AUO-General

CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C154UAN01.0
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.8)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.8)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.8)**

☐ **CUSTOMER REMARK :**

1 Li-Hsin Rd. 2. Science-Based Industrial Park
Hsinchu 300, Taiwan, R.O.C.
Tel: +886-3-500-8899
Fax: +886-3-577-2730

AUO-General

Doc. Version	0.8
Total Page	24
Date	2020/07/01

Product Specification

15.4” COLOR TFT-LCD MODULE

MODEL NAME: C154UAN01.0

Model Name: **C154UAN01.0**

Planned Lifetime: From 2020/Feb To 2023/Feb

Phase-out Control: From

EOL Schedule:

< >Preliminary Specification

< ◆ >Final Specification

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content
0.0	2019/01/29		First draft.
0.1	2019/03/07	P20	Thermal shock temperature modify
0.2	2019/07/10	P9-10 P14	Update Power Specification and modify description Update PVCOM arithmetic
0.3	2019/11/15	P9 P11 P12, P15-16 P20	Update Power Specification Update GPIO defined Update EDID register table Update Power on/off sequence
0.4	2019/12/09	P6	Update Surface treatment
0.5	2019/12/25	P23 P24	Update Packing Form Update Module/Panel Label Information
0.6	2020/01/22	P21 P22	Update color spec Update RA test condition
0.7	2020/06/29	P12 - 14	Update EDID register table
0.8	2020/07/01	P12 - 16	Update EDID register table

Contents

A. General Description

C154UAN01.0 is an a-Si type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AHVA (Advanced Hyper-Viewing Angle) technology. This model is composed of a TFT-LCD, driver ICs, PCBA, and TCON (timing controller).

B. Features

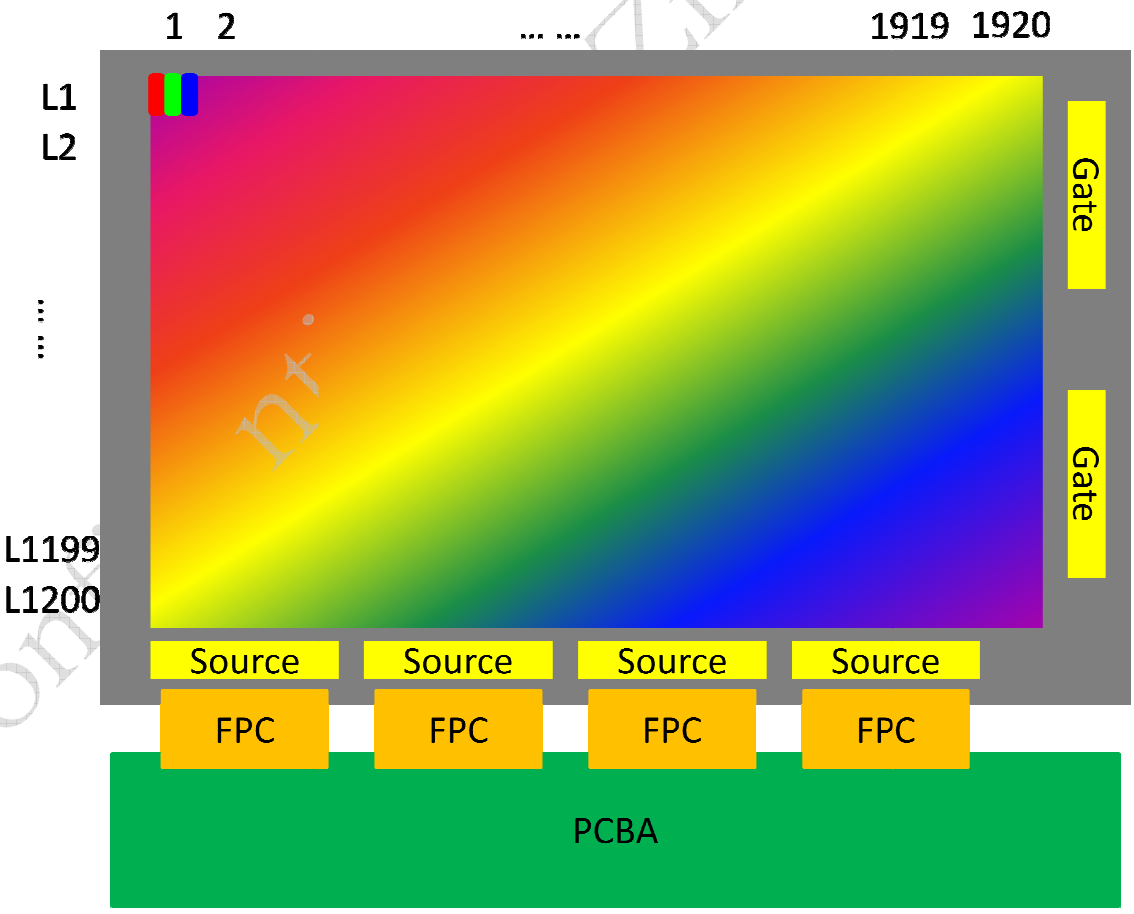
- 15.4”-inch display
- 1920 RGB x 1200 resolution in RGB stripe dot arrangement
- Interfaces: FPD-Link III
- AHVA – wide view technology

