TFT LCD Approval Specification

Model No : M190A1-PSA

Customer :_____

Approved by : _____

Note :

記錄	工作	審核	角色	投票
2008-07-30 10:30:34 CST	PMMD II Director	kevin_wu(吳柏勳 /56520/54894)	Director	Accept

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REVISION HISTORY

Version	Date	Section	Description
Ver. 2.0	Jul., 18 '08	-	M190A1- PSA Approval Specifications was first issued。

1. GENERAL DESCRIPTION

1.1 OVERVIEW

The M190A1-PSA is a 19-inch wide TFT LCD cell with driver ICs and a RSDS circuit board. The product supports 1440 x 900 WXGA+ mode. The backlight unit is not built in.

1.2 FEATURES

Super wide viewing angle

Super High contrast ratio

Super Fast response time

High color saturation

WXGA+ (1440 x 900 pixels) resolution

RSDS (Reduced Swing Differential Signaling) Interface

RoHS Compliance

1.3 APPLICATION

TFT LCD Monitor

TFT LCD TV

1.4 GENERAL SPECIFICATI0NS

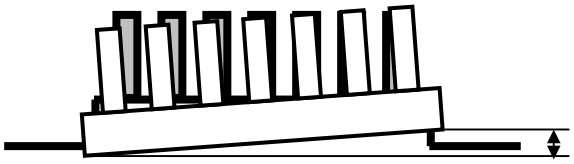
Item	Specification	Unit	Note
Diagonal Size	18.95"	inch	-
Active Area	408.24 (H) x 255.15 (V)	mm	(1)
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch	0.2835 (H) x 0.2835 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), Anti-glare (Haze 25%)	-	-

1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	-	460	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.			-	(2)

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

(2) Connector mounting position



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASE ON CMO M190A1-L0A)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

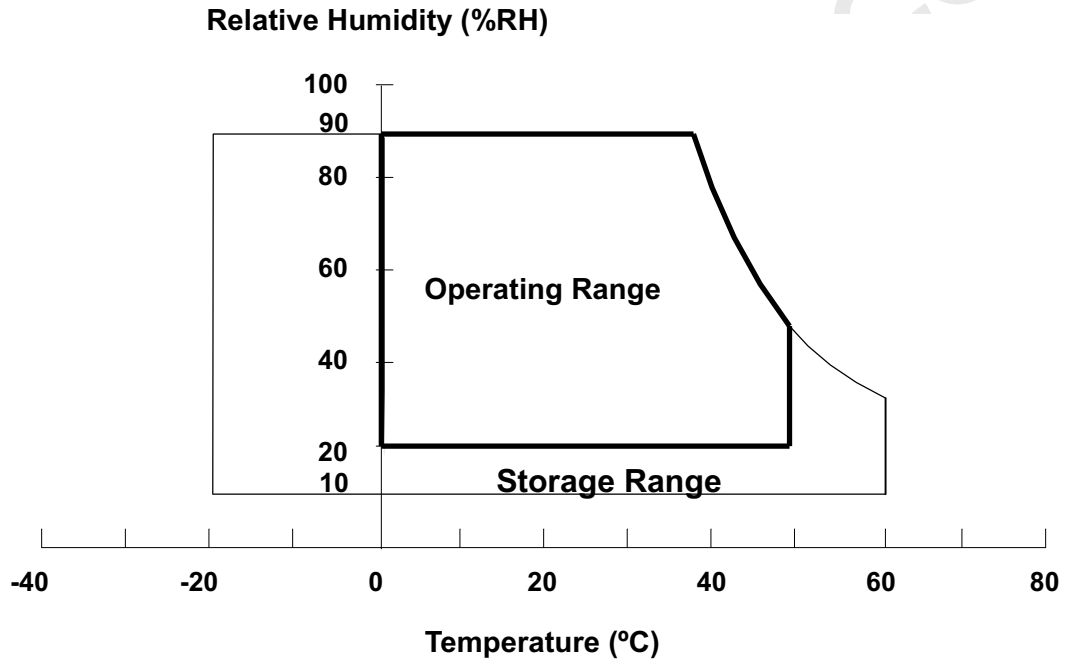
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max.



2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

High temperature or humidity may reduce the performance of panel. Please store LCD panel within the specified storage conditions.

Storage Condition: With packing.

Storage temperature range: 25±5 ºC.

Storage humidity range: 50±10%RH.

Shelf life: 30days

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage for LCD	VCCI	-0.3	+6.0	V	(1)

Note (1) Permanent damage might occur if the module is operated at conditions exceeding the maximum values.

3. ELECTRICAL CHARACTERISTICS (OPEN CELL)

3.1 TFT LCD OPEN CELL

Ta = 25 ± 2 ºC

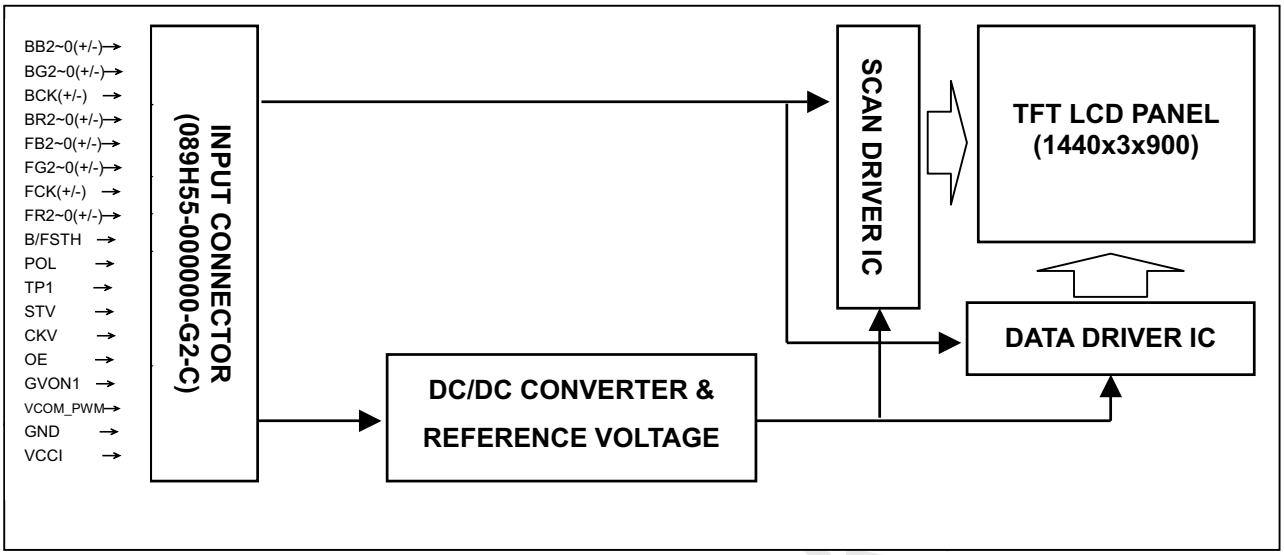
Parameter		SYMBOL	Value			UNIT	Note
			MIN	TYP	MAX		
Power Supply Voltage for LCD		VCCI	4.5	5	5.5	V	-
Power Supply Current for LCD		Icc	-	670	800	mA	(1)
Differential Impendence		Zm	-	100	-	Ω	-
LCD Inrush Current		I_{RUSH}	-	-	3	A	-
VCOM PWM	High	VCOM_PWM	2.5	-	-	V	-
	Low		-	-	0.6	V	-
VCOM PWM Frequency		VCOM_PWM	-	27	--	KHz	Adjustable Duty Cycle

