



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A060SE02 V1
CUSTOMER APPROVED	

- APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.5)
- APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.5)
- APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.5)
- CUSTOMER REMARK :

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Product Specification

6" EPD MODULE

Model Name : A060SE02 V1

Planned Lifetime: From 2009/Jul. To 2011/Jul.

Phase-out Control: From 2011/Mar. To 2011/Jul.

EOL Schedule: 2011/Jul.

< ◆ > Preliminary Specification

< > Final Specification

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

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Record of Revision

Version	Revise Date	Page	Content
0.0	2009/05/04	All	First Draft.
0.1	2009/07/06	7、9	Update VCOMDC、VCOMH、VCOML、VDPS、VDNS pin define
		16	Add VCOM relationship.
		17~18	Update power on/off sequence
		19	Update reflectance
		21	Update RA condition
0.2	2009/07/09	10	Add I/O pin structure
		19	Update Optical condition
		21	Update RA condition
0.3	2009/09/04	3	Update thickness
		4	Update module drawing
		10	Update power consumption
		17	Update optical performance
		19	Update RA condition
0.4	2009/09/08	17	Update optical performance
0.5	2009/10/14	10	Update Power Consumption
		15	Update Power On/Off Characteristics
		18~19	Update RA conditions
		24	Update application Circuit



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A. General Information

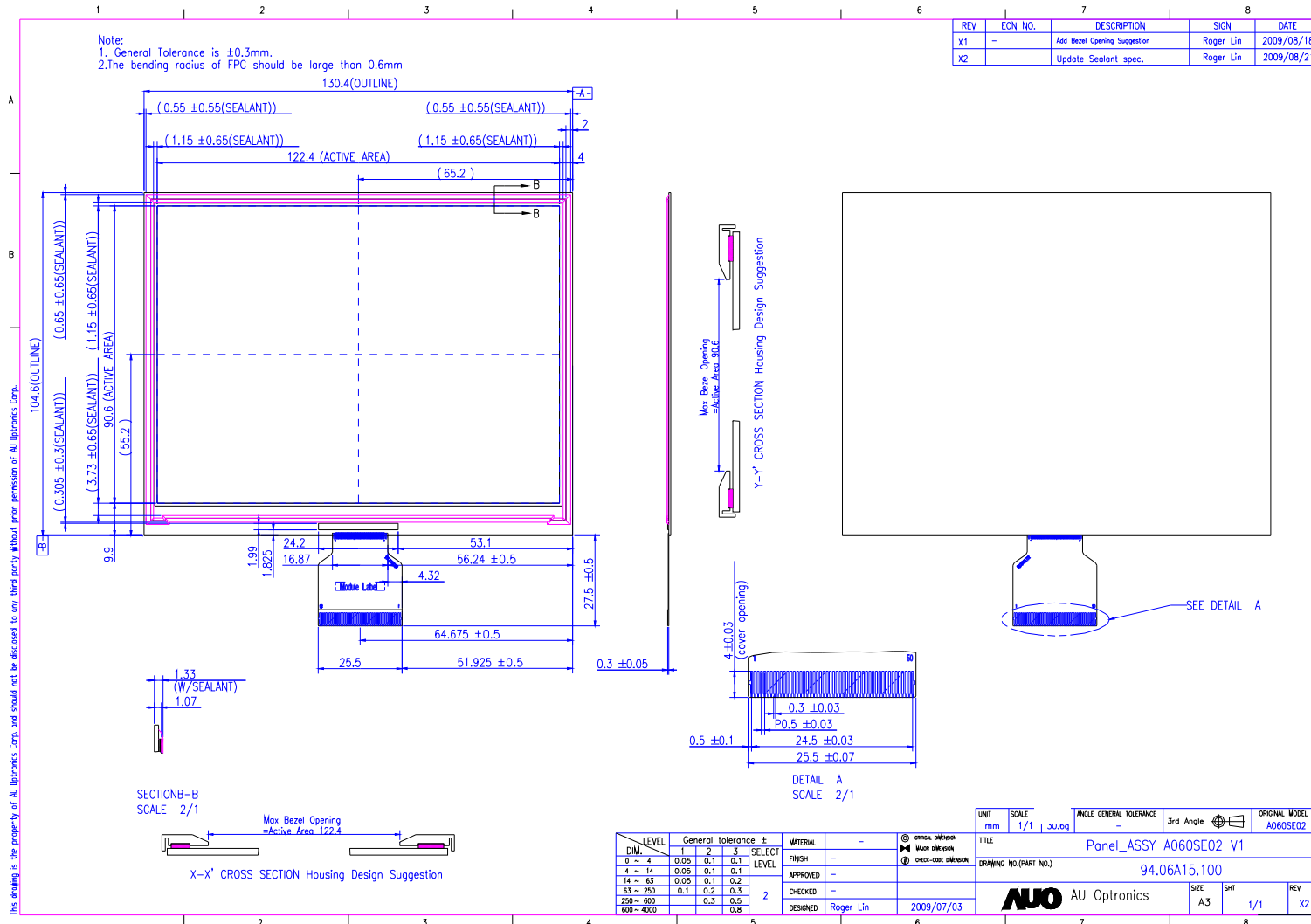
This product is for Electric Book application.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	6 (Diagonal)	
2	Display Resolution	dot	800 (H)× 600(V)	
3	Overall Dimension	mm	130.4(H) × 104.6(V) × 1.33(T)	Note 1
4	Active Area	mm	122.4(H)×90.6(V)	
5	Dot Pitch	mm	0.153 (H)x 0.151(V)	
6	Gray level	--	16	
7	Weight	g	(34.3)	

Note 1: Not include FPC but include sealant. Refer next page to get further information.



B. Outline Dimension



C. Electrical Specifications

1. Pin Assignment

Recommended connector : FH12-50S-0.5SH.

