

深圳市诚皓光电有限公司

Shenzhen ChengHao Optoelectronic Co., Ltd.

SPECIFICATION

Product Model : KD50G21-40NT-A1

Designed by	R&D Checked by	Quality Department by	Approved by

Approval by Customer

<div>OK</div> <div>NG, Problem survey:</div> <div>Approved By _____</div>

Revision Record

[illegible]

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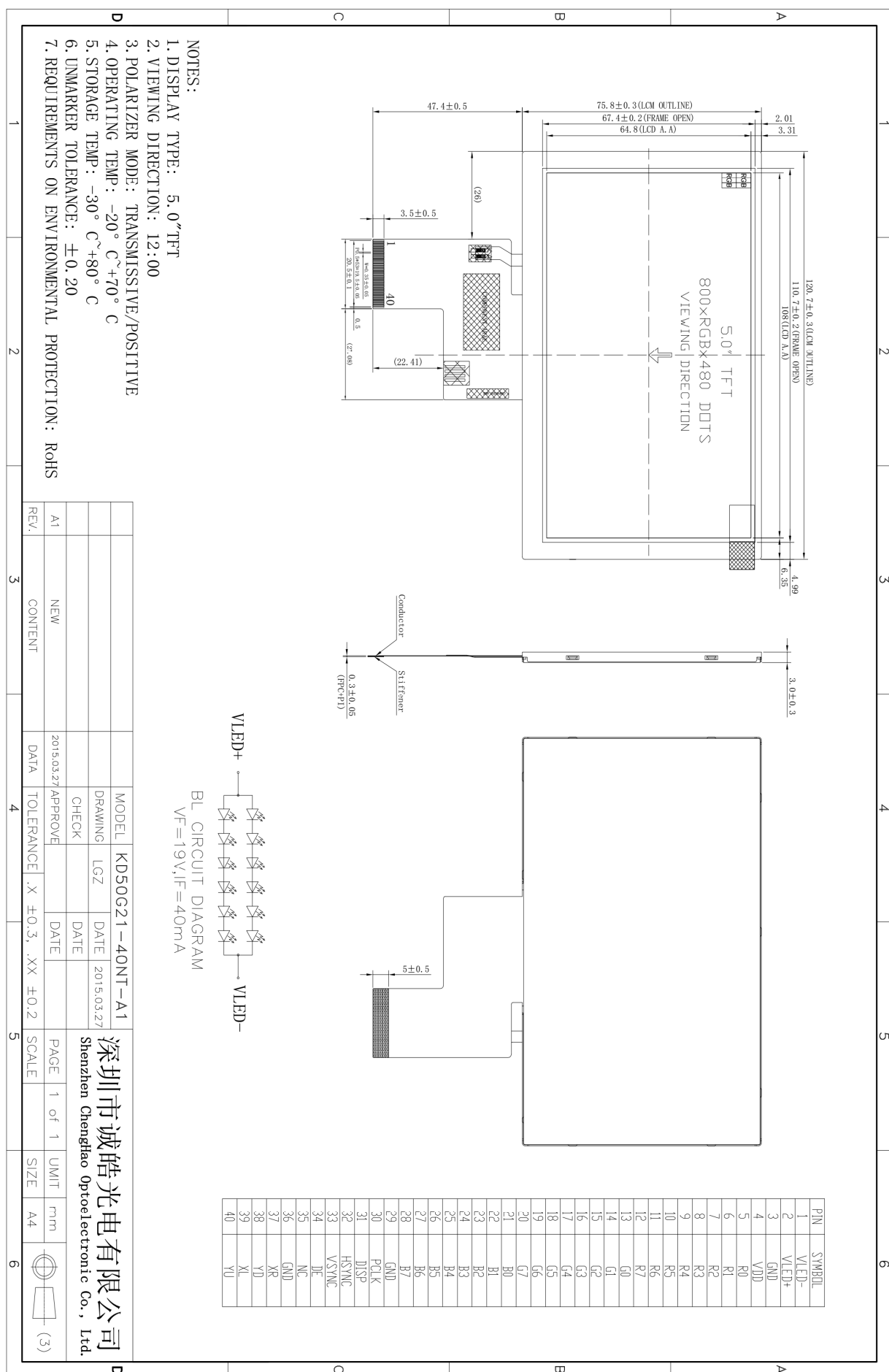
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1. Numbering System

2. General information

ITEM	STANDARD VALUES	UNITS
LCD type	5.0" TFT	--
Dot arrangement	800×3(RGB)×480	dots
Color Pixel Arrangement	RGB vertical stripe	--
Display Mode	TN / Transmissive / Normally white	--
Viewing Direction	12 o'clock	--
Gray Scale Inversion Direction	6 o'clock	--
Module size	120.7(W)×75.8(H)×3.0(T)	mm
Active area	108(W)×64.8(H)	mm
Dot pitch	0.135(W)×0.135(H)	mm
Interface	24-bit Parallel RGB Interface	--
Operating temperature	-20 ~ +70	℃
Storage temperature	-30 ~ +80	℃
Weight	TBD	g

