

DV270FHM-R01**Product Specification****Rev. O****FUZHOU BOE OPTOELECTRONICS TECHNOLOGY Co.,LTD**

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PRODUCT GROUP

REV

ISSUE DATE

Customer SPEC

Rev. 0

2022/07/15

REVISION HISTORY

()preliminary specification

(✓)Final specification

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SPEC. TITLE

DV270EHM-R01 Product Specification Rev.0

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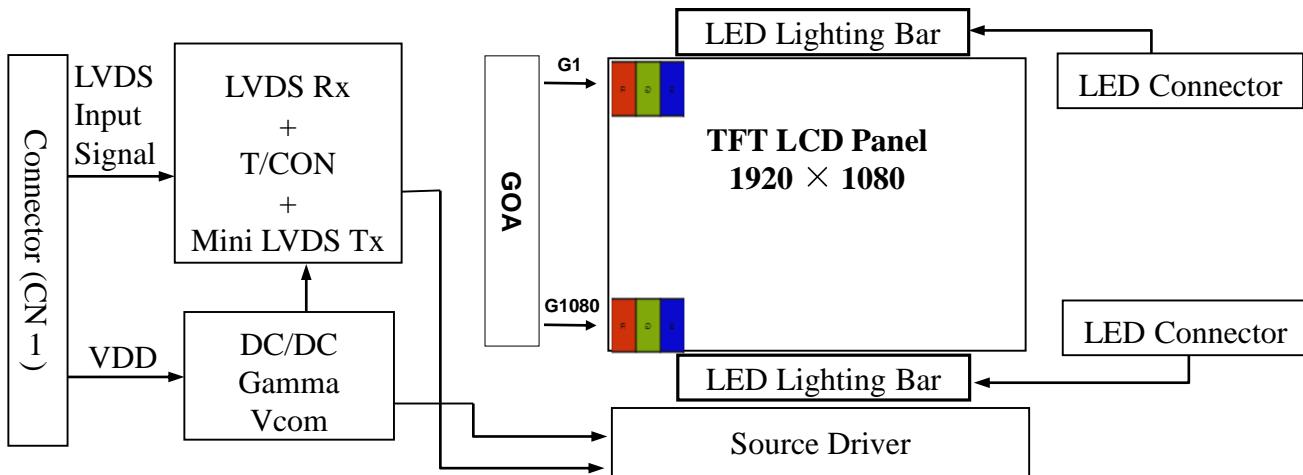
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1.0 GENERAL DESCRIPTION

1.1 Introduction

DV270FHM-R01 is a color active matrix TFT LCD MDL using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This MDL has a 27 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 MDL panel is adapted for a low reflection and higher color type.



1.2 Features

- LVDS interface with 2 pixel / clock
- Low color shift image quality
- 8-bit color depth, display 16.7M colors
- Wide viewing angle
- DE (Data Enable) only mode
- ADS technology is applied for high display quality
- RoHS compliant
- 7*24hrs usage support with dynamic video
- Landscape and Portrait usage support
- Normal Pol
- LC Tni 105°C

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1.3 Application

- Outdoor Commercial Digital Display
- Outdoor Landscape and Portrait Signage Display
- Gas Station

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	597.888(H) × 336.312(V)	mm	
Number of pixels	1920(H) × 1080(V)	pixels	
Pixel pitch	0.3114(H) × 0.3114(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	colors	
Display mode	Normally Black		
Dimensional outline	626.0(H) x363.8(V) x9.3(D) typ.	mm	Detail refer to drawing
Weight	3000(Max.)	g	
Power Consumption	6.5 (OC) + 55.2 (BLU)	Watt	Typ.
Bezel width (L/R/U/D)	12/12/12/12	mm	
Surface Treatment	Haze 25%, 3H		
Back-light	UP&LOWER edge side, 2-LED Lighting Bar type		Note 1

Note : 1.LED Lighting Bar (8*input pins)

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.

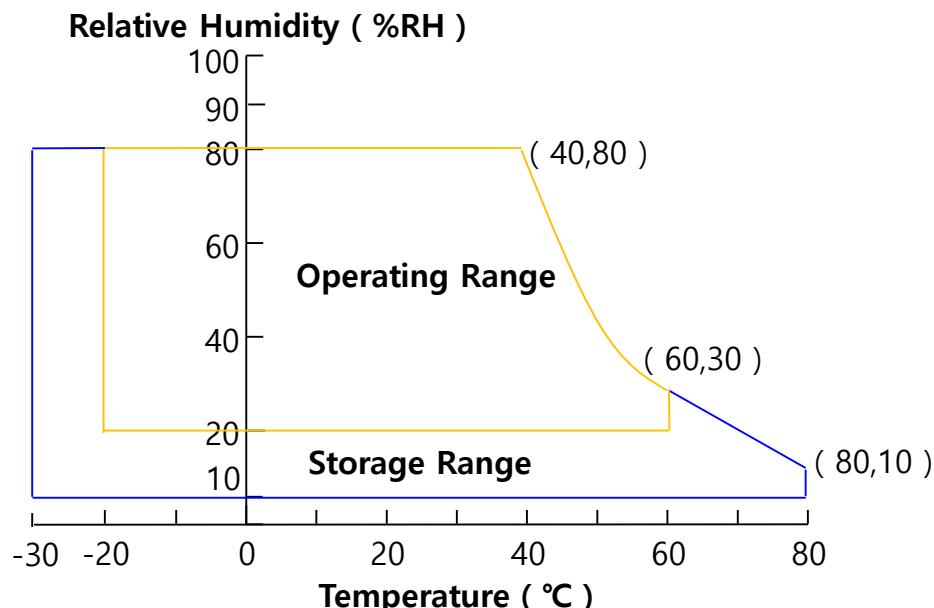
< Table 2. Module Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	6	V	T _a = 25 °C
Operating Temperature	T _{OP}	-20	+60	°C	Note 1
	T _{SUR}	-	+80	°C	
Storage Temperature	T _{ST}	-30	+80	°C	
Operating Ambient Humidity	H _{OP}	5	80	%RH	
Storage Humidity	H _{ST}	5	80	%RH	

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 TFT LCD Module

< Table 3. Module Electrical Specifications >

[Ta = 25±2 °C]

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Power Supply Input Voltage	VDD	4.5	5	5.5	Vdc	
Power Supply Ripple Voltage	VRP	-	-	300	mV	
Power Supply Current	IDD	-	1200	2000	mA	Note 1
Power Consumption	PDD	-	6	10	Watt	
Rush current	IRUSH	-		3.0	A	Note 2
LVDS Interface	Differential Input High Threshold Voltage	VLVTH		-	+100	mV
	Differential Input Low Threshold Voltage	VLVTL	-100	-	-	mV
	Input Differential Voltage	VID	100	-	600	mV
	Common Input Voltage	VLVC	0.6	1.2	1.6	V
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	
	Input Low Threshold Voltage	VIL	0	-	0.6	V

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=12.0V,

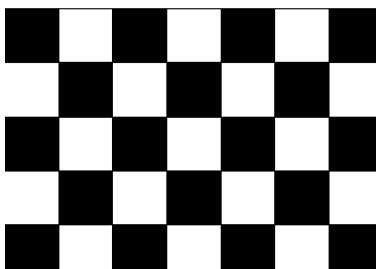
Frame rate f_V=60Hz and Clock frequency = 74.25MHz.

