

**SAMSUNG DISPLAY**

Product Specification

() Preliminary Specification

(√) Approval Specification

Any modification of Spec is not allowed without SDC's permission.

CUSTOMER		MODEL NO.	LTI216XM01
DATE OF ISSUE	2012.08.23	EXTENSION CODE	-V

Customer Approval & Feedback

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REVISION HISTORY

Date.	Rev.No.	Page	Revision Description
08/23/2012	000	All	Initial Release

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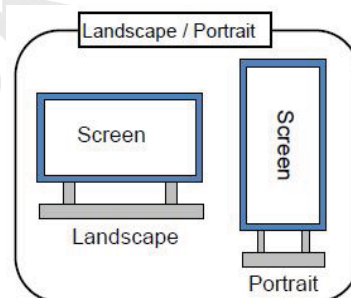
GENERAL DESCRIPTION

DESCRIPTION

LTI216XM01 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 backlight unit. The resolution of a 21.6" is 960 x 960 and this model can display up to 16.7M colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a 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

- RoHS compliance (Pb-free)
- High contrast ratio, High luminance
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle ($\pm 178^\circ$)
- 960 x 960 pixels resolution (1:1)
- Low power consumption
- Direct LED Backlight
- DE(Data Enable) mode
- 1ch LVDS (Low Voltage Differential Signaling) interface
- Super Narrow Bezel
- Landscape / Portrait type compatible



APPLICATIONS

DID(Digital Information Display)

If the intent to use this product is for other purpose, please contact Samsung Display.

GENERAL INFORMATION

Items	Specification	Unit	Note
Module Size	393.26(W) x 393.26(H)	mm	Typical , ± 1.5 m
	55.5(D)		MAX
Weight	4,200	g	MAX
Pixel Pitch	0.1345(H) x 0.1345(V)	mm	
Active Display Area	387.36(H) x 387.36(V)	mm	
Surface Treatment	Haze 44% , Anti-Glare		
Display Colors	8 bit - 16.7M	colors	
Number of Pixels	960 X 960	pixel	1:1
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Luminance of White	450 (Typ.)	cd/ m ²	



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MECHANICAL INFORMATION

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	391.76	393.26	394.76	mm	±1.5
	Vertical(V)	391.76	393.26	394.76	mm	±1.5
	Depth(D)	52.5	54.0	55.5	mm	±1.5
Weight		-	3,800	4,200	g	

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLTE RATINGS

Item		Symbol	Min.	Max.	Unit	Note
Storage Temperature		T _{STG}	-20	65	°C	(1)
Operating Temperature		T _{CENTER}	0	50	°C	(1),(2)
Glass surface Temperature (Operation)	Center	T _{CENTER}	0	50	°C	(1),(2),
	T. Uniformity	ΔT	-	10	°C	

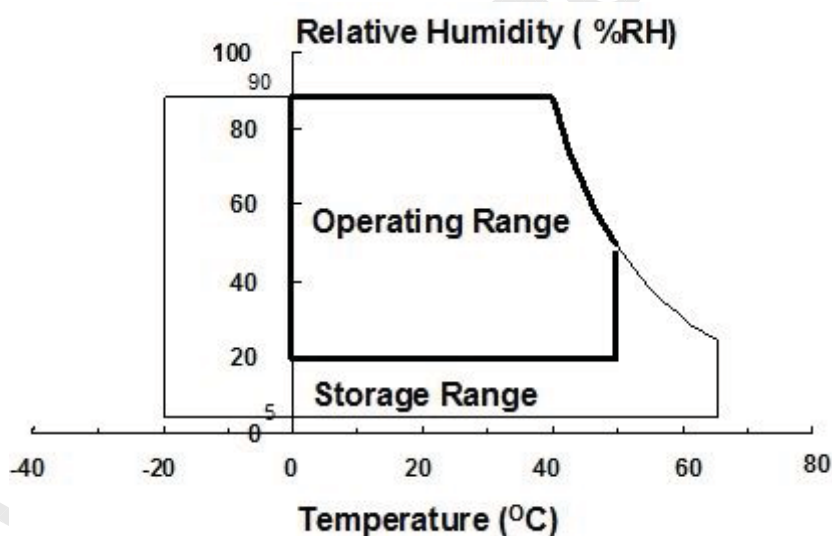
Note (1) Ta= 25 ± 2 °C

(2) 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



(3) Module Vibration and shock tests are not guaranteed due to SNB model's characteristics



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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V _{DD}	10.8	13.2	V	(1),(2)

Note (1) Within Ta (25 ± 2 °C)

(2) The permanent damage or defect to the device may occur if the panel is operated at the figure set, which exceeds a limit 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	V _{CC}	22	26	V	

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: $20 \pm 15^{\circ}\text{C}$
 - b. Humidity: $55 \pm 20\%$
 - 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 20 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 following items are measured under the stable conditions.* The optical characteristics should be measured in the dark room or the equivalent environment by the methods shown in the Note (5).

Measuring equipment : TOPCON RD-80S, TOPCON SR-3, ELDIM EZ-Contrast

Ta = 25 ± 2 °C, V_{LCD,VCC} = 3.3V, fv = 60Hz, fDCLK = 74.25MHz, IF = 100% duty

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal θ L,R=0 θ U,D=0 Viewing Angle	3000	4000	-		(3) SR-3
Response Time	G-to-G (Avg.)	Tg		-	8	16	msec	(5) RD-80S
Luminance of White (Center of screen)		Y _L		350	450	-	cd/m ²	(6) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.650	TYP. +0.03		(7),(8) SR-3
		Ry			0.330			
	Green	Gx			0.315			
		Gy			0.620			
	Blue	Bx			0.155			
		By			0.053			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-	-	72	-	%	(7) SR-3	
Color Temperature		-	-	10,000	-	K	(7) SR-3	
Viewing Angle	Hor.	θ _L	C/R≥10	75	89	-	Degree	(8) SR-3
		θ _R		75	89	-		
	Ver.	θ _U		75	89	-		
		θ _D		75	89	-		
Brightness Uniformity (9 Points)		B _{Uni}	-	-	25	%	(4) SR-3	

