CHIMEI 奇信電子 CHI HSIN ELECTRONICS CORP.

CHI HSIN ELECTRONICS

Product Specifications

Customer	
Description	**3.5” TFT LCD Module**
Model Name	**LQ035WA018**
Date	**2008/03/14**
Doc. No.	
Revision	**01**

Customer Approval	
Date	
The above signature represents that the product specifications, testing regulation, and warranty in the specifications are accepted	

Engineering			
Check	**Date**	**Prepared**	**Date**
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RECORD OF REVISIONS

Revision	Date	Page	Description
00	2007/05/16	all	New Creation
01	2008/3/14	4	4. (Absolute Maximum Ratings) is Modified
	2008/3/14	5	5.1 (Operating Conditions) is Modified

1. SUMMARY

This technical specification applies to 3.5“color TFT-LCD panel. The 3.5“ color TFT-LCD panel is designed for GPS, camcorder, digital camera application and other electronic products which require high quality flat panel displays.
This module follows RoHS.

2. FEATURES

High Resolution: 112,320 Dots (480 x 234). Image Reversion: Up/Down and Left/Right.

3. GENERAL SPECIFICATIONS

Parameter		Specifications	Unit
Screen size		3.5 (Diagonal)	inch
Display Format		480 RGB x 234	Dot
Active area		72.0 (H) x 50.544 (V)	mm
Pixel size		150 x 216	um
Surface treatment		Anti-glare	
Pixel Configuration		Delta	
Outline dimension		83.0 (W) x 60.5 (H) x 3.3 (D)	mm
Weight		40	g
View Angle direction		6 o’clock	
Temperature Range	Operation	0~60	℃
	Storage	-20~70	℃

4. ABSOLUTE MAXIMUM RATINGS

Items		Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage for Source Driver	Analog	AV_{DD}	-0.3	7.0	V	
	Digital	DV_{DD}	-0.3	7.0		
Supply Voltage for Gate Driver	Positive	V_{GH}	-0.3	32.0	V	
	Negative	V_{GL}	-22	0.3	V	
		V_{GH}-V_{GL}	-0.3	45	V	
Analog input voltage (V_R, V_G, V_B)		V_{RGB}	-0.3	7.3	V	
		VCOM	-2.9	5.0	V	

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

5. ELECTRICAL CHARACTERISTICS

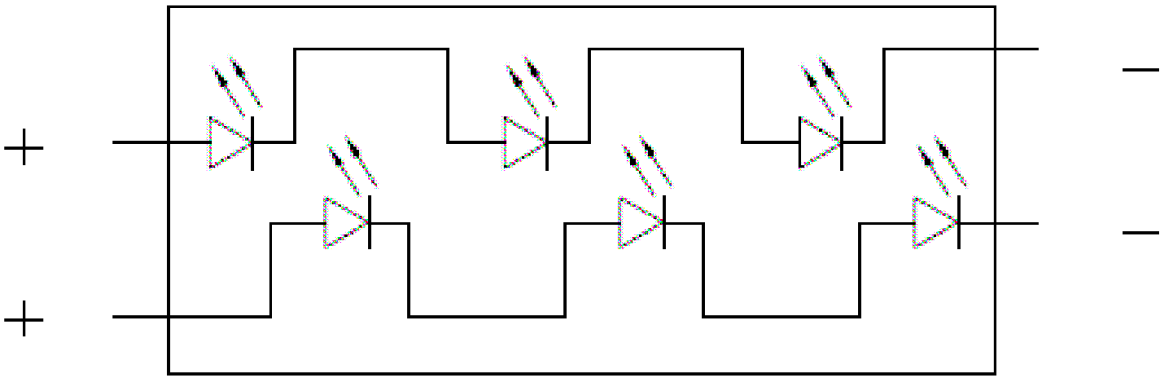
5.1. Operating Conditions:

Item	Symbol		Min	Typ	Max.	Unit	Remark
Power supply	DVDD		2.5	3.3	5.5	V	
	AVDD		3.0	3.3	5.5	V	

5.2. Backlight Driving for Power Consumption

Ta = 25 ℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
VLED voltage	VL	-	12	-	V	
LED current	IL	-	20	-	mA	
LED Life Time decay to 75%		10,000	-	-	hr	



6. DC CHARACTERS

(DVDD=2.5 to 5.5V, AVDD+3 to 5.5V, Topr=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply voltage	AVDD	3		3.5	V	-
Supply voltage	DVDD	2.5	-	5.5	V	-
Low level input voltage	VIL	0	-	0.3DVDD	V	CPH1~CPH3, OE, L/R, STH1, STH2, Q1H, Q2H, MOD, CHNSL, VBS
High level input voltage	VIH	0.7DVDD	-	DVDD	V	CPH1~CPH3, OE, L/R, STH1, STH2, Q1H, Q2H, MOD, CHNSL, VBS
Input leakage current	IIN	-	-	+\- 1	μA	CPH1~CPH3, OE, STH1, STH2, Q1H, Q2H, L/R, MOD, CHNSL, VBS
High level output voltage	VOH	DVDD-0.4	-	DVDD	V	STH1, STH2, IOH =-400μA
Low level output voltage	VOL	0	0.4	0	V	STH1, STH2, IOL=400μA
Voltage deviation of output	VVD	+\-20	VVD	-	mV	QA1 to QC160, VIN=0.1~4.9V
DC offset	VOS	-	-	+\-20	mV	Vx to QAx~QCx
Dynamic range of output	VDR	AVDD-0.4	AVDD-0.2	-	V	QA1 to QC160, 0.1 to 4.9V (AVDD =5V)
Output current	IOH	20	40	-	μA	QA1 to QC160, (AVDD =5V) VO =4.9V v.s 4.0V
Output current	IOL	20	40	-	μA	QA1 to QC160, (AVDD =5V) Vo=0.1V v.s 1.0V
Output leakage current	IO	-	-	+1	μA	QA1 to QC160 at high impedance
Pull down resistance	RI	50	100	200	kΩ	Q1H, Q2H, MOD, VBS,CHNSL
Wiring Resistance AVDD1-AVDD2	RAVDD	-	7	-	Ω	AVDD1-AVDD2
Wiring Resistance AVSS1-AVSS2	RAVSS	-	7	-	Ω	AVSS1-AVSS2
Wiring Resistance DVDD1-DVDD2	RDVDD	-	24	-	Ω	DVDD1-DVDD2
Wiring Resistance	RDVSS	-	24	-	Ω	DVSS1-DVSS2

