

Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 800480Q TMH-PW-N

5,0“ TFT

Product Specification

Ver.: 0

17.06.2015

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	17.06.2015	-	First Issue

Contents

1. General Specification
2. Interface
3. Contour Drawing
4. Absolute Maximum Ratings
5. Electrical Characteristics
6. Optical Characteristics
7. Reliability

1. General Specifications

- Size: 5.0 Inch
- Dot Matrix: 800 x (RGB) x 480 dots
- Module Dimension: 120.70 x 75.80 x 2.90 mm
- Active Area: 108.00 x 64.80 mm
- Dot Pitch: 0.045 x 0.135 mm
- LCD Type: TFT, Normally White, Transmissive
- 24-Bit-RGB-Interface
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Backlight Type: LED, Lightguide, Normally White
- With /Without TP: No Touch
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

2. Interface

2.1. LCM PIN Definition

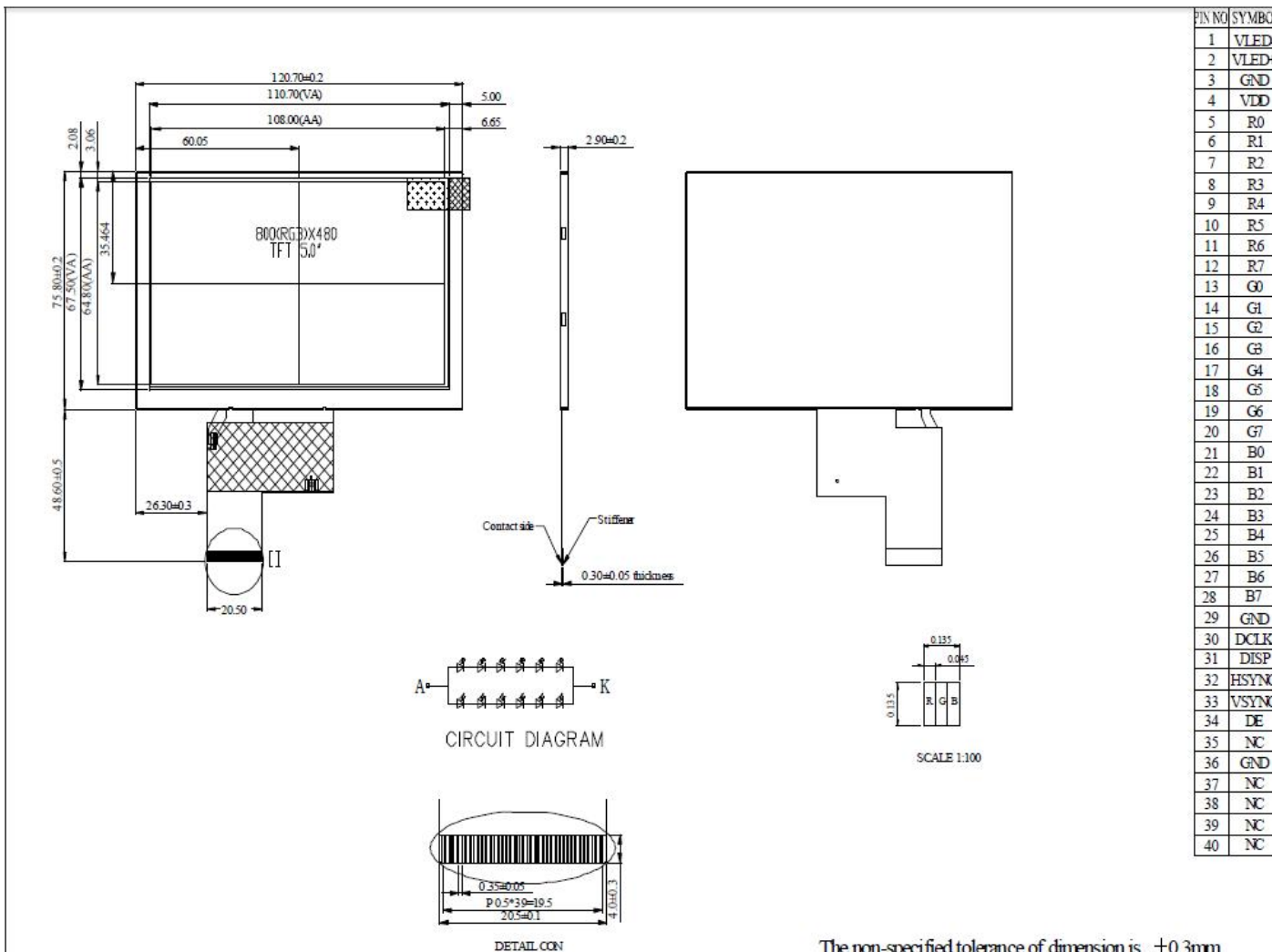
FPC connector is used for electronics interface. The recommended model is FH19SC-40S-0.5SH (05) manufactured by HIROSE.

