


## TFT LCD Approval Specification

# MODEL NO.: V236H1- L01

Customer:	
Approved by:	
Note:	

核准時間	部門	審核	角色	投票
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### REVISION HISTORY

Version	Date	Section	Description																																																									
Ver 0.0	08, July, '09	-	V236H1-L01 Tentative specification was first issued.																																																									
Ver 1.0	30, July, '09		V236H1-L01 Preliminary specification was first issued.																																																									
		1.4	Confirm total power consumption 33W																																																									
		3.3	Confirm BLU power consumption 28W																																																									
		7.2	Modify Note (6)																																																									
Ver 2.0	14, Aug, '09		V236H1-L01 Approval specification was first issued.																																																									
		1.4	Confirm total power consumption 32W																																																									
		2.2.2	Modify Lamp Voltage & Lamp Current																																																									
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Item</th> <th rowspan="2">Symbol</th> <th colspan="3">Value</th> <th rowspan="2">Unit</th> <th rowspan="2">Note</th> </tr> <tr> <th>Min.</th> <th>Typ.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Lamp Voltage</td> <td><math>V_L</math></td> <td>--</td> <td>1080</td> <td>--</td> <td><math>V_{RMS}</math></td> <td>(1), (2)</td> </tr> <tr> <td>Lamp Current</td> <td><math>I_L</math></td> <td>12.0</td> <td>12.5</td> <td>13.0</td> <td><math>mA_{RMS}</math></td> <td>(1), (2)</td> </tr> <tr> <td>Lamp Frequency</td> <td><math>F_L</math></td> <td>30</td> <td>--</td> <td>80</td> <td>KHZ</td> <td></td> </tr> </tbody> </table>	Item	Symbol	Value			Unit	Note	Min.	Typ.	Max.	Lamp Voltage	$V_L$	--	1080	--	$V_{RMS}$	(1), (2)	Lamp Current	$I_L$	12.0	12.5	13.0	$mA_{RMS}$	(1), (2)	Lamp Frequency	$F_L$	30	--	80	KHZ																											
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## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V236H1-L01 is a 23.6" TFT Liquid Crystal Display module with 2 U-type CCFL Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1920 x 1080 Full HD mode and can display up to 16.7M colors. The inverter module for Backlight is not built in.

### 1.2 FEATURES

- Extra-wide viewing angle.
- High contrast ratio.
- Fast response time.
- High color saturation.
- Full HD (1920 x 1080 pixels) resolution.
- DE (Data Enable) only mode.
- LVDS (Low Voltage Differential Signaling) interface.
- RoHS compliance.
- TCO03 compliance
- Aspect ratio: 16:9

### 1.3 APPLICATION

- TFT LCD Monitor

### 1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	521.28(H) x 293.22(V) (23.547" real diagonal)	mm	(1)
Bezel Opening Area	525.22 (H) x 297.22 (V)	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.2715 (H) x 0.2715 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally White	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Module Power Consumption	32	Watt	(2)

### 1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal(H)	543.8	544.8	545.8	mm	(1)
	Vertical(V)	319.5	320.5	321.5	mm	
	Depth(D)	45.7	46.7	47.7	mm	To Rear
	Depth(D)	50.7	51.7	52.7	mm	To Boss
Weight	-	2400	-	g	-	

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

Note (2) Please refer to sec.3.1 & 3.2 for more information of power consumption

## 2. ABSOLUTE MAXIMUM RATINGS

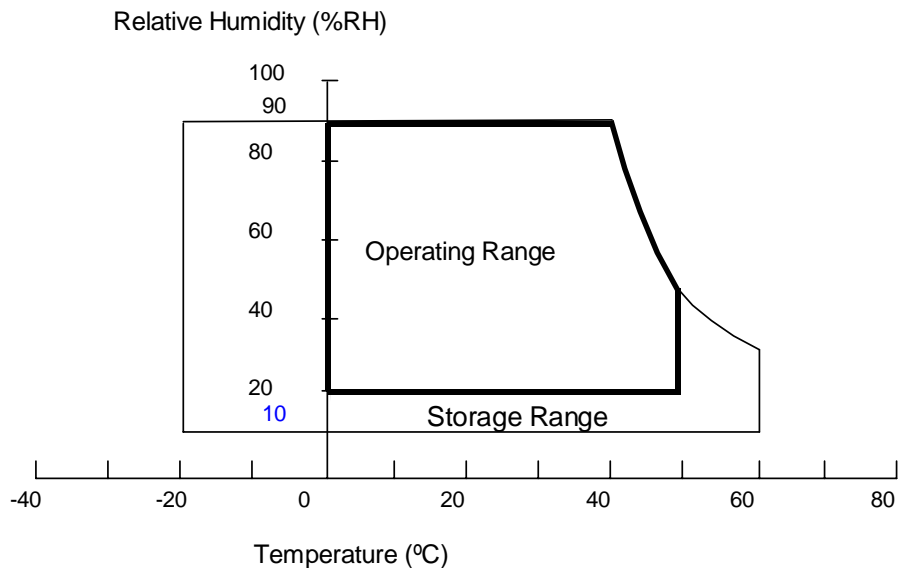
### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-20	60	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	0	50	°C	(1), (2)
Shock (Non-Operating)	S <sub>NOP</sub>	-	50	G	(3), (5)
Vibration (Non-Operating)	V <sub>NOP</sub>	-	1.0	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 temperature of panel display surface area should be 0 °C Min. and 60 °C Max



Note (3) 11ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 300 Hz, 10min/cycle, 3 cycles 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:

## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V <sub>cc</sub>	-0.3	+6.0	V	(1)PWM
Logic Input Voltage	V <sub>logic</sub>	-0.3	+3.6	V	(1)TCON

### 2.2.2 BACKLIGHT UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V <sub>L</sub>	--	1080	--	V <sub>RMS</sub>	(1), (2)
Lamp Current	I <sub>L</sub>	12.0	12.5	13.0	mA <sub>RMS</sub>	(1), (2)
Lamp Frequency	F <sub>L</sub>	30	--	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

