TFT LCD Approval Specification

MODEL NO.: V260B1 – PN3

Customer: _____

Approved by: _____

Note:

Approved By	TV Head Division
	LY Chen

Reviewed By	QA Dept.	Product Development Div.
	Hsin-Nan Chen	WT Lin

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CONTENTS -

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Jun. 19,'09	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V260B1- PN3 is a 26-inch TFT LCD cell with driver ICs and RSDS interface. This module supports 1366 x 768 WXGA format and can display 16.7M colors (6-bit+High FRC colors). The backlight unit is not built in.

1.2 CHARACTERISTICS

CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	26.0
Pixels [lines]	1366×768
Active Area [mm]	575.769×323.712
Sub -Pixel Pitch [mm]	0.1405(H)×0.4215(V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 1000
Physical Size [mm]	592(W) x 339.8(H) x 1.84(D) Typ.
Display Mode	TN, Normally White
Contrast Ratio	800:1 Typ. (Typical value measured at CMO's module)
Glass thickness (Array/CF) [mm]	0.6/0.6
Viewing Angle (CR>10)	+80/-80(H), +70/-60(V) Typ. (Typical value measured at CMO's module)
Color Chromaticity	R=(0.649, 0.328) G=(0.269,0.583) B=(0.150,0.088) W=(0.308,0.321) *Please refer to "color chromaticity" on p.12
Cell Transparency [%]	6.2%Typ. (Typical value measured at CMO's module)
Polarizer (CF side)	Anti-Glare coating, 587.4(H) x 335.2(w). Hardness: 3H
Polarizer (TFT side)	587.4(H) x 335.2(w), Hardness: 3H

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	737	-	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

+/- 0.5mm

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

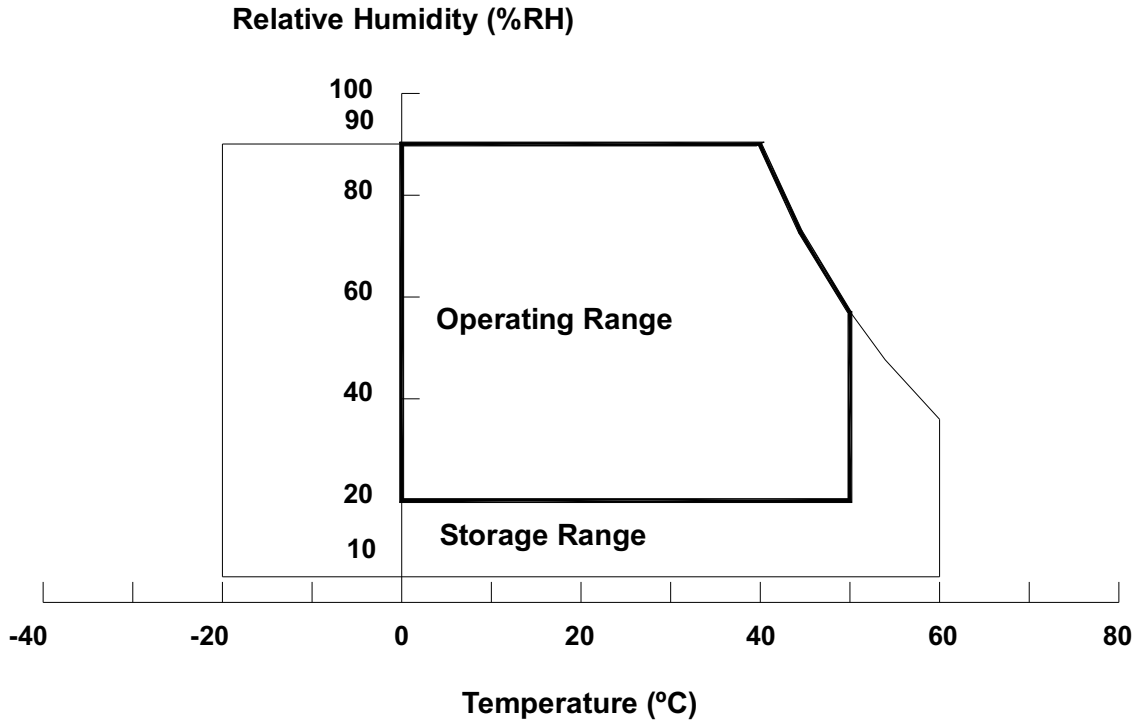
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

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

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition : With shipping package.

