User Manual for P Series (SPI Interface)

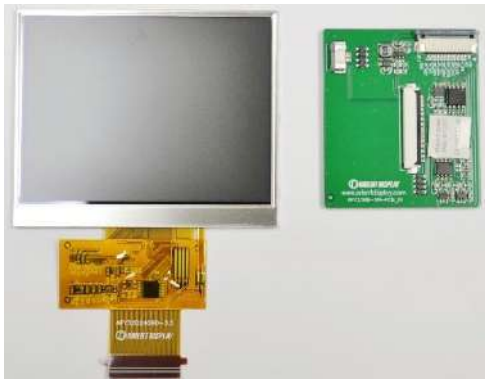
3.5”, 4.3”, 5.0”, 7.0”

Revision 0

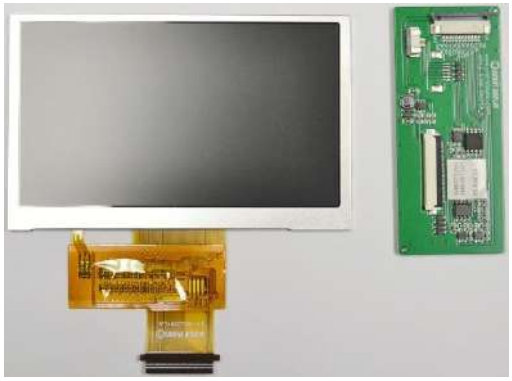
Orient Display
TFT with SPI Interface
TN Display, 12 o’ clock Viewing Direction
Medium Brightness
Top: -20~+70°C; Tstr: -30~+80°C
RoHS compliant
Controller NP4185

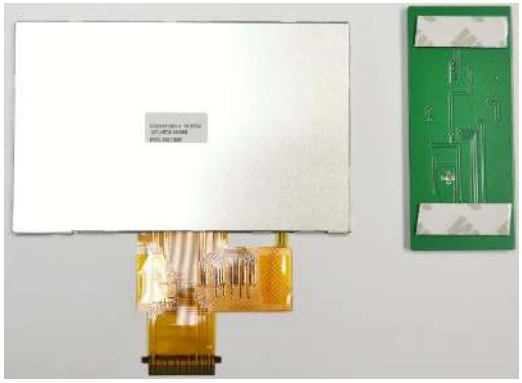
P SERIES (SPI INTERFACE) USER MANUAL

AFY320240B0-3.5N12NTM-SPI:

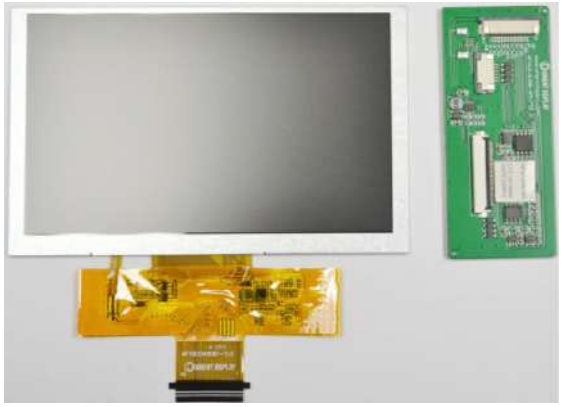


AFY480272B0-4.3N12NTM-SPI:





AFY800480B1-5.0N12NTM-SPI:



AFY800480B1-7.0N12NTM-SPI:

Product Feature

1. Interface: 4-line SPI, an additional line for logic control, total 5 GPIO.
2. Touch panel: RTP and CTP
3. The flash on board for storing UI pictures can be mapped to the flash on master board, user can directly use the flash on master board through the SPI interface, in this way the content in board can be updated remotely.
   And PCBA also is also including FLASH memory, drive circuit for programmable adjustment of backlight brightness, and power management circuit; RTP/CTP control circuit.
4. Support up to 800*480 resolution.
5. The way to use is similar with the serial port screen with the instruction, and the UI development can be completed by sending relevant instructions and control information through the SPI interface.
6. Operation voltage: 5.0V
   Logic voltage is 3.3V (TTL)

Product Feature

Compared with the traditional serial screen, there are below major differences

1. There are only two instructions, an ordinary packet instruction, and a dedicated instruction for quick point tracing. The instruction is very simple and accurate.
2. The onboard FLASH for storing UI pictures can support up to 128Mbit.
3. The onboard FLASH can be configured as an external FLASH of the user MCU through software, and the user MCU can directly operate the FLASH through the SPI interface, so that the content in the UI FLASH can be updated in the background.