No.	Symbol	I/O	Function
1	VLED-	P	Power for LED backlight cathode
2	VLED+	P	Power for LED backlight anode
3	GND	P	Power ground
4	VDD	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	GND	P	Power ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSYNC	I	Vertical sync signal
34	DE	I	Data enable
35	NC	-	No connect
36	GND	P	Power ground

37	NC	-	No connect
38	NC	-	No connect
39	NC	-	No connect
40	NC	-	No connect

Note: I: input, O: output t, P: Power

3. Contour Drawing

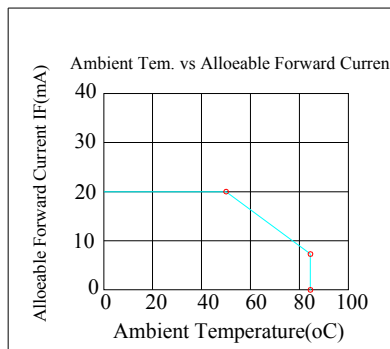


4. Absolute Maximum Ratings

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



5. Electrical Characteristics

5.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ	Max.		
Power Voltage	VDD	3.0	3.3	3.6	V	Note 2
Current for Driver	IVDD	-	17	25	mA	
Input Logic High Voltage	VIH	0.8 VDD	-	VDD	V	Note 3
Input Logic Low Voltage	VIL	0	-	0.2 VDD	V	

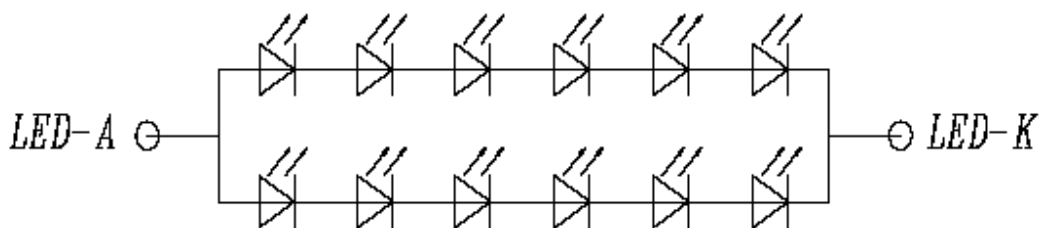
5.2. Backlight Driving Conditions (12 White Chips)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage of White LED Backlight	VL	17.4	19.8	21	V	Note 1
Curt for LED Backlight	IL	30	40	50	mA	
Luminance (on the module surface, BM-7)		400	450	-	cd/m ²	
LED Lifetime	-	20,000	-	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and L =40mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =40mA. The LED lifetime could be decreased if operating IL is larger than 40mA.

