



HIGHNESSTM

HM070WX101HA

7" Color TFT-LCD

FUNCTIONAL DRAFT SPECIFICATION

(This document is meant for customers' approval)

Release Date
01st Mar 2021

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1.0 GENERAL DESCRIPTION

1.1 Introduction

Model HM070WX101HA is a color active-matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, and a back light system. This TFT LCD has a 7(16:10) inch diagonally measured active display area with WXGA (1280 horizontal by 800 vertical pixel) resolution.

1.2 Features

- 7.0 (16:10 diagonal) inch configuration
- One channel LVDS interface
- 262K color by 6 bit R.G.B signal input
- RoHS Compliance
- Halogen Free

1.3 Applications

- Handbook
- Notebook

1.4 General information

Item	Specification	Unit
Outline Dimension	161.2(Typ) x105.5 (Typ)	mm
Display area	150.72 (H) x 94.2(V)	mm
Number of Pixel	1280 RGB (H) x 800(V)	pixels
Pixel pitch	0.11775(H) x 0.11775(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally Black	
NTSC	50	%
Surface treatment	HC	
Weight	93g(Max.)	g
Back-light	White LED	
Power Consumption	Logic and BLU 2.8 (typ.) 3.0(max)/ (Logic 1.13W + BLU 1.87W) @White pattern	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	160.9	161.2	161.5	mm
	Vertical (V)	105.2	105.5	105.8	mm
	Depth (D) w/o PCB	—	2.35	2.65	mm
	Depth (D) w/ PCB	—	4.2	4.5	
Weight		—	90	—	g

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply voltage	V _{DD}	-0.3	4.0	V	

2.1.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T _{opa}	-20	70	°C	
Storage Temperature	T _{stg}	-30	80	°C	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	640	800	—		(1)(2)(4)
Response time	Rising	Tr+Tf		—	25	35	msec	(1)(3)
White luminance (center point)		Y_L		320	400	—	cd/m ²	(1)(4)(5) ($I_L=20mA$)
Color chromaticity (CIE1931)	Red	R_x		0.558	0.588	0.618		
		R_y	0.324	0.354	0.384			
	Green	G_x	0.297	0.327	0.357			
		G_y	0.530	0.560	0.590			
	Blue	B_x	0.128	0.158	0.188			
		B_y	0.069	0.099	0.129			
	White	W_x	0.283	0.313	0.343			
		W_y	0.299	0.329	0.359			
Viewing angle	Hor.	Θ_L	CR>10	80	89	—		(1)(4)
		Θ_R		80	89	—		
	Ver.	Θ_U		80	89	—		
		Θ_D		80	89	—		
Brightness uniformity		B_{UNI}	$\Theta=0$ (9point)	—	—	1.25		(6)

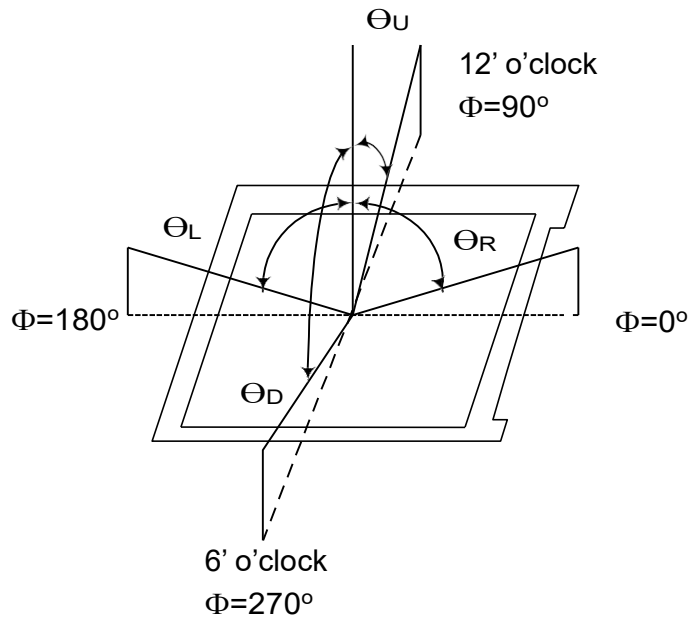
3.2 Measuring Condition

- Measuring surrounding = dark room
- Ambient temperature = 25±2°C
- 15min. warm-up time.

