



PRODUCT GROUP

REV

REV.0

TFT- LCD PRODUCT

Ver.P0

2023.3.22

APPROVAL SHEET 承认书

客户名称 Customer		
产品型号 Part NO.	DCE133FHM-N81-400	
产品内容 Product type	Mode:TFT LCD Module	
备注栏 Remarks	☐ APPROVAL FOR SEPCIFICATIONS ONLY ☒ APPROVAL FOR SEPCIFICATIONS AND SAMPLE	
客户确认签章 Signature by Customer:		
备注/ Notes:		
PREPARED BY	CHECKED BY	APPROVED BY



PRODUCT GROUP

REV

REV.0

TFT- LCD PRODUCT

Ver.P0

2023.3.22

REVISION HISTORY

(√)PreliminarySpecification

() Final Specification

Revision No.	Page	Description of Changes	Date	Prepared
0	23	Initial Release	2023.3.22	



PRODUCT GROUP

REV

REV.0

TFT- LCD PRODUCT

Ver.P0

2023.3.22

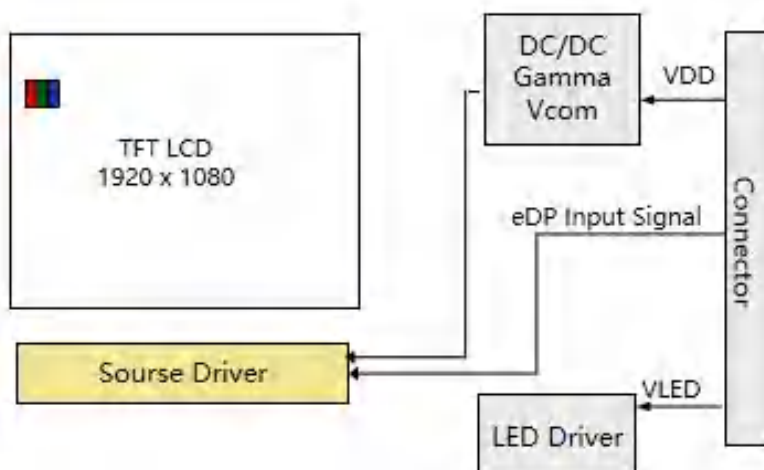
Contents

No.	Items	Page
1.0	General Description	4
2.0	Absolute Maximum Ratings	6
3.0	Electrical Specifications	7
4.0	Optical Specifications	11
5.0	Interface Connection	16
6.0	Signal Timing Specification	20
7.0	Input Signals, Display Colors & Gray Scale of Colors	25
8.0	Power Sequence	26
9.0	Connector Description	28
10.0	Mechanical Characteristics	29
11.0	Reliability Test	30
12.0	Handling & Cautions	31
15.0	Mechanical Outline Dimension	32
16.0	EDID Table	33
17.0	General Precautions	34

1.0 GENERAL DESCRIPTION

1.1. Introduction

DCE133FHM-N81-400 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 13.3 inch diagonally measured active area with Full-HD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M colors.



1.2. Features

- EDP interface
- 16.7M color depth, color gamut 72%

1.3. Applicatin

- Display panel



PRODUCT GROUP

REV

REV.0

TFT- LCD PRODUCT

Ver.P0

2023.3.22

1.4. General Specification

The followings are general specifications at the model HBM133FH11A2 . (listed in Table 1、 2)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	293.76 (H) × 165.24(V)	mm	
Number of pixels	1920 (H) × 1080 (V)	pixels	
Pixel pitch	0.153(H) × 0.153(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M		
Color gamut	72%typ./67%min.		NTSC
Display mode	Normally Black		
Dimensional outline	300.36(H)*177.54(V)*2.85	mm	
Surface treatment	FineAG		

<Table 2. Outline dimensions>

Parameter		Min	Typ	Max	Unit	Remark
Unit outline dimensions	Width	300.06	300.36	300.66	mm	
	Height	177.24	177.54	177.84	mm	
	Depth	2.65	2.85	3.05	mm	w/o PWB.[Note3-2]
Mass		-	TBD	-	g	

[Note 3-1]Outline dimensions is shown in page 20.

[Note 3-2]Without war page and deflection.



