

PRODUCT SPECIFICATION

EPD NO: IE-EPD-266-152296-BWRY

CUSTOMER: _____

APPROVED BY CUSTOMER	
Approved by	Remark

Version	Content	Date	Producer
A0	New release	2024/11/21	

CONTENTS

1. General Description.....	4
2. Features.....	4
3. Application.....	4
4. Mechanical Specifications.....	4
5. Mechanical Drawing of EPD module.....	5
6. Input/Output Terminals.....	6
7. MCU Interface.....	7
7.1 MCU interface selection.....	7
7.2 MCU Serial Peripheral Interface (3-wire SPI).....	7
7.3 MCU Serial Peripheral Interface (4-wire SPI).....	8
8. Reference Circuit.....	9
9. Absolute Maximum Rating.....	10
10. DC Characteristics.....	10
11. Serial Peripheral Interface Timing and Command Table.....	11
11.1 Serial Peripheral Interface Timing.....	11
11.2 Command Table.....	12
12. Optical characteristics.....	13
12.1 Specifications.....	13
12.2 Definition of contrast ratio.....	14
12.3 Reflection Ratio.....	14
13. Handling, Safety and Enviromental Requirements.....	15
14. Reliability test	17
15. Block Diagram.....	17
16. PartA/PartB Specification.....	17
17. Point and line standard.....	18
18. Barcode.....	20
19. Packing.....	21

1.General Description

IE-EPD-266-152296-BWRY is an Active Matrix Electrophoretic Display (AMEPD), with interface and a reference system design. The 2.66" active area contains 152×296 pixels, and has 2-bit B/W/R/Y full display capabilities. An integrated circuit contains gate buffer, source buffer, interface, timing control logic, oscillator, DC-DC, SRAM, LUT, VCOM and border are supplied with each panel.

2.Features

- Highlight Red and Yellow color
- High contrast
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable display
- Antiglare hard-coated front-surface
- Low current deep sleep mode
- On chip display RAM
- Waveform stored in On-chip OTP
- Serial peripheral interface available
- On-chip oscillator
- On-chip booster and regulator control for generating VCOM, Gate and Source driving voltage
- Available in COG package

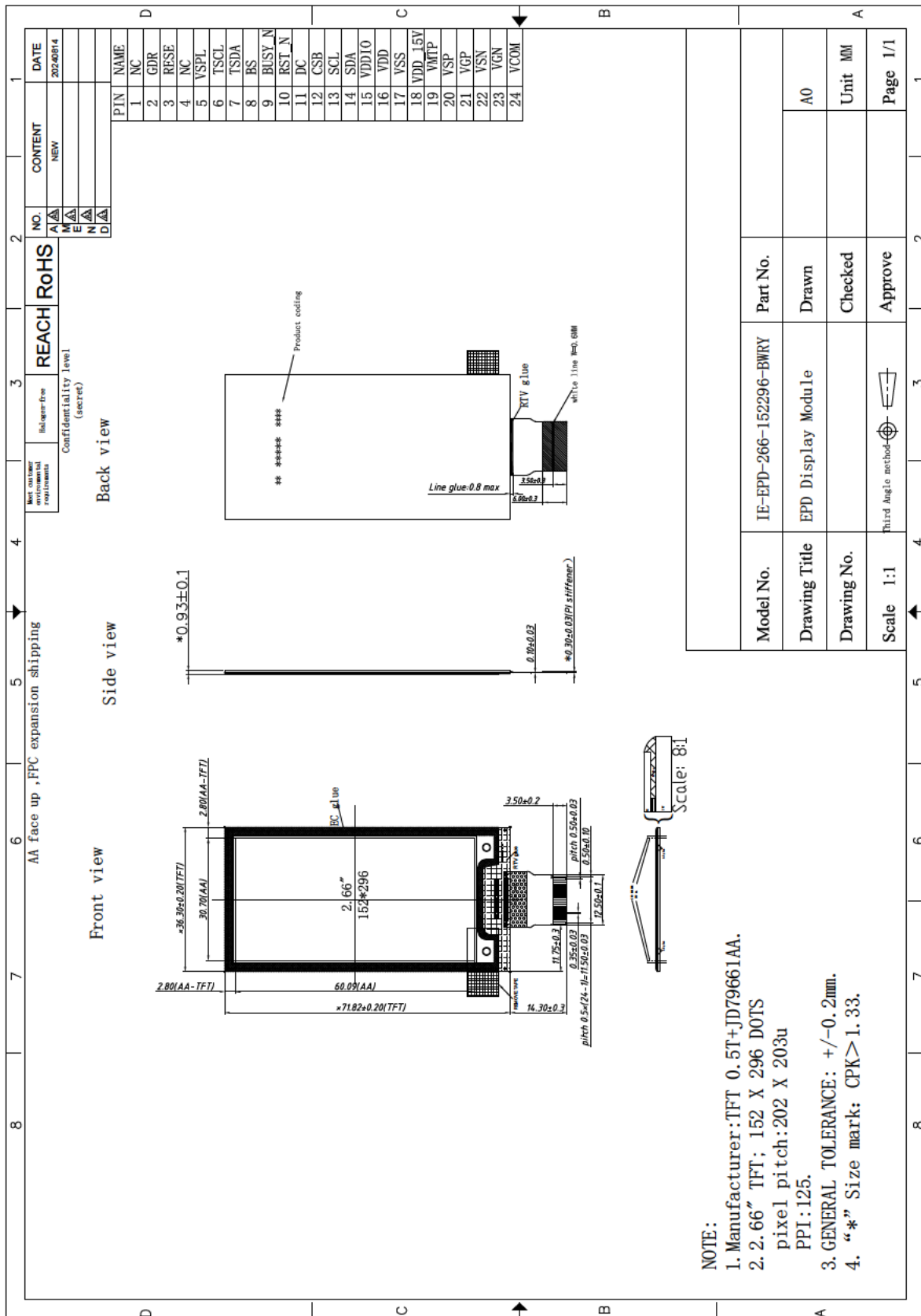
3.Application

Electronic Shelf Label System

4.Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	2.66	Inch	
Display Resolution	152(H)×296(V)	Pixel	Dpi:125
Active Area	30.70(H)×60.09(V)	mm	
Pixel Pitch	0.202×0.203	mm	
Pixel Configuration	Rectangle		
Outline Dimension	36.30(H)×71.82(V) ×0.93(D)	mm	
Weight	4.88±0.5	g	

5.Mechanical Drawing of EPD module



6.Input/Output Terminals

Pin #	Single	Description	Remark
1	NC	No connection and do not connect with other NC pins	Keep Open
2	GDR	N-Channel MOSFET Gate Drive Control	
3	RESE	Current Sense Input for the Control Loop	
4	NC	No connection and do not connect with other NC pins	Keep Open
5	VSPL	Positive Source driving voltage	
6	TSCL	No connection and do not connect with other NC pins	Keep Open
7	TSDA	No connection and do not connect with other NC pins	Keep Open
8	BS	Bus selection pin	Note 7-5
9	BUSY_N	Busy state output pin	Note 7-4
10	RST_N	Reset signal input.	Note 7-3
11	DC	Data /Command control pin	Note 7-2
12	CSB	The chip select input connecting to the MCU.	Note 7-1
13	SCL	Serial clock pin for interface.	
14	SDA	Serial data pin for interface.	
15	VDDIO	Power input pin for the Interface.	
16	VDD	Power Supply pin for the chip	
17	VSS	Ground (Digital)	
18	VDD_15V	Core logic power pin	
19	VMTP	Power Supply for OTP Programming	
20	VSP	Positive Source driving voltage	
21	VGP	Power Supply pin for Positive Gate driving voltage and VSH	
22	VSN	Negative Source driving voltage	
23	VGN	Power Supply pin for Negative Gate driving voltage, VCOM and VSL	
24	VCOM	VCOM driving voltage	

Note:I:Input,O:Output,P:Power,D:Dummy,S:Shorted line,M:Mark,PI:Power input,PO:Power output,I/O:Input/Output,PS:Power Setting,C:Capacitor pin

7.MCU Interface

7.1 MCU interface selection

IE-EPD-266-152296-BWRY use the 3-wire/4-wire serial port as communication interface for all the function and command setting.

IE-EPD-266-152296-BWRY 3-wire/4-wire engine act as a “slave mode” for all the time, and will not issue any command to the 3-wire/4-wire bus itself.

Under read mode, 3-wire/4-wire engine will return the data during “Data phase”. The returned data should be latched at the rising edge of SCL by external controller. Data in the “Hi-Z phase” will be ignored by 3-wire/4-wire engine during write operation, and should be ignored during read operation also. During read operation, external controller should float SDA pin under “Hi-Z phase” and “Data phase”.

7.2 MCU Serial Peripheral Interface (3-wire SPI)

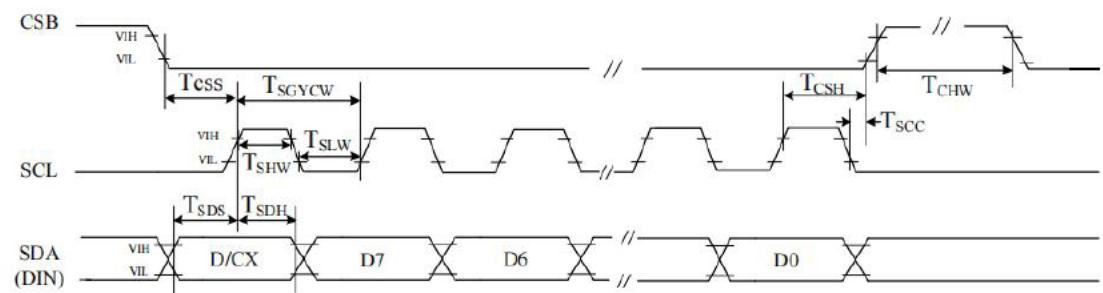


Figure 7-1: Write procedure in 3-wire SPI mode

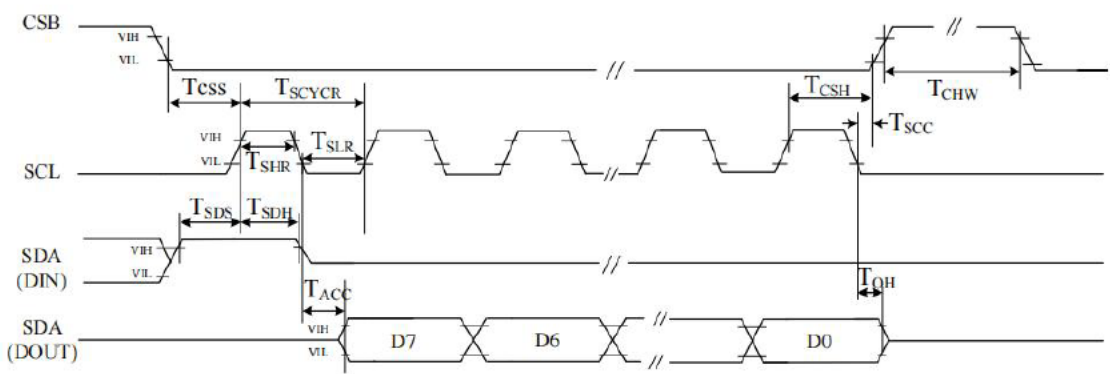
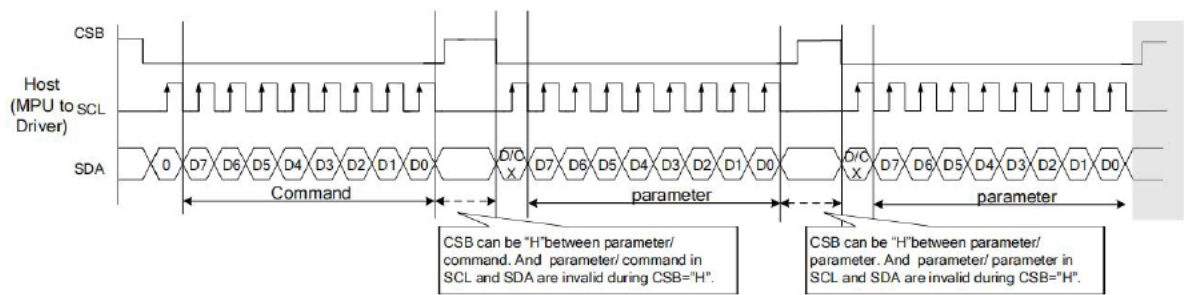


Figure 7-2: Read procedure in 3-wire SPI mode



7.3 MCU Serial Peripheral Interface (4-wire SPI)

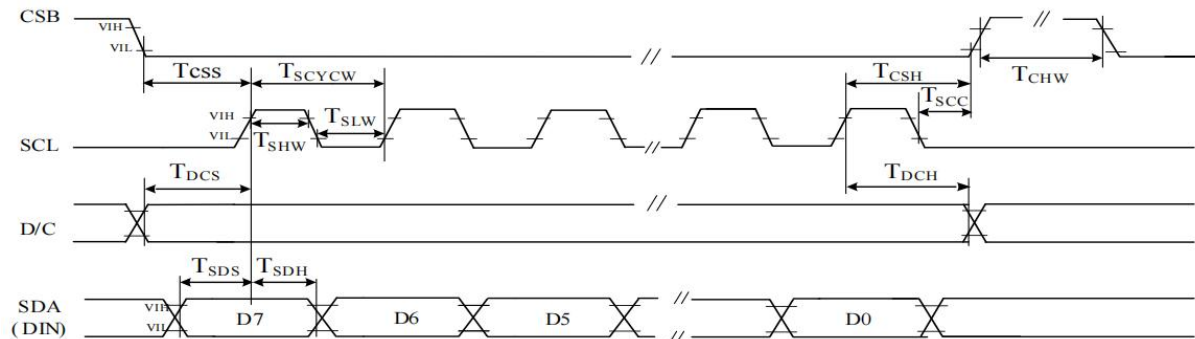


Figure 7-3: Write procedure in 4-wire SPI mode

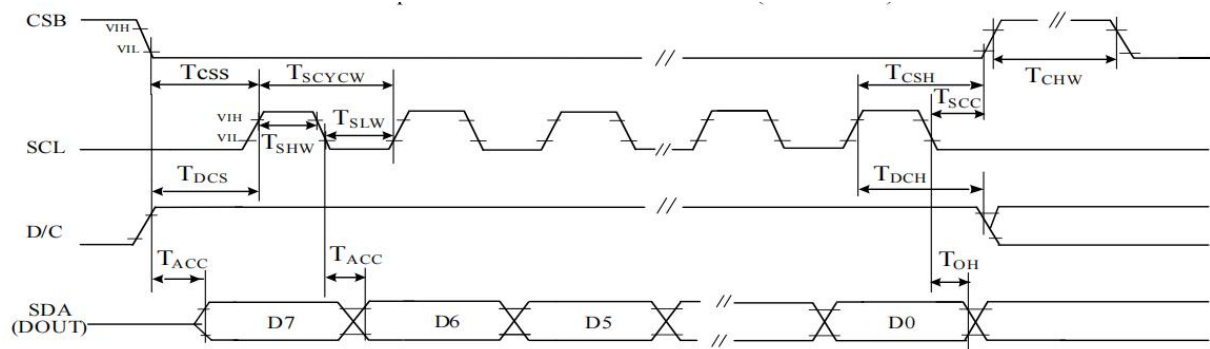
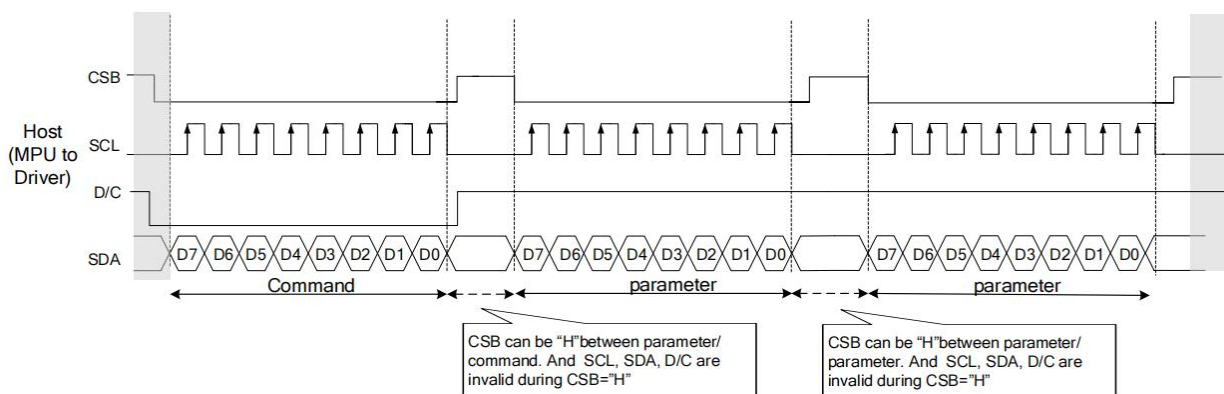
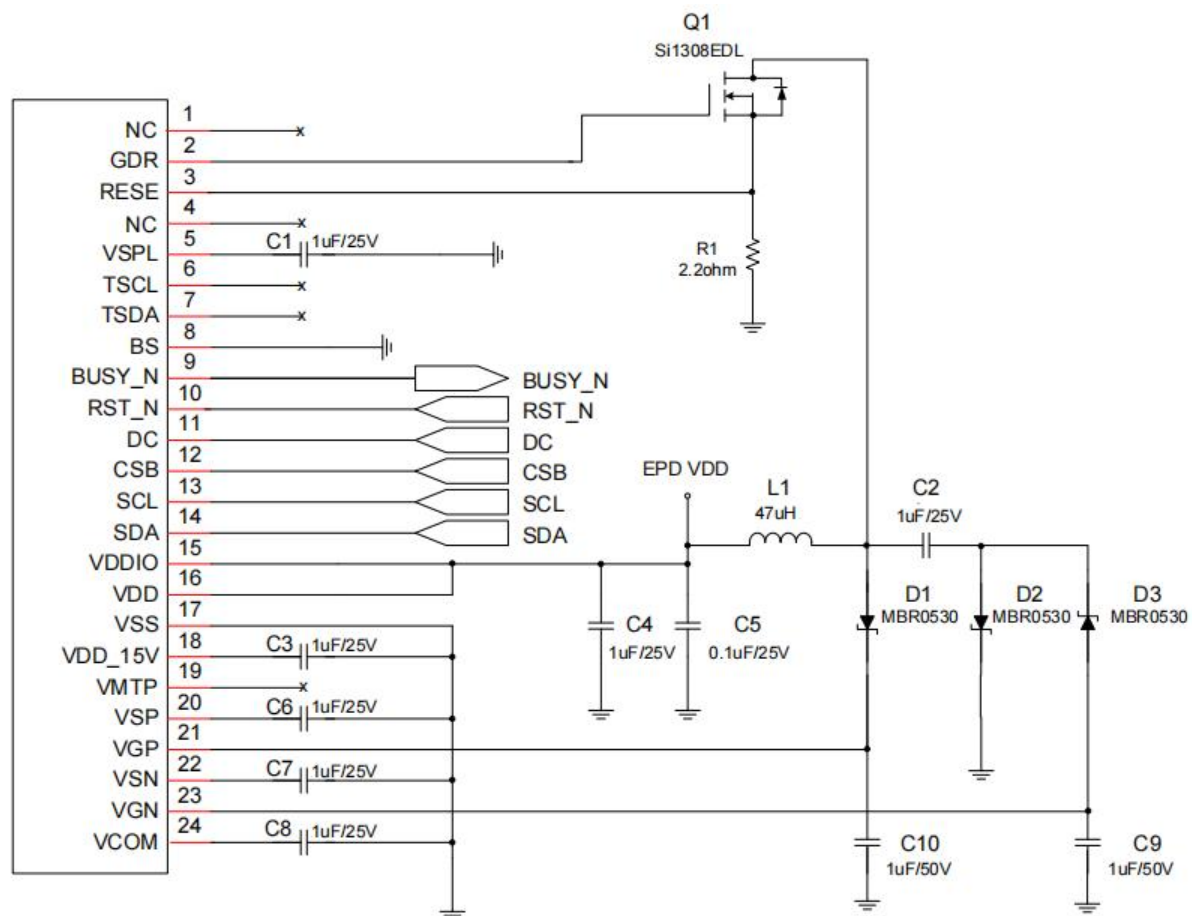


Figure 7-4: Read procedure in 4-wire SPI mode



8.Reference Circuit



Part Name	JD79661AA Value /quirement/Reference Part
C1—C4 C6-C8	1uF/0603;X5R/X7R;Voltage Rating: 25V
C9-C10	1uF/0603;X5R/X7R;Voltage Rating: 50V
C5	0.1uF/0603;X5R/X7R;Voltage Rating: 25V
D1—D3	MBR0530 -Reverse DC voltage $\geq$ 30V -Forward current $\geq$ 500mA -Forward voltage $\leq$ 430mV
R1	2.2 Ω /0603: 1% variation
Q1	NMOS:Si1308EDL/Si1304BDL -Drain-source break volatage $\geq$ 30V -Gate-source threshold voltage $\leq$ 1.5V -Drain-source on-state resistance<400m Ω
L1	47uH/NR4018T470M、CDRH2D18、LDNP-470NC -Fixed -Maximum DC current~420mA -Maximum DC resistance~650m Ω

9.Absolute Maximum Rating

Table 9-1: Maximum Ratings

Symbol	Parameter	Rating	Unit	Humidity	Unit	Note
V _{CI}	Logic supply voltage	-0.5 to +6.0	V	-	-	
T _{OPR}	Operation temperature range	0 to 40	°C	45 to 65	%	Note 9-1
T _{ttg}	Transportation temperature range	-25 to 60	°C	45 to 65	%	Note 9-2
T _{stg}	Storage condition	0 to 40	°C	45 to 65	%	Note 9-3
V _{IN}	Logic Input voltage	-0.5 to VDDIO+0.5	V	-	-	
V _{OUT}	Logic Output voltage	-0.5 to VDDIO+0.5	V	-	-	

- Note 9-1: We guarantee the single pixel display quality for 0-35°C, but we only guarantee the barcode readable for 35-40°C. Normal use is recommended to refresh every 24 hours.
- Note 9-2: T_{ttg} is the transportation condition, the transport time is within 10 days for -25°C~0°C or 40°C~60°C.
- Note 9-3: When the product is stored. The display screen should be kept white and face up. In addition, please be sure to refresh the e-paper every three months, Maximum storage time is 5 years.

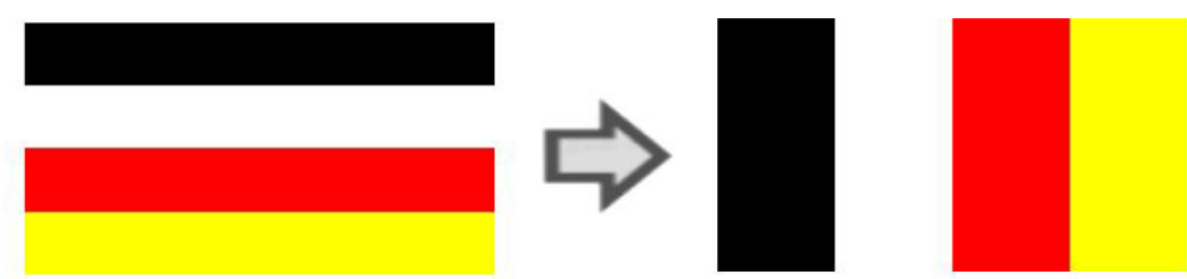
10.DC Characteristics

The following specifications apply for: VSS=0V, VCI=3.3V, T_{OPR}=25°C.

Table 11-1: DC Characteristics

Symbol	Parameter	Test Condition	Applicable pin	Min.	Typ.	Max.	Unit
V _{CI}	VCI operation voltage	-	VCI	2.3	3.0	3.6	V
V _{IH}	High level input voltage	-	SDA, SCL, CS#, D/C#, RES#, BS1	0.7V _{DDIO}	-	V _{DDIO}	V
V _{IL}	Low level input voltage	-		GND	-	0.3V _{DDIO}	V
V _{OH}	High level output voltage	I _{OH} = -400uA	BUSY	V _{DDIO} -0.4	-	-	V
V _{OL}	Low level output voltage	I _{OL} = 400uA		GND	-	GND+0.4	V
I _{update}	Module operating current	-	-	-	TBD	-	mA
I _{sleep}	Deep sleep mode	V _{CI} =3.3V	-	-	-	1	uA

- Notes: 1. The typical power is measured with following transition from horizontal 2scale pattern to vertical 2 scale pattern.
2. The deep sleep power is the consumed power when the panel controller is in deep sleep mode.
3. The listed electrical/ optical characteristics are only guaranteed under the controller & waveform provide.



11.Serial Peripheral Interface Timing and Command Table

11.1 Serial Peripheral Interface Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
SERIAL COMMUNICATION						
CSB	T_{CSS}	60			ns	Chip select setup time
	T_{CSH}	65			ns	Chip select hold time
	T_{SCC}	20			ns	Chip select CSB setup time
	T_{CHW}	40			ns	Chip select setup time
SCL	T_{SCYCW}	100			ns	Serial clock cycle (Write)
	T_{SHW}	35			ns	SCL "H" pulse width (Write)
	T_{SLW}	35			ns	SCL "L" pulse width (Write)
	T_{SCYCR}	150			ns	Serial clock cycle (Read)
	T_{SHR}	60			ns	SCL "H" pulse width (Read)
	T_{SLR}	60			ns	SCL "L" pulse width (Read)
SDA (DIN) (DOUT)	T_{SDS}	30			ns	Data setup time
	T_{SDH}	30			ns	Data hold time
	T_{ACC}			50	ns	Access time
	T_{OH}	15			ns	Output disable time
D/C	T_{DCS}	20			ns	DC setup time
	T_{DCH}	20			ns	DC hold time

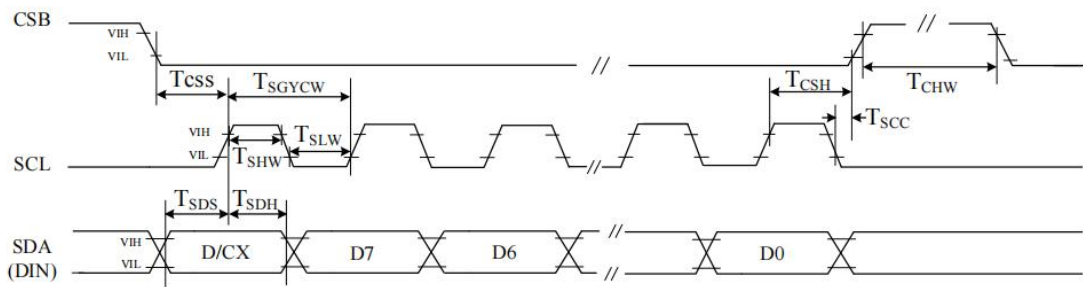


Figure 11-1: 3 pin serial interface characteristics(write mode)

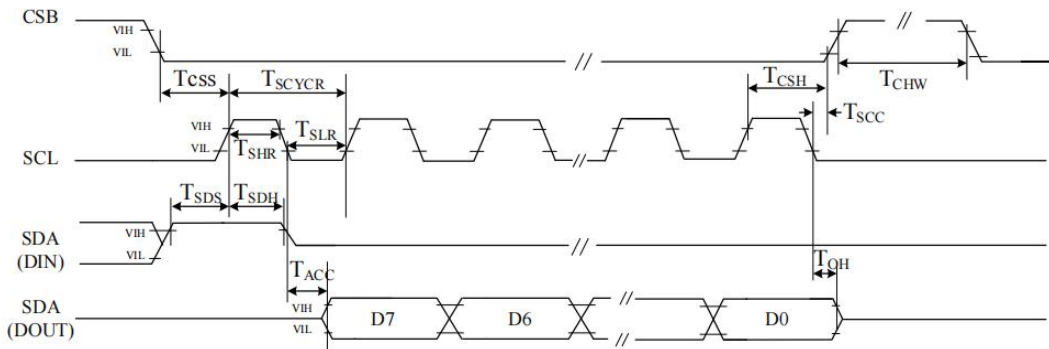


Figure 11-2: 3 pin serial interface characteristics(read mode)

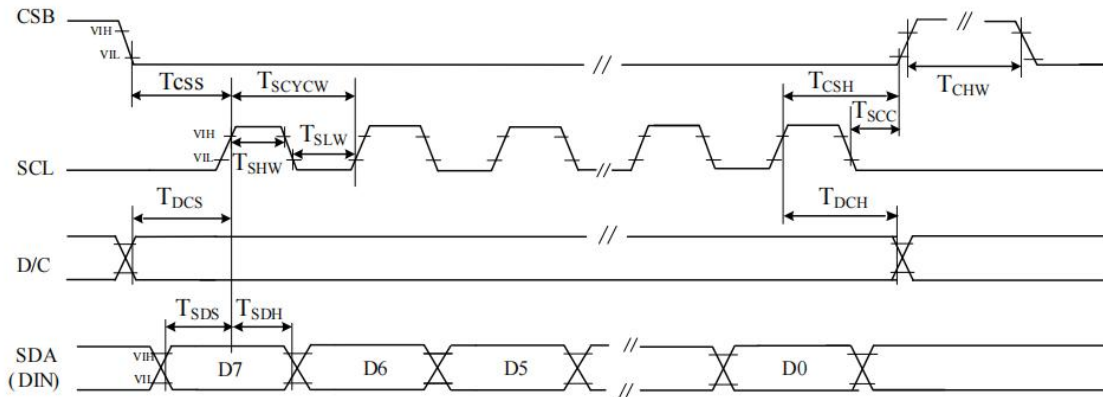


Figure 11-3: 4 pin serial interface characteristics(write mode)

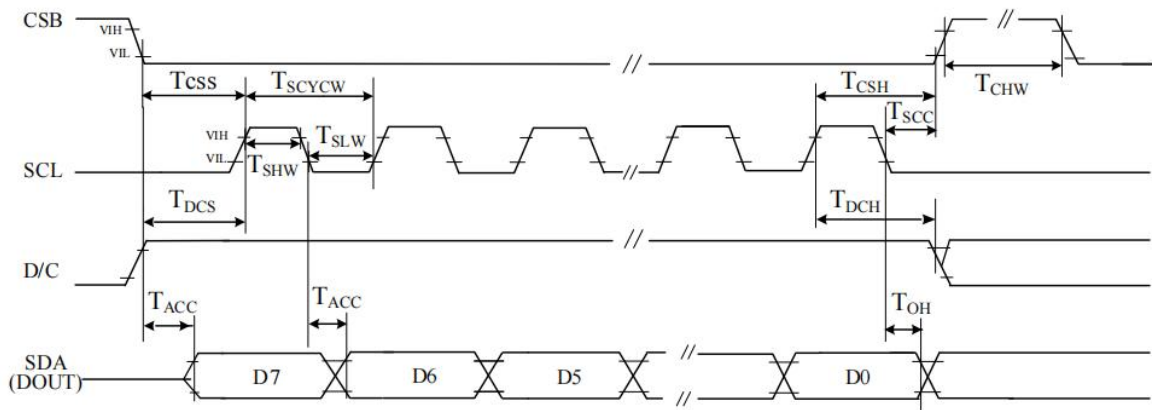


Figure 11-4: 4 pin serial interface characteristics(read mode)

11.2 Command Table

Please refer to IC JD79661AA datasheet.

12.Optical characteristics

12.1 Specifications

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

T=25℃

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT	Note
KS	Black State L* value	Black	-	9	12		Note 12
	Black State a* value	Black	-	-	8		Note 12
WS	White State L* value	White	59.5	61	-		Note 12
	White State b* value	White	-	-	2.5		Note 12
RS	Red State L* value	Red	24	-	-		Note 12
	Red State a* value	Red	38	40	-		Note 12
	Red State b* value	Red	-	-	34		Note 12
YS	Yellow State L* value	Yellow	54	-	-		Note 12
	Yellow State a* value	Yellow	-	-	18		Note 12
	Yellow State b* value	Yellow	60	66	-		Note 12

WS : White state, KS : Black state, RS: Red state, YS:Yellow state

Note 12: ①Luminance meter : i - One Pro Spectrophotometer

- ② We don't guarantee 5 years pixels display quality for humidity below 45%RH or above 70%RH; Suggest Updated once a day;
- ③To increases the black and white screen clear screen when red has refreshed for a long time , the effect is better.

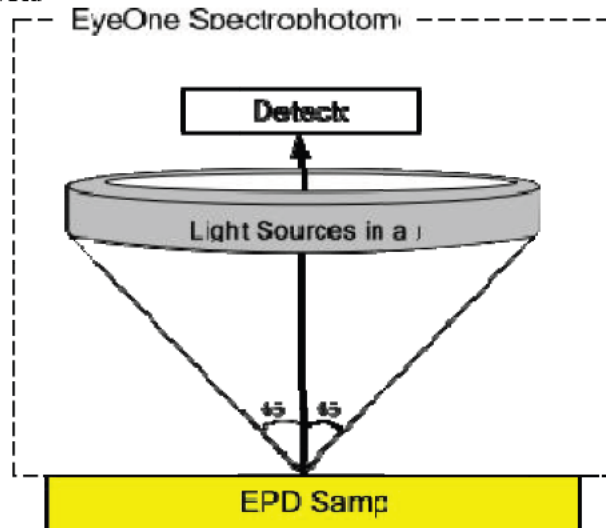
12.2 Definition of contrast ratio

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

$$CR = R1/Rd$$

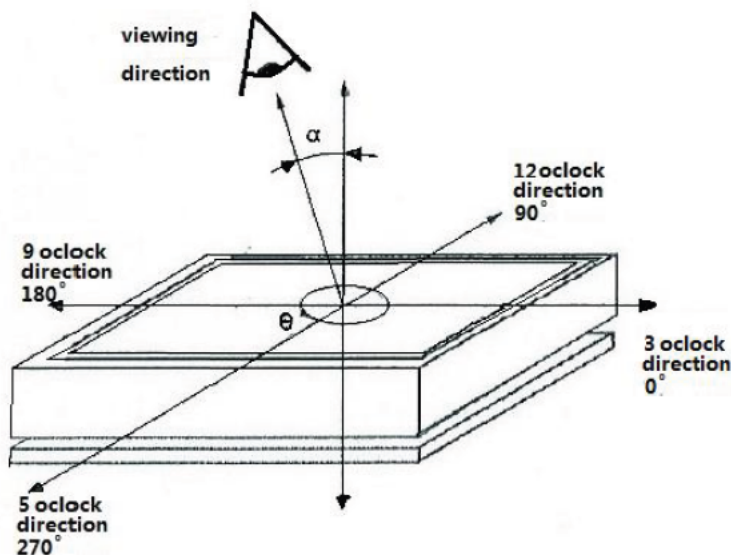


12.3 Reflection Ratio

The reflection ratio is expressed as:

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

L_{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 whiteboard. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.



13.Handling, Safety and Enviromental Requirements

WARNING	
The display module should be kept flat or fixed to a rigid, curved support with limited bending along the long axis. It should not be used for continual flexing and bending. Handle with care. Should the display break do not touch any material that leaks out. In case of contact with the leaked material then 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.	
IPA solvent can only be applied on active area and the back of a glass. For the rest part, it is not allowed.	
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.	

Mounting Precautions	
(1) It's recommended that you consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.	
(2) It's recommended that you attach a transparent protective plate to the surface in order to protect the EPD. Transparent protective plate should have sufficient strength in order to resist external force.	
(3) You should adopt radiation structure to satisfy the temperature specification.	
(4) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the PS at high temperature and the latter causes circuit break by electro-chemical reaction.	
(5) Do not touch, push or rub the exposed PS with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of PS for bare hand or greasy cloth. (Some cosmetics deteriorate the PS)	
(6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach the PS. Do not use acetone, toluene and alcohol because they cause chemical damage to the PS.	
(7) Wipe off saliva or water drops as soon as possible. Their long time contact with PS causes deformations and color fading.	

Data sheet status	
Product specification	The data sheet contains final product specifications.

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 dose not form part of the specification.

