SPECIFICATION
FOR
LCD Module
KD043WQFPA023

MODULE:	KD043WQFPA023
CUSTOMER:	

REV	DESCRIPTION	DATE
1.0	FIRST ISSUE	2017.05.06

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

Date	Rev. No.	Page	Summary
2017.05.06	V1.0	ALL	FIRST ISSUE

Contents

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 4.3'TFT-LCD contains 480X272 pixels, and can display up to 65K/262K/16.7M colors.

* Features

-Low Input Voltage: 3.3V(TYP)

-Display Colors of TFT LCD: 65K/262K/16.7M colors

Interface: 16/18/24Bit Parallel RGB

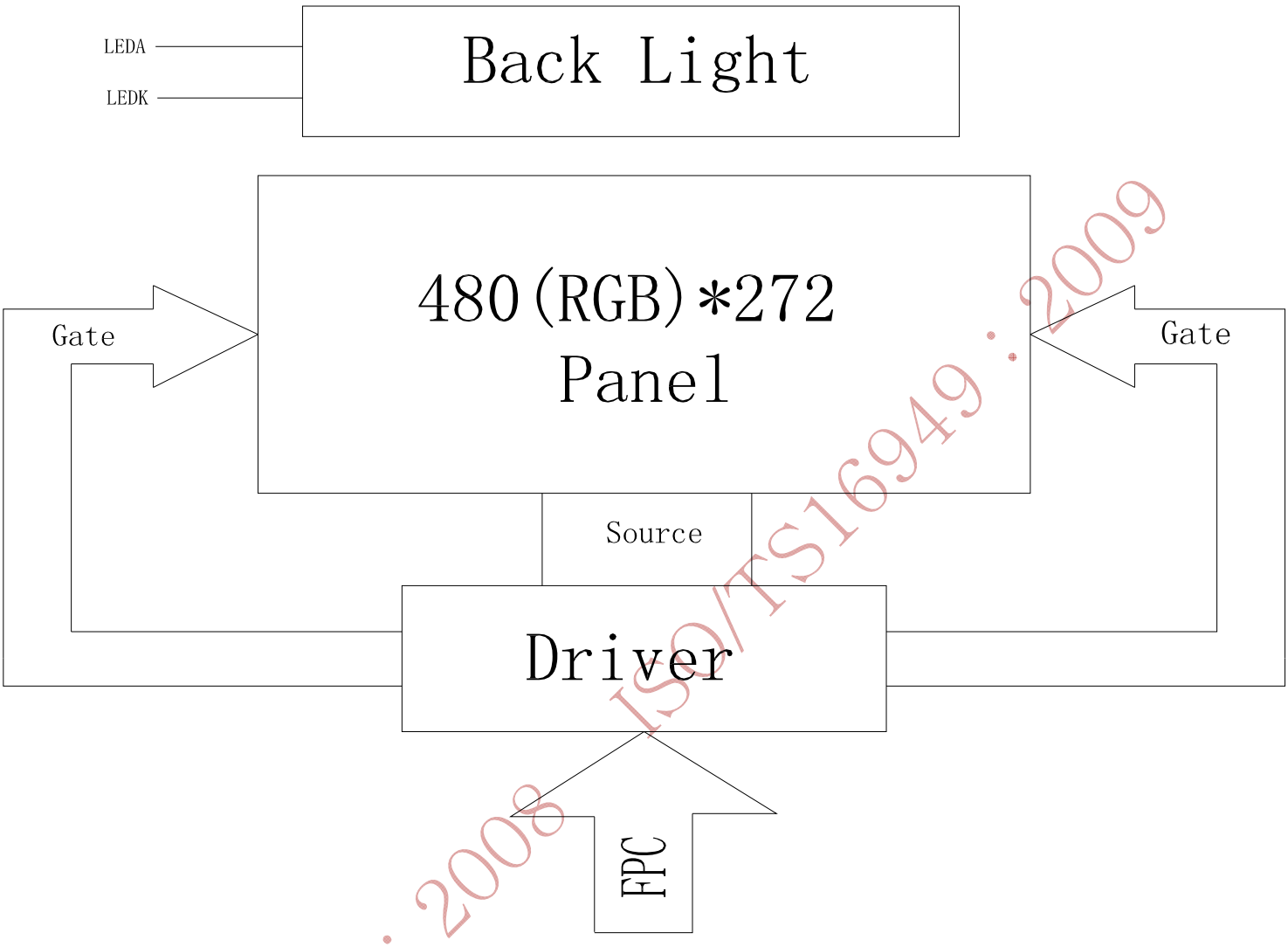
Serial-8bit RGB(Need to replace the resistor R3 to R4)

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	95.04(H) *53.86(V) (4.3inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	480(RGB)*272	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.198 (H) x 0.198 (V)	mm	-
Viewing angle	Full view angle(VA)	o'clock	-
TFT Controller IC	OTA5180A	-	-
Display mode	Transmissive/Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-40～+90	℃	-

