Top Victory Electronics CO., LTD

TFT LCD Approval Specification

Model No.: TPM215HW01-HGEL03 (REV. C1B)
(LCM No.: LMM215HGE03A00A)

Issued Date：Oct.17.2011

Signature of Customer

Published by R&D Division LCM Dept

Approved by	Checked by	Prepared by
		陳明淙

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REVISION HISTORY

Ver.	Page	Revised Descriptions	Date	Revision	Approval
V00	All	First Issue	Oct.17.11	Allen Chen	

1. GENERAL DESCRIPTION

1.1 OVERVIEW

TPM215HW01-HGEL03 is a 21.5” TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1920 x 1080 Full HD mode and can display up to 16.7M colors.The converter module for Backlight is not built in.

1.2 FEATURES

- Contrast ratio 700:1
- Response time 5ms.
- Brightness 200nits(Typ.)
- LVDS (Low Voltage Differential Signaling) interface.
- RoHS compliance.

1.3 APPLICATION

- Workstation & desktop monitor
- Display terminals for AV application

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Screen Size	21.53” real diagonal		
Driver Element	a-si TFT active matrix -	-	
Pixel Number	1920 x R.G.B. x 1080 pixel	Pixel	
Pixel Pitch	0.2482 (H) x 0.2482 (V) mm	mm	
Pixel Arrangement	RGB vertical stripe -	-	
Display Colors	16.7M color	-	
Tran missive Mode□	Normally white	Color	
Surface Treatment	AG type, 3H hard coating, Haze 25%	-	
Luminance, White	200 cd/m2	Cd/m^2	
Power Consumption	Total (20.7)W(Max.)@cell (7.7)W (Max.), BL (13)W (Max.)	-	(1)

Note (1) The specified power consumption : Total= cell (reference 4.3.1)+BL (reference 4.3.3)

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	495.1	495.6	496.1	mm	(1)
	Vertical(V)	291.7(291.85)	292.2(292.35)	292.7(292.85)	mm	(1)(2)
	Thickness(D)	9.4	9.9	10.4	mm	(1)
Bezel Area	Horizontal(H)	479.34	479.84	480.34	mm	(1)
	Vertical(V)	270.81	271.31	271.81	mm	(1)
Active Area	Horizontal(H)		476.64		mm	
	Vertical(V)		268.11		mm	
Weight		-	TBD		g	-

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

Note (2) () is mean dimension with mylar.

1.6 KEY PART LIST

Project Code			TPM215HW01-HGEL03 **C1B**
Resolution			WXGA 1366X768
Array	Vendor		CMI
CF	Vendor		CMI
LC	Vendor		Chisso
Polarizer	Front	Vender	力特
	Rear	Vender	
IC	Source	Vender	天鈺(FIT)
	Gate	Vender	天鈺(FIT)
T-con	vendor		MSTAR
PWB	Vendor		Dynamic
Connector	Vendor		FOXCONN
	Part Number		GS23301-0321R-7H
BL	Lamp Vender		Evertop LED
	Vendor		TPV

2. ABSOLUTE MAXIMUM RATINGS

2.1 ENVIRONMENT ABSOLUTE MAXIMUM RATINGS

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)

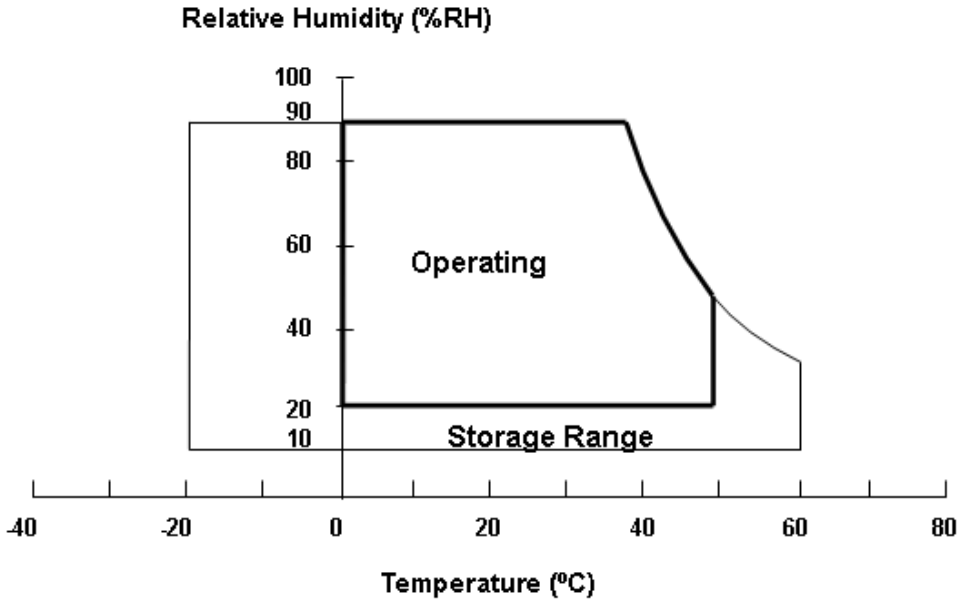
Note (1)

(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 surface should be 0 ºC min. and 60 ºC max.



2.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+6	V	(1)
Logic Input Voltage	Vin	-0.3	+3.6	V	

2.2.2 BACKLIGHT UNIT

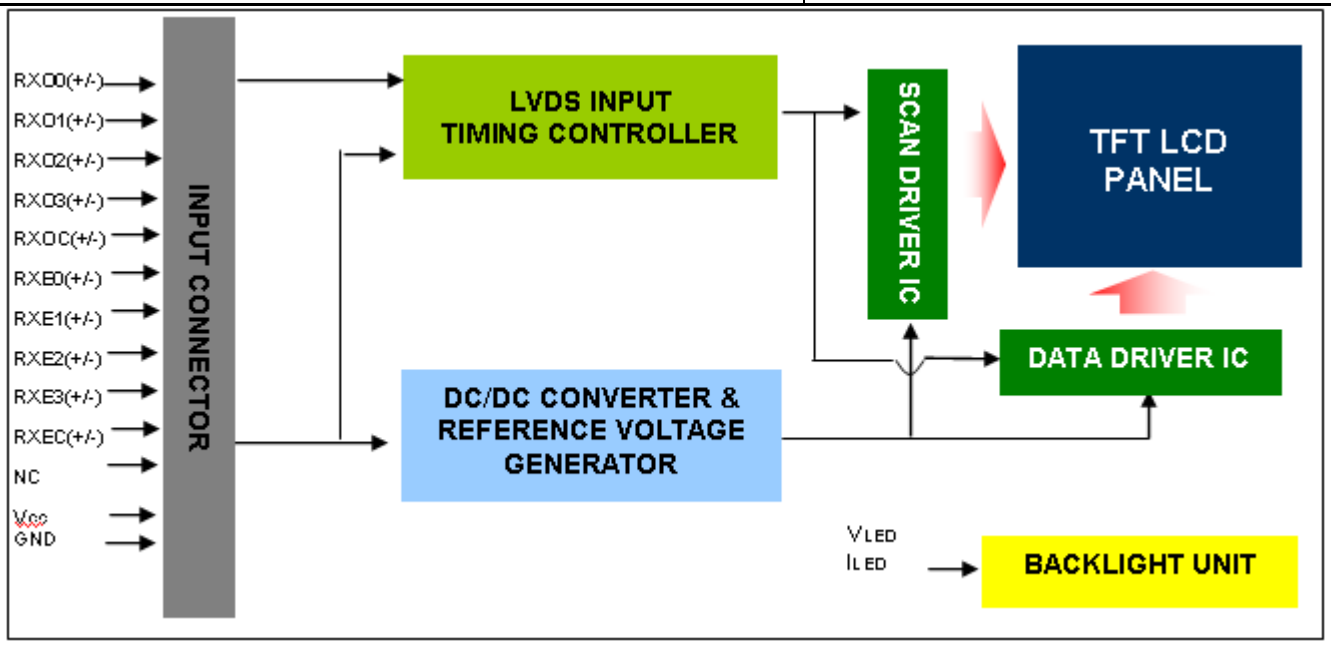
Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Light bar DC forward current	If		60	63	mA	(1)
Light bar Peak pulse current	IP			180		
LED Reverse voltage	Vr			5	V	

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.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 ℃ (Refer to 4.3.3 and 4.3.4 for further information).

