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TITLE : NV173FHM-NY1

Product Specification

Rev. P1

BOE Optoelectronics Technology Co., Ltd

SPEC. NUMBER	PRODUCT GROUP	Rev.	ISSUE DATE	PAGE
	TFT-LCD	P1	2019.2.20	1 OF 35

B2014-Q011-O (1/3)

A4(210 X 297)

BOE	PRODUCT GROUP		REV	ISSUE DATE
	Customer Spec		Rev. P0	2019.02.20

REVISION HISTORY

(√) Preliminary Specification
() Final Specification

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P0	35	Preliminary Release	2018.12.16	Li Junhao
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SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (2/3)	NV173FHM-NY1 Product Specification Rev. P0	2 OF 35

B2014-Q011-O (2/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

Contents

No.	Items	Page
1.0	General Description	4
2.0	Absolute Maximum Ratings	6
3.0	Electrical Specifications	7
4.0	Optical Specifications	10
5.0	Interface Connection	15
6.0	Signal Timing Specification	20
7.0	Input Signals, Display Colors & Gray Scale of Colors	22
8.0	Power Sequence	23
9.0	Connector Description	24
10.0	Mechanical Characteristics	25
11.0	Reliability Test	26
12.0	Handling & Cautions	26
13.0	Label	27
14.0	Packing Information	29
15.0	Mechanical Outline Dimension	30
16.0	EDID Table	32

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	3 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

1.0 GENERAL DESCRIPTION

1.1 Introduction

NV173FHM-NY1 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 17.3 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 16.7M(8bit) colors and color gamut 72%. The TFT-LCD panel used for this module is a low reflection and higher color type. Therefore, this module is suitable for Notebook PC. The LED driver for back-light driving is built in this model.

All input signals are eDP1.4 interface compatible.

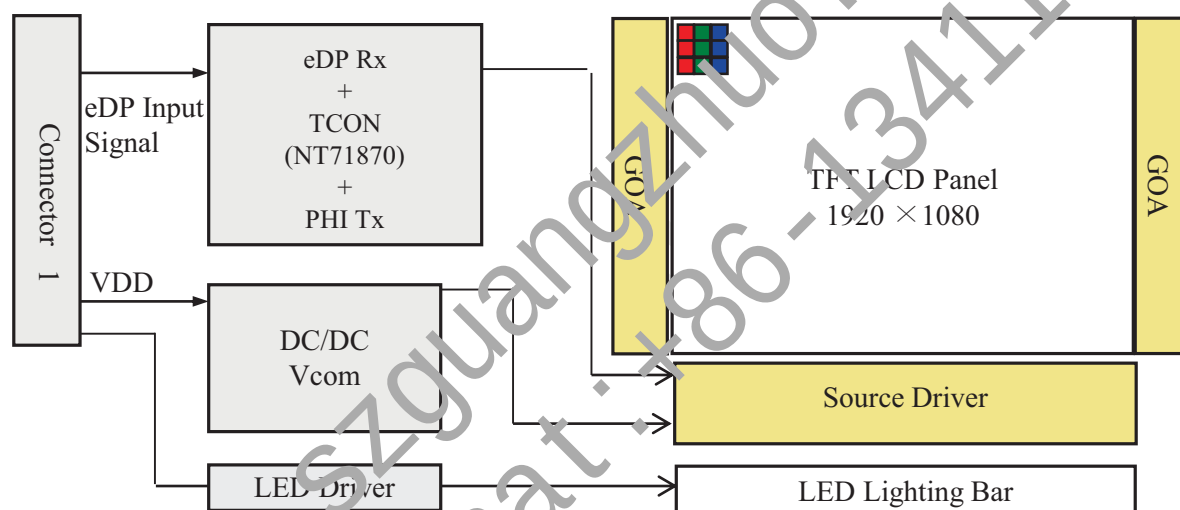


Figure 1. Drive Architecture

1.2 Features

- 4 lane eDP interface with 5.4 Gbps link rates
- Thin and light weight
- 16.7M(8bit) color depth, color gamut 72%
- Single LED lighting bar (Bottom side/Horizontal Direction)
- Data enable signal mode
- Side mounting frame
- Green product (RoHS & Halogen free product)
- On board LED driving circuit
- On board EDID chip

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	4 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

1.3 Application

- Notebook PC (Wide type)

1.4 General Specification

The followings are general specifications at the model NV173FHM-NY1 (listed in Table 1)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	381.888(H) × 214.812(V)	mm	
Number of pixels	1920 (H) × 1080 (V)	pixels	
Pixel pitch	198.9(H) × 198.9(V)	um	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M(8bit)		
Color gamut	72%typ./67%min.	NTSC	
Display mode	Normally Black		
Dimensional outline	389.888(H)*238.012(V) (Typ W/PCB)*3.5(Max)	mm	
Weight	550(max)	g	
Surface treatment	AG		
Surface hardness	3H		
Back-light	Bottom edge side, 1-LED lighting bar type		Note 1
Power consumption	P _D : 1.8 (Max without overdrive)	W	@Mosaic
	P _{BL} : 6.73(Max.)	W	
	P _{Total} : 8.53(Max.)	W	@Mosaic

Notes : 1. LED Lighting Bar (72*LED Array)

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	5 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

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 2.

< Table 2. Absolute Maximum Ratings>

Ta=25+/-2℃

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	-0.3	5.5	V	Note 1
Logic Supply Voltage	V _{IN}	V _{SS} -0.3	V _{DD} +0.3	V	
Operating Temperature	T _{OP}	0	+50	℃	Note 2
Storage Temperature	T _{ST}	-20	+60	℃	

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.

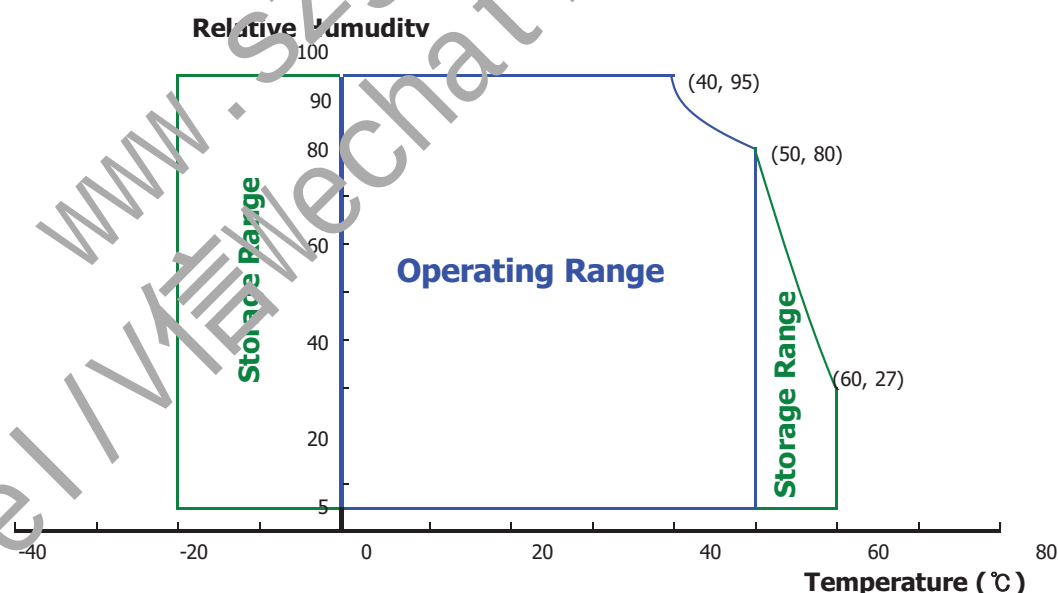


Figure 2. Temperature and Relative Humidity Range

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	6 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. 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}	-	-	200	mV	@ V _{DD} = 3.3V
Power Supply Current	I _{DD}	-	546	1361	mA	Note 1
Power Supply Inrush Current	Inrush	-	-	5	A	Note3
Power Consumption	P _D	-	1.8	4.9	W	Note 1
	P _{BI}	-	-	6.73	W	Note 2
	P _{total}	-	8.53	-	W	Note 1

