TFT LCD Approval Specification

MODEL NO.: Q07021-701

Customer : _____

Approved by : _____

Note :

紀錄	工作	審核	角色	投票
2009-12-04	Approval by Dept. Mgr.(QA RA)	Kuo-Cheng Ko	Department Manager (QA RA)	Accept
2009-12-04	Approval by Dept. Mgr.(PD)	Lifen Chou	Department Manager (PD)	Accept
2009-12-04	Approval by Dept. Mgr.(PM)	Jessie Chu	Department Manager (PM)	Accept

Contents

Record of Revision

Version	Date	Page (New)	Section	Description
Ver2.0	2009/10/15	All	All	New Creation
Ver2.1	2009/12/04	14	8	Pin7 Function content correct General Specifications add Surface Treatment item Outline Drawing update

1. Summary

This technical specification applies to 7.0“color TFT-LCD panel. This product is composed of TFT LCD panel, driver ICs, FPC and a backlight unit. This module follows RoHS

2. Features

High Resolution: 1,440,000 Dots (800 RGB x 600).

Application: Industrial Display, Instrument, Game Machine application and other electronic products which require high quality flat panel displays.

3. General Specifications

No.	Item	Specification	Unit
1	Screen Size	7(Diagonal)	inch
2	Display Resolution	800RGB x 600	pixel
3	Dot Pitch	0.059 (H) x 0.177(V)	um
4	Pixel Pitch	0.177(H) x 0.177(V)	um
5	Active Area	141.6(H) x 106.2(V)	mm
6	Outline Dimension	154.00(W) x 119.20(H) x 5.1(D)	mm
7	Pixel Configuration	RGB-Stripe	--
8	Color Depth	262k	colors
9	LCD Type	TM TN	--
10	Interface Type	Digital 18bit RGB	--
11	View direction (Gray inversion)	6 o’clock	--
12	Surface Treatment	Anti-glare	--
13	Weight	135 (typical)	g

4. Absolute Maximum Rating

(Ta = 25 ± 2℃)

Item	Symbol	Values		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	80	℃	(1)(2)
Operation Temperature	T_{OP}	-10	70	℃	(1)(2)
Digital Supply Voltage	VCC	-0.3	5.0	V	(1)(2)
Analog Power Supply Voltage	AVDD	-0.5	15	V	(1)(2)
TFT Device on voltage	V_{GH}	-0.3	42	V	(1)(2)
TFT Device off voltage	V_{GL}	V_{GH} - 42	0.3	V	(1)(2)
LED Reverse Voltage	Vr	--	5	V	(1)(2)(3)
LED Forward Current	If	--	30	mA	(1)(2)(3)

Note: (1) All of the voltages listed above are with respective to GND= 0V

(2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

(3)For single LED

5. Electrical Characteristics

5.1. Operating Conditions:

(Ta = 25 ± 2℃)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	VCC	3.0	3.3	3.6	V	
Analog Power Supply Voltage	AVDD	--	12.0	--	V	
Digital Operating Current	I_{VCC}	--	9	15	mA	(1)
Analog Operating Current	I_{AVDD}		30	45	mA	(1)
Frame Frequency	F_{Frame}	--	60	--	Hz	
TFT Device on voltage	V_{GH}	--	16	--	V	
TFT Device off voltage	V_{GL}	--	-7	--	V	
Common Power Supply Voltage	V_{COM}	--	(4.9)	--	V	(2)
Gamma Voltage	V1	--	10.58	--	V	
	V2	--	8.83	--	V	
	V3	--	8.29	--	V	
	V4	--	7.93	--	V	
	V5	--	6.79	--	V	
	V6	--	5.78	--	V	
	V7	--	3.87	--	V	
	V8	--	3.36	--	V	
	V9	--	2.72	--	V	
	V10	--	0.59	--	V	
Logic High Input Voltage	V_{IH}	0.7 V_{cc}	-	V_{cc}	V	
Logic Low Input Voltage	V_{IL}	0	-	0.3 V_{cc}	V	

Note:

(1) Test condition: VCC = 3.3 volts ; Test Pattern : Black

(2) Please adjust VCOM to make the flicker level be minimum.