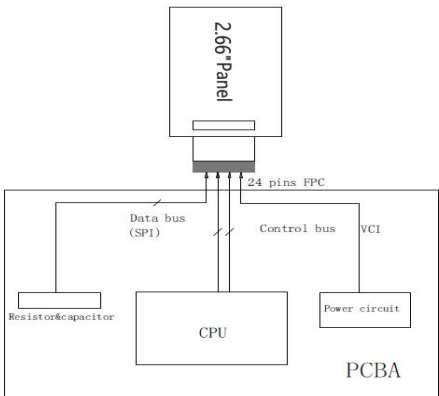
Product Environmental certification
ROHS
REMARK
All The specifications listed in this document are guaranteed for module only. Post-assembled operation or component(s) may impact module performance or cause unexpected effect or damage and therefore listed specifications is not warranted after any Post-assembled operation.

14.Reliability test

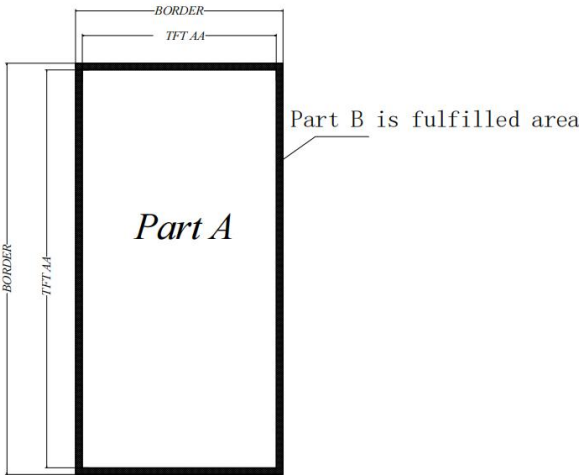
	TEST	CONDITION	REMARK
1	Low-Temperature Storage	T=-25℃， 240h	Test in white pattern
2	High-Temperature Storage	T=60℃， RH=35%， 240h	Test in white pattern
3	High-Temperature Operation	T=40℃， RH=35%， 240h	
4	Low-Temperature Operation	0℃， 240h	
5	High-Temperature,High-Humidity Operation	T=40℃,RH=80%RH, 240h	
6	High Temperature,High Humidity Storage	T=50℃,RH=80%RH,240h	Test in white pattern
7	Temperature Cycle	-25℃(30min)~60℃(30min),100 Cycle	Test in white pattern
8	UV exposure Resistance	765 W/ m² for 168h,40 ℃	Test in white pattern
9	ESD Gun	Air+/-4KV;Contact+/-2KV (Naked EPD display, including IC and FPC area)	

Note:Put in normal temperature for 1hour after test finished,display performance is ok.

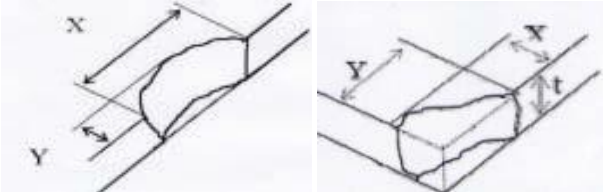
15.Block Diagram



16.PartA/PartB Specification



17.Point and line standard

Shipment Inspection Standard						
Equipment: Electrical test fixture, Point gauge						
Outline dimension	36.30(H)×71.82(V) ×0.93(D)	Unit: mm	Part-A	Active area	Part-B	Border area
Environment	Temperature	Humidity	Illuminance	Distance	Time	Angle
	19℃～25℃	55%±5%RH	600～1200Lux	300 mm	35Sec	±45°
Defect type	Inspection method	Standard		Part-A		Part-B
Spot	Electric Display	D≤0.25 mm		Ignore		Ignore
		0.25 mm<D≤0.4 mm		N≤4		Ignore
		D>0.4 mm		Not Allow		Ignore
Display unwork	Electric Display	Not Allow		Not Allow		Ignore
Display error	Electric Display	Not Allow		Not Allow		Ignore
Scratch or line defect(include dirt)	Visual/Film card	W≤0.1 mm		Ignore		Ignore
		0.1mm<W≤0.25mm, L≤3mm,		N≤2		Ignore
		L>3mm,W>0.25 mm		Not Allow		Ignore
PS Bubble	Visual/Film card	D≤0.25mm		Ignore		Ignore
		0.25mm≤D≤0.40mm		N≤4		Ignore
		D>0.40 mm		Not Allow		Ignore
Side Fragment	Visual/Film card	X≤3mm,Y≤0.5mm, Do not affect the electrode circuit (Edge chipping) N≤2; X≤2mm,Y≤2mm, Do not affect the electrode circuit(Corner chipping) N≤2;				
						
Remark	1.Cannot be defect & failure cause by appearance defect;					
	2.Cannot be larger size cause by appearance defect;					
	L=long W=wide D=point size N=Defects NO					

Note 17-1: OQC inspection: One-time sampling plan for GB/T 2828.1-2012 , Inspection Level II, CR: AC/Re=0/1, MA=0.4,MI=1.0.

Note 17-2: Spot define: That only can be seen under White State or Dark State defects

Note 17-3: Any defect which is visible under gray pattern or transition process but invisible under black and white is disregarded.

Note 17-4: Any defect must be judged by Optical Microscope.

Note 17-5: Here is definition of the “Spot” and “Scratch or line defect”

Spot: $W > 1/4L$

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

Note 17-6: Definition for L/W and D (major axis)

Note 17-7: FPC bonding area pad doesn't allowed visual inspection\

Note 17-8:

