SPECIFICATION

For

APPROVAL

(♦) **Preliminary Specification**

( ) **Final Specification**

Title	15.1" XGA TFT LCD

BUYER NAME	
MODEL NAME	

SUPPLIER	LG Philips LCD
MODEL NAME	LM151X2

SIGNATURE	DATE
/	
/	
/	

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

APPROVED BY	DATE
/G.Manager	
REVIEWED BY	
/S.Engineer	
PREPARED BY	
/S.Engineer	

Product Engineering Dept.
LG Philips LCD

CONTENTS

Record of Revisions

Revision Version	Date	DESCRIPTION
0.0	April 13, 1998	Preliminary
0.1	May 6, 1998	Preliminary, Update (Changed Interface Connections - Increased V_{DD} Lines, Fixed Interface Connector Model Name, Updated Outline Drawings)
0.2	June 16, 1998	Preliminary, Update (Updated Electrical Specifications, Optical Specifications, and Signal Timing Specifications)
0.3	June 22, 1998	Preliminary, Update (Updated Power Sequences, Updated Electrical Specifications - Back Light)
0.4	June 29, 1998	Preliminary, Update (Changed Environmental Specifications, Changed Outsize Dimensions - Thickness : Refer to Outline Drawings)
0.5	July 9, 1998	Preliminary, Update (Updated Optical Specifications)
0.6	July 21, 1998	Preliminary, Update (Updated Optical Specifications - Gamma Value)
0.7	September17, 1998	Preliminary, Update (1. Updated Optical Specifications - Contrast Ratio, Viewing angle, Cross Talk 2. Updated Signal Timing Specifications - Main Clock, Hsync, Vsync 3. Updated Electrical Characteristics - Back Light Life Time)
1.0	October 14, 1998	Final, Update (1. Updated Outsize dimensions 2. Updated Optical Specifications - Contrast Ratio 3. Updated Electrical Specifications - Lamp Kick-Off Voltage)

General Descriptions

The LG Philips LCD model LM151X2 LCD is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Tube(CCFT) back light system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has a 15.1 inch diagonally measured active display area with XGA resolution(768 vertical by 1024 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors.

LM151X2 has been designed to apply the CMOS logic level interface.

The LM151X2 LCD is intended to support applications where high brightness, wide viewing angle, high color saturation, and high color depth are very important. In combination with the vertical arrangement of the sub-pixels, the LM151X2 characteristics provide an excellent flat panel display for office automation products such as monitors.
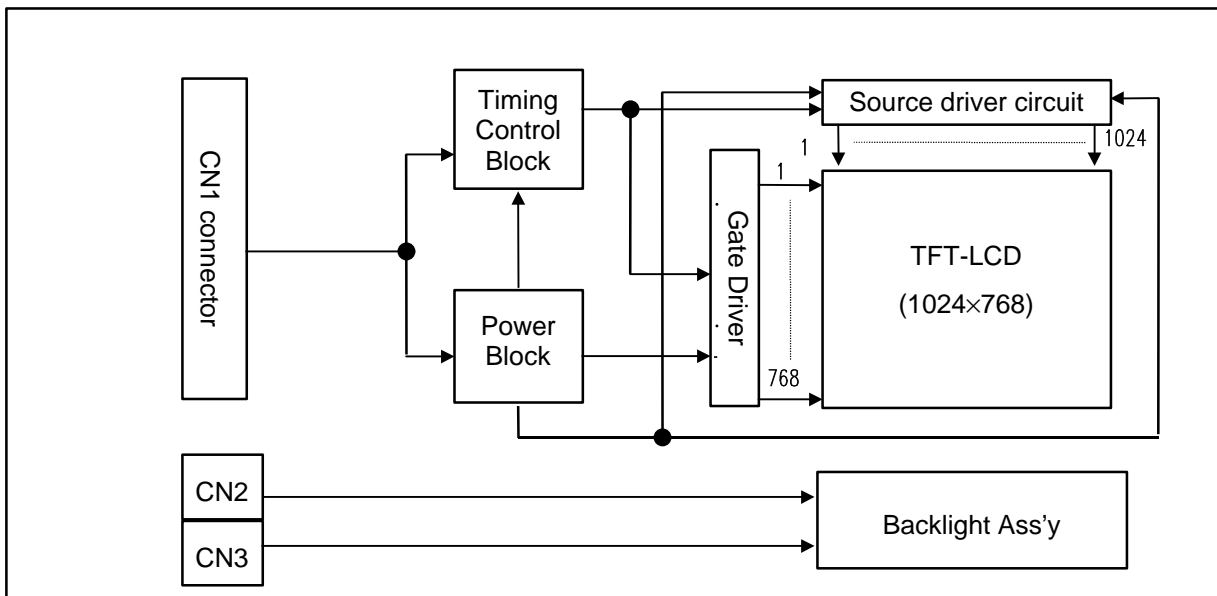
General Display Characteristics

The following are general features of the model LM151X2 LCD;

Active display area	15.1 inches(38cm) diagonal
Outsize dimensions	352.6w * 265.0h * 18.5t(typ)mm (Without Inverter and User Connector)
Pixel pitch	0.30 mm x 0.30 mm
Pixel format	1024 horiz. By 768 vert. Pixels RGB vertical stripe arrangement
Color depth	6-bit, 262,144 colors
Display operating mode	transmissive mode, normally white
Surface treatments	hard coating(3H), anti-glare treatment of the front polarizer

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Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1 ABSOLUTE MAXIMUM RATINGS

Parameter	symbol	Values Min.	Values Max.	Units	Notes
Power Input Voltage	V_{DD}	0	+3.6	V_{DC}	at 25º
Lamp Current	I_{BL}	-	9.0	mArms	2
Operating Temperature	T_{OP}	0	+50	º	1
Storage Temperature	T_{ST}	-20	+60	º	

Note: 1. The Relative Humidity must not exceed 95% non-condensing at temperatures of 40º or less.
        At temperatures greater than 40º, the wet bulb temperature must not exceed 39º.
     2. Current shall be measured at ground line.

