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1. Operating Precautions

- 1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
- 5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open nor modify the module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
- 12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

2. General Description

G215HW03V1 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support Full HD- (1920(H) x 1080(V)) screen and 16.7M (RGB 6-bits +Hi FRC data). All input signals are LVDS interface compatible.

G215HW03V1 is designed for industrial display applications.

2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	546.86(21.53")
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V		1920(x3) x 1080
Pixel Pitch	[um]	248.25 (per one triad) x248.25
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	+5.0 V
Typical Power Consumption	[Watt]	61 (Typ.) (without driver board, all black pattern)
Weight	[Grams]	1900
Physical Size	[mm]	495.6(W) x 292.2(H) x 10.5(D) Typ.
Electrical Interface		Dual channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.7M colors (RGB 6-bit + Hi_FRC)
Temperature Range Operating Storage (Non-Operating)	[°C] [°C]	0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance
Light Bar Unit		LED

2.2 Optical Characteristics

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

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m ²]		1000	1200	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			600	1000	-	4
Cross talk(in 60 Hz)	%		-	-	1.5	5
Response Time	[msec]	Rising	-	3.8	5.5	6
	[msec]	Falling	-	1.2	2.5	
	[msec]	Raising + Falling	-	5		
Viewing Angle	[degree] [degree]	Horizontal (Right) CR = 10 (Left)	55 55	60 60	- -	7
	[degree] [degree]	Vertical (Upper) CR = 10 (Lower)	60 60	70 70	- -	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.616	0.646	0.676	
		Red y	0.302	0.332	0.362	
		Green x	0.301	0.331	0.361	
		Green y	0.595	0.625	0.655	
		Blue x	0.126	0.156	0.186	
		Blue y	0.021	0.051	0.081	
		White x	0.308	0.338	0.368	
		White y	0.327	0.357	0.387	
Color Gamut	%		60	65	-	

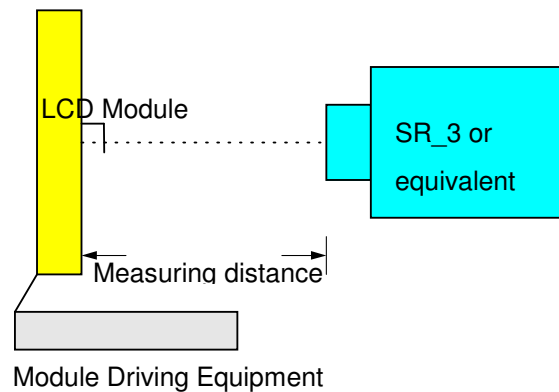
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

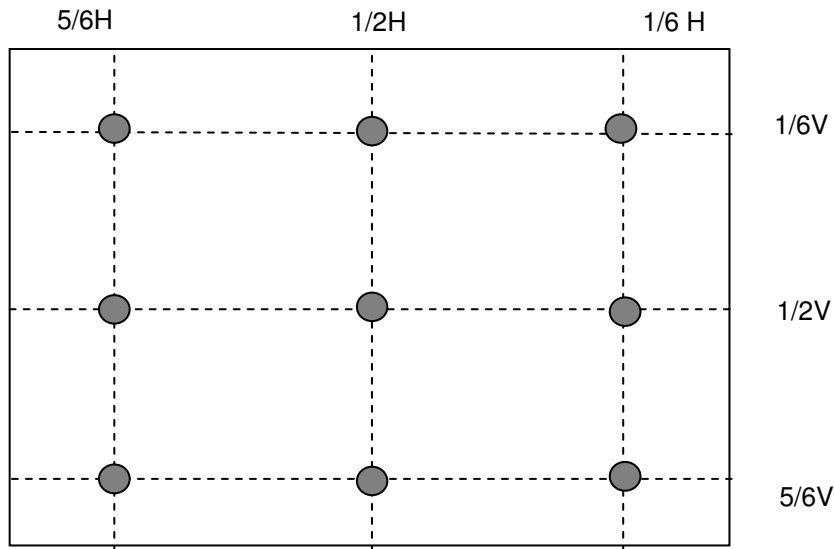
Aperture 1° with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 9 points position (Display active area : 476.64 (H) x 268.11 (V))



Note 3: The luminance uniformity of 9 points is defined by dividing 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):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

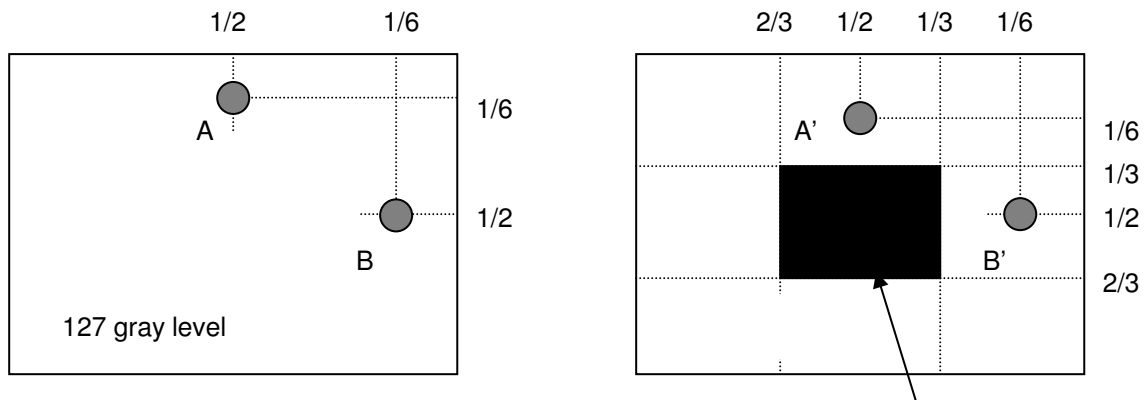
Note 5 : Definition of cross talk (CT)