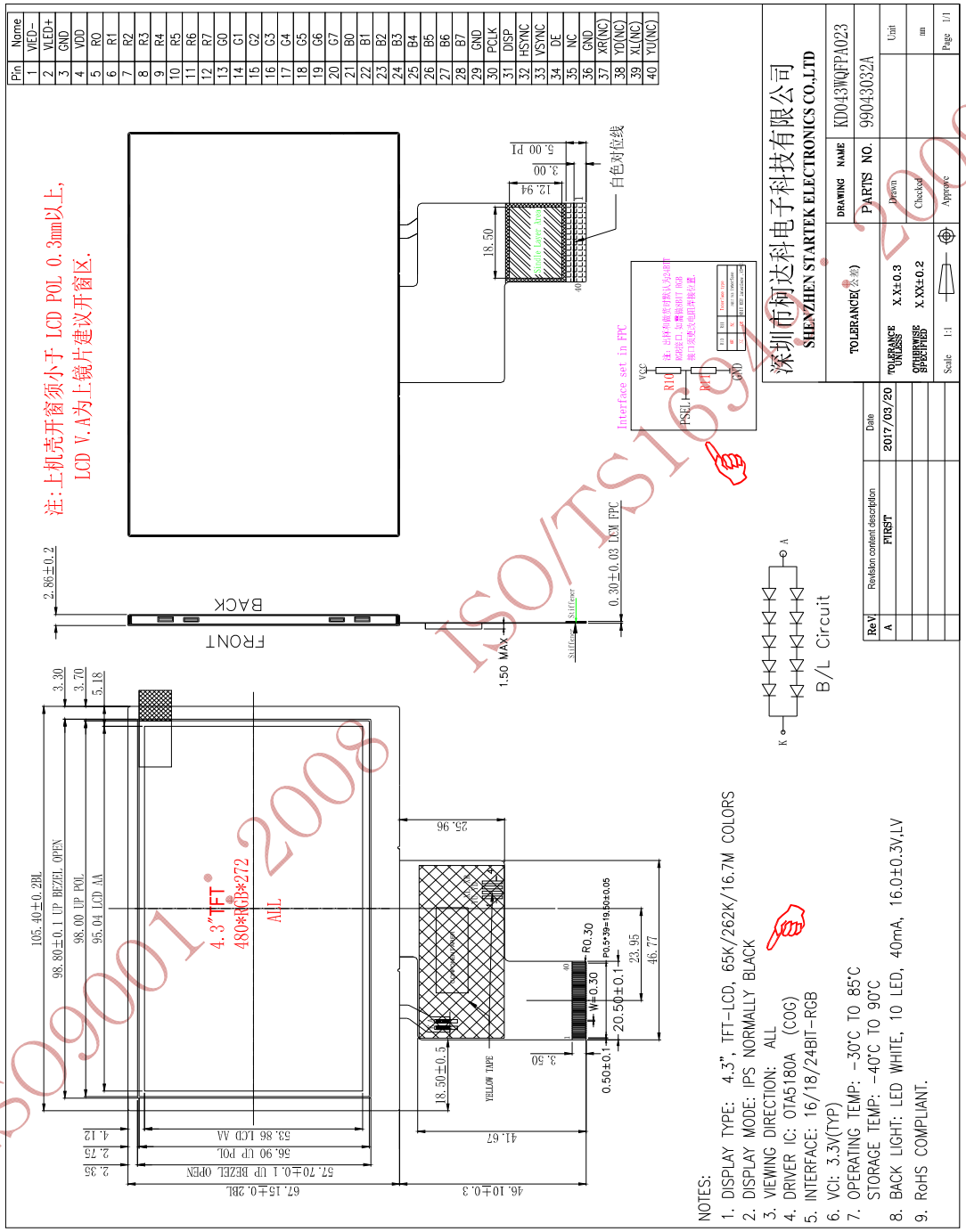
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		105.4		mm	-
	Vertical(V)		67.15		mm	-
	Depth(D)		2.86		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimension



3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	LEDK	Cathode pin OF backlight	P
2	LEDA	Anode pin of backlight	P
3	GND	Ground.	P
4	VDD	Supply voltage(3.3V).	P
5	R0	Red data input.	I
6	R1	Red data input.	I
7	R2	Red data input.	I
8	R3	Red data input.	I
9	R4	Red data input.	I
10	R5	Red data input.	I
11	R6	Red data input.	I
12	R7	Red data input.	I
13	G0	Green data input.	I
14	G1	Green data input.	I
15	G2	Green data input.	I
16	G3	Green data input.	I
17	G4	Green data input.	I
18	G5	Green data input.	I
19	G6	Green data input.	I
20	G7	Green data input.	I
21	B0	Blue data input.	I
22	B1	Blue data input.	I
23	B2	Blue data input.	I
24	B3	Blue data input.	I
25	B4	Blue data input.	I

26	B5	Blue data input.	I
27	B6	Blue data input.	I
28	B7	Blue data input.	I
29	GND	Ground.	P
30	PCLK	Clock signal. Latching data at the rising edge	I
31	DISP	Standby setting for testing, it should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.	I
32	HSYNC	Horizontal Sync input. Negative polarity.	I
33	VSYNC	Vertical Sync input. Negative polarity.	I
34	DE	Data input Enable. Active High to enable the data input Bus under “DE Mode”.	I
35	NC		
36	GND	Ground.	P
37	XR(NC)	Touch panel Right Glass Terminal	
38	YD(NC)	Touch panel Bottom Film Terminal	
39	XL(NC)	Touch panel LIFT Glass Terminal	
40	YU(NC)	Touch panel Top Film Terminal	

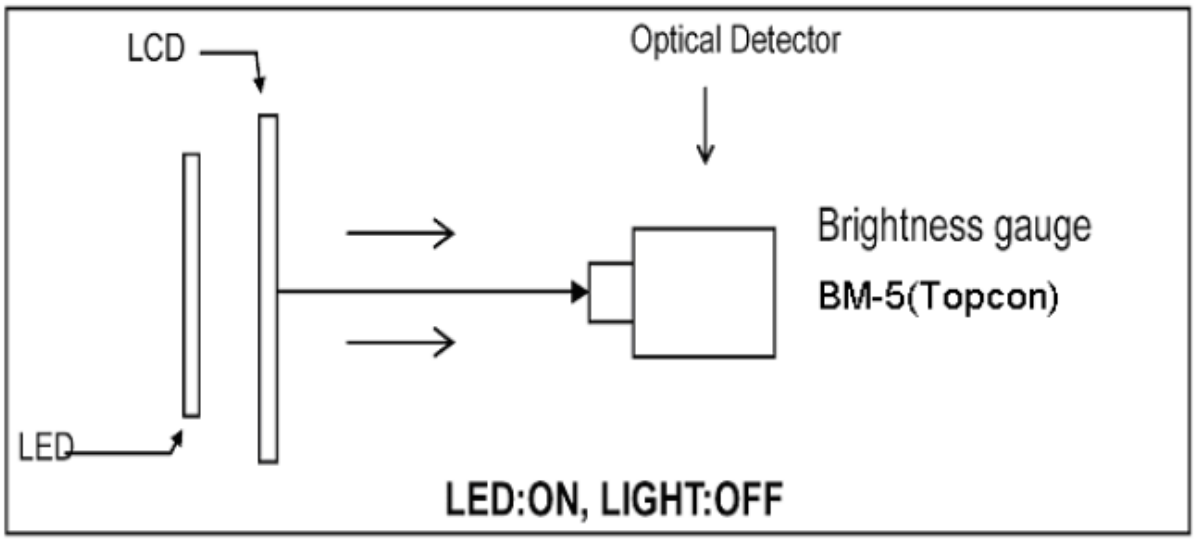
Note: When use Serial-8bit RGB，data input through G0-G7