LED CIRCUIT



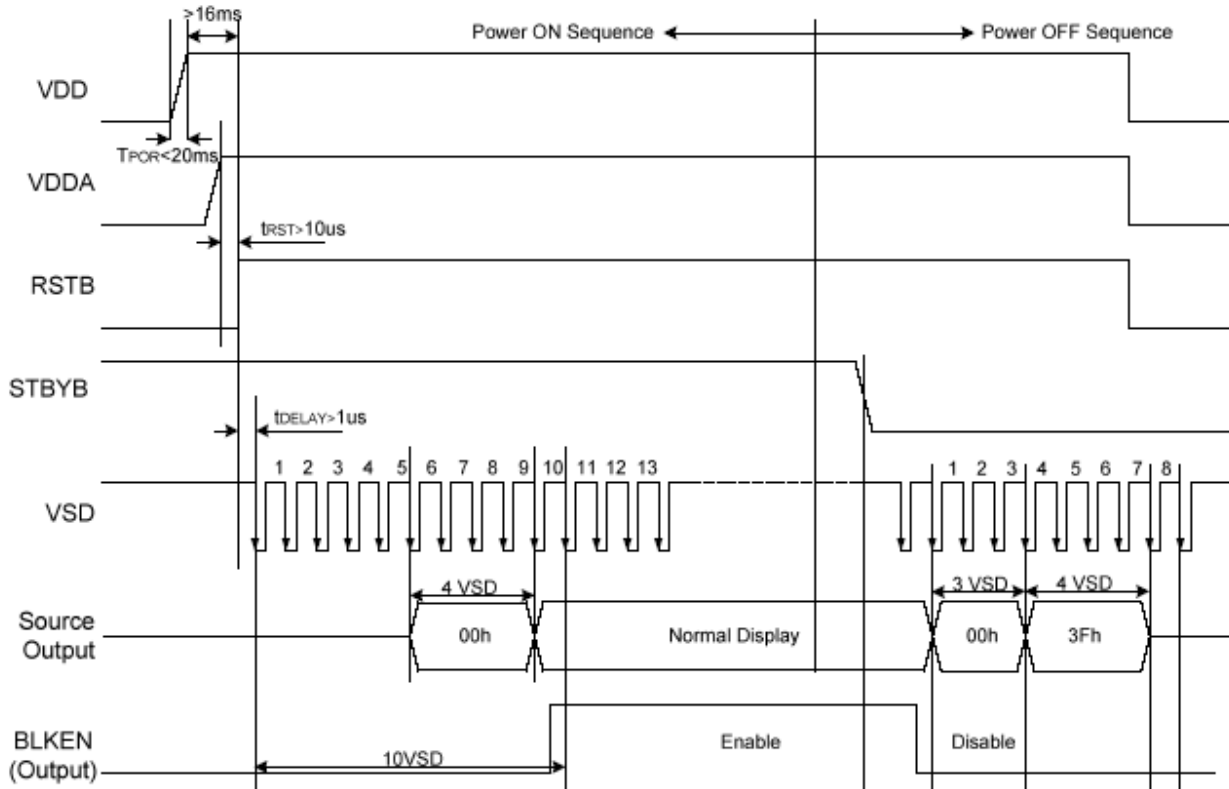
5.3. Power Sequence

To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VDD, DGND_ VDDA, AGND _ V1 to V14

Power OFF: V1 to V14 _ VDDA, AGND_ VDD, DGND

In order to prevent ILI6122 from power ON reset fail, the rising time (tPOR) of the digital power supply VDD should be maintained within given specifications. The power ON/OFF timing sequence is illustrated as below:



Note: For prevent anormal operation, tRST must be longer than 10us during Power ON sequence.

