SPECIFICATION
FOR
APPROVAL

MODEL: Y1500HB-SKT

BASE MODEL :

Customer's Confirmation

Approved by:

Reviewed by:

Prepared by:

Supplier's Confirmation

Approved by:

Reviewed by:

Prepared by:

Please return 1 copy for our confirmation with your signature and comments.   **1/26**

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Record of Revision

Version & Date	Page	Old Description	New Description	Remark
0.1 2011/09/20	All	First Edition for Customer		

Product Specification

1. General Description 1.1
Overirew

Y1500HB-SKT is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel.

The screen format is intended to support the 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.

1.2 Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

Item	Specifications	Unit
Active Area	304.128 (H) x 228.096 (V)	[mm]
Pixels H x V	1024(x3) x 768	-
Pixel Pitch	0.297 (per one triad) x 0.297	[mm]
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	TN, Normally White	-
White Luminance	1500 (center, Typ)	[cd/m²]
Contrast Ratio	700 : 1 (Typ)	-
Optical Response Time	8 ms(Typ)	[msec]
Nominal Input Voltage VDD	+3.3 V	[Volt]
Electrical Interface	1 channel LVDS	-
Surface Treatment	Anti-glare, Hardness 3H	-
Support Color Physical Size (H x V x D)	262K(6-bit) / 16.2M(8-bit) 203.0 (H) x 142.5 (V) 8.0 (D) (Typ)	-[mm]
Temperature Range Operating Storage (Non-Operating)	-30 to +85 (panel surface temperature) - 30 to +85	[°C] [°C]
RoHS Compliance	RoHS Compliance	

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2. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

2.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit
Logic /LCD Drive Voltage	VDD	-0.3	+4.0	[Volt]
Operating Temperature	TOP	0	+85	[°C]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-30	+85	[°C]
Storage Humidity	HST	8	90	[%RH]

Note : Maximum Wet-Bulb should be 39°C and no condensation.
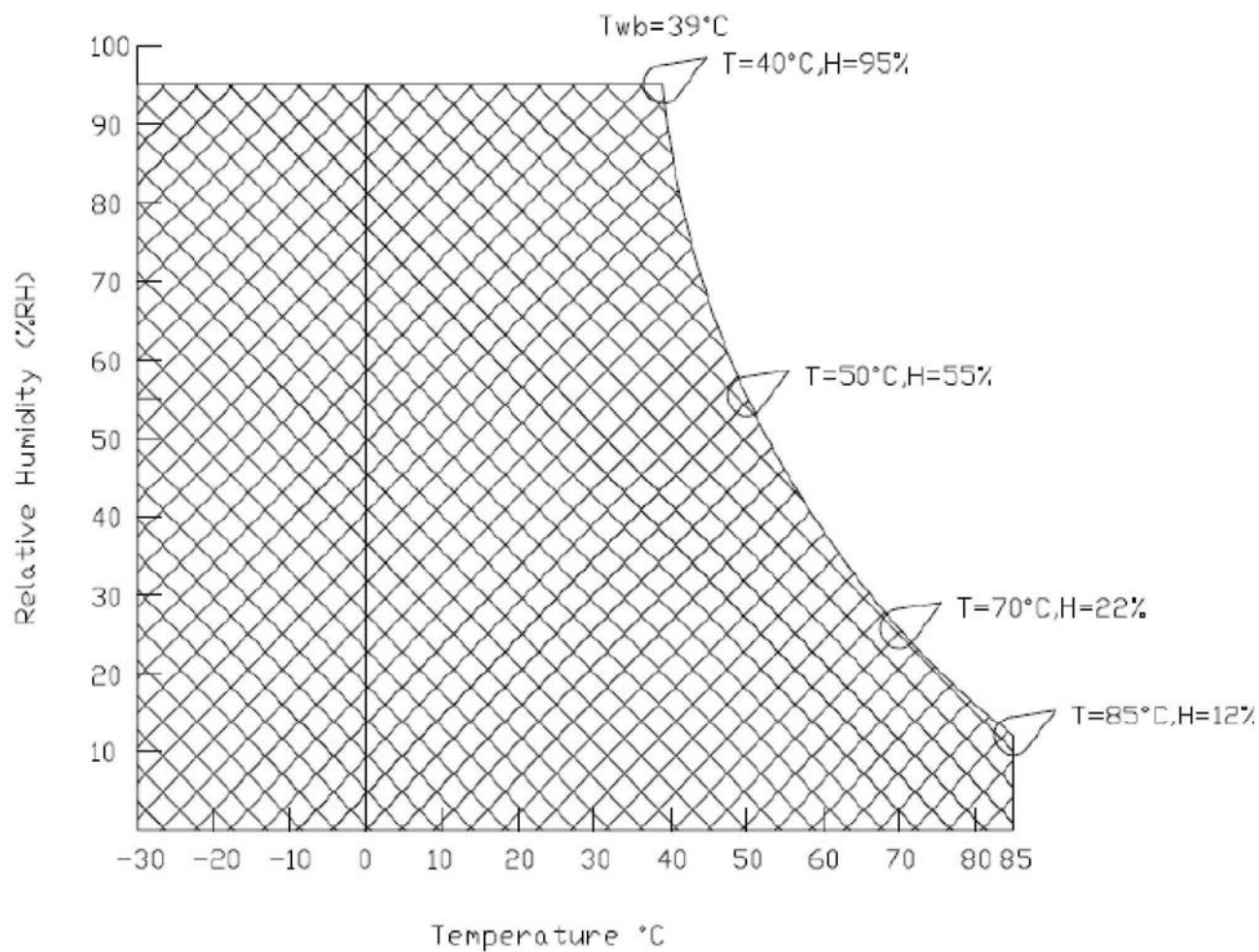
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3. Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

