



# SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : \_\_\_\_\_

CUSTOMER MODULE : \_\_\_\_\_

HG MODEL : HG090WS008

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : \_\_\_\_\_ Dept. : \_\_\_\_\_ Data : \_\_\_\_\_

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by



## Revision History

Version NO.	DATE	Description	Remak
V1.0	2021.10.13	FIRST ISSUE	



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## 1. GENERAL INFORMATION

### 1.1 features

- 1) Structure: TFT PANNEL+IC+FPC+BL
- 2) IPS Type LCD 1024 dot-segment and 600 dot-common outputs
- 3) 16.7M Color can be selected by software
- 4) White LED back light
- 5) LVDS-4 interface
- 6) Operation Temperature : - 20~60°C
- 7) Storage Temperature : - 30~70°C
- 8) CTP cover lens : -/
- 9) CTP structure : -/
- 10) LED life time: -/

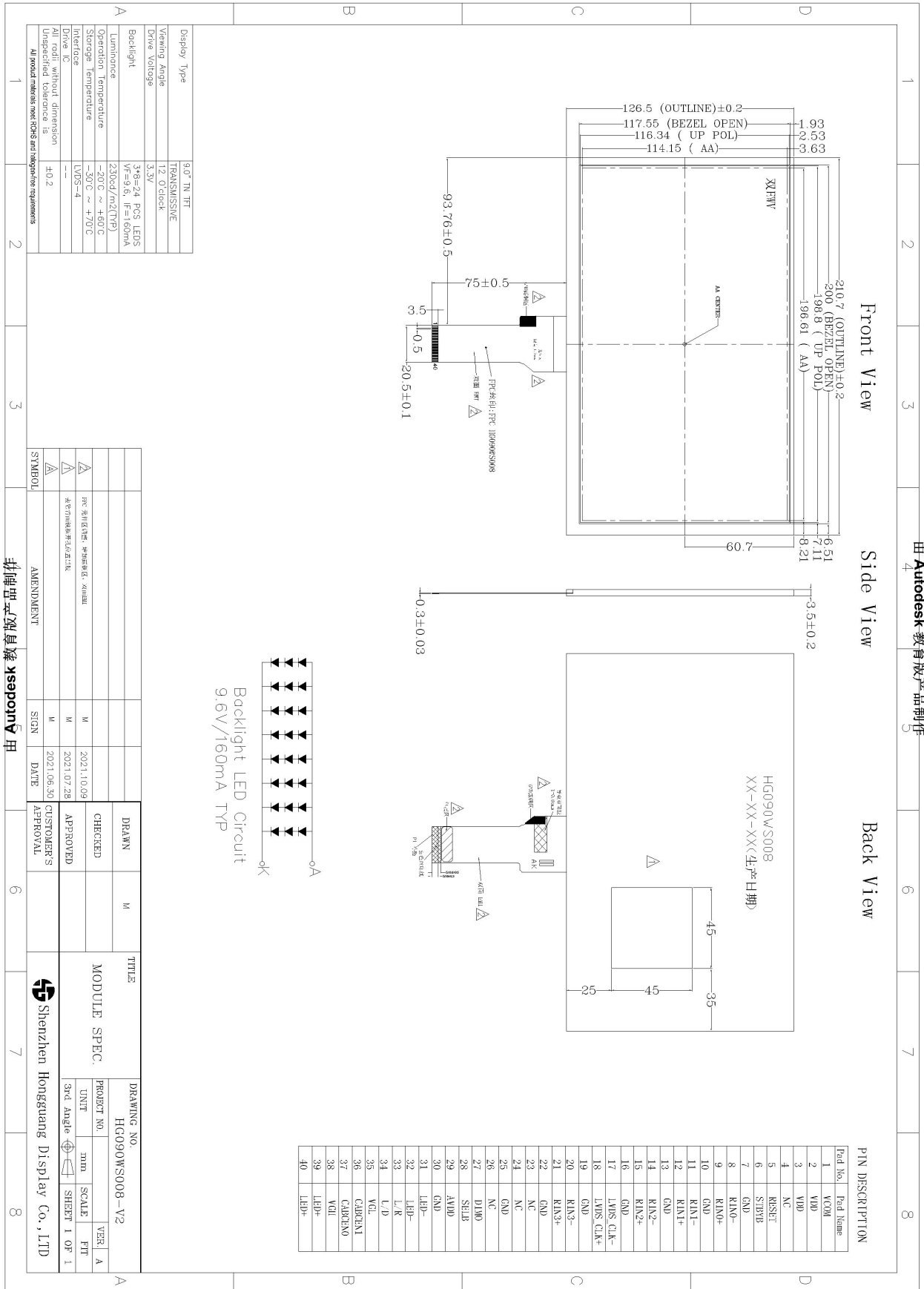
### 1.2 General specification

Item of	Contents	Unit
Panel Size	9.0	inch
LCD Type	a-si/TRANSMISSIVE	/
Display mode	Normally White	/
Pixel arrangement	1024*3(RGB)*600	Dots
Pixel pitch (W*H)	64(H) × 190.25(V)	um
Active Area	196.608(H) × 114.15(V)	Mm
Module area (W*H*T)	210.7(W) × 126.5(H) × 3.5(T)	Mm
Recommended Viewing Direction	6	0' clock
LCM IC	HX8282A01	/
Interface	LVDS-4	/
Luminance for LCM	230	cd/m2
Weight	TBD	g



