Zeppelinstrasse 19 D-82205 Gilching Fon +49-8105-778090 *info@lcd-module.de* http://www.lcd-module.com

SPECIFICATION

CUSTOMER : _____

MODULE NO.: EA TFT070-84BTS

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION:** **DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
ISSUED DATE: 2023/05/30			

Content

1.Summary

This technical specification applies to 7.0’ color TFT-LCD panel. The 7.0’ color TFT-LCD panel is designed for industrial applications which require high quality flat panel displays. This module follows RoHS.

1.1. Accessories

ZIF connector for display, bottom contact	**EA WF050-40S**
ZIF connector for display, top contact	**EA WF050-40ST**
ZIF connector for touch panel, top contact	**EA WF050-10T**

2.General Specifications

Item	Dimension	Unit
Size	7.0	inch
Dot Matrix	800 x RGB x 480 (TFT)	dots
Module dimension	165.0 x 100.0 x 7.4	mm
Active area	154.08 x 85.92	mm
Pixel Pitch	0.1926 x 0.179	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	16:9	
Backlight Type	LED white	
Brightness	350 cd/m²	
TFT Interface	24 bit RGB	
Color arrangement	RGB-STRIPE	
TFT Driver IC	HX8264-E&HX8664-B or Equivalent	
CTP IC	ILI2130 or Equivalent	
CTP Interface	I²C	
CTP FW Version	0x07.0x00.0x00.0x00.0x65.0x90.0x00.0x01	
CTP Resolution	16384*16384	
With /Without TP	With CTP	
Surface	Glare	

*Color tone slight changed by temperature and driving voltage.

3.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	℃
Storage Temperature	TST	-30	—	+80	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

4.Electrical Characteristics

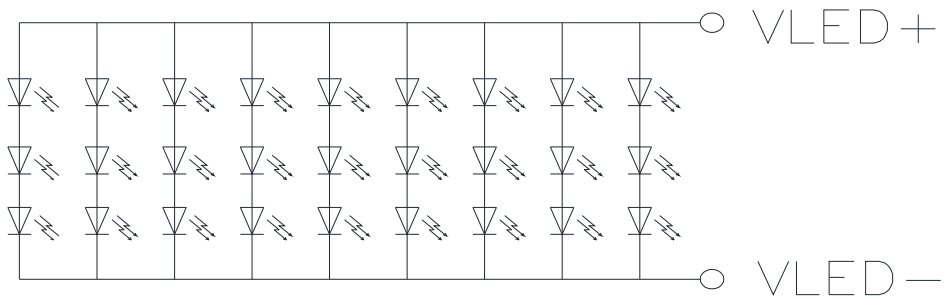
4.1. Operating conditions:

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage for Logic	VCC	3.0	3.3	3.6	V	
Power Supply for Current	VCC =3.3V		76	114	mA	
Supply Voltage for Touch Logic	VDDT	3.0	3.3	3.6	V	
Supply Current for Touch Logic	ICTP		65	98	mA	

4.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	-	180	-	mA	-
Power Consumption	-	1512	1764	1980	mW	-
LED voltage	VLED+	8.4	9.8	11.0	V	Note 1
LED Life Time	-	-	50,000	-	Hr	Note 2,3,4

Note 1 : There is 1 group of LEDs:



Backlight LED Circuit

Note 2 : Ta = 25 ℃

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

5.DC CHARATERISTICS

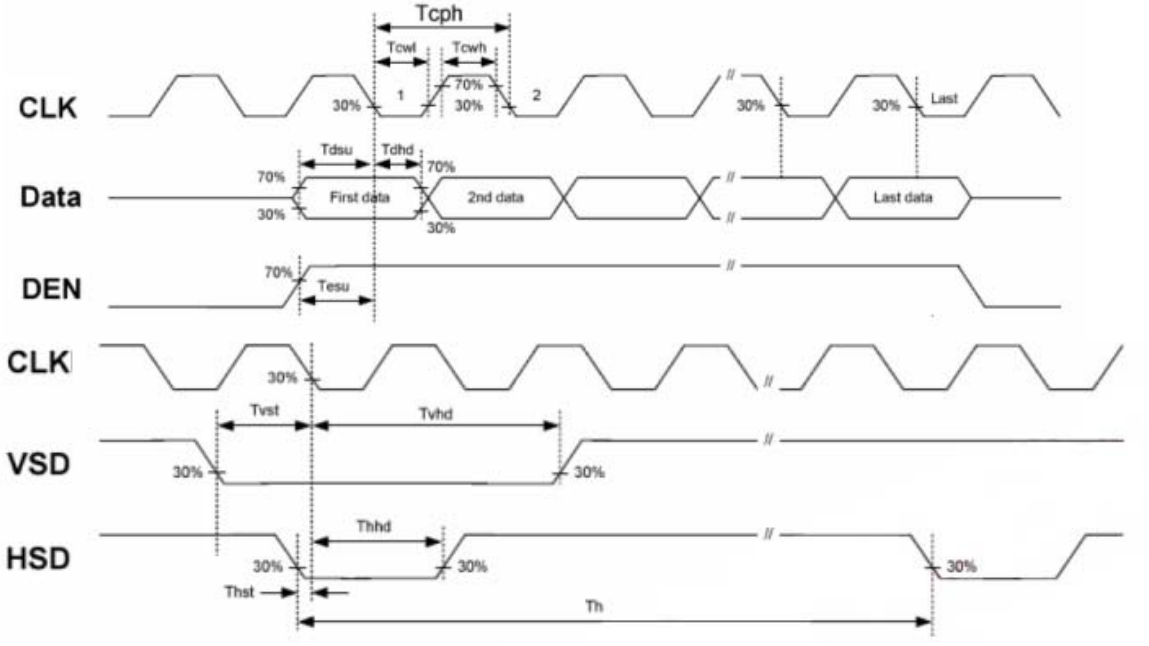
Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VCC	V	
High level input voltage	V_{IH}	0.7VCC	-	VCC	V	