C. Physical Specifications

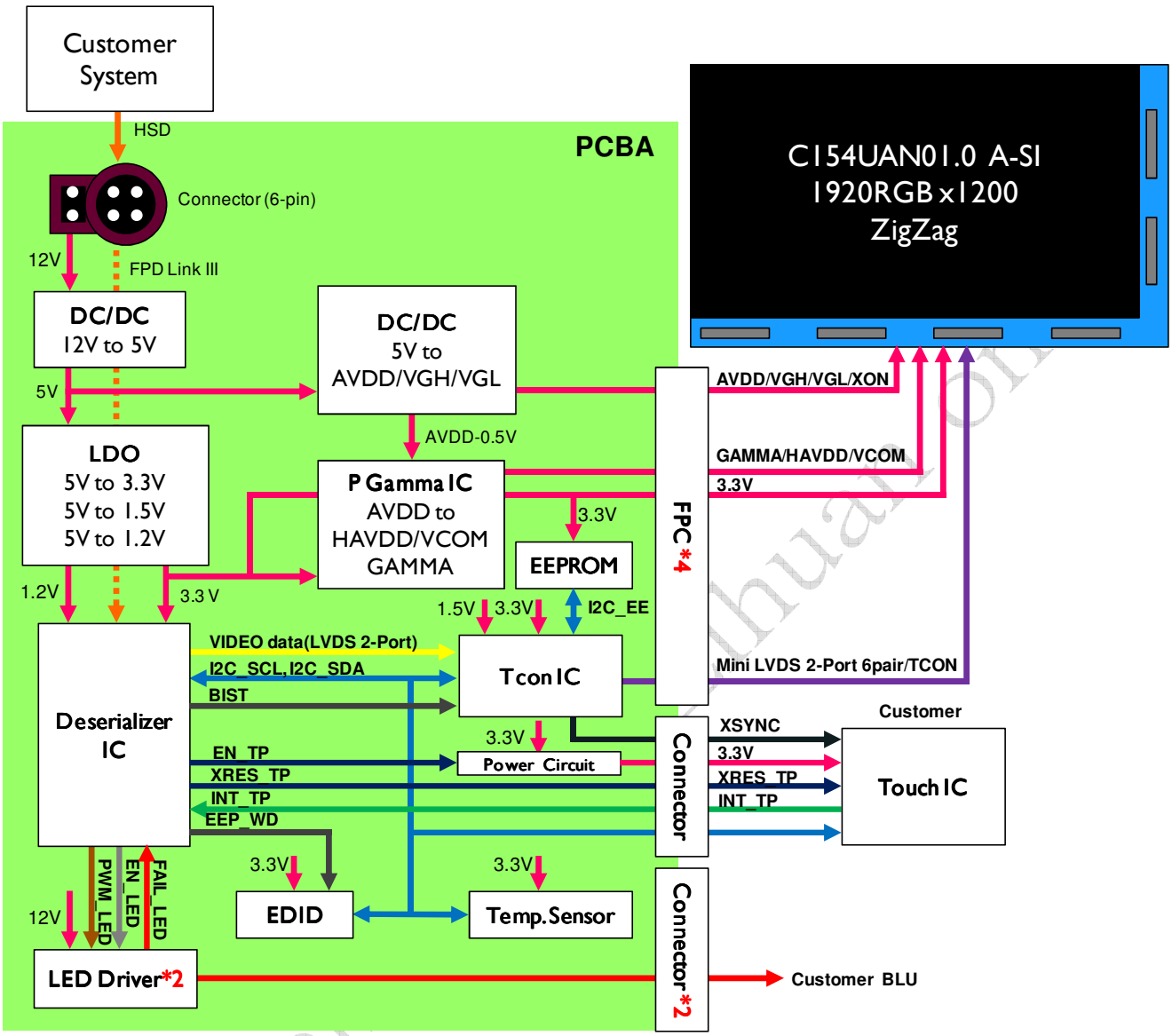
1. TFT LCD Panel

NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	**1920 RGB(H)x 1200(V)**	
2	Active Area	mm	**330.624 x 206.64mm**	
3	Screen Size	inch	**15.4"(Diagonal)**	
4	Dot Pitch	μm	**172.2um**	
5	Color Configuration	–	**R. G. B. Stripe**	Note 1
6	Color Depth	–	**16.7 M colors**	
7	Overall Dimension	mm	**341.12 x 218.64 x 1.03mm**	Note 2
8	Weight	g	**260**	
9	Display Mode	–	**Normally Black**	
10	Surface Treatment	–	**HC (3H)**	

Note 1: Below figure shows dot stripe arrangement.

