

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS1040I02-R-V1

Module Type: COG+FPC+BL

APPROVED SIGNATURE

- Approved Product Specification only
- Approved Product Specification and Samples

<u>Prepared By</u>	<u>Checked By</u>	<u>Approved By</u>

Contents

目录

1. General Description	3
3. GENERAL SPECIFICATIONS	3
4. ABSOLUTE MAXIMUM RATING	4
5. ELECTRICAL CHARACTERISTICS	5
6. DC CHARACTERISTICS	7
7. AC CHARACTERISTICS	9
8. OPTICAL CHARACTERISTICS	11
9. INTERFACE PIN CONNECTION	14
10. BLOCK DIAGRAM	16
11. QUALITY ASSURANCE	17
12. OUTLINE DRAWING	18

1. General Description

LS1040I02-R-V1 is a transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This panel has a 10.4 inches diagonally measured active display area with SVGA (800 RGB x 600) resolution. The following describes the features of this product.

2.FEATURES

- 10.4" (diagonal) inch configuration
- SVGA (800x600 pixels) resolution

3. GENERAL SPECIFICATIONS

No.	Item	Specification	Unit
1	Screen Size	10.4 (Diagonal)	inch
2	Display Resolution	800 RGB x 600	pixel
3	Dot Pitch	0.088 (H) x 0.264 (V)	mm
4	Pixel Pitch	0.264 (H) x0.264 (V)	mm
5	Active Area	211.2(H) x 158.4(V)	mm
6	Outline Dimension	228.4 (H) x 175.4 (V) x 5.9 (D)	mm
7	Pixel Configuration	RGB-Stripe	--
8	Color Depth	16.2M	colors
9	LCD Type	TM TN	--
10	Interface Type	Digital 24bit RGB	--
11	Surface Treatment	3H	--
12	View direction (Gray inversion)	6 o'clock	--
13	Weight	379	g

4. ABSOLUTE MAXIMUM RATING

(Ta = 25 ± 2°C)

Item	Symbol	Values		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-30	80	°C	
Operation Temperature	T _{OP}	-20	70	°C	
Digital Supply Voltage	VCC	-0.3	5	V	(1)
Analog Power Supply Voltage	AVDD	-0.5	15	V	(1)
TFT Device on voltage	V _{GH}	-0.3	42	V	(1)
TFT Device off voltage	V _{GL}	V _{GH} - 42	0.3	V	(1)

Note:

- (1) All of the voltages listed above are with respect to GND= 0V
- (2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

5. ELECTRICAL CHARACTERISTICS

5-1. Operating Conditions:

(Ta = 25 ± 2°C)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	VCC	3.0	3.3	3.6	V	
Digital Supply Current	I _{CC}	-	6	12	mA	Black Pattern
Analog Power Supply Voltage	AVDD	10.3	10.5	10.7	V	
Analog Supply Current	I _{AVDD}	32	40	60	mA	Black Pattern
TFT Device on voltage	V _{GH}	-	18	-	V	
TFT Device off voltage	V _{GL}	-	-7	-	V	
Common Electrode Driving Voltage	VCOM	4.15	4.45	4.75	V	
LED Reverse Voltage	V _r			1.5	V	For single LED
LED Forward Current	I _f		20	30	mA	For single LED

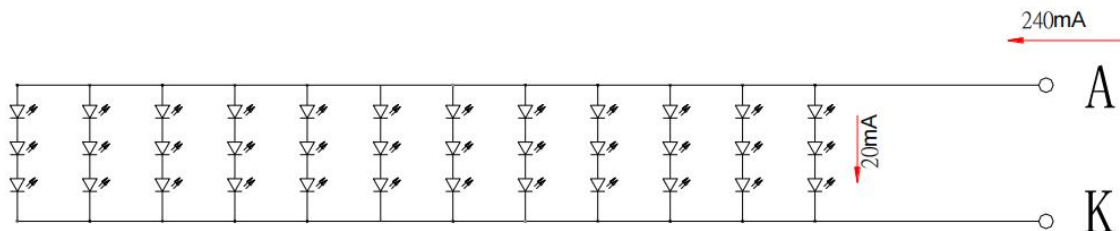
5-2. Backlight Driving Conditions:

(Ta = 25 ± 2°C)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P _{BL}	--	2.16	2.52	W	--
LED Current	I _F	--	240	--	mA	--
Backlight Voltage	V _{BL}	--	9.0	10.5	V	--
LED Life Time	--	35000	--	--	hrs	(1)

