PRODUCT SPECIFICATION

MODEL: KN050C4005A

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED

REVISION RECORD

REV NO	REV DATE	PAGE	CONTENTS	ISSUER
1.0	2017-1-10	19	First release	Liqin

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1.0 GENERAL SPECIFICATIONS

KN050C4005A is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC, FPC and a back light unit. The module display area contains 800*480 pixels. This product accords with RoHS environmental criterion.

Item	Contents	Unit
Panel Size	5" inch	
Viewing direction	6:00	O' Clock
Display Area	108.0(H) x 64.8(V)	mm
Outline Dimension	120.7*76.3*2.8	mm
Number of Pixels	800(H) x 3(RGB) x 480(V)	/
Number of color	16.2M	/
Display Mode	Normally white TN	
Electrical Interface	RGB 24Bits	
LCM Luminance	350(typ)	cd/m^2
Contrast Ratio	500:1 (Typ.) 350:1(Min.)	

2.0 ABSOLUTE MAXIMUM RATINGS

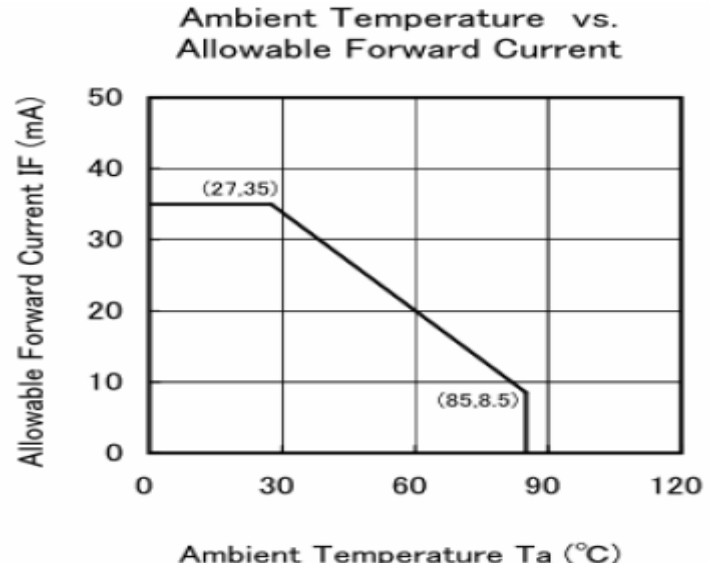
The following are maximum values which, if exceeded ,may cause fauity operation or damage to the unit.

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Digital Power Supply Voltage	VDD	-0.3	3.96	V	-
Analog Power Supply Voltage	AVDD	-0.5	14.85	V	-
TFT Gate on voltage	VGH	-0.3	40	V	-
TFT Gate off voltage	VGL	-20	0.3	V	-
Singnal Input Voltage	R0 ~ R7 G0 ~ G7 B0~B7	-0.3	3.96	V	-
GAMMA Voltage	Vr1~Vr10	-0.5	14.85	V	
Forward Current（per LED）	IF		35	MA	
Reverse Voltage（per LED）	VR		5	V	
Pulse forward current（per LED）	Ifp		100	MA	Note1
Operating temperature	Topa	-20	70	℃	Note1
Storage temperature	Tstg	-30	80	℃	Note1

Note 1：Absolute maximum rating is the limit value. When the panel is exposed operating environment beyond this range, the Panel can not assure operations and may be damaged permanently, not be able to be recovered

Note 2：condition: 1 pcs LED、1/10 duty、10ms width。

Note 3：Ambient temperature and the maximum input are fulfilling the following operating Conditions



Note 4：While the panel is used in normal temperature, the temperature in the center of panel's surface must be low than 40 ℃

3.0 ELECTRICAL CHARACTERISTICS

3.1. Typical operation conditions

Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	VDD	3	3.3	3.6	V	
Logic Input Voltage	VIL	0	-	0.3×VDD	V	
	VIH	0.7×VDD	-	VDD	V	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM	3.6	3.8	4.0	V	Note1

Note1: Please adjust VCOM to make the flicker level be minimum.