Pin No.	Symbol	I/O	I/O Structure	Description	Remark
1	Dummy	--	--	Dummy pin	
2	VCOM	O	--	VCOM polarity output signal	
3	VCOM_BOT	I	--	VCOM signal setting pin	
4	VCOMDC	P	Type2	External voltage for VCOMDC power.	
5	VCOMH	P	--	External voltage for VCOM high power.	
6	VCOML	P	--	External voltage for VCOM low power.	
7	RST_N	I	Type 3	Global reset pin. Low reset.	
8	SHD_N	I	Type 3	DC-DC converter shut down pin. "0" : Enable.(Panel shut down; Default) "1" : Disable.	
9	PWR_RDY	O	Type 1	Power ready output. When SHD_N from "1" to "0": PWR_RDY will become "0". When SHD_N from "0" to "1": after 100ms, PWR_RDY will become "1".	Note1
10	VCOMIN_0	I	Type 2	Logic Input for VCOM voltage generate.	
11	VCOMIN_1	I	Type 2	Logic Input for VCOM voltage generate.	
12	YOE	I	Type 3	Vertical output enable pin.	Note2
13	YCLK	I	Type 3	Vertical clock. input	Note2
14	UD	I	Type 3	Vertical (up/down) scan direction. U/D = "L": Shift up to down. Default U/D = "H": Shift down to up.	

15	YDIOD	I/O	Type 5	Vertical start pulse input/output. These pins are used to input and output shift data. These pins are switched as input or output by setting the UD pin as follow.										
16	YDIOU	I/O	Type 5	<table border="1"> <thead> <tr> <th>UD</th> <th>YDIOU</th> <th>YDIOD</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>Output</td> <td>Input</td> </tr> <tr> <td>H</td> <td>Input</td> <td>Output</td> </tr> </tbody> </table>	UD	YDIOU	YDIOD	L	Output	Input	H	Input	Output	
UD	YDIOU	YDIOD												
L	Output	Input												
H	Input	Output												
17	XDIOL	I/O	Type 5	Horizontal start pulse input/output. These pins are used to input and output shift data. These pins are switched as input or output by setting the SHL pin as follow.										
18	XDIOR	I/O	Type 5	<table border="1"> <thead> <tr> <th>SHL</th> <th>XDIOL</th> <th>XDIOR</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>Input</td> <td>Output</td> </tr> <tr> <td>H</td> <td>Output</td> <td>Input</td> </tr> </tbody> </table>	SHL	XDIOL	XDIOR	L	Input	Output	H	Output	Input	
SHL	XDIOL	XDIOR												
L	Input	Output												
H	Output	Input												
19	LD	I	Type 3	Latch data.										
20	D0	I	Type 3	Data input, First pixel LSB										
21	D1	I	Type 3	Data input, First pixel MSB										
22	D2	I	Type 3	Data input, Second pixel LSB										
23	D3	I	Type 3	Data input, Second pixel MSB										
24	D4	I	Type 3	Data input, Third pixel LSB										
25	D5	I	Type 3	Data input, Third pixel MSB										
26	D6	I	Type 3	Data input, Forth pixel LSB										
27	D7	I	Type 3	Data input, Forth pixel MSB										
28	SHL	I	Type 3	Horizontal (left/right) scan direction. SHL = "L": Shift right to left. SHL = "H": Shift left to right. Default										
29	XCLK	I	Type 3	Horizontal Clock input..	Note3									
30	VREF	C	--	For power setting capactor connected pin.										
31	VR	P	--	VCOMDC reference voltage										
32	AVDD	C	--	For power setting capactor connected pin.										
33	C1P	C	--	For charge pump capactor connected pin.										
34	C1N	C	--	For charge pump capactor connected pin.										
35	VSS	P	--	Digital ground										
36	VSSA	P	--	Analog ground.										
37	VDD	P	--	Analog power.										
38	VREF_POS	C	--	For power setting capactor connected pin.										
39	VREF_NEG	C	--	For power setting capactor connected pin.										

40	VDDX8	P	--	DCDC positive voltage	
41	NVDDX8	P	--	DCDC negative voltage	
42	VDD_DRV	P	--	DCDC power.	
43	ADRVU	O	Type 1	PWM output for DCDC converter.	
44	ADRVD	O	Type 1	PWM output for DCDC converter.	
45	VSS_DRV	P	--	DCDC ground.	
46	VDPS	P	--	External voltage for source positive power.	
47	VDNS	P	--	External voltage for source negative power.	
48	VDPG	C	--	For power setting capacitor connected pin.	
49	VDNG	C	--	For power setting capacitor connected pin.	
50	Dummy	D	--	Dummy pin	

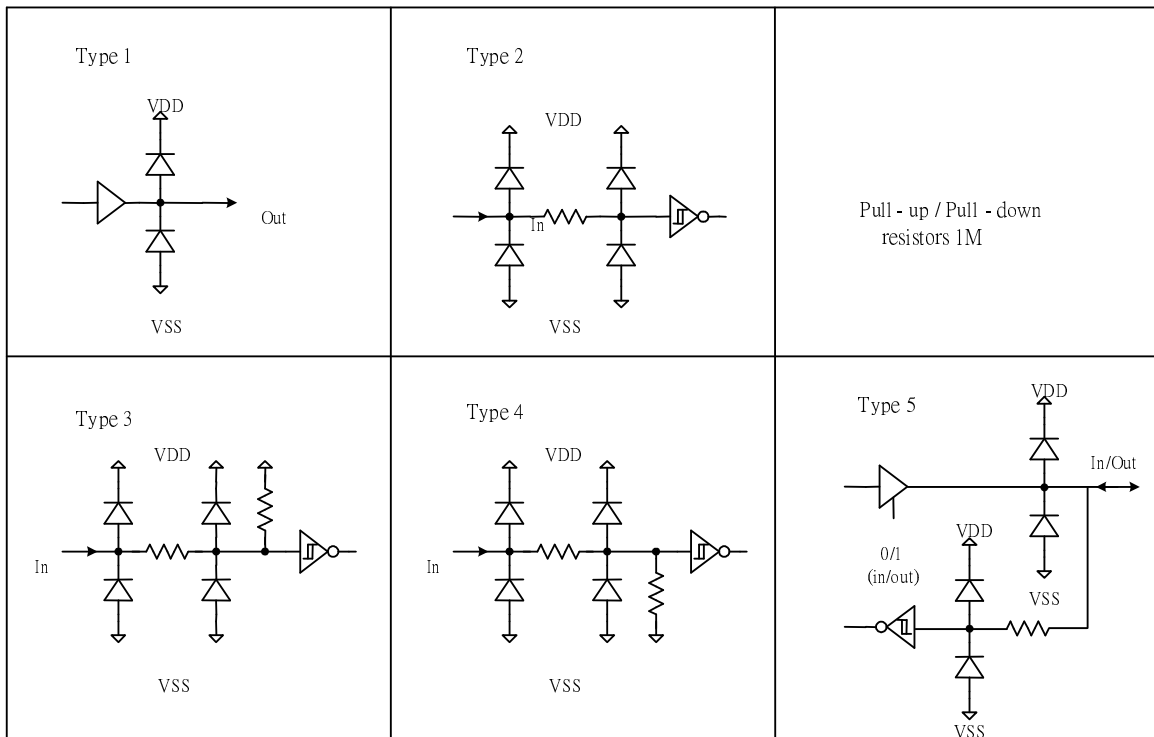
I: Input pin; O:output pin, I/O: Input / Output; P: Power pin; C: capacitor pin; D : Dummy

