

Version: Tentative 0.10

**TECHNICAL SPECIFICATION**

**MODEL NO: ES108FC1**

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**

<b>Rev.</b>	<b>Issued Date</b>	<b>Revised Contents</b>
Tentative 0.10	July.03.2017	New

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# ***TECHNICAL SPECIFICATION***

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## 1. General Description

ES108FC1 is a reflective electrophoretic E Ink® technology display module based on plastic active matrix TFT substrate. It has 10.8” active area with 1920(H) x 1080(V) 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
- 1920(H) x 1080(V) display
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Landscape pin out. Portrait mode scan.
- Plastic substrate.

## 3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	10.8	Inch	
Display Resolution	1920(H) x 1080(V)	Pixel	
Active Area	239.04(H) x 134.46(V)	mm	
Pixel Pitch	0.1245(H) x 0.1245(V)	mm	
Pixel Configuration	Square		
Outline Dimension	247.04(H) x 153.76(V) x 0.439 (D)	mm	
Module Weight	TBD	g	
Number of Gray	16 Gray Level (monochrome)		
Display operating mode	Reflective mode		
Surface treatment	Non		



**5.Input/Ouput Terminals**

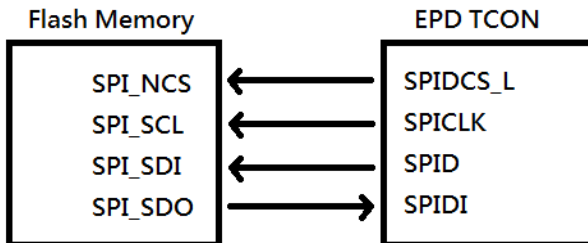
**5-1)Pin out list**

**FPC connector: Panasonic AXE550127D**

Pin No	Signal	Description	Notes
1	VGL	Negative power supply gate driver	
2	VGH	Positive power supply gate driver	
3	VDD	Digital power supply drivers	3.3V
4	MODE	Output mode selection gate driver	
5	CKV	Clock gate driver	
6	SPV	Start pulse gate driver	
7	VCOM	Common connection	
8	VDD	Digital power supply drivers	3.3V
9	VSS	Ground	
10	XCL	Clock source driver	
11	D0	Data signal source driver	
12	D8	Data signal source driver	
13	D1	Data signal source driver	
14	D9	Data signal source driver	
15	D2	Data signal source driver	
16	D10	Data signal source driver	
17	D3	Data signal source driver	
18	D11	Data signal source driver	
19	D4	Data signal source driver	
20	D12	Data signal source driver	
21	D5	Data signal source driver	
22	D13	Data signal source driver	
23	D6	Data signal source driver	
24	D14	Data signal source driver	
25	D7	Data signal source driver	
26	D15	Data signal source driver	
27	VSS	Ground	
28	XSTL	Start pulse source driver	
29	XLE	Latch enable source driver	
30	XOE	Output enable source driver	
31	XON	Test ping	Note 5-2.
32	VPOS	Positive power supply source driver	

33	VNEG	Negative power supply source driver	
34	Border	Border connection	
35	NC	NC	
36	NC	NC	
37	NC	NC	
38	NC	NC	
39	VSS	Ground	
40	VSS	Ground	
41	NC	NC	
42	NC	NC	
43	NC	NC	
44	NC	NC	
45	VSS	Ground	
46	VDD2	SPI flash power supply	1.8V
47	SPI_SCL	Serial Data Clock for Flash memory	Note 5-1
48	SPI_NCS	Chip Select for Flash memory	Note 5-1
49	SPI_SDI	Serial Data Input for Flash memory	Note 5-1
50	SPI_SDO	Serial Data Output for Flash memory	Note 5-1

**Note 5-1**



**Note 5-2**

Please connect to VDD voltage by 10K resistance.

**6. Electrical Characteristics**

**6-1) Absolute maximum rating**

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	VDD	-0.3 to +5	V
SPI Supply Voltage	VDD2	-0.5 to +2.5	V
Positive Supply Voltage	V <sub>POS</sub>	-0.3 to +18	V
Negative Supply Voltage	V <sub>NEG</sub>	+0.3 to -18	V
Max .Drive Voltage Range	V <sub>POS</sub> - V <sub>NEG</sub>	36	V
Supply Voltage	VGH	-0.3 to VGL+50V	V
Supply Voltage	VGL	-25 to +0.3	V
Supply Range	VGH-VGL	+50	V
Operating Temp. Range	TOTR	0 to +50	°C
Storage Temperature	TSTG	-25 to +70	°C