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.

a) Typ : Mosaic pattern 8*8

b) Max : HI Line 255 pattern



Figure 3. Power Measure Patterns

2. Calculated value for reference (V_{LED} × I_{LED})

3. Measure condition (Figure 4)

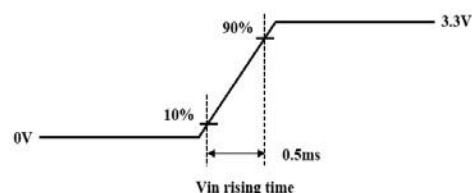


Figure 4. Inrush Measure Condition

SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (3/3)	NV173FHM-NY1 Product Specification Rev. P0	OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

3.2 Backlight Unit

< Table 4. LED Driving Guideline Specifications >

Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage		V _F	-	-	3.2	V
LED Forward Current		I _F	-	25	-	mA
LED Power Consumption		P _{LED}	-	-	6.73	W
LED Life-Time		N/A	15,000	-	-	Hour
Power Supply Voltage for LED Driver		V _{LED}	5	12	21	V
Power Supply Voltage for LED Driver Inrush		I _{led inrush}	-	-	2	A
EN Control Level	Backlight On		2.5	-	5.0	V
	Backlight Off		0	-	0.6	V
PWM Control Level	High Level		2.5	-	5.0	V
	Low Level		0	-	0.6	V
PWM Control Frequency		F _{PWM}	200	-	10,000	Hz
Duty Ratio			1	-	100	%

Notes :

1. Power supply voltage 12V for LED driver.

Calculator value for reference $I_F \times V_F \times 72 / \text{driver efficiency} = P_{LED}$

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 1KHz.

4. Measure condition (Figure 5)

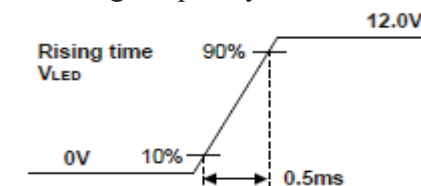


Figure 5. Inrush Measure Condition

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	8 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

3.3 LED Structure

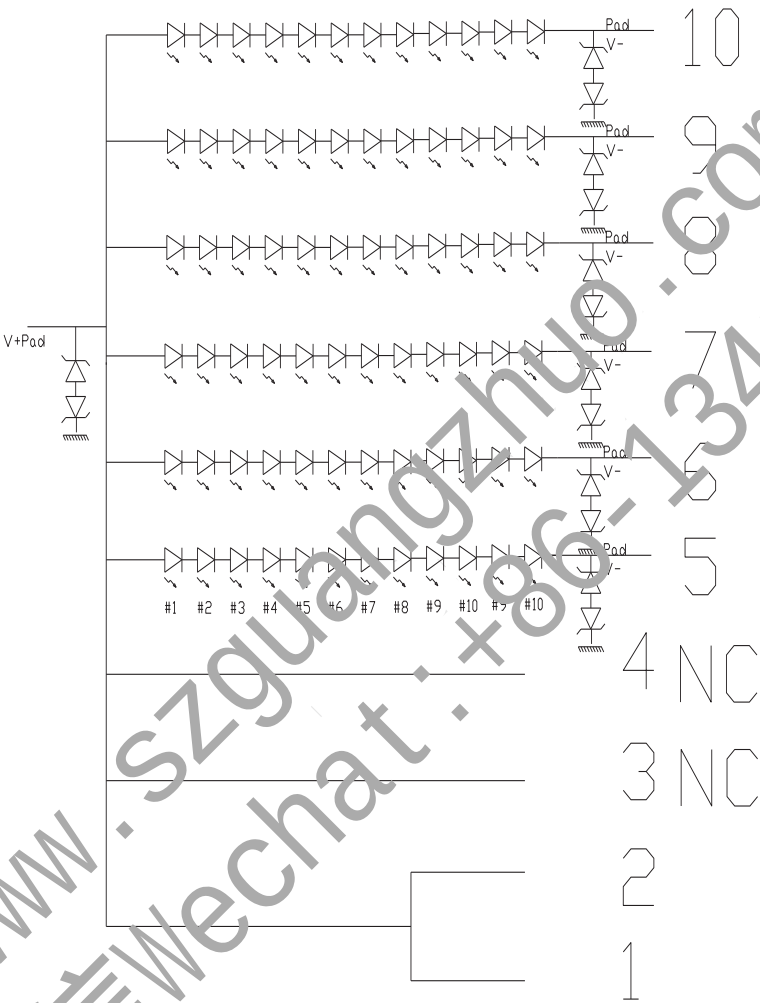


Figure 6. LED Structure

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	9 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

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 (Goniometer system and TOPCON BM-5) 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 5. 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	$\Theta = 0^\circ$	900	1200	-		Note 2
Luminance of White	5 Points	Y_w	$\Theta = 0^\circ$ $I_{LED} = 25mA$	255	300	-	cd/m ²	Note 3
White Luminance Uniformity	5 Points	ΔY_5		80	-	-		Note 4
	13 Points	ΔY_{13}		63	-	-		
White Chromaticity		W_x	$\Theta = 0^\circ$	0.283	0.313	0.343		Note 5
		W_y		0.299	0.329	0.359		
Reproduction of Color	Red	R_x	$\Theta = 0^\circ$	Typ. -0.03	0.643	Typ. +0.03		
		R_y			0.330			
	Green	G_x			0.300			
		G_y			0.602			
	Blue	B_x			0.149			
		B_y			0.058			
Color Gamut				67	72	-	%	
Response Time		T_{RT}	$T_a = 25^\circ C$ $\Theta = 0^\circ$	-	16(W/O OD)	25(W/O OD)	ms	Note 6
		GTG avg	$T_a = 25^\circ C$ $\Theta = 0^\circ$	-	15(W/O OD)	20 (W/O OD)	ms	
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2.0	%	Note 7

SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (3/3)	NV173FHM-NY1 Product Specification Rev. P0	10 OF 35

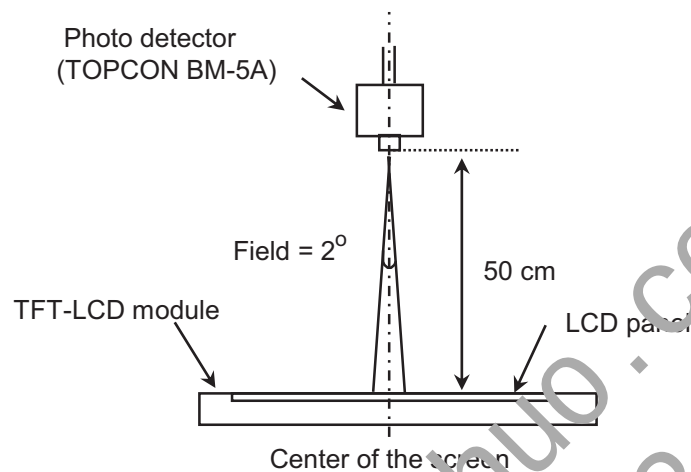
B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20
Notes : - 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 7). - 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 7) Luminance Contrast Ratio (CR) is defined mathematically. $CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$ - Center Luminance of white is defined as luminance values of 5 point average 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 8 for a total of the measurements per display. - The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 5(or 13) points} / \text{Maximum Luminance of 5(or 13) points.}$(see Figure 8 and Figure 9). - The color chromaticity coordinates specified in Table 5 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. - The electro-optical response time measurements shall be made as Figure 10 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 90% to 10% is T_r, and 10% to 90% is T_f. - 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 11).			
SPEC. NUMBER	SPEC. TITLE	PAGE	
	NV173FHM-NY1 Product Specification Rev. P0	11 OF 35	

