

TITLE : MV238FHB-NF1-D852

Preliminary Product Specification

Ver.P0

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REVISION HISTORY

(●) Preliminary specification
() Final specification

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P0		Initial Release	2023.04.06	Yang.C

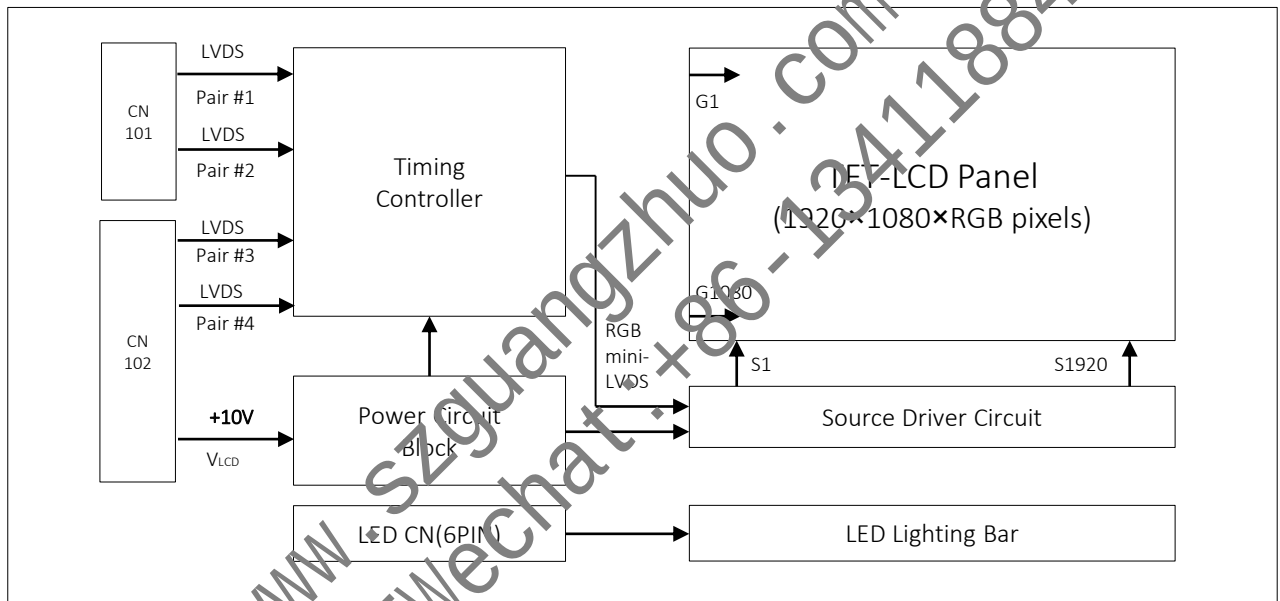
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1.0 GENERAL DESCRIPTION

1.1 Introduction

MV238FHB-NF1 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 23.8 inch diagonally measured active area with FHD 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 colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.2 Features

- LVDS Interface with 4 pixel / clock
- High-speed response
- 6bit +FRC, display 16. 7M colors
- DE (Data Enable) only
- RoHS/Halogen Free
- Gamma Correction
- Reverse type
- TUV low blue light panel

1.3 Application

- Desktop Type of PC & Workstation Use
- Slim-Size Display for Stand-alone Monitor
- Display Terminals for Control System
- Monitors for Process Controller

1.4 General Specification

The followings are general specifications at the model MV238FHB-NF1.

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	527.04(H) × 296.46(V)	mm	
Number of pixels	1920(H) × 1080(V)	pixels	
Pixel pitch	0.2745 (H) × 0.2745 (V)	mm	
Pixel arrangement	RGB Vertical stripe	-	
Display colors	16.7M	colors	
Display mode	Normaly Black	-	
Dimensional outline	534.84(H) × 308.07 (V) typ.	mm	Detail refer to drawing
Diagonal size	604.7	mm	Active area
Weight	550	g	
SS-MDL(L/R/U/D)	None	mm	
Surface Treatment	Haze 25%, 3H		
Back-light	Horizontal arranged, 1-LED Lighting Bar type		

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>

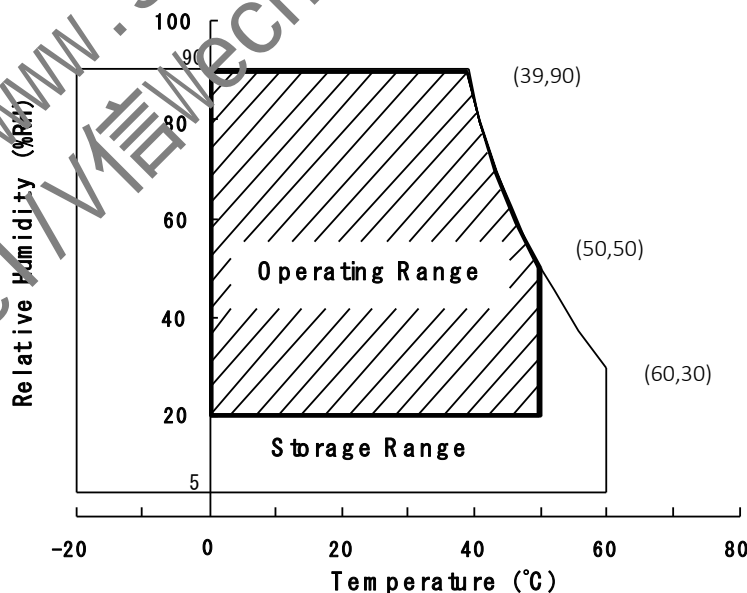
[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	11.0	V	Ta = 25 °C
Logic Supply Voltage	V_{IN}	-0.3	3.3+0.3	V	
Operating Temperature	T_{OP}	0	+50	°C	1)
Storage Temperature	T_{ST}	-20	+60	°C	1)
LCM Surface Temperature (Operation)	T surface	0	+65	°C	2)

Note : 1) Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39 °C max. and no condensation of water.

