



- ☐ Tentative Specification
- ☐ Preliminary Specification
- ☒ Approval Specification

MODEL NO.: V236H1
SUFFIX: LE3

Customer:

APPROVED BY

SIGNATURE

Name / Title

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
Chao-Chun Chung	Roger Huang	Chris Chen

**CONTENTS**

1. GENERAL DESCRIPTION.....	5
1.1 OVERVIEW	5
1.2 FEATURES	5
1.3 APPLICATION.....	5
1.4 GENERAL SPECIFICATIONS.....	5
1.5 MECHANICAL SPECIFICATIONS	6
2. ABSOLUTE MAXIMUM RATINGS	7
2.1 ABSOLUTE RATINGS OF ENVIRONMENT.....	7
2.2 PACKAGE STORAGE	8
2.3 ELECTRICAL ABSOLUTE RATINGS.....	8
2.3.1 TFT LCD MODULE	8
2.3.2 BACKLIGHT CONVERTER UNIT	8
3. ELECTRICAL CHARACTERISTICS	9
3.1 LCD ELETRONICS SPECIFICATION	9
3.2 Vcc POWER DIP CONDITION	11
3.3 BACKLIGHT CONNECTOR PIN CONFIGURATION	11
3.3.1 LED LIGHT BAR CHARACTERISTICS (Ta=25±2℃)	11
4. BLOCK DIAGRAM OF INTERFACE.....	12
4.1 TFT LCD MODULE.....	12
5. INPUT TERMINAL PIN ASSIGNMENT	13
5.1 TFT LCD Module Input	13
5.2 BACKLIGHT UNIT.....	14
5.3 LVDS INPUT SIGNAL SPECIFICATIONS	15
5.3.1 LVDS DATA MAPPING TABLE	15
5.3.2 COLOR DATA INPUT ASSIGNMENT.....	16
6. INTERFACE TIMING.....	17
6.1 DISPLAY TIMING SPECIFICATIONS	17
6.2 INPUT SIGNAL TIMING DIAGRAM	17
6.3 POWER ON/OFF SEQUENCE	19



7. OPTICAL CHARACTERISTICS	21
7.1 TEST CONDITIONS	21
7.2 OPTICAL SPECIFICATIONS	22
8. PRECAUTIONS	26
8.1 ASSEMBLY AND HANDLING PRECAUTIONS.....	26
8.2 SAFETY PRECAUTIONS	26
9. DEFINITION OF LABELS.....	27
9.1 CMI MODULE LABEL.....	27
10. PACKAGING	28
10.1 PACKAGING SPECIFICATIONS.....	28
10.2 PACKAGING METHOD	28
11. MECHANICAL CHARACTERISTIC	30

**REVISION HISTORY**

Version	Date	Page(New)	Section	Description
Ver. 2.0	Jul 22, 2010	All	All	The specification was first issued.
www.panelook.com				



1. GENERAL DESCRIPTION

1.1 OVERVIEW

V236H1-LE3 is a 23.6" TFT Liquid Crystal Display module with LED Backlight unit and a 30pin 1ch-LVDS interface. This module supports 1920 x 1080 (16:9 wide screen) formats and can display 16.7M colors (6-bit+Hi-FRC colors). The converter for backlight is not built-in.

1.2 FEATURES

- Contrast ratio (1000:1)
- Fast response time (5 ms)
- Color saturation (NTSC 72 %)
- 1920 x 1080 pixels (16:9 wide screen) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Viewing angle : 170(H)/160(V) (CR>10) TN technology
- RoHS compliance

1.3 APPLICATION

- Standard Living Room TVs
- MFM Application

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(Sub Pixel)	0.2715 (H) x 0.2715 (V)	mm	
Pixel Arrangement	RGB vertical stripe		
Display Colors	16.7M	color	
Display Operation Mode	Transmissive mode / Normally white		
Surface Treatment	Anti-Glare coating (Haze 25%), Hard coating(3H)		

Note (1) Please refer to the attached drawings in chapter 11 for more information about the front and back outlines.

**1.5 MECHANICAL SPECIFICATIONS**

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	544.3	544.8	545.3	mm	(1)
	Vertical (V)	320.0	320.5	321.0	mm	(1)
	Depth (D)	10.9	11.4	11.9	mm	(2)
Weight		---	2450	2500	g	

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

Note (2) Module Depth is between bezel to T-CON cover.

**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}	---	50	G	(3) (5)
Vibration (Non-Operating)	V _{NOP}	---	1.0	G	(4) (5)

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

(a) 90 %RH Max. ($T_a \leq 40\text{ }^{\circ}\text{C}$).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40\text{ }^{\circ}\text{C}$).

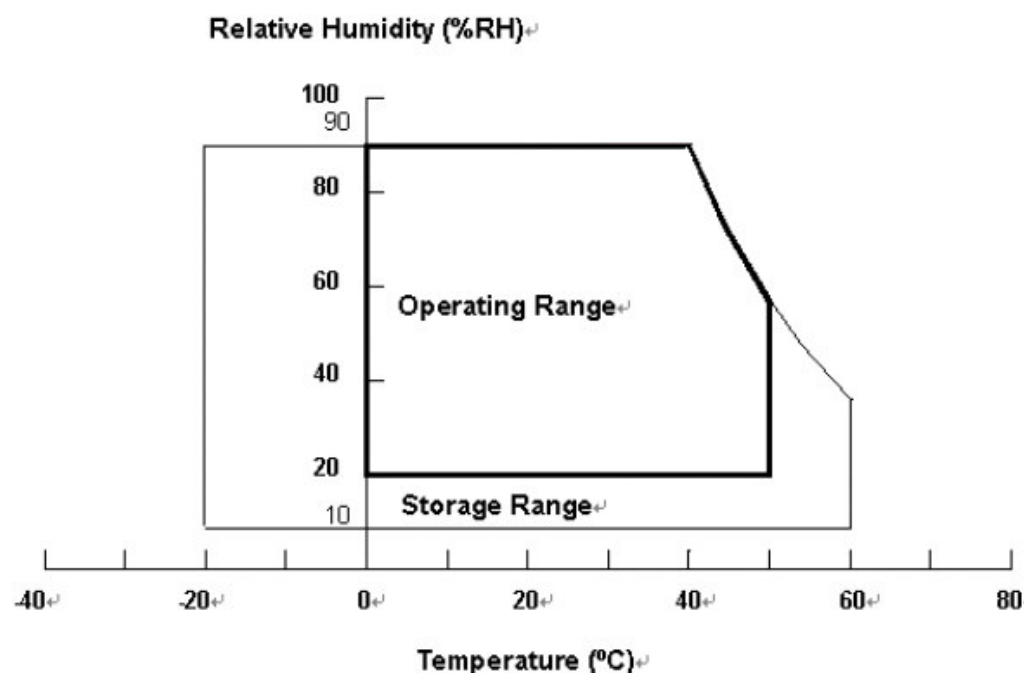
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

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

Note (4) 10 ~ 200 Hz, 10 min, 1 time 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.



