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# AU OPTRONICS CORPORATION

## Product Specifications

### 17.0” WXGA Color TFT-LCD Module

**Model Name: M170XW01 V.1**

Approved by	Prepared by

*DDBU Marketing Division / AU Optronics Corporation*

Customer	Checked & Approved by

## **Product Specifications**

### **17.0” WXGA Color TFT-LCD Module Model Name: M170XW01 V.1**

**(u ) Preliminary Specifications  
( ) Final Specifications**

**Note: This Specification is subject to change without notice.**

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Version and Date	Page	Old description	New Description	Remark
0.1 2003/08/26	All	First Edition for Customer	All	

## ***1.0 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 nor modify the Module Assembly.
8. Do not press the reflector sheet at the back of the module to any directions.
9. At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT-LCD module.
10. After installation of the TFT-LCD module into an enclosure (LCD monitor housing, for example), do not twist nor bend the TFT -LCD module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT -LCD module from outside. Otherwise the TFT -LCD module may be damaged.

## 2.0 General Description

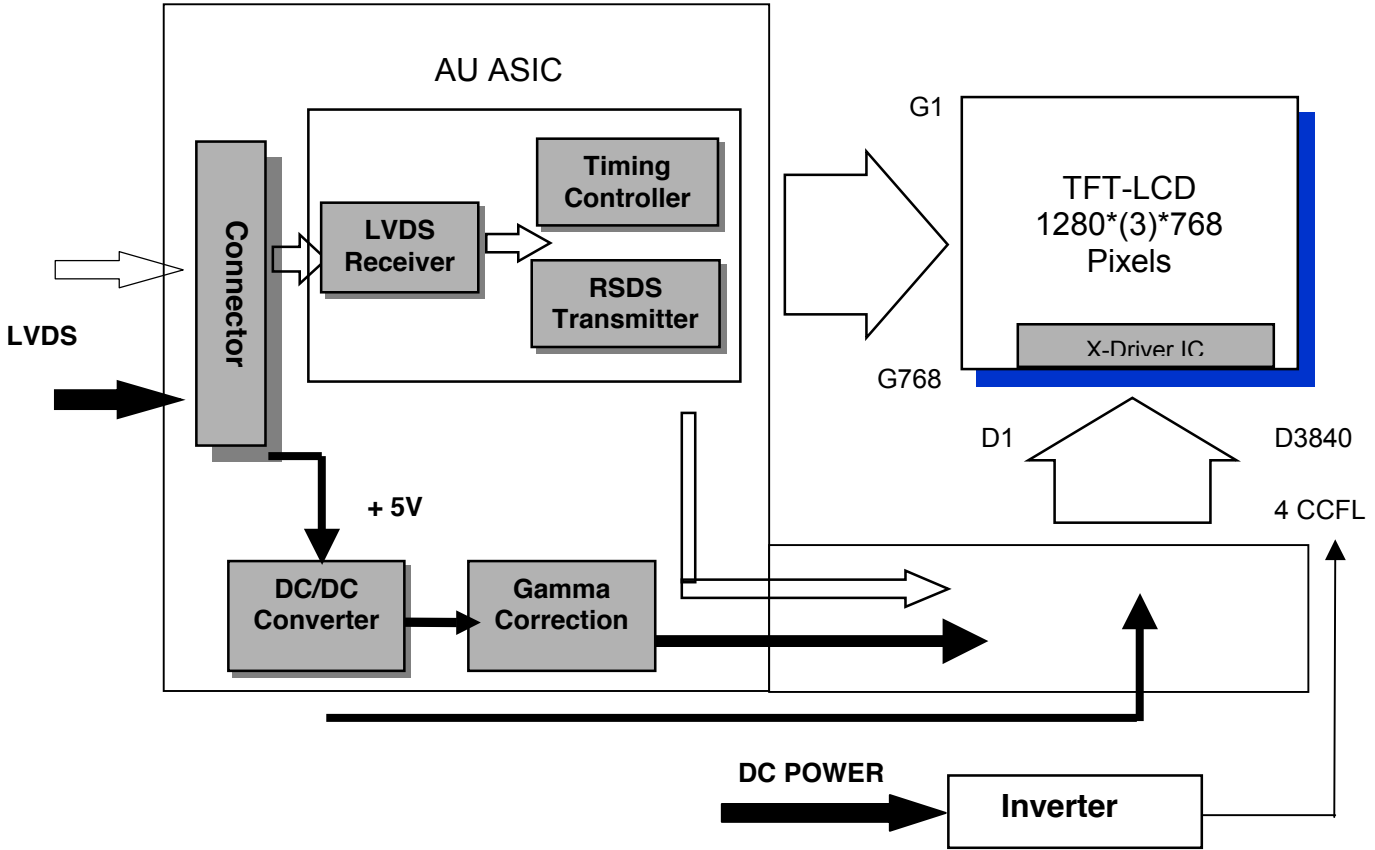
This specification applies to the 17.0 inch wide Color TFT-LCD Module M170XW01. The display supports the WXGA (1280 x 768) screen format and 16.2M colors (RGB 6-bits + FRC data). All input signals are 1 Channel LVDS interface compatible. This module does not contain an inverter card for backlight.

### 2.1 Display Characteristics (under 25 °C condition)

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	432(17.0" Wide)
Active Area	[mm]	370.56 (H) x 222.34 (V)
Pixels H x V		1280(x3) x 768
Pixel Pitch	[mm]	0.2895 (per one triad) x 0.2895
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally Black
White Luminance	[cd/m <sup>2</sup> ]	450 (center, Typ) @11mA
Contrast Ratio		600 : 1 (Typ)
Optical Response Time	[msec]	25 (Typ)
Color Saturation		72% NTSC
Nominal Input Voltage VDD	[Volt]	+5.0 V
Power Consumption (VDD line + CCFL line)	[Watt]	32W (typ) (w/o Inverter, All black pattern)
Weight	[Grams]	2000 (TBD)
Physical Size	[mm]	404 (H) x 248.5 (V) x 17.2 (D) (Typ)
Electrical Interface		R/G/B data, Clock
Support Color		16.2M colors (RGB 6-bit + FRC data)
Temperature Range		
Operating	[°C]	0 to +50
Storage (Shipping)	[°C]	-20 to +60

