AU Optronics Corp.

Product Functional Specification

14.1 inch XGA Color TFT LCD Module
Model Name : B141XG03
V.2
(UB141X02 V.2)

( ) Preliminary Specification

(◆) Final Specification

Official UK Representative

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Please verify this is the latest information. E&OE

Note: This Specification is subject to change without notice.

Record of Revision

Version	Revise Date	Page	Content
1			Differences between B141XG03 V.0 and B141XG03 V.2:
	2002/1/3	14	CCFL Pink Cable "AWM 10267 2KVAC" • "AWM3613 3KVAC"
		14	CCFL White Cable "AWM 3265 150V" • "AWM3443 300V"
		15	Product Label Format Change
		15	White Tape • Anti-shock Tape
2	2002/2/1	10	Gy = 0.575 • 0.555
3	2002/4/15	10	•$_W$ = 1.8 • 1.65

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Contents:

A. Physical specifications

NO.	Item	Specification	Remark
1	Display resolution(pixel)	1024(H)×768(V)	
2	Active area(mm)	285.7(H)×214.3(V)	
3	Screen size(inch)	14.1(Diagonal)	
4	Pixel pitch(mm)	0.279(H)×0.279(V)	
5	Color configuration	R. G. B. Vertical stripe	
6	Overall dimension(mm)	299(W)×228(H)×6.0 max(D)	Note 1
7	Weight(g)	490±10	
8	Surface treatment	Hard coating(3H), anti-glare of the front polarizer (12%)	

Note 1: Refer to Fig. 1.

B. Electrical specifications

1.Pin assignment

(1).Input signal interface

CN1 (20P) connector : FI-SEB-20P-HF10(JAE)

Pin no	Symbol	Function	Etc.
1	V_{CC}	Power supply ,3.3 V (typical)	
2	V_{CC}	Power supply ,3.3 V (typical)	
3	GND	Ground	
4	GND	Ground	
5	RxIN0-	-LVDS differential data input (R0-R5,G0)	
6	RxIN0+	+LVDS differential data input (R0-R5,G0)	
7	GND	Ground	
8	RxIN1-	-LVDS differential data input (G1-G5,B0-B1)	
9	RxIN1+	+LVDS differential data input (G1-G5,B0-B1)	
10	GND	Ground	
11	RxIN2-	-LVDS differential data input (B2-B5, HS, VS, DE)	
12	RxIN2+	+LVDS differential data input (B2-B5, HS, VS, DE)	
13	GND	Ground	
14	CKIN-	Clock Signal(-)	
15	CKIN+	Clock Signal(+)	
16	GND	Ground	
17	(V_{EDID})	(DDC 3.3V power)	
18	NC	Reserved for supplier test point	
19	(Clk_{EDID})	(DDC Clock)	
20	$(DATA_{EDID})$	(DDC Data)	