**6-2) Panel DC characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Signal ground	V <sub>SS</sub>		-	0	-	V
Logic Voltage supply	V <sub>DD</sub>		3.0	3.3	3.6	V
	I <sub>VDD</sub>	V <sub>DD</sub> =3.3V	-	-	-	mA
SPI Voltage supply	V <sub>DD2</sub>		1.65	1.8	1.95	V
	I <sub>VDD2</sub>	V <sub>DD</sub> =1.8V	-	-	-	mA
Gate Negative supply	V <sub>GL</sub>		-20.5	-20	-20.5	V
	I <sub>GL</sub>	V <sub>GL</sub> = -20V	-	-	-	mA
Gate Positive supply	V <sub>GH</sub>		27.5	28	28.5	V
	I <sub>GH</sub>	V <sub>GH</sub> = 28V	-	-	-	mA
Source Negative supply	V <sub>NEG</sub>		-15.4	-15	-14.6	V
	I <sub>NEG</sub>	V <sub>NEG</sub> = -15V	-	-	-	mA
Source Positive supply	V <sub>POS</sub>		14.6	15	15.4	V
	I <sub>POS</sub>	V <sub>POS</sub> = 15V	-	-	-	mA
Asymmetry source	V <sub>Asym</sub>	V <sub>POS</sub> +V <sub>NEG</sub>	-800	0	800	mV
Common voltage	V <sub>COM</sub>		-4	Adjusted	-1	V
	I <sub>COM</sub>		-	-	-	mA
Power panel	P		-	-	-	mW
Standby power panel	P <sub>STBY</sub>		-	-	-	mW
Operating temperature			0	-	50	°C
Storage temperature			-25	-	70	°C

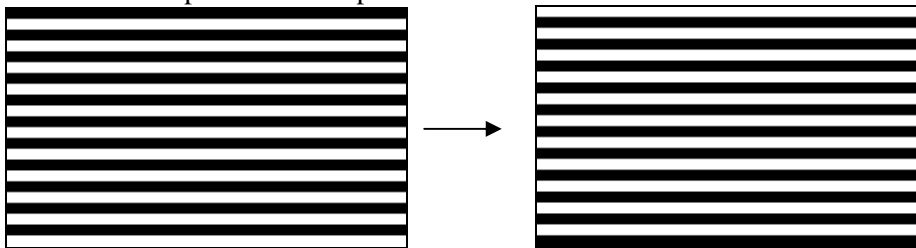


The maximum power consumption is measured using standard waveform with following pattern transition:  
from pattern of repeated 1 consecutive black scan lines followed by 1 consecutive white scan line to that of  
repeated 1 consecutive white scan lines followed by 1 consecutive black scan lines. (Note 6-1)

- The Typical power consumption is measured using standard 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  $\pm 0.1V$ .