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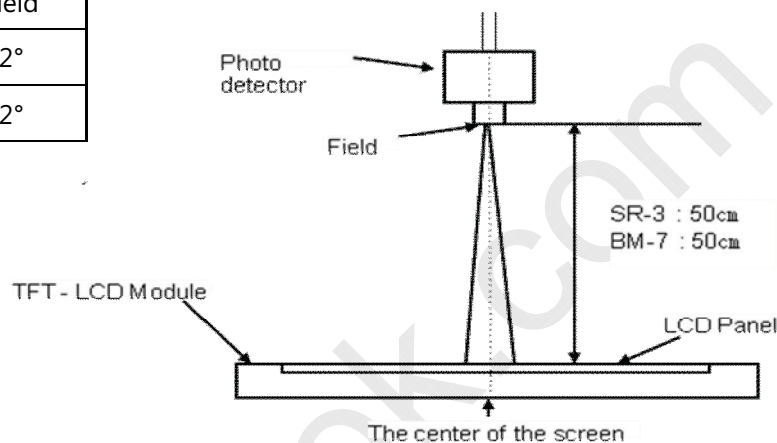
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Note (1) Test Equipment Setup

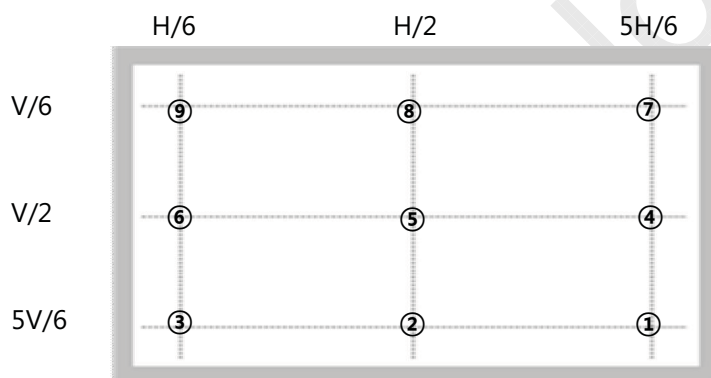
The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the backlight at the given temperature for stabilization of the backlight. This should be measured in the center of screen.

Environment condition : $T_a = 25 \pm 2^\circ\text{C}$

Photo detector	Field
SR-3	2°
RD-80S	2°



Note (2) Definition of test



Note (3) Definition of Contrast Ratio (C/R)

: Ratio of gray max ($G_{\max}$) & gray min ($G_{\min}$) at the center point ⑤ of the panel

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

$G_{\max}$: Luminance with all pixels white

$G_{\min}$: Luminance with all pixels black

Note (4) Definition of 9 points brightness uniformity

$$B_{uni} = 100 * \frac{(B_{\max} - B_{\min})}{B_{\max}}$$

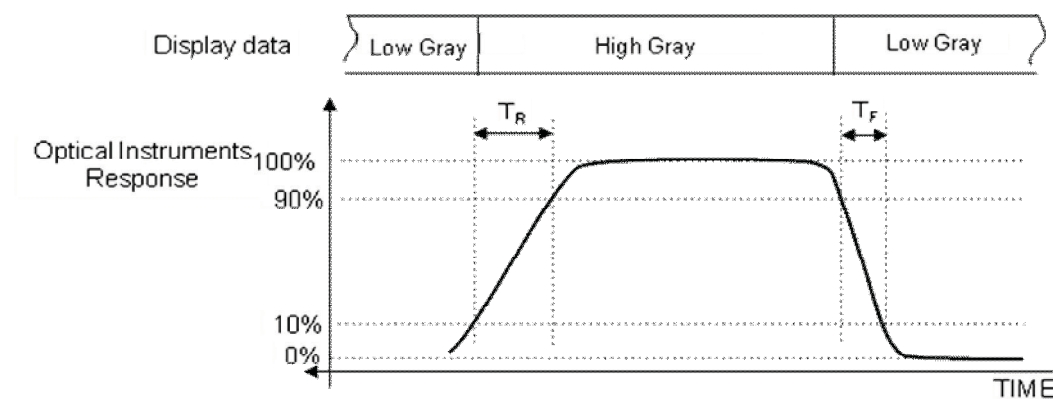
$B_{\max}$: Maximum brightness

$B_{\min}$: Minimum brightness

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Note (5) Definition of Response time : Average response time of all Gray to gray



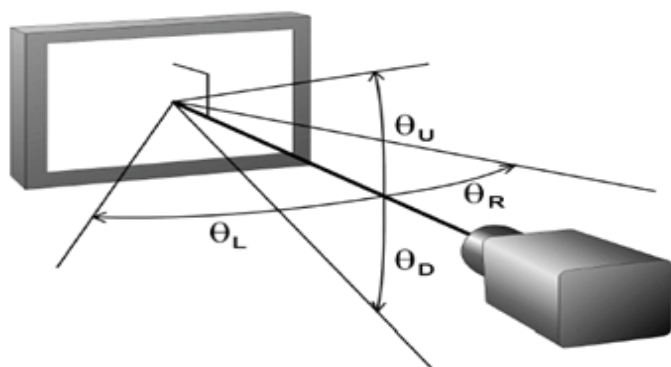
Note (6) Definition of Luminance of White : Luminance of white at center point ⑤

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 ($C/R \geq 10$)



4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD MODULE

* 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	-	310	370	mA	(2),(3)
	(b) White	-	460	540	mA	
	(c) Checker	-	390	450	mA	
Vsync Frequency	f _V	47	60	63	Hz	
Hsync Frequency	f _H	53	67.5	71	kHz	
Main Frequency	f _{DCLK}	58	74.25	78	MHz	
Rush Current	I _{RUSH}	-	-	1.8	A	(4)

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

(2) f_V = 60Hz, f_{DCLK} = 74,25 MHz, V_{DD} = 12.0V, DC Current.

