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Manufacturer Certificated



CERT. No.: 282Q19070712006



CERT. No.: 282E19070712007

Product Specification

Model: TTX702BVT-01

7.02 " TFT Display Module (1200*1920)

This module uses RoHS material

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REVISION RECORD

[illegible]

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1. GENERAL SPECIFICATIONS(主要特征描述)

Item 项目	Contents 内容	Unit 单位
LCD type 液晶显示类型	16.7M TFT TRANSMISSVIE	/
Diagonal length 尺寸	7.02	inch
Recommended Viewing Direction 推荐使用方向	ALL	0' Clock
Dot arrangement 点阵	1200(R.G.B)*1920	Dot
Module size (W*H*T) 模块外围尺寸 (宽*高*厚)	111.0mm(H) x 166.0mm(V)	mm ³
Active area (W*H) 有效显示区域 (宽*高)	94.5mm(H) x 151.2mm(V)	mm ²
Pixel size (W*H) 像素大小 (宽*高)	0.08625*0.08625	mm ²
Backlight Type 背光类型	LED(white 56*LED)	/
Drive IC 驱动 IC	HX8279	/
Interface Type 接口类型	MIPI interface	/

模组图

客户名称:
CUSTOMER NO.:
客户料号:

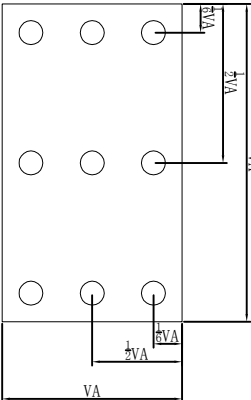
MODEL NO.:
HL C22054B-W56L070-01

Date 日期

EDITION
版本号 01

1. ☐ : UNLIT LUMINOUS
2. () : REFERENCE DIMENSION.
3. + : SAFETY CHARACTERISTIC.
4. ∇ : SPECIAL CHARACTERISTIC.
5. Unmarked tolerance is ± 0.2, unit : mm.
6. Marked "Δ" is modification rev. number.

7、测试点排布图(LAY OUT OF MEASURED POINTS):
测试距离: 500±50mm, Ø7.7 (350±50mm, Ø5.0)
测试设备: BM-7



8、保存和焊接条件 (STORAGE & SOLDERING CONDITIONS):

Store with care .Storing the units in bag condition will cause the reflector sheet and decrease it's adhesive power.Storage The products under the condition:
temperature (25℃±10℃)and humidity (40%RH±20%RH) our recommendation.
The Soldering Temperature is 310℃±5℃ and Soldering Time should be less than 3sec, and soldering iron power should be less than 25W. The soldering point should be farther than 1.6mm from body.

9、极限参数 (ABSOLUTE MAXIMUM RATINGS):

(除非特别说明,环境温度 TA=25℃ Unless specified,The Ambient temperatureTa=25℃)

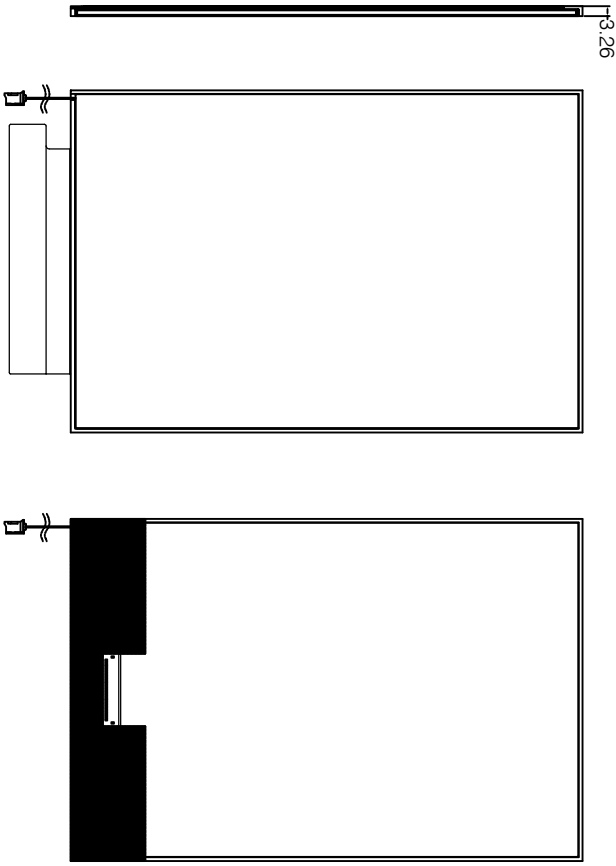
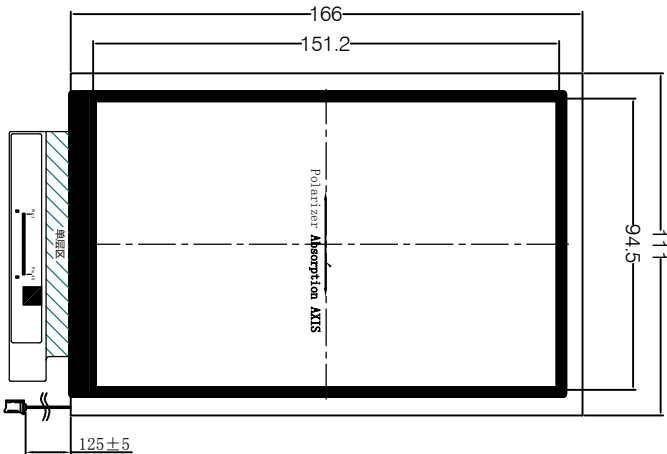
项目 Item	符号Symbble	条件 Condition	值 Rating	单位Unit
极限直流正向电流 Absolute maximum forward current	Ifm		30	mA/LED
脉冲驱动时极限正向电流 Peak forward current	Ifp	1msec 脉宽 1/10占空比 1msec plus 10% Duty Cycle	80	mA/LED
极限功耗 Power dissipation	Pd		75	mW/LED
工作温度 Operating Temperature Range	Topr		-20~+70	℃
贮存温度 Storage Temperature Range	Tstg		-30~+80	℃

当工作温度高于70℃时, Ifm 和Pd必须降额, 电流降额率是 0.3mA/℃/LED (连续驱动), 或 -0.3mA/℃/LED (脉冲驱动), 功耗降额率是 0.7mW/℃/LED, 产品的工作电流不能大于为应用工作温度条件下规定的值.
For operation above 25℃,The Ifm and Pd must be derated, the Current derating is -0.3mA/℃/LED for DC drive and 0.3mA/℃/LED for Pulse drive, the Power dissipation is -0.7mW/℃/LED. The product working current must not more than the 65% of the Ifm Ifp according to the working temperature.

10、电、光特性 (ELECTRICAL-OPTICAL CHARACTERISTICE):

(除非特别说明,环境温度 TA=25℃ Unless specified,The Ambient temperatureTa=25℃)

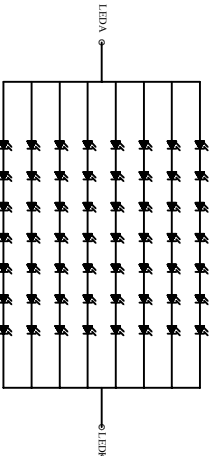
项目 Item	符号 Symbol	最小值 Min	典型值 Typ	最大值 Max	单位 Unit	测试条件 Condition
正向电压 Forward Voltage	VF			22.4	V	
亮度 Luminance (BM-7A)	Lv		400		cd/m ²	
均匀性 Uniformity	Avg	80			%	IF=280mA Ta=25℃
色坐标 (中心点) Colour Coordinate	X					
	Y					



11、WARPAGE REQUEST 翘曲度 H≤0.3mm

12、Circuit Diagram(pcs), 2*7*4=56 LED COLOR: 白色

电路图



Designer
设计

L. Y. Yang
设计

Checked
审核

Approved
批准

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4.0 INTERFACE CONNECTION. 接口定义