Note 1: Please reference chapter F

Note 2: Please reference chapter E

Note 3: Please reference chapter E

I/O Pin Structure:



2. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDD	VSSA=VSS=0	-0.3	+5.0	V	
Power voltage	VDD_DRV	VSS_DRV=0	-0.3	+5.0	V	
Source voltage	VDPS	VSSA=VSS=0		+20	V	
	VDNS	VSSA=VSS=0	-20		V	
Gate voltage	VDPG	VSSA=VSS=0	-0.3	VDNG+40		
	VDNG	VSSA=VSS=0	VDPG-40	+0.3		
Storage temperature	Tstg	-	-25	70	°C	
Operating	Topa	-	0	50	°C	

D. Electrical Characteristics

Item	Symbol	Condition	Min.	Typical	Max.	Unit
Supply Voltage	VDD	VSSA=VSS=VSS_DRV=0V	--	3.3	--	V
	VDD_DRV	VSSA=VSS=VSS_DRV=0V	--	3.3	--	
Low Level Input Voltage	Vil	Digital input pins	GND	-	0.3xVDD	V
High Level Input Voltage	Vih	Digital input pins	0.7xVDD	-	VDD	V
Operating temperature	T _{op}		-	--	-	°C
Operation Power Dissipation		VDD=VDD_DRV=3.3V VDNS=-15V VDPS=15V VCOMH=11.5V , VCOML=-18.5V	--	(21)	(28)	mA
Standby Power Dissipation		VDD=VDD_DRV=3.3V VDNS=0V VDPS=0V VCOMH=0V , VCOML=0V	--	(0.2)	(1)	mA

E. Input timing AC Characteristics

1. Horizontal input timing

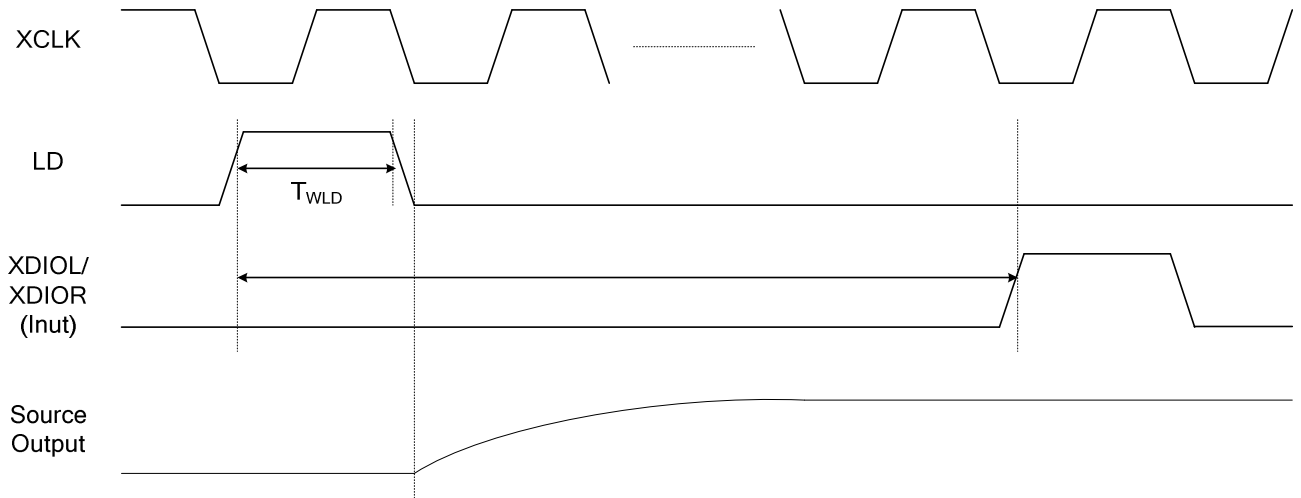
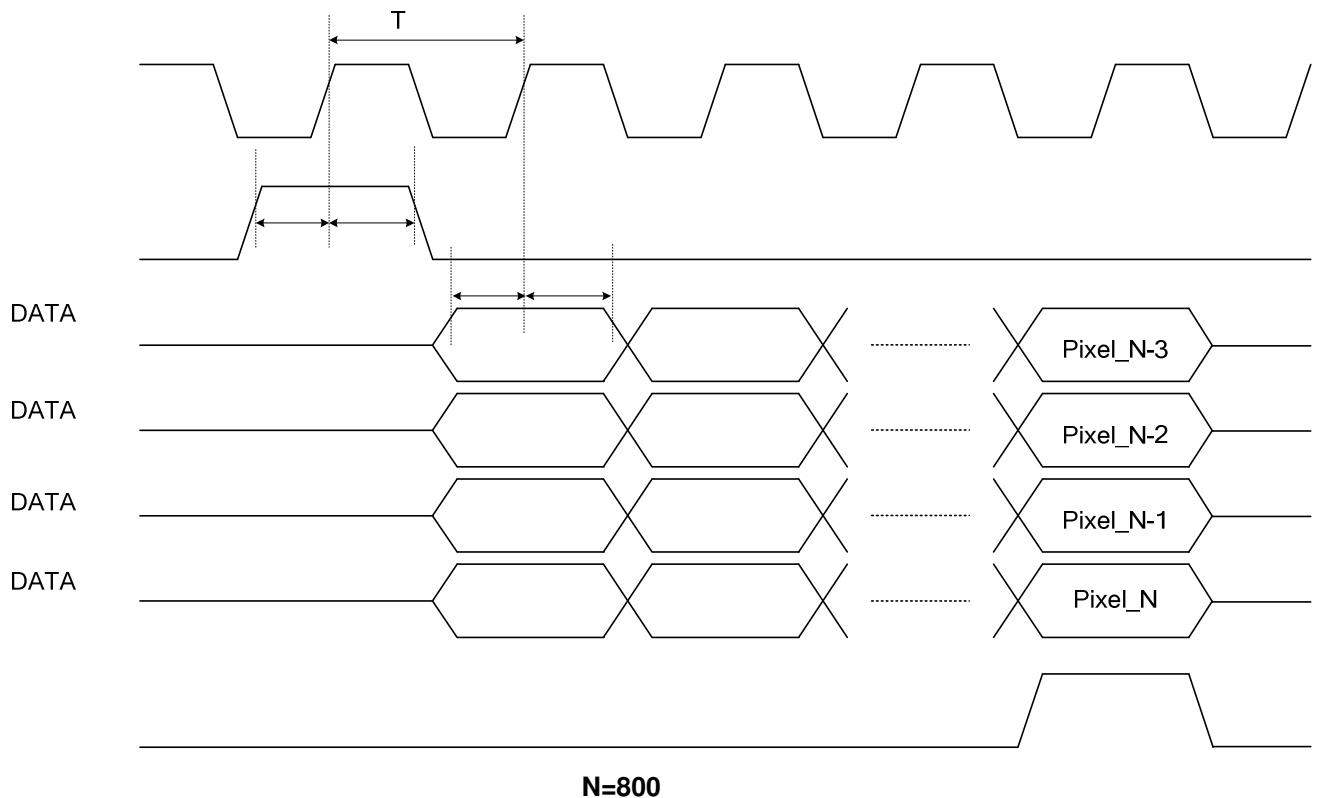


