

TFT LCD Approval Specification

MODEL NO.: N141I6 - L01

Customer : _____

Approved by : _____

Note :

核准時間	部門	審核	角色	投票
2009-07-21 09:34:24	NB 產品管理處		Director	Accept

1 GENERAL DESCRIPTION

1.1 OVERVIEW

N141I6 - L01 is a 14.1" TFT Liquid Crystal Display module with white LED Backlight unit and 30 pins LVDS interface. This module supports 1280 x 800 WXGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The converter module for backlight is not built in.

1.2 FEATURES

- White LED Backlight
- WXGA (1280 x 800 pixels) resolution.
- Follow VESA standard.
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	303.36(H) X 189.6(V)	mm	(1)
Bezel Opening Area	306.76 (H) x 193 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 800	pixel	-
Pixel Pitch	0.237 (H) x 0.237 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Anti-glare , Haze 26, 3H	-	-

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		--	420	435	g	(2)

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

(2) Weight without converter

2 ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(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) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta < 40 °C).

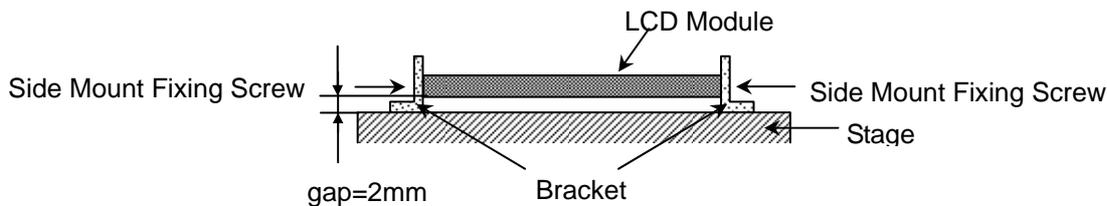
(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

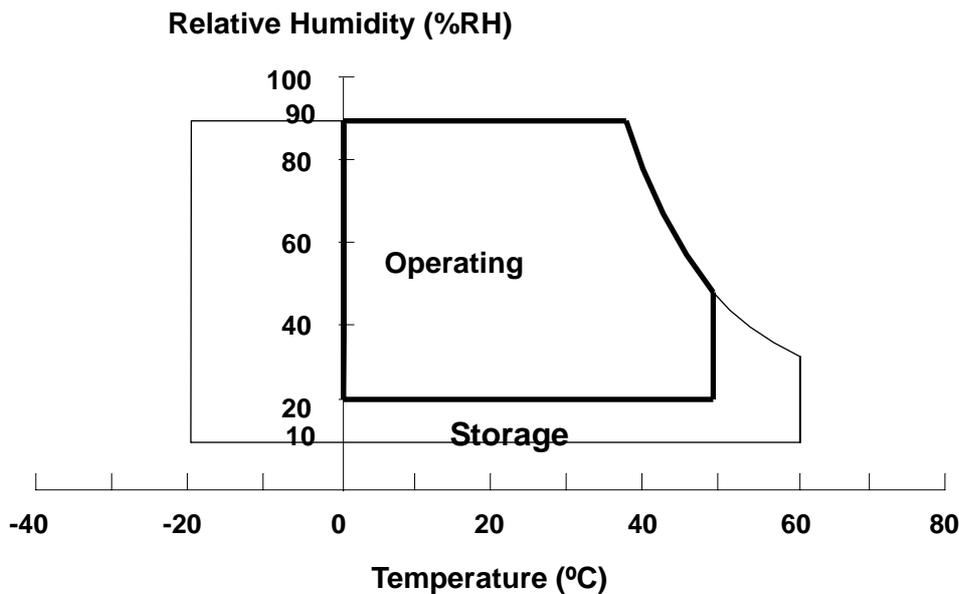
Note (2) The ambient temperature means the temperature of panel surface.

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

Note (4) 10 ~ 500 Hz, 30 min / Cycle, 1 cycles for each X, Y, Z axis. The fixing condition is shown as below:



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.



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.		
LED Light Bar Power Supply Voltage	V_L	0	27.2	V	(1), (2)
LED Light Bar Power Supply Current	I_L	0	120	mA	

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 °C

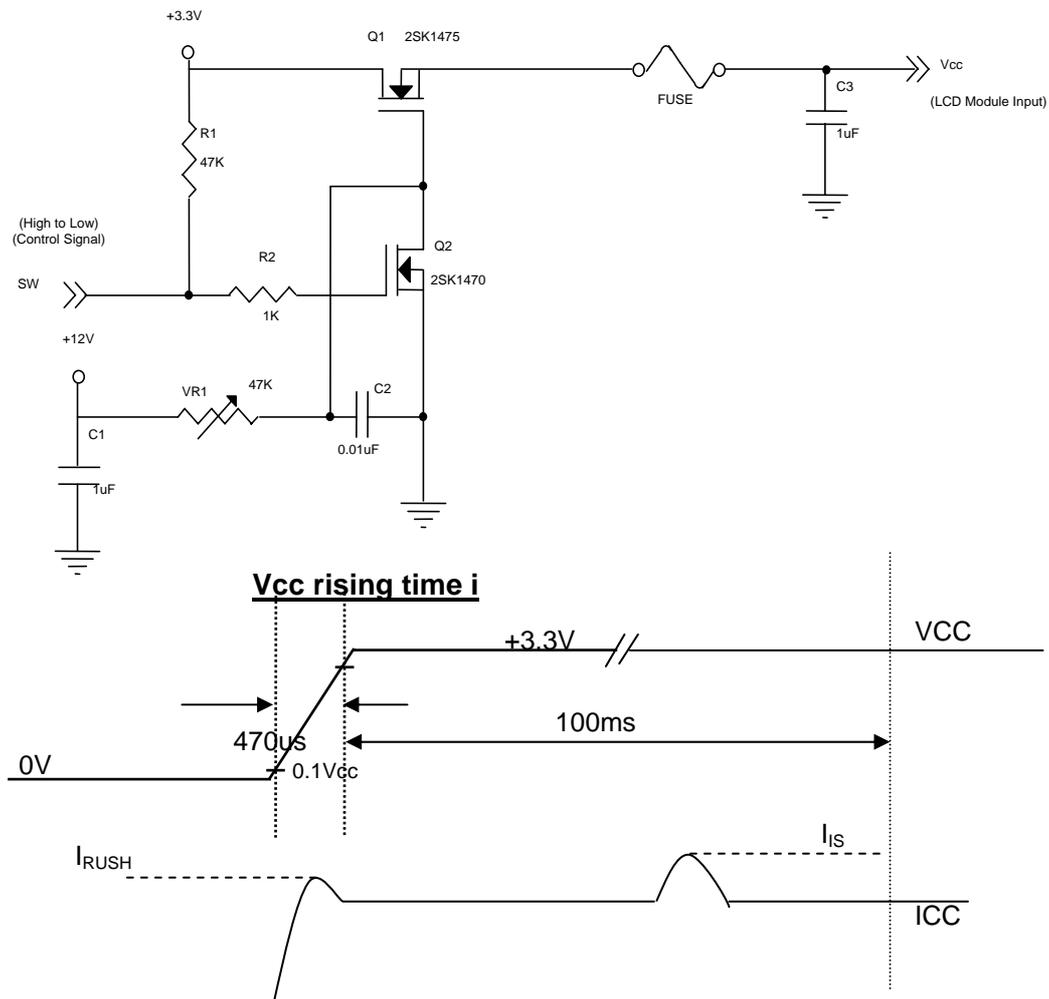
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	-
Permissible Ripple Voltage	V _{RP}		50		mV	-
Rush Current	I _{RUSH}			1.5	A	(2)
Initial Stage Current	I _{IS}			1.0	A	(2)
Power Supply Current	I _{CC}	White	235	255	mA	(3)a
		Black	300	330	mA	(3)b
LVDS Differential Input High Threshold	V _{TH(LVDS)}			+100	mV	(5), V _{CM} =1.2V
LVDS Differential Input Low Threshold	V _{TL(LVDS)}	-100			mV	(5) V _{CM} =1.2V
LVDS Common Mode Voltage	V _{CM}	1.125		1.375	V	(5)
LVDS Differential Input Voltage	V _{ID}	100		600	mV	(5)
Terminating Resistor	R _T		100		Ohm	
Power per EBL WG	P _{EBL}	-	2.3		W	(4)

Note (1) The ambient temperature is Ta = 22 ± 2 °C.