## 2. DIAGRAM FOR LCM

由 Autodesk 教育版产品制作



由 Autodesk 教育版产品制作



## 3. I/O CONNECTION & BLOCK DIAGRAM

### 3.1 I/O connection

Pin NO.	Symbol	I/O	Description
1	VCOM	P	Common Voltage
2-3	VDD	P	Power supply for digital circuits and IO pads(3.3V)
4	NC	-	Dummy
5	RESET	I	The signal will reset the LCM, Signal is active low.
6	STBYB	-	Standby mode, normally pull high .STBYB=" 1" , normal operation STBYB=" 0" ,timing control, source driver will turn off, all output are high-Z
7	GND	P	Power Ground
8	RIN0-	I	LVDS Negative data signal (-)
9	RIN0+	I	LVDS Negative data signal (+)
10	GND	P	Power Ground
11	RIN1-	I	LVDS Negative data signal (-)
12	RIN1+	I	LVDS Negative data signal (+)
13	GND	P	Power Ground
14	RIN2-	I	LVDS Negative data signal (-)
15	RIN2+	I	LVDS Negative data signal (+)
16	GND	P	Power Ground
17	LVDS_CLK-	I	LVDS Negative data signal (-)
18	LVDS_CLK+	I	LVDS Negative data signal (+)
19	GND	P	Power Ground
20	RIN3-	I	LVDS Negative data signal (-)
21	RIN3+	I	LVDS Negative data signal (+)
22	GND	P	Power Ground
23-24	NC	-	Dummy
25	GND	P	Power Ground
26	NC	-	Dummy
27	DIMO	-	NC
28	SELB	-	NC
29	AVDD	P	Power for Analog Circuit
30	GND	P	Power Ground
31-32	LED-	P	LED-
33	L/R	I	Dummy
34	U/D	I	Horizontal inversion
35	VGL	P	Vertical inversion
36	NC	-	Dummy
37	NC	-	Dummy
38	VGH	P	Gate ON Voltage
39-40	LED+	P	LED+

I: Input; O: Output; P: Power



## 4. ABSOLUTE MAXIMUM RATINGS

(GND=AGND=0V)

Item	Symbol	Values			Unit	Remarks
		Min.	Typ.	Max.		
Power Voltage Supply1	VDD	-0.5	-	3.96	V	
Power Voltage Supply2	AVDD	6.5	-	14.85	V	
Luminance(LCM)	L <sub>v</sub>	200	230	-	cd/m <sup>2</sup>	
Backlight Forward Voltage	V <sub>f</sub>	-	9.6	-	V	
LED Forward Current	I <sub>f</sub>	-	160	-	MA	Note
Operating temperature	T <sub>op</sub>	-20	-	60	°C	
Storage temperature	T <sub>st</sub>	-30	-	70	°C	

Note: (1) All of the voltages listed above are with respective to GND=0V.

(2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

(3) 24 chips (3 series 8 parallel) connection, LED luminous color: WHITE

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 Typical operation conditions :

Item	Symbol	Values			Unit	Remarks
		Min.	Typ.	Max.		
Power Voltage Supply1	VDD	3	3.3	3.6	V	
Power Voltage Supply2	AVDD	6.5	9.6	14.85	V	
Power Voltage Supply3	VGL	-6.6	-6	-5.4	V	
Power Voltage Supply4	VGH	17	18	19	V	
Power Voltage Supply5	VCOM	-	3.9	-	V	



## 5.2 TTL mode DC electrical characteristics

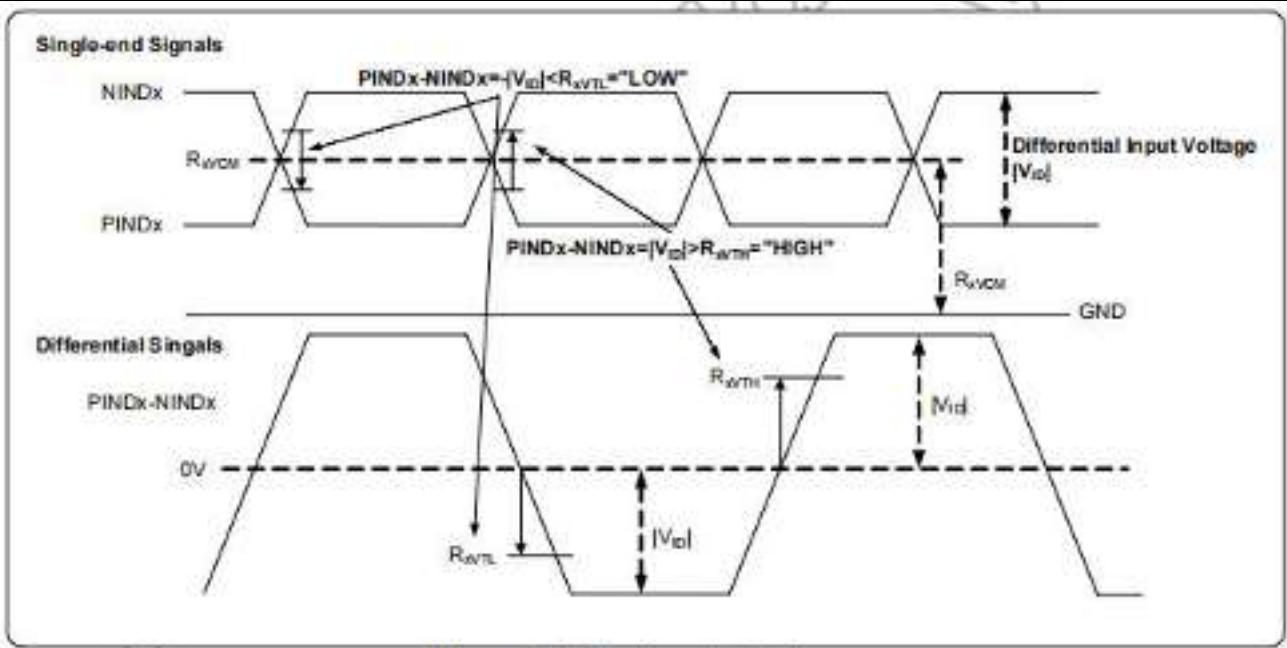
(VDD=2.3~3.6V, AVDD=6.5~13.5V, GND=AGND=0V, TA=-20℃~+85℃)