2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

The operational and non-operational maximum voltage and current values are listed in Table 3.

< Table 3. Absolute Maximum Ratings>

Ta=25+/-2°C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	-0.3	3.6	V	Note 1
Logic Supply Voltage	V _{IN}	V _{SS} -0.3	V _{DD} +0.3	V	
Operating Temperature	T _{OP}	0	+50	°C	Note 2
Storage Temperature	T _{ST}	-20	+60	°C	

Notes :

1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Temperature and relative humidity range are shown in the figure below.

95 % RH Max. (40 °C ≥ Ta) Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C)

No condensation.

3.0 ELECTRICAL SPECIFICATIONS

3.1. Electrical Specifications

< Table 4. Electrical Specifications >

Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V _{RF}	-10% VDD	-	+10% VDD	V	Note2
Power Supply Inrush Current	I _{rush}	-	-	2	A	Note3
Power Supply Current	I _{DD}	-	317	-	mA	
Power Consumption	P _{Total}	-	4.8	-	W	

Notes :

1. The supply voltage is measured and specified at the interface connector of LCM. The current draw and power consumption specified is for 3.3V at 25 °C.
2. Input voltage range:3.0~3.6V.Test condition: Oscilloscope bandwidth 20MHz, AC coupling
3. Measure condition (Figure 3.1)

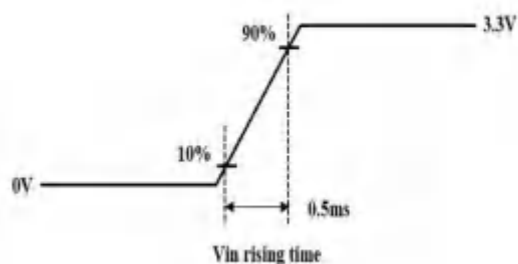


Figure 3.1. Inrush Measure Condition

3.2. Backlight Unit

< Table 5. LED Driving Guideline Specifications >Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V _F	16.8	27	29.2	V	
LED Forward Current	I _F	-	120	-	mA	
LED Power Input Voltage	V _{LED}	5	12	21	V	
LED Power Input Current	I _{LED}	-	317	-	mA	
LED Power Consumption	P _{LED}	-	3.8	-	W	
Power Supply Voltage for LED Driver Inrush	V _{LED} inrush	-	-	-	V	
LED Life-Time	N/A	-	30000	-	Hour	
Duty Ratio		5	-	93	%	

Notes :

1. Power supply voltage 12V for LED driver.
2. The LED life-time define as the estimated time to 50% degradation of initial luminous.
3. 1% duty cycle is achievable with a dimming frequency less than 2KHz.
4. Measure condition (Figure 3.2)

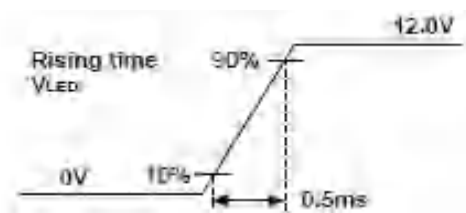


Figure 3.2. Inrush Measure Condition

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of luminance meter system (PR730&PR810) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta=270$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 o'clock.