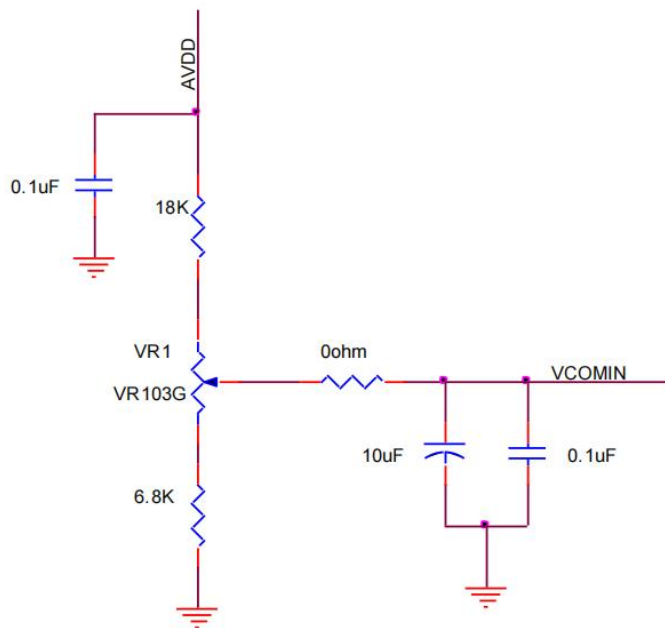
Note:

(1) Brightness to be decreased to 50% of the initial value

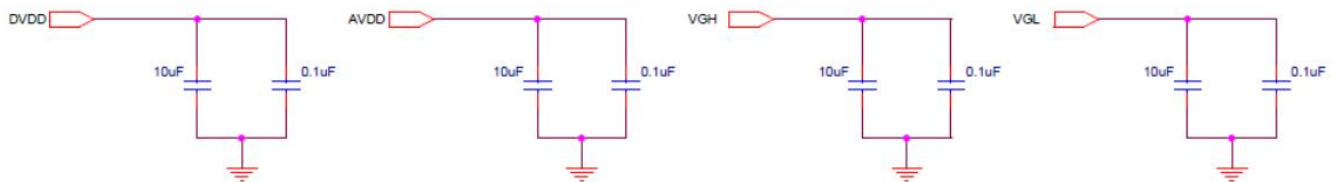


5-3. Vcom circuit

Typ. VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR;



Advice circuit



6. DC CHARACTERISTICS

6.1 Parameter

(Ta = 25 ± 2°C)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Low Level Input Voltage	V _{IL}	0	-	0.3VCC	V	(1)
High Level Input Voltage	V _{IH}	0.7 VCC	-	VCC	V	(1)

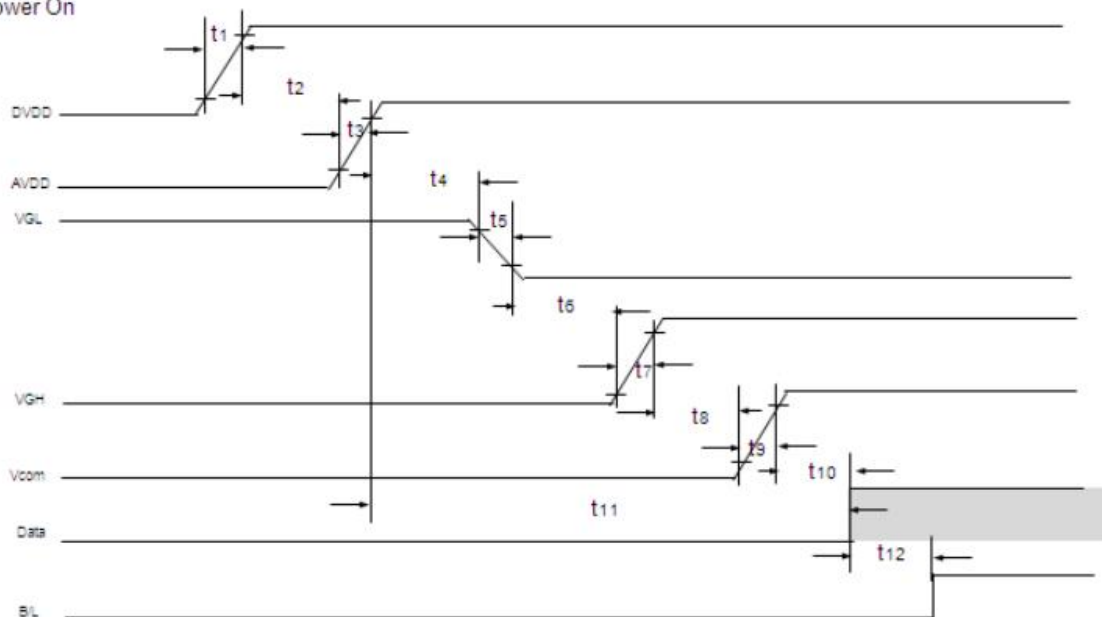
Note:

(1) For Digital Circuit

6.2 Power Sequence

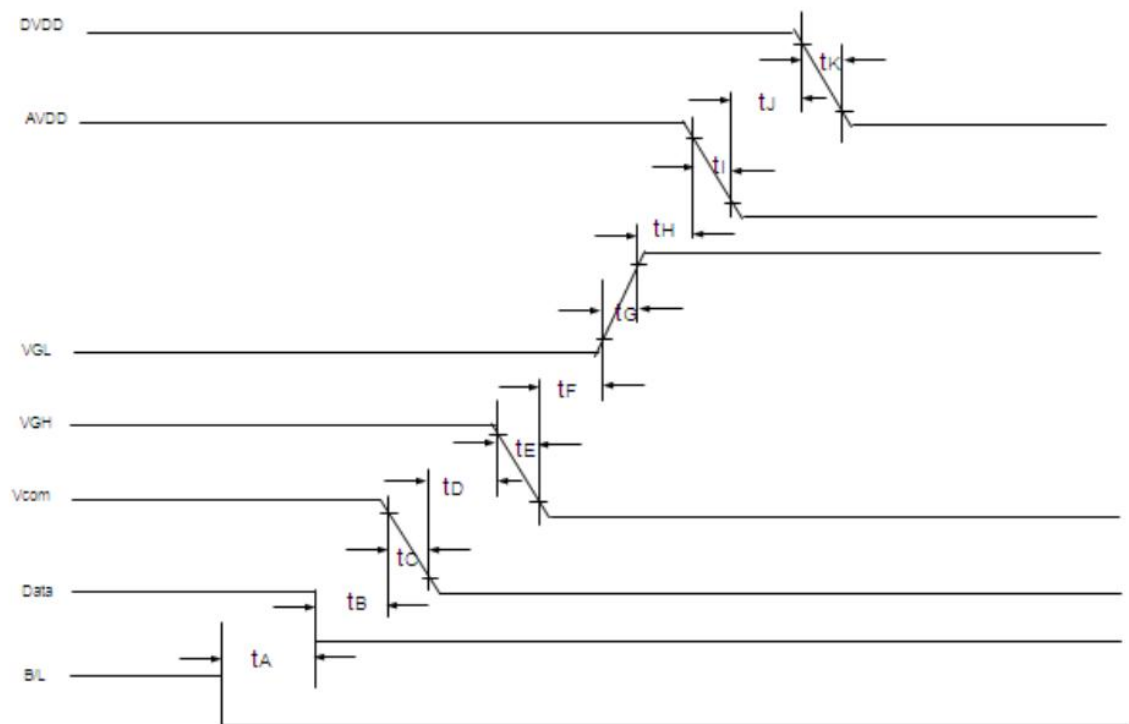
The LCD panel power ON/OFF sequence is as below

Power On



Symbol	Value			Unit	Note
	Min.	Typ.	Max.		
t1	0.1	-	20	ms	
t2	16	-	-	ms	
t3	0.1	-	10	ms	
t4	5	-	-	ms	
t5	0.1	-	10	ms	
t6	5	-	-	ms	
t7	0.1	-	10	ms	
t8	5	-	-	ms	
t9	0.1	-	10	ms	
t10	20	-	-	ms	
t11	38	-	80	ms	
t12	200	-	-	ms	

