



Product Specification

A190EN02 V0

AU OPTRONICS CORPORATION

() Preliminary Specification
(V) Final Specification

Module	19.0" SXGA Color TFT-LCD
Model Name	A190EN02 V0

Customer	Date
_____	_____
Approved by	
_____	_____
Note: This Specification is subject to change without notice.	

Checked & Approved by	Date
_____	_____
Prepared by	
_____	_____
Audio Video Business Group / AU Optronics corporation	

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Record of Revision

Version & Date	Page	Old Description	New Description
0.0 2008/01/31	All	First Edition for Customer	
0.1 2008/02/20	10	---	Update drawing of function block
	20	TFT-LCD connector information	TBD
	21	BLU connector information	TBD
0.2 2008/04/20	6	Temperature Range	Temperature Range (Ta)
	7	Luminance Uniformity:--	Luminance Uniformity 13 point: 75%, 80%
		Min. of Brightness:--	Min. of Brightness: 270
	8	---	Add drawing of note 2
	9	---	Add the definition of note 3
		---	Update the drawing in note 4
		Pin 26: NC	Pin 26: VSS, power ground
	14	CCFL Life Time: 40,000	CCFL Life Time: 30,000, add note 2
	21	---	Add information of TFT connector
		Pin 26: NC	Pin 26: VSS
22	---	Add information of BLU connector	
24	---	Add Packing Form	
25~27	Mechanical drawing	Updated	
0.3 2008/06/17	5	---	Update General Description
	22	Connector type part number: 2 PIN BHSR-02VS-1	Connector type part number: 2 PIN BHSR-02VS-1 (N)
	24	Shipping label	Added
	25	Packing Form	Updated
	26~28	Outline drawing	Updated
0.4 2008/06/24	22	Mating Type Part Number 2 PIN BHSR-02VS-1 (N)	Mating Housing Part Number BHSR-02VS-1 (N)
		7.2 title	Updated
	25	Packing Form	Removed
25~27	Outline Drawing	Updated	
0.5 2008/06//30	21,22	Mating Housing Part Number	Mating Type Part Number
	21	MDF76TW-30S-1H (58)	MDF76TW-30S-1H
	25~27	Outline Drawing	Updated



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0.6 2008/07/16	25 26, 28	Shipping Label Outline Drawing	Update Drawing Updated

1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention 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 other soft cloth.
- 5) Since the panel is made of glass, it may break or crack 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 or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the Cold Cathode Fluorescent Lamp (CCFL) reflector edge. Instead, press at the far ends of the CCFL 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, 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 (CCFL) 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 CCFL in it is supplied by Limited Current Circuit (IEC60950 or UL1950). Do not connect the CCFL in Hazardous Voltage Circuit.



2. General Description

A190EN0X V0 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 SXGA (1280(H) x 1024(V)) screen and 16.7M colors (RGB 6-bits + HiFRC data). All input signals are LVDS interface compatible. Inverter card of backlight is not included.

2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[mm]	482.6 (19.0")
Active Area	[mm]	376.32 (H) x 301.06 (V)
Pixels H x V		1280(x3) x 1024
Pixel Pitch	[mm]	0.294 (per one triad) x 0.294
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally White
White Luminance	[cd/m ²]	350 (Typ.)
Contrast Ratio		1000 : 1 (Typ)
Optical ResponseTime	[msec]	5 ms (Typ, on/off)
Nominal Input Voltage VDD	[Volt]	+5.0 V
Power Consumption	[Watt]	24.71W (Typ) (PDD=5.11W, PCFL=19.6 W @Lamp=7.5mA)
Weight	[Grams]	2000 (Typ)
Physical Size (H x V x D)	[mm]	396 (H) x 324 (V) x 16.3 (D) (Typ)
Electrical Interface		Dual channel LVDS
Surface Treatment		Hard-coating (3H), Glare treatment
Support Color		16.7M colors (RGB 6-bit data + HiFRC data)
Temperature Range (Ta)		
Operating	[°C]	0 to +60
Storage (Non-Operating)	[°C]	-20 to +60
RoHS Compliance		RoHS Compliance



2.2 Optical Characteristics

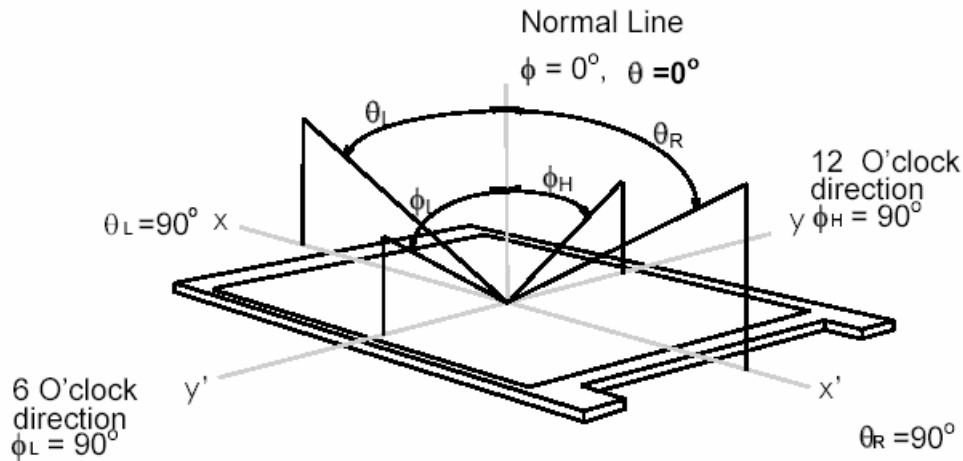
The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	70 70	80 80	-	1
		Vertical (Up) CR = 10 (Down)	70 70	80 80	-	
Luminance Uniformity	[%]	13 Points	75	80	-	2, 3
Optical Response Time	[msec]	Rising	-	3.6	5.7	4, 5
		Falling	-	1.4	2.3	
		Rising + Falling	-	5	8	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.617	0.647	0.677	4
		Red y	0.310	0.340	0.370	
		Green x	0.258	0.288	0.318	
		Green y	0.575	0.605	0.635	
		Blue x	0.115	0.145	0.175	
		Blue y	0.041	0.071	0.101	
White x		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
White Luminance (At CCFL= 7.5mA)	[cd/m ²]		270	350	-	4
Contrast Ratio			600	1000	-	4