2) Panel Surface Temperature should be Min. 0°C and Max. +65°C under the VDD = 10.0V, Frame rate = 60Hz, 25°C ambient Temp. no humidity control and LED string current is typical value.



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_{IN}	9.5	10	10.5	V	
Power Supply Current	$I_{DD Typ.}$	-	350	380	mA	Note (1)
	$I_{DD max}$	-	1000	1100	mA	
In-Rush Current	I_{RUSH}	-	2.0	4.0	A	Note (2)
Permissible Input Ripple Voltage	V_{RF}	-	-	500	mV	Note (1),(3)
Power Consumption	$P_{D Typ} -60Hz$	-	3.5	3.8	W	Note (1)
	$P_{D Typ} -180Hz$	-	4.5	4.8	W	
	$P_{D white} -60Hz$	-	3.5	3.8	W	
	$P_{D white} -180Hz$	-	4.5	4.8	W	
	$P_{D Max} -60Hz$	-	5.5	6	W	
	$P_{D Max} -180Hz$	-	10	11	W	
	P_{BL}	-	16.24	16.52	W	Note (4)
	$P_{total Typ.}$	-	19.74	20.32	W	
	$P_{total max}$	-	26.24	27.52	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 $V_{IN}=10.0V$, Clock frequency $\leq 110MHz$. Test Pattern as (a) (b) (c)

(2) Duration of rush current is about 2 ms and rising time of V_{IN} is $520 \mu s \pm 20 \%$

(3) Ripple Voltage should be covered by Input voltage Spec.

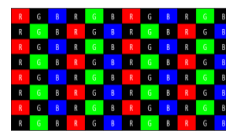
(4) Calculated value for reference (Input pins* V_{PIN} × I_{PIN}) excluding inverter loss.



(a) Typ : Color Test



(b) Full white



(c) Max : Skip Sub-pixel 255

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 TOPCONE PR730) 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 $\theta_{\phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\phi=270}$ ($=\theta_6$) 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 measurement shall be executed after 30 minutes warm-up period. VDD shall be 10.0V $\pm$ 10% at 25°C . Optimum viewing angle direction is 6 o'clock.

4.2 Optical Specifications

[VDD = 5.0V, Frame rate = 60Hz, Clock = 37.13MHz, I_{BE} = 280mA, T_a = $25\pm 2^{\circ}\text{C}$]

Parameter		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 1
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR		700	1000	-	-	Note 2
Cell Transmittance		T_t		-	3.6%	-	%	Note 3 Match BOE BLU
Luminance of White		L_w		280	350	-	cd/m ²	Note 4
White luminance uniformity		ΔY		75	80	-	%	Note 5
Reproduction of color	White	W_x	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	0.283	0.313	0.343	-	Note 6 Match BOE BLU
		W_y		0.299	0.329	0.359	-	
	Red	R_x		0.628	0.658	0.688	-	
		R_y		0.305	0.335	0.365	-	
	Green	G_x		0.273	0.303	0.333	-	
		G_y		0.590	0.620	0.650	-	
	Blue	B_x		0.112	0.142	0.172	-	
		B_y		0.022	0.052	0.082	-	
Color Gamut				95	99	-	%	sRGB CIE 1931
Response Time	G to G	T_r		-	5	11	ms	Note 7
Crosstalk				-	-	2%		Note 7

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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.
2. Contrast measurements shall be made at viewing angle of $\theta=0^{\circ}$ 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 shown in Appendix) 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 is defined as 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 :
$$\Delta Y = (\text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points}) * 100$$

(See FIGURE 2 shown in Appendix).
5. The color chromaticity coordinates specified in Table 4. 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 3 shown in Appendix 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.
7. 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. (See FIGURE 4 shown in Appendix).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

