SAMSUNG DISPLAY

Product Information

The information described in this SPEC is preliminary and can be changed without prior notice.

CUSTOMER	GA
DATE OF ISSUE	06/26/2012

MODEL NO.	LTI700HA02
EXTENSION CODE	-0

Customer Approval & Feedback

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LCD Sales & Marketing Team **Samsung Display Co., Ltd**	

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REVISION HISTORY

Date.	Rev.No.	Page	Revision Description
06/26/2012	000	all	Fist issued

GENERAL DESCRIPTION

DESCRIPTION

LTI700HA02-0 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit, and a back-light unit. This 70.0" model has a resolution of 1920 x 1080 pixels (16:9) can display up to 16.7 Million colors with the wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide an excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV, Display terminals for AV application products, and Digital Information Display (DID).

FEATURES

High contrast ratio & aperture ratio with the wide color gamut
RoHS compliance (Pb-free)
High Tni Liquid Crystal
SPVA(Super Patterned Vertical Align) mode
Wide viewing angle (±178°)
High speed response (with DCC circuit)
Wide UXGA (1920 x 1080 pixels, 16:9)
Edge LED (Light Emitted Diode) BLU
DE (Data enable) mode
The interface (2pixel/clock) of LVDS serial interface

APPLICATIONS

Digital Information Display (DID)

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	1549.44 (H) x 871.56 (V)	mm	
Driver Element	a-Si TFT active matrix		
Display colors	16.7M (8bit)		
Number of pixel	1920 X 1080	Pixel	
Pixel Arrangement	RGB vertical stripe		
Pixel pitch	0.807 (H) x 0.807 (V) (Typ)		
Display Mode	Normally Black		
Surface treatment	Haze 2.3%(Typ) / 2H(min)		Anti-Glare
Luminance of White	400(Typ)	cd/m^2	

MECHANICAL INFORMATION

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	TBD	1600.0	TBD	mm	
	Vertical (V)	TBD	922.0	TBD	mm	
	Depth (D)	TBD	11.7	TBD	mm	Min depth
Weight		-	TBD	TBD	g	

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

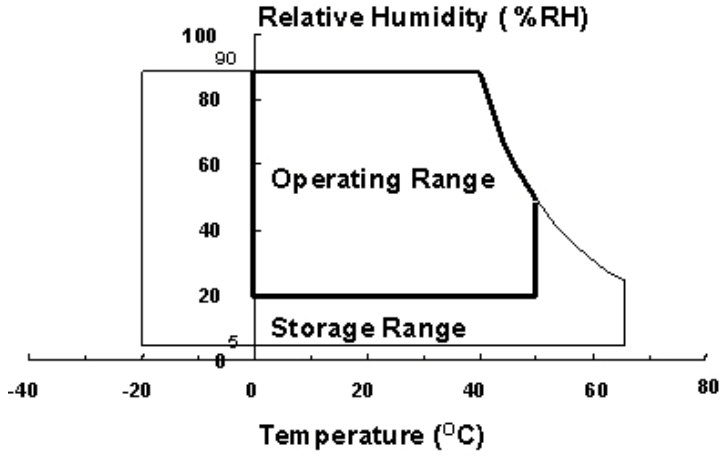
Item		Symbol	Min.	Max.	Unit	Note
Storage temperate		T_{STG}	-20	65	°C	(1)
Operation Temperature		T_{OPR}	0	50	°C	(1)
Glass Surface temperature (Operation)	Center	T_{SUR}	0	50	°C	(1), (2)
	T.Uniformity	ΔT	-	10	°C	

Note (1) Temperature and relative humidity range are shown in the figure below.

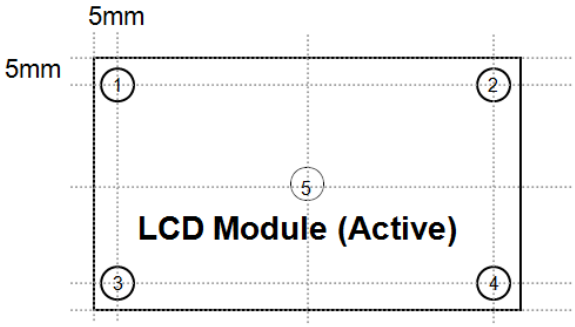
a. 90 % RH Max. (Ta ≤ 39 °C)

b. Relative Humidity is 90% or less. (Ta > 39 °C)

c. No condensation



Note (2) Definition of test point



△T should be less than *10* ℃ (ΔT = $|T_{CENTER} - T_{CORNER}|$)

T_{CENTER} : Temperature of the center of the glass surface (Test point 5)

T_{CORNER} : Temperature of each edge of the glass surface (Test point 1~4)

Note (3) Module vibration and shock tests are not guaranteed due to limitation of equipment for this model.

1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	10.8	13.2	V	(1)

Note (1) Ta= 25 ± 2 °C
The permanent damage or defect to the device may occur if the panel is operated at the figure set, which exceeds a ceiling of maximum value stated in the former spec. The functional operation should be limited to the conditions described above under normal operating conditions.

(2) BACK LIGHT UNIT

Item	**Symbol**	**Min.**	**Max.**	**Unit**	**Note**
Input Supply Voltage / Converter	Vcc		TBD	V	
LED Current	ILED,2D	-	TBD	mAmean	Continuous operation @String (1 String/PCB) Operating Current 400mA

2. Application Information for DID(Digital Information Display)

A DID's screen may display the sudden image such as an image retention.
To extend the lifetime and optimize a function of module, the below-mentioned operating conditions are required.

1. Normal operating condition
a. Temperature: 20 ±15℃
b. Humidity: 55 ±20 %
c. Display pattern: Moving image or image, which switches regularly
Note) The sudden image on the screen can be displayed after the static image is shown in the long-term.

2. The operating conditions when the module is operated under the abnormal condition.
a. Ambient condition
-It is recommended to set the DID up in the well-ventilated place.
b. The function of power off and screen saver
-The function of periodical power-off or a screen saver is needed when the static image is displayed in the long-term.

3. Operating conditions to prevent the sudden display resulted from displaying the static image in the long-term.
a. The proper operating time: Under 12 hours a day.
b. The moving image shall be inserted between the static displays periodically.
-The refresh time for liquid crystal is needed.
c. The periodic changing of background color and character's color(image)
-Use the different color for background and character (image) respectively.
-Change colors periodically.
d. Avoid combining the color for background with the color for character, which has a largely different luminance.
Note (1) Abnormal condition means all operating condition except normal operating condition.
Note (2) The moving image or black pattern is strongly recommended as a screen saver.