4.1 Electrical Interface Connection

The Interface Connector assignments are listed in Table 4

< Table 4. Pin Assignments for the Interface Connector >

1	Ag_GND	41	NC	81	VSP	121	DUMMY	161	DUMMY	201	DUMMY	241	VGH	281	CLKN	321	BIST_EN
2	NULL	42	NC	82	VSP	122	DUMMY	162	DUMMY	202	DUMMY	242	VCOM	282	CLKP	322	PWRMD
3	Ag_GND	43	VCC	83	VSP	123	DUMMY	163	DUMMY	203	DUMMY	243	VCOM	283	GND	323	NC
4	Ag_GND	44	GND	84	GND	124	DUMMY	164	DUMMY	204	DUMMY	244	VCOM	284	D1N	324	LNSW0
5	GND	45	D3N	85	GND	125	DUMMY	165	DUMMY	205	DUMMY	245	SCK	285	D1P	325	LNSW1
6	GND_db	46	D3P	86	GND	126	DUMMY	166	DUMMY	206	DUMMY	246	SDAO	286	GND	326	NC
7	VGL	47	GND	87	VSN	127	DUMMY	167	DUMMY	207	DUMMY	247	RESETB	287	D0N	327	MIPI_LAN0
8	VGL	48	D2N	88	VSN	128	DUMMY	168	DUMMY	208	DUMMY	248	STBYB	288	D0P	328	MIPI_LAN1
9	Dummy	49	D2P	89	VSN	129	DUMMY	169	DUMMY	209	DUMMY	249	DIMO	289	GND	329	NC
10	VGH	50	GND	90	PN_SWAP	130	DUMMY	170	DUMMY	210	DUMMY	250	TP_SYNC	290	GND	330	NC
11	VGH	51	CLKN	91	BIST_EN	131	DUMMY	171	DUMMY	211	DUMMY	251	SDAI	291	VCC	331	TESTIN
12	VCOM	52	CLKP	92	PWRMD	132	DUMMY	172	DUMMY	212	DUMMY	252	PWMI	292	VCC	332	TESTOUT
13	VCOM	53	GND	93	NC	133	DUMMY	173	DUMMY	213	DUMMY	253	CSB	293	DRVH3	333	VCOMOUT
14	VCOM	54	D1N	94	LNSW0	134	DUMMY	174	DUMMY	214	DUMMY	254	MIPI_TYPE	294	DRVH2	334	VCOMOUT
15	SCK	55	D1P	95	LNSW1	135	DUMMY	175	DUMMY	215	DUMMY	255	VCC	295	DRVH1	335	VCOMOUT
16	SDAO	56	GND	96	NC	136	DUMMY	176	DUMMY	216	DUMMY	256	VDD	296	VSP_O	336	VPP
17	RESETB	57	D0N	97	MIPI_LAN0	137	DUMMY	177	DUMMY	217	DUMMY	257	GND	297	VSP	337	VGH_L
18	STBYB	58	D0P	98	MIPI_LAN1	138	DUMMY	178	DUMMY	218	DUMMY	258	VSP	298	GND	338	VGH_L
19	DIMO	59	GND	99	NC	139	DUMMY	179	DUMMY	219	DUMMY	259	VSP	299	VSN	339	Dummy
20	TP_SYNC	60	GND	100	NC	140	DUMMY	180	DUMMY	220	DUMMY	260	GND	300	VSN_O	340	VGL
21	SDAI	61	VCC	101	TESTIN	141	DUMMY	181	DUMMY	221	DUMMY	261	GND	301	DRVL2	341	VGL
22	PWMI	62	VCC	102	TESTOUT	142	DUMMY	182	DUMMY	222	DUMMY	262	VSN	302	DRVL1	342	GND_dr
23	CSB	63	DRVH3	103	VCOMOUT	143	DUMMY	183	DUMMY	223	DUMMY	263	VSN	303	VLPH	343	GND_dg
24	MIPI_TYPE	64	DRVH2	104	VCOMOUT	144	DUMMY	184	DUMMY	224	DUMMY	264	VCOM0	304	VLPH	344	GND
25	VCC	65	DRVH1	105	VCOMOUT	145	DUMMY	185	DUMMY	225	DUMMY	265	VCOM0	305	VDD	345	Ag_GND
26	VDD	66	VSP_O	106	VPP	146	DUMMY	186	DUMMY	226	DUMMY	266	VCOM0	306	VDD	346	Ag_GND
27	GND	67	VSP	107	VGH_L	147	DUMMY	187	DUMMY	227	DUMMY	267	VCOM_EN	307	VDD	347	NULL
28	VSP	68	GND	108	VGH_L	148	DUMMY	188	DUMMY	228	DUMMY	268	VCL	308	VCC_EN	348	Ag_GND
29	VSP	69	VSN	109	Dummy	149	DUMMY	189	DUMMY	229	DUMMY	269	VCL	309	VCC	FPC PIN based on HX8279-D01*2	
30	GND	70	VSN_O	110	VGL	150	DUMMY	190	DUMMY	230	DUMMY	270	VCL	310	GND		
31	GND	71	DRVL2	111	VGL	151	DUMMY	191	DUMMY	231	Ag_GND	271	NC	311	VSP		
32	VSN	72	DRVL1	112	GND_dr	152	DUMMY	192	DUMMY	232	NULL	272	NC	312	VSP		
33	VSN	73	VLPH	113	GND_dg	153	DUMMY	193	DUMMY	233	Ag_GND	273	VCC	313	VSP		
34	VCOM0	74	VLPH	114	GND	154	DUMMY	194	DUMMY	234	Ag_GND	274	GND	314	GND		
35	VCOM0	75	VDD	115	Ag_GND	155	DUMMY	195	DUMMY	235	GND	275	D3N	315	GND		
36	VCOM0	76	VDD	116	Ag_GND	156	DUMMY	196	DUMMY	236	GND_db	276	D3P	316	GND		
37	VCOM_EN	77	VDD	117	NULL	157	DUMMY	197	DUMMY	237	VGL	277	GND	317	VSN		
38	VCL	78	VCC_EN	118	Ag_GND	158	DUMMY	198	DUMMY	238	VGL	278	D2N	318	VSN		
39	VCL	79	VCC	119	DUMMY	159	DUMMY	199	DUMMY	239	Dummy	279	D2P	319	VSN		
40	VCL	80	GND	120	DUMMY	160	DUMMY	200	DUMMY	240	VGH	280	GND	320	PN_SWAP		

4. ABSOLUTE MAXIMUM RATINGS(极限参数)

Parameter of absolute maximum ratings 参数	Symbol 符号	Min 最小值	Max 最大值	Unit 单位	Remark 备注
Operating temperature 操作温度	Top	-20	70	°C	At 25±5°C
Storage temperature 储存温度	Tst	-30	80	°C	
Humidity 湿度	RH	/	90%(Max60°C)	RH	
Power Voltage 电源电压	VDD	-0.3	3.6	V	
	IOVCC				

5. ELECTRICAL CHARACTERISTICS(模块电气特性)

Parameter of DC characteristics 参数	Symbol 符号	Min 最小值	Typ 典型值	Max 最大值	Unit 单位
Supply voltage for logic 逻辑电压	VDD	2.7	2.8	3.6	V
I/O power supply I/O 口电压	VDDIO	1.65	1.8	3.6	V
Input Current 输入电流	Idd	-	TBD	TBD	mA
Input voltage 'H' level 输入高电平	V _{IH}	0.7*VDDIO	-	VDDIO	V
Input voltage 'L' level 输入低电平	V _{IL}	0	-	0.3*VDDIO	V
Output voltage 'H' level 输出高电平	V _{OH}	0.8*VDDIO	-	VDDIO	V
Output voltage 'L' level 输出低电平	V _{OL}	0	-	0.2*VDDIO	V

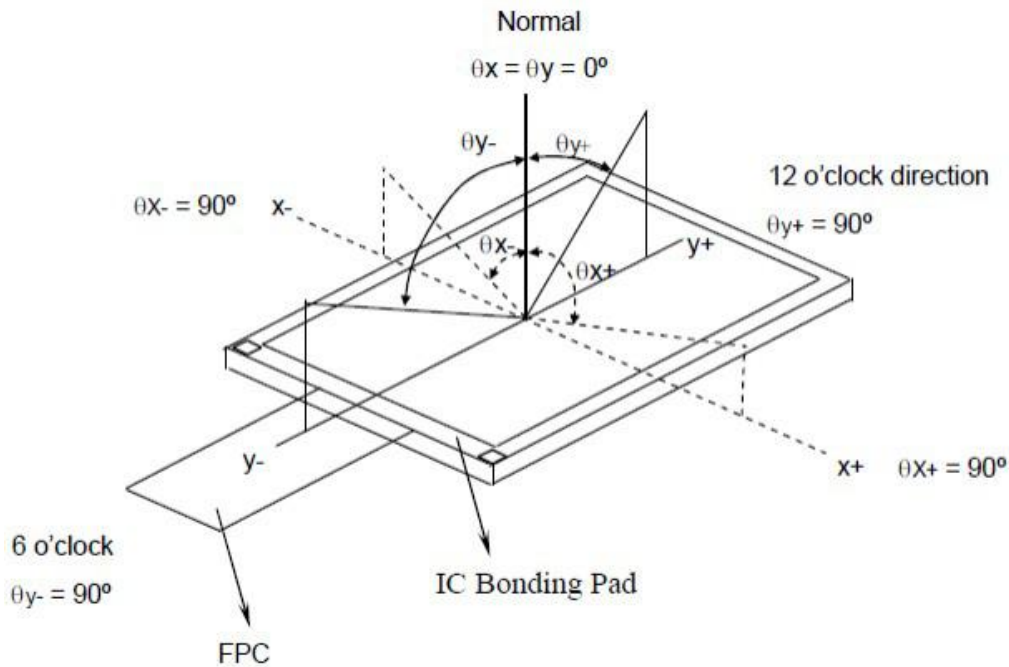
6. BACKLIGHT SPECIFICATION(背光电气特性)