6.AC CHARATERISTICS

6.1. AC Electrical Characteristics

Signal	Symbol	Min	Typ	Max	Unit
HS setup time	Thst	8	-	-	ns
HS hold time	Thhd	8	-	-	ns
VS setup time	Tvst	8	-	-	ns
VS hold time	Tvhd	8	-	-	ns
Data setup time	Tdsu	8	-	-	ns
Data hole time	Tdhd	8	-	-	ns
DE setup time	Tesu	8	-	-	ns
DE hole time	Tehd	8	-	-	ns
VCC Power On Slew rate	TPOR	-	-	20	ms
RESET pulse width	TRst	1	-	-	ms
DCLK cycle time	Tcoh	20	-	-	ns
DCLK pulse duty	Tcwh	40	50	60	%

6.2. Input Clock and Data Timing Diagram



6.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

6.4. Data Input Format

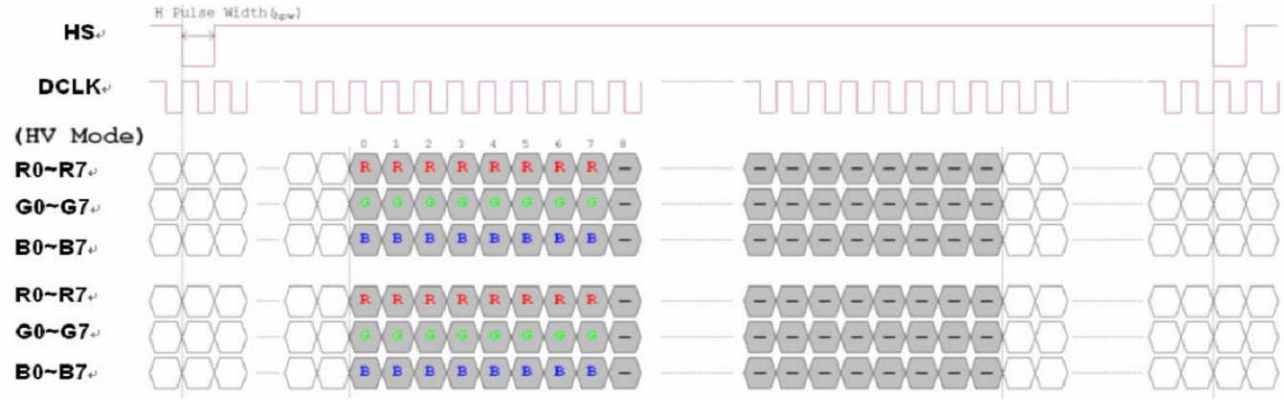


Fig. Horizontal input timing diagram

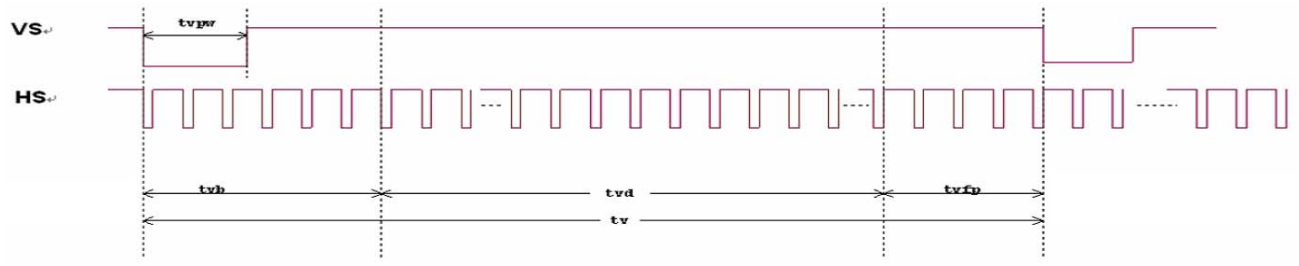


Fig. Vertical input timing diagram

6.5. Power on/off control

HX8264-E has a power ON/OFF sequence control function. In order to prevent IC from power on reset fail, the rising time(T POR) of the digital power supply VCC should be maintained within the given specifications. Please refer to “AC characteristics” for more detail on timing.