(2) LVDS channel interface data mapping diagram
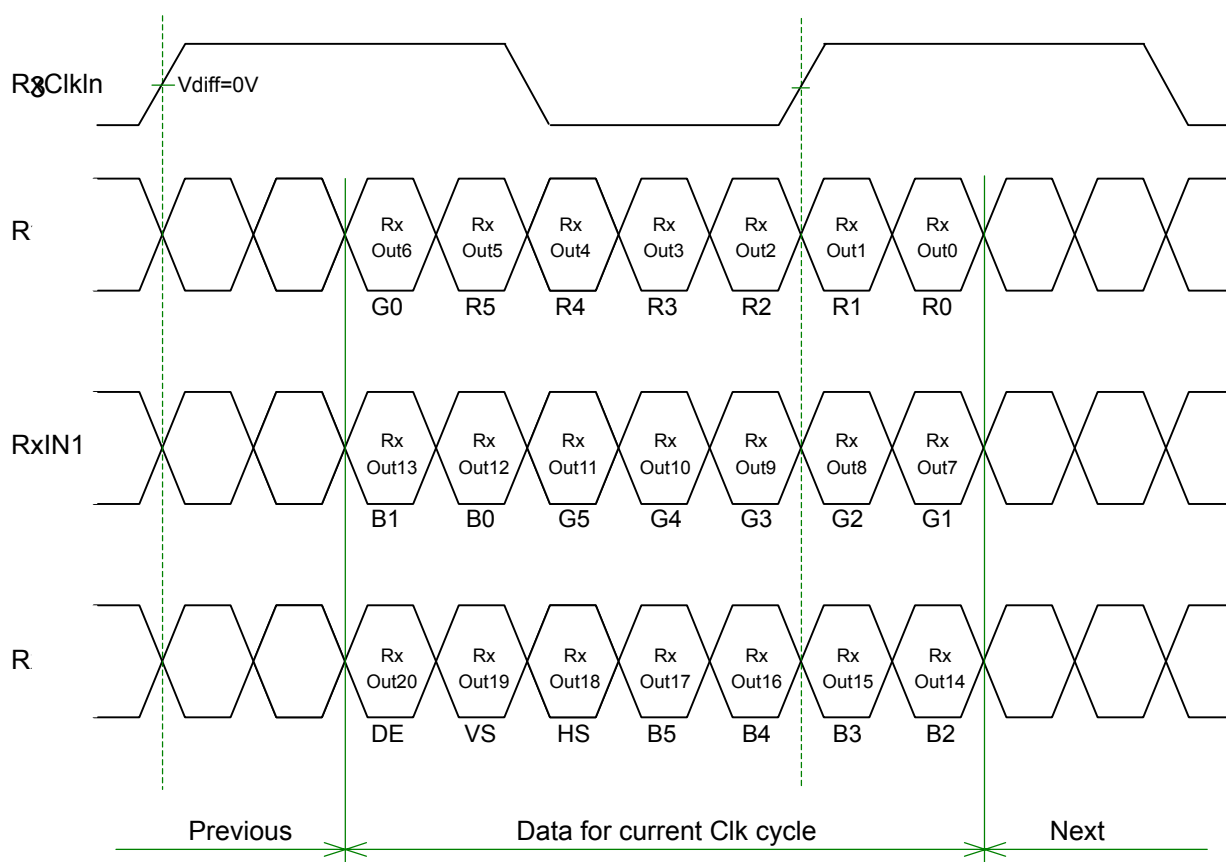
2. Absolute maximum ratings

(GND = 0 V)

Parameter	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V_{CC}	-0.3	4	V_{DC}	At 25•
Input signal voltage	V_{LH}	-0.3	V_{CC}+0.3	V_{DC}	At 25•
Operating temperature	Top	0	+50	•	Note 1
Storage temperature	T_{ST}	-20	+60	•	Note 1

Note 1:The relative humidity must not exceed 90% non-condensing at temperatures of 40・ or
       less.   At temperatures greater than 40・, the wet bulb temperature must not exceed 39
       ・.   When operate at low temperatures, the brightness of CCFL will drop and the life
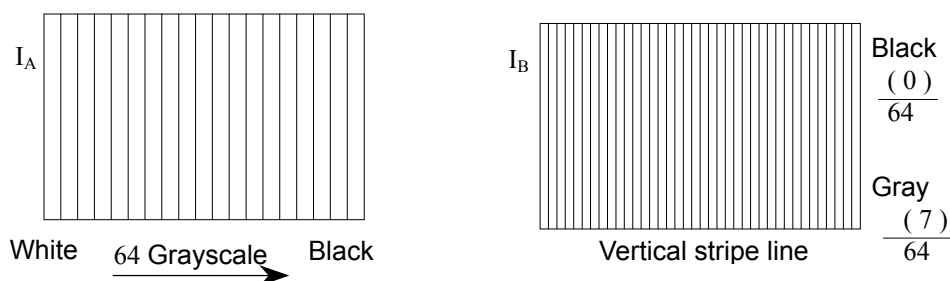   time of CCFL will be reduced.

Note 2:The unit should not be exposed to corrosive chemicals.
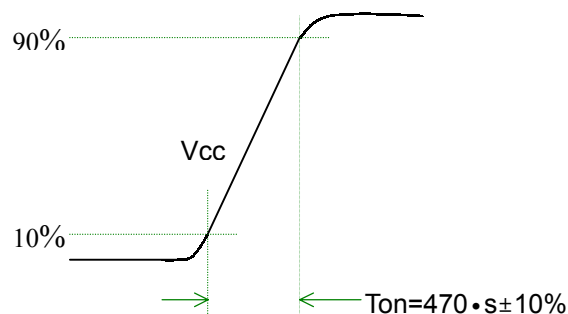
3. Electrical characteristics

a. Typical operating conditions

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	Input voltage	V_{CC}	3.0	3.3	3.6	V	
	Current consumption	I_A	-	350	-		Note 1
		I_B	-	-	550	mArms	
	Inrush current	I_{RUSH}	-	-	1800	mApeak	Note 2
Internal logic	Low voltage	V_{IL}	0	-	0.3 V_{CC}		
	High voltage	V_{IH}	0.7V_{CC}	-	V_{CC}		
Power ripple voltage		V_{RP}	-	-	100	mVp-p	

Note 1:Effective value (mArms) at V_{CC} = 3.3 V/25・.