5.4. Timing Characteristic

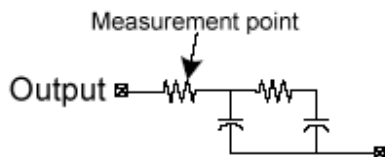
AC Electrical Characteristics

Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
VDD Power ON slew rate	tPOR	--	--	20	ms	0V ~ 0.9VDD
RSTB pulse width	tRST	10	--	--	us	CLKIN=50MHz
CLKIN cycle time	tCPH	20	--	--	ns	
CLKIN pulse duty	tCWH	40	50	60	%	
VSD setup time	tVST	8	--	--	ns	
VSD hold time	tVHD	8	--	--	ns	
HSD setup time	tHST	8	--	--	ns	
HSD hold time	tHHD	8	--	--	ns	
Data setup time	tDST	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
Data hold time	tDHD	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
DE setup time	tEST	8	--	--	ns	
DE hold time	tEHD	8	--	--	ns	
Output stable time	tSST	--	--	6	us	10% to 90% target voltage. CL=120pF, R=10KW
CLKIN frequency	fCLK	--	40	50	MHz	VDD=3.0 ~ 3.6V
CLKIN cycle time	tCLK	20	25	--	ns	
CLKIN pulse duty	tCWH	40	50	60	%	TCLK
Time from HSD to Source output	tHSO	--	20	--	CLKIN	
Time from HSD to LD	tHLD	--	20	--	CLKIN	Note (2)
Time from HSD to STV	tHSTV	--	2	--	CLKIN	
Time from HSD to CKV	tHCKV	--	20	--	CLKIN	
Time from HSD to OEV	tHOEV	--	4	--	CLKIN	
LD pulse width	tWLD	--	10	--	CLKIN	Note (2)
CKV pulse width	tWCKV	--	66	--	CLKIN	
OEV pulse width	tWOEV	--	74	--	CLKIN	

Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85 □

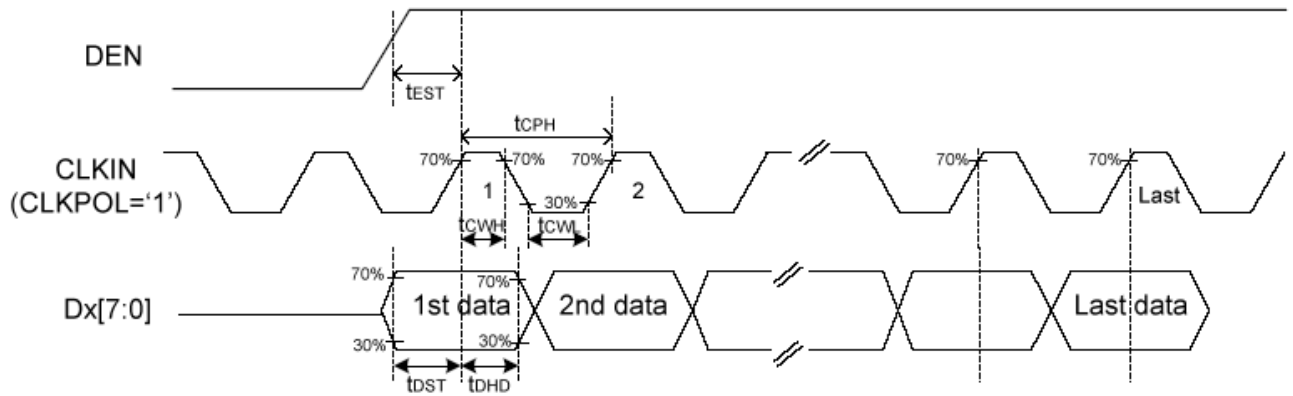
(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.

(3) Output loading condition :