4. LCD Optical Characteristics

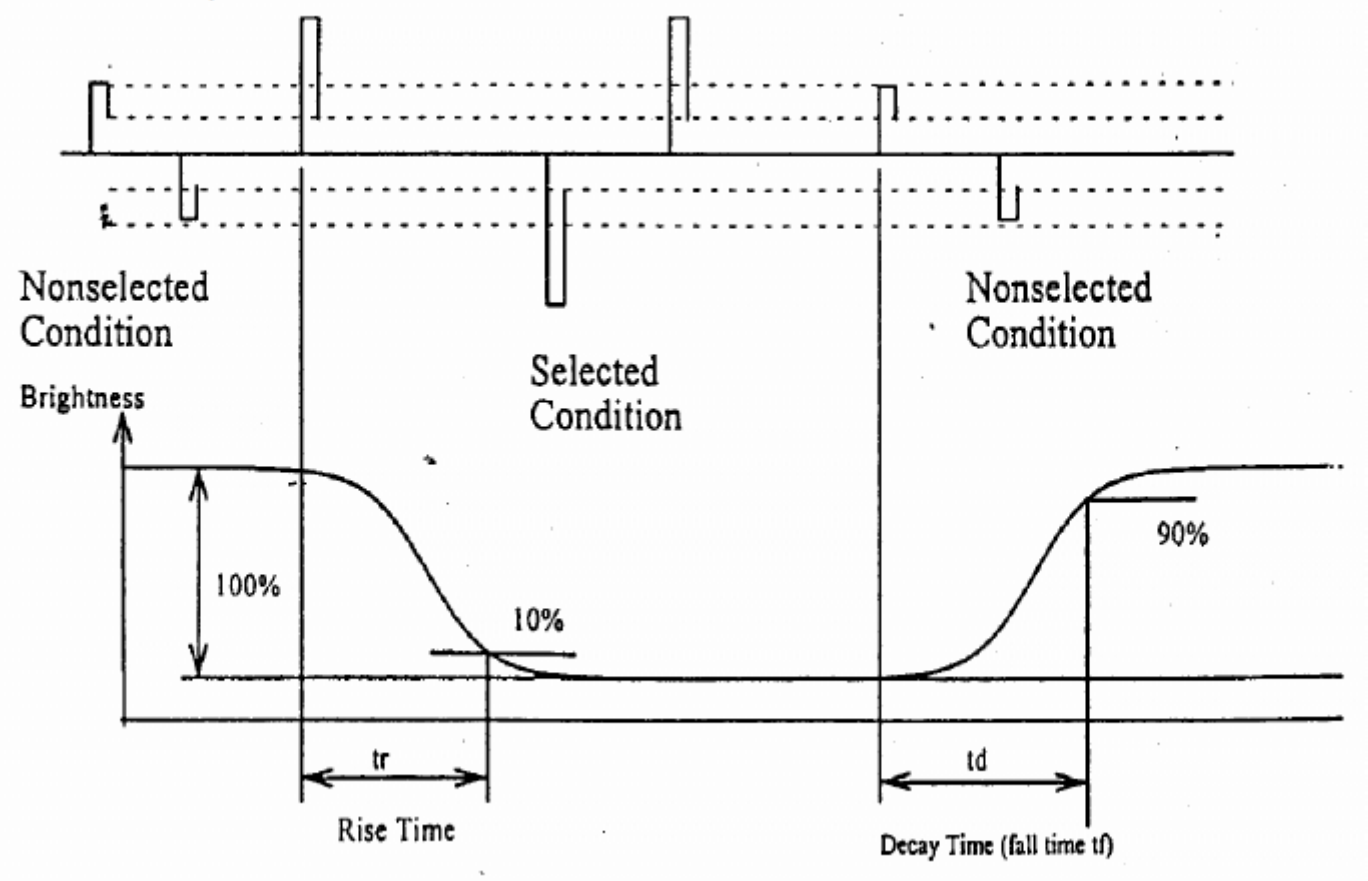
4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal viewing angle	500	600	--		θ =0° , ψ =0° LED:ON,LIGHT:OFF (Note 4)
Response time	Rising	$T_{R+}T_F$		--	35	--	msec	θ =0° , ψ =0° (Note 2)
	Falling			--				
Color gamut		S(%)		--	61	--	%	
Color Filter Chromacicity	White	W_X		0.239	0.279	0.319		CR≧10 LED:ON, LIGHT:OFF (Note 3)
		W_Y		0.269	0.309	0.349		
	Red	R_X		0.551	0.571	0.591		
		R_Y		0.314	0.334	0.354		
	Green	G_X		0.319	0.339	0.359		
		G_Y		0.558	0.578	0.598		
	Blue	B_X		0.127	0.147	0.167		
		B_Y		0.840	0.860	0.880		
Viewing angle	Hor.	$Θ_L$	CR>10	--	70	--	Degree	
		$Θ_R$		--	70	--		
	Ver.	$Θ_U$		--	70	--		
		$Θ_D$		--	70	--		
Option View Direction		Full view angle(VA)						(Note 5)

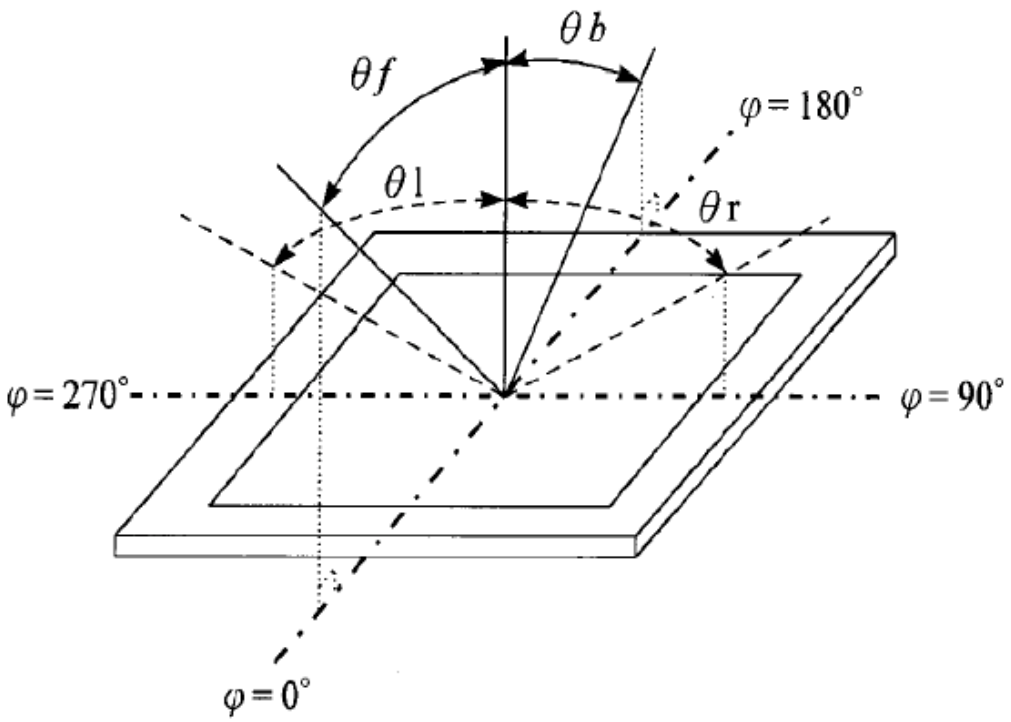
NOTE 1 :Optical characteristic measurement system



