TITLE : DV215FHM-R10

Product Specification

Rev. P0

FUZHOU BOE Display TECHNOLOGY

REVISION HISTORY

(●)preliminary specification
( )Final specification

Revision No.	Page	Description of changes	Date	Prepared
Rev.P0		Initial Release	Feb.14.2022	Guoyajie

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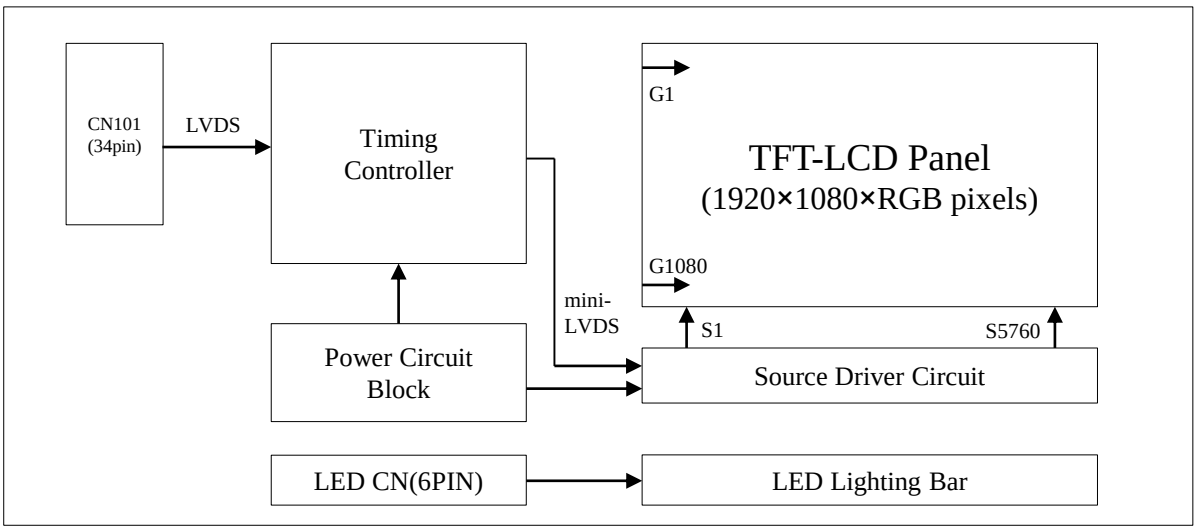
1.0 GENERAL DESCRIPTION

1.1 Introduction

DV215FHM-R10 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 21.45 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 Port 4 Pair
- High-speed response
- 0.5t Glass
- 16.7M (6Bit+FRC) color depth, display 16. 7M colors
- Incorporated edge type back-light (Two Light Bar)
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) only
- RoHS/Halogen Free
- 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 DV215FHM-R10.

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	478.66(H) × 260.28(V)	mm	
Number of pixels	1920(H) ×1080(V)	pixels	
Pixel pitch	0.2493(H) x 0.2410(V)	mm	
Pixel arrangement	RGB Vertical stripe	-	
Display colors	16.7M (6Bit+FRC)	colors	
Display mode	Normally Black	-	
Dimensional outline	499(H) x 286.2(V)× 10.7(D) typ	mm	Detail refer to drawing
Weight	2.0	Kg	TYP
Surface Treatment	Anti-glare, 3H	-	
Back-light	Up & Down edge side 2-LED Light bar Type	-	

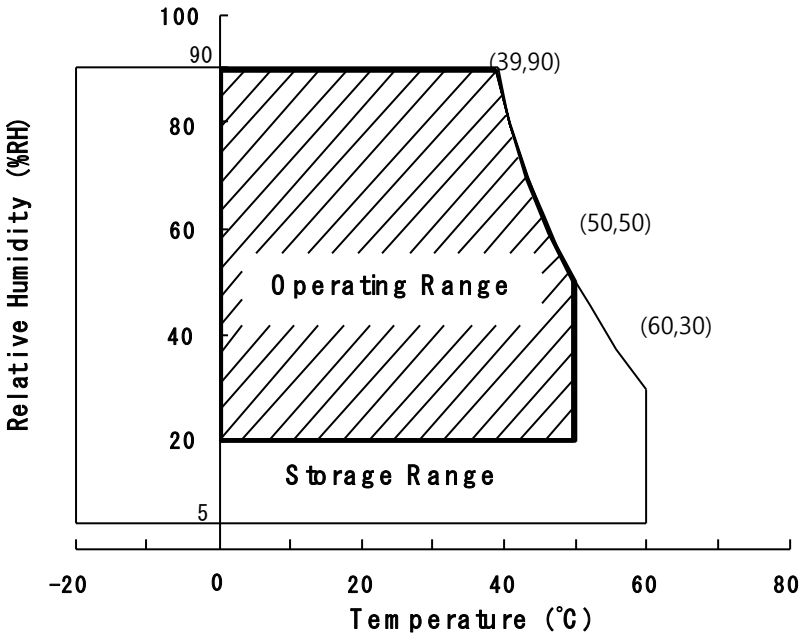
2.0 ABSOLUTE MAXIMUM RATINGS

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	5.5	V	Ta = 25 ℃
Logic Supply Voltage	V_{IN}	VSS-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	-20	+60	℃	1)
	T_{SUR}	-20	+80	℃	1)
Storage Temperature	T_{ST}	-30	+70	℃	1)

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1Electrical Specifications

< Table 3. Electrical specifications > [Ta =25±2 ℃]