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

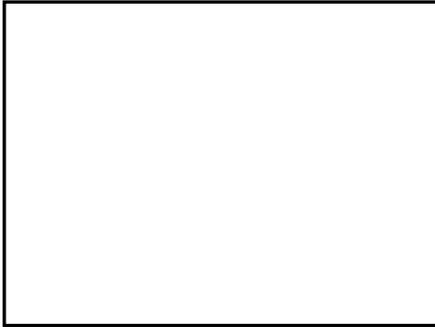
I_{IS}: the maximum current of the first 100ms after power-on

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



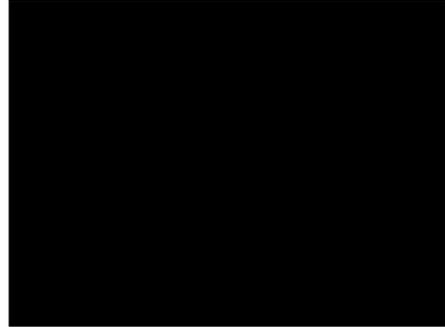
Note (3) The specified power supply current is under the conditions at $V_{CC} = 3.3\text{ V}$, $T_a = 22 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

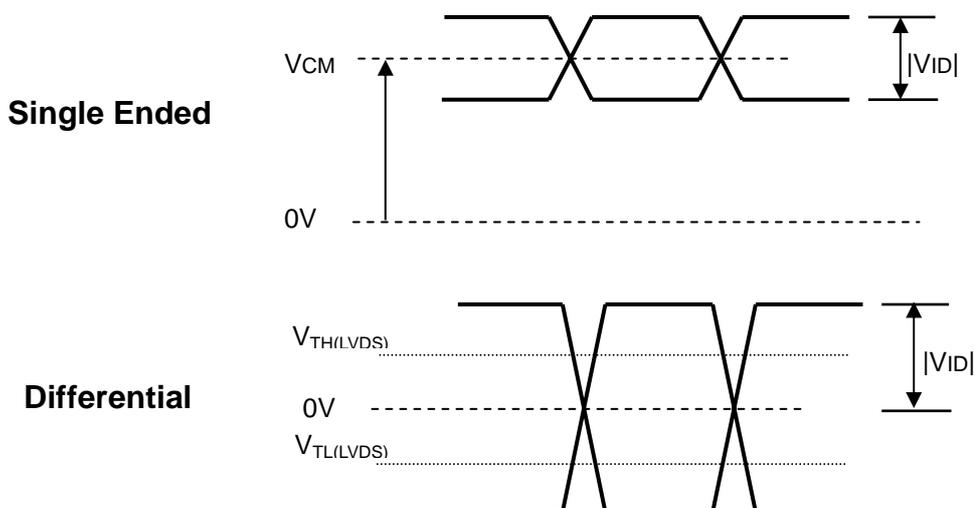


Active Area

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

- (a) $V_{CC} = 3.3\text{ V}$, $T_a = 22 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$,
- (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 converter used is provided from Sumida/ Foxconn. Please contact them for detail information. CMO doesn't provide the converter in this product.

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

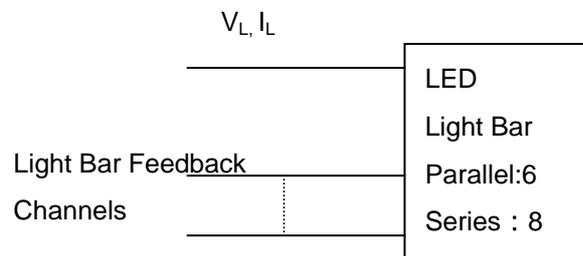


3.2 BACKLIGHT UNIT

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Quantity		48			Pcs	(1),
LED light bar Power Supply Voltage	V _L	23.2	25.2	27.2	V _{dc}	(1), (2)
LED light bar Power Supply Current	I _L	--	120	--	mA	
LED Life Time	L _{BL}	15,000	--	--	Hrs	(4)
Power Consumption	P _o	-	3.024	--	W	(3), I _L = 120.0mA, Duty=100%

Note (1) LED light bar configuration is shown as below:



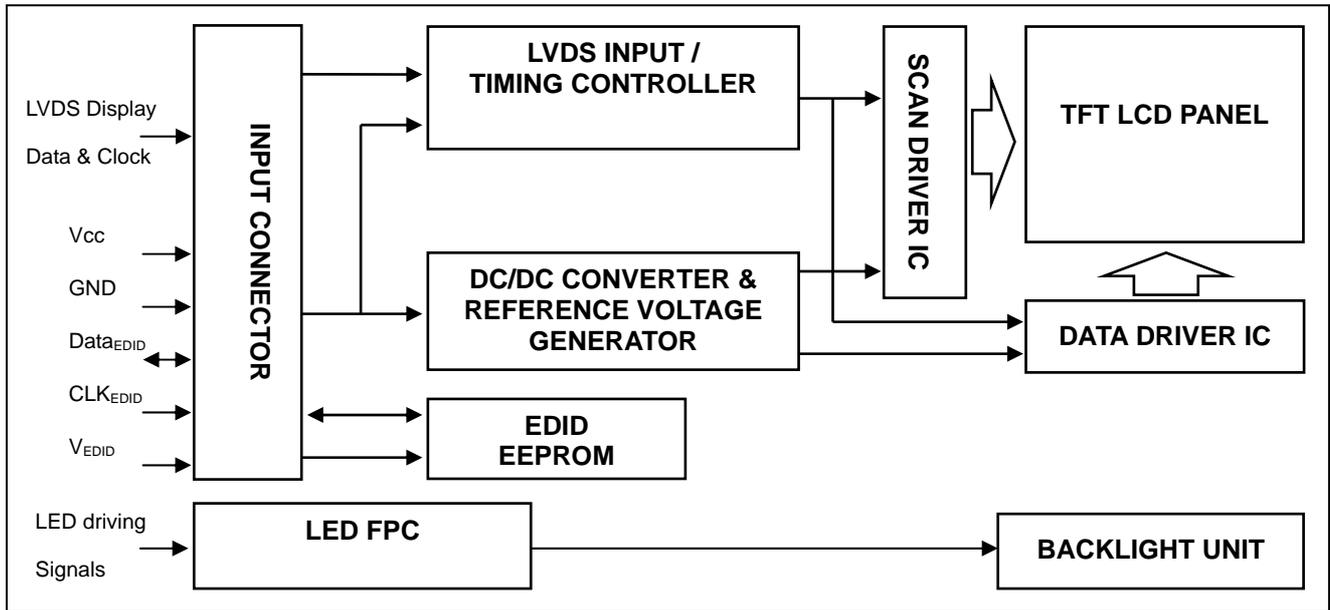
Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_o = I_L \times V_L$

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 22 ± 2 °C and I = 20 mA(Per EA) until the brightness becomes 50% of its original value.