Note(1) The specified power supply current is under the conditions at VCCI = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

(1)CN1 (Panel Interface)

Pin	Name	Description
1	BB2P	Positive RSDS differential data input. Channel B2(Back)
2	BB2N	Negative RSDS differential data input. Channel B2(Back)
3	BB1P	Positive RSDS differential data input. Channel B1(Back)
4	BB1N	Negative RSDS differential data input. Channel B1(Back)
5	BB0P	Positive RSDS differential data input. Channel B0(Back)
6	BB0N	Negative RSDS differential data input. Channel B0(Back)
7	BG2P	Positive RSDS differential data input. Channel G2(Back)
8	BG2N	Negative RSDS differential data input. Channel G2(Back)
9	BG1P	Positive RSDS differential data input. Channel G1(Back)
10	BG1N	Negative RSDS differential data input. Channel G1(Back)
11	BG0P	Positive RSDS differential data input. Channel G0(Back)
12	BR0N	Negative RSDS differential data input. Channel R0(Back)
13	BCKP	Positive RSDS differential clock input. (Back)
14	BCKN	Negative RSDS differential clock input. (Back)
15	BR2P	Positive RSDS differential data input. Channel R2(Back)
16	BR2N	Negative RSDS differential data input. Channel R2(Back)
17	BR1P	Positive RSDS differential data input. Channel R1(Back)
18	BR1N	Negative RSDS differential data input. Channel R1(Back)
19	BR0P	Positive RSDS differential data input. Channel R0(Back)
20	BR0N	Negative RSDS differential data input. Channel R0(Back)
21	FB2P	Positive RSDS differential data input. Channel B2(Front)
22	FB2N	Negative RSDS differential data input. Channel B2(Front)
23	FB1P	Positive RSDS differential data input. Channel B1(Front)
24	FB1N	Negative RSDS differential data input. Channel B1(Front)
25	FB0P	Positive RSDS differential data input. Channel B0(Front)
26	FB0N	Negative RSDS differential data input. Channel B0(Front)
27	FG2P	Positive RSDS differential data input. Channel G2(Front)
28	FG2N	Negative RSDS differential data input. Channel G2(Front)
29	FG1P	Positive RSDS differential data input. Channel G1(Front)
30	FG1N	Negative RSDS differential data input. Channel G1(Front)
31	FG0P	Positive RSDS differential data input. Channel G0(Front)
32	FG0N	Negative RSDS differential data input. Channel G0(Front)
33	FCKP	Positive RSDS differential clock input. (Front)
34	FCKN	Negative RSDS differential clock input. (Front)
35	FR2P	Positive RSDS differential data input. Channel R2(Front)
36	FR2N	Negative RSDS differential data input. Channel R2(Front)
37	FR1P	Positive RSDS differential data input. Channel R1(Front)
38	FR1N	Negative RSDS differential data input. Channel R1(Front)
39	FR0P	Positive RSDS differential data input. Channel R0(Front)
40	FR0N	Negative RSDS differential data input. Channel R0(Front)
41	BSTH	Data driver start pulse input(Back)
42	FSTH	Data driver start pulse input(Front)
43	POL	Data driver polarity inverting input
44	TP1	The contents of the data driver register are transferred to the latch circuit at the rising edge of TP1. Then the gray scale voltage is output from the device at the falling edge of TP1.
45	STV	Gate driver start pulse is read at the rising edge of CKV and a scan signal is output from the gate driver output pin.

46	CKV	Gate driver shift clock
47	OE	This pin is used to control the Gate driver output. When OE input is “H”, gate driver output is fixed to VGL level regardless CKV.
48	GVON1	Gate driver high voltage switch timing control.
49	VCOM_PWM	This pin is used to generate common voltage for panel. Adjust pulse width could be changed common voltage.
50	GND	Ground
51	GND	Ground
52	GND	Ground
53	VCCI	Input Voltage +5V
54	VCCI	Input Voltage +5V
55	VCCI	Input Voltage +5V