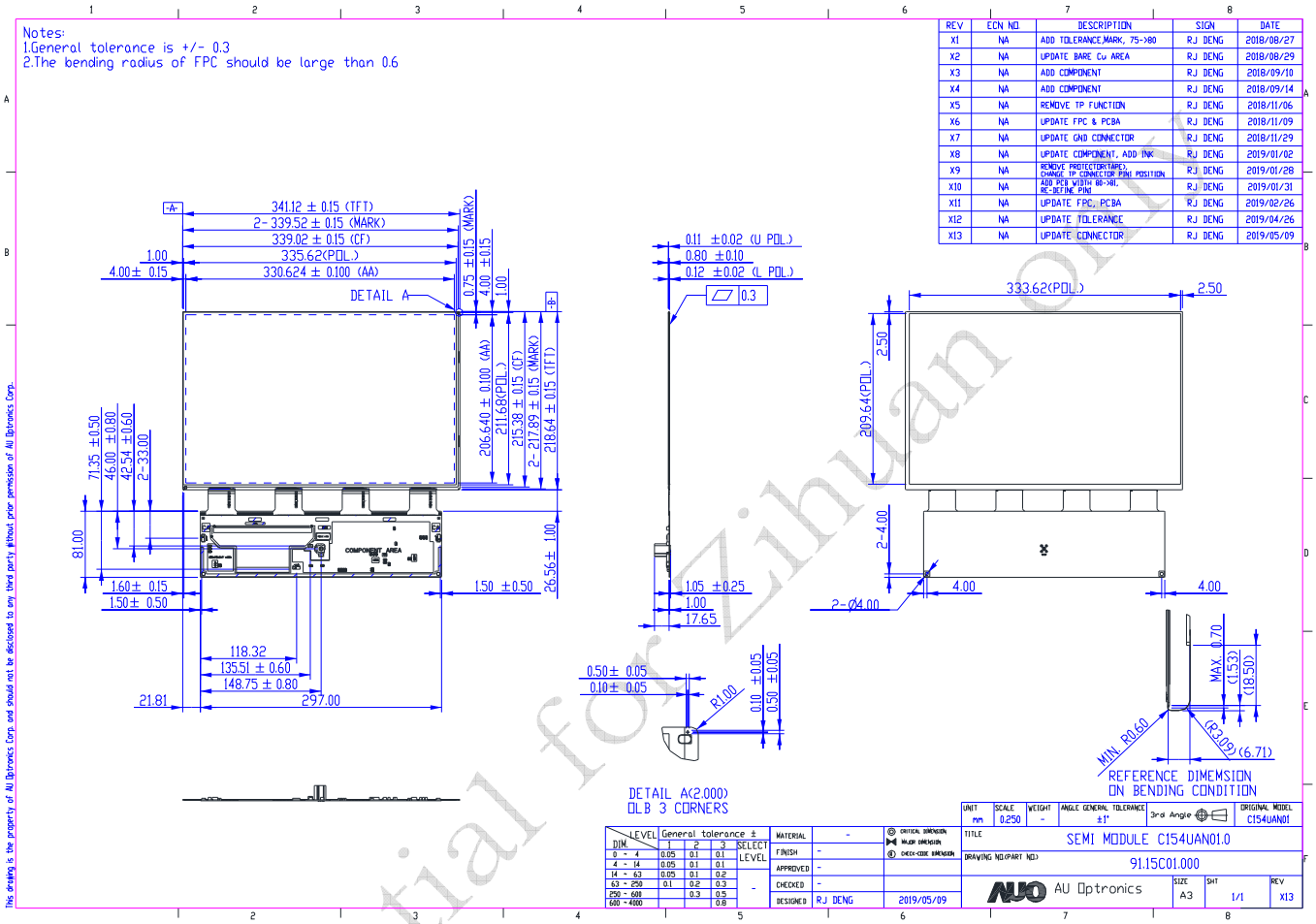


Note 2: Thickness not including PCBA. Please refer to the below drawing for further information



D. Outline Dimension

1. TFT-LCD Module



E. Electrical Specifications

1. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Supply Voltage	V_{LCD}	-0.3	25	V	Note 1
FPD-Link III Input Voltage	V_{FPD}	-0.5	2.75	V	
Storage Temperature	T_{ST}	-40	+95	℃	
Operating Temperature	T_{OP}	-30	+85	℃	

Note 1: If the operating condition exceeds the absolute maximum ratings, the panel may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

2. DC Electrical Characteristics

The following items are measured under stable condition and suggested application circuit.

a. Power Specification

Parameter	Symbol	Min	Typ.	Max.	Unit	Notes
Power Supply Voltage	V_{IN}	9.6	12.0	14.4	V	
Power Supply Current	I_{LCD}	-	400	610.3	mA	1
	I_{TOTAL}	-	1.73	2.1	A	1, 2
Power Consumption	P_{LCD}	-	4.8	7.32	W	1
	P_{TOTAL}		20.78	25.2	W	1, 2
Inrush Current	$I_{LCDINRUSH}$	-	22	25	A	

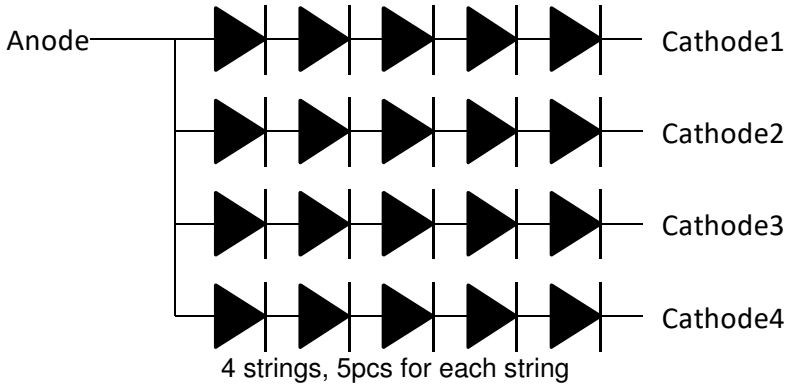
Note 1: Test Condition: 8colorbar+Grayscale pattern, V_{IN}=12.0V, Ta=25±2℃, F_V=60Hz condition.

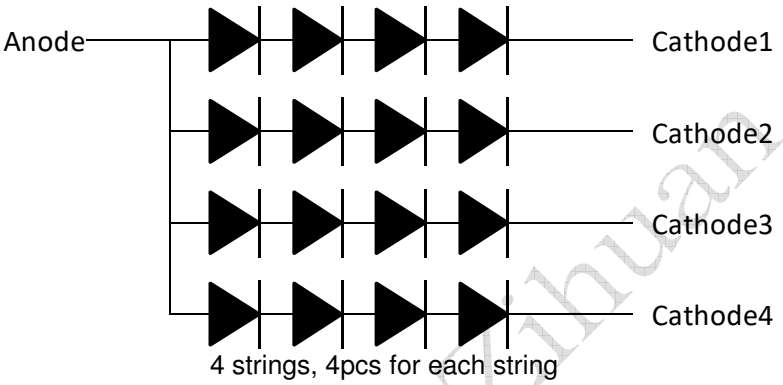
Note 2: Test Condition: Backlight duty ratio 100%

b. LED Driver Support Range

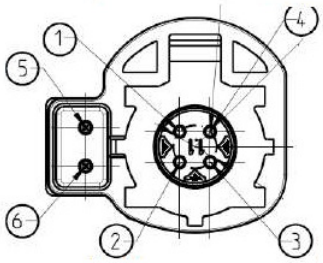
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Support Current	I_F	at 25℃	-	-	60	mA	For each string, Note 1
Supply Voltage	V_{LED}	at 25℃	22.4	24.2	25.2	V	4 strings, 4pcs for each string
			28	30.25	31.5	V	4 strings, 5pcs for each string
Supply power	P_{LED}	at 25℃	-	-	6.05	W	4 strings, 4pcs for each string
			-	-	7.56	W	4 strings, 5pcs for each string

Note 1: Base on customer condition: LED backlight is 16+20 LEDs (4 strings, 4pcs for each string) & (4 strings, 5pcs for each string).