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	VDD	2.3	-	3.6	V	-
Power supply voltage	AVDD	6.5	-	13.5	V	-
Power supply voltage	AVDDL	6.5	-	13.5	V	Full range application
		-	V8+0.1	-	V	Half AVDD application
Power supply voltage	AGNDH	0			V	Full range application
		-	V7-0.1	-	V	Half AVDD application
Low level input voltage	V <sub>L</sub>	0	-	0.3VDD	V	For digital circuit
High level input voltage	V <sub>H</sub>	0.7VDD	-	VDD	V	For digital circuit
Output low voltage	V <sub>OL</sub>	-	-	GND+0.4	V	I <sub>O</sub> =400μA
Output high voltage	V <sub>OH</sub>	VDD-0.4	-	-	V	I <sub>O</sub> =-400μA
Pull low/high resistance	R <sub>i</sub>	200	250	300	kΩ	For the digital input pin @VDD=3.3V
Input leakage current	I <sub>i</sub>	-	-	±1	μA	For digital circuit
Digital Operation current	I <sub>DD</sub>	-	12	20	mA	Fclk=50MHz, LD=48KHz, VDD=3.3V, No load
Digital stand-by current	I <sub>st1</sub>	-	10	50	μA	Clock & all functions are stopped
Analog Operating current	I <sub>DDA</sub>	-	8	10	mA	No load, Fclk=50MHz, LD=48KHz @ AVDD=10V, V1=8V, V14=0.4V
Analog Stand-by current	I <sub>st2</sub>	-	10	50	μA	No load, clock & all functions are stopped
Input level of V1~V7	Vref1	0.4AVDD	-	AVDD-0.1	V	Gamma correction voltage input
Input level of V8~V14	Vref2	0.1	-	0.6AVDD	V	Gamma correction voltage input
Output Voltage deviation	Vod1	-	±20	±35	mV	V <sub>O</sub> =AGND+0.1V~AGND+0.5V & V <sub>O</sub> =AVDD-0.5V~AVDD-0.1V
Output Voltage deviation	Vod2	-	±15	±20	mV	V <sub>O</sub> =AGND+0.5V~AVDD-0.5V
Output Voltage Offset between Chips	Voc	-	-	±20	mV	V <sub>O</sub> =AGND+0.5V~AVDD-0.5V
Dynamic Range of Output	Vdr	0.1	-	AVDD-0.1	V	SO1~SO1200
Sinking Current of Outputs	IOLy	80	-	-	μA	SO1~SO1200, V <sub>O</sub> =0.1V vs. 1.0V, AVDD=13.5V
Driving Current of Outputs	IOHy	80	-	-	μA	SO1~SO1200, V <sub>O</sub> =0.1V vs. 12.5V, AVDD=13.5V
Resistance of Gamma Table	R <sub>g</sub>	0.7*Rn	1.0*Rn	1.3*Rn	Ω	Rn: Internal gamma resistor

## 5.3 LVDS mode DC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R <sub>XVTH</sub>	-	-	+0.1	V	R <sub>XVCM</sub> =1.2V
Differential input low threshold voltage	R <sub>XVTL</sub>	-0.1	-	-	V	
Input voltage range (singled-end)	R <sub>XVIN</sub>	0	-	VDD-1.2+  V <sub>IO</sub> /2	V	-
Differential input common Mode voltage	R <sub>XVCM</sub>	V <sub>IO</sub> /2	-	VDD-1.2	V	-
Differential input voltage	V <sub>IO</sub>	0.2	-	0.6	V	-
Differential input leakage Current	R <sub>VXIZ</sub>	-10	-	+10	μA	-
LVDS Digital Operating Current	I <sub>DDLVDS</sub>	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	I <sub>stLVDS</sub>	-	10	50	μA	Clock & all Functions are stopped



