SAMSUNG ELECTRONICS

Approval

LEAD-FREE

TO

DATE :

SAMSUNG TFT-LCD

MODEL NO. : LTN156KT02-C01

NOTE : Extension code [- C01]
→ LTN156KT02-C01
Surface type [**A/Glare**]

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

wise view™

Approval

CONTENTS

REVISION HISTORY

Approval

Date	Revision No.	Page	Summary
Sep.14	A00	All	The approval specification of LTN156KT02-C01 was issued first.

GENERAL DESCRIPTION

DESCRIPTION

LTN156KT02 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 15.6” contains 1600 x 900 pixels and can display up to 262,144 colors.
6 O'clock direction is the optimum viewing angle.

FEATURES

- High contrast ratio
- HD+(1600 x 900 pixels) resolution
- Fast Response
- LED Back Light with embedded LED Driver
- DE (Data enable) only mode
- 3.3V LVDS Interface
- Onboard EDID chip

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	344.232 (H) x 193.536 (V) (15.6”diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1600 * 900	pixel	16:9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.216(H) x 0.216 (V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25%, Hardness 3H		A/G

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	358.8	359.3	359.8	mm	
	Vertical (V)	209	209.5	210	mm	
	Depth (D)	-	-	5.8	mm	(1)
Weight		-	-	475	g	

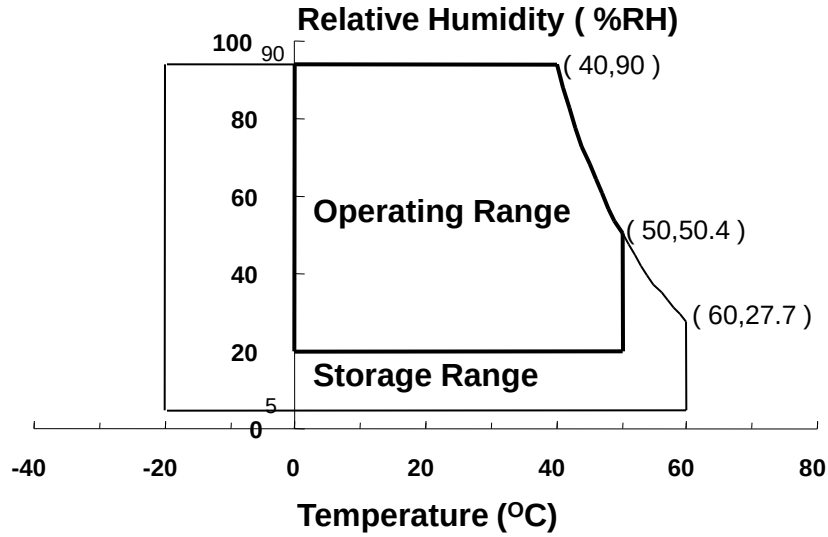
Note (1) Measurement condition of outline dimension
. Equipment : Bernier Calipers
. Push Force : 500g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperate (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) Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 °C ≥ Ta)
Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation



(2) 2ms, half sine wave, one time for ±X, ±Y, ± 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.

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 Ta (25 ± 2 °C)

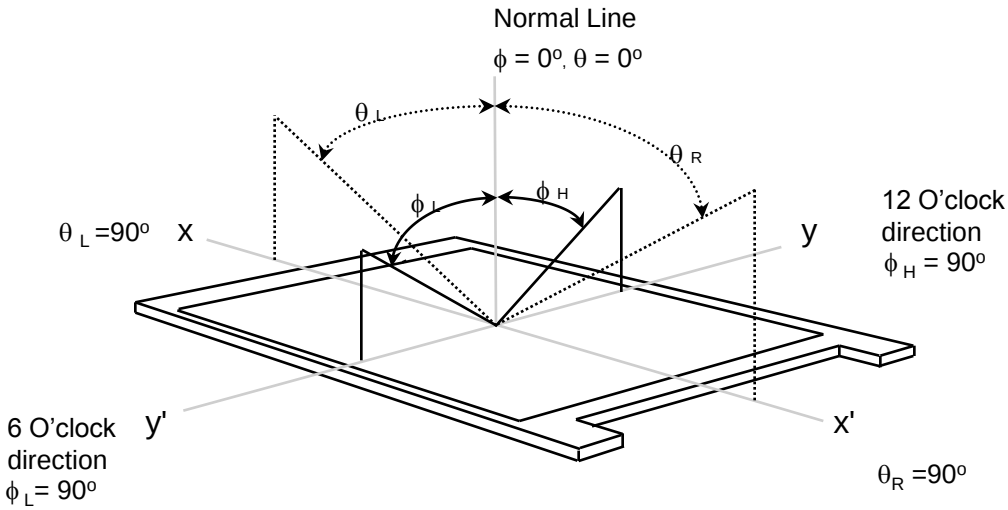
2. OPTICAL CHARACTERISTICS

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 SR-3

* Ta = 25 ± 2 °C, V_{DD}=3.3V, fv= 60Hz, f_{DCLK} = 107.8MHz, IF = 100% duty

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR	Normal Viewing Angle $\phi = 0$ $\theta = 0$	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	220	-	cd/m^2	IF=100% duty (1), (4)
Color Chromaticity (CIE)	Red	R_X		Typ-0.03	0.624	Typ +0.03	-	(1), (5) PR-650
		R_Y			0.340			
	Green	G_X			0.327			
		G_Y			0.578			
	Blue	B_X			0.154			
		B_Y			0.060			
	White	W_X			0.313			
		W_Y			0.329			
Viewing Angle	Hor.	θ_L	CR ≥ 10 At center	55	-	-	Degrees	
		θ_H		55	-	-		
	Ver.	ϕ_H		45	-	-		
		ϕ_L		45	-	-		
Color Gamut		CG		-	60	-	%	
13 Points White Variation		δ_L		-	-	1.7	-	(6)

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

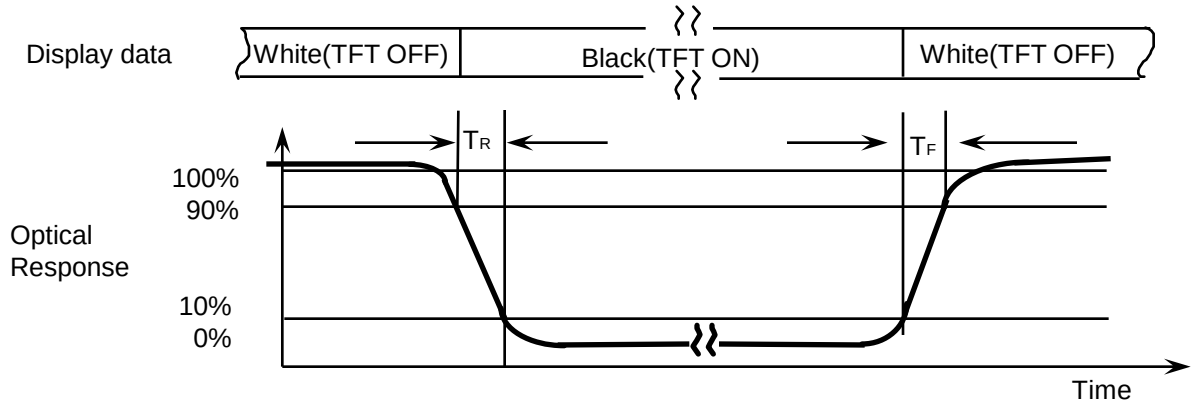


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

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

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

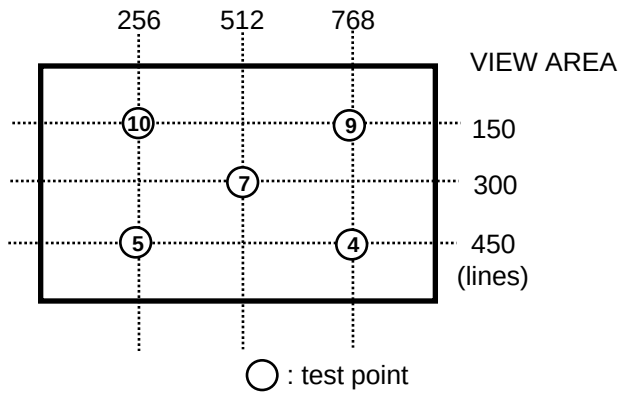
Note 3) Definition of Response time :



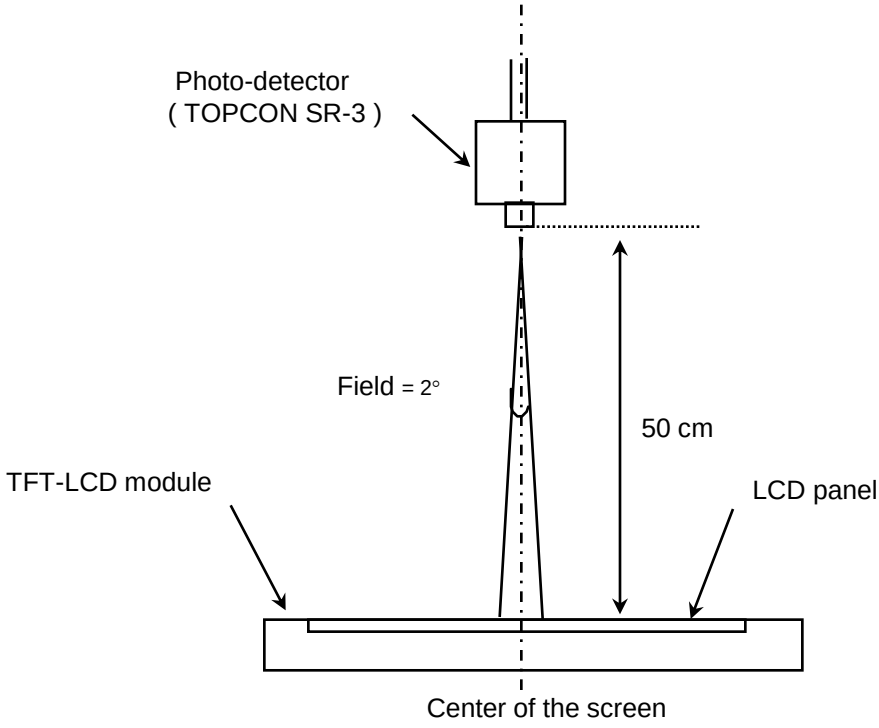
Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

Average Luminance of White ($Y_{L,AVE}$)

$$Y_{L,AVE} = \frac{Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}}{5}$$



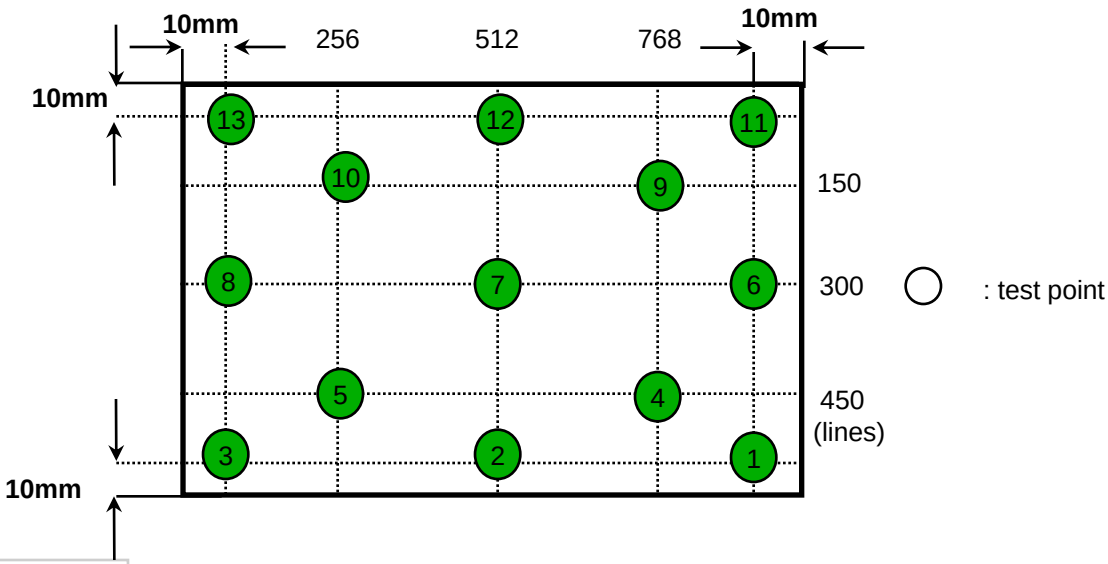
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
IF current : 19mA
Environment condition : Ta = 25 ± 2 °C



[Optical characteristics measurement setup]

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

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



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

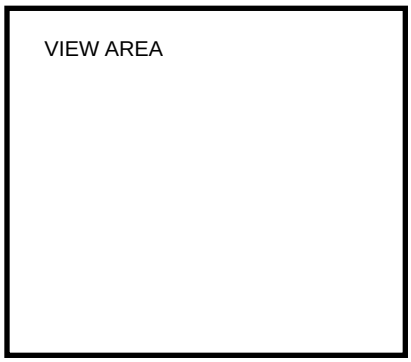
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Main Frequency		f_{DCLK}	-	107.8	-	MHz	-
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	IDD	-	550	-	mA	*a),b),c)
	Mosaic		-	600	-	mA	
	V.stripe		-	650	700	mA	

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

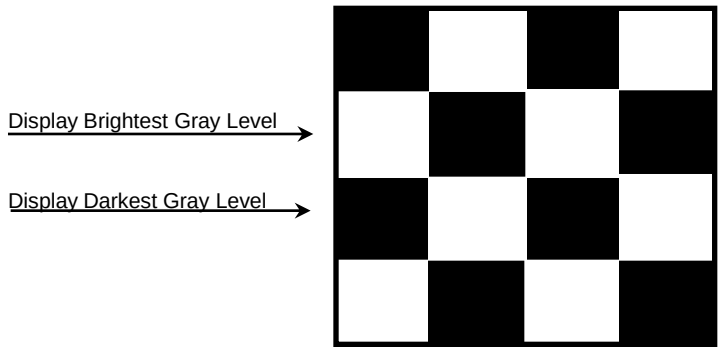
(2) f_V = 60Hz, f_{DCLK} = 107.8MHZ, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

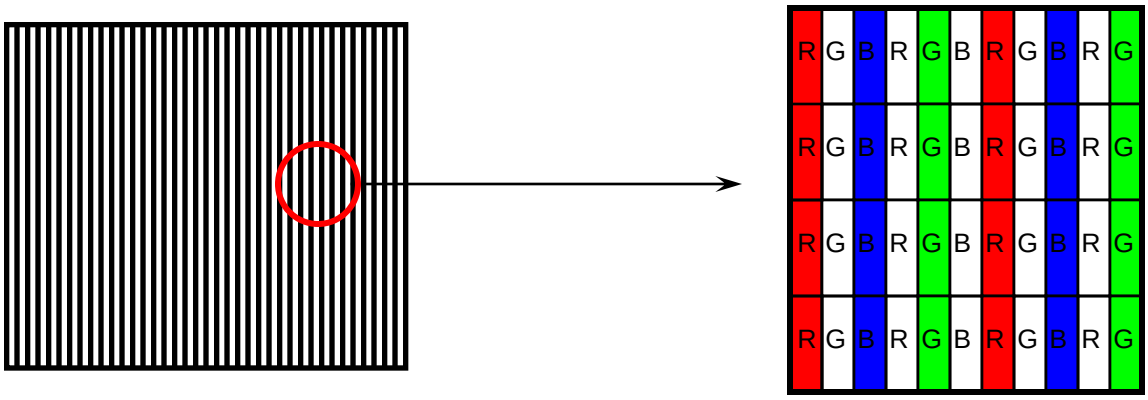
*a) White Pattern



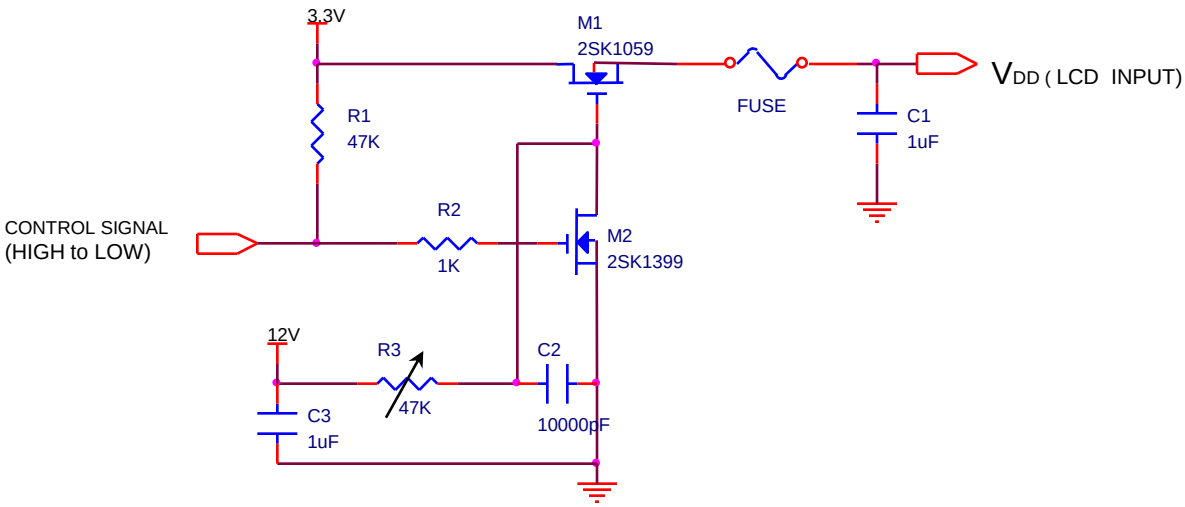
*b) Mosaic Pattern



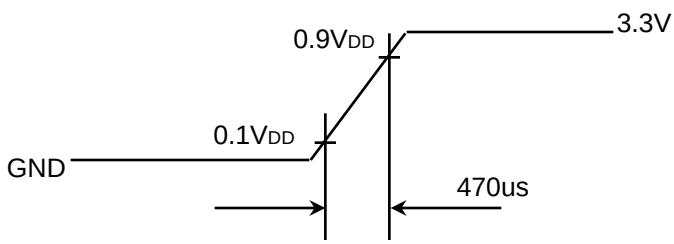
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



VDD rising time is 470us



3.2 LED Driver

- On board LED Driver

Ta= 25 ± 2 °C

Item-	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	5	12	26	V	-
Input Current	I	-	443	-	mA	-
EN control level	ON	1.5	3.3	5.0	V	
	OFF	0	0	0.5	V	
PWM control level	ON	1.5	3.3	5.0	V	
	OFF	0	0	0.1	V	
PWM Control Duty Ratio	D	10	-	100	%	-
External PWM Dimming Control Frequency (BLIM)	F_{BLIM}		1	10	kHz	
Operating Life Time	Hr	10,000	-	-	Hour	

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the condition Ta= 25 ± 2 °C and IF = 19 mArms until one of the following event occurs.
When the brightness becomes 50% or lower than the original.

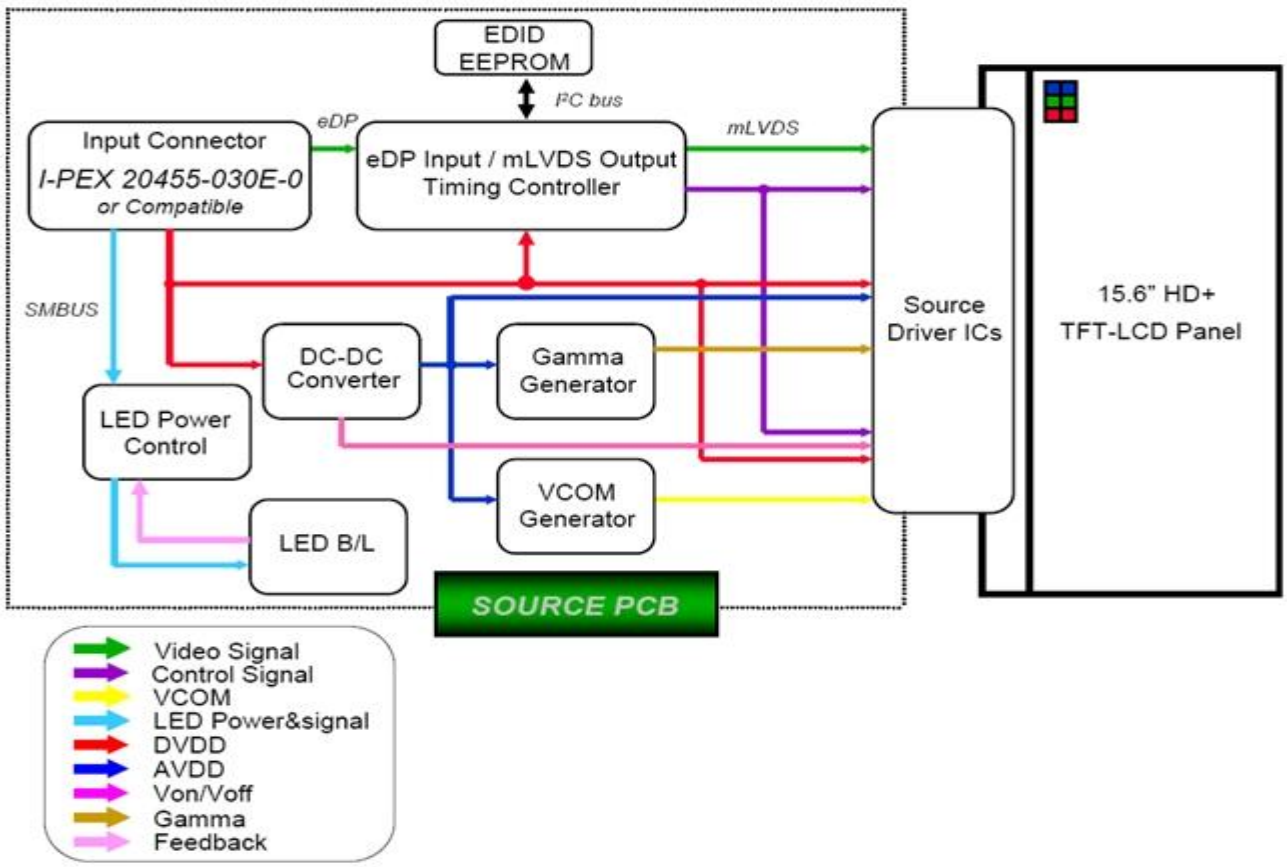
3.3 BACK-LIGHT UNIT

Ta= 25 ± 2 °C

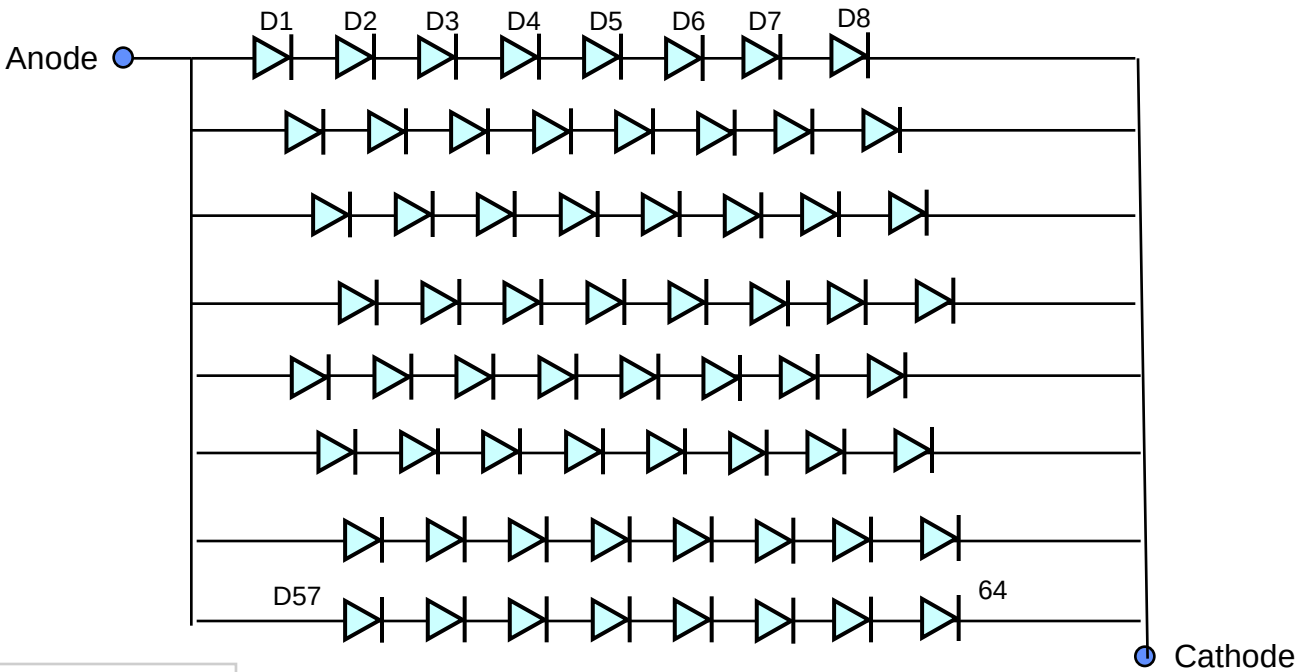
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	19	-	mA	
LED Forward Voltage	VF	3.0	3.2	3.4	V	
LED Array Voltage	VP	-	25.6	-	V	VF X 8 LEDs
Power Consumption	P	4.5	4.7	5.0	W	IFXVFX64LED (W/O)

4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED placement structure



5. INPUT TERMINAL PIN ASSIGNMENT

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

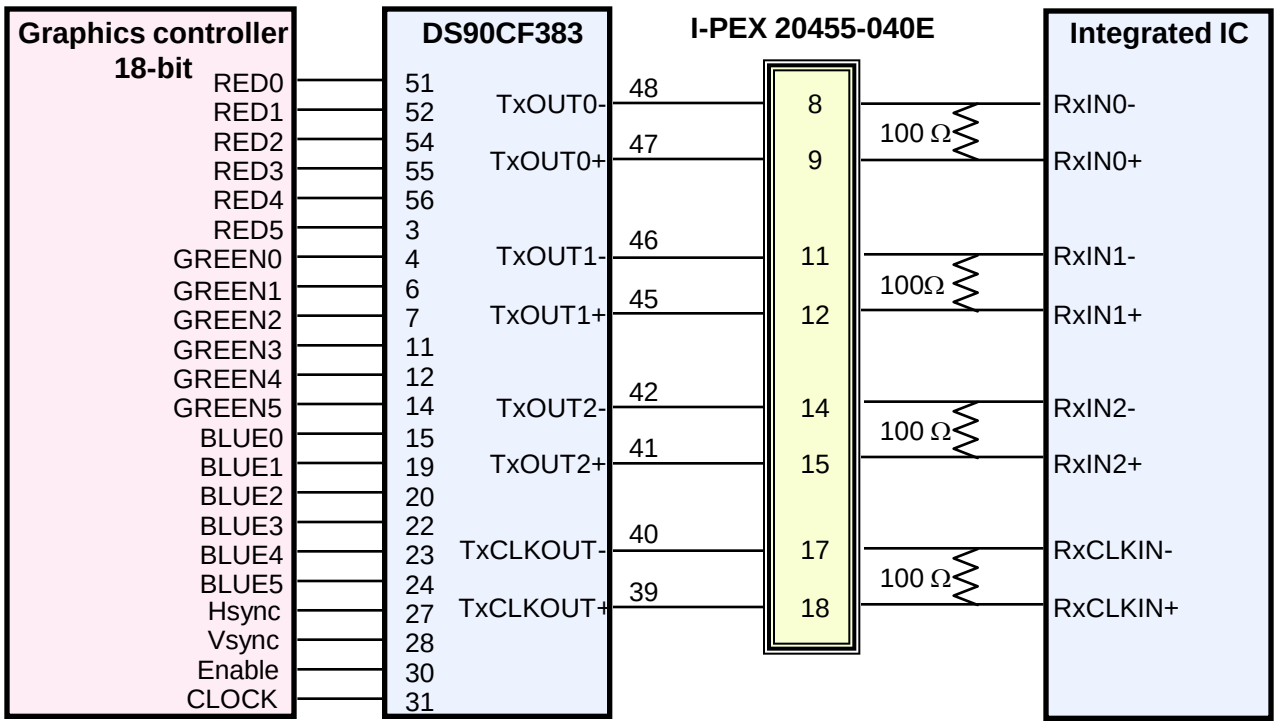
No.	Symbol	Function	Polarity	Remarks
1	NC			
2	VDD	Power Supply, 3.3 V (typical)		
3	VDD	Power Supply, 3.3 V (typical)		
4	V EEDID	DDC 3.3V power		
5	WPN	EDID WPN		
6	Clk EEDID	DDC Clock		
7	DATA EEDID	DDC Data		
8	Odd_Rin0-	- LVDS differential data input (R0-R5, G0) (odd pixels)	Negative	
9	Odd_Rin0+	+ LVDS differential data input (R0-R5, G0) (odd pixels)	Positive	
10	VSS	Ground – Shield		
11	Odd_Rin1-	- LVDS differential data input (G1-G5, B0-B1) (odd pixels)	Negative	
12	Odd_Rin1+	+ LVDS differential data input (G1-G5, B0-B1) (odd pixels)	Positive	
13	VSS	Ground – Shield		
14	Odd_Rin2-	- LVDS differential data input (B2-B5, HS, VS, DE) (odd pixels)	Negative	
15	Odd_Rin2+	+ LVDS differential data input (B2-B5, HS, VS, DE) (odd pixels)	Positive	
16	VSS	Ground – Shield		
17	Odd_ClkIN-	- LVDS differential clock input (odd pixels)	Negative	
18	Odd_ClkIN+	+ LVDS differential clock input (odd pixels)	Positive	
19	VSS	Ground – Shield		
20	Even_Rin0-	- LVDS differential data input (R0-R5, G0) (even pixels)		
21	Even_Rin0+	+ LVDS differential data input (R0-R5, G0) (even pixels)		
22	VSS	Ground – Shield		
23	Even_Rin1-	- LVDS differential data input (G1-G5, B0-B1) (even pixels)		
24	Even_Rin1+	+ LVDS differential data input (G1-G5, B0-B1) (even pixels)		
25	VSS	Ground – Shield		
26	Even_Rin2-	- LVDS differential data input (B2-B5, HS, VS, DE) (even pixels)		
27	Even_Rin2+	+ LVDS differential data input (B2-B5, HS, VS, DE) (even pixels)		
28	VSS	Ground – Shield		
29	Even_ClkIN-	- LVDS differential clock input (even pixels)		
30	Even_ClkIN+	+ LVDS differential clock input (even pixels)		

No.	Symbol	Function	Polarity	Remarks
31	VSSLED	Ground – LED		
32	VSSLED	Ground – LED		
33	VSSLED	Ground – LED		
34	NC			
35	PWM	System PWM Signal Input (+3.3V Swing)		
36	LED_EN	LED enable pin (+3.3V Input)		
37	NC	NC		
38	VDDLED	7.5V – 21V LED power		
39	VDDLED	7.5V – 21V LED power		
40	VDDLED	7.5V – 21V LED power		

5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
51	TxIN0	R0	14	TxIN14	G5
52	TxIN1	R1	15	TxIN15	B0
54	TxIN2	R2	19	TxIN18	B1
55	TxIN3	R3	20	TxIN19	B2
56	TxIN4	R4	22	TxIN20	B3
3	TxIN6	R5	23	TxIN21	B4
4	TxIN7	G0	24	TxIN22	B5
6	TxIN8	G1	27	TxIN24	Hsync
7	TxIN9	G2	28	TxIN25	Vsync
11	TxIN12	G3	30	TxIN26	DE
12	TxIN13	G4	31	TxCLKIN	Clock

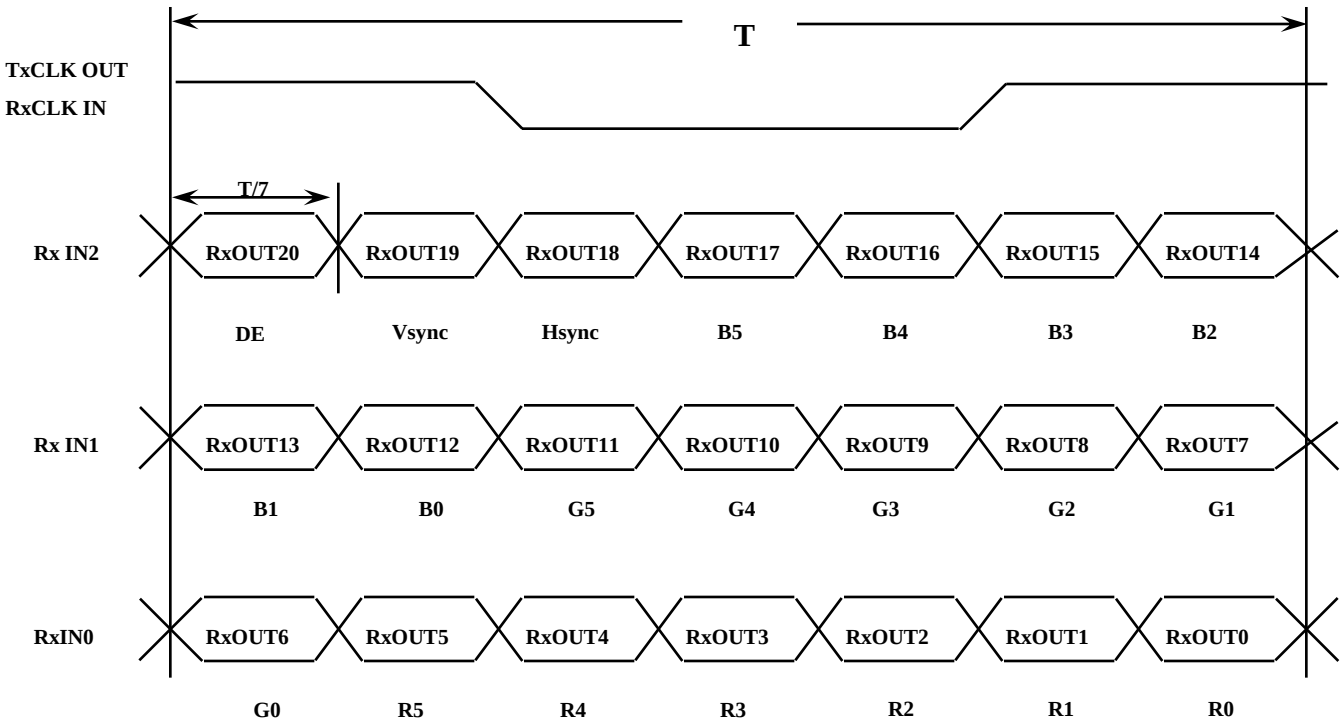
LVDS INTERFACE



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

5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



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

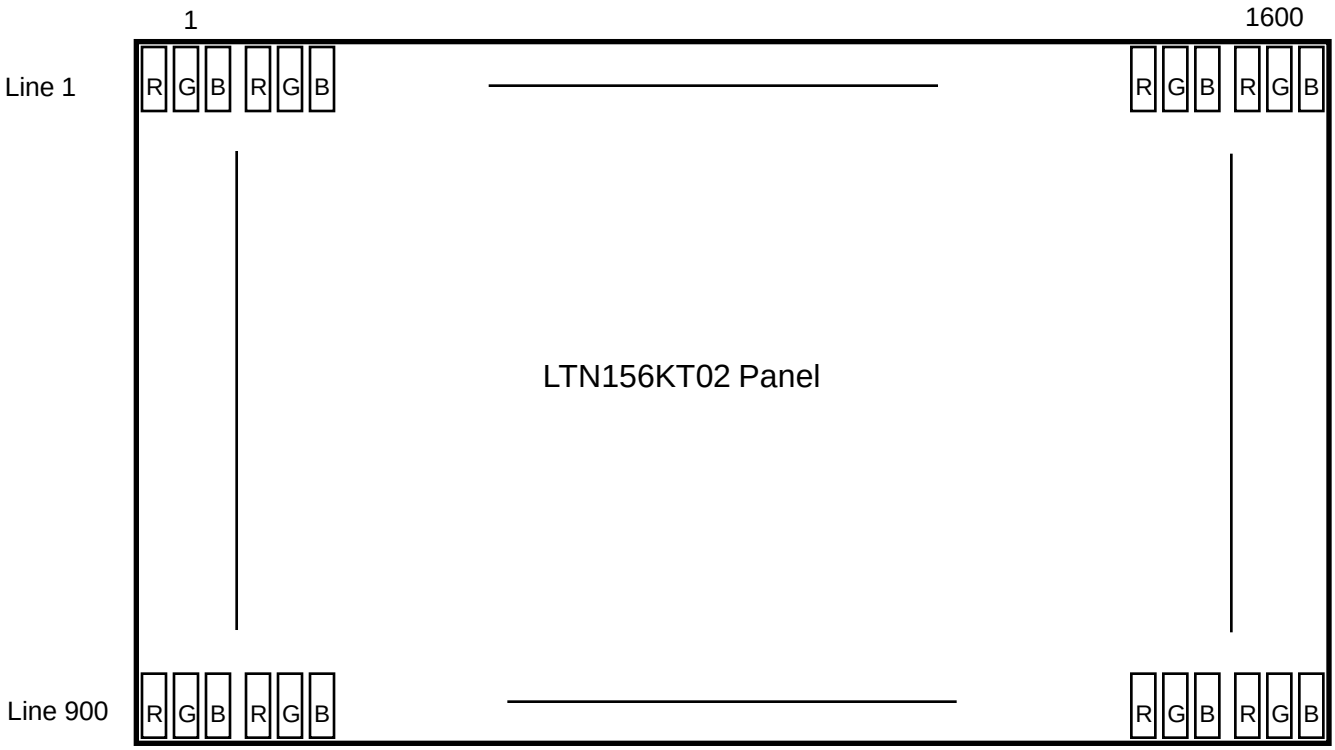
Note 1) Definition of gray :
Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note 2)Input signal: 0 =Low level voltage, 1=High level voltage

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

5.5 Pixel Format in the display

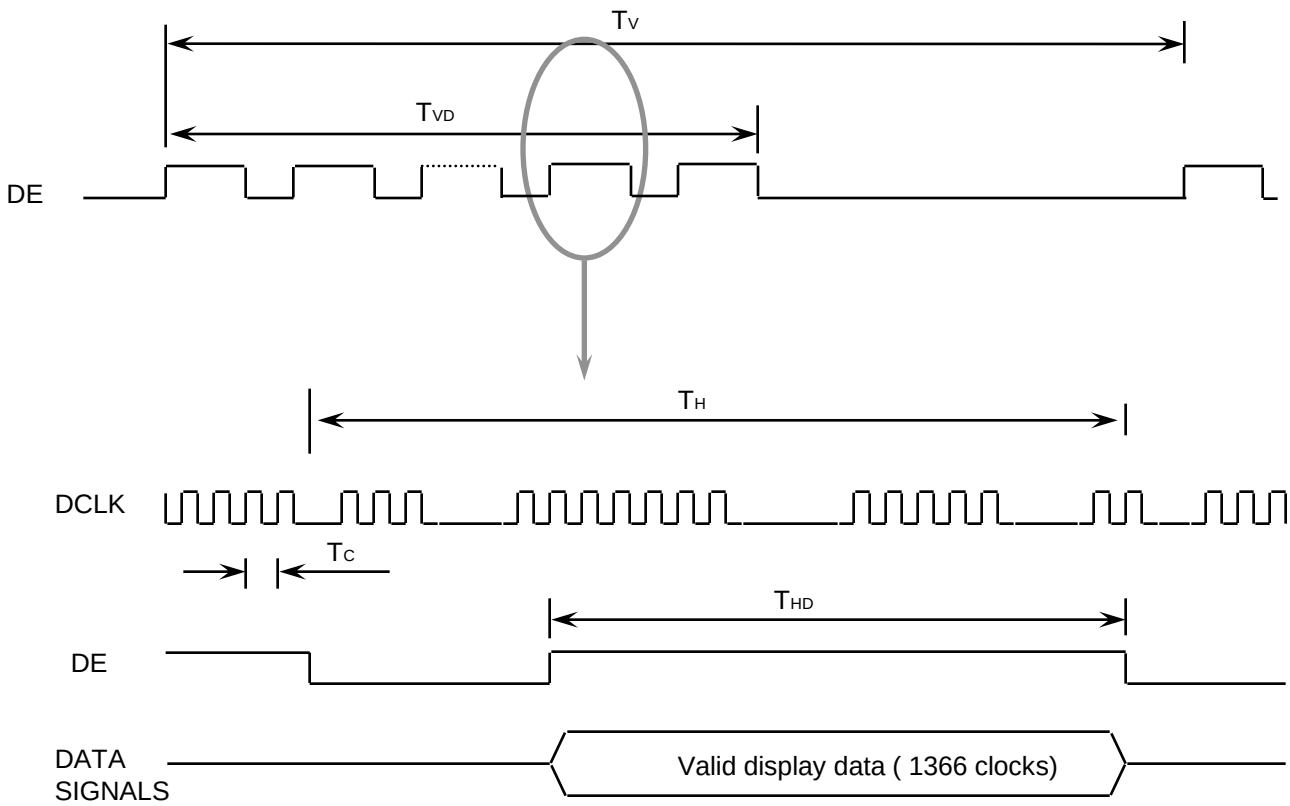


6. INTERFACE TIMING

6.1 Timing Parameters

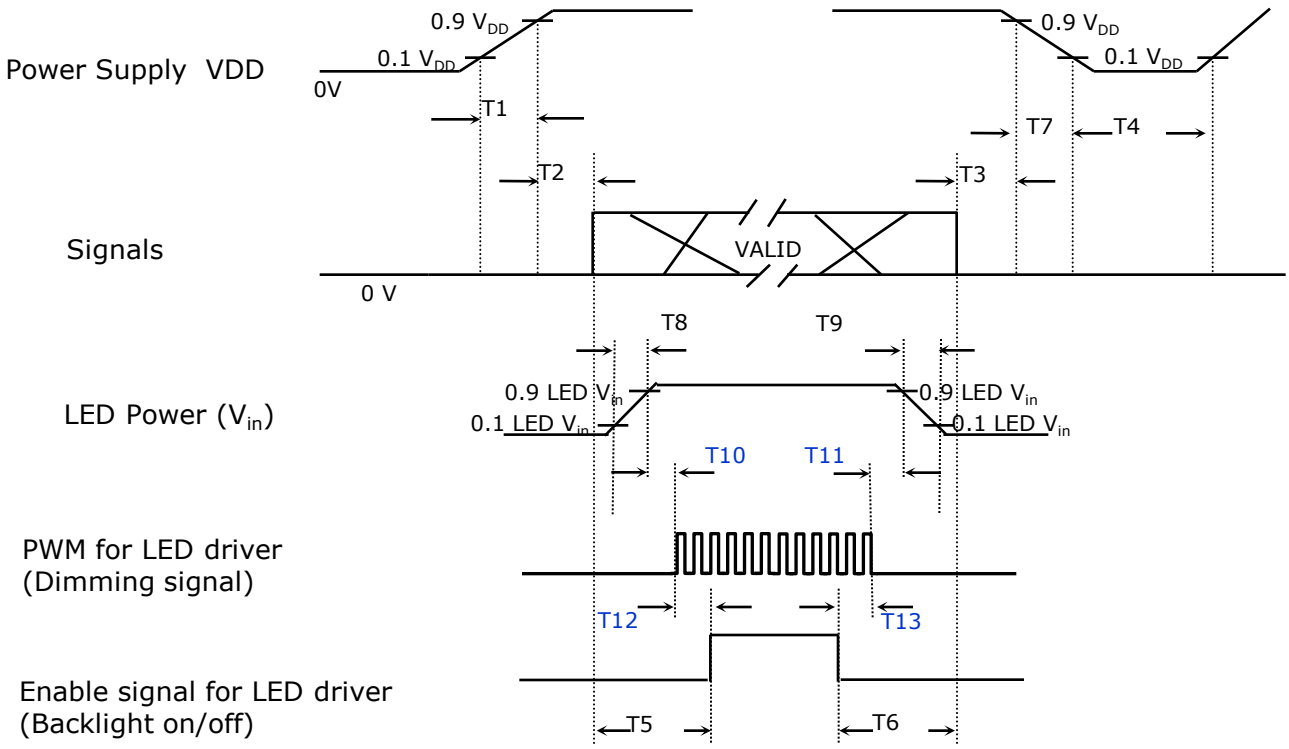
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	-	930	-	Lines	
Vertical Active Display Term	Display Period	TVD	-	900	-	Lines	
One Line Scanning Time	Cycle	TH	-	1760	-	Clocks	
Horizontal Active Display Term	Display Period	THD	-	1600	-	Clocks	

6.2 Timing diagrams of interface signal



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

Timing (ms)	Remarks
0.5 < T1 ≤ 10	V_{DD} rising time from 10% to 90%
0 < T2 ≤ 50	Delay from V_{DD} to valid data at power ON
0 < T3 ≤ 50	Delay from valid data OFF to V_{DD} OFF at power Off
500 ≤ T4	V_{DD} OFF time for Windows restart
200 ≤ T5	Delay from valid data to B/L enable at power ON
200 ≤ T6	Delay from valid data off to B/L disable at power Off
0 < T7 ≤ 10	V_{DD} falling time from 90% to 10%
0.5 < T8 ≤ 10	LED V_{in} rising time from 10% to 90%
0.5 < T9 ≤ 10	LED V_{in} falling time from 90% to 10%
0 ≤ T10	Delay from LED driver Vin rising time 90% to PWM ON
0 ≤ T11	Delay from PWM Off to LED driver Vin falling time 10%, Must Keep rule
0 ≤ T12	Delay from PWM ON to B/L Enable ON, Must Keep rule
0 ≤ T13	Delay from B/L Enable Off to PWM Off

Power Sequence & Timing Parameters

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 white.

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

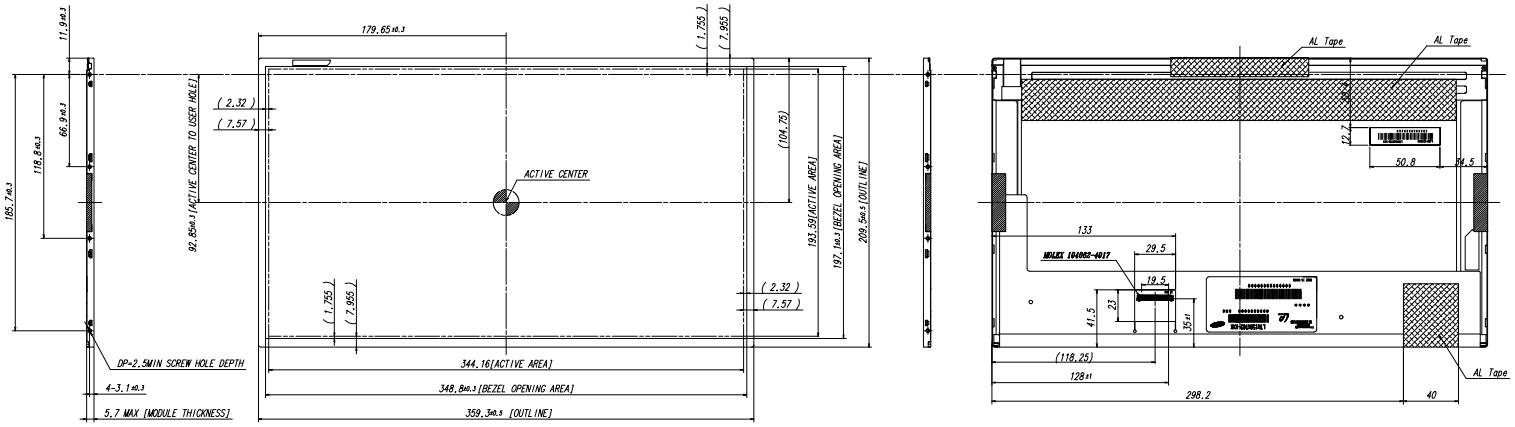
(4) T4 should be measured after the module has been fully discharged between power off and on period.

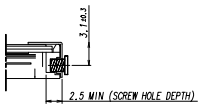
(5) Interface signal shall not be kept at high impedance when the power is on.

7. Mechanical Outline Dimension

Approval

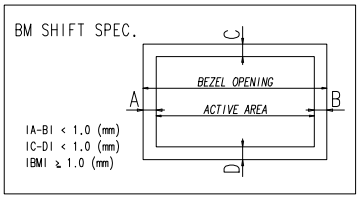
Refer to the next page





<USER HOLE SCREW HOLE DEPTH>

Preliminary Version REV.000
156HD+ / 5.7MAX



* NOTE
1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   -. MAKER : MOLEX OR COMPATIBLE
   -. INPUT CONNECTOR : MOLEX 104062-4017 OR EQUIVALENT
2. LED CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   -. MAKER : UJU Electronics
   -. PART NO : 51441-1041
3. CALIFERS MEASURING FORCE : 750 ± 250 gfcm
4. MAXIMUM SCREW TORQUE : MAX 2.5 Kgf-cm(5TIMES)
5. WEIGHT : 475 g 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	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	REASON	CHK'D BY
UNIT	mm						MODEL NAME	LTN156KT02-XXX
SCALE	1/1			I.S.PARK		B.S.KIM		
DRWG NUMBER							PART/SHEET NAME	OUTLINE DIMENSION
2.0		2010.07.31				2010.08.02		
SAMSUNG ELECTRONICS						SPEC. NO	CODE NO.	-
						2010.03.01		

SHEET 1/1
VER. 000

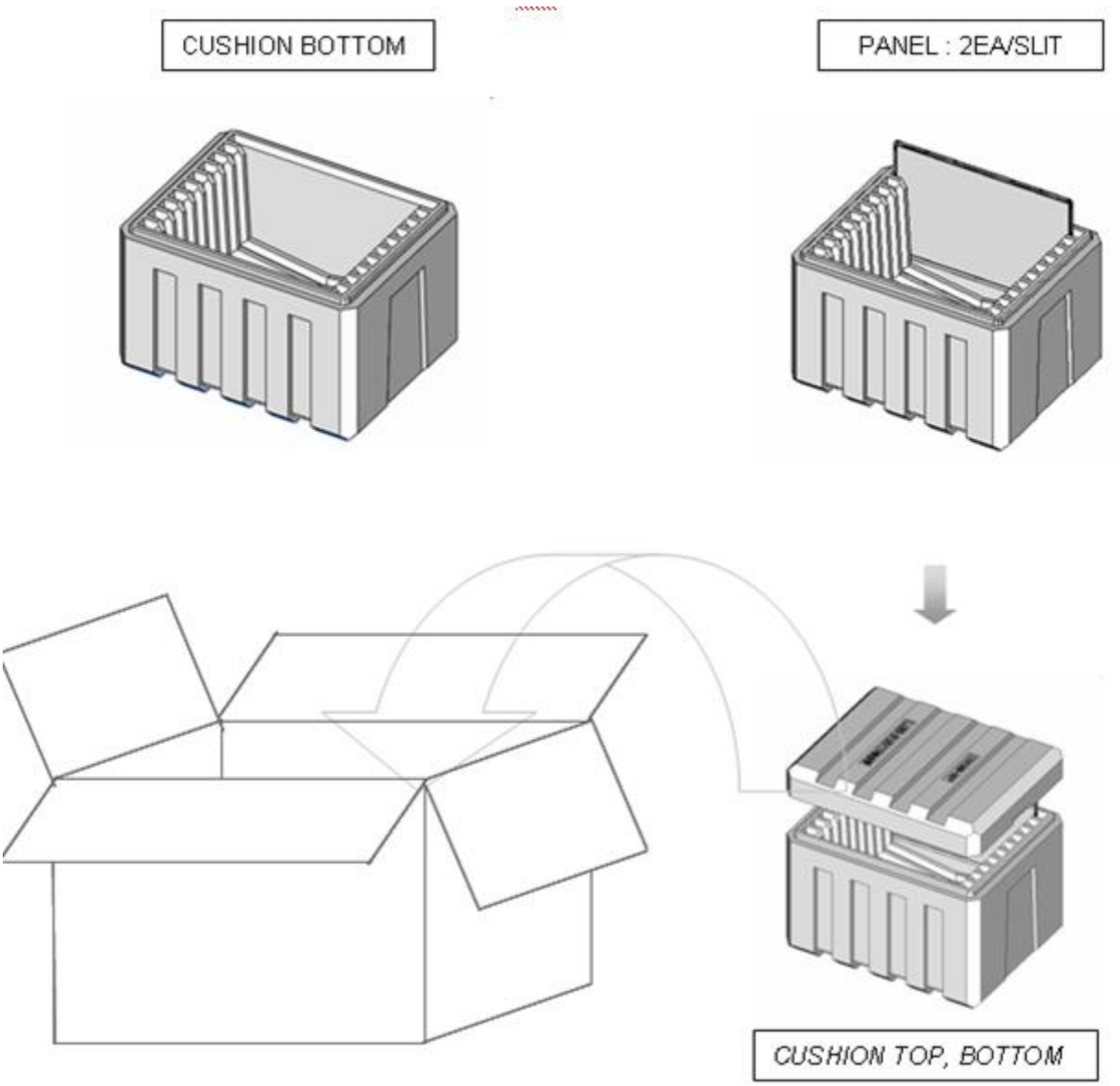
8. PACKING

1. CARTON(Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrupad form as shock absorber

(2) Packing Method



Note 1)Total Weight : Approximately 12.4 kg

2) Acceptance number of piling : 20 sets

3) Carton size : 344(W) × 432(D) × 329(H)

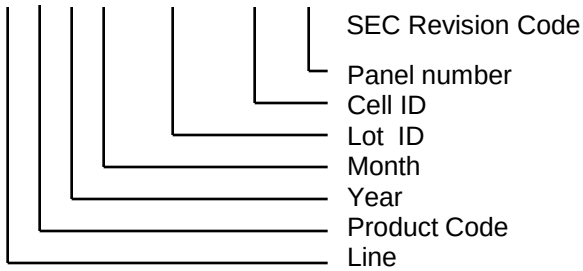
(3)Packing Material

No	Part name	Quantity
1	Static electric protective sack	20
2	Packing case (Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

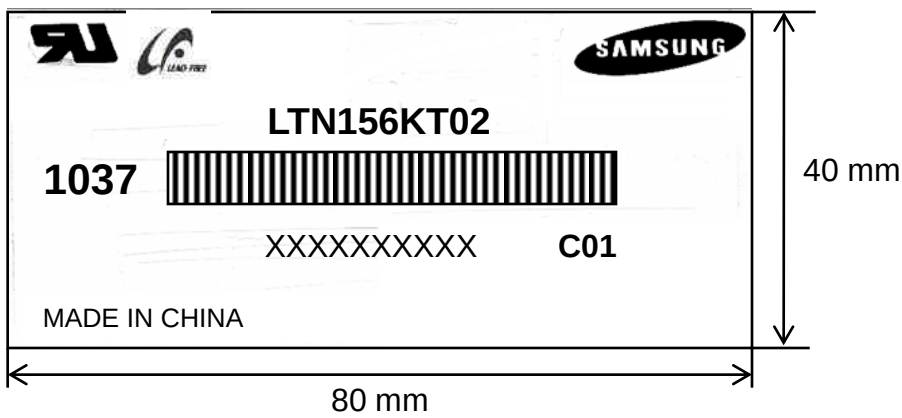
9. MARKINGS & OTHERS

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

(1)Parts number : LTN156KT02
(2)Revision code : 3 letters
(3)Lot number : X X X X XXX XX X **C01**

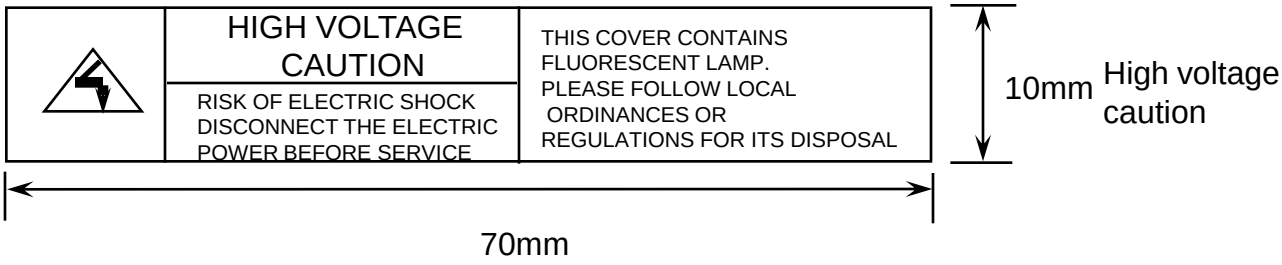


(5) Nameplate Indication

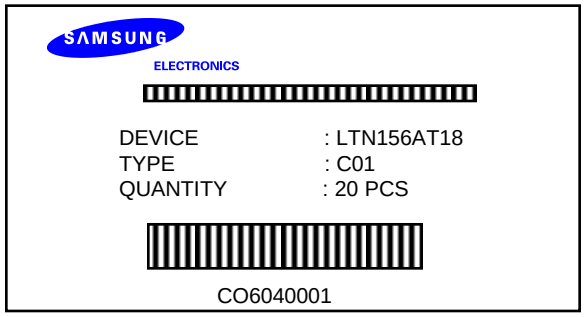


Parts name : LTN156KT02
Lot number : XXXXXXXXXX
Inspected work week : 1037(2010 year, 37nd week)

High voltage caution label



(6) Packing small box attach



10. GENERAL PRECAUTIONS

Approval

1. 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 (Isoprophyl 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 fingerstalls 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) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

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

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 °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.

3. 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).

(e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

4. 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.

11. EDID

Approval

Address (HEX)	FUNCTION	Value HEX	BIN	DEC	ASCII or Data	Notes
00	Header	00	00000000	0		EDID Header
01		FF	11111111	255		
02		FF	11111111	255		
03		FF	11111111	255		
04		FF	11111111	255		
05		FF	11111111	255		
06		FF	11111111	255		
07		00	00000000	0		
08	ID Manufacturer Name	4C	01001100	76	S	3 character ID
					E	
09		A3	10100011	163	C	"SEC"
0A	ID Product Code	45	01000101	69	[E]	
0B		32	00110010	50	[2]	
0C	32-bit serial no.	00	00000000	0		
0D		00	00000000	0		
0E		00	00000000	0		
0F		00	00000000	0		
10	Week of manufacture	00	00000000	0		
11	Year of manufacture	14	00010100	20	2010	2010
12	EDID Structure Ver.	01	00000001	1	1	EDID Ver. 1.0
13	EDID revision #	03	00000011	3	3	EDID Rev. 3
14	Video input definition	80	10000000	128		
15	Max H image size	22	00100010	34	34	34 cm(approx)
16	Max V image size	13	00010011	19	19	19 cm(approx)
17	Display Gamma	78	01111000	120	2.2	Gamma 2.2
18	Feature support	0A	00001010	10		
19	Red/green low bits	CC	11001100	204		10000111
1A	Blue/white low bits	95	10010101	149		11111110
1B	Red x/ high bits	9F	10011111	159	0.624	Red x 0.624= 1001010010
1C	Red y	57	01010111	87	0.340	Red y 0.340= 0101011100
1D	Green x	53	01010011	83	0.327	Green x 0.327= 0100111101
1E	Green y	94	10010100	148	0.578	Green y 0.578= 1000110011
1F	Blue x	27	00100111	39	0.154	Blue x 0.154= 001001111
20	Blue y	0F	00001111	15	0.060	Blue y 0.060= 001001111
21	White x	50	01010000	80	0.313	White x 0.313= 0101000001
22	White y	54	01010100	84	0.329	White y 0.329= 0101010001
23	Established timing 1	00	00000000	0		
24	Established timing 2	00	00000000	0		
25	Established timing 3	00	00000000	0		
26	Standard timing #1	01	00000001	1		not used
27		01	00000001	1		
28	Standard timing #2	01	00000001	1		not used
29		01	00000001	1		

2A	Standard timing #3	01	00000001	1		not used
2B		01	00000001	1		
2C	Standard timing #4	01	00000001	1		not used
2D		01	00000001	1		
2E	Standard timing #5	01	00000001	1		not used
2F		01	00000001	1		
30	Standard timing #6	01	00000001	1		not used
31		01	00000001	1		
32	Standard timing #7	01	00000001	1		not used
33		01	00000001	1		
34	Standard timing #8	01	00000001	1		not used
35		01	00000001	1		
36	Detailed timing/monitor descriptor #1	5D	01011101	93	98.21	Main clock= 98.21 MHz
37		26	00100110	38		
38		40	01000000	64	1600	Hor active=1600 pixels
39		A0	10100000	160	160	Hor blanking=160 pixels
3A		60	01100000	96		4bit : 4bit
3B		84	10000100	132	900	Vertcal active=900 lines
3C		1E	00011110	30	30	Vertical blanking=30 lines
3D		30	00110000	48		4bit : 4bit
3E		30	00110000	48	48	Hor sync. Offset
3F		20	00100000	32	32	H sync. Width=32 pixels
40		25	00100101	37	2 5	V sync. Offset=2 lines V sync. Width=5 lines
41		00	00000000	0		2bit : 2bit :2bit :2bit
42		58	01011000	88	344	H image size= 344 mm(approx)
43		C2	11000010	194	194	V image size = 194 mm(approx)
44		10	00010000	16		
45		00	00000000	0		No Horizontal Border
46		00	00000000	0		No Vertical Border
47		19	00011001	25		
48	Detailed timing/monitor descriptor #2	00	00000000	0		Manufacturer Specified (Timing)
49		00	00000000	0		
4A		00	00000000	0		
4B		0F	00001111	15		
4C		00	00000000	0		
4D		00	00000000	0		**Value**=HSPWmin / 2
4E		00	00000000	0		**Value**=HSPWmax / 2
4F		00	00000000	0		**Value**=Thbpmin /2
50		00	00000000	0		**Value**=Thbpmax /2
51		00	00000000	0		**Value**=VSPWmin /2
52		00	00000000	0		**Value**=VSPWmax /2
53		00	00000000	0		**Value**=Tvbpmin / 2
54		00	00000000	0		**Value**=Tvbpmax / 2
55		1E	00011110	30		Thpmin=**value***2 + HA pixelclks
56		B4	10110100	180		Thpmax=**value***2 + HA pixelclks
57		02	00000010	2		Tvpmin=**value***2 + VA lines
58		74	01110100	116		Tvpmax=**value***2 + VA lines
59		00	00000000	0		Module revision

5A		00	00000000	0		ASCII Data String Tag
5B		00	00000000	0		
5C		00	00000000	0		
5D		FE	11111110	254		
5E		00	00000000	0		
5F		53	01010011	83	[S]	
60		41	01000001	65	[A]	
61	Detailed timing/monitor	4D	01001101	77	[M]	
62	descriptor #3	53	01010011	83	[S]	
63		55	01010101	85	[U]	
64		4E	01001110	78	[N]	
65		47	01000111	71	[G]	
66		0A	00001010	10	[^]	
67		20	00100000	32	[ ]	
68		20	00100000	32	[ ]	
69		20	00100000	32	[ ]	
6A		20	00100000	32	[ ]	
6B		20	00100000	32	[ ]	
6C		00	00000000	0		Monitor Name Tag (ASCII)
6D		00	00000000	0		
6E		00	00000000	0		
6F		FE	11111110	254		
70		00	00000000	0		
71		4C	01001100	76	[L]	
72		54	01010100	84	[T]	
73	Detailed timing/monitor	4E	01001110	78	[N]	
74	descriptor #4	31	00110001	49	[1]	
75		35	00110101	53	[5]	
76		36	00110110	54	[6]	
77		4B	01001011	75	[K]	
78		54	01010100	84	[T]	
79		30	00110000	48	[0]	
7A		32	00110010	50	[2]	
7B		43	01000011	67	[C]	
7C		30	00110000	48	[0]	
7D		31	00110001	49	[1]	
7E	Extension Flag	00	00000000	0		
7F	Checksum	**92**	10010010	**146**		