3. Pin Assignment

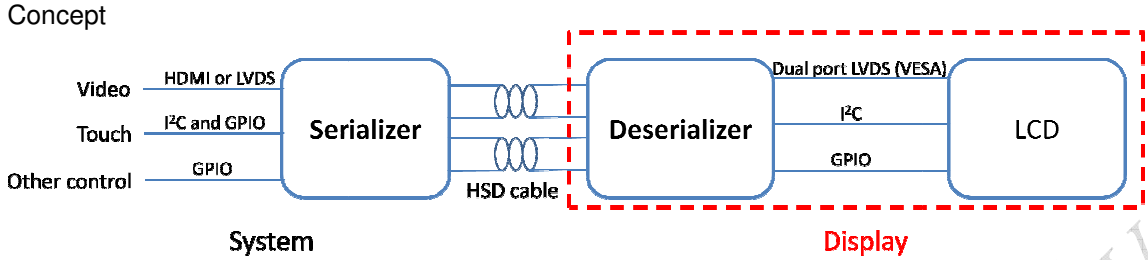


Pin No.	Pin Symbol	I/O	Description
1	Rin1P	I/O	FPD-Link III, input/output data 1+
2	Rin0P	I/O	FPD-Link III, input/output data 0+
3	Rin1N	I/O	FPD-Link III, input/output data 1-
4	Rin0N	I/O	FPD-Link III, input/output data 0-
5	12V	P	Power input
6	GND	G	System ground

Note 1: The pin assignment of hybrid connector combined GPIO, I^2C and FPD-Link..
Note 2: The input data should be FPD-Link III.
Note 3: HSD cable can control video/touch/control/backlight.

4 Protocol Requirement

System Concept



Note 1: Deserializer and LCD communicate through LVDS.
Note 2: HSD cable is used as physical I/F between system and LCD
Note 3: See below table for internal communication protocol in LCD.

Video	Touch INT	Touch Information	EDID Data Read/Write	EDID control
Dual port LVDS (VESA)	GPIO	I^2C	I^2C	GPIO
Temperature	Power			
I^2C	GPIO			

I2C Slave Address for Ser/Des

Slave ID	Device Address	Function
0	0x1010000b	EDID spec
1	0x1010001b	EDID measurement
2	0x1110100b	PGMA/VCOM device
3	0x1001100b	Temperature sensor
4	0x0100100b	Touch panel

※ Detailed Address information can be modified in development process.

GPIO defined

DS90UB948	Function	Description
D_GPIO0	EEP_WD	EEPROM read/write enable H: Read only L: Write enable
D_GPIO1	EEP_A2	EEPROM slave address H: 1010000b/1010001b L: 1010100b/1010101b
D_GPIO2	FAIL (LED ASIL J1)	LED error detect
D_GPIO3	FAIL (LED ASIL J2)	LED error detect
GPIO0	INT (TP)	Touch panel interrupt
GPIO1	-	-
GPIO2	PWM (LED)	LED PWM input
GPIO3	XRES	Touch reset
GPIO5	EN (LED)	LED enable
GPIO6	-	-
GPIO7	BIST	Auto-run H: Auto-run enable without LVDS input L: Auto-run disable
GPIO8	EN_TPWR	Touch switch

a. EDID register table

EDID spec

Address		Function	Value
DEC	HEX		
0	00h	Header	00
1	01h		FF
2	02h		FF
3	03h		FF
4	04h		FF
5	05h		FF
6	06h		FF
7	07h		00
8	08h	Manufacturer ID	06
9	09h		AF
10	0Ah	Product ID Code	00
11	0Bh		00
12	0Ch	Serial number	00
13	0Dh		00
14	0Eh		00
15	0Fh		00
16	10h	Manufacturer Date	2A
17	11h		1C
18	12h	EDID Version #	01
19	13h	EDID Version #	04
20	14h	Video Input Type	A5
21	15h	Horizontal Size (cm)	21
22	16h	Vertical Size (cm)	15
23	17h	Gamma spec	78
24	18h	Supported Features	0A
25	19h	Red / Green - bits1 & 0	93
26	1Ah	Blue / White - bits1 & 0	75
27	1Bh	Red X Spec.	AC
28	1Ch	Red Y Spec.	50
29	1Dh	Green X Spec.	45
30	1Eh	Green Y Spec.	A4
31	1Fh	Blue X Spec.	26
32	20h	Blue Y Spec.	0E

Address		Function	Value
DEC	HEX		
33	21h	White X Spec.	50
34	22h	White Y Spec.	54
35	23h	Established timings	00
36	24h		00
37	25h	Manufacturer's Reserved Timing	00
38	26h	Standard Timings Supported	D1
39	27h		00
40	28h		00
|	|		00
51	33h		00
52	34h		00
53	35h		00
54	36h	Pixel clock	5C
55	37h		3A
56	38h	Horizontal active LSB	80
57	39h	Horizontal blanking LSB	7A
58	3Ah	Horizontal active MSB[7:4]/ Horizontal blanking MSB[3:0]	70
59	3Bh	Vertical active LSB	B0
60	3Ch	Vertical blanking LSB	14
61	3Dh	Vertical active MSB[7:4]/ Vertical blanking MSB[3:0]	40
62	3Eh	Horizontal sync. front porch LSB	2A
63	3Fh	Horizontal sync. Pulse width LSB	3C
64	40h	Horizontal sync. front porch LSB[7:4]/ Horizontal sync. Pulse width LSB[3:0]	A6
65	41h	Horizontal sync. front porch MSB[7:6]/ Horizontal sync. Pulse width MSB[5:4]/ Vertical sync. front porch MSB[3:2]/ Vertical sync. Pulse width MSB[1:0]/	00
66	42h	Horizontal image size LSB	4B
67	43h	Vertical image size LSB	CF
68	44h	Horizontal image size MSB[7:4]/ Vertical image size MSB[3:0]	10
69	45h	Horizontal border	00
70	46h	Vertical border	00
71	47h	Polarity	18

Address		Function	Value
DEC	HEX		
72	48h	Detailed timing description # 2 or monitor descriptor	00
73	49h		00
74	4Ah		00
|	|		00
87	57h		00
88	58h		00
89	59h		00
90	5Ah	Detailed timing description # 3 or monitor descriptor	00
91	5Bh		00
92	5Ch		00
|	|		00
105	69h		00
106	6Ah		00
107	6Bh		00
108	6Ch	Detailed timing description # 4 or monitor descriptor	00
109	6Dh		00
110	6Eh		00
|	|		00
123	7Bh		00
124	7Ch		00
125	7Dh		00
126	7Eh	Extension flag	00
127	7Fh	Checksum	C1