(3) Power dissipation check pattern (LCD Module only)

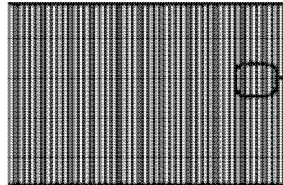
a) Black Pattern



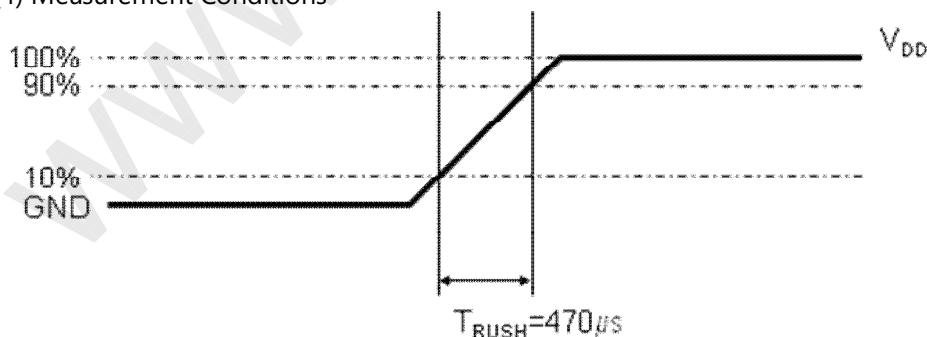
b) White Pattern



c)Checker Pattern



(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is 470 μs.

4.2 BACK LIGHT UNIT

Item	Min.	Typ.	Max.	Unit	Note
Operating Life Time	50,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.
[Operating condition : Ta = 25±2°C]

4.3 CONDITION & SPECIFICATION OF CONVERTER'S INPUT

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	V _{in}	-	22	24	26	V	Ta=25±2 °C
Inrush Current (*2)	Inrush	V _{in} = 24.0V dim =Max	-	-	2.5	Adc	Initial turn on
Output Current (*1)	I _{LED}	V _{in} = 24.0V dim =Max	47.5	50	52.5	mAmean	After 1 hour Warm-up, @1string
Converter On/Off Control	ENA	Enable	3	-	5.25	V	
		Disable	-0.3	-	0.4		
A_DIM	V _{A_DIM}	V _{IN} = 24V	0	-	3.3	V	
	I _{A_DIM}	V _{IN} = 24V	10	-	50	mAmean	@1string

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°C)

(3) Additional Appendix for Input current at room temperature (25 °C)

5. INPUT TERMINAL PIN ASSIGNMENT

5.1 INPUT SIGNAL & POWER

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

Pin	Description		Pin	Description	
1	Vdd (12V)		26	No connection	
2	Vdd (12V)		27	No connection	
3	Vdd (12V)		28	No connection	
4	Vdd (12V)		29	No connection	
5	Vdd (12V)		30	No connection	
6	No connection		31	GND	
7	GND		32	No connection	
8	GND		33	No connection	
9	GND		34	GND	
10	LVDS Signal	RX1A_N	35	No connection	
11		RX1A_P	36	No connection	
12		RX1B_N	37	No connection	
13		RX1B_P	38	No connection	
14		RX1C_N	39	GND	
15		RX1C_P	40	No connection	NOTE1
16		Ground	41	No connection	
17		RX1CLK_N	42	No connection	
18		RX1CLK_P	43	No connection	
19		Ground	44	No connection	
20		RX1D_N	45	LVDS_SEL	NOTE2
21		RX1D_P	46	No connection	NOTE1
22	No connection		47	No connection	
23	No connection		48	No connection	
24	GND		49	No connection	
25	No connection		50	No connection	
			51	No connection	

Note 1) No Connection : These pins are only used for SAMSUNG internal purpose.

Note 2) LVDS OPTION : IF THIS PIN : HIGH (3.3 V) → NORMAL NS LVDS FORMAT

OTHERWISE : LOW (GND) OR OPEN(NC) → JEIDA LVDS FORMAT

Sequence : On = VDD(T1) ≥ LVDS Option ≥ Interface Signal(T2)

