() Preliminary Specification
(V) Final Specification

Module	15" XGA TFT-LCD Module
Model Name	G150XVN01.0

Customer	Date

Approved by

Note: This Specification is subject to change without notice.

Checked & Approved by	Date

Vito Huang 02/25/2014

Prepared by	Date

Vivian Huang 02/25/2014

Audio-Video Display Business Unit /
AU Optronics corporation

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Record of Revision

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1. Handling 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) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
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 light bar edge. Instead, press at the far ends of the LED light bar 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 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
14) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) 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

G150XVN01.0 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, a driver circuit, and a backlight system. The screen format is intended to support the XGA (1024(H) x 768(V)) screen and 16.2M colors. All input signal is one channel LVDS interface.

2.1 Display Characteristics

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

| Items	Unit	Specifications
Screen Diagonal	[inch]	15.0"
Active Area	[mm]	304.128 (H) x 228.096 (V)
Pixels H x V		1024 x 768
Pixel Pitch	[mm]	0.297 (per one triad) x 0.297
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		VA, Normally Black
White Luminance	[cd/m^2]	300 (center, Typ)
Contrast Ratio		1500 : 1 (Typ)
Optical ResponseTime	[msec]	35 (Typ, on/off)
Nominal Input Voltage VDD	[Volt]	+3.3
Power Consumption	[Watt]	15 (Typ)
Weight	[Grams]	950 (Max)
Physical Size (H x V x D)	[mm]	326.5 (H) x 253.5 (V) x 9.6(D) (Typ)
Electrical Interface		one channel LVDS
Surface Treatment		Hard-coating (3H), Anti-Glare treatment
Support Color		16.2M / 262K colors

Temperature Range
    Operating
    Storage (Non-Operating)
	[^{o}C]
	[^{o}C]
		-10 to +70 (Tgs)
		-30 to +70 (Ta)

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
Viewing Angle	[degree]	Horizontal　　(Right) CR = 10　　(Left)		80 80	89 89	- 	1
		Vertical　　(Up) CR = 10　　(Down)		80 80	89 89	- 	
Contrast Ratio		Normal Direction		900	1500	-	
Optical Response Time	[msec]	Raising Time (TrR)		-	20	-	2
		Falling Time (TrF)		-	15	-	
		Rising + Falling		-	35	-	
Color / Chromaticity Coordinates (CIE)		Red x		0.585	0.635	0.685	
		Red y		0.295	0.345	0.395	
		Green x		0.268	0.318	0.368	
		Green y		0.575	0.625	0.675	
		Blue x		0.100	0.150	0.200	
		Blue y		0.019	0.069	0.119	
		White x		0.250	0.300	0.350	
		White y		0.275	0.325	0.375	
Central Luminance	[cd/m^2]			240	300	-	3
Luminance Uniformity	[%]	5 Points		75	-	-	4,5
NTSC	%			-	72	-	

Optical Equipment: BM-5A, BM-7, PR880, or equivalent

Note 1: Definition of viewing angle

Viewing angle is the measurement of contrast ratio 10, or 5, 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 follows; 90° ( ) horizontal left and right and 90° ( ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.
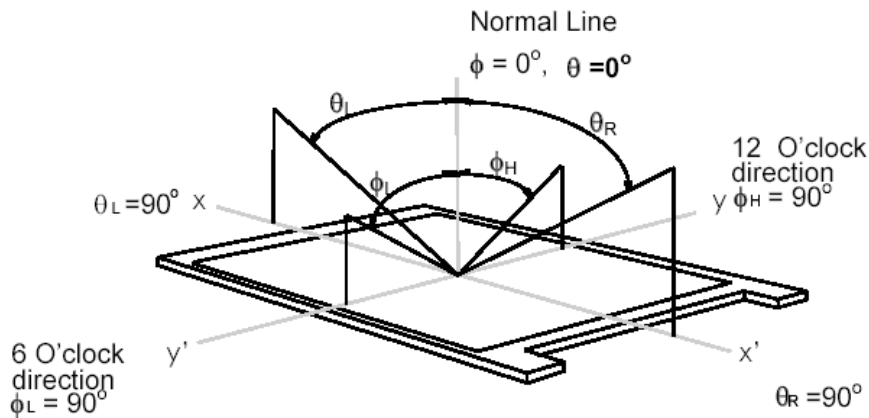

Note 2: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to "Full Black" (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.
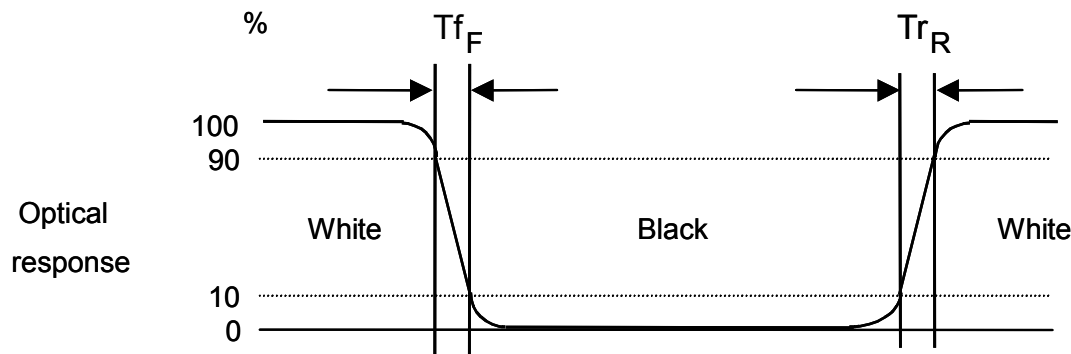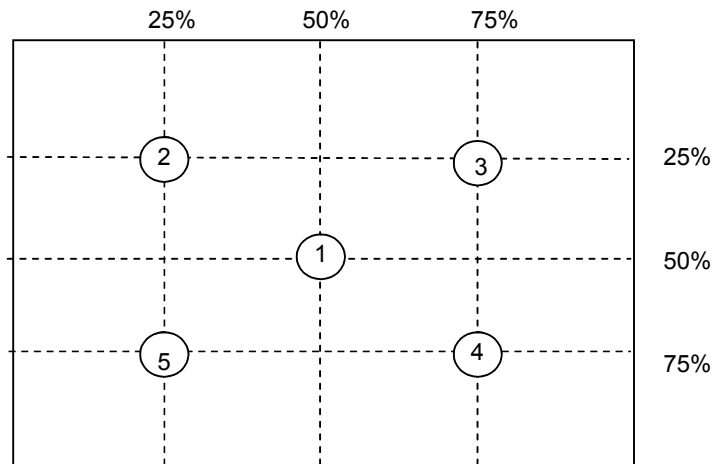
Note 3: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.