DVSS1-DVSS2						
Supply current VB, VC=2.5V,no load, BS="H"(analog)	IDD	-	4.5	6	mA	fCPH=5MHz, fOE=15.7KHz,VA, Supply current VB, VC=2.5V,no load, BS="H"
		-	3.5	5	mA	f_{CPH}=5MHz, f_{OE}=15.7KHz,VA, VB, VC=2.5V,no load, BS="L"
Operating current(digital)	I_{CC}	-	0.6	1.5	mA	f_{CPH} =5MHz, f_{OE}=15.7KHz, no load
Stand by current (digital)	I_{ST}	-	-	50	μA	Clock & all functions are stopped

7. AC CHARACTERS

(DVDD=2.5~5.5V, AVDD=5V, Topr=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock cycle time	Tcph	100	-	2,000	ns	CPHn
CPHn pulse duty	Tcwh	40	-	60	%	CPHn
CPHn phase delay	TC12 TC23 TC31	20	-	Tcph	ns	CPH1-CPH2 CPH2-CPH3 CPH3-CPH1
Set-up time of analog signals	Tasu	60	-	-	ns	VA,VB,VC-CPHn
Hold time of analog signals	Tahd	40	-	-	ns	CPHn-VA,VB,VC
STHn set-up time	Tsu	20	-	-	ns	STHn-CPHn
STHn hold time	Thd	10	-	-	ns	CPHn-STHn
Propagation delay of STHn	Tphl	10	35	50	ns	CL=25pF
OEH to STH period	T_{OE-STH}	1	-	-	T_{CPH}	-
OEH pulse width	Twoe 1	1	-	-	us	OE input with positive polarity
	Twoe 2	1	-	-	Tcph	OE input with negative polarity
Settling time	Tst	-	12	20	us	96% final value or precision ≤30mV, CL=60pF

Function operation Timing Diagram-1

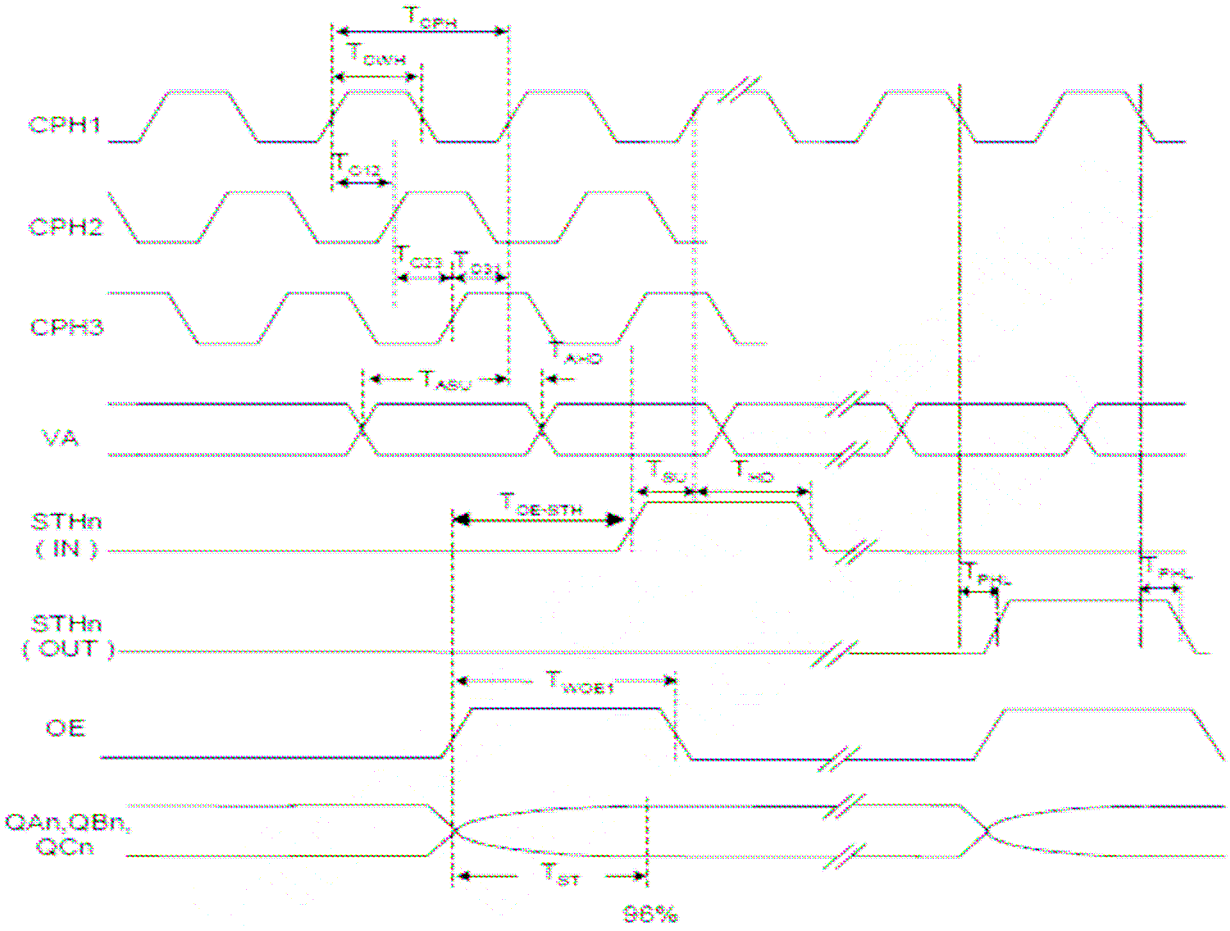


Figure 9. 1 AC Characteristics Timing Chart (OE input with positive polarity)