OFF = Interface Signal(T3) ≥ LVDS Option ≥ VDD

Note 3) LVDS Connector

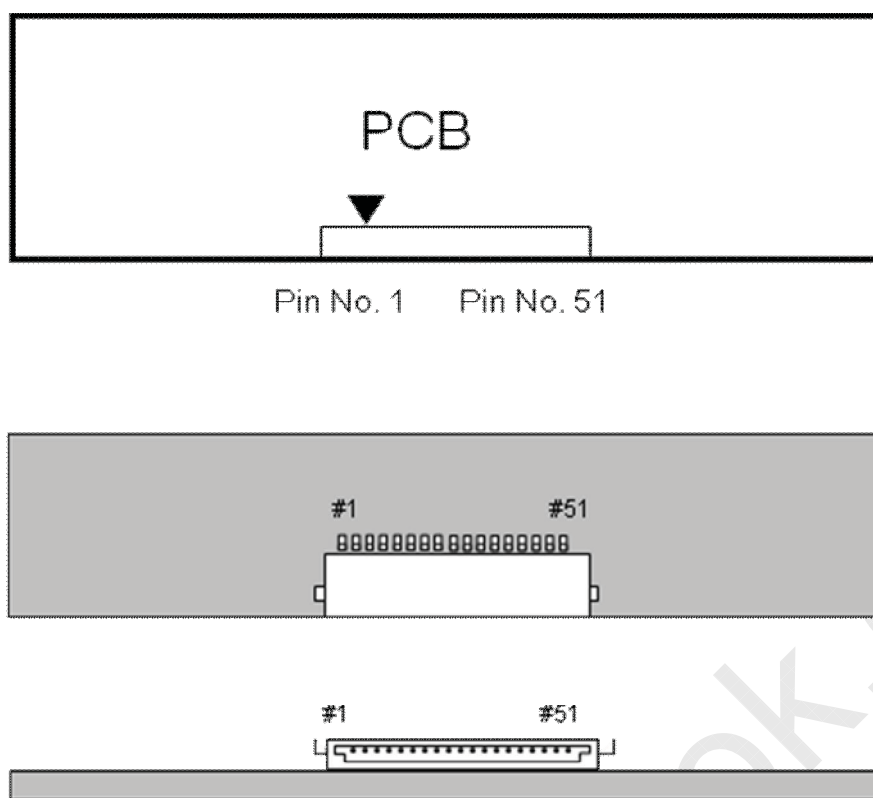


Fig. Connector diagram

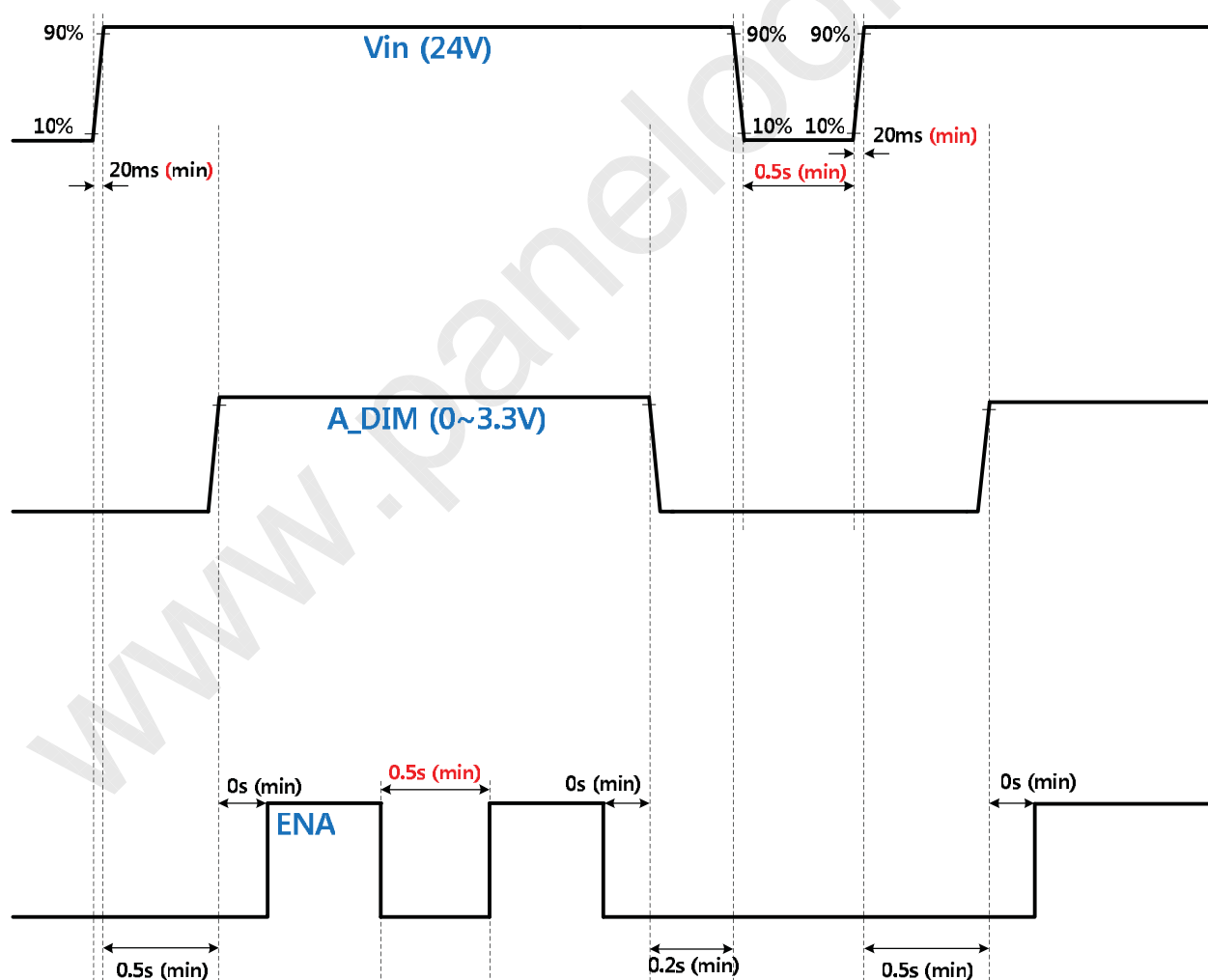
- a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
- b. All power input pins should be connected together.
- c. All N.C pins should be separated from other signal or power.

22022WR-014B1 (YEONHO)

Pin No.	SYMBOL	Pin Configuration(FUNCTION)
1, 2, 3, 4, 5	Vin	Power Supply DC 24V
6, 7, 8, 9, 10	GND	Ground
11	NC	No connection
12	ENA	ENA (Converter on/off Control signal)
13	A_DIM	Analog Dimming Control [0V: Min, 3.3V: MAX]
14	-	No Connection

Note) Pin 14 must be disconnected from signal

5.3 THE POWER SEQUENCE FOR INPUTTING TO THE CONVERTER



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5.4 LVDS INTERFACE

- LVDS Receiver : T-CON (merged)
- Data Format : JEIDA

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

5.5 INPUT SIGNALS, BASIC DISPLAY COLORS AND GRAY SCALE

COLOR	DISPLAY	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	1	B255	

Note (1) Definition of gray : Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note (2) Input signal: 0 =Low level voltage, 1=High level voltage

6. INTERFACE TIMING

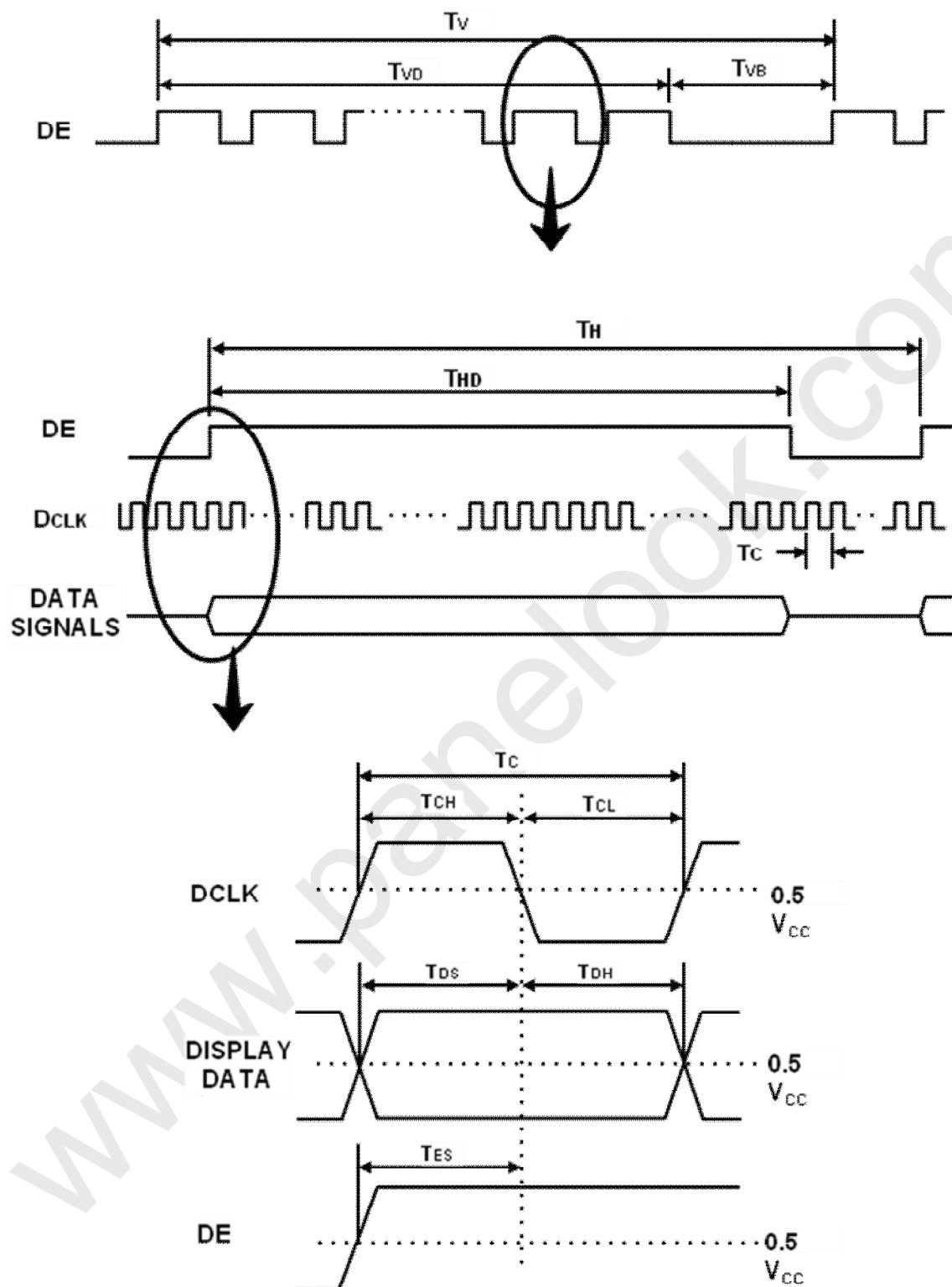
6.1 THE PARAMETERS OF TIMING(DE MODE)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	$1/T_C$	58	74.25	78	MHz	-
Hsync		F_H	53	67.5	71	KHz	-
Vsync		F_V	47	60	63	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	960	-	Lines	-
	Vertical Total	T_V	968	1125	1475	Lines	-
Horizontal Display Team	Active Display Period	T_{HD}	-	960	-	Clocks	-
	Horizontal Total	T_H	995	1100	1612	Clocks	-

Note)

- (1) Test Point: TTL controls signal and CLK at LVDS Tx at the input terminal of system.
- (2) Internal VDD = 3.3V
- (3) The spread spectrum
 - The limit of spread spectrum's range of SET in which the LCD module is assembled should be within $\pm 3\%$
 - Frequency for modulation : Min 30KHz ~ Max 300KHz

6.2 TIMING DIAGRAMS OF INTERFACE SIGNAL (ONLY DE MODE)



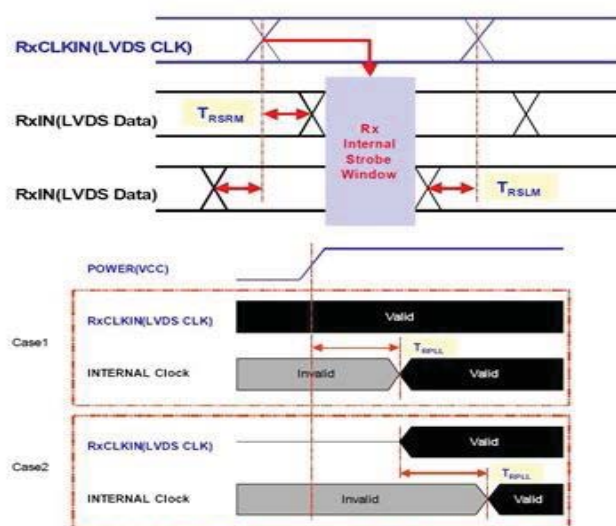
6.3 CHARACTERISTICS OF LVDS INPUT DATA

(1) Specification of DC

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
IO Supply Voltage	VDD33_LVDS		3.0	3.3	3.6	V
Core Supply Voltage	VDD12_LVDS		1.1	1.2	1.3	V
Color Depth			-	8/10	-	Bit
Input Clock Range(Data Rate@1ch)	FIN		25 (175)	-	100 (700)	MHz (Mbps)
Input Common Mode Voltage	VCM		0.3	-	1.8	V
Differential Input Voltage	VID		200	350	600	mV