3. Electrical Specifications

The LM151X2 requires two power inputs. One input is employed to power the LCD electronics and to drive the voltages to drive the TFT array and liquid crystal. And the second input for the backlight CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2 ELECTRICAL CHARACTERISTICS:

Parameter	Symbol	Values Min.	Values Typ.	Values Max.	Units	Notes
MODULE :						
Power Supply Input Voltage	V_{DD}	3.15	3.3	3.45	V_{DC}	1
Power Supply Input Current	I_{DD}	-	500	800	mA	1, 2
Power Supply Kick Off Current	I_{DDI}	-	-	1,500	mA	7
Data Input High Voltage	V_{IH}	0.7 V_{DD}	-	V_{DD} + 0.5	V	1
Data Input Low Voltage	V_{IL}	-0.5	-	0.3 V_{DD}	V	1
BACK LIGHT :						
Back light Input voltage	V_{BL}	685	585	570	V_{RMS}	
Backlight Input Current	I_{BL}	3.0	8.0	9.0	mA	3
Lamp Kick-Off Voltage		-	-	880	V_{RMS}	At 25 2
		-	-	1145	V_{RMS}	At 0 2
						4
		1290	-	-	V_{RMS}	At 25 2
		1660	-	-	V_{RMS}	At 0 2
						5
Operating Frequency	F_{BL}	30	50	80	KHz	
Life time		25,000	40,000	-	hours	6

Notes: 1. All values shall be measured at the user connection.
       2. The input current shall be measured at V_{DD} of 3.3V at 25 , refresh rate of 60Hz, and clock frequency of 65MHz under 9 gray pattern.
       3. The backlight input current shall be measured at the ground cable and does not include loss of external inverter.
       4. Voltages at both ends of the lamp.
       5. Voltages at secondary side of transformer using the balancing capacitor, 22pF in inverter. These voltages can be changed with customer's own design of inverter.
       6. The life time is defined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current.
       7. Power supply kick off current means power supply input current at the moment of LCM power on. This current is higher than the current at the normal operating condition and it lasts for 50~100ms.

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4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 . The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° and aperture 1 degree. The test equipment is PhotoResearch Prichard SpectroRadiometer Model 1980B-SC or equivalent. The input signal voltage and timing specification are V_{DD} of 3.3V and VESA XGA @60Hz respectively. The input current of backlight is 8mA(F_{BL} = 50KHz) at the ground terminals.

Table 2 OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	200	250	-		1
Average Brightness, white	SB_{WH}	170	200	-	cd/m^2	2
Brightness Variation	SB_V	-	-	30	%	3
Response Time	Tr		50	80	msec	4
Rise Time	Tr_R	-	20	30		
Decay Time	Tr_D	-	30	50		
CIE Color Coordinates						
Red	x_R	0.600	0.630	0.660		
	y_R	0.310	0.340	0.370		
Green	x_G	0.270	0.300	0.330		
	y_G	0.570	0.600	0.630		
Blue	x_B	0.110	0.140	0.170		
	y_B	0.070	0.100	0.130		
White	x_W	0.290	0.320	0.350		
	y_W	0.310	0.340	0.370		
Viewing Angle by CR $\geq$ 10					degree,	5
x axis, right (=0º)		55	60	-		
x axis, left(=180º)		55	60	-		
y axis, up(=90º)		40	45	-		
y axis, down (=270º)		40	45	-		
Cross talk						
Horizontal		-	-	1.5	%	6
Vertical		-	-	1.5		
Gamma value		-	-	-		7

Notes 1. Contrast Ratio (CR) is defined mathematically as:

$$\frac{(\text{Surface Brightness with all white pixels})}{(\text{Surface Brightness with all black pixels})}$$

Contrast ratio shall be measured at the center of the display (Location 1).

2. Average Brightness is the average of brightness value at location 1 to 5 with all pixels displaying white.

$$B(AVE) = \frac{B1 + B2 + B3 + B4 + B5}{5}$$

3. The variation in surface brightness, SB_V is defined as :

$$\frac{\text{Maximum} (B_1, B_2, ...B_{13}) - \text{Minimum} (B_1, B_2, ...B_{13})}{\text{Average} (B_1, B_2, ... B_5)} \times 100(\%)$$

Where B1 to B13 are the brightness with all pixels displaying white at 13 locations.
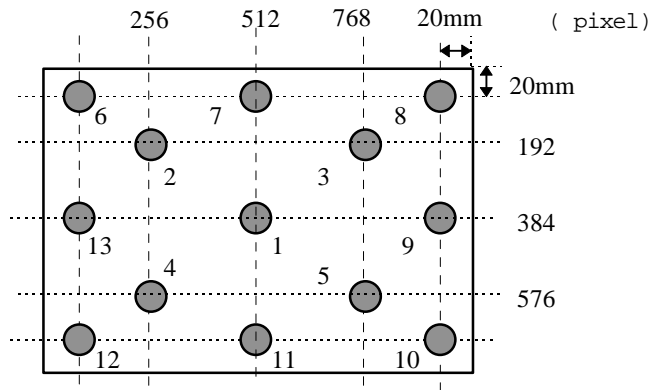
4. The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".
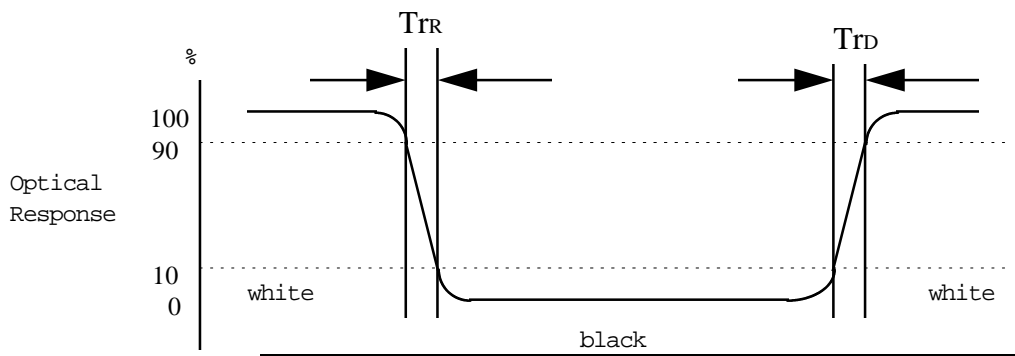
5. Viewing angle is the angle at which the contrast ratio is greater than 10.