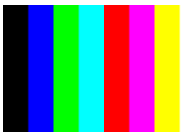
Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	$I_{DD\ Typ.}$	-	TBD	TBD	mA	
	$I_{DD\ Max}$	-	TBD	TBD	mA	
In-Rush Current	I_{RUSH}	-	2.0	3.0	A	Note 2
Permissible Input Ripple Voltage	V_{RF}	-	-	300	mV	**V_{DD} = 5.0V**
High Level Differential Input Threshold Voltage	V_{IH}	-	-	+100	mV	Vcm=1.2V
Low Level Differential Input Threshold Voltage	V_{IL}	-100	-	-	mV	
Differential input voltage	$\|V_{ID}\|$	200	-	600	mV	
Differential input common mode voltage	Vcm	1.0	1.2	1.5	V	
Power Consumption	$P_{D\ Typ.}$	-	TBD	TBD	W	Note1
	$P_{D\ Max}$	-	TBD	TBD	W	
	P_{BL}	-	TBD	TBD	W	100% duty, Note 3
	$P_{total\ Typ.}$	-		TBD	W	Note1
	$P_{total\ Max}$	-	TBD	TBD	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=60Hz. Test Pattern of power supply current

a) Typ : Color Bar pattern

b) Max : Skip Sub pixe L255



2. Duration of rush current is about 2 ms and rising time of VDD is 520 μs ± 20 %

3. Calculated value for reference (VL × IL) ×4(channel) ×2(light bar) excluding driver loss. (LED Light bar: : 17S4P)

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Light Bar Input Voltage Per Input Pin	VPIN	47.6	51	54.4	V	Duty 100%
LED Light Bar Input Current Per Input Pin	IPIN	-	76		mA	Note1,2,
LED Power Consumption	PBL	-	31	33.1	W	Note 3
LED Life-Time	-	50000	-		Hrs	Note 4

LED bar consists of 68LED packages,4 strings(parallel)*17packages(serial)
Note1: There are two light bar ,and the specified current is input LED chip 100% duty current
Note2: The sense current of each input pin is 76mA
Note3: PBL=4 Input pins*VP_{IN} ×IP_{IN} * 2 (light bar)
Note4: The lifetime is determined as the time at which luminance of LED become 50% of the initial brightness or not normal lighting at IPIN=76mA on condition of continuous operating at 25 ±2 ℃

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 $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, 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 5.0V +/-10% at 25°C. Optimum viewing angle direction is 6 'clock.

4.2 Optical Specifications

[VDD = 5.0V, Frame rate = 60Hz, Clock = 60.4MHz, I_{BL} = 608mA, Ta =25±2 °C]

< Table 4. Module Optical >

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	Θ = 0° (Center) Normal Viewing Angle	700	1000			Note 2
Luminance of White		Y_w		1200	1500	-	cd/m²	Note 3
White luminance uniformity		ΔY		75	-	-	%	Note 4
Reproduction of color	White	W_x		-0.03	0.313	+0.03	-	Note 5
		W_y			0.329		-	
	Red	R_x			0.651		-	
		R_y			0.338		-	
	Green	G_x			0.319		-	
		G_y			0.622		-	
	Blue	B_x			0.152		-	
		B_y			0.064		-	
Response Time	GTG	T_g		-	14	20	ms	Note 6
Color Gamut				68	72	-	%	NTSC CIE 1931
Cross Talk		CT		-	-	2.0	%	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 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 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 :
   ΔY = (Minimum Luminance of 9points / Maximum Luminance of 9points) * 100
   (See FIGURE 2 shown in Appendix).
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. 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 fV =60Hz to optimize.
   Each time in below table is defined as appendix Figure 3and shall be measured by switching the input signal for "any level of gray(bright)"and "any level of gray(dark)".

Measured Response Time		Target																
		0	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
Start	0																	
	15																	
	31																	
	47																	
	63																	
	79																	
	95																	
	111																	
	127																	
	143																	
	159																	
	175																	
	191																	
	207																	
	223																	
	239																	
	255																	

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.

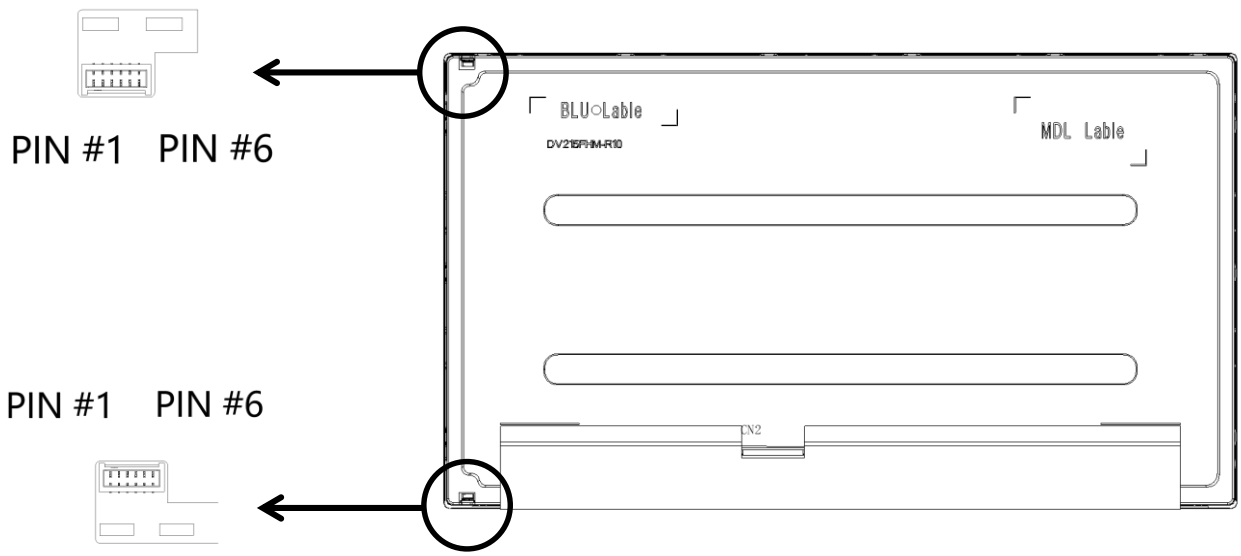
5.1 Electrical Interface Connection

5.1.1 LED Light Bar

-LED connector： CI1406M1VL0-NH manufactured by Cvilux or equivalent

< Table 5. LED Light Bar>

Pin No	Symbol	Description
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED power supply
4	VLED	LED power supply
5	IRLED3	LED current sense for string3
6	IRLED4	LED current sense for string4

