Version: 0.1

<div align="center">

TECHNICAL   SPECIFICATION

MODEL   NO. : ET017QG1

</div>

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 _____

Dep	PM	FAE	Front Light	Panel Desing	Electronic Design	Mechanical Design	Product Verification	Prepared By
Sign								

Revision History

Rev.	Issued Date	Revised Contents
0.1	Jun,13.2013	Preliminary SPEC

TECHNICAL SPECIFICATION

CONTENTS

1. Application

ET017QG1 is a reflective electrophoretic E Ink® technology display module based on active matrix TFT.It has 1.73" active area with 240 x 320 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 TFT electrophoretic
- 240*320 display
- No glass, No broken risk
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape, portrait mode
- Front Light Module

3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	1.73	Inch	
Display Resolution	240 (H) ×320(V)	Dot	
Active Area	27.00 (H)×34.56 (V)	mm	
Pixel Pitch	0.1125(H)x0.108(V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	32.2(H)×43.51(V)×1.135(D)	mm	
Module Weight	TBD	g	

4. Mechanical Drawing of EPD Module
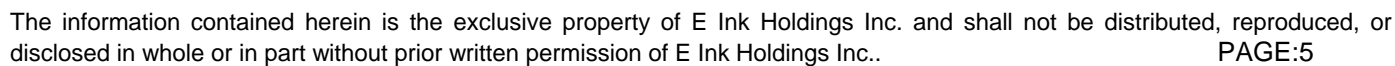
5.Input/Ouput Terminals

Pin #	Signal	Description
1	VNEG	Negative power supply source driver
2	VPOS	Positive power supply source driver
3	VSS	Ground
4	VDD	Digital power supply drivers
5	XCL	Clock source driver
6	XLE	Latch enable source driver
7	OEH	Output enable source driver
8	NC	NO Connection
9	NC	NO Connection
10	NC	NO Connection
11	XSTL	Start pulse source driver
12	D0	Data signal source driver
13	D1	Data signal source driver
14	D2	Data signal source driver
15	D3	Data signal source driver
16	D4	Data signal source driver
17	D5	Data signal source driver
18	D6	Data signal source driver
19	D7	Data signal source driver
20	NC	NO Connection
21	NC	NO Connection
22	VCOM	Common voltage
23	VGG	Positive power supply gate driver
24	VEE	Negative power supply gate driver
25	NC	NO Connection
26	NC	NO Connection
27	MODE1	Output mode selection gate driver
28	MODE1	Output mode selection gate driver
29	NC	NO Connection
30	NC	NO Connection
31	NC	NO Connection
32	SPV	Start pulse 1st gate driver
33	CKV	Clock 1st gate driver
34	BORDER	Border connection
35	NC	NO Connection
36	NC	NO Connection
37	LED+	LED Positive power supply
38	NC	NO Connection
39	LED-	LED Negative power supply

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	-	TBD	TBD	mA
Gate Negative supply	V_{EE}		-21	-20	-19	V
	I_{EE}	GV_{EE} =-20V	-	TBD	TBD	mA
Gate Positive supply	V_{GG}		21	22	23	V
	I_{GG}	GV_{DD} = 22V	-	TBD	TBD	mA
Source Negative supply	V_{NEG}		-15.4	-15	-14.6	V
	I_{NEG}	V_{NEG} = -15V	-	TBD	TBD	mA
Source Positive supply	V_{POS}		14.6	15	15.4	V
	I_{POS}	V_{POS} = 15V	-	TBD	TBD	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}		-4	Adjusted	-0.3	V
	I_{COM}		-	TBD	-	mA
Maximum power panel	P_{MAX}		-	-	TBD	mW
Standby power panel	P_{STBY}		-	-	TBD	mW
Typical power panel	P_{TYP}		-	TBD	-	mW
Operating temperature			0	-	50	℃
Storage temperature			-25	-	70	℃
Maximum image update time at 25℃			-	1000	-	ms

- 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 Eink
- Vcom is recommended to be set in the range of assigned value ± 0.1V
- The maximum I_{COM} inrush current is about TBD mA

