

15" XGA**High brightness color TFT-LCD module****Model: VM15****Model control code: VM15B6 V7****Date: Jan. 15th, 2016****Note: This specification is subject to change
without notice****Customer :** _____**Date :** _____**Approved****Prepared****Date:****Date:**

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RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2015/03/30	All	First Edition for customer		
0.2 2016/01/15	14		LED driving current: 29.8V 300mA	2 LED lamp

1. HANDLING PRECAUTIONS

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

2. General Description

2.1, Overview

VM15B6 V7 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support XGA(1024(H) x 768(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits). All input signals are LVDS interface compatible. All the design rules of this module can correspond to PSWG standard.

2.2 Features

- Sunlight readable display, 1500nits.
- Wide operation temperature.
- LED backlight
- RoHS Compliance

2.3 Application

Industrial Application.

2.4 Display Specifications

Items	Unit	Specification
Screen Diagonal	inch	15
Active Area	mm	304.128(H) x 228.096(V)
Pixels H x V	pixels	1024x3(RGB) x 768
Pixels Pitch	um	297 (per one triad) x 297
Pixel Arrangement		RGB Vertical stripe
Display mode		TN mode, normally white
White luminance (center)	Cd/m ²	1500 (Typ.)
Contrast ratio		700 (Typ.)
Optical Response Time	msec	8 ms (Typ. on/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (VDD Line + LED L Lines)	Watt	TBD (VDD Line=TBDW; LED line=17.9W)
Weight	Grams	TBD
Physical size	mm	326.5(H)x 253.5(V) x 12.0(D) (typ.)
Electrical Interface		1 Channel LVDS
Support Colors		16.2 M (RGB 8-bit) / 262k (RGB 6-bit)
Surface Treatment		Anti-Glare, 3H
Temperature range		
Operating	°C	-30 ~ 85 (LCD surface temp)
Storage (Shipping)	°C	-30 ~ 85
RoHS Compliance		RoHS Compliance

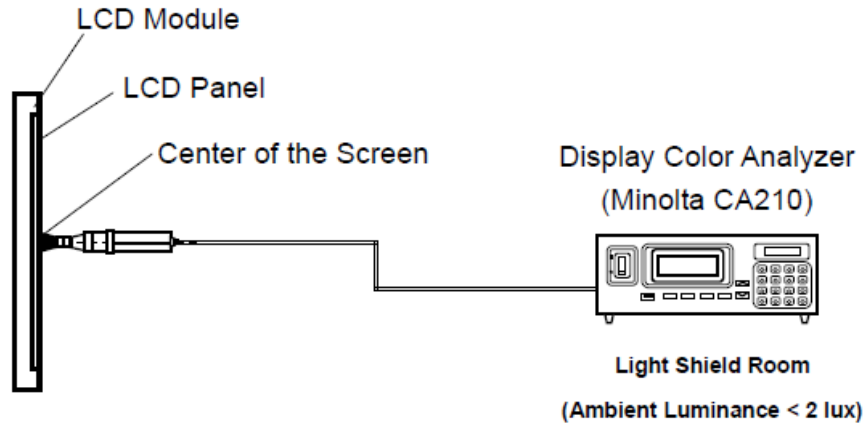
2.5 Optical Characteristics

The following optical characteristics are measured under stable condition at 25 °C

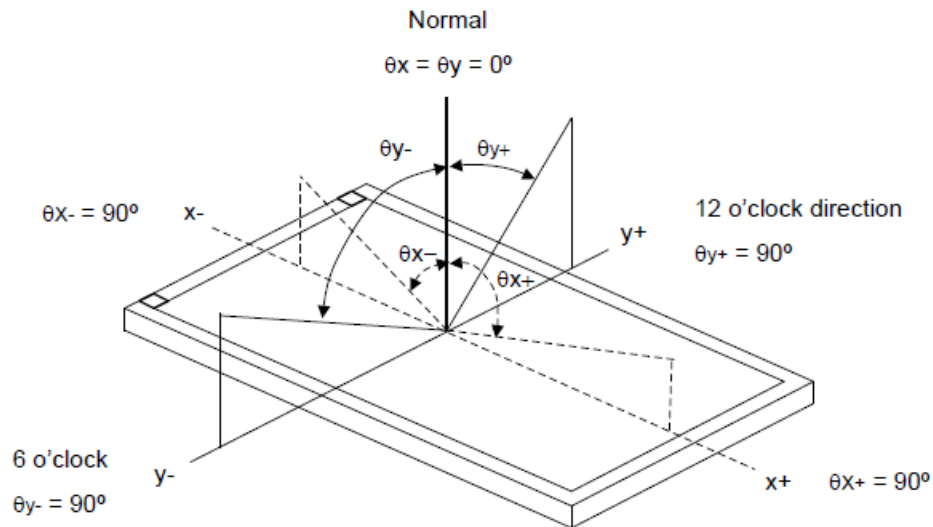
Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right) CR=10 (Left)	140	160		2
		Vertical (Up) CR=10 (Down)	120	140		
Contrast Ratio		Normal Direction	400	700		3
Response Time	msec	Raising time (T _{rR})		5.7		4
		Falling time (T _{rF})		2.3		
		Raising + Falling		8		
Color / Chromaticity Coordinates (CIE)		Red x	-0.04	TBD	+0.04	5
		Red y		TBD		
		Green x		TBD		
		Green y		TBD		
		Blue x		TBD		
		Blue y		TBD		
Color coordinates (CIE) White		White x		0.31		
		White y		0.34		
Center Luminance	Cd/m ²		1200	1500		6
Luminance Uniformity	%			65		7
Crosstalk (in 60 Hz)	%				1.2	
Flicker	dB				-20	

