

Product Type : EPD

Model Number : BLGDEP014TT1

Description : Screen Size: 1.43"
Color: Black and White
Display Resolution: 296*128

1. General Description

reflective electrophoretic E Ink technology display module based on active matrix TFT and plastic substrate. The plastic substrate is protected by an outer covering, which is a part of the display. It has 1.43" active area with 128 x 296 pixels, the display is capable to display images at 2 gray levels (1 bits) depending on the display controller and the associated waveform file it used.

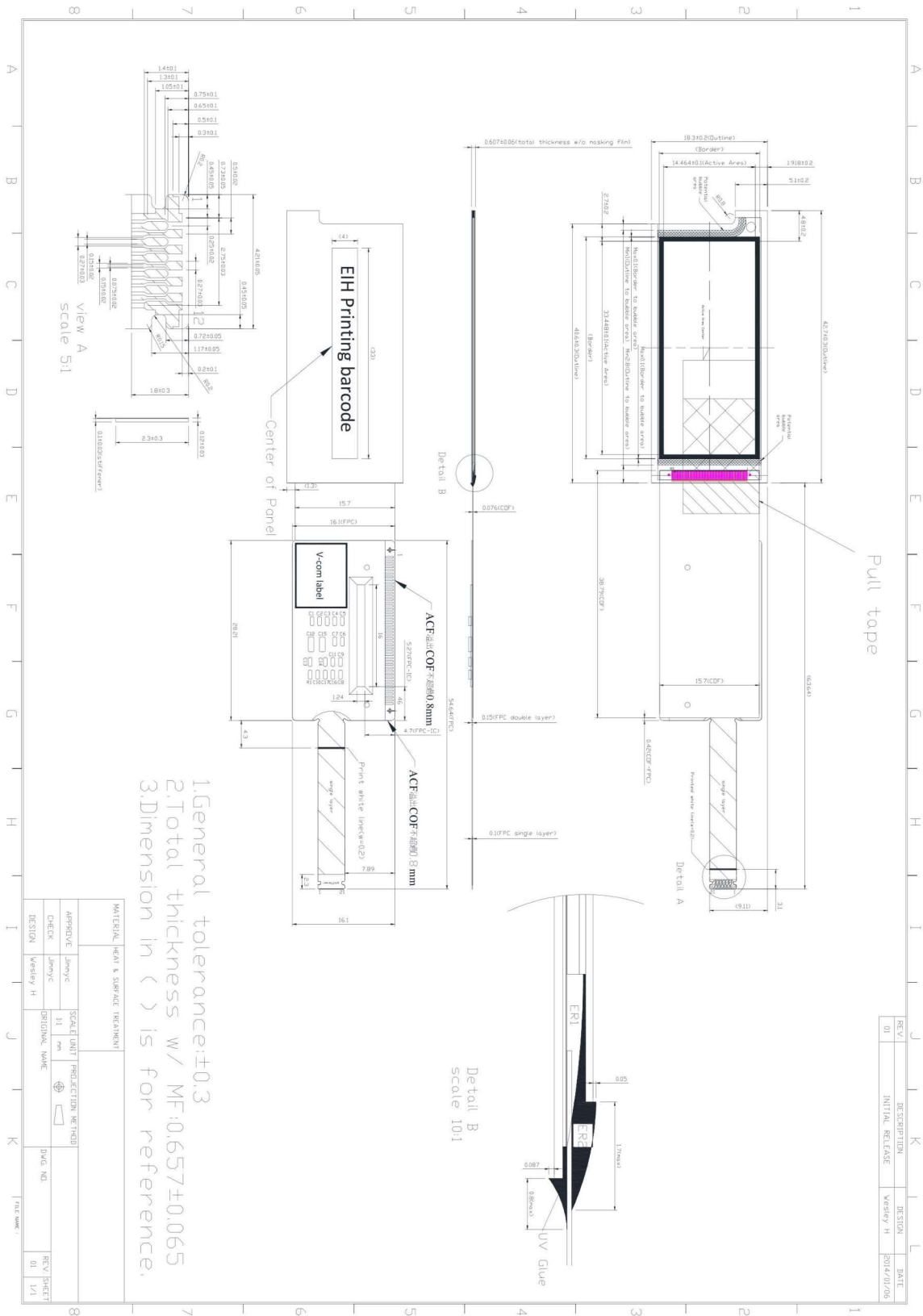
2. Features

- High contrast reflective/electrophoretic technology
- 128x296 display
- High reflectance
- Ultra wide viewing angle
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Hard-coated front-surface
- Plastic substrate

