PRODUCTION SPECIFICATION
OF TFT LCD MODULE

Model No. : M185BN20 C1-HD

OC PN: MV185WHB-N20

CUSTOMER	
CONFIRMED BY	
APPROVED BY	

DILIANG ELECTRONICS	
PREPARED BY	
CONFIRMED BY	

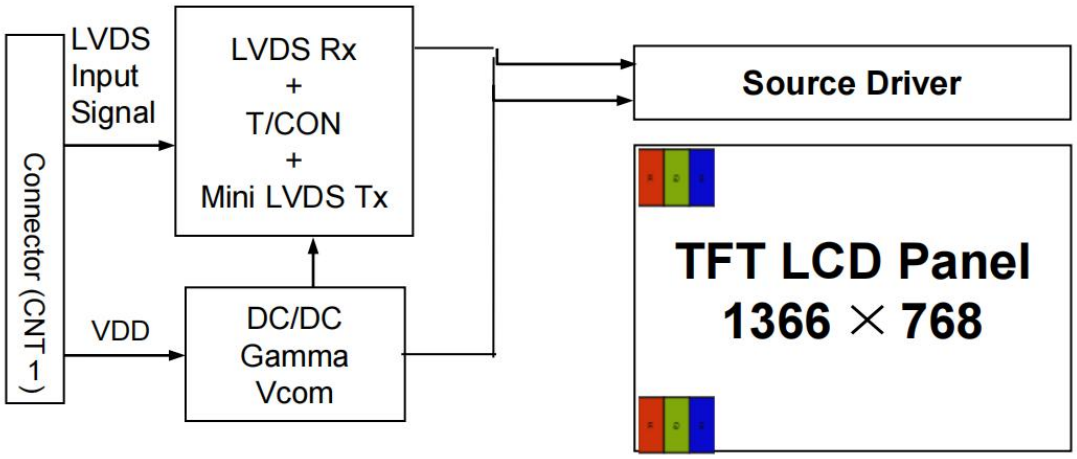
Date	Rev.	Page	Old Description	New Description	Remark
2023.07.15	1.0	All	The specification was first issued		

1. GENERAL DESCRIPTION

1.1 OVERVIEW

The specification is applied to 18.5" module (M185BN20 C1-HD) used BOE MV185WHB-N20 opencell. MV185WHB-N20 is a color active matrix TFT LCD open cell using amorphous silicon

TFT's (Thin Film Transistors) as an active switching devices. This open cell has a 18.5 inch diagonally measured active area with HD resolutions (1366 horizontal by 768 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 OC is adapted for a low reflection and higher color type.



1.2 Features

- **LVDS Interface with 1 pixel / clock**
- High-speed response
- 6-bit (Hi-FRC) color depth, display 16. 7M colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) only
- RoHS/Halogen Free
- Gamma Correction
- forward type

1.3 General Specifications

Item	Specification	Unit	Note
Active Area	409.8(H) X 230.4(V)	mm	
Module Size	430.37(H) * 254.60 (V) * 9.50 (D)	mm	
Module Weight	1.26	kg	Max.
Number of Pixels	1366*768	pixel	
Pixel Pitch (Sub Pixel)	0.100(H) x 0.300(V)	um	
Pixel Arrangement	RGB Vertical Stripe	-	
Display Colors	16.7 M	color	8bit
Display Mode	Normally Black		
Module Brightness	300	Cd/㎡	Typical value measured at DL BLU
Color Chroma	R = (0.636, 0.359)		
Contrast Ratio	G = (0.308, 0.641)		
	B = (0.152, 0.079)		
	W = (0.300, 0.320)		
	1000:1(Typ.)		
View Angle (CR 10)	+89/-89 (H), +89/-89 (V) (Typ.)		
Surface Treatment	Anti-glare, Haze 3%, Hard Coating (3H)		