| Item	Conditions		Min.	Typ.	Max.	Unit	Note
Contrast Ratio			400	700			4
Response Time	Rising		-	5.7		[mesc]	6
	Falling		-	2.3			
	Rising + Falling		-	8			
White Luminance			-	1500	-	[cd/m²]	1
Luminance Uniformity	9 Point		75	80	-	[%]	1,2,3
Color / Chromaticity Coordinates (CIE)	Red x		0.612	0.642	0.672	-	
	Red y		0.307	0.337	0.367		
	Green x		0.276	0.306	0.336		
	Green y		0.551	0.581	0.611		
	Blue x		0.114	0.144	0.174		
	Blue y		0.071	0.101	0.131		
	White x		0.283	0.313	0.343		
	White y		0.299	0.329	0.359		
				65	-		
Viewing Angle	Horizontal (Right)		70	80	-	[degree]	7
	CR = 10 (Left)		70	80			
	Vertical (Up) CR		60	70	-		
	= 10 (Down)		50	60			

Note 1: Measurement method

Equipment : Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)
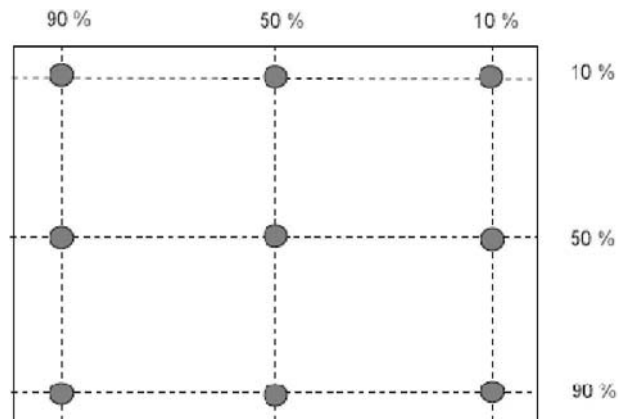
Aperture   1° with 50cm viewing distance

Test Point   Center

Envitonment   *< 1 lux*

Module Driving Equipment
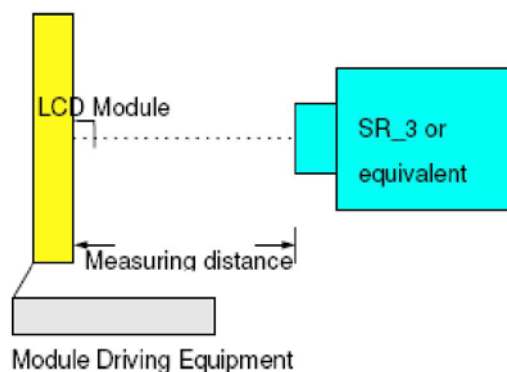
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Note 2: Definition of 9 points position (Display active area : 304.128(H) x 228.096(V))