3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	1.43	Inch	
Display Resolution	128 (H) ×296(V)	Pixel	
Active Area	14.464 (H)×33.448 (V)	mm	
Pixel Pitch	0.113 (H)×0.113 (V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	18.3(H)*42.7(V)*0.607(D)	mm	
Module Weight	0.87±0.1	g	

4. Mechanical Drawing of EPD Module



5. Input /Output Interface

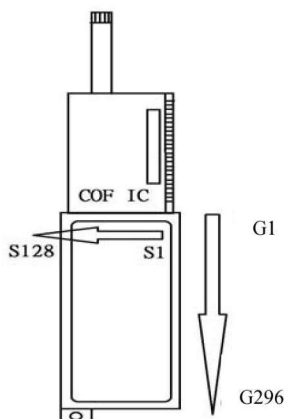
5-1) Pin Assignment

Pin	Symbol	note
1	VDD	Power supply
2	PWRON	Power on switching pin Connect to VDD
3	CSB	Chip select Low: chip is enabled High: Chip is disabled Must be fixed at VDD level when chip is not active.
4	SCL	Serial input clock
5	SDI	serial input data
6	SDO	serial output data
7	RESETB	Reset pin, Low active. The chip must be reset after power-on.
8	BUSY	The BUSY pin is used to determine whether this chip is idle or internally operating. When chip is performing some internal operations, this pin is set to "VDD"
9	OEI	Gate output enable pin. When OEI="VDD", all gate channels driver output="VGL" When OEI="GND" gate channels will output VGH or VGL depends on the data Must be fixed at GND level when use internal OE function.
10	GND	Ground
11	VCOM	A supply voltage to the common electrode of TFT panel.
12	VCOM_P	Common Connection

5-2) Panels Electrical Connection

SERVICE	CONNECTOR	TYPE NUMBER	NUMBER OF PINS	MATING CONNECTOR
Interface	DDK	FF28-12A-R11A-3H	12	0.25mm pitch

5-3) Panel Scan direction



6. Electrical Characteristics

6-1) Absolute maximum rating

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	VDD	-0.3 to +6	V
Operating Temp. Range	TOTR	0 to +50	°C
Storage Temperature	TSTG	-25 to +70	°C

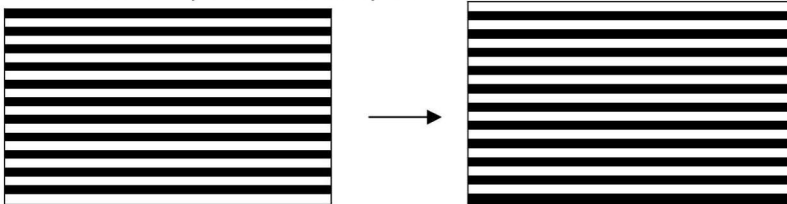
6-2) Panel DC characteristics

Parameter	symbol	conditions	Min	Typ	Max	Unit
Signal ground	Vss		-	0	-	V
Logic voltage supply	Vdd		2.3	3.3	3.6	V
	Ivdd	Vdd=3.3V	-	6	13	mA
Common voltage	Vcom		-4	Adjusted	-1	V
Maximum Power panel	Pmax		-	-	42	mW
Typical power panel	Ptyp		-	20	-	mW
Standby power panel	Pstby		-	-	0.017	mW

- The maximum power consumption is measured 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 with following pattern transition: from horizontal 2 gray scale pattern to vertical 2 gray scale pattern.(Note 6-2)
- The standby power is the consumed power when the panel controller is in standby mode.

