

**UNIPAC OPTOELECTRONICS CORPORATION**

Spec. No.	413-212-103P
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Version : 0.5

Total pages : 18

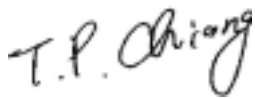
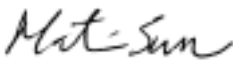
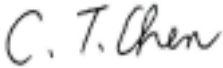
Date : 2001.08.09

Unipac 14.1" COLOR TFT-LCD MODULE

PRELIMINARY SPECIFICATION

MODEL NAME: B141PN01 (UB141P03)

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A. Physical specifications

NO.	Item	Specification	Remark
1	Display resolution(pixel)	1400(H)×1050(V)	SXGA+
2	Active area(mm)	285.6(H)×214.2(V)	
3	Screen size(inch)	14.1(Diagonal)	
4	Pixel pitch(mm)	0.204(H)×0.204(V)	
5	Color configuration	R. G. B. Vertical stripe	
6	Overall dimension(mm)	298.5×226.7×5.2 [W xH xD]	Note 1
7	Weight(g)	455g	
8	Surface treatment	Hard coating(3H), anti-glare of the front polarizer(Haze25%)	

Note 1: Refer to Fig. 1. on page 15,16.



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B. Electrical specifications

1.Pin assignment

(1).Input signal interface

CN1 (30P) connector : FI-XB30S-HF10 (JAE)

Matching connector : FI-X30H (wire Type)

FI-X30M (FPC Type)

Pin no	Symbol	Function	Etc.
1	V _{CC}	+3.3 V power supply	
2	V _{CC}	+3.3 V power supply	
3	GND	Ground	
4	GND	Ground	
5	ReIN0-	LVDS receiver signal channel 0 (EVEN)	
6	ReIN0+		
7	ReIN1-	LVDS receiver signal channel 1 (EVEN)	
8	ReIN1+		
9	ReIN2-	LVDS receiver signal channel 2 (EVEN)	
10	ReIN2+		
11	ReCLKIN-	LVDS receiver signal clock (EVEN)	
12	ReCLKIN+		
13	RoIN0-	LVDS receiver signal channel 0 (ODD)	
14	RoIN0+		
15	RoIN1-	LVDS receiver signal channel 1 (ODD)	
16	RoIN1+		
17	RoIN2-	LVDS receiver signal channel 2 (ODD)	
18	RoIN2+		
19	RoCLKIN-	LVDS receiver signal clock 3 (ODD)	
20	RoCLKIN+		



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(2) LVDS transmitter/receiver signal mapping(EVEN)

	Symbol	Function	
TxIN0	EVEN R0	EVEN Red data (LSB)	6 bit even red display data
TxIN1	EVEN R1	EVEN Red data	
TxIN2	EVEN R2	EVEN Red data	
TxIN3	EVEN R3	EVEN Red data	
TxIN4	EVEN R4	EVEN Red data	
TxIN5	EVEN R5	EVEN Red data (MSB)	
TxIN6	EVEN G0	EVEN Green data (LSB)	6 bit even green display data
TxIN7	EVEN G1	EVEN Green data	
TxIN8	EVEN G2	EVEN Green data	
TxIN9	EVEN G3	EVEN Green data	
TxIN10	EVEN G4	EVEN Green data	
TxIN11	EVEN G5	EVEN Green data (MSB)	
TxIN12	EVEN B0	EVEN Blue data (LSB)	6 bit even blue display data
TxIN13	EVEN B1	EVEN Blue data	
TxIN14	EVEN B2	EVEN Blue data	
TxIN15	EVEN B3	EVEN Blue data	
TxIN16	EVEN B4	EVEN Blue data	
TxIN17	EVEN B5	EVEN Blue data (MSB)	
TxIN18	Hs	EVEN Horizontal sync	
TxIN19	Vs	Vertical sync	
TxIN20	DE	Data enable	
TxCLKIN	EVEN CLK	EVEN Clock	even Dot clock



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(3) LVDS transmitter/receiver signal mapping(ODD)