3.2. TFT-LCD current consumption

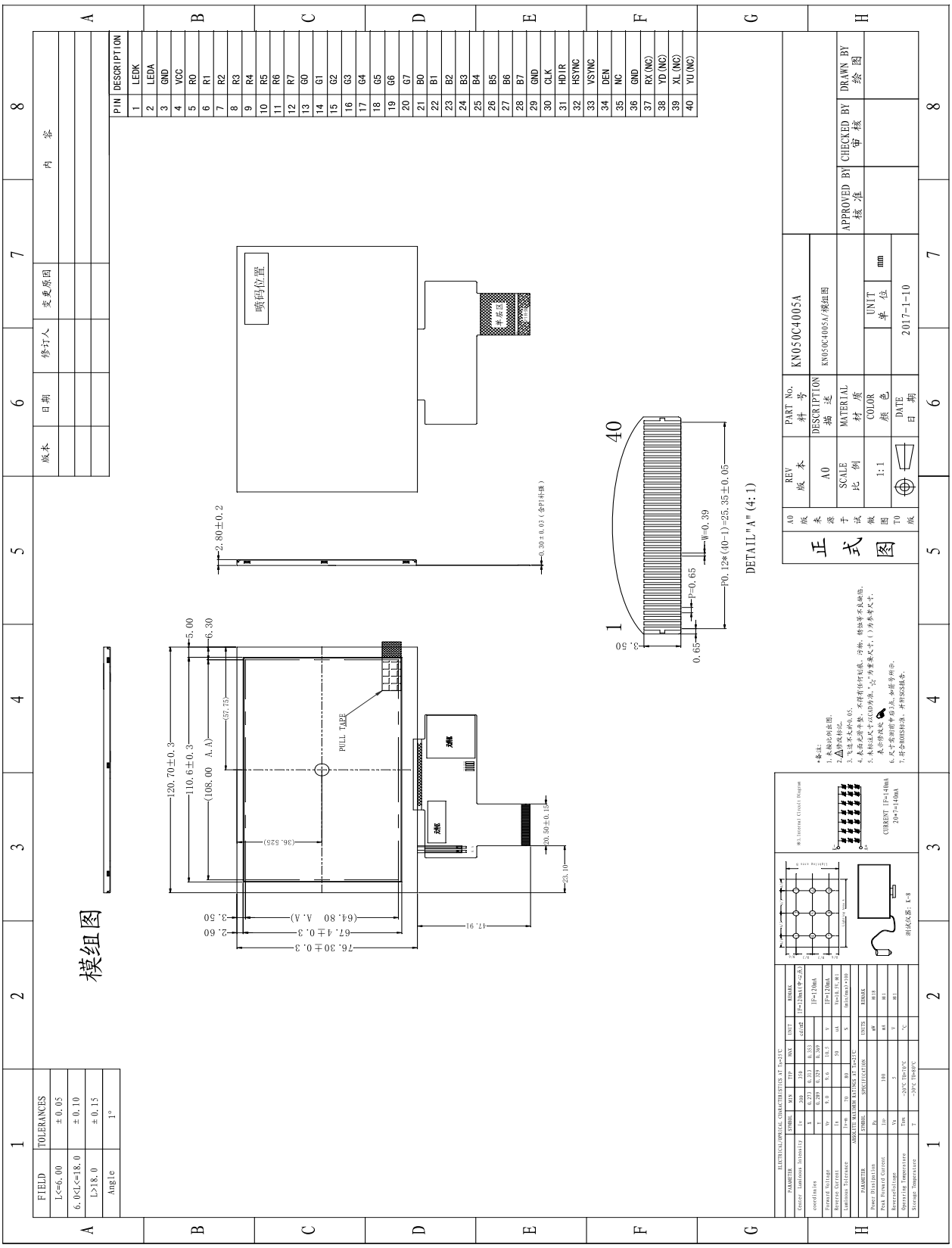
ITEM	SYMBOL	CONDITIONS	MIN	Typ	MAX	UNIT	NOTE
Gate on power current	IVGH	VGH =18V	-	2	3	mA	Note1
Gate off power current	IVGL	VGL= -6V	-	2	3	mA	Note1
Digital power current	IVDD	VDD = 3.3V	-	15	25	mA	Note1
Analog power current	IAVDD	AVDD = Vr1+0.8	-	25	40	mA	Note1
Total Power Consumption	PC		-	338	539	mW	Note1

3.3 BACKLIGHT CHARACTERISTICS

Typical operation conditions

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	**Vf**	9.0	9.6	10.5	**V**	**If=120mA**
Luminance	**Lv**	300	350	-	**cd/m2**	**If=120mA**
Number of LED	**--**	18			**Piece**	**--**
Connection mode	**P**	3serial 6parallel			**--**	**--**