Test Pattern of power supply current

a) Typ : Mosaic 7X5 (L0/L255)

b) Max : Vline Subline (L255)

c) Flicker Pattern



R	G	B	R	G	B	R	G	B	R	G	B
+	+	-	+	+	-	+	+	-	+	+	-
R	G	B	R	G	B	R	G	B	R	G	B
-	-	+	+	-	-	+	+	-	+	+	-
R	G	B	R	G	B	R	G	B	R	G	B
+	+	-	+	+	-	+	+	-	+	+	-
R	G	B	R	G	B	R	G	B	R	G	B
-	-	+	+	-	-	+	+	-	+	+	-
R	G	B	R	G	B	R	G	B	R	G	B
+	+	-	+	+	-	+	+	-	+	+	-

Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

3.0 ELECTRICAL SPECIFICATIONS

3.2 Backlight Unit

< Table 3. Backlight Unit Electrical Specifications >

[Ta = 25 ± 2 °C]

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V _F	-	3.0	3.2	V	-
LED Forward Current	I _F	-	100	-	mA	-
LED Power Consumption	P _{LED}		34.2	-	W	Note 1
LED Life-Time	N/A	50000	-	-	Hour	IF = 100mA

Notes : 1. Power supply voltage 12V for LED Driver, Driver efficiency 87%,

Calculator Value for reference IF × VF × 96 / 0.87 = PLED

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

3.3 Backlight Input Pin Assignments

Connector type : CI0106S0000-6pin or equivalent

Pin No.	Symbol	Feature
1	CH1+	VLED OUT CH1,Blue
2	CH1-	I Return CH1,White
3	NC	NC
4	NC	NC
5	CH1+	VLED OUT CH1,Blue
6	CH1-	I Return CH1,White

DC Input specification

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
LED forward voltage per channel	VLED	-	37.2	38.4	V
LED forward current per channel	ILED	-	400	-	mA

4.0 INTERFACE CONNECTION

4.1 Interface Input Signal & Power : Cable length suggest less than 300mm

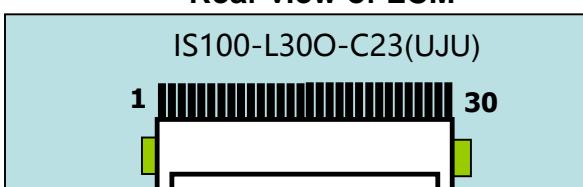
- LVDS Connector : IS100-L300-C23(UJU).

< Table 4. Module Input Connector Pin Configuration >

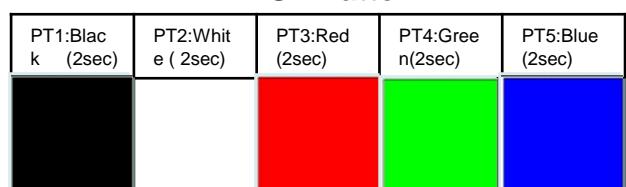
Pin No	Symbol	Description	Pin No	Symbol	Description
1	RXO0-	Negative Transmission data of Pixel 0 (ODD)	16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)
2	RXO0+	Positive Transmission data of Pixel 0 (ODD)	17	GND	Power Ground
3	RXO1-	Negative Transmission data of Pixel 1 (ODD)	18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)
4	RXO1+	Positive Transmission data of Pixel 1 (ODD)	19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)
5	RXO2-	Negative Transmission data of Pixel 2 (ODD)	20	RXEC-	Negative Transmission Clock (EVEN)
6	RXO2+	Positive Transmission data of Pixel 2 (ODD)	21	RXEC+	Positive Transmission Clock (EVEN)
7	NC	LCD Self test Pin	22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)
8	RXOC-	Negative Transmission Clock (ODD)	23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)
9	RXOC+	Positive Transmission Clock (ODD)	24	GND	Power Ground
10	RXO3-	Negative Transmission data of Pixel 3 (ODD)	25	NC	LCD Self test Pin
11	RXO3+	Positive Transmission data of Pixel 3 (ODD)	26	NC	LCD Self test Pin
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)	27	NC	No Connect
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)	28	VDD	Power Supply: +5V
14	GND	Power Ground	29	VDD	
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)	30	VDD	

Notes : 1. Input Level of LVDS signal is based on the EIA-644 Standard.

Rear view of LCM



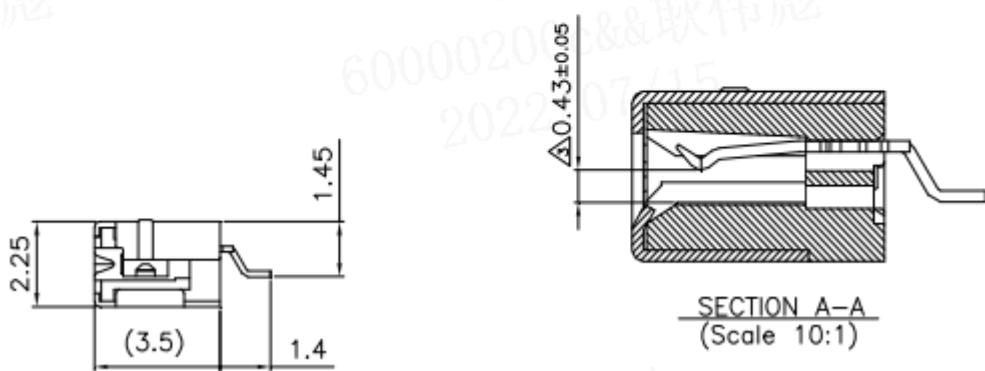
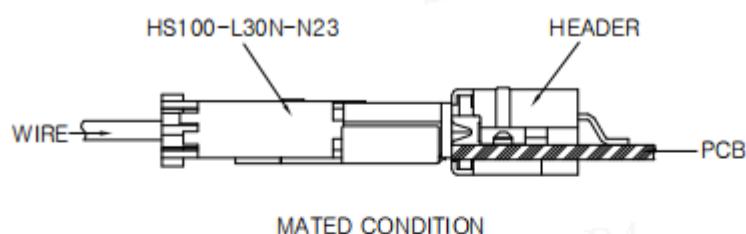
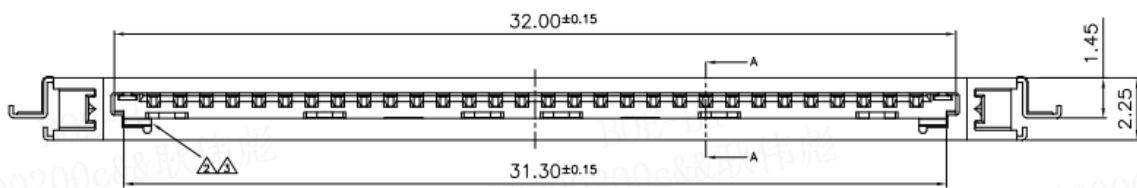
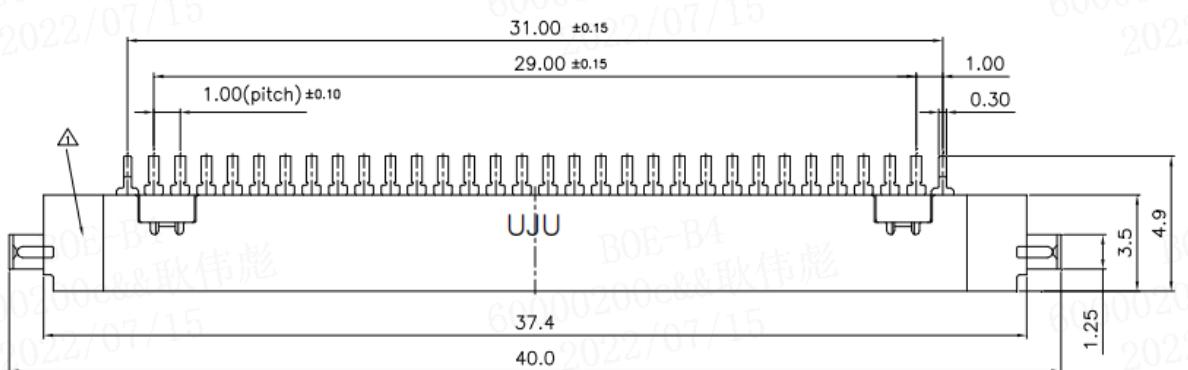
BIST Pattern