● CN101 Module Side Connector : IS050-C51B-C39-S or Equivalent

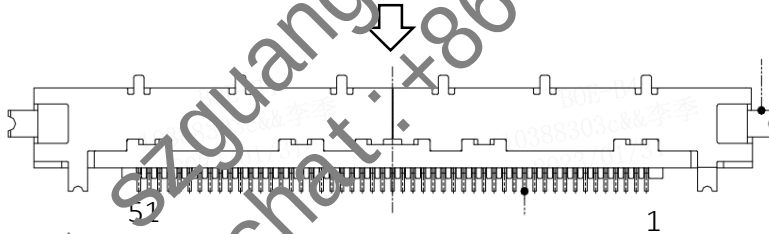
Pin No	Symbol	Function	Pin No	Symbol	Function
1	GND	Power Ground	21	GND	Power Ground
2	NC	No Connection	22	ALV3N	Port1 Negative Transmission data of Pixel 3
3	SDA	Reserved for LCD manufacturer's	23	ALV3P	Port1 Positive Transmission data of Pixel 3
4	SCL	Reserved for LCD manufacturer's	24	NC	No Connection
5	NC	No Connection	25	NC	No Connection
6	GND	Power Ground	26	GND	Power Ground
7	NC	No Connection	27	NC	No Connection
8	NC	No Connection	28	BLV0N	Port2 Negative Transmission data of Pixel 0
9	NC	No Connection	29	BLV0P	Port2 Positive Transmission data of Pixel 0
10	NC	No Connection	30	BLV1N	Port2 Negative Transmission data of Pixel 1
11	GND	Power Ground	31	BLV1P	Port2 Positive Transmission data of Pixel 1
12	ALV0N	Port1 Negative Transmission data of Pixel 0	32	BLV2N	Port2 Negative Transmission data of Pixel 2
13	ALV0P	Port1 Positive Transmission data of Pixel 0	33	BLV2P	Port2 Positive Transmission data of Pixel 2
14	ALV1N	Port1 Negative Transmission data of Pixel 1	34	GND	Power Ground
15	ALV1P	Port1 Positive Transmission data of Pixel 1	35	BLV CLKN	Port2 Negative Transmission Clock
16	ALV2N	Port1 Negative Transmission data of Pixel 2	36	BLV CLKP	Port2 Positive Transmission Clock
17	ALV2P	Port1 Positive Transmission data of Pixel 2	37	GND	Power Ground
18	GND	Power Ground	38	BLV3N	Port2 Negative Transmission data of Pixel 3
19	ALV CLKN	Port1 Negative Transmission Clock	39	BLV3P	Port2 Positive Transmission data of Pixel 3
20	ALV CLKP	Port1 Positive Transmission Clock	40	NC	No Connection

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

- CN101 Module Side Connector : IS050-C51B-C39-S or Equivalent

Pin No	Symbol	Function	Pin No	Symbol	Function
41	NC	No Connection	47	NC	No Connection
42	NC	No Connection	48	VIN	Power Supply: +10V
43	NC	No Connection	49	VIN	Power Supply: +10V
44	NC	No Connection	50	VIN	Power Supply: +10V
45	GND	Power Ground	51	VIN	Power Supply: +10V
46	GND	Power Ground			

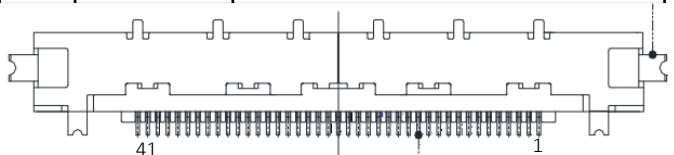


5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

- CN102 Module Side Connector : IS050-C41B-C39-S or Equivalent

Pin No	Symbol	Function	Pin No	Symbol	Function
1	NC	No. Connection	22	NC	No. Connection
2	NC	No. Connection	23	NC	No. Connection
3	NC	No. Connection	24	GND	Power Ground
4	NC	No. Connection	25	GND	Power Ground
5	NC	No. Connection	26	DLV0N	Port4 Negative Transmission data of Pixel 0
6	NC	No. Connection	27	DLV0P	Port4 Positive Transmission data of Pixel 0
7	NC	No. Connection	28	DLV1N	Port4 Negative Transmission data of Pixel 1
8	NC	No. Connection	29	DLV1P	Port4 Positive Transmission data of Pixel 1
9	GND	Power Ground	30	DLV2N	Port4 Negative Transmission data of Pixel 2
10	CLV0N	Port3 Negative Transmission data of Pixel 0	31	DLV2P	Port4 Positive Transmission data of Pixel 2
11	CLV0P	Port3 Positive Transmission data of Pixel 0	32	GND	Power Ground
12	CLV1N	Port3 Negative Transmission data of Pixel 1	33	DLVCLKN	Port4 Negative Transmission Clock
13	CLV1P	Port3 Positive Transmission data of Pixel 1	34	DLVCLKP	Port4 Positive Transmission Clock
14	CLV2N	Port3 Negative Transmission data of Pixel 2	35	GND	Power Ground
15	CLV2P	Port3 Positive Transmission data of Pixel 2	36	DLV3N	Port4 Negative Transmission data of Pixel 3
16	GND	Power Ground	37	DLV3P	Port Positive Transmission data of Pixel 3
17	CLVCLKN	Port3 Negative Transmission Clock	38	NC	No. Connection
18	CLVCLKP	Port3 Positive Transmission Clock	39	NC	No. Connection
19	GND	Power Ground	40	GND	Power Ground
20	CLV3N	Port3 Negative Transmission data of Pixel 3	41	GND	Power Ground
21	CLV3P	Port3 Positive Transmission data of Pixel 3			