	Symbol	Function	
TxIN0	ODD R0	ODD Red data (LSB)	6 bit odd red display data
TxIN1	ODD R1	ODD Red data	
TxIN2	ODD R2	ODD Red data	
TxIN3	ODD R3	ODD Red data	
TxIN4	ODD R4	ODD Red data	
TxIN5	ODD R5	ODD Red data (MSB)	
TxIN6	ODD G0	ODD Green data (LSB)	6 bit odd green display data
TxIN7	ODD G1	ODD Green data	
TxIN8	ODD G2	ODD Green data	
TxIN9	ODD G3	ODD Green data	
TxIN10	ODD G4	ODD Green data	
TxIN11	ODD G5	ODD Green data (MSB)	
TxIN12	ODD B0	ODD Blue data (LSB)	6 bit odd blue display data
TxIN13	ODD B1	ODD Blue data	
TxIN14	ODD B2	ODD Blue data	
TxIN15	ODD B3	ODD Blue data	
TxIN16	ODD B4	ODD Blue data	
TxIN17	ODD B5	ODD Blue data (MSB)	
TxIN18	NC	NONE	
TxIN19	NC	NONE	
TxIN20	NC	NONE	
TxCLKIN	ODD CLK	ODD Clock	odd Dot clock

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 lifetime of CCFL will be reduced.

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



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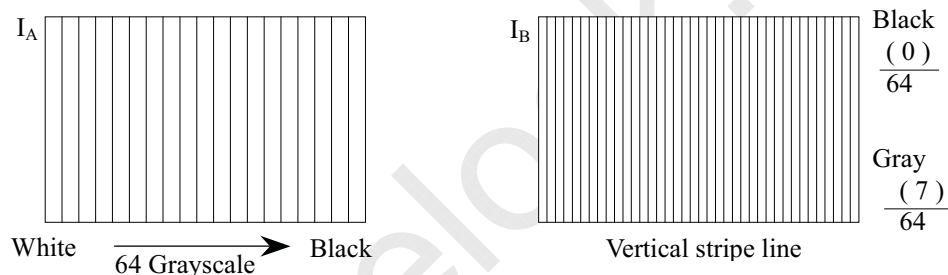
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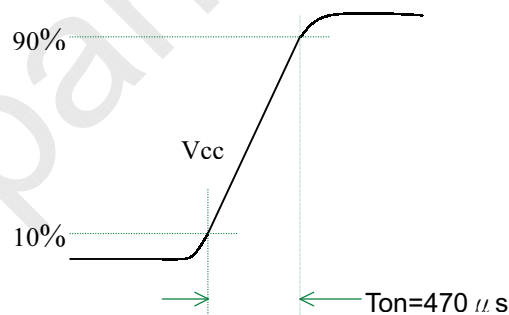
3. Electrical characteristics

a. Typical operating conditions

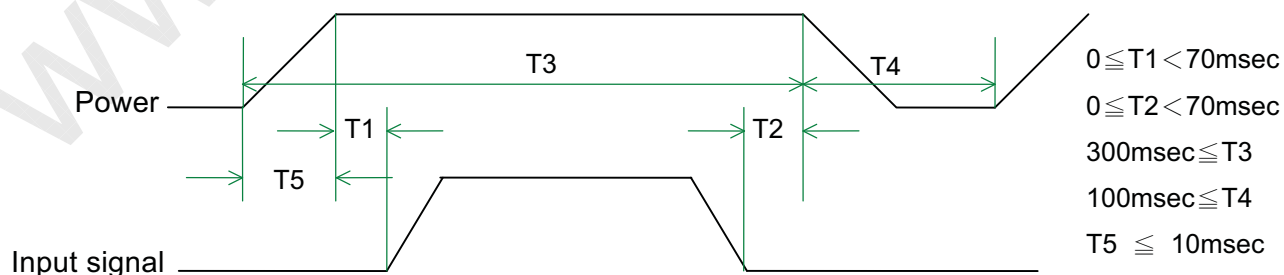
	Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	Input voltage	V_{CC}	3.0	3.3	3.6	V	
	Current consumption	I_A	-	440	-	mArms	Note 1
		I_B	-	-	660	mArms	
	Inrush current	I_{RUSH}	-	-	2200	mApeak	Note 2
Internal logic	Low voltage	V_{IL}	0	-	$0.3 V_{CC}$		
	High voltage	V_{IH}	$0.7V_{CC}$	-	V_{CC}		
	Power ripple voltage	V_{RP}	-	-	100	mVp-p	

Note 1: Effective value (mArms) at $V_{CC} = 3.3 \text{ V}/25^\circ\text{C}$.