4.0 INTERFACE CONNECTION

4-2 CNT Dimension

-30pin Connector: IS100-L30O-C23(UJU)



4.3 LVDS Interface

- LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data
< Table 5. LVDS Input Data Mapping >

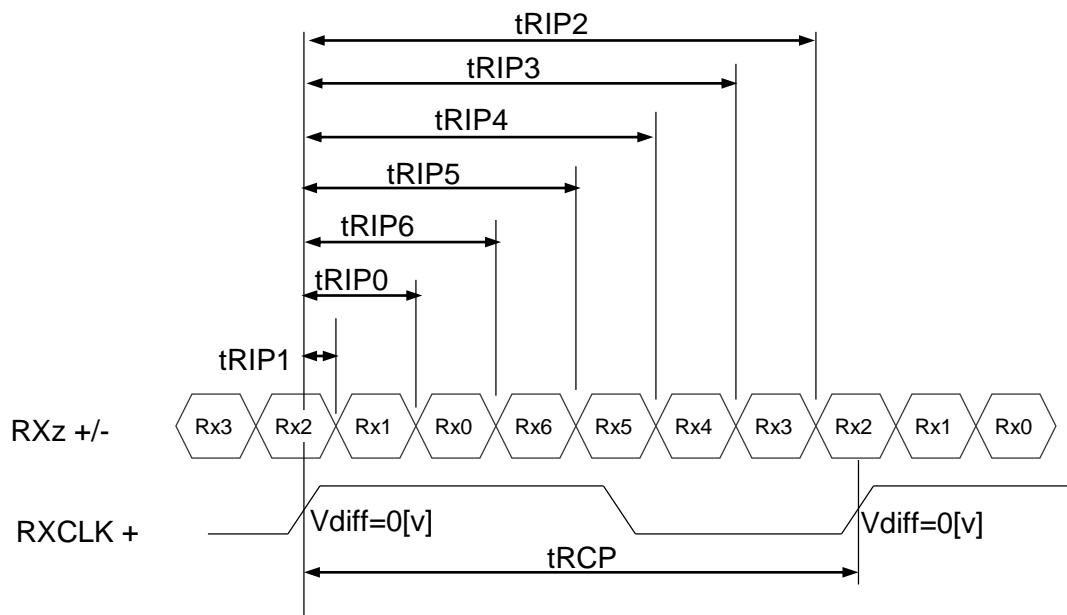
Channel No.	Data No.	8-bit LVDS Type
		VESA
0	Bit-0	R0
	Bit-1	R1
	Bit-2	R2
	Bit-3	R3
	Bit-4	R4
	Bit-5	R5
	Bit-6	G0
1	Bit-0	G1
	Bit-1	G2
	Bit-2	G3
	Bit-3	G4
	Bit-4	G5
	Bit-5	B0
	Bit-6	B1
2	Bit-0	B2
	Bit-1	B3
	Bit-2	B4
	Bit-3	B5
	Bit-4	HS
	Bit-5	VS
	Bit-6	DE
3	Bit-0	R6
	Bit-1	R7
	Bit-2	G6
	Bit-3	G7
	Bit-4	B6
	Bit-5	B7
	Bit-6	-

4.4 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 6.

<Table 6. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCP	10.47	13.47	16.84	nsec	
Receiver Data Input Margin	tRMG	-0.60	-	+0.60	nsec	fCLKIN=74.25M Hz
Input Data 0	tRIP1	- tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7- tRMG	T/7	T/7+ tRMG	Clock	
Input Data 2	tRIP6	2 T/7- tRMG	2T/7	2T/7+ tRMG	Clock	
Input Data 3	tRIP5	3T/7- tRMG	3T/7	3T/7+ tRMG	Clock	
Input Data 4	tRIP4	4T/7- tRMG	4T/7	4T/7+ tRMG	Clock	
Input Data 5	tRIP3	5T/7- tRMG	5T/7	5T/7+ tRMG	Clock	
Input Data 6	tRIP2	6T/7- tRMG	6T/7	6T/7+ tRMG	Clock	



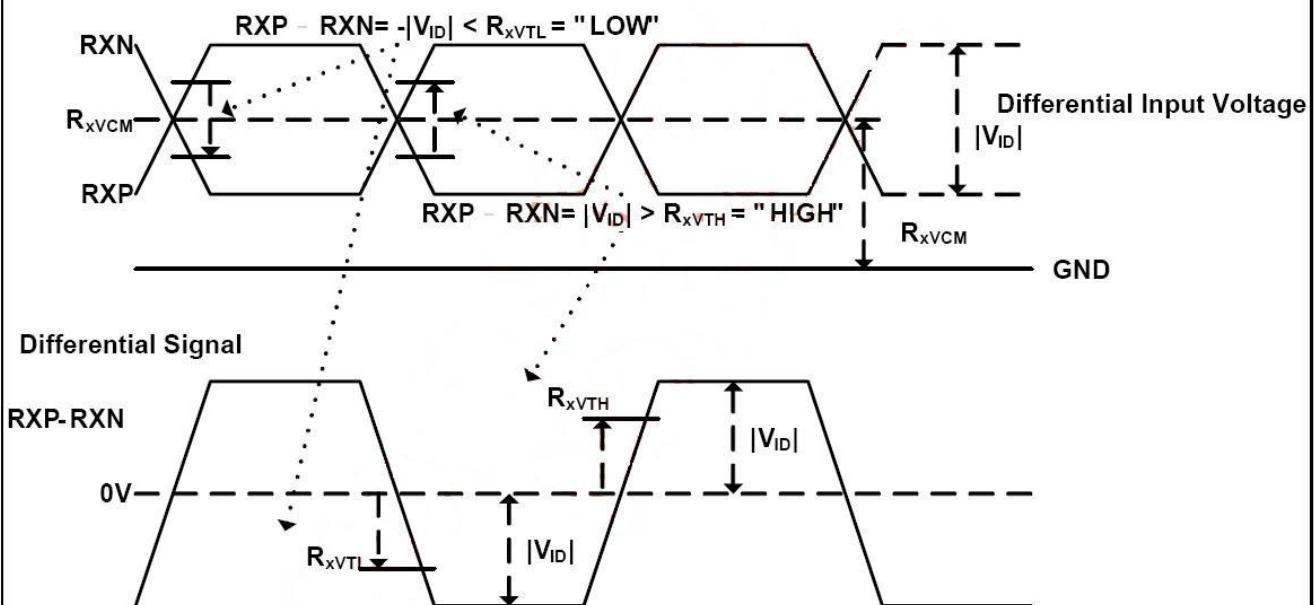
* Vdiff = (RXz+)-(RXz-), ..., (RXCLK+)-(RXCLK-)