Storage temperature range : 25±5 ℃

Storage humidity range : 50±10%RH

Shelf life : a month

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VIN5	4.5	5.5	V	(1)
Logic Input Voltage	VDD	-0.3	3.6	V	

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.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VIN5	4.5	5.0	5.5	V	
		VDD	3.1	3.3	3.5	V	
Power Supply Current		I5V	-	1000	-	mA	
		I3.3V	-	50	-	mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

3.2 RSDS CHARACTERISTICS

Ta = 25 ± 2 ºC

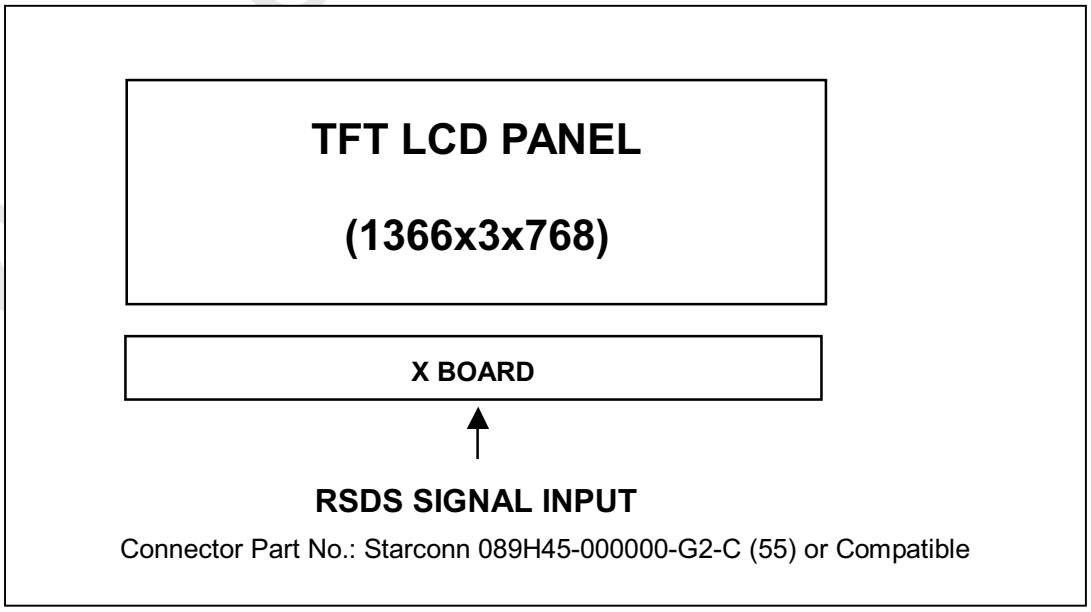
Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
RSDS high input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	100	200	-	mV
RSDS low input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	-	-200	-100	mV
RSDS common mode input voltage range	V_{CMRSDS}	$V_{DIFFRSDS}$ = 200mV (2)	0.1	1.2	VDD-1.2	V
RSDS Input leakage current	I_{DL}	$D_{xx}P$, $D_{xx}N$,CLKO ,CLPN	-10	-	10	μA

Note (1) V_{CMRSDS} = (VCLKP + VCLKN)/2 or V_{CMRSDS} = ($VD_{XX}P$ + $VD_{XX}N$)/2

Note (2) $V_{DIFFRSDS}$ = VCLKP - VCLKN or $V_{DIFFRSDS}$ = $VD_{XX}P$ - $VD_{XX}N$

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

CN2(X) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	29	TP1	RSDS data latch
2	NC	No connection	30	POL	polarity invert
3	NC	No connection	31	GND	Ground
4	GND	Ground	32	NC	No connection
5	B2P	RSDS data signal (Blue2)	33	VDD	Logic Power supply: +3.3V
6	B2N	RSDS data signal (Blue2)	34	VDD	Logic Power supply: +3.3V
7	B1P	RSDS data signal (Blue1)	35	VIN5	Power supply: +5V
8	B1N	RSDS data signal (Blue1)	36	VIN5	Power supply: +5V
9	B0P	RSDS data signal (Blue0)	37	VIN5	Power supply: +5V
10	B0N	RSDS data signal (Blue0)	38	STV	Scan driver start pulse
11	G2P	RSDS data signal (Green2)	39	CKV	Scan driver clock
12	G2N	RSDS data signal (Green2)	40	OE	Scan driver output enable
13	G1P	RSDS data signal (Green1)	41	NC	No connection
14	G1N	RSDS data signal (Green1)	42	NC	No connection
15	G0P	RSDS data signal (Green0)	43	GVOFF	3-level power control signal
16	G0N	RSDS data signal (Green0)	44	NC	No connection
17	CLKP	Data driver clock	45	GND	Ground
18	CLKN	Data driver clock			
19	R2P	RSDS data signal (Red2)			
20	R2N	RSDS data signal (Red2)			
21	R1P	RSDS data signal (Red1)			
22	R1N	RSDS data signal (Red1)			
23	R0P	RSDS data signal (Red0)			
24	R0N	RSDS data signal (Red0)			
25	GND	Ground			
26	NC	No connection			
27	NC	No connection			
28	STH	source driver start pulse			

Note (1) CN2 Connector Part No.: HIROSE FH12-45S-0.5SH (55) or Compatible.