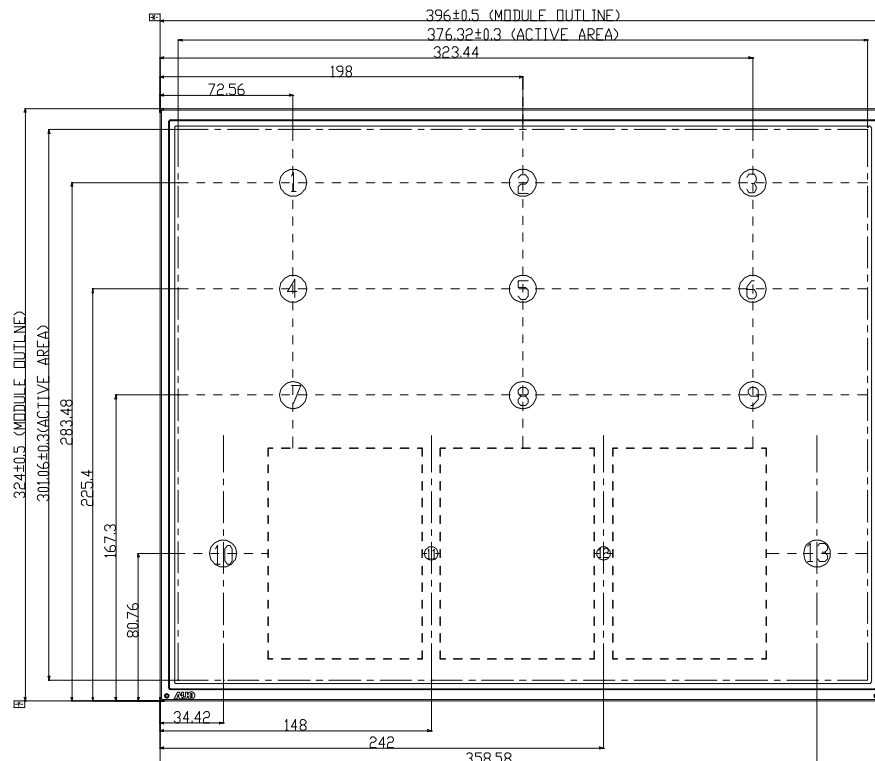
Optical Equipment: BM-5A, BM-7, PR880, or equivalent

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° (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 about its center to develop the desired measurement viewing angle.



Note 2: 13 points position

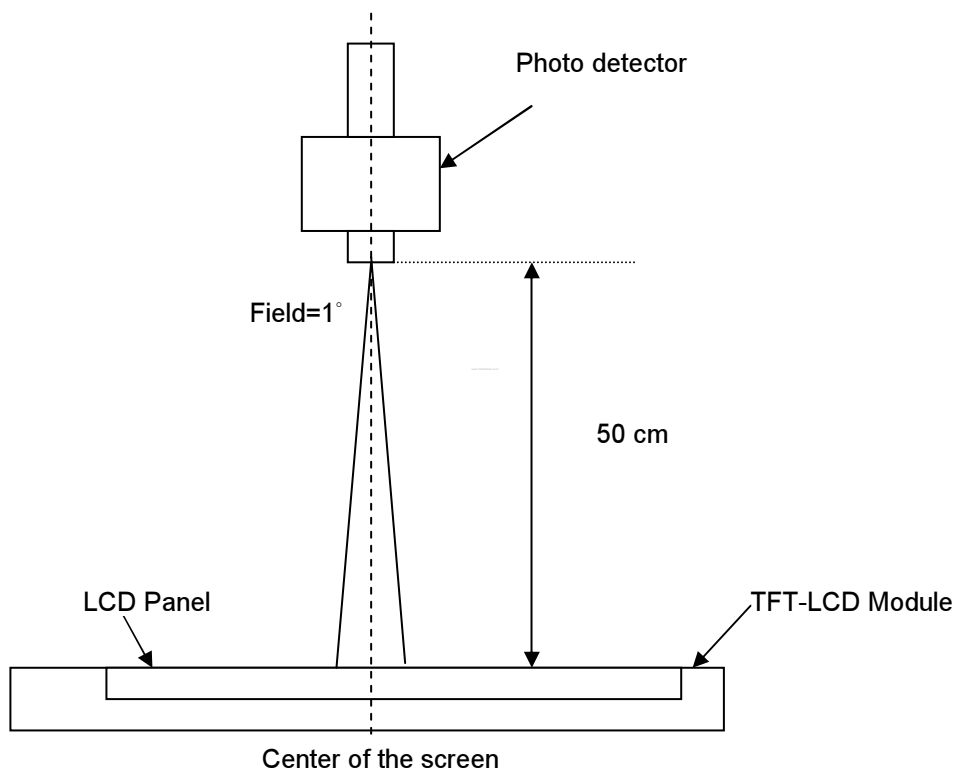


Note 3:

$$\delta_{W13} = \frac{\text{Minimum Luminance of 13 points}}{\text{Maximum Luminance of 13 points}}$$

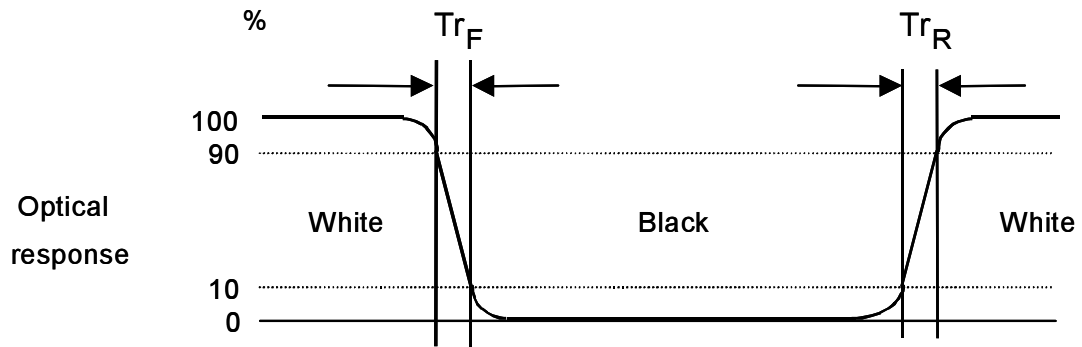
Note 4: Measurement method

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.