2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

- (a) 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 °C at normal humidity without condensation.
- (b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	6.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	3.6	V	

2.3.2 BACKLIGHT CONVERTER UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Forward Current Per Input Pin	I _F	0	40	50	mA	(1) (2) Duty=100%
LED Reverse Voltage Per Input Pin	V _R	---	---	60	V	
LED Pulse Forward Current Per Input Pin	I _{FP}	---	---	160	mA	Pulse Width ≤ 10msec. and Duty ≤ 10%

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 input pin of LED light bar at Ta=25±2 °C (Refer to 3.2 for further information).

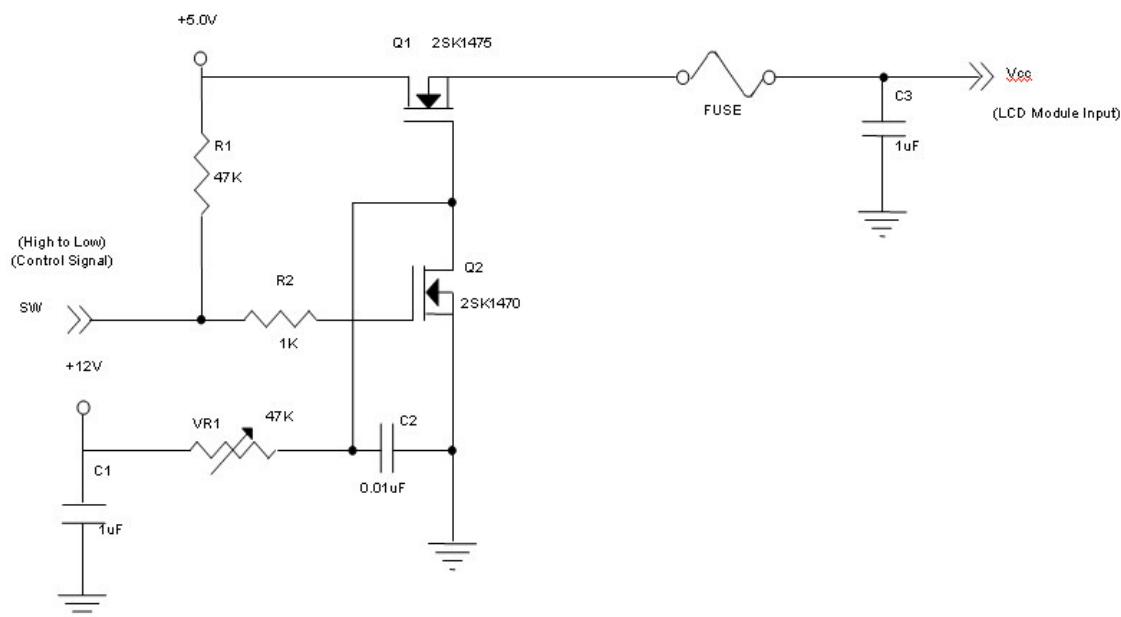
3. ELECTRICAL CHARACTERISTICS

3.1 LCD ELETRONICS SPECIFICATION

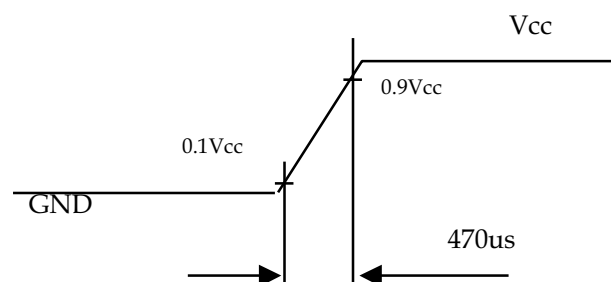
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V _{CC}	4.5	5.0	5.5	V	-
Ripple Voltage		V _{RP}	-	-	300	mV	-
Rush Current		I _{RUSH}	-	-	3	A	(2)
Power Supply Current	White		-	0.5	0.6	A	(3)a
	Black		-	1.1	1.32	A	(3)b
	Vertical Stripe		-	0.9	1.08	A	(3)c
Power Consumption		PLCD	-	5.5	6.6	Watt	(4)
LVDS differential input voltage		V _{id}	200	-	600	mV	-
LVDS common input voltage		V _{ic}	1.0	1.2	1.4	V	-
Logic High Input Voltage		V _{IH}	2.64	-	3.6	V	-
Logic Low Input Voltage		V _{IL}	0	-	0.66	V	-

Note (1) The ambient temperature is $T_a = 25 \pm 2$ °C.

Note (2) Measurement Conditions:

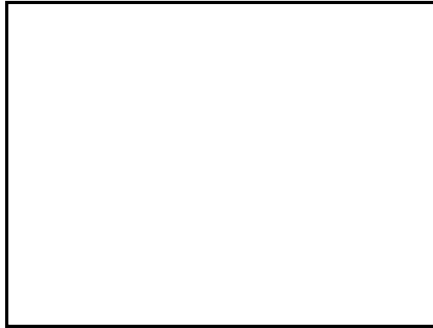


Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at $V_{CC} = 5\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



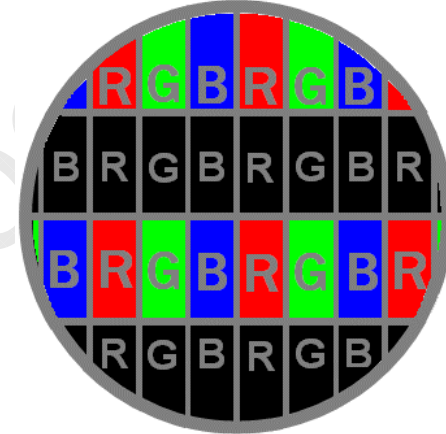
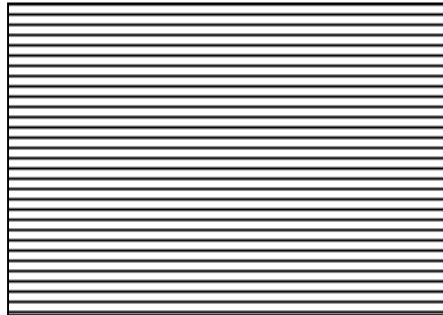
Active Area

