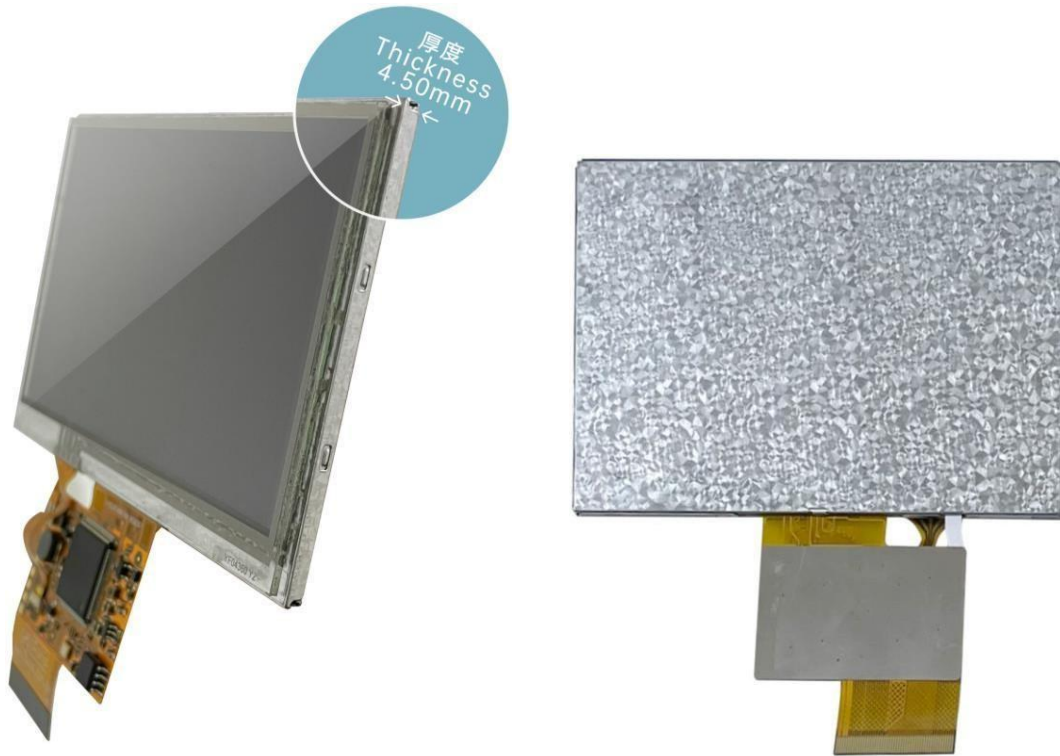


AGM-043A0-I3-R

Features:

- Based on T5L0, running DGUS II system.
- 4.3 inch, 480*272 pixels resolution, 262K colors, TN TFT display.
- LCD and TP frame lamination process, only 4.5mm thickness.
- COF structure. The entire core circuit of the smart screen is fixed on the FPC of LCM, featured by light and thin structure, low cost and easy production.
- 50 pins, including IO, UART, CAN, AD and PWM from user CPU core for easy secondary development.



1 External Interface



PIN	Definition	I/O	Functional Description
1	+5V	I	, DC3.6-5.5V Power supply, DC3.6-5.5V.
2	+5V	I	
3	GND	GND	GND
4	GND	GND	
5	GND	GND	
6	AD7	I	5 ADC , 3.3V , 12bit , 0-3.3VAD6 , UART3 OS , 16KHzAD1 AD5 , AD3 AD7 , 32KHz ADAD1AD3AD5AD7 , 64KHzAD; 1024 64, 1 64Hz 16bitAD 5 input ADCs. 12-bit resolution in case of 3.3V power supply. 0-3.3V input voltage. Except for AD6, the rest data is sent to OS core via UART3 in real time with 16KHz sampling rate. AD1 and AD5 can be used in parallel, and AD3 and AD7 can be used in parallel, which equals to two 32KHz sampling AD. AD1, AD3, AD5, AD7 can be used in parallel, which equals to a 64KHz sampling AD; the data is summed 1024 times and then divided by 64 to obtain a 64Hz 16bit AD value by oversampling.
7	AD6	I	
8	AD5	I	
9	AD3	I	
10	AD1	I	
11	+3.3	O	3.3V , 150mA 3.3V output, maximum load of 150mA.
12	SPK	O	MOSFET , 10K GND External MOSFET to drive buzzer or speaker. The external 10K resistor should be pulled down to the ground to ensure that power-on is low level.
13	SD_CD	IO	SD/SDHC , SD_CD SD GND 22pF SD/SDHC interface,The SD_CD connects a 22pF capacitor to GND near the SD card interface.
14	SD_CK	O	
15	SD_D3	IO	
16	SD_D2	IO	
17	SD_D1	IO	
18	SD_D0	IO	
19	PWM0	O	2 16bit PWM , 10K GND OS UART3 2 16-bit PWM output. The external 10K resistor should be pulled down to the ground to ensure that power-on is low level. The OS core can be controlled in real time via UART3.
20	PWM1	O	
21	P3.3	IO	RX8130 SD2058 I2C RTC, IO