1.2 Mechanical Specification

Item		Min	Typ	Max	Unit	Note
Weight		-100	1260	+100	g	-
Module Size	Horizontal(H)	(TYP)-1	430.37	(TYP)+1	mm	1
	Vertical (V)		254.60		mm	
	Depth(D)		9.50		mm	

2. Absolute Maximum Ratings

2.1 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[oC]	Note 3
Glass surface temperature (operation)	TGS	0	+65	[oC]	Note 3, Note 4
Operation Humidity	HOP	5	90	[%RH]	Note 3
Storage Temperature	TST	-20	+60	[oC]	
Storage Humidity	HST	5	90	[%RH]	

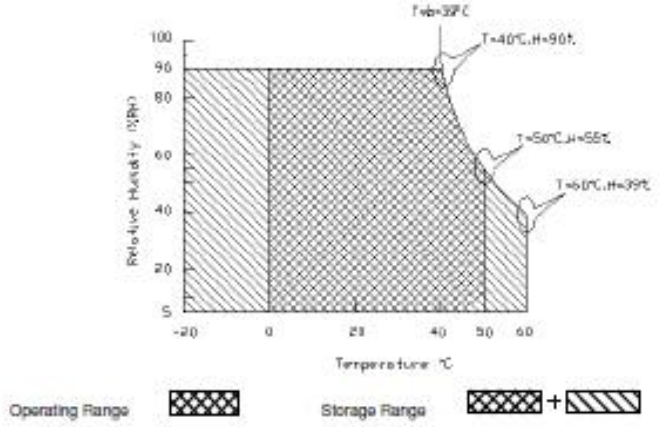
Note 1: With in Ta (25C)

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

Note 3: Temperature and relative humidity range are shown as the below figure.

1. 90% RH Max
2. Max wet-bulb temperature at 39

Note 4: Function Judged only



2.2 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
LED operation Voltage	V_{led}	39	-	45	V_{led}	
LED operation Current	I_{led}	-	240	-	mA	- (1)
BackLight Power	P_{BL}	9.36	-	10.80	W	
Lift time	Lt	-	30000	-	Hrs	

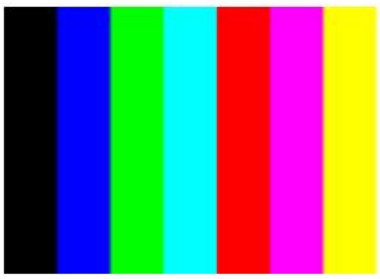
Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal operating Conditions.

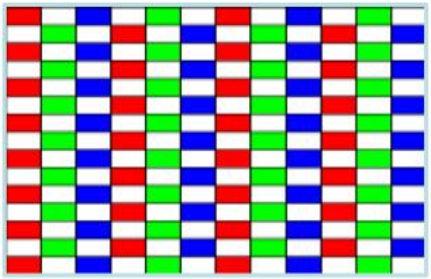
3. ELECTRICAL SPECIFICATIONS

3.1 ELECTRICAL CHARACTERISTICS

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	4.5	5.0	5.5	V	Note1
Power Supply Current	I_{DD}	-	500	720	mA	
In-Rush Current	I_{RUSH}	-	2.0	3.0	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	Vcm	1.0	1.2	1.5		V_{IH}=100mV, V_{IL}=-100mV
Power Consumption	P_D	-	2.5	3.6	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
Clock frequency 75.4MHz. Test Pattern of power supply current
a) Typ : Color Test
b) Max : Skip Sub-pixel
Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)





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

INTERFACE CONNECTION.

