Shenzhen Starbillions Electronics Co.,Ltd

APPROVAL SHEET
承 认 书

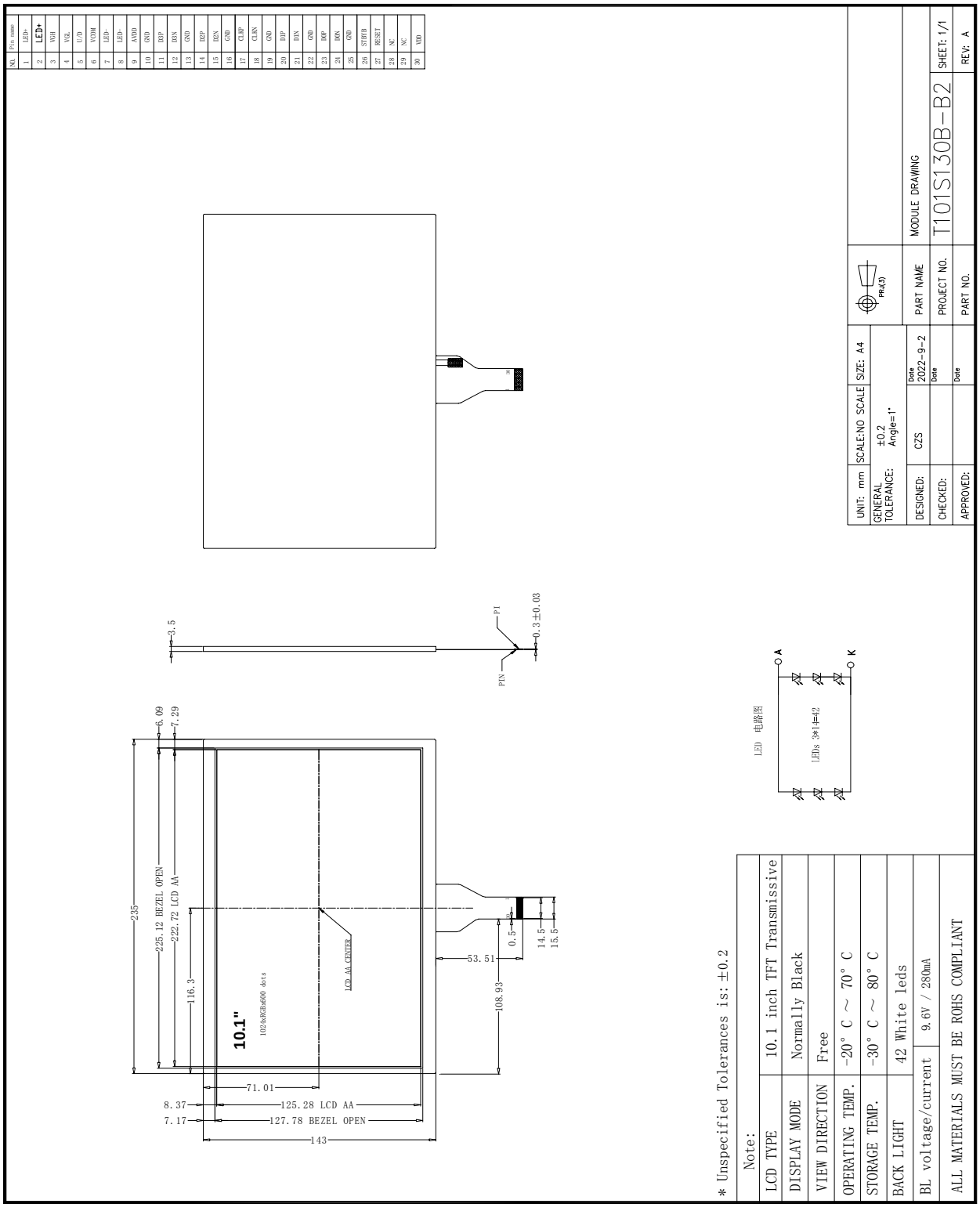
Customer 客户名称	
Part NO. 产品型号	T101S130B-B2
Product type 产品内容	Mode: Transmissive type .Normally white. TFT LCD Module LCD Module: Graphic 1024RGB*600Dot-matrix
Remarks 备注栏	□APPROVAL FOR SEPCIFICATIONS ONLY ■APPROVAL FOR SEPCIFICATIONS AND SAMPLE
Signature by Customer: 客户确认签章	

