Specification for Approval

Customer:_____

Model Name:_____

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
Peter	*Peng Jun*		

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2024-08-21	NEW ISSUE	
B	2024-08-30	MODIFY ITEM 5.2 & 6.1 & 7 & 8.2 & 14	P.6 & P.7 & P.10 & P11 & P24

Table of Contents

1. General Description

AM-640480-057F is a 5.7 inch TFT Liquid Crystal Display module with a LED backlight unit and a-20pin 6bit LVDS interface controller board. The converter for the LED Backlight Unit is built in. This module supports 640 (R.G.B)x 480 WVGA mode which main application is the automotive display and industrial field.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	5.7"	
LCD type	IPS TFT	
Display Mode	Transmissive /Normally Black	
Resolution	640 RGB x 480	Pixels
View Direction	Full View	Best Image
Gray Scale Inversion Direction	-	
Module Outline	126.5(W) × 100(H) × 7.6(D) mm	mm
Active Area	115.2(H) x 86.4 (V)	mm
Pixel Size	60 x180	um
Pixel Arrangement	R.G.B. Vertical Stripe	
Display Colors	16.7M	
Interface	LVDS interface	
With or without touch panel	without	
Driver IC		-
Operating Temperature	**-30～80**	℃
Storage Temperature	**-30～85**	℃
Weight	-	g

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCI	-0.3	5.0	V
Storage temperature	T_{stg}	-30	+85	℃
Operating temperature	T_{op}	-30	+80	℃

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		VCI	2.5	3.0	3.3	V
Logic Low input voltage		V_{IL}	GND	-	0.3*VCI	V
Logic High input voltage		V_{IH}	0.7*VCI	-	VCI	V
Logic Low output voltage		V_{OL}	GND	-	0.2*VCI	V
Logic High output voltage		V_{OH}	0.8*VCI	-	VCI	V
Current Consumption All Black	Logic	$I_{CC+}\ I_{IN}$	-	9	-	mA
	Analog					

5. Backlight Characteristic

Ta = 25 ± 2 ℃

5.1 BACKLIGHT UNIT

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	
Converter Power Supply Current		I_i	---	0.24	0.264	A	@ Vi = 12V (Duty 100%)
Converter Power Consumption		P_{LED}	---	2.8	3.08	W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on		2.5	---	5	V	
	Backlight off		0	---	0.3	V	
PWM Control Voltage			0.7	---	2.5	V	
PWM Control Duty Ratio			10		100	%	
PWM Control Frequency		f_{PWM}	100		500	Hz	
LED Life Time		L_L	30,000			Hrs	(2)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and I_{LED} = 50mA$_{DC}$(LED forward current) until the brightness becomes ≦ 50% of its original value.

Note (3) Please note that LED life will be shorter than the average life described in the specification if operate in higher ambient temperature.
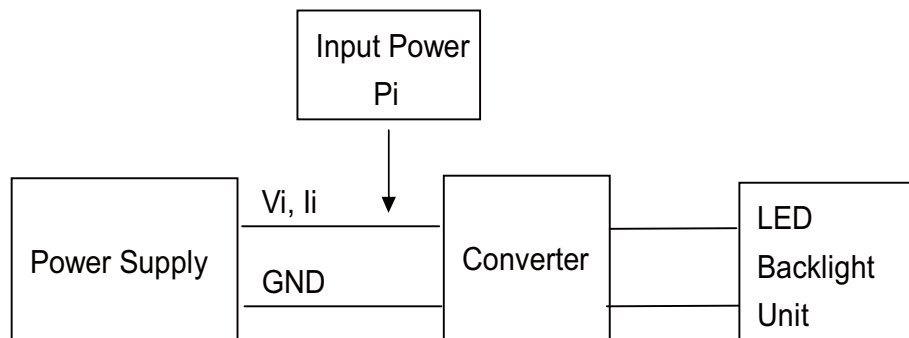
5.2. Backlight

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	Ta=25 ℃, I_F=20mA/LED	8.2	9.2	10.5	V
Forward Current	I_F	Ta=25 ℃, V_F=3.0V/LED	-	160	-	mA
Power dissipation	P_D		-	1260	-	mW
Uniformity	Avg		80	-	-	%
LED working life(25℃)	-		-	50,000	-	Hrs
Drive method	Constant current					
LED Configuration	24 White LEDs (3 LEDs in one string and 8 groups in parallel)					

Note1：LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at Ta=25±2 ℃,60%RH±5%, I_F=20mA/LED.

