CHI MEI OPTOELECTRONICS CORP.

DOC.NO: 14003169
Issue Date: MAR, 16.2000
Model: N141X204
Preliminary

TFT-LCD Specification

Model No: N141X204

Customer : Dell Computer Corporation

Approved by : _____

Note :

Liquid Crystal Division		
QRA Dept.	RD Dept.	System Dept.
Approval	Approval	Approval

Version 1.0

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CONTENTS

REVISION HISTORY

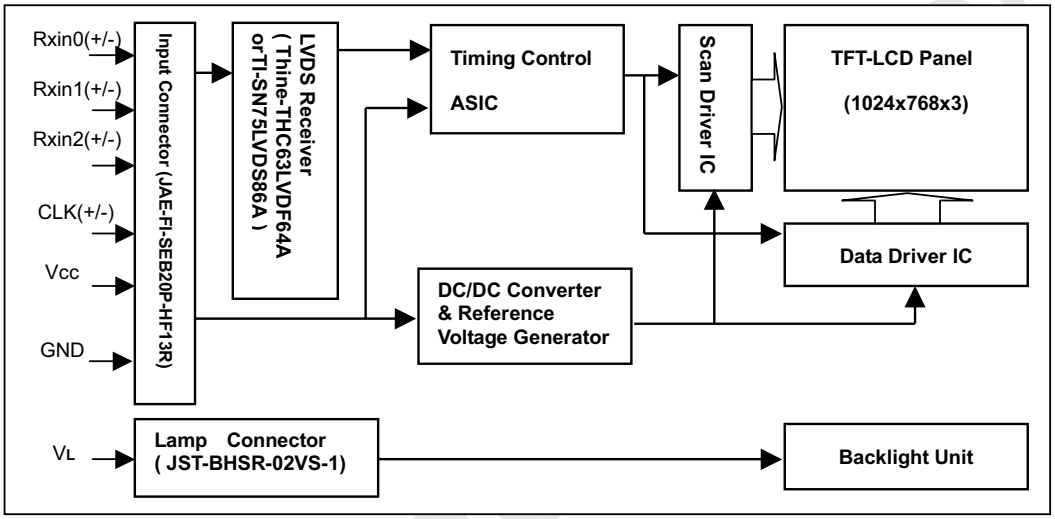
VERSION	Date	DESCRIPTION
Ver 1.0	Mar, 16.00	Issue Preliminary Specification.

GENERAL DESCRIPTION

OVERVIEW

This product is a 14.1" TFT Liquid Crystal Display Module with a Backlight unit and 20 pins LVDS (Low Voltage Differential Signal) interface. This module supports 1024 x 768 XGA mode and can display 262,144 colors. The inverter module for Backlight is not built in.

BLOCK DIAGRAM



APPLICATION

-Note Book PC

GENERAL SPECIFICATI0NS

Item	Specifications	Unit
Screen Size	14.1 Diagonal	inch
Bezel opening area	288.8(W)x217.4(H)	mm
Effective display area	285.7(W)x214.3(H)	mm
Pixel number	1024 x R.G.Bx768	pixel
Pixel pitch	0.279(H)x0.279(V)	mm
Pixel Arrangement	R.G.B Vertical Stripe	-
Display Color	6 bits, 262,144	color
Transmissive mode	Normally white	-
Surface treatments	Hard coating(3H) and anti-glare	-

MECHANICAL SPECIFICATIONS

ITEM		MIN.	TYP.	MAX.	Unit
Module size	Horizontal	298	298.5	299	mm
	Vertical	227	227.5	228	mm
	Depth	-	5.8	6.1	mm
Weight		-	570	590	g

1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Unit	Remarks
		Min.	Max.		
Power supply voltage	V_{CC}	-0.3	+4.0	V	Ta=25°C
Logic input voltage	V_{IN}	-0.3	V_{CC}+0.3	V	
Operating temperature	Top	0	+50	°C	Note
Storage temperature	Tst	-20	+60	°C	

Note : 90%RH MAX. (at Ta ≤ 40 °C)

Maximum wet-bulb temperature : 39 °C or lower (at Ta > 40 °C)

2. ELECTRICAL SPECIFICATIONS

MODULE						
Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	V_{CC}	3.0	3.3	3.6	V	1
"H" level LVDS signal input	V_{IH}	-	-	+100	mV	
"L" level LVDS signal input	V_{IL}	-100	-	-	mV	
Power Supply Current	I_{CC}	-	400	500	mA	
Rush Current	IRUSH	-	1.6	1.8	A	
Ripple voltage	V_{RP}	-	50	-	mV	
Terminating resistor	Rt	-	100	-	Ohm	

BACKLIGHT (1 Lamp)						Ta=25±2 °C
Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Lamp Voltage	V_L	-	700	-	V_{RMS}	I_L=6.0mA
Lamp Current	I_L	2.0	6.0	7.0	mA	2
Startup Voltage	V_S	-	860	1030 (25 °C)	V_{RMS}	3
		-	1075	1300 (0 °C)	V_{RMS}	3
Operating Frequency	F_L	40	55	70	KHz	4
Power Consumption	P_L	-	4.2	-	W	5, I_L=6.0mA
Lamp Life time	L_{BL}	10000	15000	-	Hrs	6

The connector information of Black light unit.