## 2.2 Functional Block Diagram

The following diagram shows the functional block of the 17.0 inches Wide Color TFT-LCD Module:



HIROSE DF14F-20P-1.25H

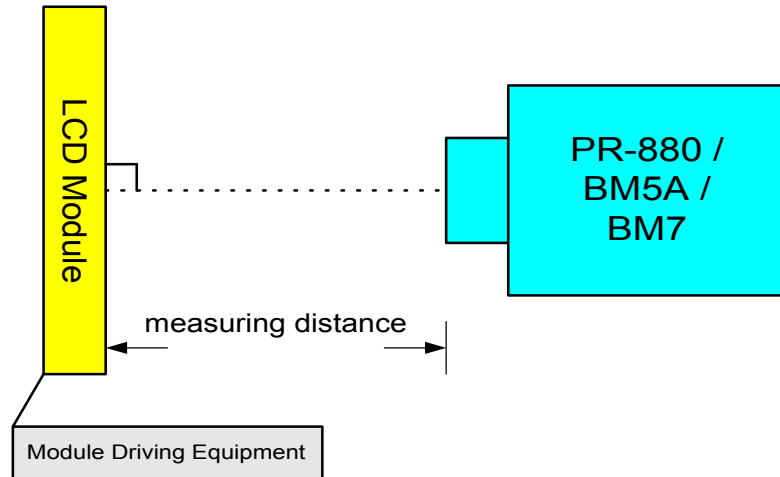
Mating Type: HIROSE DF14-20S-1.25C



**2.3 Optical Characteristics** (under 25 °C condition)

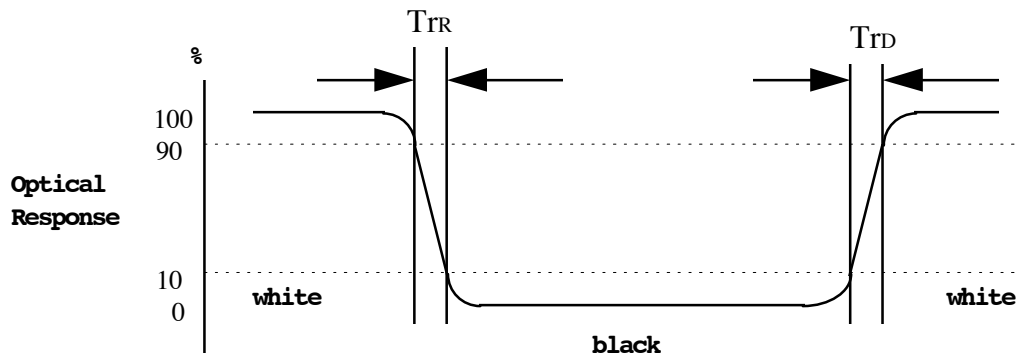
Item	Unit	Conditions	Min.	Typ.	Max.
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	75	85 85	-
		Vertical (Up) CR = 10 (Down)	75	85 85	-
		Horizontal (Right) CR = 5 (Left)	-	90 90	- -
		Vertical (Up) CR = 5 (Down)	-	90 90	- -
Contrast ratio		Normal Direction	400	600	-
Response Time (Note 1)	[msec]	Raising Time	-	15	25
		Falling Time	-	10	15
		Raising + Falling	-	25	40
Color / Chromaticity Coordinates (CIE)		Red x	0.61	0.64	0.67
		Red y	0.31	0.34	0.37
		Green x	0.26	0.29	0.32
		Green y	0.58	0.61	0.64
		Blue x	0.11	0.14	0.17
		Blue y	0.04	0.07	0.10
Color Coordinates (CIE) White		White x	0.28	0.31	0.34
		White y	0.30	0.33	0.36
White Luminance @ CCFL 11.0mA (Center)	[cd/m <sup>2</sup> ]		400	450	-
Luminance Uniformity (Note 2)	[%]		75	80	-
Cross talk (in 75Hz) (Note 3)	[%]		-	-	1.5

Equipment	Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (PR 880, BM-5A/ BM7)
Aperture	1° with 100cm VD or 2° with 50cm viewing distance
Test Point	Center (VESA point 9)
Environment	< 1 lux

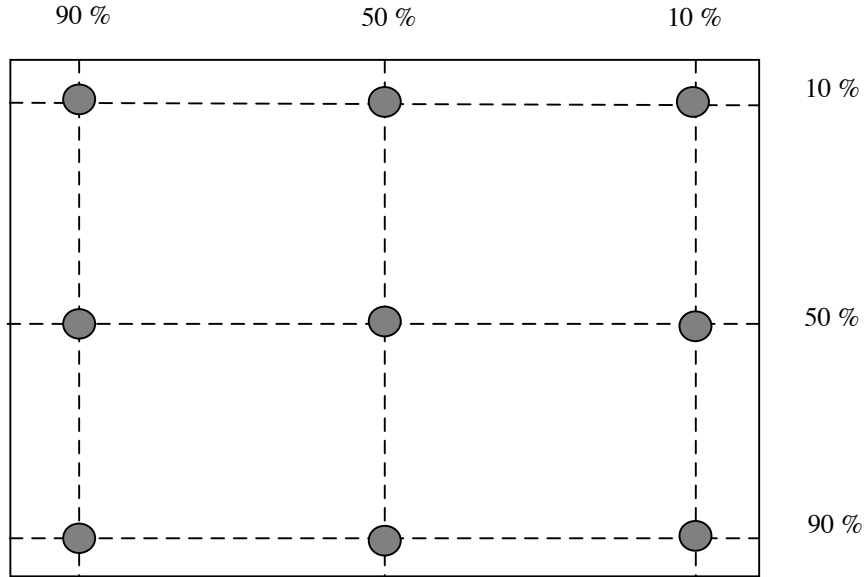


**Note 1: Definition of Response time**

The output signals of photodetector 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 is interval between the 10% and 90% of amplitudes.