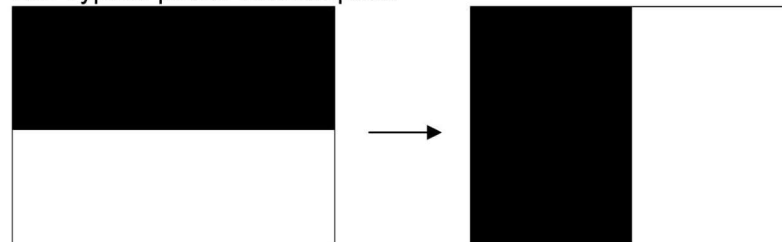
Note 6-1

The maximum power consumption



Note 6-2

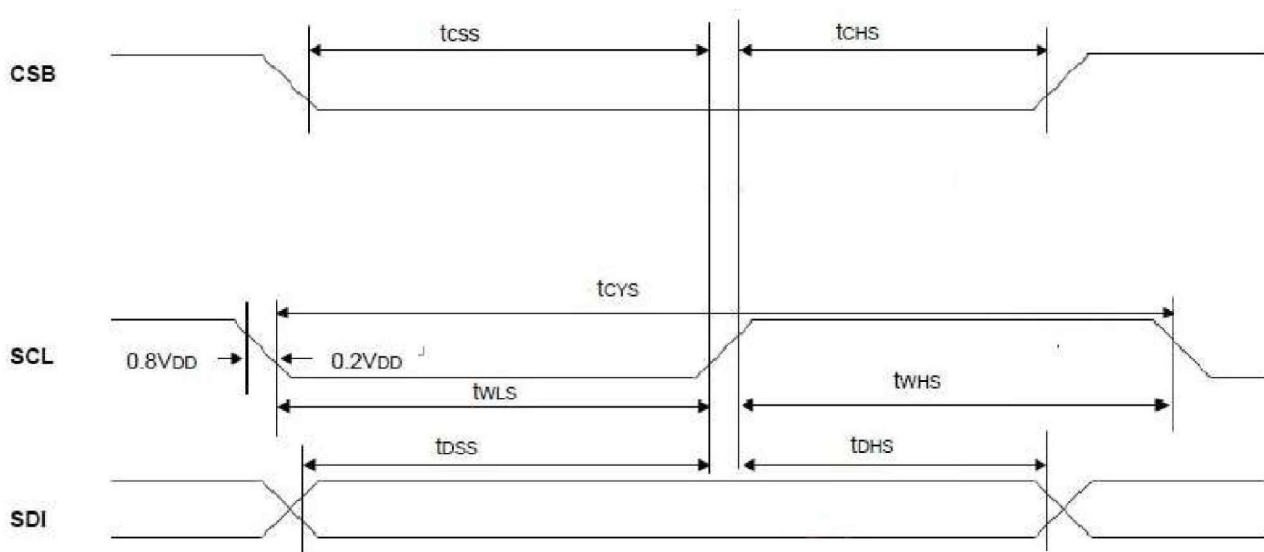
The Typical power consumption



6-3) Panel AC characteristics

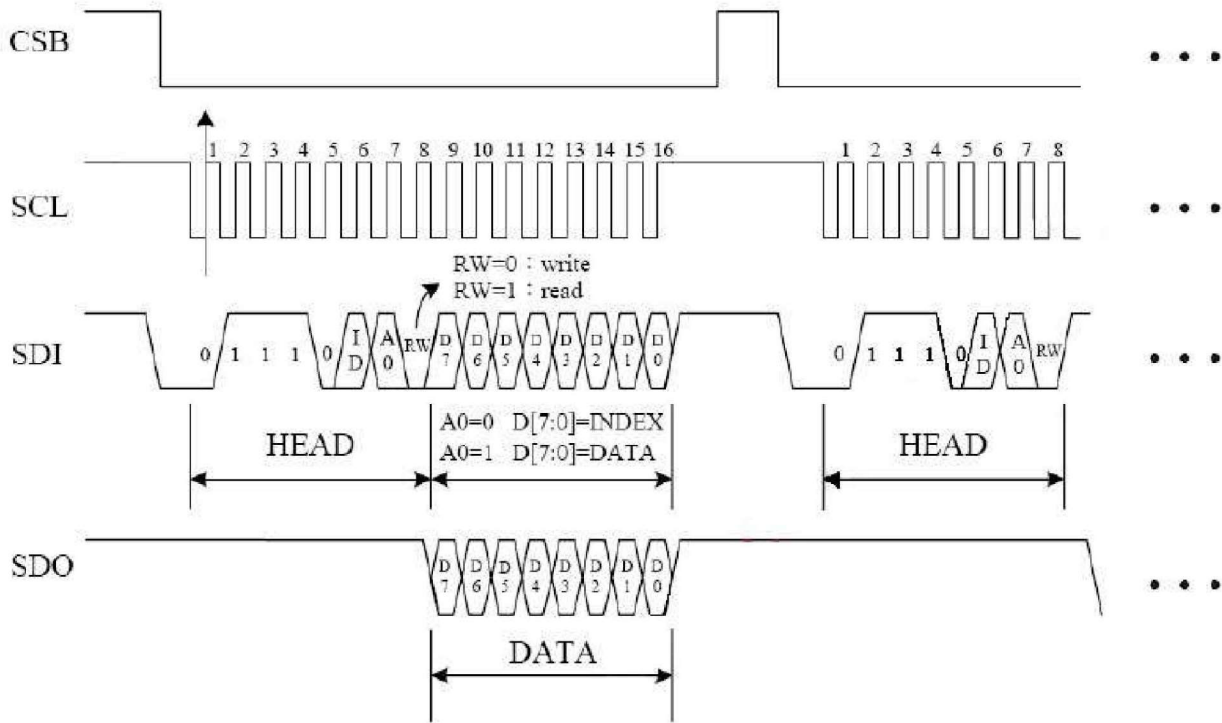
VCC=2.3V to 3.6V, Temp=-20 to +75°C