b. Black Pattern



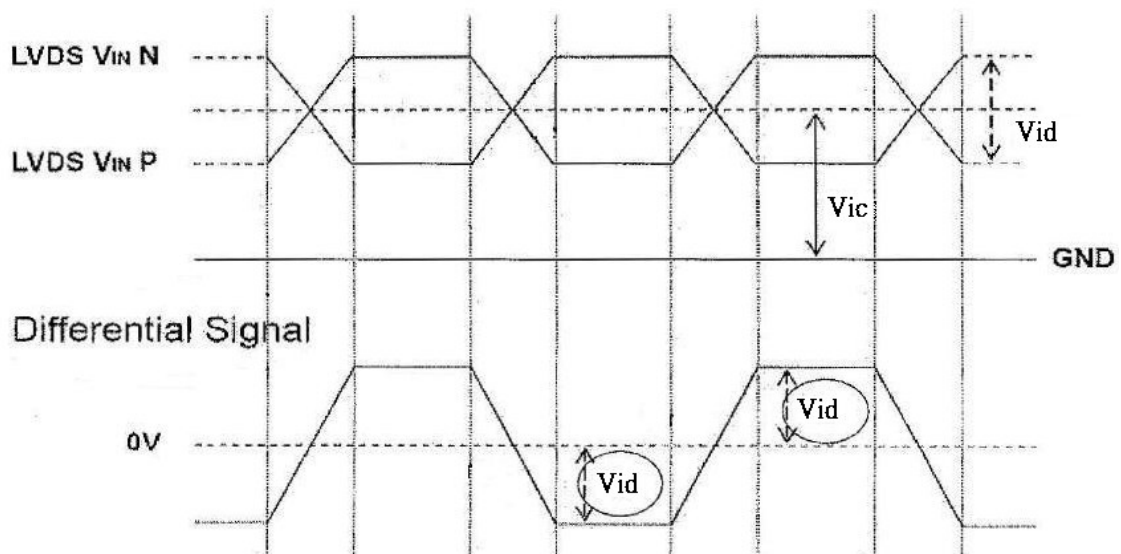
Active Area

c. Horizontal Pattern

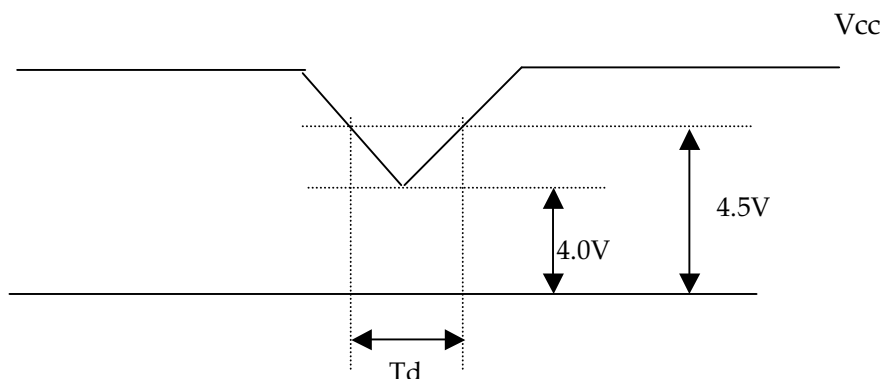


Note (4) The LVDS input characteristics are as follows:

Single-End



3.2 Vcc POWER DIP CONDITION



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

3.3 BACKLIGHT CONNECTOR PIN CONFIGURATION

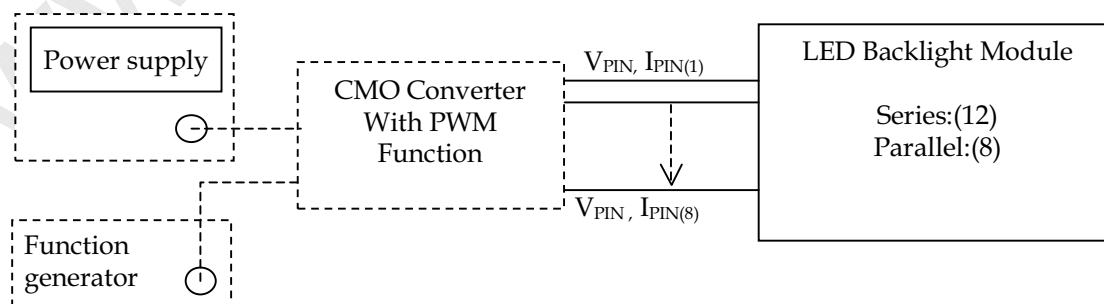
3.3.1 LED LIGHT BAR CHARACTERISTICS ($T_a=25\pm 2^\circ C$)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	V_{PIN}	34	38.4	42	V	(1) Duty=100%, $I_{PIN}=40mA$
LED Light Bar Current Per Input Pin	I_{PIN}	0	40	50	mA	(1) (2) Duty=100%
LED Life Time	L_{LED}	30000	---	---	Hrs	(3)
Power Consumption	P_{BL}	---	12.3	13.5	W	(1) Duty=100%, $I_{PIN}=40mA$

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

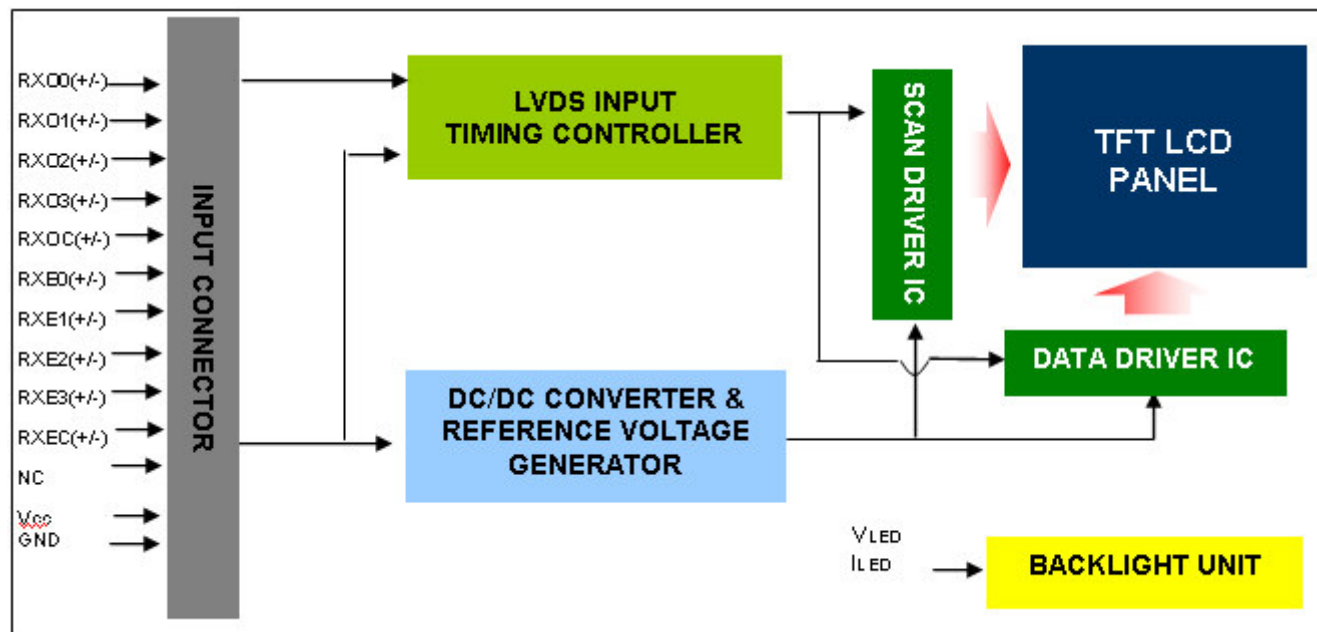
Note (2) $P_{BL} = I_{PIN} \times V_{PIN} \times (8)$ input pins, LED light bar circuit is (12)Series, (8)Parallel.

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at $T_a = 25 \pm 2^\circ C$ and $I = (20)mA$ (per chip) until the brightness becomes $\leq 50\%$ of its original value.



