HB140WX1-400

Preliminary Product Specification

Rev. P0

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

REVISION HISTORY

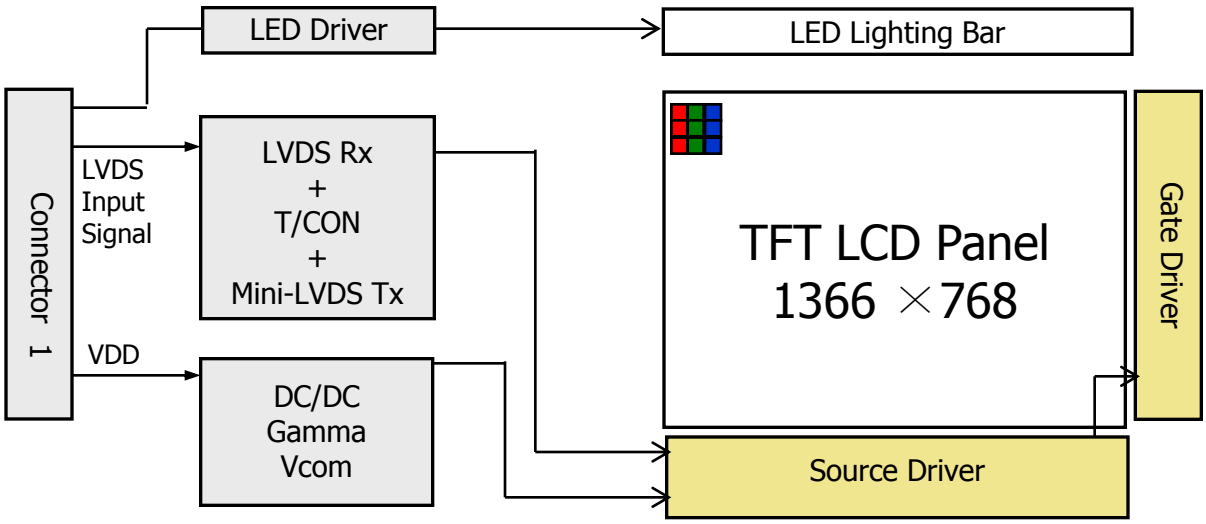
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2012.06.27	吕凤珍

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

HB140WX1-400 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 14.0 inch diagonally measured active area with WXGA 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 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type. Therefore, this module is suitable for Notebook PC. The LED Driver for back-light driving is built in this model.
All input signals are LVDS interface compatible.



1.2 Features

- 1 Channel LVDS Interface with 1 pixel / clock
- Thin and light weight
- 6-bit color depth, display 262K colors
- Single LED Lighting Bar. (Top side/Horizontal Direction)
- Data enable signal mode
- Up/Down Mounting Frame
- Green Product (RoHS & Halogen free product)
- On board LED Driving circuit
- Low driving voltage and low power consumption
- On board EDID chip

1.3 Application

- Notebook PC (Wide type)

1.4 General Specification

The followings are general specifications at the model HB140WX1-400. (listed in Table 1.)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	309.4(H) ×173.95(V)	mm	
Number of pixels	1366 (H) ×768 (V)	pixels	
Pixel pitch	0.2265(H) ×0.2265 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262K	colors	
Display mode	Normally White		
Dimensional outline	320.9(H)*187.6(V)*3.6(Max)	mm	
Weight	320 (max)	g	
Surface treatment	Anti-Glare		
Back-light	Upper edge side, 1-LED Lighting Bar type		Note 1
Power consumption	P_D : 0.9 (max)	W	
	P_{BL} : 2.3 (max)	W	
	P_{total} : 3.2 (max)	W	

Notes : 1. LED Lighting Bar (36*LED Array)

2.0 ABSOLUTE MAXIMUM RATINGS

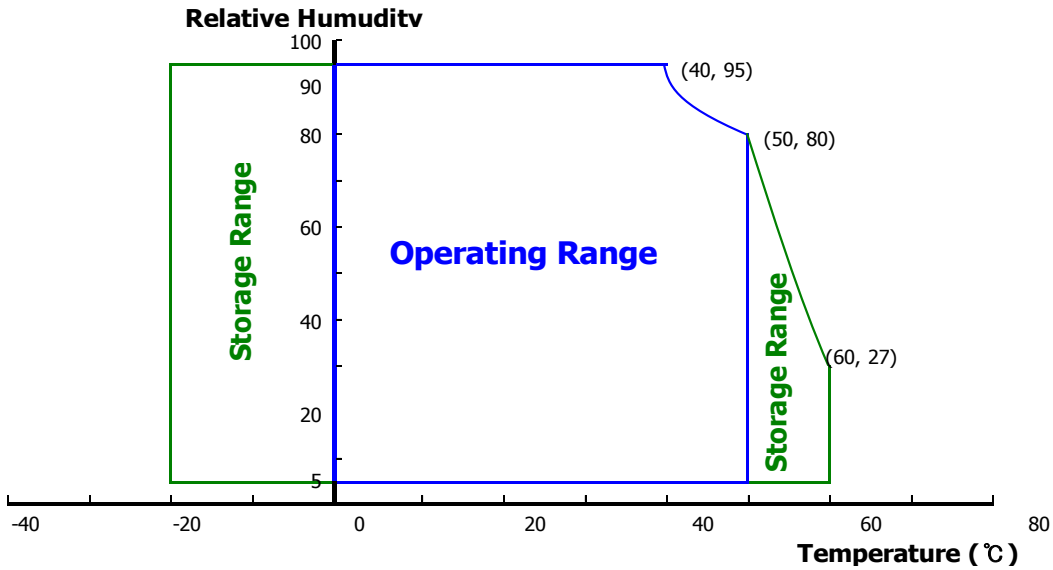
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings> Ta=25+/-2°C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	4.0	V	Note 1
Logic Supply Voltage	V_{IN}	V_{ss}-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	0	+50	℃	Note 2
Storage Temperature	T_{ST}	-20	+60	℃	

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 ^{O}C ≥ Ta)
Maximum wet - bulb temperature at 39 ^{O}C or less. (Ta > 40 ^{O}C) No condensation.



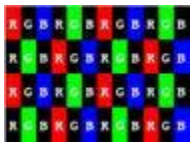
3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical specifications > Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V_{RF}	-	-	100	mV	At V_{DD} = 3.3V
Power Supply Current	I_{DD}	-	192	-	mA	Note 1
Positive-going Input Threshold Voltage	V_{IT+}	-	-	100	mV	V_{cm} = 1.2V typ.
Negative-going Input Threshold Voltage	V_{IT-}	-100	-	-	mV	
Differential Input Voltage	V_{ID}	200	-	600	mV	
Power Consumption	P_D	-	0.64	0.9	W	Note 1
	P_{BL}	-		2.3	W	Note 2
	P_{total}	-	2.84	3.2	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25℃.
a) Typ : Window XP pattern
b) Max : Vertical 2 line skip pattern