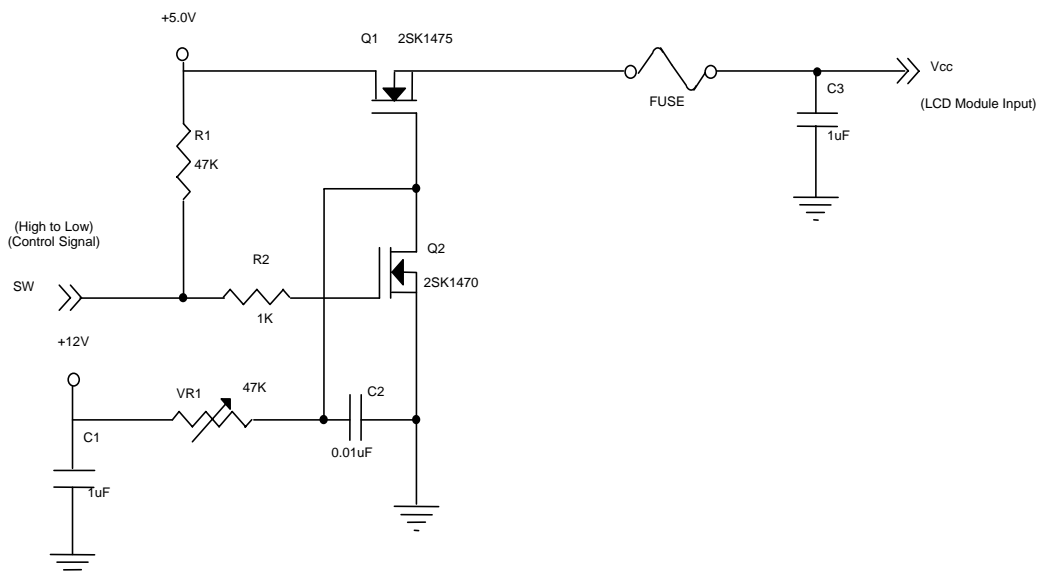
#### 3.1 TFT LCD MODULE

 $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ 

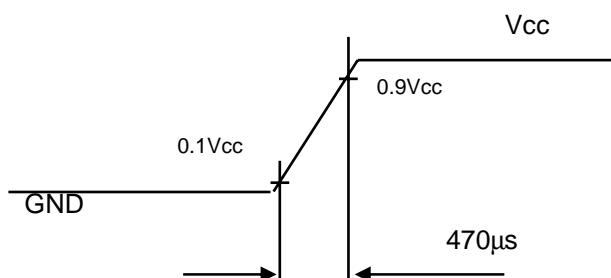
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V <sub>CC</sub>	4.5	5.0	5.5	V	-
Ripple Voltage	V <sub>RP</sub>	--	--	300	mV	-
Power on Rush Current	I <sub>RUSH</sub>	--	--	3	A	(2)
Power Supply Current	White	--	0.5	0.6	A	(3a)
	Black	--	1.0	1.2	A	(3b)
	Vertical Stripe	--	0.9	1.08	A	(3c)
Power Consumption	PLCD	--	5	6	Watt	(4)
LVDS differential input voltage	V <sub>id</sub>	100	--	600	mV	
LVDS common input voltage	V <sub>ic</sub>	1.0	1.2	1.4	V	
Logic High Input Voltage	V <sub>IH</sub>	2.64	--	3.6	V	
Logic Low Input Voltage	V <sub>IL</sub>	-0.3	--	0.66	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



**Vcc rising time is 470μs**



Note (3) The specified power supply current is under the conditions at  $V_{cc} = 5.0\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^\circ\text{C}$ ,  $f_v = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



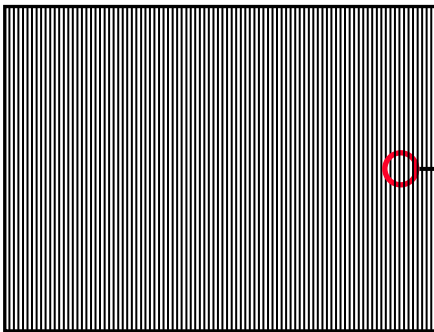
Active Area

b. Black Pattern

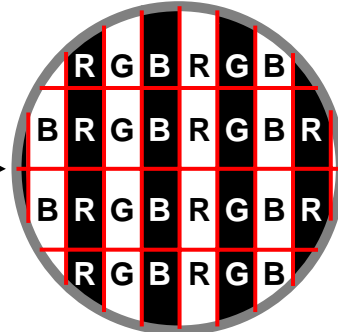


Active Area

c. Vertical Stripe Pattern

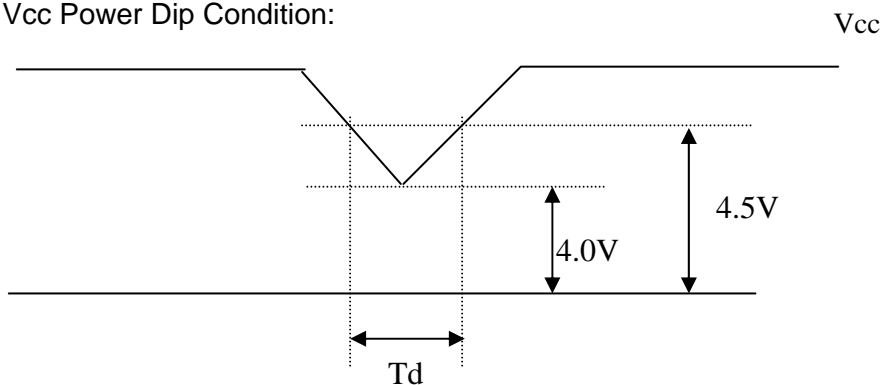


Active Area



Note (4) The power consumption is specified at the pattern with the maximum current

### 3.2 $V_{cc}$ Power Dip Condition:



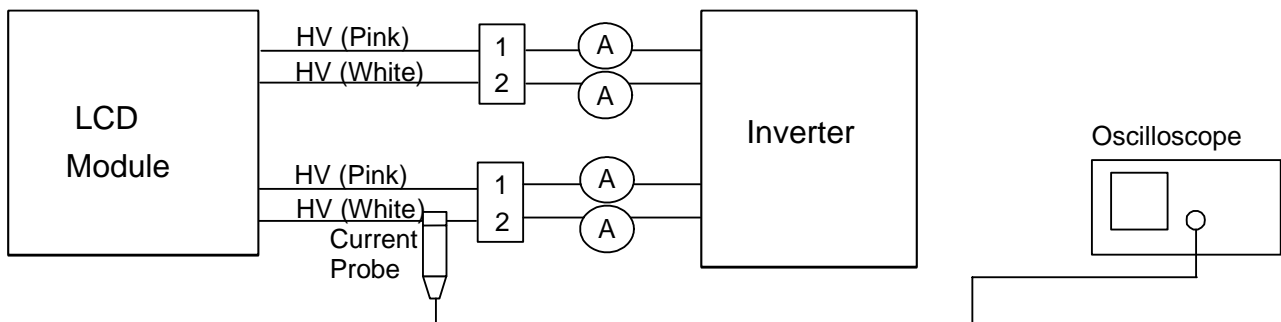
Dip condition:  $4.0\text{V} \leq V_{cc} \leq 4.5\text{V}, T_d \leq 20\text{ms}$

## 3.3 BACKLIGHT UNIT

 $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ 

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	$V_L$	--	1080	--	$V_{RMS}$	$I_L = 12.5 \text{ mA}$
Lamp Current	$I_L$	12.0	12.5	13.0	$\text{mA}_{RMS}$	(1)
Lamp Turn On Voltage	$V_S$	--	--	2080 (0 )	$V_{RMS}$	(2)
		--	--	1680 (25 )	$V_{RMS}$	(2)
Operating Frequency	$F_L$	30	--	80	KHz	(3)
Lamp Life Time	$L_{BL}$	50,000	--	--	Hrs	(5), $I_L = 12.5 \text{ mA}$
Power Consumption	$P_L$	--	27	--	W	(4), $I_L = 12.5 \text{ mA}$

Note (1) Lamp current is measured by AC current probe & oscilloscope as shown below:



Measure equipment:  
 AC Current probe: Tektronix P6022  
 Oscilloscope: TDS3054B  
 $T_a = 25 \pm 2 \text{ }^\circ\text{C}$

