深圳国显科技有限公司

Shenzhen K&D Technology Co.,Ltd

SPECIFICATION FOR LCD MODULE

Customer : _____

Product Model: KD50G6-40NM-A3

Sample code: _____

Designed by	Checked by	Approved by

Final Approval by Customer

☐ LCM Machinery OK **Checked By** _____ ☐ LCM Display OK **Checked By** _____	☐ LCM OK ☐ NG，Problem survey: **Approved By** _____

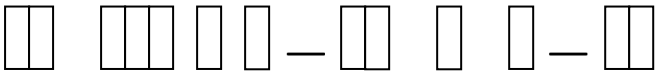
※**The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.**

Revision History

Version	Contents	Date	Note
A	Original	2008.12.15	

Contents

1 Numbering System



No	Definition	Specifications
(1)	TFT LCM Productor No.	KD ---- Kingdisplay technologiy Co.,Ltd
(2)	Display monitor opposite angle line size	Unit :mm or mmm (size <10 inch: takes two integers ; size >=10 inch: takes three integers)
(3)	Productor Types	D ---- Digital photo frame / DVD G ----GPS M ----MP P ----Mobil-Phone 。。。
(4)	Productor Development Series No.	By two figures characters expression from 01 to 99
(5)	Interface PIN Number	By two figures characters expression from 01 to 99
(6)	With Touch Panel Or Not	T----With T/P ； N----Without T/P
(7)	LCD Type	A----AUO ； M----CMO ； C----CPT； P----PVI； L----LG； W----Wintek； H----HSD； T----Topply； Y----Hydis； I----Hitach； S----Sharp。。。
(8)	Productor Development edition No.	By The English litters : A 1~ Z9

2 Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of Shenzhen K&D Technology Co.,Ltd.

3 Normative Reference

GB/T4619-1996 《 Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

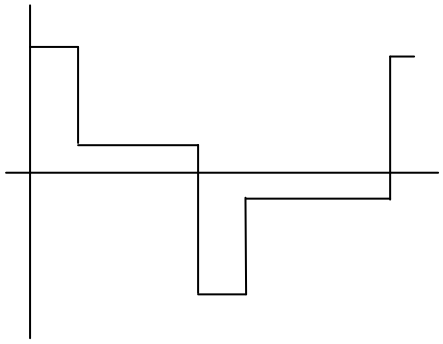
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PARTGB2828`2829-87《National Standard of PRC》

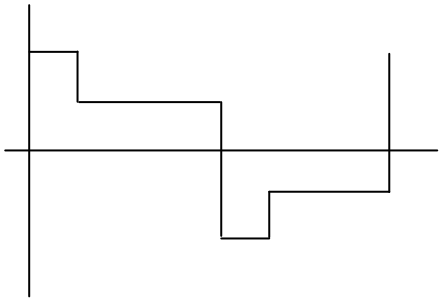
4 Definitions

4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.



【 selected waveform 】



【 non-selected waveform 】

① Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

(f_f=80Hz, Φ=10° θ=270° at 25℃)

② Vth2: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

(f_f=80Hz, Φ=10° θ=270° at 25℃)

③ Vop: (Vth1(50%)+Vth2(50%))/2 (f_f=80Hz, Φ=10° θ=270° at 25℃)

4.2 Definition of Response Time Tr, Td

①Tr: The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. (f_f=80Hz, Φ=10°θ=270°at 25 ℃)

②Td: The time required which the brightness of segment becomes 90% from 10% when waveform is switched to

selected one from selected one. (f_f=80Hz, Φ=10°θ=270°at 25℃)