2. Calculated value for reference (V_{LED} × I_{LED})

3.0 ELECTRICAL SPECIFICATIONS

3.2 Backlight Unit

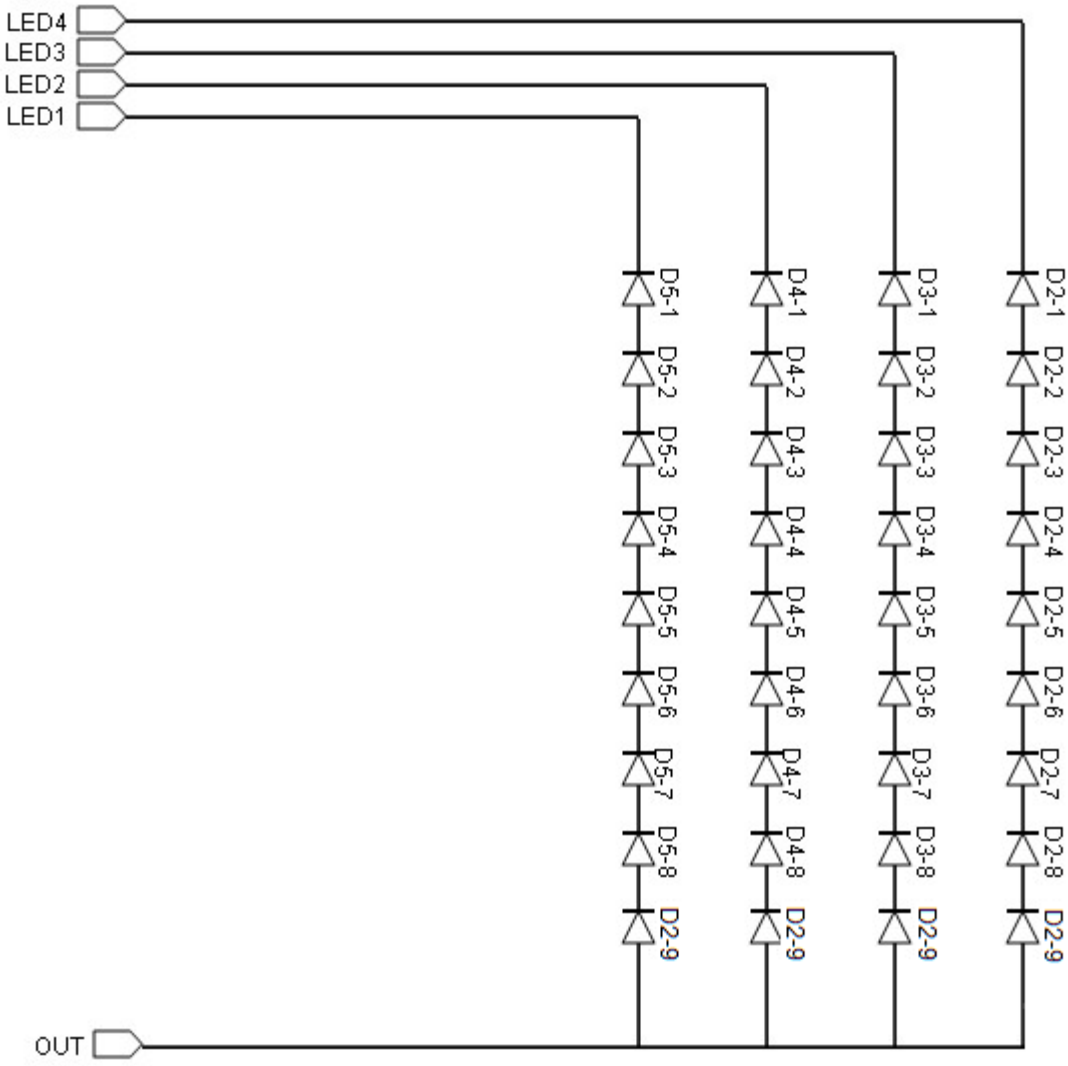
< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage		V_F	TBD	TBD	3.0	V	-
LED Forward Current		I_F	-	18.6		mA	-
LED Power Consumption		P_{LED}			2.3	W	Note 1
LED Life-Time		N/A	15,000	-	-	Hour	I_F = 20mA
Power supply voltage for LED Driver		V_{LED}	6	12	21	V	
EN Control Level	Backlight on		2.0		5.0	V	
	Backlight off		0		1.0	V	
PWM Control Level	PWM High Level		2.0		5.0	V	
	PWM Low Level		0		0.1	V	
PWM Control Frequency		F_{PWM}	100	-	10,000	Hz	
Duty Ratio		-	1	-	100	%	

Notes : 1. Power supply voltage12V for LED Driver, Driver efficiency 90%,
Calculator Value for reference $I_F \times V_F \times 36 / 0.9 = P_{LED}$
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

3.0 ELECTRICAL SPECIFICATIONS

3.3 LED structure



4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3+/- 0.3V at 25°C. Optimum viewing angle direction is 6 'clock.

4.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	40	45	-	Deg.	Note 1
		Θ_9		40	45	-	Deg.	
	Vertical	Θ_{12}		15	20	-	Deg.	
		Θ_6		30	45	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	500	600			Note 2
Luminance of White	5 Points	Y_w	Θ = 0° I_{LED} = 20mA	170	200	-	cd/m^2	Note 3
White Luminance uniformity	5 Points	ΔY5		80	-	-		Note 4
	13 Points	ΔY13		65	-	-		
White Chromaticity		x_w	Θ = 0°	0.283	0.313	0.343		Note 5
		y_w		0.299	0.329	0.359		
Reproduction of color	Red	x_R	Θ = 0°	-0.03	0.592	+0.03		
		y_R			0.347			
	Green	x_G			0.329			
		y_G			0.571			
	Blue	x_B			0.151			
		y_B			0.115			
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	12	16	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	2.0	%	Note 7

Notes :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 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) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as luminance values of 5 point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

4. The White luminance uniformity on LCD surface is then expressed as : ΔY =Minimum Luminance of 5(or 13) points / Maximum Luminance of 5(or 13) points.
(see FIGURE 2 and FIGURE 3).

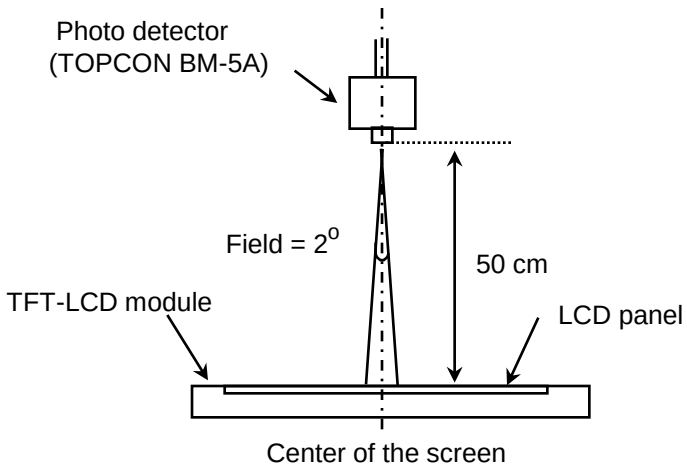
5. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

6. The electro-optical response time measurements shall be made as FIGURE 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark.
(See FIGURE 5).