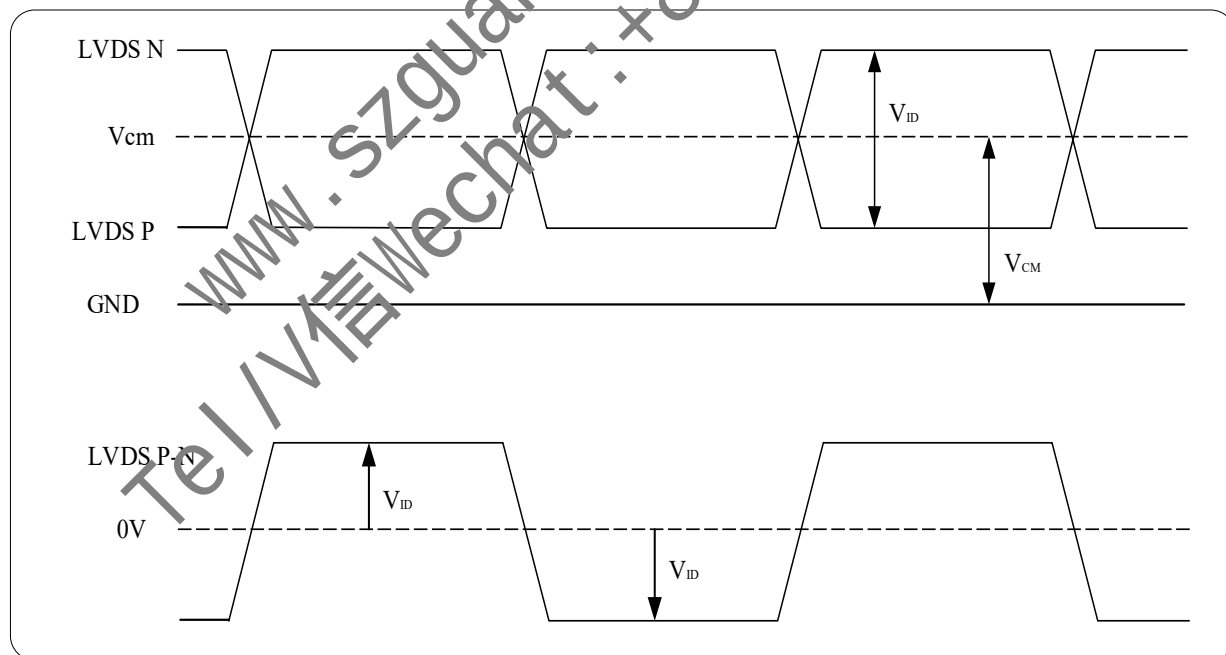


5.3 LVDS Characters

Parameter.		Min.	Typ.	Max.	Unit	Remarks
High Level Differential Input Threshold Voltage	V_{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V_{IL}	-100	-	-	mV	
Differential input voltage	$ V_{ID} $	200	-	600	mV	Note(1),(2)
Differential input common mode voltage	V_{cm}	1.0	1.2	1.5		$V_{IH}=100\text{mV}$, $V_{IL}=-100\text{mV}$

Notes: (1) The product should be always operated within above ranges.

(2) The LVDS input signal has been defined as follows:

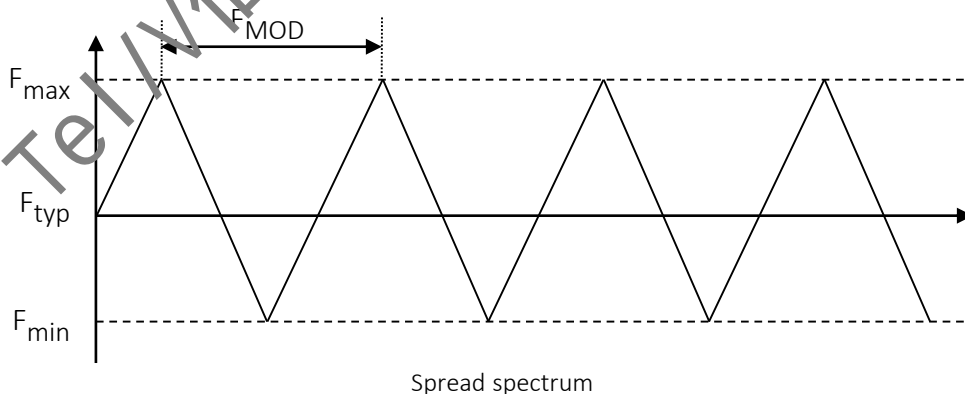


6.0 SIGNAL TIMING SPECIFICATION

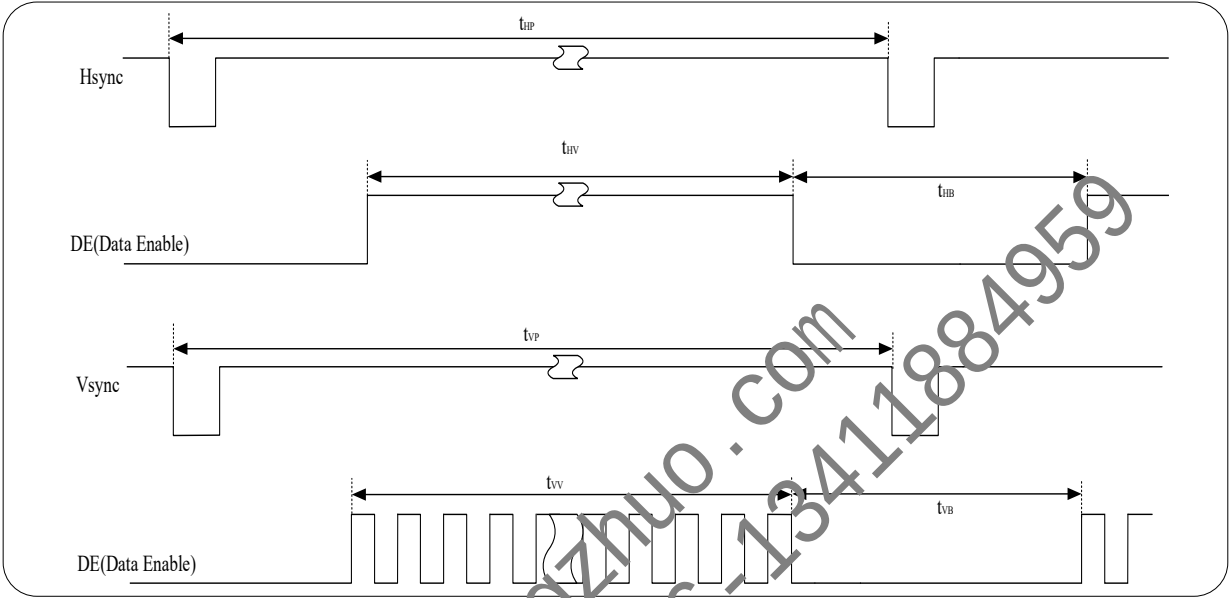
6.1 The MV238FHB-NF1 is operated by the DE only.

