SPECIFICATION

ED037TC1

3.69", 280x480, SPI

Version: 1.1
Date: 29.05.2020

Note: This specification is subject to change without prior notice

Version: <u>0.1</u>

Technical Specification

MODEL NO: **VB3300-CGA (ED037TC1)**

The content of this information is subject to be changed without notice.

Please contact E Ink or its agent for further information.

☐Customer's Confirmation

Customer _____

Date _____

By _____

☐E Ink's Confirmation

Approved By _____

Confirmed By _____

Prepared By _____

Revision History

Rev.	Issued Date	Revised Contents
1.0	2020-03-27	1. New
1.1	2020-05-29	1. Consolidate Template 2. Consolidate Wording Description 3. Remove SPI Command 4. Remove Reference Circuit 5. Add Block Diagram 6. Modify Packing

TECHNICAL SPECIFICATION

CONTENTS

2. Application

The VB3300-CGA is a color, reflective electrophoretic E Ink® technology display module. It is based on active matrix TFT substrate, featuring capacitive touch panel and front light and color component. It has 3.7" active area, the display is capable to display images at 2 gray levels (1 bit) depending on the display controller and the associated waveform file it used.

3. Features

➢ High contrast reflective/electrophoretic technology

➢ Ultra wide viewing angle

➢ Ultra low power consumption

➢ Glass TFT

➢ Portrait mode

➢ Commercial temperature range

➢ All in one IC that integrated source driver, gate driver, TCON, PMIC and OTP memory in the module.

4. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	3.69	Inch	
Display Resolution	280(H) x 480(V)	Pixel	150dpi B/W
Display color	monochrome	-	
Active Area	47.32(H) x 81.12(V)	mm	
Pixel Pitch	0.169(H) x 0.169(V)	mm	
Outline Dimension	54.9(H) x 93.3(V) × 0.78 (D)	mm	
Module Weight	8.10 ± 0.81	g	
Number of Gray	2 Gray Level		

5. Mechanical Drawing of EPD Module

6. **Output Interface**

5-1) Recommended Connector Type of Panel

Panasonic Y5B AYF532435 or P-TWO 196225-24041

5-2) Pin Assignment of Panel

Pin #	Signal	I/O	Description	Remark
1	NC	-	NC	
2	GDR	O	N-MOS gate control	
3	RESE	O	Current sense input for control loop.	
4	NC	P	NC	
5	VSH2	P	Positive source voltage for reserve	5V (Reserve.)
6	TSCL	O	I2C clock for external temperature sensor	
7	TSDA	I/O	I2C data for external temperature sensor	
8	BS1	I	Input interface setting	
9	BUSY	O	Driver status.	
10	RES#	I	Global reset pin	
11	D/C#	I	Serial communication Command/Data input	
12	CS#	I	Serial communication chip select.	
13	SCL	O	Serial communication clock input.	
14	SDA	I/O	Serial communication data input.	
15	VDDIO	P	Digital/IO/Analog power	3.3V
16	VCI	P	Digital/IO/Analog power	3.3V
17	VSS	P	Ground	
18	VDD	P	1.8V voltage input &output	1.8V
19	VPP	O	OTP program power	7.5V
20	VSH1	P	Positive source voltage	+15V
21	VGH	P	Positive gate voltage	+20V
22	VSL	P	Negative source voltage	-15V
23	VGL	P	Negative gate voltage	-20V
24	VCOM	P	VCOM output	