Item of backlight characteristics 项目	Symbol 符号	Min 最小值	Typ 典型值	Max 最大值	Unit 单位	Condition 条件
Forward voltage 正向电压	V _f		21	22.4	V	I _f =380 mA
BL Luminance 背光亮度	L _v	50000		-	cd/m ²	
Backlight uniformity 均匀度	No less than 80% (不低于 80%)					
Number of LED LED 数量	-	21			Piece	
Connection mode 连接模式	S/P/M	7 In series-2parallel 混联			-	

7. ELECTRO-OPTICAL CHARACTERISTICS(光电参数)

Item of electro-optical characteristics 项目		Symbol 符号	Condition 条件	Min 最小值	Typ 典型值	Max 最大值	Unit 单位	Note 备注
LCM Surface Luminance 模组表面亮度		Lv	--	300	400	--	cd/m ²	Note 4
Contrast Ratio 对比度		CR	--	720	900	--	--	Note 2
Response time 响应时间		Tr+Tf	--	20	30	--	msec	Note 3
Transmittance 过率率		trans		--	3.65	--	%	
Color gamut 色域		S (%)		--	70	--	%	
Color chromaticity (CIE 1931) 色彩饱和度	White	WX	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	-0.03	0.303	+0.03		Note 4 Note 5
		WY		-0.03	0.323	+0.03		
	Red	RX		-0.03	0.654	+0.03		
		RY		-0.03	0.319	+0.03		
	Green	GX		-0.03	0.259	+0.03		
		GY		-0.03	0.574	+0.03		
	Blue	BX		-0.03	0.140	+0.03		
		BY		-0.03	0.084	+0.03		
Viewing angle 视角范围	Ver.	TOP/Y+	$CR \geq 10$	--	80	--	deg	Note 1
		BOT/Y-		--	80	--		
	Hor.	Left/X-		--	80	--		
		Right/X+		---	80	--		

Note (1): Definition of Viewing Angle （视角定义）

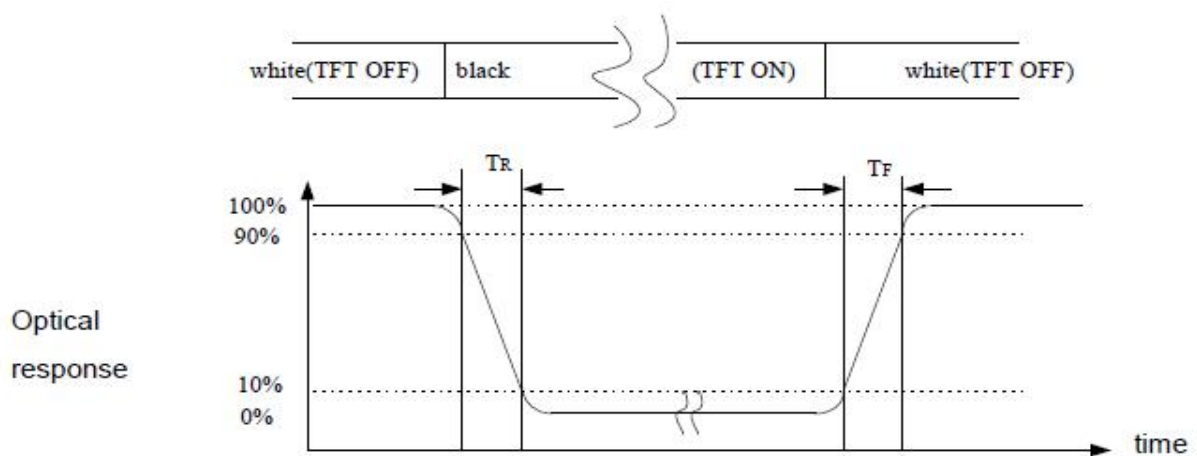


Note (2): Definition of Contrast Ratio(CR) (对比度定义)

Measured point 1 through 5 of panel. (测试 P1 到 P5 的亮度)

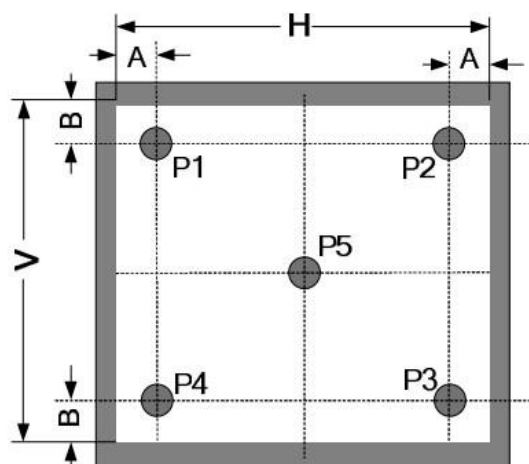
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}} \quad \text{对比度} = \frac{\text{显示白色画面时平均表面亮度}}{\text{显示黑色画面时平均表面亮度}}$$

Note (3): Definition of Response Time:sum of TR and TF (响应时间定义)



Note (4): Measuring method for Contrast ratio, Surface Luminance, Luminance uniformity, CIE(x,y) Chromaticity (对比度, 表面亮度, 均匀度, CIE 坐标测试方法)

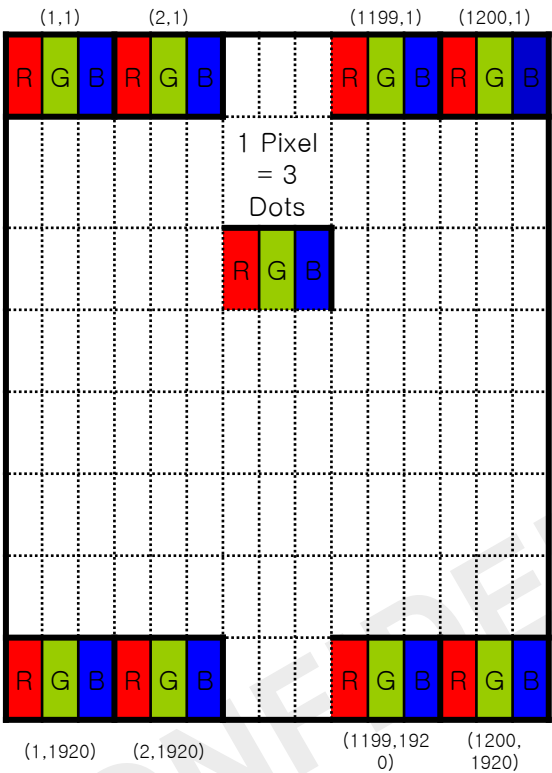
A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size $\varnothing=5\text{mm}$, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-7



Note (5): CIE(x,y) Chromaticity, The X,Y value is determined by screen active area position 5. (CIE 坐标测试测试点为显示屏中心点 P5)

