7.0” WVGA

High brightness color TFT-LCD module

Model: VM07B2 V3

Version：01

Date: Aug. 10th, 2021

Note: This specification is subject to change without notice

Customer： _____ **Date：** _____

Approved	**Prepared**
Date:	**Date:**

Contents

RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2021/08/10	All	First Edition for customer		

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

This specification applies to the Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display a LED backlight system. The screen format is intended to support WVGA (800(H) x 480(V)) screen and 262K colors (6 bit).

2.2 Features

- High brightness display, 1000nits by LED backlight.
- Long operation lifetime BLU design
- Wide view angle
- Wide operation temperature
- RoHS Compliance

2.3 Application

Industrial applications.

2.4 Display specifications

Items	Unit	Specification
Screen Diagonal	inch	7.0”
Active Area	mm	152.4 (H) X 91.44 (V)
Pixels H x V	pixels	800 x3(RGB) x 480
Pixels Pitch	um	190.5 (per one triad) x 190.5
Pixel Arrangement		RGB Vertical stripe
Display mode		Normally white, Transmissive
White luminance (center)	Cd/m^2	1000 (Typ)
Contrast ratio		500:1 (Typ.)
Optical Response Time	msec	25 ms (Typ. On/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (Vcc Line + LED backlight)	Watt	6.585 W (VDD line=0.825 W; LED lines= 5.76 W)
Weight	Grams	130
Physical size	mm	165 (W)× 104 (H)× 5.5 (D)
Electrical Interface		TTL
Support colors		262K
Surface Treatment		Anti-glare, Hardness 3H
Temperature range Operating Storage	 ^0C ^0C	 -20 ~ 70 (TFT surface) -30 ~ 80
RoHS Compliance		RoHS Compliance

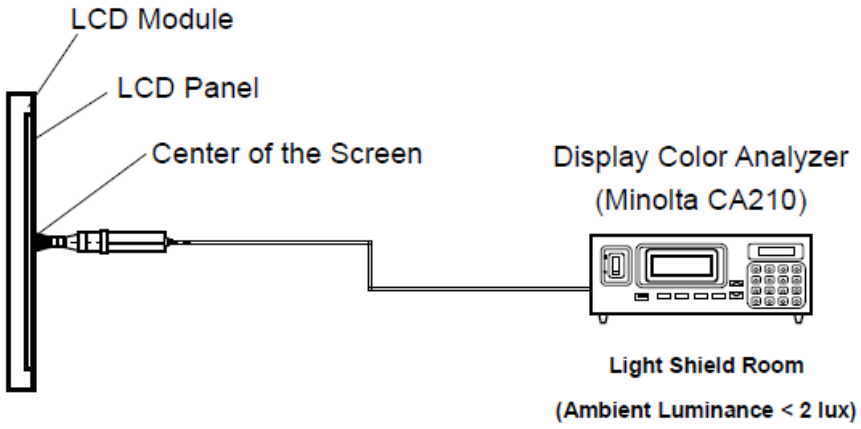
2.5 Optical characteristics

The following optical characteristics are measured under stable condition at 25 ^{0}C

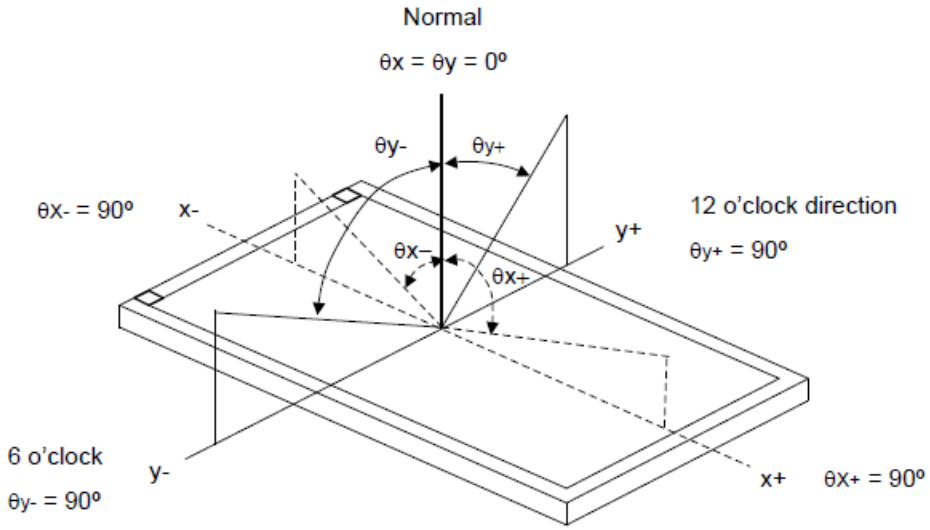
Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)	60	70		2
		CR=10 (Left)	60	70		
		Vertical (Up)	40	50		
		CR=10 (Down)	60	70		
Contrast Ratio		Normal Direction	400	500		3
Response Time	msec	Raising + Falling		25	50	4
Color coordinates (CIE) White		White x	-0.05	0.310	+0.05	5
		White y		0.330		
Center Luminance	Cd/m^2		800	1000		6
Luminance Uniformity	%		70	75		7
Crosstalk (in 60 Hz)	%				1.5	
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.