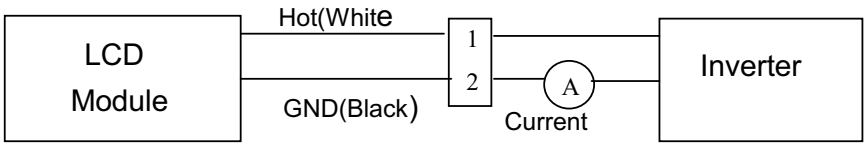
Pin	Symbol	Description	Remark
1	HV	Lamp power input	White
2	LV	Ground	Black

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

User's connector Part No.: SM02B-BHSS-1-TB (JST)

Note 1: The operating temperature range is 0 ~ 50 °C, and the typical value of Power Supply Current is measured in black pattern.

Note2: Lamp current is measured by utilizing a current meter for high frequency as shown below:



Note3: The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note4: 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.

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Note5: $P_L = I_L \times V_L$.

Note6: The lifetime (Hr) of a lamp can be defined as the time in which it continues to operate under the condition Ta = 25±2°C and I_L = 6.0 mArms until one of the following event occurs:

(1) When the brightness becomes 50% or lower than its original,

(2) When the effective ignition length becomes 80% or lower than 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.)

Note7: 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 designed with care so as not to produce 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. When the above situation is confirmed, the module should be operated in the same manners as it is installed in your instrument.

3. INTERFACE SPECIFICATIONS

3.1 THE PIN ASSIGNMENT OF INTERFACE CONNECTOR.

Pin	Symbol	Description	Notes
1	V_{CC}	Power supply +3.3 v	
2	V_{CC}	Power supply +3.3 v	
3	Vss	Ground	
4	Vss	Ground	
5	Rxin0-	LVDS differential data input (Negative)	R0~R5,G0
6	Rxin0+	LVDS differential data input (Positive)	
7	Vss	Ground	
8	Rxin1-	LVDS differential data input (Negative)	G1~G5,B0,B1
9	Rxin1+	LVDS differential data input (Positive)	
10	Vss	Ground	
11	Rxin2-	LVDS differential data input (Negative)	B2~B5,DE,Hsync, Vsync
12	Rxin2+	LVDS differential data input (Positive)	
13	Vss	Ground	
14	CLK-	LVDS Clock Data input (Negative)	LVDS level
15	CLK+	LVDS Clock Data input (Negative)	
16	Vss	Ground	
17	NC	Non-connection	
18	NC	Non-connection	
19	Vss	Ground	
20	Vss	Ground	

Connector Part No.: FI-SEB20P-HF13R (JAE) or Equivalent

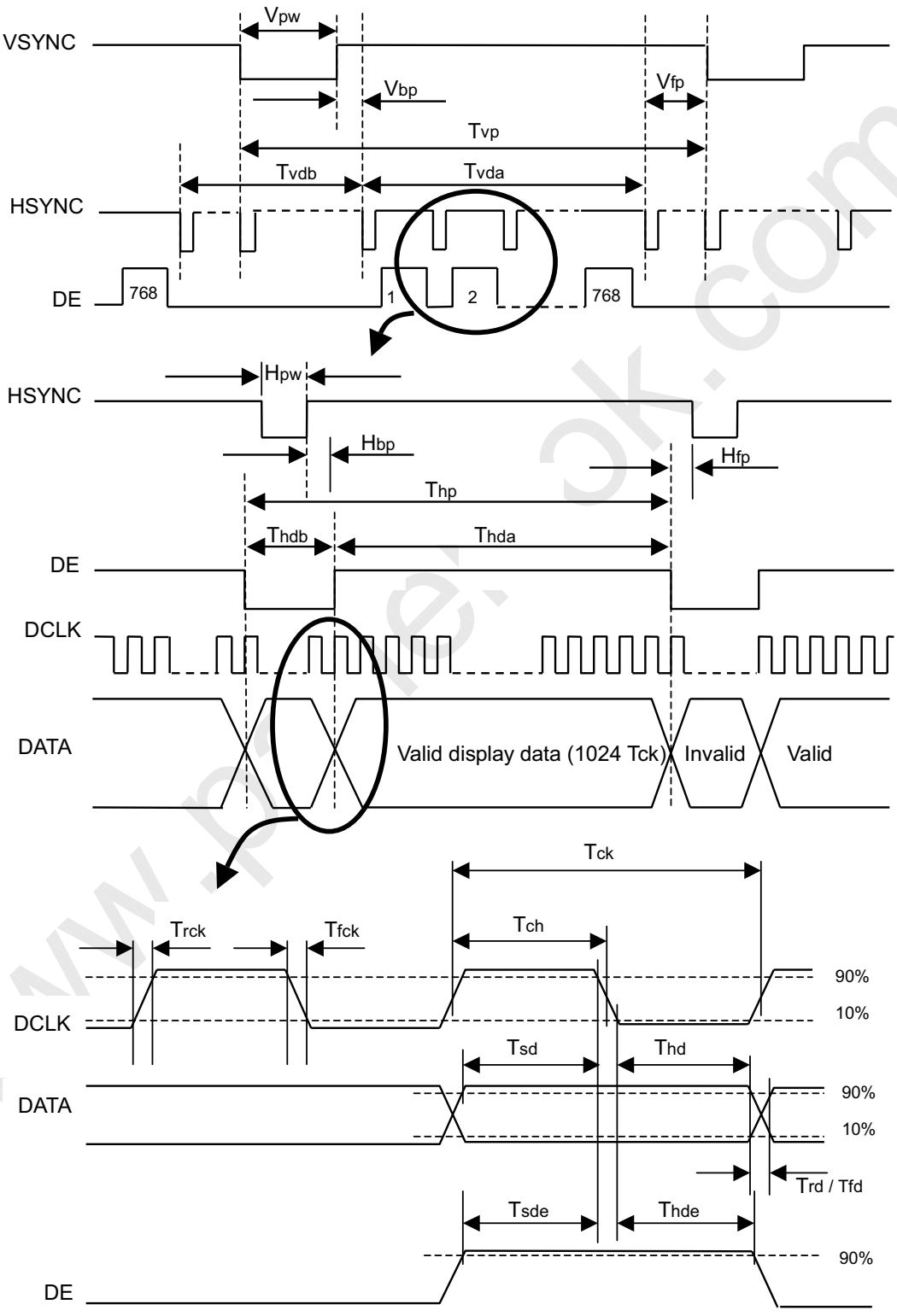
User's connector Part No: FI-S20S or FI-SE20M (JAE)