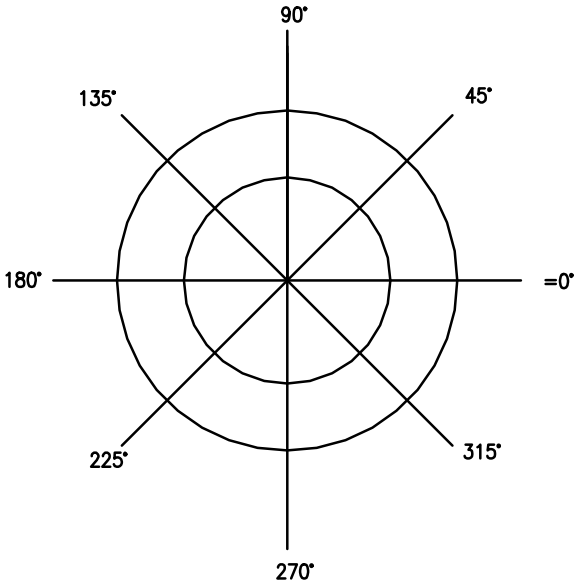
4.3 Definition of Contrast Ratio Cr

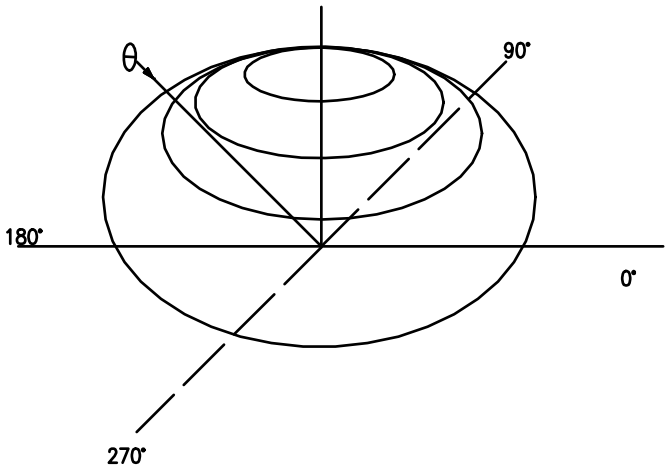
Cr=A/B

① A: Segments brightness in case of non-selected waveform

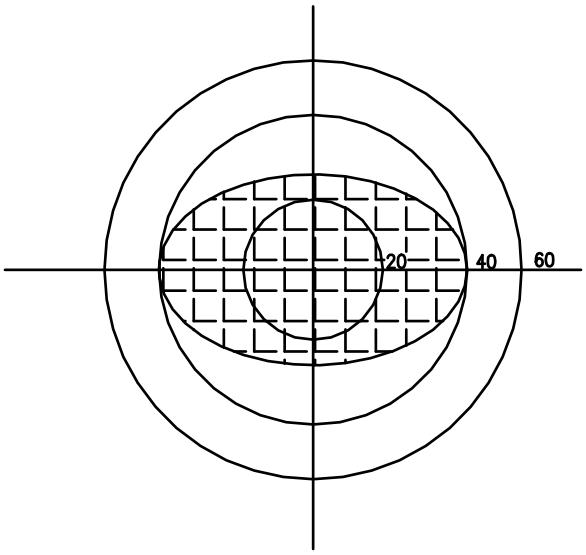
② B: Segments brightness in case of selected waveform

4.4 Definition of Angle and Viewing Range





Angular Graph: Constrast Ratio



Such as:
Viewing Angle Range:
80(Cr>2) Horizontal
70(Cr>2) Vertical

5 Technology Specifications

5.1 Feature

This single-display module is suitable for use in Multidedia Player products. The LCD adopts one backlight with High brightness 12-lamps white LED.

1) Construction: 5.0″ a-Si color TFT-LCD ,White LED backlight.
2) LCD:
   - 2.1 Amorphous-TFT 5.0-inch display, transmissive, normally white type.
   - 2.2 800(RGB)×480 dots Matrix.
   - 2.3 Narrow-contact ledge technique.
   - 2.4 LCD Driver IC: HX8258A × 2 and HX8662C × 1.
3) Low cross talk by frame rate modulation.
4) RGB interface.
5) Video signal interface: Parallel RGB or serial.

5.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional outline	120.7(W) ×75.8(H)×3.1 Max(T)	mm
Active area	108.0(W) ×64.8 (H)	mm
Pixel size	135(W) ×135(H)	um
Resolution	800(RGB) × 480	pixel

5.3 Absolute Max. Rating

Item	Symbol	Value			Unit	Remark
		Min	typ	Max		
Logic power supply	DVDD	3.0	3.3	3.6	V	
Driver power supply	AVDD	11	12	13	V	
Input high voltage	V_{IH}	0.7DVDD	-	DVDD	V	
Input low voltage	V_{IL}	0	-	0.3DVDD	V	
Operating temperature	T_{OPR}	-20		+70	℃	
Storage temperature	T_{STG}	-30		+80	℃	

5.4 Electrical Characteristics (VSS=0V,Ta=-20 to 70℃)

(VDD=2.25V to 3.6V, VDC=5V or AVDD=10V, VSS=0V, VGH=4*VDC, VGL=-2*VDC, VCL=-1*VDC)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Input H voltage	V_{IH}	CKV, STV, R/L, OE	0.8VDD	-	VDD	V
Input L voltage	V_{IL}		VSS	-	0.2VDD	
Output H voltage	V_{OH}	I_{OH}=200μA	VDD-0.3	-	VDD	
Output L voltage	V_{OL}	I_{OL}=200μA	VSS	-	VSS+0.3	
Output H resistance	R_{OH}	V_{OUT} = VGH-1.0V	-	-	1000	Ω
Output L resistance	R_{OL}	V_{OUT} = VGL+1.0V	-	-	1000	Ω
Pull high resistance	R_{PU}	TC1, 2 SEQ1,2 TEST1, 2, 3 VGHS1, 2, 3 VGLS1, 2, 3 STB CH_SEL	150	-	-	kΩ
VGR output current	I_{VGR}	-	-	-	2	mA
Regulator output voltage	VGR	No load	4.4	4.5	4.6	V
VGH voltage	VGH	External C=1μF	-	4VDC	-	V
VGL voltage	VGL	External C=1μF	-	-2VDC	-	V
VCL voltage(1)	VCL	External C=4.7μF	-	-VDC	-	V
VCOMH output voltage	VCOMH1	No load. LNIV=VDD, COMC=0.65V, COMPP=3.65V	4.2	4.3	4.4	V
VCOML output voltage	VCOML1	No load. LNIV=VDD, COMC=0.65V, COMPP=3.65V	-3.1	-3.0	-2.9	V
VCOMH output voltage	VCOMH2	No load. LNIV=VSS, COMC=2.75V, COMPP=VSS	5.4	5.5	5.6	V
Input leakage current	I_{IN}	V_I=0V or 3.6V	-1.0	-	+1.0	μA
VDD Power consumption(2)	I_{VDD1}	No load, LNIV=VDD, VDD=2.5V, VDC=5.0V F_{CPV}=20KHz, OE =V_{IL}	-	150	200	μA
VDC Power consumption(2)	I_{VDC1}		-	1800	2500	
VDD Power consumption(3)	I_{VDD2}	No load, LNIV=VSS, VDD=2.5V, AVDD=10.0V F_{CPV}=20KHz, OE =V_{IL}	-	150	200	μA
AVDD Power consumption(3)	I_{AVDD1}		-	TBD	TBD	
Digital standby current	I_{VDD3}	STB = "L", all function shut down	-	-	100	μA

Analog standby current	I_{VDC3}		-	-	200	

Note:

(1)VCL voltage will be disabled for Dot inversion setting.

