TFT LCD Tentative Specification

MODEL NO.: N133I6 - L01

Customer:

Approved by:

Note:

記錄	工作	審核	角色	投票
2008-02-27 20:11:05 CST	PMMD Director	cs_lee(李志聖 /56510/44926)	Director	Accept

- CONTENTS -

REVISION HISTORY

Version	Date	Page (New)	Section	Description
0.0	Jan, 28,'08	All	All	Tentative specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N133I6 - L01 is a 13.3" TFT Liquid Crystal Display module with 48 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 inverter module for Backlight is not built in.

1.2 FEATURES

- Thin and Light Weight
- WXGA (1280 x 800 pixels) resolution
- DE only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

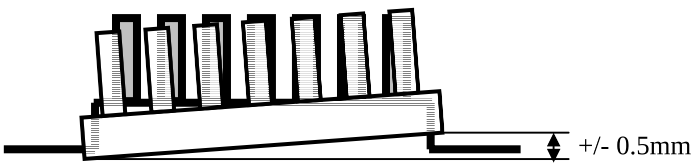
Item	Specification	Unit	Note
Active Area	286.08 (H) x 178.8 (V)	mm	(1)
Top Polarizer size	289.48 (H) x 182.2 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 800	pixel	-
Pixel Pitch	0.2235 (H) x 0.2235 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Glare , 3H	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	296.85	297.15	297.45	mm	(1)
	Vertical(V)	--	203.15	--	mm	
	Depth(D)	--	--	3.045	mm	
Weight		---	--	219	g	-
I/F connector mounting position		The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

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

Note (2) Connector mounting position



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

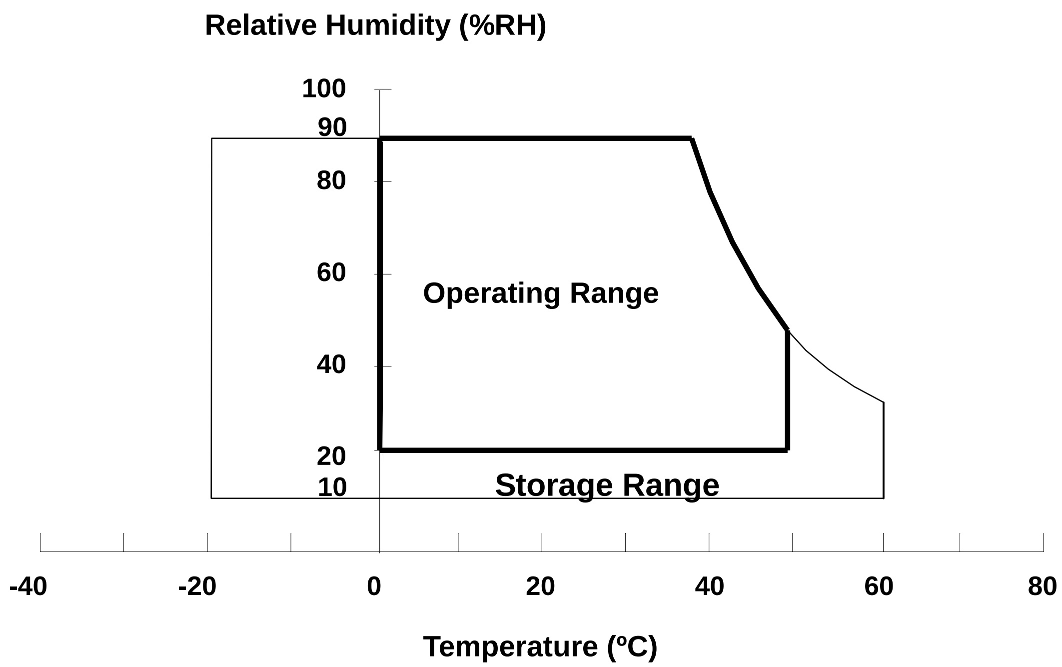
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	200/2	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

(c) No condensation.



Note (2) The temperature of panel surface should be 0 ºC Min. and 50 ºC Max.

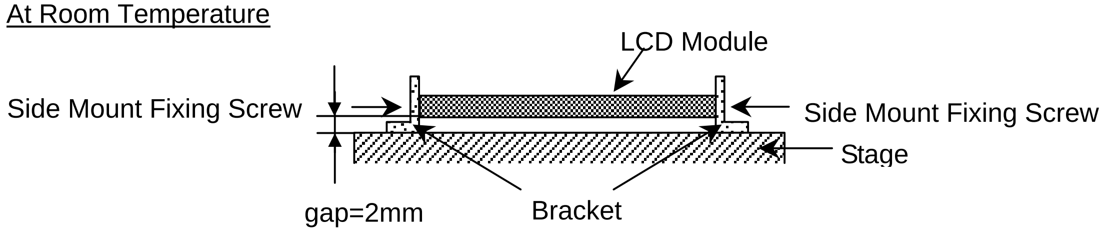
Note (3) 1 time for ± X, ± Y, ± Z. for Condition (200G / 2ms) is half Sine Wave,

Note (4) 10 ~ 500 Hz, 0.5 Hr / Cycle, 1 cycles for each X, Y, Z.

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:

At Room Temperature



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	Value		Unit	Note
	Min	Max.		
LED Light Bar Input Current	(22.4)	(29.6)	V_{RMS}	(1), (2)
LED Light Bar Input Current	(115.5)	(150)	mA_{RMS}	
LED Peak Pulse Current	-	(100)	mA_{RMS}	

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 Section 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

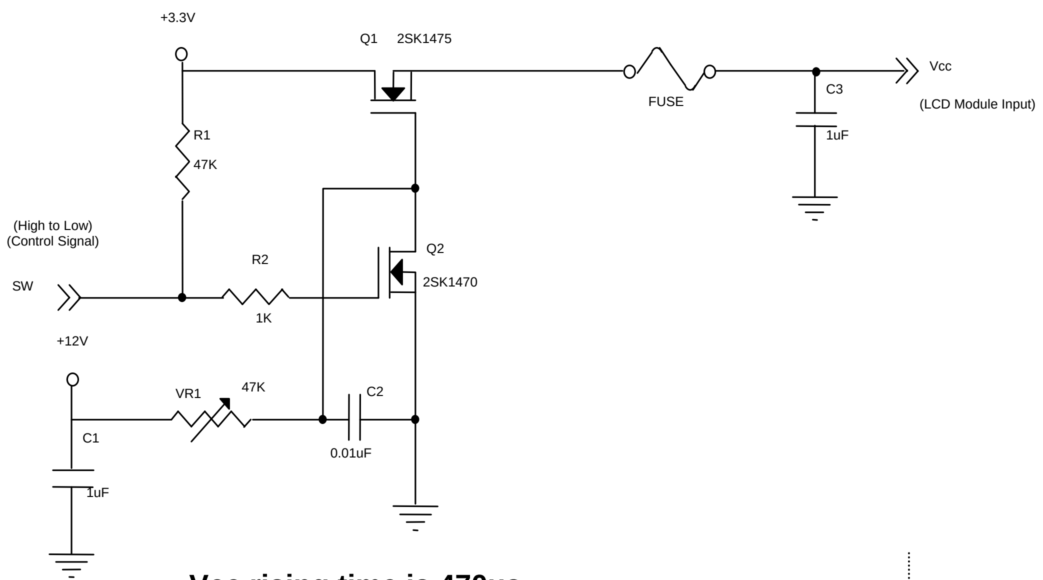
Parameter		Symbol	Value Min.	Value Typ.	Value Max.	Unit	Note
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Permissive Ripple Voltage		V_{RP}	-	50	-	mV	-
Rush Current		I_{RUSH}	-	-	1.5	A	(2)
Initial Stage Current		I_{IS}	-	-	1.0	A	(2)
Power Supply Current	White	Icc	-	(190)	(220)	mA	(3)a
	Black		-	(230)	(260)	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}	-	TBD	-	W	(4)