The area of applications

Mainly for small appliances, smart home, control industry, etc.

Instructions description

//***//

// SPI timing request 1: when FLASH_SW=1, it is equivalent that the flash is the user's MCU interface. The SPI timing is the standard 4-wire timing. At this time, the SPI FLASH is directly operated, and the SPI flash is readable and writable.

// SPI timing request 2: When FLASH_SW=0, the SPI timing is also a standard 4-wire timing but has no readback function, and the busy flag must be judged after the command/data is sent (output by the SPI_MISO pin), and the send command is as follows:

// 1. First set FLASH CS to be 0 (First, FLASH_CS is pulled low)

// 2. Send commands (ie 12 configuration parameters), if you need to follow the display data, continue to send the display data

// 3. After send commands are all finished, the display controller inside needs to be processed. For this purpose, the busy flag status must be judged (FLASH_MISO=1 is busy)

// When judging the busy flag, an exit mechanism is required to prevent the controller from waiting when the set parameters do not correspond to the written parameters.

// The exit mechanism is an appropriate delay. It is recommended that the delay reaches 120ms and is still busy, then it is forced to exit. Please refer to SPI_Check_Busy()

// 4. at last, set FLASH_CS to be 1 (Final FLASH_CS is pulled high)

// PS 1: The FLASH_SW pin of the display controller is pull-down by default. If you do not need to operate the SPI FLASH, you can not process this

pin

// PS 2: For the user board, configure FLASH_MISO as the busy flag input detection pin

// PS 3: The maximum input buffer of the display controller is 4096 bytes. If the one-time input is larger than 4096 bytes, it needs to be split and transferred.

//********** The following are several basic application functions **********//

// Calculate the cache address according to the coordinate point

//uint32_t Get_XY2DramAddr(uint16_t X,uint16_t Y)
//{
// uint32_t Dram_addr;
// Dram_addr = (X+Y*1536)*2; // Each line of bytes is fixed to 1536*2 bytes

// return(Dram_addr);
//}
//---
// The description of common command parameters is as follows (12 parameters need to be sent at one time for each command, that is, sent in a function package): If you need to modify the screen brightness, you can modify it at the same time as you are refreshing the screen

//void Set_NP4185_Comd(uint8_t COMD,uint16_t Dram_addr,uint16_t Flash_addr,uint16_t H_size,uint16_t V_size,uint8_t BL_PWM)
//{
// FLASH_ReadWriteByte(COMD); // Command[0x01:User SPI data to Dram to display = The user SPI directly writes the display data to the display cache and refreshes the screen]
// // [0x04:Flash data to Dram to display = Read data from flash and write to display cache refresh]

// FLASH_ReadWriteByte((uint8_t)(Dram_addr>>16)); // Dram_address[19:16] Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen

// FLASH_ReadWriteByte((uint8_t)(Dram_addr>>8)); // Dram_address[15:8] Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen

// FLASH_ReadWriteByte((uint8_t)(Dram_addr)); // Dram_address[7:0] Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen
// FLASH_ReadWriteByte((uint8_t)(Flash_addr>>16)); // flash_address[19:16] Specify the controller to read display data from a certain address of SPI FLASH for display. When the user SPI interface operates the display buffer, this address is invalid (can be any value)
// FLASH_ReadWriteByte((uint8_t)(Flash_addr>>8)); // flash_address[15:8] Specify the controller to read display data from a certain address of SPI FLASH for display. When the user SPI interface operates the display buffer, this address is invalid (can be any value)

