NV126A1M-N52

Preliminary Product Specification

Rev. P0

HEFEI BOE OPTOELECTRONICS TECHNOLOGY CO.,LTD

REVISION HISTORY

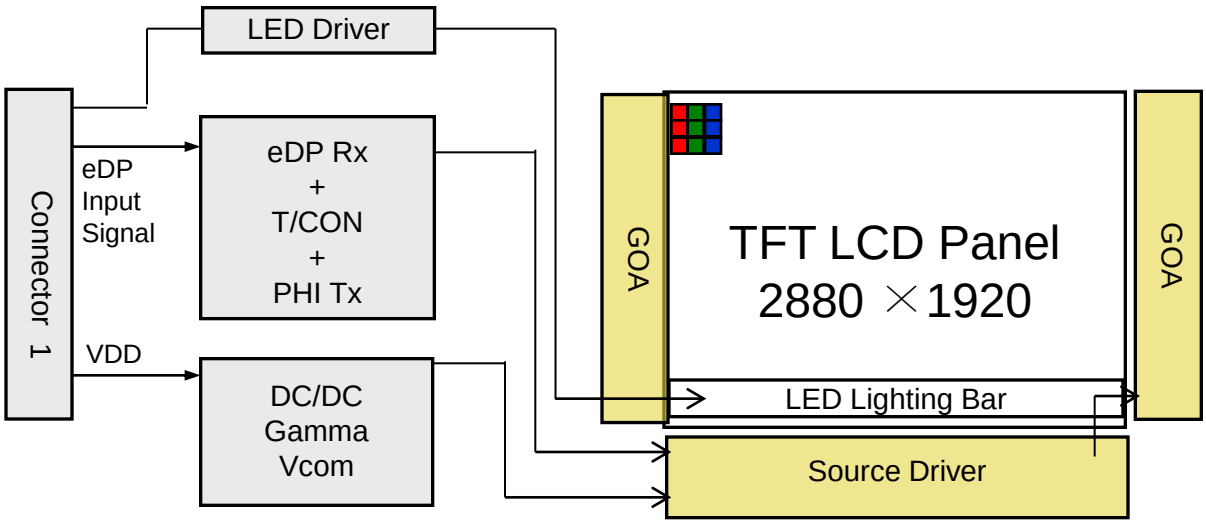
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2016.04.07	Liu Bin

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

NV126A1M-N52 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 12.6 inch diagonally measured active area with A1M resolutions (2880 horizontal by 1920 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 colors. The TFT-LCD panel used for this module is a 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 eDP1.3 interface compatible.



1.2 Features

- 4 lane eDP1.3 Interface with 5.4Gbps Link Rates
- Thin and light weight
- True 8bit, display 16.7M colors
- Single LED Lighting Bar. (Down side/Horizontal Direction)
- Thin Mounting frame
- Green Product (RoHS & Halogen free product)
- On board LED Driving circuit
- Low driving voltage and low power consumption
- On board EDID chip

1.3 Application

- Notebook PC (Wide type)

1.4 General Specification

The followings are general specifications at the model NV126A1M-N52. (listed in Table 1.)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	266.112(H) × 177.408(V)	mm	
Number of pixels	2880(H) × 1920(V)	pixels	
Pixel pitch	0.0924(H) × 0.0924(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	Colors	
Display mode	Normally Black（HADS）		
Outline dimension	271.2(H) × 187.752(V）	Mm	
Weight	152(typ.)156(max.)	G	
Surface treatment	Hard Coating		
Back-light	Lower Down side, 1-LED Lighting Bar type		Note 1
Power consumption	P_D : 1.595(max)	W	@mosaic
	P_{BL} : 4.3(max)	W	with driver
	P_{total} : 5.895(max)	W	

Notes : 1. LED Lighting Bar (60*LED Array)

2.0 ABSOLUTE MAXIMUM RATINGS

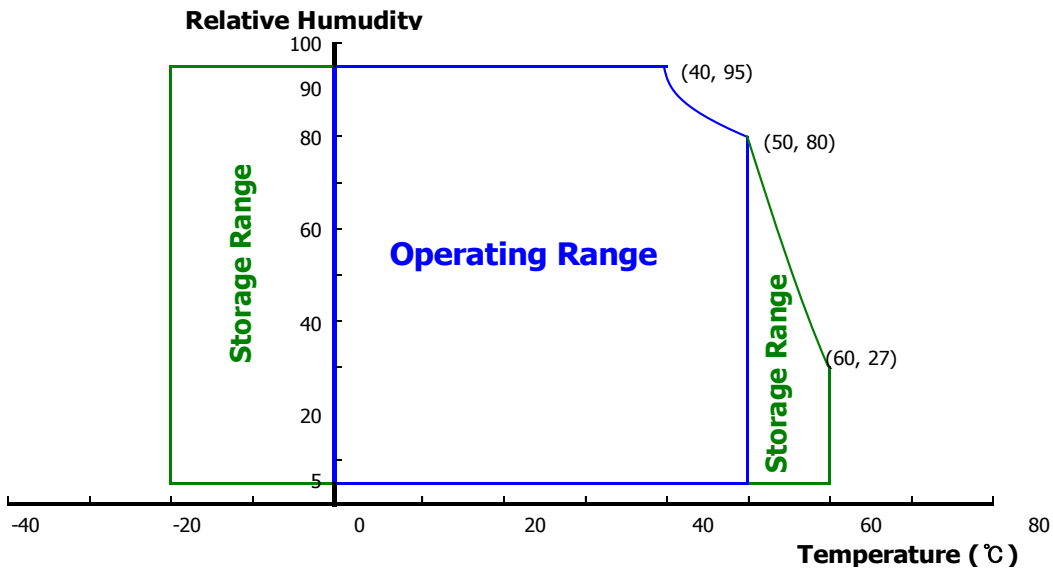
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings> Ta=25+/-2˚C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	4.0	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 ^{O}C ≥ Ta)
Maximum wet - bulb temperature at 39 ^{O}C or less. (Ta > 40 ^{O}C) No condensation.



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}	-	-	100	mV	At V_{DD} = 3.3V
Power Supply Current	I_{DD}	-	TBD	-	mA	Note 1
Differential Input Voltage	V_{ID}	100	200	-	mV	-
Power Consumption	P_D	-	-	1.595	W	Note 1
	P_{BL}	-	-	4.3	W	Note 2
	P_{total}	-	-	5.895	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℃.
a) Mosaic Pattern: 1.595(W) Max