3.2.1 Module Input Signal & Power

CN1 Module Side Connector : UJU IS100-L30R-C23or Equivalent

Pin No	Symbol	Function	Remark
1	NC	Not Connect	
2	NC	Not Connect(*Reserved for LCD manufacturer's use)	
3	NC	Not Connect(*Reserved for LCD manufacturer's use)	
4	GND	Power Ground	
5	RX0-	Negative Transmission data of Pixel 0	
6	RX0+	Positive Transmission data of Pixel 0	
7	GND	Power Ground	
8	RX1-	Negative Transmission data of Pixel 1	
9	RX1+	Positive Transmission data of Pixel 1	
10	GND	Power Ground	
11	RX2-	Negative Transmission data of Pixel 2	
12	RX2+	Positive Transmission data of Pixel 2	
13	GND	Power Ground	
14	RXCLK-	Negative Transmission Clock	
15	RXCLK+	Positive Transmission Clock	
16	GND	Power Ground	
17	RX3-	Negative Transmission data of Pixel 3	
18	RX3+	Positive Transmission data of Pixel 3	
19	GND	Power Ground	
20	NC	Not Connect	
21	NC		
22	NC		
23	GND	Power Ground	
24	GND		
25	GND		
26	VDD	Power Supply: +5V	
27	VDD		
28	VDD		
29	VDD		
30	VDD		

Note 1 : This pin should be connected with GND.

3.2.2 LVDS Interface (Tx; THC63LVDF83Aor Equivalent)

	Input Signal	Transmitter		Interface		MV185WHB-N20 (CN11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
L V D S	OR0	51	48 47	OUT0- OUT0+	RX0- RX0+	5 6	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4					
	OG1	6	46 45	OUT1- OUT1+	RX1- RX1+	8 9	
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15					
	OB1	19					
	OB2	20	42 41	OUT2- OUT2+	RX2- RX2+	11 12	
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27					
	Vsync	28					
	DE	30					
	MCLK	31	40 39	CLK OUT- CLK OUT+	RX CLK- RX CLK+	14 15	
	OR6	50	38 37	OUT3- OUT3+	RX3- RX3+	17 18	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
	RSVD	25					