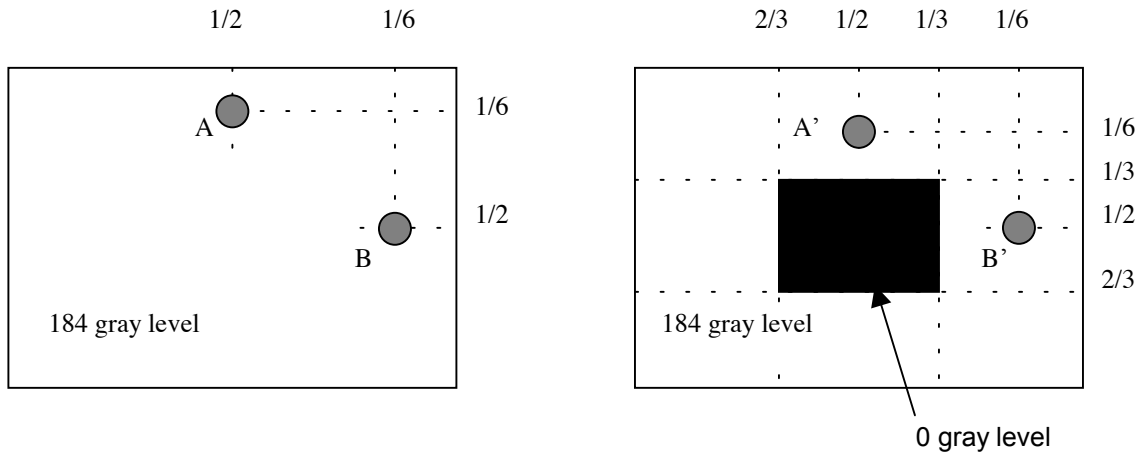
**Note 2: Brightness uniformity of these 9 points is defined as below**



Minimum Luminance in 9 Points (1-9)

$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 Points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

**Note 3:**



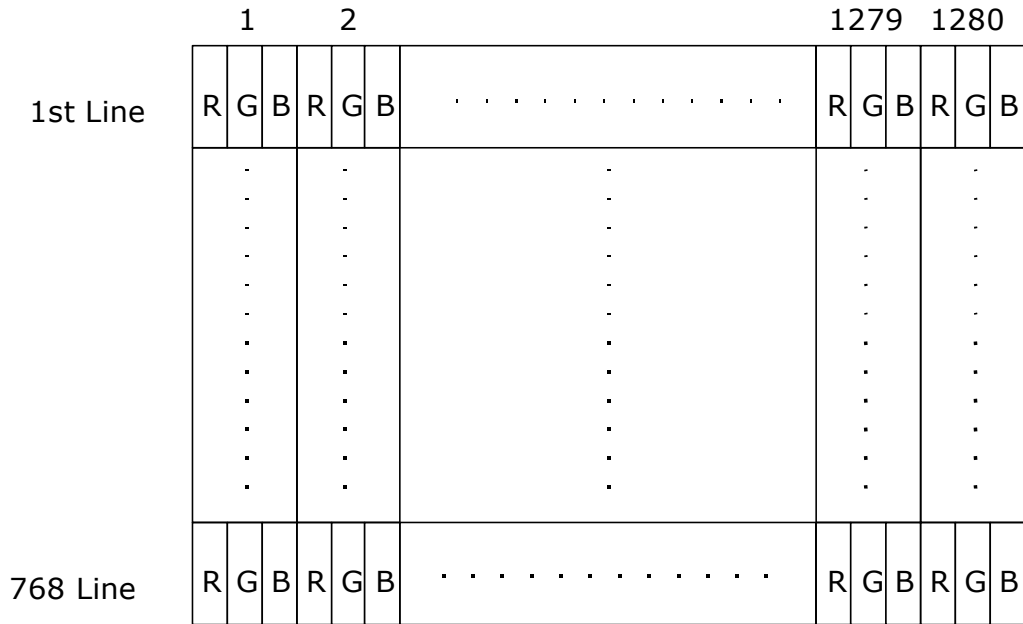
Unit: percentage of dimension of display area

$$|L_A - L_{A'}| / L_A \times 100\% = 1.5\% \text{ max.}, L_A \text{ and } L_B \text{ are brightness at location A and B}$$

$$|L_B - L_{B'}| / L_B \times 100\% = 1.5\% \text{ max.}, L_{A'} \text{ and } L_{B'} \text{ are brightness at location A' and B'}$$

**2.4: Pixel format image**

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



**3.0 Electrical characteristics**

**3.1 Absolute Maximum Ratings**

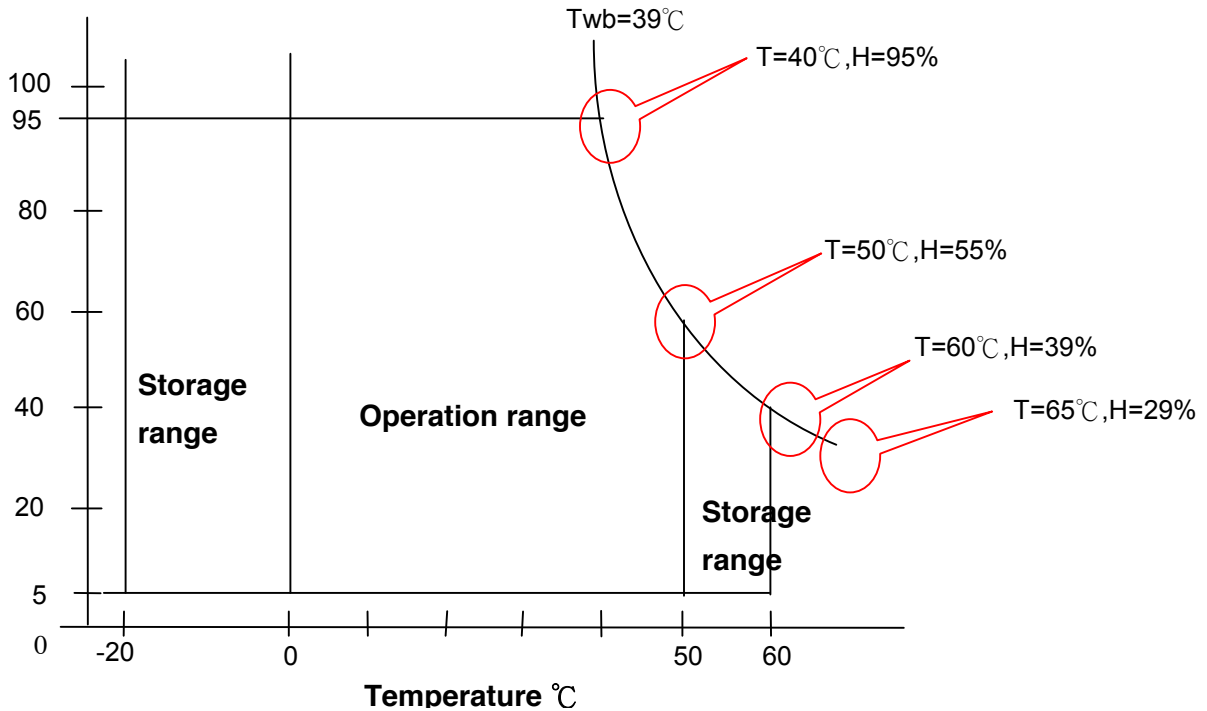
Absolute maximum ratings of the module is as following:

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VIN	+4.5	+5.5	[Volt]	
Select LVDS data order	SELLVDS	-0.3	+4	[Volt]	
CCFL Inrush current	ICFLL	-	38	[mA]	Note 1
CCFL Current	ICFL	-	11.6	[mA] rms	
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	8	95	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	8	95	[%RH]	Note 2

**Note 1: Duration=50 msec.**

**Note 2: Maximum Wet-Bulb should be 39°C and No condensation**

**Relative Humidity %**



### 3.2 Connectors

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

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	HIROSE or compatible
Type Part Number	DF14F-20P-1.25H
Mating Housing Part Number	DF14-20S-1.25C
Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type Part Number	BHR-04VS-1
Mating Type Part Number	SM04 (4.0)B-BHS-1-TB

### 3.3 Signal Pin

Pin#	Signal Name	Pin#	Signal Name
1	POWER	2	POWER
3	GND	4	GND
5	RxIN0-	6	RxIN0+
7	GND	8	RxIN1-
9	RxIN1+	10	GND
11	RxIN2-	12	RxIN2+
13	GND	14	RxCLKIN-
15	RxCLKIN+	16	GND
17	RxIN3-	18	RxIN3+
19	GND (FOR AUO TEST)	20	NC (FOR AUO TEST)

### 3.4 Signal Description

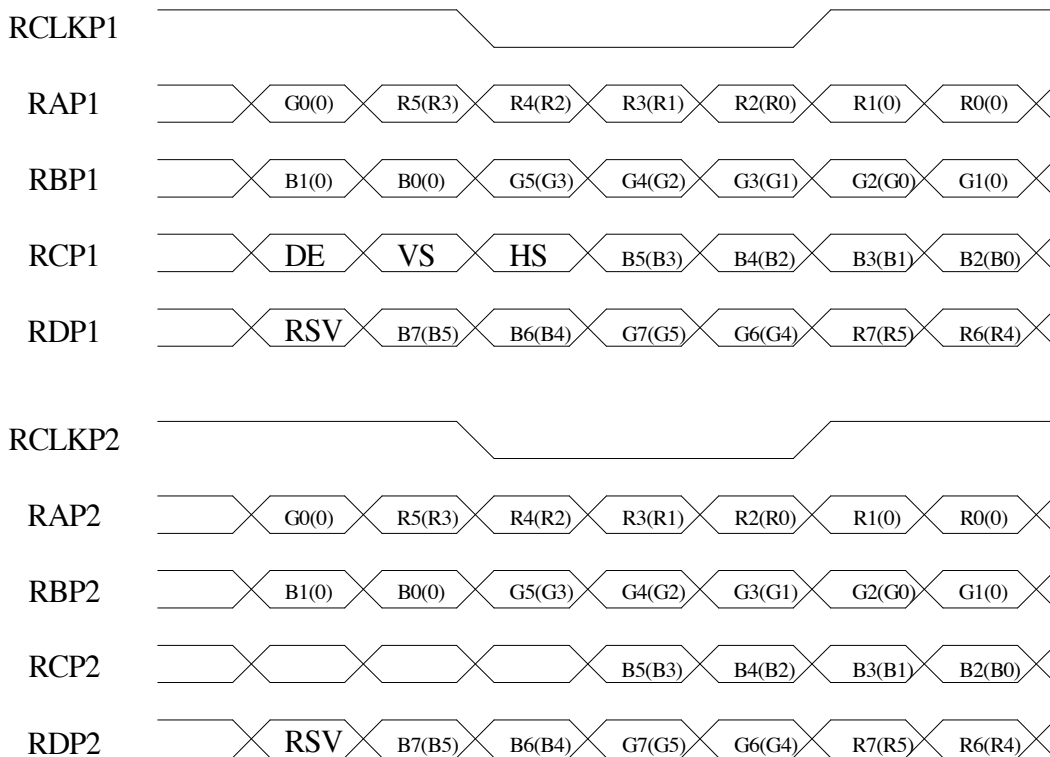
PIN #	SIGNAL NAME	DESCRIPTION
1	POWER	Power
2	POWER	Power
3	GND	Power Ground
4	GND	Power Ground
5	RxIN0-	Negative LVDS differential data input
6	RxIN0+	Positive LVDS differential data input
7	GND	Power Ground
8	GND	Power Ground
9	RxIN0-	Negative LVDS differential clock input
10	RxIN0+	Positive LVDS differential data input
11	GND	Power Ground
12	GND	Power Ground
13	RxIN0-	Negative LVDS differential clock input
14	RxIN0+	Positive LVDS differential data input
15	GND	Power Ground
16	GND	Power Ground
17	RxIN0-	Negative LVDS differential clock input
18	RxIN0+	Positive LVDS differential data input
19	GND	For AUO Test
20	NC	For AUO Test

TI LVDS transmitter SN75LVDS83	Module LVDS signal (interface connector pin7)
Signal Name	Low(open)
D0	Red0
D1	Red1
D2	Red2
D3	Red3
D4	Red4
D5	Red7
D6	Red5
D7	Green0
D8	Green1
D9	Green2
D10	Green6
D11	Green7
D12	Green3
D13	Green4
D14	Green5
D15	Blue0
D16	Blue6
D17	Blue7
D18	Blue1
D19	Blue2
D20	Blue3
D21	Blue4
D22	Blue5
D23	NA
D24	H Sync
D25	V Sync
D26	Display Timing
D27	Red6