4.0 DIMENSIONAL DRAWING



5.0 INTERFACE PIN CONNECTIONS

Pin.No	Symbol	Function
1	VLEDK	Power for LED backlight (Anode)
2	VLEDA	Power for LED backlight (Cathode)
3	GND	Power ground
4	VCC	Common Voltage
5-12	R0-R7	*5 Bit RED Data Bus*
13-20	G0-G7	*6 Bit GREEN Data Bus*
21-23	GND	Power ground
21-28	B0~B7	5 Bit BLUE Data Bus
29	GND	Power ground
30	CLK	Colock signal
31	HDIR	DISPLAY ON/OFF
32	HSYNC	Horizontal sync input in RGB mode
33	VSYNC	Vertical sync input in RGB mode
34	DEN	Data enable
35	NC	No Connection
36	GND	Power ground
37-40	NC	No Connection

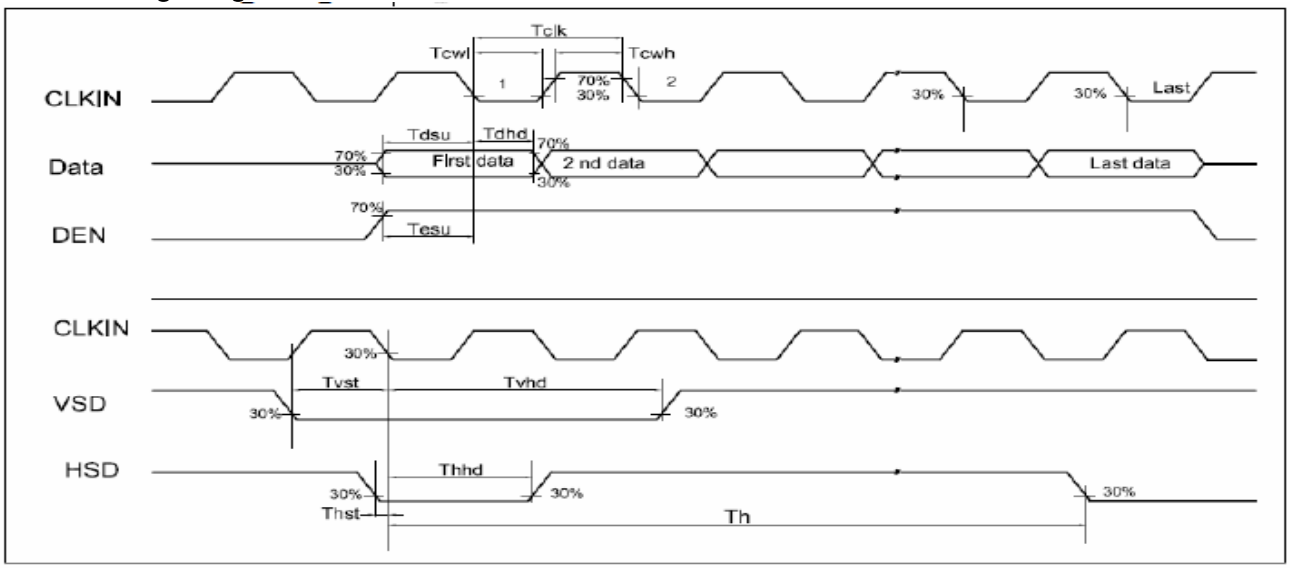
6.0 INPUT SIGNAL TIMING

6.1 TTL Timing

6.1.1 Timing Specification

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Note
DCLK	Dot Clock	1/Tclk	28.5	30	38	MHz	
	DCLK pulse duty	Tcwh	40	50	60	%	
DE	Setup Time	Tesu	8	-	-	ns	
	Hold time	Tehd	8	-	-	ns	
	Horizontal Period	t_H	908	928	1000	t_{CLK}	
	Horizontal Valid	t_{HA}		800		t_{CLK}	
	Horizontal Blank	t_{HB}	108	128	200	t_{CLK}	
	Vertical Period	t_V	523	538	633	t_H	
	Vertical Valid	t_{VA}		480		t_H	
	Vertical Blank	t_{VB}	43	58	153	t_H	
SYNC	HSYNC Setup Time	Thst	8	-	-	ns	
	HSYNC Hold Time	Thhd	8	-	-	ns	
	VSYNC Setup Time	Tvst	8	-	-	ns	
	VSYNC Hold Time	Tvhd	8	-	-	ns	
	Horizontal Period	th	908	928	1000	t_{CLK}	
	Horizontal Pulse Width	thpw	4	48	60	t_{CLK}	thb + thpw=88DCLK is fixed
	Horizontal Back Porch	thb	28	40	84	t_{CLK}	
	Horizontal Front Porch	thfp	20	40	112	t_{CLK}	
	Horizontal Valid	thd		800		t_{CLK}	
	Vertical Period	tv	523	538	633	th	
	Vertical Pulse Width	tvpw	3	3	3	th	tvpw + tvb = 32th is fixed
	Vertical Back Porch	tvb	29	29	29	th	
	Vertical Front Porch	tvfp	11	26	121	th	
	Vertical Valid	tvd		480		th	
DATA	Setup Time	Tdsu	8	-	-	ns	
	Hold Time	Tdhd	8	-	-	ns	