3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size = 20 ~ 21 mm

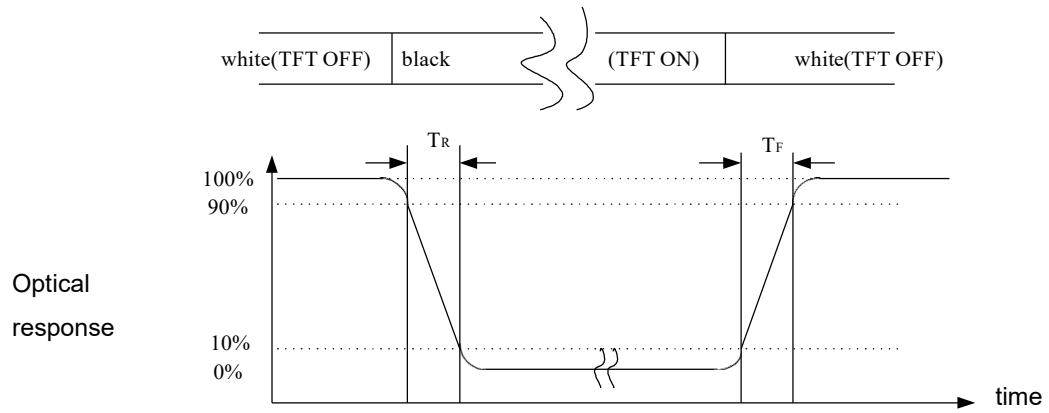
Note (1) Definition of Viewing Angle:



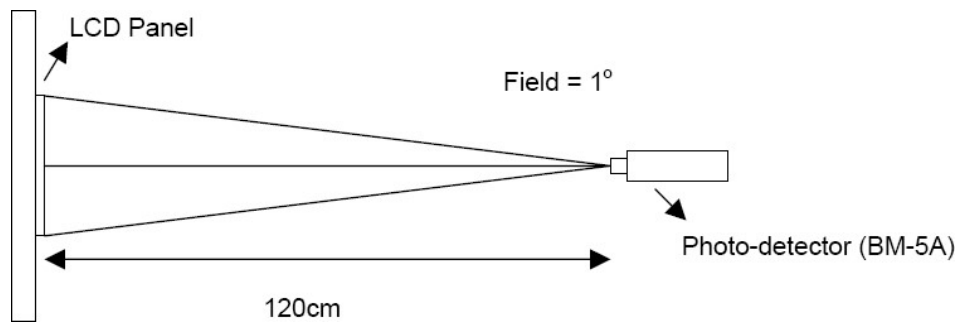
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of Average Luminance Uniformity of White (9 Point)

$$\text{Average Luminance Uniformity} = \frac{Y_1 + Y_2 + Y_3 + Y_4 + Y_5 + Y_6 + Y_7 + Y_8 + Y_9}{9}$$