4.2 Optical Specifications

<Table 6. Optical Specifications>

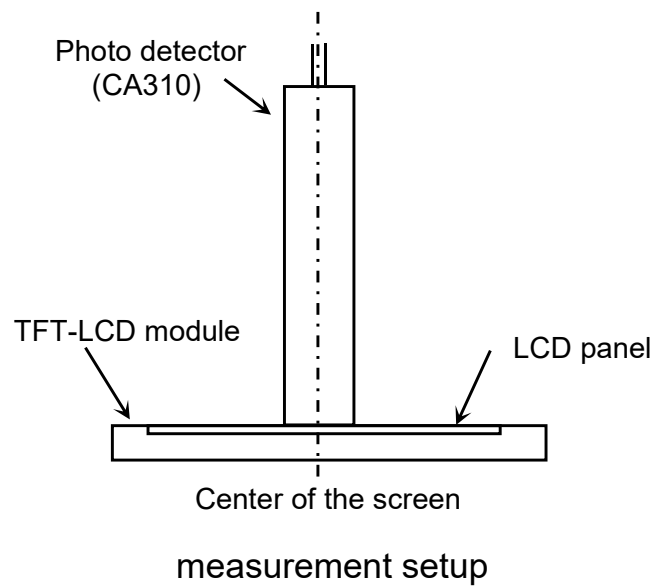
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast Ratio		CR	$\Theta = 0^\circ$	600	800	-		Note 2
White Luminance Uniformity		5points			80			Note 3
White Chromaticity		W_x	$\Theta = 0^\circ$	0.268	0.298	0.328		Note 4
		W_y		0.306	0.336	0.366		
Reproductio nof Color	Red	R_x	$\Theta = 0^\circ$	Typ.-0.03	0.642	Typ.+0.03		
		R_y			0.351			
	Green	G_x			0.335			
		G_y			0.621			
	Blue	B_x			0.134			
		B_y			0.057			
Color Gamut				67	72	-	%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25°C $\Theta = 0^\circ$	-	30	35	ms	Note 5
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2.0	%	Note 6
Luminance		Lv			400		cd/m ²	

Notes :

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 4.3.1).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ 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 4.3.1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$
3. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}$. (see Figure 4.3.2).
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. Measurements shall be made at the center of the panel.
5. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See Figure 4.3.4).

4.3 Optical Measurements



Optical characteristics measurement setup

Figure 4.3.1. Measurement Set Up

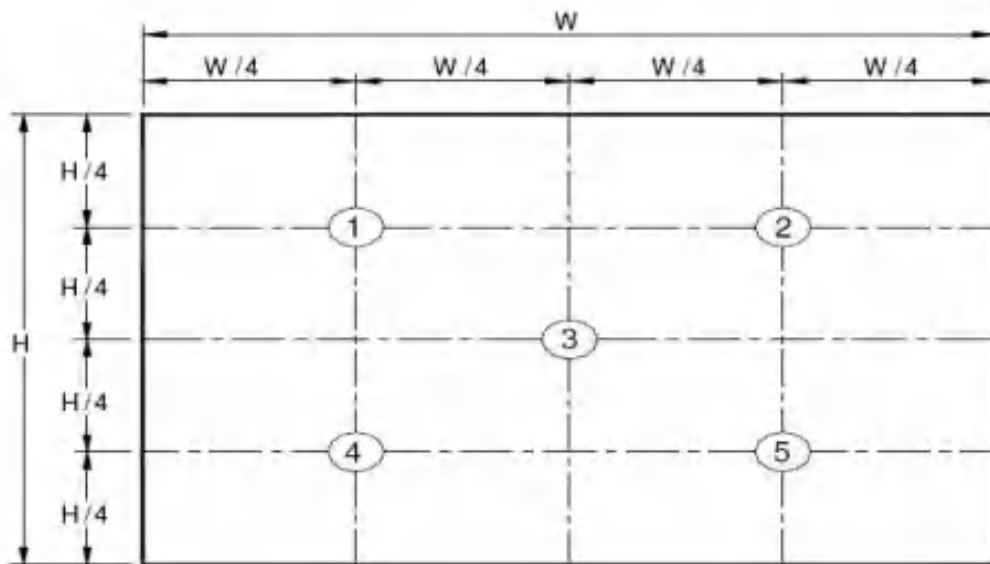


Figure 4.3.2. White Luminance and Uniformity Measurement Locations (5 points)

Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure 7 for a total of the measurements per display.