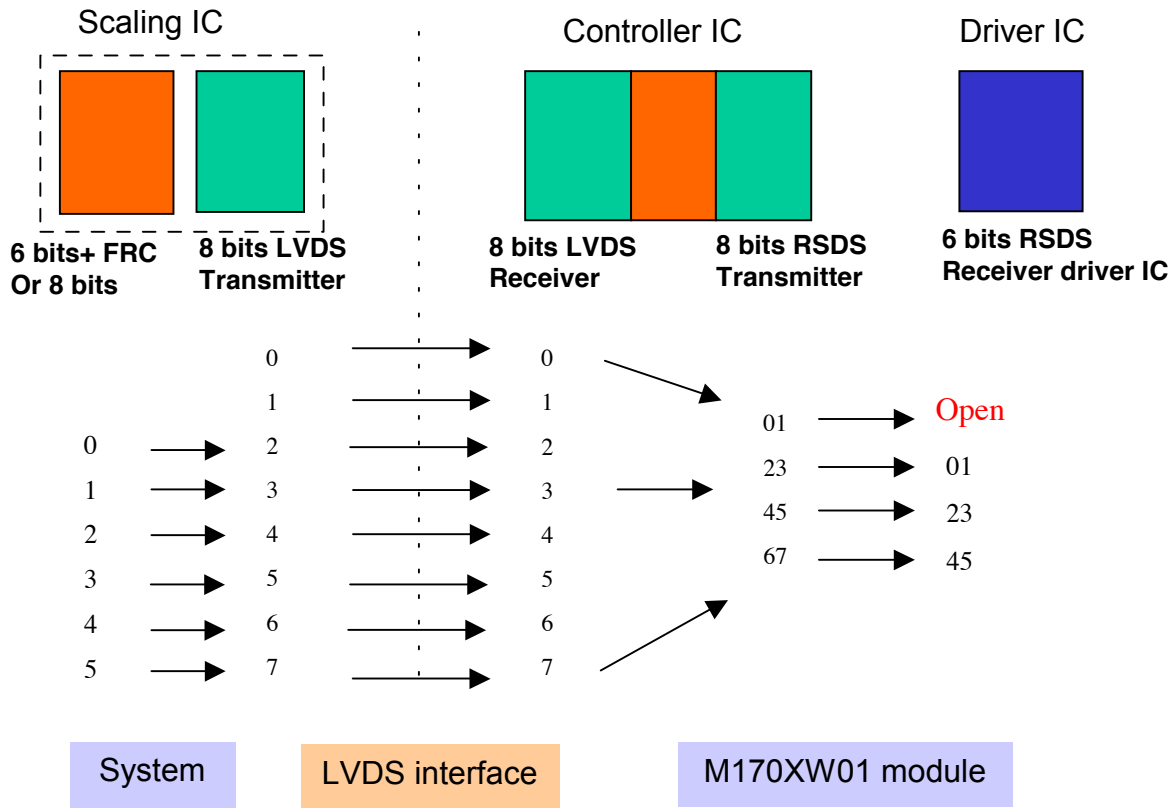


LVDS DATA Name	Description
DSP	Display Timing: (DE mode) When the signal is high, the pixel data shall be valid to be displayed
V-S	Vertical Sync: Both Positive and Negative polarity are acceptable
H-S	Horizontal Sync: Both Positive and Negative polarity are acceptable