$$CT = | YB - YA | / YA \times 100 (\%)$$

Where

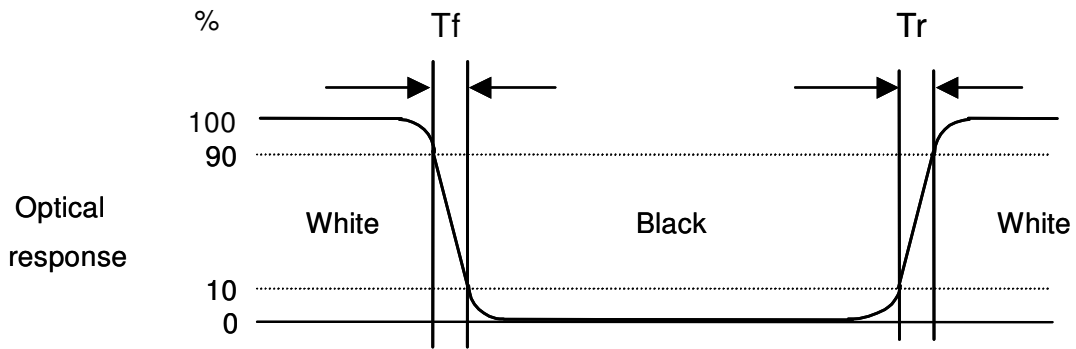
YA = Luminance of measured location without gray level 0 pattern (cd/m²)

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



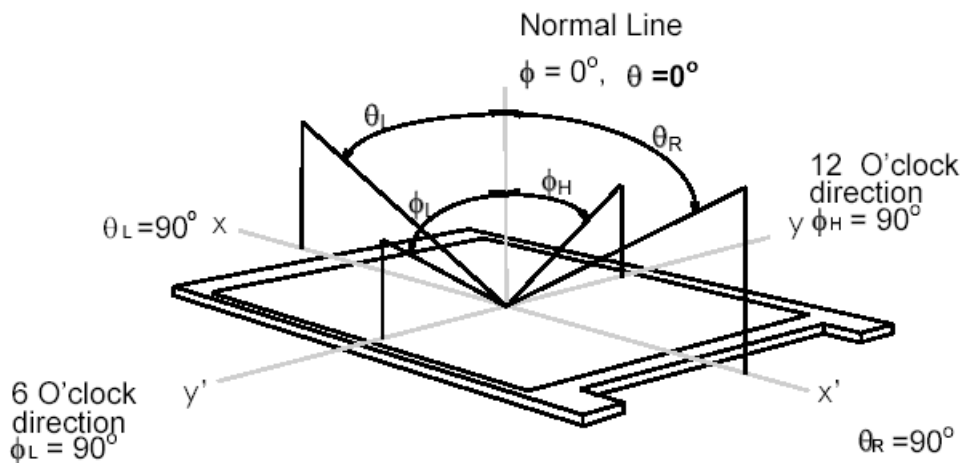
Note 6: Definition of response time:

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.

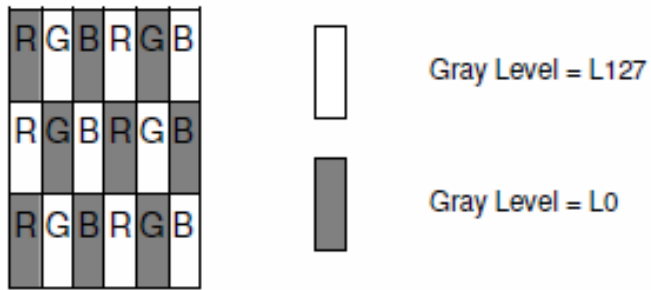


Note 7: Definition of viewing angle

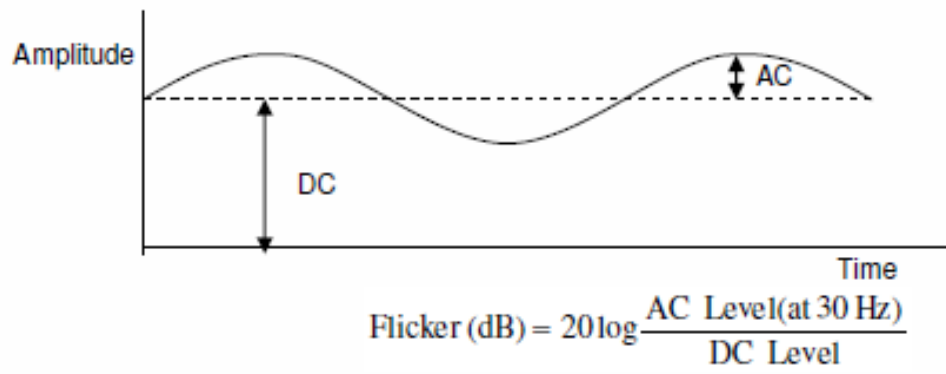
Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