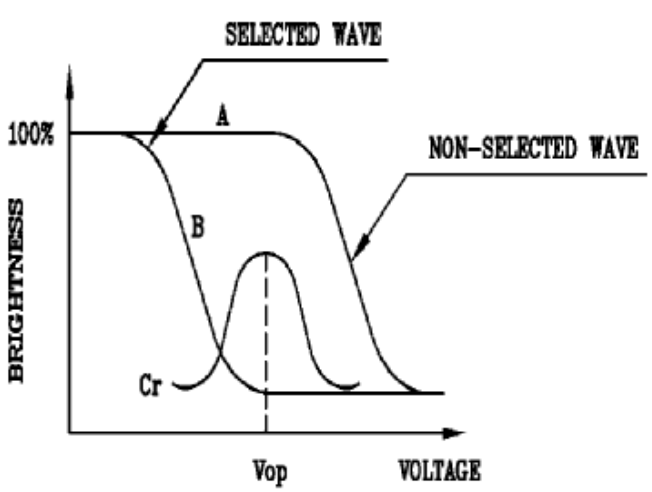
NOTE 2: Response time definition



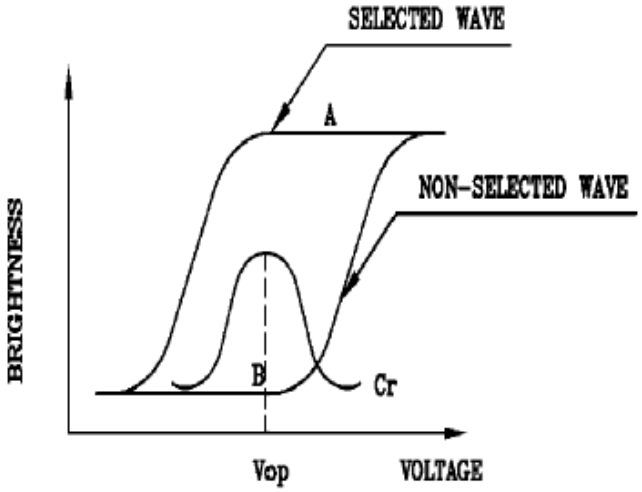
NOTE 3 : ϕ 、θ definition



NOTE 4: Contrast Definition



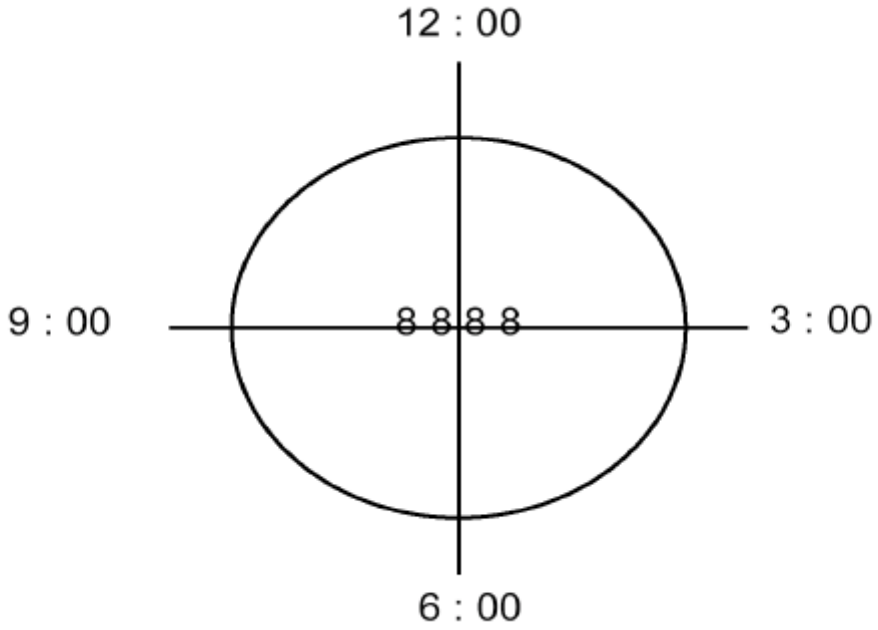
(positive type)



(negative type)

Contrast Ratio : Cr=A/B

NOTE 5: Visual angle direction priority



5. Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	4.5	**V**
Operating temperature	T_{OP}	-30	+85	℃
Storage temperature	T_{ST}	-40	+90	℃

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Normal mode Current consumption	IDD	--	13	--	mA	
Level input voltage	V_{IH}	0.7 VDD		VDD	V	
	V_{IL}	GND		0.3 VDD	V	
Level output voltage	V_{OH}	0.8 VDD		VDD	V	
	V_{OL}	GND		0.2 VDD	V	

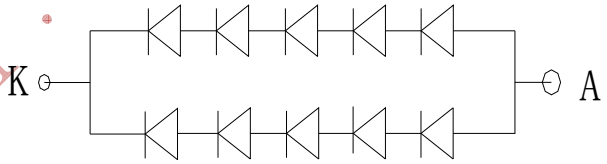
5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 10 chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	30	40	--	mA	
Forward Voltage	V_F	--	16	--	V	
LCM Luminance	L_V	350	410	--	cd/m2	Note3
LED life time	Hr	50000	--	--	Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

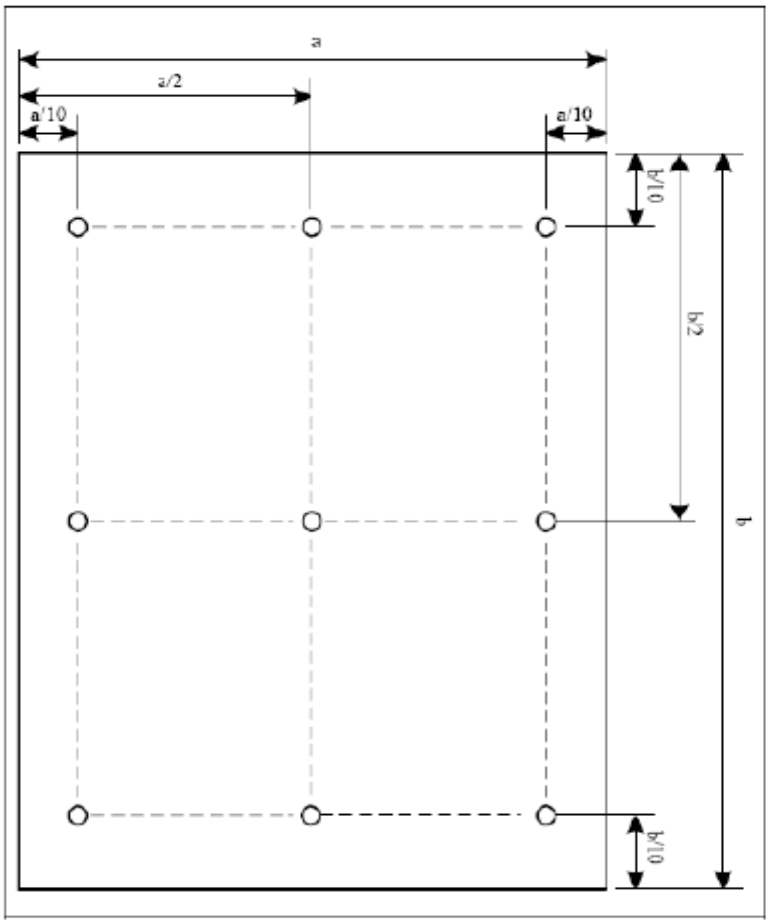
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



