E ink 元太科技 E Ink Holdings

Version: 1.0

TECHNICAL   SPECIFICATION

MODEL   NO：ED115OC1

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	Jun.3.2012	New

TECHNICAL   SPECIFICATION

CONTENTS

1. General Description

ED115OC1 is a reflective electrophoretic E Ink® technology display module based on active matrix TFT substrate. It has 11.5" active area with 2760 x 2070 pixels, the display is capable to display images at 2-16 gray levels (1-4 bits) depending on the display controller and the associated waveform file it used.

2. Features

➢ High contrast reflective/electrophoretic technology
➢ 2760x2070 display
➢ 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	11.5	Inch	
Display Resolution	2760 (H)×2070 (V)	Pixel	
Active Area	233.22 (H)×174.915(V)	mm	
Pixel Pitch	0.0845 (H)x0.0845 (V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	249.47 (H)×192.165 (V)×1.18 (D)	mm	
Module Weight	114.2±10	g	
Number of Gray	16 Gray Level (monochrome)		
Display operating mode	Reflective mode		
Surface treatment	Anti-glare treatment for protective sheet		

4.Mechanical Drawing of EPD Module
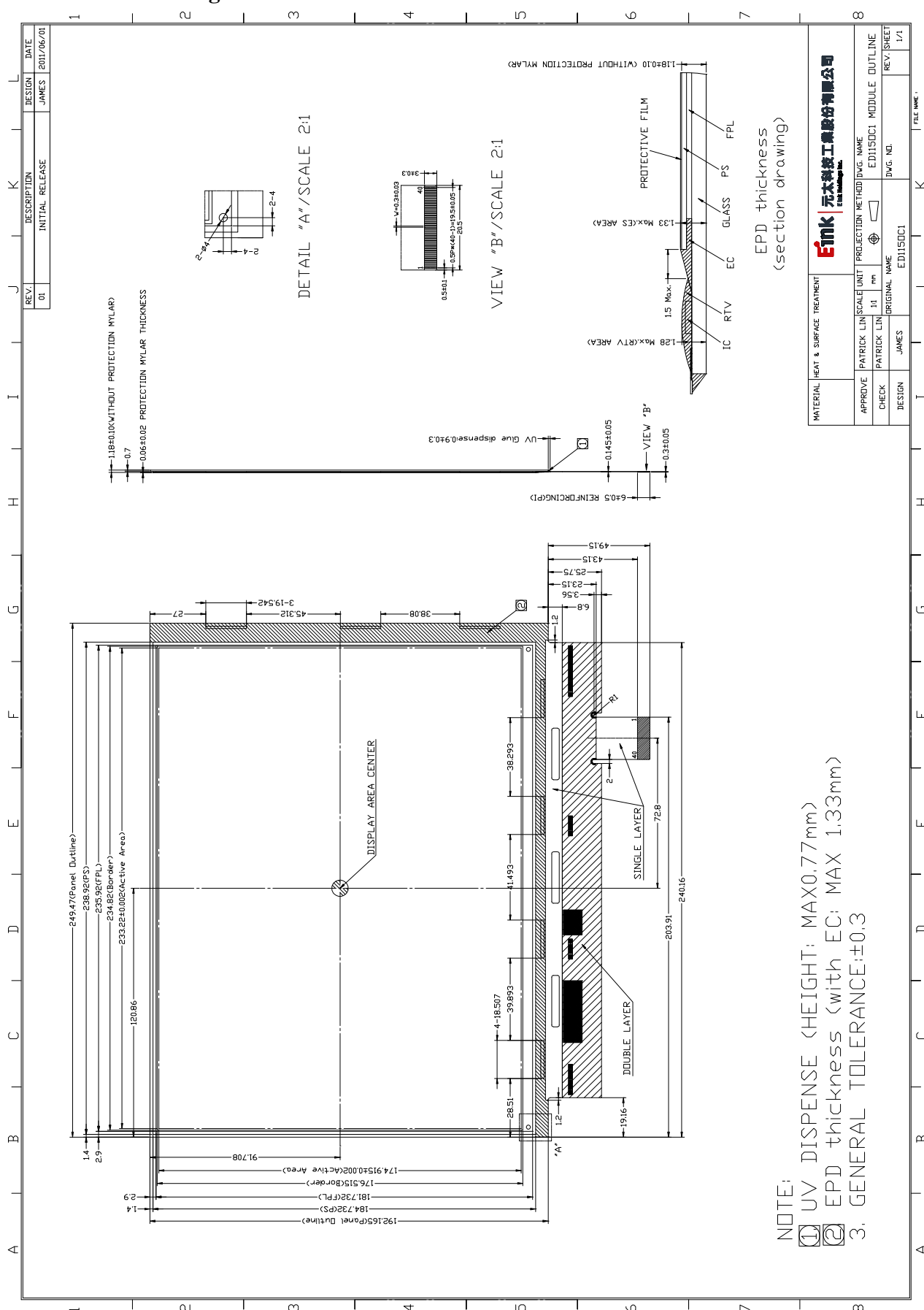
5.Input/Ouput Terminals
5-1)Pinout List