(2)Power consumption with the following condition:

Output no load, VGH =20V, VGL = -10V, VDD =2.5V, VDC =5.0V, V_{IH}=VDD, V_{IL}=VSS, F_{CPV}=20KHz, OE =V_{IL},

(3)Power consumption with the following condition:

Output no load, VGH =20V, VGL = -10V, VDD =2.5V, AVDD =10.0V, V_{IH}=VDD, V_{IL}=VSS, F_{CPV}=20KHz, OE =V_{IL},

5.5 Optical specifications

Item		Symbol	Conditions	Specifications Min.	Typ.	Max.	Unit	Note
Transmittance		T%	Viewing normal angle $\theta_X = \theta_Y = 0°$		7.5		%	All left side data are based on CMO's following condition –T6 NTSC: 50% LC:5091 Light : C light (Machine:BM5A) Normal Polarizer Without DBEF Simulation Data Reference Only
Contrast Ratio		CR		150	250		--	
Response Time		T_R			15	20	ms	
		T_F			35	50	ms	
Chromaticity	Red	X_R		0.585	0.615	0.645		
		Y_R		0.314	0.344	0.374		
	Green	X_G		0.277	0.307	0.337		
		Y_G		0.532	0.562	0.592		
	Blue	X_B		0.103	0.133	0.163		
		Y_B		0.120	0.150	0.180		
	White	X_W		0.279	0.309	0.339		
		Y_W		0.320	0.350	0.380		
Viewing Angle	Hor.	θ_{X+}	Center CR≥10		45		deg.	
		θ_{X-}			45			
	Ver.	θ_{Y+}			15			
		θ_{Y-}			35			

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

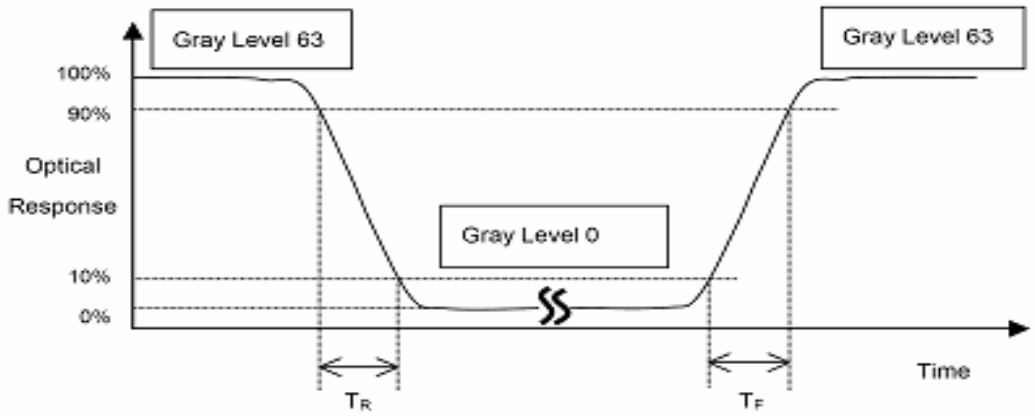
L63: Luminance of gray level 63

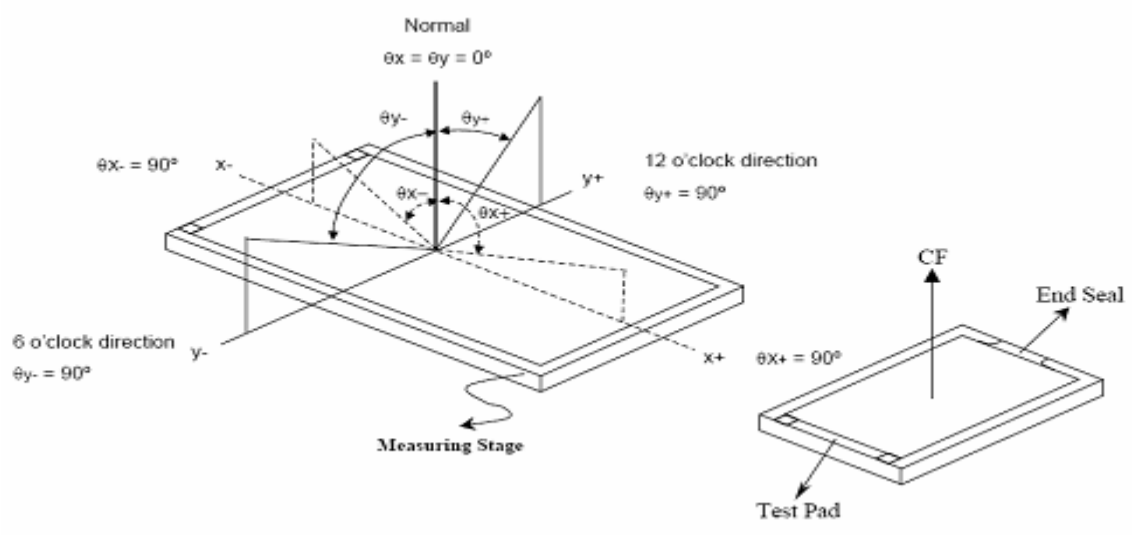
L0: Luminance of gray level 0

CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (TR, TF):