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

4.3 Optical Measurements



Optical characteristics measurement setup

Figure 7. Measurement Set Up

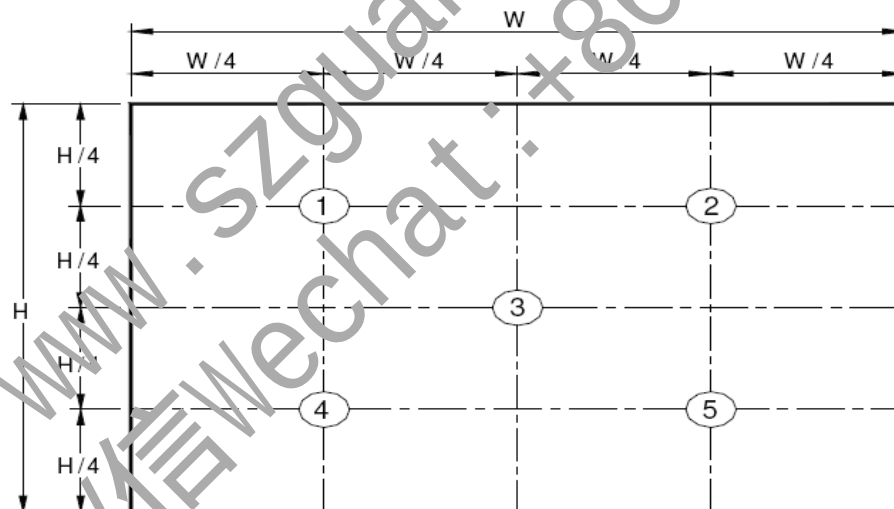


Figure 8. White Luminance and Uniformity Measurement Locations (5 points)

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.

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	12 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

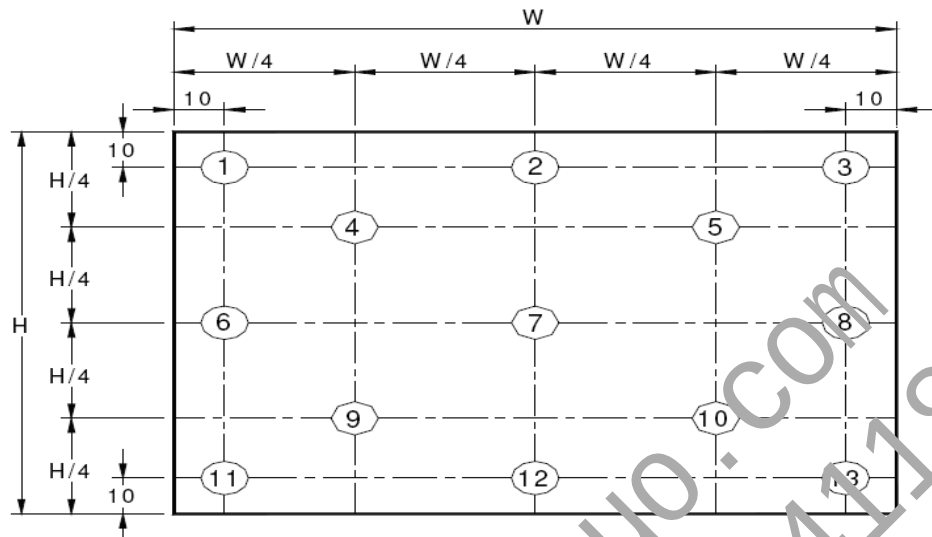


Figure 9. Uniformity Measurement Locations (13 points)

The White luminance uniformity on LCD surface is then expressed as : $\Delta Y5$ = Minimum Luminance of five points / Maximum Luminance of five points (see Figure 8), $\Delta Y13$ = Minimum Luminance of 13 points / Maximum Luminance of 13 points (see Figure 9).

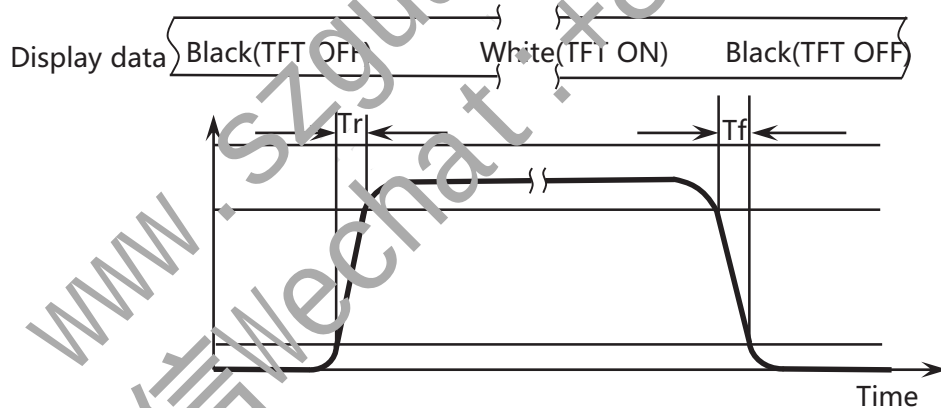


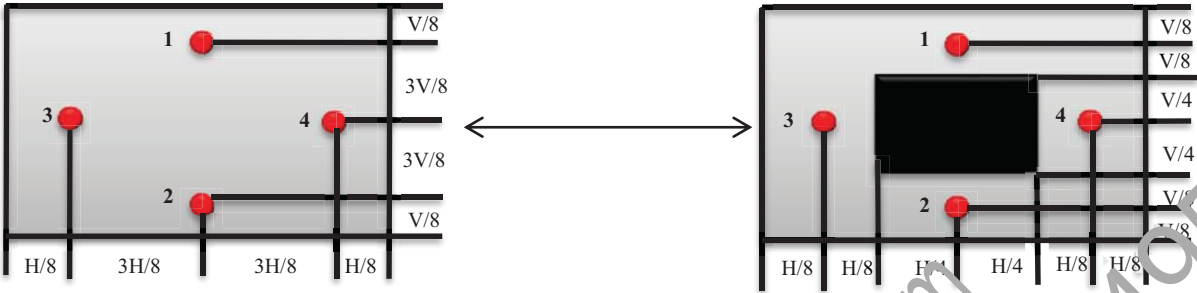
Figure 10. Response Time Testing

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

The test system : Goniometer system and TOPCON BM-5

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	13 OF 35

	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20



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

Figure 11. 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)

The test system: Goniometer system and TOPCON BM-5

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	14 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

The electronics interface connector is MSAK24025P40.

The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	NC reserved	No Connection
2	H_GND	Ground
3	LANE3_N	eDP RX Channel 3 Negative
4	LANE3_P	eDP RX Channel 3 Positive
5	H_GND	Ground
6	LANE2_N	eDP RX Channel 2 Negative
7	LANE2_P	eDP RX Channel 2 Positive
8	H_GND	Ground
9	LANE1_N	eDP RX Channel 1 Negative
10	LANE1_P	eDP RX Channel 1 Positive
11	H_GND	Ground
12	LANE0_N	eDP RX Channel 0 Negative
13	LANE0_P	eDP RX Channel 0 Positive
14	H_GND	Ground
15	AUX_CH_P	eDP AUX CH Positive
16	AUX_CH_N	eDP AUX CH Negative
17	H_GND	Ground
18	LCD_VCC	Power Supply, 3.3V (Typ.)
19	LCD_VCC	Power Supply, 3.3V (Typ.)
20	LCD_VCC	Power Supply, 3.3V (Typ.)