5.2 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					
		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

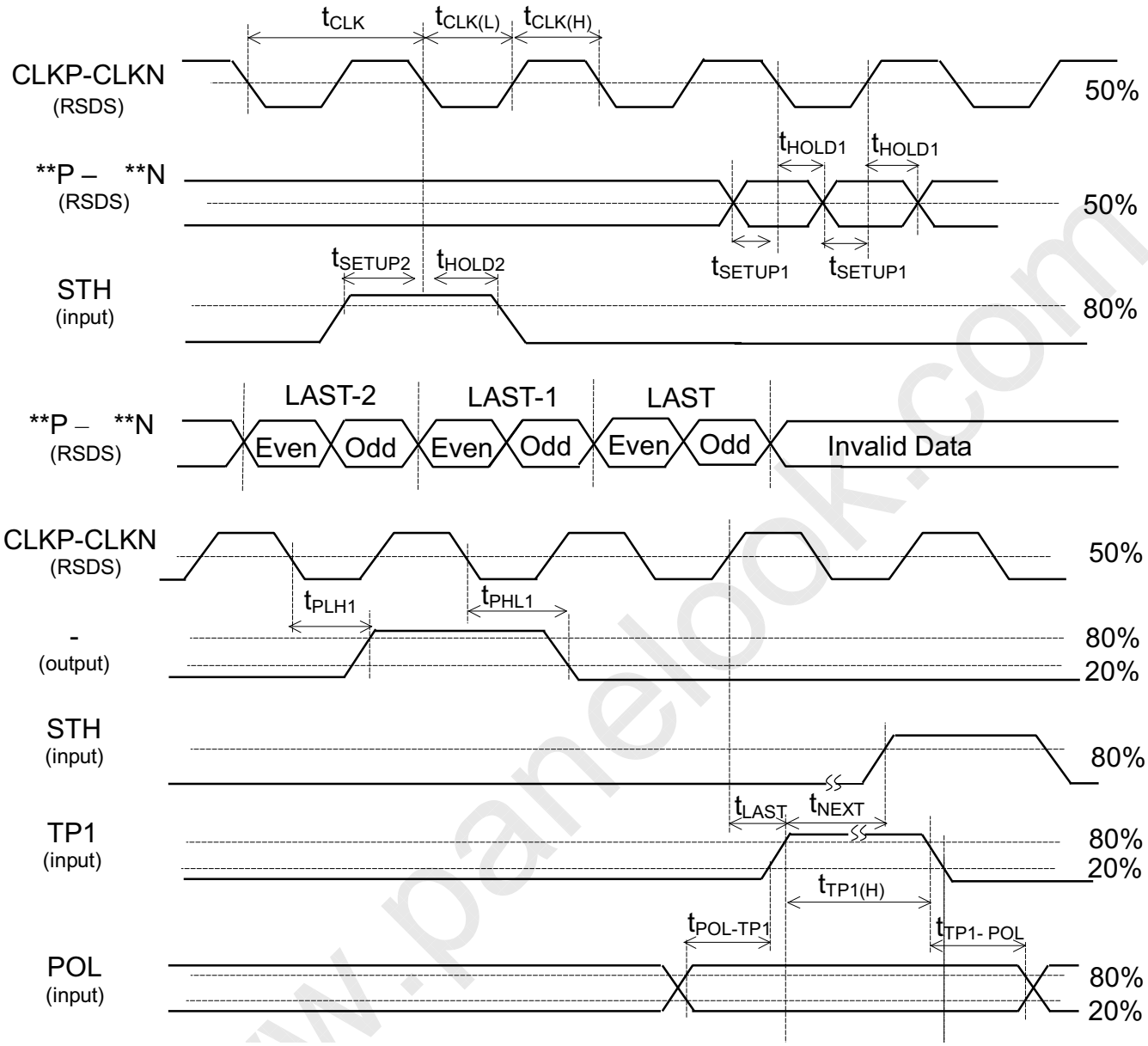
6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