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 22 ± 2 °C and I_L = 20 mA(Per EA) until the brightness becomes 50% of its original value.

4 BLOCK DIAGRAM
4.1 TFT LCD MODULE



5 INPUT TERMINAL PIN ASSIGNMENT

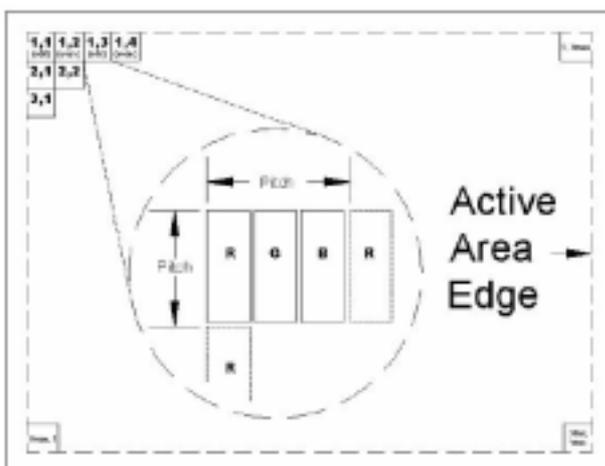
5.1 TFT LCD MODULE

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		DDC 3.3V Power
5	NC	Non-Connection		
6	CLK _{EDID}	DDC Clock		DDC Clock
7	DATA _{EDID}	DDC Data		DDC Data
8	Rxin0-	LVDS Differential Data Input	Negative	R0~R5,G0
9	Rxin0+	LVDS Differential Data Input	Positive	
10	Vss	Ground		
11	Rxin1-	LVDS Differential Data Input	Negative	G1~G5, B0, B1
12	Rxin1+	LVDS Differential Data Input	Positive	
13	Vss	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2~B5, DE, Hsync, Vsync
15	Rxin2+	LVDS Differential Data Input	Positive	
16	Vss	Ground		
17	CLK-	LVDS Clock Data Input	Negative	LVDS Level Clock
18	CLK+	LVDS Clock Data Input	Positive	
19	Vss	Ground		
20	NC	Non-Connection		
21	NC	Non-Connection		
22	NC	Non-Connection		
23	NC	Non-Connection		
24	NC	Non-Connection		
25	NC	Non-Connection		
26	NC	Non-Connection		
27	NC	Non-Connection		
28	NC	Non-Connection		
29	NC	Non-Connection		
30	NC	Non-Connection		

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

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

Note (3) The first pixel is even.

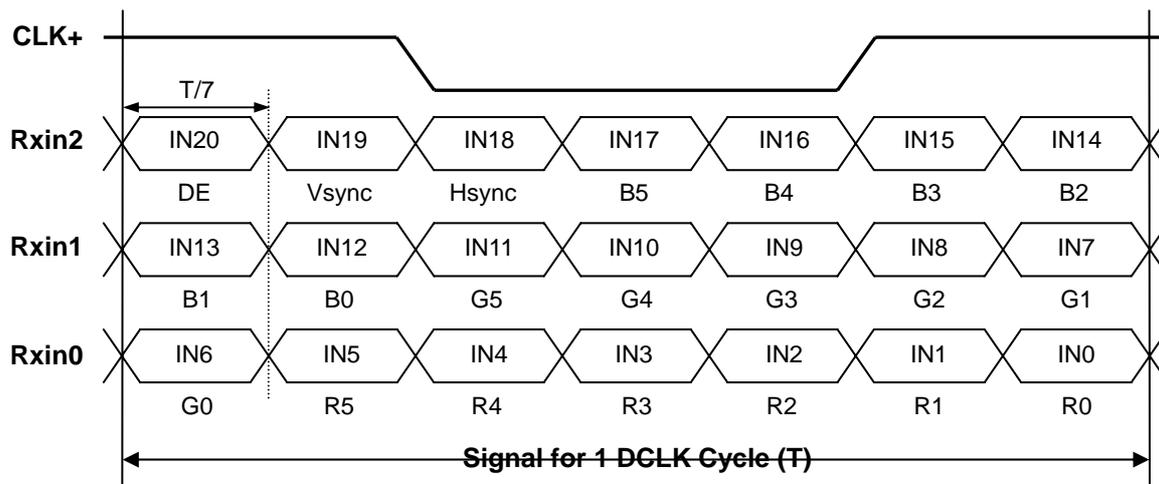


5.2 BACKLIGHT UNIT

Pin	Symbol	Description
1	CH1	Light-bar Feedback Channel 1
2	CH2	Light-bar Feedback Channel 2
3	CH3	Light-bar Feedback Channel 3
4	CH4	Light-bar Feedback Channel 4
5	CH5	Light-bar Feedback Channel 5
6	CH6	Light-bar Feedback Channel 6
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection
10	V _L	LED Light-bar Input Power
11	V _L	LED Light-bar Input Power
12	V _L	LED Light-bar Input Power

Note (1) User's connector Part No.: HRS, FH33-12S-0.5SH(05) 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.

Color		Data Signal																	
		Red						Green						Blue					
		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
	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	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
Gray Scale Of Red	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
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Gray Scale Of Green	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
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
Gray Scale Of Blue	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
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	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 FPD standards.

Byte # (decimal)	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 (N141I6-L01)	41	01000001
11	0B	ID product code (hex LSB first; N141I6-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)	1F	00011111
17	11	Year of manufacture (fixed year code)	12	00010010
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("3")	03	00000011
20	14	Video I/P definition ("digital")	90	10010000
21	15	Max H image size ("30.336cm")	1E	00011110
22	16	Max V image size ("18.96cm")	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	77	01110111
26	1A	Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0	B5	10110101
27	1B	Rx=0.580	91	10010001
28	1C	Ry=0.340	55	01010101
29	1D	Gx=0.310	50	01010000
30	1E	Gy=0.550	90	10010000
31	1F	Bx=0.155	28	00101000
32	20	By=0.155	25	00100101
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
54	36	Detailed timing description # 1 Pixel clock ("64.28MHz", According to VESA CVT Rev1.1)	1C	00011100
55	37	# 1 Pixel clock (hex LSB first)	19	00011001
56	38	# 1 H active ("1280")	00	00000000
57	39	# 1 H blank ("46")	2E	00101110
58	3A	# 1 H active : H blank ("1280 : 160")	50	01010000
59	3B	# 1 V active ("800")	20	00100000
60	3C	# 1 V blank ("8")	08	00001000
61	3D	# 1 V active : V blank ("800 :23")	30	00110000
62	3E	# 1 H sync offset ("14")	0E	00001110
63	3F	# 1 H sync pulse width ("9")	09	00001001
64	40	# 1 V sync offset : V sync pulse width ("3 : 6")	12	00010010
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("48: 32 : 3 : 6")	00	00000000
66	42	# 1 H image size ("303 mm")	2F	00101111
67	43	# 1 V image size ("190 mm")	BE	10111110
68	44	# 1 H image size : V image size ("303 : 190")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71	47	# 1 Non-interlaced ; Normal display, no stereo ; Digital Separate ; V sync POL is negative ; H sync POL is positive	1A	00011010
72	48	Detailed timing description # 1 Pixel clock ("46.75MHz", According to VESA CVT Rev1.1)	43	01000011
73	49	# 1 Pixel clock (hex LSB first)	12	00010010
74	4A	# 1 H active ("1280")	00	00000000
75	4B	# 1 H blank ("160")	A0	10100000
76	4C	# 1 H active : H blank ("1280 : 160")	50	01010000
77	4D	# 1 V active ("800")	20	00100000
78	4E	# 1 V blank ("15")	0F	00001111
79	4F	# 1 V active : V blank ("800 :15")	30	00110000
80	50	# 1 H sync offset ("48")	30	00110000
81	51	# 1 H sync pulse width ("32")	20	00100000
82	52	# 1 V sync offset : V sync pulse width ("3 : 6")	36	00110110
83	53	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("48: 32 : 3 : 6")	00	00000000
84	54	# 1 H image size ("303 mm")	2F	00101111
85	55	# 1 V image size ("190 mm")	BE	10111110

