Version：5.0

TECHNICAL SPECIFICATION

MODEL NO : ED097OC4

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Please contact E Ink or its agent for further information.

☐Customer's Confirmation

Customer

Date

By

☐E Ink's Confirmation

Confirmed By 傅承貞

Prepared By 江銘輝

Revision History

Rev.	Issued Date	Revised Contents
1.0	May. 26, 2010	New
2.0	Apr 29,2011	Update 9. Optical characteristics Update 11. Reliability test Update 12. Barcode definition
3.0 July.28.2011 Update		
4.0	Sep.19.2011	Modify 12.Barcode definition MFG code: TYT FAB4：H➔L
5.0	Dec.02.2011	Modify Page 5 4.Mechanical Drawing of EPD Module for logo change Page 19 13.Border definition Page 20 16. Packing for logo change Add Page 17 11.Criteria

TECHNICAL SPECIFICATION

CONTENTS

1. Application

The display is a TFT active matrix electrophoretic display, with associated interface and control logic, and a reference system design. It comprises TFT substrate, Electrophoretic front plane laminate (FPL-e-ink film), Protective sheet (PS), Driver IC on glass and FPCB. The 9.7" active area contains 1200x825 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 used.

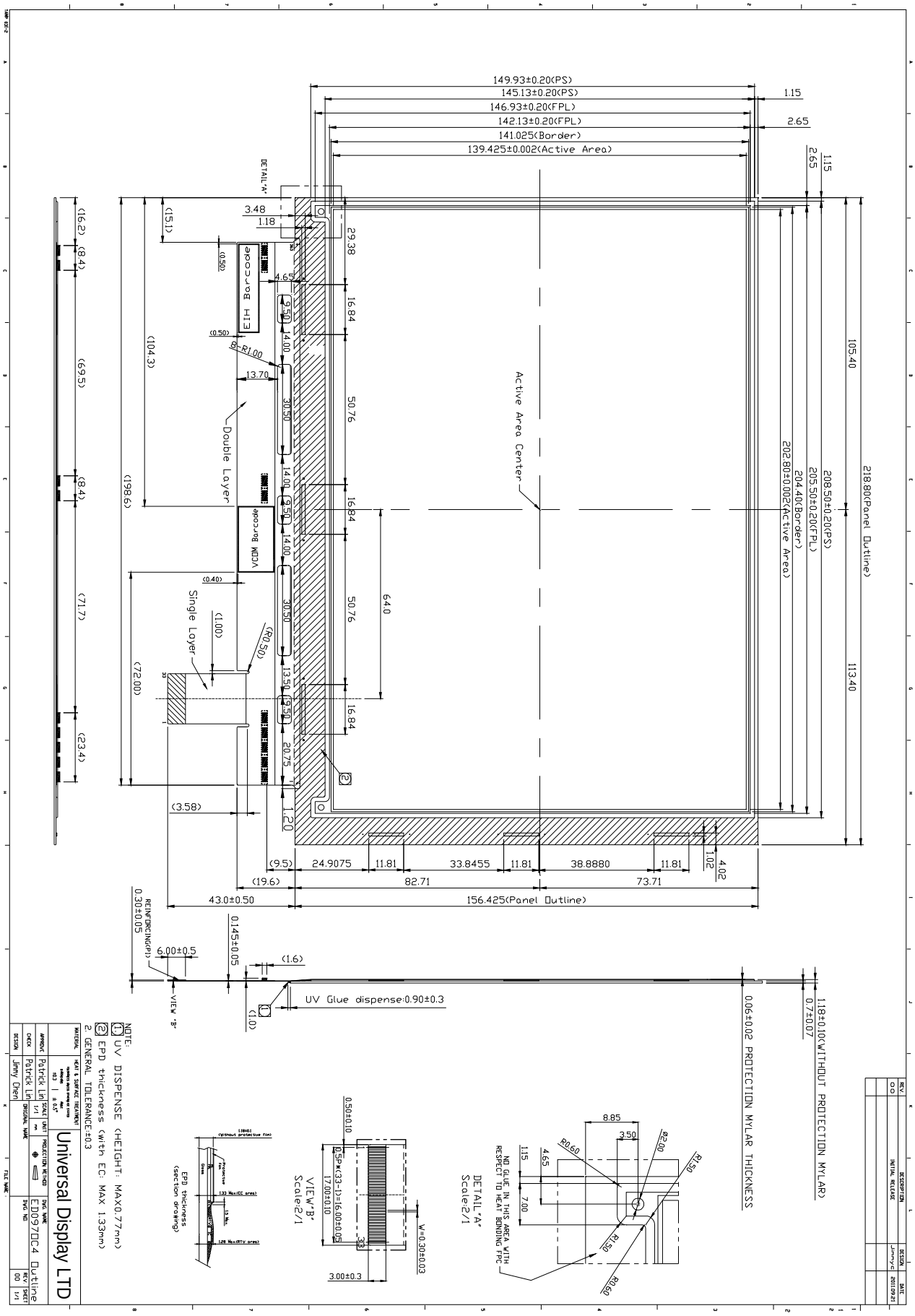
2. Features

- High contrast TFT electrophoretic
- 1200x825 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	9.7	Inch	
Display Resolution	1200 (H)×825 (V)	Pixel	
Active Area	202.8 (H)×139.425 (V)	mm	
Pixel Pitch	0.169 (H)x0.169 (V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	218.8 (H)×156.425 (V)×1.18 (D)	mm	
Module Weight	80±5	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)Pin out List