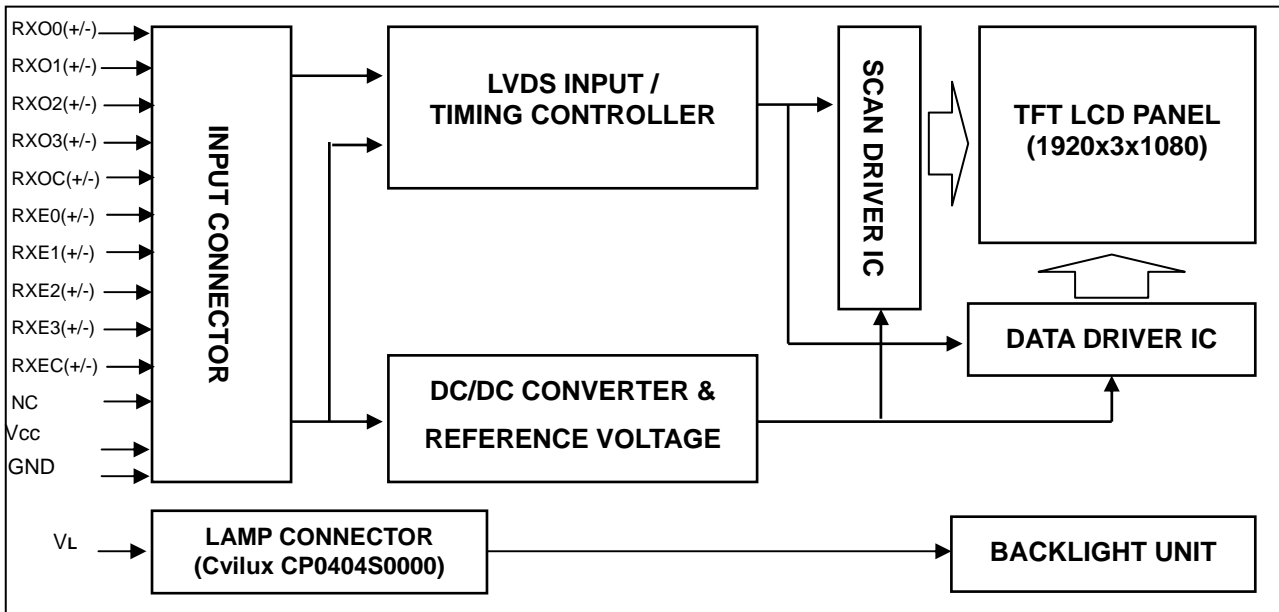
Note (2) The lamp starting voltage  $V_S$  should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in 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.

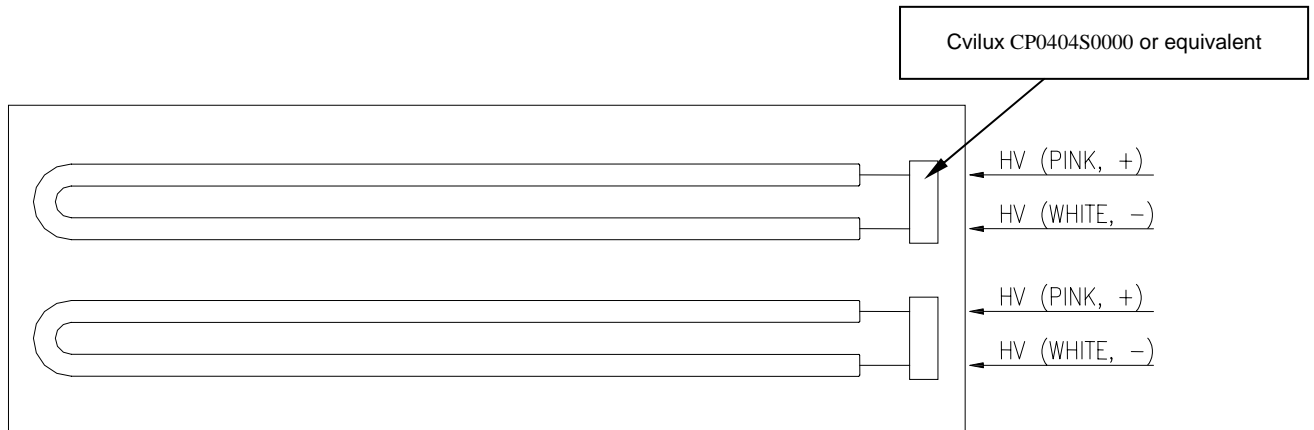
Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at  $T_a = 25 \pm 2$  and  $I_L = 12.0 \sim 13.0 \text{ mA}_{RMS}$ .

## 4. BLOCK DIAGRAM

### 4.1 TFT LCD MODULE



### 4.2 BACKLIGHT UNIT



Note: On the same side, the same polarity lamp voltage design for lamps is recommended.

## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	For LCD internal use only, Do not connect
26	NC	For LCD internal use only, Do not connect
27	NC	For LCD internal use only, Do not connect
28	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1) Connector Part No.: STM MSAKT2407P30HA or Starconn 093G30-B0001A or Equivalent

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.

## 5.2 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

## 5.3 BACKLIGHT UNIT:

Pin	Symbol	Description	Remark
1-1	HV	High Voltage	Pink
1-2	HV	High Voltage	White
2-3	HV	High Voltage	Pink
2-4	HV	High Voltage	White

Note (1) Connector Part No.: Cvilux CP0404S0000or equivalent

### 5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-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							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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	0	0	0	0	0	
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red(255)	1	1	1	1	1	1	1	1	0	0	0	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	0	0	0	0	0	
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	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	0	0	0	0	0	
	Blue(1)	0	0	0	0	0	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	0	0	0	0	0	1	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1		

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

## 6. INTERFACE TIMING

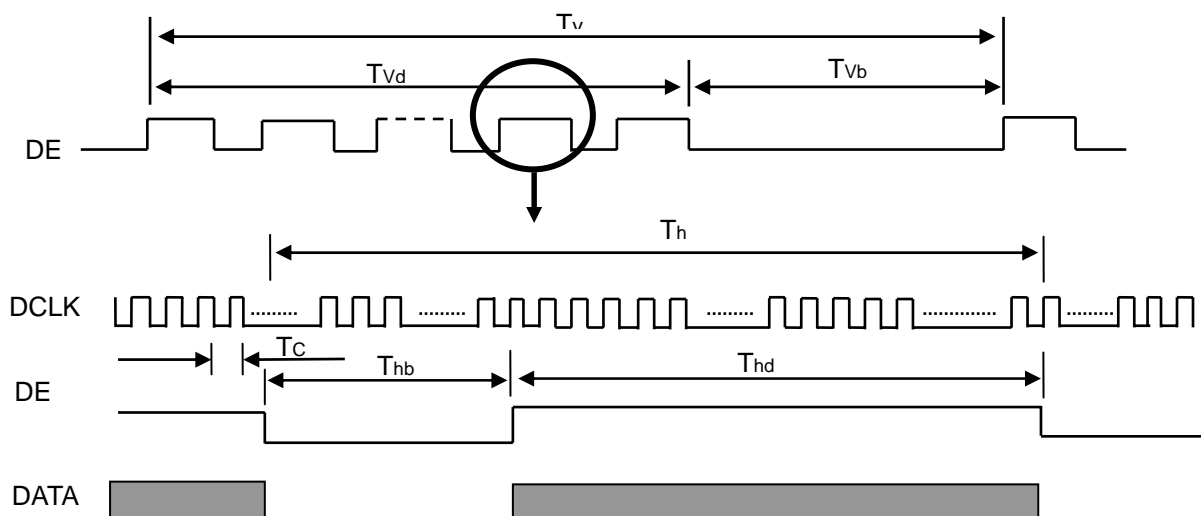
### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