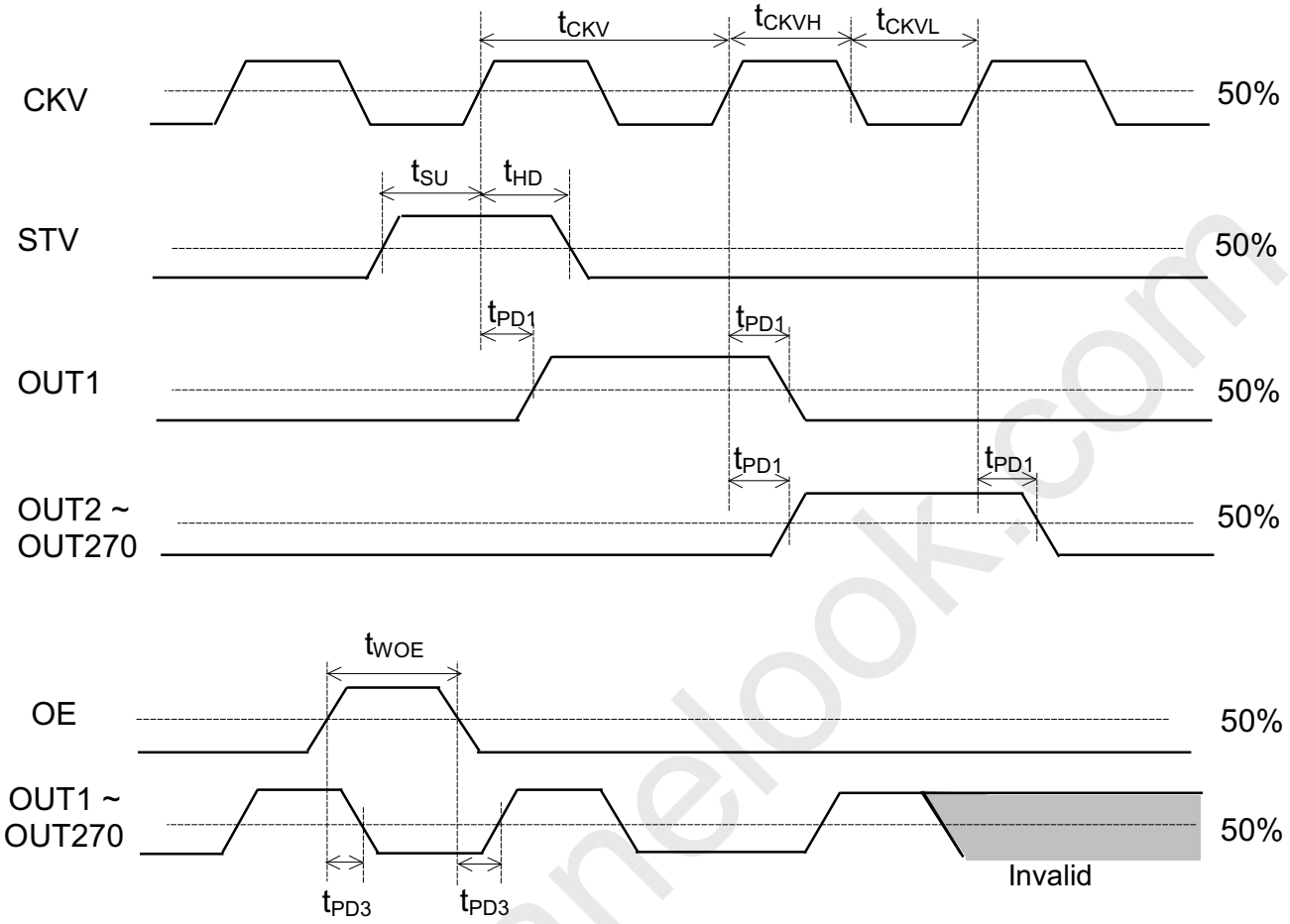
(a) Timing Spec

	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD (1)	Clock pulse width	t_{CLK}	-	12.5	-	-	ns
	Clock pulse low period	$t_{CLK(L)}$	-	5	-	-	ns
	Clock pulse high period	$t_{CLK(H)}$	-	5	-	-	ns
	Data setup time	t_{SETUP1}	-	4	-	-	ns
	Data hold time	t_{HOLD1}	-	1	-	-	ns
	Start pulse setup time	t_{SETUP2}	-	2	-	-	ns
	Start pulse hold time	t_{HOLD2}	-	2	-	-	ns
	TP1 high period	$t_{TP1(H)}$	-	15	-	-	CLKP
	Last data CLK to TP1 high	t_{LAST}	-	1	-	-	CLKP
	TP1 high to STH 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
VD	CKV period	t_{CKV}	-	5	-		μs
	CKV pulse width	t_{CKVH}, t_{CKVL}	50% duty cycle	2	-		μs
	OE pulse width	t_{WOE}	-	1	-		μs
	Data setup time	t_{SU}	-	0.5	-		μs
	Data hold time	t_{HD}	-	0.5	-		μs
	CKV to output delay time	t_{PD1}	CL=300pF	-	-	1	μs
	OE to output delay time	t_{PD3}	CL=300pF	-	-	0.8	μs

