(V) Preliminary Specifications
( ) Final Specifications

Module	15 Inch Color TFT-LCD
Model Name	G150XG03 V3

Customer	**Date**	**Approved by**	**Date**
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Note: This Specification is subject to change without notice.		General Display Business Division / AU Optronics corporation	

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Record of Revision

Version and Date	Page	Old description	New Description
0.0 2009/07/06	All	First Edition	

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 CCFL Reflector edge. Instead, press at the far ends of the CFL 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) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
12) Cold cathode fluorescent lamp in LCD contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
13) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
14) The LCD module is designed so that the CFL in it is supplied by Limited Current Circuit (IEC60950 or UL1950). Do not connect the CFL in Hazardous Voltage Circuit.
15) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
16) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
17) The data on this specification sheet is applicable when LCD module is placed in landscape position.
18) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

2. General Description

G150XG03 V3 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 XGA (1024(H) x 768(V)) screen and 16.2M (RGB 8-bits) coloars. All input signals are LVDS interface compatible. Inverter card of backlight is not included. All design rules of this module can correspond to PSWG standard.

2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	15
Active Area	[mm]	304.128(H) x 228.096(V)
Pixels H x V		1024x3(RGB) x 768
Pixel Pitch	[mm]	0.297 x 0.297
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 typ.
Typical Power Consumption	[Watt]	12.82 (64 Gray Bar Pattern , exclude inverter)
Weight	[Grams]	1100g (max.)
Physical Size	[mm]	326.5(H)x 253.5(V) x 12.0(D) (max.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 0 to +65 (+65 °C as panel surface temperature) -20 to +65
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

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

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m2]	IRCFL= 8mA (center point)	200	250	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			400	700	-	4
Cross talk	%		-	1.2	1.5	5
Response Time	[msec]	Rising	-	5.7		6
	[msec]	Falling	-	2.3		
	[msec]	Raising + Falling	-	8		
Viewing Angle	[degree]	Horizontal (Right) CR = 10	70	80	-	7
	[degree]	(Left)	70	80	-	
	[degree]	Vertical (Upper) CR = 10	50	60	-	
	[degree]	(Lower)	60	70	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.578	0.608	0.638	
		Red y	0.304	0.334	0.364	
		Green x	0.258	0.288	0.318	
		Green y	0.548	0.578	0.608	
		Blue x	0.115	0.145	0.175	
		Blue y	0.038	0.068	0.098	
		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Color Gamut	%			60	-	

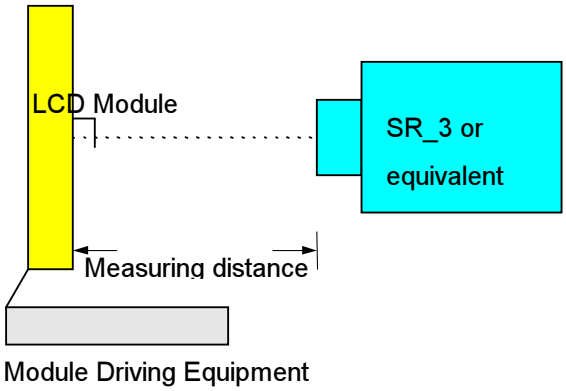
Note 1: Measurement method

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

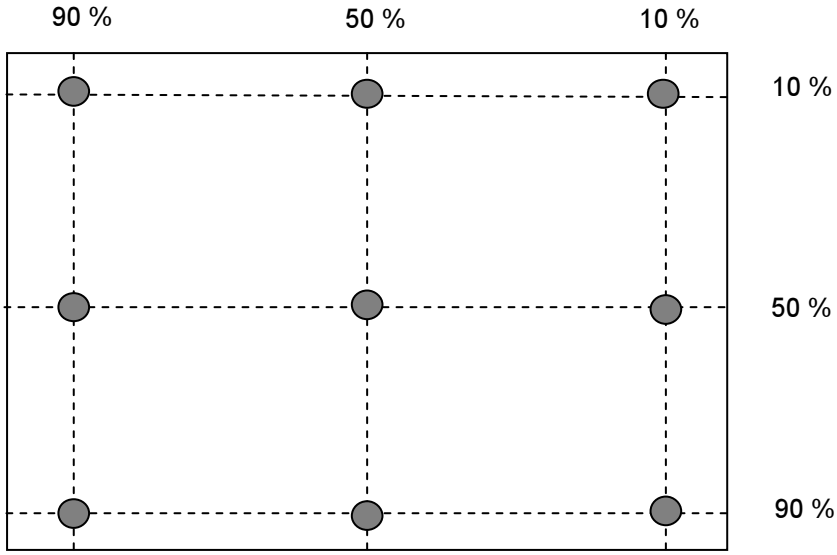
Aperture 1□with 50cm viewing distance

Test Point Center

Environment *< 1 lux*



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 dividing the minimum luminance values by the maximum test point luminance

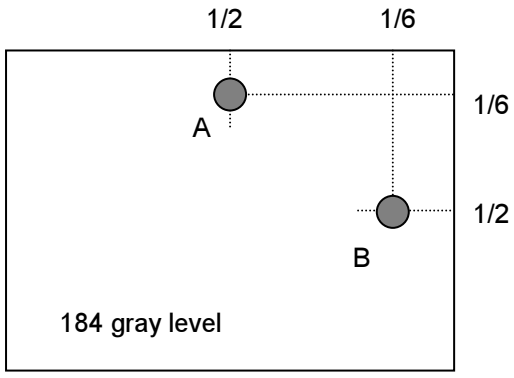
$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

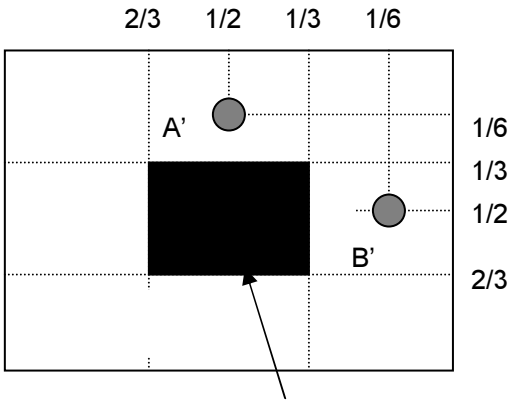
Note 4： Definition of contrast ratio (CR):

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

Note 5： Definition of cross talk (CT)

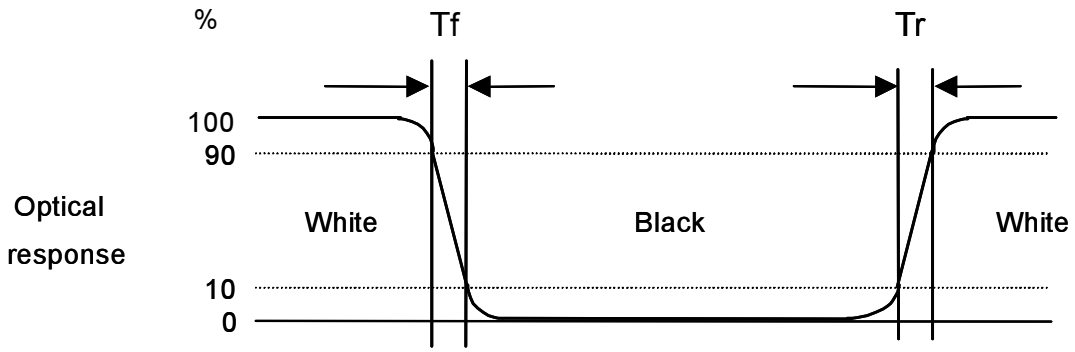
CT = | YB – YA | / YA × 100 (%)
Where
YA = Luminance of measured location without gray level 0 pattern (cd/m2)
YB = Luminance of measured location with gray level 0 pattern (cd/m2)