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

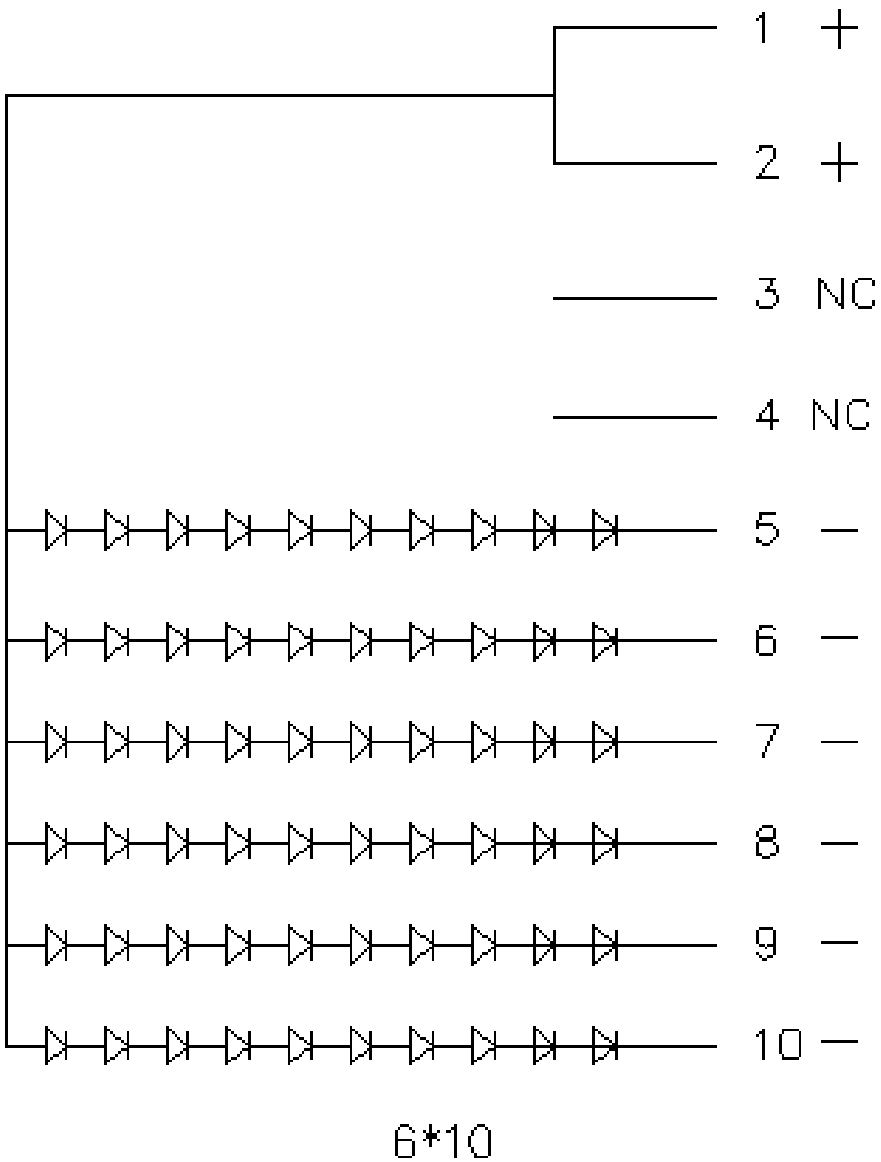
3.2 Backlight Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage		V_F	-	2.86	3.0	V	-
LED Forward Current		I_F	-	21	-	mA	-
LED Power Consumption		P_{LED}	-	-	4.3	W	Note 1
LED Life-Time		N/A	15,000	-	-	Hour	I_F = 20mA
Power supply voltage for LED Driver		V_{LED}	4.2	-	24	V	-
EN Control Level	Backlight on	-	2	-	-	V	-
	Backlight off	-	-	-	0.8	V	-
PWM Control Level	PWM High Level	-	1.5	-	-	V	-
	PWM Low Level	-	-	-	0.6	V	-
PWM Control Frequency		F_{PWM}	200	-	25,000	Hz	-
Duty Ratio		-	1	-	100	%	Note3

Notes : 1. Power supply voltage 24V for LED Driver
Calculator Value for reference $I_F \times V_F \times 60/$ 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 for the frequency range from 200Hz to1KHz.

3.3 LED structure



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±2℃) 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 θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, 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+/- 0.3V at 25°C. Optimum viewing angle direction is 6 '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	Θ = 0°	900	1200	-	-	Note 2
Luminance of White	Center Point	Y_w	Θ = 0° I_{LED} = 20mA	400	450	-	cd/m²	Note 3
White Luminance uniformity	5 Points	ΔY5		80%	85%	-	-	Note 4
	13 Points	ΔY13		67%	72%	-	-	
White Chromaticity		x_w	Θ = 0°	-0.025	0.305	+0.025	-	Note 5
		y_w			0.320		-	
Reproduction of color	Red	x_R	Θ = 0°	-0.025	0.665	+0.025	-	-
		y_R			0.320		-	
	Green	x_G			0.270		-	
		y_G			0.660		-	
	Blue	x_B			0.150		-	
		y_B			0.070		-	
Gamut		-	Θ = 0°	80	85	-	%	NTSC
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	25	30	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	2.0	%	Note 7

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 1).

2. Contrast measurements shall be made at viewing angle of Θ= 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 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. Center Luminance of white pattern on 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 2 for a total of the measurements per display.

4. The White luminance uniformity on LCD surface is then expressed as : ΔY =Minimum Luminance of 5(or 13) points / Maximum Luminance of 5(or 13) points.
(see FIGURE 2 and FIGURE 3).

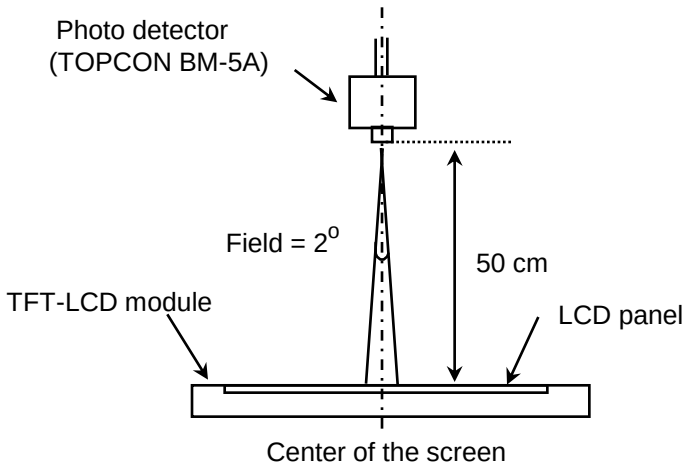
5. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

6. The electro-optical response time measurements shall be made as FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

7. 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 5).