*Center luminance = Y1 luminance

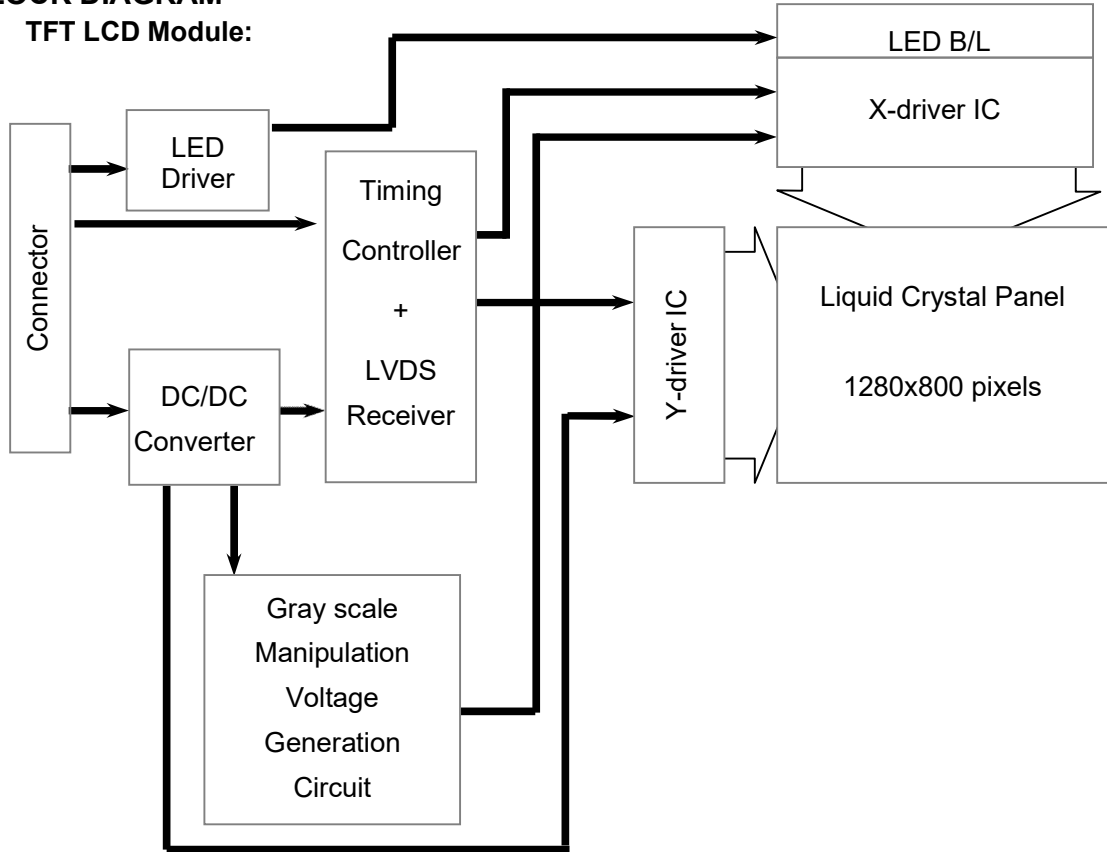


Note (6) Definition of brightness uniformity

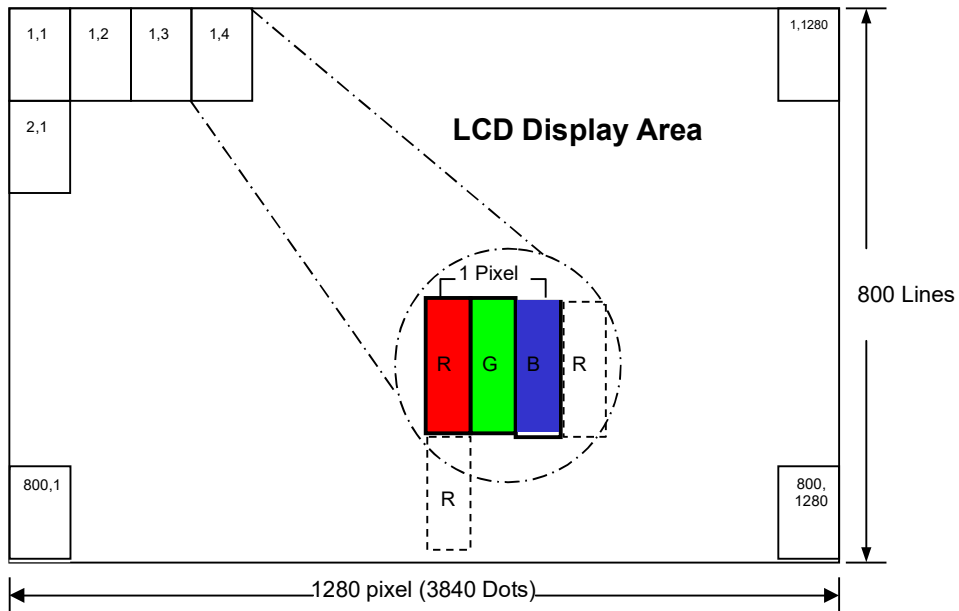
$$\text{Luminance uniformity (9 points)} = \frac{(\text{Max Luminance of 9 points})}{(\text{Min Luminance of 9 points})}$$