4. Only the lifetime of DID stated in this spec is guaranteed if the DID is used under the proper operating conditions.

3. OPTICAL CHARACTERISTICS

The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ELDIM EZ-Contrast

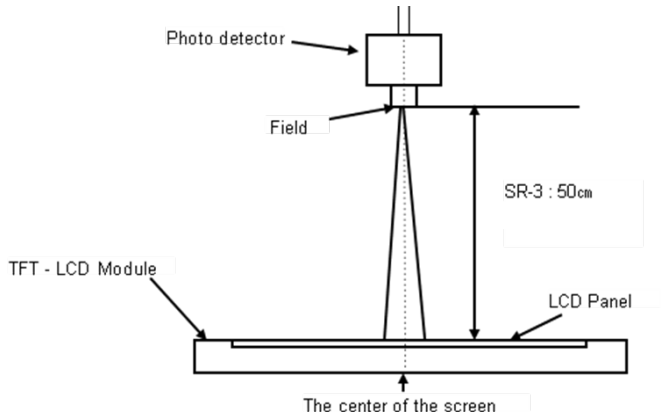
Ta = 25 ± 2 °C, V_{DD} =12V, fv= 60Hz, f_{DCLK} = 148.5MHz, I_F = 100% Duty

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		C/R	Normal $\phi = 0$ $\theta = 0$ Viewing Angle	3000	4000	-	-	(3) SR-3
Response time	G-to-G (AVG)	T_g		-	8	15	msec	(5) RD-80S
Luminance of White (At the center of screen)		Y_L		300	400	-	cd/m^2	(6) SR-3
Color Chromaticity (CIE 1931)	Red	R_X		TYP. -0.03	0.640	TYP +0.03	-	(7), (8) SR-3
		R_Y			0.333			
	Green	G_X			0.320			
		G_Y			0.605			
	Blue	B_X			0.150			
		B_Y			0.055			
	White	W_X			0.280			
		W_Y			0.290			
Color Gamut		-	-	-	70	-	%	(7) SR-3
Color temperature		-	-	-	10000	-	K	
Viewing Angle	Hor.	θ_L	CR ≥ 10	79	89	-	Degree	(8) EZ-Contrast
		θ_R		79	89	-		
	Ver.	θ_U		79	89	-		
		θ_D		79	89	-		
Brightness Uniformity (9 Point)		B_{uni}	-	-	-	TBD	%	(4) SR-3

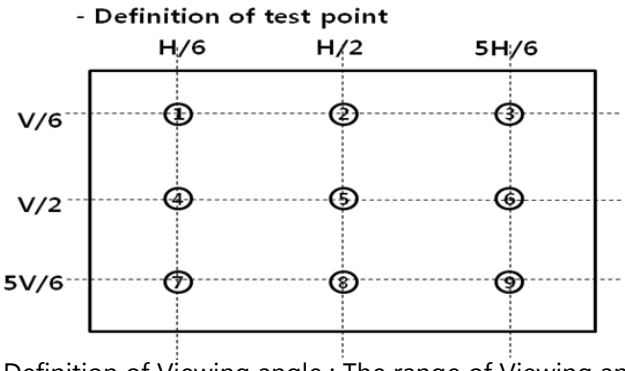
Note (1) Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the backlight at the given temperature for stabilization of the backlight. This should be measured in the center of screen.

Single lamp current : 160mA
Environment condition : Ta = 25 ± 2 °C



Note (2) Definition of test point



H : Horizontal length of Active Area
V : Vertical height of Active Area.

Note (3) Definition of Viewing angle : The range of Viewing angle(10 ≤ C/R).
: Ratio of max. gray (Gmax) & min. gray (Gmin) at the center point ⑤ of the panel.

$$C/R = \frac{G\max}{G\min}$$

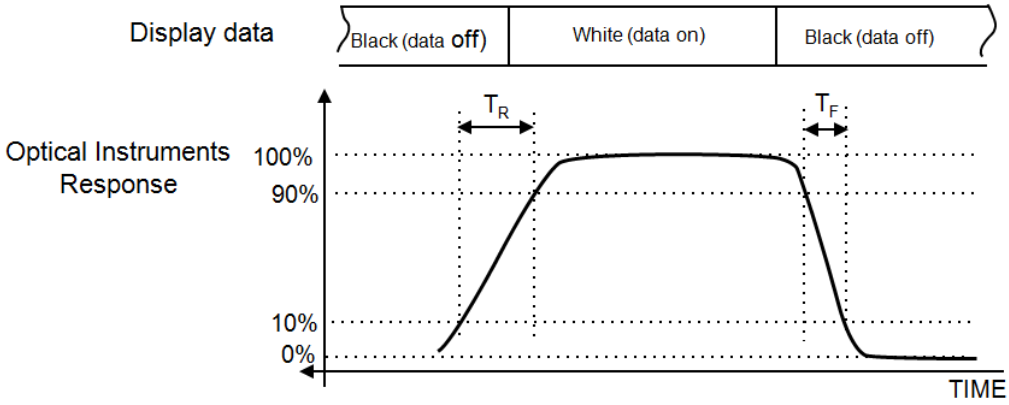
Gmax : Luminance in all white pixels
Gmin : Luminance in all black pixels.

Note (4) Definition of brightness uniformity at 9 points (Test pattern : Full white)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (5) Definition of Response time : Average response time of all Gray to Gray except Tr, Tf



※ G-to-G : Average response time between the whole gray scale to the whole gray scale.

Gray to Gray Response Time											
	Gray	End									
		0	31	63	95	127	159	191	223	255	
Start	0		Tr(0-31)	Tr(0-63)	Tr(0-95)	Tr(0-127)	Tr(0-159)	Tr(0-191)	Tr(0-223)	Tr(0-255)	Ton
	31	Tf(31-0)		Tr(31-63)	Tr(31-95)	Tr(31-127)	Tr(31-159)	Tr(31-191)	Tr(31-223)	Tr(31-255)	
	63	Tf(63-0)	Tf(63-31)		Tr(63-95)	Tr(63-127)	Tr(63-159)	Tr(63-191)	Tr(63-223)	Tr(63-255)	
	95	Tf(95-0)	Tf(95-31)	Tf(95-63)		Tr(95-127)	Tr(95-159)	Tr(95-191)	Tr(95-223)	Tr(95-255)	
	127	Tf(127-0)	Tf(127-31)	Tf(127-63)	Tf(127-95)		Tr(127-159)	Tr(127-191)	Tr(127-223)	Tr(127-255)	
	159	Tf(159-0)	Tf(159-31)	Tf(159-63)	Tf(159-95)	Tf(159-127)		Tr(159-191)	Tr(159-223)	Tr(159-255)	
	191	Tf(191-0)	Tf(191-31)	Tf(191-63)	Tf(191-95)	Tf(191-127)	Tf(191-159)		Tr(191-223)	Tr(191-255)	
	223	Tf(223-0)	Tf(223-31)	Tf(223-63)	Tf(223-95)	Tf(223-127)	Tf(223-159)	Tf(223-191)		Tr(223-255)	
	255	Tf(255-0)	Tf(255-31)	Tf(255-63)	Tf(255-95)	Tf(255-127)	Tf(255-159)	Tf(255-191)	Tf(255-223)		
		Toff									

T*(X-Y) : Response time from level of gray at X to level of gray at Y

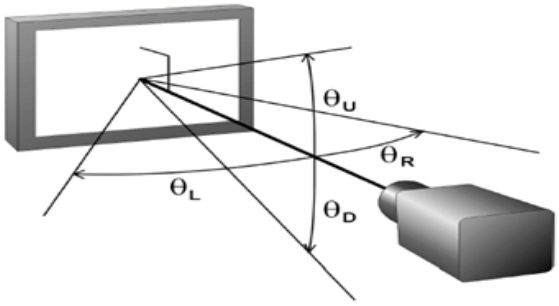
The definition of response time = Σ [T*(X-Y)] / 72

Note (6) Definition of Luminance of White : Luminance of white at center point ⑤

Note (7) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (8) Definition of Viewing Angle : Viewing angle range (C/R ≥ 10)



4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD MODULE

The connector to transmit a display data and a timing signal should be connected.