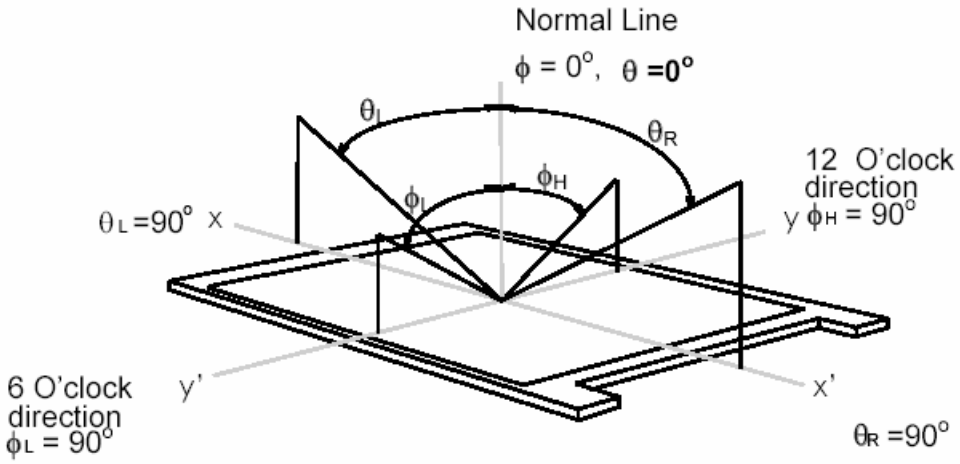
Note 6: Definition of response time:

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.



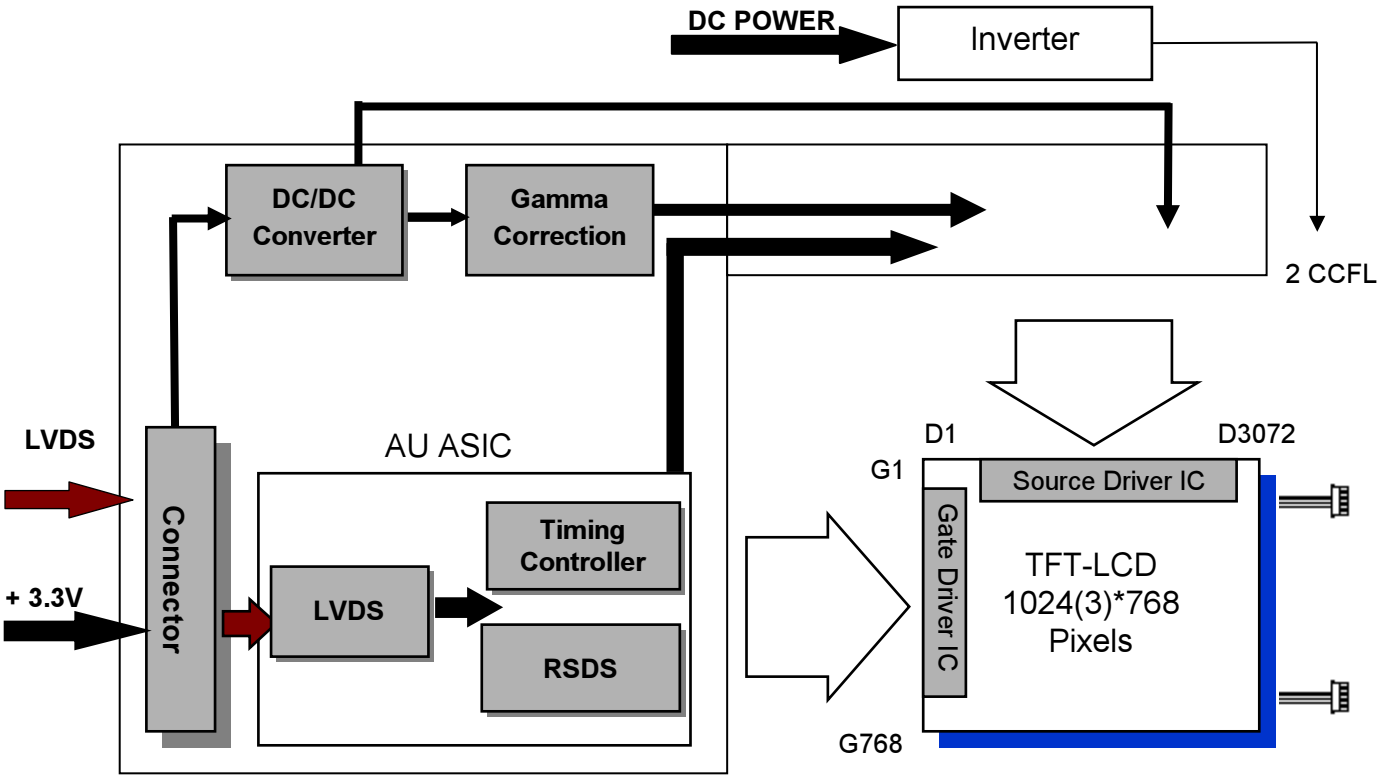
Note 7: Definition of viewing angle

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.