Pin #	Signal	Description
1	VNEG	Negative power supply source driver
2	NC	NO Connection
3	VPOS	Positive power supply source driver
4	NC	NO Connection
5	VSS	Ground
6	NC	NO Connection
7	VDD	Digital power supply drivers
8	CKH	Clock source driver
9	LEH	Latch enable source driver
10	OEH	Output enable source driver
11	RL	Shift direction source driver
12	STH	Start pulse source 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	NC	NO Connection
22	VCOM	Common voltage
23	NC	NO Connection
24	VGG	Positive power supply gate driver
25	NC	NO Connection
26	VEE	Negative power supply gate driver
27	NC	NO Connection
28	MODE2	Output mode selection gate driver
29	MODE1	Output mode selection gate driver
30	UD	Shift direction gate driver
31	STV	Start pulse gate driver
32	CKV	Clock gate driver
33	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 +45	V
Supply Voltage	VEE	-25.0 to +0.3	V
Supply Range	VGG-VEE	-0.3 to +45	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	-	1.02	3.06	mA
Gate Negative supply	V_{EE}		-21	-20	-19	V
	I_{EE}	V_{EE} =-20V	-	0.73	2.19	mA
Gate Positive supply	V_{GG}		21	22	23	V
	I_{GG}	V_{GG} = 22V	-	0.80	2.40	mA
Source Negative supply	V_{NEG}		-15.4	-15	-14.6	V
	I_{NEG}	V_{NEG} = -15V	-	33.54	67.08	mA
Source Positive supply	V_{POS}		14.6	15	15.4	V
	I_{POS}	V_{POS} = 15V	-	29.19	58.38	mA
Border supply	V_{Border}	V_{POS} = 15V	14.6	15	15.4	V
		V_{NEG} = -15V	-15.4	-15	-14.6	V
Asymmetry source	V_{Asym}	V_{POS}+V_{NEG}	-800	0	800	mV
Common voltage	V_{COM}		-2.5	Adjusted	-0.3	V
	I_{COM}		-	0.43	-	mA
Maximum power panel	P_{MAX}		-	-	2044	mW
Standby power panel	P_{STBY}		-	-	0.6	mW
Typical power panel	P_{TYP}		-	976	-	mW
Operating temperature			0	-	50	℃
Storage temperature			-25	-	70	℃
Maximum image update time at 25℃			-	-	1000	ms

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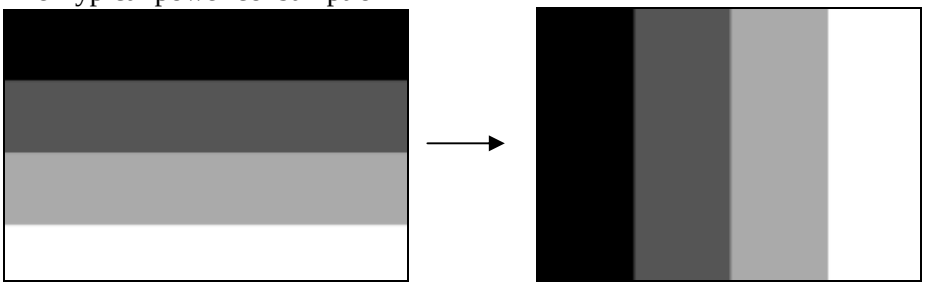
- The Typical power consumption is measured with following pattern transition: from horizontal 4 gray scale pattern to vertical 4 gray scale pattern.(Note 6-1)
- The standby power is the consumed power when the panel controller is in standby mode.
- The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by E Ink
- Vcom is recommended to be set in the range of assigned value ± 0.1V
- The maximum I_{COM} inrush current is about 1.56A

