SHARP

No.	LD – 19X54
DATE	Oct. 11. 2007

TECHNICAL LITERATURE

FOR

TFT - LCD module

These parts have corresponded with the RoHS directive.

MODEL No. LQ121K1LG11

The technical literature is subject to change without notice. So, please contact SHARP or its representative before designing your product based on this literature.

Engineering department
Mobile LCD Division Ⅲ
MOBILE LIQUID CRYSTAL DISPLY GROUP
SHARP CORPORATION

RECORDS OF REVISION

LQ121K1LG11

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-19X54	Oct. 11. 2007	–	–	–	1st Issue

1. Application

This technical literature applies to the color 12.1W TFT-LCD module LQ121K1LG11.

The device listed in these technical literature sheets was designed and manufactured for use in general electronic equipment.

In case of using the device for applications such as control and safety equipment for transportation (controls of aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.

Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment(trunk lines), nuclear power control equipment and medical or other equipment for life support.

SHARP assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in these technical literature sheets.

Confirm "10. Handling Precautions " item when you use the device.

Contact and consult with a SHARP sales representative for any questions about this device.

2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a back light unit. Graphics and texts can be displayed on a 1280×RGB×800 dots panel with about 16 million colors by using LVDS (Low Voltage Differential Signaling) and supplying +3.3V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight.

Viewing angle is 6 o'clock direction. It is a wide viewing-angle-module.

Backlight-driving DC/AC inverter is not built in this module.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	31 (Diagonal)	cm
	12.1 (Diagonal)	Inch
Active area	261.12 (H)×163.2 (V)	mm
Pixel format	1280 (H)×800 (V)	Pixel
	(1 pixel=R+G+B dots)	
Pixel pitch	0.204 (H)×0.204 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Aspect ratio	16:10	
Display mode	Normally white	
Unit outline dimensions *1	278.0(W)×184.0(H)×11.3(D)	mm
Mass	640	g
Surface treatment	Anti-glare and hard-coating 3H	

*1.Note: excluding back light cables, cover and pet sheet.

The thickness of module (D) doesn't contain the projection.

Outline dimensions are shown in Fig.1.

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V DC power supply)

Using connectors : DF14H-20P-1.25H (56) (Hirose Electric Co., Ltd.)

Corresponding connectors : DF14-20S-1.25C (connector) (Hirose Electric Co., Ltd.)

: DF14-2628SCFA (terminal) (Hirose Electric Co., Ltd.)

Using LVDS receiver : Type contained in a control IC

(THC63LVDF84A (THINE) equivalent)

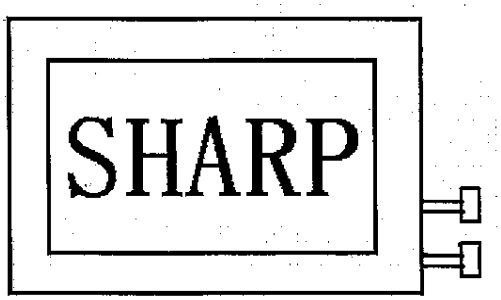
Corresponding LVDS Transmitter : THC63LVDM83R (THINE) or equivalent)

(※) Please do not use it besides corresponding connector

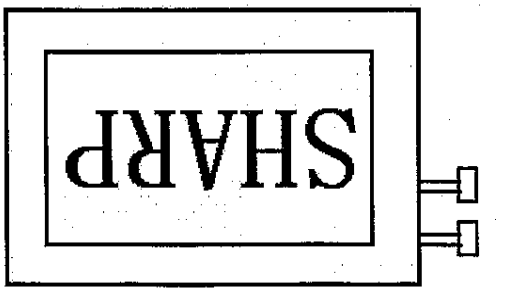
Pin No.	Symbol	Function	Remark
1	Vcc	+3.3V Power supply	
2	Vcc	+3.3V Power supply	
3	GND		
4	GND		
5	RxIN0-	Receiver signal (-)	LVDS
6	RxIN0+	Receiver signal (+)	LVDS
7	GND		
8	RxIN1-	Receiver signal (-)	LVDS
9	RxIN1+	Receiver signal (+)	LVDS
10	GND		
11	RxIN2-	Receiver signal (-)	LVDS
12	RxIN2+	Receiver signal (+)	LVDS
13	GND		
14	CK IN-	Receiver signal (-)	LVDS
15	CK IN+	Receiver signal (+)	LVDS
16	GND		
17	RxIN3-	Receiver signal (-)	LVDS
18	RxIN3+	Receiver signal (+)	LVDS
19	RL/UD	Horizontal/Vertical display mode select signal	【Note1】
20	SELLVDS	LVDS_SET	【Note2】

【note1】

RL/UD= "LOW"



RL/UD= "HIGH"



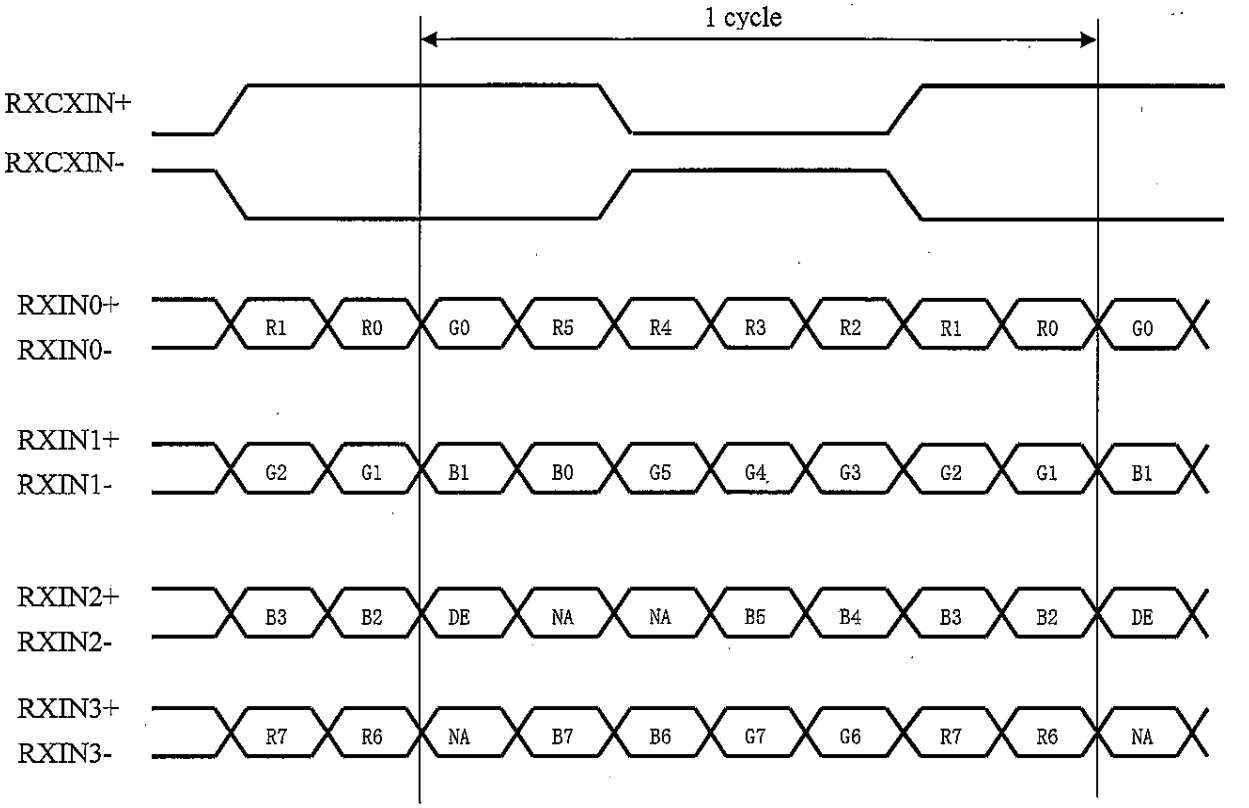
4-2. Data Mapping

1) 8 bit input

【note2】 pin assignment with LVDS_SET pin (Thine: THC63LVDM83R)