(3)

5.2. Backlight Driving Conditions:

(Ta = 25 ± 2℃)

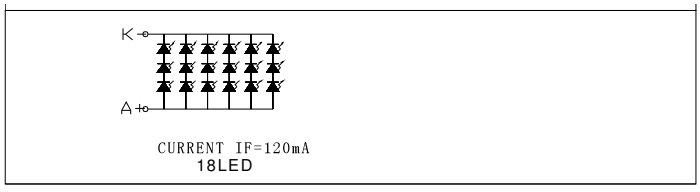
(1)

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	1188	1260	mW	
LED Current	I_F	-	120	-	mA	
Backlight Voltage	V_{BL}	-	9.9	10.5	V	
Life Time	--	10,000	--	--	hr	(1)

Note:

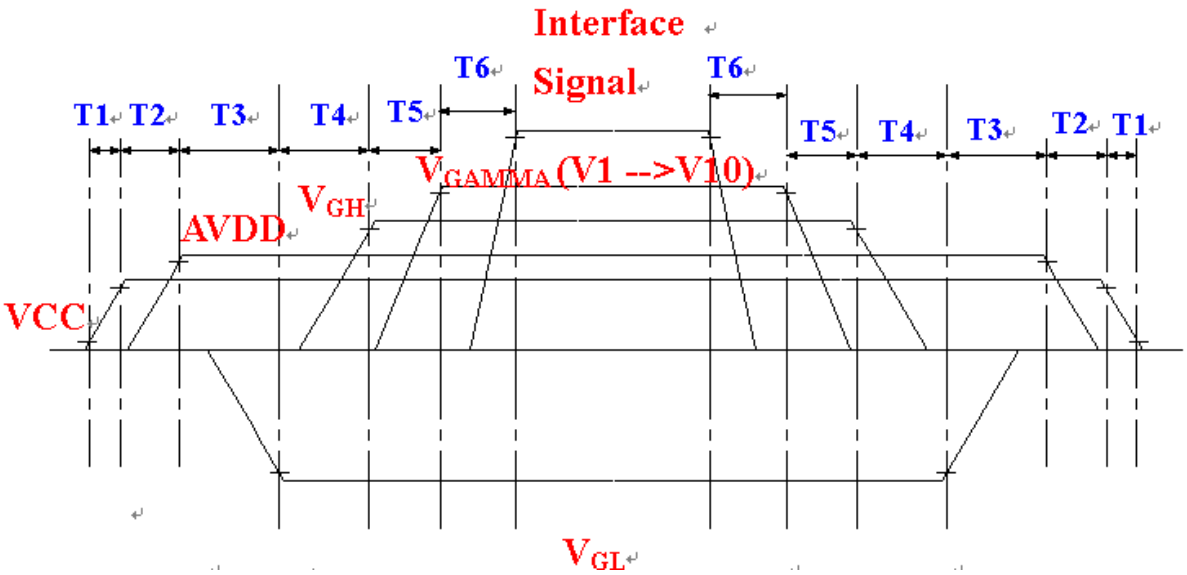
Brightess to be decreased to 50% of the initial value

(2)There are 6 Groups LED shown as below, V_{LED}=9.9V



6. AC Characteristics

6.1. Power On/Off Sequence



	Min.	Typ.	Max.	Unit
T1	-	-	20	ms
T2	16	-	-	ms
T3	> 0			ms
T4	>0			ms
T5	>0			ms
T6	>0			ms