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module:



4.2 Pixel Format



5.0 INTERFACE PIN CONNECTION

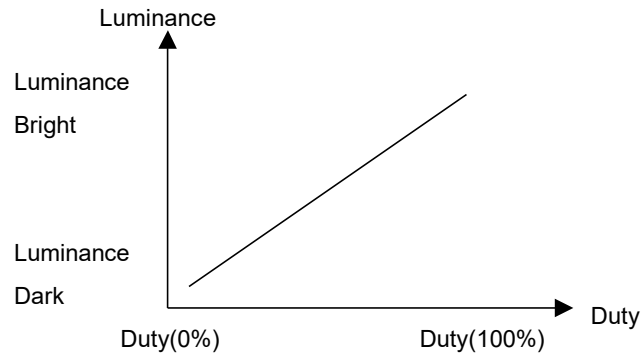
5.1 TFT LCD Module - CN1 (Input signal): MSA24046P30B (STM or equivalent)

Pin No.	Signal	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	VDD	Power Supply, 3.3V (typical)
4	NC	NC
5	GND	Ground
6	RXIN0-	- LVDS differential data input (R0-R5, G0)
7	RXIN0+	+ LVDS differential data input (R0-R5, G0)
8	GND	Ground
9	RXIN1-	- LVDS differential data input (G1-G5, B0-B1)
10	RXIN1+	+ LVDS differential data input (G1-G5, B0-B1)
11	GND	Ground
12	RXIN2-	- LVDS differential data input (B2-B5, HS, VS, DE)
13	RXIN2+	+ LVDS differential data input (B2-B5, HS, VS, DE)
14	GND	Ground
15	RXCLKIN-	- LVDS differential clock input
16	RXCLKIN+	+ LVDS differential clock input
17	GND	Ground
18	NC	NC
19	NC	NC
20	GND	Ground
21	NC	NC
22	NC	NC
23	GND	Ground
24	LED_EN	Adjust for LED backlight brightness (20KHz)
25	NC	NC
26	NC	NC
27	VLED	LED Power Supply, 3~5V
28	VLED	LED Power Supply, 3~5V
29	VLED	LED Power Supply, 3~5V
30	VLED	LED Power Supply, 3~5V

Note - The brightness of LCD panel could be changed by adjusting PWM

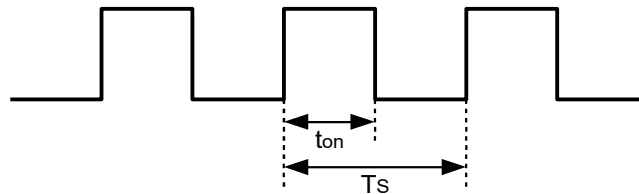
[Note]

(1) LED_EN can adjust brightness to control Pin. Pulse duty the bigger the brighter.



(2) LED_EN Signal=0~3.3V > Operation Conditions :

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
LED_EN Logic-High Level	V _{ADJH}		1.8	3.3	3.6	V
LED_EN Logic-Low Level	V _{ADJL}		0	0	0.4	V
Dimming Frequency	F _{ADJ}		18	20	22	kHz
Dimming Duty Cycle	D		20	--	100	%



$$D = t_{on} / T_s \times 100\%$$

$$F_{ADJ} = 1 / T_s$$

6.0 ELECTRICAL CHARACTERISTICS

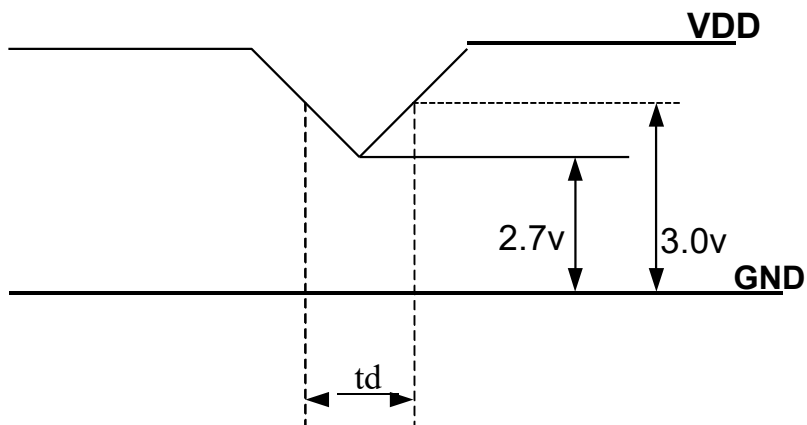
6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note (2)
Current of power supply	I_{DD}	-	0.267	-	A	$V_{DD} = 3.3V \times \text{White pattern (L63)}$
Inrush current	I_{RUSH}	-	-	1.50	A	Note (2)