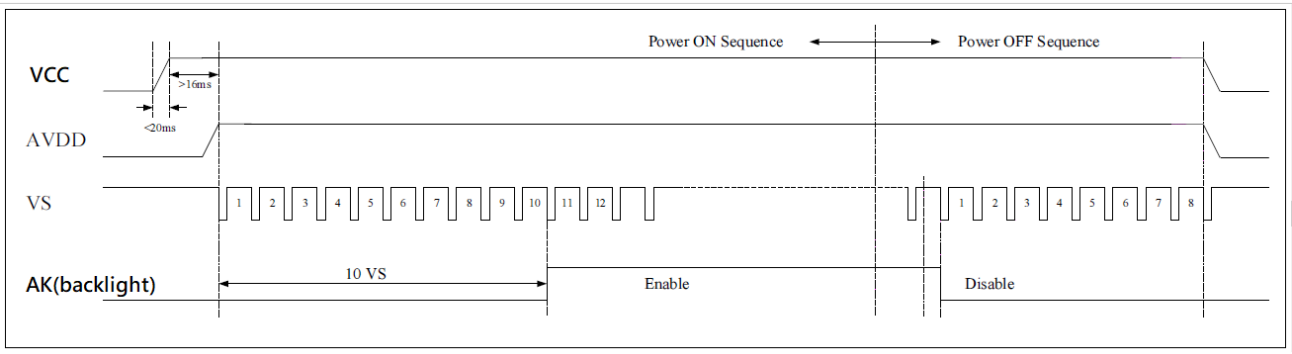


Figure 3 Power on/off timing sequence

7.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	θ=0°、Φ=0°	-	25	50	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	500	800	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.26	0.31	0.36	-	Note 2,5,6
		Wy		0.28	0.33	0.38	-	
Viewing angle (Gray Scale Inversion Direction)	Hor.	ΘR	CR≧10	60	70	-	Deg.	Note 1
		ΘL		60	70	-		
	Ver.	ΦT		50	60	-		
		ΦB		60	70	-		
Brightness		-	-	250	350	-	cd/m²	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5

Ta=25±2℃, IL=180mA

Note 1: Definition of viewing angle range

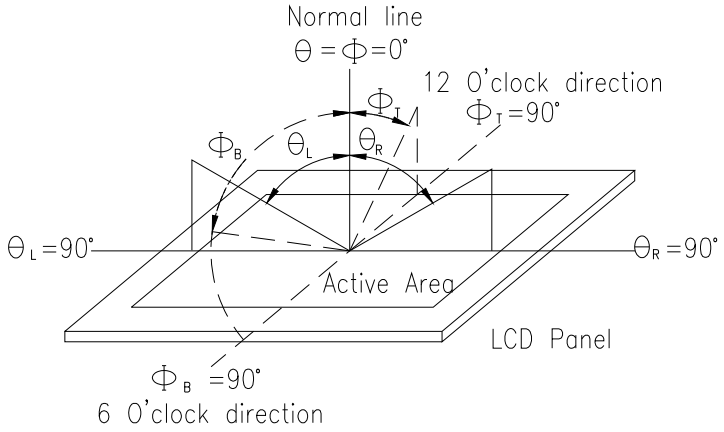


Fig. 7.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

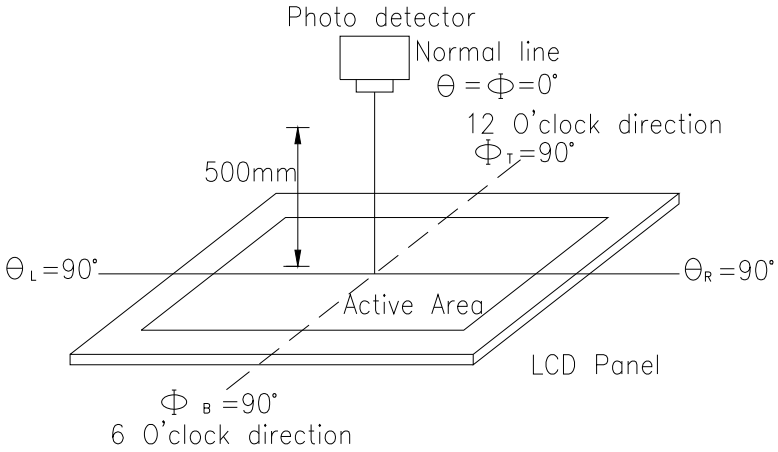
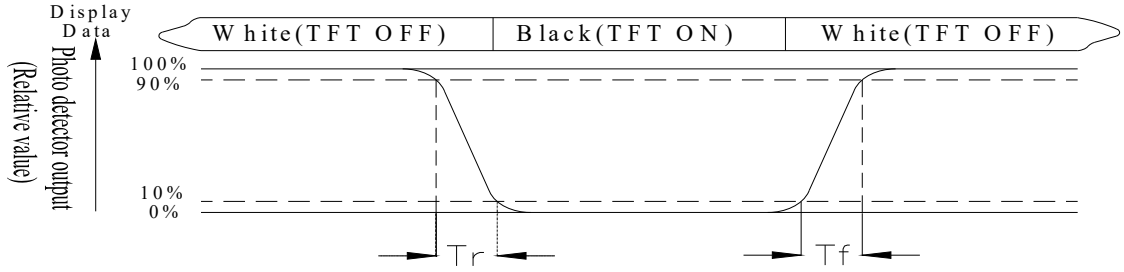