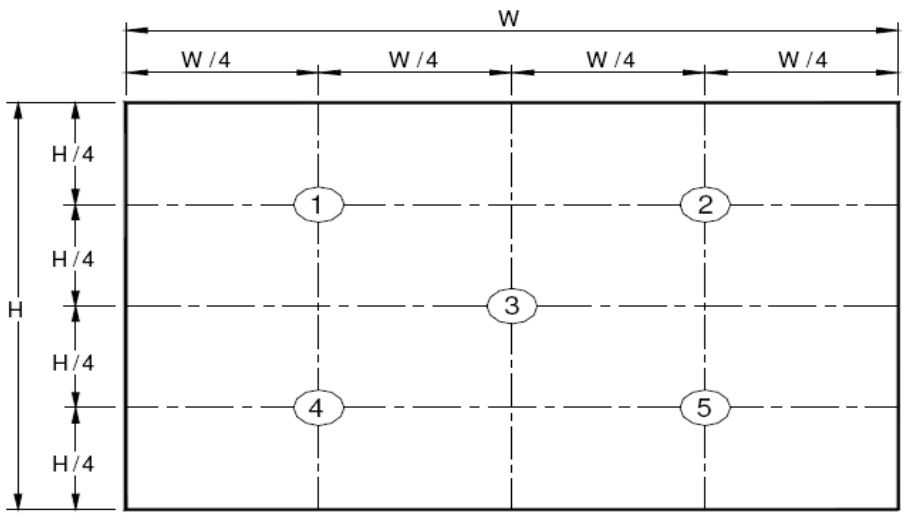
4.3 Optical measurements

Figure 1. Measurement Set Up



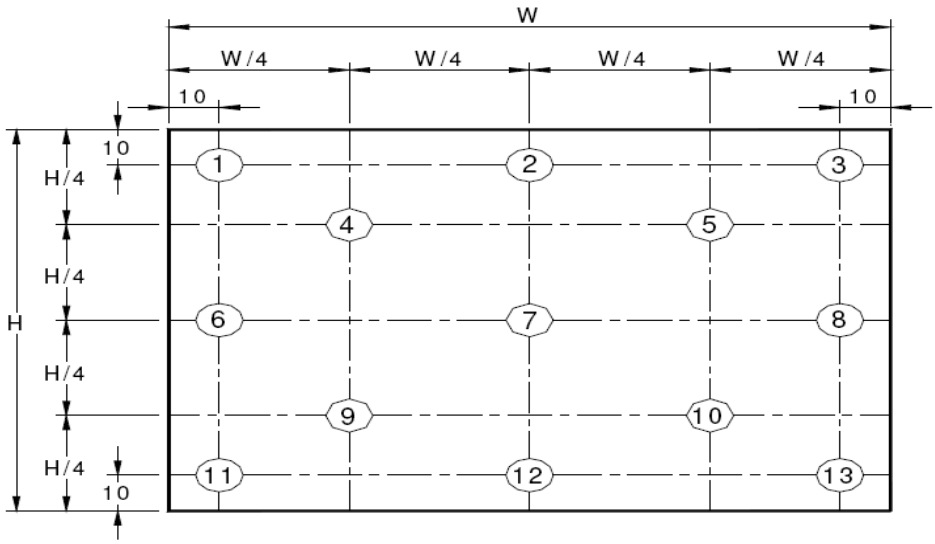
Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



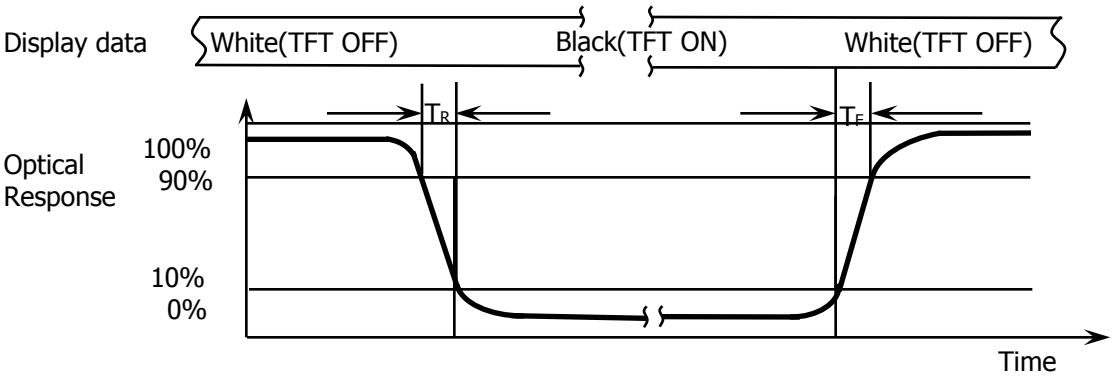
Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



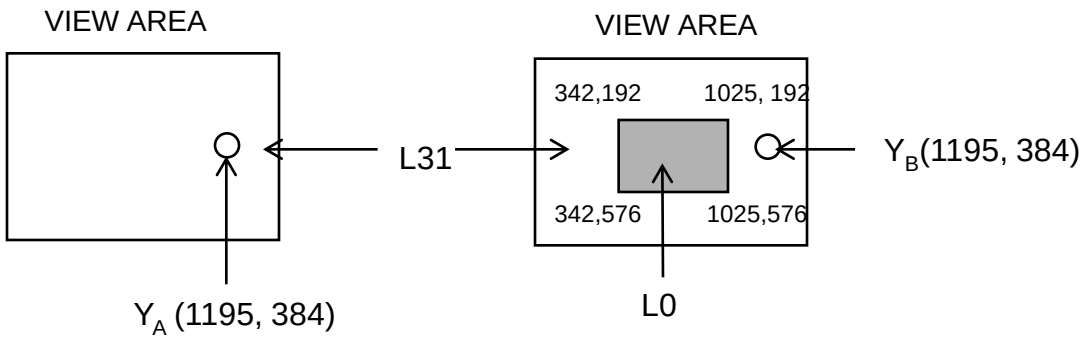
The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see FIGURE 2) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.

Figure 5. Cross Modulation Test Description



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns

Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark (Refer to FIGURE 5).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

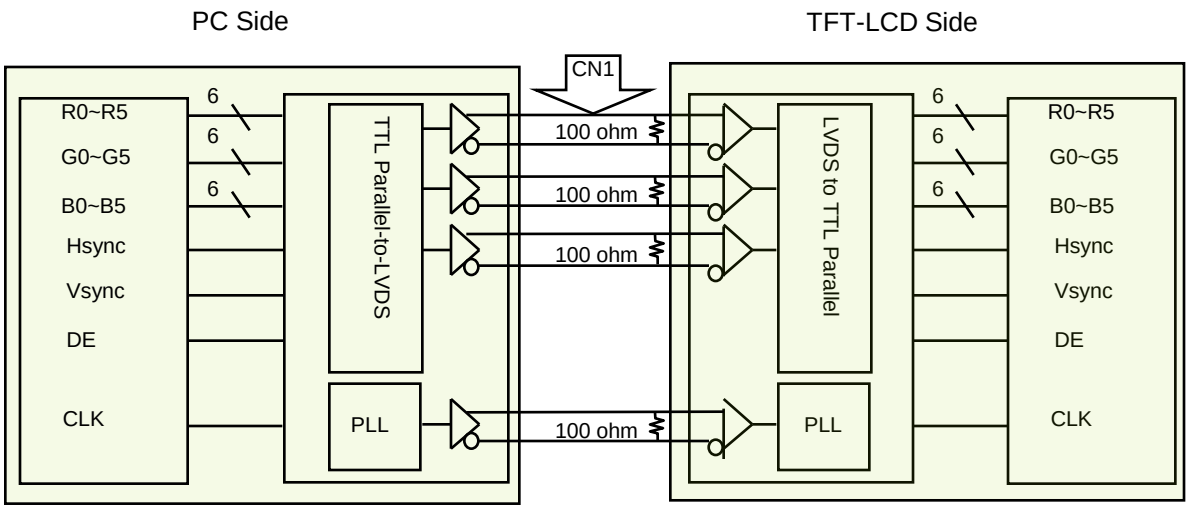
The electronics interface connector is STM or Compatible or equivalent. The mating connector part number is I-PEX 20455-040T-11 or Compatible. The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	NC	No Connection
2	VDDIN	Power Supply, 3.3V (typ.)
3	VDDIN	Power Supply, 3.3V (typ.)
4	VDC	VDC 3.3Vpower for EDID
5	NC	No Connection
6	CLK EDID	EDID Clock
7	Data EDID	EDID Data
8	RxIN0-	Transmission Data of 0 Negative -
9	RxIN0+	Transmission Data of 0 Positive +
10	GND	Ground
11	RxIN1-	Transmission Data of 1 Negative -
12	RxIN1+	Transmission Data of 1 Positive +
13	GND	Ground
14	RxIN2-	Transmission Data of 2 Negative -
15	RxIN2+	Transmission Data of 2 Positive +
16	GND	Ground
17	RxCLKIN-	Sampling Clock of Negative -
18	RxCLKIN+	Sampling Clock of Positive +
19	NC	No Connection
20	NC	No Connection
21	NC	No Connection
22	GND	Ground
23	NC	No Connection
24	NC	No Connection
25	GND	Ground
26	(CE)	No Connection
27	(CTL)	No Connection
28	GND	Ground
29	NC	No Connection
30	NC	No Connection