4.2 Data Input Format

<Figure 2. Pixel Format>



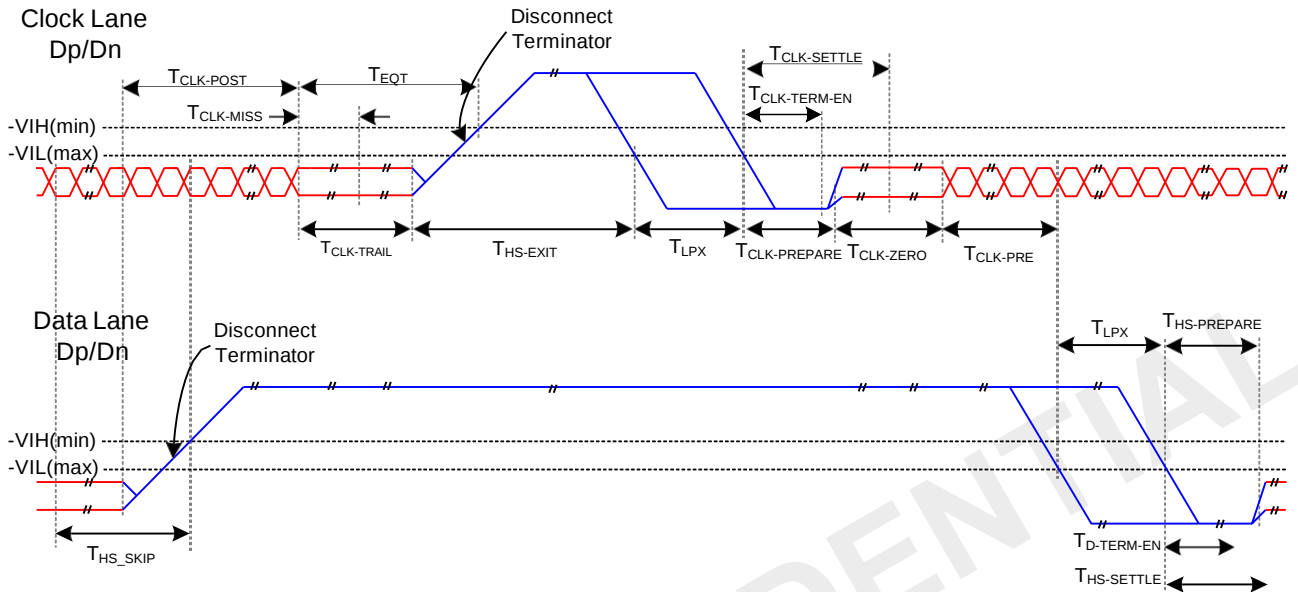
Display Position of Input Data (V-H)

<Figure 3. Scan direction>

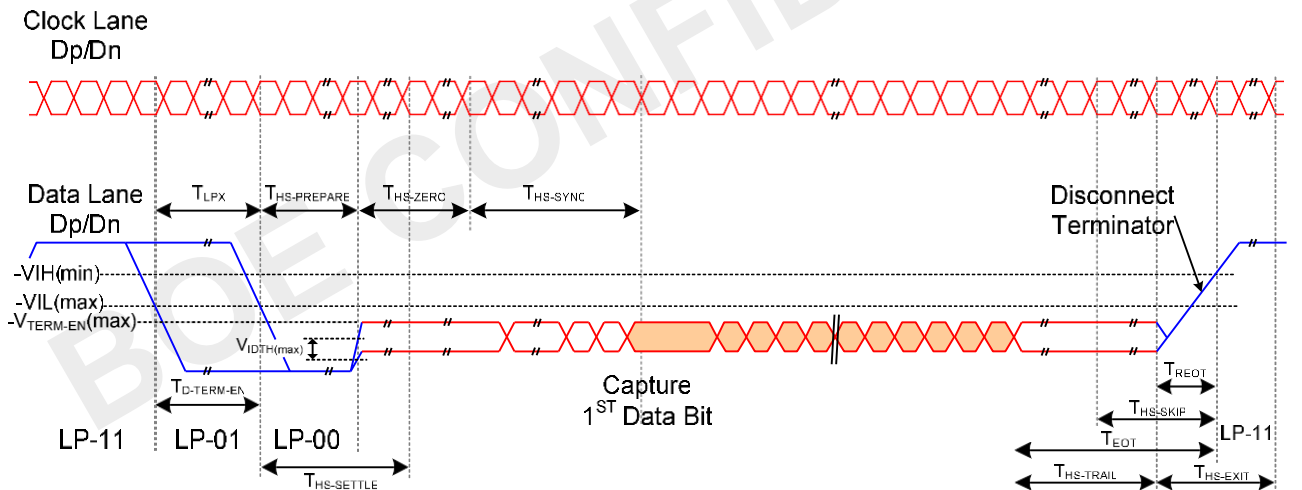


4.3 MIPI Interface Timing

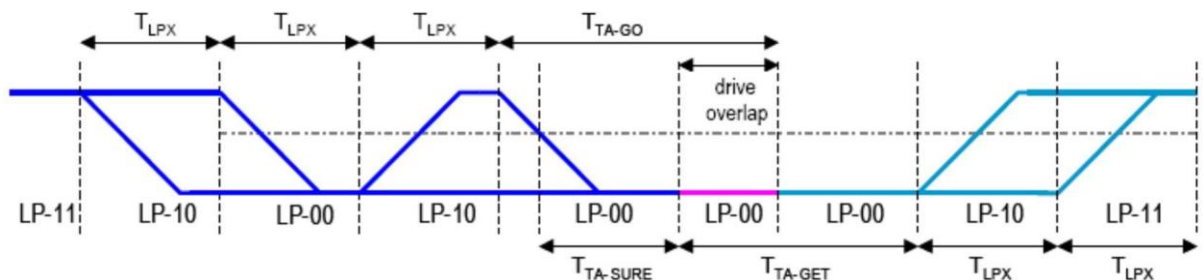
< Figure 4. Timing Chart of Signals in MIPI Interface >



Switching the clock lane between clock transmission and low-power mode



Timing of high-speed data transmission in bursts



Turnaround Procedure

4.3 MIPI Interface Timing

Parameter	Description	Spec.			Unit
		Min.	Typ.	Max.	
T _{REOT}	30%-85% rise time and fall time	-	-	35	ns
T _{CLK-MISS}	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
T _{CLK-POST} *1	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of THS-TRAIL to the beginning of T _{CLK-TRAIL} .	60 ns + 52*UI (For DCS)	-	-	ns
T _{CLK-PRE}	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8	-	-	ns
T _{CLK-SETTLE}	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of T _{CLK-PRE} .	95	-	300	ns
T _{CLK-TERM-EN}	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses V _{IL,MAX} .	Time for Dn to reach V _{TERM-EN}	-	38	ns
T _{HS-SETTLE}	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of T _{HSPREPRE} .	85 ns + 6*UI		145 ns + 10*UI	ns
T _{EOT}	Time from start of T _{HS-TRAIL} or T _{CLK-TRAIL} period to start of LP-11 state	-	-	105ns+48*UI	-
T _{HS-EXIT} (1)	time to drive LP-11 after HS burst	100	-	-	ns
T _{HS-PREPRE}	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6*UI	ns
T _{HS-PREPRE} + T _{HS-ZERO}	T _{HS-PREPRE} + Time to drive HS-0 before the Sync sequence	145ns + 10*UI	-	-	ns
T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns
T _{HS-TRAIL}	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4*UI	-	-	ns
T _{LPX}	Length of any Low-Power state period	50	-	-	ns
Ratio T _{LPX}	Ratio of T _{LPX(MASTER)} /T _{LPS(SLAVE)} between Master and Slave side	2/3	-	3/2	-
T _{TA-GET}	Time to drive LP-00 by new TX	5*T _{LPX}			ns
T _{TA-GO}	Time to drive LP-00 after Turnaround Request	4*T _{LPX}			ns
T _{TA-SURE}	Time-out before new TX side starts driving	T _{LPX}	-	2*T _{LPX}	ns

Note: (1) For image transmission:

T_{CLK-POST} min value =164 when MIPI max frequency per lane = 0.53Gbps.

T_{CLK-POST} min value =112 when MIPI max frequency per lane = 1Gbps

4.3 MIPI Interface PIN map

Pin NO.	Pin name	Description	Pin NO.	Pin name	Description
1	NC	No connection	21	MIPI_3P	MIPI Positive data signal (+)
2	IOVCC	Power supply for system ,IOVCC=1.8V	22	GND	Ground
3	IOVCC		23	NC	No connection
4	GND	Ground	24	NC	No connection
5	RST	Device reset signal	25	GND	Ground
6	NC	No connection	26	NC/TE	Tearing effect output signal for NVM(OTP),Let it open when not in use
7	GND	Ground	27	PWMO	PWM control signal for LED driver
8	MIPI_0N	MIPI Negative data signal (-)	28	NC/BIST	Enables the Test Image Generation function, if not used, connect to ground
9	MIPI_0P	MIPI Positive data signal (+)	29	NC	No connection
10	GND	Ground	30	GND	Ground
11	MIPI_1N	MIPI Negative data signal (-)	31	LED-	LED cathode
12	MIPI_1P	MIPI Positive data signal (+)	32	LED-	
13	GND	Ground	33	NC	No connection
14	MIPI_CKN	MIPI Negative clock signal (-)	34	VSN	Analog supply negative voltage
15	MIPI_CKP	MIPI Positive clock signal (+)	35	VSN	
16	GND	Ground	36	NC	No connection
17	MIPI_2N	MIPI Negative data signal (-)	37	VSP	Analog supply positive voltage
18	MIPI_2P	MIPI Positive data signal (+)	38	VSP	
19	GND	Ground	39	LED+	LED anode
20	MIPI_3N	MIPI Negative data signal (-)	40	LED+	