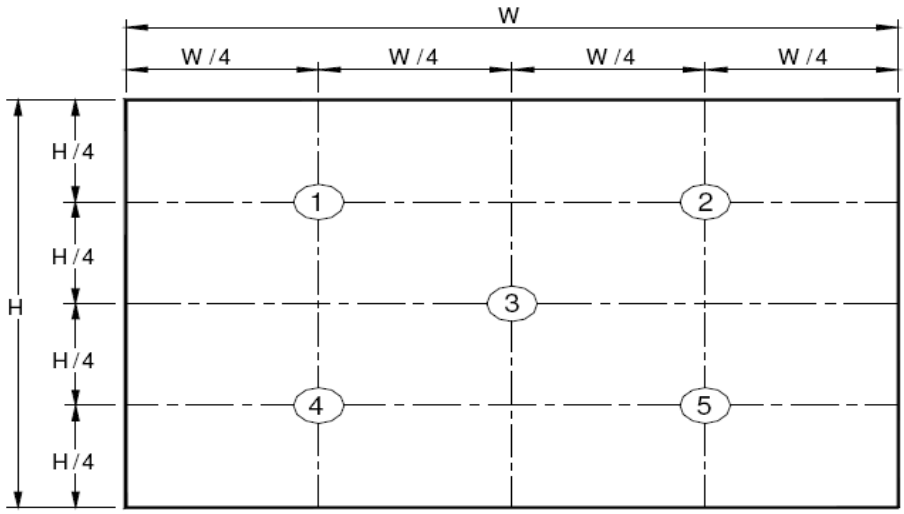
4.3 Optical measurements

Figure 1. Measurement Set Up



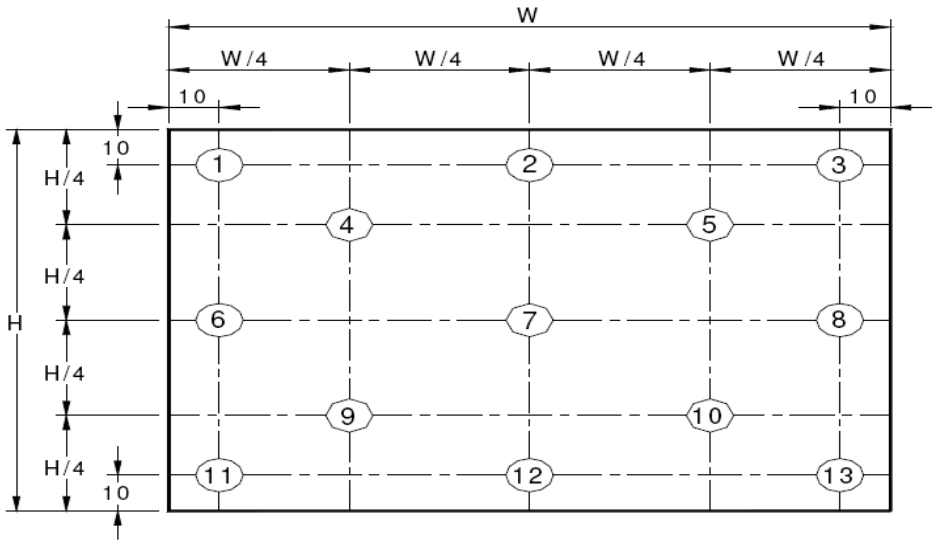
Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



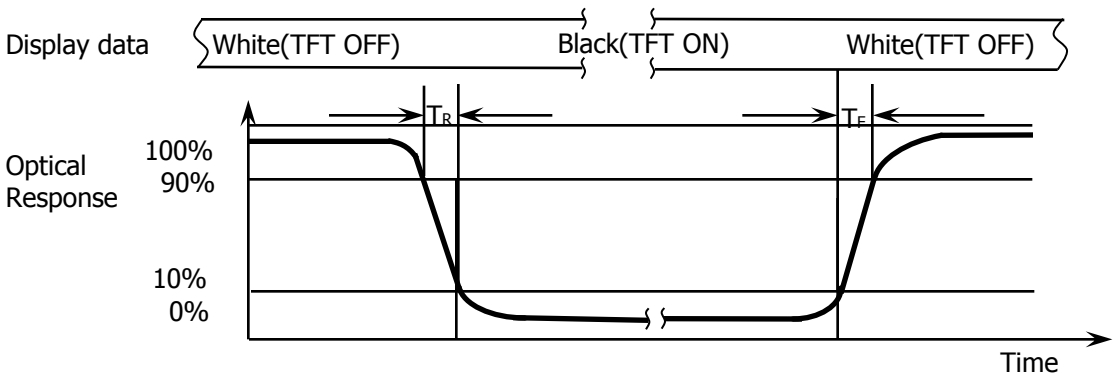
Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



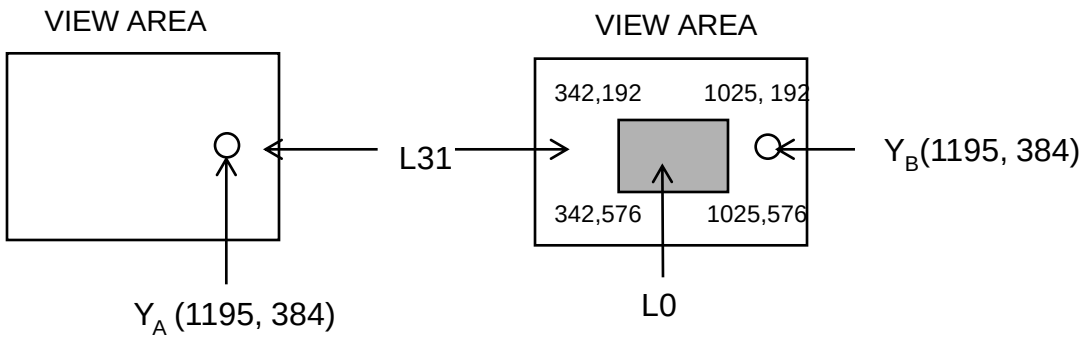
The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see FIGURE 2) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.

Figure 5. Cross Modulation Test Description



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

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns

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 (Refer to FIGURE 5).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

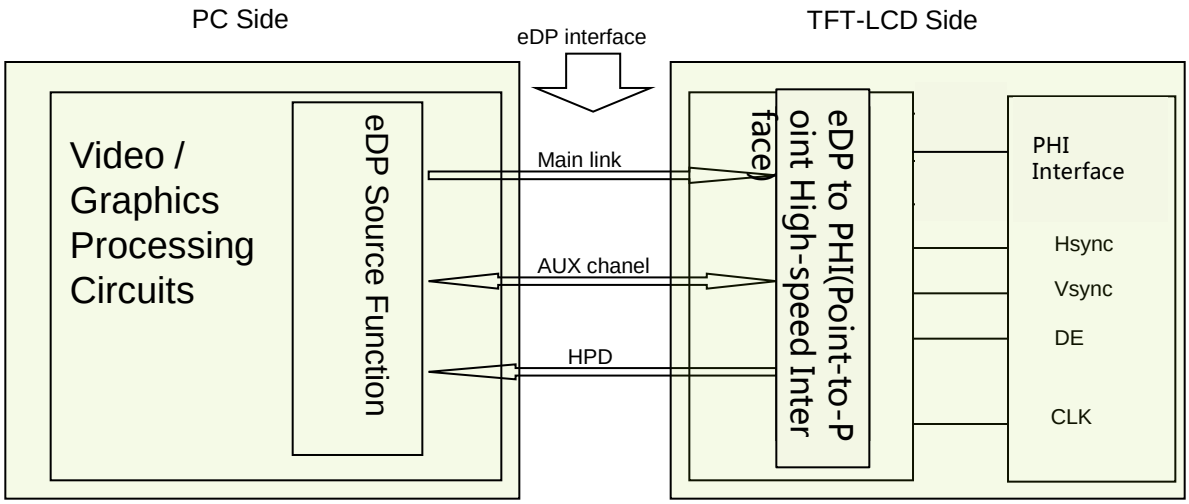
The electronics interface connector is IPEX 20718-051E-01