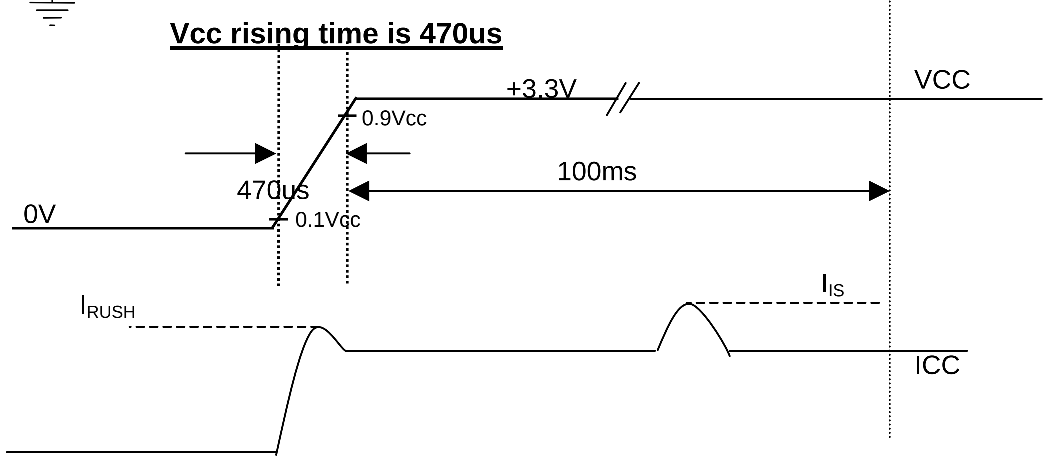
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

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

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

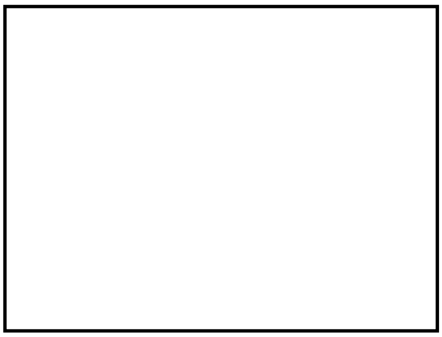
Measurement Conditions: Shown as the following figure. Test pattern: black.





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.

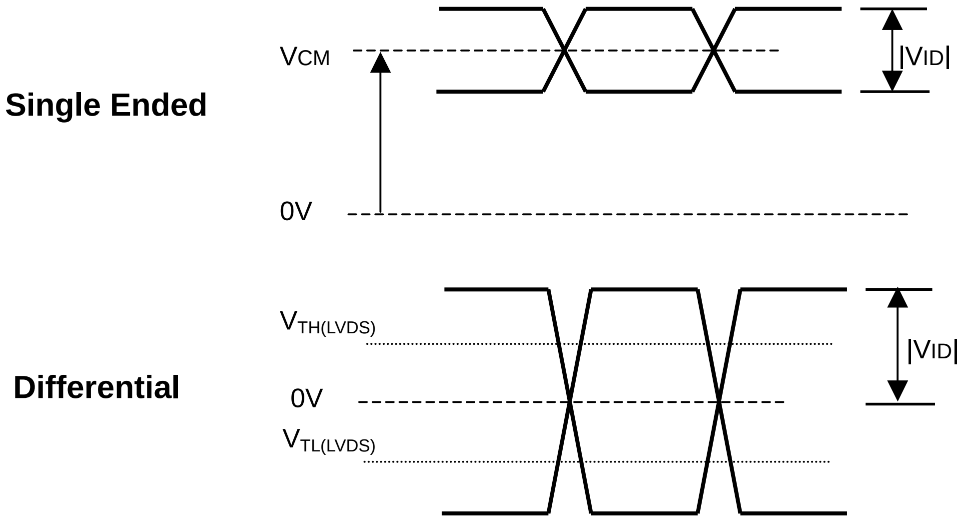
(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

(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 ___TBD___. Please contact them 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.

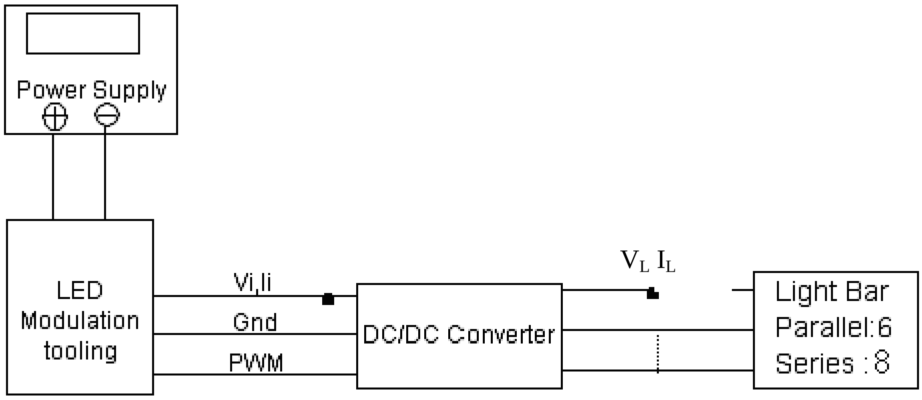


3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED light bar input voltage	V_L	(22.4)	(26.4)	(29.6)	V_{RMS}	(1), (Duty 100%)
LED light bar input current	I_L	(115.5)	(120)	(150)	mA_{RMS}	(1), (Duty 100%)
LED Current Peak	I_f	-	-	(100)	mA_{RMS}	Per EA
Power Consumption	P_L	(2.59)	(3.17)	(4.44)	W	(2), I_L = 120 mA
LED Life Time	L_{BL}	(10000)	-	-	Hrs	(3)