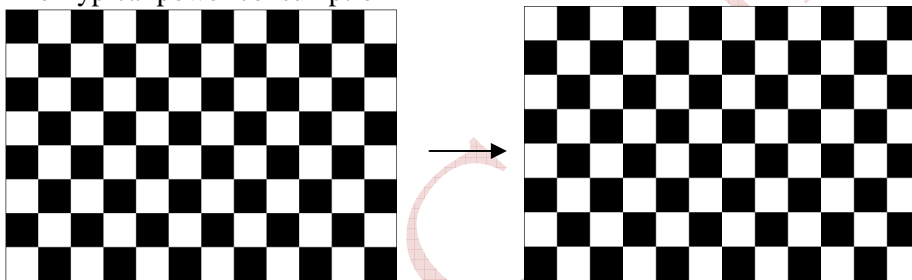
Note 6-1

The maximum power consumption



Note 6-2

The Typical power consumption

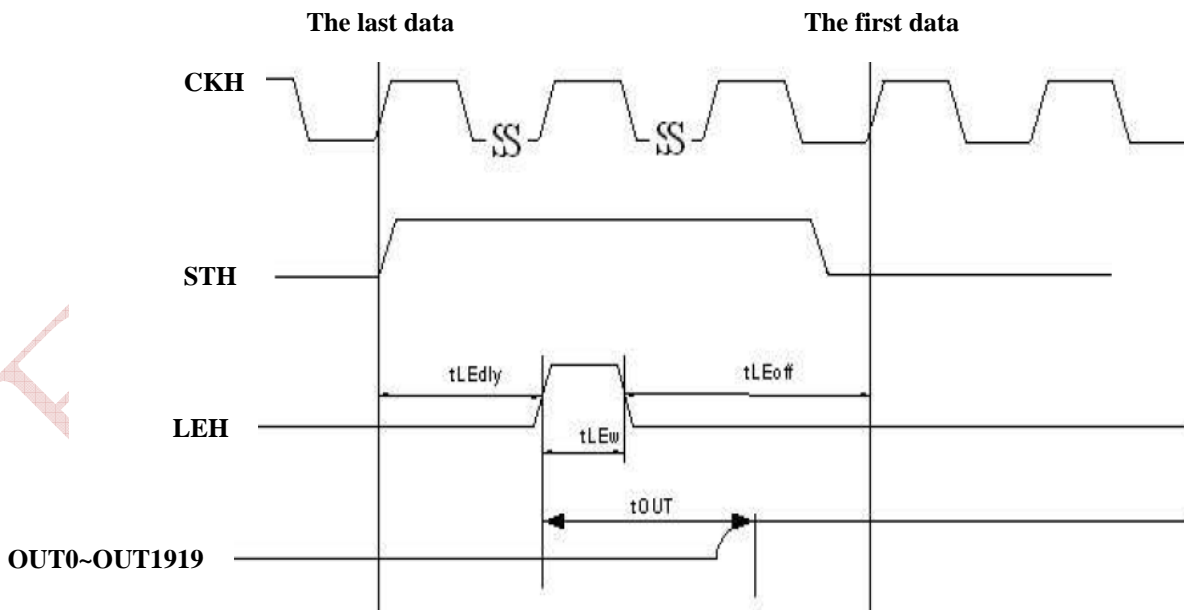