TFT LCD
MODULE
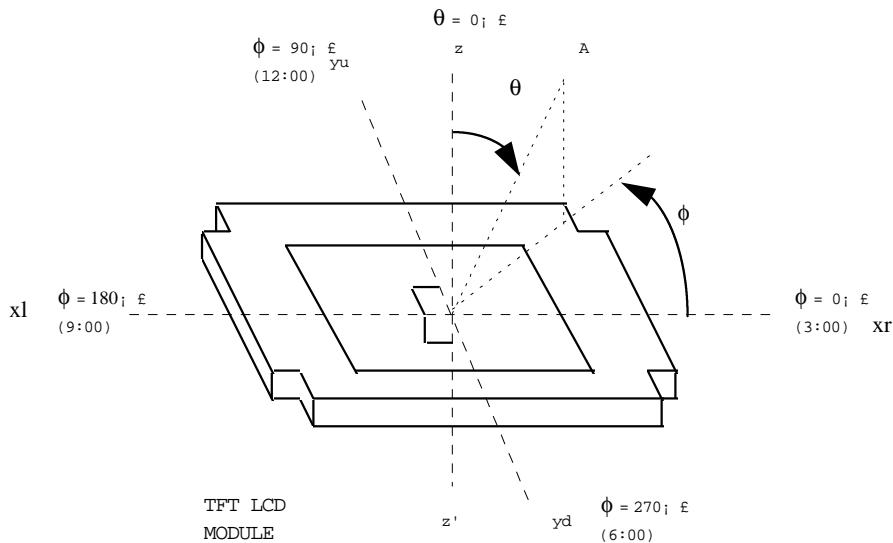
6. Cross talk shall be measured at two locations.

$$\text{Crosstalk Ratio} = 100 \times \frac{\left| \text{Brightness at pattern A} - \text{Brightness at pattern B} \right|}{\text{Brightness at pattern A}}$$

Pattern A
(Mid-gray : Gs(S)=31)

Pattern B
(Background:Gs(S)=31, Rectangular:Gs(S)=0 & 63)

[256, 192]

[512, 96] ● 1

[896, 384] ● 2

[768, 576]
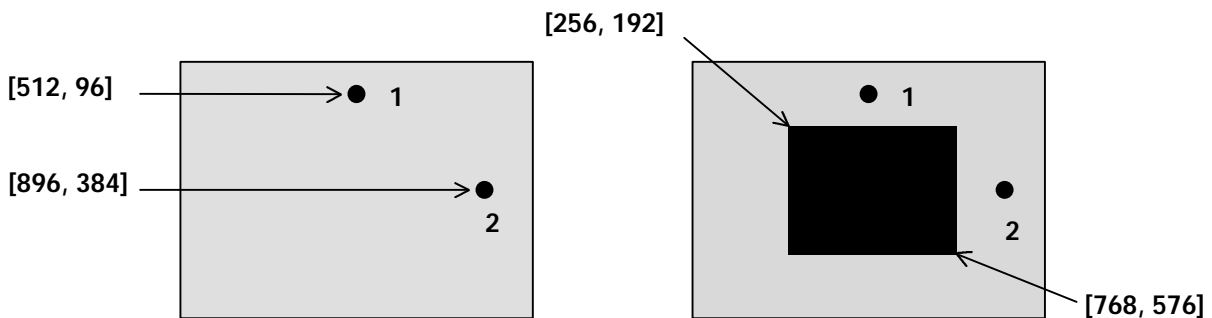
Vertical Crosstalk shall be measured at the location 1 and horizontal crosstalk shall be measured at the location 2.

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7. Gamma values shall be measured at the center location.

n	Gs(S)	Relative Brightness(%)		Remark
		min	max	
0	0	-	0.67	
1	7	-	1.8	
2	15	2.3	4.3	
3	23	5.4	9.4	
4	31	10.4	20.4	
5	39	22.8	34.8	
6	47	41.1	55.1	
7	55	66.7	82.7	
8	63	100	100	

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5. Interface Connections

This LCD employs three interface connections, a 41 pin connector is used for the module electronics and two connectors, a three pin connector, are used for the integral backlight system.

The electronics interface connector is a model DF9B-41P-1V manufactured by Hirose. The pin configuration for the connector is shown in the table below.
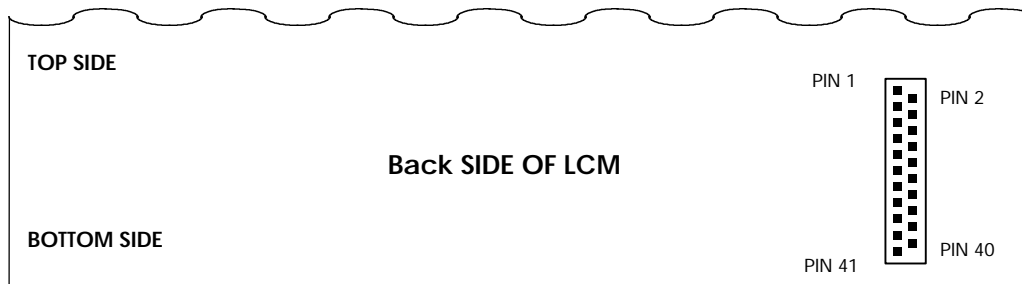
Table 3 MODULE CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	System Ground. Note 1	2	DCLK	Data Input Clock
3	GND	System Ground	4	H_{sync}	H_{sync}. Horizontal Sync Signal
5	V_{sync}	V_{sync}. Vertical Sync Signal	6	GND	System Ground
7	GND	System Ground	8	GND	System Ground
9	R0	Red data 0 (LSB)	10	R1	Red data 1
11	R2	Red data 2	12	GND	System Ground
13	R3	Red data 3	14	R4	Red data 4
15	R5	Red data 5 (MSB)	16	GND	System Ground
17	GND	System Ground	18	GND	System Ground
19	G0	Green data 0 (LSB)	20	G1	Green data 1
21	G2	Green data 2	22	GND	System Ground
23	G3	Green data 3	24	G4	Green data 4
25	G5	Green data 5 (MSB)	26	GND	System Ground
27	GND	System Ground	28	GND	System Ground
29	B0	Blue data 0 (LSB)	30	B1	Blue data 1
31	B2	Blue data 2	32	GND	System Ground
33	B3	Blue data 3	34	B4	Blue data 4
35	B5	Blue data 5 (MSB)	36	GND	System Ground
37	DE	Data Enable Signal	38	V_{DD}	Power Supply for LCD Module
39	V_{DD}	Power Supply for LCD Module	40	V_{DD}	Power Supply for LCD Module
41	V_{DD}	Power Supply for LCD Module			

Notes: 1. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
2. All V_{DD}(power input) pins should be connected together.

TOP SIDE

Back SIDE OF LCM

BOTTOM SIDE

PIN 1   PIN 2

PIN 41   PIN 40

The backlight interface connector is a model BHR-03VS-1, manufactured by JST. The mating connector part number is SM02(8.0)B-BHS-1-TB or equivalent. The pin configuration for the connector is shown in the table below.

Table 4 BACKLIGHT CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	HV	Lamp power input	1
2	NC	No connect	
3	LV	Ground	2

Notes: 1. The input power terminal is colored pink. Ground pin color is light pink.
2. The backlight ground should be common with Vss.

6. Signal Timing Specifications

Parameter		Symbol	Value			Units	Notes
			Min.	Typ.	Max.		
Main Clock	Frequency	$f_{CLK}(=1/t_{CLK})$	63.0	65.0	70.0	MHz	
	High duration	t_{wcH}	$0.45\ t_{CLK}$	$0.5\ t_{CLK}$	$0.55\ t_{CLK}$	ns	
	Low duration	t_{wcL}	$0.45\ t_{CLK}$	$0.5\ t_{CLK}$	$0.55\ t_{CLK}$	ns	
	Rise Time	t_{rCLK}	-	-	8	ns	
	Fall Time	t_{fCLK}	-	-	8	ns	
Data (RGB data including sync)	Set-up duration	t_{SD}	5.0	-	-	ns	for f_{CLK}
	Hold duration	t_{HD}	5.0	-	-	ns	for f_{CLK} note 1
Hsync	Period	t_{HP}	16.5	20.7	-		
			1056	1344	1520	clock	
	Pulse Width	t_{WH}	8	136	-	clock	
Vsync	Period	t_{VP}	-	16.7	-	msec	
			777	806	858	lines	
	Pulse Width	t_{WV}	1	6	-	lines	
Data Enable	Set-up duration	t_{SI}	5.0	-	-	ns	for f_{CLK}
	Hold duration	t_{HI}	5.0	-	-	ns	for f_{CLK}
	Horizontal Back Porch	t_{HBP}	8	160	-	clock	
	Horizontal Active		1024	1024	-	clock	
	Horizontal Front porch	t_{HFP}	8	24	-	clock	
	Vertical Back Porch	t_{VBP}	5	29	-	lines	
	Vertical Active		768	768	-	lines	
	Vertical Front porch	t_{VFP}	1	3	-	lines	
Hsync- Clock phase difference		t_{HC}	t_{CLK}-10	-	t_{wcL}	ns	
Hsync-Vsync phase difference		t_{HV}	-	-	t_{HP}-t_{WH}	ns	