Test Pattern: Subchecker Pattern **measured by TOPCON SR-3**

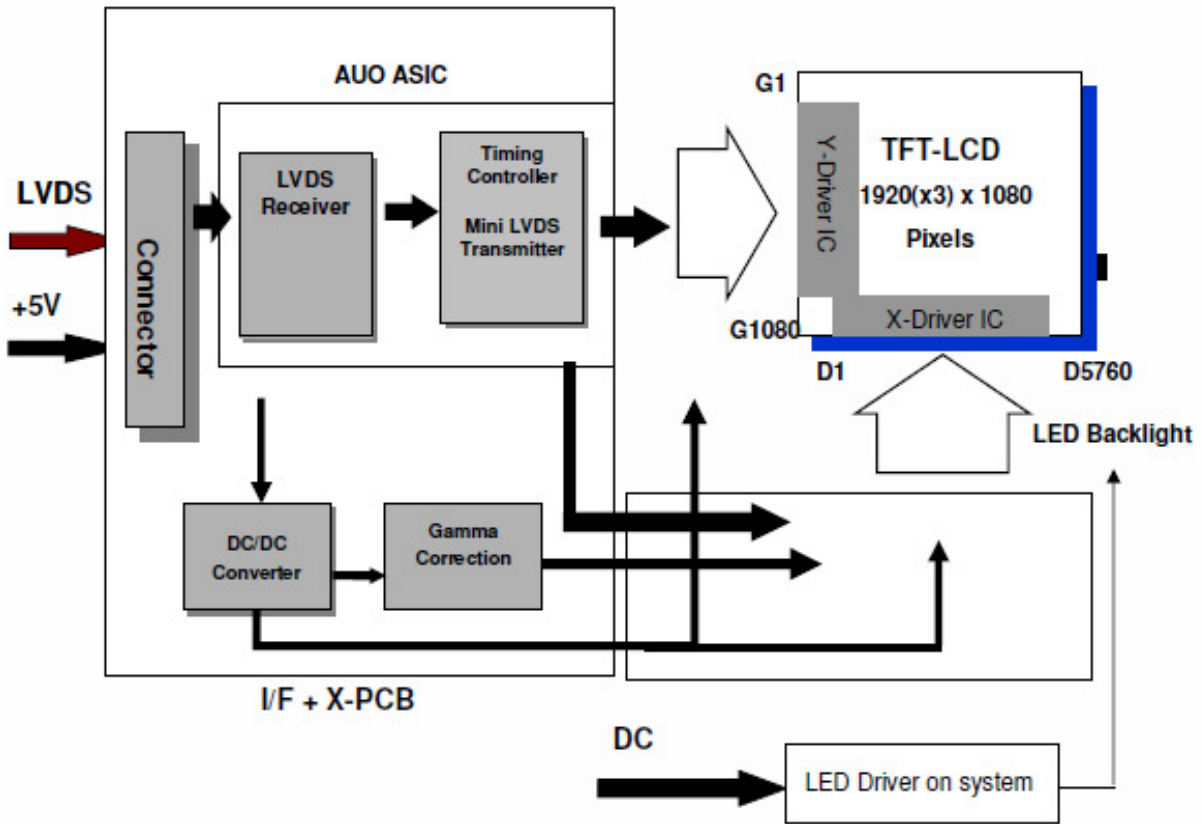


Method: Record dBV & DC value with TRD-100



3. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:



I/F PCB Interface:

JAE-FI-XPB30SRLA-HF11

P-TWO-187121-30091-3(A)

Mating Type:

FI-X30HL (Locked Type)

4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	Vin	0	6.0	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	0	+50	[°C]
Glass surface temperature (operation)	TGS	0	+65	
Operation Humidity	HOP	5	+95	[%RH]
Storage Temperature	TST	-20	+60	[°C]
Storage Humidity	HST	5	90	[%RH]

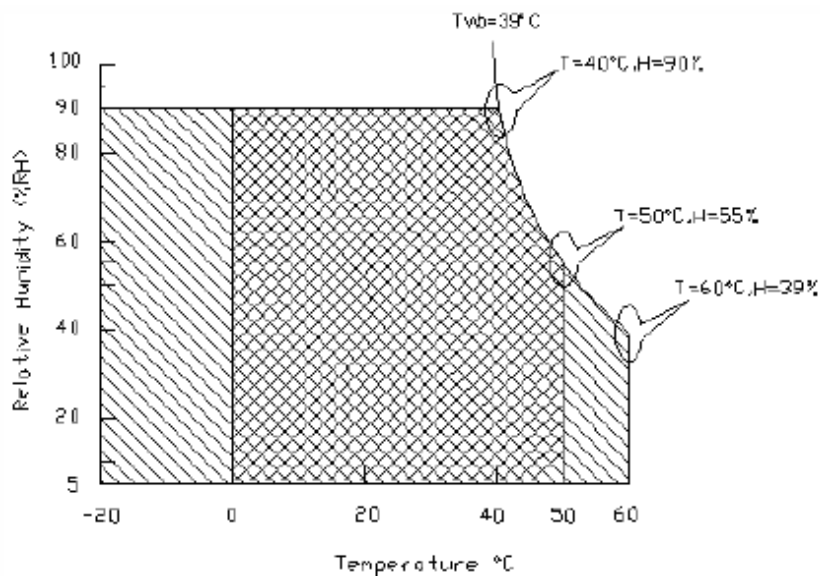
Note 1: With in Ta (25°C)

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.

- 90% RH Max (Ta ≤ 39°C)
- Max wet-gulb temperature at 39°C or less (Ta ≤ 39°C)
- No condensation