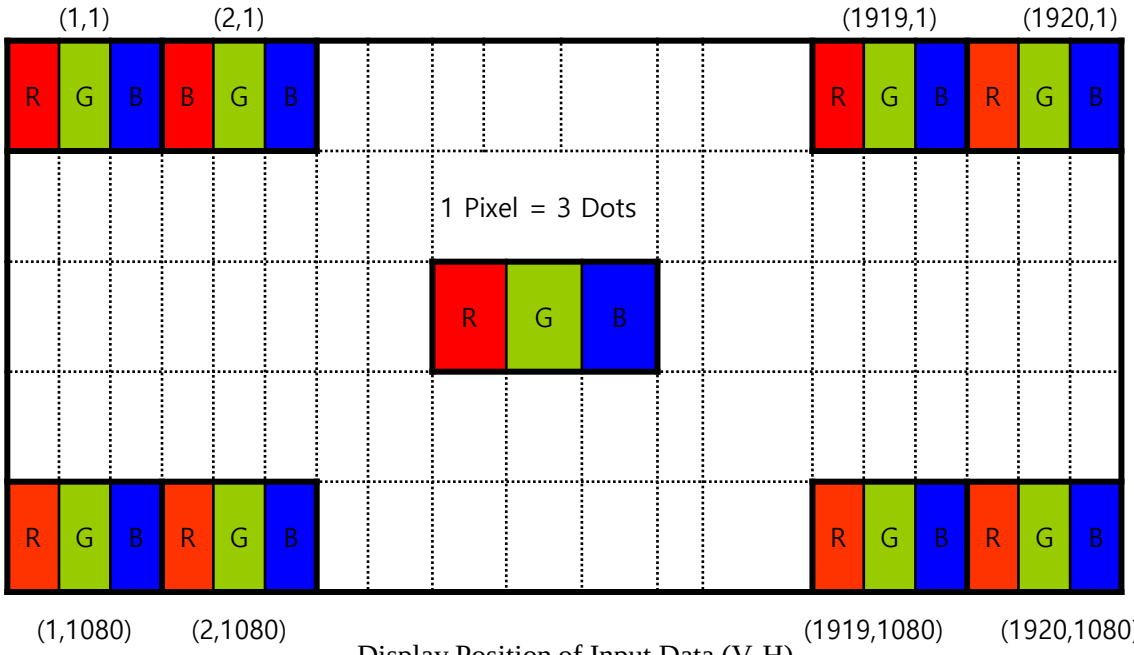


5.2 Electrical Interface Connection

- CN101 IS100-L30O-C23

Pin No	Symbol	Function	Pin No	Symbol	Function
1	OLV0N_T	Negative Transmission data of Pixel 0	18	ELV2N_T	Negative Transmission data of Pixel 2
2	OLV0P_T	Positive Transmission data of Pixel 0	19	ELV2P_T	Positive Transmission data of Pixel 2
3	OLV1N_T	Negative Transmission data of Pixel 1	20	ELVCLKN_T	Negative Transmission Clock
4	OLV1P_T	Positive Transmission data of Pixel 1	21	ELVCLKP_T	Positive Transmission Clock
5	OLV2N_T	Negative Transmission data of Pixel 2	22	ELV3N_T	Negative Transmission data of Pixel 3
6	OLV2P_T	Positive Transmission data of Pixel 2	23	ELV3P_T	Positive Transmission data of Pixel 3
7	GND	Power Ground	24	GND	Power Ground
8	OLVCLKN_T	Negative Transmission Clock	25	WP_EEPROM	Write Protect
9	OLVCLKP_T	Positive Transmission Clock	26	SCL_PM	SCL_PG
10	OLV3N_T	Negative Transmission data of Pixel 3	27	SDA_PM	SCL_PG
11	OLV3P_T	Positive Transmission data of Pixel 3	28	VDDIN	POWER 5V
12	ELV0N_T	Negative Transmission data of Pixel 0	29	VDDIN	
13	ELV0P_T	Positive Transmission data of Pixel 0	30	VDDIN	
14	GND	Power Ground	31	GND	Power Ground
15	ELV1N_T	Negative Transmission data of Pixel 1	32	GND	Power Ground
16	ELV1P_T	Positive Transmission data of Pixel 1	33	GND	Power Ground
17	GND	Power Ground	34	GND	Power Ground

5.2 Data Input Format



Display Position of Input Data (V-H)

5.3 Back-light Interface Connection

-LED connector： CI1406M1VL0-NH manufactured by Cvilux or equivalent

Pin	Function
1	Channel 1 Current Feedback
2	Channel 2 Current Feedback
3	LED Power Supply
4	LED Power Supply
5	Channel3 Current Feedback
6	Channel4 Current Feedback

6.0 SIGNAL TIMING SPECIFICATION

6.1 The DV215FHM-R10 is operated by the DE only.

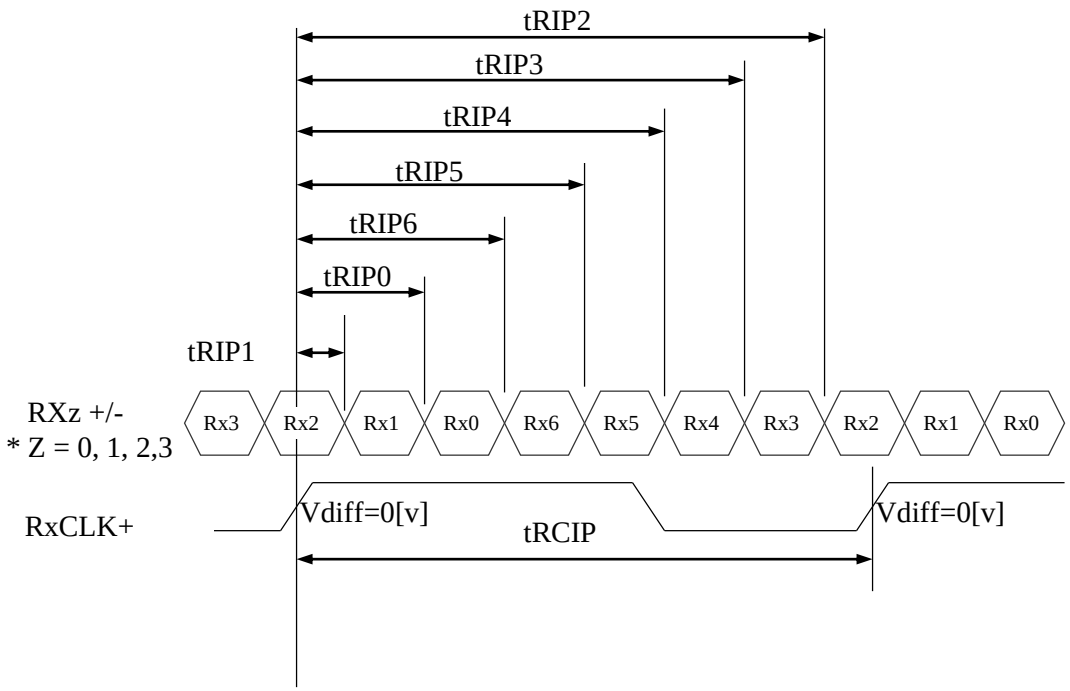
Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	10.78	13.47	16.16	ns	
	Frequency	fCLK	61.87	74.25	92.8	MHz	
Hsync	Period	tHP	1050	1100	1120	tCLK	
	Horizontal Valid	tHV	960	960	960	tCLK	
	Horizontal Blank	tHB	90	140	160		
	Frequency	fH	56	67.5	84.5	KHz	
Vsync	Period	tVP	1110	1125	1251	tHP	
	Vertical Valid	tVV	1080	1080	1080	tHP	
	Vertical Blank	tVB	30	45	171	tHP	
	Frequency	fV	50	60	75	Hz	
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%	