3.2 INPUT SIGNAL TIMING SPECIFICATIONS

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

Signal	Parameter	Symbol	Min	Typ	Max	Unit	Remarks
DCLK	Pixel clock period	Tck	-	15	-	ns	
	Duty ratio (%Tch)	-	40	50	60	%	Tch/Tck
	Rise time	Trck	-	4.9	-	ns	
	Fall time	Tfck	-	4.7	-	ns	
DATA	Setup time	Tsd	-	4.8	-	ns	
	Hold time	Thd	-	4.2	-	ns	
	Rise time	Trd	-	5.5	-	ns	
	Fall time	Tfd	-	5.5	-	ns	
DE	Setup time	Tsde	3.5	4.0	-	ns	
	Hold time	Thde	3.5	4.2	-	ns	
VSYNC	Vertical period	Tvp	771	806	812	Thp	
	Vertical display blank period	Tvdb	3	38	44	Thp	
	Vertical display active period	Tvda	768	768	768	Thp	
	Vertical sync. back porch	Vbp	0	29	44	Thp	
	Vertical sync. front porch	Vfp	0	3	43	Thp	
	Vertical sync. pulse width	Vpw	1	6	44	Thp	
HSYNC	Horizontal period	Thp	1340	1344	1366	Tck	
	Horizontal display blank period	Thdb	178	320	342	Tck	
	Horizontal display active period	Thda	1024	1024	1024	Tck	
	Horizontal sync. back porch	Hbp	0	160	342	Tck	
	Horizontal sync. front porch	Hfb	0	24	319	Tck	
	Horizontal sync. pulse width	Hpw	23	145	342	Tck	

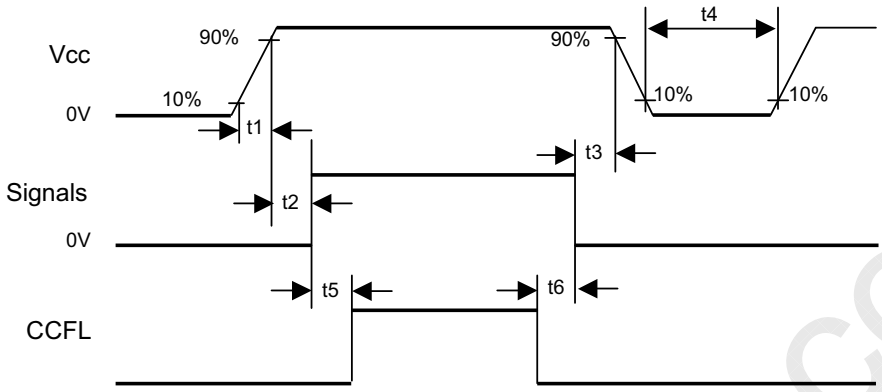
INPUT SIGNAL TIMING DIAGRAM



3.3 COLOR DATA INPUT ASSIGNMENT

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

3.4 POWER UP/DOWN SEQUENCE



Timing Specifications:

$0 \le t1 \le 10mS$

$0 \le t2 \le 50mS$

$0 \le t3 \le 50mS$

$t4 \ge 1S$

$t5 \ge 170mS$

$t6 \ge 200mS$ (min.)

Notes: 1. Please avoid floating state of interface signal at invalid period.

2. When the interface signal is invalid, be sure to pull down the power supply for LCD Vcc to 0V.

4. INVERTER UNIT SPECIFICATIONS

INVERTER SUPPLIER: SUMIDA
TYPE: IV002 (IV11155/T)

4.1 CONNECTOR PIN ASSIGNMENT

Input : CN1
Model No.: WR-L16S-VF-1
Supplier : JAE

PIN	SYMBOL
1,2,4	Vin
3,5,6	GND
7	5VSUS
8	5VALW
9	SMB_DAT
10	SMB_CLK
11	FPVEE
12	N.C
13	PANEL_ID3=1
14	PANEL_ID2=0
15	PANEL_ID1=1
16	PANEL_ID0=1

Output : CN2
Model No. : SM02B-BHSS1-TB
Supplier : JST

PIN	Symbol	Description
1	HV Output	High voltage
2	HV Return	Return

4.2 WEIGHT

Approximately 10 gm.