Fig. 8.2. Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%



Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 2.0V
"±" means that the analog input signal swings in phase with VCOM signal.
"±" means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.
Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

8.Interface

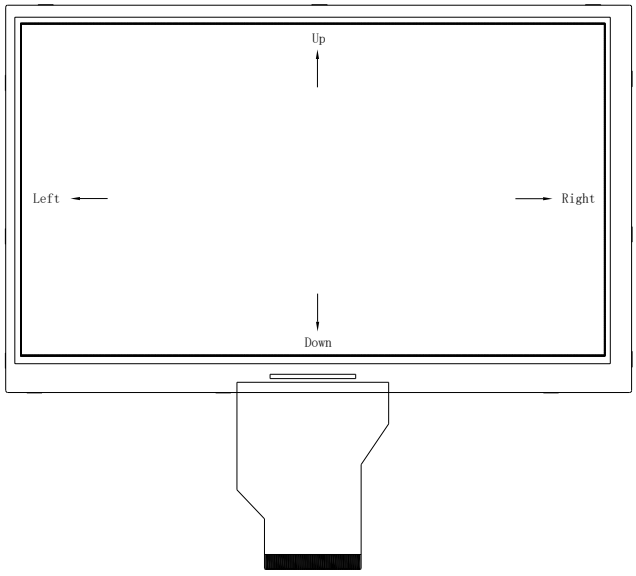
8.1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	VLED-	Backlight ground	
2	VLED+	Power supply for backlight	
3	GND	Power ground	
4	VCC	Power for Digital Circuit	
5	R0	Red data(LSB)	
6	R1	Red data	
7	R2	Red data	
8	R3	Red data	
9	R4	Red data	
10	R5	Red data	
11	R6	Red data	
12	R7	Red data(MSB)	
13	G0	Green data(LSB)	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data	
19	G6	Green data	
20	G7	Green data(MSB)	
21	B0	Blue data(LSB)	
22	B1	Blue data	
23	B2	Blue data	
24	B3	Blue data	
25	B4	Blue data	
26	B5	Blue data	
27	B6	Blue data	
28	B7	Blue data(MSB)	
29	GND	Power Ground	
30	CLK	Sample clock	Note 3
31	R/L	Right /Left selection	Note 4
32	Hsync	Horizontal Sync Input	
33	Vsync	Vertical Sync Input	
34	NC	Not connected	
35	U/D	Up/down selection	
36	RESET	Global reset pin.	Note 6
37	NC	Not connected	
38	NC	Not connected	
39	NC	Not connected	
40	NC	Not connected	

I: input, O: output, P: Power
Note 1: When select DE mode, MODE=”1”, VS and HS must pull high.
When select SYNC mode, MODE= ”0”, DE must be grounded.
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.
Note 3: Data shall be latched at the falling edge of DCLK.
Note 4: Source Right or Left sequence control
R/L =”L”, shift left: last data=S1←S2←S3…←S1200=first data
R/L =”H”, shift left: last data=S1←S2←S3…←S1200=last data
Note 5: Gate Up or Down scan control
U/D=”L”, STV2 output vertical start pulse and UD pin output logical “0” to gate driver
U/D=”H”, STV1 output vertical start pulse and UD pin output logical “1” to gate driver
Note 6: Global reset pin. Active low to enter reset state . Suggest to connect with an RC reset circuit for stability. Normally pull high.
Note 7: Dithering function enable control, normally pull high.
When DITHB=”1”, Disable internal dithering function,
When DITHB=”0”, Enable internal dithering function,

Setting of scan		Scanning direction
U/D	R/L	
L	H	Up to down, left to right
H	L	Down to up, right to left
L	L	Up to down, right to left
H	H	Down to up, left to right