Note 1: Measurement method

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



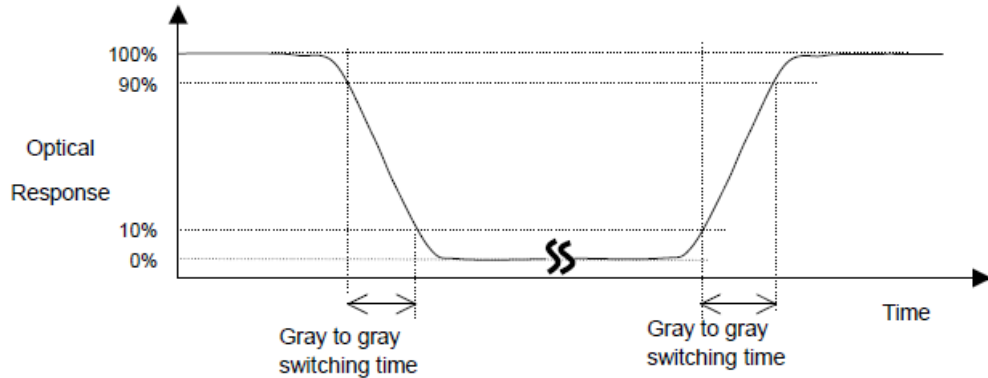
Note 2: Definition of viewing angle



Note 3: Contrast ratio is measured by Minolta CA210

Note 4: Definition of Response time

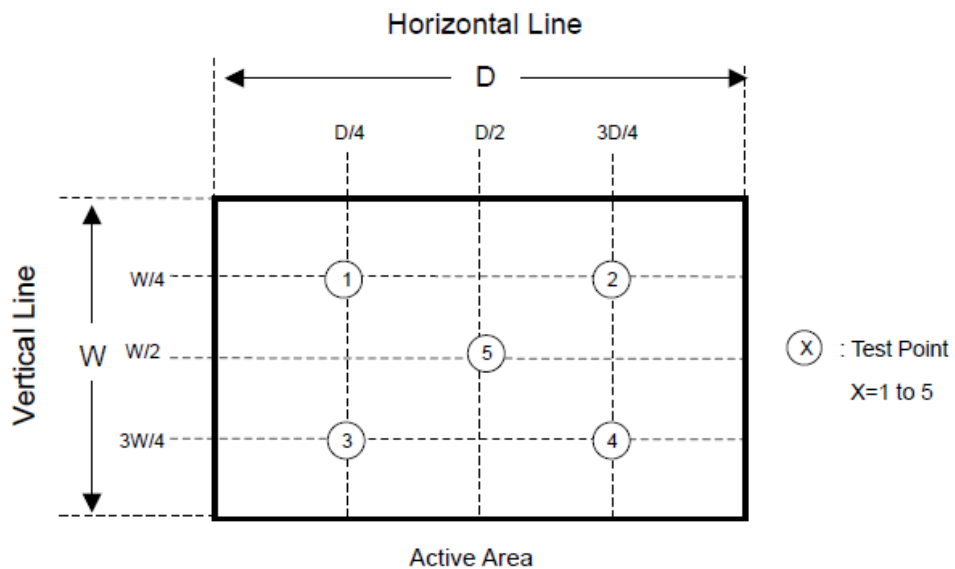
The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time), and from “Full White” to “Full Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.



Note 5: Color chromaticity and coordinates (CIE) is measured by Minolta CA210

Note 6: Center luminance is measured by Minolta CA210

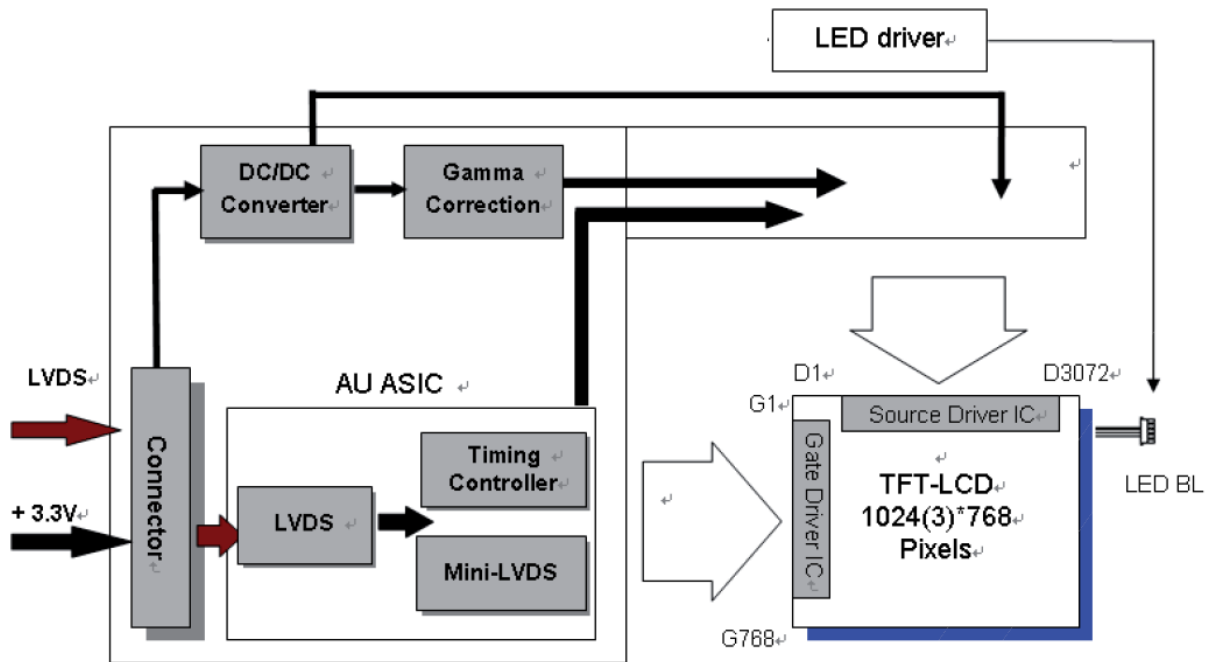
Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minolta CA210