86	56	# 1 H image size : V image size ("303 : 190")	10	00010000
87	57	# 1 H boarder ("0")	00	00000000
88	58	# 1 V boarder ("0")	00	00000000
89	59	# 1 Non-interlaced ; Normal display, no stereo ; Digital Separate ; V sync POL is negative ; H sync POL is positive	1A	00011010
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	1st character ("T")	54	01010100
96	60	2st character ("6")	36	00110110
97	61	3st character ("6")	36	00110110
98	62	4st character ("1")	31	00110001
99	63	5st character ("H")	48	01001000
100	64	LCD Supplier EEDID Revision #: "1"	80	10000000
101	65	Manufacturer P/N ("N")	4E	01001110
102	66	Manufacturer P/N ("1")	31	00110001
103	67	Manufacturer P/N ("4")	34	00110100
104	68	Manufacturer P/N ("1")	31	00110001
105	69	Manufacturer P/N ("1")	49	01001001
106	6A	Manufacturer P/N ("6")	36	00110110
107	6B	Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
108	6C	Flag	00	00000000
109	6D	Flag	00	00000000
110	6E	Flag	00	00000000
111	6F	Data Type Tag:	00	00000000
112	70	Flag	00	00000000
113	71	SMBUS value @ 10nits = 44d	00	00000000
114	72	SMBUS value @ 17nits = 64d	00	00000000
115	73	SMBUS value @ 24nits = 77d	00	00000000
116	74	SMBUS value @ 30nits = 86d	00	00000000
117	75	SMBUS value @ 60nits = 122d	00	00000000
118	76	SMBUS value @ 100nits = 159d	00	00000000
119	77	SMBUS value @ 180nits = 219d	00	00000000
120	78	SMBUS value @ max nits = 255d	00	00000000
121	79	Bit[1:0] 00:reserved, 01: single LVDS, 10: dual LVDS, 11:reserved Bit[2] 0: No RTC support , 1: RTC support Bit[7:3] Reserved	01	00000001
122	7A	BIST Enable: Yes = '01' No = '00' ("Yes")	01	00000001
123	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
124	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
125	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	8E	10001110

6 INTERFACE TIMING

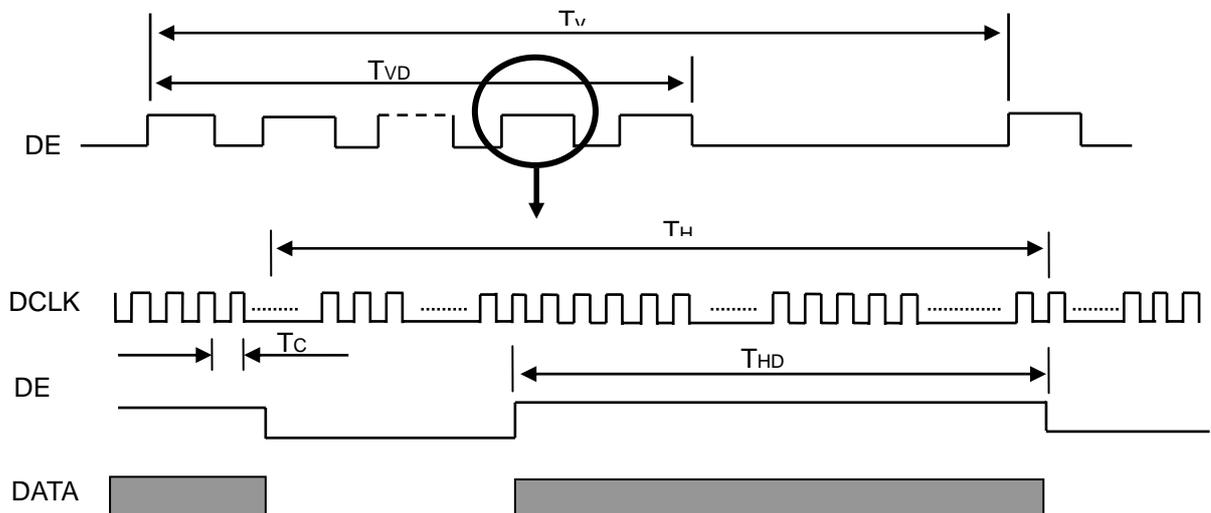
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

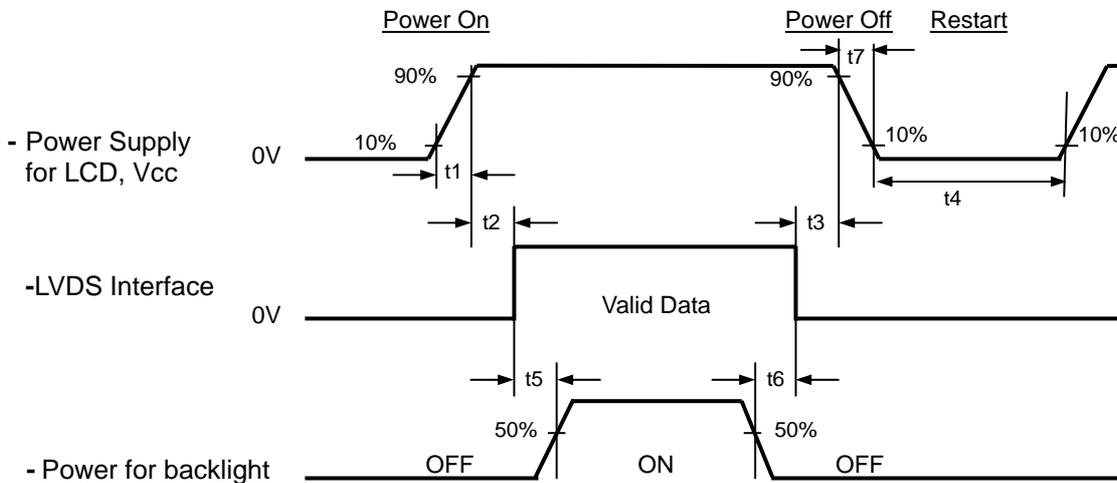
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	50	71	80	MHz	-
DE	Vertical Total Time	TV	810	823	1028	TH	-
	Vertical Active Display Period	TVD	800	800	800	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	38	TV-TVD	TH	-
	Horizontal Total Time	TH	1360	1440	1800	Tc	-
	Horizontal Active Display Period	THD	1280	1280	1280	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	160	TH-THD	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE



Timing Specifications:

$0.5 < t_1$	10 msec
$0 < t_2$	50 msec
$0 < t_3$	50 msec
t_4	500 msec
t_5	200 msec
t_6	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 converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter 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 1ms t_7 300 ms.

