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ELECTRONICS

Preliminary



TO :

DATE : Dec.5 , 2008.

SAMSUNG TFT-LCD

MODEL NO. : LTN101XT01

NOTE : Extension code [-001]

→ LTN101XT01

Surface type [**Anti-Glare**]

The information described in this SPEC is preliminary and can be changed without prior notice

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GENERAL DESCRIPTION

DESCRIPTION

LTN101XT01 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight unit. The resolution of a 10.1" contains 1024 x 576 pixels and can display up to 262,144 colors. 6 O'clock direction is the optimum viewing angle.

FEATURES

- High contrast ratio, high aperture structure
- 1024 x 576 pixels resolution (16:9)
- Color Gamut (Typical 45%)
- Low power consumption
- Fast Response Time
- White LED
- DE(Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- RoHS Compliance

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	222.72 (H) x 125.28(V) (10.1" diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1024 x 576	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2175 (H) x 0.2175 (V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 0, Hardness 3H		

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Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	234.5	235.0	235.5	mm	
	Vertical (V)	142.5	143.0	143.5	mm	
	Depth (D)	-	-	5.2	mm	(1)
Weight		-	-	190	g	

Note (1) Measurement condition of outline dimension

. Equipment : Vernier Calipers

. Push Force : 500g · f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

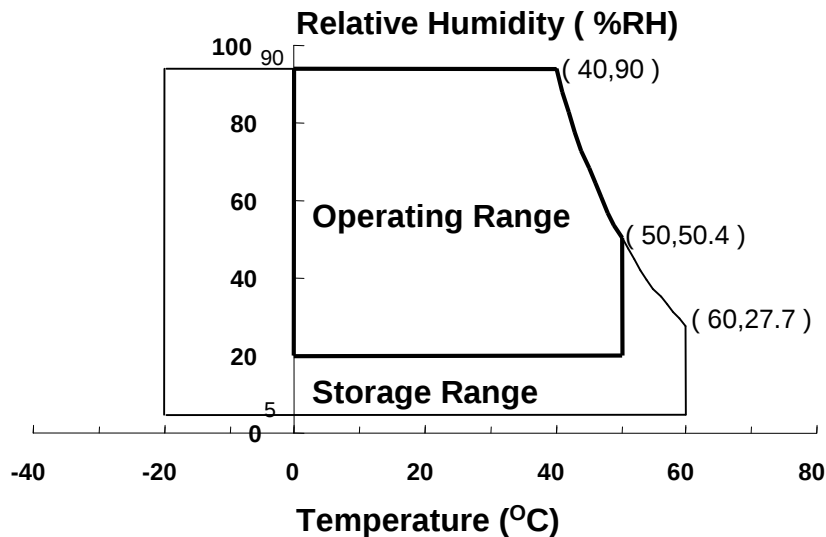
1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1),(5)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1),(5)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

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

95 % RH Max. ($40^{\circ}\text{C} \geq T_a$)

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



(2) 2ms, half sine wave, one time for $\pm X$, $\pm Y$, $\pm Z$.

(3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.

(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.

(5) If product is used for extended time excessively or exposed to high temperatures for extended time, there is a possibility of wide viewing angle film damage which could affect visual characteristics.

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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

 $V_{DD} = 3.3V$, $V_{SS} = GND = 0V$

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)
Logic Input Voltage	V_{IN}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)

Note (1) Within T_a ($25 \pm 2^\circ C$)

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2. OPTICAL CHARACTERISTICS

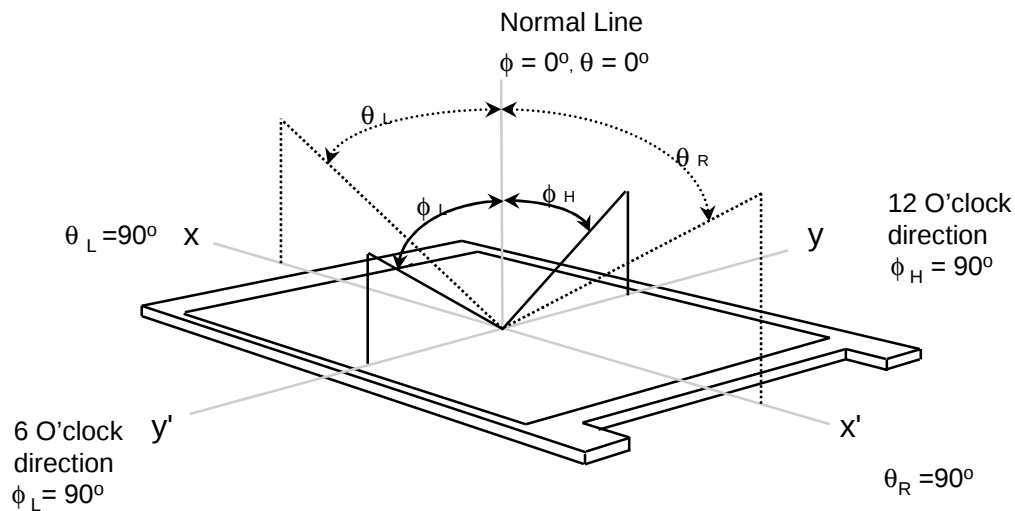
The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5).
Measuring equipment : TOPCON BM-5A and PR-650

* Ta = 25 ± 2 °C, VDD=3.3V, fv= 60Hz, fDCLK = (72.33)MHz, IL = 6.0 mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR	Normal Viewing Angle ϕ = 0 θ = 0	-	400	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T _{RT}		-	16	25	msec	(1), (3)
Average Luminance of White (5 Points)		Y _{L,AVE}		-	200	-	cd/m²	I _L =6.0mA (1), (4)
Color Chromaticity (CIE)	Red	R _X		(TBD)	(TBD)	(TBD)	-	(1), (5) PR-650
		R _Y		(TBD)	(TBD)	(TBD)		
	Green	G _X		(TBD)	(TBD)	(TBD)		
		G _Y		(TBD)	(TBD)	(TBD)		
	Blue	B _X		(TBD)	(TBD)	(TBD)		
		B _Y		(TBD)	(TBD)	(TBD)		
	White	W _X		0.283	0.313	0.343		
		W _Y	0.299	0.329	0.359			
Viewing Angle	Hor.	θ _L	CR ≥ 10	30		-	Degrees	(1), (5) BM-5A
		θ _H		30	-	-		
	Ver.	ϕ _H		20	-	-		
		ϕ _L		10	-	-		
13 Points White Variation		δ _L		-	1.4	1.6	-	(6)

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Note 1) Definition of Viewing Angle : Viewing angle range($10 \leq C/R$)

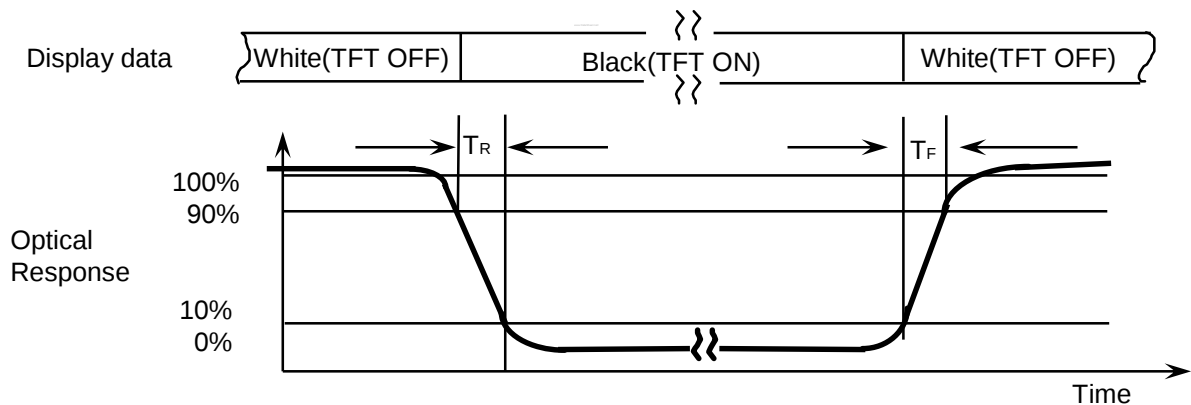


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax), gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