The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

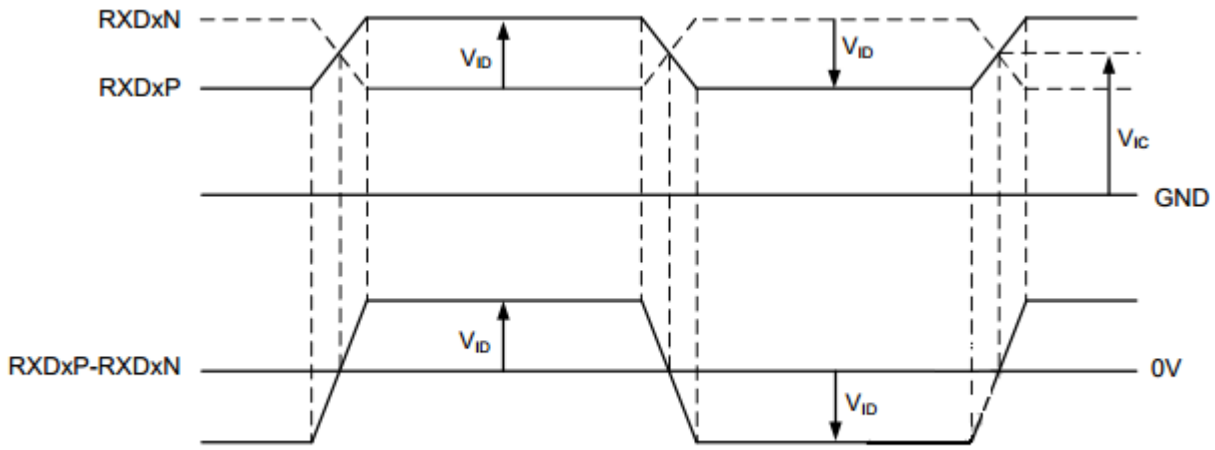
Terminal	Symbol	Functions	Terminal	Symbol	Functions
Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	27	ID	0-Novatek , 1-Himax
2	GND	Ground	28	GND	Panel self test enable
3	GND	Ground	29	GND	LCD Ground
4	DBC	Content Adaptive Brightness Control function	30	BL_ENABLE	LED enable pin(+3.3V Input)
5	H_GND	Ground	31	BL_PWM	System PWM Signal Input
6	Lane3_N	eDP RX channel 3 negative	32	NC	NC
7	Lane3_P	eDP RX channel 3 positive	33	NC	NC
8	H_GND	Ground	34	BL_PWR	LED Power Supply 5V-21V
9	Lane2_N	eDP RX channel 2 negative	35	BL_PWR	LED Power Supply 5V-21V
10	Lane2_P	eDP RX channel 2 positive	36	BL_PWR	LED Power Supply 5V-21V
11	H_GND	Ground	37	BL_PWR	LED Power Supply 5V-21V
12	Lane1_1N	eDP RX channel 1 negative	38	NC	NC
13	Lane1_1P	eDP RX channel 1 positive	39	NC	NC
14	H_GND	Ground	40	/STOP	/STOP
15	Lane1_0N	eDP RX channel 0 negative	41	SDA	Need pull-up resister at Host
16	Lane1_0P	eDP RX channel 0 positive	42	SCL	Need pull-up resister at Host
17	H_GND	Ground	43	TP-ID	NC
18	AUX_CH_P	eDP AUX CH positive	44	Sensor-ID	NC
19	AUX_CH_N	eDP AUX CH negative	45	IRQ	Need pull-up resister at Host
20	H_GND	Ground	46	RESET	Low Active (Built-in pull-up 100kohm)
21	LCD_VCC	Power Supply, 3.3V (typ.)	47	VDD	3.3V
22	LCD_VCC	Power Supply, 3.3V (typ.)	48	HSYNC	LCD HSync Input
23	LCD_VCC	Power Supply, 3.3V (typ.)	49	TP-GND	TP Ground
24	LCD_VCC	Power Supply, 3.3V (typ.)	50	GND	Ground
25	BIST	Panel self test enable	51	GND	Ground
26	HPD	Hot plug detect output			

5-2. eDP Interface

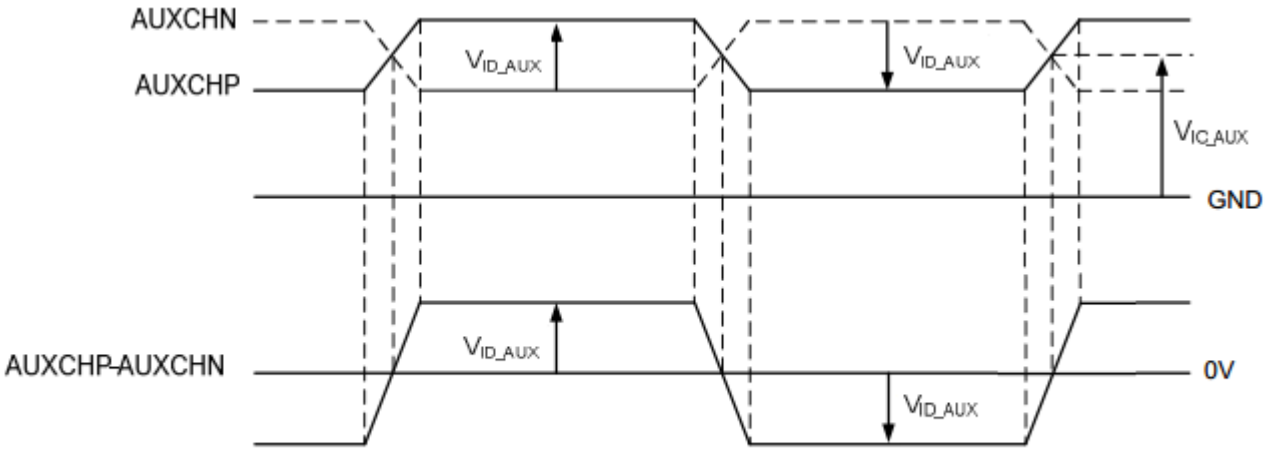


Note. Transmitter : NT71394 or equivalent.
Transmitter is not contained in Module.

5.3.eDP Input signal



Main Link V_{ID} and V_{IC} definition



AUX CH V_{ID_AUX} and V_{IC_AUX} definition

5.4 Back-light & LCM Interface Connection

Interface Connector : STM MSK24022P10D

<Table 7. Pin Assignments for the BLU & LCM Connector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	6	FB5	LED cathode connection
2	FB1	LED cathode connection	7	FB6	LED cathode connection
3	FB2	LED cathode connection	8	NC	NC
4	FB3	LED cathode connection	9	Vout	LED anode connection
5	FB4	LED cathode connection	10	Vout	LED anode connection