7 OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

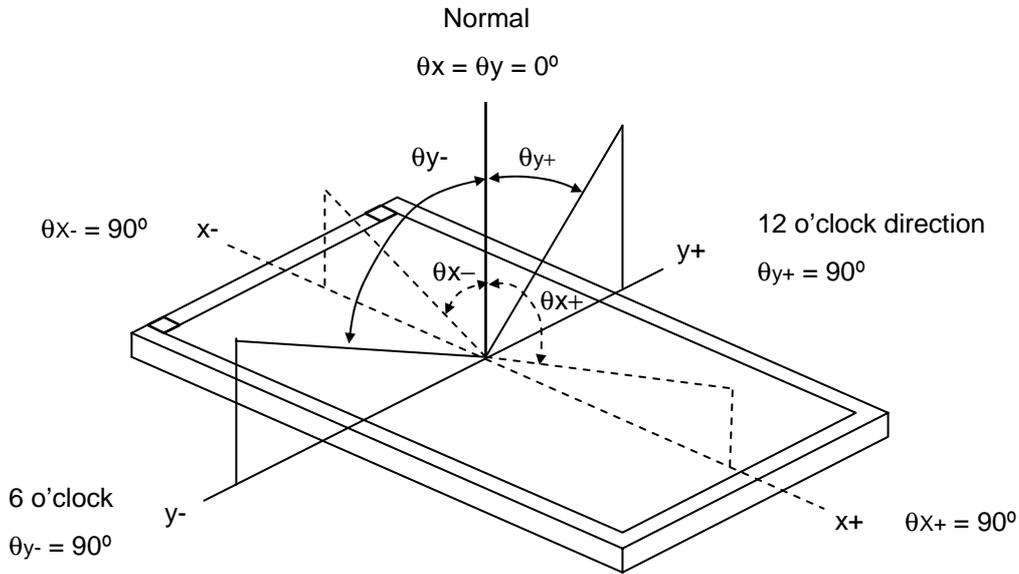
Item	Symbol	Value	Unit
Ambient Temperature	T _a	22±2	°C
Ambient Humidity	H _a	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I _L	120	mA

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	400	500	-	-	(2), (6)
Response Time		T _R		-	3	8	ms	(3)
		T _F		-	7	12	ms	
Average Luminance of White		L _{AVE}		200	220	-	cd/m ²	(4), (6)
White Variation		δW5p		-	-	20	%	(5),(6)
		δW13p				35	%	
Color Gamut		C.G		42	45		%	(6),(7)
Color Chromaticity	Red	R _x		-0.02	+0.02	0.580	-	(1), (6)
		R _y				0.340	-	
	Green	G _x				0.310	-	
		G _y	0.550			-		
	Blue	B _x	0.155			-		
		B _y	0.155			-		
	White	W _x	0.313			-		
		W _y	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 (θ_x, θ_y):



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

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

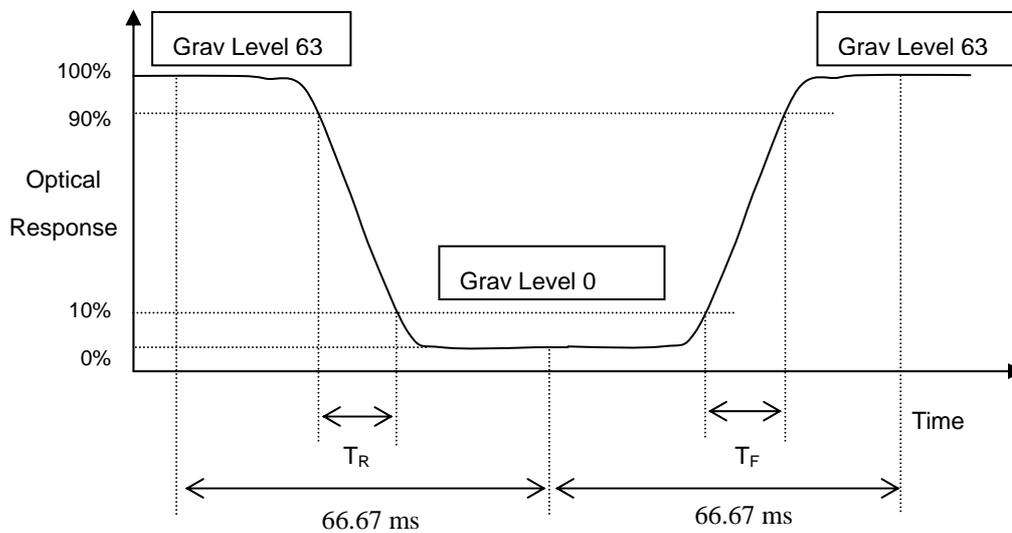
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (55)$$

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

$$L_{AVE} = [L(33) + L(37) + L(55) + L(73) + L(77)] / 5$$

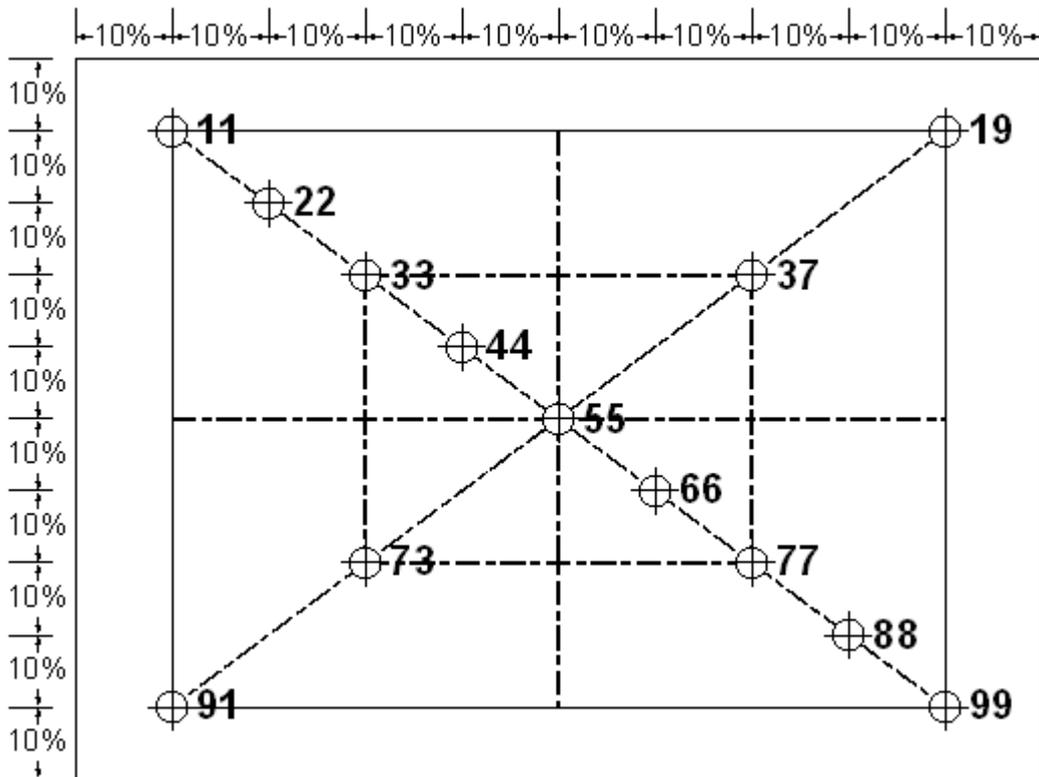
L(x) is corresponding to the luminance of the point X at Figure in Note (5)