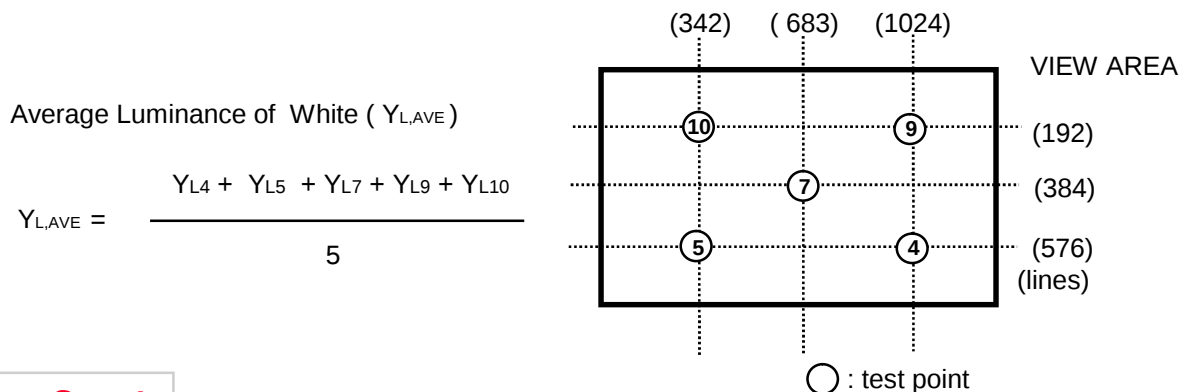
$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

Points : (4), (5), (7), (9), (10) at the figure of Note (6).

Note 3) Definition of Response time :

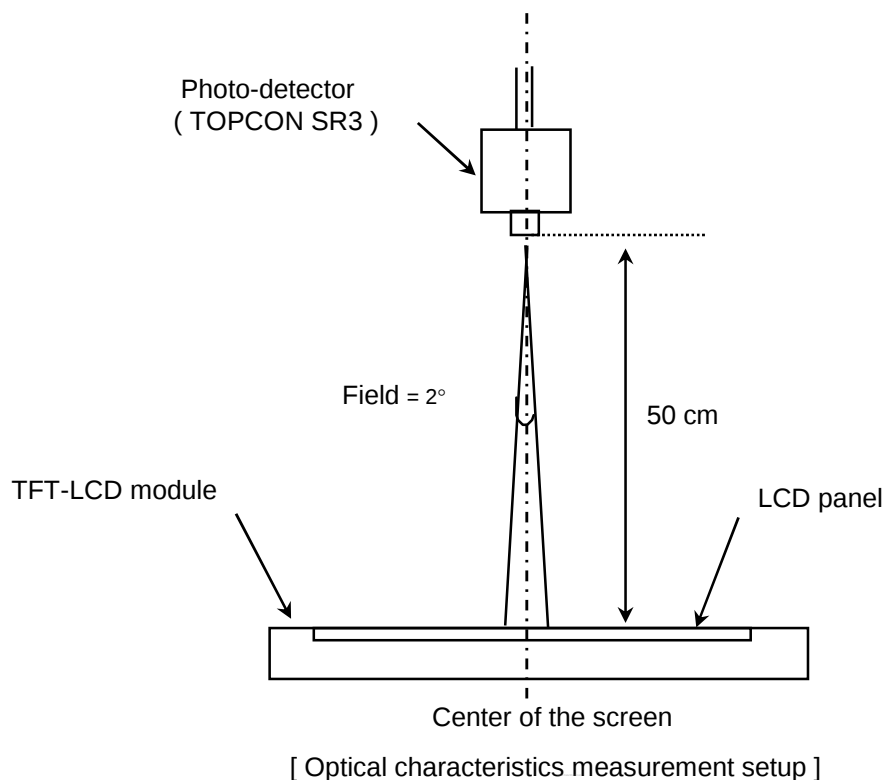


Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.



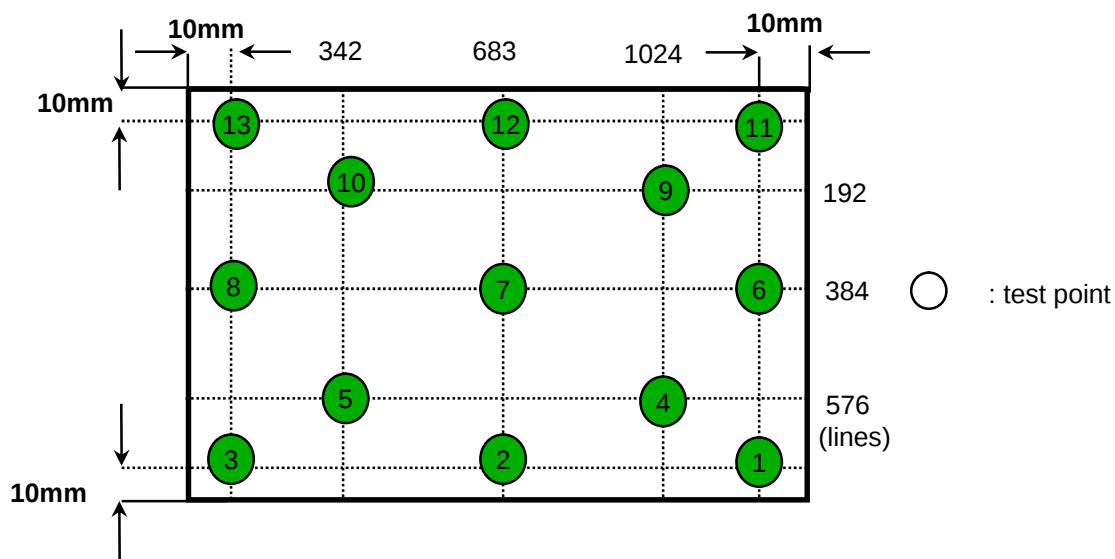
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Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
Lamp current : 6.0mA (Inverter : SIC-130T)
Environment condition : $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$



Note 6) Definition of 13 points white variation (δL), CR variation(C_{VER}) [① ~ ⑬]

$$\delta L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$



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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

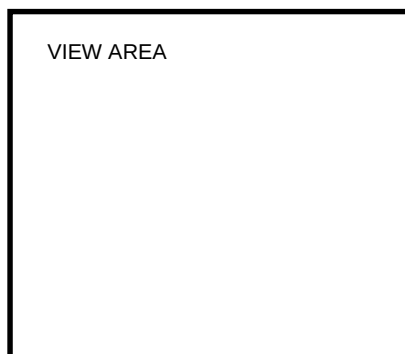
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V _{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V _{IH}	-	-	+100	mV	V _{CM} = +1.2V
	Low	V _{IL}	-100	-	-	mV	
Vsync Frequency		f _v	-	60	65	Hz	
Hsync Frequency		f _H	-	(TBD)	-	KHz	
Main Frequency		f _{DCLK}	-	(TBD)	-	MHz	
Rush Current		I _{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I _{DD}	-	(TBD)	-	mA	(2),(3)*a
	Mosaic		-	(TBD)	-	mA	(2),(3)*b
	V. stripe		-	(TBD)	(TBD)	mA	(2),(3)*c

