



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG055FH021

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



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1. GENERAL INFORMATION

1.1 features

- 1) Structure: AMOLED+IC+FPC
- 2) IPS Type LCD 1080 dot-segment and 1920 dot-common outputs
- 3) 16.7M Color can be selected by software
- 4) White LED back light
- 5) MIPI interface
- 6) Operation Temperature : - 40~70°C
- 7) Storage Temperature : - 40~85°C
- 8) CTP cover lens : -/
- 9) CTP structure : -/
- 10) LED life time: -/

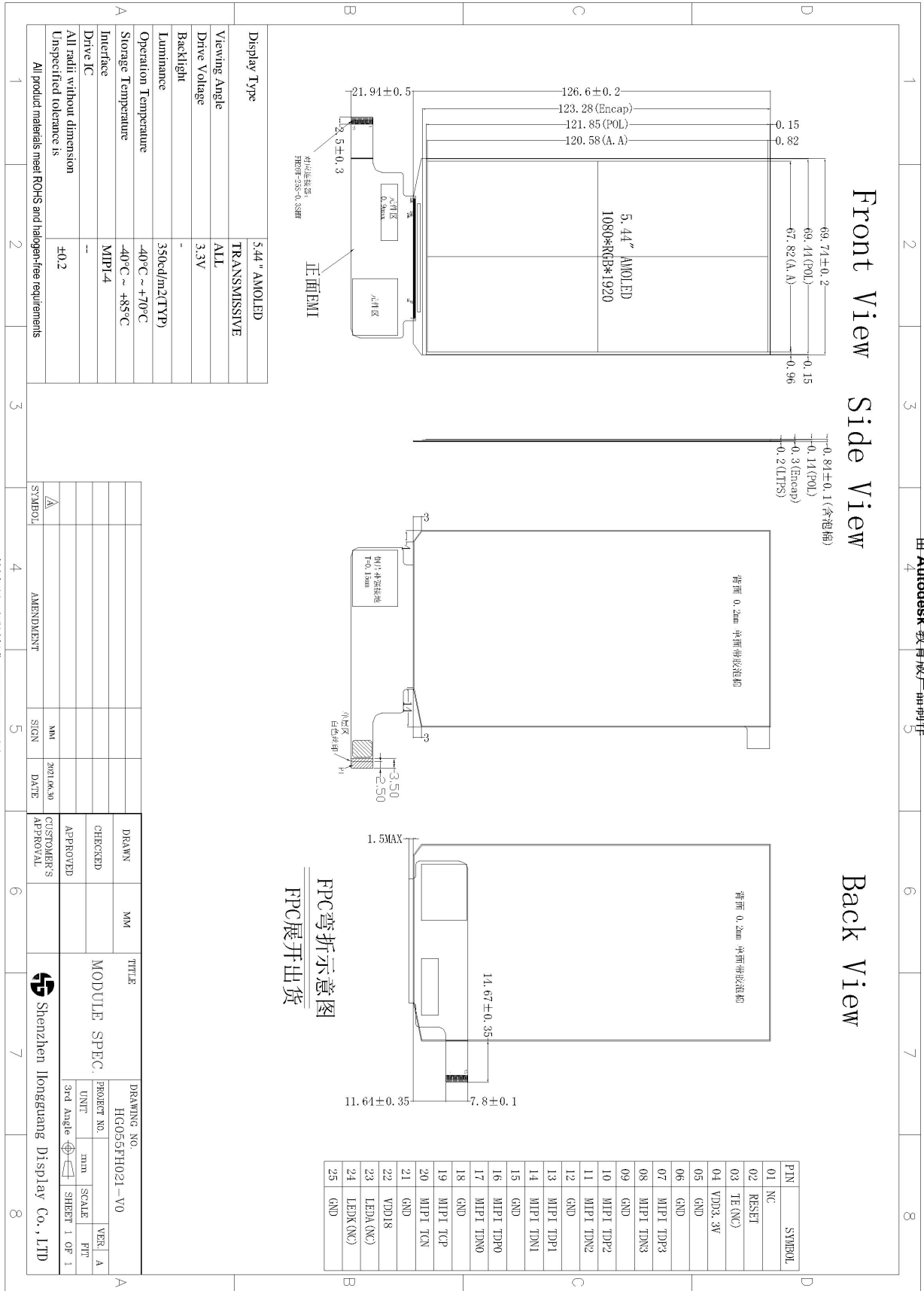
1.2 General specification

Item of	Contents	Unit
Panel Size	5.44	inch
LCD Type	a-si/TRANSMISSIVE	/
Display mode	Normally Black	/
Pixel arrangement	1080*3 (RGB)*1920	Dots
Pixel pitch (W*H)	31.4(H)*62.8 (V)	um
Active Area	67.82 * 120.58	Mm
Module area (W*H*T)	69.74 (H)*126.6(V)*0.84(T)	Mm
Recommended Viewing Direction	ALL	0' clock
IC	SH8801A0	/
Interface	4 lane MIPI	/
Luminance for LCM	350	cd/m2
NTSC	109	%
Weight	TBD	g