Note 6-1

The Typical power consumption
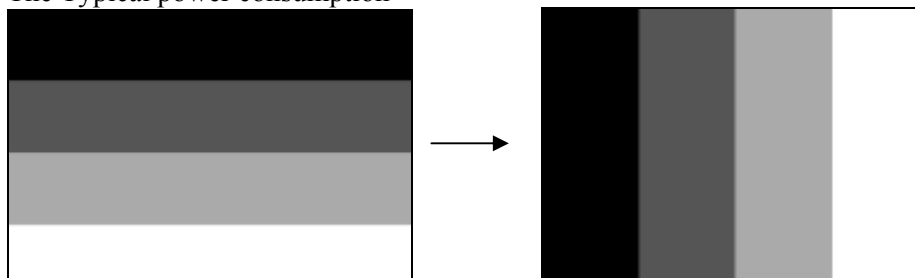
6-3) Recommended driving condition for Front light

GND = 0 V， Ta = 25°C

| Parameter	Symbol	Min	TYP	MAX	Unit	Remark
Supply voltage of LED Front light	V_{LED}	-	(3.3)	-	V	
Supply current of LED Front light	I_{LED}	-	(5)	-	mA	
Front light Power Consumption	P_{LED}	-	(16.5)	-	mW	Note 6-1

*() for reference

6-4)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
SPV setup time	tSU	100	-	twH-100	ns
SPV hold time	tH	100	-	twH-100	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock XCL cycle time	tcy	25	-	-	ns
D0 .. D7 setup time	tsu	12	-	-	ns
D0 .. D7 hold time	th	12	-	-	ns
XSTL setup time	tstls	12	-	-	ns
XSTL hold time	tstlh	12	-	-	ns
XLE on delay time	tLEdly	40	-	-	ns
XLE high-level pulse width (When VCC=3.0V to 3.6V)	tLEw	250	-	-	ns
XLE off delay time	tLEoff	200	-	-	ns
Output setting time to +/-30mV(C_{load}=200pF)	tout	-	-	12	us