Pin #	Signal	Description
1	VEE	Negative power supply gate driver
2	NC	NO Connection
3	VGG	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	STV	Start pulse gate driver
9	VSS	Ground
10	VCOM	Common voltage
11	VDD	Digital power supply drivers
12	VSS	Ground
13	CKH	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	STH	Start pulse source driver
32	LEH	Latch enable source driver
33	OEH	Output enable source driver
34	ISEL	L: input data bus width is 8-bit, i.e., D7 ~ D0 are valid inputs. D15 ~ D8 are internal pull down, and user should connect to logic "L" levels or let them open. ISEL = H: input data bus width is 16-bit.
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	Border	Border connection

6.Electrical Characteristics

6-1) Absolute maximum rating

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	VDD	-0.3 to +7	V
Positive Supply Voltage	V_{POS}	-0.3 to +18	V
Negative Supply Voltage	V_{NEG}	+0.3 to -18	V
Max .Drive Voltage Range	$V_{POS} - V_{NEG}$	36	V
Supply Voltage	VGG	-0.3 to +55	V
Supply Voltage	VEE	-32 to +0.3	V
Supply Range	VGG-VEE	-0.3 to +55	V
Operating Temp. Range	TOTR	0 to +50	℃
Storage Temperature	TSTG	-25 to +70	℃

6-2) Panel DC characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Signal ground	V_{SS}		-	0	-	V
Logic Voltage supply	V_{DD}		3.0	3.3	3.6	V
	I_{VDD}	V_{DD}=3.3V	-	3.06	4.62	mA
Gate Negative supply	V_{EE}		-24.5	-24	-23.5	V
	I_{EE}	V_{EE} =-24V	-	0.58	1.39	mA
Gate Positive supply	V_{GG}		21.5	22	22.5	V
	I_{GG}	V_{GG} = 22V	-	0.53	1.38	mA
Source Negative supply	V_{NEG}		-15.4	-15	-14.6	V
	I_{NEG}	V_{NEG} = -15V	-	24.91	119.5	mA
Source Positive supply	V_{POS}		14.6	15	15.4	V
	I_{POS}	V_{POS} = 15V	-	23.79	121.19	mA
Asymmetry source	V_{Asym}	$V_{POS}+V_{NEG}$	-800	0	800	mV
Common voltage	V_{COM}		-4	Adjusted	-1	V
	I_{COM}		-	2	-	mA
Power panel	P		-	768	3790	mW
Standby power panel	P_{STBY}		-	-	0.18	mW
Operating temperature			0	-	50	℃
Storage temperature			-25	-	70	℃

- The maximum power consumption is measured using 25Hz waveform with following pattern transition: from pattern of repeated 1 consecutive black scan lines followed by 1 consecutive white scan line to that of repeated 1 consecutive white scan lines followed by 1 consecutive black scan lines. (Note 6-1)
- The Typical power consumption is measured using 25Hz waveform with following pattern transition: from checkers with 200dot black and 200dot white to the converse checkers. (Note 6-2)
- The standby power is the consumed power when the panel controller is in standby mode.
- Vcom is recommended to be set in the range of assigned value $\pm$ 0.1V.
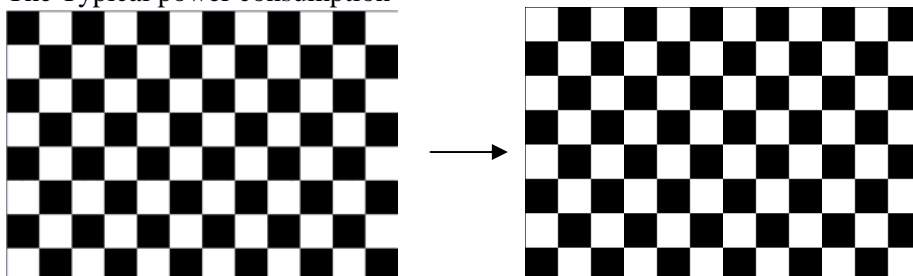- The maximum I_{COM} inrush current is about 1.42A

Note 6-1

The maximum power consumption
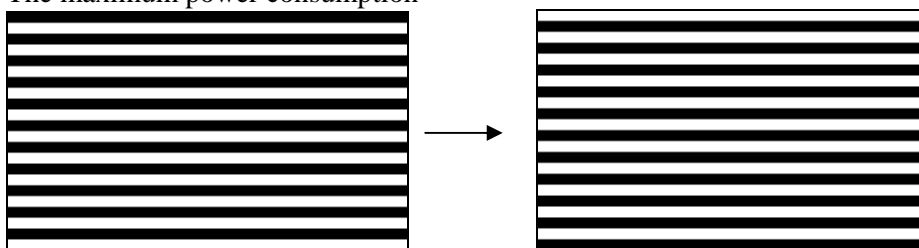
Note 6-2

The Typical power consumption

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
Minimum "H" clock pulse width	twH	0.5	-	-	us
Clock rise time	trckv	-	-	100	ns
Clock fall time	tfckv	-	-	100	ns
STV setup time	tSU	100	-	twH-100	ns
STV hold time	tH	100	-	twH-100	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock　CKH　cycle time	tcy	16.7	20	DC	ns
D0 .. D7 setup time	tsu	8	-	-	ns
D0 .. D7 hold time	th	8	-	-	ns
STH setup time	tstls	8	-	-	ns
STH hold time	tstlh	8	-	-	ns
LEH　on　delay time	tLEdly	40	-	-	ns
LEH　high-level pulse width	tLEw	40	-	-	ns
LEH　off　delay time	tLEoff	200	-	-	ns
Output setting time to +/- 30mV(C_{load}=200pF)	tout	-	-	12	us
Frame Sync Length	t 1	2	-	-	Lines

