

DISPLAY Elektronik GmbH

TFT MODULE

DEM 480128D TMH-PW-N

5,2" TFT

Product Specification

Version: 2

08.10.2016

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	23.06.2016		First Issue
1	11.08.2016		Modify Vibration Test
2	08.10.2016		Modify Counter Drawing Modify Summary

Contents

1. Summary
2. General Specification
3. Interface
4. Counter Drawing
5. Block Diagram
6. Absolute Maximum Ratings
7. Electrical Characteristics
8. DC Characteristics
9. Interface Timing Characteristics
10. Optical Characteristics
11. Reliability
12. Display start address setting

1. Summary

This 5.2" TFT is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT LCD module. It is usually designed for industrial application and this module follows RoHS.

2. General Specifications

- Size: 5.2 Inch
- Dot Matrix: 480 x RGB x 128 dots
- Module Dimension: 180.00 x 65.00 x 8.80 mm
- Active Area: 127.152 x 33.9072 mm
- Dot Pitch: 0.0883 x 0.2649 mm
- LCD Type: TFT, Normally White, Transmissive
- View Direction: 6 o'clock
- Gray Scale Inversion Direction: 12 o'clock
- Aspect Ratio: Bar Type
- Backlight Type: LED, Normally White, typ. 50.000h
- Driver IC: SSD1963
- Interface: Digital 8-Bit/16-Bit-MCU (8080) Interface
- With /Without TP: Without TP
- Surface: Glare

*Color tone slight changed by temperature and driving voltage.

3. Interface

3.1. LCM PIN Definition (CON4)

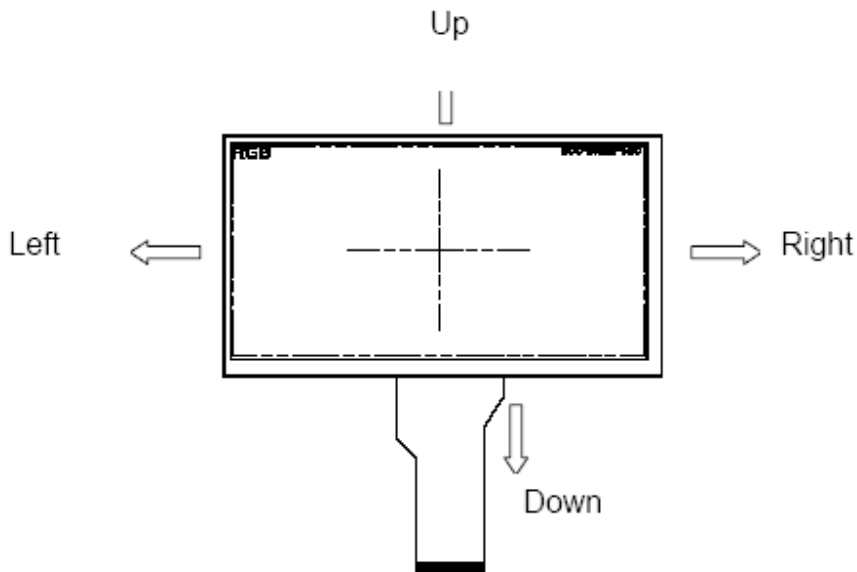
Pin	Symbol	Function	Remark
1	GND	System round pin of the IC. Connect to system ground.	
2	VDD	Power Supply : +3.3V	
3	BL_E	Backlight control signal , H: On \ L: Off	
4	D/C	Data/Command select	
5	WR	Write strobe signal	
6	RD	Read strobe signal	
7	DB0	Data bus	
8	DB1	Data bus	
9	DB2	Data bus	
10	DB3	Data bus	
11	DB4	Data bus	
12	DB5	Data bus	
13	DB6	Data bus	
14	DB7	Data bus	
15	DB8	Data bus (When select 8bits mode, this pin is NC)	Note1
16	DB9	Data bus (When select 8bits mode, this pin is NC)	Note1
17	DB10	Data bus (When select 8bits mode, this pin is NC)	Note1
18	DB11	Data bus (When select 8bits mode, this pin is NC)	Note1
19	DB12	Data bus (When select 8bits mode, this pin is NC)	Note1
20	DB13	Data bus (When select 8bits mode, this pin is NC)	Note1
21	DB14	Data bus (When select 8bits mode, this pin is NC)	Note1
22	DB15	Data bus (When select 8bits mode, this pin is NC)	Note1
23	NC	No connect	
24	NC	No connect	
25	CS	Chip select	
26	RESET	Hardware reset	
27	LR	Right /Left selection; Default R/L is Pull High	Note2,3
28	UD	Up/down selection; Default U/D is Pull High	Note2,3
29	NC	No connection	
30	NC	No connection	
31	NC	No connection	
32	NC	No connection	
33	VLED-	VLED- for B/L LED inverter (GND)	
34	VLED-	VLED- for B/L LED inverter (GND)	
35	VLED+	VLED+ for B/L LED inverter (+5V)	
36	VLED+	VLED+ for B/L LED inverter (+5V)	

