SAMSUNG

ELECTRONICS

Preliminary

TO : General

DATE : Feb, 13, 2009

SAMSUNG TFT-LCD
MODEL NO. : LTN140AT02-C

NOTE :
- Extension code **[C02]**
- Surface type [**Glare**]

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

SAMSUNG ELECTRONICS CO., LTD.

wise view™

이재수08084035응용기술1파트(LCD)1292122244 20090811105325   496271249955409

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Date	Rev. No.	Page	Summary
Nov. 25. 2008	P00	All	. The preliminary specification was first issued.
Dec. 19. 2008	P01	22	. Packing SPEC was changed.

이재수08084035응용기술1파트(LCD)1292122244 20090811105325

496271249955409

GENERAL DESCRIPTION

DESCRIPTION

LTN140AT02-G is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight unit. The resolution of a 14.0" contains 1,366 x 768 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
- 1366 x 768 pixels resolution
- Low power consumption
- Fast Response
- LED BLU with LED driver
- 60% Color Gamut
- DE(Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- Pb-free product

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	309.4(H) x 173.95(V) (14.0" diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1366 x RGB(3) x 768	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2265(H) x 0.22265(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 0, Hard-Coating 3H		

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Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	323.0	323.5	324	mm	
	Vertical (V)	191.5	192.0	192.5	mm	
	Depth (D)	-	-	5.2	mm	
Weight		-		350	g	

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 $\geq$ Ta)
　　　　　Maximum　wet - bulb　temperature at　39 °C or less. (Ta > 40 °C) No condensation

Relative Humidity (%RH)

- (40,90)
- (50,50.4)
- (60,27.7)

Operating Range

Storage Range

Temperature (°C)
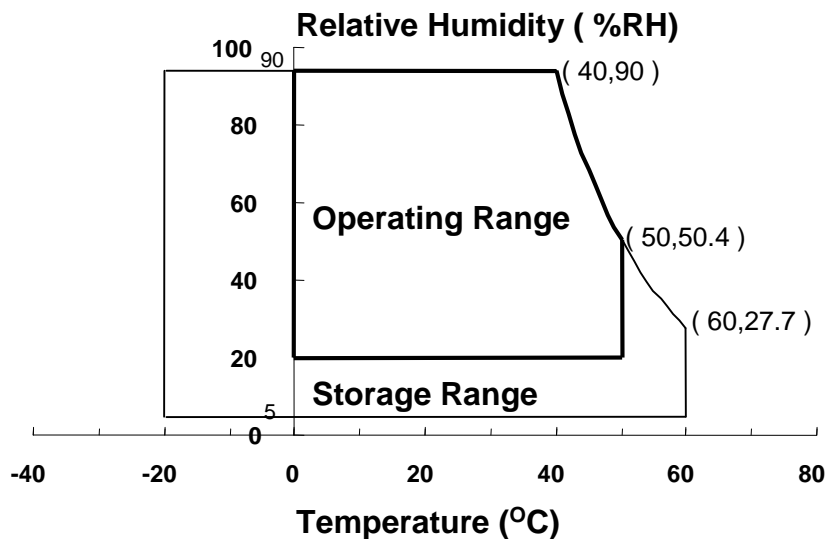
　(2)　2ms, half sine wave, one time for $\pm$X, $\pm$Y, $\pm$ Z.
　(3)　5 - 500 Hz, random vibration, 30min for X, Y, Z.
　(4)　At testing Vibration and Shock, the fixture in holding the Module to be tested have to be
　　　　hard and rigid enough so that the Module would not be twisted or bent by the fixture.

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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}	VSS - 0.3	3.6	V	(1)

Note (1) Within Ta (25 $\pm$ 2 $°C$)

(2) BACK-LIGHT UNIT

Ta = 25 $\pm$ 2 $°C$

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Current	I_L	-	20	-	mArms	(1)
LED Voltage	V_L	-	3.2	-	V	(1)

Note 1) Permanent damage to the device may occur if maximum values are exceeded
Functional operation should be restricted to the conditions described under normal operating conditions.
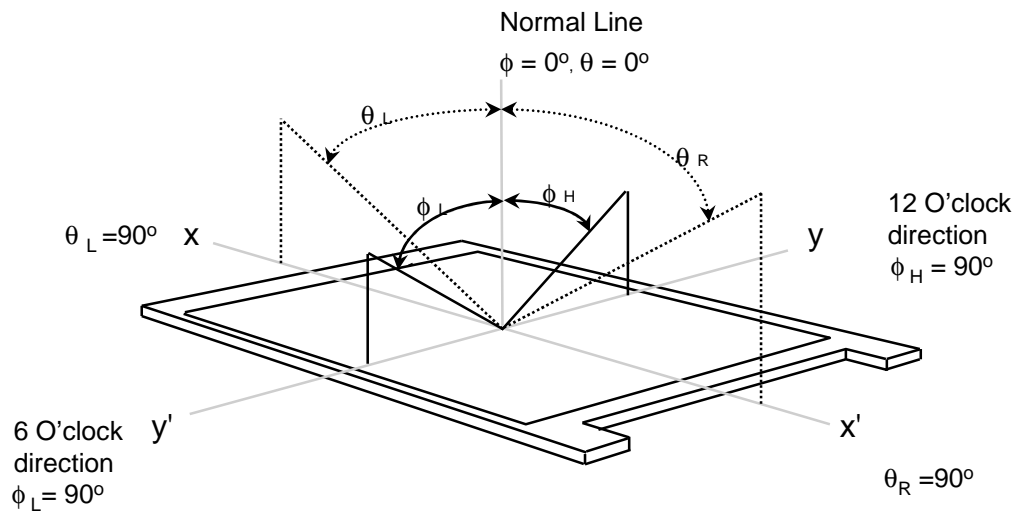
2. OPTICAL CHARACTERISTICS

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, V_{DD}=3.3V, fv= 60Hz, f_{DCLK} = 72.33MHz, I_L = 20 mArms

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR		500	-	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		$T_{RT\_B/W}$		-	16	20	msec	(1), (3)
Average Luminance of White (5 Points)		$Y_{L,AVE}$		200	220	-	cd/m^2	I_L=20mA (1), (4)
Color Chromaticity (CIE)	Red	R_X	Normal Viewing Angle $\phi = 0$ $\theta = 0$	(0.580)	(0.610)	(0.640)	-	(1), (5) PR-650
		R_Y		(0.310)	(0.340)	(0.370)		
	Green	G_X		(0.315)	(0.345)	(0.375)		
		G_Y		(0.560)	(0.590)	(0.620)		
	Blue	B_X		(0.125)	(0.155)	(0.185)		
		B_Y		(0.030)	(0.060)	(0.090)		
	White	W_X		(0.283)	(0.313)	(0.343)		
		W_Y		(0.299)	(0.329)	(0.359)		
Color Gamut				-	60	-	%	
Viewing Angle	Hor.	θ_L	CR ≥ 10	40	-	-	Degrees	(1), (5) BM-5A
		θ_R		40	-	-		
	Ver.	ϕ_H		15	-	-		
		ϕ_L		30	-	-		
	Hor.	θ_L	CR ≥ 100	20	-	-	Degrees	
		θ_R		20	-	-		
	Ver.	ϕ_H		5	-	-		
		ϕ_L		10	-	-		
13 Points White Variation		δ_L		-	-	1.7	-	(6)

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Note 1) Definition of Viewing Angle : Viewing angle range($10 \leq C/R$, $100 \leq C/R$)

Normal Line
$\phi = 0^\circ$, $\theta = 0^\circ$

θ_L

θ_R

ϕ_L ϕ_H

$\theta_L = 90^\circ$ x

y

12 O'clock direction
$\phi_H = 90^\circ$

6 O'clock y'
direction
$\phi_L = 90^\circ$
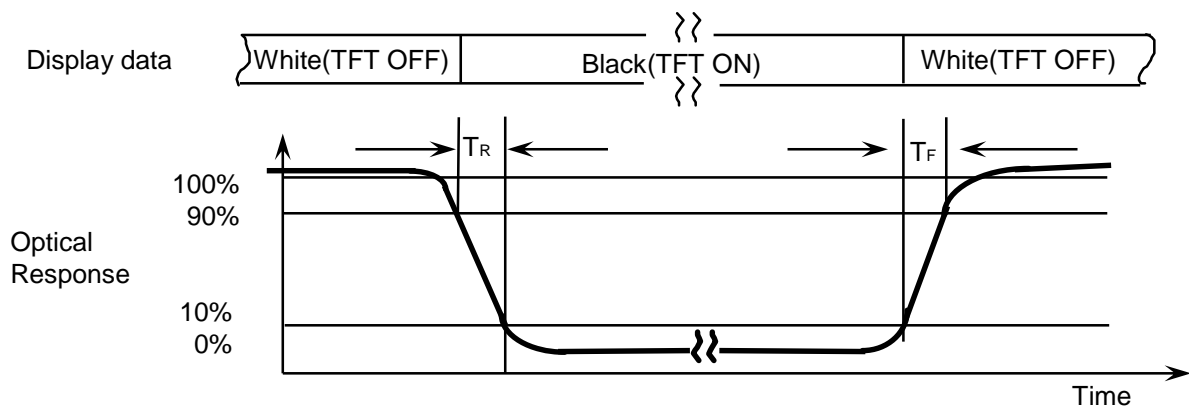
x'

$\theta_R = 90^\circ$

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 :

Display data   White(TFT OFF)   Black(TFT ON)   White(TFT OFF)

T_R T_F

100%
90%

Optical
Response

10%
0%

Time

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

(320)   (640)   (960)

VIEW AREA

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

⑩   ⑨   (200)

⑦   (400)

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

⑤   ④   (600)
(lines)
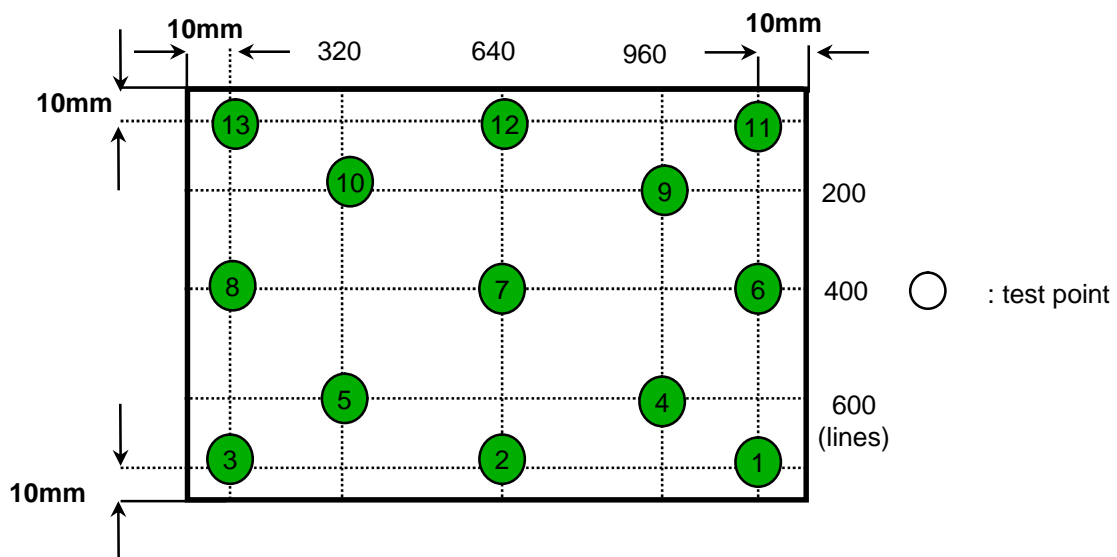
◯ : test point
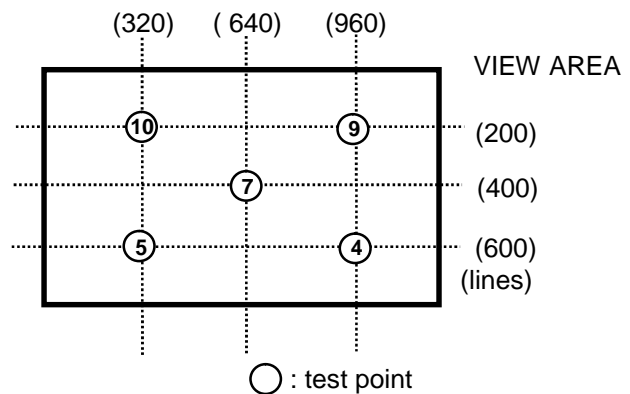
Samsung Secret

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. Environment condition : Ta = 25 ± 2 °C

Photo-detector (TOPCON BM-5A PR-650)

Field = 2°

50 cm

TFT-LCD module

LCD panel

Center of the screen

[Optical characteristics measurement setup]
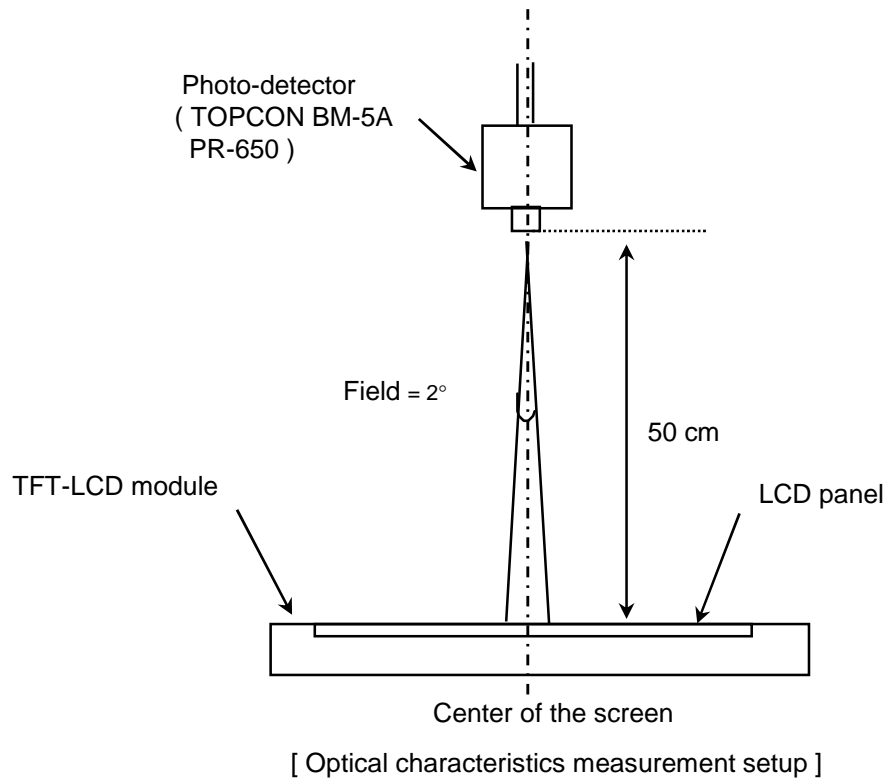
Note 6) Definition of 13 points white variation (δ L), CR variation(C_{VER}) [① ~ ⑬]

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

10mm   10mm

320   640   960

10mm

13   12   11

10

9   200

8   7   6   400   ◯ : test point

5   4

600 (lines)

3   2   1

10mm

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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		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	47.4	-	KHz	fv*790
Main Frequency		f_{DCLK}	-	72.33	-	MHz	fh*1526
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	(300)	-	mA	(2),(3)*a
	Mosaic		-	(350)	-	mA	(2),(3)*b
	V. stripe		-	(395)	(485)	mA	(2),(3)*c

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

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

(3) Power dissipation pattern

*a) White Pattern   *b) Mosaic Pattern

VIEW AREA

Display Brightest Gray Level

Display Darkest Gray Level
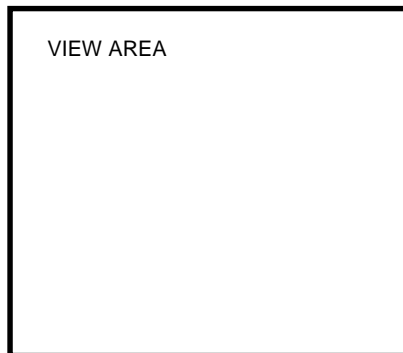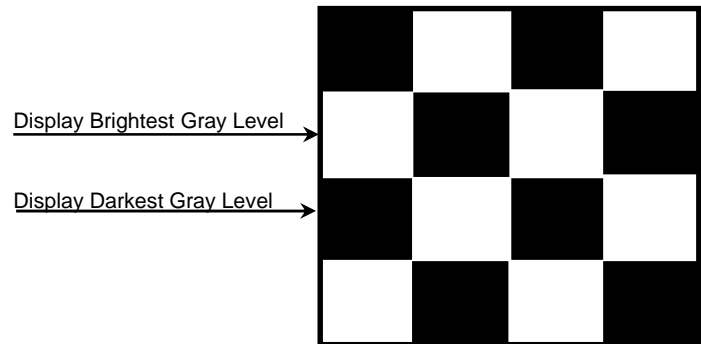
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*c) 1dot Vertical stripe pattern
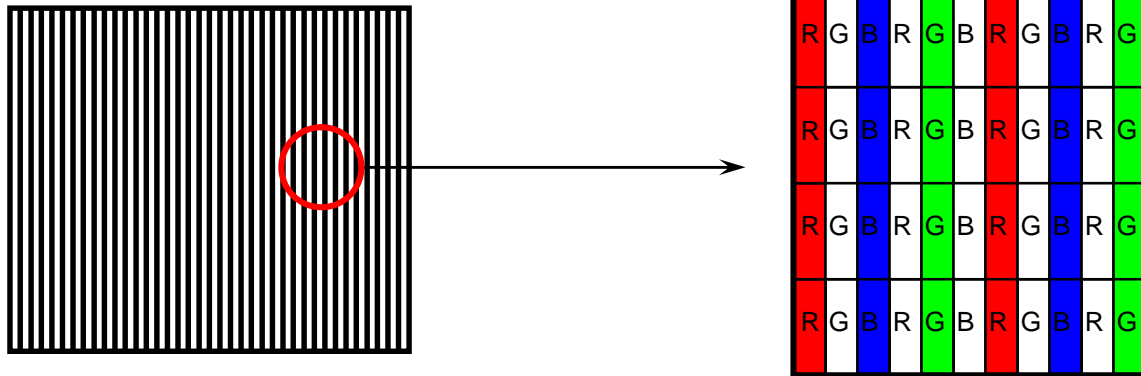
4) Rush current measurement condition

V_{DD} rising time is 470us

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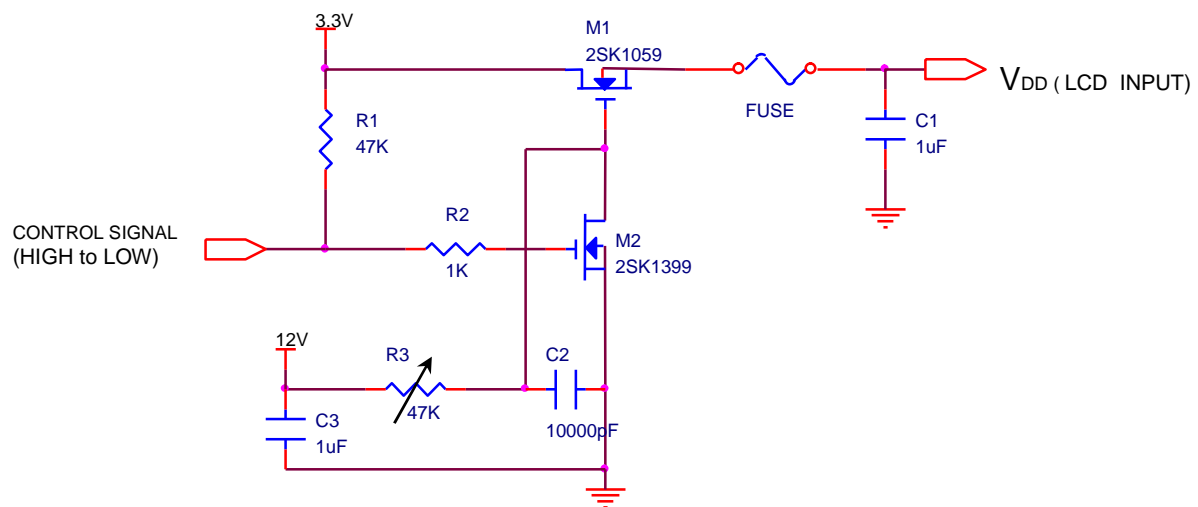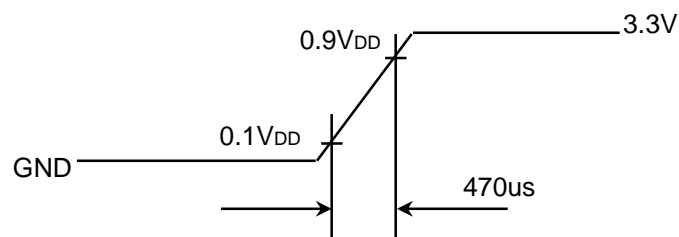
3.2 BACK-LIGHT UNIT

Ta= 25 $\pm$ 2 $^\circ$C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	20	-	mA	
LED Forward Voltage	VF	3.0	3.2	3.4	V	
LED Array Voltage	VP	21.0	22.4	23.8	V	VF X 7 LEDs
Power Consumption	P	-	3.09	3.28	W	IF X VF X 42LEDs
Operating Life Time	Hr	12,000	-	-	Hour	(1)

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the
condition Ta= 25 $\pm$ 2 $^\circ$C and IF = 19.0 mArms until one of the following event occurs.
　1. When the brightness becomes 50% or lower than the original.

3.3 LED Driver

- On board LED Driver (Manufacturer : Richtek)

Ta= 25 $\pm$ 2 $^\circ$C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	7	12	21	V	
Operating Frequency	F_o	675	750	825	KHz	
Burst Ratio	D	5	-	100	%	
External PWM Dimming Control Frequency (BLIM)	F_{BLIM}	0.1	-	10	kHz	Vin=6~20V, BLIM=PWM 0V~3.3V
Efficiency	η	-	80	-	%	BLIM=100%

Note - Test Equipment : Fluke 45

4. BLOCK DIAGRAM

4.1 TFT LCD Module

I²C bus

EDID
EEPROM

LVDS

Input Connector

LVDS Input/RSDS Output
Timing Controller

RSDS

DC-DC
Converter

Gamma
Generator

VCOM
Generator

Gate Pulse
Generator

Source
Driver
IC

14.1" WXGA
TFT-LCD Panel

Gate IC

SOURCE PCB

Video Signal
Control Signal
VCOM
Gamma
DVDD
AVDD
Von/Voff
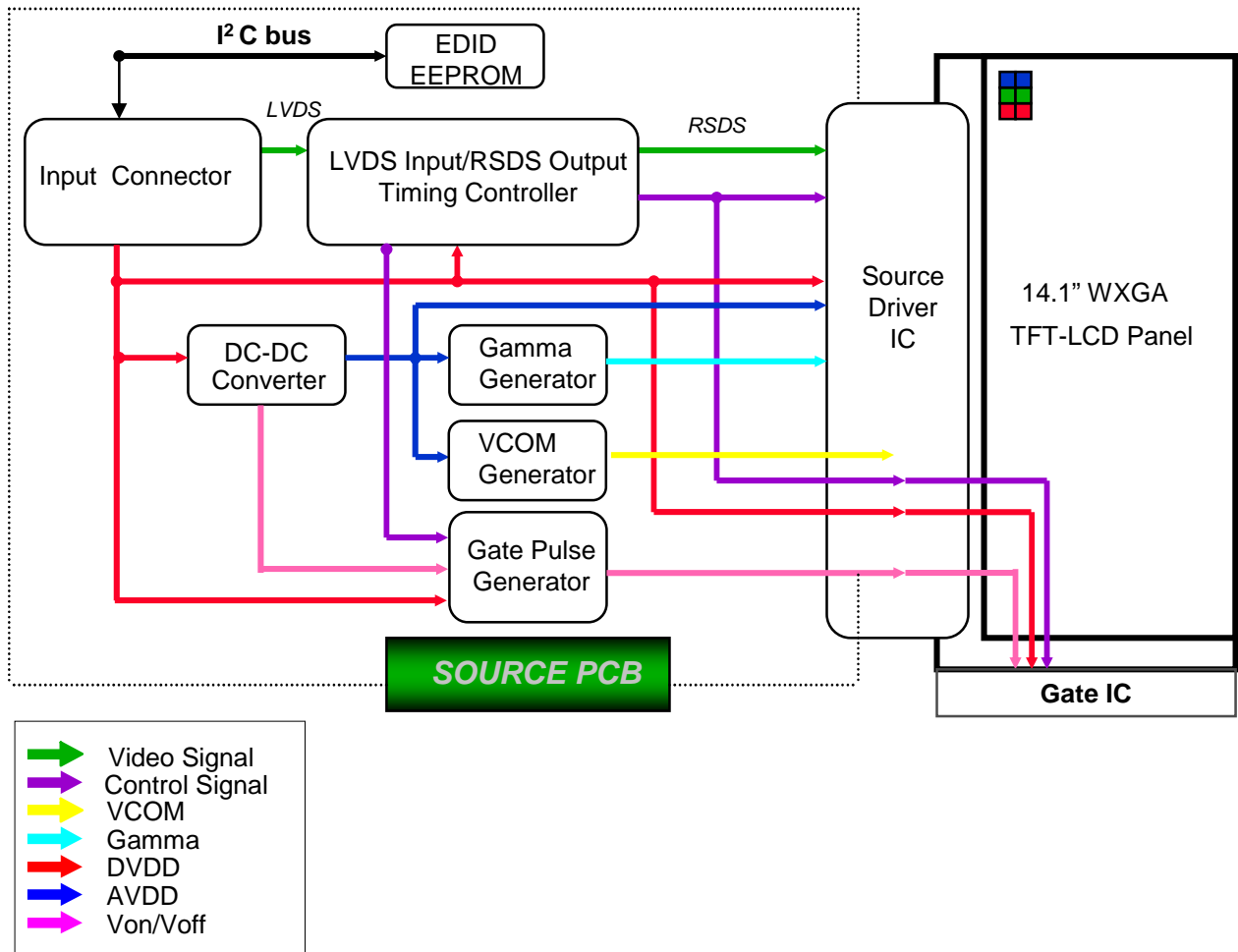
4.2 LED connection and placement

LED Power

Channel 1
Channel 2
Channel 7
Channel 6

1 2 ... 6 7

1 2 ... 6 7

1 2 ... 6 7
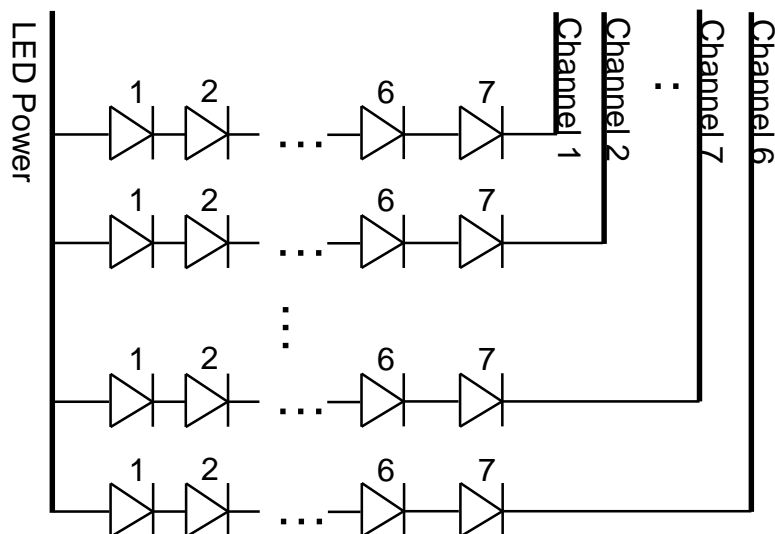
1 2 ... 6 7

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5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power

(LVDS, Connector : I-PEX, 20455-40E or equivalent – Locking type connector)

Pin	Symbol	Function
1	NC	No Connection (Reserved for supplier)
2	VCC	Power Supply, 3.3V (typical)
3	VCC	Power Supply, 3.3V (typical)
4	VCC_EDID	DDC 3.3V power
5	NC	No Connection (Reserved for supplier)
6	CLK_EDID	DDC Clock
7	DATA_EDID	DDC Data
8	RXin0-	- LVDS differential data (R0-R5, G0)
9	RXin0+	+ LVDS differential data (R0-R5, G0)
10	GND	Ground
11	RXin1-	- LVDS differential data (G1-G5, B0-B1)
12	RXn1+	+ LVDS differential data (G1-G5, B0-B1)
13	GND	Ground
14	RXin2-	- LVDS differential data (B2-B5,HS,VS, DE)
15	RXn2+	+ LVDS differential data (B2-B5,HS,VS, DE)
16	GND	Ground
17	ClkIN-	- LVDS differential clock input
18	ClkIN+	+ LVDS differential clock input
19	GND	Ground
20~21	NC	No Connection
22	NC	Ground
23~24	NC	No Connection
25	NC	Ground
26~27	NC	No Connection
28	NC	Ground
29~30	NC	No Connection
31~33	VBL-	LED Ground
34	NC	No Connection
35	PWM	PWM for luminance control
36	LED_EN	BL On/Off (On: 2.0~3.3V, Off: 0~0.5V)
37	NC	No Connection
38~40	VBL(7~20)	*LED Power Supply 7V-20V

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5.3 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
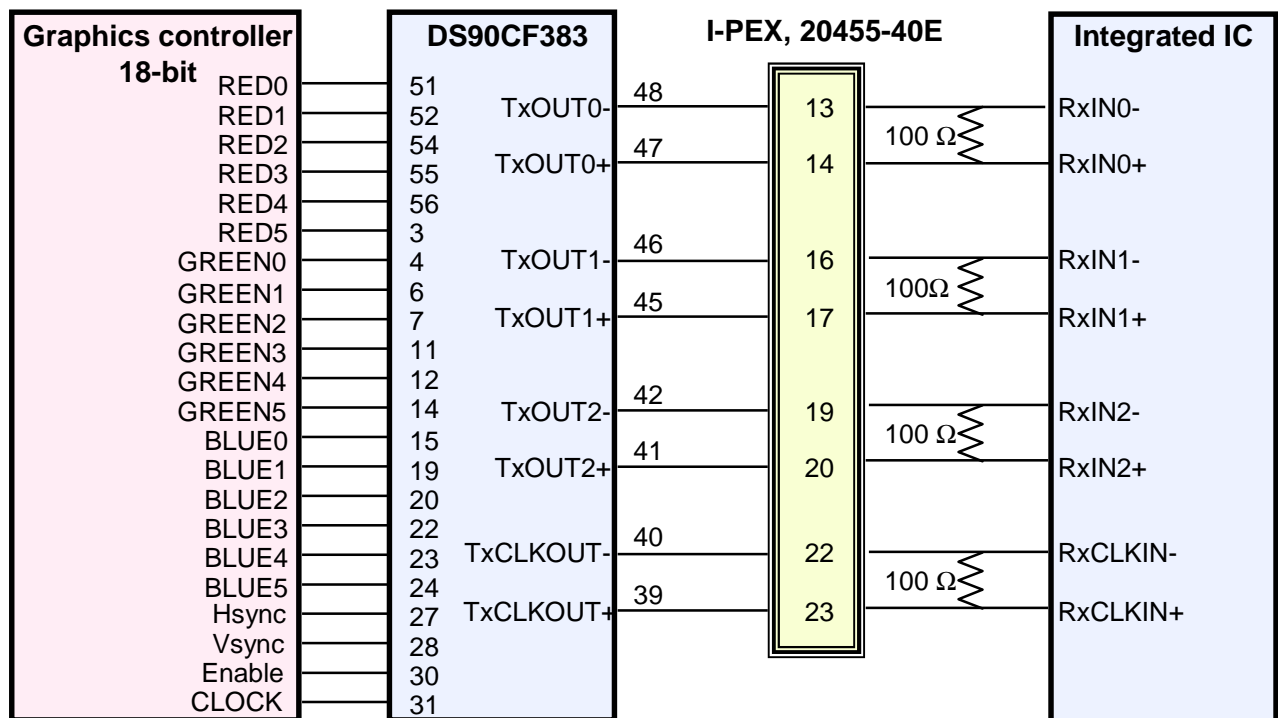
Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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5.4 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON

TxCLK OUT RxCLK IN							T
Rx IN2	RxOUT20	RxOUT19	RxOUT18	RxOUT17	RxOUT16	RxOUT15	RxOUT14
	DE	Vsync	Hsync	B5	B4	B3	B2
Rx IN1	RxOUT13	RxOUT12	RxOUT11	RxOUT10	RxOUT9	RxOUT8	RxOUT7
	B1	B0	G5	G4	G3	G2	G1
RxIN0	RxOUT6	RxOUT5	RxOUT4	RxOUT3	RxOUT2	RxOUT1	RxOUT0
	G0	R5	R4	R3	R2	R1	R0

T/7

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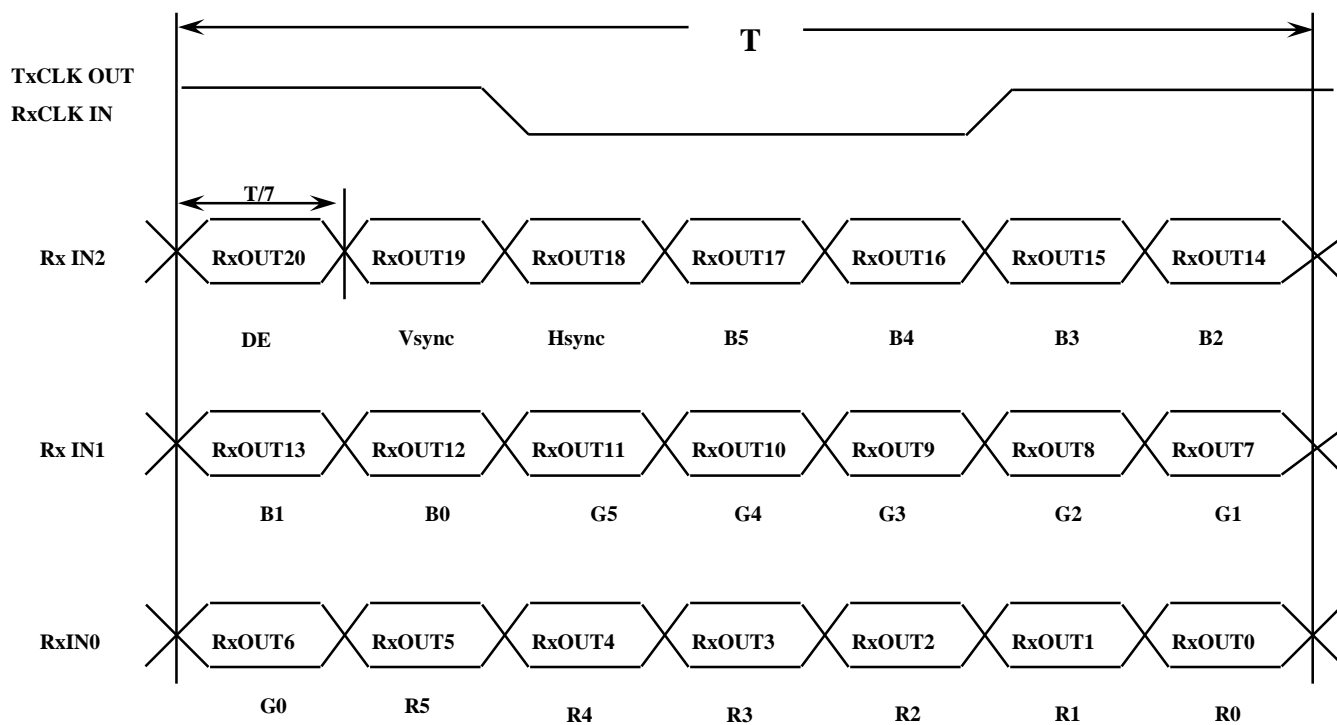
5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

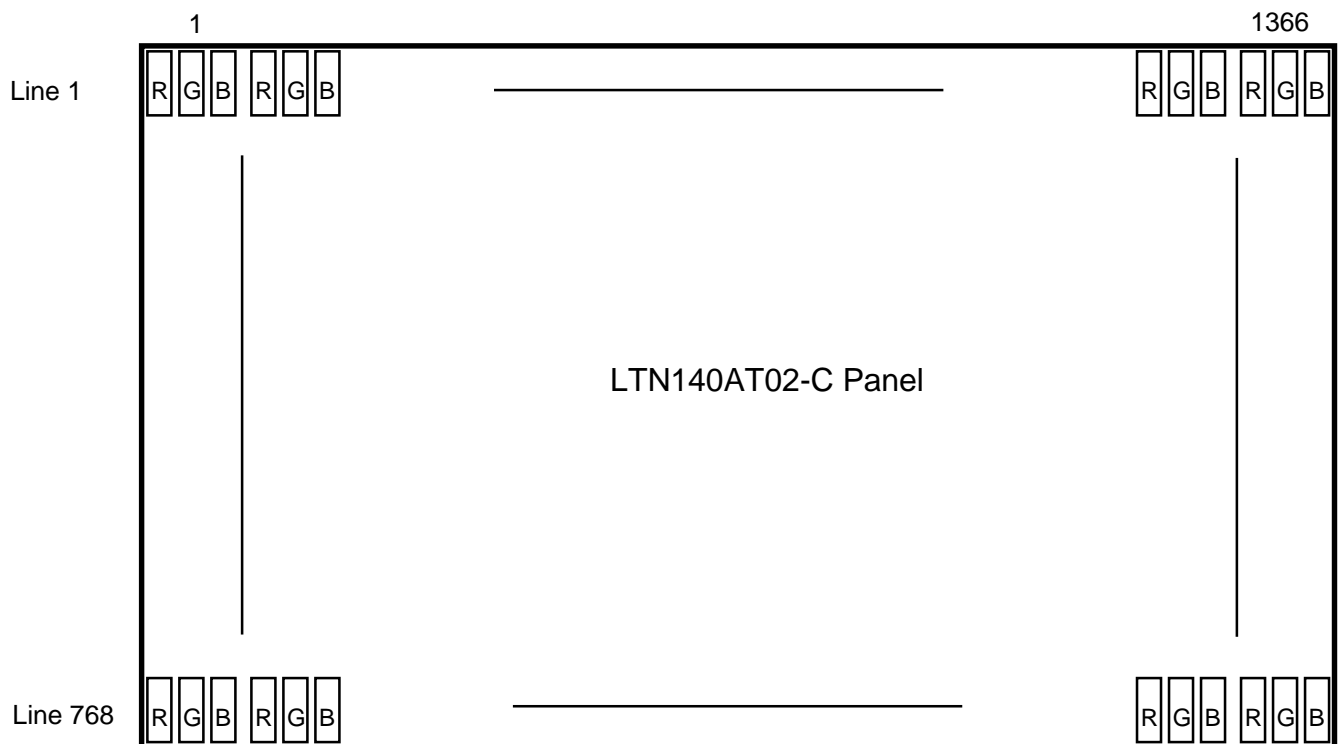| Color	Display	Data Signal																		Gray Scale Level
		Red						Green						Blue						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45	B5	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	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

Line 1   1   ... 1366

RGB RGB ... RGB RGB

LTN140AT02-C Panel

Line 768 RGB RGB ... RGB RGB

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6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	T_V	772	790	974	Lines	
Vertical Active Display Term	Display Period	T_{VD}	-	768	-	Lines	
One Line Scanning Time	Cycle	T_H	1436	1526	1550	Clocks	
Horizontal Active Display Term	Display Period	T_{HD}	-	1366	-	Clocks	

6.2 Timing diagrams of interface signal

DE

T_V

T_{VD}

T_H

DCLK

T_C

DE

T_{HD}

DATA SIGNALS — Valid display data (1280 clocks)

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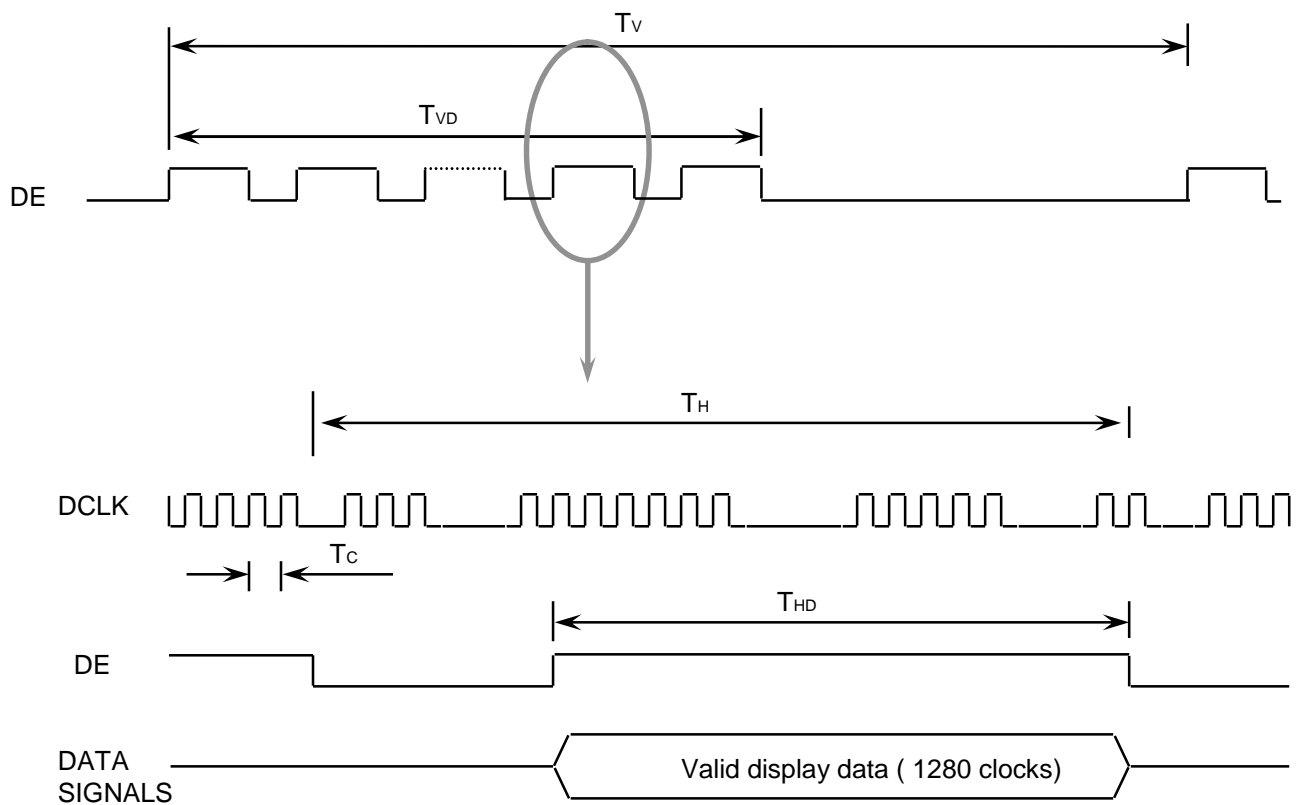
6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.
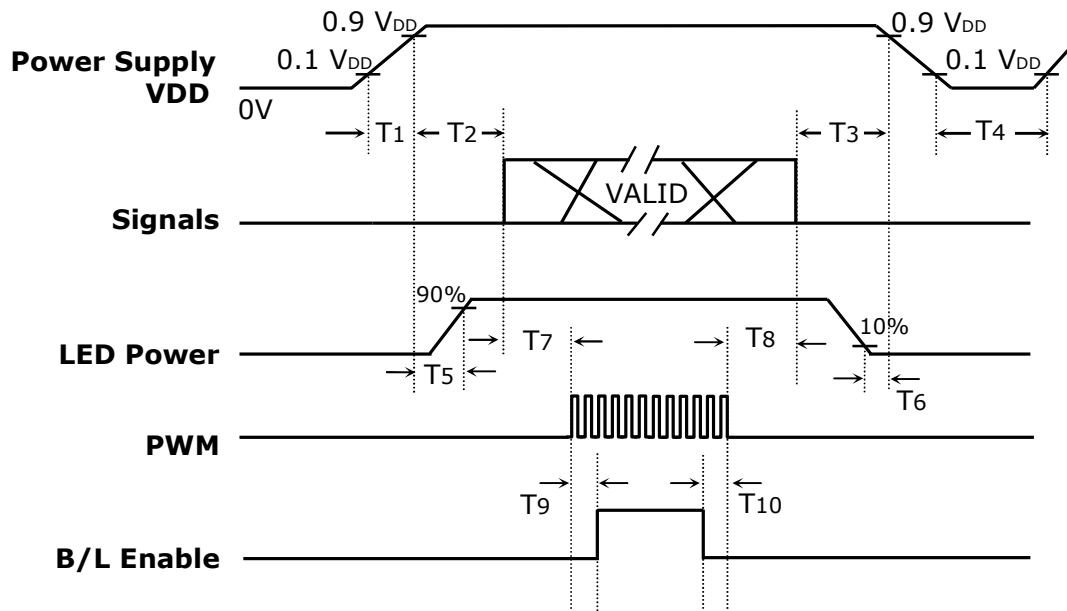
Power ON/OFF Sequence

Timing (ms)	Remarks
$0.5 < T_1 \leq 10$	V_{DD} rising time from 10% to 90%
$0 < T_2 \leq 50$	Delay from V_{DD} to valid data at power ON
$0 < T_3 \leq 50$	Delay from valid data OFF to V_{DD} off at power OFF
$500 \leq T_4$	V_{DD} OFF time for Windows restart
$0 < T_5 \leq T_2$	Delay from V_{DD} ON to LED driver power ON
$0 < T_6 \leq T_3$	Delay from LED driver power OFF to V_{DD} OFF
$0 < T_7$	Delay from valid data to PWM ON
$0 < T_8$	Delay from PWM OFF to valid data OFF
$0 < T_9$	Delay from PWM ON to B/L Enable ON
$0 < T_{10}$	Delay from B/L Enable Off to PWM OFF

Power Sequence & Timing Parameters

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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 B/L operation 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.

   (6) EN must be turned on late than VDD and PWM signal.
        EN must be turned off early than VDD and and PWM signal.

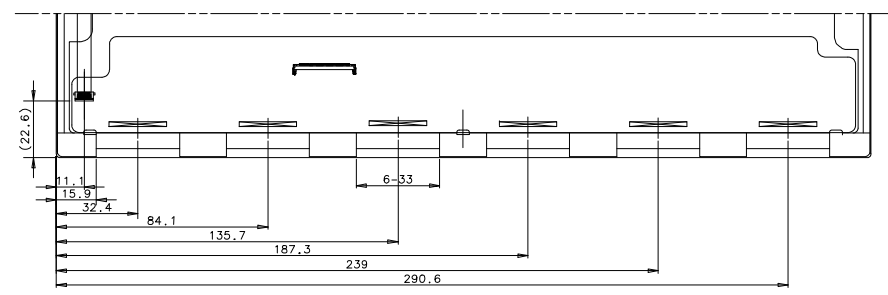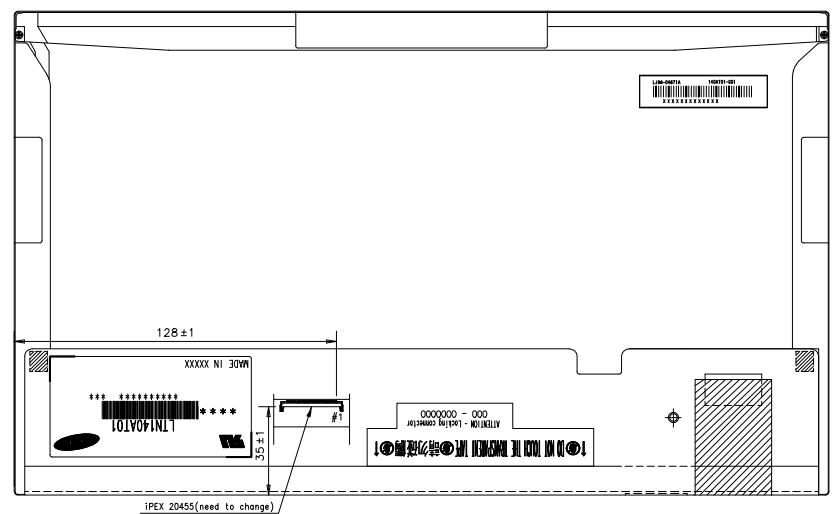## 7. Mechanical Outline Dimension

It will be attached with PDF file

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323.5±0.5

161.75±0.3

14±0.3

(96)

81±0.3

178±0.3

162±0.3

192±0.5

82±0.3

(7.32)

173.952(Active Area)

177.36±0.5(Bezel Openning)

Active Center

309.399(Active Area)

312.8±0.5(Bezel Openning)

(5.35)

3.1±0.3

5.2 MAX

M2,Depth max 2.5

LTN140AT01

XXXXX IN 30WM

128±1

35±1

iPEX 20455(need to change)

(22.6)

11.1

15.9

32.4

84.1

135.7

187.3

239

290.6

6-33

* NOTE

1. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 2.5mm MAX.