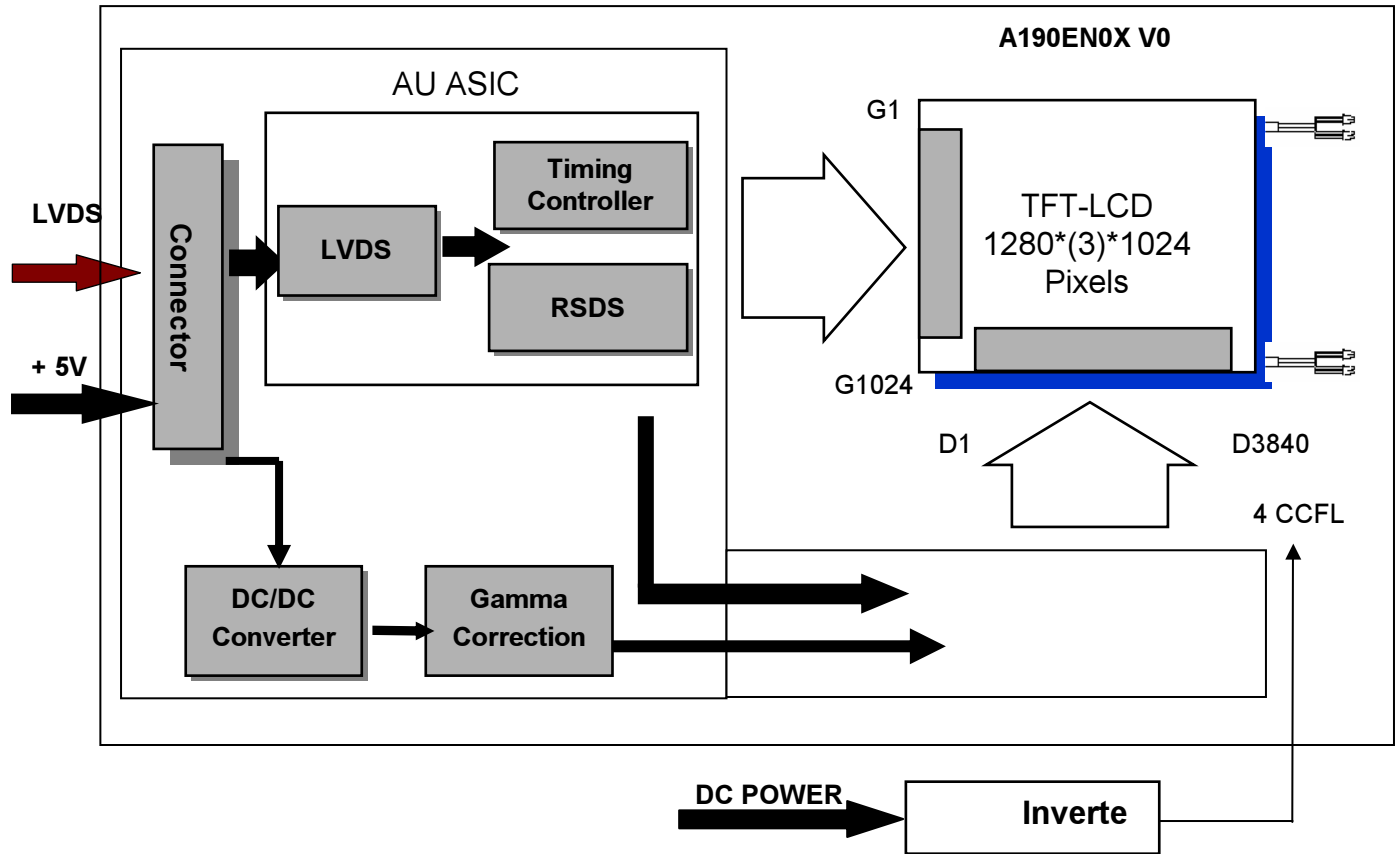
Note 5: Definition of response time:

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.



3. Functional Block Diagram

The following diagram shows the functional block of the 19.0 inches Color TFT-LCD Module:



4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+6	[Volt]	Note 1, 2

4.2 Absolute Ratings of Backlight Unit

Item	Symbol	Min.	Max.	Unit	Conditions
CCFL Current	ICFL	-	8	[mA] rms	Note 1, 2

Note 1: With in Ta= 25°C

Note 2: Permanent damage to the device may occur if exceed maximum values

5. Electrical characteristics

5.1 TFT LCD Module

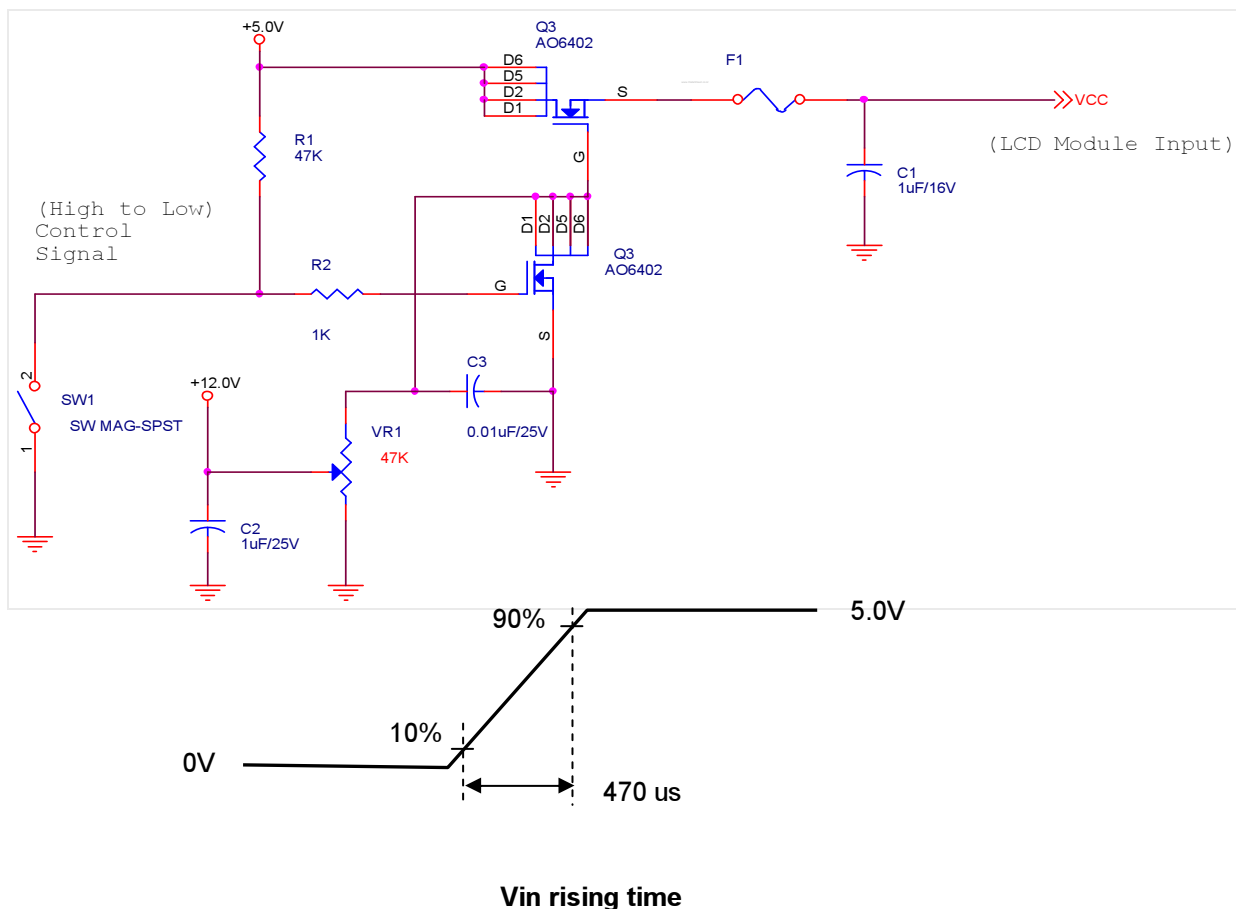
5.1.1 Power Specification

Input power specifications are as follows:

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	±10%
IDD	Input Current	-	1.02	1.34	[A]	VDD= 5.0V, All Black Pattern At 75Hz, +30%
PDD	VDD Power	-	5.11	6.71	[Watt]	VDD= 5.0V, All Black Pattern At 75Hz, Note 1
IRush	Inrush Current	-	-	2.5	[A]	Note 2
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	VDD= 5.0V, All Black Pattern At 75Hz

Note 1: The variance of VDD power consumption is ±30%.

Note 2: Measurement conditions:



5.2 Backlight Unit

Parameter guideline for CCFL Inverter is under stable conditions at 25°C (Room Temperature):

Parameter	Min.	Typ.	Max.	Unit	Condition
CCFL Standard Current(ISCFL)	7.0	7.5	8.0	[mA] rms	Note 2
CCFL Operation Current(IRCFL)	3.0	7.5	8.0	[mA] rms	Note 2
CCFL Frequency(FCFL)	40	60	80	[KHz]	Note 3,4
CCFL Ignition Voltage(ViCFL, Ta= 0°C)	1690	-	-	[Volt] rms	Note 5
CCFL Ignition Voltage(ViCF, Ta= 25°C)	1300	-	-	[Volt] rms	
CCFL Operation Voltage (VCFL)	544 (@ 7.5mA)	653 (@ 7.5mA)	783 (@ 7.5mA)	[Volt] rms	Note 6
CCFL Power Consumption(PCFL)	-	19.6	21.56	[Watt]	Note 6
CCFL Life Time(LTCFL)	30,000	-	-	[Hour]	Note 2,7

Note 1: Typ. are AUO recommended design points.

- *1 All of characteristics listed are measured under the condition using the AUO test inverter.
- *2 In case of using an inverter other than listed, it is recommended to check the inverter carefully. Sometimes, interfering noise stripes appear on the screen, and substandard luminance or flicker at low power may happen.
- *3 In designing an inverter, it is suggested to check safety circuit very carefully. Impedance of CCFL, for instance, becomes more than 1 [M ohm] when CCFL is damaged.
- *4 Generally, CCFL has some amount of delay time after applying kick-off voltage. It is recommended to keep on applying kick-off voltage for 1 [Sec] until discharge.
- *5 Reducing CCFL current increases CCFL discharge voltage and generally increases CCFL discharge frequency. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

Note 2: CCFL standard current is measured at 25±2°C.

Note 3: CCFL discharge frequency should be carefully determined to avoid interference between inverter and TFT LCD.

Note 4: The frequency range will not affect to lamp life and reliability characteristics.

Note 5: CCFL inverter should be able to give out a power that has a generating capacity of over 1,690 voltage. Lamp units need 1,690 voltage minimum for ignition.

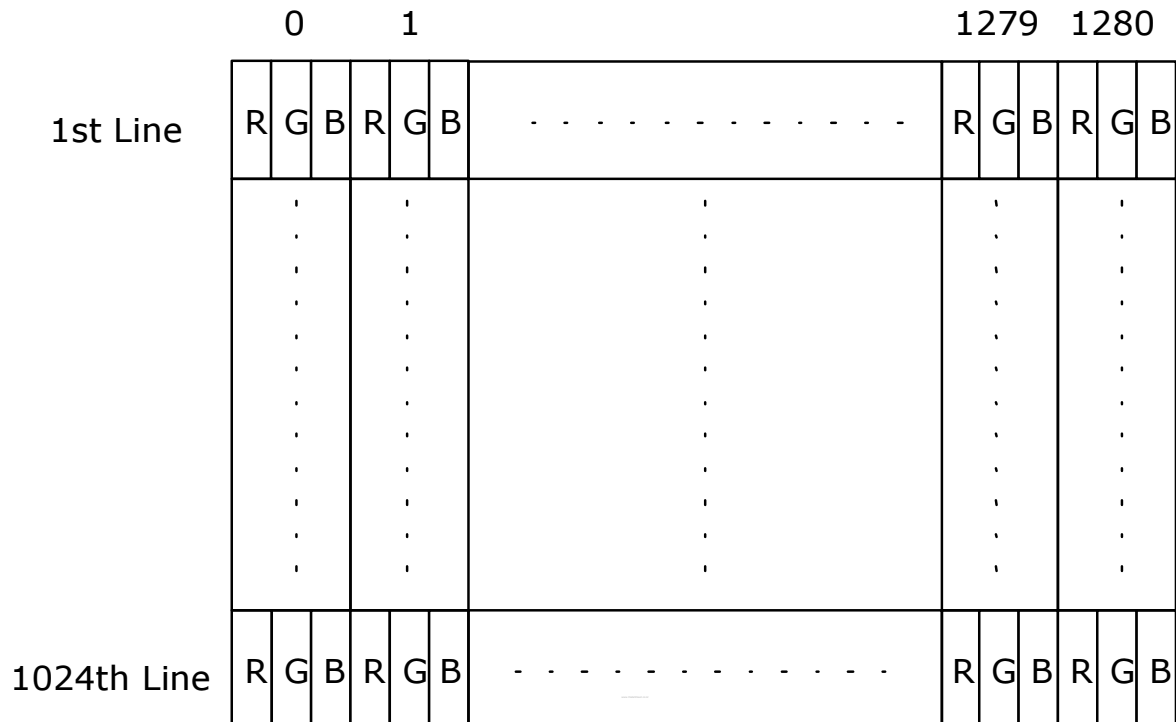
Note 6: The variance of CCFL power consumption is ±10%. Calculator value for reference (ISCFL × VCFL × 4 = PCFL)

Note 7: Definition of life: brightness becomes 50%. The typical life time of CCFL is on the condition at 7.5 mA lamp current.