Photo detector

Field=1

50 cm

LCD Panel

TFT-LCD

Center of the screen
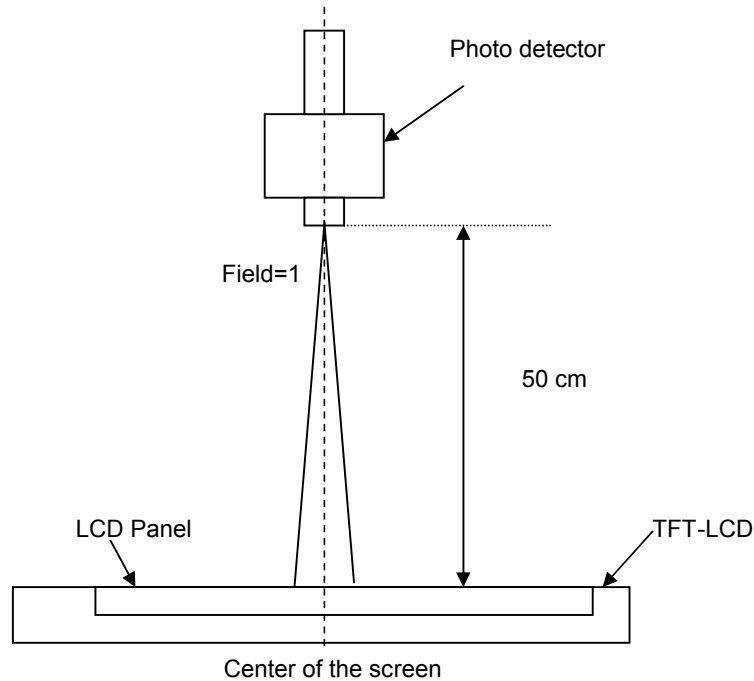
Note 4: 5 points position

25%   50%   75%

25%

2   3

1   50%

5   4   75%

Note 5:

$$Uniformity = \frac{Minimum\ Luminance\ in\ 5\ points\ (1\text{-}5)}{Maximum\ Luminance\ in\ 5\ Points\ (1\text{-}5)}$$

3. Functional Block Diagram

The following diagram shows the functional block of the 15.0 inches wide Color TFT-LCD Module:
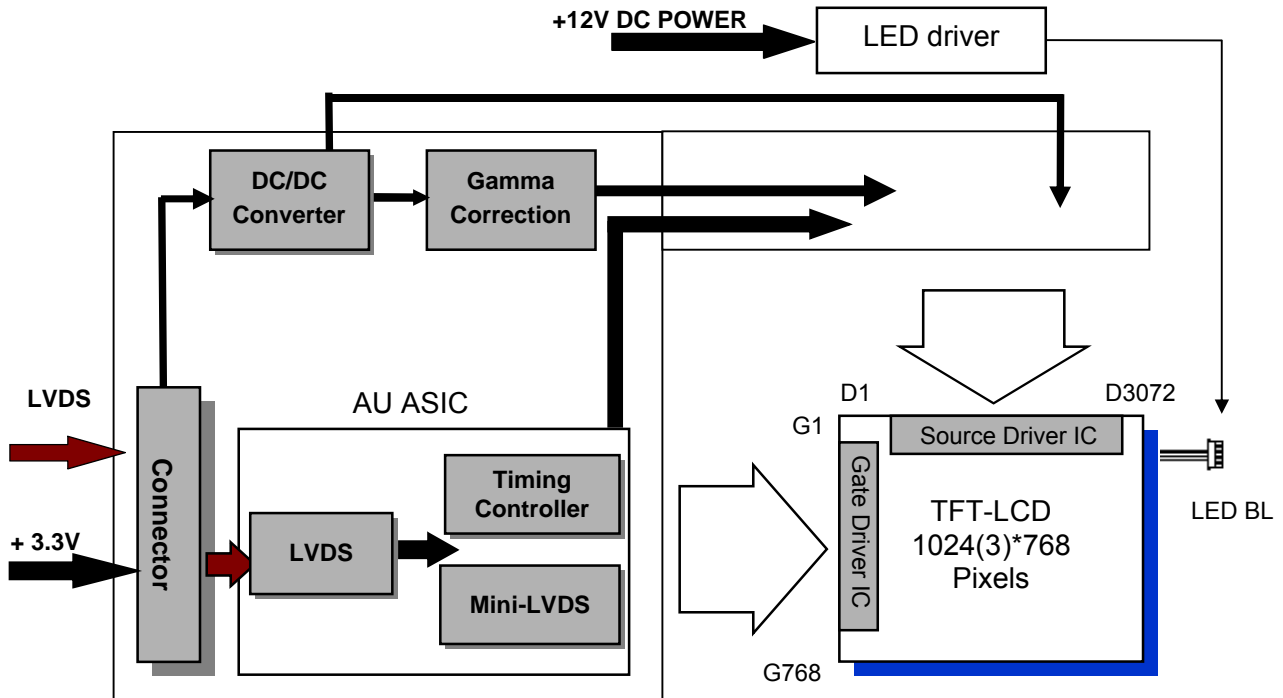
4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+4.0	[Volt]	Note 1,2