Figure 1: LD input timing



N=800

Figure 2: Horizontal data Input timing

(VDD=VDD_DRV=3.3V, VSSA=VSS=VSS_DRV=0V, TA=25°C)

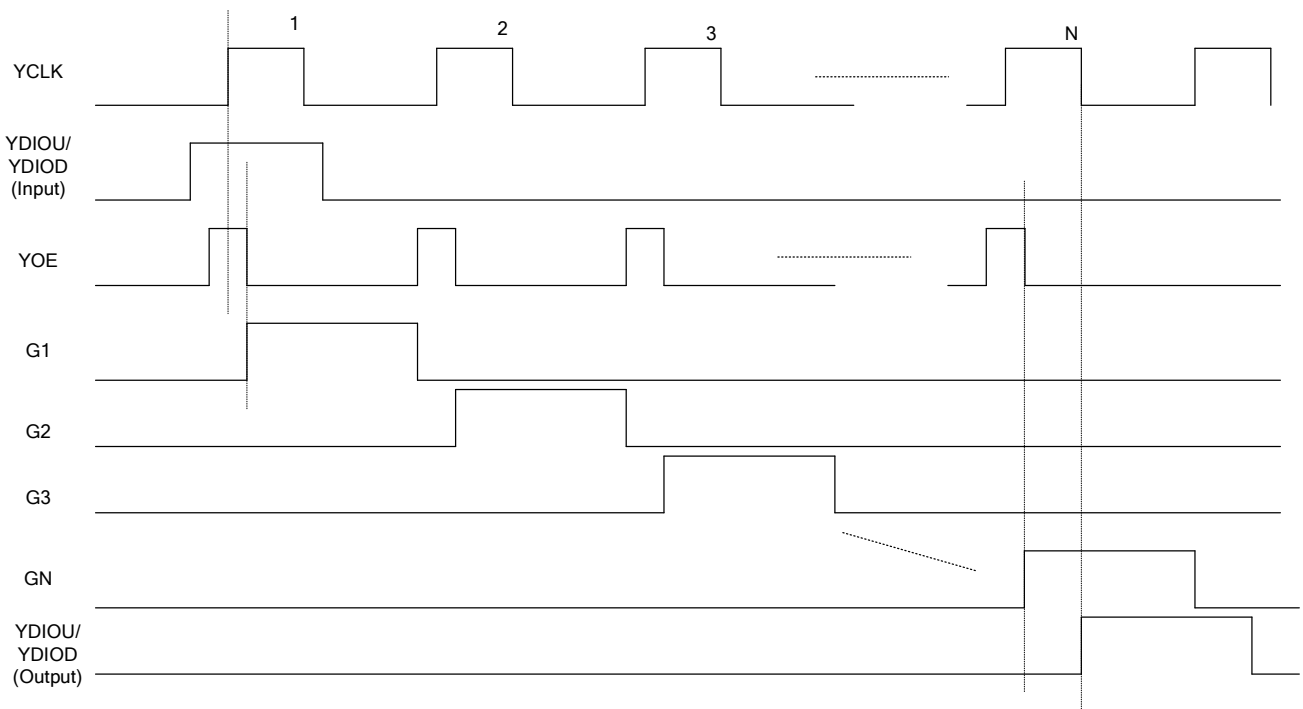
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock pulse width	T_{WXDCLK}	13			ns
Data setup time	T_{setup}	2	-	-	ns
Data hold time	T_{hold}	2	-	-	ns
LD pulse width	T_{WLD}	1	-	-	XCLK
Time from LD to XDIOL/XDIOR	T_{LD_DIO}	5	-	-	XCLK

1.1 Relation ship of input data and source output voltage

The source driver output voltage will base on input 2 bits data, and the relationship is as below:

MSB	LSB	Function
0	0	Source output is 0V
0	1	Source output is VDPS(+15V)
1	0	Source output is VDNS(-15V)
1	1	Source output is floating