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



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



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.

The above on/off sequence should be applied to avoid abnormal function in the display.



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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 (applied to ODD & EVEN)

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																		
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	1	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	↕																		
	↕																		
	bright																		
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	1	0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	↕																		
	↕																		
	bright																		
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
Basic colors	Yellow	1	1	1	1	1	1	1	1	1	1	1	0	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
	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
Basic colors	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	0	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
	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
Basic colors	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	0	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

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.



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c. Input signal timing

Timing diagrams of input signal are shown in Fig 2.

(1). Timing characteristics of Input signals (DE Mode)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
CLK	Frequency	Fck	51	54	57	MHz	
	Period	Clk	17.5	18.5	19.6	ns	
Hs Horizontal sync	Period	Th	820	844	1023	Clk	
			-	-	-	μs	
	Display	Thd	700			Clk	
	Pulse	Thw	10	56	240	Clk	
	Display start	The	32	120	120	Clk	
	Front	Thf	0	24		Clk	
	Back	Thb	32	64	120	Clk	The-Thw
	Blanking	Thbl	120	144	323	Clk	Th-700
Vs Vertical sync	Period	Tv	1058	1066	2047	Th	
			-	-	-	ms	
	Display	Tvd	1050			Th	
	Pulse	Tvw	1	3	120	Th	
	Display start	Tve	3	15		Th	
	Back	Tvb	2	12			Tve-Tvw
	Front	Tvf	0	1			
	Blanking	Tvbl	8	16	997		Tv-1050



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(2). Timing characteristics of Input signals (**HV Mode**)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
CLK	Frequency	Fck	51	54	57	MHz	
	Period	Clk	17.5	18.5	19.6	ns	
Hs Horizontal sync	Period	Th	820	844	1023	Clk	
			-	-	-	μs	
	Display	Thd	700			Clk	
	Pulse	Thw	56	56	56	Clk	
	Display start	The	120	120	120	Clk	
	Front	Thf	0	24	203	Clk	
	Back	Thb	64	64	64	Clk	The-Thw
	Blanking	Thbl	120	144	323	Clk	Th-700
Vs Vertical sync	Period	Tv	1065	1066	2047	Th	
						ms	
	Display	Tvd	1050			Th	
	Pulse	Tvw	3	3	3	Th	
	Display start	Tve	15	15	15	Th	
	Back	Tvb	12	12	12		Tve-Tvw
	Front	Tvf	0	1	962		
	Blanking	Tvbl	15	16	977		Tv-1050

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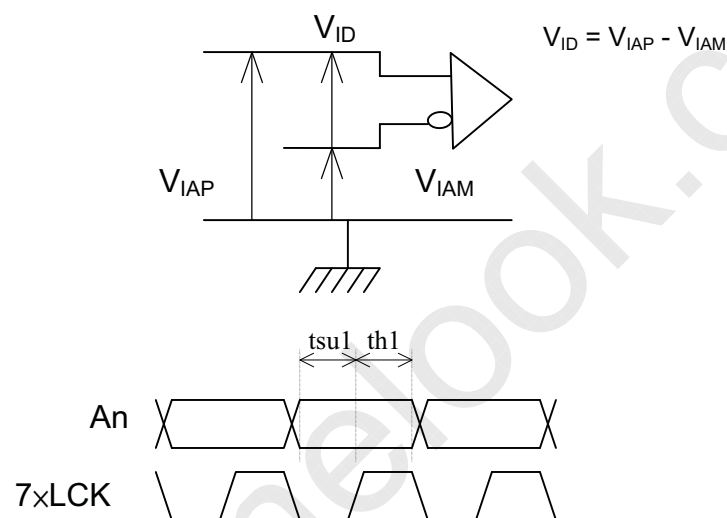
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(3). The timing condition of LVDS