5.4 Touch Interface Connection

Interface Connector : IPEX 20542-010E-01

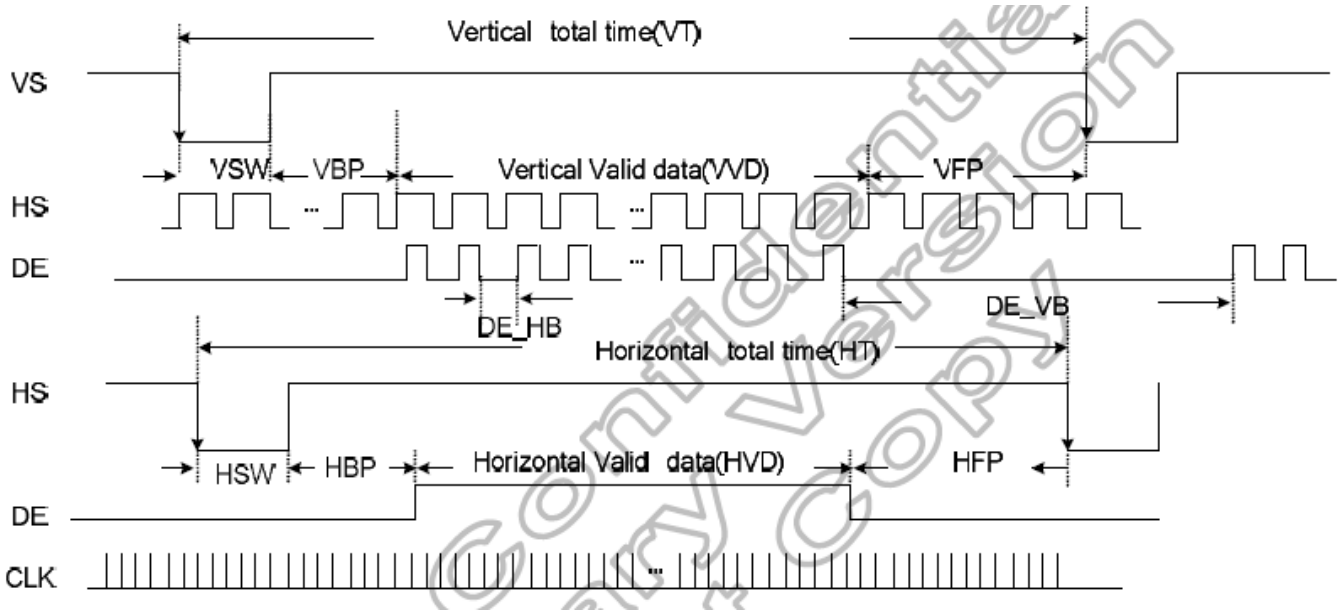
<Table 8. Pin Assignments for the TPConnector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	/STOP	/STOP	6	IRQ	Need pull-up resister at Host
2	SDA	Need pull-up resister at Host	7	RESET	Low Active (Built-in pull-up 100kohm)
3	SCL	Need pull-up resister at Host	8	VDD	3.3V
4	TP-ID	NC	9	HSYNC	LCD HSync Input
5	Sensor-ID	NC	10	TP-GND	TP Ground

6.0 SIGNAL TIMING SPECIFICATION

6.1 The NV126A1M-N52 is operated by the DE only.

ITEM	Symbol		Min	Typ	Max	Unit	Note
CLK	Period	t_{CLK}	-	2.77	-	ns	
	Frequency	-	-	353.86	-	Mbps	
Hsync	Period	t_{HP}	-	3040	-	t_{CLK}	
	Frequency	f_H	-	182.4	-	KHz	
Vsync	Period	t_{VP}	-	1940	-	t_{HP}	
	Frequency	f_V	-	116.4	-	Hz	
Horizontal Active Display Term	Valid	t_{HV}	-	2880	-	t_{CLK}	
	Total	t_{HP}	-	3040	-	t_{CLK}	
Vertical Active Display Term	Valid	t_{VV}	-	1920	-	t_{HP}	
	Total	t_{VP}	-	1940	-	t_{HP}	

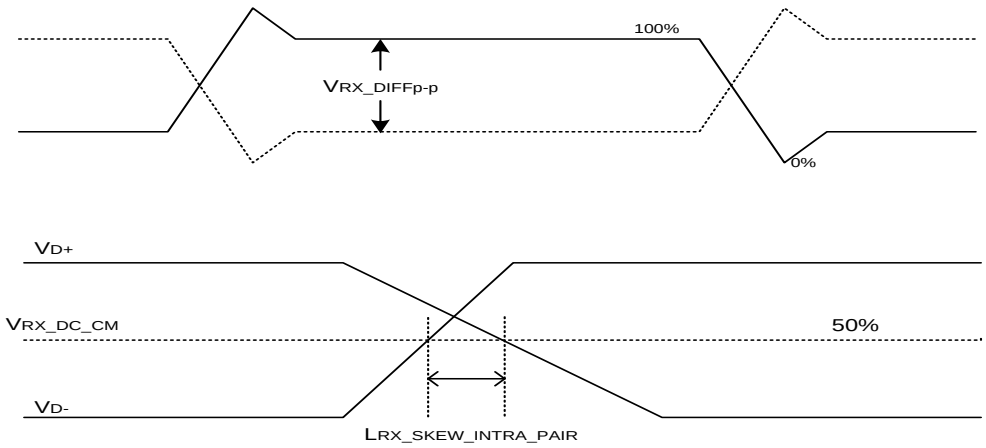


6.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 8.

<Table 8. eDP Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
Differential peak-to-peak input voltage at package pins	$V_{RX-DIFFp-p}$	120	-	-	mV	
Rx input DC common mode Voltage	$V_{RX\_DC\_CM}$	0	-	2.0	V	
Differential termination resistance	$R_{RX-DIFF}$		100		Ω	
Rx short circuit current limit	I_{RX_SHORT}			50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	$L_{RX\_SKEW\_INTRA\_PAIR}$	-	-	60	ps	