Note1: When select 8bit mode, DB0~DB7 be used, DB8~DB15 no connect
 When select 16bit mode, DB0~DB15 be used

Note 2: Selection of scanning mode and LR, UD Pull High 10kΩ on FPC

Setting of scan control input		Scanning direction
UD	LR	
L	H	Down to up, left to right
H	L	Up to down, right to left
L	L	Down to up, right to left
H	H	Up to down, left to right

Note 3: Definition of scanning direction. refer to the figure as below:



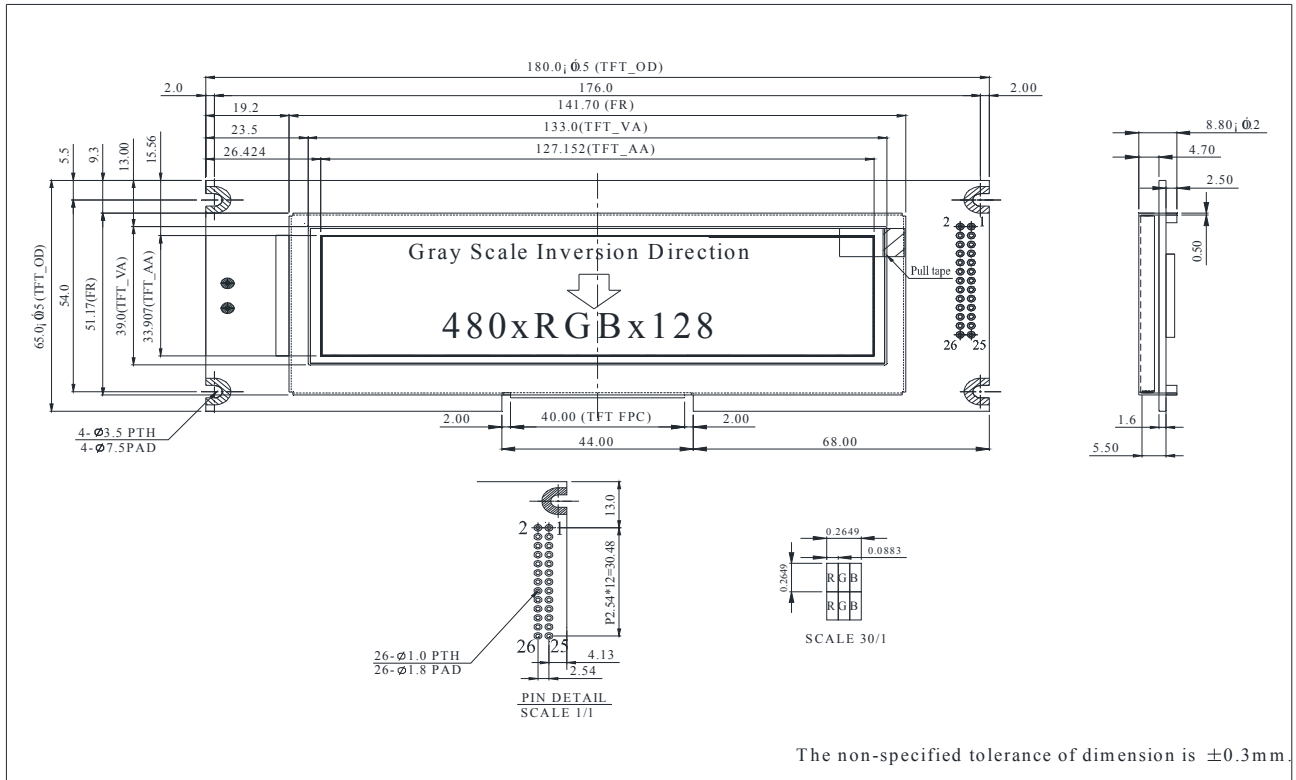
3.2. LCM PIN Definition (CON1)