3. ELECTRICAL SPECIFICATIONS

3.1 FUNCTION BLOCK DIAGRAM



3.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT

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)

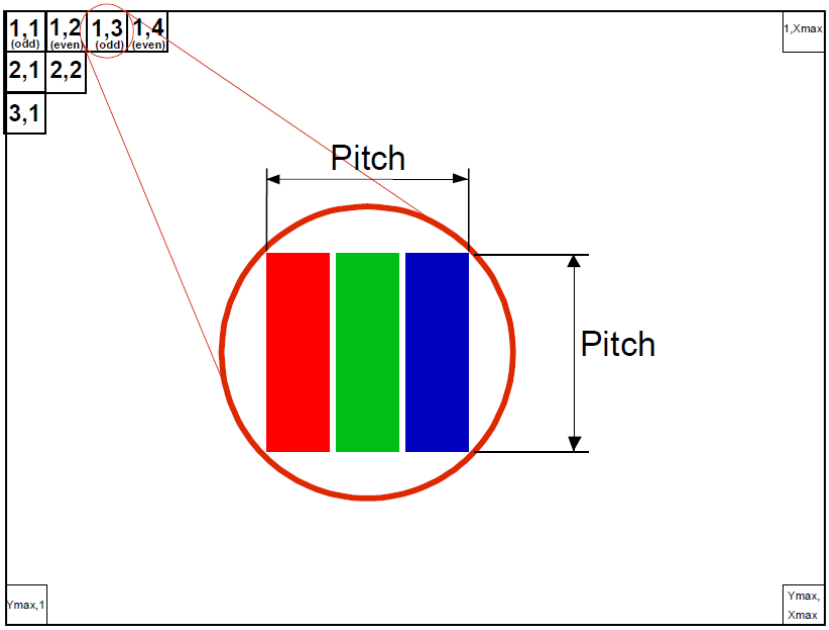
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (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.:093G30-B2001A-G4(STARCONN) or 187098-30091 (P-TWO) 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.



3.3 ELECTRICAL CHARACTERISTICS

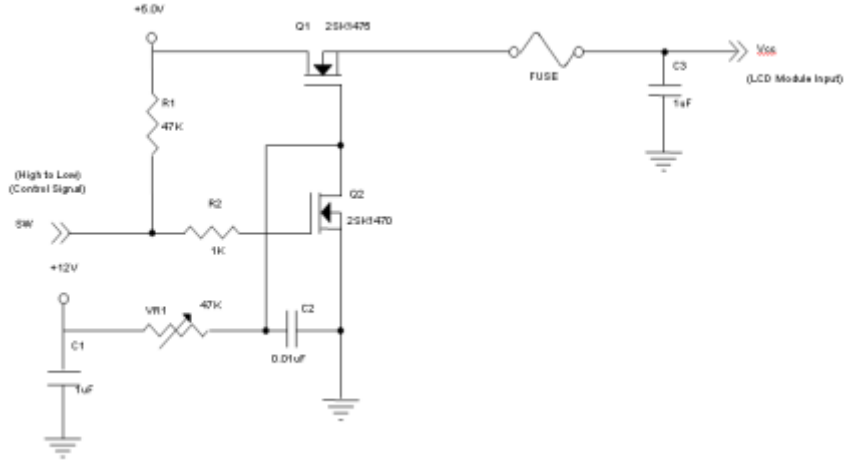
3.3.1 LCD ELETRONICS SPECIFICATION

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V_{cc}	4.5	5	5.5	V	
Ripple Voltage	V_{rp}	-	-	300	mV	
Rush Current	I_{rush}			3	A	(2)

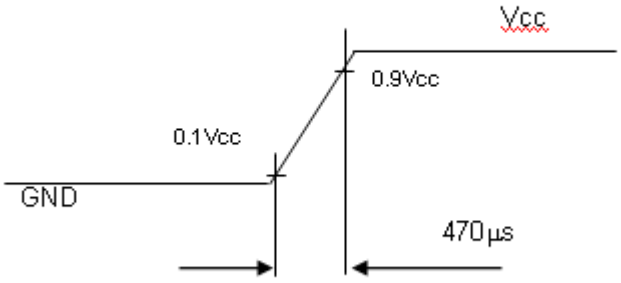
Power Supply Current—White			0.51	0.61	A	(3)a
Power Supply Current--Black			1.05	1.26	A	(3)b
Power Supply Current--Vertical Stripe			1.06	1.26	A	(3)c
Power Consumption	PLCD		5.3	6.3	Watt	(4)
AC off Rush Current	I_{off_RUSH}			4	A	(5)
LVDS differential input voltage	VID	200	-	600	mV	
LVDS common input voltage	VIC	1.0	1.2	1.4	V	

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

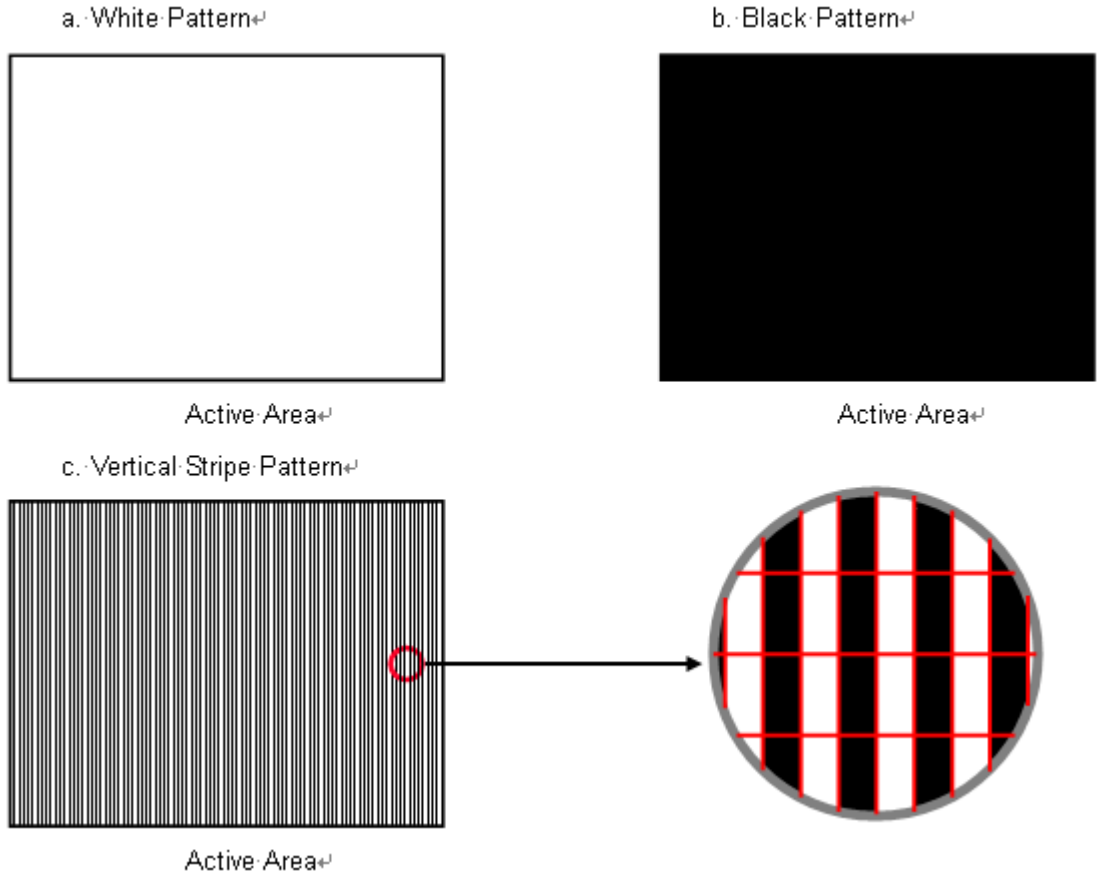
Note (2) Measurement Conditions:



Vcc rising time is 470µs



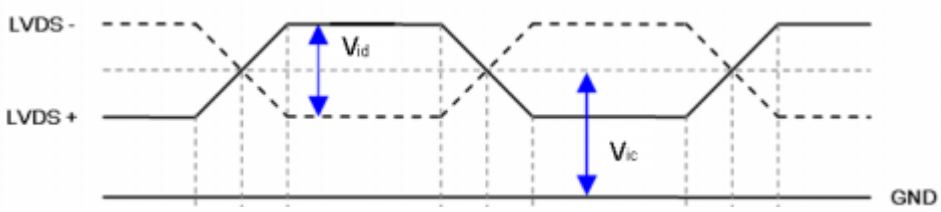
Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.



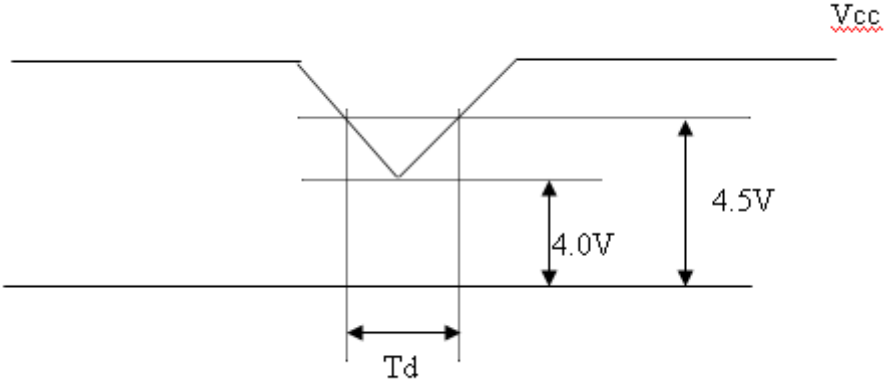
Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) The Rush current would be happened when system doesn't follow Power sequence in AC off status

Note (6) VID waveform condition



3.3.2 Vcc Power Dip Condition



3.3.3 BACKLIGHT UNIT (LED matrix is 13S4P) :

Parameter	Symbol	Value			Unit	Note
		Min	Typ.	Max.		
Light Bar Input Voltage	V_{LED}	35	41.6	48.1	V_{DC}	(Duty 100%)
Light Bar Input Current	I_{LED}	58	60	63	mA DC	(Duty 100%) per string (1)
Power Consumption	P_{LED}	8.1	9.9	12	W	(2)
LED Life Time	L_{BL}	30000			Hrs	(3)
IFP LED Peak forward current	I_{LED}			180	mA DC	(4)

Parameter guideline for LED driving is under stable conditions at 25℃ (Room Temperature):

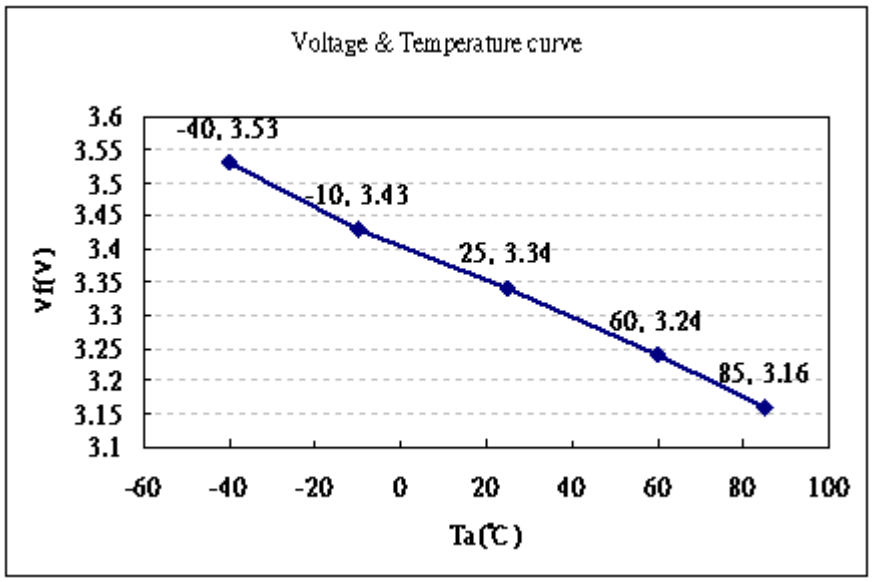
Note (1) The LED can work normally if the PWM dimming ratio range is from 0% to 100% and the operation current is 60mA.

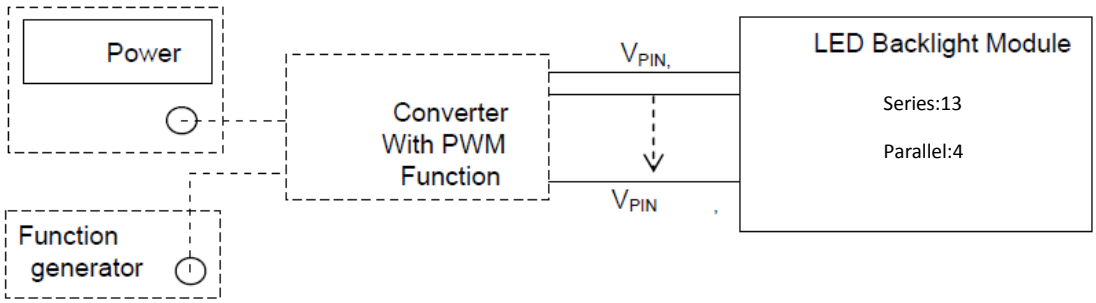
Note (2) $P_{LED} = (I_{LED} \times 4) \times V_{LED}$, LED matrix is 16S4P.The The V_f difference of each string should be within 3V

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2℃ and I = 60 mA(Per EA) until the brightness becomes ≤50% of its original value.