Note (5) Definition of White Variation (δW_{5p} , δW_{13p}):

Measure the luminance of gray level 63 at 5, 13 points

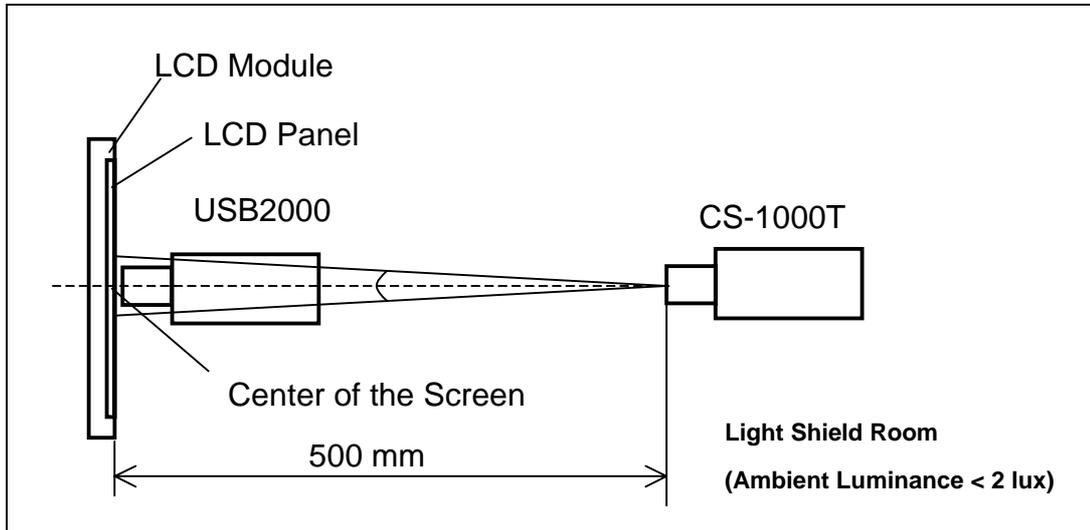
$$\delta W_{5p} = \{1 - \{ \text{Minimum} [L(33) + L(37) + L(55) + L(73) + L(77)] / \text{Maximum} [L(33) + L(37) + L(55) + L(73) + L(77)] \} \} * 100\%$$

$$\delta W_{13p} = \{1 - \{ \text{Minimum} [L(11) \sim L(99)] / \text{Maximum} [L(11) \sim L(99)] \} \} * 100\%$$



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.



Note (7) Definition of color gamut (C.G):

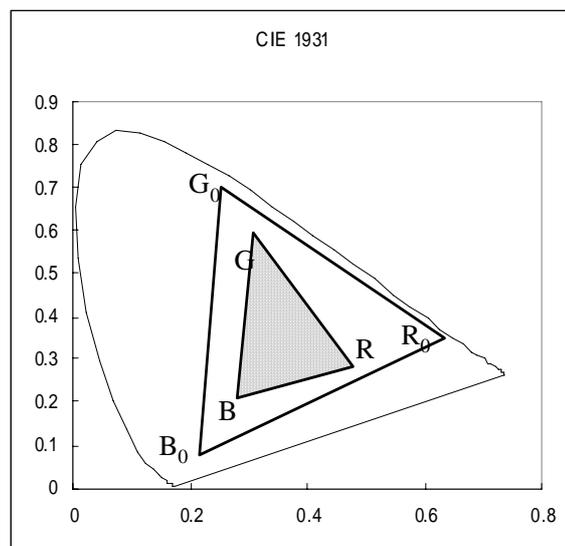
$$C.G = \Delta R G B / \Delta R_0 G_0 B_0 * 100\%$$

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 63 gray levels of red, green, and blue, respectively.

$\Delta R_0 G_0 B_0$: area of triangle defined by R_0, G_0, B_0

$\Delta R G B$: area of triangle defined by R, G, B



8 PRECAUTIONS

8.1 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 STORAGE 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 °C. 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 converter. Do not disassemble the module or insert anything into the Backlight unit.

8.4 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

- (1) UL60950-1 or updated standard.
- (2) IEC60950-1 or updated standard.
- (3) UL60065 or updated standard.
- (4) IEC60065 or updated standard.