4.4 Porch setting

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	h _{pw}	10	24	-	Clock
Horizontal Sync. Back Porch	h _{bp}	50	80	-	Clock
Horizontal Sync. Front Porch	h _{fp}	20	60	-	Clock
Vertical Sync. Width	v _s	-	2	-	Line
Vertical Sync. Back Porch	v _{bp}	-	10	-	Line
Vertical Sync. Front Porch	v _{fp}	-	14	-	Line

4.5 Reset Timing:

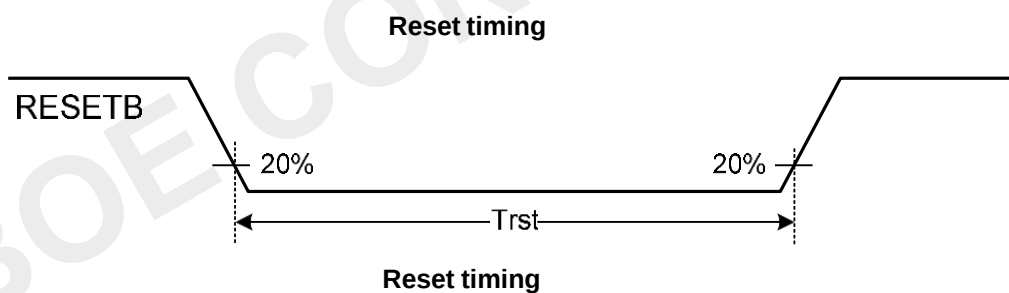
When RESETB of the reset pin equals to Low, it will be in the condition of reset. When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

The closed interval of low can be shown as the following.

(VDD=1.7V~2.0V, VSS=0V, T_{OPR} =-20°C~+85°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	s

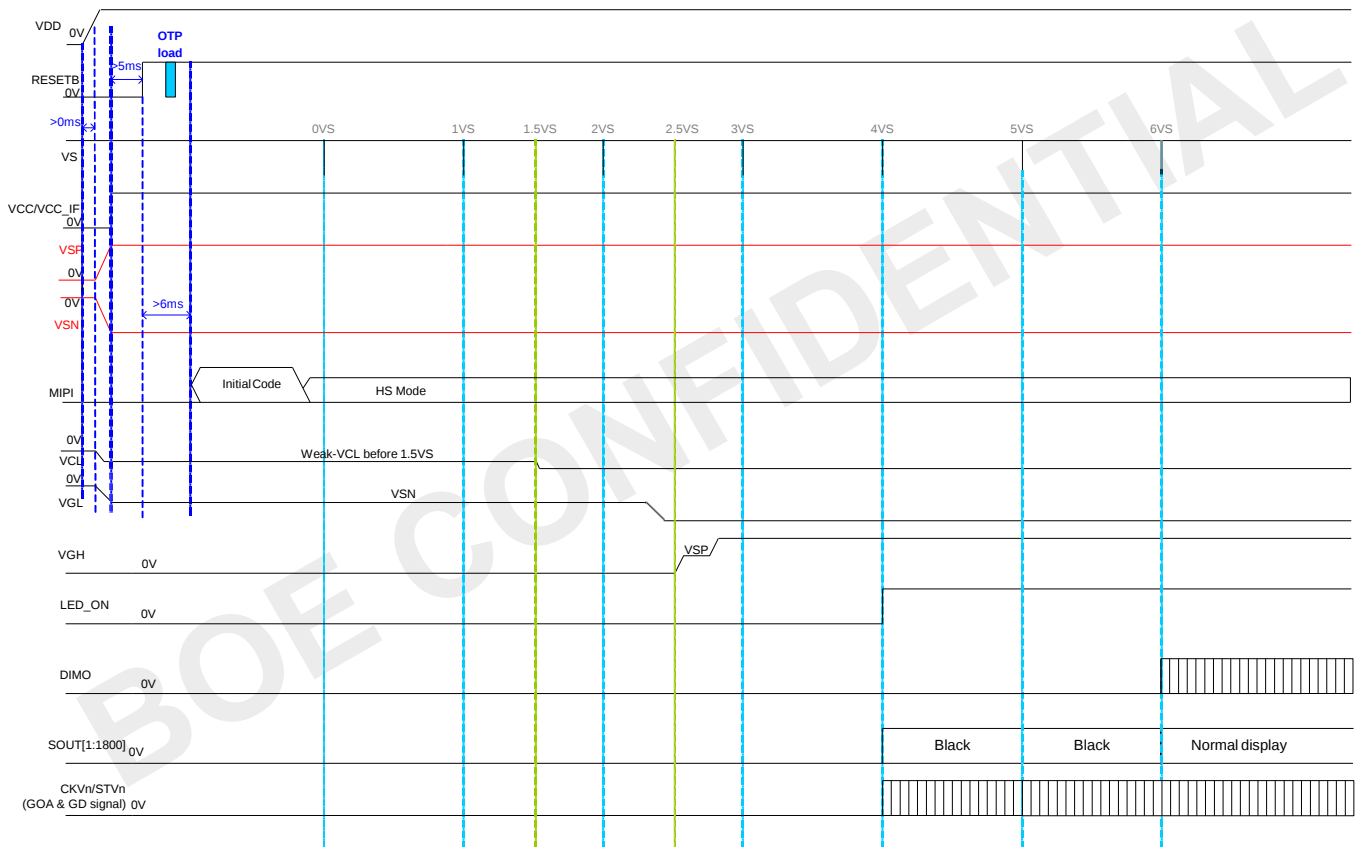


5.0 POWER SEQUENCE

5.1 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD FOG, the power on/off sequence shall be as shown in below

<Figure 5. Power on/off>

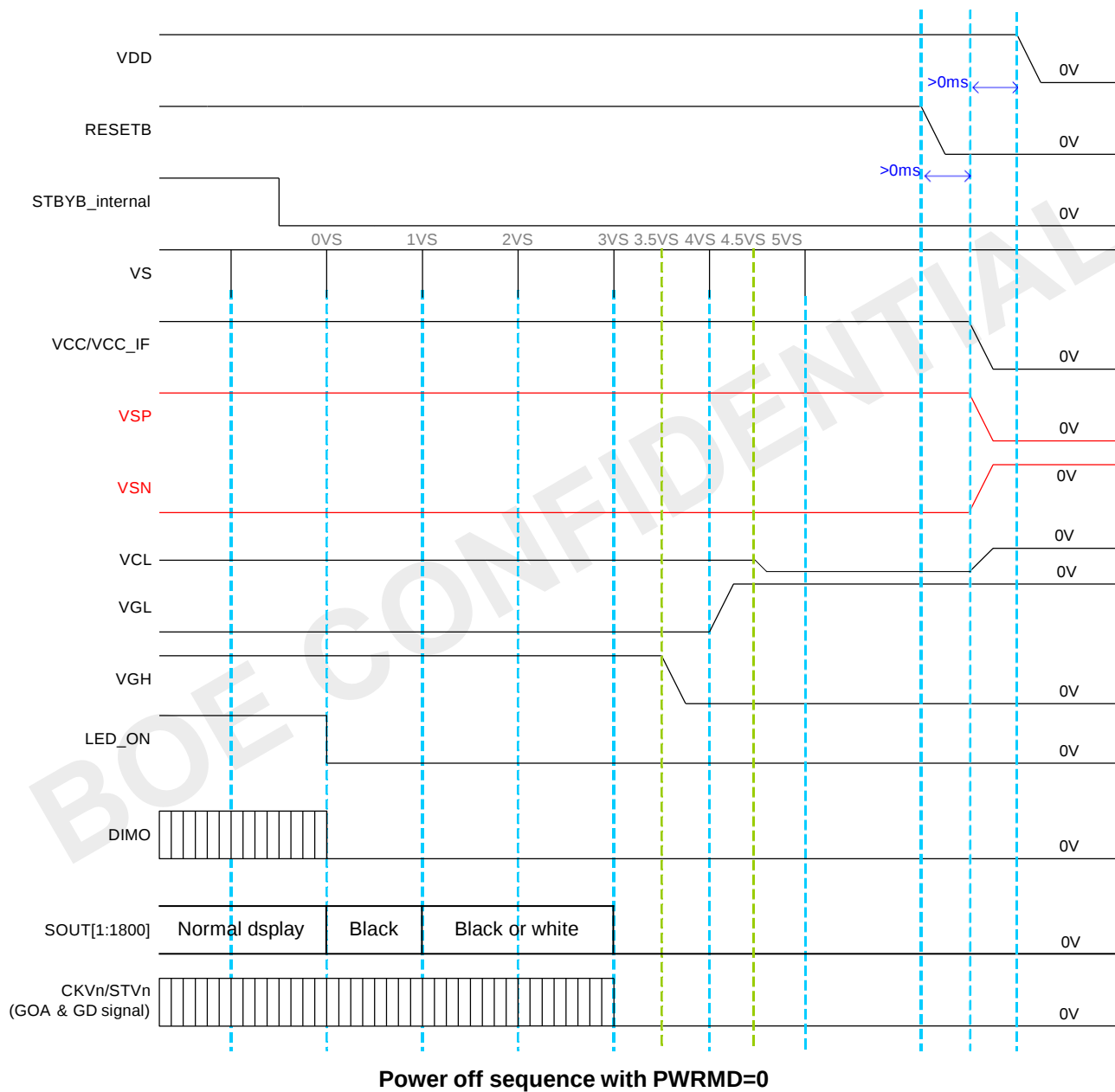


Note: (1) Finish to write the GOA MUX (page1 registers) and GOA timing setting (page3 registers) within 50ms after reset pulls to high.

