PRODUCT TECHNICAL LITERATURE

SHARP

Liquid Crystal Displays Group

LQ370T3LZ39

TFT-LCD Module

Technical Literature Issue Date: June 23, 2004

No: LD-16555

SHARP

No.	LD – 16555
DATE	JUN. 23. 2004

TECHNICAL LITERATURE

FOR

TFT - LCD module

MODEL No. LQ370T3LZ39

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

DEVELOPMENT ENGINEERING DEPT. II
KAMEYAMA DEVELOPMENT CENTER
MIE-KAMEYAMA PRODUCTION GROUP
SHARP CORPORATION

RECORDS OF REVISION

LQ370T3LZ39

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-16555	JUN. 23. 2004	-	-	-	1st. Issue

1. Application

This technical literature applies to the color 37.0" Wide XGA TFT-LCD module LQ370T3LZ39.

* These technical literature sheets are proprietary products of SHARP CORPORATION ("SHARP") and include materials protected under copyright of SHARP. Do not reproduce or cause any third party to reproduce them in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP.

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

* In case of using the device for applications such as control and safety equipment for transportation (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 that does not comply with the instructions and the precautions specified in these technical literature sheets.

* 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, inverter circuit and back light system etc. Graphics and texts can be displayed on a 1366×RGB×768 dots panel with 16,777,216 colors by using LVDS (Low Voltage Differential Signaling) to interface, +5V of DC supply voltages.

This module also includes the DC/AC inverter to drive the CCFT. (+12V of DC supply voltage)

And in order to improve the response time of LCD, this module applies the Over Shoot driving (O/S driving) technology for the control circuit .In the O/S driving technology, signals are being applied to the Liquid Crystal according to a pre-fixed process as an image signal of the present frame when a difference is found between image signal of the previous frame and that of the current frame after comparing them.

By using the captioned process, the image signals of this LCD module are being set so that image response can be completed within one frame, as a result, image blur can be improved and clear image performance can be realized.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	94.0 (Diagonal)	cm
	37.0 (Diagonal)	inch
Active area	819.6 (H) x 460.8 (V)	mm
Pixel Format	1366 (H) x 768 (V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.600(H) x 0.600 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally black	
Unit Outline Dimensions (*1)	877.0(W) x 514.6(H) x 56.0(D)	mm
Mass	(11.0)	kg
Surface treatment	Anti glare, low reflection coating Hard coating: 2H Haze: 23 +/- 5%	

(*1) Outline dimensions are shown in Fig.1

4. Input Terminals

4-1. TFT panel driving

CN1 (Interface signals and +5V DC power supply) (Shown in Fig.1)

Using connector : FI-X30SSL-HF (Japan Aviation Electronics Ind. , Ltd.)

Mating connector : FI-X30H, FI-X30C or FI-X30M (Japan Aviation Electronics Ind. , Ltd.)

Mating LVDS transmitter : THC63LVDM83A or equivalent device

Pin No.	Symbol	Function	Remark
1	VCC	+5V Power Supply	
2	VCC	+5V Power Supply	
3	VCC	+5V Power Supply	
4	VCC	+5V Power Supply	
5	GND	GND	
6	GND	GND	
7	GND	GND	
8	GND	GND	
9	SELLVDS	Select LVDS data order 【Note1】	Pull up Default H:3.3V
10	NC		
11	GND	Ground	
12	RIN0-	Negative (-) LVDS differential data input	LVDS
13	RIN0+	Positive (+) LVDS differential data input	LVDS
14	GND	Ground	
15	RIN1-	Negative (-) LVDS differential data input	LVDS
16	RIN1+	Positive (+) LVDS differential data input	LVDS
17	GND	Ground	
18	RIN2-	Negative (-) LVDS differential data input	LVDS
19	RIN2+	Positive (+) LVDS differential data input	LVDS
20	GND	Ground	
21	CLKIN-	Clock Signal(-)	LVDS
22	CLKIN+	Clock Signal(+)	LVDS
23	GND	Ground	
24	RIN3-	Negative (-) LVDS differential data input	LVDS
25	RIN3+	Positive (+) LVDS differential data input	LVDS
26	GND	Ground	
27	R/L	Horizontal shift direction 【Note 2】	
28	U/D	Vertical shift direction 【Note 2】	
29	Reserved	Not Available	
30	Reserved	Not Available	

【note】 GND of a liquid crystal panel drive part has connected with a module chassis.

【Note1】 SELLVDS

Transmitter		SELLVDS	
Pin No	Data	=L(GND)	=H(3.3V) or Open
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

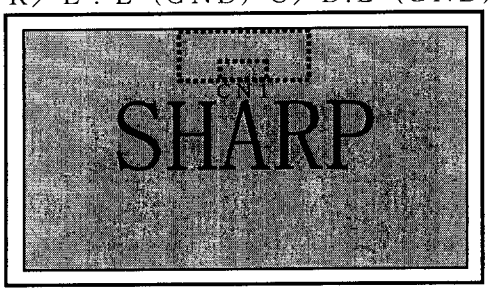
NA: Not Available

(*) Since the display position is prescribed by the rise of DE (Display Enable) signal, please do not fix DE signal during operation at "High."

【Note 2】 Display reversal function

Normal (Default)

R／L : L (GND) U／D:L (GND)



Horizontal reverse image

R／L : H (3. 3V) U／D : L (GND)



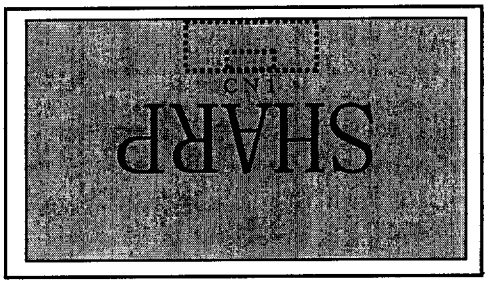
Vertical reverse image

R／L : L (GND) U／D:H (3. 3V)