4.2 Absolute Ratings of Environment

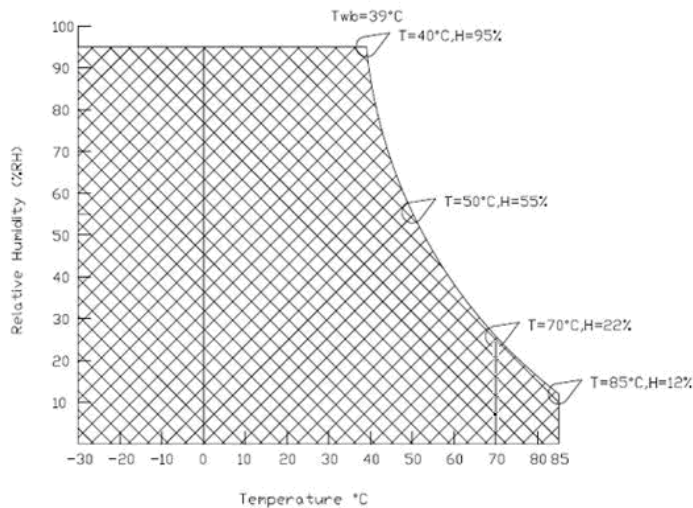| Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature (Tgs)	TOP	-10	+70	[^{o}C]	Note 3
Operation Humidity	HOP	5	95	[%RH]	Note 3
Storage Temperature (Ta)	TST	-30	+70	[^{o}C]	
Storage Humidity	HST	5	95	[%RH]	

Note 1: With in Ta (25)
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.

        1. 95% RH Max (Ta   39   )
        2. Max wet-bulb temperature at 39   or less. (Ta   39   )
        3. No condensation
Note 4: Function Judged only

5. Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	+/-10%
IDD	Input Current	-	530	700	[mA]	VDD= 3.3V, All White Pattern At 60Hz,
PDD	VDD Power	-	1.75	-	[Watt]	VDD= 3.3V, All White Pattern At 60Hz
IRush	Inrush Current	-	-	2	[A]	Note 1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	500	[mV] p-p	VDD= 3.3V, All White Pattern At 60Hz

Note 1: Measurement conditions:

The duration of rising time of power input is 500us.

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.
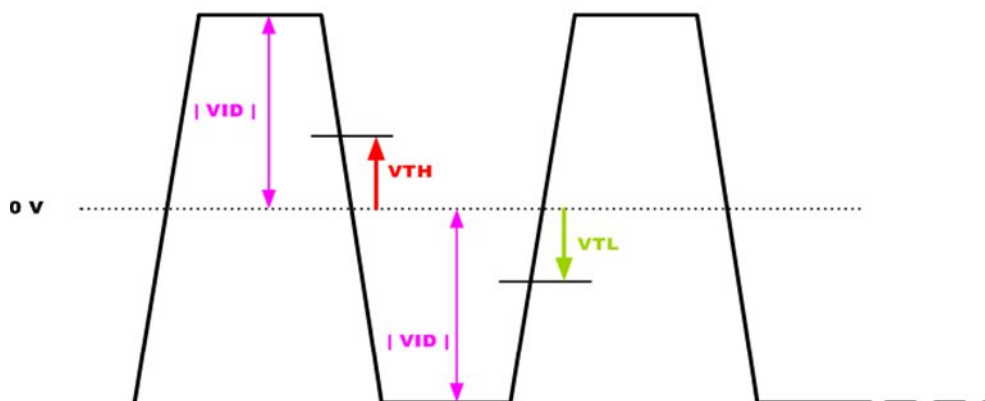
Each signal characteristics are as follows;

Symbol	Parameter	Min	Typ	Max	Units	Condition
V_{TH}	Differential Input High Threshold	-	-	+100	[mV]	V_{CM} = 1.2V Note 1
V_{TL}	Differential Input Low Threshold	-100	-	-	[mV]	V_{CM} = 1.2V Note 1
V_{ID}	Input Differential Voltage	100	400	600	[mV]	Note 1
V_{CM}	Differential Input Common Mode Voltage	+1.1	-	+1.45	[V]	V_{TH}-V_{TL} = 200mV (max) Note 1

Note1: LVDS Signal Waveform
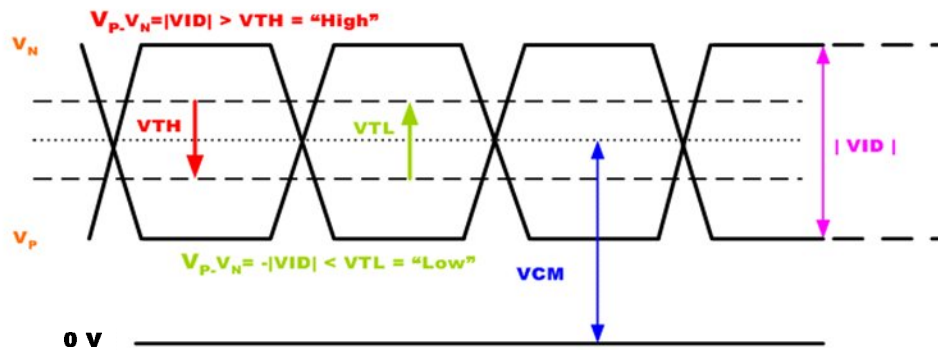
5.1.3 Backlight unit

Parameter guideline for LED driving is under stable conditions at 25　(Room Temperature):

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VCC	Input Voltage	10.8	12	13.2	[Volt]	
ICC	Input Current	-	1.1	1.3	[A]	100% PWM Duty
PCC	Power Consumption	-	13.2	-	[Watt]	100% PWM Duty
F$_{PWM}$	Dimming Frequency	200	-	20K	[Hz]	
	Swing Voltage	3	3.3	5	[Volt]	
	Dimming duty cycle	5	-	100	%	
I$_F$	LED Forward Current	-	110	-	[mA]	Ta = 25℃
V$_F$	LED Forward Voltage	-	3.2	3.6	[Volt]	I$_F$ = 110mA, Ta = 25℃
P$_{LED}$	LED Power Consumption	-	11.264	12.672	[Watt]	I$_F$ = 110mA, Ta = 25℃
LED Life Time		-	50,000	-	Hrs	I$_F$= 110mA, Ta= 25℃

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

Note 2: VCC, ICC, PCC are defined for LED backlight.(100% duty of PWM dimming)

Note 3: I$_F$, V$_F$ are defined for one channel LED. There are four LED channels in back light unit.

