

CUSTOMER APPROVE

SPECIFICATION

FOR

DOUBLE LIN TFT-LCD MODULE

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Product No. : MV215FHM-N30

APPROVED	CHECKED	PREPARED
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Revision History

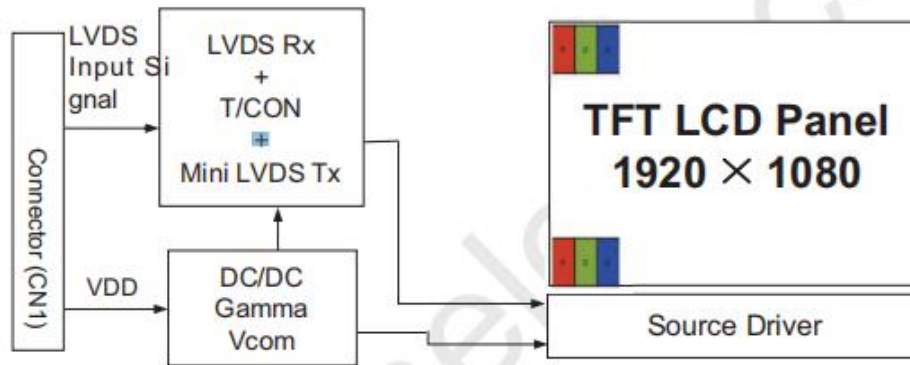
Date	Rev.	Page	Old Description	New Description	Remark
2024-09-21	1.0	All	The specification was first issued		

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1. General Description

MV215FHB-N30 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 21.5 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 2 pixel / cloc
- High-speed response
- 0.5t Glass
- 6-bit (Hi-FRC) color depth, display 16. 7M colors
- Incorporated edge type back-light (one Light Bar)
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) only
- RoHS/Halogen Free
- ES 7.0 compliant
- Gamma Correction
- Reverse type

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 MV215FHB-N30.

The following items are characteristics summary on the table under 25°C condition:

ITEMS	Unit	SPECIFICATIONS
Active Area	[mm]	476.064(H) x 267.786(V)
Pixels H x V	-	1920(H) x1080(V)
Pixels Pitch	[mm]	0.24795(H) x 0.24795(V)
Pixels Arrangement	-	RGB Vertical stripe

Display Mode	-	Normally Black
White Luminance(Center)	[cd/m ²]	300 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Response Time	[msec]	14ms (Typ.on/off)
Viewing Angle	[degree]	89/89/89/89
Outline Dimension	[mm]	485.6(H) x 280.88(V) x 7.0(D) (Typ.)
Electrical Interface	-	Dual Channel LVDS
Support Color		16.7M colors (RGB 6 - bits)
Surface Treatment		Anti - Glare 3H
Temperature Range Operating Storage(Shipping)	[oC] [oC]	0 to +50°C -20 to +70°C

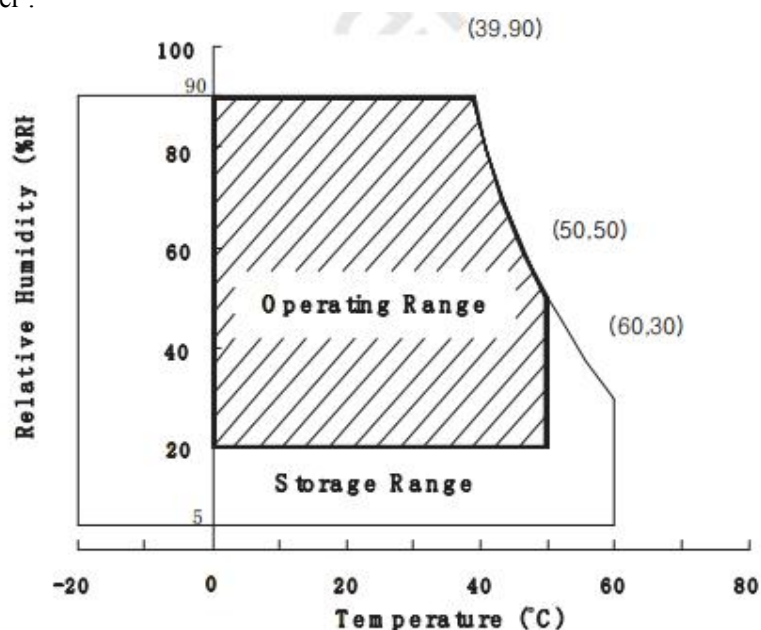
2.0 ABSOLUTE MAXIMUM RATINGS

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 >

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	VDD	-0.3	5.5	V	Ta = 25 °C
Logic Supply Voltage	VIN	VSS-0.3	VDD+0.3	V	
Operating Temperature	TOP	0	+50	°C	
Storage Temperature	TST	-20	+60	°C	

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 .