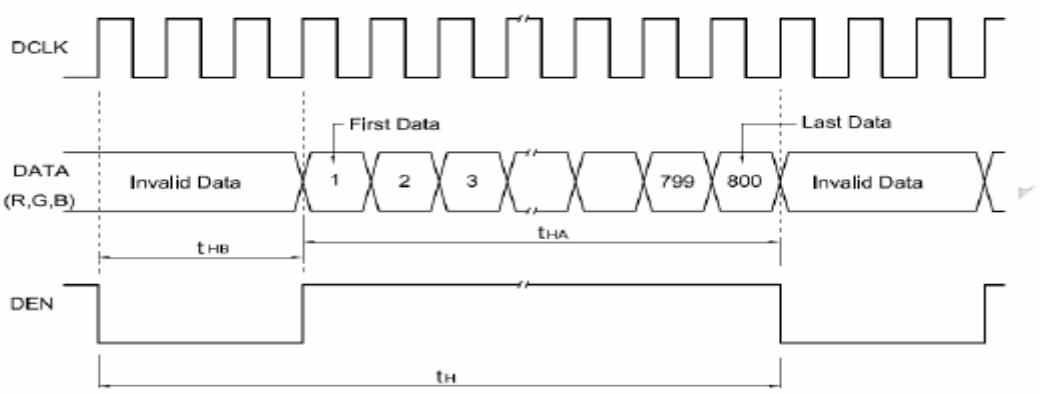
6.1.2 Timing Diagram



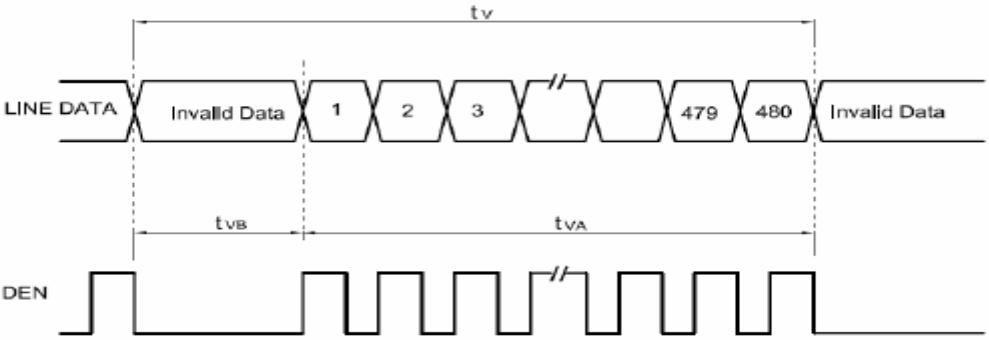
6.2 Timing Sequence(Timing Chart)

6.2.1 DE mode：

Horizontal timing：

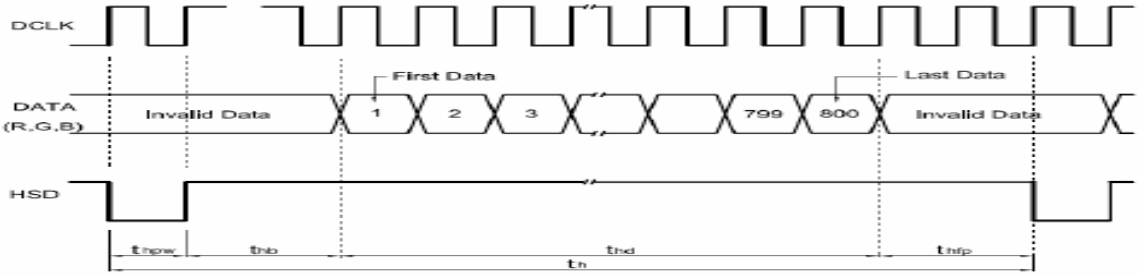


Vertical timing：

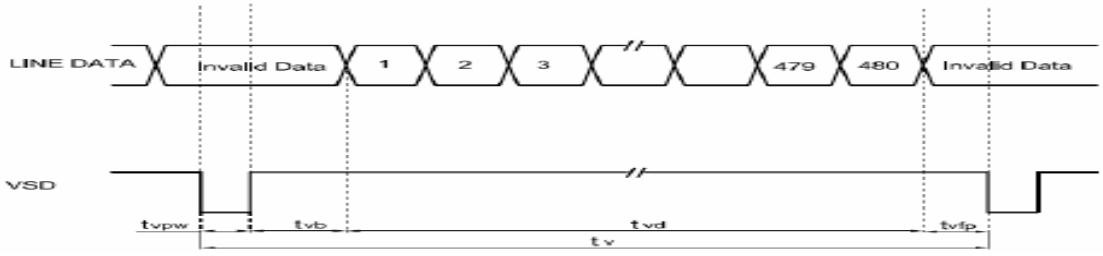


6.2.2 SYNC mode

Horizontal timing：



Vertical timing：



6.3 Color data definition

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note 1：Definition of gray scale:
Color (n): n means level of gray scale. Larger n means brighter level.
Note 2：Data: 1= High, 0 = Low