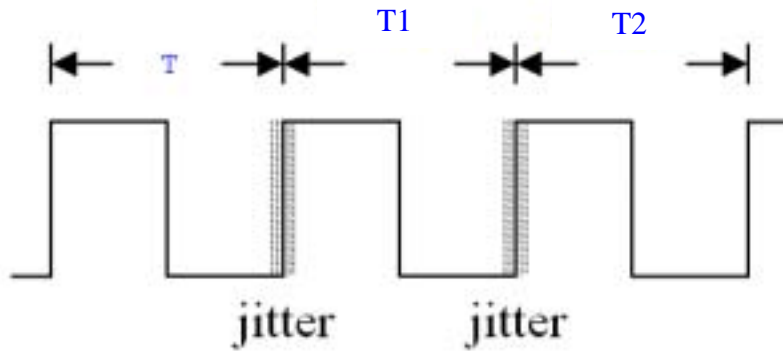
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	$F_c$	58.54	74.25	98	MHz	
	Period	$T_c$	-	13.47	-	ns	
	Input cycle to cycle jitter	$T_{rc1}$	$-20 \cdot T_c$	-	$20 \cdot T_c$	ps	(1)
	Spread spectrum modulation range	$F_{clk_{in\_mod}}$	$0.98 \cdot F_c$	-	$1.02 \cdot F_c$	MHz	(2)
	Spread spectrum modulation frequency	$F_{SSM}$	-	-	200	KHz	
	High Time	$T_{ch}$	-	4/7	-	$T_c$	-
	Low Time	$T_{cl}$	-	3/7	-	$T_c$	-
LVDS Data	Setup Time	$T_{lvs}$	600	-	-	ps	(3)
	Hold Time	$T_{lvh}$	600	-	-	ps	
Vertical Active Display Term	Frame Rate	$F_r$	50	60	75	Hz	$T_v = T_{vd} + T_{vb}$
	Total	$T_v$	1115	1125	1136	$T_h$	-
	Display	$T_{vd}$	1080	1080	1080	$T_h$	-
	Blank	$T_{vb}$	35	45	56	$T_h$	-
Horizontal Active Display Term	Total	$T_h$	1050	1100	1150	$T_c$	$T_h = T_{hd} + T_{hb}$
	Display	$T_{hd}$	960	960	960	$T_c$	-
	Blank	$T_{hb}$	90	140	190	$T_c$	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

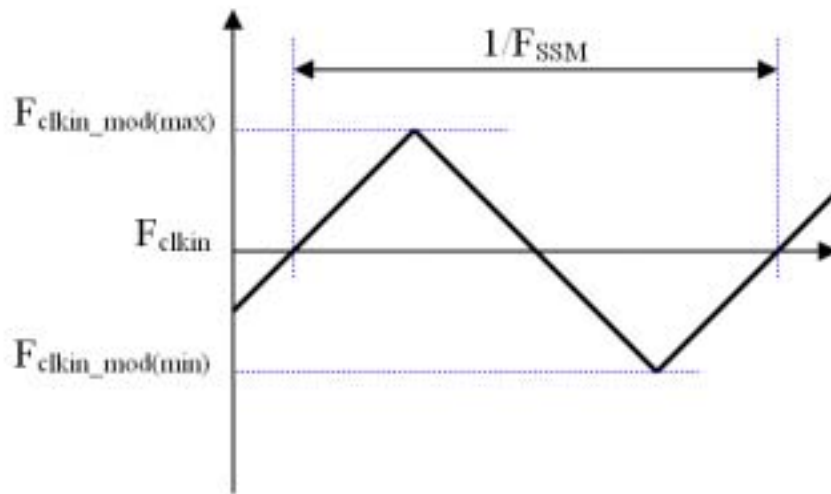
### INPUT SIGNAL TIMING DIAGRAM



Note (1) The input clock cycle-to-cycle jitter is defined as below figures.  $T_{rc1} = |T_1 - T_1|$

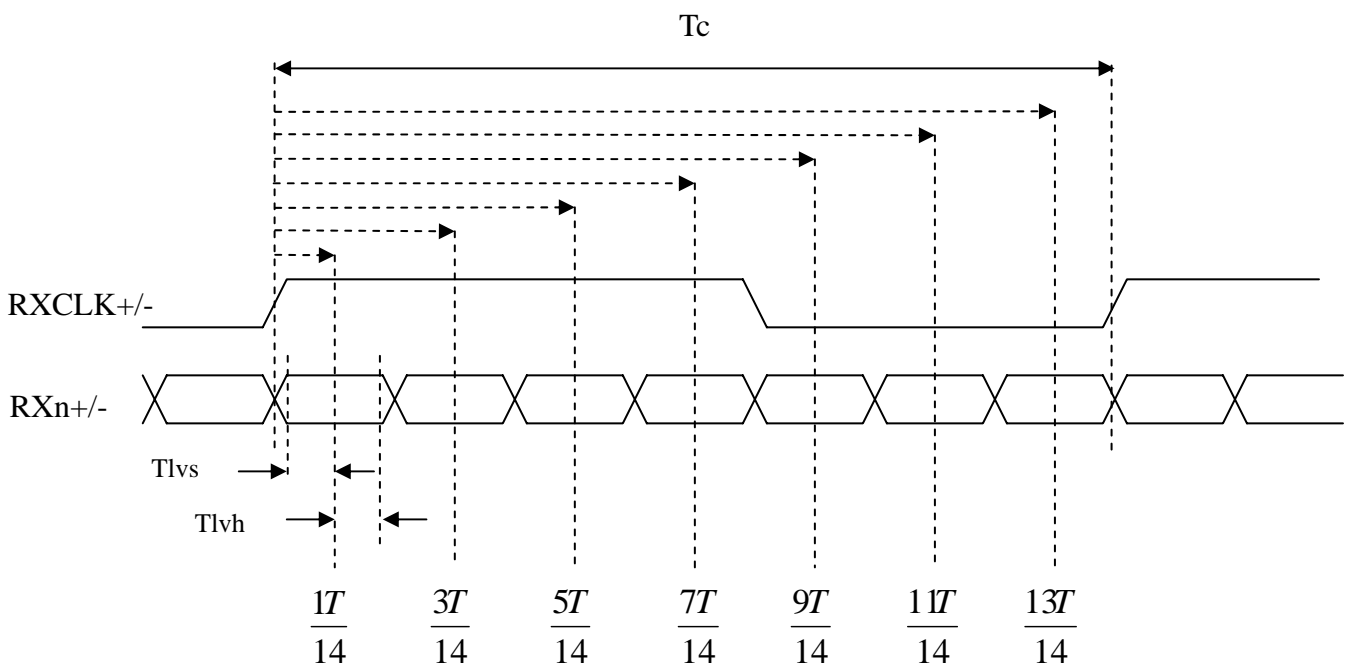


Note (2) The SSCG (Spread spectrum clock generator) is defined as below figures.



