E Ink Holdings Inc. **ED060SCE**

Version: 1.0

TECHNICAL SPECIFICATION

MODEL NO: ED060SCE

The content of this information is subject to be changed without notice.
Please contact EIH or its agent for further information.

☐Customer's Confirmation

Customer _____

Date _____

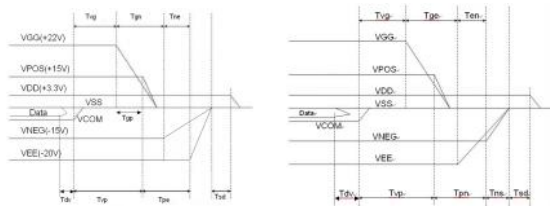
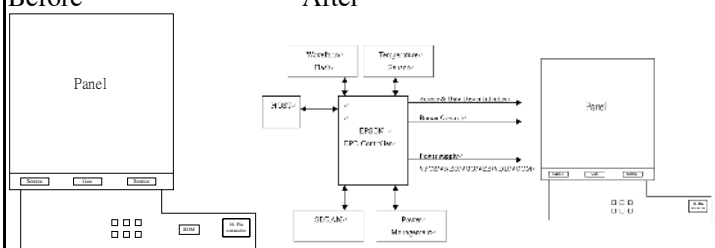
By _____

☐EIH's Confirmation

Confirmed By Frank.Shan

Prepared By 侯采君

Revision History

Rev.	Issued Date	Revised Contents
0.1	October 1, 2010	Preliminary
0.2	October 5, 2010	Add Page 5 4.Mechanical Drawing of EPD Module Add Note 3: double side tape size :75×4mm 3M#8018 0.06t Modify Page 12 7.Power on Sequence Power On Power Down Modify page13 Power Down Before After  Modify Page19 11. Reliability test Remove "Remark" Add < Criteria > 1、Main display module should no defect of function, screen quality and appearance (including : Line,no image) Modify Page23 14.Block Diagram Before After 
1.0	October 29, 2010	Page 4 3.Mechanical specification Add module weight Page 20 12.Bar code definition Add 1.EPD Model code 8.Module Manufacturer code Page 8 6-2)Panel DC Characteristics Modify power consumption Page 15 9.Optical characteristics Delete Gn Min: DS+(WS-DS)×(n-1)/(m-1) and Max :DS+(WS-DS)×(n+1)/(m-1)

TECHNICAL SPECIFICATION

CONTENTS

1. Application

The display is a TFT active matrix electrophoretic display, wi th associated interface and control logic, and a reference system design.

The 6” active area contains 600 x 800 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.