4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD MODULE





5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD Module Input

Pin No.	Symbol	Description	Note
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	
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.:

MSCKT2407P30HA (STM) or 093G30-B2001A (Starconn) or equivalent

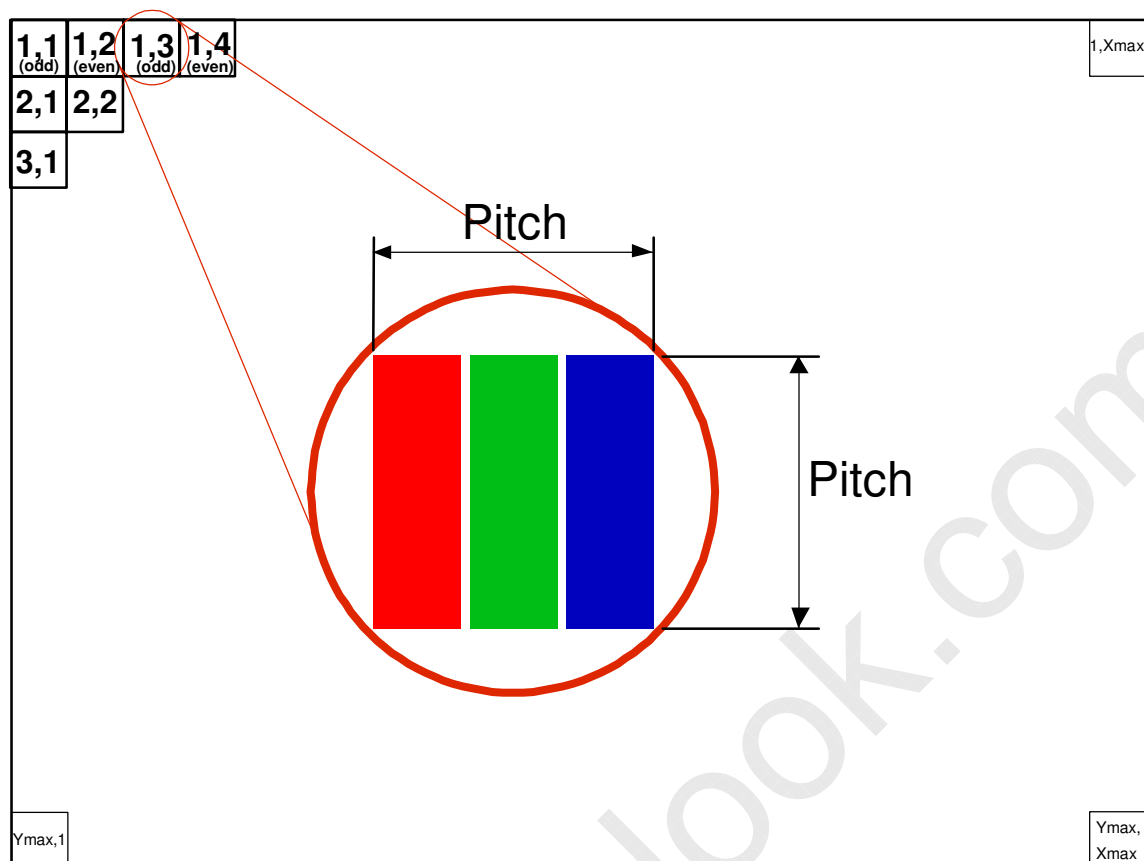
Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE)

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.

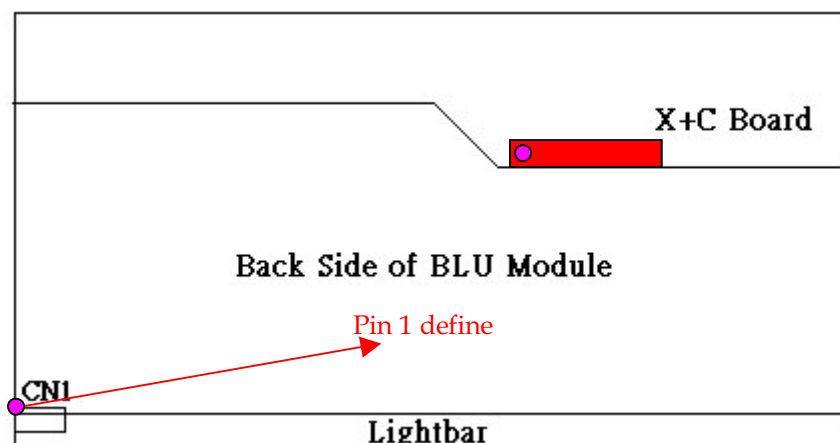


5.2 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.

CN1: Entery, 7083K-F12N-00L

CN1		
Pin	Symbol	Description
1	NC	Cathode of LED string
2	CH1	Cathode of LED string
3	CH2	Cathode of LED string
4	CH3	Cathode of LED string
5	NC	Not connection, this pin should be open
6	VL	VLED
7	VL	VLED
8	NC	Not connection, this pin should be open
9	CH4	Cathode of LED string
10	CH5	Cathode of LED string
11	CH6	Cathode of LED string
12	NC	Cathode of LED string



5.3 LVDS INPUT SIGNAL SPECIFICATIONS

5.3.1 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

5.3.2 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	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	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	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	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	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	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	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	0
	Green(2)	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	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	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	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	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	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	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	0	1	1	1	1	1	1	1	1