Note(4): Pulse Width ≦10 msec and Duty ≦ 1/10

Note(5)：Voltage &Temperature curve



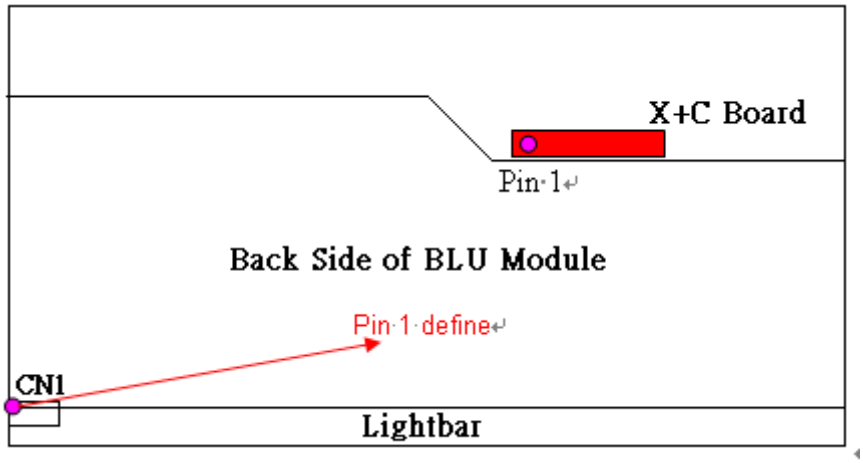


3.3.4 LIGHTBAR Connector Pin Assignment

Connector: 91500-01001-H01

CN1

Pin	number Description
1	IR LED (Current Out)
2	IR LED (Current Out)
3	VLED (Voltage In)
4	VLED (Voltage In)
5	IR LED (Current Out)
6	IR LED (Current Out)



3.4 LVDS INPUT SIGNAL SPECIFICATIONS

3.4.1 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

3.4.2 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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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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

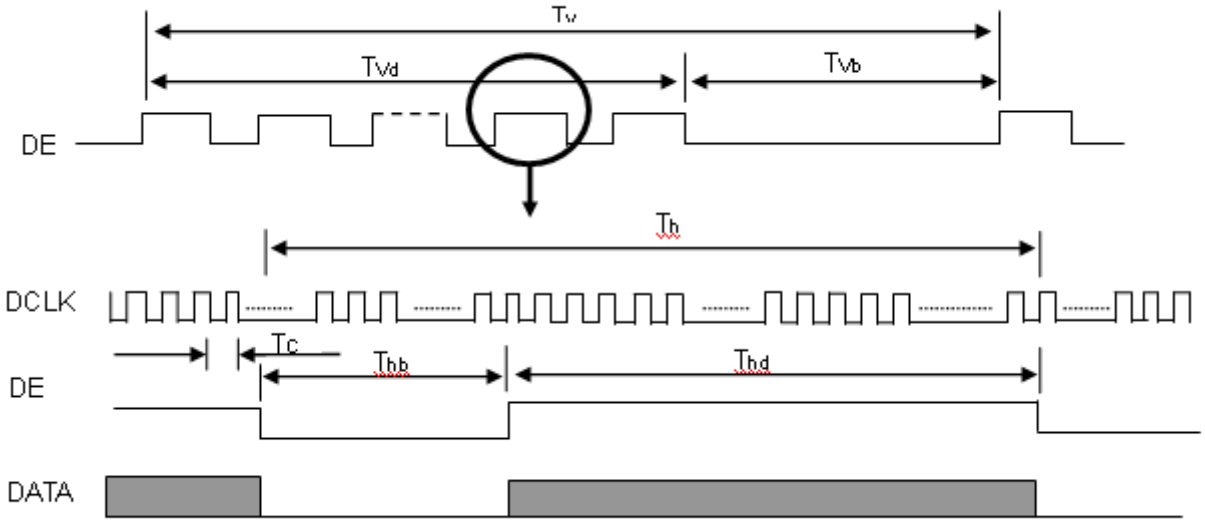
3.5 DISPLAY TIMING SPECIFICATIONS

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

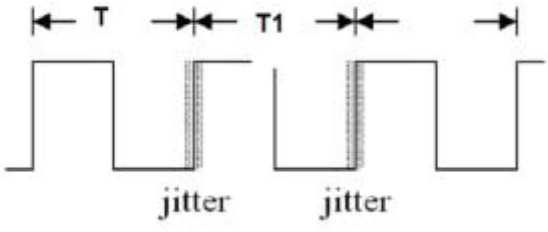
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	58.54	74.25	97.98	MHz	-
	Period	Tc	-	13.47	-	ns	
	Input cycle to cycle jitter	T_{rcl}	-	-	200	ns	(1)
	Input Clock to data skew	TLVCCS			400	ps	(2)
	Spread spectrum modulation range	Fclkin_mod	Fc*98%		Fc*102%	MHz	(3)
	Spread spectrum 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	Tv-Tvd	45	Tv-Tvd	Th	-
Horizontal Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	Th-Thd	140	Th-Thd	Tc	-

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

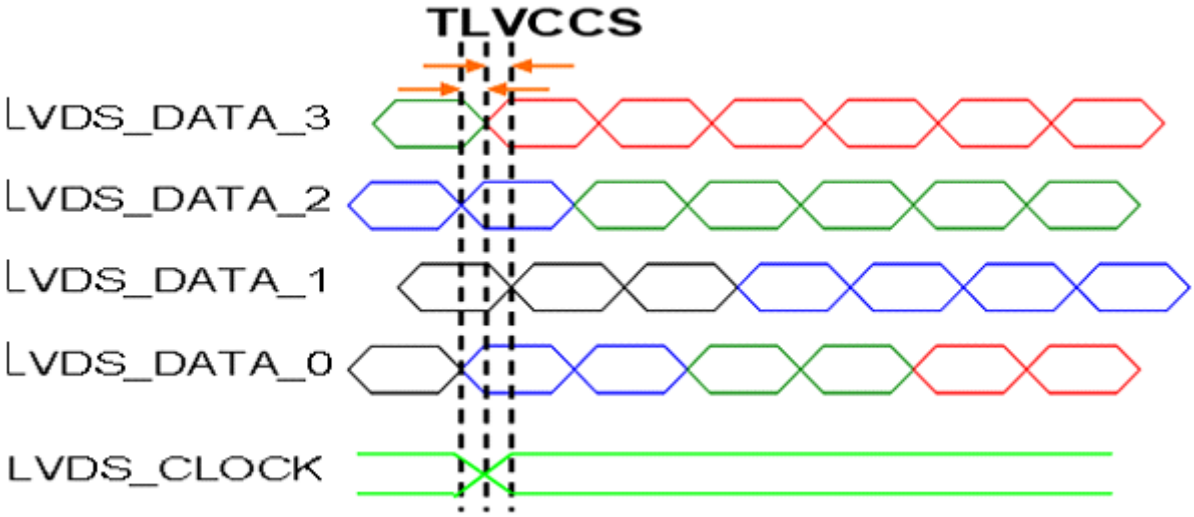
INPUT SIGNAL TIMING DIAGRAM



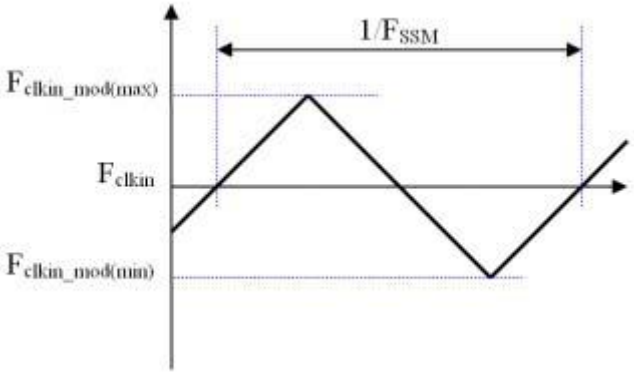
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



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

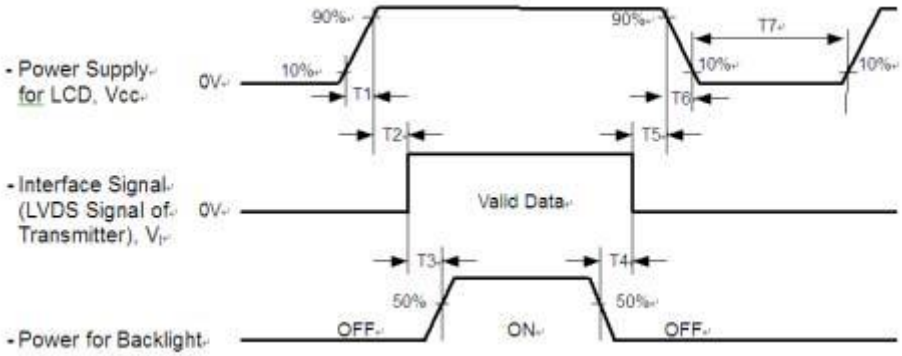


Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



3.6 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	5	-	150	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) TPV 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".

