

**19.0” 1920 x 360 Stretched
High brightness color TFT-LCD module**

Model: VM19S1 V2

Date: Oct. 8th, 2021

**Note: This specification is subject to change
without notice**

Customer : _____

Date : _____

Approved

Prepared

Date:

Date:

Contents

- 1. Handling Precautions**
- 2. General Description**
 - 2.1 Overview
 - 2.2 Features
 - 2.3 Application
 - 2.4 Display specifications
 - 2.5 Optical characteristics
- 3. Function block diagram**
- 4. Absolute Maximum Ratings**
 - 4.1 TFT LCD module
 - 4.2 Backlight unit
 - 4.3 Environment
- 5. Electrical characteristics**
 - 5.1 LCD electronics specification
 - 5.2 Backlight unit
 - 5.3 Interface connector
 - 5.3.1 TFT connector(CN1)
 - 5.3.2 Backlight connector(CN2)
- 6. LVDS interface**
 - 6.1 LVDS interface
- 7. Signal timing specification**
 - 7.1 DE mode
 - 7.2 LVDS Rx interface timing parameter
- 8. Signal timing waveforms of interface signal**
 - 8.1 Sync timing waveforms
 - 8.2 Vertical timing waveforms
 - 8.3 Horizontal timing waveforms
- 9. Input signal basic display colors & gray scale of colors**
- 10. Power sequence**
- 11. Reliability Test**
- 12. Shipping package**
- 13. Mechanical Characteristics**

RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2021/10/08	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 1920(H) x 360(V) screen and 16.7M colors.

2.2 Features

- High brightness display, 1600nits by LED backlight.
- Long operation lifetime BLU design
- Wide operation temperature.
- 1920 x 360 pixel resolution.
- RoHS Compliance

2.3 Application

Industrial applications.

2.4 Display specifications

Items	Unit	Specification
Screen Diagonal	mm	19.0
Active Area	mm	476.64 (H) X 89.37 (V)
Pixels H x V	pixels	1920 x3(RGB) x 360
Pixels Pitch	um	248.25 (per one triad) x 248.25
Pixel Arrangement		RGB Vertical stripe
Display mode		Normally Black
White luminance (center)	Cd/m ²	1600 (Typ)
Contrast ratio		1200:1 (Typ.)
Optical Response Time	msec	30 ms (Typ. On/off)
Normal Input Voltage VDD	Volt	5.0
Power Consumption (Vcc Line + LED backlight)	Watt	19.38W (VDD line=3.0 W; LED lines= 16.38 W)
Weight	Grams	780
Physical size	mm	491.5 (W)×109.4 (H)×8.4 (D)
Electrical Interface		2-ch LVDS
Support colors		16.7M colors
Surface Treatment		Anti-glare and hard-coating 3H
Temperature range		
Operating	°C	-20 ~ 70 (TFT surface)
Storage	°C	-20 ~ 70
RoHS Compliance		RoHS Compliance