Ta = 25 ± 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	TBD	TBD	mA	(2), (3)
	(b) White		-	TBD	TBD		
	(C) TBD		-	TBD	TBD		
Vsync Frequency		f_V	48	60	62	Hz	-
Hsync Frequency		f_H	54	67.5	69.75	kHz	-
Main Frequency		F_{dclk}	118.8	148.5	153.5	MHz	-
Rush Current		IRUSH	-	-	7	A	(4)

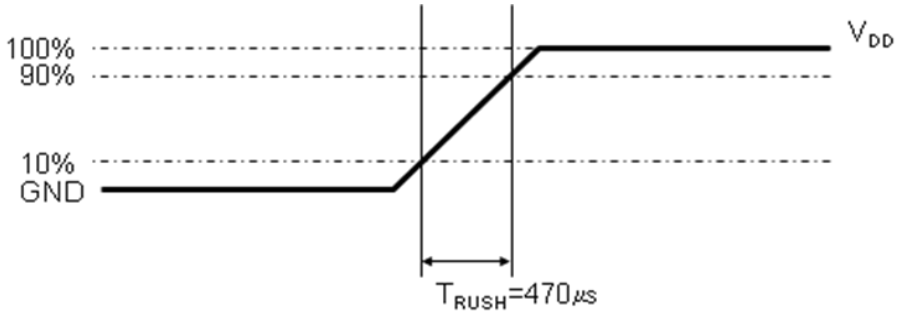
Note (1) The ripple voltage should be controlled under 10% of V_{DD}.

Note (2) f_V=60Hz, f_{DCLK} = 148.5MHz, V_{DD} = 12.0V, DC Current.

Note (3) The pattern for checking the power dissipation (LCD module only).

a) Black Pattern b) White Pattern c) TBD

Note (4) Conditions for measurement



The rush current, I_{RUSH} can be measured when T_{RUSH}. is 470㎲.

4.2 BACK LIGHT UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	30,000	-	-	Hour	(1)

Note (1) It is Defined as the time to take until the brightness reduce to 50% of its original value
[Operating Condition : Ta = 25±2℃ , IL = 160mA , For single LED Only]

- Back light unit is composed of 4–LED bars
- 4 LED bars , 2 string / 1 bar , 27pcs of LEDs / 1String.

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Temperature range	Top	-30		85	℃	
Storage Temperature range	Tstg	-40		100	℃	
Junction Temperature	Tj			145	℃	
LED Forward Current	IF			260	mA	Per string
	IFP			360	mA	Per string
LED Forward Voltage	VF			202.5	V	@IF max, per string
	VFP			204.8	V	@IFP max, per string
Thermal Resistance Junction to PCB	Rth, JS			15	K/W	
Power Dissipation	Pd			105.3	W	Per bar
Operating Life Time	Hr			TBD	Hour	
LED Counts	Q			54	EA	Per bar

4.3 CONVERTER INPUT CONDITION & SPECIFICATION

ITEM	SYMBOL	CONDITION	SPECIFICATION			UNIT	NOTE
			MIN	TYP	MAX		
Input Voltage	Vin		22	24	26	V	Ta=25±2 °C
Inrush Current Note(*2)(*3)	$I_{INRUSH,N}$	V_{IN} = 24V, Dim=Max			TBD	A (max)	Initial turn on
Output Current(1)	$I_{LED\ N}$	Vin = 22~26V V_{DIM} = Max	152	160	168	mA	
Converter On/Off Control	ENA	Enable	2.4	-	5.5	V	After 1hour Warm-up
		Disable	-0.3	-	0.8		
Analog Dimming	V_{A_DIM}	Vin = 24.0V	0	-	3.3	V	
Backlight On/Off	ON	Vin = 24.0V	2.4	-	5.5	V	
	OFF		-0.3	-	0.8		

※ Power Consumption is measured at 400[cd/m2] of luminance condition which is the typical luminance value. Lamp Current is measured at the point before Lamp.

Note

(*1) All data was approved after running 120 minutes.

(*2) Inrush is measured within BLU on 10ms after leaving the BLU as it is at least 1hr or more at room temperature(25℃)

(*3) Additional Appendix for Input current at room temperature(25℃)

ITEM	SYMBOL	CONDITION	SPECIFICATION			UNIT	NOTE
			MIN	TYP	MAX		
Input Current (Normal Mode)	Iovershoot,N	Vin=24V, Dim=Max	-	TBD	TBD	Amean	Overshoot Current After Turn-on
	Isaturation,N		-	TBD	TBD	Amean	Saturation current after 1hr aging

5. INPUT TERMINAL PIN ASSIGNMENT

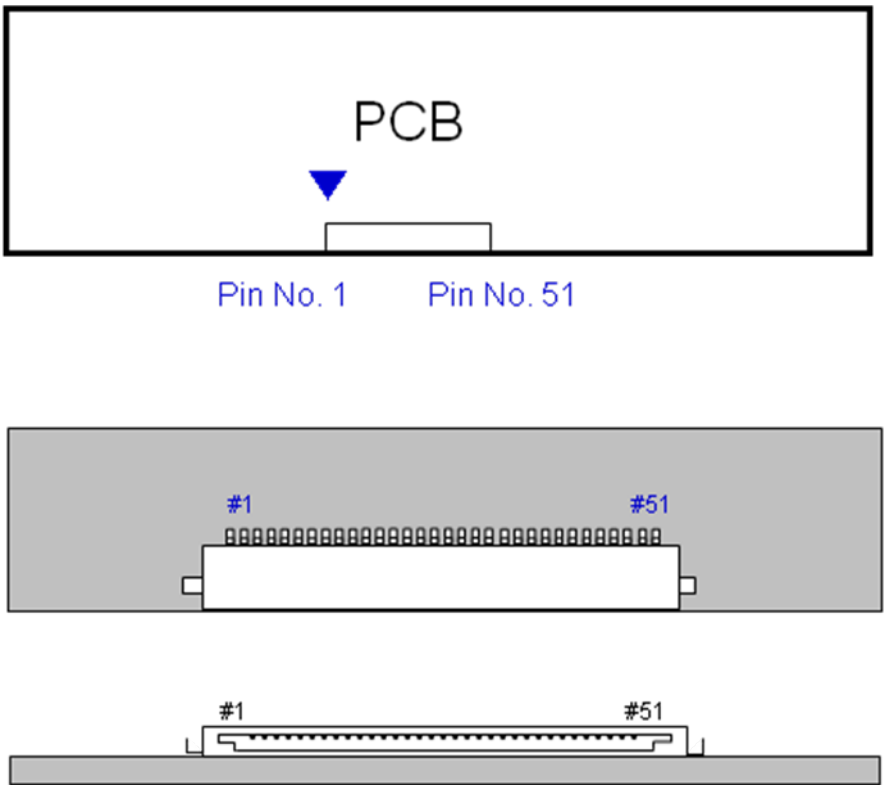
5.1 INPUT SIGNAL & POWER

Connector :FI-RE51S-HF-J (JAE)