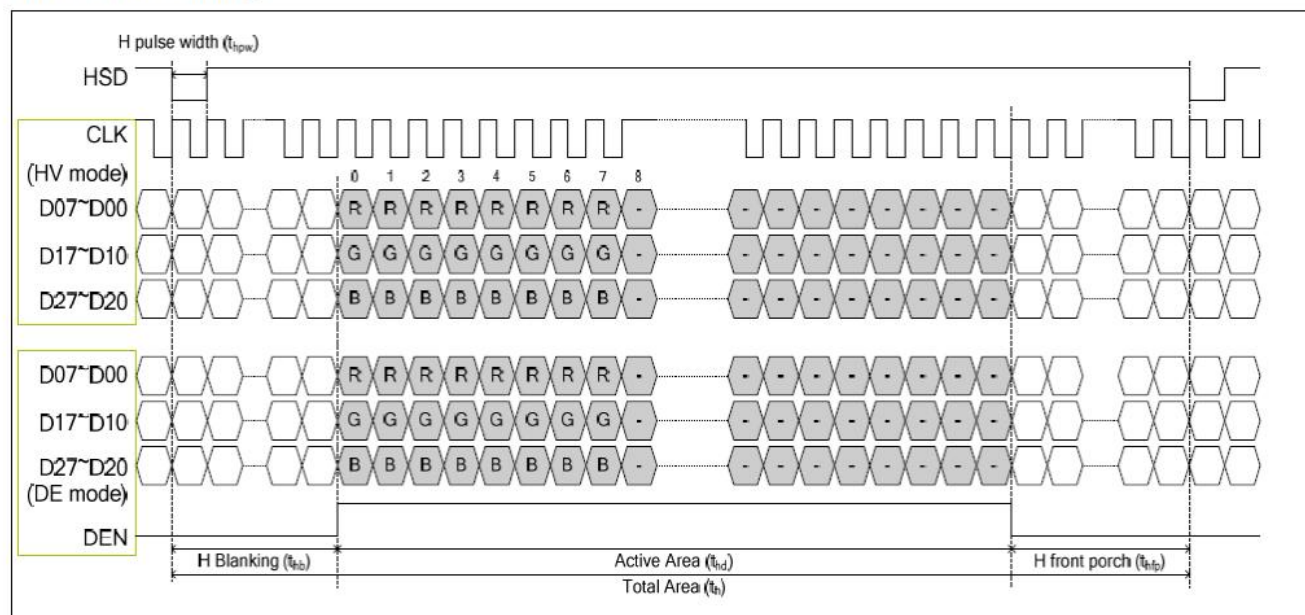
Power Off



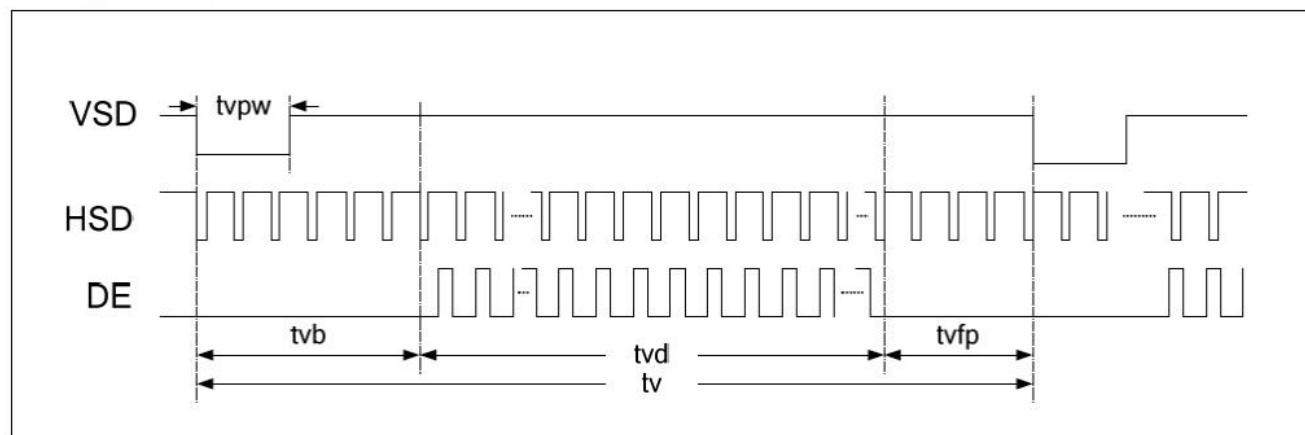
7. AC CHARACTERISTICS

7.1. Data Timing (Under frame rate is equal to 60Hz)

Horizontal Timing



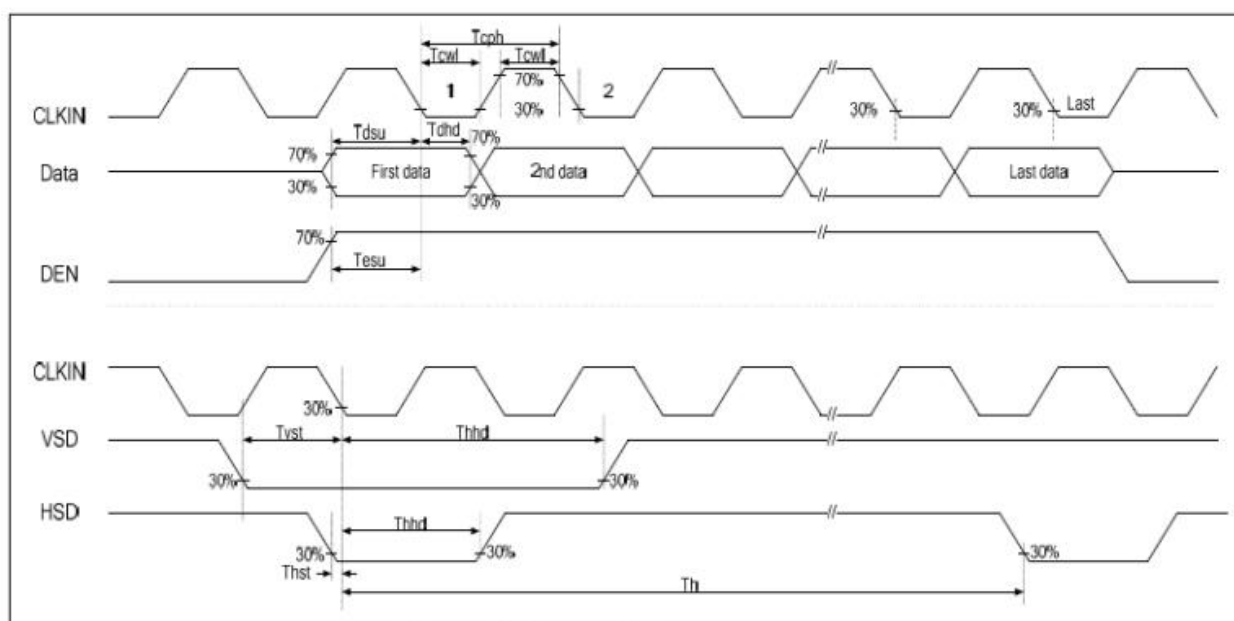
Vertical Timing



7.3. AC Electrical characteristic

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew Rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us
Repair OPA Output Stable time	T_{Rsst}	-	-	6	ns

7.4. Input Clock and Data Timing Waveform



8. OPTICAL CHARACTERISTICS

(Ta = 25 ± 2°C, If=20mA)

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Contrast Ratio		CR	Viewing normal angle $\theta=0^{\circ}$ $\Phi=0^{\circ}$ B/L On	300	500	--	--	(2),(4), (6)
Brightness		B		400	450	--	cd/m ²	
Response time		T _r		--	10	20	ms	(3)
		T _f		--	15	30	ms	
Chromaticity	Red	R _x		0.523	0.573	0.623	--	(2)(5)(6)
		R _y		0.30	0.350	0.40	--	
	Green	G _x		0.286	0.336	0.386	--	
		G _y		0.547	0.597	0.647	--	
	Blue	B _x		0.102	0.152	0.202	--	
		B _y		0.062	0.112	0.162	--	
	White	W _x		0.26	0.31	0.36	--	
		W _y		0.28	0.33	0.38	--	
Viewing Angle	Hor.	θ_L	CR ≥ 10 B/L On	60	70	-	deg.	(1)
		θ_R		60	70	-		
	Ver.	Φ_T		40	50	-		
		Φ_B		50	60	-		
NTSC		--	--	--	50	--	%	
Uniformity		--	--	--	80	--	%	(7)

Note:

(1) Definition of viewing angle range

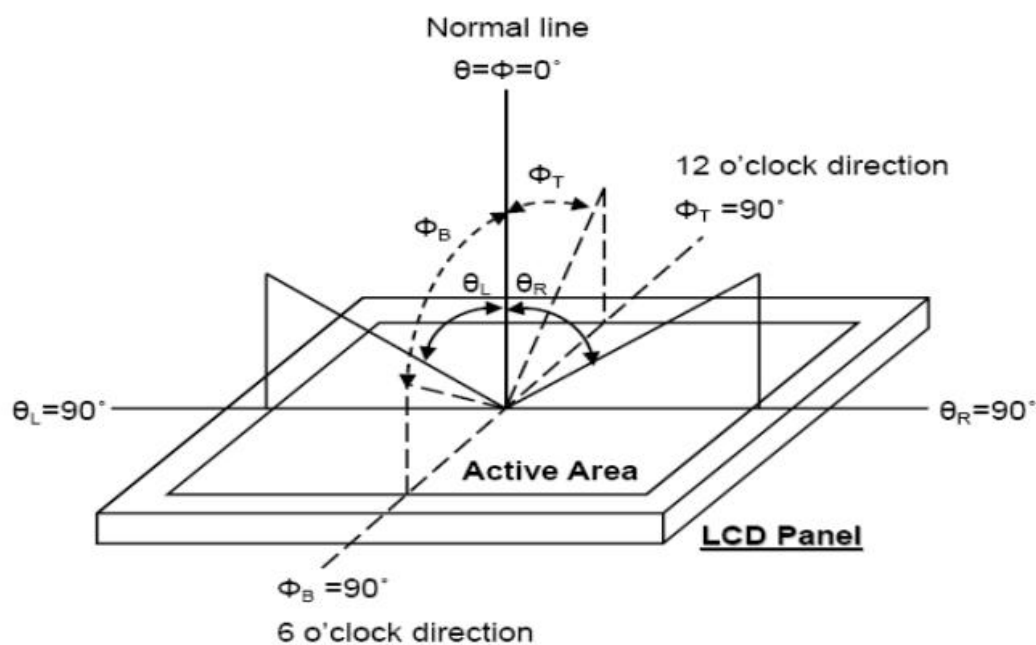


Fig. 8-1 Definition of viewing angle

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

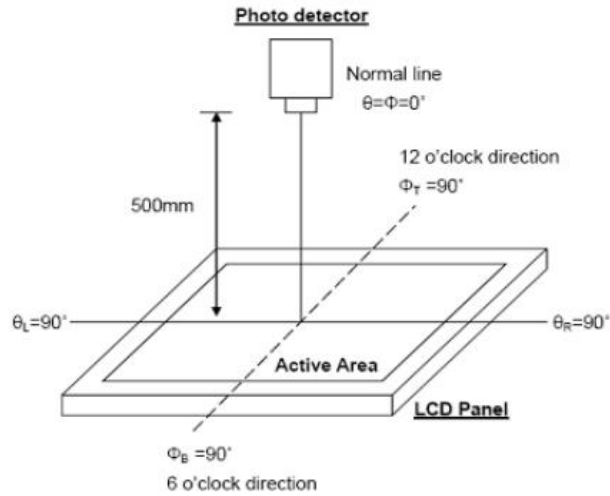


Fig. 8-2 Optical measurement system setup

(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%.

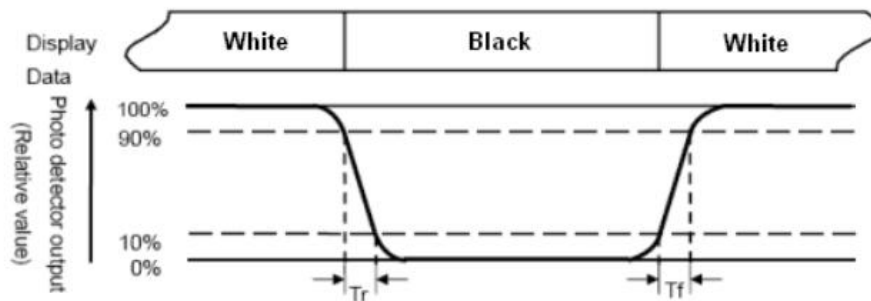


Fig. 8-3 Definition of response time

(4) Definition of contrast ratio:

The contrast ratio is defined as the following expression.