Note 3: The luminance uniformity of 9 points is defined by diving the minimum luminance values by the maximum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$
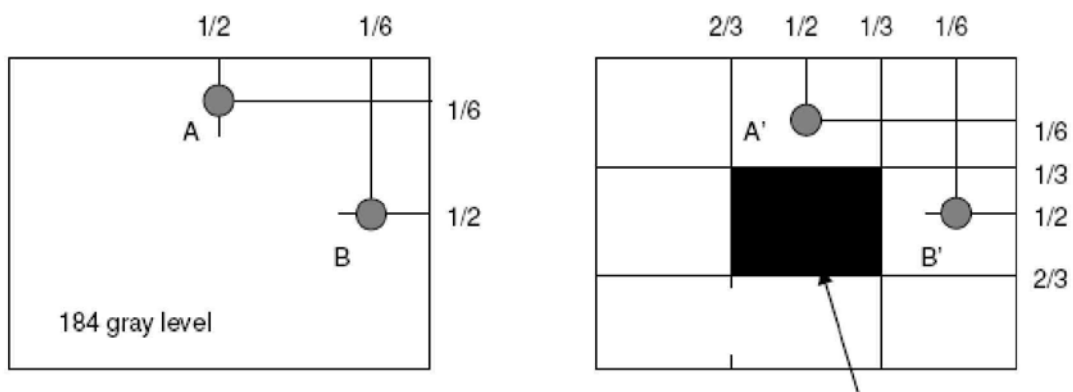
Note 5: Definition of cross talk (CT)

CT= **|** YB - YA **|** / YA x 100 (%)

Where

YA = Luminance of measured location without gray level 0 pattern (cd/m²)

YB = Luminance of measured location with gray level 0 pattern (cd/m²)

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Note 6: Definition of viewing angle

The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.
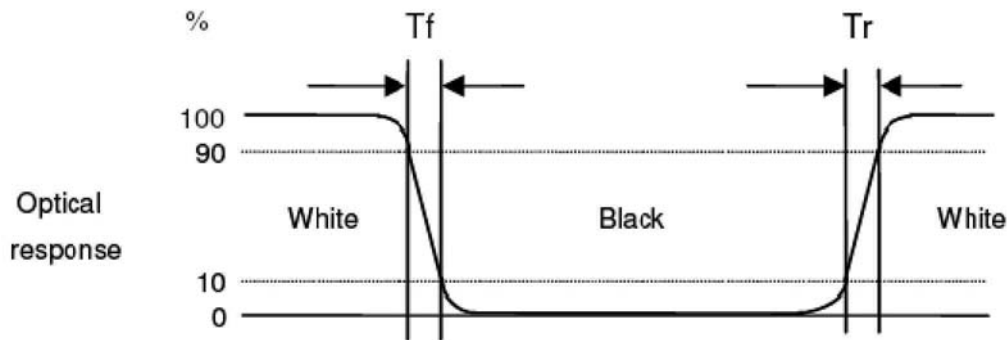
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio > 10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (9) horizontal left and right, and 90° (O) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display sutface with the screen totated to its center to develop the desired measurement viewing angle.
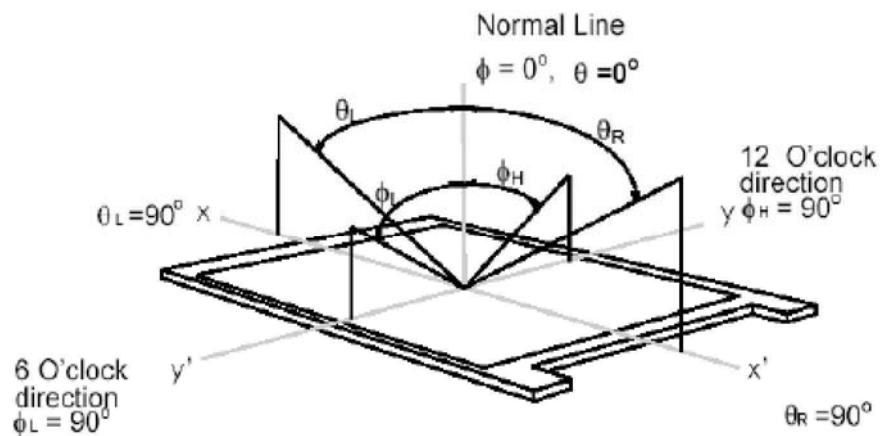
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4. Functional Block Diagram

