Issued Date : Aug 17, 2004

SAMSUNG TFT-LCD

MODEL NO. : LTA400W2-L01

Note :_____

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Any Modification of Spec is not allowed without SEC's permission.

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Samsung Electronics Co . , LTD.

Contents

Revision History

No	Date	Page	Before change	After change	remark
0.0	2004.08.17	7	Constrast Ratio[Min, Typ] = [500, 800]	Constrast Ratio[Min, Typ] = [700, 800]	Changed
			Color Chromaticity Red [Rx, Ry] = [TBD, TBD]	Color Chromaticity Red [Rx, Ry] = [0.638, 0.331]	Changed
			Color Chromaticity Green [Gx, Gy] = [TBD, TBD]	Color Chromaticity Green [Gx, Gy] = [0.282, 0.595]	Changed
			Color Chromaticity Blue [Bx, By] = [TBD, TBD]	Color Chromaticity Blue [Bx, By] = [0.144, 0.237]	Changed
		11	Power Consumption (a) Black [Min, Max] = [-, 1100]	Power Consumption (a) Black [Min, Max] = [1300, 1500]	Changed
			Power Consumption (a) White [Min, Max] = [-, 1700]	Power Consumption (a) White [Min, Max] = [1600, 1700]	Changed
			Power Consumption (a) N-pattern [Min, Max] = [-, 2000]	Power Consumption (a) N-pattern [Min, Max] = [1700, 2000]	Changed
		14	Lamp Current[Min, Typ, Max] = [4.0, 5.5, 7.0]	Lamp Current[Min, Typ, Max] = [4.0, 5.5, 6.5]	Changed
			Lamp Voltage[Min, Typ, Max] = [-, TBD, -]	Lamp Voltage[Min, Typ, Max] = [1480, 1540, 1600]	Changed
			Lamp Frequency[Min, Max] = [-, -]	Lamp Frequency[Min, Max] = [40, 80]	Changed
			Operation Life Time[Min] = [-]	Operation Life Time[Min] = [50000]	Changed
			Start Up Voltage Max[0 , 25] = [TBD, TBD]	Start Up Voltage Max[0 , 25] = [2500, 1990]	Changed
		19	Input Current[Typ] = [TBD]	Input Current[Typ] = [8]	Changed
			PWM Frequency[Min, Typ, Max] = [120, -, 240]	PWM Frequency[Min, Typ, Max] = [120, 150, 180]	Changed
		21	Clock[Min, Typ, Max] = [65, 80, 90]	Clock[Min, Typ, Max] = [60, 80, 85]	Changed
			Hsync[Min, Typ, Max] = [43, 48, 53]	Hsync[Min, Typ, Max] = [43, 50, 53]	Changed
			Horizontal Total[Min, Typ, Max] = [1570, 1600, 1700]	Horizontal Total[Min, Typ, Max] = [1552, 1600, 1656]	Changed

General Description

* Description

LTA400W2-L03 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFTs as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a back-light system. The resolution of a 40.0" contains 1366 x 768 pixels and can display up to 16.7 million colors with wide viewing angle of 85° or higher in all directions.

* Features

- High contrast ratio, high aperture structure
- PVA(Patterned Vertical Align) mode
- Wide viewing angle(± 170°)
- High speed response
- WXGA (1366 x 768 pixels) resolution (16:9)
- Low Power consumption
- 20 lamps with ' C ' Type CCFL (Cold Cathode Fluorescent Lamp)
- LVDS(Low-Voltage Differential Signal) interface. (1pixel/clock)

* Applications

Home-alone Multimedia TFT-LCD TV
Display terminals for AV application products
High Definition TV (HD TV)

* General information

Items	Specification	Unit	Note
Display area	885.168(H) × 497.664(V)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16.7M(8bits-true)	colors	
Number of pixels	1366 x 768	pixel	16:9
Pixel arrangement	RGB Vertical Stripe		
Pixel pitch	0.648(H) × 0.216(W)	mm	
Display mode	Normally Black		
Surface treatment	Haze 44%, Hard Coating(3H)		conductive pol

* Mechanical information (Panel Module Only with Inverter)

Item		Min.	Typ.	Max.	Note
Module size	Horizontal(H)	951.0	952.0	953.0	mm
	Vertical(V)	550.0	551.0	552.0	mm
	Depth(D)	50.0	51.0	52.0	mm
Weight		-	10.5	-	Kg

1. Absolute Maximum Ratings

1.1 Absolute ratings of environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-20	65	℃	(1)
Operating temperature	T_{OPR}	0	50	℃	(1)
(Ambient temperature)	Tsur	0	65	℃	(2)
Shock (non - operating)	Snop	-	50	G	(3),(5)
Vibration (Non - operating)	Vnop	-	1.5	G	(4),(5)

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

93.8 % RH Max. (40 °C $\geq$ Ta)

Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C)　No condensation.

(2) Abnormal visual problems by panel surface temperature can be occurred in specific range. But materials(ex : polarizer) are not damaged permanently in this range, Tsur.

(3) 11ms, sine wave, 1 time for　$\pm X,\ \pm Y,\ \pm Z$ axis

(4) 10～300Hz/1.5G

(10min/cycle, 30min for X,Y,Z axis)

(5) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

Relative Humidity (%RH)

Operating Range

Storage Range

Temperature (°C)
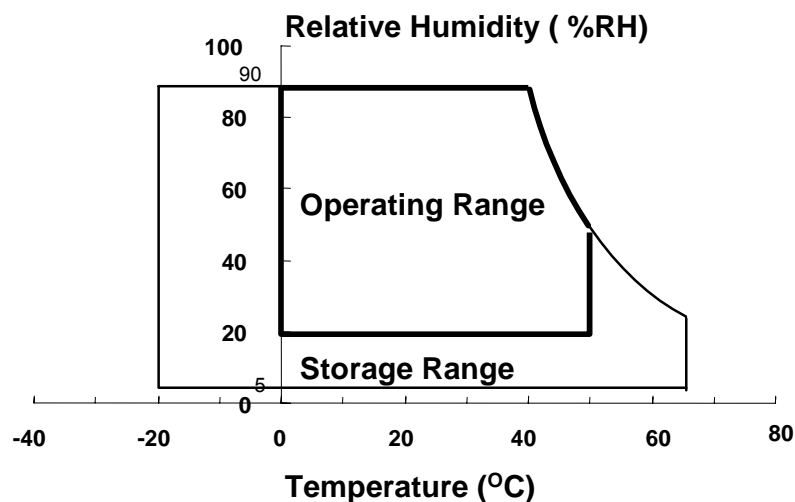
1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD Module   (Vss = GND = 0 V)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	Vss-0.5	6.5	V	(1)

NOTE (1) Within Ta (25 ± 2 °C)

(2) BACK-LIGHT UNIT   (Ta = 25 ± 2°C)

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage/ Inverter	V_{CC}	V_{ss}-0.5	24	V	(1)
Lamp Current	I_L	4.0	7.0	rms	(2),(3)
Lamp Frequency	F_L	40	80		(2)

NOTE (1) Inverter Input power
   (2) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under Normal Operating Conditions.
   (3) Specified values are for a single lamp.

2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

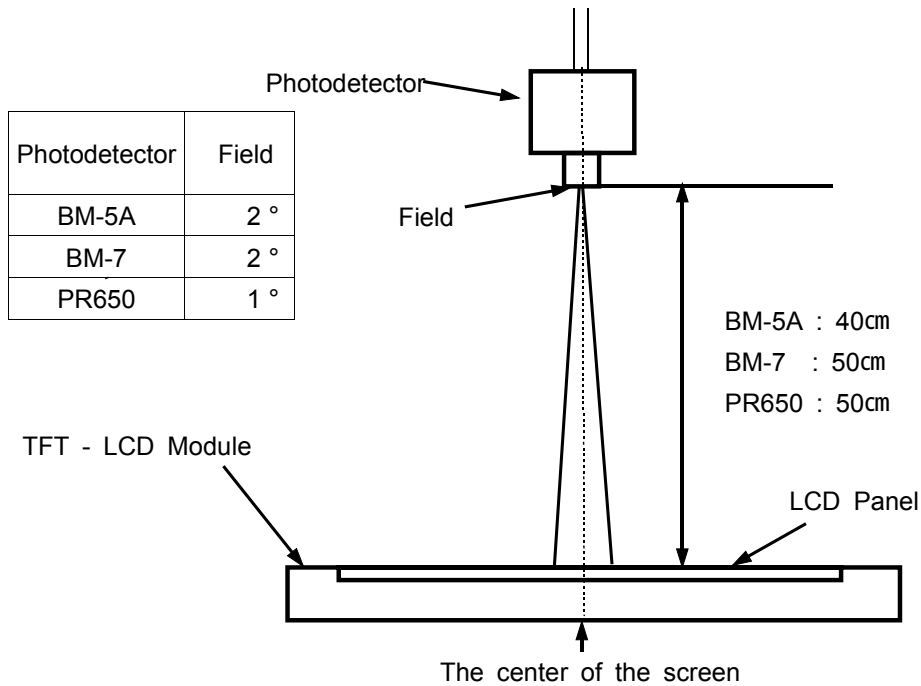Measuring equipment : TOPCON BM-5A , BM-7, PHOTO RESEARCH PR650

* Ta = 25 ± 2°C , V_{DD}=5.0V, fv= 60Hz, f_{DCLK}=80 MHz, I_L = 5.5mA$_{rms}$

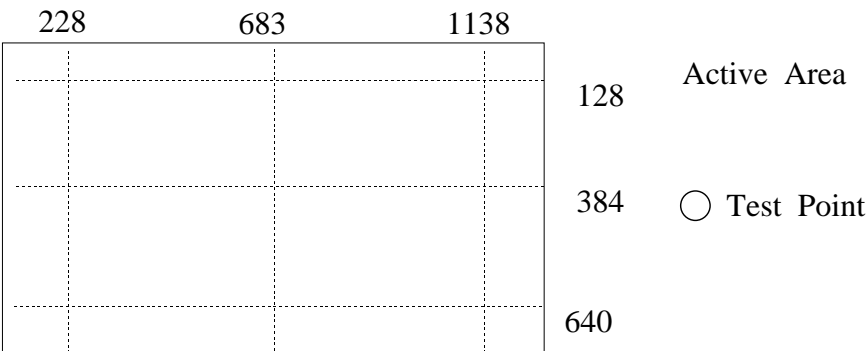| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		700	800	-		(3) BM-5A
Response Time	Rising	Tr		-	10	13	msec	(4) BM-7
	Falling	Tf		-	6	7		
Luminance of White (Center of screen)		YL	Normal $\phi = 0$ $\theta = 0$	400	500	-	cd/m2	(5) BM-5A Dimmer Voltage2.8V
Color Chromaticity (CIE 1931)	Red	Rx	Viewing Angle	TYP. -0.03	0.638	TYP. +0.03		(6) PR650
		Ry			0.331			
	Green	Gx			0.282			
		Gy			0.595			
	Blue	Bx			0.144			
		By			0.237			
	White	Wx			0.280			
		Wy			0.290			
Color Temperature		k		-	10000	-		
Viewing Angle	Hor.	θ L	C/R≥10	75	85	-	Degrees	(7) BM-5A
		θ R		75	85	-		
	Ver.	ϕ H		75	85	-		
		ϕ L		75	85	-		
Brightness Uniformity (9 points)		Buni		-	-	25	%	(8) BM-5A

Note 1) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min ,the measurement should be executed.   Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.

A single lamp current : 5.5mA

Environment condition : Ta = 25 ± 2 °C

Photodetector	Field
BM-5A	2°
BM-7	2°
PR650	1°

Photodetector

Field

BM-5A : 40
BM-7 : 50
PR650 : 50

TFT - LCD Module

LCD Panel

The center of the screen

Optical Measuring Equipment Setup

Note 2) Definition of test point

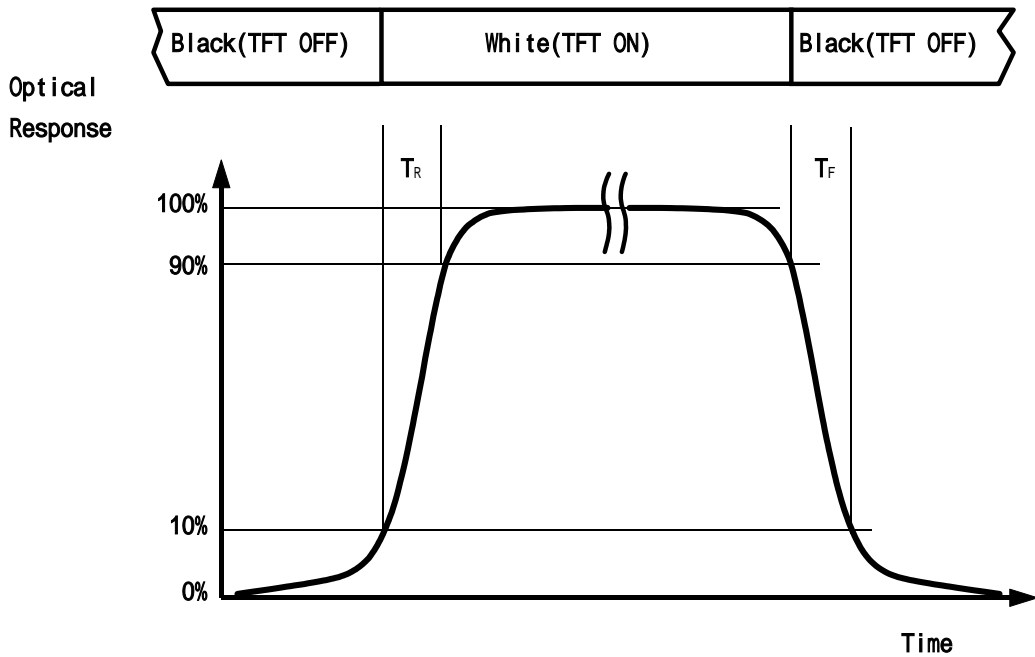228   683   1138

128   Active Area

384   ◯ Test Point

640

Note 3) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin)
at the center point(5) of the panel

$$CR = \frac{G \max}{G \min}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

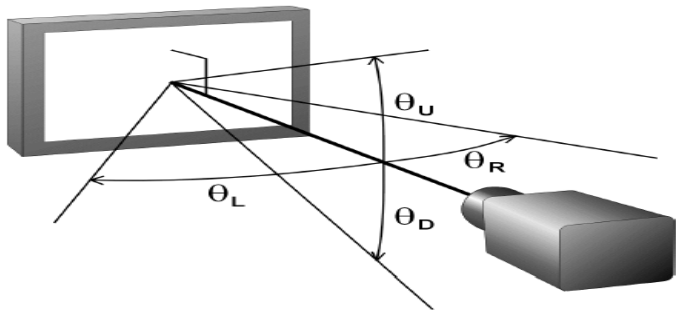Note 4) Definition of Response time : Sum of Tr ,Tf

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

Note 6) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red , Green , Blue & White at center point(5).

Note 7) Definition of Viewing Angle : Viewing angle range (CR≥10)

Note 8) Definition of 9 points brightness uniformity

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

    Bmax : Maximum brightness
    Bmin : Minimum brightness

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3. Electrical Characteristics

3.1 TFT LCD MODULE

Ta = 25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	4.5	5.0	5.5	V	(1)
Power Consumption	(a)Black	I_{DD}		1300	(1500)	mA	(2),(3), (5)
	(b)White			1600	(1900)	mA	
	(c)N-Pattern			1700	(2000)	mA	
Vsync Frequency		f_V	48	60	66	Hz	
Hsync Frequency		f_H	43	50	53	kHz	
Main Frequency		f_{DCLK}	60	80	85	MHz	
Rush Current		I_{RUSH}	-	-	4	A	(4)

Note　(1)　Main pixel clock frequency is the value which is measured at the input of LVDS transmitter.

　　　(2)　f_V=60Hz, f_{DCLK}=80MHz, V_{DD} = 5.0V, DC Current.

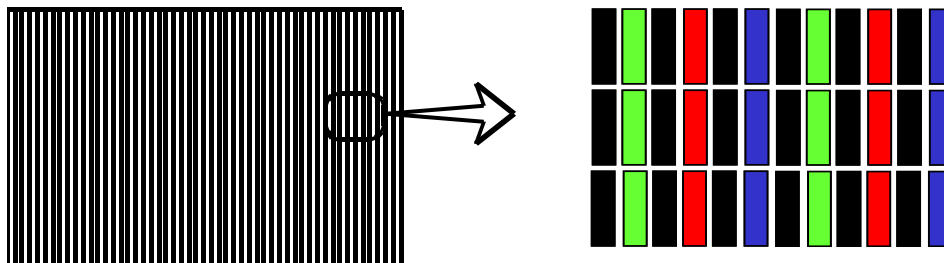　　　(3)　Power dissipation check pattern(LCD Module only)

(a) Black Pattern
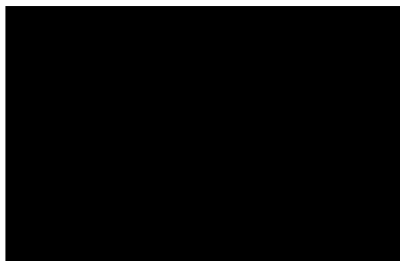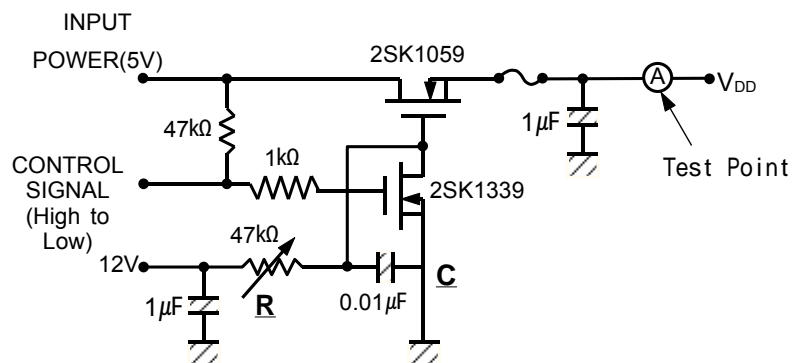
(b) White Pattern
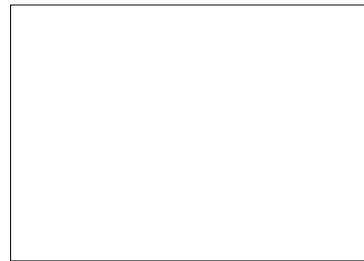
(C) N-pattern
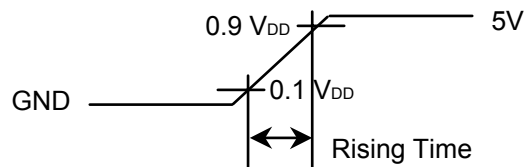
(4) Measurement Conditions (Rising time =470   )

Note : Control Signal : High(+5V) -->Low(Ground)

All Signal lines to panel except for power 5V : Ground

The rising time of supplied voltage is controlled to 470us by R and C value.

(5) Power Consumption   Except for Inverter power consumption

3.2   BACK-LIGHT UNIT

The back-light system is an 'C 'type direct light with 20 CCFTs (Cold Cathode
Fluorescent Tube) The characteristics of 20 lamps are shown in the following tables.

Ta=25 ± 2°C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp Current	I_L	4.0	5.5	6.5	mArms	(1)
Lamp Voltage	V_L	1480	1540	1600	Vrms	(1)
Lamp Frequency	f_L	40	-	80	kHz	(2)
Operating Life Time	Hr	50000	-	-	Hour	(3)
Start up Voltage	Vs	-	-	0 :2500 25 :1990	Vrms	(4)

**Note)   The waveform of the inverter output voltage must be area symmetric and the design
of the inverter must have specifications for the modularized lamp.
Specified values are for a single lamp.**

   The performance of the back-light, for example life time or brightness, is much influenced by
the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter
should be carefully designed so as not to produce too much leakage current from high-voltage
output of the inverter.

   When you design or order the inverter, please make sure that a poor lighting caused by the
mismatch of the back-light and the inverter(miss lighting, flicker, etc.) never occur. When you
confirm it, the module should be operated in the same condition as it is installed in your
instrument.

Note (1) lamp current is measured with current meter.
        Refer to the following block diagram of the back-light unit for more information.
        Lamp Voltage Min : Lamp Current 7.0 mArms
        Lamp Voltage Max : Lamp Current 4.0 mArms
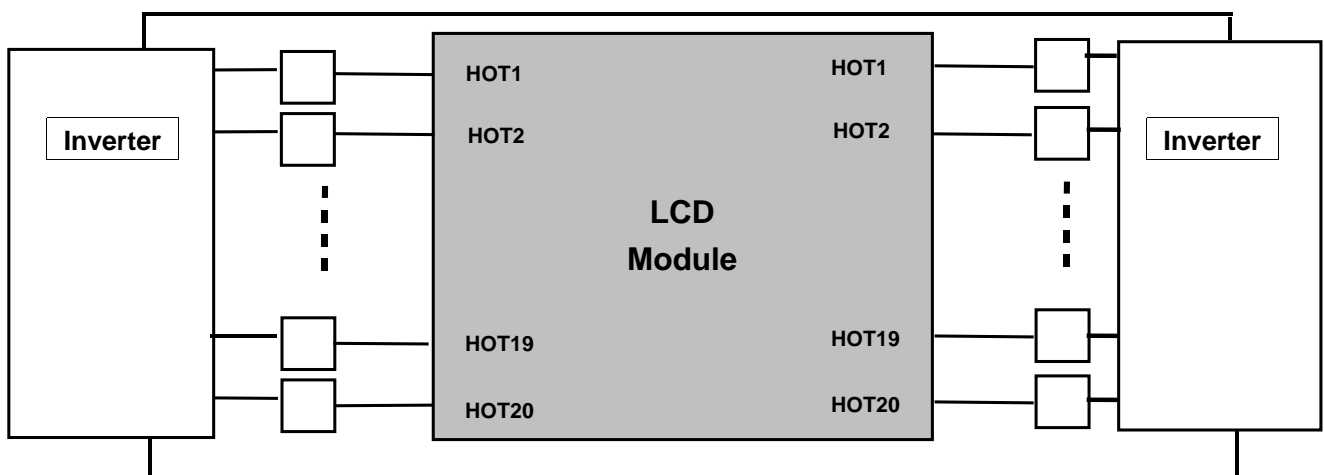
(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display.

(3) Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of Ta = $25\pm2°$C and IL = 6.5mArms(max) for a lamp until the brightness becomes 50% or lower than it's original value.

(4) If an inverter has shutdown function it should keep its output for more than 1 second even if the lamp connector open. Otherwise the lamps may not to be turned on.

Preliminary

4. Block Diagram

4.1 TFT LCD MODULE

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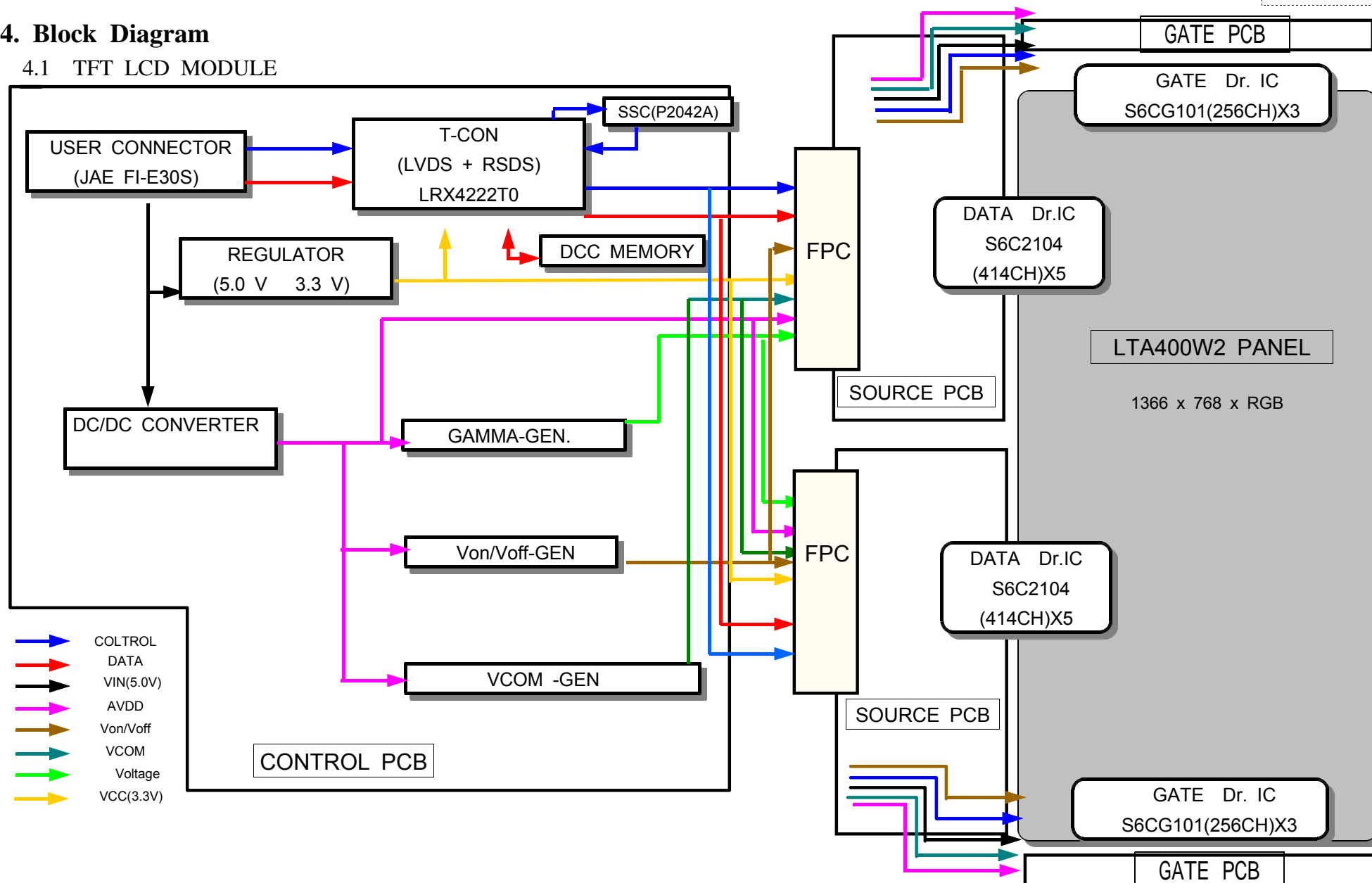
4.2   BACK-LIGHT UNIT

HOT : HIGH VOLTAGE (Part NO. : TBD)

HOT 1	CCFL1,2	HOT 1
HOT 2		HOT 2
HOT 3	CCFL3,4	HOT 3
HOT 4		HOT 4
HOT 17		HOT 17
HOT 18	CCFL17,18	HOT 18
HOT 19		HOT 19
HOT 20	CCFL19,20	HOT 20

5.   Input Terminal Pin Assignment

5.1. Input Signal & Power : Connector FI-E30S (JAE)

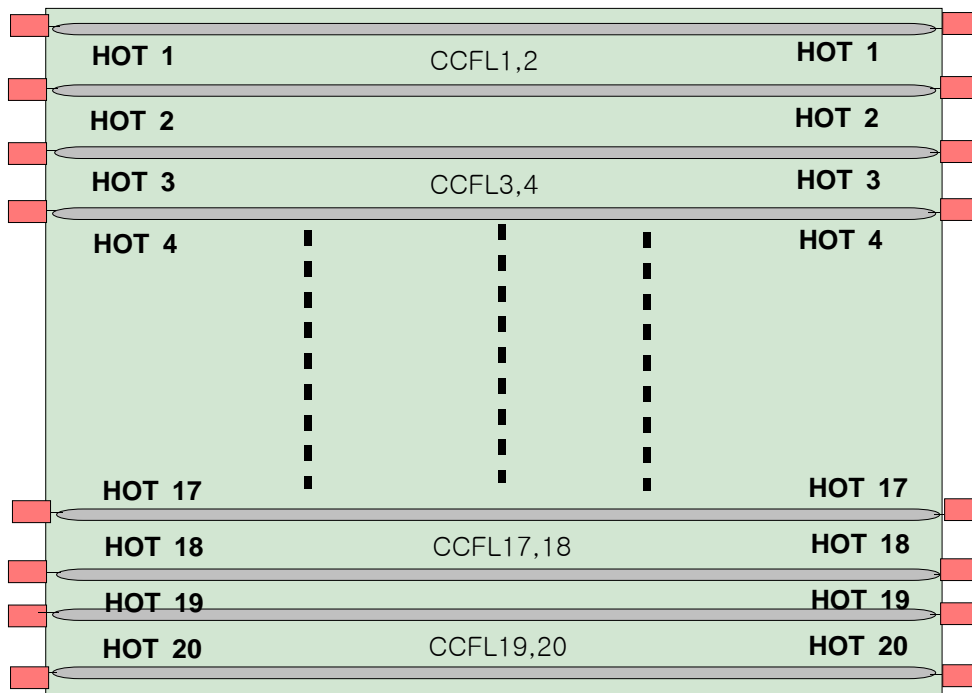| N o	S i g n a l	N o	S i g n a l
1	N . C *	1 6	G N D
2	N . C *	1 7	R x 3 -
3	N . C *	1 8	R x 3 +
4	G N D	1 9	G N D
5	R x 0 -	2 0	N . C *
6	R x 0 +	2 1	L V D S O P T I O N **
7	G N D	2 2	N . C *
8	R x 1 -	2 3	G N D
9	R x 1 +	2 4	G N D
1 0	G N D	2 5	G N D
1 1	R x 2 -	2 6	V d d (+ 5 V d c)
1 2	R x 2 +	2 7	V d d (+ 5 V d c)
1 3	G N D	2 8	V d d (+ 5 V d c)
1 4	R x C L K -	2 9	V d d (+ 5 V d c)
1 5	R x C L K +	3 0	V d d (+ 5 V d c)

*   NOT CONNECTED : THIS PINS ARE ONLY USED FOR SEC INTERNAL OPERATIONS.

** 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

5.2 LVDS Interface
- LVDS Receiver : Tcon (merged)
- JEIDA & Normal Data Format

	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

5.4 Inverter specification

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Input Voltage	Vin	-	21.6	24.0	26.4	V	
Input Current	Iin	Vin=24.0V, Vbr=0V after 2hr aging	-	8	-	A	
Lamp Current	Io_Lmax	Vbr=3.3V	-	6.5	-	mArms	
	Io_Lmin	Vbr=0V	-	4	-		
Operating Frequency	Fop	VIN=24.0V Vbr=0V	55	60	65	kHz	
Shut down Time	Ts-d	No load	1	1.5	2	sec	
Open Lamp Voltage	Vopen	No load	1500	-	-	Vrms	
Back-Light On/Off Control	On/Off	Enable the inverter	2.4	-	5.5	V	
		Disable the inverter	0	-	0.8	V	
PWM Frequency	Fpwm	VIN=24.0V Vbr=0V	120	150	180	Hz	
PWM Minimum Duty	PMD	VIN=24.0V Vbr=0V	30	-	100	%	(1)
Analog Dimmer	Max Lum	-	-	3.3	-	V	
	Min. Lum	-	-	0	-		

Vbr = 5.0V means 100% of PWM dimming

Note(1) High Duty = On/(On + Off)
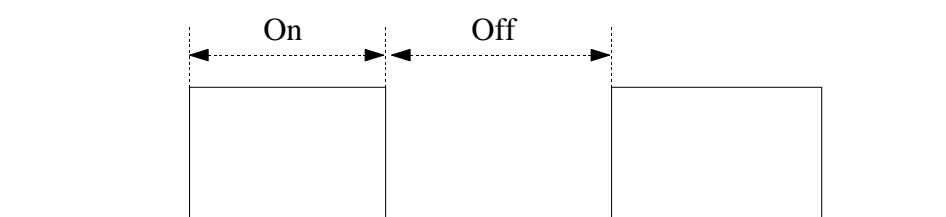
5.5 Input Signal,Basic Display Colors and Gray Scale of Each Color

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	-
	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		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
	LIGHT	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		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
	LIGHT	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		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
	LIGHT	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)

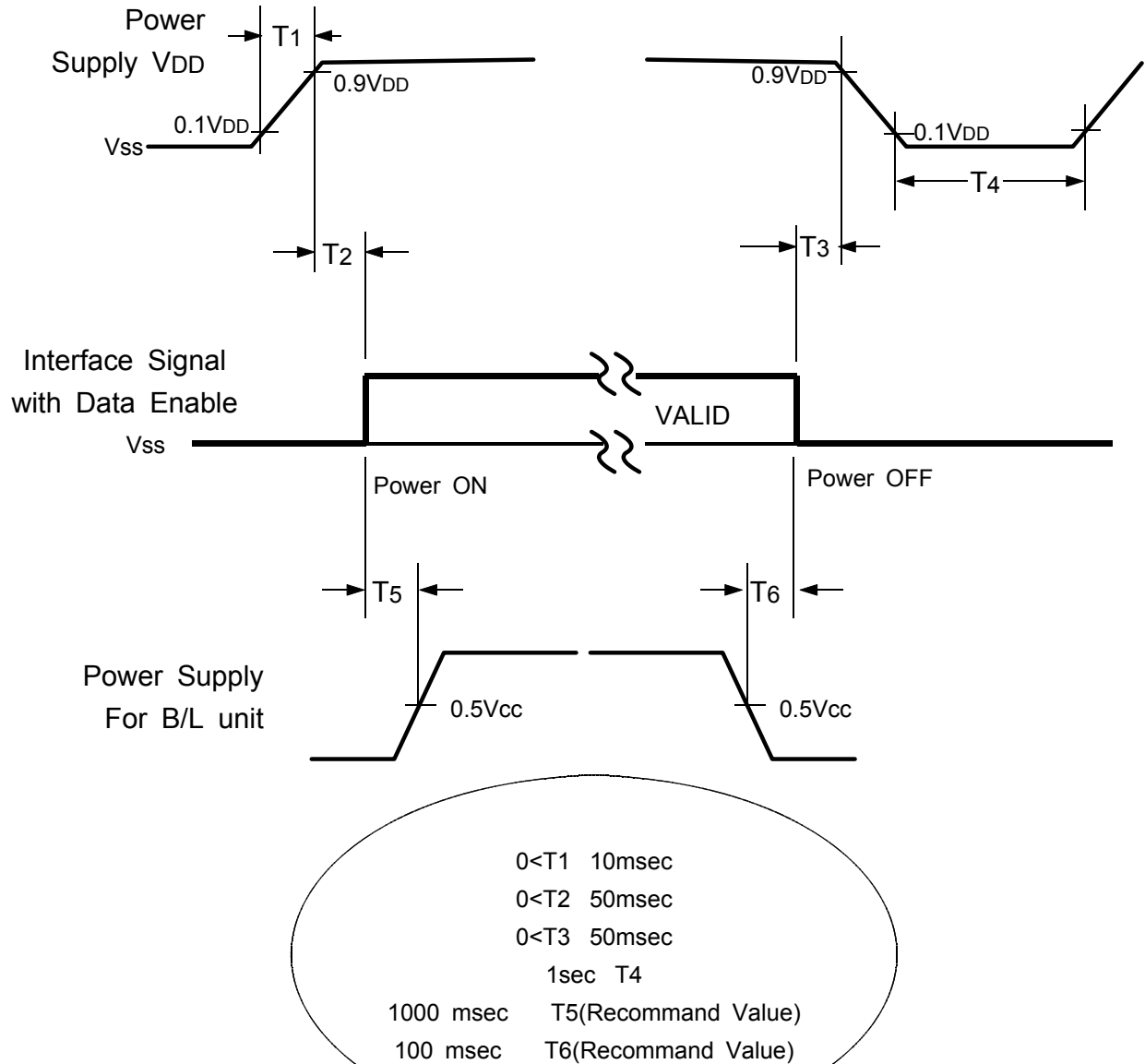| SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Clock	Frequency	1/TC	60	80	85	MHz	-
Hsync		Fh	43	50	53	KHz	-
Vsync		Fv	48	60	66	Hz	-
Vertical Active Disply Term	Display Period	T_{VD}	-	768	-	lines	-
	Vertical Total	T_V	773	838	1200	lines	-
Horizontal Active Display Term	Display Period	T_{HD}	-	1366	-	clocks	-
	Horizontal Total	T_H	1552	1600	1656	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does not
       have an effect on normal operation.

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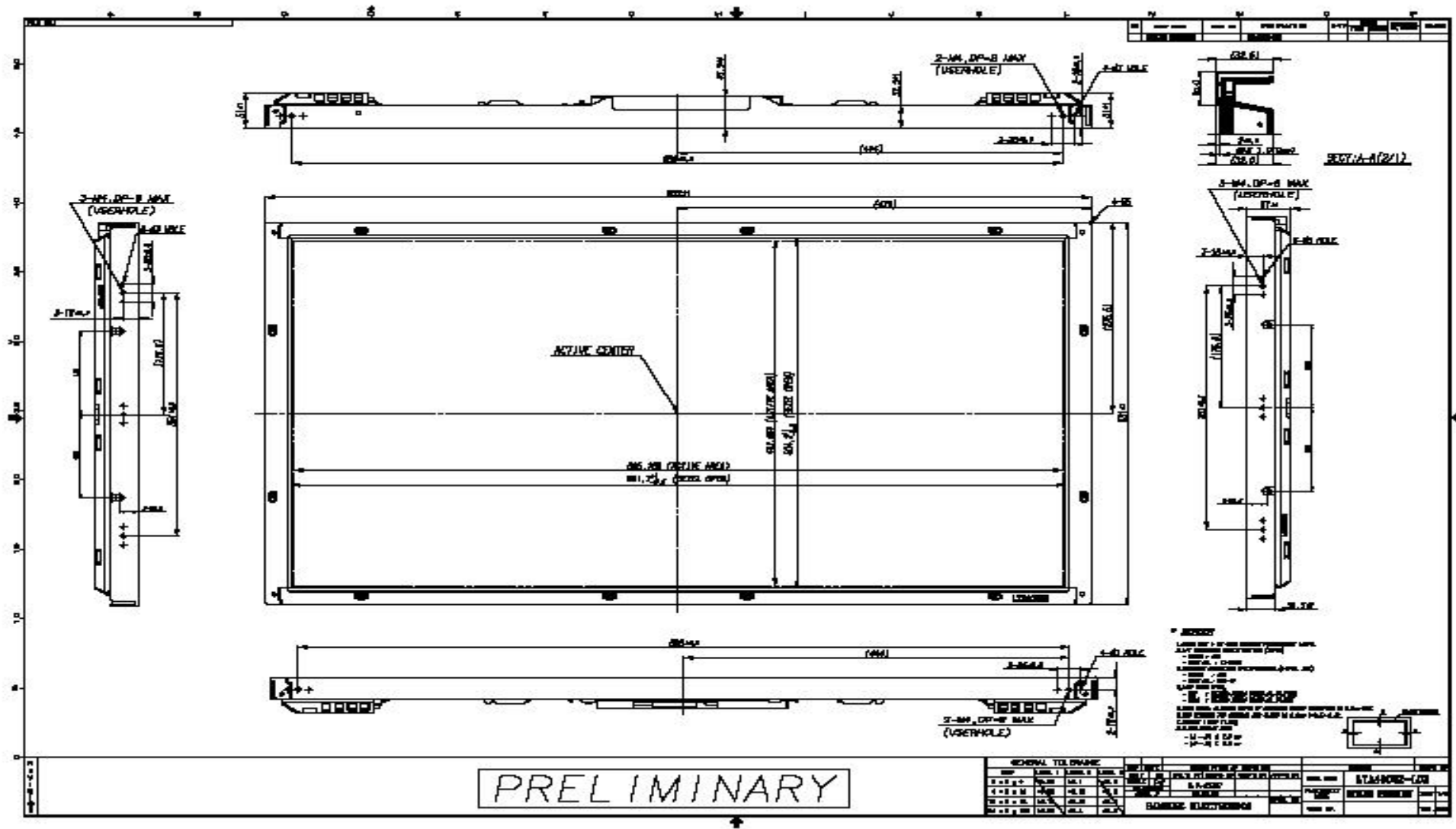6.2   Timing diagrams of interface signal (DE only mode)
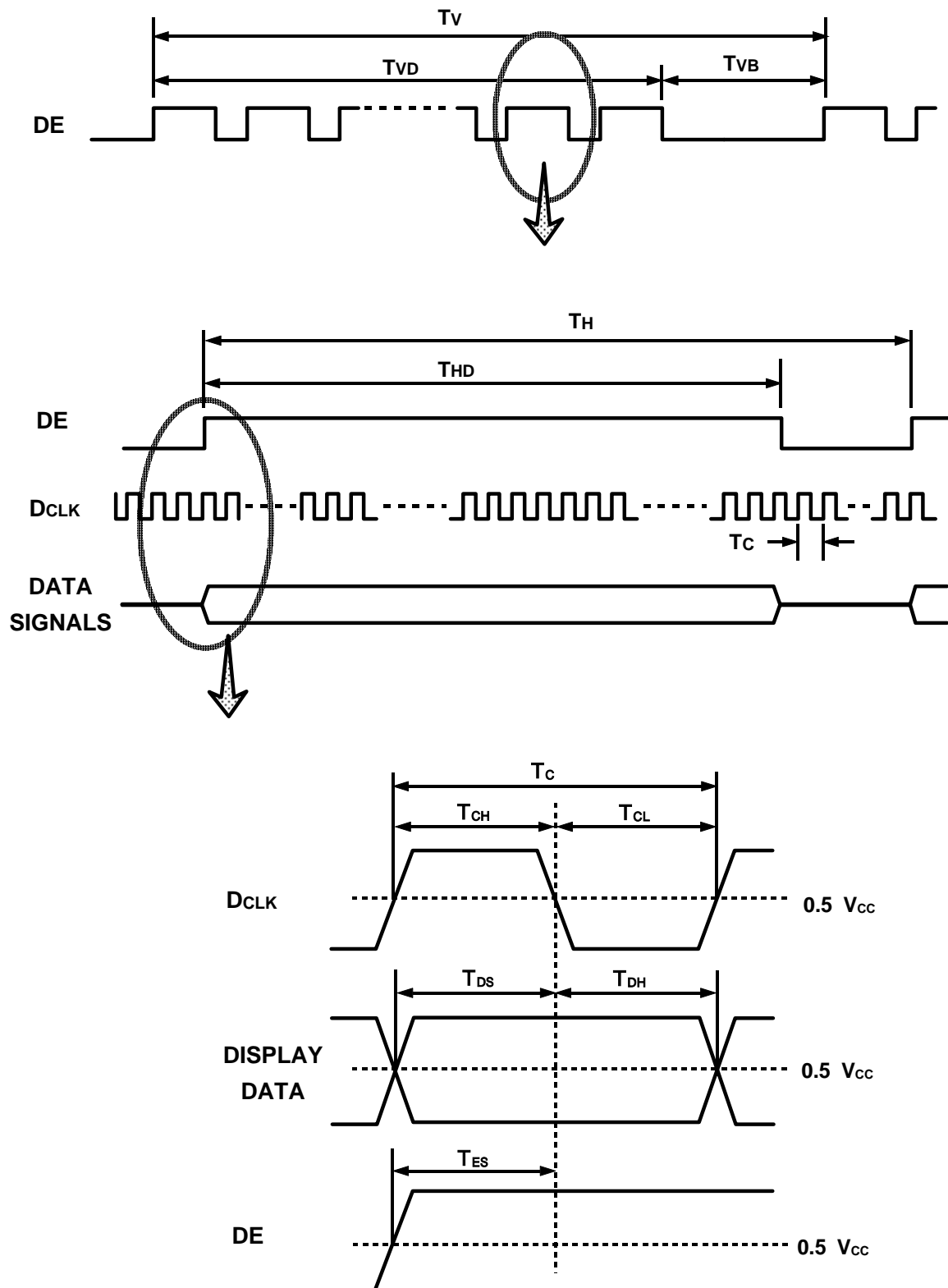
6.3   Power ON/OFF Sequence

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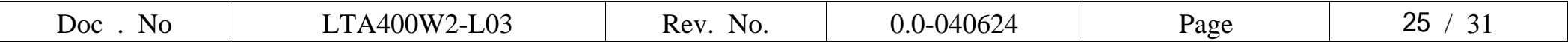   should be as the diagram below.

0<T1 10msec
0<T2 50msec
0<T3 50msec
      1sec T4
1000 msec   T5(Recommand Value)
100 msec   T6(Recommand Value)

NOTE.

   (1)The supply voltage of the external system for the module input should be the
       same as the definition of VDD.

   (2) 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 become abnormal screen.

   (3) In case of VDD = off level, please keep the level of input signals on the low or
       keep a high impedance.

   (4) T4 should be measured after the module has been fully discharged between
       power off and on period.

   (5) Interface signal shall not be kept at high impedance when the power is on.

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7. Outline Dimension (Front View)

PRELIMINARY

7. Outline Dimension (Rear View)

PRELIMINARY

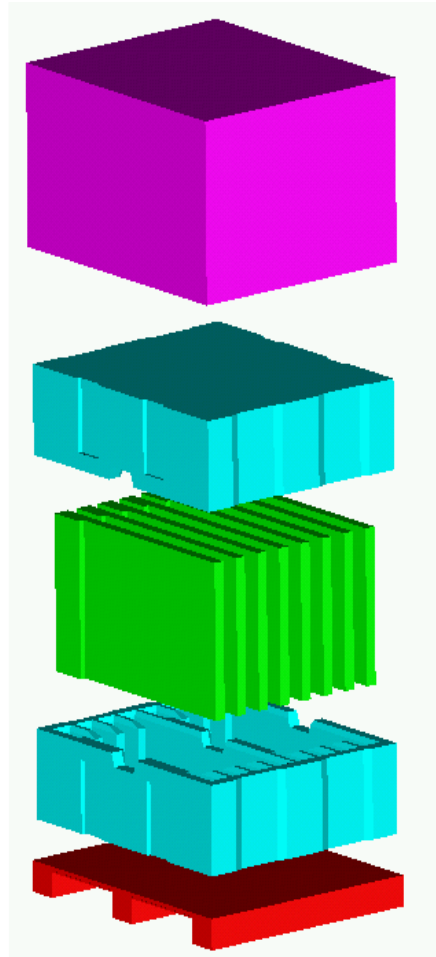| Doc . No | LTA400W2-L03 | Rev. No. | 0.0-040624 | Page | 25 / 31 |

8. PACKING

8.1 Carton

1) Packing Form

Corrugated fiberboard box and EPS cushion as shock absorber

2) Packing Method

**Packing
-PalletBox**

Cushion-Foam

LCD Module

Cushion-Foam

Pallet

Direction: be able to open it
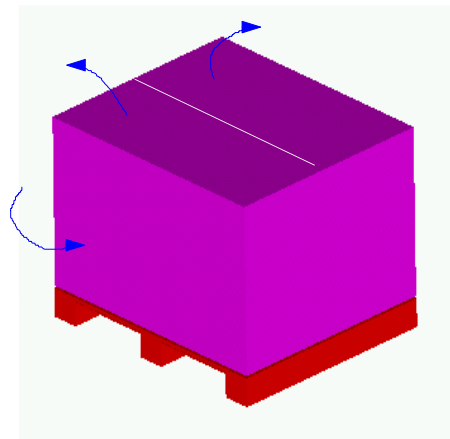
8.2 Packing Specification

ITEM	SPEC	Remark
Pallet	8 ea / Pallet	1. Pallet weight = TBD kg 2. TBD Kg / Pallet → TBD Kg / Pallet

9. MARKING & OTHERS

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

(1) Parts number : LTA400W2-L03-00R6

(2) Revision   : One letter

(3) Control   : One letter

(4) Lot number   : $\underset{1}{6}$ $\underset{2}{D}$ $\underset{3}{4}$ $\underset{4}{A}$ $\underset{5}{123}$ $\underset{6}{01}$ $\underset{7}{A}$

```
6 : Line
D : Device
4 : Year
A : Month
123 : LOT NO
01 : GLASS NO
A : CELL NO
```

(5) Nameplate   Indication

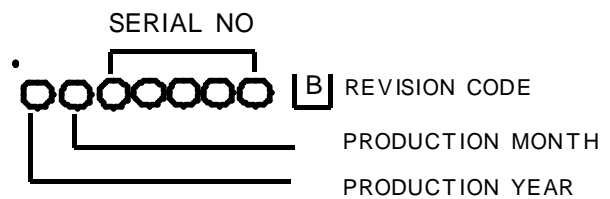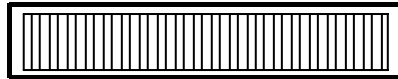| Doc . No | LTA400W2-L01 | Rev. No. | 0.0-040817 | Page | 27 / 31 |
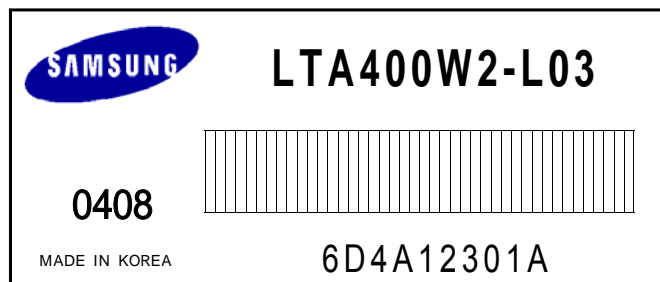
(6) Bar code marking for Customer

    The bar code marking is attached to module backside.

    1) MODEL NAME : LTA400W2-L03-00R6
    2) SAMSUNG
    3) MADE IN KOREA
    4) PRODUCTION NUMBER
    5) USER MODEL NAME
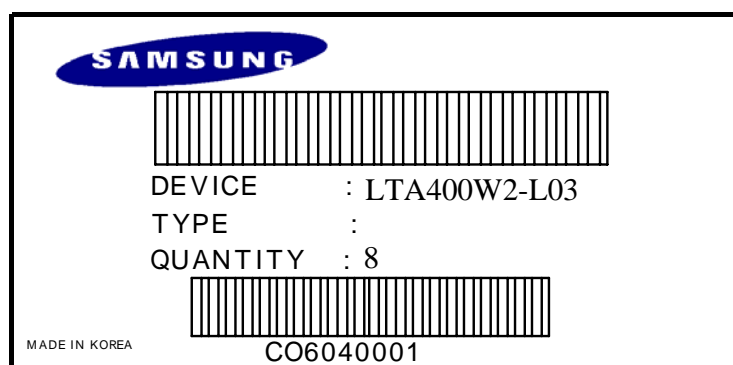
  Bar code shows

    a) User model name
       LTA400W2-L01-00R6

SAMSUNG
MADE IN KOREA

6430008B

SERIAL NO

B REVISION CODE
PRODUCTION MONTH
PRODUCTION YEAR

(7) Packing box attach

SAMSUNG

DEVICE   : LTA400W2-L03
TYPE   :
QUANTITY : 8

MADE IN KOREA   CO6040001

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10.   General Precautions

10.1 Handling

(a) When the module is assembled into a system, it should be attached firmly using all 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 CCFL back-light.

(c) Note that polarizers are very fragile and can 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 absorbent cotton or soft cloth.

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

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes and mouth. In case of contact with skin or clothes, thoroughly wash it away with soap and water.

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

(i) Use finger-stalls with soft gloves to keep display clean during the incoming inspection and the assembly process.

(j) Do not disassemble the module.

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

(l) Do not adjust the variable resistor located on the back side.

(m) I/F connector pins should not be touched directly with bare hands.

10.2 Storage

   (a) Do not expose the module in high temperature, and/or high humidity for a long time. It is highly recommended to store the module within the temperature from 0 to 35°C and relative humidity of less than 70%.

   (b) Do not store the TFT-LCD module in direct sunlight. The module shall be stored in a dark place. Prolonged exposure to sunlight or fluorescent light during the storage will damage the module.

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 following item 6.3 " Power on/off sequence ".

   (c) The Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall 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 at the minimum length possible to be connected directly. The longer cable between the back-light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

Operation Condition Guide

   (a) The LCD product should to be operated under normal conditions.
       Normal condition is defined as below;
          - Temperature   : 20 ± 15
          - Humidity : $65\pm 20\%$
          - 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.

10.4 Others

(a) Use Ultra-violet light filters if outdoor operation is necessary.

(b) Avoid water condensation. Moisture may penetrate sensitive electrical connections resulting in improper operation.

(c) Do not exceed the absolute maximum rating values. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, etc..) Otherwise, the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time, it can result in the situation where the image " sticks" (remains) on the screen.
We recommend that you should discuss SEC when you want the module to be operated in displaying the same pattern for a long time.

(e) The module has sensitive PCB circuitry on the back side and should be handled carefully in order prevent stress and possible failure.