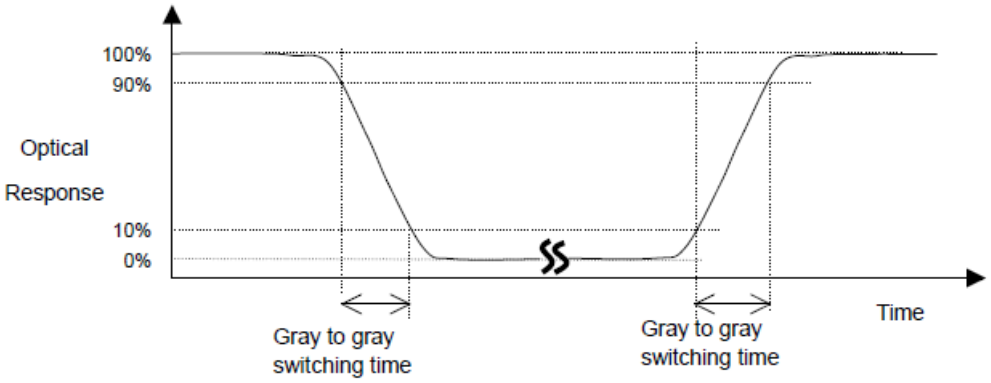
Note 2: Definition of viewing angle



Note 3: Contrast ratio is measured by Minolta CA210

Note 4: Definition of Response time

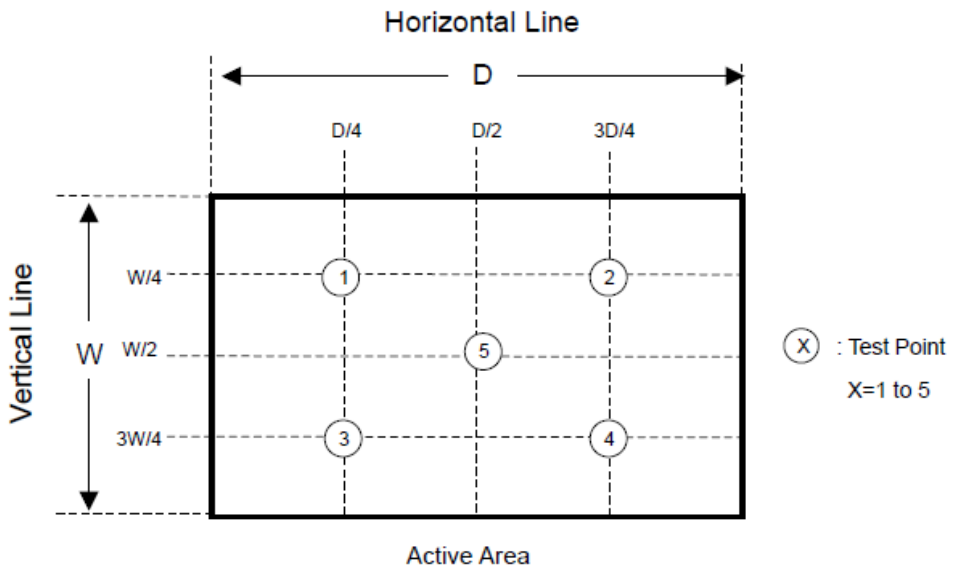
The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time), and from “Full White” to “Full Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as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



Uniformity = (Min. Luminance of 5 points) / (Max. Luminance of 5 points)

3. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

3.1 TFT LCD module

Items	Symbol	Min	Max	Unit	Conditions
Power supply voltage	V_{DD}	-0.3	6.0	Volt	Note 1, 2

3.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED bar input current			600	mA	

3.3 Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T_{OS}	-20	-	70	^{0}C	Note 3
Operation Humidity	H_{OP}	10		85	%	
Storage temperature	T_{ST}	-30		80	^{0}C	
Storage Humidity	H_{ST}	5		90	%	

Note 1: With in Ta= 25℃

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).