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	15 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

The electronics interface connector is MSAK24025P40.

The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
21	LCD_VCC	Power Supply, 3.3V (Typ.)
22	LCD_Self_Test	No Connection
23	LCD_GND	Ground
24	LCD_GND	Ground
25	LCD_GND	Ground
26	LCD_GND	Ground
27	HPD	Hot Plug Detect Output
28	BL_GND	LED Ground
29	BL_GND	LED Ground
30	BL_GND	LED Ground
31	BL_GND	LED Ground
32	BL_Enable	LED Enable Pin(+3.3V Input)
33	NC	No Connection
34	NC	No Connection
35	NC	No Connection
36	BL_PWR	LED Power Supply 5V-21V
37	BL_PWR	LED Power Supply 5V-21V
38	BL_PWR	LED Power Supply 5V-21V
39	BL_PWR	LED Power Supply 5V-21V
40	NC	No Connection

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	16 OF 35

	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

5.2 eDP Interface

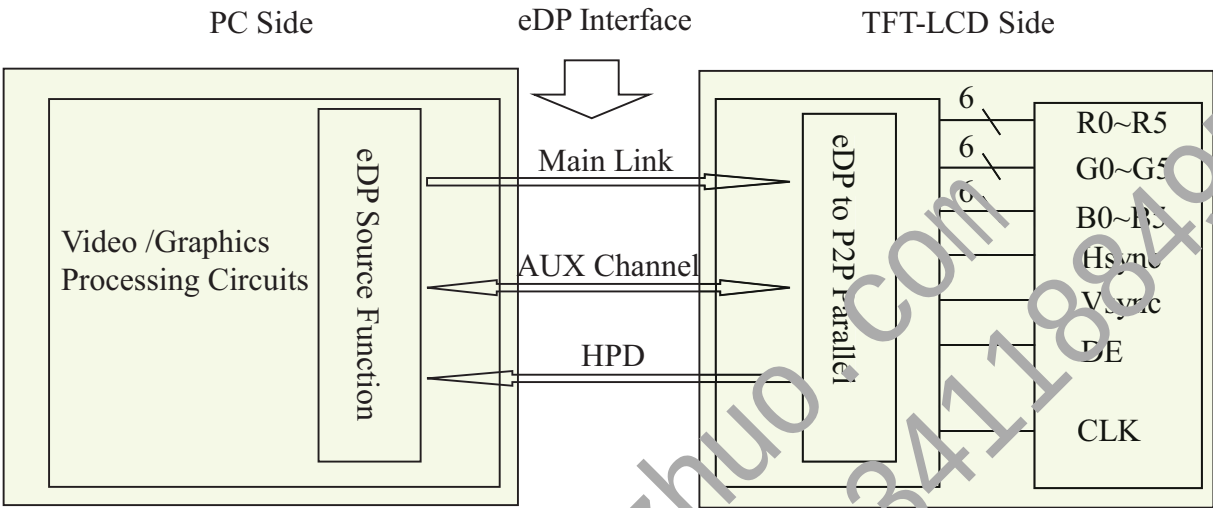


Figure 12. eDP Interface Architecture

Note:
Transmitter NT71870.
Transmitter is not contained in module.

5.3.eDP Input signal

Lane 0	Lane 1	Lane 2	Lane 3
R0-7:0	R1-7:0	R2-7:0	R3-7:0
G0-7:0	G1-7:0	G2-7:0	G3-7:0
B0-7:0	B1-7:0	B2-7:0	B3-7:0
R4-7:0	R5-7:0	R6-7:0	R7-7:0
G4-7:0	G5-7:0	G6-7:0	G7-7:0
B4-7:0	B5-7:0	B6-7:0	B7-7:0
R8-7:0	R9-7:0	R10-7:0	R11-7:0
G8-7:0	G9-7:0	G10-7:0	G11-7:0
B8-7:0	B9-7:0	B10-7:0	B11-7:0

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	17 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

5.3 Data Input Format

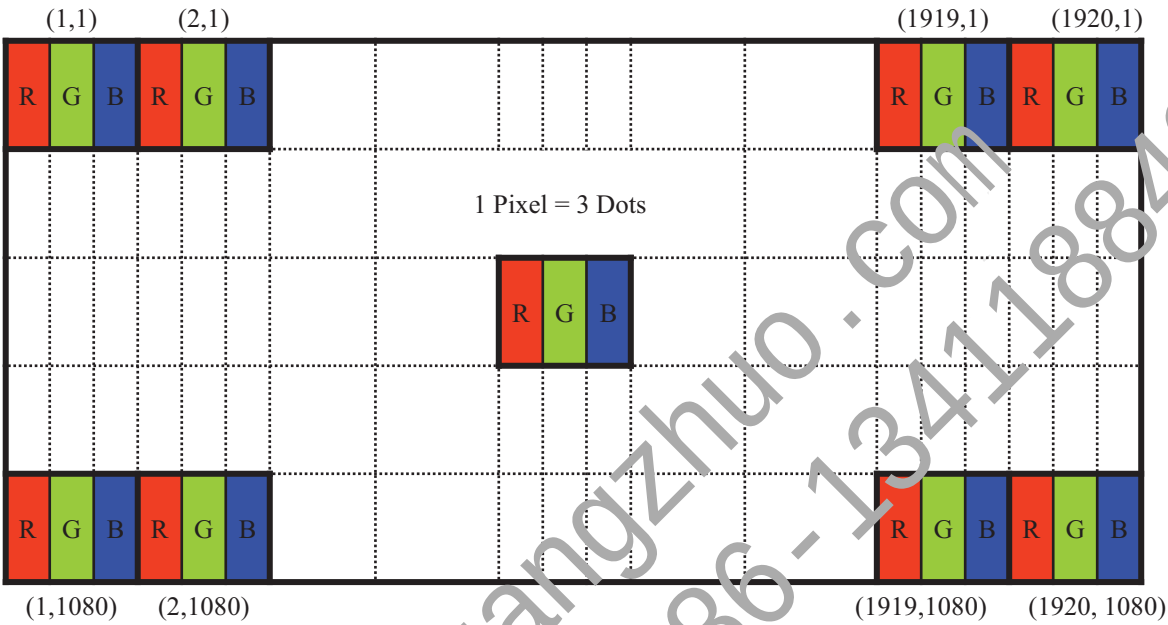


Figure 13 Display Position of Input Data (V-H)

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	18 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

5.4 Back-light & LCM Interface Connection

BLU Interface Connector: STM MSK24022P10.

<Table 7. Pin Assignments for the BLU Connector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LED	LED cathode connection	6	LED	LED cathode connection
2	LED	LED cathode connection	7	NC	No Connection
3	LED	LED cathode connection	8	NC	No Connection
4	LED	LED cathode connection	9	Vout	LED anode connection
5	LED	LED cathode connection	10	Vout	LED anode connection

SPEC. NUMBER

SPEC. TITLE

NV173FHM-NY1 Product Specification Rev. P0

PAGE

19 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

6.0 SIGNAL TIMING SPECIFICATION

6.1 The NV173FHM-NY1 Is Operated By The DE Only

< Table 8. Signal Timing Specification >

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc		357.4		MHz
Frame Period		Tv	2707	1128	1128	lines
			60	144	144	Hz
			16.7	6.94	6.94	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	-	2220	-	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

Note : The above is as optimized setting.

SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (3/3)	NV173FHM-NY1 Product Specification Rev. P0	20 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

6.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 9.