22	P3.2	IO	SCL P3.2, SDA P3.3 10K 3.3V If using RX8130 or SD2058 I2C RTC to connect to both IOs, SCL should be connected to P3.2, and SDA connected to P3.3 in parallel with 10K resistor pull-up to 3.3V.
23	P3.1/EX1	IO	1 , It can be used as an external interrupt 1 input at the same time, and supports both low voltage level or trailing edge interrupt modes.
24	P3.0/EX0	IO	0 , It can be used as an external interrupt 0 input at the same time, and supports both low voltage level or trailing edge interrupt modes.
25	P2.7	IO	IO IO interface
26	P2.6	IO	IO IO interface
27	P2.5	IO	IO IO interface
28	P2.4	IO	IO IO interface
29	P2.3	IO	IO IO interface
30	P2.2	IO	IO IO interface
31	P2.1	IO	IO IO interface
32	P2.0	IO	IO IO interface
33	P1.7	IO	IO IO interface
34	P1.6	IO	IO IO interface
35	P1.5	IO	IO IO interface
36	P1.4	IO	IO IO interface
37	P1.3	IO	IO IO interface
38	P1.2	IO	IO IO interface
39	P1.1	IO	IO IO interface
40	P1.0	IO	IO IO interface
41	UART4_TXD	O	4 UART4
42	UART4_RXD	I	
43	UART5_TXD	O	5 UART5
44	UART5_RXD	I	
45	P0.0	IO	IO IO interface
46	P0.1	IO	IO IO interface
47	CAN_TX	O	CAN (CAN , 6-(7)) CAN interface (External CAN chip drive is required, refer to Figure 1. See 6 - (7) for circuit reference) CAN interface
48	CAN_RX	I	
49	UART2_TXD	O	2 UART2 (OS UART0 UART0 serial port of OS core)
50	UART2_RXD	I	

2 Specification Parameters

2.1 Product Parameters

Main Chip	T5L0
User Interface	50Pin_0.5mm FPC
FLASH	8M Bytes
UI UI Version	DGUSII / TA
Power Supply	HDL662S HDL662S adapter board power supply
Display Color	262K 262K colors
Dimensions	4.3 4.3 inch
Resolution	480*272
(A.A) Active Area	94.64mm (W)×53.46mm (H)
L/R/U/D Viewing Angle	TV , 70° /70° /40° /30° (L/R/U/D) TV viewing angel, typical value of 70° /70° /40° /30° (L/R/U/D)
Backlight Service Life	>10000 (,) > 10000 hours (Time of the brightness decaying to 50% on the condition of continuous working with the maximum brightness)
Brightness	200nit
Brightness Control	100 (1%~30%, ,) 0~100 grade (When the brightness is adjusted to 1%~30% of the maximum brightness, flickering may occur and is not recommended to use in this range)
Type	Resistive Touch Panel.
Structure	ITO +ITO , 3H ITO film + ITO glass structure and hardness 3H.
Light Transmittance	78%±3%