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>

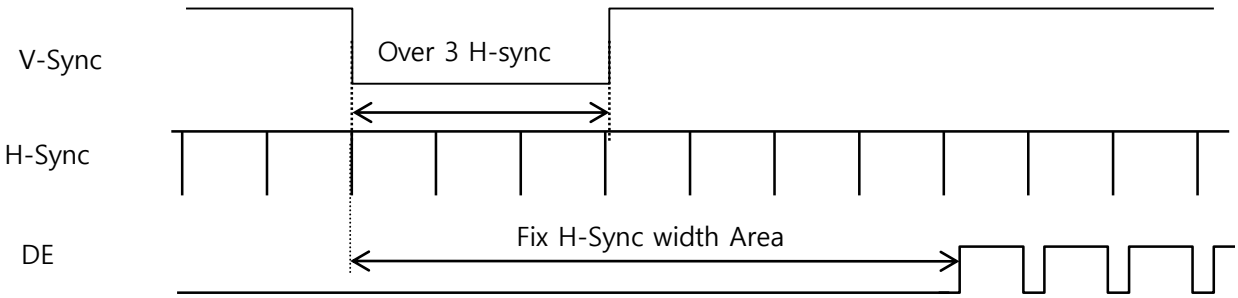
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	13.24	16.55	20.68	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.4	2 ×tRCIP/7	2 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.4	3 ×tRCIP/7	3 ×tRCIP/7+0.4	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	



* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

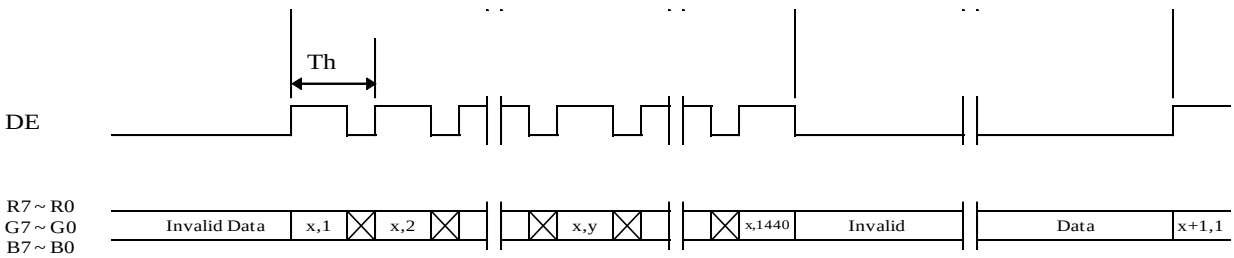
7.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

7.1 Sync Timing Waveforms

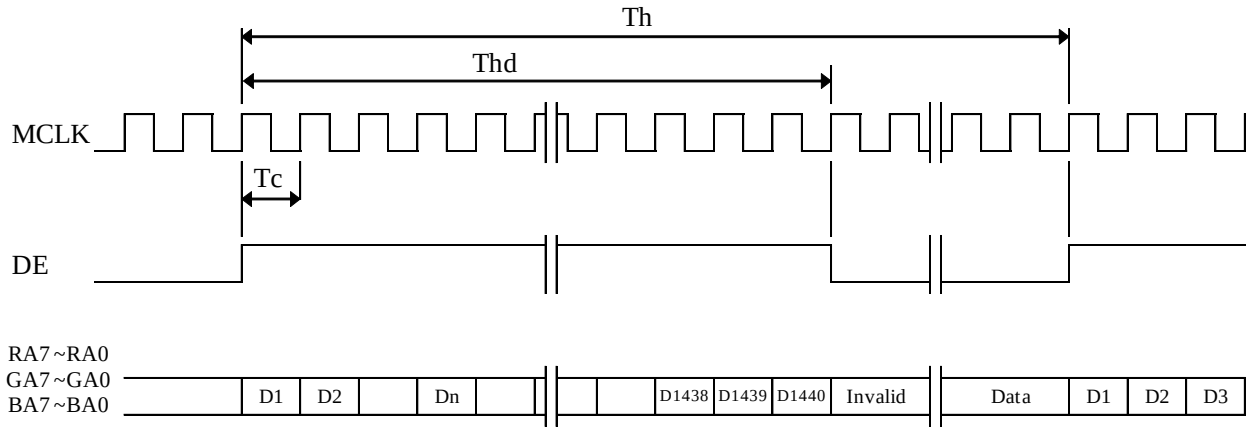


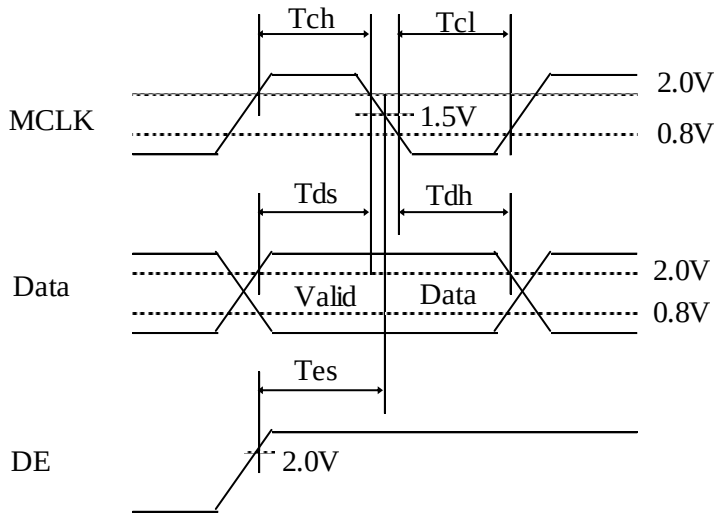
1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

