CHI MEI
OPTOELECTRONICS CORP.

TFT LCD Tentative Specification

MODEL NO.: M236H7- L01

Customer:

Approved by:

Note:

Version 0.0

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-

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REVISION HISTORY

Version	Date	Section	Description
Ver. 0.0	12, Apr, 10	-	M236H7-L01 Tentative Specification was first issued.

Version 0.0

1. GENERAL DESCRIPTION

1.1 OVERVIEW

M236H7-L01 is a 23.6" TFT Liquid Crystal Display touch module which embedded Optical Touch unit with W7 logo certification. The light source of the module is 2 CCFL Backlight unit and interface is 30 pins 2ch-LVDS which 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

- Full HD (1920 x 1080 pixels) resolution

- DE (Data Enable) only mode

- LVDS (Low Voltage Differential Signaling) interface

- RoHS compliance

- Touch function "Plug and Play"

- Dual touch; Gesture supported

- W7 logo certification

1.3 APPLICATION

- TFT LCD Monitor, AIO Computers

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Diagonal size	23.547	inch	-
Active Area	521.28 (H) x 293.22 (V)	mm	(1)
Bezel Opening Area	530.28 (H) x 302.22 (V)	mm	(1)
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	-	-
Glass Surface Treatment	7H hard		
Module Power Consumption	21.7	Watt	(2)

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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	
	Depth(D)	20	20.5	21	mm	
Weight		-	3295	3395	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.

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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

TBD

2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+6.0	V	(1)
Logic Input Voltage	Vlogic	-0.3	+3.6	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2)
Lamp Current	I_L	3.0	8.0	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	40	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).

2.2.3 OPTICAL TOUCH UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
USB Voltage	V_{USB}	4.75	5.25	V	

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	300	mV	-
Power on Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White		-	0.55	0.67	A	(3)
	Black		-	1.5	1.9	A	(3)
	Vertical Stripe		-	1.18	1.43	A	(3)
Power Consumption		P_{LCD}		7.5	9.5	Watt	(4)
LVDS differential input voltage		Vid	200	-	600	mV	(5)
LVDS common input voltage		Vic	-	1.2	-	V	
Logic High Input Voltage		VIH	2.64	-	3.6	V	
Logic Low Input Voltage		VIL	-0.3	-	0.66	V	

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

Note (2) Power on rush current measurement conditions:
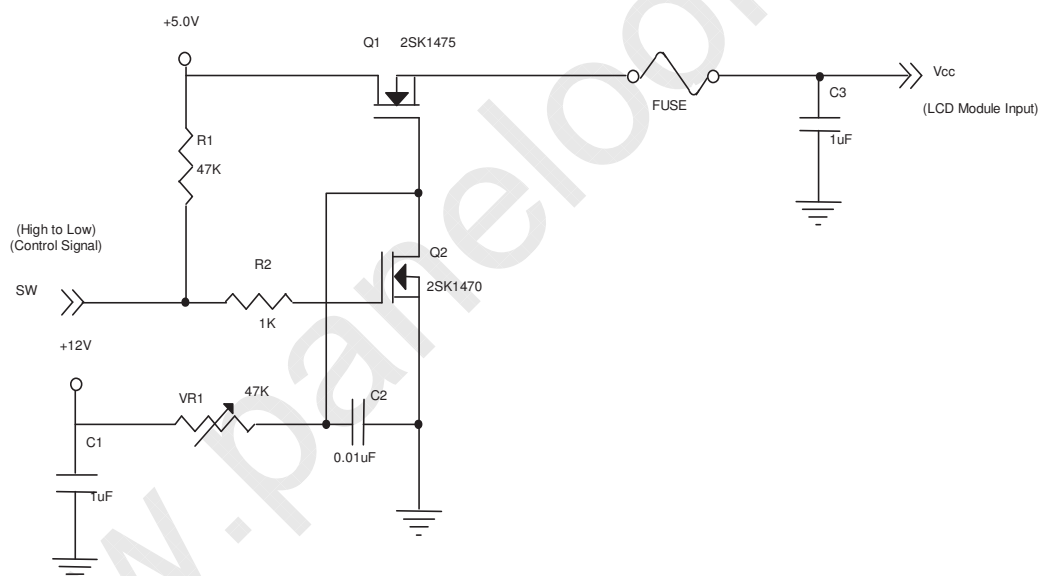
Vcc rising time is 470μs

7 / 30

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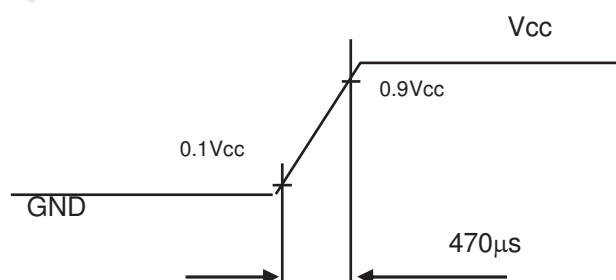
Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, F_r = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

b. Black Pattern
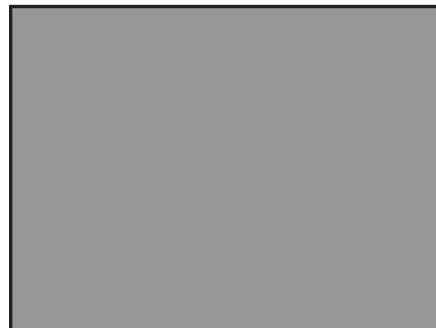
Active Area

Active Area

c. Vertical Stripe Pattern

Active Area

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

Note (5) VID waveform condition

Single-End

LVDS VIN N

LVDS VIN P

Vid

Vic

GND

Differential Signal

0V

Vid

Vid

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3.1.2 Vcc Power Dip Condition:

Vcc

4.5V

4.0V

Td

Dip condition: $4.0V \leq Vcc \leq 4.5V, Td \leq 20ms$

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

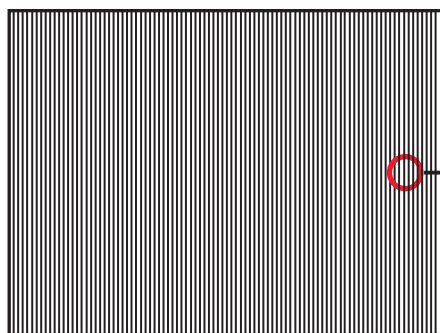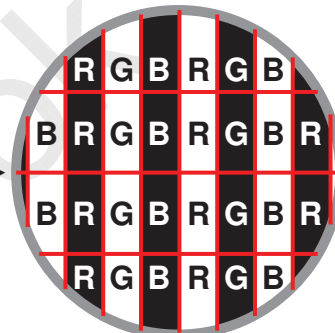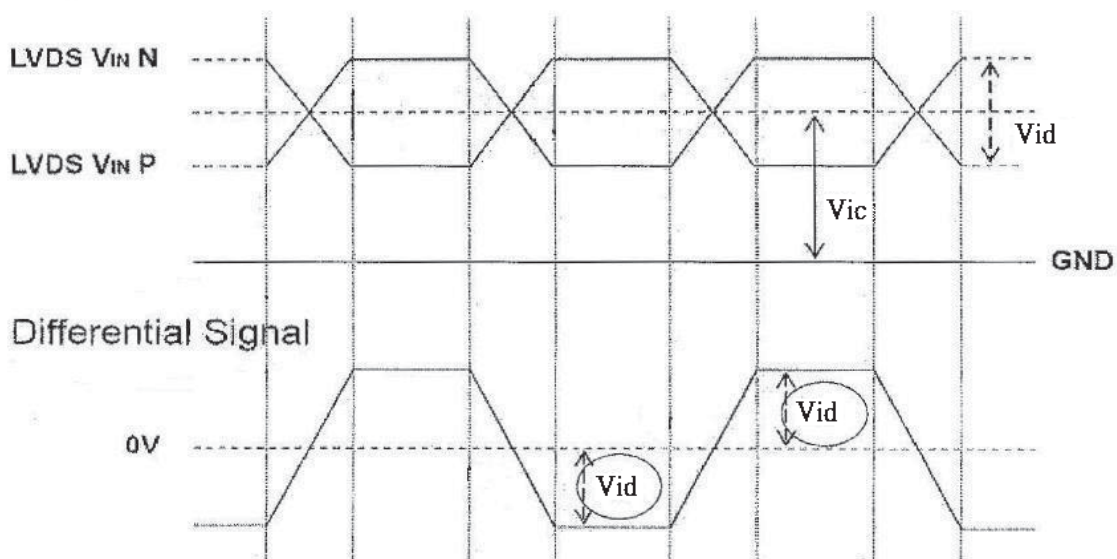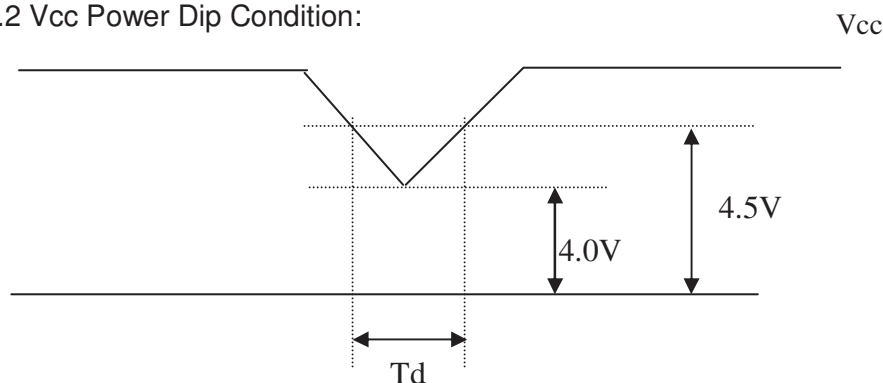| Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	819	910	1001	V_{RMS}	I_L = 7.5 mA
Lamp Current	I_L	3.0	7.5	8.0	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S			1880(0℃)	V_{RMS}	(2)
				1480 (25℃)	V_{RMS}	(2)
Operating Frequency	F_L	40		80	KHz	(3)
Lamp Life Time	L_{BL}	50000			Hrs	(5), I_L = 7.5mA
Power Consumption	P_L	12.285	13.65	15.015	W	(4), I_L = 7.5 mA

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

HV (Pink)
LV (White)
1 2
A

HV (Blue)
LV (Black)
Current Probe
1 2
A

Current Amplify　Oscilloscope
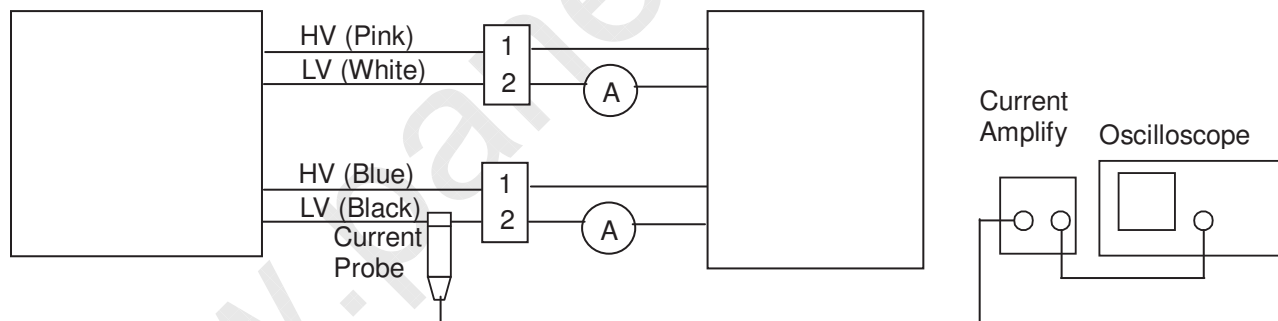
Measure equipment:
Current Amplify: Tektronix TCPA300
Current probe: Tektronix TCP312
Oscilloscope: TDS3054B

Ta = 25 ± 2 ºC

Note (2) The voltage that must be larger than Vs should be applied to the lamp for more than 1 second after startup.　Otherwise, the lamp may not be turned on normally.　It is the value output voltage of NF circuit.

Note (3) The lamp frequency may produce interference with horizontal synchronization frequency from the display, which might cause line flow on the display.　In order to avoid interference, the lamp frequency should be detached from the horizontal synchronization frequency and its harmonics as far as possible.

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Note (4) $P_L = I_L \times V_L \times 2$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition

Ta = 25 ±2 °C and I_L =7.5 mArms until one of the following events occurs:

(a) When the brightness becomes $\leqq$ 50% of its original value.

(b) When the effective ignition length becomes $\leqq$ 80% of its original value.

(The effective ignition length is a scope that luminance is over 80% of that at the center point.)

Note (6) 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 carefully designed to avoid producing 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.   If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform (Unsymmetrical ratio is less than 10%).   Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave.   Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display.   Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp.   It shall help increase the lamp lifetime and reduce its leakage current.

a. The asymmetry rate of the inverter waveform should be 10% below;

b. The distortion rate of the waveform should be within $\sqrt{2}$ ± 10%;

c. The ideal sine wave form shall be symmetric in positive and negative polarities.
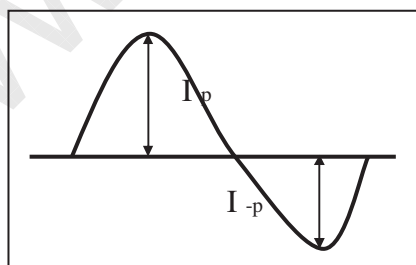
I_p I_{-p}	* Asymmetry rate: $\mid I_p - I_{-p} \mid / I_{rms}$ * 100% * Distortion rate I_p (or I_{-p}) / I_{rms}