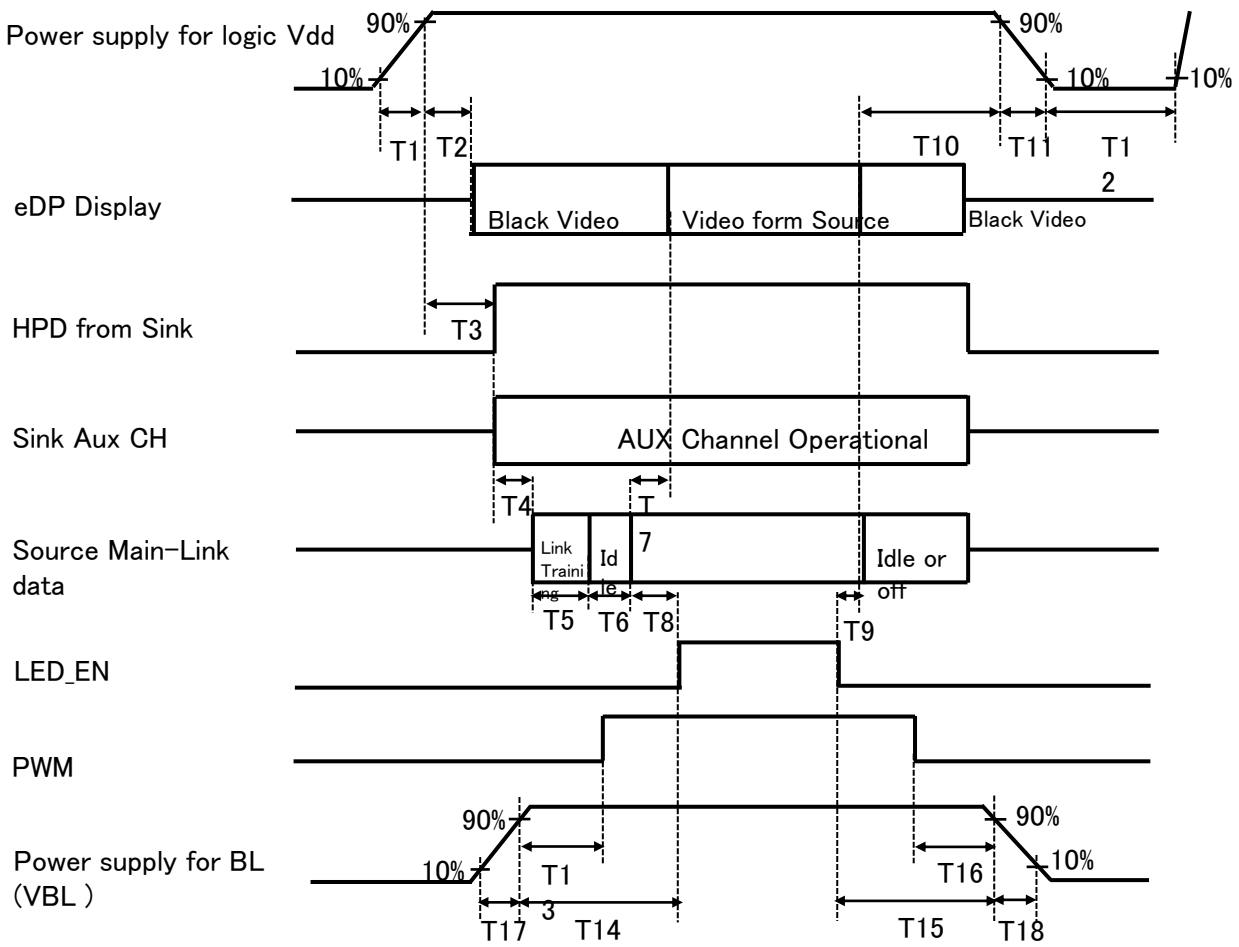


7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Color & Gray Scale		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	1	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	1	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	1	0	1	1	1	1	1	1	1	0	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 seq uence shall be as shown in below



- 0.5ms ≤ T1 ≤ 10 ms
- 0ms ≤ T2 ≤ 200 ms
- 0ms ≤ T3 ≤ 200 ms
- 0ms ≤ T13
- 0ms ≤ T14
- 0ms ≤ T17
- 0ms ≤ T7 ≤ 50ms
- 0ms ≤ T10 ≤ 500 ms
- 0 ms ≤ T11 ≤ 10 ms
- 150ms ≤ T12
- 0ms ≤ T15
- 0ms ≤ T16
- 0ms ≤ T18

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 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

Connector Name /Description	**For Signal Connector**
Manufacturer	IPEX
Type/ Part Number	20718-051E-01or Compatible
Mating housing/ Part Number	or Compatible

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

FIGURE 6 shows mechanical outlines for the model NV126A1M-N52.
Other parameters are shown in Table 9.

<Table 9. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	266.112(H) × 177.408(V)	
Number of pixels	2880(H) × 1920(V)	
Pixel pitch	0.0924(H) × 0.0924(V)	
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7M	
Display mode	HADS	
Dimensional outline	271.2(H) × 187.752(V)	mm
Weight	156Max	gram
Back Light	Connector :ACES	
	6P*10S	

10.2 Mounting

See FIGURE 6.

10.3 Glare and Polarizer Hardness.

The surface of the LCD has a glare 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 50cm from the screen with an overhead light level of 350lux.

11.0 RELIABILITY TEST

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

<Table 10. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 70 ℃, 240 hrs
2	Low temperature storage test	Ta = -30 ℃, 240 hrs
3	High temperature/High humidity Storage	Ta = 60 ℃, 90%RH, 240 hrs
4	High temperature operation test	Ta = 60 ℃, 240 hrs
5	Low temperature operation test	Ta = -10 ℃, 240 hrs
6	Thermal Shock Storage	Ta = -30 ℃ ↔ 70 ℃ (0.5 hr), 27 cycle
7	Package Drop test	Height: 60cm, 1 corner, 3 edges, 6 surfaces: 1 time for each direction
8	Shock test (non-operating)	220G, 2ms, Half sine ±X,±Y,±Z
9	Package Vibration test	Frequency range: 10-55Hz, stroke:1.5mm, swep time: 1 minute, test period: 2 hours for each direction of X, Y, Z
10	Electro-static discharge test	Power OFF: Air discharged +/- 15kV Criteria C Contact discharged +/- 8kV Criteria C Power ON: Air discharged +/- 10kV Criteria B Contact discharged +/- 6kV Criteria B

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.

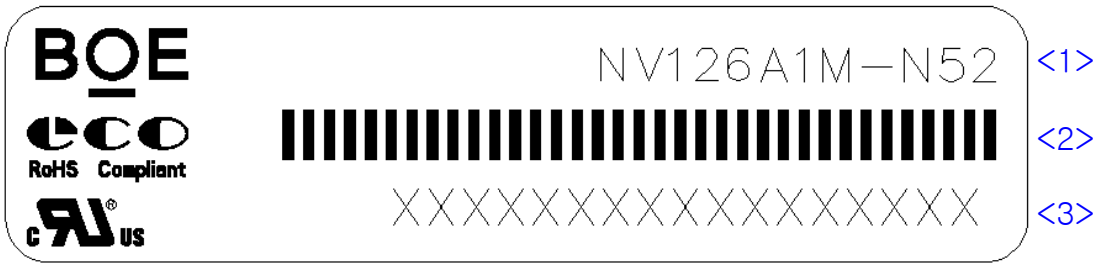
(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(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.

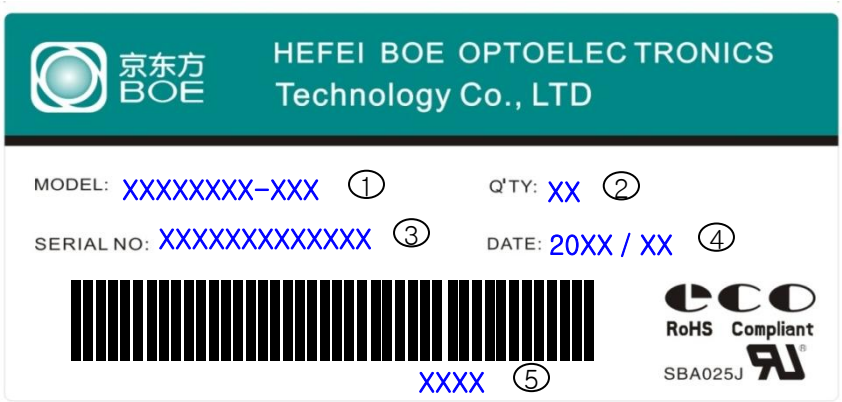
13.0 LABEL

(1) MDL ID



序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	X	X	P	3	1	5	A	X	X	X	X	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					