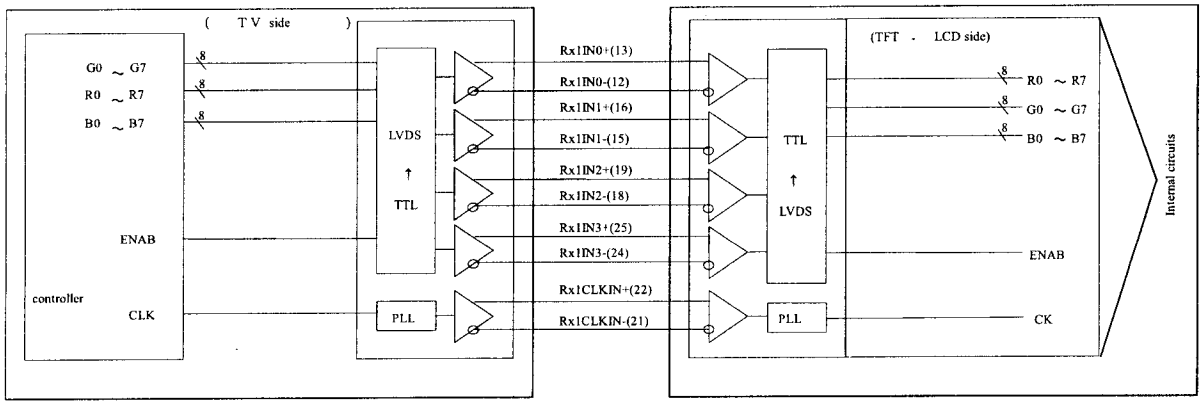
Horizontal and vertical reverse image

R／L : H (3. 3V) U／D:H (3. 3V)