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3.3 OPTICAL TOUCH UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
USB Voltage	V_{USB}	4.75	5	5.25	V	
USB Current	I_{USB}	65	-	110	mA	(1)
Power Consumption	P_{USB}	0.33	-	0.55	W	(1)

Note(1) Depend on operating mode

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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

RXO0(+/-)
RXO1(+/-)
RXO2(+/-)
RXO3(+/-)
RXOC(+/-)
RXE0(+/-)
RXE1(+/-)
RXE2(+/-)
RXE3(+/-)
RXEC(+/-)
NC
Vcc
GND

INPUT CONNECTOR

LVDS INPUT / TIMING CONTROLLER

SCAN DRIVER IC

TFT LCD PANEL (1920x3x1080)

DATA DRIVER IC

DC/DC CONVERTER & REFERENCE VOLTAGE

VL → **LAMP CONNECTOR (YEONHO 35001HS-02L)** → **BACKLIGHT UNIT**

VUSB → **USB CONNECTOR (ACES 85204-05001)** → **OPTICAL TOUCH SCREEN**

4.2 BACKLIGHT UNIT

1 HV(Pink)
2 LV(White)

1 HV(Blue)
2 LV(Black)

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4.3 OPTICAL TOUCH UNIT

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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.: FI-XB30SL-HF10 (JAE) or 187066-30091 (P-TWO)

Note (2) Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

Note (3) Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE)

Note (4) The first pixel is odd.

Note (5) Input signal of even and odd clock should be the same timing.

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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	LV	Low Voltage	White
2-3	HV	High Voltage	Blue
2-4	LV	Low Voltage	Black

Note (1) Connector Part No.: YEONHO 35001HS-02L or equivalent

Note (2) User's connector Part No.: YEONHO 35001WR-02L or equivalent

5.4 OPTICAL TOUCH UNIT

Pin	Name	Description
1	V_{USB}	USB Voltage, +5.0V power supply
2	D-	Data -
3	D+	Data +
4	GND	Ground
5	Shield GND	Shielding Ground

Note (1) Connector Part No.: ACES 85204-05001 (5 pin) or equivalent

Pin 1 define

Rear side of panel module

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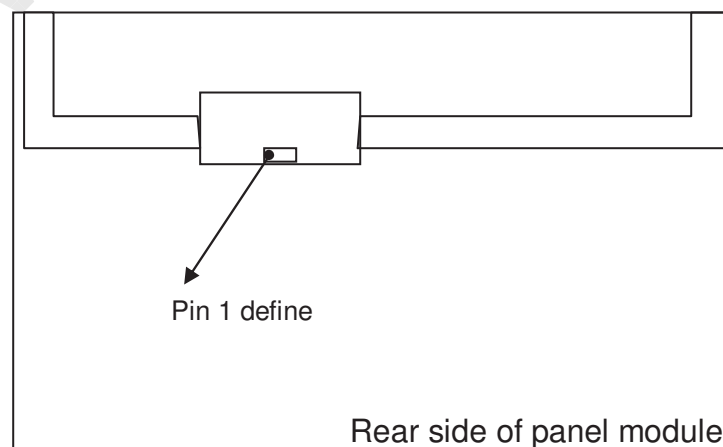
5.5 COLOR DATA INPUT ASSIGNMENT

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
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	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	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	0	1	0	0	0	0	0	0	0	0	0
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	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	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	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
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	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

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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	Fc	58.54	74.25	98	MHz	-
	Period	Tc	-	13.47	-	ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc	-	0.02*Tc	ns	(1)
	Spread spectrum modulation range	F_{clkin_mod}	0.98*Fc	-	1.02*Fc	MHz	(2)
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	(3)
	Hold Time	Tlvh	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr	50	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1115	1125	1136	Th	-
	Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	56	Th	-
Horizontal Active Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	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.
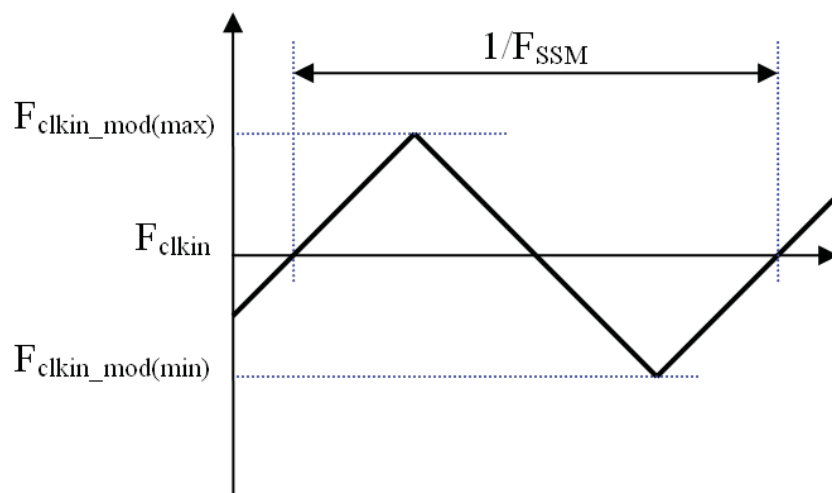
INPUT SIGNAL TIMING DIAGRAM

