

ENGINEERING SPECIFICATIONS

TFT COLOR LCD MODULE

TM100SV-02L01

- 25cm (10.0 inch) diagonal
- SVGA resolution (800xR·G·Bx600 dots)
- Within CFL backlight unit
- Nonglare surface type

(TENTATIVE)

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Tottori SANYO Electric Co., Ltd.
Electronic Device Business Headquarters
LCD Division

Department Manager

S. Iwasaki
S.Iwasaki

Engineering Manager

N. Omote
N.Omote

■ NOTICES

1. The contents stated in this document and the product may be subject to change without prior notice.

When you kindly study to use this product, please ask us or our distributor for the latest information.

2. This product is developed and produced for usage onto normal electronic products (office automation equipments, communication peripherals, electric appliance products, game machines, etc.) and is not suitable for applications which need extremely high reliability and extreme safety (aero- or space-use machines, control equipments for nuclear power, life keeping equipments, etc.).

3. This document shall not grant or guarantee any right to adapt intellectual property or any other patents of third party.

4. Please use this product correctly according to operating conditions and precautions for use stated in this document.

Please install safety proof in your designing to avoid human accident, fire accident and social damage which may be resulted from malfunction of this product.

5. This product is not designed to withstand against radiant rays.

6. It is strictly prohibited to copy or publish a part or whole of this document without our prior written approval.

MECHANICAL CHARACTERISTICS

Ta=25°C

ITEM	SPECIFICATION	UNIT
Module size	236.0(W) × 168.0(H) × 6.1max(t)	mm
Resolution	800 × R · G · B(W) × 600(H)	pixel
Sub pixel pitch	0.0845(W) × 0.2535(H)	mm
Pixel pitch	0.2535(W) × 0.2535(H)	mm
Active viewing area	202.8(W) × 152.1(H)	mm
Bezel opening area	207.2(W) × 156.5(H)	mm
Weight	270 TYP.	g

ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power supply voltage	V _{DD} -V _{SS}	0	4.0	V	
Input voltage	V _I	V _{SS}	V _{DD}	V	
CFL lamp current	I _L	-	6.5	mA	

ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN	MAX	UNIT	NOTE
Ambient temperature	T _{ST}	Storage	-20	60	°C	Note 1
	T _{OP}	Operation	0	50		
Humidity	-	Ta ≤ 40°C	-	85	%RH	No condensation Note 2
Vibration	-	Storage	-	1.5	G	Note 3
Shock	-	Storage	-	50	G	XYZ 11ms/direction

[Note 1] Care should be taken so that the LCD module may not be subjected to the temperature beyond this specification.

[Note 2] Ta > 40°C: Absolute humidity shall be less than that of 85% RH/40°C.

[Note 3] 10-200Hz, 30min/cycle, X/Y/Z each one cycle and except for resonant frequency.

ELECTRICAL CHARACTERISTICS

V_{DD}=3.3V, f_v=60Hz, f_{CLX}=40MHz, T_a=25°C

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Power supply voltage	V _{DD} -V _{SS}		3.0	3.3	3.6	V	
Input logic voltage	V _{IH}	High level	2.0	-	V _{DD}	V	
	V _{IL}	Low level	V _{SS}	-	0.8		
Power Supply current	I _{DD}	Note 1	-	250	370	mA	

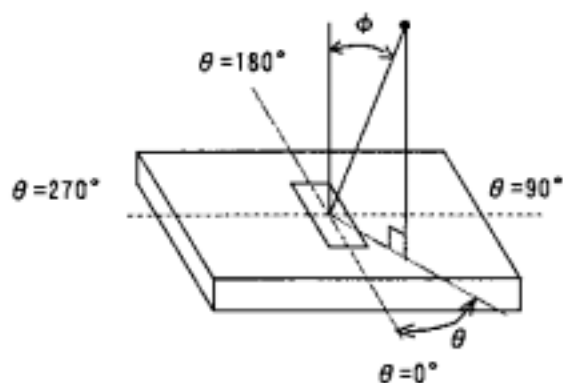
[Note 1] Typ. value : display pattern is 64 gray scale bar.