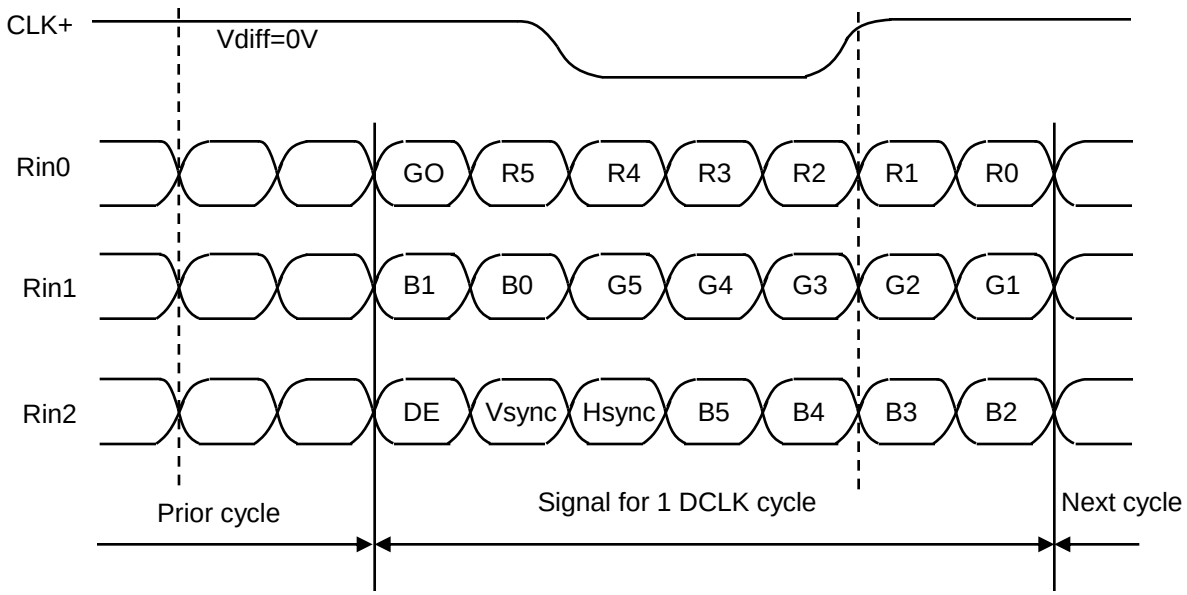
Terminal	Symbol	Functions
Pin No.	Symbol	Description
31	VLED_GND	LED Ground
32	VLED_GND	LED Ground
33	VLED_GND	LED Ground
34	NC	No Connection
35	PWM	System PWM Signal Input
36	LED_EN	LED enable pin(+3.3V Input)
37	CABC	CABC enable pin (0:Bypass;1 Enable)
38	VLED	LED Power Supply 6V-21V
39	VLED	LED Power Supply 6V-21V
40	VLED	LED Power Supply 6V-21V

5-2. LVDS Interface



Note. Transmitter : Thine THC63LVDM63A or equivalent.
Transmitter is not contained in Module.

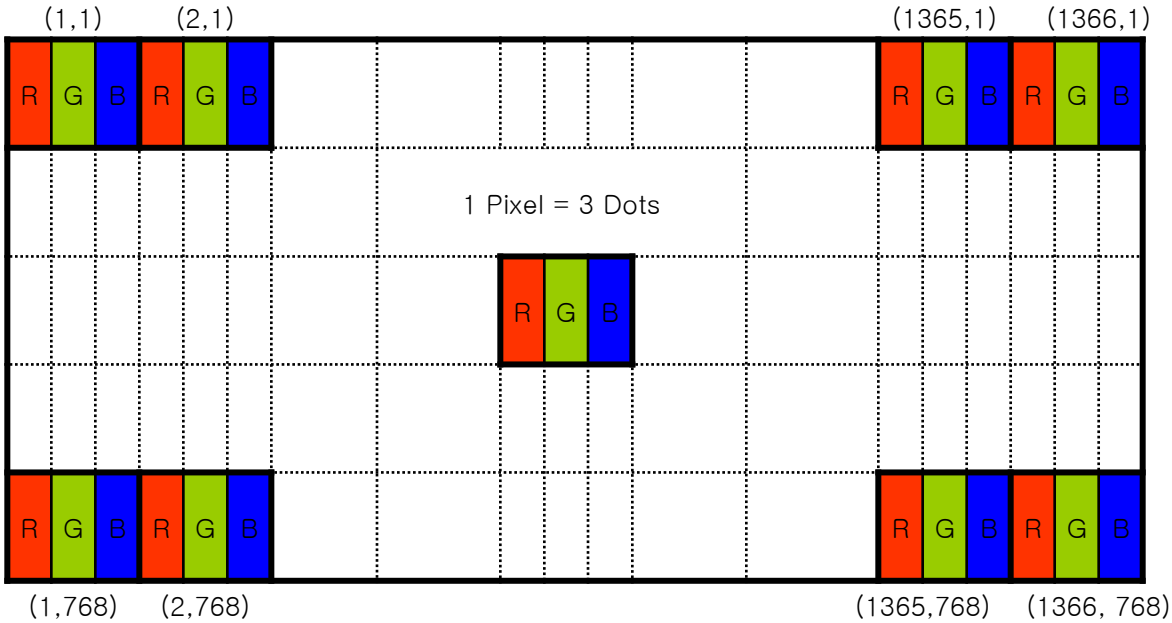
5.3.LVDS Input signal



Note. Pin connection in case of using Thine THC63LVDM63A

5.3 Data Input Format

<Table 6. Pin Assignments for the Interface Connector>



Display Position of Input Data (V-H)

5.4 Back-light & LCM Interface Connection

Interface Connector: MS24022P10 or Equivalent

<Table 7. Pin Assignments for the BLU & LCM Connector>

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LED1	LED cathode connection	6	NC	No Connection
2	LED2	LED cathode connection	7	NC	No Connection
3	LED3	LED cathode connection	8	Vout	LED anode connection
4	LED4	LED cathode connection	9	Vout	LED anode connection
5	NC	No Connection	10	Vout	LED anode connection

6.0 SIGNAL TIMING SPECIFICATION

6.1 The HB140WX1-400 **is operated by the DE only.**

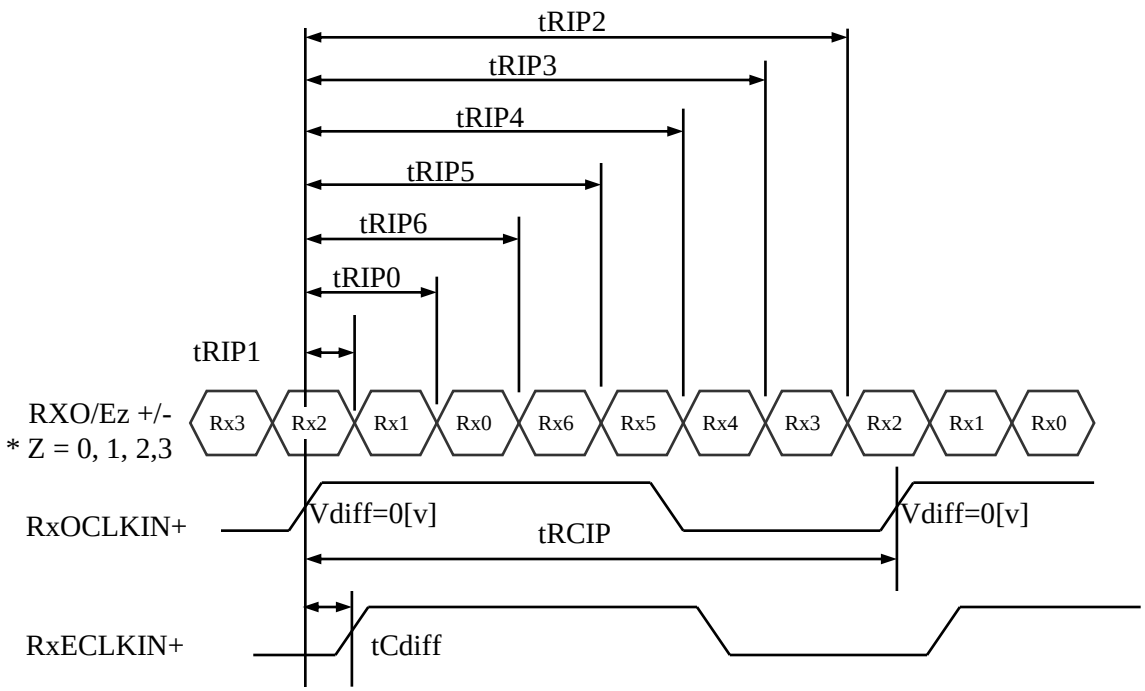
Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	67.5	72.3	76.3	MHz
	High Time	Tch	-	4/7	-	Tc
	Low Time	Tcl	-	3/7	-	Tc
Frame Period		Tv	778	790	802	lines
			-	60	-	Hz
			-	16.7	-	ms
Vertical Display Period		Tvd	768	768	768	lines
One line Scanning Period		Th	1446	1526	1586	clocks
Horizontal Display Period		Thd	1366	1366	1366	clocks

6.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 8.

<Table 8. LVDS Rx Interface Timing Specification>

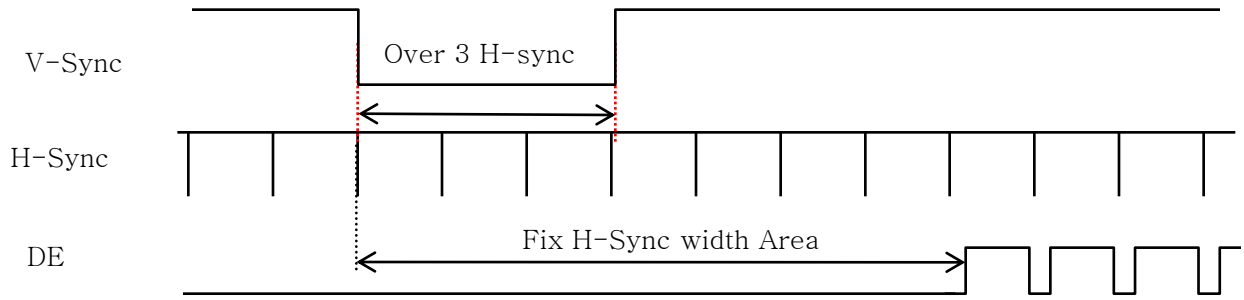
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	-	13.83	25	nsec	
CLK Difference	tCdiff	-tRCIP*(3/7)	0	+tRCIP*(3/7)	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRICP/7-0.4	tRICP/7	tRICP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRICP/7-0.4	2 ×tRICP/7	2 ×tRICP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRICP/7-0.4	3 ×tRICP/7	3 ×tRICP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRICP/7-0.4	4 ×tRICP/7	4 ×tRICP/7+0.4	nsec	
Input Data 5	tRIP3	5 ×tRICP/7-0.4	5 ×tRICP/7	5 ×tRICP/7+0.4	nsec	
Input Data 6	tRIP2	6 ×tRICP/7-0.4	6 ×tRICP/7	6 ×tRICP/7+0.4	nsec	



* Vdiff = (RXO/Ez+)-(RXO/Ez-),…. ,(RXO/ECLK+)-(RXO/ECLK-)

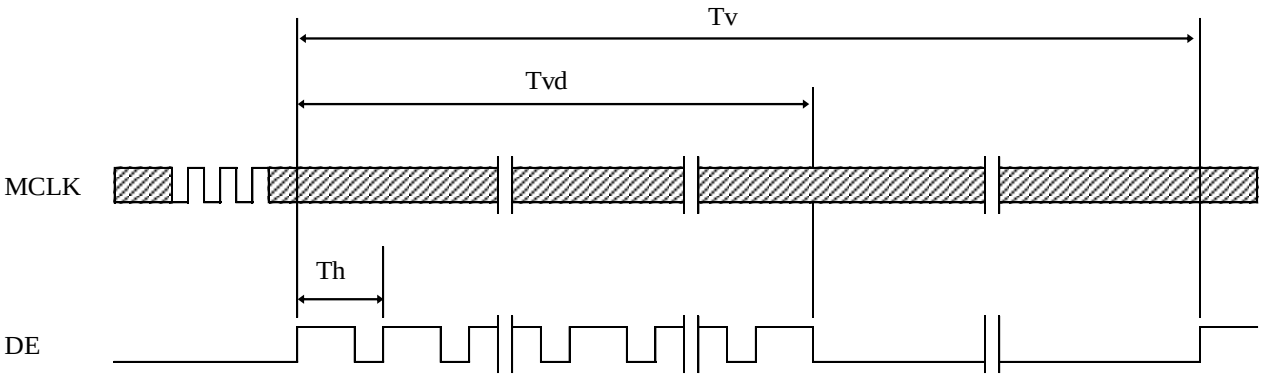
7.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

7.1 Sync Timing Waveforms

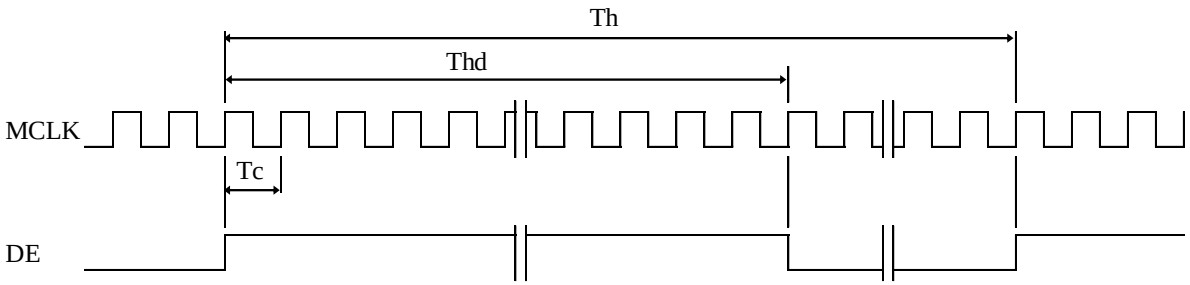


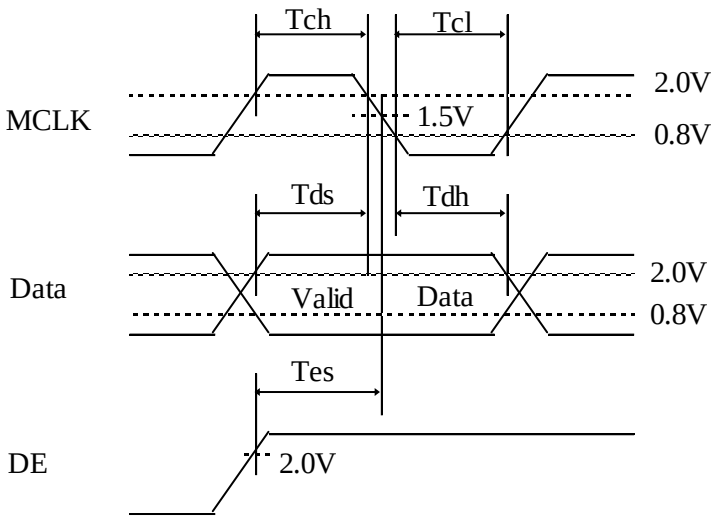
1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

7.2 Vertical Timing Waveforms



7.3 Horizontal Timing Waveforms



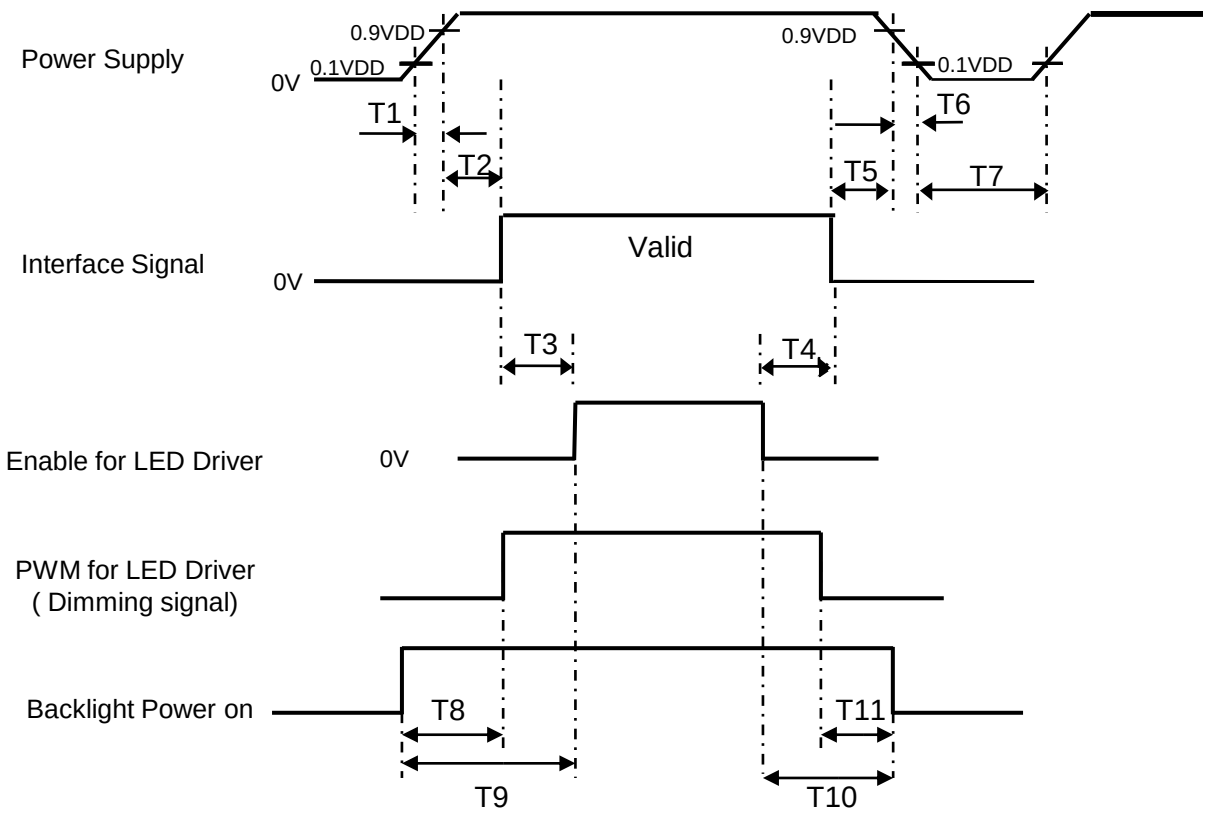


8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

	Colors & Gray scale	Data signal																	
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic colors	Black	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	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Light Blue	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray scale of Red	Black	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	0
	Darker	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	1	0	1	1	1	1	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
	Red	1	1	1	1	1	1	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	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	△	↑						↑						↑					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	0	0	0	0	0	0	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	1	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	△	↑						↓						↑					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray scale of White & Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
	▽	↑						↑						↑					
	Brighter	↓						↓						↓					
	▽	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1
		0	1	1	1	1	1	0	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

9.0 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



- 0.5ms ≤ T1 ≤ 10 ms
- 0 ms ≤ T2 ≤ 50 ms
- 200 ms ≤ T3
- 0 ms ≤ T4
- 0ms ≤ T5
- 0 ms ≤ T6 ≤ 10 ms
- 150ms ≤ T7
- 0 ms ≤ T8
- 0 ms ≤ T9
- 0ms ≤ T10
- 0ms ≤ T11

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. Back Light must be turn on after power for logic and interface signal are valid.

10.0 Connector Description

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

10.1 TFT LCD Module

Connector Name /Description	**For Signal Connector**
Manufacturer	STM or Compatible
Type/ Part Number	MSAK24025P40G or Compatible
Mating housing/ Part Number	I-PEX 20455-040T-11 or Compatible

11.0 MECHANICAL CHARACTERISTICS

11.1 Dimensional Requirements

FIGURE 6 shows mechanical outlines for the model HB140WX1-400.
Other parameters are shown in Table 9.

<Table 9. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	309.40 (H) ×173.95 (V)	
Number of pixels	1366 (H) X 768 (V) (1 pixel = R + G + B dots)	
Pixel pitch	0.2265 (H) X 0.2265 (V)	
Pixel arrangement	RGB Vertical stripe	
Display colors	262K	
Display mode	Normally white	
Dimensional outline	320.9(H)*187.6(V)*3.6(Max)	mm
Weight	320 (max)	gram
Back Light	Connector : MS24022P10	
	LED, Horizontal-LED Array type	

10.2 Mounting

See FIGURE 6.

10.3 Anti-Glare and Polarizer Hardness.

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

10.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 350lux.

12.0 RELIABILITY TEST

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

<Table 10. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 ℃, 240 hrs
2	Low temperature storage test	Ta = -20 ℃, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240 hrs
4	High temperature operation test	Ta = 50 ℃, 240 hrs
5	Low temperature operation test	Ta = 0 ℃, 240 hrs
6	Thermal shock	Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle
7	Vibration test (non-operating)	1.5G, 10~500Hz,Half Sine X,Y,Z / Sweep rate : 1 hour
8	Shock test (non-operating)	220G, Half Sine Wave 2msec ±X,±Y,±Z Once for each direction
9	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV

13.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module
- Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module
- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

14.0 LABEL

(1) Product label

1	2	3	4	5	6	7
X X	X	X	X X	X	X X X X	X X X X X X

Type designation

No 1. Control Number

No 2. Rank / Grade

No 3. Line classification

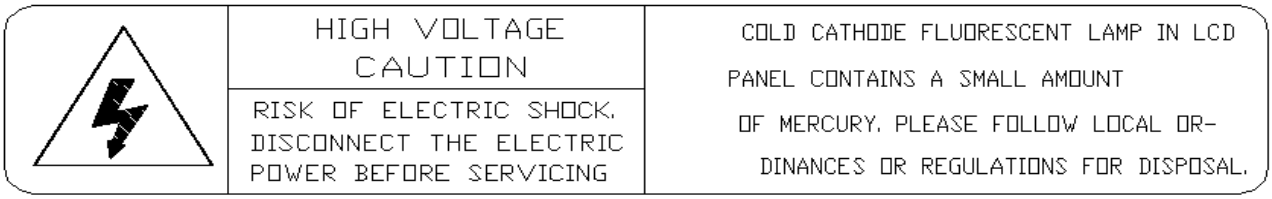
No 4. Year (10 : 2010, 11: 2011, …)

No 5. Month (1, 2, 3, …, 9, X, Y, Z)

No 6. Product Identification (FG)

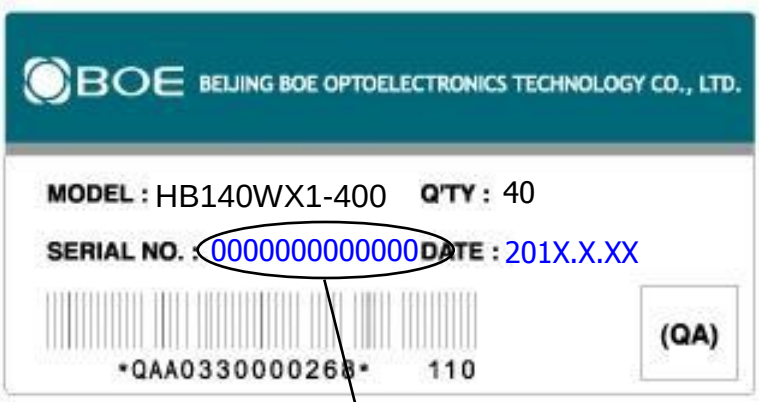
No 7. Serial Number

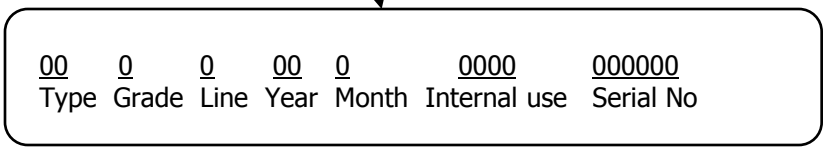
(2) High voltage caution label



(3) Box label

Label Size: 110 mm (L) × 56 mm (W)
Contents
Model: HB140WX1-400
Q`ty: Module Q`ty in one box
Serial No.: Box Serial No. See next figure for detail description.
Date: Packing Date
Internal use of Product