Pin	Description		Pin	Description		
1	Vdd (12V)		26	LVDS Signal	Rx2[A]P	
2	Vdd (12V)		27		Rx2[B]N	
3	Vdd (12V)		28		Rx2[B]P	
4	Vdd (12V)		29		Rx2[C]N	
5	Vdd (12V)		30		Rx2[C]P	
6	No connection		31	GND		
7	GND		32	LVDS CLOCK	Rx2CLK_N	
8	GND		33		Rx2CLK_P	
9	GND		34	GND		
10	LVDS Signal	Rx1[A]N	35	LVDS Signal	Rx2[D]N	
11		Rx1[A]P	36		Rx2[D]P	
12		Rx1[B]N	37	No connection		
13		Rx1[B]P	38	No connection		
14		Rx1[C]N	39	GND		
15		Rx1[C]P	40	No connection		NOTE1
16	GND		41	No connection		
17	LVDS CLOCK	Rx1CLK_N	42	No connection		
18		Rx1CLK_P	43	No connection		
19	GND		44	No connection		
20	LVDS Signal	Rx1[D]N	45	LVDS_SEL		NOTE2
21		Rx1[D]P	46	No connection		NOTE1
22	No connection		47	No connection		
23	No connection		48	No connection		
24	GND		49	No connection		
25	LVDS Signal	Rx2[A]N	50	No connection		
			51	No connection		

(NOTE1) NOT CONNECTED : THIS PINS ARE ONLY USED FOR SEC INTERNAL OPERATIONS.
(NOTE2) LVDS_SEL : IF THIS PIN : HIGH (3.3V) → NORMAL NS LVDS FORMAT
: LOW (GND) → JEIDA LVDS FORMAT
Sequence : On = Vdd(T1) ≥ LVDS Option ≥ Interface Signal(T2)
OFF = Interface Signal(T3) ≥ LVDS Option ≥ Vdd

Note (3) LVDS Connector



a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All N.C pins should be separated from other signal or power.

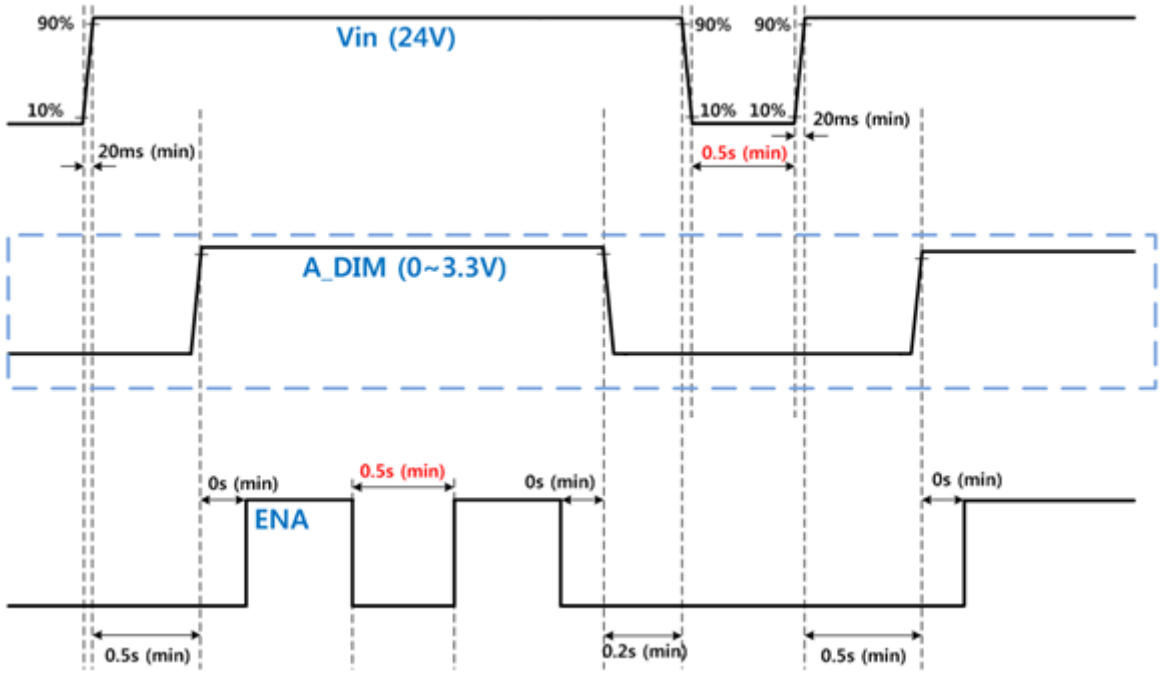
5.2 CONVERTER INPUT PIN CONFIGURATION

Connector : YEON HO, 20022WS-H145J CN001

PIN no.	Pin Configuration(FUNCTION)
1	Vin (24V)
2	Vin (24V)
3	Vin (24V)
4	Vin (24V)
5	Vin (24V)
6	GND
7	GND
8	GND
9	GND
10	GND
11	No Connection
12	Converter On / Off Control Signal
13	Analog Dimming Control Signal (0~3.3V)
14	No Connection

Note) Pin 14 should be disconnected from signal.

5.3 CONVERTER INPUT POWER SEQUENCE



5.4 LVDS INTERFACE

- LVDS Receiver : Tcon(Merged)
- Data Format (JEIDA & Normal) Default LVDS Option : JEIDA

	LVDS pin	JEIDA -DATA	VESA-DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

5.5 INPUT SIGNALS, BASIC DISPLAY COLORS AND GRAY SCALE

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R3~ R252
	↓ LIGHT	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G3~ G252
	↓ LIGHT	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B3~ B252
	↓ LIGHT	:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray(n = Gray Level)