Issued by	Checked by	Approved by

1. PHYSICAL DATA

Item	Contents	Unit
LCD type	TFT TRANSMISSIVE	---
Viewing direction	ALL	o'clock
Module size (W×H×T)	235× 143 × 3.5	mm^3
Active area(W×H)	222.72 ×125.28	mm^2
Number of dots(W×H)	1024 × RGB × 600	dots
Pixel Pitch(W×H))	0.2175 × 0.2088	mm
Colors	16.7M	---
Backlight Type	42 white leds 9.6V 280mA	---
Interface Type	MIPI	---

2. Mechanical Dimension



3. Pin Descriptions

Pin No.	Symbol	Functional	Notes
1	LED+	Back light LED+	
2	LED+	Back light LED+	
3	VGH	Gate ON Voltage	
4	VGL	Gate OFF Voltage	
5	U/D	Gate up or down scan control	
6	Vcom	Common voltage	
7	LED-	Back light LED-	
8	LED-	Back light LED-	
9	AVDD	Power for Analog Circuit	
10	GND	Ground	
11	MIPI_TDP3	MIPI data input	
12	MIPI_TDN3	MIPI data input	
13	GND	Ground	
14	MIPI_TDP2	MIPI data input	
15	MIPI_TDN2	MIPI data input	
16	GND	Ground	
17	MIPI_TDP	MIPI clock input	
18	MIPI_TDN	MIPI clock input	
19	GND	Ground	
20	MIPI_TDP1	MIPI data input	
21	MIPI_TDN1	MIPI data input	
22	GND	Ground	
23	MIPI_TDP0	MIPI data input	
24	MIPI_TDN0	MIPI data input	
25	GND	Ground	
26	STBYB	Standby mode, Normally pulled high	
27	RESET	Global reset pin	
28-29	NC	No connection	
30	VDD	Power supply for digital circuits +1.8V input	

4. OPERATION SPECIFICATION

4.1 Absolute maximum ratings

Parameter	Symbol	Min	Max	Unit
Power supply1	V_{DD}	-0.3	+2.5	V
Power supply2	Avdd	-0.5	+13.5	V
Operating temperature	T_{OPR}	-20	70	℃
Storage temperature	T_{STG}	-30	80	℃

4.2 Input driver voltage for LCD

Parameter	Min	Typ	Max	Unit
VDD	**1.5**	**1.8**	2.5	V
VGH	15	21	29	V
VGL	-5	-8	-10	V
AVDD	--	9.6	--	V
VCOM	--	4.15	--	V

Note: Please adjust Vcom to make the flicker level be minimum

5. MIPI DC Characteristics

(VDD=VDD_IF=1.8V,AVDD=8 to 13.5V,GND=AGND=GND_IF=0V,TA=-20℃ to 85℃)