(2) Box ID



蓝色字体为后打印标识,

Label Size: 115mm*55mm

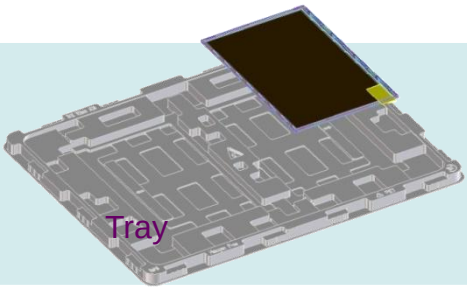
1. **FG-CODE**
2. **Box 产品数量**
3. **Box ID, 编码规则如下**
4. **Box Packing 日期**
5. **FG-CODE 后四位**

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

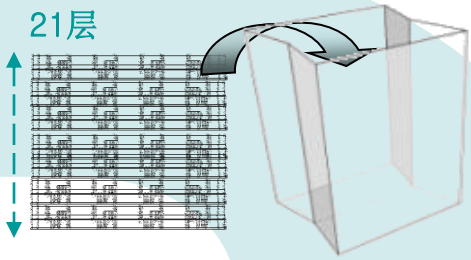
14.0 PACKING INFORMATION

14.1 Packing order

2ea Panel per Tray



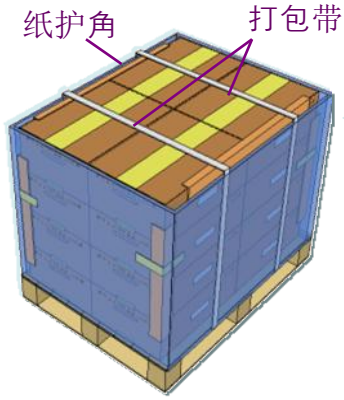
21ea Trays with Cover-Tray



4layers per Pallet, 4 inner boxes per layer

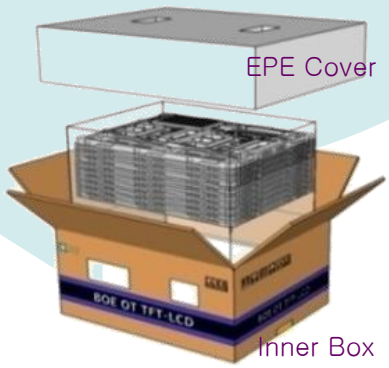
Pallet outer package : Protective film & Paper Corner

640pcs Panels per Pallet



2EA Cushion -EPE Board per Inner Box

40pcs MDL per Inner Box



14.2 Notes

- Box Dimension: 510mm × 410mm × 250mm
- Package Quantity in one Box: 40pcs

15.0 MECHANICAL OUTLINE DIMENSION

Figure 6. TFT-LCD Module Outline Dimension (Front View)

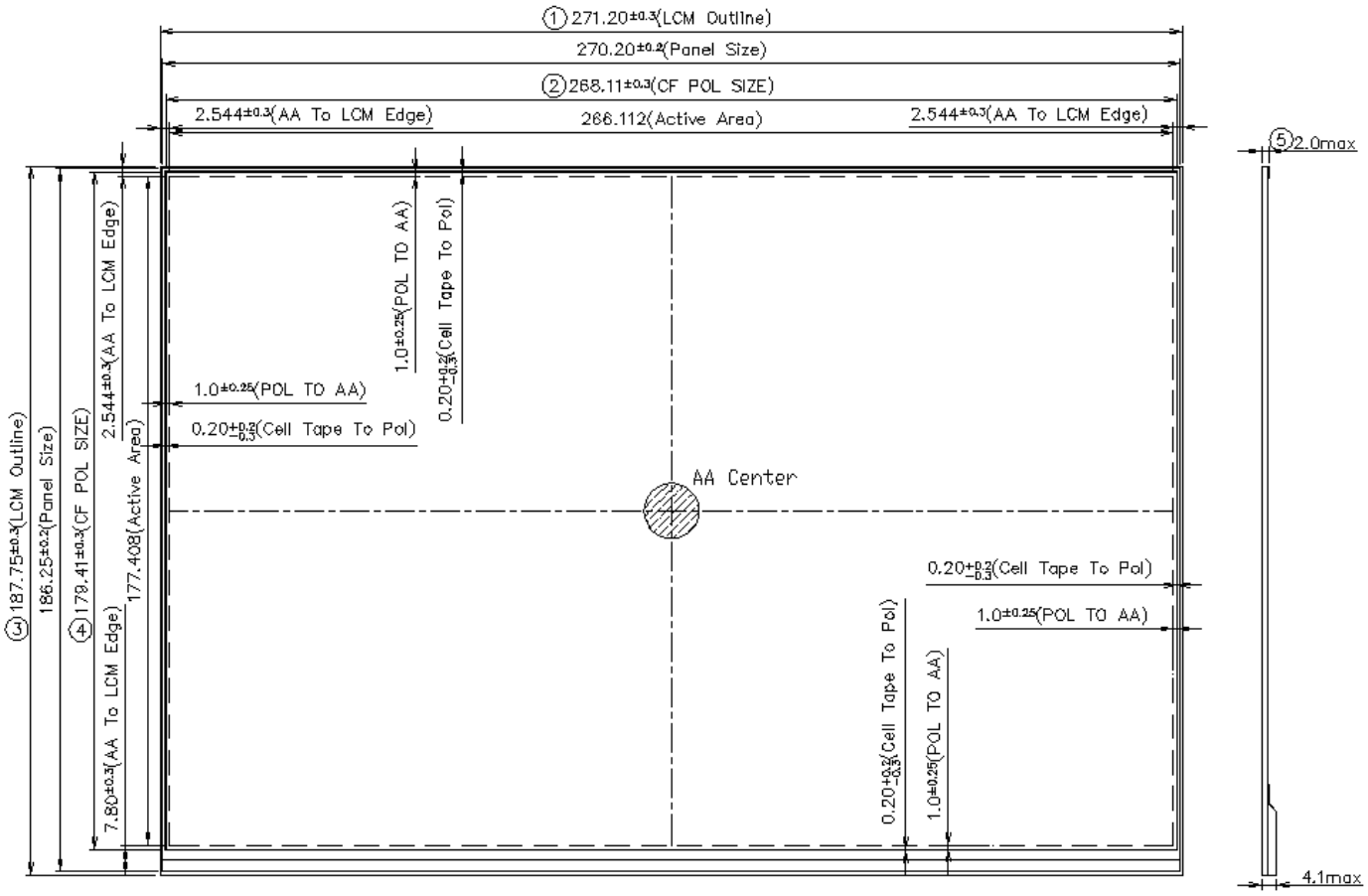
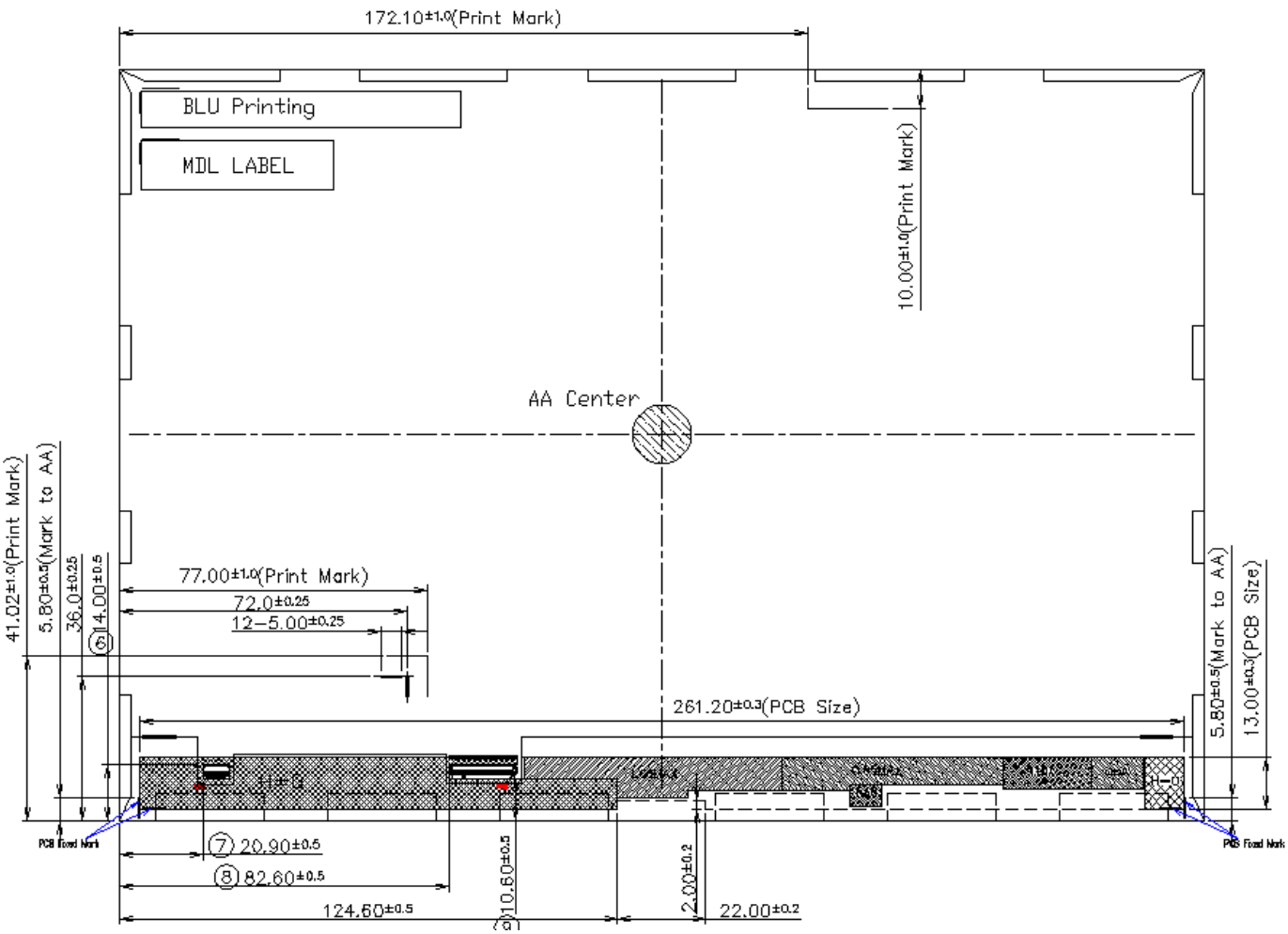