<Table 9. eDP Main-Link RX TP4 Package Pin Parameters>

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock (Link clock down-spreading)	SSC	-0.5	-	0	%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	100	-	1200	mV	
Rx input DC common mode voltage	VRX_DC_CM	-	GND	-	V	
Differential termination resistance	RRX-DIFF	80	-	120	Ω	
Single-ended termination resistance	RRX-SE	40	-	60	Ω	
Rx short circuit current limit	IRX_SHORT	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_INTRA_PAIR	-	-	60	ps	

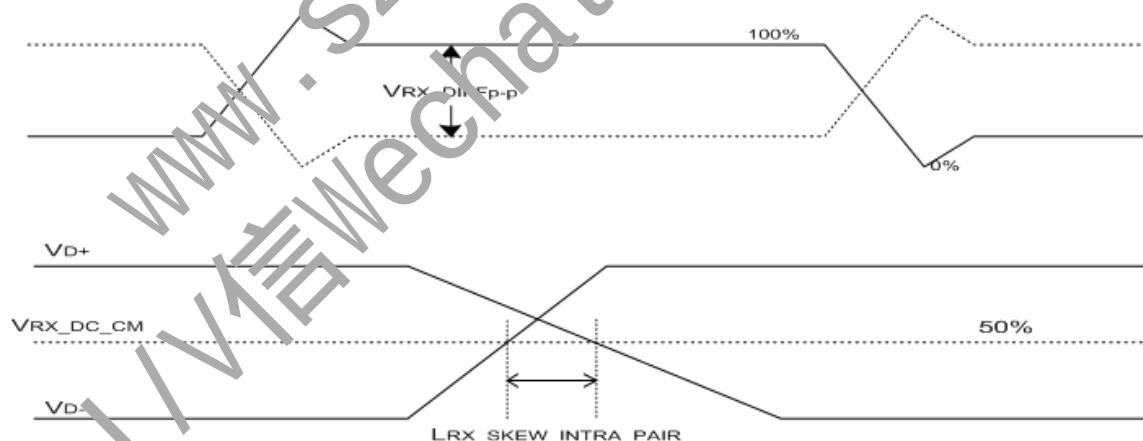


Figure 14. VRX-DIFFp-p & LRX_SKEW_INTRA_PAIR

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	21 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

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

<Table 10. Input Signal & Basic Display Colors & Gray Scale of Colors >

	Colors & Gray scale	Data signal																	
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic colors	Black	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	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Light Blue	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray scale of Red	Black	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	0
	Darker	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	▽	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	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	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	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	1	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray scale of White & Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1
	▽	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	22 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

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.

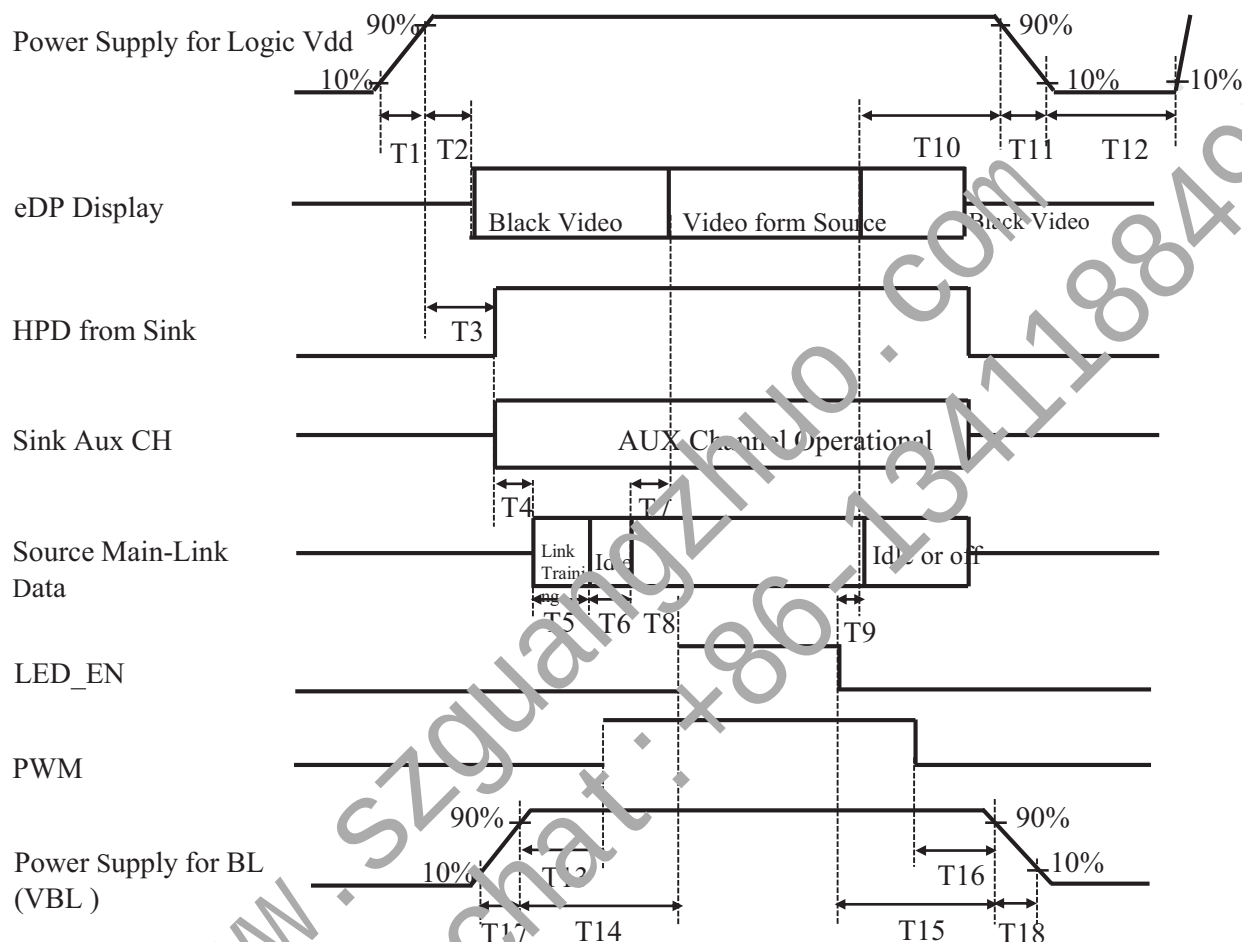


Figure 15. Power Sequence

- $0.5\text{ms} \leq T1 \leq 10\text{ms}$
- $0\text{ms} < T2 \leq 200\text{ms}$
- $0\text{ms} < T3 \leq 20\text{ms}$
- $T3+T4+T5+T6+T8 > 200\text{ms}$
- $0\text{ms} < T7 \leq 50\text{ms}$
- $50\text{ms} < T8$
- $0\text{ms} < T9$
- $0\text{ms} < T10 < 500\text{ms}$
- $0.5\text{ms} \leq T11 \leq 10\text{ms}$
- $500\text{ms} \leq T12$
- $0\text{ms} < T13$
- $0\text{ms} < T14$
- $0\text{ms} < T15$
- $0\text{ms} < T16$
- $0.5\text{ms} \leq T17$
- $0.5\text{ms} \leq T18$

Notes

- When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
- 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.

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	23 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

9.0 Connector Description

Physical interface is described as for the connector on LCM.

These connectors are capable of accommodating the following signals and will be following components.

9.1 TFT LCD Module

< Table 11. Signal Connector >

Connector Name /Description	For Signal Connector
Manufacturer	STM
Type/ Part Number	MSAK2402SP40
Mating housing/ Part Number	IPEX 20455-040E

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	24 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

Figure 20 shows mechanical outlines for the model NV173FHM-NY1.
Other parameters are shown in Table 12.