3. External Dimensions



4. Interface

Pin	Symbol	Description.
1	LED-K	LED backlight (Cathode).
2	LED-A	LED backlight (Anode).
3	GND	Ground.
4	VDD	Power supply.
5~12	R0~R7	Red Data.
13~20	G0~G7	Green Data.
21~28	B0~B7	Blue Data.
29	GND	Ground.
30	DCLK	Dot clock signal input. Latching input data at its rising edge.
31	DISP	Display on/off.
32	HSYNC	Horizontal sync input. Negative polarity.
33	VSYN	Vertical sync input. Negative polarity.
34	DEN	Data enable input. Active high to enable the input data bus.
35	NC	NC.
36	GND	Ground.
37	XR	NC
38	YD	
39	XL	
40	YU	

5. Absolute Maximum Ratings

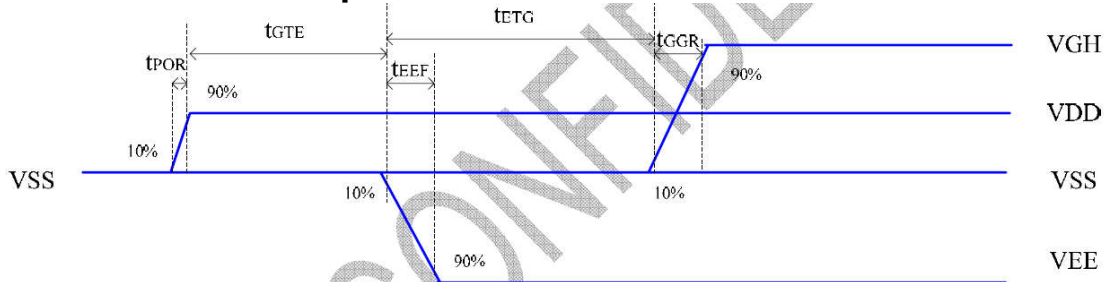
Item	Symbol	Min.	Max.	Unit
Analog Supply Voltage	VDD	-0.3	5	V
Input Voltage	V _{in}	-0.3	VDD+0.3	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

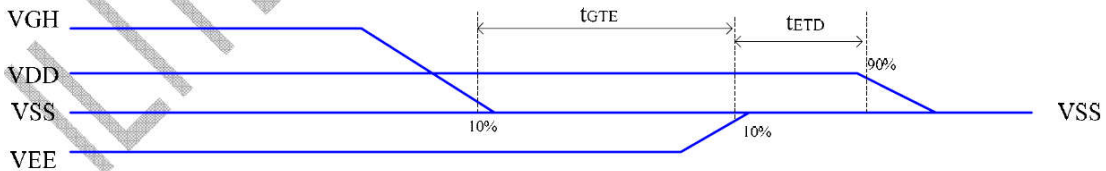
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog Supply Voltage	VDD	3.0	3.3	3.6	V	-
Input High Voltage	V _{IH}	0.7VDD	-	VDD	V	Digital input pins
Input Low Voltage	V _{IL}	GND	-	0.3VDD	V	Digital input pins
Output High Voltage	V _{OH}	VDD-0.4	-	VDD	V	Digital output pins
Output Low Voltage	V _{OL}	GND	-	VDD+0.4	V	Digital output pins
I/O Leak Current	I _{LI}	-1	-	1	uA	-

7. Timing Characteristics

7.1 Power ON/OFF Sequence



Power on sequence (VDD→VEE→VGH)



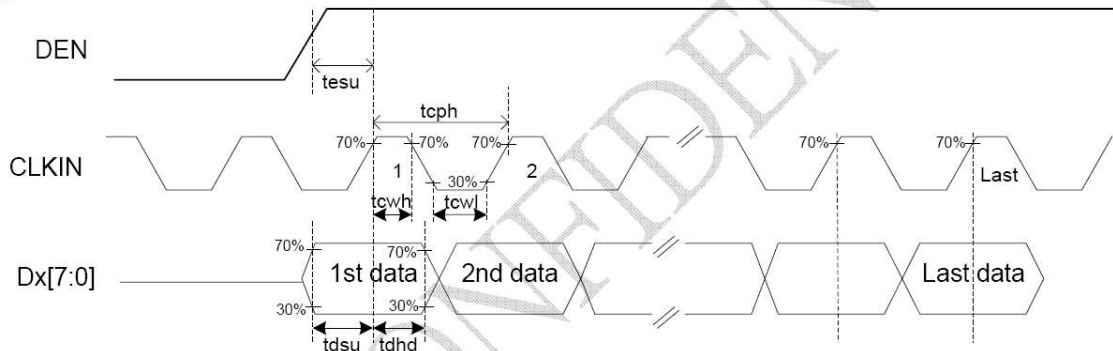
Power off sequence (VGH→VEE→VDD)