4. OPTICAL CHARACTERISTICS

4.1 TEST CONDITIONS

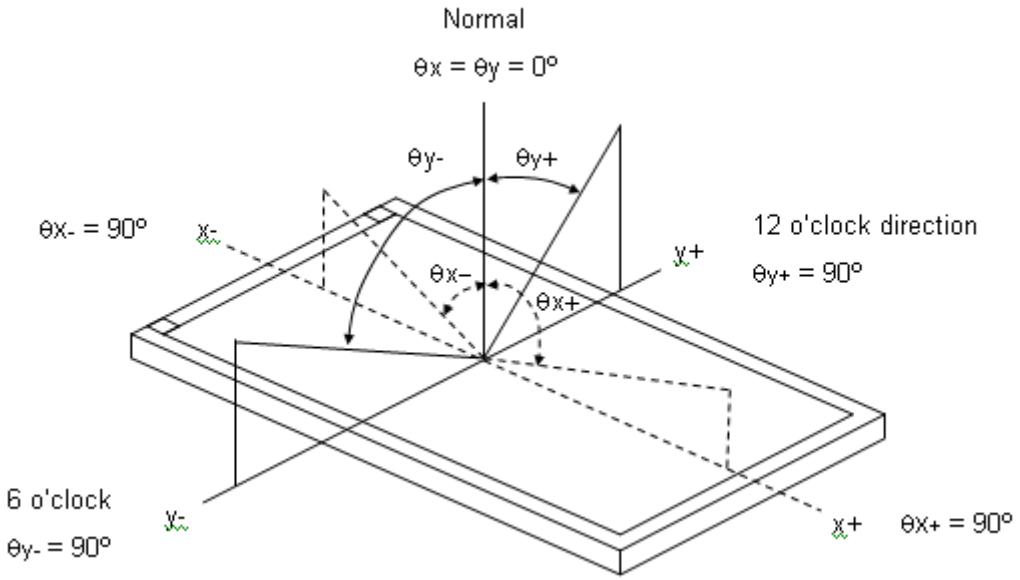
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Light Bar Input Voltage	V_{LB}	54.4	VDC
Light Bar Input Current	I_{LB}	60	mADC
Duty	D	100	%

4.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	Typ – 0.03	Typ – 0.03	0.641	Typ + 0.03		(1), (5)
		Ry			0.338			
	Green	Gx			0.315			
		Gy			0.629			
	Blue	Bx			0.159			
		By			0.059			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		150	200	---	cd/m^2	(4), (5)
Contrast Ratio		CR		500	700	---	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	---	1.5	2.2	ms	(3)
		T_F		---	3.5	5.5	ms	
White Variation		δW	θ_x=0°, θ_Y =0°	70	--	--	-	(5), (6)
Viewing Angle	Horizontal	θx- + θx+	CR ≧ 10 BM-5A	---	90	---	Deg.	(1), (5)
	Ve tical	θy- + θy+		---	65	---		

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



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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

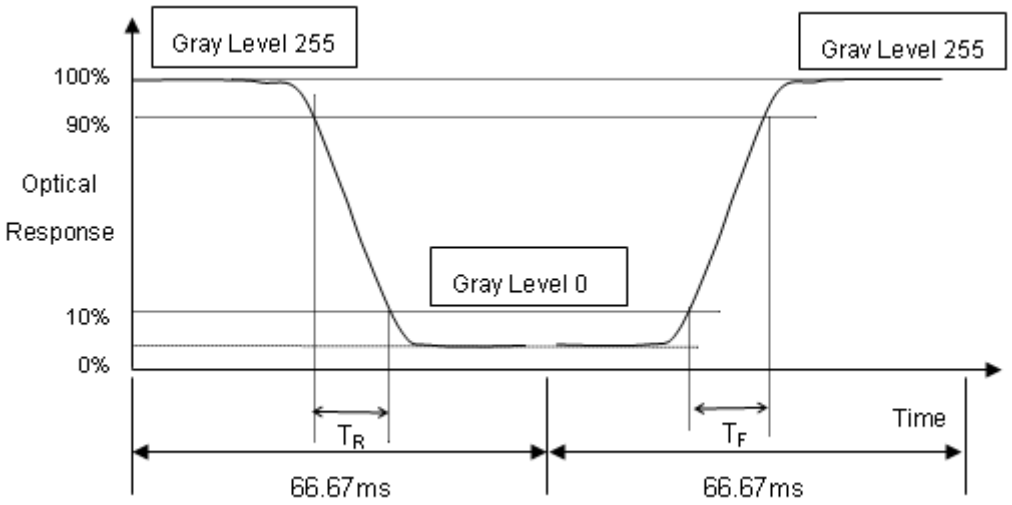
L255: Luminance of gray level 255

L 0: 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 (TR, TF):



Note (4) Definition of Luminance of White (Lc):

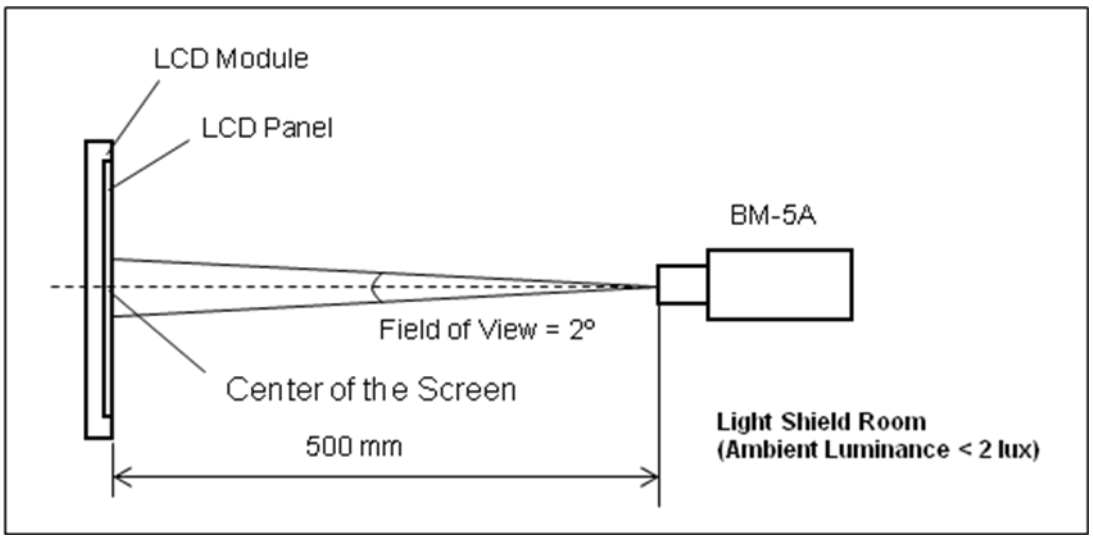
Measure the luminance of gray level 255 at center point