Power on sequence with PWRMD=0 and repair OP disable

5.0 POWER SEQUENCE

5.1 Power ON/OFF Sequence



The diagram shows the timing of DSI-D0+ (dashed line) and DSI-D0- (solid line) signals. The timeline is divided into three main sections: 'Display Module is Controlling', 'Control Change', and 'MCU is Controlling'.
 - In the 'Display Module is Controlling' section, the signals transition from LP-11 to LP-10, then to LP-00. The time from the start of LP-10 to the start of LP-00 is labeled T_{LPXD} . This sequence repeats.
 - The 'Control Change' section is marked by two black diamonds and contains a long interval labeled T_{TA-GOD} .
 - In the 'MCU is Controlling' section, the signals transition from LP-00 to LP-10, and then to LP-11. The time from the start of LP-10 to the start of LP-11 is labeled T_{LPXM} .
 - A legend at the bottom right indicates: DSI-D0+ (dashed line) and DSI-D0- (solid line).

Table 48 Low Power State Period Timings – A

Signal	Symbol	Description	Min	Max	Unit
DSI-D0+/-	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU → Display Module (ILI9806E)	50	75	ns
DSI-D0+/-	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module (ILI9806E) → MPU	50	75	ns
DSI-D0+/-	$T_{TA-SURED}$	Time-out before the Display Module (ILI9806E) starts driving	T_{LPXD}	$2 \times T_{LPXD}$	ns

Signal	Symbol	Description	Time	Unit
DSI-D0+/-	T _{TA-GETD}	Time to drive LP-00 by Display Module (ILI9806E)	$5 \times T_{LPXD}$	ns
DSI-D0+/-	T _{TA-GOD}	Time to drive LP-00 after turnaround request – MPU	$4 \times T_{LPXD}$	ns

Preparation from Low Power Mode to High Speed Mode

High Speed Data Transmission

DSI-CLK+/-

DSI-Dn+/-

$V_{ILLPX}(Max)$

$V_{TERM-EN}(Max)$

LP-11

LP-01

LP-00

T_{LPX}

$T_{HS-PRP-PAU}$

T_{HS-0}

$T_{HS-SETTLE}$

$T_{HS-TERM-EN}$

Rx Synchronized

Tx Synchronization

Low Power Mode, Disable Rx Line Termination

High Speed Mode, Enable Rx Line Termination

DSI-CLK+/-, DSI-Dn+/-

DSI-CLK-/-, DSI-Dn-/-

$n = 0, 1$

Table 50 Data Lanes – Low Power Mode to High Speed Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-Dn+/-, n=0 and 1	T _{LPX}	Length of any Low Power State Period	50	-	ns
DSI-Dn+/-, n=0 and 1	T _{HC-PREPARE}	Time to drive LP-00 to prepare for HS Transmission	40+4xUI	85+6xUI	ns
DSI-Dn+/-, n=0 and 1	T _{HC-TERM-EN}	Time to enable Data Lane Receiver line termination measured from when Dn crosses V _{IL} MAX	-	35+4xUI	ns

Data Lanes from High Speed Mode to Low Power Mode

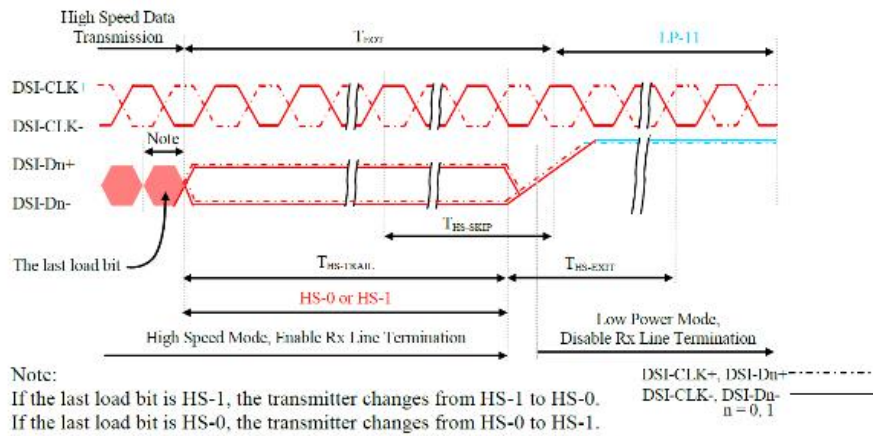


Figure 120 Data Lanes – High Speed Mode to Low Power Mode Timings

Table 51 Data Lanes – High Speed Mode to Low Power Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-Dn+/-, n=0 and 1	$T_{HS-SKIP}$	Time-Out at Display Module (ILI9806E) to ignore transition period of EoT	40	$55+4xUI$	ns
DSI-Dn+/-, n=0 and 1	$T_{HS-EXIT}$	Time to driver LP-11 after HS burst	100	-	ns

DSI Clock Burst – High Speed Mode to/from Low Power Mode

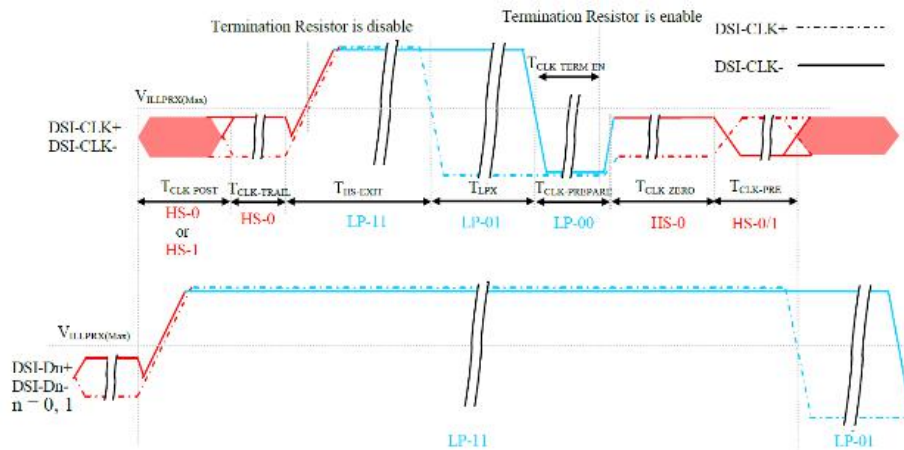


Figure 121 Clock Lanes – High Speed Mode to/from Low Power Mode Timings

Table 52 Clock Lanes – High Speed Mode to/from Low Power Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-CLK+/-	$T_{CLK-POST}$	Time that the MPU shall continue sending HS clock after the last associated Data Lanes has transitioned to LP mode	$60+52xUI$	-	ns
DSI-CLK+/-	$T_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns
DSI-CLK+/-	$T_{HS-EXIT}$	Time to drive LP-11 after HS burst	100	-	ns
DSI-CLK+/-	$T_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	38	95	ns
DSI-CLK+/-	$T_{CLK-TERM-EN}$	Time-out at Clock Lane to enable HS termination	-	38	ns
DSI-CLK+/-	$T_{CLK-PREPARE}$	Minimum lead HS-0 drive period before starting Clock	300	-	ns
DSI-CLK+/-	$T_{CLK-PRE}$	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	$8xUI$	-	ns

8.3 REST Timing Characteristics

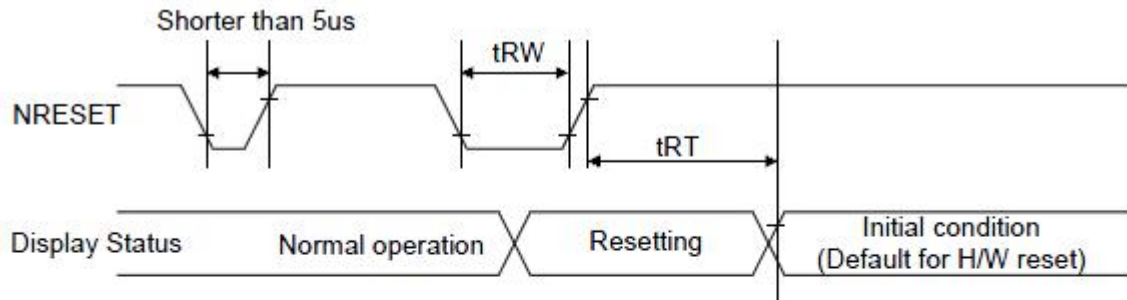


Figure 102 Reset Timing

Table 41 Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		us
	tRT	Reset cancel		5(note 1,5)	ms
				120 (note 1,6,7)	ms

Note:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from OTP to registers. This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the Table 43.