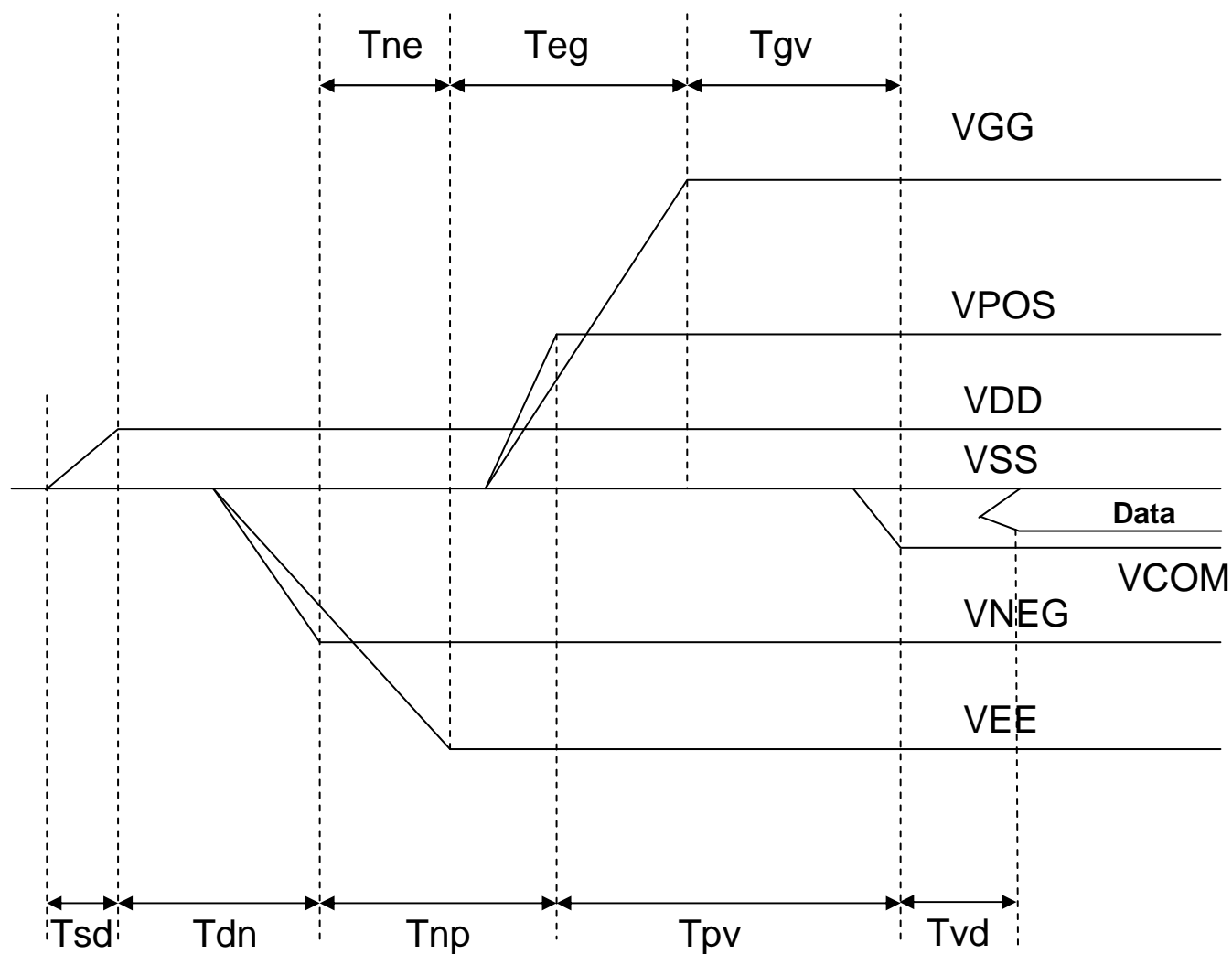## OUTPUT LATCH CONTROL SIGNALS
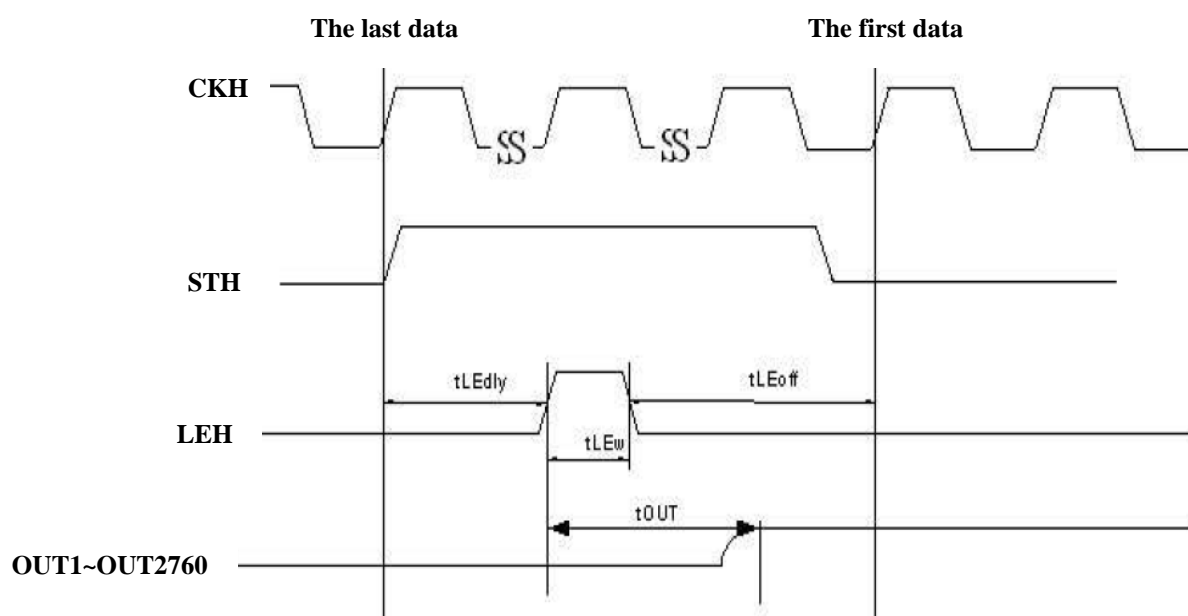