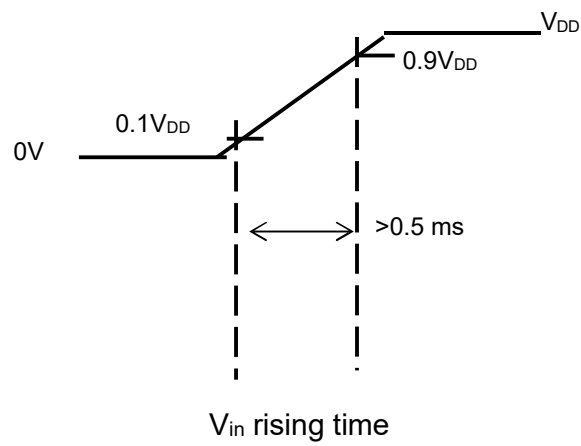
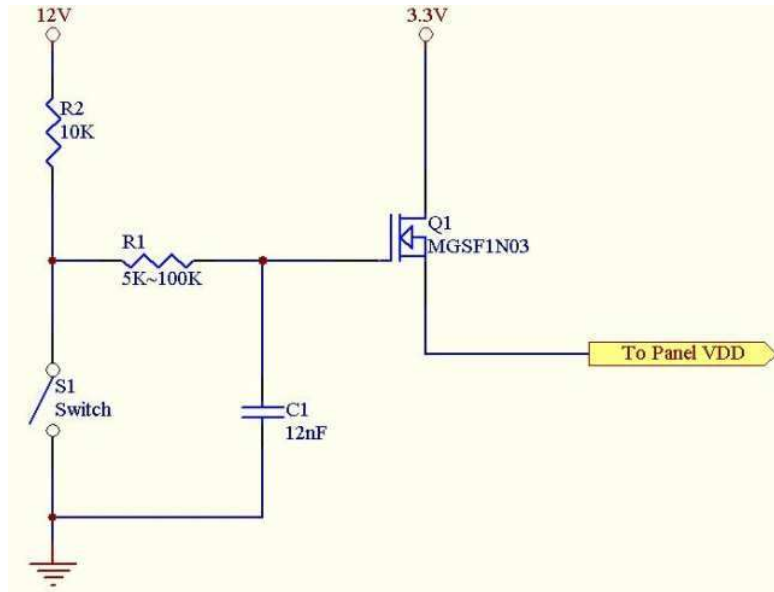
Note (1): V_{DD} -dip condition:

When V_{DD} operating within $2.7V \leq V_{DD} < 3.0V$, $t_d \leq 10ms$, the display may momentarily become abnormal.

$V_{DD} < 2.7V$, V_{DD} dip condition should also follow the Power On/Off conditions for supply voltage.