7.2 Timing Diagram of interface Signal Parallel 24-bit RGB Mode

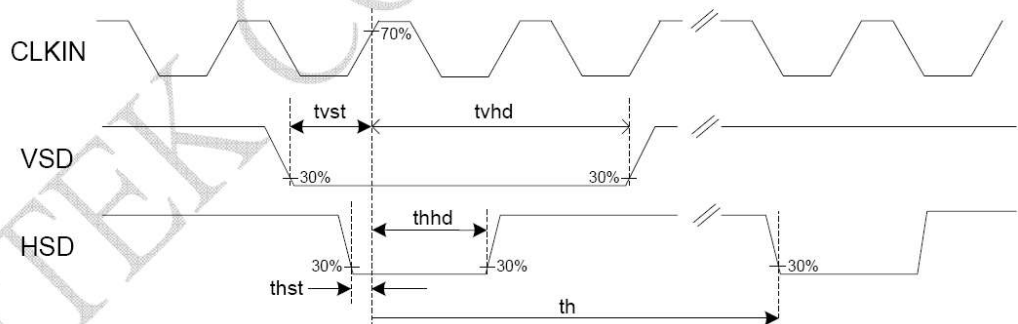
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN Frequency	Fclk	-	40	50	MHz	VDD = 3.0V ~3.6V
CLKIN Cycle Time	Tclk	20	25	-	ns	
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	64	-	CLKIN	
Time from HSD to LD	Thld	-	64	-	CLKIN	
Time from HSD to STV	Thstv	-	2	-	CLKIN	
Time from HSD to CKV	Thckv	-	20	-	CLKIN	
Time from HSD to OEV	Thoev	-	4	-	CLKIN	
LD Pulse Width	Twld	-	10	-	CLKIN	
CKV Pulse Width	Twckv	-	66	-	CLKIN	
OEV Pulse Width	Twoev	-	74	-	CLKIN	

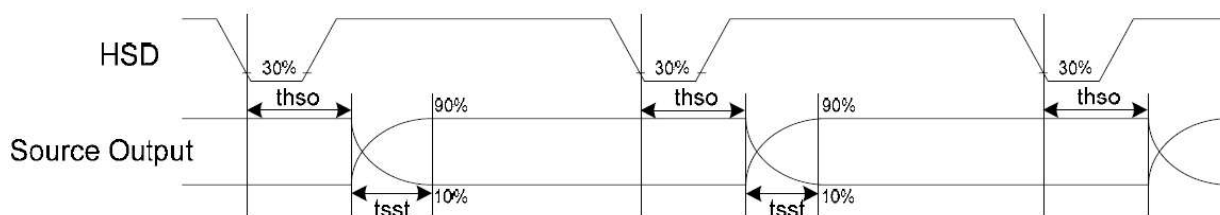
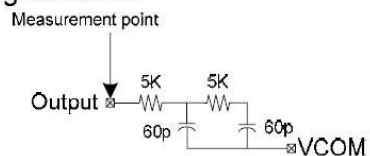
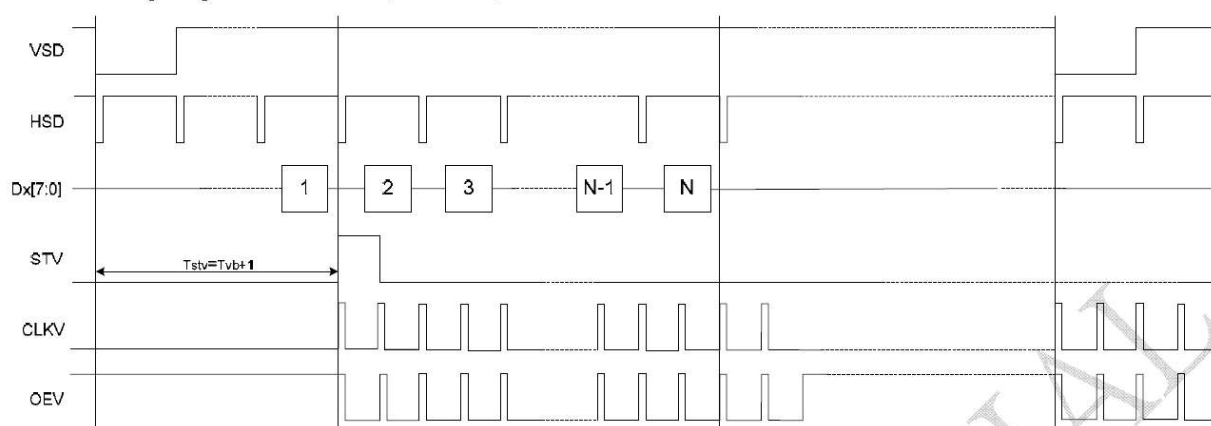
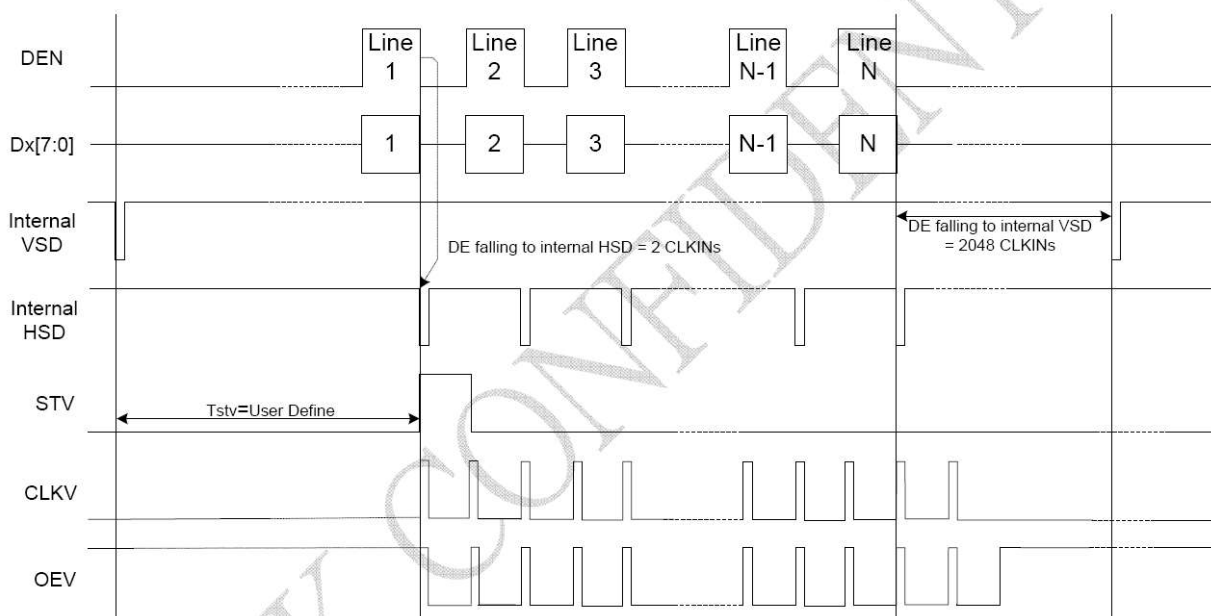
Input Clock and Data Timing Diagram