(b) Horizontal Timing Chart

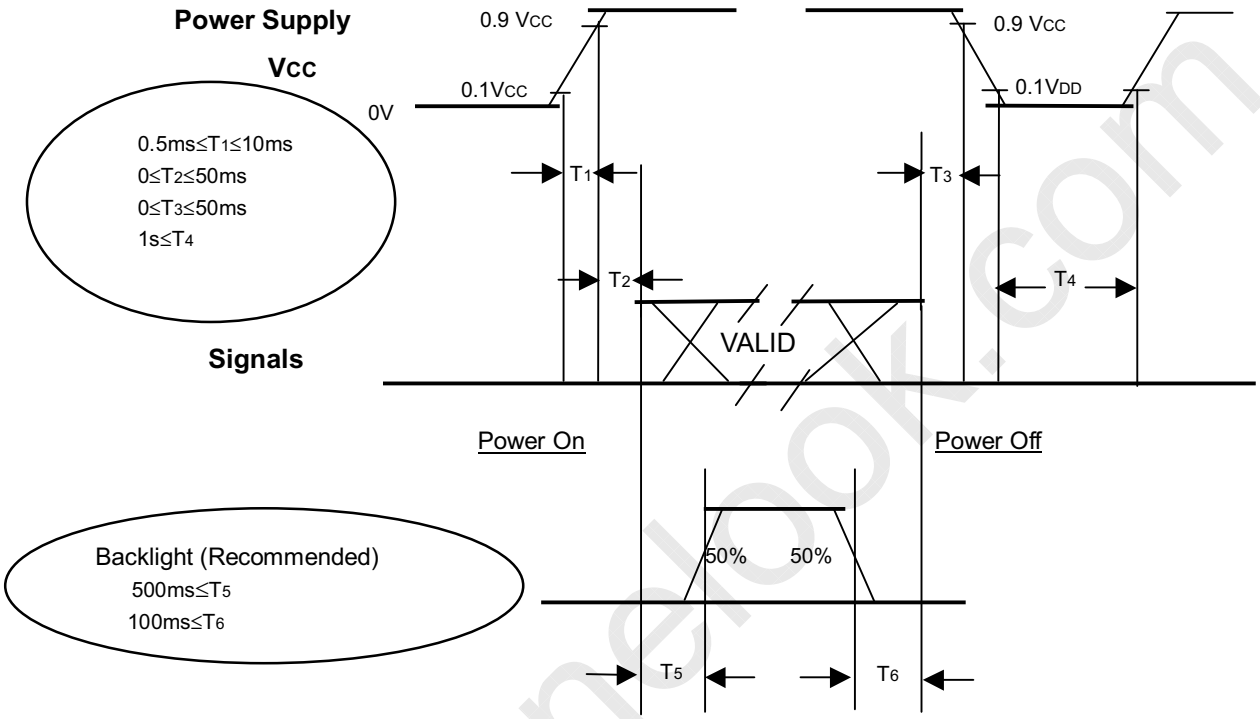


(c) Vertical Timing Chart



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.



Power ON/OFF Sequence

Note :

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

(2) Please 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, instantly, function abnormally.

(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 on/off periods.

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

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"		
Lamp Current (High side)	I_L	7.5mA ± 0.5	mA
Oscillating Frequency (Inverter)	F_W	58±3	KHz
Frame rate		60	Hz

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	Red	Rcx	θ_x=0°, θ_Y =0° Viewing Angle at Normal Direction Standard light source "C"	-	0.649	-	-	(0),(5)
		Rcy			0.328		-	
	Green	Gcx			0.269		-	
		Gcy			0.583		-	
	Blue	Bcx			0.150		-	
		Bcy			0.088		-	
	White	Wcx			0.308		-	
		Wcy			0.321		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° with CMO module	-	6.2	-	%	(1),(7)
Contrast Ratio		CR		600	800	-		(1),(3)
Response Time		T_R	θ_x=0°, θ_Y =0° with CMO Module@60Hz	-	3	5	ms	(4)
		T_F		-	5	8	ms	
White Variation		δW	θ_x=0°, θ_Y =0° with CMO module	-	-	1.3	-	(1),(6)
Viewing Angle	Horizontal	θ_x+	CR≥10 With CMO module	70	80	-	Deg.	(1),(2)
		θ_x-		70	80	-		
	Vertical	θ_Y+		70	80	-		
		θ_Y-		60	70	-		

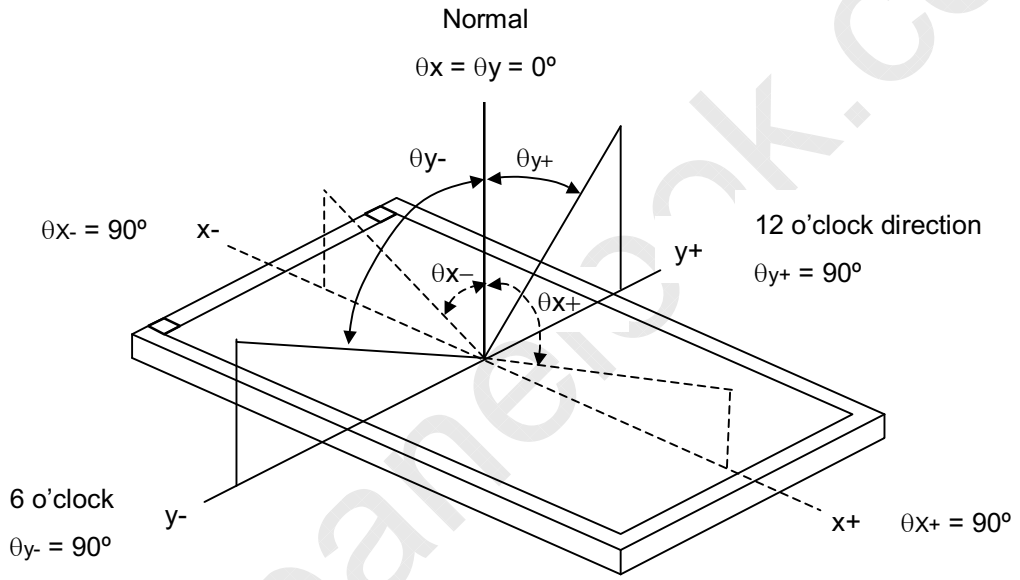
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrum. White is without signal input and R,G,B are with signal input. BLU(for V260B1-LN1) is supplied by CMO.
2. Calculate cell's spectrum.
3. 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 voltage are based on suitable gamma voltages.