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

6. INTERFACE TIMING

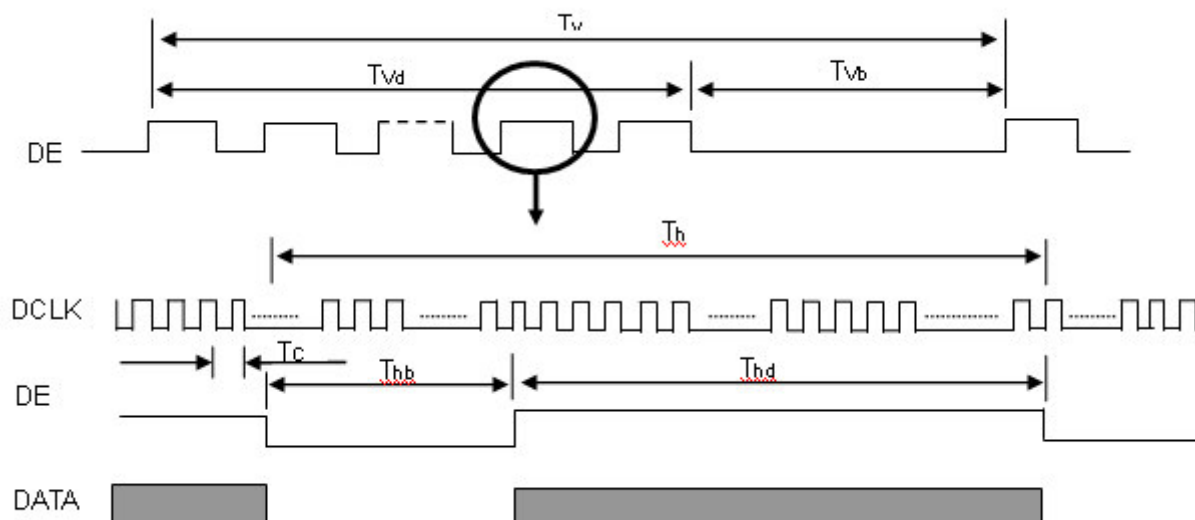
6.1 DISPLAY TIMING SPECIFICATIONS

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

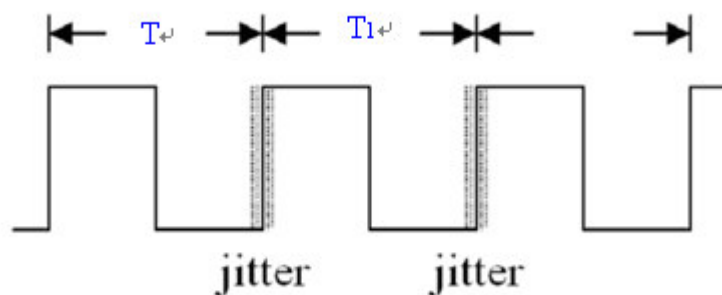
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	58.53	74.25	98	MHz	-
	Period	Tc	-	13.47	-	ns	-
	Input cycle to cycle jitter	T _{rcl}	-0.02*Tc	-	0.02*Tc	ns	(1)
	Input Clock to data skew	TLVCCS	-400		+400	ps	(2)
	Spread spectrum modulation range	F _{clk_in_mod}	0.98*Fc	-	1.02*Fc	MHz	(3)
	Spread spectrum modulation frequency	F _{SSM}	-	-	200	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1115	1125	1136	Th	-
	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	56	Th	-
Horizontal Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	90	140	190	Tc	-

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

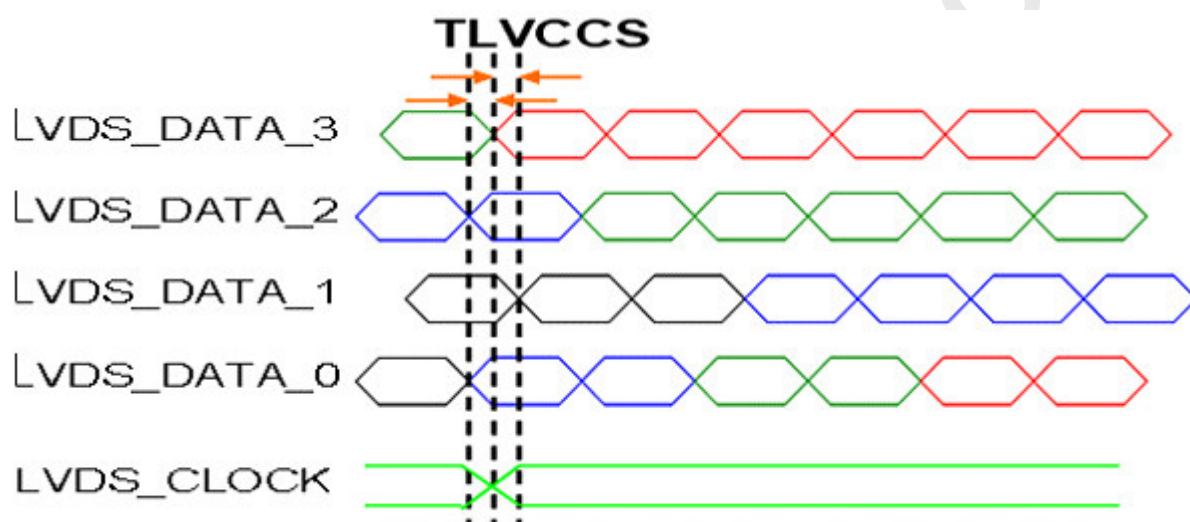
6.2 INPUT SIGNAL TIMING DIAGRAM



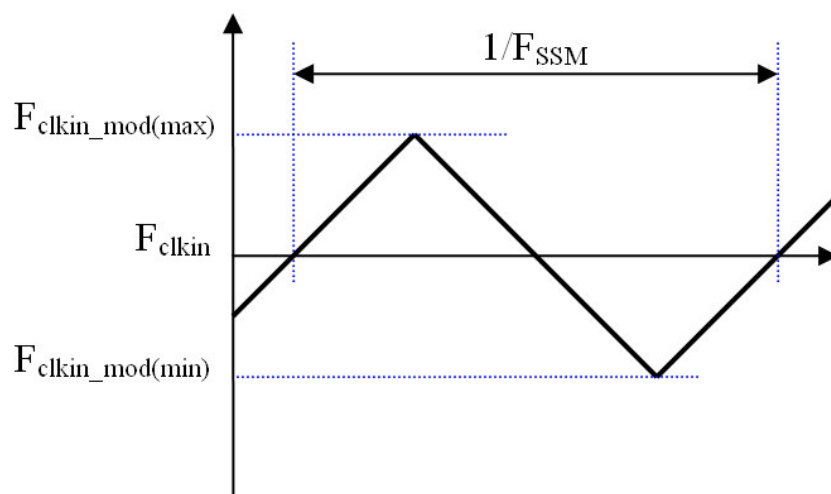
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = I T_1 - Tl$



Note (2) Input Clock to data skew is defined as below figures.

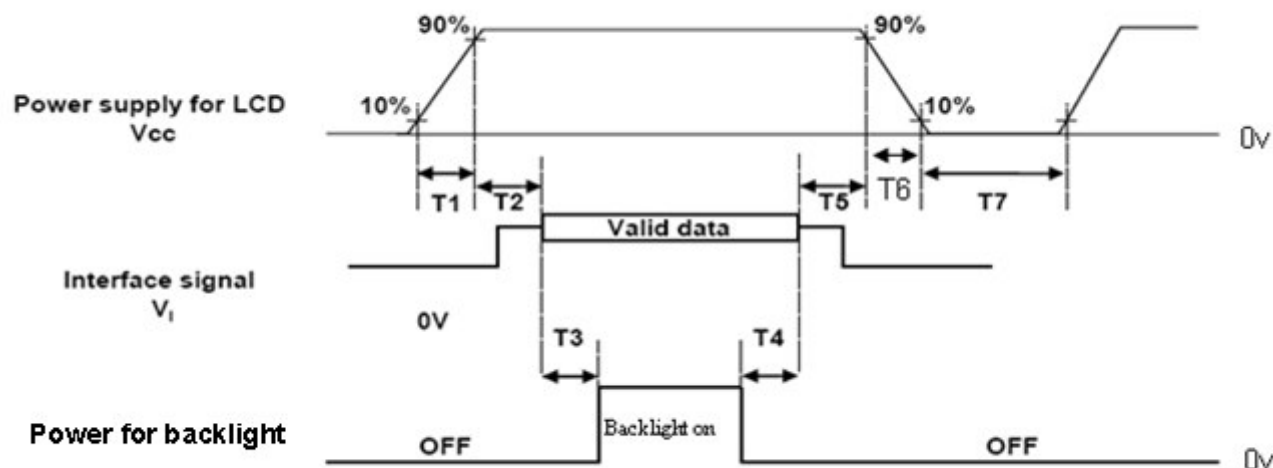


Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



6.3 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.5	--	10	ms
T2	0	--	50	ms
T3	450	--	--	ms
T4	90	--	--	ms
T5	0	--	50	ms
T6	0.5	--	100	ms
T7	500	--	--	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) CMO won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "T6 spec".



www.panelook.com

**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 _{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	I _{PIN}	20 ± 0.6	mA _{DC}
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	CMI 27-D041745 + Transfer board		

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.