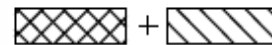
Note 4: Function Judged only



Operating Range



Storage Range



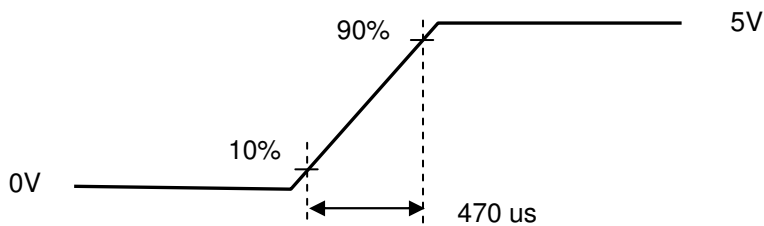
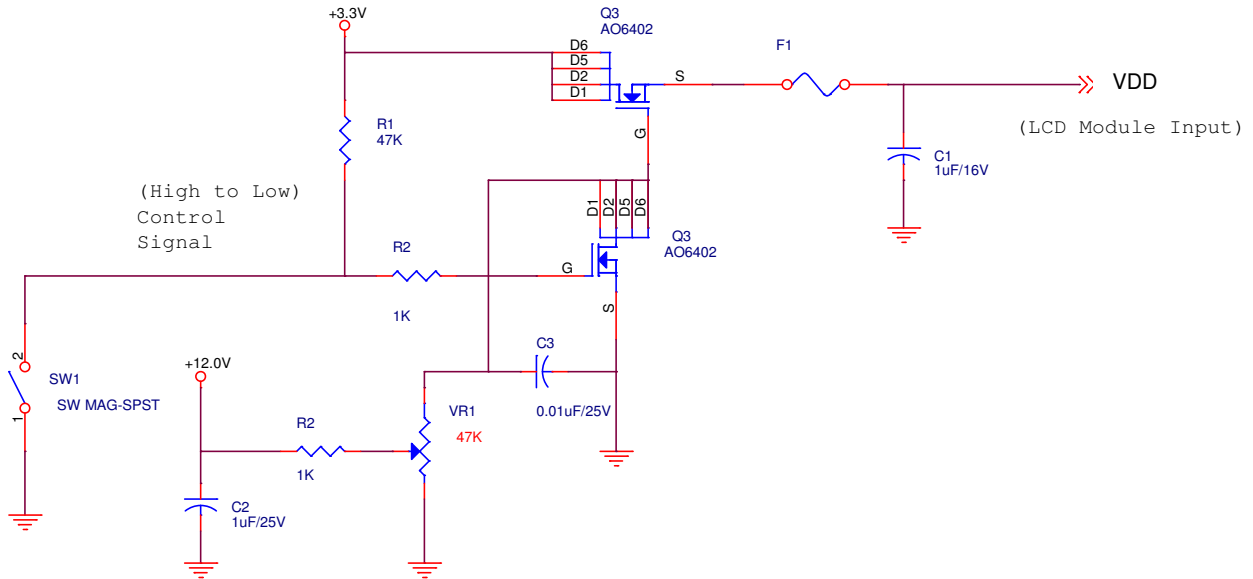
5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	± 10%
IDD	VDD Current	-	820	980	[mA]	All Black Pattern (VDD=5.0V, at 60Hz)
		-	920	1100		All Black Pattern (VDD=5.0V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	4.1	4.9	[Watt]	All Black Pattern (VDD=5.0V, at 60Hz)
		-	4.6	5.5		All Black Pattern (VDD=5.0V, at 60Hz)

Note 1: Measurement condition:



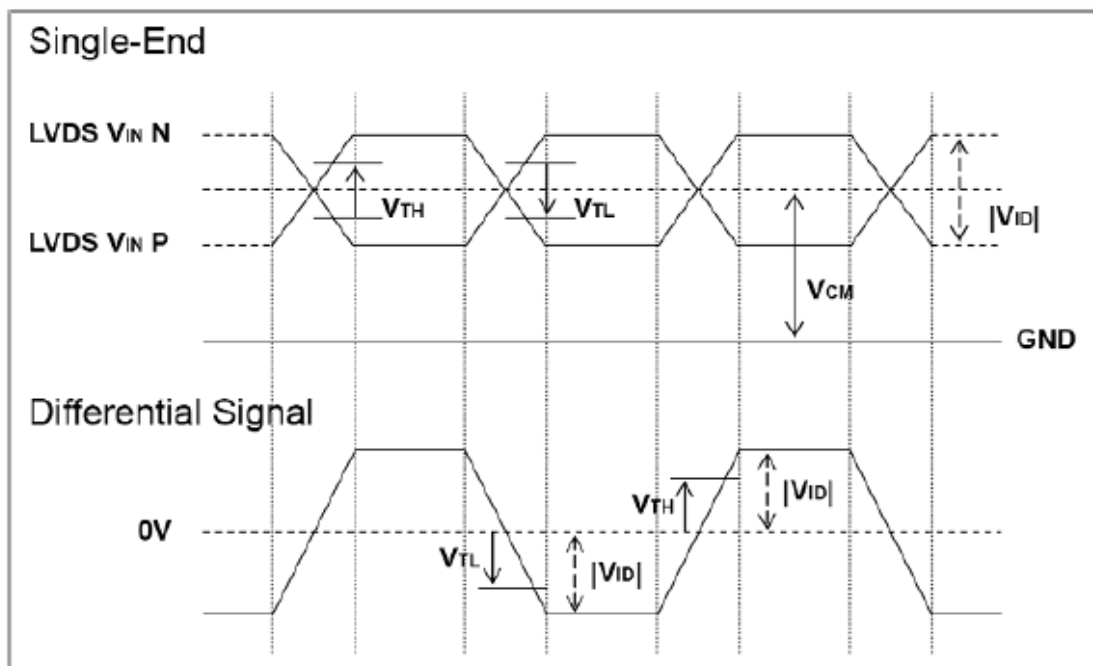
VDD rising time

5.1.2 Signal Electrical Characteristics

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

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
V _{TH}	Differential Input High Threshold	-	-	100	[mV]	V _{CM} =1.2V
V _{TL}	Differential Input Low Threshold	-100	-	-	[mV]	V _{CM} =1.2V
V _{ID}	Input Differential Voltage	100	-	600	[mV]	
V _{ICM}	Differential Input Common Mode Voltage	+1.	+1.2	+1.5	[V]	V _{TH} /V _{TL} =±100mV

Note: LVDS Signal Waveform.



5.2 Backlight Unit

5.2.1 Parameter guideline for LED

Following characteristics are measured under stable condition using a LED driving board at 25°C (Room Temperature).