4. Electrical characteristics

4.1 LCD electronics specification

4.1.1 Power specification

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{CC}	3.1	3.3	3.5	V	Note 1
	V_{LED}	4.8	5.0	5.2	V	Note 2
Current consumption	Icc	-	250	300	mA	
	I_{LED}	-	500	550	mA	Note 3
Input logic high voltage	V_{IH}	$0.7V_{CC}$	-	V_{CC}	V	Note 4
Input logic low voltage	V_{IL}	0	-	$0.3V_{CC}$	V	

Note1: V_{CC} setting should match the signals output voltage (refer to Note 4) of customer's system board.
Note 2: LED driving voltage.
Note 3: LED driving current.
Note 4: DCLK,DE, HS, VS, R0~ R5,,G0~ G5,B0~ B5.

4.2 Backlight unit

Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		18		[V]	2
LED current (IL)		320		[mA]	2
LED power (PL)		5.76		[W]	
LED lite time (MTBF)		100,000		[Hour]	1

Note 1: The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ and typical LED Current at 320 mA

Note 2: The variance of LED Light Bar power consumption is ±10%. Calculator value for reference (IL × VL = PLED)

4.3 Interface connector

4.3.1 TFT connector(CN1)

TFT LCD Panel Driving Section

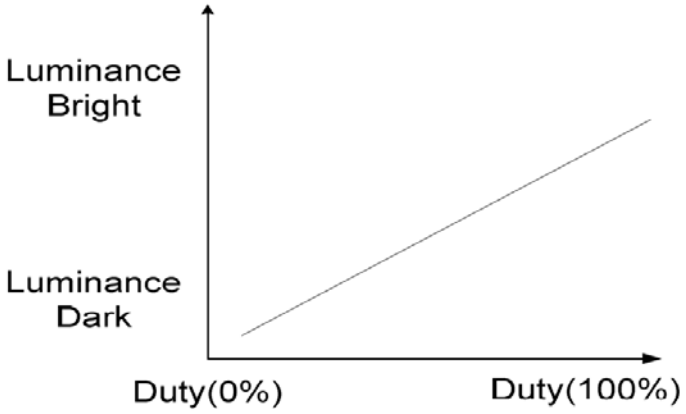
TTL Connector is used for the module electronics interface. The recommended model is FH19SC-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	NC	-	No connection	
2	NC	-	No connection	
3	NC	-	No connection	
4	NC	-	No connection	
5	NC	-	No connection	
6	V_{CC}	P	Power voltage for digital circuit	
7	V_{CC}	P	Power voltage for digital circuit	
8	MODE	I	DE or HV mode control	
9	DE	I	Data enable	
10	VS	I	Vsync signal input	
11	HS	I	Hsync signal input	
12	GND	P	Power ground	
13	B5	I	Blue data input (MSB)	
14	B4	I	Blue data input	
15	B3	I	Blue data input	
16	GND	P	Power ground	
17	B2	I	Blue data input	
18	B1	I	Blue data input	

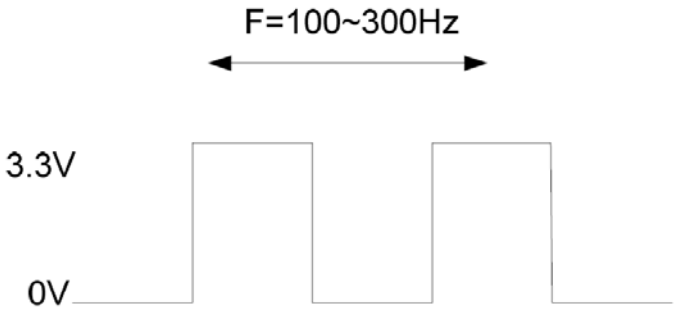
19	B0	I	Blue data input(LSB)	
20	GND	P	Power ground	
21	G5	I	Green data input(MSB)	
22	G4	I	Green data input	
23	G3	I	Green data input	
24	GND	P	Power ground	
25	G2	I	Green data input	
26	G1	I	Green data input	
27	G0	I	Green data input(LSB)	
28	GND	P	Power ground	
29	R5	I	Red data input(MSB)	
30	R4	I	Red data input	
31	R3	I	Red data input	
32	GND	P	Power ground	
33	R2	I	Red data input	
34	R1	I	Red data input	
35	R0	I	Red data input(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power ground	
39	L/R	I	Select left or right scanning direction	
40	U/D	I	Select up or down scanning direction	

I: input, O: output, P: power

Note1: ADJ adjust brightness to control Pin,Pulse duty the bigger the brighter.



Note 2: ADJ signal=0~3.3V,operation frequency:100~300Hz.

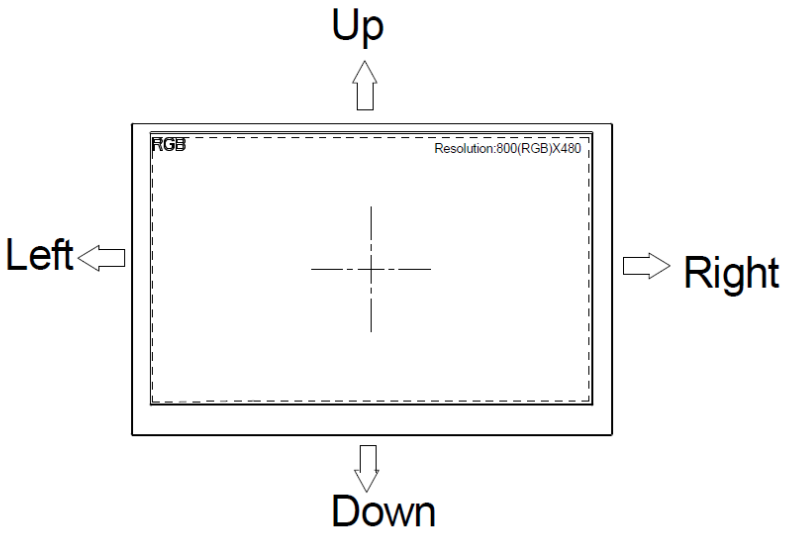


Note 3: DE Mode, Mode="H",HS floating and VS floating
HV Mode, Mode="L" and DE floating

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	R/L	
GND	V_{CC}	Up to down, left to right
V_{CC}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V_{CC}	V_{CC}	Down to up, left to right

Note 5: Scanning direction refer to the figure below.



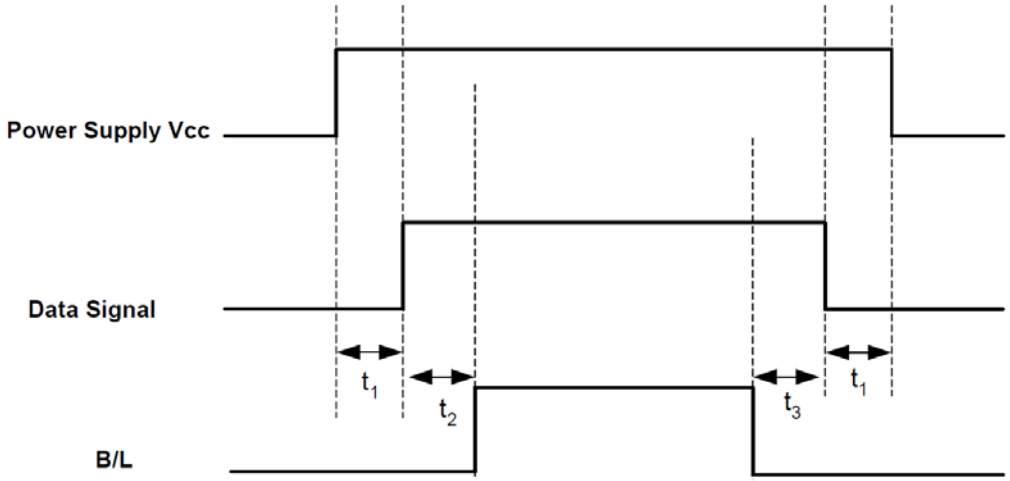
4.3.2 Backlight connector(CN2)

Recommended connector : BHSR-02VS-1 manufactured by JST

Pin no	Symbol	I/O	Description	Remark
1	VLED+	P	Backlight LED anode	Red
2	VLED-	P	Backlight LED cathode	Black

5. Signal characteristics

5.1 Power sequence



t_1 > 50 mSec
t_2 ≧ 200 mSec
t_3 ≧ 200 mSec

Note: Data Signal includes DCLK, DE, HS, VS, R0~ R5, G0~ G5, B0~ B5.