5-3) Panel Scan Directions

Gate scan direction

G1 ⟶ G1072

S1

Source scan direction

S1448

2D BARCODE
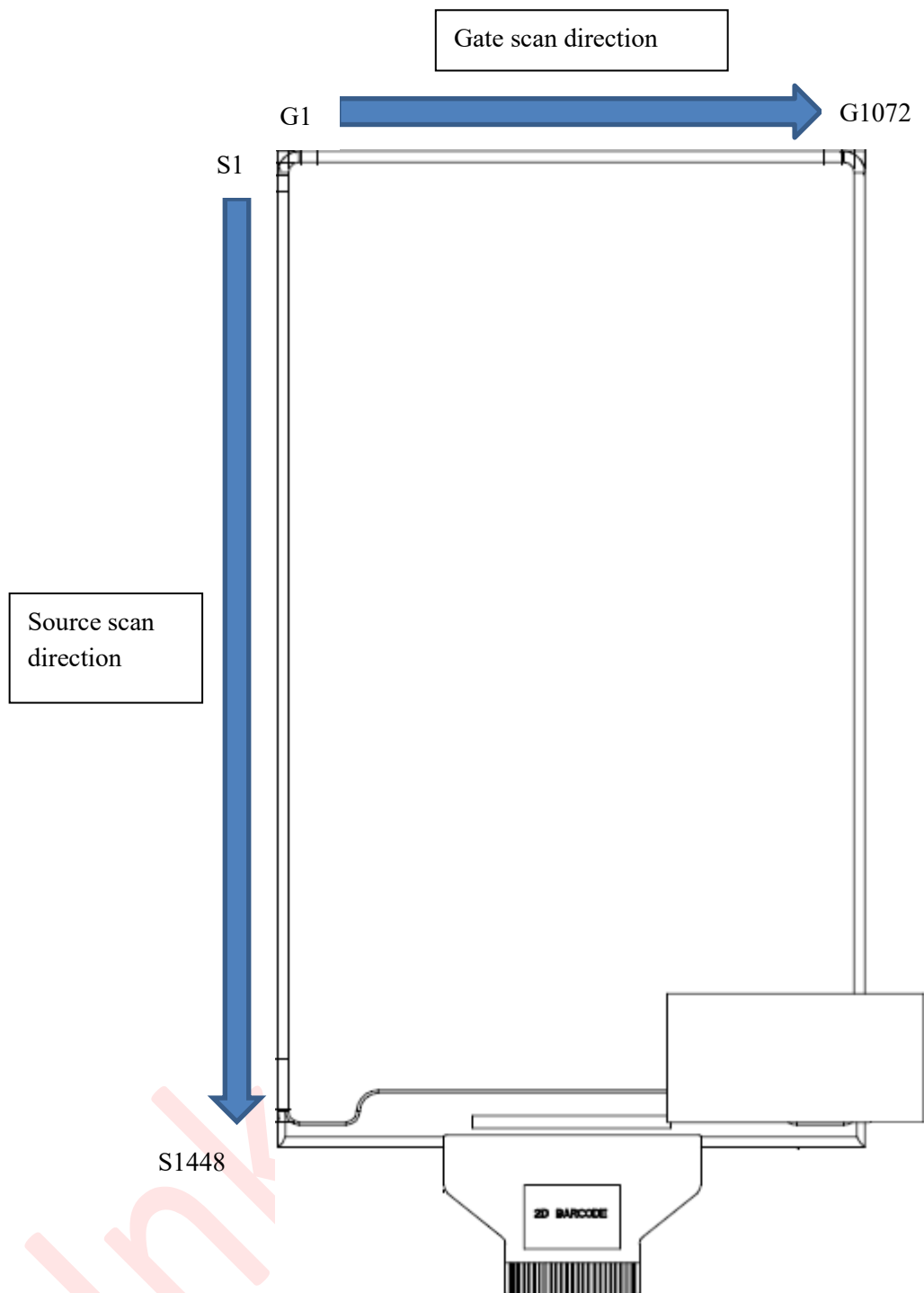
7. **Electrical Characteristics**

6-1) Absolute Maximum Ratings of panel only:

Parameter	Symbol	Rating	Unit
Digital/IO/Analog power	VDD	-0.3 to +5.5	V
Operating Temp. Range	Tot	0 to +55	℃
Storage Temperature	Tst	-25 to +70	℃

6-2) Panel DC characteristics

DIGITAL DC CHARACTERISTICS							
Symbol	Parameter		Conditions	MIN.	TYP.	MAX.	Unit
VDD	Logic supply voltage			2.4	3.3	3.6	V
VGH	Positive Gate driving voltage			--	20	--	V
VGL	Negative Gate driving voltage			--	-20	--	V
VSH	Positive source driving voltage			--	15	--	V
VSL	Negative source driving voltage			--	-15	--	V
VCOM_DC	VCOM_DC output voltage				Adjusted		V
V_{IL}	Low level input voltage		Digital input pins	0	--	0.2xVDD	V
V_{IH}	High level input voltage		Digital input pins	0.8xVDD	--	VDD	V
V_{OH}	High level output voltage		Digital input pins, I_{OH}= 400 uA	0.8xVDD	--	--	V
V_{OL}	Low level output voltage		Digital input pins, I_{OL}= -400 uA	0	--	0.2xVDD	V
R_{IN}	Pull-up/down impedance				200		KΩ
I_{MSTB}	Module stand-by current		Stand-by mode	--	0.2		mA
I_{MDS}	Module deep sleep & Flash power down current		Deep sleep mode & Flash power down mode		1.0		uA
TYP pattern	Inc	Inrush Current		--	0.16	--	A
	I_{MOPR}	Module operating current		--	16	--	mA
	P	Operation Power Dissipation	VDD=3.3V with DC-DC	--	53	--	mW
Heavy loading pattern	Inc	Inrush Current		--	**0.18**	--	A
	I_{MOPR}	Module operating current		--	**148**	--	mA
	P	Operation Power Dissipation	VDD=3.3V with	--	**488**	--	mW

			DC-DC				
P$_{STBY}$	P$_{STBY}$	Standby Power Dissipation	VDD=3.3V		0.26		mW

- The maximum average Currents for power consumption and Max. Currents are measures using 50Hz waveform with heavy loading pattern transition:

- The Typical power consumption is measure using 50Hz waveform with following pattern transition:

- The standby power is the consumed power when the panel controller is in standby mode.