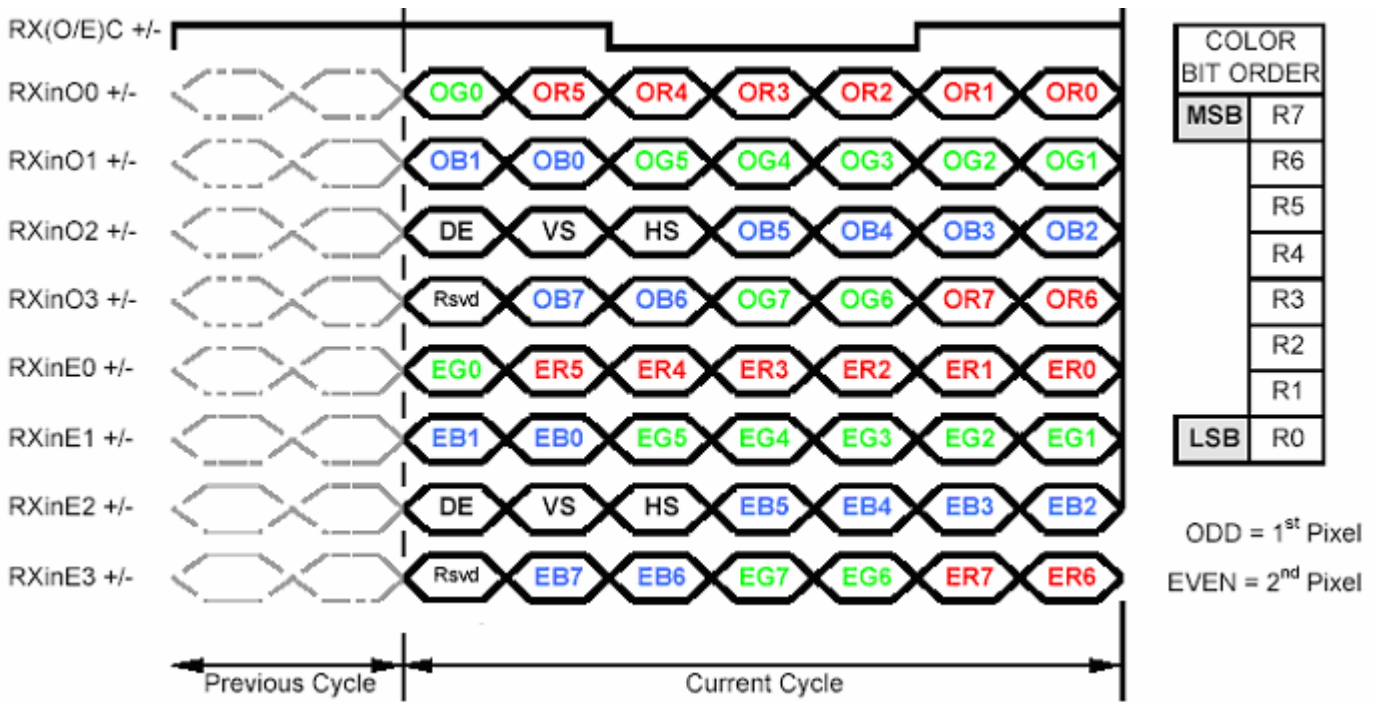
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 The Input Data Format



Note1: Normally, DE, VS, HS on EVEN channel are not used.

Note2: Please follow PSWG.

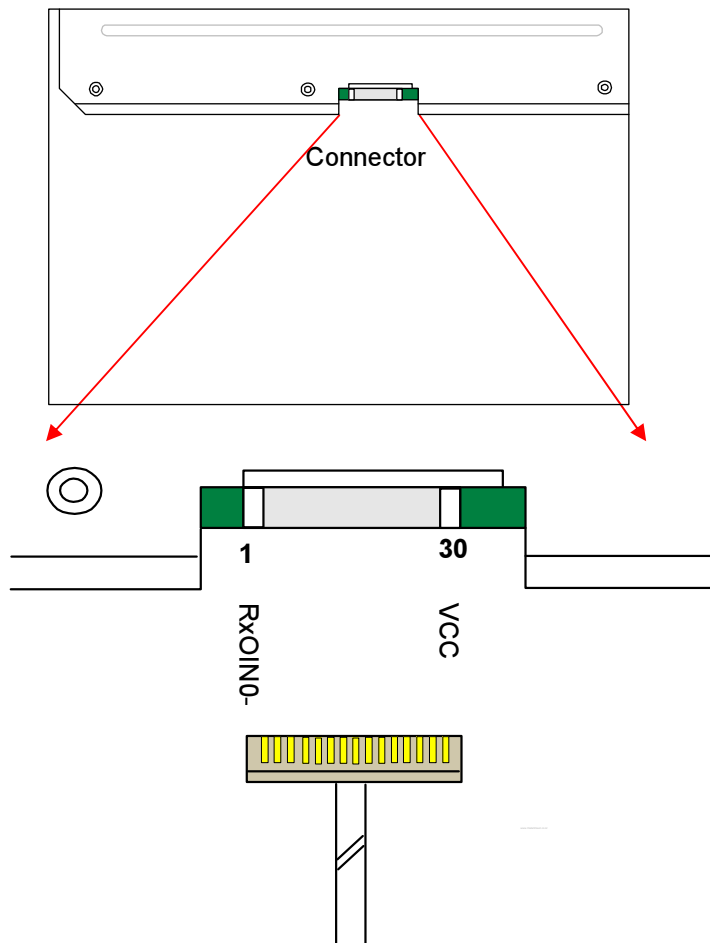
Note3: 8-bit in

6.3 Signal Description

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

PIN #	SIGNAL NAME	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, H-Sync,V-Sync,DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	VSS	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	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	VSS	Power Ground
15	RxEIN1-	Negative LVDS differential data input (Even data)
16	RxEIN1+	Positive LVDS differential data input (Even data)
17	VSS	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	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	VSS	Power Ground
25	VSS	Power Ground
26	VSS	Power Ground
27	VSS	Power Ground
28	VCC	+5.0V Power Supply
29	VCC	+5.0V Power Supply
30	VCC	+5.0V Power Supply

Note1: Start from left side



Note2: Input signals of odd and even clock shall be the same timing.