Transmitter		20pin SELLVDS	
Pin No	Data	= L (GND) or Open	= H (3.3V)
51	TA0	R0 (LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7 (MSB)
4	TA6	G0 (LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7 (MSB)
15	TB5	B0 (LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	B4	B6
24	TC3	B5	B7 (MSB)
27	TC4	(NA)	(NA)
28	TC5	(NA)	(NA)
30	TC6	DE	DE
50	TD0	R6	R0 (LSB)
2	TD1	R7 (MSB)	R1
8	TD2	G6	G0 (LSB)
10	TD3	G7 (MSB)	G1
16	TD4	B6	B0 (LSB)
18	TD5	B7 (MSB)	B1
25	TD6	(NA)	(NA)
31	CLK IN	CLK	CLK

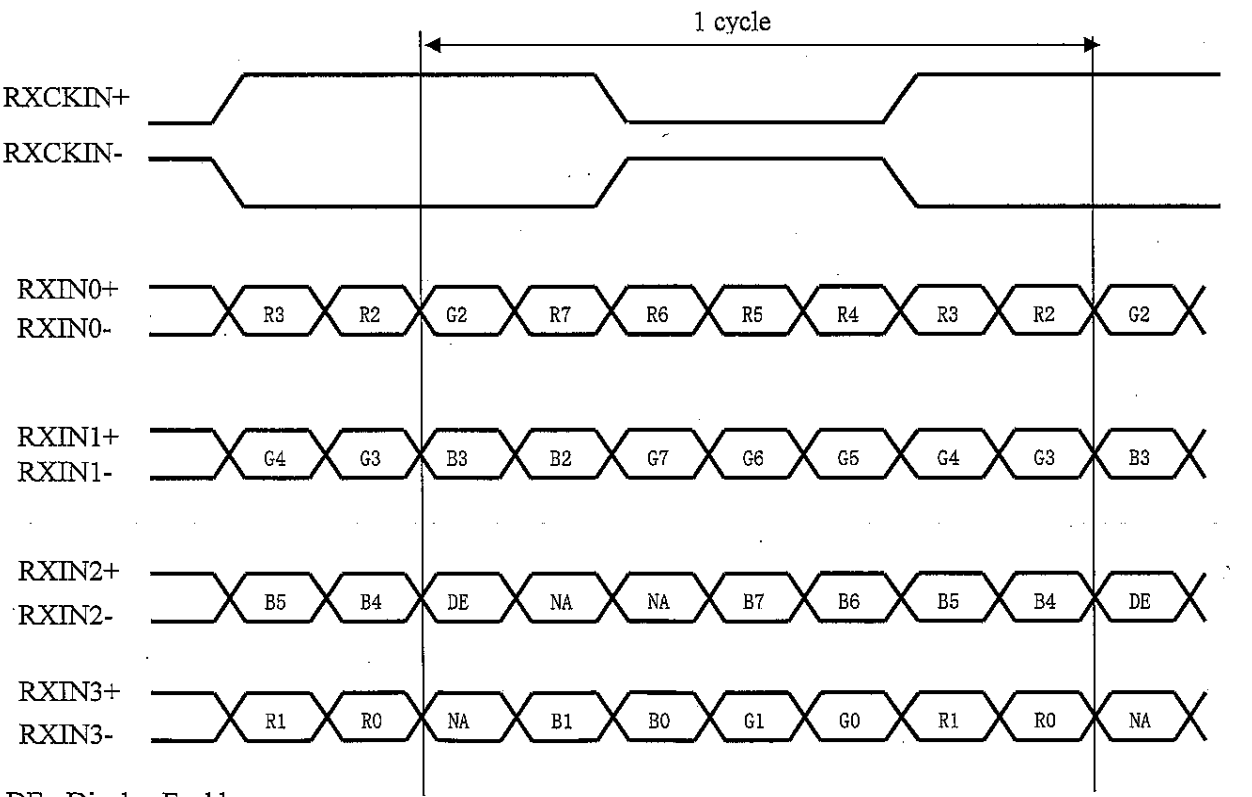
<SELLVDS = L or Open>



DE : Display Enable

NA : Not Available

<SELLVDS=H>



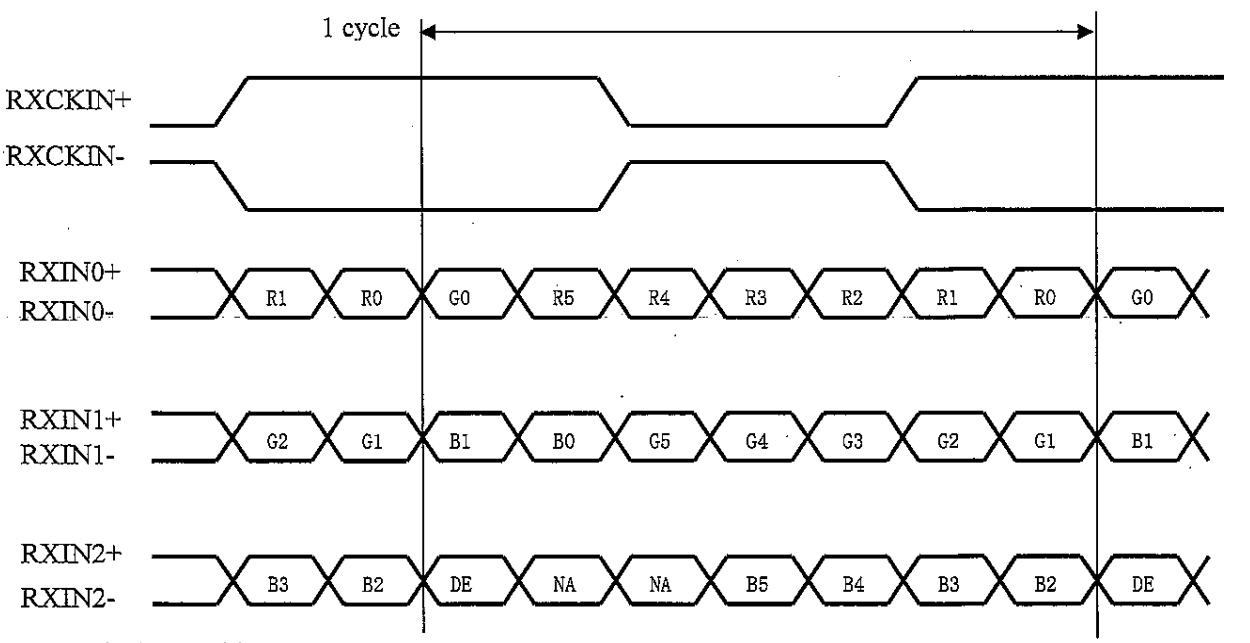
DE : Display Enable

NA : Not Available

2) 6 bit input

【note1】 pin assignment with SELLLVDS pin (Thine: THC63LVDM83R)