Parameter	Symbol	Min	Typ	Max	Unit
Serial	tCYS	50	-	-	nS
SCLK	tWHS	25	-	-	nS
SCLK	tWLS	25	-	-	nS
Data	tDSS	12	-	-	nS
Data	tDHS	12	-	-	nS
CSB	tCSS	12	-	-	nS
CSB	tCHS	20	-	-	nS

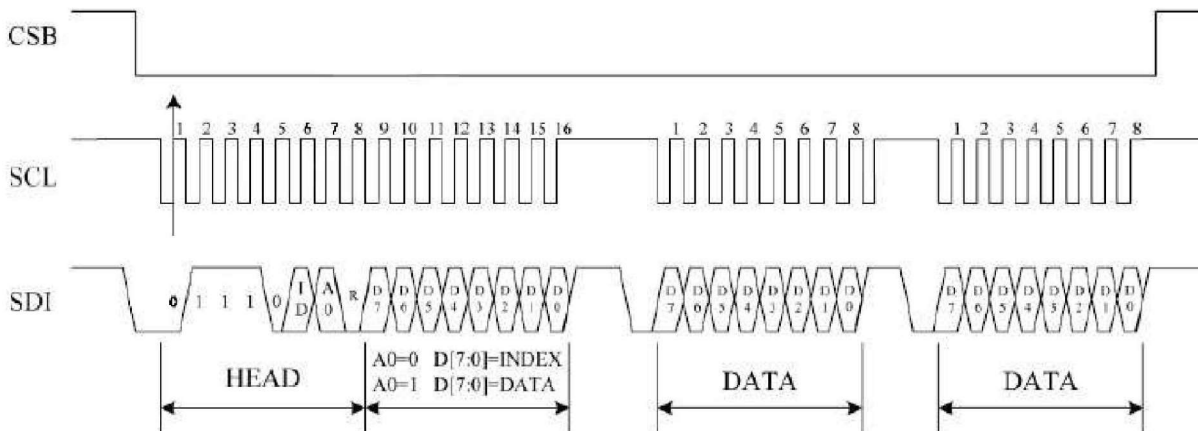


Serial Bus Timing Characteristics (for Serial MCU)