Pin	Symbol	Function	Remark
1	NC(FG)	No connect (Frame Grand)	
2	GND	System round pin of the IC. Connect to system ground.	
3	VDD	Power Supply : +3.3V	
4	BLE	Backlight control signal , H: On \ L: Off	
5	WR	Write strobe signal	
6	RD	Read strobe signal	
7	CS	Chip select	
8	D/C	Data/Command select	
9	NC	No connect	
10	RESET	Hardware reset	
11	DB0	Data bus	
12	DB1	Data bus	
13	DB2	Data bus	
14	DB3	Data bus	
15	DB4	Data bus	
16	DB5	Data bus	
17	DB6	Data bus	
18	DB7	Data bus	
19	NC	No connect	
20	NC	No connect	
21	VLED+	VLED+ for B/L LED inverter (+5V)	Note3
22	VLED-	VLED- for B/L LED inverter (GND)	Note3
23	NC	No connect	
24	NC	No connect	
25	NC	No connect	
26	GND	Hardware reset	

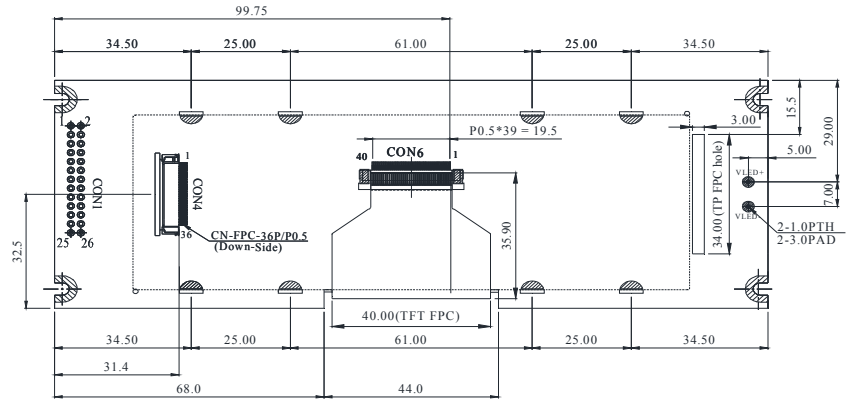
Note3:

When PCB right side CON1 select Pin1~Pin20, Pin21~Pin22 no connect, +5V can input on PCB left side VLED+/- PAD