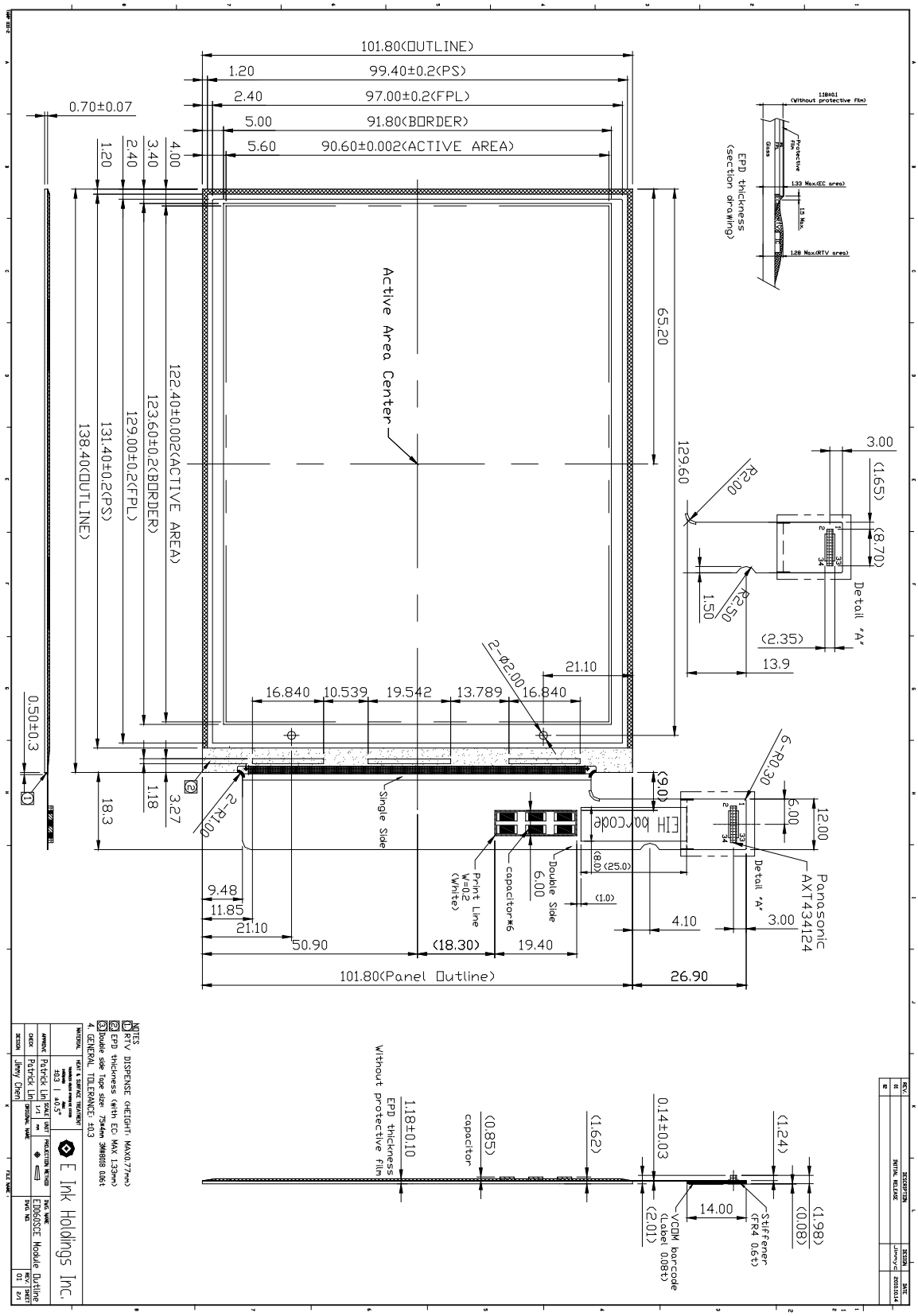
2. Features

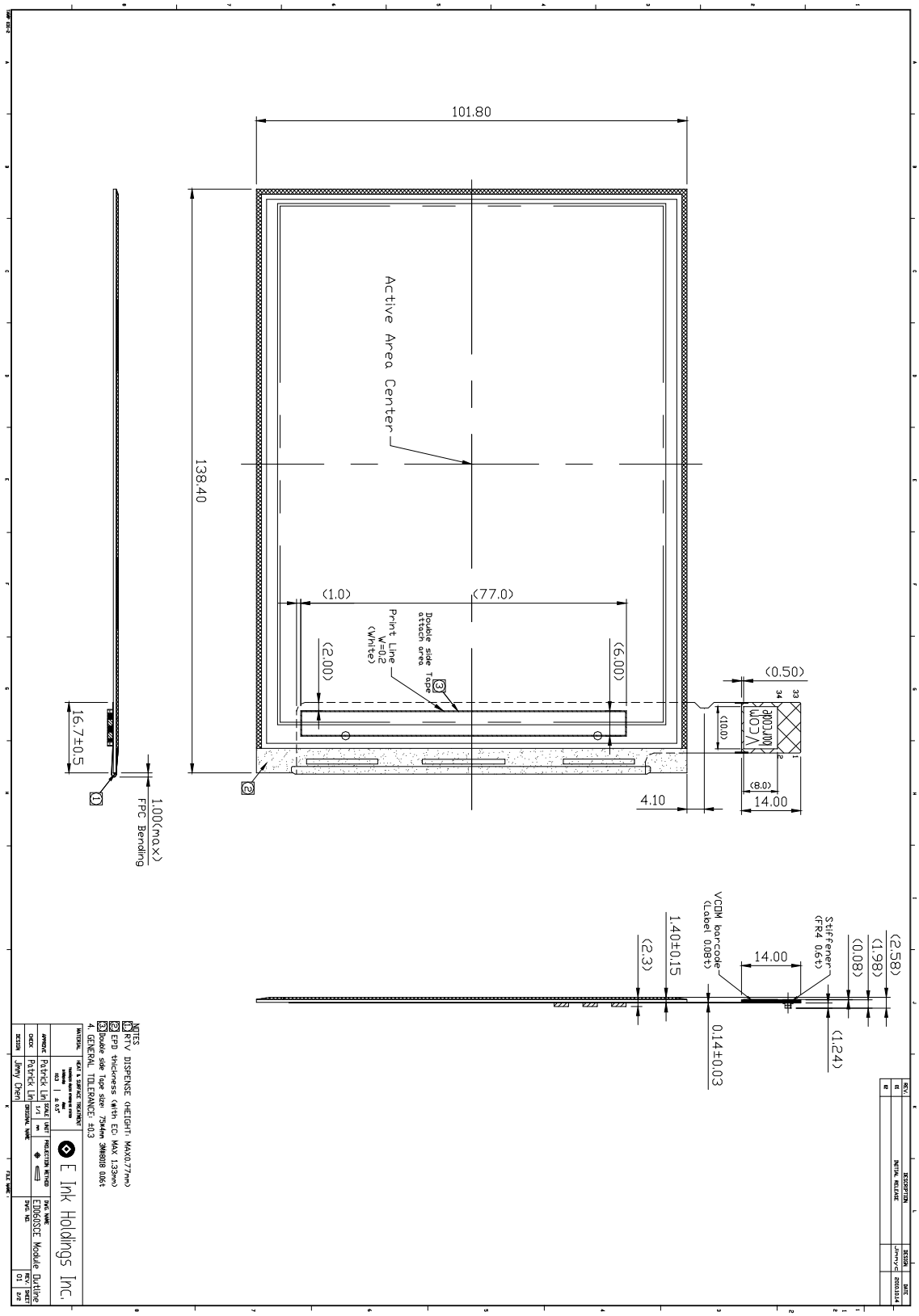
- High contrast TFT electrophoretic
- 600 x 800 display
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape, portrait mode
- Antiglare hard-coated front-surface

3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	6.0 (3:4 diagonal)	Inch	
Display Resolution	600 (H)×800(V)	Pixel	
Active Area	90.6 (H)×122.4 (V)	mm	
Pixel Pitch	0.151 (H)×0.153 (V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	101.8(W)×138.4(H)×1.18(D) (panel area height)	mm	
Module Weight	34±4	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/Output Interface

5-1) Connector type: AXT434124

Pin Assignment

Pin #	Signal	Description	Remark
1	VNEG	Negative power supply source driver	
2	VPOS	Positive power supply source driver	
3	VNEG	Negative power supply source driver	
4	VPOS	Positive power supply source driver	
5	VDD	Digital power supply drivers	
6	VSS	Ground	
7	VDD	Digital power supply drivers	
8	VSS	Ground	
9	XCL	Clock source driver	
10	XLE	Latch enable source driver	
11	XOE	Output enable source driver	
12	XSTL	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	VCOM	Common connection	
22	NC	NC	
23	VCOM	Common connection	
24	NC	NC	
25	VGG	Positive power supply gate driver	
26	MODE1	Output mode selection gate driver	
27	VEE	Negative power supply gate driver	
28	CKV	Clock gate driver	
29	VEE	Negative power supply gate driver	
30	SPV	Start pulse gate driver	
31	VSS	Ground	
32	BORDER	Border connection	
33	NC	NC	
34	NC	NC	

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	℃

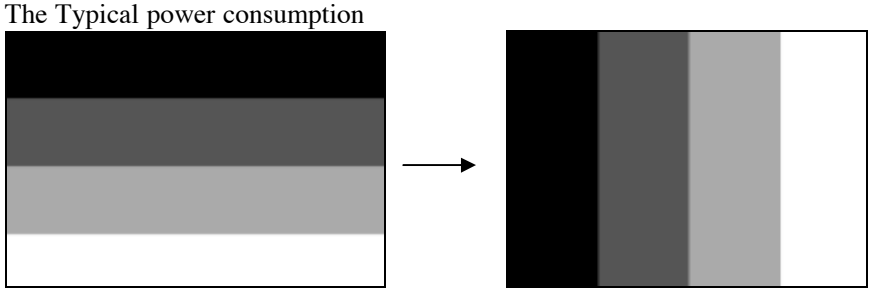
6-2) Panel DC characteristics

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	-	0.6	1.8	mA
Gate Negative supply	V_{EE}		-21	-20	-19	V
	I_{EE}	V_{EE} =-20V	-	1.3	3.9	mA
Gate Positive supply	V_{GG}		21	22	23	V
	I_{GG}	V_{GG} = 22V	-	0.7	2.1	mA
Source Negative supply	V_{NEG}		-15.4	-15	-14.6	V
	I_{NEG}	V_{NEG} = -15V	-	6.6	13.2	mA
Source Positive supply	V_{POS}		14.6	15	15.4	V
	I_{POS}	V_{POS} = 15V	-	6.5	13.0	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}		-	0.20	-	mA
Panel Power	P		-	240	530	mW
Standby power panel	P_{STBY}		-	-	0.4	mW
Operating temperature			0	-	50	℃
Storage temperature			-25	-	70	℃

- The Typical power consumption is measured using 85Hz waveform 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 EIH.
- Vcom is recommended to be set in the range of assigned value ± 0.1V
- The maximum I_{COM} inrush current is about 800 mA

Note 6-1

The Typical power consumption

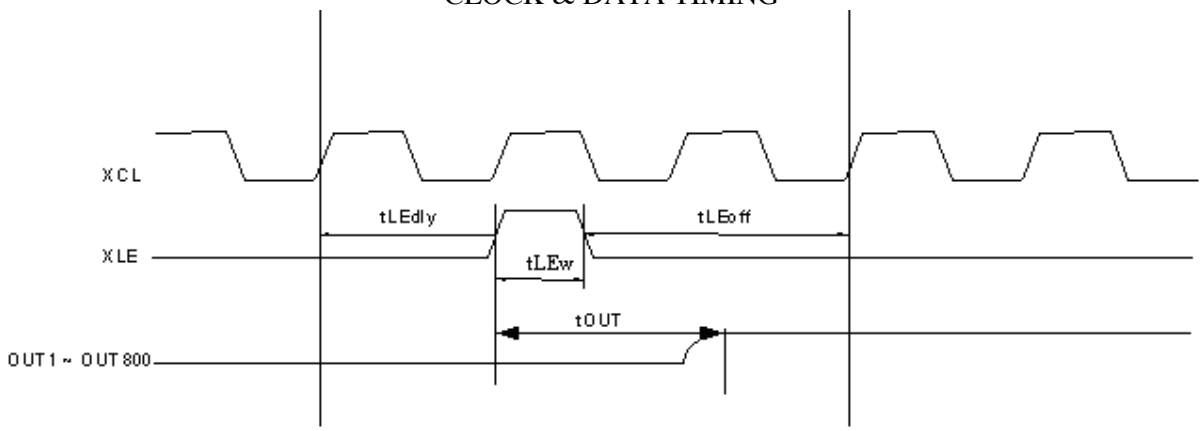


6-3) Panel AC characteristics

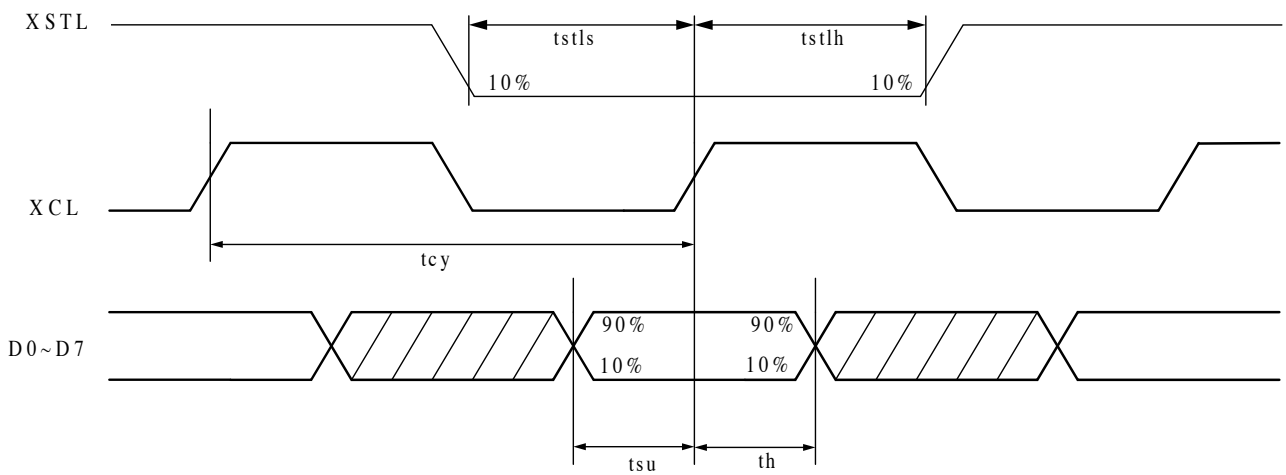
VDD=3.0V to 3.6V, unless otherwise specified.

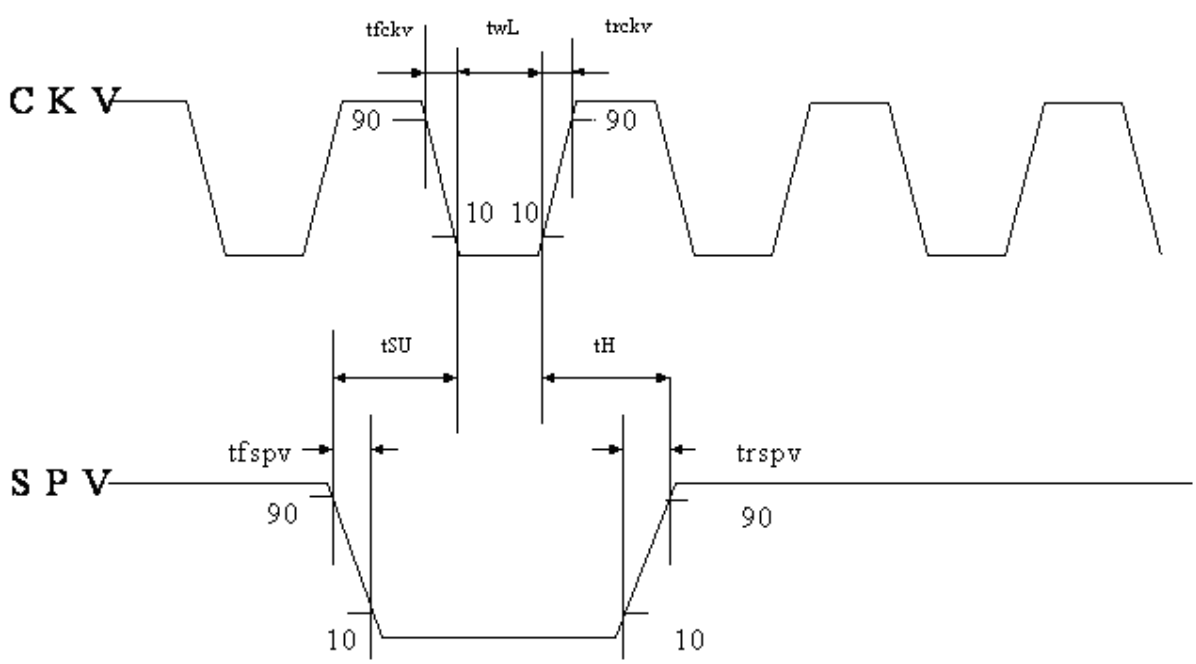
Parameter	Symbol	Min.	Typ.	Max.	Unit	App Pin
Clock frequency	fckv	-	-	200	kHz	CKV
Minimum "L" clock pulse width	twL	0.5	-	-	us	
Clock rise time	trckv	-	-	100	ns	
Clock fall time	tfckv	-	-	100	ns	
Data setup time	tSU	100	-	-	ns	CKV, SPV
Data hold time	tH	100	-	-	ns	
Pulse rise time	trspv	-	-	100	ns	SPV
Pulse fall time	tfspv	-	-	100	ns	
Clock XCL cycle time	tcy	50	-	DC	ns	Below table
D0 ..D7 setup time	tsu	8	-	-	ns	
D0 .. D7 hold time	th	1	-	-	ns	
XLE on delay time	tLEdly	40	-	-	ns	
XLE high-level pulse width	tLEw	40	-	-	ns	
XLE off delay time	tLEoff	200	-	-	ns	
Output setting time to +/- 30mV(C_{load}=200pF)	tout	-	-	12	us	

CLOCK & DATA TIMING



OUTPUT LATCH CONTROL SIGNALS





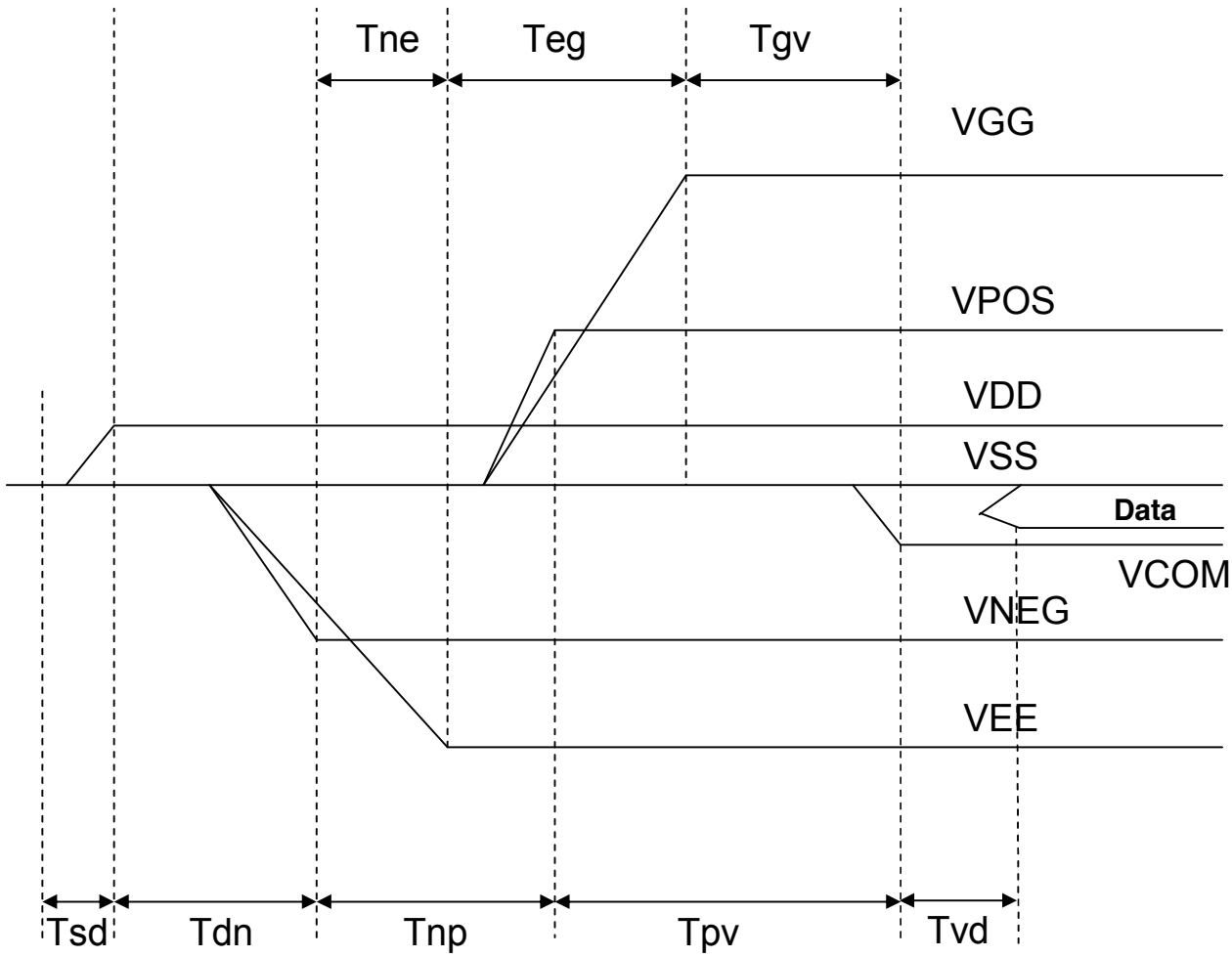
7.Power on Sequence

Power Rails must be sequenced in the following order ：

1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM

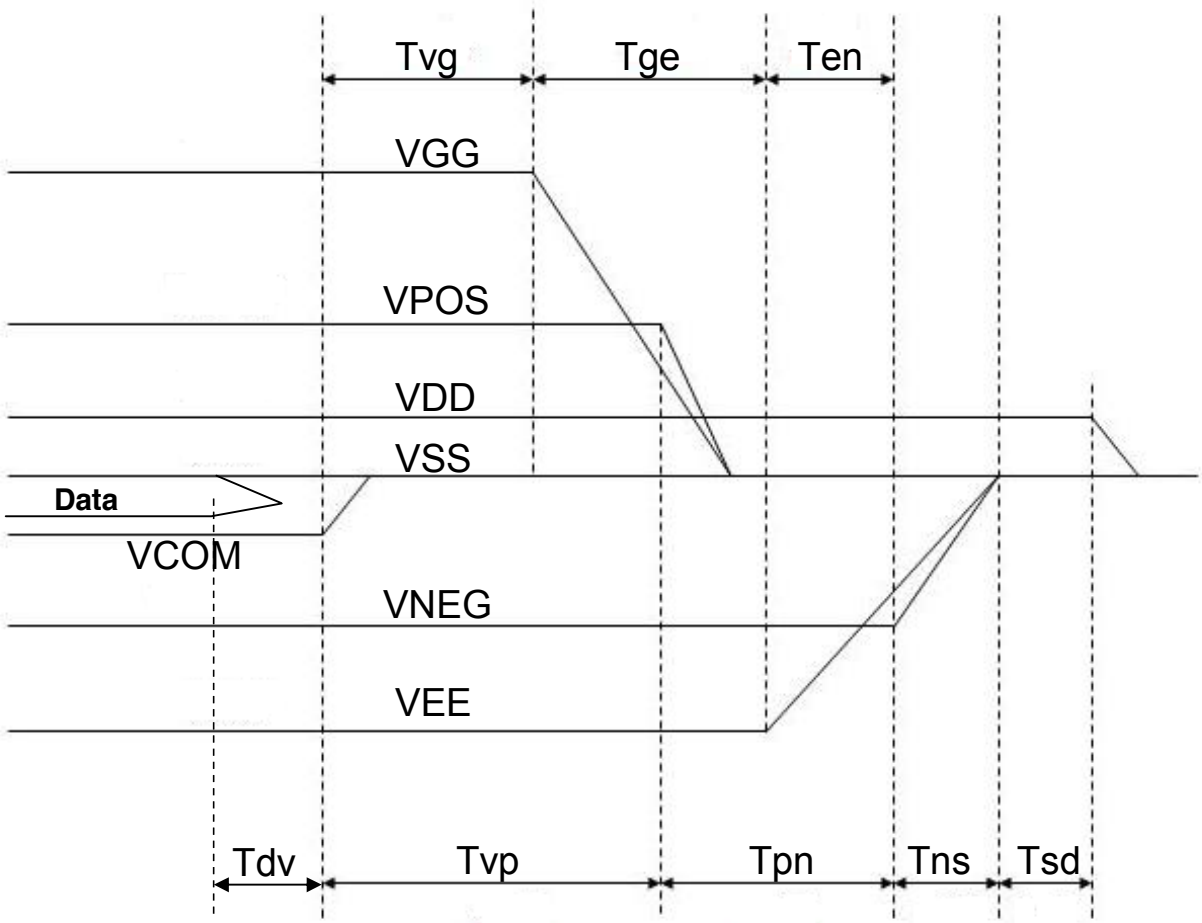
2. VSS → VDD → VEE → VGG (Gate driver)

POWER ON



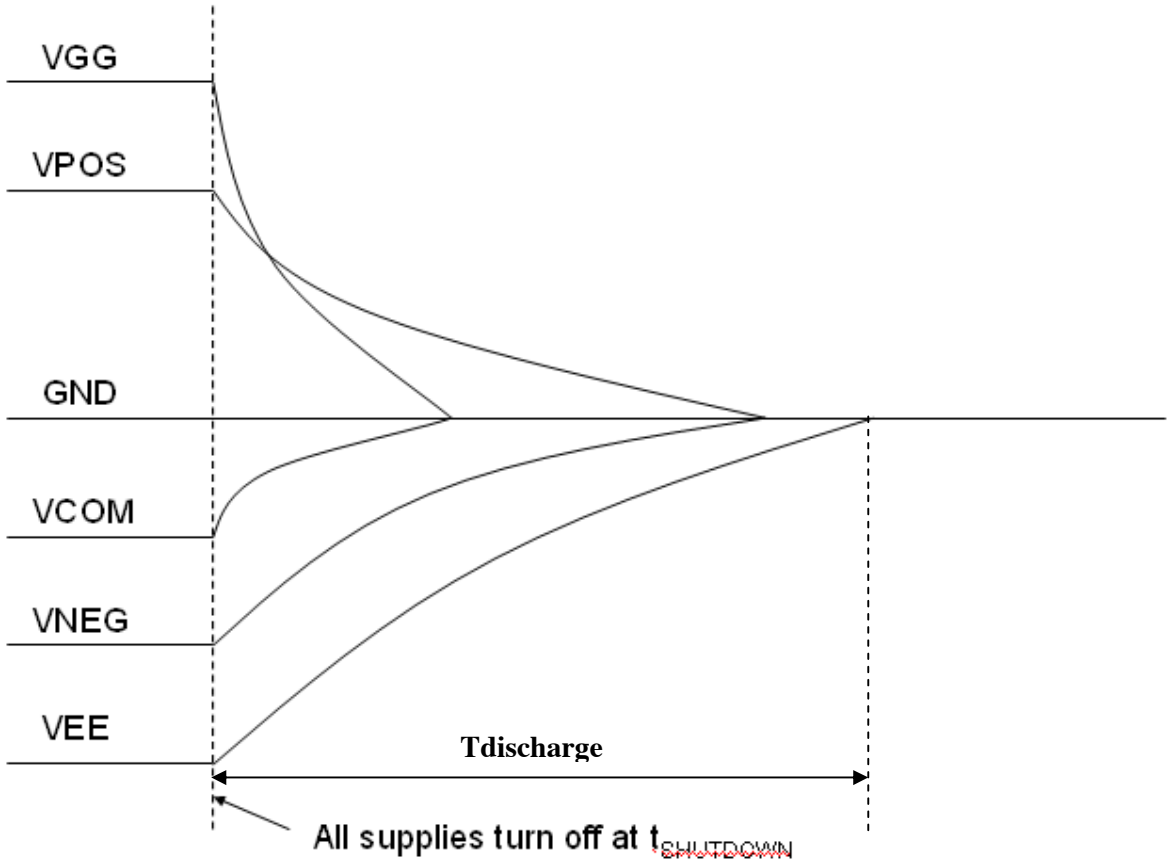
	Min	Max
Tsd	100us	-
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-

POWER DOWN



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

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 ED60SCE is applied at a maximum screen refresh rate of 85Hz.

	Min	Max
Refresh Rate	-	85Hz

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

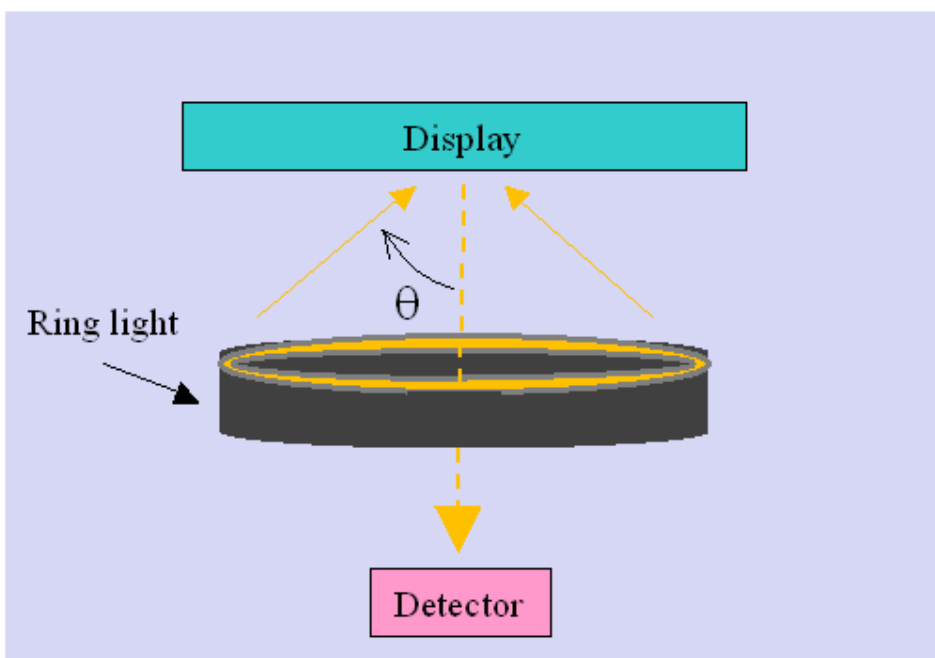
Symbol	Parameter	Conditions	Min	Typ.	Max	Unit	Note
R	Reflectance	White	30	40	-	%	Note 9-1
Gn	N_{th} Grey Level	-	-	DS+(WS-DS) ×n/(m-1)	-	L*	-
CR	Contrast Ratio	-	10	12	-		-

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

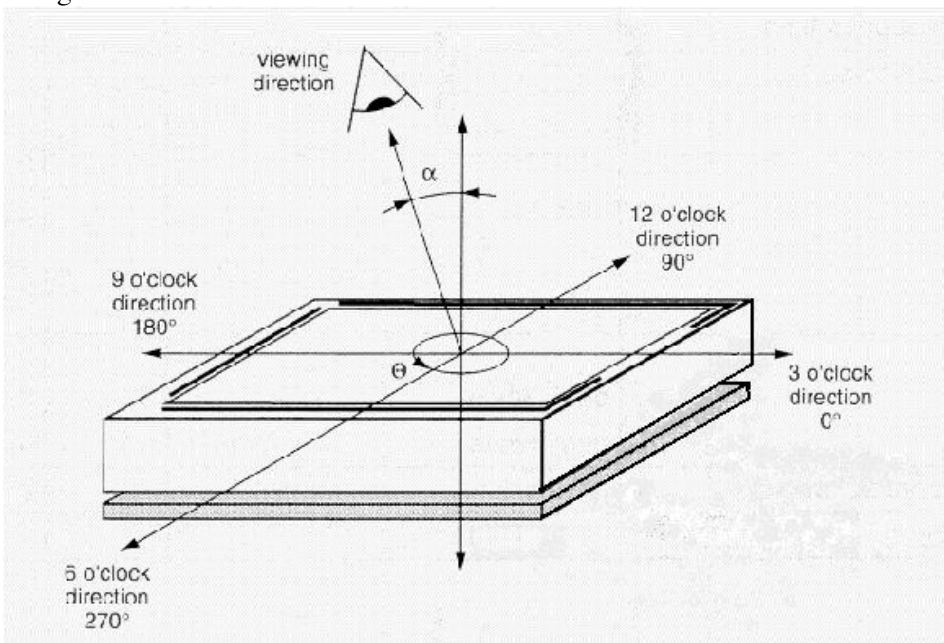


9-3) Reflection Ratio

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.



α = declination / θ = azimuth

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.
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°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 30min 30min Test in white pattern	IEC 60 068-2-14
8	UV exposure Resistance	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: 200gf Speed: 30 times/min Total 13,500times,	

Actual EMC level to be measured on customer application

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

< Criteria >

1、Main display module should no defect of function, screen quality and appearance (including : Line,no image)

12.Bar Code definition

E01	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

EPD Model Code	Part Number
E41	ED060SCE

2-Internal Control Codes

DO NOT CARE

3-FPL Version Code

FPL Version Code	Platform
3	Eink ver. 2.3
4	Eink ver. V110
5	Eink ver. V110A
6	Eink ver. V220C
7	Eink ver. V250
8	Eink ver. V220E

4-FPL Batch Code

FPL Batch Code	Translation
01-99	001-099
A0-A9	100-109
B0-B9	110-119
. . .	. . .
Z0-Z9	320-329

5-Year

Year	Translation
F	2005
G	2006
H	2007
I	2008
J	2009
K	2010
. . .	. . .
Z	2025

6-Month

Month	Translation
1	Jan
2	Feb
3	Mar
4	Apr
5	May
6	Jun
7	Jul
8	Aug
9	Sep
A	Oct
B	Nov
C	Dec

