - RESET: It is Connector Input to receive Signal RESET (Active = 0) from MCU in order to reset Module.
 - INTA: It is Connector Interrupt Output, especially Interrupt from Port GPA (when GPA is run as Input).
 - INTB: It is Connector Interrupt Output, especially Interrupt from Port GPB (when GPB is run as Input).

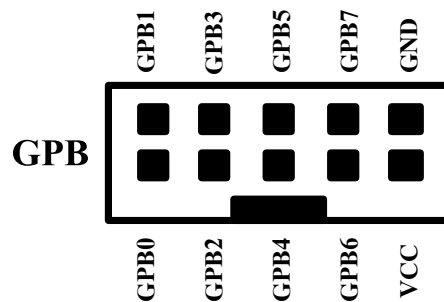
- SCL: It is Connector Input to receive Signal Serial Clock of I2C from MCU.
- SDA: It is Connector Input/Output to receive/send Serial Data of I2C between MCU and Module.
- GND: It is Connector Ground in the part of Power Supply of Module.

2.Jum-PullUp: This Jumper is used to interface R-PullUp for Pin SDA, SCL and RESET of Module. If Pin I2C BUS SDA and SCL are not interfaced with R-PullUp from external, it has to set this Jumper to the position of ENA in order to interface with R-PullUp; but, if outside of Module interfaces R-PullUp with both pins, it has to set this Jumper to the position of DIS. For JUMPER RES, it always sets to the position of ENA to interface R-PullUp with Pin RESET and it is always '1' although user controls the operation through Pin RESET, it protects Module from reset in the unwanted condition.

3. GPA-I/O: It is Connector I/O for 8-Bit Port GPA. It can be setup either to be Input or Output in the Bit level; it depends on Command from user that is sent to setup Module. It arranges Pin as shown in the picture below;

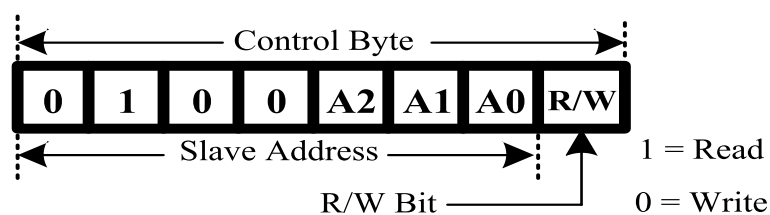


4. GPB-I/O: It is Connector I/O for 8-Bit Port GPB. It can be setup either to be Input or Output in the Bit level; it depends on Command from user that is sent to setup Module. It arranges Pin as shown in the picture below;



5. Jum-Address: This Jumper is used to setup the Address Slave A0,A1,A2 for MCP23017, it will be Control Byte for the device as shown in the table below. It can setup 8 values; so, it can interface 8 of MCP23017 in the same BUS I2C in parallel.

