BPI-LCD1602

Maximum Power at Minimum Size

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Banana Pi LCD1602   Expansion Module User Manual

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Attention:
Due to technical requirements components, please do not hand directly connected
Touch. Core board and development system contains static-sensitive devices. Quiet Electrical charge easily accumulate in the human body and the device can not detect possible Damage to equipment, it is recommended to take anti-static measures, it is recommended not to hand. Touch, stored in anti-static effect devices.

Banana Pi Expand Module Serial：

Infinity cascade IO expand module：

    This module is designed specifically for the Banana Pi IO expansion modules. The module expand 32 IO, Multiple modules can cascade, infinity cascade，infinity GPIO.

I2C GPIO expand module：

    This module is designed specifically for the Banana Pi IO expansion modules. The Module use I2C bus to connect to Banana Pi. The module expand 8 Bidirectional GPIO and wit isolation protection function which can effectively excessive external voltage. There are 8 I2C address, you can choose one of them through setup the jumper. Multiple modules can cascade and maximum cascade 8 modules!

Prototype development module：

    The Prototype development module is designed specifically for the Banana Pi. The module suitable enthusiasts and user can weld peripheral to the module；The module expand some amphenol connector and some SMT, so the user can finish prototype test easily.

Berryclip expand module：

    The BerryClip module is designed specifically for learning how to use the GPIO of Banana Pi. There are 6 multiple color LED, 1 button and 1 Buzzer on the module.

Berryclip(DIY) expand module：

    The module is not the end product, you need weld them by yourself. The function of the module is the same as BerryClip module.

UNO compatibility module：

    The module makes Banana Pi compatible with Arduino Uno and many Arduino Shields. The module's GPIO is the same as Arduino Uno and you can choose the voltage of GPIO between 5V or 3V through setup jumper.

T Electric level convert module：

    The module expand the GPIO of Banana Pi to breadboard. It convert 3.3V electric to 5V electric level, then the Banana Pi can connect many 5V electric level peripheral.

IO extraction module：

The module expand all of GPIO of Banana Pi to breadboard.

RTC expand module：

The RTC module is specifically designed for Banana Pi. There is a 0.2uF SuperCapacitor on the board to keep the real time for a long time after the Banana Pi has power off.

AD/DA expand module：

The AD/DA module is specifically designed for Banana Pi. There is 8bit high resolution DAC and ADC on one chip.

I2C electric level conversion expand module：

The I2C electric level conversion module is specifically designed for Banana Pi. The module convert the 3.3V of I2C electric level to 5V level or convert 5V to 3.3V.

I2C electric level conversion expand module：

The Serial Por module is specifically designed for Banana Pi. The module use Maxim MAX232 chip and DB9 port. So the user don't need to connect Dupont Line and that avoid wrong wiring. User can use this module to debug Banana Pi easily.

1. Product Specification：
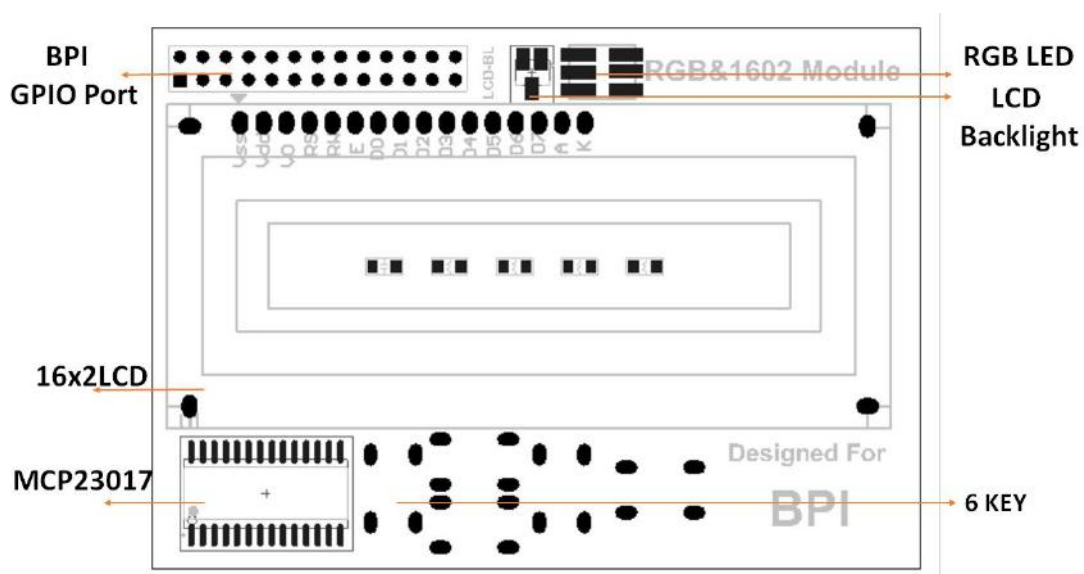
2. Produce Overview：

The RGB1602 Display module is specifically designed for Banana Pi. The module with 1602 LCD screen and it communicated with Banana Pi with I2C. In addition there are six programmable key and RGB LED on the module. User can use Python or C(wiringPi) to drive the module with simple and less code.