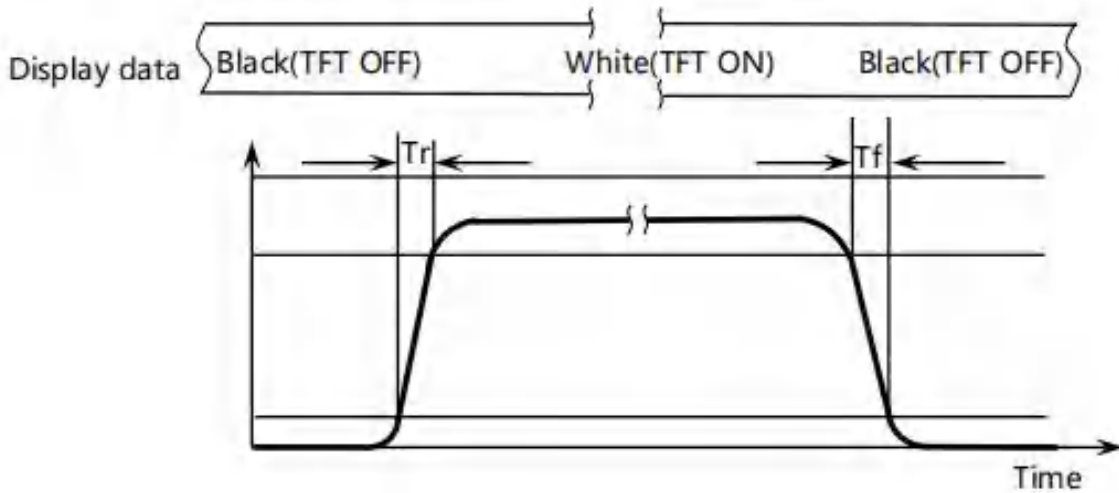
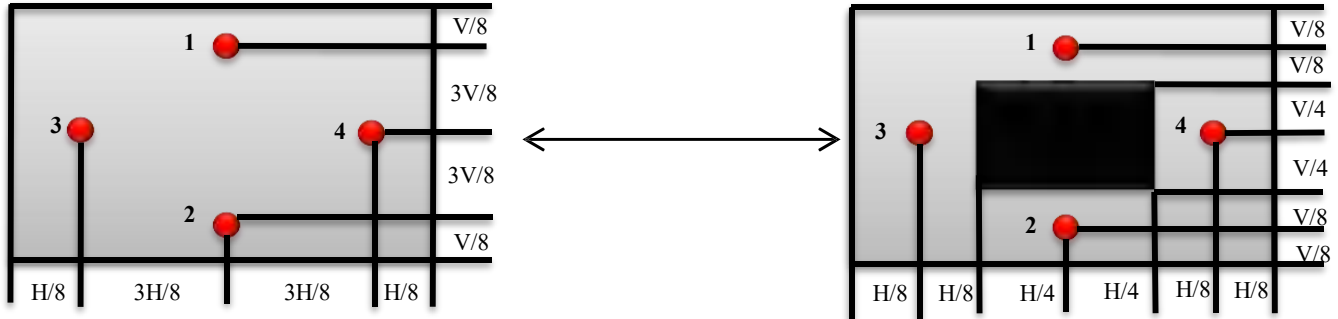


Figure 4.3.3. Response Time Testing

The electro-optical response time measurements shall be made as shown in Figure 10 by switching the “data” input signal ON and OFF. Tf: The luminance to change from 90% to 10% ,Tr: The luminance to change from 10% to 90% .



$$\text{Cross Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Figure 4.3.4. Cross Talk Modulation Test Description

Where:

Y_A = Initial luminance of measured area (cd/m²)

Y_B = Subsequent luminance of measured area (cd/m²)

The location 1/2/3/4 measured will be exactly the same in both patterns. The test background gray is from L64 to L192. Take the largest data as the result.

Cross Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (Refer to Figure 11)

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

The connector interface pin assignments are listed in Table 7.

<Table 7. Pin Assignments for the Interface Connector>

Pin No.	Symbol	I/O	Function	Remark
1	NC	-	No connection	
2	H_GND	P	High Speed round	
3	Lane1_N	I	Complement Signal Link Lane 1	
4	Lane1_P	I	True Signal Link Lane 1	
5	H_GND	P	High Speed Ground	
6	Lane0_N	I	Complement Signal Link Lane 0	
7	Lane0_P	I	True Signal Link Lane 0	
8	H_GND	P	High Speed Ground	
9	AUX_CH_P	I	True Signal Auxiliary Channel	
10	AUX_CH_N	I	Complement Signal Auxiliary Channel	
11	H_GND	P	High Speed Ground	
12	LCD_VDD	P	LCD logic and driver power(3.3V)	
13	LCD_VDD	P	LCD logic and driver power(3.3V)	
14	LCD_TEST	I	Panel self test enable	
15	LCD_GND	P	LCD logic and driver ground	
16	LCD_GND	P	LCD logic and driver ground	
17	HPD	O	HPD signal pin	
18	LED-1	P	Backlight ground	
19	LED-2	P	Backlight ground	
20	LED-3	P	Backlight ground	
21	LED-4	P	Backlight ground	
22	BL_ENABLE	I	Backlight on/off	
23	BL_PWM_DIM	I	System PWM	
24	NC	-	No connection	
25	NC	-	No connection	
26	BL_PWR	P	Backlight power	
27	BL_PWR	P	Backlight power	
28	BL_PWR	P	Backlight power	
29	BL_PWR	P	Backlight power	
30	NC	-	No connection	