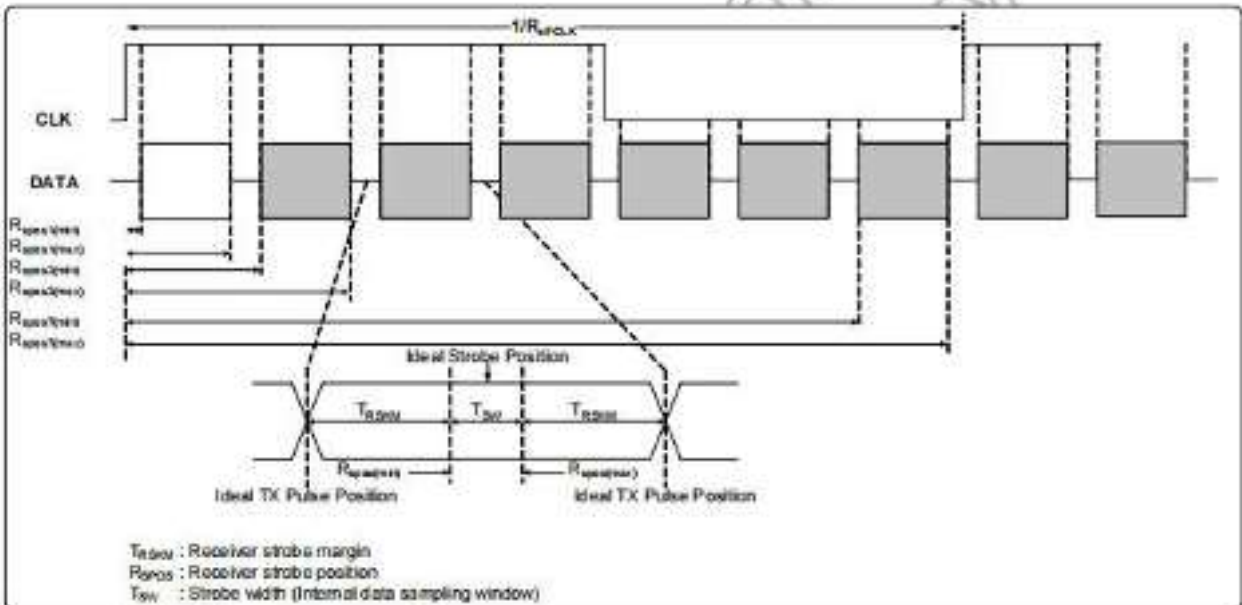
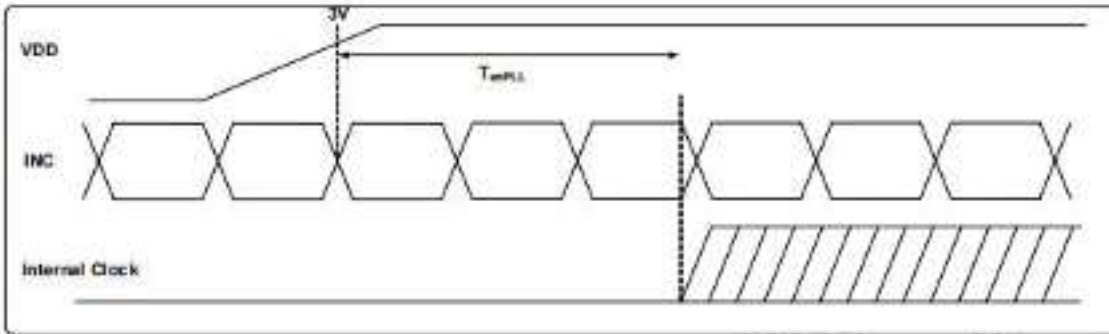
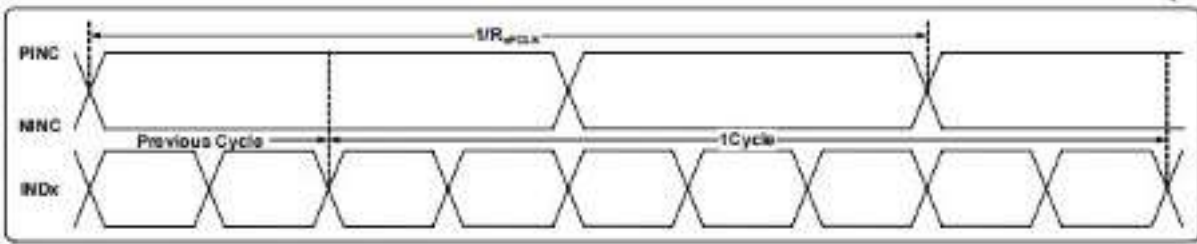


### 5.3 TTL mode AC electrical characteristics

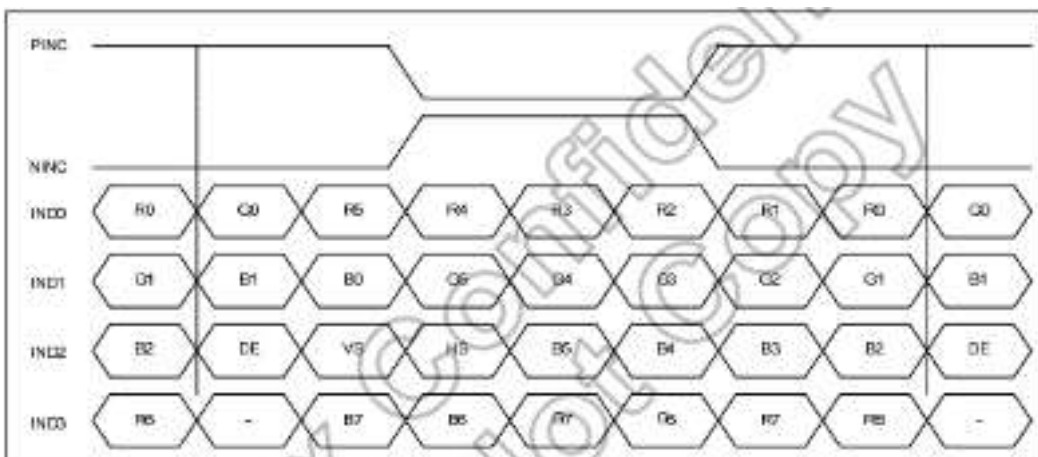
Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
VDD Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0V to 90% VDD
GRB pulse width	$T_{PGR}$	50	-	-	$\mu$ s	DCLK=65MHz
DCLK cycle time	$T_{CDB}$	14	-	-	ns	-
DCLK pulse duty	$T_{CDB}$	40	50	60	%	-
VSD setup time	$T_{VSD}$	5	-	-	ns	-
VSD hold time	$T_{VSD}$	5	-	-	ns	-
HSD setup time	$T_{HSD}$	5	-	-	ns	-
HSD hold time	$T_{HSD}$	5	-	-	ns	-
Data set-up time	$T_{DSU}$	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
Data hold time	$T_{DHD}$	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
DE setup time	$T_{DESU}$	5	-	-	ns	-
DE hold time	$T_{DEHD}$	5	-	-	ns	-
Output stable time	$T_{SST}$	-	-	6 3	$\mu$ s	10% to 90% target voltage. CL=90pF R=10K ohm (Cascade) Dual gate

### 5.4 LVDS mode AC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	$R_{XFCLK}$	20	-	71	MHz	-
Input data skew margin	$T_{RSDM}$	500	-	-	pS	$ V_{ID} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCLK}=71MHz$
Clock high time	$T_{LVCH}$	-	$4/(7 * R_{XFCLK})$	-	ns	-
Clock low time	$T_{LVCL}$	-	$3/(7 * R_{XFCLK})$	-	ns	-
PLL wake-up time	$T_{PWRU}$	-	-	150	$\mu$ s	-