3. Functional Block Diagram

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



3804-F20N-06R / MSB240420E

JST-BDBR-03(4.0)V-S

Mating Type: HRS DF14-20S-1.25C

SM03B-BHS-1R

4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

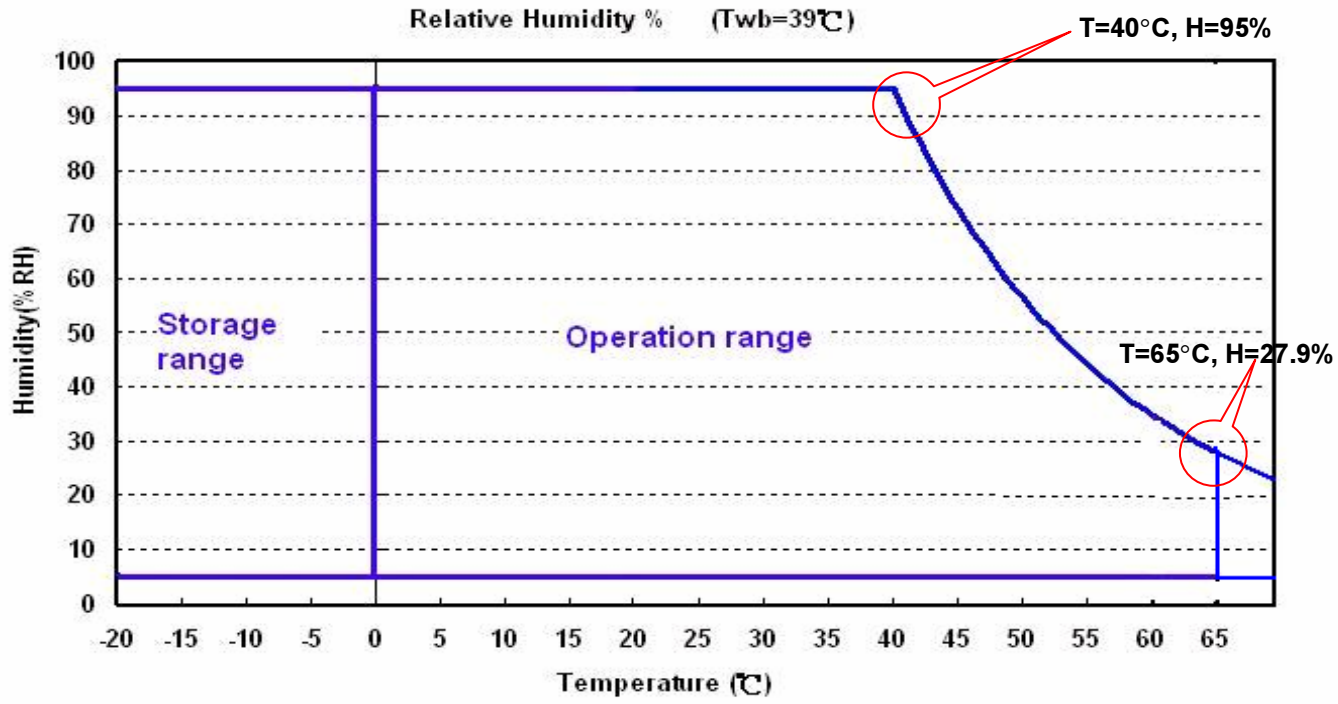
Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	Vin	-0.3	+3.6	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	0	+65*	[°C]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-20	+65	[°C]
Storage Humidity	HST	8	90	[%RH]

Note: Maximum Wet-Bulb should be 39□ and no condensation.

* 65 °C is panel surface temperature



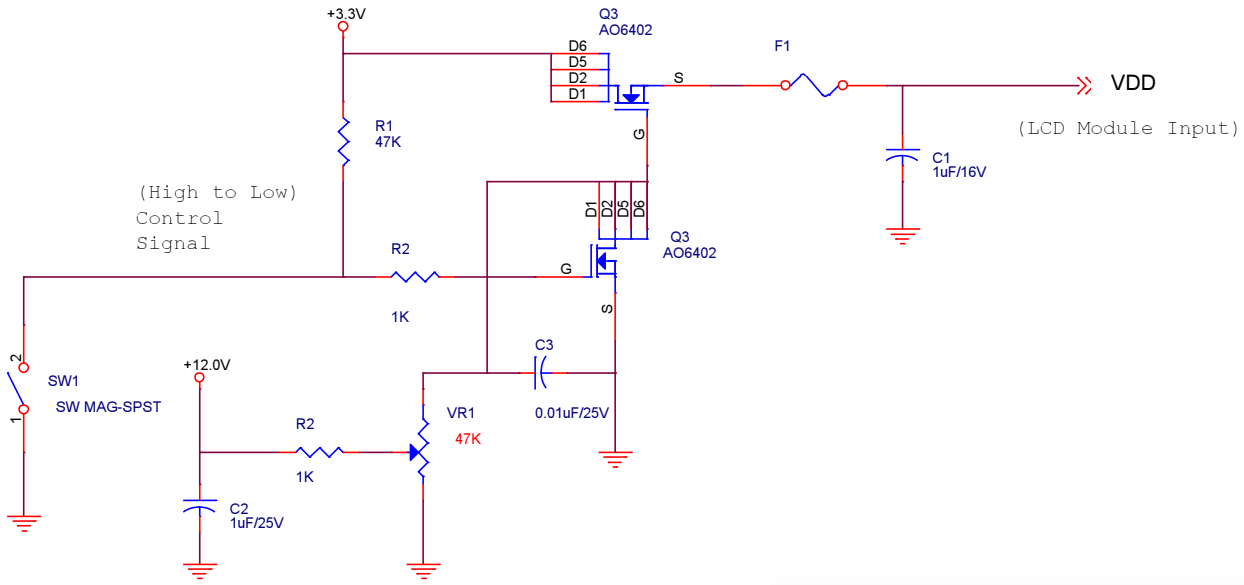
5. Electrical Characteristics

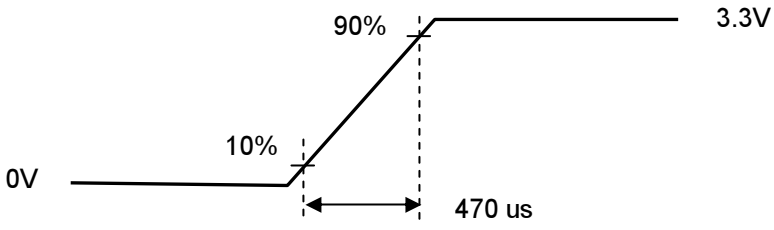
5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
IDD	VDD Current	-	1	1.5	[A]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	3.3	5	[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:





VDD rising time

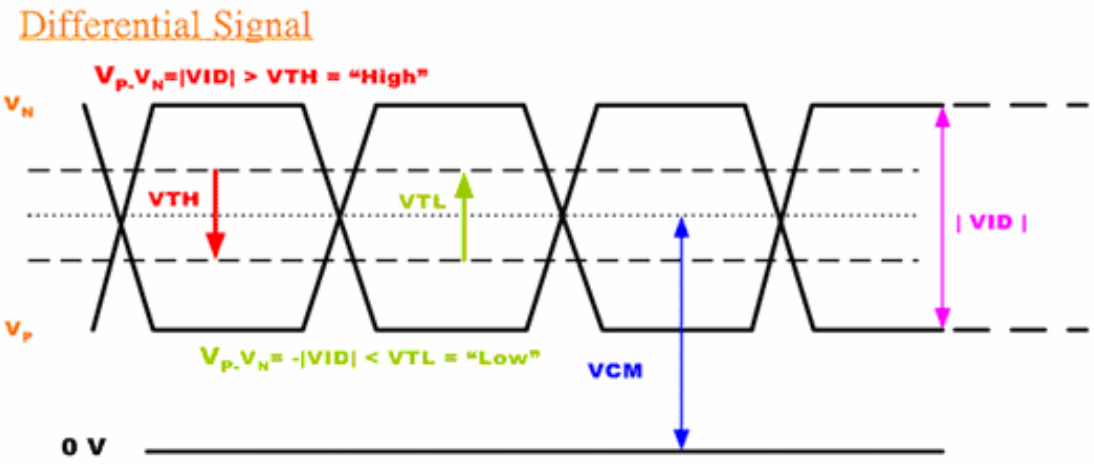
64 Gray pattern

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
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
| VID |	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.1		1.45	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.