Item	Symbol	Min.	Typ.	Max.	Unit
The differential level	VID	0.1	-	0.6	V
The common mode input voltage	VIC	$\frac{ VID }{2}$	-	$2.4 - \frac{ VID }{2}$	V
The input setup time	tsu1	500	-	-	ps
The input hold time	th1	500	-	-	ps



d.Display position

EVEN	ODD	-	-	-	EVEN	ODD
D(0,1)	D(1,1)		D(X,1)		D(1398,1)	D(1399,1)
D(0,2)	D(1,2)		D(X,2)		D(1398,2)	D(1399,2)
⋮	⋮		⋮		⋮	⋮
D(0,Y)	D(1,Y)		D(X,Y)		D(1398,Y)	D(1399,Y)
⋮	⋮		⋮		⋮	⋮
D(0,1049)	D(1,1049)		D(X,1049)		D(1398,1049)	D(1399,1049)
D(0,1050)	D(1,1050)		D(X,1050)		D(1398,1050)	D(1399,1050)



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e.Backlight unit

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

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	-	650	-	Vrms	$I_L = 6mA$.
Lamp current	I_L	3	6	6.5	mArms	Note 1
Power consumption	P_L	-	3.9	-	W	Note 2
Lamp starting voltage	V_s	-	-	1400 (T=0°C)	Vrms	Note 3
		-	-	1050 (T=25°C)		
Frequency	F_L	50	60	80	KHz	Note 4
Lamp life time	L_L	10000	-	-	Hr	Note 5

Note 1: Using the inverter of PWM type(keep stable peak value of output voltage during adjusting lamp current), the minimum lamp current is 3mA.

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 limiter circuit.

Note 3: The inverter open voltage should be designed larger than the lamp starting voltage at T=0°C, 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: T= 25°C , $I_L = 6mA$. Brightness to be decrease to the 50% of the initial value.

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



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C. Optical specifications (Note 1, Note 2)

Item		Symbol	Condition	Specification			Unit	Remark
				Min.	Typ.	Max.		
Response time		Tr Tf	$\theta = 0^{\circ}$	-	20	40	ms	Note 4
Rising time				-	30	50		
Falling time				-	30	50		
Contrast ratio		CR	$\theta = 0^{\circ}$	150	250	-		Note 3,5
Viewing angle Top Bottom Left Right			$CR \geq 10$	10	-	-	deg.	Note 3,8
				30	-	-		
				40	-	-		
				40	-	-		
				40	-	-		
Brightness	5 points	Y_L	$\theta = 0^{\circ}$	(120)	150	- -		Note 3,6,7,9
Color chromaticity(CIE)		Wx	$\theta = 0^{\circ}$	-	0.310	-		Note 3
		Wy		-	0.330	-		
		Rx		-	TBD	-		
		Ry		-	TBD	-		
		Gx		-	TBD	-		
		Gy		-	TBD	-		
		Bx		-	TBD	-		
		By		-	TBD	-		
White uniformity		δ_w		-	-	1.8		Note 3,9

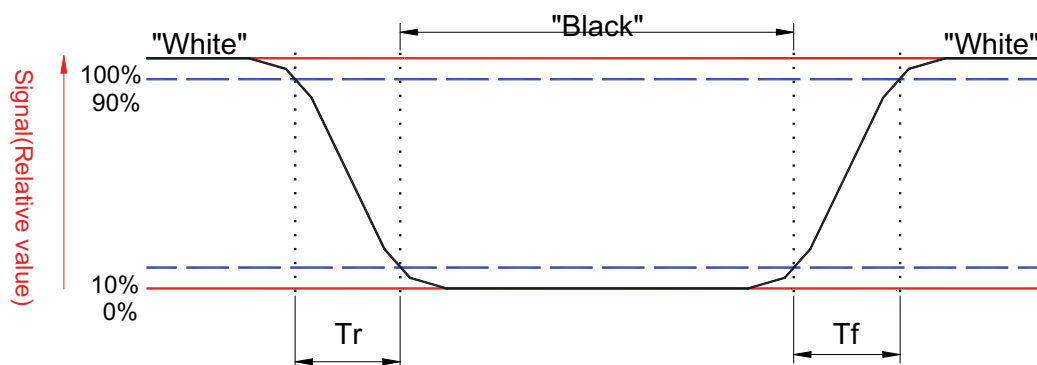
Note 1: Ambient temperature = 25°C.

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.