4.3 ELECTRICAL CHARACTERISTICS:

1. Max brightness (SMB_DATA=00H)

(Room temperature : 25°C ± 3°C)

	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Input voltage	Vin	9	14	21	V	Load=N141X204
Input current	Iin	200	360	600	mA	
Frequency	f	49	57	66	kHz	
Output current	Iout	5.7	6.2	6.7	mArms	
Open voltage	Vopen	1200	1400	1600	Vrms	@No Load

2. Min brightness (SMB_DATA=FFH)

(Room temperature : 25°C ± 3°C)

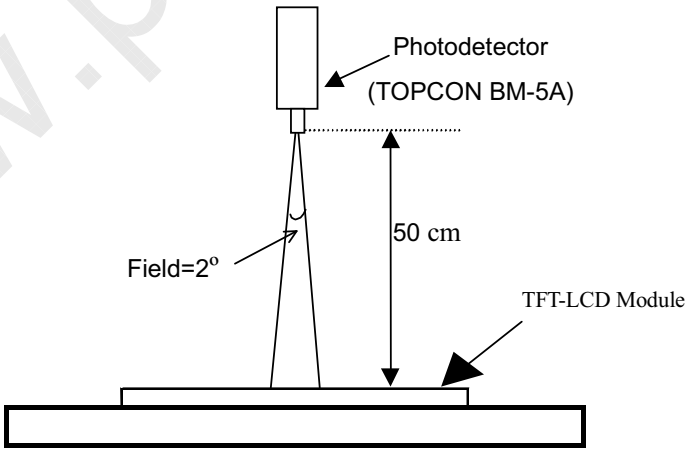
	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Input voltage	Vin	9	14	21	V	Load=N141X204
Input current	Iin	105	220	370	mA	
Frequency	f	54	62	69	kHz	
Output current	Iout	1.8	2.3	2.5	mArms	

5. OPTICAL SPECIFICATIONS

The following optical specifications shall be measured in a dark room or equivalent state (ambient luminance ≤1 lux, and at room temperature). The measurement must be taken after backlight warming up for 20 minutes. The operation temperature is 25°C ± 2°C. The measurement method is shown in Note 1.

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Central Luminance		L	Center,I_L =6.0mA	120	150	-	Cd/m^2	1, 2, 4
Contrast ratio		CR	Center	150	200	-	-	1, 3
Viewing Angle	Horizontal	θx+	Center CR ≥10	40	45	50	degree	1, 4
		θx-		40	45	50		
	Vertical	θy+	Center CR ≥10	10	15	20		
		θy-		30	35	40		
Average Luminance		Lavg	I_L = 6.0mA	110	140	-	Cd/m^2	1, 5
Brightness Uniformity		Buni	θx = θy = 0°	1.0	1.4	1.6		1, 6
Response Time	Rising	Tr	Center θx = θy = 0°	-	15	30	ms	1, 7
	Falling	Tf		-	35	50	ms	
Chromaticity		Xw	Center θx = θy = 0°	0.290	0.310	0.330		1, 8
		Yw		0.310	0.330	0.350		
		X_R		0.546	0.566	0.586		
		Y_R		0.308	0.328	0.348		
		X_G		0.280	0.300	0.320		
		Y_G		0.547	0.567	0.587		
		X_B		0.126	0.146	0.166		
		Y_B		0.104	0.124	0.144		

Note 1: The method of optical measurement:



Note 2: Definition of Central Luminance (L):

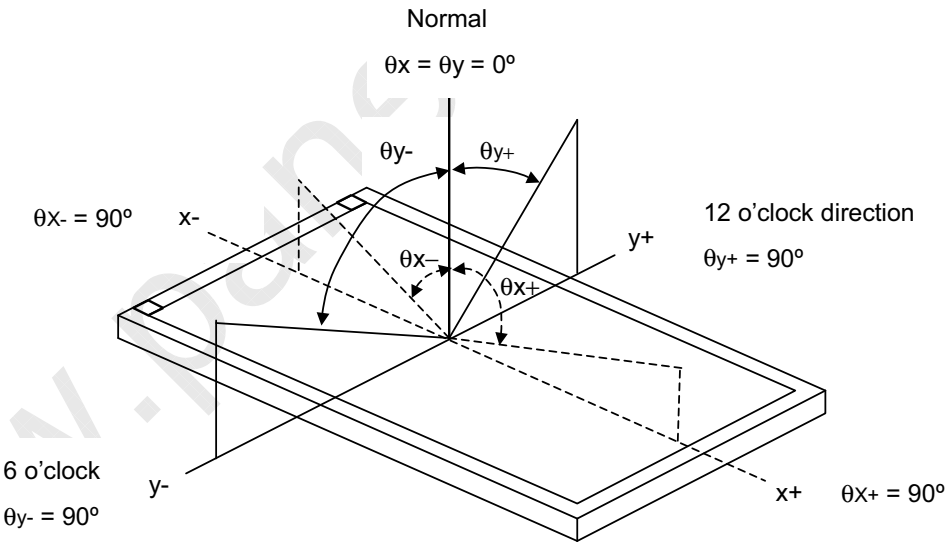
Central Luminance must be measured at the central point of the LCD module and at the viewing angle of the $\theta x = \theta y = 0^{\circ}$ (Note 4).

Note 3: Definition of Contrast Ratio (CR):

Contrast ratio measurement must be made at the viewing angle of the $\theta x = \theta y = 0^{\circ}$ (Note 4) and at the central point of the LCD module. The Luminance (Note 2) shall be measured with all pixels in the viewing field set initially to be white state, then black state.