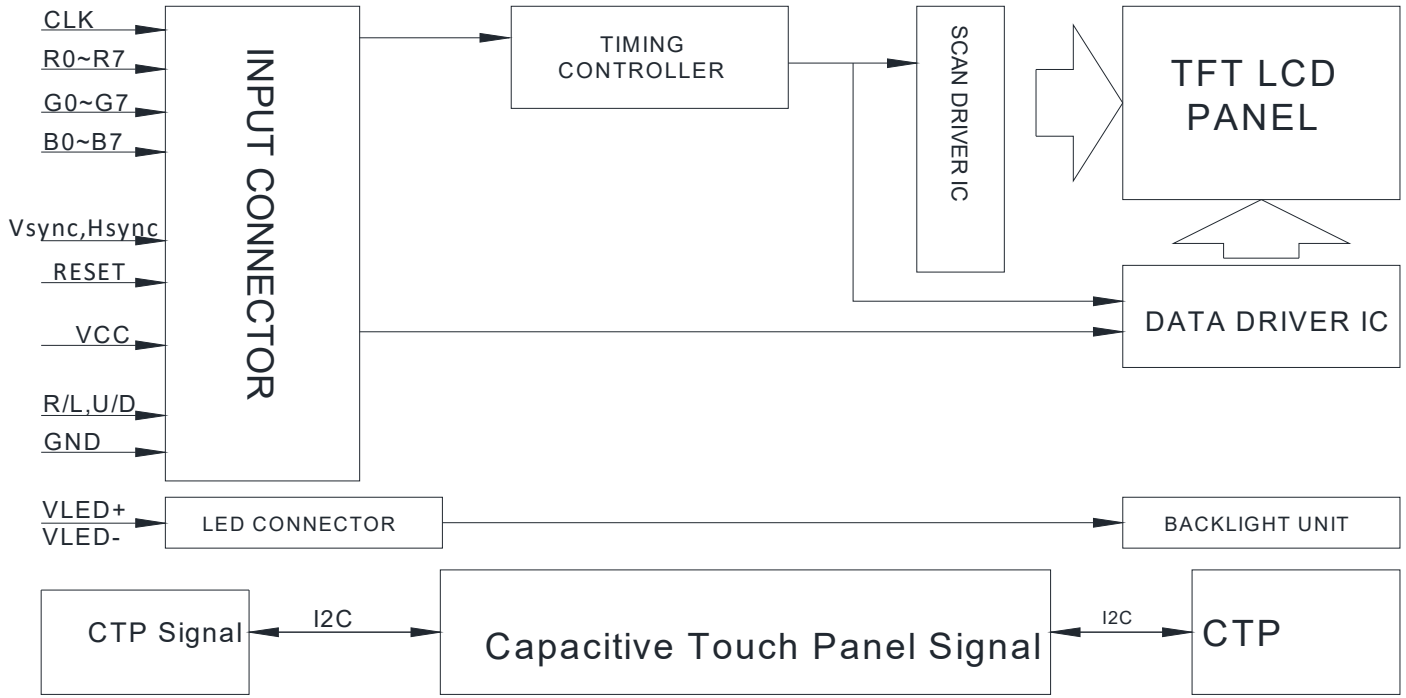
Note 4: Definition of scanning direction.
Refer to the figure as below:



8.2. PCAP PIN Definition

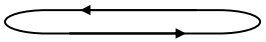
Pin	Symbol	Function	Remark
1	VSS	Ground for analog circuit	
2	VDDT	Power Supply : +3.3V	
3	SCL	I2C clock input	
4	NC	Not connected	
5	SDA	I2C data input and output	
6	NC	Not connected	
7	/RST	External Reset, Low is active	
8	NC	Not connected	
9	/INT	External interrupt to the host	
10	VSS	Ground for analog circuit	

9.Block Diagram



10.Reliability

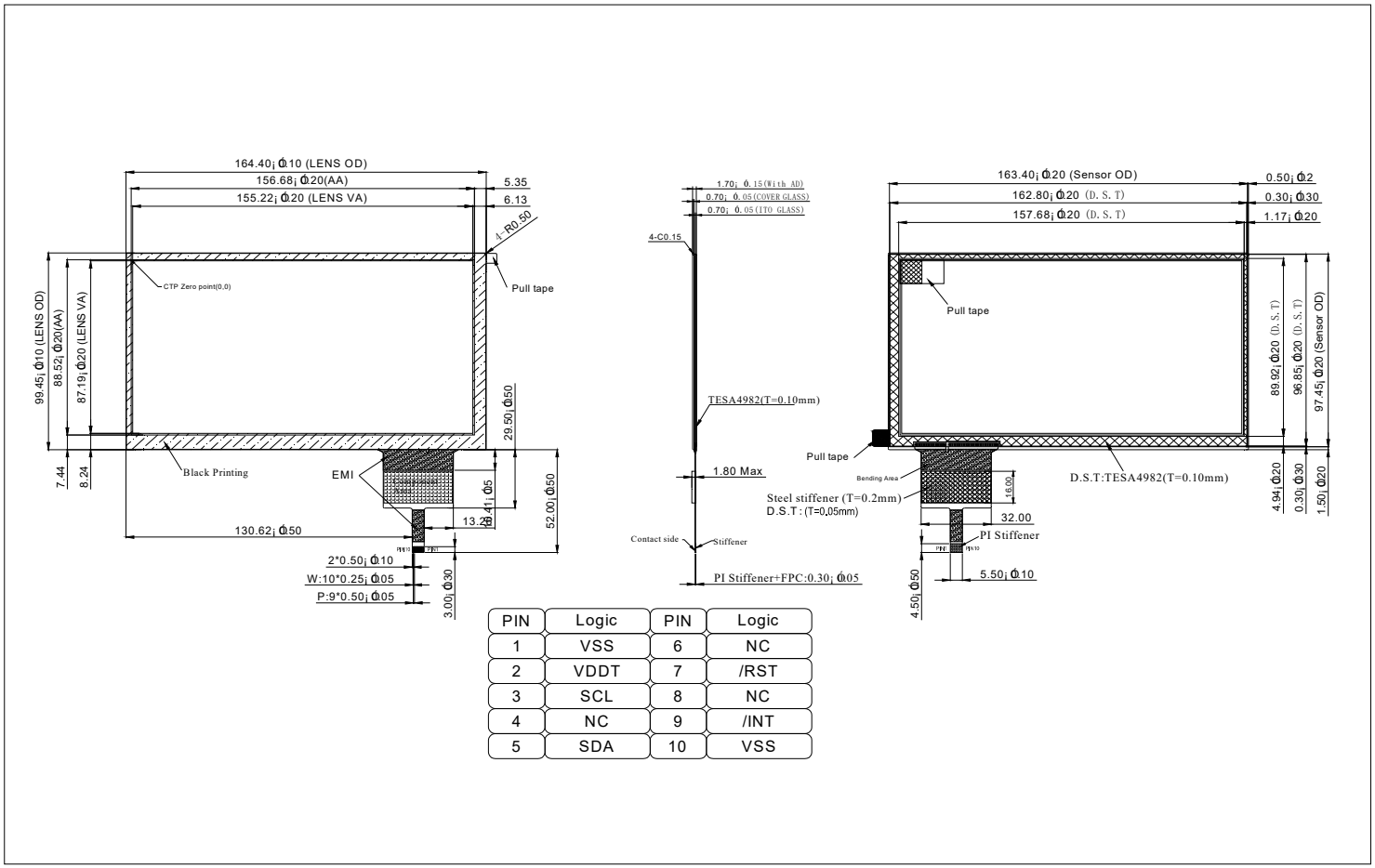
Content of Reliability Test (Wide temperature, -20℃~70℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃  30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	——
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	——