9 PACKAGING
9.1 CARTON

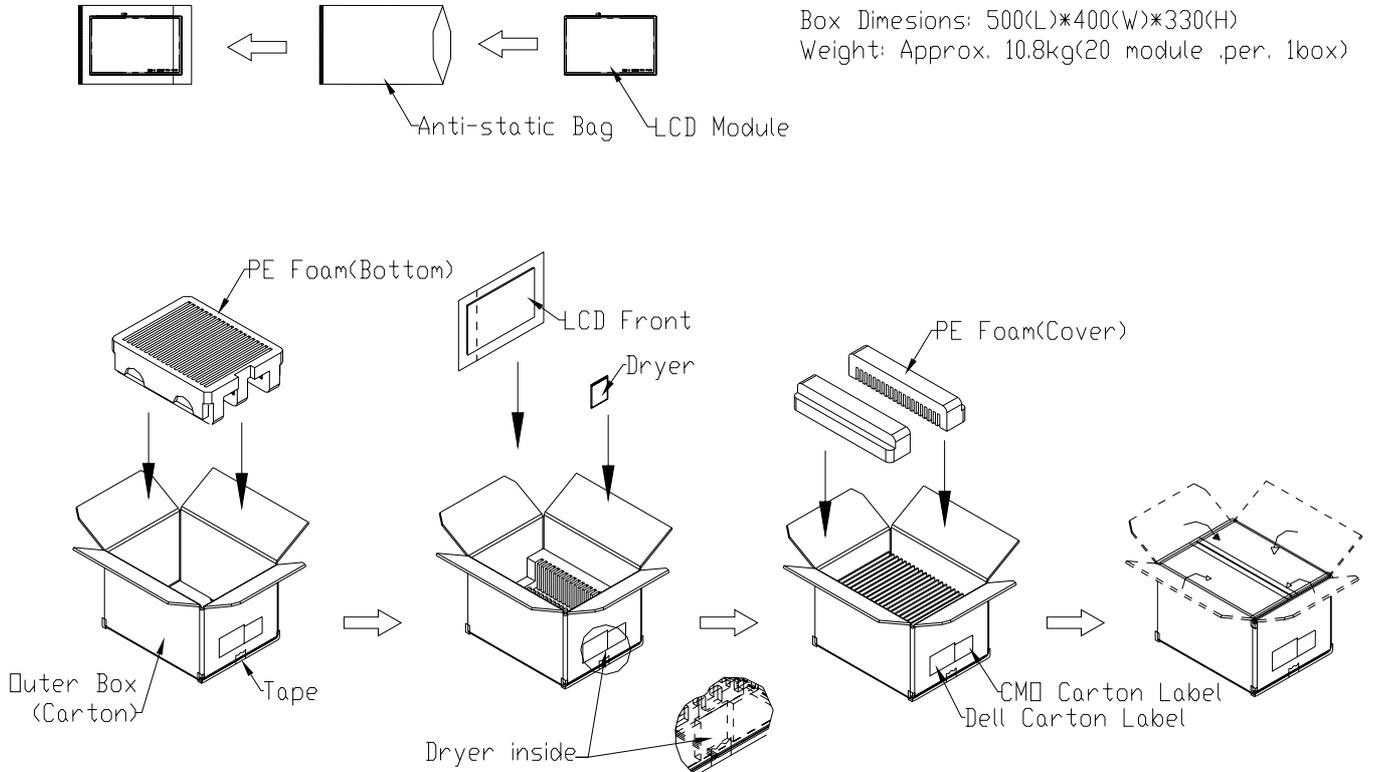


Figure. 9-1 Packing method

9.2 Pallet

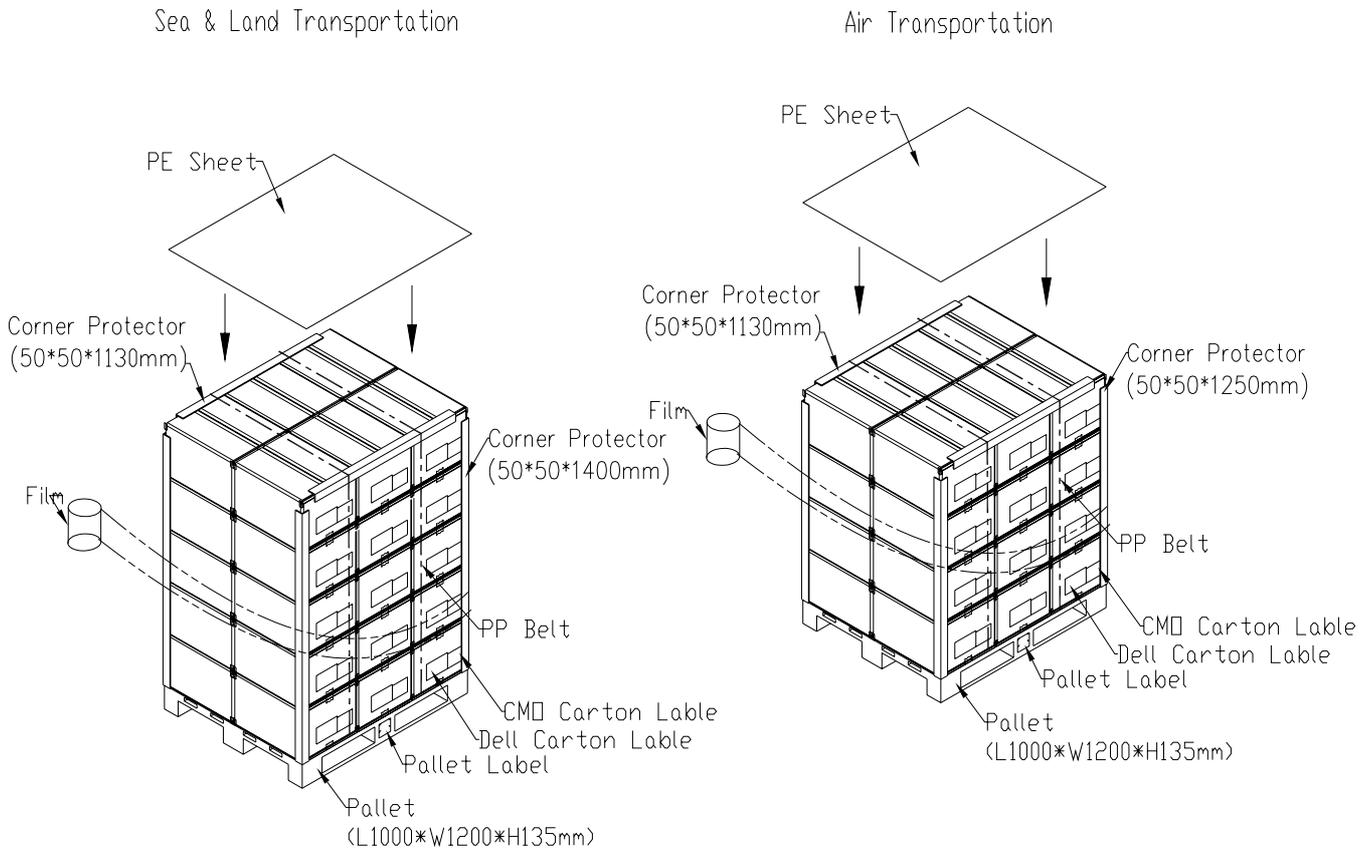
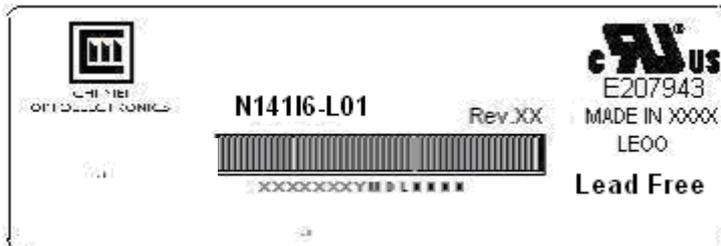


Figure. 9-2 Packing method

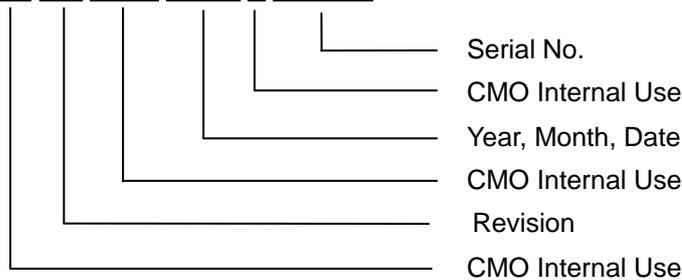
10 DEFINITION OF LABELS

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: N141I6 - L01
- (b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (c) Serial ID: XXXXXXYMDXNNNN



- (d) Production Location: MADE IN XXXX. XXXX stands for production location.
- (e) UL/CB logo: "LEOO" especially stands for panel manufactured by CMO Ningbo satisfying UL/CB requirement. "LEOO" is the CMO's UL factory code for Ningbo factory.