5.2 Timing characteristics

5.2.1 Timing conditions

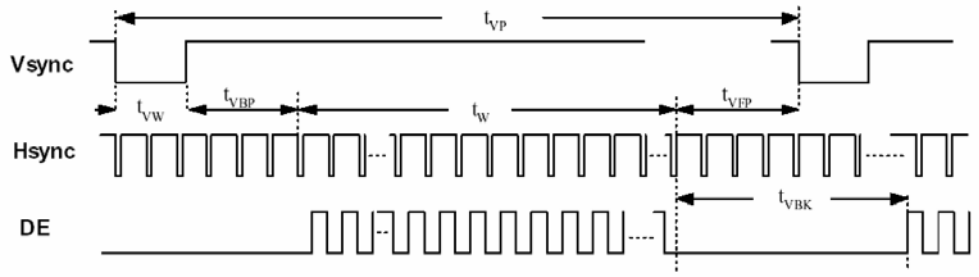
Input signal characteristics of SYNC mode.

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Period	t_{CLK}	23.2	25.0	30.7	ns	
Clock Frequency	f_{CLK}	32.4	40	43	MHz	
Clock Low Level Width	t_{WCL}	8	-	-	ns	
Clock High Level Width	t_{WCH}	8	-	-		
Clock Rise/Fall Time	t_{CLKr}, t_{CLKf}	-	-	3		
HSYNC Period	t_{HP}	862	1056	1100	t_{CLK}	
HSYNC Pulse Width	t_{HW}	-	1	-	t_{CLK}	
HSYNC Back Porch	t_{HBP}	-	45	-	t_{CLK}	
HSYNC Width + Back Porch	$t_{hw} + t_{HBP}$	46			t_{CLK}	
Horizontal valid data width	t_{HV}	800			t_{CLK}	
HSYNC Front Porch	t_{HFP}	$t_{HP} - t_{HW} - t_{HBP} - t_{HV}$			t_{CLK}	
Horizontal Blank	t_{HBK}	$t_{HP} - t_{HV}$			t_{CLK}	
VSYNC Period	t_{VP}	628	635	650	t_{HP}	
VSYNC Pulse Width	t_{VW}	-	1	-	t_{HP}	
VSYNC Back Porch	t_{VBP}	22			t_{HP}	
Vertical valid data width	t_{w}	480			t_{HP}	
Vertical Front Porch	t_{VFP}	$t_{VP} - t_{VW} - t_{VBP} - t_{w}$			t_{HP}	
Vertical Blank	t_{VBK}	$t_{VP} - t_{w}$			t_{HP}	
Data Setup Time	t_{DS}	5	-	-	ns	
Data Hold Time	t_{DH}	10	-	-	ns	

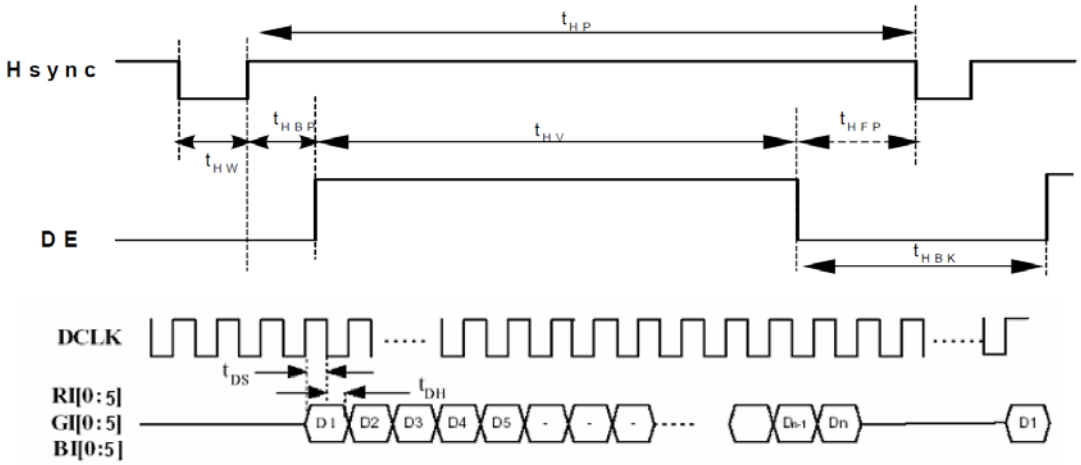
Input signal characteristics of DE mode.