Notes: 1. All data input shall be latched at falling edge of data clock.
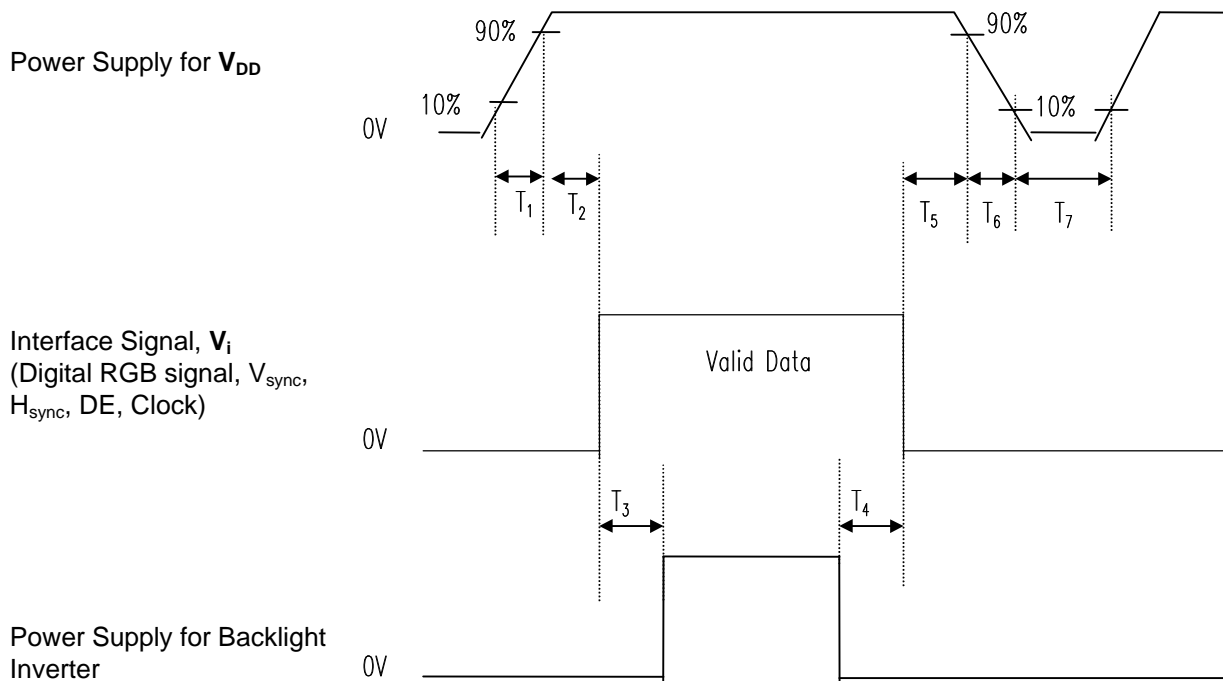
7. Signal Timimg Waveforms
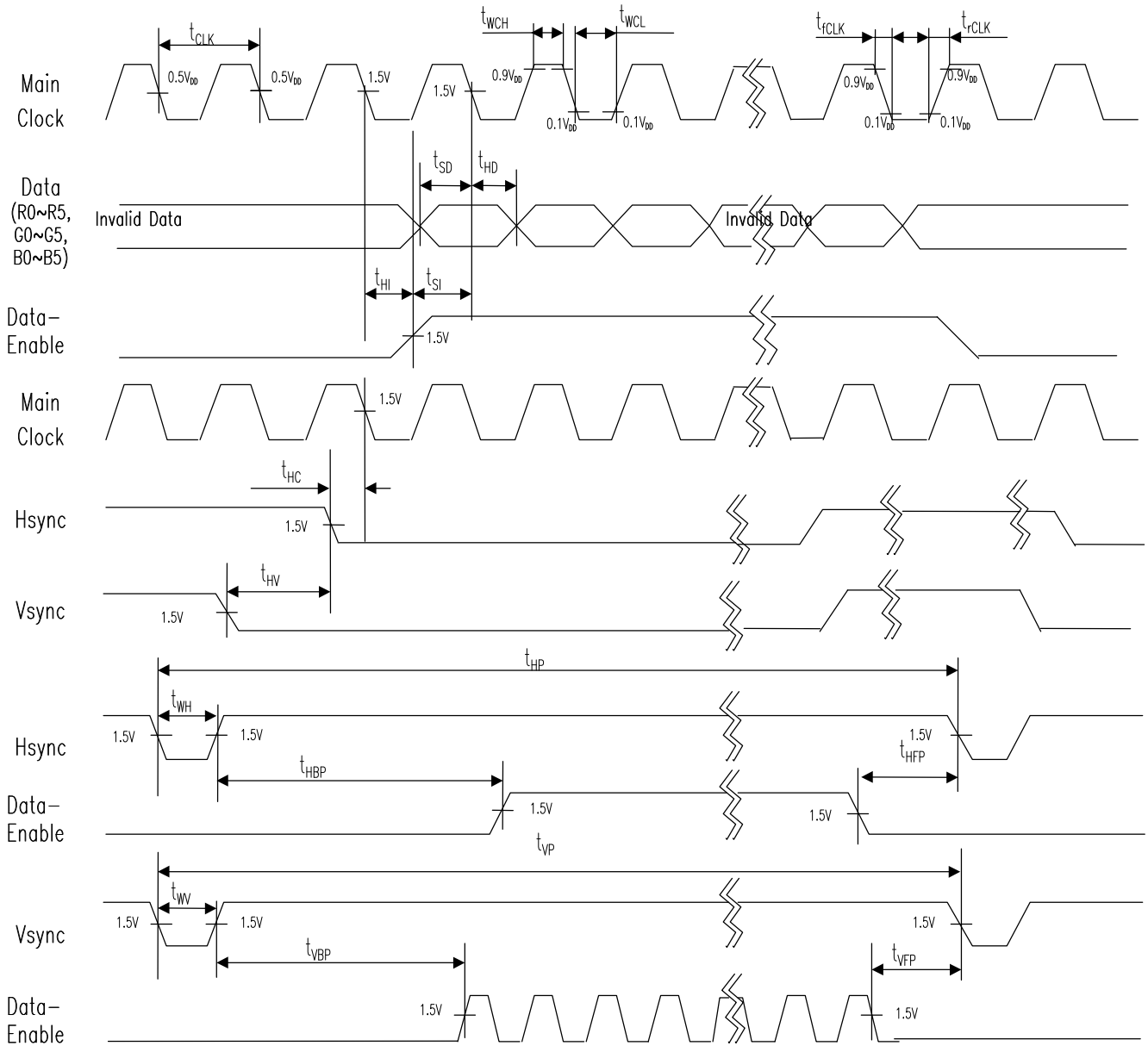
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8. Color Input Data References

The brightness of each primary color(red, green and blue) is based on the 6-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 5 COLOR DATA REFERENCE

Color		Input Color Data																	
		Red						Green						Blue					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	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
Red	Red(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63) Bright	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63) Bright	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63) Bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

9. Power Sequences

Power Supply for **V$_{DD}$**

Interface Signal, **V$_i$**
(Digital RGB signal, V$_{sync}$,
H$_{sync}$, DE, Clock)

Valid Data

Power Supply for Backlight
Inverter

- ■ **T$_1$, T$_6$** : 10 ns ~ 20 ms.
- ■ **T$_2$, T$_5$** : 50 ms (max.)
- ■ **T$_3$, T$_4$** : 300 ms (min.)
- ■ **T$_7$**   : 500ms (min.)

Notes: 1. Please avoid floating state of interface signal at invalid period.

2. When the interface signal is invalid, be sure to pull down the power supply for LCD V$_{DD}$ to 0V.

3. BackLight inverter power must be turn on after power supply for LCD and interface signal are valid.

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10. Mechanical Characteristics

The chart below provides general mechanical characteristics for the model LM151X2 LCD. Please refer to appendix 2 regarding the detailed mechanical drawing of the LCD module.

Parameter	Value	Symbol	Notes

Outside dimension
  Width
  Height
  Thickness
	352.6 (typ)
	265.0 (typ)
	18.5 (typ)
		mm	

Bezel area
  Width
  Height
	311.2
	234.4
		mm	

Active area
  Width
  Height
	307.2
	230.4
		mm	

Weight	1500(typ) 1600 (max)	gram	
Front surface of LCD	Hard coating 3H. Anti-glare treatment of the front polarizer	-	

11. Environmental Specifications

No	Test ITEM		Conditions
1	Temperature	Operating Non-operating	0 ~ 50 -20 ~ 60
2	Humidity	Operating Non-operating	20% ~ 80% RH (non-condensing) 5% ~ 95% RH 　(38.7 maximum wet bulb temperature)
3	Altitude		Operating : 12,000ft Storage　: 40,000ft
4	Vibration test (non-operating)		Waveform : Random Vibration level : 1.0G RMS Bandwidth : 10~200Hz Duration : X, Y, Z, 20 min 　　one time each direction
5	Shock test (non-operating)		Shock level : 100G Waveform: half sine wave, 2ms Direction : ±X, ±Y, ±Z 　　one time each direction

12. Incoming Inspection Standards for TFT-LCD Modules

1. Scope
   This incoming inspection standard shall be applied to TFT-LCD Modules(hereafter called "LCMs") supplied by LG Electronics Inc.(hereafter called the "Supplier") to Customer.