EDID measurement

Address		Function
DEC	HEX	
0	00	Red X
1	01	
2	02	Red Y
3	03	
4	04	Green X
5	05	
6	06	Green Y
7	07	
8	08	Blue X
9	09	
10	0A	Blue Y
11	0B	
12	0C	White X
13	0D	
14	0E	White Y
15	0F	
16	10	Gamma
17	11	Black Luminance *100
18	12	White Luminance (whole number part only)
19	13	
20	14	Contrast Ratio (whole number l part only)
21	15	
22	16	-
|	|	
25	19	
26	1A	-
27	1B	T% *100
28	1C	
29	1D	T% Bin
30	1E	PVCOM
31	1F	
32	20	Flicker (if dB: *(-1), if %: round)
33	21	
34	22	Touch FW Version
35	23	Reference BLU used for optical measurement
36	24	Temp Sensor (℃)
|	|	-
59	3B	

Address		Function	
DEC	HEX		
60	3C	Tesla EDID Version – Major (3)	
61	3D	Tesla EDID Version – Minor (4)	
62	3E	Tesla EDID Version – Patch (0)	
63	3F	Flag	
64	40	Flag	
65	41	Flag	
66	42	Data Type Tag	
67	43	Flag	
68	44	SERIAL NUMBER OF PANEL	Alphanumeric Data String (ASCII String)
69	45		Alphanumeric Data String (ASCII String)
70	46		Alphanumeric Data String (ASCII String)
71	47		Alphanumeric Data String (ASCII String)
72	48		Alphanumeric Data String (ASCII String)
73	49		Alphanumeric Data String (ASCII String)
74	4A		Alphanumeric Data String (ASCII String)
75	4B		Alphanumeric Data String (ASCII String)
76	4C		Alphanumeric Data String (ASCII String)
77	4D		Alphanumeric Data String (ASCII String)
78	4E		Alphanumeric Data String (ASCII String)
79	4F		Alphanumeric Data String (ASCII String)
80	50		Alphanumeric Data String (ASCII String)
81	51		Alphanumeric Data String (ASCII String)
82	52		Alphanumeric Data String (ASCII String)
83	53		Alphanumeric Data String (ASCII String)
84	54		Alphanumeric Data String (ASCII String)
85	55		Alphanumeric Data String (ASCII String)
86	56		Alphanumeric Data String (ASCII String)
87	57		Alphanumeric Data String (ASCII String)
88	58	-	
|	|	-	
91	5B	-	

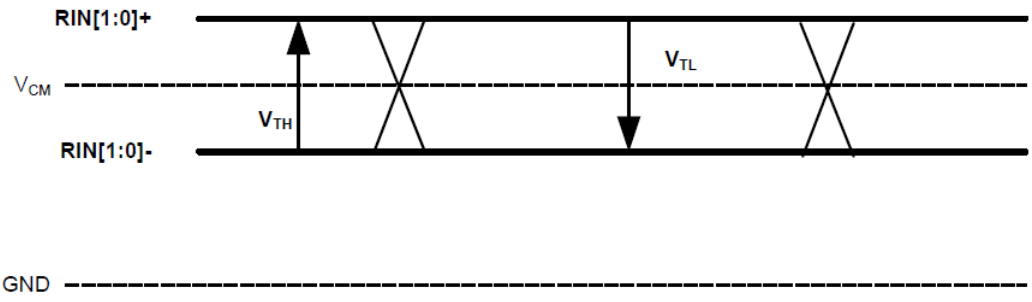
The EDID table follows VESA standard version 1.4.

b. PVCOM register

Register address								MSB Register data														LSB
A7	A6	A5	A4	A3	A2	A1	A0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	1	0	0	1	0	MSB byte								LSB byte							

PVCOM voltage= 13.5V*(MSB*256+LSB)/1024

5 AC Electrical Characteristics

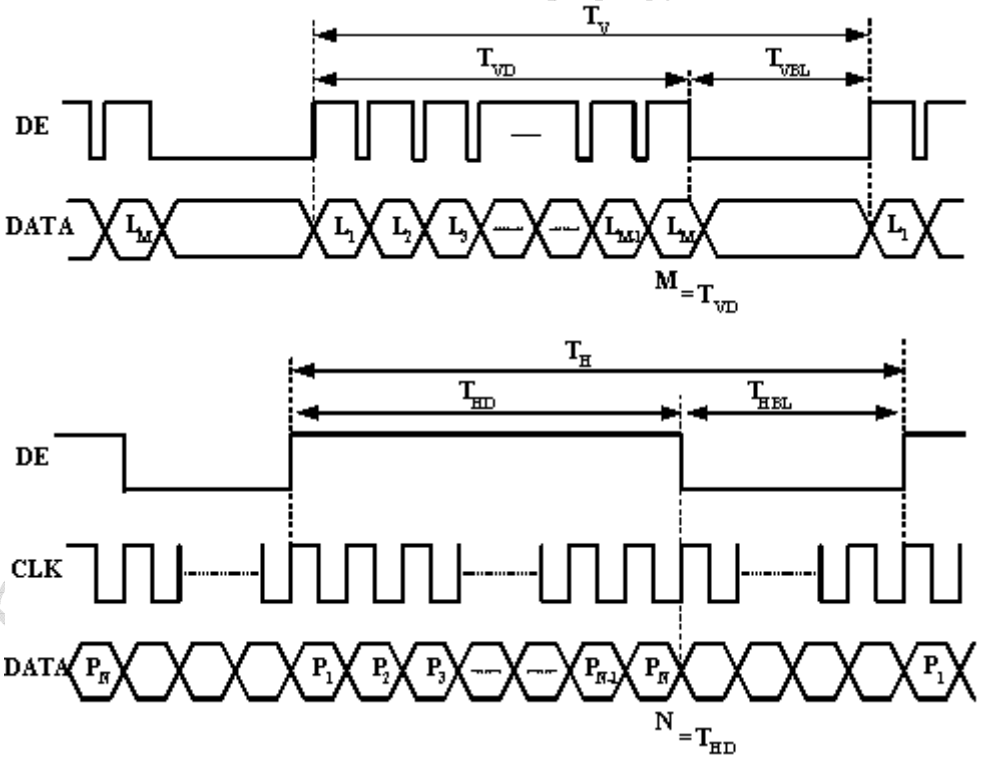


Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Differential Common-mode Voltage	V_{CM}	-	2.1	-	V	
Differential Threshold High Voltage	V_{TH}	-	-	50	mV	
Differential Threshold Low Voltage	V_{TL}	-50	-		mV	