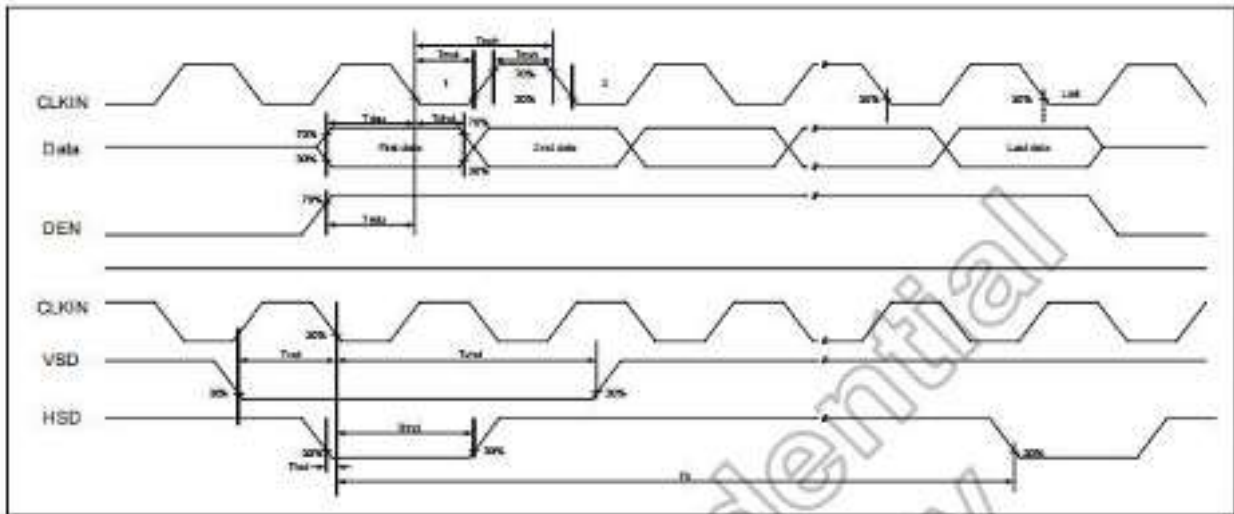


### 5.5 LVDS mode data input format (8-bit)

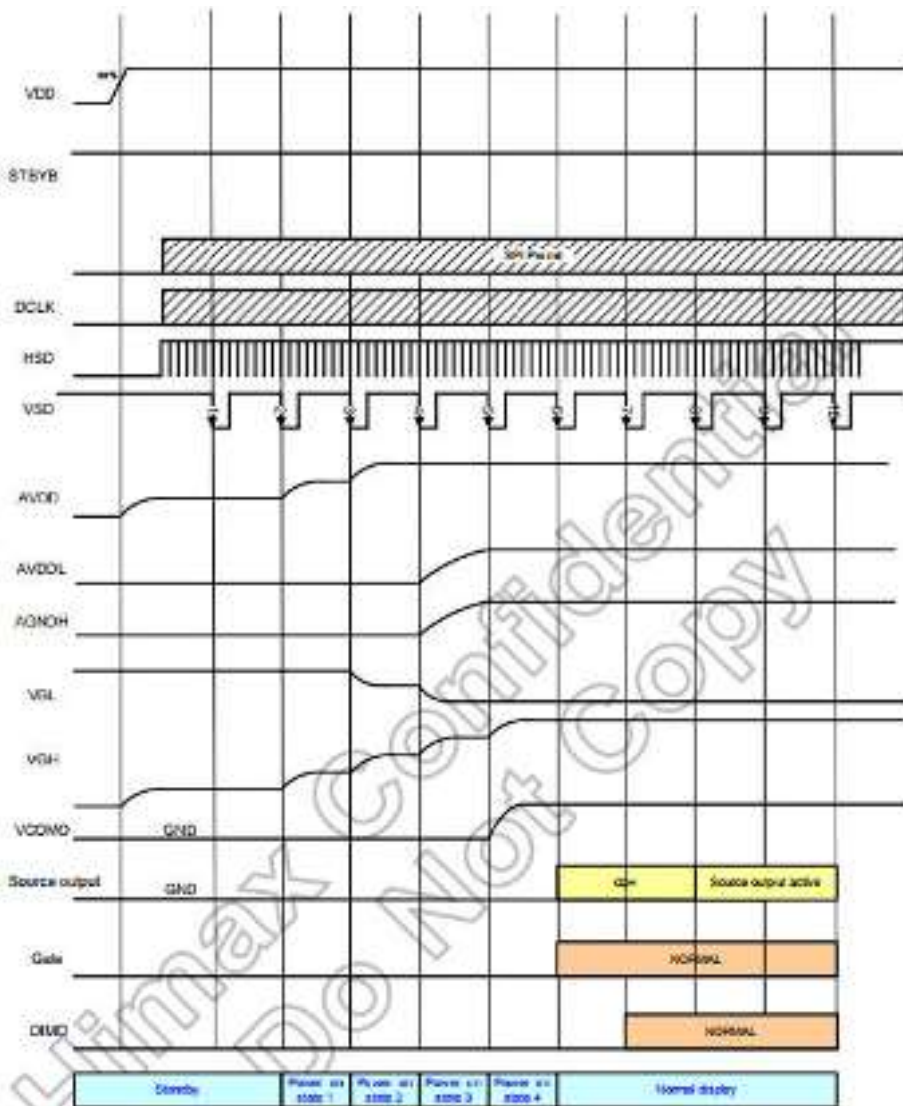




### 5.6 Input clock and data timing diagram

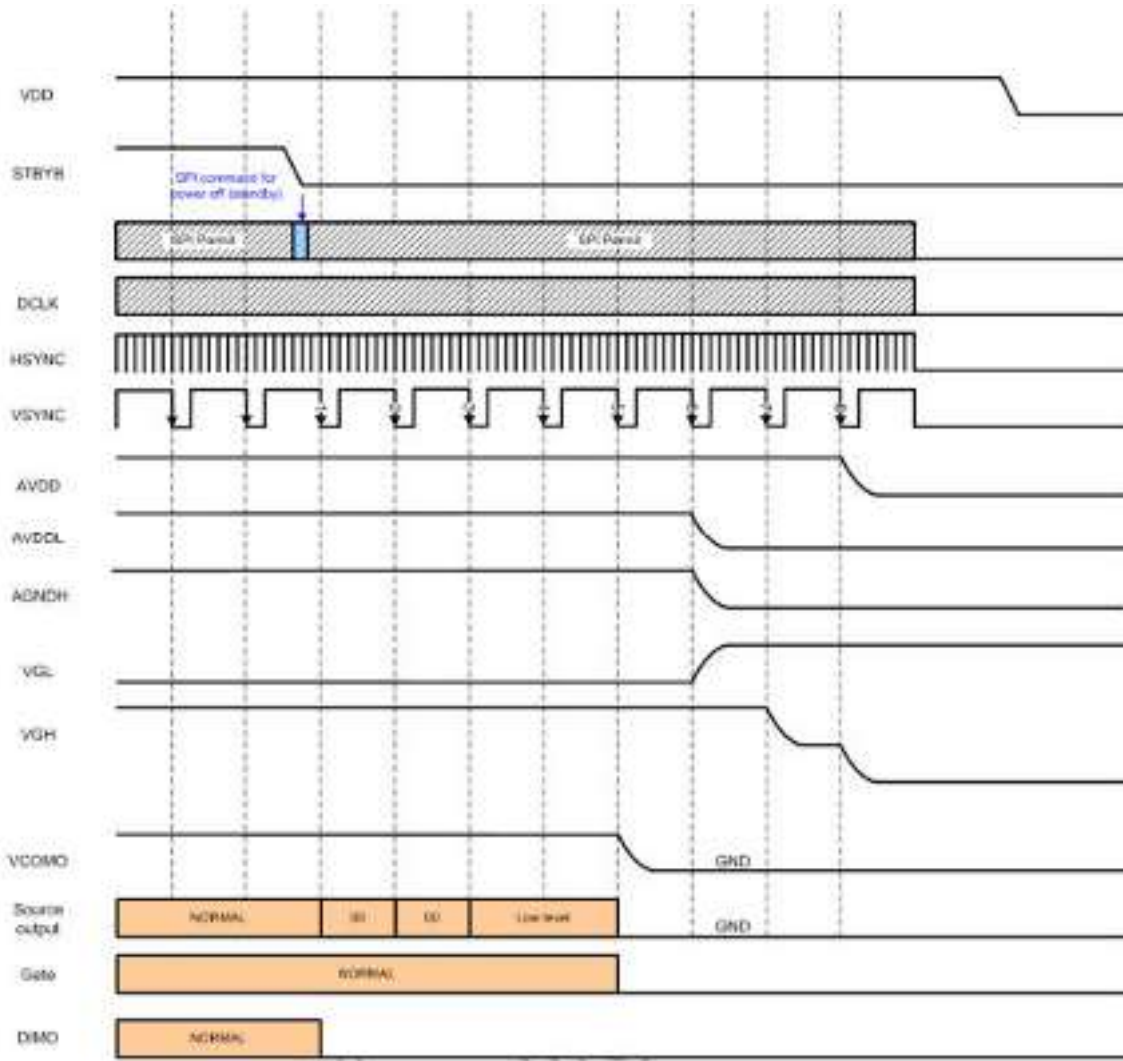


### 5.7 Power on timing sequence





## 5.8 Power off timing sequence



Note: Low level=3FH, when NBW=L (Normally white)

Low level=00H, when NBW=H (Normally black)



## 6. ELECTRO-OPTICAL CHARACTERISTICS

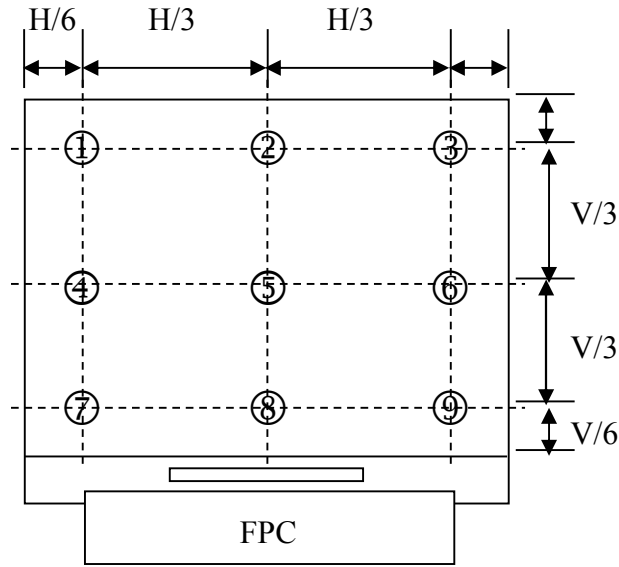
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio (Center point)		C/R	-	-	500	-	-	Note(1)	
Luminance uniformity		U <sub>w</sub>	θ = 0. Normal viewing angle B/L On  Note(1)	80	85	-	%	Note(2)	
Response Time		Tr + Tf		-	25	40	ms	Note(3)	
Color Chromaticity (CIE 1931)	White	W <sub>x</sub>			0.30			参考 值	Note(5)
		W <sub>y</sub>			0.32				
	Red	R <sub>x</sub>		0.635					
		R <sub>y</sub>		0.322					
	Green	G <sub>x</sub>	-0.02	0.301	+0.02				
		G <sub>y</sub>		0.584					
Blue	B <sub>x</sub>		0.141						
	B <sub>y</sub>		0.133						
Viewing Angle	Hor.	∅ 3R	C/R≥10	60	70	-	Deg	Note(4)	
		∅ 9L		60	70	-			
	Ver.	∅ 12U		50	60	-			
		∅ 6D		60	70	-			



Note1 Definition of Contrast Ratio (CR):

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

Note2: Definition of Luminance Uniformity: Active area is divided into 9 measuring areas (Shown in below), every measuring point is placed at the center of each measuring area.