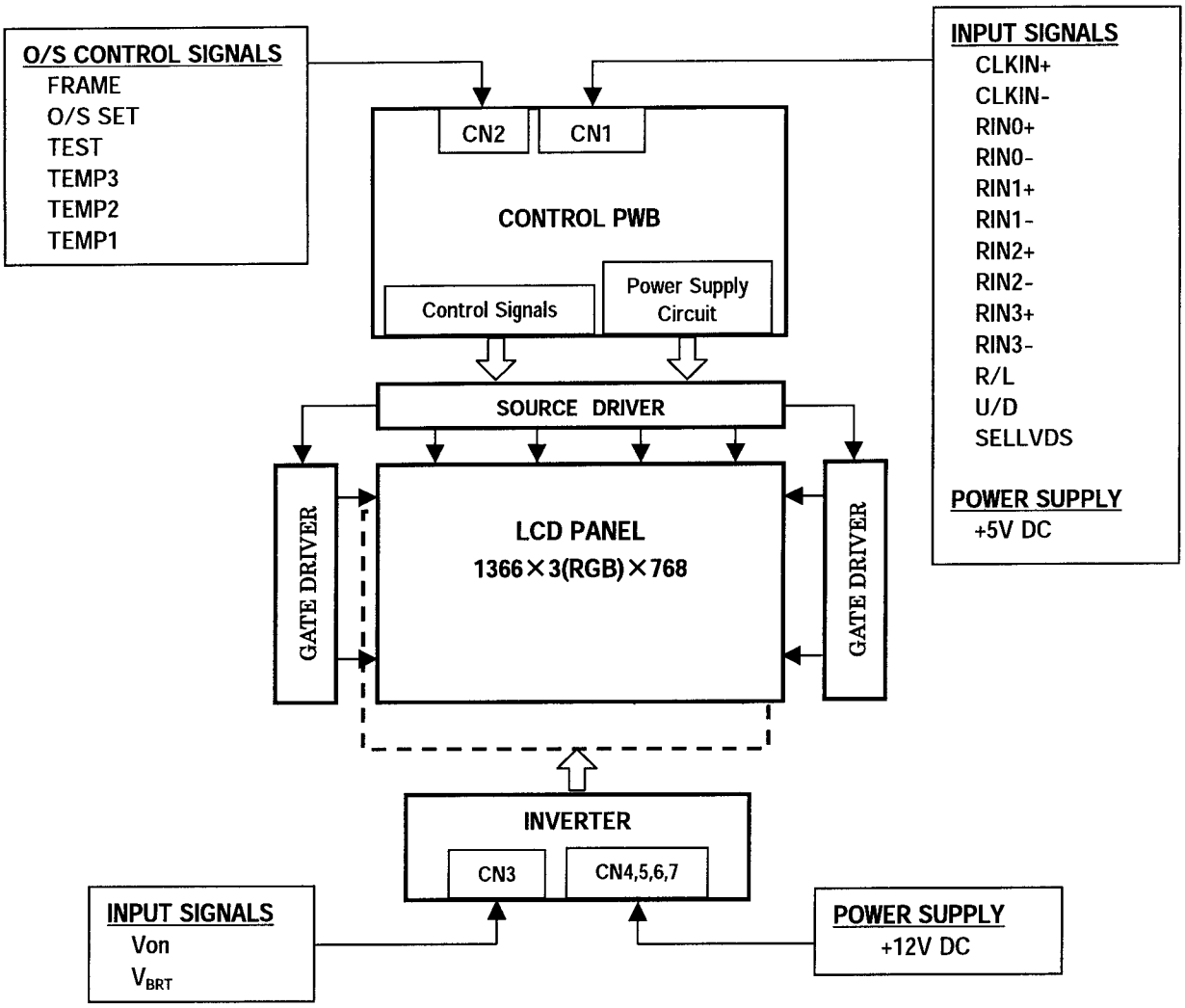


・Interface block diagram

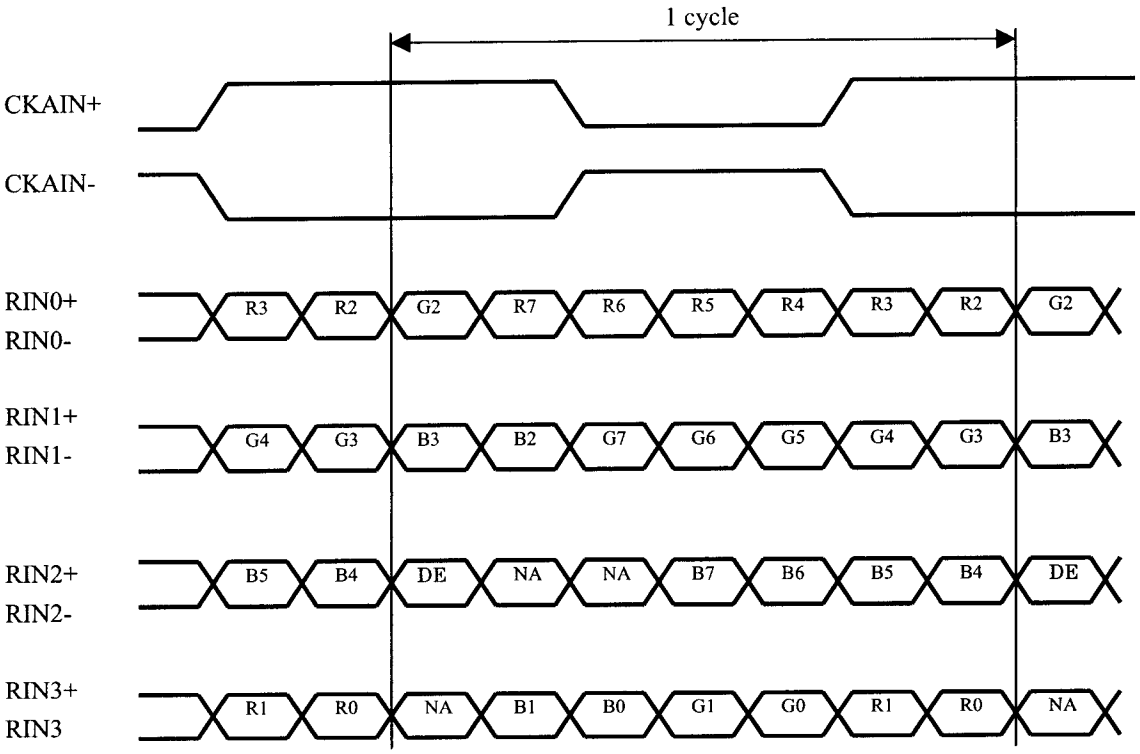
Corresponding Transmitter: THC63LVDM83A (THine) or equivalent device



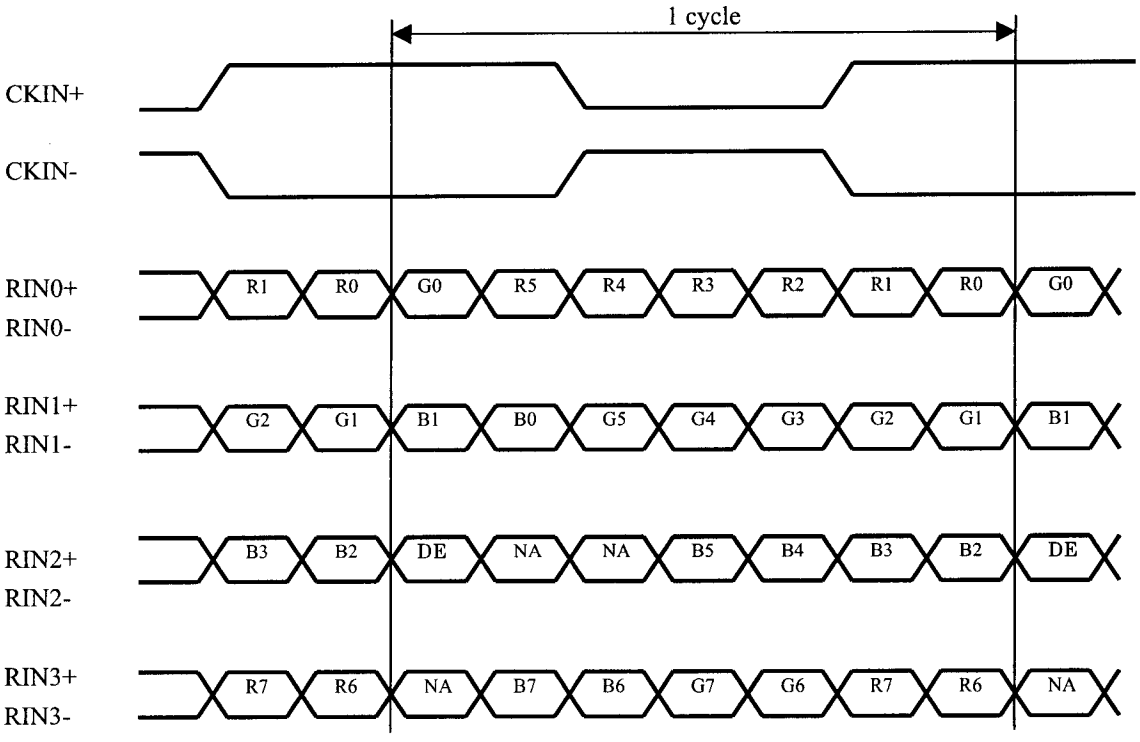
・Block Diagram (LCD Module)



SELLVDS= High (3.3V) or Open



SELLVDS= Low(GND)



DE: Display Enable

NA: Not Available (Fixed Low)

CN2 (O/S control) (Shown Fig 1)

O/S Driving Pin No and function

Using connector : SM07B-SRSS-TB-A (JST)

Mating connector : SHR-07V-S or SHR-07V-S-B (JST)

Pin No.	Symbol	Function	Default
1	Frame	Frame frequency setting H:60Hz, L:50Hz	Pull down 10kΩ: (GND)
2	O/S set	O/S operation setting H:O/S_ON, L:O/S_OFF	Pull down 10kΩ: (GND)
3	TEST	Fix to 3.3V level usually.	Pull down 30kΩ: (GND)
4	Temp3	Data3 of panel surface temperature	Pull down 10kΩ: (GND)
5	Temp2	Data2 of panel surface temperature	Pull down 10kΩ: (GND)
6	Temp1	Data1 of panel surface temperature	Pull down 10kΩ: (GND)
7	GND	GND	

*L: Low level voltage (GND) H: High level voltage(3.3V)

【Note】 In case of O/S set setting "L"(O/S_OFF), it should be set the Temp1~3 to "L".

According as the surface temperature of the panel, enter the optimum 3 bit signal into pin No.4,5,6. Measuring the correlation between detected temperature by the sensor on PWB in users side and actual surface temperature of panel at center, convert the temperature detected by the sensor to the surface temperature of panel to enter the 3 bit temperature data.

Pin no.	Surface temperature of panel							
	0-5℃	5-10℃	10-15℃	15-20℃	20-25℃	25-30℃	30-35℃	35℃ and above
4	L	L	L	L	H	H	H	H
5	L	L	H	H	L	L	H	H
6	L	H	L	H	L	H	L	H

*L: Low level voltage (GND) H: High level voltage(3.3V)

*For overlapping temperatures (such as 5℃,10℃,15℃,20℃,25℃, 30℃,35℃) select the optimum parameter, judging from the actual picture image.