Symbol	Parameter	Min	Typ	Max	Unit	Remark
Vcc	Input Voltage	-	12	-	Volt	
Ivcc	Input Current	-	5.1	-	A	100% Dimming
PLED	Power Consumption	-	55.3	-	Watt	100% Dimming
Inrush	Inrush Current		TBD		A	
VLED on/off	On Control Voltage	-	-	0.8	Volt	
	Off Control Voltage	2	-	5.5	Volt	
FPWM	PWM Dimming Frequency	140	-	240	Hz	
	High Voltage		5		Volt	
	Low Voltage	-	3		Volt	
	Dimming Duty Cycle	5	-	100	%	
I _F	LED Forward Current	-	960		mA	Ta = 25°C
Operating Life		44000	-	-	Hrs	Ta = 25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: If G215HW03V1 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

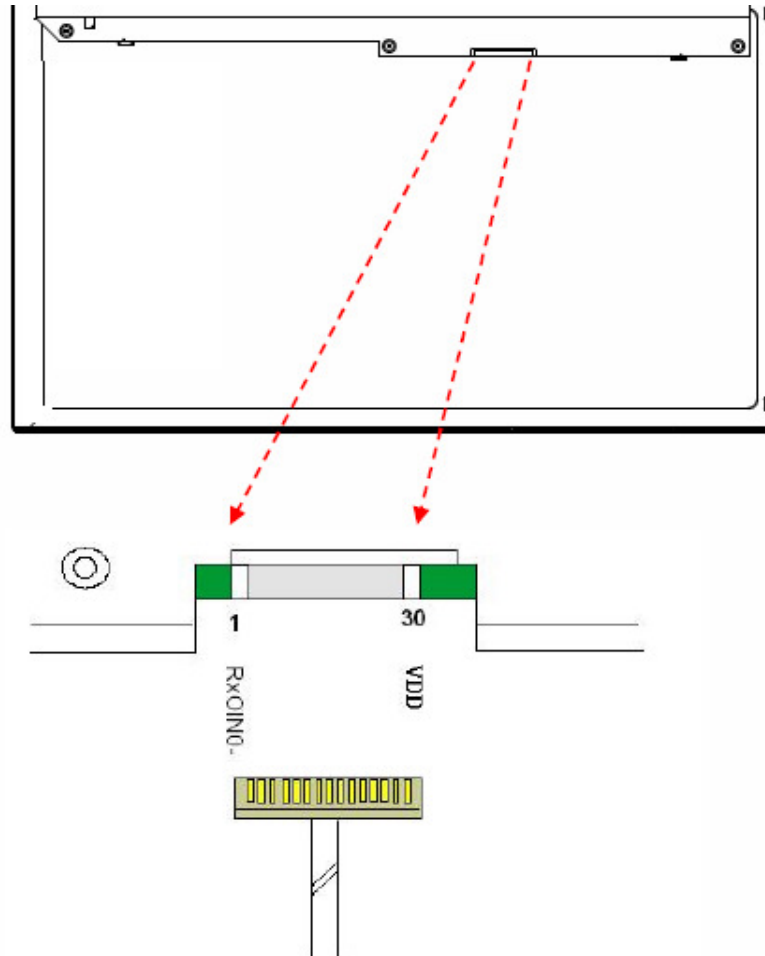
Note 3: Operating life means brightness goes down to 50% initial brightness. Min. operating life time is estimated data.

6.3 Signal Description

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

Pin No.	Symbol	Description
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data,DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data,DSPTMG)
7	GND	Power Ground
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RxEIN1-	Positive LVDS differential data input (Even data)
16	RxEIN1+	Negative LVDS differential data input (Even data)
17	GND	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLK-	Negative LVDS differential clock input (Even clock)
21	RxECLK+	Positive LVDS differential clock input (Even clock)
22	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for AUO test only. Do not connect)
26	NC	No connection (for AUO test only. Do not connect)
27	NC	No connection (for AUO test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

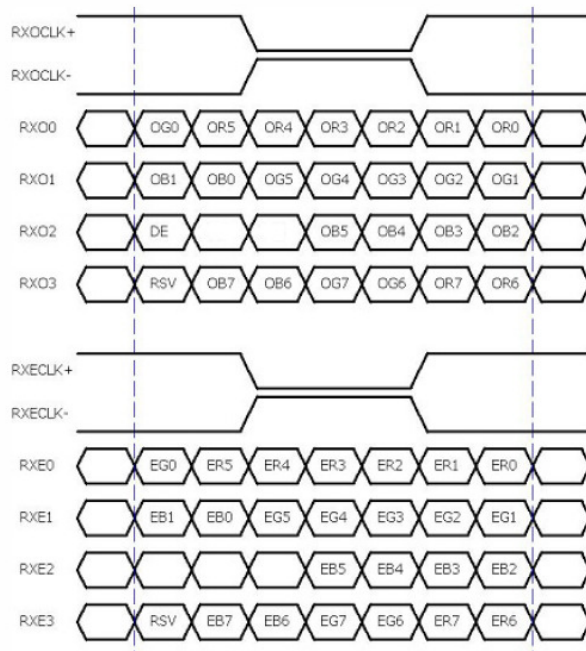
Note 1: Start from left side



6.4 The Input Data Format

6.4.1 SEL68

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



Note1: R/G/B data 7:MSB, R/G/B data 0:LSB O = "First Pixel Data" E = "Second Pixel Data"