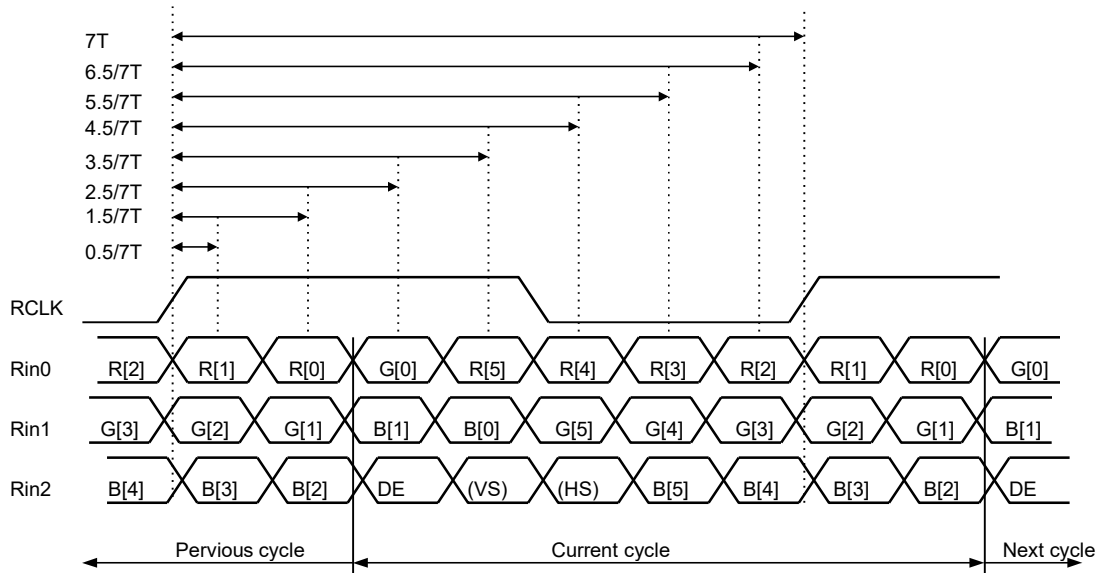
Note = (2) Power on Inrush current test circuit



6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V_{th}	—	—	100	mV	$V_{CM}=1.2V$
Differential Input Low Threshold	V_{tl}	-100	—	—	mV	
Input Current	I_{IN}	-10	—	+10	μA	
Differential input Voltage	$ V_{ID} $	0.1	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	$(V_{ID} /2)$	1.25	$2.4-(V_{ID} /2)$	V	

6.3 Bit Mapping & Interface Definition



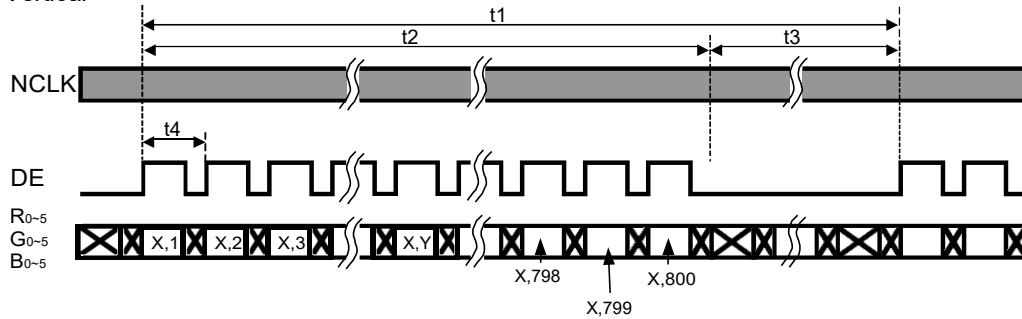
LVDS Receiver Input Timing Definition
for 6bits LVDS input

6.4 Interface Timing (DE mode)

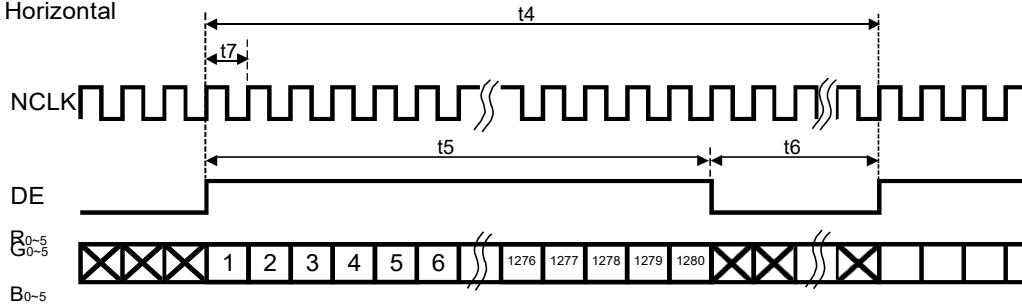
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	803	823	1023	line
Vertical Display Time	t2	800	800	800	line
Vertical Blanking Time	t3	3	23	223	line
1 Line Scanning Time	t4	1334	1440	1961	clock
Horizontal Display Time	t5	1280	1280	1280	clock
Horizontal Blanking Time	t6	54	160	681	clock
Clock Rate	t7	64.3	71.1	82	MHz