Figure 7. TFT-LCD Module Outline Dimensions (Rear view)



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	AC	172		1708	ID = 1708
0B		06	6			
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	19	25		2015	Manufactured in 2015
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	1B	27		27	27 cm (Approx)
16	Max V image size	12	18		18	18 cm (Approx)
17	Display Gamma	78	120		2.2	Gamma curve = 2.2
18	Feature support	2	2			RGB display, Preferred Timming mode
19	Red/Green low bits	99	153		-	Red / Green Low Bits
1A	Blue/White low bits	23	35		-	Blue / White Low Bits

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
1B	Red x high bits	A7	167	670	0.655	Red (x) = 10100111 (0.655)
1C	Red y high bits	54	84	337	0.330	Red (y) = 01010100 (0.33)
1D	Green x high bits	47	71	286	0.280	Green (x) = 01000111 (0.28)
1E	Green y high bits	A1	161	645	0.630	Green (y) = 10100001 (0.63)
1F	Blue x high bits	25	37	148	0.145	Blue (x) = 00100101 (0.145)
20	BLue y high bits	10	16	66	0.065	Blue (y) = 00010000 (0.065)
21	White x high bits	4E	78	312	0.305	White (x) = 01001110 (0.305)
22	White y high bits	52	82	327	0.320	White (y) = 01010010 (0.32)
23	Established timing 1	00	0		-	
24	Established timing 2	00	0		-	
25	Established timing 3	00	0		-	
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			

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
36	Detailed timing/monitor descriptor #1	A6	166		353.9	353.9MHz Main clock
37		8B	139			
38		40	64		2880	Hor Active = 2880
39		A0	160		160	Hor Blanking = 160
3A		B0	176		-	4 bits of Hor. Active + 4 bits of Hor. Blanking
3B		80	128		1920	Ver Active = 1920
3C		14	20		20	Ver Blanking = 20
3D		70	112		-	4 bits of Ver. Active + 4 bits of Ver. Blanking
3E		30	48		48	Hor Sync Offset = 48
3F		20	32		32	H Sync Pulse Width = 32
40		84	132		8	V sync Offset = 8 line
41		00	0		4	V Sync Pulse width : 4 line
42		0A	10		266	Horizontal Image Size = 266 mm (Low 8 bits)
43		B1	177		177	Vertical Image Size = 177 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
48	Detailed timing/monitor descriptor #2	26	38		235.9	235.9MHz Main clock
49		5C	92			
4A		40	64		2880	Hor Active = 2880
4B		A0	160		160	Hor Blanking = 160
4C		B0	176		-	4 bits of Hor. Active + 4 bits of Hor. Blanking
4D		80	128		1920	Ver Active = 1920
4E		14	20		20	Ver Blanking = 20
4F		70	112		-	4 bits of Ver. Active + 4 bits of Ver. Blanking
50		30	48		48	Hor Sync Offset = 48
51		20	32		32	H Sync Pulse Width = 32
52		84	132		8	V sync Offset = 8 line
53		00	0		4	V Sync Pulse width : 4 line
54		0A	10		266	Horizontal Image Size = 266 mm (Low 8 bits)
55		B1	177		177	Vertical Image Size = 177 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			

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
5A	Detailed timing/monitor descriptor #3	00	0			ASCII Data Sting Tag
5B		00	0			
5C		00	0			
5D		FE	254			
5E		00	0			
5F		42	66		B	Manufacture name : BOEHF
60		4F	79		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			
6C	Detailed timing/monitor descriptor #4	00	0			Product Name Tag (ASCII)
6D		00	0			
6E		00	0			
6F		FE	254			
70		00	0			
71		4E	78		N	Model name : NV126A1M-N52
72		56	86		V	
73		31	49		1	
74		32	50		2	
75		36	54		6	
76		41	65		A	
77		31	49		1	
78		4D	77		M	
79		2D	45		-	
7A		4E	78		N	
7B		35	53		5	
7C		32	50		2	
7D		0A	10			
7E	Extension flag	00	0			
7F	Checksum	63	99	99	-	