7.0 ELECTRO-OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Luminance		L	θ = 0°	300	350	--	cd/m2	Note1 Note5
Luminance Uniformity		YU	9 points	70	80	--	%	Note1 Note5
Contrast Ratio		CR	Point-9	350	500	--	-	Note3
Response Time		Rr+Tf	Point-5	--	20	35	ms	Note4
Viewing Angle K=Contrast Ratio>10	Horizontal	Θ L	Point-5 θ = 0°	--	70			Note2
		Θ R		--	70	--		
	Vertical	Θ U		--	65	--		
		Θ D		--	55	--		
Color Filter Chromacicity	White	X	θ = 0°	0.273	0.313	0.353		Note1
		Y		0.289	0.329	0.369		
	Red	X	θ = 0°	0.585	0.625	0.665		
		Y		0.313	0.353	0.393		
	Green	X	θ = 0°	0.313	0.353	0.393		
		Y		0.554	0.594	0.634		
	Blue	X	θ = 0°	0.122	0.162	0.202		
		Y		0.066	0.106	0.146		
Color gamut (NTSC ratio)			θ = 0°	45	50	--	%	

Note 1.Ambient condition：25℃±2℃，60±10%RH，under 10 Lunx in the darkroom。
Lighting the LCM and measuring after 10 minutes.
Note 2.Measure device：BM-5A (TOPCON)，viewing cone=1°，I_L=80mA。

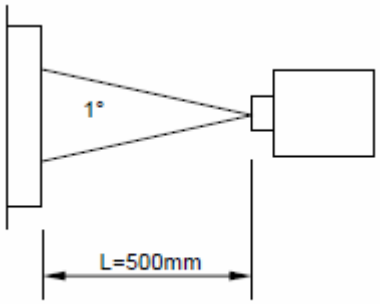


Fig.8-1 viewing cone=1°

Note 3. Definition of Contrast Ratio：
CR = White Luminance (ON) / Black Luminance (OFF)
Note 4.Definition of Luminance Uniformity： L = L(MIN) △ / L (MAX) × 100%

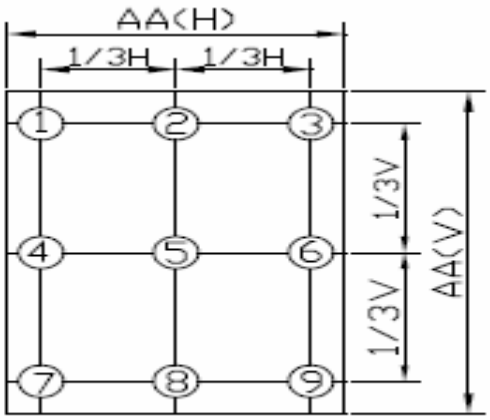


Fig.8-2 Measuring point

Note 5. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.

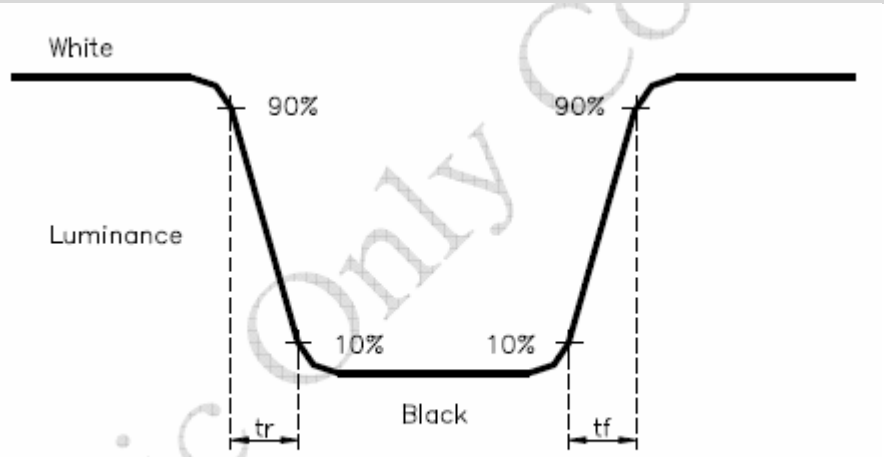


Fig.8-3 Definition of Response Time (White - Black)