3.3 Backlight Electrical / Optical Characteristics

3.3.1 backlight connector

"CN2 : PH2.0-2P

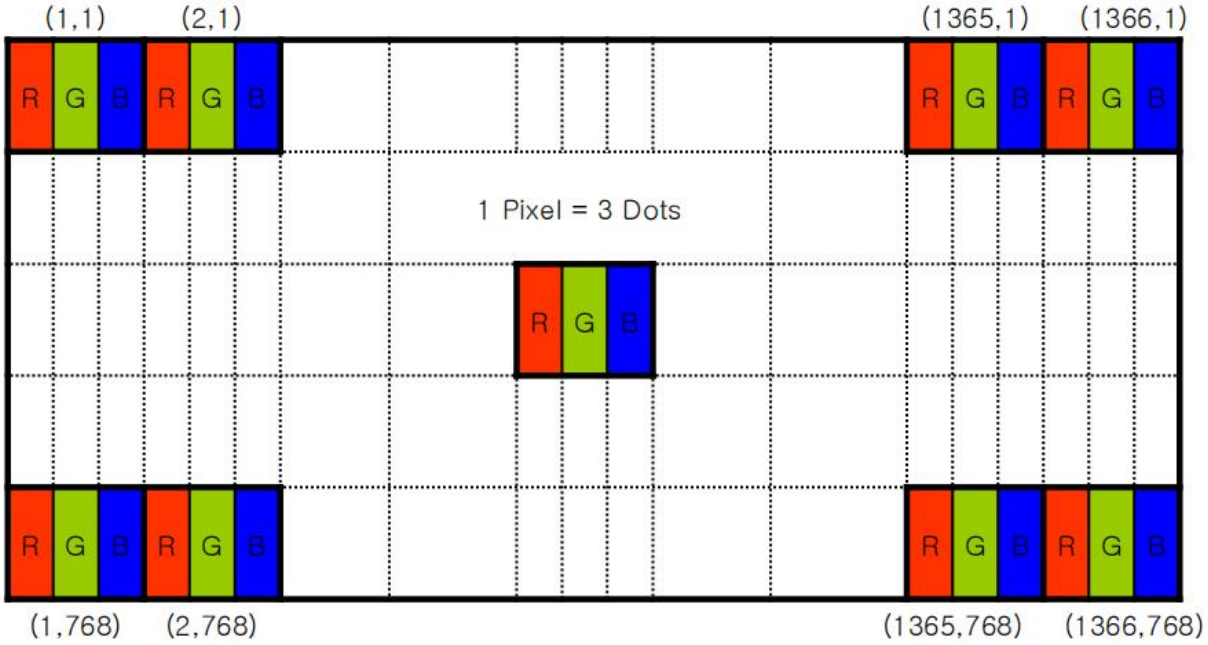
Pin#	Signal Name
1	VDD-
2	VDD+

3.3.2 LED Bar

Parameter	Symbols	Min	Typ	Max	Unit
Forward Voltage (one circuit)	VF	2.8	-	3.6	MHz
Reverse Current (one circuit)	IR	-	-	10	μA
Forward Current	IF	-	90	120	Ma
Chromaticity Coordinates	X	0.255	0.270	0.285	
	Y	0.225	0.240	0.255	
Lumen	¢	20	22	24	LM
Viewing Angle	2θ1/2	-	120	-	Deg.
Number Of LED	Pcs	-	56	-	Pcs
Operation Voltage(LB)	VLB	39	-	45	V
Operation Current(LB)	ILB	-	240	-	mA
Power Consumption	PLB	9.36	-	10.80	W

3.4. Data Input Format

3.4.1 Timing Parameters (DE only mode)



Display Position of Input Data (V-H)

3.5 SIGNAL TIMING SPECIFICATION

3.5.1The MV185WHB-N20 is operated by the DE only

Item	Symbols		Min	Typ	Max	Unit
DCLK	Period	tCLK	10.6	13.26	15.91	ns
	Frequency	-	62.9	75.4	94.3	MHz
Horizontal Display Term	Period	tHP	1446	1560	1936	tCLK
	Horizontal Valid	tHV	1366	1366	1366	tCLK
	Horizontal Blank	tHB	80	194	570	tCLK
	Frequency	fH	40.3	48.36	60.45	KHz
Vertical Display Term	Period	tVP	778	806	888	tHP
	Vertical Valid	tVV	768	768	768	tHP
	Vertical Blank	tVB	10	38	120	tHP
	Frequency	fV	50	60	75	Hz
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%

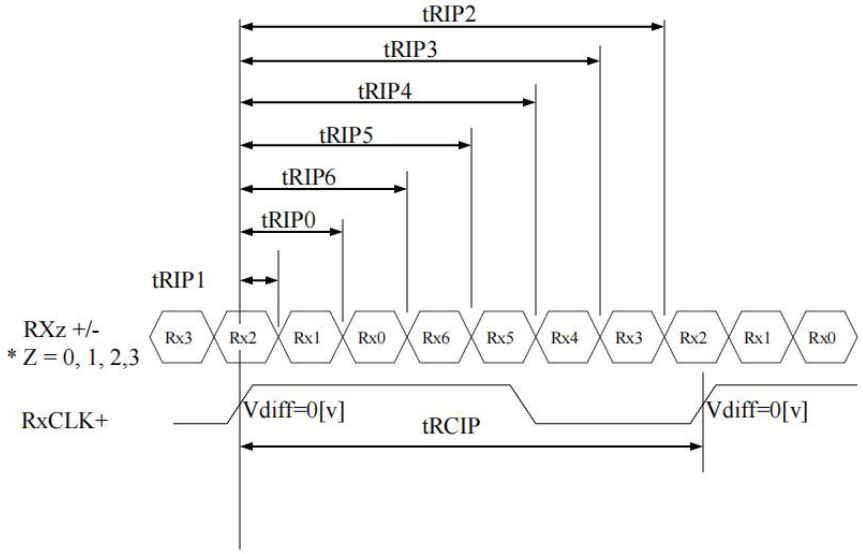
Note: The DCLK range at last line of V-blanking should be set in 0~987