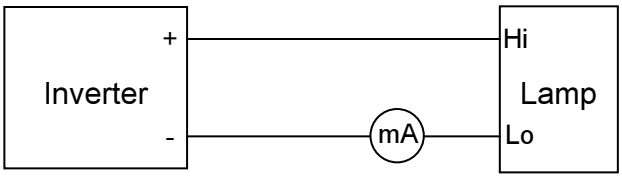
5.2 Backlight Unit

5.2.1 Parameter guideline for CCFL

Following characteristics are measured under a stable condition using an inverter at 25□ (Room Temperature):

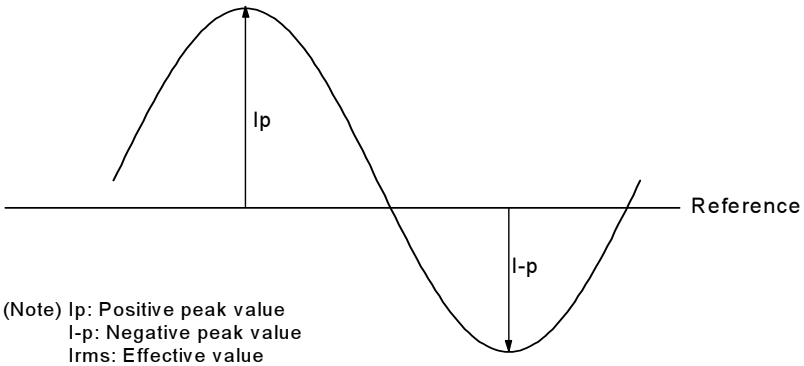
Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
IRCFL	CCFL operation range	3.5	8	8.5	[mA] rms	(Ta=25°C) Note 1
FCFL	CCFL Frequency	40	55	60	[KHz]	(Ta=25°C) Note 2
ViCFL (0°C) (reference)	CCFL Ignition Voltage	-	1080	1290	[Volt] rms	(Ta= 0°C)
ViCFL (25°C) (reference)	CCFL Ignition Voltage	-	860	1030	[Volt] rms	(Ta=25°C)
VCFL	CCFL Discharge Voltage	540	600	660	[Volt] rms	(Ta=25°C) Note 3 IRCFL=8mA VCFL = Typ±10%
PCFL	CCFL Power consumption (inverter excluded)	-	9.52	10.47	[Watt]	(Ta=25°C) Note 3 IRCFL=8mA
Lamp Life		30,000	-		Hrs	(Ta=25°C) Note 4 IRCFL = 8mA

Note 1: IRCFL is defined as the return current of an inverter. (In Figure. 1)



(Figure. 1: Measurement of return current)

A stable IRCFL is a current without flicker or biasing waveform provided by inverter that ensures the backlight perform to its specification. The ideal sine waveform should be symmetric in positive and negative polarities and the asymmetry rate of the inverter waveform should be below 10%.



(Note) Ip: Positive peak value
I-p: Negative peak value
Irms: Effective value

DC Bias = (| Ip – I-p| / Irms) x 100 % <10%

Crest Factor = Ip or (I-p) / Irms should have the range within 1.414 ± 10%

It is recommended to use the inverter with detection circuit (ie: balance and protection circuit) to avoid overvoltage, overcurrent, or mismatching waveform.

Note 2: CCFL frequency should be carefully determined to avoid interference between inverter and TFT LCD. Higher frequency will induce higher leakage current and further impact lamp life.

Note 3: Calculator value for reference (IRCFLxVCFLx2=PCFL).

Note 4: The definition of lamp life means when any of following conditions happen:

a) Luminance falls to 50% or less of the initial value.
b) Normal lighting is no more available (flickering, pink lighting, no lighting, etc.)
c) Lamp voltage or lighting start voltage exceeds the specified value.

Lamp life time shortens according to

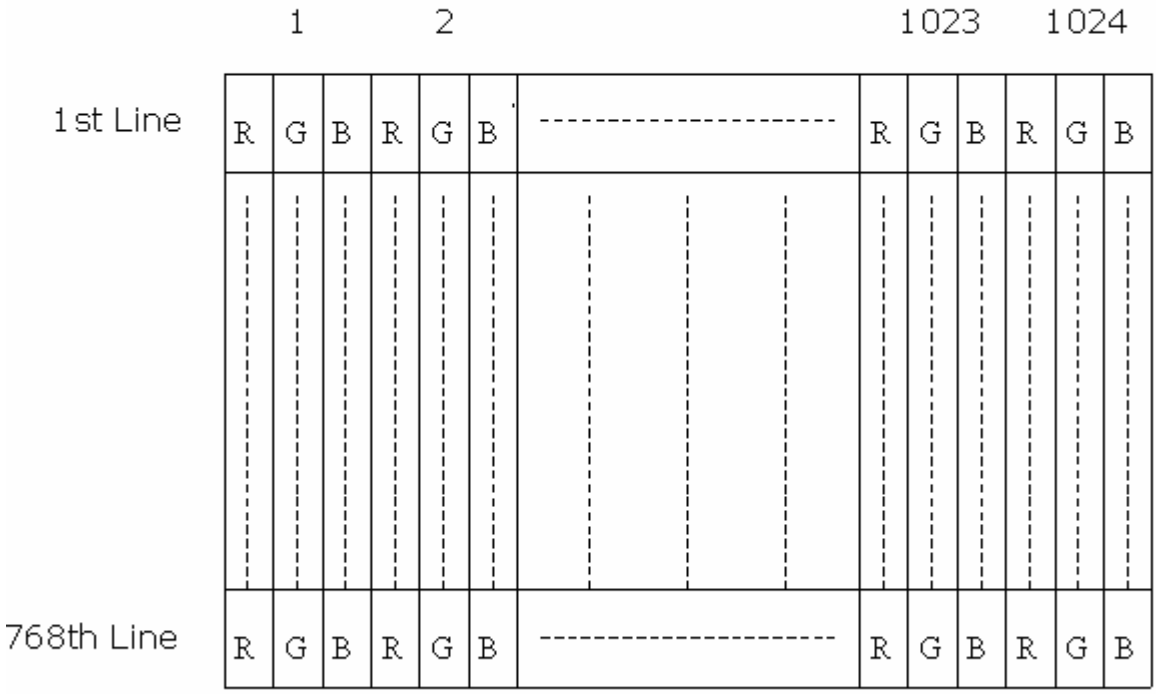
a) Placing methodology: mercury is unevenly distributed in portrait mounting
b) Environmental condition: low temperature reduces the presence of mercury vapor, which results in approximately lamp life of 1,000 hours
c) CCFL surface temperature: Presence of gradient in lamp surface temperature causes uneven mercury migration
d) Inverter design: its resonance capacitor should be fine-tuned according to the impedance of CCFL
e) Over driving current (> 8.5 mA) shortens lamp life time dramatically.

Note 5: The display is with dual lamp design, and the CCFL current in above table refers to each lamp

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.