Timing Diagram of Interface Signal (DE mode)

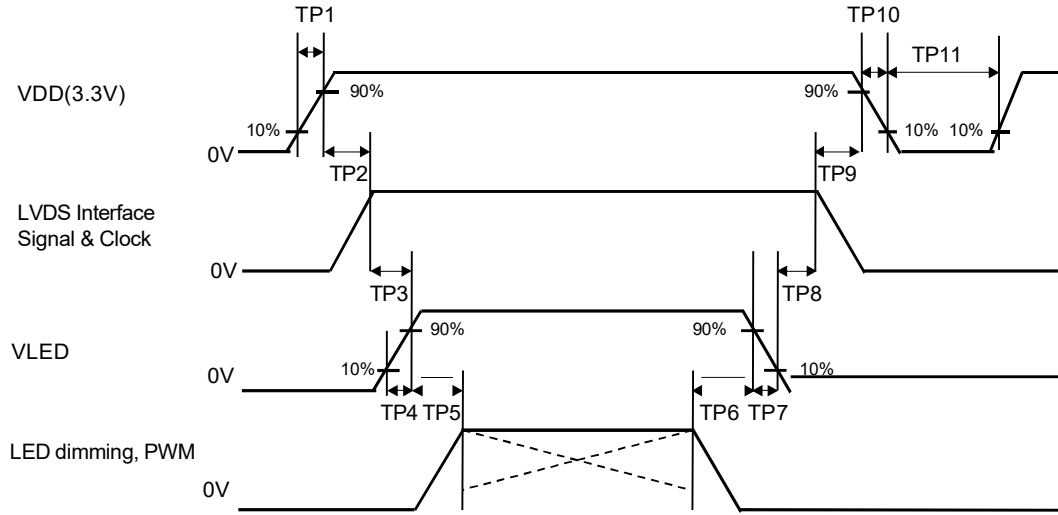
(1) Vertical



(2) Horizontal



6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	200	--	--	msec	
TP4	0.5	--	10	msec	
TP5	10	--	--	msec	
TP6	10	--	--	msec	
TP7	0	--	10	msec	
TP8	200	--	--	msec	
TP9	0	--	50	msec	
TP10	1	--	10	msec	

- Note =**
- (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD} .
 - (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
 - (3) In case of V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.
 - (4) TP13 should be measured after the module has been fully discharged between power off and on period.
 - (5) Interface signal shall not be kept at high impedance when the power is on.
 - (6) The duty of LED dimming signal should be more than 20% in TP6 and TP14
 - (7) PWM can adjust brightness to control Pin. Pulse duty the bigger the brighter

6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	20	--	mA	Ta=25°C
LED Voltage	V_F	3.0	3.2	3.3	Volt	Ta=25°C
LED Power consumption	P_{LED}	--	1.536	1.584	Watt	Ta=25°C Note (1)
LED Life-Time	N/A	10,000	--	--	Hour	Ta=25°C $I_F=20mA$ Note (2)

Note (1): Calculator value for reference $P=I_F \times V_F \times N$ (LED Qty')

Note (2): The LED lifetime defines as the estimated time to 50% degradation of final luminous.