Function operation Timing Diagram-2

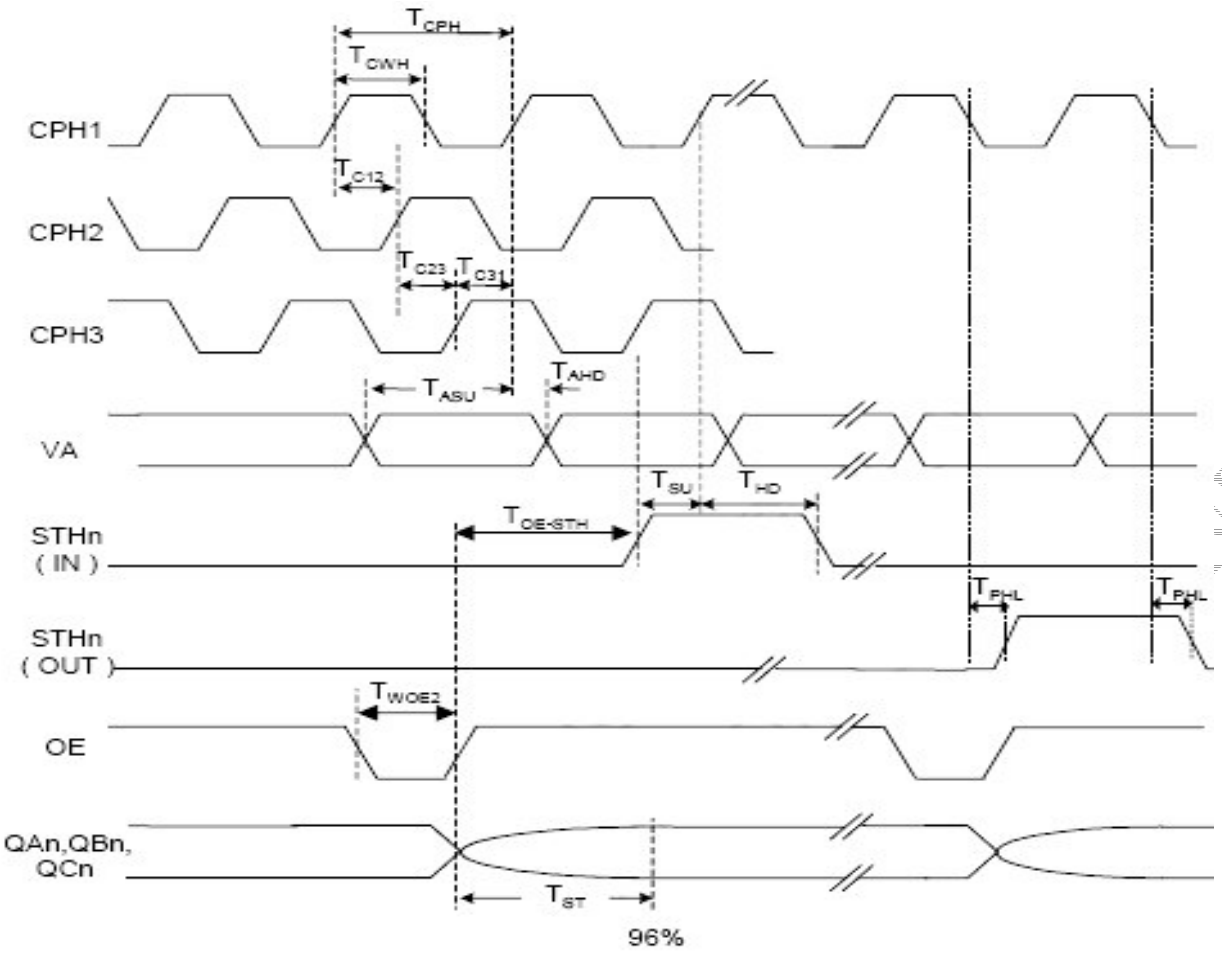


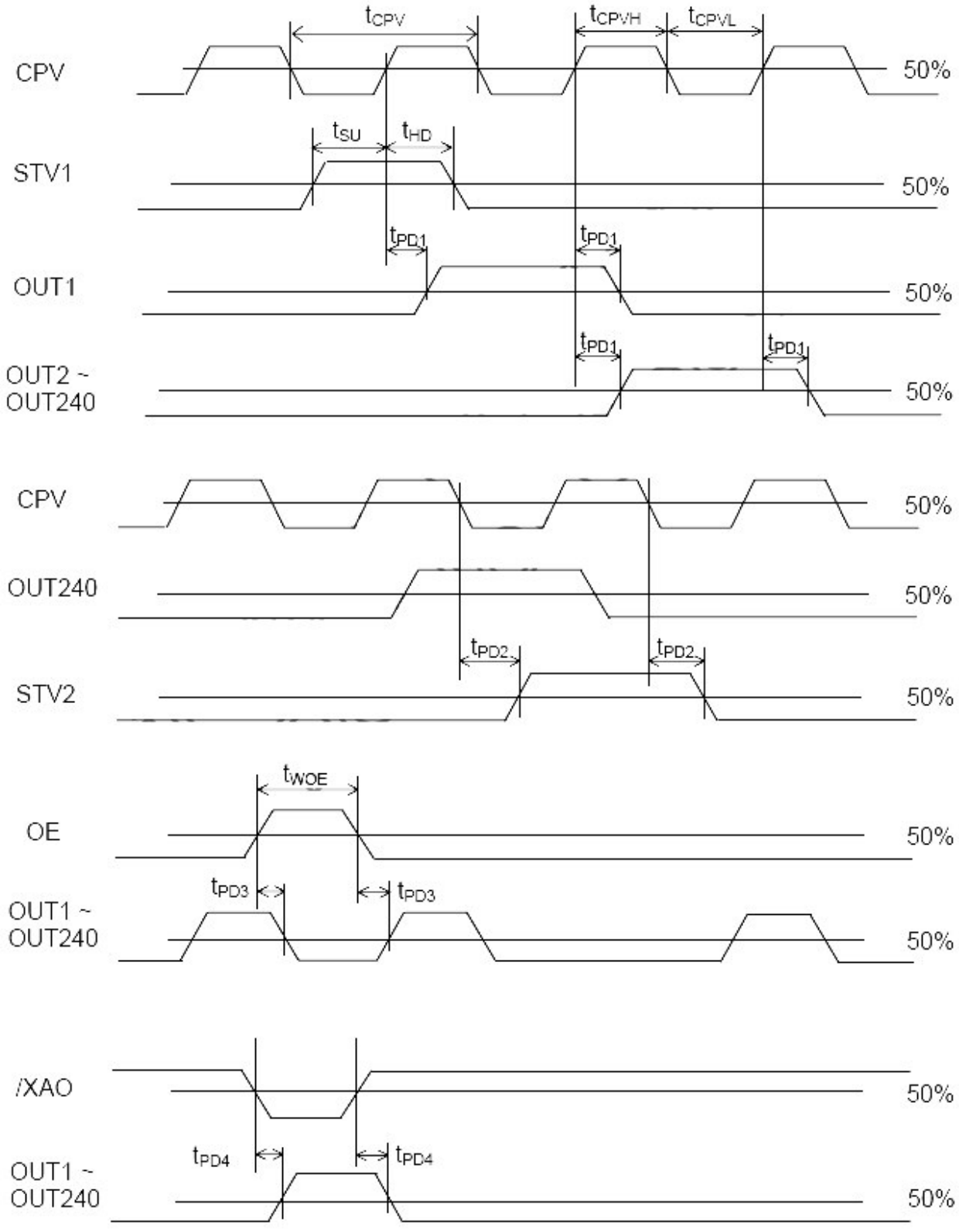
Figure 9. 2 AC Characteristics Timing Chart (OE input with negative polarity)

7.2 AC Characteristics Gate Driver (VGH=20V, VEE=-15V, VDD=3.3V, TA=25℃)

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
CPV period	t_{CPV}	-	5			μs
CPV pulse width	t_{CPVH}, t_{CPVL}	50% duty cycle	2.5			
OE pulse width	t_{WOE}	-	1			
Data setup time	t_{SU}	-	0.2			
Data hold time	t_{HD}	-	0.3			
CPV to output delay time	t_{PD1}	CL=220pF			0.9	
Start pluse output delay time	t_{PD2}	CL=20pF			0.5	
OE to output delay time	t_{PD3}	CL=220pF			0.8	
/XAO to output delay time	t_{PD4}	CL=220pF			1.0	

Note: The measurement point for all of above signals is at 50% of input/output amplitude.

Gate Driver Timing Diagram



7.3 Sequential sampling (MOD="L" and Q1H="L", Q2H="L", L/R ="H")

Example for delta array. he relationship among VA, VB, VC and QA, QB, QC is changing step by step in sequential sampling. This example shows the case of first sampling just after STH1 input.