8bits input: M170XW01 only catch bit 2 to bit 7 for 6 bit display



**Note: R/G/B data 7:MSB, R/G/B data 0:LSB**



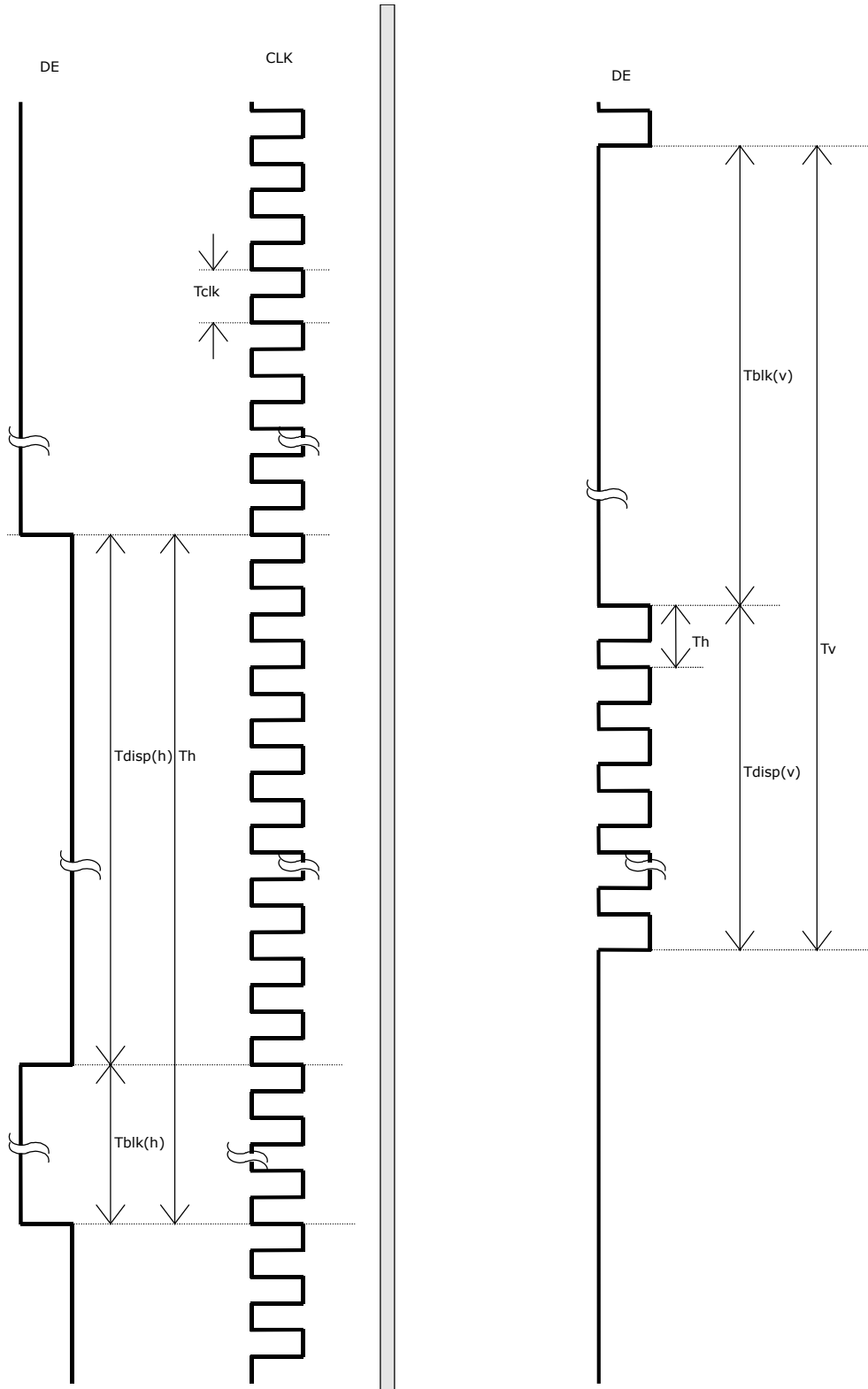
### 3.5 Interface Timings

#### 3.5.1 Timing Characteristics

Item	Symbol	Min	Typ	Max	Unit	
Data CLK	Tclk	35	64	83	MHz	
H-section	Period	Th	1320	1350	1440	Tclk
	Display Area	Tdisp(h)	1280	1280	1280	Tclk
V-section	Period	Tv	777	790	823	Th
	Display Area	Tdisp(v)	768	768	768	Th
Frame Rate	f	47	60	70	Hz	

**Note:** Typical value refer to VESA STANDARD (\*1) Tha+Thb should be less than 1024 Tck.

### 3.5.2 Timing Definition

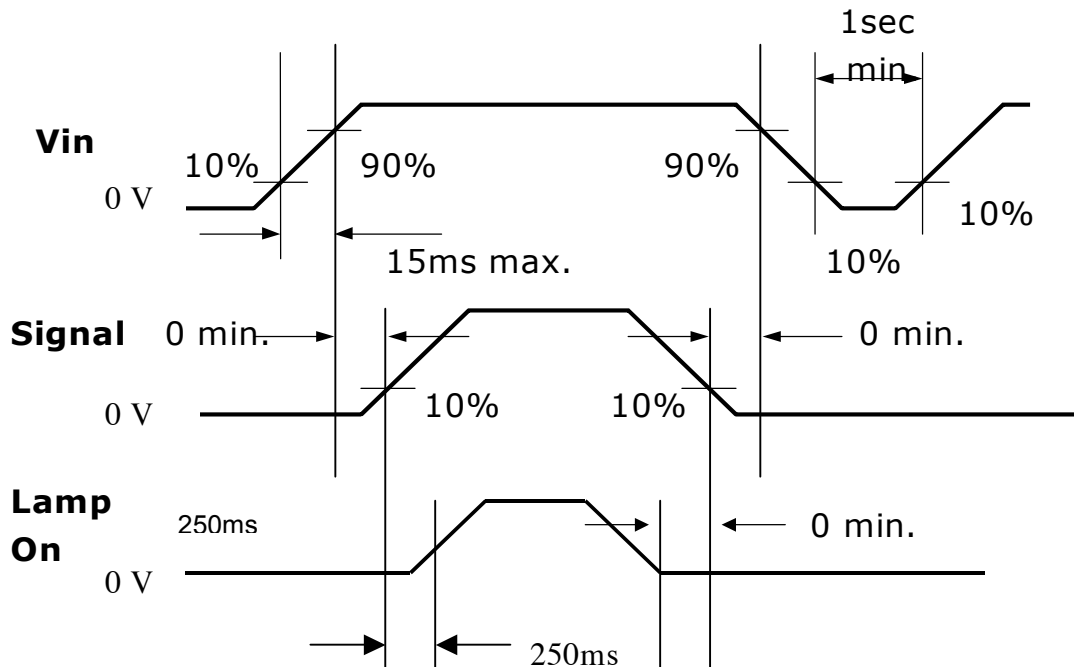


### 3.6 Power Consumption

Symbol	Parameter	Min	Typ	Max	Units	Condition
VDD	Logic/LCD Drive Voltage	4.5	5	5.5	[Volt]	
IDD	VDD current		950	1200	[mA]	
PDD	VDD Power		4.75	6.6	[Watt]	Vin=5V, All Black Pattern
VDDrp	Allowable Logic/LCD Drive Ripple Voltage			100	[mV] p-p	
VDDns	Allowable Logic/LCD Drive Ripple Noise			100	[mV] p-p	

### 3.7 Power ON/OFF Sequence

Vin 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 Vin is off.



## 4.0 Backlight Characteristics

### 4.1 Signal for Lamp connector

Pin #	Signal Name
1	Lamp High Voltage
2	Lamp Low Voltage

### 4.2 Parameter guideline for CFL Inverter

Symbol	Parameter	Min	Typ	Max	Units	Condition
(L63)	White Luminance	400	450	-	[cd/m <sup>2</sup> ]	(Ta=25°C)
ISCFL	CCFL standard current	10.5	11.0	11.5	[mA] rms	(Ta=25°C)
IRCFL	CCFL operation range	5.5	6.0	6.5	[mA] rms	(Ta=25°C)
ICFL	CCFL Inrush current	-	26	34	[mA]	Note 1
fCFL	CCFL Frequency	40	50	60	[KHz]	(Ta=25°C) Note 2
ViCFL (0°C)	CCFL Ignition Voltage	1800			[Volt] rms	(Ta=0°C) Note 3
ViCF (25°C)	CCFL Ignition Voltage	1400			[Volt] rms	(Ta=25°C) Note 3
TCFL	CCFL Dark start time			0.5	sec	(Ta=25°C)
VCFL	CCFL Discharge Voltage (Reference)	570	600	630	[Volt] rms	(Ta=25°C) Note 4
PCFL	CCFL Power consumption	23.94	26.4	28.98	[Watt]	(Ta=25°C) Note 4

*Note 1:* Duration=50 [msec]

*Note 2:* CCFL Frequency should be carefully determined to avoid interference between inverter and TFT LCD

*Note 3:* CCFL inverter should be able to give out a power that has a generating capacity of over 1800 voltage. Lamp units need 1800 voltage minimum for ignition

*Note 4:* Calculator value for reference (ISCFL x VCFL x 4=PCFL)

*Note 5:* Lamp connecting method is required to use "Terminal connecting".