$$\text{Uniformity} = (\text{Min. Luminance of 5 points}) / (\text{Max. Luminance of 5 points})$$

3. Functional Block Diagram

The following diagram shows the functional block of the 15 inches Color TFT-LCD Module:



4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Items	Symbol	Min	Max	Unit	Conditions
Logic/ LCD drive voltage	V _{in}	-0.3	3.6	Volt	Note 1, 2

4.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED Current	I _{LED}		480	mA	Note 1, 2

4.3 Absolute Ratings of Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T _{OP}	-30	-	85	°C	Note 3
Operation Humidity	H _{OP}	8		90	%	
Storage temperature	T _{ST}	-30		85	°C	
Storage Humidity	H _{ST}	8		90	%	

Note 1: With in T_a= 25°C

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).

5. Electrical characteristics

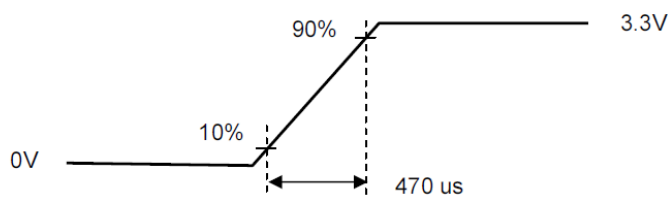
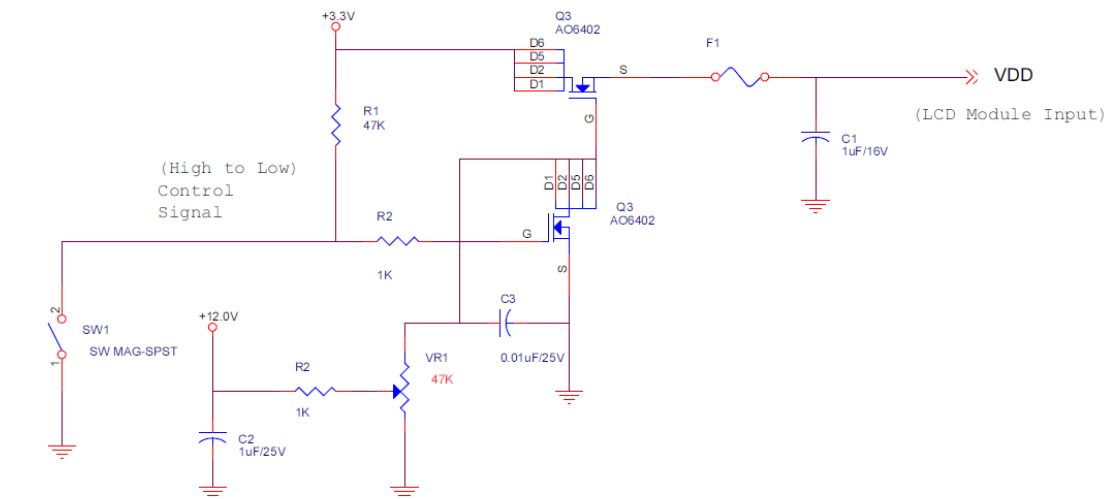
5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows

Symbol	Parameter	Min	Typ.	Max	Unit	Conditions
VDD	Logic/ LCD Drive Voltage	3	3.3	3.6	Volt	+/- 10%
IDD	Input current		TBD		mA	VDD=3.3V, All black pattern.
PDD	VDD power		TBD		W	VDD=3.3V, All black pattern.
IRush	Inrush current			TBD	A	

Note 1: Measurement condition:



VDD rising time



64 Gray pattern

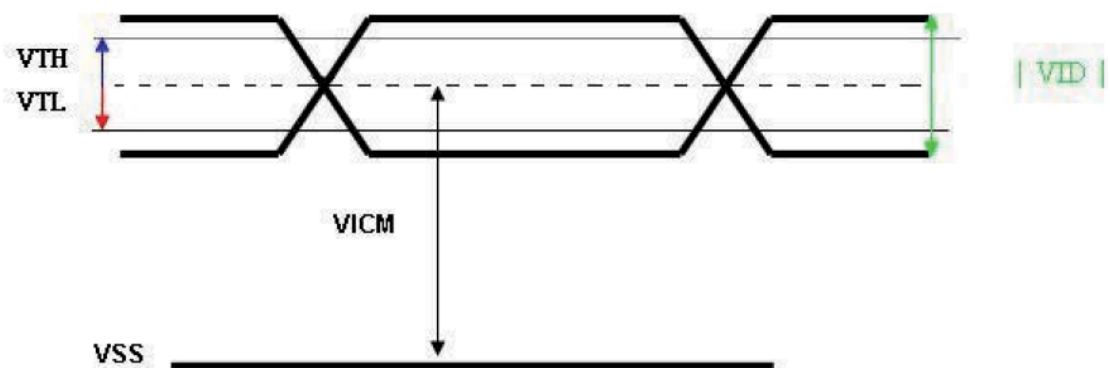
5.1.2 Signal Electrical Characteristics

Input signal shall be low or Hi-Z state when VDD is off.

Characteristics of each signal are as following:

Symbol	Parameter	Min	Typ	Max	Unit	Condition
VTH	Differential Input High Threshold			+100	mV	VICM = 1.25V
VTL	Differential Input Low Threshold	-100			mV	VICM = 1.25V
VID	Input Differential Voltage	100	400	600	mV	
VICM	Differential Input Common Mode Voltage	1.15	1.2	1.45	V	VTH/VTL = 100mV

Note: LVDS Signal Waveform.



5.2 Backlight Unit

Parameter guideline is under stable conditions at 25°C (Room Temperature):

Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		29.7		[V]	2
LED current (IL)		300		[mA]	2,
LED power (PL)		17.9		W	
LED Life Time(LTLED)		50,000		[Hour]	1

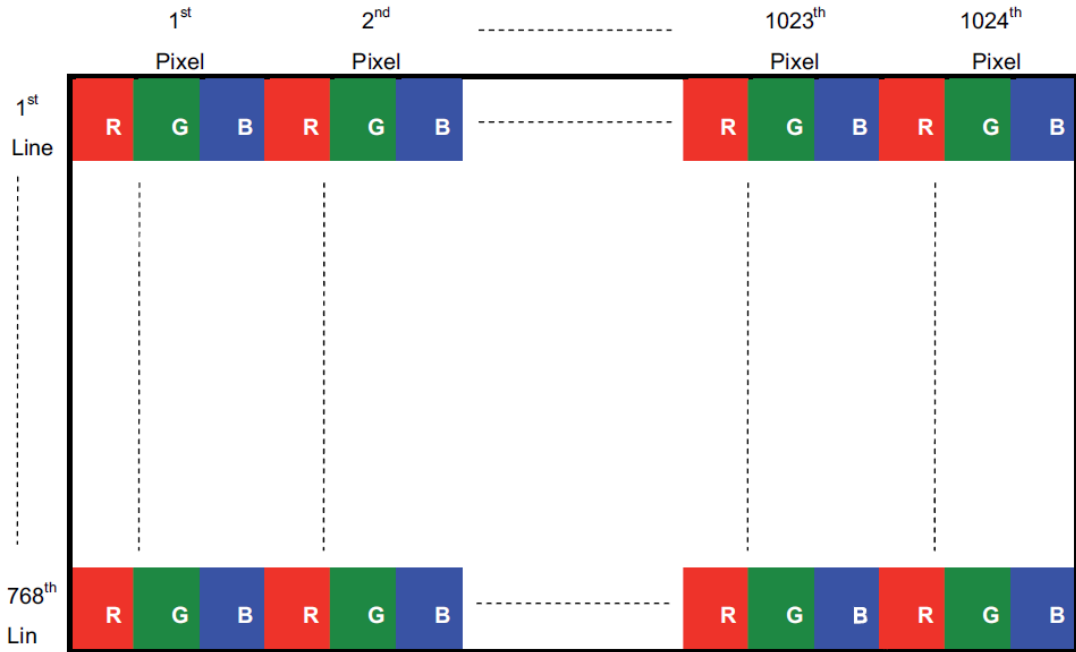
Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 330 mA.

Note 2: $PL = VL \times IL \times 2$

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 Scanning Direction:

The following figures show the image seen from the front view. The arrow indicates the direction of scan.



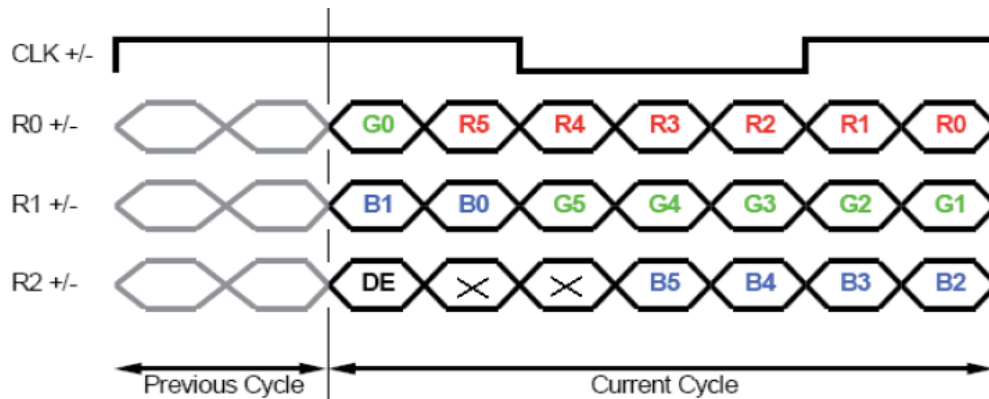
6.3 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

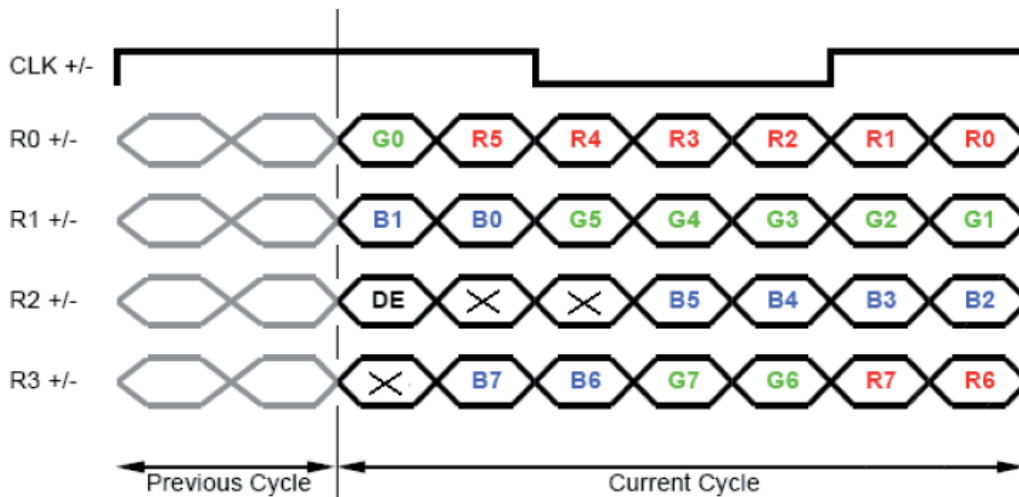
Pin No.	Symbol	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	NC	No Connect
4	NC	No Connect
5	Rin1-	- LVDS differential data input
6	Rin1+	+ LVDS differential data input
7	VSS	Ground
8	Rin2-	- LVDS differential data input
9	Rin2+	+ LVDS differential data input
10	VSS	Ground
11	Rin3-	- LVDS differential data input
12	Rin3+	+ LVDS differential data input
13	VSS	Ground
14	ClkIN-	- LVDS differential clock input
15	ClkIN+	+ LVDS differential clock input
16	VSS	Ground
17	Rin4-	- LVDS differential data input
18	Rin4+	+ LVDS differential data input
19	VSS	Ground
20	SEL LVDS	H or NC: 8bit/L: 6bit

6.4 The Input Data Format

SEL LVDS = "L" for 6 bits LVDS Input



SEL LVDS = "H" or NC for 8 bits LVDS Input



Note1: Please follow PSWG.

Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.5 Interface Timing

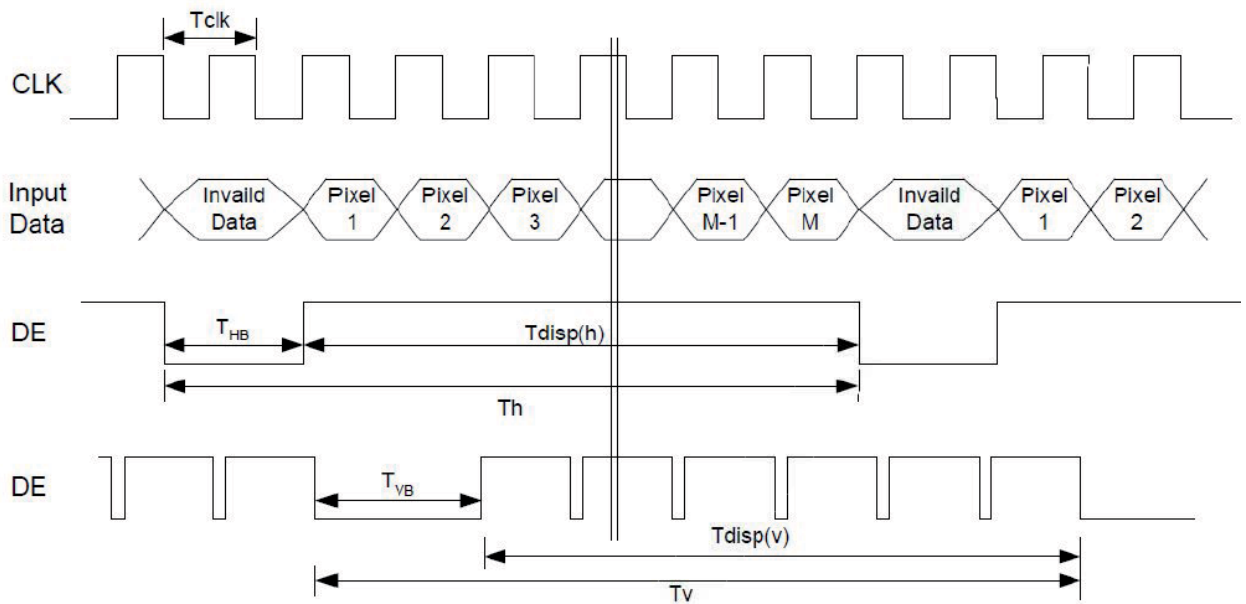
6.5.1 Timing Characteristics

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit	
Clock Timing	Clock frequency	$1/T_{\text{Clock}}$	50	65	80	MHz	
Vsync Timing	Vertical Section	Period	T_V	776	806	990	Vsync Timing
		Active	T_{VD}	-	768	-	
		Blanking	T_{VB}	8	38	222	
Hsync Timing	Horizontal Section	Period	T_H	1094	1344	1720	Hsync Timing
		Active	T_{HD}	-	1024	-	
		Blanking	T_{HB}	70	320	696	
Frame Rate		F	50	60	75	Hz	

Note: DE mode.

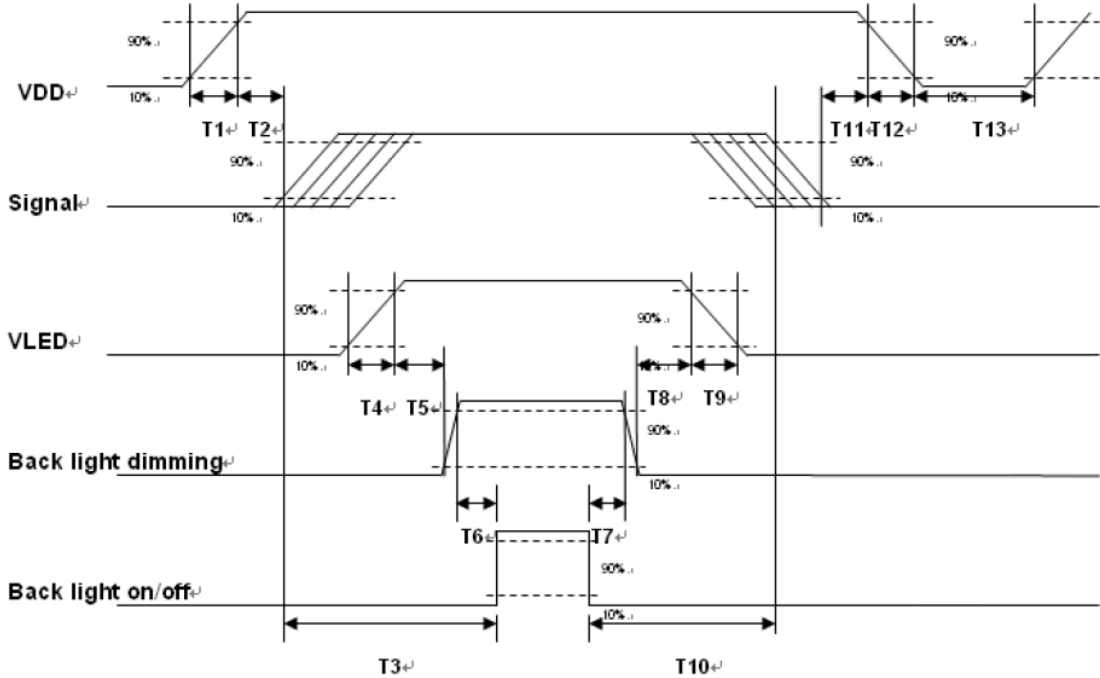
Note: Typical value refer to VESA STANDARD

6.5.2 Input Timing Diagram



6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	220	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	100	-	-	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	2	-	10	[ms]
T13	1000	-	-	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7.0 Connector & Pin Assignment

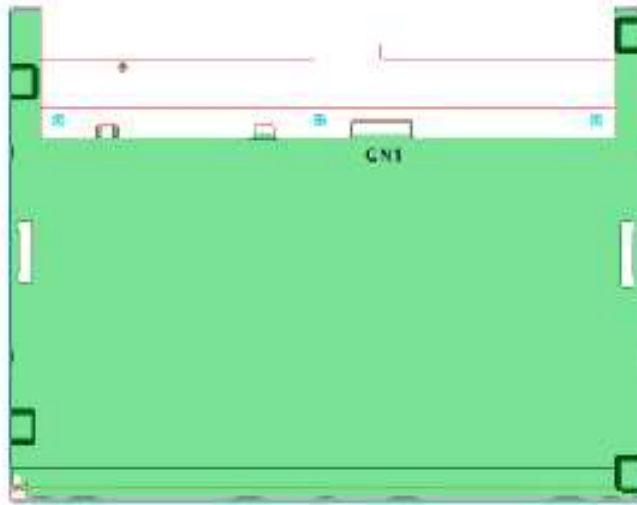
Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

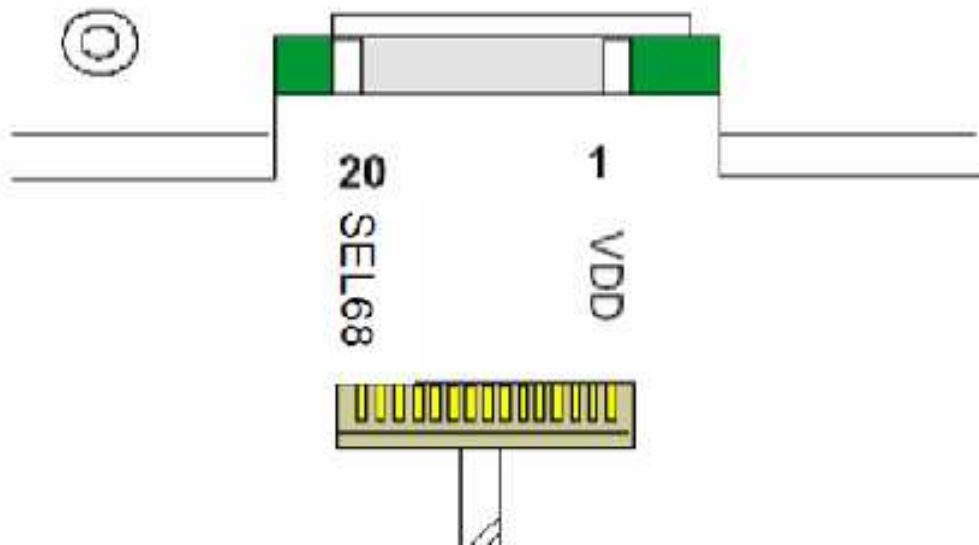
Connector Name / Designation	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420E or compatible
Mating Model Number	P240420 or compatible