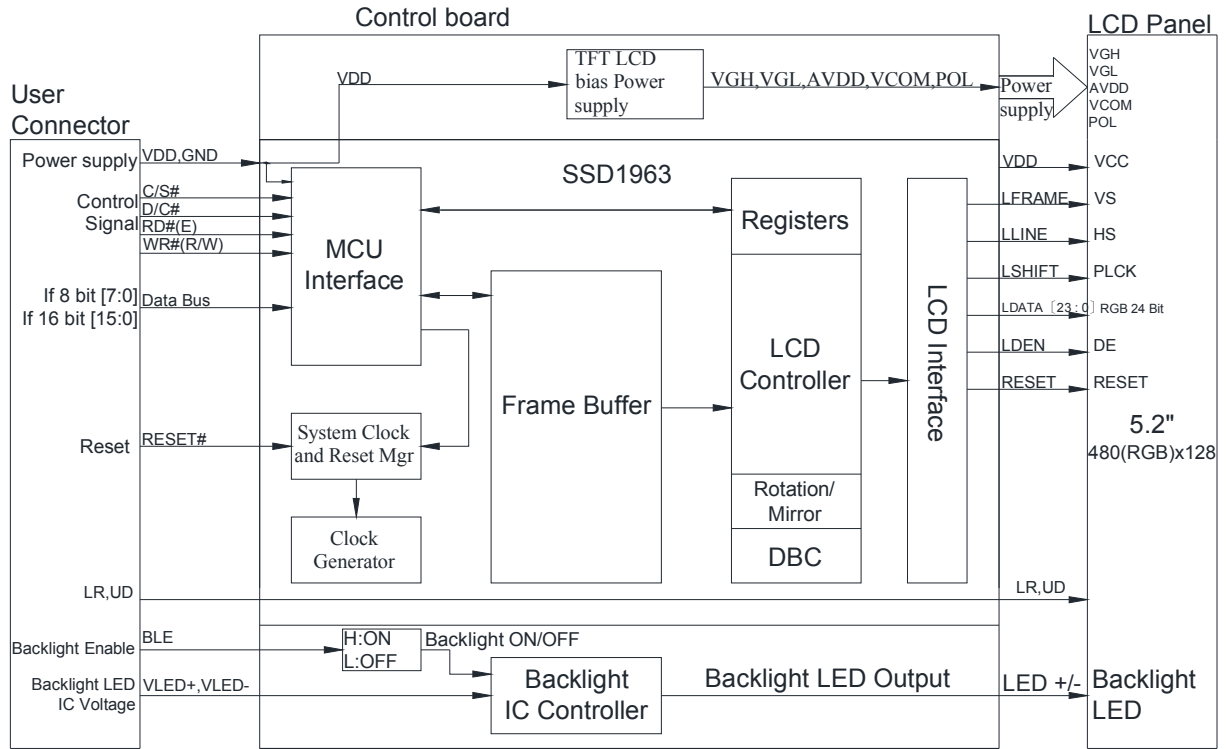
4. Counter Drawing



CON1		CON4	
PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC(FG)	1	GND
2	GND	2	VDD
3	VDD	3	BL_E
4	BLE	4	D/C
5	WR	5	WR
6	RD	6	RD
7	CS	7	DB0
8	D/C	8	DB1
9	NC	9	DB2
10	RESET	10	DB3
11	DB0	11	DB4
12	DB1	12	DB5
13	DB2	13	DB6
14	DB3	14	DB7
15	DB4	15	DB8
16	DB5	16	DB9
17	DB6	17	DB10
18	DB7	18	DB11
19	NC	19	DB12
20	NC	20	DB13
21	VLED+	21	DB14
22	VLED-	22	DB15
23	NC	23	NC
24	NC	24	NC
25	NC	25	CS
26	GND	26	RESET
		27	LR
		28	UD
		29	NC
		30	NC
		31	NC
		32	NC
		33	VLED-
		34	VLED-
		35	VLED+
		36	VLED+



5. Block Diagram



6. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T _{OP}	-20	—	+70	°C
Storage Temperature	T _{ST}	-30	—	+80	°C

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

Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$,

Absolute humidity shall be less than 90% RH at 60°C

7. Electrical Characteristics**7.1. Operating Conditions:** (CON3.Pin1=GND, Pin2=VDD)

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VDD	—	3.0	3.1	3.3	V	-
Supply Current For LCM	IDD	—	—	200	—	mA	Note1

Note 1 : This value is test for VDD =3.3V , Ta=25°C only

7.2. Backlight Driving Conditions: (CON3.Pin33,34=VLED-, Pin35,36=VLED+)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Operation Current For LED Driver	VLED=5V	-	250	-	mA	Note 1,2
Supply Voltage For LED Driver	VLED+	-	5	-	V	Note 1,2
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1 : Base on VLED= 5V for the back light driver IC specification

Note 2 : Ta = 25°C

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

Note 4 : The single LED lamp case

8. DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low Level Input Voltage	V_{IL}	0	-	0.3VDD	V	
High Level Input Voltage	V_{IH}	0.7VDD	-	VDD	V	