4.5 LVDS Receiver Differential Input (DC Characteristics)

< Table 7-1. LVDS Rx DC Characteristics >

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input High Threshold Voltage	VTH	-	-	+100	mV	VCM=1.2V
Differential Input Low Threshold Voltage	VTL	-100	-	-	mV	
Differential Input Common Mode Voltage	VCM	0.8	1.2	1.6	V	
Differential Input Voltage	VID	100	-	600	mV	

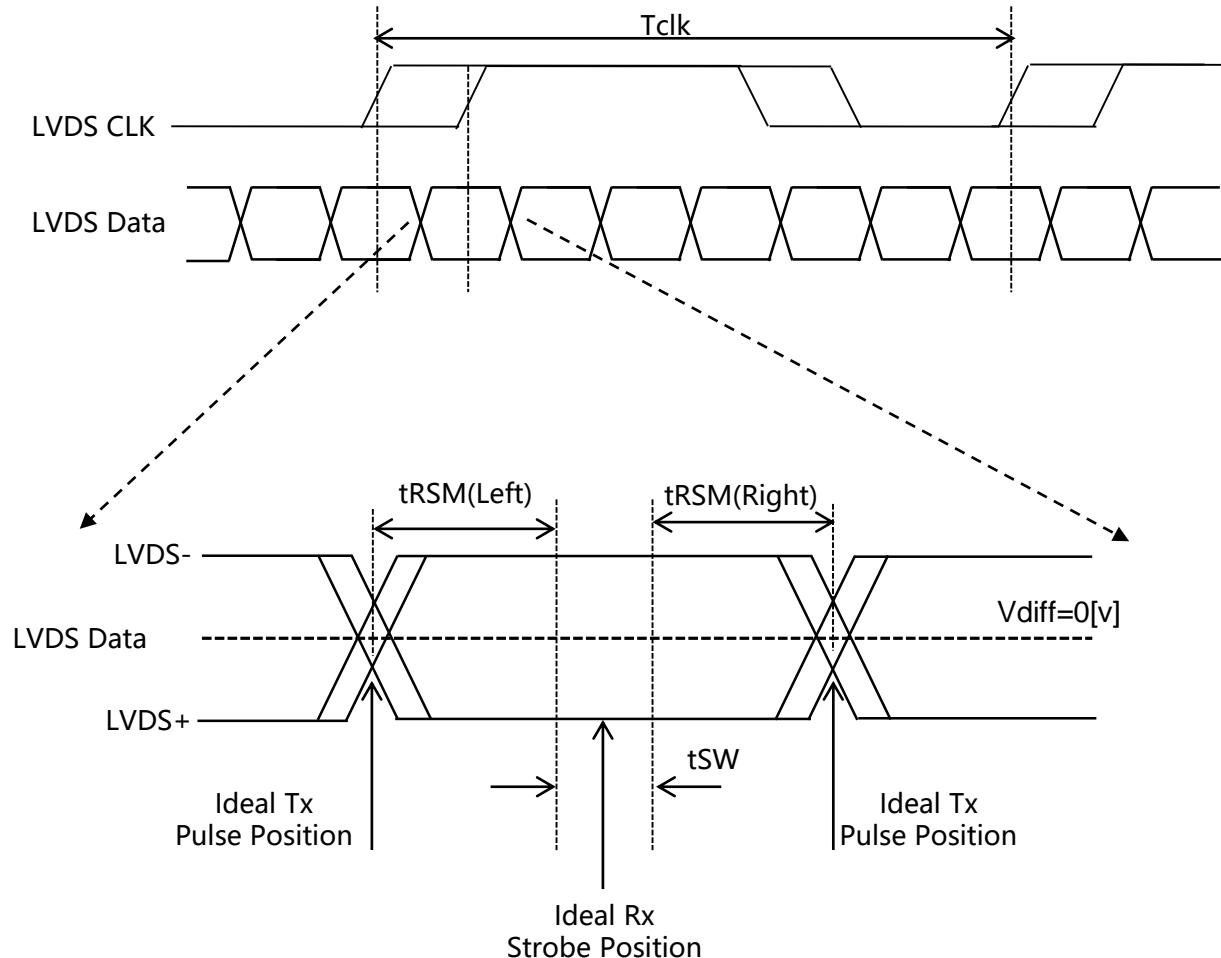
Single-end Signals



4.5 LVDS Receiver Differential Input (AC Characteristics)

< Table 7-1. LVDS Rx AC Characteristics >

Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Strobe Width	t_{SW}	200	-	-	ps	
Receiver Skew Margin	t_{RSM}	-	-	400	ps	$V_{cm}=1.2V$ $VID = 400mV$ @65MHz



Note:

RSM: Receiver Skew Margin

SW: Strobe Width (Setup and Hold time; TCON Internal data sampling window)

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5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters (DE only mode)

< Table 8. Timing Table >

Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	10.77	13.47	16.18	ns	
	Frequency	-	61.8	74.25	92.8	MHz	
Horizontal	Horizontal Period	tHP	1050	1100	1120	tCLK	
	Horizontal Valid	tHV	960			tCLK	
	Horizontal Blank	tHB	90	140	160		
	Frequency	fH	56	67.5	84.5	KHz	
Vertical	Vertical Period	tVP	1110	1125	1251	tHP	
	Vertical Valid	tVV	1080			tHP	
	Vertical Blank	tVB	30	45	171	tHP	
	Frequency	fV	50	60	75	Hz	
LVDS Rx Clock	CLK Jitter	TJitter	-	-	200	ps	