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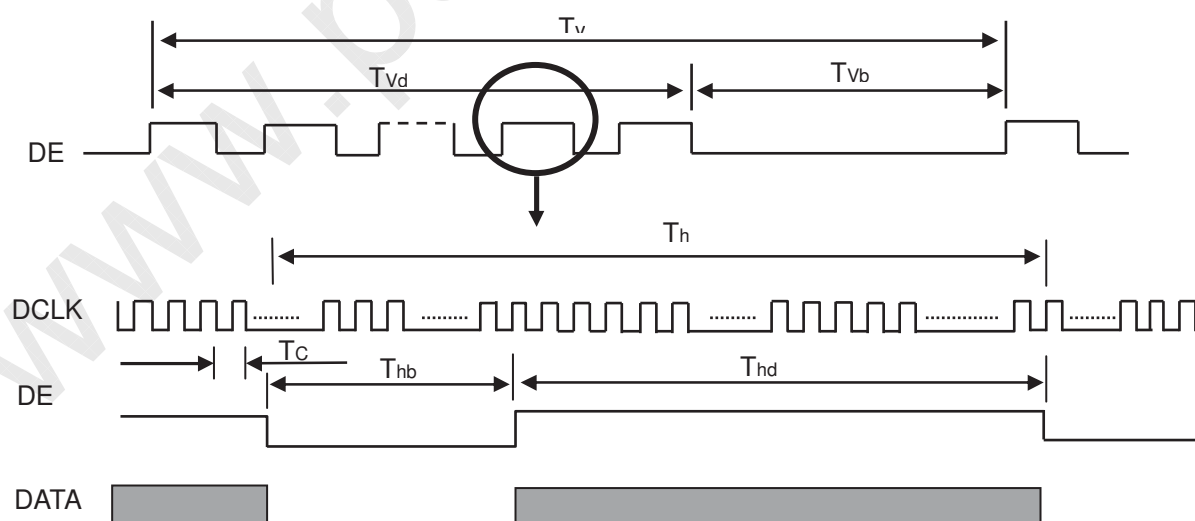
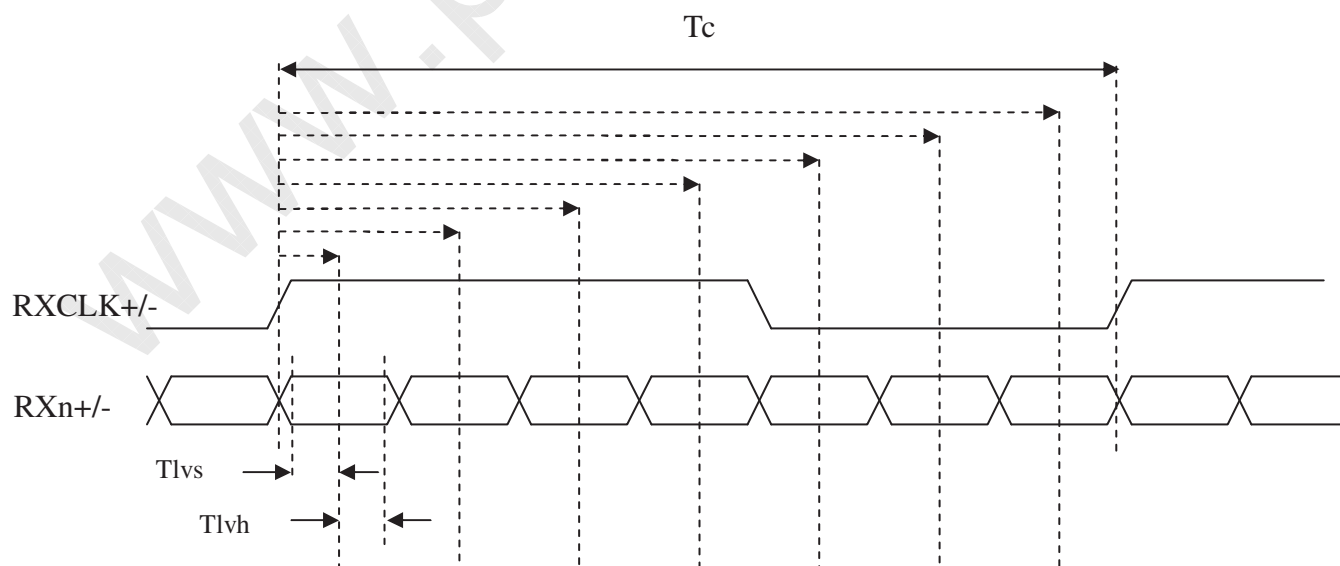Note (1) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T|$
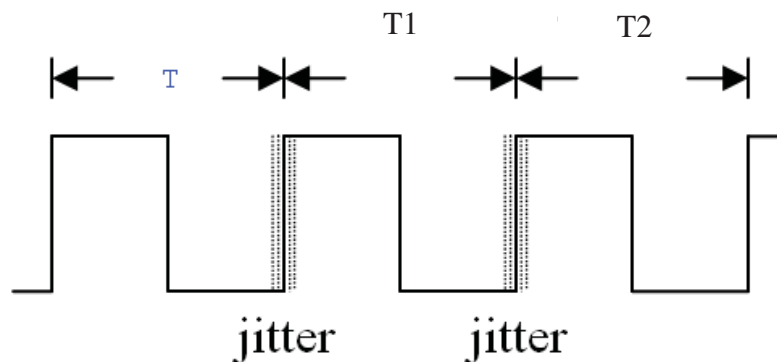
Note (2) The SSCG (Spread spectrum clock generator) is defined as below figures.

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

LVDS RECEIVER INTERFACE TIMING DIAGRAM

Version 0.0

Tentative

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.
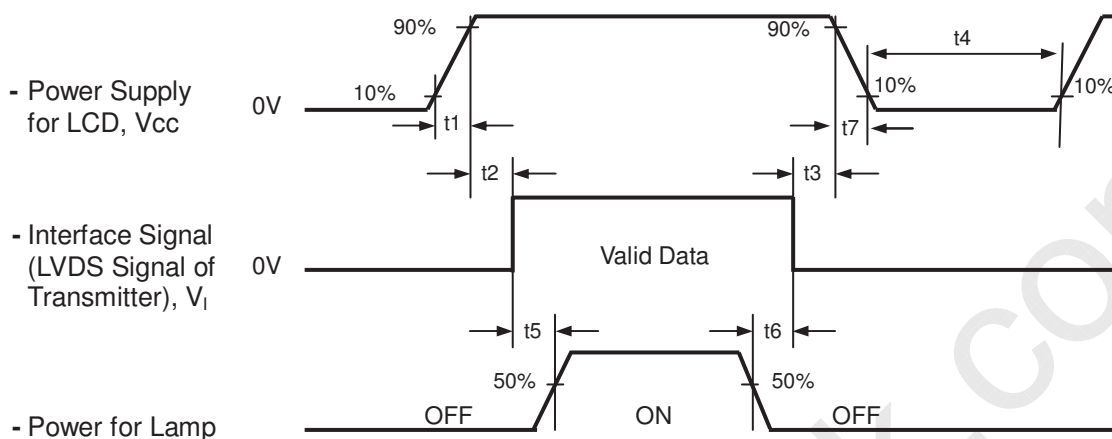
Timing Specifications:

$0.5 < t1 \leqq 10$ msec

$0 < t2 \leqq 50$ msec

$0 < t3 \leqq 50$ msec

$t4 \geqq 500$ msec

$t5 \geqq 450$ msec

$t6 \geqq 90$ msec

$5 < t7 \leqq 100$ 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 before the backlight 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) 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 "t7 spec".

Version 0.0
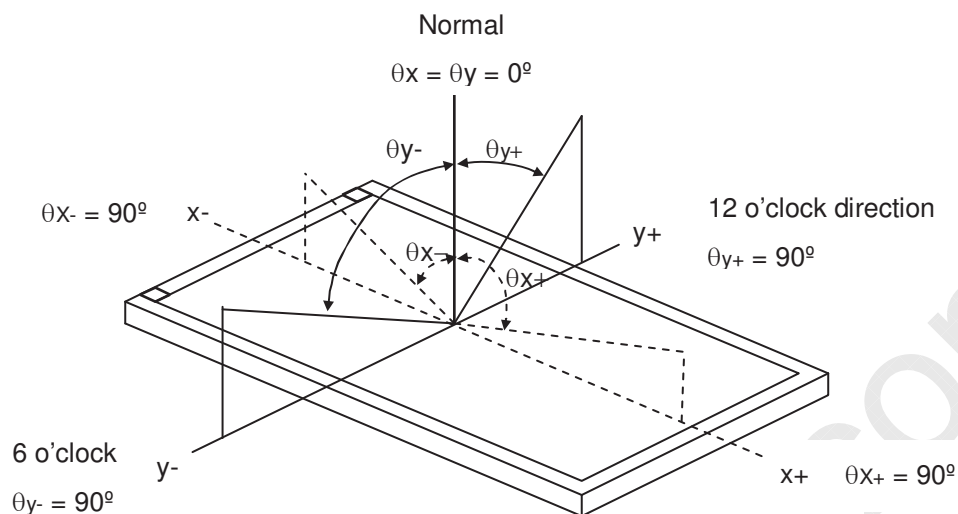
7. OPTICAL CHARACTERISTICS

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}	7.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	7.5±0.5	mA
Inverter Operating Frequency	F_L	55±5	KHz
Inverter	Logah MIT70070.50		