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.
Note3: The packing have to including into the vibration testing.

Zeppelinstrasse 19 D-82205 Gilching Fon +49-8105-778090 *info@lcd-module.de* *http://www.lcd-module.com*

11.Touch Panel Information



PIN	Logic	PIN	Logic
1	VSS	6	NC
2	VDDT	7	/RST
3	SCL	8	NC
4	NC	9	/INT
5	SDA	10	VSS

11.1 PCAP controller ILI2130

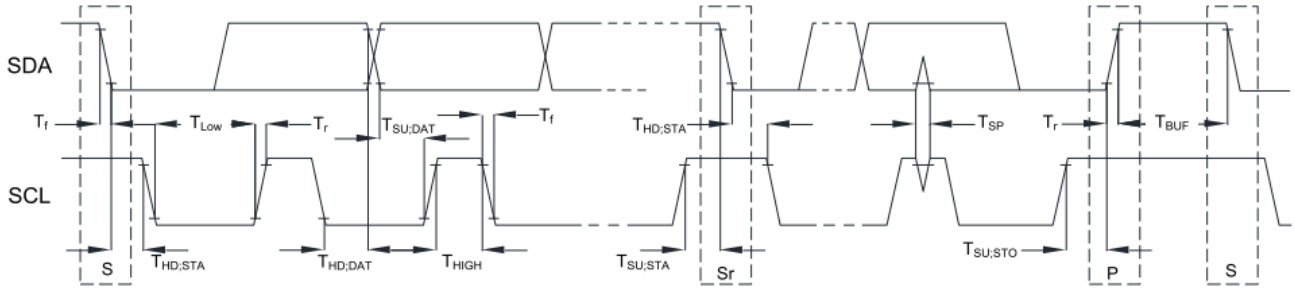
11.1.1 Device address

The device addresses are 7-binary bits long and are conventionally expressed as 4 bits followed by 3 bits followed by the letter ‘b’, 1000 001b. These addresses occupy the high seven bits of an eight-bit field on the bus.

MSB							LSB
1	0	0	0	0	0	1	0/1
7-bit Device Address							R/W

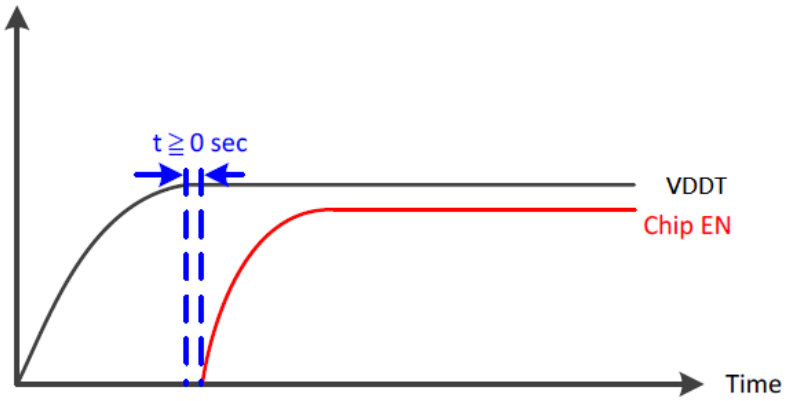
7-bit Device Address: 0x41
8-bit Device Address Read: 0x83
8-bit Device Address Write :0x82

11.1.2 I²C AC Characteristics

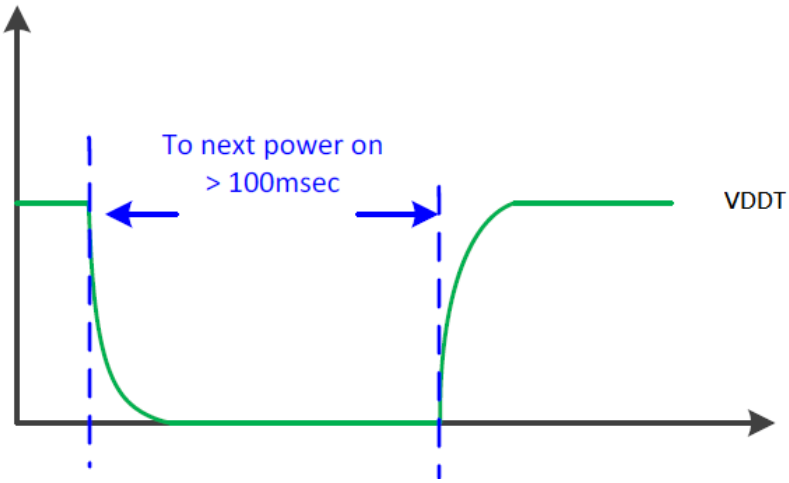


Item	Symbol	100kHz		400kHz		Unit
		Min.	Max.	Min.	Max.	
SCL standard mode clock frequency	FSCL	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock is generated.	THD;STA	4	--	0.6	--	us
LOW period of the SCL clock	TLOW	4.7	--	1.3	--	us
HIGH period of the SCL clock	THIGH	4	--	0.6	--	us
Setup time for a repeat START condition.	TSU;STA	4.7	--	0.6	--	us
Data hold time	THD;DAT	0	3.45	0	0.9	us
Data setup time	TSU;DAT	250	--	100	--	ns
Rising time of both SDA and SCL signals	Tr	--	1000	--	300	ns
Falling time of both SDA and SCL signals	Tf	--	300	--	300	ns
Setup time for STOP condition.	TSU;STO	4	--	0.6	--	us
Free time between STOP and START condition	TBUF	4.7	--	1.3	--	us
Pulse width of spikes which must be suppressed by input filter	TSP	--	--	0	50	ns

11.2. Power On Sequence



11.3. Power Off to Power On Sequence



11.4 Code example for PCAP

```
#include "main.h"
//================ By IC ===========
unsigned char ILI2130_buf[11];
/***************************************
 * if touch point add 3~10 finger
 * u can add buf size for add finegr
 * 1 finger point add bufsize[5]
 * finger 1 buf[2~5]
 * finger 2 buf[7-10]
 * finger 3 buf[12~15]
 * finger 4 buf[17~20]
 * finger 5 buf[22~25]
 * finger 6 buf[27~30]
 * finger 7 buf[32~35]
 * finger 8 buf[37~40]
 * finger 9 buf[42~45]
 * finger 10 buf[47~50]
 * 10 finger total 51 buf
***************************************/

void CTP_initial_ILI2130(void)
{
    TRISCbits.TRISC4 = 0;    //CTP_SCL
    TRISGbits.TRISG7 = 0;    //CTP_SDA
    TRISAbits.TRISA2 = 1;    //CTP_INT
    CNPU3bits.CN35PUE = 1;  //INT_Internal Pull High
}

void I2C_SrCondition(void)
{
   CTP_SCL = 0;
    delay(T4);
   CTP_SDA = 1;
   delay(T4);

    CTP_SCL = 1;
    delay(T4);
    CTP_SDA = 0;
    delay(T4);
}

void I2C_CLK_ILI2130(void)// I2C SCL Timing
{
     CTP_SCL = 1;  //SCL High
     delay(T4);    //delay(4)

     CTP_SCL = 0;  //SCL Low
     delay(T4);    //delay(4)
}
//=============================================
unsigned char ILI2130_DataRead(void)
{
    unsigned char Data;

    Data = LCD_GetData_I2C();

    return Data ;
}
```

```
//================================================
void ILI2130_received_data(void)
{
    unsigned int i;

   //TOUCH DATA
    for(i=0;i<11;i++)
    {
         ILI2130_buf[i]=ILI2130_DataRead();
         CTP_SDA = 0;
         delay(T4);
         I2C_CLK_ILI2130();
    }
    I2C_StopCondition();
}

//================================================
unsigned int ILI2130_Get_X1_Value_16bit(void)
{
  unsigned int temp,temp1;

  temp=0;
  if(ILI2130_buf[1]==0x40)
  {
      temp|=ILI2130_buf[3];
      temp1=(temp<<8);
      temp= temp1|ILI2130_buf[2];
  }
  return temp;
}

unsigned int ILI2130_Get_Y1_Value_16bit(void)
{
  unsigned int temp2,temp3;

  temp2=0;
  if(ILI2130_buf[1]==0x40)
  {
      temp2|=ILI2130_buf[5];
      temp3=(temp2<<8);
      temp2= temp3|ILI2130_buf[4];
  }
  return temp2;
}

unsigned int ILI2130_Get_X2_Value_16bit(void)
{
  unsigned int temp,temp1;
  temp=0;
  if(ILI2130_buf[6]==0x41)
  {
      temp|=ILI2130_buf[8];
      temp1=(temp<<8);
      temp= temp1|ILI2130_buf[7];
  }
  return temp;
}

unsigned int ILI2130_Get_Y2_Value_16bit(void)
{
  unsigned int temp2,temp3;

  temp2=0;
  if(ILI2130_buf[6]==0x41)
  {
      temp2|=ILI2130_buf[10];
```

```
        temp3=(temp2<<8);
        temp2= temp3|ILI2130_buf[9];
    }

    return temp2;
}

void ILI2130_Communication(void)
{
     I2C_StartCondition();              //s
     LCD_SendAddress(0x82);              //A            write to slave 8
     Slave_ack();//1

     LCD_SendAddress(0x10); //8
     Slave_ack();//1
     //I2C_StopCondition();

     I2C_SrCondition();
     LCD_SendAddress(0x83);              //   read slave data
     Slave_ack();
}
//=========================================================
```