- The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by E Ink.

- Vcom is recommended to be set in the range of assigned value ±0.1 V
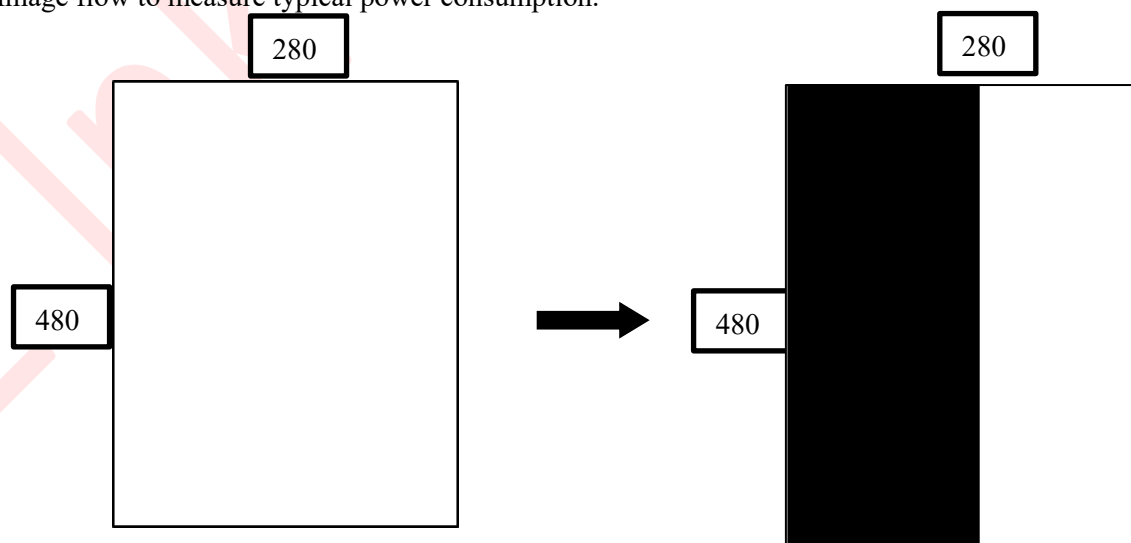
Note 6-1
Image flow to measure heavy loading power consumption.
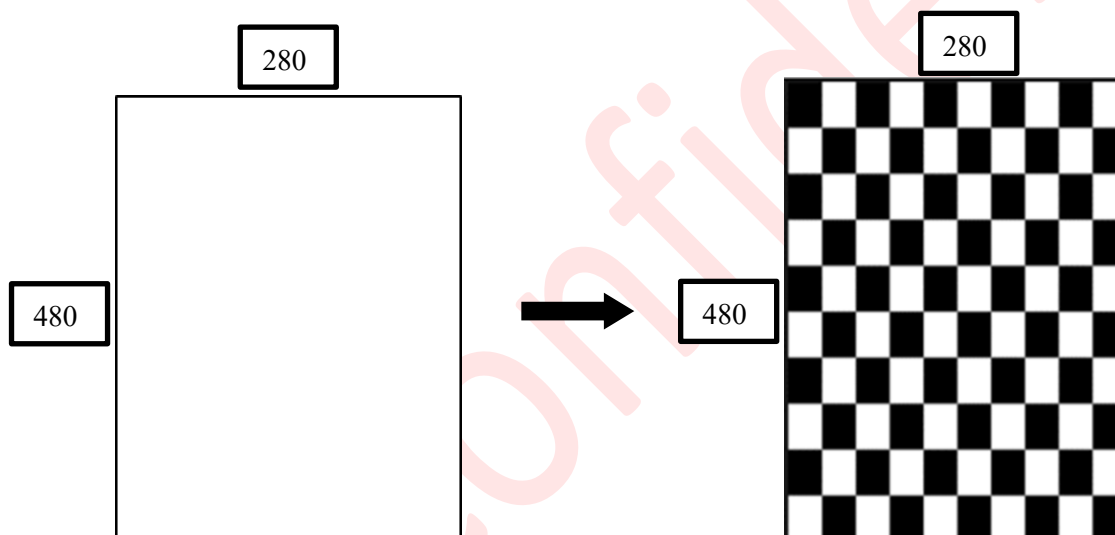
Note 6-2
Image flow to measure typical power consumption.