I_A White   64 Grayscale   Black

I_B Vertical stripe line   Black $\frac{(0)}{64}$ Gray $\frac{(7)}{64}$

Note 2: Refer to the following power-on condition.

90%

Vcc

10%

Ton=470・s±10%

Sequence of Power-on/off and signal-on/off

T1

0.9Vcc

0.9Vcc

0.1Vcc

0.1Vcc

T4

T1・10ms

Power Supply
Vcc

T2

T3

0ms・T2・50ms

0ms・T3・50ms

400ms・T4

VALID

200ms・T5

T5
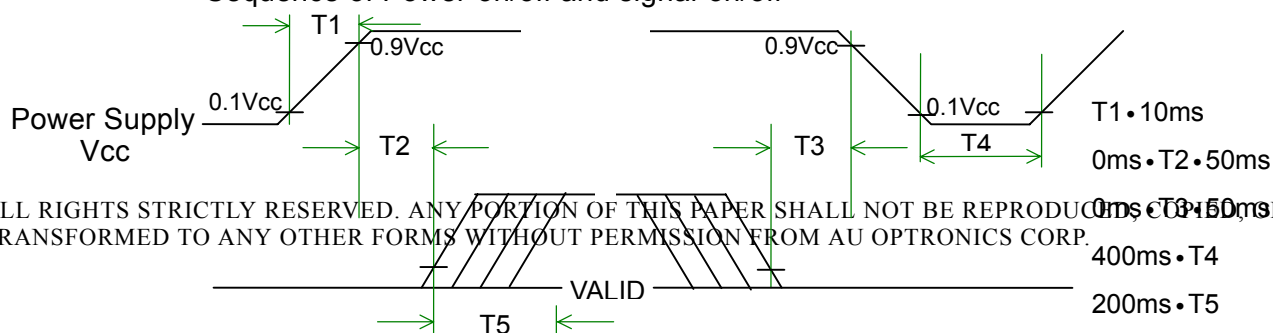
LVDS
Interface

Backlight
  On
Apply the lamp voltage within the LCD operating range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal.

Caution

The above on/off sequence should be applied to avoid abnormal function in the display.
In case of handling:
Make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

b. Display color v.s. input data signals

Display colors		Data signal (0 : Low level, 1: High level)																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	• • bright																		
		1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0

		R						G						B					
Green grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	•																		
	•																		
	bright																		
		0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
		0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	•																		
	•																		
	bright																		
		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note : Each basic color can be displayed in 64 gray scales using the 6 bit data signals.   By combining the 18-bit data signals(R,G,B), the 262,144 colors can be achieved on the display.

c. Input signal timing

Timing diagrams of input signal are shown in Fig 2.

(1). Timing characteristics of input signals

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
CLK clock	Frequency	Fck	50	65	70	MHz	
	Period	Clk	15.2	15.4	20	ns	
Hs Horizontal sync	Period	Th	1046	1344	1648	Clk	
			20	20.7	-	•s	
	Display period	Thd		1024		Clk	
	Pulse width	Thw	2	136	-	Clk	
	Display start	The	296	296	296	Clk	DE non-using
			8	296	600	Clk	DE using
	Front porch	Thf	8	24	-	Clk	
	Back porch	Thb	4	160	-	Clk	
	Blanking	Thb1	22	320	624	Clk	
Vs Vertical sync	Phase shift	Tvpd	2	320	-	Clk	
	Period	Tv	771	806	927	Th	
			-	16.6	20	ms	
	Display width	Tvd		768		Th	
	Pulse width	Tvw	1	6	-	Th	

	Display start	Tve	-	35	-	Th	DE non-using
	Front porch	Tvf	0	3	-	Th	
	Blanking	Tvb1	3	38	159	Th	

Available data input timing

Horizontal	DE non-using	When DE signal is fixed Low, after falling edge of Hs, counting 296 clocks, then getting valid data from 297th clock's data.
	DE using	Valid data is according to rising edge of "DE" signal. The time should be 8 to 600 clocks between falling edge of Hs and rising edge of DE.
Vertical	DE non-using	After falling edge of Vs, counting 35 Th, then getting 36th Th's data. (in DE non-using mode and DE using mode).
	DE using	Valid data is according to the first rising edge of "DE" signal after DE keeps low during blanking period.