Note 6-1

The Typical power consumption

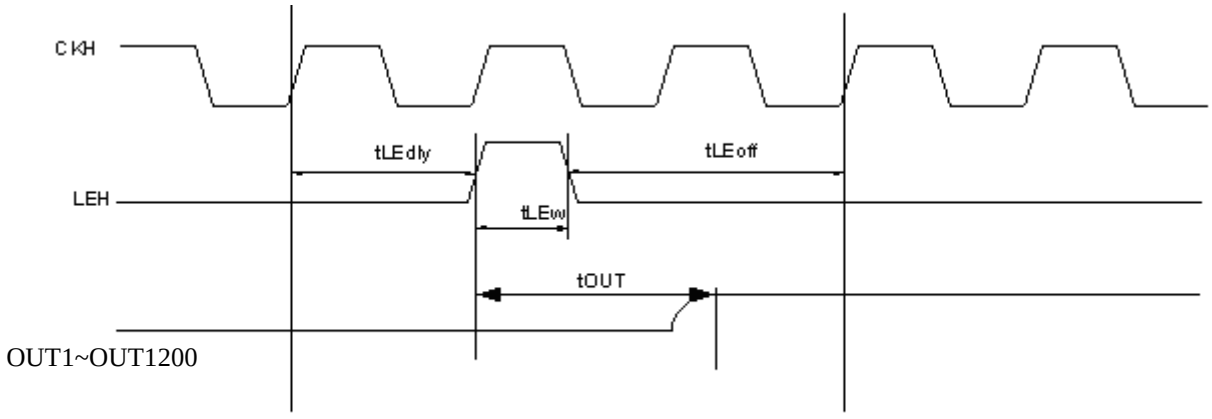


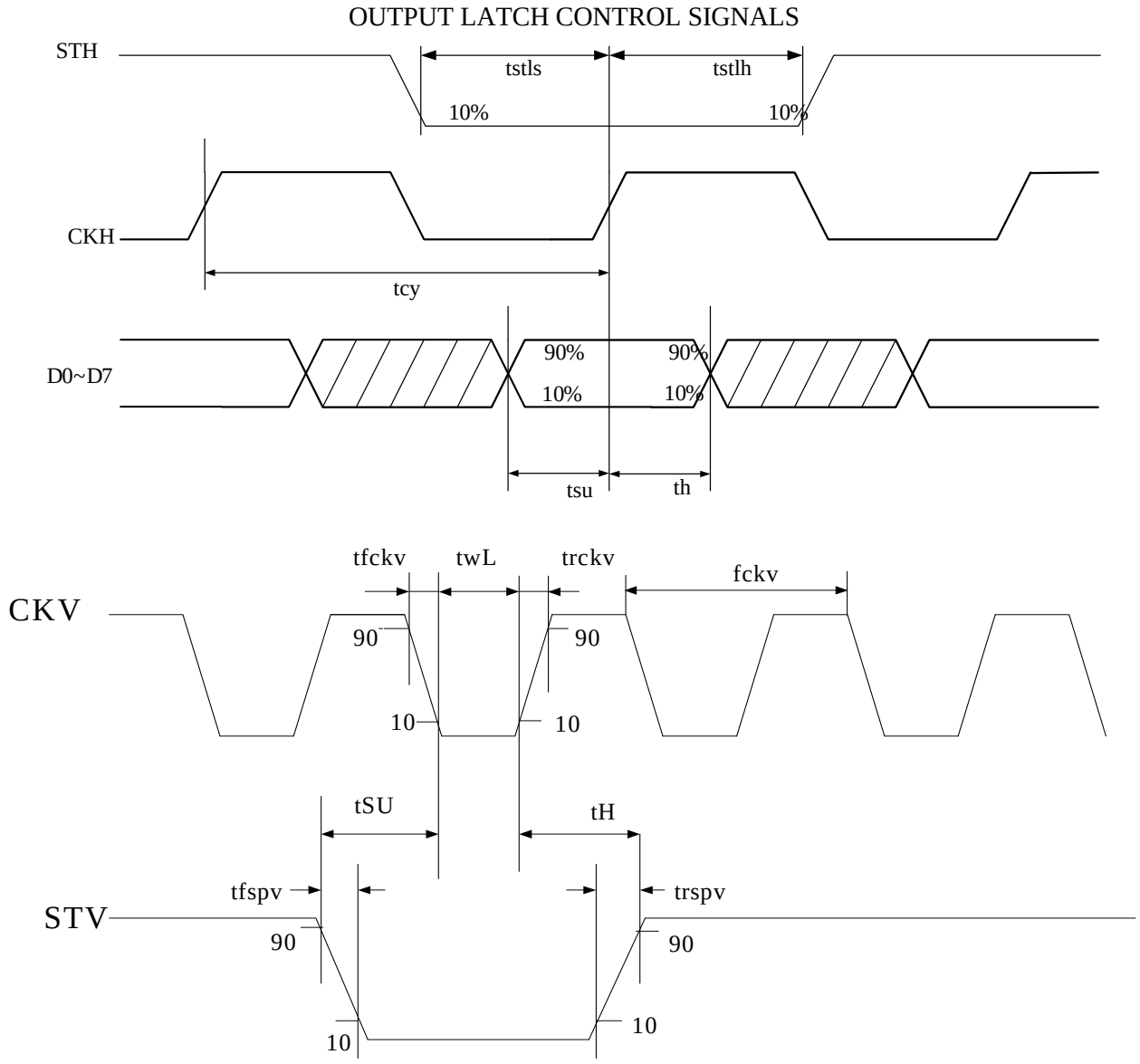
6-3) Panel AC characteristics

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
Clock rise time	trckv	-	-	100	ns
Clock fall time	tfckv	-	-	100	ns
Data setup time	tSU	100	-	-	ns
Data hold time	tH	100	-	-	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock CKH cycle time	tcy	50	-	DC	ns
D0 .. D7 setup time	tsu	8	-	-	ns
D0 .. D7 hold time	th	1	-	-	ns
STH setup time	tstls	10	-	-	ns
STH hold time	tstlh	10	-	-	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