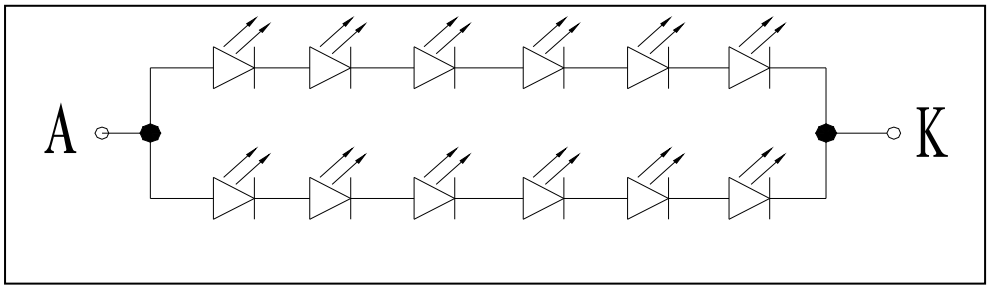




5.6 LED back light specification (12 White Chips)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	Vf	If=40mA	18	19.2	20.4	V
Uniformity (with L/G)	ΔB_p	If=40mA	80	-	-	%
Luminance for LCD	L_V	If=40mA	5200	-	-	cd/m^2

LED CIRCUIT



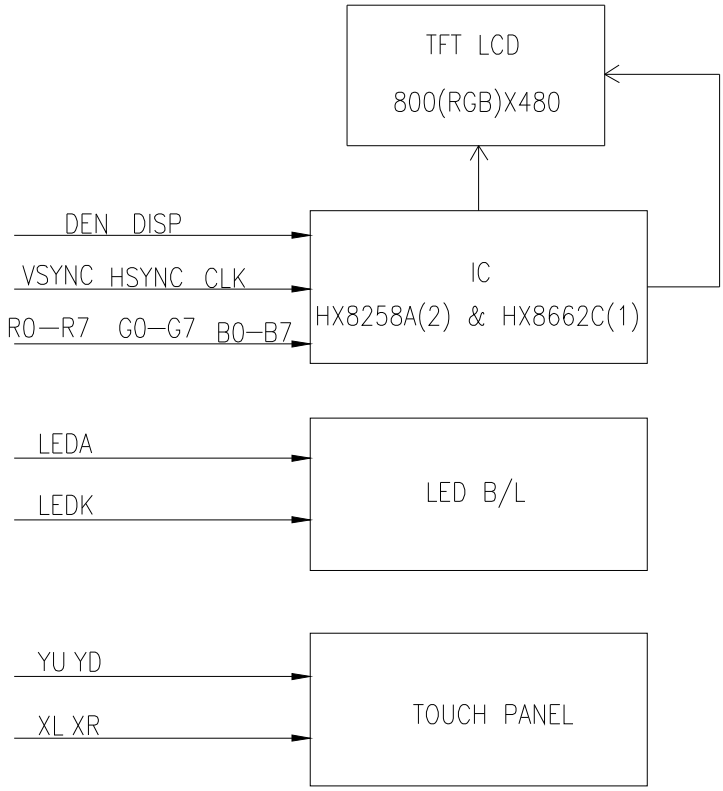
5.7 Interface Pin Connections

PIN NO.	Symbol	Description
1	LED-K	LED backlight(Cathode)
2	LED-A	LED backlight(anode)
3	GND	Ground
4	VDD	Power supply (Digital +3.0V)
5-12	R0-R7	Red Data
13-20	G0-G7	Green Data
21-28	B0-B7	Blue Data
29	GND	Ground
30	CLK	Clodk
31	DISP	Display on/off

32	HSYNC	Horizontal sync input in RGB mode (short to GND if not used)
33	VSYNC	Vertical sync input in RGB mode (short to GND if not used)
34	DEN	Data Enable
35	AVDD	Power supply (12V)
36	GND	Ground
37	NC	NC
38	NC	NC
39	NC	NC
40	NC	NC