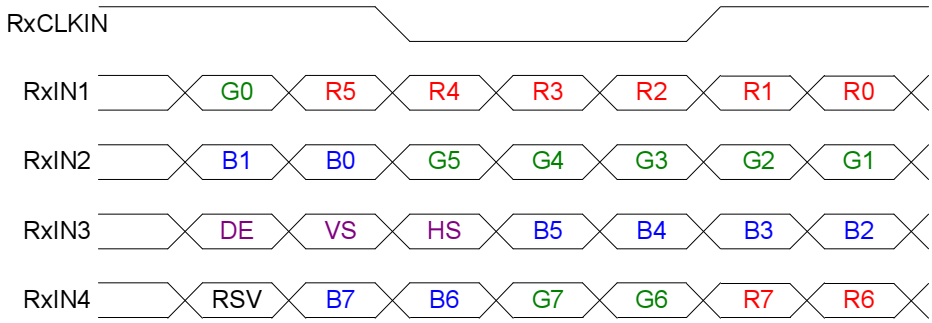


6.3 Signal Description

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.

3804-F20N-06R (E&T) / MSB240420E(STM)		
Pin No.	**Symbol**	**Description**
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	VSS	Ground
4	GND	Ground
5	Rin1-	- LVDS differential data input (R0-R5, G0)
6	Rin1+	+ LVDS differential data input (R0-R5, G0)
7	VSS	Ground
8	Rin2-	- LVDS differential data input (G1-G5, B0-B1)
9	Rin2+	+ LVDS differential data input (G1-G5, B0-B1)
10	VSS	Ground
11	Rin3-	- LVDS differential data input (B2-B5, HS, VS, DE)
12	Rin3+	+ LVDS differential data input (B2-B5, HS, VS, DE)
13	VSS	Ground
14	ClkIN-	- LVDS differential clock input
15	ClkIN+	+ LVDS differential clock input
16	GND	Ground
17	Rin4-	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
18	Rin4+	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
19	VSS	Ground
20	GND	Ground

6.4 The Input Data Format



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

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0	Red-pixel Data For 8Bits LVDS input MSB: R7 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0	Green-pixel Data For 8Bits LVDS input MSB: G7 ; LSB: G0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0	Blue-pixel Data For 8Bits LVDS input MSB: B7 ; LSB: B0
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.

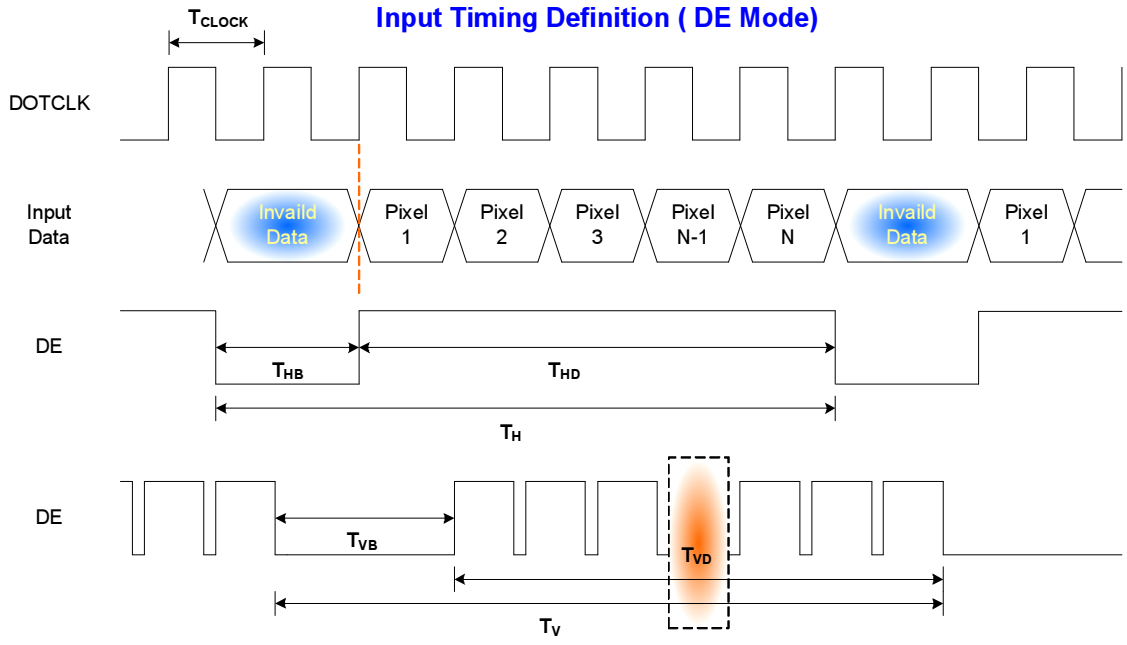
6.5 Interface Timing

6.5.1 Timing Characteristics

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock Timing	Clock frequency		1/ T_{Clock}	50	65	81	MHz
Vsync Timing	Vertical Section	Period	T_V	776	806	1024	T_{Line}
		Active	T_{VD}	768	768	768	
		Blanking	T_{VB}	15	38	200	
Hsync Timing	Horizontal Section	Period	T_H	1054	1344	2048	T_{Clock}
		Active	T_{HD}	1024	1024	1024	
		Blanking	T_{HB}	200	320	1000	

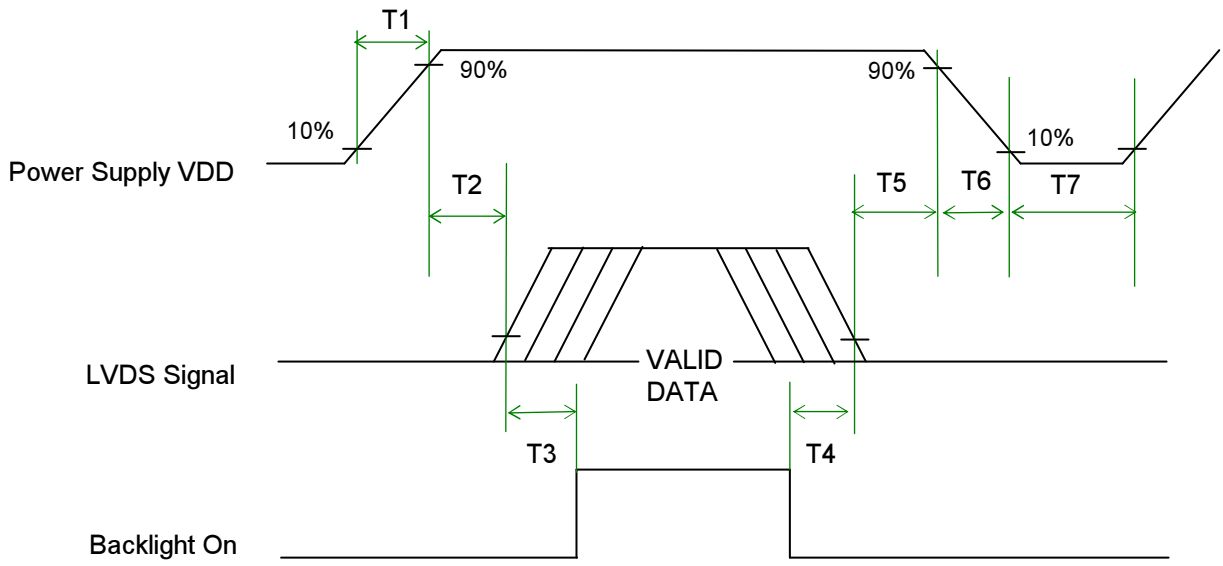
Note: DE mode.
Note : Typical value refer to VESA STANDARD

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
T7	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.