9. Interface timing

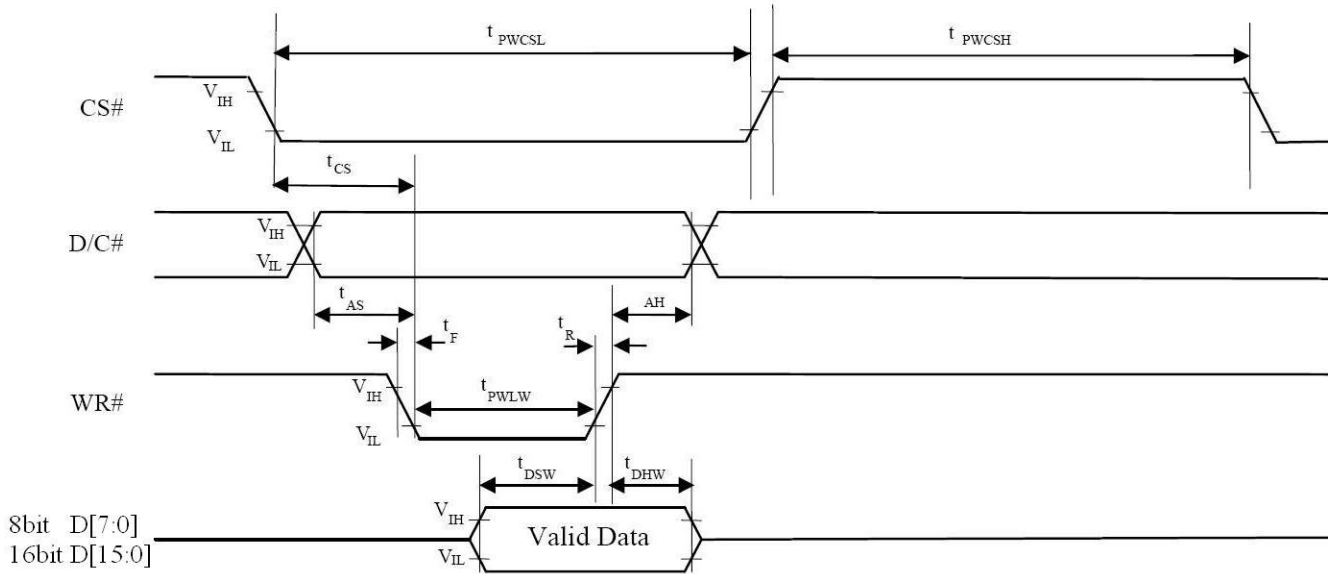
9.1. 8080 Mode 8bit/16bit

The 8080 mode MCU interface consist of CS#, D/C#, RD#, WR#, Data Bus signals. This interface use WR# to define a write cycle and RD# for read cycle. If the WR# goes low when the CS# signal is low, the data or command will be latched into the system at the rising edge of WR#. Similarly, the read cycle will start when RD# goes low and end at the rising edge of RD#.