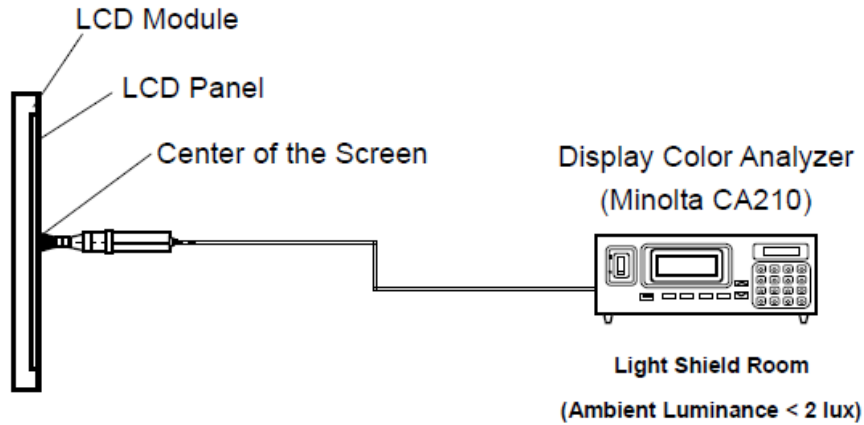
2.5 Optical characteristics

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

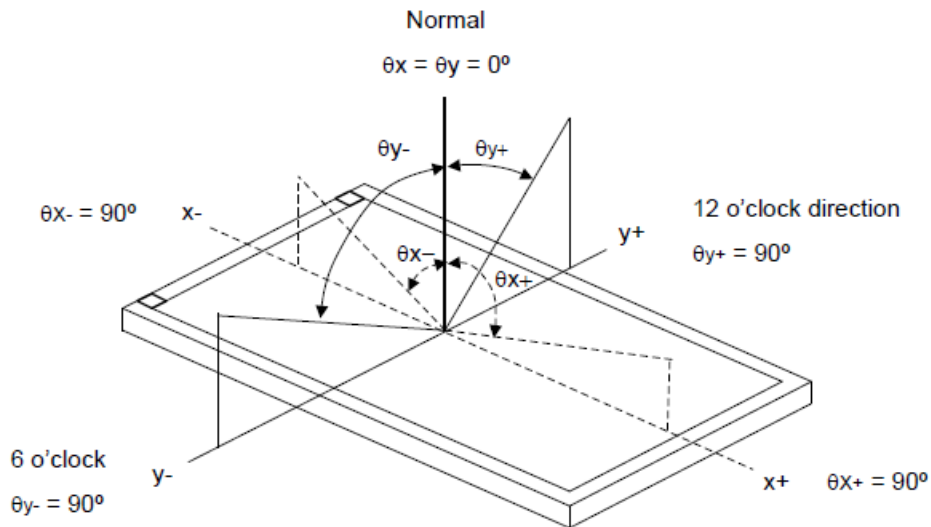
Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)	85	89		2
		CR=10 (Left)	85	89		
		Vertical (Up)	85	89		
		CR=10 (Down)	85	89		
Contrast Ratio		Normal Direction	900	1200		3
Response Time	msec	Raising + Falling		30	35	4
Color / Chromaticity Coordinates (CIE)		Red x	-0.05	0.655	+0.05	5
		Red y		0.328		
		Green x		0.303		
		Green y		0.607		
		Blue x		0.140		
		Blue y		0.088		
Color coordinates (CIE) White		White x		0.311		
		White y		0.326		
Center Luminance	Cd/m ²		1300	1600		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.