3.6 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

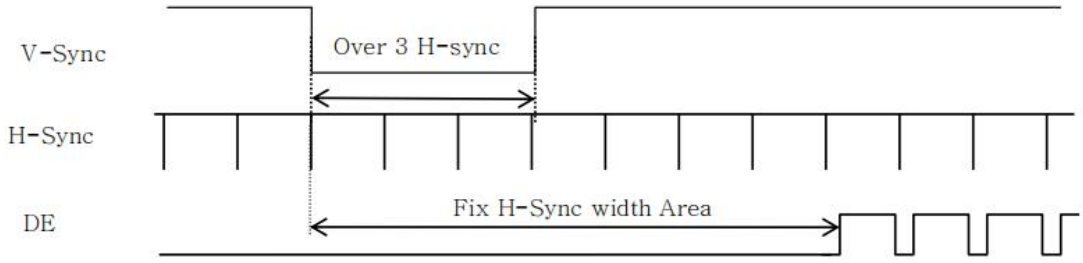
<Table 4. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.60	13.26	15.91	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	



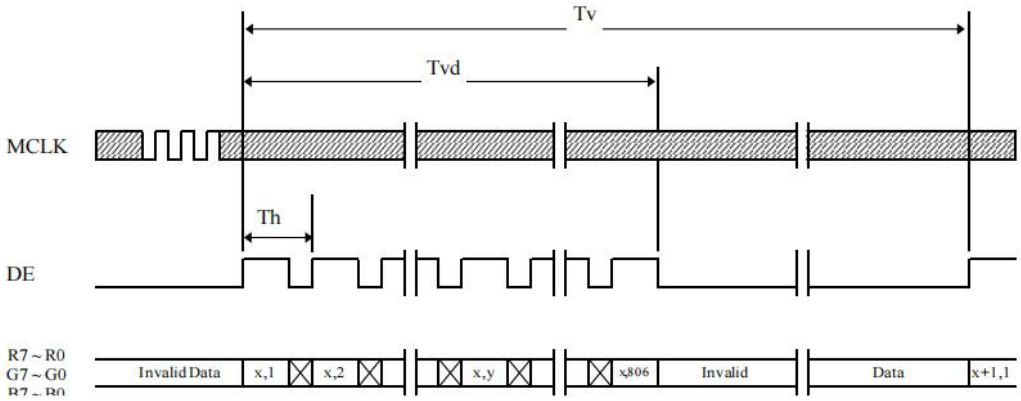
3.7 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