Item		Symbol	Values			Unit	Remark
			Min.	Typ.	Max.		
DCLK	Period	t_{CLK}	23.2	25.0	30.7	ns	
	Frequency	f_{CLK}	32.4	40.0	43.0	MHz	
	Low Level Width	t_{WCL}	6	-	-	ns	
	High Level Width	t_{WCH}	6	-	-		
	Rise/Fall Time	t_{CLKr}, t_{CLKf}	-	-	3		
	Duty	-	0.45	0.50	0.55	-	t_{CLKL}/ t_{CLK}
DE	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	10	-	-		
	Rise/Fall Time	t_{DEr}, t_{DEf}	-	-	16		
	Horizontal Period	t_{HP}	862	1056	1100	t_{CLK}	
	Horizontal Valid	t_{HV}	800				
	Horizontal Blank	t_{HBK}	t_{HP} - t_{HV}				
	Vertical Period	t_{VP}	628	635	650	t_{HP}	
	Vertical Valid	t_{w}	480				
	Vertical Blank	t_{VBK}	t_{VP} - t_{w}				
DATA	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	10	-	-		
	Rise/Fall Time	t_{Dr}, t_{Df}	-	-	3		

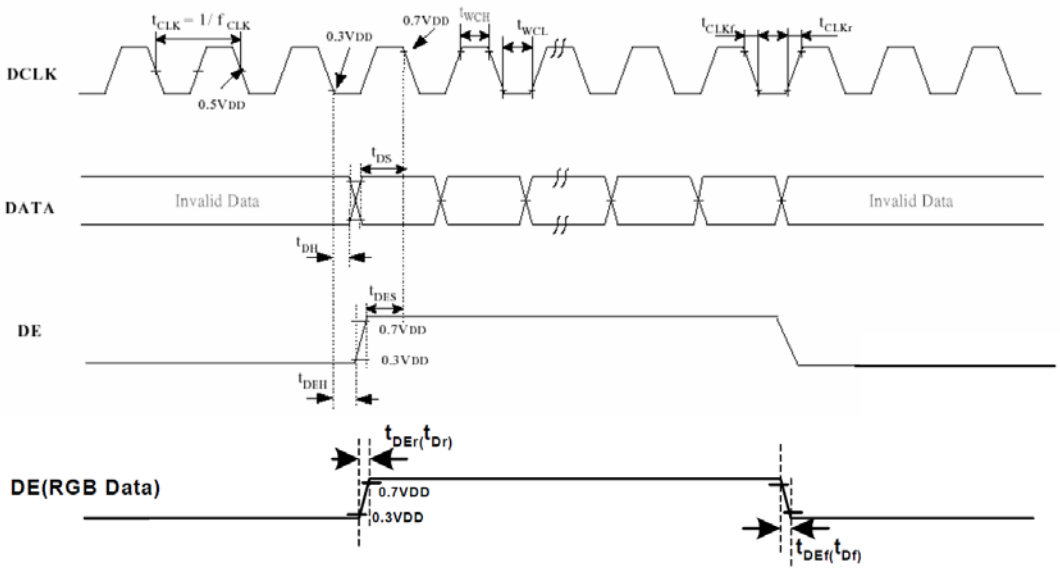
5.2.2 Timing diagram



Input Vertical Timing



Input Horizontal Timing



DE and RGB Input Timing

6. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta=40℃, 80%RH, 240hours	
High Temperature Operation (HTO)	Ts= 70℃, 240hours	3
Low Temperature Operation (LTO)	Ta= -20℃, 240hours	
High Temperature Storage (HTS)	Ta= 80℃, 240hours	
Low Temperature Storage (LTS)	Ta= -30℃, 240hours	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 100 cycles	
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