5.3. Backlighting circuit
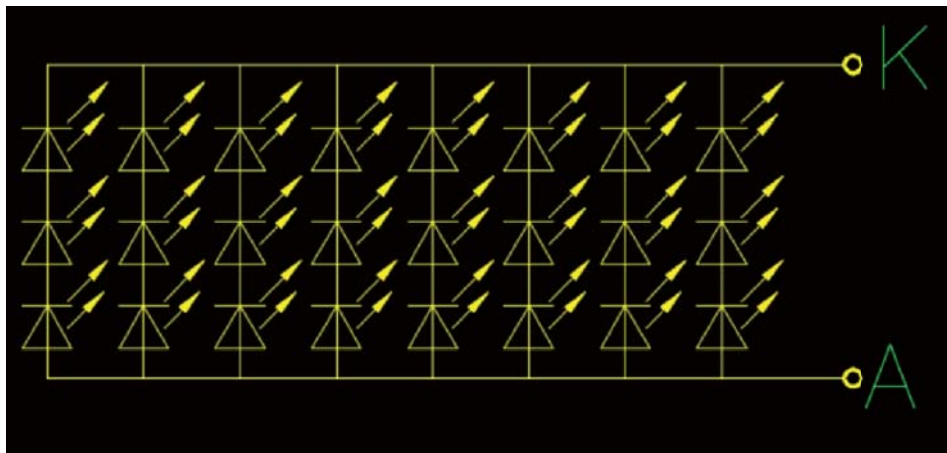
6. Optical Characteristics

### 6.1. Optical Characteristics

Ta=25ºC, VCI=2.8V

	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance		Lv	Normally viewing angle θX = φY =0º	400	500	-	cd/m²
	Contrast ratio(See 6.3)		CR		1000	1200	-	
	Response time (See 6.2)		TR+TF		-	30	35	ms
	Chromaticity Transmissive (See 6.5)	White	Xw		-	-	-	
			Yw		-	-	-	
	Viewing Angle (See 6.4)	Horizontal	θX+	Center CR≥10	75	80	-	Deg.
			θX-		75	80	-	
		Vertical	φY+		75	80	-	
			φY-		75	80	-	
	NTSC Ratio(Gamut)				55	60	-	%

6.2. Definition of Response Time
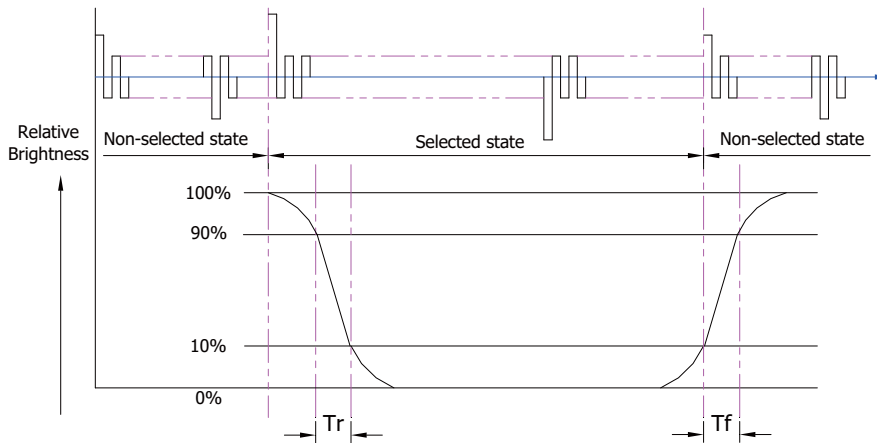
6.2.1. Normally Black Type (Negative)
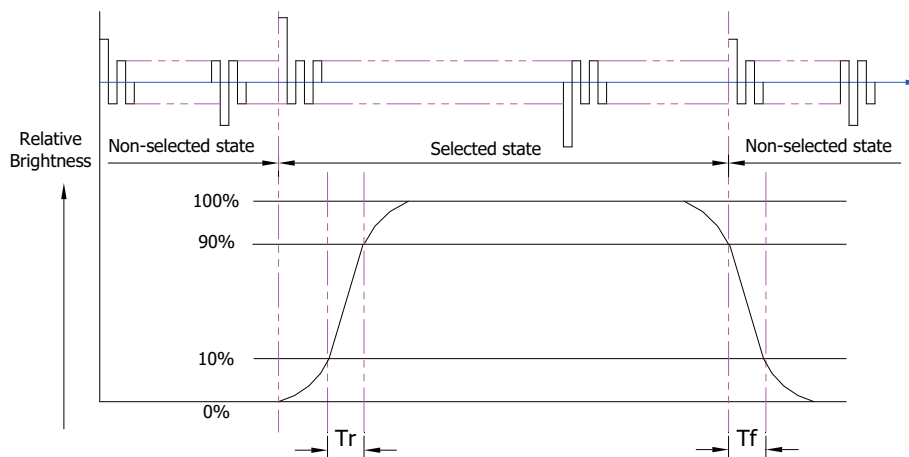
Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine: LCD-5100