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

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5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Logic / LCD Drive Voltage	VDD	3.0	3.3	3.6	[Volt]	±10%
VDD Current	IDD	-	550	660	[mA]	64 Gray Bar Patten (VDD=3.3V, at 60Hz)
Inrush Current	IRush	-	-	3	[A]	Note 1
VDD Power	PDD	-	1.9	2.2	[Watt]	64 Gray Bar Patten (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:

VDD rising time

64 Gray pattern

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5.1.2 Signal Electrical Characteristics

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

Item	Symbol	Min	Typ	Max	Unit	Remark
Differential Input High Threshold	VTH	-	-	100	[mV]	VICM=1.2V
Differential Input Low Threshold	VTL	-100	-	-	[mV]	VICM=1.2V
Input Differential Voltage	1 VID |	100	400	600	[mV]	
Differential Input Common Mode Voltage	VICM	1.1	-	1.45	[V]	VTH/VTL=±100mV

Note : LVDS Signal Waveform.

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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.

Fig. 1 Normal scan (Pin4, REV = Low or NC)   Fig. 2 Reverse scan (Pin4, REV = High)

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6.3 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

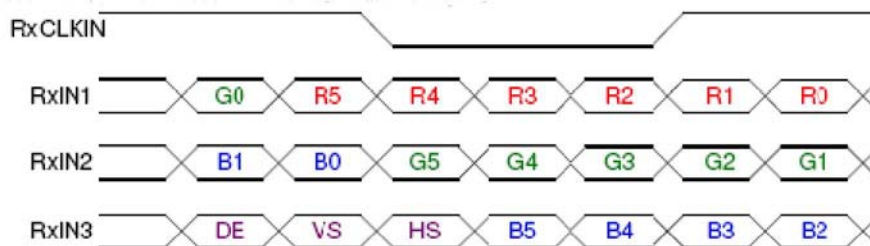| PIN#	SYMBOL	DESCRIPTION
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	VSS	Ground
4	REV	Reverse Scan selection *.Note1
5	RxIN1-	- LVDS differential data input (R0-R5, G0)
6	RxIN1+	+ LVDS differential data input (R0-R5, G0)
7	VSS	Ground
8	RxIN2-	- LVDS differential data input (G0-G5, B0-B1)
9	RxIN2+	+ LVDS differential data input (G0-G5, B0-B1)
10	VSS	Ground
11	RxIN3-	- LVDS differential data input (B2-B5, HS, VS, DE)
12	RxIN3+	+ LVDS differential data input (B2-B5, HS, VS, DE)
13	VSS	Ground
14	RxCLKIN-	- LVDS differential clock input
15	RxCLKIN+	+ LVDS differential clock input
16	VSS	Ground
17	RxIN4-	- LVDS differential data input (R6-R7, G6-G7, B6-B7)
18	RxIN4+	+ LVDS differential data input (R6-R7, G6-G7, B6-B7)
19	VSS	Ground
20	SEL68	Selection for 6 bits/8bits LVDS data input *Note1

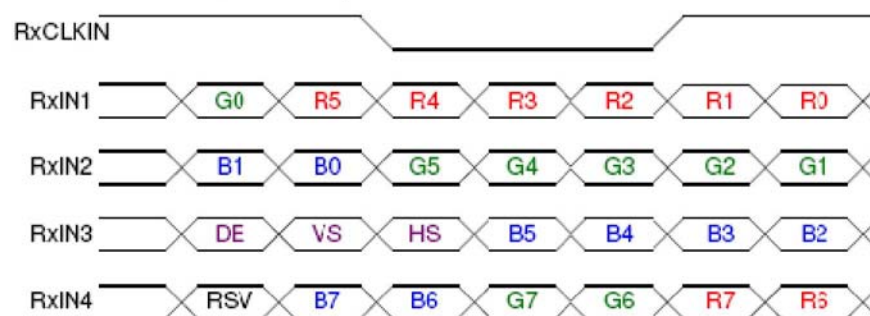Note1 : Input signals shall be in low status when VDD is off.