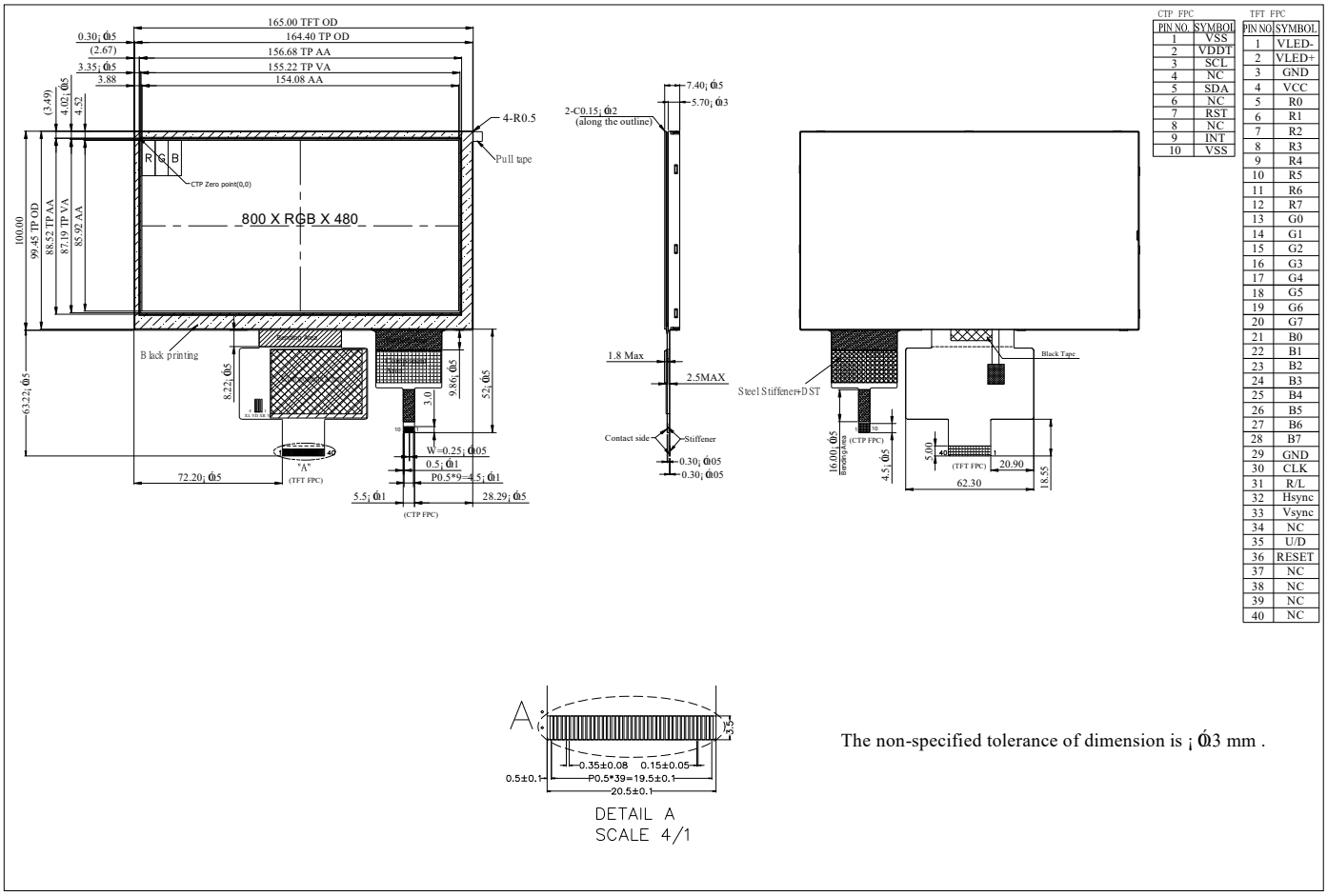
11.5 Programming guide for PCAP

More information on getting touch data and programming is written here:
https://www.lcd-module.de/eng/pdf/zubehoer/ILI2130_Programming_Guide_V1_50.pdf

11.6 Comparsion between ILI2130 and FT5426 (EA TFT070-84ATS)

https://www.lcd-module.de/eng/pdf/zubehoer/ILI2130_comparsion_FT5426.pdf

12.Contour Drawing



CTP FPC

PIN NO.	SYMBOL
1	VSS
2	VDDT
3	SCL
4	NC
5	SDA
6	NC
7	RST
8	NC
9	INT
10	VSS

TFT FPC

PIN NO	SYMBOL
1	VLED-
2	VLED+
3	GND
4	VCC
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLK
31	R/L
32	Hsync
33	Vsync
34	NC
35	U/D
36	RESET
37	NC
38	NC
39	NC
40	NC

The non-specified tolerance of dimension is ¡ Ø3 mm .