B/L Circuit

NOTE 3：Luminance Uniformity of these 9 points is defined as below:

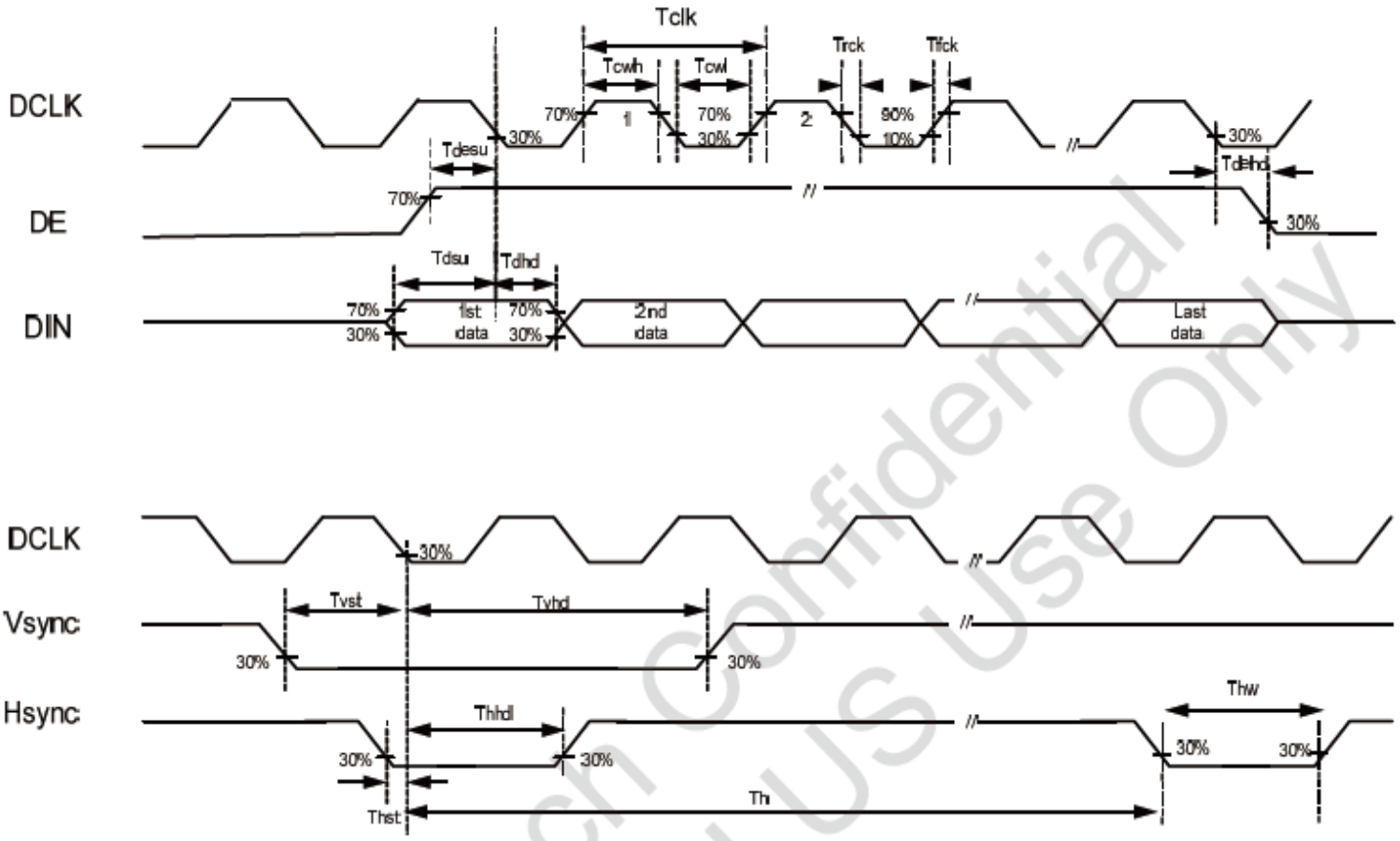


$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. AC Characteristic

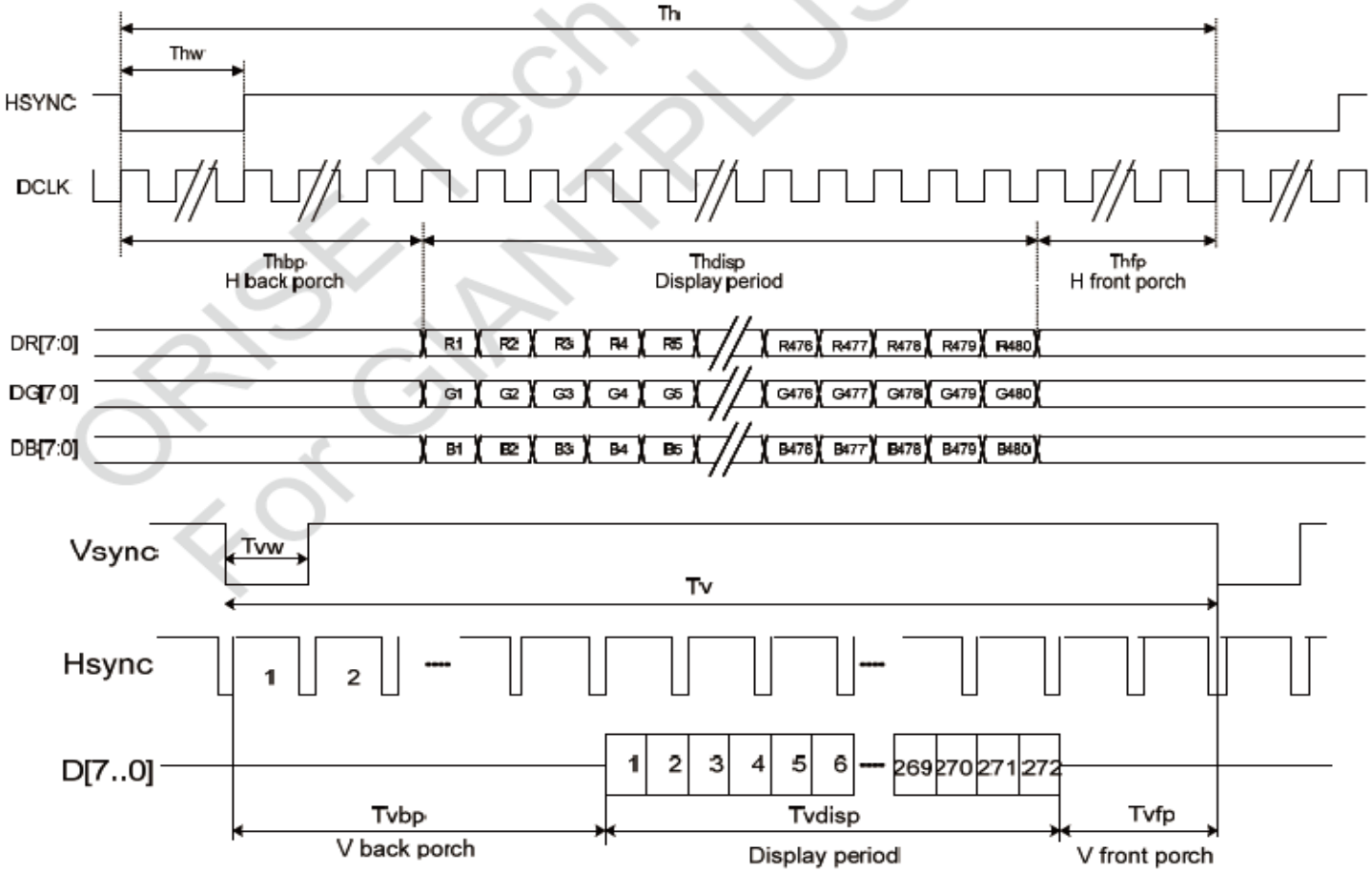
6.1 Clock and Data Input Timing Diagram



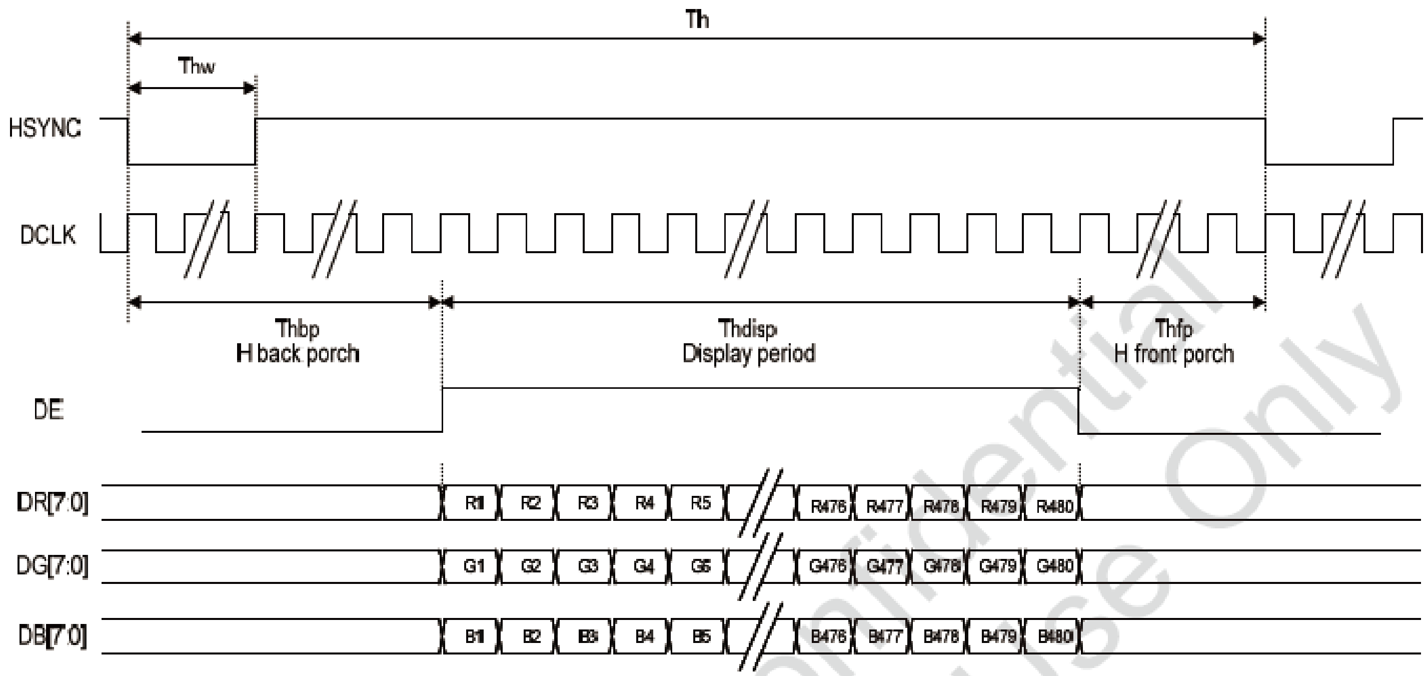
6.2 Parallel RGB Timing Input table

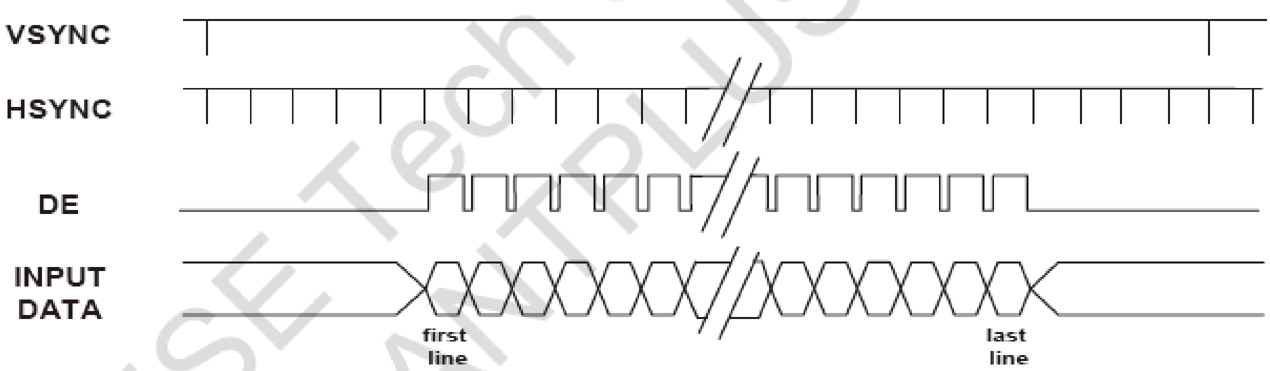
Item		Symbol	Min.	Typ.	Max.	Unit	
DCLK Frequency		Fclk	5	9	12	MHz	
DCLK Period		Tclk	83	110	200	ns	
Hsync	Period Time	Th	490	531	605	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	8	43		DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8		DCLK	
	Pulse Width	Thw	1			DCLK	
Vsync	Period Time	Tv	275	288	335	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12		H	By V_BLANKING setting
	Front Porch	Tvfp	1	4		H	
	Pulse Width	Tvw	1	10		H	