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6.4 The Input Data Format
6.4.1 SEL68

SEL68 = "High" or "NC" for 6 bits LVDS Input

	RxCLKIN						
RxIN1	G0	R5	R4	R3	R2	R1	R0
RxIN2	B1	B0	G5	G4	G3	G2	G1
RxIN3	DE	VS	HS	B5	B4	B3	B2

SEL68 = "Low" for 8 bits LVDS Input

	RxCLKIN						
RxIN1	G0	R5	R4	R3	R2	R1	R0
RxIN2	B1	B0	G5	G4	G3	G2	G1
RxIN3	DE	VS	HS	B5	B4	B3	B2
RxIN4	RSV	B7	B6	G7	G6	R7	R6

Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	Remark
R7	Red Data 7	Red-pixel Data
R6	Red Data 6	
R5	Red Data 5	For 8Bits LVDS input
R4	Red Data 4	MSB: R7 ; LSB: R0
R3	Red Data 3	
R2	Red Data 2	For 6Bits LVDS input
R1	Red Data 1	MSB: R5 ; LSB: R0
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data
G6	Green Data 6	
G5	Green Data 5	For 8Bits LVDS input
G4	Green Data 4	MSB: G7 ; LSB: G0
G3	Green Data 3	
G2	Green Data 2	For 6Bits LVDS input
G1	Green Data 1	MSB: G5 ; LSB: G0
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data
B6	Blue Data 6	
B5	Blue Data 5	For 8Bits LVDS input
B4	Blue Data 4	MSB: B7 ; LSB: B0
B3	Blue Data 3	
B2	Blue Data 2	For 6Bits LVDS input
B1	Blue Data 1	MSB: B5 ; LSB: B0
B0	Blue Data 0	
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Synchronous Signal	
HS	Horizontal Synchronous Signal	

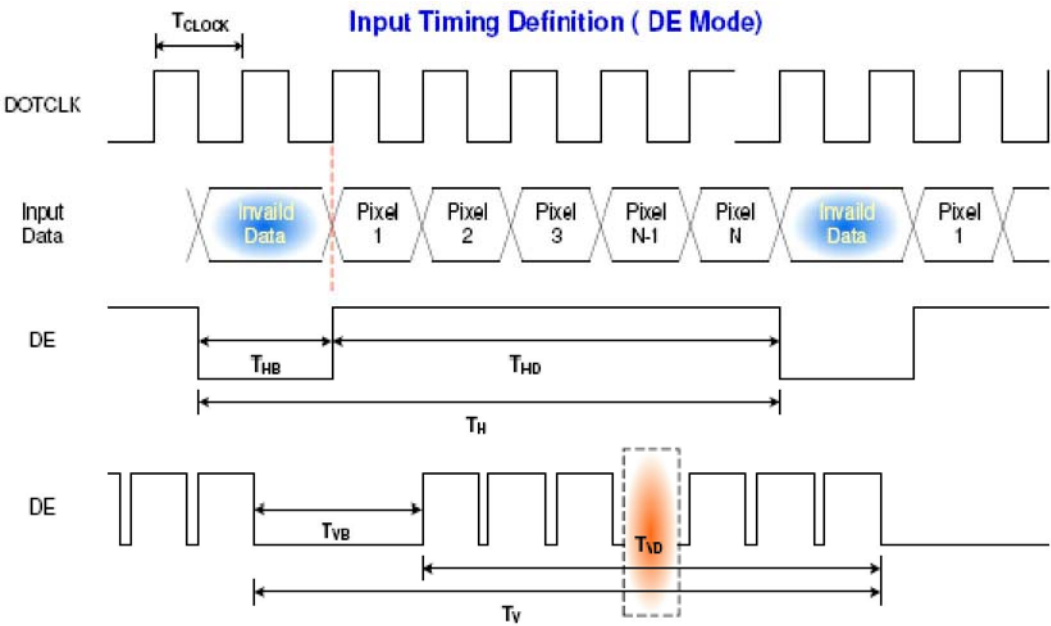Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

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6.5 Interface Timing

6.5.1 Timing Characteristics

| Parameter		Symbol	Min	Typ	Max	Unit	Condition
Clock frequency		1/ T Clock	50	65	81	MHz	
Vertical Section	Period	Tv	776	806	1024	TLine	
	Active	TVD	768	768	768		
	Blanking	TVB	8	38	256		
Horizontal Section	Period	TH	1054	1344	2048	TClock	
	Active	THD	1024	1024	1024		
	Blanking	THB	30	320	1024		