2.2 Interface Parameters

Item	Conditions	Min	Typ	Max	Unit
Baudrate	() User Set(Configure the CFG file)	3150	115200	3225600	bps
Output Voltage(TXD)	Output 1	3.0	3.3	-	V
	Output 0	-	0	0.3	V
Input Voltage(RXD)	Input 1	-	-	3.3	V
	Input 0	0	-	0.5	V
Interface	UART2: TTL; UART4: TTL; (OS Only available after OS configuration) UART5: TTL; (OS Only available after OS configuration)				
Data Format	UART2: N81; UART4: N81/E81/O81/N82; (OS) 4 modes (OS configuration) UART5: N81/E81/O81/N82; (OS) 4 modes (OS configuration)				

2.3 Electrical specifications

Rated Power	<2W	
Operating Voltage	3.6~5.5V, 5V 3.6~5.5V, typical value of 5V	
Operating Current	190mA	VCC=5V, VCC=5V, max backlight
	80mA	VCC=5V, VCC=5V, backlight off
: 5V 0.5A Recommended power supply: 5V 0.5A DC		

2.4 Operating Environment

Operating Temperature	-10°C~60°C
Storage Temperature	-20°C~70°C
Operating Humidity	10%~90%RH, 60%RH 10%~90%RH, typical value of 60% RH

3 Reliability Test

, ESD,

The smart screen products undergo a series of procedural reliability tests, including high and low temperature, ESD, pulse and surge, and waterproof tests before mass production to ensure product quality.

3.1 ESD ESD Test

: 25°C

Test temperature: 25°C

: , , 4.1 ,

GB/T 17626.2 B

Test process: the product was placed on the test bench to perform contact and air discharge in turn of the serial screen iron frame and display area as shown in Fig.4.1 below. During the experimental process, it was observed whether the screen is dead, black, white, splash, or reboot. According to the experiment results, the performance is in line with the criteria GB/T 17626.2 B level and above.



3

4.1

Electrostatic discharge test

Discharge Type	Discharge Value	Result
Contact discharge	±4KV	Normal operation
Air discharge	±4KV	Normal operation