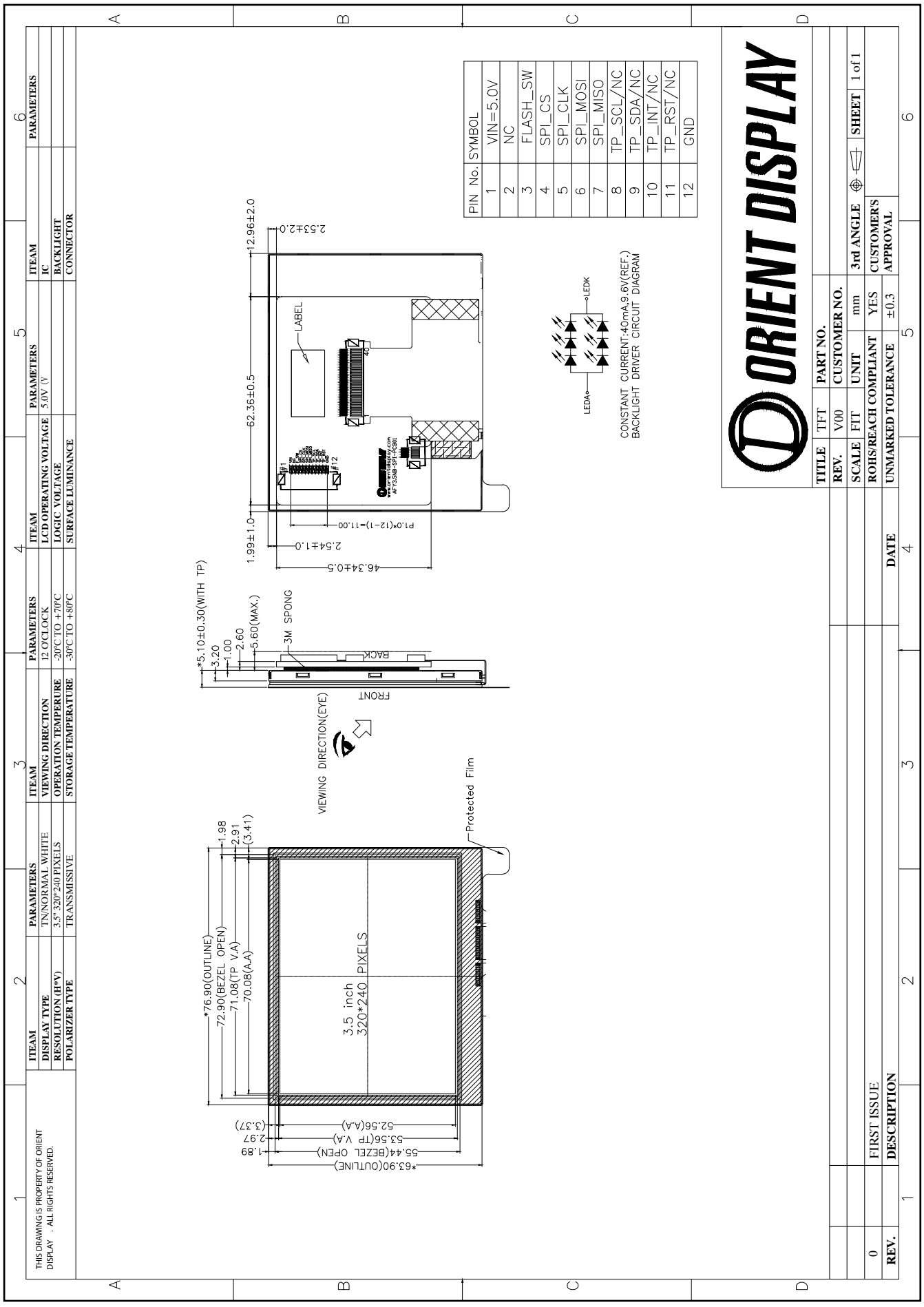
// FLASH_ReadWriteByte((uint8_t)(Flash_addr)); // flash_address[7:0] Specify the controller to read display data from a certain address of SPI FLASH for display. When the user SPI interface operates the display buffer, this address is invalid (can be any value)

// FLASH_ReadWriteByte((uint8_t)((V_size-1)>>8)); // V_size-1[15:8] set the quantity of pixel in perpendicular
// FLASH_ReadWriteByte((uint8_t)(V_size-1)); // V_size-1[7:0]
// FLASH_ReadWriteByte((uint8_t)((H_size-1)>>8)); // H_size-1[15:8] set the quantity of pixel in horizontal
// FLASH_ReadWriteByte((uint8_t)(H_size-1)); // H_size-1[7:0]
// FLASH_ReadWriteByte(BL_PWM); // Backlight lightness[255~0] set the level of backlight brightness, highest 225, and 0 is closed backlight
//}
//---
// Quick point drawing command