OPTICAL CHARACTERISTICS

Ta=25°C, Vpp=3.3V, fv=60Hz

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE	
Brightness	B	$\phi=0^\circ$	TBD	(170)	-	cd/m ²	Note 5,7	
Contrast ratio	CR	$\phi=0^\circ$	-	250	-	-	Note 2,4,7	
Viewing angle range	ϕ	CR>10	$\theta=0^\circ$	30	40	-	deg.	Note 1,2,4,7
			$\theta=90^\circ$	40	50	-		
			$\theta=180^\circ$	10	20	-		
			$\theta=270^\circ$	40	50	-		
Response time	Rise	tr	$\phi=0^\circ$	-	25	-	ms.	Note 3,4,7
	Fall	tf		-	15	-		
Color of CIE Coordinate	Red	x	$\phi=0^\circ$	-	(0.59)	-	-	Note 4,7
		y		-	(0.36)	-		
	Green	x		-	(0.32)	-		
		y		-	(0.56)	-		
	Blue	x		-	(0.15)	-		
		y		-	(0.13)	-		
	White	x		-	(0.33)	-		
		y		-	(0.35)	-		

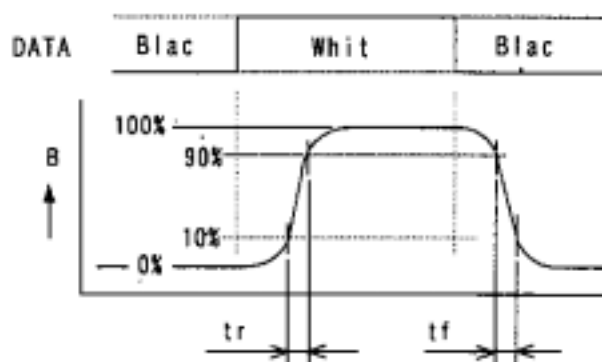
[Note 1] ϕ and θ



[Note 2] Definition of Contrast ratio "CR":

$$CR = \frac{\text{Brightness at ON}}{\text{Brightness at OFF}}$$

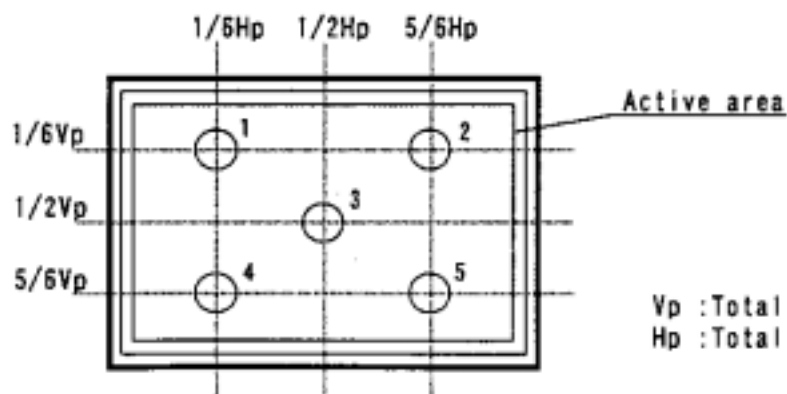
[Note 3] Definition of Response time:



[Note 4] Measurement point is the point 3 shown in Note 6. (center of active viewing area)

[Note 5] The brightness shall be the average of 5 points shown in Note 6.

[Note 6] Measurement points:



Vp : Total Number of Vertical pixel
Hp : Total Number of horizontal pixel

[Note 7] Measurement condition:

- ① Measurement equipment : BM-5A(TOPCON Corp.), Field=2°
- ② Ambient temperature : 25 ±2°C
- ③ LCD : All pixels are WHITE, V_{DD}=3.3V, f_v=60Hz
- ④ Measure after 30 minutes of CFL warm up.
- ⑤ I_L=6 mArms with the CFL inverter CXA-L0612A-VJL

■ BACKLIGHT CHARACTERISTICS

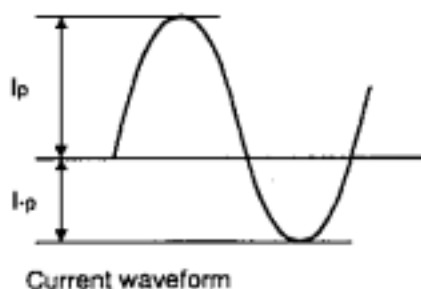
T_a=25°C

ITEM	SYM.	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Lamp voltage	V _L		-	(500)	-	Vrms	at I _L =6 mArms
Lamp current	I _L		(3)	-	(6)	mArms	(Recommended value)
Operating frequency	f _L		(40)	T. B. D	(65)	KHz	(Recommended value)
Start up voltage	V _s		-	-	(1200)	Vrms	at T _a = 0°C
Operating life	t _{OL}		20000	-	-	Hours	at I _L =6 mArms

[Note 1] Backlight driving conditions (operating frequency f_L especially) may interfere with horizontal frequency f_H, causing the beat or flicker on the display. Therefore the operating frequency f_L shall be adjusted in relation to horizontal frequency f_H to avoid interference.

[Note 2] The inverter open voltage should be larger than start up voltage, otherwise backlight may blinking for a moment after turns on or not be turned on.
And this voltage should be applied to lamp for more than 1 second to start up, otherwise backlight may not be turned on.

[Note 3] If driving current waveform is asymmetrical, mercury deviation inside of CFL will incline to one side and consequently abnormal lighting may occur. To prevent such unfavorable lighting, driving current waveform is asked to have unbalance rate of less than 10% and wave-height rate of less than $\sqrt{2} \pm 10\%$.
And this driving waveform shall be confirmed in your system.

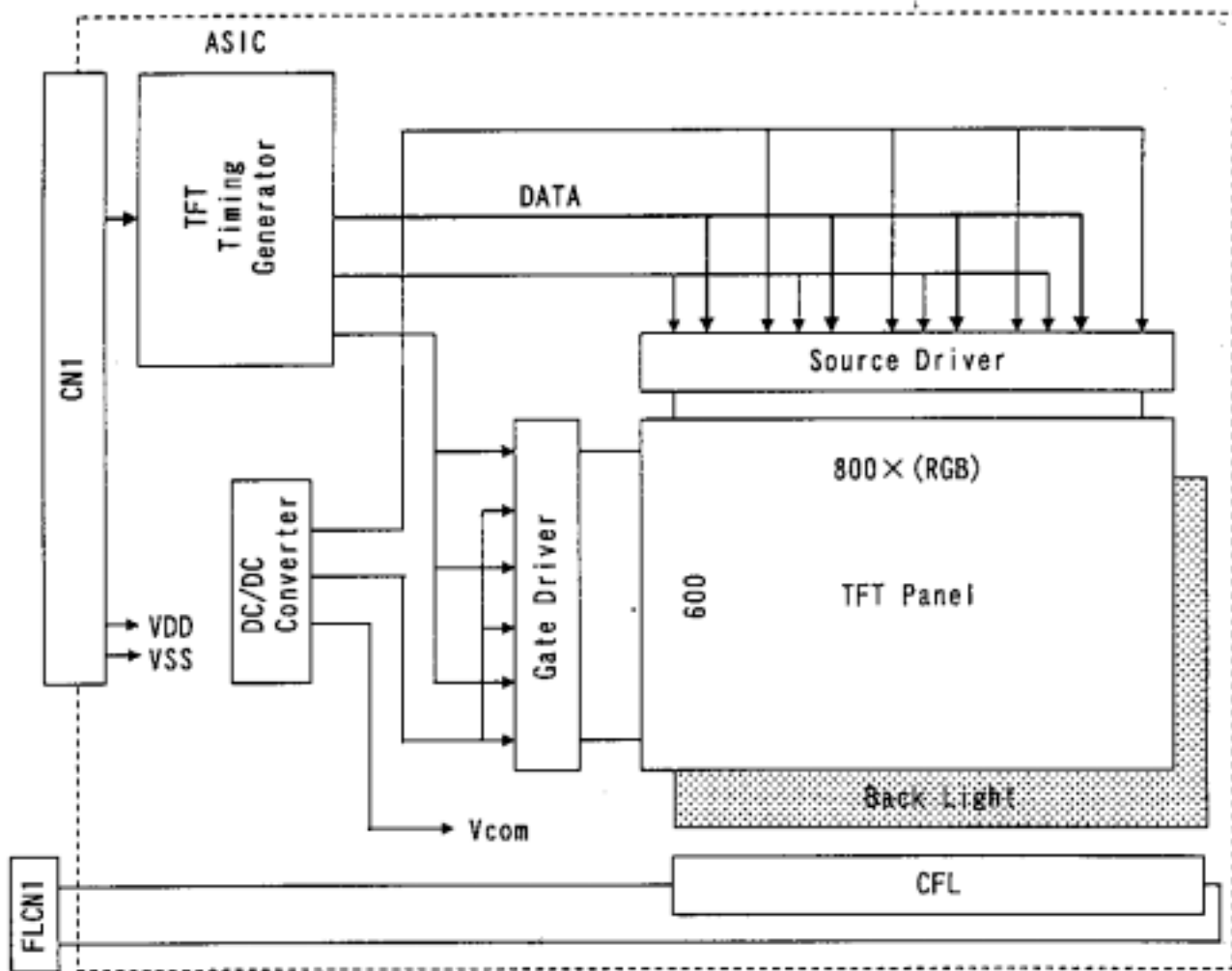


$$\text{Unbalance rate} = |I_p - I_{-p}| / I_L \times 100 (\%)$$

$$\text{Wave-height rate} = I_p \text{ (or } I_{-p}) / I_L$$

I_p : High peak value
I_{-p} : Low peak value
I_L : Effective value

■ BLOCK DIAGRAM



■ INTERFACE PIN CONNECTIONS

LCM : CNT

PIN NO.	SYMBOL	FUNCTION
1	VDD	Power Supply (3.3V normal)
2	VDD	Power Supply (3.3V normal)
3	DE	Data Enable (positive)
4	VSS	Ground
5	B5	Blue Data (MSB)
6	B4	Blue Data
7	B3	Blue Data
8	B2	Blue Data
9	B1	Blue Data
10	B0	Blue Data (LSB)
11	VSS	Ground
12	G5	Green Data (MSB)
13	G4	Green Data
14	G3	Green Data
15	G2	Green Data
16	G1	Green Data
17	G0	Green Data (LSB)
18	VSS	Ground
19	R5	Red Data (MSB)
20	R4	Red Data
21	R3	Red Data
22	R2	Red Data
23	R1	Red Data
24	R0	Red Data (LSB)
25	VSS	Ground
26	VSS	Ground
27	VSS	Ground
28	VSS	Ground
29	DCLK	Data Clock
30	VSS	Ground

CN1 : DF19L-30P-1H(HIROSE)

Suitable mating connector : FPC type ; DF19G-30S-1F(HIROSE)
: Cable type ; DF19G-30S-1C(HIROSE)

Back Light : FLCN1

PIN NO.	SYMBOL	FUNCTION
1	H.V	High voltage for CFL
2	LGND	Low voltage for CFL

FLCN1 : BHSR-02VS-1(JST)

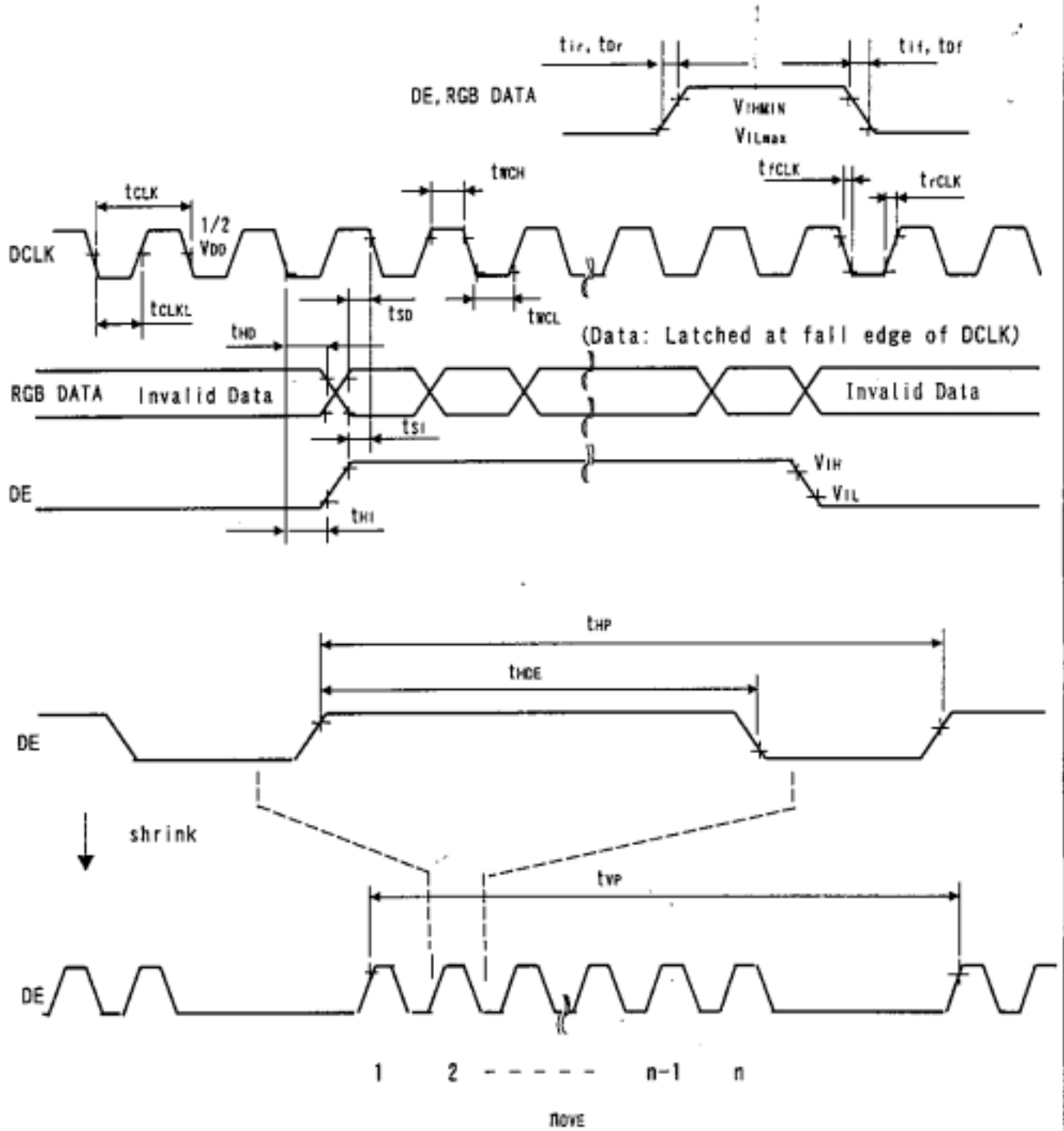
Suitable mating connector : SM02B-BHSS-1(JST)