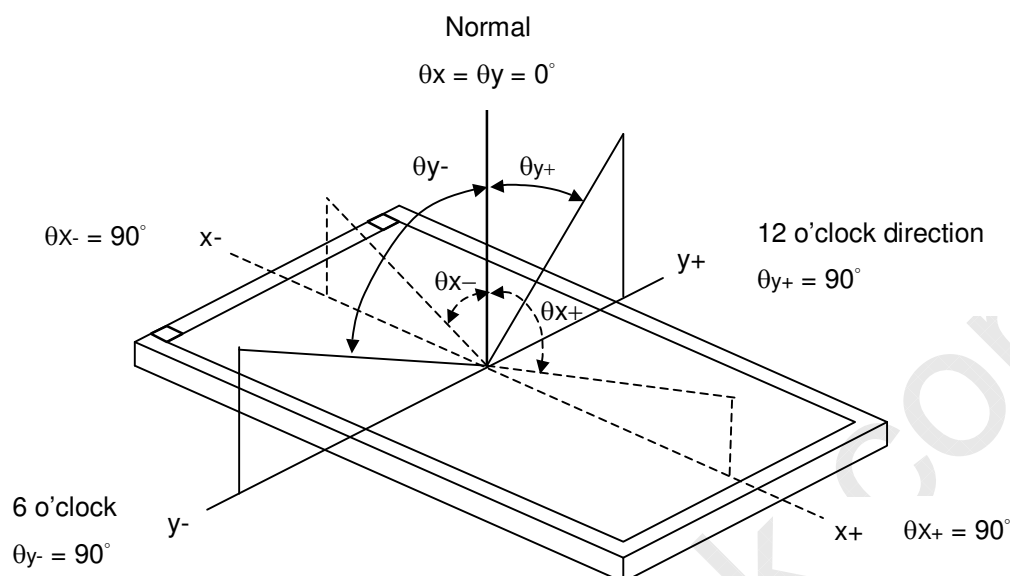
**7.2 OPTICAL SPECIFICATIONS**

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 7.1.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction	700	1000	---		(2)	
Response Time		T _R		---	1.5	2.5	ms	(3)	
		T _F		---	3.5	5.5			
Center Luminance of White		L _C		240	280	---	cd/m ²	(4)	
White Variation		δW		---	---	1.33		(7)	
Cross Talk		CT		---	2%	---	%	(5)	
Color Chromaticity	Red	R _x		Typ. -0.03	0.641	Typ. +0.03		(6)	
		R _y			0.338				
	Green	G _x			0.315				
		G _y			0.629				
	Blue	B _x			0.159				
		B _y			0.059				
	White	W _x			0.313				
		W _y			0.329				
	Color Gamut			CG		72	---	%	NTSC Ratio
	Viewing Angle	Horizontal		θ _{x+} + θ _{x-}	CR>10	150	170	---	Deg.
Vertical		θ _{y+} + θ _{y-}	140	160		---			
Horizontal		θ _{x+} + θ _{x-}	CR>5	160	178	---			
Vertical		θ _{y+} + θ _{y-}		150	170	---			

Note (1) Definition of Viewing Angle (θ_x , θ_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.

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

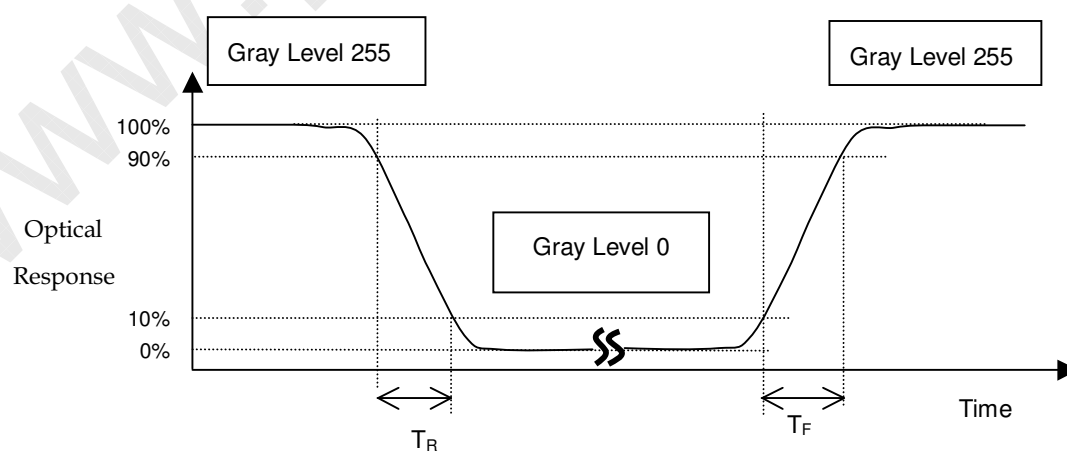
L_{255} : Luminance of gray level 255

L_0 : Luminance of gray level 0

$$CR = CR(5),$$

$CR(X)$ is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

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 and 5 points

$$L_C = L(5)$$

$L(X)$ is corresponding to the luminance of the point X at the figure in Note (7).

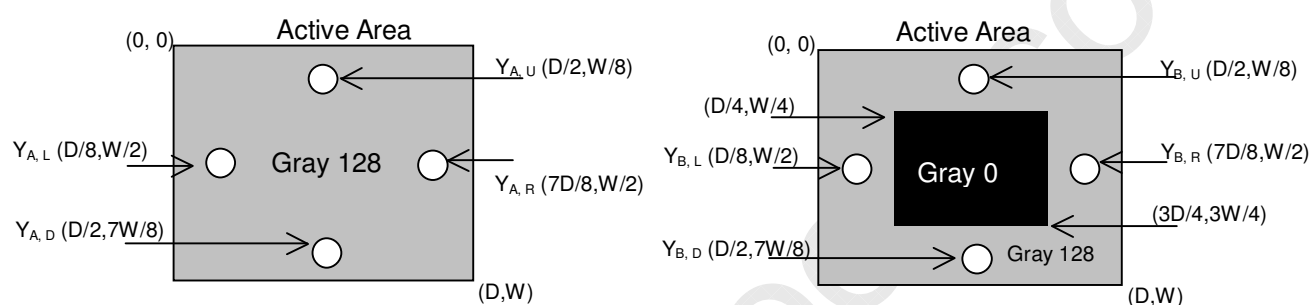
Note (5) Definition of Cross Talk (CT):

$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where:

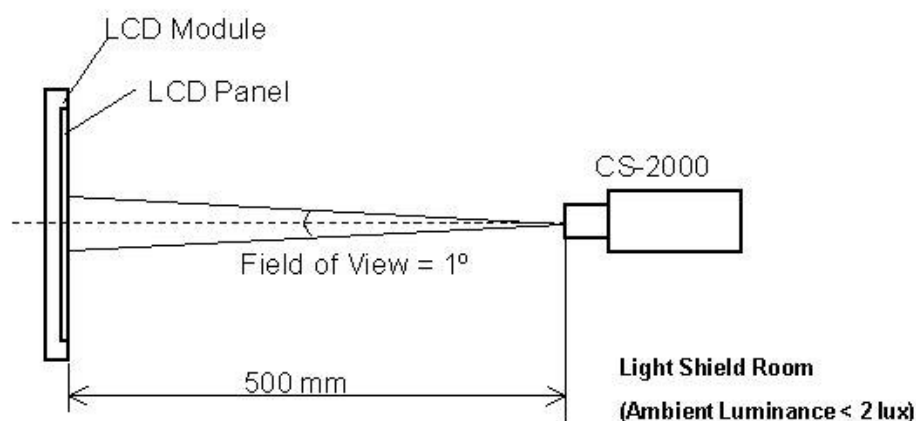
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)



