TFT LCD Approval Specification

MODEL NO.: N141C3 - L01

Customer:

Approved by:

Note:

記錄	工作	審核	角色	投票
2007-05-22 18:17:37 CST	Approve by Dept. Mgr.(QA RA)	yuan_chan(趙俊淵/52760/54760)	Department Manager(QA RA)	Accept
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2007-05-15 11:17:49 CST	Approve by Director	wy_li(李汪洋/44701)	Director	Accept

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
0.0	Oct 11,'06	All	All	Tentative specification was first issued.
2.0	Mar. 12,'07	All	All	Approval specification was first issued.
2.1	May. 09,'07	14,15,16	5.5	Change EDID code (WWAN frequency change to 107.8 MHz)
	May. 15,'07	30	11	Outline drawing update (mylar location changed).

1 GENERAL DESCRIPTION

1.1 OVERVIEW

N141C3 - L01 is a 14.1" TFT Liquid Crystal Display module with single CCFL Backlight unit and 30 pins LVDS interface. This module supports 1440 x (3 RGB) x 900 WXGA+ mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for backlight is not built in.

1.2 FEATURES

- Thin and Light Weight
- WXGA+ (1440 x 900 pixels) resolution
- DE only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 2 pixel/clock
- RoHS compliance

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	303.48(H) X 189.675(V) (14.1 inch Diagonal)	mm	(1)
Bezel Opening Area	306.76 (H) x 193.0 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch	0.21075 (H) x 0.21075 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Anti-glare and Hard Coat , Haze 26, (3H min.)	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	319	319.5	320	mm	(1)
	Vertical(V)	205	205.5	206	mm	
	Depth(D)	--	5.2	5.5	mm	
Weight		--	425	430	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions

2 ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

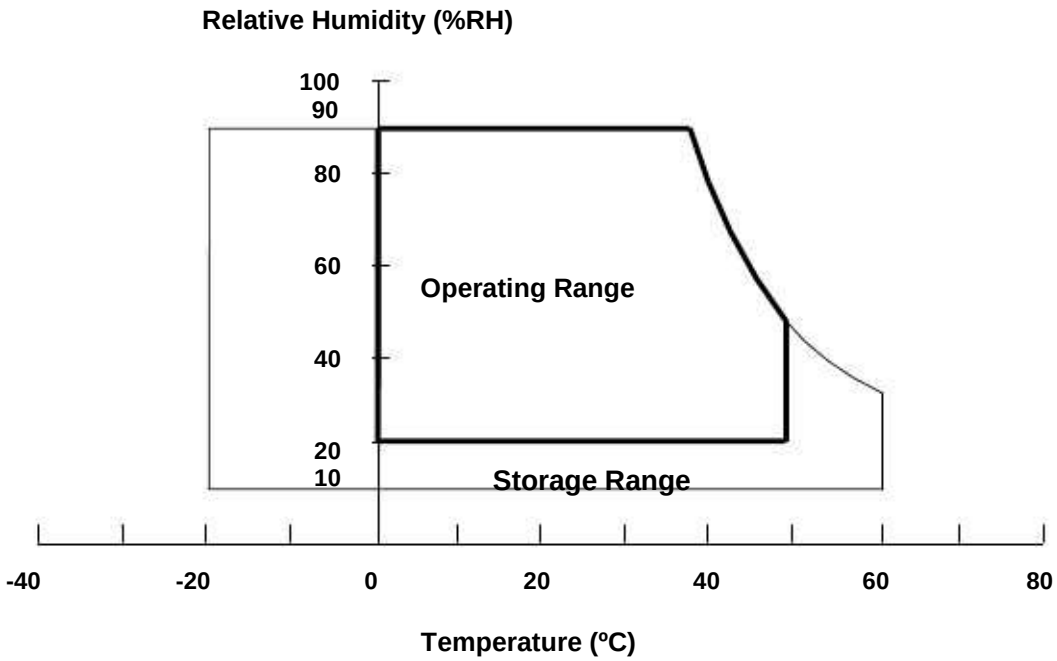
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	220/2	G/ms	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) (a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max..

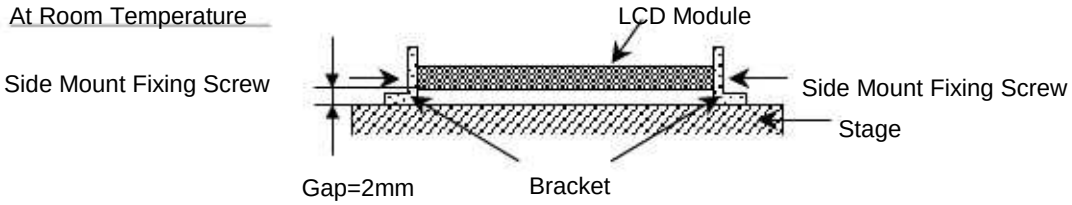


Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 200 Hz, 30 min / Cycle, 1 cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2)
Lamp Current	I_L	2.0	6.5	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	45	80	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

3 ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

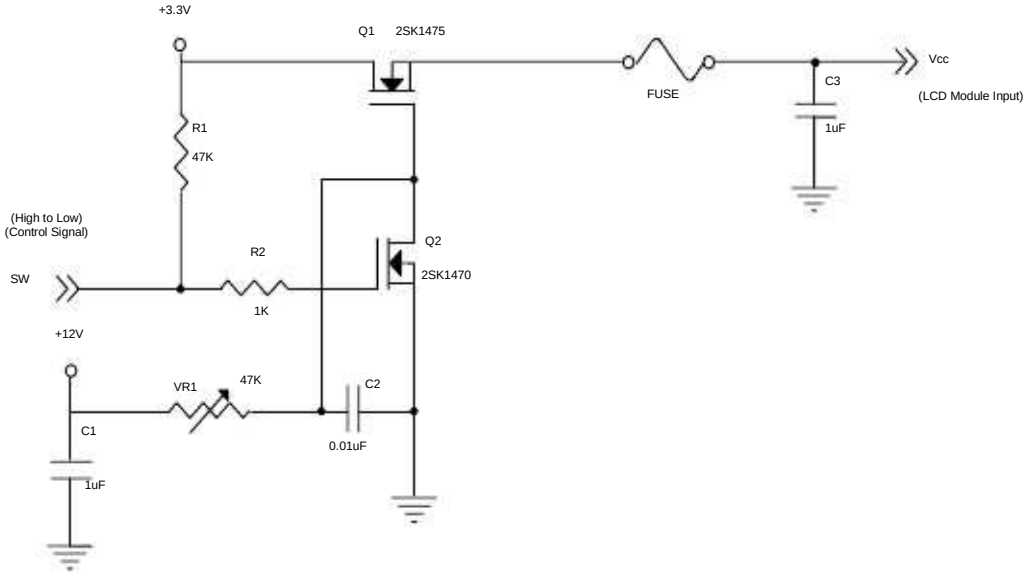
Parameter	Symbol	Value Min.	Value Typ.	Value Max.	Unit	Note
Power Supply Voltage	Vcc	3.0	3.3	3.6	V	-
Permissive Ripple Voltage	V_{RP}	-	50	-	mV	-
Rush Current	I_{RUSH}	-	-	1.5	A	(2)
Initial Stage Current	I_{IS}	-	-	1.0	A	(2)
Power Supply Current White	Icc	-	380	430	mA	(3)a
Power Supply Current Black	Icc	-	465	510	mA	(3)b
LVDS Differential Input High Threshold	$V_{TH(LVDS)}$	-	-	+100	mV	(5), V_{CM}=1.2V
LVDS Differential Input Low Threshold	$V_{TL(LVDS)}$	-100	-	-	mV	V_{CM}=1.2V (5)
LVDS Common Mode Voltage	V_{CM}	1.125	-	1.375	V	(5)
LVDS Differential Input Voltage	$\|V_{ID}\|$	100	-	600	mV	-
Terminating Resistor	R_T	-	100	-	Ohm	(4)
Power per EBL WG	P_{EBL}	-	3.69	-	W	