2. Vertical input timing



N=600

Figure 3: Vertical input timing

3. VCOM voltage definition

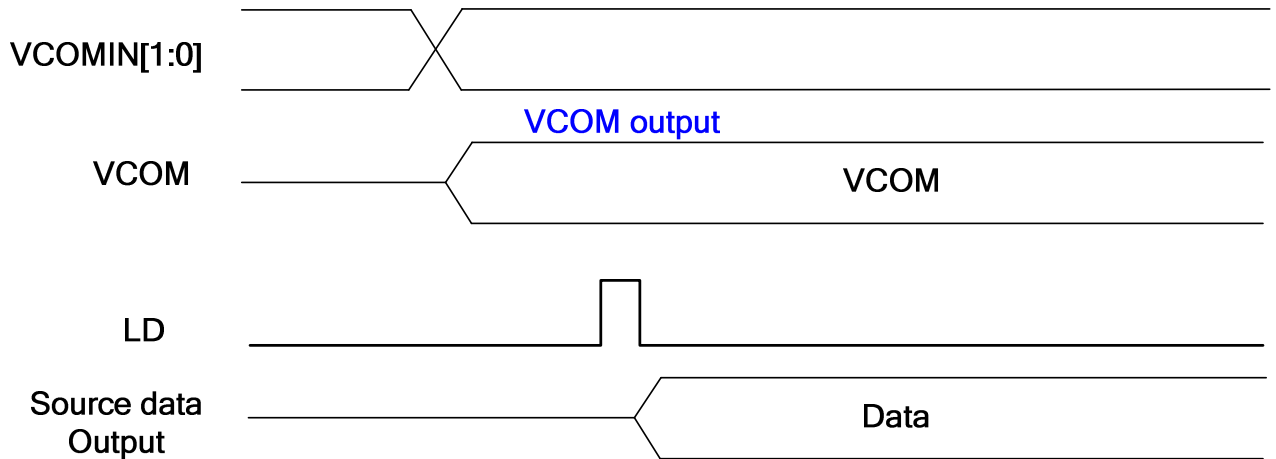
The VCOM output voltage will base on input pins VCOMIN[1:0], and the relationship is as below:

VCOMIN[1 :0]	Function
00	VCOM output is (-VDC) v
01	VCOM output is (VDPS-VDC) v
10	VCOM output is (VDNS-VDC) v
11	VCOM output is floating

4. VCOM relationship

VCOM will change while VCOMIN change

Source output will change while LD signal falling edge.

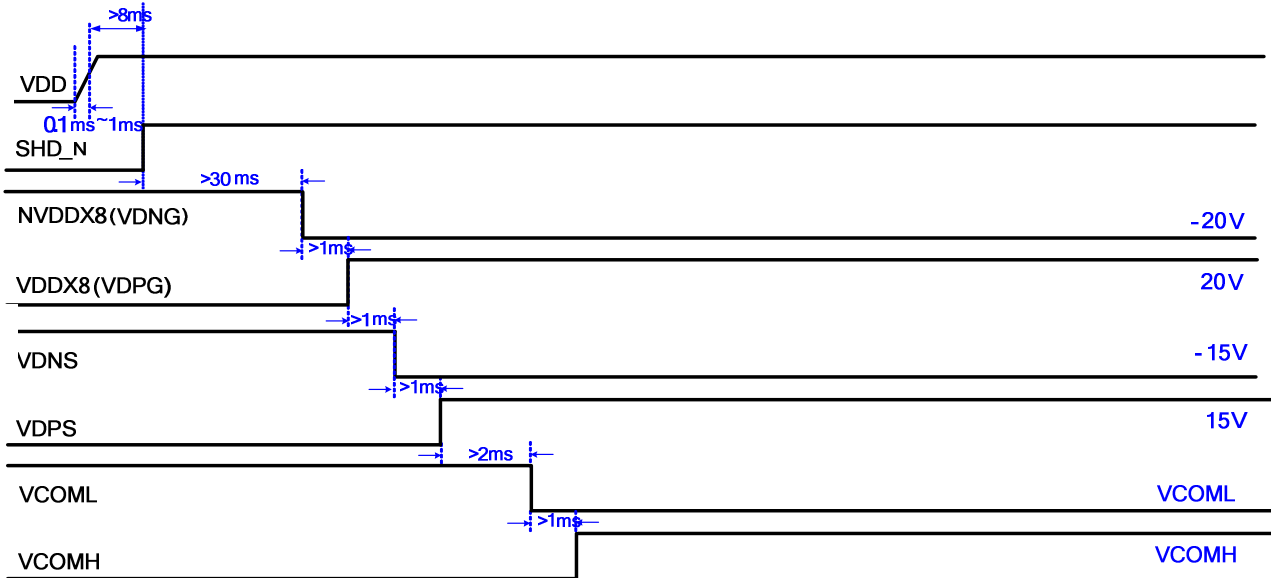


F. Power On/Off Characteristics

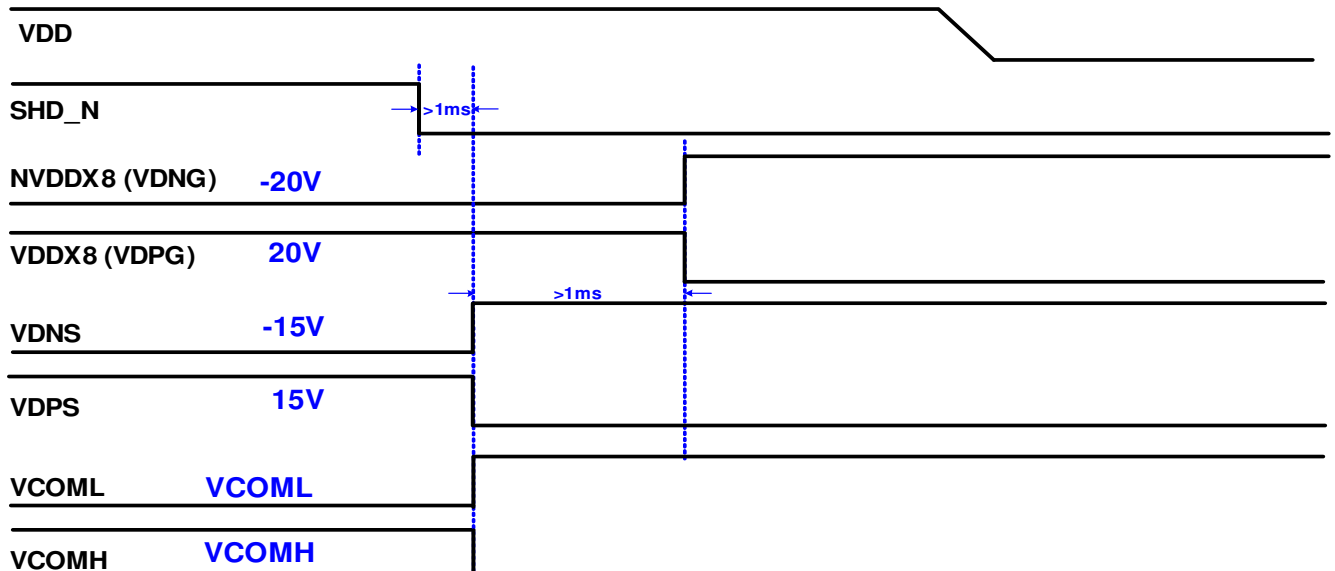
1. Recommended Power On/off Sequence

The suggested power on/off sequence is below:

Power on sequence:



2. Power off sequence:



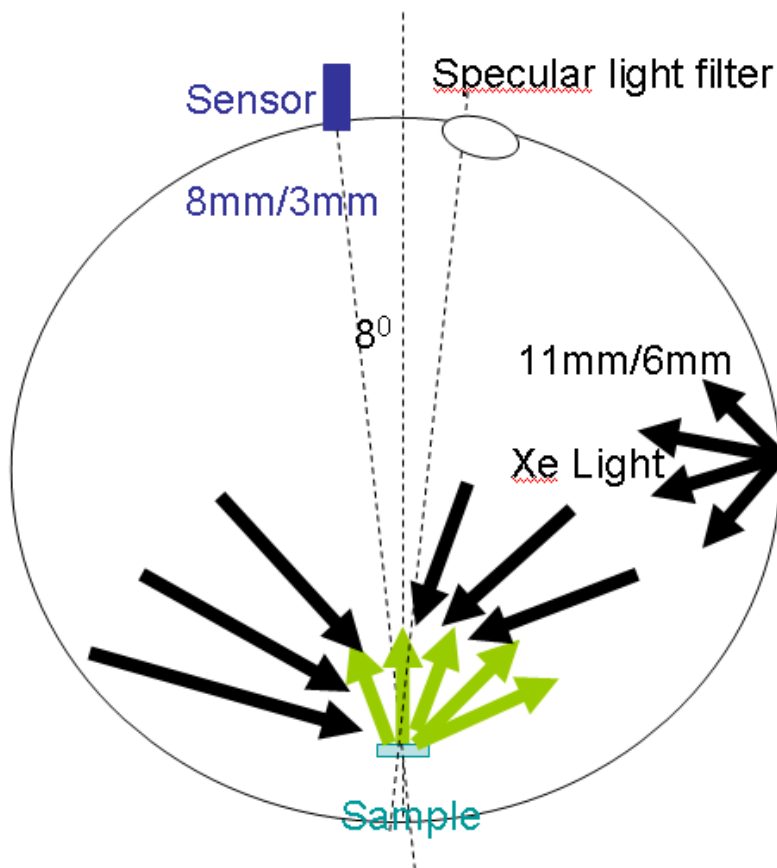
G. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Reflectance	R	white	30	33	--	%	Note1,4
Contrast Ratio	CR	At optimized viewing angle	5	6	--		Note1, 5
Response time	T _r	30V		(300)		ms	Note 3
	T _f	30V		(300)			

Note 1. Ambient temperature =25°C

Note 2. Reflectance and contrast ratio are measured by KONICA MINOLTA spectrophotometer CM-2600d.

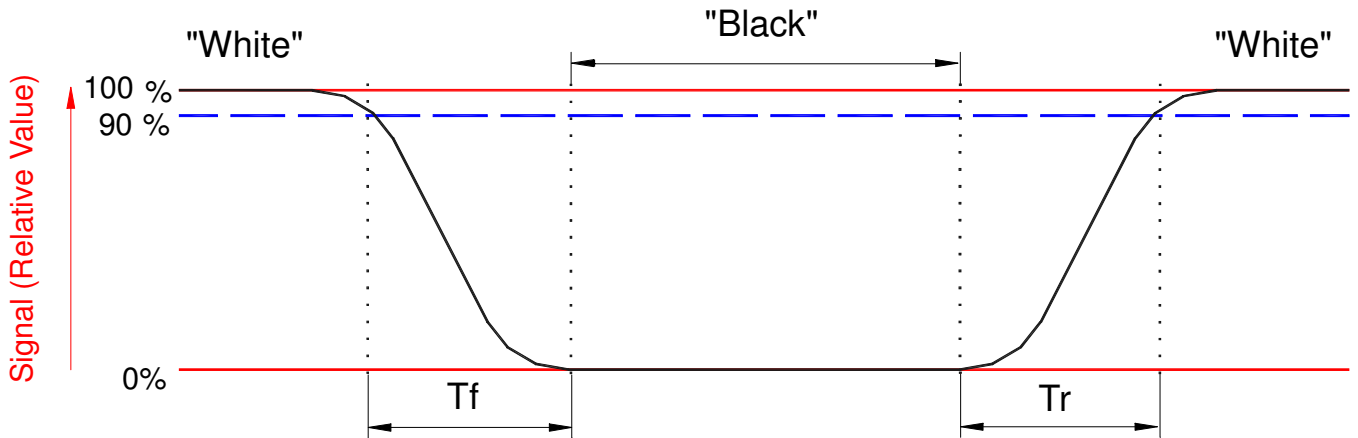


Note 3. Definition of response time:

The response time is defined as the time from image load to full updated display.

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(raising time) and from “white” to “black”(falling time), respectively.

Refer to figure as below.



Note 4. Definition of Reflectance:

The Reflectance is expressed as:

$$R = \text{Reflectance Factor}_{\text{white board}} \times (L_{\text{center}} / L_{\text{white board}})$$

L_{center} is the luminance measured at center in a white area. $L_{\text{white board}}$ is the luminance of a standard white board.

Note 5. Definition of contrast ratio:

The contrast ratio (CR) is the ratio between the reflectance in a full white area (Rl) and reflectance in a dark area (Rd).