(1) For typical Read/Write data command



(2) For Channel setting and Write data command



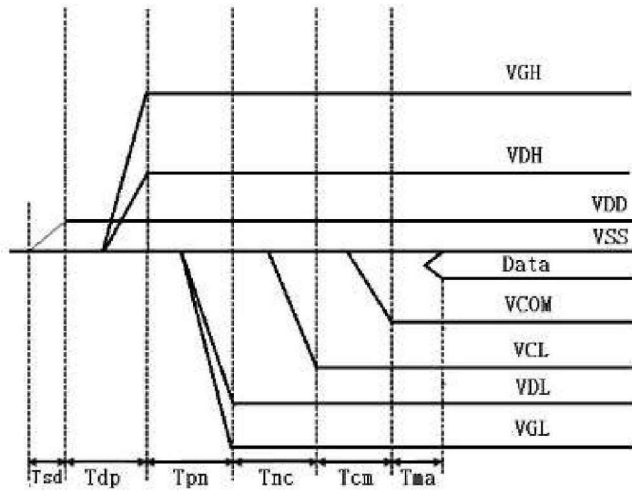
7. Power Sequence

Power Rails must be sequenced in the following order :

7.1 VSS->VDD->VDH->VDL(Source Driver)->VCOM->VCL

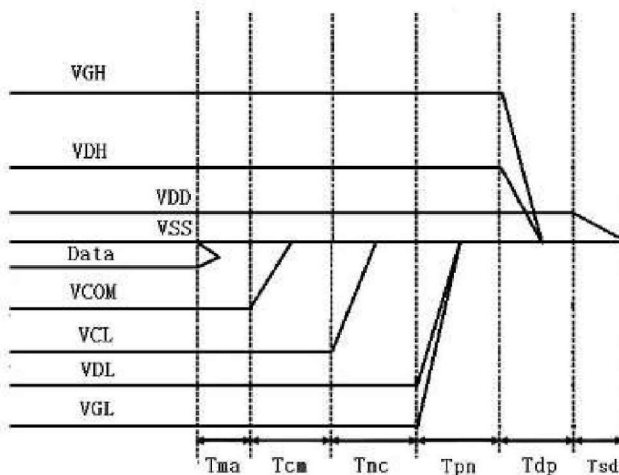
7.2 VSS->VDD->VGH->VGL(Gate Driver)

POWER ON



	Min	Max
Tsd	30us	-
Tdp	60ms	-
Tpn	60ms	-
Tnc	60ms	-
Tcm	60ms	-
Tma	1ms	-

POWER DOWN



	Min	Max
Tsd	30us	-
Tdp	60ms	-
Tpn	60ms	-
Tnc	60ms	-
Tcm	60ms	-
Tma	1ms	-

9. Optical characteristics

9-1) Specifications

Measurements are made with that the illumination is under an angle of 45 degrees, the detector is perpendicular unless otherwise specified.

T = 25°C

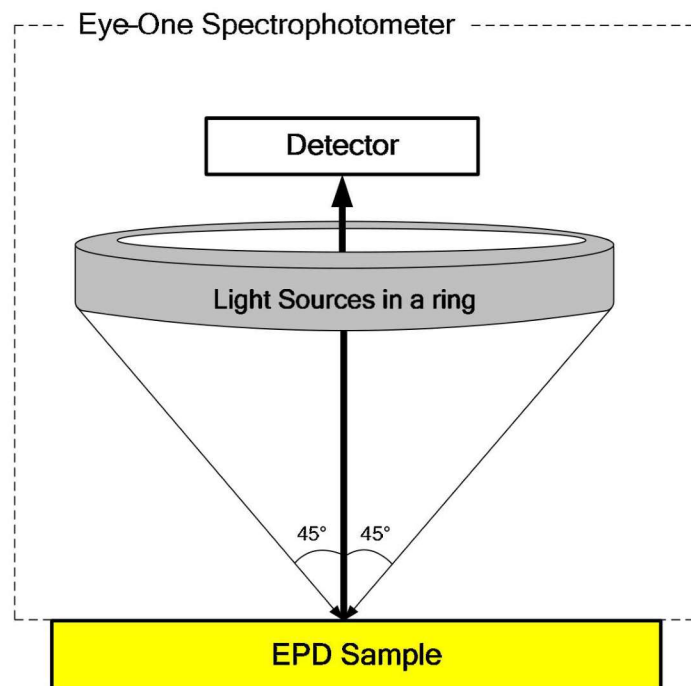
Symbol	Parameter	Conditions	Min	Typ.	Max	Unit	Note
R	Reflectance	White	30	35	-	%	Note 9-1
Gn	N th Grey Level	-	-	$DS+(WS-DS) \times n/(m-1)$	-	L*	-
CR	Contrast Ratio	-	9	11	-		-
T _{update}	Update time	1-bit mode		TBD	-	ms	-