3.7.1 Sync Timing Wave forms

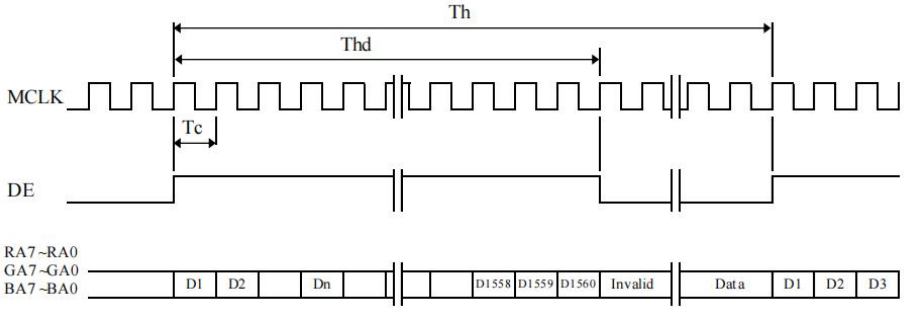


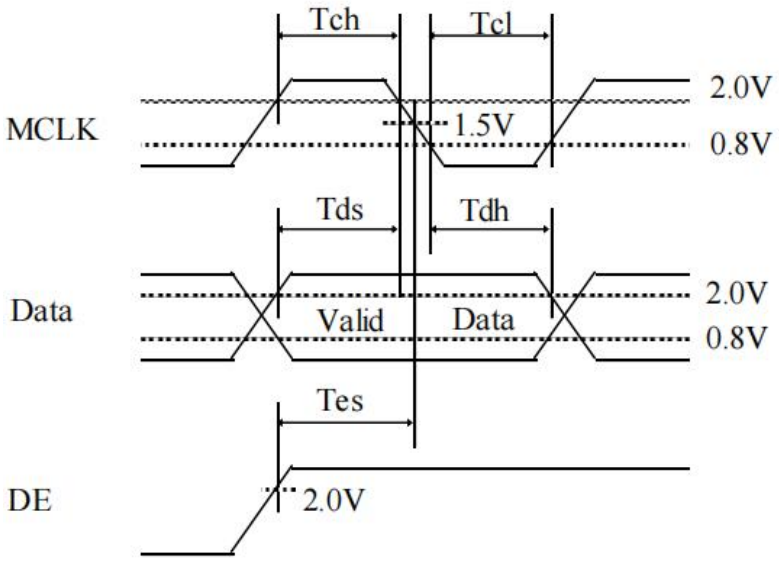
1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

3.7.2 Vertical Timing Wave forms



3.7.3 Horizontal Timing Wave forms



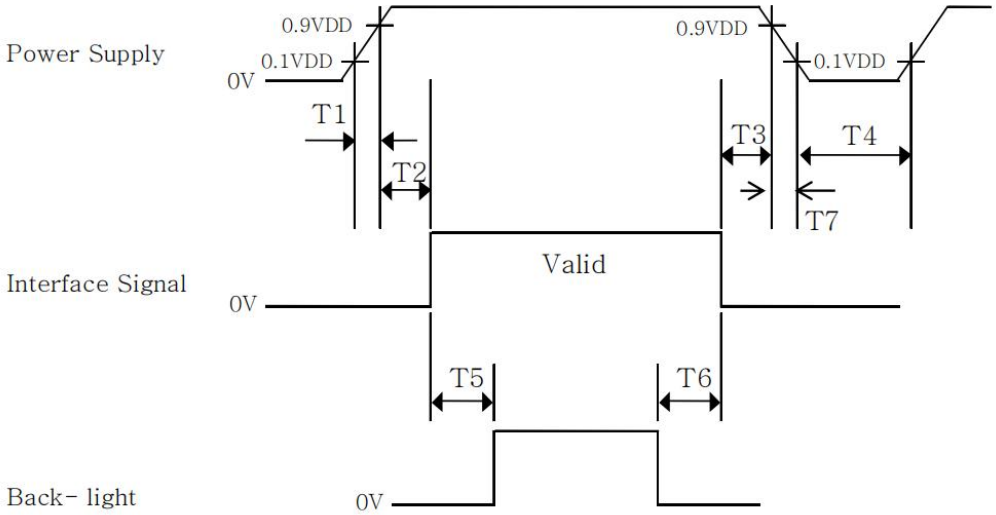

Tch
Tcl
2.0V
MCLK
1.5V
0.8V
Tds
Tdh
Data
2.0V
Valid
Data
0.8V
Tes
DE
2.0V

3.8 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

3.9 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
- 200 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.
5. The above power sequence be satisfied at these case
   a. AC/DC Power On/Off
   b. Mode Change(Resolution, Frequency, Timing, Sleep Mode, Color Depth Change, etc)
   If not to follow power sequence, these is a risk of abnormal display.