DE Mode

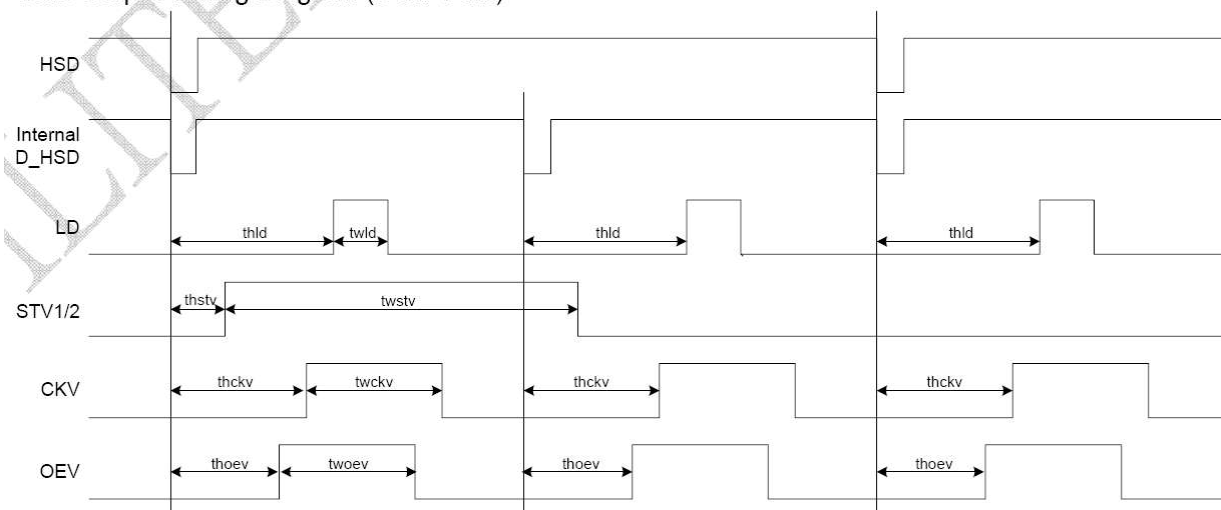


HV Mode

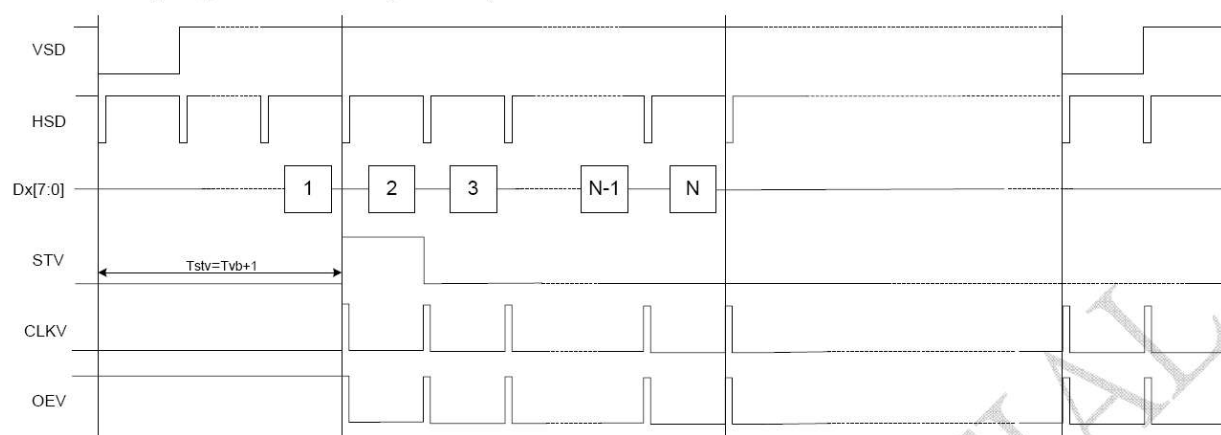


Source output timing diagram**Output Loading condition****Vertical Timing Diagram of HV Mode (Dual Gate)****Vertical Timing Diagram of DE Mode (Dual Gate)**