OUTPUT LATCH CONTROL SIGNALS
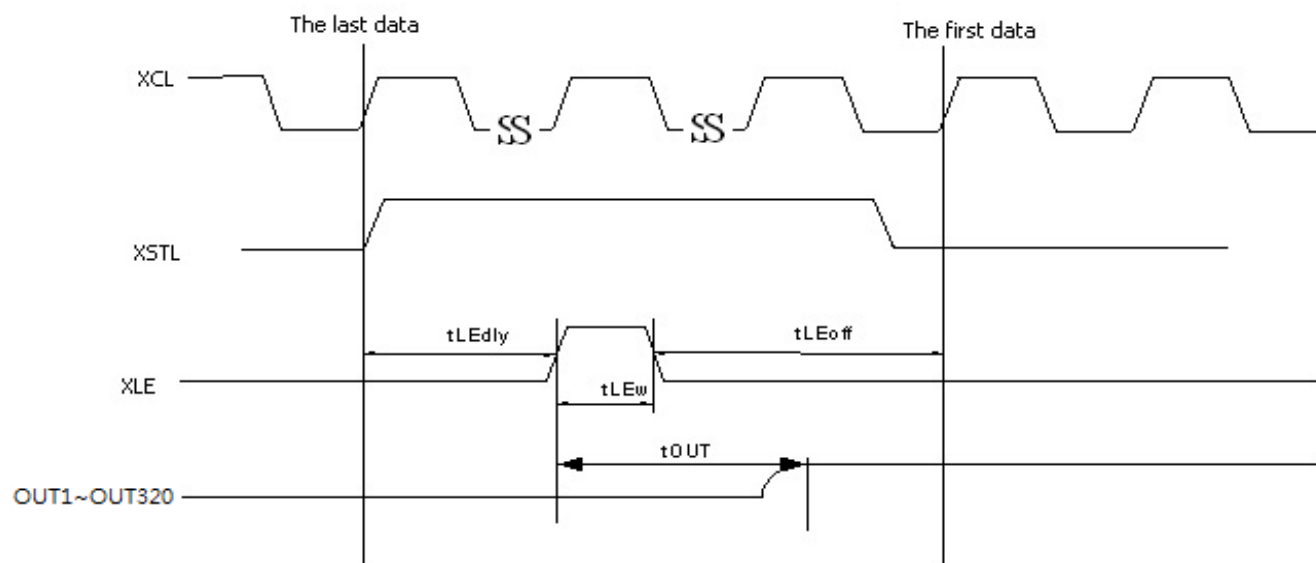
CLOCK & DATA TIMING
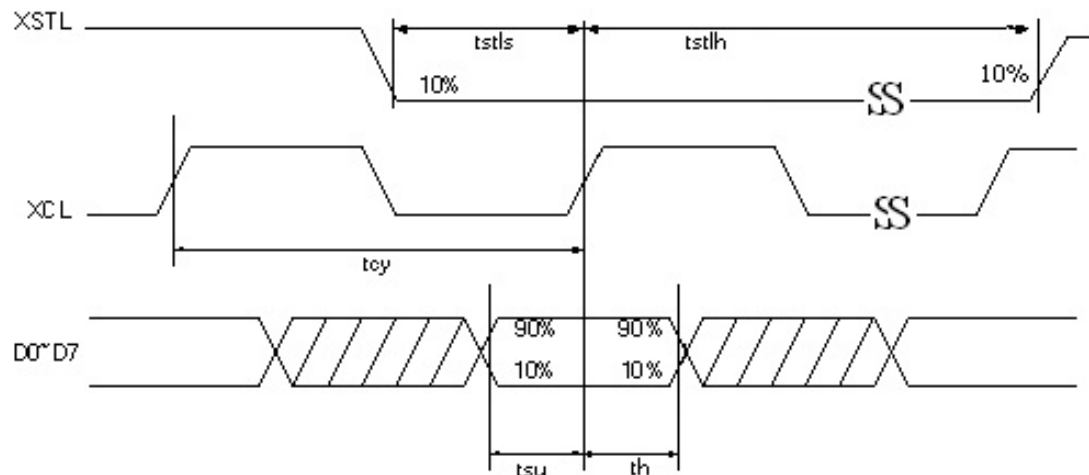
CKV & SPV TIMING