Transmitter		20pin SELLVDS	
Pin No	Data	= L (GND) or Open	= H (3.3V)
51	TA0	_	R0 (LSB)
52	TA1	_	R1
54	TA2	_	R2
55	TA3	_	R3
56	TA4	_	R4
3	TA5	_	R5 (MSB)
4	TA6	_	G0 (LSB)
6	TB0	_	G1
7	TB1	_	G2
11	TB2	_	G3
12	TB3	_	G4
14	TB4	_	G5 (MSB)
15	TB5	_	B0 (LSB)
19	TB6	_	B1
20	TC0	_	B2
22	TC1	_	B3
23	TC2	_	B4
24	TC3	_	B5 (MSB)
27	TC4	_	(NA)
28	TC5	_	(NA)
30	TC6	_	DE
50	TD0	_	GND
2	TD1	_	GND
8	TD2	_	GND
10	TD3	_	GND
16	TD4	_	GND
18	TD5	_	GND
25	TD6	_	(NA)

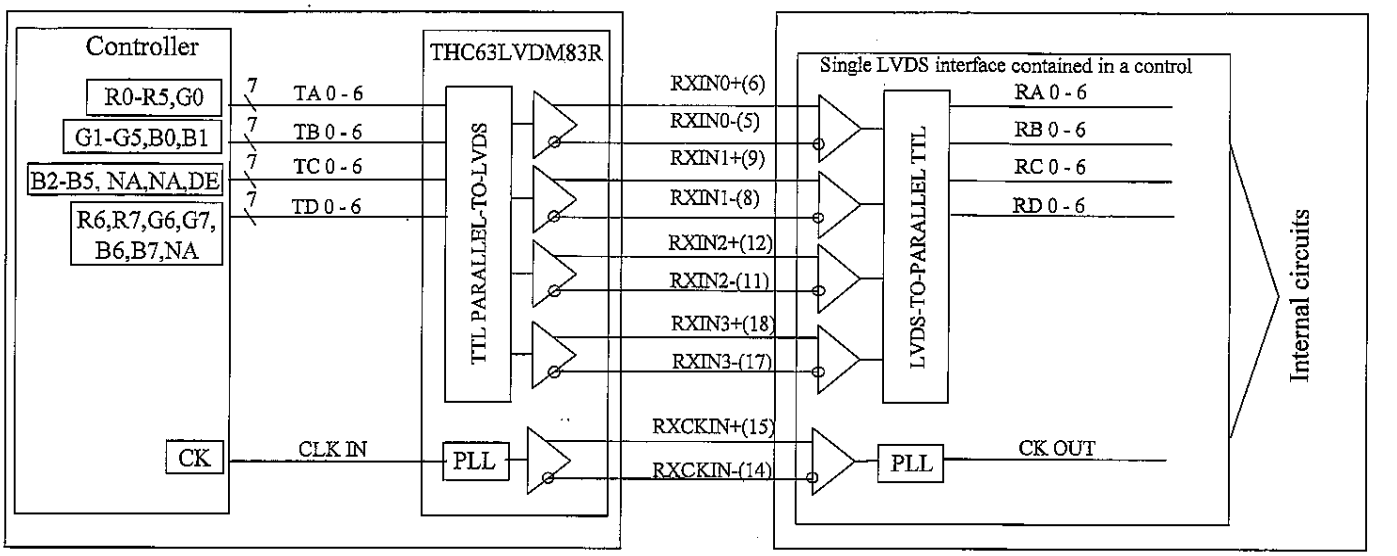


DE : Display Enable

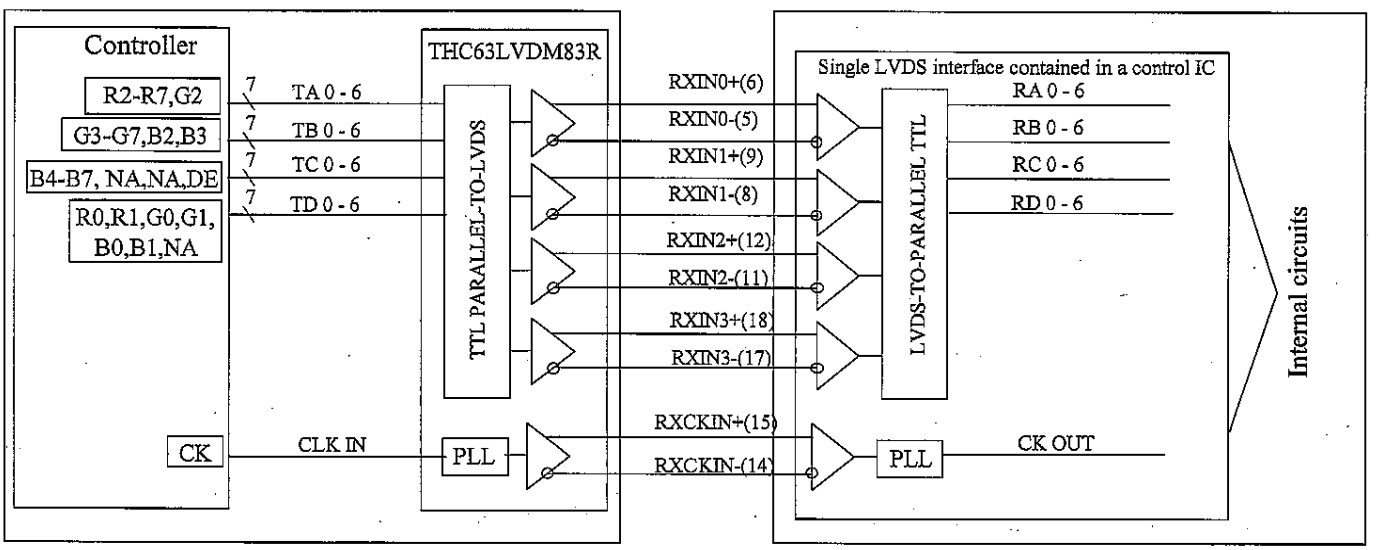
NA : Not Available

(Computer Side) (TFT-LCD side)