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

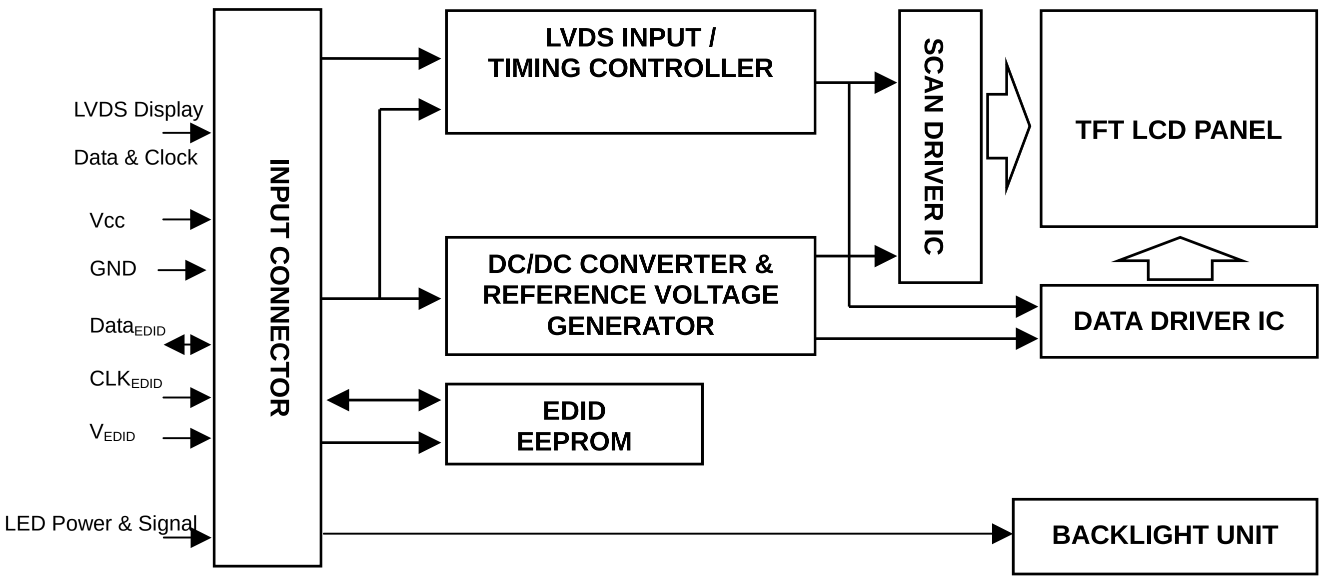


Note (2) $P_L = I_L \times V_L$

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I = 20 mA(Per EA) until one of the following events occurs:

(a)When the brightness becomes ≦ 50% of its original value.

4. BLOCK DIAGRAM



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	No connect		
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	Vss	Ground		
21	Vdc(1&2&3)	LED Annold (Positive)		
22	Vdc(4&5&6)	LED Annold (Positive)		
23	NC	No connect		

24	Vdc1	LED Cathode (Negative)		
25	Vdc2	LED Cathode (Negative)		
26	Vdc3	LED Cathode (Negative)		
27	Vdc4	LED Cathode (Negative)		
28	Vdc5	LED Cathode (Negative)		
29	Vdc6	LED Cathode (Negative)		
30	Vss	Ground		

Note (1) Connector Part No.: 20347-330E-12(I-PEX) or equivalent

Note (2) User's connector Part No: 20345-030T-12(I-PEX) or equivalent

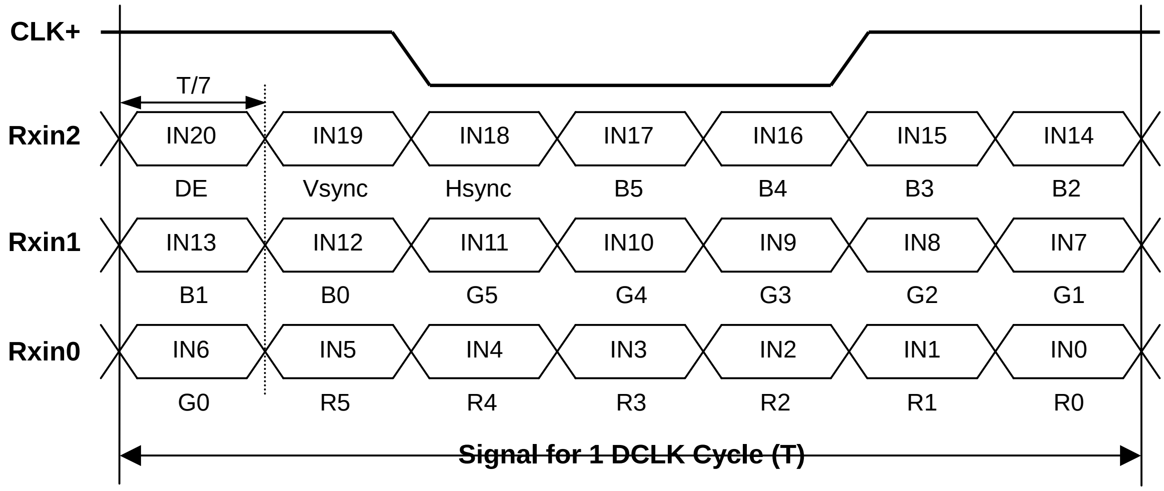
5.2 BACKLIGHT UNIT

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.

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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	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

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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 # (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 (“APP”)	06	00000110
9	9	EISA ID manufacturer name (Compressed ASCII)	10	00010000
10	0A	ID product code (N133I6-L01)	6F	01101111
11	0B	ID product code (hex LSB first; N133I6-L01)	9C	10011100
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 “35”)	23	00100011
17	11	Year of manufacture (fixed “2007”)	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	Max H image size (“29.7cm”)	1d	00011101
22	16	Max V image size (“19.2cm”)	13	00010011
23	17	Display Gamma (Gamma = ”2.2”)	78	01111000
24	18	Feature support (“Active off, RGB Color”)	0A	00001010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	5C	01011100
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	80	10000000
27	1B	Red-x (Rx = “0.595”)	98	10011000
28	1C	Red-y (Ry = “0.345”)	58	01011000
29	1D	Green-x (Gx = ”0.320”)	51	01010001
30	1E	Green-y (Gy = ”0.555”)	8E	10001110
31	1F	Blue-x (Bx = ”0.155”)	27	00100111
32	20	Blue-y (By = ”0.145”)	25	00100101
33	21	White-x (Wx = ”0.313”)	50	01010000
34	22	White-y (Wy = ”0.329”)	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2 (1280x800@60Hz)	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