6-3) Panel AC characteristics

The following specifications apply for: VDDIO - VSS = 2.2V to 3.7V, T_{OPR} = 25°C, CL=30pF

Table 12-1 : Serial Peripheral Inter face Timing Characteristics

6.3.1 Write mode

Symbol	Parameter	Min	Typ	Max	Unit
f_{SCL}	SCL frequency (Write Mode)			20	MHz
t_{CSSU}	Time CS# has to be low before the first rising edge of SCLK	20			ns
t_{CSHLD}	Time CS# has to remain low after the last falling edge of SCLK	20			ns
t_{CSHIGH}	Time CS# has to remain high between two transfers	100			ns
t_{SCLCYC}	SCL cycle time	50			ns
$t_{SCLHIGH}$	Part of the clock period where SCL has to remain high	25			ns
t_{SCLLOW}	Part of the clock period where SCL has to remain low	25			ns
t_{SISU}	Time SI (SDA Write Mode) has to be stable before the next rising edge of SCL	10			ns
t_{SIHLD}	Time SI (SDA Write Mode) has to remain stable after the rising edge of SCL	40			ns

Read mode

Symbol	Parameter	Min	Typ	Max	Unit
f_{SCL}	SCL frequency (Read Mode)			2.5	MHz
t_{CSSU}	Time CS# has to be low before the first rising edge of SCLK	100			ns
t_{CSHLD}	Time CS# has to remain low after the last falling edge of SCLK	50			ns
t_{CSHIGH}	Time CS# has to remain high between two transfers	250			ns
$t_{SCLHIGH}$	Part of the clock period where SCL has to remain high	180			ns
t_{SCLLOW}	Part of the clock period where SCL has to remain low	180			ns
t_{SOSU}	Time SO(SDA Read Mode) will be stable before the next rising edge of SCL		50		ns
t_{SOHLD}	Time SO (SDA Read Mode) will remain stable after the falling edge of SCL		0		ns

Note: All timings are based on 20% to 80% of VDDIO-VSS

6-4)Refresh rate

The module is applied at a maximum refresh rate of 50 Hz.