Note 4: If G150XVN01.0 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 5: Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

Note 6: LED lifetime is definition: brightness is decreased to 50% of the initial value. LED lifetime is restricted under normal condition, ambient temperature = 25　and LED operating IF = 110mA.
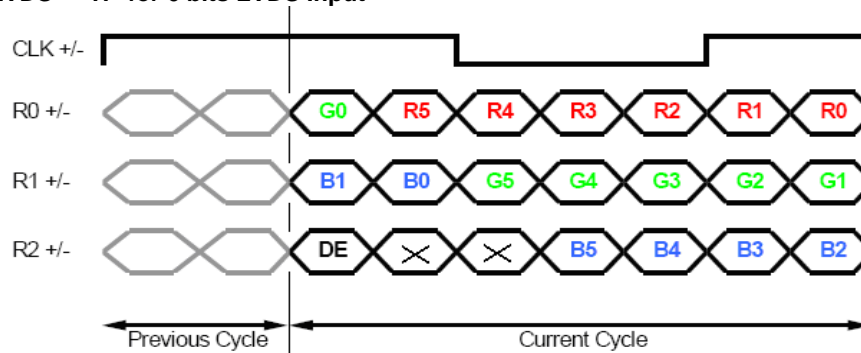
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.
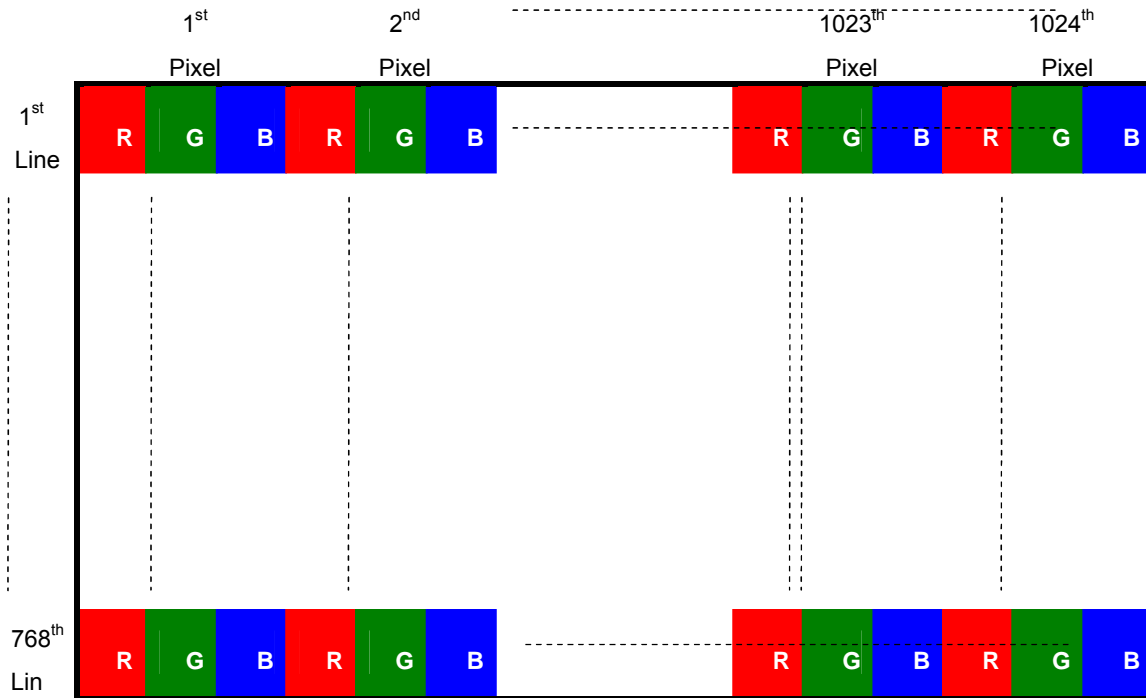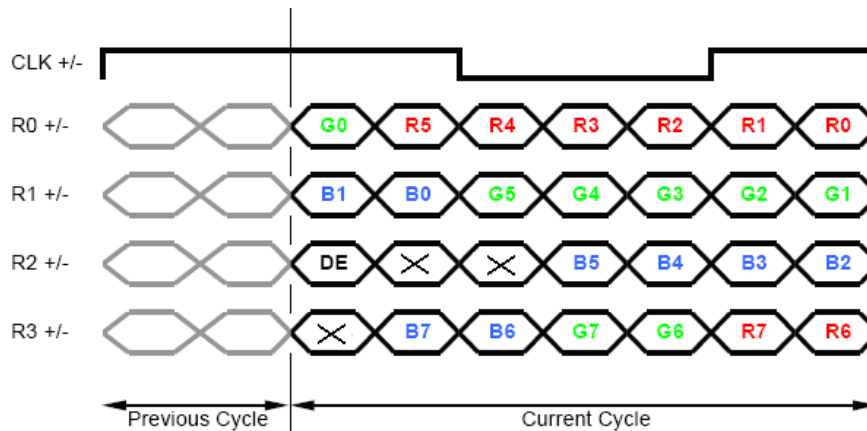
6.2 The Input Data Format