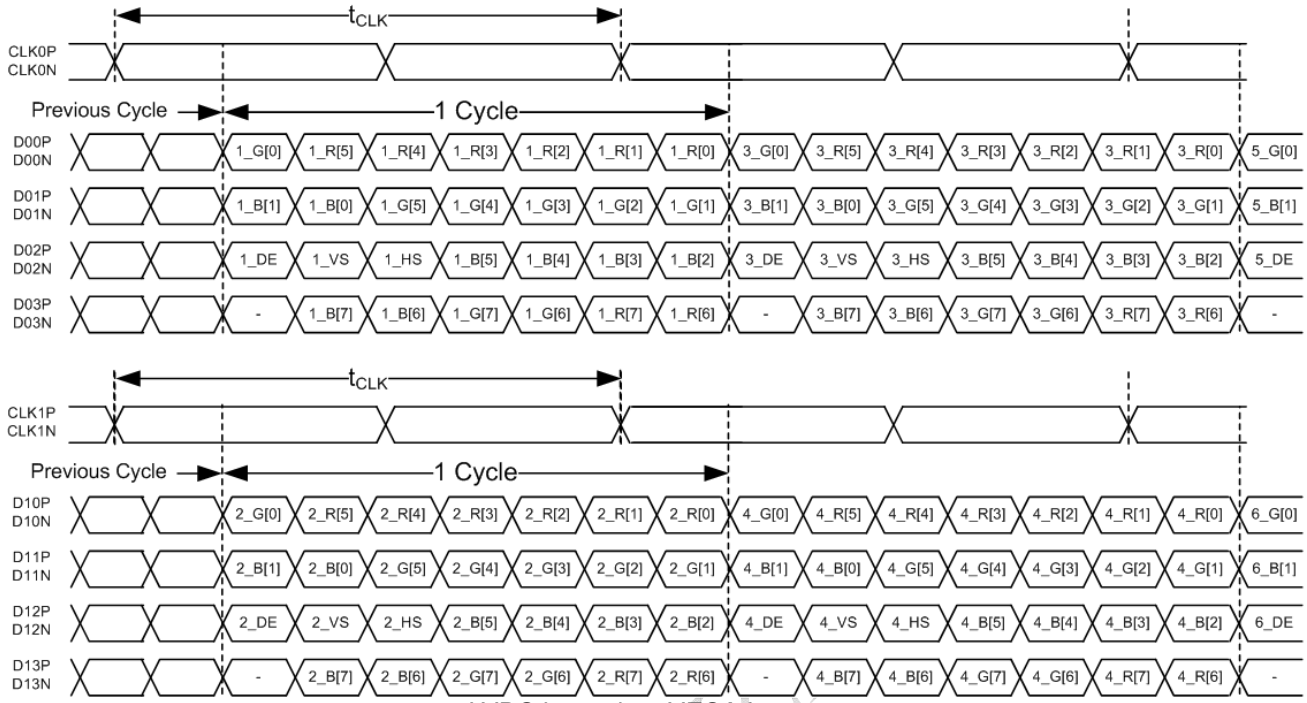
6. Input Timing Diagram

Parameter		Symbol	Typ.	Unit.
DCLK frequency		F_{DCLK}	149.47	MHz
Data bit rate		F_{DATA}	1046.32	Mbit/sec
HSYNC	Period	T_H	2042	t_{DCLK}
	Display period	T_{HD}	1920	t_{DCLK}
	Blanking	T_{HBL}	122	t_{DCLK}
VSYNC	Period	T_V	1220	t_H
	Display period	T_{VD}	1200	t_H
	Blanking	T_{VBL}	20	t_H
Frame rate		$1/T_V$	60	Hz

a. Timing Diagram



b. Differential Input Data Format



LVDS input data VESA format

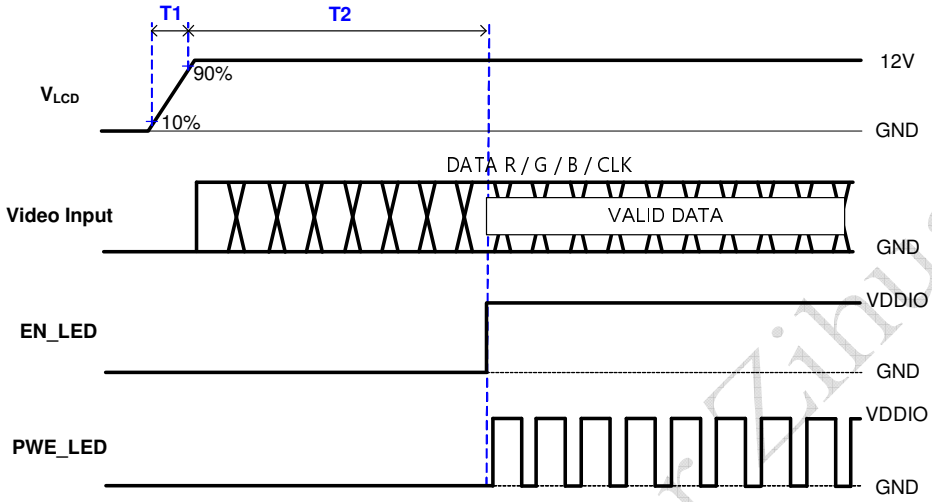
7. Power on/off sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

a. Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	200			ms

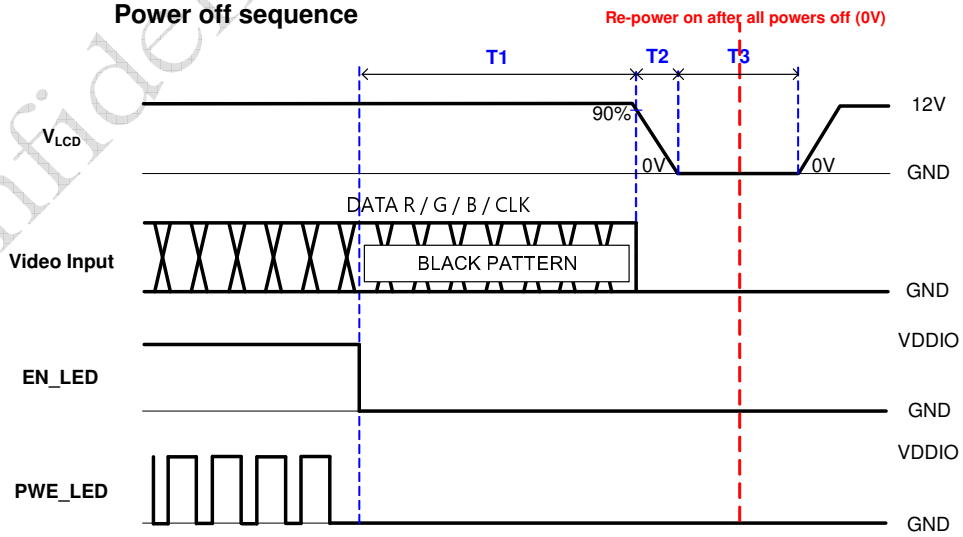
Power on sequence



b. Power off sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0	-	-	ms
T2	-	-	10	ms
T3	1000			ms

Power off sequence



All signals must be discharge to zero voltage when power off.

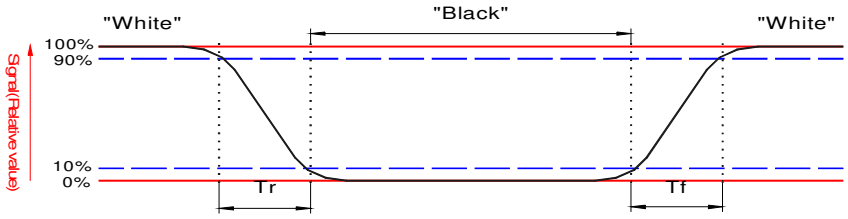
Optical specifications (all for reference)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise	Tr+Tf	θ=0°, 25°C	-	-	20	ms	Note 3
Viewing Angle	CR	θ =60° φ=0, 10, 45, 90, 135, 170, 180, 225, 270, 315	100			deg.	Note 7, 8,10
White Chromaticity	X	θ=0°	0.303	0.318	0.333		Note 11
	Y	θ=0°	0.314	0.329	0.344		
Red Chromaticity	X	θ=0°	0.671	0.686	0.701		
	Y	θ=0°	0.286	0.301	0.316		
Green Chromaticity	X	θ=0°	0.252	0.267	0.282		
	Y	θ=0°	0.625	0.640	0.655		
Blue Chromaticity	X	θ=0°	0.134	0.149	0.164		
	Y	θ=0°	0.043	0.058	0.073		
Contrast ratio	CR	θ =0°	1200	1500	-		Note 4, 5, 6
Transmittance	Tr%	Ta=25℃		4.0		%	Note 2, 6, 9

Note 1: Measurement should be performed in the dark room, optical ambient temperature = 25 ℃.

Note 2: To be measured in the center area of TFT-LCD with a field angle of 1° by Topcon luminance meter SR3, after 10 minutes operation and warm up 30 minutes.

Note 3: Definition of response time:
The output signals of photo detector are measured when the input signals are changed from “black state” to “white state” (falling time) and from “white state” to “black state” (rising time), respectively.



Note 4: Based on liquid crystal characteristics, the response time will become slower and the color of panel will become darker than the above optical specification when ambient temperature is below 25 ℃.

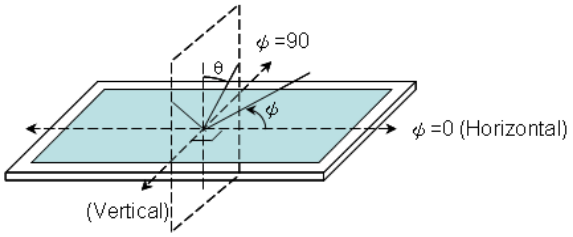
$$\text{Contrastratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5: Contrast ratio is calculated with the following formula.

Note 6: White Vdata=V1 or V18
Black Vdata=V9 or V10
(For definition of V1, V9, V10 & V18, please refer to Appendix)
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of

module are electrically opened.

Note 7: Definition of viewing angle: refer to figure as below.



Note 8: Viewing angles are measured at the center of the panel when all the input terminals of LCD oanel are electrically opened.

Note 9: Transmittance is measured at the center of the display.
Measuring conditions:
(1) Ambient temperature: Ta=25 degreeC;
(2) Display:white
(3) Light source: Defined by BHTC BLU (W/O DEBEF).

Note 10: The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 11: Measurement should be performed with ROE backlight-cross BEF EJ bin, and B/L color range between x=0.293~0.298; y= 0.272~0.282(measured by AUO side CA310).