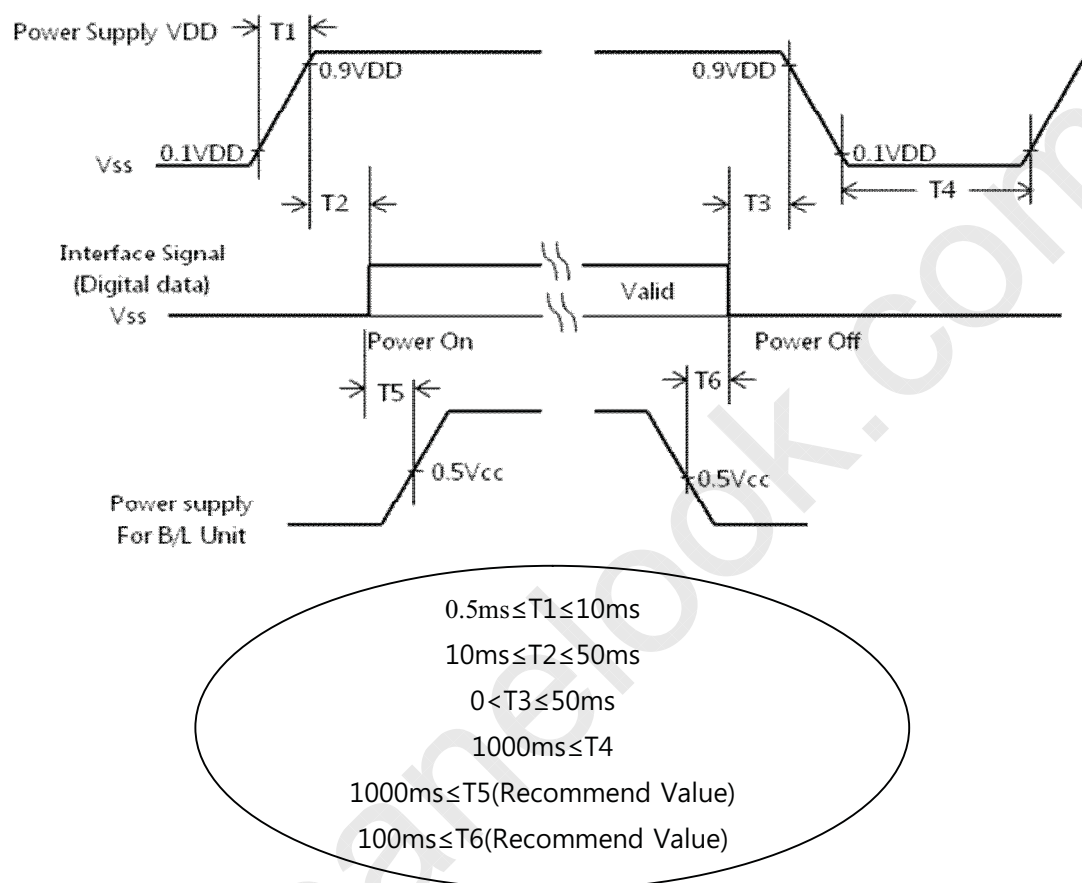
(2) Specification of AC

Symbol	Characteristic	Min.	Typ.	Max.	Unit
FIN	Input Clock Frequency (= 1/T)	25	-	100	MHz
tRCP	Output Clock period	11.11		40	ns
tRSRM	Input Data position	FIN=85MHz		+400	ps
		FIN=78MHz		+450	ps
		FIN=75MHz		+500	ps
tRSLM	Input Data position	FIN=85MHz	-400		ps
		FIN=78MHz	-450		ps
		FIN=75MHz	-500		ps
tRPLL	Lock Time			100	μsec
tduty	Rx Output Clock Duty Ratio	45	50	55	%



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.



T1 : The time, during which the level of V_{DD} is rising from 10% to 90%.

T2 : The change for the time, during which the V_{DD} start rising the level above 90% until the valid data of signal started coming in.

T3 : The change for the time, during which the valid data of signal started coming until the V_{DD} started coming out.

T4 : The time, during which the V_{DD} start coming out to restart the Windows.

T5 : The time, during which the valid data starts coming in until the power of B/L exceed 50%.

T6 : The time, during which the level of B/L's power falls below 50% until the valid data of signal starts coming out.

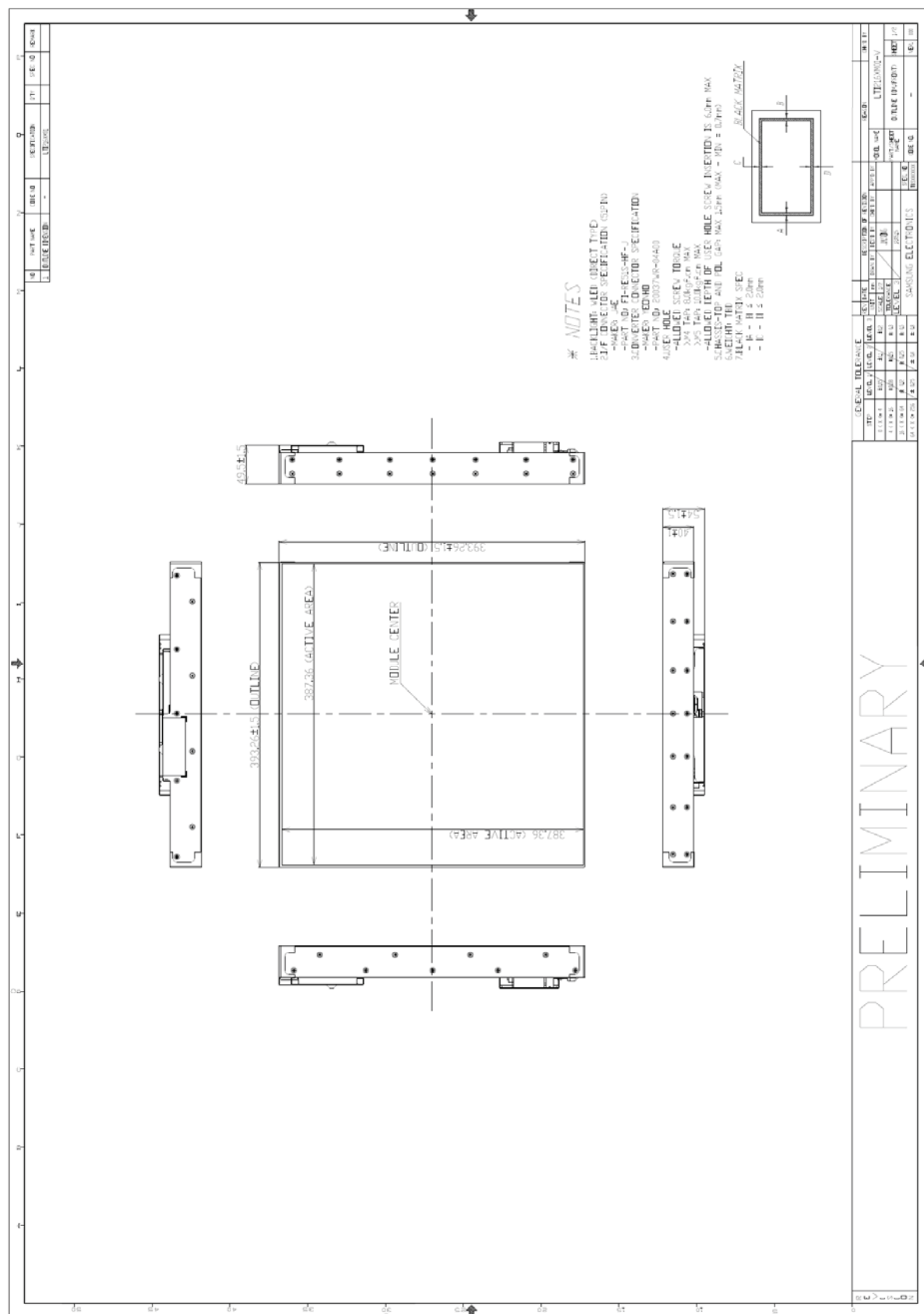
- The inputted V_{DD} 's value for supply voltage, BLU, and signal to the external system of the module shall be computed in observance of the former mentioned value.
- The method to apply the voltage to the lamp within the range, which the LCD operates. When the back-light is turned on before the LCD 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 V_{DD} is off.
- The value shall be measured after the module has been fully discharged between the periods when the power is on and off during the T4.

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7. OUTLINE DIMENSION

7.1 FRONT



DEFEITINADY

8. RELIABILITY TEST

Item	Test condition	Quantity
HTOL	50℃, 500hr determination	4EA
LTOL	0℃, 500hr determination	4EA
T/S	-20~50℃ Dwell time:30min, 100cycle	4EA
LTOL	0℃, 500hr determination	4EA
HTS	60℃, 500hr determination	4EA
LTS	-25℃, 500hr determination	4EA
THB	40℃ / 95%RH, 500hr determination	4EA
WHTS	60℃ / 75%RH, 250hr determination	4EA
Thermal Shock	-20℃ ~ 50℃, 200cycle determination	4EA
Image Sticking	50℃, Mosaic Pattern (9×10)	4EA
ESD(operation)	contact : ±10 kV, 150 pF/330Ω, 210Point, 1 time/Point non-contact : ±15 kV, 150 pF/330Ω, 210Point, 1 time/Point	3EA
Inverter Input Con. ESD	contact : ±15kV, 150 pF/340, Input Con.Pin, 3 times/Pin	3EA
Dust	6.6~8.6um, 5sec Spray, 5min sedimentation / 10hr, Power 10min on, 10min off	2EA
PALLET Vibration → PALLET Drop	Vibration : 1.05Grms 5~200Hz 1hr/stack side Drop : 2 edge 1face(bottom) 20 cm	1PALLET
		1PALLET
Altitude	-40~50℃, 0~45,000ft, 1cycle(72.5hr)	4EA

※ We don't guarantee about Vibration and Shock test due to the SNB panel characteristics.

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

* HTOL/ LTOL : High/Low Temperature Operating Life

** THB : Temperature Humidity Bias

*** HTS/LTS : High/Low Temperature Storage

**** WHTS : Wet High Temperature Storage

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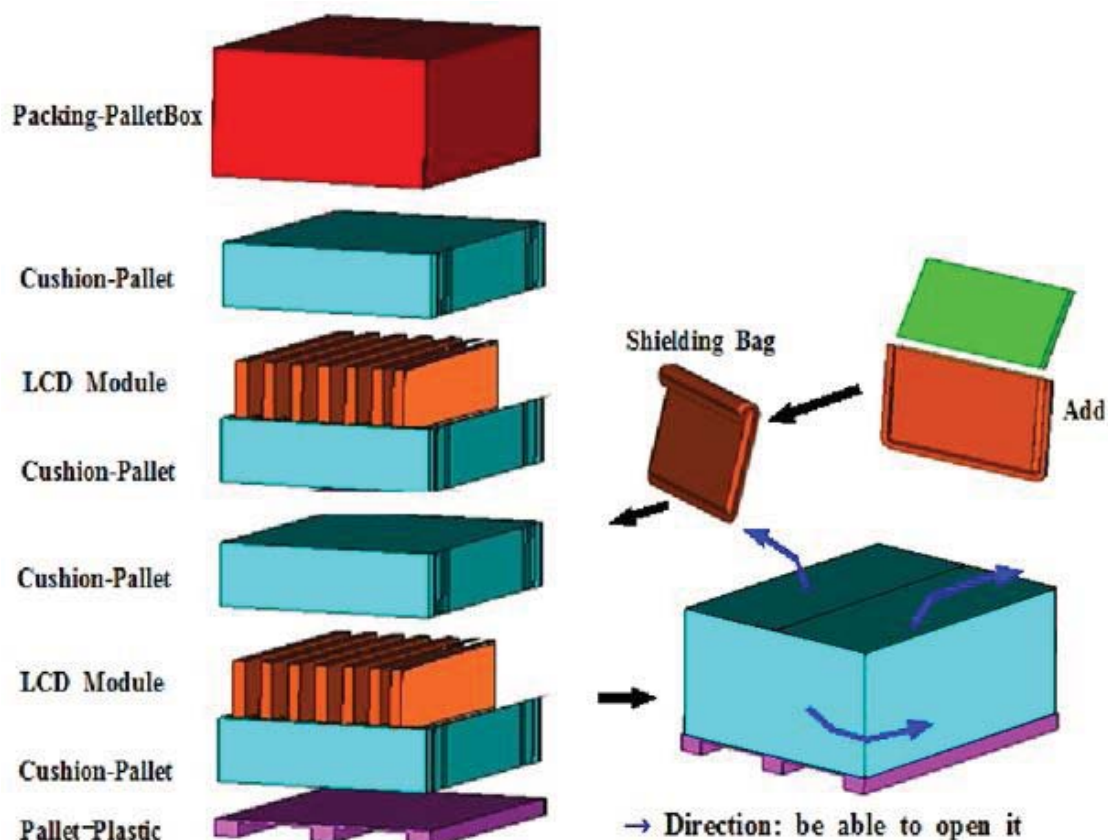
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9. PACKING