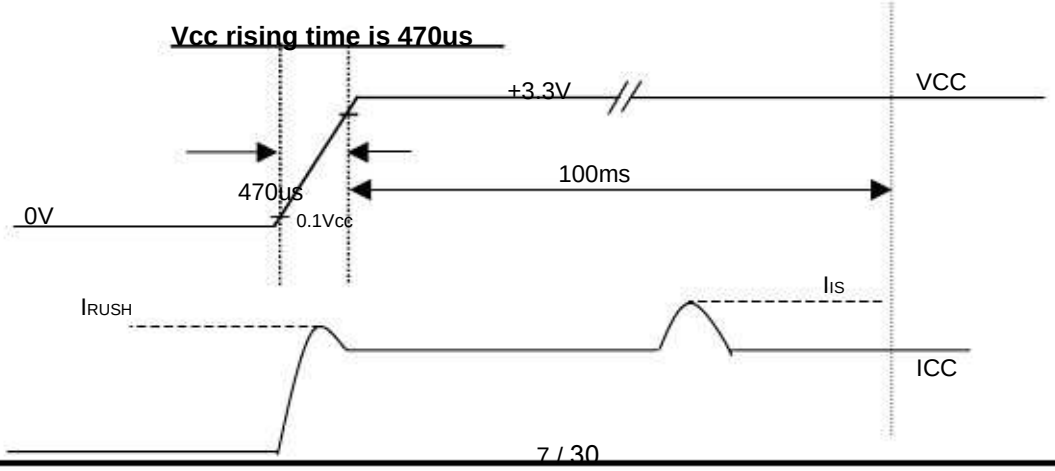
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when VCC is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.





Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

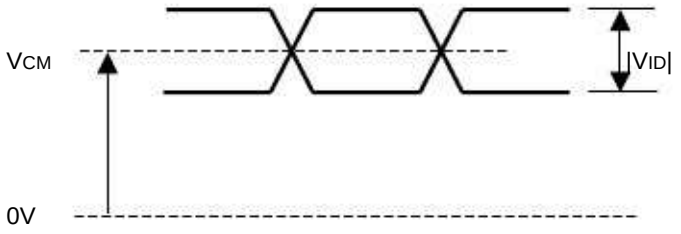
(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

(c) Luminance: 60 nits.

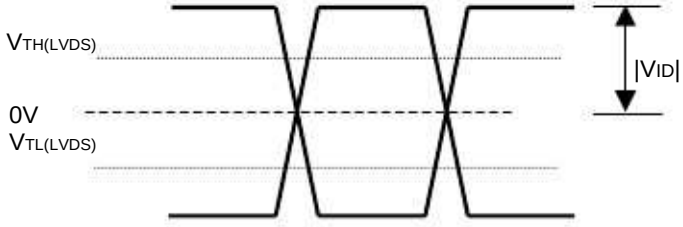
(d) The inverter used is provided from Sumida (www.sumida.com.tw). Please contact Sumida for detail information. CMO doesn't provide the inverter in this product.

Note (5) The parameters of LVDS signals are defined as the following figures.

Single Ended



Differential

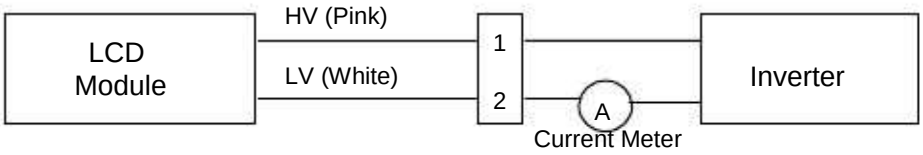


3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	612	680	748	V_{RMS}	I_L = 6.0 mA
Lamp Current	I_L	2.0	6.0	6.5	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1370 (25 °C)	V_{RMS}	(2)
		-	-	1520 (0 °C)	V_{RMS}	(2)
Operating Frequency	F_L	45	-	80	KHz	(3)
Lamp Life Time	L_{BL}	15,000	-	-	Hrs	(5)
Power Consumption	P_L	-	4.08	-	W	(4), I_L = 6.0 mA

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:



Note (2) The voltage that must be larger than Vs should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = 6 mArms until one of the following events occurs:

(a) When the brightness becomes or lower than 50% of its original value.

(b) When the effective ignition length becomes or lower than 80% of its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter

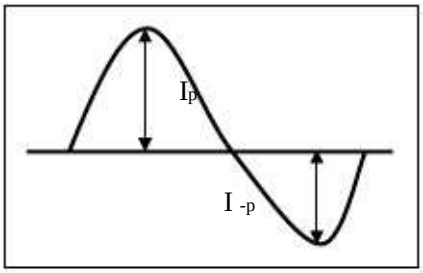
which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp. It shall help increase the lamp lifetime and reduce its leakage current.

a. The asymmetry rate of the inverter waveform should be 10% below.

b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$.

c. The ideal sine wave form shall be symmetric in positive and negative polarities.



* Asymmetry rate:

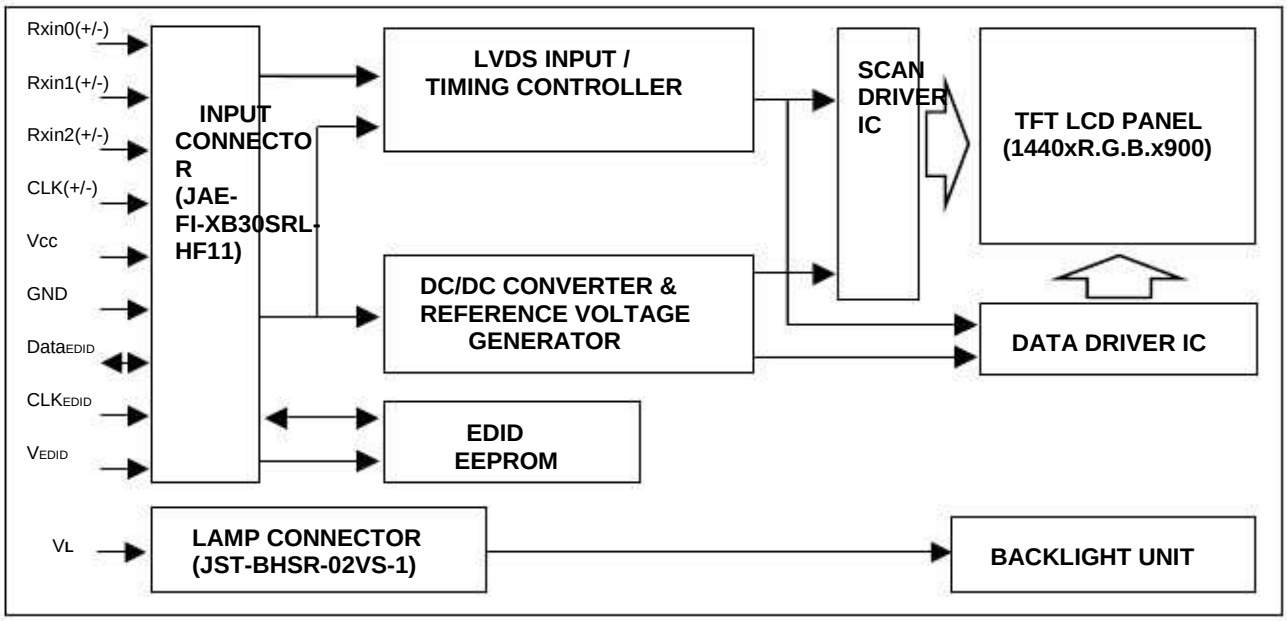
$$| I_p - I_{-p} | / I_{rms} * 100\%$$

* Distortion rate

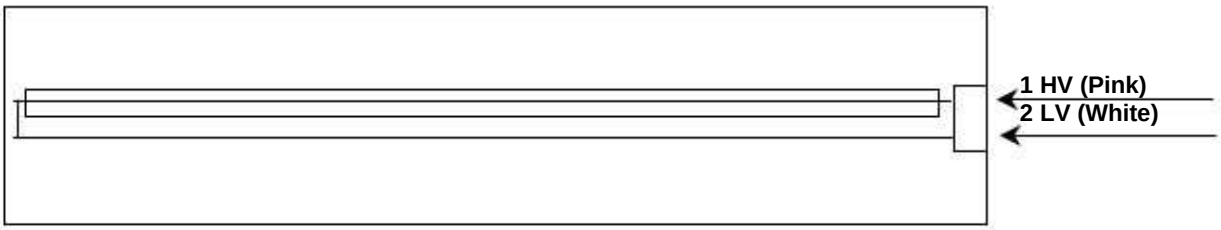
$$I_p \text{ (or } I_{-p}) / I_{rms}$$

4 BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



5 INPUT TERMINAL PIN ASSIGNMENT

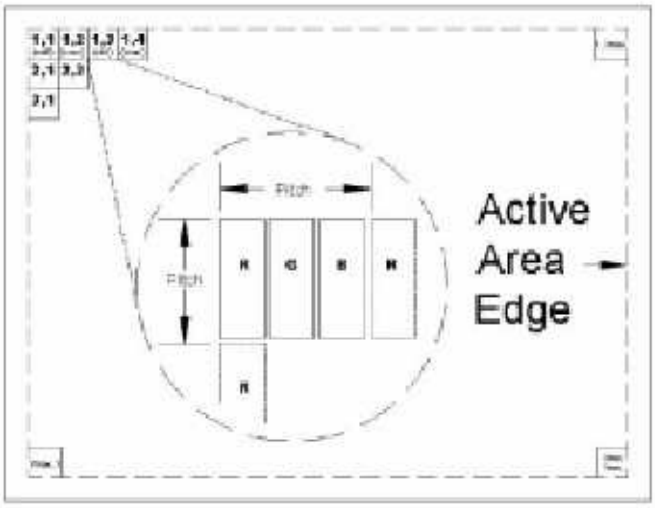
5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		
2	Vcc	Power Supply +3.3 V (typical)		
3	Vcc	Power Supply +3.3 V (typical)		
4	V_{EDID}	DDC 3.3V Power		
5	NC	Non-Connection		
6	CLK_{EDID}	DDC Clock		
7	$DATA_{EDID}$	DDC Data		
8	RXO0-	LVDS Differential Data Input (Odd)		-
9	RXO0+	LVDS Differential Data Input (Odd)	Negative	
10	Vss	Ground	Positive	
11	RXO1-	LVDS Differential Data Input (Odd)		
12	RXO1+	LVDS Differential Data Input (Odd)		
13	Vss	Ground	Negative	
14	RXO2-	LVDS Differential Data Input (Odd)	Positive	
15	RXO2+	LVDS Differential Data Input (Odd)		
16	Vss	Ground	Negative	
17	RXOC-	LVDS Clock Data Input (Odd)	Positive	
18	RXOC+	LVDS Clock Data Input (Odd)		
19	Vss	Ground		
20	RxE0-	LVDS Differential Data Input (Even)	Negative	
21	RxE0+	LVDS Differential Data Input (Even)	Positive	
22	Vss	Ground		
23	RxE1-	LVDS Differential Data Input (Even)	Negative	
24	RxE1+	LVDS Differential Data Input (Even)	Positive	
25	Vss	Ground		
26	RxE2-	LVDS Differential Data Input (Even)		
27	RxE2+	LVDS Differential Data Input (Even)	Negative	
28	Vss	Ground	Positive	
29	RXEC-	LVDS Clock Data Input (Even)		
30	RXEC+	LVDS Clock Data Input (Even)	Negative	
			Positive	
			Negative	
			Positive	

Note (1) Connector Part No.: JAE-FI-XB30SRL-HF11 or equivalent

Note (2) User's connector Part No: JAE-FI-X30C2L or equivalent

Note (3) The first pixel is odd as shown in the following figure.



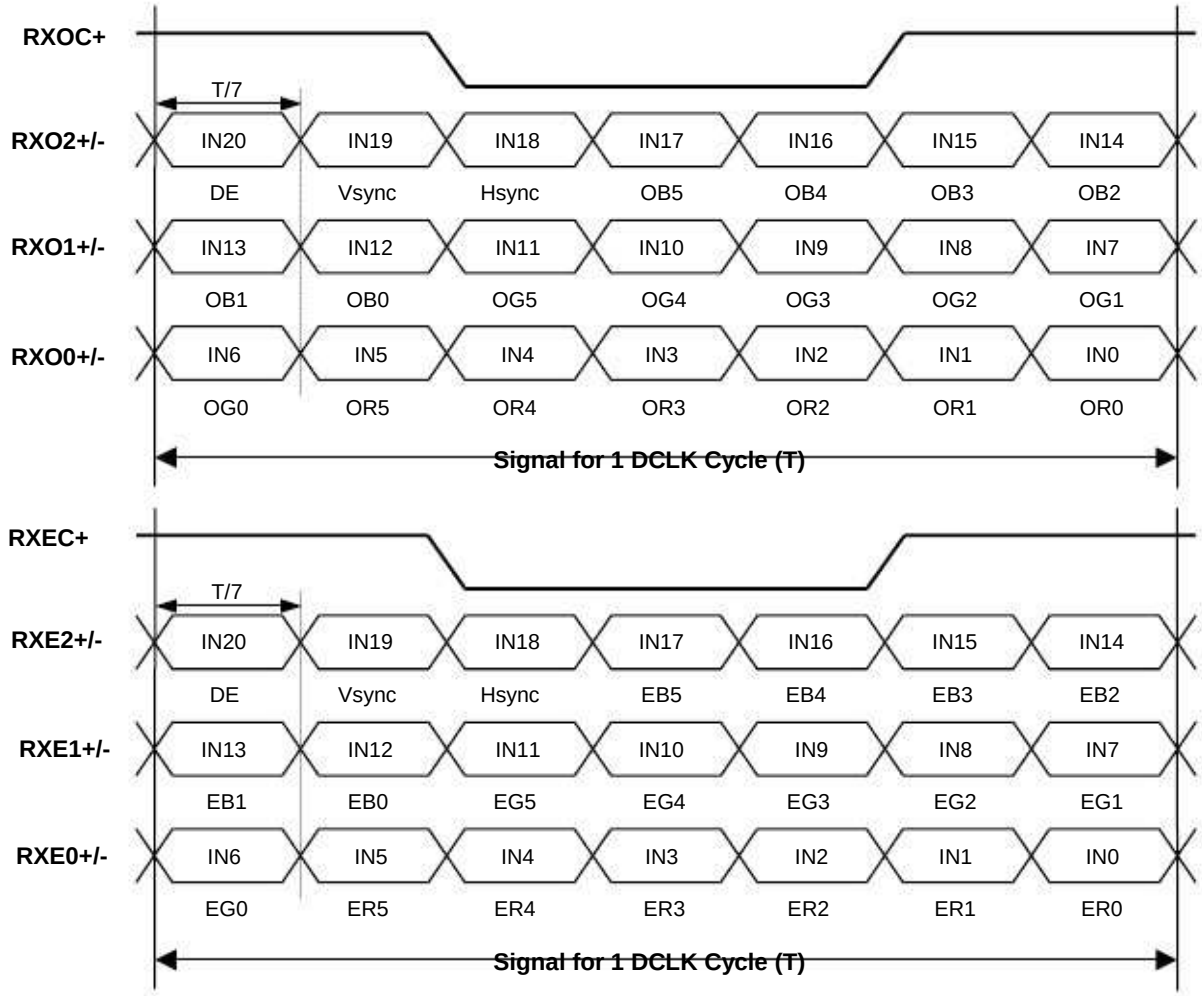
5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Color
1	HV	High Voltage	Pink
2	LV	Ground	White