7. Connector & Pin Assignment

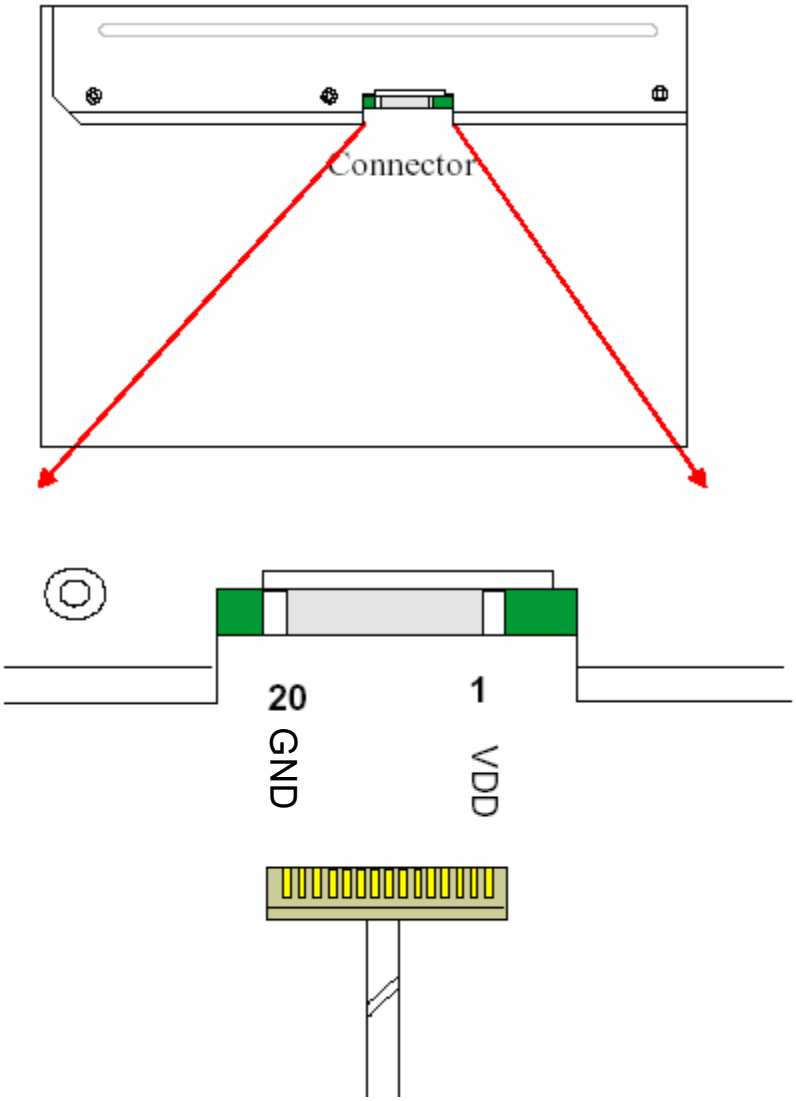
Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module: LVDS Connector

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

Pin#	Signal Name	Pin#	Signal Name
1	VDD	2	VDD
3	VSS	4	GND
5	Rin1-	6	Rin1+
7	VSS	8	Rin2-
9	Rin2+	10	VSS
11	Rin3-	12	Rin3+
13	VSS	14	ClkIN-
15	ClkIN+	16	GND
17	Rin4-	18	Rin4+
19	VSS	20	GND

7.1.1 Connector Illustration



7.2 Backlight Unit: Lamp Connector

Connector Name / Designation	Lamp Connector
Manufacturer	JST or compatible
Connector Model Number	JST BHR-03VS-1 or compatible
Mating Model Number	SM03B-BHS-1R

7.3 Lamp Connector Pin Assignment

Pin#	Symbol	Cable color	Signal Name
1	HV	Pink	Lamp High Voltage
2	NC	NC	No Connection
3	LV	White	Ground

- Cable length: 120 ± 5 mm
- Connector-output position: right side (front view)
- Lamp assembly design shall be easy for replacement and repair

8. Reliability Test Criteria

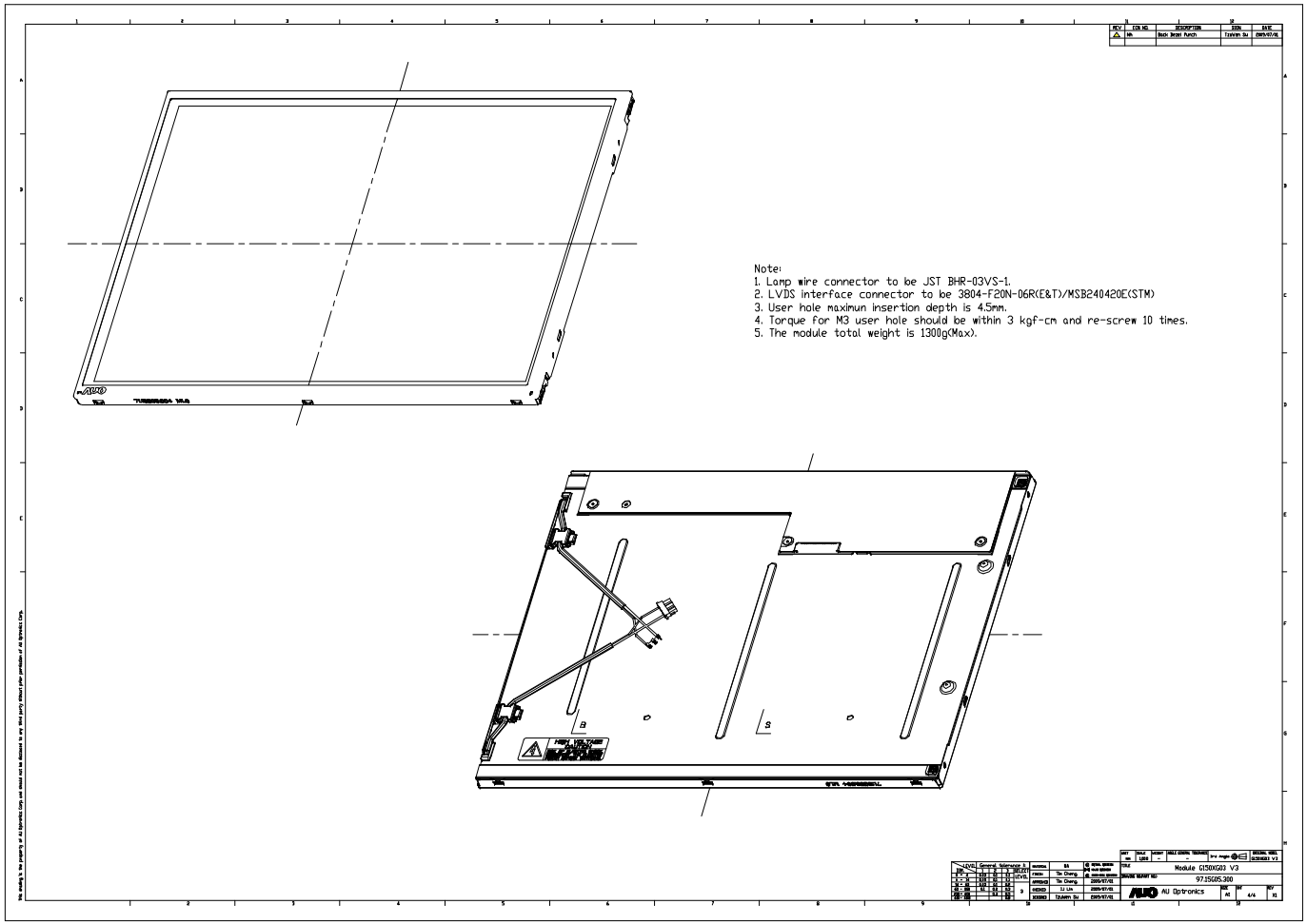
Items	Required Condition	Note
Temperature Humidity Bias	50□/80%,300 hours	
High Temperature Operation	60□,300 hours	
Low Temperature Operation	0□,300 hours	
Hot Storage	65□,300 hours	
Cold Storage	-20□,300 hours	
Thermal Shock Test	-20□/30 min ,60□/30 min ,100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine 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: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 1