Note (1) Connector Part No.: 089H55-000000-G2-C

5.2 COLOR DATA INPUT ASSIGNMENT

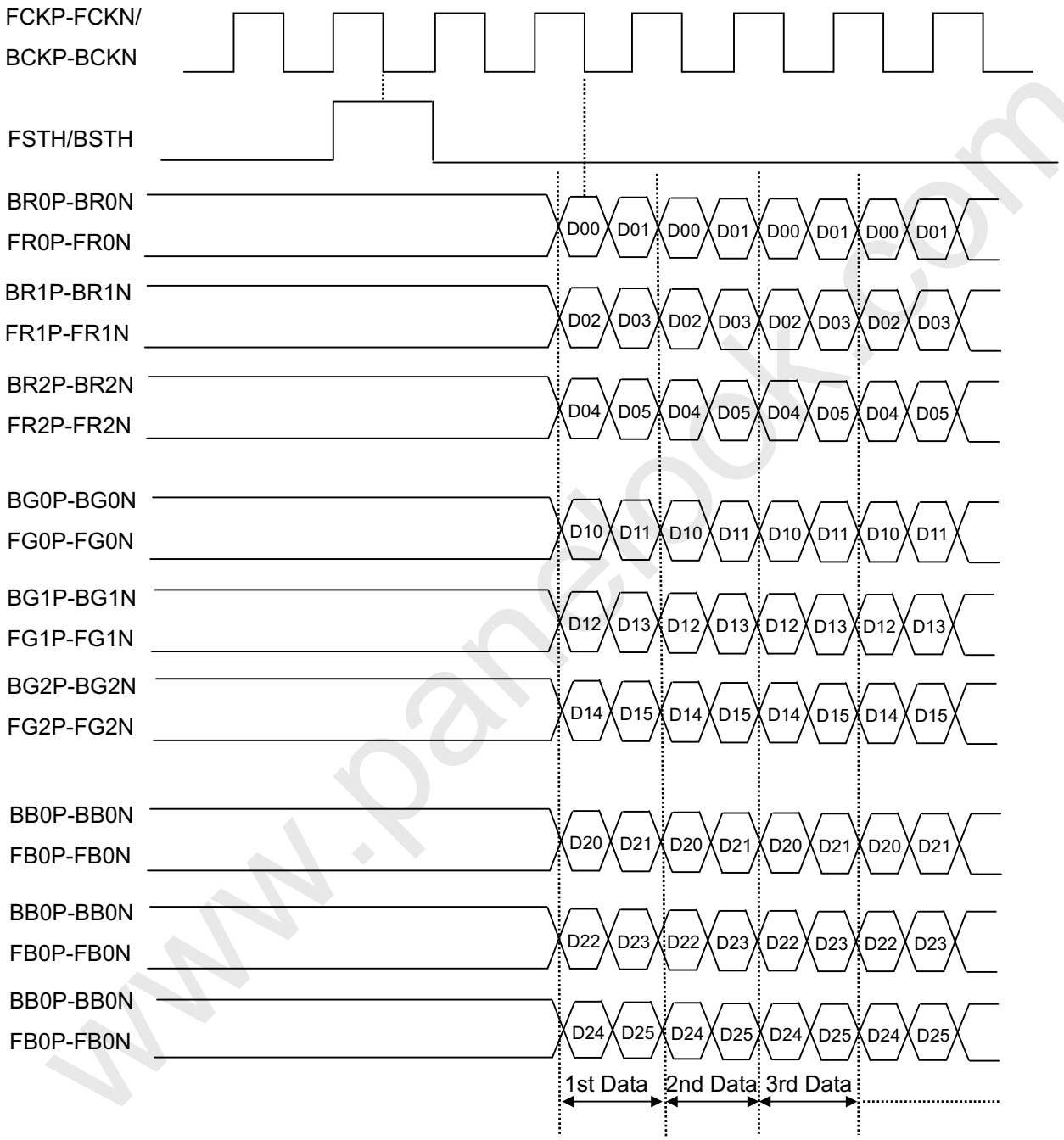
The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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

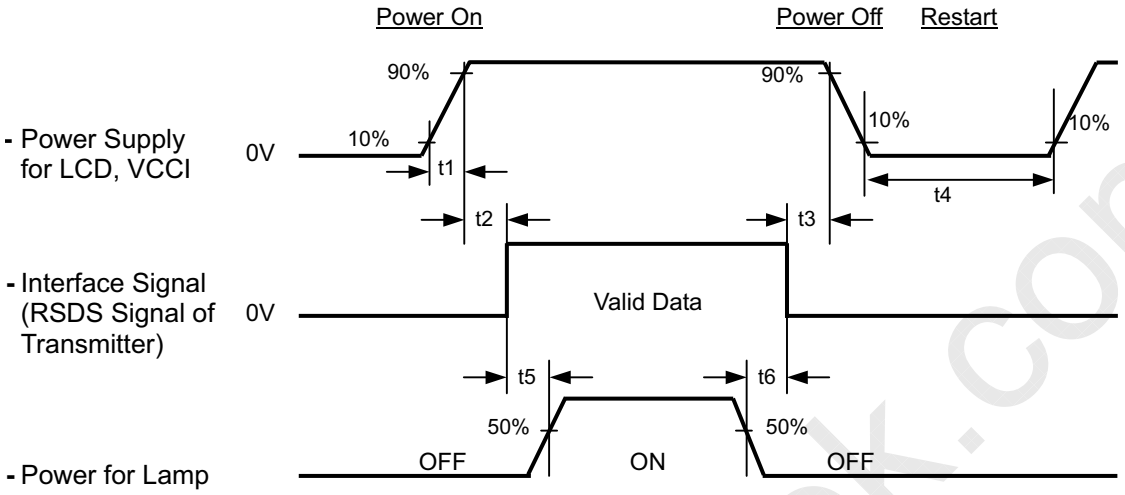
6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS



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 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3 ≦ 50 msec

t4 ≧ 500 msec

t5 ≧ 450 msec

t6 ≧ 90 msec

Note.

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

(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 VCCI = 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.