6.2. Data Timing

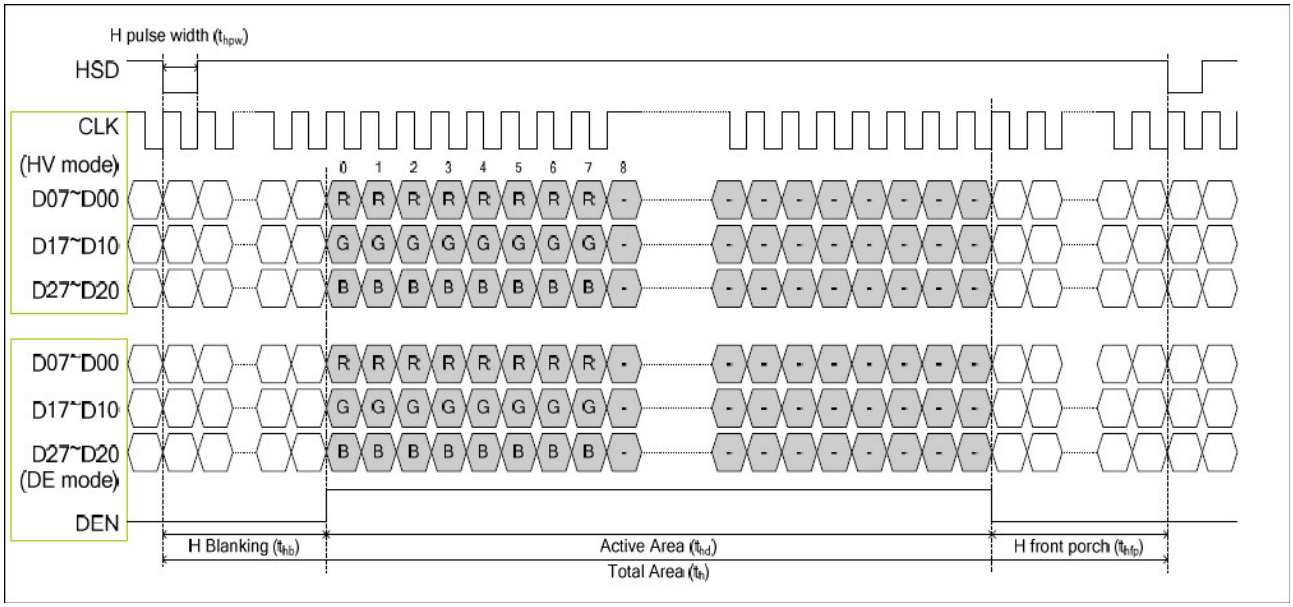
Horizontal Timing

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd		800		CLK
CLK Frequency	fclk	-	40	50	MHz
One Horizontal Line	th	-	1000	-	CLK
HS Pulse Width	thpw	1	48	-	CLK
HS Back Porch	thb	-	88	-	CLK
HS Front Porch	thfp	-	112	-	CLK
DE mode Blanking	th-thd	85	120	-	CLK

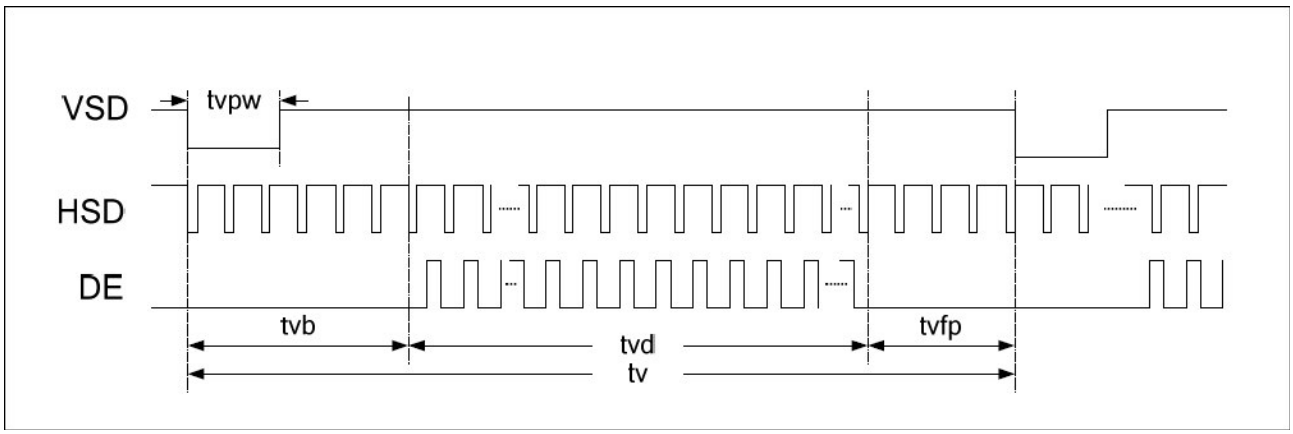
Vertical Timing

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	-	600	-	th
VS Period Time	tv	-	660	-	th
VS Pulse Width	tvpw	-	3	-	th
VS Back Porch	tvb	-	39	-	th
VS Front Porch	tvfp	-	21	-	th