Table 42 Reset Descript

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out mode. The display remains the blank state in Sleep In mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection also applies during a valid reset pulse as shown below:

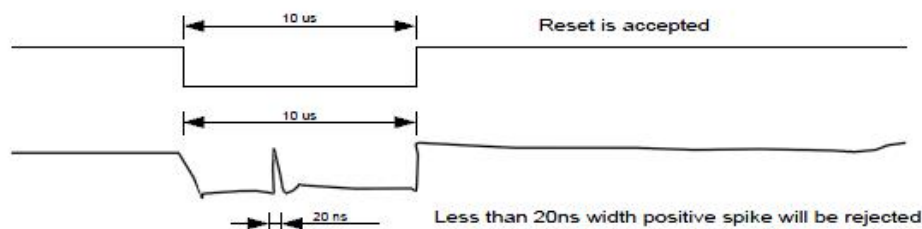


Figure 103 Positive Noise Pulse during Reset Low

5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

9. RELIABILITY TEST CONDITIONS(可靠性实验条件)

N0. 序号	Test Item 实验项目	Test Condition 实验条件	Inspection after test 判定标准
1	High Temperature Storage 高温存放	80±2°C,96 hours	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects. (试验结束后须正常室温存放 2~4 个小时之后才能测试判定, 不允许有以下缺陷)
2	Low Temperature Storage 低温存放	-30±2°C,96 hours	
3	High Temperature Operating 高温操作	70±2°C,96 hours	
4	Low Temperature Operating 低温操作	-20±2°C,96 hours	
5	Damp proof Test Storage 高温高湿存放	60±2°C,90%RH,96 hours	1. Air bubble in the LCD (模块中有气泡); 2. Seal leak (漏液); 3. Non-display (不显示); 4. Missing segments(漏笔); 5. Glass crack (玻璃破碎); 6. Current IDD is twice higher than initial value (电流 Idd 大于初时值的 2 倍); 7. The surface damage (表面损伤); 8. Do not meet the electrical characteristics (不满足模块电气性能);
6	Damp proof Test Operating 高温高湿操作	40±2°C,90%RH,96 hours	
7	Temperature Cycle Storage 冷热循环存放	-20±2°C(30min) ~ 25°C(5min) ~ 80±2°C(30min), 10Cycle.	
8	Vibration Test 振荡试验	Frequency(频率):10HZ-55Hz , Amplitude(振幅):1.5mm , x,y,z every direction for 1 hour (Packing condition) (包装状态, x,y,z 每个方向各 1 小时)	
9	Dropping Test 跌落试验	Drop to the ground from 1M height, one time, every side of carton (Packing condition) (包装状态, 一米高度, 6 面各一次)	
10	ESD Test 静电测试	C:150pf; R:330Ω; Voltage:8KV; Air discharge(空气放电),10 time	

Remark (备注):

- The samples should be applied to only on test item(每个被测试样品只能用于其中的一个测试项目);
- Sample size for each teat item is 5~10 pcs(每个测试项目的样品数量为 5~10 片);
- For Damp Proof Test,Pure water(Resistance>10M Ω)should be used (对于防潮试验, 试验箱的用水必须是电阻大于 10M 欧姆的纯水);
- In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting ,it would be judged as a good part (如果由静电引起产品故障, 当放置一段时间后能够恢复正常, 则不视为产品缺陷);
- Failure Judgment Criterion:Basic Specification ,Electrical Characteristic, mechanical Characteristic, Optical Characteristic (故障判断标准: 基本规格, 电气特性, 机械特性, 光电特性) .

10. INSPECTION CRITERION(检查标准)

1. Sample plan (检验方案)

Sampling plan according to GB/T2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC Z1.4-1993,normal level 2 and based on: 参考国标 GB T2828.1-2003 等, 2 级检验水准。

Major defect (重缺陷): AQL 0.4

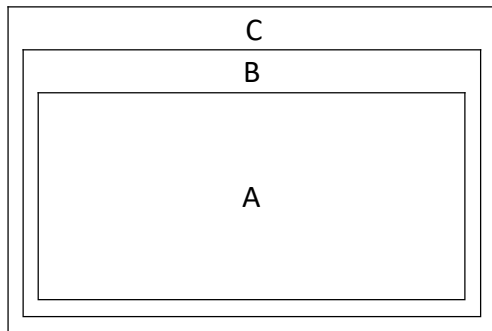
Minor defect (轻缺陷): AQL 1.0

2. Inspection condition (检查条件)

Viewing distance for cosmetic inspection is about 30cm with bare eyes,and under an environment of 20~40W light intensity,all directions for inspecting the sample should be within 45° against perpendicular line.

目视被检产品 30cm, 在 20 至 40W 的日光灯环境下, 检视角为 LCD 平面法线±45° 以内。

3. Definition of inspection zone in LCD (检查范围定义) .



Zone A: character/Digit area 显示区域

Zone B: viewing area except Zone A (Zone A+Zone B=minimum Viewing area)

显示区域外的可视区域 (区域 A+B 等于最小可视区域)

Zone C: outside viewing area(invisible area after assembly in customer's product)

非可视区, 客户装机后不能观察到的区域

Note: As a general rule ,visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

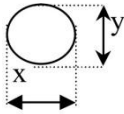
一般情况下, 非可视区的外观缺陷在不影响质量和客户装机时是允许的。

4. Inspection Standard (检查标准)

4.1 Major Defect (重缺陷)

NO. 序号	Items to be inspected 检查项目	Inspection Standard 检查标准	Classification of defects 缺陷级别
4.1.1	All functional defects 全部功能缺陷	1. no display 不显示 2. Display abnormally 显示异常 3. Missing vertical, horizontal segment 缺线 4. Short circuit 短路 5. Back-light no lighting, flickering and abnormal lighting 背光不亮、闪动、异显 6. Touch panel no function 触摸屏无功能	Major defect (重缺陷)
4.1.2	Missing 掉落	Missing component 零件掉落	
4.1.3	Outline dimension 外形尺寸	Overall outline dimension beyond the drawing is not allowed 外形尺寸超过图纸允许范围	

4.2 Cosmetic Defect (外观缺陷)

NO. 序号	Items to be inspected 检查项目	Inspection Standard 检查标准					Classification of defects 缺陷级别
4.2.1	Clear Spots 明显点	For dark/white spot, size Φ is defined as $\Phi=(x+y)/2$. 					Minor defect (轻缺陷)
	Black and white Spot defect pinhole, Foreign Particle, Dirt under polarizer or TP 黑白点, 针孔, 异物点, 偏光片污点, TP 污点	Zone Size(mm)		Acceptable Qty			
				A	B	C	
		$\Phi\leq0.10$		Ignore		Ignore 忽略不计	
		$0.10<\Phi\leq0.15$		2			
		$0.15<\Phi\leq0.2$		1			
		$\Phi>0.2$		0			
4.2.2	Touch panel Newton ring/ Interference lines 触摸屏牛顿环、干涉线	1. Regular 规则 $S\leq5\text{mm}$ 允许 1 个 		When makes the text distortion or linear deformation, are not allowed. 当使文字失真或直线变形时均不允许			Minor defect (轻缺陷)
		2. Irregular 不规则 $S\leq1/6$ TP area 允许 1 个 					
4.2.3	Line defect 线缺陷	Defined: L line length; W line width 					Minor defect (轻缺陷)
	Black line,White line, Foreign material under polarizer 黑白线, 偏光片异物	Size(mm)		Acceptable Qty			
		Width	Length	A	B	C	
		$W\leq0.02$	Ignore	Ignore		Ignore 忽略不计	
		$0.02<W\leq0.03$	$L\leq3.0$	2			
		$0.03<W\leq0.04$	$L\leq2.0$	1			
		$W\geq0.04$	Define as spot defect				