7. Driver DC CHARACTERISTICS

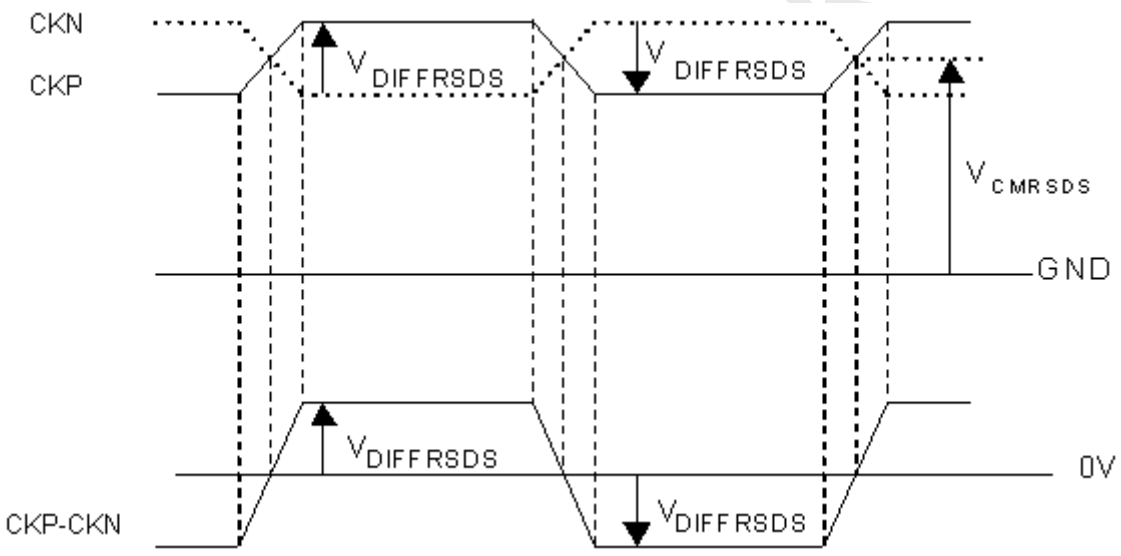
7.1 ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
RSDS input "Low" Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = + 1.2 V (1)	-	-200	-100	mV
RSDS input "High" Voltage	$V_{DIFFRSDS}$		100	200	-	mV
RSDS reference voltage	V_{CMRSDS}	$V_{DIFFRSDS}$ = + 200 mV (2)	1.0	1.2	1.4	V
Input "Low" voltage	V_{IL}	FSTH, BSTH, TP1, POL	0	-	0.66	V
Input "High" voltage	V_{IH}		2.64	-	3.3	V

Note:

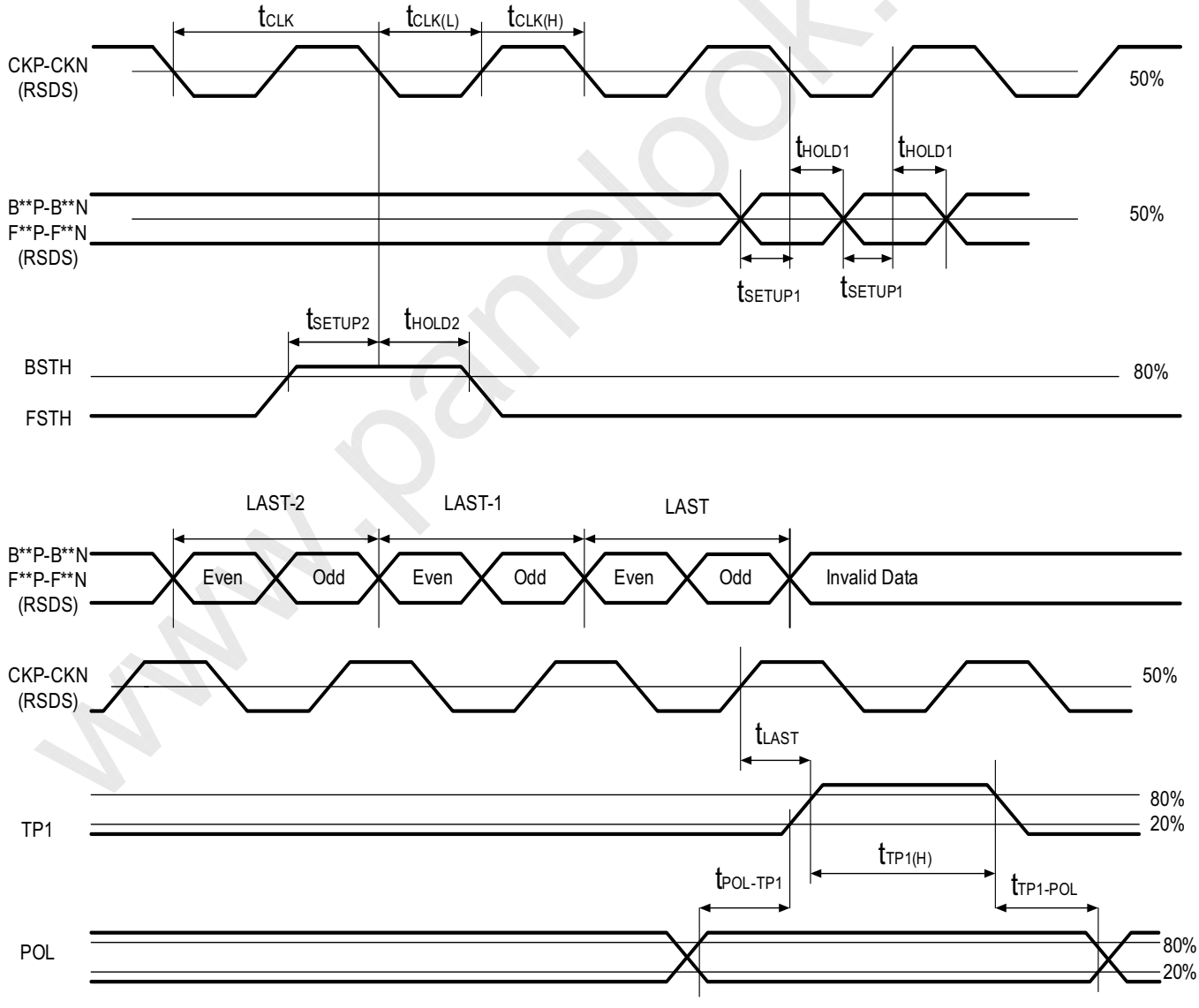
(1) VCMRSDS = (VCKP + VCKN) / 2 or VCMRSDS = (VB/FxxP + VB/FxxN) / 2