Lc = L (5)

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

Note (5) Measurement Setup:

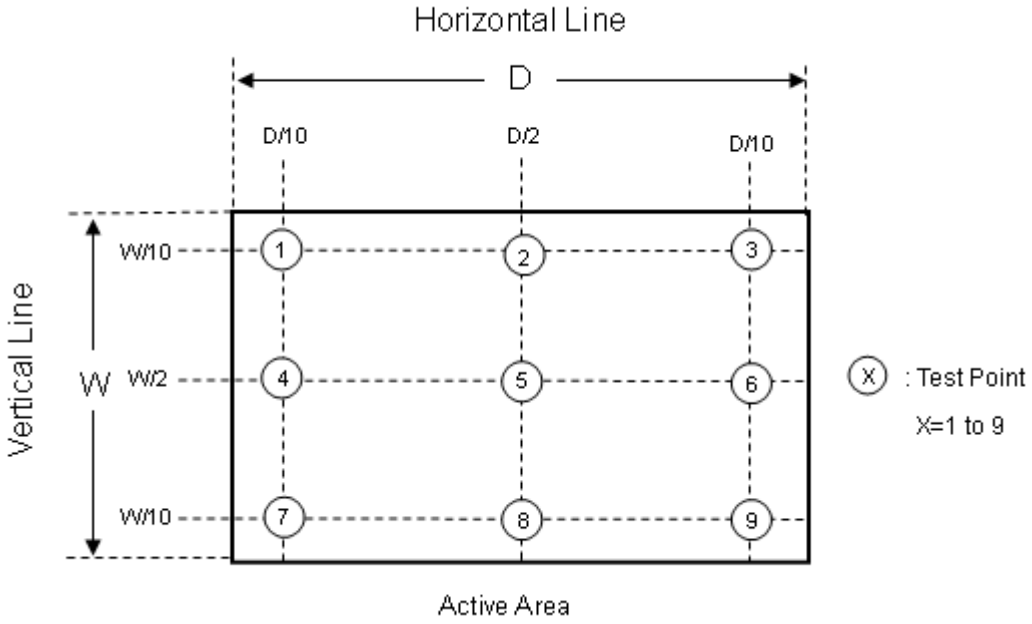
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



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

Measure the luminance of gray level 255 at 9 points

δW = Minimum [L (1) ~ L (9)] / Maximum [L (1) ~ L (9)] x 100%



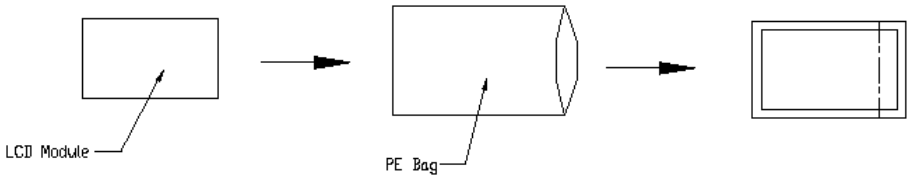
5. PACKAGING

5.1 PACKING SPECIFICATIONS

TBD

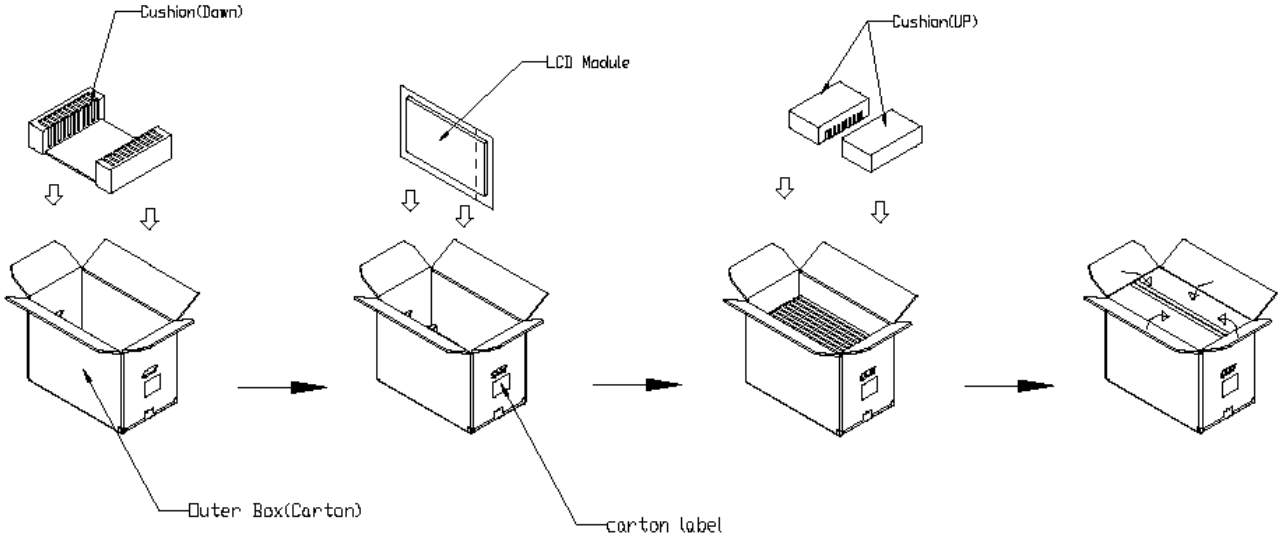
5.2 PACKING METHOD (TBD)

Packing method

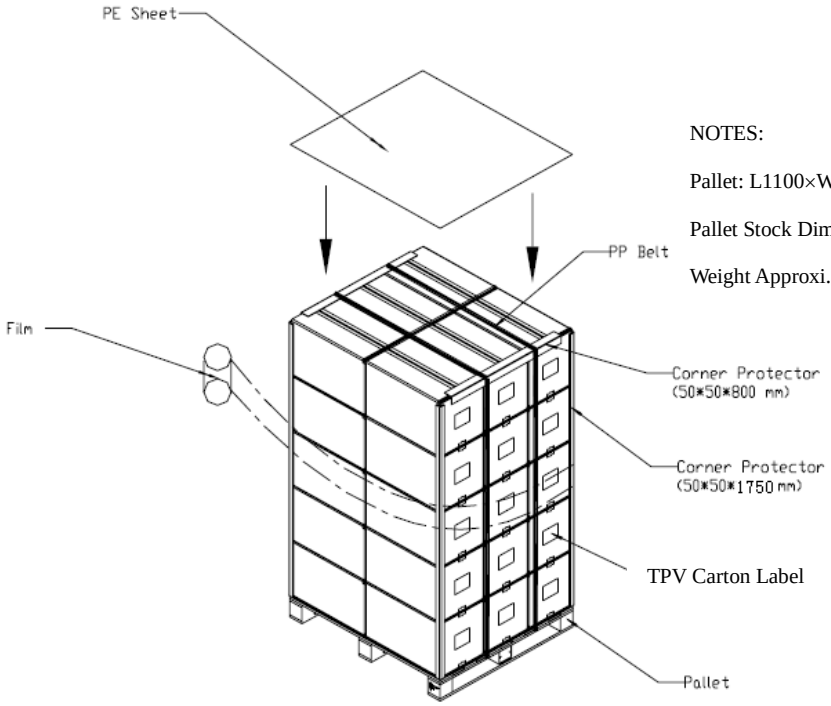


Box dimensions:525(L) x 310(W) x 347(H) mm

Weight:14.8 Kg (9 modules per box)