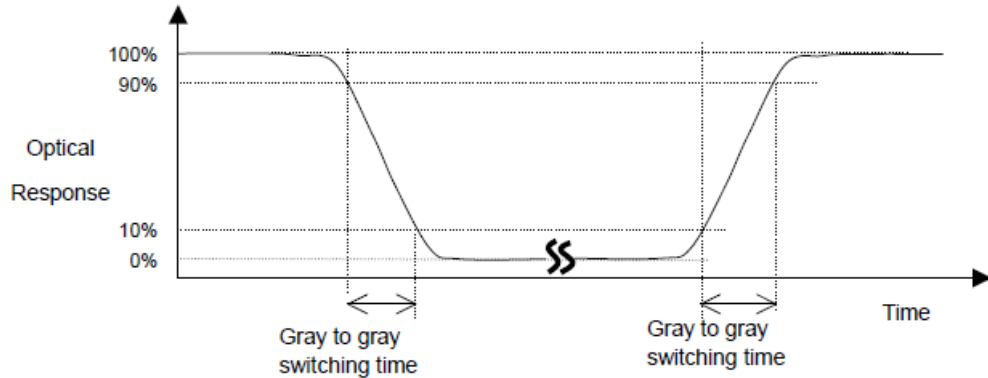
Note 2: Definition of viewing angle



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

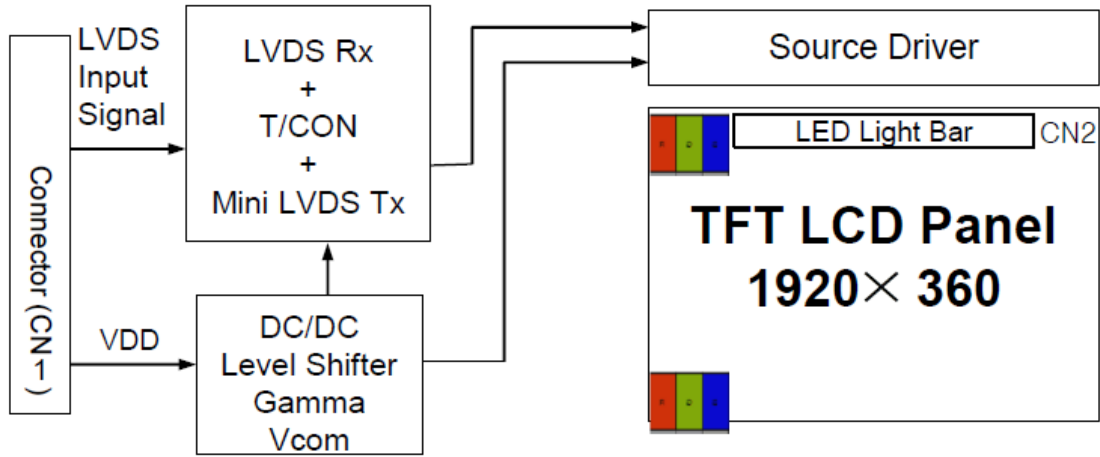
Note 6: Center luminance is measured by Minolta CA210

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



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

3. Function block diagram



4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD module

Items	Symbol	Min	Max	Unit	Conditions
Power supply voltage	V_{DD}	-0.3	7.0	Volt	Note 1, 2
Logic supply voltage	V_{IN}	$V_{SS}-0.3$	$V_{DD}+0.3$	Volt	

4.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED bar input current			840	mA	

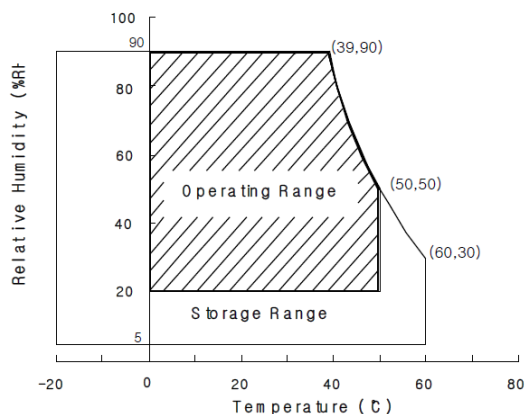
4.3 Environment

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

Note 1: With in $T_a = 25^{\circ}C$

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 LCD electronics specification

[Ta = 25 ± 2 °C]

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	I _{DD}	-	600	800	mA	
In-Rush Current	I _{RUSH}	-	2	3	A	Note 2
Permissible Input Ripple Voltage	V _{RF}	-	-	300	mV	Note1,3
High Level Differential Input Threshold Voltage	V _{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V _{IL}	-100	-	-	mV	
Differential input voltage	V _{ID}	200	-	600	mV	
Differential input common mode voltage	V _{cm}	1.0	1.2	1.5		V _{IH} =100mV, V _{IL} =-100mV
Power Consumption	P _D	-	3.0	4.0	W	@60Hz

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 and Clock frequency = 75.4MHz. Test Pattern of power supply current
 a) Typ: Color Test
 b) Max: Skip Sub Pixel



a)



b)

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

5.2 Backlight unit

Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		39		[V]	2
LED current (IL)		420		[mA]	2,
LED Power (PL)		16.38		[W]	
LED Life Time(LTLED)		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°C and typical LED Current at 420 mA

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

5.3 Interface connector

5.3.1 TFT connector(CN1)

- CN1 Module Side Connector : UJU IS100-30O-C23 or Equivalent
 User Side Connector : JAE FI-X30H or Equivalent