Pin#	Signal Name	Pin#	Signal Name
1	VDD	2	VDD
3	NC	4	NC
5	Rin1-	6	Rin1+
7	VSS	8	Rin2-
9	Rin2+	10	VSS
11	Rin3-	12	Rin3+
13	VSS	14	ClkIN-
15	ClkIN+	16	VSS
17	Rin4-	18	Rin4+
19	VSS	20	SEL68

Connector Illustration



LVDS(CN1):



7.2 Backlight Unit: LED Connector

For UP / DOWN connectors

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Power for LED backlight anode	White
2	VLED-	P	Power for LED backlight cathode	Black

LED Light Bar Connector is used for the integral backlight system. The recommended model is BHSR-02VS-1 manufactured by JST.

8. Reliability Test

Environment test conditions are listed as following table.

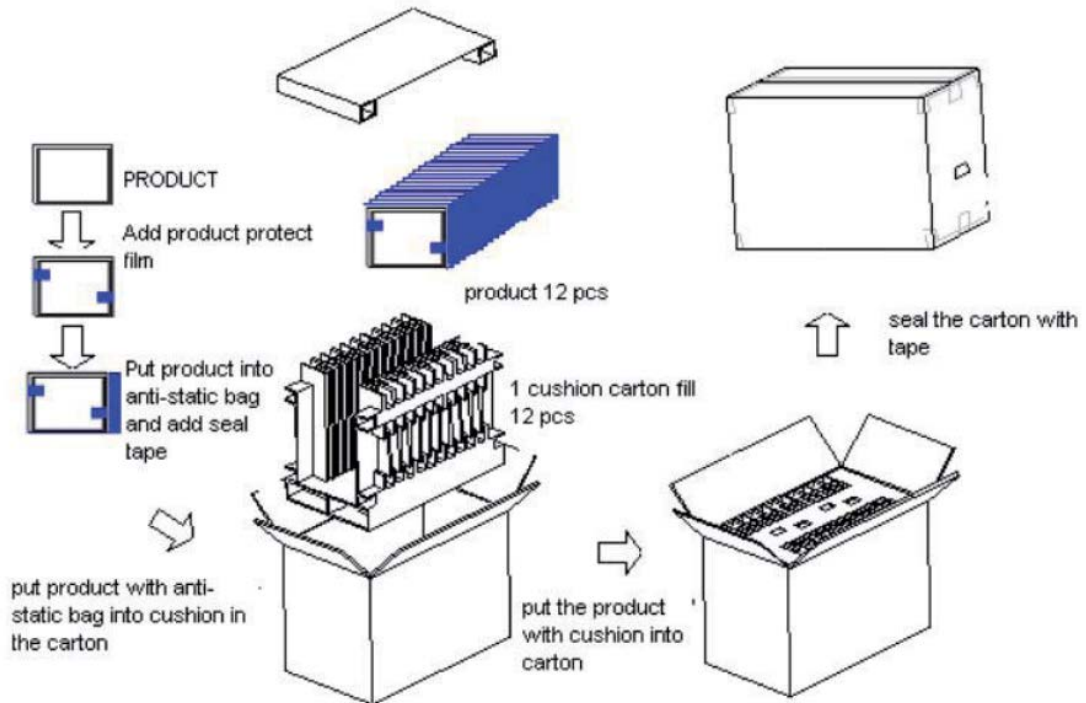
Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 85°C, 50%RH, 300hours	3
Low Temperature Operation (LTO)	Ta= -30°C, 300hours	
High Temperature Storage (HTS)	Ta= 85°C, 300hours	
Low Temperature Storage (LTS)	Ta= -30°C, 300hours	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	2