(2). The timing condition of LVDS

Item	Symbol	Min.	Typ.	Max.	Unit
The differential level	•VID•	0.1	-	0.6	V
The common mode input voltage	VIC	0.9	-	2	V
The input setup time	tsu1	500	-	-	ps
The input hold time	th1	500	-	-	ps

$$V_{ID} = V_{IAP} - V_{IAM}$$
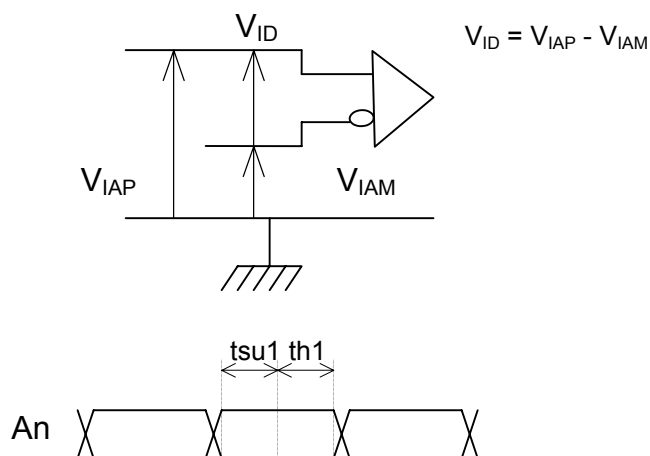
d. Display position

D(1,1)	D(2,1)	……	D(X,1)	……	D(1023,1)	D(1024,1)
D(1,2)	D(2,2)	……	D(X,2)	……	D(1023,2)	D(1024,2)
⋮		……	⋮	……	⋮	⋮
D(1,Y)	D(2,Y)	……	D(X,Y)	……	D(1023,Y)	D(1024,Y)
⋮		……	⋮	……	⋮	⋮
D(1,767)	D(2,767)	……	D(X,767)	……	D(1023,767)	D(1024,767)
D(1,768)	D(2,768)	……	D(X,768)	……	D(1023,768)	D(1024,768)

e. Backlight unit

The backlight system is an edge-lighting type with a CCFT(Cold Cathode Fluorescent Tube).

The characteristics of a single lamp are shown in the following tables.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	594	660	726	Vrms	Note 1
Lamp current	I_L	3	6	6.5	mArms	Note 1
Power consumption	P_L		3.96		W	Note 2
Lamp starting voltage	V_S		-	1530 (T=0•)	Vrms	Note 3
			-	1250(T=25•)		
Frequency	F_L	50	60	80	KH$_Z$	Note 4
Lamp life time	L_L	10000	-	-	Hr	Note 1, 5

Note 1: T= 25•

Note 2: Inverter should be designed with the characteristic of lamp. When you are designing the inverter, the output voltage of the inverter should comply with the following conditions.

    (1). The area under the positive and negative cycles of the waveform of the lamp current and lamp voltage should be area symmetric(the symmetric ratio should be

larger than 90%).

(2). There should not have any spikes in the waveform.

(3). The waveform should be sine wave as possible.

(4). Lamp current should not exceed the maximum value within the operating temperature (It is prohibited to over the maximum lamp current even if operated in the non-guaranteed temperature). When lamp current over the maximum value for a long time, it may cause fire. Therefore, it is recommend that the inverter should have the current limited circuit.

Note 3: The inverter open voltage should be designed larger than the lamp starting voltage at $T=0^oC$, otherwise backlight may be blinking for a moment after turning on or not be able to turn on. The open voltage should be measured after ballast capacitor. If an inverter has shutdown function it should keep its open voltage for longer than 1 second even if lamp connector is open.

Note 4: Lamp frequency may produce interference with horizontal synchronous frequency and

this may cause line flow on the display.   Therefore lamp frequency shall be detached

from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.   In case using the inverter by PWM control, PWM frequency may interference with frame frequency.   We suggest that PWM frequency is same as frame frequency.

Note 5: Brightness to be decrease to the 50% of the initial value under I_L = 6mA.

Note 6: CN2 connector (backlight): BHSR-02VS-1(JST).

Mating connector: SM02B-BHSS-1-TB (JST).