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

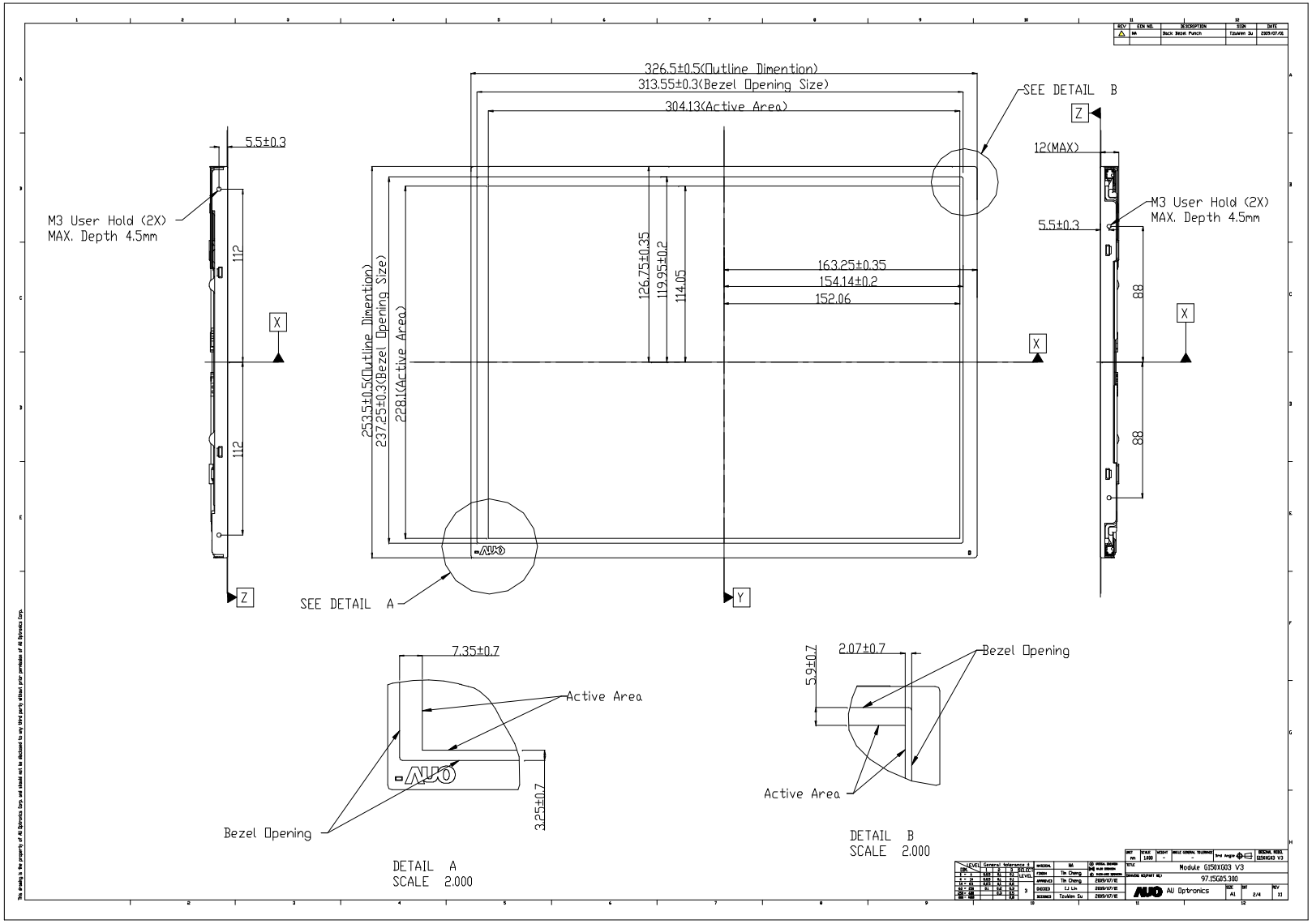
. Self-recoverable. No hardware failures.