CLOCK & DATA TIMING





6-4) Power Consumption

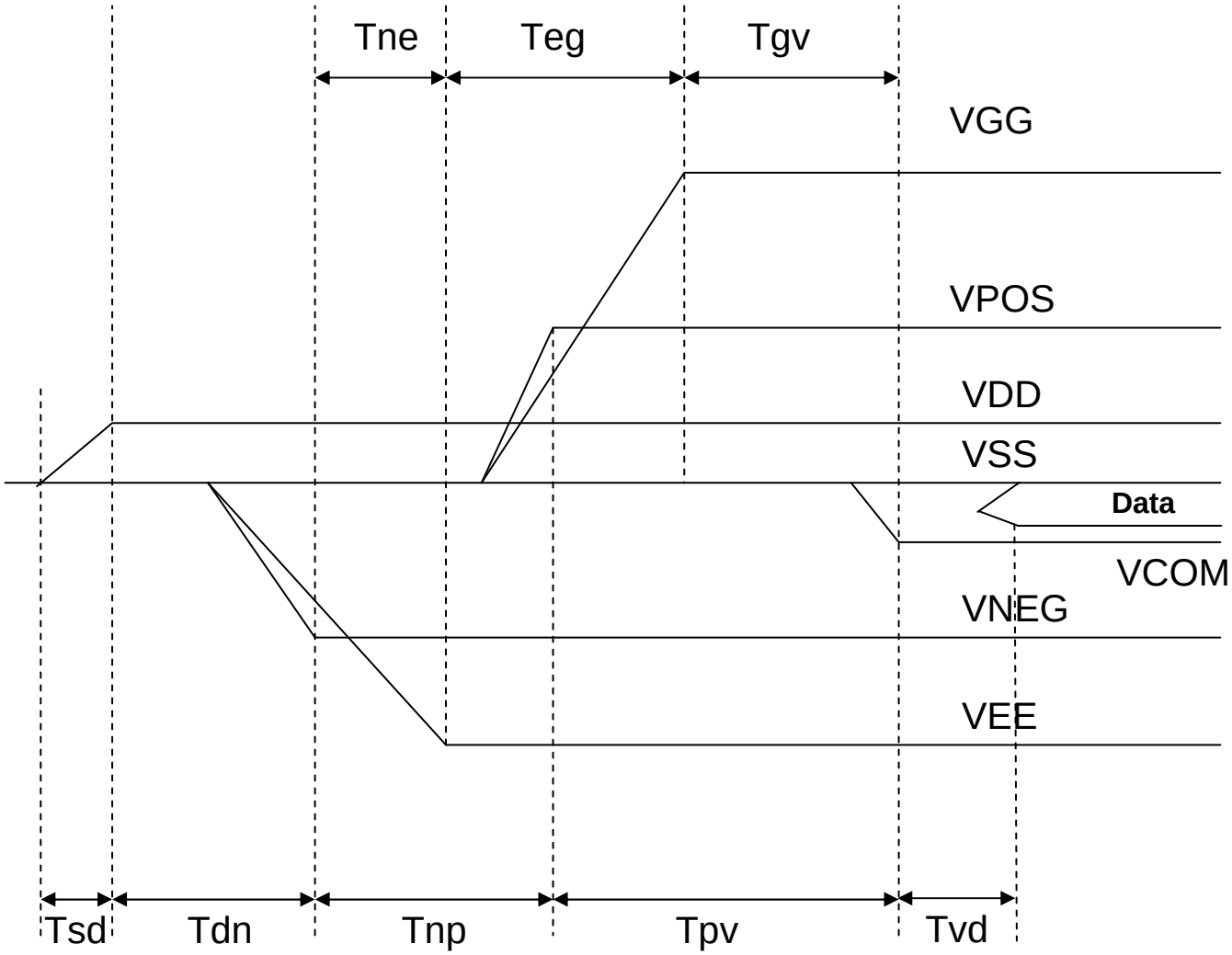
Parameter	Symbol	Conditions	TYP	Max	Unit	Remark
Panel power consumption during update.	-	-	976	2044	mW	
Power consumption in standby mode	-	-	-	0.6	mW	

7. Power on Sequence

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

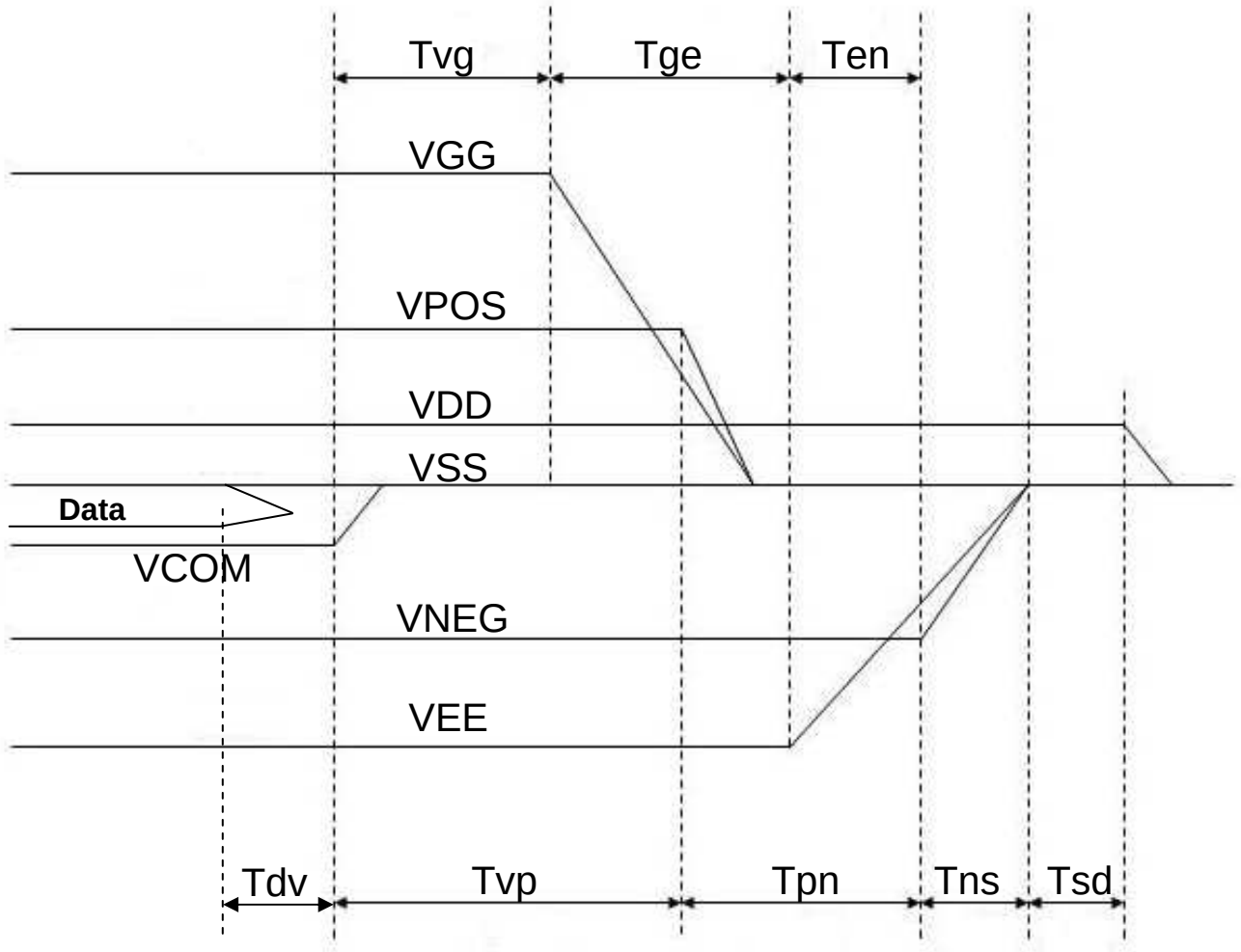
2. VSS → VDD → VEE → VGG (Gate driver)

POWER ON



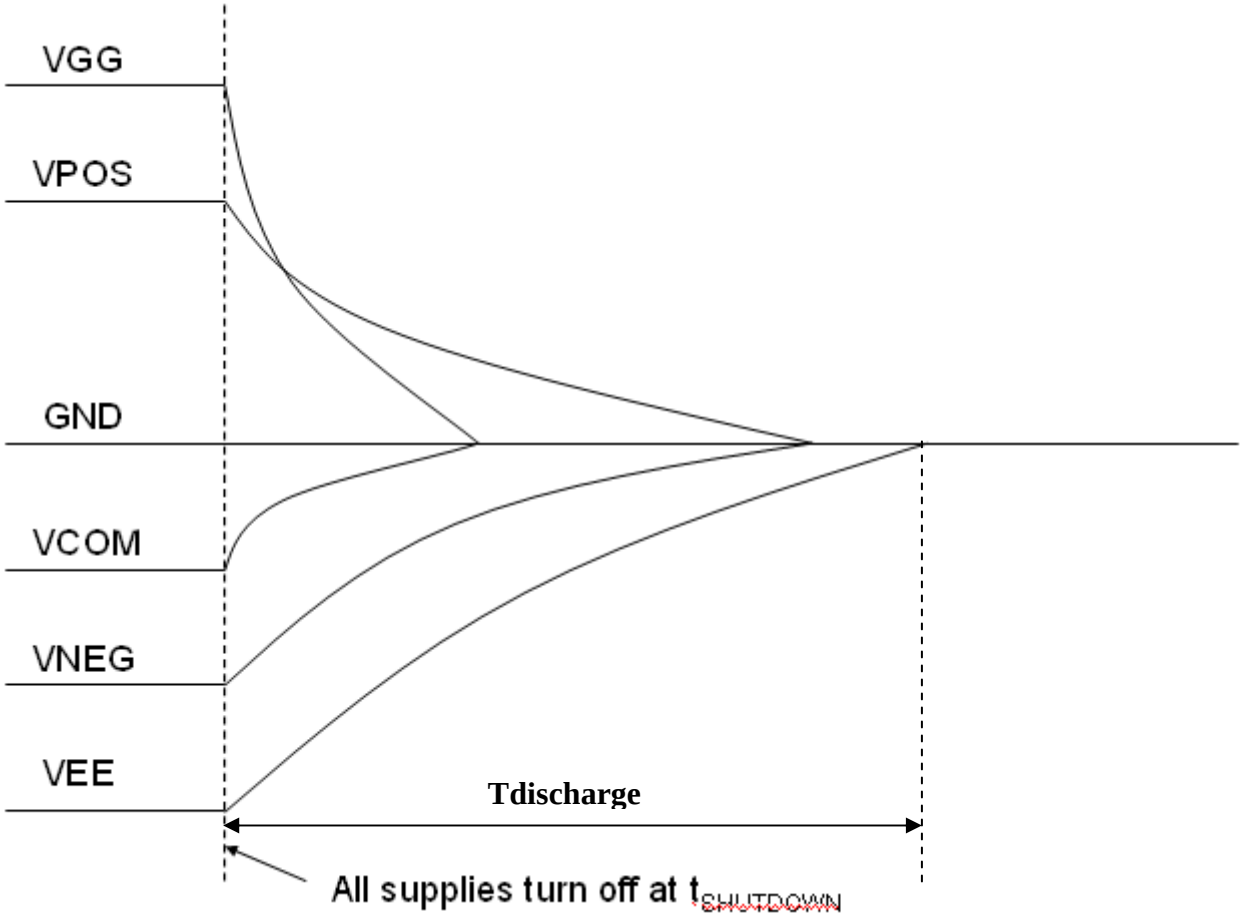
	Min	Max
Tsd	100us	-
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-

POWER DOWN



	Min	Max
Tdv	100us	-
Tvp	0us	-
Tpn	0us	-
Tns	-	1000ms
Tsd	100us	-
Tvg	0us	-
Tge	0us	-
Ten	0us	-

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 ED097OC4 is applied at a maximum screen refresh rate of 50Hz.

	Min	Max
Refresh Rate	-	50Hz

9. Optical characteristics

9-1) 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	TYP.	MAX	UNIT	Note
R	Reflectance	White	30	40	-	%	Note 9-1
Gn	N_{th} Grey Level	-	-	DS+(WS-DS) ×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

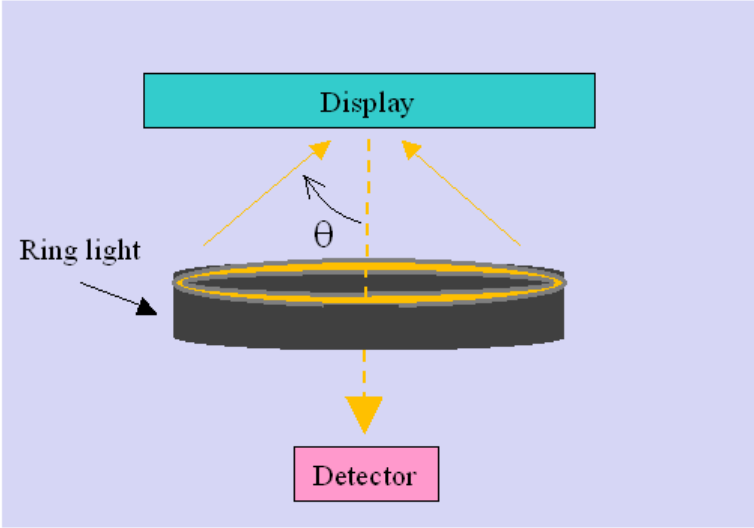
m:4、8、16　when 2、3、4 bits mode

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



9-3) 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 white board. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.

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
(1) The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components.
(2) Disassembling the display module can cause permanent damage and invalidate the warranty agreements.
(3) 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 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℃, RH = 30% for 240 hrs	IEC 60 068-2-2Bp
2	Low-Temperature Operation	T = 0℃ for 240 hrs	IEC 60 068-2-2Ab
3	High-Temperature Storage	T = +70℃, RH=23% for 240 hrs (Test In White Pattern)	IEC 60 068-2-2Bp
4	Low-Temperature Storage	T = -25℃ for 240 hrs (Test In White Pattern)	IEC 60 068-2-1Ab
5	High-Temperature, High-Humidity Operation	T = +40℃, 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:0.8 mm Load: 300gf Speed: 2 times/sec Total 13,500times,	Test with bezel and device to simulate full product test

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.

12. Barcode definition

E35	00	6	01	1	I	7	4	00361	A	T
1	2	3	4	2	5	6	2	7	2	8

1 : EPD model code:

ED097OC4:E35/E37

2 : Internal control codes:

3 : FPL reversion code

V220: 6 ; V220E:8

4 : FPL batch code:

(BL/P/B...)001~099:01~99, 100~109:A0~A9, 110-119:B0~B9… 320~329:Z0~Z9

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.