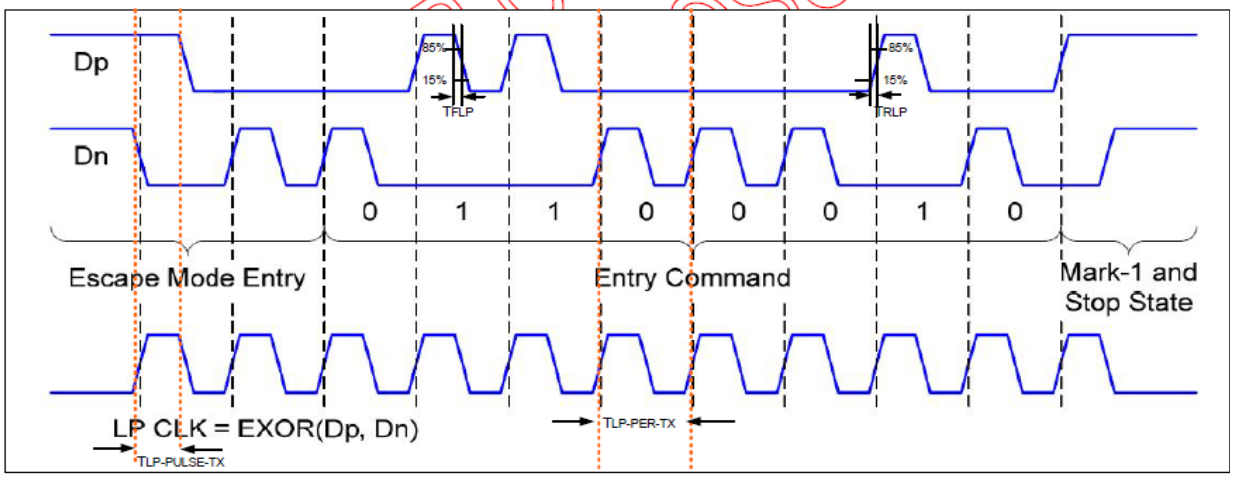
Parameter	Symbol	Min.	Typ.	Max.	Unit
MIPI Characteristics for High Speed Receiver					
Single-ended input low voltage	V_{ILHS}	-40	-	-	mV
Single-ended input high voltage	V_{IHHS}	-	-	460	mV
Common-mode voltage	V_{CDRXDC}	70	-	330	mV
Differential input impedance	Z_{ID}		100		ohm
HS transmit differential voltage(VOD=VDP-VDN)	$\|V_{OD}\|$	140	200	250	mV
MIPI Characteristics for Low Power Mode					
Pad signal voltage range	V_I	-50	-	1350	mV
Ground shift	V_{GNDSH}	-50	-	50	mV
Logic 0 input threshold	V_{IL}	0	-	550	mV
Logic 1 input threshold	V_{IH}	880	-	1350	mV
Input hysteresis	V_{HYST}	25	-	-	mV
Output low level	V_{OL}	-50	-	50	mV
Output high level	V_{OH}	1.1	1.2	1.3	V
Output impedance of Low Power Transmitter	Z_{OLP}	80	100	125	ohm
Logic 0 contention threshold	$V_{ILCD,MAX}$	-	-	200	mV
Logic 0 contention threshold	$V_{IHCD,MIN}$	450	-	-	mV

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6. MIPI AC Characteristics

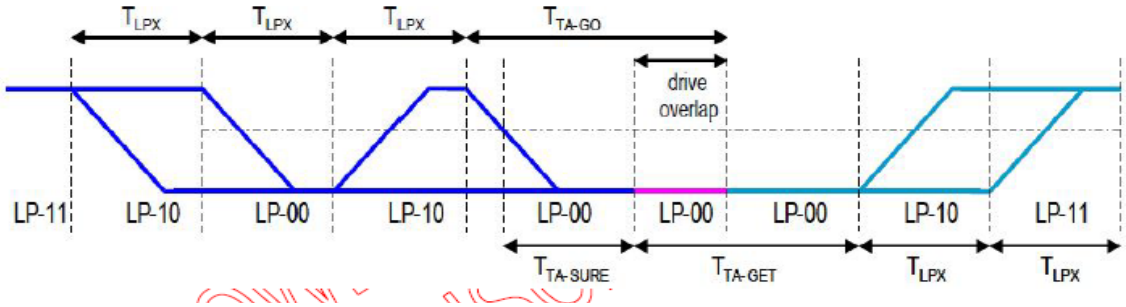
Parameter		Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time		T_{RLP} /T_{FLP}	-	-	25	ns	-
30%~85% rising time and falling time		T_{REOT}	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	First LP EXOR clock pulse after STOP state or Last pulse before stop state	$T_{LP-PULSE-TX}$	40	-	-	ns	-
	All other pulses		20	-	-	ns	-
Period of the LP EXOR clock		$T_{LP-PER-TX}$	90	-	-	mV/ns	-
Slew Rate @C_{LOAD} =0pF		$\delta V/\delta t_{SR}$	30	-	500	mV/ns	-
Slew Rate @C_{LOAD} =5pF			30	-	200	mV/ns	-
Slew Rate @C_{LOAD} =20pF			30	-	150	mV/ns	-
Slew Rate @C_{LOAD} =70pF			30	-	100	mV/ns	-
Load Capacitance		T_{RLP}	-	-	70	pF	-