Note3: Please follow PSWG.

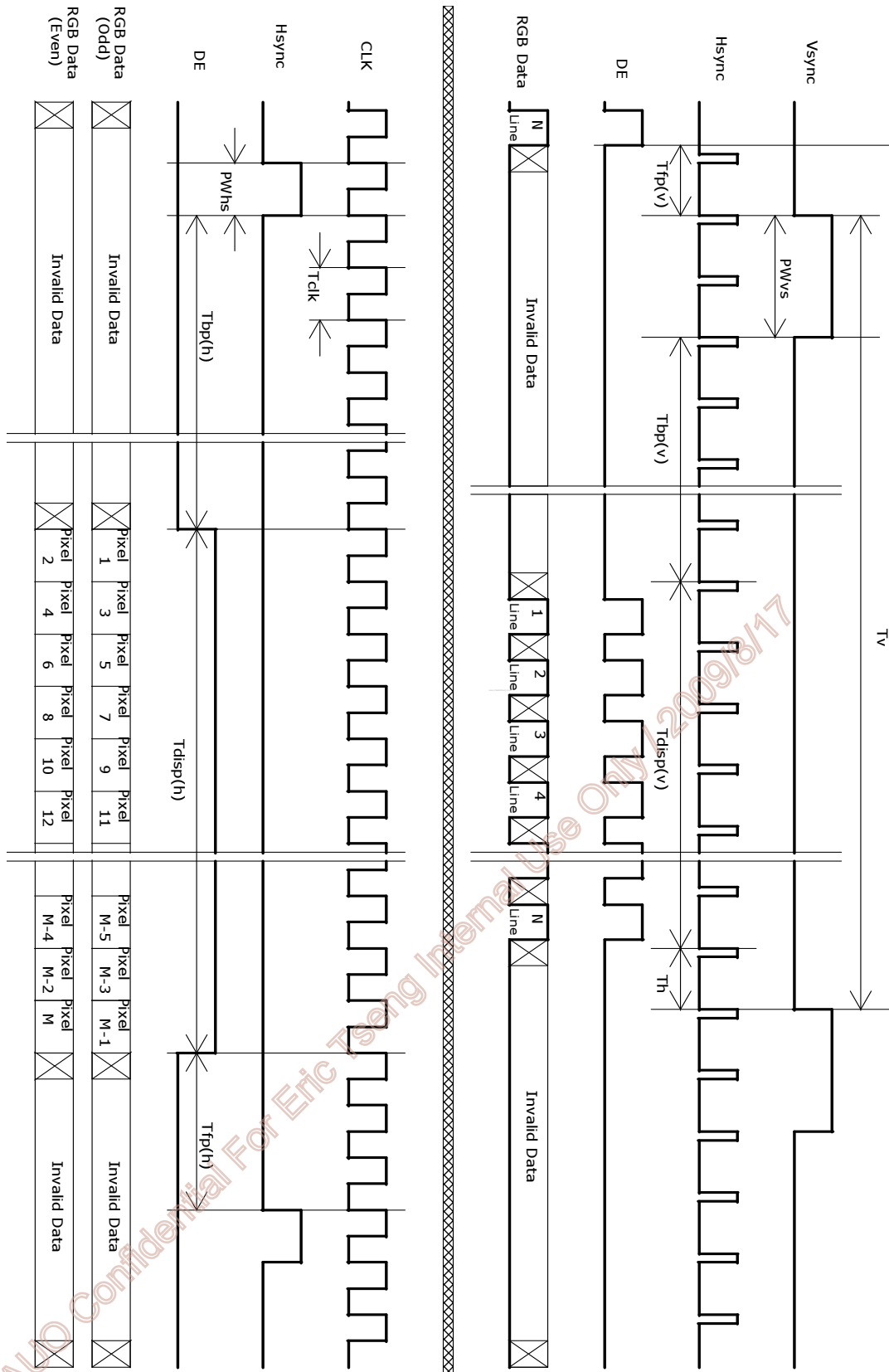
6.4 Interface Timing

6.4.1 Timing Characteristics

Item	Symbol	Min	Typ	Max	Unit
Data CLK	Tclk	40	54	67.5	MHz
H-section	Period	Th	844	1024	Tclk
	Display Area	Tdisp(h)	640	640	Tclk
V-section	Period	Tv	1066	2048	Th
	Display Area	Tdisp(v)	1024	1024	Th
Frame Rate	F	50	60	75	Hz

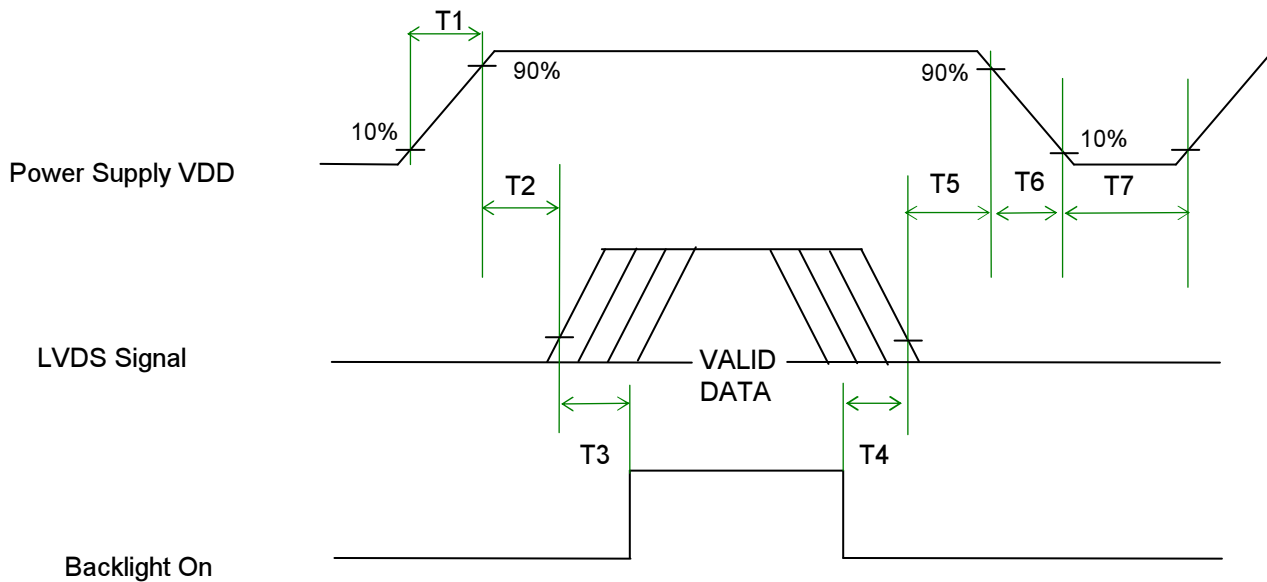
Note : DE mode only

6.4.2 Timing Diagram



6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is 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.



Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	-	50	[ms]
T3	300	-	-	[ms]
T4	300	-	-	[ms]
T5	0	16	50	[ms]
T6	-	-	10	[ms]
T7	500	-	-	[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 TFT LCD Module

7.1.1 Connector

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	HRS
Type Part Number	MDF76TW-30S-1H
Mating Type Part Number	MDF76-30P-1C

7.1.2 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	VSS	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	VSS
15	RxEIN1-	16	RxEIN1+
17	VSS	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	VSS
25	VSS	26	VSS
27	VSS	28	VCC
29	VCC	30	VCC

7.2 Backlight Unit

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

7.2.1 Connector

Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type Part Number	BHSR-02VS-1 (N)
Mating Type Part Number	SM02B-BHSS-1-TB

7.2.2 Pin Assignment

	Connector No.	Pin No.	Input	Color	Function
Upper	CN1	1	Hot1	Red	High Voltage
		2	Cold1	White	Low Voltage
	CN2	1	Hot2	Blue	High Voltage
		2	Cold2	White	Low Voltage

	Connector No.	Pin No.	Input	Color	Function
Lower	CN3	1	Hot1	Red	High Voltage
		2	Cold1	White	Low Voltage
	CN4	1	Hot2	Blue	High Voltage
		2	Cold2	White	Low Voltage

8. Reliability Test

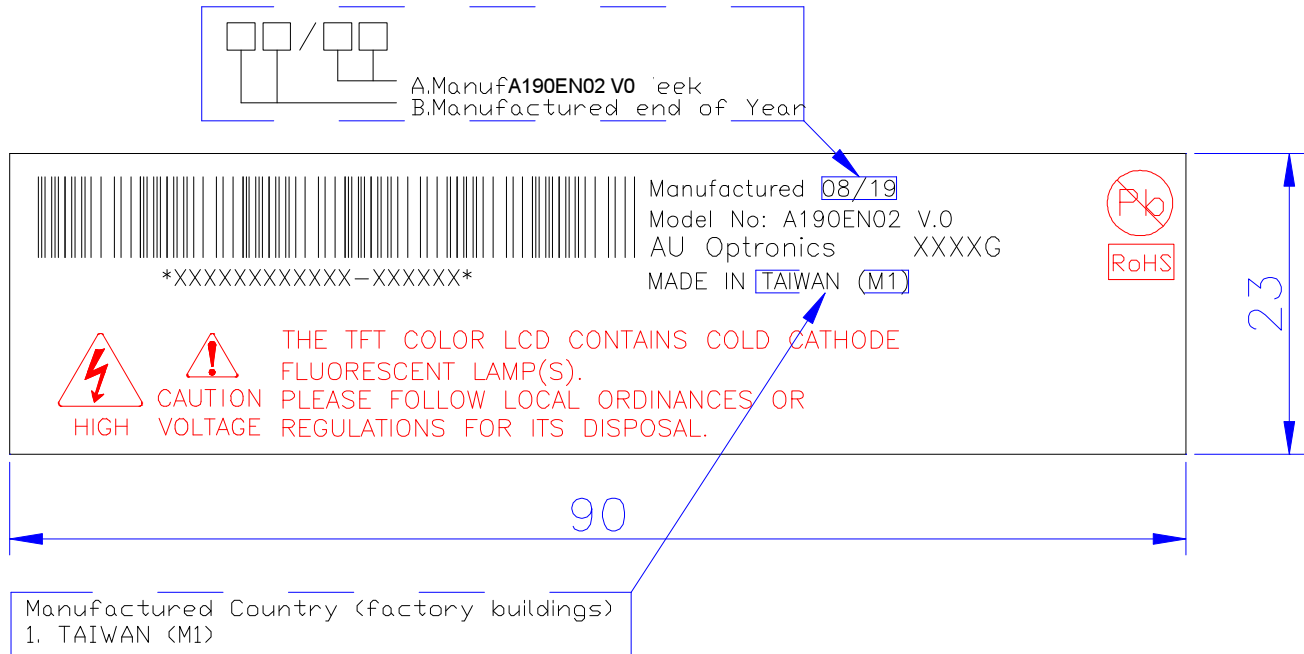
Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 60°C, 240hours	
Low Temperature Operation (LTO)	Ta= 0°C, 240hours	
High Temperature Storage (HTS)	Ta= 60°C, 240hours	
Low Temperature Storage (LTS)	Ta= -20°C, 240hours	
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 - 10 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 50 cycles	1
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point.	