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Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

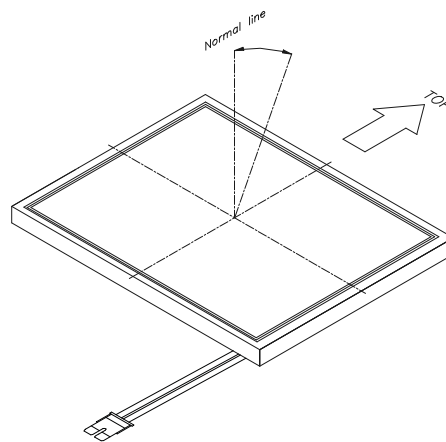
$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 6: Definition of brightness:

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

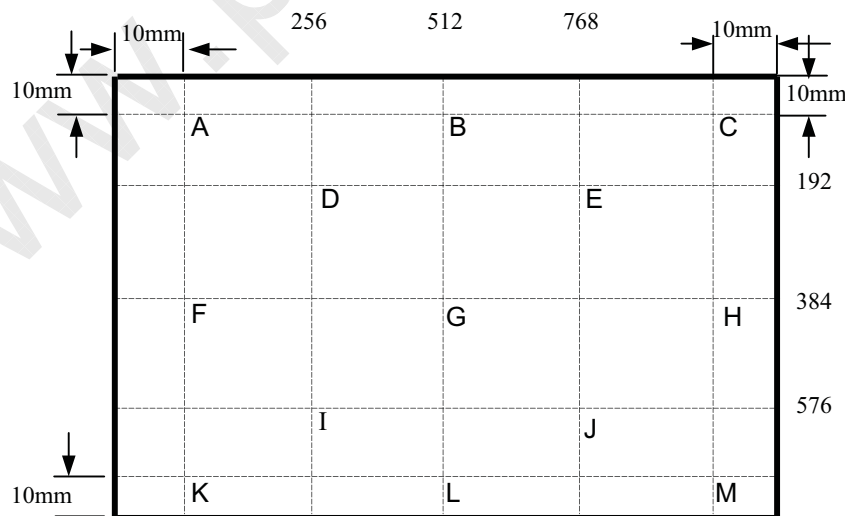
Note 7: Driving conditions for CCFL : $I_L = 6.0 \text{ mA}$,60 KHz frequency

Note 8: Definition of viewing angle.



Note 9: Definition of white uniformity:

White uniformity is defined as the following with thirteen measurements (A~M).



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

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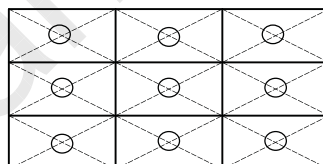
D. Reliability test items(Note 1)

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℃ 1H. 10mins. 1H. 8cycles	Display quality	Note 1, 2
Interface connector ESD test	200 PF, 0Ω, 200V, CN1	Display function	Note 3
Contact discharge	100 PF, 1.5KΩ, ±8KV, 1second, 9 points on the panel, 10 times each place	Display function	Note 3
Vibration (non-operation)	Sweep: 1.5G, 10Hz ~ 300Hz ~ 10Hz/10min ; 30min for each direction X, Y, Z	Display quality	Note 1, 2
Mechanical shock (non-operation)	240G, 2ms, ±X, ±Y, ±Z once for each direction	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.