Pin No	Symbol	Function	Remark
1	RXO0-	Negative Transmission data of Pixel 0 (ODD)	
2	RXO0+	Positive Transmission data of Pixel 0 (ODD)	
3	RXO1-	Negative Transmission data of Pixel 1 (ODD)	
4	RXO1+	Positive Transmission data of Pixel 1 (ODD)	
5	RXO2-	Negative Transmission data of Pixel 2 (ODD)	
6	RXO2+	Positive Transmission data of Pixel 2 (ODD)	
7	GND	Power Ground	
8	RXOC-	Negative Transmission Clock (ODD)	
9	RXOC+	Positive Transmission Clock (ODD)	
10	RXO3-	Negative Transmission data of Pixel 3 (ODD)	
11	RXO3+	Positive Transmission data of Pixel 3 (ODD)	
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)	
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)	
14	GND	Power Ground	
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)	
16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)	
17	GND	Power Ground	
18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)	
19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)	
20	RXEC-	Negative Transmission Clock (EVEN)	
21	RXEC+	Positive Transmission Clock (EVEN)	
22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)	
23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)	
24	GND	Power Ground	
25	CTL	CTL_DVR for LCD manufacturer	
26	CE	CE_DVR for LCD manufacturer	
27	NC	Not connection	
28	VDD1	Power Supply:+5V	
29	VDD2		
30	VDD3		

5.3.2 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

6. LVDS interface

6.1 LVDS interface

	Input Signal	Transmitter		Interface		(CN11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
E V E N L V D S	ER0	51	48 47	OUT0- OUT0+	RXE0- RXE0+	12 13	
	ER1	52					
	ER2	54					
	ER3	55					
	ER4	56					
	ER5	3					
	EG0	4	46 45	OUT1- OUT1+	RXE1- RXE1+	15 16	
	EG1	6					
	EG2	7					
	EG3	11					
	EG4	12					
	EG5	14					
	EB0	15	42 41	OUT2- OUT2+	RXE2- RXE2+	18 19	
	EB1	19					
	EB2	20					
	EB3	22					
	EB4	23					
	EB5	24					
	Hsync	27	40 39	CLK OUT- CLK OUT+	RXE CLK- RXE CLK+	20 21	
	Vsync	28					
	DE	30					
	MCLK	31	38 37	OUT3- OUT3+	RXE3- RXE3+	22 23	
	ER6	50					
	ER7	2					
	EG6	8					
EG7	10						
EB6	16						
EB7	18						
RSVD	25						