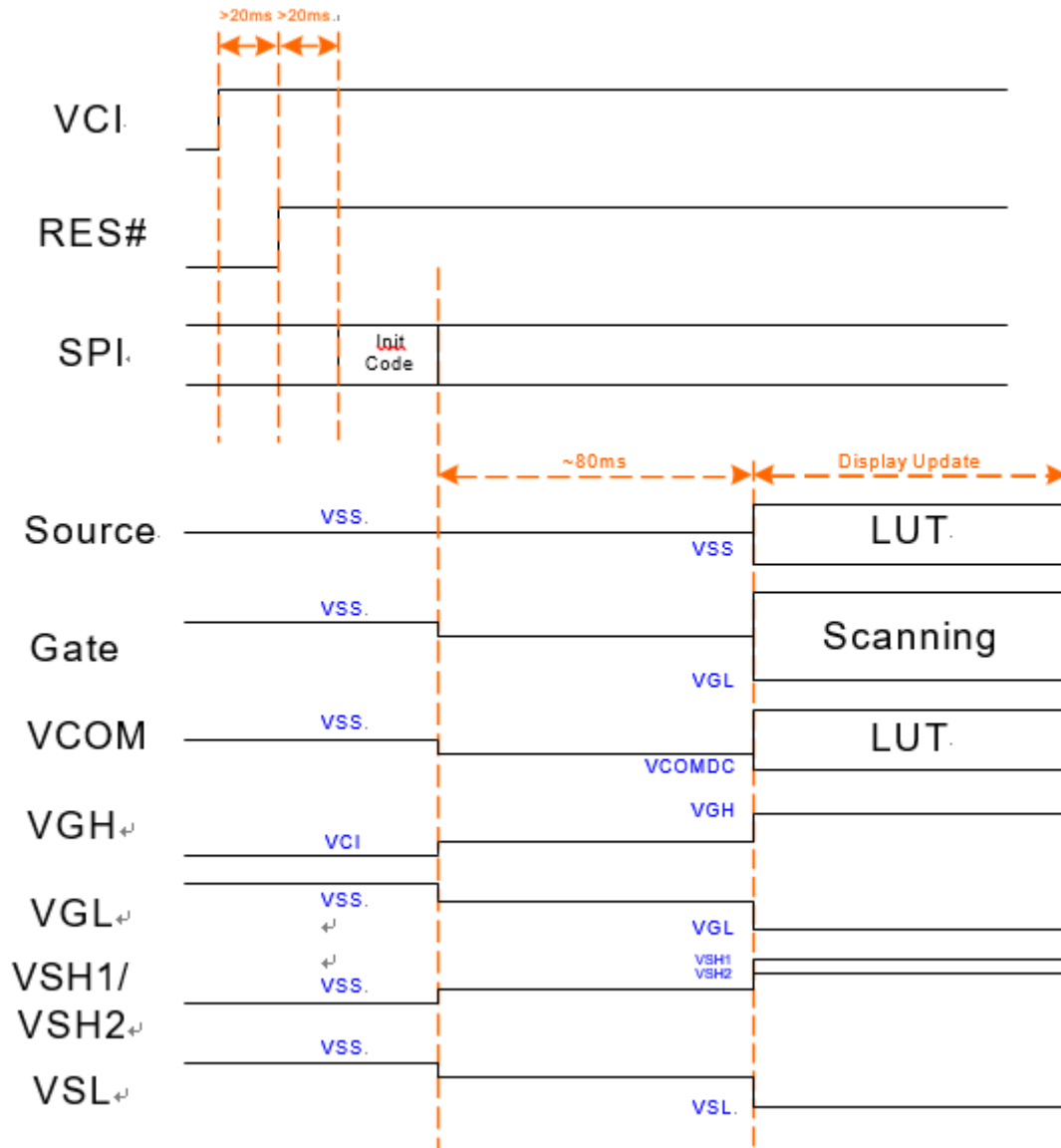|	Min	Max
Refresh Rate	-	50 Hz

6-5) Data transmission waveform

Display on sequence with softstart setting is shown in Figure
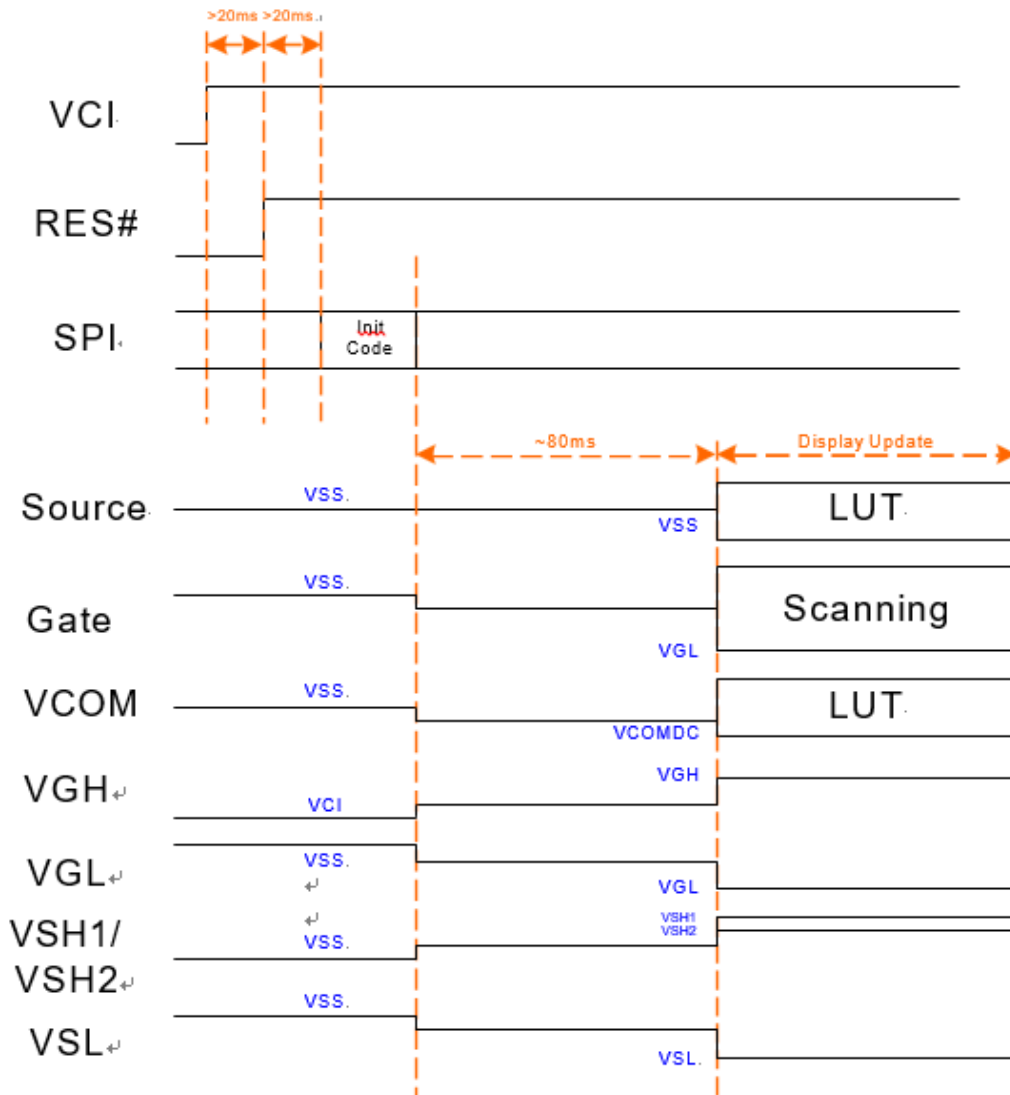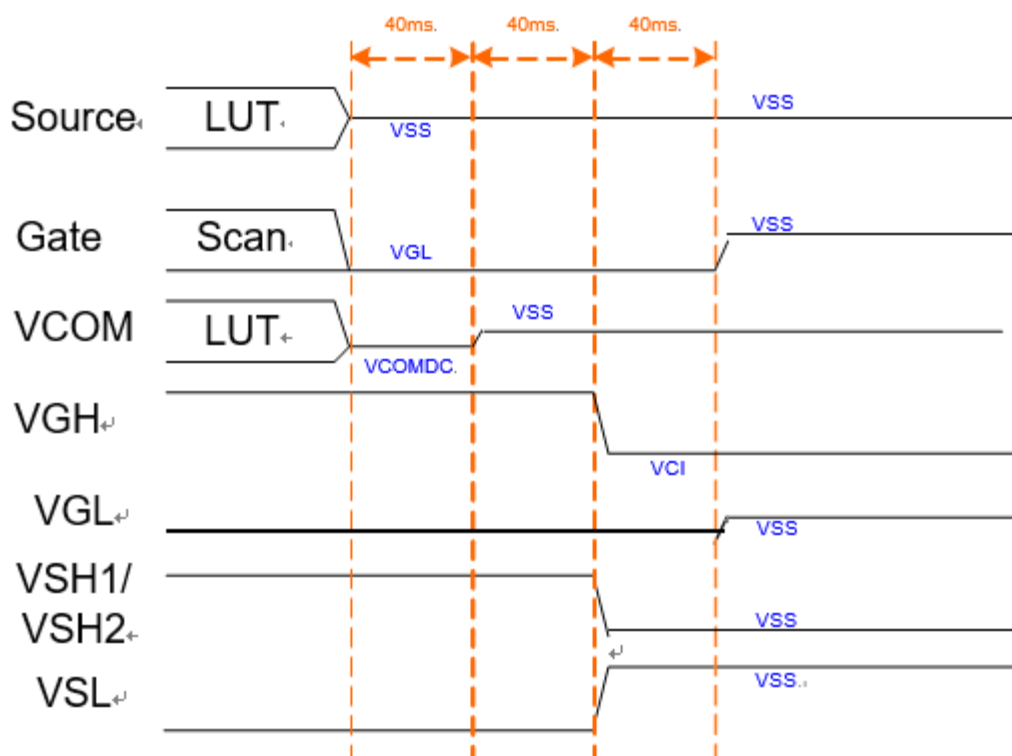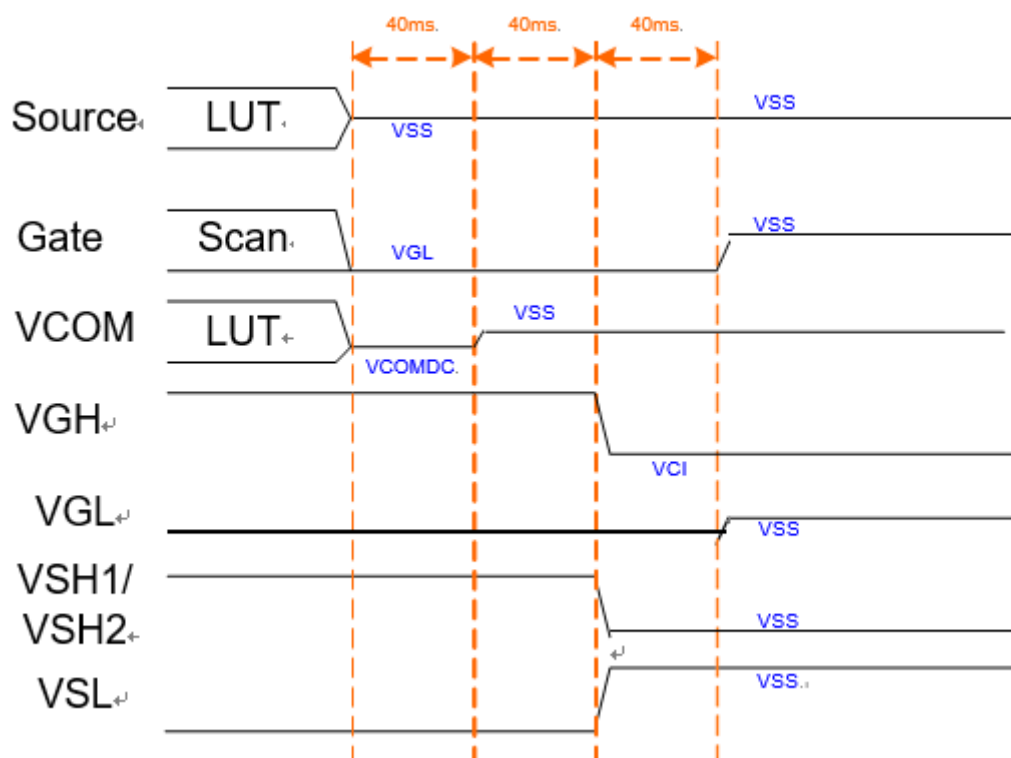
8. Power Sequence

In order to prevent IC fail in power on resetting, the power sequence must be followed as below.

Power on sequence

Power off sequence

9. **Optical Characteristics**

8-1) Specifications

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

$T = 25^{\circ}C$

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit	Note
R	Reflectance	White	35	45	-	%	Note 9-1
Gn	N_{th} Grey Level	-	-	$DS+(WS-DS)\times n/(m-1)$	-	L*	-
CR	Contrast Ratio	-	10	16	-		-

WS: White state , DS: Dark state, Gray state from Dark to White :DS、G1、G2…、Gn…、Gm-2、WS
     m:4   when 2 bits mode
Note 9-1: Luminance meter: Eye – One Pro Spectrophotometer

8-2) Definition of contrast ratio
     The contrast ratio (CR) is the ratio between the reflectance in a full white area (Rl) and the reflectance in a dark area (Rd): CR = Rl / Rd
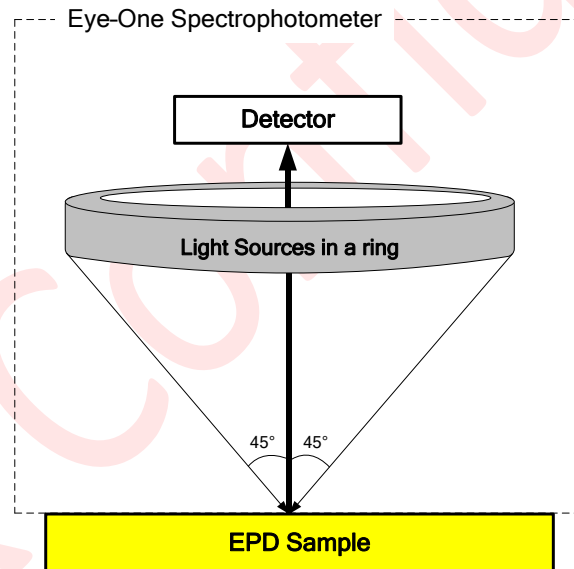
Reflection Ratio

The reflection ratio is expressed as:

R = Reflectance Factor_white board   x   (L_center / L_white board)
L_{center} is the luminance measured at center in a white area (R=G=B=1). $L_{white board}$ 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.

9. Handling, Safety and Environmental Requirements and Remark

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.
IPA solvent can only be applied on active area and the back of a glass. For the rest part, it is not allowed.

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	This data sheet contains formal 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 at 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.	

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.

10. Reliability Test

|	TEST	CONDITION	METHOD	REMARK
1	High-Temperature Operation	T = +60°C, RH = 35%　for 240 hrs	IEC 60 068-2-2Be	
2	Low-Temperature Operation	T = 0°C for 240 hrs	IEC 60 068-2-1Ae	
3	High-Temperature Storage	T = +70°C, RH= 40% for 240 hrs Test in white pattern	IEC 60 068-2-2 Bb	
4	Low-Temperature Storage	T = -25°C for 240 hrs Test in white pattern	IEC 60 068-2-1Ab	
5	High-Temperature, High-Humidity Operation	T = +40°C, RH = 90% for 168 hrs	IEC 60 068-2-78	
6	High Temperature, High- Humidity Storage	T = +60℃, RH=80%　for 240 hrs Test in white pattern	IEC 60 068-2-78	
7	Temperature Cycle	-25℃→+70℃, 100 Cycles 30min　30min Test in white pattern	IEC 68-2-14 Nb	
8	Solar radiation test	765 W/m^2 for 168hrs,40℃ Test in white pattern	IEC60 068-2-5Sa	
9	Package Vibration	1.04G, Frequency: 10~500Hz Direction: X,Y,Z Duration: 1 hours in each direction	Full packed for shipment	
10	Package Drop Impact	Drop from height of 100 cm on concrete surface. Drop sequence: 1 corner,3 edges,6 faces One drop for each.	Full packed for shipment	
11	Electrostatic Effect (non-operating)	(Machine model)+/- 250V 0Ω, 200pF	IEC 62180	

Actual EMC level to be measured on customer application

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

< Criteria >

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image). All the cosmetic specification is judged before the reliability stress.

