



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG101WX026T01

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	2020.11.28	FIRST ISSUE	



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1. GENERAL INFORMATION

1.1 features

- 1) Structure: TFT PANNEL+IC+FPC+BL
- 2) IPS Type LCD 1280 dot-segment and 800 dot-common outputs
- 3) 252K Color can be selected by software
- 4) White LED back light
- 5) LVDS interface
- 6) Operation Temperature : -20~60°C
- 7) Storage Temperature : -30~70°C
- 8) CTP cover lens : Asahi
- 9) CTP structure : G+G
- 10) LED life time: -/

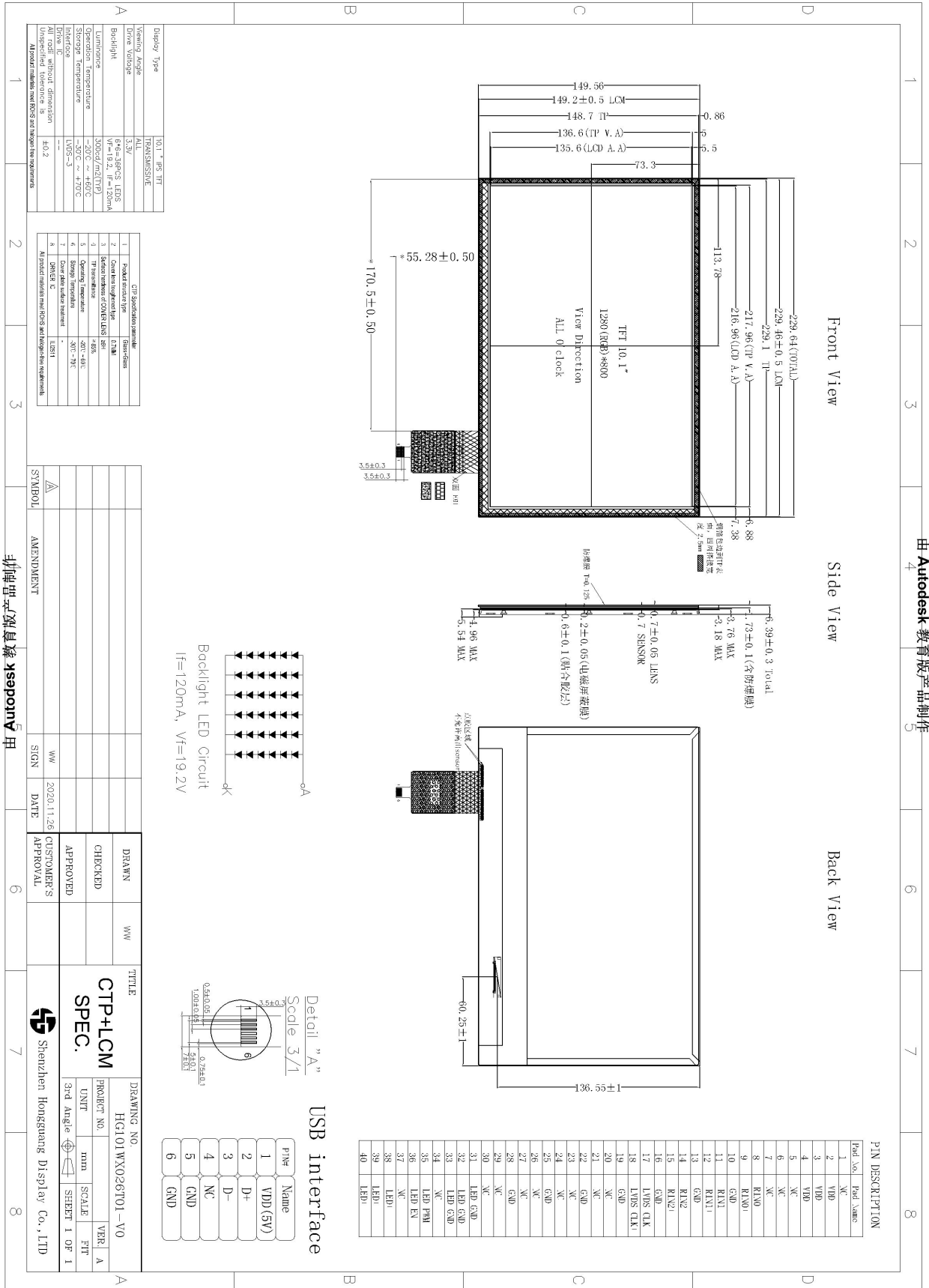
1.2 General specification

Item of	Contents	Unit
Panel Size	10.1	inch
LCD Type	a-si/TRANSMISSIVE	/
Display mode	Normally Black	/
Pixel arrangement	1280*3 (RGB) *800	Dots
Pixel pitch (W*H)	0.0565 (H) × RGB × 0.1695 (V)	um
Active Area	216.96 (H) *135.6 (V)	Mm
Module area (W*H*T)	229.64 (H) *149.56 (V) *6.39 (T)	Mm
Recommended Viewing Direction	ALL	0' clock
Interface	LVDS 6bit	/
Luminance for LCM+TP	270	cd/m ²
NTSC	45	%
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