Item	Symbols		Min	Typ	Max	Unit	Remark
DCLK	Period	tCLK	9.1	11.7	25	ns	(1)
	Frequency	-	40	85.4	110	MHz	
Hsync	Period	tHP	520	527	560	tCLK	
	Horizontal Valid	tHV	480	480	480	tCLK	
	Horizontal Blank	tHB	40	41	80		
	Frequency	fH	75.9	158.7	208.7	KHz	
Vsync	Period	tVP	1110	1125	4219	tHP	
	Vertical Valid	tVV	1080	1080	1080	tHP	
	Vertical Blank	tVB	30	45	3139	tHP	
	Frequency	fV	48	144	180	Hz	
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%	
	Module Frequency	F _{MOD}	30	-	200	KHz	

Note:(1) The DCLK Max include 3% SSr.



6.2 SIGNAL TIMING WAVEFORMS

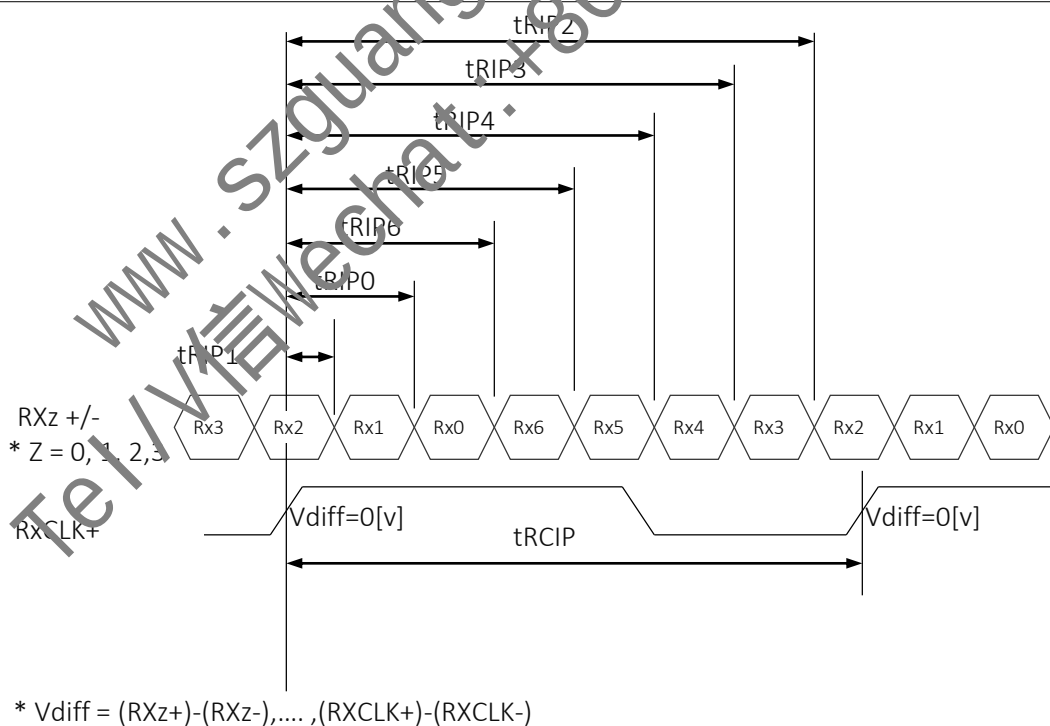


6.3 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

<Table 4. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	9.1	11.7	25	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.4	2 ×tRCIP/7	2 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.4	3 ×tRCIP/7	3 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRCIP/7-0.4	4 ×tRCIP/7	4 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 ×tRCIP/7-0.4	5 ×tRCIP/7	5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 ×tRCIP/7-0.4	6 ×tRCIP/7	6 ×tRCIP/7+0.4	nsec	

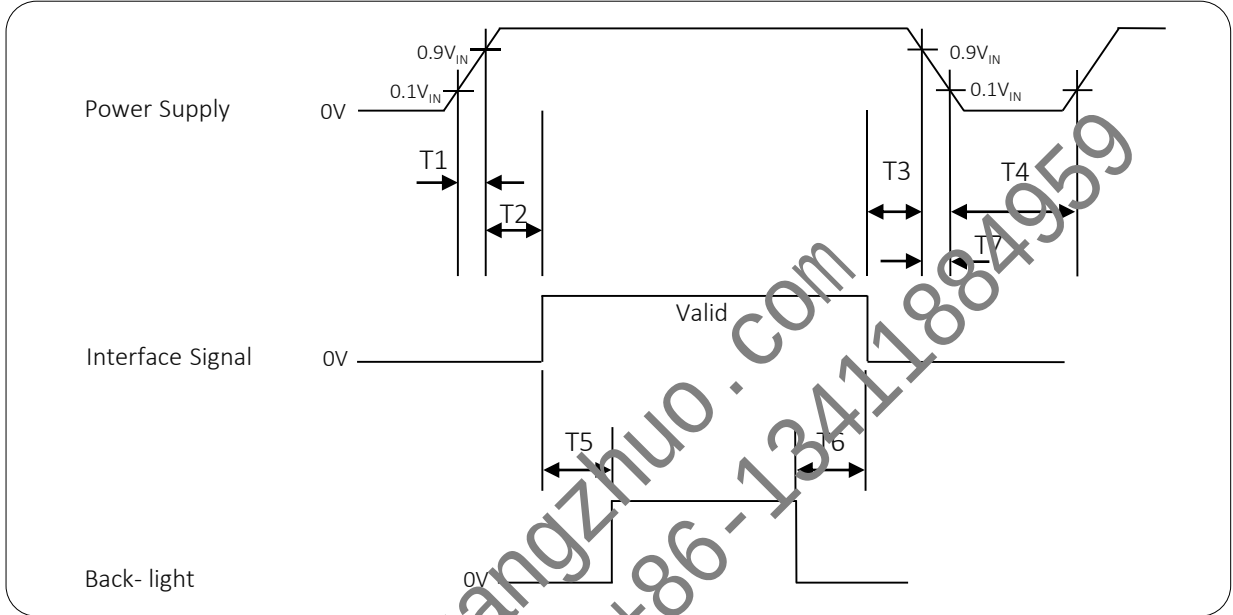


7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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	0	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	0	1	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	0	1	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

The power on/off sequence shall be as shown in below.



Parameter	Min.	Typ.	Max.	Unit
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0.1	-	50	ms
T4	1000	-	-	ms
T5	500	-	-	ms
T6	200	-	-	ms

Notes: (1) When the power supply V_{IN} 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.

(3) Back Light must be turn on after power for logic and interface signal are valid.

(4) T7 decreases smoothly, there is none re-bouncing voltage.

(5) The above power sequence should be satisfied at these case

- AC/DC power On/Off

- Mode Change (Resolution, frequency, timing, sleep mode, color depth change etc.)

If not to follow power sequence, there is a risk of abnormal display.

(6) If T3=0ms, there is a risk of flicker when power On/Off.

(7) If T6=0ms, there is a risk of abnormal display when power off.

9.0 MECHANICAL CHARACTERISTICS

9.1 Dimensional Requirements

FIGURE 6 (located in Appendix) shows mechanical outlines for the model MV238FHB-NF1.
Other parameters are shown in Table 5.

<Table 5. Dimensional Parameters>

Parameter	Specification	Unit
Dimensional outline	534.84(H) × 308.07 (V) typ.	mm
Weight	TBD	gram
Active area	527.04(H) × 296.46(V)	mm
Pixel pitch	0.2745(H)mm x 0.2745(V)mm	mm
Number of pixels	1920 (H)×1080 (V) (1 pixel = R + G + B dots)	pixels
Back-light	Horizontal arranged 1-LED Lighting Bar type	

9.2 Mounting

See FIGURE 5. (shown in Appendix)

9.3 Anti-Glare and Polarizer Hardness

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.

9.4 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.

9.5 Tilt/Pivot usage

Guarantee 30Khrs on static office circumstance (20±5°C & 35~75%RH) only for the panel peel off at tilt (-35° ~ + 80°) and pivot (-180° ~ + 180°) usage.

10.0 RELIABILITY TEST

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

<Table 6. Reliability Test Parameters >

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, 240hrs
4	High temperature operation test	Ta = 50 °C, 240hrs
5	Low temperature operation test	Ta = 0 °C, 240hrs
6	Thermal shock	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle
7	Electro-static discharge test	Contact : 150 pF, 330Ω, 8 KV

BOE www.szguangzhuo.com 广卓液晶屏 echodeng61@hotmail.com jimei@jimeihk.com +86-13411884959		PRODUCT GROUP	REV	ISSUE DATE
		TFT- LCD PRODUCT	Ver.PO	2023.04.06
11.0 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. • Ultra-violet ray filter is necessary for outdoor operation • If the product will be used in extreme conditions such as high temperature, humidity, display patterns, operation time, etc., it is strongly recommended to contact BOE for application engineering device. Otherwise, the reliability and function of the module may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stocks, markets, and controlling systems. (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.				
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12.0 HANDLING & CAUTIONS

(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.
- When this reverse model is used as a forward-type model (PCB on top side), BOE can not guarantee any defects of LCM.
- If LCD module containing system is out of BOE 's operating or storing condition, BOE can not guarantee LCD module operating properly.

13.0 PRODUCT SERIAL NUMBER

MV238FHB-NF1

B4

XXXX

XXXXXXXXXXXXXXXXXXXX

P/N: XXXXXXXXXXXX

FRU: XXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX

BOE


RoHS Compliant


UL US

MADE IN CHINA

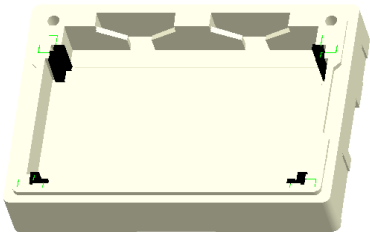
Digit	1		2	3	4		5	6						7			
Code	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Des.	1. Control Number 2. Rank/Grade 3. Line Classification 4. Year(2001:01, 2002:02, ...) 5. Month(1, 2, 3, ..., 9, X, Y, Z) 6. Internal Use 7. Serial Number																

BOE	www.szguangzhuo.com 广卓液晶屏 echodeng61@hotmail.com jimei@jimei.hk.com +86-13411884959	PRODUCT GROUP	REV	ISSUE DATE
		TFT- LCD PRODUCT	Ver.PO	2023.04.06