## **5.0 Vibrations, Shock, and Drop**

### **5.1 Vibration & Shock**

Frequency: 10 - 200Hz  
 Sweep: 30 Minutes each Axis (X, Y, Z)  
 Acceleration: 1.5G (10~200Hz P- P)  
 Test method:

Acceleration (G)	1.5
Frequency (Hz)	10~200~10
Active time (min)	30

### **5.2 Shock Test Spec:**

Acceleration (G)	50
Active time	20
Wave form	half-sin
Times	1

Direction:  $\pm X$  ,  $\pm Y$ ,  $\pm Z$

### **5.3 Drop test**

Package test: The drop height is 60 cm.

## **6.0 Environment**

The display module will meet the provision of this specification during operating condition or after storage or shipment condition specified below. Operation at 10% beyond the specified range will not cause physical damage to the unit.

## **6.1 Temperature and Humidity**

### **6.1.1 Operating Conditions**

The display module operates error free, when operated under the following conditions;

Temperature	0 °C to 50 °C
Relative Humidity	8% to 95%
Wet Bulb Temperature	39.0 °C

### **6.1.2 Shipping Conditions**

The display module operates error free, after the following conditions;

Temperature	-20 °C to 60 °C
Relative Humidity	8% to 95%
Wet Bulb Temperature	39.0 °C

## **6.2 Atmospheric Pressure**

The display assembly is capable of being operated without affecting its operations over the pressure range as following specified;

	<b>Pressure</b>	<b>Note</b>
Maximum Pressure	1040hPa	0m = sea level
Minimum Pressure	674hPa	3048m = 10.000 feet

*Note:* Non-operation attitude limit of this display module = 30,000 feet. = 9145 m.

## **6.3 Thermal Shock**

The display 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.

Thermal shock cycle            -20 °C for 30min  
  60 °C for 30min

Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before powering on.

## **7.0 Reliability**

This display module and the packaging of that will comply following standards.

### **7.1 Failure Criteria**

The display assembly will be considered as failing unit when it no longer meets any of the requirements stated in this specification. Only as for maximum white luminance, following criteria is applicable.

*Note : Maximum white Luminance shall be 115 cd/m<sup>2</sup> or more.*

### **7.2 Failure Rate**

The average failure rate of the display module (from first power-on cycle till 1,000 hours later) will not exceed 1.0%. The average failure rate of the display module from 1,000 hours until 16,000 hours will not exceed 0.7% per 1000 hours.

### **Usage**

The assumed usage for the above criteria is:

- 220 power-on hours per month
- 500 power on/off cycles per month
- Maximum brightness setting
- Operation to be within office environment (25<sup>0</sup>C typical)

### **7.2.2 Component De-rating**

All the components used in this device will be checked the load condition to meet the failure rate criteria.



**7.3 CCFL Life**

The assumed CCFL Life will be longer than 30,000 hours, typical value is 40,000 hours under stable condition at  $25 \pm 5^{\circ}\text{C}$ ; Standard current at  $7.0 \pm 0.5\text{mA}$ .

Definition of life:

Brightness becomes 50% or less than the minimum luminance value of CCFL.

**7.4 ON/OFF Cycle**

The display module will be capable of being operated over the following ON/OFF Cycles.

ON/OFF	Value	Cycles
+Vin and CCFL power	30,000	10 seconds on / 10 seconds off

**8.0 Safety**

**8.1 Sharp Edge Requirements**

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

**8.2 Materials**

**8.2.1 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 AU Toxicologist.

**8.2.2 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.

**8.3 Capacitors**

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

**8.4 Hazardous Voltages**

Any point exceeding 42.4 volts meets the requirement of the limited current circuit. The current through a 2KΩ resistance is less than 0.7 x f (kHz) mA.