4-2. Backlight driving

CN3 (Inverter control)

Using connector: B6B-PH-K-S(JST)

Mating connector: PHR-6 (JST)

Pin No.	Symbol	Function	Remark
1	V_{ON}	Inverter ON/OFF	【Note 1】
2	Reserved	Not Available	
3	Reserved	Not Available	
4	V_{BRT}	Brightness Control	【Note 2】
5	Reserved	Not Available	
6	GND	GND	

*GND of an inverter board is not connected to GND of a module chassis and a liquid crystal panel drive part.

【Note 1】 Inverter ON/OFF

Input voltage	Function
5V	Inverter: ON
0V	Inverter: OFF

【Note 2】 Brightness Control

PWM Brightness Control is regulated by analog input voltage (0V to 5V) .

Input voltage	Function
5V	Brightness Control (15%): (Dark)
0V	Brightness Control (95%): (Bright)

CN4, CN5, CN6, CN7 (Inverter Power input Pin layout)

Using connector: B2P-VH (JST)

Mating connector: VHR-2N (JST)

Pin No.	Symbol	Function
1	V_{INV}	+12V
2	GND	GND

*GND of an inverter board is not connected to GND of a module chassis and a liquid crystal panel drive part.

4-3. The back light system characteristics

The back light system is direct type with 18 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.

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Life time	T_L	60000	-	-	Hour	【Note】

【Note】 · Lamp life time is defined as the time when brightness becomes 50% of the original value in the continuous operation under the condition of Ta=25 ℃ and brightness control(V_{BRT}=0V).

· Above value is applicable when the long side of LCD module is placed horizontally (Landscape position).

(Lamp lifetime may vary if LCD module is in portrait position due to the change of mercury density inside the lamp.)

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage (for Control)	V_I	Ta=25 ℃	-0.3 ~ 3.6	V	【Note 1】
5V supply voltage (for Control)	VCC	Ta=25 ℃	0 ~ + 6	V	
Input voltage (for Inverter)	V_{BRT} V_{ON}	Ta=25 ℃	0 ~ + 6	V	
12V supply voltage (for Inverter)	V_{INV}	Ta=25 ℃	0 ~ +14	V	
Storage temperature	Tstg	-	-25 ~ +60	℃	【Note 2】
Operation temperature (Ambient)	Topa	-	0 ~ +50	℃	

【Note 1】 SELLVDS, R/L, U/D,TEST, Frame, O/S set, Temp1, Temp2, Temp3

【Note 2】 Humidity 95%RH Max.(Ta≦40℃)

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

No condensation.

6. Electrical Characteristics

6-1. Control circuit driving

Ta=25 ℃

Parameter		Symbol	Min.	Typ.	Max.	Uniit	Remark
+5V supply voltage	Supply voltage	Vcc	+4.5	+5.0	+5.5	V	【Note 1】
	Current dissipation	Icc	(60)	(1800)	(3000)	mA	【Note 2,7】
Permissible input ripple voltage		V_{RP}	-	-	100	mV_{P-P}	Vcc = +5.0V
Differential input threshold voltage	High	V_{TH}	-	-	100	mV	V_{CM} = +1.2V 【Note 6】
	Low	V_{TL}	-100	-	-	mV	
Input Low voltage		V_{IL}	-	-	1.0	V	【Note 3】
Input High voltage		V_{IH}	2.3	-	3.3	V	
Input leak current (Low)		I_{IL1}	-	-	100	μA	V_I = 0V 【Note 4】
		I_{IL2}	-	-	400	μA	V_I = 0V 【Note 5】
Input leak current (High)		I_{IH1}	-	-	100	μA	V_I =3.3V 【Note 4】
		I_{IH2}	-	-	400	μA	V_I =3.3V 【Note 5】
Terminal resistor		R_T	-	100	-	Ω	Differential input

【Note】 V_{CM}: Common mode voltage of LVDS driver.

【Note 1】

Input voltage sequences

0 < t1 ≦ 20ms

0 < t2 ≦ 20ms

0 < t3 ≦ 1s

0 < t4 ≦ 1s

t5 ≧ 200ms

t6 ≧ 0

t7 ≧ 300ms

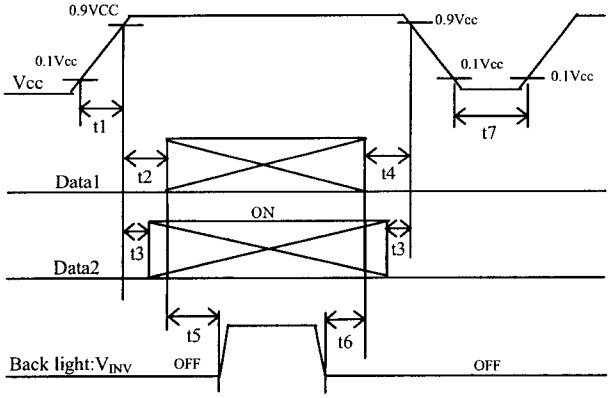
Dip conditions for supply voltage

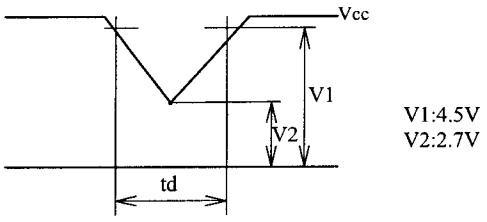
a) 2.7V ≦ Vcc < 4.5V

td ≦ 10ms

b) Vcc < 2.7V

Dip conditions for supply voltage is based on input voltage sequence.





※ Data1:CLKIN±,RIN0±,RIN1±, RIN2±, RIN3±

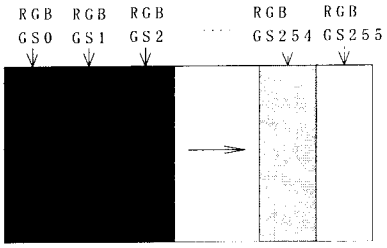
※ Data2:R/L,U/D,SELLVDS,Frame,O/Sset,Temp1,2,3

※

About the relation between data input and back light lighting, please base on the above-mentioned input sequence.