4 Optical Characteristics

4.1 Test Condition

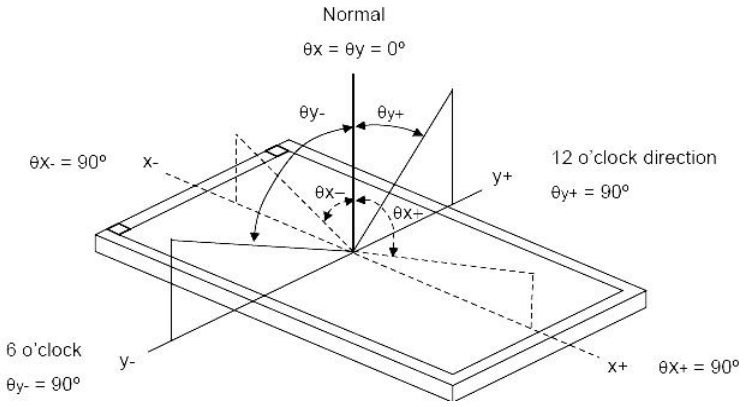
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ± 2	℃
Ambient Humidity	Ha	50 ± 10	%RH
Supply Voltage	Vcc	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Input Voltage	V_{LED}	40	V
LED Input Current	I_{LED}	240	mA
Power Consumption	Pw	9.6	W

4.2 Optical Characteristics

The relative measurement methods of optical characteristics are shown as below.
The following items should be measured under the test conditions described in 4.1

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θx=0,θy=0, viewing normal angle	—	1000	—	—	—
Response Time		TL		—	14	25	ms	Note 3
Brightness uniformity		BU		70	75	—	—	Note 2
Center Luminance of White		Lc		250	300	—	cd/m2	—
The color chromatic	Red	Rx		Typ. -0.03	0.636	Typ. +0.03	—	—
		Ry			0.359		—	—
	Green	Gx			0.308		—	—
		Gy			0.641		—	—
	Blue	Bx			0.151		—	—
		By			0.071		—	—
	White	Wx			0.300		—	—
		Wy			0.320		—	—
Viewing Angle	Horizontal	θx+	CR≧10	—	89	—	Deg	Note 1
		θx-		—	89	—		
	Vertical	θy+		—	89	—		
		θy-		—	89	—		

Note 1: The definition of viewing angle



Note 2: Definition of luminance , CR measured positions and brightness uniformity

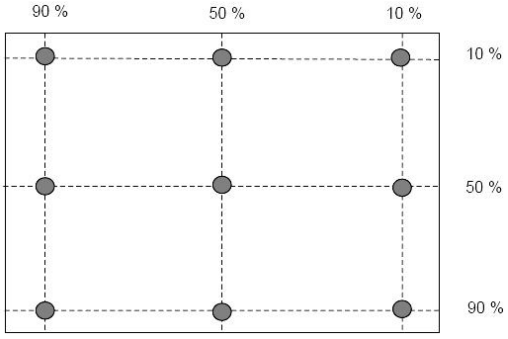
(a) Measure White luminance on the below 9 points and take the average value .

(b) CR : measures the same 9 points and take the average value .The Definition of Contrast Ratio is as follows :

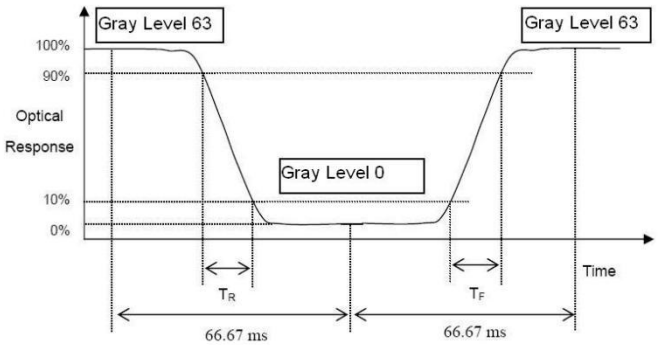
CR = ON(white L63)Luminance / OFF (Black L0)Luminance