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	$\theta_x=0°$, $\theta_Y=0°$ CS-1000T	Typ - 0.03	0.648	Typ + 0.03	-	(1), (5)
		Ry			0.332			
	Green	Gx			0.275			
		Gy			0.610			
	Blue	Bx			0.150			
		By			0.075			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		200	230	-	cd/m^2	(4), (5)
Contrast Ratio		CR		800	1000	-	-	(2), (5)
Response Time		T_R	$\theta_x=0°$, $\theta_Y=0°$	-	1.3	2.2	ms	(3)
		T_F		-	3.7	5.8		
White Variation		δW	$\theta_x=0°$, $\theta_Y=0°$	-	-	1.33	-	(5), (6)
Viewing Angle	Horizontal	$\theta_x^{+}+\theta_x-$	CR $\geqq$ 10	150	170	--	Deg.	(1), (5)
	Vertical	$\theta_Y^{+}+\theta_Y-$		140	160	--		
Viewing Angle	Horizontal	$\theta_x^{+}+\theta_x-$	CR $\geqq$ 5	160	178	--	Deg.	(1), (5)
	Vertical	$\theta_Y^{+}+\theta_Y-$		150	170	--		

Version 0.0

Note (1) Definition of Viewing Angle (θx, θy):

Normal

$\theta x = \theta y = 0^\circ$

$\theta y-$ $\theta y+$

$\theta x- = 90^\circ$ x-

12 o'clock direction

$\theta y+ = 90^\circ$

θx y+

$\theta x+$

6 o'clock   y-

x+ $\theta x+ = 90^\circ$

$\theta y- = 90^\circ$

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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

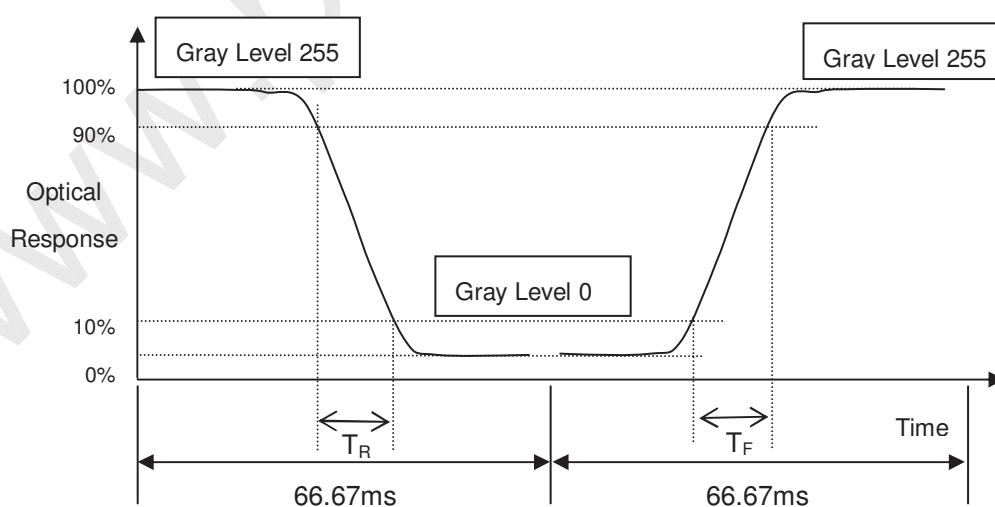L255: Luminance of gray level 255

L0: 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):

Gray Level 255

Gray Level 255

100%

90%

Optical

Response

Gray Level 0

10%

0%

T_R

T_F

Time

66.67ms   66.67ms

Version 0.0
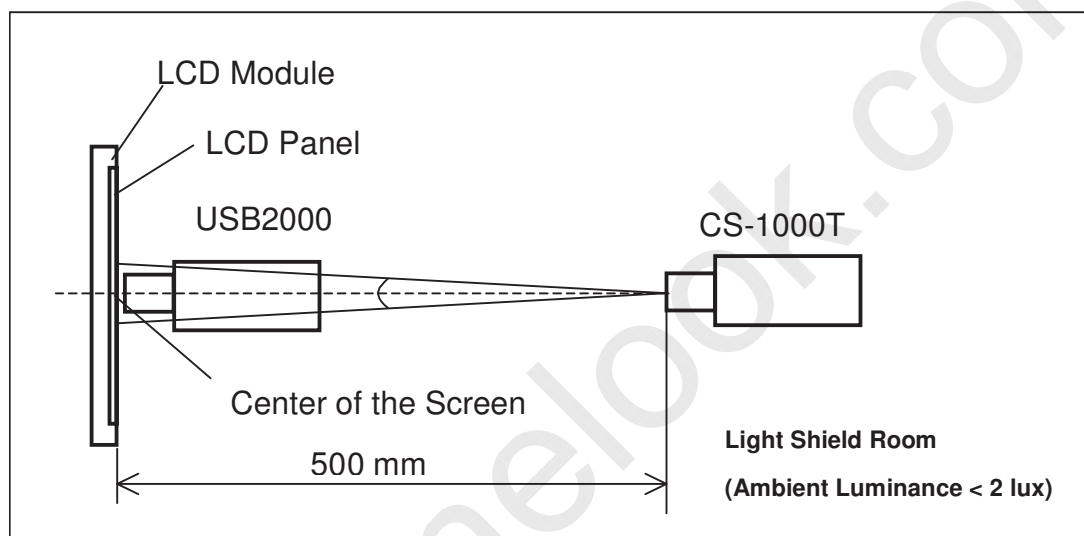
Note (4) Definition of Luminance of White (L_C):