(2) VDIFFRSDS = VCKP - VCKN or VDIFFRSDS = VB/FxxP – VB/FxxN



8. Driver AC CHARACTERISTICS

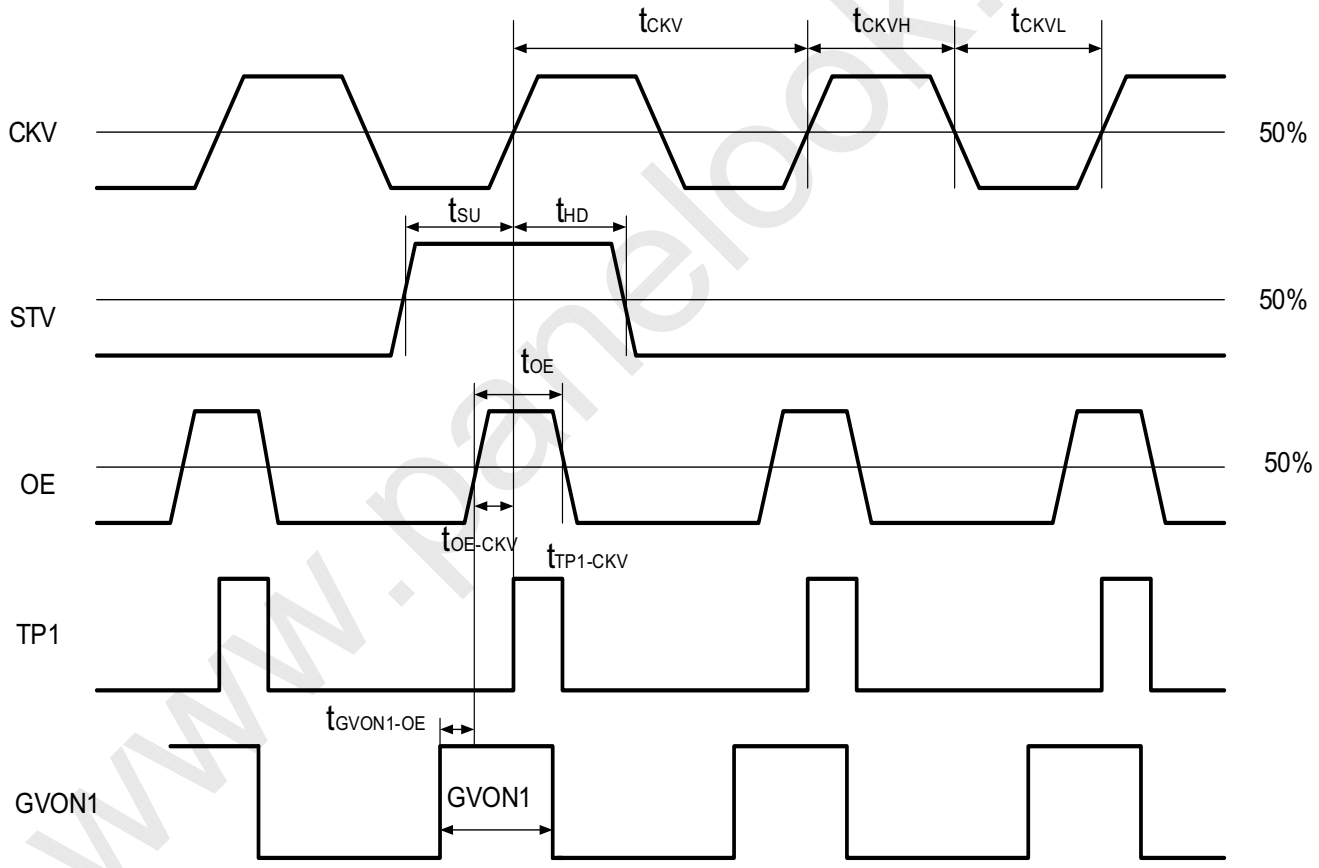
Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
Clock pulse width	t_{CLK}	-	11	-	-	ns
Clock pulse low period	$t_{CLK(L)}$	-	5	-	-	ns
Clock pulse high period	$t_{CLK(H)}$	-	5	-	-	ns
RSDS data setup time	t_{SETUP1}	-	2.6	-	-	ns
RSDS data hold time	t_{HOLD1}	-	1.5	-	-	ns
Start pulse setup time	t_{SETUP2}	-	2.3	-	-	ns
Start pulse hold time	t_{HOLD2}	-	1.8	-	-	ns
TP1 high period	$t_{TP1(H)}$	-	15	-	-	CLKP
Last data CLK to TP1 high	t_{LAST}	-	1	-	-	CLKP
TP1 high to F/BSTH high	t_{NEXT}	-	6	-	-	CLKP
POL to TP1 setup time	$t_{POL-TP1}$	POL toggle to TP1 rising	3	-	-	ns
TP1 to POL hold time	$t_{TP1-POL}$	TP1 falling to POL toggle	2	-	-	ns



9. VERTICAL TIMING

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
CKV period	t_{CKV}	-	5	-	-	μs
CKV pulse width	t_{CKVH}, t_{CKVL}	50% duty cycle	2.5	-	-	
OE pulse width	t_{OE}	-	1	-	-	
STV to CKV setup time	t_{SU}	-	700	-	-	ns
CKV to STV hold time	t_{HD}	-	700	-	-	ns
OE to CKV time	t_{OE-CKV}	-	0.5	-	-	μs
TP1 to CKV	$t_{TP1-CKV}$	-	0	0	0	μs
GVON1 to OE	$t_{GVON1-OE}$	-	0.5	-	-	us
GVON1 pulse width	t_{GVON1}	-	1.5	-	-	μs

Note 1:OE, TP1 frequency same as CKV



10. OPTICAL CHARACTERISTICS

10.1 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"		
Lamp Current	I_L	7.0	mA
Inverter Operating Frequency	F_L	55	KHz
Inverter	Darfon VK.13165.101		