3.2 High and Low Temperature Test

: -20~70°C

Test temperature:-20~70°C

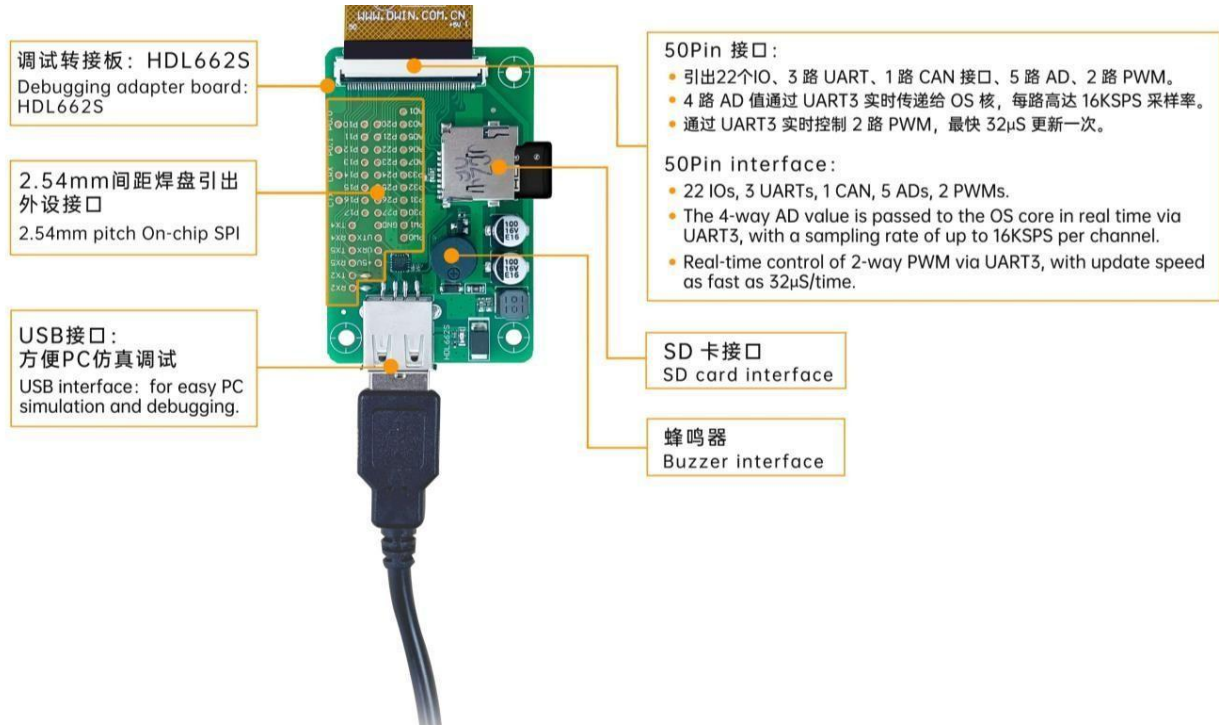
: , 12H, 20 , ,

Test process: the product will be placed obliquely in the high and low temperature test chamber for 12h for 20 on and off cycles. Then it will be check at room temperature after power on for the appearance and function, CTP offset situation, jumping point, page random switching and failure.

Temperature	Result
High temperature (70°C)	Normal operation
Low temperature (-20°C)	Normal operation

4 Debug

It is recommended for new users of smart LCMs to purchase official accessories. For more details, please refer to customer service center.

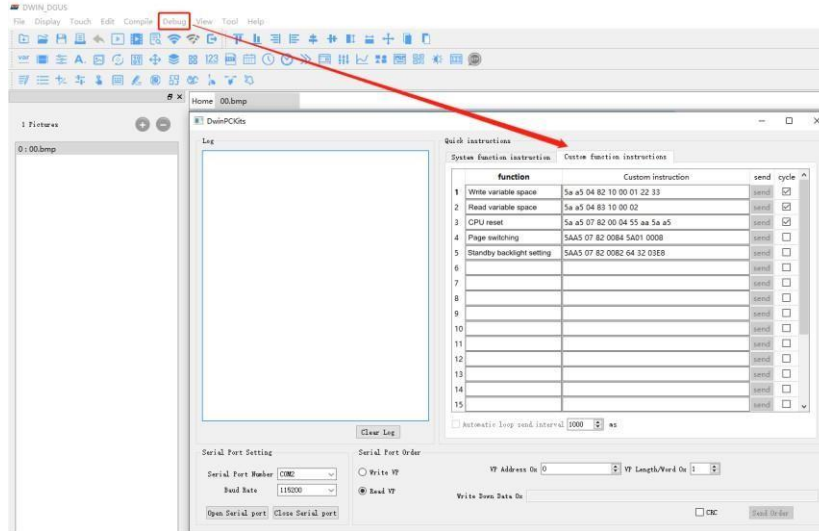


: _____

Operation steps: open serial assistant - custom function command - set command - send.

For example:

- (1) Page switching Tx: 5AA5 07 82
0084 5A01 0008
- (2) Standby backlight setting Tx:
5AA5 07 82 0082 64 32 03E8



DGUS
DGUS operation

5 T5L0 T5L0 ASIC

T5L0 ASIC GUI ASIC,

2020

T5L0 ASIC is a low-power, cost-effective, GUI and application highly integrated single-chip dual-core ASIC designed by DWIN Technology for small-size LCD and mass produced in 2020.

(1) 8051 , 1T () , 250MHz

Mature and stable 8051 core which is the most widely used with the maximum operating frequency of T5L is up to 250MHz, 1T(single instruction cycle)high speed operation.

(2) CPU (GUI CPU) DGUS II :

Separate GUI CPU core running DGUS II System:

- , 2.4GB/S , 18bit 1024*768 (TA) , 854*480 (DGUS) High-speed display memory, 2.4GB/S bandwidth. 18-bit color display resolution support up to 1024*768 (TA mode), 854*480 (DGUS mode).
- 2D , UI
2D hardware acceleration and the UI with animation and icons as its main feature is extremely cool and smooth.
- JPEG , 16Mbytes SPI Flash Images and icons stored in JPEG format. Adopt Low-cost 16Mbytes SPI Flash.
- High quality ratio and sound restoration and playback.
- 128Kbytes , OS CPU ,
128Kbytes variable storage space for exchanging data with OS CPU Core and memory.
- 2 10bit 800KHz DC/DC , LED
2 10-bit 800KHz DC/DC controllers simplify LED backlight, analog power design and save cost and space.
- PC ,
Support DGUS development and simulation on PC. Support backend remote upgrade.