Pin no.	Symbol	Function	Remark
1	H	CCFL power supply(H.V.)	Cable color: Pink
2	L	CCFL power supply(GND)	Cable color: White

C. Optical specifications (Note 1, Note 2)

Item		Symbol	Condition	Specification			Unit	Remark
				Min.	Typ.	Max.		
Response time Rising time Falling time		Tr Tf	•=0°	- -	20 30	40 50	ms	Note 4
Contrast ratio		CR	•=0°	150	200	-		Note 3,5
Viewing angle	Top Bottom Left Right		CR•10	15 35 40 40	- - - -	- - - -	deg.	Note 3,8
Brightness	5 points	Y_L	•=0°	130	150	-		Note 3,6,7,9
		Wx		0.280	0.310	0.340		

|						
	Wy		0.300	0.330	0.360	
	Rx		0.547	0.577	0.607	
	Ry		0.298	0.328	0.358	
	Gx		0.270	0.300	0.330	
	Gy		0.525	0.555	0.585	
	Bx		0.115	0.145	0.175	
	By		0.090	0.120	0.150	
White uniformity	•w		-	-	1.65		Note 3,9

Note 1: Ambient temperature = 25•.

Note 2: To be measured in dark room after lighting the backlight for 30 minutes.

Note 3: To be measured with a viewing cone of 1° by Topcon luminance meter BM-5A.

Note 4: Definition of response time:

The output signals of BM-7 are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.
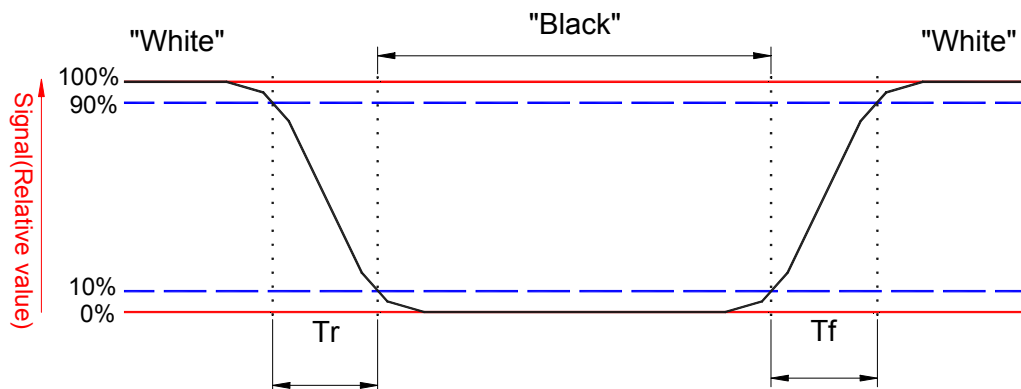
Note 5. Definition of contrast ratio:

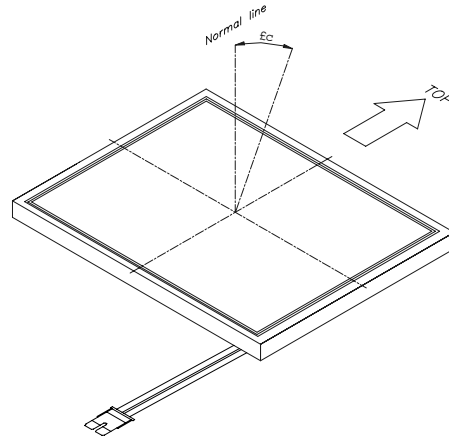Contrast ratio is calculated with the following formula.

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

Note 6: Definition of brightness:

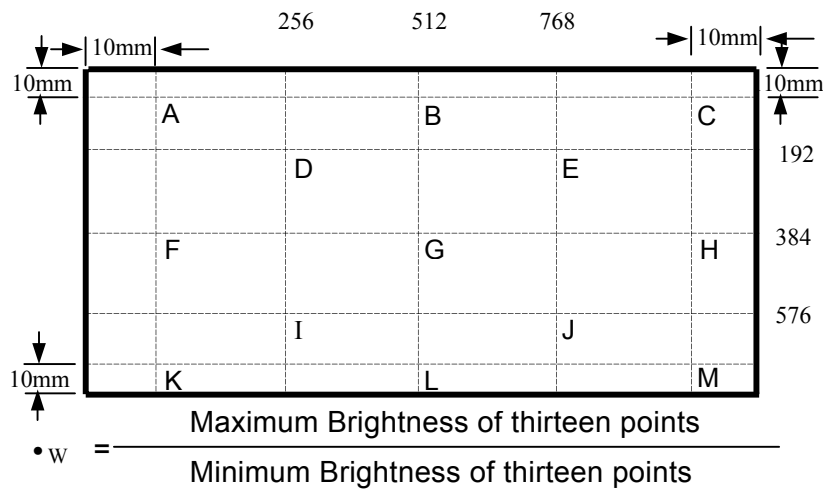$$\text{Brightness}(Y_L) = \frac{Y_{LD} + Y_{LE} + Y_{LG} + Y_{LI} + Y_{LJ}}{5}$$

Note 7: Driving conditions for CCFL : I_L=6.0 mA, 60Hz frequency.