10.2 OPTICAL SPECIFICATIONS

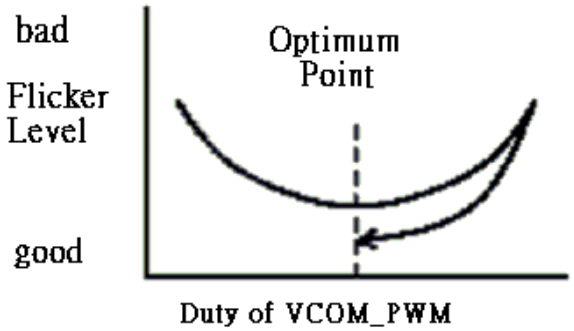
The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 9.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rcx	θ_x=0°, θ_Y =0° CS-1000T Standard light source "C"	Typ - 0.03	0.653	Typ + 0.03	-	(0),(6)
		Rcy			0.329		-	
	Green	Gcx			0.275		-	
		Gcy			0.598		-	
	Blue	Bcx			0.146		-	
		Bcy			0.193		-	
	White	Wcx			0.320		-	
		Wcy			0.360		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° CS-1000T, CMO BLU	5.0	5.6	-	%	(1), (8)
Contrast Ratio		CR		630	1000	-	-	(1), (3)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	1.5	6.5	ms	(4)
		T_F		-	3.5	8.5	ms	
Transmittance uniformity		δT%	θ_x=0°, θ_Y =0° CA-210	-	1.25	1.4	-	(1), (7)
Viewing Angle	Horizontal	θ_x+	CR≥10 BM-5A	75	85	-	Deg.	(1), (2) (6)
		θ_x-		75	85	-		
	Vertical	θ_Y+		70	80	-		
		θ_Y-		70	80	-		

10.3 FLICKER ADJUSTMENT

Adjustment Method：

Flicker should be adjusted by turning the duty of VCOM_PWM (refer to 5.1). It is adjusted to the point with least flickering of the whole screen. After making it surely overrun at once, it should be adjusted to the optimum point.



Note (0) Light source is the standard light source “C” which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following：

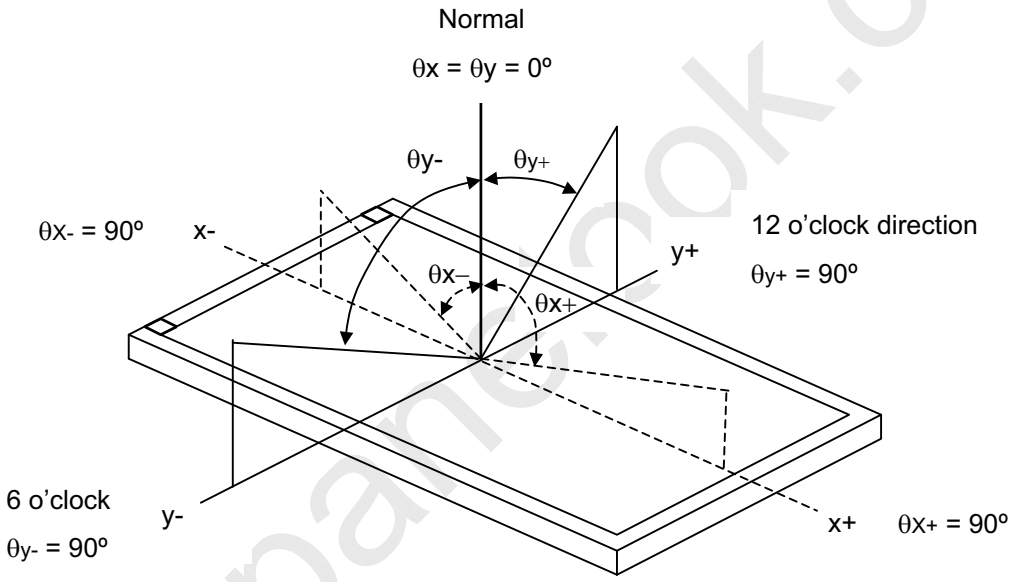
Measure Module’s and BLU’s spectrums. White is without signal input and R, G, B are with signal input. BLU(for M190A1-L0A BLU) is supplied by CMO.

Calculate cell’s spectrum.

Calculate cell’s chromaticity by using the spectrum of standard light source “C”

Note (1) Light source is the BLU which is supplied by CMO and driving voltages are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

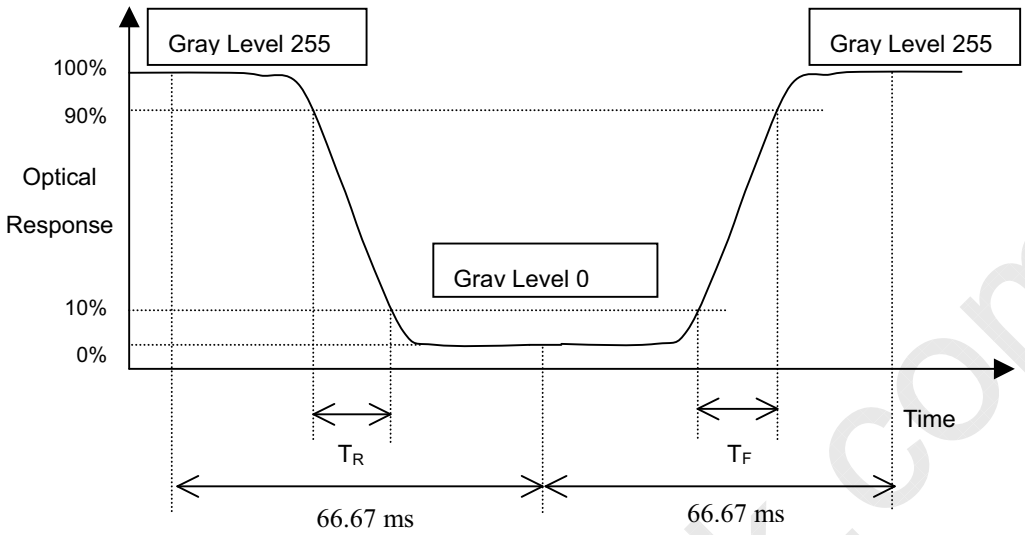
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1)

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

Note (4) Definition of Response Time (T_R, T_F):



Note (5) Definition of Luminance of White (L_C):