Horizontal Timing

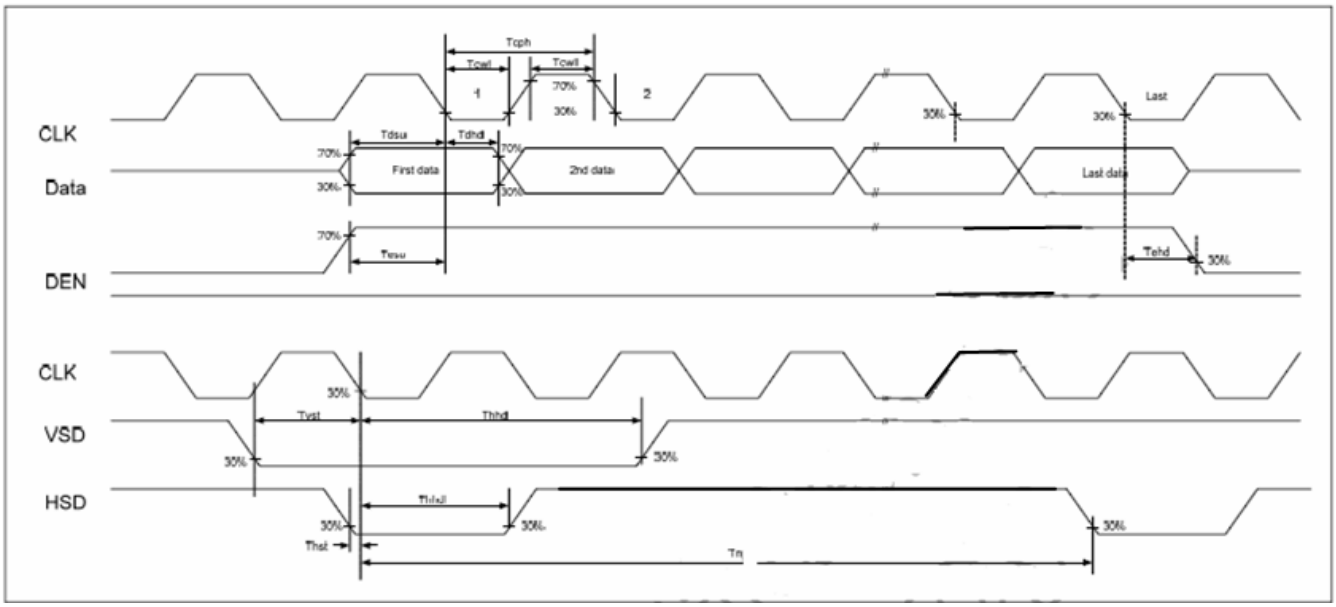


Vertical Timing



6.3. AC Timing Diagrams

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



7. Optical Characteristics

(Ta = 25 ± 2℃, I_F=20mA)

Note:

(1)

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Contrast Ratio		CR	Viewing normal angle θ= 0° Φ= 0° B/L On	300	400	--	--	(2),(4),(6)
Brightness		B		200	250	--	cd/m^2	
Response time		T_r		--	5	10	ms	(3)
		T_f		--	15	20	ms	
Chromaticity	Red	Rx			0.552		--	(2)(5)(6)
		Ry			0.367		--	
	Green	Gx			0.340		--	
		Gy			0.577		--	
	Blue	Bx			0.154		--	
		By			0.113		--	
	White	Wx			0.31		--	
		Wy			0.33		--	
Viewing Angle	Hor.	θ_L	CR≧10 B/L On	--	70	--	deg.	(1)
		θ_R		--	70	--		
	Ver.	Φ_T		--	50	--		
		Φ_B		--	70	--		
NTSC		--	--	--	45	--	%	
Uniformity		--	--		80	--	%	(7)