6.2.2. Normally White Type (Positive)

Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

6.3. Definition of Contrast Ratio

Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

6.4. Definition of Viewing Angles
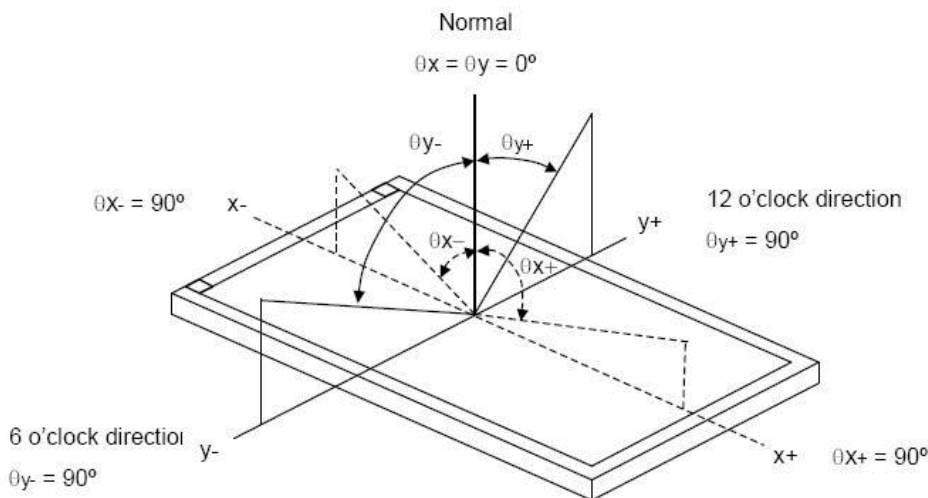
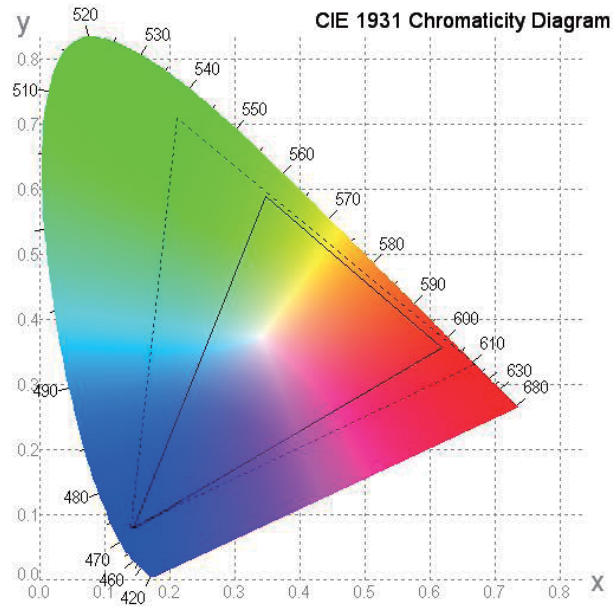Measuring machine: LCD-5100 or EQUI

6.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)

### 6.6. Definition of Surface Luminance, Uniformity and Transmittance

Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1.   Surface Luminance: L_V = average (L_{P1}:L_{P9})

6.6.2.   Uniformity = Minimal (L_{P1}:L_{P9}) / Maximal (L_{P1}:L_{P9}) * 100%

6.6.3.   Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7
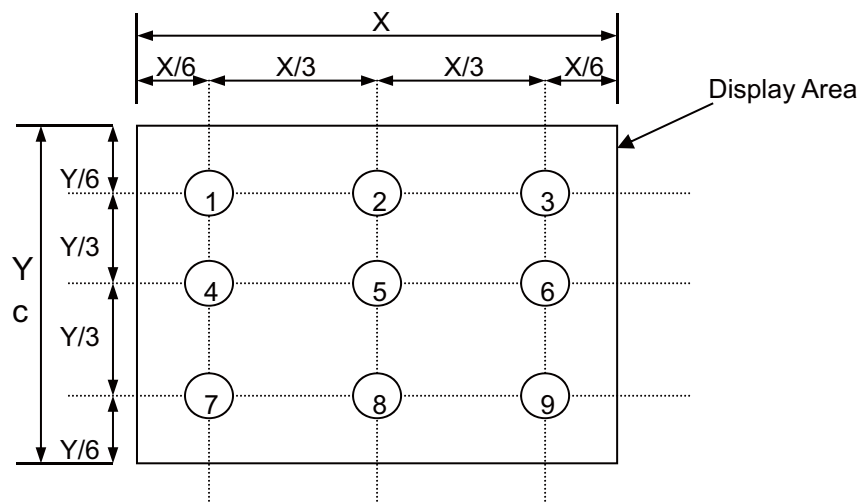
7. Block Diagram and Power Supply
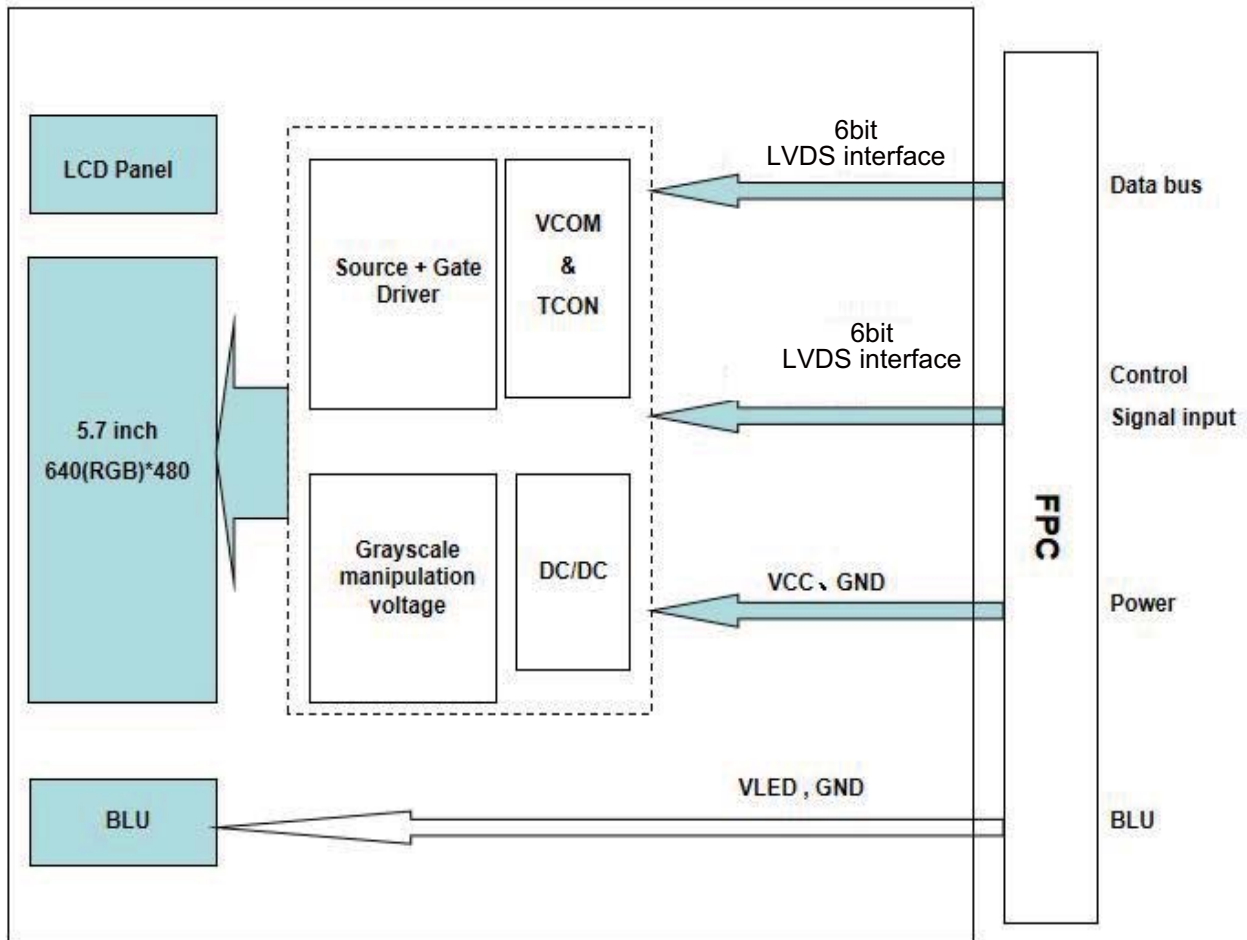
8. Interface Pins Definition