SEL LVDS = "H" for 6 bits LVDS Input

SEL LVDS = "L" or NC for 8 bits LVDS Input


Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB,   R/G/B data 0:LSB (8bits LVDS input)

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
DF14H-30P-1.25H (HIROSE)		
1	GND	Ground
2	GND	Ground
3	VCC	LED BL Power Supply, 12V
4	VCC	LED BL Power Supply, 12V
5	GND	Ground
6	On/Off	LED BL On/Off (3.3-5V:On, 0V:Off)
7	PWM	LED BL PWM dimming
8	GND	Ground
9	VDD	LCD Power Supply, 3.3V
10	VDD	LCD Power Supply, 3.3V
11	GND	Ground
12	GND	Ground
13	Rin0-	- LVDS differential data input (R0-R5, G0)
14	Rin0+	+ LVDS differential data input (R0-R5, G0)
15	GND	Ground
16	Rin1-	- LVDS differential data input (G1-G5, B0-B1)
17	Rin1+	+ LVDS differential data input (G1-G5, B0-B1)
18	GND	Ground
19	Rin2-	- LVDS differential data input (B2-B5, HS, VS, DE)
20	Rin2+	+ LVDS differential data input (B2-B5, HS, VS, DE)
21	GND	Ground
22	ClkIN-	- LVDS differential clock input
23	ClkIN+	+ LVDS differential clock input
24	GND	Ground
25	Rin3-	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
26	Rin3+	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
27	GND	Ground
28	RL/UD	H: 180 degree rotation/ L: Normal mode
29	SEL LVDS	L : 8 bit / H : 6bit
30	GND	Ground (Note 1)

Note1: Start from left side
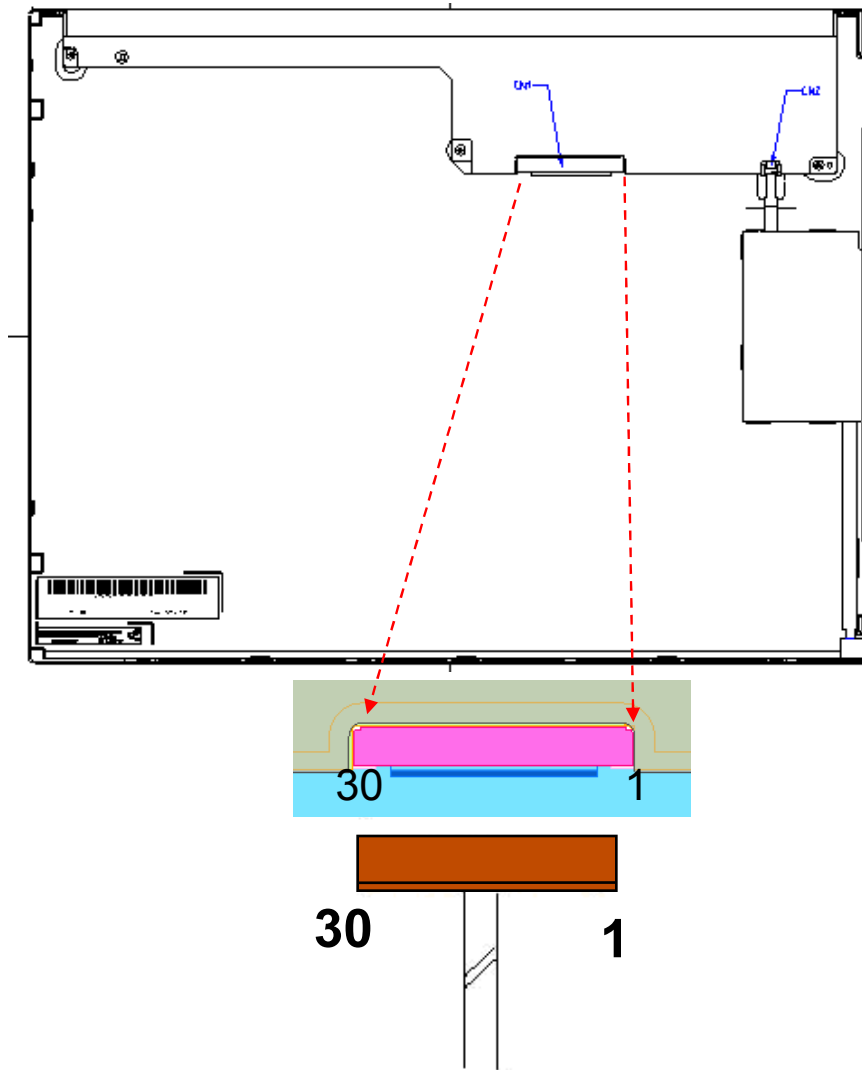
6.4 Interface Timing

6.4.1 Timing Characteristics

| Signal	Item	Symbol	Min	Typ	Max	Unit
Vertical Section	Period	Tv	776	-	1023	Th
	Active	Tdisp(v)	768	768	768	Th
	Blanking	Tbp(v)+Tfp(v)+PWvs	8	-	255	Th
Horizontal Section	Period	Th	1064	-	2047	Tclk
	Active	Tdisp(h)	1024	1024	1024	Tclk
	Blanking	Tbp(h)+Tfp(h)+PWhs	40	-	1023	Tclk
Clock	Frequency	Freq.	50	65	81	MHz
Frame Rate	Frequency	1/Tv	50	60	75	Hz