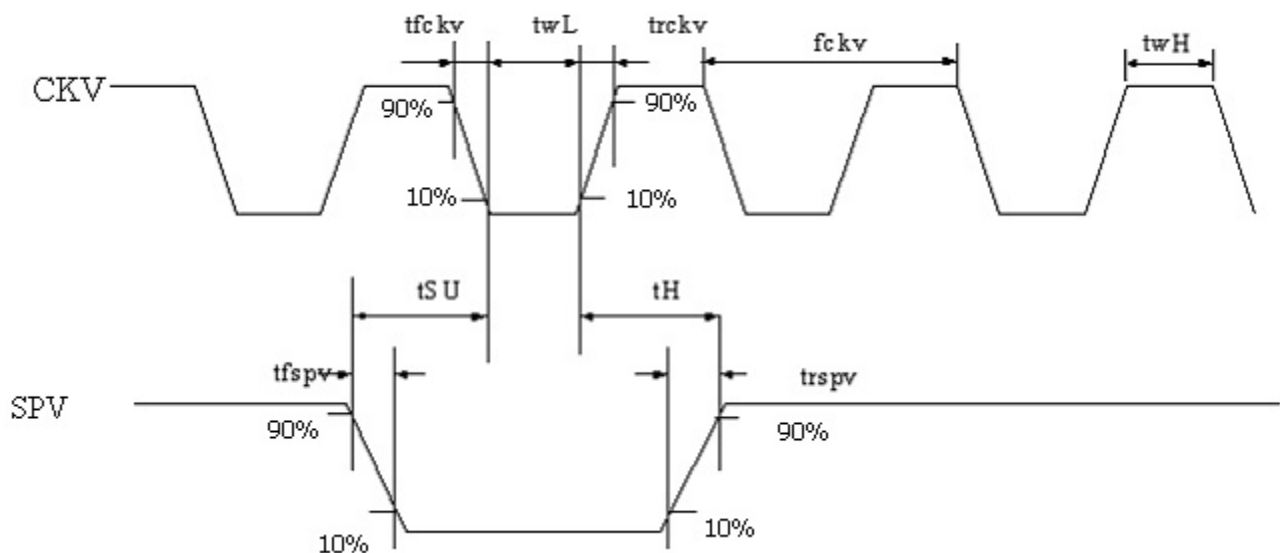
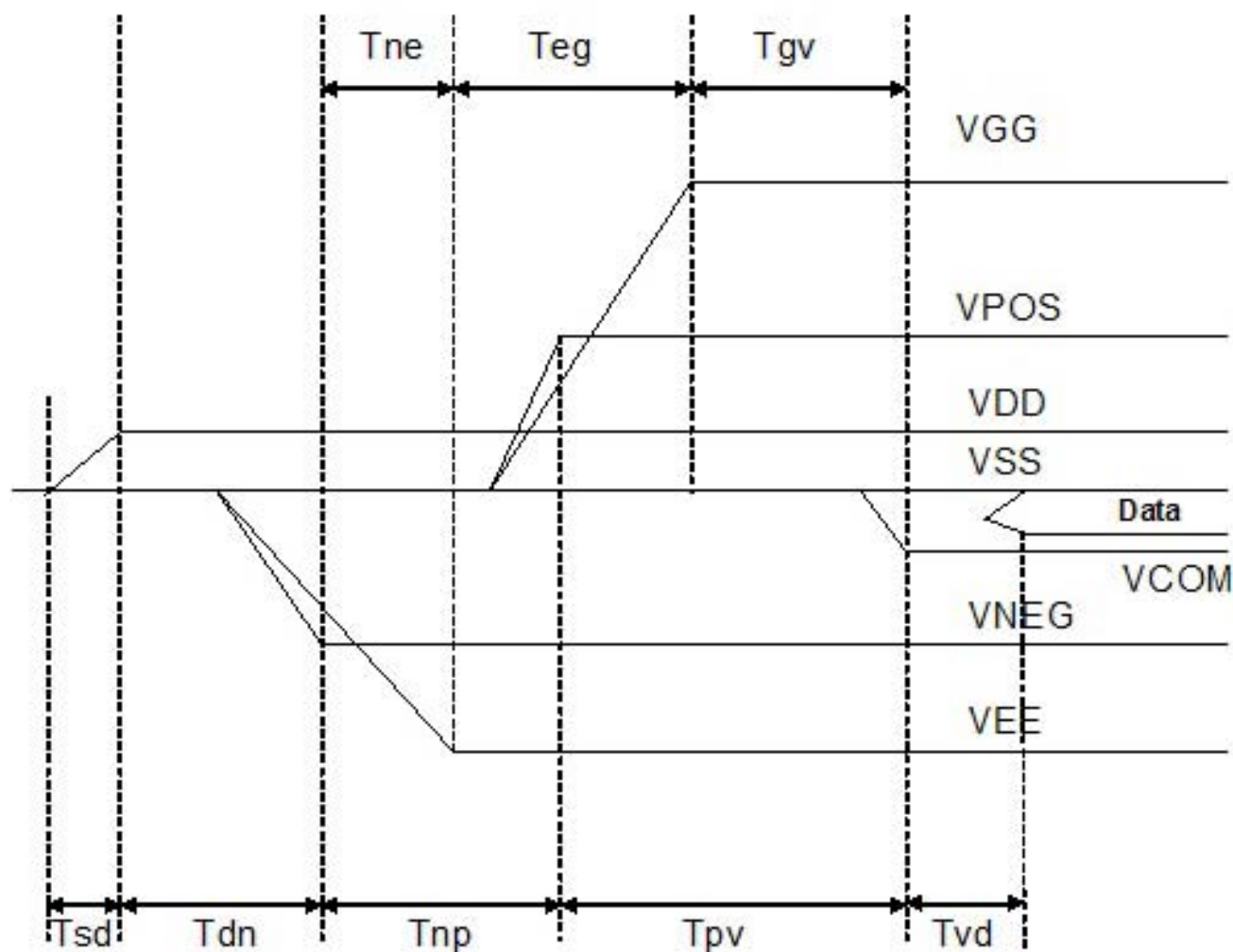## GATE OUTPUT TIMING
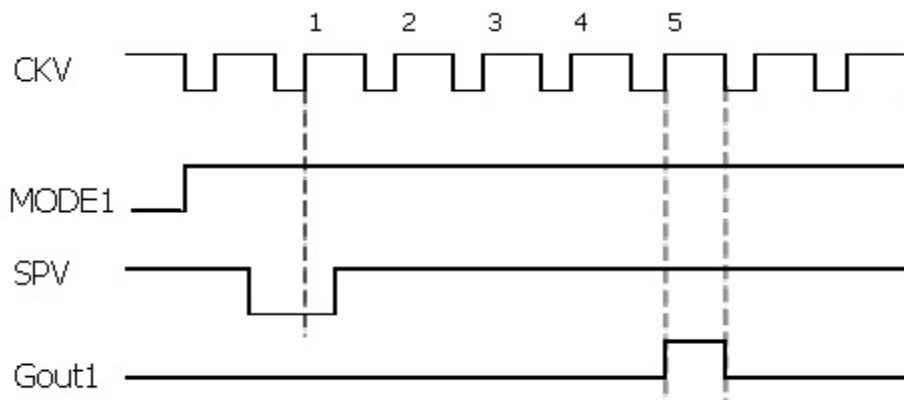
Note：First gate line on timing

After 5CKV，gate line is on .

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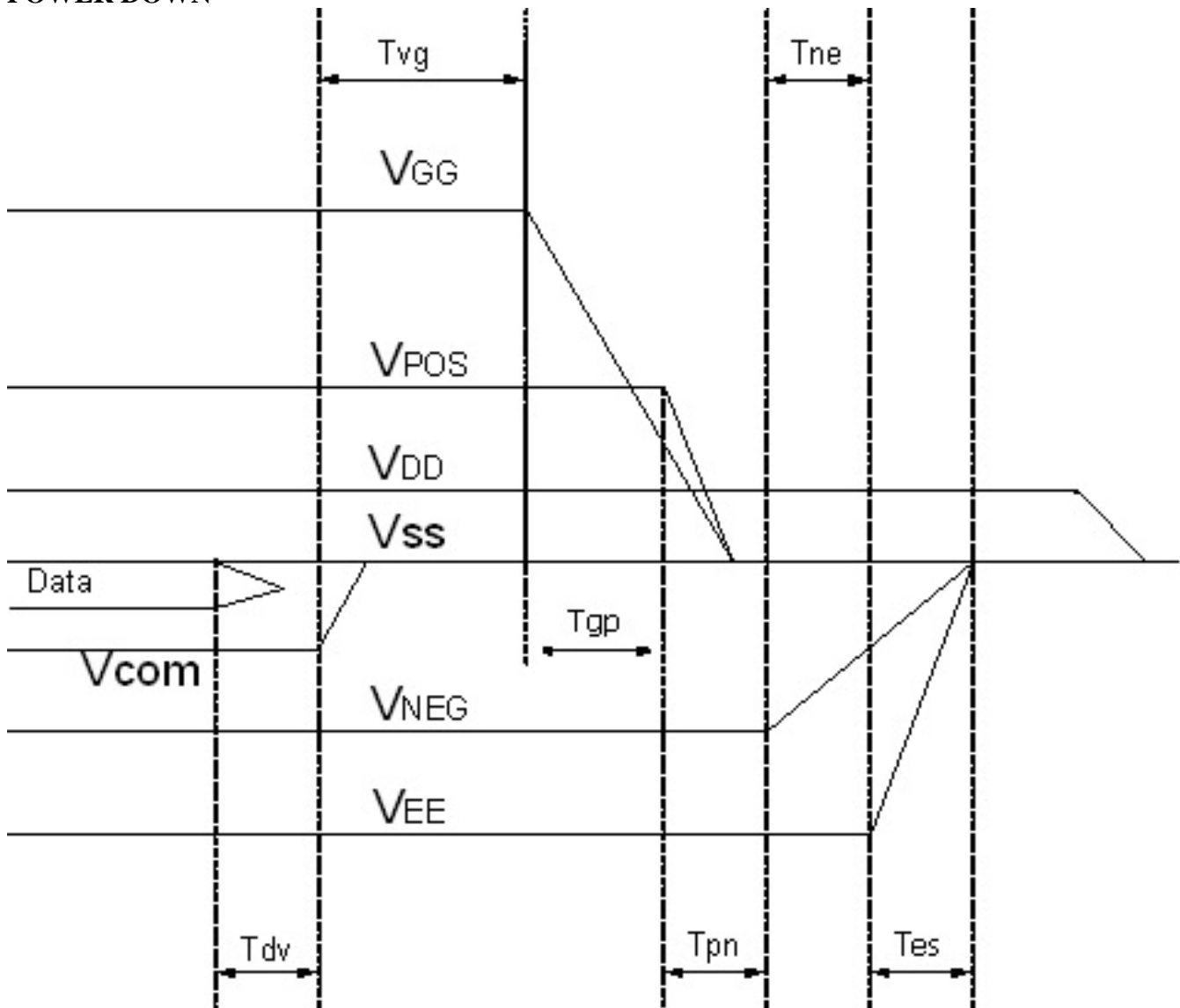
Power Rails must be sequenced in the following order：
1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM
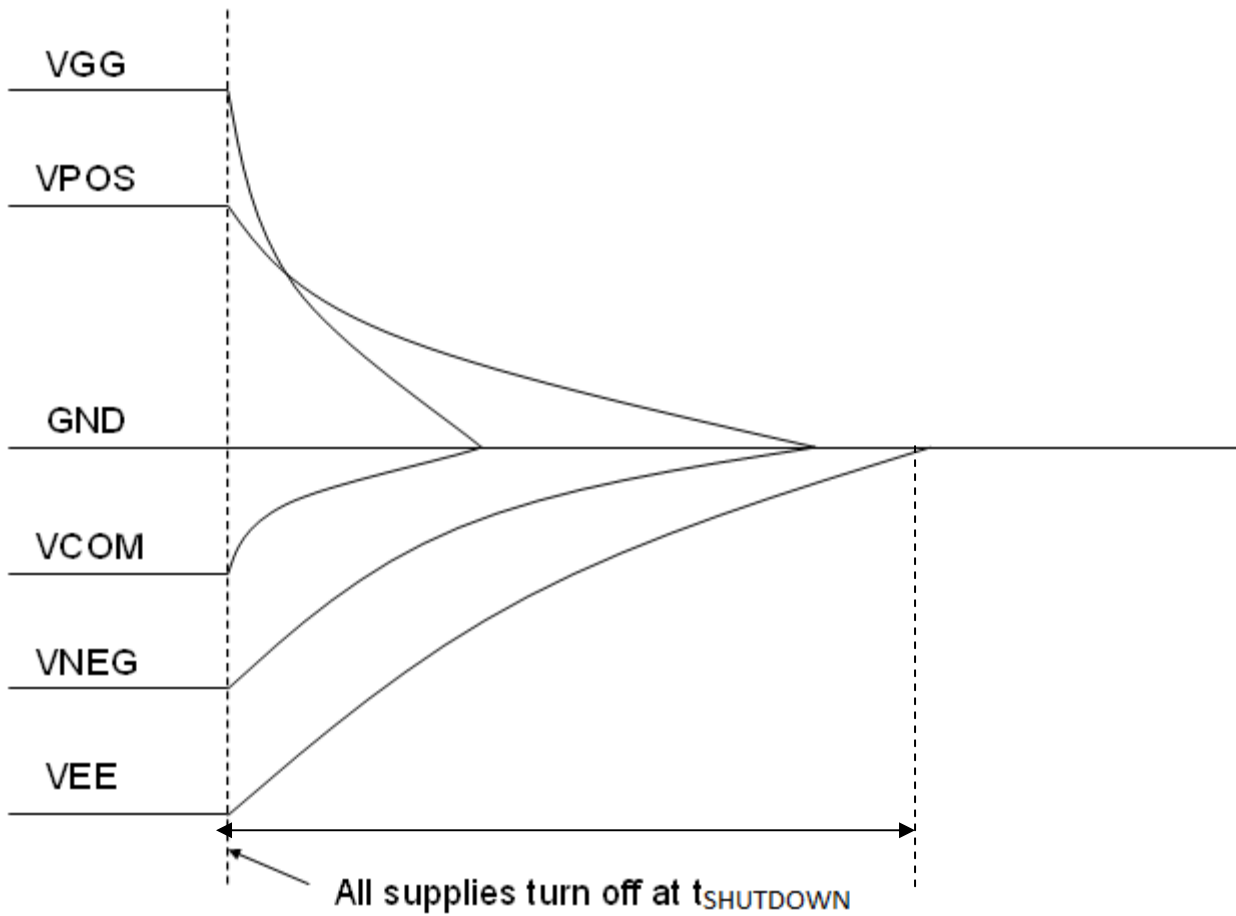
2. VSS → VDD → VEE → VGG (Gate driver)

POWER ON

	Min	Max
Tsd	30us	-
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-

POWER DOWN

	Min	Max
Tdv	100μs	-
Tvg	0μs	-
Tgp	0μs	-
Tpn	0μs	-
Tne	0μs	-
Tes	0s	-

8. Discharge time Sequence

All supplies turn off at $t_{SHUTDOWN}$

Note8-1：Supply voltages decay through pulldown resistors.
Note8-2：VEE must remain negative of Vcom during decay period.

8-1) Refresh Rate
The module ET017QG1 is applied at a maximum screen refresh rate of 85Hz..

	Min	Max
Refresh Rate	-	85Hz.

9. Optical characteristics

9-1) Specifications

Measurements are made by PR655 with MS-75 or equivalent SepctaScan Colorimeter with that the illumination is at an angle 45° from the perpendicular at the center of sample surface, and the detector is perpendicular unless otherwise specified

T = 25°C

| Symbol	Parameter		Conditions		Min	Typ.	Max	Unit	Note
R	Reflectance		White		32	40	-	%	Note 9-1
Gn	N_{th} Grey		-	Front Light off	-	DS+(WS-DS)×n/(m-1)	-	L*	-
	Level								
CR	Contrast Ratio		-		9	12	-	-	Note 9-2
Brightness			θ=0°		TBD	TBD	-	cd/㎡	Note 9-4
White Chromaticity		x	θ=0°		0.27	0.31	0.35	-	-
		y		Front Light On	0.29	0.33	0.37	-	
Luminance Uniformity			θ=0°		-	-	-	%	-
CR	Contrast Ratio		θ=0°		TBD	TBD	-	-	Note 9-5

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

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
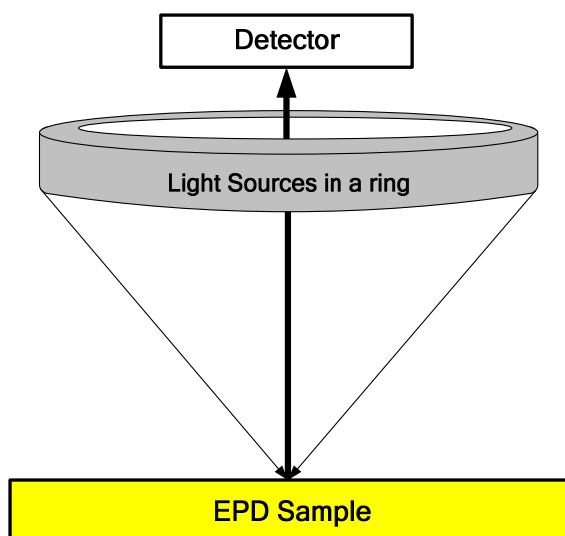
9-3) Reflection Ratio

The reflection ratio is expressed as:

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

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.