6.2.1 SYNC Mode Timing Diagram



6.2.2 SYNC-DE Mode Timing Diagram

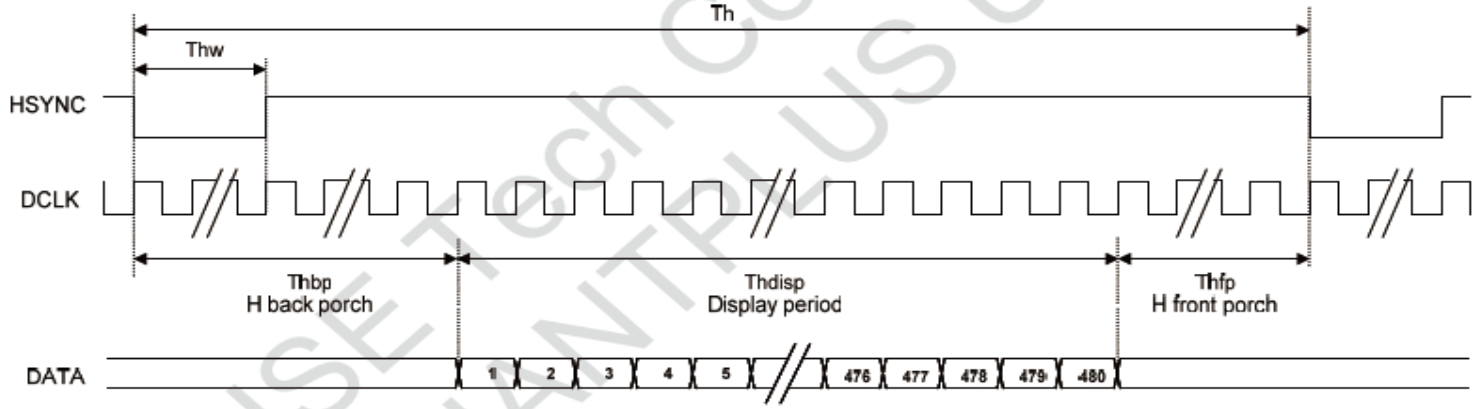




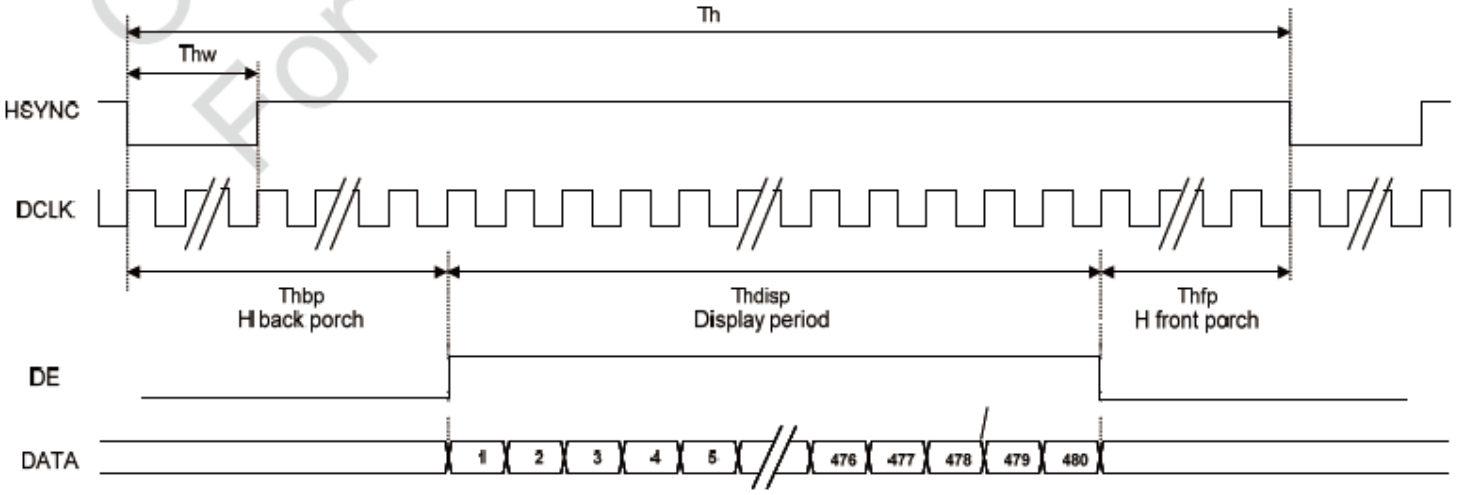
6.3 Serial-8bit RGB Timing Input table

Item		Symbol	Min.	Typ.	Max.	Unit	
DCLK Frequency		Fclk	24	27	30	MHz	
DCLK Period		Tclk	42	37	33	ns	
Hsync	Period Time	Th	1560	1716	1900	DCLK	
	Display Period	Thdisp		1440		DCLK	
	To 1st Data Input	Thbp	108	129	255	DCLK	By H_BLANKING setting
	Front Porch	Thfp	12	168	205	DCLK	
	Pulse Width	Thw	1			DCLK	
Vsync	Period Time	Tv	274	288	335	H	
	Display Period	Tvdisp		272		H	
	Delay to 1st Gate Output	Tvbp		12		H	By V_BLANKING setting
	Front Porch	Tvfp		3		H	
	Pulse Width	Tvw	1	10		H	