6 Signal timing diagram and Circuit block diagram

6.1 Circuit block diagram

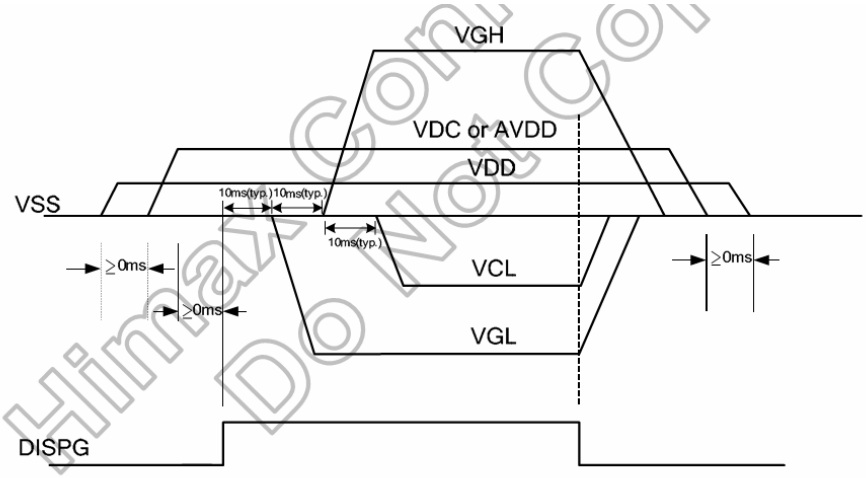


6.2 Signal Timing Diagram

6.2.1 Power ON/OFF Sequence

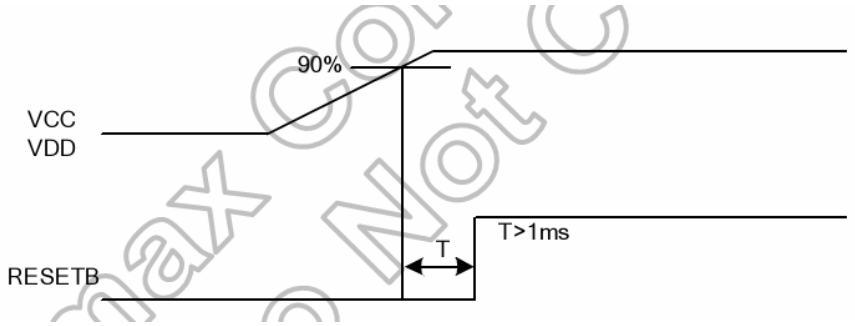
To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VCC, GND → VDDA, VSS → V1 to V10
Power OFF: V1 to V10 → VDDA, VSS → VCC, GND

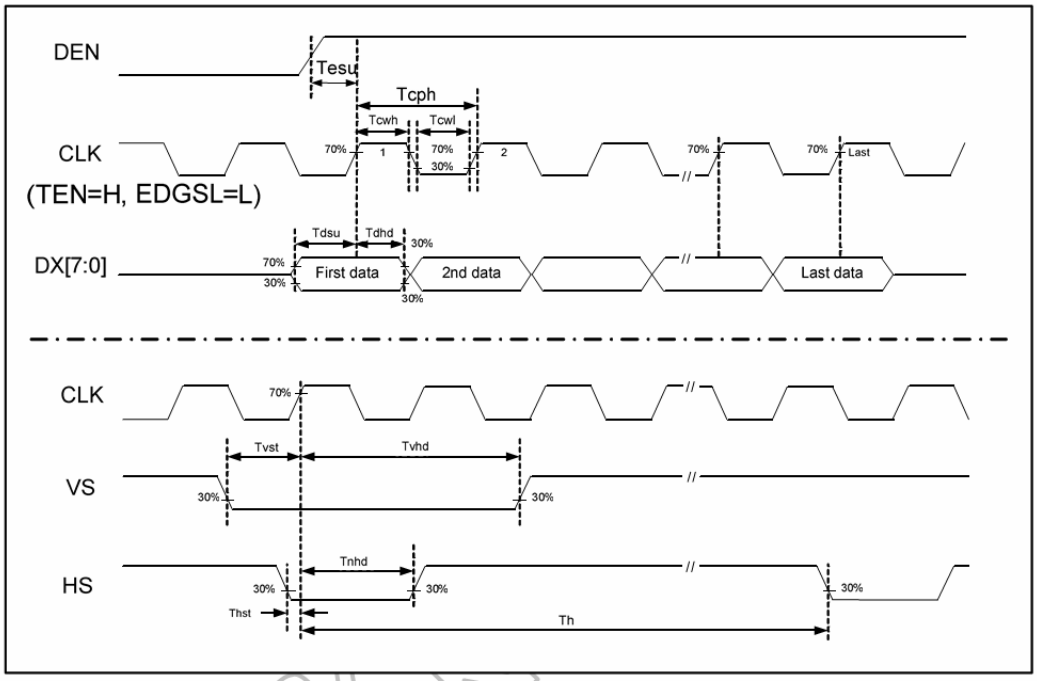


6.2.2 Reset timing

The reset input must be held for at least 1ms after power is stable.

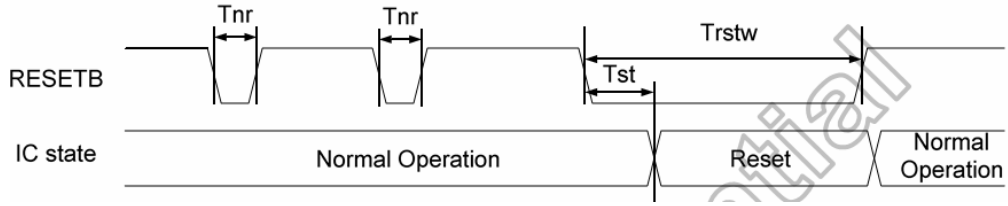


6.2.3 Timing Diagram of interface Signal



Hardware reset timing

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
RESETB low pulse width	T_{rstw}	10	-	-	μs
Negative noise pulse width	T_{nr}		-	2	μs
Reset start time	T_{st}	2	-		μs