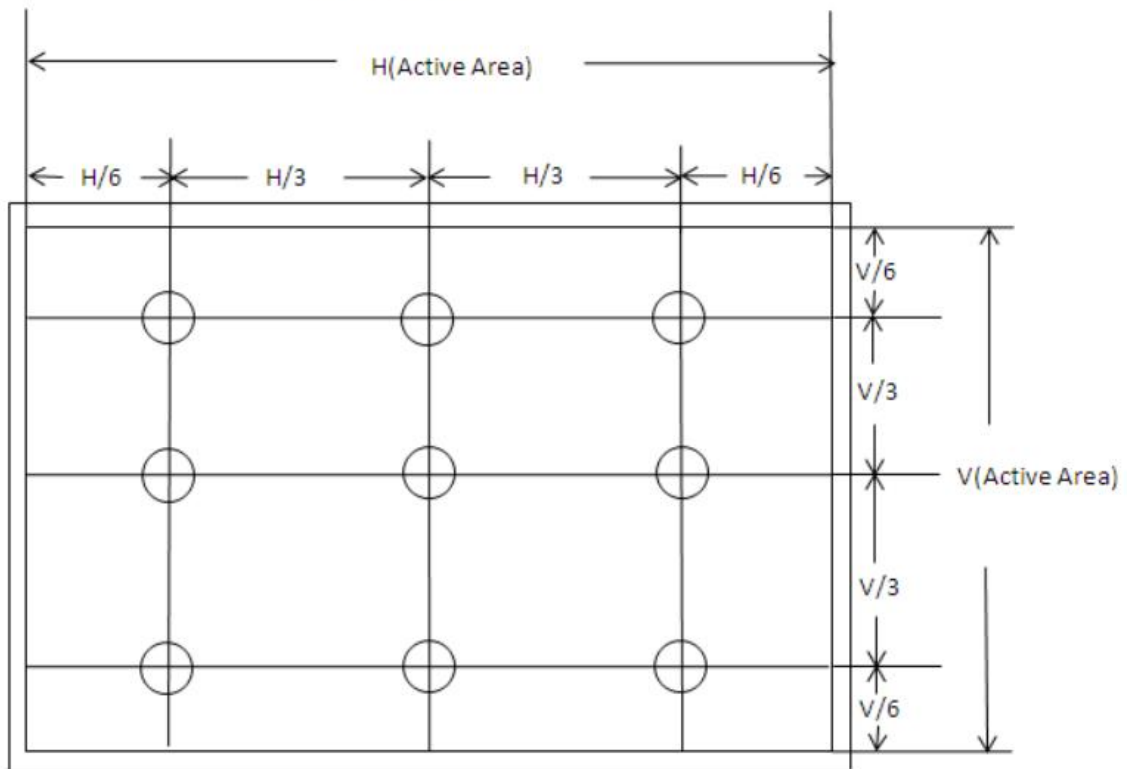
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

(5) Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

(6) Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$(7) \text{ Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$



9.INTERFACE PIN CONNECTION

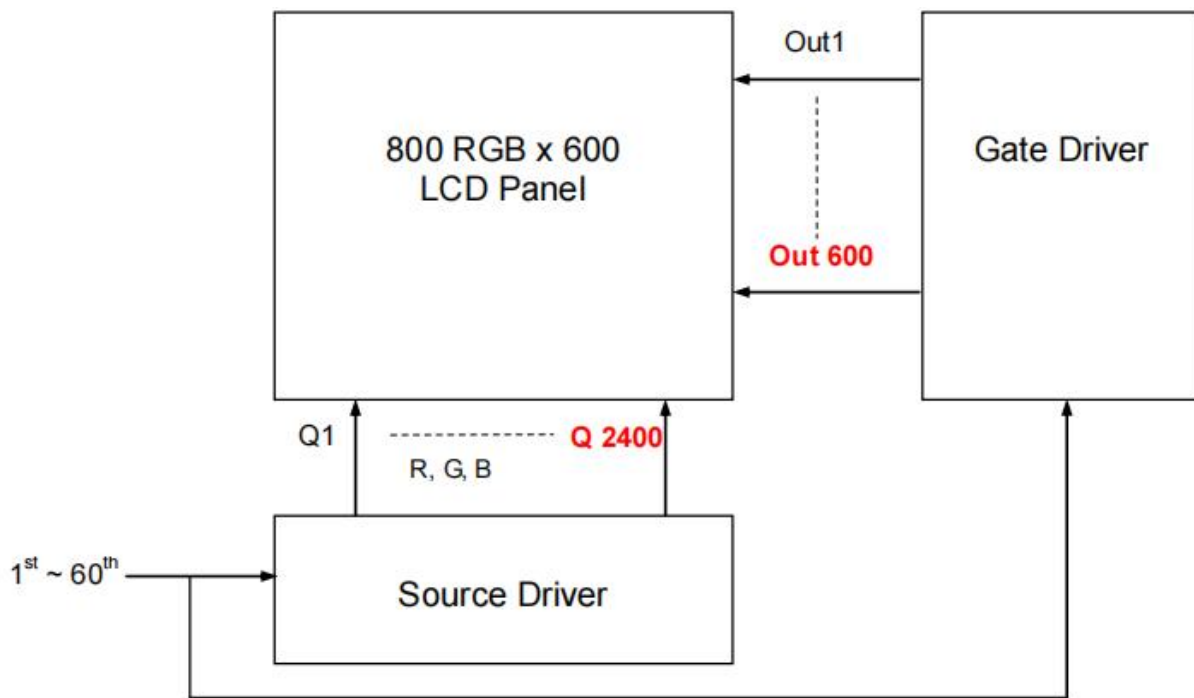
Pin	Symbol	I/O	Function	Remark
1	GND	G	Power Ground	
2	AVDD	P	Analog input voltage	
3	VCC	P	Digital input voltage	
4	R0	I	Red data input (LSB)	
5	R1	I	Red data input	
6	R2	I	Red data input	
7	R3	I	Red data input	
8	R4	I	Red data input	
9	R5	I	Red data input	
10	R6	I	Red data input	
11	R7	I	Red data input (MSB)	
12	G0	I	Green data input (LSB)	
13	G1	I	Green data input	
14	G2	I	Green data input	
15	G3	I	Green data input	
16	G4	I	Green data input	
17	G5	I	Green data input	
18	G6	I	Green data input	
19	G7	I	Green data input (MSB)	
20	B0	I	Blue data input (LSB)	
21	B1	I	Blue data input	
22	B2	I	Blue data input	
23	B3	I	Blue data input	
24	B4	I	Blue data input	
25	B5	I	Blue data input	
26	B6	I	Blue data input	
27	B7	I	Blue data input (MSB)	
28	CLKIN	I	Dot clock input	
29	DEN	I	Data enable signal	
30	HSD	I	HSYNC signal	
31	VSD	I	VSYNC signal	