Definition of viewing angle range

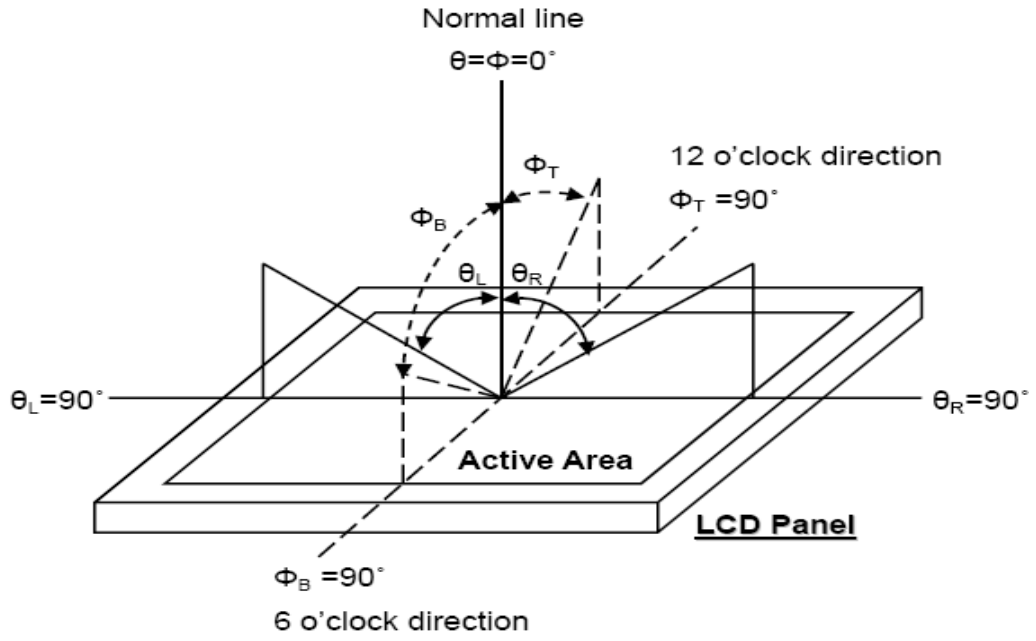


Fig. 8-1 Definition of viewing angle

(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.

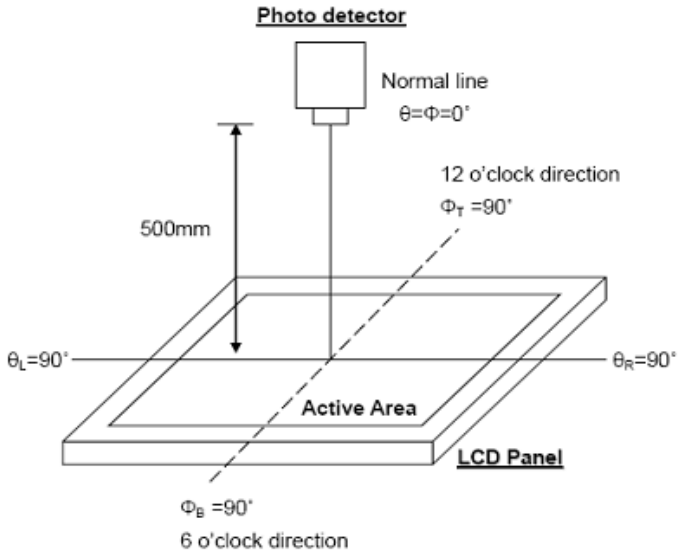


Fig. 8-2 Optical measurement system setup

(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, 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 from10% to 90% .

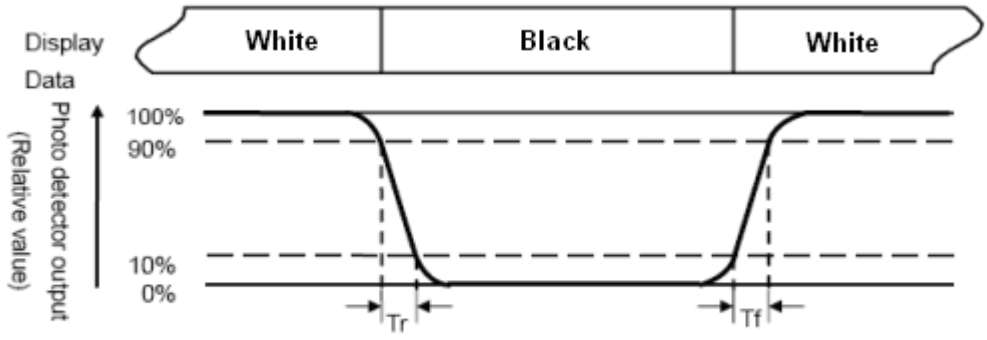


Fig. 8-3 Definition of response time

(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.