7. Signal timing specification

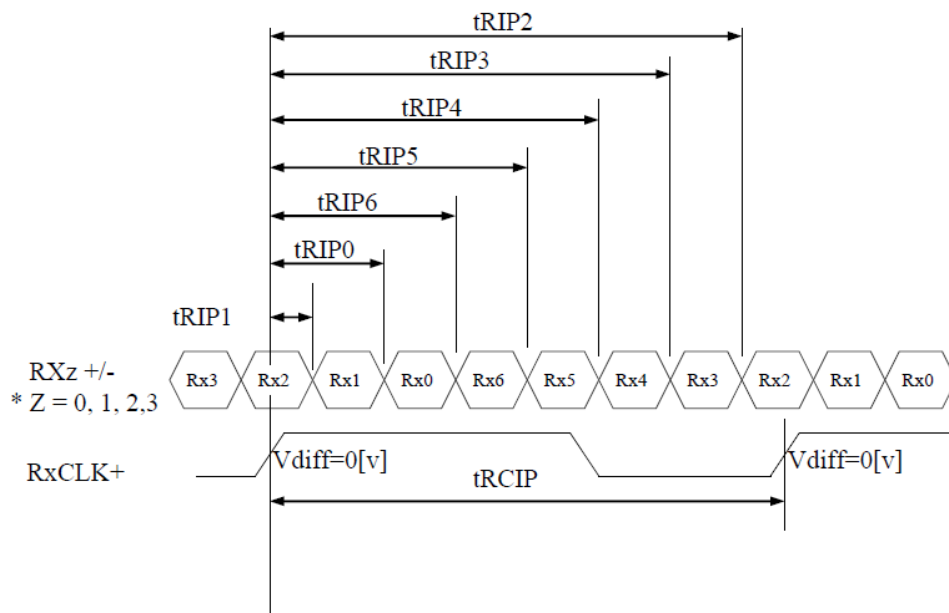
7.1 DE mode

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	61.93	74.32	92.90	MHz
	High Time	Tch	-	4/7 Tc	-	
	Low Time	Tcl	-	3/7 Tc	-	
Frame Period		Tv	1091	1125	1149	lines
			50	60	75	Hz
			20	16.67	13.33	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	1060	1100	1200	clocks
Horizontal Display Period		Thd	-	960	-	clocks
Modulating frequency of input clock during SSC		FLV _{MOD} (F=85MHz z,V _{IC} =1.2V,V _{ID} = ±200mV)	10	-	300	KHz
Maximum deviation of input clock during SSC		FLV _{DEV} (F=85MHz, V _{IC} =1.2V,V _{ID} =±200mV)	-3	-	+3	%

7.2 LVDS Rx interface timing parameter

The specification of the LVDS Rx interface timing parameter is shown as below.

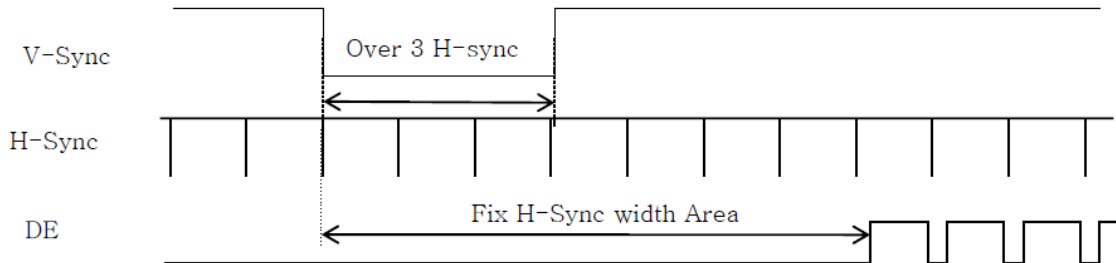
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.60	13.25	20.00	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 × tRCIP/7-0.4	2 × tRCIP/7	2 × tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 × tRCIP/7-0.4	3 × tRCIP/7	3 × tRCIP/7+0.4	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	



* $V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$

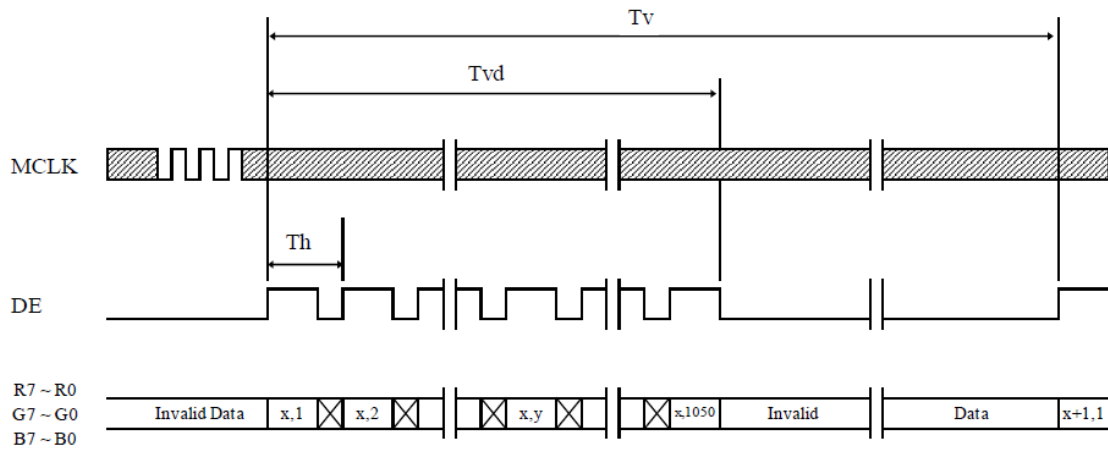
8. Signal timing waveforms of interface signal

8.1 Sync timing waveforms

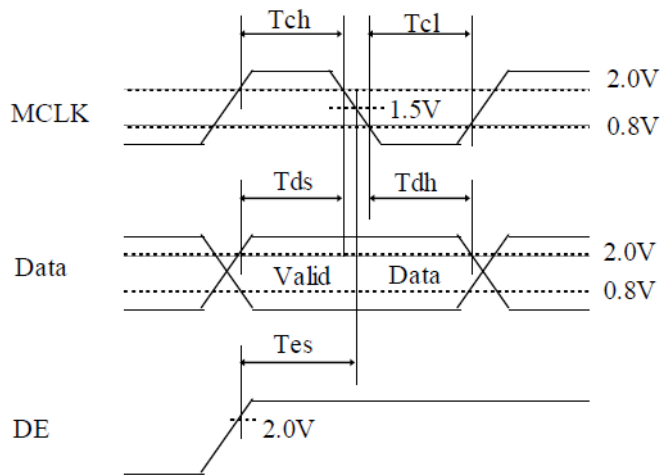
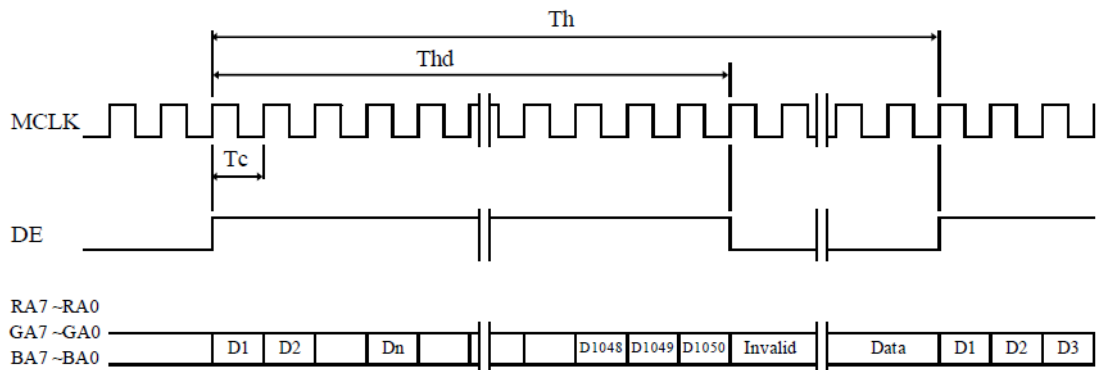


- 1) Need over 3 H-sync during V-Sync Low
- 2) Fix H-Sync width from V-Sync falling edge to first rising edge