7.2 Vertical Timing Waveforms



7.3 Horizontal Timing Waveforms



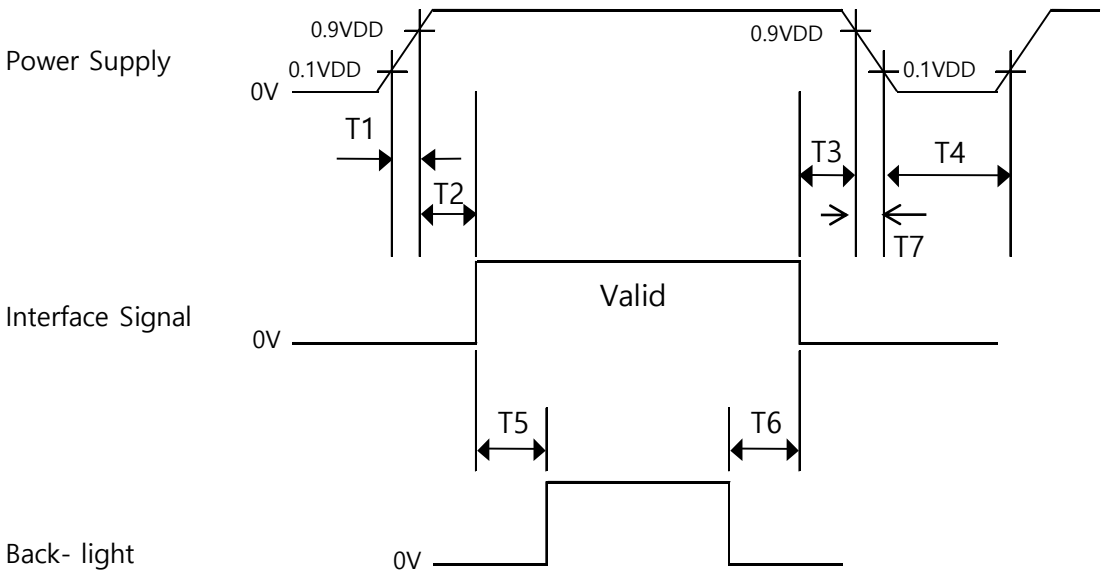


8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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
	△	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

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 ms ≤ T1 ≤ 10 ms
- 0 ≤ T2 ≤ 50 ms
- 0 ≤ T3 ≤ 50 ms
- 1 sec ≤ T4
- 500 ms ≤ T5
- 200 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 MV270QHM-N61. Other parameters are shown in Table 8.

<Table 8. Dimensional Parameters>

Parameter	Specification	Unit
Dimensional outline	499(H) x 286.2(V)× 10.7(D) typ.	mm
Weight	2.0	Kg
Active area	478.66(H) × 260.28(V)	mm
Pixel pitch	0.2493(H) x 0.2410(V)	mm
Number of pixels	1920(H) ×1080(V)(1 pixel = R + G + B dots)	pixels
Back-light	Up & Down edge side 2-LED Light bar Type	

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.

10.5 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.

11.0 RELIABLITY 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 = 70 ℃, 240 hrs	
2	Low temperature storage test	Ta = -30 ℃, 240 hrs	
3	High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240hrs	
4	High temperature operation test	Ta = 60 ℃, 240 hrs	
5	Low temperature operation test	Ta = -20℃, 240hrs	
6	Thermal shock	Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle	
7	Vibration test (non-operating)	Frequency	Random,10 ~ 300 Hz, 30 min/Axis
		Gravity\ AMP	1.0 Grms
		Period	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	

12.0 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.

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.

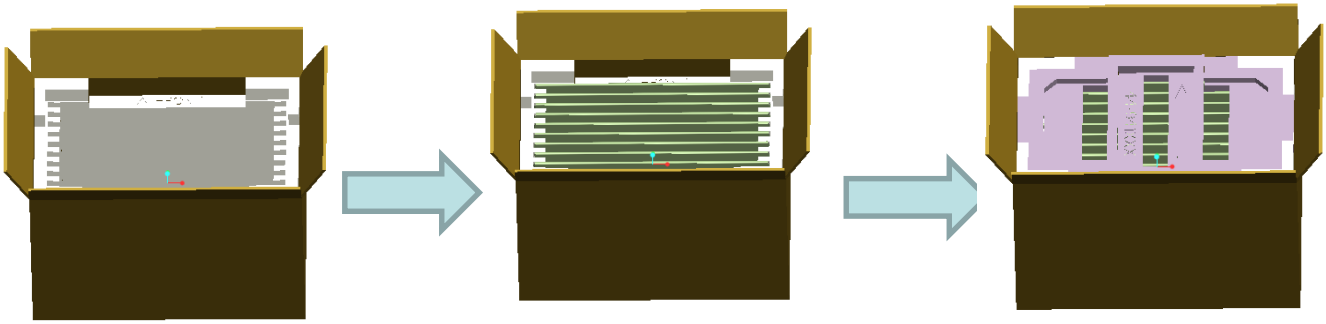
13.0 PRODUCT SERIAL NUMBER

MDL ID Naming Rule:

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. Model Code GBN 2. Grade 3. Line 4. Year(2016:16, 2017:17, …) 5. Month(1, 2, 3, …, 9, X, Y, Z) 6. Model Extension Code 7. Serial Number																