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

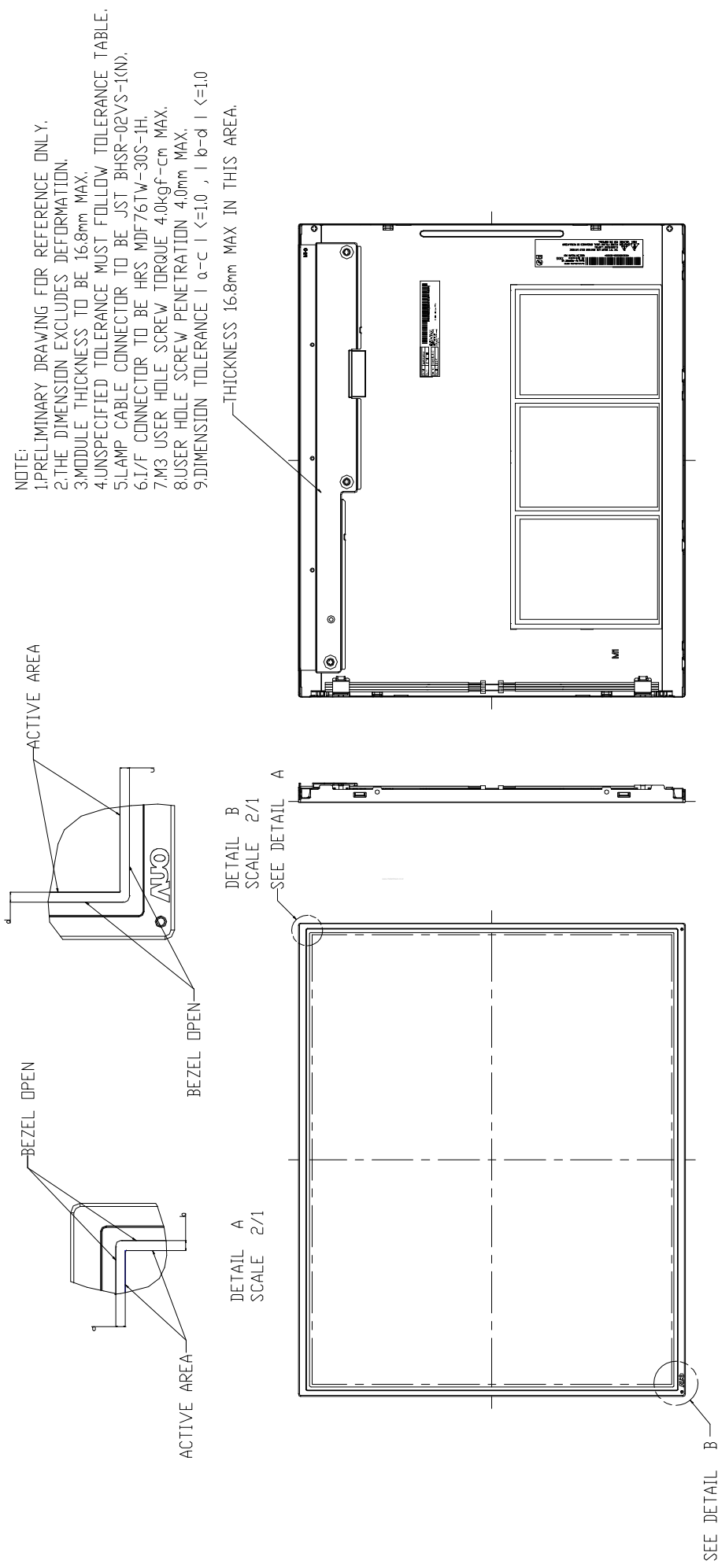
9. Shipping Label



A. Manufactured end of year mark						B. Manufactured week mark			
Mark	08	09	10	11	...	Mark	01	02	...
Definition	2008	2009	2010	2011	...	Definition	1st Week	2nd Week	...

Shipping No. has 18 digits: for example: VW7400100001-PM0100
VW7400100001-PM0100 => Lot number
 VW74001**00001**-PM0100 => Serial number
 VW7400100001-**PM0100** => Factory number

10. Outline Drawing

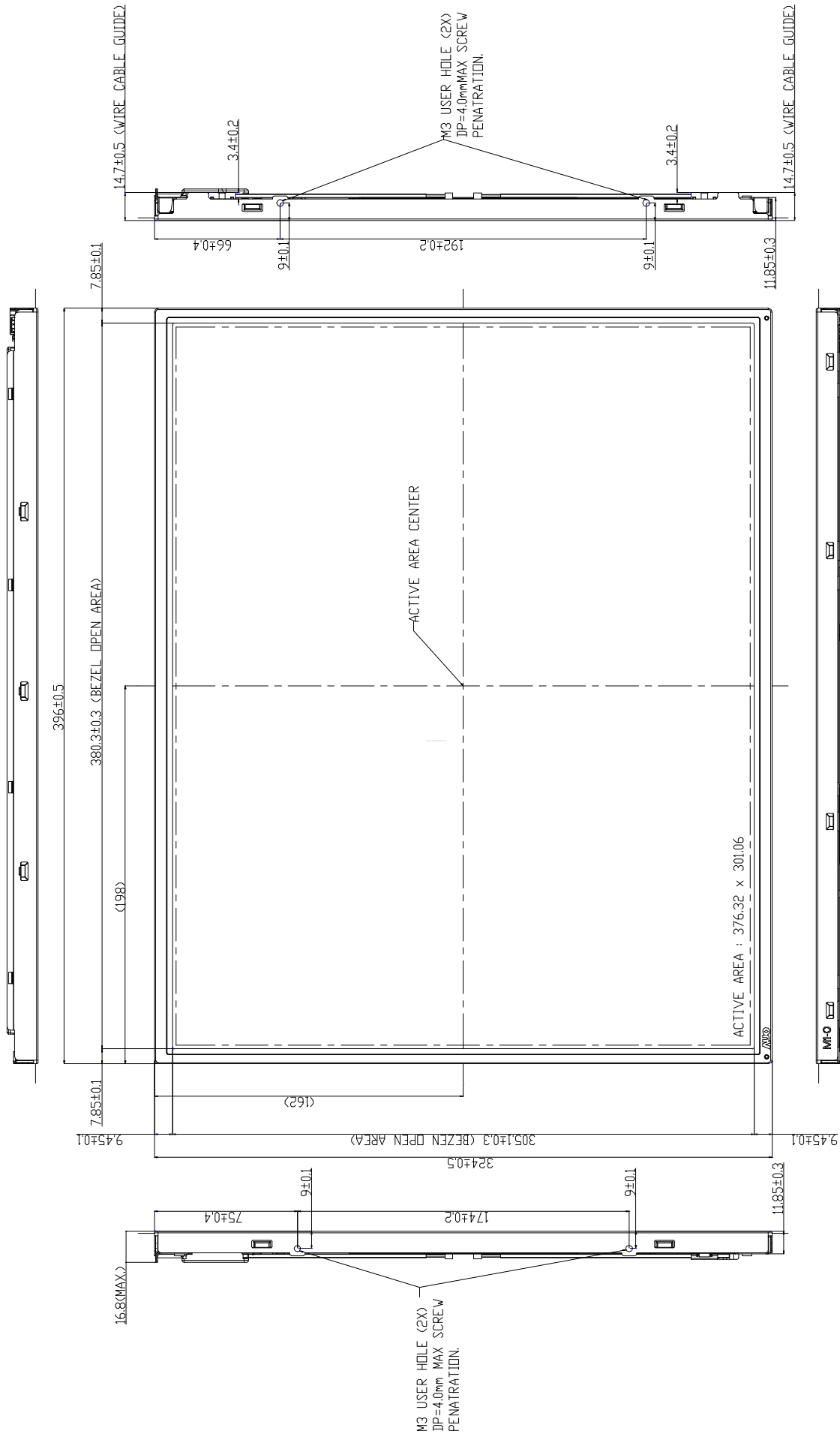




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