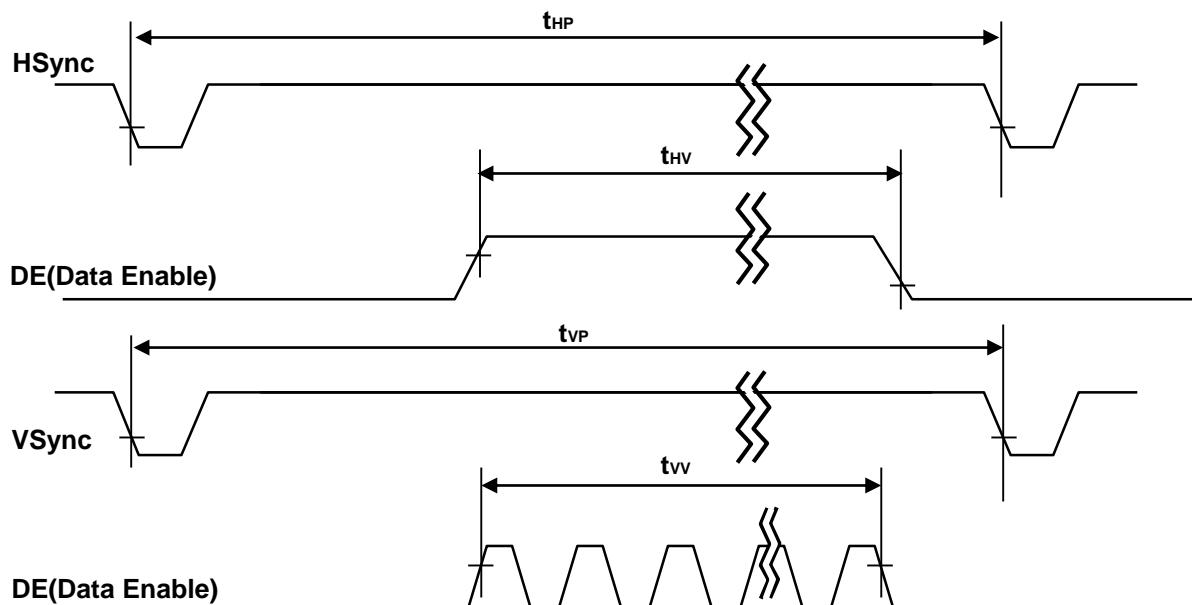
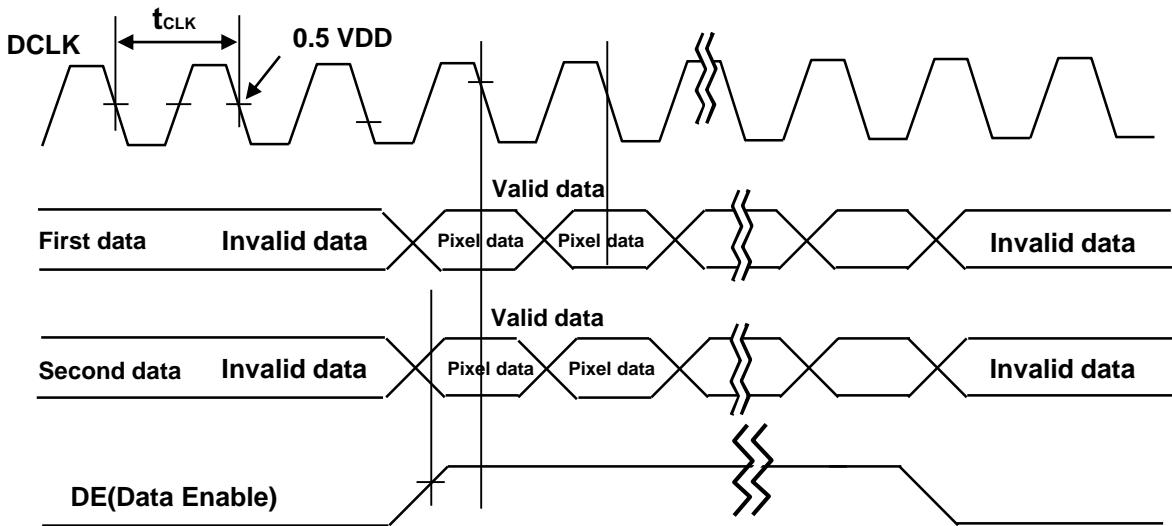
Note

1. DE Only Mode , While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.
2. Best operation clock frequency is 74.25Mhz.
3. Frequency] = [H Total] * [V Total] * [vertical Frame rate]
H Total, V Total and Frame rate should operate within the range between Frequency_Min and Max
4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.
5. Main frequency Max is 92.8 MHz without spread spectrum

< Table 9. LVDS Input SSCG>

Symbol	Parameter	Condition	Min	Typ	Max	Unit
F_{LVMOD}	Modulating frequency of input clock during SSC	$F=75MHz$	30	-	100	KHz
F_{LVDEV}	Maximum deviation of input clock frequency during SSC		-3	-	+3	%

5.2 Signal Timing Waveform



Note: While operation, DE signal should be have the same cycle and continuous;

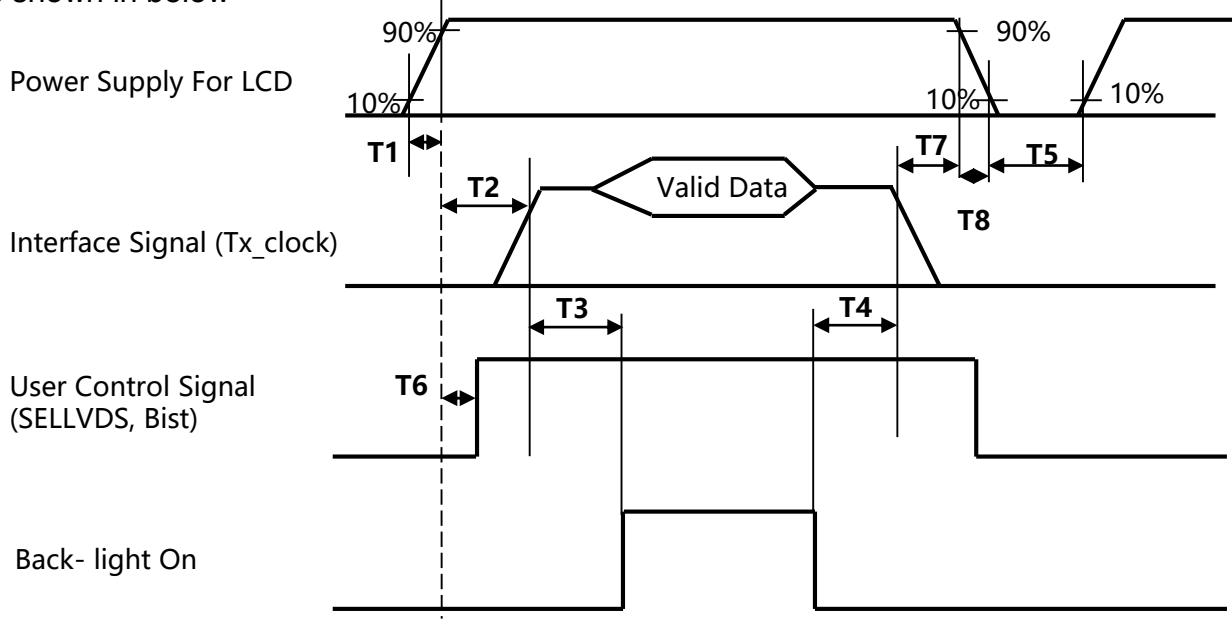
5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 10. Input Signal and Display Color Table >

Color & Gray Scale	Input Data Signal																							
	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	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	
	Red	1	1	1	1	1	1	1	1	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	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
	White	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	1	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	
	△	↑					↑					↑												
	▽	↓					↓					↓												
	Brighter	1	1	1	1	1	1	0	1	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	
	Red	1	1	1	1	1	1	1	1	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	1	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	
	△	↑					↑					↑												
	▽	↓					↓					↓												
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	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	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	0	0	0	0	0	0	0	0	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	1	0	0	0	0	0	
	△	↑					↑					↑												
	▽	↓					↓					↓												
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	△	↑					↑					↑												
	▽	↓					↓					↓												
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	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	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

5.4 Power Sequence

To prevent a latch-up or DC operation of the Module, the power on/off sequence shall be as shown in below



< Table 11. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0.1	-	T7	ms
T3	400	-	-	ms
T4	200	-	-	ms
T5	1	-	-	s
T6	0.1	-	T2	ms
T7	0.1	-	-	ms
T8	0.5	-	10	Ms

Note 1: Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

Note 2: When the power supply VDD is 0V, keep the level of input signals on the low or high impedance;

※ Please avoid floating state of interface signal at invalid period.