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).
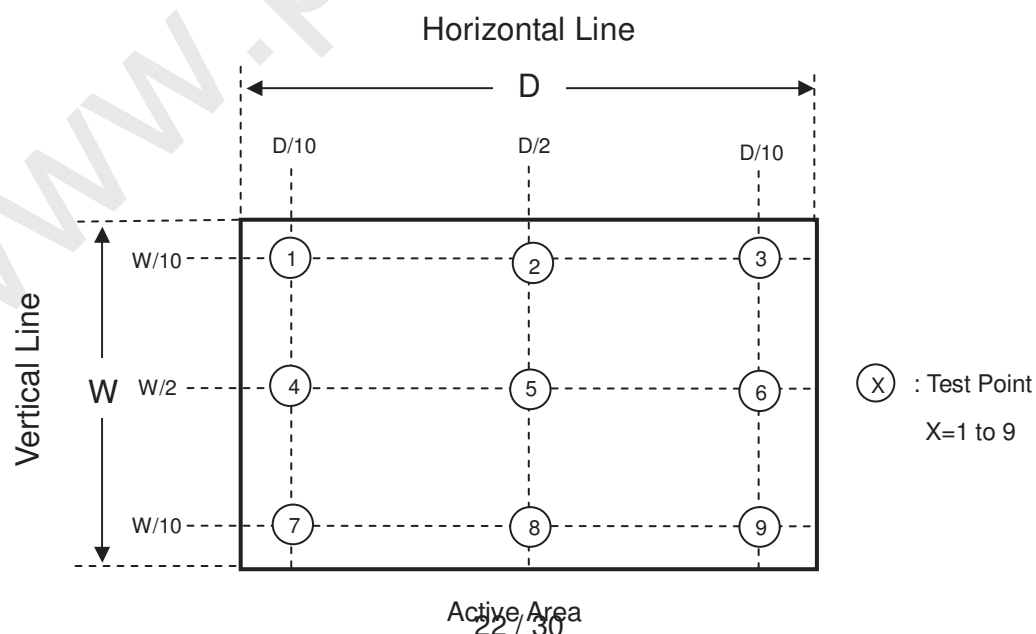
Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.

LCD Module

LCD Panel

USB2000

CS-1000T

Center of the Screen

Light Shield Room
(Ambient Luminance < 2 lux)

500 mm

Note (6) Definition of White Variation (δW): Measure the luminance of gray level 255 at 9 points

$\delta W = \text{Maximum} [L(1) \sim L(9)] / \text{Minimum} [L(1) \sim L(9)]$

Horizontal Line

D

D/10   D/2   D/10

Vertical Line

W   W/10

W/2

W/10

①   ②   ③
④   ⑤   ⑥
⑦   ⑧   ⑨

Ⓧ : Test Point
X=1 to 9

Active Area

Version 0.0

Tentative

8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 7 LCD modules / 1 Box

(2) Box dimensions: 620(L) X 348(W) X 430(H) mm

(3) Weight: approximately: 27kg (7 modules per box)

8.2 PACKING METHOD

(1) Carton Packing should have no failure in the following reliability test items.

| Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: TBD Top & Bottom: TBD Right & Left: TBD Back & Forth: TBD	Non Operation
Dropping Test	TBD	Non Operation
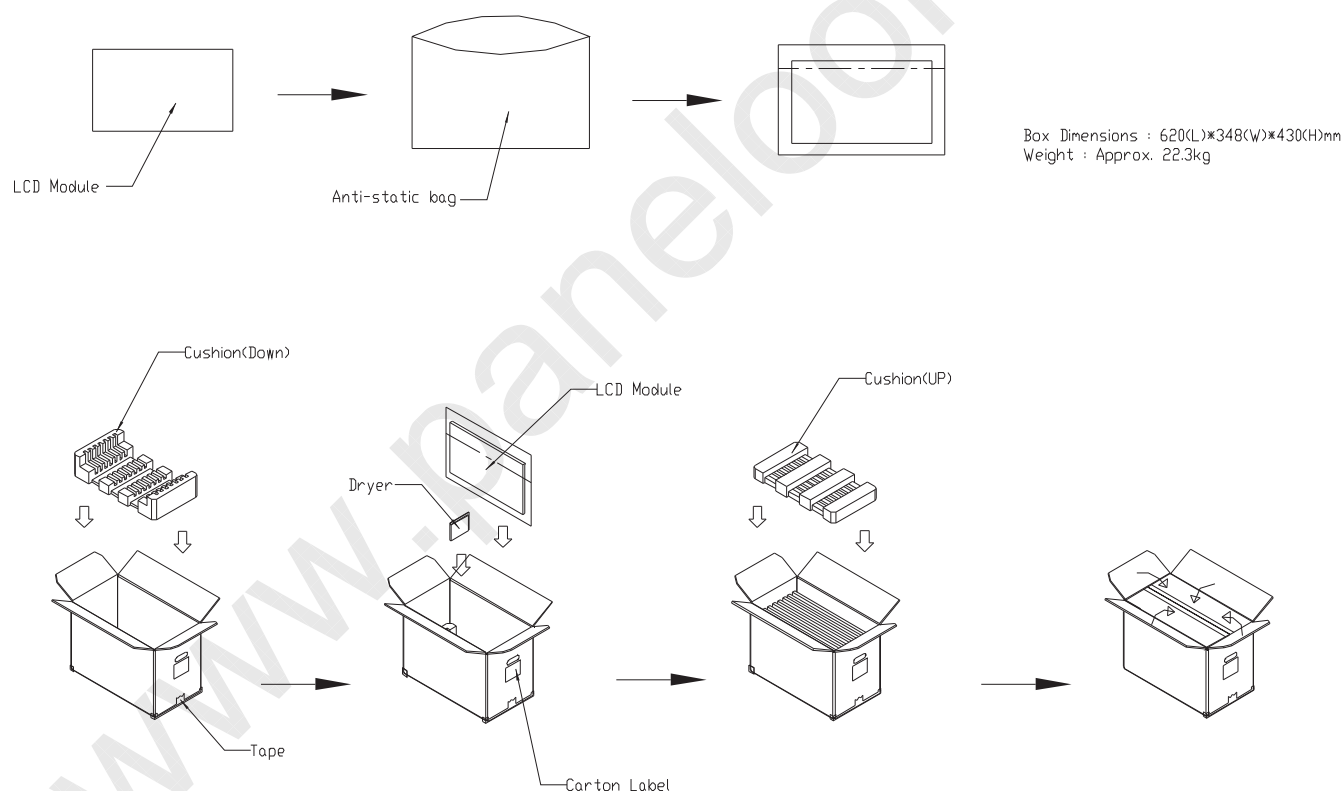
Figure 8-1 Packing method

Version 0.0

Doc No.:
Issued Date: 12, Apr, 2010
Model No.: M236H7-L01
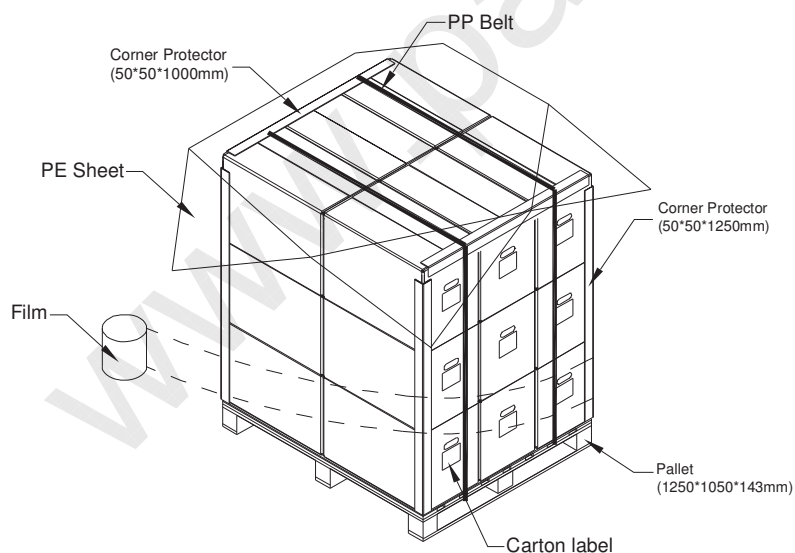
Tentative