11.Block Diagram
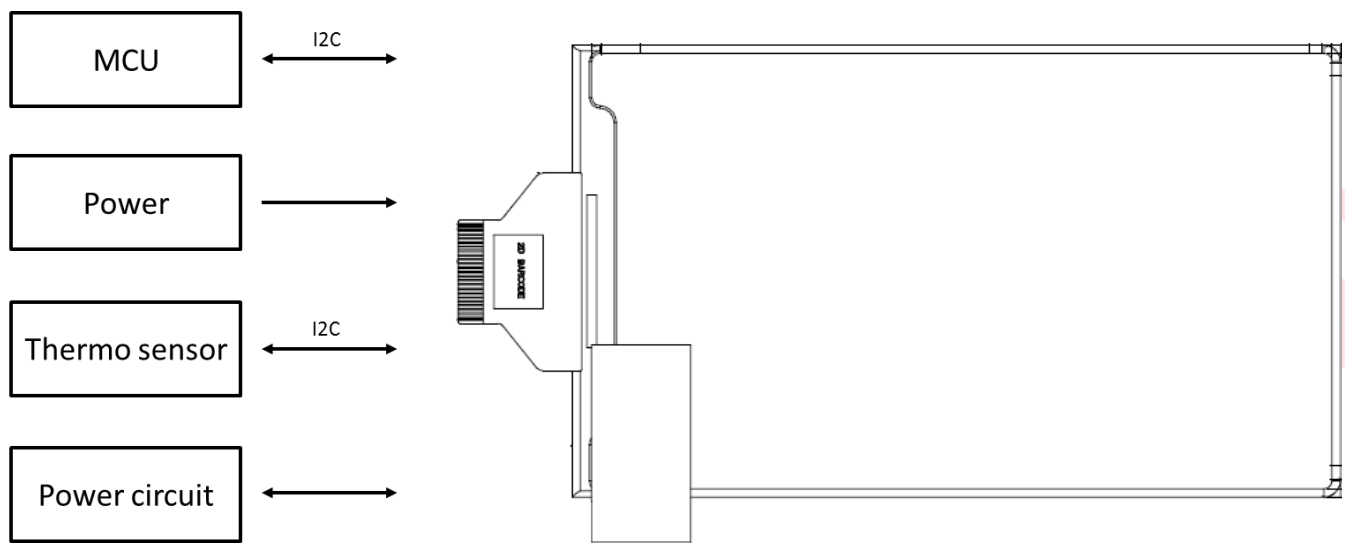
12.Packing

REV	DESCRIPTION	DESIGN	DATE
01	INITIAL RELEASE	Botsang Huang	2019/05/21
02	Update EPD drawing	Botsang Huang	2019/05/28
03	Update TRAY design	Botsang Huang	2020/01/07

Empty tray

1st Layer

2nd Layer

Total 12 Layers

Tape

<u>NOTE:</u>
1. One layer include:
   10 pcs module & 1pcs tray & 1pcs EPE sheet

2. Q'TY: 120 pcs panel/carton.
3. Dimension: 445*365*170mm

7	30g 加厚複合紙活礦乾燥劑73*95mm	2	
6	EPE SHEET	12	
5	CARTON INTERNAL	1	
4	摺口袋450*380*580mm	1	抗靜電
3	ED037TC1	120	
2	TRAY	13	抗靜電
1	EPE FOAM	2	
ITEM	DESCRIPTION	Q'TY	REMARK

MTL.SPEC.	UNSPECIFIED TOL'S ±5.0mm	REMARK	
	ANGLE		
	ROUGHNESS		

E ink | 元太科技工業股份有限公司
E Ink Holdings Inc.

APPROVE	May Lee	2020/01/07	SCALE	UNIT	SHEET	DWG.TITLE
CHECK	May Lee	2020/01/07	1:1	mm	1 OF 1	ED037TC1/2 PACKING
DESIGN	Botsang Huang	2020/01/07	MTL.NO.		DWG.NO.	A4 SIZE

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