6.5 Interface Timing

6.5.1 Timing Characteristics

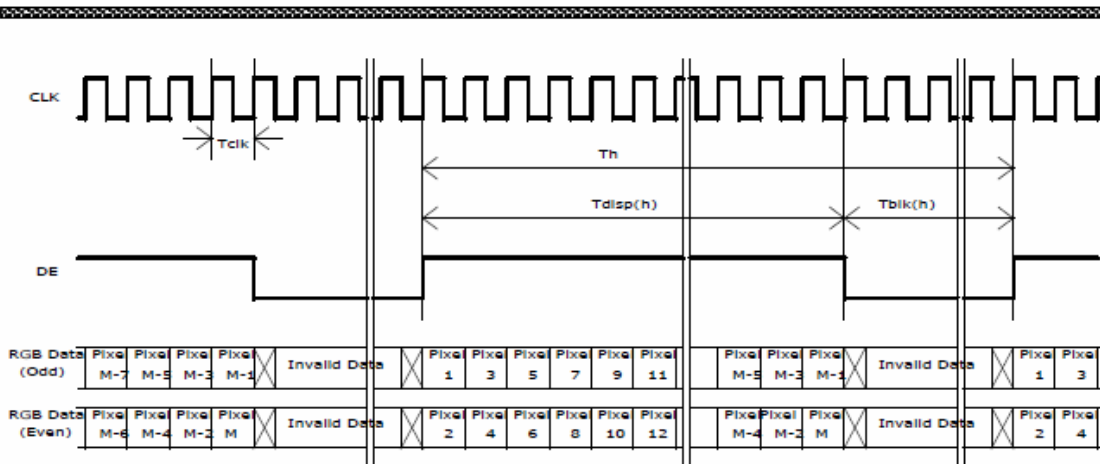
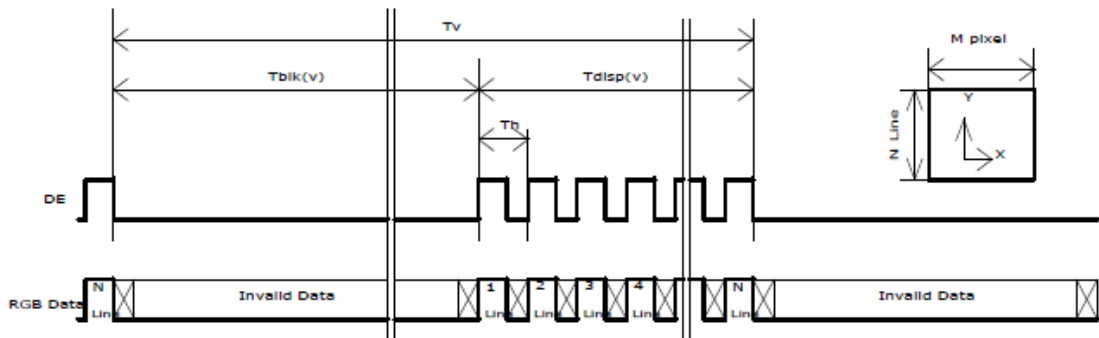
Basically, interface timing described here is not actual input timing of LCD module but close to output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Timing	Clock frequency	Tclk	25	13.3	11.1	MHz
		Freq	40	75	90	
Vsync Timing	Vertical Section	Period	T_V	1088	1120	T_{Line}
		Active	T_{VD}	1080	1080	
		Blanking	T_{VB}	8	40	
Hsync Timing	Horizontal Section	Period	T_H	1034	1060	T_{Clock}
		Active	T_{HD}	960	960	
		Blanking	T_{HB}	74	100	
Frame Rate		F	50	60	75	Hz

Note: DE mode only.

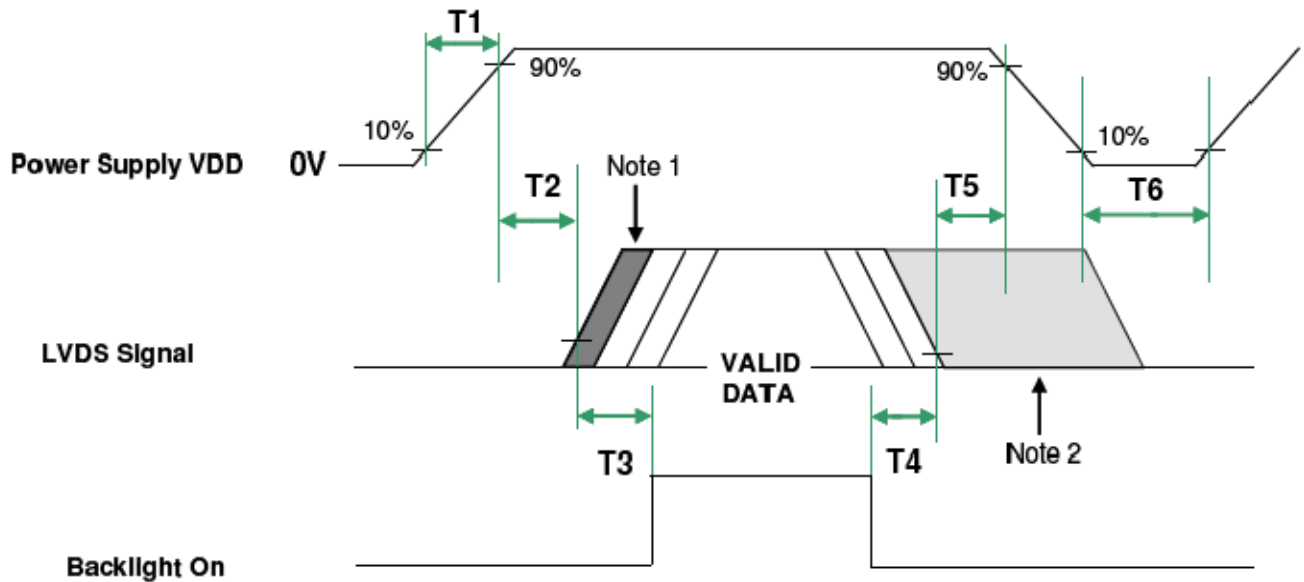
Note : Typical value refer to VESA STANDARD

6.5.2 Input Timing Diagram



6.6 Power ON/OFF Sequence

VDD power and LED 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		Unit
	Min.	Max.	
T1	0.5	10	[msec]
T2	0	50	[msec]
T3	500	-	[msec]
T4	200	-	[msec]
T5	40	-	[msec]
T6	1000	-	[msec]

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.