Note 6. Definition of view angle(_，_)：

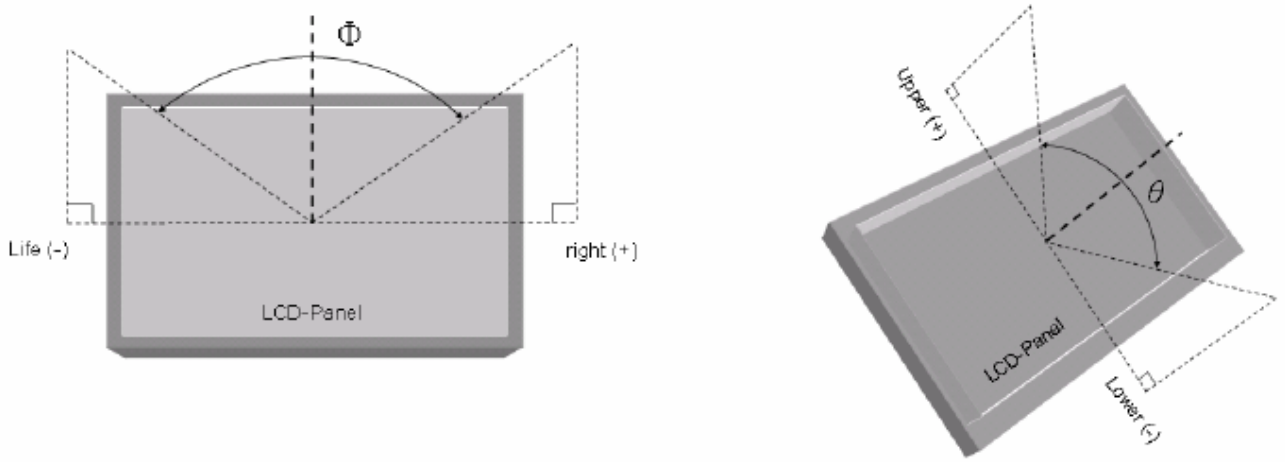


Fig.8-4 Definition of Viewing Angle

8. RELIABILITY

8.1 MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

8.2 TESTS

NO.	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 240H Restore 2H at 25℃ Power off	Aftertesting,cosmetic and electrical defects should not happen.
2	Low Temperature Storage	-30℃±2℃ 240H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 240H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 240H Restore 2H at 25℃ Power on	
5	High Temperature & Humidity Operation	60℃±2℃ 90%RH 24H Power on	
6	Temperature Cycle	-20℃←→25℃←→70℃ 30min 5min 30min after 10cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s2, 120min	
8	Shock Test	Half-sinewave,300m/s2,11ms	
9	Drop Test(package state)	800mm, concrete floor,1corner, 3edges, 6 sides each time	1.After testing, cosmetic and electrical defects should not happen. 2.the product should remain at initial place 3.Product uncovered or package broken is not permitted.
10	Electro Static Discharge Test (non-operation)	150pF，330Ω，Contact:±4KV,Air:±8KV Measure point :LCD glass and metal bezel	IEC61000-4-2：2001 GB/T17626.2-2006
		200pF，0Ω，±200V contact test Measure point :IF connector pins	

9.0 Inspection Standards

9.0 INSPECTION STANDARDS

9.1 Purpose

This incoming inspection standard shall be applied to TFT-LCD supplied by ZHONGSHEN to its customer.

9.2 Scope

This inspection standard contains Cosmetic Specifications and Electrical Specifications.

9.3 Classification of defects

9.3.1 Major defect.

The major defect is a defect that is likely to result in product failure or reduction in