$$\text{Contrast ratio (CR)} = \frac{Rl}{Rd}$$

H. Reliability Test Items

	Test	Condition	Condition	Remark
1	High-Temperature Operation	Tamb=+50°C, RH=30% for 240hrs	IEC 60068-2-2Bp	At the end of the test electric,mechanical, and optical specifications shall be satisfied.
2	Low-Temperature Operation	Tamb=0°C for 240hrs	IEC 60068-2-2Ab	At the end of the test electric,mechanical, and optical specifications shall be satisfied.
3	High-Temperature functional	Tamb=+60°C, RH=26% for 240hrs	IEC 60068-2-2Bp	At the end of the test electric,mechanical, specifications shall be satisfied.
4	Low-Temperature functional	Tamb=-10°C for 240hrs	IEC 60068-2-2Ab	At the end of the test electric,mechanical, specifications shall be satisfied.
5	High-Temperature Storage	Tamb=+70°C, RH=23% for 240hrs	IEC 60068-2-2Bp	At the end of the test electric,mechanical, and optical specifications shall be satisfied.
6	Low-Temperature Storage	Tamb=-25°C for 240hrs	IEC 60068-2-2Ab	At the end of the test electric,mechanical, and optical specifications shall be satisfied.
7	High-Temperature, High-Humidity Operation	Tamb=+40°C, RH=90% for 168hrs	IEC 60068-2-3CA	At the end of the test electric,mechanical, specifications shall be satisfied.
8	High-Temperature, High-Humidity Storage	Tamb=+60°C, RH=80% for 240hrs	IEC 60068-2-3CA	At the end of the test electric,mechanical, specifications shall be satisfied.
9	Temperature Cycle	1 Cycle : [-25° C 30min] -> [+70° C 30min] : 100 cycles	IEC 60068-2-14	At the end of the test electric,mechanical, specifications shall be satisfied.
10	Sunlight effect	1120mW/cm2 for 168hrs, 40°C	IEC 60068-2-5Sa	At the end of the test electric,mechanical, and optical specifications shall be satisfied.
11	Package Vibration	1.04G, Frequency : 10 ~ 500HZ Direction : X, Y, Z Duration : 1 hours in each direction		At the end of the test electric,mechanical, and optical specifications shall be satisfied.
12	Package Drop Impact	Drop from height of 100 cm on concrete surface. Drop sequence : 1 corner, 3 edges, 6 faces one drop for each.		At the end of the test electric,mechanical, and optical specifications shall be satisfied.

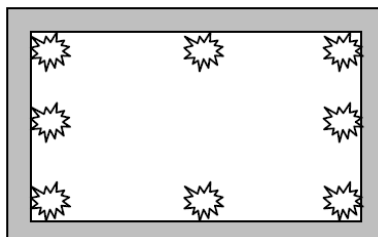
13	Electrostatic discharge	Air-mode : +/- 8kV Contact-mode : +/- 4kV	IEC 61000-4-2	At the end of the test electric,mechanical, specifications shall be satisfied. (Note. 3)
14	Altitude test Operation	700hPa(=3,000m) 48hrs		At the end of the test electric,mechanical, specifications shall be satisfied.
15	Altitude test Storage	260hPa(=10,000m) 48hrs		At the end of the test electric,mechanical, specifications shall be satisfied.
16	FPC Soldering Strength	Pull the FPC soldered part with a force of 500g in the horizontal and vertical directions		At the end of the test electric,mechanical, specifications shall be satisfied.
17	FPC bending Performance	Apply MIT method. Bending rate radius : 1.0mm Weight 500gf, Bending angle : ± 135° Bending cycle : 20 times		At the end of the test electric,mechanical, specifications shall be satisfied.
18	Stylus Tapping	POLYACETAL Pen : Top R0.8mm Load : 300gf Speed : 3 times/sec Total 13,500 times		Pass criteria - no glass breakage or damage to microcapsules.

Note 1. Tamb: Ambient Temperature = 25°C

Note 2. In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

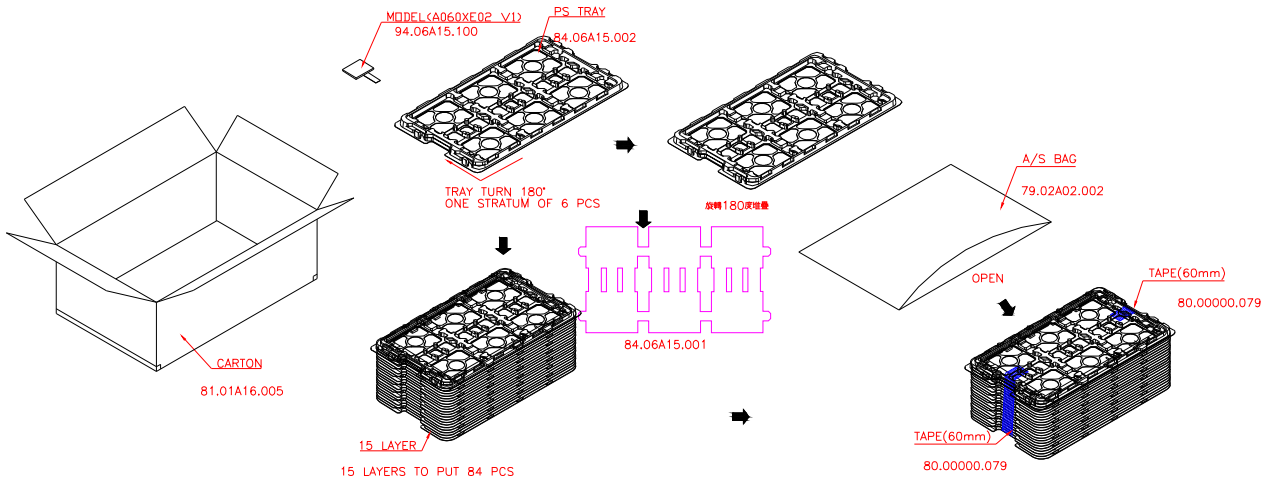
Note 3. ESD testing method.

1. Ambient: 24~26°C , 56~65%RH, atmospheric pressure : 940~960hPa
2. Instruments:NoisekenESS-2000,
3. Operation System: AUO pattern generator
4. Test Mode: Non-operating mode, test pattern: chess
5. Test Method:
 - a. Contact Discharge: 150pF(330Ω) 1sec, 8 points, 25 times/point
 - b. Air Discharge: 150pF(330Ω) 1sec, 8 points, 25 times/point
6. Test point:

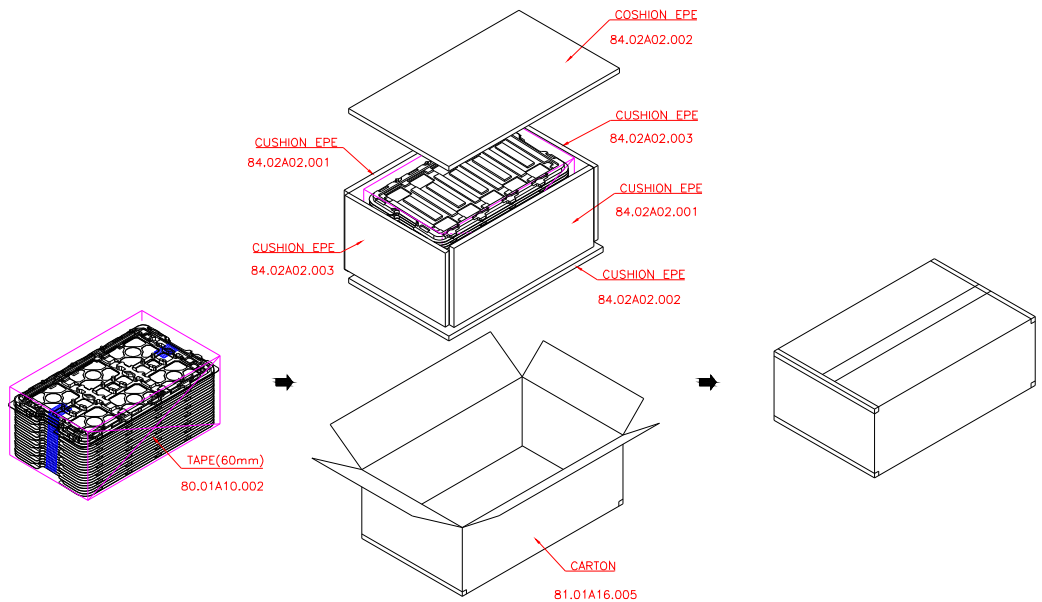


I. Packing and Marking

1. Packing Form



MAX. CAPACITY:84 MODULES
 MAX. WEIGHT:TBD kg
 MEAS. 600 x 353 x 210 mm



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 22-digit serial number and printed with code 39/128 with the following definition:

ABCDEFGHIJKLMN OPQRST UV

- For internal system usage and production serial numbers.
- AUO Module or Panel factory code, represents the final production factory to complete the Product
- Product version code, ranging from 0~9 or A~Z (for Version after 9)
- Week Code, the production week when the product is finished at its production process

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:

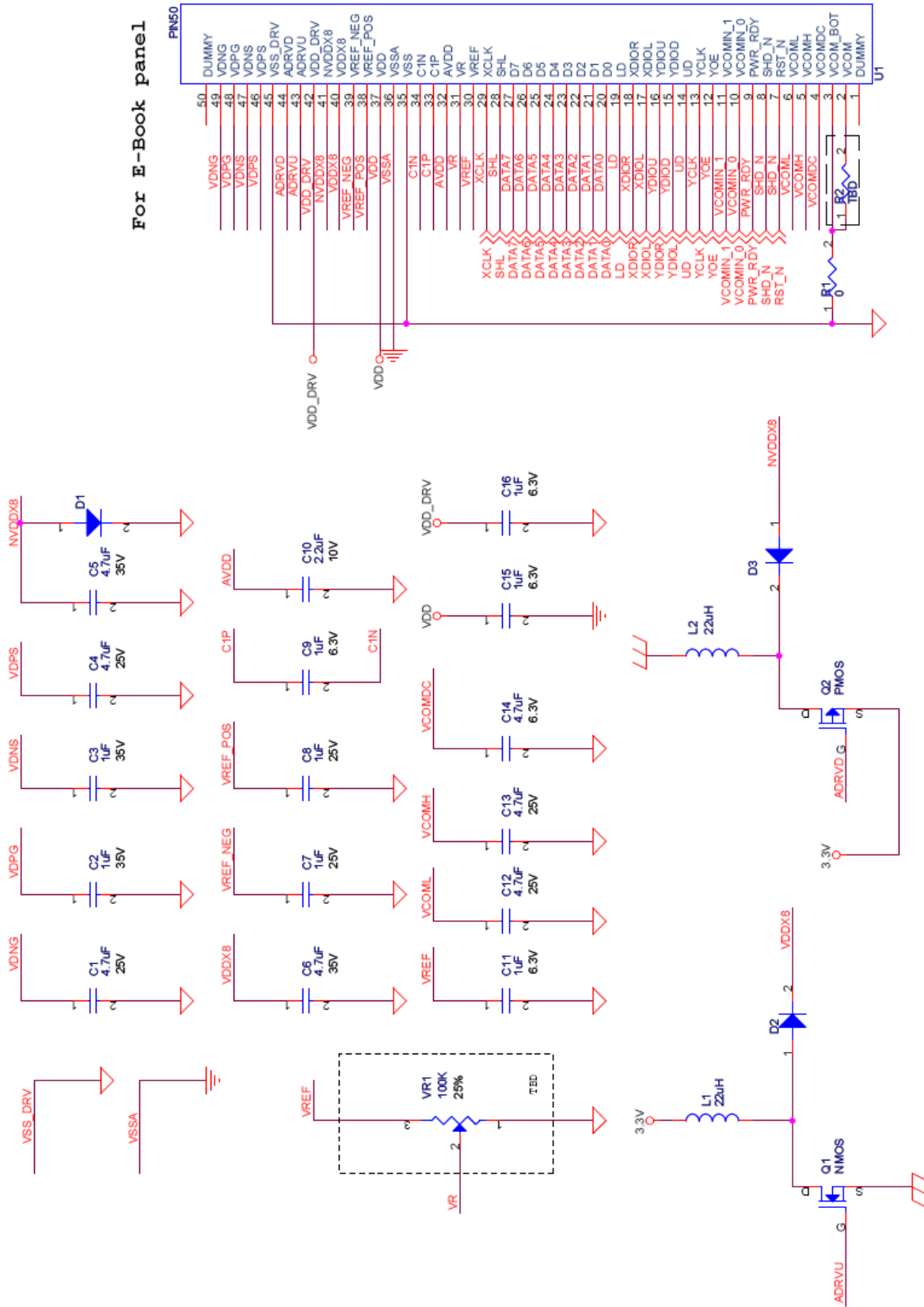
ABC-DEFG-HIJK-LMN

- DEFG appear after first "-" represents the packing date of the carton
- Date from 01 to 31
- Month, ranging from 1~9, A~C. A for Oct, B for Nov and C for Dec.
- A.D. year, ranging from 1~9 and 0. The single digit code represents the last number of the year

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

J. Application Note

1. Application Circuit



Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Be sure to turn off the power when connecting or disconnecting the circuit.
8. Display surface never likes dirt or stains.
9. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
10. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
11. Acetic acid or chlorine compounds are not friends with display module.
12. Static electricity will damage the module, please do not touch the module without any grounded device.
13. Do not disassemble and reassemble the module by self.
14. Be careful do not touch the rear side directly.
15. No strong vibration or shock. It will cause module broken.
16. Storage the modules in suitable environment with regular packing.
17. Be careful of injury from a broken display module.
18. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.