※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

Note 3: The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

Note 4: T5 should be measured after the Module has been fully discharged between power off and on period

Note 5: If the on time of signals (Interface signal and user control signals) precedes the on time of Power (VLCD), it will be happened abnormal display. When T6 is NC status, T6 doesn't need to be measured

Note 6: T8: Voltage of VDD must decay smoothly after power-off, there should be none re-bounding voltage. (customer system decide this value)

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6.0 OPTICAL SPECIFICATIONS

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 PR730) and test unit shall be located at an approximate distance 180cm 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 12.0V at 25°C. Optimum viewing angle direction is 6 'clock.

< Table 12. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta = 25 ± 2 °C]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark	
Viewing Angle	Horizontal	θ_3	CR > 10	80	89	-	Deg.	Note 1	
		θ_9		80	89	-	Deg.		
	Vertical	θ_{12}		80	89	-	Deg.		
		θ_6		80	89	-	Deg.		
Brightness		Lv		1300	1500		nit	MDL	
Contrast ratio		CR		700:1	1000:1	-		Note 2	
White luminance uniformity		ΔY		75	-	-	%	Note 3	
Reproduction of color	White	W_x	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	0.313				Note 4	
		W_y		0.329					
	Red	R_x		0.649					
		R_y		0.342					
	Green	G_x		-0.03	0.317			TYP. + 0.03	
		G_y		0.609					
	Blue	B_x		0.149					
		B_y		0.065					
Color Gamut				68	72	-	%		
Response Time	G to G	T_g		-	14	20	ms	Note 5	

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. 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 5 shown in Appendix).

4. The color chromaticity coordinates specified in Table 9 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel. The BLU is used by BOE.
5. Response time T_g 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 Figure 2 and 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
0																	
15																	
31																	
47																	
63																	
79																	
95																	
111																	
127																	
143																	
159																	
175																	
191																	
207																	
223																	
239																	
255																	

6. Definition of Transmittance (T%) :

Module is with white(L255) signal input

$$\text{Transmittance} = \frac{\text{Luminance of LCD Module}}{\text{Luminance of BLU}} \times 100 \%$$

7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

Figure 3(located in Appendix) shows mechanical outlines for the model DV270FHM-R01 . Other parameters are shown in Table 13.

< Table 13. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	626.0(H) x363.8(V) x9.3(D) typ.	mm
Weight	3000	gram
Active area	919.3(H)*138.85(V)	mm
Pixel pitch	159.6(H) ×478.8(V)	um
Number of pixels	1920(H) ×290(V)(1 pixel = R + G + B dots)	pixels
Back-light	UP&LOWER edge side, 2-LED Lighting Bar type	

7.2 Mounting

See FIGURE 5. (shown in Appendix)

7.3 Anti-Glare and Polarizer Hardness.

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

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8.0 RELIABILITY TEST

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

< Table 14. 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	Packing Vibration test (non-operating)	Frequency 5 ~ 300 Hz, Random Gravity / AMP 1.49 G Period X, Y 30 min, Z 60min
8	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV

This test condition is based on BOE module.

9.0 PRODCUT SERIAL NUMBER



- ① FG-CODE
- ② Module ID , 最后一位为Revision Code (扫描不显示) , 前17位编码规则如下
- ③ PPID (客户端ID)
- ④ D/PN码 , 规格待确定
- ⑤ 生产年份+生产周别 (中间无空格)

MDL ID Naming Rule:

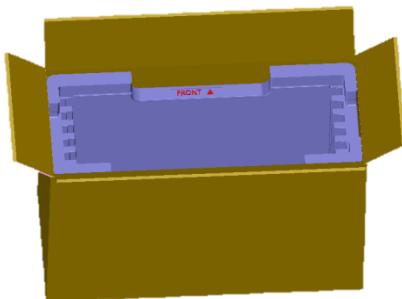
Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code	S	L	S	A	1	0	8	5	9	4	2	0	0	0	1	D	B
Description	Product Code/GBN→FG-CODE—一对应		Grade	line	Year		Month	Model Extension Code (Last 4 Digits of FG-CODE)				Serial No. Hex-Decimal 000000-FFFFFF					

10.0 PACKING INFORMATION

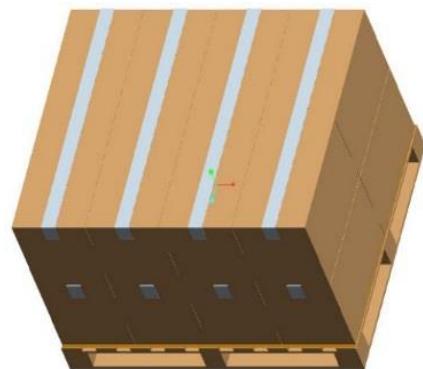
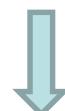
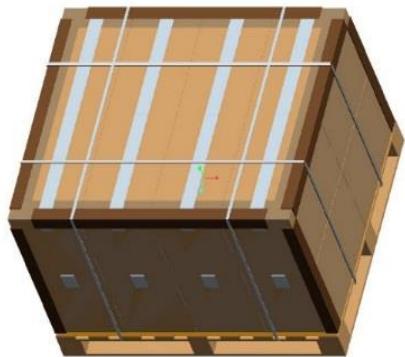
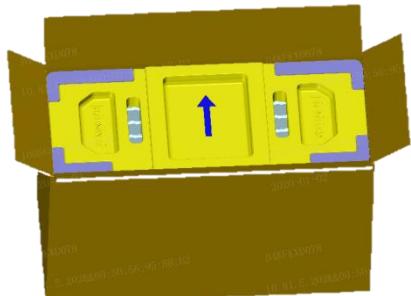
BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

10.1 Packing Order

1. Put 1 EPO bottom into the inner box.



2. Put each module into a PE bag. Insert 6 Pcs MDL into each box



5. Put 8 ea Paper Corner around the EPO Boxes (96 ea MDLs per pallet) and Pack with 4 packing belts.

4. Put the boxes on the pallet (16 ea boxes per pallet)

10.2 Packing Note

- Box Dimension : 715 mm(L)×280 mm(W)×470 mm(H)
- Package Quantity in one Box : 6 pcs

10.3 Box Label

- Label Size : 100mm (L) × 50mm (W)

• Contents

Model : DV270FHM-R01

Q`ty : Module 6 Q`ty in one box

Serial No. : Box Serial No.

Date : Packing Date



Digit Code	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	X	X	X	X	1	6	3	D	0	0	1	A	1
Description	Products G BN		Grade	Line	Year		Mon th	Revisi on Code	Serial No.				

11.0 PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD Module.

11.1 Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount a module using specified mounting holes (Details refer to the drawings)
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Do not apply mechanical stress or static pressure on module; Abnormal display cause by pressing some parts of module during assembly process, do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on module, and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the module should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the module surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane & alcohol is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene, because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading..

- This module has its circuitry PCB's on the rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire
- Do not disassemble the module.