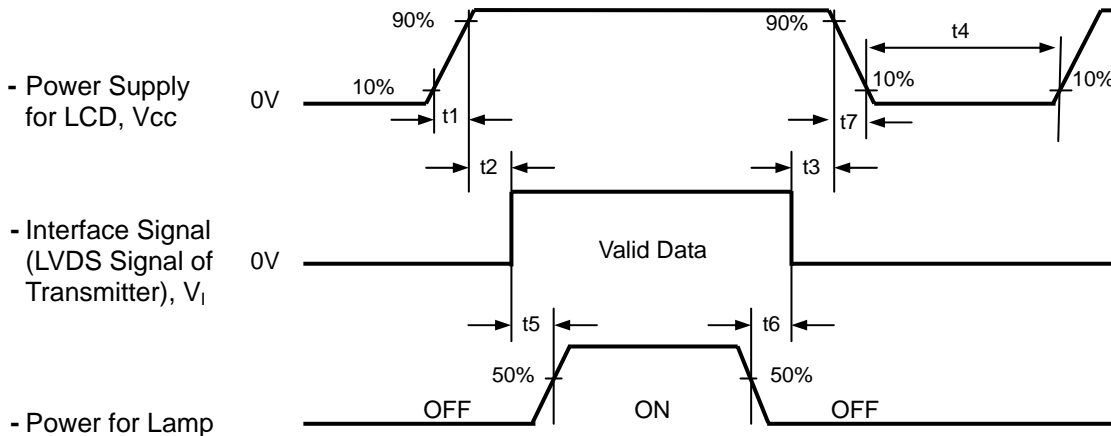
Note (3) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

**LVDS RECEIVER INTERFACE TIMING DIAGRAM**



## 6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



### Timing Specifications:

$0.5 < t_1$	10 msec
$0 < t_2$	50 msec
$0 < t_3$	50 msec
$t_4$	500 msec
$t_5$	450 msec
$t_6$	90 msec
$5 < t_7$	100 msec

### Note.

- (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.
- (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.
- (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.
- (4) T4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.
- (6) CMO won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- (7) It is suggested that Vcc falling time follows t7 specification, else slight noise is likely to occur when LCD is turned off (even backlight is already off).

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

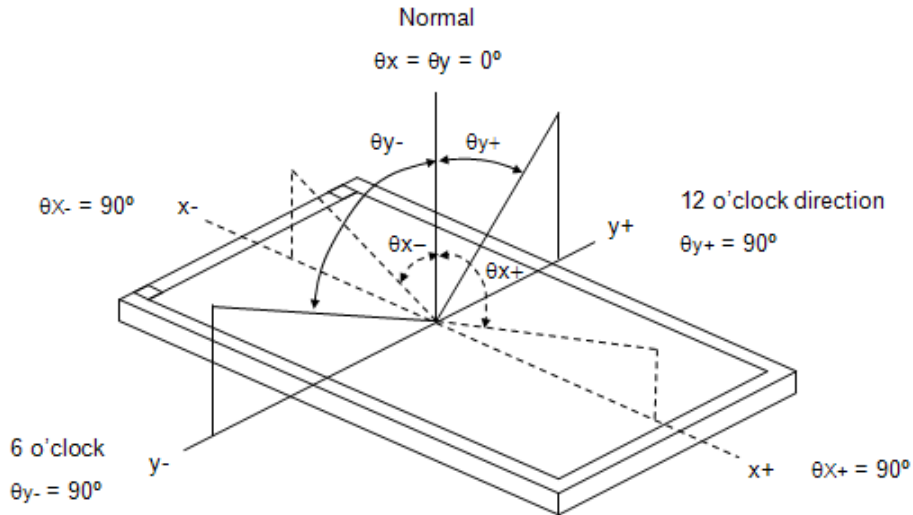
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V <sub>CC</sub>	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I <sub>L</sub>	12.5±0.5	mA
Inverter Operating Frequency	F <sub>L</sub>	58±3	KHz
Inverter	Logah F236H1-2UA-L001		

### 7.2 OPTICAL SPECIFICATIONS

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 (5).

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note						
Color Chromaticity (CIE 1931)	Red	Rx	θ <sub>x</sub> =0°, θ <sub>y</sub> =0° CS-1000T	Typ - 0.03	Typ + 0.03	-	(1), (5)						
		Ry											
	Green	Gx											
		Gy											
	Blue	Bx											
		By											
	White	Wx											
		Wy											
	Center Luminance of White (Center of Screen)	L <sub>C</sub>							240	300	-	cd/m <sup>2</sup>	(4), (5)
	Contrast Ratio	CR							600	800	-	-	(2), (5)
Response Time	T <sub>R</sub>	θ <sub>x</sub> =0°, θ <sub>y</sub> =0°	-	1.5	2.5	ms	(3)						
	T <sub>F</sub>			3.5	5.5								
White Variation	δW	θ <sub>x</sub> =0°, θ <sub>y</sub> =0°	-	-	1.3	-	(5), (6)						
Viewing Angle	Horizontal	θ <sub>x+</sub>	CR 10	70	80	Deg.	(1), (5)						
		θ <sub>x-</sub>		70	80								
	Vertical	θ <sub>y+</sub>		70	80								
		θ <sub>y-</sub>		60	70								

Note (1) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):  
 Viewing angles are measured by Autronic Conoscope Cono-80



Note (2) Definition of Contrast Ratio (CR):  
 The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

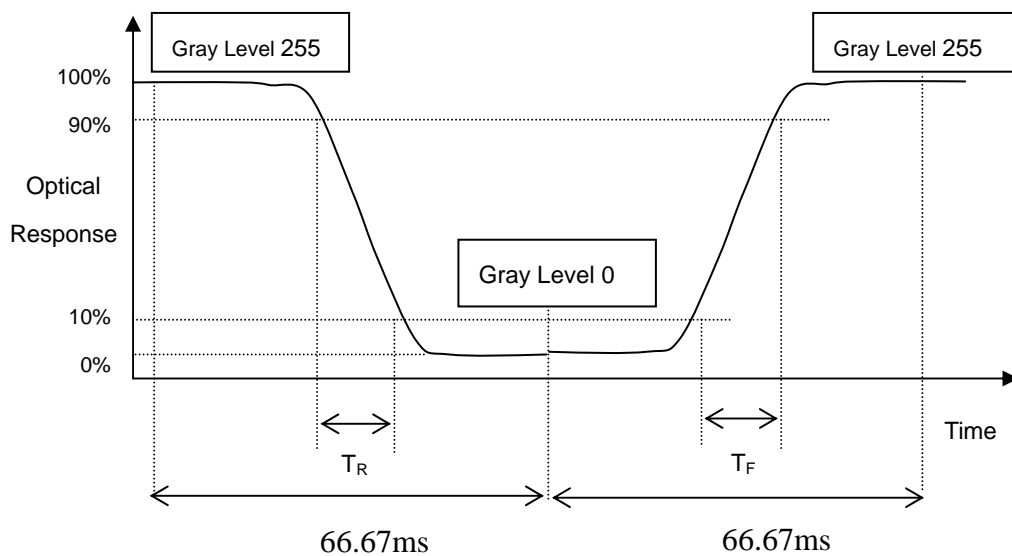
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

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



Note (4) Definition of Luminance of White ( $L_C$ ):