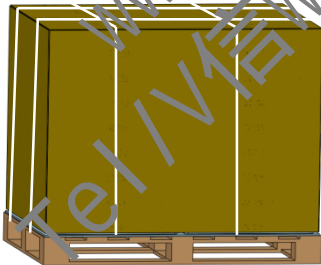
14.0 Packing

14.1 Packing Order

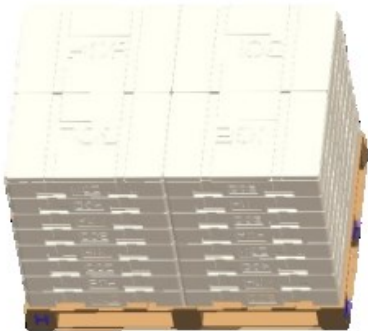
put one 2t EPE pad in the EPO bottom.



Put one open cell on the EPE pad, then one 2t EPE pad ... , totally 14 pcs open cells and 14 pcs 2t EPE pads in the EPO bottom, finally put another 2t EPE pad on the top.



Put 1 ea Out Box on the pallet.
Pack with 4 packing belts.
then wrap with a wrapping film.



put the EPO boxes on the pallet (8ea EPO boxes per row) and a cover on the top of the EPO boxes.Total 16 boxes,252 pcs OC.



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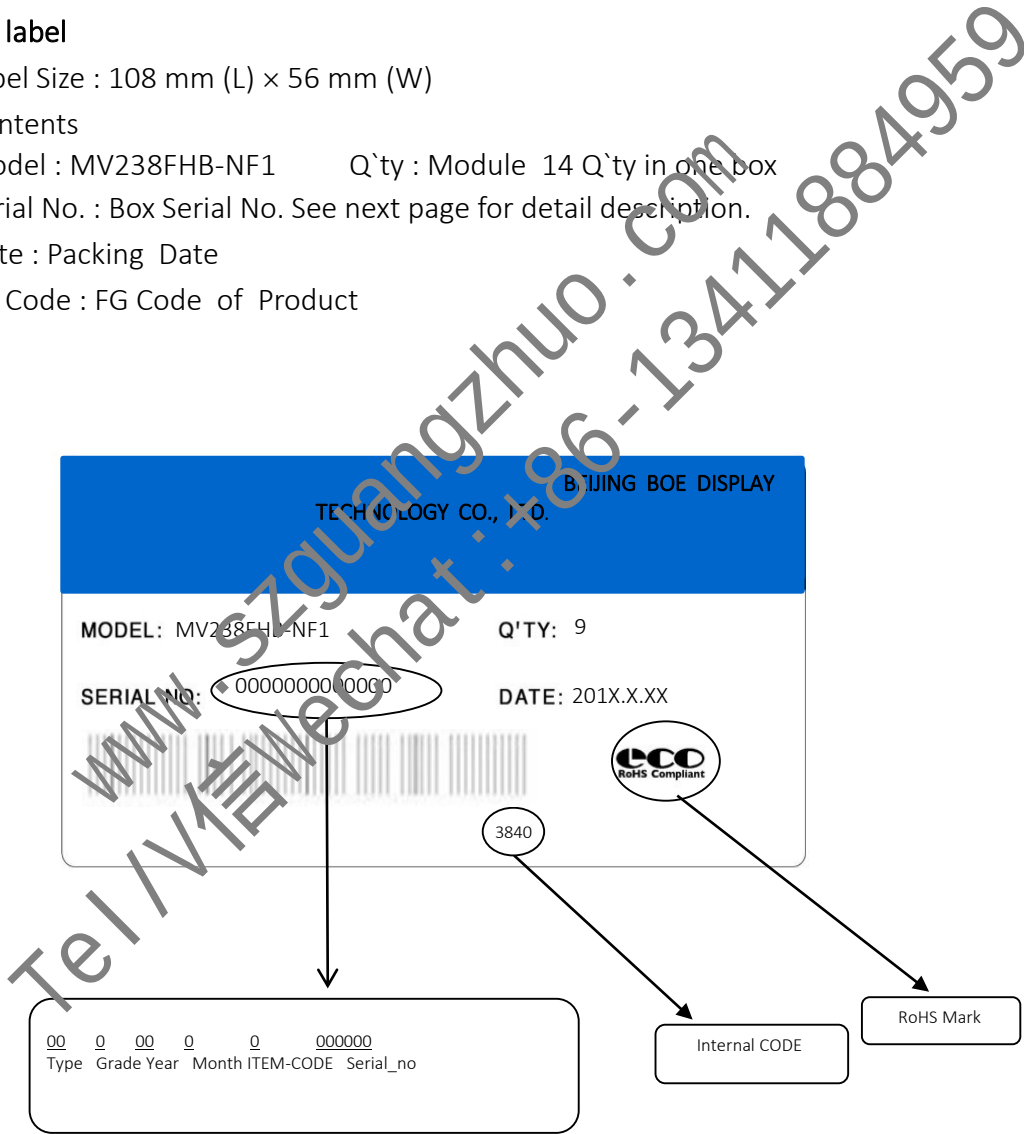
	www.szguangzhuo.com 广卓液晶屏 echodeng61@hotmail.com jimei@jimei.hk.com +86-13411884959	PRODUCT GROUP	REV	ISSUE DATE
		TFT- LCD PRODUCT	Ver.P0	2023.04.06