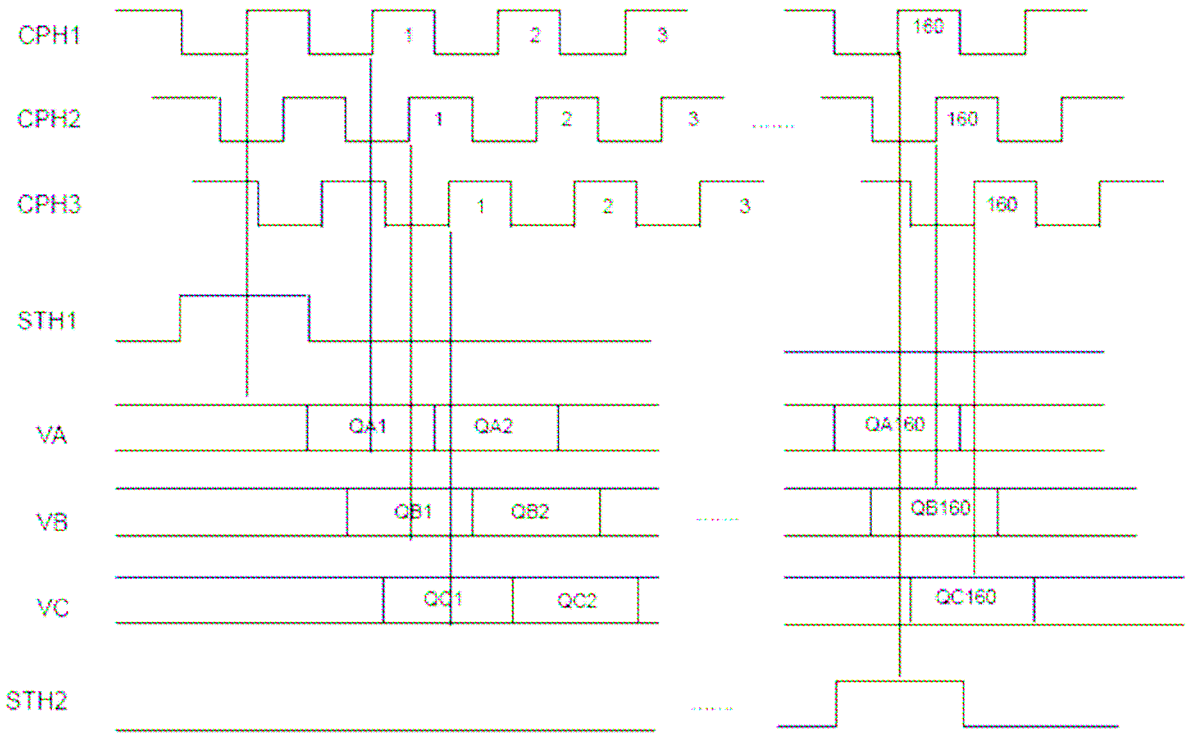


Figure 5. 2 Sequential sampling

8. OPTICAL CHARATERISTIC

Ta=25±2℃, ILED=20mA

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr	θ=0°、Φ=0°	-	15	30	ms	Note 3,5
		Tf		-	25	50	ms	
Contrast ratio		CR	At optimized viewing angle	100	120	-	-	Note 4,5
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.250	0.300	0.350	-	Note 2,6,7
		Wy		0.27	0.320	0.37		
	Red	Rx		0.53	0.58	0.63		
		Ry		0.30	0.35	0.40		
	Green	Gx		0.28	0.33	0.38		
		Gy		0.52	0.57	0.62		
	Blue	Bx		0.09	0.14	0.19		
		By		0.06	0.11	0.16		
Viewing angle	Hor.	ΦR	CR≧10	-	35	-	Deg.	Note 1
		ΦL		-	35	-		
	Ver.	ΦT		-	15	-		
		ΦB		-	35	-		
Brightness		-	-	200	240	-	cd/m²	Center of display
Uniformity		U		75	80		%	

Note 1: Definition of viewing angle range

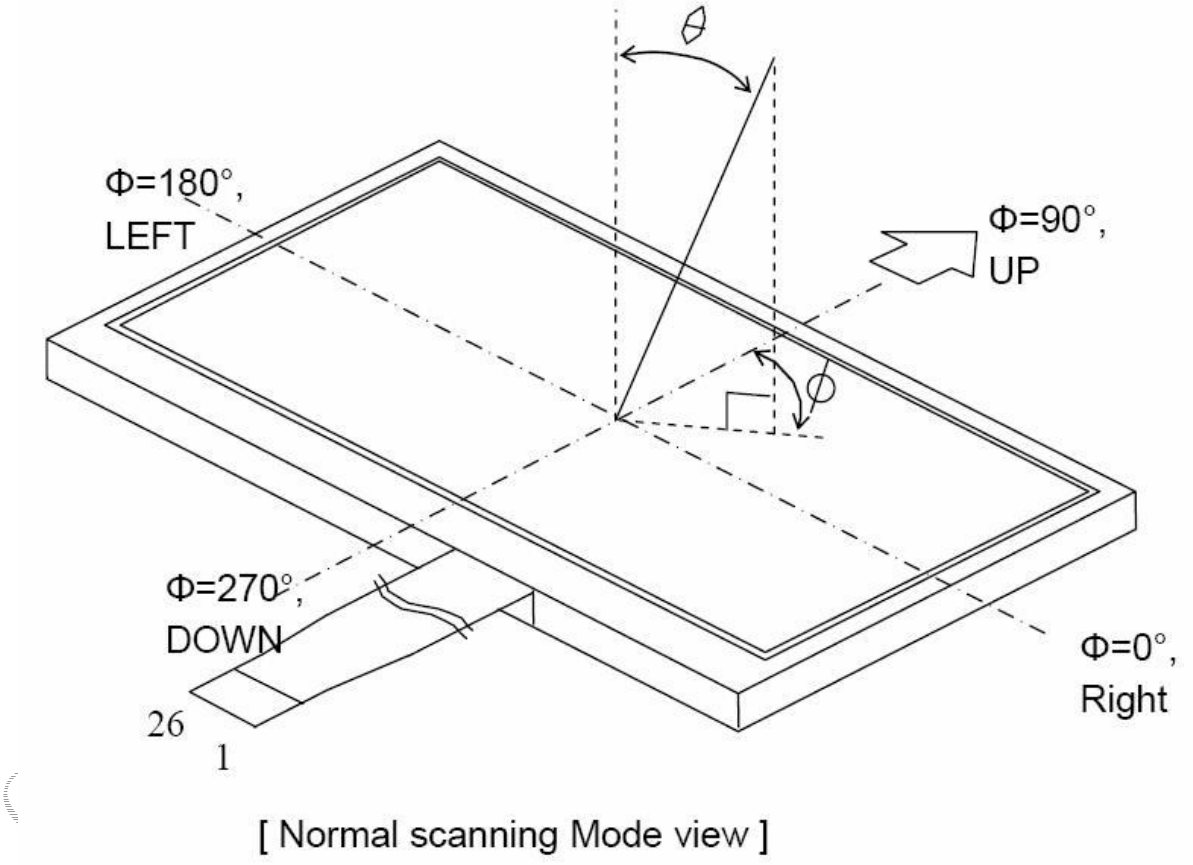


Fig. 8-1 Definition of viewing angle

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

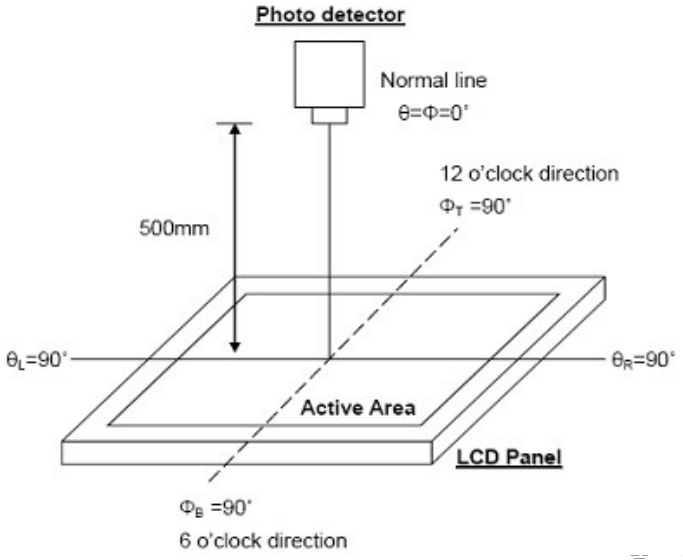


Fig. 8-2 Optical measurement system setup

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 from10% to 90% .

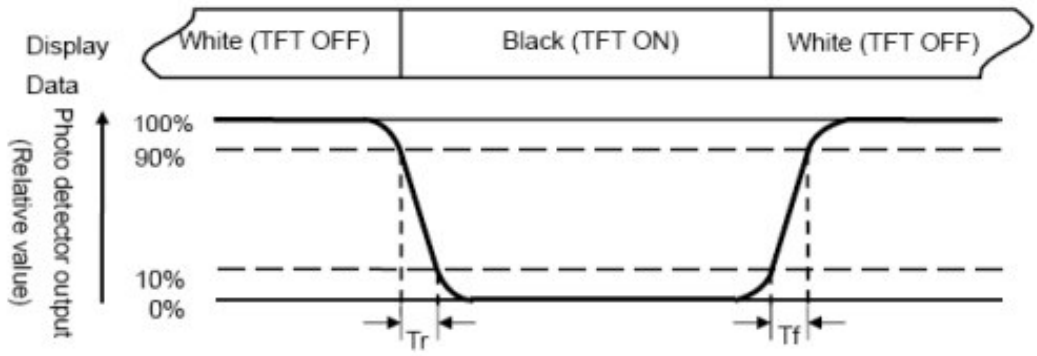


Fig. 3-3 Definition of response time

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 = V_{i50} ± 1.5V
Black Vi = V_{i50} ± 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.

Note 8 : Uniformity (U) = $\frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$

9. Interface

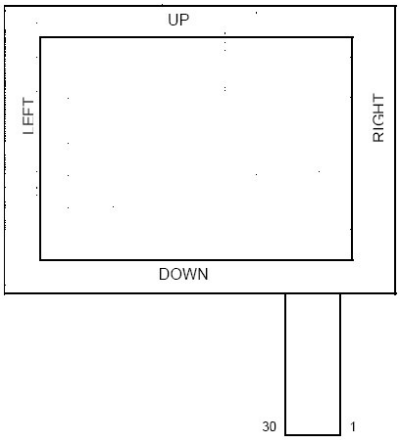
9.1 PIN Connections

Pin No	Symbol	I/O	Description	Remark
1	GND		Ground of Gate Driver.	
2	VCC	I	Logic power of Gate Driver	Note 3
3	VGL	I	Gate off Voltage	Note 4
4	VGH	I	Gate on Voltage	Note 6
5	STVR	I/O	Vertical Start Pulse input, when U/D=High	Note 1
6	STVL	I/O	Vertical Start Pulse input, when U/D=LOW	Note 1
7	CKV		Shift clock input for gate driver	
8	U/D	I	Up / Down Control for Gate Driver	
9	OEV	I	Output enable for Gate driver	
10	VCOM	I	Common Electrode Voltage	Note 4
11	VCOM	I	Common Electrode Voltage	Note 4
12	GLED1	I	Ground of LED 1.	
13	VLED1	I	Voltage of LED 1.	
14	VLED2	I	Voltage of LED 2.	
15	GLED2	I	Ground of LED 2.	
16	L/R	I	Left / Right for Source Driver	Note 1
17	Q1H		Analog signal rotate input.	
18	OEH		Output enable for Source driver	
19	STHL	I/O	Start Pulse for Source Driver input, when L/R=High	Note 1
20	STHR	I/O	Start Pulse for Source Driver input, when L/R=LOW	Note 1
21	CPH3	I	Sampling and Shift Clock for Source Driver	
22	CPH2	I	Sampling and Shift Clock for Source Driver	
23	CPH1	I	Sampling and Shift Clock for Source Driver	
24	DVDD		Logic power input of Source driver.	
25	DVSS		Ground of Source driver	
26	VR	I	Video Input R	Note 4
27	VG	I	Video Input G	Note 4
28	VB	I	Video Input B	Note 4
29	AVDD	I	Analog Power Input of Source Driver	Note 2
30	AVSS	I	Analog GND of Source Driver	

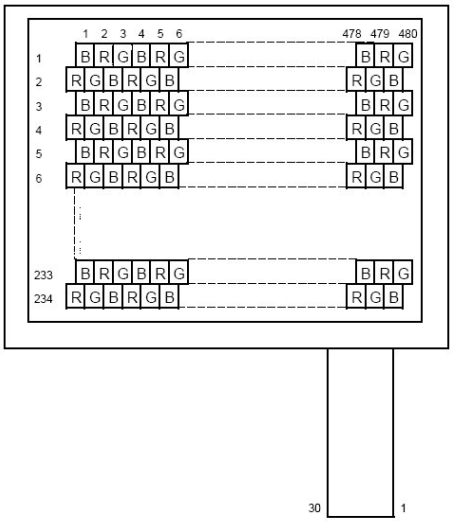
Note 1: Selection of scanning mode (please refer to the following table)

Setting of scan control input		IN/OUT state For start pulse				Scanning direction
U/D	L/R	STVR	STVL	STHR	STHL	
GND	V_{CC}	Output	Input	Output	Input	From up to down, and from left to right.
V_{CC}	GND	Input	Output	Input	Output	From down to up, and from right to left.
GND	GND	OUT	Input	Input	Output	From up to down, and from right to left.
V_{CC}	V_{CC}	Input	Output	Output	Input	From down to up, and from left to right.