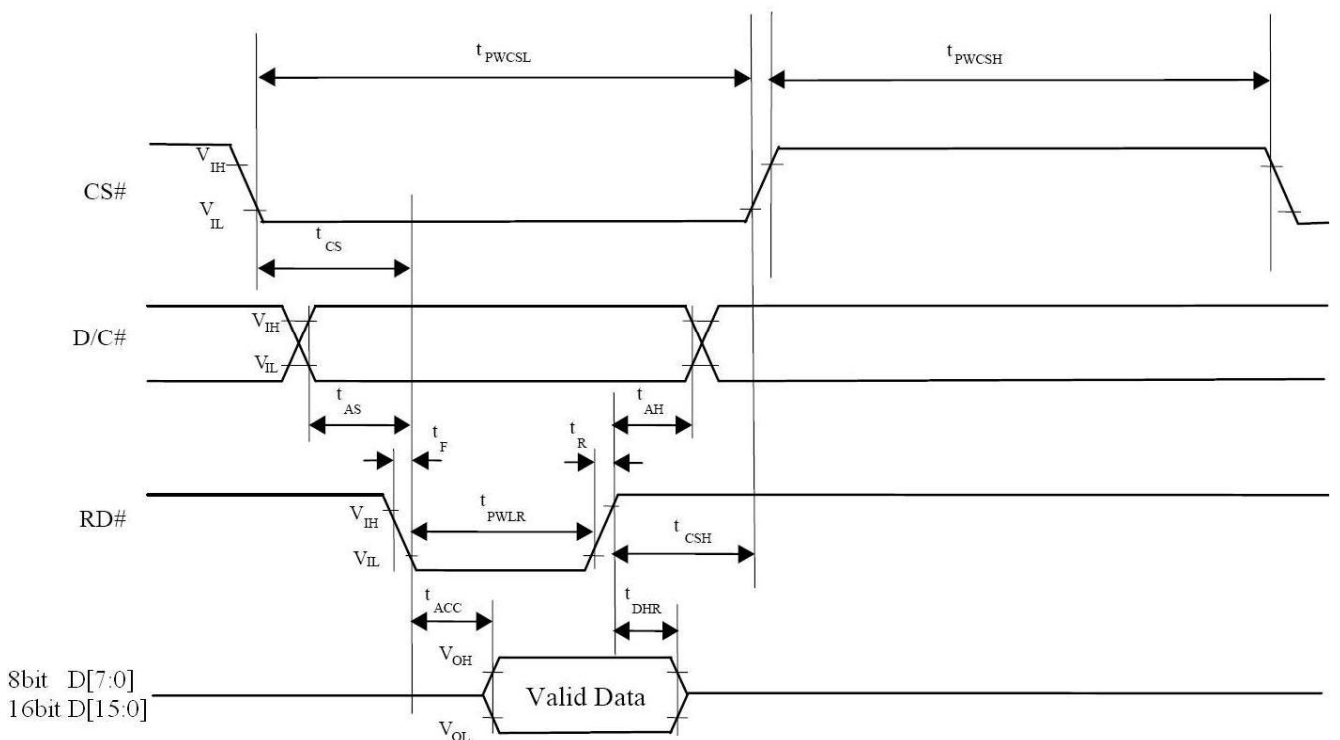
9.2. 8080 Mode Write Cycle

Symbol	Parameter	Min	Typ	Max	Unit
fMCLK	System Clock Frequency	1	-	110	MHz
tMCLK	System Clock Period	1/ fMCLK	-	-	ns
tPWCSH	Control Pulse High Width Write Read	13 30	1.5* tMCLK 3.5* tMCLK	-	ns
tPWCSL	Control Pulse Low Width Write (next write cycle) Write (next read cycle) Read	13 80 80	1.5* tMCLK 9* tMCLK 9* tMCLK	-	ns
tAS	Address Setup Time	1	-	-	ns
tAH	Address Hold Time	2	-	-	ns
tDSW	Write Data Setup Time	4			ns
tDHW	Write Data Hold Time	1	-	-	ns
tPWLW	Write Low Time	12			ns
tDHR	Read Data Hold Time	1	-	-	ns
tACC	Access Time	32			ns
tPWLR	Read Low Time	36	-	-	ns
tR	Rise Time	-		0.5	ns
tF	Fall Time	-	-	0.5	ns
tCS	Chip select setup time	2		-	ns
tCSH	Chip select hold time to read signal	3	-	-	ns

9.3. Parallel 8080-series Interface Timing Diagram (Write Cycle)



9.4. Parallel 8080-series Interface Timing Diagram (Read Cycle)



9.5. Pixel Data Format

Interface	Cycle	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]
16 bits (565 format)	1 st	R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1 st	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
	2 nd	B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0
	3 rd	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
8 bits	1 st									R7	R6	R5	R4	R3	R2	R1	R0
	2 nd									G7	G6	G5	G4	G3	G2	G1	G0
	3 rd									B7	B6	B5	B4	B3	B2	B1	B0

10. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response Time	Tr+ Tf	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	35	-	.ms	Note 3	
Contrast Ratio	CR	At optimized Viewing Angle	300	500	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ$ 、 $\phi=0$	0.24	0.29	0.34		Note 2,5
		Wy		0.26	0.31	0.36		
Viewing Angle (Gray Scale Inversion Direction)	Hor.	Θ_R	CR ≥ 10	55	65	-	Deg.	Note 1
		Θ_L		55	65	-		
	Ver.	Φ_T		55	65	-		
		Φ_B		45	55	-		
Brightness	-	-	400	500	-	cd/m ²	Center of display	

Ta=25±2°C, VLED /ILED = 5V /250mA

Note 1: Definition of viewing angle range

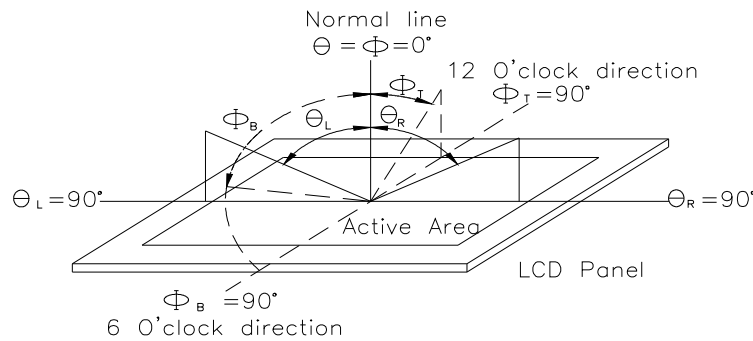


Fig.11.1. Definition of viewing angle

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.