2. MAXIMUM SCREW TORQUE SPEC : 2.5kgf-cm Max

3. MODULE WEIGHT SPEC : 350g MAX

4. MEASURING FORCE : 750 +/- 250gf-cm

8. PACKING

1. CARTON(Internal Package)

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

(2) Packing Method

CUSHION TOP

PANEL

CUSHION BOTTOM
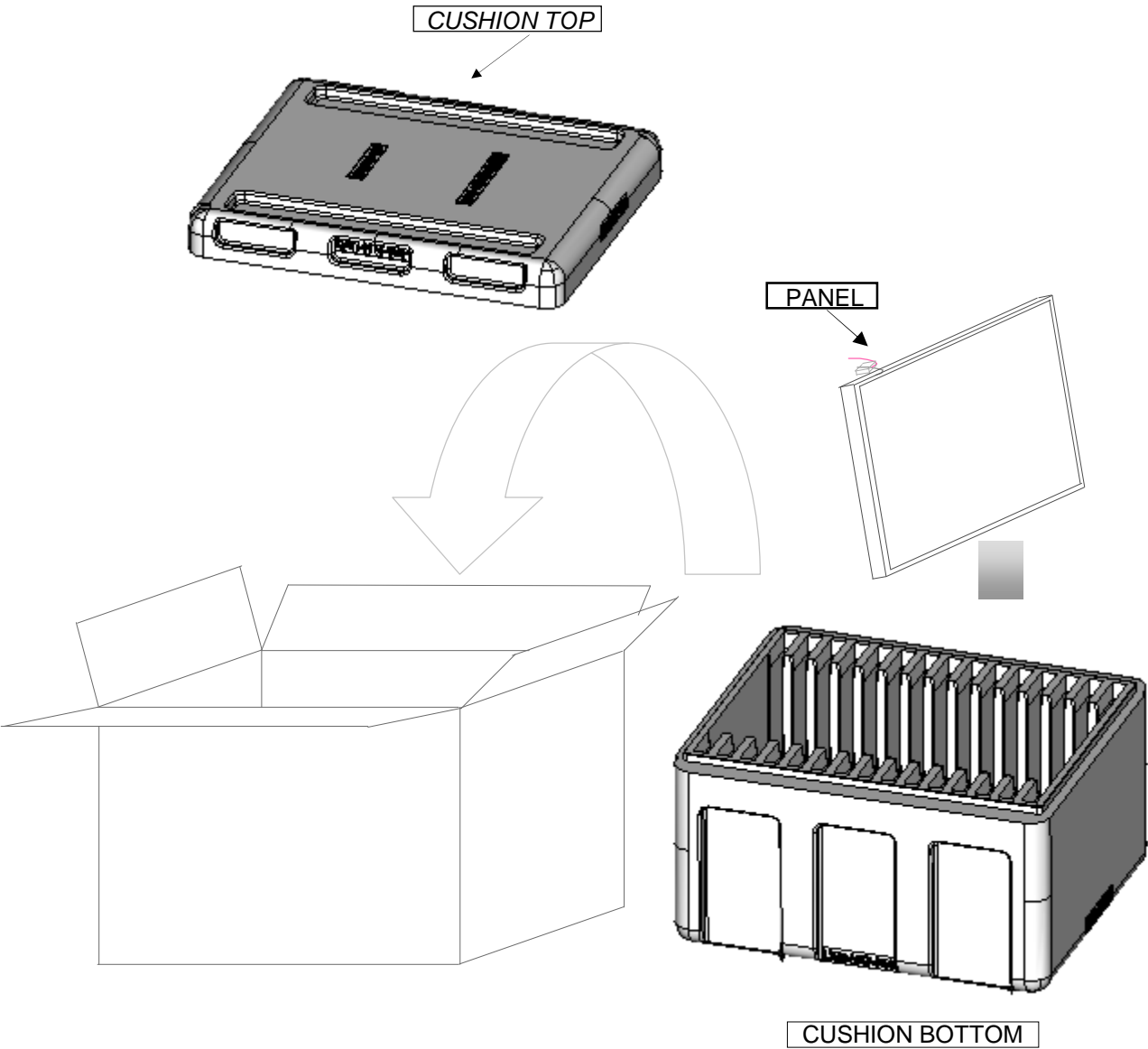
Note 1) Total Weight : Approximately 5.0 kg

2) Acceptance number of piling : 30 sets

3) Carton size : 408(W) * 325(D) * 294(H)

| No	Part name	Quantity
1	Static electric protective sack	30
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 : LTN140AT02-G01
(2) Revision   : Three letters
(3) Lot number   : 6 J 7 F <u>XXX</u> <u>XX</u> <u>X</u>

```
                    │ │ │ │  │   │  │
                    │ │ │ │  │   │  └─ Cell Position No.(In the one Glass)
                    │ │ │ │  │   └──── Glass No.(In the one Lot)
                    │ │ │ │  └──────── Lot No.(Glass)
                    │ │ │ └─────────── Month
                    │ │ └───────────── Year(Note 1)
                    │ └─────────────── Product Code
                    └───────────────── Line
```
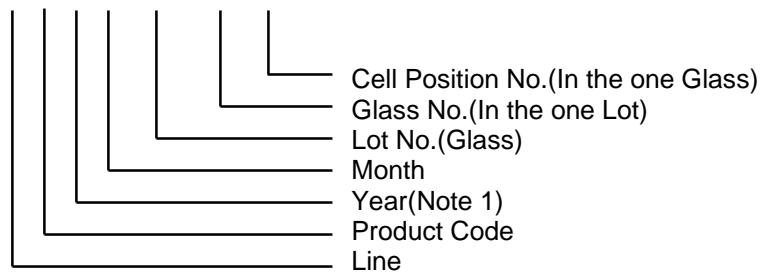
NOTE 1). This code indicating year is omitted in the products of KIHENG site.
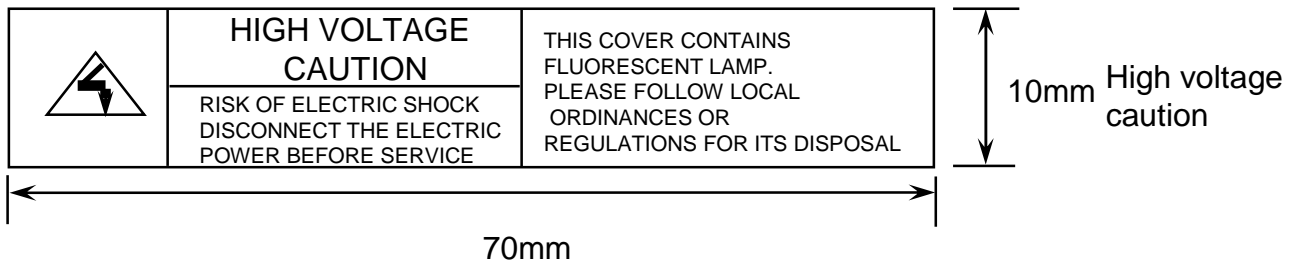
(4) Nameplate Indication

80 mm

40 mm
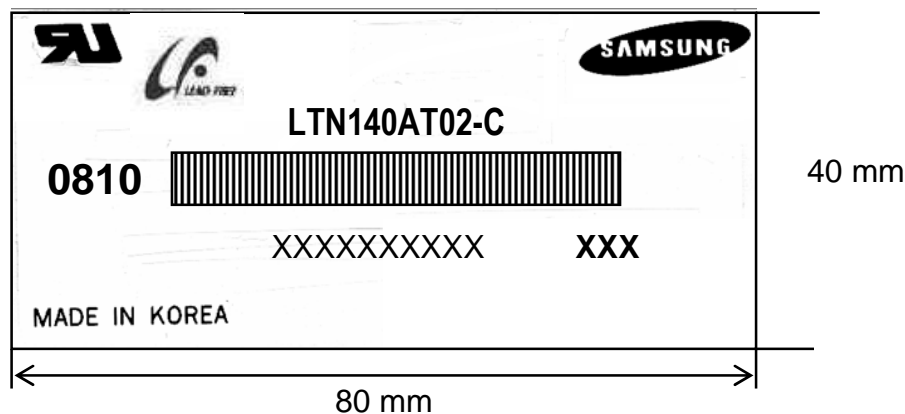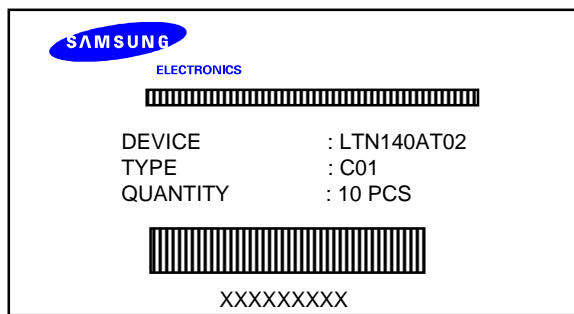
Parts name   : LTN140AT02-C
Lot number   : XXXXXXXXXX
Inspected work week   : 0810(2008 year 10th week)
Product Revision Code : **XXX**

Samsung Secret

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This HIGH VOLTAGE CAUTION is carved in mold frame

⚡	HIGH VOLTAGE CAUTION RISK OF ELECTRIC SHOCK DISCONNECT THE ELECTRIC POWER BEFORE SERVICE	THIS COVER CONTAINS FLUORESCENT LAMP. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR ITS DISPOSAL

10mm   High voltage caution

70mm

(6) Packing box attach

SAMSUNG
ELECTRONICS

▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐

DEVICE   : LTN140AT02
TYPE   : C01
QUANTITY   : 10 PCS

▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌

XXXXXXXXX

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

wise view ™

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10. GENERAL PRECAUTIONS

Preliminary

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.

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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.

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