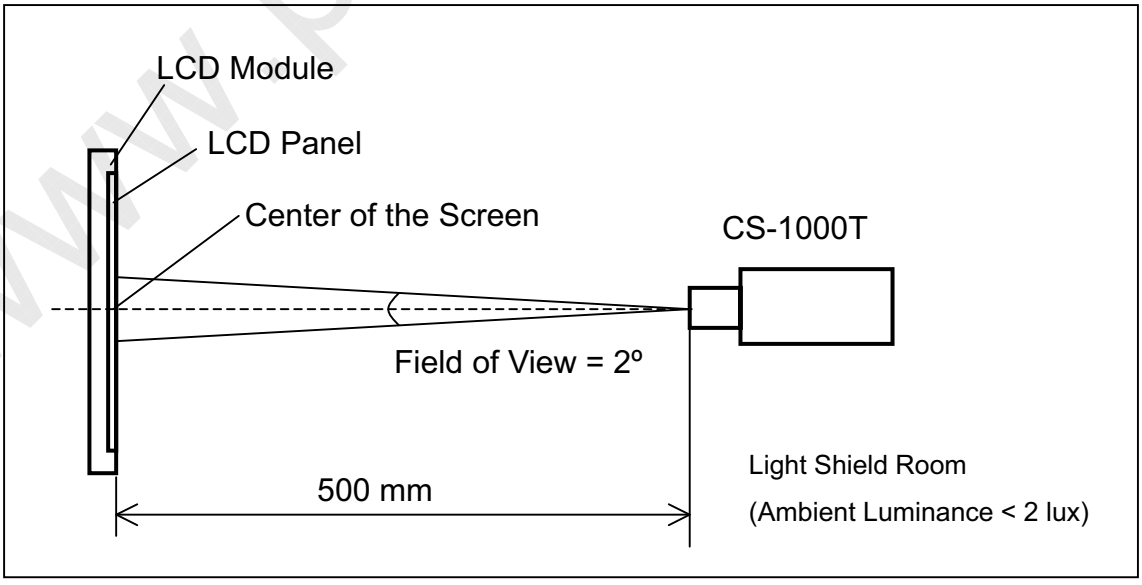
Measure the luminance of gray level 255 at center point

L_C = L (1)

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

Note (6) Measurement Setup:

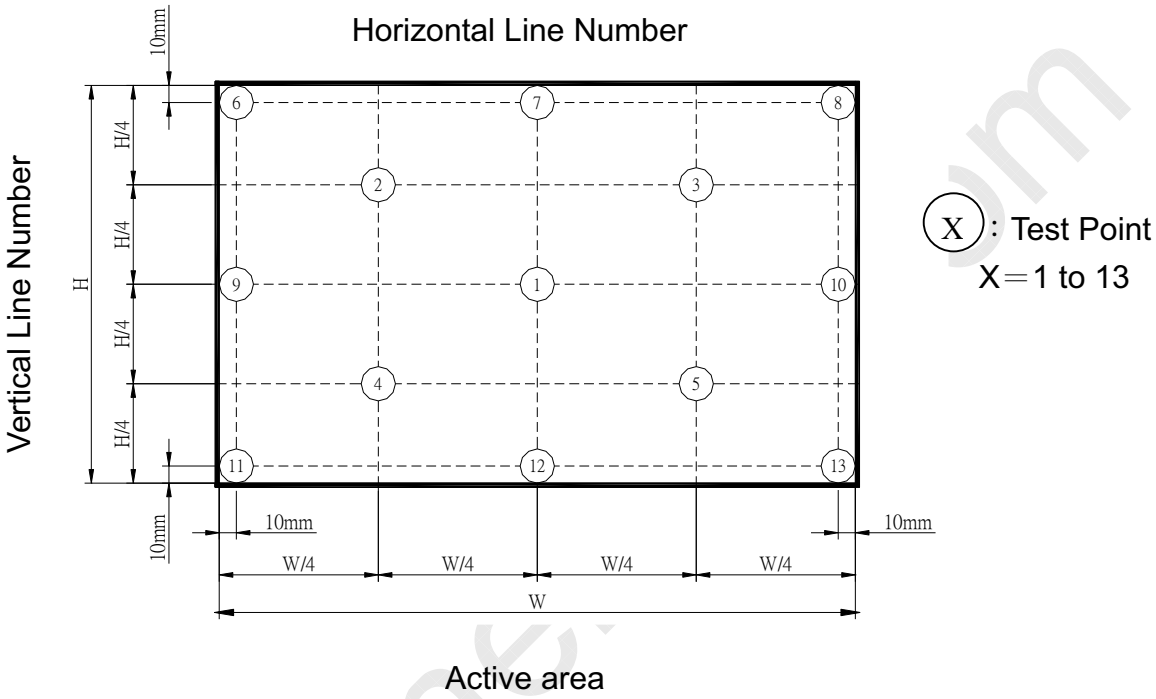
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (7) Definition of Transmittance Variation (δT%):

Measure the transmittance at 13 points

$$\delta T\% = \frac{\text{Maximum [L (1), L (2),.....L (12), L (13)]}}{\text{Minimum [L (1), L (2),..... ....L (12), L (13)]}}$$



Note (8) Definition of Transmittance (T%):

Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

11. PACKAGING

11.1 PACKING SPECIFICATIONS

(1) 27 open cells / 1 Box

(2) Box dimensions: 570 (L) X 450 (W) X 315 (H) mm

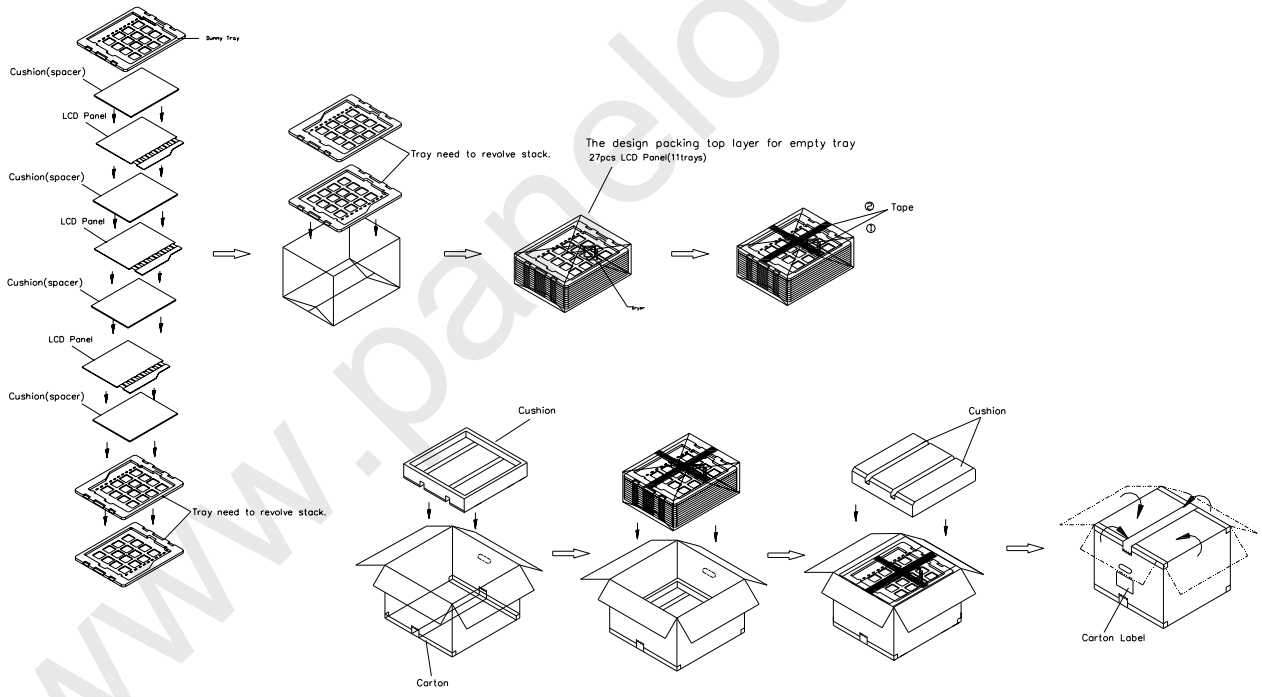
(3) Weight: approximately 19.8Kg (27 open cells per box)

11.2 PACKING METHOD

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

Test Item	Test Conditions	Note
Packing Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation

(2) Packing method.

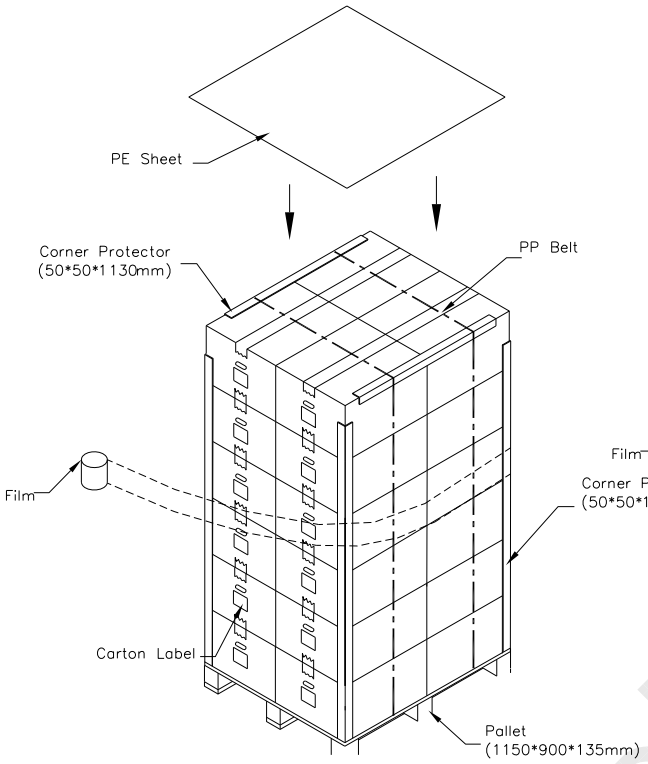


(1) 27 LCD Cells+PCB/1 box

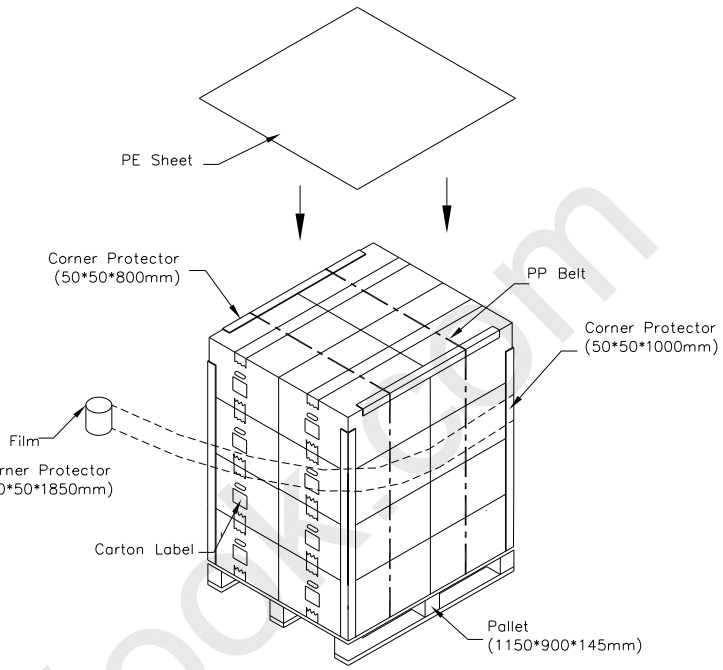
(2) Carton dimensions : 570(L)x450(W)x315(H)mm

(3) Weight :approximately 19.8kg(27 Cells per Carton).

Sea and Land Transportation



Air Transportation



12. DEFINITION OF LABELS

12.1 CMO OPEN CELL LABEL

The barcode nameplate is pasted on each OPEN CELL as illustration for CMO internal control.

Barcode definition:

Serial ID: CM-19A1A-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
19A1A	Model number	M190A1-PSA=19A1A
X	Revision code	C1:1, C2:2,…
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
L	Cell line #	0~12=1~C
XX	Module location	Tainan, Taiwan=TN
L	Module line #	0~12=1~C
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… 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	Manufacturing sequence of product

12.2 CARTON LABEL

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

Model Name: M190A1 –PSA

Carton ID: CMO internal control

Quantities: 27 pcs

13. PRECAUTIONS

13.1 ASSEMBLY AND HANDLING PRECAUTIONS

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

(2) To assemble backlight 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 will be damaged.

(4) Always follow the correct power sequence when the product 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) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

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

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

13.2 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 product's end of life, it is not harmful in case of normal operation and storage.

14. PANEL DRAWING