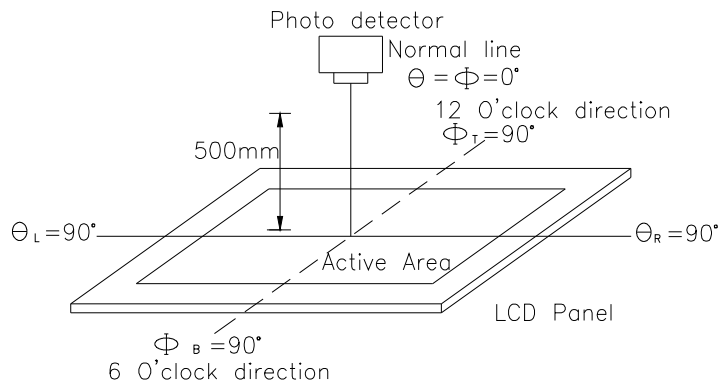
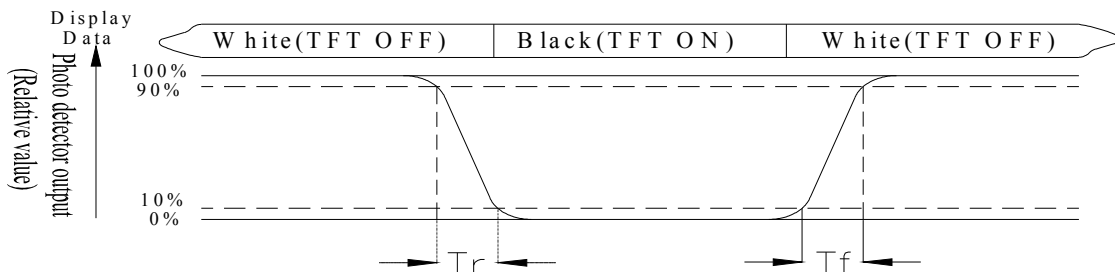


Fig. 11.2. Optical measurement system setup

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, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , 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 $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” 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.

11. Reliability

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

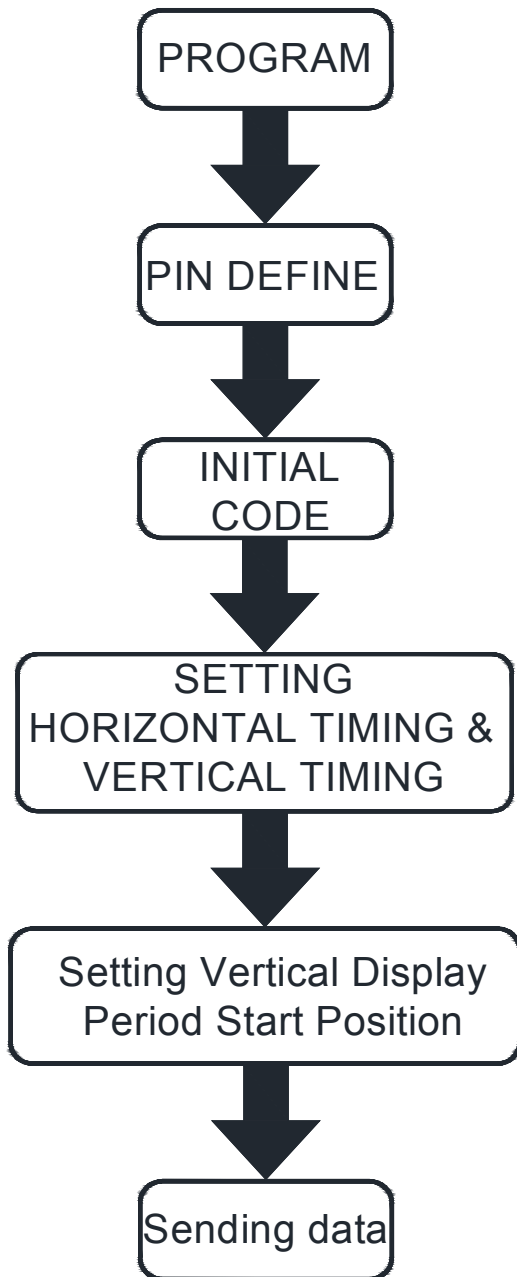
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60%,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20□ 25□ 70□</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 3 1.5mm 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.

12. Display start address setting



Ex.
One horizontal line=0x0213
VS period time=0x0124
HS Blanking=0x2b
VS Blanking=0x10
HS Front Porch=0x05
VS Front Porch=0x08

Suggestion :
Vertical Display Period
Start Position=0x44

Note :
For different Controller ICs, the value of vertical display period start position need to be adjusted accordingly.