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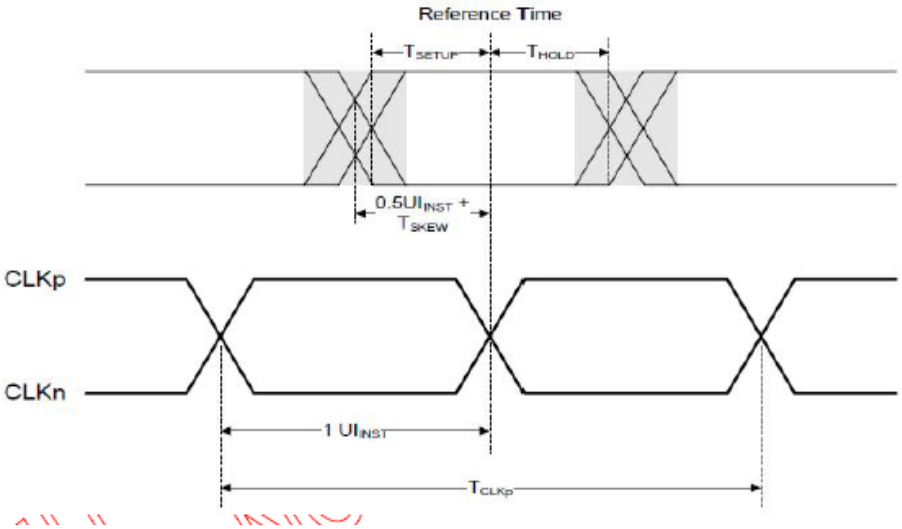
Turnaround Procedure Operation Timing Parameters

Parameter	Symbol	Min	Typ	Max	Units
Length of any Low-Power state period: Master side	T_{LPX}	50	-	75	ns
Length of any Low-Power state period: Slave side	T_{LPX}	50	55.56	58.34	ns
Ratio of T_{LPX}(Master)/ T_{LPX} (Slave) between Master and Slave side	Ratio T_{LPX}	2/3	-	3/2	
Time-out before new TX side start driving	$T_{TA-Sure}$	T_{LPX}	-	$2T_{LPX}$	ns
Time to drive LP-00 by new TX	T_{TA-GET}	-	$5T_{LPX}$	-	ns
Time to drive LP-00 after Turnaround Request	T_{TA-GO}	-	$4T_{LPX}$	-	ns