**9.0 Other requirements**

**9.1 National Test Lab Requirement**

The display module will satisfy all requirements for compliance to

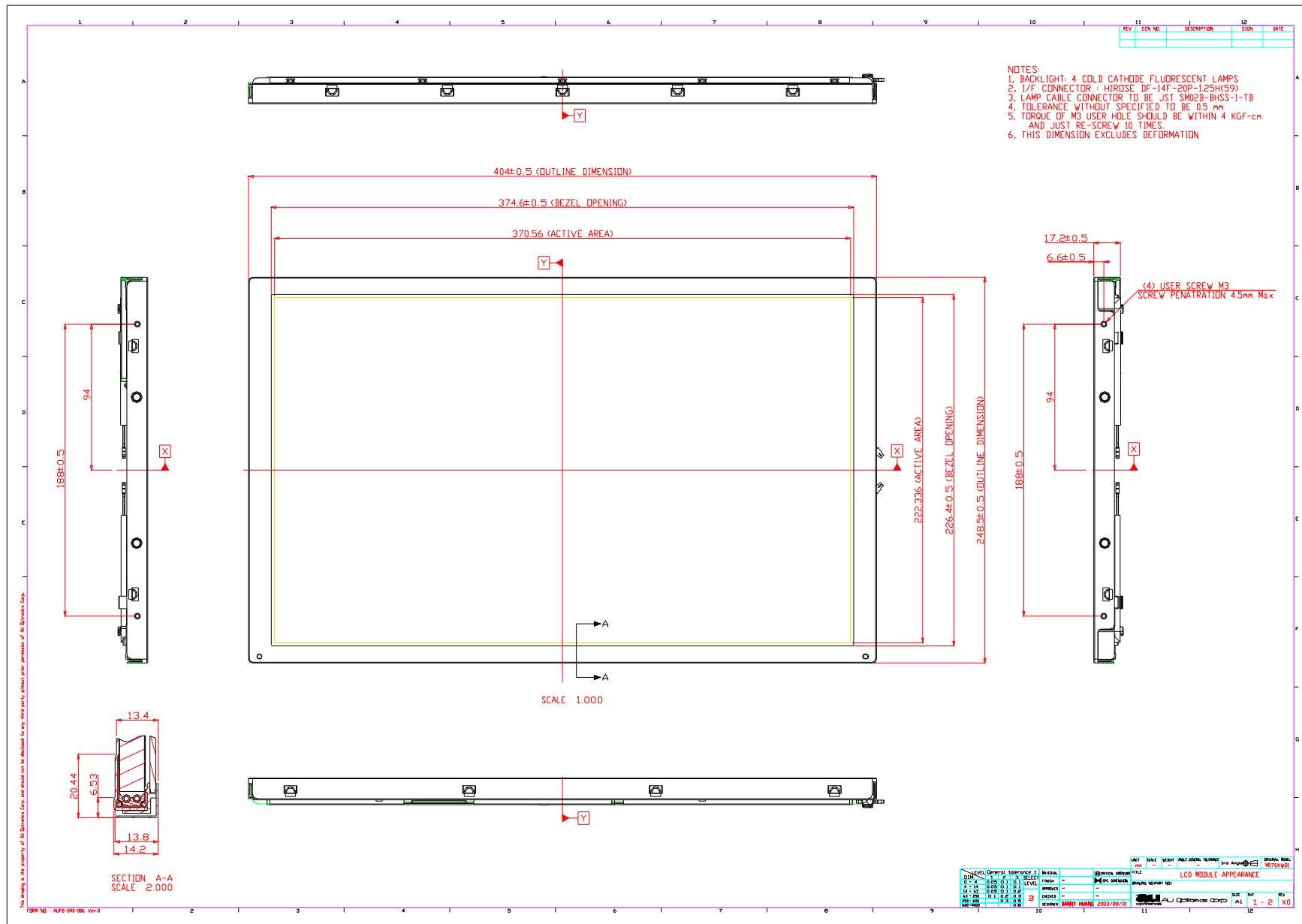
UL 1950, First Edition	U.S.A. Information Technology Equipment
CSA C22.2 No.950-M89	Canada, Information Technology Equipment
EEC 950	International, Information Technology Equipment
EN 60 950	International, Information Processing Equipment
(European Norm for IEC950)	

**9.2 Label**

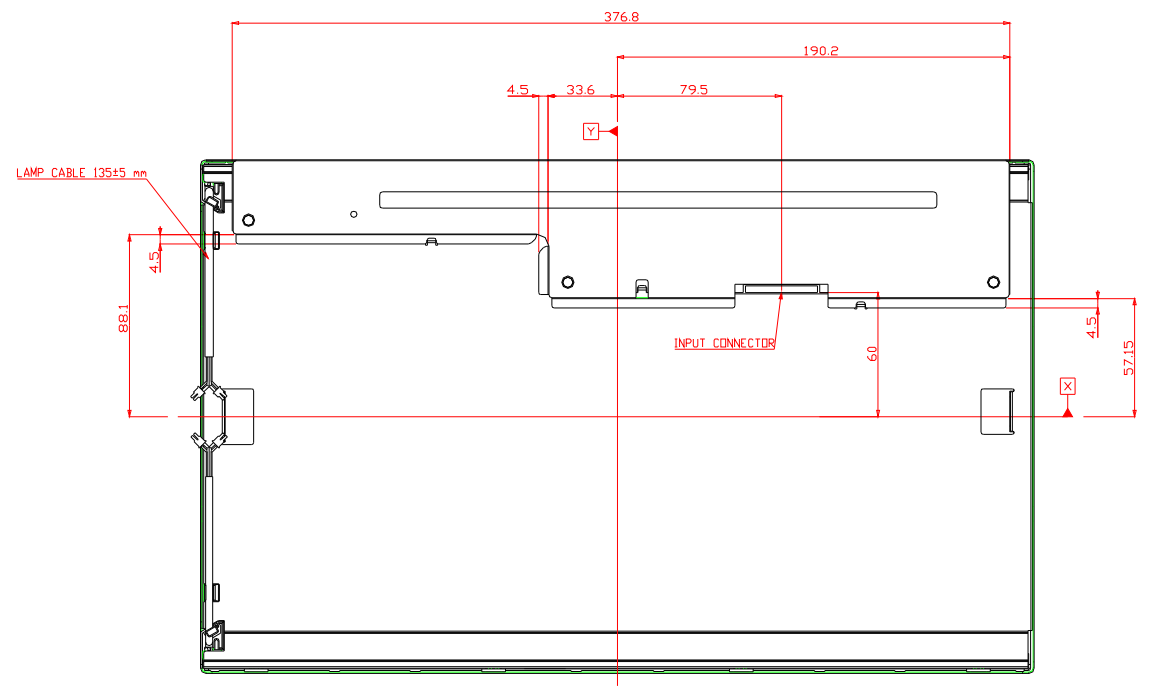
**9.2.1 Product label**

 MM1XXXXXXXXXX-XXXXX Sample :	Model No: M170XW01 V.1 AU Optronics RA Guarantee	02/09 MADE IN TAIWAN XXXXX	
 XXXXXXXXXXXXXXXXXXXXXXXX			

# 10.0 Mechanical Characteristics



REV.	EQ. NO.	DESCRIPTION	ISS.	DATE



SCALE 1.000

The Project is the property of All Starwrest Corp. and should not be released to any third party without prior permission of All Starwrest Corp.

FORM NO. - ALP-040-06 Ver-0

C/L		General		Interference		Internal		External		EQUIPMENT		EQUIPMENT		EQUIPMENT		EQUIPMENT		EQUIPMENT	

DRAWING TITLE: LCD MODULE APPEARANCE  
 DRAWING NO.: M70XV01  
 DATE: 2003/08/01  
 DRAWN BY: DANNY HUANG  
 CHECKED BY: [Signature]  
 SCALE: 2 - 2 X0