Note 8: Definition of viewing angle

Note 9: Definition of white uniformity:
White uniformity is defined as the following with thirteen measurements (A~M).

$$\bullet_W = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

D. Reliability test items(Note 1)

| Test tem	Test Condition	Judgement	Remark
High temperature storage	60•, 240Hrs	Display quality	Note 1, 2
Low temperature storage	-20•, 240Hrs	Display quality	Note 1, 2
High temperature & high humidity operation	40•, 90%RH, 240Hrs (No condensation)	Display quality	Note 1, 2
High temperature operation	50•, 240Hrs	Display quality	Note 1, 2
Low temperature operation	0•, 240Hrs	Display quality	Note 1, 2

Temperature cycling (non-operation)	-20•~60• 1Hr, 10mins, 1Hr, 5cycles	Display quality	Note 1, 2
Electrostatic discharge (non-operation)	150PF, 150•, ±10KV, 1second, 9 points on the panel, 10 times each place	Display function	Note 3
Vibration (non-operation)	Sweep:1G, 10H$_Z$ ~ 500H$_Z$ ~ 10H$_Z$ /2.5min 2 hour for each direction X, Y, Z	Display quality	Note 1, 2
Mechanical shock (non-operation)	Half-Sine Wave , 220G,2ms, ±X, ±Y, ±Z	Display quality	Note 1, 2

Note 1: Evaluation should be tested after storage at room temperature for one hour.

Note 2: There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

Note 3: The discharging points are shown as below.
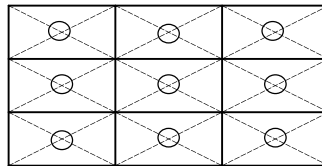
E. Display quality

The display quality of the color TFT-LCD module should be in compliance with the Unipac's incoming inspection standard.
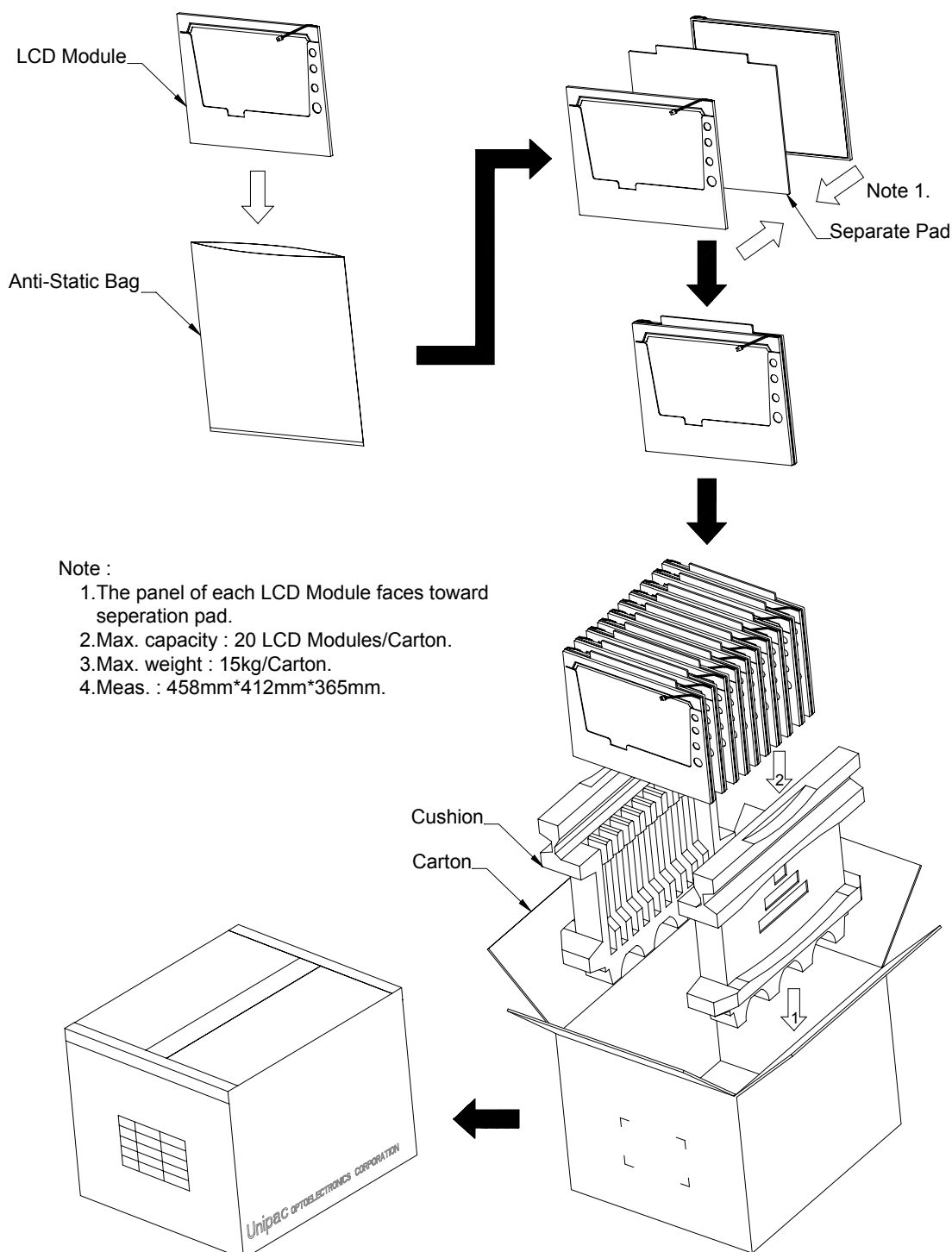
F. Handling precaution