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

Viewing angles are measured by EZ-Contrast 160R (Eldim)



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

The contrast ratio can be calculated by the following expression.

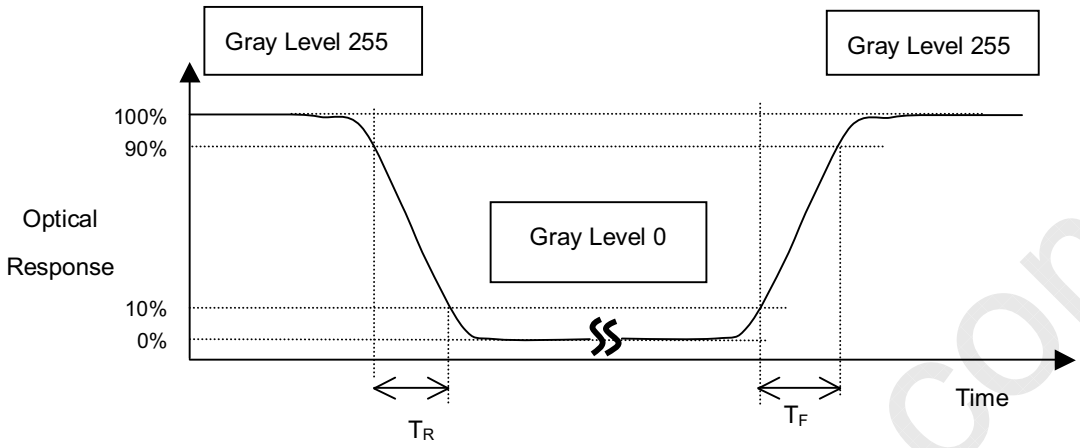
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

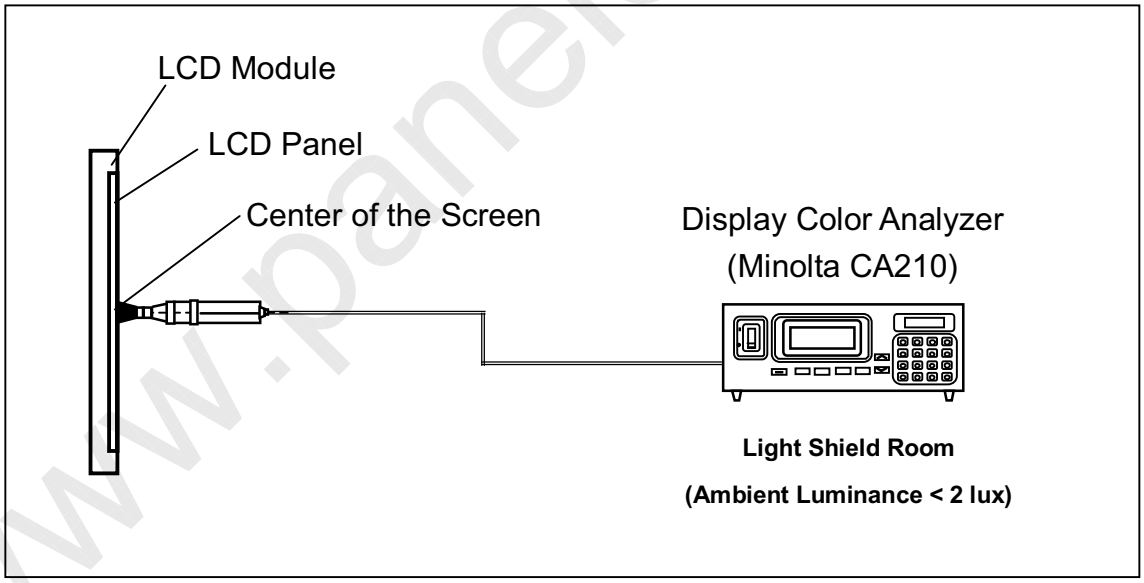
CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

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



Note (5) Measurement Setup:

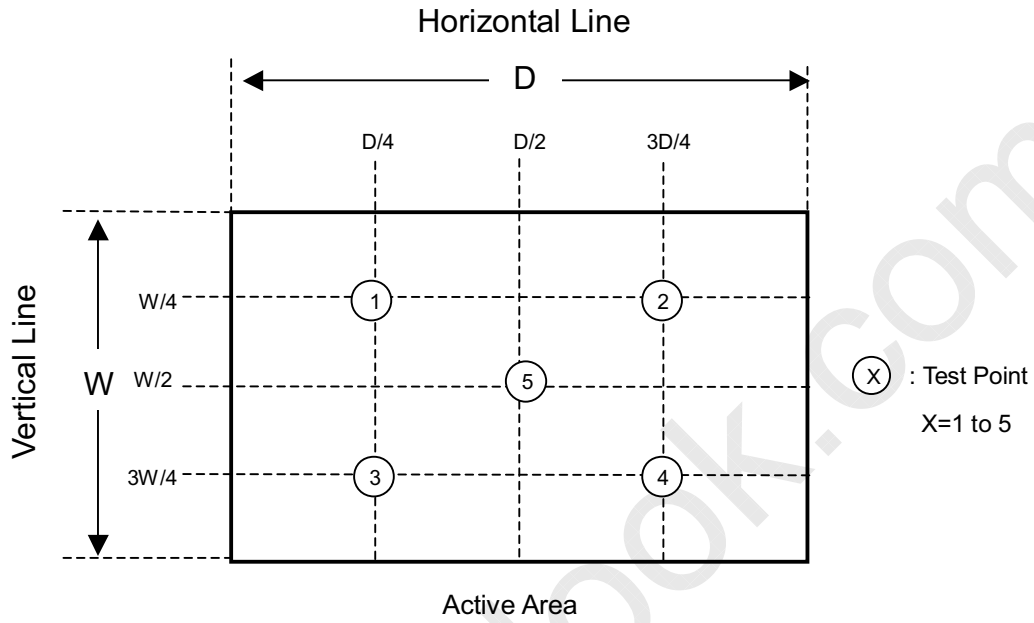
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



Note (7) Definition of Transmittance (T%) :

Module is without signal input.

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

8. PRECAUTIONS

8.1 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.

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

9. PACKAGING

9. Packing

9.1 PACKING SPECIFICATIONS

(1) 15 LCD TV Panels / 1 Box

(2) Box dimensions : 804 (L) X 565 (W) X 363 (H)

(3) Weight : approximately 23.5 Kg (15 panels per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