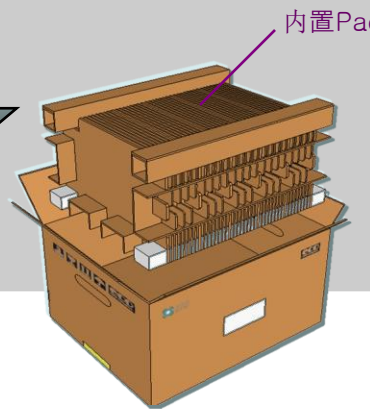




15.0 PACKING INFORMATION

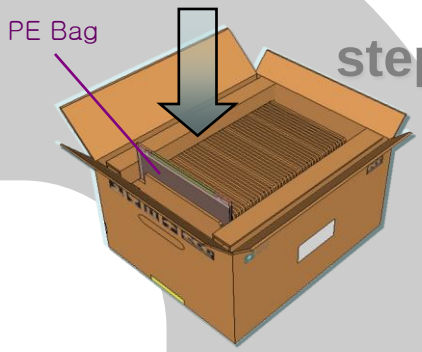
15.1 Packing order

-. Put Pad into the inner box



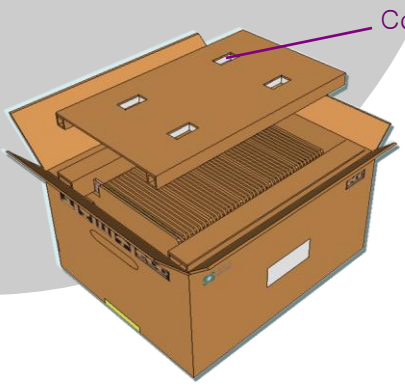
step 1

-.Put module into the paper spacer and modules bundled by PE Bag

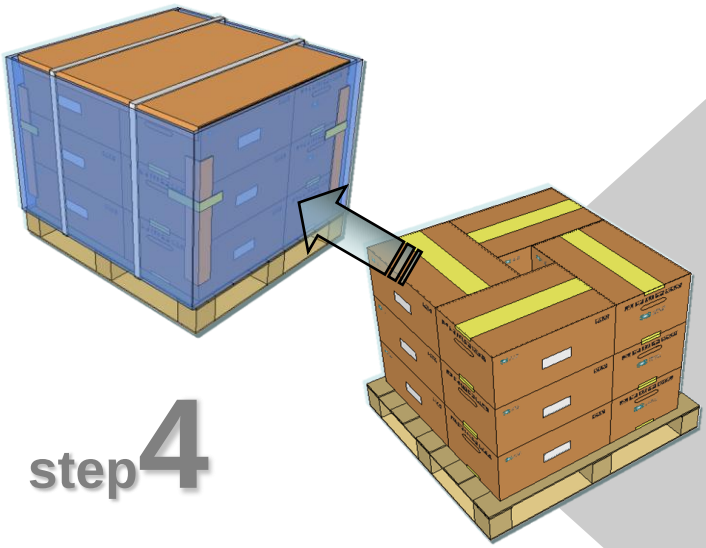


step 2

-. Put Cover on the top of the pad



step 3



step 4

-. 12ea Box/Pallet, 480ea MDL/Pallet

15.2 Notes

- Box Dimension: 580mm(W) x 450mm(D) x 280mm(H)
- Package Quantity in one Box: 40pcs
- Total Weight: 15kg

16.0 MECHANICAL OUTLINE DIMENSION

Figure 6. TFT-LCD Module Outline Dimension (Front View)

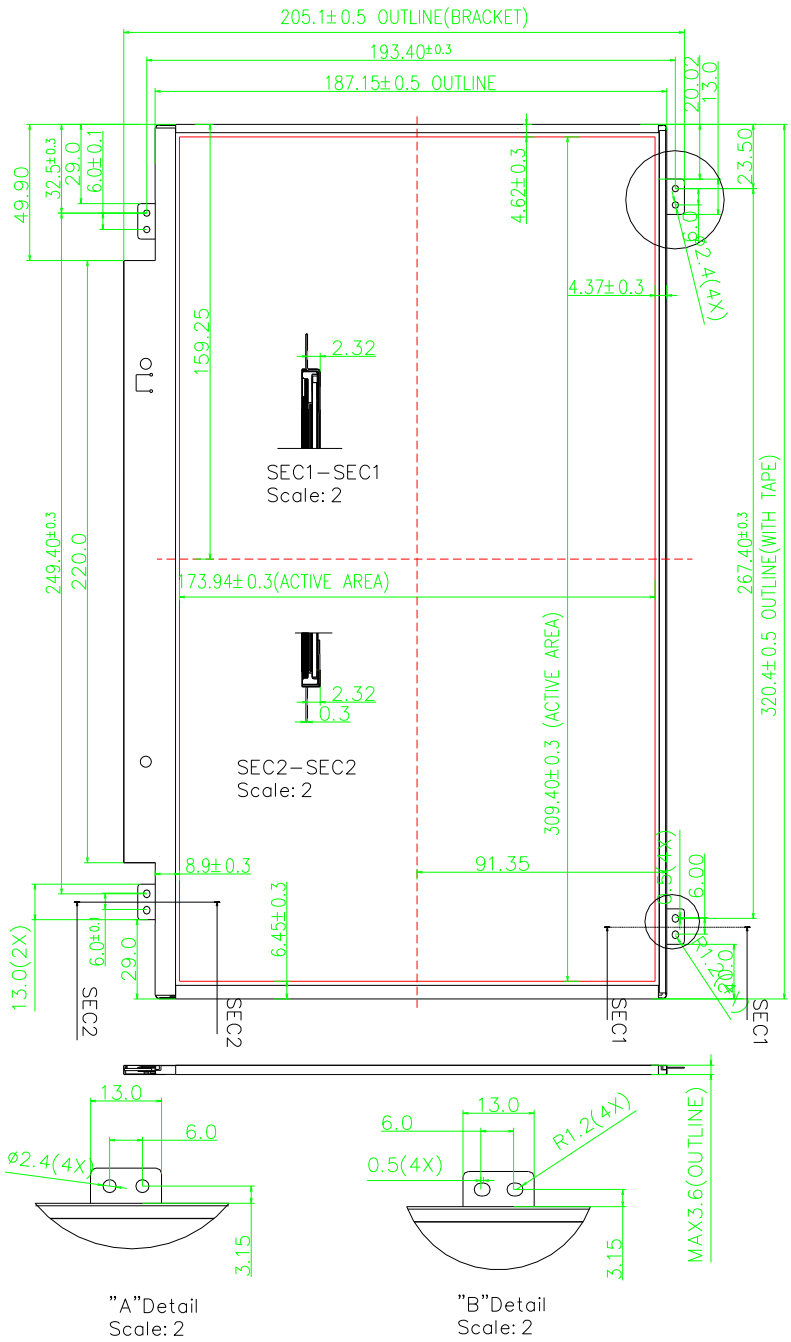
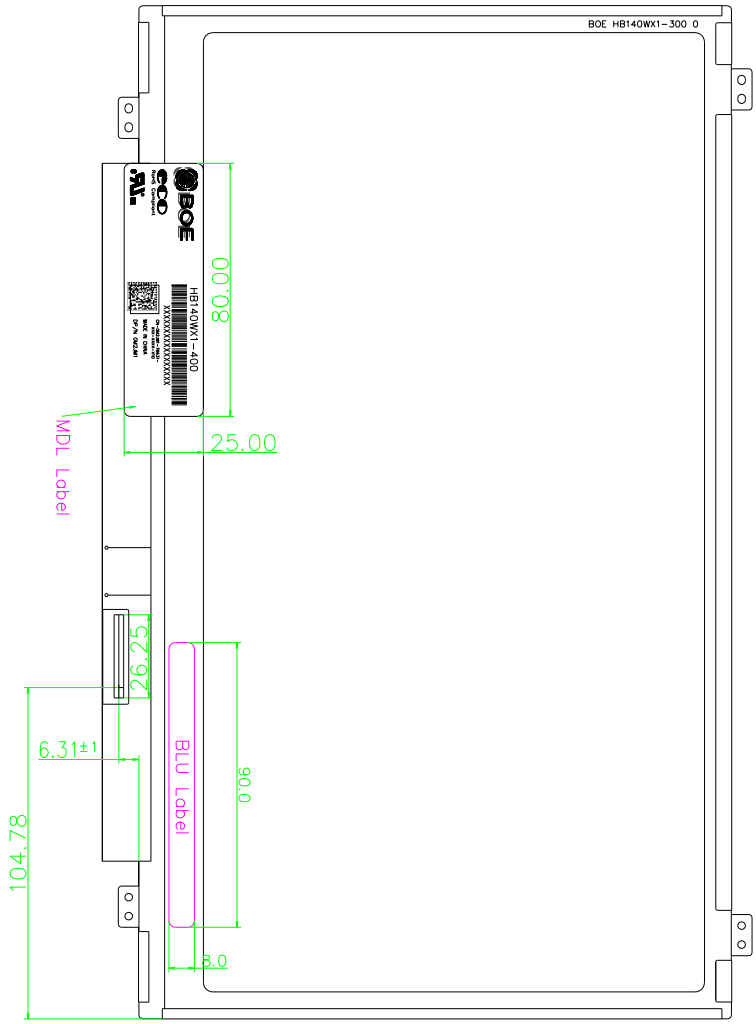