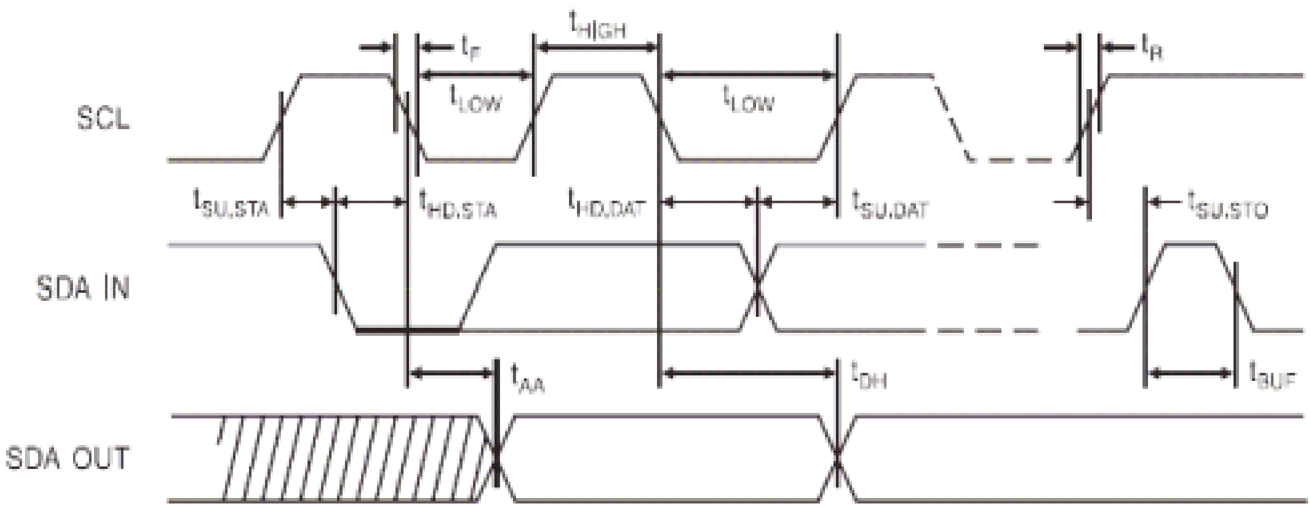
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard 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 (“71MHz”, According to VESA CVT Rev1.1)	BC	10111100
55	37	# 1 Pixel clock (hex LSB first)	1B	00011011
56	38	# 1 H active (“1280”)	00	00000000
57	39	# 1 H blank (“160”)	A0	10100000
58	3A	# 1 H active : H blank (“1280 : 160”)	50	01010000
59	3B	# 1 V active (”800”)	20	00100000
60	3C	# 1 V blank (”23”)	17	00010111
61	3D	# 1 V active : V blank (”800 :23”)	30	00110000
62	3E	# 1 H sync offset (”48”)	30	00110000
63	3F	# 1 H sync pulse width ("32”)	20	00100000
64	40	# 1 V sync offset : V sync pulse width (”3 : 6”)	36	00110110
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 (”286.08 mm”)	1E	00011110
67	43	# 1 V image size (”178.8 mm”)	B2	10110010
68	44	# 1 H image size : V image size (”286 : 178”)	10	00010000
69	45	# 1 H boarder (”0”)	00	00000000
70	46	# 1 V boarder (”0”)	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing/monitor	00	00000000
73	49	descriptor #2	00	00000000
74	4A		00	00000000
75	4B		01	00000001
76	4C	Version	00	00000000
77	4D	Apple edid signature	06	00000110
78	4E	Apple edid signature	10	00010000
79	4F	Link Type (LVDS Link,MSB justified)	20	00100000
80	50	Pixel and link component format (6-bit panel interface)	00	00000000
81	51	Panel features (No inverter)	00	00000000
82	52		00	00000000
83	53		00	00000000
84	54		00	00000000
85	55		00	00000000
86	56		00	00000000

87	57		00	00000000
88	58		0A	00001010
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 (Model Name “N133I3-L01”, ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of name (“N”)	4E	01001110
96	60	# 3 2nd character of name (“1”)	31	00110001
97	61	# 3 3rd character of name (“3”)	33	00110011
98	62	# 3 4th character of name (“3”)	33	00110011
99	63	# 3 5th character of name (“I”)	49	01001001
100	64	# 3 6th character of name (“6”)	36	00110110
101	65	# 3 7th character of name (“-”)	2D	00101101
102	66	# 3 8th character of name (“L”)	4C	01001100
103	67	# 3 9th character of name (“0”)	30	00110000
104	68	# 3 9th character of name (“1”)	31	00110001
105	69	# 3 New line character indicates end of ASCII string	0A	00001010
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
111	6F	# 4 FC (hex) defines Monitor name ("Color LCD", ASCII)	FC	11111100
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name ("C")	43	01000011
114	72	# 4 2nd character of name ("o")	6F	01101111
115	73	# 4 3rd character of name ("l")	6C	01101100
116	74	# 4 4th character of name ("o")	6F	01101111
117	75	# 4 5th character of name ("r")	72	01110010
118	76	# 4 6th character of name (<space>)	20	00100000
119	77	# 4 7th character of name ("L")	4C	01001100
120	78	# 4 8th character of name ("C")	43	01000011
121	79	# 4 9th character of name ("D")	44	01000100
122	7A	# 4 New line character # 4 indicates end of Monitor name	0A	00001010
123	7B	# 4 Padding with "Blank" character	20	00100000
124	7C	# 4 Padding with "Blank" character	20	00100000
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	E5	11100101

5.5 EDID SIGINAL SPECIFICATION

(1) EDID Power

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Power supply voltage	Vcc	—	1.8	—	5.5	V



(2) DC characteristics

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Supply current Vcc=5.0V	Icc	READ at 100kHz	—	0.4	1.0	mA
Supply current Vcc=5.0V	Icc	WRITE at 100kHz	—	2.0	3.0	mA
Standby Current	ISB	Vin=Vcc or Vss	—	1.6	4.0	µA
Input Leakage Current	ILI	Vin=Vcc or Vss	—	0.1	3.0	µA
Onput Leakage Current	ILO	Vout=Vcc or Vss	—	0.05	3.0	µA
Input Low Level	VIL	—	-0.6	—	Vcc x 0.3	V
Input High Level	VIH	—	Vcc x 0.7	—	Vcc+0.5	V
Output Low Level Vcc=3.0V	VOL2	IOL=2.1mA	—	—	0.4	V
Output Low Level Vcc=1.8V	VOL1	IOL=0.15mA	—	—	0.2	V

(3) AC characteristics (VCC=1.8~5.5V standard operation mode)

Parameter	Symbol	Min	Max	Unit
Clock Frequency, SCL	FSCL	—	400	kHz
Clock Pulse Width Low	TLOW	1.2	—	μs
Clock Pulse Width High	THIGH	0.6	—	μs
Noise Suppression Time	TI	—	50	ns
Clock Low to Data Out Valid	TAA	0.1	0.9	μs
Time the bus must be free before a new transmission can start	TBUF	1.2	—	μs
Start Hold Time	THD.STA	0.6	—	μs
Start Set-up Time	TSU.STA	0.6	—	μs
Data in Hold Time	THD.DAT	0	—	μs
Data in Set-up Time	TSU.DAT	100	—	ns
Inputs Rise Time	TR	—	0.3	μs
Inputs Fall Time	TF	—	300	ns
Stop Set-up Time	TSU.STO	0.6	—	μs
Data Out Hold Time	TDH	50	—	ns
Write Cycle Time	TWR	—	5	ms

6. INTERFACE TIMING

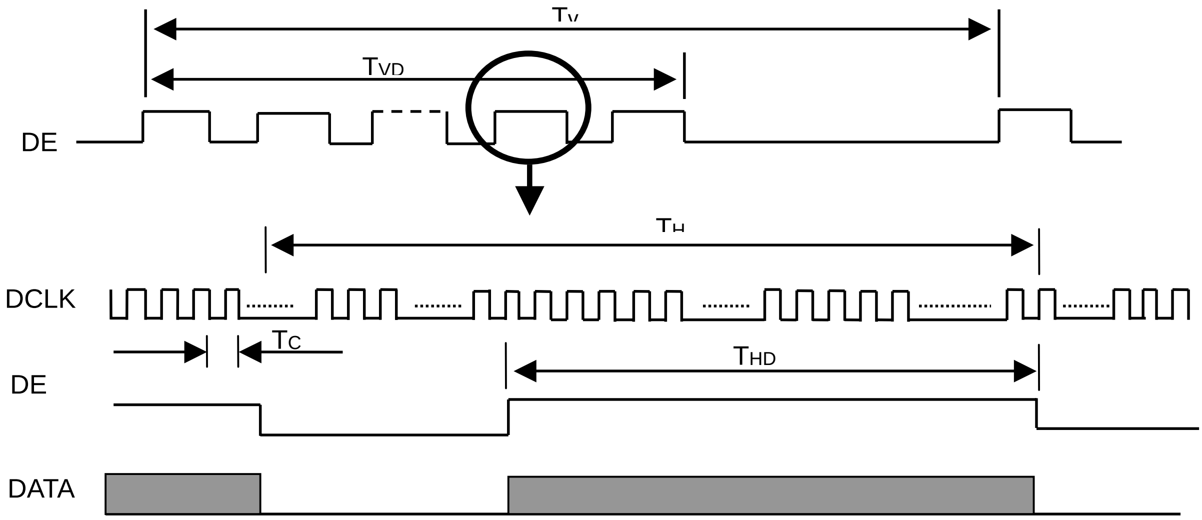
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