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

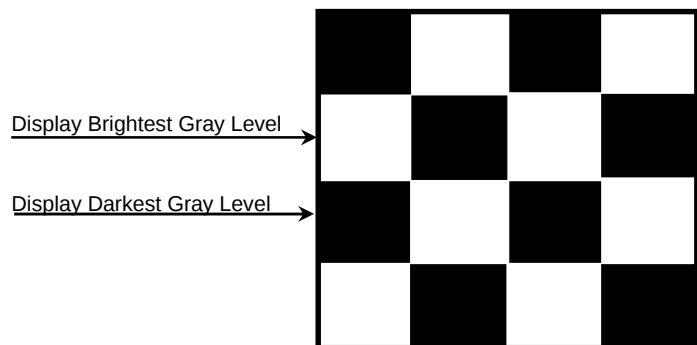
(2) f_v = 60Hz, f_{DCLK} = 72.33 MHz, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

*a) White Pattern

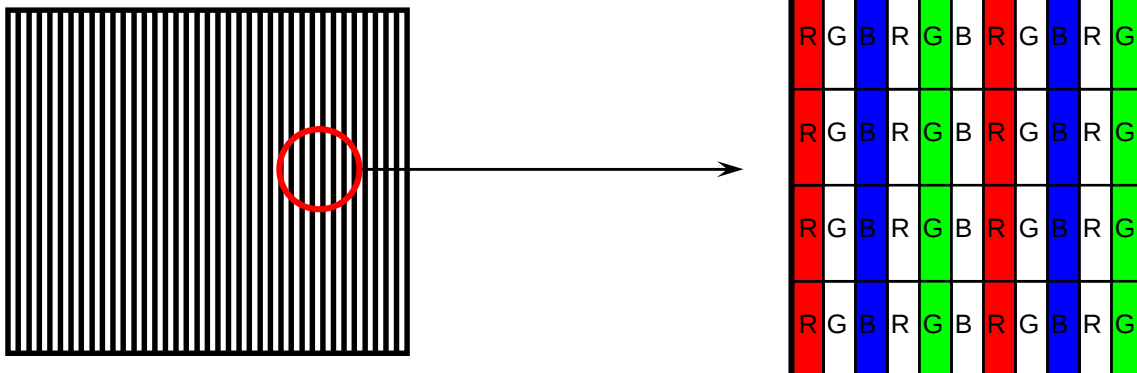


*b) Mosaic Pattern

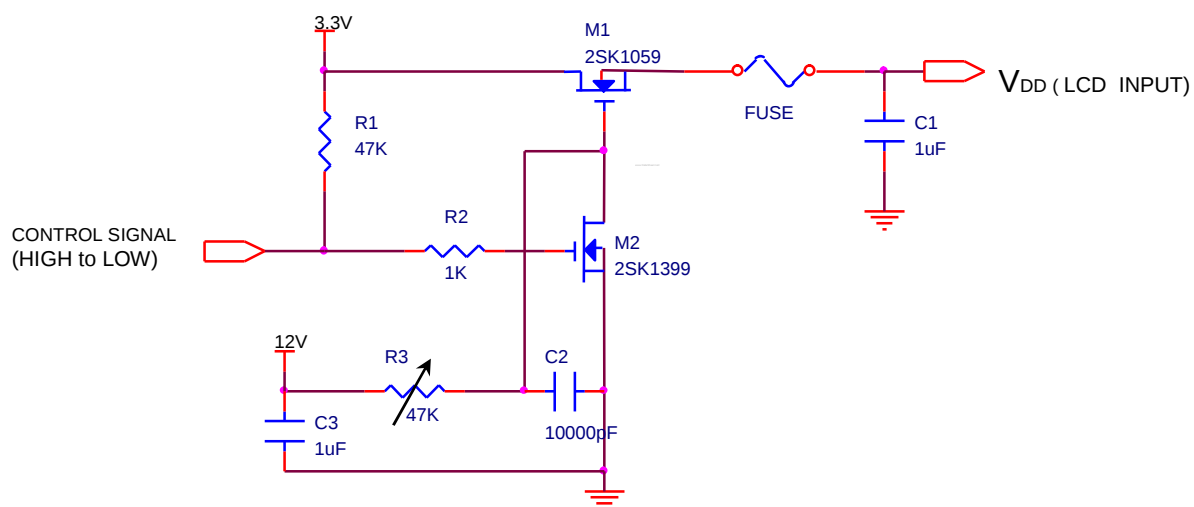


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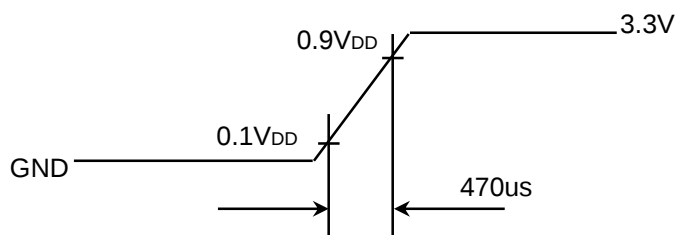
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



V_{DD} rising time is 470us



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3.2 BACK-LIGHT UNIT

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Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	TBD	-	mA	
LED Forward Voltage	VF	-	TBD	TBD	V	
LED Array Voltage	VP	-	TBD	TBD	V	
Power Consumption	P	-	TBD	TBD	W	

3.3 LED Driver

- LED Driver Manufacturer : Maxim

Ta= 25 ± 2 °C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V _{in}	6.0	TBD	20	V	
Input Current	I	-	-	-	mA	
Input Power	P _{in}	TBD	TBD	TBD	W	
Operating Frequency	F _o	TBD	TBD	TBD	MHz	600KHz Possible
Output PWM Frequency	F _{PWM}	TBD	TBD	TBD	kHz	
Burst Ratio	D	TBD	TBD	TBD	%	
External PWM Dimming Control Frequency (BLIM)	F _{BLIM}	TBD	TBD	TBD	kHz	Vin=6~20V, BLIM=PWM 0V~3.3V
Output Current (each LED string)	I _{out}	TBD	TBD	TBD	mA	Vin=6~20V, BLIM=100% ALC=0V
		TBD	TBD	TBD	mA	Vin=6~20V, BLIM=20% ALC=0V
		TBD	TBD	TBD	mA	Vin=6~20V, BLIM=20% ALC=5V, 0 Lux
Output Power	P _{out}	TBD	TBD	TBD	W	BLIM=100%
Efficiency	η	TBD	TBD	TBD	%	BLIM=100%