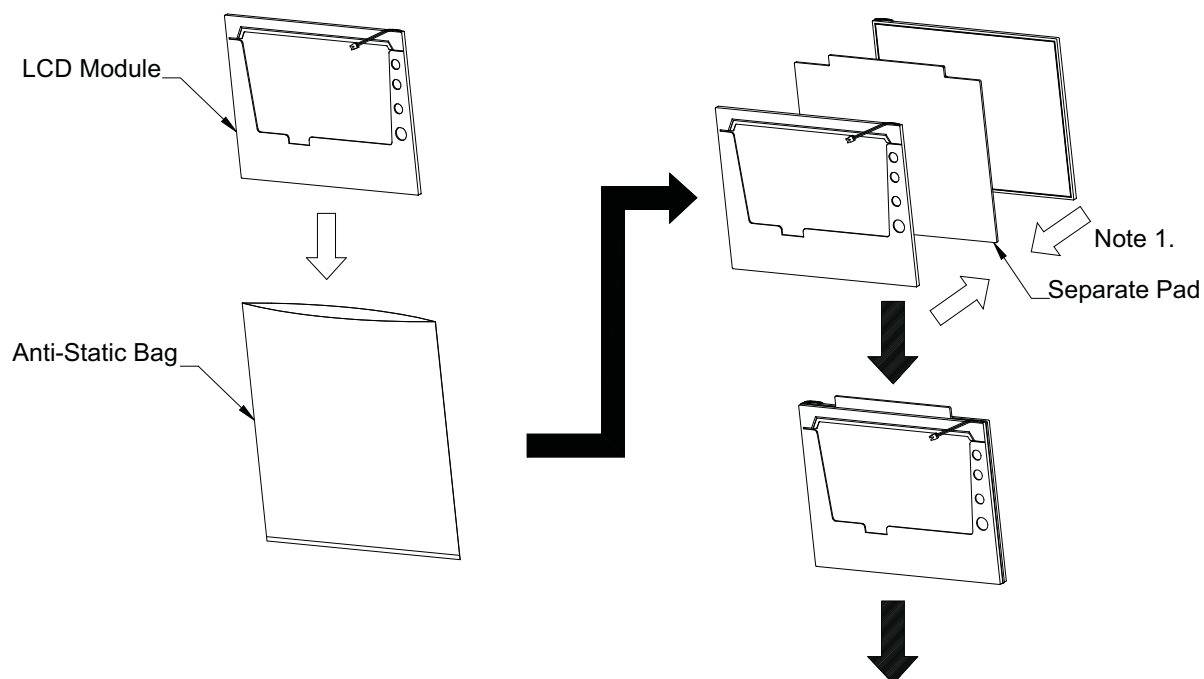


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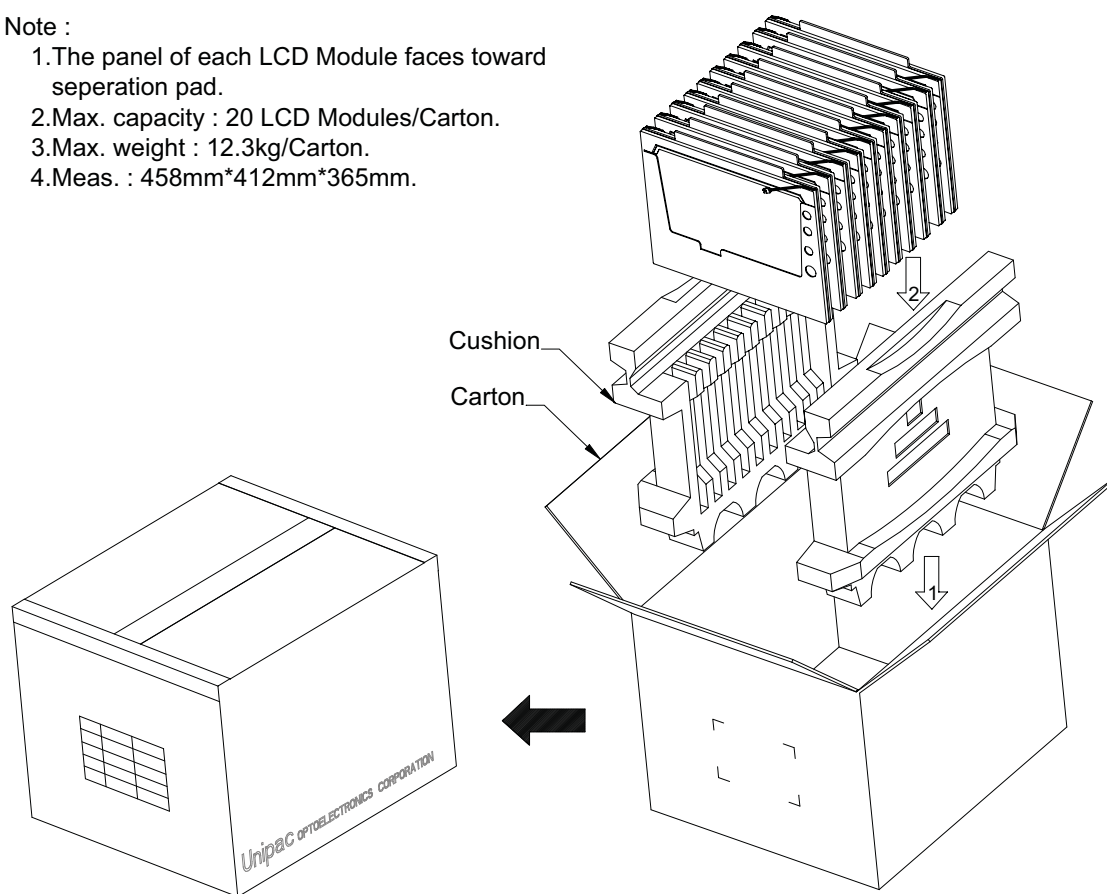
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G. Packing form