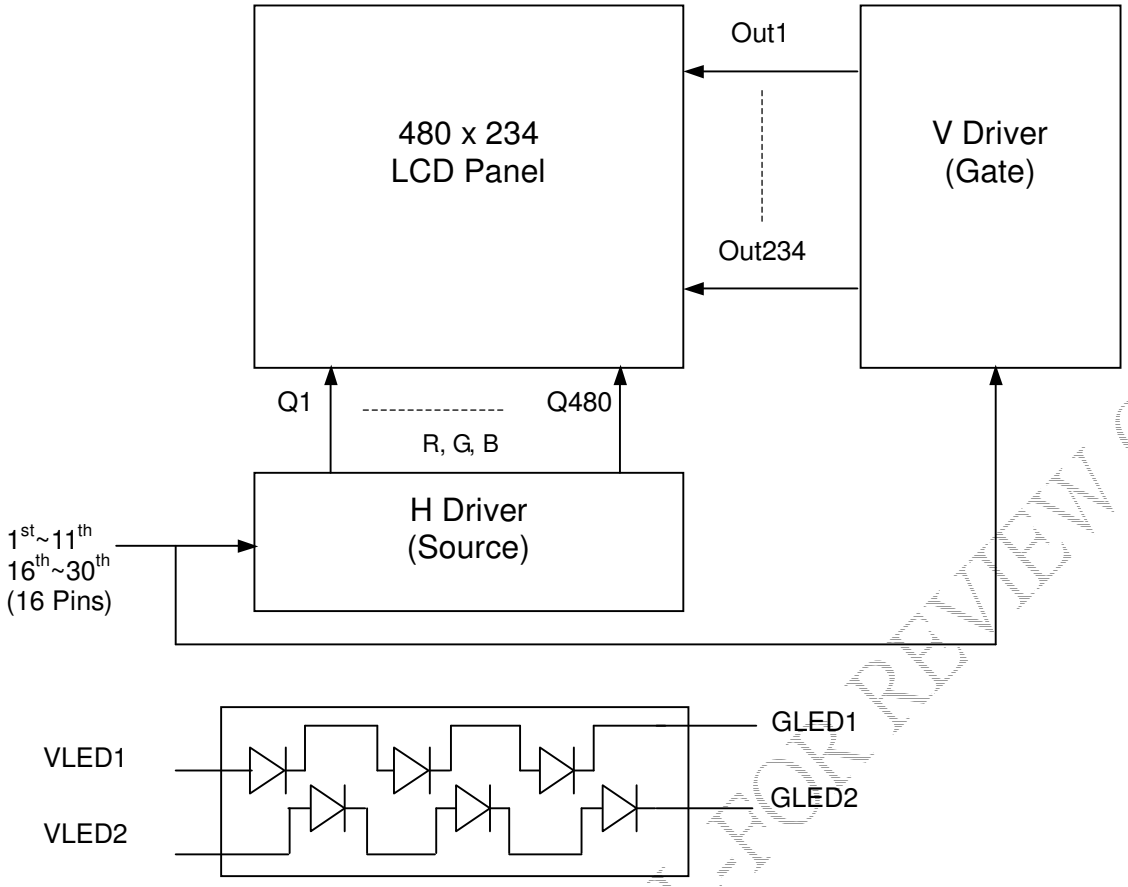
Note 2: AV_{DD}=+3.3V(Typ.)
Note 3: DV_{DD}, V_{CC}=+3.3V(Typ.)
Note 4: V_{COM}=+6V_{pp}
Note 5: V_{GL}=-15.0V(Typ.)
Note 6: V_{GH}=+25.0V(Typ.)
Note 7: Definition of scanning direction



9,2 Pixel Arrangement and Input Connector Pin Number.



10. BLOCK DIAGRAM



11. QUALITY ASSURANCE

11.1 Test Condition

11.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 20 ± 5°C
Humidity : 65 ± 5%

11.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

11.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

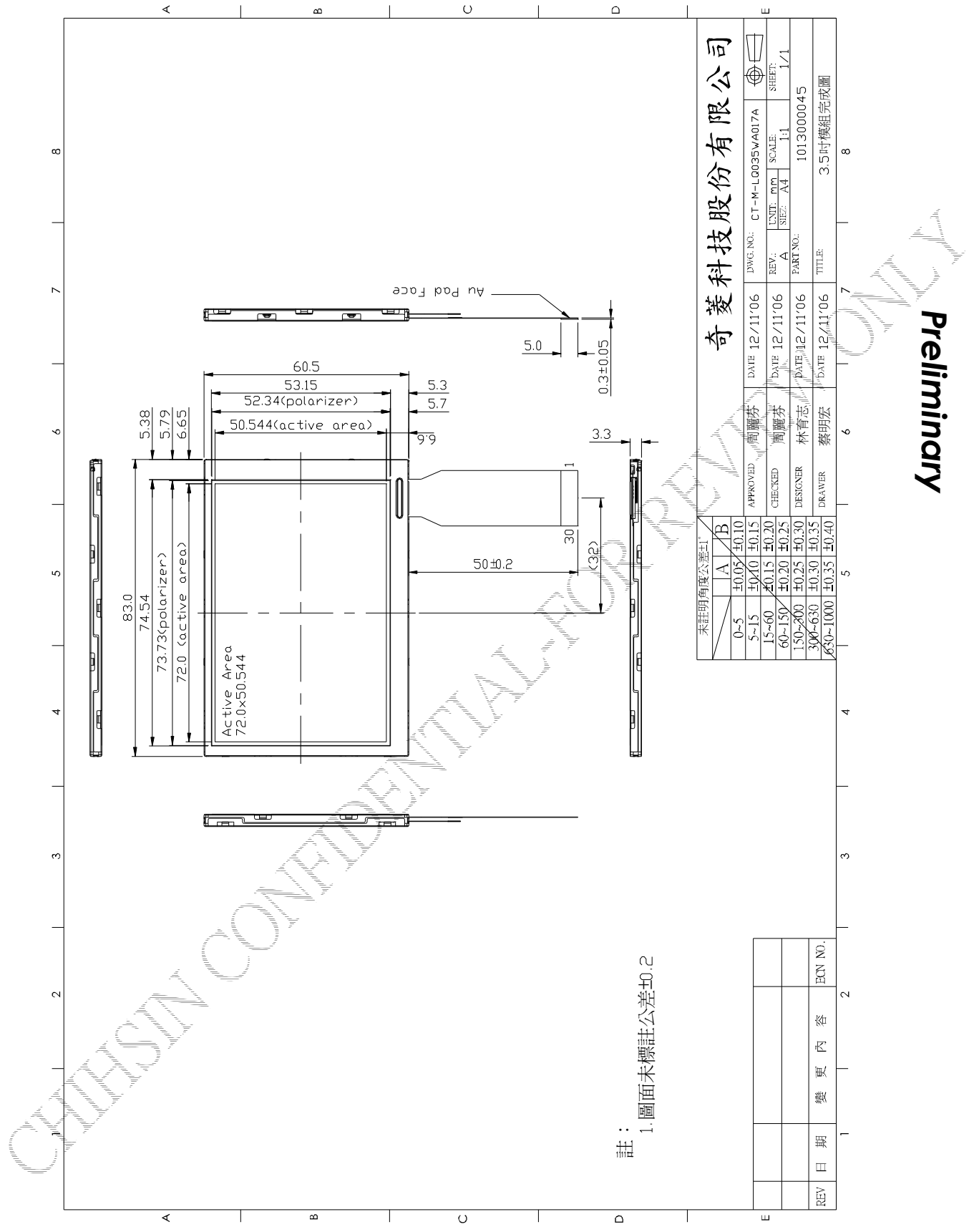
11.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