9-4)Optical characteristics are determined after the front light has been 'ON' and stable for approximately 60 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the EPD display surface at a viewing angle of Φ and θ equal to 0°.
The typical luminance value is measured at LED current 5 mA.

9-5)Contrast Ratio:

$$CR = \frac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$$

10.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. Contact E Ink for advice on mounting the display in a curved shape.

CAUTION
The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronics components. Disassembling the display module can cause permanent damage and invalidates the warranty agreements.

Observe general precautions that are common to handling delicate electronic components. The panel can be deformed 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

TBD

12. Bar Code definition

EA3	00	6	01	1	N	7	4	00361	A	T
1	2	3	4	2	5	6	2	7	2	8

1 ：EPD model code:

    ET017QG1: EA3

2 ：Internal control codes:Do not care

3 ：FPL reversion code

    V220:6   V220E:8

4 ：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:

    N: 2013 / P: 2014 / Q: 2015 / R: 2016 /... / Z: 2024

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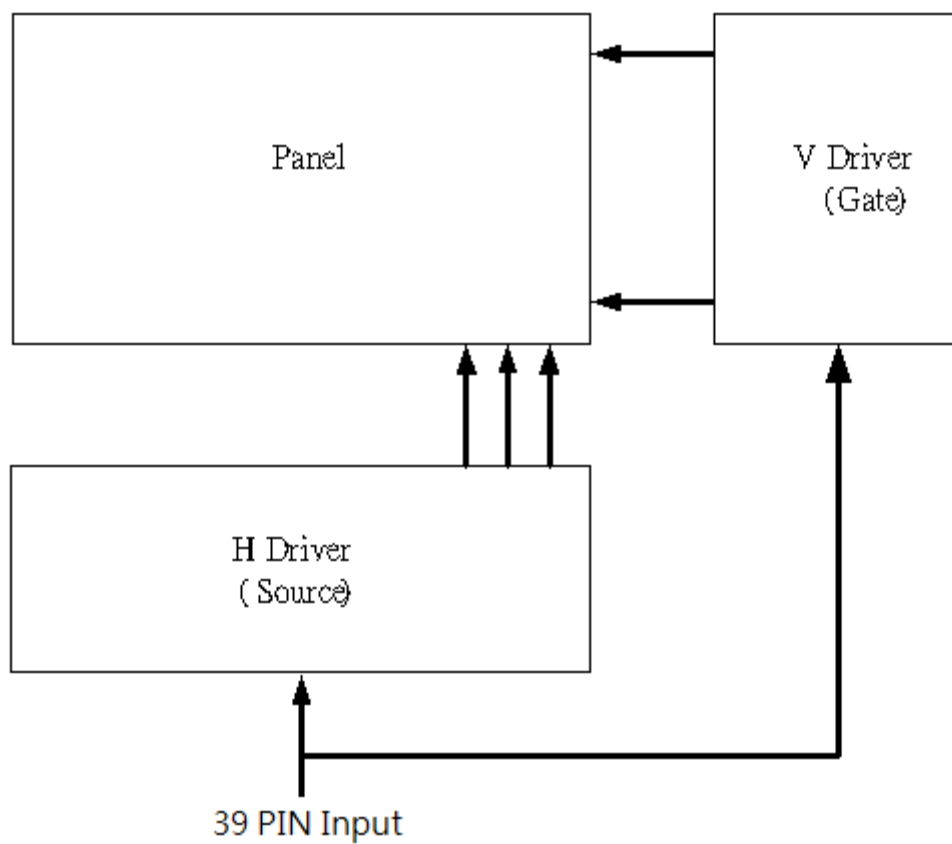
    1:Jan.   2:Feb. ... 9:Sep. A:Oct. B:Nov. C:Dec.

7 ：Serial number

    00000-99999

8 ：MFG code:

    TOC FAB3 : T ；TOC FAB2 : Y ；TOC FAB1 : K ；EIH : P ；MOS : S ；Microveiw : G ；
    TYT FAB5 : G ；TYT FAB4 : L

13.Block Diagram

14.Packing

TBD