When back light is switched on before panel operation or after a panel operation stop, it may not display normally. But this phenomenon is not based on change of an incoming signal, and does not give damage to a liquid crystal display.

【Note 2】 Typical current situation: 256 gray-bar pattern (Vcc = +5.0V)
The explanation of RGB gray scale is seen in section 8.



Vcc=5.0V
CK=82.0MHz
Th=20.67 μ s

【Note 3】 R/L, U/D, SELLVDS, TEST, Frame, O/S set, Temp1, Temp2, Temp3
【Note 4】 R/L, U/D
【Note 5】 SELLVDS, TEST, Frame, O/S set, Temp1, Temp2, Temp3
【Note 6】 CKIN+/CKIN-, RIN0+/RIN0-, RIN1+/RIN1-, RIN2+/RIN2-, RIN3+/RIN3-,
【Note 7】 The minimum current value is a value when inputting only voltage (V cc=5 V)
and cutting an incoming signal (CK,ENAB,DATA).

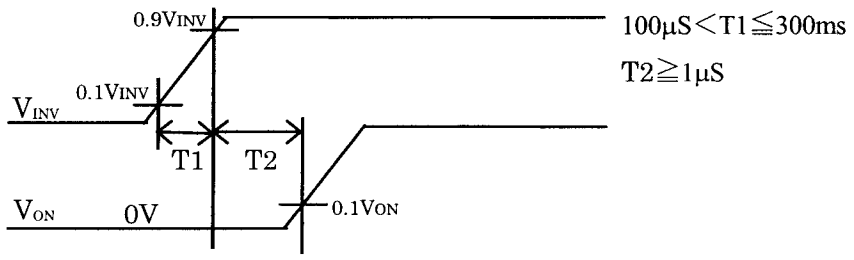
6-2. Inverter driving for back light

The back light system is direct type with 18 CCFTs (Cold Cathode Fluorescent Tube). Ta=25℃

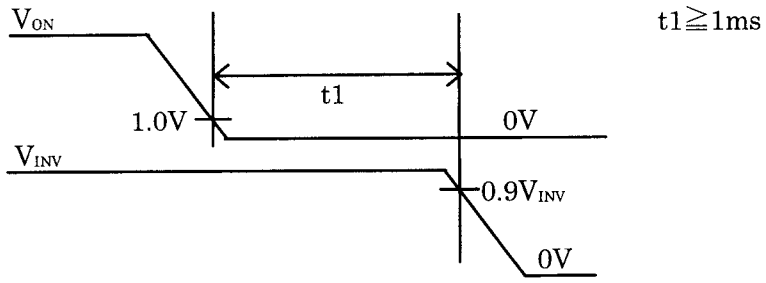
Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+12V	Current dissipation 1	I_{INV1}	-	12	13	A	V_{INV} = 12V, V_{BRT} = 0V, V_{ON}=5V 【Note 1】
	Current dissipation 2	I_{INV2}	-	11	12		
	Supply voltage	V_{INV}	11	12	13	V	【Note 2】
Permissible input ripple voltage		V_{RF}	-	-	200	mV_{p-p}	V_{INV} = +12V
Input voltage (Low)		V_{ONL}	0	-	1	V	Von impedance=24kΩ
Input voltage (High)		V_{ONH}	2.3	5.0	5.5	V	
Brightness control voltage		V_{BRT}	0	-	5.0	V	
Brightness control voltage vs Brightness Ratio		-	0	→	5	V	
			95	→	15	%	

【Note 1】
I_{INV}1: The current value of less than 1 hour after switching on the light. (Inrushe current is not included.)
I_{INV}2: The current value after 1 hour or more have passed since the light was switched on the light.

【Note 2】 1)V_{INV}-turn-on condition



2) V_{INV}-turn-off condition



7. Timing characteristics of input signals

7-1. Timing characteristics

Timing diagrams of input signal are shown in Fig.2

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	65	82	85	MHz	
Data enable signal	Horizontal period	TH	1560	1696	1940	clock	
			17.0	20.67	-	μs	
	Horizontal period (High)	THd	1366	1366	1366	clock	
	Vertical period	TV	778	806	972	line	
	Vertical period (High)	TVd	768	768	768	line	

【Note】 When vertical period is very long, flicker and etc. may occur.
Please turn off the module after it shows the black screen.
Please make sure that length of vertical period should become of an integral multiple of horizontal length of period. Otherwise, the screen may not display properly.