6.3.1 SYNC Mode Timing Diagram



6.3.2 SYNC-DE Mode Timing Diagram



7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

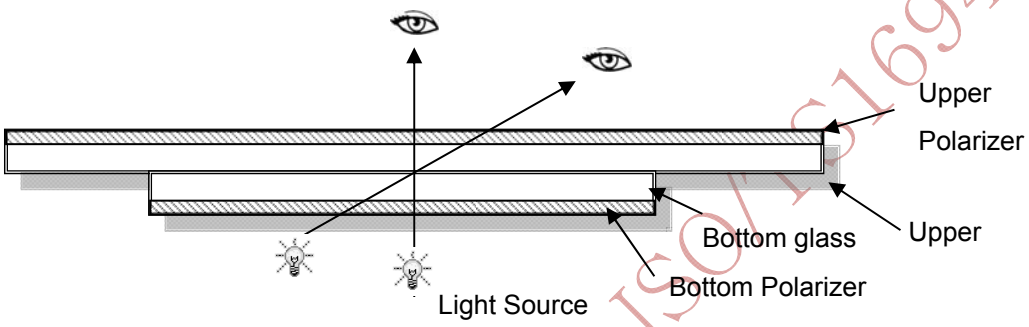
Temperature : 25±5℃

Humidity : 65%±10%RH

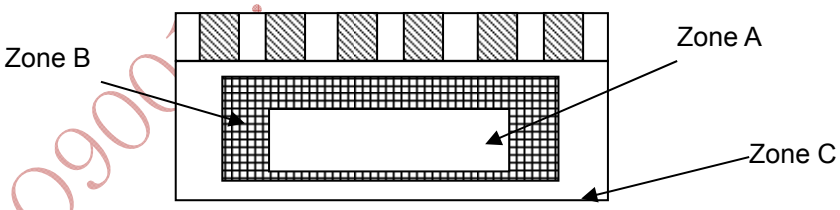
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



7.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

7.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ

AQL:

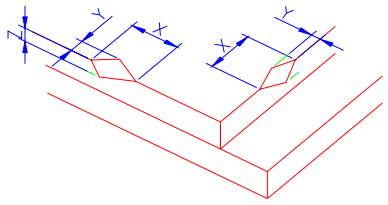
Major defect	Minor defect
0.65	1.5

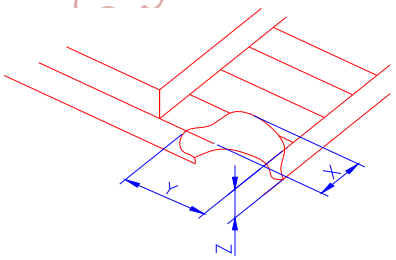
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

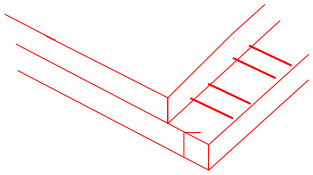
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

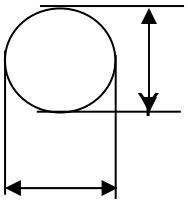
7.1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken

NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr>
</table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 

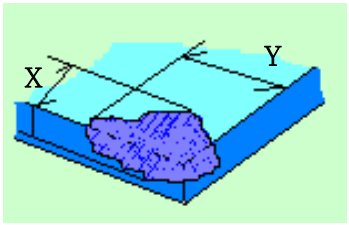
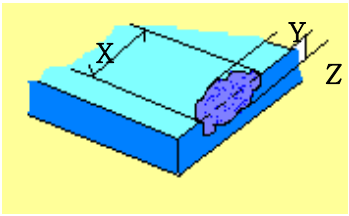
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr>
</table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

<table>
<tr><th>Number</th><th>Items</th><th>Criteria (mm)</th></tr>
<tr><td>2.0</td><td>Spot defect
 
X
Φ=(X+Y)/2</td><td>① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Accep able Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.30</td><td colspan="2">Ignore</td><td rowspan="4">Ignor</td></tr>
<tr><td>0.20<Φ≤0.3</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">2</td></tr>
<tr><td>Φ＞0.4</td><td colspan="2">0</td></tr>
</table>
②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.3</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">2</td></tr>
<tr><td>Φ＞0.4</td><td colspan="2">0</td></tr>
</table>
③ Polarizer accidented spot
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.3</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.25<Φ≤0.5</td><td colspan="2">2(distance≧10mm)</td></tr>
<tr><td>Φ>0.5</td><td colspan="2">0</td></tr>
</table></td></tr>
<tr><td></td><td>Line defect (LCD/TP /Polarizer black/white line, scratch, stain)</td><td>
<table>
<tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.05</td><td>Igno e</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.04<W≤0.07</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.06<W≤0.09</td><td>L≤2.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.09<W</td><td colspan="4">Define as spot defect</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>3.0</td><td>Polarizer Bubble</td><td>
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.2<Φ≤0.4</td><td colspan="2">3(distance≧10 m)</td></tr>
<tr><td>0.4<Φ≤0.6</td><td colspan="2">2</td></tr>
<tr><td>0.6<Φ</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td>4.0</td><td>SMT</td><td>According to IPC-A-610C class Ⅱ standard . Function defect and missing part are major defect ,the others are minor defect.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>TP bubble/ accidented spot</td><td>
<table>
<tr><th rowspan="2">Size Φ(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.3</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.25<Φ≤0.3</td><td colspan="2">3 (distance≧</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">2</td></tr>
<tr><td>0.4<Φ</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td>Assembly deflection</td><td>beyond the edge of backlight ≤0.15mm</td></tr>
</table>

<table>
<tr><td>5.0</td><td>TP
Related</td><td>Newton
Ring</td><td>Newton Ring area>1/3 TP area
NG

Newton Ring area≤1/3 TP area
OK</td><td> 
 
  </td></tr>
<tr><td></td><td></td><td>TP corner
broken
X：length
Y：width
Z：height</td><td><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤3.0mm</td><td>Y≤3.0mm</td><td>Z<LCD
thicknes</td></tr></table>*
Circuitry broken is not allowed.</td><td>  </td></tr>
<tr><td></td><td></td><td>TP edge
broken
X：length
Y：width
Z：height</td><td><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤6.0mm</td><td>Y≤2.0mm</td><td>Z<LCD
thicknes</td></tr></table>* Circuitry broken is not allowed.</td><td>  </td></tr>
</table>

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

8. Reliability Test Result

8.1 Condition

Item	Condition	Sample Size	Test Result	Note
Low Temperature Operating Life test	-30℃, 96HR	3ea	pass	-
Thermal Humidity Operating Life test	85℃90%RH, 96HR	3ea	pass	-
Temperature Cycle ON/OFF test	-30℃ ↔ 85℃, ON/OFF, 20CYC	3ea	pass	(1)
High Temperature Storage test	90℃, 96HR	3ea	pass	-
Low Temperature Storage test	－40℃, 96HR	3ea	pass	-
ESD test	150pF, 330Ω , ±6KV(Contact)/± 8KV(Air), 5 points/panel, 10 times/point	3ea	pass	
Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	3ea	pass	
Box Drop Test	1 Corner 3 Edges 6 faces, 66㎝(MEDIUM BOX)	1box	pass	-

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static; it may cause damage to the CMOS ICs.
(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(10) Do not disassemble the module.
(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
(12) Pins of I/F connector shall not be touched directly with bare hands.
(13) Do not connect, disconnect the module in the “Power ON” condition.
(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%
(2) Do not store the TFT-LCD module in direct sunlight.
(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

10. Packing

----TBD----------