**6-3 )Panel AC characteristics**

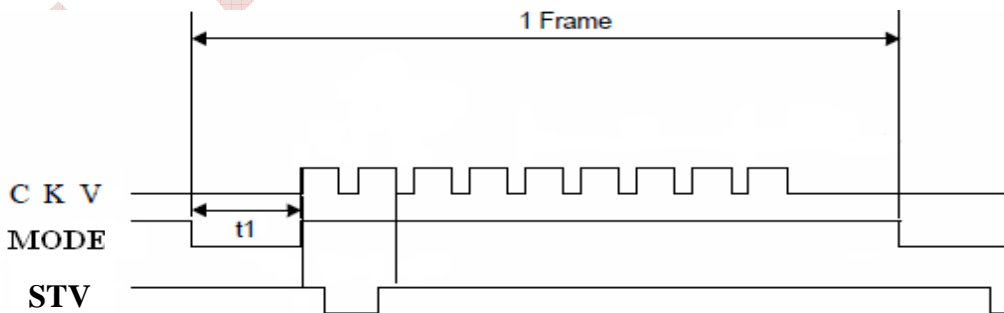
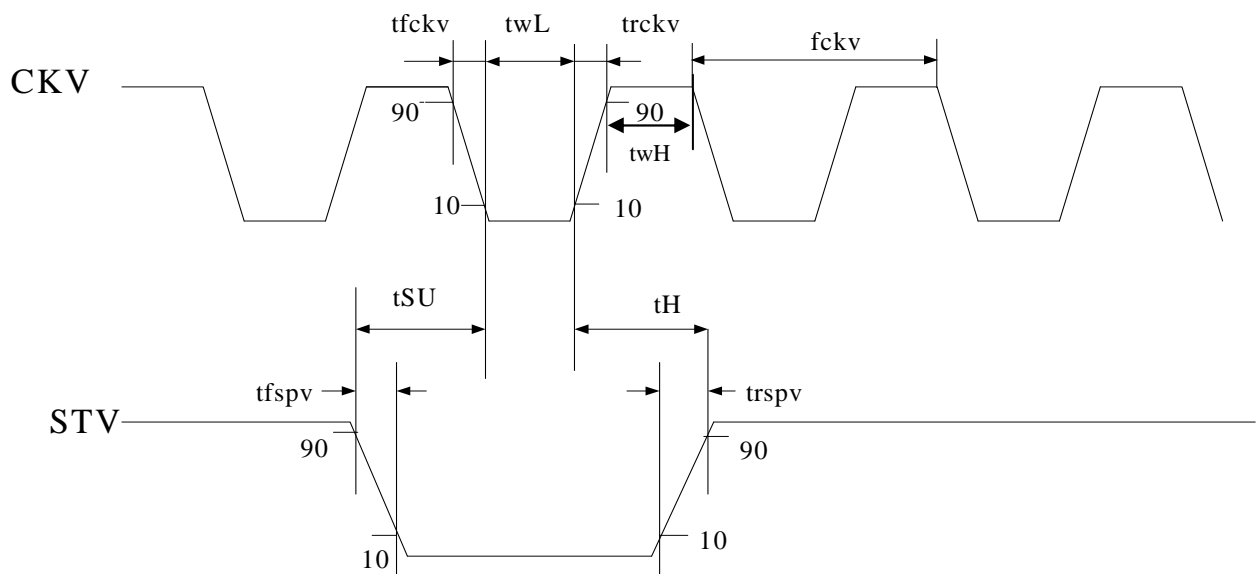
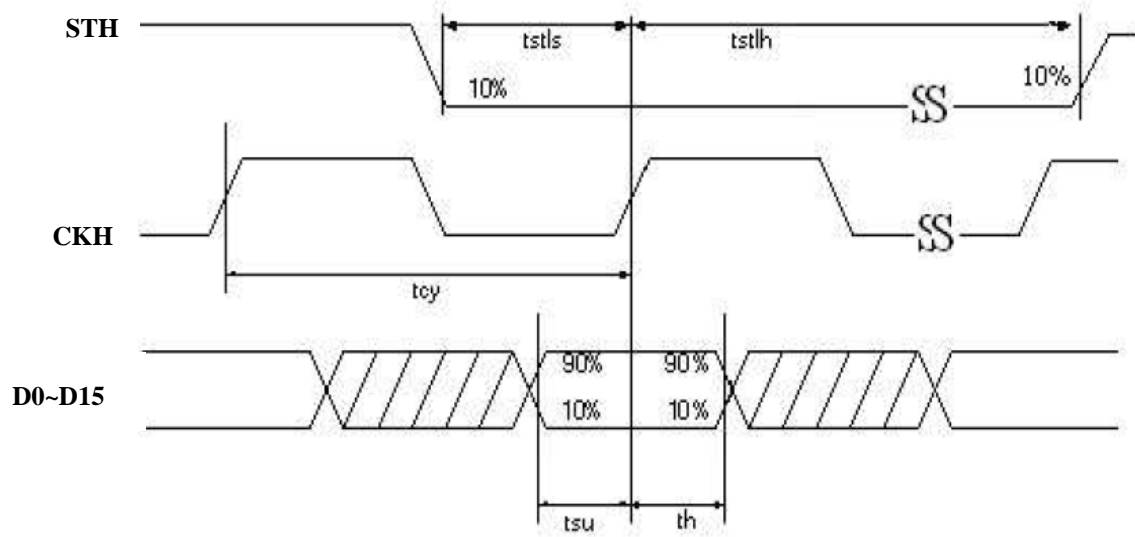
VDD=3.0V to 3.6V, unless otherwise specified.