7-Serial Number

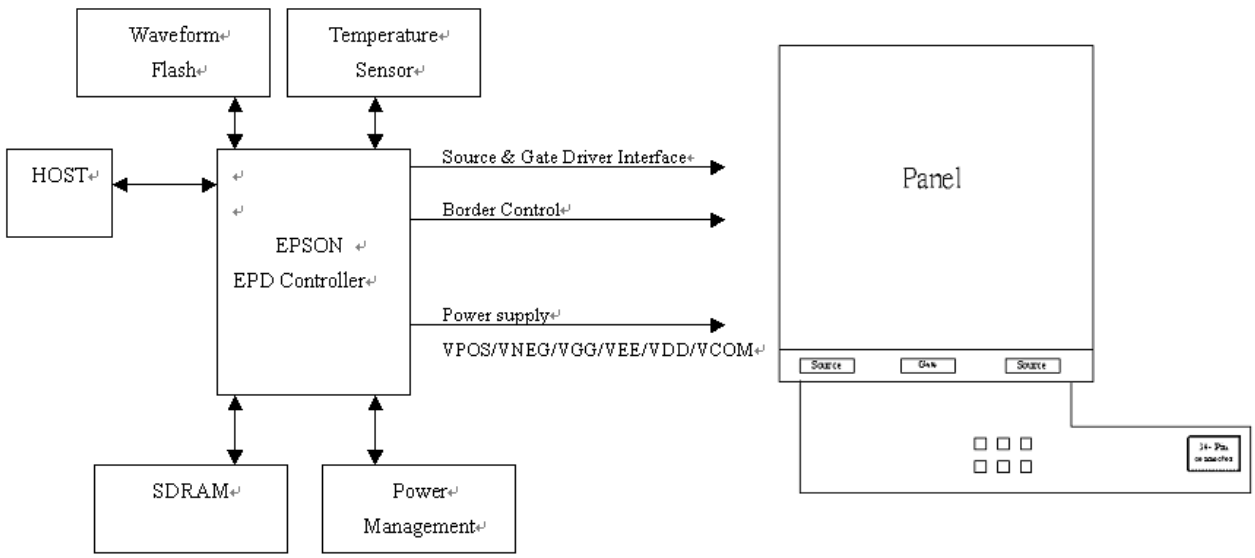
Serial Number
00000-99999

8-Module Manufacturer Code

Module Manufacturer Code	Translation
T	TOC
P	EIH

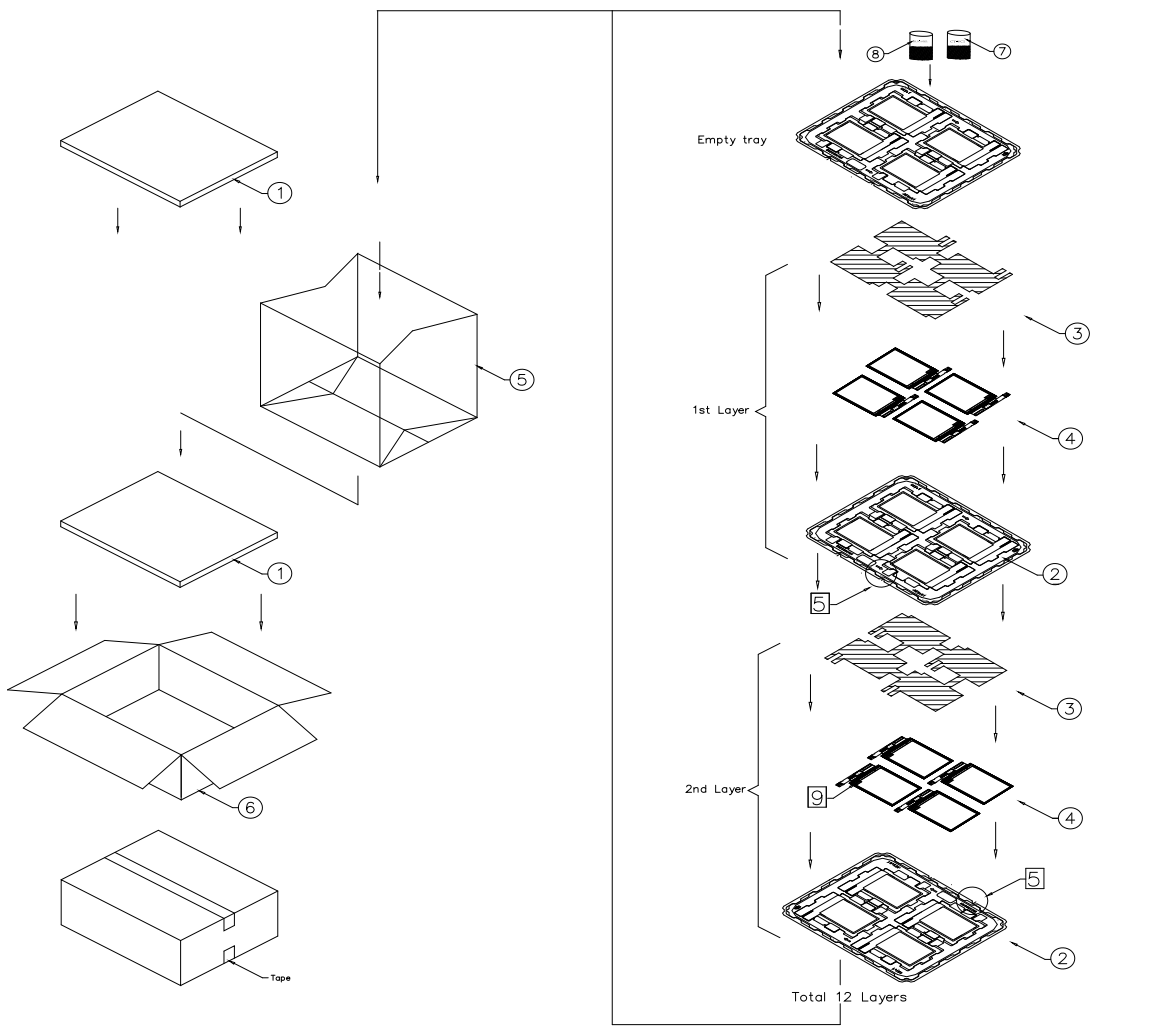
13. Border definition

14.Block Diagram



15.Packing

REV	DESCRIPTION	DESIGN	DATE
00	INITIAL RELEASE	Charlie	'10.07.20



NOTE:
1. One layer include: 1 piece of cushion sheet, 4 pcs module & 1 piece of tray.
2. Q'TY: 48 pcs panel/carton.
3. Dimension: 455*375*190mm
4. Weight: 4.8 KG
5. Make sure tray stacked with 180° rotation. We can check this by lateral side view.

ITEM	PART NO.	DESCRIPTION	QTY	REMARK
9	99-1310114	EASY TAPE	48	For Remove Protect Sheet
8	99-3100075	30g加厚複合紙活磷乾燥劑73*95mm(高科JK0030)	2	
7	50-0700021	防鏽劑(保護容積25L)	3	
6	50-0100096	CARTON INTERNAL	1	
5	50-0510041	摺口袋450*380*700mm	1	抗靜電
4		ED060SCE	48	
3	50E0210111	EPE CUSHION SHEET	12	抗靜電
2	50E0310161	TRAY	13	抗靜電
1	50-0300491	EPE FOAM	2	

MTL.SPEC.	UNSPECIFIED TOL'S ±5.0mm ANGLE ROUGHNESS	REMARK	元太科技股份有限公司 E Ink Holdings Inc.

APPROVE	Patrick Lin	'10.07.20	SCALE 1:1	UNIT mm	SHEET 1 OF 1	DWG.TITLE ED060SCE PACKING Dim
CHECK	Patrick Lin	'10.07.20				
DESIGN	CharlieYang	'10.07.20	MTL.NO.	DWG.NO.	REV. 01	A4 SIZE