

Display Elektronik GmbH

DATA SHEET

**E-PAPER
MODULE**

DEE 1120840E5-RGB

10.3”
E-PAPER DISPLAY

Product Specification

Ver.: 0

30.10.2023

Version	Content	Date	Producer
0	New Release	30.10.2023	DR

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1. General Description

DEE 1120840E5-RGB is a color reflective electrophoretic display module, It has 10.3” active area with 1120 x 840 color pixels (TFT 2240 x 1680), so this display is capable of displaying images at 4096 colors, with integrated circuits including source and gate drivers, can be used in portable electronic devices, such as E-book Reader.

2. Features

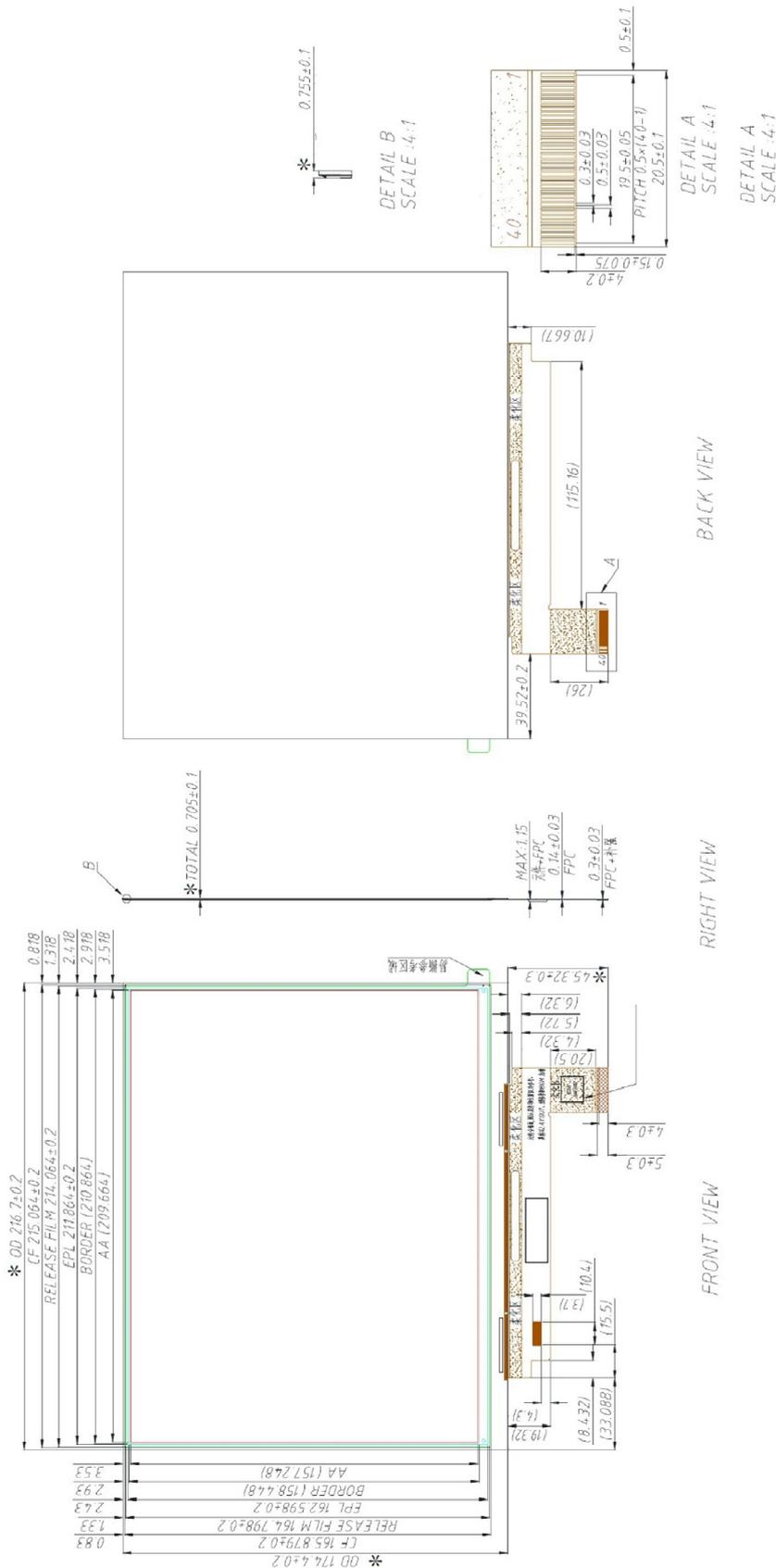
- u Color Display
- u High Contrast Reflective / Electrophoretic Technology
- u Wide Viewing Angle
- u Ultra Low Power Consumption
- u Reflective Mode
- u Bistable Display
- u Commercial Temperature Range
- u Landscape Mode