6.7 LED Driver

6.7.1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
LED Power Supply voltage	V_{LED}	-0.3	6	Volt	
LED_EN	V_{EN}	--	6	Volt	

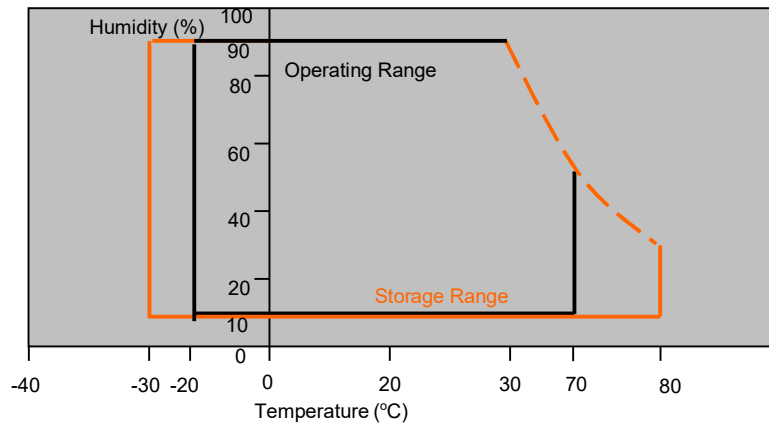
6.7.2 DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply Voltage	V_{LED}	3.0	--	5.0	Volt	
LED_EN High Threshold	V_{LED_ENH}	1.4	--	V_{LED}	Volt	
LED_EN Low Threshold	V_{LED_ENL}	--	--	0.5	Volt	

7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta= +80°C, 240hrs	
2	Low Temperature Storage	Ta= -30°C, 240hrs	
3	High Temperature Operation	Ta= +70°C, 240hrs	
4	Low Temperature Operation	Ta= -20°C, 240hrs	
5	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200 cycles	
6	Vibration	Sine Wave 1.04G, 5~500Hz, XYZ 30min/each direction	
7	Shock	Half-Sine, 100G, 6ms, ±XYZ, 3 cycle	

Storage / Operating temperature

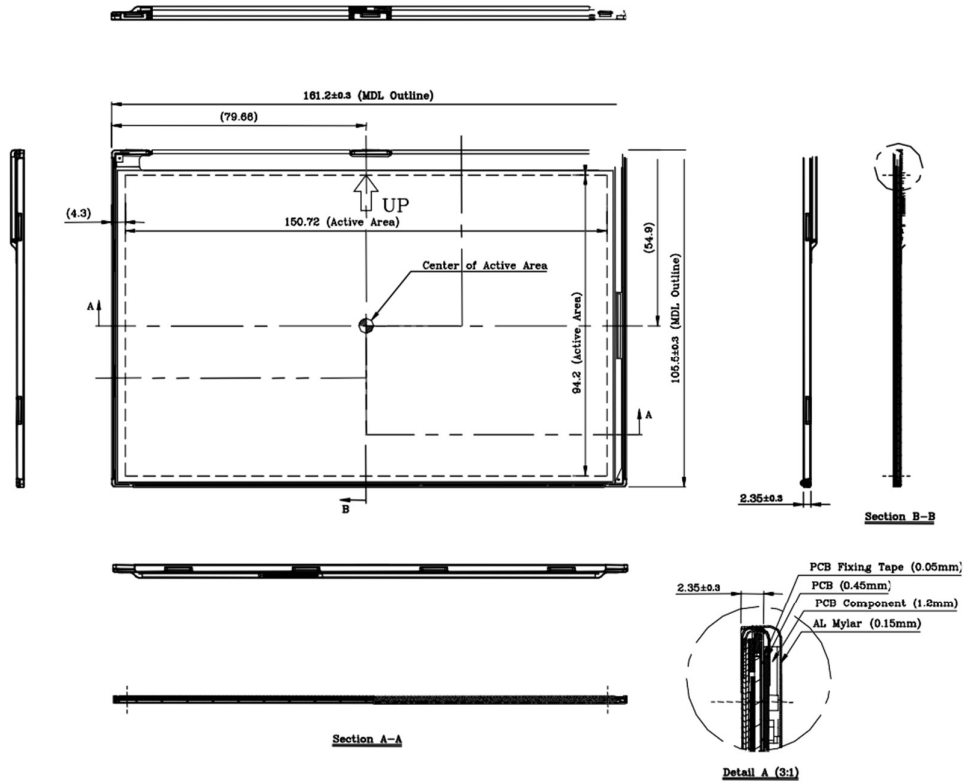


Note. Max wet bulb temp.=39°C

8.0 OUTLINE DIMENSION

8.1 Front View Outline Dimension

Unit : mm



8.2 Back View Outline Dimension