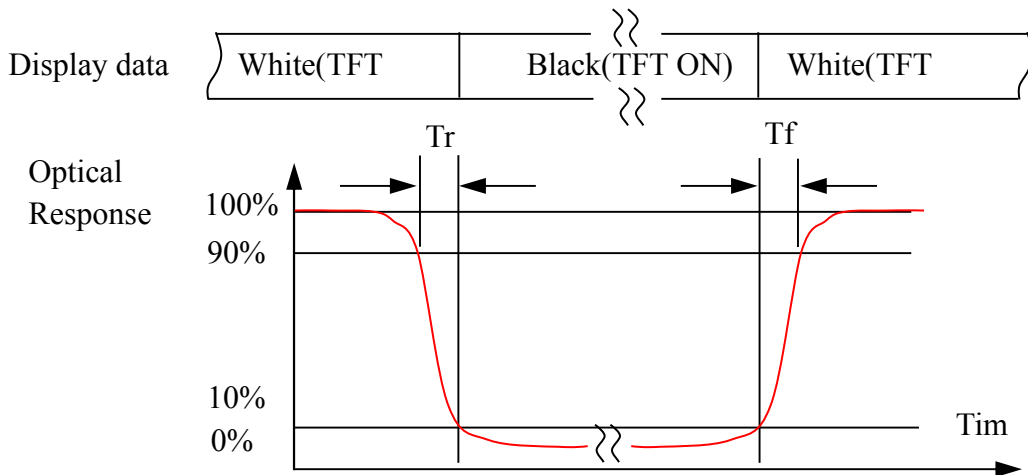
The spot locations for luminance measurement

$$\text{Luminance Uniformity} = \frac{H/6 B_{\min}}{V/6 B_{\max}} \times 100\%$$

$B_{\max}$ : The measured maximum luminance of all measurement position.

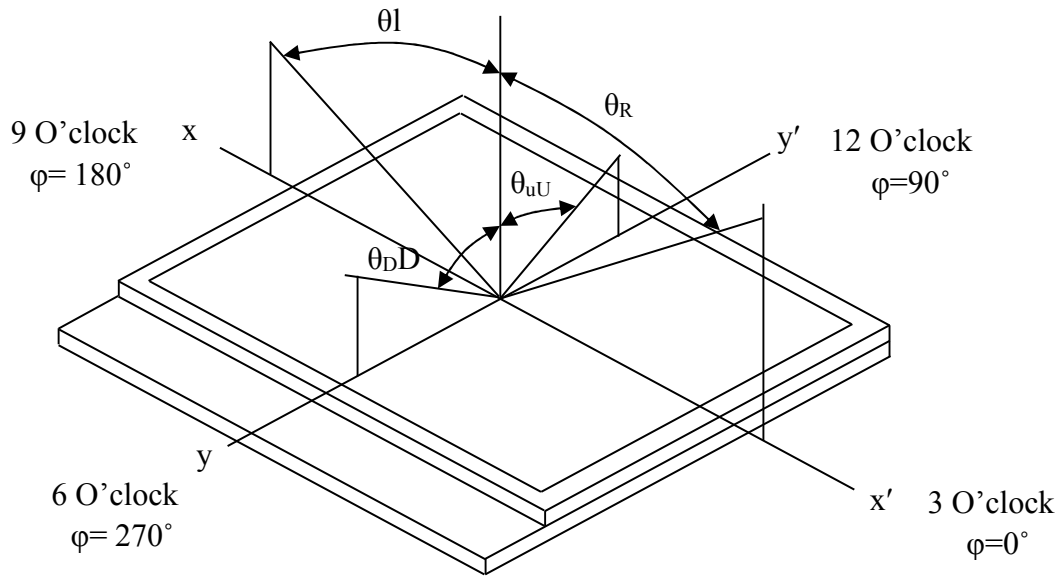
$B_{\min}$ : The measured minimum luminance of all measurement position.

Note 3: Definition of Response time: Sum of  $T_r$  and  $T_f$





Note4. Definition of Viewing Angle: The viewing angle range that the  $CR \geq 10$



Note 5: Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.



## 7. RELIABILITY TEST CONDITIONS

No	Test Item	Test Condition	STANDARD
1	High Temperature Storage	+70°C / 96Hours	1. Functional test is OK. Missing Segment, short, unclear segment, on-display, display abnormally and liquid crystal leak are un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temperature Storage	-30°C / 96Hours	
3	High Temperature Operating	+60°C / 96Hours	
4	Low Temperature Operating	-20°C / 96Hours	
5	Thermal and cold shock	0°C↔+50°C x 10cycles (30min) (5min) (30min)	
6	Operate at High Temperature and Humidity	60°C x 90%RH / 24H	1. Function test is OK. 2. No glass crack, chipped glass, end seal loose and fall, epoxy frame crack and so on. 3. No structure loose and fall.
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z	
8	Dropping test	Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces.	
9	ESD test	Contact: ±6KV Air: ±10KV 150PF/330Ω,5Points/panel,5times	The test results shall be subject to the whole machine test.