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: LVDS Connector

Connector Name / Designation	Signal Connector
Manufacturer	JAE, P-TWO,
Connector Model Number	JAE-FI-XPB30SRLA-HF11 P-TWO-187121-30091-3(A)
Adaptable Plug	FI-X30HL (Locked Type)

Pin#	Signal Name	Pin#	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC (for BV test only. Do not connect)	26	NC (for BV test only. Do not connect)
27	NC (for BV test only. Do not connect)	28	VDD
29	VDD	30	VDD

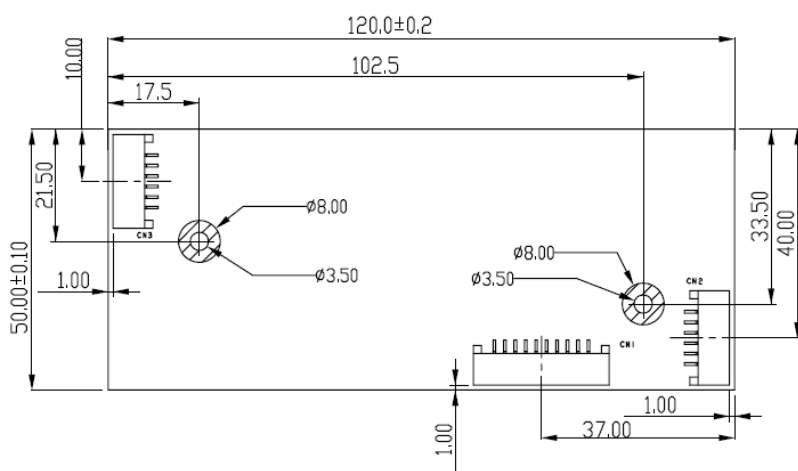
7.2 Backlight Unit: LED Driver Connector

Connector Name / Designation	LED Driver Connector
Manufacturer	CviLux
Connector Model Number	CI0110M1HR0
Mating Model Number	CI0110S0000

7.3 LED Driver Connector Pin Assignment

Pin#	Symbol	Signal Name
1	Vcc	12V
2	Vcc	12V
3	Vcc	12V
4	Vcc	12V
5	GND	GND
6	GND	GND
7	GND	GND
8	GND	GND
9	Enable	3.3V-On / 0V-Off
10	Dimming	PWM Dimming(140Hz to 240)

7.4 Driver Board Outline



- Note:
1. Unit: mm
 2. Size: 120mm X 45mm X 13mm
 3. PCB Thickness 1.6mm
 4. The Height of top side is 10mm
 5. The Height of Bottom is 1.4mm
 6. Connector Type:
CN1 : CviLux CI0110M1HR0
CN2 & CN3 : CviLux CI0106M1HR0
 7. No component and trace allowed area.

8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	50°C/80%,300 hours	
High Temperature Operation	Ta= 50°C , 50%RH, 300hours	
Low Temperature Operation	Ta= 0°C , 300hours	
Hot Storage	Ta= 60°C , 300hours	
Cold Storage	Ta= -20°C , 300hours	
Thermal Shock Test	-20°C/30min, 60°C/30min, 100 cycles	Note 1
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 4KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 2

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°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: EN61000-4-2, ESD class B: Certain performance degradation allowed

No data lost

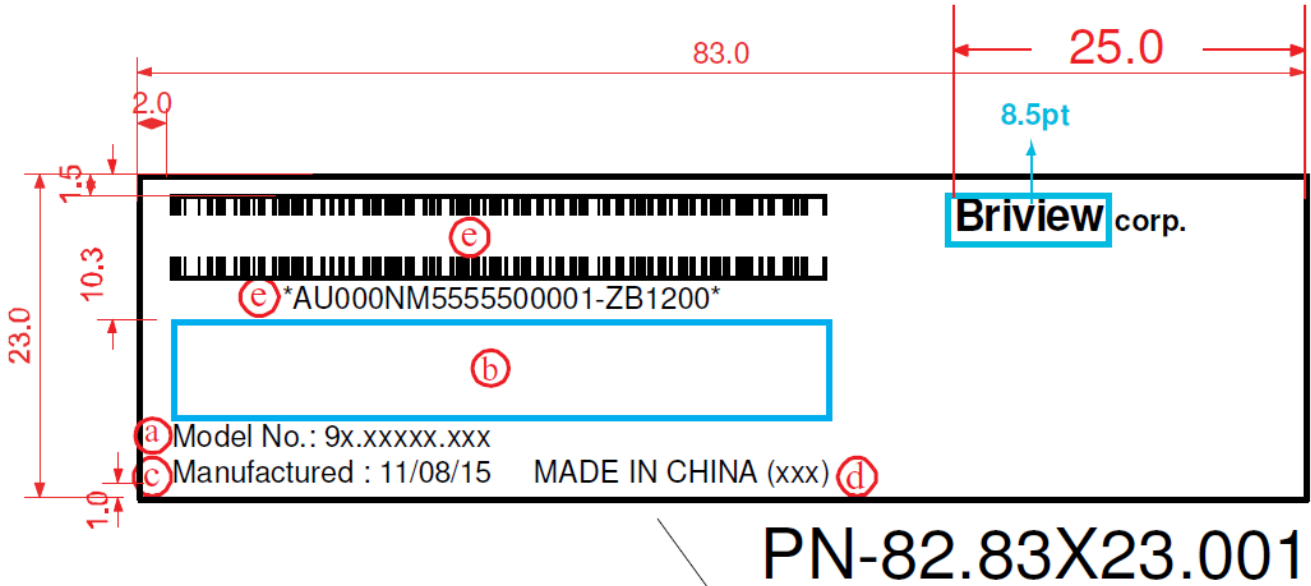
Self-recoverable

No hardware failures.