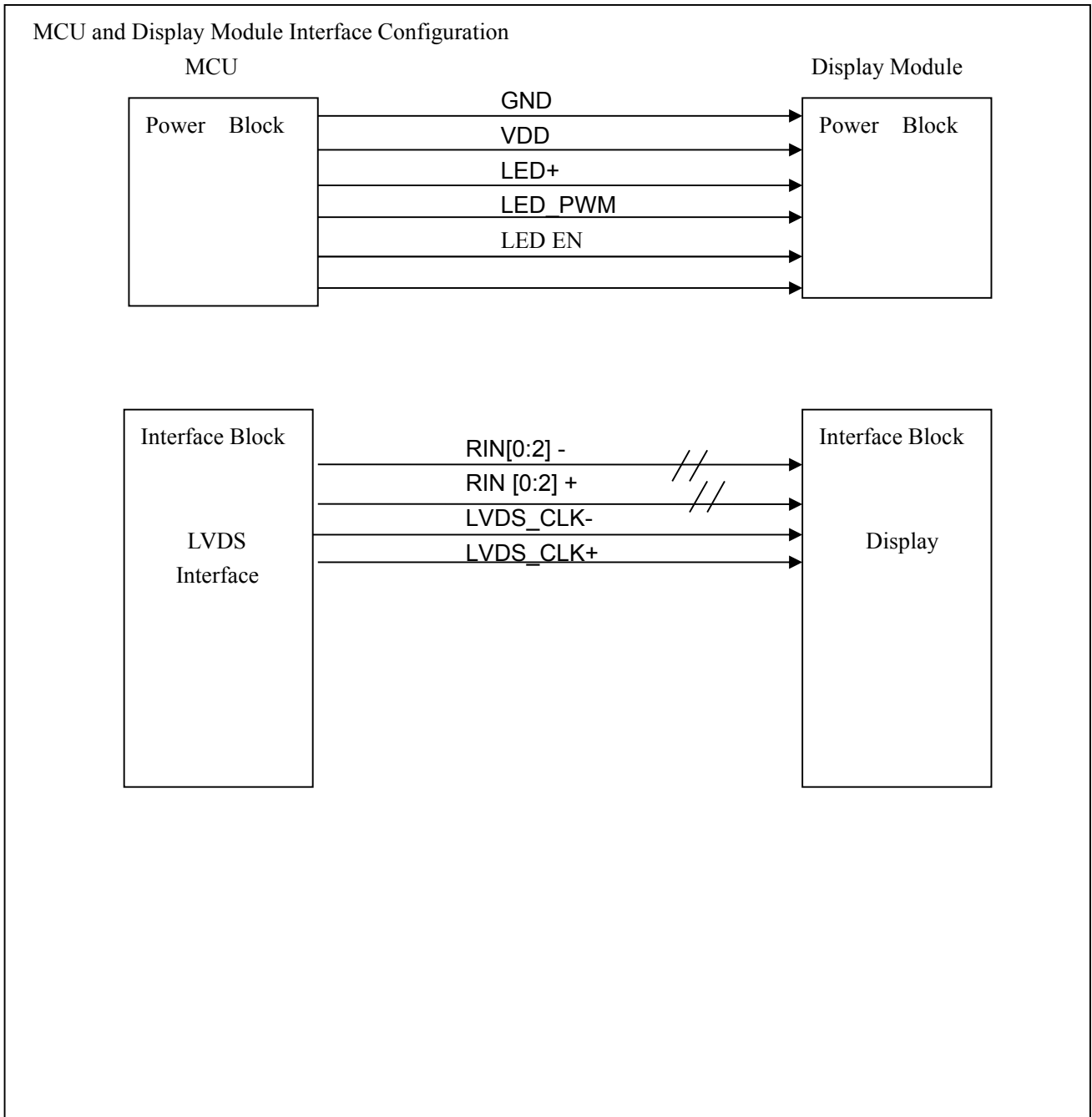
3.1 I/O connection

LCM Pin NO.	Symbol	I/O	Description
1	NC	-	Dummy
2-4	VDD	P	Power supply for digital circuits and IO pads(3.3V)
5-7	NC	-	Dummy
8	RIN0-	P	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+	P	LVDS Negative data signal (+)
13	GND	I	Power Ground
14	RIN2-	I	LVDS Negative data signal (-)
15	RIN2+	P	LVDS Negative data signal (+)
16	GND	I	Power Ground
17	LVDS_CLK-	I	LVDS Negative data signal (-)
18	LVDS_CLK+	P	LVDS Negative data signal (+)
19	GND	I	Power Ground
20	NC	-	Dummy
21	NC	-	Dummy
22	GND	I	Power Ground
23	NC	-	Dummy
24	NC	-	Dummy
25	GND	P	Power Ground
26	NC	-	Dummy
27	NC	-	Dummy
28	GND	P	Power Ground
29	NC	-	Dummy
30	NC	-	Dummy
31-33	GND	P	Power Ground
34	NC	-	Dummy
35	LED_PWM	I	LED PWM signal pin
36	LED_EN	I	LED enable input level
37	NC	-	Dummy
38-40	LED+	P	LED Anode

I: Input; O: Output; P: Power



3.2 block diagram





4. ABSOLUTE MAXIMUM RATINGS

(GND=AGND=0V)

Parameter of absolute maximum ratings 参数	Symbol 符号	Min 最小值	Max 最大值	Unit 单位
Power supply voltage1	VDD	VSS-0.3	4.0	V
Operating temperature	T _{op}	-20	60	°C
Storage temperature	T _{st}	-30	70	°C
Humidity	RH	-	90%(Max)/50°C	RH

Note:

1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40°C and temperature refers to the LCM surface temperature ;
2. BOE is not responsible for product problems beyond the use conditions.