Note (1) Connector Part No.: JST- BHSR-02VS-1 or equivalent

Note (2) User's connector Part No.: SM02B-BHSS-1-TB or equivalent

5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL



5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

		Data Signal																	
Color		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
	Black	0	0	0	0	0	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
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Basic	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Colors	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	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(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Red	Red(61)	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gray	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Green	Green(61)	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gray	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Blue	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.5 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.

	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name (“CMO”)	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AF	10101111
10	0A	ID product code (N141C3-L01)	30	00110000
11	0B	ID product code (hex LSB first; N141C3-L01)	14	00010100
12	0C	ID S/N (fixed “0”)	00	00000000
13	0D	ID S/N (fixed “0”)	00	00000000
14	0E	ID S/N (fixed “0”)	00	00000000
15	0F	ID S/N (fixed “0”)	00	00000000
16	10	Week of manufacture (fixed week code)	0B	00001011
17	11	Year of manufacture (fixed year code)	11	00010001
18	12	EDID structure version # (“1”)	01	00000001
19	13	EDID revision # (“3”)	03	00000011
20	14	Video I/P definition (“digital”)	80	10000000
21	15	Active area horizontal 30.348cm	1E	00011110
22	16	Active area vertical 18.9675cm	13	00010011
23	17	Display Gamma (Gamma = ”2.2”)	78	01111000
24	18	Feature support (“Active off, RGB Color”)	0A	00001010
25	19	Rx1 Rx0 Ry1 Ry0 Gx1 Gx0 Gy1 Gy0	09	00001001
26	1A	Bx1 Bx0 By1 By0 Wx1 Wx0 Wy1 Wy0	05	00000101
27	1B	Rx=0.590	97	10010111
28	1C	Ry=0.340	57	01010111
29	1D	Gx=0.319	51	01010001
30	1E	Gy=0.541	8A	10001010
31	1F	Bx=0.152	27	00100111
32	20	By=0.125	20	00100000
33	21	Wx=0.313	50	01010000
34	22	Wy=0.329	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer’s reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001

44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
		Detailed timing description # 1 Pixel clock (“107.8MHz”, According to VESA CVT Rev1.1)		
		# 1 Pixel clock (hex LSB first)		
54	36	# 1 H active (“1440”) # 1 H blank (“418”)	1C	00011100
55	37	# 1 H active : H blank (“1440 : 418”)	2A	00101010
56	38	# 1 V active (”900”)	A0	10100000
57	39	# 1 V blank (”67”)	A2	10100010
58	3A	# 1 V active : V blank (”900 :67”)	51	01010001
59	3B	# 1 H sync offset (”126”)	84	10000100
60	3C	# 1 H sync pulse width (“84”)	43	01000011
61	3D	# 1 V sync offset : V sync pulse width (” 8 : 15”)	30	00110000
62	3E	# 1 H sync offset : H sync pulse width : V sync offset : V sync	7E	01111110
63	3F	width (”126: 84 : 8 : 15”)	54	01010100
64	40	# 1 H image size (”303 mm”) # 1 V image size (”190 mm”)	8F	10001111
		# 1 H image size : V image size (”303 : 190”)		
		# 1 H boarder (”0”)		
		# 1 V boarder (”0”)		
65	41	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	00	00000000
66	42	Detailed timing description # 2	2F	00101111
67	43	# 2 Flag	BE	10111110
68	44	# 2 Reserved	10	00010000
69	45	# 2 FE (hex) defines ASCII string (Model Name “N141C3-L01”,	00	00000000
70	46	ASCII)	00	00000000
		# 2 Flag		
		# 2 1st character of name (“N”)		
		# 2 2nd character of name (“1”)	18	00011000
71	47	# 2 3rd character of name (“4”)		
72	48	# 2 4th character of name (“1”)	00	00000000
73	49	# 2 5th character of name (“C”)	00	00000000
74	4A	# 2 6th character of name (“3”)	00	00000000
		# 2 7th character of name (“-”)		
		# 2 8th character of name (“L”)		
		# 2 9th character of name (“0”)	FE	11111110
75	4B	# 2 9th character of name (“1”)		
76	4C	# 2 New line character indicates end of ASCII string	00	00000000
77	4D	# 2 Padding with “Blank” character	4E	01001110
78	4E	# 2 Padding with “Blank” character	31	00110001
79	4F		34	00110100
80	50		31	00110001
81	51		43	01000011
82	52		33	00110011
83	53		2D	00101101
84	54		4C	01001100
85	55		30	00110000
86	56		31	00110001
87	57		0A	00001010
88	58		20	00100000
89	59		20	00100000

90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor “CMO”, ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string (“C”)	43	01000011
96	60	# 3 2nd character of string (“M”)	4D	01001101
97	61	# 3 3rd character of string (“O”)	4F	01001111
98	62	# 3 New line character indicates end of ASCII string	0A	00001010
99	63	# 3 Padding with “Blank” character	20	00100000
100	64	# 3 Padding with “Blank” character	20	00100000
101	65	# 3 Padding with “Blank” character	20	00100000
102	66	# 3 Padding with “Blank” character	20	00100000
103	67	# 3 Padding with “Blank” character	20	00100000
104	68	# 3 Padding with “Blank” character	20	00100000
105	69	# 3 Padding with “Blank” character	20	00100000
106	6A	# 3 Padding with “Blank” character	20	00100000
107	6B	# 3 Padding with “Blank” character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
		# 4 FE (hex) defines ASCII string (Model Name“N141C3-L01”, ASCII)		
		# 4 Flag		
		# 4 1st character of name (“N”)		
		# 4 2nd character of name (“1”)		
		# 4 3rd character of name (“4”)		
		# 4 4th character of name (“1”)		
		# 4 5th character of name (“C”)	FE	11111110
111	6F	# 4 6th character of name (“3”)		
112	70	# 4 7th character of name (“-”)	00	00000000
113	71	# 4 8th character of name (“L”)	4E	01001110
114	72	# 4 9th character of name (“0”)	31	00110001
115	73	# 4 9th character of name (“1”)	34	00110100
116	74	# 4 New line character indicates end of ASCII string	31	00110001
117	75	# 4 Padding with “Blank” character	43	01000011
118	76	# 4 Padding with “Blank” character	33	00110011
119	77	Extension flag	2D	00101101
120	78	Checksum	4C	01001100
121	79		30	00110000
122	7A		31	00110001
123	7B		0A	00001010
124	7C		20	00100000
125	7D		20	00100000
126	7E		00	00000000
127	7F		9C	10011100