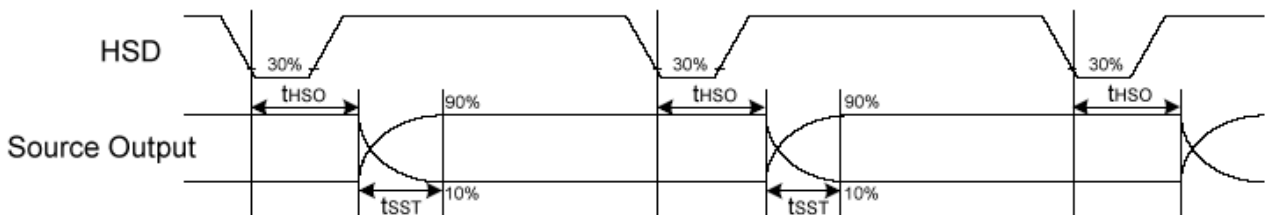


Input Clock and Data Timing Diagram

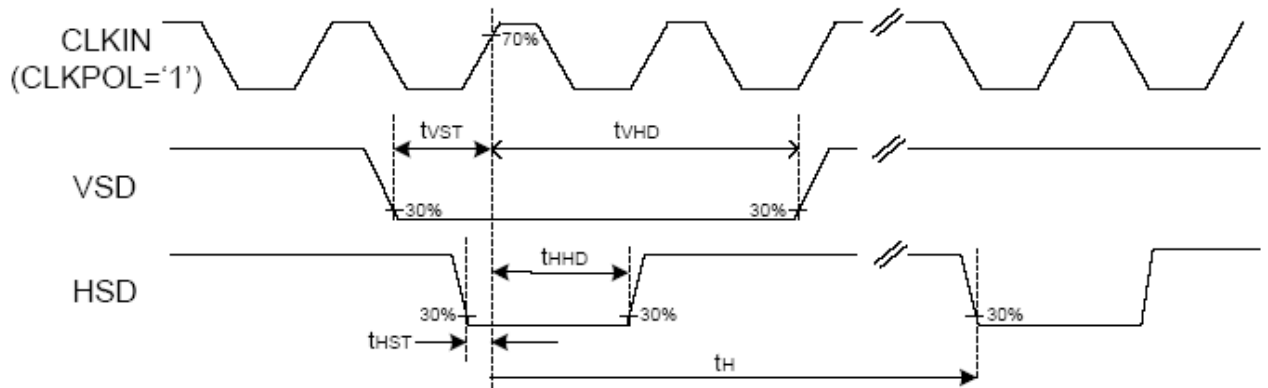
DE Mode (MODE='1')



Source Output timing Diagram (Cascade)



SYNC Mode (MODE='0')



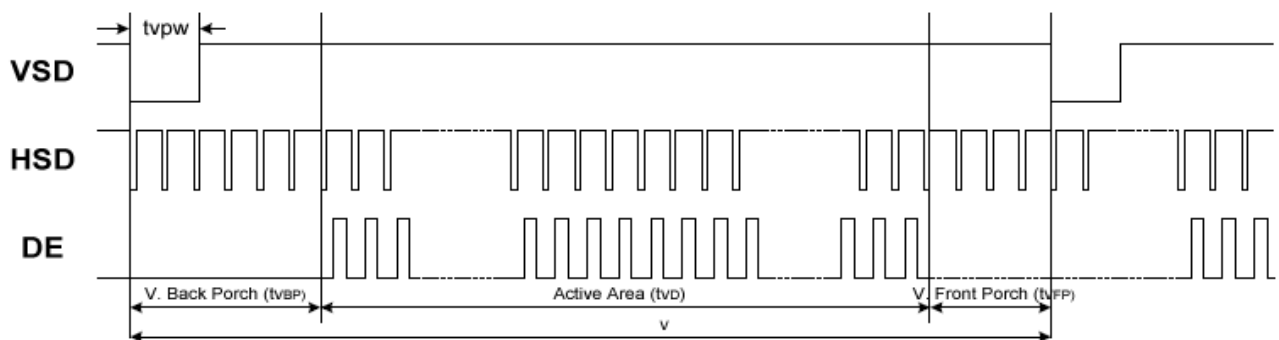
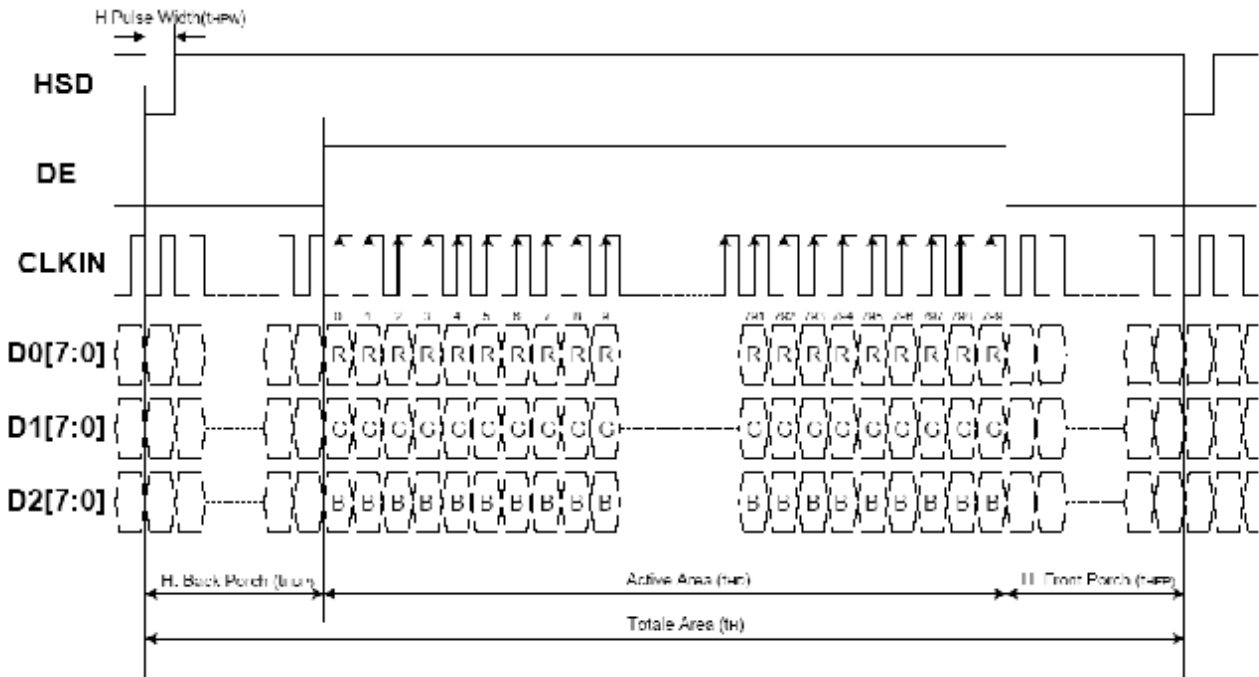
Timing