10. Label and Packaging

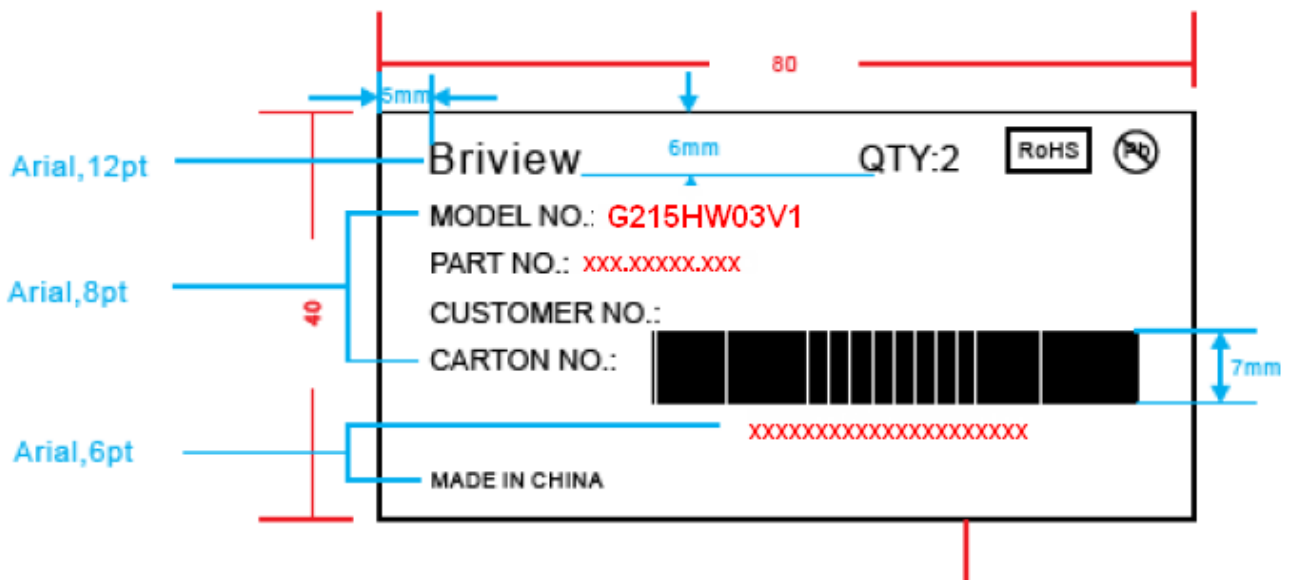
10.1 Shipping Label (on the rear side of TFT-LCD display)

✂ Shipping Label **without** UL and Green



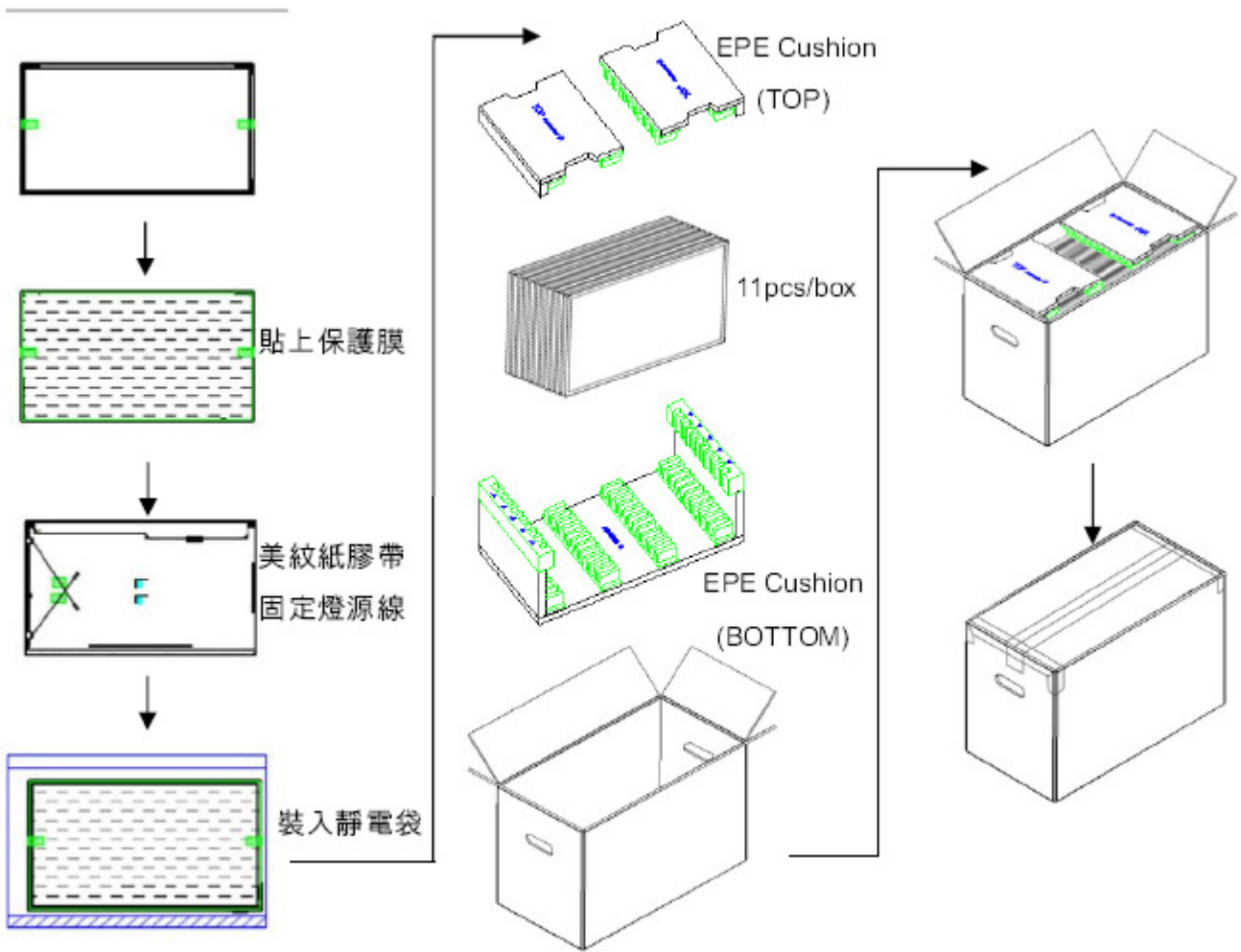
10.2 Carton Label

4. Carton Label(90mm*100mm): 82. 15B06. 004



10.3 Carton Package

Carton: 556mm×292mm×375mm
Carton and cushion weight: 1200g



11 Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 60950-1, Second Edition

U.S.A. Information Technology Equipment