 <i>Good Display</i>	LCD MODULE SPECIFICATIONS	SPEC NO	
	GDEW080T5	REV NO	

# Good Display Specifications



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Revision History

Rev.	Issued Date	Revised Contents
1.0	Nov.09.2015	Preliminary
1.1	Nov.19.2015	1. In part 13: Add Packing. 2. In part 6-2) and 8-1): Add Image update time at 25°C.
1.2	Feb.22.2016	1. In part 10: Modify note 2.



***TECHNICAL SPECIFICATION***

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## Product Specification

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### 1. Over View

The display is a TFT active matrix electrophoretic display, with associated interface and control logic, and a reference system design. The 8" active area contains  $768 \times 1024$  pixels, and has 1-4 bit full display capabilities. An integrated circuit contains interface, timing control logic are supplied with each panel.

### 2. Features

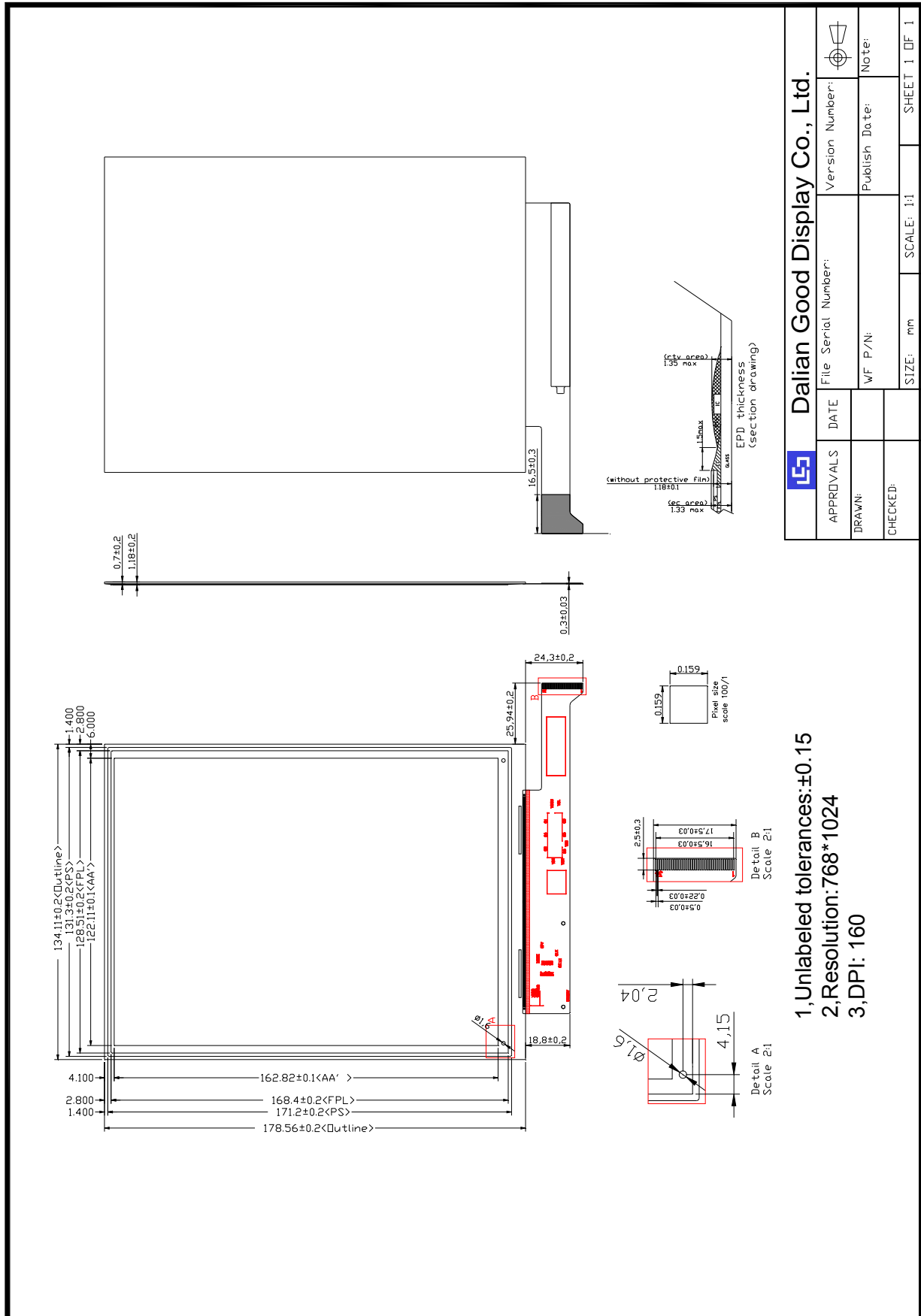
- High contrast TFT electrophoretic
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape, portrait mode
- Antiglare hard-coated front-surface

### 3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	8	Inch	
Display Resolution	768(H) $\times$ 1024(V)	Pixel	Dpi:160
Active Area	122.11 (H) $\times$ 162.82 (V)	mm	
Pixel Pitch	0.159 $\times$ 0.159	mm	
Pixel Configuration	Rectangle		
Outline Dimension	134.11(H) $\times$ 178.56(V) $\times$ 1.18(D)	mm	
Weight	57 $\pm$ 5	g	



4. Mechanical Drawing of EPD module



Dalian Good Display Co., Ltd.		Version Number:	
APPROVALS	DATE	File Serial Number:	
DRAWN:		WF P/N:	Note:
CHECKED:		SIZE: mm	SCALE: 1:1
			SHEET 1 DF 1

- 1, Unlabeled tolerances: ±0.15
- 2, Resolution: 768 \* 1024
- 3, DPI: 160



## Product Specification

### 5. Input/Output Terminals

#### 5-1) Pin out List

Pin #	Single	Description
1	VNEG	Negative power supply source driver
2	VEE	Negative power supply gate driver
3	VSS	Ground
4	NC	No connection
5	NC	No connection
6	VDD	Digital power supply drivers
7	VSS	Ground
8	CKH	Clock source driver
9	VSS	Ground
10	LEH	Latch enable source driver
11	OEH	Output enable source driver
12	STH	Start pulse gate driver
13	D0	Data signal source driver
14	D1	Data signal source driver
15	D2	Data signal source driver
16	D3	Data signal source driver
17	D4	Data signal source driver
18	D5	Data signal source driver
19	D6	Data signal source driver
20	D7	Data signal source driver
21	VCOM	Common voltage control
22	NC	NO Connection
23	NC	NO Connection
24	NC	NO Connection
25	NC	NO Connection
26	VSS	Ground
27	MODE1	Output mode selection gate driver
28	CKV	Clock gate driver
29	STV	Start pulse gate driver
30	NC	NO Connection
31	BORDER	Border connection
32	VSS	Ground
33	VPOS	Positive power supply source driver
34	VGG	Positive power supply gate driver



## Product Specification

### 6. Electrical Characteristics

#### 6-1) Absolute maximum rating

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	V <sub>DD</sub>	-0.3 to +7	V
Positive Supply Voltage	V <sub>POS</sub>	-0.3 to +18	V
Negative Supply Voltage	V <sub>NEG</sub>	-0.3 to -18	V
Max .Drive Voltage Range	V <sub>POS</sub> -V <sub>NEG</sub>	36	V
Supply Voltage	V <sub>GG</sub>	-0.3 to +45	V
Supply Voltage	V <sub>EE</sub>	-25.0 to +0.3	V
Supply Range	V <sub>GG</sub> -V <sub>EE</sub>	-0.3 to +45	V
Operating Temp. range	T <sub>OPR</sub>	0 to +50	°C
Storage Temp. range	T <sub>STG</sub>	-25 to +70	°C

#### 6-2) Panel DC Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Single ground	V <sub>SS</sub>		-	0	-	V
Logic Supply Voltage	V <sub>DD</sub>		3.0	3.3	3.6	V
	I <sub>VDD</sub>	V <sub>DD</sub> =3.3V	-	1.5	-	mA
Gate Negative Supply	V <sub>EE</sub>		-21	-20	-19	V
	I <sub>EE</sub>	V <sub>EE</sub> =-20V	-	3.0	-	mA
Gate Positive Supply	V <sub>GG</sub>		21	22	23	V
	I <sub>EE</sub>	V <sub>GG</sub> =22V	-	0.6	-	mA
Source Negative Supply	V <sub>NEG</sub>		-15.4	-15	-14.6	V
	I <sub>NEG</sub>	V <sub>NEG</sub> = -15V	-	37.6	75.2	mA
Source Positive Supply	V <sub>POS</sub>		14.6	15	15.4	V
	I <sub>POS</sub>	V <sub>POS</sub> = 15V	-	30	-	mA
Border Supply	V <sub>Border</sub>	V <sub>POS</sub> =15V	14.6	15	15.4	V
		V <sub>NEG</sub> =-15V	-15.4	-15	-14.6	V
Asymmetry Source	V <sub>ASYM</sub>	V <sub>POS</sub> + V <sub>NEG</sub>	-800	0	800	mV
Common voltage	V <sub>COM</sub>		-2.5	Adjusted	-0.5	V
	I <sub>COM</sub>		-	0.2	-	mA
Maximum power panel	P <sub>MAX</sub>		-	-	TBD	mW
Standby power panel	P <sub>STBY</sub>		-	-	TBD	mW
Typical power panel	P <sub>TYP</sub>		-	TBD	-	mW
Operating temperature			0	-	50	°C
Storage temperature			-25	-	70	°C
Image update time at 25°C	-	-	-	1	-	Sec

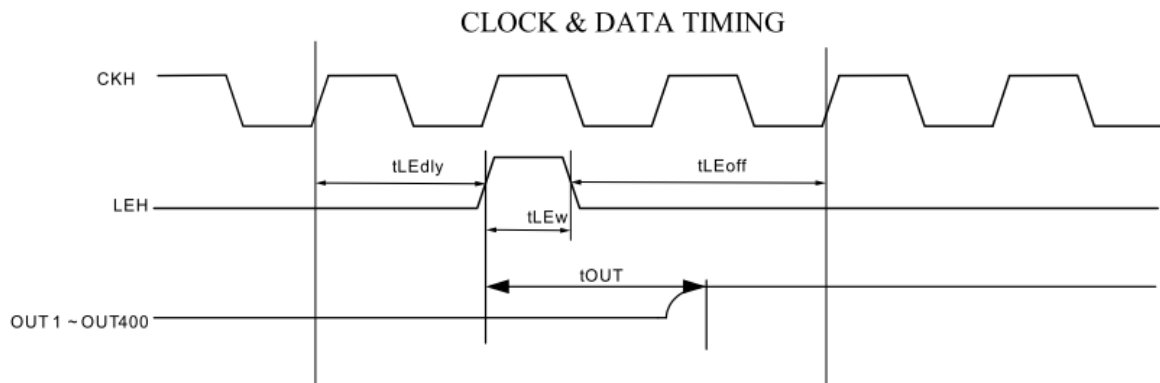


## Product Specification

### 6-3) Panel AC Characteristics

VDD=3.0V to 3.6V, unless otherwise specified.

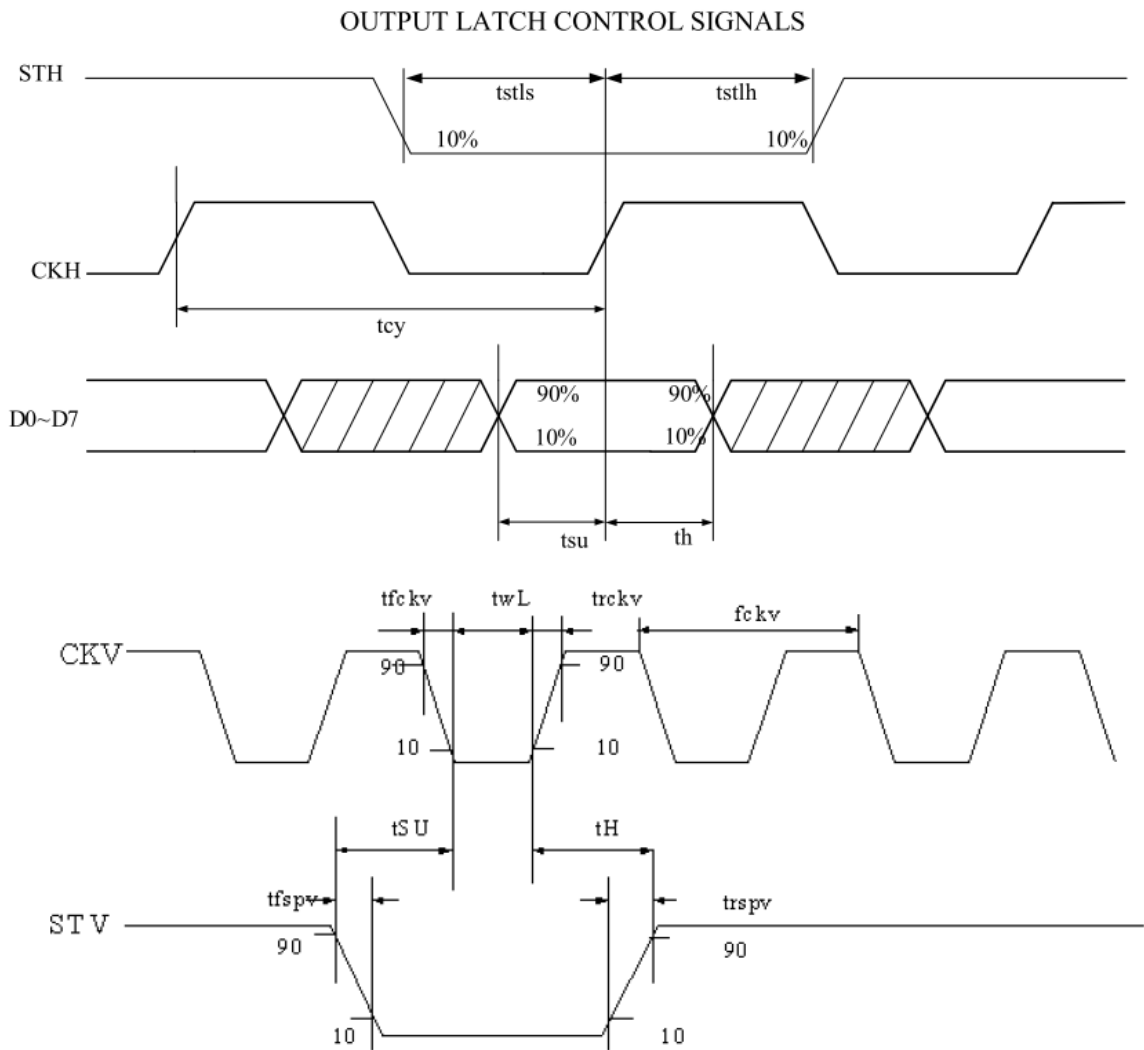
Parameter	Symbol	Min.	Typ.	Max.	unit
Clock frequency	fckv	-	-	200	kHz
Minimum "L" clock pulse width	twL	0.5	-	-	us
Clock rise time	trekv	-	-	100	ns
Clock fall time	tfekv	-	-	100	ns
Data setup time	tSU	100	-	-	ns
Data hold time	tH	300	-	-	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock CKH cycle time	tcy	40	-	DC	ns
D0..D7 setup time	tsu	8	-	-	ns
D0..D7 hold time	th	8	-	-	ns
STH setup time	tstls	100	-	-	ns
STH hold time	tstls	10	-	-	ns
LEH on delay time	tLEdly	40	-	-	ns
LEH high-level pulse width	tLEW	40	-	-	ns
LEH off delay time	tLEoff	40	-	-	ns
Output setting time to +/-30mV (V <sub>load</sub> =200pF)	tout	-	-	12	us







Product Specification



6-4) Power Consumption

Parameter	Symbol	Conditions	TYP	Max	Unit	Remark
Maximum Panel power consumption	-	-	-	TBD	mW	-
Power consumption in standby mode	-	-	-	TBD	mW	-
Panel power consumption during update	-	-	TBD	-	mW	-



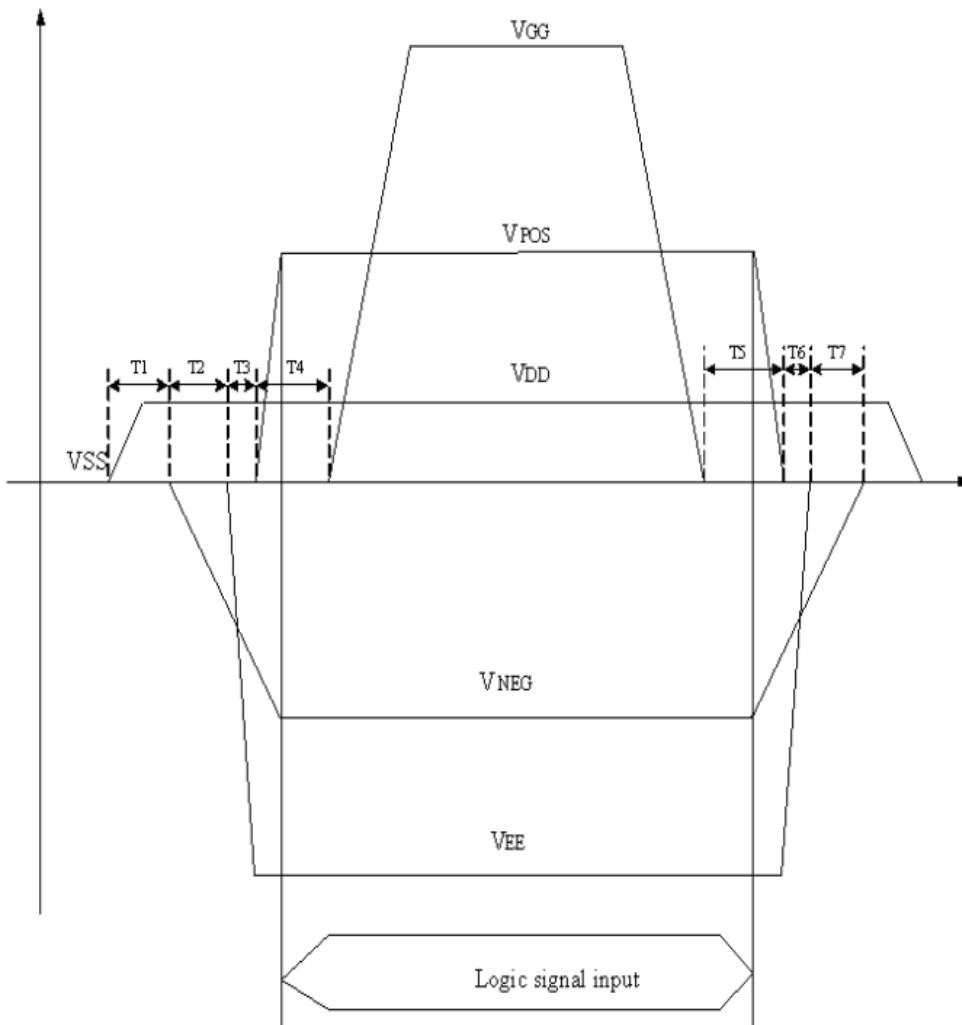
## Product Specification

### 7. Power on sequence

Power Rails must be sequenced in following order:

1. VSS→VDD→VNEG→VPOS (Source driver)
2. VEE→VGG (Gate drive)

#### Power on



T1: 100us (min)

T2: 0us (min)

T3: 1000us (min)

T4: 0us (min)

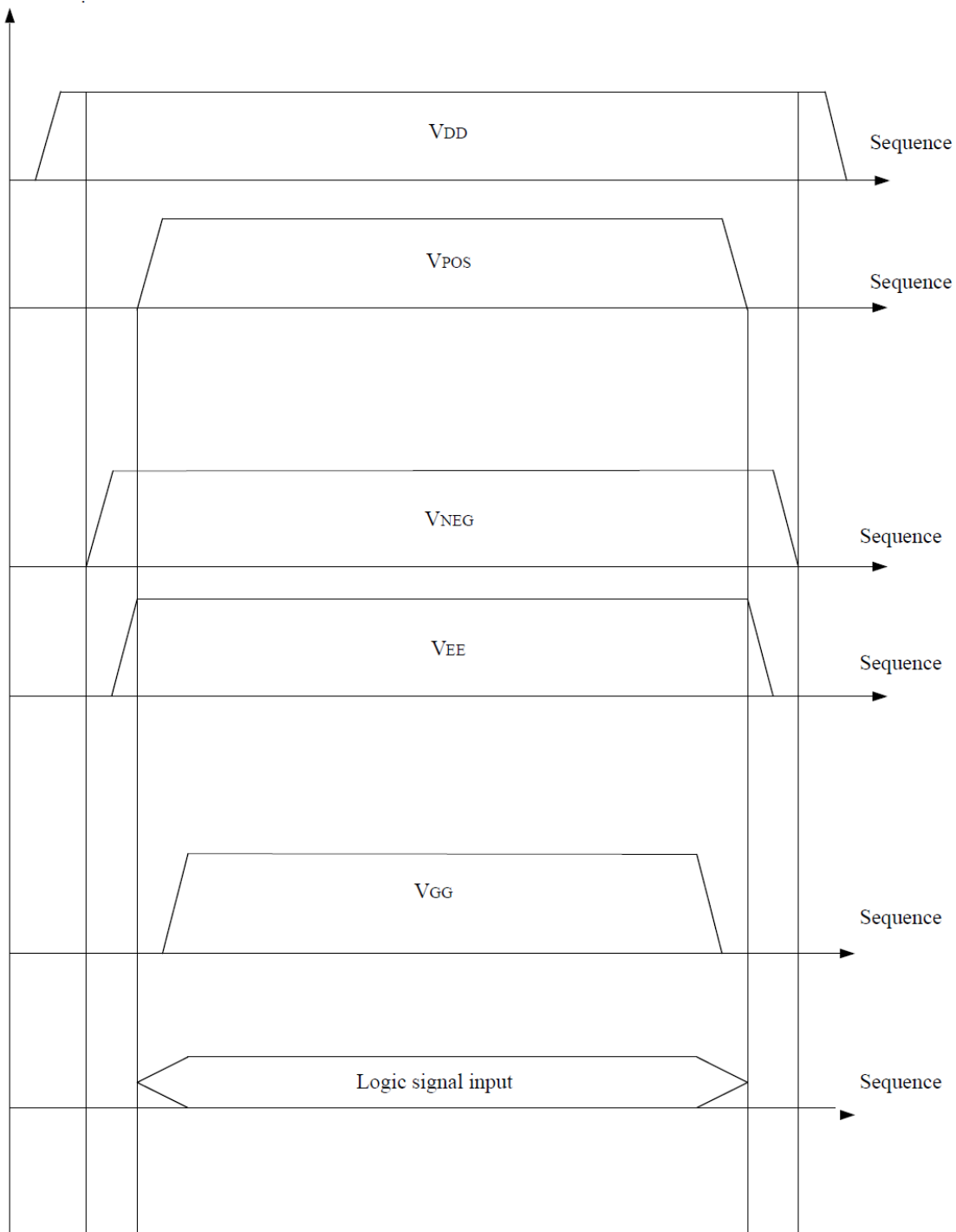
T5: 0us (min)

T6: 0us (min)

T7: 0us (min)



Power Down





## Product Specification

### 8. Optical characteristics

#### 8-1) Specifications

Measurements are made with that the illumination is under an angle of 45 degrees, the detection is perpendicular unless otherwise specified.

T=25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYPE	MAX	UNIT	Note
R	Reflectance	White	30	35	-	%	Note 8-1
G <sub>n</sub>	N <sub>th</sub> Grey Level	-	-	$DS+(WS-DS) \times n/(m-1)$	-	L*	-
CR	Contrast Ratio	indoor	8		-	-	-
T <sub>update</sub>	Update time	25°C	-	1	-	Sec	-
Panel's life		0°C~50°C		1000000 times or 5 years	-	-	Note 8-2

WS : White state; DS : Dark state, Gray state from Dark to White : DS、G1、G2...、Gn...、Gm-2、WS  
m : 4、8、16 when 2、3、4 bit mode.

Note 8-1: Luminance meter: Eye – One Pro Spectrophotometer

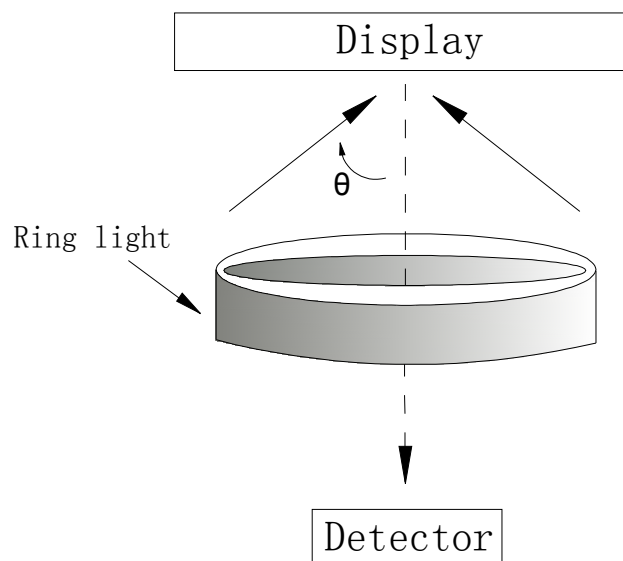
Note 8-2: Panel life will not guaranteed when work in temperature below 0 degree or above 50 degree. Each update interval time should be minimum at 180 seconds.

#### 8-2) Definition of contrast ratio

The contrast ratio (CR) is the ratio between the reflectance in a full white area (R1) and the reflectance in a dark area (Rd)():

R1: white reflectance      Rd: dark reflectance

$$CR = R1/Rd$$





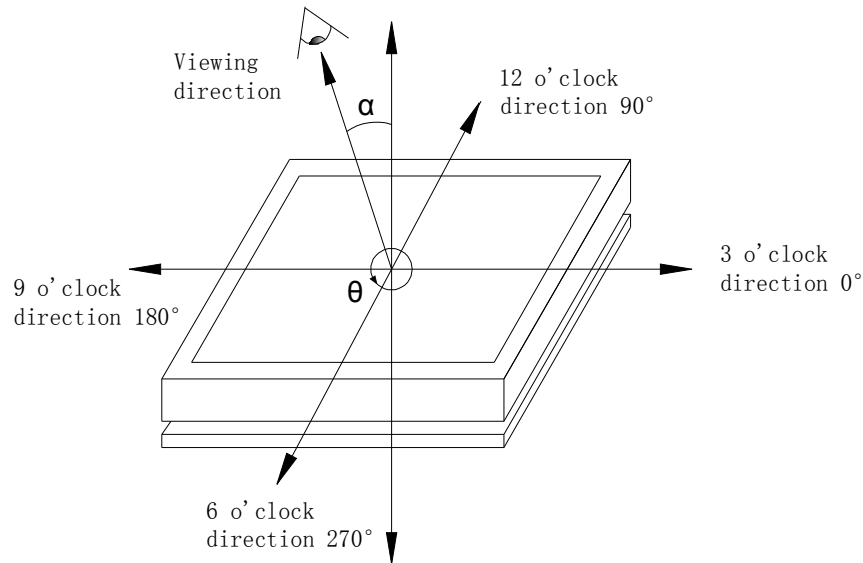
## Product Specification

### 8-3) Reflection Ratio

The reflection ratio is expressed as:

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

$L_{\text{center}}$  is the luminance measured at center in a white area ( $R=G=B=1$ ).  $L_{\text{white board}}$  is the luminance of a standard white board. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.



### 8-4) Bi-stability

1. The value of Contrast ratio in different time as follows:

Bi-stability	Result
250 hours	CR >8
500 hours	CR >8
750 hours	CR >7.5
1000 hours	CR >7



## Product Specification

### 9. HANDLING, SAFETY AND ENVIRONMENTAL REQUIREMENTS

#### WARNING

The display glass may break when it is dropped or bumped on a hard surface. Handle with care. Should the display break, do not touch the electrophoretic material. In case of contact with electrophoretic material, wash with water and soap.

#### CAUTION

The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components.

Disassembling the display module can cause permanent damage and invalidate the warranty agreements.

Observe general precautions that are common to handling delicate electronic components. The glass can break and front surfaces can easily be damaged. Moreover the display is sensitive to static electricity and other rough environmental conditions.

#### Data sheet status

Product specification	The data sheet contains final product specifications.
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#### Limiting values

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134).

Stress above one or more of the limiting values may cause permanent damage to the device.

These are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

#### Application information

Where application information is given, it is advisory and does not form part of the specification.

#### Product Environmental certification

ROHS



## Product Specification

### 10. Reliability test

	TEST	CONDITION	METHOD	REMARK
1	High-Temperature Operation	T = 50°C, RH=35% for 240 hrs	When the experimental cycle finished, the EPD samples will be taken out from the high temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-2Bp.	When experiment finished, the EPD must meet electrical and optical performance standards.
2	Low-Temperature Operation	T = 0°C for 240 hrs	When the experimental cycle finished, the EPD samples will be taken out from the low temperature environmental chamber and set aside for a few minutes. As EPDs return room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-2Ab.	When experiment finished, the EPD must meet electrical and optical performance standards.
3	High-Temperature Storage	T = +70°C, RH=35% for 240 hrs Test in white pattern	When the experimental cycle finished, the EPD samples will be taken out from the high temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-2Bp.	When experiment finished, the EPD must meet electrical and optical performance standards.
4	Low-Temperature Storage	T = -25°C for 240 hrs Test in white pattern	When the experimental cycle finished, the EPD samples will be taken out from the low temperature environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-2Ab	When experiment finished, the EPD must meet electrical and optical performance standards.
5	High Temperature, High-Humidity Operation	T=+40°C, RH=80% for240hrs	When the experimental cycle finished, the EPD samples will be taken out from the environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-3CA.	When experiment finished, the EPD must meet electrical and optical performance standards.
6	High Temperature, High-Humidity Storage	T=+60°C, RH=80% for240hrs Test in white pattern	When the experimental cycle finished, the EPD samples will be taken out from the environmental chamber and set aside for a few minutes. As EPDs return to room temperature, testers will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-3CA.	When experiment finished, the EPD must meet electrical performance standards.
7	Temperature Cycle	[-25°C 30mins]→ [+70°C, RH=35% 30mins], 70cycles, Test in white	1. Samples are put in the Temp & Humid. Environmental Chamber. Temperature cycle starts with -25°C, storage period 30 minutes. After 30 minutes, it needs 30min to let temperature rise to 70°C. After 30min, temperature will be adjusted to 70°C, RH=35% and storage period	When experiment finished, the EPD must meet electrical and optical performance



## Product Specification

		pattern	is 30 minutes. After 30 minutes, it needs 30min to let temperature rise to -25°C. One temperature cycle (2hrs) is complete. 2. Temperature cycle repeats 70 times. 3. When 70 cycles finished, the samples will be taken out from experiment chamber and set aside a few minutes. As EPDs return to room temperature, tests will observe the appearance, and test electrical and optical performance based on standard # IEC 60 068-2-14NB.	standards.
8	UV exposure Resistance	765 W/m <sup>2</sup> for 168 hrs,40°C	Standard # IEC 60 068-2-5 Sa	
9	Electrostatic discharge	Machine model: +/-250V, 0 Ω ,200pF	Standard # IEC61000-4-2	
10	Package Vibration	1.04G,Frequency : 10~500Hz Direction : X,Y,Z Duration:1hours in each direction	Full packed for shipment	
11	Package Drop Impact	Drop from height of 122 cm on Concrete surface Drop sequence:1 corner, 3edges, 6face One drop for each.	Full packed for shipment	

Actual EMC level to be measured on customer application.

Note: (1) The protective film must be removed before temperature test.

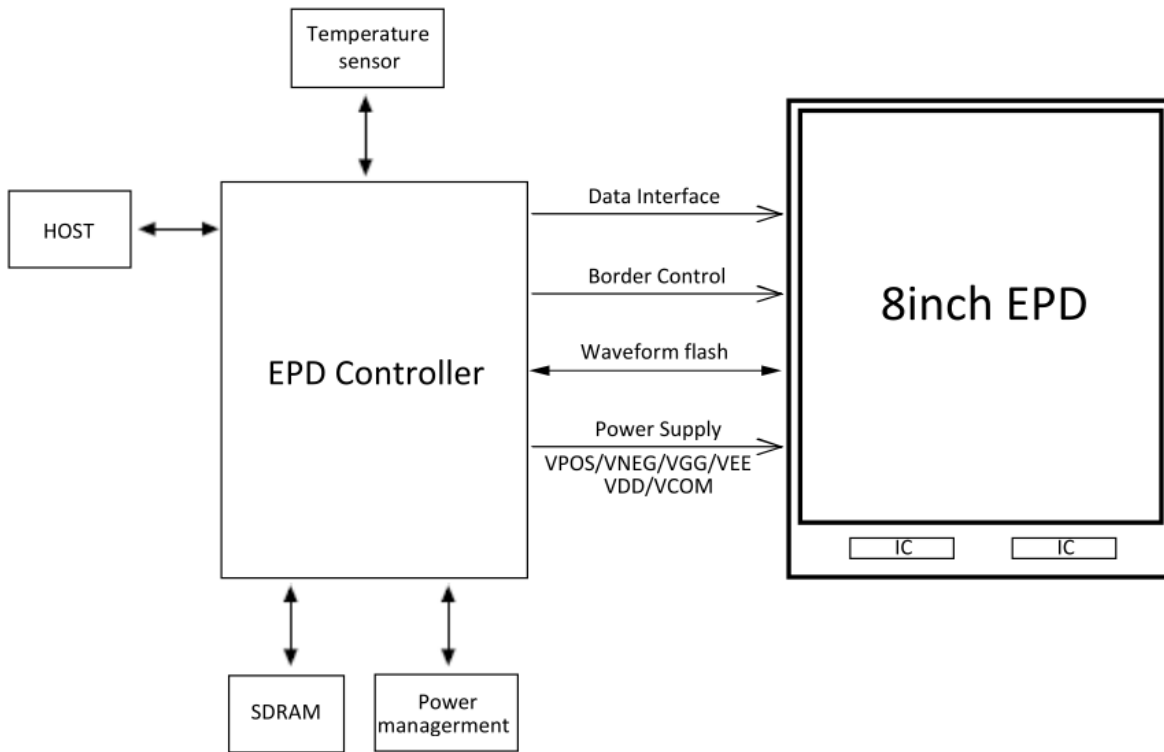
(2) In order to make sure the display module can provide the best display quality, the update should be made after putting the display module in stable temperature environment for 4 hours at 25°C.





# Product Specification

## 11. Block Diagram





**Product Specification**

**12. Point and line standard**

**Shipment Inseption Standard**

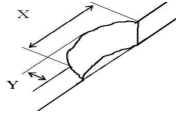
Part-A: Active area                      Part-B: Border area

Equipment: Electrical test fixture, Point gauge

Outline dimension:

134.11(H)×178.56(V)×1.18(D)

Unit: mm

Environment	Temperature	Humidity	Illuminance	Distance	Time	Angle
	23±2℃	55±5%RH	1200~1500Lux	300 mm	35 Sec	
Name	Causes	Spot size		Part-A	Part-B	
Spot	B/W spot in glass or protection sheet, foreign mat. Pin hole	D ≤ 0.25mm		Ignore	Ignore	
		0.25mm < D ≤ 0.4mm		4		
		0.4mm < D ≤ 0.5mm		1		
		0.5mm < D		0		
Scratch or line defect	Scratch on glass or Scratch on FPL or Particle is Protection sheet.	Length	Width	Part-A	Ignore	
		L ≤ 2.0mm	W ≤ 0.2 mm	Ignore		
		2.0 mm < L ≤ 8.0mm	0.2 mm < W ≤ 0.5mm	2		
		8.0 mm < L	0.5mm < W	0		
Air bubble	Air bubble	D1, D2 ≤ 0.25 mm		Ignore	Ignore	
		0.25 mm < D1, D2 ≤ 0.4mm		4		
		0.4mm < D1, D2		0		
Side Fragment						
	X ≤ 6mm, Y ≤ 1mm & display is ok, Ignore					

Remarks: Spot define: That only can be seen under WS or DS defects.

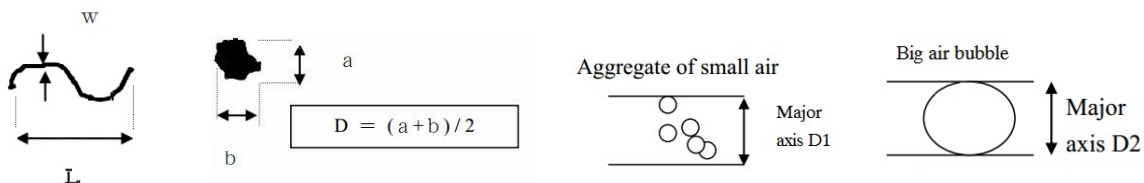
Any defect which is visible under gray pattern or transition process but invisible under black and white is disregarded.

Here is definition of the “Spot” and “Scratch or line defect”.

Spot:  $W > 1/4L$                       Scratch or line defect:  $W \leq 1/4L$

Definition for L/W and D (major axis)

FPC bonding area pad doesn't allowed visual inspection.



Note: AQL = 0.4



13. Packing