8.2 Vertical timing waveforms



8.3 Horizontal timing waveforms

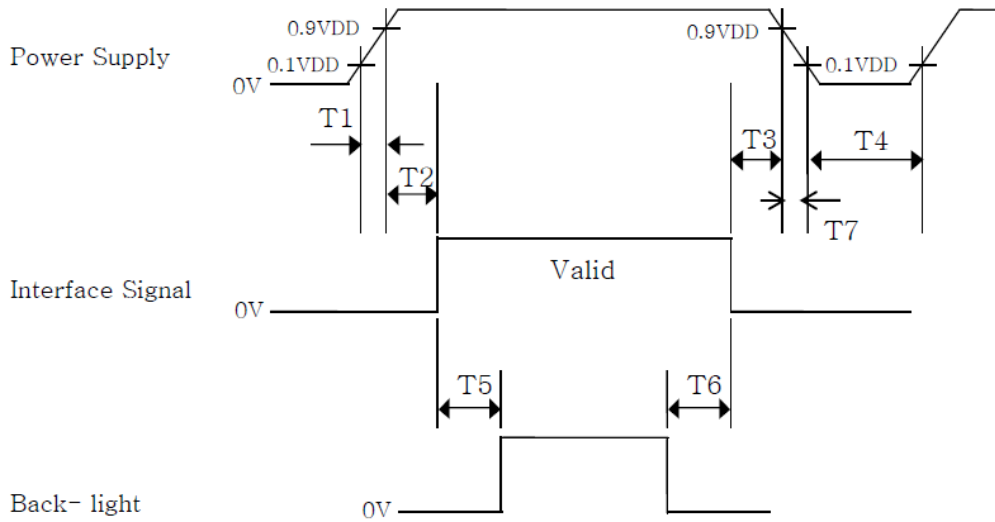


9. Input signal basic display colors & gray scale of colors

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	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	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	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	
	△																								
	▽																								
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	▽	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	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	1	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△																								
	▽																								
	Brighter	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	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	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	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	
	△																								
	▽																								
	Brighter	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	1	1	1	1	1	1	1	0	
	Blue	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	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	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	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	

10. Power sequence

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



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

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.

11. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta=40°C, 80%RH, 240hours	
High Temperature Operation (HTO)	Ts= 70°C, 240hours	3
Low Temperature Operation (LTO)	Ta= -20°C, 240hours	
High Temperature Storage (HTS)	Ta= 70°C, 240hours	
Low Temperature Storage (LTS)	Ta= -20°C, 240hours	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	

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 -10°C to 50°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.

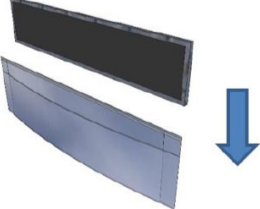
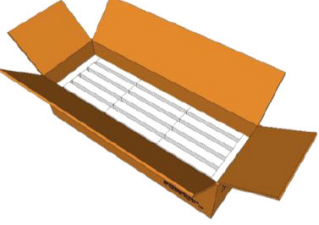
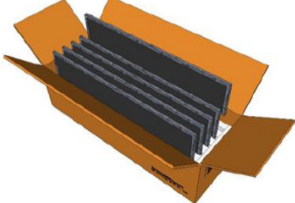
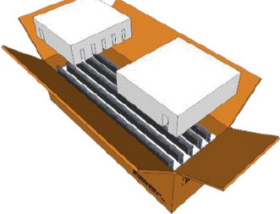
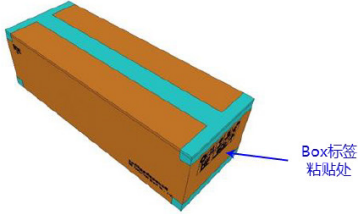

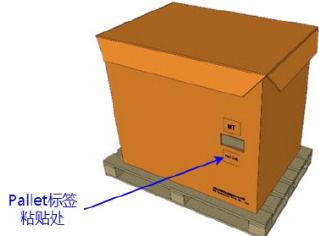
Note 3: TFT surface.

Note 4: There should be no condensation on the surface of panel during test.

Note 5: In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before reliability test.

Note 6: Before cosmetic and function test, the product must have enough recovery time, at least 4 hours at room temperature.

12. Shipping package

<p>将MDL放入防尘袋内，并用防尘袋自带双面胶封口。产品PCB侧朝下，封口胶带置于产品金属背板侧。 1 MDL/ Bag</p>	<p>将Bottom缓冲材放置于箱底，放置方式详见Cushion Instructions.</p>
 <p style="text-align: right;">Step 1</p>	 <p style="text-align: right;">Step 2</p>
<p>降装好防尘袋的产品垂直插入缓冲Bottom内。产品PCB侧朝上。 5 MDL/Inner Box</p>	<p>加盖缓冲Cover。</p>
 <p style="text-align: right;">Step 3</p>	 <p style="text-align: right;">Step 4</p>
<p>采用“H”形封箱方式，对Box进行封箱，并在Box的Mark处粘贴相应标签。 5 MDL/Inner Box</p>	<p>按如下图片所示对Inner Box进行码拍。 24 Inner Box/Pallet</p>
 <p style="text-align: right;">Step 5</p>	 <p style="text-align: right;">Step 6</p>
<p>套上Outer Box和Top Cover，用打包带打包，并粘贴相应标签。 120 MDL/Pallet</p>	
 <p style="text-align: right;">Step 7</p>	

13. Mechanical Characteristics

