



ELECTRONICS

Customer :

Date : 2003. 3. 15

SAMSUNG TFT-LCD
MODEL NO. : LTA260W1-L02

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

SAMSUNG ELECTRONICS CO., LTD.



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Revision History

Product Information

No	Date	Page	Befor change	After change	Remark
0.1	2002.11.08	All	First issued		
0.2	2003.01.15	5	Vibration (Vnop) Max. 1.0G	Vibration (Vnop) Max. 1.5G	
		6		Add to Inverter Power spec.	
			Lamp Current(Max:7.0/ Min:4.0)	Lamp Current(Max:6.0/ Min:3.0)	
		7	Measuring equipment :IL= 5.0mA	Measuring equipment :IL= 4.5mA	
				Add to R,G,B Color Chromaticity	
		12	Lamp Voltage (Max:965 / Min:890)	Lamp Voltage (Max:1054/ Min:846)	
		13	Block Diagram	Block Diagram	
		16	Inverter Pin configuration	Inverter Pin configuration (PWM Frequency etc.)	
				Add to Inverter Input specification	
		17		Add to Inverter Power sequence	
23,24		Add to Packing			
25,26		Add to Marking & Others			

GENERAL DESCRIPTION

DESCRIPTION

LTA260W1-L02 is a color active matrix TFT (Thin Film Transistor) liquid crystal display 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 including Inverter.

The resolution of 26.0" contains 1,280 x 768 pixels and can display up to 16.7million colors with wide viewing angle of 85degrees or higher in all directions.

FEATURES

- High contrast ratio, High aperture structure
- PVA (Patterned Vertical Alignment) mode
- WXGA(1280x768 pixels) resolution (15:9)
- High response time
- Direct type 16 CCFLs (Cold Cathode Fluorescent Light)
- DE only Mode
- LVDS Interface with 1 pixel / clock

APPLICATIONS

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

GENERAL SPECIFICATIONS

ITEM	SPECIFICATION	UNIT	NOTE
Active area	566.4(H) X 339.84(V)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16.7M (true color)	color	
Number of pixel	1280 x 768	pixel	15:9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.4425(H) x 0.4425(V)	mm	
Display Mode	Normally Black		
Surface treatment	Haze 44% , Anti-glare & Hard - Coating (3H)		

Product Information

▪ Mechanical Information (Module only)

ITEM		MIN.	TYP.	MAX.	NOTE
Module size	Horizontal (H)	626	627	628	mm
	Vertical (V)	388	389	390	mm
	Depth (D)	-	-	49.0	mm
Weight		-	-	8,000	g

1. ABSOLUTE MAXIMUM RATINGS

1.1 ABSOLUTE RATINGS OF ENVIRONMENT

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage temperature	T_{STG}	-20	65	$^{\circ}C$	(1)
Operating temperature (Ambient temperature)	T_{OPR}	0	50	$^{\circ}C$	(1)
Shock (non-operating)	Snop	-	50	G	(2),(4)
Vibration (non-operating)	Vnop	-	1.5	G	(3),(4)

Note

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

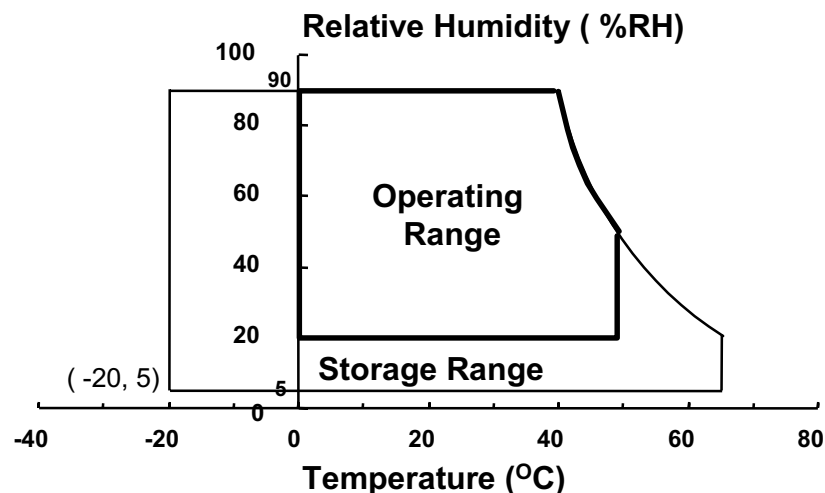
90 % RH Max. ($40^{\circ}C \geq T_a$)

Maximum wet-bulb temperature at $39^{\circ}C$ or less. ($T_a > 40^{\circ}C$) No condensation.

(2) 11ms, sine wave, 1 time for $\pm X, \pm Y, \pm Z$ axis

(3) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

(4) 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.



1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

(V_{SS} = GND = 0 V)

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	VDD	V _{SS} -0.5	6.5	V	(1)

NOTE (1) With Ta (25 ± 2 °C)

(2) BACK-LIGHT UNIT

Ta = 25 ± 2 °C

ITEM	SYMBOL	MIN.	MAX.	UNIT.	NOTE
Power supply (Inverter)	VAA	V _{SS} -0.5	18.0	V	(1)
Lamp current	IL	3.0	6.0	mArms	(2), (3)
Lamp frequency	FL	40	60	KHz	(2)

NOTE (1) Inverter main 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

Product Information

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).

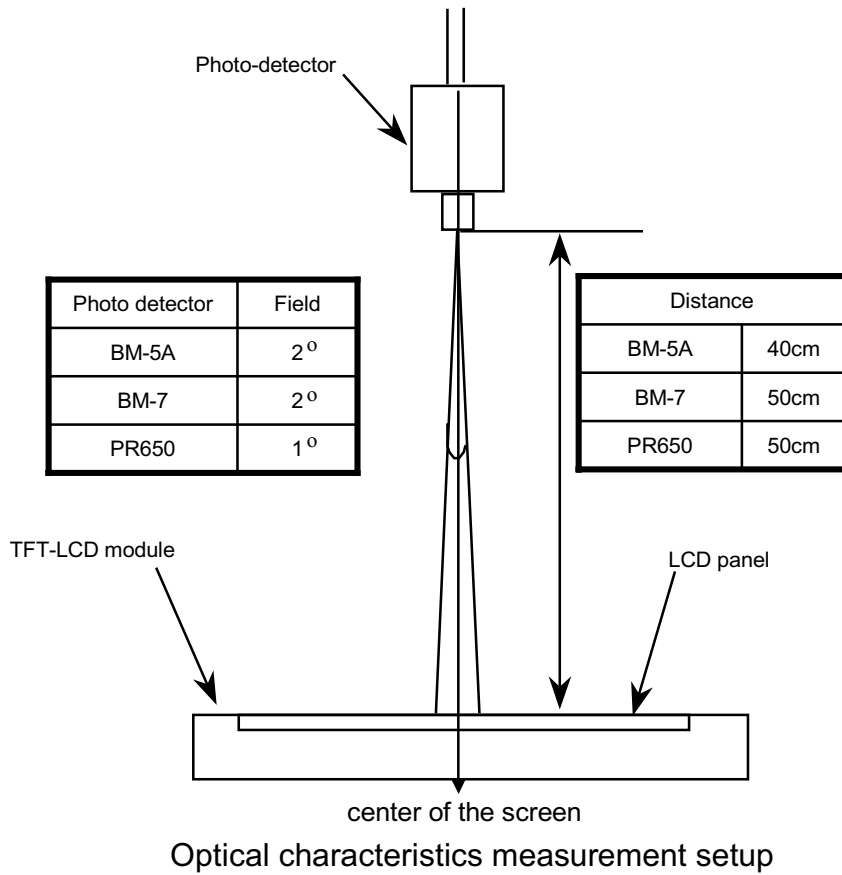
Measuring equipment : TOPCON BM-5A, BM-7, Photo research PR650, EZ-Contrast(Eldim)

* $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, $V_{DD} = 5.0\text{V}$, $V_{CC} = 5.2\text{V}$, $f_v = 60\text{Hz}$, $f_{DCLK} = 65\text{MHz}$, $I_L = 4.5 \text{ mA}$

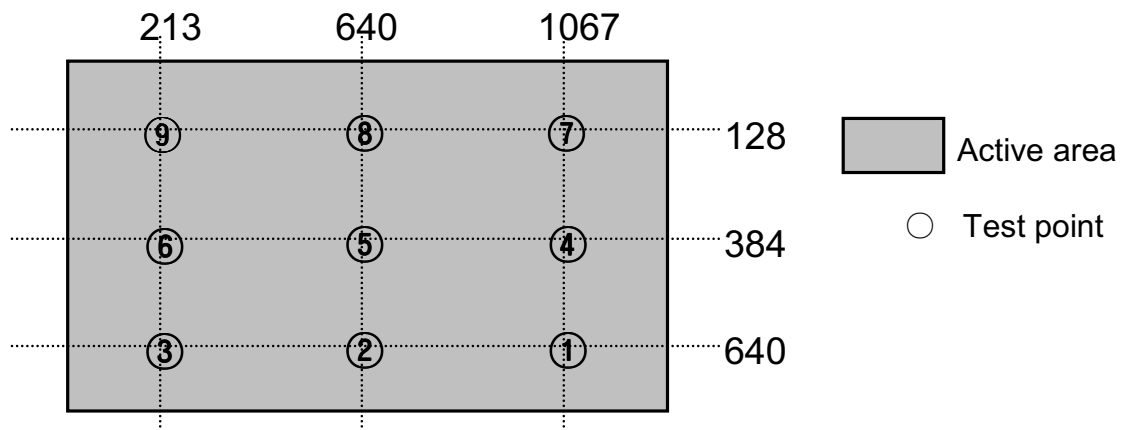
ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	
Contrast Ratio (Center of screen)		CR		400	500	-		(3), BM-5A	
Response Time	Rising	T_R	$\phi = 0,$ $\theta = 0$ Normal Viewing Angle	-	15	18	msec	(4) BM-7	
	Falling	T_F		-	8	11			
Luminance of White (Center of screen)		Y_L			400	450	-	cd/m ²	(5), BM-5A
Color Chromaticity (CIE 1931)	Red	R_x		Normal Viewing Angle	Typ. -0.03	0.648	Typ. +0.03		(6) PR650
		R_y	0.331						
	Green	G_x	0.276						
		G_y	0.596						
	Blue	B_x	0.141						
		B_y	0.069						
	White	W_x	0.280						
		W_y	0.290						
Viewing Angle	Hor.	θ_L	$CR \geq 10$	75	85	-	Degrees	(7) BM-5A	
		θ_R							
	Ver.	ϕ_H							
		ϕ_L							
Brightness Uniformity (5 Point)		B_{UNI}		-	-	25	%	(8) BM-5A	

Product Information

Note 1) 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 : $T_a = 25 \pm 2 \text{ }^\circ\text{C}$



Note 2) Definition of measurement point

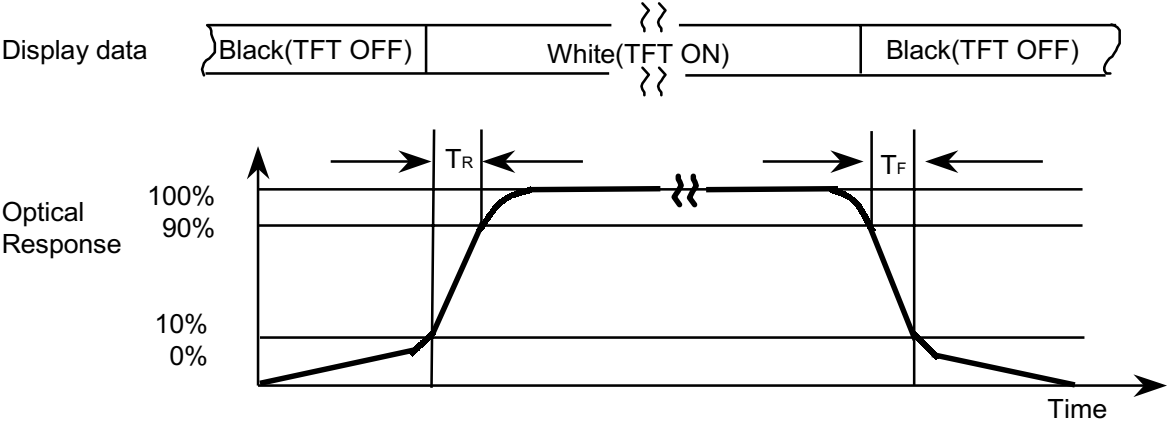


Note 3) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at the center point of panel.

$$CR = \frac{\text{Luminance with all pixels white (Gmax)}}{\text{Luminance with all pixels black (Gmin)}}$$

Product Information

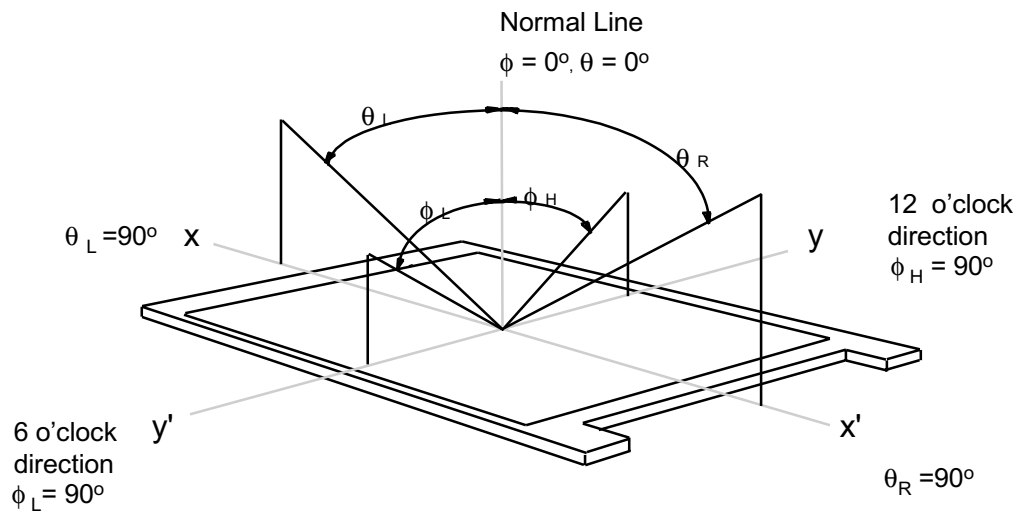
Note 4) Definition of Response time : Sum of T_R, T_F



Note 5) Definition of Luminance of White : Luminance of white at center point⑤

Note 6) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point⑤

Note 7) Definition of Viewing Angle : Viewing angle range ($10 \leq CR$)



Note 8) Definition of 9 points brightness uniformity

$$B_{uni} = \left| 1 - \frac{B_{min}}{B_{max}} \right| \times 100$$

B_{max} : Maximum Brightness
 B_{min} : Minimum Brightness

3. ELECTRICAL CHARACTERISTICS

Product Information

3.1 TFT LCD MODULE

Ta= 25 ± 2 °C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Voltage of Power Supply	V _{DD}	4.5	5.0	5.5	V	(1)
Current of Power Supply	A) White	-	1100	-	mA	(2),(3),(4)
	B) Black	-	910	-	mA	
	C) N-pattern	1300	1370	1450	mA	
Vsync Frequency	F _v	48	60	66	Hz	
Hsync Frequency	F _h	47.5	48.5	49.5	kHz	
Main Frequency	f _{DCLK}	58	65	80	MHz	
Rush Current	I _{rush}	-	-	3.0	A	(5)

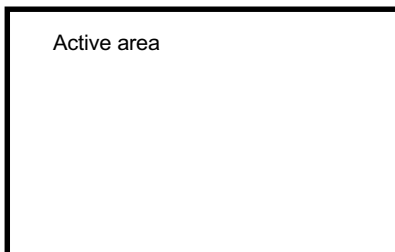
Note (1) Main pixel clock frequency is the value which is measured at the input of LVDS transmitter.

(2) f_v=60Hz, f_{DCLK} =65MHZ, V_{DD} = 5.0V, DC Current.

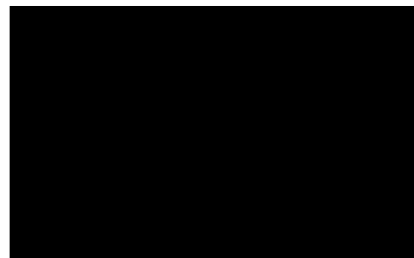
(3) Power dissipation check pattern (LCD Module only)

(4) Power Consumption: Except for Inverter power consumption

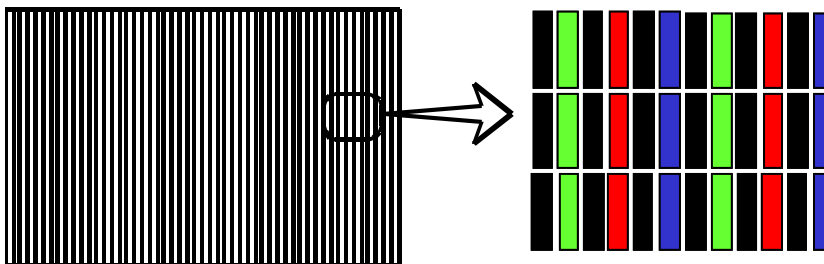
a) White Pattern



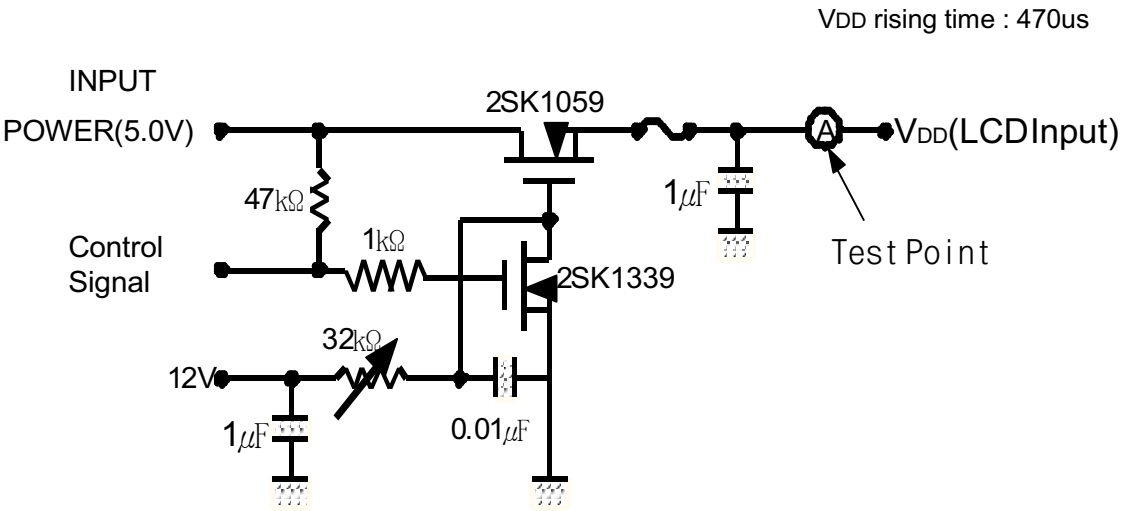
b) Black Pattern



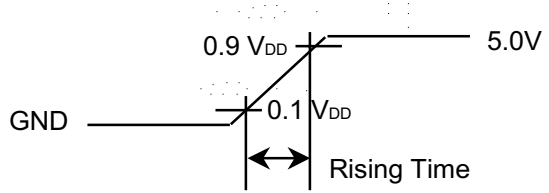
c) N-Pattern



(5) Measurement Conditions



Note : Control Signal : High(+5.0V) -->Low(Ground)
 All Signal lines to panel except for power 5.0V : Ground
 The rising time of supplied voltage is controlled to 470us by R3 and C2 value.



Product Information

3.2 BACK-LIGHT UNIT

The back-light system is an edge-lighting type with 16 CCFTs(Cold Cathode Fluorescent Tube).

The characteristics of two lamps are shown in the following tables.

Ta= 25 ± 2 °C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	IL	3.0	4.5	6.0	mArms	(1)
Lamp Voltage	VL	846	975	1054	Vrms	(1)
Lamp Frequency	FL	47.5	48.5	49.5	KHz	(2)
Operating Life Time	Hr	50,000	-	-	Hour	(3) at 6mA
Startup Voltage	Vs	-	-	0°C : 1640	Vrms	(4)
				25°C :1350		

Note (1) Lamp current is measured with current meter.

Refer to the block diagram of the back-light unit in the next page for more information.

Lamp Voltage tolerance (at 48.5KHz) : 985Vrms±7% at 3mArms

910Vrms± 7% at 6mArms

(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore, we synchronized the lamp frequency to horizontal frequency.

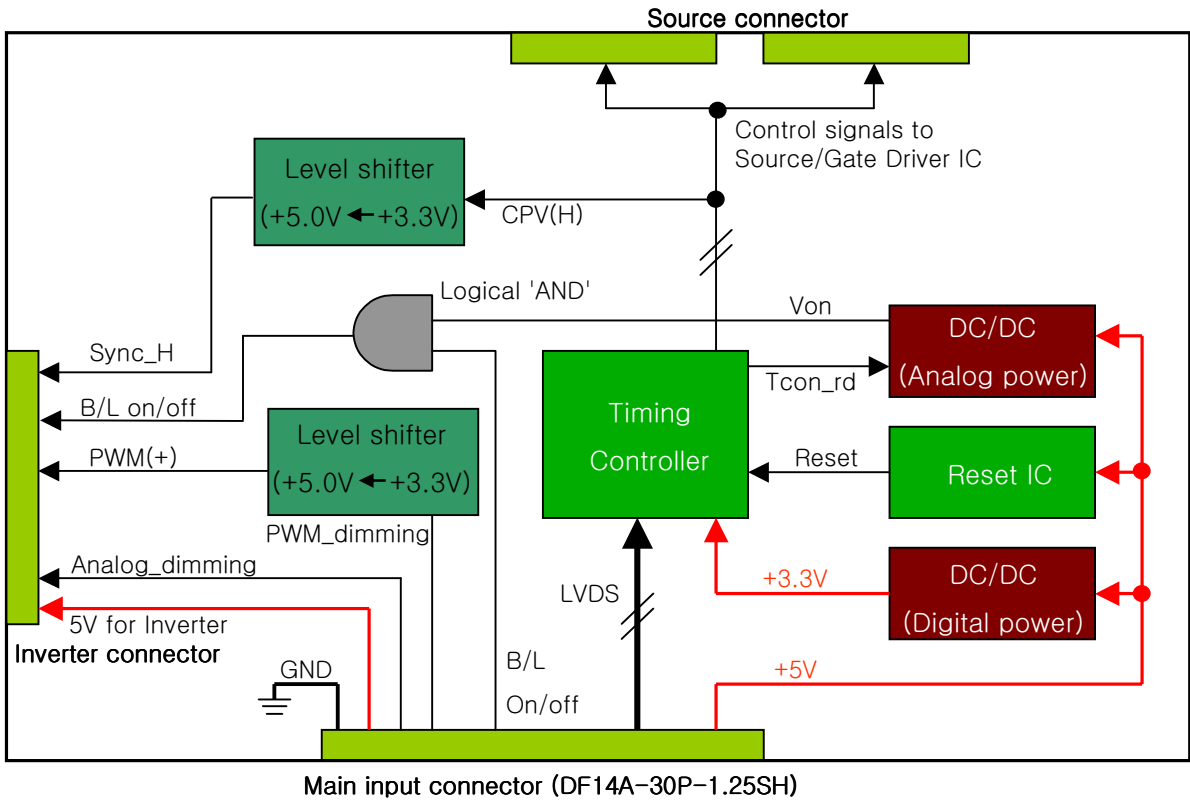
(3) Life time (Hr) of a lamp is defined

- as the time in which it continues to operate under the condition of Ta = 25 ± 2 °C and IL = 6.0mArms 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.

4. BLOCK DIAGRAM

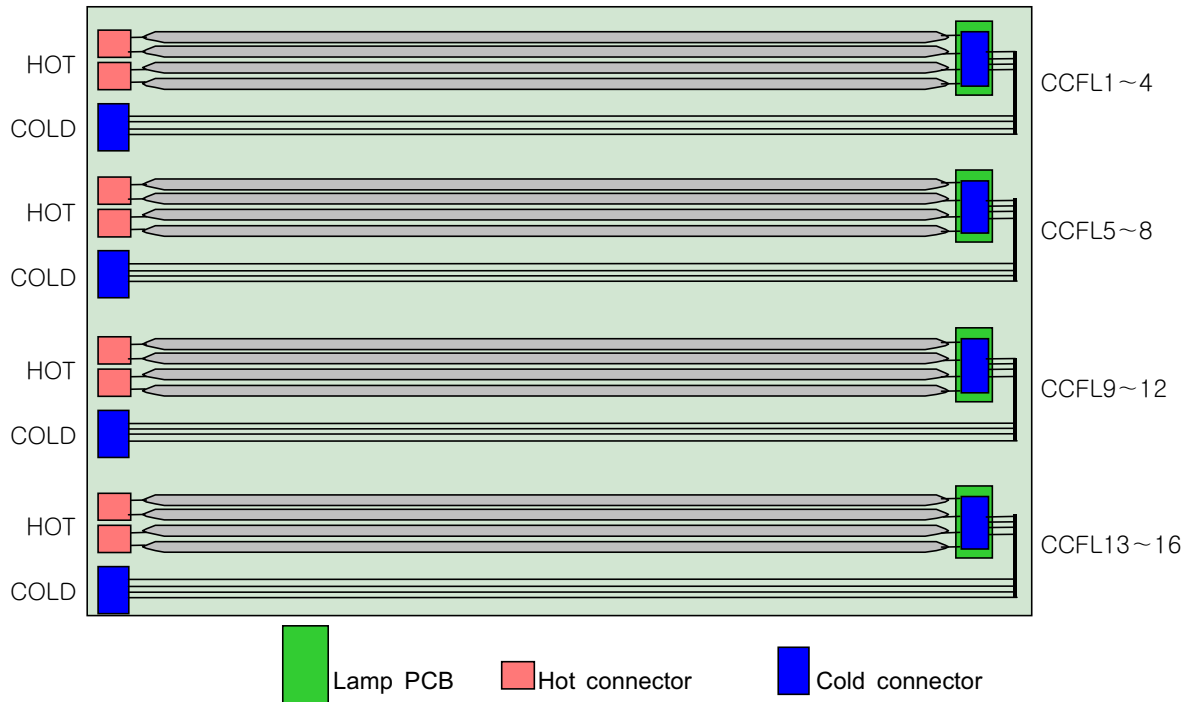
4.1 Module input interface



Pin# 1 (PWM dimming)	Pin# 2 (Analog dimming)	Pin# 3 (B/L on/off)	Pin# 5,6,8,9,11,12, 14,15,17,18	Pin# 30	Pin# 26~29	Others
TTL	-	TTL	LVDS	Inverter logic power	Module power	GND

4.2 BACK-LIGHT UNIT

- HOT: High Voltage (part no: 20015WR-07A01 (Yeun-Ho Electronics))
- COLD: Ground (part no: 20015WR-070404(Yeun-Ho Electronics))



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 Module Input Signal & Power

- Connector: (DF14A-30P-1.25SH / Hirose)

No	Signal	No	Signal
1	PWM dimming	16	GND
2	Analog dimming	17	Rx3-
3	B/L On/Off	18	Rx3+
4	GND	19	GND
5	Rx0-	20	Reserved (No connection)
6	Rx0+	21	Reserved (No connection)
7	GND	22	Reserved (No connection)
8	Rx1-	23	GND
9	Rx1+	24	GND
10	GND	25	GND
11	Rx2-	26	Vin (+5V)
12	Rx2+	27	Vin (+5V)
13	GND	28	Vin (+5V)
14	RxCLK-	29	Vin (+5V)
15	RxCLK+	30	Inverter VCC(=5.2[V])

5.2 LVDS Interface

- LVDS Receiver: Tcon (LVDS Rx merged)
- Pixel data (single data)

	DATA	T-CON LWLR3281B Normal
TxOUT/RxIN0	TxIN/RxOUT0	R0
	TxIN/RxOUT1	R1
	TxIN/RxOUT2	R2
	TxIN/RxOUT3	R3
	TxIN/RxOUT4	R4
	TxIN/RxOUT6	R5
	TxIN/RxOUT7	G0
TxOUT/RxIN1	TxIN/RxOUT8	G1
	TxIN/RxOUT9	G2
	TxIN/RxOUT12	G3
	TxIN/RxOUT13	G4
	TxIN/RxOUT14	G5
	TxIN/RxOUT15	B0
	TxIN/RxOUT18	B1
TxOUT/RxIN2	TxIN/RxOUT19	B2
	TxIN/RxOUT20	B3
	TxIN/RxOUT21	B4
	TxIN/RxOUT22	B5
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DE
TxOUT/RxIN3	TxIN/RxOUT27	R6
	TxIN/RxOUT5	R7
	TxIN/RxOUT10	G6
	TxIN/RxOUT11	G7
	TxIN/RxOUT16	B6
	TxIN/RxOUT17	B7
	TxIN/RxOUT23	

5.3 INVERTER Pin configuration

- Power input connector(2ea) : 20015WR-15A00 (Yeun-Ho Electronics)
- Output HOT connector : 20015WR-07A01 (Yeun-Ho Electronics)
- Output COLD connector : 20015WR-070404 (Yeun-Ho Electronics)

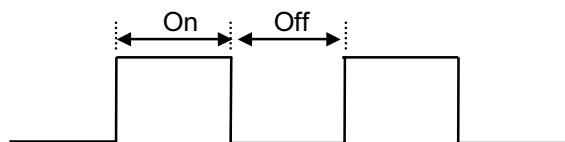
Pin No.	1	2	3	4	5	6	7
Function	GND	GND	GND	GND	GND	GND	N.C.
8	9	10	11	12	13	14	15
+16V (Block A/ C)	+16V (Block A/ C)	+16V (Block A/ C)	+16V (Block A/ C)	+16V (Block B/ D)	+16V (Block B/ D)	+16V (Block B/ D)	+16V (Block B/ D)

5.4 INVERTER Input specification

Item	Symbol	MIN	TYP	MAX	Unit	Note
Inverter Main power	Vaa	14.4	16.0	17.6	V	(1)
	Iaa		6.0		A	
Stand by Current	Iaa_st		2		mA	
PWM dimming	High-duty	30	-	100	%	(2)
	High(on)	3.0	-	5.25	V	
	Low(off)	0	-	0.3		
	Fpwm	130	150	210	Hz	(3)
Analog dimming	Vana	0	-	3.3	V	
	Iana	0	-	3	mA	
Lamp current	Maximum	5.0	5.5	6.0	mArms	(4)
	Minimum	3.0	3.5	4.0		
Backlight on/off	High(on)	3.0	-	5.25	V	(5)
	Low(off)	0	-	0.3		

Note(1) Controlled by Analog & PWM dimming Maximum (After 1Hr aging)

Note(2) High-duty= On/(On+Off) * 100



Note(3) To avoid some waving noise in low dimming range, the typical value is recommended.

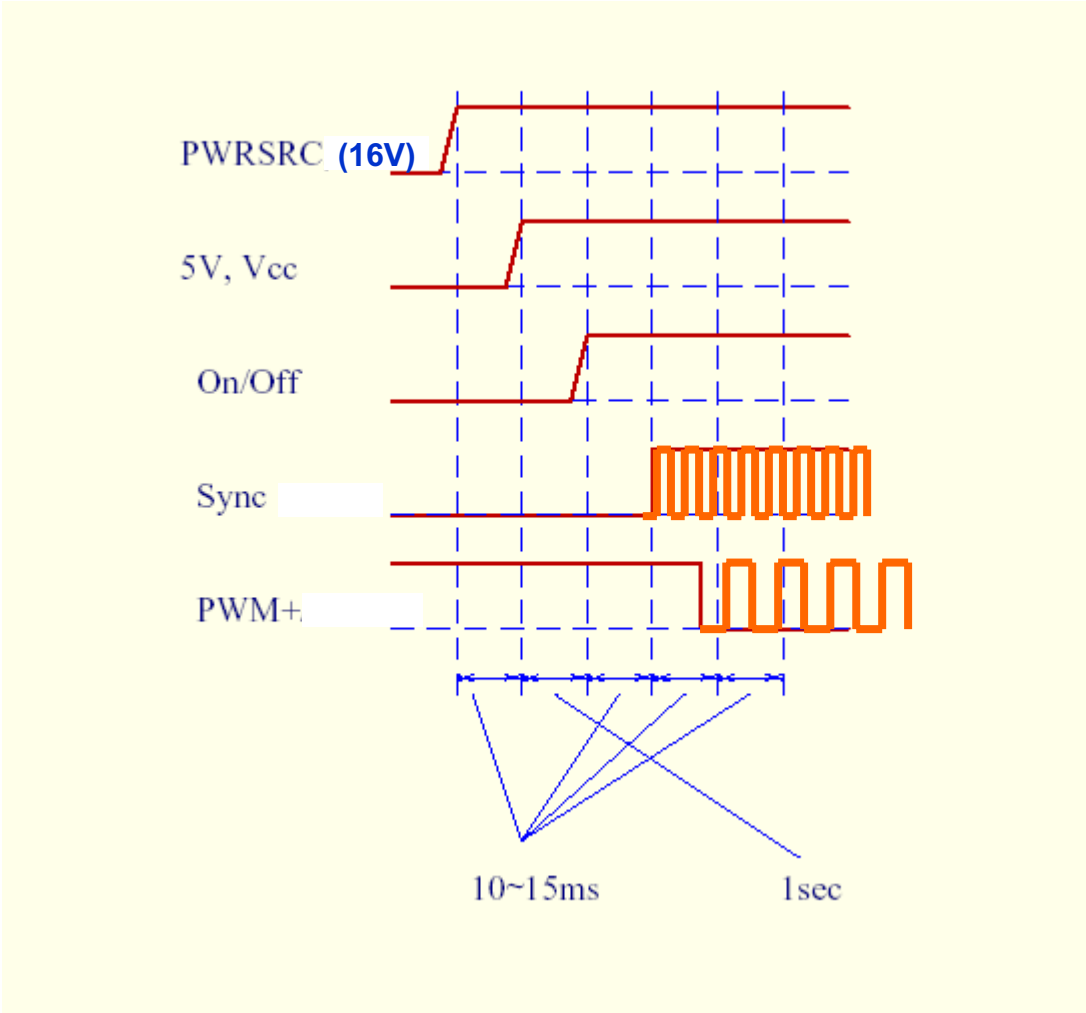
Note(4) - Controlled by Analog dimming only

- Analog dimming 0V (Maximum lamp current)

- Analog dimming 3.3V (Minimum lamp current)

Note(5) The TV board's impedance of Back light On/Off should be 51[kΩ].

5.5 INVERTER Power sequence



Product Information

5.6 Input Signal, Basic Display Colors and Gray Scale of Each Colors

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	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	R1	
		0	1	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	R253	
		0	1	1	1	1	1	1	1	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	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	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	G1	
		0	0	0	0	0	0	0	0	0	1	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	G253	
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	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	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	B1	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	B253	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	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

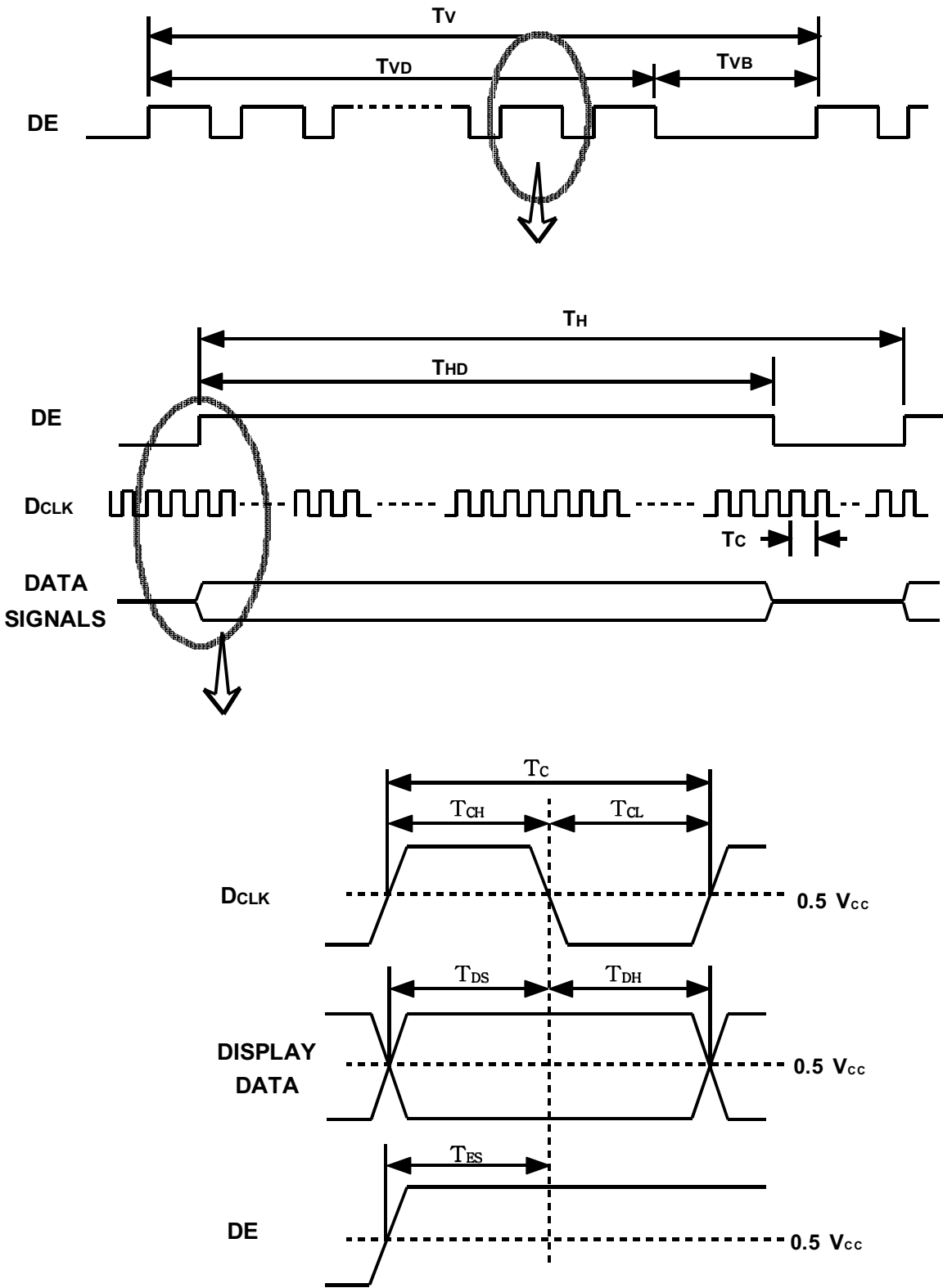
6.1 Timing Parameters (DE only mode)

SIGNAL	ITEM	SYMBOL	MIN	TYP	MAX	Unit
Clock	Frequency	fDCLK	58	65	80	MHz
Hsync		Fh	47.5	48.5	49.5	KHz
Vsync		Fv	48	60	66	Hz
Vertical timing	Display period	Tvd	768	768	768	Lines
	Total	Tv	787	806	1170	Lines
Horizontal timing	Display period	Thd	1280	1280	1280	Clocks
	Total	Th	1332	1344	1464	Clocks

Note) This product is DE only mode.

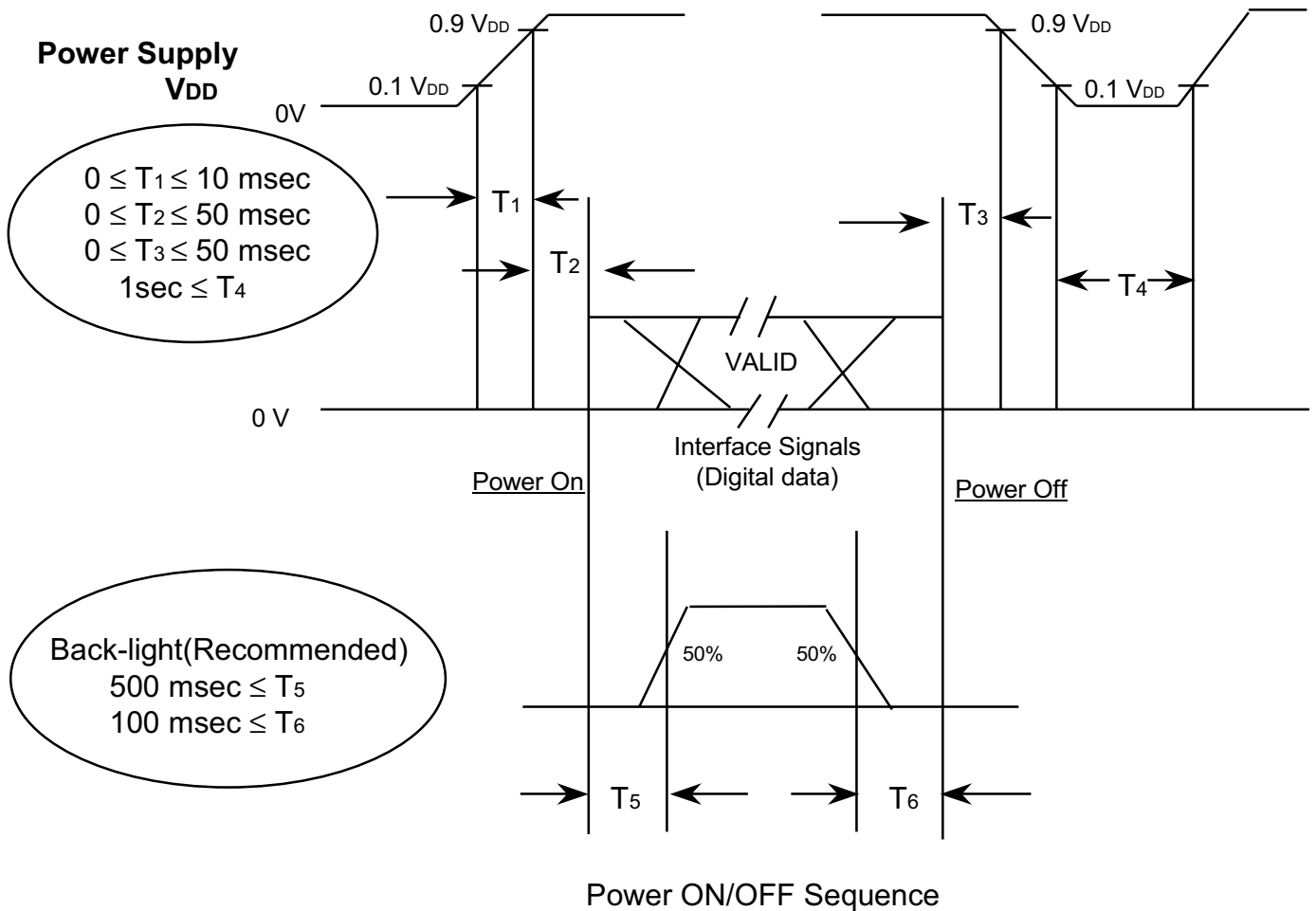
The input of Hsync & Vsync signal does not have an effect on normal operation

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.



Power ON/OFF Sequence

NOTE.

- (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.
- (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 V_{DD} = 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.

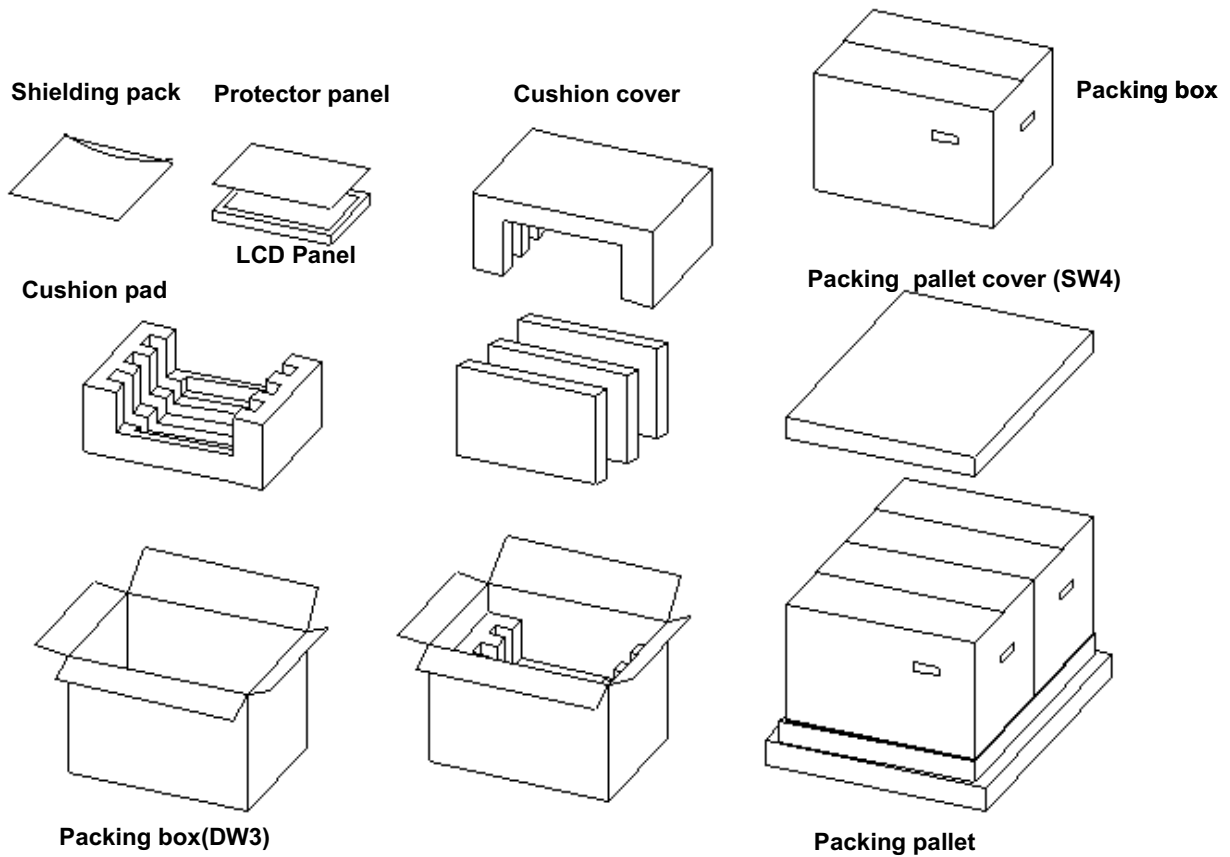
7. OUTLINE DIMENSION

Product Information

: Refer to another file.

8. PACKING

- CARTON(Internal Package)
 - (1) Packing Form
Corrugated fiberboard box and corrugated cardboard as shock absorber
 - (2) Packing Method



- Packing Specification

ITEM	Specification	Remark
LCD Packing	3ea/Box	1. 8.0Kg/LCD 2. 4Kg/Box : Total 28Kg/ box 3. Packing case Material : DW3 4. Pallet cover Material : SW4
Pallet	6Box/Pallet	1. Pallet weight: 6Kg 2. Total 174Kg/Pallet
Packing Direction	Vertical	

Product Information

- Packing Cushion & Box



9. MARKING & OTHERS

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

(1) Parts number : LTA260W1-L02

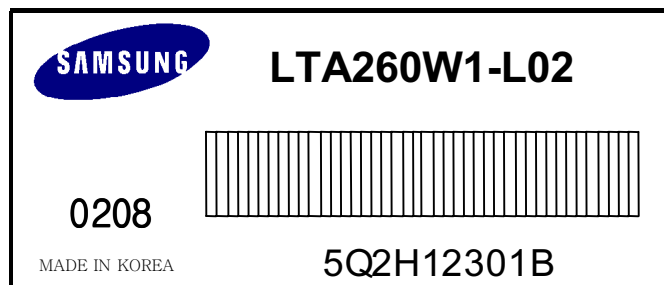
(2) Revision : One letter

(3) Control : One letter

(4) Lot number : 5 Q 2 H 123 01 B
 1 2 3 4 5 6 7

- ① 5 : Line
- ② Q : Device
- ③ 2 : Year
- ④ H : Month
- ⑤ 123 : LOT NO
- ⑥ 01 : GLASS NO
- ⑦ B : CELL NO

- Nameplate Indication



Product Information

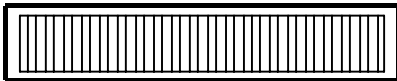
- Bar code marking for Customer

The bar code marking is attached to module backside.

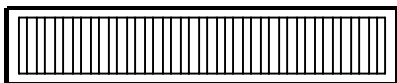
- 1) MODEL NAME : LTA260W1-L02
- 2) SAMSUNG
- 3) MADE IN KOREA
- 4) PRODUCTION NUMBER
- 5) USER MODEL NAME

Bar code shows

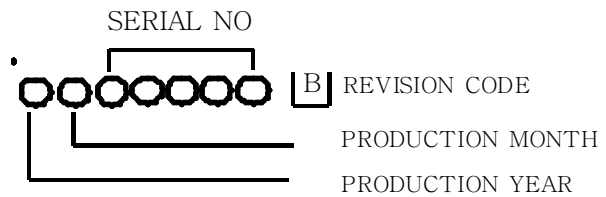
- a) User model name
LTA260W1-L02



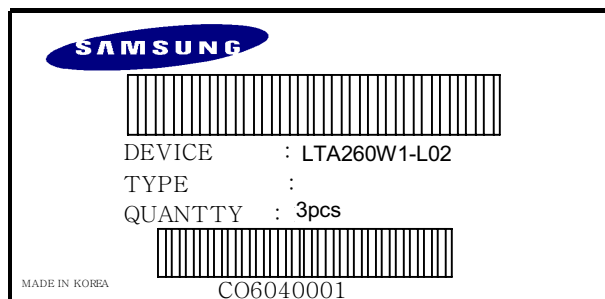
SAMSUNG
MADE IN KOREA



6430008B



- Packing box attach



▪ 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(Isopropyl 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 finger-stalls 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 adjust the variable resistor which is located on the back side.
- (m) Pins of I/F connector shall not be touched directly with bare hands.

▪ 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 °C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD module in direct sunlight.
- (c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

▪ Operation

- (a) Do not connect, 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) 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 shall be a minimized length and 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).

▪ 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. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.
- (d) If the module displays the same pattern continuously for a long period of time, it can be the situation when the image “sticks” to the screen.
- (e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.