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	0.5 x tcy	-	0.8 x tcy	ns
STV hold time	tH	0.5 x tcy	-	300 x tcy	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock CKH cycle time	tcy	16.7	50	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	10.5x tcy	-	-	ns
LEH high-level pulse width	tLEw	300	-	-	ns
LEH off delay time	tLEoff	200	-	-	ns
Output setting time to +/- 30mV(C <sub>load</sub> =200pF)	tout	-	-	20	us

**OUTPUT LATCH CONTROL SIGNALS**



**CLOCK & DATA TIMING**

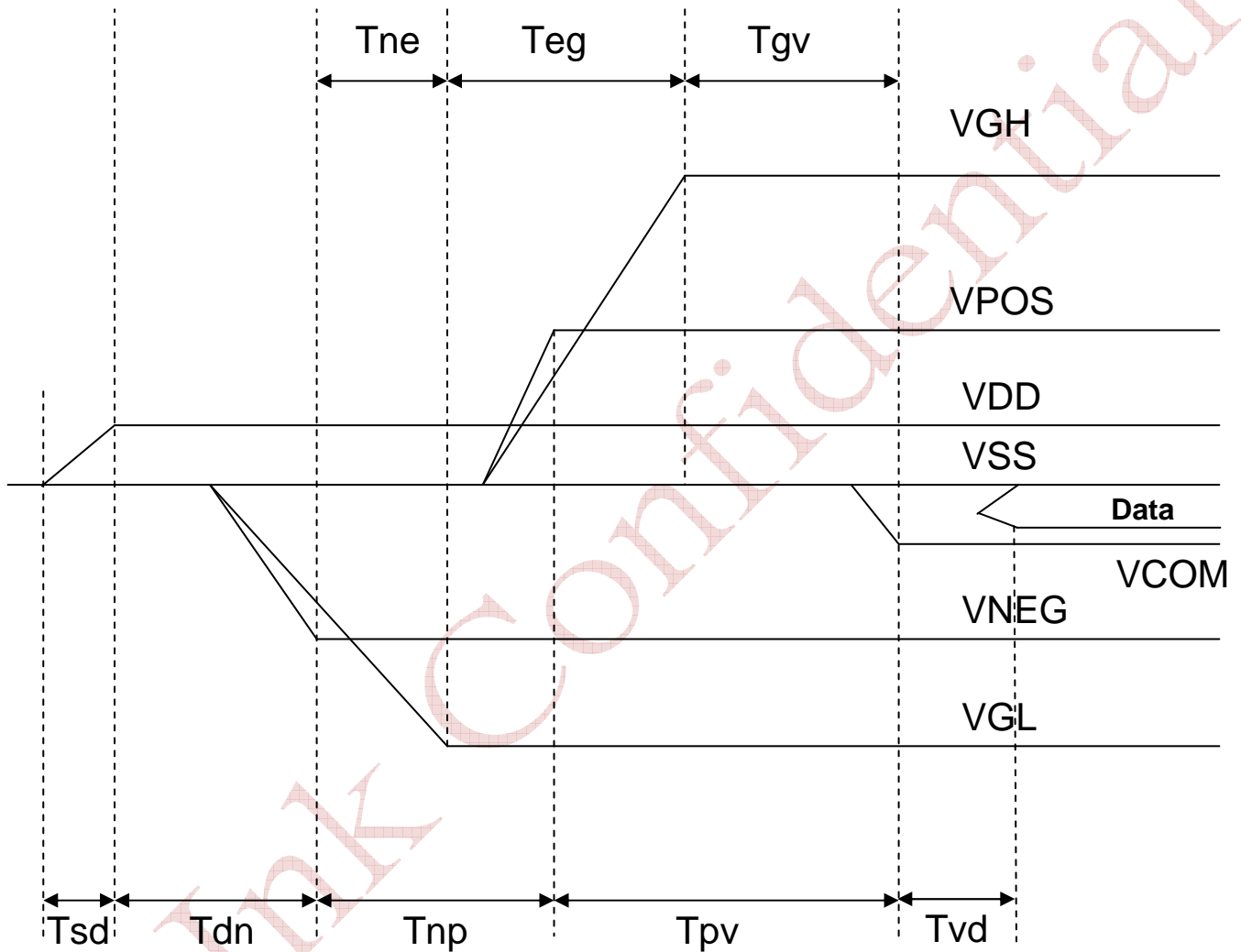


**7. Power on Sequence**

Power Rails must be sequenced in the following order :

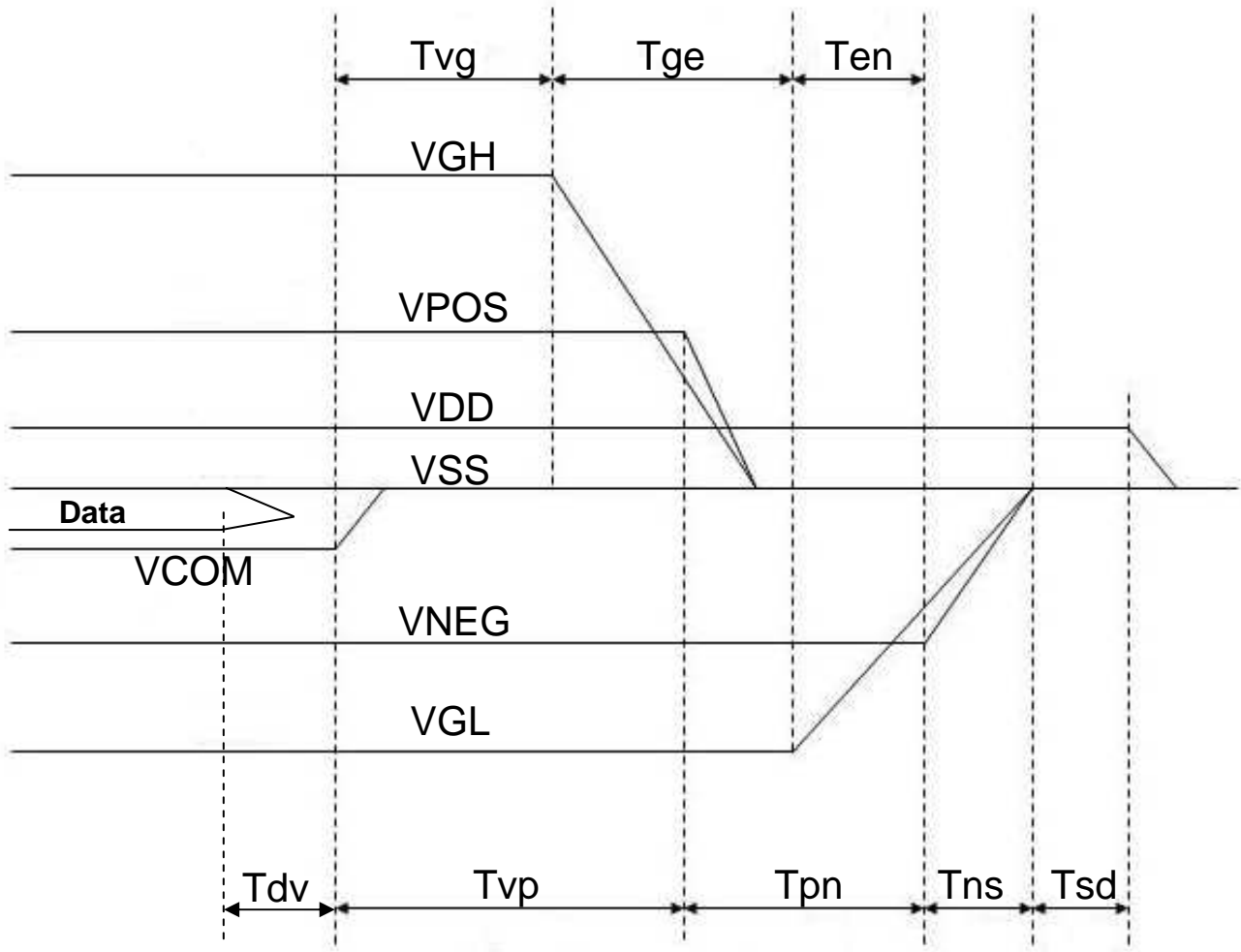
1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM
2. VSS → VDD → VGL → VGH (Gate driver)

**POWER ON**



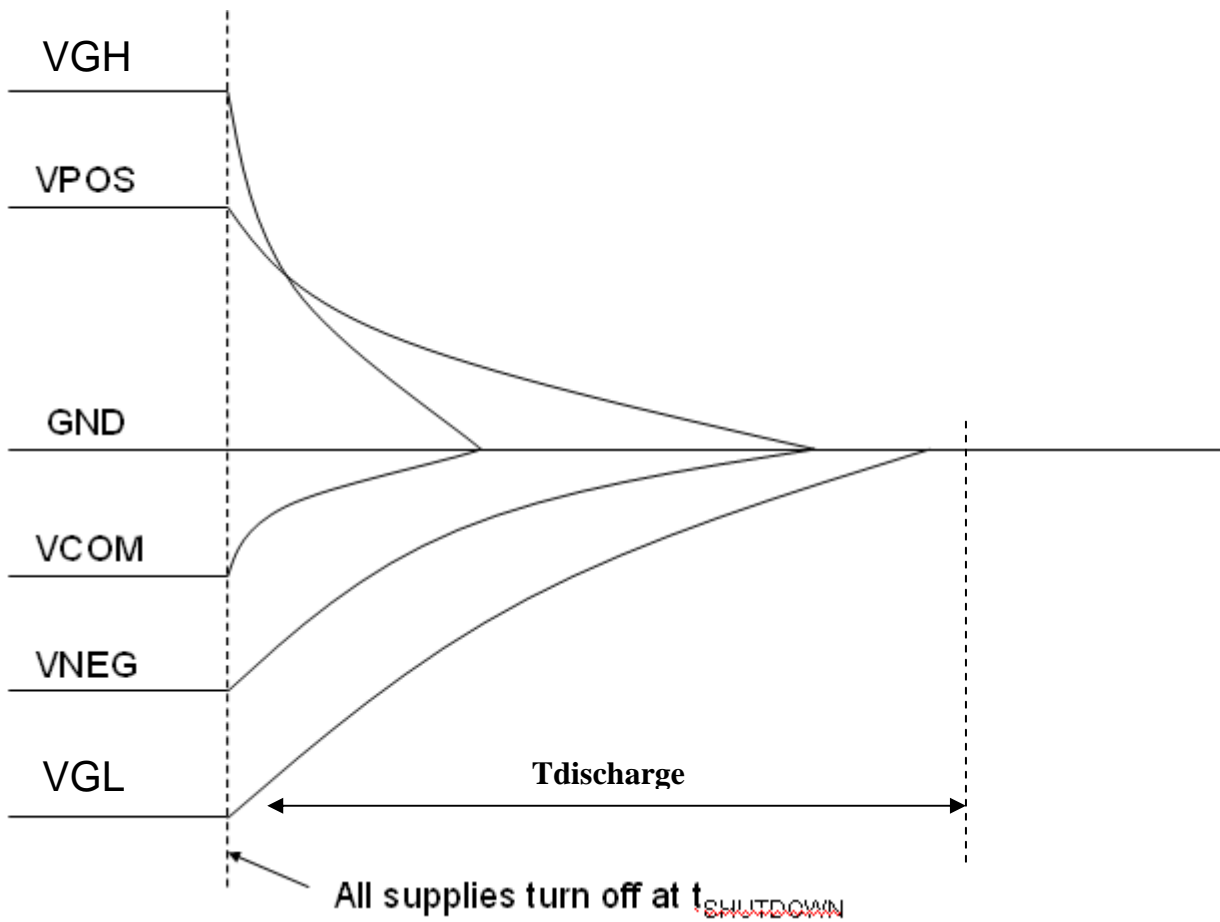
	Min	Max
Tsd	100us	-
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-

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 : VGL must remain negative of all other supplies during decay period.