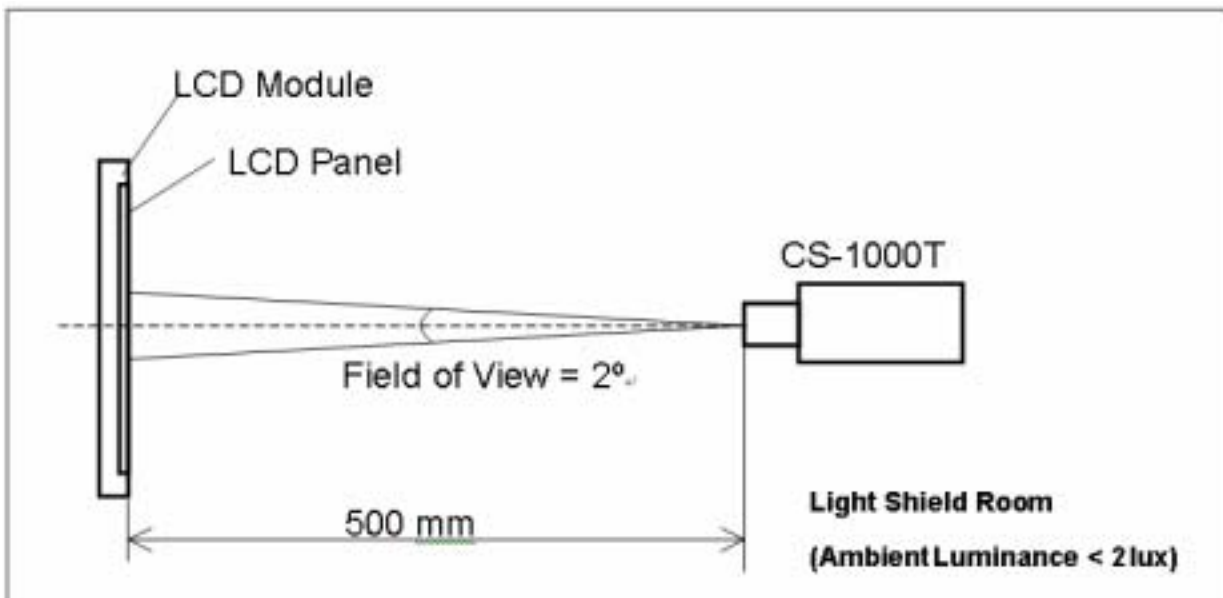
Measure the luminance of gray level 255 at center point

$$L_C = L(5)$$

$L(x)$  is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

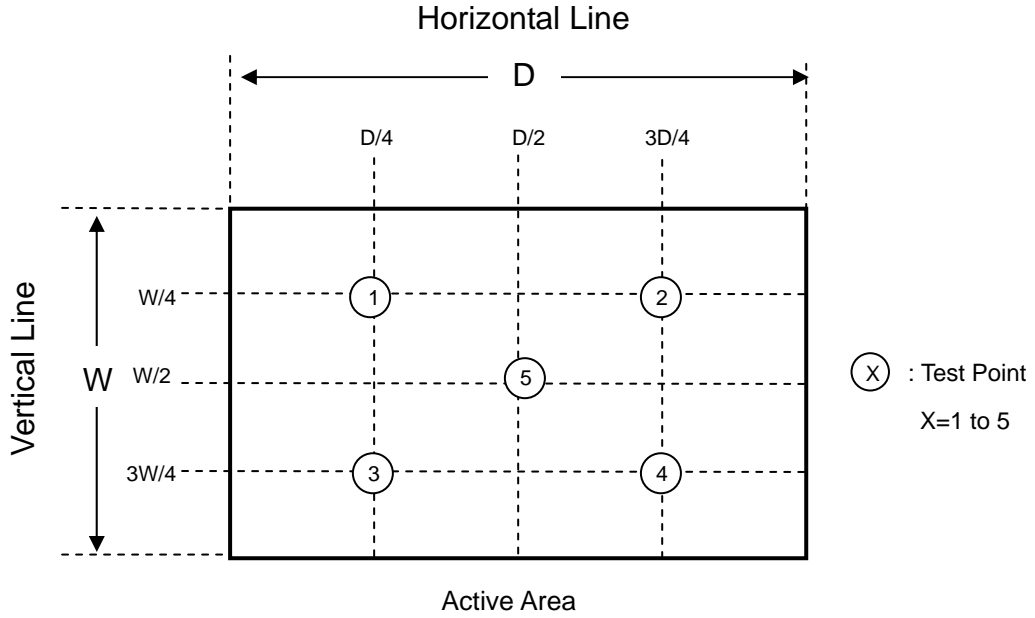
The LCD module should be stabilized at given temperature for (60 minutes) to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for (60 minutes) in a windless room.



Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \text{Maximum} [L (1), L (2), L (3), L (4), L (5)] / \text{Minimum} [L (1), L (2), L (3), L (4), L (5)]$$



## 8. PACKAGING

### 8.1 PACKING SPECIFICATIONS

- (1) 4 LCD TV modules / 1 Box
- (2) Box dimensions: 620(L) X 346 (W) X 390 (H) mm
- (3) Weight: approximately 12Kg (4modules per box)

### 8.2 PACKING METHOD

Figures 8-1 and 8-2 are the packing method

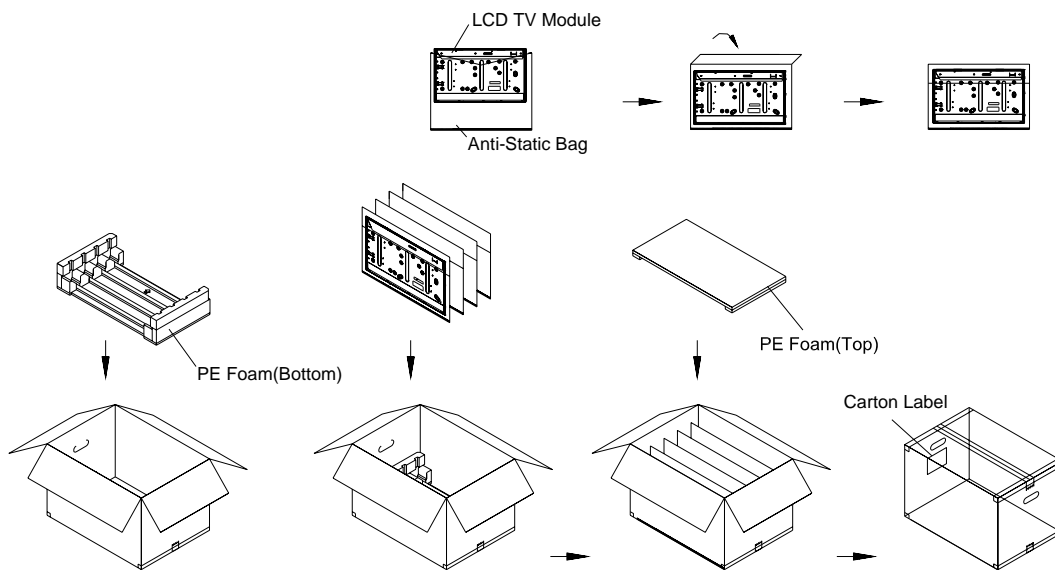
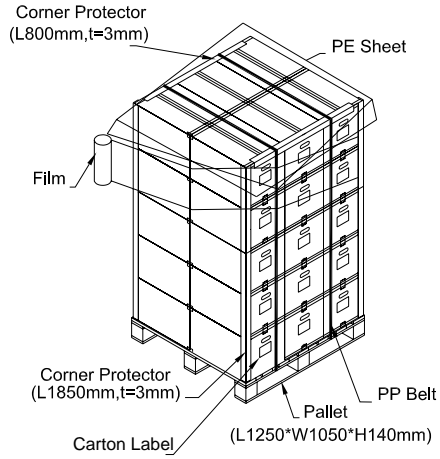


Figure.8-1 Packing Method

Sea / Land Transportation  
(40ft Container)