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.
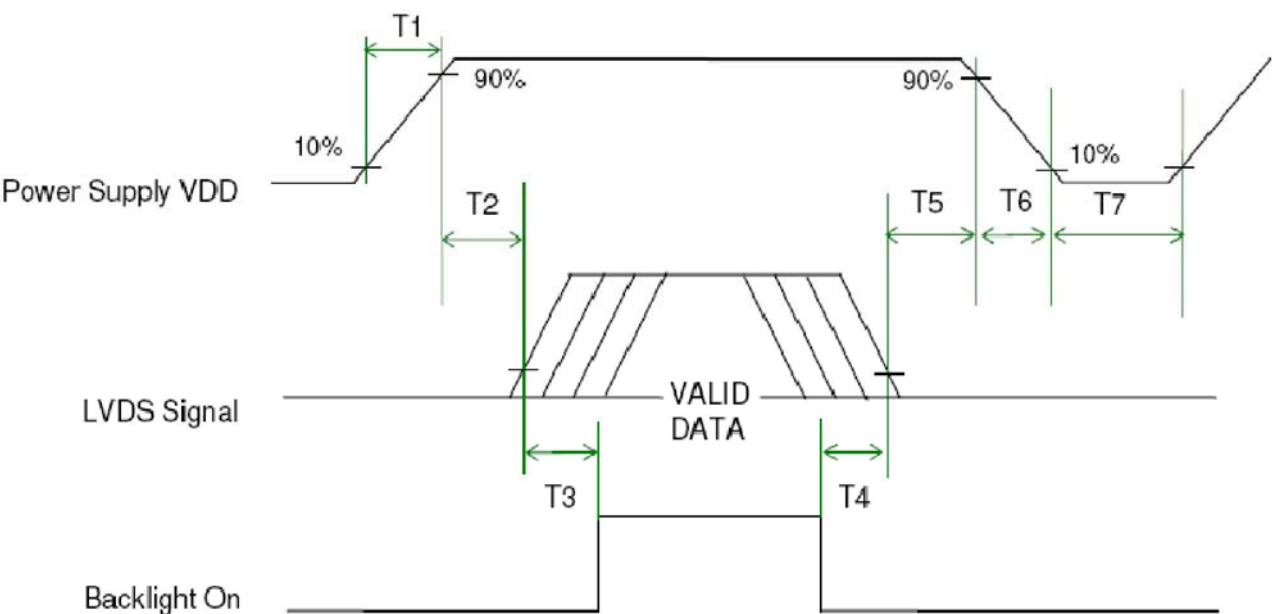
Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	40	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	16	50	ms
T6	0	-	10	ms
11	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.

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7. 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

7.1.1 Connector

Connector Name / Designation	Signal Connector
Manufacturer	E&T or compatible
Connertor Model Number	3804-F20N-06R / MSB240420E
Adaptable Plug	HRS DF14-20S-1.25C

7.1.2 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	VDD	2	VDD
3	VSS	4	REV
5	RxIN1-	6	RxIN1+
7	VSS	8	RxIN2-
9	RxIN2+	10	VSS
11	RxIN3-	12	RxIN3+
13	VSS	14	RxCKIN-
15	RxCKIN+	16	GND
17	RxIN4-	18	RxIN4+
19	VSS	20	SEL68