8.1 LVDS I/O PINASSIGNMENT

CN1

Pin	Name	I/O	Description
1	VCC_IN	I	Digital power supply (+3.3V)
2	VCC_IN	I	Digital power supply (+3.3V)
3	GND	I	Ground
4	GND	I	Ground
5	RX0-	I	LVDS differential data input Pair 0
6	RX0+	I	
7	GND	I	Ground
8	RX1-	I	LVDS differential data input Pair 1
9	RX1+	I	
10	GND	I	Ground
11	RX2-	I	LVDS differential data input Pair 2
12	RX2+	I	
13	GND	I	Ground
14	RXC-	I	LVDS differential Clock input Pair
15	RXC+	I	
16	NC	I	No Connected
17	NC	I	No Connected
18	NC	I	No Connected
19	NC	I	No Connected
20	NC	I	No Connected

Note (1) Connector Part No.: 076B20-0048RA-G4,Starconn or equivalent

8.2 BACKLIGHT PIN ASSIGNMENT   (Converter connector pin)

CN3

No	Symbol	I/O	Description
1	Vi	I	Converter input voltage
2	ADJ	I	Backlight Adjust
3	EN	I	Enable pin
4	V_{GND}	I	Converter ground
5	NC	I	No Connected

9. AC Characteristics

	Vertical Valid	tw	480	480	480	tHP	
	Vertical Blank	tVBK	35	45	80	tHP	
	Vertical Frequency	fv	55	60	65	HZ	
Data R, G, B	Setup time	tDS	5	-	-	ns	
	Hold time	tDH	10	-	-	ns	
	Rise, Fall time	tDr, tDf	-	-	3	ns	

Timing Diagram:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock Period	tCLK	33	40	43	ns	
Clock Frequency	fCLK	23	25	30	MHz	
Clock Low Level Width	tWCL	6	-	-	ns	
Clock High Level Width	tWCH	6	-	-	ns	
Clock Rise, Fall Time	tCLKr, tCLKf	-	-	3	ns	
HSYNC Period	tHP	750	800	900	tCLK	
HSYNC Pulse Width	tHW	5	30	-	tCLK	
HSYNC Front Porch	tHFP	1	16	116	tCLK	
HSYNC Back Porch	tHBP	1	114	139	tCLK	
HSYNC Width + Back Porch	tHW + tHBP	144	144	144	tCLK	
Horizontal Blank	tHBK	1	160	260	tCLK	
Horizontal Valid	tHV	640	640	640	tCLK	
VSYNC Period	tVP	515	525	560	tHP	
VSYNC Pulse Width	tVW	1	3	5	tHP	
VSYNC Front Porch	tVFP	1	10	45	tHP	