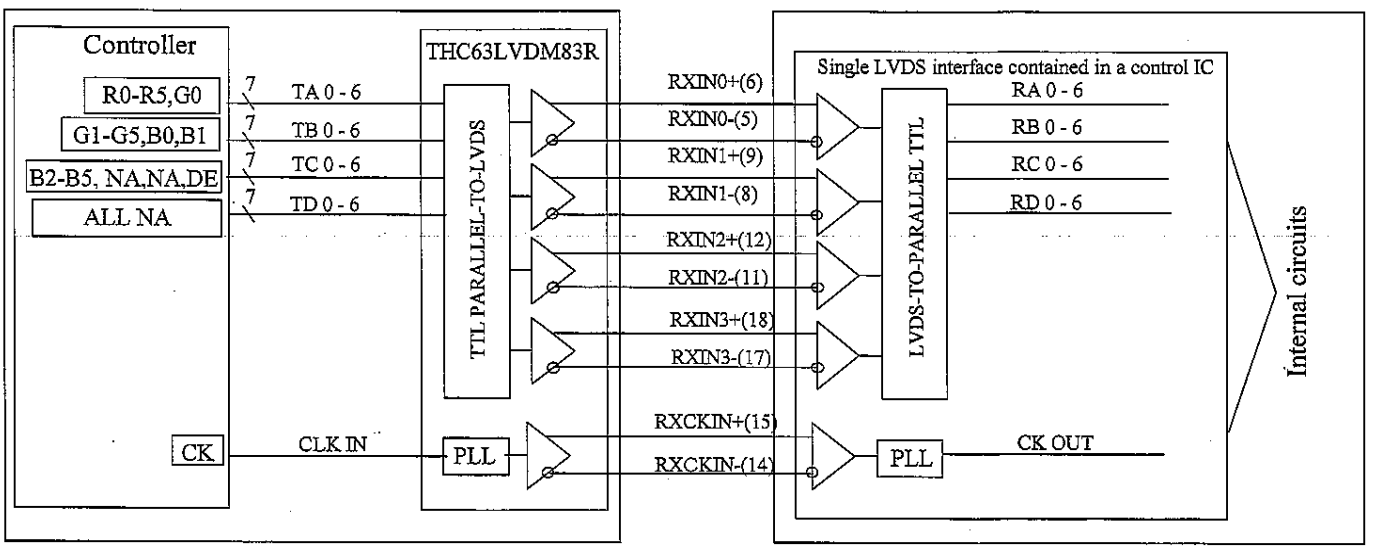
①8Bit Mode
SELLVDS=H (20 pin=3.3[V])



②8Bit Mode
SELLVDS=L (20 pin=GND)



③6Bit Mode
SELLVDS=L (20 pin=GND)



4-4. Backlight

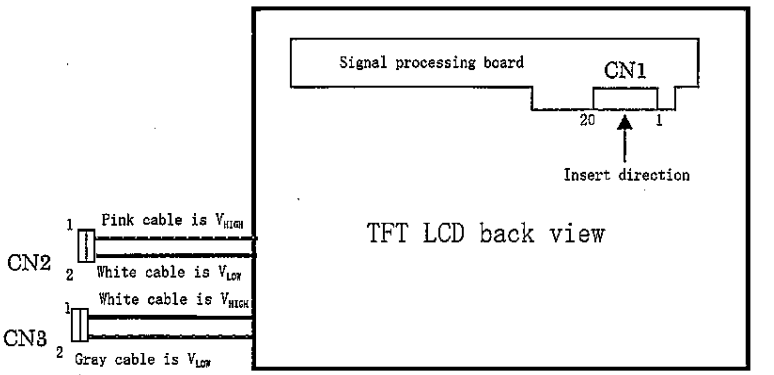
CN 2, 3

The module-side connector : BHR-02(8.0)VS-1N (JST)

The user-side connector : SM02(8.0)B-BHS-1-TB (JST)

The user-side connector : SM02(8.0)B-BHS-1R-TB (JST)

Pin no.	symbol	Function	Color of FL cable	
			CN 2	CN 3
1	V_{HIGH}	Power supply for lamp (High voltage side)	Pink	White
2	V_{LOW}	Power supply for lamp (Low voltage side)	White	Gray



5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Terminal Symbol	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	Vcc	-0.3 ～ +4.0	V	【Note1】
Input voltage	VI1	Ta=25℃	RXINi-/+(i=0,1,2,3) RXCLK IN-/+	-0.3 ～ Vcc+0.3	V	
	VI2	Ta=25℃	RL/UD,SELLVDS	-0.3 ～ Vcc+ 0.3	V	
Lamp input voltage	T_{HIGH}	—	T_{HIGH}(CN2,CN3)	0 ～ +2000	Vrms	【Note1,2】
Storage temperature	T_{STG}	—	—	-25 ～ + 70	℃	【Note1】
Operating temperature	T_{OPA}	Ambient	—	0 ～ + 70 (Panel surface)	℃	【Note1,3】

【Note1】 Humidity : 95%RH Max. (Ta≦40℃)

Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃)

No condensation.

【Note2】 Do not keep the high voltage when the lamp does not work.

【Note3】 In the operation temperature, there is possibility of causing deterioration in display fineness such as screen irregularity though it does not arrive at destruction when used in 50℃＜T_{OPA}≦70℃.

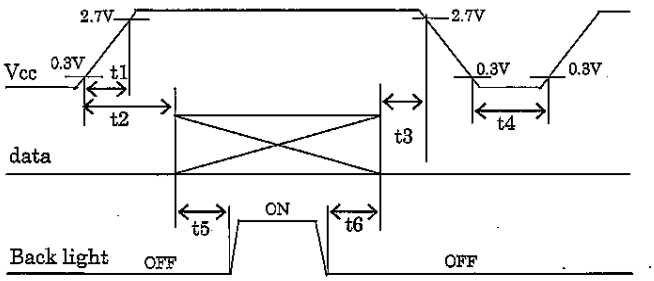
6. Electrical Characteristics

6-1. TFT-LCD panel driving Ta=+25℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{CC}	+3.0	+3.3	+3.6	V	【Note3】
Current dissipation	Vcc=3.3V	I_{CC}	—	(450)	(530)	mA	【Note4】
Input voltage for LVDS	LVDS signal	V_L	0	—	2.4	V	
Permissive input ripple voltage		V_{RP}	—	—	100	mVp-p	Vcc=+3.3V
Differential input threshold voltage	High	V_{TH}	—	—	V_{CM} +100	mV	V_{CM}=+1.2V
	Low	V_{TL}	V_{CM} -100	—	—	mV	【Note1】
Input voltage	High	V_{IH}	2.1	—	—	V	【Note2】
	Low	V_{IL}	—	—	0.8	V	
Input current	High	I_{OH}	—	—	400	μA	V_{12}=+3.3V 【Note2】
	Low	I_{OL}	-10	—	+10	μA	V_{12}=0V 【Note2】
Terminal resistor		R_T	—	100	—	Ω	Differential input

【Note1】 V_{CM} : Common mode voltage of LVDS driver.
【Note2】 RL/UD, SELLVDS

【Note3】 On-off condition for supply voltage

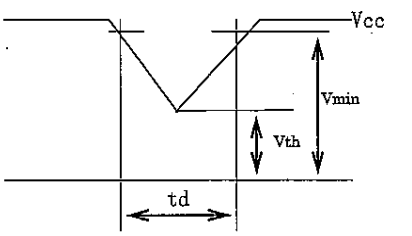


0<t1≦10ms 0<t2≦20ms

0<t3≦1s 1s≦t4

200ms≦t5 200ms≦t6

Vcc-dip conditions

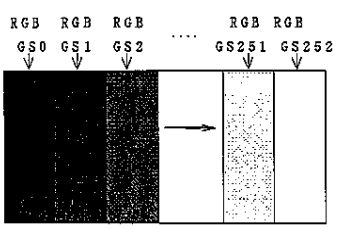


1) Vth ≦ Vcc < Vmin
td ≦ 10ms

2) Vcc<Vth
Vcc-dip conditions should also follow the on-off conditions for supply voltage.