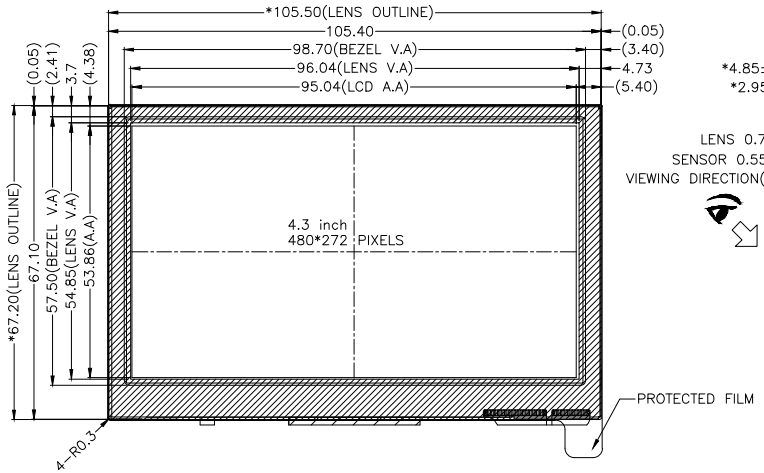
//void Set_NP4185_DotComd(uint16_t X,uint16_t Y,uint16_t color)
//{
// uint16_t Dram_addr;
// Dram_addr=Get_XY2DramAddr(X,Y);
// FLASH_CS_L();

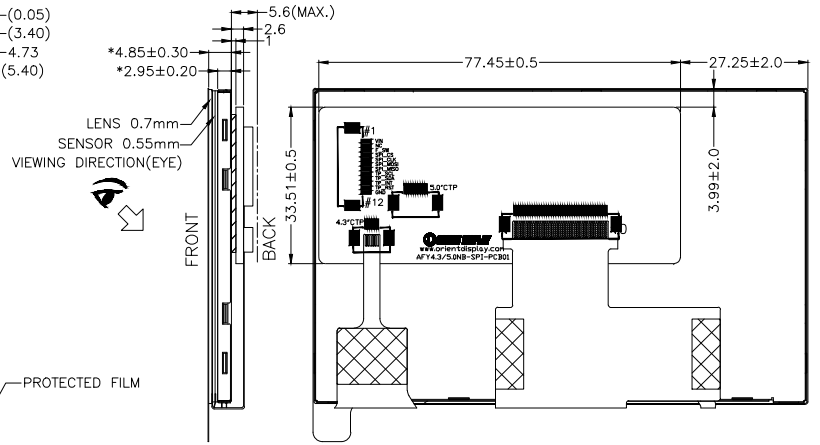
```
  //   FLASH_ReadWriteByte( 0x08 );                                  // Command[0x08:]
  //   FLASH_ReadWriteByte( (uint8_t)(Dram_addr>>16) );          // Dram_address[19:16]       Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen
  //   FLASH_ReadWriteByte( (uint8_t)(Dram_addr>>8) );           // Dram_address[15:8]       Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen

  //   FLASH_ReadWriteByte( (uint8_t)(Dram_addr) );                // Dram_address[7:0]       Specify the user's SPI interface to start writing display data to a certain address in the display cache and directly refresh the screen
  //   FLASH_ReadWriteByte(color);        // Display font color



  //   FLASH_ReadWriteByte(color>>8);
  //   SPI_Check_Busy();
  //   FLASH_CS_H();
  //}
  //------------------------------------------------------------------------------------------------------------------------
  //Busy flag judgment

  //uint8_t SPI_Check_Busy(void)
  //{
  //   uint8_t ucErrTime=0;
  //   while(FLASH_MISO_GET()==1)
  //   {
  //            LL_mDelay(10);
  //            ucErrTime++;
  //           if(ucErrTime>250)                //It is recommended to be greater than 120ms (the time to update a frame is about 100ms at 800*480 resolution)

  //                    return 1;
  //   }
  //   return 0;
  //}
  //*****************************IMPORTANT*******************************//
  // When the user's SPI interface directly flashes the screen to the display controller (0x01 or 0x08 command), the maximum buffer of the controller's receiving area is 4096 bytes and the processing speed is very fast, but still need to pay attention to the following:
  // 1. The maximum SPI clock is 8MHz, and the display data can be continuously written in bursts at or below 8MHz
  // 2. Use the function of drawing points as little as possible. After all, it is slow to send data one point at a time with coordinate parameters, but there is a trick: if it is a continuous area, the displayed data can be pre-made into a Display area blocks, send in bursts at once, very fast
```