Input Vertical Timing
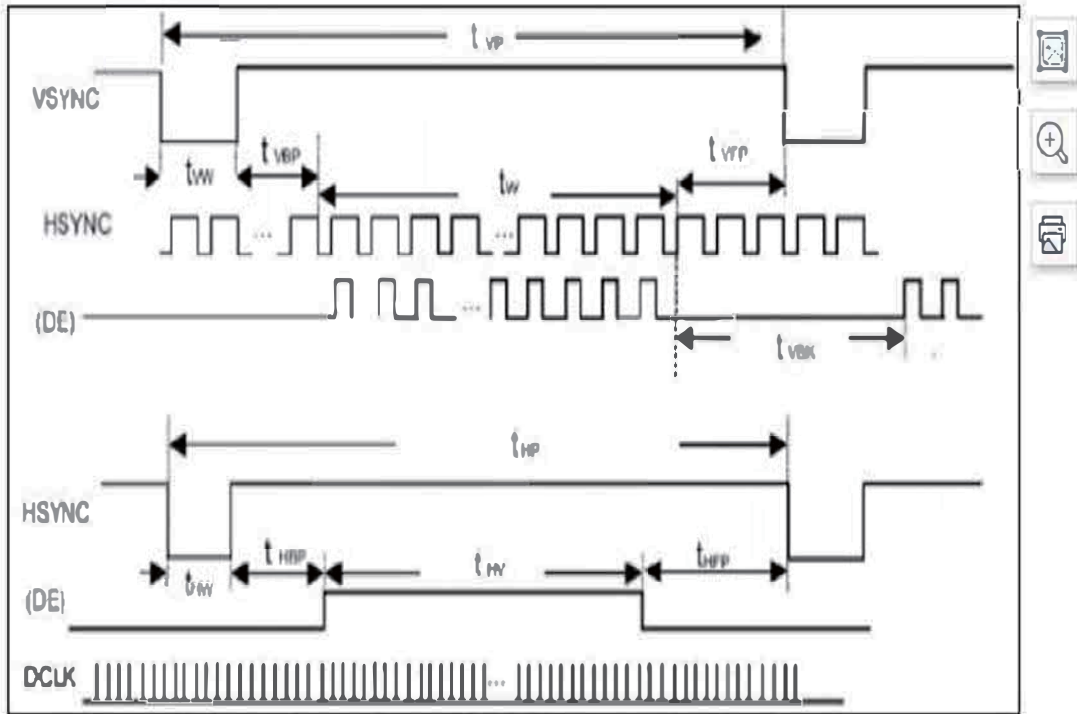
Note: If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.
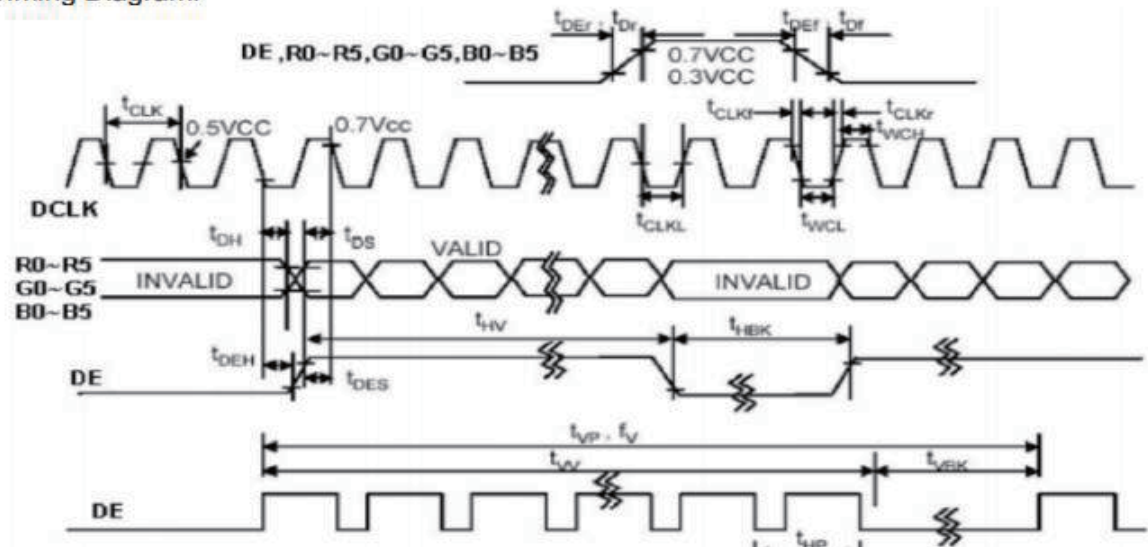
Input Horizontal Timing
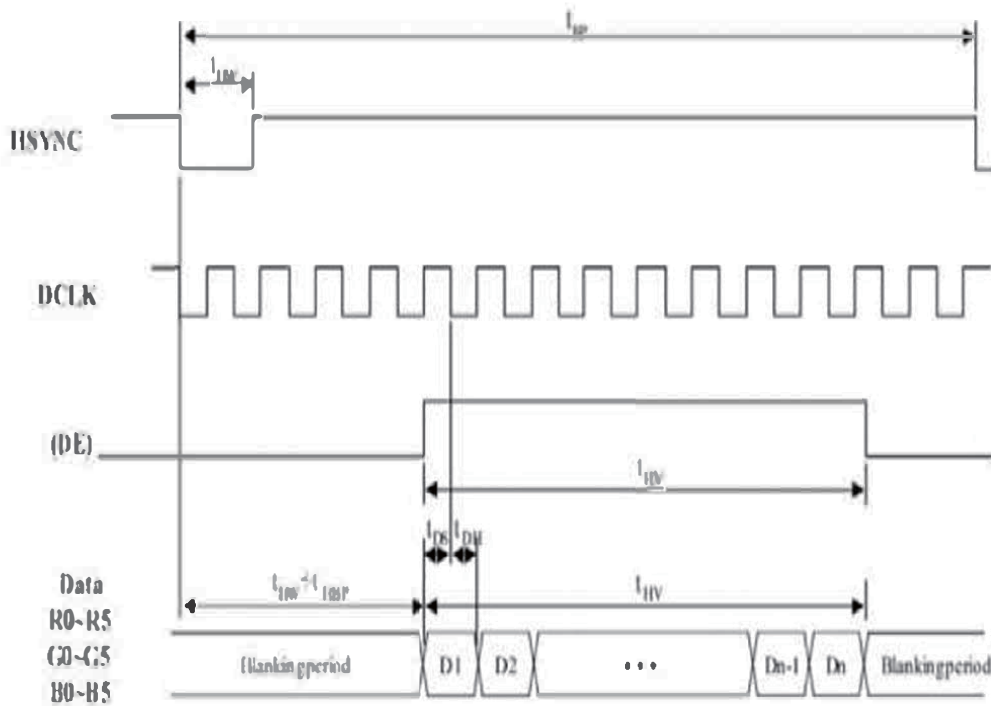
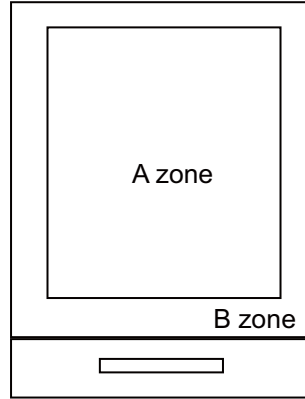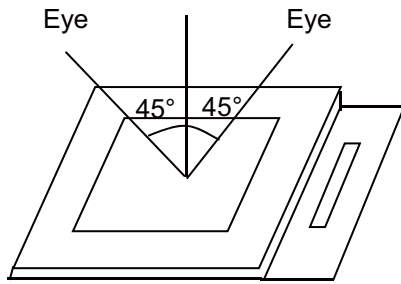Note: If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