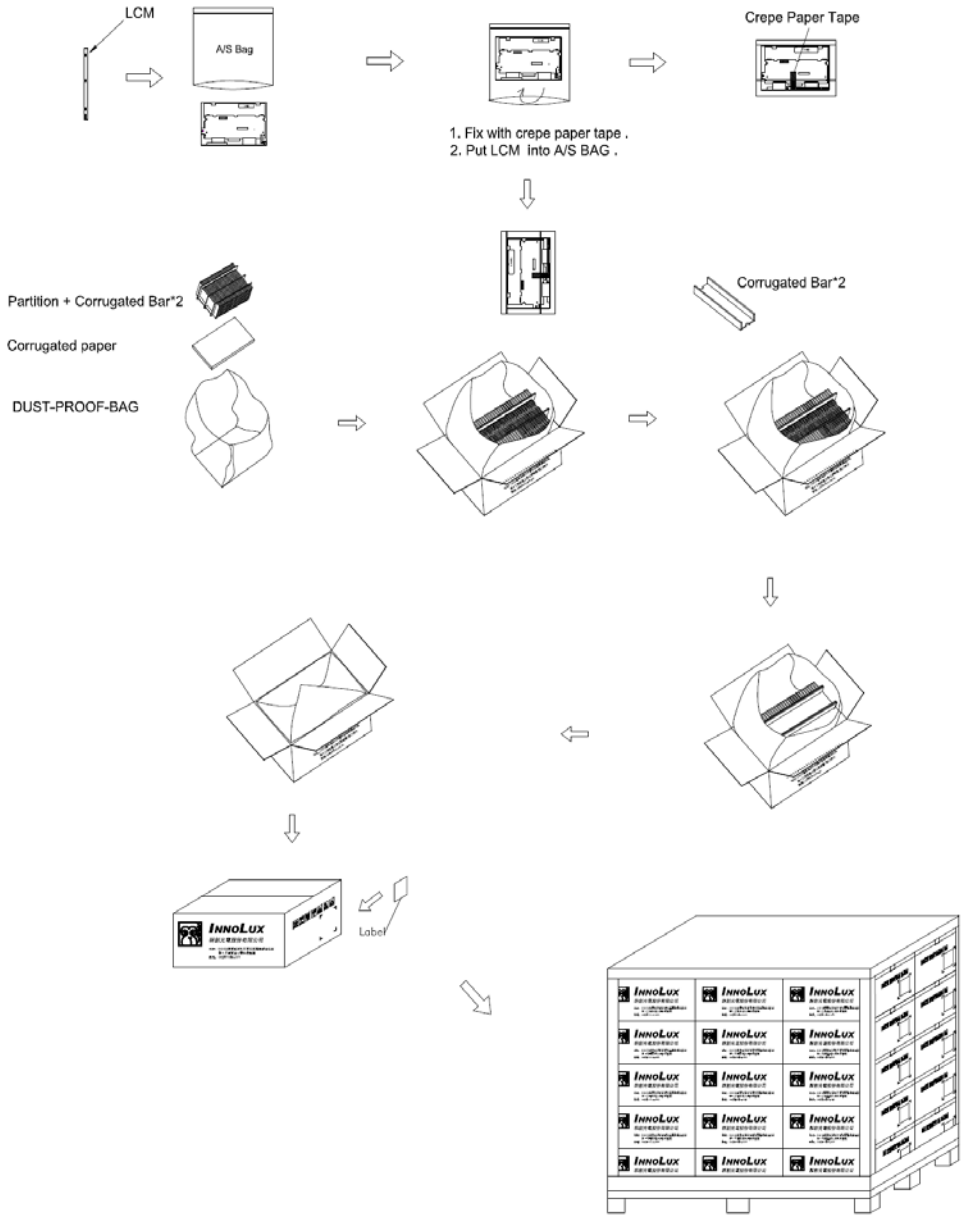
Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

7. Shipping package
(TBD)

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	VM07B2	165X104X5.5	0.130	50pcs	
2	Partition	BC Corrugated Paper	512 X 349 X 226	1.466	1 set	
3	Corrugated Bar	BC Corrugated Paper	512X162	0.046	4 set	
4	Corrugated Board	BC Corrugated Paper	510 X 343	0.130	1pcs	
5	Dust-Proof Bag	PE	700X530	0.048	1 pcs	
6	A/S Bag	PE	180 X 160 X 0.05	0.002	50 pcs	
7	Carton	Corrugated paper	530 X 355 X 255	1.100	1 pcs	
8	Total weight	9.528 Kg ± 5%				


LCM
A/S Bag
Crepe Paper Tape
1. Fix with crepe paper tape .
2. Put LCM into A/S BAG .
Partition + Corrugated Bar*2
Corrugated paper
DUST-PROOF-BAG
Corrugated Bar*2
Label
INNOLUX

8. Mechanical Characteristics