For ocean shipping



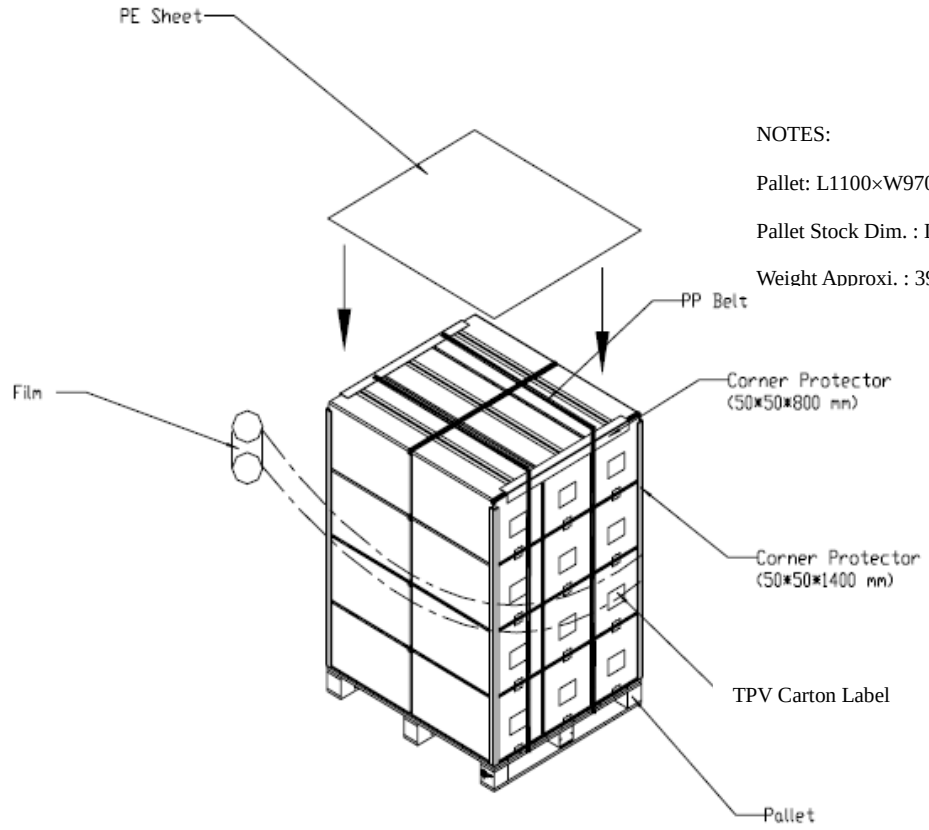
NOTES:

Pallet: L1100×W970×H135mm

Pallet Stock Dim. : L1100×W970×H1960mm

Weight Approxi. :444 kg

For air transport



NOTES:

Pallet: L1100×W970×H135mm

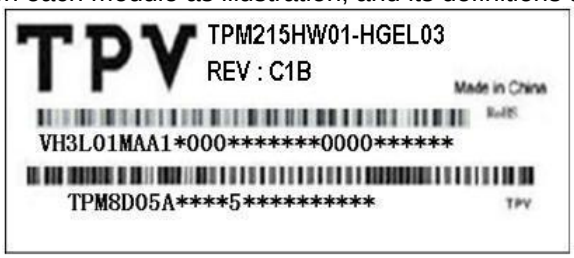
Pallet Stock Dim. : L1100×W970×H1595mm

Weight Approxi. : 390 kg

6. DEFINITION OF LABELS

6.1 TPV MODULE LABEL

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



(a) Model Name: TPM215HW01-HGEL03
(b) Revision: Rev. XXX, for example: C1A, C1B…,…, or etc.

Code	Definition	Description
TP	Panel Logo Supplier Code	TP=TPV
M8D05	Model No.	1st Code : Cell Vender 2nd Code : Product Size 3rd Code : CELL Type for LCD/TV（D:LCD V:TV） 4th & 5th Code: CELL Model NO.
A	Reserved	Use “A” for thi code
*	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, NS =N, Novatek=P
*	Gate Driver IC Code	
**	Cell Location	Tainan, Taiwan =TN, Ningbo,China=NB Xiamen,China=XM, Suzhou, China=SZ
*	Provision Code	1. For RD use & definition; at not special occasion indication 0 2. For TCO’03 Model，indication 3 3. For TCO’06 Model，indication 6
**	B/L & Module Location	B/L Production Location ：BLU,Fuqing,China=5，Diguang,Wuhan,China=6 F-Bridge,Fuqing,China =7，MR,Fuqing,China=8 Module Production Location：BLU,Fuqing,China=B，CTOC,Fuqing,China=C F-Bridge,Fuqing,China =F，MR,Fuqing,China=M HSO,Wuhan,China=H
*	Module Line	CTOC line: 0~9，TPV line: A～Z
***	Year, Month, Day	Year: 2001=1, 2002=2, 2003=3…2009=9,2010=A, 2011=B…。 Month：1~12=1，2，3，~9，A，B，C。 Day：1~31=1，2，3，~9，A，B，C，~W，X，Y (excluding I，O and U Character)。
****	Serial No.	Manufacturing Serial No.
TPV	LCM Location	TPV: FQ Factory, None (keep empty): CTOC

7. RELIABILITY TEST

Environment test conditions are listed as following table.

Items	Required Condition	Note
High Temperature Storage	Ta= 60℃, 240hours	
Low Temperature Storage	Ta= -20℃, 240hours	
High Temperature Operation	Ta= 50℃, 240hours	
Low Temperature Operation	Ta= -5℃, 240hours	
Temperature Humidity Bias	Ta= 50℃, 80%RH, 240hours	
Thermal Shock Test	-20℃/30min, 60℃ / 30min, 100 cycles	
Power On/Off Test	25℃±2℃,On/10sec, Off /10sec, 30,000 cycles	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 500 Hz Sweep: 20 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Harf-sine Active Time: 11 ms Direction: ± X, ± Y, ± Z.(one time for each Axis)	
Box Drop Test (Non-operation)	1 Conner, 3 Edge, 6 Face,	

[Result Evaluation Criteria]

Under the display quality test condition with normal operation state, these should be no change which may affect practical Display functions.

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) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

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

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 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 module's end of life, it is not harmful in case of normal operation and storage.