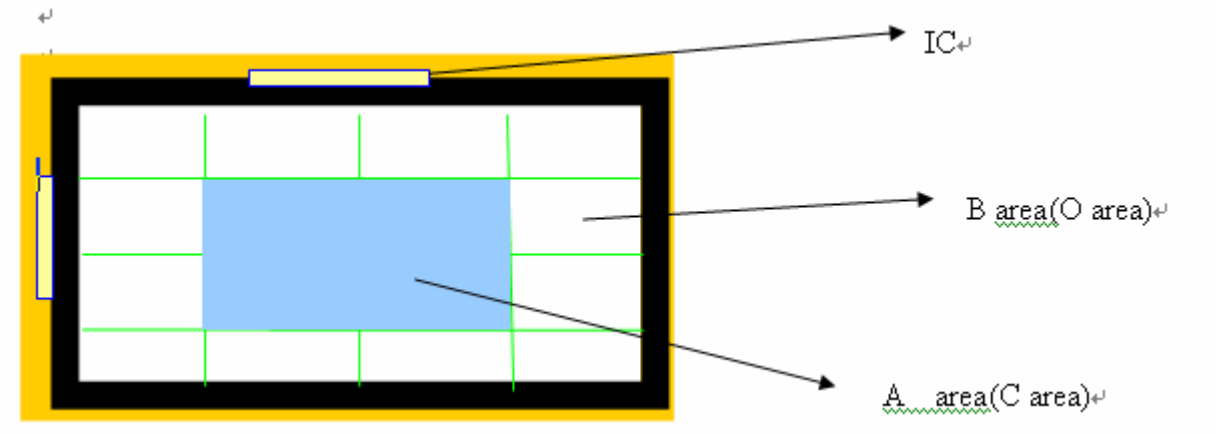
Product's intended usage.

9.3.2 Minor defect.

The minor defect is a defect that has little bearing on the effective use or Operation of the product.

9.4 Definition

9.4.1 Display area definition



9.5 Inspection conditions is as follows

9.5.1 Viewing distance is approximately 35-40 cm

9.5.2 Viewing angle is normal to the LCD panel as 45°

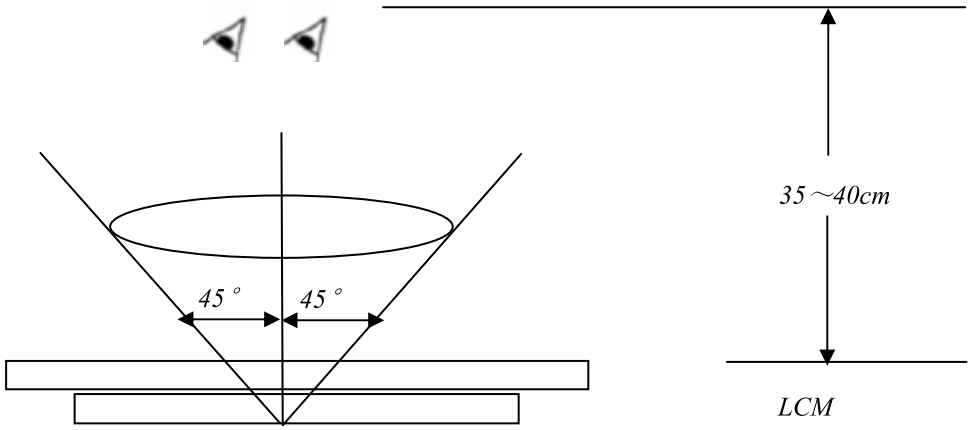
9.5.3 Ambient temperature is approximately 25±5℃