Note (6) Measurement Setup:

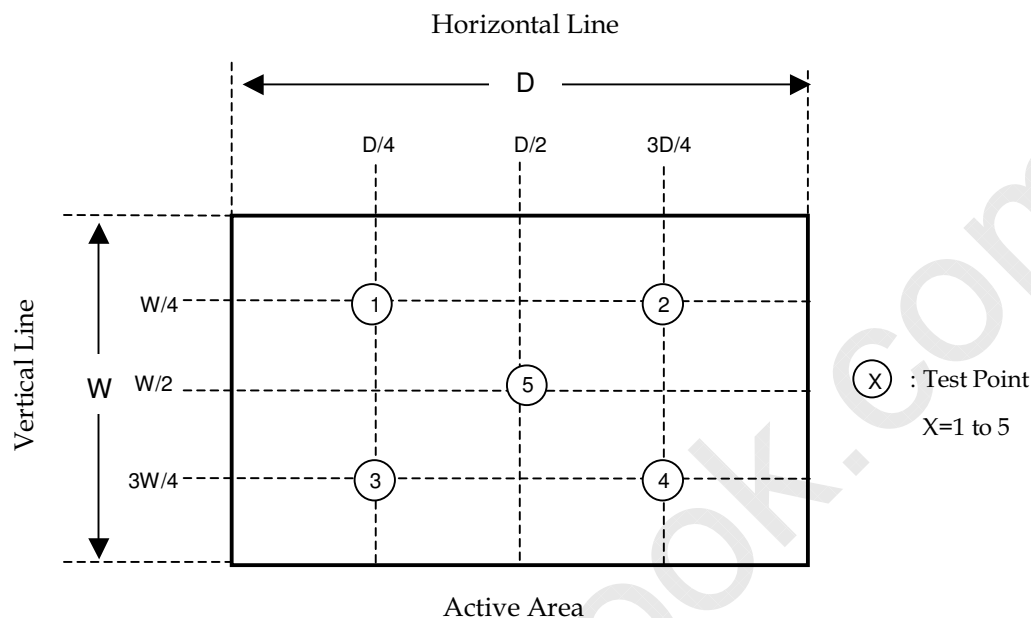
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

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. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

- [1] Do not apply rough force such as bending or twisting to the module during assembly.
- [2] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [3] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.
- [4] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- [5] Do not plug in or pull out the I/F connector while the module is in operation.
- [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] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [9] When storing modules as spares for a long time, the following precaution is necessary.
 - [9.1] 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°C at normal humidity without condensation.
 - [9.2] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [10] When ambient temperature is lower than 10°C, the display quality might be reduced. For example, the response time will become slow.

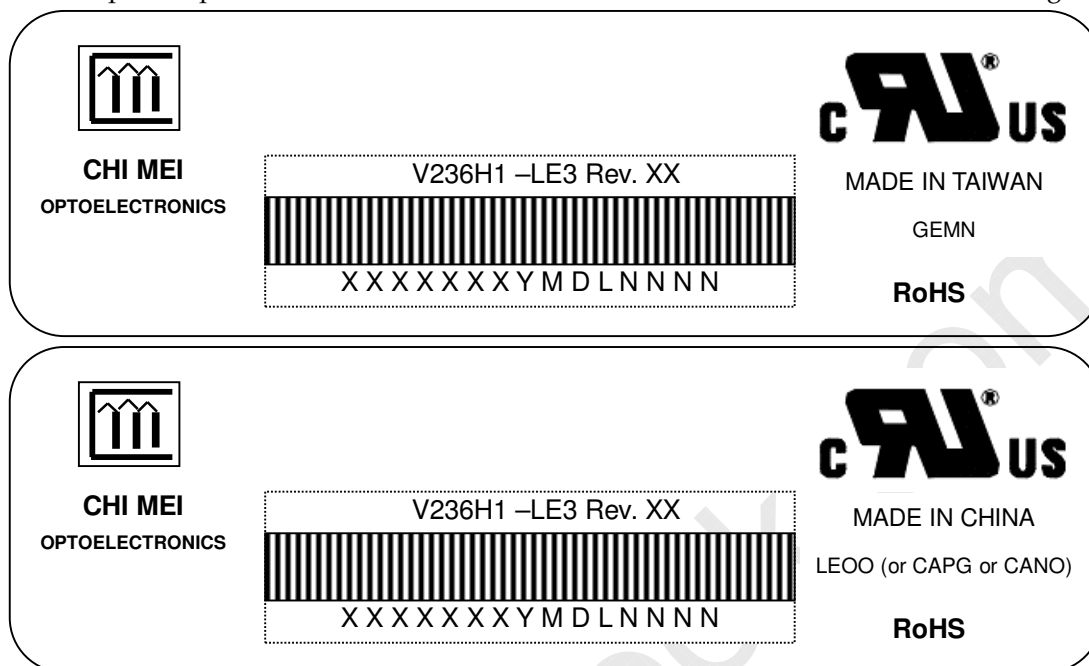
8.2 SAFETY PRECAUTIONS

- [1] 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.
- [2] After the module's end of life, it is not harmful in case of normal operation and storage.

9. DEFINITION OF LABELS

9.1 CMI MODULE LABEL

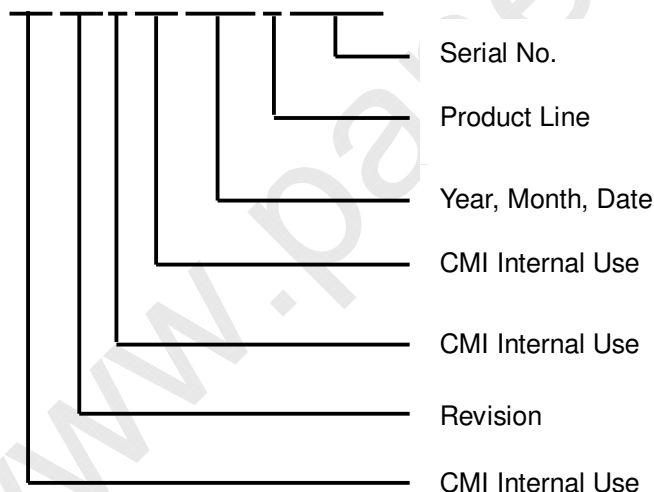
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: V236H1-LE3

Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

Serial ID: X X X X X X X Y M D L N N N N



Serial ID includes the information as below:

Manufactured Date:

Year: 2001=1, 2002=2, 2003=3, 2004=4...2010=0, 2011=1, 2012=2...

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

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

Revision Code: Cover all the change

Serial No.: Manufacturing sequence of product

Product Line: 1 → Line1, 2 → Line 2, ...etc.