**8-1) Refresh Rate**

	Min	Max
<b>Refresh Rate</b>	-	85Hz

**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°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT	Note
R	Reflectance	White	35	46	-	%	Note 9-1
Gn	N <sub>th</sub> Grey Level	-	-	$DS+(WS-DS) \times n / (m-1)$	-	L*	-
CR	Contrast Ratio	-	12	16	-	-	-

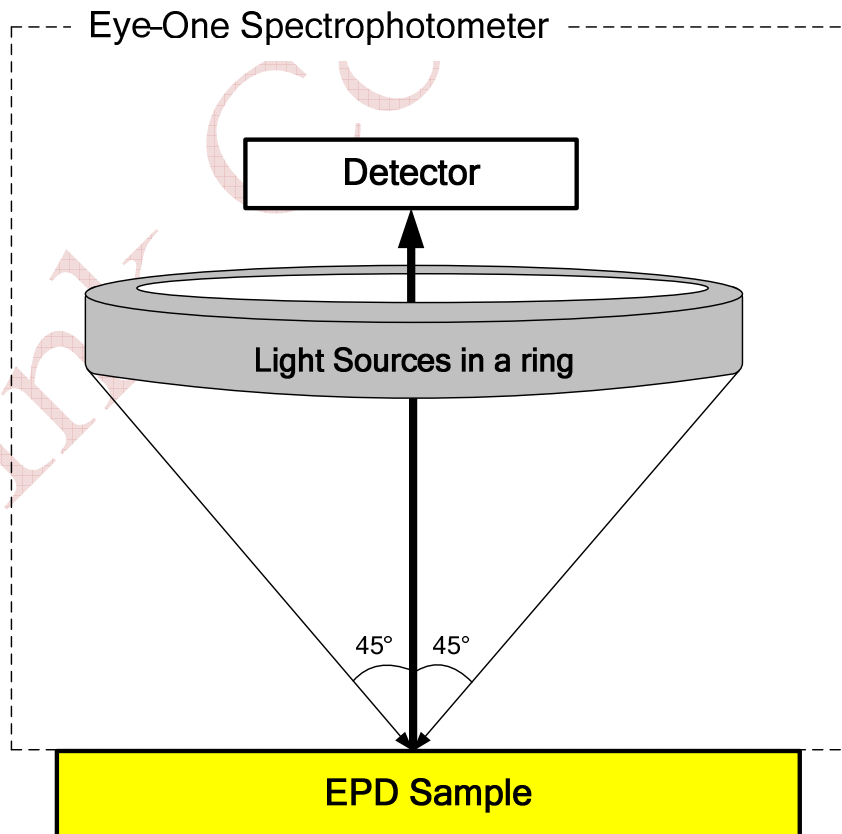
WS: White state , DS: Dark state, Gray state from Dark to White :DS、G1、G2...、Gn...、Gm-2、WS  
m:4、8、16 when 2、3、4 bits mode

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:

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

$L_{\text{center}}$  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.

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**10.HANDLING, SAFETY AND ENVIROMENTAL REQUIREMENTS**

<b>WARNING</b>
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.

<b>CAUTION</b>
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.

<b>Data sheet status</b>	
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
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 72 hrs	IEC 60 068-2-2Bp
2	Low-Temperature Operation	T = 0°C for 72 hrs	IEC 60 068-2-2Ab
3	High-Temperature Storage	T = +60°C, RH=25% for 72 hrs (Test In White Pattern)	IEC 60 068-2-2Bp
4	Low-Temperature Storage	T = -25°C for 72 hrs (Test In White Pattern)	IEC 60 068-2-1Ab
5	High-Temperature, High-Humidity Operation	T = +40°C, RH = 90% for 72 hrs	IEC 60 068-2-3CA
6	High Temperature, High- Humidity Storage	T = +60°C, RH=80% for 72 hrs (Test In White Pattern)	IEC 60 068-2-3CA
7	Temperature Cycle	-25°C → +70°C, 50 Cycles 30mins 30 mins (Test In White Pattern)	IEC 60 068-2-14
8	Solar Radiation test	765 W/m <sup>2</sup> for 72hrs,40°C (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)	(Air mode)+/-12kV; (Test in active area.) (Contact mode)+/-8kV (Test in active area.)	IEC 62179, IEC 62180