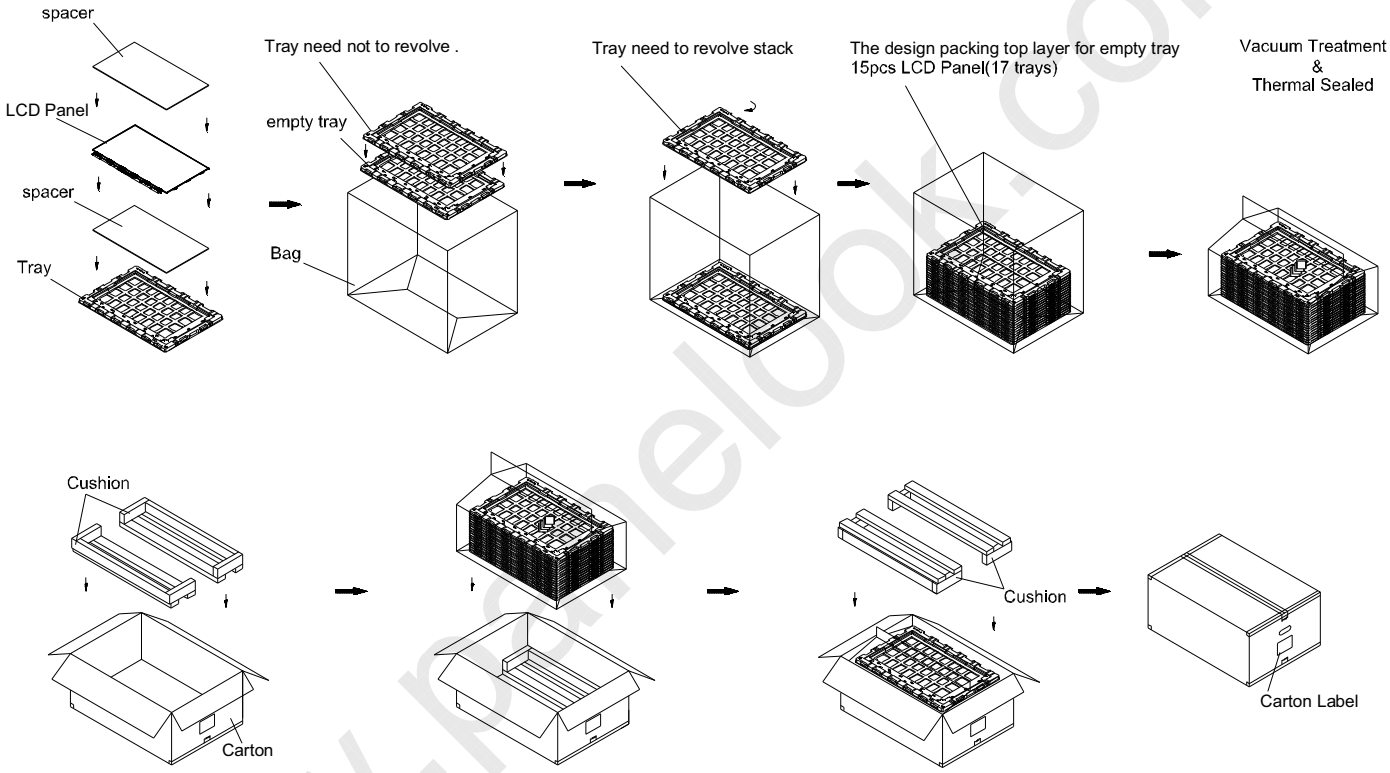


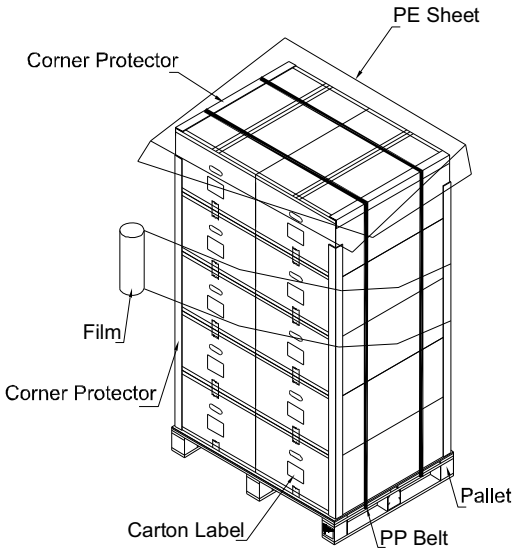
Figure.9-1 Packing Method

Sea Transportation

Corner Protector:L1650*50*50mm
L800*50*50mm
Pallet:L1150*W840*H140mm
Pallet Stack:L1150*W840*H1960mm
Gross:265kg

Air Transportation

Corner Protector:L1250*50*50mm
L800*50*50mm
Pallet:L1150*W840*H140mm
Pallet Stack:L1150*W840*H1597mm
Gross:215kg



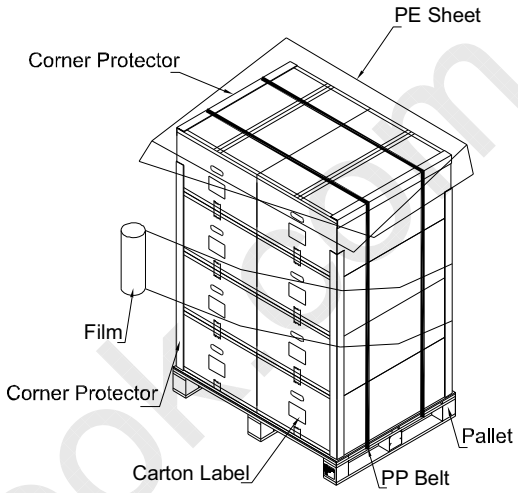


Figure.9-2 Packing Method

10. REGULATORY STANDARDS

10.1 SAFETY

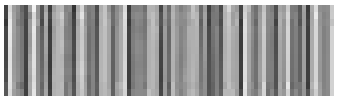
Regulatory	Item	Standard
Information Technology equipment	UL	UL 60950-1: 2003
	cUL	CAN/CSA C22.2 No.60950-1-03
	CB	IEC 60950-1:2001
Audio/Video Apparatus	UL	UL 60065: 2003
	cUL	CAN/CSA C22.2 No.60065-03
	CB	IEC 60065:2001

11. DEFINITION OF LABELS

11.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMO internal control.

V260B1-PN3



XXXXXXXXXXXXX

V260B1-PN3 Rev.

XXXXXXXXXXXXX

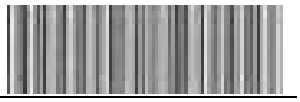
11.2 CARTON LABEL

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

P.O. NO._____

Parts ID._____

Carton ID._____ Quantities 15



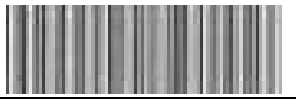
XXXXXXXXXXXXX

Made in Taiwan

P.O. NO._____

Parts ID._____

Carton ID._____ Quantities 15



XXXXXXXXXXXXX

Made in China

(a) Model Name: V260B1– PN3

(b) Carton ID: CMO internal control

(c) Quantities: 15

12. MECHANICAL DRAWING