14.0 Packing

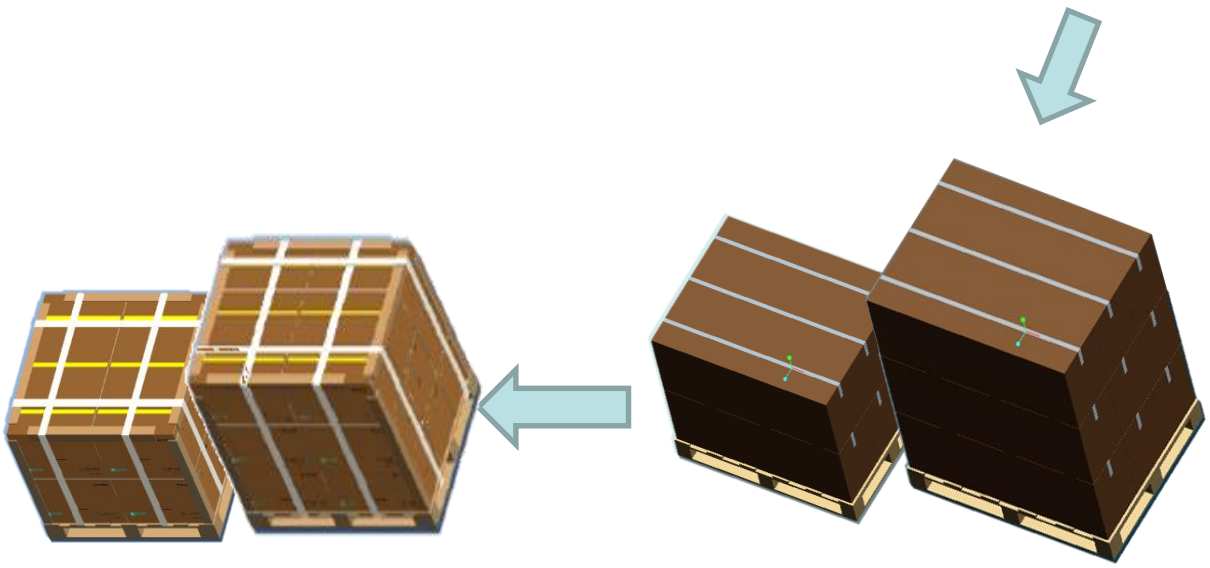
14.1 Packing Order



Put 1 EPO bottom into th e inner box.

Put each module into a PE bag. Insert 10Pcs MDL into each box

Put 1 EPO cover in the box.



Place paper corners and wrap film around the b oxes.
Pack with 4 packing belts.

Put the boxes on the pallet (12/18ea boxes per ballet)

14.2 Packing Specification and Note

Item	Specification			Remark
	Q'ty	Dimension(mm)	Weight (kg)	
MDL	1	499(H) x 286.3(V)× 14.3(10.7)(D) typ	2.2	-
Cushion	-	-	-	-
Box	1	574(L)×366(W)×390(H)	1.17	without Panel & cushion
Packing Box	10pcs/Box	574(L)×366(W)×390(H)	24.2	with panel & cushion
Pallet	1	1180(L)×1140(W)×130(H)	23	-
Packing Pallet	12/18 Box/Pallet	1180(L)×1140(W)×923/1313 (H	316.7/462.2	-

14.3 Box label

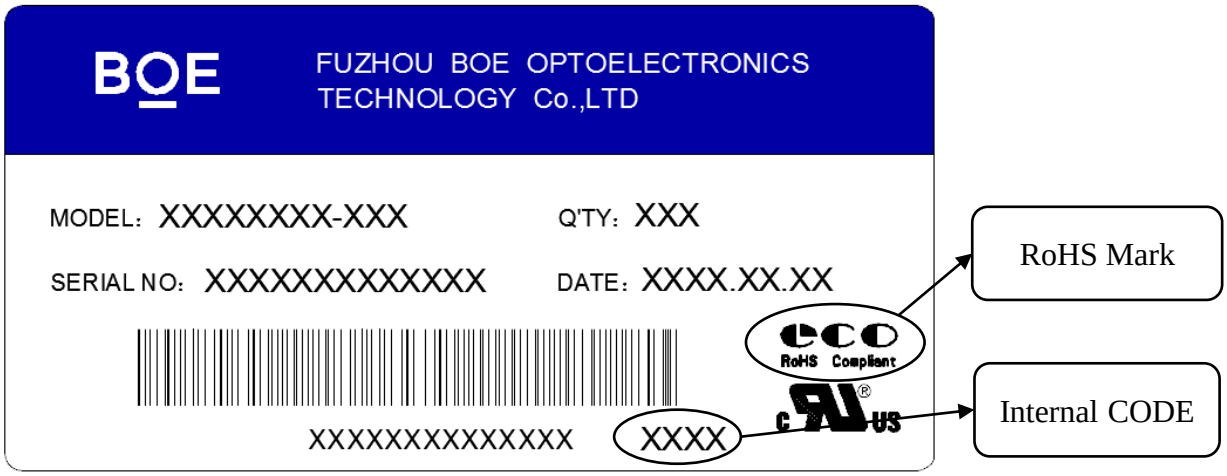
- Label Size : 100 mm (L) × 50 mm (W)
- Contents

  Model : DV215FHM –R10

  Q`ty : Module 10Q`ty in one box

  Serial No. : Box Serial No. See next page for detail description.

  Date : Packing Date



Digit	1		2	3	4		5	6	7				
Code	x	x	x	x	x	x	x	x	x	x	x	x	x
Des.	1. Model Code GBN 2. Grade 3. Line 4. Year(2016:16, 2017:17, …) 5. Month(1, 2, 3, …, 9, X, Y, Z) 6. Revision Code 7. Serial Number												