F. Reliability Test Items(Note 1~3)

No.	Test items	Conditions		Remark
1	Thermal Shock (TS) Non-operation	-40 ℃ ~ 95 ℃	150 cycles	
2	Power Thermal Cycle Operation (PTCE)	-30 ℃ ~ 85 ℃	600 cycles	
3	High temperature operation	Ta= 85 ℃	1000 Hrs	
4	Low temperature operation	Ta= -30 ℃	1000 Hrs	
5	High temperature and high humidity storage (HTHE)	Ta= 85 ℃, 85 % RH	360 Hrs	
6	High temperature and high humidity Operation (HTHE)	Ta= 65 ℃, 90 % RH	1000 Hrs	
7	Vibration (with carton)	Random vibration: 0.015 G^2/Hz from 5 ~ 200 Hz –6 dB/Octave from 200 ~ 500 Hz		
8	Drop (with carton)	Height: 60 cm 1 corner, 3 edges, 6 surfaces		

Note 1: Ta: Ambient temperature

Note 2: In the standard condition, there is no display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: I_L = 80mA

G. Packing and Marking

1. Packing Form

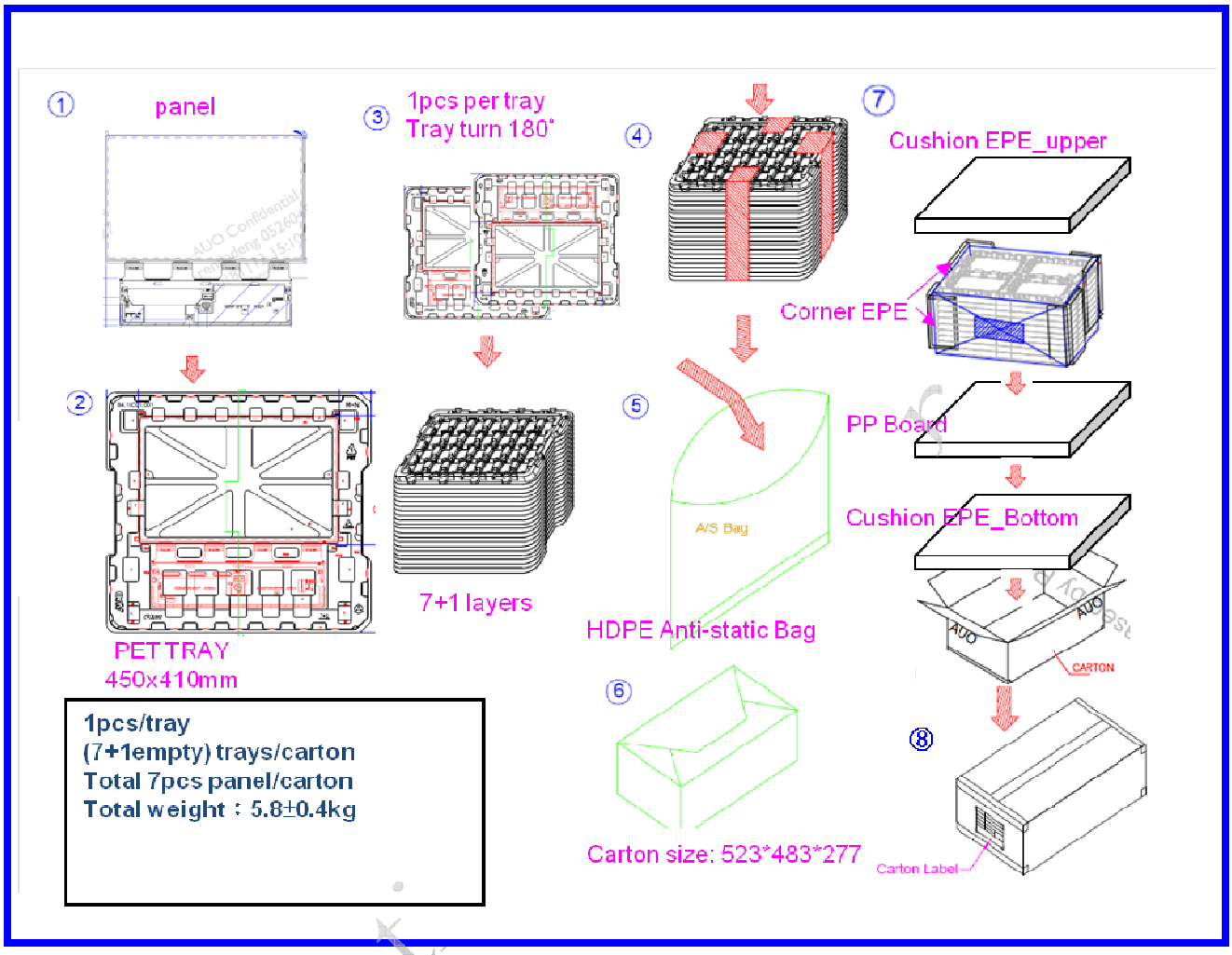


Fig. 10. Packing diagram

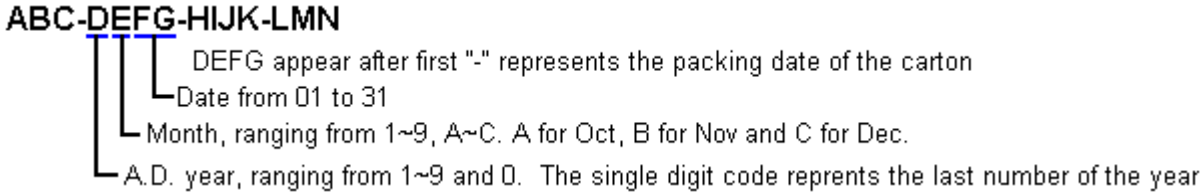
2. Module/Panel Label Information

The module/panel (collectively called as the “Product”) will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 20-digit serial number with the following definition:

2D barcode information
1: Display Vendor, A:AUO
2~4: Panel_size,15.4” :154
5: Model_Ver.,0
6~8:Factory,S17
9~10:Year,ex. 2011 code:11;2012 code:12
11:Month,ex : 1,2,3,4,5,6,7,8,9,A,B,C
12:Date,ex : 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F,G,H,I,J,K,L,M,N,P,Q,R,S,T,I,V,W
13~16:Serial number,from 0001~9999
17~19:Sample_Ver.; Build code+Build main config code+Build sub config code
20:Sample type,ex : S for sample; A for MP

3. Carton Label Information

The packing carton will be attached with a carton label where packing Q’ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:



Refer to the drawing of packing format for the location and size of the carton label.

4. Warehouse storage condition:

Room temperature: 25 +/- 5 degrees
Humidity: 30% ~ 70%