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

6.4.2 Timing Diagram
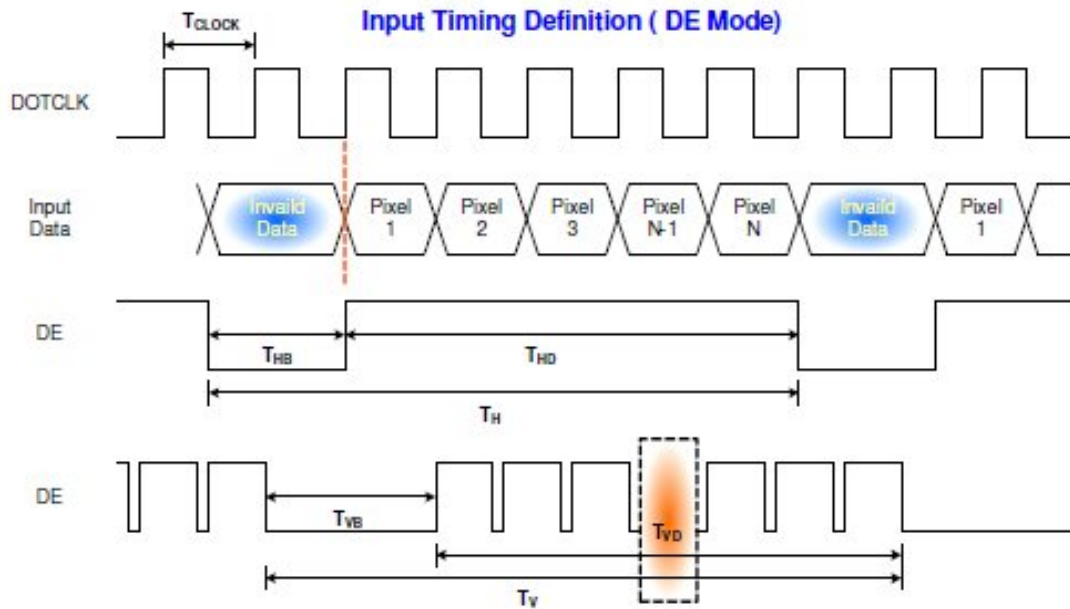
6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence are as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.
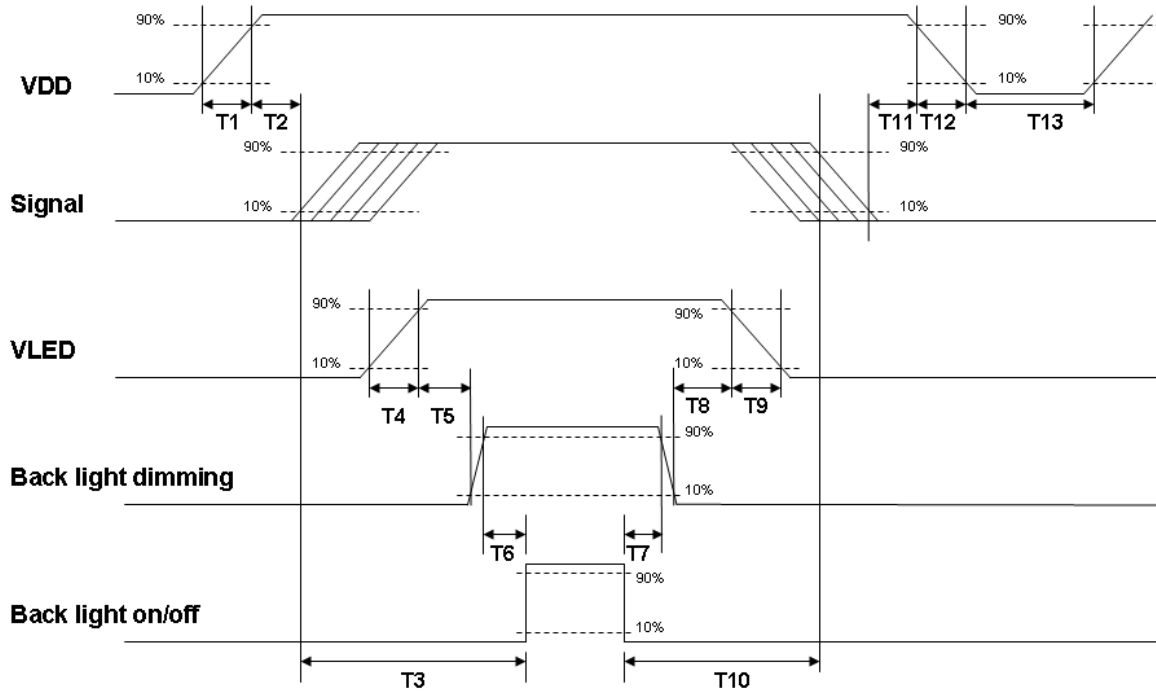
Parameter	Value			Unit
	Min.	**Typ.**	**Max.**	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	220	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	100	-	-	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

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 Connector

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	HIROSE
Type Part Number	HRS DF14H-30P-1.25H
Mating Housing Part Number	HRS DF14-30S-1.25C

7.2 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	GND	16	Rin1-
2	GND	17	Rin1+
3	VCC	18	GND
4	VCC	19	Rin2-
5	GND	20	Rin2+
6	On/Off	21	GND
7	PWM	22	ClkIN-
8	GND	23	ClkIN+
9	VDD	24	GND
10	VDD	25	Rin3-
11	GND	26	Rin3+
12	GND	27	GND
13	Rin0-	28	RL/UD
14	Rin0+	29	SEL LVDS
15	GND	30	GND

8. Reliability Test

Environment test conditions are listed as following table.

| No.	Test items	Conditions	Remark
1	High temperature storage	Ta= 70 240Hrs	
2	Low temperature storage	Ta= -30 240Hrs	
3	High temperature operation	Tgs= 70 240Hrs	
4	Low temperature operation	Ta= -10 240Hrs	
5	High temperature and high humidity	Ta= 40 , 95% RH 240Hrs	
6	Thermal shock	-30 /30min, 70 /30min, 50 cycles	
7	Vibration	Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 - 10 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
8	Mechanical shock	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
9	Vibration (with carton)	Random vibration: 0.015G2/Hz from 5~200Hz –6dB/octave from 200~500Hz	
10	Electro Static discharge (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.

Note2:

- Water condensation is not allowed for each test items.

- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.

- The reliability test is performed only to examine the TFT-LCD module capability.

- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.
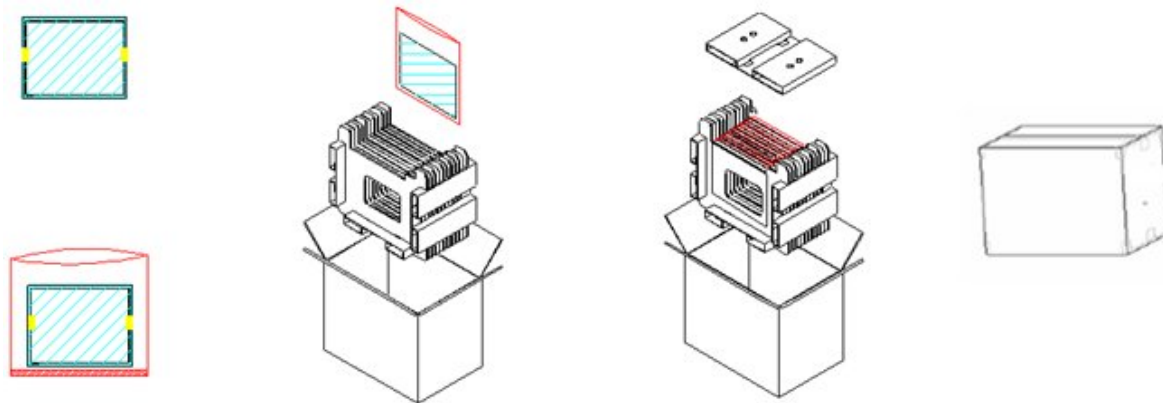
- No function failure occurs.

9. Shipping Label
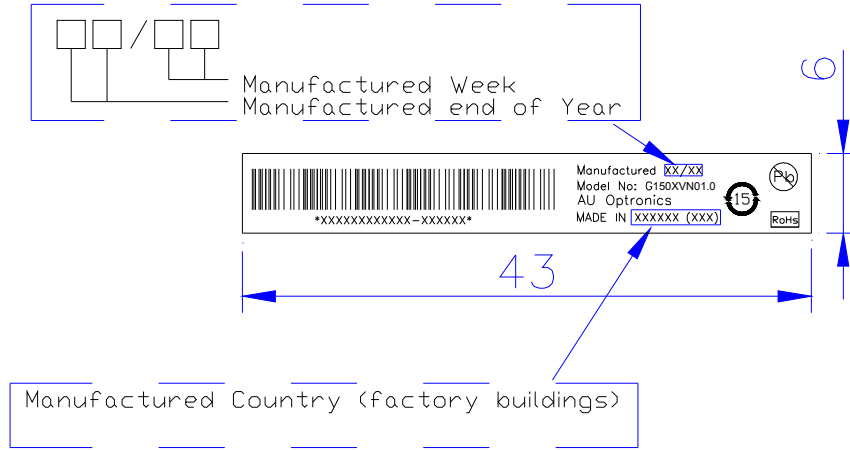
Unit: mm

10. Packing Form

10.1 Packaging Material

FILM PROTECT
BAG ANTI-STATIC
TAPE
TAPE CREPED PAPER
PACKING CARTON
LABEL SPEC
LABEL CARTON.
CUSHION PACKING

10.2 Packing Instruction

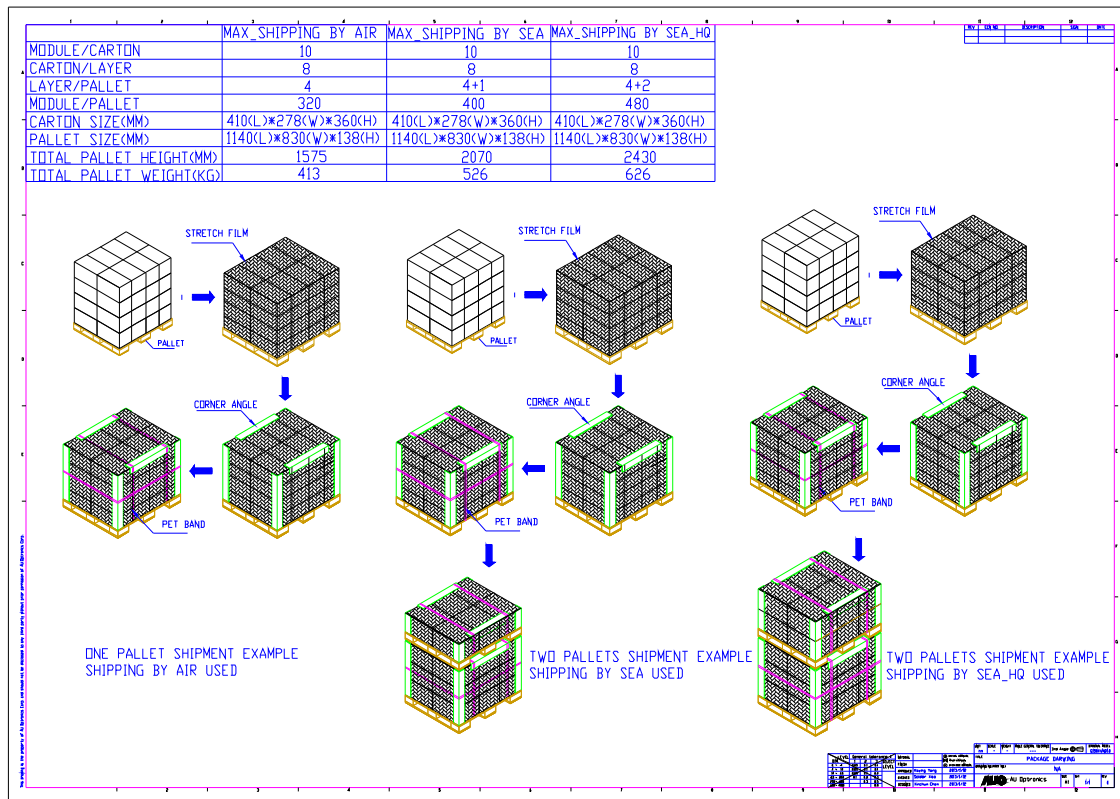

Max capacity   10 TFT-LCD module per carton

Max weight: 12.5 kg per carton

Outside dimension of carton: 410mm(L)* 278mm(W)*360mm(H)