3. Produce Features：

- 1602 LCD screen
- RGB LED on board
- 6 programmable single key
- Communicate with I2C
- Can be controlled by the program backlit lights out

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4. Port：

- Banana Pi connection port

5. Product Parameters：

- Working voltage: 5.0V
- ASC II string can be sidplay
- 4 wire to drive the 1602 LCD screen
- Use MCP23017 to expand IO

6. Typical Application：

- Information monitoring
- School educational
- Human-computer interaction

7. How to use：

Just insert the module to Banana Pi, like the below picture:

8. More information：

The MCP23017/MCP23S17 (MCP23X17) device family provides 16-bit, general purpose parallel I/O expansion for I2C bus or SPI applications. The two devices differ only in the serial interface.

• MCP23017 – I2C interface

• MCP23S17 – SPI interface

The MCP23X17 consists of multiple 8-bit configuration registers for input, output and polarity selection. The system master can enable the I/Os as either inputs or outputs by writing the I/O configuration bits (IODIRA/B). The data for each input or output is kept in the corresponding input or output register. The polarity of the Input Port register can be inverted with the Polarity Inversion register. All registers can be read by the system master. The 16-bit I/O port functionally consists of two 8-bit ports (PORTA and PORTB). The MCP23X17 can be configured to operate in the 8-bit or 16-bit modes via IOCON.BANK.

There are two interrupt pins, INTA and INTB, that can be associated with their respective ports, or can be logically OR'ed together so that both pins will activate if either port causes an interrupt. The interrupt output can be configured to activate under two conditions (mutually exclusive):

1. When any input state differs from its corresponding Input Port register state. This is used to indicate to the system master that an input state has changed.
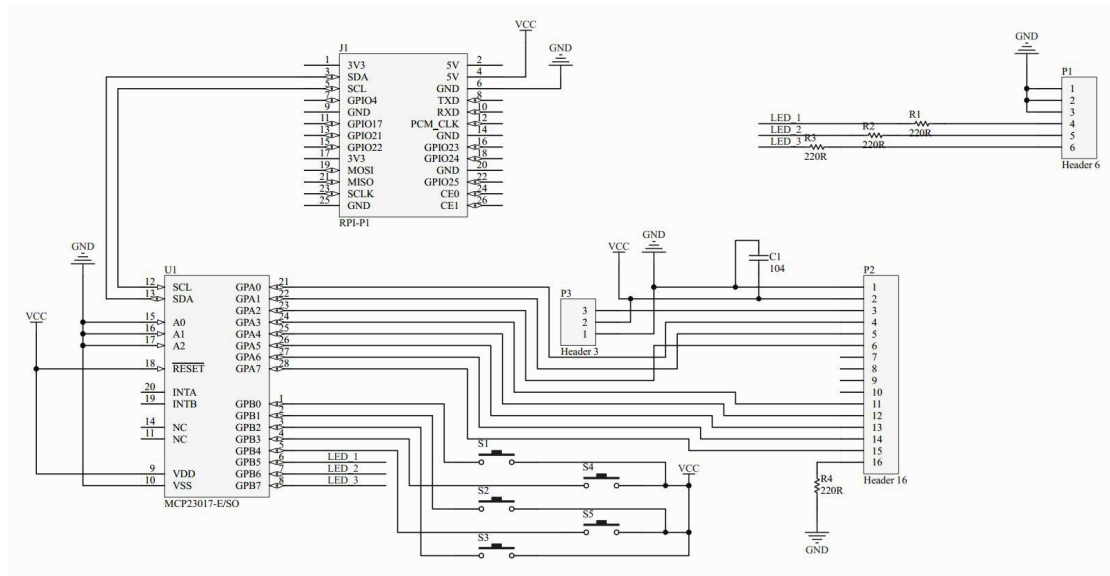
2. When an input state differs from a preconfigured register value (DEFVAL register).

The Interrupt Capture register captures port values at the time of the interrupt, thereby saving the condition that caused the interrupt. The Power-on Reset (POR) sets the registers to their default values and initializes the device state machine.
The hardware address pins are used to determine the device address.

8.1   Schematic diagram：

More information please check：

http://www.microchip.com/wwwproducts/Devices.aspx?product=MCP23017

8.2   Testbench：

```c
#include <stdio.h>
#include <wiringPi.h>
#include <mcp23017.h>
#include <lcd.h>

int main()
{
        int display,i,count;
        wiringPiSetup();
        mcp23017Setup (100, 0x20);
        printf ("Raspberry Pi - MCP23017 Test\n");
        for(i=0;i<16;i++)
          pinMode(100+i,OUTPUT);
        digitalWrite(107,1);
        digitalWrite(101,0);
```

```
display=lcdInit(2,16,4,100,102,103,104,105,106,0,0,0,0);
lcdHome(display);
lcdClear(display);
lcdPosition(display,0,0);
lcdPuts(display,"Hello World");
while(1)
{
        lcdPosition(display,0,1);
        lcdPrintf(display,"%d",count++);
        delay(300);
        printf("lcd1602\n");
}
}
```