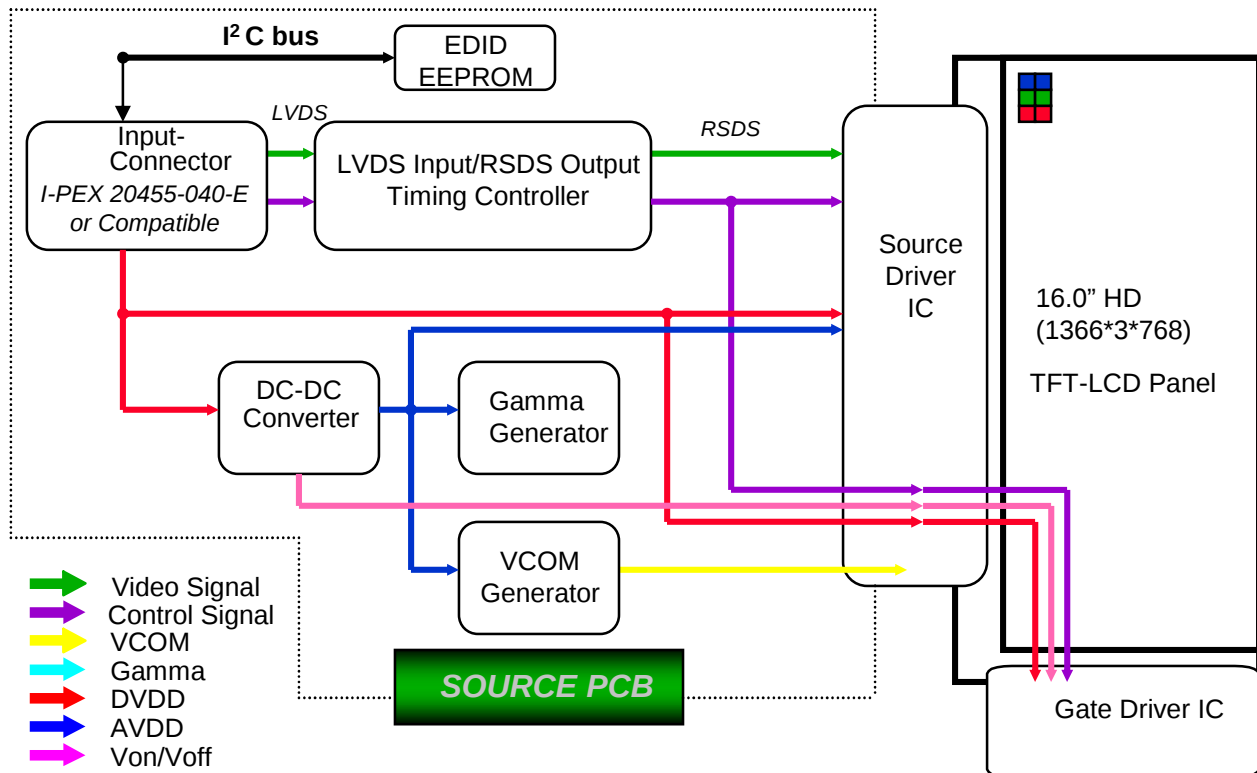
Note - Test Equipment : Fluke 45

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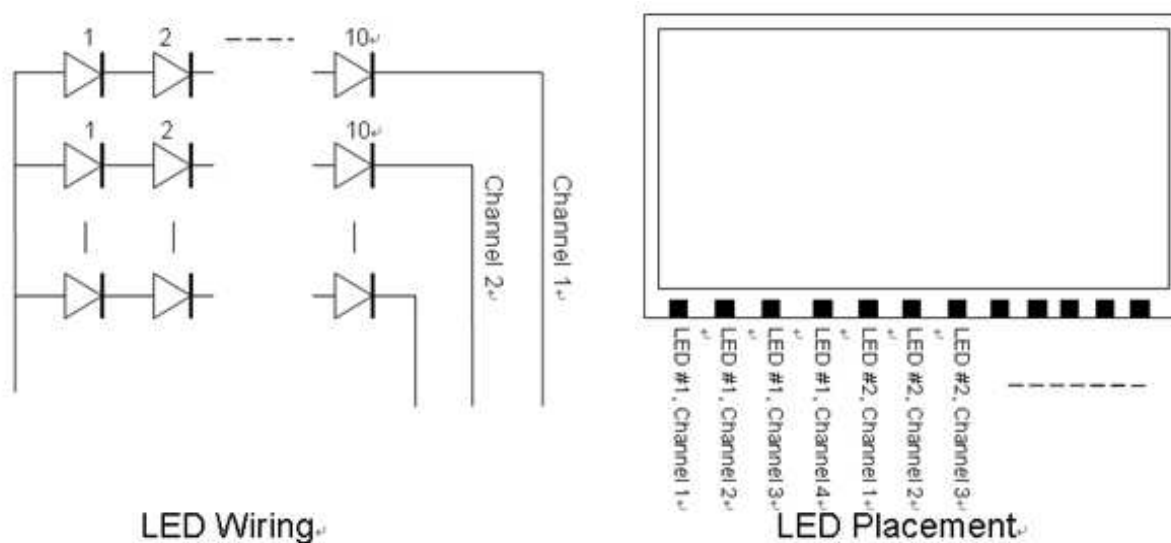
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4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED connection and placement



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : I-PEX 20455-040E-0)

PIN NO	SYMBOL	FUNCTION	POLARITY	REMARK
1	NC	No Connection		
2	AVDD	POWER SUPPLY +3.3V		
3	AVDD	POWER SUPPLY +3.3V		
4	DVDD	DDC 3.3V Power		
5	NC	No Connection		
6	SCL	DDC Clock		
7	SDA	DDC data		
8	RxIN0-	LVDS Differential Data INPUT (R0-R5,G0)	Negative	
9	RxIN0+	LVDS Differential Data INPUT (R0-R5,G0)	Positive	
10	VSS	Ground		
11	RxIN1-	LVDS Differential Data INPUT (G1-G5,B0-B1)	Negative	
12	RxIN1+	LVDS Differential Data INPUT (G1-G5,B0-B1)	Positive	
13	VSS	Ground		
14	RxIN2-	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Negative	
15	RxIN2+	LVDS Differential Data INPUT (B2-B5,Sync,DE)	Positive	
16	VSS	Ground		
17	RxCLK-	LVDS Differential Data INPUT (Clock)	Negative	
18	RxCLK+	LVDS Differential Data INPUT (Clock)	Positive	
19	VSS	Ground		
20	NC	No Connection		
21	NC	No Connection		
22	VSS	GND		
23	NC	No Connection		
24	NC	No Connection		
25	VSS	GND		
26	NC	No Connection		
27	NC	No Connection		
28	VSS	GND		
29	NC	No Connection		
30	NC	No Connection		

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5. INPUT TERMINAL PIN ASSIGNMENT