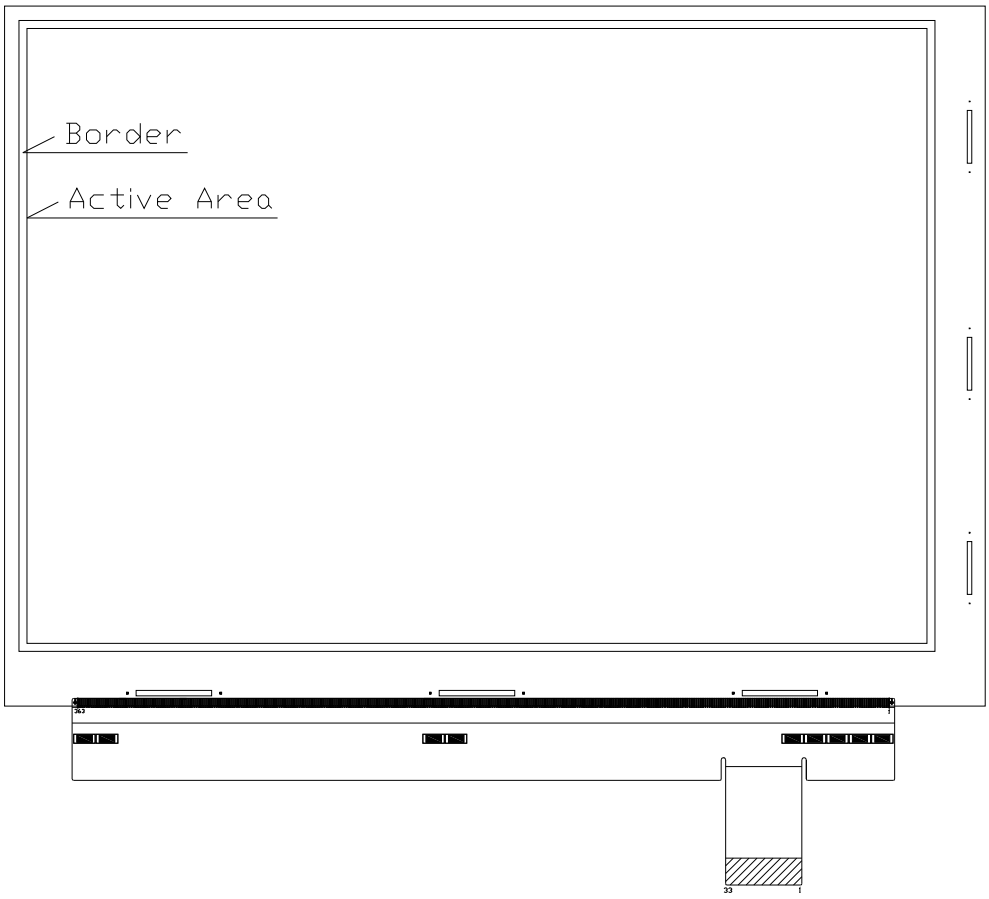
7 : Serial number

8 : MFG code:

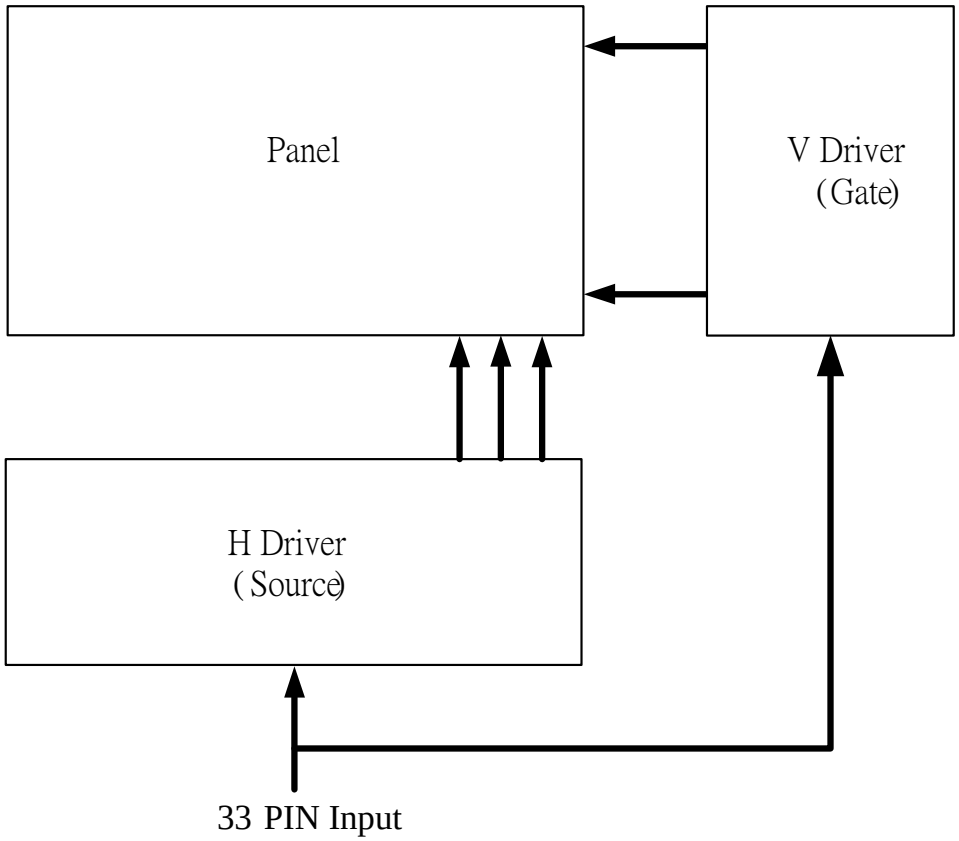
TYT FAB 5:G TYT FAB 4:L TOC FAB 3:T TOC FAB 2:Y TOC FAB 1:K EIH : P MOS:S