(c) The definition of White Vibration

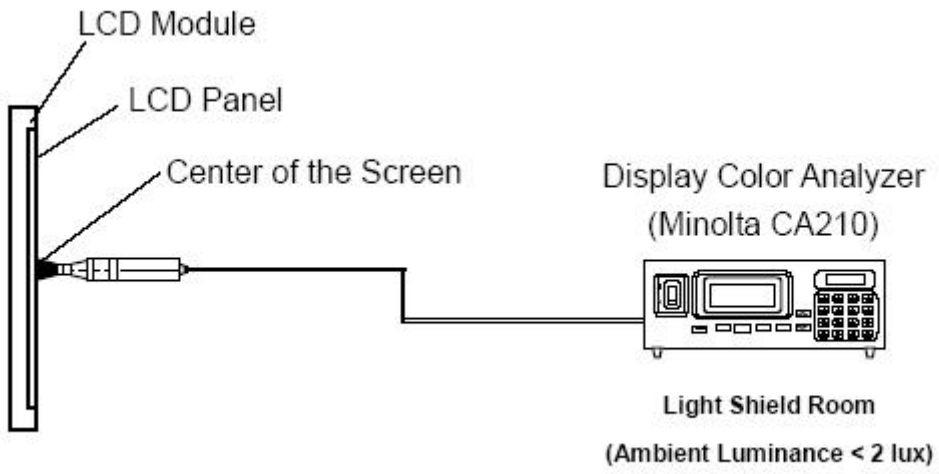
$$\frac{\text{The minimum brightness of 9 dot}}{\text{The maximum brightness of 9 dot}} \times 100\%$$



Note 3:Definition of Response Time (TR, TF):



Note 4: The measure method



(a) : The measurement point is the center of the active area except for the measurement of Luminance Uniformity

(b) : Photometer :CA-210

5.0 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃， 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50℃， 50%RH, 300hours	
Low Temperature Operation (LTO)	Ta= 0℃， 300hours	
High Temperature Storage (HTS)	Ta= 60℃， 300hours	
Low Temperature Storage (LTS)	Ta= -20℃， 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction:±X,±Y,±Z(one time for each Axis)	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 4KV, 150pF(330) 1sec, 8 points, 25 times/ point.	2
	Air Discharge: ± 8KV, 150pF(330) 1sec 8 points, 25 times/ point.	
Altitude Test	Operation:18,000 ft Non-Operation:40,000 ft	

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℃ to 60℃, 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: EN61000-4-2, ESD class B: Certain performance degradation allowed

No data lost

Self-recoverable

No hardware failures.

6.0 Shipping Label

6.1Panel Label

6.2 Carton Label

7. Packaging

9.1 Carton(internal package)

(1)Packaging Form

(2) Packaging Method

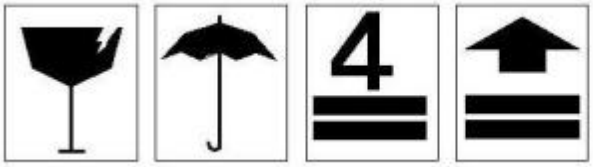
(3) Carton box size : 450*270*345mm

(4) Gloss weight of 1 carton: 13.10KG

(5) Packing pictures :

Note 1) Acceptable number of piling : 10 sets

7.2 Packing Mark



8. PRECAUTION

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

1 Do not apply rough force such as bending or twisting to the module during assembly.
2 To assemble or install module into user's system can be in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
3 It's not permitted to have pressure or impulse on the module because the LED panel and Backlight will will be damaged.
4 Always follow the correct power sequence when LED module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
5 Do not pull the I/F connector in or out while the module is operating .
6 Do not disassemble the module.
Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very
7 soft and easily scratched.
8 It is dangerous that moisture come into or contacted the LED module, because moisture may damage LED module when it is operating.
9 High temperature or humidity may reduce the performance of module. Please store LED module within the specified storage conditions.
10 When ambient temperature is lower than 10 ℃ may reduce the display quality. For example, the response time will become slowly.

8.2 SAFETY PRECAUTIONS

1 It is dangerous that moisture come into or contacted the LED module, because the moisture may damage LED module when it is operating.
2 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.
3 After the modlule's end of life, it is not harmful in case of normal operation and storage.

9. Outline dimensions