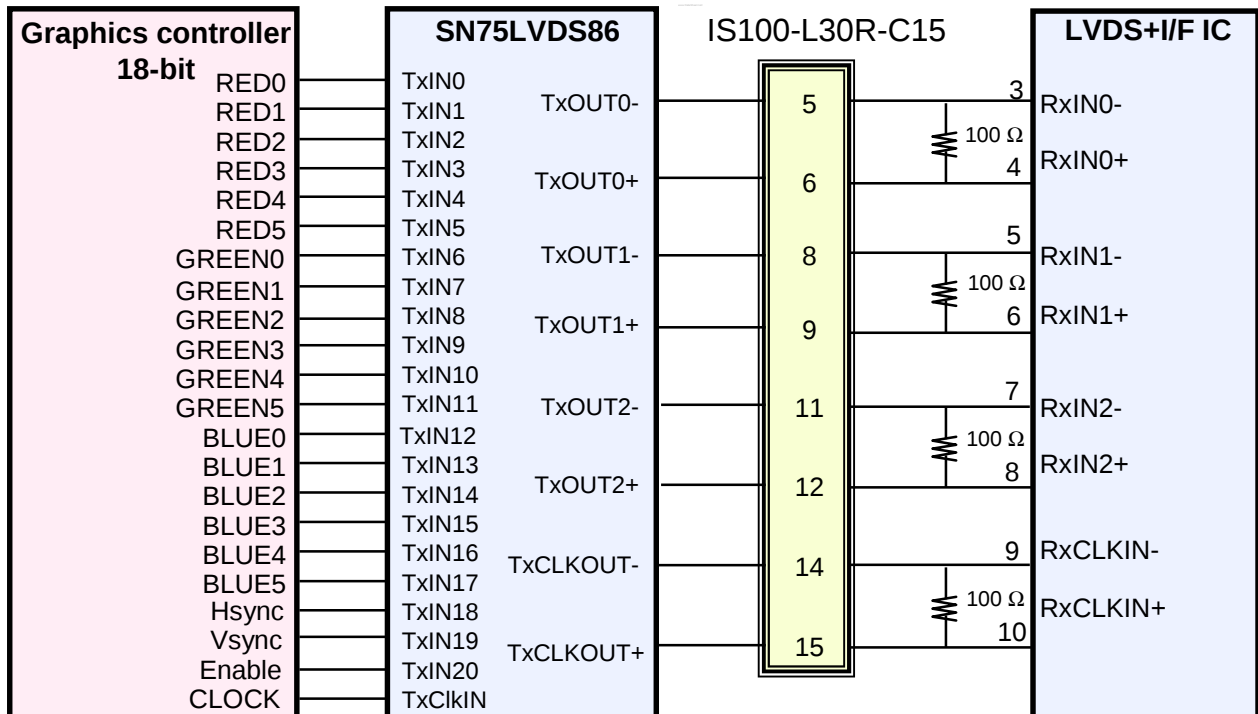
5.1. Input Signal & Power (LVDS, Connector : I-PEX 20455-040E-0)

PIN NO	SYMBOL	FUNCTION	POLARITY	REMARK
31	VBL-	LED Ground		
32	VBL-	LED Ground		
33	VBL-	LED Ground		
34	NC	No Connection		
35	BLIM	PWM for luminance control (200~1KHz, 3.3V)		
36	BL_Enable	BL On/Off (On:2.0~3.3V, Off:0~0.5V)		
37	NC	No Connection		
38	VBL+	LED Power Supply 6V~20V		
39	VBL+	LED Power Supply 6V~20V	Positive	
40	VBL+	LED Power Supply 6V~20V		

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5.2 LVDS Interface : Transmitter SN75LVDS86 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
44	TxIN0	R0	12	TxIN11	G5
45	TxIN1	R1	13	TxIN12	B0
47	TxIN2	R2	15	TxIN13	B1
48	TxIN3	R3	16	TxIN14	B2
1	TxIN4	R4	18	TxIN15	B3
3	TxIN5	R5	19	TxIN16	B4
4	TxIN6	G0	20	TxIN17	B5
6	TxIN7	G1	22	TxIN18	Hsync
7	TxIN8	G2	23	TxIN19	Vsync
9	TxIN9	G3	25	TxIN20	DE
10	TxIN10	G4	26	TxCLKIN	Clock

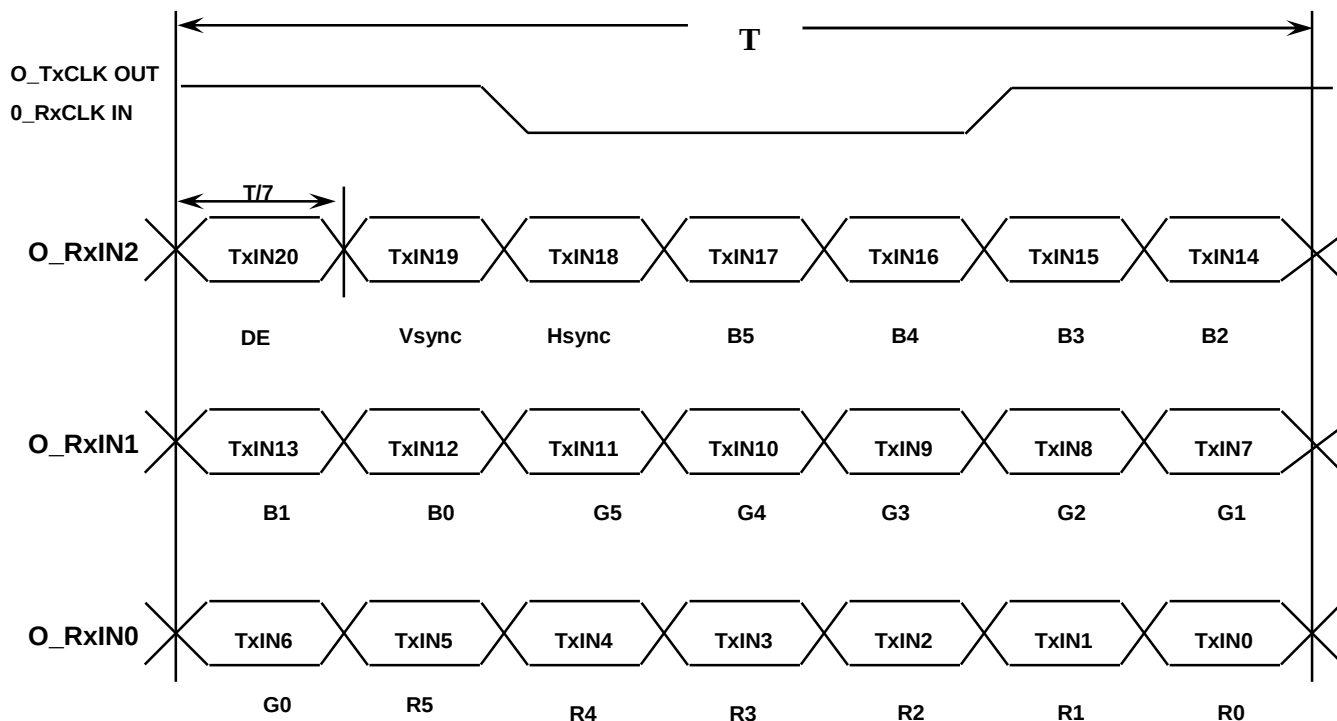
LVDS INTERFACE

Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



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5.4 Input Signals, 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	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