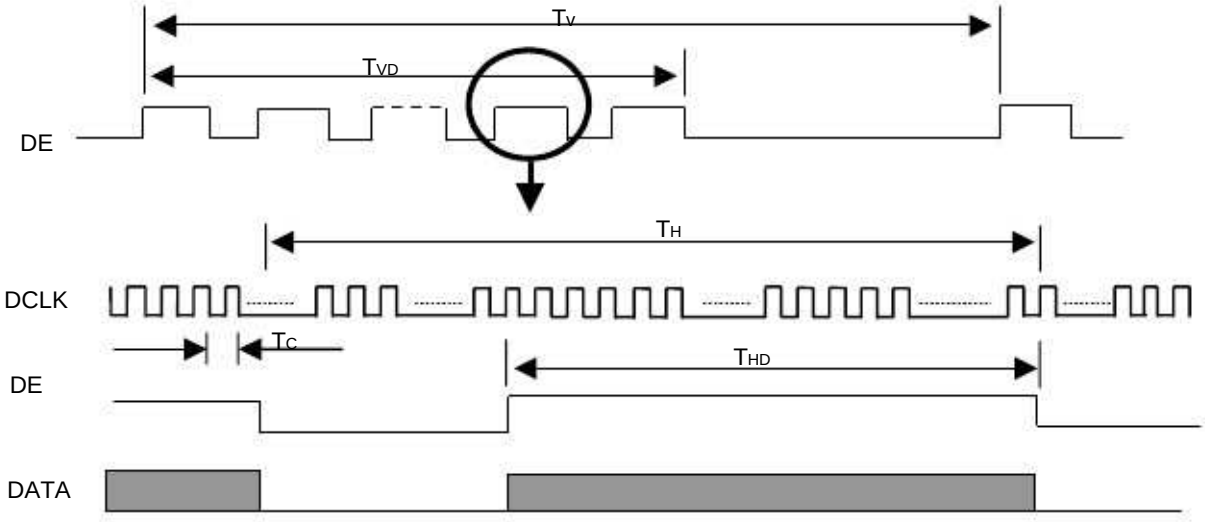
6 INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

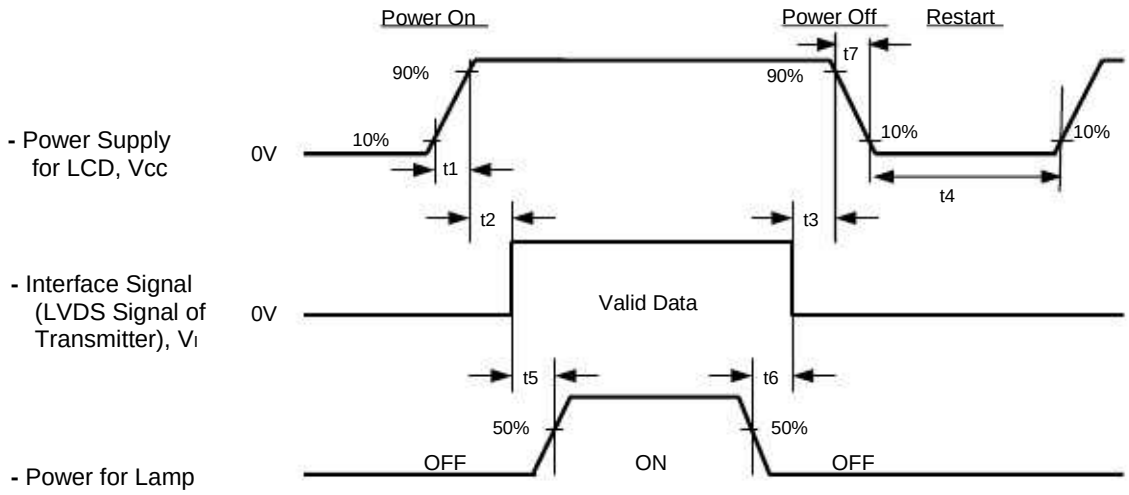
The specifications of input signal timing are as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	25	44.5	60	MHz	(2)
DE	Vertical Total Time	TV	910	926	1500	TH	-
	Vertical Active Display Period	TVD	900	900	900	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	26	TV-TVD	TH	
	Horizontal Total Time	TH	760	800	880	Tc	
	Horizontal Active Display Period	THD	720	720	720	Tc	(2)
	Horizontal Active Blanking Period	THB		80		Tc	(2)
			TH-THD		TH-THD		(2)

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE



Timing Specifications:

0.5< t1 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3 ≦ 50 msec

t4 ≧ 500 msec

t5 ≧ 200 msec

t6 ≧ 200 msec

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow 5□t7□300 ms.

7 OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

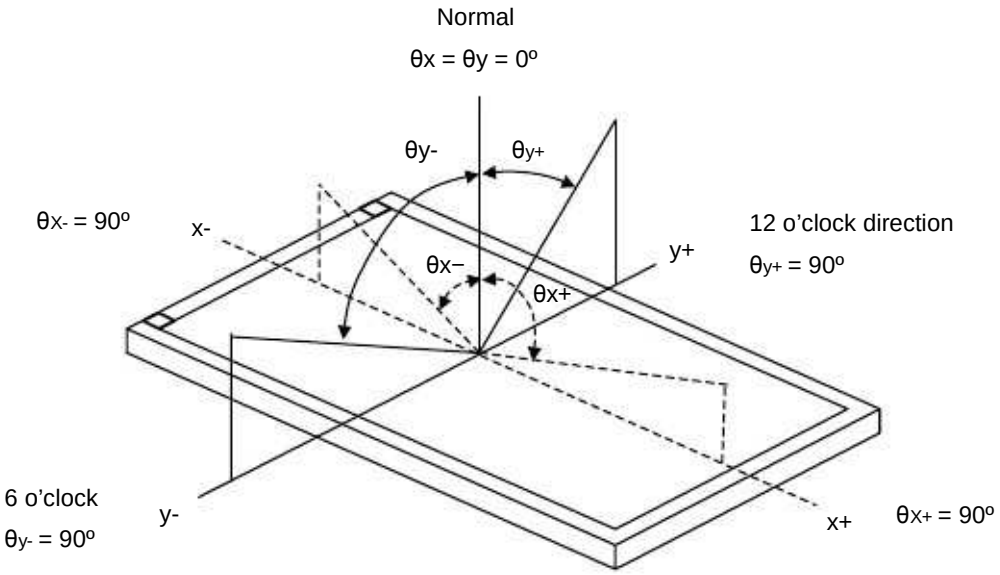
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	%RH50±10	
Supply Voltage	V_{CC}	3.3V	
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	6.0mA	
Inverter Driving Frequency	F_L	61KHz	
Inverter	Sumida H05-4915		

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_X=0°, θ_Y=0° Viewing Normal Angle	250	400	-	-	(2), (6)
Response Time		T_R		-	5	10	ms	(3)
		T_F		-	11	16	ms	
Average Luminance of White		L_{AVE}		185	220	-	cd/m^2	(4), (6)
White Variation		δW 5pts		-	-	1.4	-	(6)
Color Chromaticity	Red	Rx		TYP -0.03	0.590	TYP +0.03	-	(1), (6)
		Ry			0.340		-	
	Green	Gx			0.319		-	
		Gy			0.541		-	
	Blue	Bx			0.152		-	
		By			0.125		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Viewing Angle	Horizontal	θ_X+	CR≥10	40	45	-	Deg.	
		θ_X-		40	45	-		
	Vertical	θ_Y+		15	20	-		
		θ_Y-		40	45	-		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