High speed transmission

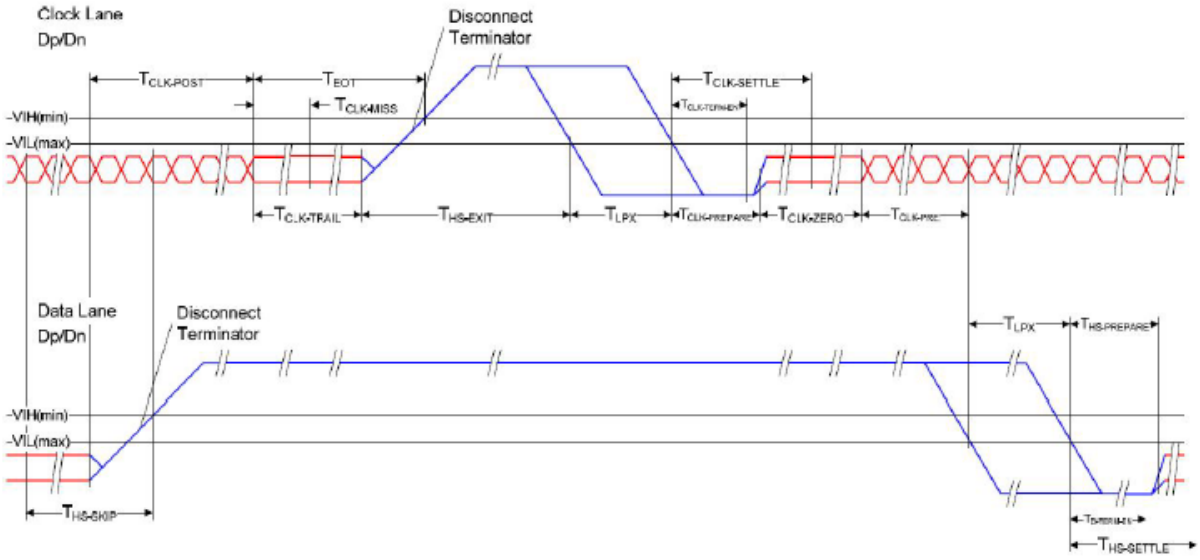
Parameter	Symbol	Min	Typ	Max	Units
UI instantaneous	UI_{INST}	2	-	12.5	ns
Data to Clock Skew(measured at transmitter)	$T_{SKEW(TX)}$	-0.15	-	0.15	UI_{INST}
Data to Clock Setup time(measured at receiver)	$T_{SETUP(RX)}$	0.15	-	-	UI_{INST}
Data to Clock Hold time(measured at receiver)	$T_{HOLD(RX)}$	0.15	-	-	UI_{INST}
20%~80% rise time and fall time	T_R, T_F	150	-	-	ps
		-	-	0.3	UI_{INST}



High Speed Clock Transmission

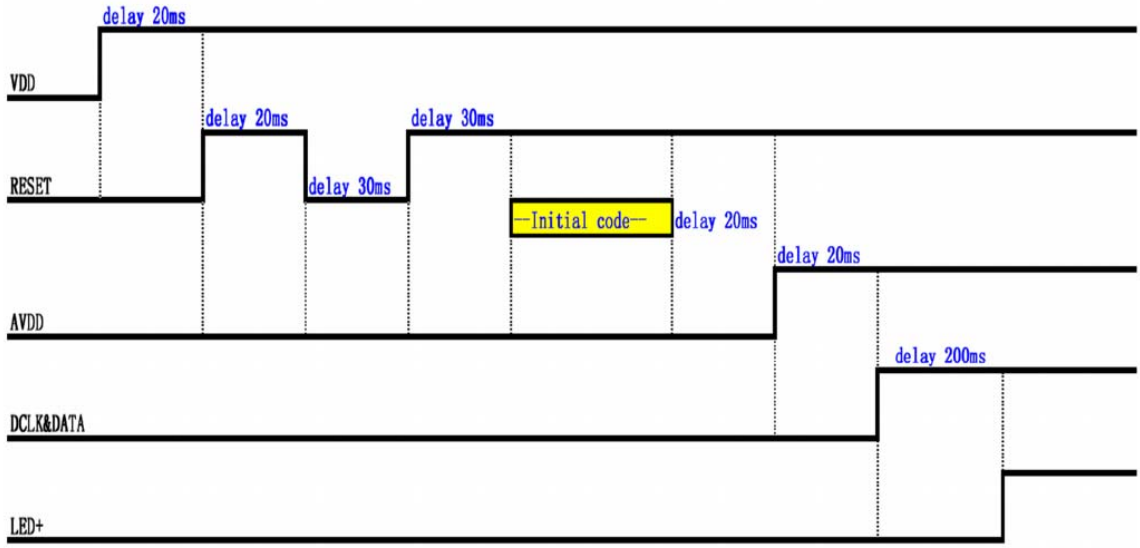
Parameter	Symbol	Min	Typ	Max	Units
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TCLK-POST	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	TCLK-MISS	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	TCLK-PREPARE	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	TCLK-PREPARE + TCLK-ZERO	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross VIL,MAX	THS-TERM-EN	-	-	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	TCLK-PRE	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	TCLK-TRAIL	60	-	-	ns