2. DIAGRAM FOR LCM

由 Autodesk 教育版产品制作





3. I/O CONNECTION & BLOCK DIAGRAM

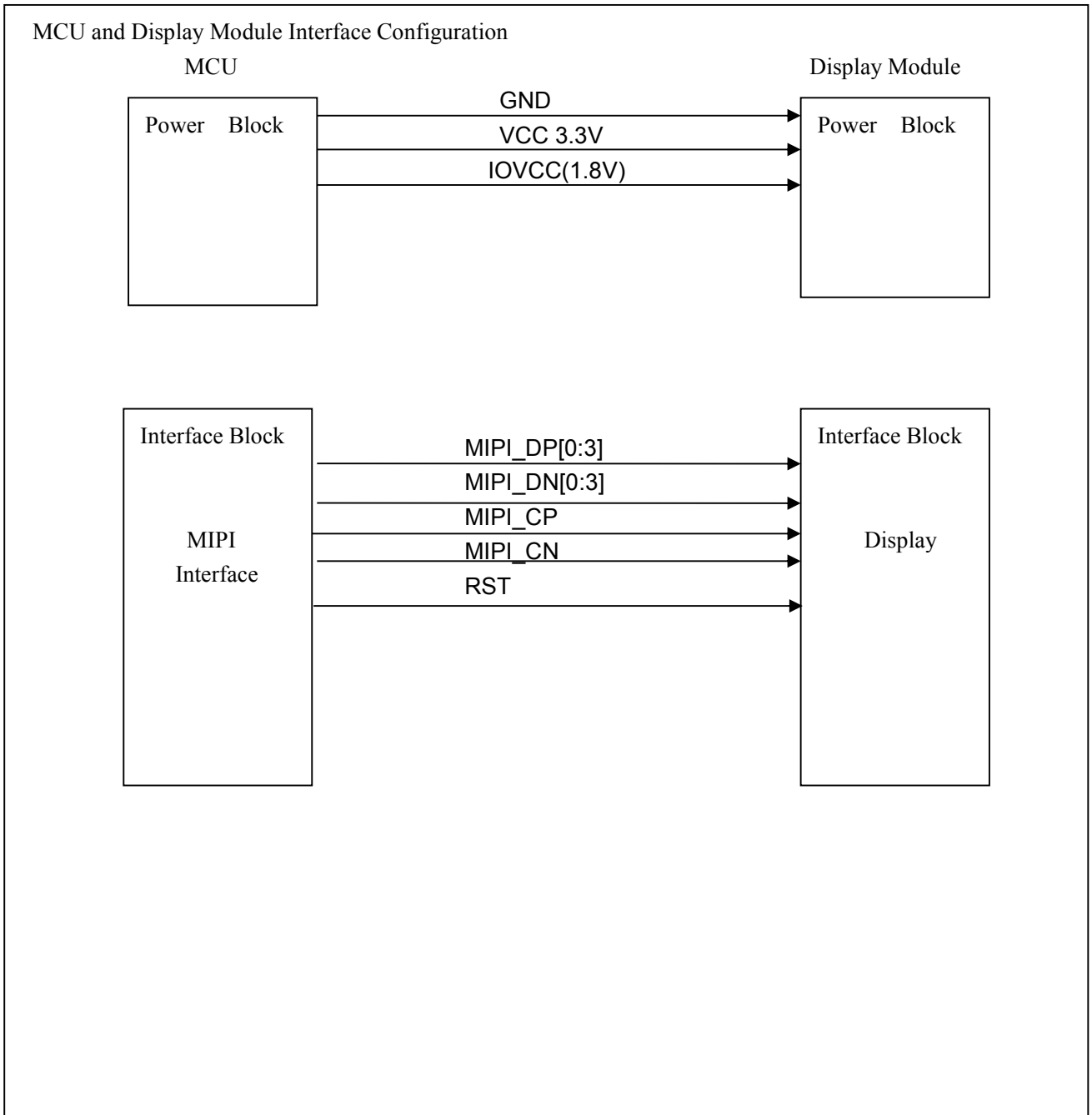
3.1 I/O connection

LCM Pin No.	Symbol	I/O	Description
1	NC	-	NC
2	RESET	I	Chip reset signal
3	TE(NC)	I	Tearing effect output pin
4	VDD 3.3V	P	Power supply for digital circuits and IO pads(3.3V)
5	GND	P	Power Ground
6	GND	P	Power Ground
7	MIPI-DP3	I	DSI-D3+ differential data signals for MIPI interface
8	MIPI-DN3	I	DSI-D3- differential data signals for MIPI interface
9	GND	P	Power Ground
10	MIPI-DP2	I	DSI-D2+ differential data signals for MIPI interface
11	MIPI-DN2	I	DSI-D2- differential data signals for MIPI interface
12	GND	P	Power Ground
13	MIPI-DP1	I	DSI-D1+ differential data signals for MIPI interface
14	MIPI-DN1	I	DSI-D1- differential data signals for MIPI interface
15	GND	P	Power Ground
16	MIPI-DP0	I	DSI-D0+ differential data signals for MIPI interface
17	MIPI-DN0	I	DSI-D0- differential data signals for MIPI interface
18	GND	P	Power Ground
19	MIPI_CP	I	DSI-CLK+ differential clock signals for MIPI interface
20	MIPI_CN	I	DSI-CLK- differential clock signals for MIPI interface
21	GND	P	Power Ground
22	IOVCC 1.8V	P	Power supply for digital circuits and IO pads(1.8V)
23	NC	-	NC
24	NC	-	NC
25	GND	P	Power Ground

I: Input; O: Output; P: Power



3.2 block diagram





4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Supply Voltage for I/O Block	VDDI-VSS	-0.3 to +3.6	V
Supply Voltage for Power Circuit	VCI-VSS	-0.3 to +4.0	V
Supply Voltage for Power/Source Circuit	AVDD-VSS	-0.3 to +8.4	V
AMOLED Supply Voltage Range	VSS-VINT	-0.3 to +6.6	V
	VREFP-VSS	-0.3 to +6.6	V
	VLOUT2-VSS	-0.3 to +15.0	V
	VSS-VLOUT3	-0.3 to +15.0	V
	VGH-VSS	-0.3 to +11	V
	VSS-VGL	-0.3 to +11	V
	UELVD - VSS	-0.3 to +5.5	V
	VSS- UELVSS	-0.3 to +4.4	V
	VLOUT2-VLOUT3	-0.3 to +26	V
Supply Voltage for OTP	VOTP-VSS	-0.3 to +6.2	V
Input Voltage Range	V _{in}	-0.3 to VDDI + 0.3	V
Storage Temperature	T _{stg}	-55 to +125	°C



5. ELECTRICAL CHARACTERISTICS

5.1 Typical Operation Conditions

Parameter	Symbol	Condition	Specification			Application Pin	Unit	Note
			Min.	Typ.	Max.			
Power supply voltage	VDDI		1.65	1.8	1.98	VDDI	V	
	VCI		2.7	2.8	3.6	VCI		
	AVDD	-	-	-	7.9	AVDD		
	VOTP			6.0		VOTP		

NOTE: TA = -40 to 85 °C

5.2 DC CHARACTERISTICS

DC Characteristic for Interface Signals

Parameter	Symbol	Condition	Specification			Pin	Unit
			Min.	Typ.	Max.		
Logic high level input voltage	VIH_IO1	-	$0.8 \times VDDI$	-	VDDI	RESX	V
Logic low level input voltage	VIL_IO1	-	0.0	-	$0.2 \times VDDI$		
Logic high level output voltage	VOH_IO1	IOUT = -1 mA	$0.8 \times VDDI$	-	VDDI	TE	
Logic low level output voltage	VOL_IO1	IOUT = +1 mA	0.0	-	$0.2 \times VDDI$		
Input high level leakage current	I _{IH}	VIN = VDDI	-	-	1	RESX	μA
Input low level leakage current	I _{IL}	VIN = VSS	-1	-	-		

NOTE: TA = -40 to 85 °C

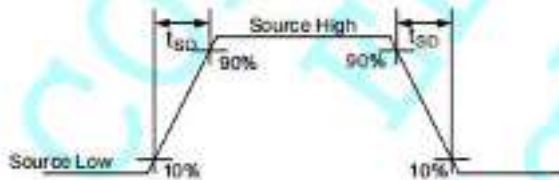


DC Characteristics for Internal Circuits

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Operating frequency	$F_{oscTA25}$	$T_A = 25\text{ }^\circ\text{C}$	TBD	110	TBD	MHz	
Voltage efficiency of Step-up output	VLOUT2	$I_{VLOUT2} = -3\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	90	-	-	%	
	VLOUT3	$I_{VLOUT3} = +3\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	90	-	-		
	AVEE	$I_{AVEE} = +10.0\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	90	-	-		
Panel driving voltage	VGH	$I_{VGH} = -3\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	Target - 0.1	Target	-	V	
	VGL	$I_{VGL} = +3\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	Target - 0.1	Target	-		
	VINT	$I_{VINT} = +1\text{mA}$, $T_A = 25\text{ }^\circ\text{C}$	Target - 0.1	Target	-		
Output on resistance of Gate driver	R_{onVgh}	$VGH = 6.6\text{ V}$	-	-	2	k Ω	
	R_{onVgl}	$VGL = -8.0\text{ V}$	-	-	2		
Delay, Source driver	t_{sd}	$AVDD = \text{TBD}$ $VREGOUT = \text{TBD}$ $VGS = \text{TBD}$ $SR_SET = 5'b10100$	-	-	T.B.D	μs	(1)
Source output voltage deviation; mean value (channel to channel)	ΔV_{in}	$VSS + 1.0\text{V} < V_{so} < AVDD - 1.0\text{ V}$	-	-	± 5	mV	(2)

NOTE: $T_A = -40$ to $85\text{ }^\circ\text{C}$ Unless Otherwise Specified

1. Measurement condition (Delay Measurement of Source Driver), EDS load (0.1k, 100pF)



2. $SR_SET=5'b10100$, Offset cancellation condition=ON



DC Characteristics for Reset

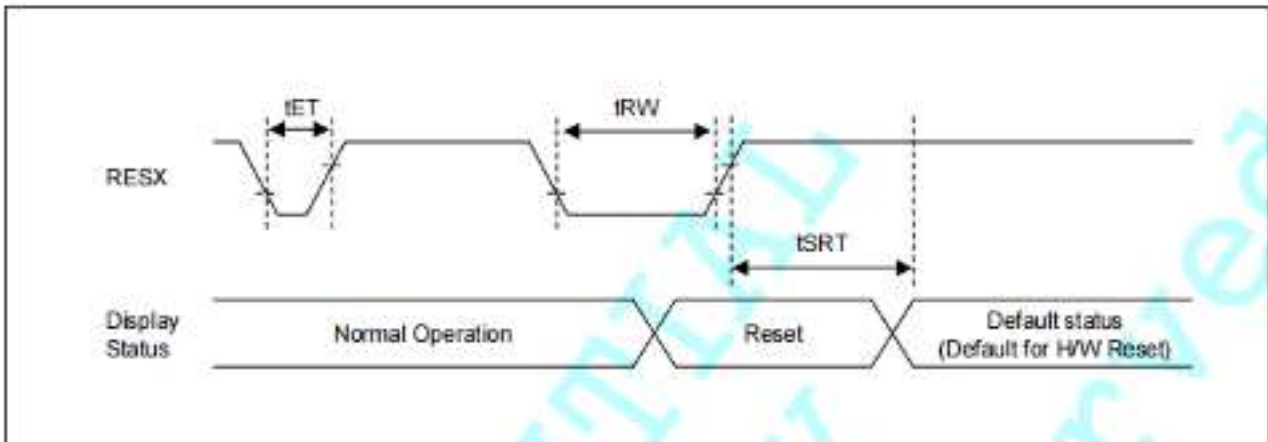


Figure 1 Reset Input Timing

Table 11 Reset Input Timing

Parameter	Symbol	Pad	Min.	Typ.	Max.	Unit	Note
Reset low pulse width	tRW	RESX	10	–	–	μs	–
Secure reset completion time	tSRT	RESX	–	–	5	ms	Reset during Sleep In mode
		RESX	–	–	150		Reset during Sleep Out mode
Reset un-reacted pulse width	tET	RESX			5	μs	–

NOTE:

1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

Table 12 RESX Pulse

RESX Pulse	Action
Shorter than 5 μs	Reset rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset start

2. During the reset period, the display will be blanked (The display is entering blanking sequence, for which the maximum time is 150ms, when Reset starts in Sleep Out-mode. The display remains in the blank state in Sleep In-mode) and then return to Default condition for HW reset.
3. During Reset Completion Time, ID bytes (or similar) value in OTP will be latched to the internal register during this period. This loading is done every time when there is HW reset complete time (tSRT) within 5ms after a rising edge of RESX.



5.3 High Speed Clock and Data Timing

Below Figure shows the sequence of the high speed data transmission.

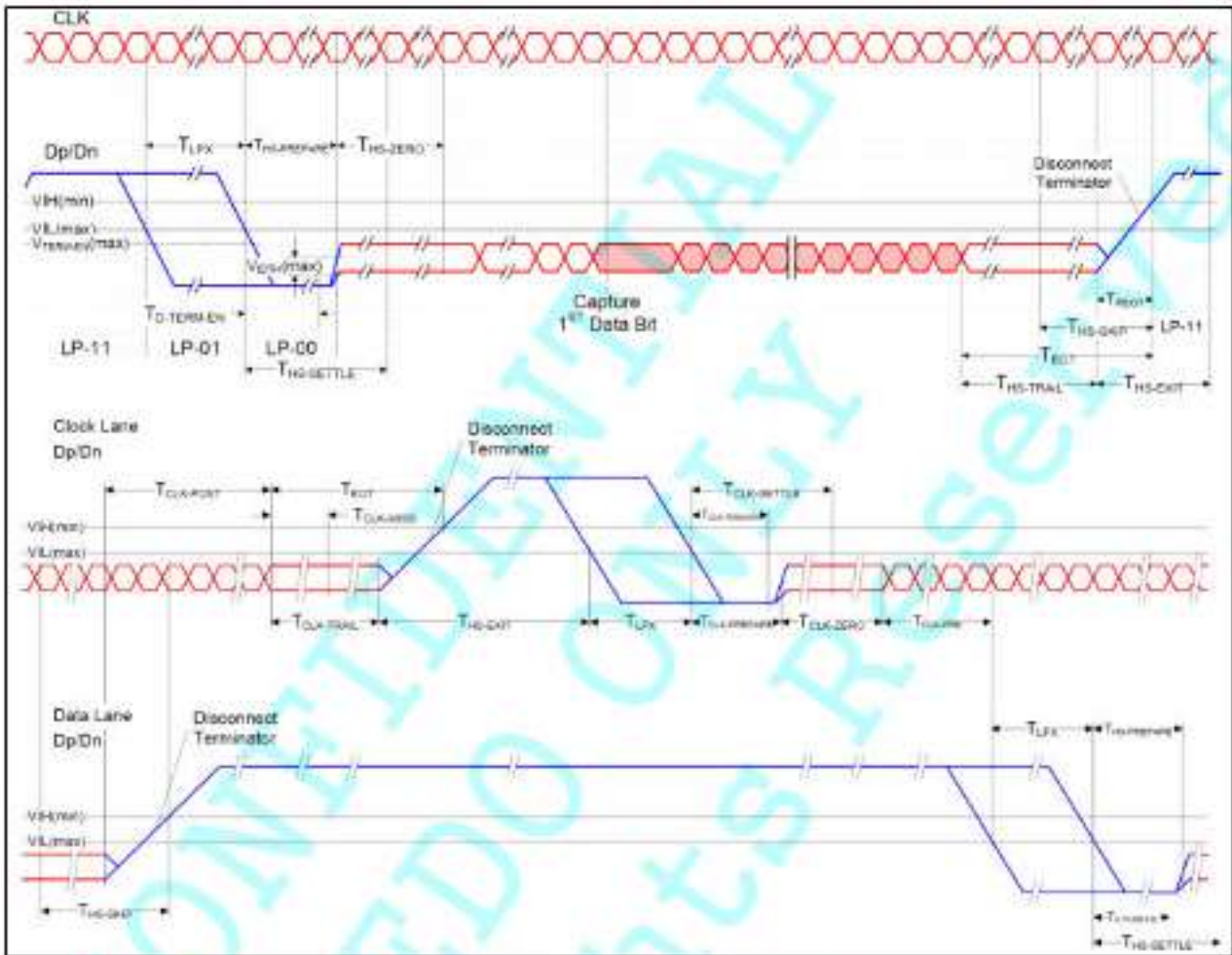


Figure 9 High Speed Clock and Data timing

The values in the following table require a clock tolerance no worse than $\pm 10\%$ for implementation.

5.4 MIPI Receiver Initialization

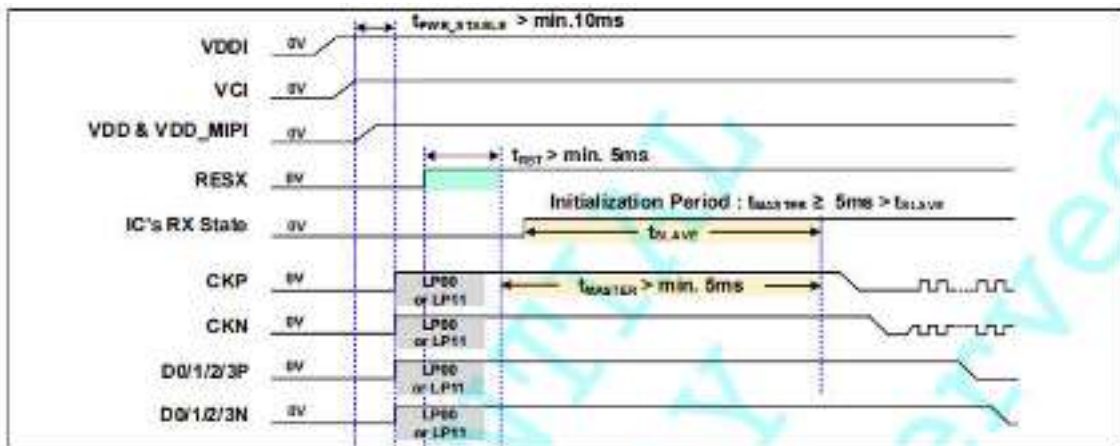


Figure 10 MIPI lanes Status when Reset Operation & Initialization Time



5.5 Power On/Off Sequence

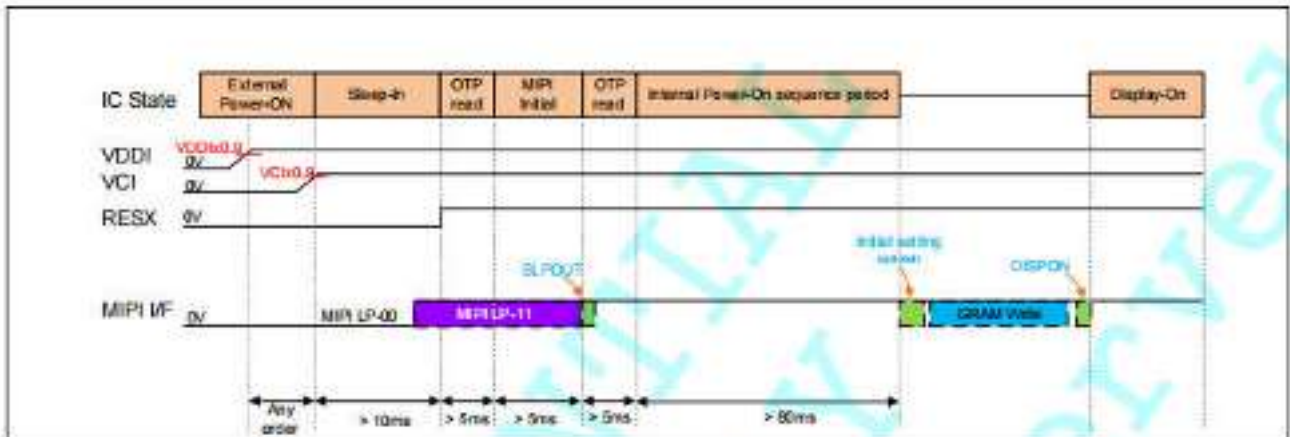


Figure 16 Power-On Sequence

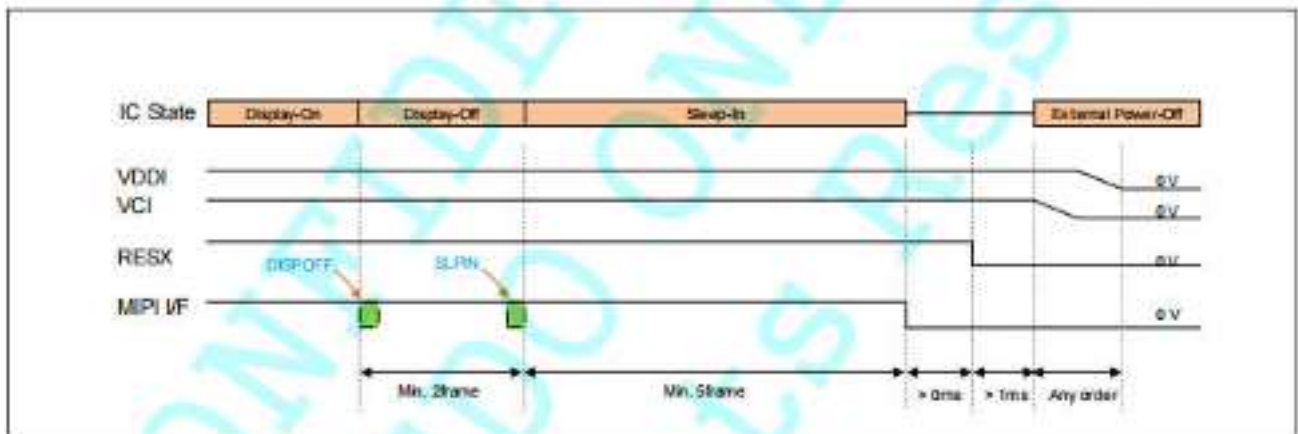


Figure 17 Power-Off Sequence

5.6 Power Ramp Up/Down

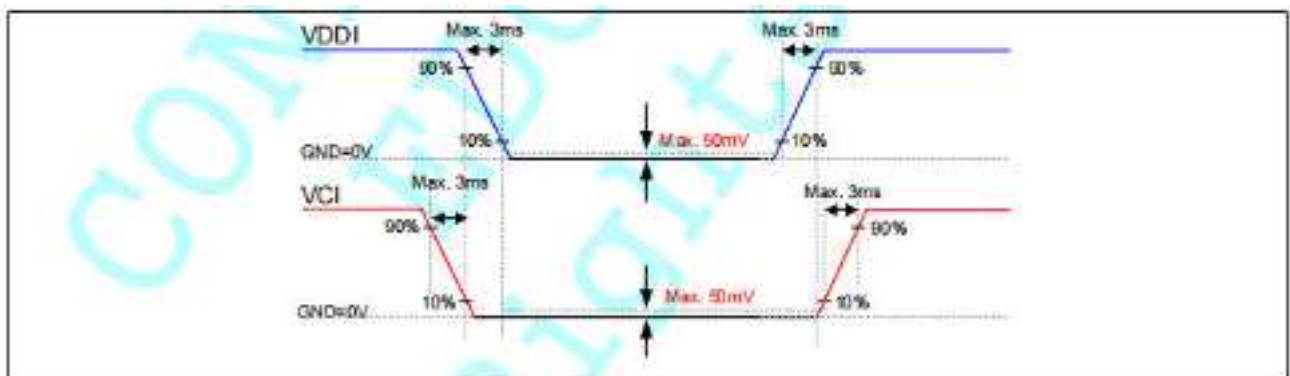


Figure 19 Power Ramp Up/Down



6. ELECTRO-OPTICAL CHARACTERISTICS

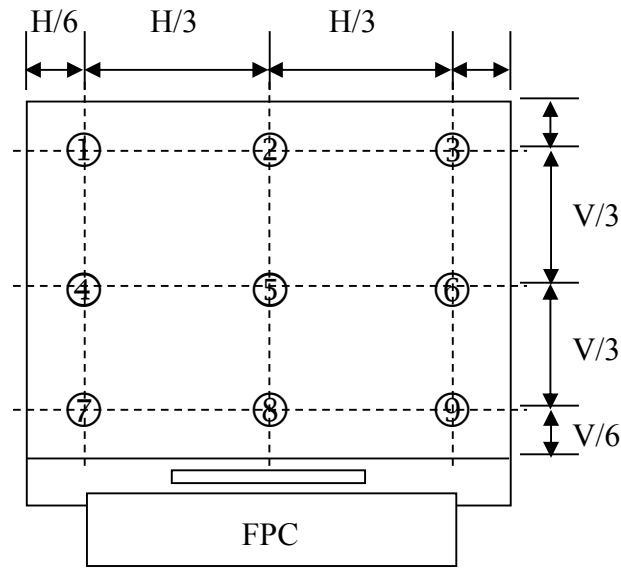
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center point)		C/R	-	60000	-	-	-	Note(1)
Luminance uniformity		U _w	θ = 0. Normal viewing angle B/L On Note(1)	75	-	-	%	Note(2)
Response Time				-	-	2	ms	Note(3)
Color Chromaticity (CIE 1931)	White	W _x			0.295			参考 值
		W _y		0.305				
	Red	R _x		0.69				
		R _y		0.31				
	Green	G _x	-0.02	0.235	+0.02			
		G _y		0.72				
	Blue	B _x		0.143				
		B _y		0.044				
Viewing Angle	Hor.	∅ 3R	C/R≥10	80	-	-	Deg	Note(4)
		∅ 9L		80	-	-		
	Ver.	∅ 12U		80	-	-		
		∅ 6D		80	-	-		



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.



