SAMSUNG ELECTRONICS

Approval

Customer : Visual Display Division **DATE : 16.June.2010**

SAMSUNG TFT-LCD

MODEL : LTF320HF01(BN07-00809A)

Any Modification of Specification is not allowed without SEC's Permission.

NOTE :

Customer's *Approval*	
SIGNATURE	DATE

APPROVAED BY	DATE
JEONG MIN HEO	16.June.2010
PREPARED BY	DATE
BONG U LEE	16.June.2010

LCD Business

Samsung Electronics Co . , LTD.

Contents

Revision History

Date	Rev. No	Page	Summary
Dec 02, 2009	000	all	First issued
16.June. 2010	001	25 Page	Packing type change

General Description

Description

LTF320HF01 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 32.0“ is 1920 x 1080 and this model can display up to 1.07 Billion 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 and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle (± 178°)
- High speed response
- Resolution is 1920x1080(16:9)
- Low Power consumption
- U-Type 4 CCFLs (Cold Cathode Fluorescent Lamp)
- DE(Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface (4pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	760 (H_{TYP}) X 450 (V_{TYP})	mm	± 1.0mm
	50.2(D_{MAX})		
Weight	6200(MAX)	g	With Inverter
Pixel Pitch	0.36375 (H) × 0.36375 (V)	mm	
Active Display Area	698.4 (H) × 392.85 (V)	mm	
Surface Treatment	Haze 5.5%, Hard-coating(2H)	-	Non-Glare
Display Colors	1.07 Billion (10bit Dithering)	colors	
Number of Pixels	1920 x 1080	pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	500 (Typ.)	cd/m^2	

1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	10.8	*13.2*	V	(1)
Storage temperature		T_{STG}	-20	65	℃	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	℃	(2),(5)
	T. Uniformity	△T	-	10	℃	
Shock (non - operating)		S_{nop}	-	50	G	(3)
Vibration (non - operating)		V_{nop}	-	1.5	G	(4)

Note (1) Ta= 25 ± 2 ℃

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

a. 90 % RH Max. (Ta ≤ 39 ℃)

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

c. No condensation

(3) 20ms, sine wave, one time for ± X, ± Y, ± Z axis

(4) 10-300 Hz, Sweep rate 11min, 30min for X,Y,Z axis

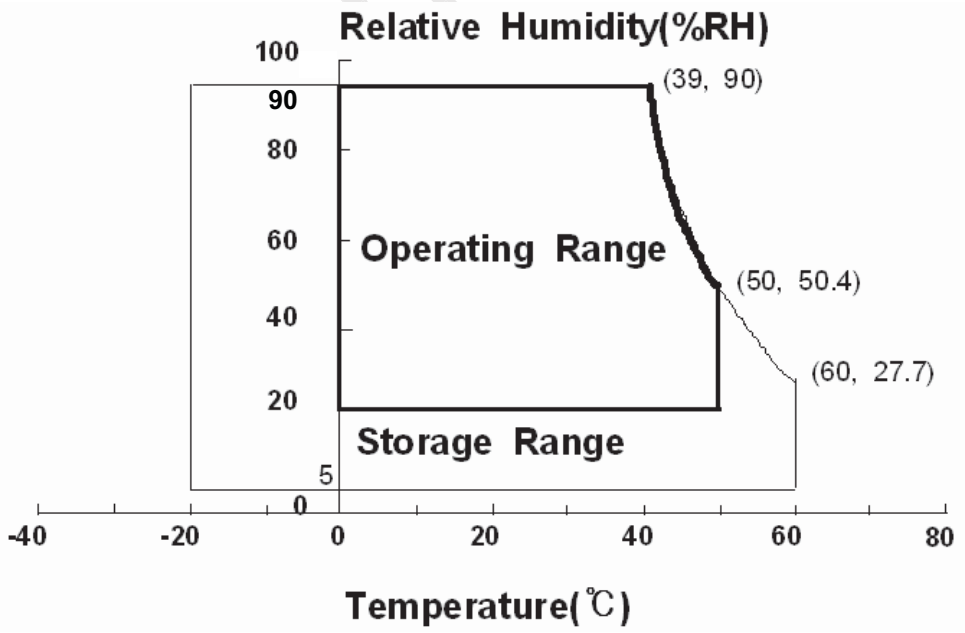
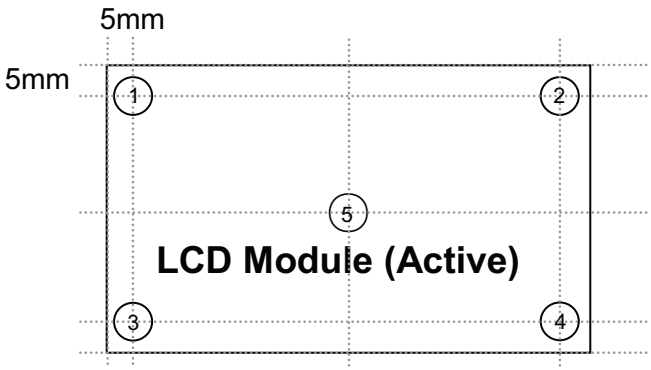


Fig. Temperature and Relative humidity range

(5) Definition of test point



△T should be less than *10* ℃ (△T = | T_{OPR} – T_{MAX}|)

T_{OPR} : Temperature of the center of the glass surface (Test point 5)
T1~ T4 : Temperature of each edge of the glass surface
T_{MAX} : The highest temperature of the glass surface

2. Optical Characteristics

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

(Ta = 25 ± 2℃, VDD=12V, fv= 120Hz, f_{DCLK}=297MHz, I_L = Max

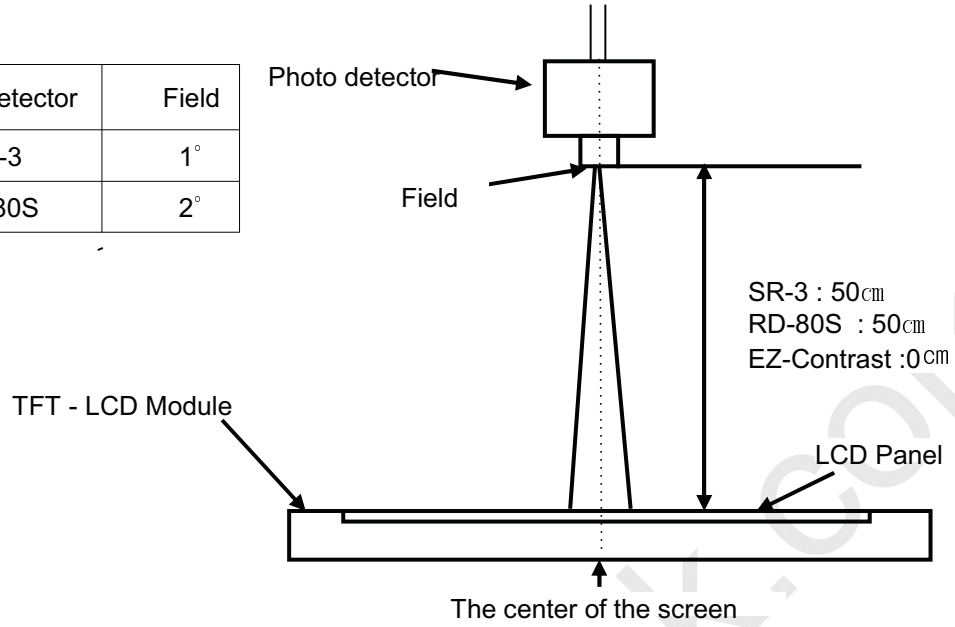
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal θL,R=0 θU,D=0 Viewing Angle	-	6000	-		(1) SR-3
Response Time	G-to-G (Avg)	Tg			6	8	msec	(3) RD-80S
Luminance of White (Center of screen)		Y_L		450	500	-	cd/m^2	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.640	TYP. +0.03		(5),(6) SR-3
		Ry			0.340			
	Green	Gx			0.300			
		Gy			0.600			
	Blue	Bx			0.150			
		By			0.060			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10000	-	K	(5) SR-3
Viewing Angle	Hor.	θ_L	C/R≥10	79	89	-	Degree	(6) EZ-Contrast
		θ_R		79	89	-		
	Ver.	θ_U		79	89	-		
		θ_D		79	89	-		
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

- Test Equipment Setup

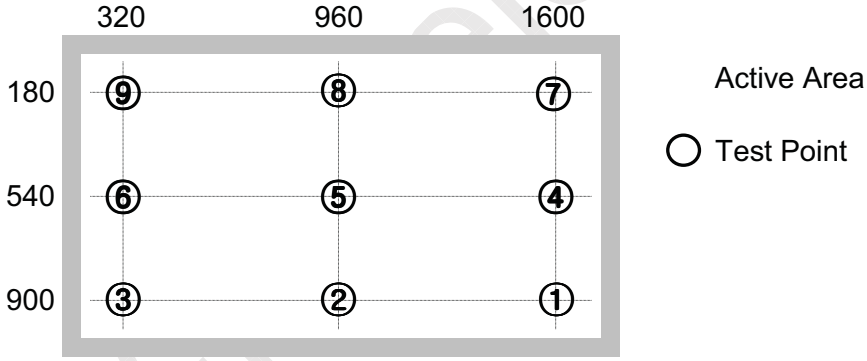
The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at 25 ± 2℃ for stabilization of the back light. This should be measured in the center of screen.

Single lamp current : Max
Environment condition : Ta = 25 ± 2 ℃

Photo detector	Field
SR-3	1°
RD-80S	2°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

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

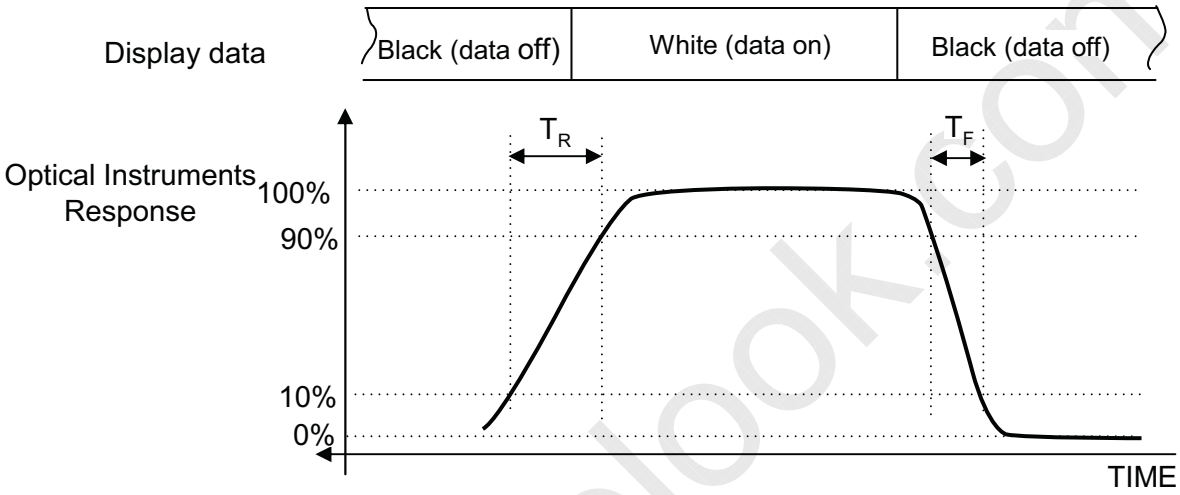
Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

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

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

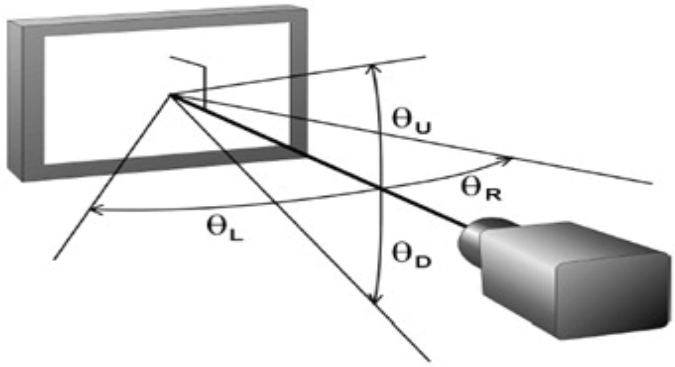


※ G- to- G : Average response time between Gray to gray (scale)

Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

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

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)



3. Electrical Characteristics

3.1 TFT LCD Module

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

Ta = 25℃ ± 2 ℃

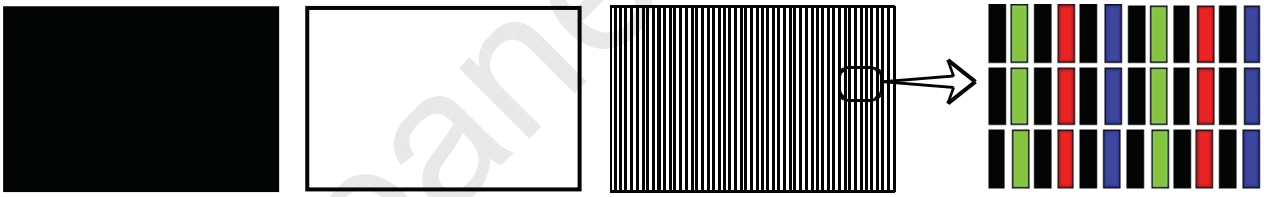
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}		700	900	mA	(2),(3)
	(b) White			700	900	mA	
	(c) N-Pattern			900	1000	mA	
Vsync Frequency		f_V	95	120	125	Hz	
Hsync Frequency		f_H	120	135	140	kHz	
Main Frequency		f_{DCLK}	260	297	305	MHz	
Rush Current		I_{RUSH}	-	-	7	A	(4)

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

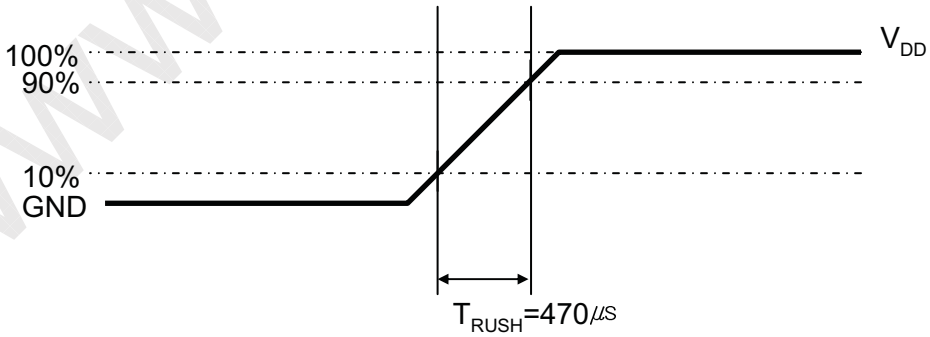
(2) fv= 120 Hz, f_{DCLK} = 297 MHz, V_{DD} = 12.0V, DC Current.

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

a) Black Pattern b) White Pattern c) N-Pattern



(4) Measurement Conditions

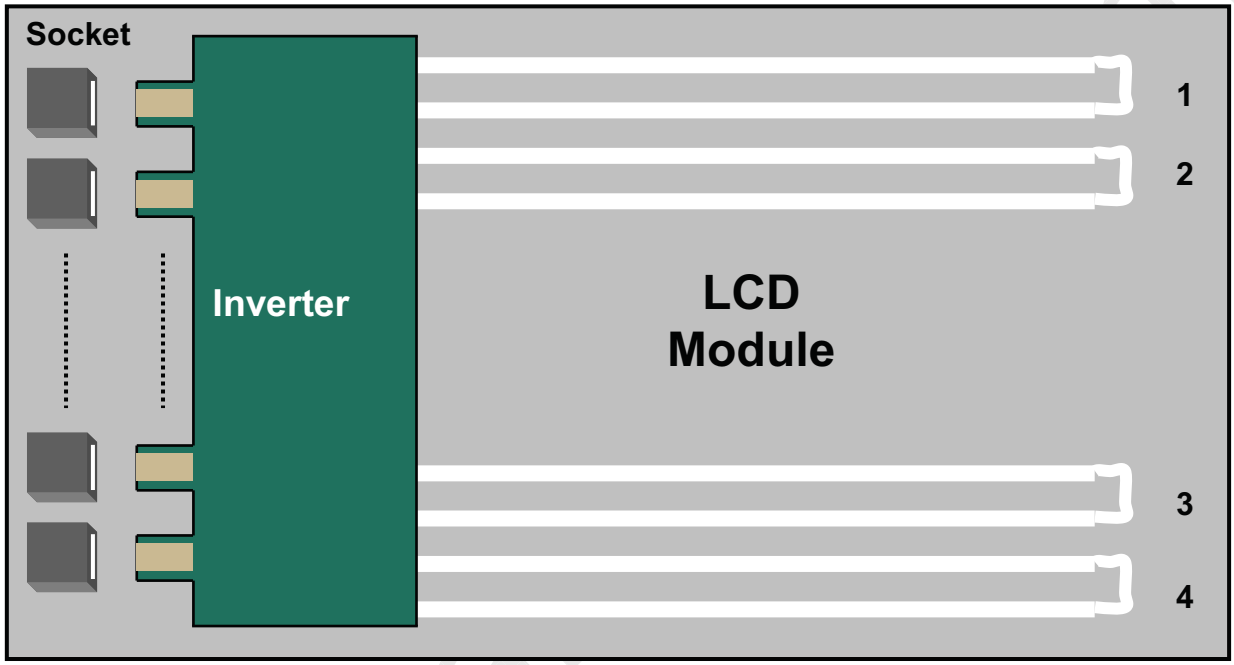


Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470㎲.

3.2 Back Light Unit

The back light unit consists of 4 U-type CCFLs (Cold Cathode Fluorescent Lamp).

Ta=25 ± 2℃



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	-	50000	-	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℃, For single lamp only.]

3.3 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	22.5	25	27.5	Vdc	Ta=25± 2 ℃
Input Current	Iin	Vin=24.0V Vdim=3.3V Ta=25℃		-	4.3	A	(1) (2)
Frequency	F_{LAMP}	Vin=24.0 V	61	63	65	kHz	-
Backlight On/Off	ON	Vin=24.0 V	2.4	-	5.25	Vdc	-
	OFF	Vin=24.0 V	-0.3	-	0.8		-
External PWM Dimming Control	V_{High}		2.4		5.25	Vdc	(3),(4)
	V_{Low}		-0.3		0.4		
	$F_{EXT.PWM}$	Vin=24, Dim=100%	156	166	176	Hz	
	D_{pwm}		15	-	100	%	

Note) Power Consumption is measured when 450[cd/m^2] of luminance which is the typical luminance.
Lamp Current is measured at the point before Lamp.

(1) Max Value of the Power Consumption is measured during initial turn-on time* of the backlight.

(2) Max Value of the Power Consumption is measured after 60 min warm-up.

(3) When EX-DIM(Pin 14) is used, DIM(Pin13) has to be open or connected to ground.

(4) EX-PWM Frequency is selected not to interfere the Waterfall & Acoustic Noise.

* Initial turn-on time : From 0sec to 60min after turn-on

(2) Lamp frequency which may produce interference with horizontal synchronous frequency may cause line flow on the display. Therefore lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) is defined as the time when brightness of a lamp unit itself becomes 50% or less than its original value at the condition of Ta = 25± 2℃ and I_L = 6.5 mArms

(4) Designing a system inverter intended to have better display performance, power efficiency and lamp reliability.

They would help increase the lamp lifetime and reduce leakage current.

a. The measurement should be done at typical lamp current.

b. The asymmetry rate of the inverter waveform should be less than 10%.

c. The distortion rate of the waveform should be √2 with ±10% tolerance.

- Inverter output waveform had better be more similar to ideal sine wave.

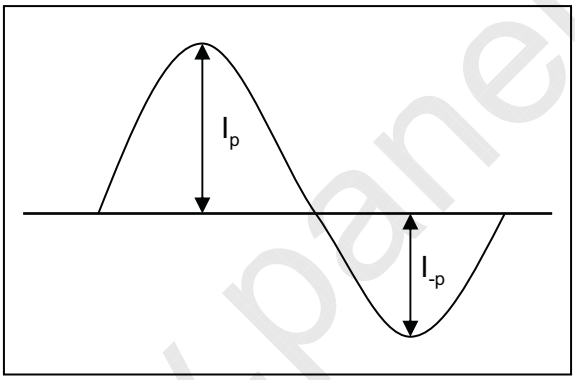


Fig. Wave form of the inverter

▪ Asymmetry rate

$$\frac{|I_p - I_{-p}|}{I_{rms}} \times 100$$

▪ Distortion rate

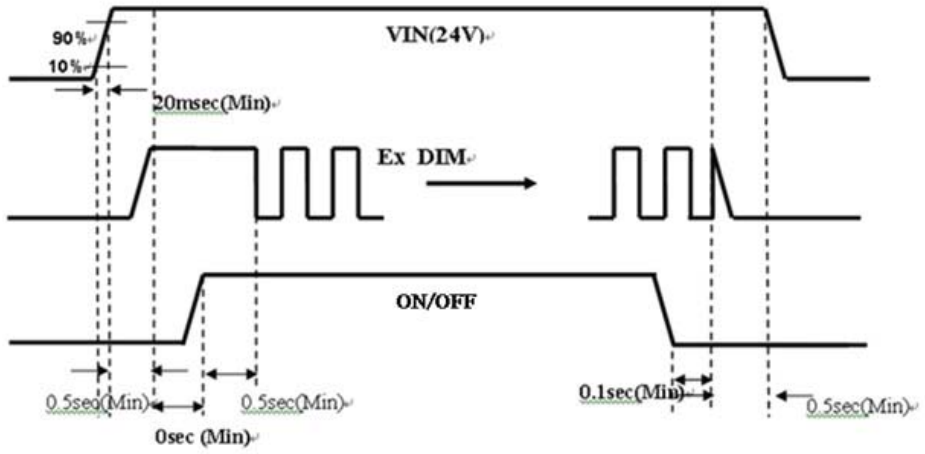
$$\left|\frac{I_p}{I_{rms}}\right| \text{ or } \left|\frac{I_{-p}}{I_{rms}}\right|$$

(5) If an inverter has shutdown function, it should keep its output for over 1 second even if the lamp connector is open. Otherwise the lamps may not be turned on.

3.4. Inverter input pin configuration (Connector : 20022WR-14AML→ Yeon-HO)

PIN NO	SYMBOL	FUNCTION
1	Vin	Power Supply(25V)
2	Vin	
3	Vin	
4	Vin	
5	Vin	
6	GND	Ground
7	GND	
8	GND	
9	GND	
10	GND	
11	Error out	Error out (Normal: GND, Abnormal: open collector)
12	ENA	Enable (Backlight on ~ off)
13	NC	Not use
14	Ext. Dim	External PWM dimming signal(Pulse)

5.3. Inverter Input Power Sequence



Note) SEQUENCE : On = Vin(25V) > Dimming Control≥ Backlight On/off
OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

4. Input Terminal Pin Assignment

4.1. Input Signal & Power

Pin Number	Signal	Pin Number	Signal	Pin Number	Signal
1	Panel_VCC	27	Ch3[1] -	53	Ch4[4] +
2	Panel_VCC	28	Ch3[1] +	54	Ch4[4] -
3	Panel_VCC	29	Ch3[2] -	55	Ch4[3] +
4	Panel_VCC	30	Ch3[2] +	56	Ch4[3] -
5	Panel_VCC	31	GND	57	GND
6	N.C	32	Ch3CLK-	58	Ch4CLK+
7	GND	33	Ch3CLK+	59	Ch4CLK-
8	GND	34	GND	60	GND
9	GND	35	Ch3[3] -	61	Ch4[2] +
10	Ch1[0] -	36	Ch3[3] +	62	Ch4[2] -
11	Ch1[0] +	37	Ch3[4] -	63	Ch4[1] +
12	Ch1[1] -	38	Ch3[4] +	64	Ch4[1] -
13	Ch1[1] +	39	GND	65	Ch4[0] +
14	Ch1[2] -	40	SCL_I(for TCON)	66	Ch4[0] -
15	Ch1[2] +	41	NC	67	GND
16	GND	42	NC	68	Ch2[4] +
17	Ch1CLK-	43	WP(EEPROM)	69	Ch2[4] -
18	Ch1CLK+	44	SDA_I(for TCON)	70	Ch2[3] +
19	GND	45	LVDS_SEL	71	Ch2[3] -
20	Ch1[3] -	46	NC	72	GND
21	Ch1[3] +	47	NC	73	Ch2CLK+
22	Ch1[4] -	48	NC	74	Ch2CLK-
23	Ch1[4] +	49	NC	75	GND
24	GND	50	NC	76	Ch2[2] +
25	Ch3[0] -	51	NC(HVS for LCD)	77	Ch2[2] -
26	Ch3[0] +	52	GND	78	Ch2[1] +
(NC) NOT CONNECTED : THIS PINS ARE ONLY USED FOR SEC INTERNAL OPERATIONS. (LVDS_SEL) : IF THIS PIN : HIGH (3.3V) → NORMAL NS LVDS FORMAT				79	Ch2[1] -
				80	Ch2[0] +
				81	Ch2[0] -
				82	GND

Note(1) Pin number starts from Right side

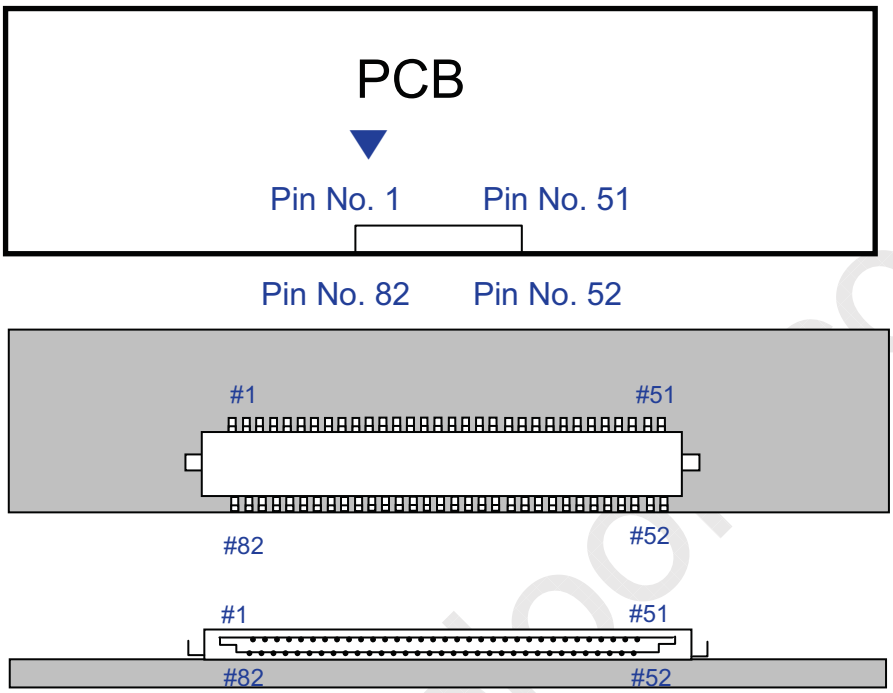
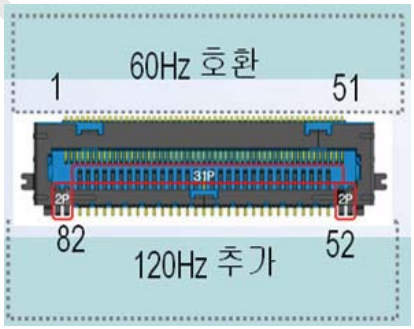


Fig. Connector diagram

a. Power GND pins should be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pin should be separated from other signal or power.



4.2 LVDS Interface

- LVDS Receiver : Tcon (merged)
- Data Format (JEIDA)

	LVDS pin	JEIDA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4
	TxIN/RxOUT1	R5
	TxIN/RxOUT2	R6
	TxIN/RxOUT3	R7
	TxIN/RxOUT4	R8
	TxIN/RxOUT6	R9
	TxIN/RxOUT7	G4
TxOUT/RxIN1	TxIN/RxOUT8	G5
	TxIN/RxOUT9	G6
	TxIN/RxOUT12	G7
	TxIN/RxOUT13	G8
	TxIN/RxOUT14	G9
	TxIN/RxOUT15	B4
	TxIN/RxOUT18	B5
TxOUT/RxIN2	TxIN/RxOUT19	B6
	TxIN/RxOUT20	B7
	TxIN/RxOUT21	B8
	TxIN/RxOUT22	B9
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2
	TxIN/RxOUT5	R3
	TxIN/RxOUT10	G2
	TxIN/RxOUT11	G3
	TxIN/RxOUT16	B2
	TxIN/RxOUT17	B3
	TxIN/RxOUT23	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0
	TxIN/RxOUT29	R1
	TxIN/RxOUT30	G0
	TxIN/RxOUT31	G1
	TxIN/RxOUT32	B0
	TxIN/RxOUT33	B1
	TxIN/RxOUT34	REVERSED

4.3 Input Signals, Basic Display Colors and Gray Scale of Each Color

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

Note) Definition of Gray :

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

Input Signal : 0 = Low level voltage, 1 = High level voltage

5. Interface Timing

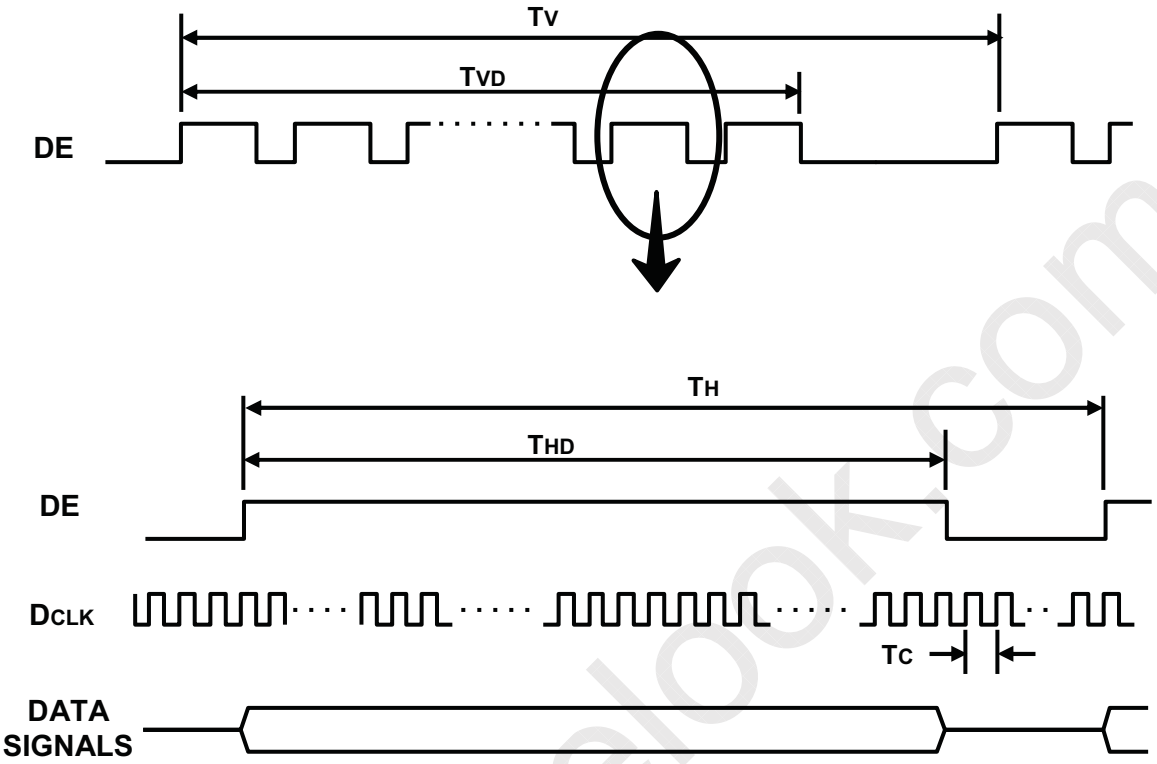
5.1 Timing Parameters

- (DE only mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	240	297	305	MHz	-
Hsync		F_H	120	135	140	KHz	-
Vsync		F_V	95	120	125	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1092	1125	1350	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

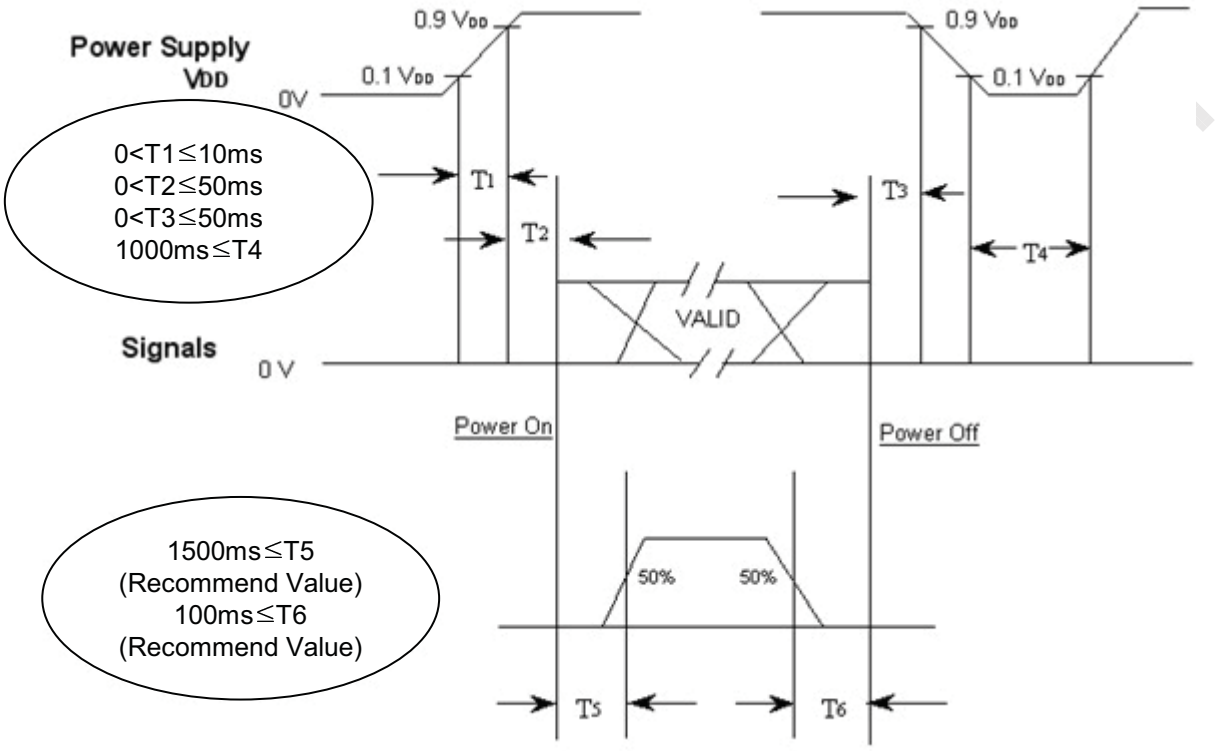
Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

5.2 Timing diagrams of interface signal (DE only mode)



5.3 Power ON/OFF Sequence

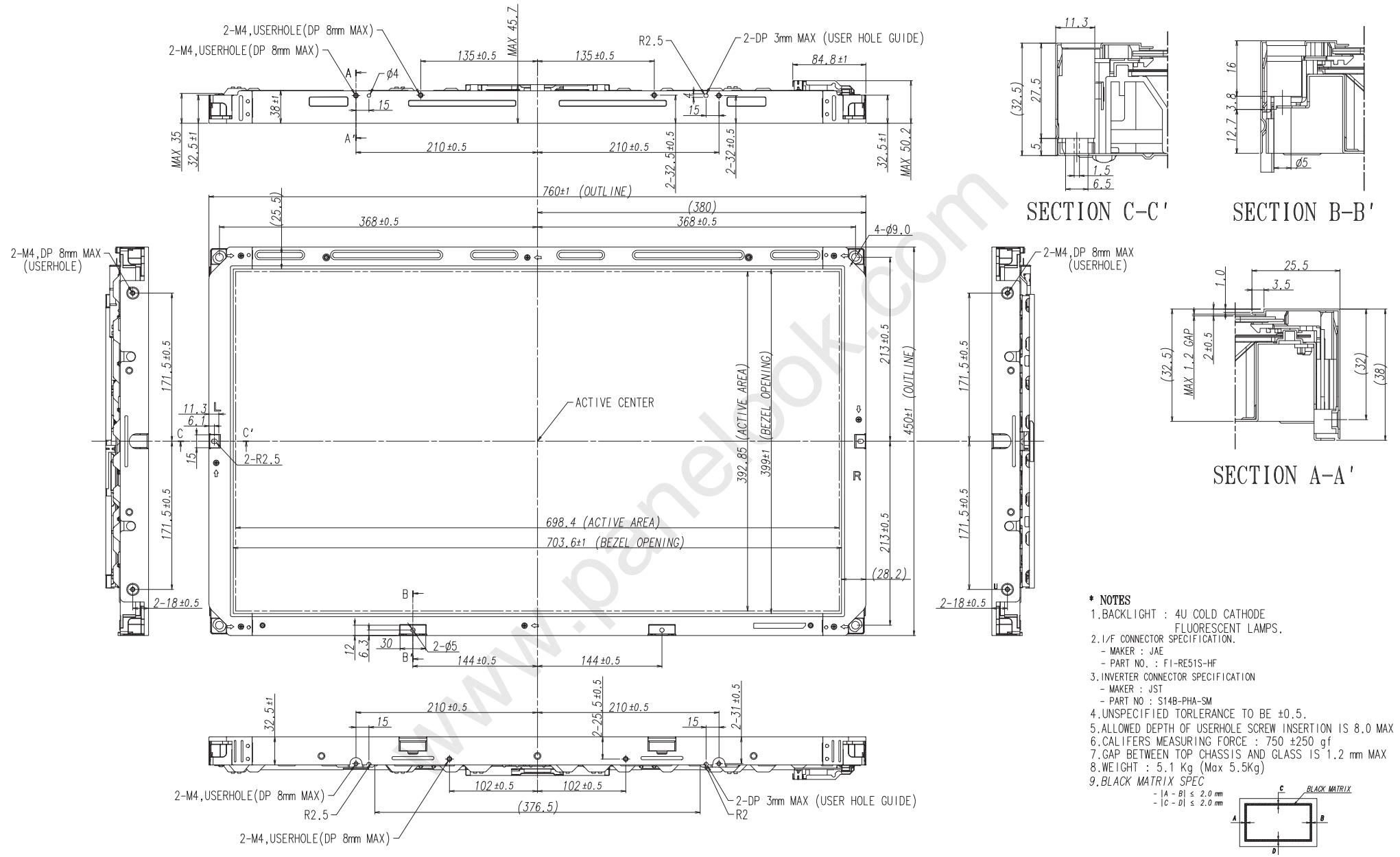
To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



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.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
1	OUTLINE DIMENSION	-	LTF320HF01	1		



* NOTES

1. BACKLIGHT : 4U COLD CATHODE FLUORESCENT LAMPS.
2. I/F CONNECTOR SPECIFICATION.
   - MAKER : JAE
   - PART NO. : FI-RE51S-HF
3. INVERTER CONNECTOR SPECIFICATION
   - MAKER : JST
   - PART NO : S14B-PHA-SM
4. UNSPECIFIED TORLERANCE TO BE ±0.5.
5. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 8.0 MAX
6. CALIFERS MEASURING FORCE : 750 ±250 gf
7. GAP BETWEEN TOP CHASSIS AND GLASS IS 1.2 mm MAX
8. WEIGHT : 5.1 Kg (Max 5.5Kg)
9. BLACK MATRIX SPEC
   - |A - B| ≤ 2.0 mm
   - |C - D| ≤ 2.0 mm

APPROVAL

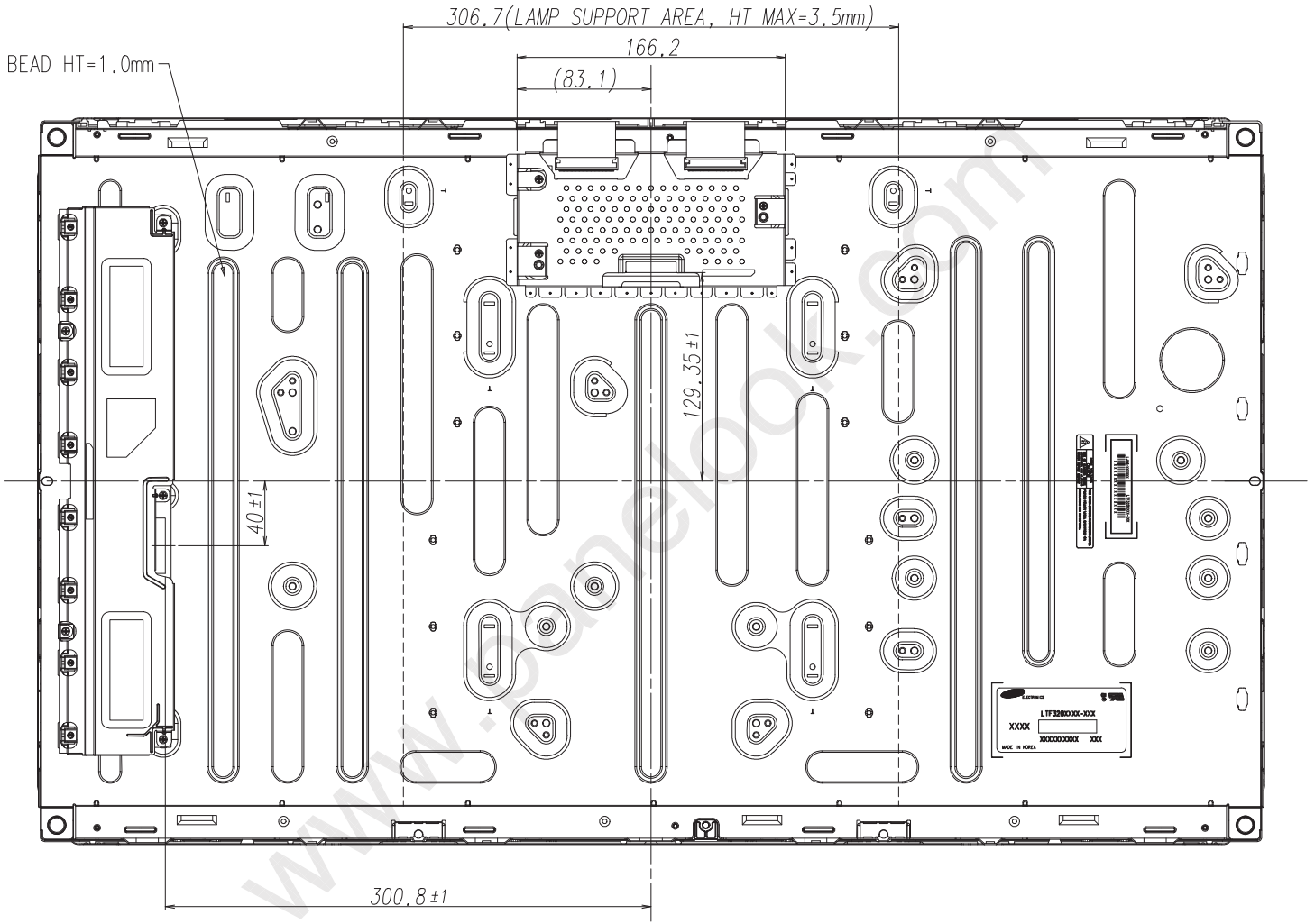
GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X <= 4	±0.05	±0.1	±0.2
4 < X <= 16	±0.08	±0.15	±0.3
16 < X <= 64	±0.12	±0.25	±0.5
64 < X <= 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	REASON	CHK'D BY

UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
SCALE	1/2		K.R.KO		J.H.CHUN
TOLERANCE LEVEL	3		09.11.16		09.11.17
SAMSUNG ELECTRONICS					SPEC. NO

MODEL NAME	LTF320HF01		
PART/SHEET NAME	OUTLINE DIM.(FRONT)	SHEET	1/2
CODE NO.	-	VER.	000

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
	OUTLINE DIMENSION	-	LTF320HF01	1		



APPROVAL

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION				REASON	CHG'D BY
UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY		
SCALE	1/2		K.R.KO		J.H.CHUN		
TOLERANCE		. .	09.11.16		09.11.17		
SAMSUNG ELECTRONICS					SPEC. NO		

MODEL NAME	LTF320HF01		
PART/SHEET NAME	OUTLINE DIM.(REAR)	SHEET	2/2
CODE NO.	-	VER.	000

7. Reliability Test

Item	Test condition	Quantity
Temperature Step stress	-20℃～ 60℃, 10Cycle, 80hr	4EA
HTOL	50℃operation,1000hr	8EA
LTOL	0℃operation, 1000hr	4EA
LTOL 2	-20℃, -10 ℃ Each condition over 5hr off, over 1hr on	4EA
HTS	70℃storage, 500hr	4EA
LTS	-30℃storage, 500hr	4EA
THB	40℃ / 95%RH, 30sec On / Off , 500hr operation	4EA
WHTS	60℃ / 75%RH, 500hr	4EA
Thermal Shock	-20℃(30min) ~ 60 ℃(30min) storage, 200cycle	4EA
ALTITUDE	-10℃～ 45℃, 0～ 40,000fit , 18hr	2EA
ESD	contact : ± 8 kV ,150㎊/330Ω,200Point,1 time/Point (operation) non-contact : ± 15 kV,150㎊/330Ω,200Point,1 time/Point (operation) Inverter input pin : ± 15 kV,150㎊/330Ω, 3 times/Pin	3EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	11msec, ± XYZ 1time/axis ~15Kg 50G, 11msec 15Kg ~ 20Kg ± XY 40G ± Z 30G, 11msec 20Kg ~ 30G, 11msec	3EA
Noise	On 90 min / Off 90 min	2 EA
Dust	5hr on/off (yellow earth 5sec spread / 5 min precipitation)	2 EA
Short term Image sticking	25~50℃ Mosaic pattern (9*10) 12hr fix	8 EA
Long term Image sticking	50℃ Mosaic pattern (9*10) 504hr fix	4 EA
PALLET Vibration	1.05 Grms, Random, Z axis 1Hr	1PALLET(24EA)
PALLET Drop	20cm, 4Edge(Bottom), 1Face(Bottom)	1PALLET(24EA)

[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

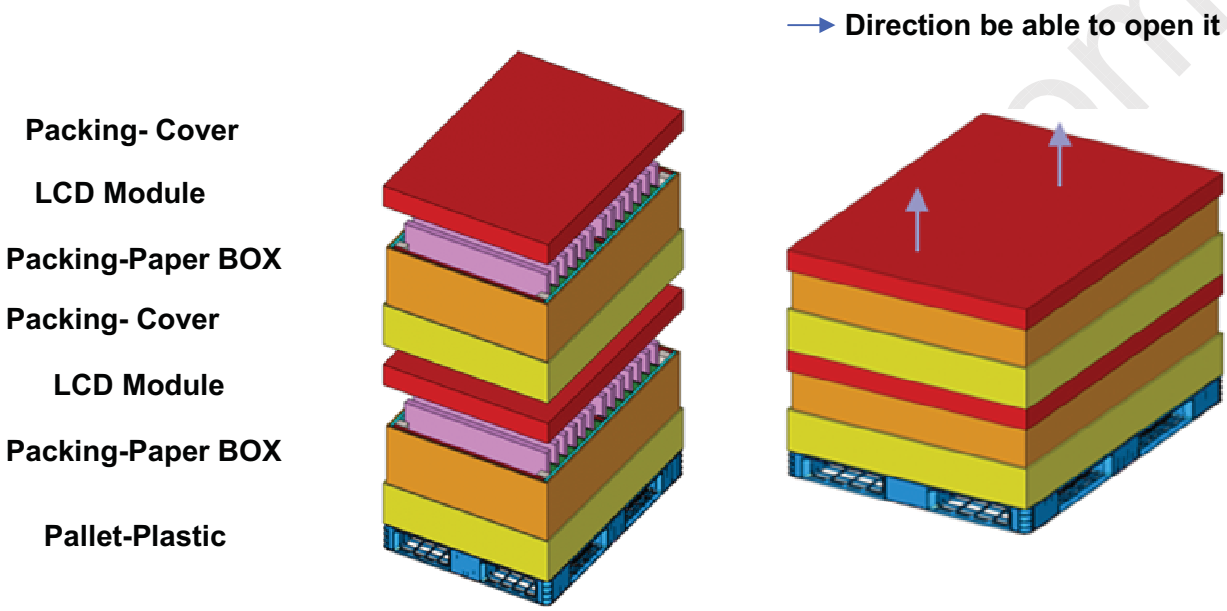
8. PACKING

8.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



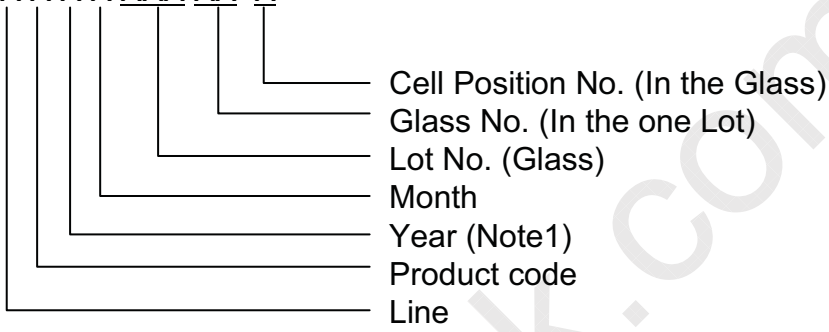
8.2 Packing Specification

Item	Specification	Remark
LCD Packing	30ea / (Packing-Pallet Box)	1. 6.0kg/LCD(30ea) 2. 13kg/Packing paper BOX -SET(2ea) 3. Packing BOX Material : Paper 4. Packing Pallet Box Material : DW4
Pallet	1Box / Pallet	1.Pallet weight = 8kg
Packing Direction	Vertical	1150 x 850 x 1125
Total Pallet Size	H x V x height	1150mm(H) x 850mm(V) x 1125mm(height)
Total Pallet Weight	214kg	Pallet(8kg) + Module(180kg) + Packing paper BOX (up+botton= 26kg)

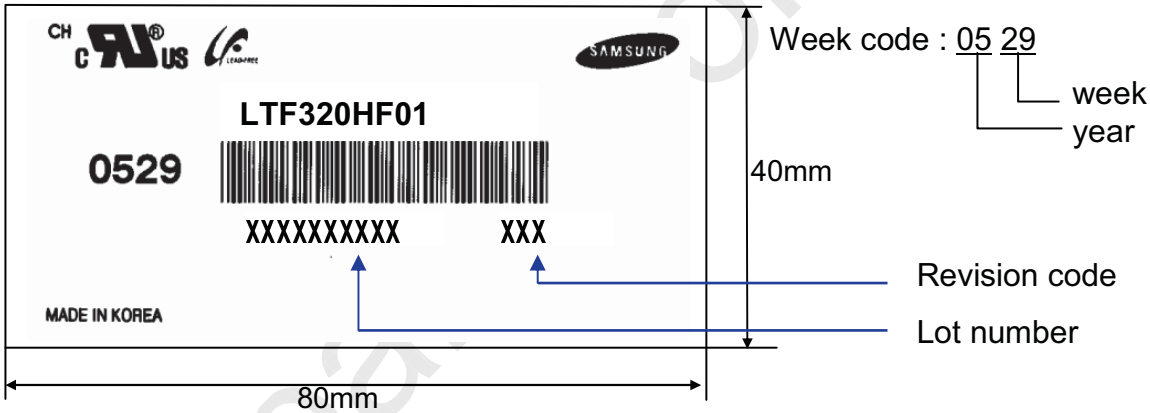
8. MARKING & OTHERS

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

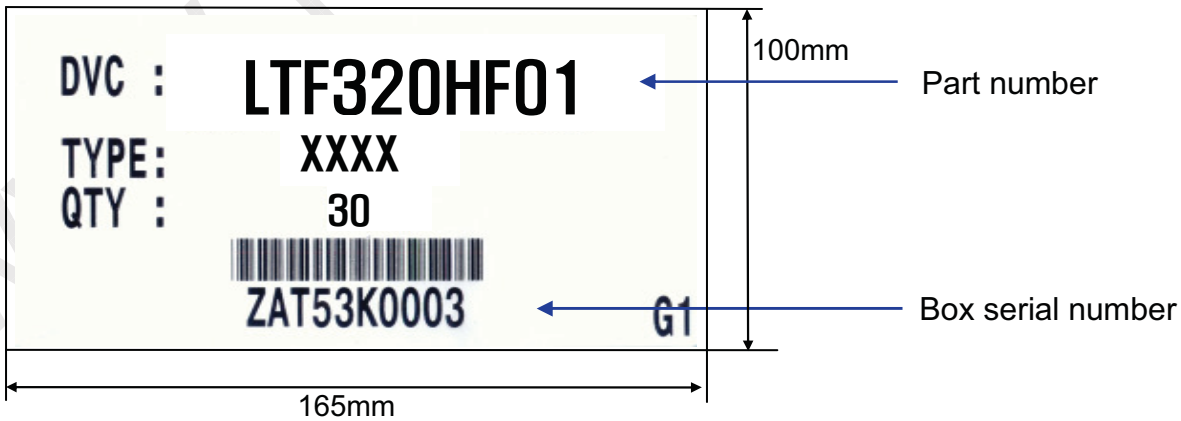
(1) Parts number : LTF320HF01
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



(6) Others

1. After service part
   Lamps cannot be replaced because of the narrow bezel structure.

10. General Precautions

10.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) 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.

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

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

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

(g) 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.

(h) 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 with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.

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

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of inverter & LVDS board.

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module

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

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

(b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact 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.

10.5 Others

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

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

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

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

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

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