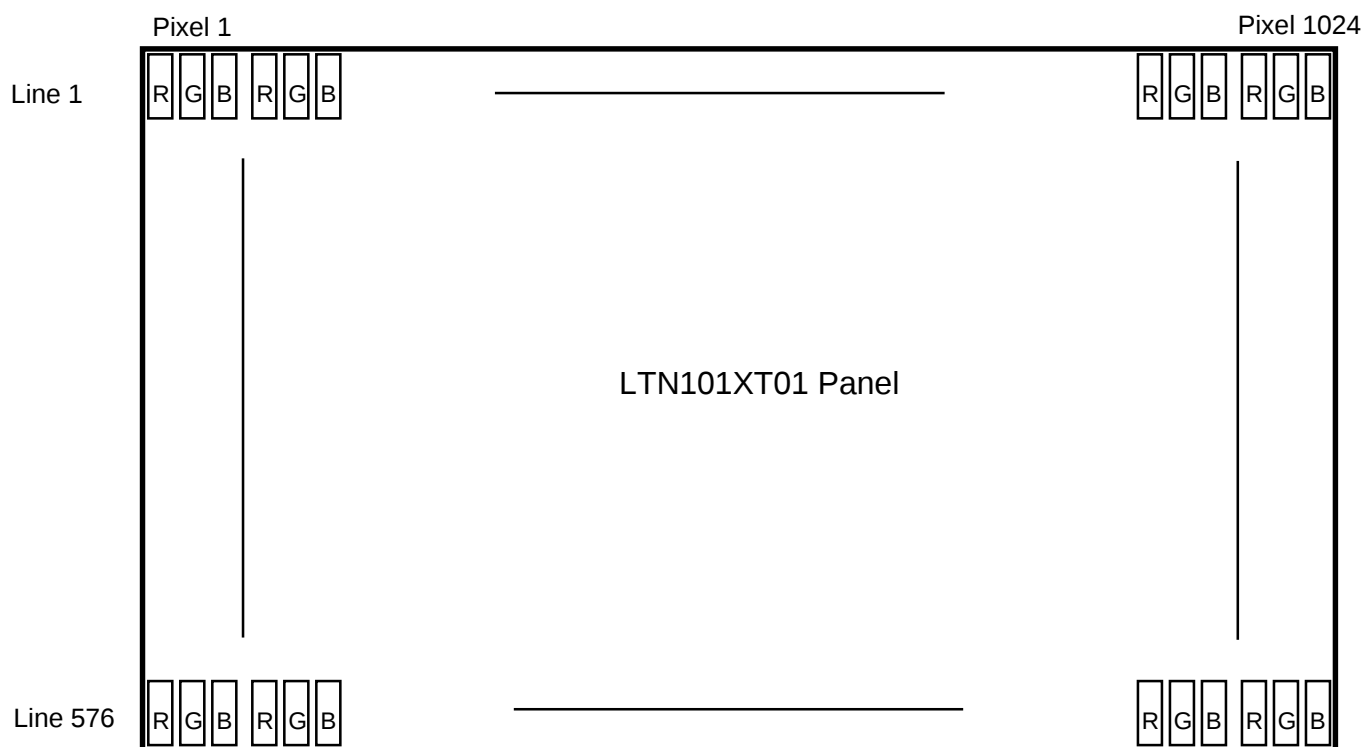
Note 1) Definition of gray :

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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5.6 Pixel Format in the display



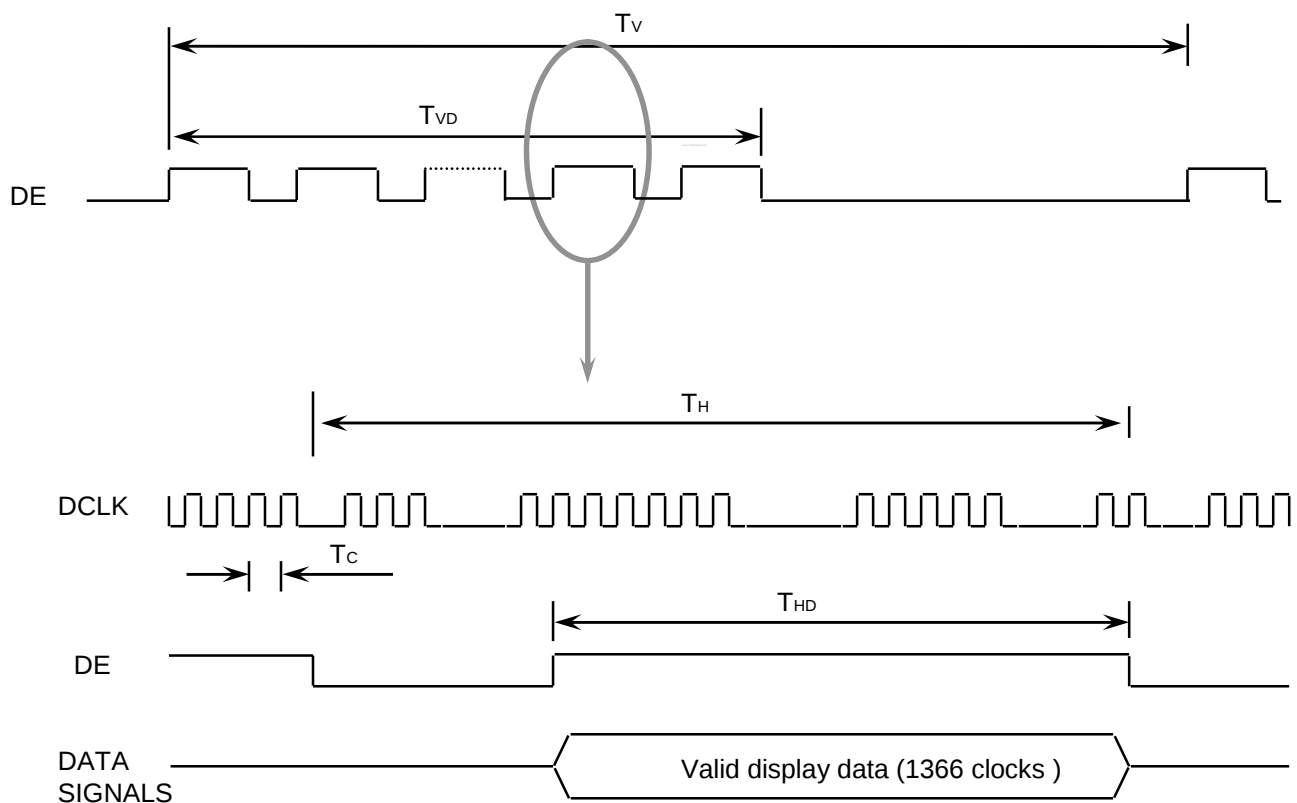
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6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	(TBD)	(TBD)	(TBD)	Lines	
Vertical Active Display Term	Display Period	TVD	-	576	-	Lines	
One Line Scanning Time	Cycle	TH	(TBD)	(TBD)	(TBD)	Clocks	
Horizontal Active Display Term	Display Period	THD	-	1024	-	Clocks	