*1 P: POWER I: Input O: Output

[Note1] Don't input any signals or any powers into a NC pin. Keep the NC pin open.

5.2 eDP Interface

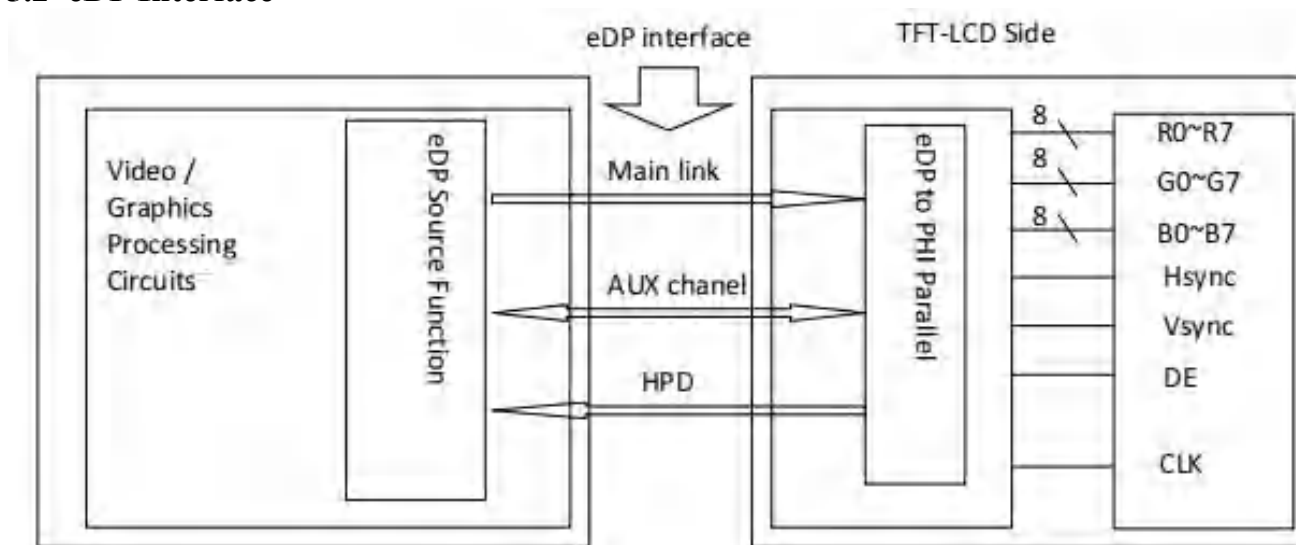


Figure 5.2. eDP Interface Architecture

5.3 Data Input Format

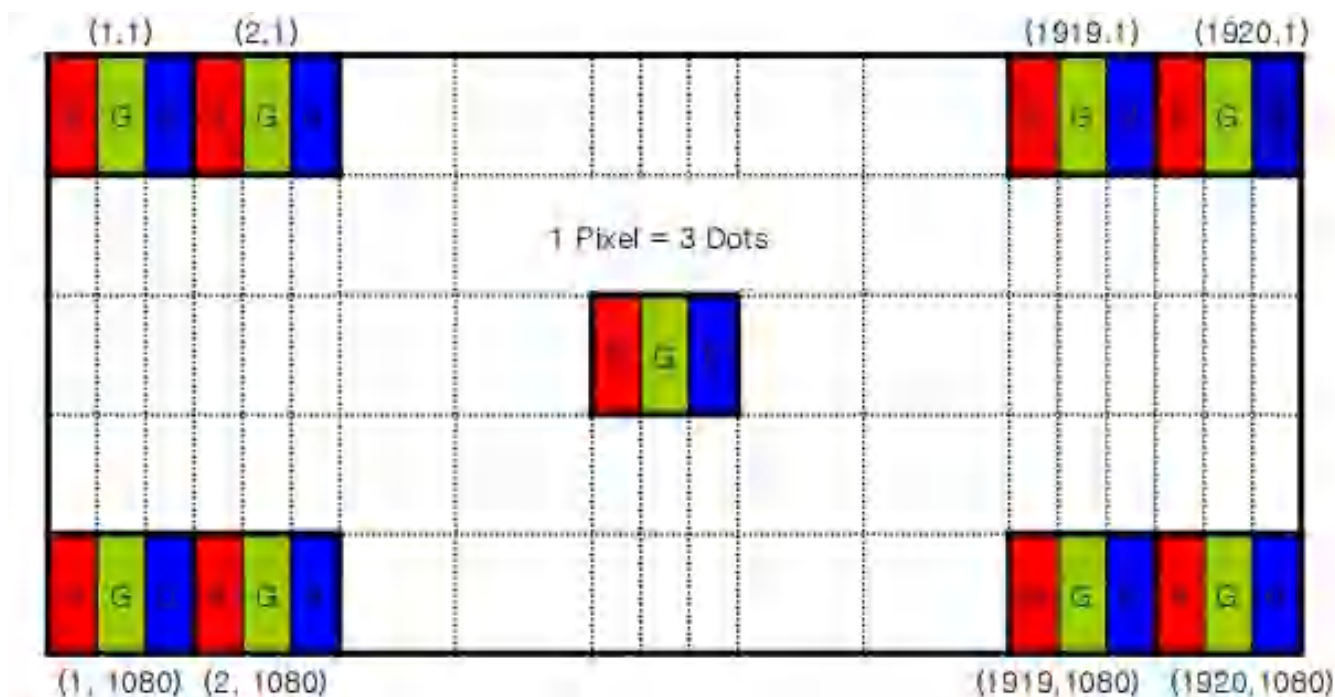


Figure 5.3. Display Position of Input Data (V-H)

6.0 SIGNAL TIMING SPECIFICATION

6.1 The HBM133FH11A2 Is Operated By The DE Only

< Table 8. Signal Timing Specification >

Item	Symbols	Min	Typ	Max	Unit
DCLK Frequency	Fclk	-	477	-	MHz
Horizontal display aea	thd	1920			pixel
HSYNC period time	th	2080	2142	2400	pixel
HSYNC blanking	thb+ thfp	-	222	-	pixel
Vertical display area	Tvd	1080			H
Frequency	fV	40	60	66	HZ
VSYNC period time	Tv	1090	1100	1238	H
VSYNC blanking	Tvb+ Tvfp	-	20	-	H