As for the power sequence for backlight, it is recommended to apply above mentioned input timing. If the backlight is lit on and off at a timing other than shown above, displaying image may get disturbed. This is due to variation of output signal from timing generator when LVDS signal is changed from on to off or vice versa, but has no harm to the module itself.

【Note4】 Typical current situation : 253-gray-bar pattern
Vcc=+3.3V, fck=83.5MHz, Ta=25℃
Refer to Chapter 8 for RGB each gray scale

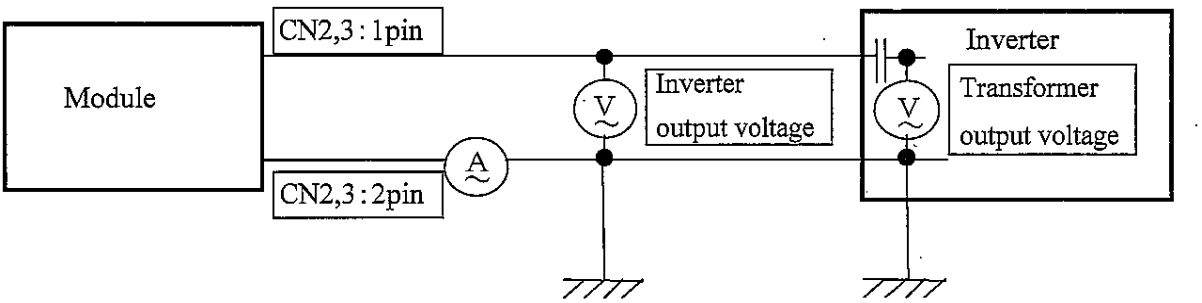


6-2. Backlight

The back light system is an edge-lighting type with 2 CCFTs (Cold Cathode Fluorescent Tube).
The characteristics of the lamp are shown in the following table.
The value mentioned below is at the case of one CCFT.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp current range	I_L	3.0	6.5	7.0	mArms	【Note1】
Lamp voltage	V_L	—	515	580	Vrms	I_L=6.5 mArms Ta=25℃
Lamp power consumption	P_L	—	3.1	—	W	【Note2】
Lamp frequency	F_L	40	—	70	kHz	【Note3】
Kick-off voltage 【Note4】	Vs	—	—	1180	Vrms	Inverter output voltage, Ta=0℃
		—	—	1420		Transformer output voltage, Ta=0℃
Lamp life time	L_L	50,000 (Lamp unit)	—	—	hour	(6.5) mA 【Note5】

【Note1】 Lamp current measure by high frequency current measurement equipment connected to V_{LOW} at circuit showed below.



【Note2】 Referential data per one CCFT by calculation (I_L × V_L) .
The data don't include loss at inverter. (I_L=6.5 mArms)

【Note3】 Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, adjust lamp frequency, and keep inverter as far as from module or use electronic shielding between inverter and module to avoid interference.

【Note4】 The open output voltage of the inverter shall be maintained for more than 1s; otherwise the lamp may not be turned on.

【Note5】 Above value is applicable when lamp is placed horizontally.
Lamp life time is defined that it applied either ① or ② under this condition
(Continuous turning on at Ta=25 °C, I_L=6.5mArms)
① Brightness becomes 50% of the original value under standard condition.
② Kick-off voltage at Ta=0°C exceeds maximum value, (1,420)Vrms.
(Lamp life time may vary if lamp is in portrait position due to the change of mercury density inside the lamp.)
Lamp life time shortens according to the state of mounting and use.
In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.(Continuous operating for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.)
In case of such usage under lower temp environment, periodical lamp exchange is recommended.

【Note6】 The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occur. when you confirm it, the module should be operated in the same condition as it is installed in your instrument.
Be sure to use a back light power supply with the safety protection circuit such as the detection circuit for the excess voltage, excess current and or electric discharge waveform.
Be sure to use the detect circuit by which one side of the CCFT lamps can be controlled independently. Otherwise, when one side of the CCFT is open, the excess current may possibly be applied to the other side of the lamp.

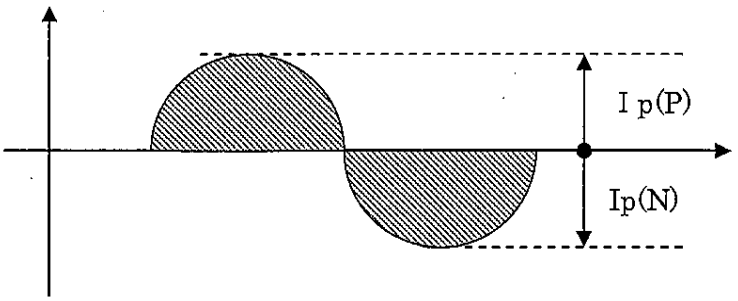
【Note7】 It is required to have the inverter designed so that to allow the impedance deviation of the two CCFT lamps and the capacity deviation of ballast capacitor.

【Note8】 Under the environment of 10 lx or less, lamp may not turn on or it may take some time to turn on.

【Note9】 A lamp waveform should satisfy the following conditions.

Wave efficiency : $1.20 \leqq Ip(P) / Irms \text{ or } Ip(N) / Irms \leqq 1.63$

Imbalanced value: $0.95 \leqq Ip(P) / Ip(N) \leqq 1.05$

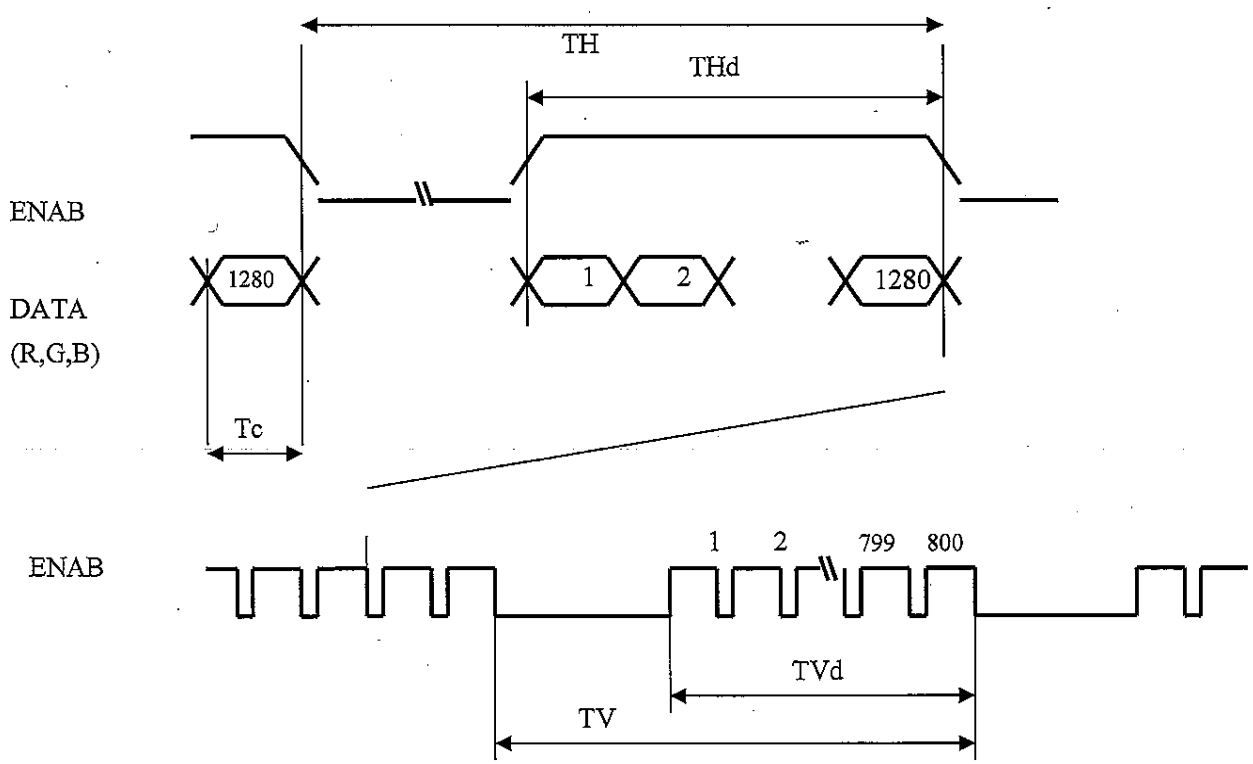


7. Timing characteristics of input signals

7-1. Timing characteristics

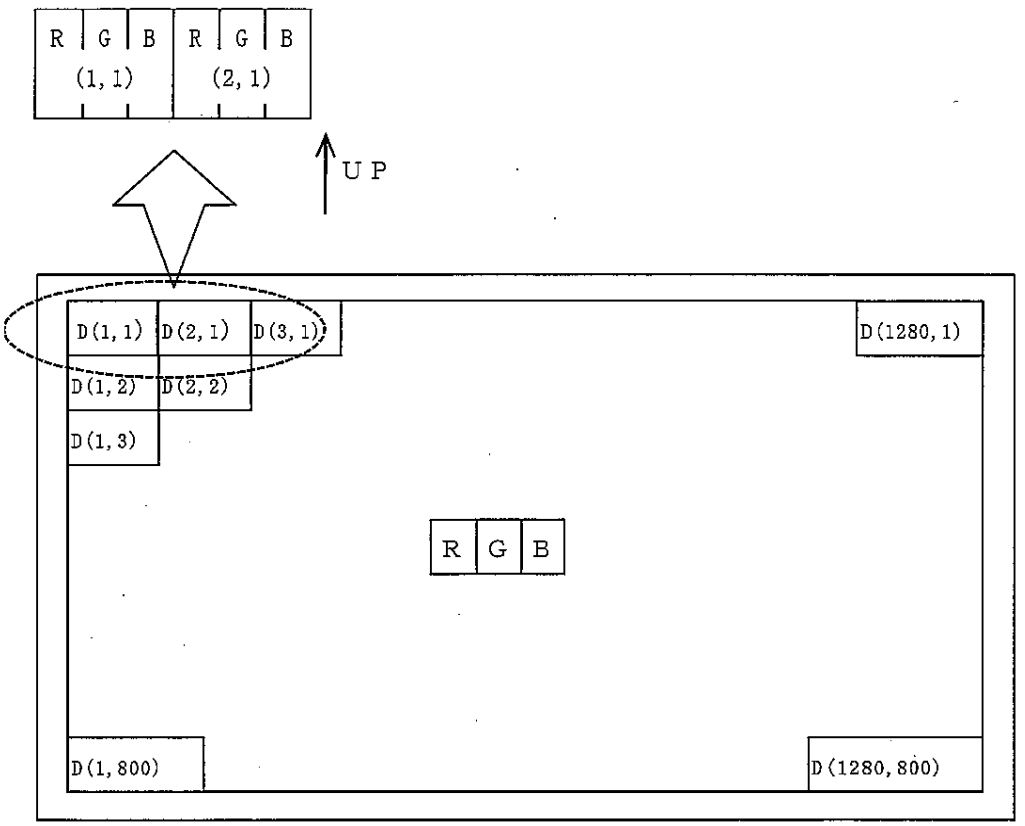
Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock signal	Frequency	1/Tc	60	83.5	85	MHz
ENAB signal	Horizontal period	TH	1480	1680	1880	clock
			17.41	20.12	-	μs
	Horizontal period (High)	THd	1280	1280	1280	clock
	Vertical period	TV	803	831	831	line
			15.87	16.72	-	ms
	Vertical period (High)	TVd	800	800	800	line

【Note】 In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



7-2. Input Data Signals and Display Position on the screen

Display position of input data (H, V)



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

8-1. 8bit input

	Colors & Gray scale	Gray Scale	Data signal																							
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	—	0	0	0	0	0	0	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	0	0	0	0	X	X	1	1	1	1	1	1
	Green	—	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	—	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1
	Red	—	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	—	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1
	Yellow	—	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	—	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS251	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS252	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS251	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS252	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1
	⇩	GS251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
	Blue	GS252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage. X : Don't care

Each basic color can be displayed in 253 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16-million-color display can be achieved on the screen.

8-2. 6bit input

	Colors & Gray scale	Gray Scale	Data signal																	
			R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	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	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	⇩	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	⇩	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage.

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

9. Optical Characteristics

Ta=25℃, Vcc =+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21, θ 22	CR≧10	70	80	—	Deg.	
	Vertical	θ 12		60	70	—	Deg.	
		θ 11		60	70	—	Deg.	
Contrast ratio		C R	Optimum viewing angle	250	400	—		【Note2,4】
Response Time		τ r+ τ d	θ =0°	—	35	—	ms	【Note3,4,5】
Chromaticity of White		x		0.263	0.313	0.363		【Note4】
		y		0.279	0.329	0.379		
Chromaticity of Red		x		—	0.581	—		
		y		—	0.322	—		
Chromaticity of Green		x		—	0.307	—		
		y		—	0.546	—		
Chromaticity of Blue		x		—	0.151	—		
		y		—	0.581	—		
Luminance of white		YLI		300	370	—	cd/m^2	【Note4】
White Uniformity		δ w		—	—	1.33		【Note5】

※The measurement shall be executed 30 minutes after lighting at rating.(IL=6.5mArms)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