15.0 APPENDIX

Figure 1. Measurement Set Up

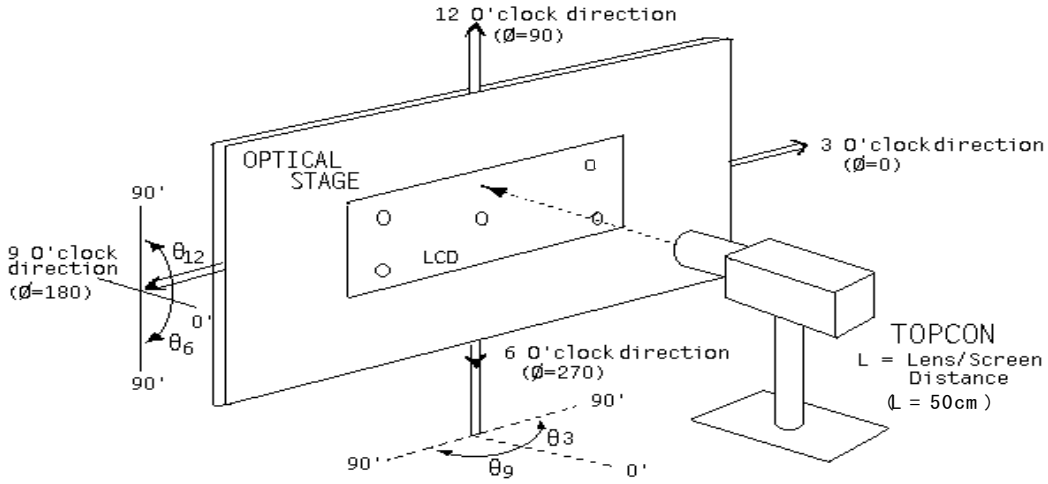


Figure 2. White Luminance and Uniformity Measurement Locations (9 points)

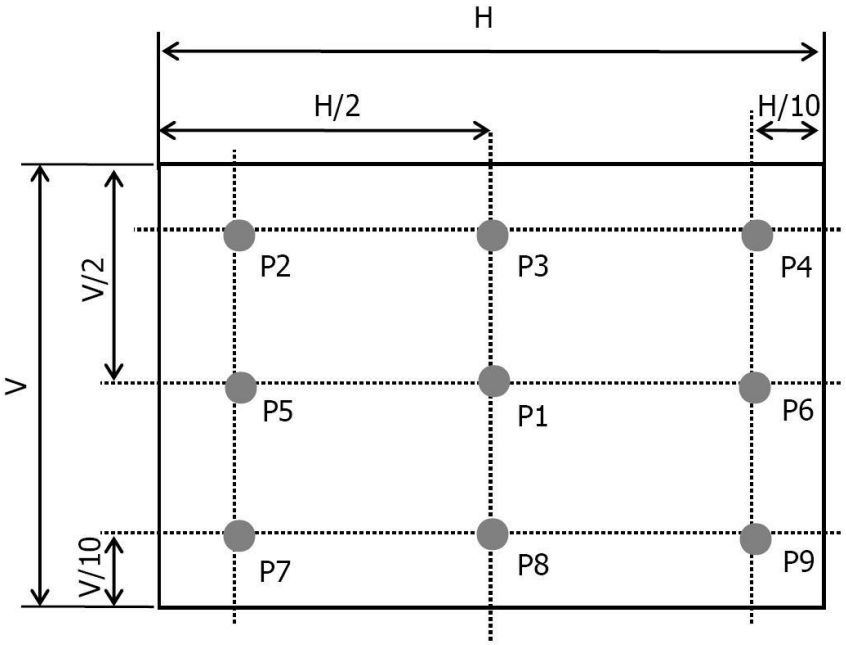


Figure 3. Response Time Testing

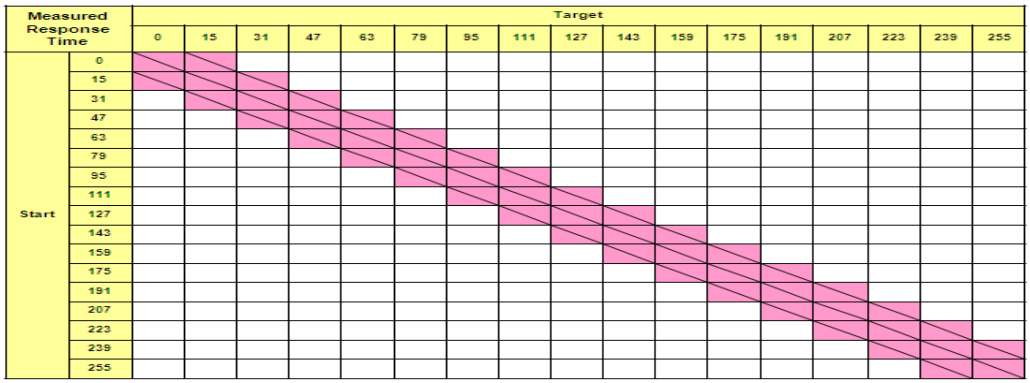
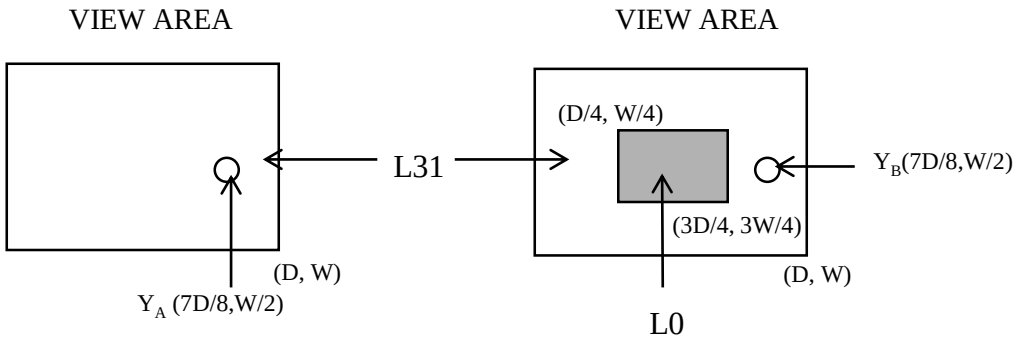