<Table 12. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	381.888 (H) × 214.812 (V)	mm
Number of pixels	1920 (H) X 1080 (V) (1 pixel = R + G + B dots)	pixels
Pixel pitch	198.9 (H) × 198.9 (V)	um
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7 M(8bit)	
Display mode	Normally Black	
Dimensional outline	389.888(H)*238.012(V) (W/PCB)*3.5(Max)	mm
Weight	550(max)	g

10.2 Mounting

See Figure 20.

10.3 Glare and Polarizer Hardness

The surface of the LCD has an AG coating to maximize readability and hard coating to reduce scratching.

10.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 30cm from the screen with an overhead light level of 100lux.

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	25 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

11.0 RELIABILITY TEST

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

<Table 13. Reliability Test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 60°C , 240 hrs
2	Low temperature storage test	Ta = -20°C , 240 hrs
3	High temperature & high humidity operation test	Ta = 50°C , 80%RH, 240 hrs
4	High temperature operation test	Ta = 50°C , 240 hrs
5	Low temperature operation test	Ta = -10°C , 240 hrs
6	Thermal shock	Ta = -20 °C → 60 °C (0.5 hr), 100 cycle
7	Vibration test (non-operating)	Ta = 25°C , 1.47G, 1~200Hz, Half Sine X,Y,Z / Sweep rate: 1 hour
8	Shock test (non-operating)	Ta = 25°C , 220G Half Sine Wave 2hr set ± X, ± Y, ± Z Once for each direction
9	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV

12.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module

- Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation

- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	26 OF 35

B2014-Q011-O (3/3)

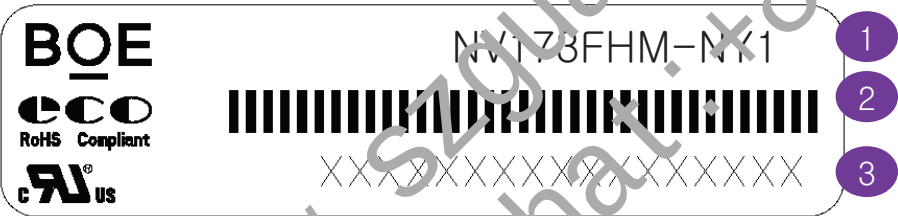
A4(210 X 297)

	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

- (4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
 - Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.
- (5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
 - Applying fixed pattern for a long time may cause image sticking.
- (6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
 - Do not re-adjust variable resistor or switch etc.
 - When returning the module for repair or etc. Please pack the module not to be broken. We recommend to use the original shipping packages.

13.0 LABEL

(1) Product Label



Label Size: 48mm × 12mm
物料号: 44-9231007
1. FG-CODE
2. MDL ID 条形码
3. MDL ID

Module ID Naming Rule. Figure 16. Product Label

<Table 14. Module ID Naming Rule>

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	4	A	P	3	1	2	7	3	9	4	0	0	0	1	E	E	J
描述	GBN代码		等级	B3	年份		月	FG Code后四位				序列号					
SPEC. NUMBER			SPEC. TITLE												PAGE		
			NV173FHM-NY1 Product Specification Rev. P0												27 OF 35		

	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

(2) Box Label

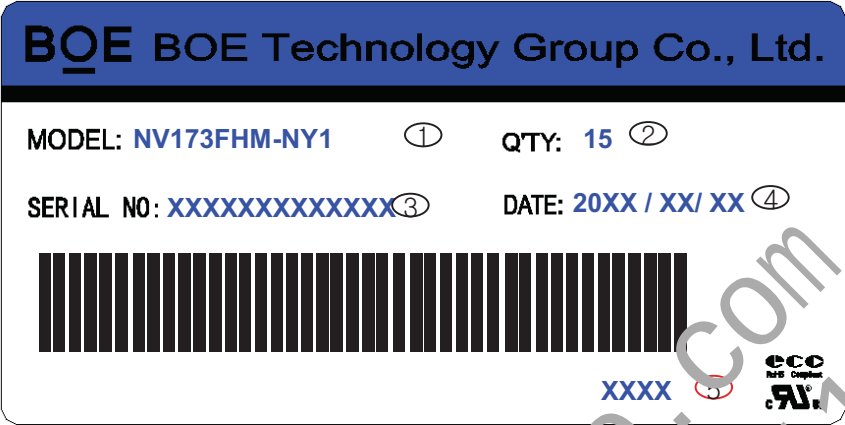


Figure 17. Box Label

Serial number marked part needs to print, show as follows:

1. FG-CODE(First 12 bit)
2. Product quantity
3. Box ID
4. Date
5. The client section material number(the client)
6. FG-Code Last four bit

Total Size:115×55mm

< Table 15. Box Label Naming Rule >

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13
代码	X	X	3	3	1	5	B	0	0	0	1	H	D
描述	GBN代码		等级	B3	年份		月	Rev	序列号				

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	28 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