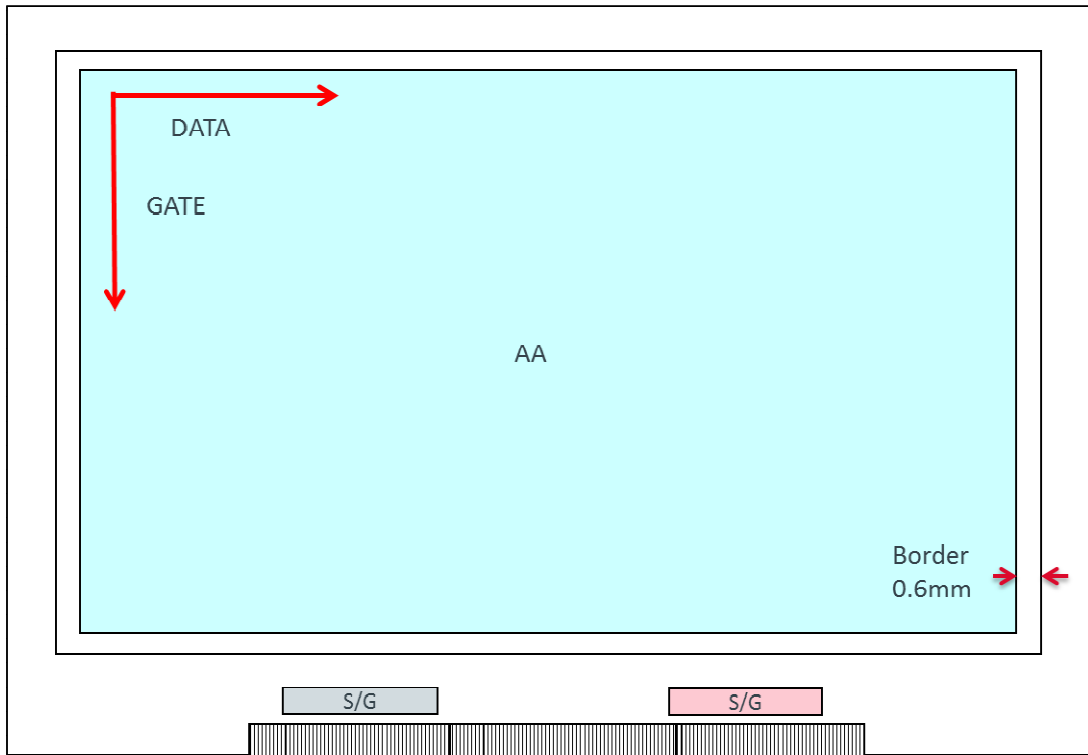
Actual EMC level to be measured on customer application

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

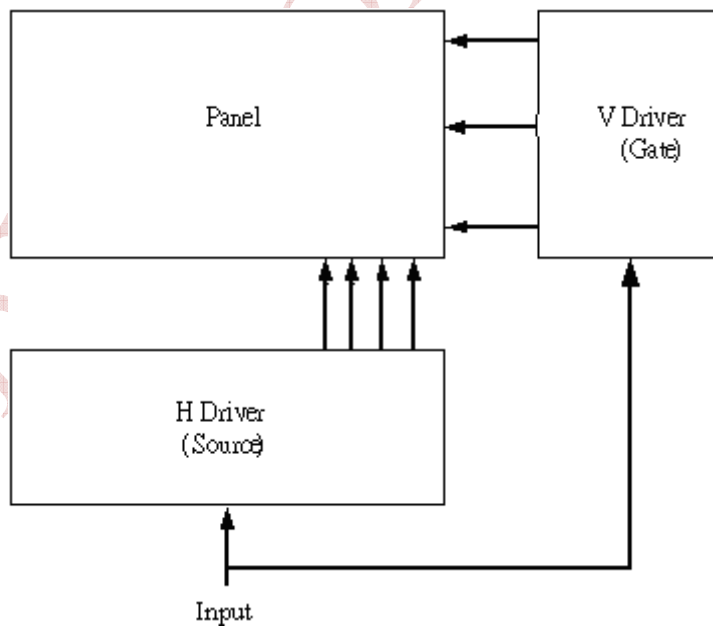
**[Criteria]**

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.

**12. Border definition and scan direction**



**13. Block Diagram**



**14.Packing**  
TBD

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