Figure 4. Cross Modulation Test Description



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

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

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

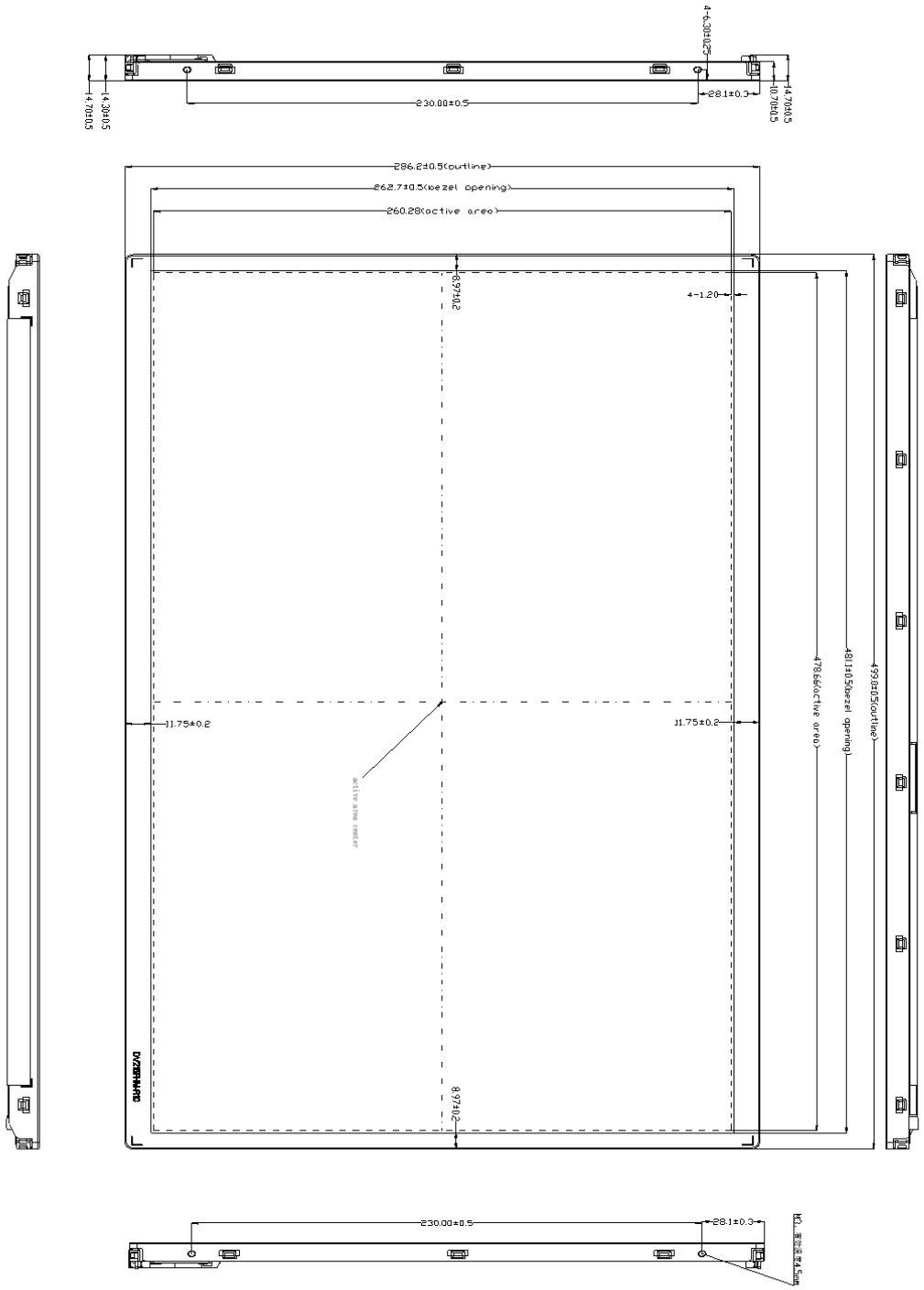
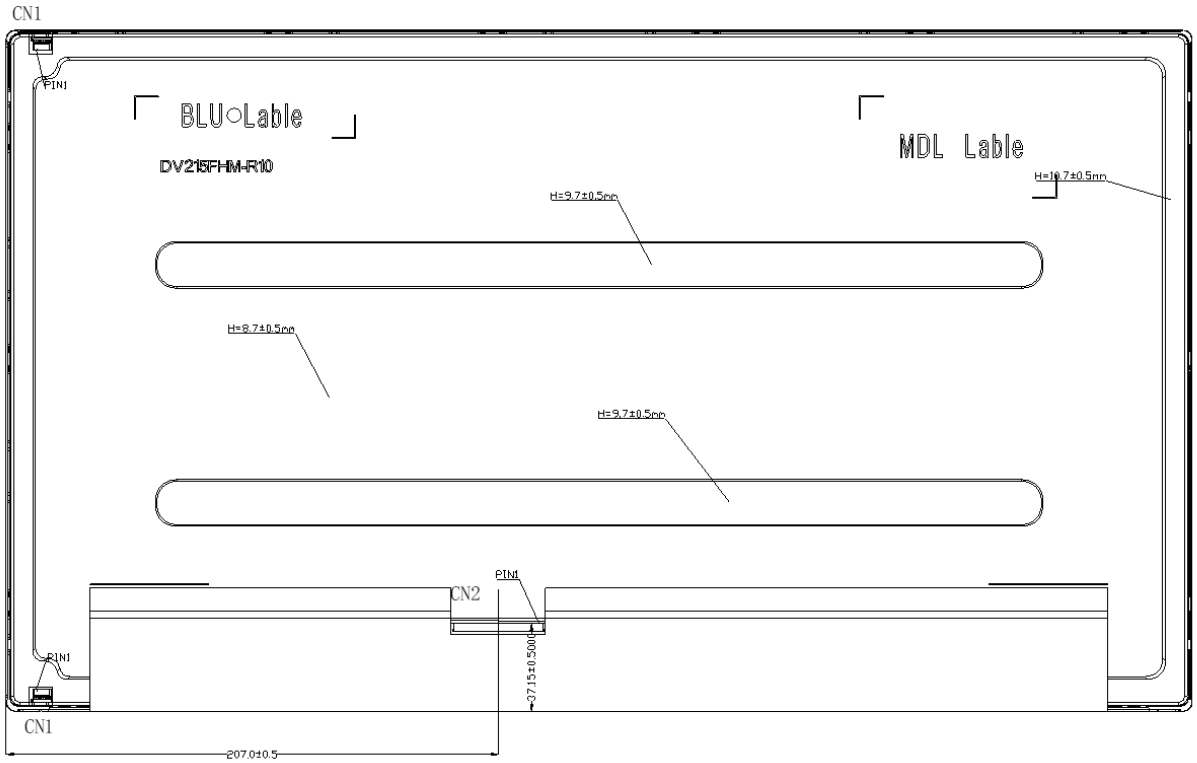


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)



NOTE

1. General tolerance is ±0.5mm
2. CNT1: CI1406SL000-NH (6Pin)
   CNT2: IS100-L30O-C23