(3) CPU (OS CPU) 8051 DWIN OS , CPU:

Separate CPU (OS CPU) core runs user 8051 code or DWIN OS system and user CPU is omitted in practical application:

- 8051 , 64Kbytes , 32Kbytes RAM
Standard 8051 core and instruction set, 64Kbytes code space, 32Kbytes on-chip RAM.
- 64bit (MDU) , 64bit MAC 64bit
64-bit integer mathematical operation unit (MDU), including 64-bit MAC and 64-bit divider.

- WDT, 3 16bit Timers, 12

Built-in software WDT, 3 16-bit Timers, 12 interrupt signals support up to four levels of interrupt nesting.

- IAP ,

Support IAP online simulation and debugging with unlimited breakpoints.

- DGUS

Upgrade code online through DGUS system.

- (4) 1Mbytes Flash, , ,

1Mbytes on-chip Flash with DWIN patent encryption technology ensure code and data security.

- (5) -40°C~+85°C (-55°C~105°CIC)

Operating temperature ranges from -40°C to +85°C (IC operating temperature customizable from -55°C to 105°C).

- (6) , , PCB , EMC/EMI

Low power consumption and strong anti-interference ability. It can work stably on double-sided PCB and passes EMC/EMI test easily.

6 COF Screen Secondary Development

8051 , C

Standard 8051 core, easy to develop in C language and assembly language.

(1) 22 IO 22 IOs:

IO , , , IO 8051 C :

To use output function of IO, you need to open the output control, output strength and peripheral multiplexing power-on initialization configuration. Subsequent use of IO is consistent with the standard 8051 as follows.

```
#include "sys.h"
sbit LED1 = P1^0;
sbit KEY1 = P1^1;
//IO Pin initialization
void io_init()
{
    PORTDRV = 0x01;//8mA Driving current is 8mA
    P1MDOUT |= 0x01;//P1.0 ,LED1 Set P1.0 as output to drive LED1 light
    P1MDOUT &= 0xFD;//P1.1 ,Set P1.1 as input to read the voltage level change of the pin
}
void main(void)
{
    u16 cnt_1ms;
    u16 key1_sta;//KEY1 Store the voltage level state of the KEY1 pin sys_init();//System initialization
    io_init();//IO Pin initialization cnt_1ms = 0;
    key1_sta = KEY1;
    while(1)
    {
        cnt_1ms++;
        sys_delay_ms(1);//, LED1 500ms Delay sub-function, LED1 blinks every 500ms. if(cnt_1ms==500)
        {
            LED1 = !LED1;
            cnt_1ms = 0;
        }
        //KEY1 ,If the voltage level of the pin has changed, it will be updated in the interface if(key1_sta!=KEY1)
        {
            key1_sta = KEY1;
            sys_write_vp(0x1000,(u8*)&key1_sta,1);
        }
    }
}
```

```

    }
}
}

```

(2) 3 UARTS 3 UARTs:

, 3225600bps, :

High-speed serial port, supporting up to 3225600bps, as follows.

```

#include "sys.h"
#include "uart2.h"
void main(void)
{
    u16 len;
    sys_init();//System initialization uart2_init(115200);//2
    Initialize serial port 2 while(1)
    {
        if(uart2_rx_sta&UART2_PACKET_OK)//Received serial packet
        {
            len = uart2_rx_sta&UART2_PACKET_LEN;//,"\r\n""\n'Get the length of the serial packet without "\r\n" or '\n' terminator
            uart2_buf[len++] = 0;//2 Add 2 empty strings at the end uart2_buf[len++] = 0;
            printf("T5L_C51:%s\r\n",uart2_buf);//"T5L_C51:"Return the received packet to the sender with the prefix "T5L_C51:"
            sys_write_vp(0x2000,uart2_buf,len/2+1);// At the same time display the packet to the
interface
            uart2_rx_sta = 0;//0 Reset means that this serial packet is disposed of
        }
    }
}