Microview :V

13. Border definition

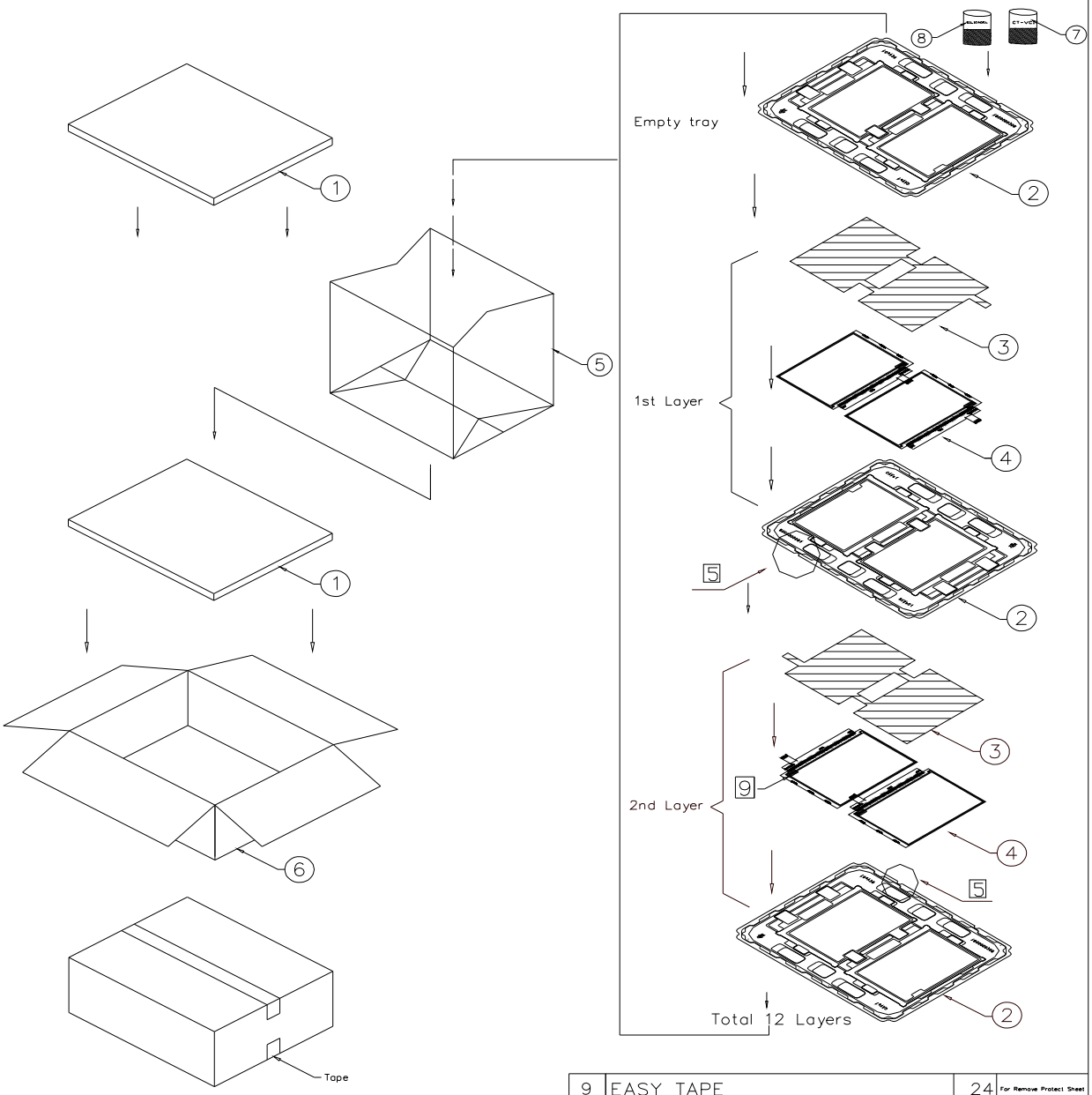


14. Block Diagram



15. Packing

REV	DESCRIPTION	DESIGN	DATE
01	INITIAL RELEASE	Jimmyc	'11.09.21



NOTE:

1. One layer include: 1 piece of cushion sheet, 2pcs panel & 1 piece of tray.
2. Q'TY: 24 pcs panel/carton.
3. Dimension: 455*375*190mm
4. Weight: 4.7 KG
5. Make sure tray stacked with 180° rotation. We can scheck this by lateral side view.

ITEM	PART NO. DESCRIPTION	QTY	REMARK
9	EASY TAPE	24	For Remove Protect Sheet
8	30g加厚複合紙活碳乾燥劑73*95mm(禹林JK0030)	2	
7	防鏽劑(保護容積25L)	3	
6	CARTON INTERNAL	1	
5	摺口袋450*380*700mm	1	抗靜電
4	ED097OC4 Panel	24	
3	EPE CUSHION SHEET	12	抗靜電
2	PS TRAY	13	抗靜電
1	EPE FOAM	2	

MTL.SPEC.	UNSPECIFIED TOL'S ANGLE ROUGHNESS	REMARK

Universal Display LTD

APPROVE	Patrick Lin	'11.09.21	SCALE 1:1	UNIT mm	SHEET 1 OF 1
CHECK	Patrick Lin	'11.09.21	DWG.TITLE: ED097OC4 PACKING DRAW		
DESIGN	Jimmyc	'11.09.21	MTL.NO.	DWG.NO.	REV. 01 / A4 SIZE