5. ELECTRICAL CHARACTERISTICS

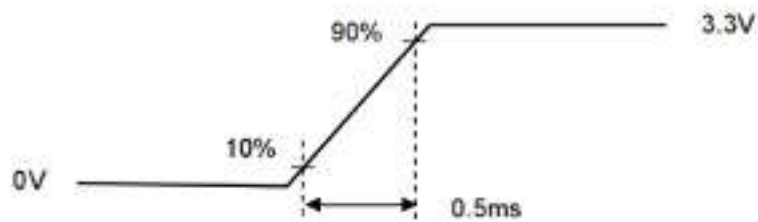
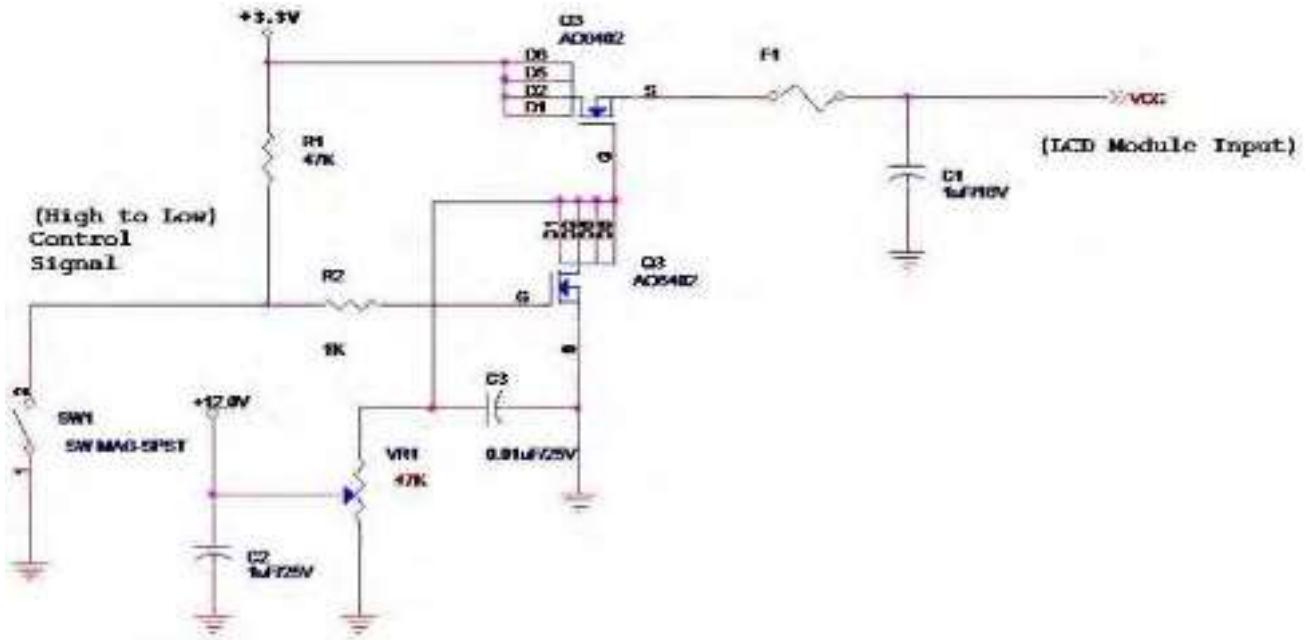
5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
IDD	VDD Current	-	170	245	[mA]	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	1500	[mA]	Note 1
PDD	VDD Power	-	0.56	0.8	[Watt]	All Black Pattern (VDD=3.3V, at 60Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] P-P	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1 : Maximum Measurement Condition: White Pattern at 3.3V driving voltage. ($P_{max}=V_{3.3} \times I_{white}$)

Note 2: Measure Condition



VDD rising time

5.1.2 Signal Electrical Characteristics

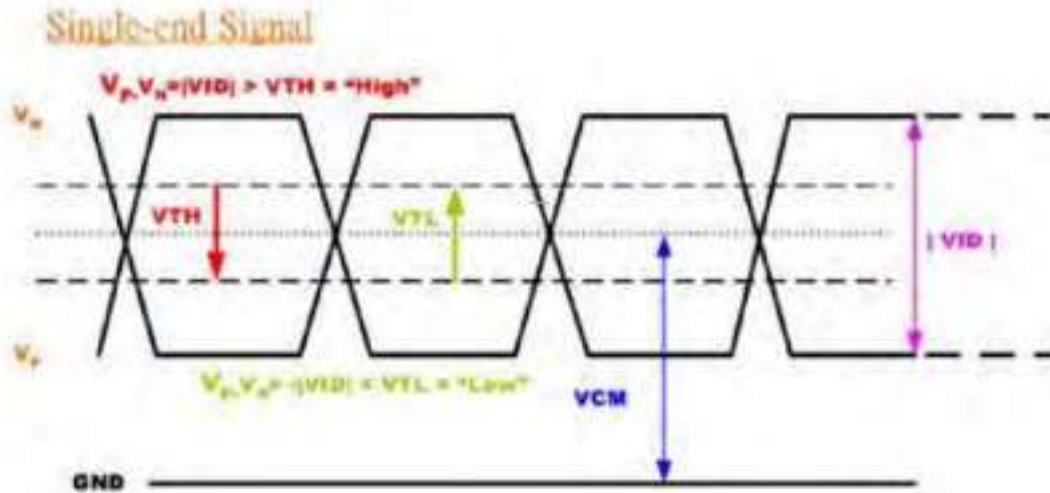
Input signals shall be low or Hi-Z state when VDD is off.

Signal electrical characteristics are as follows;

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	---		100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100		---	[mV]	VCM=1.2V
VID	Input Differential Voltage	100		600	[mV]	
VICM	Differential Input Common Mode Voltage	1.125		1.375	[V]	VTH/VTL=+-100mV



Note: LVDS Signal Waveform.