Figure 7. TFT-LCD Module Outline Dimensions (Rear view)



NOTE:
1.MAX SCREW TYPE: M1.4, LENGTH:2.0MM.
2.MAX SCREW TORQUE:1.2KGF-CM.
3.LCD MODULE INPUT CONNECTOR:MASK24025P40.

17.0 EDID Table

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
00	Header	00	0		0	EDID Header
01		FF	255		255	
02		FF	255		255	
03		FF	255		255	
04		FF	255		255	
05		FF	255		255	
06		FF	255		255	
07		00	0		0	
08	ID Manufacturer Name	09	9		BOE	ID = BOE
09		E5	229			
0A	ID Product Code	C8	200		1480	ID = 1480
0B		05	5			
0C	32-bit serial No.	00	0			
0D		00	0			
0E		00	0			
0F		00	0			
10	Week of manufacture	01	1		1	
11	Year of Manufacture	16	22		2012	Manufactured in 2012
12	EDID Structure Ver.	01	1		1	EDID Ver 1.0
13	EDID revision #	04	4		4	EDID Rev. 0.4
14	Video input definition	80	128		-	
15	Max H image size	1F	31		31	31 cm (Approx)
16	Max V image size	11	17		17	17 cm (Approx)
17	Display Gamma	78	120		2.2	Gamma curve = 2.2
18	Feature support	0A	10			RGB display, Preferred Timming mode
19	Red/Green low bits	B0	176		-	Red / Green Low Bits
1A	Blue/White low bits	90	144		-	Blue / White Low Bits
1B	Red x high bits	97	151	606	0.592	Red (x) = 10010111 (0.592)
1C	Red y high bits	58	88	355	0.347	Red (y) = 01011000 (0.347)
1D	Green x high bits	54	84	336	0.329	Green (x) = 01010100 (0.329)
1E	Green y high bits	92	146	584	0.571	Green (y) = 10010010 (0.571)
1F	Blue x high bits	26	38	154	0.151	Blue (x) = 00100110 (0.151)
20	BLue y high bits	1D	29	117	0.115	Blue (y) = 00011101 (0.115)
21	White x high bits	50	80	320	0.313	White (x) = 01010000 (0.313)
22	White y high bits	54	84	336	0.329	White (y) = 01010100 (0.329)
23	Established timing 1	00	0		-	
24	Established timing 2	00	0		-	

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
25	Established timing 3	00	0		-	
26	Standard timing #1	01	1			Not Used
27		01	1			
28	Standard timing #2	01	1			Not Used
29		01	1			
2A	Standard timing #3	01	1			Not Used
2B		01	1			
2C	Standard timing #4	01	1			Not Used
2D		01	1			
2E	Standard timing #5	01	1			Not Used
2F		01	1			
30	Standard timing #6	01	1			Not Used
31		01	1			
32	Standard timing #7	01	1			Not Used
33		01	1			
34	Standard timing #8	01	1			Not Used
35		01	1			
36	Detailed timing/monitor descriptor #1	E4	228		71.4	71.4MHz Main clock
37		1B	27			
38		56	86		1366	Hor Active = 1366
39		7A	122		122	Hor Blanking = 122
3A		50	80		-	4 bits of Hor. Active + 4 bits of Hor. Blanking
3B		00	0		768	Ver Active = 768
3C		20	32		32	Ver Blanking = 32
3D		30	48		-	4 bits of Ver. Active + 4 bits of Ver. Blanking
3E		30	48		48	Hor Sync Offset = 48
3F		20	32		32	H Sync Pulse Width = 32
40		36	54		3	V sync Offset = 3 line
41		00	0		6	V Sync Pulse width : 6 line
42		35	53		309	Horizontal Image Size = 309 mm (Low 8 bits)
43		AD	173		173	Vertical Image Size = 173 mm (Low 8 bits)
44		10	16		-	4 bits of Hor Image Size + 4 bits of Ver Image Size
45		00	0		0	Hor Border (pixels)
46		00	0		0	Vertical Border (Lines)
47		1A	26			Refer to right table

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
48	Detailed timing/monitor descriptor #2	30	48		56.8	56.8MHz Main clock
49		16	22			
4A		56	86		1366	Hor Active = 1366
4B		00	0		256	Hor Blanking = 256
4C		51	81		-	4 bits of Hor. Active + 4 bits of Hor. Blanking
4D		00	0		768	Ver Active = 768
4E		6C	108		108	Ver Blanking = 108
4F		30	48		-	4 bits of Ver. Active + 4 bits of Ver. Blanking
50		30	48		48	Hor Sync Offset = 48
51		20	32		32	H Sync Pulse Width = 32
52		36	54		3	V sync Offset = 3 line
53		00	0		6	V Sync Pulse width : 6 line
54		35	53		309	Horizontal Image Size = 309 mm (Low 8 bits)
55		AD	173		173	Vertical Image Size = 173 mm (Low 8 bits)
56		10	16		-	4 bits of Hor Image Size + 4 bits of Ver Image Size
57		00	0		0	Hor Border (pixels)
58		00	0		0	Vertical Border (Lines)
59		1A	26			
5A	Detailed timing/monitor descriptor #3	00	0			ASCII Data Sting Tag
5B		00	0			
5C		00	0			
5D		FE	254			
5E		00	0			
5F		4D	77		M	D/PN:M2JM1
60		32	50		2	
61		4A	74		J	
62		4D	77		M	
63		31	49		1	
64		0A	10		1010	EDID:X10
65		48	72		H	BOE PN
66		42	66		B	
67		31	49		1	
68		34	52		4	
69		34	52		4	
6A		30	48		0	
6B		30	48		0	

Address (HEX)	Function	Hex	Dec	crc	Input values.	Notes
6C	Detailed timing/monitor descriptor #4	00	0			Product Name Tag (ASCII)
6D		00	0			
6E		00	0			
6F		00	0			
70		00	0			
71		00	0		00000000	6-bit Color Depth & no FRC
72		41	65		01000001	WLED & singal light bar & one light bar
73		01	1		00000001	Frame rate 40Hz~65Hz
74		94	148		10010100	Light Controller:PWM & Max. Luminance 200
75		00	0		00000000	Front Surface: Anti-Glare & RGB v-stripe
76		10	16		00000001	NTSC & DBC
77		00	0		00000000	no Motion Blur & no Active Gamma
78		00	0		00000000	no Wireless Enhancement & no In-Cell Scanner
79		01	1		00000001	Single LVDS
7A		01	1		00000001	Built-In Self Test
7B		0A	10			
7C		20	32			
7D		20	32			
7E	Extension flag	00	0			
7F	Checksum	D1	209	209	-	