Input Signal : 0 = Low Level Voltage, 1 = High Level Voltage

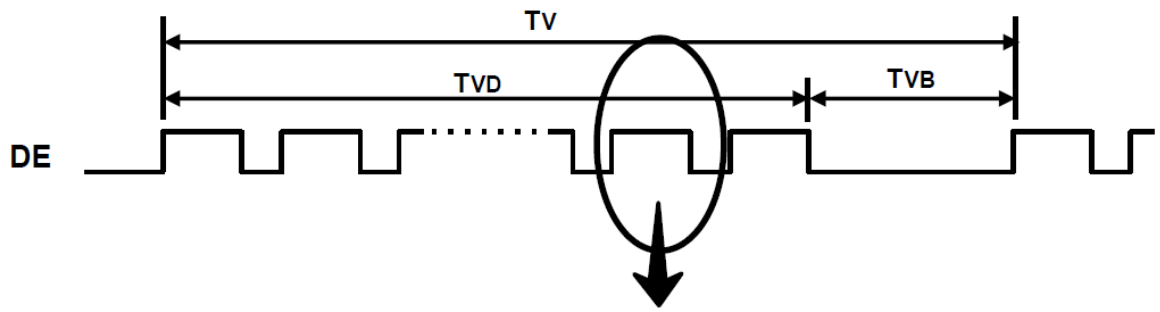
6. INTERFACE TIMING

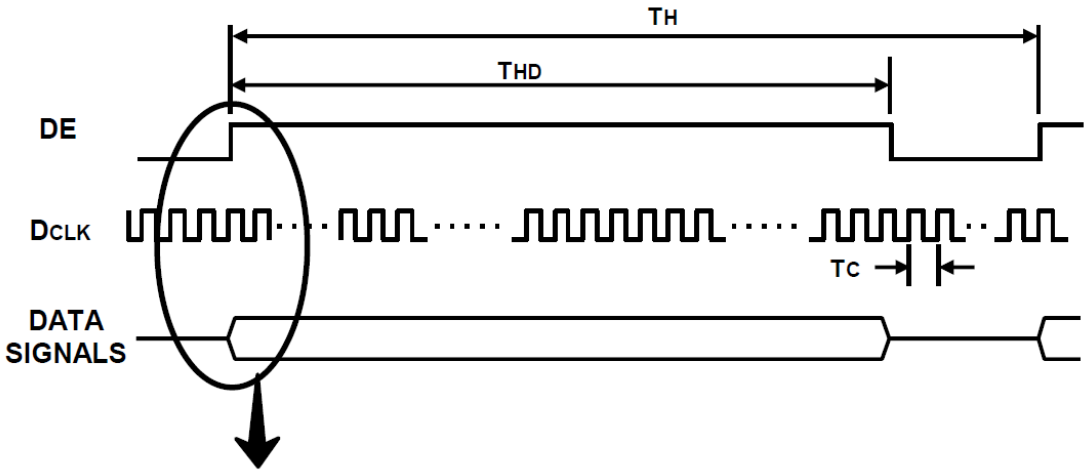
6.1 TIMING PARAMETERS (DE ONLY MODE)

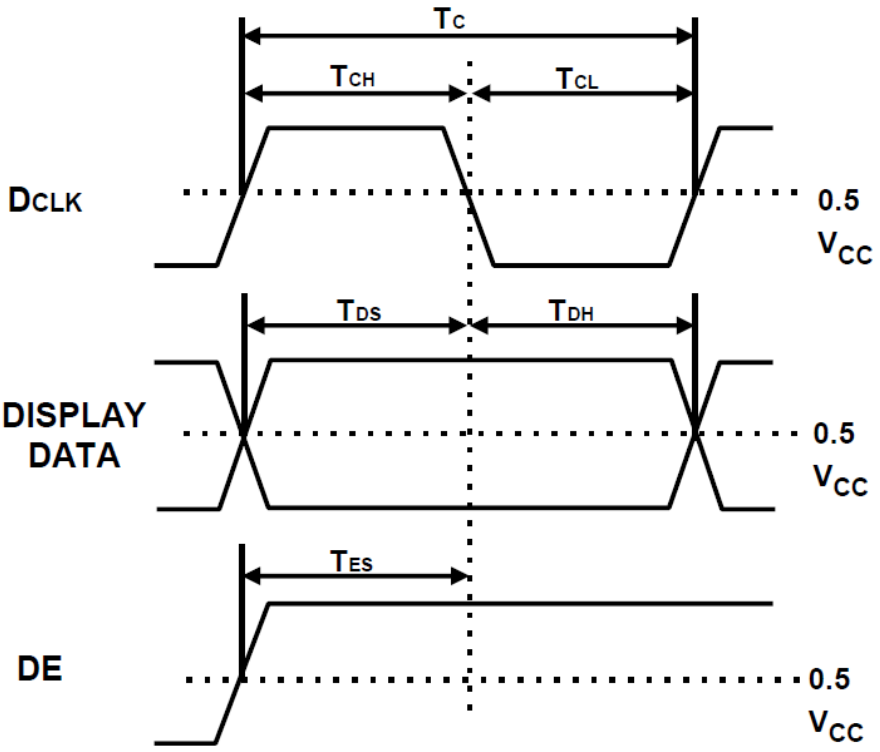
SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	118.8	148.5	153.5	MHz	-
Hsync		F_H	54	67.5	69.75	KHz	-
Vsync		F_V	48	60	62	Hz	-
Term for the vertical display	Active display period	T_{VD}	-	1080	-	Lines	-
	Total vertical	T_V	1100	1125	1158	Lines	-
Term for the horizontal display	Active display period	T_{HD}	-	1920	-	Clocks	-
	Total Horizontal	T_H	2090	2200	2350	clocks	-

Note) This product is DE only mode.
The input of Hsync & Vsync signal does not have an effect on normal operation.
Test Point : TTL control signal and CLK at LVDS Tx input terminal in system.

6.2 TIMING DIAGRAMS OF INTERFACE SIGNAL (DE ONLY MODE)



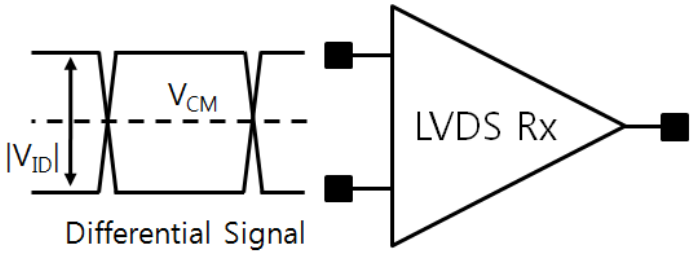




6.3 CHARACTERISTICS OF INPUT DATA OF LVDS

(1) Specification for DC

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT
Supply voltage for IO	VDD33_LVDS	TBD			V
Supply voltage in the core	VDD12_LVDS				V
Color depth					Bit
Input voltage at the common mode	V_{CM}				V
Input voltage for differential	$\|V_{ID}\|$				mV



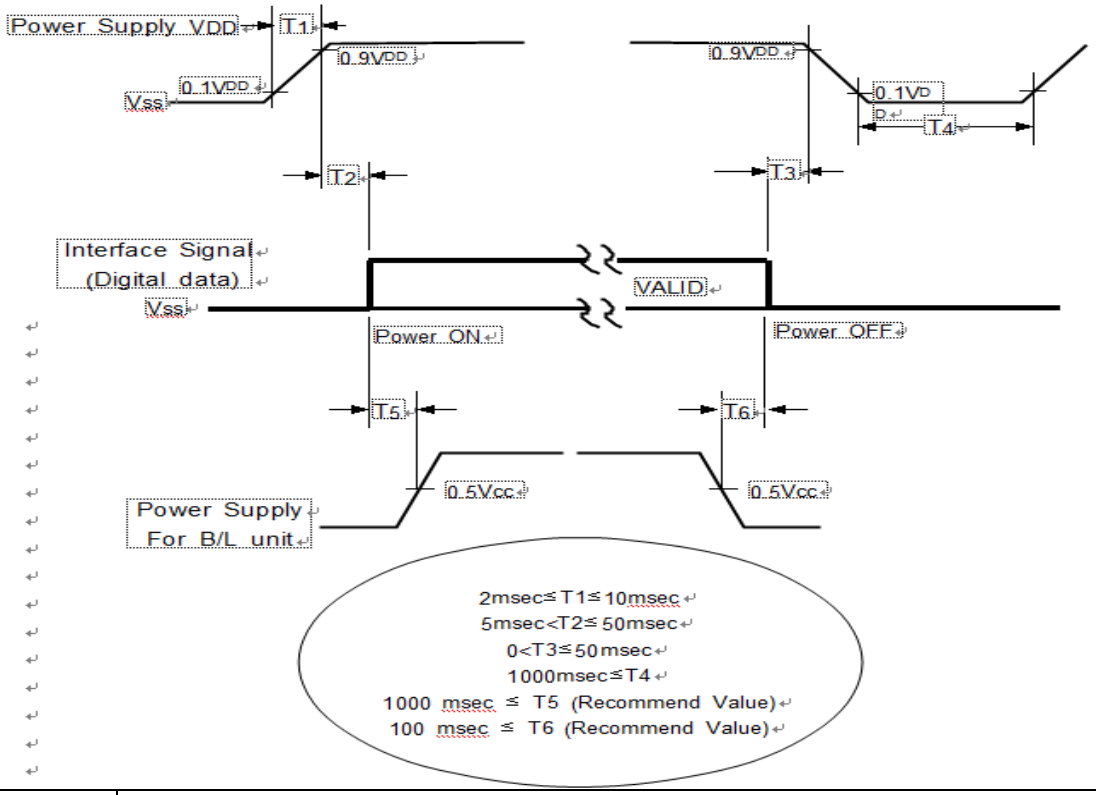
Definition of DC Characteristics of LVDS receiver

(2) Specification for AC

ITEM		SYMBOL	Min.	Typ.	Max.	UNIT
Frequency for input clock (=1/T)		FIN	TBD			MHz
Period of output clock		t_{RCP}				ns
Position of input data	FIN=85MHZ	t_{RSRM}				ps
	FIN=78MHZ					
	FIN=75MHZ					
Position of input data	FIN=85MHZ	t_{RSLM}				ps
	FIN=78MHZ					
	FIN=75MHZ					
Lock time		t_{RPLL}				usec
Duty ratio of Rx's clock for output		T_{duty}				%

6.4 THE SEQUENCE OF POWER ON AND OFF

To prevent the product from being latched up or the DC in the LCD module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.

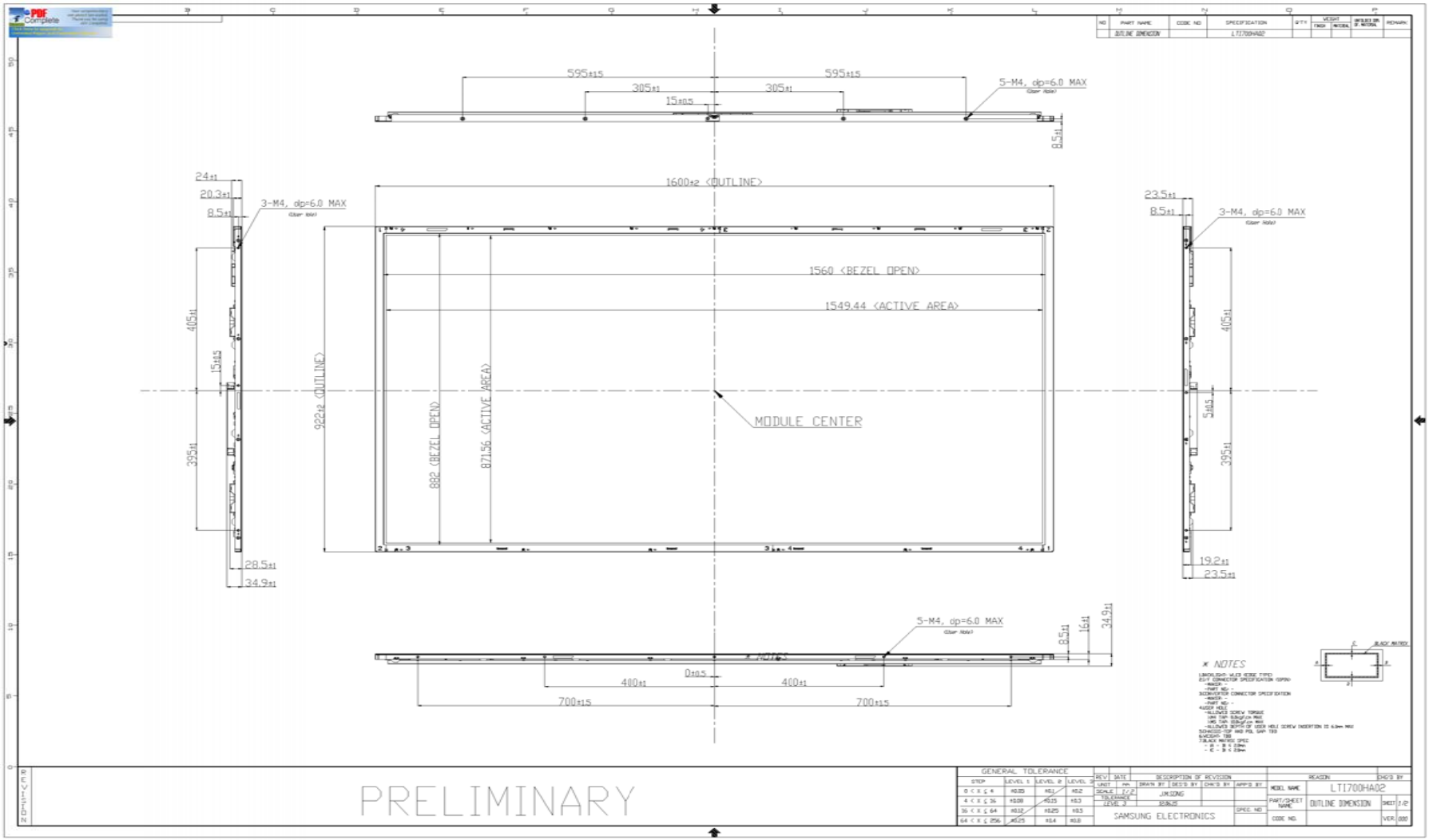


Timing	Remarks
T_1	The time, during which the level of V_{DD} is rising from 10% to 90%.
T_2	The changing time, during which the V_{DD} starts rising beyond 90% until the valid data of signal started coming in.
T_3	The changing time, during which the valid data of signal starts leaving out until the V_{DD} starts falling below 90%.
T_4	The changing time, during which the V_{DD} starts falling below 10% to restart the Windows.
T_5	The changing time, during which the signal of BLU starts rising beyond 50%.
T_6	The changing time, during which the signal of BLU starts falling below 50%.