WS: White state , DS: Dark state

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 (RI) and the reflectance in a dark area (Rd): $CR = R_I / R_d$



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,ENVIROMENTAL REQUIREMENTS AND REMARK

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.
REMARK
All the specifications listed in this document are guaranteed for module only. Post-assembled operation or component(s) may impact module performance or cause unexpected effect or damage and therefore listed specifications is not warranted after any post-assembly operation.

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 preliminary 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 = -5°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	Temperature Cycle	-25°C → +70°C, 100 Cycles 30min 30min Test in white pattern	IEC 60 068-2-14
7	Solar radiation test	765 W/m ² for 168hrs, 40°C Test in white pattern	IEC60 068-2-5Sa
8	Package Vibration	1.04G, Frequency: 10~500Hz Direction: X,Y,Z Duration: 1 hours in each direction	Full packed for shipment
9	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
10	Electrostatic Effect (non-operating)	(Machine model)+/- 250V 0Ω, 200pF	IEC 62179, IEC 62180
11	COF Soldering Strength	Pull the COF soldered part with a force of 500g in the Horizontal and Vertical directions.	

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. Bar Code definition



- (1) YYYYYYYYY: Module No.
- (2) MMMMMMMM: Product date: year month day.
- (3) Bar Code definition.

T 01 B S215AB YYY 00001

(1) (2) (3) (4) (5) (6)

(1) Module Assemble Vendor.

(2) Version.

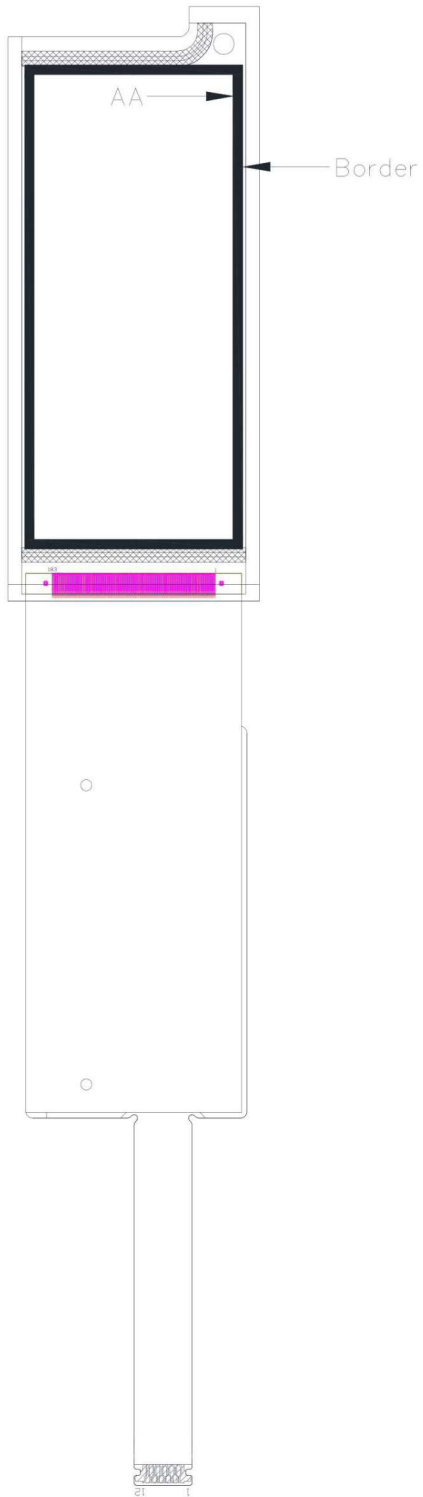
(3) Application.

(4) O-Paper Film LOT.

(5) Product LOT.

(6) Product Serial Number.

13. Border definition



14. Block Diagram