10. PACKAGING

10.1 PACKAGING SPECIFICATIONS

- (1) 11 LCD TV modules / 1 Box
- (2) Box dimensions : 620(L) x 348(W) x 430(H)mm
- (3) Weight : approximately :29.5Kg(11 modules per box)

10.2 PACKAGING METHOD

Figures 10-1 and 10-2 are the packing method

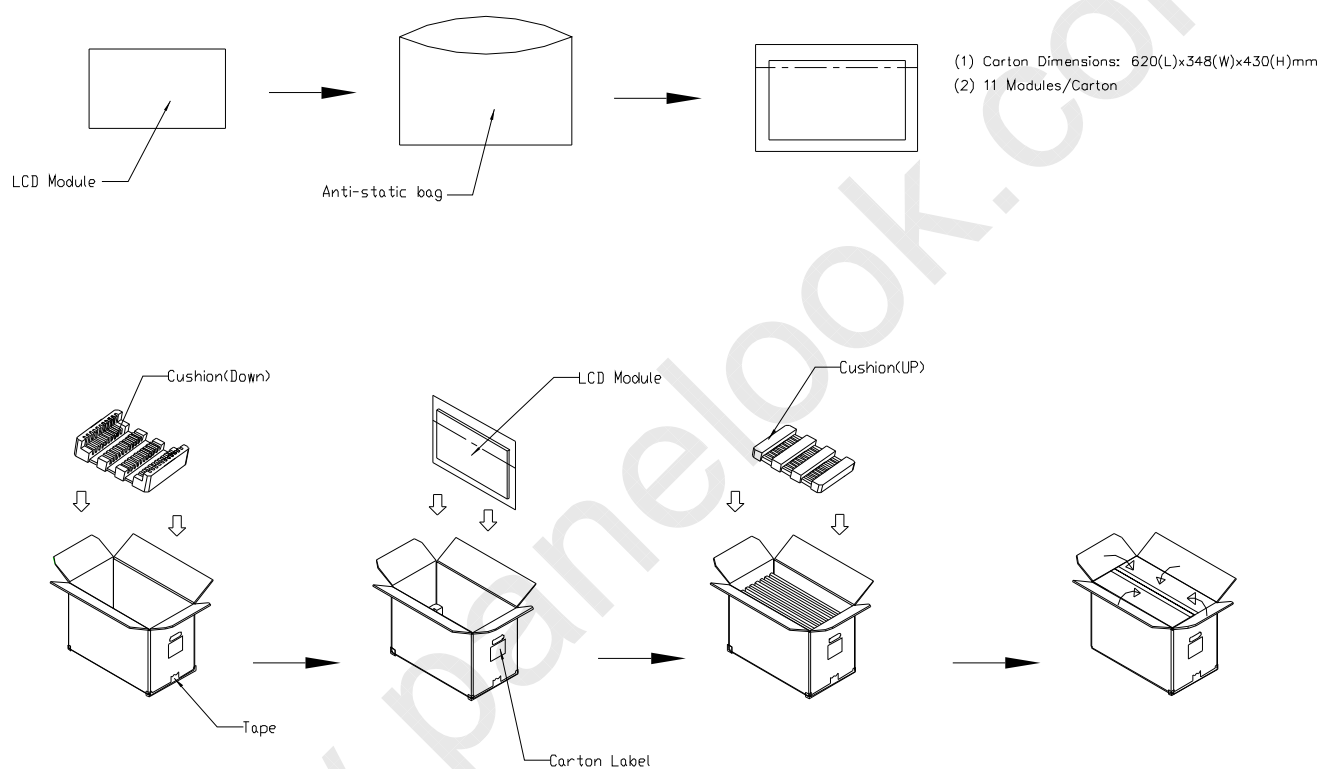
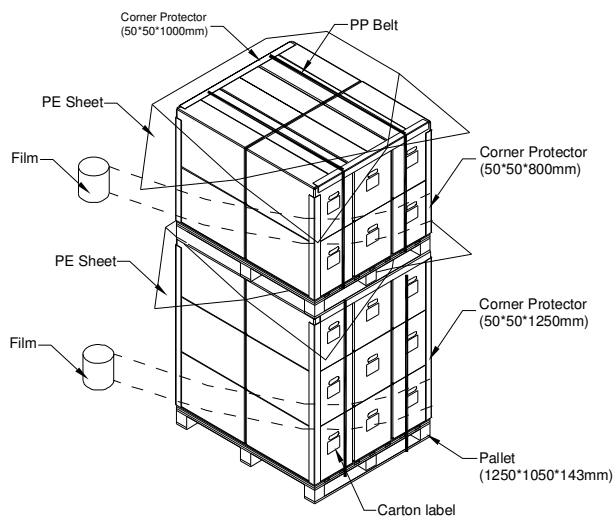


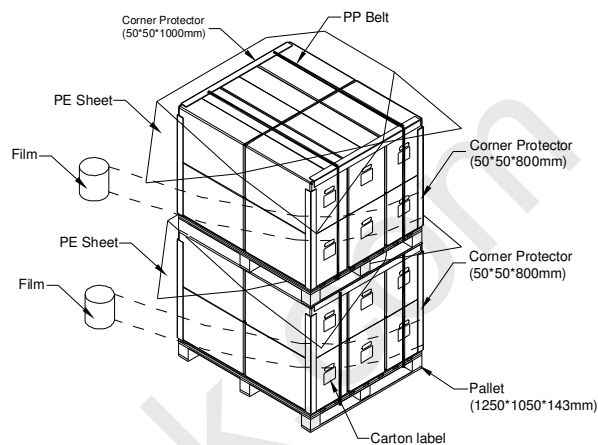
Figure 10-1 packing method



Sea / Land Transportation (40ft HQ Container)



Sea / Land Transportation (40ft Container)



For air transport

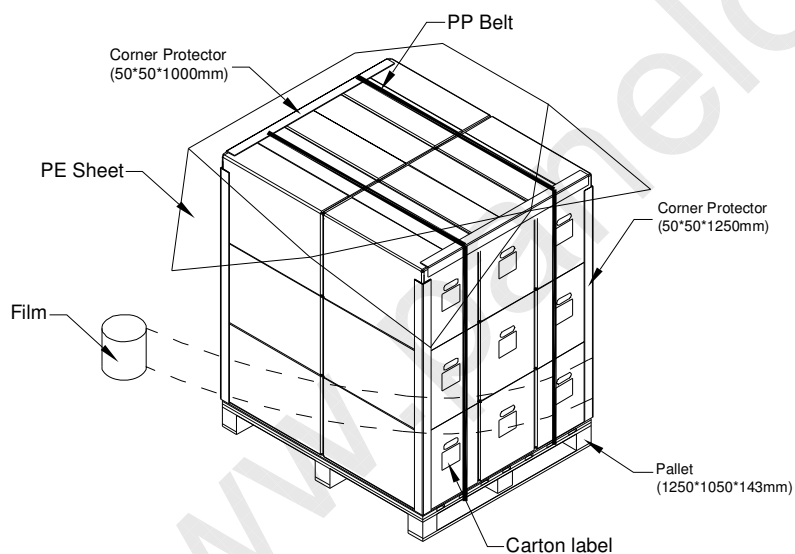


Figure 10-2 packing method

11. MECHANICAL CHARACTERISTIC