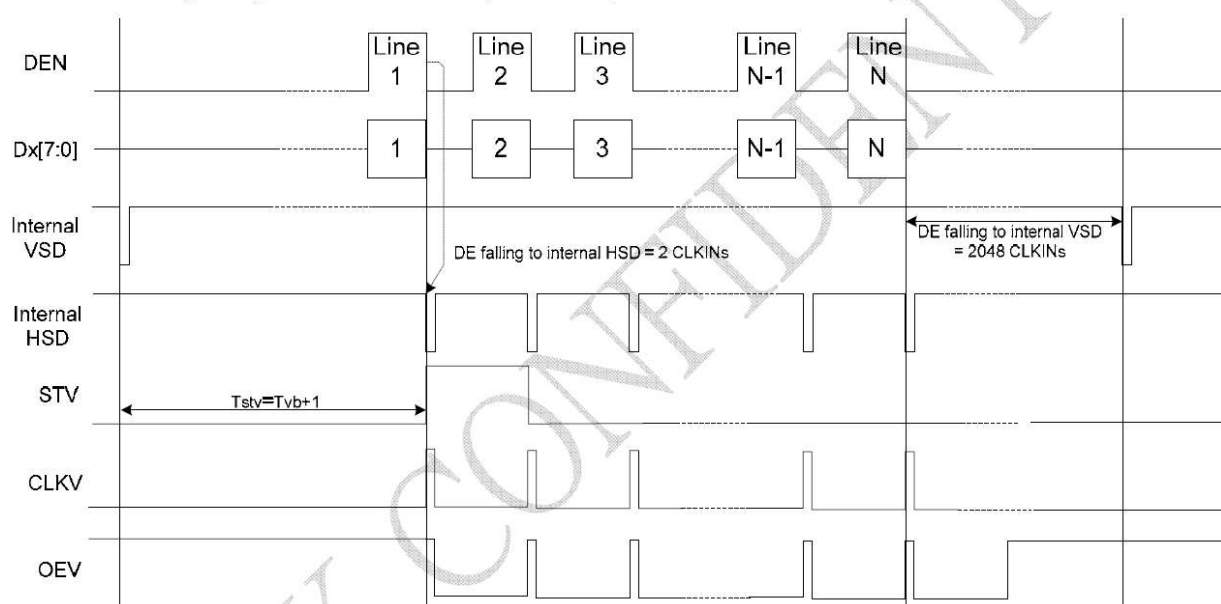
Gate Output Timing Diagram (Dual Gate)



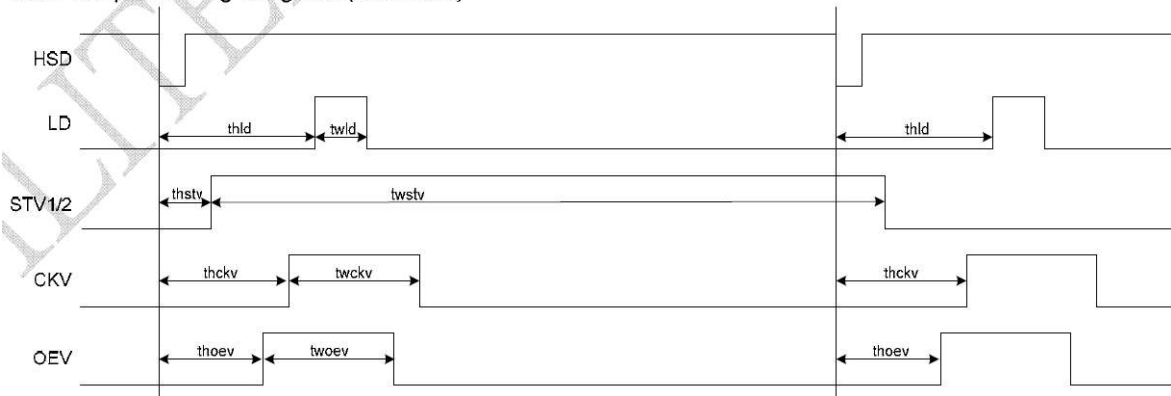
Vertical Timing Diagram of HV Mode (Cascade)



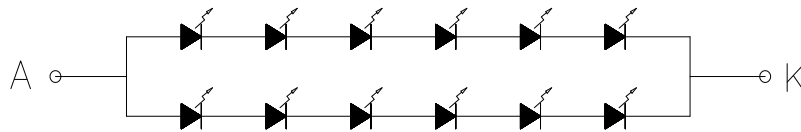
Vertical Timing Diagram of DE Mode (Cascade)



Gate Output Timing Diagram (Cascade)



8. Backlight Characteristics



Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	V_f	18.0	19.8	21.0	V	$I_f=40mA$
Luminous Intensity for LCM	-	250	300	-	Cd/m^2	$I_f=40mA$
Life Time	-	20000	-	-	Hr	$I_f=40mA$
Backlight Color	White					