For ocean shipping

Sea / Land Transportation (40ft HQ Container)
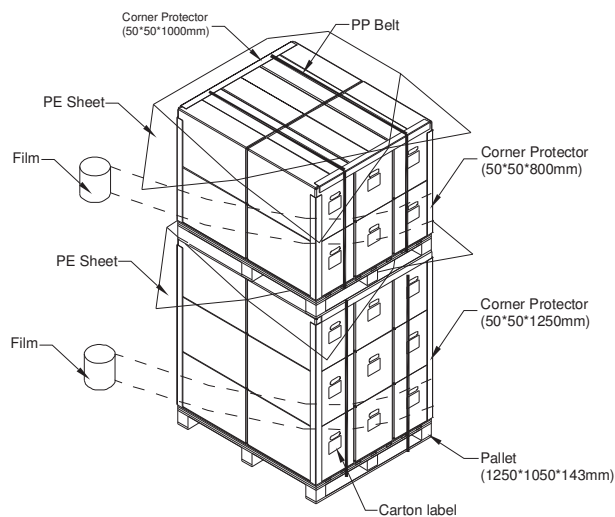
Sea / Land Transportation (40ft Container)
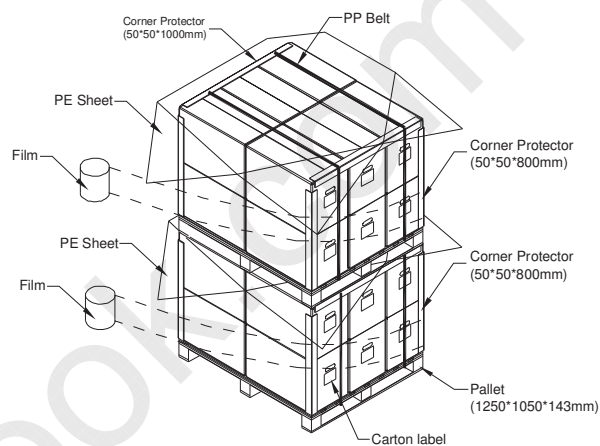
Figure 8-2 Packing method

For air transport

Figure 8-3 Packing method

Version 0.0

Doc No.:
Issued Date: 12, Apr, 2010
Model No.: M236H7-L01

Tentative

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.

(a) Model Name: M236H7-L01

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

(c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X	CMO internal use	-
XX	CMO internal use	-
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3…2010=0, 2011=1, 2012=2… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, …
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM-23H71-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
23H71	Model number	M236H7-L01= 23H71
X	Revision code	Non ZBD: 1,2,~,8,9 / ZBD: A~Z
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
X	Gate driver IC code	
XX	Cell location	Tainan Taiwan=TN, Ningbo China=CN
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN ; Ningbo China=NP
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3…2010=0, 2011=1, 2012=2… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	By LCD supplier

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(e) FAB ID(UL Factory ID):

Region	Factory ID
TWCMO	GEMN
NBCMO	LEOO
NBCME	CANO
NHCMO	CAPG

Version 0.0

Tentative

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 is 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 comes into or contacts 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, it may reduce display quality.   For example, the response time will become slow and the starting voltage of CCFL will be higher than that in 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 contacting 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

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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.　Sunlight or fluorescent light is prohibited in storing.
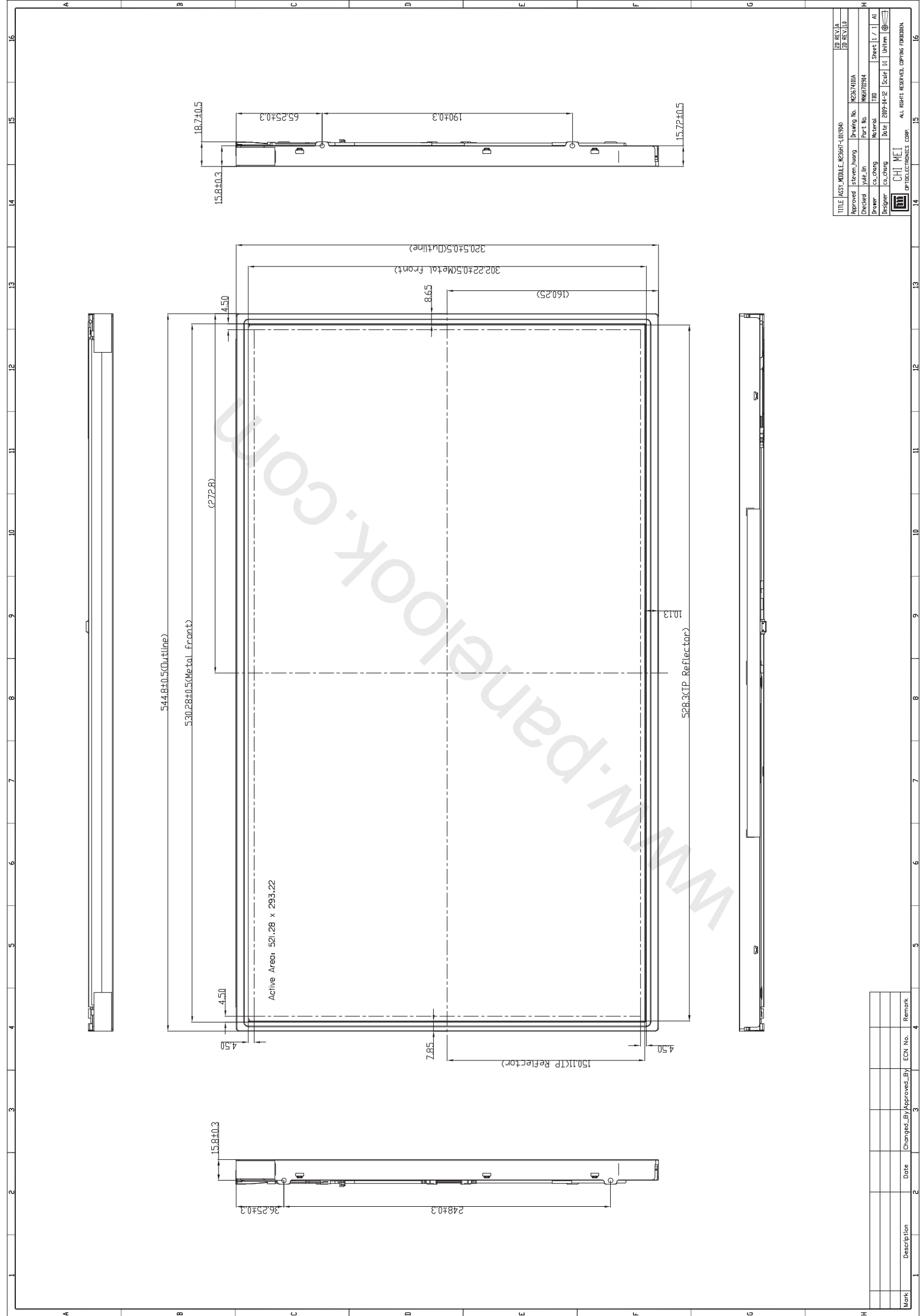
10.5. Operation condition guide