32	MODE	I	H: DE mode (Default) L: SYNC mode	
33	NC	I	No connect (please leave it open)	
34	NC	I	No connect (please leave it open)	
35	NC	-	No connect (please leave it open)	
36	VCC	P	Digital input voltage	
37	NC	-	No connect (please leave it open)	
38	GND	G	Power Ground	
39	GND	G	Power Ground	
40	AVDD	P	Analog input voltage	
41	VCOM	P	VCOM DC input	
42	DITH	I	Dithering function setting H: Disable dithering function L: Enable dithering function	
43	NC	-	No connect (please leave it open)	
44	VCOM out	O	connect a capacitor	
45	NC		No connect (please leave it open)	
46	NC		No connect (please leave it open)	
47	NC		No connect (please leave it open)	
48	NC		No connect (please leave it open)	
49	NC		No connect (please leave it open)	
50	NC		No connect (please leave it open)	
51	NC		No connect (please leave it open)	
52	NC		No connect (please leave it open)	
53	NC		No connect (please leave it open)	
54	NC		No connect (please leave it open)	
55	NC	-	No connect (please leave it open)	
56	VGH	P	TFT turn on voltage	
57	VCC	P	Digital input voltage	
58	VGL	P	TFT turn off voltage	
59	GND	G	Power Ground	
60	NC	-	No connect (please leave it open)	

Note:

(1) Suggested connector: MT-FP160N-2FR (UJU) or any equivalent

10.BLOCK DIAGRAM



11.QUALITY ASSURANCE

No.	Test Items	Test Condition	Note
1	High Temperature Storage Test	Ta=80℃ Dry 240h	
2	Low Temperature Storage Test	Ta=-30℃ Dry 240h	
3	High Temperature Operation Test	Ta=70℃ Dry 240h	
4	Low Temperature Operation Test	Ta=-20℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=50℃ 80%RH 240h	
6	Electro Static Discharge Test	Panel surface / top case Contact / Air : ±6KV / ±8KV , 150pF , 330Ω	Non-operating
7	Shock Test (non-operating)	Shock Level : 180G Waveform: Half Sinusoidal wave Shock Time : 2ms 3 Axis for all six faces/ each	
8	Vibration Test (non-operating)	Frequency Range: 10~500Hz/ Sweep: 1.5G Amplitude: 0.37 oct/min For 3 Axis 1hrs/axis	
9	Thermal Shock Test	-20℃ (0.5Hr) ~ +60℃ (0.5Hr) for 100 cycles	

Note:

(1) All the cosmetic specifications are judged before the reliability stress.

12. OUTLINE DRAWING