8.3 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

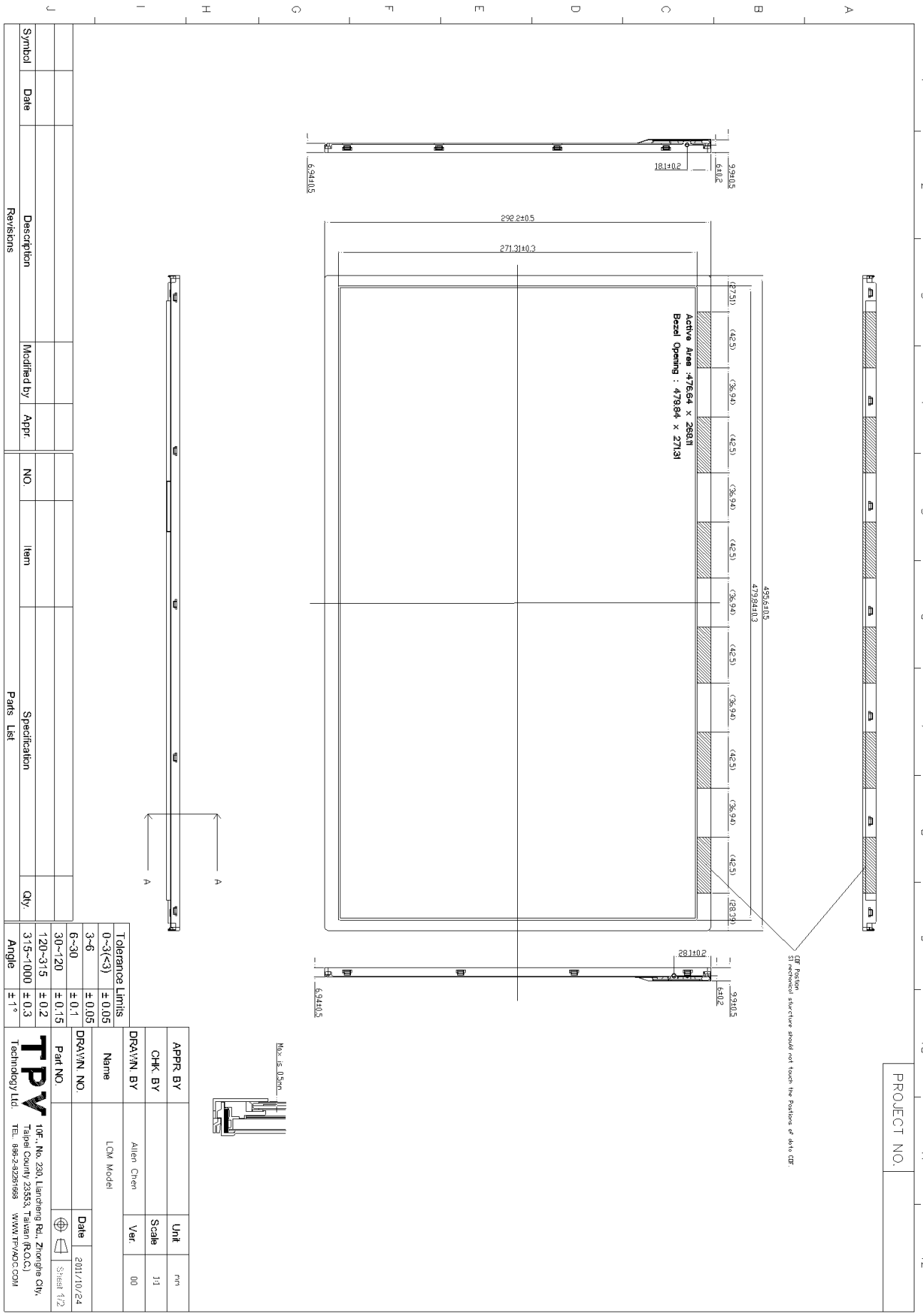
(1) UL60950-1 or updated standard.

(2) IEC60950-1 or updated standard.

8.4 OTHER

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

9. MECHANICAL CHARACTERISTICS



Revisions				
Symbol	Date	Description	Modified by	Appr.

Parts List			
NO.	Item	Specification	Qty.

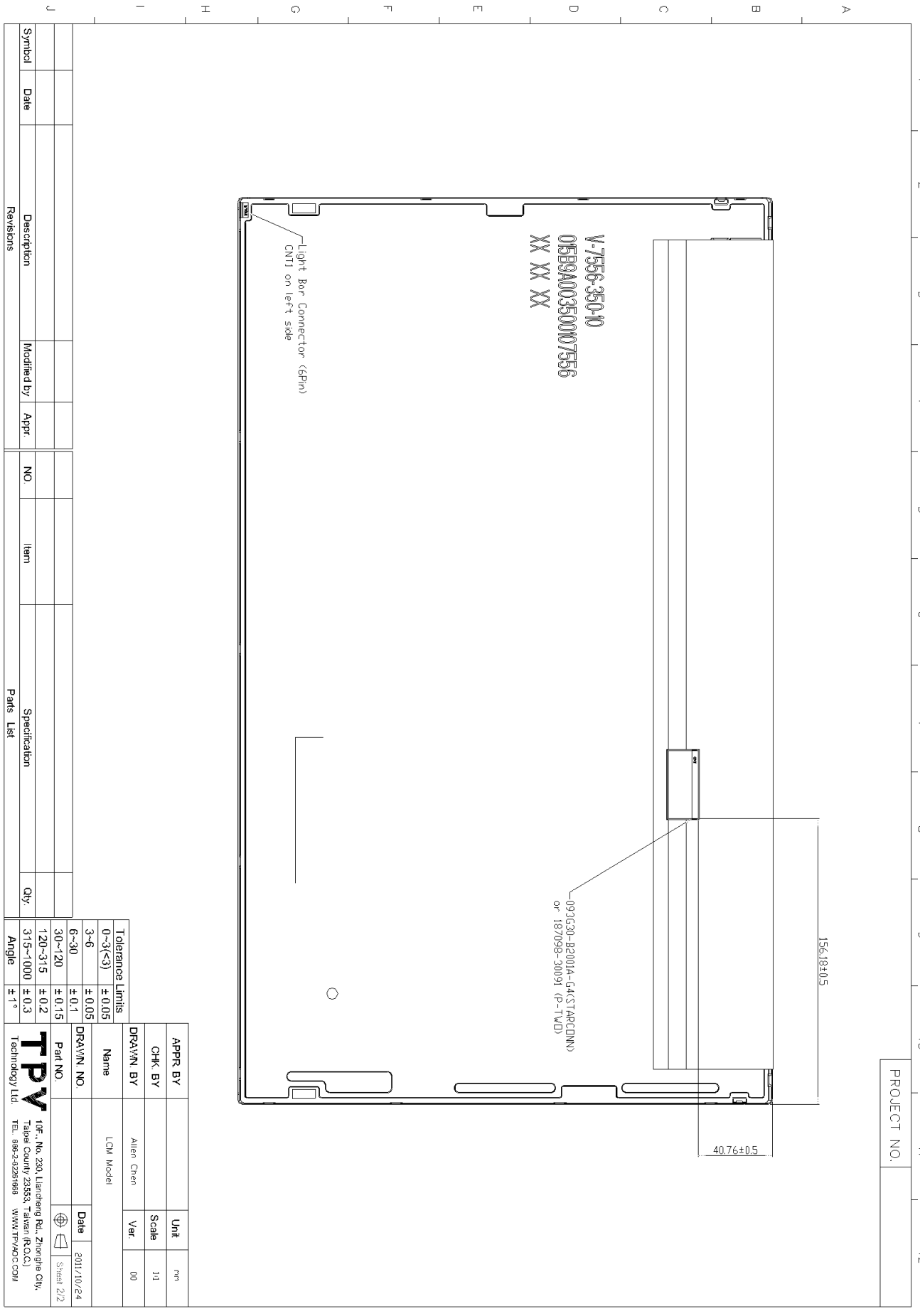
Tolerance Limits	
0~3(<3)	± 0.05
3~6	± 0.05
6~30	± 0.1
30~120	± 0.15
120~315	± 0.2
315~1000	± 0.3

Angle
± 1°

APPR. BY		
CHK. BY		
DRAWN BY	Allen Chen	
Name	LCM Model	
DRAWN NO.		Date
Part NO.		Sheet 1/2

Unit	mm
Scale	1/1
Ver.	00

TPV Technology Ltd.
10F., No. 230, Liancheng Rd., Zhonghe City, Taipei County 23553, Taiwan (R.O.C.)
TEL: 886-2-8226-1668 WWW.TPV-AOC.COM



Revisions

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120~315	± 0.2
315~1000	± 0.3
Angle	
± 1°	

APPR. BY		
CHK. BY		
DRAWN BY	Name	Allen Chen
DRAWN NO.	Part NO.	LCM Model
Date	2011/10/24	
Sheet 22		
Ver.	00	
Scale	1/1	
Unit	mm	

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