2. Incoming inspection
   The Customer shall have the right to conduct at its own cost and expense, an incoming inspection of the LCMs at the destination specified in the relevant bills of lading in accordance with the LCM's specifications separately agreed upon and the inspection standard set forth in this article.

   The Customer shall notify the Supplier in writing of the inspection results(acceptance or rejection) in accordance with the said inspection standard within 40 days after the date of the bills of lading.

   Should Customer fail to so notify the Supplier within the said 40 days period, the Customer's right to reject the LCMs shall then lapse, and the said LCMs shall be deemed to have been accepted by the Customer.

3. Method of Incoming inspection
   Unless otherwise agreed upon in writing, the sampling inspection method based on MIL-STD-105E shall be applied to the Customer's incoming inspection.

4. Classification of defects
   Defects are classified as either a major defect or a minor defect based on the degree of defect defined herein.

   a) Major defect
     A major defect is a defect that is likely to result in product failure, or reduction in the product's intended usage.

   b) Minor defect
     A minor defect is a defect that has little bearing on the effective use or operation of the product.

   Specific criteria of judgement of major and/or minor defects or other related issues shall be in accordance with the attached "Classification of Defects". (refer to appendix 4)

5. Acceptable Quality Level("AQL")
   The AQL for major and minor defects shall be respectively set forth below.

   a) Major defects : AQL = 0.65%
   b) Minor defects : AQL = 1.5%

6. Sampling Inspection Method
   a) Lot size   : Quantity per shipment lot
   b) Sampling type : Normal inspection, Single sampling
   c) Inspection level : II
   d) Sampling table : Table in MIL-STD-105E

7. Determination of acceptability and subsequent disposal
   If the number of defects found in the LCM sampling lot is equal to or less than the applicable acceptance level, the lot shall be accepted.

   If the number of defects is greater than the applicable acceptance level, the lot shall be rejected. The Customer shall inform the Supplier of the detailed results of such inspection within the time period stipulated in item #2 "Incoming inspection".

   a) Accepted lot
     An acceptance under the above incoming inspection shall constitute an acceptance by the Customer of such lot of the LCMs in terms of the landed quality thereof.

   b) Rejected lot
     If a shipment lot of products is rejected under the above incoming inspection due to any defects for which the Supplier is responsible and such a fact is clearly confirmed by the Supplier through a separate inspection or as otherwise decided, the Supplier shall choose one of the following three options which must be determined by mutual consent. The Supplier shall advise the Customer of its choice not later than 14 working days(Monday to Friday) of receipt of the "Customer's notification of rejected lot" :

     -1. The Customer shall return the rejected lot to the place to be designated by the Supplier and the Supplier shall screen all of the products in the lot and repair or replace the defective products.

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-2. The Supplier shall screen all of the products in the lot and repair or replace the defective products within a reasonable time period at the Customer's facility.

-3. The Customer shall screen the entire lot for the good LCMs at the expense of the Supplier to be separately agreed upon. The rejected products shall be returned to the place designated by the Supplier.

8. Inspection Specifications

a) General conditions

i) The environment conditions
- Ambient temperature : 20~25
- Humidity   : 65 5%RH
- Ambient illumination : Single 20W fluorescent lamp non-directive (About 300 to 700 Lux)

ii) Viewing distance
The distance between the LCM and the eyes of the inspector shall be at least 35cm.

III) Inspection zone for external inspection
External inspection should be performed from front side(Display area)

b) External Inspection Standards

Inspection items		Inspection Standards	Remark
Dent	Dot shape	D 0.5, N 8	On the polarizer
Scratches	Line shape	0.01 W 0.2, 5 L 20, N 4	On the polarizer
Stain inclusion	Dot shape	0.2 D 0.5, N 5	Operating
	Line shape	0.05 W 0.1, 0.3 L 3.0, N 5	Operating

W : Width(mm)

L : Length(mm)

D : Average diameter(mm)

Note) Those extraneous substances which can be wiped out easily are acceptable.

c) Display-on Inspection(Visual inspection)

i) Dot Defect
- Bright Dot Defects : When the LCM is turned on, dots(sub-pixels) which appear bright in the display area at Black(Dark) Mode are bright dot defects.
  . R, G or B 1 dot   : 6 Max.
  . R, G or B join 2 dots : 1 Max.
  . R, G or B join 3 dots : 0 max.
  . Minimum Distance between defects : D   10mm
  . Total amount of Bright dot defects   : 6 Max.

- Black Dot defects : When the LCM is turned on, dots(sub-pixels) which appear black in the display area at White(Bright) Mode are black dot defects.
  . 1 dot   : 6 Max.
  . Join 2 dots : 1 Max.
  . Join 3 dots : 0 max.
  . Minimum Distance between defects : D   10mm
  . Total amount of Black dot defects   : 6 Max.

- Total amount of Dot Defect(Bright and Black Dot) : 10 Max. (Combination)

ii) Line Defect
All line defects such as vertical, horizontal or cross line defect are not allowed.

Note 1) Dot Defect : Defected area > 1/2 dot
     2) 1 Dot   : Defect dot is isolated, not attached to other defect dot.
     3) 3 Join N Dot : N dots are consecutive. (N means the number of defect dots)

9. Other
If any problems arise with the LCM supplied by LGE, the Customer and Supplier will cooperate and make efforts to solve it with mutual confidence and respect.

Product Specification

13. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L

A, B : DIVISION CODE
C, D, E : MODEL CODE
F : YEAR
G : MONTH
H, I, J, K, L : SERIAL NO.