9. AC Characteristics

	Parameter	Symbol	Min.	Typ.	Max.	Unit	
	Vertical Valid	tw	480	480	480	tHP	
	Vertical Blank	tVBK	35	45	80	tHP	
	Vertical Frequency	fv	55	60	65	HZ	
Data R, G, B	Setup time	tDS	5	-	-	ns	
	Hold time	tDH	10	-	-	ns	
	Rise, Fall time	tDr, tDf	-	-	3	ns	

Timing Diagram:

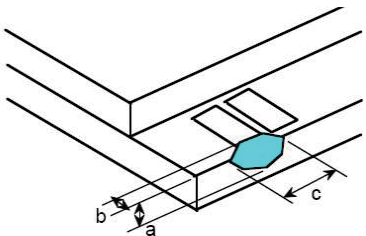| Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock Period	tCLK	33	40	43	ns	
Clock Frequency	fCLK	23	25	30	MHz	
Clock Low Level Width	tWCL	6	-	-	ns	
Clock High Level Width	tWCH	6	-	-	ns	
Clock Rise, Fall Time	tCLKr, tCLKf	-	-	3	ns	
HSYNC Period	tHP	750	800	900	tCLK	
HSYNC Pulse Width	tHW	5	30	-	tCLK	
HSYNC Front Porch	tHFP	1	16	116	tCLK	
HSYNC Back Porch	tHBP	1	114	139	tCLK	
HSYNC Width + Back Porch	tHW + tHBP	144	144	144	tCLK	
Horizontal Blank	tHBK	1	160	260	tCLK	
Horizontal Valid	tHV	640	640	640	tCLK	
VSYNC Period	tVP	515	525	560	tHP	
VSYNC Pulse Width	tVW	1	3	5	tHP	
VSYNC Front Porch	tVFP	1	10	45	tHP	

10.5.2. Basic principle:

    10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.
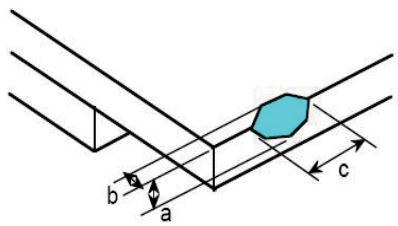
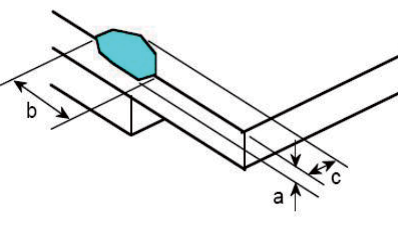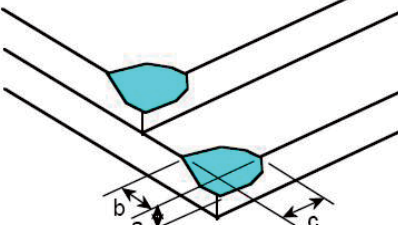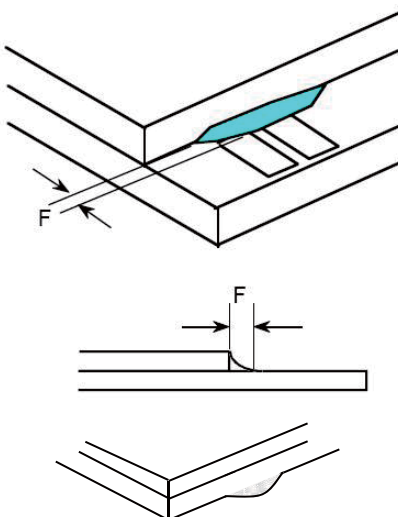   10.5.2.2. New item must be added on time when it is necessary.