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in black state}}$$

Note 4: Definitions of Viewing Angle (CR ≥ 10):

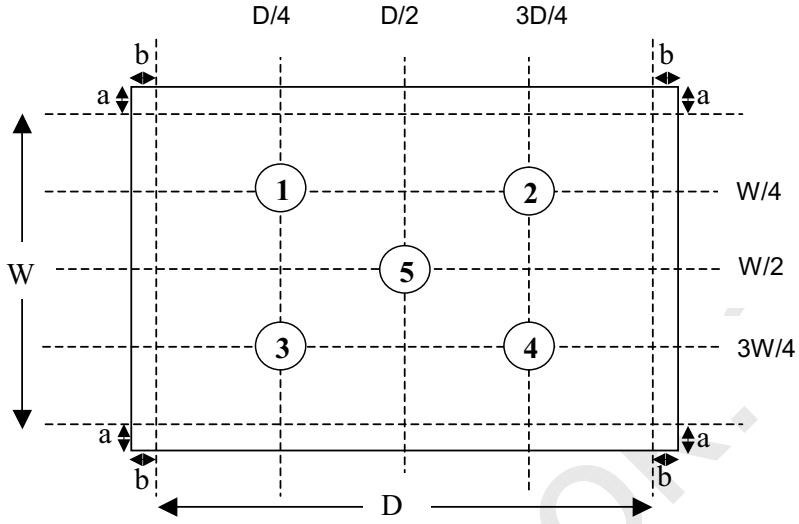


Note 5: Definition of Average Luminance:

The Average Luminance is defined as arithmetic mean value of five spots across the LCD surface at white state. The Luminance (Note 2) shall be measured with all pixels in the viewing field at white state. The measuring spots must be taken at the locations shown in the following figure, where a = b = 15mm.

$$Lave = \frac{L1 + L2 + L3 + L4 + L5}{5}$$

Luminance Measuring Points

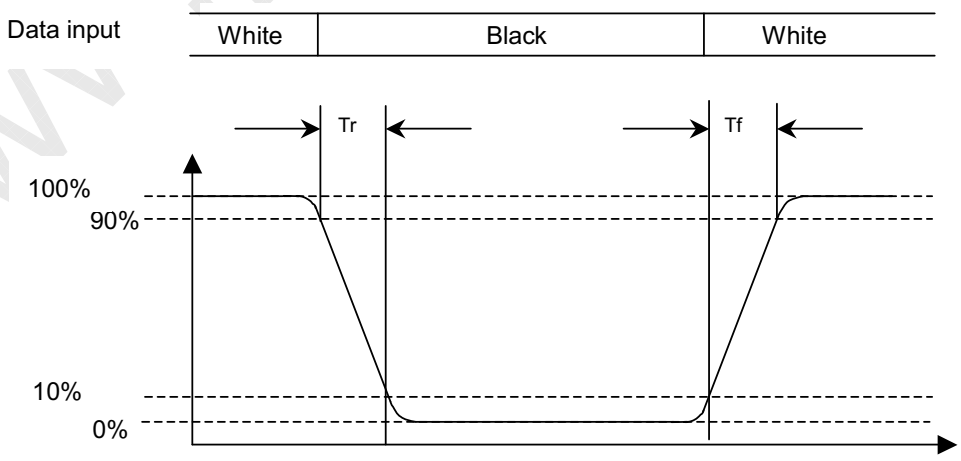


Note 6: Definition of Brightness Uniformity (Buni):

$$Buni = \frac{\text{Maximum luminance of 5 points}}{\text{Minimum luminance of 5 points}} \quad \text{(Note 5).}$$

Note 7: Definition of Response Time:

The Response Time is set initially by defining the " Rising Time (Tr)" and the " Falling Time (Tf)" respectively. Tr and Tf are defined as following figure.



Note 8: Definition of Chromaticity:

The color coordinates (Xw, Yw), (X_R,Y_R), (X_G,Y_G), and (X_B,Y_B) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

6. MECHNICAL DRAWING

Please refer to the attached drawings.

7. PRECAUTION

7. 1 ASSEMBLY AND HANDLING PRECAUTION

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

(2) To assembly and install module into user's system are only in clean working areas. The Dust and oil may cause an electrical short or worsen the polarizer.

(3) It's not permitted to pressure or impulse the module because the LCD panel and backlight,

(4) Always follow the correct power sequence when user connects and operates the LCD module to prevent damage to the CMOS LSI chips during latchup.

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

(6) Do not disassembly the module.

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

(8) Any moisture come into contact with the LCD module is dangerous because LCD modules is turned on with moisture on its surface may cause it damage.

(9) The high temperature or humidity may reduce the performance of module, to store LCD module within the specified storage condition.

(10)The ambient temperature is lower than 10ºC may reduce the display quality, for example, response time become slowly, the starting voltage of CCFL is higher than room temperature.

(11)The mounting screw method is recommended in Figure 6.1.

7.2 SAFETY PRECAUTION

(1) The startup voltage of backlight is approximately 1000 Volts. It may cause electrical shock during assembly 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.