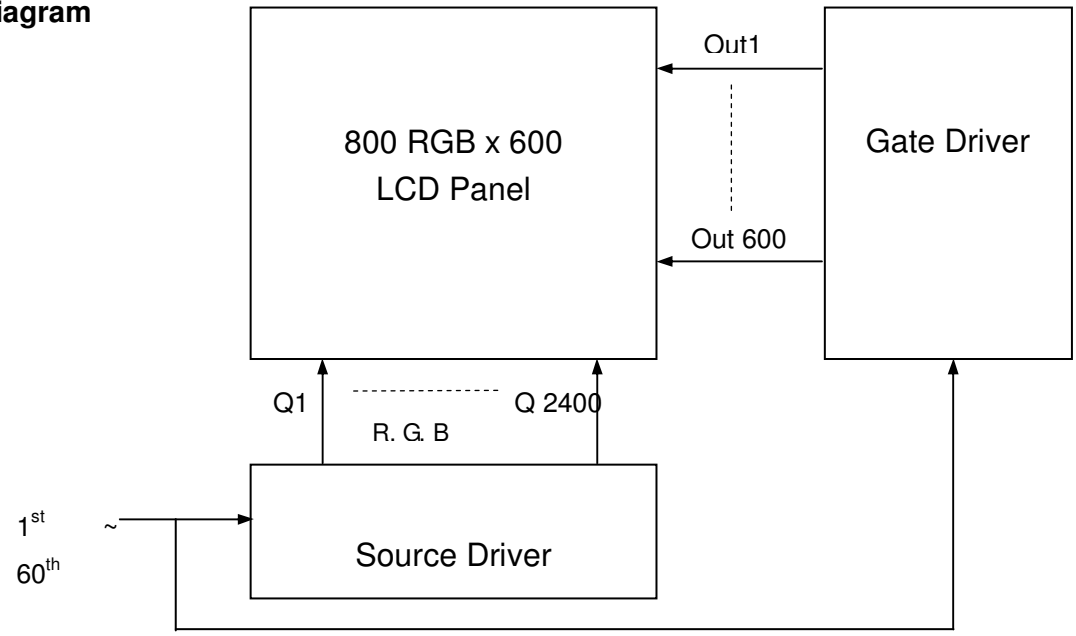
$$\text{(7) Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

8. Interface Pin Connection

Pin	Symbol	I/O	Function	Remark
1	NC	-	NC	
2	NC	-	NC	
3	NC	-	NC	
4	NC	-	NC	
5	NC	-	NC	
6	GND	I	Power Ground	
7	EDGSL	I	When EDGSL=**H**, Latch Data By Rising Edge of CLK. When EDGSL=**L**, CLK Polarity is Inverted, Latch Data by Falling Edge of CLK.	
8	VCC	I	Digital Power Supply (+3.3V)	
9	V9	I	Gamma voltage level 9	
10	VGL	I	Gate OFF power supply voltage	
11	V2	I	Gamma voltage level 2	
12	VGH	I	Gate ON power supply voltage	
13	V6	I	Gamma voltage level 6	
14	RESETB	I	Hardware Global Reset. Low Active. (Default Pull high)	
15	VCOM	I	Common electrode voltage input	
16	GND	I	Power Ground	
17	AVDD	I	Analog Power Supply	
18	NC	-	NC	
19	NC	-	NC	
20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	I	Power ground	
24	R5	I	Red data (MSB)	
25	R4	I	Red data	
26	R3	I	Red data	
27	R2	I	Red data	
28	R1	I	Red data	

29	R0	I	Red data (LSB)	
30	GND	I	Power ground	
31	GND	I	Power ground	
32	G5	I	Green data (MSB)	
33	G4	I	Green data	
34	G3	I	Green data	
35	G2	I	Green data	
36	G1	I	Green data	
37	G0	I	Green data (LSB)	
38	DE	I	Input Data Enable Control. When DE Mode. Active High To Enable Data Input. (Default Pull Low)	
39	NC	-	NC	
40	GND	I	Power ground	
41	DCLK	I	Clock Signal Input. When CLK=H, User Can Input Different Polarity CLK By EDGSL Setting. When CLK=L, User Can Select CLK Rising Or Dual Edge To Latch By EDGSL Setting.	
42	VCC	I	Digital Power Supply (+3.3V)	
43	NC	-	NC	
44	NC	-	NC	
45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data (LSB)	
51	NC	I	NC	
52	V1	I	Gamma voltage level 1	
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	NC	-	NC	
57	NC	-	NC	
58	AVDD	I	Analog Power Supply	
59	GND	I	Power ground	
60	VCOM	I	Common electrode voltage input	