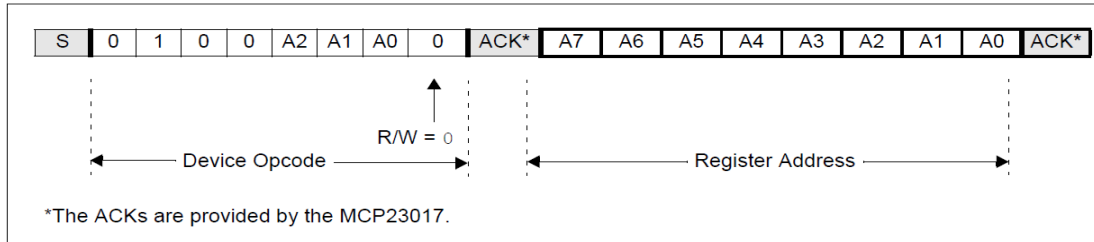
Format Control Byte MCP23017



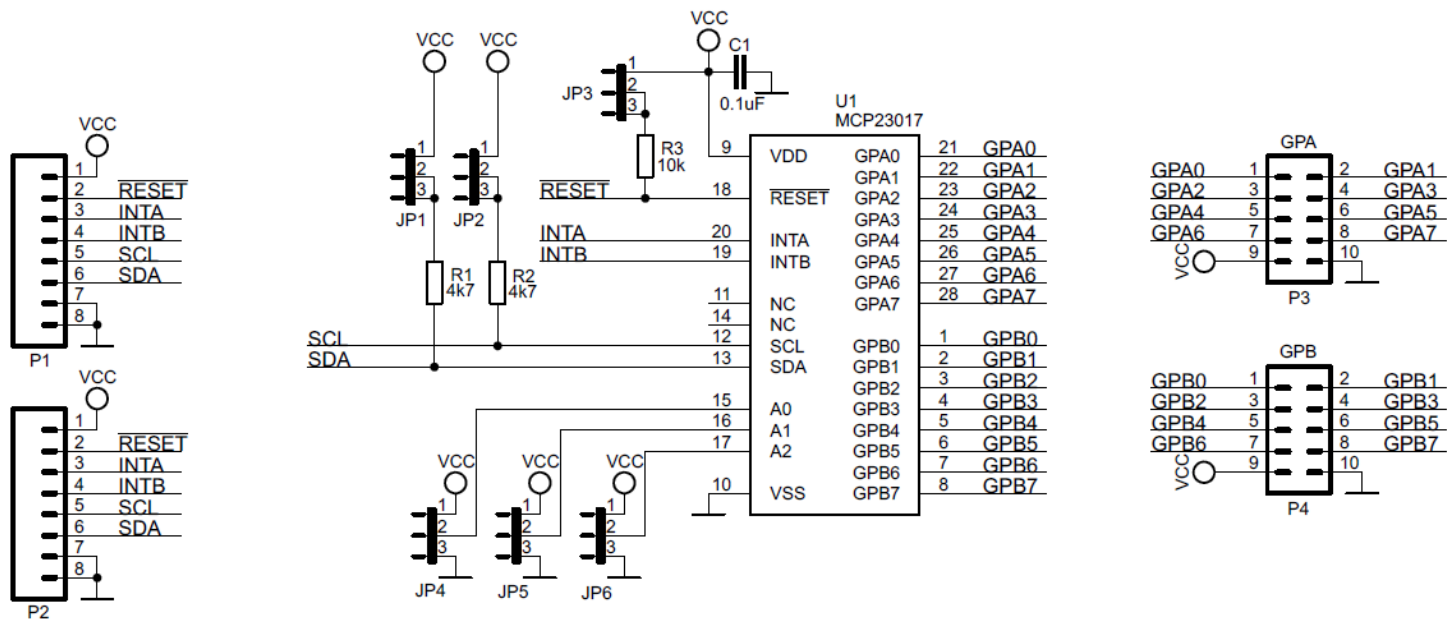
Referred to examples in CD, it sets A0,A1,A2 to the side of '0'; so, Address Slave A0,A1,A2 is also '0'. When replacing these values in the table above, then Control Byte for writing is 0x40 and the Control Byte for reading is 0x41.

How to interface

1. For Jumper PULL-UP, it has to set Jumper RES to the position of ENA and it has to set Jumper SDA and SCL to the position of ENA if both Pins are not interfaced with any R-PullUp from external Module; but, if both Pins are interfaced with R-PullUp from external Module, it has to set both Jumpers to the position of DIS.
2. For Jumper Address, it has to set Jumper A0,A1,A2 to either position of 0 of 1, depending on preferable Address of user; referred to the example program, it set all Jumper to the position of '0'. Next, it replaces A0,A1,A2 into the table above and user can read the Control Byte for reading/writing I2C device; these values are stored and used to send Command. Referred to the example, it is 0x40(W) and 0x41(R).
3. Interface Cable SDA and SCL of MCU with PIN SDA and SCL of the Module, respectively. For PIN RESET, INTA, INTB of Module, it should be floated if it is unused. Finally, interface Power Supply DC 5V with this Module at PIN VCC and GND.
4. Interface Cable on the side of Port GPA or GPB to any device that user requires controlling the operation such as LED or SW. or Board Interface I/O.
5. Write program Interface I2C and format of sending Address Register is illustrated in the picture below (please read and see example in the CD).



Please read the way to write program for controlling operation of Module from Data Sheet and example programs provided in CD. The example programs in CD illustrate how to do as follows. Firstly, look at Control Module from function *init_MCP23017()*, it refers to Address Register in Bank 0 that is Address Default. Next, set Port GPA[0..7] as Output that interfaces LED Common Anode (Active '0'); and, set Port GPB[0..7] as Input that interfaces SW and also sets Pull-Up. In the part of Setup Interrupt for PIN INTA and INTB of Module, it is unnecessary to setup any value if it is unused. Finally, look at the part of Main program, user reads value from the state of pressing SW from Port GPB. If any Bit is pressed (pressing SW. = '0'), it makes LED of that Bit in Port GPA lit up (ON); next, read Port GPB again to check if SW. is released.



Picture shows Circuit of ET-MINI MCP 23017.