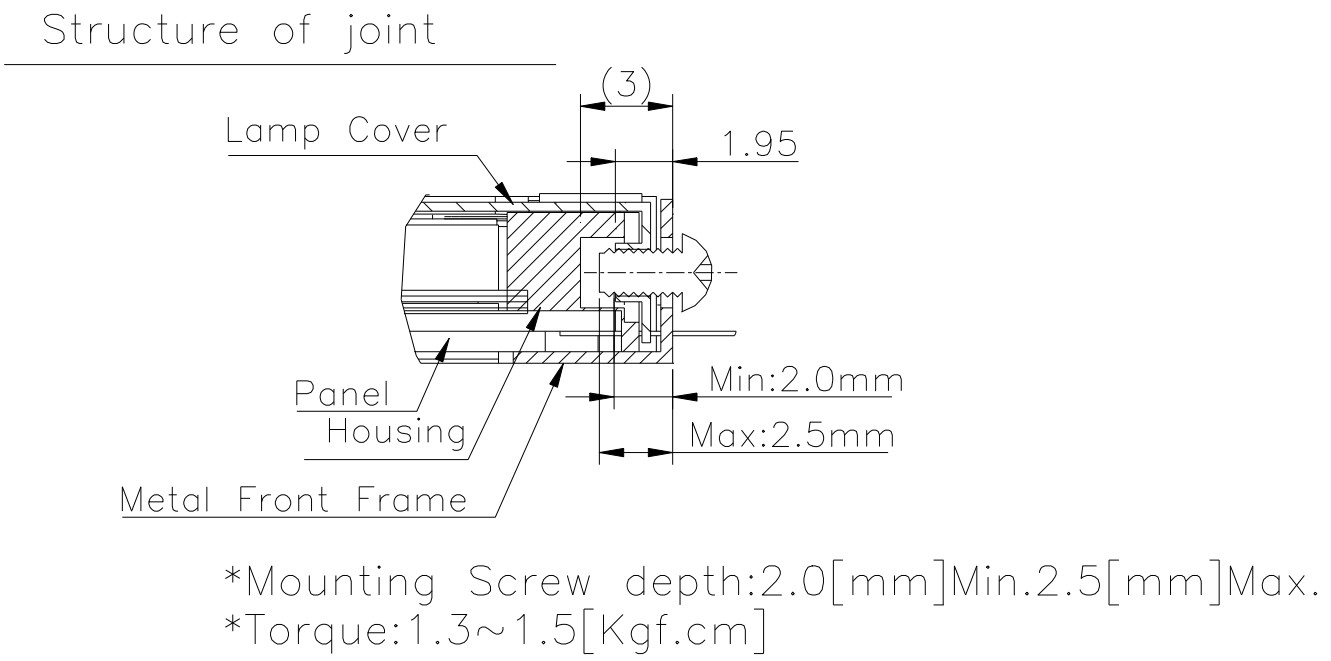


Figure 7.1 : Mounting Screw Method

8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 10 LCD modules / 1 Box

(2) Box dimensions : 422(L) X 337(W) X 345(H) mm

(3) Weight : approximately 7.0Kg (10 modules per box)

8.2 PACKING Method

The Figure. 8-1,2 show the packing method.