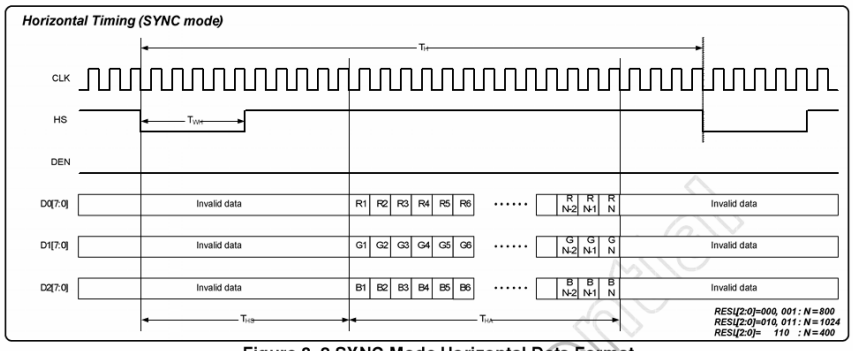


Figure 8. 2 SYNC Mode Horizontal Data Format

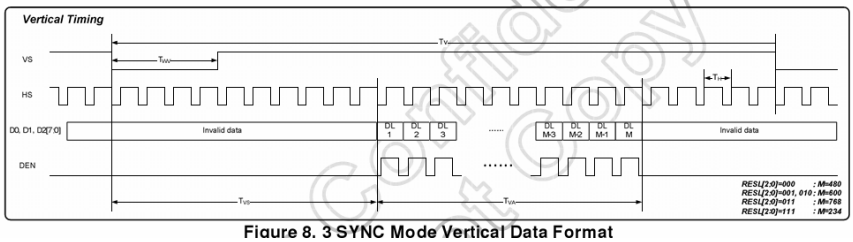


Figure 8. 3 SYNC Mode Vertical Data Format

- **sync mode**

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	-	33.26	-	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	-	1056	-	T_{CPH}
HS pulse width	T_{WH}	1	128	-	T_{CPH}
HS-first horizontal data time	T_{HS}	STHD[7:0]+88(i)			T_{CPH}
HS Active Time	T_{HA}	-	800	-	T_{CPH}
VS period	T_V	-	525	-	T_H
VS pulse width	T_{WV}	1	2	-	T_H
VS-DEN time	T_{VS}	STVD[6:0]+8			T_H
VS Active Time	T_{VA}	-	480	-	T_H

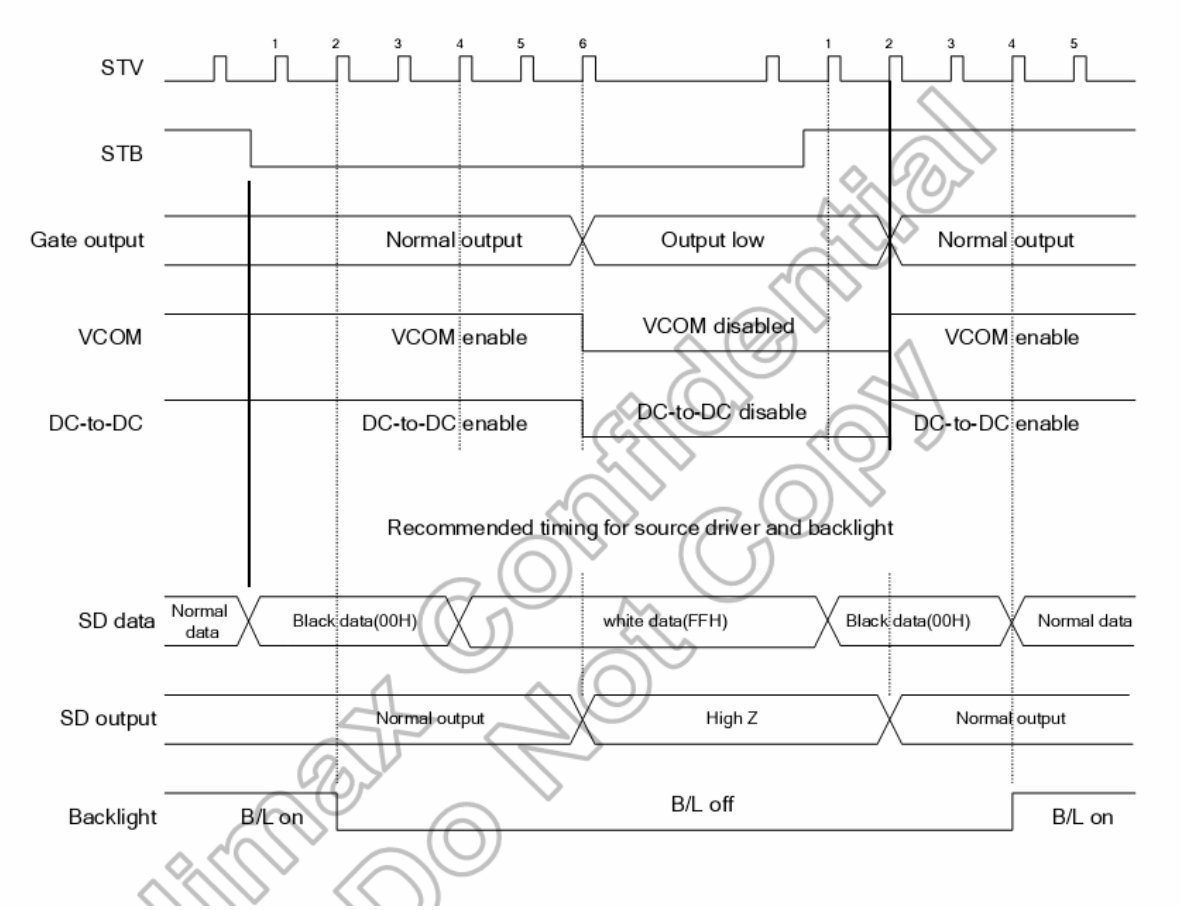
- **DE mode**

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	-	33.26	-	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}
DE pulse width	T_{DH}	-	800	-	T_{CPH}
DE frame blanking	T_{HS}	10	45	110	$T_{DEH}+T_{DEL}$
DE frame width	T_{EP}	-	480	-	$T_{DEH}+T_{DEL}$

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
OEV pulse width	T_{OEV}	-	150	-	T_{CPH}
CKV pulse width	T_{CKV}	-	133	-	T_{CPH}
DE(internal)-STV time	T_1	-	4	-	T_{CPH}
DE(internal)-CKV time	T_2	-	40	-	T_{CPH}
DE(internal)-OEV time	T_3	-	23	-	T_{CPH}
DE(internal)-POL time	T_4	-	157	-	T_{CPH}
STV pulse width	-	-	1	-	T_H

(i). $T_{HS}+T_{HA}<T_H$

6.2.4 Gate Driver Timing Control



7 Reliability Test Conditions And Methods

NO	Item	Condition	Method
1	High / Low Temperature Storage	80℃/-30℃ 120hrs	Check and record every 48Hrs
2	High / Low Temperature Life	70℃/-20℃ 120hrs (operating mode)	Check and record every 48Hrs
3	High Temperature、High Humidity Operating	60℃,90% RH, 96Hrs	Check and record every 48hrs
4	Thermal Shock	-30℃(30Min) ⟶ 25℃(5Min) ⟶ 80℃(30Min) (conversion time, : 5 sec) 20 cycles	Each 10 cycles end , check

5	Vibration	10Hz~55Hz~10Hz Amplitude: 1.5mm 2hrs for each direction(X,Y,Z)	Each direction end, Check the Appearance and Electrical Characteristics
6	Static Electricity	Gap mood: ±1KV~±8KV (10 times air discharge with positive/negative voltage voltage gap : 1kv) Touch mood: ±1KV~±4KV	Each discharge end, Check the Electrical Characteristics
7	Curve	60 Thousand times, 40 times/min 150°（according to die if exist)	Check and record every 2~4 thousand times
8	Slump	Free faller movement for each side、cording、angle (75cm High、6 sides、2 angle、2 cording)	End

8 Inspection standard

No	Item	Criterion	
01	Outline Dimension	In accord with drawing	
02	Position-finding Dimension Assemble Dimension	In accord with drawing	

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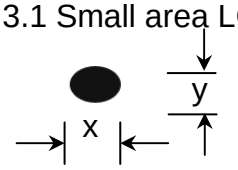
<td rowspan="2">03</td>
<td rowspan="2">LCD black spots, white spots (Round type)</td>
<td>Round type: non display
3.1 Small area LCD Unit : mm
 

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 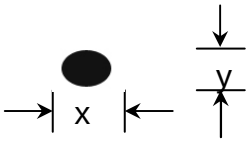

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C-STN : if D＞0.1 , unqualified</td>
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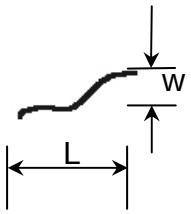
<td>LCD black spots, white spots (Line Style)</td>
<td>4.1 Small area LCD
Unit : mm
 

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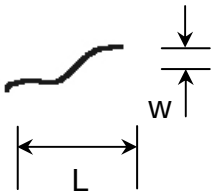
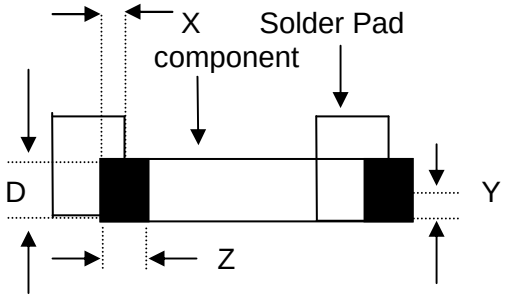
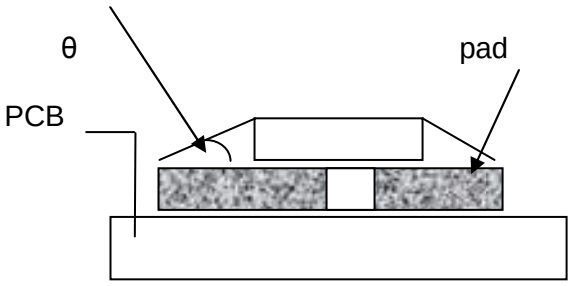
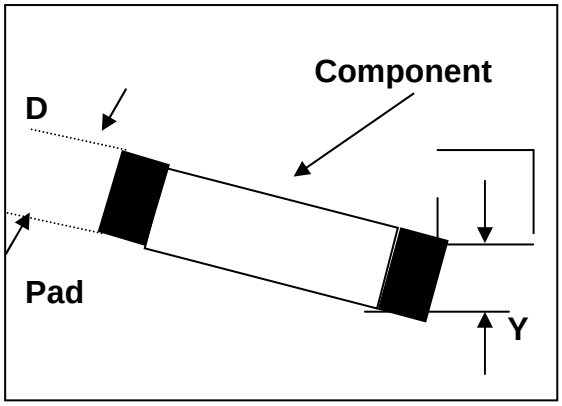
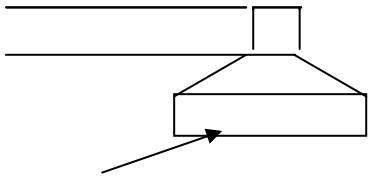
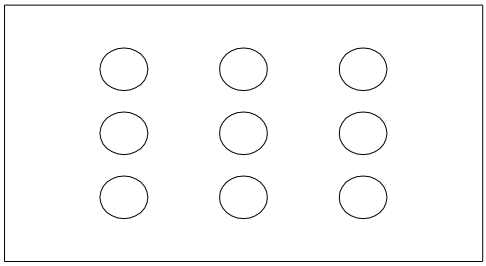
<table>
<tr><td></td><td></td><td colspan="2">4.2Large area LCD
 

<table><tr><th>Length</th><th>Width</th><th>Qualified Quantity</th></tr><tr><td>-</td><td>≤0.015</td><td>Ignore</td></tr><tr><td>≤2.0</td><td>0.015＜W≤ 0.025</td><td>2</td></tr><tr><td>≤1.0</td><td>0.025＜W≤ 0.05</td><td>1</td></tr><tr><td>-</td><td>D＞0.05</td><td>According to circle</td></tr></table>CSTN : If W ≥ 0.015 , unqualified
Ignore beyond viewing area</td><td></td></tr>
<tr><td>05</td><td>LCD Scratch 、Threadlike Fiber</td><td colspan="2">Same to NO.3 circle
sightline and surface of LCD is vertical
(2)Same to NO.3 line style</td><td></td></tr>
<tr><td>06</td><td>POL</td><td colspan="2">It is not admissible that POL is beyond the edge of glass, else, unqualified.
It is essential that POL is over the 50 percent of width of frame , else ,unqualified.
According to the drawing in case of special definition.</td><td></td></tr>
<tr><td rowspan="3">07</td><td rowspan="3">IC/FPC Bonding</td><td>Scratch</td><td>Reject</td><td></td></tr>
<tr><td>Intensity Of Adhesion</td><td>If lower than specification, reject</td><td></td></tr>
<tr><td>Gold Fold Twist</td><td>Reject</td><td></td></tr>
<tr><td rowspan="2">07</td><td rowspan="2">IC/FPC Bonding</td><td>Silicon</td><td>According to outline, no gold outside, seal can not be higher than LCD</td><td></td></tr>
<tr><td>FPC Gold Sever</td><td>Reject</td><td></td></tr>
<tr><td>08</td><td>SMT</td><td>Lack of Component、Polarity Inverse</td><td>If exist, reject</td><td></td></tr>
</table>

		Leak Solder、 Virtual Solder	If exist, reject	
		Short Circuit In Solder Point	If exist, reject	
		Tin Ball	If exist, reject	
		Tin Acumination	If visual, reject	
		Height Solder Point	If higher 0.5mm than component. reject	
		Height of component	Either side higher 0.5mm than component, reject	
		Component Shift	 X<3/4Z reject y＞1/3D reject	

08	SMT	Few Tin	 If θ≤20° reject	
		Component Deflection	 If Y >1/3D reject	
		Component Carcass Sideways	Reject	
		Component Carcass Sideways	If exist with visual inspection , reject	
		Lot Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: Tin accrete the solder side completely , full circle arc , ok C: Jointing include whole solder side, height of tin>50 percent of height of component, reject	
		Few Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: height of tin > 1/3 of solder side of component , ok C: height of tin ≤ 1/3 of solder side of component, reject	

<table>
<tr><td>08</td><td>SMT</td><td colspan="2">Normal
 
Jointing side</td><td></td></tr>
<tr><td rowspan="2">09</td><td rowspan="2">Light</td><td>Short circuit 、 Open circuit</td><td>Forbid</td><td></td></tr>
<tr><td>Quality of CSTN Display</td><td>1、Rolling strake with visual inspection, forbid
2、Differentness of color in viewing area with visual inspection (full white、red、green、blue), forbid
3 、 Display change with visual inspection , forbid</td><td></td></tr>
<tr><td>10</td><td>Color Of CIE Coordinate</td><td colspan="2"><table><tr><td></td><td>x</td><td>y</td></tr><tr><td>white</td><td>±0.05</td><td>±0.05</td></tr><tr><td>Red</td><td>±0.05</td><td>±0.05</td></tr><tr><td>Green</td><td>±0.05</td><td>±0.05</td></tr><tr><td>Blue</td><td>±0.05</td><td>±0.05</td></tr></table>According to the specification or sample customer have approved
Drive LCD under normal condition, 25℃ Φ=0 Θ=0
Test white、red、green blue with DMS Record</td><td></td></tr>
<tr><td>11</td><td>Brightness</td><td>In accord with product specification</td><td>Drive condition is according to specification
Measure location is in Follow Picture
3、Adjust brightness instrument tozero , burrow against the surface of LCD , press “measure” , record when the display is steady.
(YOKOGAWA-3298)</td><td></td></tr>
</table>

			 Measure location	
12	CR (Max)	According to specification	According to product specification Measure instrument (DMS-501)	
13	Response time	According to specification	According to product specification Measure instrument (DMS-501)	
14	Viewing angle	According to specification	According to product specification Measure instrument (DMS-501)	
15	Vibration、Ring	Compare with the sample customer supply	Compare with the sample customer supply when assemble	
16	Frequency Of FPC Bend	According to the use of product (main FPC of foldaway cell phone ≥6 thousand)	Measure instrument Bend angle : 150° Fix FPC in the casement when customer supply	

9 Handling Precautions

9.1 Mounting method

The LCD panel of Daxian LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in 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.

9.2 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) , Salfur (S)

If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

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

9.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended 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.

9.4 packing

- Module employ 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 direct to sunshine or high temperature/humidity

9.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause 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 then the operating temperature range and on the other hand at higher temperature LCD's how 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.

9.6 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

9.7 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

10 Precaution for use

10.1

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.

10.2

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 Daxian , 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.

11 Dimensional Outline