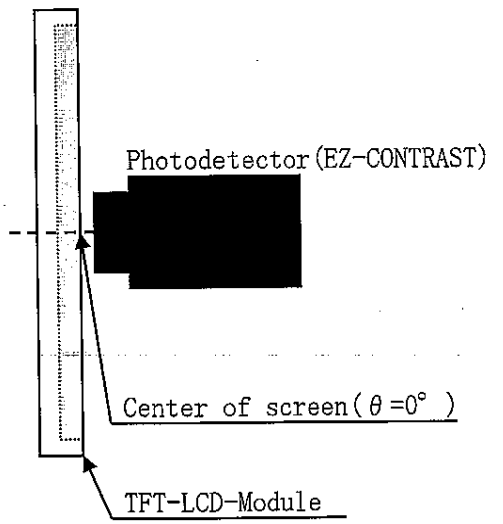


Fig2-1 Viewing angle measurement method

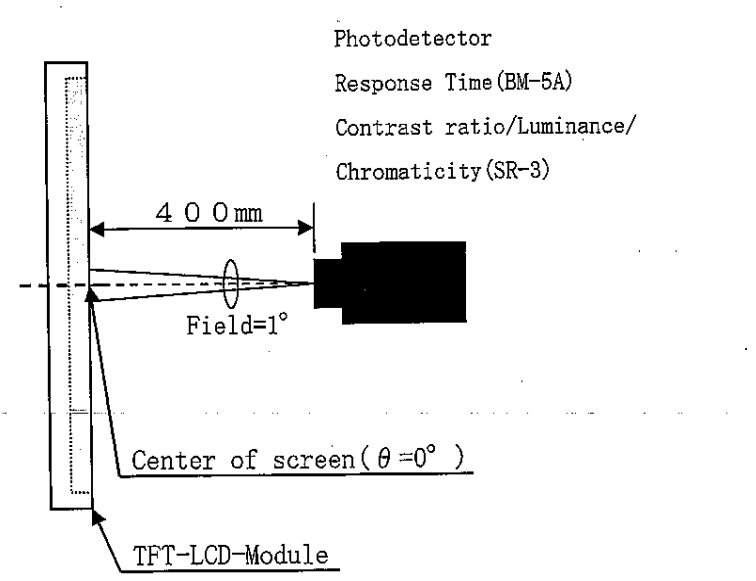
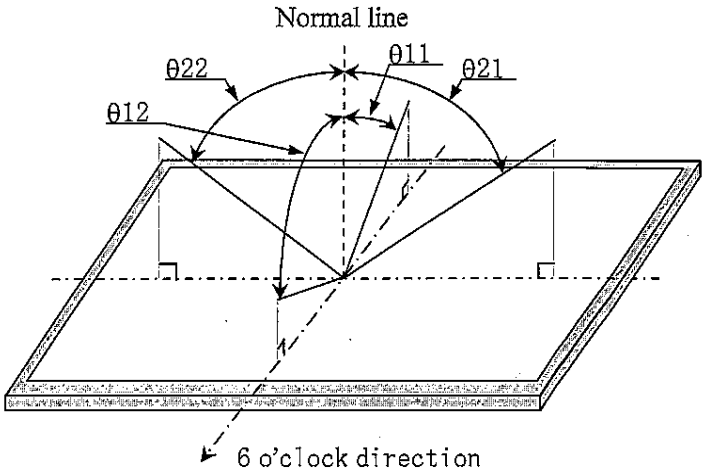


Fig2-2 Luminance/Contrast ratio/Response time/Chromaticity measurement method

Fig2 Optical characteristics measurement method

【Note1】 Definitions of viewing angle range:



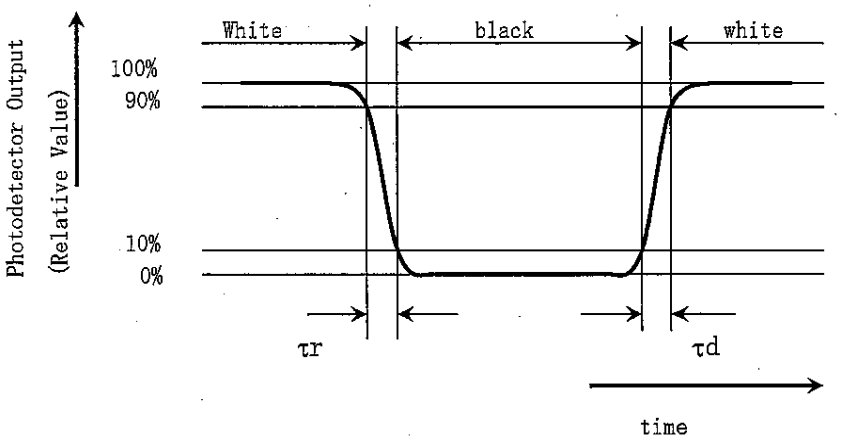
【Note2】 Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note3】 Definition of response time:

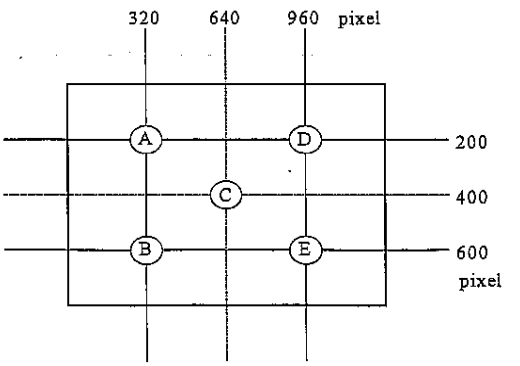
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



【Note4】 This shall be measured at center of the screen.

【Note5】 Definition of white uniformity:

White uniformity is defined as the following with five measurements (A~E).



$$\delta w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

10. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.

c) Since the front polarizer is easily damaged, pay attention not to scratch it.
Blow away dust on the polarizer with antistatic N_2 blow. It is undesirable to wipe off because a polarizer is sensitive.
It is recommended to peel off softly using the adhesive tape when soil or finger oil is stuck to the polarizer.
When unavoidable, wipe off carefully with a cloth for wiping lenses.

d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.

h) Since there is a circuit board in the module back, stress is not added at the time of a design assembly. Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.

i) Protection film is attached to the module surface to prevent it from being scratched .
Peel the film off slowly, just before the use, with strict attention to electrostatic charges.
Blow off 'dust' on the polarizer by using an ionized nitrogen.

j) The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

k) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.

l) Connect GND to 4 place of mounting holes to stabilize against EMI and external noise.

m) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to electrical shock. When exchange lamps or service, turn off the power without fail.

n) When handling LCD modules and assembling them into cabinets, please avoid that long-terms storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the modules.

o) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.

p) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter, or line processing.

q) When install LCD modules in the cabinet, please tighten with "torque = (0.196)N·m(Max).
Be sure to confirm it in the same condition as it is installed in your instrument.

r) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.

s) Notice : Never dismantle the module , because it will cause failure.

t) Be careful when using it for long time with fixed pattern display as it may cause afterimage.
(Please use a screen saver etc., in order to avoid an afterimage.)

u) Adjusting volume have been set optimally before shipment, so do not change any adjusted value.
If adjusted value is changed, the specification may not be satisfied.

v) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

w) The lamp used for this product is very sensitive to the temperature.
Luminance decreases rapidly when it is used for a long time or repeatedly under the environment of the low temperature or the module is being cooled.
Please avoid the continuous or repeating use of it under such an environment.
It may decrease up to 50% of the initial luminance in about one month under the low temperature environment.
Please consult our company when it is used under the environment like the above mentioned.

x) In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.(Continuous operating for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.)
The life of a lamp is accelerated when using it in the environment where a lamp cannot get warm easily. (When using it outdoors and ON/OFF is repeated frequently)
In case of such usage under lower temp environment, periodical lamp check and exchange is recommended.

11. Packing form

TBD

12. Reliability test items

No	Test item	Conditions	
1	High temperature storage test	Ta = 70℃ 240h	
2	Low temperature storage test	Ta = -25℃ 240h	
3	High temperature & high humidity operation test	Ta = 40℃ ; 95%RH 240h (No condensation)	
4	High temperature operation test	Ta = 70℃ 240h	
5	Low temperature operation test	Ta = 0℃ 240h	
6	Vibration test (non- operating)	Waveform : Sine wave Frequency : 10～57Hz/Vibration width (one side) : 0.075mm : 58～500Hz/Gravity : 9.8m/s^2 Sweep time : 11minutes Test period : 3 hours (1 hour for each direction of X,Y,Z)	【Note】
7	Shock test	Max. gravity : 490m/s^2 Pulse width : 11ms, half-sine wave Direction : ±X, ±Y, ±Z, once for each direction.	
8	Thermal shock test (non- operating)	Ta=-30℃～75℃ ; 5 cycles Test period : 10 hours (1 hour for each temperature)	【Note】
9	Electrostatic discharge test (non- operating)	Contact discharge (150pF 330Ω): non-operation=±10kV, operation=±8kV Aerial discharge (150pF 330Ω): non-operation=±20kV, operation=±15kV	

【Note】
A gap of panel shall not occur by vibration or the shock.