6.2 Timing diagrams of interface signal

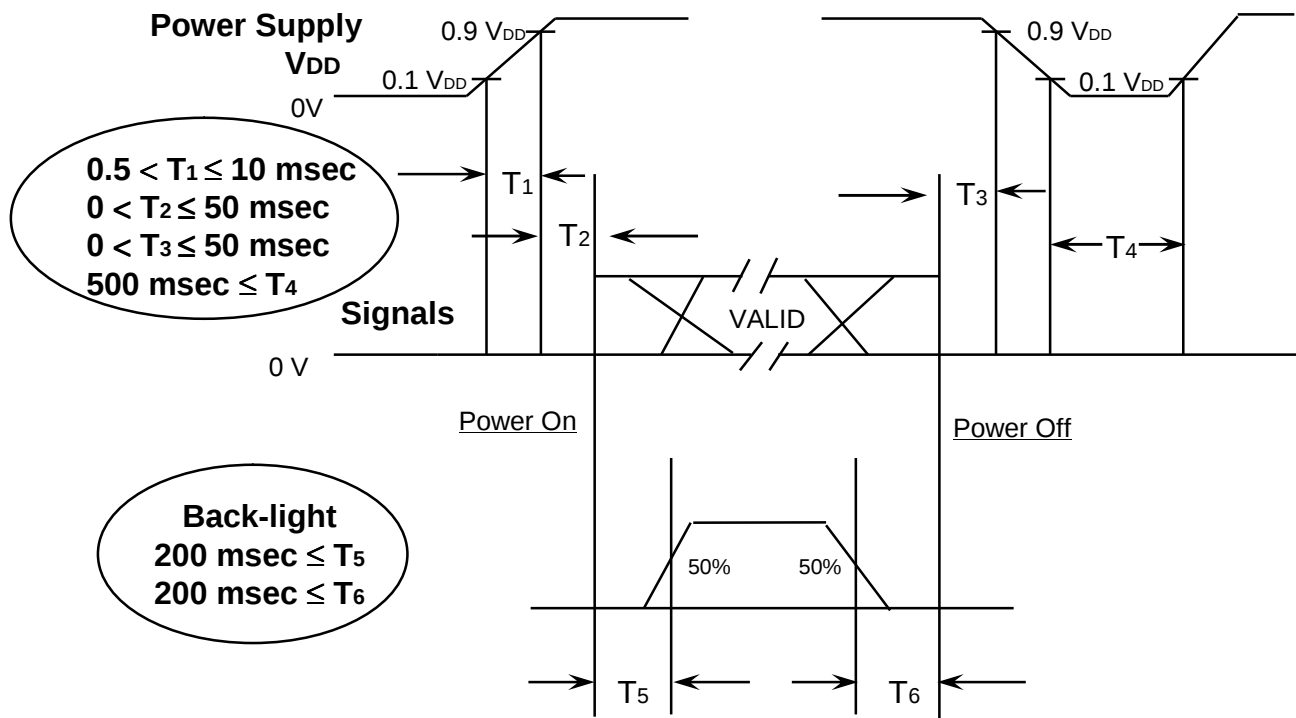


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6.3 Power ON/OFF Sequence

Preliminary

: 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

- T1 : Vdd rising time from 10% to 90%
- T2 : The time from Vdd to valid data at power ON.
- T3 : The time from valid data off to Vdd off at power Off.
- T4 : Vdd 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.

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 white.
- (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. Mechanical Outline Dimension

Preliminary

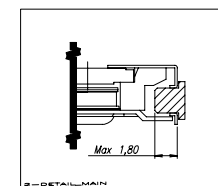
[Refer to the next page]

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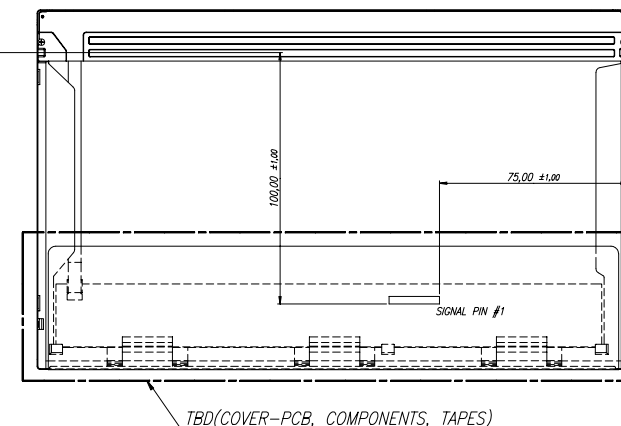
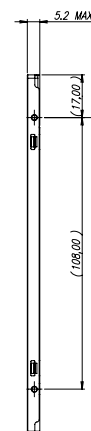
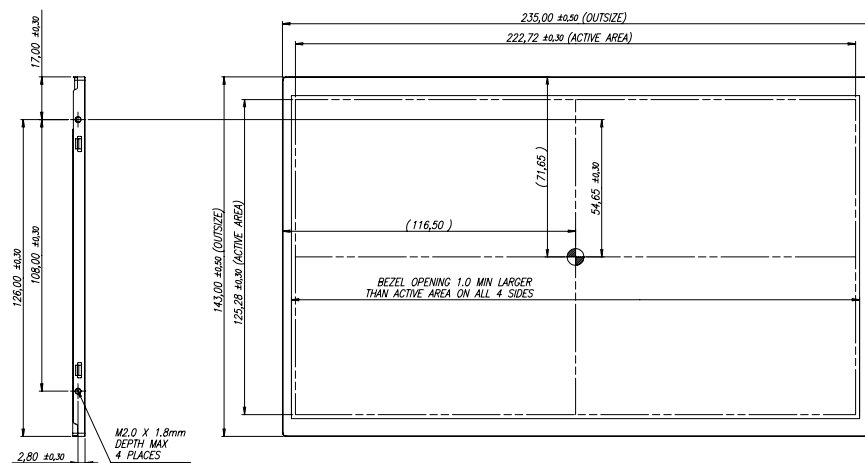
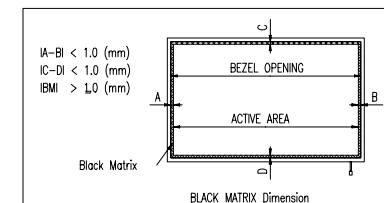
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PRELIMINARY

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO.	REMARK
1	OUTLINE	LTN101NT01				



SCREW PENETRATION DEPTH



* NOTE

1. INTERFACE CONNECTOR TYPE : I-PEX 20455-040E-0(I-PEX) or EQUIVALENT(LOCK TYPE)
2. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 1.8mm MAX.
3. CALIFERS MEASURING FORCE : 750±150 gf
4. USER HOLE TORQUE SPEC : 2.5 kgfcm Max(5TIMES)
5. WEIGHT SPEC : 190g Max
6. IN ORDER TO AVOID IC DAMAGE, IT IS NOT ALLOW THAT OVERLAPPING OF CABLES OR ANTENNAS, CAMERA, WLAN, WWAN OVER THESE COF LOCATIONS

REV	DATE	DESCRIPTION OF REVISION	REASON	CHK'D BY
UNIT	mm	DRAWN BY	DES'D BY	CHK'D BY
SCALE	1/1	JJ.LEE	D.S.SHN	
DRAWN TO SCALE	±0.5	2008.09.11	2008.09.11	
SAMSUNG ELECTRONICS		SPEC. NO.	PART/SHEET NAME	MODEL NAME
			OUTLINE DIMENSION	LTN101NT01
			SHEET	1/1
			VER.	000