CLOCK & DATA TIMING
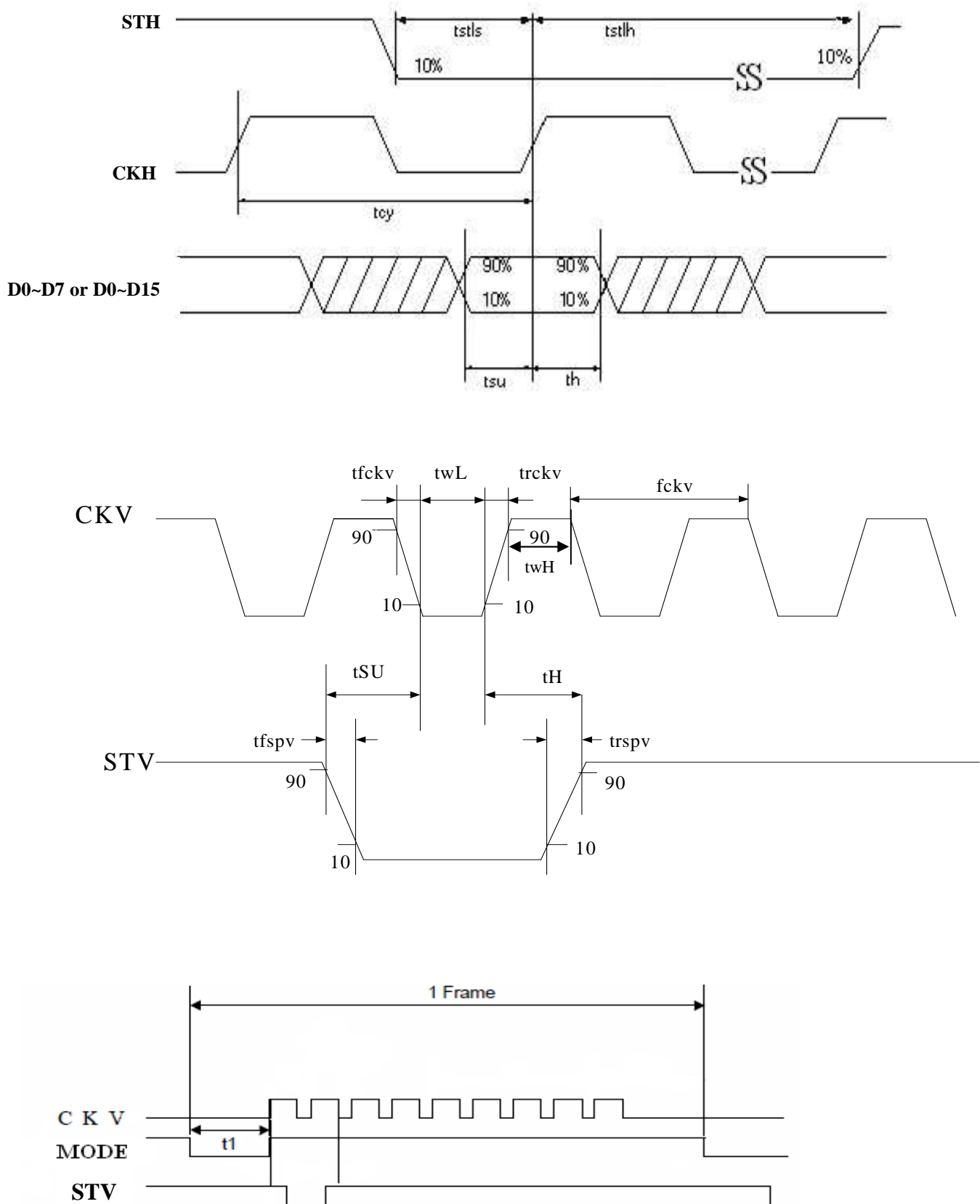
7. Power on Sequence

Power Rails must be sequenced in the following order：
1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM
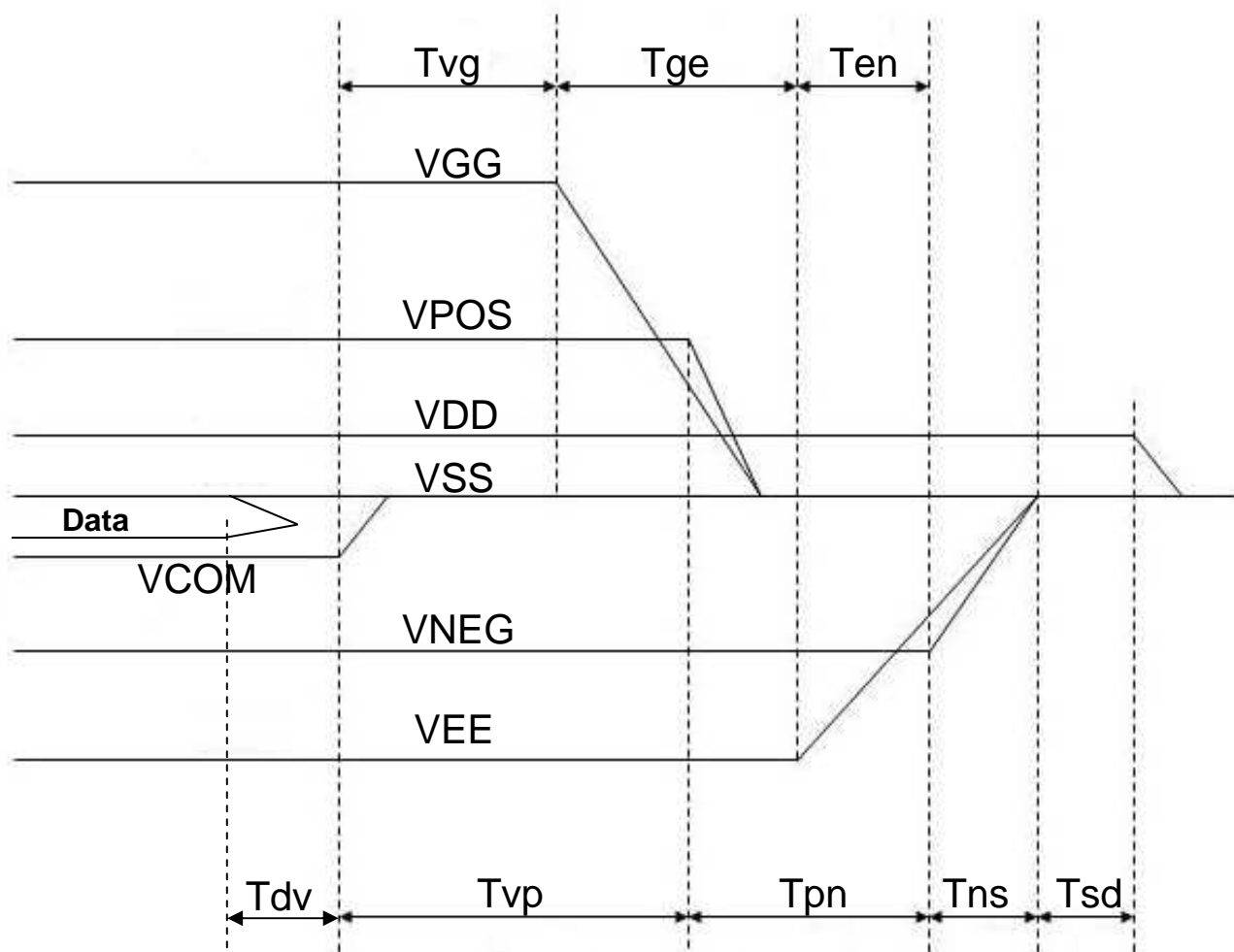
2. VSS → VDD → VEE → VGG (Gate driver)

POWER ON

	Min	Max
Tsd	100us	-
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-

POWER DOWN

	Min	Max
Tdv	$100\,\mu s$	-
Tvp	$0\,\mu s$	-
Tpn	$0\,\mu s$	-
Tns	-	1000ms
Tsd	$100\,\mu s$	-
Tvg	$0\,\mu s$	-
Tge	$0\,\mu s$	-
Ten	$0\,\mu s$	-

8. Discharge time Sequence
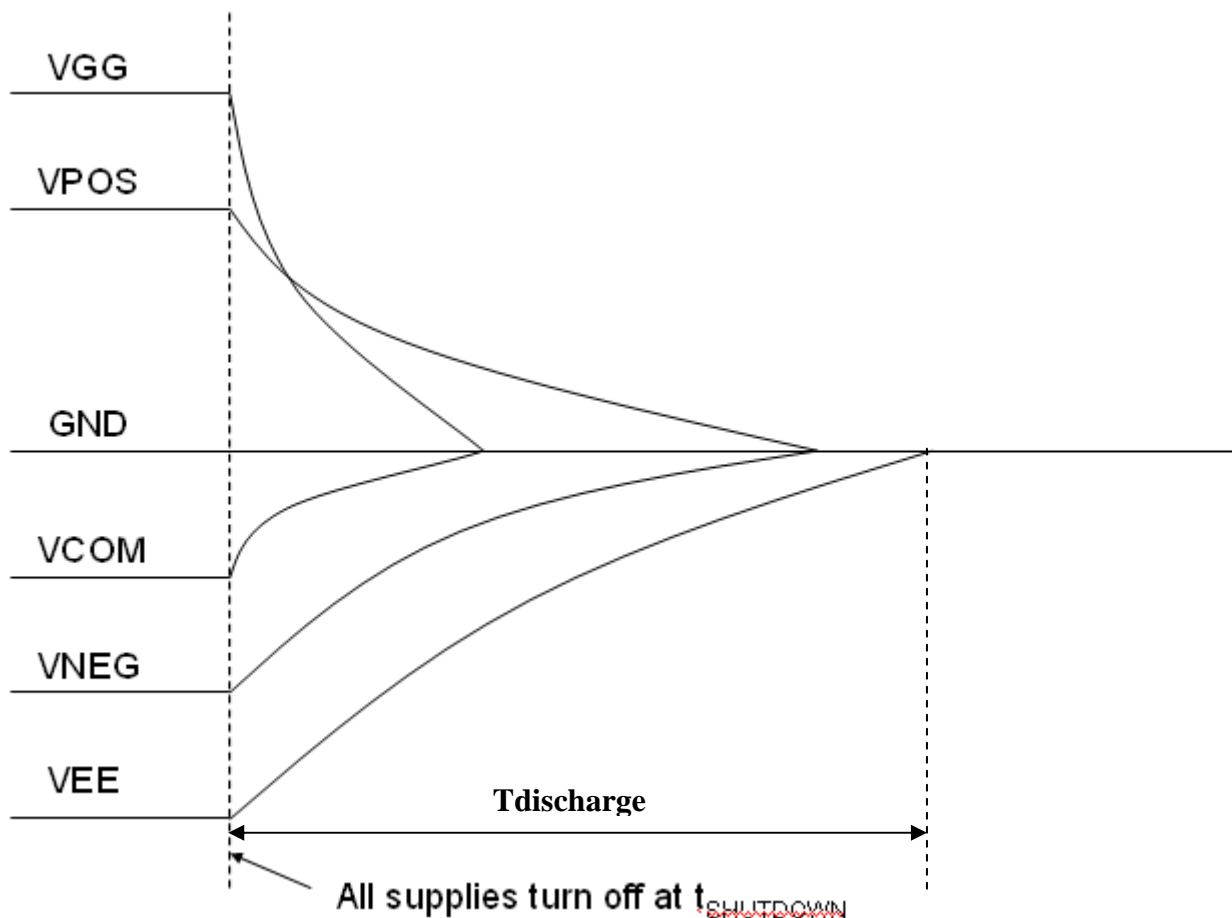
Note8-1：Supply voltages decay through pulldown resistors.
Note8-2：VEE must remain negative of all other supplies during decay period.

8-1) Refresh Rate
The module ED115OC1 is applied at a maximum screen refresh rate of 25Hz.

	Min	Max
Refresh Rate	-	25Hz

9. Optical characteristics

9-1)Specifications

Measurements are made with that the illumination is at an angle of 45 degrees from the perpendicular at the center of sample surface, the detector is perpendicular unless otherwise specified.

$T = 25^{\circ}C$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT	Note
R	Reflectance	White	30	35	-	%	Note 9-1
Gn	N_{th} Grey Level	-	-	$DS+(WS-DS) \times n/(m-1)$	-	L*	-
CR	Contrast Ratio	-	10	12	-		-

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 bits mode

Note 9-1: Luminance meter :Eye – One Pro Spectrophotometer

9-2)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

Eye-One Spectrophotometer

Detector

Light Sources in a ring

45°   45°

EPD Sample
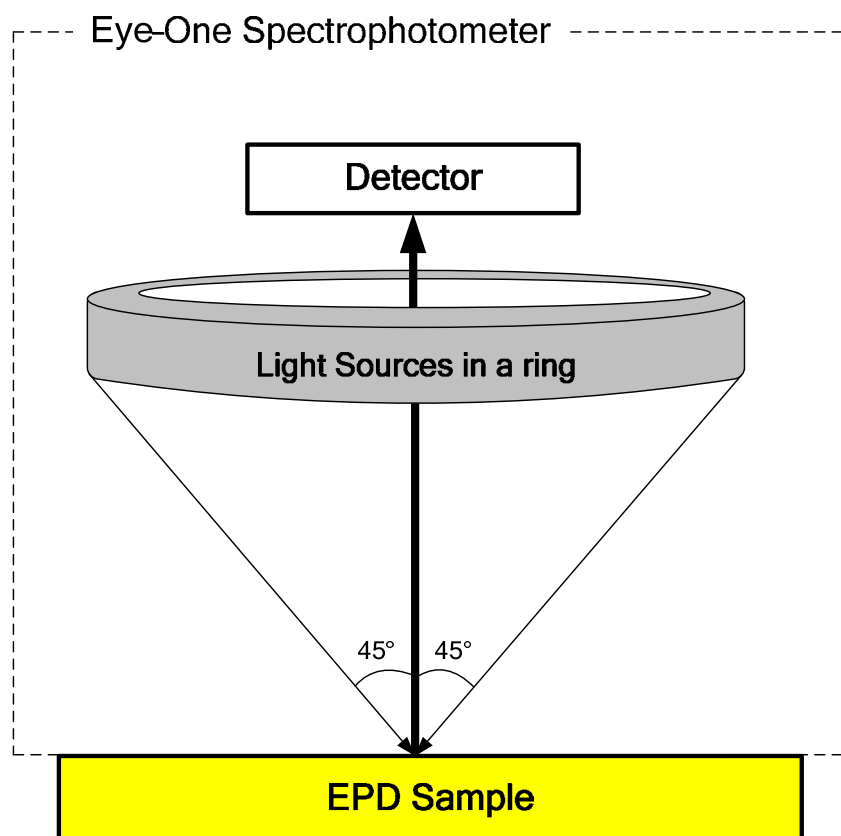
9-3)Reflection Ratio

The reflection ratio is expressed as:

R = Reflectance Factor$_{\text{white board}}$ x   (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.

9-3)Reflection Ratio

10.HANDLING, SAFETY AND ENVIROMENTAL 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	This 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 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.	

11. Reliability test

	TEST	CONDITION	METHOD
1	High-Temperature Operation	T = +50°C, RH = 30% for 240 hrs	IEC 60 068-2-2Bp
2	Low-Temperature Operation	T = 0°C for 240 hrs	IEC 60 068-2-2Ab
3	High-Temperature Storage	T = +70°C, RH=23% for 240 hrs (Test In White Pattern)	IEC 60 068-2-2Bp
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 60 068-2-3CA
6	High Temperature, High- Humidity Storage	T = +60℃, RH=80% for 240hrs (Test In White Pattern)	IEC 60 068-2-3CA
7	Temperature Cycle	-25℃ → +70℃, 100 Cycles 30mins 30 mins (Test In White Pattern)	IEC 60 068-2-14
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 122 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 62179, IEC 62180
12	Altitude test Operation	700hPa (= 3000m) 48Hr	
13	Altitude test Storage	260hPa (= 10000m) 48Hr (Test In White Pattern)	
14	Stylus Tapping	POLYACETAL Pen: Top R:0.8mm Load: 300gf Speed: 2 times/sec Total 13,500times,	Note：test with housing and device to simulate full product

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.

![Eink 元太科技 E Ink Holdings]

12. Bar Code definition

E4R	00	4	01	1	I	7	4	00361	A	T
1	2	3	4	2	5	6	2	7	2	8

1 ：EPD model code:

　　ED115OC1: E4R

2 ：Internal control codes: Do not care

3 ：FPL reversion code

　　V220: 6

　　V220E: 8

4 ：FPL batch code:

FPL batch code

01~99	001~099	G0~G9	160~169	Q0~Q9	230~239	X0~X9	300~309
A0~A9	100~109	H0~H9	170~179	R0~R9	240~249	Y0~Y9	310~319
B0~B9	110~119	J0~J9	180~189	S0~S9	250~259	Z0~Z9	320~329
C0~C9	120~129	K0~K9	190~199	T0~T9	260~269		
D0~D9	130~139	L0~L9	200~209	U0~U9	270~279		
E0~E9	140~149	M0~M9	210~219	V0~V9	280~289		
F0~F9	150~159	N0~N9	220~229	W0~W9	290~299		

5 ：Year:

　　F:2005 / G:2006 / H:2007 / I:2008 /... / Z:2024

6 ：Month:

　　1:Jan.　2:Feb. ... 9:Sep. A:Oct. B:Nov. C:Dec.