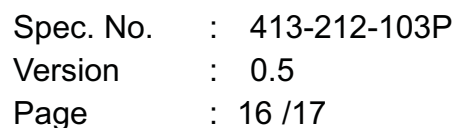


Note :

- 1.The panel of each LCD Module faces toward seperation pad.
- 2.Max. capacity : 20 LCD Modules/Carton.
- 3.Max. weight : 12.3kg/Carton.
- 4.Meas. : 458mm*412mm*365mm.



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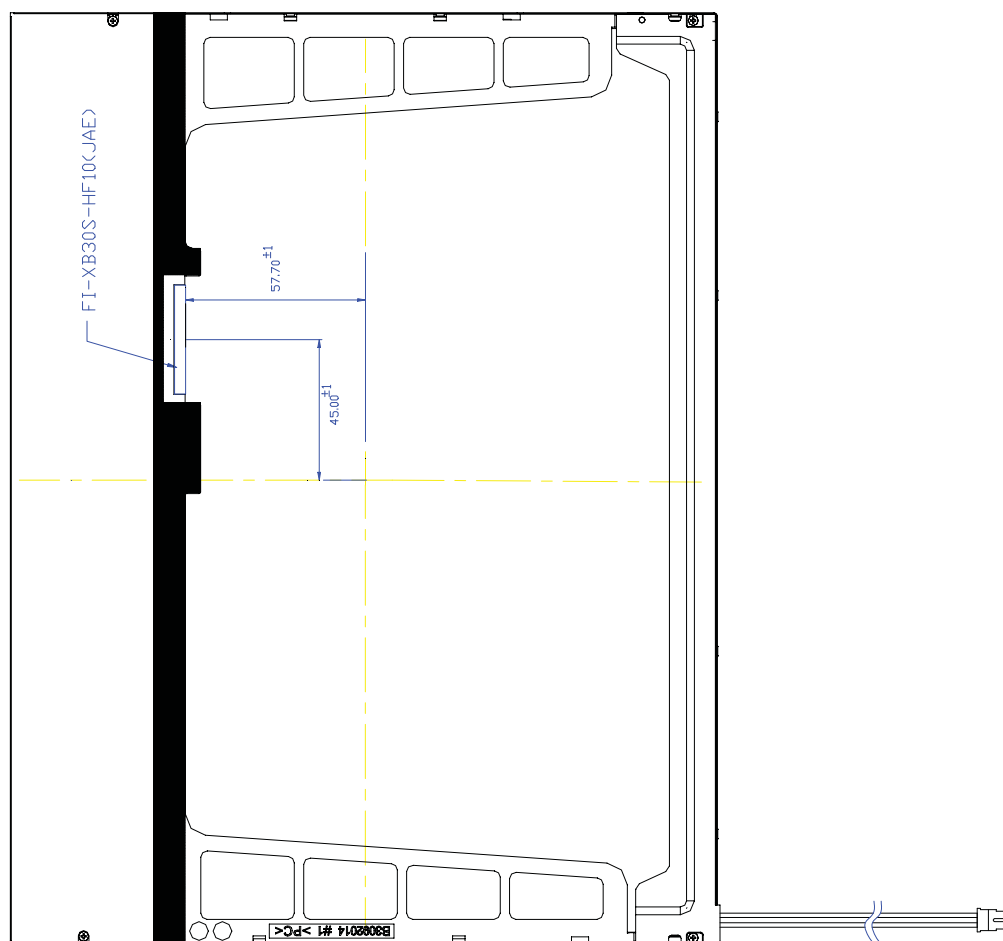
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**Fig.1-(b) LCM outline dimensions (Back side)**