Horizontal Input Timing						
Parameter	Symbol	Value			Unit	
		Min.	Typ.	Max.		
Horizontal display area	tHD	--	800	--	CLKIN	
CLKIN frequency	fCLK	--	33.3	50	MHz	
1 Horizontal line period	tH	862	1056	1200	CLKIN	
HSD pulse width	Min.	tHPW	--	1	--	CLKIN
	Typ.		--	--	--	CLKIN
	Max.		--	40	--	CLKIN
HSD back porch	SYNC	tHBP	46	46	46	CLKIN
HSD front porch	SYNC	tHFP	16	210	354	CLKIN

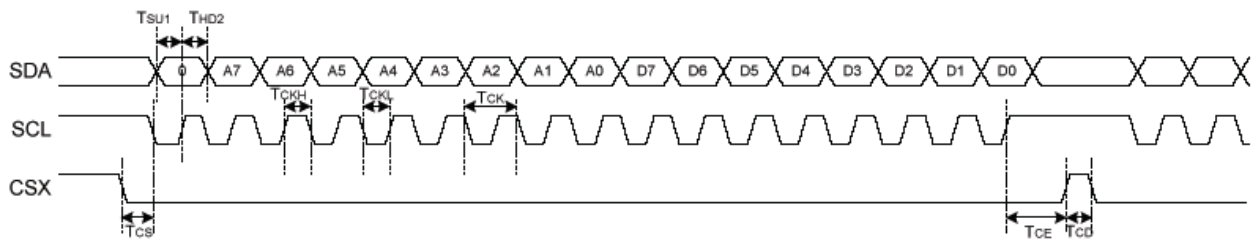
Vertical Input Timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tVD	--	480	--	HSD
VSD period time	tV	510	525	650	HSD
VSD pulse width	tVPW	1	--	20	HSD
VSD back porch	tVBP	23	23	23	HSD
VSD front porch	tVFP	7	22	147	HSD

Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
SCL period	TCK	60	--	--	ns	
SCL high width	TCKH	30	--	--	ns	
SCL low width	TCKL	30	--	--	ns	
Data setup time	TSU1	12	--	--	ns	
Data hold time	THD1	12	--	--	ns	
CSX to SCL setup time	TCS	20	--	--	ns	
CSX to SDA hold time	TCE	20	--	--	ns	
CSX high pulse width	TCD	50	--	--	ns	