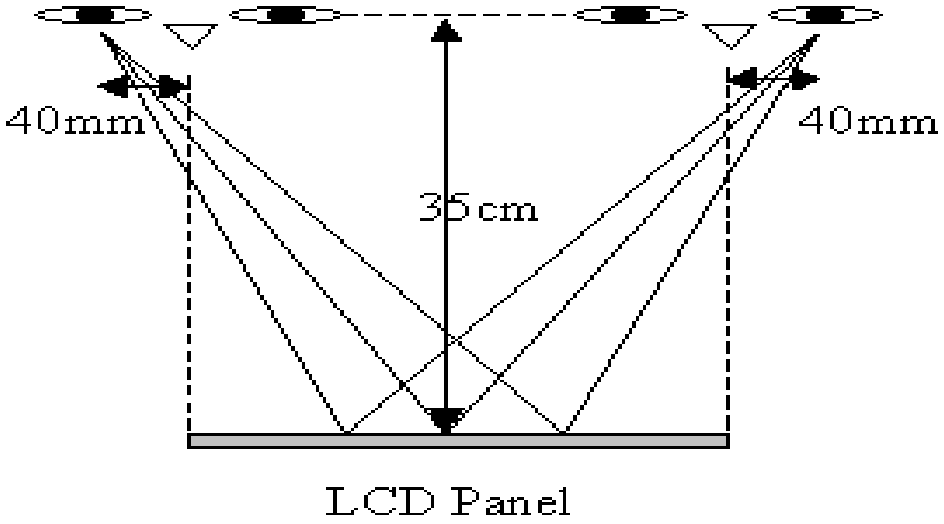
9.5.4 Ambient humidity is 60±5% RH

9.5.5 Ambient luminance is from 300-500 Lux.

9.5.6 Input signal timing should be typical value(3s-5s).

9.5.7 Mura & Light leakage inspection at ND-Filter 6%.





9.6 Sampling method

9.6.1 According to the MIL-STD-105E general inspection level , Ⅱ Sampling plan.

9.6.2 AQL: MA 0.65 MI 1.0

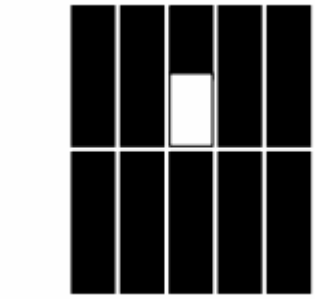
9.7 Inspection Criteria

DEFECT TYPE			LIMIT			Defect	Note
VISUAL DEFECT	SCRATCH		W≤0.05mm and L≤5mm		Ignore	Maj	NOTE1
			0.05mm<W≤0.2mm L≤10mm		N≤4		
			10mm<L, 0.1mm<W		N=0		
	INTERNAL	SPOT	Φ≤0.2mm		Ignore		
			0.2mm<Φ≤0.5mm		N≤4		
			Φ>0.5mm		N=0		
		FIBER	0.1mm≤W≤0.2mm L≤2.5mm		N≤4		
			0.2mm<W, 2.5mm<L		N=0		
		POLARIZER BUBBLE	Φ≤0.25mm		Ignore		
			0.25mm<Φ≤0.5mm		N≤4		
			Φ>0.5mm		N=0		
		DENT	Φ<0.25mm		Ignore		
			0.25mm≤Φ≤0.5mm		N≤4		
			Φ>0.5mm		N=0		
ELECTRICAL DEFECT	BRIGHT DOT		C Area	O Area	Total	Maj	NOTE2 NOTE3
			N≤4（contain C area and O area）		N≤4		
	DARK DOT		N≤5（contain C area and O area）		N≤5		
	TWO ADJACENT DOT		N≤1	N≤2	N≤3		
	THREE OR MORE ADJACENT DOT		NOT ALLOWLED				
	LINE DEFECT		NOT ALLOWLED				

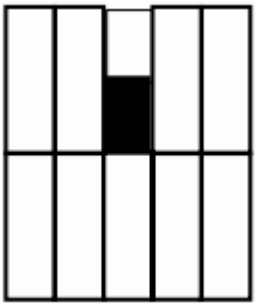
Note1: Minimum distance between dot defects and spot is 5mm;

Note2: The definition of Bright dot and Dark dot

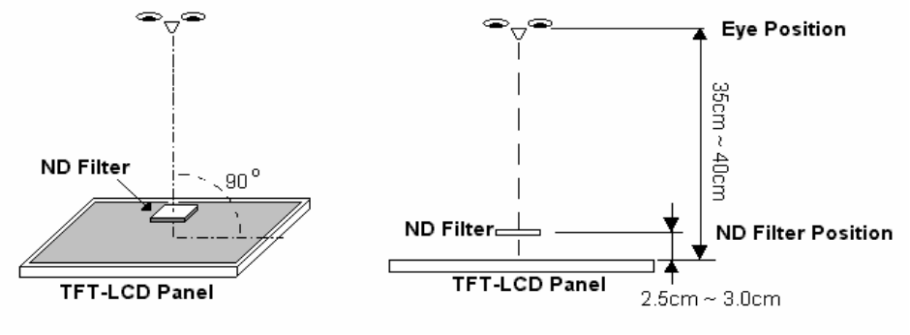
-bright area is more than 50% of one dot



-dark area is more than 50% of one dot



-The bright dot shall be visible under ND-Filter 5% as following:



NOTE3:

-A bit rate(bright dot model)≤10%;

-Class Chipping but not affect the function of quality OK;

-Polarizing film appearance does not affect the function OK;

10.0 HANDLING PRECAUTION

(1) Don't disassemble and reassemble the module by self.
(禁止自行拆解)
(2) Acid, alkali, alcohol or touched directly by hand will damage the display.
(酸性、碱性、酒精或手的直接接触将会损伤显示面)
(3) Static electricity will damage the module. Please configure grounding device.
(静电会损伤模组，请装配接地设备)
(4)The strong vibration, shock, twist or bend will cause material damage, even module broken.
(强烈的撞击、震动、扭转或弯曲将会造成原材损伤，甚至面板破裂)
(5) It is easy to cause image sticking while displaying the same pattern for very long time.
(长期显示同一画面会造成影像残留)
(6) The response time, brightness and performance will vary from different temperature.
(响应时间、亮度与均匀性会因温度而有所改变)
(7)12 months of the product term, the kaineng shipment date began to count.
(12 个月)