3. Mechanical Specifications

3.1 Dimension

PARAMETER	VALUE	UNIT	Remark
Display Resolution	2240 x 1680 (B/W) 1120 x 840 (Color)	dots	271 PPI (B/W) 135 PPI (Color)
Color	4096	-	-
Active Area Dimensions	209.664 x 157.248	mm	-
Screen Size	10.3	Inch	-
Pixel Pitch	0.0936 x 0.0936	mm	-
Pixel Configuration	Square	-	-
Overall Dimensions	216.70 x 174.40 x 0.705	mm	-
Weight	70± 5	g	-

3.2 Mechanical Drawing of EPD Module



NOTES:
 1. Display module 10.3" array for EPD; 4. Mark "*" for control DIM, Reference dimension in ().

2. Unspecified Tolerance ±0.20; 5. Product thickness include: CF+EPL+TFT.

3. Material conform to the RoHS standard;

4. Pin Assignment

No.	Pin Name	Description
1	VGL	Negative power supply gate driver
2	NC	NO Connection
3	VGH	Positive power supply gate driver
4	NC	NO Connection
5	VDD	Digital power supply drivers
6	MODE	Output mode selection gate driver
7	CKV	Clock gate driver
8	SPV	Start pulse gate driver
9	VSS	Ground
10	VCOM	Common voltage connection
11	VDD	Digital power supply drivers
12	VSS	Ground
13	CLK	Clock source driver
14	D0	Data signal source driver
15	D1	Data signal source driver
16	D2	Data signal source driver
17	D3	Data signal source driver
18	D4	Data signal source driver
19	D5	Data signal source driver
20	D6	Data signal source driver
21	D7	Data signal source driver
22	VSS	Ground
23	D8	Data signal source driver
24	D9	Data signal source driver
25	D10	Data signal source driver
26	D11	Data signal source driver
27	D12	Data signal source driver
28	D13	Data signal source driver
29	D14	Data signal source driver
30	D15	Data signal source driver
31	SPH	Start pulse source driver
32	LE	Latch enable source driver
33	OE	Output enable source driver
34	NC	NO Connection
35	NC	NO Connection
36	VPOS	Positive power supply source driver
37	NC	NO Connection
38	VNEG	Negative power supply source driver
39	NC	NO Connection
40	VBORDER	Border connection

5. Electrical Characteristics

5.1 Module DC Characteristics

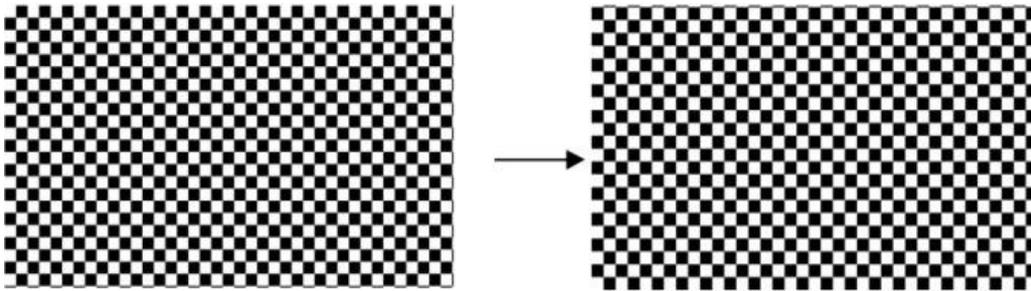
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Signal Ground	VSS		-	0	-	V
Logic Voltage Supply	VDD		3.0	3.3	3.6	V
	IVDD	VDD=3.3V	-	4	6.5	mA
Gate Positive Supply	VGH		27	28	29	V
	IVGH	VGH=28V	-	1.1	1.2	mA
Gate Negative Supply	VGL		-21	-20	-19	V
	IVGL	VGL=-20V	-	1	13.5	mA
Source Positive Supply	VPOS		14.6	15	15.4	V
	IPOS	VPOS=15V	-	1	81	mA
Source Negative Supply	VNEG		-15.4	-15	-14.6	V
	INEG	VNEG=-15V	-	0.96	81	mA
Asymmetry Source	VASYM	VPOS+VNEG	-800	0	800	mV
Common Voltage	VCOM	-	-2.0	-1.0	--0.8	V
	ICOM	-	-	0.2	0.2	mA
Standby Power Module	PSTBY	-	-	TBD	TBD	mW
Typical Power Module	PTYP	-	-	100	TBD	mW
Operating Temperature	-	-	0		50	°C
Storage Temperature	-	-	-20	-	70	°C
Maximum Image Update Time at 25°C	-	-	-	450	-	ms

Notes:

1. The maximum power and maximum current are specified for the worst case power consumption (Note 5-1).
2. The typical power is measured when “typical images” are displayed (Note 5-2).(Note 5-3).
3. The standby power is the consumed power when the module controller is in standby mode.
4. The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by DISPLAY.

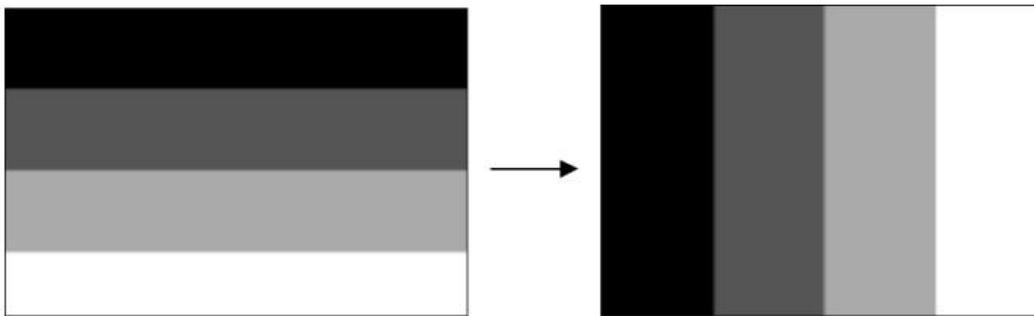
Note 5-1

The maximum average current and Maximum Currents for B/W display



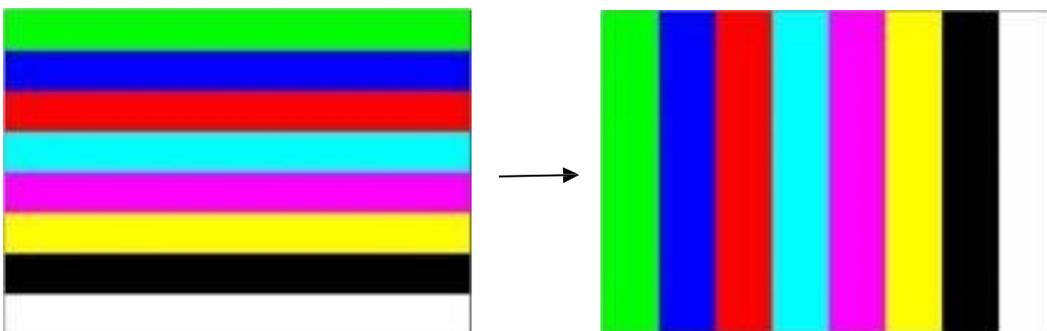
Note 5-2

The typical power consumption for B/W display



Note 5-3

The typical power consumption at color display

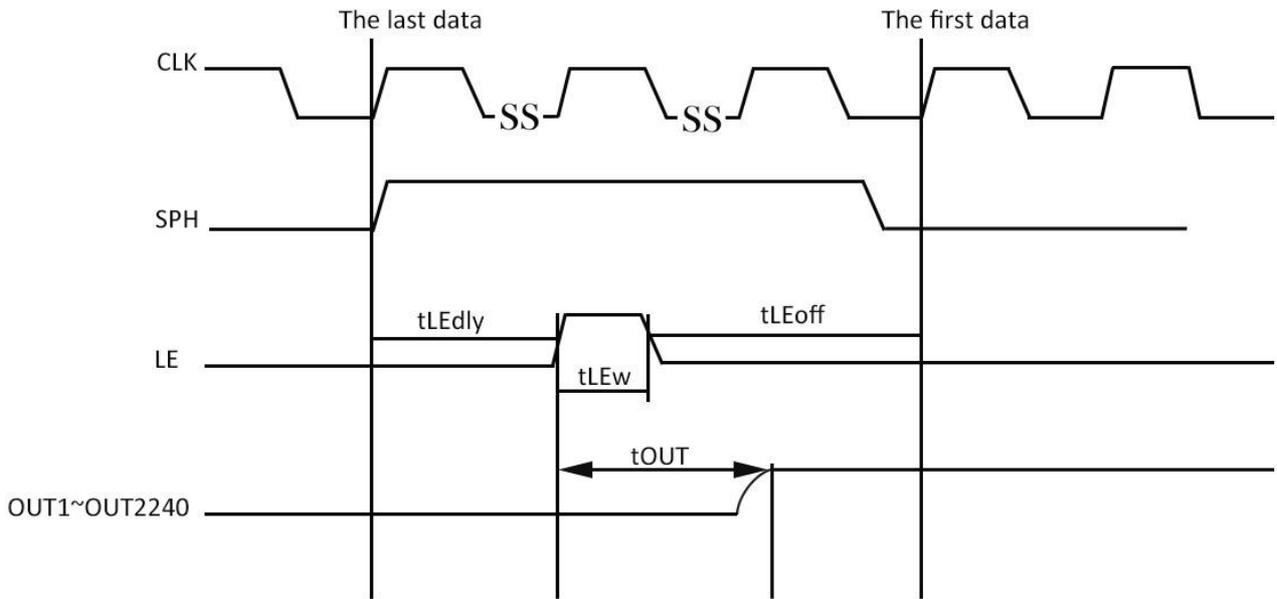


5.2 Module AC characteristics

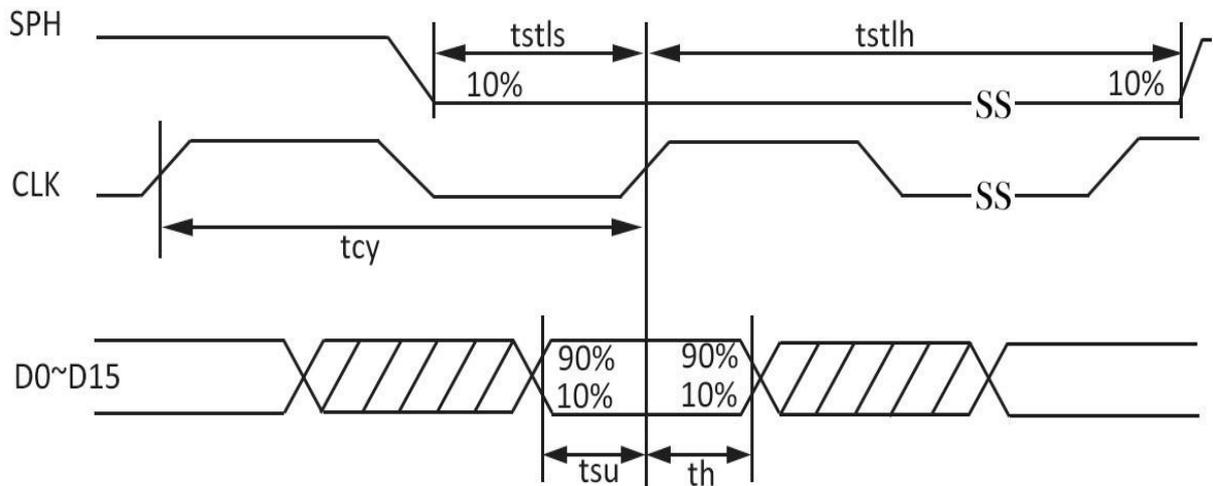
Note: VDD= 3.0V to 3.6V, unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit	App Pin
Clock frequency	fcpv	-	-	200	kHz	CPV
Clock CPV high time	tCPVh	0.5	-	-	us	
Clock CPV low time	tCPVl	0.5	-	-	us	
Data setup time	tSU	100	-	-	ns	CPV STV
Data hold time	tH	300	-	-	ns	
Clock CLK cycle time	tclk	40	-	-	ns	Below table
D0 .. D15, SPH setup time	tsu	8	-	-	ns	
D0 .. D15, SPH hold time	th	8	-	-	ns	
LE on delay time	tLEdly	40	-	-	ns	
LE high-level pulse width	tLEw	40	-	-	ns	
LE off delay time	tLEoff	40	-	-	ns	
SHR setup time	tMsu	100	-	-	ns	
SHR hold time	tMh	10	-	-	ns	

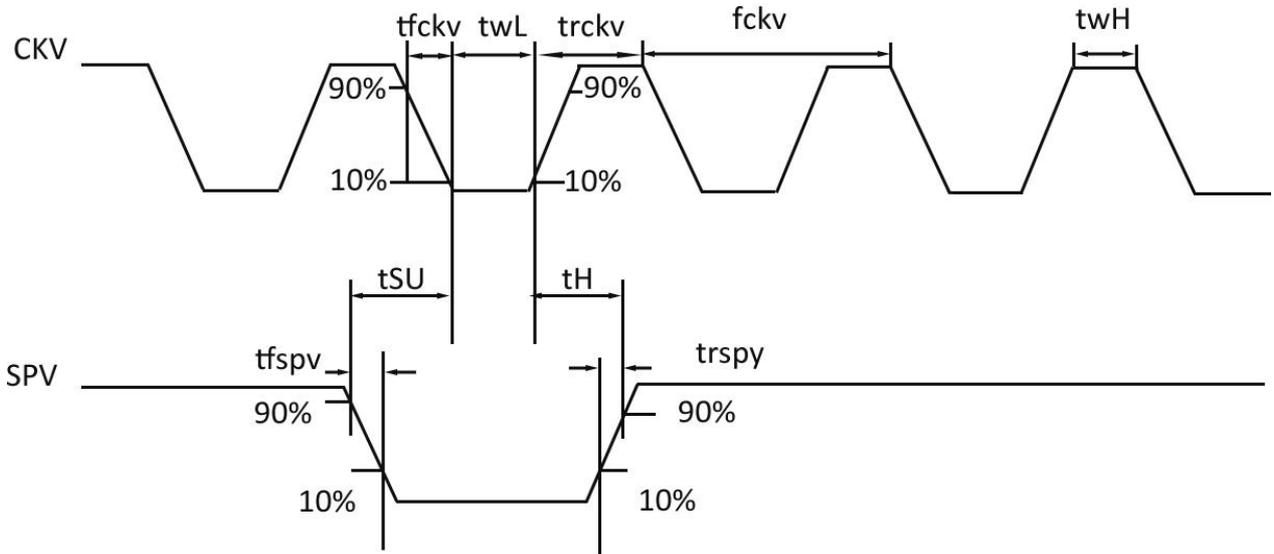
Output Latch Control Signals



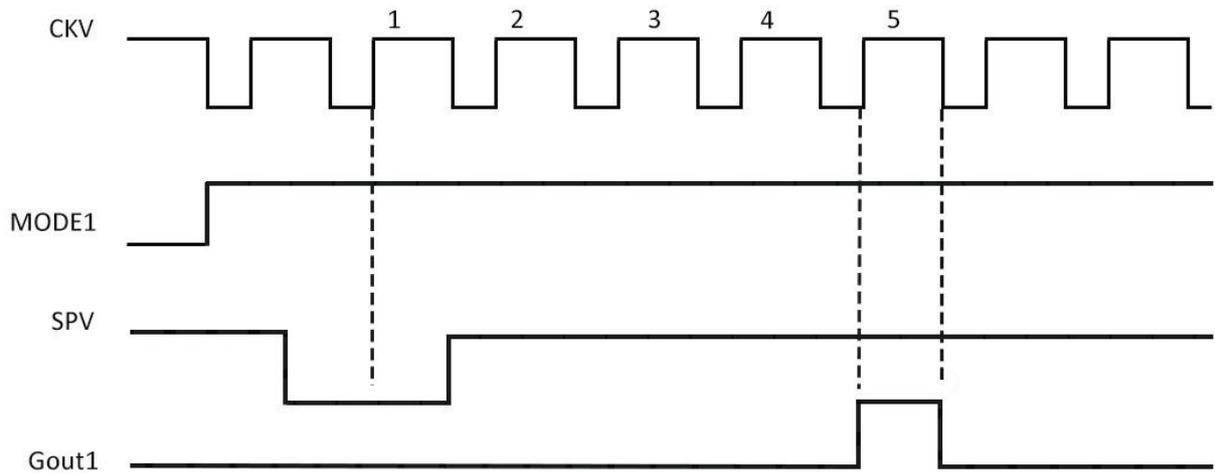
Clock & Data Timing



CKV & SPV Timing



Gate Output Timing

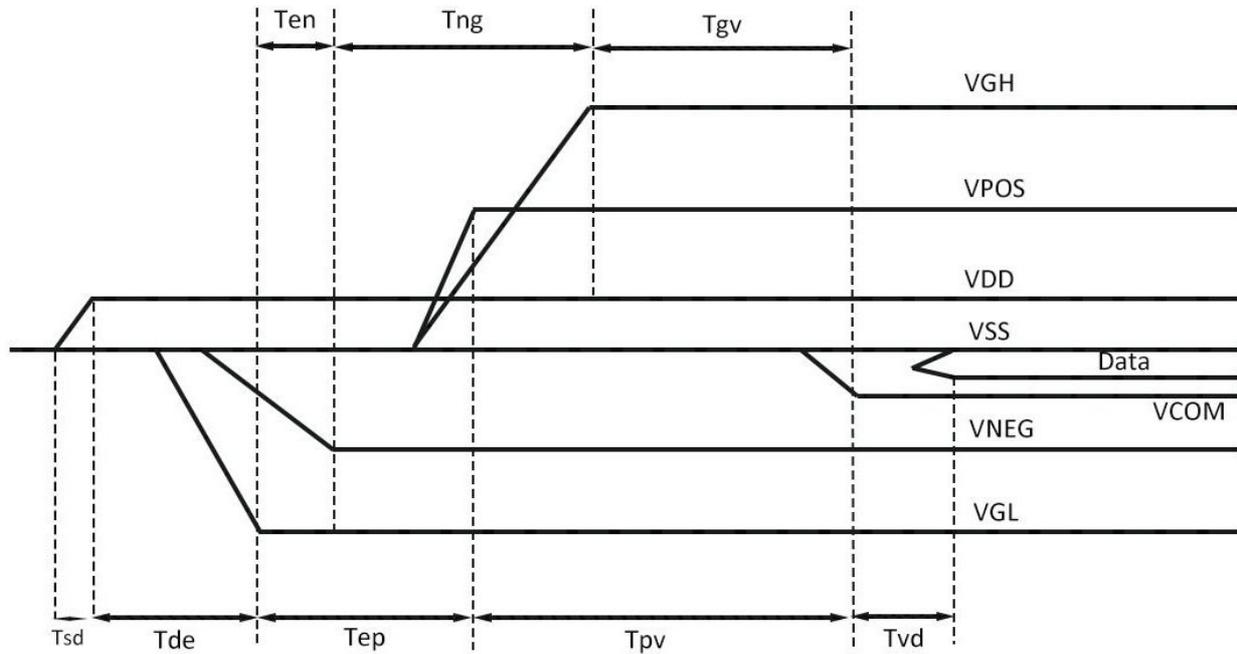


6. Power On/Off Sequence

To prevent the device from damage due to latch up, the power on/off sequence shown below must be followed. When power on: VDD -> VGL -> VNEG/VGH/VPOS -> Vcom

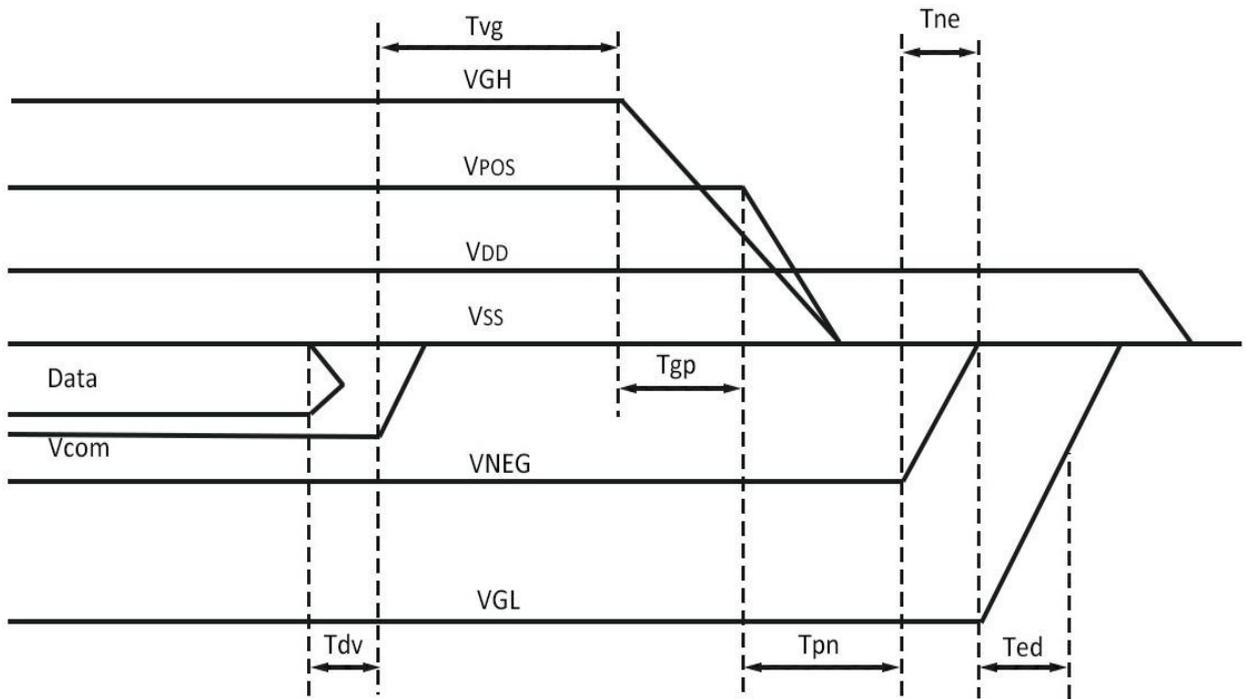
When power off: Vcom -> VNEG/VGH/VPOS -> VGL ->

VDD Power on



	Min	Max
Tsd	30us	-
Tde	100us	-
Tep	1000us	-
Tpv	100us	-
Tvd	100us	-
Ten	0us	-
Tng	1000us	-
Tgv	100us	-

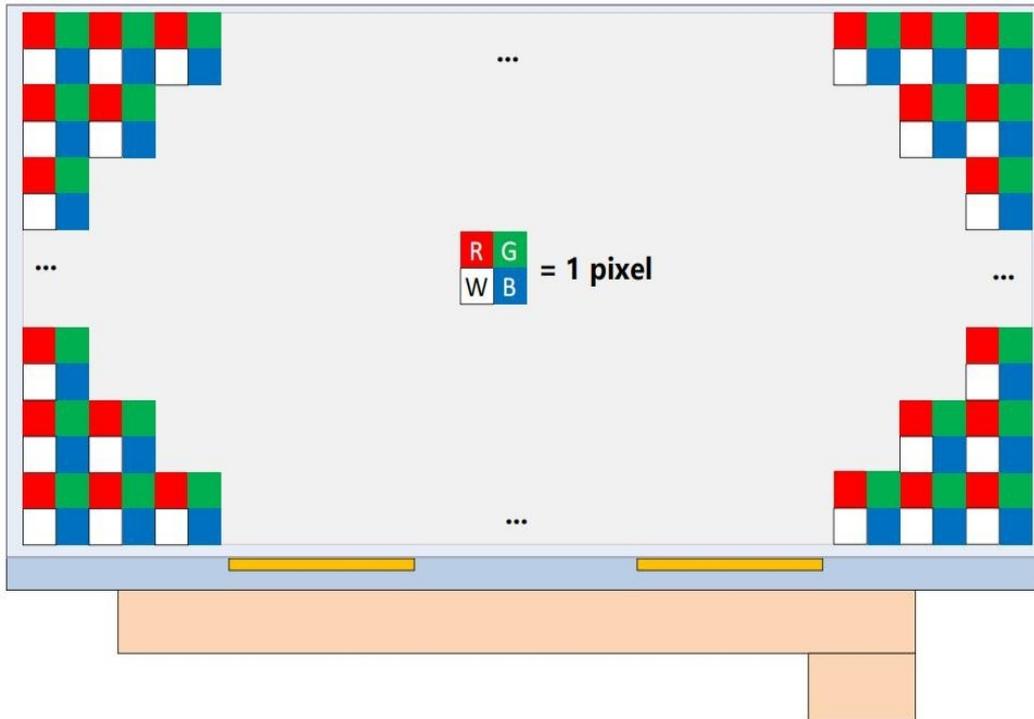
Power Off



	Min	Max
Tdv	100us	-
Tvg	0us	-
Tgp	0us	-
Tpn	0us	-
Tne	0us	-
Ted	0.5us	-

7. Pixel Arrangement

The Color EPD module pixel arrangement:



8. Optical Characteristics

Parameter	Conditions	Values			Units	Notes
		Min.	Typ.	Max		
White Reflectivity	White	-	20	-	%	1-1
Contrast Ratio (CR)	-	-	18	-	-	1-2
NTSC	-	-	≥ 5	-	%	-

(T=25°C, fv = 85Hz. Measurements are made with BYK.)

Notes:

1-1. Luminance meter: BYK.

1-2. CR=Surface Reflectance with all white pixel/Surface Reflectance with all black pixels.

9. Handling, Safety and Environment Requirements

Warning

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

Caution

Disassembling the display module can cause permanent damage and invalidates 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.

10. Reliability Test

No.	TEST	CONDITION	METHOD	REMARK
1	High-Temperature Operation	T = +50°C, RH = 30% for 240hrs	IEC 60068-2-2Bp	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
2	Low-Temperature Operation	T = 0°C for 240hrs	IEC 60068-2-2Ab	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
3	High-Temperature Storage	T = +60°C, RH=26% for 168hrs Test in white pattern	IEC 60068-2-2Bp	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
4	Low-Temperature Storage	T = -25°C for 240hrs Test in white pattern	IEC 60068-2-1Ab	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
5	High-Temperature, High-Humidity Operation	T = +40°C, RH = 90% for 168 hrs	IEC 60068-2-3CA	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
6	High Temperature, High-Humidity Storage	T = +50°C, RH=80% for 240hrs Test in white pattern	IEC 60068-2-3CA	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
7	Thermal Shock	1 cycle: [-25°C 30min] → [+70°C 30 min] : 100 cycles Test in white pattern	IEC 60068-2-14	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
8	Package Vibration	1.04G, Frequency: 10~500Hz Direction: X, Y, Z Duration: 1 hours in each direction	Full packed for shipment	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
9	Package Drop Impact	Drop from height of 122 cm on concrete surface. Drop sequence: 1 corner, 3 edges, 6 faces One drop for each	Full packed for shipment	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.
10	Electrostatic Effect (non-operating)	Machine model +/- 250V, 0Ω, 200pF	IEC 62179 IEC 62180	At the end of the test, electrical, mechanical, and optical specifications shall be satisfied.

11. Inspection Standard

12.1 Appearances Inspection Standard

12.1.1 Appearances Specification

This appearance inspection shall be applied to segment EPD modules.

12.1.2 Inspection Conditions

Viewing Angle: $\alpha = \pm 45^\circ$

Viewing Distance: 30cm \pm 10cm

Ambient Luminance: 700~1000 Lux.

Supply Voltage: Typical value described on the Electrical Characteristics

Environment Ambient Temperature: 20°C~25°C

Environment Ambient Humidity: 40~70%RH

ESD should be controlled within $\pm 200V$

12.1.3 Inspection Level: Level II

Sampling table: GB/T 2828.1-2012 II, unless otherwise agreed in writing.

12.1.4 Acceptance Quality Level (AQL)

Major Defect: 0.65 , Minor Defect: 1.5

12.1.5 Classification of Defects

Defects are classified as either a major or a minor defect defined as below.

Major Defect :It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.

Minor Defect :It is a defect that will not result in functioning problem with deviation classified.

12.2 Quality Criteria

12.2.1 Zone Definitions

A Zone: EPD Active Area (not including border)

B Zone: Out of Active Area

12.2.2 Appearances Criteria

As shown in the tables below. If any other items, standard values or applicable zones are required to be defined, a written agreement shall be signed, and otherwise a limited sample shall be made for reference.

Major Defects:

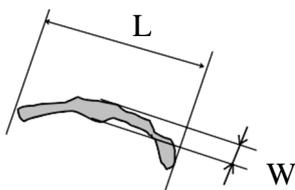
Item	Description	Classification
No Display	No display shown on screen due to malfunction	Major
Line Missing	Line missing	Major
Abnormal Display	Unusual pattern or function displayed	Major
TFT Broken	TFT broken by external force	Major

Minor Defects:

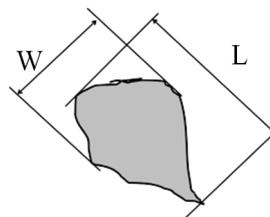
Item		Criteria	Specific Zone	
Name	Description		A Zone	B Zone
Dot defect	Spot/ Air bubble/ Foreign material in dot shape	$D \leq 0.30\text{mm}$	Ignore	Ignore
		$0.30\text{mm} < D \leq 0.50\text{mm}$	≤ 5	
		$D > 0.50\text{mm}$	0	
Line defect	Scratch on top surface/ Foreign material in line or spiral shape	$L \leq 1.0 \text{ mm} , W \leq 0.15\text{mm}$	Ignore	Ignore
		$1.0\text{mm} < L \leq 5.0\text{mm} \ \& \ 0.15\text{mm} < W \leq 0.5\text{mm}$	≤ 4	
		$L > 5.0\text{mm} \ \text{or} \ W > 0.5\text{mm}$	0	
Chipping	Corner chip	Not affect the display, not have diffuse or comminuted cracks		
	Edge chip			
Curl	Curl for Panel	$\leq 1.0 \text{ mm}$		

Remarks:

Definitions of “line” and “dot”:

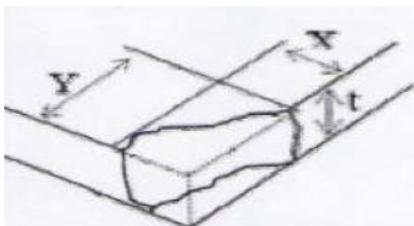


a. Line

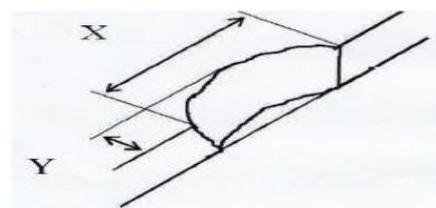


b. Dot

When $L \leq 0.5\text{mm}$ or $L < 4W$, defined as a dot. Definitions of “Chipping”:



c. Corner chip



d. Edge chip