■ SIGNAL TIMING PARAMETERS(DE_MODE)

	PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
DCLK	Frequency	f _{CLK}	38	40	41	MHz	t _{CLK} =1/f _{CLK}
	Width-Low	t _{wCL}	5	-	-	ns	
	Width-High	t _{wCH}	5	-	-	ns	
	Rise Time	t _{rCLK}	-	-	10	ns	
	Fall Time	t _{fCLK}	-	-	10	ns	
	Duty	D	(0.40)	0.50	(0.60)	-	D=t _{CLKL} /t _{CLK}
DE	Setup Time	t _{SI}	(3)	-	-	ns	For DCLK
	Hold Time	t _{HI}	(1.5)	-	-	ns	
	Horiz. Period	t _{HP}	950	1056	1100	t _{CLK}	
	Horiz. DE	t _{HDE}	800	800	800	t _{CLK}	
	Vert. Period	t _{VP}	609	628	800	t _{HP}	f _v =60Hz Typ.
	Vert. DE	t _{VDE}	600	600	600	n	
DATA	Setup Time	t _{SD}	3	-	-	ns	For DCLK
	Hold Time	t _{HD}	3	-	-	ns	
	Rise/Fall Time	t _{DR} , t _{DF}	-	-	10	ns	

[Note 1] f_H (Horizontal Frequency) = 1/t_{HP}
 f_V (Vertical Frequency) = 1/t_{VP}

■ INTERFACE SIGNAL TIMING DIAGRAM (DE_MODE)