### NOTE:

1. The reliability items will be fully performed in new sample qualification,
2. The reliability status will be tested as monitor during mass production. Individual reliability test shall be performed by lot, Moreover, the individual reliability item shall be decided according to reliability plan.
3. All samples are inspected after keeping in the room with normal temperature and humidity for 2 hours or above.
4. Vibration test: It is not necessary to test for those products without assembly frame, backlight, PCB and so on.
5. Dropping test: It is necessary for affirming new package.
6. For the high temperature and high humidity test, pure water of over 10 MΩ.cm should be used.
7. Each test item applies for test LCM only once. Then tested LCM cannot be used again in any other test item.
8. The quantity of LCM examination for each test item is 5pcs to 10pcs.





## 8. INSPECTION STANDARDS

### 8.1 AQL Sampling inspection standard

使用 GB/T 2828-2003 一般 II 水平, 采用正常检查一次抽样方式; 具体抽检方式参照《成品检验管理程序》、《抽样管理规范》

缺陷区分	AQL 允收水准
严重缺陷	0 收 1 退
重缺	0.4
轻缺	1.0

### 8.2 Inspect the condition

8.2.1 在 20—40W 日光灯的照明条件下, 样品离检查者眼睛约 30cm 处进行检查。检验方向以垂直线前后左右 45° (以时钟 3 点、6 点、9 点、12 点)

8.2.2 检验者视力需达到标准视力 1.0 以上。

8.2.3 检验者需戴静电手环、两手八个手指套。

8.2.4 外观检验者以目视检查或以菲林对比卡比对。

8.2.5 电性测试使用电测测架, 主板, 电源线及单片机。

8.2.6 若标准与规格书不符时, 以产品发行之规格书特殊检验规格、工程变更为准

8.2.7 辉色度检测请参照样品, 检测方法依照辉色度检验标准。

8.2.8 电测检验环境: 照度为 200LUX 以下, 外观检验环境: 照度为 600LUX-1000LUX, 检验时间: 1 秒-3 秒。

8.2.9 检验工具: 电测测架, 主板, 电源线及单片机, 菲林对比卡, 游标卡尺, 放大镜, 实体显微镜 (必要时) 等等。

### 8.3 Judgment criterion

小尺寸点、线判定标准: (6.2 寸以内)

1	点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点)		判定 (A/B/C 区)	$D \leq 0.10$ , 忽略不计, 但密集型不允许	MI	OK
				$0.1 < D \leq 0.15$ , $ds \geq 10$		$N \leq 2$
				$0.15 < D \leq 0.2$ , $ds \geq 10$		$N \leq 1$
				LCD 亮点: $0.15 < D$		$N \leq 1$
				$D > 0.2$		NG
			判定 (D 区)	同背面丝印油墨区杂质判定标准		
			注: 1) D 区的点状缺陷需在不影响 CTP 功能、客户组装及整机的外观的情况下, 判定 OK		MI	
2	线状缺陷 (磨伤、无感划伤、毛屑、纤维等)		判定 (A/B/C 区)	$W \leq 0.03mm$ , $L \leq 3mm$ , $ds \geq 10$	MI	$N \leq 2$
				$0.03mm < W \leq 0.05mm$ , $L \leq 3mm$ , $ds \geq 10$		$N \leq 1$
				$W > 0.05mm$ 或 $L > 3mm$		NG



## 中尺寸点、线判定标准：（6.2~8寸以内）

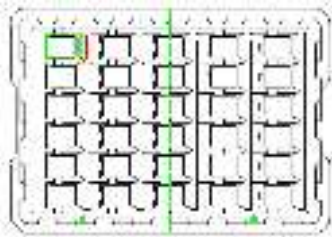
1	点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点)		判定(A/B/C区)	$D \leq 0.10$ , 忽略不计, 但密集型不允许	MI	OK
				$0.15 < D \leq 0.25$ , $ds \geq 10$		$N \leq 2$
				$0.25 < D \leq 3$ , $ds \geq 10$		$N \leq 1$
				LCD亮点: $0.2 < D$		$N \leq 1$
				$D > 0.3$		NG
判定(D区)	同背面丝印油墨区杂质判定标准					
注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK					MI	
2	线状缺陷 (磨伤、无感划伤、毛屑、纤维等)		判定(A/B/C区)	$W \leq 0.03mm$ , $L \leq 3mm$ , $ds \geq 10$	MI	$N \leq 2$
				$0.03mm < W \leq 0.05mm$ , $L \leq 3mm$ , $ds \geq 10$		$N \leq 1$
				$W > 0.05mm$ 或 $L > 3mm$		NG

## 大尺寸点、线判定标准：（8.1~13.3寸以内）

1	点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点)		判定(A/B/C区)	$D \leq 0.1$ , 忽略不计, 但密集型不允许	MI	OK
				$0.15 < D \leq 0.3$ , $ds \geq 10$		$N \leq 2$
				$0.3 < D \leq 0.35$ , $ds \geq 10$		$N \leq 1$
				LCD亮点: $0.25 < D$		$N \leq 1$
				$D > 0.35$		NG
判定(D区)	同背面丝印油墨区杂质判定标准					
注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK					MI	
2	线状缺陷 (磨伤、无感划伤、毛屑、纤维等)		判定(A/B/C区)	$W \leq 0.05mm$ , $L \leq 5mm$ , $ds \geq 10$	MI	$N \leq 2$
				$0.05mm < W \leq 0.07mm$ , $L \leq 5mm$ , $ds \geq 10$		$N \leq 1$
				$W > 0.07mm$ 或 $L > 5mm$		NG



## 9. PACKAGE DRAWING



一盘:TBD pcs

9.2

Use empty tray



Put products into the tray



一叠:TBD pcs 盘

9.3



9.4