Note : 1. YEAR

YEAR	89	90	91	92	93	94	95	96	97	98	99
Mark	9	0	1	2	3	4	5	6	7	8	9

2. MONTH

MONTH	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jun.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	0	N	D

b) Location of Lot Mark

Serial NO. Is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

14. Packing Form

a) Package quantity in one box : 8 pcs
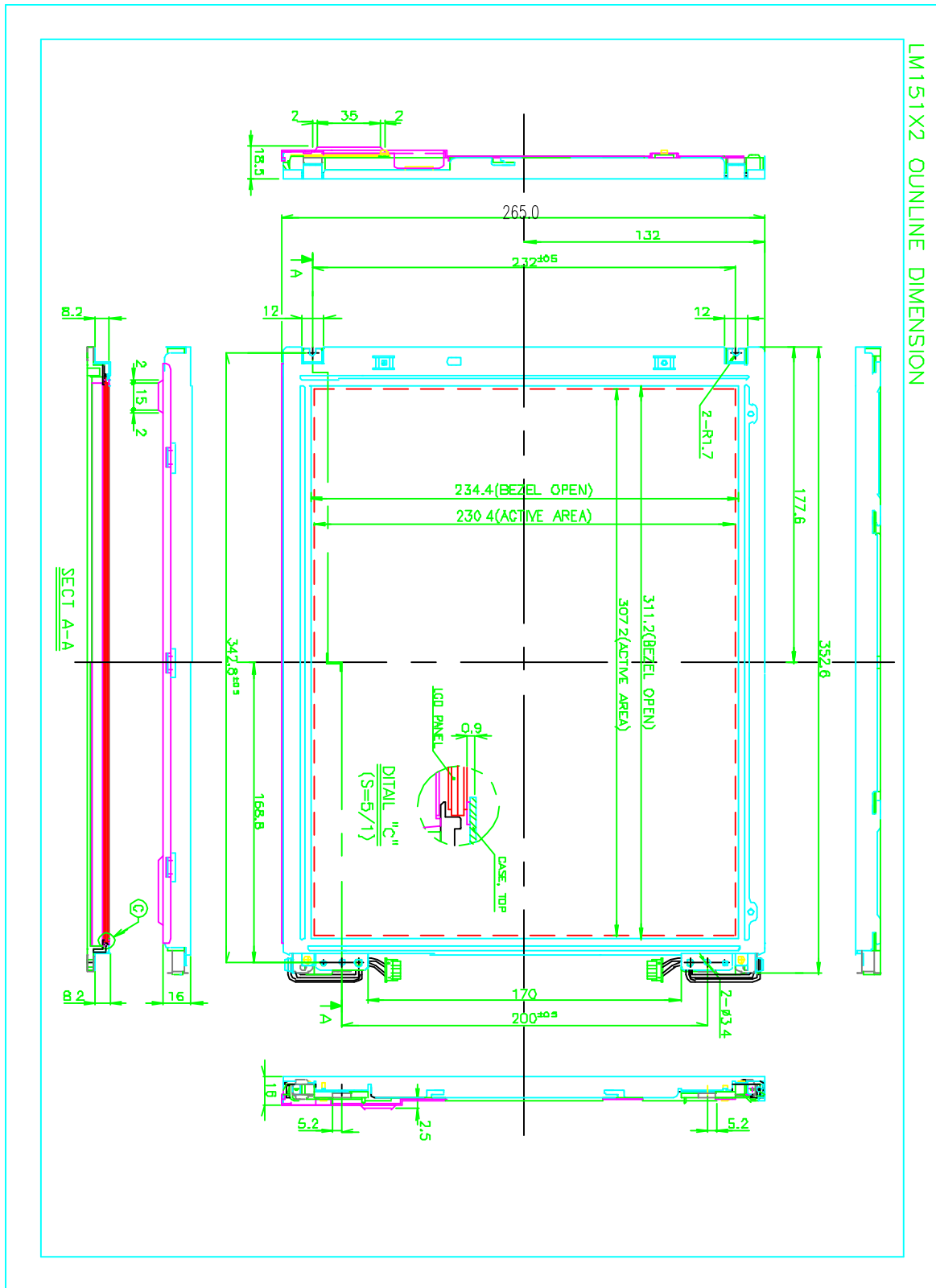
b) Box Size : 587mm x 408mm x 378mm

Note : 1. Please, refer to appendix 3 regarding the detailed packing assembly drawing.
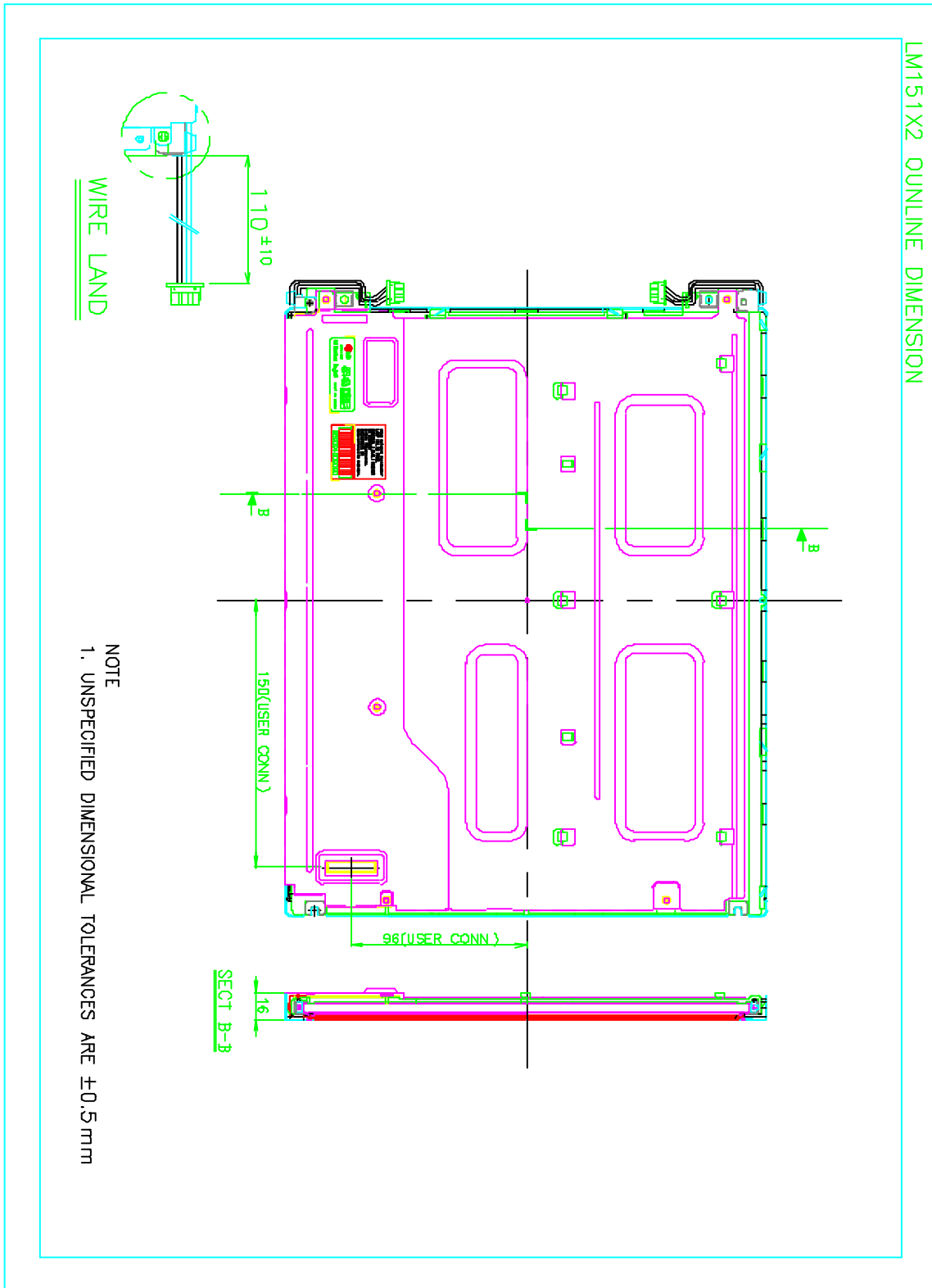
15. PRECAUTIONS