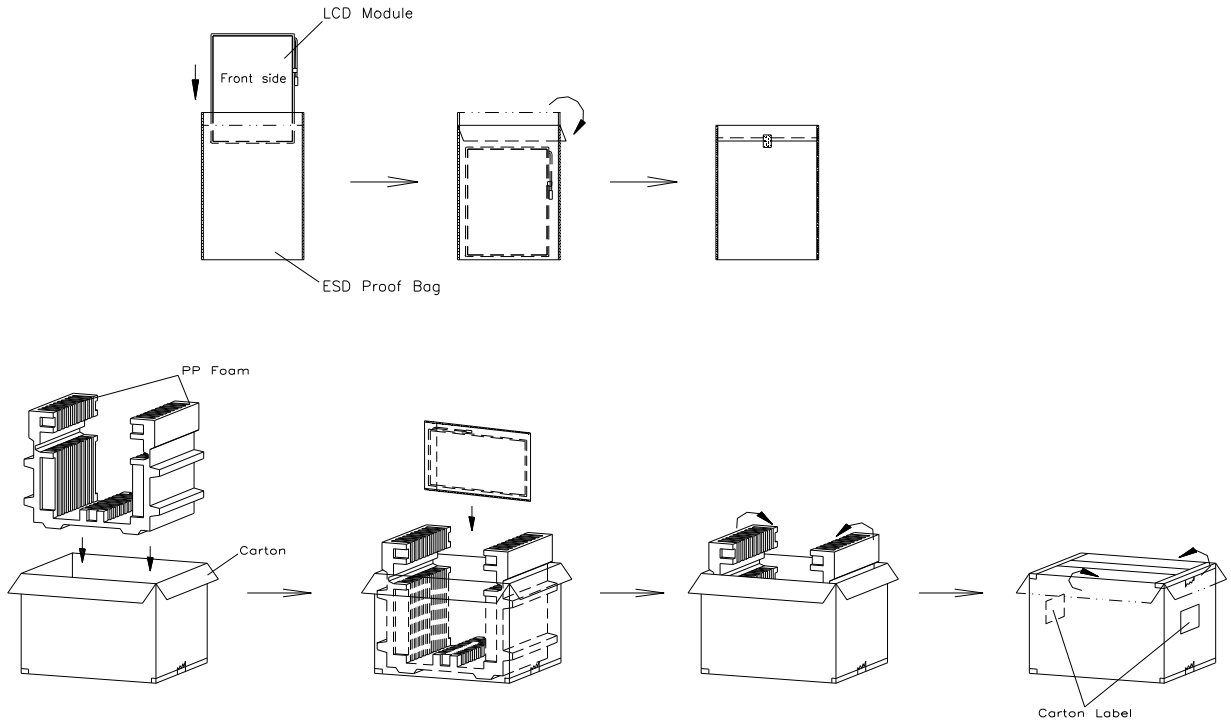


Figure. 8-1 Packing method

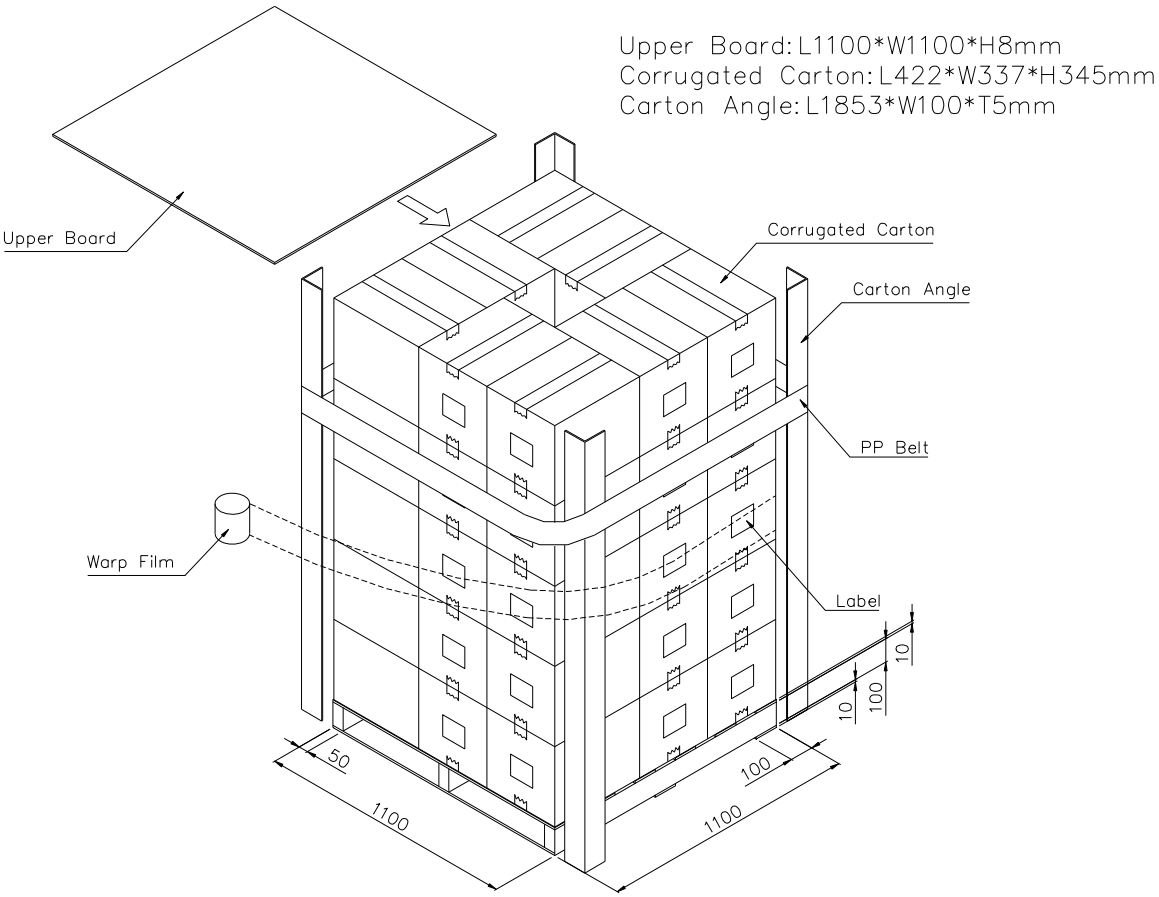
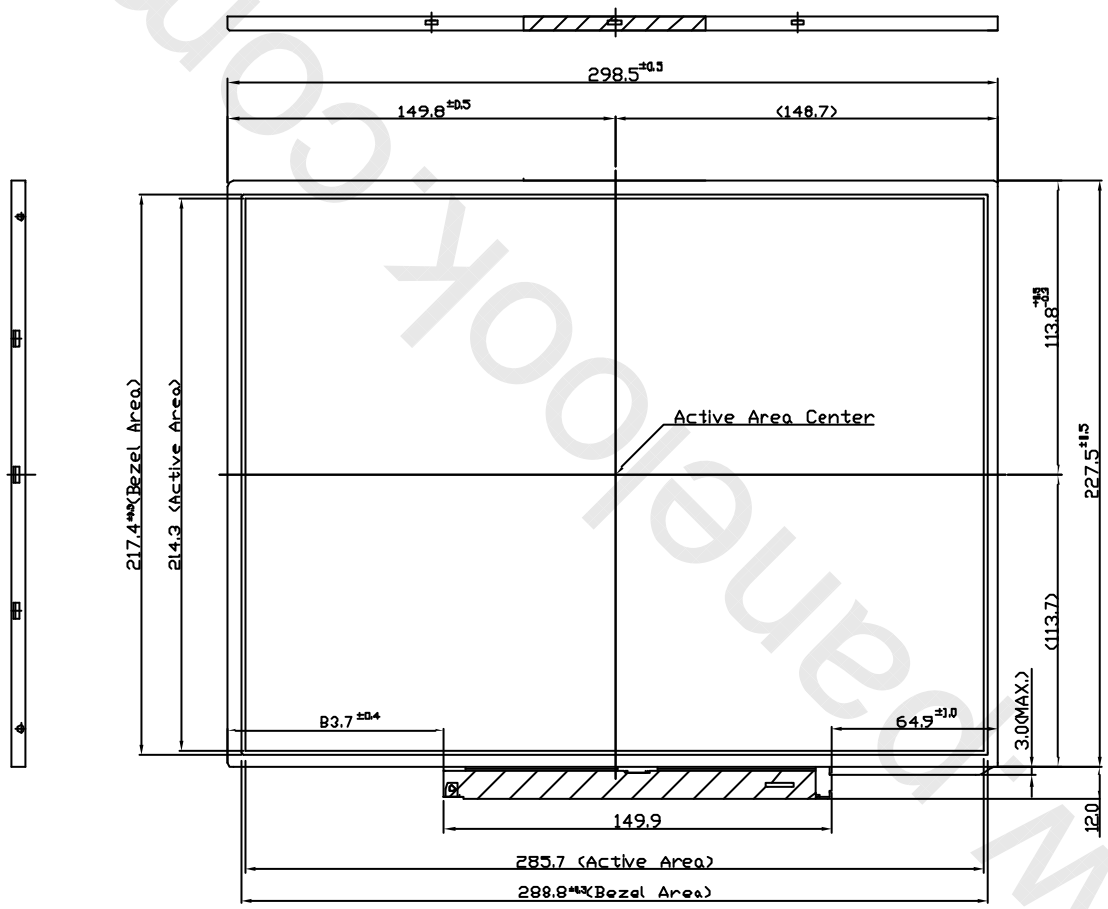
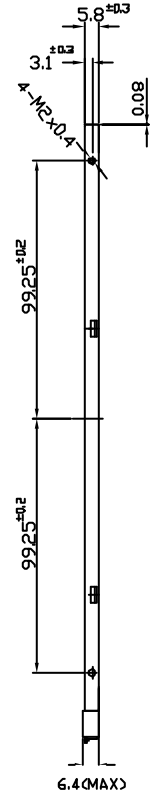