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

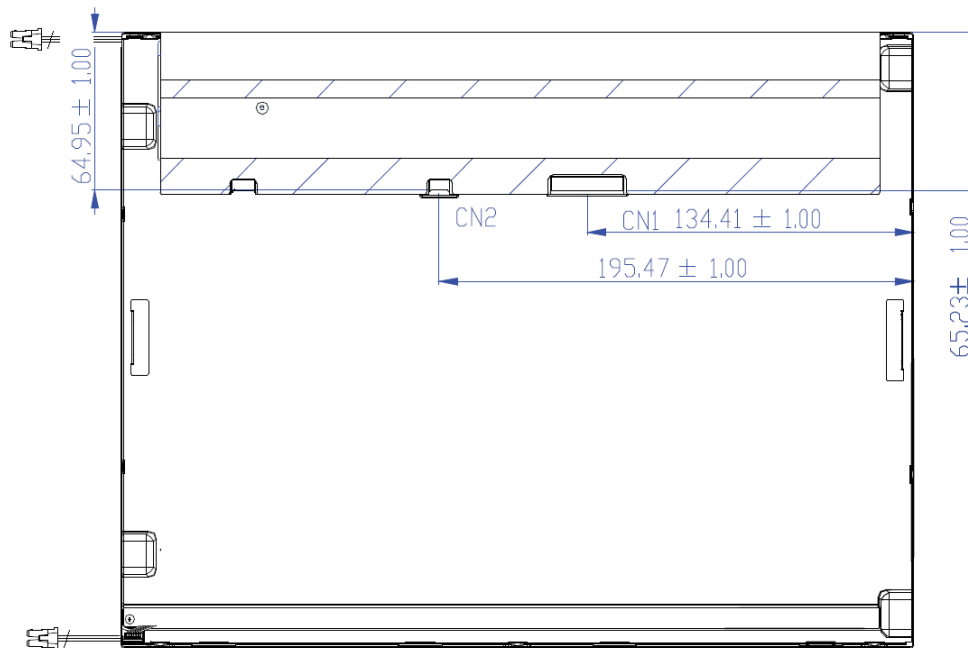
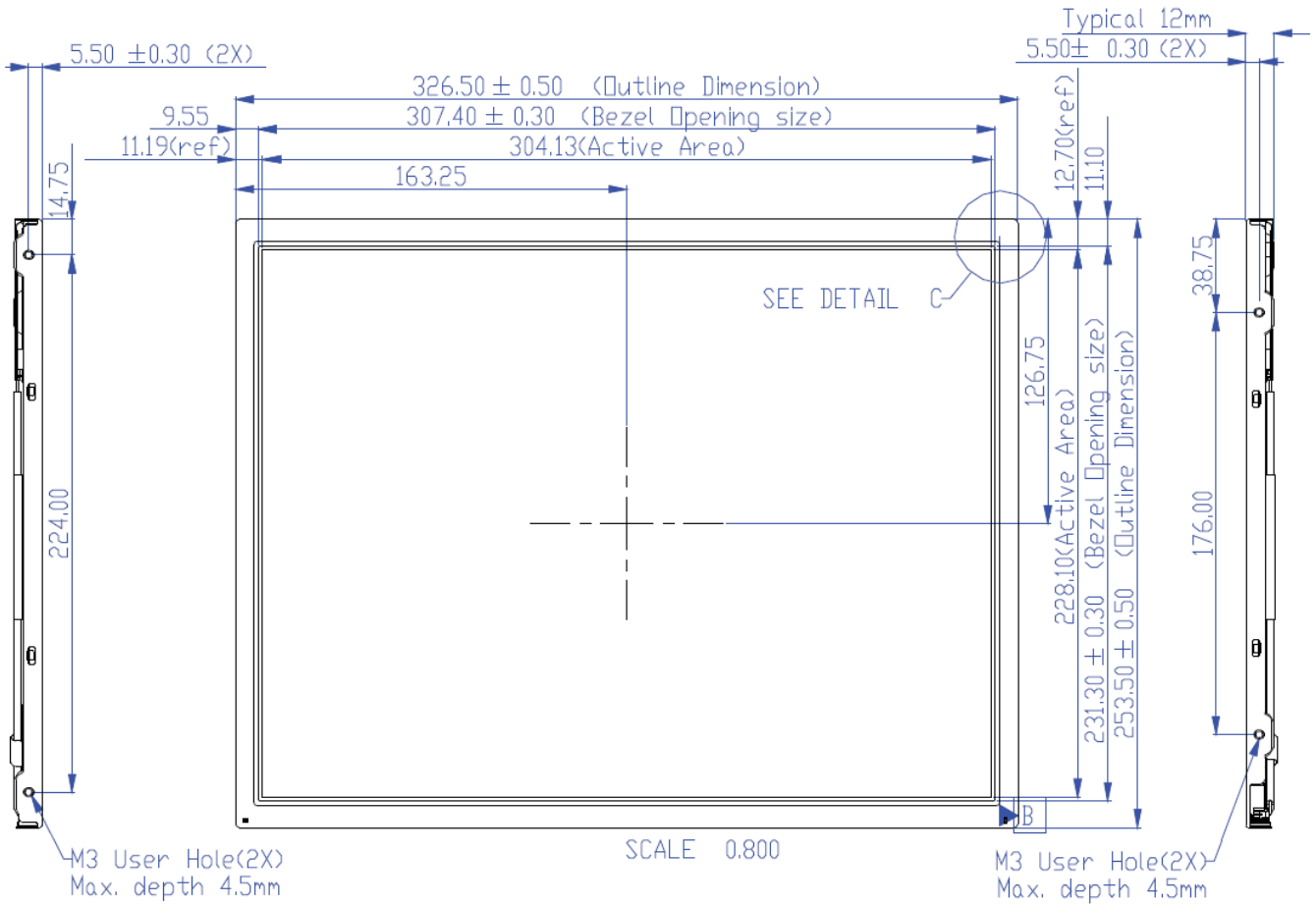
Note 3: The test items are tested by open frame type chassis.

9. Shipping Label & Package (TBD)



Carton capacity: 12 pcs
Carton weight: 12.56Kg
Carton outline: 430mm*384mm*350mm

10. Mechanical Characteristic



(The LED Cable length: 200 mm)