7 ：Serial number

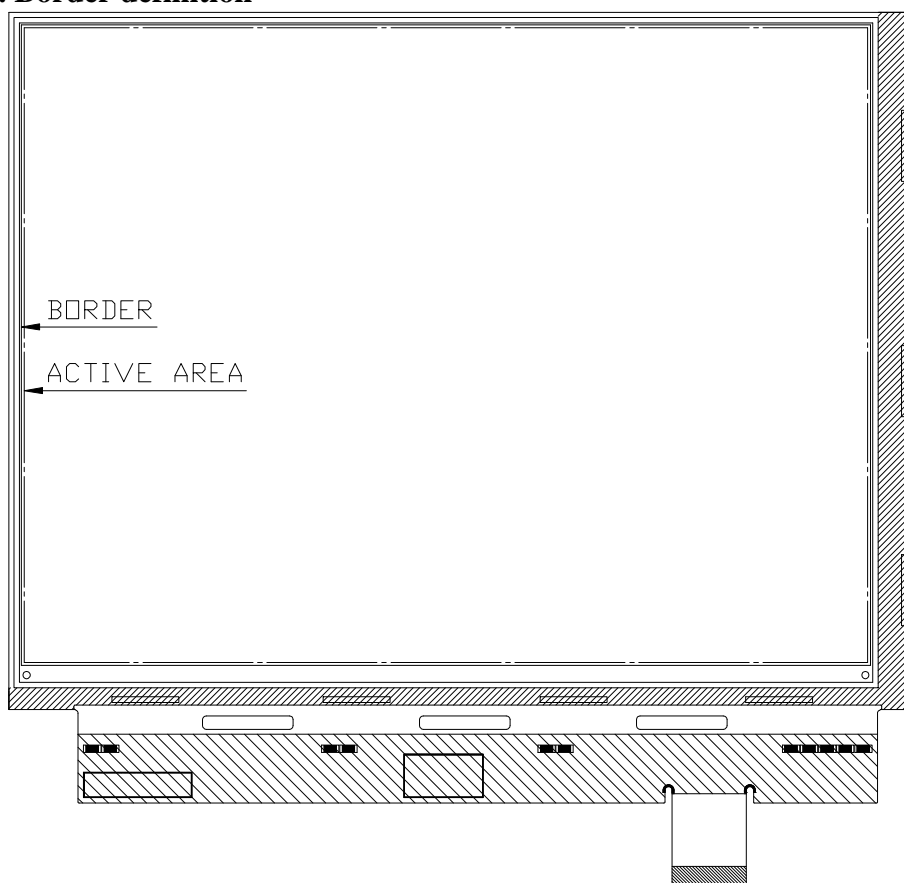8 ：MFG code:
　　TOC FAB3：T
　　TOC FAB2：Y
　　TOC FAB1：K
　　EIH：P
　　MOS：S
　　Microview：V
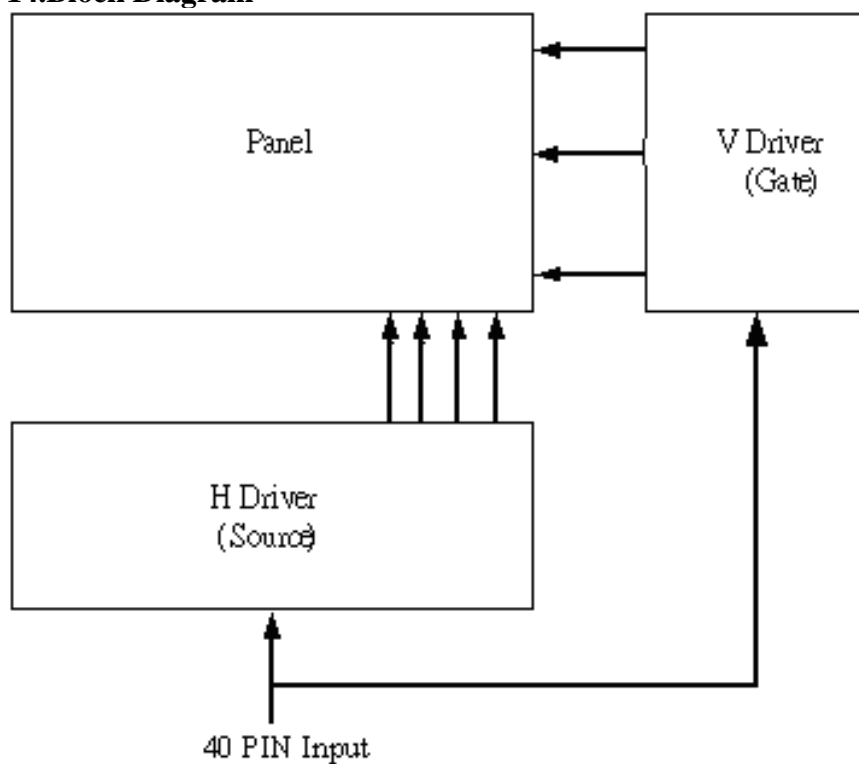　　TYT FAB4：L

　　TYT FAB5：G

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13. Border definition

14.Block Diagram

15.Packing

REV.	DESCRIPTION	DESIGN	DATE
01	INITIAL RELEASE	JAMES	2011/12/29

Empty tray

1st Layer

2nd Layer

Total 12 Layers

TAPE

NOTE:
1. ONE LAYER INCLUDE:1 PIECE OFCUSHION SHEET, 1 PCS MODULE & 1 PIECE OF TRAY.
2. Q'TY:12 PCS PANEL/CARTON.
3. DIMENSION: 455*375*190mm.
4. WEIGHT: 4.2 Kg.
5. TRAY 需180交叉堆疊，疊堆後可從側邊檢視圓弧防呆方向是否正確

ITEM	DESCRIPTION	Q'ty	REMARK
6	CARTON INTERNAL	1	
5	摺口袋 450*380*700mm	1	抗靜電
4	ED115OC1	12	
3	EPE CUSHION SHEET	12	抗靜電
2	TRAY	13	抗靜電
1	EPE FOAM	2	

MTL.SPEC.	UNSPECIFIED TOL.		REMARK	
	ANGLE			
	ROUGHNESS			

APPROVE	PATRICK LIN	SCALE	UNIT	SHEET	DWG.TITLE
CHECK	PATRICK LIN			1 OF 1	11.5" PACKING DRAW.

元太科技工業股份有限公司 E Ink Holdings Inc.

DESIGN	JAMES	MTL.NO. ED115OC1	DWG.NO.	REV. 01	A4 SIZE