9. Optical Characteristics

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle ($CR \geq 10$)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		200	250	-	cd/m^2	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. DVDD=3.3V, IL=60mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

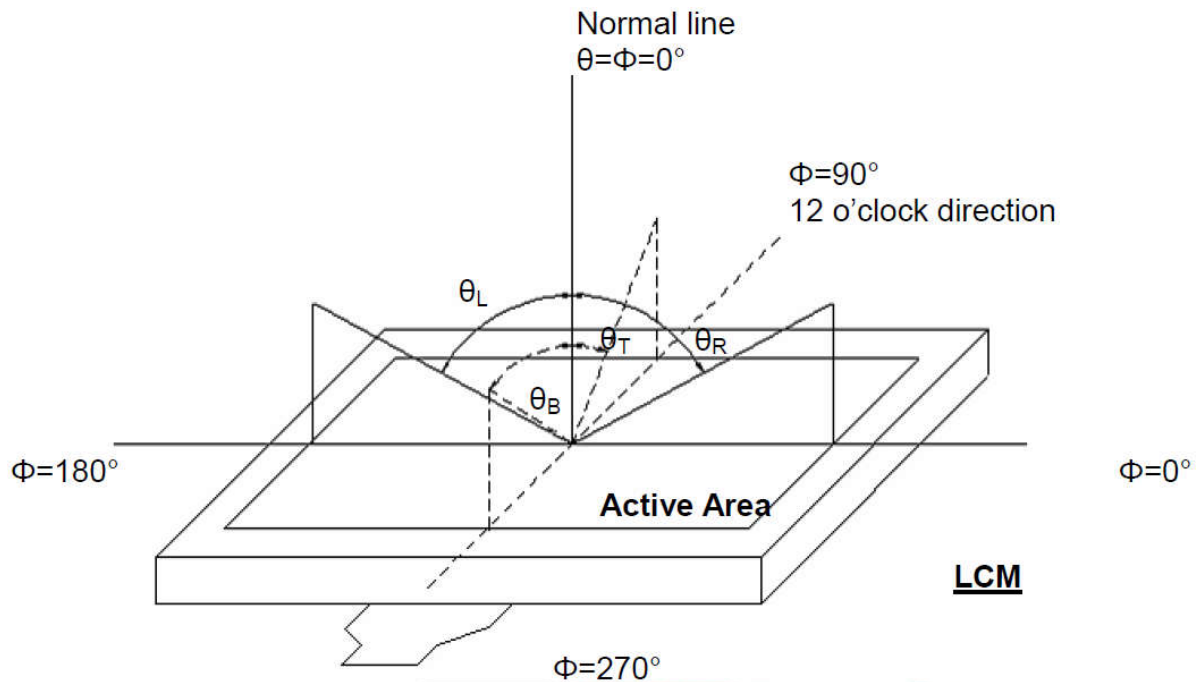
Note 1: Definition of viewing angle range

Fig. 1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

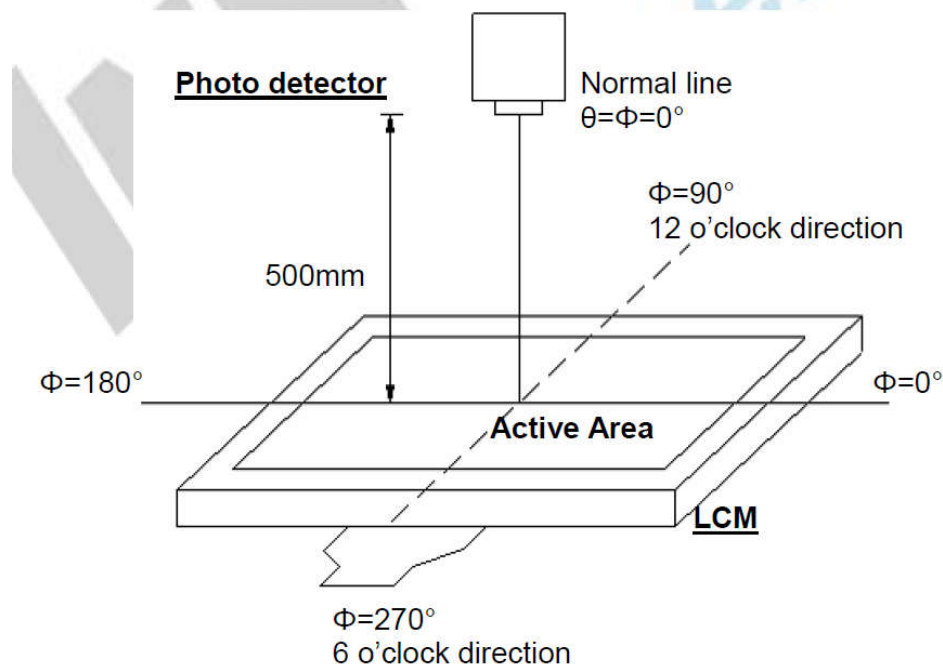


Fig. 2 Optical measurement system setup

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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

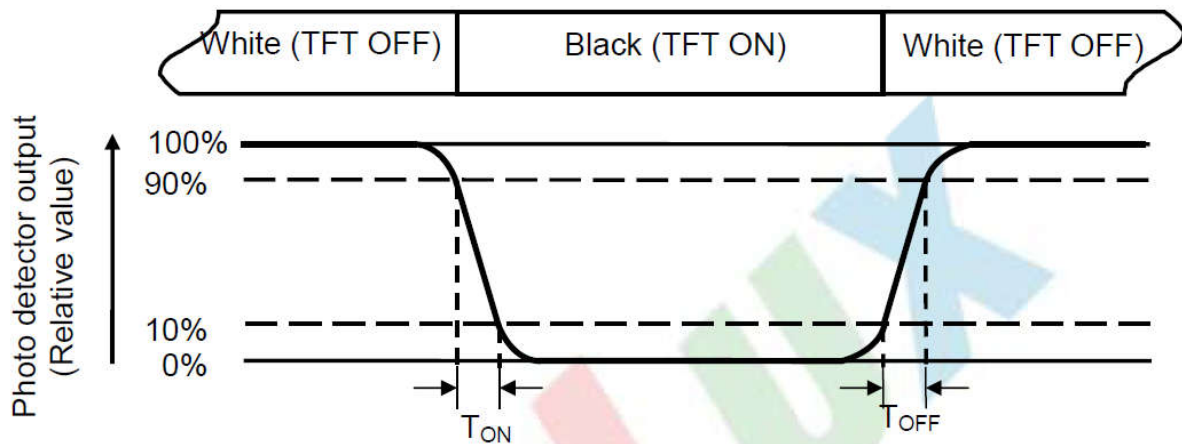


Fig. 3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=180mA .

10. Reliability Test Conditions And Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80℃±2℃×96Hours	Inspection after 2~4hours storage at room temperature,the samples should be free from defects: 1,Air bubble in the LCD. 2,Sealleak. 3,Non-display. 4,Missing segments. 5,Glass crack. 6,Current IDD is twice higher than initial value. 7,The surface shall be free from damage. 8,The electric charateristic requirements shall be satisfied.
②	Low Temerature Storage	-30℃±2℃×96Hours	
③	High Temperature Operating	70℃±2℃×96Hours	
④	Low Temperature Operating	-20℃±2℃×96Hours	
⑤	Temperature Cycle(Storage)	-20℃ \longleftrightarrow 25℃ \longleftrightarrow 70℃ (30min) (5min) (30min) 1cycle Total 10cycle	
⑥	Damp Proof Test (Storage)	50℃±5℃×90%RH×96Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (Packing Condition)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑨	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:

- 1,The Test samples should be applied to only one test item.
- 2,Sample side for each test item is 5~10pcs.
- 3,For Damp Proof Test,Pure water(Resistance > 10MΩ)should be used.
- 4,In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting,it would be judge as a good part.
- 5,EL evaluation should be excepted from reliability test with humidity and temperature:Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
- 6,Failure Judgment Criterion:Basic Specification Electrical Characteristic,Mechanical Characteristic,Optical Characteristic.

11. Inspection Standard

This standard apply to C-STN/TFT module

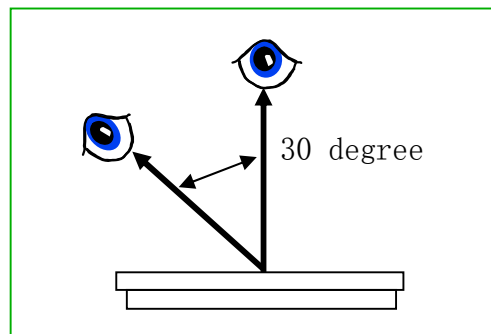
1. Spot check plan:

According to spot check level II ,MIL-STD-105E Level II ,the rank of accept or reject is below:

3A 级、2A 级: major non-conformance: AQL 0.25 minor non-conformance: AQL 0.4

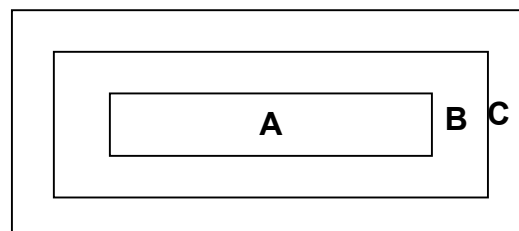
A 级: major non-conformance: AQL 0.65 minor non-conformance: AQL 1.

2. Inspection condition:



Under daylight lamp 20~40W, product distance inspector'eye 30cm,incline degree 30°.