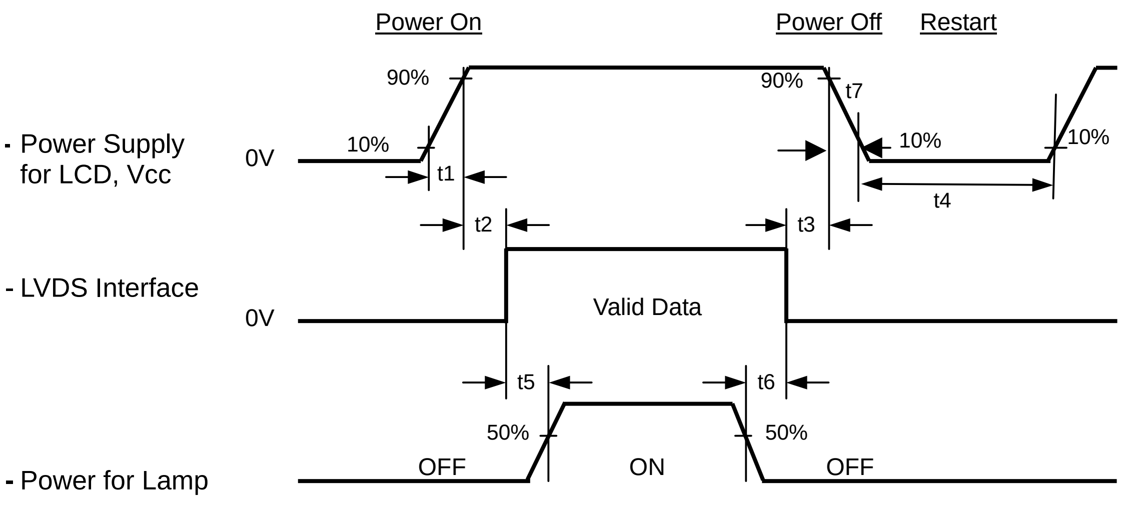
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	50	71.1	80	MHz	-
DE	Vertical Total Time	TV	810	823	1900	TH	-
	Vertical Addressing Time	TVD	800	800	800	TH	-
	Horizontal Total Time	TH	1360	1440	1900	Tc	-
	Horizontal Addressing Time	THD	1280	1280	1280	Tc	-

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 ≦ t1 ≦ 10 ms

0 ≦ t2 ≦ 50 ms

0 ≦ t3 ≦ 50 ms

t4 ≧ 500 ms

t5 ≧ 200 ms

t6 ≧ 200 ms

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.

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7 OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

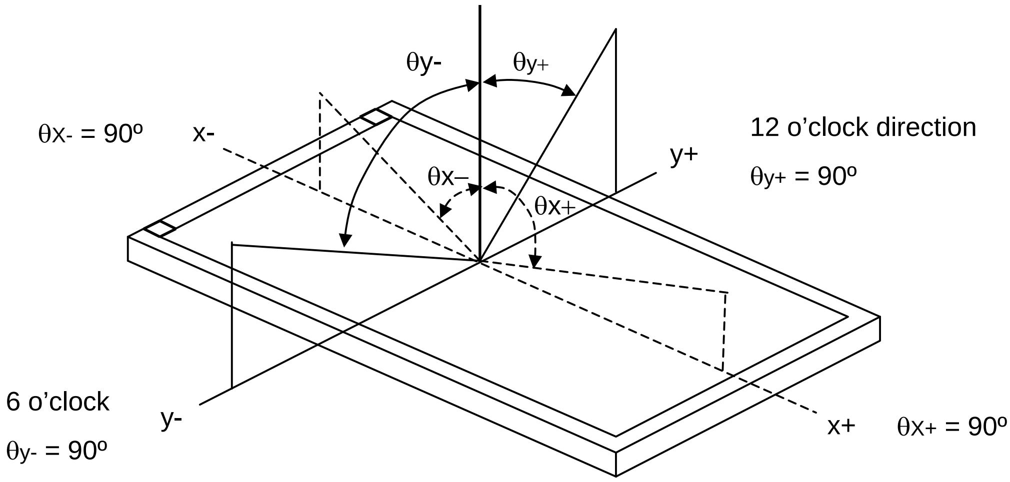
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{o}C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	(120)	mA

The measurement methods of optical characteristics are shown in Section 7.2. The following items should be measured under the test conditions described in Section 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	(380)	(550)		-	(2), (5)
Response Time		T_R		-	(7)	(12)	ms	(3)
		T_F		-	(9)	(14)	ms	
Average Luminance of White		L_{AVE}		(300)	(350)		cd/m^2	(4), (5)
White Variation		δW				1.4	-	(5), (6)
Color Chromaticity	Red	Rx		TYP -0.05	(0.595)	TYP +0.05	-	(1)
		Ry			(0.355)		-	
	Green	Gx			(0.330)		-	
		Gy			(0.550)		-	
	Blue	Bx			(0.160)		-	
		By			(0.146)		-	
	White	Wx			(0.313)		-	
		Wy			(0.329)		-	
Viewing Angle	Horizontal	θ_X+	CR≥10	(50)	(60)		Deg.	
		θ_X-		(50)	(60)			
	Vertical	θ_Y+		(30)	(40)			
		θ_Y-		(40)	(50)			

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

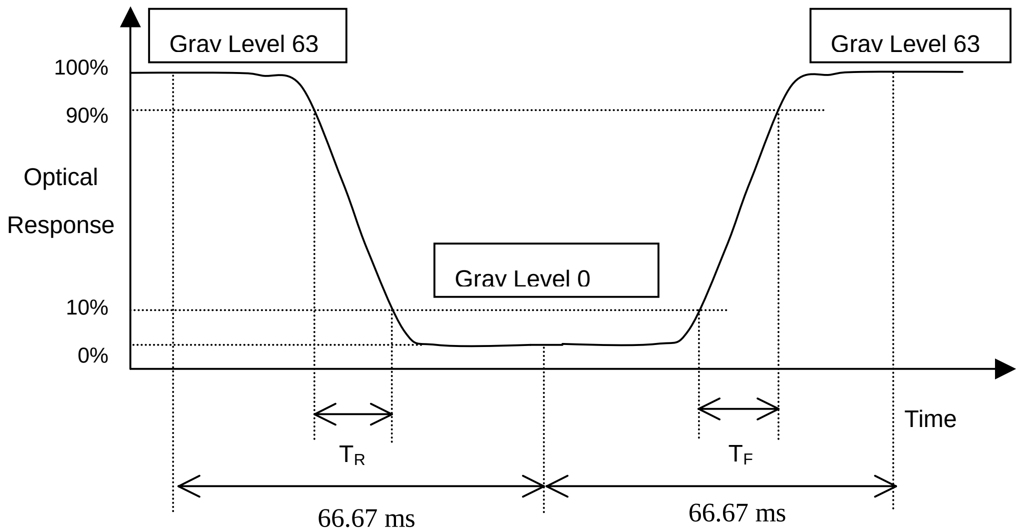
L63: Luminance of gray level 63

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 (6).