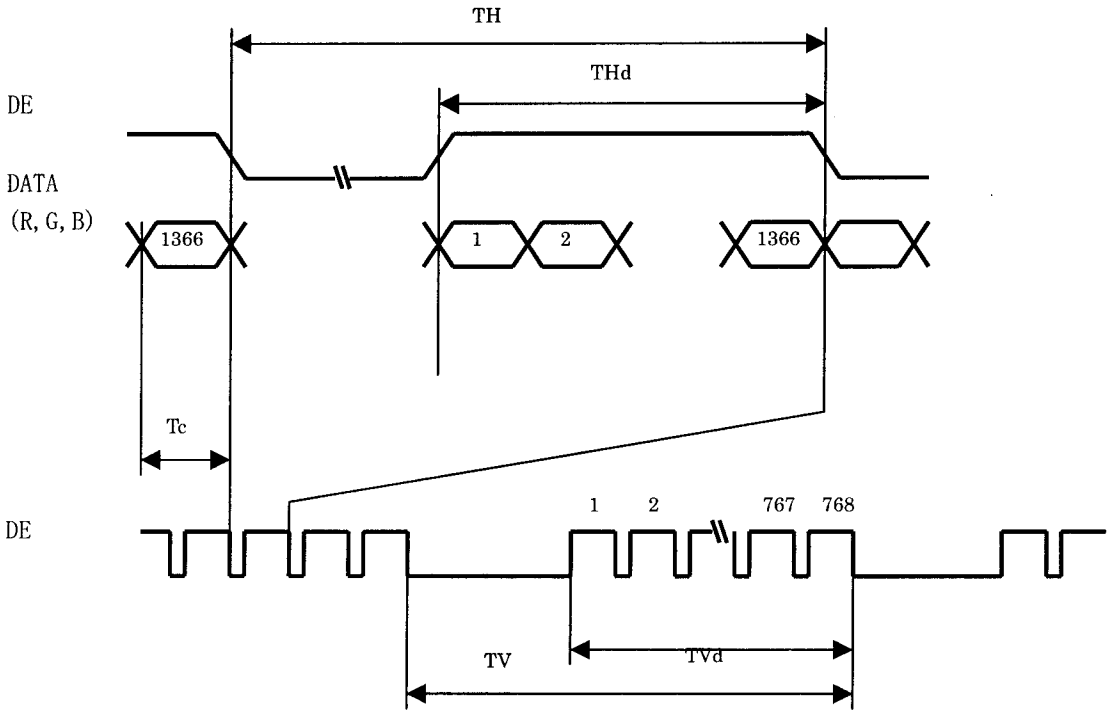
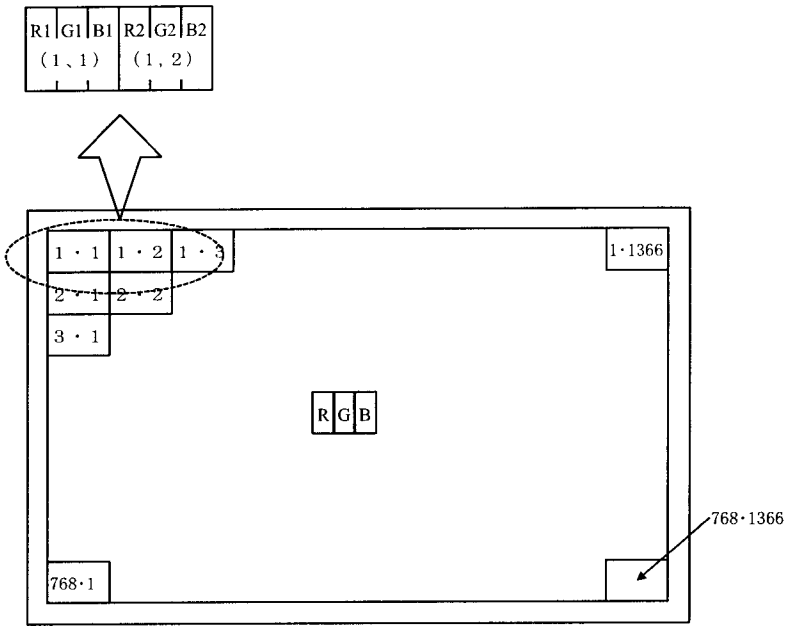


Fig.2 Timing characteristics of input signals

7-2. Input data signal and display position on the screen



Display Position of Data (V,H)

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

	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	1	1	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	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	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	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	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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

Each basic color can be displayed in 256 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.

9. Optical characteristics

Ta=25℃, Vcc = +5V, V_{INV} = +12V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21 θ 22	CR≧10	70	85	-	Deg.	【Note1,4】
	Vertical	θ 11 θ 12		70	85	-	Deg.	
Contrast ratio		CRn		-	(800)	-		【Note2,4】
Response time		τ r τ d		-	(15)	(45)	ms	【Note3,4,5】
Luminance of white		X		(0.242)	(0.272)	(0.302)	-	【Note 4】
		Y		(0.247)	(0.277)	(0.307)	-	
Luminance of red		X	θ =0 deg.	(0.610)	(0.640)	(0.670)	-	
		Y		(0.300)	(0.330)	(0.360)	-	
Luminance of green		X		(0.270)	(0.300)	(0.330)	-	
		Y		(0.570)	(0.600)	(0.630)	-	
Luminance of blue		X		(0.120)	(0.150)	(0.180)	-	
		Y		(0.030)	(0.060)	(0.090)	-	
Luminance of white		Y_{L1}			(500)		cd/m^2	【Note 4】
Luminance uniformity		δ w		-	-	(1.25)		【Note 6】

Measurement condition : Set the value of V_{BRT} to maximum luminance of white.

*The measurement shall be executed 60 minutes after lighting at rating.

【Note】 The optical characteristics are measured using the following equipment.

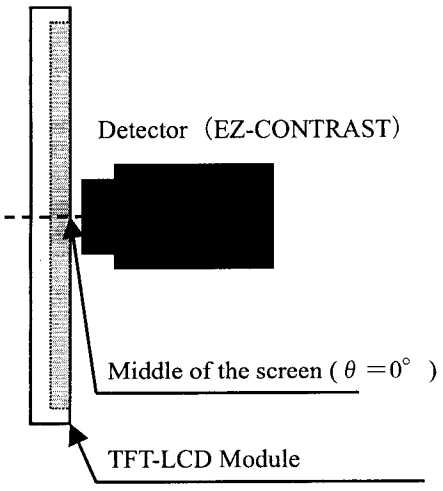


Fig.3-1 Measurement of viewing angle range.

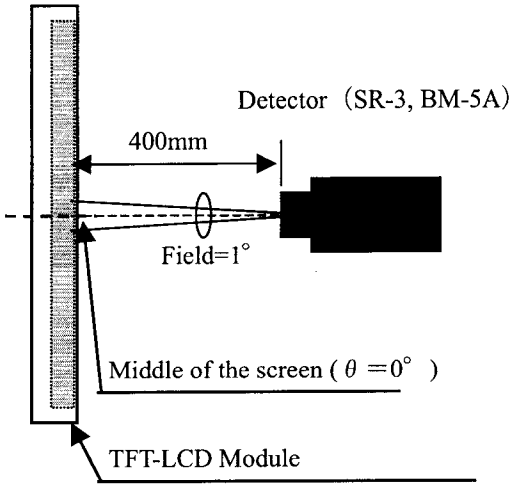
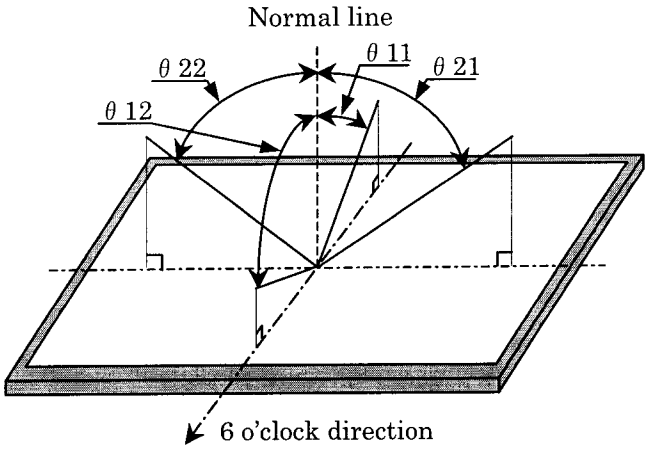


Fig.3-2 Measurement of Contrast and luminance and chromaticity and Response time. (Contrast, Luminance and Chromaticity: SR-3, Response time: BM-5A).