Air Transportation

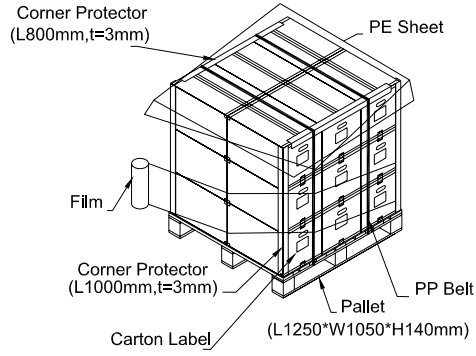
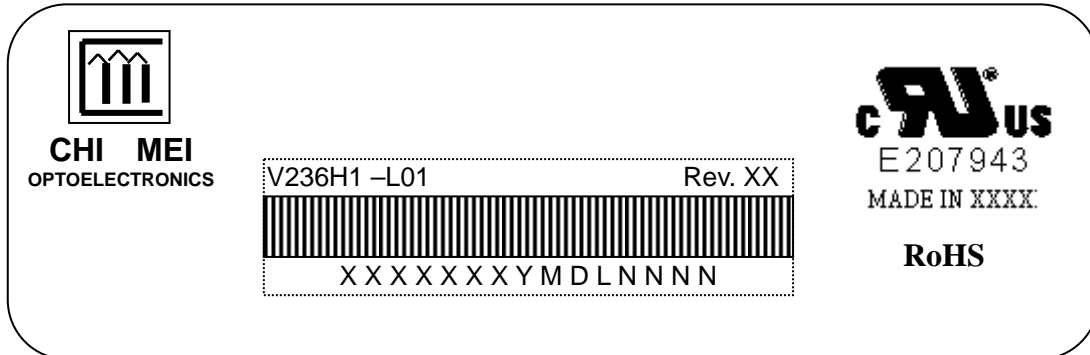


Figure.8-2 packing method

9. DEFINITION OF LABELS

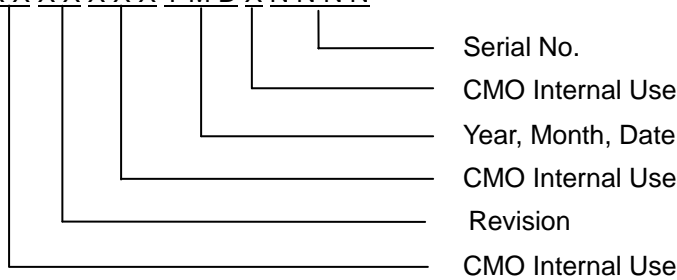
9.1 CMO MODULE LABEL

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



Model Name: **V236H1-L01**

- (a) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (b) Serial ID: XXXXXXXXYMDXNNNN



- (c) Production Location: MADE IN XXXX. XXXX stands for production location.
- (d) UL Factory ID:

Region	Factory ID
TWCMO	GEMN
NBCMO	LEOO
NBCME	CANO
NHCMO	CAPG

## 10. PRECAUTIONS

### 10.1 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 10°C 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.

### 10.2 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.

### 10.3 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.

### 10.4. Storage

- (1) Do not leave the module in high temperature, and high humidity for a long time.  
It is highly recommended to store the module with temperature from 0 to 35  
And relative humidity of less than 70%
- (2) Do not store the TFT – LCD module in direct sunlight
- (3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

#### 10.5. Operation condition guide

- (1) The LCD product should be operated under normal condition.

Normal condition is defined as below :

Temperature :  $20\pm 15$

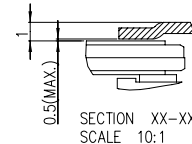
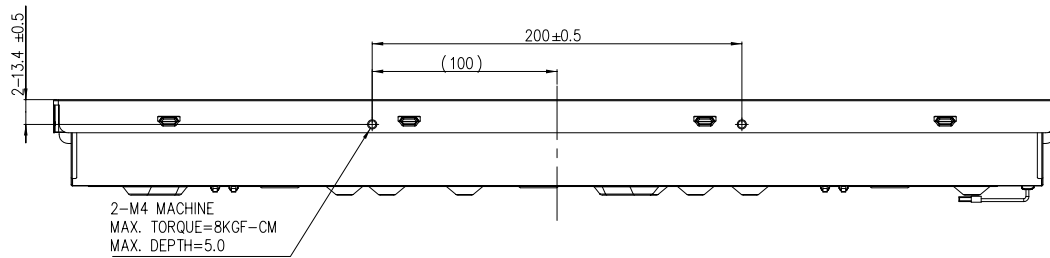
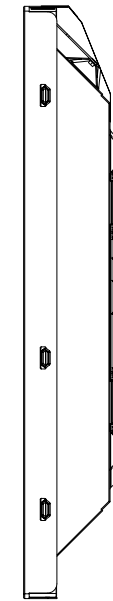
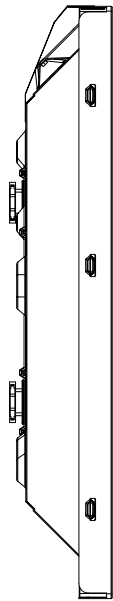
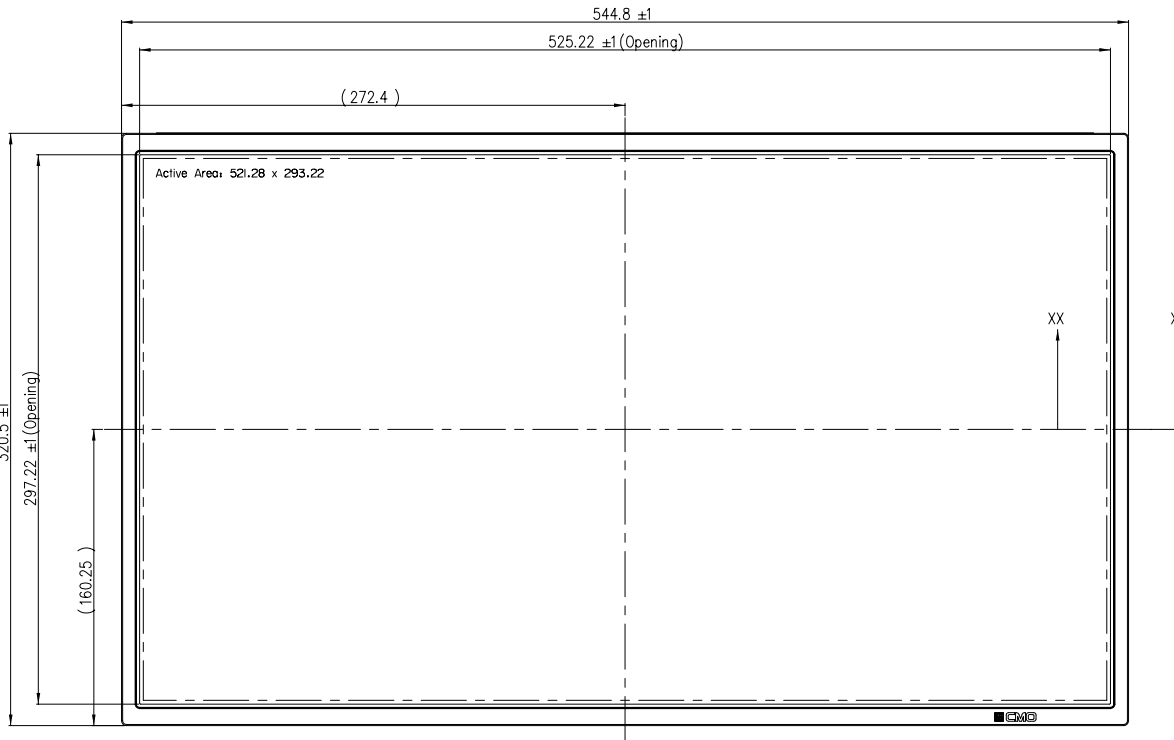
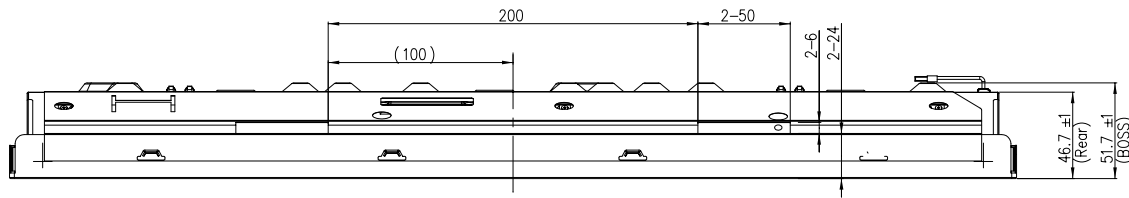
Humidity:  $65\pm 20\%$