14.0 PACKING INFORMATION

14.1 Packing Order

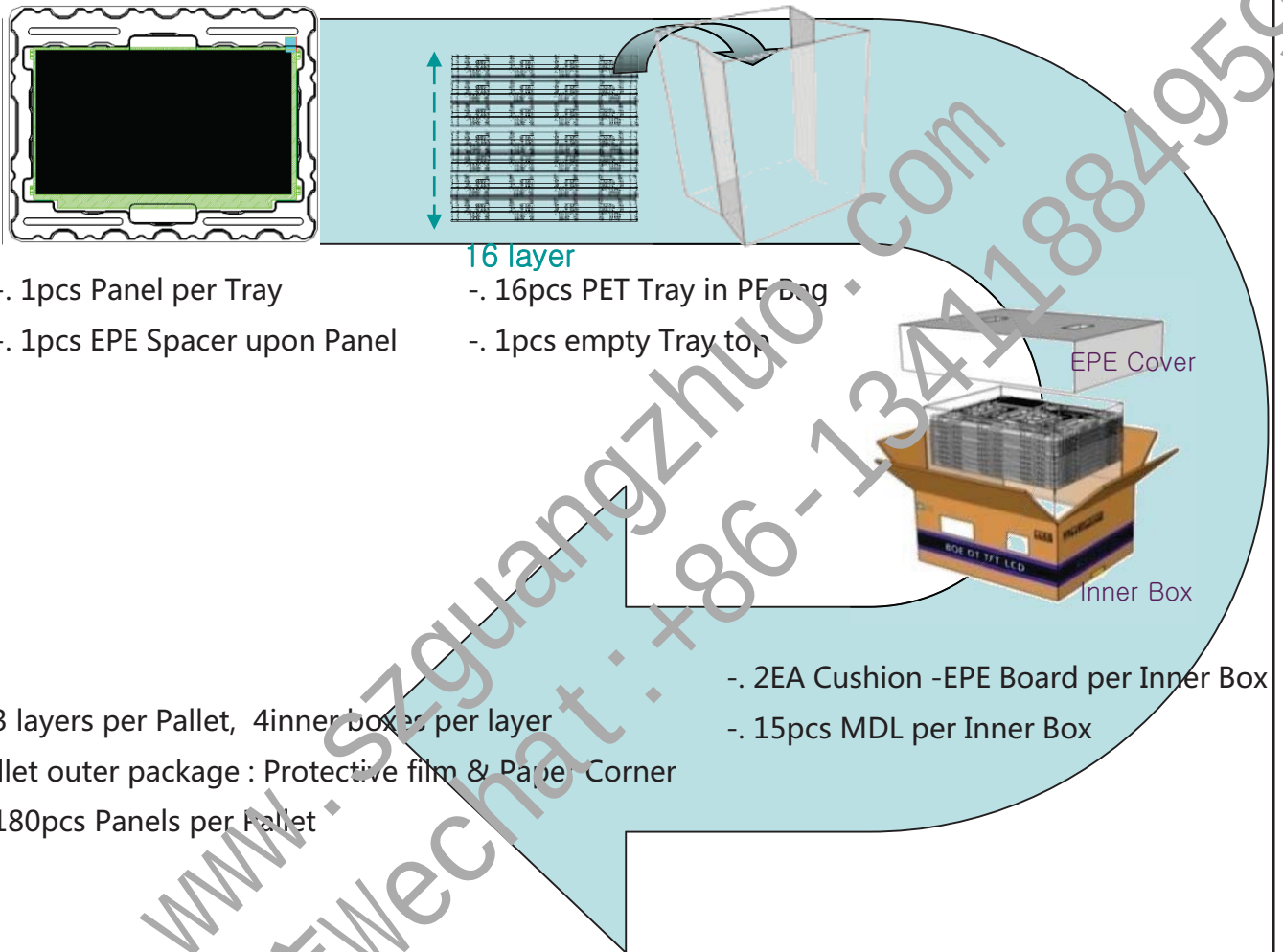


Figure 18. Packing Order

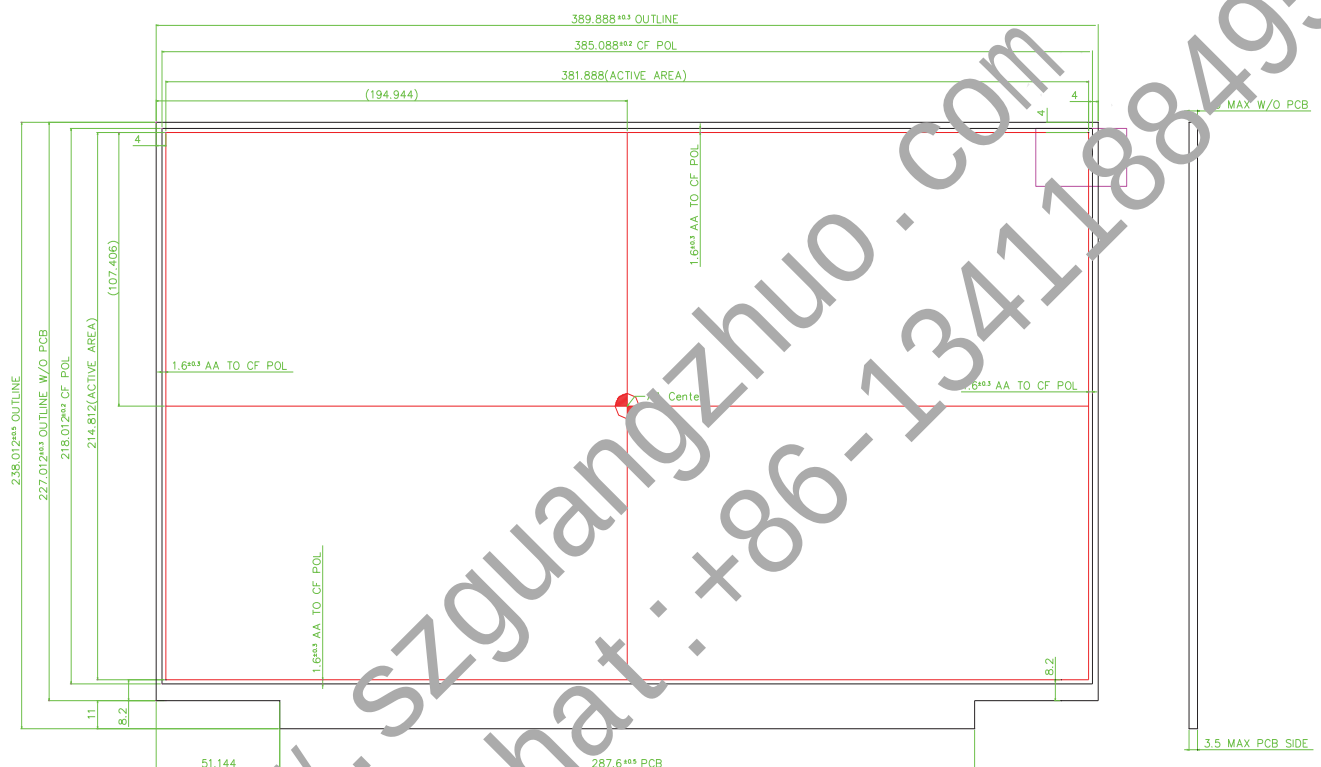
14.2 Note

- Box dimension: 470mm*360mm*318mm
- Package quantity in one box: 30pcs
- Total weight:

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	29 OF 35

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

15.0 MECHANICAL OUTLINE DIMENSION



Notes: .
1. LCD Warps: 0.6mm MAX

Figure 19. TFT-LCD Module Outline Dimension (Front View)

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	30 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

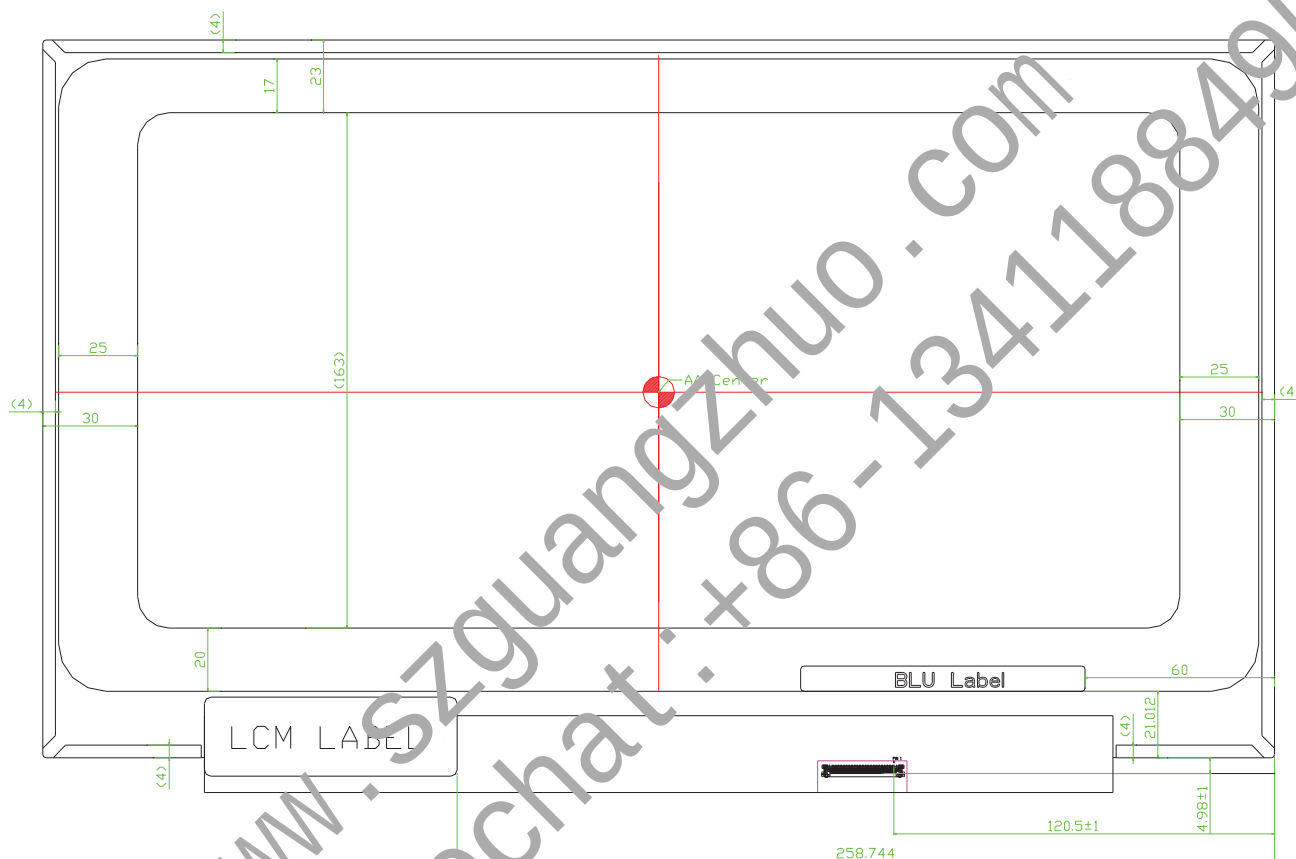


Figure 20. TFT-LCD Module Outline Dimensions (Rear view)