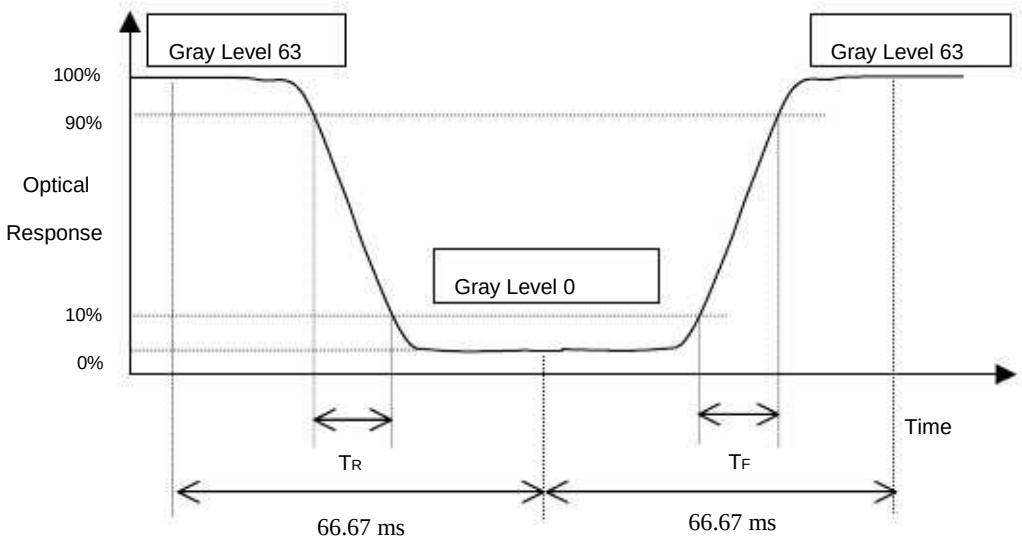
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Average Luminance of White (L_{AVE}):

Measure the luminance of gray level 63 at 5 points

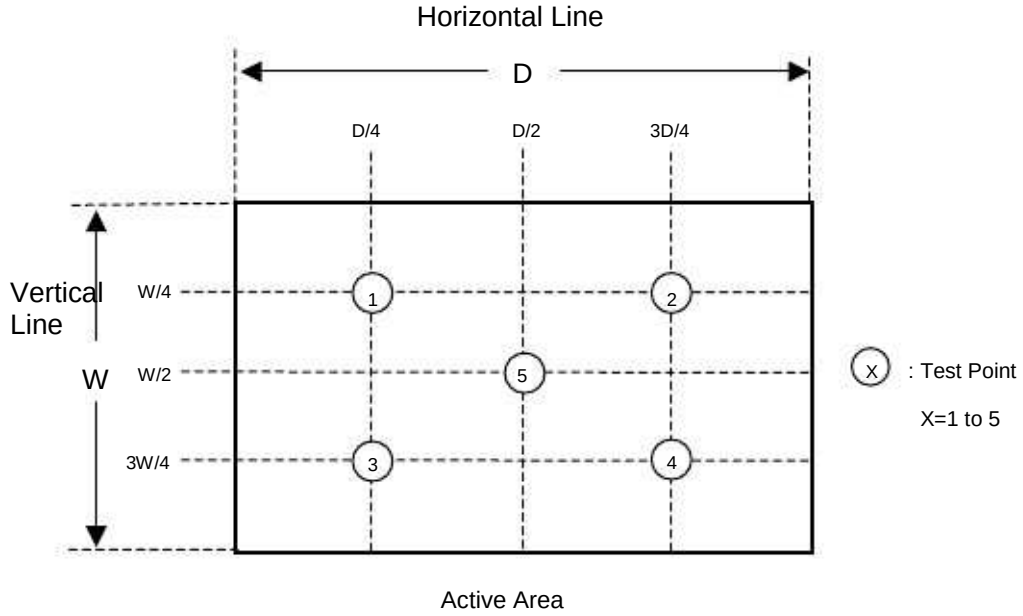
L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (5)

Note (5) Definition of White Variation (δW):

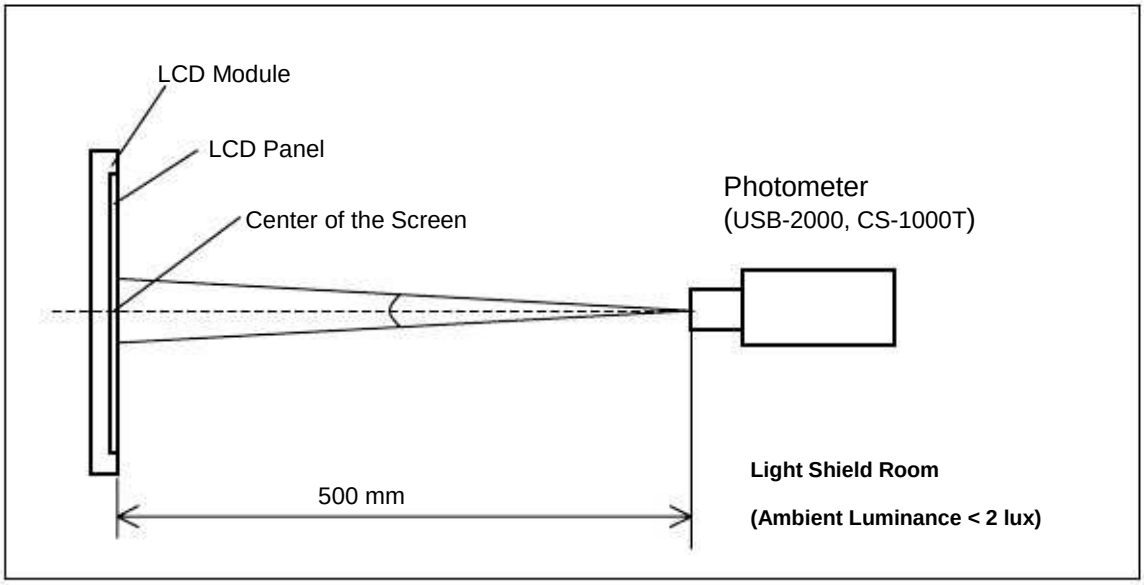
Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