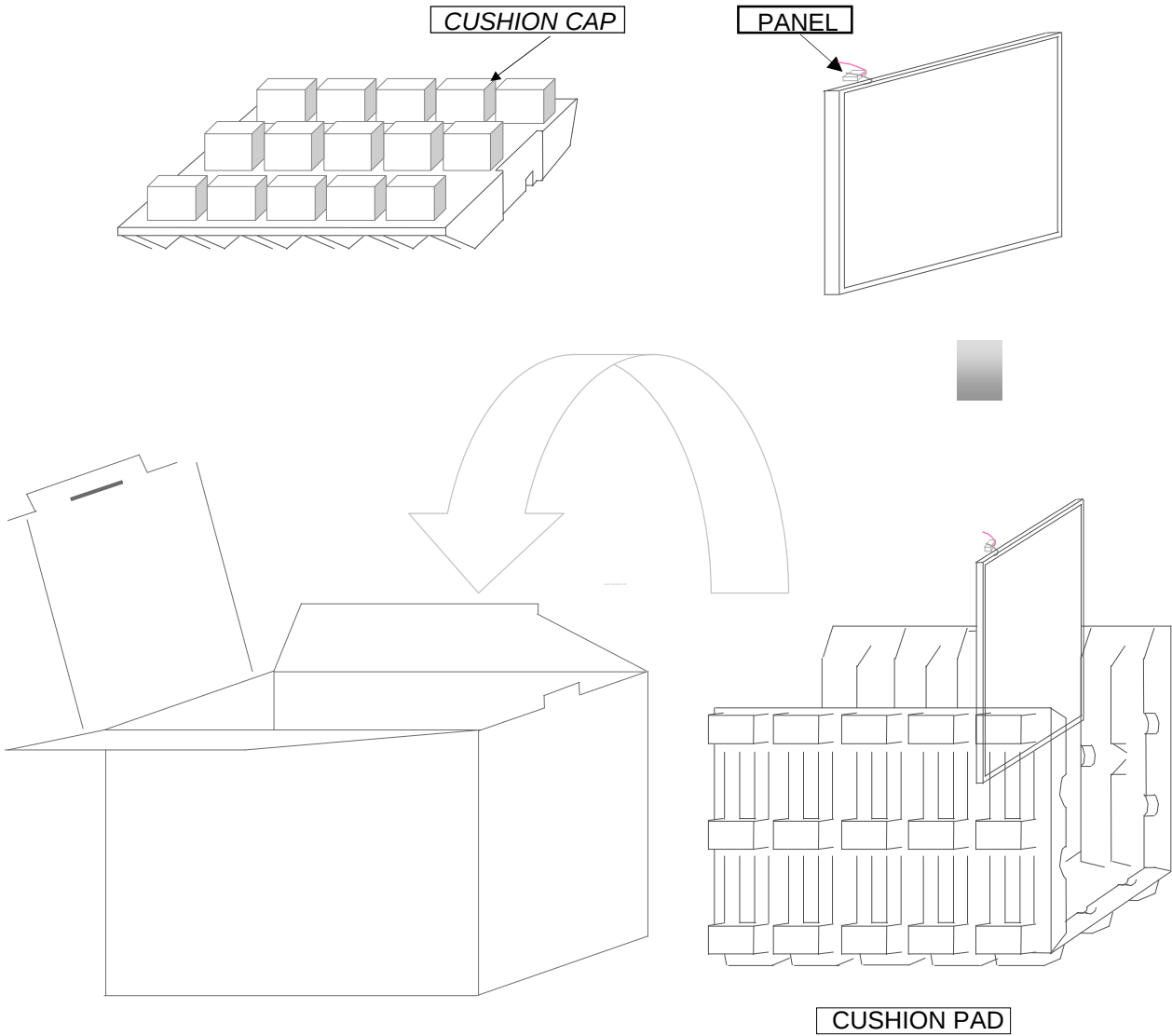
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8. PACKING

1. CARTON(Internal Package)

- (1) Packing Form
- Corrugated Cardboard box and Corrupad form as shock absorber

(2) Packing Method



Note 1)Total Weight : Approximately (TBD) kg

2) Acceptance number of piling : (TBD) sets

3) Carton size : TBD

PACKING CASE

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(3)Packing Material

No	Part name	Quantity
1	Static electric protective sack	(TBD) pcs
2	Packing case (Inner box) included shock absorber	(TBD) set
3	Pictorial marking	(TBD) pcs
4	Carton	(TBD) set

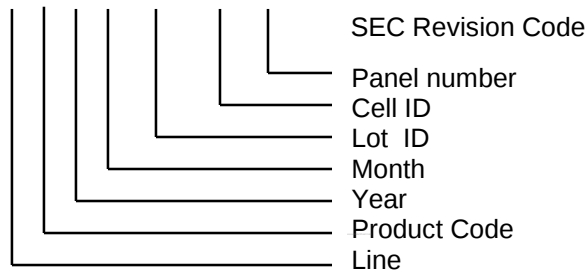
9. MARKINGS & OTHERS

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

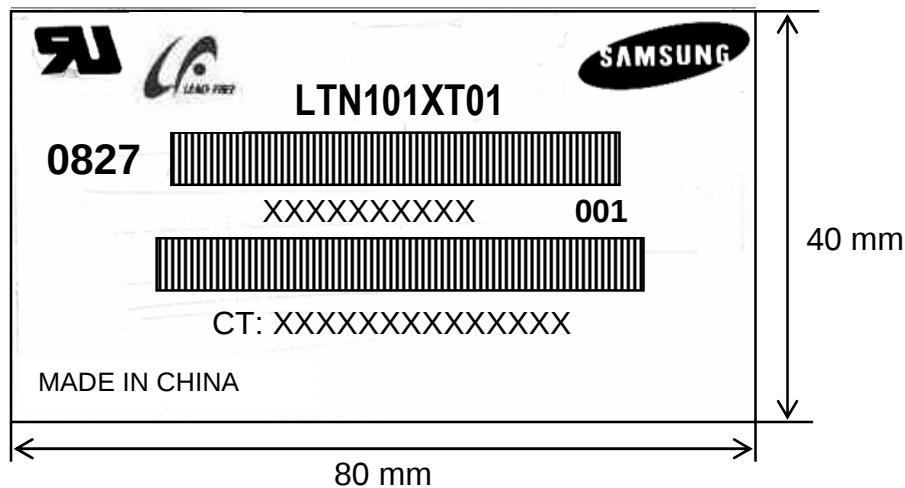
(1)Parts number : LTN101XT01

(2)Revision code : 3 letters

(3)Lot number : X X X X XX XX XX H01



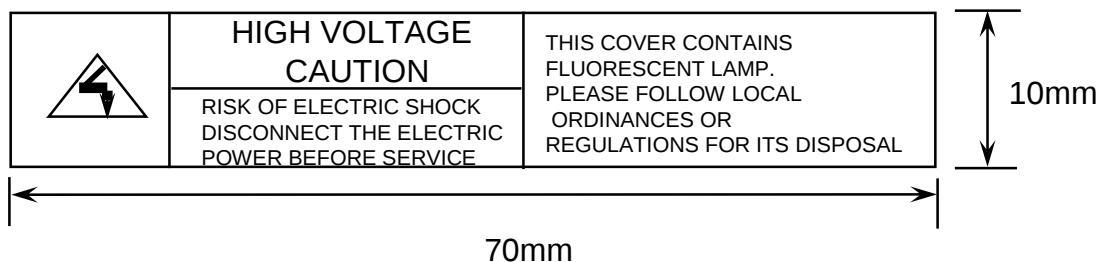
(4) Nameplate Indication



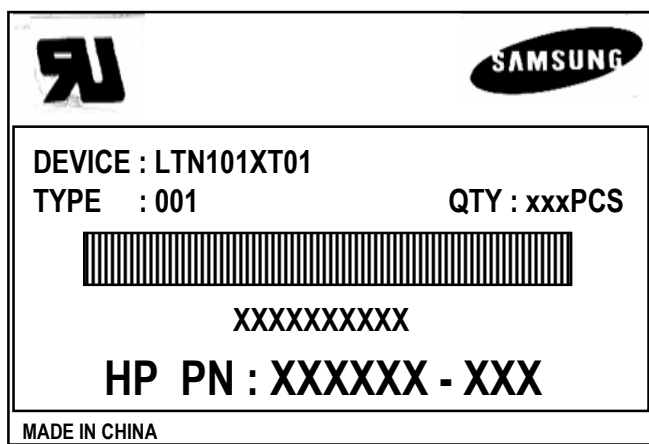
Parts name : LTN101XT01
 Lot number : XXXXXXXXXX
 Inspected work week : 0827 (2008 year 27th week)
 Product Revision Code : 001
 CT code : XXXXXXXXXXXXXXXX (Released after HP's approval)

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(5) High voltage caution notice



(6) Packing small box attach



(7) Packing box Marking : Samsung TFT-LCD Brand Name



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