【Result Evaluation Criteria】
Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

13. Others

13-1. Lot No. Label:

Label format: TBD

Manufacturing country: Japan, China, Taiwan

13-2. Packing box Label:

TBD

13-3. The chemical ozone depleting substance is not used.

13-4. Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal. (It marks on the back of the module.)

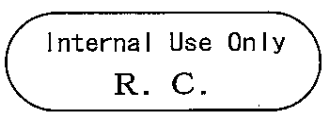
・COLD CATHODE FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL AMOUNT OF MERCURY, PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR DISPOSAL. ・当該液晶ディスプレーパネルは蛍光管が組込まれていますので、地方自治体の条例、または、規則に従って廃棄してください。

13-5. If any problem occurs in relation to the description of this specification, it shall be resolved through discussion with spirit of cooperation.

The figure left below (cardboard box recycling symbol mark) is written to the packing box.
And, the figure right below is written to the packing box of the settlement for the RoHS restriction.

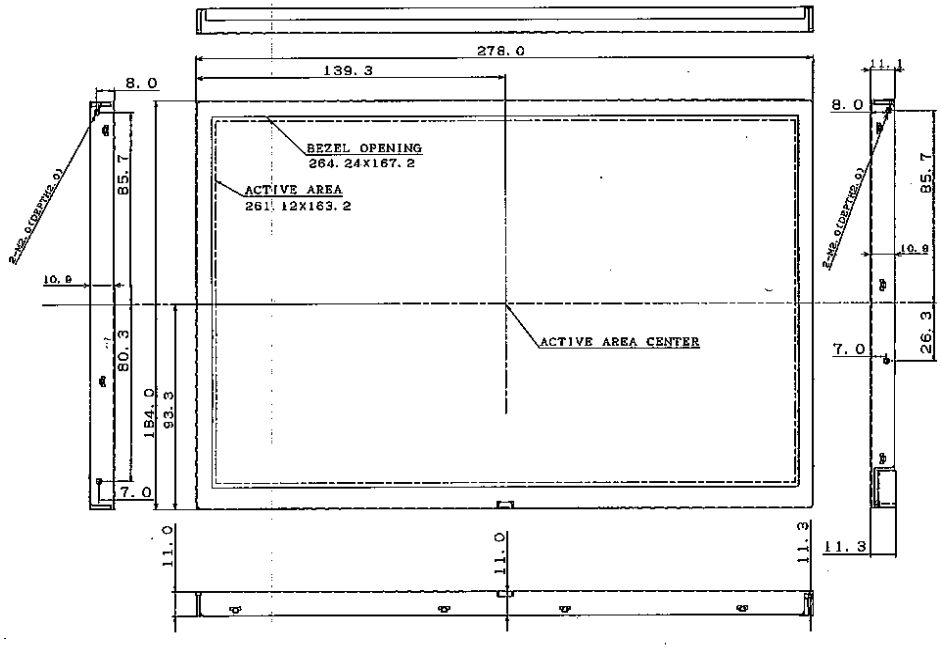
※ R.C. (RoHS Compliance) means it suits the RoHS directive.
This LCD module is compliant with RoHS Directive.

Cardboard box・
Recycling symbol mark

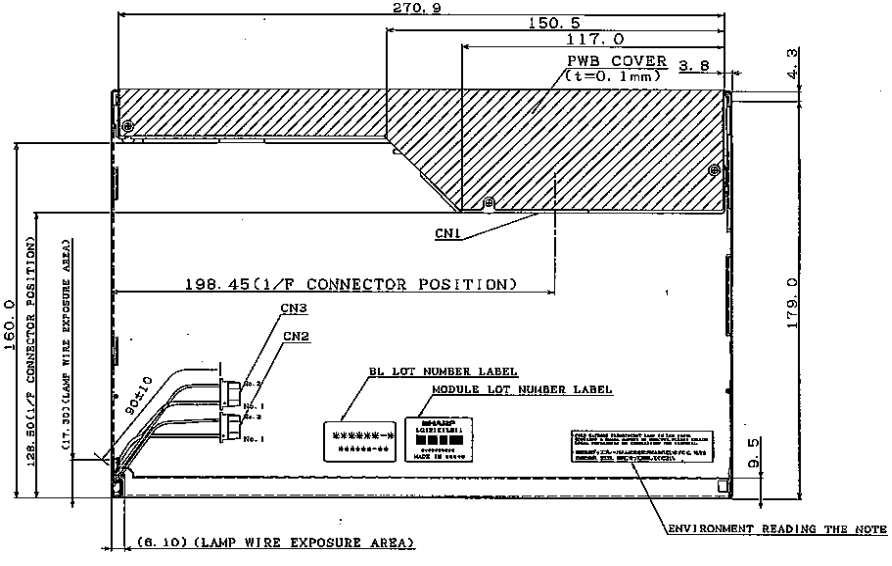


Mark for RoHS directive

FRONT VIEW



REAR VIEW



INTERFACE CONNECTOR

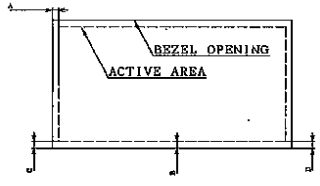
CN1 : PIN LAYOUT

Pin	1	2	3	4	5	6	7
	VCC	VCC	GND	GND	RxIN0-	RxIN0+	GND
8	9	10	11	12	13	14	15
RxIN1-	RxIN1+	GND	RxIN2-	RxIN2+	GND	CK IN-	CK IN+
16	17	18	19	20			
GND	RxIN3-	RxIN3+	RL/UD	SELLVDS			

CORRESPONDING CONNECTOR:

CONNECTOR : DF14-20S-1.25C (HIROSE ELECTRIC)
TERMINAL : DF14-2628SCFA (HIROSE ELECTRIC)

BEZEL/DISPLAY POSITION



1)TOLERANCE X DIRECTION A:1.6±0.8
2)TOLERANCE Y DIRECTION B:2.0±0.8
3)OBLIQUITY OF DISPLAY AREA |C-D|<0.8

I/F CONNECTOR

CN1 : [DF14H-20P-1.25H(HIROSE ELECTRIC)]

CCFT CONNECTOR

CN2, CN3 : [BHR-02(8.0)VS-1N(JST)]

1	VHIGH
2	VLOW

NOTES)

1)UNSPECIFIED TOLERANCE TO BE ±0.5.

2)WARPING OF COMPONENTS SUCH AS TAPE, BEZEL, PCB, CHASSIS, FPC, PROTECTION COVER, ETC. ARE EXCLUDED FROM THICKNESS AND DIMENSIONS OF THE MODULE.

3)RECOMMENDED TIGHTEN TORQUE FOR MOUNTING
0.196±0.02N·m
(2.0±0.2kgf·cm)

LQ121K1LG11 OUTLINE DIMENSIONS