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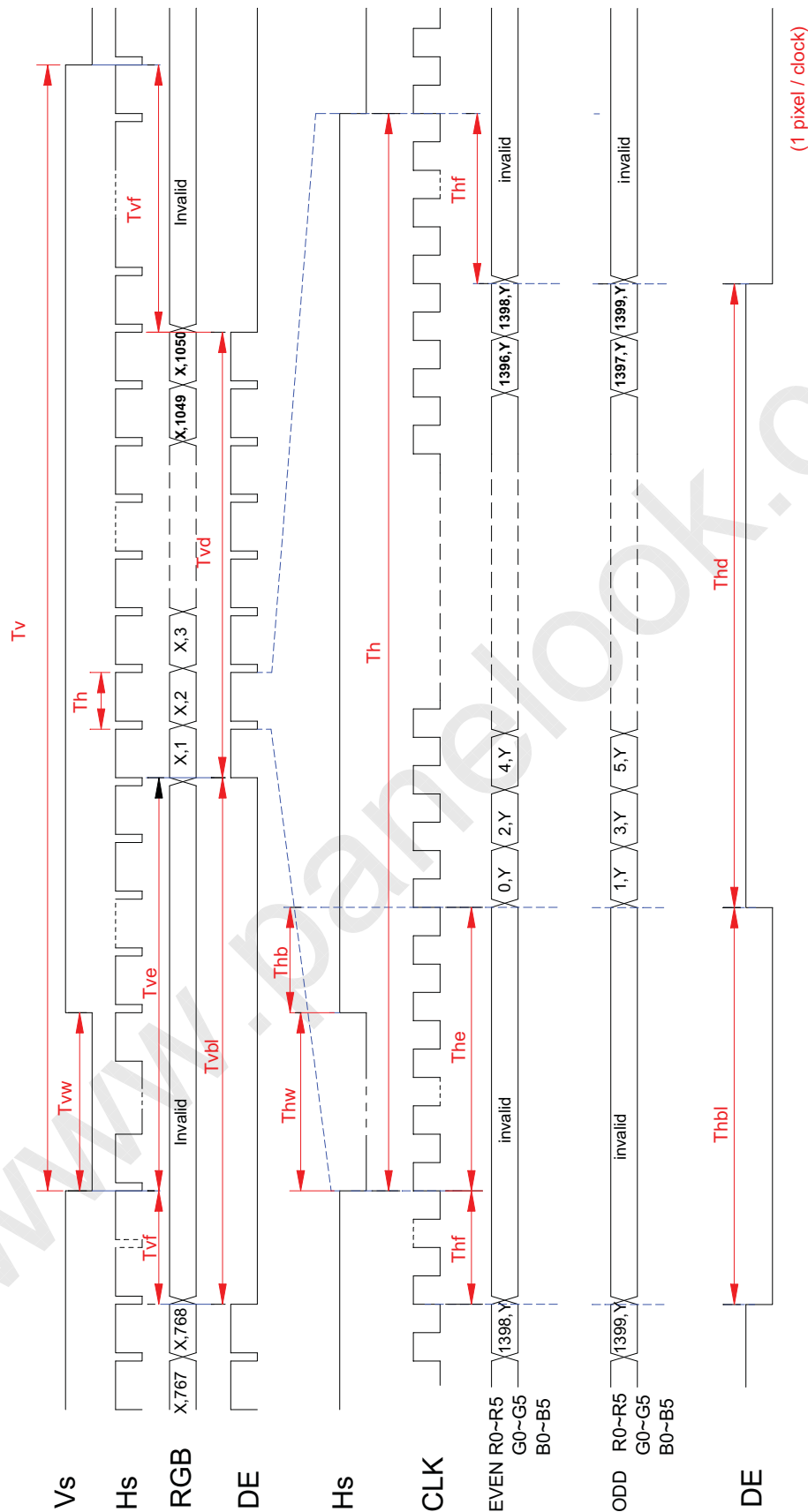


Fig.2 Timing chart

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