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



(3) Packing Material

Item	Specification	Remark
LCD Packing	36ea / (Packing-Pallet Box)	1. 3.8Kg / LCD (36ea) 2. 17.12 Kg / Cushion-pallet (4ea) 3. 4.43 Kg / Packing-Pallet Box (1ea) 4. Cushion-pallet Material : EPS 5. Packing-Pallet Box Material : SW
Pallet	1Box / Pallet	1. Pallet weight = 14.5kg => Pallet Material : WOOD
Total Pallet Size	H x V x height	971mm(H) x 1136mm(V) x 1211mm(height)
Total Pallet Weight	172.85kg	Pallet(14.5kg) + Module(3.8kg*36ea=136.8kg) + Cushion(17.12kg) + Pallet-BOX(4.43kg)

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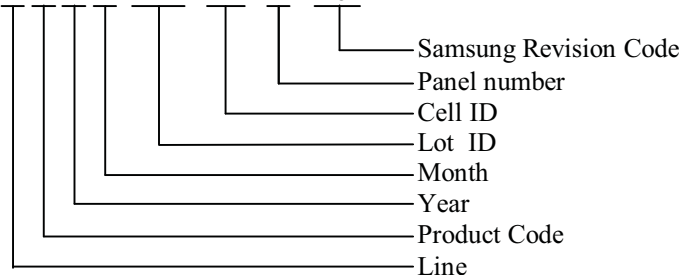
10. MARKING

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

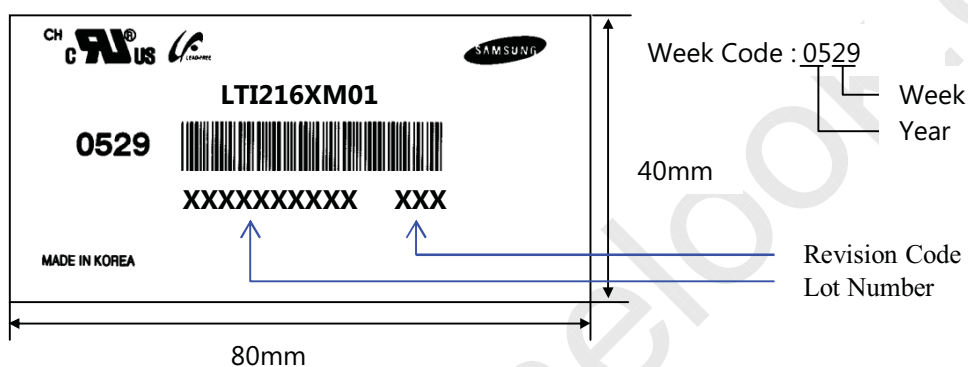
(1) Parts number : LTI216XM01

(2) Revision code : 3 letters

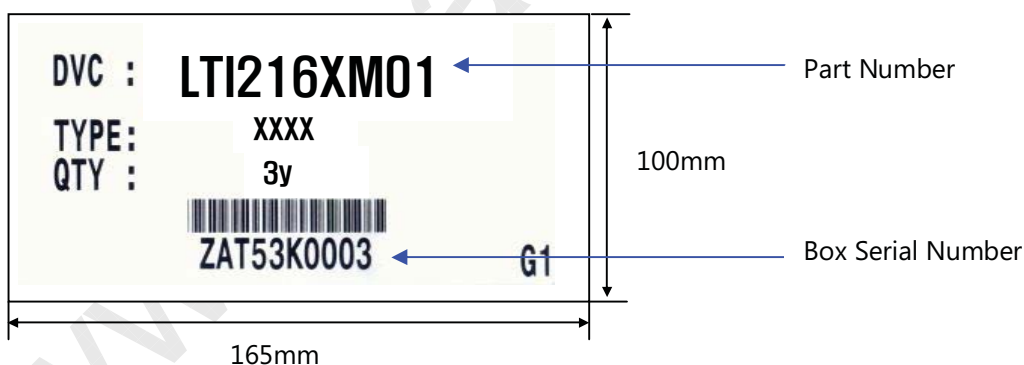
(3) Lot number : X X X X XXX XX X V01



(4) Nameplate Indication



(5) Packing small Box Attach



(6) Others

1. After service part

Lamps cannot be replaced because of the narrow bezel structure.

11. 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 LED FPC.
- (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.

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11.2 STORAGE

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

ITEM	Unit	Min.	Max.
Storage Temperature	(°C)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months		
Storage Condition	- The storage room should be equipped with a good ventilation facility, which has a temperature controlling system. - Products should 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, which 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°C temperature and a humidity of 50% for 24 hours. - If you store semi-manufactured products for more than 3 months, bake the products under the condition including the 50°C temp. and the 10% humidity for 24hrs after being used.		

11.3 OPERATION

- Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- The power shall be always turned on/off by the item 6.5. "Power on/off sequence"
- 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.
- 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 may cause the luminance of lamp(CCFL) to lower and need a higher startup voltage(Vs).

11.4 OPERATION CONDITION GUIDE

- The LCD product should be operated under normal conditions.
Normal condition is defined as below;
 - Temperature : 20±15°C
 - Humidity : 55±20%
 - Display pattern : continually changing pattern (Not stationary)
- 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.

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11.5 OTHERS

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Module should be turned clockwise (regular front view perspective) when used in portrait mode.
- (c) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (d) 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.
- (e) 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.
- (f) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.
- (g) Please contact SDC in advance when you display the same pattern for a long time.