■ **RELATIONSHIP BETWEEN INPUT DATA AND DISPLAY COLOR**

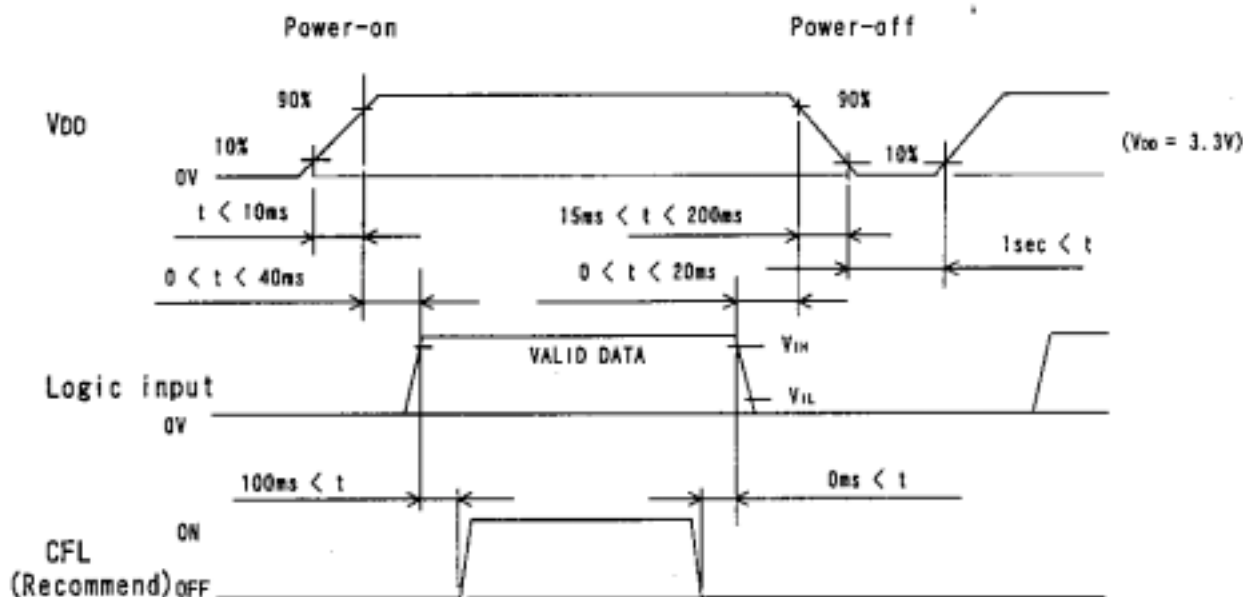
DISPLAY COLOR		INPUT DATA																	
		R DATA					G DATA					B DATA							
		MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB								
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
BASIC COLOR	BLACK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	RED (63)	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L
	GREEN (63)	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L
	BLUE (63)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H
	CYAN	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H
	MAGENTA	H	H	H	H	H	H	L	L	L	L	L	L	L	H	H	H	H	H
	YELLOW	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L
WHITE	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
RED	BLACK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	RED (1)	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L
	RED (2)	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L
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	RED (61)	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L
	RED (62)	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L
RED (63)	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	
GREEN	BLACK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	GREEN (1)	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L
	GREEN (2)	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L
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	GREEN (61)	L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L
	GREEN (62)	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L
GREEN (63)	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	
BLUE	BLACK	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
	BLUE (1)	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H
	BLUE (2)	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H
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	BLUE (61)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H
	BLUE (62)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L
BLUE (63)	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	

Note 1) Color(n) --- 'n' indicates gray scale step.

■ **RELATIONSHIP BETWEEN INPUT DATA AND DISPLAY POSITION**

1-1	1-2	1-3										1-799	1-800	
2-1	2-2														2-800
3-1														.	
.														.	
.														.	
.														.	
												Vp · Hp	R G B		
599-1														599-800	
600-1	600-2										600-799	600-800		

■ POWER ON/OFF SEQUENCE REQUIREMENT



When the power is off, logic input must be kept at either low level or high impedance.

Power sequence for CFL(backlight) is not specified especially, however it is recommended to consider some timing difference between logic input as shown above. If backlight lights on before LCD starts function, or if backlight is kept on after LCD stopped function, screen may look white for a moment or abnormal image may be displayed.

This is caused by variation in output signal from timing generator at logic input on or off. It does not cause damage to liquid crystal molecule and driving circuit.

■ PRECAUTIONS

1. This data sheet explains the outline of LCD module. Before designing your system with this LCD module, please ask for specification to understand our more precautions and recommendations.
2. Please avoid disassembling or modification of this module.
3. Since this LCD module consists of glass, dropping, pinching strongly or punching may break or result in damage. When glass breaks, please be careful not to be injured by glass piece.
4. When glass breaks and fluid flows out, do not suck in, drink or touch the fluid. If the fluid should stick to hand or clothes, wipe off with soap or alcohol immediately and then wash it with water. If the fluid should get in eyes, wash eyes immediately with washing lotion for more than 15 minutes and then consult the doctor.
5. Since high voltage is applied to CFL during lighting, please make design to avoid electric shock or take care in handling. Since poor connection of CFL connector may cause burning due to leakage of high voltage, please make sure of proper connection.
6. CFL contains mercury inside. Please follow regulations or rules established by local autonomy at its disposal.
7. Please do not rub, press or touch the display surface with hard material or jigs, because the polarizer at surface can be easily scratched. When the display surface gets a drop of water or contamination, wipe it off lightly with soft cloth.
8. Since this LCD module contains semiconductors, please pay attention against static-electricity in handling.
9. Please switch OFF power supply before connecting or disconnecting interface connector.
10. For storage, please store under room temperature, low humidity and dark circumstance in original packing condition.