NO. 序号	Items to be inspected 检查项目	Inspection Standard 检查标准	Classification of defects 缺陷级别						
4.2.4	Polarize scratch 偏光片划伤	If the Polarizer scratch can be seen after mobile phone cover assembling or in the operating condition,judge by the line defect of 4.2.3,(片划伤可以在客户组装后或操作状态下按 4. 2. 3 标准进行判定)	Minor defect (轻缺陷)						
		If the Polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following (如片划伤只能在非操作状态下或某个角度可见, 则按以下标准判定)							
		Size(mm)		Acceptable Qty					
		Width		Length	A	B	C		
		W≤0.02		Ignore	Ignore				
		0.02< W≤0.03		2.0<L≤5.0	2				
		0.03< W≤0.05		L≤2.0	1				
W≥0.05		0							
4.2.5	Polarize Air bubble,TP Film bubble 偏光片气泡,TP 菲林气泡 (鱼眼)	Air bubbles between glass & polarizer 玻璃与片之间	Minor defect (轻缺陷)						
		Size(mm)\Zone		Acceptable Qty					
				A	B	C			
		Φ≤0.15		Ignore					
		0.15<Φ≤0.25		2					
		0.25<Φ≤0.30		1					
		Φ>0.30		0					
4.2.6	Glass defect 玻璃缺陷	1. Chips on corner (崩角) <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3</td><td>≤S</td><td>≤T</td></tr></table> Remark: S= contact pad length; T= the thickness of glass	X	Y	Z	≤3	≤S	≤T	Minor defect (轻缺陷)
		X	Y	Z					
		≤3	≤S	≤T					
		2. Usual surface cracks (一般边崩) <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3</td><td><S</td><td>Ignore</td></tr></table> Remark: S= Inner border line of the seal; S= 玻璃内部边缘环氧框	X	Y	Z	≤3	<S	Ignore	Minor defect (轻缺陷)
		X	Y	Z					
≤3	<S	Ignore							
3. Crack (裂纹) Cracks tend to break are not allowed 任何区域向内延伸的裂纹都不允许	Major defect (重缺陷)								

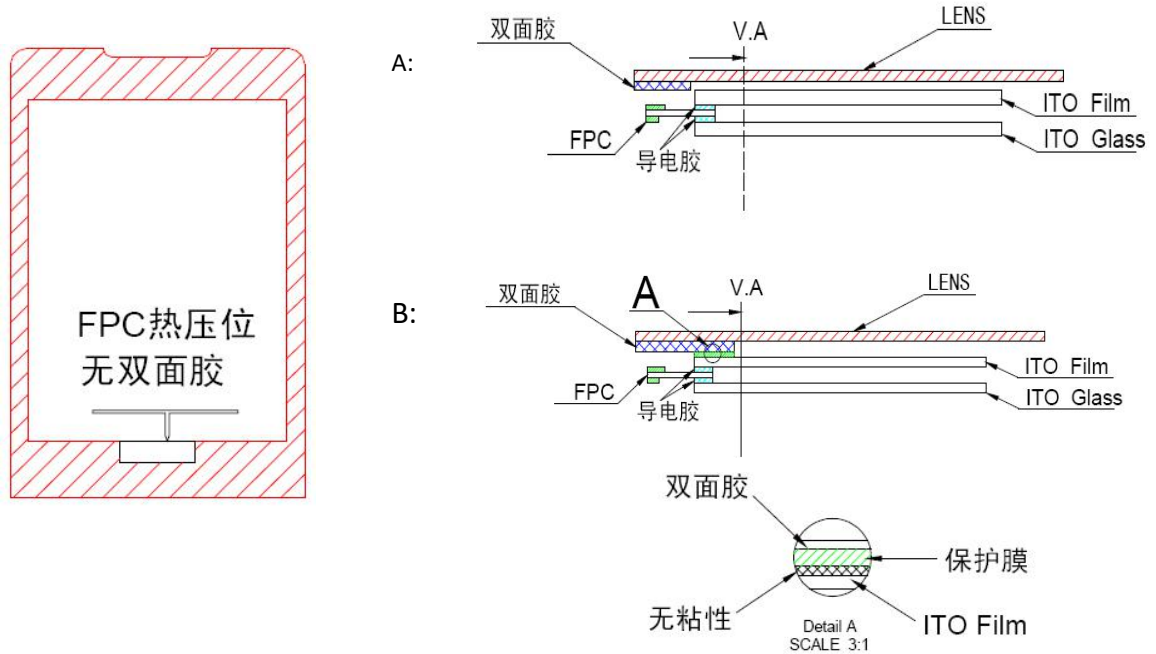
11. PRECAUTIONS FOR USING LCD MODULES(使用注意事项)

11.1 Using LCD Modules 使用

- 11.1.1 As glass is fragile, It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact. (由于玻璃是脆的，使用过程请特别注意边缘区，防止跌落或振动，不能机械碰撞)。
- 11.1.2 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals(some cosmetics are determined to the polarizer) (请勿施加过大的压力于显示屏或连接部位，否则会引起色调变化。不要裸手接触显示屏，这将弄脏显示区和降低端子之间的绝缘能力。一些外观问题是由偏光片决定的)。
- 11.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air. (覆盖液晶显示模块显示平面的偏光片是软性且易被擦伤，请小心轻拿。请勿用任何硬度大于 HB 铅笔芯的物品（玻璃，镊子等）接触、撞压或摩擦裸露偏光片。不要放置或粘附物体在显示区域上以免留下痕迹。冷凝在表面和端子将会损坏或弄脏偏光片。产品在低温下测试之后，与室温空气接触之前必须在容器内升温)
- 11.1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents: Isopropyl alcohol; Ethyl alcohol. Do not scrub hard to avoid damaging the display surface (如果显示平面受污，可对平面吹热气且轻轻地用软性干布擦除。如果受污严重，用含下列一种溶剂的湿布擦除：甘油，酒精。请勿用力擦拭以免损坏显示平面。)
- 11.1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following: Water, Ketone, Aromatic solvents. Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats. (除以上提到的溶剂外，其他溶剂可能会损坏偏光片，特别要避免使用以下溶剂：水，丙酮，芳烃溶剂。立即擦掉唾液或水滴，长时间与水接触会引起变形或褪色。避免接触油和油脂)
- 11.1.7 Do not attempt to disassemble or process the LCD module. (请勿拆卸液晶显示模块)
- 11.1.8 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment. (由于液晶显示模块使用 CMOS 集成，要特别注意静电放电问题。对 CMOS 器件，要特别注意静电。为防止静电损坏，注意保持合宜的工作环境)
- 11.1.9 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable. (开机时，先让逻辑电压，再接通模拟高压，如显示屏驱动电压。关机时，先断开模拟高压，再关逻辑电压。正负电源都稳定后再送控制信号。)

11.1.10 In the use of connector products, the operating process of attention to turn off the power before pull off and insert action. To avoid damage to the module (在使用连接器的产品时，插接过程注意先关闭电源再进行拔插动作，避免损坏模块)

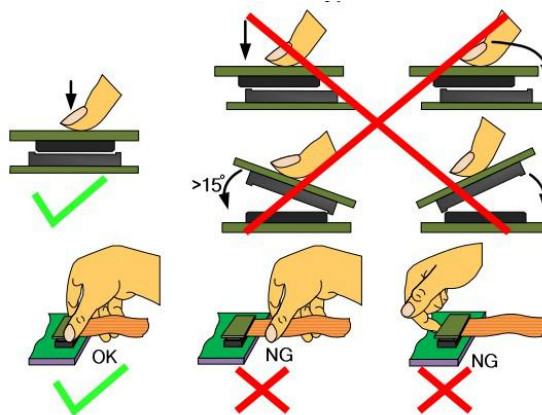
11.1.11 When use LENS ,you must be do the following things (当使用假纯平 TP 结构时，注意须按以下方法处理：LENS 的双面胶避开 RTP 的 FPC 热压位，或在热压位上加贴保护膜，避免 LENS 双面胶拉动 FPC 造成损伤而无触摸)



11.1.12 Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows

(用板对板连接器安装液晶显示模块注意事项： 请注意连接器的公母及连接位置，请勿出现下图所示的连接方式。)



11.2 Storage Modules 储存

11.2.1 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH. (避光保存，避免直接暴露在太阳光或黄光灯下，保持温度在 0~35 摄氏度之间，保持相对湿度在 40%RH 和 60%RH 之间。)

11.2.2 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped). (偏光片表面避免接触其他物质，建议存放在货运防静电包装中)