Figure. 8-2 Packing method



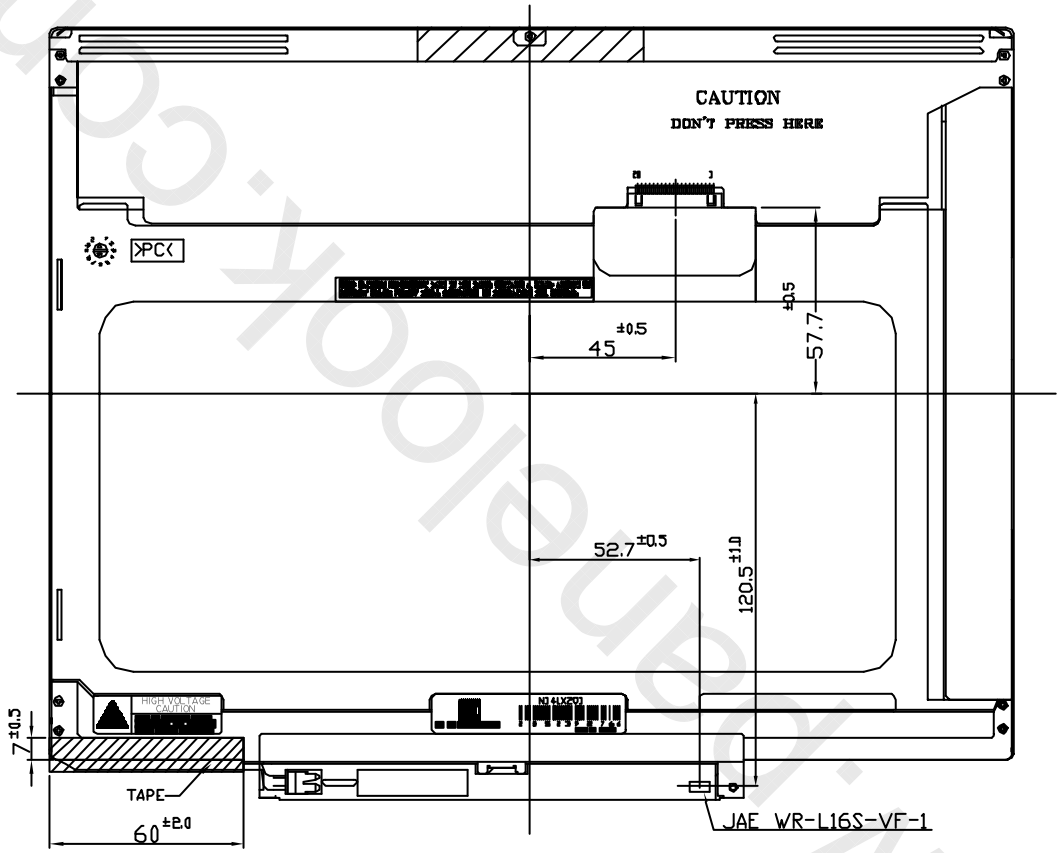


NOTES:
1.GENERAL TOLERANCE:±0.3

MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECO NO.

CHI MEI
OPTOELECTRONICS CORP.

APPROVED: JACK FAN	DWG NO.: N14124111A				
CHECKED: DAVIS WANG	DATE: 03/27/00				
DESIGNER: JOSEPH_KANG	PART NO.: PART				
DRAWER: JOSEPH_KANG	REV.: REV.	UNIT:	SCALE:	SHEET:	
TITLE: N141X204-080_OUTLINE		MM		1/2	



MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECO NO.

CHI MEI
OPTOELECTRONICS CORP.

APPROVED: JACK FAN		DWG NO.: N14124111A			
CHECKED: DAVIS WANG		DATE: 03/27/00			
DESIGNER: JOSEPH_KANG		PART NO.: PART			
DRAWER: JOSEPH_KANG	REV.: REV.	UNIT: MM	SCALE:	SHEET: 2/2	
TITLE: N141X204-080_OUTLINE					