3. LCD area define:



Area A: display area

Area B: VA area

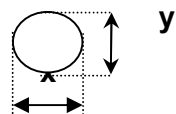
Area C: out of VA area,not in sight after assembly

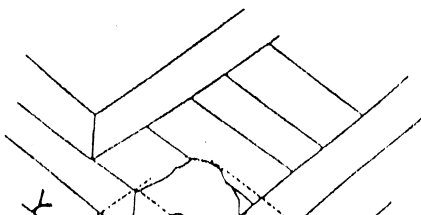
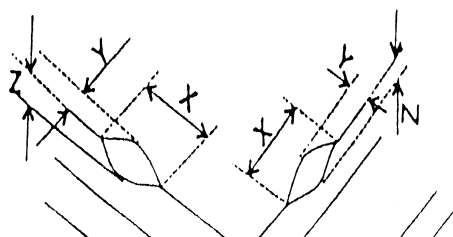
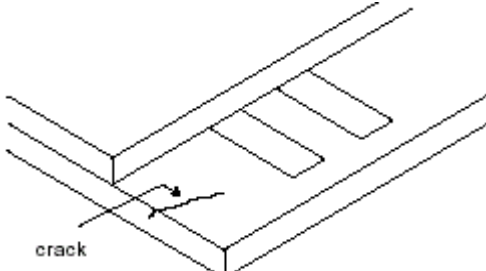
Remark :non-conformance at area C,but is OK that isn't influence reliability of product & assembly by customer.

4. Inspection standard**4.1 Major non-conformance**

NO.	Item	Inspection standard	Rate
4.1.1	Function non-conformance	1) No display, display abnormaly 2) Miss line, short 3) B/L no function or function abnormaly 4) TP no function	major
4.1.2	miss	No matter miss what component	
4.1.3	Out of size	Module dimension out of spec	

4.2 Appearance non-conformance

NO.	Item	Inspection standard	Rate																											
4.2.1	Black or white spot (power on)	<div> <div>dot non-conformance define Φ</div> <div> $\Phi = \frac{(x+y)}{2}$  </div> </div>	Minor																											
		<div>A grade</div> <table> <tr> <th rowspan="2"> <div>area</div> <div>size (mm)</div> </th> <th colspan="3">Most approve q'ty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="2">ignore</td> <td rowspan="5">ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.15$</td> <td colspan="2">3</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.20$</td> <td colspan="2">2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.3$</td> <td colspan="2">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="2">0</td> </tr> </table>		<div>area</div> <div>size (mm)</div>	Most approve q'ty			A	B	C	$\Phi \leq 0.10$	ignore		ignore	$0.10 < \Phi \leq 0.15$	3		$0.15 < \Phi \leq 0.20$	2		$0.20 < \Phi \leq 0.3$	1		$0.3 < \Phi$	0					
		<div>area</div> <div>size (mm)</div>			Most approve q'ty																									
				A	B	C																								
		$\Phi \leq 0.10$		ignore		ignore																								
		$0.10 < \Phi \leq 0.15$		3																										
		$0.15 < \Phi \leq 0.20$		2																										
$0.20 < \Phi \leq 0.3$	1																													
$0.3 < \Phi$	0																													
Most approve 4 damages, dot to dot $\geq 10\text{mm}$																														
4.2.2	Black or white line (power on)	<div>A grade</div> <table> <tr> <th colspan="2">Size(mm)</th> <th colspan="3">Most approve q'ty</th> </tr> <tr> <th>L(length)</th> <th>W(width)</th> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td>ignore</td> <td>$W \leq 0.03$</td> <td colspan="2">ignore</td> <td rowspan="5">ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="2">2</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.05 < W \leq 0.07$</td> <td colspan="2">1</td> </tr> <tr> <td></td> <td>$0.07 < W$</td> <td colspan="2">Treat with dot non-conformance</td> </tr> </table>	Size(mm)		Most approve q'ty			L(length)	W(width)	A	B	C	ignore	$W \leq 0.03$	ignore		ignore	$L \leq 5.0$	$0.03 < W \leq 0.05$	2		$L \leq 3.0$	$0.05 < W \leq 0.07$	1			$0.07 < W$	Treat with dot non-conformance		Minor
		Size(mm)		Most approve q'ty																										
		L(length)	W(width)	A	B	C																								
		ignore	$W \leq 0.03$	ignore		ignore																								
		$L \leq 5.0$	$0.03 < W \leq 0.05$	2																										
		$L \leq 3.0$	$0.05 < W \leq 0.07$	1																										
			$0.07 < W$	Treat with dot non-conformance																										
Most approve 3 damages, line to line $\geq 10\text{mm}$																														
4.2.3	Polarizer position	1) polarizer attach meet drawing, disallow out of LCD. 2) polarizer must cover display area (special require unless)	Minor																											

4.2.4	LCD non-conformance	<p>(i) crash at side (remark: S=ITO length)</p>  <table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0</td><td>≤S</td><td>ignore</td></tr></table> <p>Crash disallow extend to ITO or seal.</p>	X	Y	Z	≤3.0	≤S	ignore	Minor	
		X	Y	Z						
		≤3.0	≤S	ignore						
<p>(ii) commonly surface scathe</p>  <table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2.0</td><td><frame edge</td><td>ignore</td></tr></table>	X	Y	Z	≤2.0	<frame edge	ignore				
X	Y	Z								
≤2.0	<frame edge	ignore								
<p>(iii) crack Disallow extend crack</p> 										
4.2.5	Contrast voltage warp	VOP/Vlcd voltage of confirmed sample±0.15V	Minor							
4.2.6	color	Color & luminance of module scope reference spec	Minor							
4.2.7	Cross talk	Reference confirmed limit sample	Minor							

12. Handling Precautions

12.1 Mounting method

The LCD panel of CH LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicide coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity

12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution For Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to CH LCD , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

14. Packing Method