9. Block Diagram



10. Quality Assurance

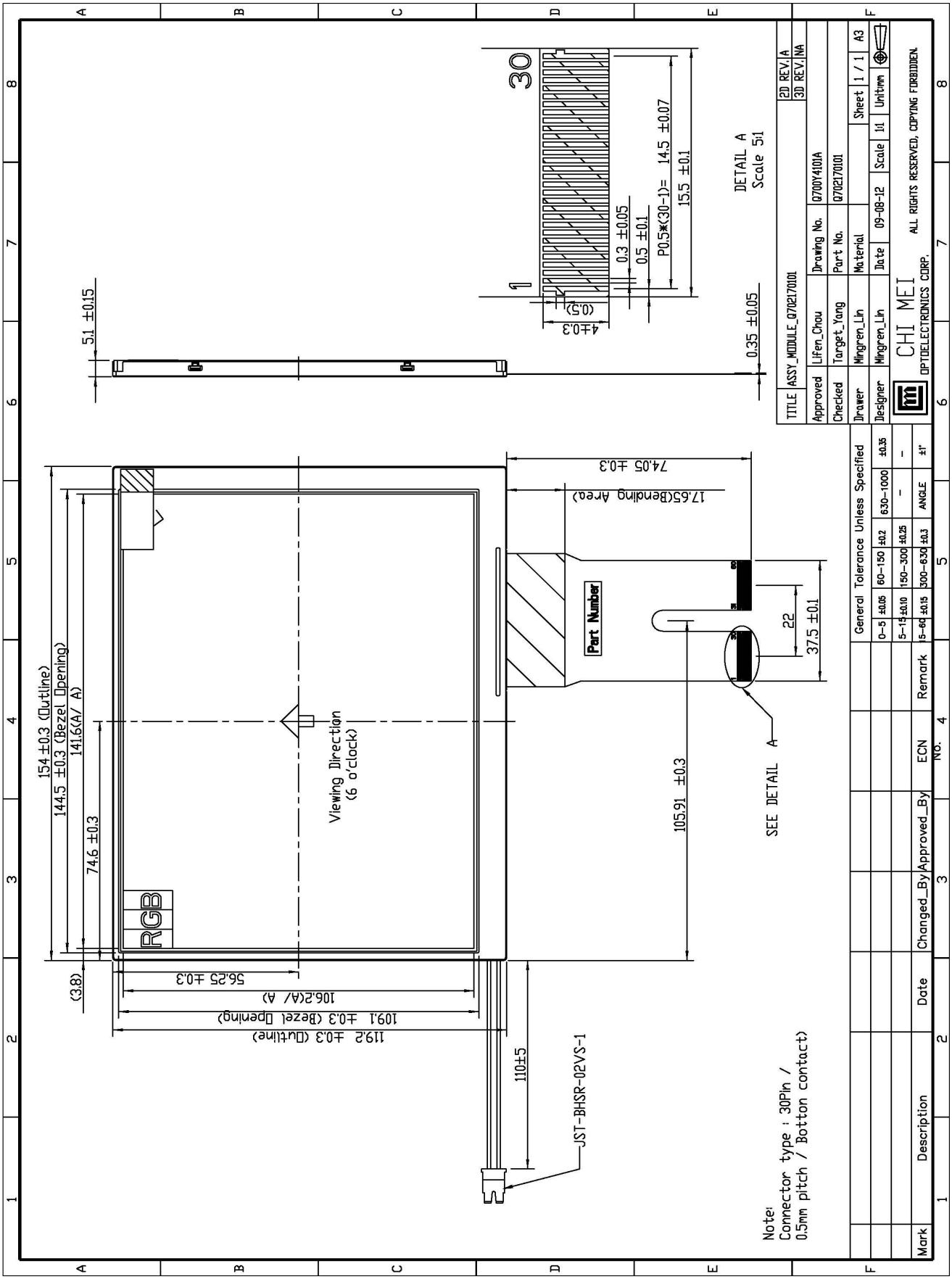
No.	Test Items	Test Condition	Note
1	High Temperature Storage Test	Ta=80℃ Dry 240h	
2	Low Temperature Storage Test	Ta=-30℃ Dry 240h	
3	High Temperature Operation Test	Ta=70℃ Dry 240h	
4	Low Temperature Operation Test	Ta=-20℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60℃ 90%RH 240h	
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	-30℃(0.5Hr) ~ +80℃(0.5Hr) for 100 cycles	

Note:

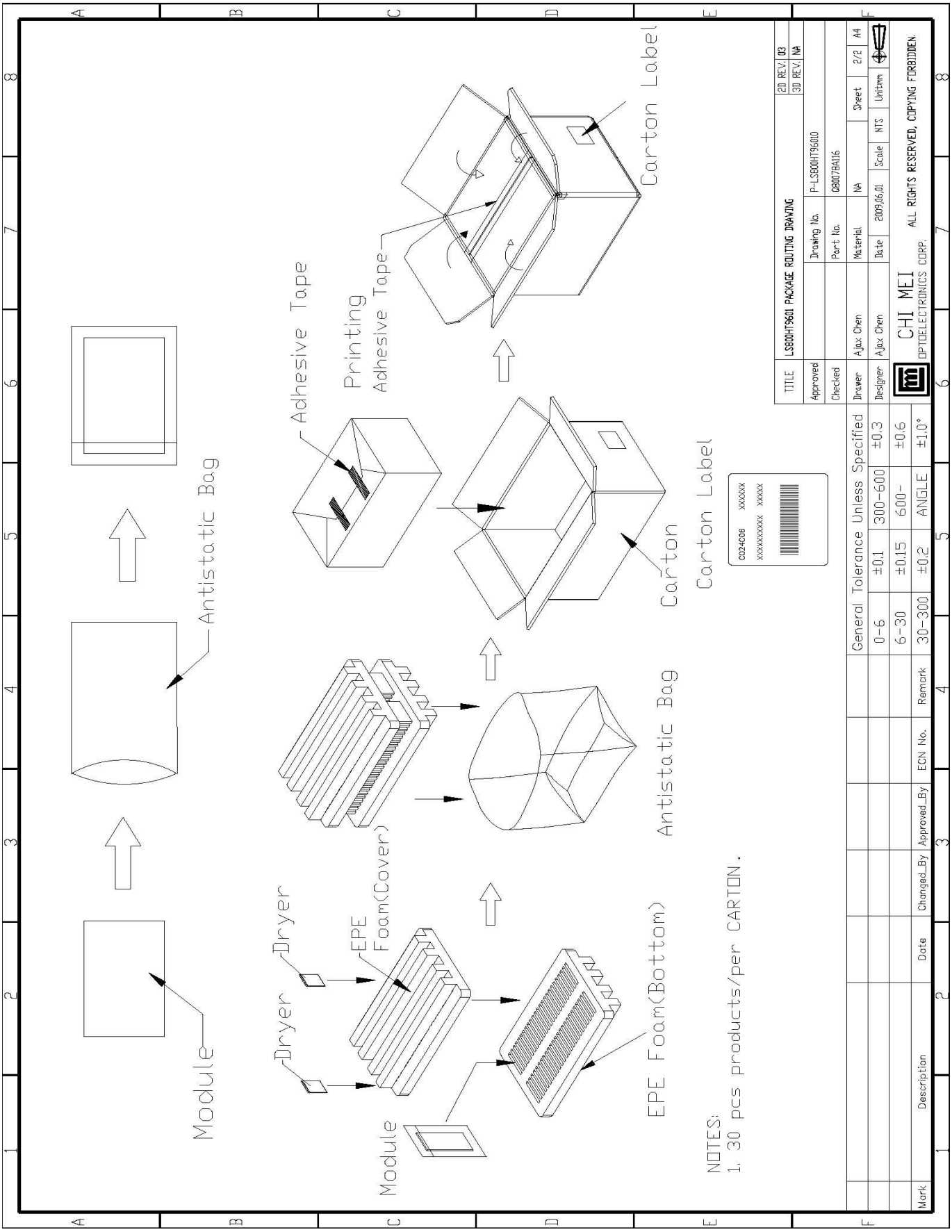
(1) The test samples have recovery time for 4 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.

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

11. Outline Drawing



12. Package Form



13. Precautions

Please pay attention to the following when you use this TFT-LCD module.

13.1 Mounting Precautions

(1) You must mount a module using arranged in four corners or four sides.

(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.

(3) Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(4) You should adopt radiation structure to satisfy the temperature specification.

(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)

(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(9) Do not open the case because inside circuits do not have sufficient strength.

13.2 Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : V=±200mV(Over and under shoot voltage)

(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)

(3) Brightness depends on the temperature. (In lower temperature, it becomes lower)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.

(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

13.3 Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

13.4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

13.5 Storage

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

13.6 Handling Precautions for Protection Film

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.