10.6. Inspection Specification
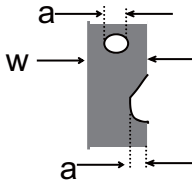
No.	Item	Criteria (Unit: mm)		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	$\varphi = (a + b)/2$ **Distance between 2 defects should more than 3mm apart.**	**Size \ Area**	**Acc. Qty**
			φ≤0.10	**Ignore**
			0.10<φ≤0.15	**2**
			0.15<φ≤0.25	**1**
			0.25<φ	**0**
			Total	**2 no include φ≤ 0.10**

No.	Item	Criteria (Unit: mm)			
02	Electrical Defect (Minor defect)		Display Area	Total	
		Bright dot	**0**	**0**	Note1
		Dark dot	**N≤2**	**N≤2**	
		Total dot	**N≤2**	**N≤2**	
		Mura	**Not visible through 5% ND filters.**		Note2
		Remark: **1. Bright dot caused by scratch and foreign object accords to item 1.**			

| 03 | Black and White line
Scratch
Foreign material
(Line type)
(Minor defect) | |

Length	Width	Acc. Qty
/	W ≦ 0.03	Ignore
L ≦ 2.5	0.03 ＜ W ≦ 0.05	3
L ≦ 2.5	0.05 ＜ W ≦ 0.10	2
/	0.1 ＜ W	
Total		3

Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.

| 04 | Glass Crack
(Minor defect) | |

Crack is potential to enlarge, any type is not allowed.

| 05 | Glass　Chipping Pad Area:
(Minor defect) | |

Length and Width	Acc. Qty
c > 3.0, b< 1.0	1
c< 3.0, b< 1.0	3
a<Glass Thickness	

06	Glass Chipping Rear of Pad Area: (Minor defect)		Length and Width	Acc. Qty
			c > 3.0, b< 1.0	1
			c< 3.0, b< 1.0	2
			c< 3.0, b< 0.5	4
			a<Glass Thickness	

07	Glass Chipping Except Pad Area: (Minor defect)		Length and Width	Acc. Qty
			c > 3.0, b< 1.0	1
			c< 3.0, b< 1.0	2
			c< 3.0, b< 0.5	4
			a<Glass Thickness	

08	Glass Corner Chipping: (Minor defect)		Length and Width	Acc. Qty
			c < 3.0, b< 3.0	Ignore
			a<Glass Thickness	

09	Glass Burr: (Minor defect)		Length	Acc. Qty
			F < 1.0	Ignore
			Glass burr don't affect assemble and module dimension.	

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width a<w/3. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.
11	Bubble on Polarizer (Minor defect)	<table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table>
12	Dent on Polarizer (Minor defect)	<table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table>
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.
14	Touch Panel	D: Diameter W: width L: length 14.1 Spot: D<0.25 is acceptable 　　　　0.25≤D≤0.4 2dots are acceptable and the distance between defects should more than 10 mm. 　　　　D>0.4 is unacceptable 14.2 Dent: D>0.40 is unacceptable 14.3 Scratch: W≤0.03, L≤10 is acceptable, 　　　　0.03<W≤0.10, L≤10 is acceptable Distance between 2 defects should more than 10 mm. 　　　　W>0.10 is unacceptable.
15	PCB	15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.
16	Soldering	Follow IPC-A-610C standard
17	Electrical Defect (Major defect)	The below defects must be rejected. 17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display.

		17.3 No function or no display.
		17.4 Current exceeds product specifications.
		17.5 LCD viewing angle defect.
		17.6 No Backlight.
		17.7 Dark Backlight.
		17.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

10.7. Classification of Defects

10.7.1. Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

10.7.2. Two minor defects are equal to one major in lot sampling inspection.

10.8. Identification/marking criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

10.9. Packaging

10.9.1. There should be no damage of the outside carton box, each packaging box should have one identical label.

10.9.2. Modules inside package box should have compliant mark.

10.9.3. All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.
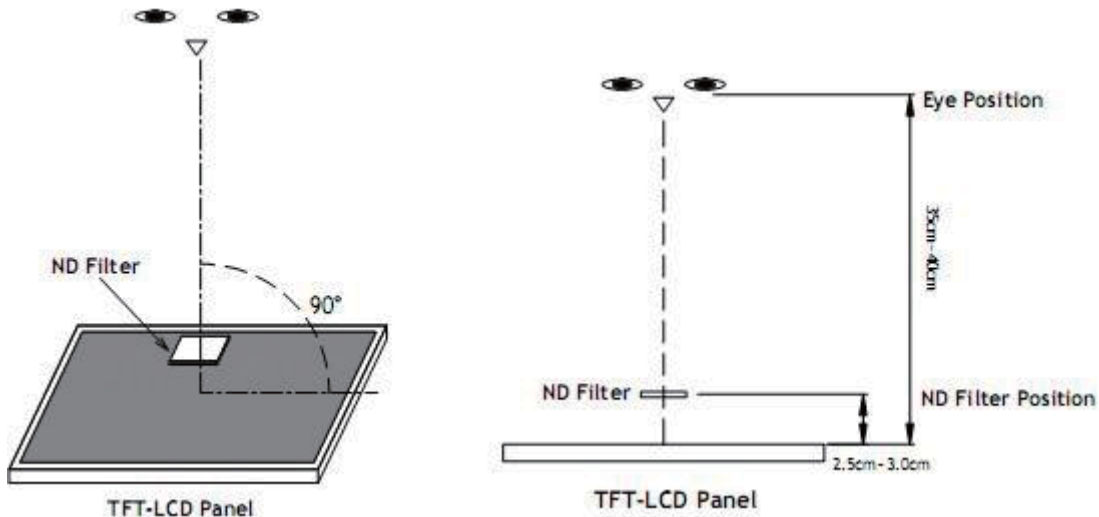
Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

11. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	**80℃, 96Hrs**	2	GB/T2423.2 -2008
2	Low Temperature Operating	**-30℃, 96Hrs**	2	GB/T2423.1 -2008
3	High Humidity	**50℃, 90%RH, 96Hrs**	2	GB/T2423.3 -2006
4	High Temperature Storage	**85℃, 96Hrs**	2	GB/T2423.2 -2008
5	Low Temperature Storage	**-30℃, 96Hrs**	2	GB/T2423.1 -2008
6	Thermal Cycling Test	**-30℃, 60min~80℃, 60min, 20 cycles.**	2	GB/T2423.22 -2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	2	GB/T5170.14 -2009
8	Electrical Static Discharge	Air:±8KV 150pF/330Ω 5 times	2	GB/T17626.2 -2006
		Contact:±4KV 150pF/330Ω 5 times		
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value.

12. Precautions and Warranty

12.1. Safety

12.1.1.   The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

12.1.2.   Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

12.2. Handling

12.2.1.   Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2.   Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

12.3. Storage

12.3.1.   Do not store the LCD module beyond the specified temperature ranges.

12.3.2.   Strong light exposure causes degradation of polarizer and color filter.

12.4. Metal Pin (Apply to Products with Metal Pins)

12.4.1.   Pins of LCD and Backlight

12.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

12.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

12.4.1.3. Solder Wetting

Solder   Pin Lead   Solder   Pin Lead
Recommended   Not Recommended
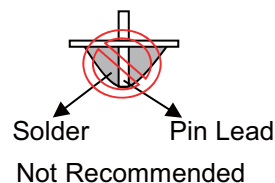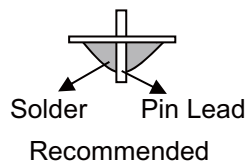
12.4.2.   Pins of EL

12.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

12.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

12.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270～290℃

Typical Soldering Time: ≤2s
Minimum solder distance from EL lamp (body):2.0mm

12.4.2.4. No horizontal press on the EL leads during soldering.

12.4.2.5. 180° bend EL leads three times is not allowed.

12.4.2.6. Solder Wetting

Recommended   Not Recommended

12.4.2.7. The type of the solder iron:

Recommended   Not Recommended

12.4.2.8. Solder Pad

12.5. Operation

12.5.1. Do not drive LCD with DC voltage

12.5.2. Response time will increase below lower temperature

12.5.3. Display may change color with different temperature

12.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear "fractured".

12.5.5. Do not connect or disconnect the LCM to or from the system when power is on.

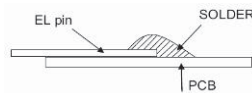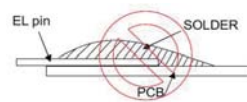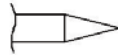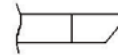12.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.

12.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

12.5.8. Do not display the fixed pattern for long time（we suggest the time not longer than one hour）because it may develop image sticking due to the TFT structure.

12.6. Static Electricity

12.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

12.6.2. The normal static prevention measures should be observed for work clothes and benches.

12.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

12.7. Limited Warranty

12.7.1.   Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

12.7.2.   If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used

12.7.3.   . After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

13. Packaging

TBD

14. Outline Drawing

NOTES:
1. LED CIRCUIT DIAGRAM:
Metering Point(测试点)

Metering Point(测试点)
(固定电流测试)

2.Do not scale drawing.
3.⚠ Modification rev.number.
4.General Tolerance: ±0.3
5.Draft angle 1.5°:
6.Operating Temperature:-30~+80℃ :Storage Temperature:-30~+85℃
7.possession materials are insulated (ex FPC ,LED)
8.( ) referencedimension, :◇ critical dimension

项目 Item		符号 Symbol	最小值 min.	典型值 typ.	最大值 max.	单位 Unit	测定条件 Condition
主屏 Main screen	亮度 Luminance	Lv	400	500		cd/m2	IF=160MA (固定电流测试)
	均匀性 Uniformity	Avg	80			%	
	色度坐标 Colour Coordinate	X	0.26		0.33		
		Y	0.26		0.33		
	正向电压 Forward Voltage	Vf	8.2	9.2	10.5	V	
	反向漏电电流 Reverse Current	Ir			20	uA	Vr= 5.0V

TITLE: OUTLINE DIMENSION		
DRAWN BY:	D/N:AM-640480-057F	
CHECKED BY:	Rev:B	
APPROVED BY:	SCALE: 1 : 1	SHEET NO: 1 OF 1 UNIT: mm

于都上晴電子有限公司
YU DU AMSON ELECTRONICS Co.,Ltd.

SMY.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
⚠	first issue	A	XG.SU	2024/08/21
⚠	modify luminance	B	XG.SU	2024/08/30

Front

Rear View

Label

ROHS