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



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

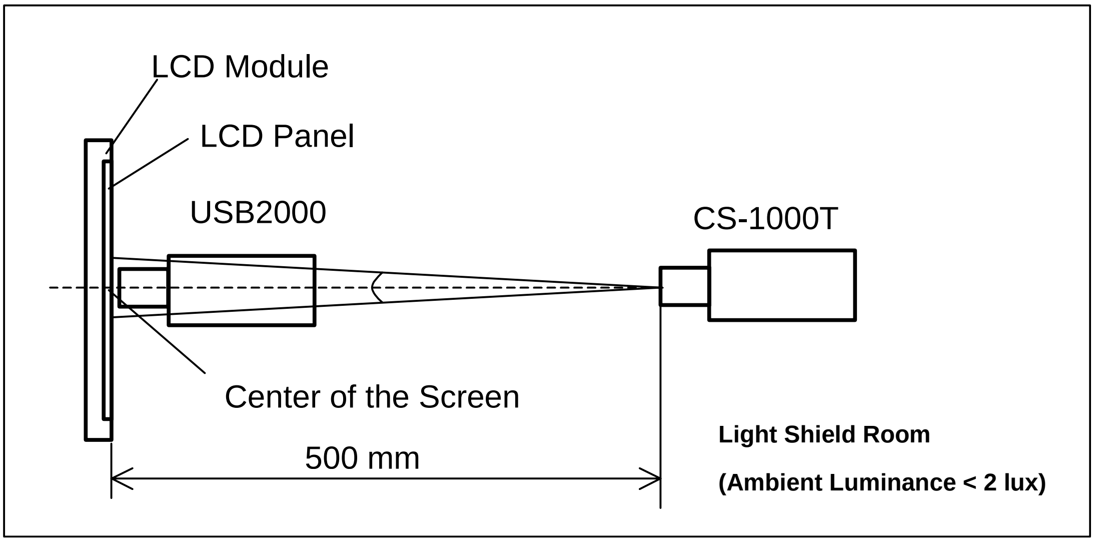
Measure the luminance of gray level 63 at 5 points

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 (6).

Note (5) Measurement Setup:

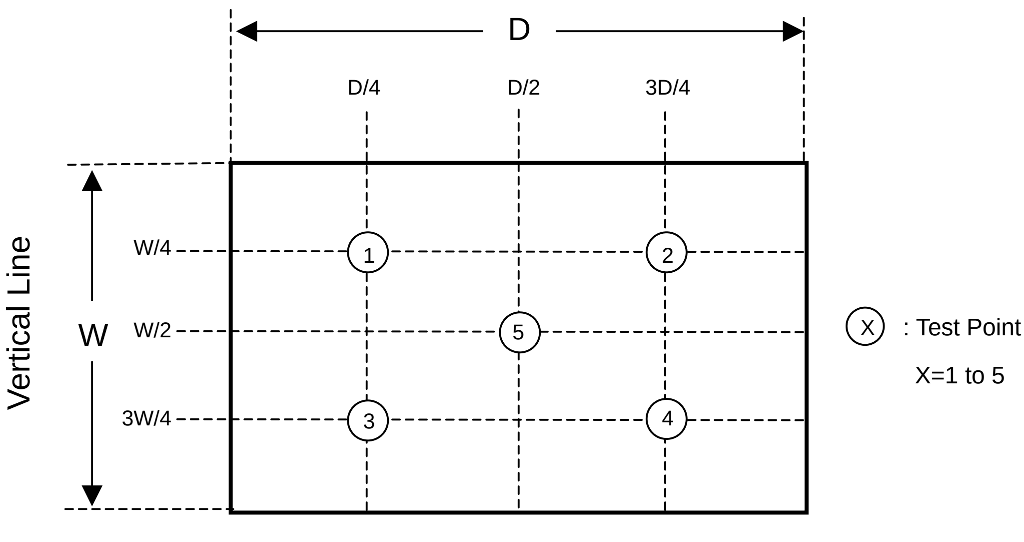
The LCD module should be stabilized at given temperature for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 15 minutes in a windless room.



Note (6) 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)]



8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

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

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

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

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

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

8.2 SAFETY PRECAUTIONS

(1) 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.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