14.2 Packing Note

- Box Dimension : 544mm(W) × 398mm(L) × 130mm(H)
- Package Quantity in one Box : 14 pcs

14.3 Box label

- Label Size : 108 mm (L) × 56 mm (W)
- Contents
Model : MV238FHB-NF1 Q`ty : Module 14 Q`ty in one box
Serial No. : Box Serial No. See next page for detail description.
Date : Packing Date
FG Code : FG Code of Product



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15.0 APPENDIX

Figure 1. Measurement Set Up

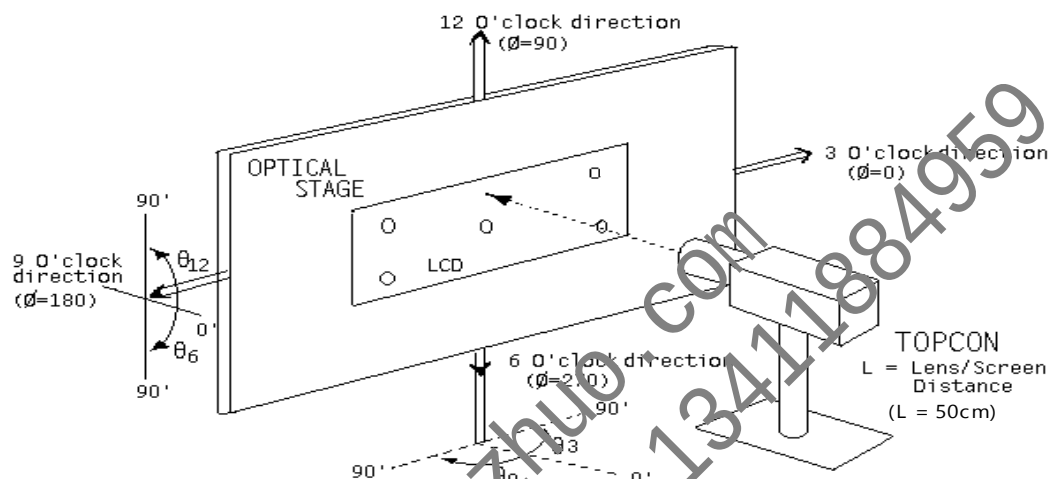


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

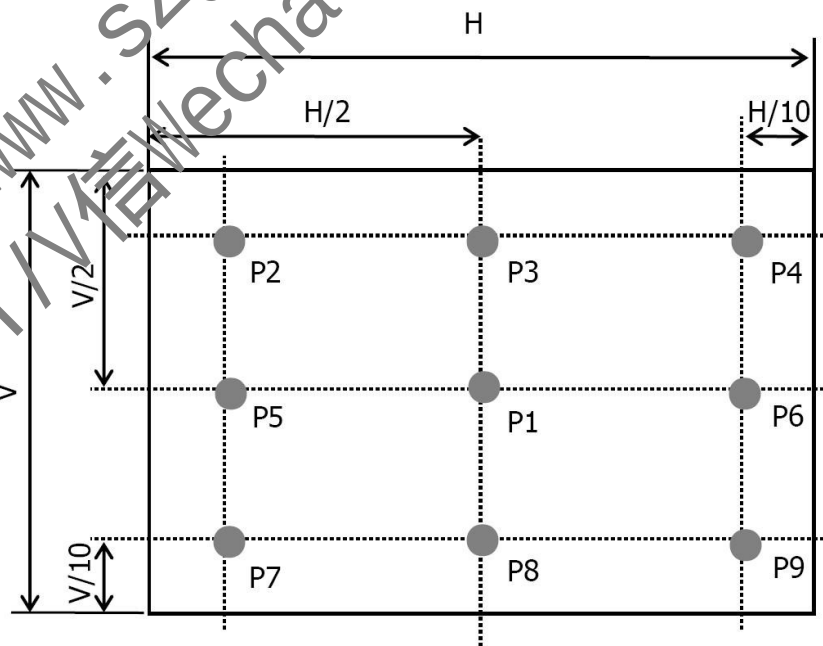
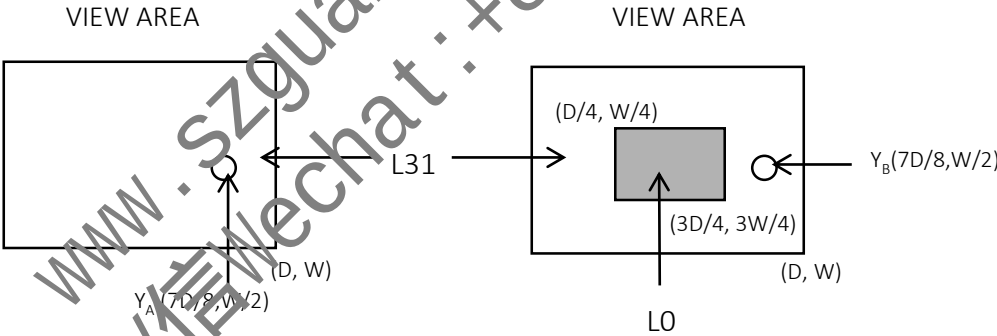


Figure 3. Response Time Testing

Measured Response Time		Target				
		0	63	127	191	255
Start	0					
	63					
	127					
	191					
	255					

Figure 4. Cross Modulation Test Description



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

Where: Y_A = Initial luminance of measured area (cd/m²)
 Y_B = Subsequent luminance of measured area (cd/m²)
The location measured will be exactly the same in both patterns

Figure 5. TFT-LCD Module Outline Dimensions (Front view)