3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

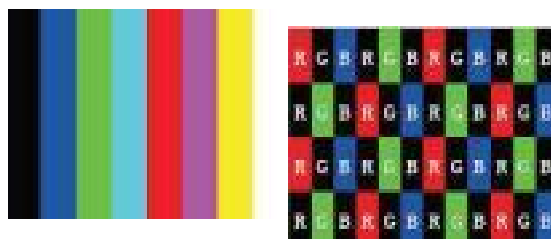
< Table 3. Electrical specifications >

[Ta =25±2]

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	I _{DD}	-	500	1200	mA	
In-Rush Current	I _{RUSH}	-	2.0	3.0	A	Note 2
Permissible Input Ripple Voltage	V _{RF}	-	-	300	mV	Note1,3
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	
Differential input common mode voltage	V _{cm}	1.0	1.2	1.5		V _{IH} =100mV, V _{IL} =-100mV
Power consumption	P _D	-	2.5	6	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 vDD=5.0v, Frame rate=75Hz clock frequency = 92.9 MHz. Test pattern of power supply current

- a) Typ : color Test
- b) Max : skip subpixel255



- 2. Duration of rush current is about 2 ms and rising time of vDD is 520 μs ± 20 %
- 3. Ripple voltage should be covered by Input voltage spec.

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°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 Θ₀=0 (=Θ₃) as the 3 o'clock direction (the“right”), Θ₀=90 (= Θ₁₂) as the 12 o'clock direction (“upward”), Θ₀=180 (= Θ₉) as the 9 o'clock direction (“left”) and Θ₀=270(= Θ₆) 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 30minutes warm-up period. vDD shall be 5.0v +/-10% at 25°C. optimum viewing angle direction is 6 ,clock.

4.2 Optical Specifications

[vDD = 5.0v, Frame rate = 60Hz, clock = 78MHz, IBL = 160mA, Ta = 25±2 °C]

< Table 4. Module optical >

Parameter		symbol	condition	Min.	Typ.	Max.	unit	Remark
viewing Angle range	Horizontal	Θ3	cR > 10	85	89	-	Deg.	Note 1
		Θ9		85	89	-	Deg.	
	vertical	Θ12		85	89	-	Deg.	
		Θ6		85	89	-	Deg.	
Luminance contrast ratio		cR	Θ = 0。 (center) Normal viewing Angle	700	1000			Note 2
cell Transmittance		Tr		-	5.6	-	%	Note 3
Reproduction of color	white	wx		0.283	0.313	0.343	-	Note 4
		wy		0.299	0.329	0.359	-	
	Red	Rx		0.609	0.639	0.669	-	
		Ry		0.327	0.357	0.387	-	
	Green	Gx		0.279	0.309	0.339	-	
		Gy		0.608	0.638	0.668	-	
	Blue	Bx		0.122	0.152	0.182	-	
		By		0.039	0.069	0.099	-	
ResponseTime	GTG	Tg			14	20	ms	Note 5
cross Talk		cT		-	-	2.0	%	Note 6

Note :

- 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.
- 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.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

- 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.
- The white luminance uniformity on LCD surface is then expressed as $\Delta Y = (\text{Minimum Luminance of 9 points} / \text{Maximum Luminance of 9 points}) * 100$ (see FIGURE 2 shown in Appendix).
- 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.
- Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_v = 60\text{Hz}$ to optimize. Each time in below table is defined as appendix Figure 3 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)".



7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing minance (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

Module side Connector : UJU Is100-L30R-C23 or Equivalent

User side Connector : JAE FI-X30H or Equivalent

pin No	symbol	Function	Remark
1	RX00-	Negative Transmission data of pixel 0 (ODD)	
2	RX00+	positive Transmission data of pixel 0 (ODD)	
3	RX01-	Negative Transmission data of pixel 1 (ODD)	
4	RX01+	positive Transmission data of pixel 1 (ODD)	
5	RX02-	Negative Transmission data of pixel 2 (ODD)	
6	RX02+	positive Transmission data of pixel 2 (ODD)	
7	BIST	Bist function	Note 1
8	RXOC-	Negative Transmission Clock (ODD)	
9	RXOC+	positive Transmission Clock (ODD)	
10	RX03-	Negative Transmission data of pixel 3 (ODD)	
11	RX03+	positive Transmission data of pixel 3 (ODD)	
12	RXE0-	Negative Transmission data of pixel 0 (EVEN)	
13	RXE0+	positive Transmission data of pixel 0 (EVEN)	
14	GND	power Ground	
15	RXE1-	Negative Transmission data of pixel 1 (EVEN)	
16	RXE1+	positive Transmission data of pixel 1 (EVEN)	
17	GNG	power Ground	
18	RXE2-	Negative Transmission data of pixel 2 (EVEN)	
19	RXE2+	positive Transmission data of pixel 2 (EVEN)	
20	RXEC-	Negative Transmission Clock (EVEN)	
21	RXEC+	positive Transmission Clock (EVEN)	
22	RXE3-	Negative Transmission data of pixel 3 (EVEN)	
23	RXE3+	positive Transmission data of pixel 3 (EVEN)	
24	GND	power Ground	Note 2
25	CTL	*Reserved for LCD manufacturer,s(CTL_DVR)	
26	CE	*Reserved for LCD manufacturer,s(CE_DVR)	

27	NC	power supply: +5V	
28	VDD		
29	VDD		
30	VDD		

Note 1 : H: white-Black-Red-Green-Blue pattern Aging, L:Black pattern,when no LVDs signal

Note2: This pin should be connected with GND.

5.2 LVDS Interface (Tx; THC63LVDF83A Or Equivalent)

5.2.1 LVDS Interface

	Input Signal	Transmitter		Interface		MV215FHB-N30 (CN11)	Remark
		pin No.	pin No.	System (Tx)	TFT-LCD(Rx)	pin No.	
L V D S	OR0	51	48 47	OUT0- OUT0+	RXO0- RXO0+	1 2	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4					
	OG1	6	46 45	OUT1- OUT1+	RXO1- RXO1+	3 4	
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15					
	OB1	19					
	OB2	20	42 41	OUT2- OUT2+	RXO2- RXO2+	5 6	
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27					
	Vsync	28					
	DE	30					
	MCLK	31	40 39	- CLK OU	K- RXO CL	8 9	
	OR6	50	38 37	T+ OUT3- OUT3+	K+ RXO3- RXO3+	10 11	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
	RSVD	25					

6.0 SIGNAL TIMING SPECIFICATION

6.1 The Mv215FHB-N30 is operated by the DE only.

Item	symbols		Min	Typ	Max	unit	Note
DcLK	Period	tcLK	11.1	13.47	16.7	ns	
	Frequency	-	60	74	90	MHz	
Hsync	Period	tHP	1050	1100	1120	tcLK	
	Horizontal valid	tHv	960	960	960	tcLK	
	Horizontal Blank	tHB	90	140	160		
	Frequency	fH	64	67	83	KHz	
	width	twH	16	32	48	tcLK	
	Horizontal Back Por ch	tHBP	32	48	64		
	Horizontal Front Po rch	tHFP	42	60	40		
vsync	Period	tvP	1110	1125	1251	tHP	
	vertical valid	tvv	1080	1080	1080	tHP	
	vertical Blank	tvB	30	45	171	tHP	
	Frequency	fv	50	60	75	Hz	
	width	twv	2	4	16	tHP	
	vertical Back Porch	tvBP	5	8	32		
	vertical Front Porch	tvFP	23	33	123		
LvDs Receiv er clock	Input spread spectru m ratio	ssr	-3	-	+3	%	

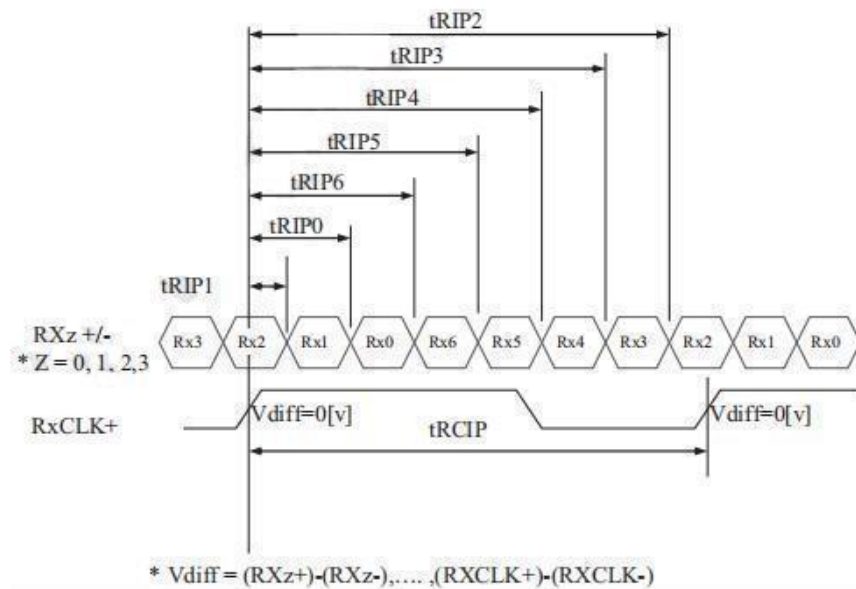
Note 1 : This DcLK range at last line of v-blanking should be set in 0~987.

6.2 LVDS Rx Interface Timing parameter

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

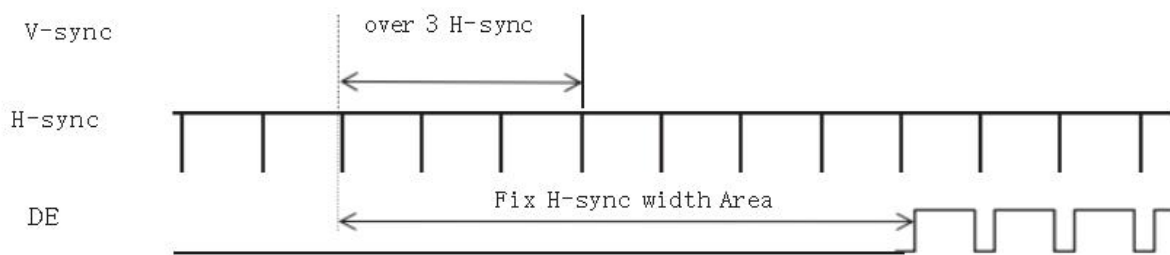
<Table 4. LvDS Rx Interface Timing Specification>

Item	SYmbol	Min	TYP	Max	unit	Remark
CLKIN Period	tRCIP	15.4	19.3	23.1	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 X tRCIP/7-0.4	2 X tRCIP/7	2 X tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 X tRCIP/7-0.4	3 X tRCIP/7	3 X tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 X tRCIP/7-0.4	4 X tRCIP/7	4 X tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 X tRCIP/7-0.4	5 X tRCIP/7	5 X tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 X tRCIP/7-0.4	6 X tRCIP/7	6 X tRCIP/7+0.4	nsec	



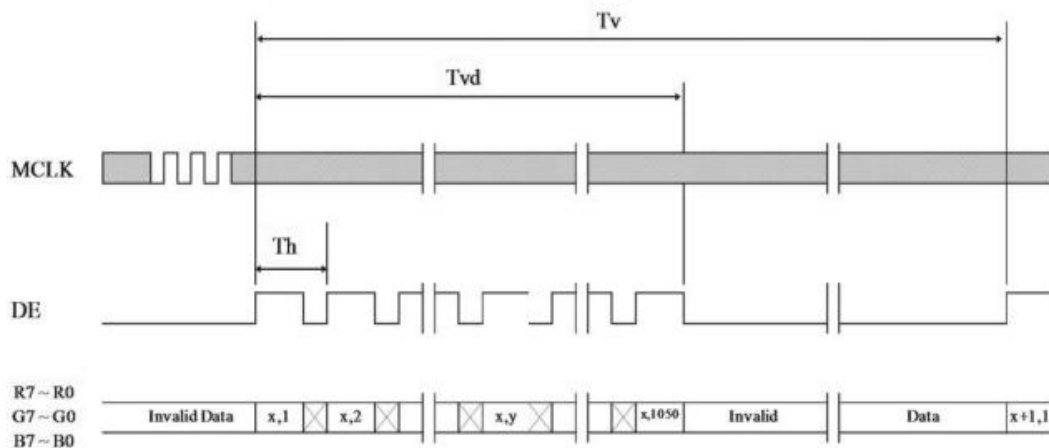
7.0 SIGNAL TIMING wAVEFORMS OF INTERFACE SIGNAL

7.1 Sync Timing waveforms

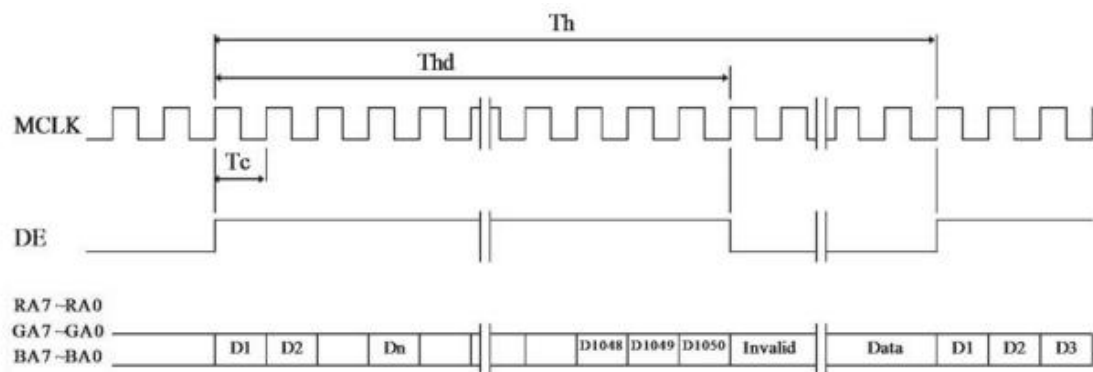
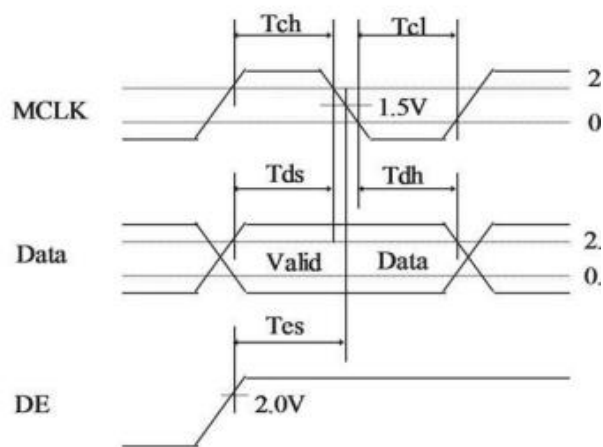


1. Need over 3 H-sync during V-sync Low
2. Fix H-sync width from V-sync falling edge to first rising edge

7.2 Vertical Timing waveforms



7.3 Horizontal Timing waveforms



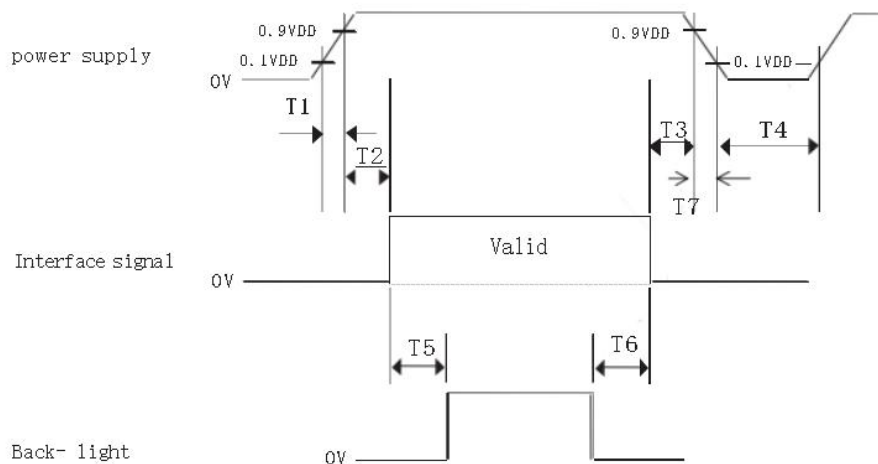
8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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
	Δ	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
	Δ	↑								↑								↑							
	▽	↓								↓								↓							
	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
	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
	Δ	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

Gray scale of GREEN	Δ	$\uparrow$								$\uparrow$								$\uparrow$							
	∇	$\downarrow$								$\downarrow$								$\downarrow$							
	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
Gray scale of BLUE	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	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
	Δ	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	1	0	0
Gray scale of WHITE	Δ	$\uparrow$								$\uparrow$								$\uparrow$							
	∇	$\downarrow$								$\downarrow$								$\downarrow$							
	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
Gray scale of BLUE	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
	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
	Δ	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
Gray scale of WHITE	Δ	$\uparrow$								$\uparrow$								$\uparrow$							
	∇	$\downarrow$								$\downarrow$								$\downarrow$							
	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
Gray scale of BLUE	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

9.0 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



- $0.5 \text{ ms} < T1 < 10 \text{ ms}$
- $0 < T2 < 50 \text{ ms}$
- $0 < T3 < 50 \text{ ms}$
- $1 \text{ sec} < T4$
- $200 \text{ ms} < T5$
- $200 \text{ ms} < T6$

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.
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.

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

FIGURE 5 (located in Appendix) shows mechanical outlines for the model MV215FHB-N30. other parameters are shown in Table 8.

<Table 8. Dimensional parameters>

parameter	Specification	unit
weight	400(simulation)	gram
Active area	476.064 (H) X267.786 (V)	mm
pixel pitch	0.24795(H) X0.24795(V)	mm
Number of pixels	1920 (H)X1080 (V) (1 pixel = R + G + B dots)	pixels

10.2 Mounting

see FIGURE 5 . (shown in Appendix)

10.3 Anti-Glare and polarizer Hardness.

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

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 9 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	vibration test (non-operating)	Frequency Gravity / AMp period	Random, 10 ~ 300 Hz, 30 min/Axis 1.5 Grms X, Y, Z 30 min
8	shock test (non-operating)	Gravity	50G
		pulse width	11msec, sine wave
		Direction	±X, ±Y, ±Z once for each
9	Electro-static discharge test	Air : 150 pF, 330Ω, 15 Kv contact : 150 pF, 330Ω, 8 Kv	

12. Backlight Unit

12.1 LED Pin Assignment

it includes 76 pcs (4014) LED in theLED light bar.(4 strings and 9 pcs LED of one string)

connector CN2 : PH- 2P *1

Pin	Signal Name
1	VDD- (Black)
2	VDD+ (Red)



12.2 Electrical Characteristics

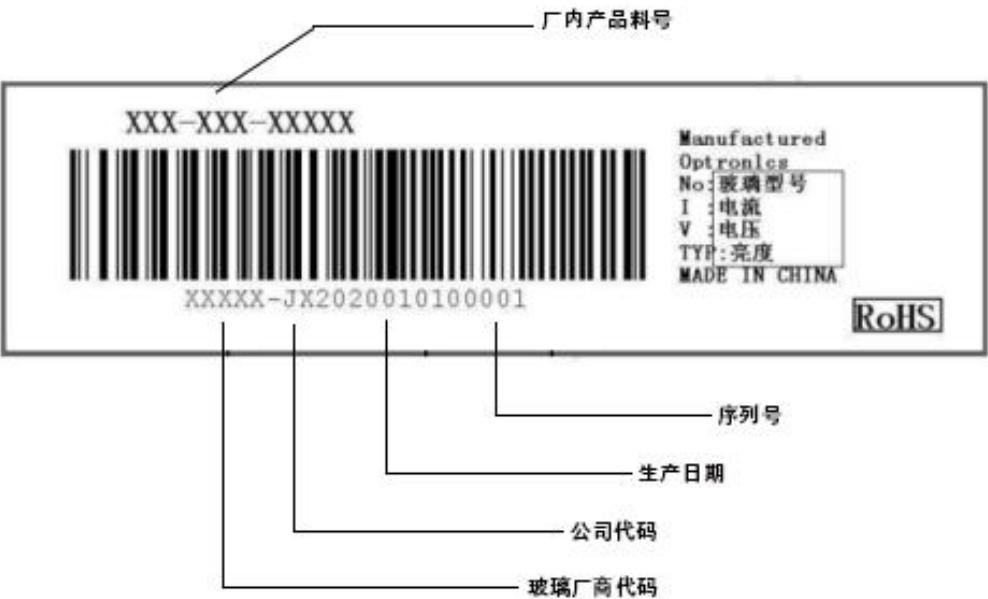
12.2.1 Recommednded Operating Condition

(Ta=25℃)