9. Mechanical Characteristics

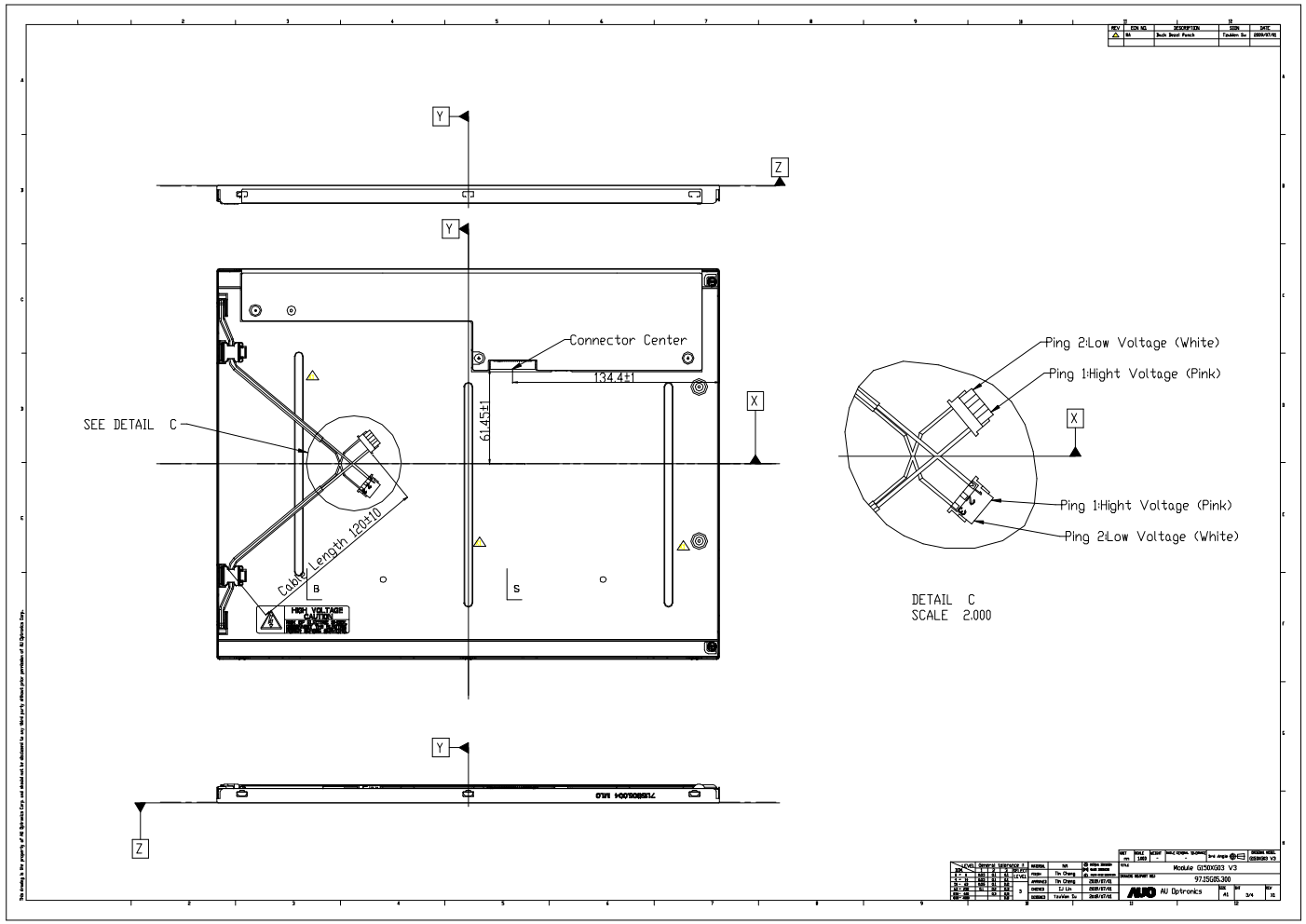
9.1 LCM Front View and Rear View



9.2 LCM Outline Dimension (Front View)

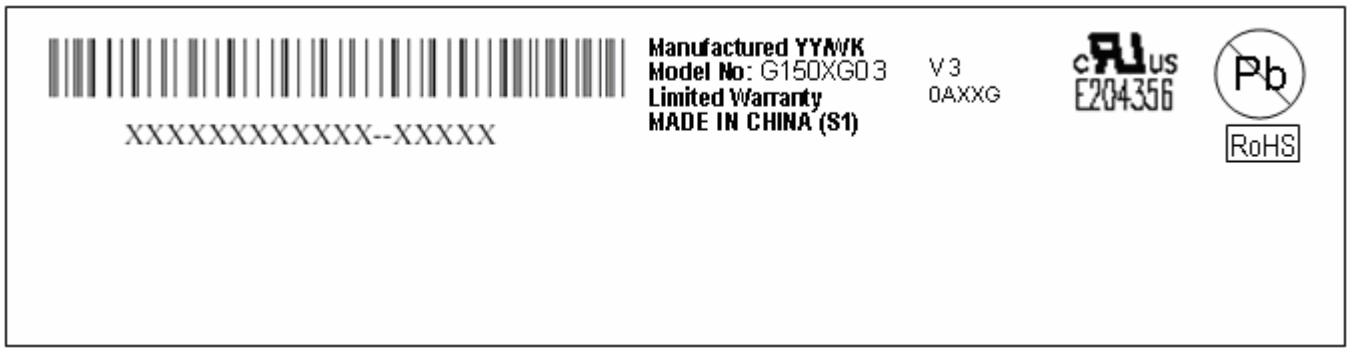


9.3 LCM Outline Dimension (Rear View)


Y
Z
Y
Connector Center
134.4±1
SEE DETAIL C
61.45±1
X
Cable Length 120±10
B
S
Y
Z
Ping 2:Low Voltage (White)
Ping 1:Hight Voltage (Pink)
X
Ping 1:Hight Voltage (Pink)
Ping 2:Low Voltage (White)
DETAIL C
SCALE 2.000
Module G150XG03 V3
97.15G05.300
AU Optronics

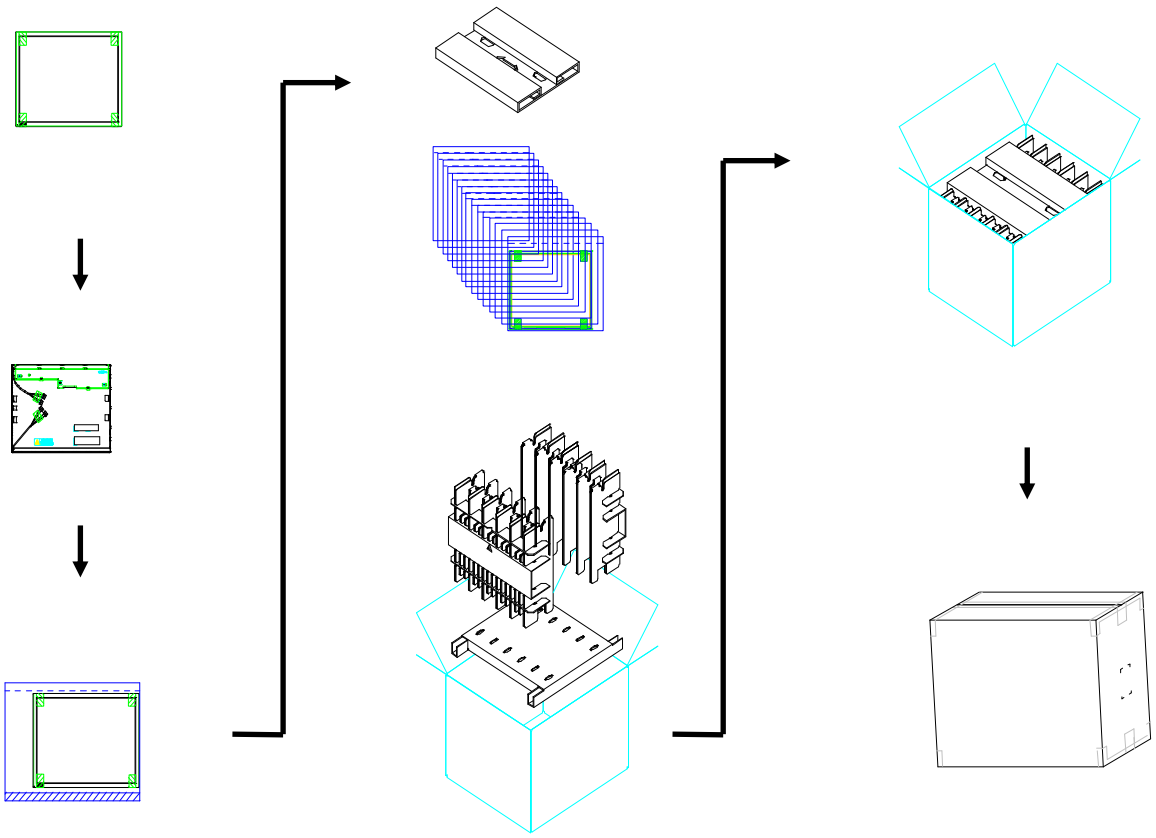
10. Label and Packaging

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



10.2 Carton Package

Max capacity: 15 TFT-LCD module per carton (15pcs * 1 layers)
Max weight: 20 kg per carton
Outside dimension of carton: 375(L)mm* 430(W)mm* 360(H)mm



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 1950, First Edition	U.S.A. Information Technology Equipment