11.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Module at the “Power On” Condition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- Do not allow to adjust the adjustable resistance or switch
- The electrochemical reaction caused by DC voltage will lead to LCD module degradation, so DC drive should be avoided.
- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- Design the length of cable to connect between the connector for back-light and the converter as shorter as possible and the shorter cable shall be connected directly , The long cable between back-light and Converter may cause the Luminance of LED to lower and need a higher startup voltage
- The cables should be as short as possible between System Board and PCB interface.
- Connectors are precision devices to transmit electrical signals, and operators should plug in parallel
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

11.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.
- Do not touch interface pin directly.

11.4 Precautions for Strong Light Exposure

- Do not leave the module operation or storage in Strong light . Strong light exposure causes degradation of polarizer and color filter.

11.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	TYP	MAX
Storage Temperature	(°C)	5	25	40
Storage Humidity	(%rH)	40	50	75
Storage Life	6 months			
Storage Condition	<ul style="list-style-type: none"> • The storage room should be equipped with a dark and good ventilation facility. • Prevent products from being exposed to the direct sunlight, moisture and water. • The product need to keep away from organic solvent and corrosive gas. • Be careful for condensation at sudden temperature change. • Storage condition is guaranteed under packing conditions. 			

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
- As the original protective film, do not use the adhesive protective film to avoid change of Pol color and characteristic.

11.6 Precautions for protection film

- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- People who peeled off the protection film should wear anti-static strap and grounded well.

11.7 Appropriate Condition for Commercial Display

-Generally large-sized LCD modules are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition

- Temperature: $20\pm15^{\circ}\text{C}$
- Operating Ambient Humidity : $55\pm20\%$
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up Commercial Display system

2. Special operating condition

a. Ambient condition

- Well-ventilated place is recommended to set up Commercial Display system.

b. Power and screen save

- Periodical power-off or screen save is needed after long-term display.

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD module may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD module will return to normal display.

d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD module may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD module 's surface which may affect the operation of the polarizer and LCD module

e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

f. Products exposed to low temperature environment for a long time, need to carry out necessary protection , low temperature environment is usually refrigerators , vending machine Etc...

g. Long time and large angle forward use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice

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h. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.

- a. Suitable operating time: under 20 hours a day.
- b. Static information display recommended to use with moving image.
 - Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.
- c. Background and character (image) color change
 - Use different colors for background and character, respectively.
 - Change colors themselves periodically.
- d. Avoid combination of background and character with large different luminance.
 - 1) Abnormal condition just means conditions except normal condition.
 - 2) Black image or moving image is strongly recommended as a screen save

4. Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.

5. Module should be turned clockwise based on front view when used in portrait mode.

11.8 Other Precautions

A. LC Leak

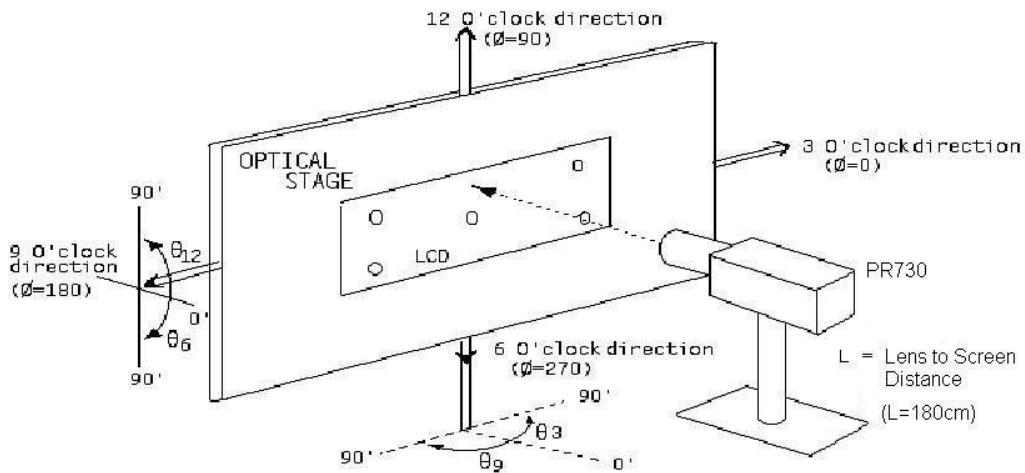
- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