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

Normal condition is defined as below:

Temperature: 20±15℃

Humidity: 65±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

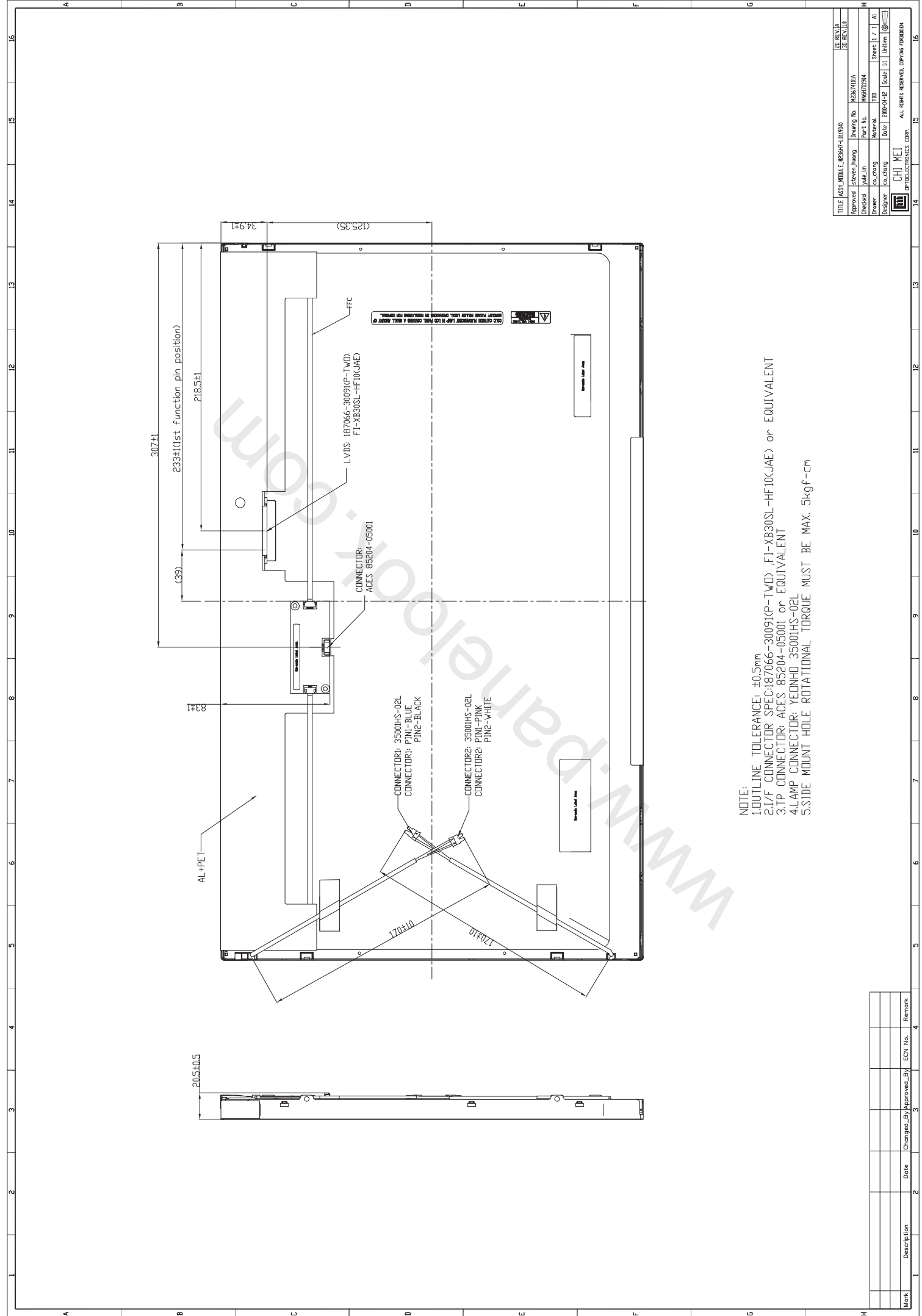When fixed patterns are displayed for a long time, remnant image is likely to occur.

11. MECHANICAL CHARACTERISTICS

[Refer to the next 2 pages]

Version 0.0

Active Area: 521.28 x 293.22

544.8±0.5(Outline)

530.28±0.5(Metal Front)

(272.8)

4.50

4.50

4.50

528.3(TP Reflector)

150.11(TP Reflector)

7.85

320.5±0.5(Outline)

302.22±0.5(Metal Front)

8.65

(160.25)

10.13

4.50

18.7±0.5

65.25±0.3

190±0.3

15.72±0.5

15.8±0.3

15.8±0.3

36.25±0.3

248±0.3

Mark Description Changed_By Approved_By ECN No. Remark Date

NOTE:
1.OUTLINE TOLERANCE: ±0.5mm
2.I/F CONNECTOR SPEC:187066-3009I(P-TWD),FI-XB30SL-HF10(JAE) or EQUIVALENT
3.TP CONNECTOR: ACES 85204-05001 or EQUIVALENT
4.LAMP CONNECTOR: YEONHO 35001HS-02L
5.SIDE MOUNT HOLE ROTATIONAL TORQUE MUST BE MAX. 5kgf-cm

CONNECTOR1: 35001HS-02L
CONNECTOR1: PIN1-BLUE
            PIN2-BLACK

CONNECTOR2: 35001HS-02L
CONNECTOR2: PIN1-PINK
            PIN2-WHITE

CONNECTOR:
ACES 85204-05001

LVDS: 187066-3009I(P-TWD)
FI-XB30SL-HF10(JAE)

FFC

AL+PET

34.9±1

(125.35)

218.5±1

307±1

233±1(1st function pin position)

(39)

83±1

170±10

170±10

20.5±0.5

TITLE	ASSY_MODULE_M236H71-L01(904)	
Approved	steven_huang	
Checked	yule_lin	
Drawer	cu_chung	
Designer	cu_chung	

Drawing No. | M236H71-L01(904)
Part No. | M06H70094
Material | TBD
Date | 2010-04-12

Sheet 1 / 1 | A1
Scale 1:1 | Unit:mm

2D REV.|A
3D REV.|1.0

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Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark