Product Specification

MODEL NO.	LTM184HL01
EXTENSION CODE	M01

IT Development Team
Samsung Display Co., Ltd

SAMSUNG DISPLAY

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REVISION HISTORY

Date.	Rev. No.	Page	Revision Description
14/08/29	V0.0	All	Initial Release

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1. GENERAL DESCRIPTION

DESCRIPTION

The LTM184HL01-C01 uses a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFTs as switching components. This model is composed of a TFT LCD panel, a driver circuit, and a backlight unit. This 18.4″ model has a resolution of 1920 x 1080 pixels and can display up to 262,144 colors.

FEATURES

High contrast ratio
FHD (1920 x 1080 pixels) resolution
Low power consumption
Fast Response
LED back light with an embedded LED driver
DE (Data enable) only mode
5.0V LVDS Interface
Onboard EDID chip

APPLICATIONS

- Workstation & Desktop monitors
- Display terminals for AV Products
- Monitors for Industrial machine
If the intent to use this product is for other purpose, please contact Samsung Display.

GENERAL INFORMATION

| Item	Specification	Unit	Note
Display area	408.96(H) x 230.04(V)	mm	
Driver Element	a-Si TFT active matrix		
Display colors	262,144 (6bit)		
Number of pixel	1920 * 1080 (FHD)	Pixel	16:9
Pixel Arrangement	RGB vertical stripe		
Pixel pitch	0.213(H) x 0.213(V)	mm	
Display Mode	Normally Black, PLS mode		
Thickness of glass	0.5	mm	
Surface treatment	(AG type, Haze 25% , Hard coating (3H))		
Environmental safe regulation	Pb Free, Halogen Free		
Power Consumption	Total 10.83W(Typ) @Logic 2.49W(Typ) BLU 8.34W (Typ) Total 12.71W(Max)		Mosaic PTN

MECHANICAL INFORMATION

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	442.9	443.4	443.9	mm	with flange
		430.5	431.0	431.5	mm	w/o flange
	Vertical (V)	266.0	266.5	267.0	mm	with flange & PCB
		247.0	247.5	248.0	mm	w/o flange & PCB
	Depth (D)			4.3	mm	(1)
Weight				680	g	

NOTE (1) Measuring method for thickness
Force to be applied for measurement (1,2,3,4 Part) : The 200gf when using the height gauge.
Force to be applied for measurement (5,6,7,8,9 Part) : The 30gf when using the height gauge.
Force to be applied for measurement (COF Part) : The 50gf when using the height gauge.
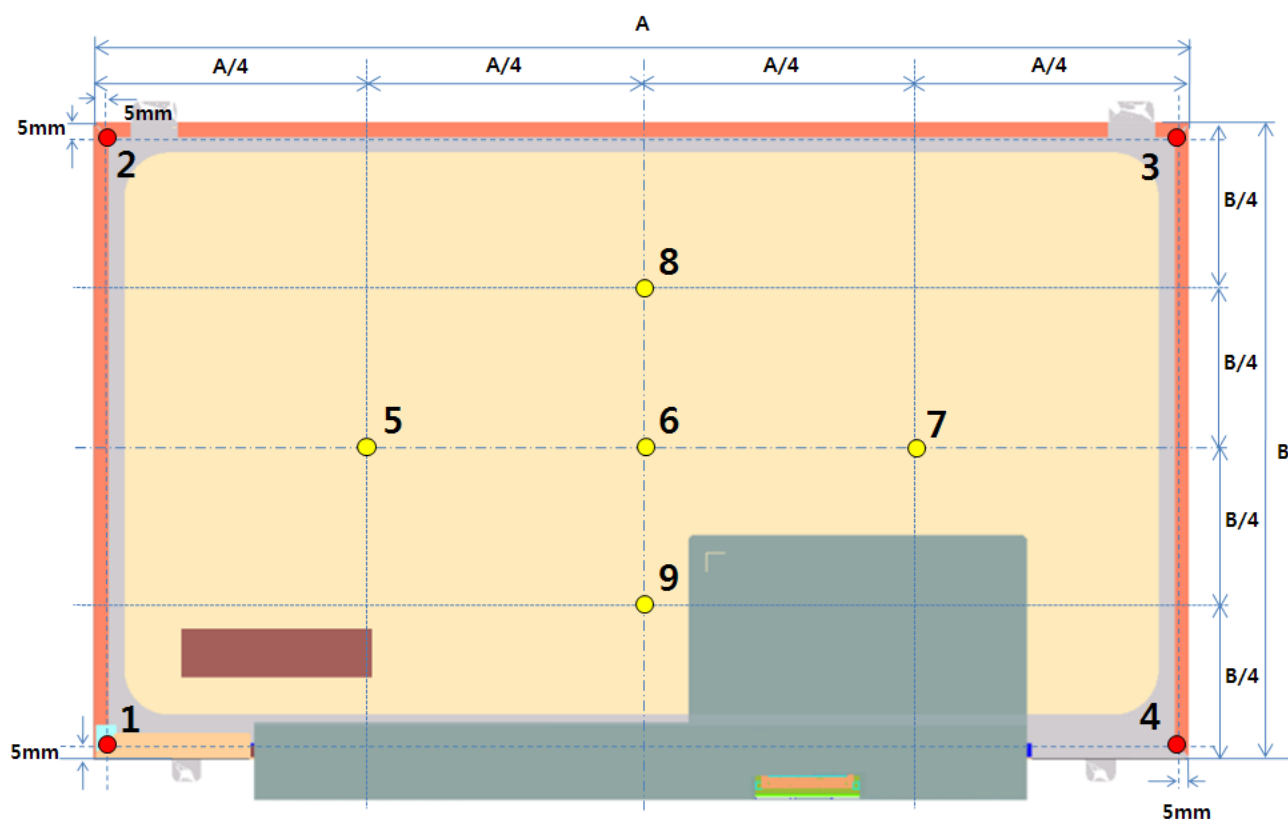
This picture is reference for measurement. Appearance may be different according to each model type.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperature (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2), (4)
Vibration (non-operating)	Vnop	-	2.41	G	(3), (4)

Note (1) The range of temperature and relative humidity is shown in the graph below 90% RH Max. .

(39℃ ≥ Ta) If the temperature is higher than 40 ℃, the maximum temperature of wet–bulb shall be less than 39℃. No condensation
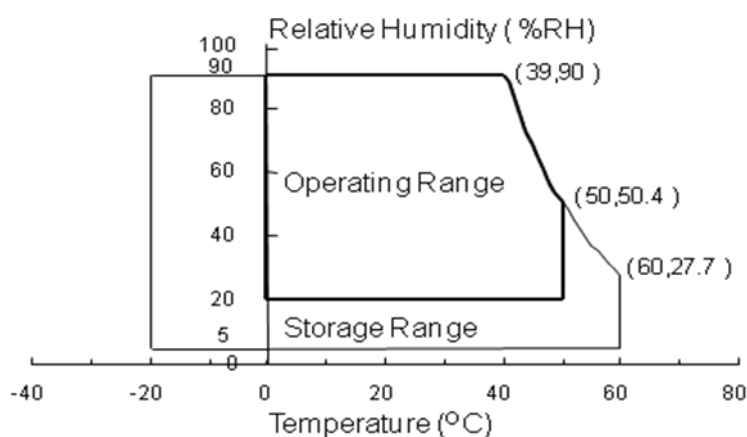
(2) Vibrate ±X, ±Y, and ± Z axis in the shape of the half sine wave one time for 2ms.

(3) Vibrate the X, Y, and Z randomly within a 5 - 500 Hz range for 30min.

(4) When testing a vibration and a shock, the fixture, which holds the module to be tested, shall be hard and rigid in order for the module not to be twisted or bent by the fixture.

2.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

$V_{LCD\_VCC} = 5.0V$, $V_{SS} = GND = 0V$

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{LCD_VCC}	V_{SS} - 0.5	5.5	V	(1), (2)
LVDS Input Voltage	V_{LVDS}	V_{SS} - 0.5	5.5		

Note (1) Within Ta (25 ± 2 °C)

    (2) Permanent damage to the device may occur if exceed maximum values.

(2) BACKLIGHT UNIT

VSS = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
BLU Supply Voltage	V_{BL_PWR}	7.5	21	V	(1), (2)
BLU Supply Current	I_{BL_PWR}	-	0.840	A	(1), (2) Vin=12V Duty 100%

Note (1) Within Ta (25 ± 2 °C)

    (2) Permanent damage to the device may occur if exceed maximum values

2.3 THE OTHERS

(1) STATIC ELECTRICITY PRESSURE RESISTANCE

Item	Test Conditions	Remark
CONTACT DISCHARGE	150pF, 330Ω, ± 8kV, 200points, 1 time/point	Operating
AIR DISCHARGE	150pF, 330Ω, ± 15kV, 200points, 1 time/point	Operating

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3 Optical Characteristics

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

(Ta = 25 ± 2°C, VDD=5V, fv= 60Hz, f$_{DCLK}$=59.2MHz)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		700	1000	-		(3) SR-3
Response Time	G to G	-		-	16	30	msec	(5) RD-80S
Luminance of White (Center of screen)		Y$_L$		300	350	-	cd/m^2	(6) SR-3
White variation (11P)		δ$_L$		-	-	1.6		(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx	Normal Viewing Angle $\phi = 0$ $\theta = 0$	- 0.025	0.647	+0.025		
		Ry			0.341			
	Green	Gx			0.328			
		Gy			0.610			
	Blue	Bx			0.148			
		By			0.068			
	White	Wx			0.310			
		Wy			0.340			(7),(8) SR-3
◦)Color Chromaticity (CIE 1976)	Red	Ru'		-	0.446	-		
		Rv'		-	0.529	-		
	Green	Gu'		-	0.136	-		
		Gv'		-	0.568	-		
	Blue	Bu'		-	0.168	-		
		Bv'		-	0.174	-		
	White	Wu'		-	0.192	-		
		Wv'		-	0.474	-		

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Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Gamut		-			72	-	%	
Color Temperature		-		-	6500	-	K	
A) Gamma value				1.9	2.2	2.5		
Viewing Angle	Hor.	θ_L	CR≥10		89	-	Degrees	(8) EZ-Contrast
		θ_R			89	-		
	Ver.	θ_U			89	-		
		θ_D			89	-		
A) Flicker		F		-	-	8		(9)
A) Cross Modulation		CT		-	-	5	%	(10)

Note (1) Test equipment setup

Measure the panel, which is left for 30 min. at the normal temp. after leaving it for 30 min with turning the back light on at the rating. The measurement should be executed under the condition including the ambient temp., 25℃±2℃, the dark room, windless (removed the direct wind), and no vibration.

[Optical characteristics measurement setup]

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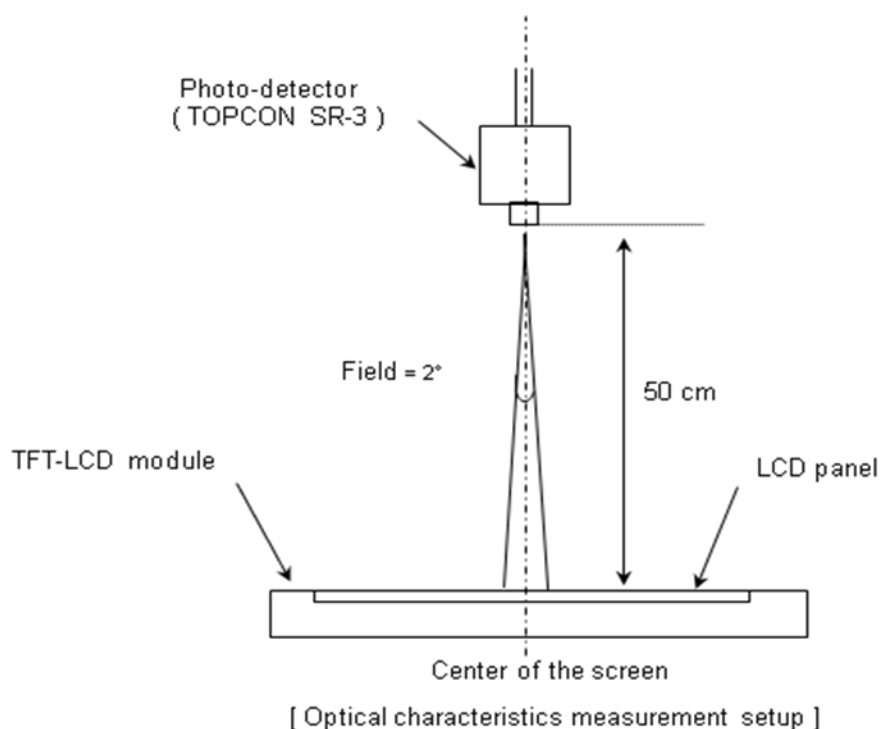
Note (2) The definition of test point
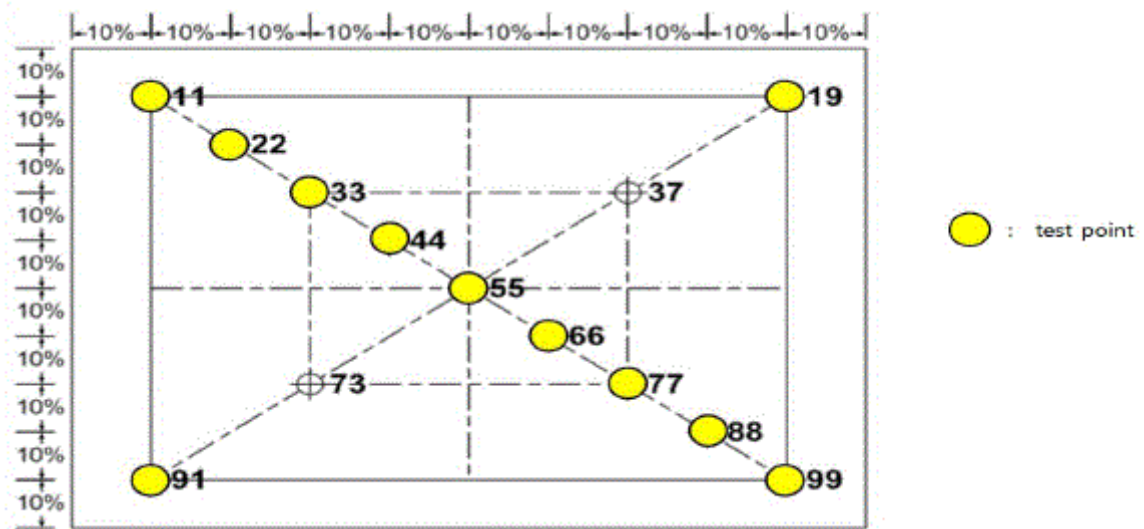
Note (3) The definition of contrast ratio (CR)

: Ratio of gray max (G_{max}) & gray min (G_{min}) at the center point[55] of the panel
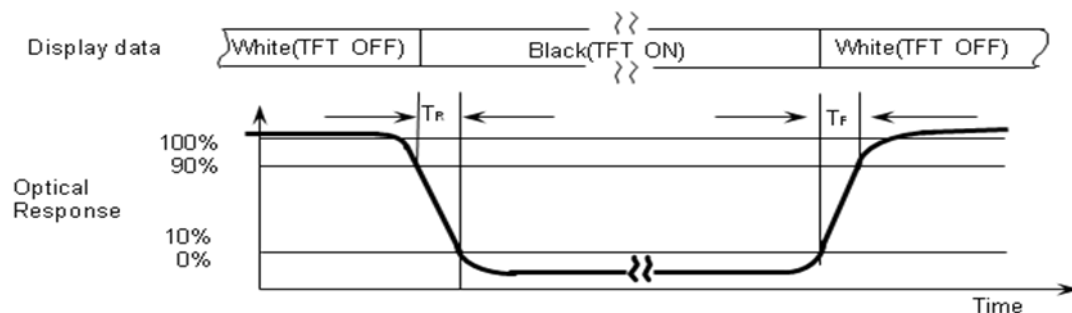
$$CR = \frac{G_{max}}{G_{min}}$$

G_{max} : Luminance with all pixels white
G_{min} : Luminance with all pixels black

Note (4) The definition of 13 points white variation(δ_L), [11~99]

$$\delta L = \frac{\text{Maximum luminance of 11 points}}{\text{Minimum luminance of 11 points}}$$

Note (5) The definition of Response time: Subtotal of the time, during which the transmission changes from 10% to 90% when the TFT turns on and off.

Note (6) The definition of luminance of white : Luminance of white at center point [55]

Note (7) The definition of color chromaticity (CIE 1931, CIE1976)
Color coordinate of Red, Green, Blue & White at center point[55]

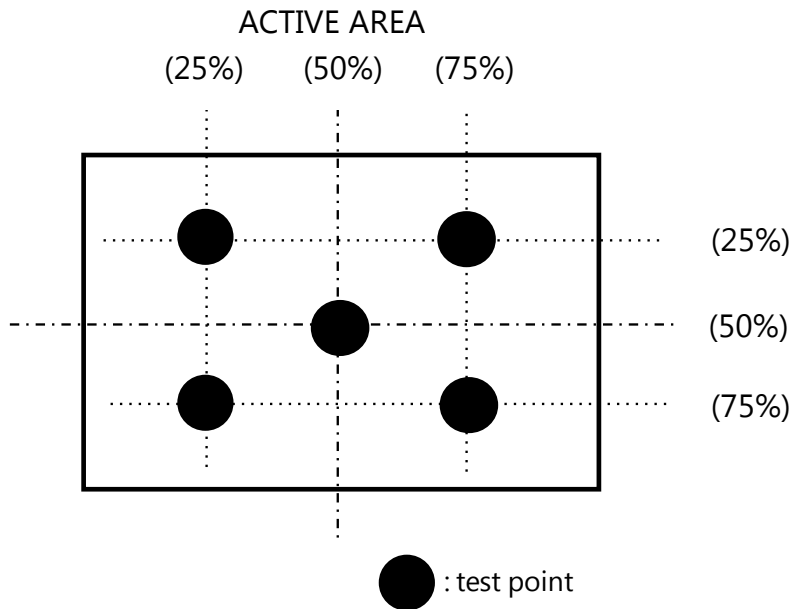Note (8) The definition of viewing angle: The range of viewing angle (10 $\leq$ C/R)

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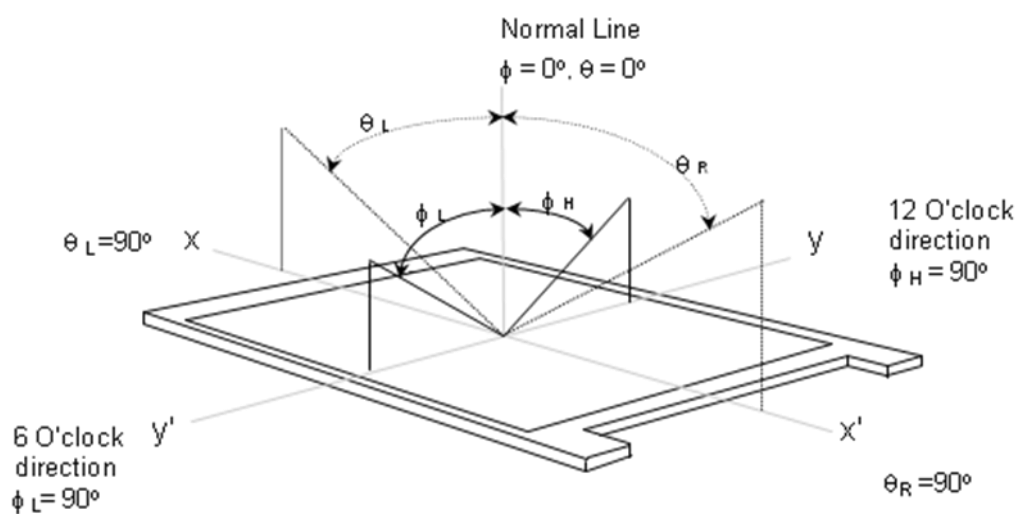
Note (9) The definition of flicker
Measuring equipment :RD-80S
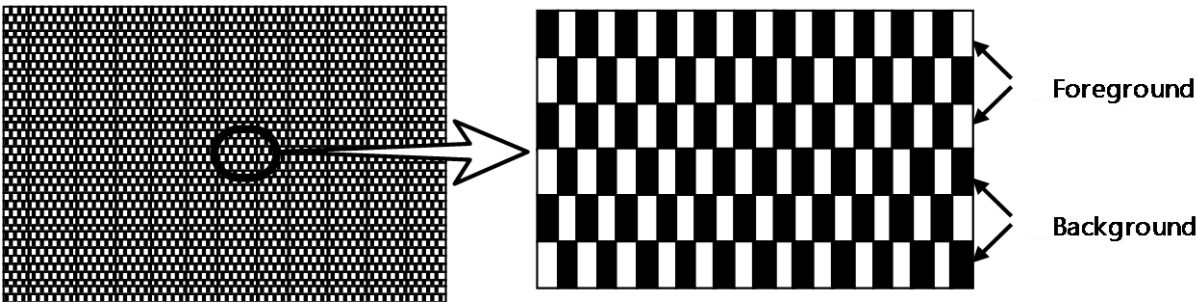Calculation depends on the flicker measurement standards.
[Measurement Point]

ACTIVE AREA

(25%)   (50%)   (75%)

(25%)

(50%)

(75%)

⬤ : test point

[Flicker Measurement Pattern]

1 DOT inverting drive

Foreground

Background

Note (7) The definition of crosstalk (Cross modulation)

: The phenomenon, which the contrast ratio is decreased by the interference of signal between pixels

Crosstalk Calculation Method

$$\textbf{Crosstalk Modulation Ratio(D}_{SHA}\textbf{)} \ = \ \frac{\left| \ \textbf{Y}_A \ - \ \textbf{Y}_B \ \right|}{\textbf{Y}_A} \times \textbf{100 (\%)}$$

Where

Y_A, Y_B = Measured under the 2° viewing angle (Measured area: ψ12 ㎜)

Black ground pattern except White Bar includes 1-63 Gray Ranges.

1) The method of measurement for horizontal-crosstalk
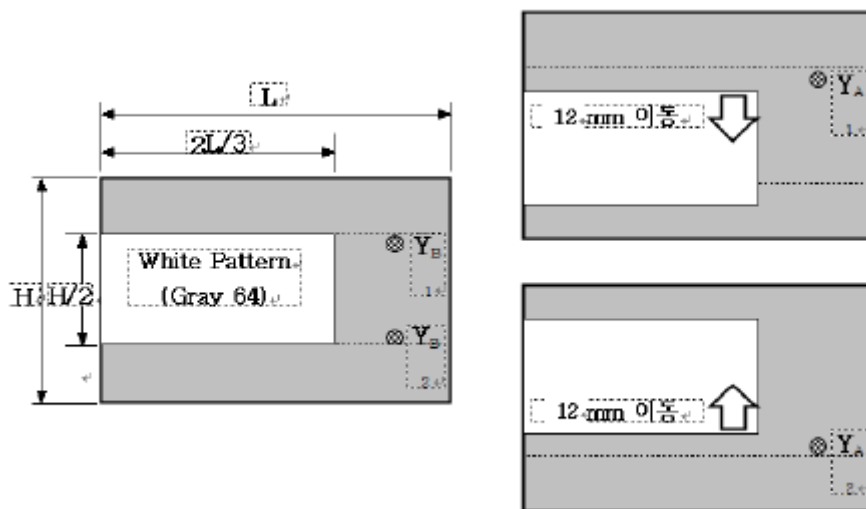
2) The method of measurement for vertical-crosstalk

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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

4.2 THE STRUCTURE OF LED PLACEMENT

(1LED BAR : 6 channels x 12ea = 72ea) * 2ea

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5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD MODULE

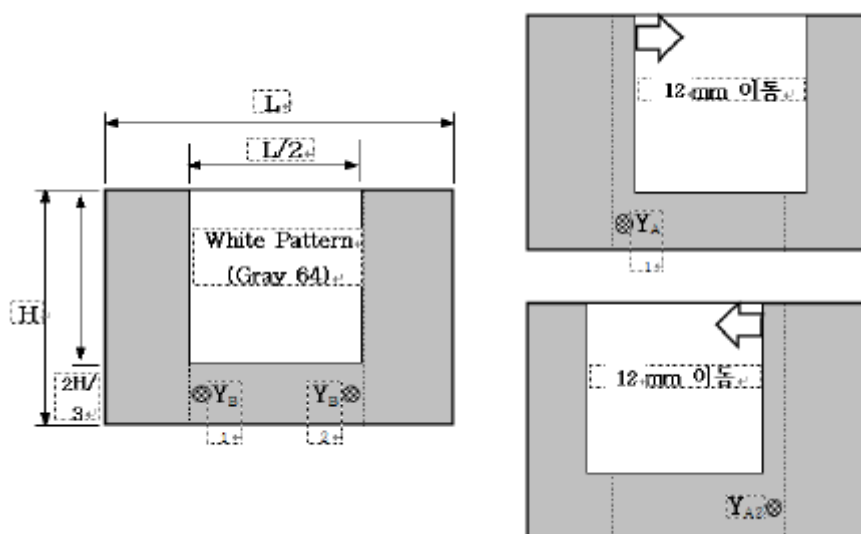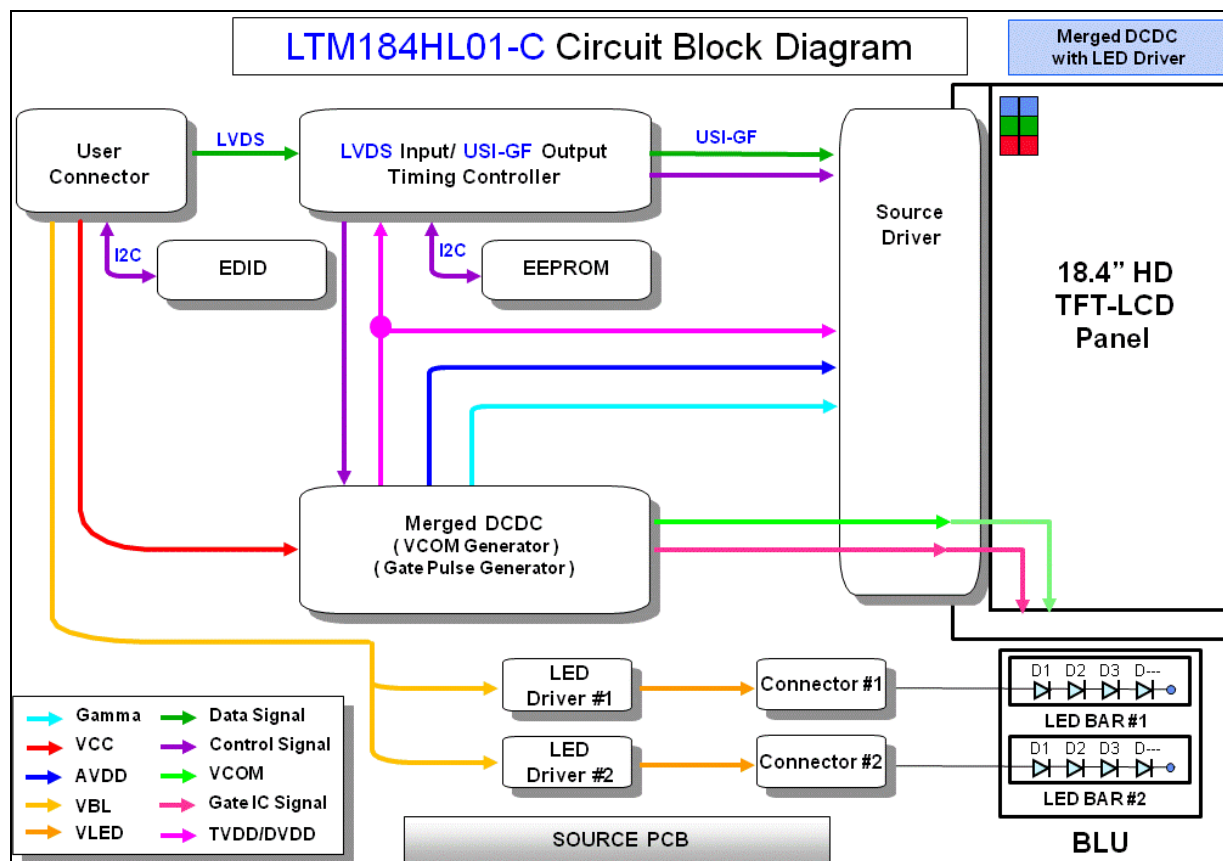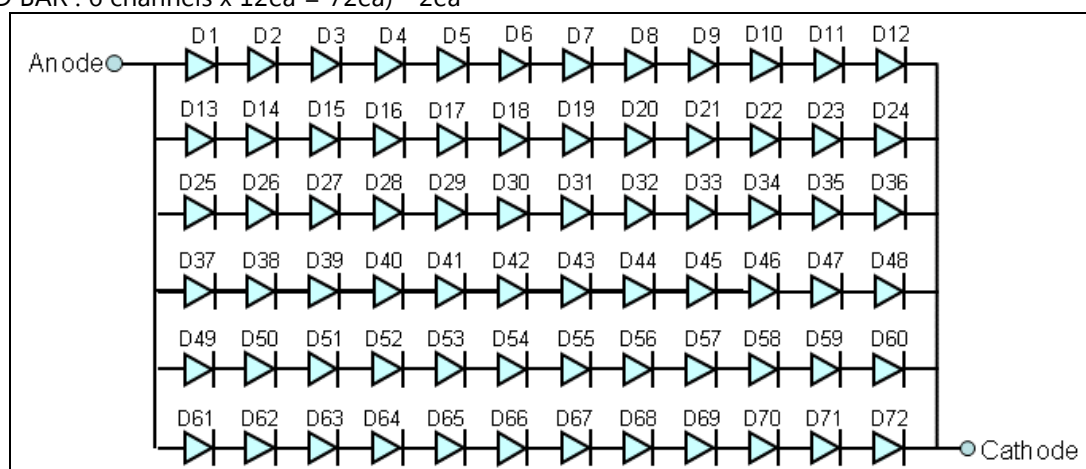<div align="right">Ta = 25 ± 2 °C</div>

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage		V_{LCD_VCC}	4.5	5.0	5.5	V	
T-CON TTL Input Voltage	High	V_{IH}	0.7 V_{LCD_VCC}	-	-	V	(1)
	Low	V_{IL}	-	-	0.3 V_{LCD_VCC}	V	
Vsync	60Hz	f_V	-	60	-	Hz	(3)
Hsync	60Hz	f_H	65.4	66.0	66.6	kHz	
Main Frequency	60Hz	f_{DCLK}	64.7	66.6	69.2	MHz	(3)
Rush Current		I_{RUSH}	-	-	5	A	(6)
Input Current	White	I_{LCD_VCC}	-	589	620	mA	(2), (5)
	Mosaic	I_{LCD_VCC}	-	498	525	mA	
	Black	I_{LCD_VCC}	-	405	430	mA	
	V.Stripe	I_{LCD_VCC}	-	647	680	mA	
	Red	I_{LCD_VCC}	-	659	700	mA	(2), (5)
	Green	I_{LCD_VCC}	-	540	570	mA	
	Blue	I_{LCD_VCC}	-	587	620	mA	
	1Dot	I_{LCD_VCC}	-	672	710	mA	(2), (5)
EDID Input Voltage		V_{EDID}	3.0	3.3	3.6	V	
EDID Input Current		I_{EDID}	-	-	5	mA	
Skew		PS	-400	-	400	ps	(2)

Note (1) The data pins for display and signal pins for timing should be connected. (GND= 0V)

(2) f_V = 60Hz, f_{DCLK} = 66.6MHZ, V_{LCD_vcc} = 5.0V, DC Current.

(3) In the case of 40Hz & 50Hz for sDRRS, FOS,

Flicker & Brightness are not guaranteed, because their level might be different from 60Hz operation.

Note (5) The dissipation pattern for power

*a) White Pattern   *b) Mosaic Pattern   *c) Black Pattern

VIEW AREA

*d) Vertical stripe pattern   *h) 1dot pattern

*e) Red Pattern   *f) Green Pattern   *g) Blue Pattern
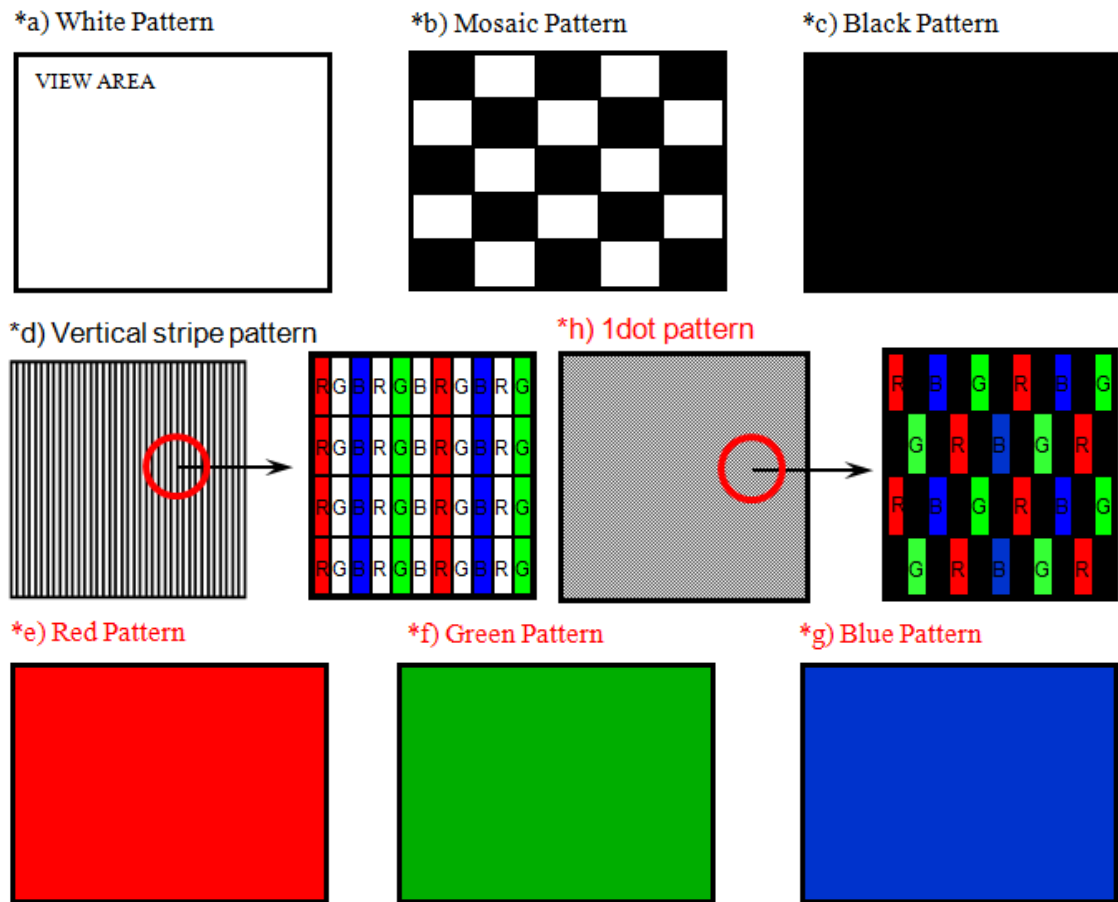
Note (6) The condition for measurement for rush current

5.2 BACK LIGHT UNIT

Ta = 25 ± 2 °C

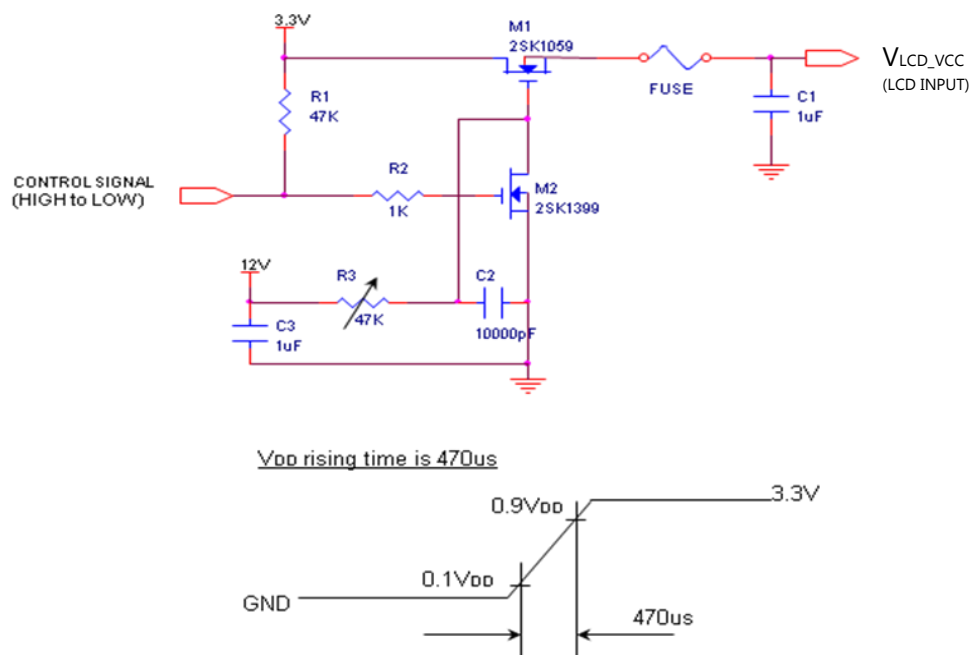| Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	18	21	mA	
LED Forward Voltage	VF	2.7	2.8	2.9	V	
LED Array Voltage	VP	32.4	33.6	34.8	V	
LED Power Consumption	P	-	7.3	8.8	W	Total
LED Life time	Hr	15,000	-	-	Hours	(1)
LED Counts	Q	-	144	-	EA	72ea*2Bars

Note (1) The life time (Hr) of LEDs can be defined as the time during which it continues to operate under the condition, which the Ta is 25 ± 2 °C and IF = 21.0 mArms until the one of the following events occurs when the brightness becomes 50% or lower than the original.

5.3 LED DRIVER

The manufacturer of LED driver: Richtek RT8561   Ta= 25 ± 2 °C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage		V_{BL_PWR}	7.5	12	21	V	
Input Current		I_{BL_PWR}	-	695	840	mA	Vin=12V Duty 100%
PWM duty Ratio		$D_{BL\_PWM\_DIM}$	1	-	100	%	PWM : 200Hz~1kHz PWM : 1kHz~10kHz PWM : 10kHz~20kHz *PWMI min duty 1% @ DPST_EN*
			10		100		
			20		100		
External PWM Frequency		$F_{BL\_PWM\_DIM}$	0.1	1	10	kHz	
In-Rush Current		$I_{RUSH\_BL\_PWR}$	-	-	1.5	A	(1)
EN Control Level	High	V_{BL_ENABLE}	1.5	-	5.0	V	
	Low		0.0	-	1.0	V	
PWM Control Level	High	$V_{BL\_PWM\_DIM}$	1.3	-	5.0	V	
	Low		0.0	-	0.1	V	
V_{BL_PWR} @ LED Driver On		V_{BL_PWR}	7.5	-	21.0	V	
V_{BL_PWR} @ LED Driver Off		V_{BL_PWR}	0	-	5.5	V	
Operating frequency		FO	0.8	1.0	1.2	kHz	
Efficiency		η	-	87	-	%	

Note (1) Rush current measurement condition
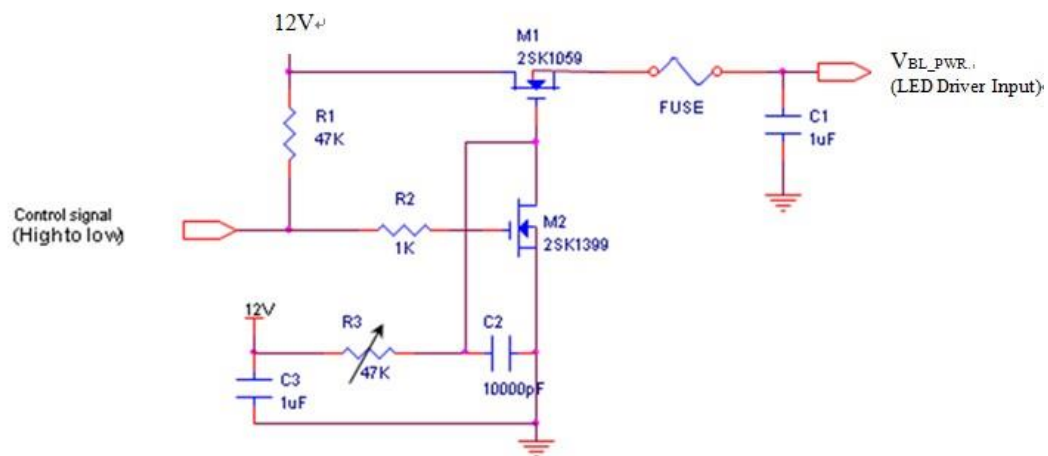
The V_{BL_PWR} rising time is 470us.

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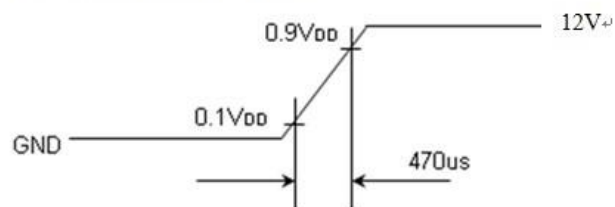
5.4 LVDS INTERFACE

5.4.1 LVDS DC Specifications

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential input high threshold voltage	V_{TH}	-	-	+200	mV	V_{CM} = 1.2V
Differential input low threshold voltage	V_{TL}	-200	-	-	mV	
Differential input voltage	$|V_{ID}|$	200	400	600	mV	
Common mode voltage	V_{CM}	0.4	1.2	1.8	V	$|V_{ID}|$= 200mV

5.4.2 LVDS AC Specifications

Characteristics		Symbol	Min.	Typ.	Max.	Unit	Remarks
ROUTCLK frequency		f_{RCP}	66.14	71.42	83.88	MHz	
LVDS RX Skew (Strobe) Right Margin	85MHz	T_{RSRM}	-	-	400	ps	
	50MHz		-	-	700	ps	
LVDS RX Skew (Strobe) Left Margin	85MHz	T_{RSLM}	-400	-	-	ps	
	50MHz		-700	-	-	ps	
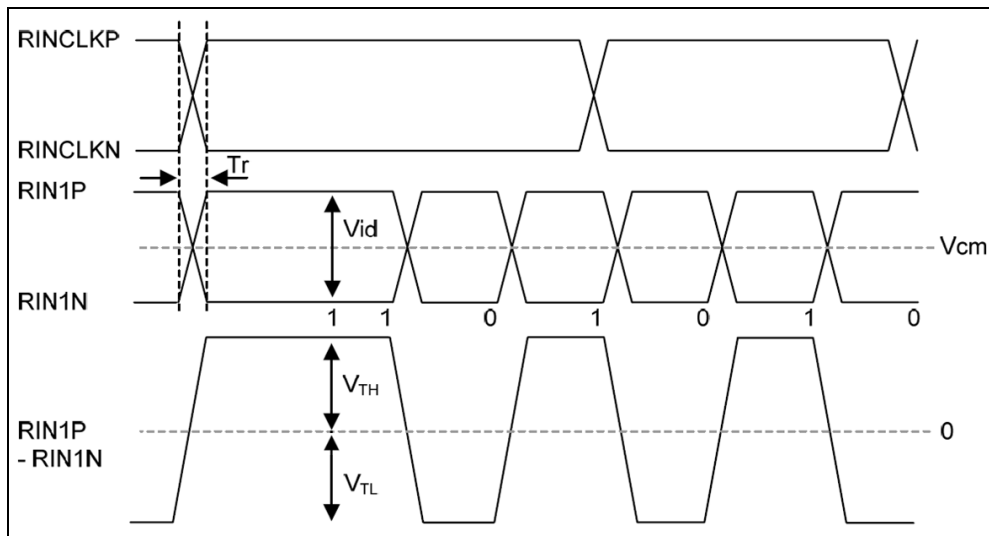
< The definition of LVDS DC characteristics >
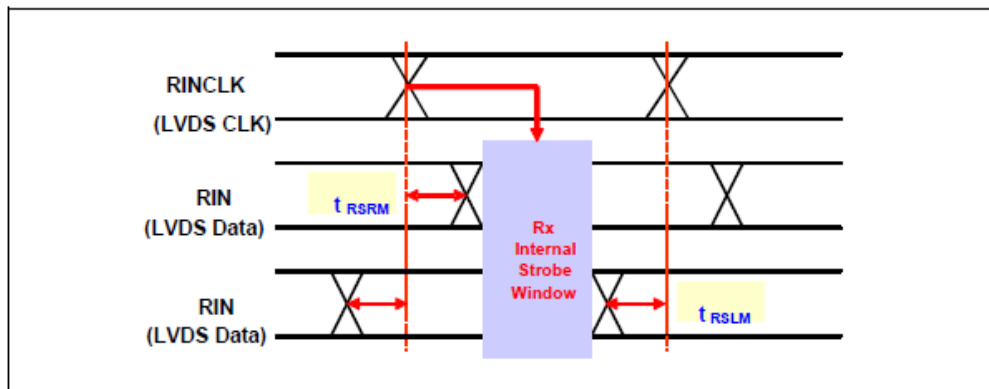
< The definition of LVDS Receiver Skew (Strobe) Margin >

5.4.3 Timing diagrams of LVDS transmission

SAMSUNG DISPLAY
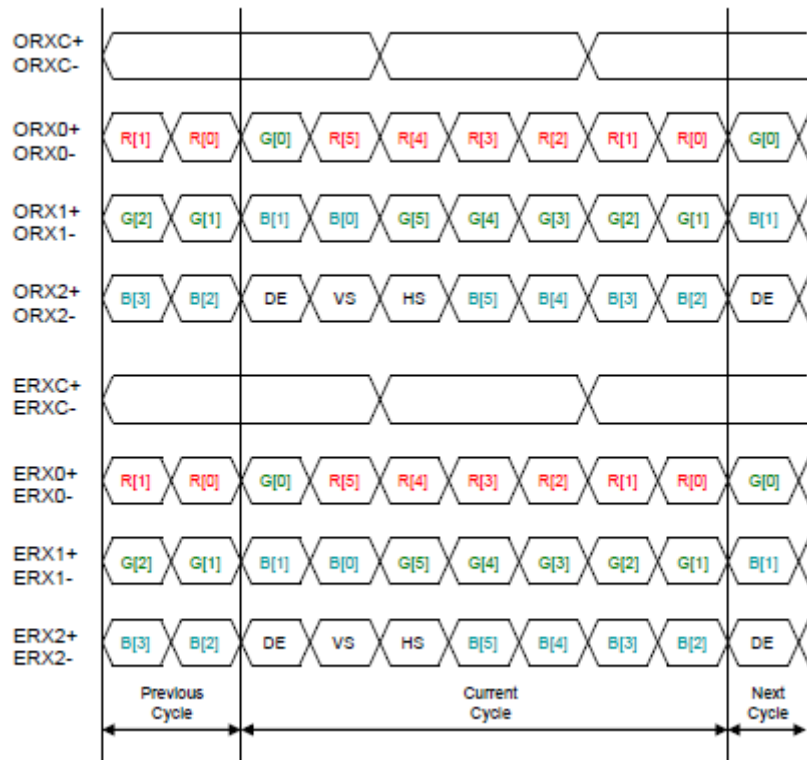
5.5 INTERFACE TIMING

5.5.1 TIMING PARAMETERS

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Vertical Display Term	Active Display Period	T_V	-	1080	-	Lines	
	Vertical Total	T_{VD}	1090	1100	1110	Lines	
Horizontal Display Term	Active Display Period	T_H	-	1920	-	Clocks	
	Horizontal Total	T_{HD}	1980	2020	2080	Clocks	

5.5.2 TIMING DIAGRAMS OF INTERFACE SIGNAL
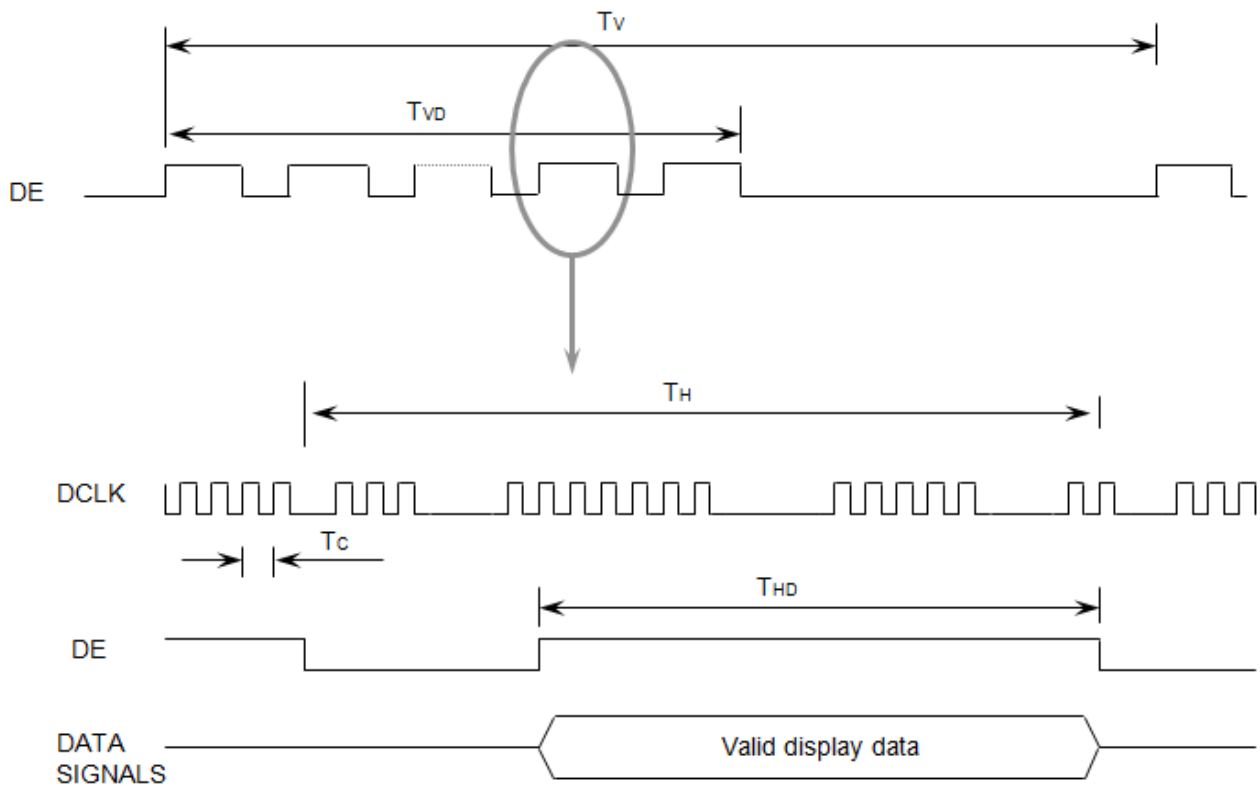
5.6 INPUT COLOR DATA MAPPING

Color	Display	Red						Green						Blue						Gray Scale Level
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45	B5	
Basic Colors	Black	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	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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	-
Gray Scale Of Red	Black	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	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
Gray Scale Of Green	Black	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	1	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
Gray Scale Of Blue	Black	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	1	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

Note (1) Definition of gray: Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note (2) Input signal: 0 =Low level voltage, 1=High level voltage

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5.7 POWER ON/OFF SEQUENCE

To prevent the product from being latched up or the DC in the LCD module from starting an operation, the order to turn the power on and off should be changed to the order as shown in the diagram below.
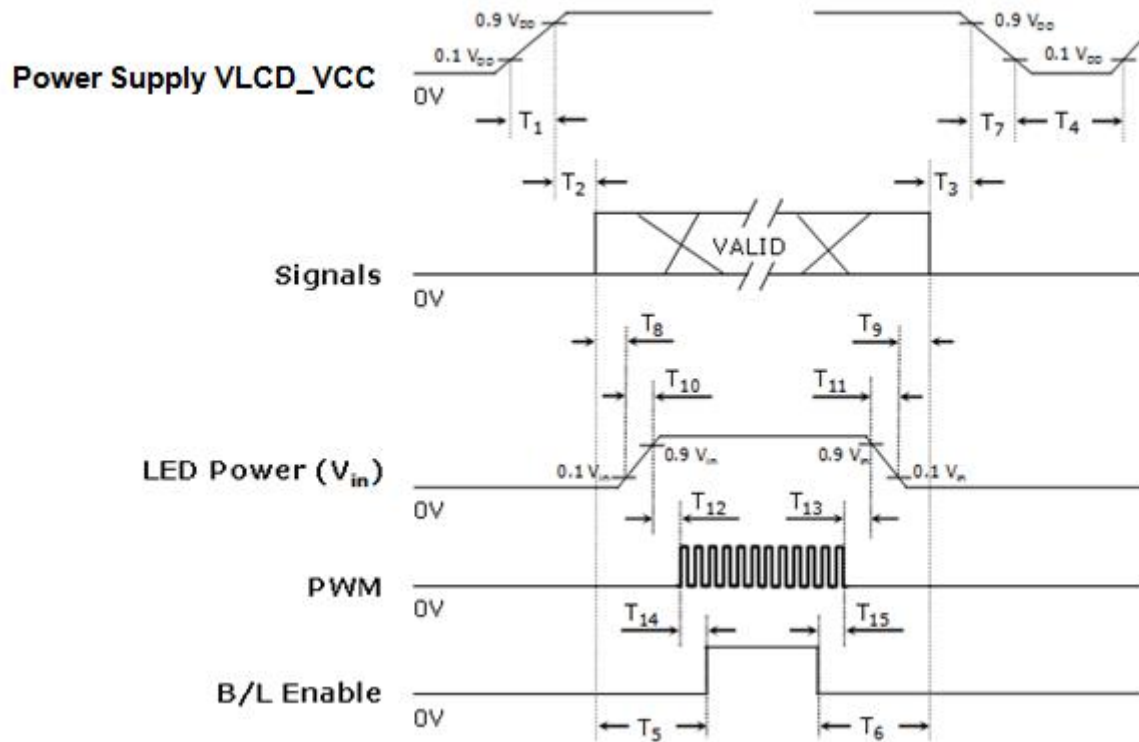
Timing (ms)	Remarks
$0.5 < T_1 \leq 10$	V_{LCD_VCC} rising time from 10% to 90%
$0 < T_2 \leq 50$	Interval from V_{LCD_VCC} to valid data at power ON
$0 < T_3 \leq 50$	Interval from valid data OFF to V_{LCD_VCC} OFF at power Off
$500 \leq T_4$	V_{LCD_VCC} OFF time for Windows restart
$200 \leq T_5$	Interval from valid data to B/L enable at power ON
$200 \leq T_6$	Interval from valid data off to B/L disable at power Off
$0 < T_7 \leq 10$	V_{LCD_VCC} falling time from 90% to 10%
$10 < T_8$	Interval from valid data on to LED driver Vin rising time 10%
$10 < T_9$	Interval from LED driver Vin falling time 10% to valid data Off
$0.5 < T_{10} \leq 10$	LED V_{in} rising time from 10% to 90%
$0.5 < T_{11} \leq 10$	LED V_{in} falling time from 90% to 10%
$0 < T_{12}$	Interval from LED driver Vin rising time 90% to PWM ON
$0 < T_{13}$	Interval from PWM Off to LED driver Vin falling time 90%
$0 \leq T_{14}$	Interval from PWM ON to B/L Enable ON
$0 \leq T_{15}$	Interval from B/L Enable Off to PWM Off

The backlight may be flashed if the interface signal remains floated when the above-mentioned signal becomes invalid.

Note   (1) The power voltage from system shall be supplied to the input pin of LCD constantly.

(2) Enable the voltage to the LED within the range, which the LCD is operated. The screen becomes white when turning the back-light on before the LCD is operated or turning the LCD off before turning the back-light off. Operation or the LCD turns off before the back-light turns off; the display may momentarily become white.

(3) Don't leave the system at a high impedance state, which the interface signal is out for a long time after the V_{LCD_VCC} is enabled.

(4) The T4 should be measured the module is fully discharged.

(5) The interface signal shall not maintain the high impedance when the power is on.

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## 5.8 INPUT TERMINAL PIN ASSIGNMENT

5.8.1 INPUT SIGNAL & POWER

(LVDS, Connector: 20455-040E-0, I-PEX or the equipment with the equivalent capability)

Pin	Symbol	Function
1	NC	No Connection (Reserved for supplier)
2	LCD_VCC	Power Supply, 5.0V (typical)
3	LCD_VCC	Power Supply, 5.0V (typical)
4	VCC_EDID	DDC 3.3V Power
5	NC (WPN)	No Connect (or BIST EN)
6	CLK_EDID	DDC Clock
7	DAT_EDID	DDC Data
8	RXO0-	-LVDS differential data input (R0-R5, G0), ODD DATA
9	RXO0+	+LVDS differential data input (R0-R5, G0), ODD DATA
10	H_GND	Ground
11	RXO1-	-LVDS differential data input (G1-G5, B0-B1), ODD DATA
12	RXO1+	+LVDS differential data input (G1-G5, B0-B1), ODD DATA
13	H_GND	Ground
14	RXO2-	-LVDS differential data input (B2-B5, HS, VS, DE), ODD DATA
15	RXO2+	+LVDS differential data input (B2-B5, HS, VS, DE), ODD DATA
16	H_GND	Ground
17	RXOC-	-LVDS differential clock input, ODD DATA
18	RXOC+	+LVDS differential clock input, ODD DATA
19	LCD_GND	Ground-Shield
20	RXE0-	-LVDS differential data input (R0-R5, G0), EVEN DATA
21	RXE0+	+LVDS differential data input (R0-R5, G0), EVEN DATA
22	LCD_GND	Ground
23	RXE1-	-LVDS differential data input (G1-G5, B0-B1), EVEN DATA
24	RXE1+	+LVDS differential data input (G1-G5, B0-B1), EVEN DATA
25	LCD_GND	Ground
26	RXE2-	-LVDS differential data input (B2-B5, HS, VS, DE), EVEN DATA
27	RXE2+	+LVDS differential data input (B2-B5, HS, VS, DE), EVEN DATA
28	LCD_GND	Ground
29	RXEC-	-LVDS differential clock input, EVEN DATA
30	RXEC+	+LVDS differential clock input, EVEN DATA
31	BL_GND	LED Ground
32	BL_GND	LED Ground
33	BL_GND	LED Ground
34	NC	No Connection
35	BL_PWM_DIM	PWM for luminance control (200~1KHz, under 5V)
36	BL_ENABLE	BL On/Off (On: 2.0~under 5V, Off: 0~0.5V)
37	NC	No Connection
38	BL_PWR	LED Power Supply 7.5V-21V
39	BL_PWR	LED Power Supply 7.5V-21V
40	BL_PWR	LED Power Supply 7.5V-21V

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6. PIXEL FORMAT

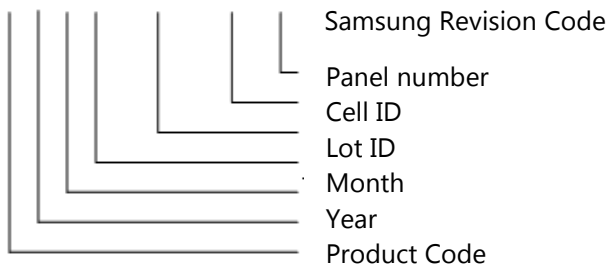# SAMSUNG DISPLAY
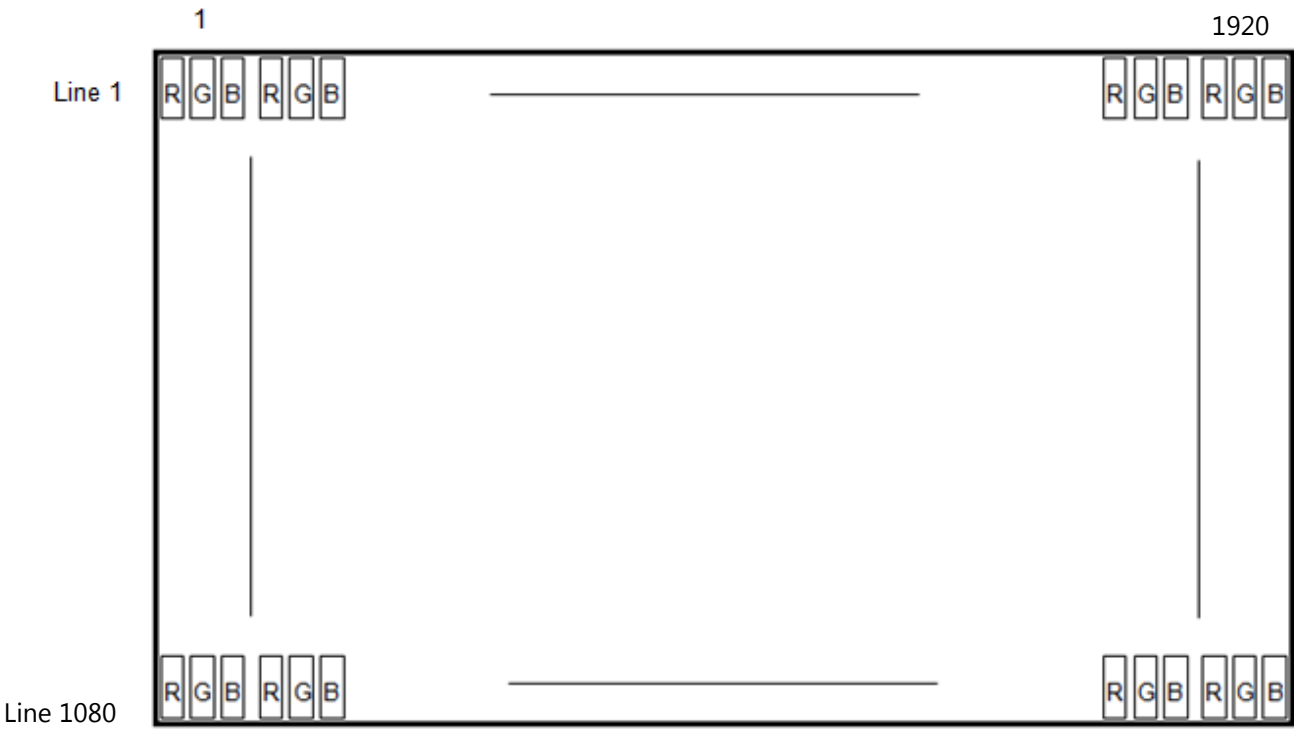
7. OUTLINE DIMENSION
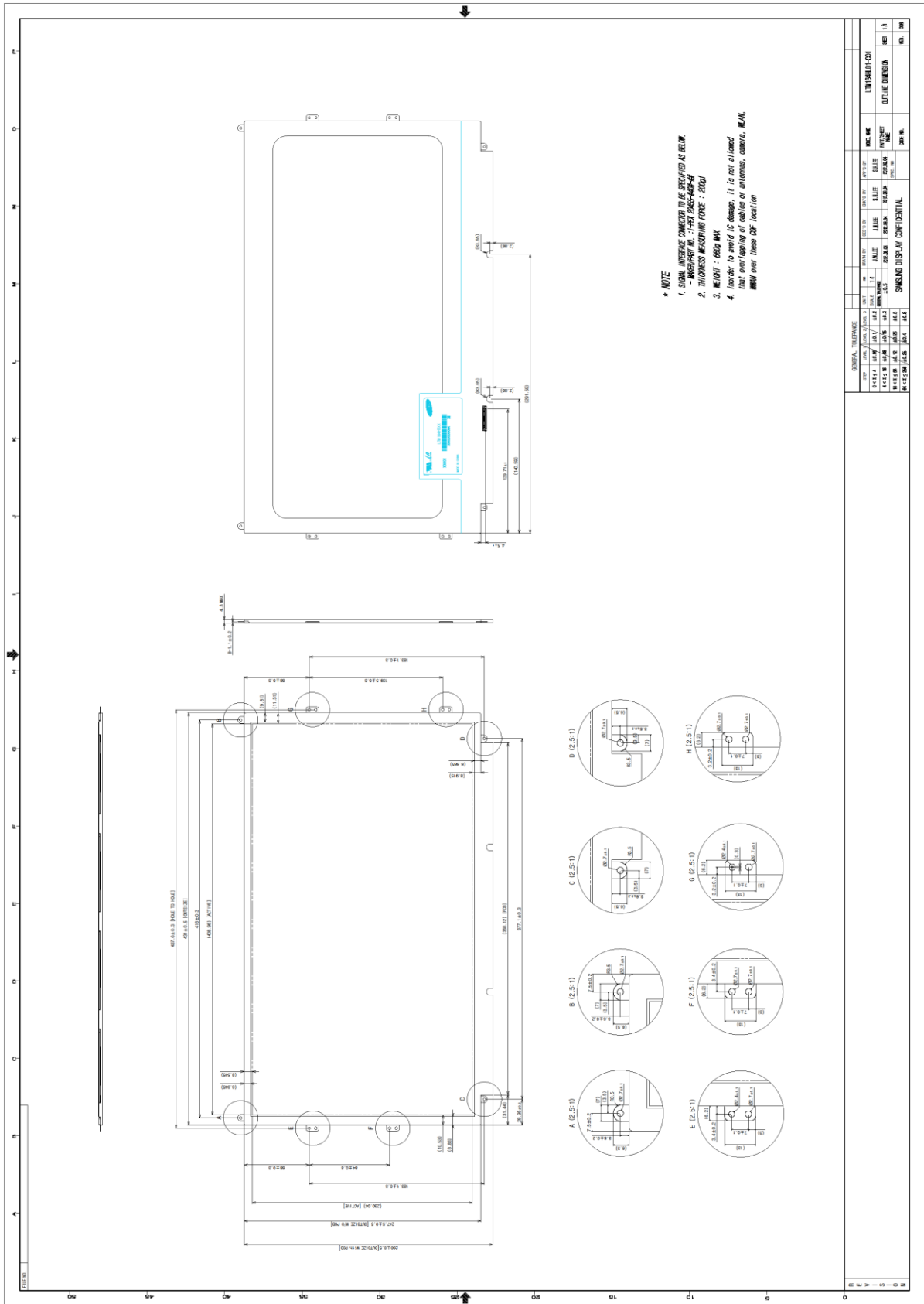
8. MARKING

A nameplate is affixed to the specified location on each product.

(1)Parts number   : LTM184HL01
(2)Revision code   : 3 letters
(3)Lot number   : X X X X XXX XX X   CXX

```
                                                Samsung Revision Code
                                                Panel number
                                                Cell ID
                                                Lot ID
                                                Month
                                                Year
                                                Product Code
```

9. GENERAL PRECAUTIONS

9.1 STORAGE

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

ITEM	Unit	Min.	Max.
Storage Temperature	(℃)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months		
Storage Condition	- The storage room should be equipped with a good ventilation facility, which has a temperature controlling system. - Products should be placed on the pallet, which is away from the wall not on the floor. - Prevent products from being exposed to the direct sunlight, moisture, and water; Be cautious not to pile the products up. - Avoid storing products in the environment, which other hazardous material is placed. - If products are delivered or kept in the storage facility more than 3 months, we recommend you to leave products under the condition including a 20℃ temperature and a humidity of 50% for 24 hours. - If you store semi-manufactured products for more than 3 months, bake the products under the condition including the 50℃ temp. and the 10% humidity for 24hrs after being used.		