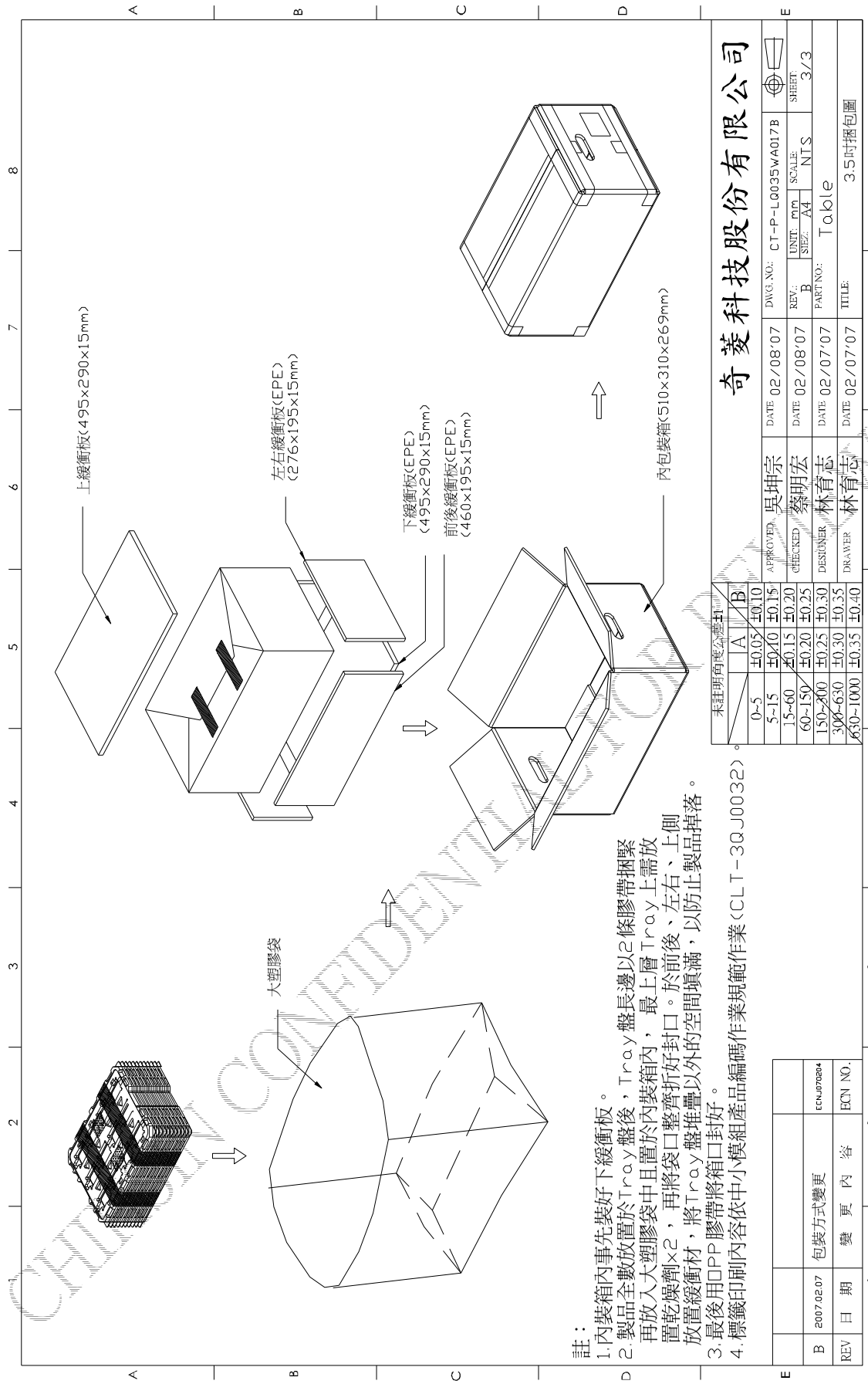
11.1.5 Test Method

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	T=70°C,240hrs
2	Low Temperature Storage Test	T=-20°C,240hrs
3	High Temperature Operation Test	T=60°C,240hrs
4	Low Temperature Operation Test	T=0°C,240hrs
5	High Temperature and High Humidity Operation Test	T=60°C,95% RH,240hrs
6	Thermal Cycling Test (No operation)	-20C → +25°C → +70°C,200 Cycles 30 min 5min 30 min
7	Vibration Test (No operation)	Frequency:10~ 55 Hz Amplitude:1.0mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electrostatic Discharge Test (No operation)	150pF,330Ω Air:± 15KV;Contact: ± 8KV 10 times/point;4 points/panel face

12. OUTLINE DRAWING



13. PACKAGE INFORMATION



14. PRECAUTIONS

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

14.1 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.

14.2 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.

14.3 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.

14.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

14.5 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.

14.6 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.
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