The Handling of the TFT-LCD should be in compliance with the Unipac's handling principle standard.

G. Packing form

LCD Module

Anti-Static Bag

Note 1.

Separate Pad

Note :
1. The panel of each LCD Module faces toward seperation pad.
2. Max. capacity : 20 LCD Modules/Carton.
3. Max. weight : 15kg/Carton.
4. Meas. : 458mm*412mm*365mm.

Cushion

Carton

Unipac OPTOELECTRONICS CORPORATION
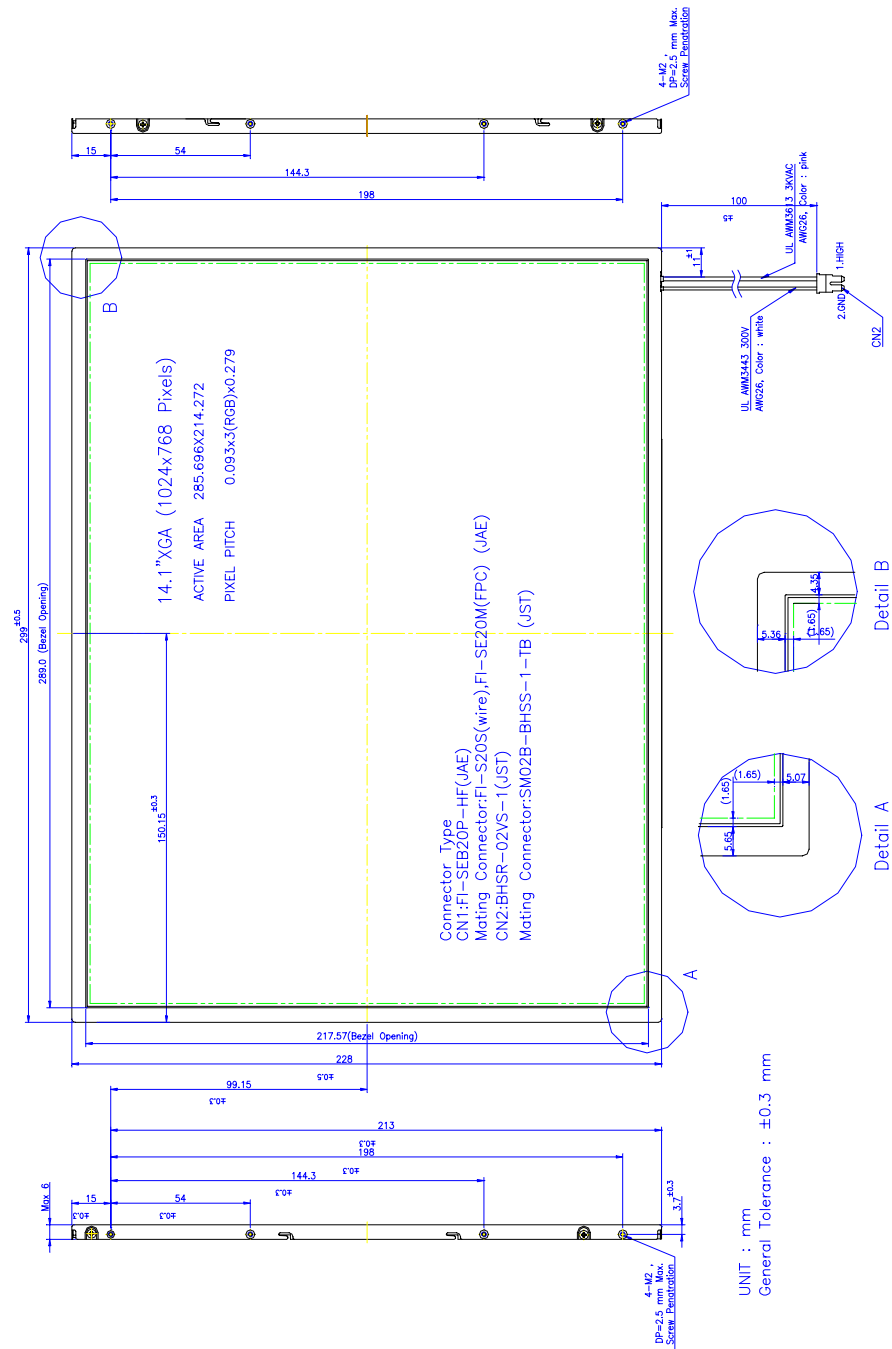
Fig.1-(a) LCM outline dimensions (Front side)