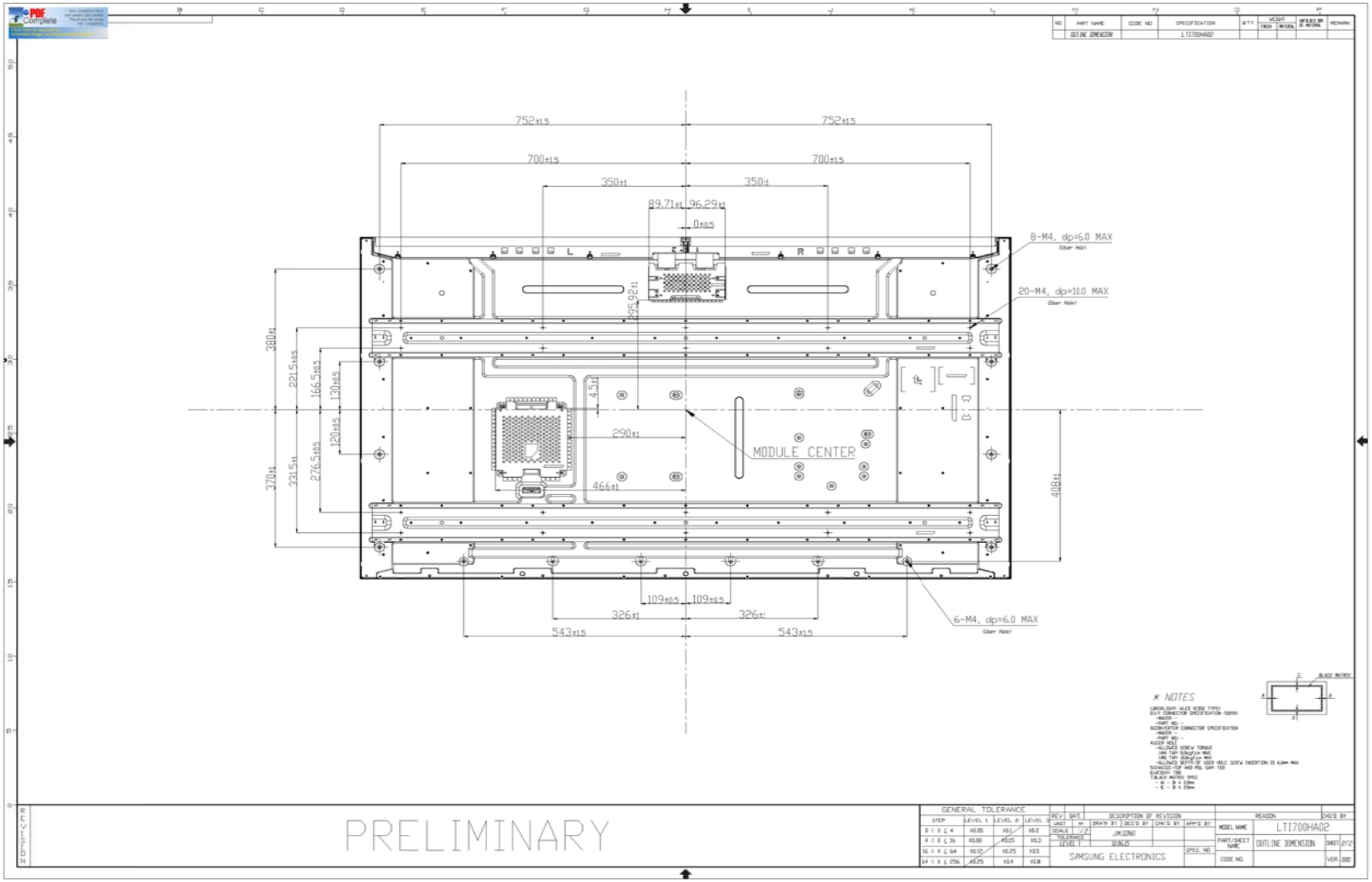
- The inputted V_{DD} 's value for supply voltage, BLU, and signal to the external system of the module shall be computed with referring to the former mentioned value.
- The method to apply the voltage to the lamp within the range, which the LCD operates. When the back-light is turned on before the LCD is operated or the power of LCD is turned off before the back-light is turned off, the abnormal display on the screen may be shown momentarily.
- Please keep the level of input signal low or keep the level of impedance high when the value of V_{DD} is below 10%.
- The value shall be measured after the module has been fully discharged between the period, which the power is turned on and the period, which the power is turned off like the T4 timing. The backlight may be flashed if the interface signal remains floated when the above-mentioned signal becomes invalid.

7. OUTLINE DIMENSION

7.1 FRONT



7.2 BACK

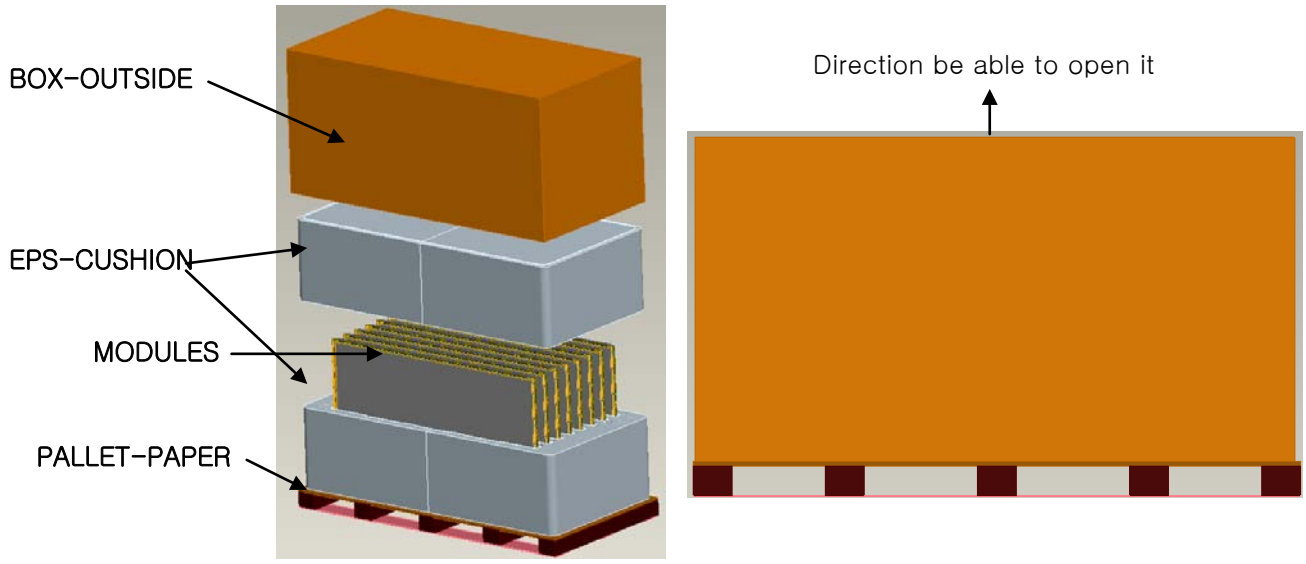

752±1.5
752±1.5
700±1.5
700±1.5
350±1
350±1
89.71±1
96.29±1
0±0.5
8-M4, dp=5.0 MAX
20-M4, dp=11.0 MAX
295.92±1
380±1
221.5±0.5
166.5±0.5
130±0.5
120±0.5
276.5±0.5
331.5±1
370±1
4.5±1
290±1
MODULE CENTER
466±1
408±1
109±0.5
109±0.5
326±1
326±1
543±1.5
543±1.5
6-M4, dp=6.0 MAX
PRELIMINARY
SAMSUNG ELECTRONICS
LTI700HA02
OUTLINE DIMENSION

8. PACKING

8.1 CARTON (INTERNAL PACKAGE)

(1) Packing Form
Corrugated fiberboard box and corrugated cardboard as shock absorber.