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7.1.3 Connector Illustration
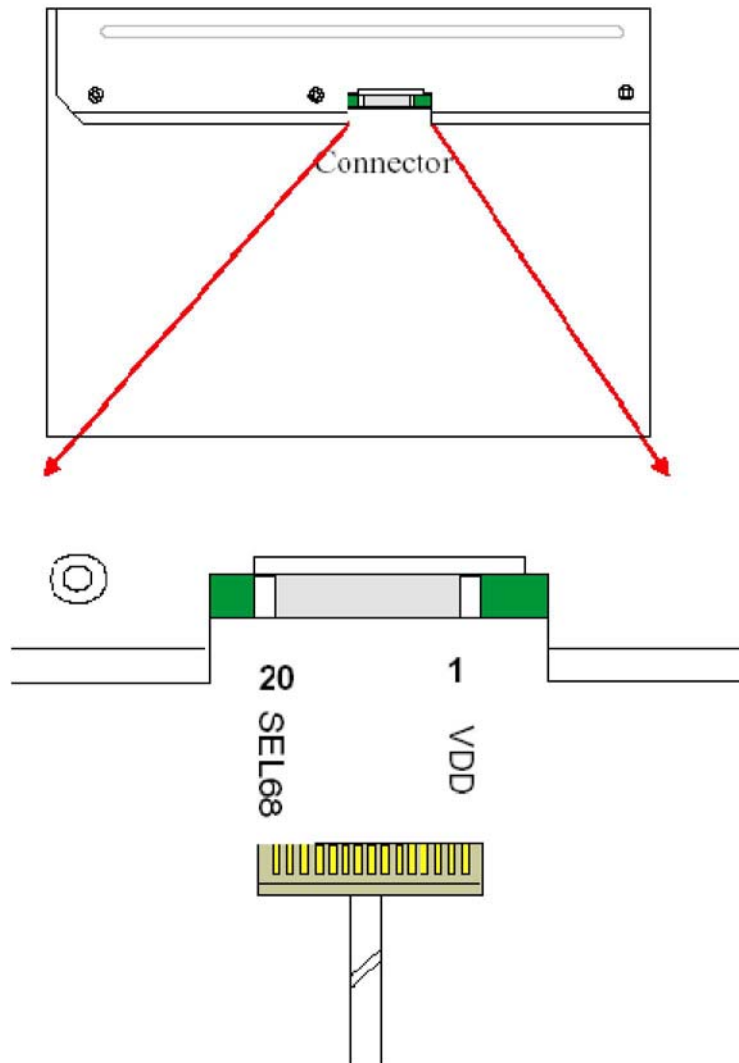
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7.2 Backlight Unit

7.2.1 Connector

Connector Name / Designation	LED Connector
Manufacturer	JST
Type Part Number	S3B-XH-A-1 or compatible.
Mating Housing Part Number	XHP-3

7.2.2 Pin Assignment

Connectoe No.	PIN#	Symbol	Signal Name
CN1	1	LED+	LED High Voltage
	2	NC	NC
	3	LED-	LED Low Voltage
CN2	1	LED+	LED High Voltage
	2	NC	NC
	3	LED-	LED Low Voltage

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8. Reliability Test

Items	Required Condition	Note
Temperature Humidity Bias	50°C, 90%RH, 300hours	
High Temperature Operation	85°C, 300hours	
Low Temperature Operation	-30°C, 300hours	
Hot Storage	85°C, 300hours	
Cold Storagr	-30°C, 300hours	
Thermal Shock Test	-20°C/30min, 60°C/30min, 100 cycles	
Vibration Test (Non-operation)	Acceleration: 1.5 G Frequency: 10 - 200 -10 Hz, P-P Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
On/Off Test	On/10sec, Off/1 Osec, 30,000 cycles	
ESD (Electrostatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Q) 1sec, 8 points, 25 times/ point. Air Discharge: ± 15KV, 150pF(330Q) 1sec, 8 points, 25 times/ point.	1

Note 1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost.
Self-recoverable. No hardware failures.