Drawings

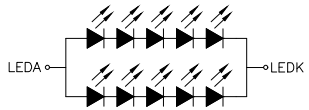

ITEAM PARAMETERS
DISPLAY TYPE TN/NORMAL WHITE
RESOLUTION (H*V) 3.5" 320*240 PIXELS
POLARIZER TYPE TRANSMISSIVE
ITEAM PARAMETERS
VIEWING DIRECTION 12 OCLOCK
OPERATION TEMPERURE -20°C TO +70°C
STORAGE TEMPERATURE -30°C TO +80°C
ITEAM PARAMETERS
LCD OPERATING VOLTAGE 5.0V (V
LOGIC YOLTAGE
SURFACE LUMINANCE
ITEAM PARAMETERS
IC
BACKLIGHT
CONNECTOR
PIN No. SYMBOL
1 VIN=5.0V
2 NC
3 FLASH_SW
4 SPI_CS
5 SPI_CLK
6 SPI_MOSI
7 SPI_MISO
8 TP_SCL/NC
9 TP_SDA/NC
10 TP_INT/NC
11 TP_RST/NC
12 GND
CONSTANT CURRENT:40mA,9.6V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM
LEDK
LEDA
ORIENT DISPLAY
TITLE TFT
REV. V00
SCALE FIT
PART NO.
CUSTOMER NO.
UNIT mm
ROHS/REACH COMPLIANT YES
UNMARKED TOLERANCE ±0.3
3rd ANGLE
CUSTOMER'S APPROVAL
SHEET 1 of 1
REV. DESCRIPTION DATE
0 FIRST ISSUE
THIS DRAWING IS PROPERTY OF ORIENT DISPLAY . ALL RIGHTS RESERVED.
*76.90(OUTLINE)
72.90(BEZEL OPEN)
71.08(TP V.A)
70.08(A.A)
1.98
2.91
(3.41)
3.5 inch
320*240 PIXELS
Protected Film
VIEWING DIRECTION(EYE)
FRONT
BACK
3M SPONG
*5.10±0.30(WITH TP)
3.20
1.00
2.60
5.60(MAX.)
*63.90(OUTLINE)
55.44(BEZEL OPEN)
53.56(TP V.A)
52.56(A.A)
(3.37)
1.89
2.97
LABEL
62.36±0.5
12.96±2.0
2.53±2.0
46.34±0.5
2.54±1.0
1.99±1.0
P1.0*(12-1)=11.00

ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS
DISPLAY	TN/NORMAL WHITE	VIEWING DIRECTION	12 O'CLOCK	LCD OPERATING VOLTAGE	/	IC	NP4185+64Mbit Flash
RESOLUTION	4.3" 480*272 PIXELS	OPERATION TEMPERURE	-20°C TO +70°C	LOGIC VOLTAGE(VDD)	3.3V	BACKLIGHT	EDGE,WHITE
POLARIZER TYPE	TRANSMISSIVE	STORAGE TEMPERATURE	-30°C TO +80°C	SURFACE LUMINANCE	472 Nits	CONNECTOR	ZIF





PIN No.	SYMBOL
1	VIN=5.0V
2	NC
3	FLASH_SW
4	SPI_CS
5	SPI_CLK
6	SPI_MOSI
7	SPI_MISO
8	TP_SCL/NC
9	TP_SDA/NC
10	TP_INT/NC
11	TP_RST/NC
12	GND



CONSTANT CURRENT:40mA,15.0V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM

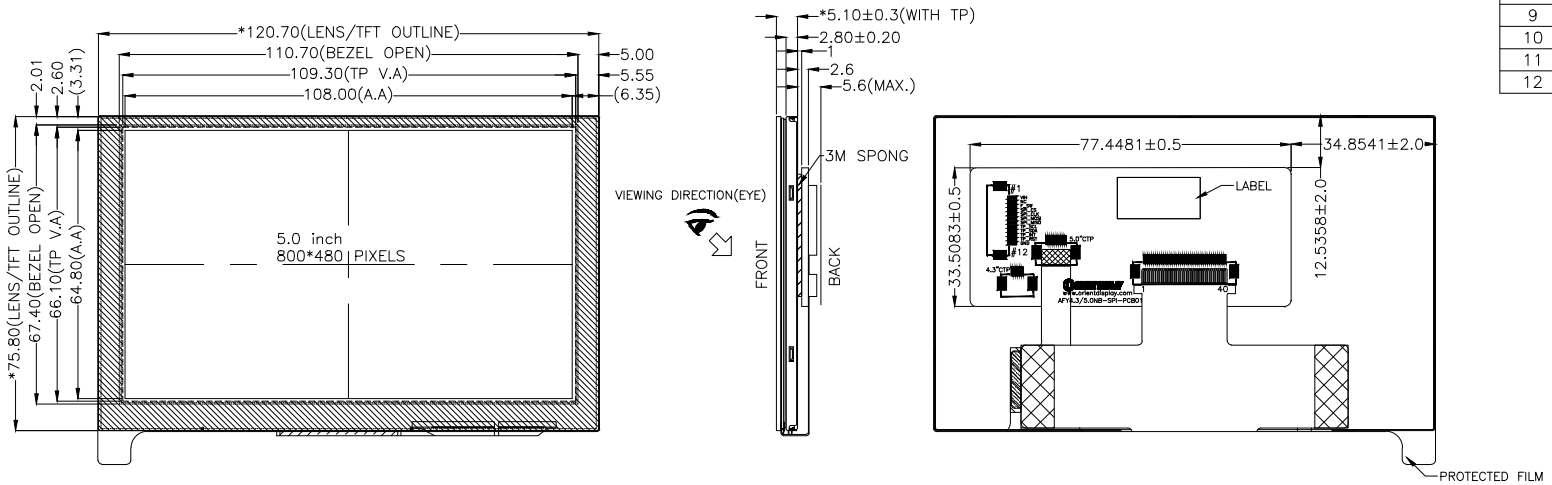
ORIENT DISPLAY

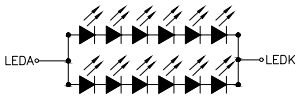
TITLE	TFT	PART NO.		AFY4.3NB-SPI-PCB01			
REV.	V00	CUSTOMER NO.		AFY4.3NB-SPI-PCB01			
SCALE	FIT	UNIT	mm	3rd ANGLE		SHEET	1 of 1
ROHS/REACH COMPLIANT			YES	CUSTOMER'S APPROVAL			
UNMARKED TOLERANCE			±0.3				

REV.	SYMBOL	DESCRIPTION	DATE
0	-	FIRST ISSUE	2021-11-24

ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS
DISPLAY	TN/NORMAL WHITE	VIEWING DIRECTION	12 O'CLOCK	LCD OPERATING VOLTAGE	/	IC	NP4185+128Mbit Flash
RESOLUTION	5.0" 800*480 PIXELS	OPERATION TEMPERURE	-20°C TO +70°C	LOGIC VOLTAGE(VDD)	3.3V	BACKLIGHT	EDGE,WHITE
POLARIZER TYPE	TRANSMISSIVE	STORAGE TEMPERATURE	-30°C TO +80°C	SURFACE LUMINANCE	427Nits	CONNECTOR	ZIF

PIN No.	SYMBOL
1	VIN=5.0V
2	NC
3	FLASH_SW
4	SPI_CS
5	SPI_CLK
6	SPI_MOSI
7	SPI_MISO
8	TP_SCL/NC
9	TP_SDA/NC
10	TP_INT/NC
11	TP_RST/NC
12	GND