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

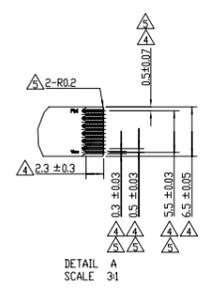
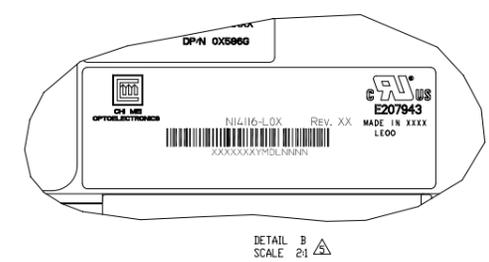
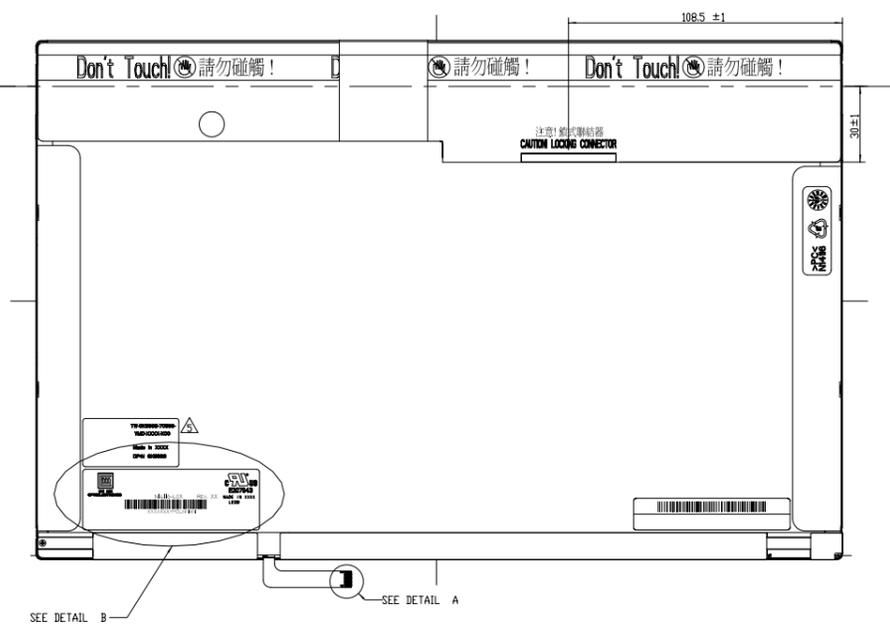
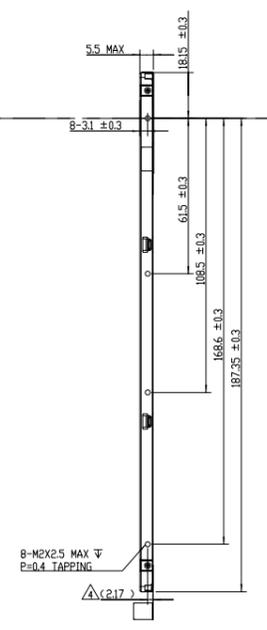
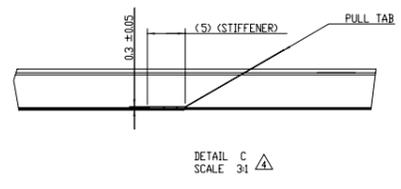
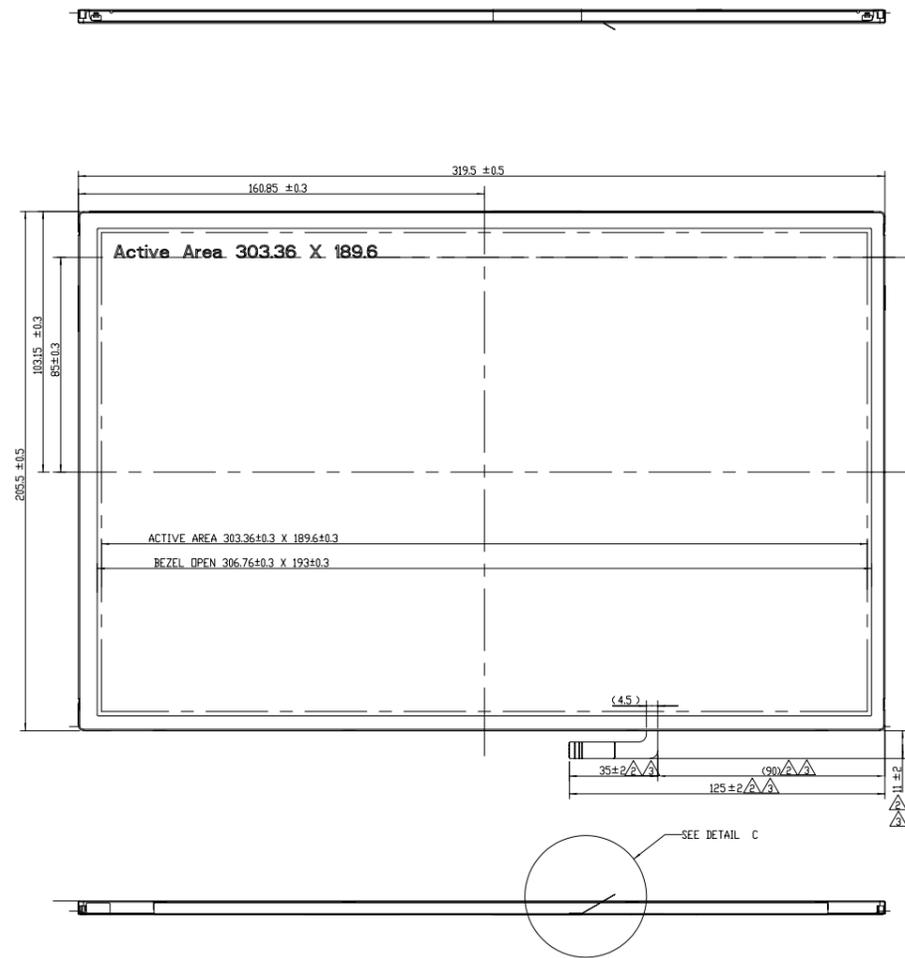
10.2 CMO CARTON LABEL

CMO carton label is as below:



The image shows a template for a CMO carton label. It features a blue header with the CHI MEI logo and the text 'CHI MEI OPTOELECTRONICS'. Below the header, there are four horizontal lines for inputting information: 'PO.NO.', 'Part ID.', 'Model Name', and 'Carton ID.'. The 'Model Name' line is partially obscured by a large, semi-transparent 'CMO' watermark. To the right of the 'Carton ID.' line, the word 'Quantities' is printed. At the bottom of the label, there is a 'Made in XXXX' field and a 'GP' logo (a green circle with 'GP' inside) next to the 'RoHS' text.

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



NOTES:
 1.GENERAL TOLERANCE±0.5mm.
 2.MAX. SCREW TORQUE : 2.0 kg-cm.
 3.THE GAP BETWEEN PANEL AND BEZEL IS 0.5mm MAX.
 4.LCD MIDDLE INPUT CONNECTOR : FI-XB30SR-LHF11(JAE) OR EQUIVALENT.
 5.LIGHTBAR FPC CONNECTOR : HIROSE, FH33-12S-0.5SH(05).

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark
△	MODIFY DETAIL A AND B AND TITLE AND PWD NAME.	2008/05/14	KALLEN KE			
△	MODIFY DETAIL A AND ADD DETAIL C.	2008/05/06	KALLEN KE			
△	MODIFY DIMENSIONS.	2008/05/06	KALLEN KE			
△	MODIFY DIMENSIONS AND NOTES.	2008/05/03	KALLEN KE			

TITLE: OUTLINE DRAWING N4116-L01/L02 (W/O CONVERTER FOR BELL MOBILE)				ED REV. 15
Approved	SHENMAN CHANG	Drawing No.	N4116L02	ED REV. 11+
Checked	SHENMAN CHANG	Part No.	NA	
Drawer	KALLEN KE	Material	T30	Sheet 1 / 1 AB
Designer	KALLEN KE	Date	04-May-2008	Scale 1:1 Unit: mm
CHI MEI OPTOELECTRONICS CORP.				ALL RIGHTS RESERVED. COPYING FORBIDDEN.