Pallet size   1140 mm * 830 mm * 135mm

10.3 Palletizing

	MAX_SHIPPING BY AIR	MAX_SHIPPING BY SEA	MAX_SHIPPING BY SEA_HQ
MODULE/CARTON	10	10	10
CARTON/LAYER	8	8	8
LAYER/PALLET	4	4+1	4+2
MODULE/PALLET	320	400	480
CARTON SIZE(MM)	410(L)*278(W)*360(H)	410(L)*278(W)*360(H)	410(L)*278(W)*360(H)
PALLET SIZE(MM)	1140(L)*830(W)*138(H)	1140(L)*830(W)*138(H)	1140(L)*830(W)*138(H)
TOTAL PALLET HEIGHT(MM)	1575	2070	2430
TOTAL PALLET WEIGHT(KG)	413	526	626

Module by air_Max   (2 *4) *4 layers   one pallet put 32 boxes   total 320pcs module

Module by sea_Max   (2 *4) *4 layers + (2 *4) *1 layers , two pallet put 40 boxes   total 400pcs module

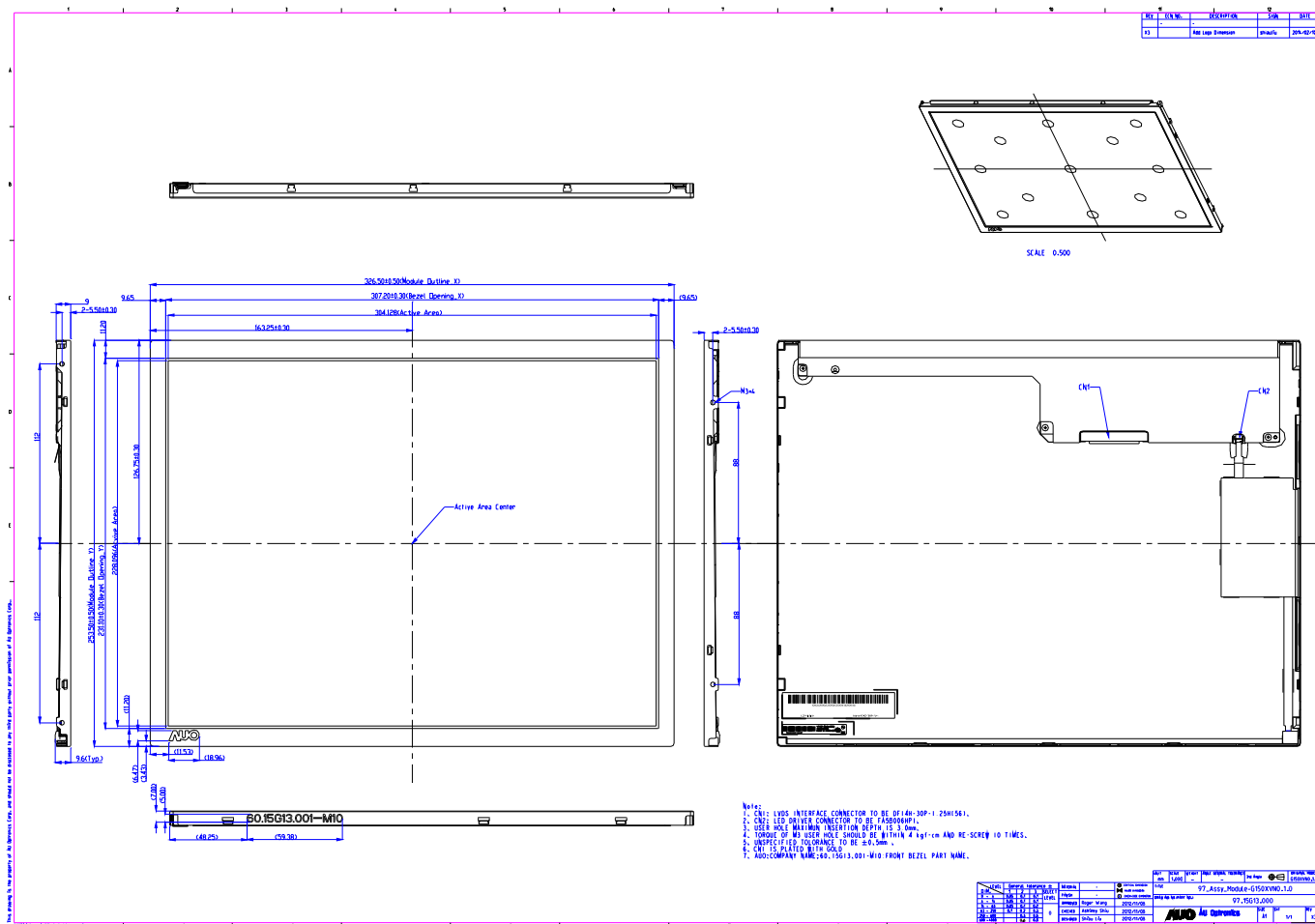Module by sea_HQ_Max   (2 *4) *4 layers+(2 *4) *2 layers, two pallet put 48 boxes, total 480pcs module

11. Outline Drawing

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