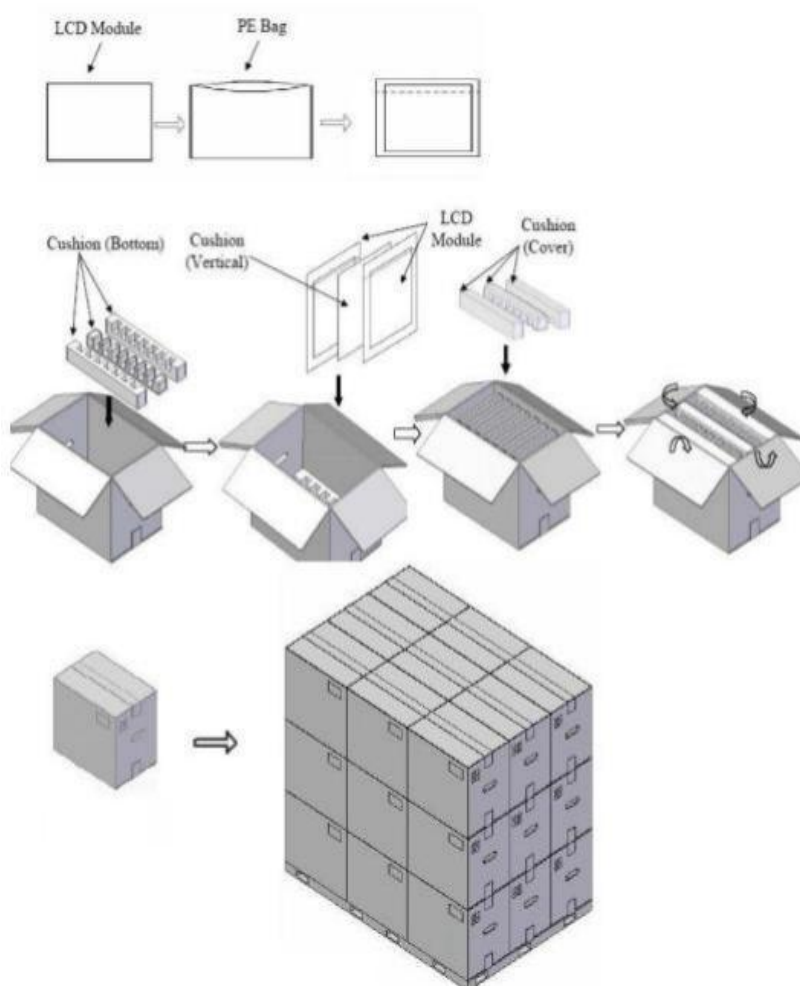
Item	Symbol	Min.	Typ.	Max.	Unit
LED operation Voltage	V _{LED}	55.1	-	64.8	V
LED operation Curent	I _{LED}	-	240	-	mA
BackLinght Power	P _{BL}	13.22	-	15.55	W
Luminance	L	250	300		nit
LED Life Time		30000			Hrs
Luminance uniformity	△L	75	80		%

13.Shipping Label

The label is on the panel as shown below



Parameter	Packing box	Unit
Size	555(L)x275(W)x345(H)(typ.)	mm
Weight	1.9(typ.)	Kg
Total weight	19.54(typ.) (with 10 products)	Kg



14. Precaution

14.1 Assembly and Handling precautions

1. Do not apply rough force such as bending or twisting to the module during assembly.
2. To assemble or install module into user's system can be in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
3. It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
4. Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
5. Do not pull the I/F connector in or out while the module is operating.
6. Do not disassemble the module.
6. Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

7. It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
8. High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
9. When ambient temperature is lower than 10 °C may reduce the display quality. For example, the response time will become slowly.

14.2 Safety Precautions

1. It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
2. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth, in case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
3. After the module's end of life, it is not harmful in case of normal operation and storage.