8 PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

8.2 SAFETY PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

9 PACKAGING

9.1 CARTON

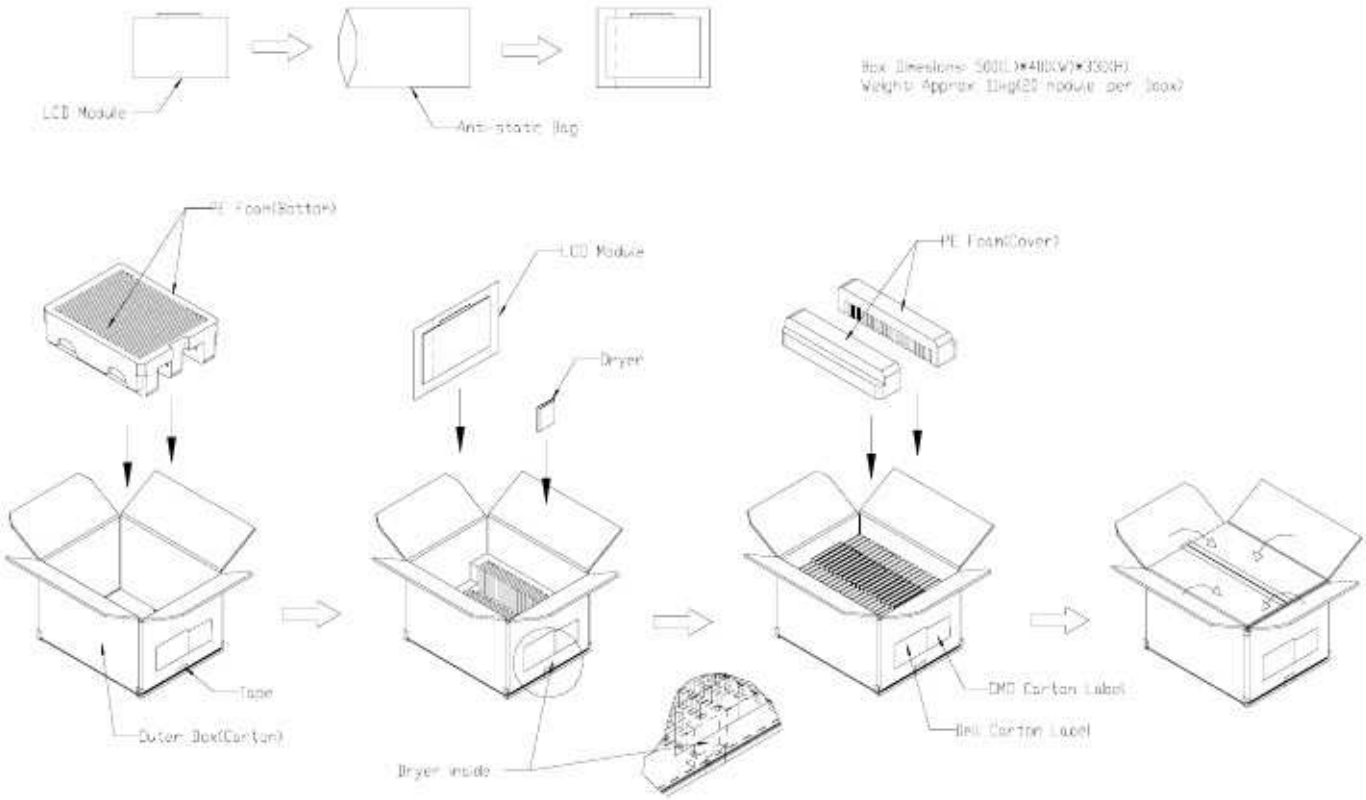


Figure. 9-1 Packing method

9.2 PALLET FOR SEA FREIGHT

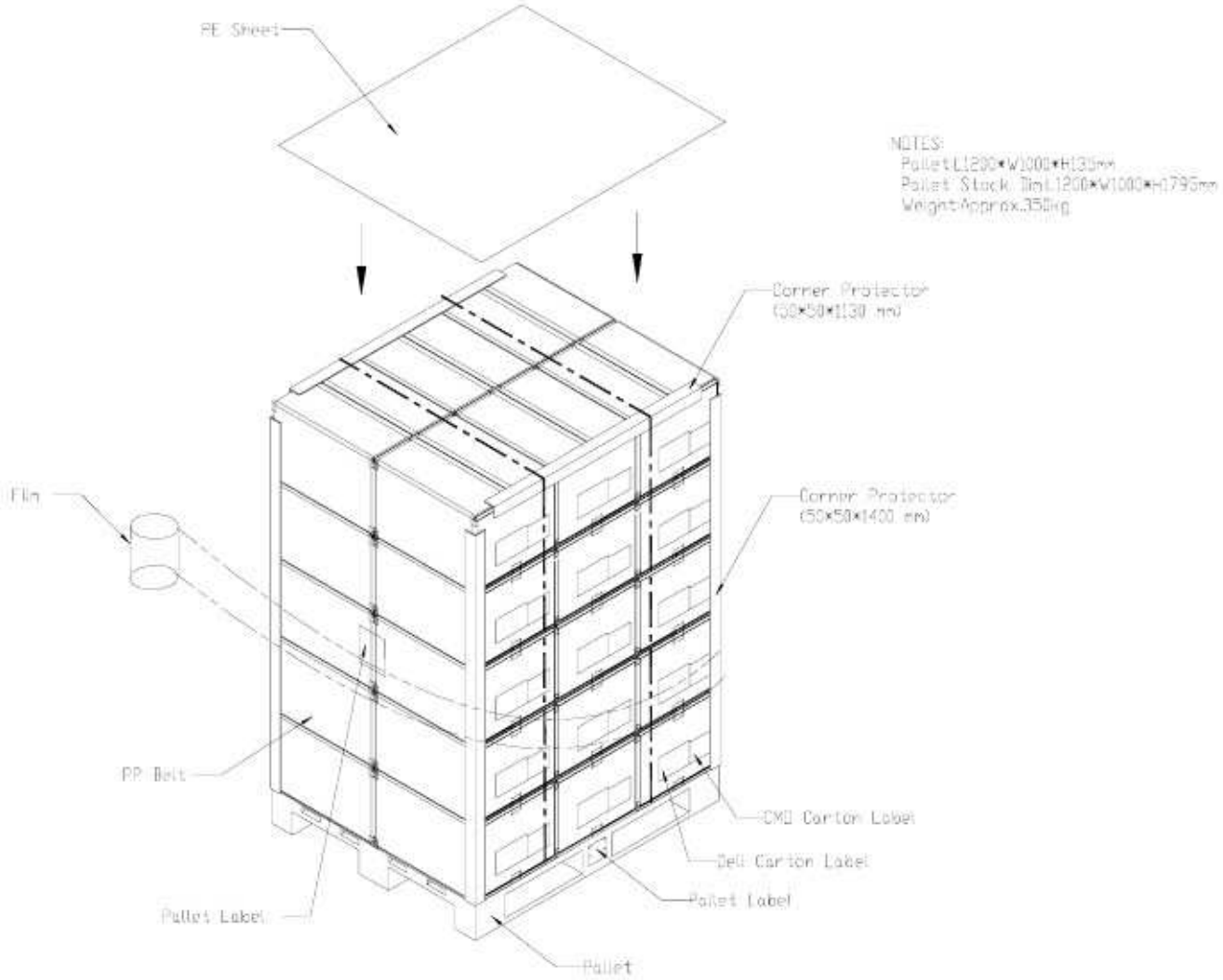


Figure. 9-2 Packing method

9.3 PALLET FOR AIR FREIGHT

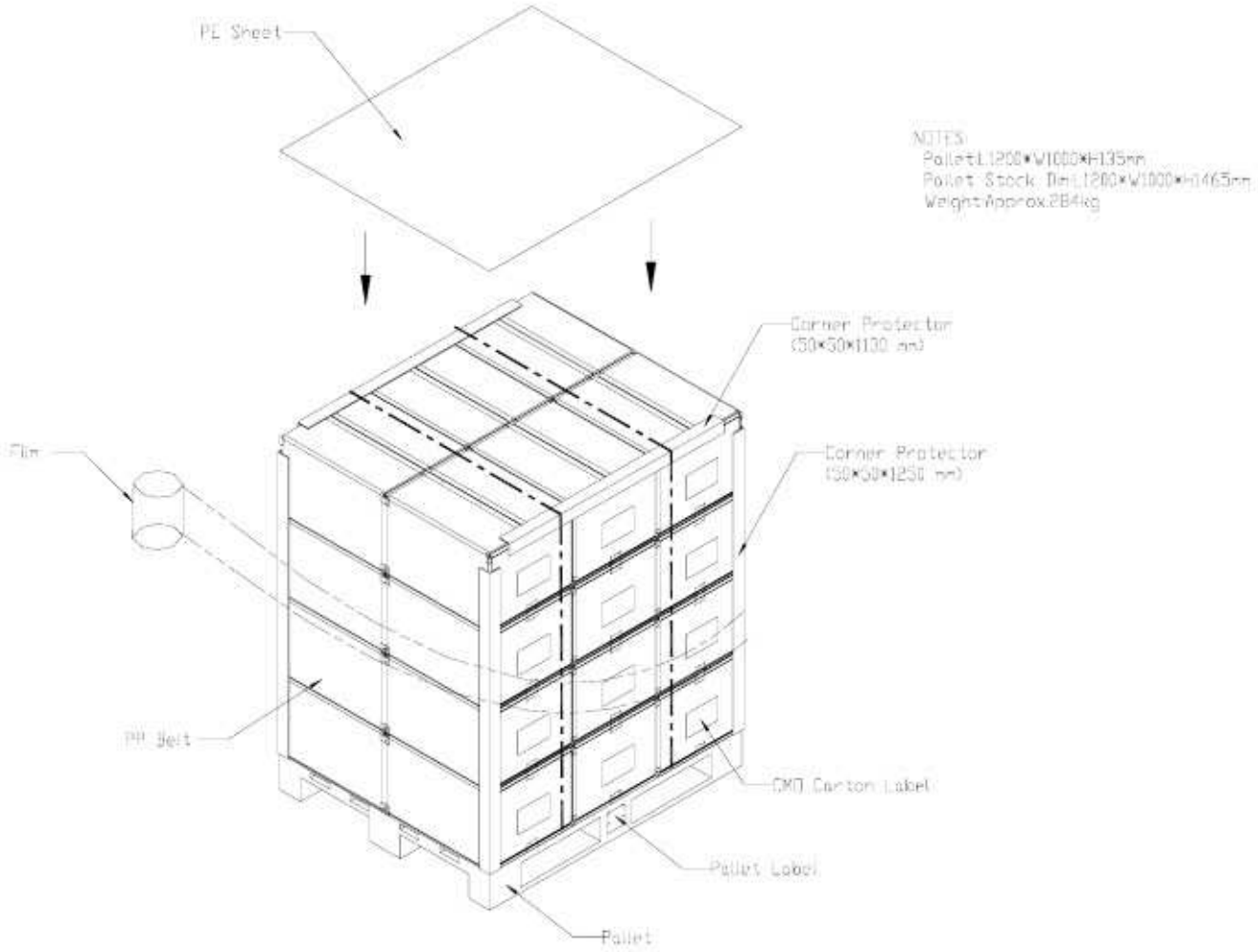


Figure. 9-3 Packing method

10 DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) Model Name: N141C3 - L01

(b) Revision: Rev. XX, for example: A1, …, C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D X N N N N

- Serial No.
- CMO Internal Use
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use