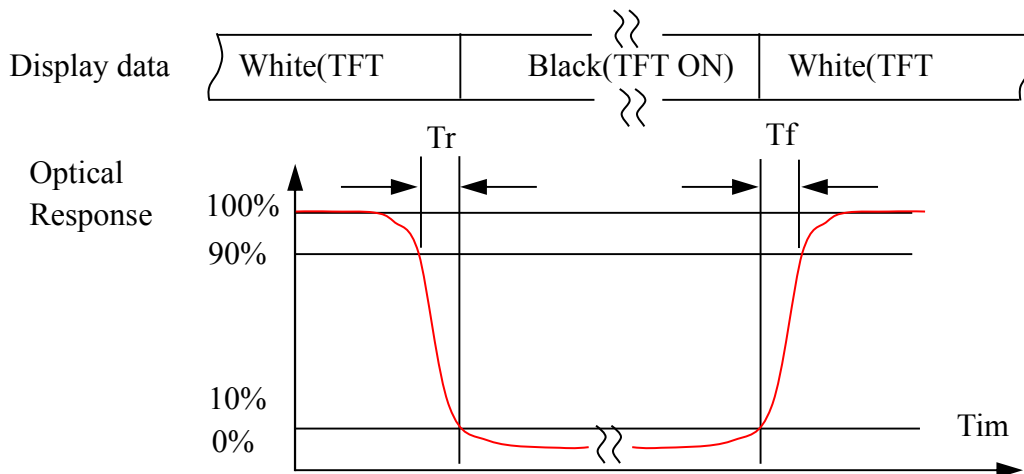
The spot locations for luminance measurement

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

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

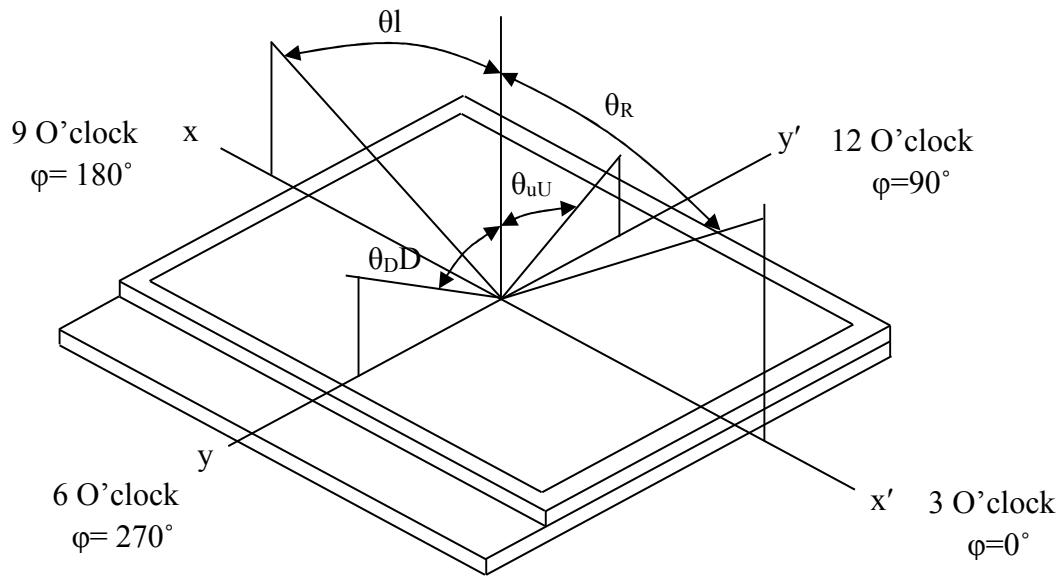
B_{\min} : The measured minimum luminance of all measurement position.

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	+85°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	-40°C / 96Hours	
3	High Temperature Operating	+70°C / 96Hours	
4	Low Temperature Operating	-40°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	
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z	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.
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/pa nel,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