```

(3) 1 CAN 1 CAN:

CAN :

Only the special function registers of the CAN need to be configured as follows.

```

void CanInit()
{
    P0MDOUT = 0x04;    //P0.2(CAN_TX)P0.2(CAN_TX) is configured as output
    P0 = 0xFF;        //Output high voltage level
    ADR_H = 0xFF;     //DGUS Configuring DGUS variable memory addresses
    ADR_M = 0x00;
    ADR_L = 0x60;
    ADR_INC = 1;     //Configure address increments
    RAMMODE = 0x8F;  //Write mode
}

```

```

while(!APP_ACK);          //, Waiting for confirmation,
APP_ACK 8051 , 1=OK, 0=BUSY, Among answers of Hardware to 8051
occupied variable memory request, 1=OK and 0=BUSY, which need to continue to wait.
DATA3 = 0x1A;            //DGUS 0xFF:0060 Variable memory address 0xFF:0060 assignment
DATA2 = 0x17;
DATA1 = 0x0F;
DATA0 = 0;
APP_EN = 1;
while(APP_EN);          //, Wait for the data operation to be completed, and reset after the
operation is completed
DATA3 = 0;              //0xFF:0061 Acceptance register 0xFF:0061 assignment reset
DATA2 = 0;
DATA1 = 0;
DATA0 = 0;
APP_EN = 1;
while(APP_EN);          //, Wait for the data operation to be completed, and reset after the
operation is completed
DATA3 = 0xFF;           //0xFF:0062 1, Acceptance Mask Register 0xFF:0062 all
set to 1, and no acceptance of reception
DATA2 = 0xFF;
DATA1 = 0xFF;
DATA0 = 0xFF;
APP_EN = 1;
while(APP_EN);          //, Wait for the data operation to be completed, and reset after the
operation is completed
RAMMODE = 0;           //DGUS Terminate access to DGUS variable memory
CAN_CR = 0xA0;         //CAN , FF0060-FF0062 Open CAN and configure FF0060-FF0062
while(CAN_CR&0x20);    //FF0060-FF0062 Execute the configuration of FF0060-FF0062
ECAN = 1;              //CAN Open the CAN interrupt
EA = 1;                //Open the total interrupt
}

```

(4) 5 A/D: 12bit, 16bit

5 A/Ds: 12-bit, supports sampling to 16-bit

A/D :

Only the special function registers of the A/Ds need to be configured as follows.

```

#include "sys.h"
#include "adc.h"
void main(void)
{
    u16 ad;
    float vol;
    sys_init();//System initialization
    while(1)

```

```

{
    ad = adc_read_avg(ADC_CHANNEL0,10);//1.0 ad Read the ad value of channel 0 vol =
    ad*(3300.0f/4095);//2.,mV Calculate the voltage in mV sys_write_vp(0x2000,(u8*)&ad,1);//ad
    Update the ad value sys_write_vp(0x2001,(u8*)&vol,2);//Update the voltage value
}
}

```

(5) 2 PWM: 16bit

2 PWMs: 16-bit high accuracy, adjustable resolution.

PWM :

Only need to configure the frequency and duty cycle of PWM as follows.

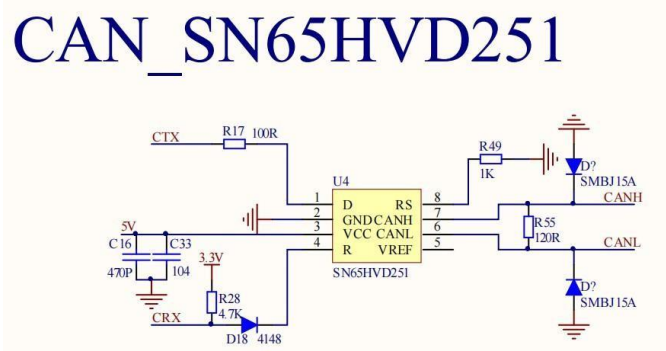
```

void Pwm_0()
{
    u8 i=0;
    u8 temp[6]={0xAA,0x20,0x42,0x56,0x78,0};//pwm_0 100%
    Write_Dgus(0x87,0x2042);//100khz Write_Dgus(0x86,0x5A01);//
    for(i=0;i<5;i++)
        //temp[5]+=temp[i];
    for(i=0;i<6;i++)//OneSendDa
        ta3(temp[i]);
}