Please pay attention to the followings when you use this TFT-LCD module with Back-light unit.

1) You must mount Module using mounting holes arranged in 4 corners.

2) Be sure to turn off the power when connecting or disconnecting the circuit.

3) Note that the polarizers are easily damaged. Pay attention not to scratch or press this surface with any hard object.

4) When the LCD surface become dirty, please wipe it off with a soft material. (ie. cotton ball)

5) Protect the module from the ESD as it may damage the electronic circuit (C-MOS). Make certain that treatment person's body are grounded through wrist bend.

6) Do not disassemble the module and be careful not to incur a mechanical shock that might occur during installation. It may cause permanent damage.

7) Do not leave the module in high temperatures, particularly in areas of high humidity for a long time.

8) The module not be expose to the direct sunlight.

9) Avoid contact with water as it may a short circuit within the module.

10) Do not apply invalid signal, especially very high frequency data clock and H_{sync}. Invalid signal causes improper shutdown of DC/DC converter in LCM or permanent damage to LCD module.
(If DC/DC converter in LCM is in shutdown state, LCM shows only white screen. Then please turn off and on once LCM power.)

11) If the LCM displays the same pattern continuously for a long period of time, it can be the image sticking to the screen.

Product Specification

16. APPENDIX 1 : Outline Drawings

ALPHA POINT
http://www.alpha.fi

Alpha Point Ltd.
P.O. Box 41
00751 Helsinki, Finland

Tel.: +358-9-34 64 34 1
Fax: +358-9-34 64 34 2

LM151X2 OUNLINE DIMENSION

WIRE LAND

110 ±10

150(USER CONN)

96(USER CONN)

SECT B-B

16

NOTE
1. UNSPECIFIED DIMENSIONAL TOLERANCES ARE ±0.5mm

17. APPENDIX 2 : Packing Assembly Drawings

NO	PART NO	DESCRIPTION	MATERIAL
①	3921L-0011A	PACKING ASS'Y	
②	3880L-0001B	LCD MODULE	
③	3920L-0011A	BAG	PE 300(H)X4.50(V)
④	3630L-0014A	PACKING	DW3 356X578 T7
⑤	3630L-0018A	PACKINGPLATE	BAR DW3 403X116 T7
⑥	3630L-0017A	PACKINGPLATE	YPLATE DW3 582X368 T7
⑦	3630L-0019A	PACKINGPLATE	XPLATE DW3 109BX403 T7
⑧	3630L-0013A	PACKINGPLATE	GATE DW3 356X72 T7
⑨	3630L-0020A	PACKINGPLATE	ZPLATE DW3 403X318 T7
⑩	3890L-0009B	PACKINGPLATE	SHEET DW3 320X418 T7
⑪	7263L-0001A	BOX	DW3 587X408X378 T7
⑫	3950L-0001A	SILICAGEL	GEL 25G
⑬	7250L-0017A	STAPLE	35X18
⑭	7250L-0023A	TAPE	LOGO 70MMX50M
⑮		TAPE	MASKING 20MMX50M

70 ±15

12 UNITS / 1 PALLET

NO	PART NO	DESCRIPTION	MATERIAL
⑧	3858L-A001B	SHEET, ANGLE	PAPER
⑦	3858L-A001A	SHEET, ANGLE	PAPER
⑥	4770L-C002A	BAND, CLIP	STEEL
⑤	4770L-P001A	BAND, PACKING	P.P
④	3980L-F001A	WRAP, FILM	P.E
③	3922L-0001A	PACKING SHEET	SW1
②	3930L-0001A	PALLET	WOOD
①	3921L-0011A	PACKING ASS'Y	

18. APPENDIX 3 : Classification of Defects

Inspection Item	Criterion for Defect	Type
Operating Frequency	Does not meet specified range in the spec.	Major
Power Consumption	Does not meet specified range in the spec.	Major
Contrast Ratio	Does not meet specified range in the spec.	Major
Line Defect	Vertical line defect Horizontal line defect Cross line defect	Major
Scratches, Dents or Bubbles	Shall be accordance with the item 8.b) "External inspection standards" on this incoming inspection standard	Minor
Extraneous Substance	Shall be accordance with the item 8.b) "External inspection standards" on this incoming inspection standard	Minor
Dot Defect	Shall be accordance with the item 8.b) "External inspection standards" on this incoming inspection standard	Minor
Bezel Appearance	Deep damage is found on plating, the ground metal is exposed, or rust may occur. (Irregular plating or coating is ignored)	Minor
Damaged Parts	a) The lead wire part is disconnected b) The lead wire part is not yet disconnected, but is damaged c) Function, performance or product value is impaired	Major Minor Major
Bezel Claw Forming	a) Bezel claw missing b) The bezel claw is not formed sufficiently	Major Minor