(2) Packing Method



8.2 PACKING SPECIFICATION

ITEM	Specification	Remark
LCD Packing	8ea / Box (Packing-Pallet Box)	1. TBD kg/LCD(8ea- Typical weight) 3. TBD kg/Packing-Pallet Box 6. Packing Pallet Box Material : EPS ,Paper
Desiccant(drier)	4	10g/EA, Cobalt-dichloride-free
Pallet	1 Box/Pallet	1. Pallet Weight : TBD 2. TBD kg/Pallet
Packing Direction	Vertical	-
Pallet Size	H x V x Height	2025 x 1050 x 1199
Total Pallet Weight	TBD	Module(* 8) + Pallet(TBD) + Packing SET(TBD)+ Desiccant(0.04 * 10) = TBD kg

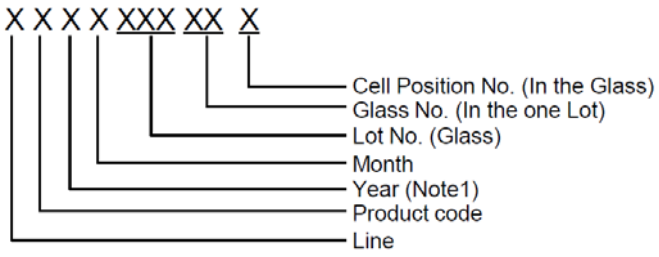
9. MARKINGS & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

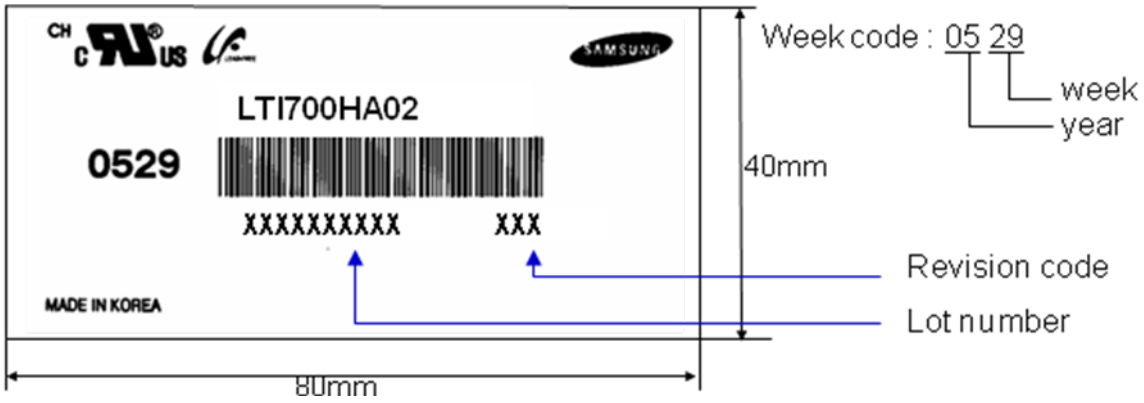
(1) Parts number : LTI700HA02

(2) Revision code : Three letters

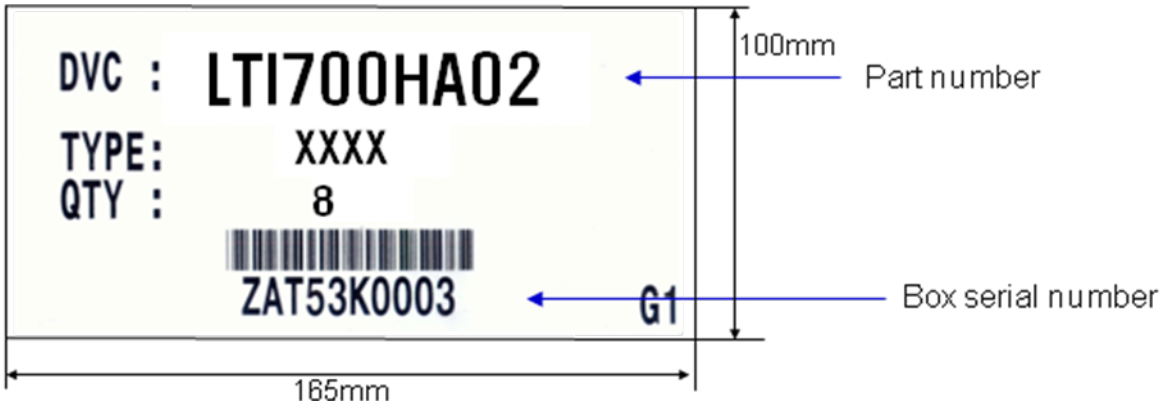
(3) Lot number :



(4) Nameplate Indication



(5) Packing small box attach



10. GENERAL PRECAUTIONS

10.1 HANDLING

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static. it may cause damage to the C-MOS Gate Array IC.

(i) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not pull or fold the Lamp wire.

(l) Do not touch any component which is located on the back side.

(m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(n) Pins of I/F connector shall not be touched directly with bare hands.

10.2 STORAGE

We highly recommend to comply with the criteria in the table below.

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage life	12 months		
Storage Condition	- The storage room shall be equipped with a good ventilation facility, which has a temperature controlling system. - Products shall be placed on the pallet, which is away from the wall not on the floor. - Prevent products from being exposed to the direct sunlight, moisture, and water.; Be cautious not to pile the products up. - Avoid storing products in the environment where other hazardous material is placed. - If products are delivered or kept in the storage facility more than 3 months, we recommend you to leave products under the condition including a 20℃ temperature and a humidity of 50% for 24 hours.		

10.3 OPERATION

(a) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.

(b) The power shall be always turned on/off by the item 6.5. "Power on/off sequence"

(c) The module has a circuit with a high frequency. The system manufacturers shall suppress the electromagnetic interference sufficiently. The methods to ground and shield are important to minimize the interference.

(d) Design the length of cable to connect between the connector for back-light and the inverter as short as possible and the shorter cable shall be connected directly.

The longer cable between that of back-light and that of inverter(converter) may cause the luminance of lamp(LED) to lower and need a higher startup voltage(Vs).

10.4 OPERATION CONDITION GUIDE

(a) The LCD product should be operated under normal conditions.

Normal condition is defined as below;

- Temperature : 20±15℃
- Humidity : 55±20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact SDC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

10.5 OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SDC in advance when you display the same pattern for a long time.