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9. Label and Packaging

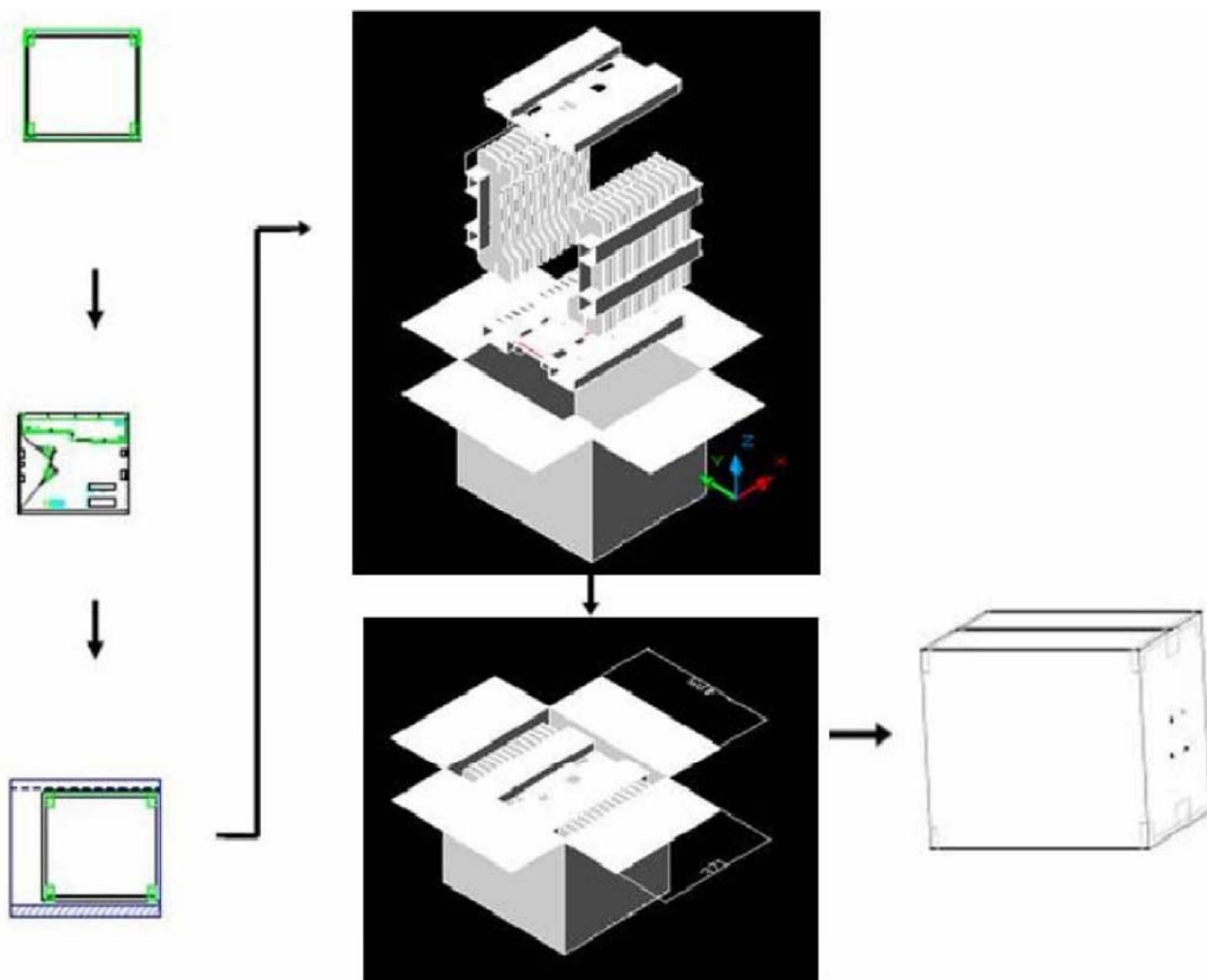### 9.1 Shipping Label   (on the rear side of TFT-LCD display)

9.2 Carton Package

Max. Capacity: 15pcs LCD Modules / per carton (12pcs * 1 layers)

Max. Weight: 20 kg / per carton

Outside dimension of carton : 375(L) mm x 430(W) mm x 353(H) mm

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11. LED Driver Charateristic

11.1 Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Input Supply Voltage	V_{IN}	-	+12.0	+ 13.0	[Volt]	
Input Current	I_{IN}	-	0.5	1.2	[A]	
Output Voltage	V_{out}	-	8.5	9.0	[Volt]	
Output Current	I_{out}	-	0.6	1.4	[mA]	
Frequency		-	-	1M	[Hz]	

Note1: Backlight LED power consumption is calculated by PL=VL X IL .

Note2: The life time of a LED is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of LED.) as the time in which it continues to operate under the condition at Ta = 25 ±2°C.

Note3: For AUO G150XG01 V1.

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11.2 Connector & Pin Assignment

11.2.1 LED Connector

Connector Name / Designation	Input Connector
Manufacturer	JST
Type Part Number	S5B-PH-KL or compatible.
Mating Housing Part Number	PHR-5

Pin Assignment

Pin#	Signal Name
1	Vin (DC +12.OV)
2	GND
3	Brightness
4	GND
5	ON/OFF Control (ON:+5V;OFF:0V)

11.2.2 Lamp Connector

Connector Name	LED Connector
Manufacturer	JST
Type Part Number	S3B-XH-A-1 or compatible.
Mating Housing Part Number	XHP-3

Pin Assignment

Connectoe No.	PIN#	Symbol	Signal Name
CN2	1	LED+	LED High Voltage
	2	NC	NC
	3	LED-	LED Low Voltage
CN6	1	LED+	LED High Voltage
	2	NC	NC
	3	LED-	LED Low Voltage

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11.3 Mechanical Structure (PCB)

Dimension: 130(L) mm X 20(W) mm