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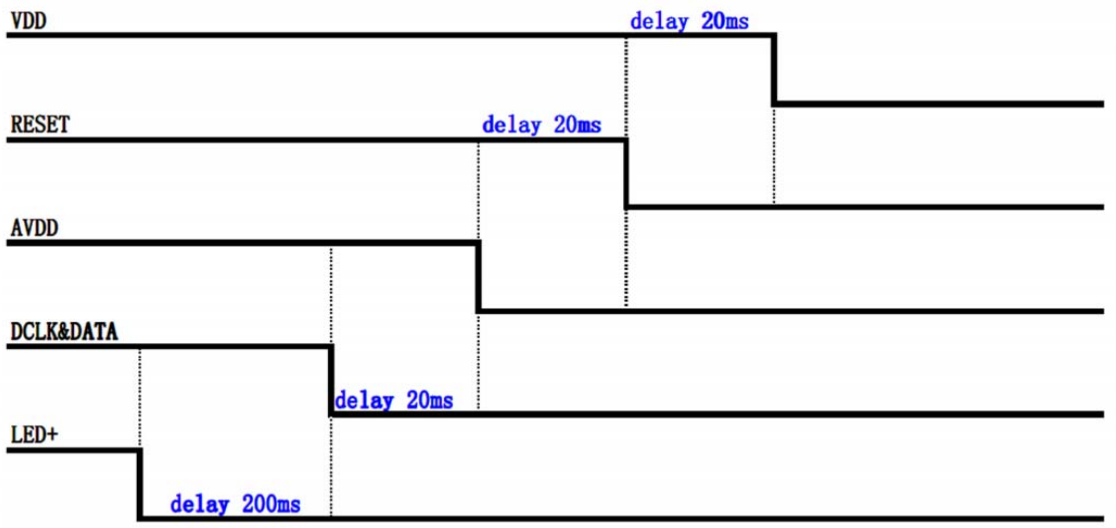
7. Power on/off timming

1. Power ON Timming



Note: 1.請將VDD/AVDD/VGH/VGL/VCOM等電壓的紋波控制在**200mV**以內。
2.保持VDD/RESET/AVDD等電壓足夠的驅動能力，避免拉高有台階。
3. STBYB：直接OPEN或者接VDD。主板上的VGH/VGL/VCOM一般由AVDD倍壓和分壓而來。控制AVDD即可控制其他三組電壓。

2. Power Off Timming



Note：1. 將AVDD/VGH/VGL/VCOM四組電壓的放電時間控制在50ms內。
2. Power off后，讓VDD/AVDD/VGH/VGL/VCOM五組電壓保持在GND。
3.主板Sleep In請follow “Power Off Timming”

3. EK79007 MIPI參數設置

3.1 MIPI 4-LANE

MIPI CLK=170MHZ(340Mbps);

H back porch:160;
H front porch:160;
H pulse width:10;

V back porch:23;
V front porch:12;
V pulse width:1;

3.2.MIPI 2-LANE

MIPI CLK=230MHZ(460Mbps);

H back porch:60;
H front porch:60;
H pulse width:10;

V back porch:10;
V front porch:5;
V pulse width:2;

Note：1. VDD的電壓範圍：1.8V~2.0V.
2.RESET/STBYB/UPDN/SHLR等信號拉“H”時，電壓一定要和VDD相同
3. MIPI 2-LANE時，需要在初始化裡面多加指令（RB2H,0x10）。
4. 初始化代碼和AVDD/VGH/VGL/VCOM等電壓參數，隨著玻璃異常而改變。

8. Backlight Characteristic

Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V_{LED}	**9.0**	**9.3**	**9.6**	**V**
LED module current	I_{LED}	**--**	**280**		**mA**
LCM Surface Luminance ★1	L_S	**360**	**400**	**--**	mcd
LCM Surface brightness uniform ★2	L_D	**80**	**--**	**--**	%

★ 1 Test condition is:

(a) Center point on active area.

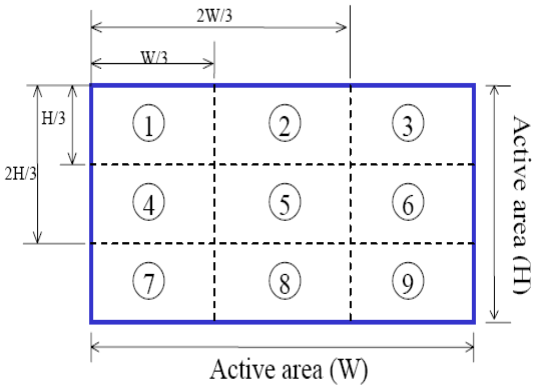
(b)Best Contrast.

★2 Uniform measure condition:

(1)Measure 9 point. Measure location show below;

(2)Uniform=(Min. brightness /Max. brightness)*100%

(3)Best Contrast.



9. Electro-optical Characteristics

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	WV-Pol Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	-	800	-		Note 2
Cell Transmittance		Tr		4.8	5.8	-	%	Base on C Light Note 3
White Chromaticity		x_w		TYP. - 0.03	0.307	TYP. + 0.03		Note 4 Base on C Light
		y_w			0.338			
Reproduction of color (C light)	Red	R_x			0.605			
		R_y			0.336			
	Green	G_x			0.297			
		G_y			0.552			
	Blue	B_x			0.139			
		B_y			0.132			
Color Gamut (C light)				-	50	-	%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	30	40	ms	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 5).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 5) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer.

4. The color chromaticity coordinates specified in Table 6 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Calculation is based on C light.

5. The electro-optical response time measurements shall be made as FIGURE 6 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

10. Reliability

10.1 Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

10.2 Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃*120Hrs	No Defect Of Operational Function In Room Temperature Are Allowable
2	Low Temperature Non-Operating Test	-30℃*120Hrs	
3	High Temperature/Humidity Non Operating Test	60℃*75%RH*120Hrs	
4	High Temperature Operating Test	70℃*120Hrs	
5	Low Temperature Operating Test	-20℃*120Hrs	
6	Thermal Shock Test	-10℃(30Min) -50℃(30Min) *10CYCLES	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

12. Inspection standards

1.AQL(Acceptable Quality Level

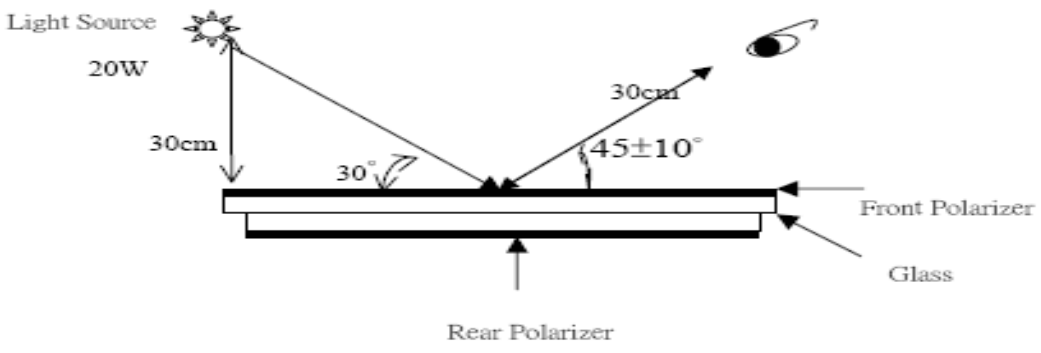
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