12.0 APPENDIX

< Figure 1. Measurement Set Up >

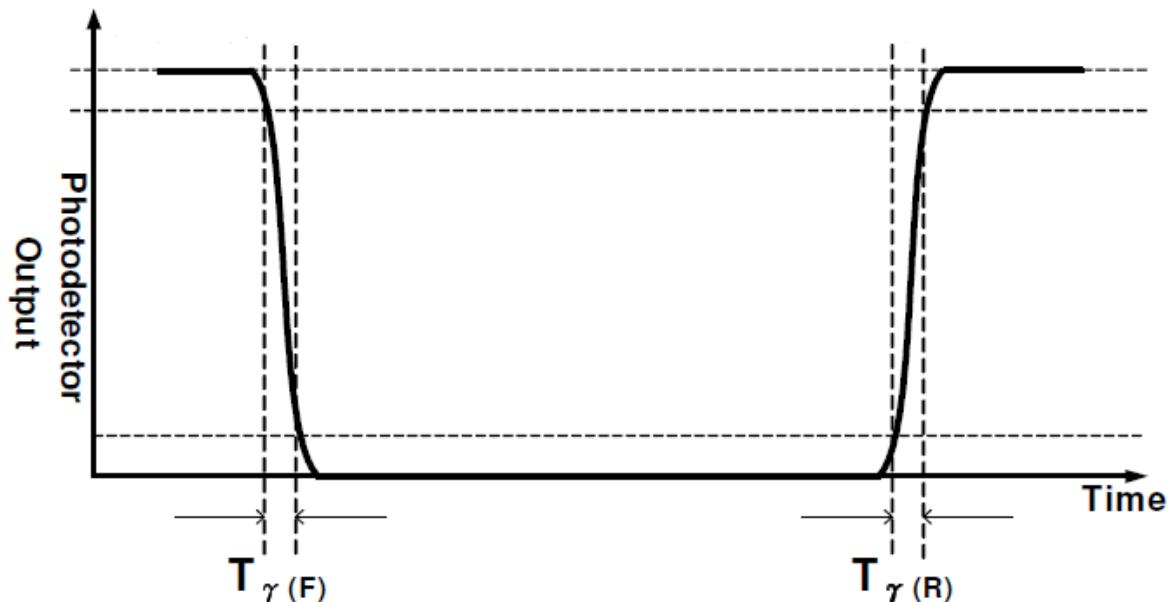


< Figure 2. Response Time Testing >

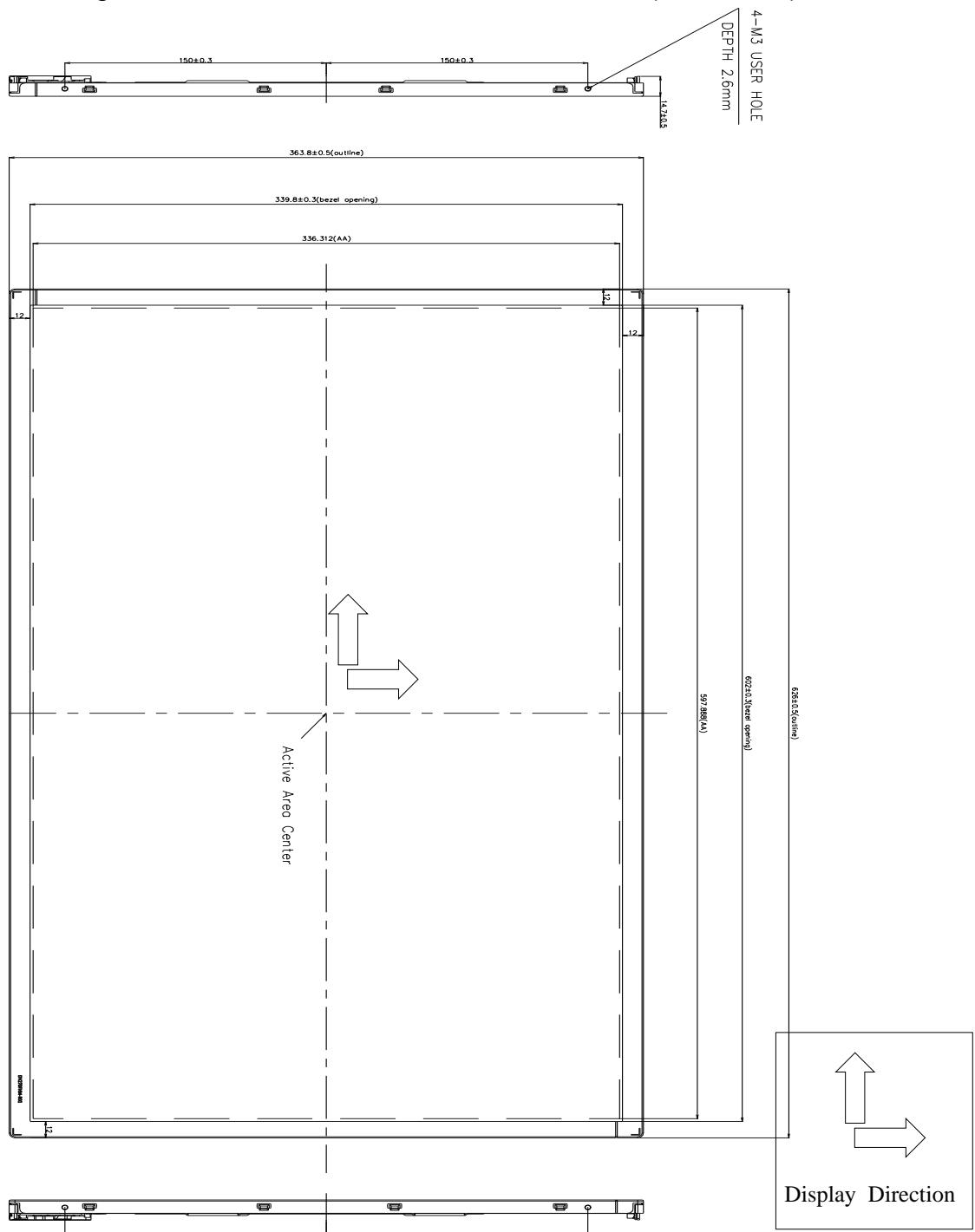
Any level of gray (Bright)

Any level of gray (Dark)

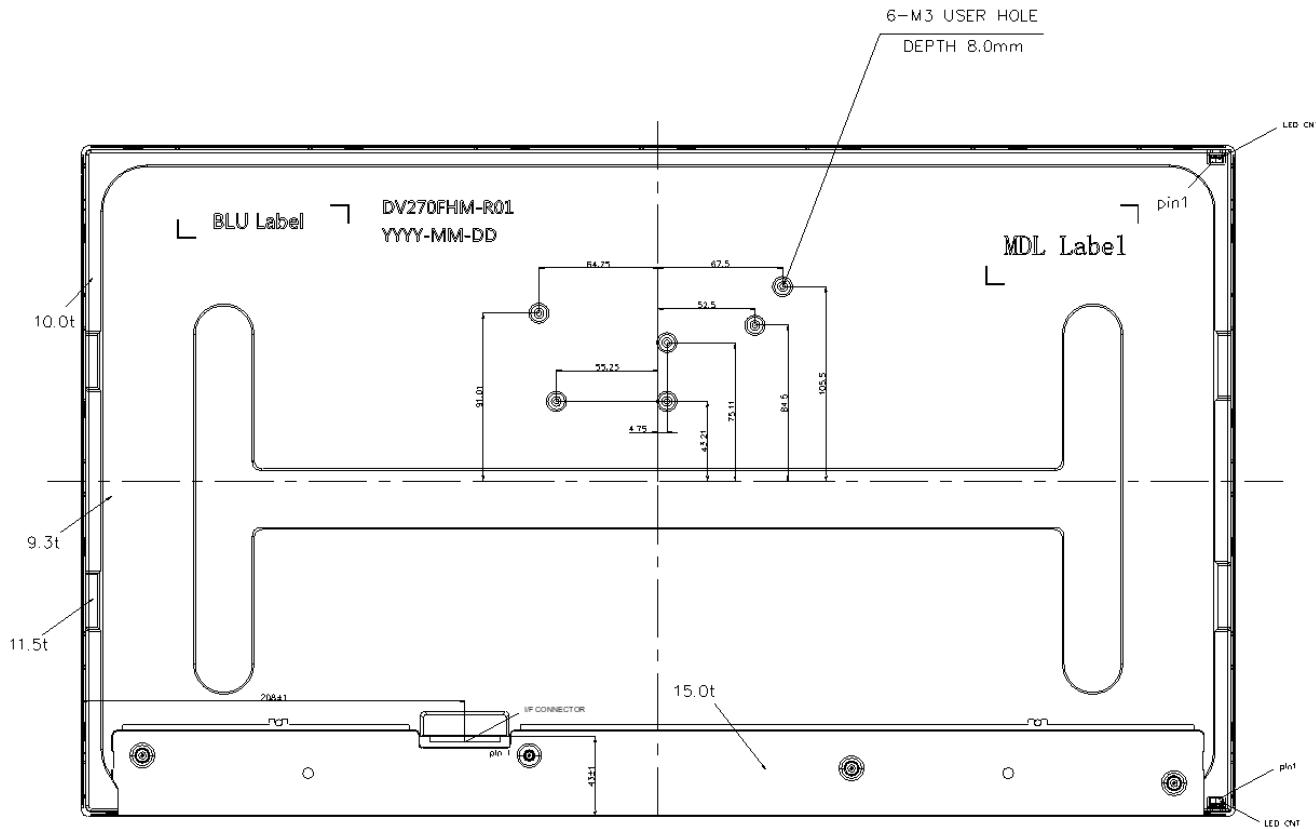
Any level of gray (Bright)



< Figure 3.TFT-LCD Module Outline Dimensions (Front View) >



< Figure 4.TFT-LCD Module Outline Dimensions (Rear View) >

**NOTE**

1. I/F CONNECTOR:IS100-L300-C23(UJU)
2. LED CONNECTOR:CI1406M1VL0-NH, 6 pin or Equivalent
3. USER MOUNTING TORQUE SPEC:max. 5 kgf-cm
4. PCB MOUNTING TAP - SUSTAIN TORQUE : Min. 4 Kgf-cm

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< Figure 5. White Luminance and Uniformity Measurement Locations >