Display pattern : continually changing pattern(Not stationary)

- (2) If the product will be used in extreme conditions such as high temperature , high humidity , high altitude , display pattern or operation time etc...It is strongly recommended to contact CMO for application engineering advice . Otherwise , Its reliability and function may not be guaranteed.

#### 10.6 OTHER

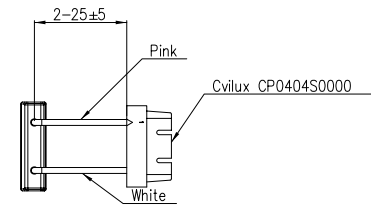
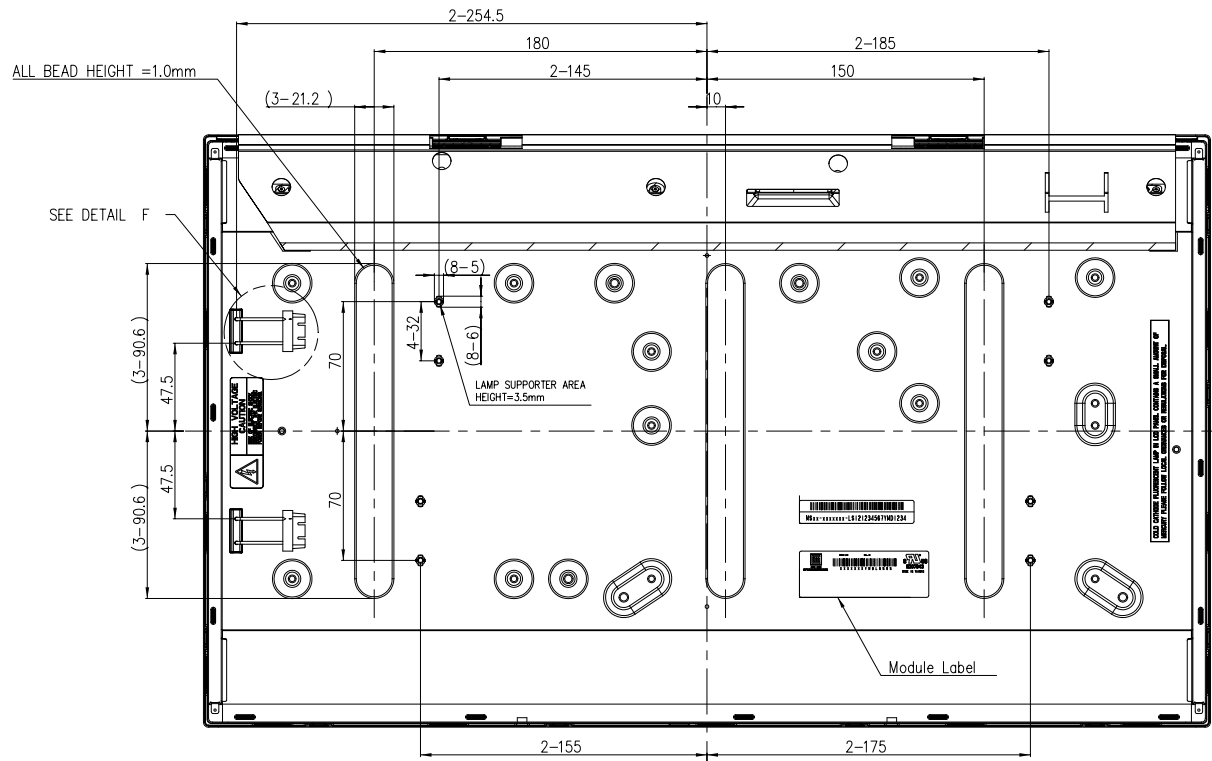
When fixed patterns are displayed for a long time, remnant image is likely to occur.



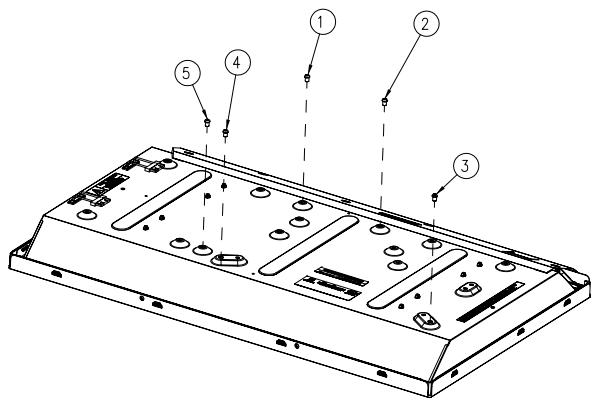
Notes:  
1.UNSPECIFIED TOLERANCE : ±1.0mm.

		<b>CHI MEI</b> 奇美電子股份有限公司 OPTOELECTRONICS CORP.	
APPROVED: Davis Wong	DWG NO.: V23614101A		
CHECKED: Steven Lin	DATE: 2009/8/12		
DESIGNER: Tobias_Wang	PART NO.:	UNIT: mm	SCALE: 1:1
DRAWER: Tobias_Wang	REV: A	SHEET: 1/3	
TITLE: Assy_Module_V236H1-L01			
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REV	DESCRIPTION	DATE	DRAWN BY	APPROVAL BY	CHK NO.



DETAIL F  
SCALE 2:1



SCALE 1:2

NOTE:  
 1.IT IS RECOMMENDED THAT ALL SCREWS SHOULD BE INCLUDED  
 WHEN CMO'S PRODUCT IS APPLIED IN ORDER TO  
 GUARANTEE STRUCTURE STRENGTH OF PRODUCT.  
 2.SCREW: M4  
 3.MAX. TORQUE: 8 KGF-CM.

		<b>CHI MEI</b> 奇美電子股份有限公司		
OPTOELECTRONICS CORP.				
APPROVED: Davis Wong	DWG NO.: V23614101A			
CHECKED: Steven Lin	DATE: 2009/8/12			
DESIGNER: Tobias_Wang	PART NO.:			
DRAWER: Tobias_Wang	REV.: A	UNIT: mm	SCALE: 1:1	SHEET: 3/3
TITLE: Assy_Module_V236H1-L01				
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NO.	DESCRIPTION	DATE	DRAWN BY	APPROVAL BY	CHK NO.
1					
2					