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

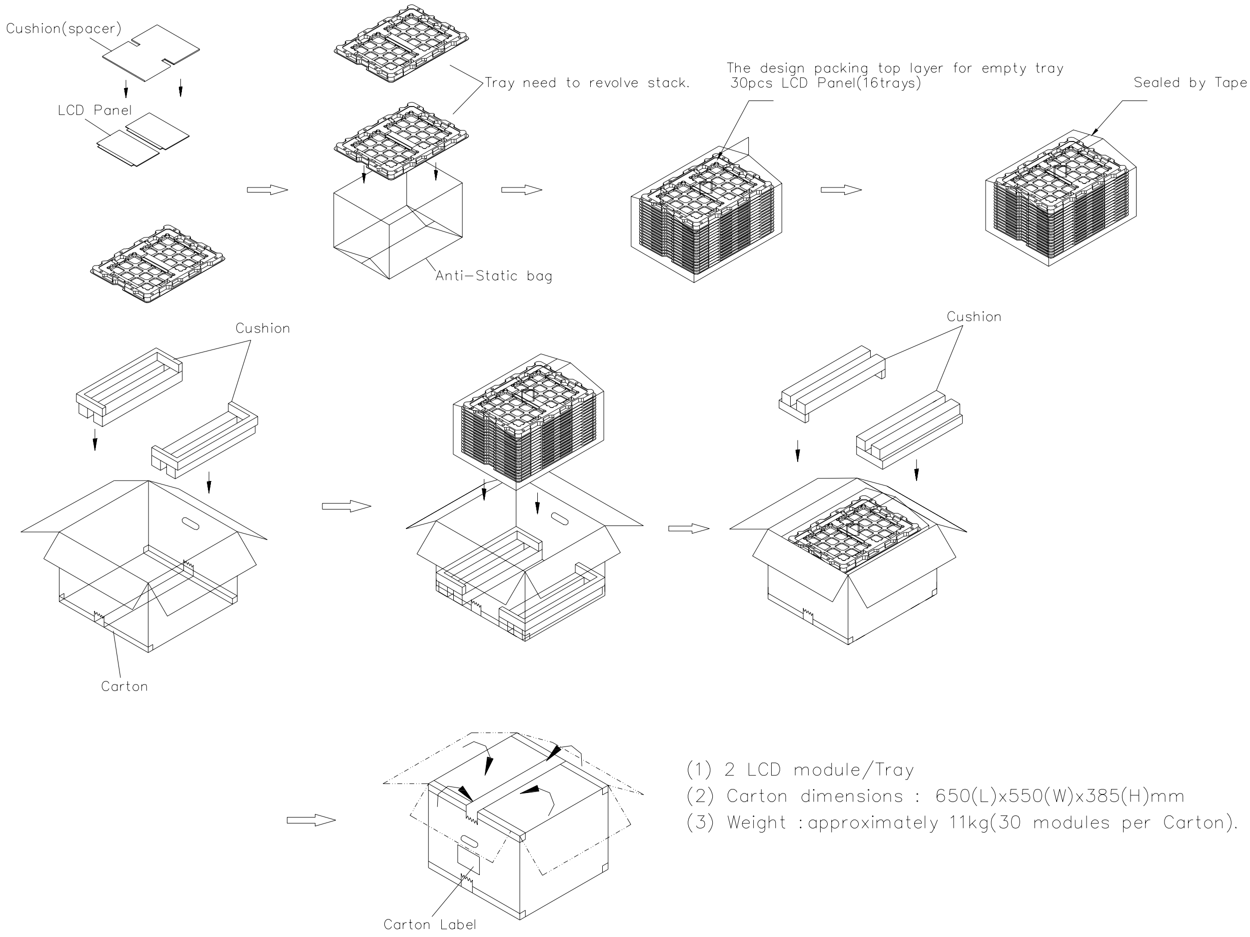


Figure. 9-1 Packing method

9.2 PALLET FOR SEA FREIGHT

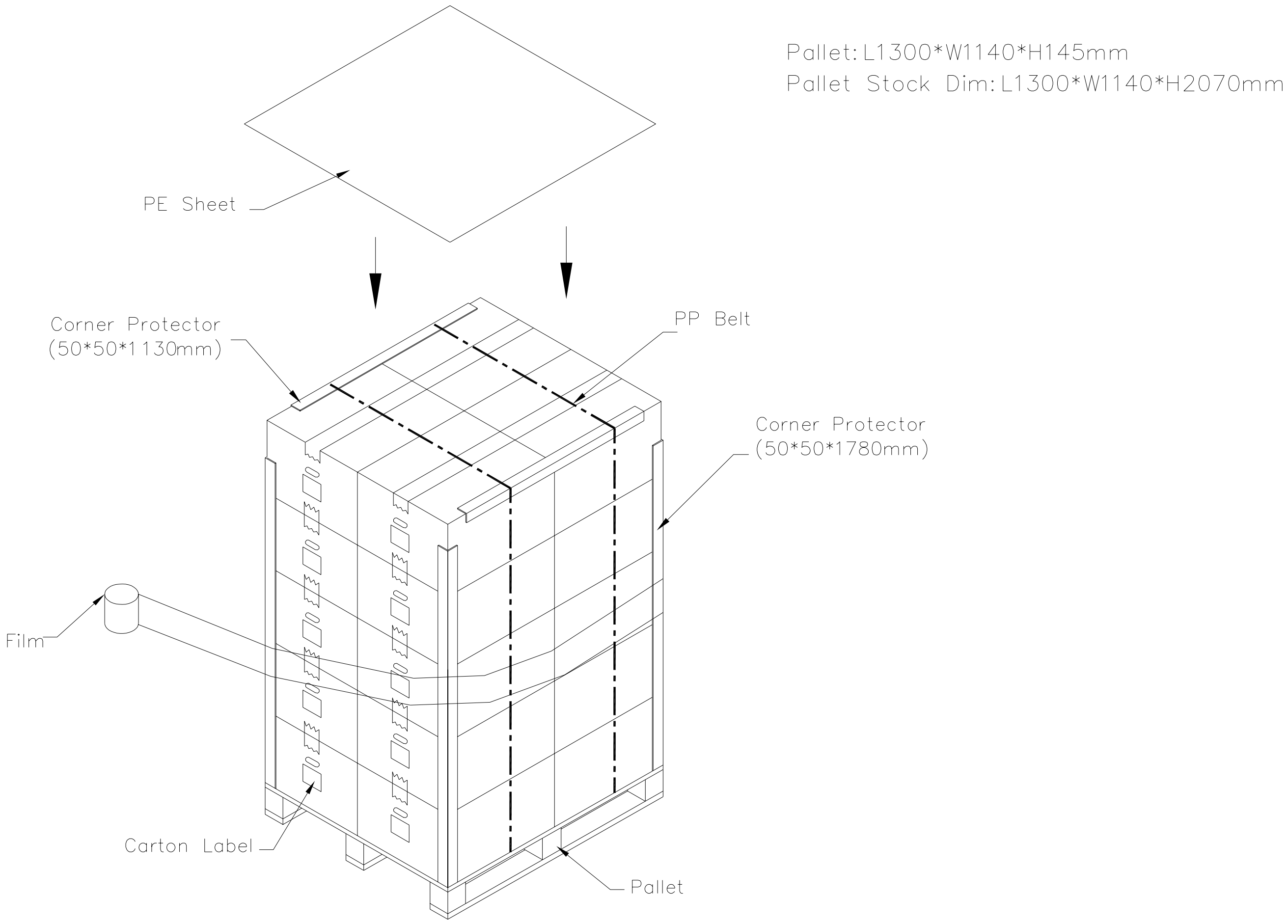


Figure. 9-2 Packing method

9.3 PALLET FOR AIR FREIGHT

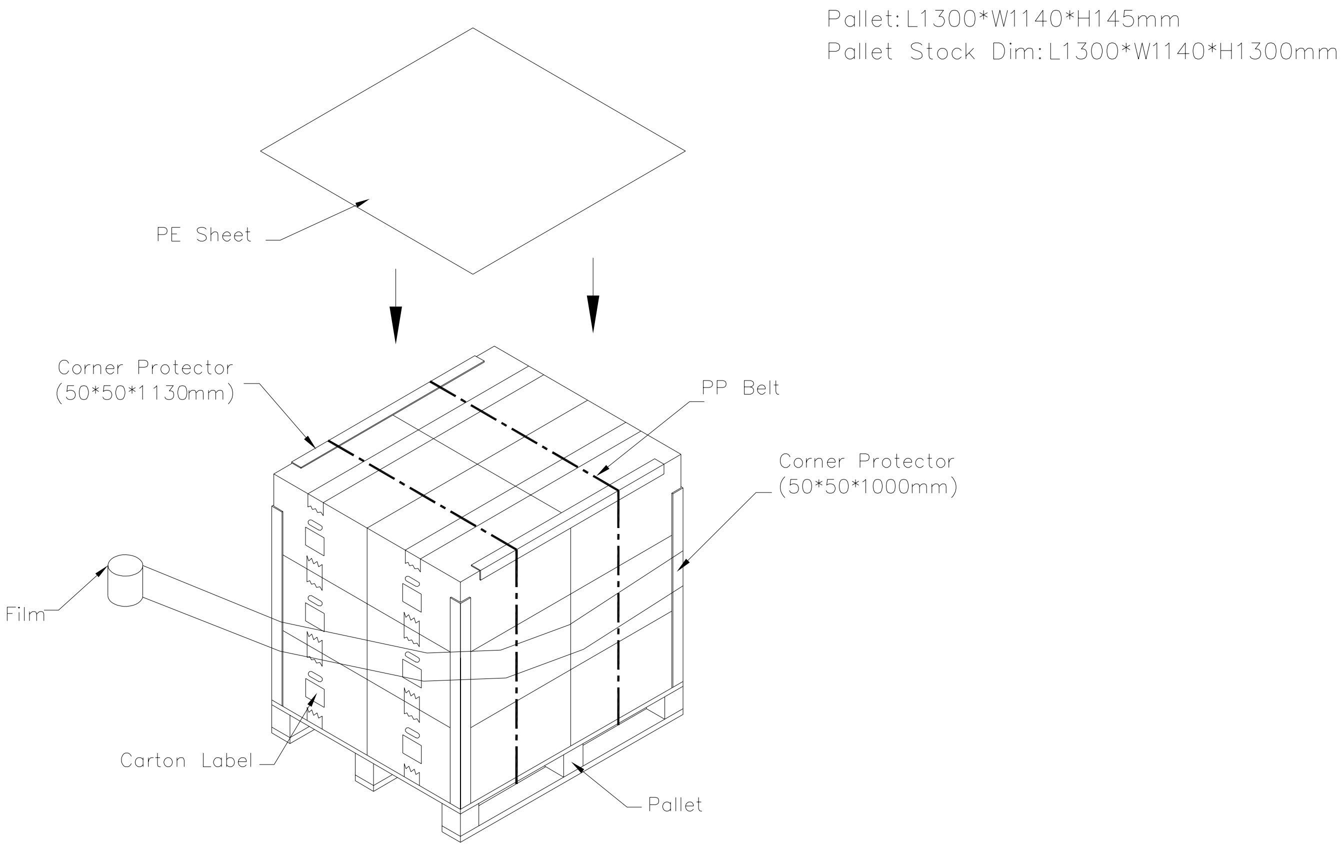
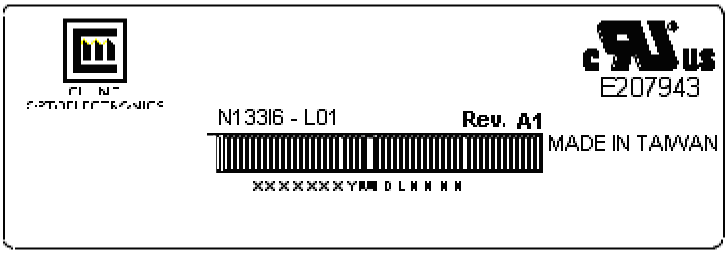


Figure. 9-3 Packing method

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: N133I6 - L01

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

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

- N N N N — Serial No.
- X — CMO Internal Use
- Y M D — Year, Month, Date
- X X X — CMO Internal Use
- X X — Revision
- X X — CMO Internal Use

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

Serial ID includes the information as below:

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

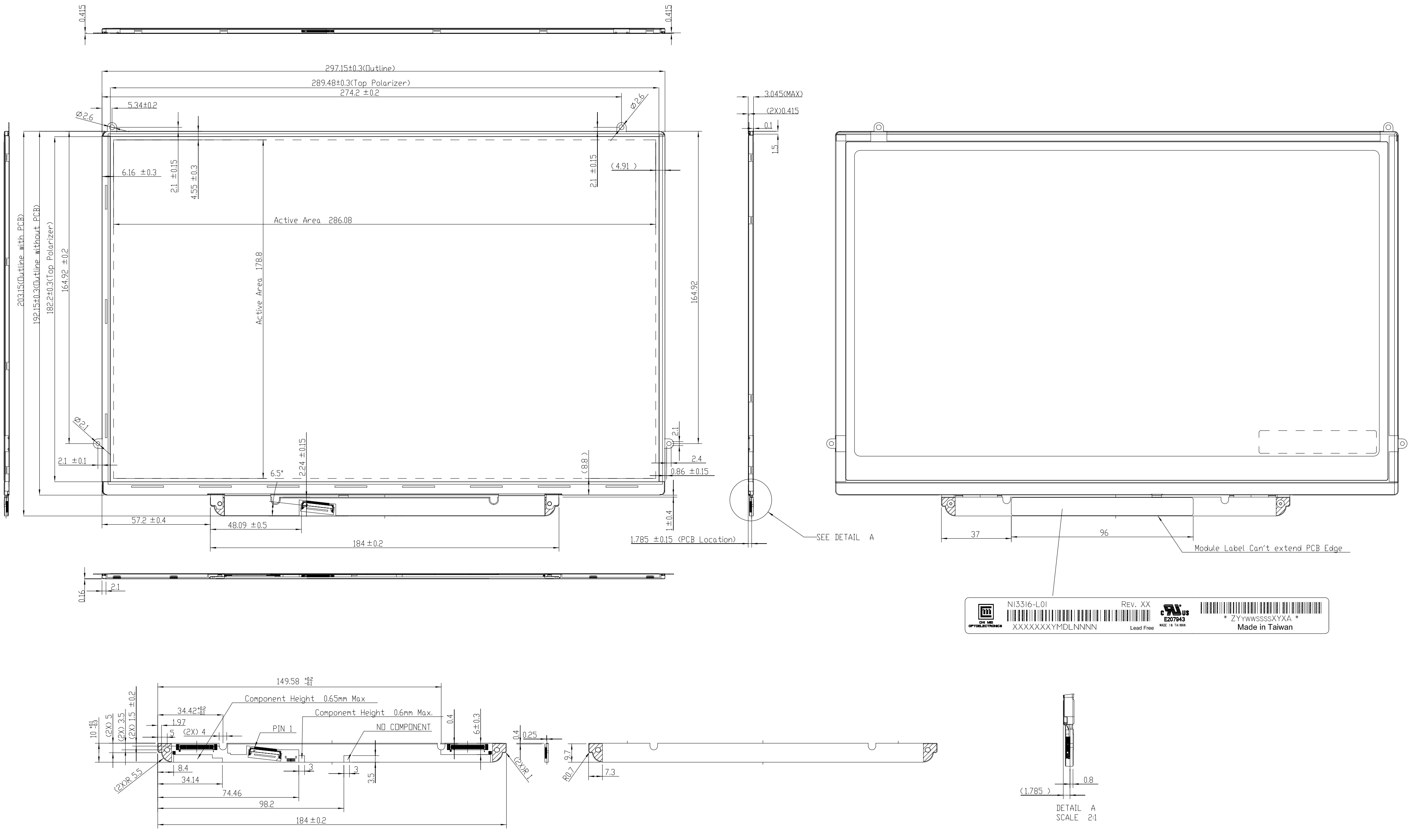
Month: 1~9, A~C, for Jan. ~ Dec.

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



NOTE:
1.OUTLINE TOLERANCE: 0.3mm.
2.REAR BEZEL: AL 5052 T=0.3mm.
3.'*' MARKS THE DESIGN CRITICAL DIMENSION.
4.'Ⓟ' MARKS THE PROCESS CRITICAL DIMENSION.
5.Weight :219 Max.
6.LVDS: I-PEX 20347-330E-12
7.Flatness 0.5mm Max.

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

TITLE	ASSY_MODULE_N13316-L01			2D REV. 1	3D REV. 1.6
Approved	BILL_SHEU	Drawing No.	N133641011		
Checked	SHUNNAN	Part No.	TBD		
Drawer	YAOCHIEN	Material	TBD	Sheet 1 / 1	A1
Designer	YAOCHIEN	Date 01-Mar-2007	Scale 1:1	Unit:mm	

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