Data Input Format



SPI Timing



6. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response Time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	10	20	.ms	Note 3,5	
	Tf		-	10	20	.ms		
Contrast Ratio	CR	At optimized viewing angle	500	700	-	-	Note 4,5	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0^\circ$	Wx	0.26	0.31	0.36		Note 2,6,7
			Wy	0.28	0.33	0.38		
Viewing Angle	Hor.	$CR \geq 10$	Θ_R	60	70	-	Deg.	Note 1
			Θ_L	60	70	-		
	Ver.		Φ_T	40	50	-		
			Φ_B	60	70	-		
Brightness	-	-	400	450	-	cd/m ²	Center of display	

Ta=25±2°C

Note 1: Definition of viewing angle range

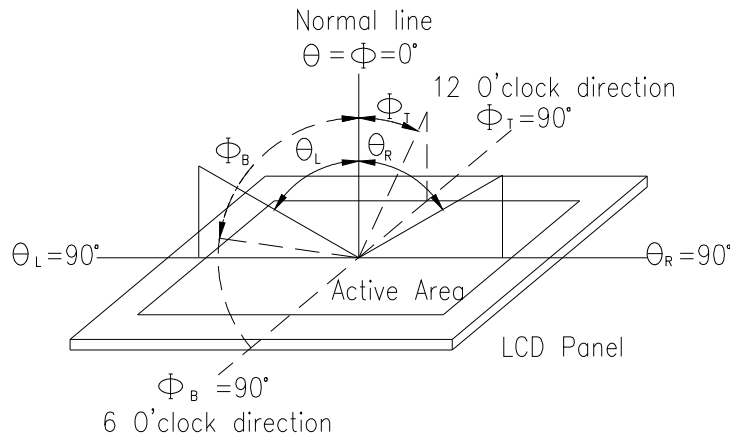


Fig. 6.1. Definition of viewing angle

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-7or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

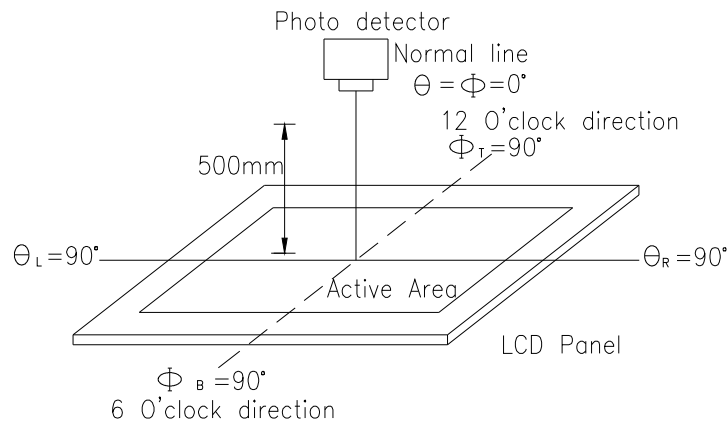
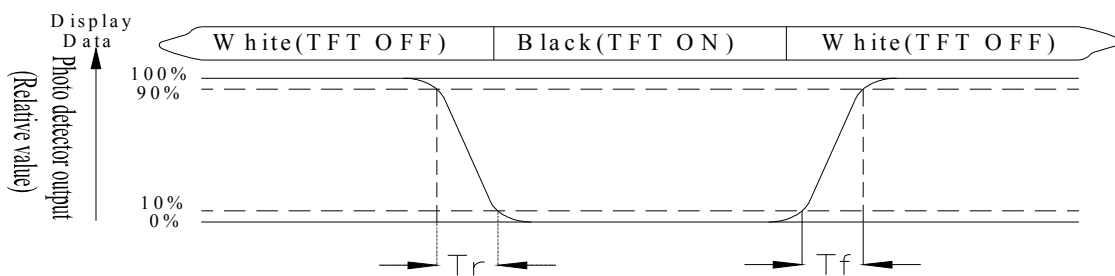


Fig. 6.2. Optical measurement system setup

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.

7. 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°C 25°C 70°C</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 : 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=800V, RS=1.5kΩ CS=100pF 1 time	—

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.