【Note 1】 Definitions of viewing angle range :



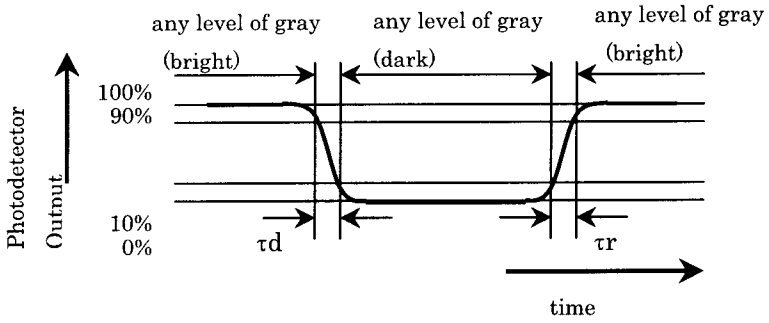
【Note 2】 Definition of contrast ratio :

The contrast ratio is defined as the following.

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

【Note 3】 Definition of response time

The response time is defined as the following figure and shall be measured by switching the input signal for "any level of gray (bright)" and "any level of gray (dark)".



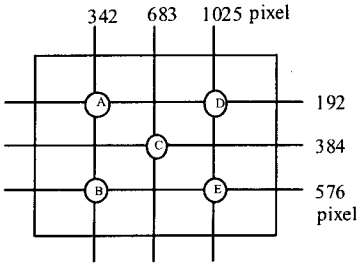
【Note 4】 This shall be measured at center of the screen.

【Note 5】 15ms is the value when O/S driving is used at typical input time value .

【Note 6】 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 of the module

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

b) This product is using the parts (inverter, CCFT etc), which generate the high voltage. Therefore, during operating, please don't touch these parts.

c) Brightness control voltage is switched for "ON" and "OFF", as shown in Fig.4. Voltage difference generated by this switching, ΔV_{INV}, may affect a sound output, etc. when the power supply is shared between the inverter and its surrounding circuit. So, separate the power supply of the inverter circuit with the one of its surrounding circuit.

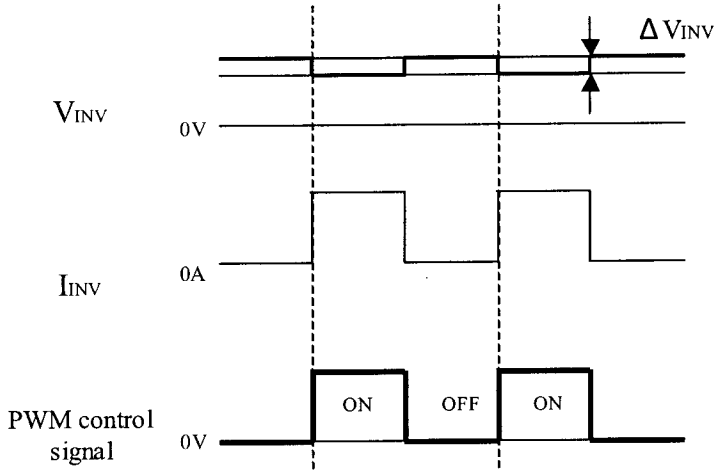


Fig.4 Brightness control voltage.

*Since inverter board's GND is not connected to the frame of the LCD module, please connect it with the Customer's GND of inverter power supply.

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

e) Since the front polarizer is easily damaged, pay attention not to scratch it.

f) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.

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

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

i) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.

j) The module has some printed circuit boards (PCBs) on the back side, take care to keep them form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.

k) Observe all other precautionary requirements in handling components.

l) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc.. So, please avoid such design.

m) When giving a touch to the panel at power on supply, it may cause some kinds of degradation. In that case, once turn off the power supply, and turn on after several seconds again, and that is disappear.

n) When handling LCD modules and assembling them into cabinets, please be noted that long-term 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 LCD modules.

12. Packing form

a) Piling number of cartons: 2 maximum

b) Packing quantity in one carton: 5 pcs.

c) Carton size: (1136)(W)×(608) (H)×(789) (D)

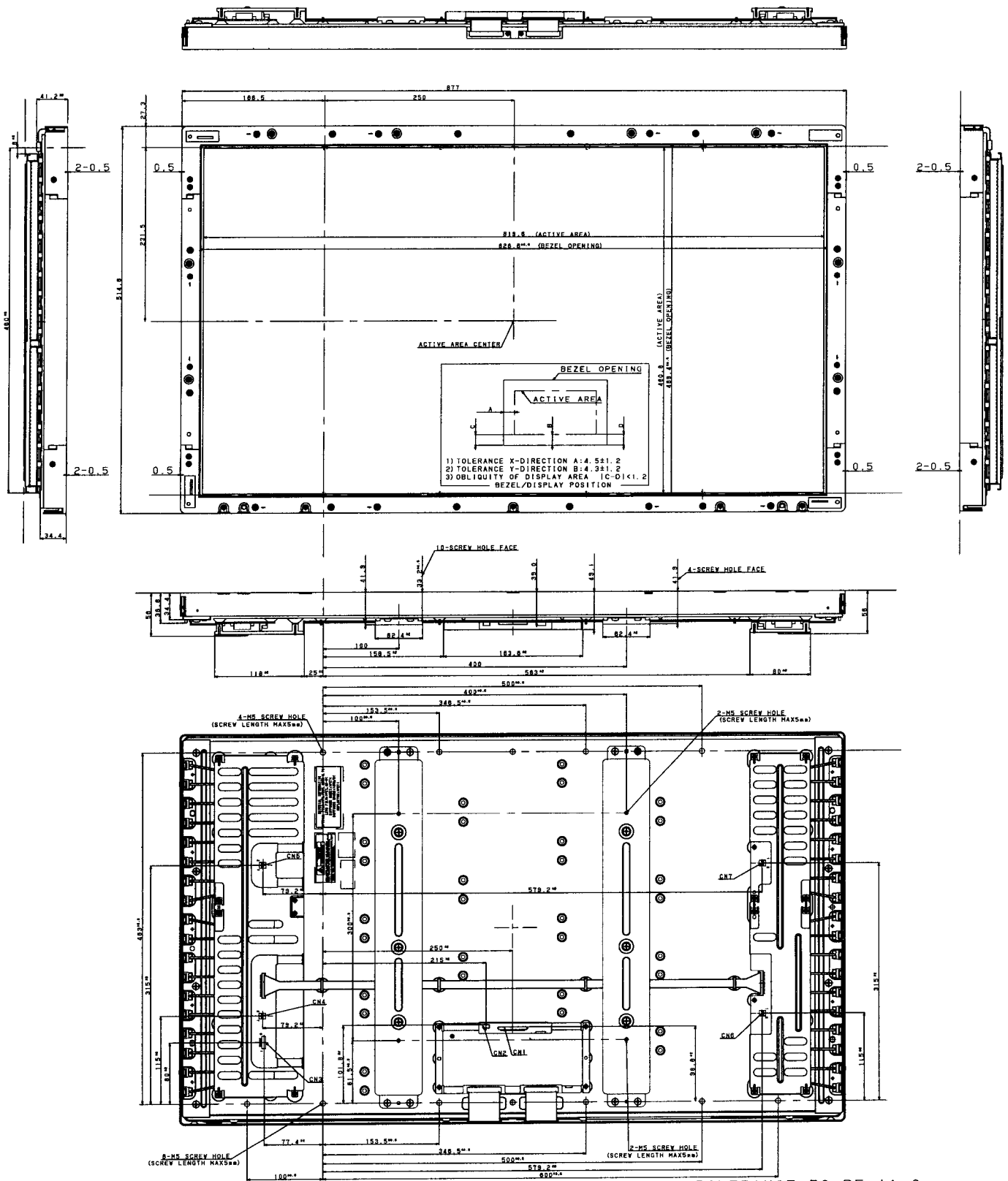
d) Total mass of one carton filled with full modules: T.B.D. kg