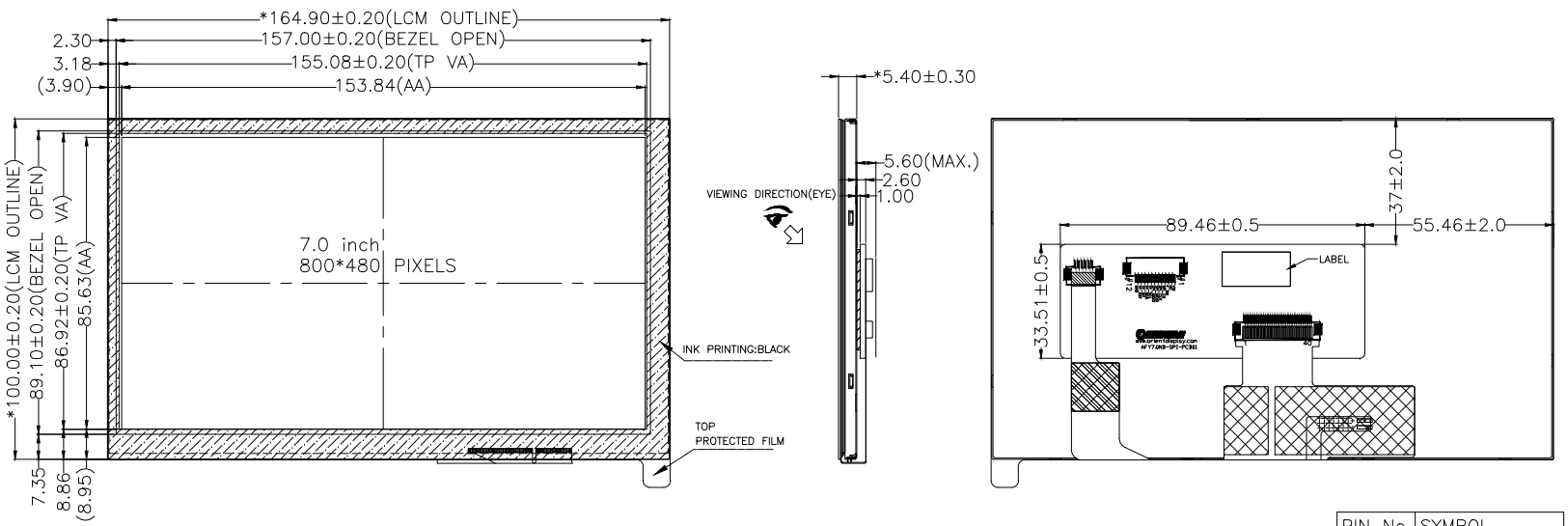
CONSTANT CURRENT:40mA,18.6V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM

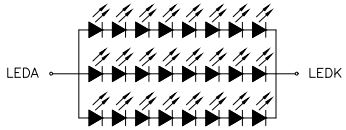
ORIENT DISPLAY

TITLE	TFT	PART NO.		AFY5.0NB-SPI-PCB01			
REV.	V00	CUSTOMER NO.		AFY5.0NB-SPI-PCB01			
SCALE	FIT	UNIT	mm	3rd ANGLE		SHEET	1 of 1
ROHS/REACH COMPLIANT			YES	CUSTOMER'S APPROVAL			
UNMARKED TOLERANCE			±0.3				

REV.	SYMBOL	DESCRIPTION	DATE
0	-	FIRST ISSUE	2021-11-24

ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS	ITEAM	PARAMETERS
DISPLAY	TN/NORMAL WHITE	VIEWING DIRECTION	12 O'CLOCK	LCD OPERATING VOLTAGE	5.0V (VIN)	IC	NP4185+128Mbit Flash
RESOLUTION	7.0" 800*480 PIXELS	OPERATION TEMPERURE	-20°C TO +70°C	LOGIC VOLTAGE(VDD)	3.3V	BACKLIGHT	EDGE,WHITE
POLARIZER TYPE	TRANSMISSIVE	STORAGE TEMPERATURE	-30°C TO +80°C	SURFACE LUMINANCE	472 Nits	CONNECTOR	ZIF





CONSTANT CURRENT:60mA,25.6V(REF.)
BACKLIGHT DRIVER CIRCUIT DIAGRAM

PIN No.	SYMBOL
1	VIN
2	NC
3	FLASH_SW
4	SPI_CS
5	SPI_CLK
6	SPI_MOSI
7	SPI_MISO
8	TP_SCL/NC
9	TP_SDA/NC
10	TP_INT/NC
11	TP_RST/NC
12	GND

ORIENT DISPLAY

TITLE	TFT	PART NO.	AFY5.0NB-SPI-PCB01
REV.	V00	CUSTOMER NO.	AFY5.0NB-SPI-PCB01
SCALE	FIT	UNIT	mm
3rd ANGLE		SHEET	1 of 1
ROHS/REACH COMPLIANT		YES	CUSTOMER'S APPROVAL
UNMARKED TOLERANCE		±0.3	

REV.	SYMBOL	DESCRIPTION	DATE
0	-	FIRST ISSUE	2021-11-24