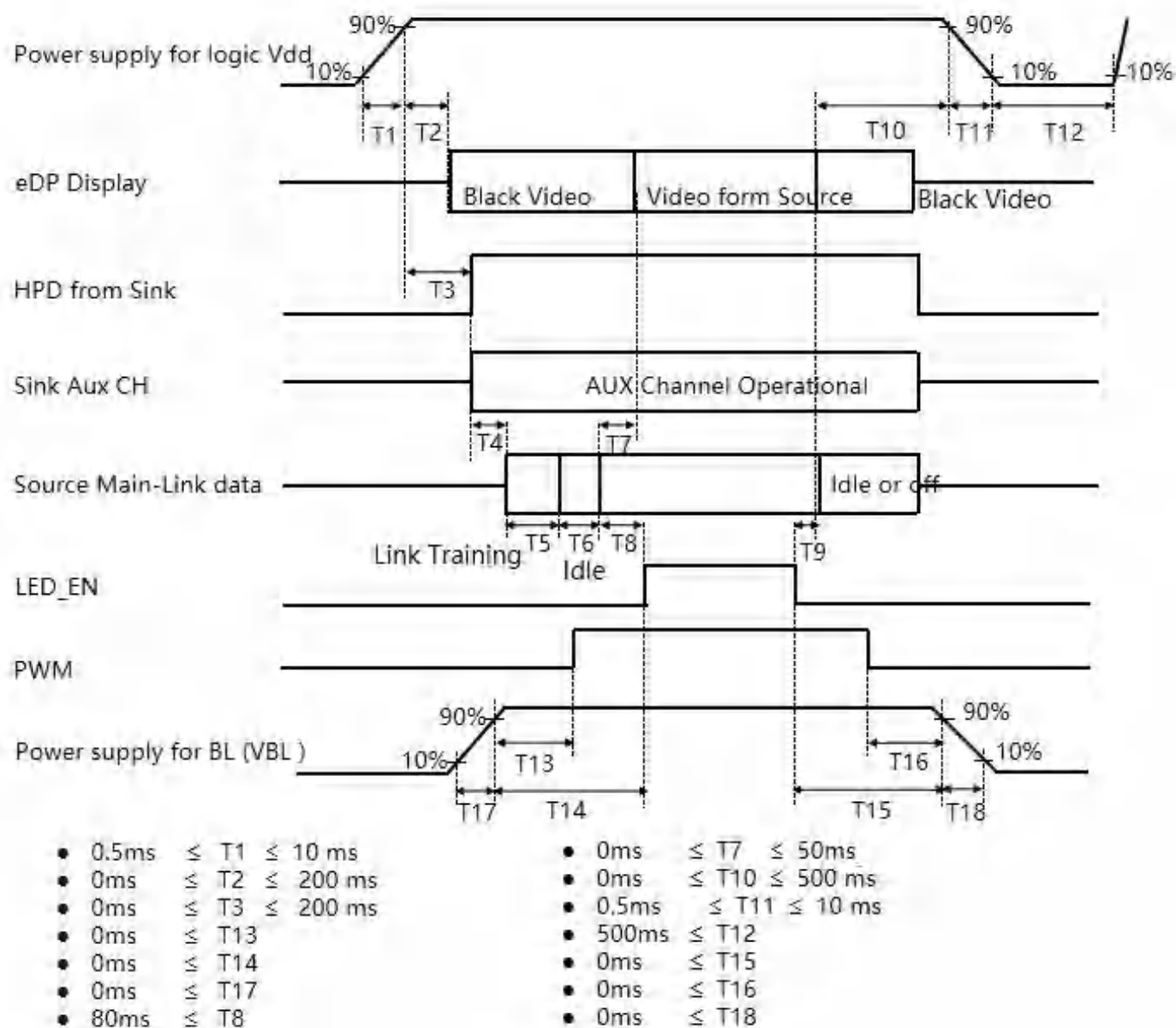
Note : The above is as optimized setting.

7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

8.0 POWER SEQUENCE

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



Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.



9.0 MECHANICAL CHARACTERISTICS

9.1 Dimensional Requirements

The DCE133FHB-N81-400 parameters are shown in Table 9.-

<Table 9. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	293.76(H) × 165.24(V)	mm
Number of pixels	1920(H) X 1080 (V) (1 pixel = R + G + B dots)	pixels
Pixel pitch	0.153(H) X 0.153 (V)	um
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7M	Colors
Display mode	Normally Black	
Dimensional outline	300.36(H)*177.54(V)*2.85(B)	mm
Weight	TBD	g

10.0 RELIABILITY TEST

The reliability test items and its conditions are shown in below.

<Table 10. Reliability Test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 60°C , 72 hrs	
2	Low temperature storage test	Ta = -20°C , 72 hrs	
3	High temperature & high humidity operation test	Ta = 50°C , 80%RH, 72 hrs	
4	High temperature operation test	Ta = 50°C , 72 hrs	
5	Low temperature operation test	Ta = 0°C , 72 hrs	
6	Thermal shock	Ta = -20 °C ↔ 55 °C (0.5 hr), 1hr/cycle, 100 cycle	
7	Packing Vibration test (non-	Ta = 25°C , 60%RH, 1.47G, 5~300Hz, Random, ± Z / hr	Note 1
8	Electro-static discharge test (operating)	Air : 150 pF, 330Ω, ± 15 KV Contact : 150 pF, 330Ω, ± 8 KV Ta = 25°C , 60%RH,	Note 2

Notes :

1. The fixture must be hard enough , so that the module would not be twisted or bent.
2. Self- recovery and restart recovery is allowed. No hardware failures.

[illegible]