```

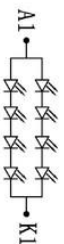
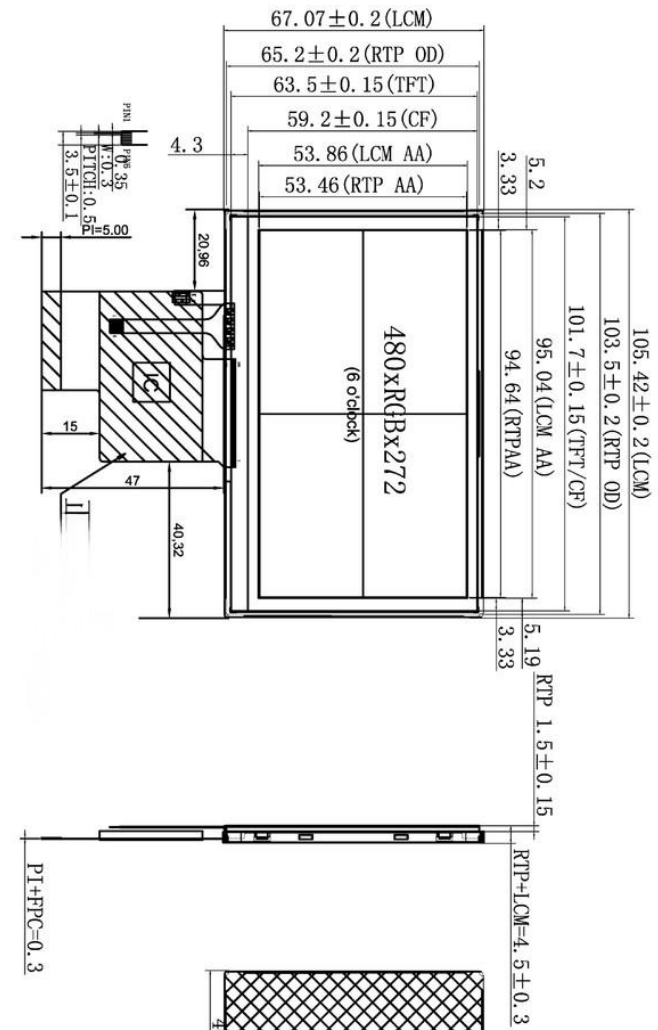
(6) CAN

CAN circuit design parameters

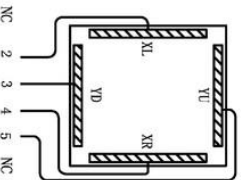


液晶屏PIN 定义

Pin#	Name	26	P26
1	+5V	27	P27
2	+5V	28	P28
3	GND	29	P29
4	GND	30	P30
5	GND	31	P31
6	AD07	32	P32
7	AD06	33	P33
8	AD05	34	P34
9	AD03	35	P35
10	AD01	36	P36
11	+3.3V	37	P37
12	SRK	38	P38
13	SD_CD	39	P39
14	SD_CK	40	P40
15	SDD3	41	P41
16	SDD2	42	P42
17	SDD1	43	P43
18	SDD0	44	P44
19	PWM0	45	P45
20	PWM1	46	P46
21	P33	47	P47
22	P32	48	P48
23	P31	49	P49
24	P30	50	P50
25	P27		



* Circuit Diagram 电路图
(LED series) Color: 颜色
VF=12V IF=10mA
标注亮度: 为盖工玻璃后亮度



Pin#	Name
1	XL
2	YL
3	XR
4	YR
5	YD
6	YU

逻辑图

Pin#	Name
1	NC
2	TPXL
3	TPYL
4	TPXR
5	TPYU
6	NC

REVISION RECORD		VER	DATE	FILE NAME :	SIGNATURE :	TOLERANCES : ±0.2
1	VI-1					ANGLES : ±0.1°
2	VI-1					
3	VI-1					
4	VI-1					
5	VI-1					
6	VI-1					