SPEC. NUMBER	SPEC. TITLE	PAGE
	NV173FHM-NY1 Product Specification Rev. P0	31 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

16.0 EDID Table

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
00	Header	00	0		0	EDID Header
01		FF	255		255	
02		FF	255		255	
03		FF	255		255	
04		FF	255		255	
05		FF	255		255	
06		FF	255		255	
07		00	0		0	
08	ID Manufacturer Name	09	9		BOE	ID = BOE
09		E5	229			
0A	ID Product Code	56	86		2134	ID = 2134
0B		08	8			
0C	32-bit serial No.	00	0			
0D		00	0			
0E		00	0			
0F		00	0			
10	Week of manufacture	01	1		1	
11	Year of Manufacture	1C	28		2018	Manufactured in 2018
12	EDID Structure Ver.	01	1		1	EDID Ver 1.0
13	EDID revision #	04	4		4	EDID Rev. 0.4
14	Video input definition	A5	165		-	
15	Max H image size	26	38		38	38 cm (Approx)
16	Max V image size	15	21		21	21 cm (Approx)
17	Display Gamma	78	120		2.2	Gamma curve = 2.2
18	Feature support	02	2		-	RGB display, Preferred Timming mode
19	Red/Green low bits	9C	156		-	Red / Green Low Bits
1A	Blue/White low bits	30	48		-	Blue / White Low Bits
1B	Red x high bits	A4	164	658	0.643	Red (x) = 10100100 (0.643)
1C	Red y high bits	34	84	337	0.330	Red (y) = 01010100 (0.33)
1D	Green x high bits	4C	76	307	0.300	Green (x) = 01001100 (0.3)
1E	Green y high bits	9A	154	616	0.602	Green (y) = 10011010 (0.602)
1F	Blue x high bits	26	38	152	0.149	Blue (x) = 00100110 (0.149)
20	Blue y high bits	0E	14	59	0.058	Blue (y) = 00001110 (0.058)
21	White x high bits	50	80	320	0.313	White (x) = 01010000 (0.313)
22	White y high bits	54	84	336	0.329	White (y) = 01010100 (0.329)
23	Established timing 1	00	0		-	
24	Established timing 2	00	0		-	
25	Established timing 3	00	0		-	

SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (3/3)	NV173FHM-NY1 Product Specification Rev. P0	32 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE		PRODUCT GROUP				REV	ISSUE DATE
		Customer Spec				Rev. P0	2019.02.20
26	Standard timing #1	01	1			Not Used	
27		01	1				
28	Standard timing #2	01	1			Not Used	
29		01	1				
2A	Standard timing #3	01	1			Not Used	
2B		01	1				
2C	Standard timing #4	01	1			Not Used	
2D		01	1				
2E	Standard timing #5	01	1			Not Used	
2F		01	1				
30	Standard timing #6	01	1			Not Used	
31		01	1				
32	Standard timing #7	01	1			Not Used	
33		01	1				
34	Standard timing #8	01	1			Not Used	
35		01	1				
36	Detailed timing/monitor descriptor #1	97	151		357.4	357.35MHz Main clock	
37		8B	139				
38		80	128		1920	Hor Active = 1920	
39		18	24		280	Hor Blanking = 280	
3A		71	113		-	4 bits of Hor. Active + 4 bits of Hor. Blanking	
3B		38	56		1080	Ver Active = 1080	
3C		30	48		48	Ver Blanking = 48	
3D		40	6		-	4 bits of Ver. Active + 4 bits of Ver. Blanking	
3E		6C	108		108	Hor Sync Offset = 108	
3F		30	48		48	H Sync Pulse Width = 48	
40		AA	170		10	V sync Offset = 10 line	
41		00	0		10	V Sync Pulse width : 10 line	
42		7E	126		382	Horizontal Image Size = 382 mm (Low 8 bits)	
43		D7	215		215	Vertical Image Size = 215 mm (Low 8 bits)	
44		10	16		-	4 bits of Hor Image Size + 4 bits of Ver Image Size	
45		00	0		0	Hor Border (pixels)	
46		00	0		0	Vertical Border (Lines)	
47	1A	26		-	Refer to right table		
SPEC. NUMBER		SPEC. TITLE					PAGE
		NV173FHM-NY1 Product Specification Rev. P0					33 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE		PRODUCT GROUP				REV	ISSUE DATE
		Customer Spec				Rev. P0	2019.02.20
48	Detailed timing/monitor descriptor #2	9C	156		357.4	357.4MHz Main clock	
49		8B	139				
4A		80	128		1920	Hor Active = 1920	
4B		18	24		280	Hor Blanking = 280	
4C		71	113		-	4 bits of Hor. Active + 4 bits of Hor. Blanking	
4D		38	56		1080	Ver Active = 1080	
4E		5B	91		1627	Ver Blanking = 1627	
4F		46	70		-	4 bits of Ver. Active + 4 bits of Ver. Blanking	
50		6C	108		108	Hor Sync Offset = 108	
51		30	48		48	H Sync Pulse Width = 48	
52		AA	170		10	V sync Offset = 10 line	
53		00	0		10	V Sync Pulse width : 10 line	
54		7E	126		382	Horizontal Image Size = 382 mm (Low 8 bits)	
55		D7	215		215	Vertical Image Size = 215 mm (Low 8 bits)	
56		10	16		-	4 bits of Hor Image Size + 4 bits of Ver Image Size	
57		00	0		0	Hor Border (pixels)	
58		00	0		0	Vertical Border (Lines)	
59		1A	26		-		
5A	Detailed timing/monitor descriptor #3	00	0		ASCII Data Sting Tag		
5B		00	0				
5C		00	0				
5D		FF	254				
5E		00	0				
5F		42	66		B	Manufacture name : BOEHF	
60		4F	72		O		
61		45	69		E		
62		20	32				
63		48	72		H		
64		46	70		F		
65		0A	10				
66		20	32				
67		20	32				
68	20	32					
69	20	32					
6A	20	32					
6B	20	32					
SPEC. NUMBER		SPEC. TITLE					PAGE
		NV173FHM-NY1 Product Specification Rev. P0					34 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)

BOE	PRODUCT GROUP	REV	ISSUE DATE
	Customer Spec	Rev. P0	2019.02.20

6C	Detailed timing/monitor descriptor #4	00	0			Product Name Tag (ASCII)
6D		00	0			
6E		00	0			
6F		FE	254			
70		00	0			Model name : NV173FHM-NY1
71		4E	78		N	
72		56	86		V	
73		31	49		1	
74		37	55		7	
75		33	51		3	
76		46	70		F	
77		48	72		H	
78		4D	77		M	
79		2D	45			
7A		4E	78		N	
7B		59	89		V	
7C		31	49		1	
7D		0A	10			
7E	Extension flag	00	0			
7F	Checksum	D3	211	211		

SPEC. NUMBER	SPEC. TITLE	PAGE
B2014-Q011-O (3/3)	NV173FHM-NY1 Product Specification Rev. P0	35 OF 35

B2014-Q011-O (3/3)

A4(210 X 297)