



# SAMJE

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上海三佳电子显示技术有限公司

DATA SHEET

SAMSUNG

LTI460AA04

28.11.2008

## Contents

Revision History .....	(3)
General Description .....	(4)
General Information .....	(4)
1. Absolute Maximum Ratings .....	(5)
2. Application information for I.D. (Information Display) .....	(6)
3. Optical Characteristics .....	(7)
4. Electrical Characteristics .....	(10)
4.1 TFT LCD Module	
4.2 Back Light Unit	
4.3 Inverter Input & Specification	
5. Input Terminal Pin Assignment .....	(13)
5.1 LVDS Connector	
5.2 Inverter Input Pin Configuration	
5.3 Inverter Input Power Sequence	
5.4 LVDS Interface	
5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color	
6. Interface Timing .....	(19)
6.1 Timing Parameters (DE only mode)	
6.2 Timing Diagrams of interface Signal (DE only mode)	
6.3 Power ON/OFF Sequence	
7. Outline Dimension .....	(22)
8. Packing .....	(24)
9. Marking & Others .....	(25)
10. General Precaution .....	(26)
10.1 Handling	
10.2 Storage	
10.3 Operation	
10.4 Operation Condition Guide	
10.5 Others	

## General Description

### Description

LTI460AA04 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 46.0" is 1366 x 768 and this model can display up to 16.7 million 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 ( $\pm 178^\circ$ )
- High speed response
- Super narrow bezel, Black top chassis
- Landscape / Portrait type compatible
- WXGA (1366 x 768 pixels) resolution (16:9)
- Low power consumption
- Direct Type 24 CCFTs(Cold Cathode Fluorescent Tube)
- DE(Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface (1pixel/clock)

## General Information

Items	Specification	Unit	Note
Module Size	1025.653(W <sub>TYP</sub> ) x 579.844(H <sub>TYP</sub> )	mm	$\pm 1.0$ mm
	59.43(D <sub>MAX</sub> )		
Weight	16,000(Max)	g	
Pixel Pitch	0.7455(H) x 0.7455(V)	mm	
Active Display Area	1018.353(H) x 572.544(V)	mm	
Surface Treatment	Haze 44% , Hard-coating (3H)		
Display Colors	8 bit - 16.7M	colors	
Number of Pixels	1366 x 768	pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Luminance of White	700 (Typ.)	cd/m <sup>2</sup>	

MODEL

LTI460AA04

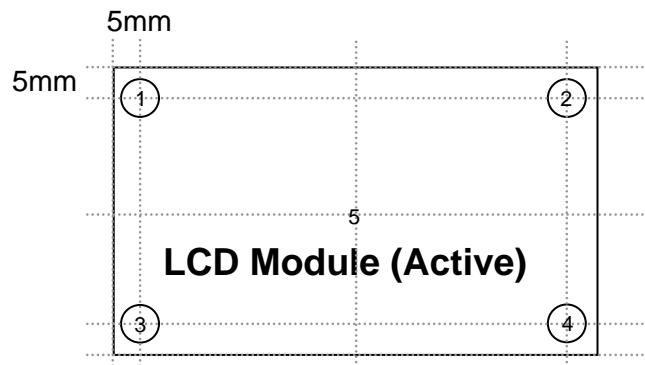
Doc. No

05-000-G-081118

Page

4 / 27

(5) Definition of test point



T should be less than 10 (  $T = |T_{\text{CENTER}} - T_{\text{CORNER}}|$  )

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

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

## 2. Application information for DID (Digital Information Display)

A long-term display like DID application may cause uneven display including image retention. To optimize module's lifetime and function, several operating usages are required.

### 1. Normal operating condition

- Temperature:  $20 \pm 15$
- Humidity:  $65 \pm 20 \%$
- Display pattern: moving picture or regular switchover display

Note) Long-term static information image may cause uneven display.

### 2. Operating usages under abnormal operating condition. Note (1)

#### a. Ambient condition

- Well-ventilated place is recommended to set up DID system.

#### b. Power off and screen saver

- Periodical power-off or screen saver is needed after long-term static display. Note (2)

### 3. Operating usages to protect uneven display due to long-term static information display

#### a. Suitable operating time for E-DID : under 20 hours a day.

#### b. Periodical display contents change from static image to moving picture.

- Liquid crystal refresh time is required.

#### c. Periodical background color and character (image) color change

- Use different colors for background and character (image), respectively.
- Change colors periodically.

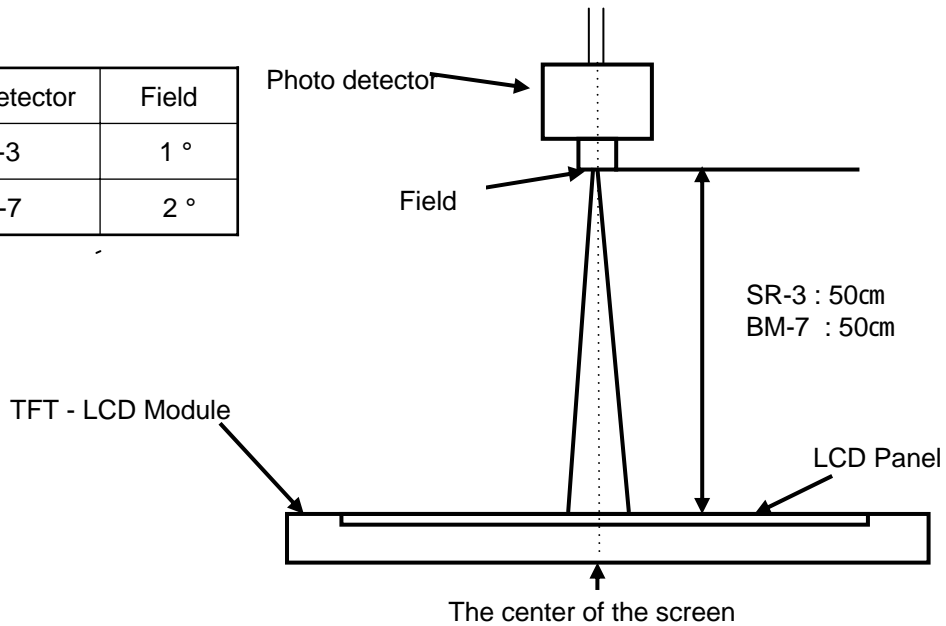
#### d. Avoid combination of background and character with large different luminance.

Note (1) Abnormal condition means every operating condition except normal operating condition.

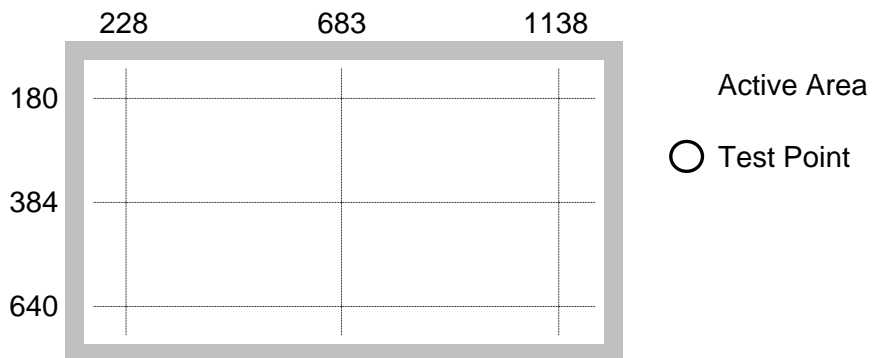
Note (2) Moving picture or black pattern is strongly recommended for screen saver.

### 4. Lifetime in this spec is guaranteed only when DID is used under right operating usages.

Photo detector	Field
SR-3	1 °
BM-7	2 °



Note (2) Definition of test point



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

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point of the panel

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

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

## 4. Electrical Characteristics

### 4.1 TFT LCD Module

The connector for display data & timing signal should be connected.

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

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	-	500	-	mA	(2),(3)
	(b) White	-	650	-	mA	
	(c) N-Pattern	-	700	1000	mA	
Vsync Frequency	$f_V$	-	60	-	Hz	
Hsync Frequency	$f_H$	43	50	53	kHz	
Main Frequency	$f_{DCLK}$	65	80	85	MHz	
Rush Current	$I_{RUSH}$	-	-	6	A	(4)

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

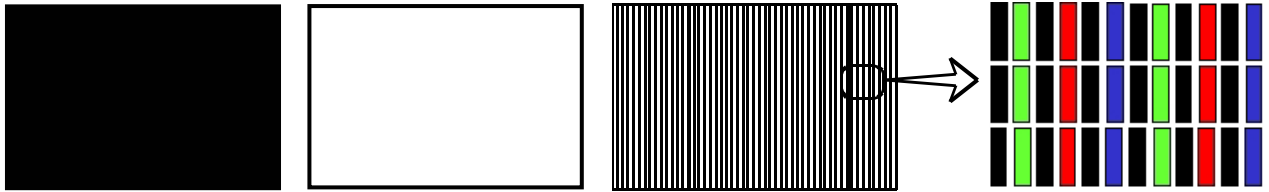
(2)  $f_V = 60\text{Hz}$ ,  $f_{DCLK} = 80\text{MHz}$ ,  $V_{DD} = 12.0\text{V}$ , DC Current.

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

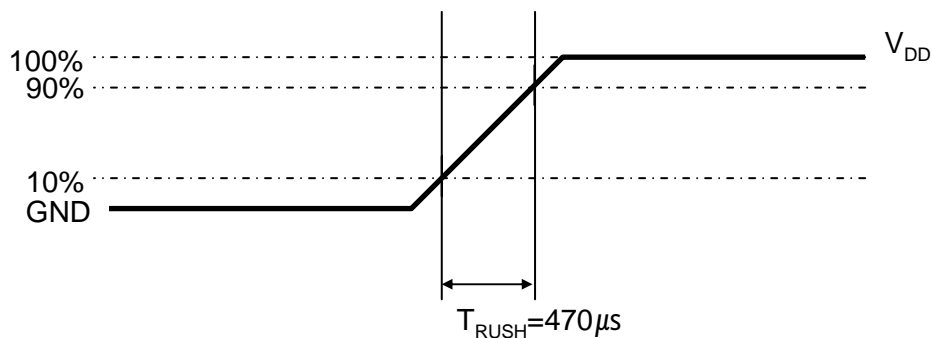
a) Black Pattern

b) White Pattern

c) N-Pattern



(4) Measurement Conditions



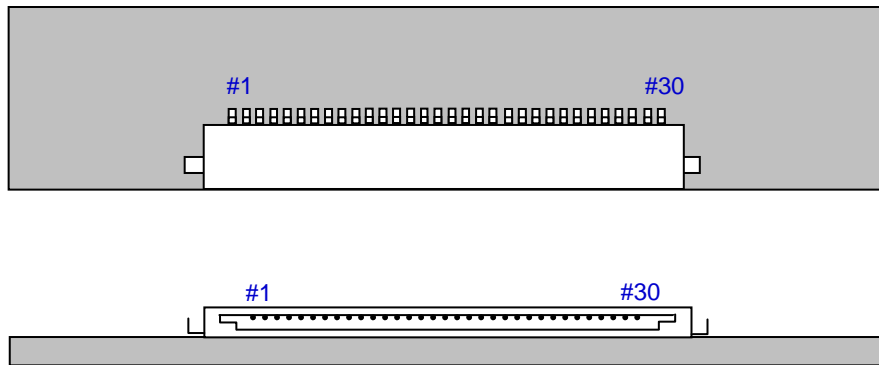
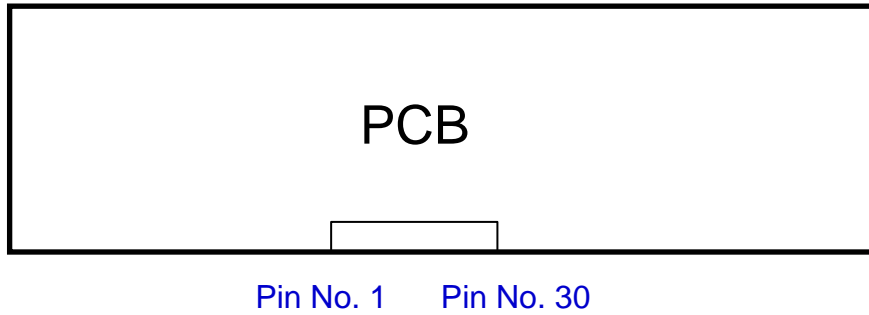
Rush Current  $I_{RUSH}$  can be measured when  $T_{RUSH}$  is  $470\mu\text{s}$ .

### 4.3 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	V <sub>in</sub>	-	22	24	26	V	Ta=25±2 °C
Input Current	I <sub>in</sub>	V <sub>in</sub> = 24.0V V <sub>dim</sub> = 3.3V	-	-	12	A	After 1 hour Warm-up
Lamp Current	I <sub>O,MAX</sub>	V <sub>dim</sub> = 3.3V	5.5	6.0	6.5	mArms	
Frequency	F <sub>LAMP</sub>	V <sub>in</sub> = 24.0V	60.0	62.5	65.0	kHz	
Backlight On/Off	ON	V <sub>in</sub> = 24.0V	2.4	-	5.25	V	
	OFF	V <sub>in</sub> = 24.0V	0	-	0.8		
Dimming Control	V <sub>DIM</sub>	Max Lum	3.3	-	-	V	
		Min. Lum	-	-	0		

Note (1) Power Consumption is measured at 700[cd/m<sup>2</sup>] of luminance condition which is the typical luminance value. Lamp Current is measured at the point before Lamp.

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.



## 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

## 6. Interface Timing

### 6.1 Timing Parameters (DE only mode)

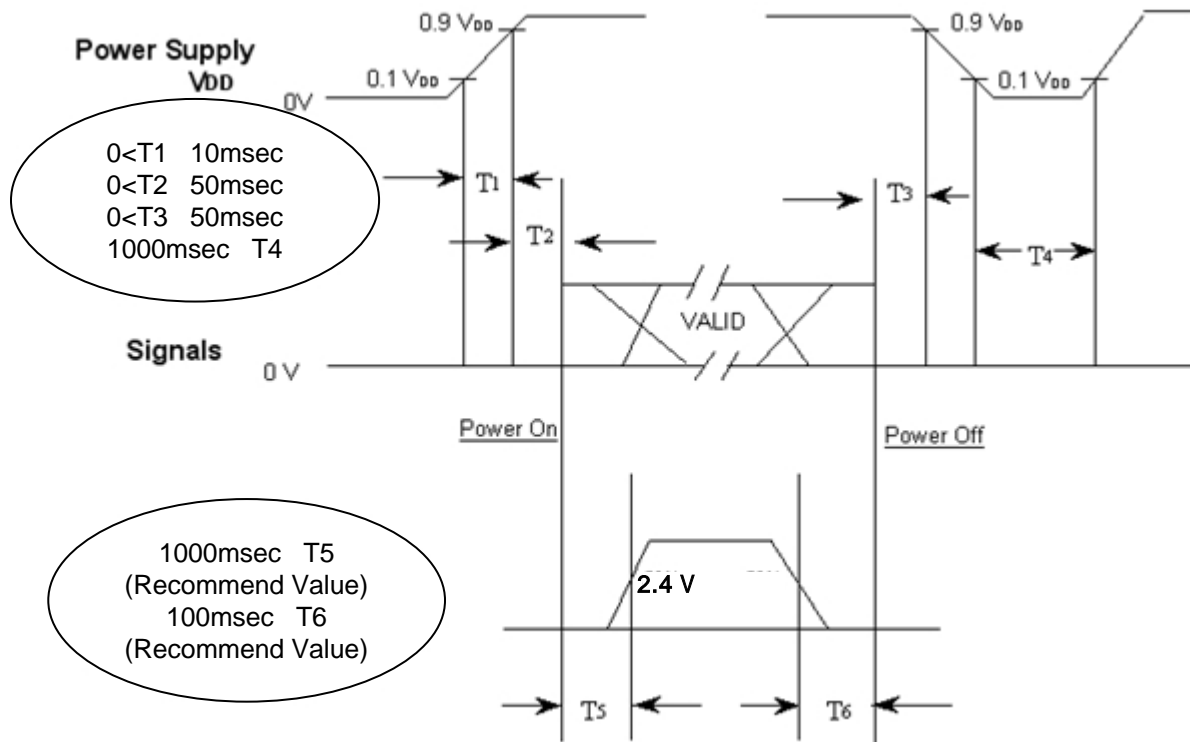
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	$1/T_C$	65	80	85	MHz	-
Hsync		$F_H$	43	50	53	KHz	-
Vsync		$F_V$	-	60	-	Hz	-
Vertical Display Term	Active Display Period	$T_{VD}$	-	768	-	Lines	-
	Vertical Total	$T_V$	773	838	1500	Lines	-
Horizontal Display Term	Active Display Period	$T_{HD}$	-	1366	-	Clocks	-
	Horizontal Total	$T_H$	1568	1600	2000	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

### 6.3 Power ON/OFF Sequence

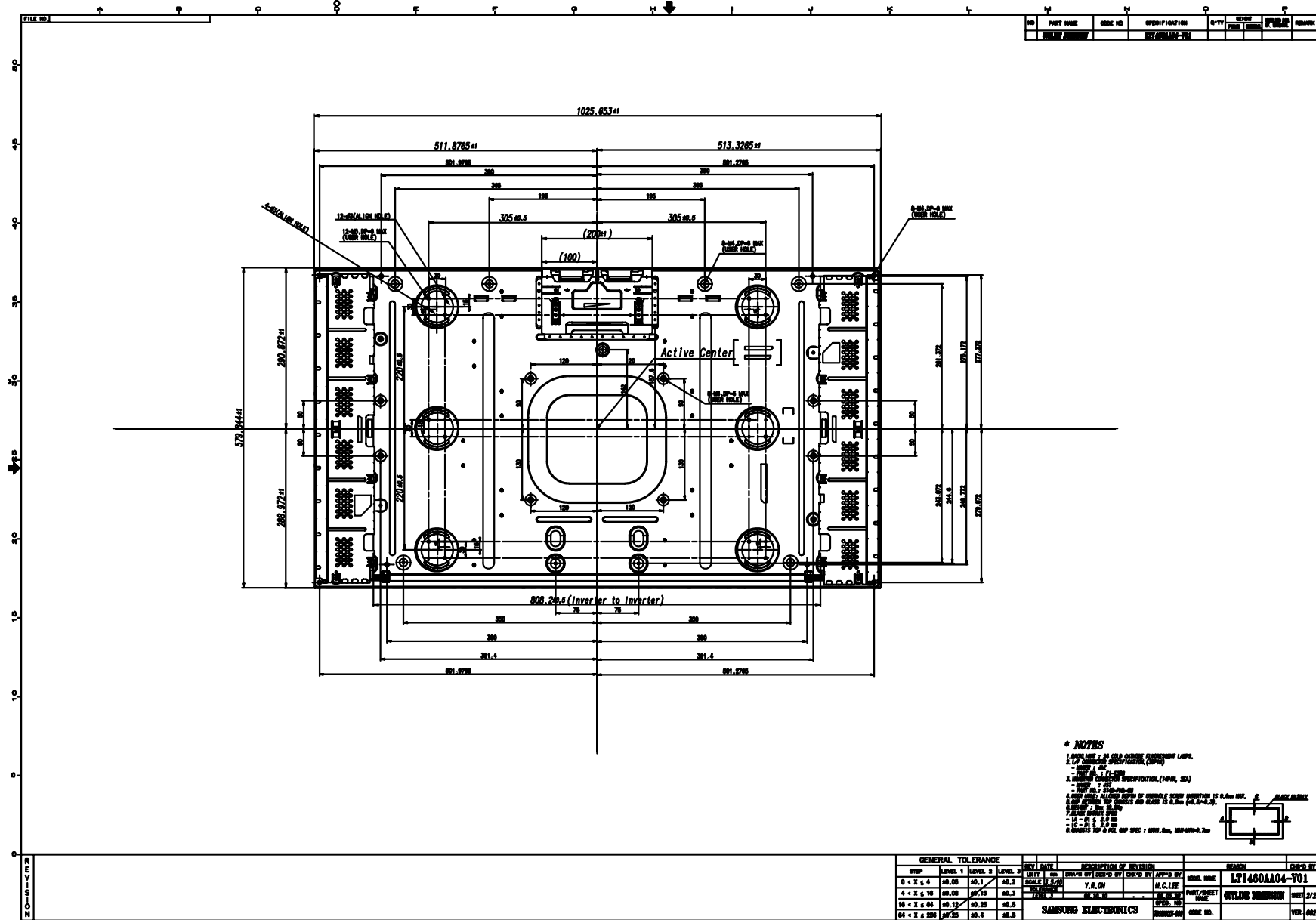
To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



- $T1$  :  $V_{DD}$  rising time from 10% to 90%
- $T2$  : The time from  $V_{DD}$  to valid data at power ON.
- $T3$  : The time from valid data off to  $V_{DD}$  off at power Off.
- $T4$  :  $V_{DD}$  off time for Windows restart
- $T5$  : The time from valid data to B/L enable at power ON.
- $T6$  : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of  $V_{DD}$ .
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of  $V_{DD}$  = off level, please keep the level of input signals low or keep a high impedance.
- $T4$  should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

# 7. Outline Dimension (Rear View)



NO	PART NAME	CODE NO	SPECIFICATION	QTY	UNIT	REMARK
	OUTLINE DIMENSION		727.08000-701			

**NOTES**

1. DIMENSION LINE IS OLD CENTER (REFERENCE LINE).
2. 1.7 DIMENSION (CONTOUR) (DIP)
3. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
4. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
5. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
6. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
7. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
8. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
9. DIMENSION TOLERANCE SPECIFICATION (MM, IN)
10. DIMENSION TOLERANCE SPECIFICATION (MM, IN)

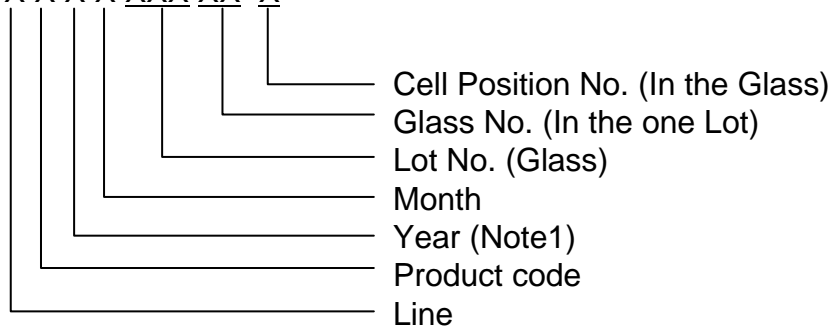


GENERAL TOLERANCE				REV	DATE	DESCRIPTION OF REVISION	REVISION	CHG'D BY
STEP	LEVEL 1	LEVEL 2	LEVEL 3	REV	DATE	DESCRIPTION OF REVISION	REVISION	CHG'D BY
0 - X < 4	±0.08	±0.1	±0.2			INITIAL BY / DESIGNED BY / CHECKED BY / APP'D BY		
4 - X < 10	±0.08	±0.10	±0.3			Y.R.OH		
10 - X < 64	±0.12	±0.20	±0.5			Y.R.OH		
64 - X < 250	±0.20	±0.4	±0.8			SAMSUNG ELECTRONICS		

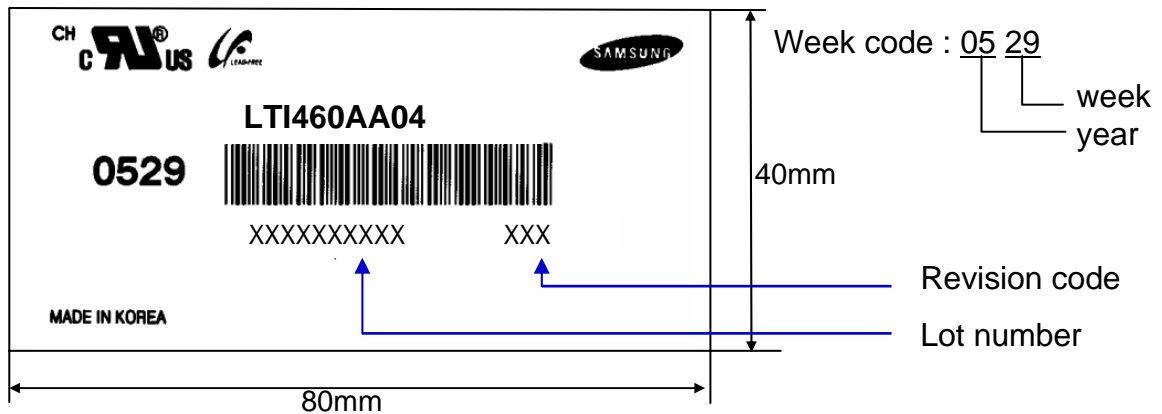
## 9. MARKING & OTHERS

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

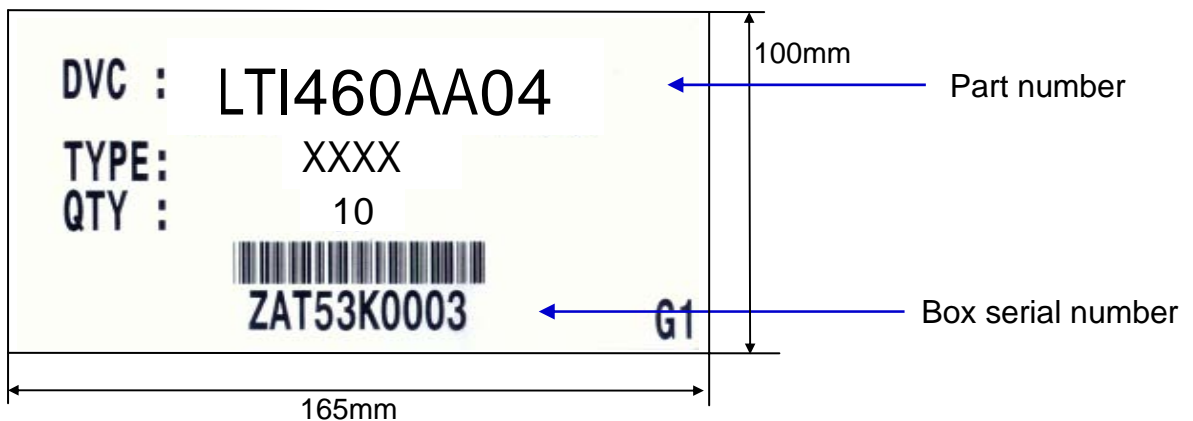
- (1) Part number : LTI460AA04
- (2) Revision: Three letters
- (3) Lot number : X X X X XXX XX X



### (4) Nameplate Indication



### (5) Packing box attach



### (6) Others

- 1. After service part

Lamps cannot be replaced because of the narrow bezel structure.

MODEL	LTI460AA04	Doc. No	05-000-G-081118	Page	24 / 27
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## 10.2 Storage

- (a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 0 to 35 and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD Module in direct sunlight.
- (c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

## 10.3 Operation

- (a) Do not connect or disconnect the Module in the "Power On" condition.
- (b) Power supply should always be turned on/off by the "Power on/off sequence"
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of lamp(CCFT) and may require 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 :  $20 \pm 15$
  - Humidity :  $55 \pm 20\%$
  - 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 SEC 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.

# SAMJE

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