5.2 Backlight Unit

Following characteristics are measured under a stable condition using an inverter at 25

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VLED	Input Voltage	5.5	-	12	[Volt]	
I _{VLED}	Input Current	-	-	217	[mA]	100% Brightness (VLED = 12V)
P _{VLED}	Power Consumption	-	-	2.6	[Watt]	100% Brightness (VLED = 12V)
V _{EN_HI}	Enable Input High Level	2.5	-	5.5	[Volt]	VLED_EN
V _{EN_LO}	Enable Input Low Level	-	-	0.8	[Volt]	
F _{PWM}	Dimming Frequency	200	-	20K	[Hz]	PWM Dimming
V _{PWM_HI}	Logic Input High Level	2.5	-	5.5	[Volt]	
V _{PWM_LO}	Logic Input Low Level	-	-	0.8	[Volt]	
	Dimming duty cycle	5	-	100	%	
I _F	LED Forward Current	-	22	-	[mA]	Ta = 25°C
Operation Life		15,000	25,000	-	Hrs	(Ta=25°C), Note 2 I _F =19mA

Note 1: Ta means ambient temperature of TFT-LCD module.

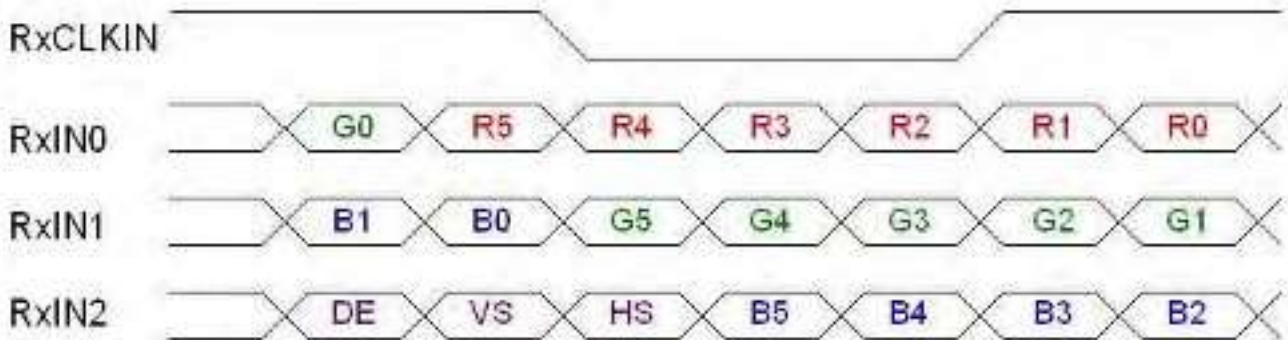
Note 2: VLED, I_{VLED}, P_{VLED} are defined for LED backlight.(100% duty of PWM dimming)

Note 3: If module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 4: Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.



5.3 The Input Data Format



Signal Name	Description	
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
RxCLKIN	Data Clock	The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of RxCLKIN. When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN .
HS	Horizontal Sync	The signal is synchronized to RxCLKIN .

Note: Output signals from any system shall be low or High-impedance state when VDD is off.



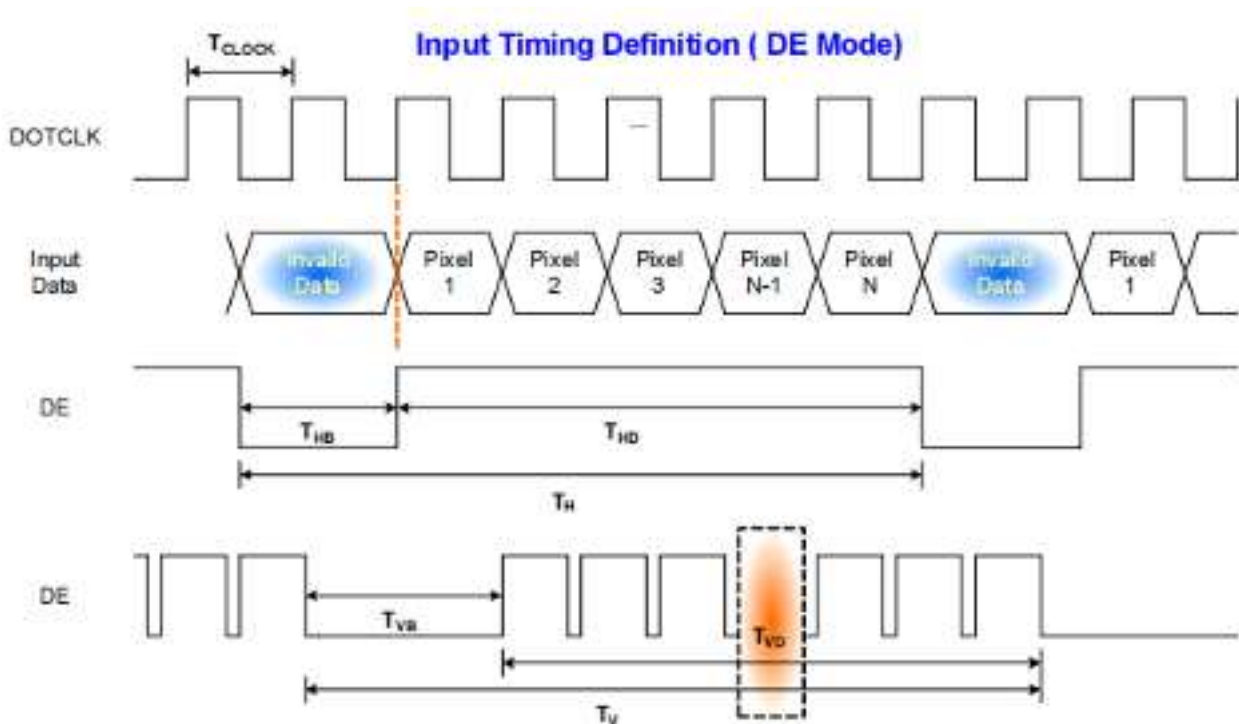
5.4 Interface Timing

5.4.1 Timing Characteristics

Signal	Symbol	Min.	Typ.	Max.	Unit	
Clock Frequency	$1/T_{Clock}$	64	68.93	85	MHz	
Vertical Section	Period	T_V	808	816	1023	T_{Line}
	Active	T_{VD}	800			
	Blanking	T_{VB}	8	16	223	
Horizontal Section	Period	T_H	1310	1408	2047	T_{Clock}
	Active	T_{HD}	1280			
	Blanking	T_{HB}	40	168	767	
Frame Rate	F	---	60	---	Hz	

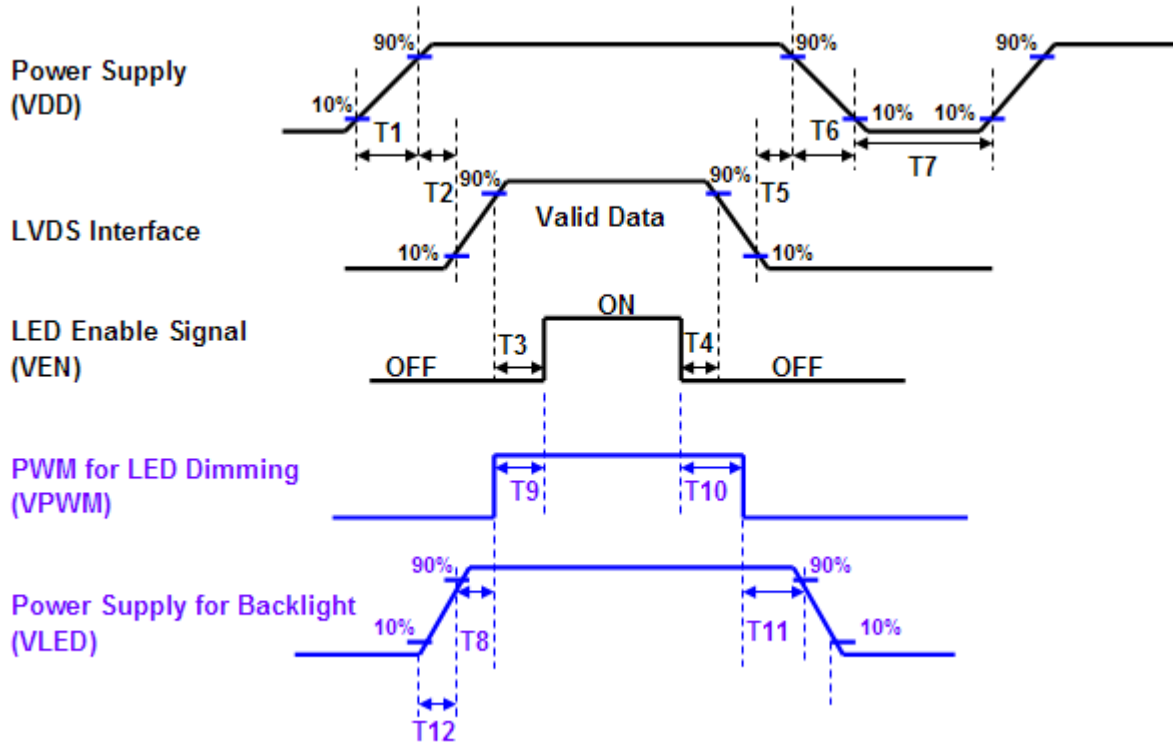
Note : DE mode.

5.4.2 Input Timing Diagram



5.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5		10	[ms]
T2	0		50	[ms]
T3	200		-	[ms]
T4	200		-	[ms]
T5	0		50	[ms]
T6	0		10	[ms]
T7	500		-	[ms]
T8	10		-	[ms]
T9	0		180	[ms]
T10	0		180	[ms]
T11	10		-	[ms]
T12	0.5		10	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.



6. ELECTRO-OPTICAL CHARACTERISTICS

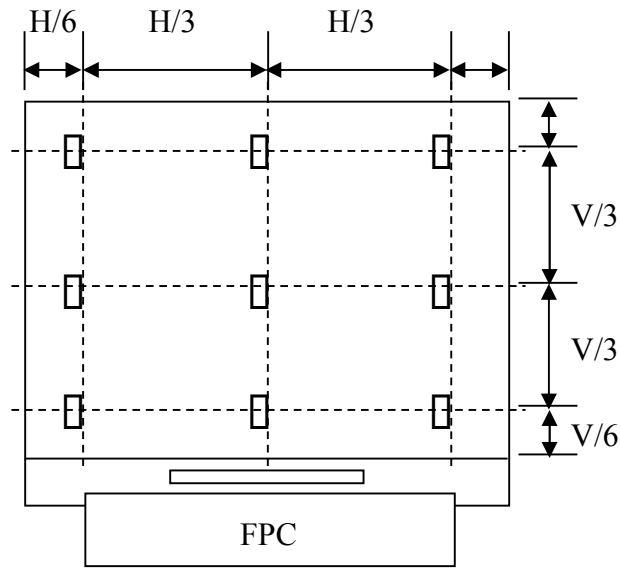
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio (Center point)		C/R	-	1000	1300	-	-	Note(1)	
Luminance uniformity		U_w	$\alpha = 0$. Normal viewing angle B/L On Note(1)	80	-	-	\square	Note(2)	
Response Time		$Tr + Tf$		-	25	35	ms	Note(3)	
Color Chromaticity (CIE 1931)	White	W_x			0.313			参考 值	Note(5)
		W_y			0.329				
	Red	R_x			0.579				
		R_y			0.338				
	Green	G_x		-0.02	0.325	+0.02			
		G_y			0.56				
	Blue	B_x			0.152				
		B_y			0.125				
Viewing Angle	Hor.	$\phi \square R$	C/R \square 10	80	85	-	Deg	Note(4)	
		$\phi \square L$		80	85	-			
	Ver.	$\phi \square U$		80	85	-			
		$\phi \square D$		80	85	-			



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.



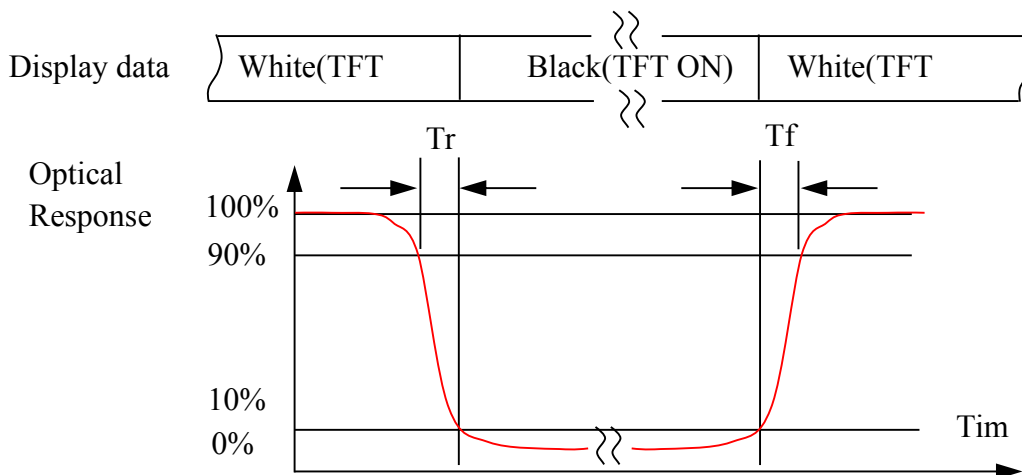
The spot locations for luminance measurement

$$\text{Luminance Uniformity} = \frac{B_{\min}}{B_{\max}} \times 100\%$$

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

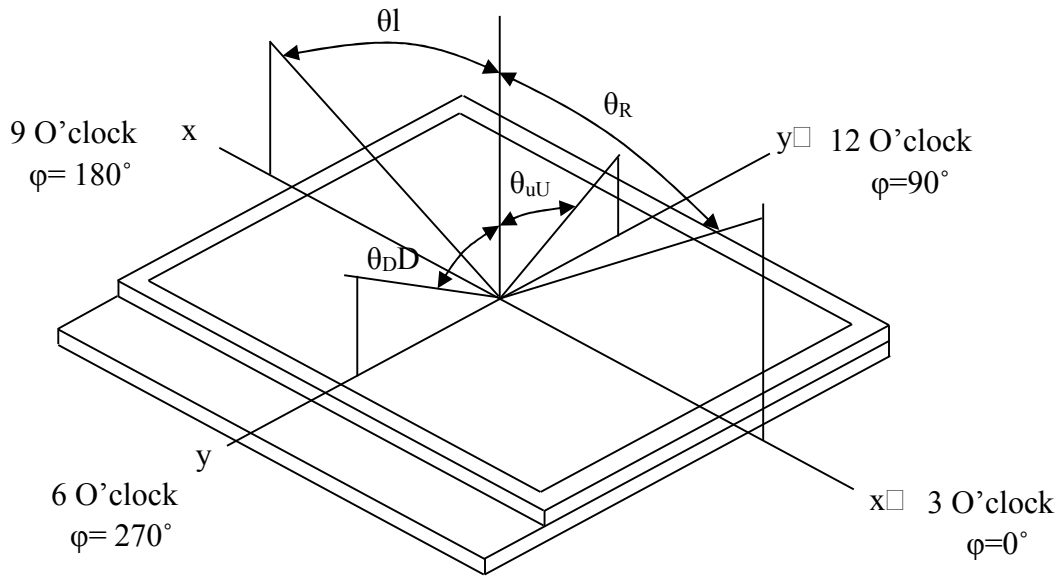
B_{\min} : The measured minimum luminance of all measurement position.

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	50°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
				$0.15 < D \leq 0.25$, $ds \geq 10$ $0.25 < D \leq 3$, $ds \geq 10$ LCD亮点: $0.2 < D$ $D > 0.3$		N ≤ 2
			判定(D区)	同背面丝印油墨区杂质判定标准		N ≤ 1
			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	NG
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 ≤ 2
				$0.03mm < W \leq 0.05mm$, $L \leq 3mm$, $ds \geq 10$		N ≤ 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
				$0.15 < D \leq 0.3$, $ds \geq 10$ $0.3 < D \leq 0.35$, $ds \geq 10$ LCD亮点: $0.25 < D$ $D > 0.35$		N ≤ 2
			判定(D区)	同背面丝印油墨区杂质判定标准		N ≤ 1
			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	NG
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 ≤ 2
				$0.05mm < W \leq 0.07mm$, $L \leq 5mm$, $ds \geq 10$		N ≤ 1
				$W > 0.07mm$ 或 $L > 5mm$		NG



9. PACKAGE DRAWING