14.1"XGA (1024x768 Pixels)
ACTIVE AREA　285.696X214.272
PIXEL PITCH　0.093x3(RGB)x0.279

Connector Type
CN1:FI-SEB20P-HF(JAE)
Mating Connector:FI-S20S(wire),FI-SE20M(FPC) (JAE)
CN2:BHSR-02VS-1(JST)
Mating Connector:SM02B-BHSS-1-TB (JST)

Detail A

Detail B

UNIT : mm
General Tolerance : ±0.3 mm
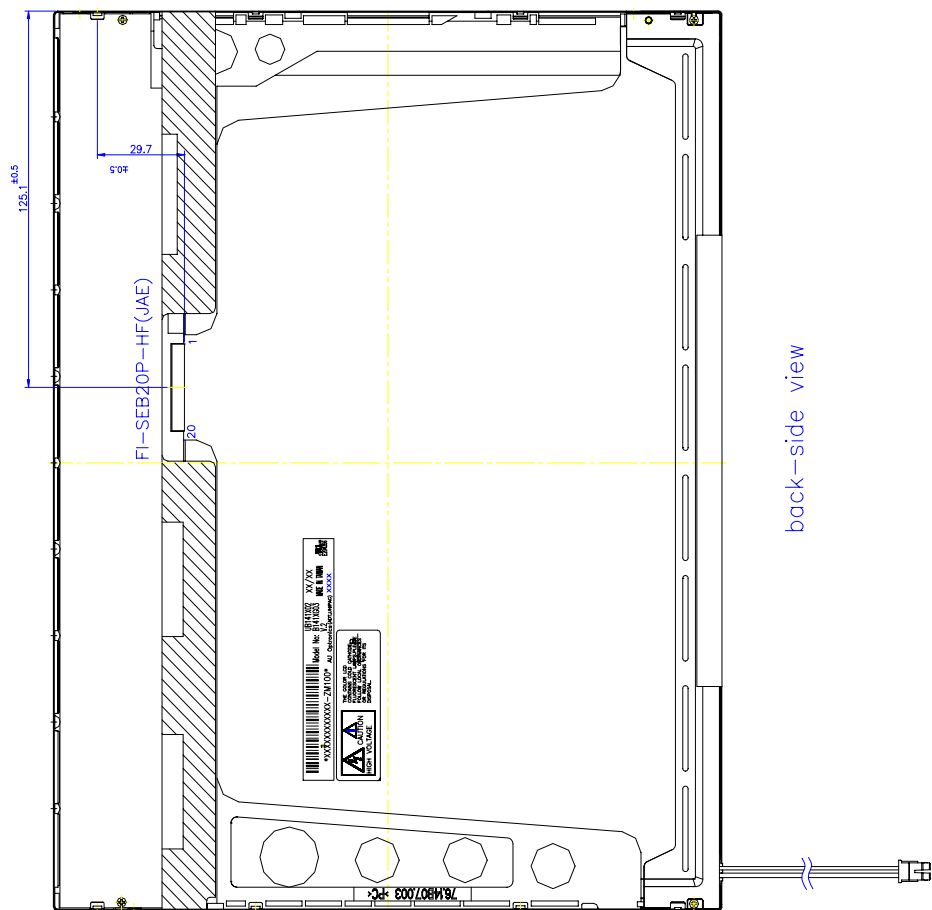
Fig.1-(b) LCM outline dimensions (Back side)

Fig.2 Timing chart

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