2. Basic conditions for inspection

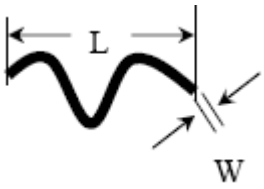
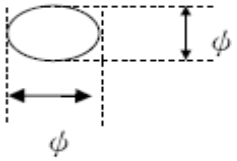
The LCM face to us, in normal environment, the lux is 1000±200.(Darkroom's lux: 100±50),About an angle of incidence 30,a distance of 30 cm with an angle of 45 degree to check the products without uncovering the film!

(As shown below)

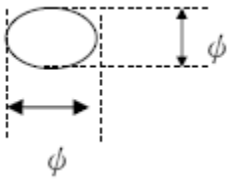
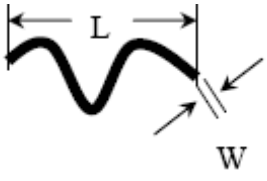


3.Inspection item and criteria

3.1 LCD appearance defect(View area)

NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		W≦0.03mm	disregard	
		0.03mm<W≦0.05mm; L≦3.0mm	2	
		0.05mm<W≦0.1mm; L≦3.0mm	1	
		W>0.1mm;L>3.0mm	0	
2	Polarizer bubble、concave and convex (minor defect)	φ≦0.2mm	disregard	note1: φ=(L+W)/2, L:Length, W :Width note2:disregard if out of AA
		0.2mm<φ≦0.3mm	2	
		0.3mm<φ≦0.5mm	1	
		0.5mm<φ	0	
3	Black dots、dirty dots、impurities、eye winker (minor defect)	φ≦0.15mm	disregard	note2:disregard if out of AA 
		0.15mm<φ≦0.25mm	2	
		0.25mm<φ≦0.3mm	1	
		0.3mm<φ	0	
4	Polarizer prick (minor defect)	φ≦0.1mm	disregard	note1: φ=(L+W)/2, L=Length, W=Width note2:the distance between two dots>5mm
		0.1mm<φ≦0.25mm	3	
		φ>0.25mm	0	

3.2Electrical criteria

NO	Defect item	Criteria	Remark	
1	No display (major defect)	No display 【Reject】		
2	Missing line (major defect)	Missing line 【Reject】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】		
6	Mura (major defect)	ND filter 2%test		
7	Over current (major defect)	Over current 【Reject】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Reject】		
11	Black/white dots 、 Dirty dots、eye winker (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		Φ≦0.15mm	disregard	
		0.15mm< Φ ≦0. 25㎜	2	
		0.25mm< Φ ≦0. 3㎜	1	
		0.3mm< Φ	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	W≦0.03mm	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		0.03mm<W≦0. 0. 05㎜ L≦3. 0㎜	2	
		0.05mm<W≦0. 1㎜ L≦3. 0㎜	1	
		W>0.1mm;L>3.0mm	0	

13.Precautions for using LCD modules.

13.1 Safety

(1)Do not swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
(2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
(3)If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

13.2 Storag Conditions

(4)Store the panel or module in a dark place where the temperature is 23±5℃and the humidity is below 45 ±20%RH.
(5)Store in anti-static electricity container.
(6)Store in clean environment, free from dust, active gas, and solvent.
(7)Do not place the module near organics solvents or corrosive gases.
(8))Do not crush, shake, or jolt the module.

13.3Handling Precautions

(9)Avoid static electricity, which can damage the CMOS LSI.
(10)The polarizing plate of the display is very fragile, please handle if very carefully.
(11)Do not give external shock.
(12)Do not apply excessive force on the surface.
(13)Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(14)Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
(15)Do not operate it above the absolute maximum rating.
(16)Do not remove the panel or frame from the module.

13.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.