13. Reliability test item

No.	Test item	Condition
1	High temperature storage test	Ta=60℃ 240h
2	Low temperature storage test	Ta=-25℃ 240h
3	High temperature and high humidity operation test	Ta=40℃ ; 95%RH 240h (No condensation)
4	High temperature operation test	Ta=50℃ 240h
5	Low temperature operation test	Ta=0℃ 240h
6	Vibration test (non-operation)	Frequency: 10~57Hz/Vibration width (one side): 0.075mm : 58~500Hz/Acceleration: 9.8 m/s2 Sweep time: 11 minutes Test period: 3 hours (1h for each direction of X, Y, Z)
7	Shock test (non-operation)	Maximum acceleration: 490m/s^2 Pulse width: 11ms, sinusoidal half wave Direction: +/-X, +/-Y, +/-Z, once for each direction.
8	ESD	* At the following conditions, it is a thing without incorrect operation and destruction. (1)Non-operation: Contact electric discharge ±10kV Non-contact electric discharge±20kV (2)Operation Contact electric discharge ±8kV Non-contact electric discharge ±15kV Conditions: 150pF、330ohm

【Result evaluation criteria】

Under the display quality test condition with normal operation state, there shall be no change which may affect practical display function.



1. UNSPECIFIED TOLERANCE TO BE ±1.0

DATE:2004.06.25

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Suggested applications (if any) are for standard use; See Important Restrictions for limitations on special applications. See Limited Warranty for SHARP's product warranty. The Limited Warranty is in lieu, and exclusive of, all other warranties, express or implied. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR USE AND FITNESS FOR A PARTICULAR PURPOSE, ARE SPECIFICALLY EXCLUDED. In no event will SHARP be liable, or in any way responsible, for any incidental or consequential economic or property damage.

SHARP®

NORTH AMERICA

SHARP Microelectronics of the Americas
5700 NW Pacific Rim Blvd.
Camas, WA 98607, U.S.A.
Phone: (1) 360-834-2500
Fax: (1) 360-834-8903
Fast Info: (1) 800-833-9437
www.sharpsma.com

EUROPE

SHARP Microelectronics Europe
Division of Sharp Electronics (Europe) GmbH
Sonninstrasse 3
20097 Hamburg, Germany
Phone: (49) 40-2376-2286
Fax: (49) 40-2376-2232
www.sharpsme.com

JAPAN

SHARP Corporation
Electronic Components & Devices
22-22 Nagaike-cho, Abeno-Ku
Osaka 545-8522, Japan
Phone: (81) 6-6621-1221
Fax: (81) 6117-725300/6117-725301
www.sharp-world.com

TAIWAN

SHARP Electronic Components
(Taiwan) Corporation
8F-A, No. 16, Sec. 4, Nanking E. Rd.
Taipei, Taiwan, Republic of China
Phone: (886) 2-2577-7341
Fax: (886) 2-2577-7326/2-2577-7328

SINGAPORE

SHARP Electronics (Singapore) PTE., Ltd.
438A, Alexandra Road, #05-01/02
Alexandra Technopark,
Singapore 119967
Phone: (65) 271-3566
Fax: (65) 271-3855

KOREA

SHARP Electronic Components
(Korea) Corporation
RM 501 Geosung B/D, 541
Dohwa-dong, Mapo-ku
Seoul 121-701, Korea
Phone: (82) 2-711-5813 ~ 8
Fax: (82) 2-711-5819

CHINA

SHARP Microelectronics of China
(Shanghai) Co., Ltd.
28 Xin Jin Qiao Road King Tower 16F
Pudong Shanghai, 201206 P.R. China
Phone: (86) 21-5854-7710/21-5834-6056
Fax: (86) 21-5854-4340/21-5834-6057
Head Office:
No. 360, Bashen Road,
Xin Development Bldg. 22
Waigaoqiao Free Trade Zone Shanghai
200131 P.R. China
Email: smc@china.global.sharp.co.jp

HONG KONG

SHARP-ROXY (Hong Kong) Ltd.
3rd Business Division,
17/F, Admiralty Centre, Tower 1
18 Harcourt Road, Hong Kong
Phone: (852) 28229311
Fax: (852) 28660779
www.sharp.com.hk
Shenzhen Representative Office:
Room 13B1, Tower C,
Electronics Science & Technology Building
Shen Nan Zhong Road
Shenzhen, P.R. China
Phone: (86) 755-3273731
Fax: (86) 755-3273735