(d) Production Location: MADE IN XXXX. XXXX stands for production location.

(e) LEOO: UL compliance remarks for CMO NingBo site production. It won't be available when production location isn't CMO NingBo.

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

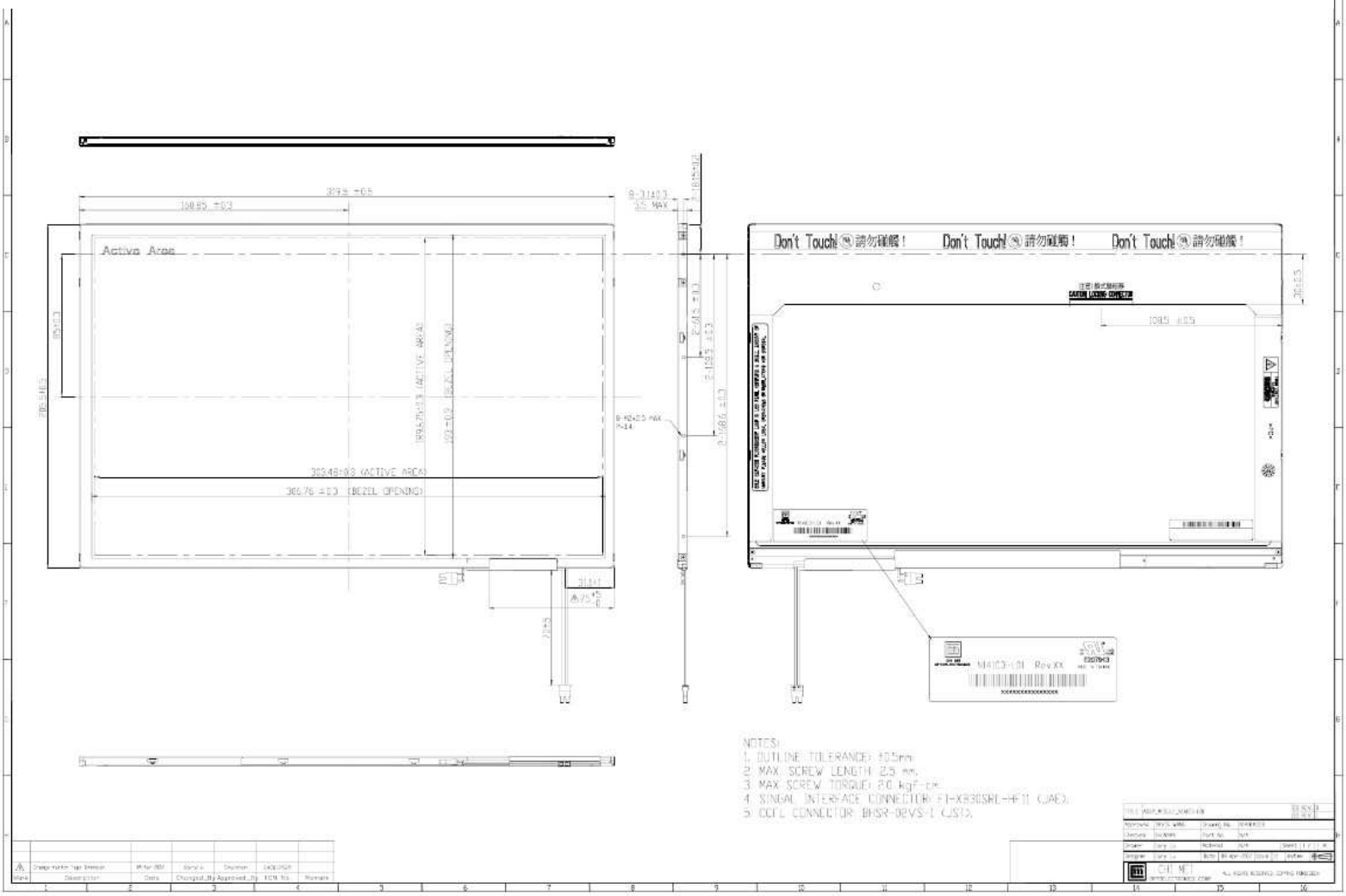
Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

10.2 CMO CARTON LABEL

(a) Production location: Made In XXXX. XXXX stands for production location.



NOTES:
1. OUTLINE TOLERANCE: ±0.5mm
2. MAX. SCREW LENGTH: 2.5 mm.
3. MAX. SCREW TORQUE: 2.0 kgf-cm.
4. SIGNAL INTERFACE CONNECTOR: FI-XR30SRE-HF11 (JAE).
5. CCFL CONNECTOR: BHSR-02VS-1 (JST).