

Specification No.

LCP-03029

To: \_\_\_\_\_

# Delivery Specification

Name of Product    **CG Silicon – LCD Module**

Model Name    **7.1 inch Module**

[Receipt Stamp]


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## 1. Scope

This specification applies to the 7.1 inch color CGS – LCD module.

This specification is the proprietary product and includes materials protected under copyright. Please handle with care and do not reproduce this specification in any form.

The device listed in this specification was developed and manufactured for use in OA equipment.

In case of using the device for applications such as transportation (aircraft, trains, automobiles, etc.), disaster-prevention & safety equipment, rescue and any security 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.

This device is not designed for equipment that requires an extreme level of reliability and safety such as aerospace applications, major communication device, nuclear power control equipment and medical or other equipment for life support. Do not use for the above.

We assume no responsibility for any damage resulting from the use of the device which does not comply with the instruction and the precautions specified in this specification.

## 2. General Description

This module is a color active matrix minim reflection LCD incorporating CGS-TFT (Continuous Grain Silicon Thin Film Transistor). It is composed of a color CGS-LCD panel, driver ICs, control circuit, power supply circuit and a back light unit. With LVDS (Low Voltage Differential Signaling) for its interface, supplying +3.3 V DC for CGS-TFT panel driving and power source for back-light, it displays figures and letters with 262,144 colors on a 1024 x 3 x 768 dots panel.

Furthermore, with a color filter of high rendition and a minim reflection panel, it displays clear images in direct sunlight outdoors, which makes it a suitable module for multi-media purpose.

Its best view of direction is from 6 o'clock position.

DC/AC inverter for the lamp is not built in.

## 3. Specification

Item	Specification	Unit
Display Size	18 (7.1inch) width across corner	cm
Effective Display	144.38 (H) x 108.29 (V)	mm
Pixel Format	1024 x 768 (1 pixel = R + G+ B dot)	pixel
Pixel Pitch	0.141 (H) x 0.141 (V)	mm
Pixel Alignment	RGB stripe alignment	
Display Mode	Normally white	
Unit Outline Dimension *1	169.0(W) x 122.0 (H) x 7.5 (Max)(D)	mm
Mass	130 ± 10	g
Surface Treatment	Anti-glare, LR-coating and hard-coating 2H	

\*1 Note: This is the dimension excluding back- light cables/connecter and any projection.  
Outline dimensions are shown in Fig. 1.

#### 4. Input Terminals Pin Assignments

##### 4-1 LCD Panel Driving Unit

CN1(LVDS interface signal and +3.3V power supply)

Connector used : SL00-26L2 (Kel Corporation)

Connector mating: SL20-26S, SL20-26L (Kel Corporation)

Pin No.	Symbol	Function	Remarks
1	Vcc	+3.3V power supply	
2	Vcc	+3.3V power supply	
3	Vcc	+3.3V power supply	
4	Vcc	+3.3V power supply	
5	GND		
6	GND		
7	RXCKIN+	CK receiver signal (+) for LVDS	LVDS
8	RXCKIN-	CK receiver signal (-) for LVDS	LVDS
9	GND		
10	RXIN2+	CH 2 receiver signal (+) for LVDS	LVDS
11	RXIN2-	CH 2 receiver signal (-) for LVDS	LVDS
12	GND		
13	RXIN1+	CH 1 receiver signal (+) for LVDS	LVDS
14	RXIN1-	CH 1 receiver signal (-) for LVDS	LVDS
15	GND		
16	RXIN0+	CH 0 receiver signal (+) for LVDS	LVDS
17	RXIN0-	CH 0 receiver signal (-) for LVDS	LVDS
18	GND		
19	GND		
20*	N.C.	This is open.	Reserved
21**	/RLINV	Horizontal scan control signal**	
22**	/USDW	Vertical scan control signal**	
23	GND		
24	GND		
25	GND		
26	GND		

\* [Not available: make sure this pin is opened.]

\*\* When /RLINV is high, scans from LEFT to RIGHT; when low, scans from RIGHT to LEFT  
(It is pulled up internally, and when the pin is open, scans from LEFT to RIGHT.)

When /USDW is high, scans from TOP to BOTTOM; when low, BOTTOM to TOP.

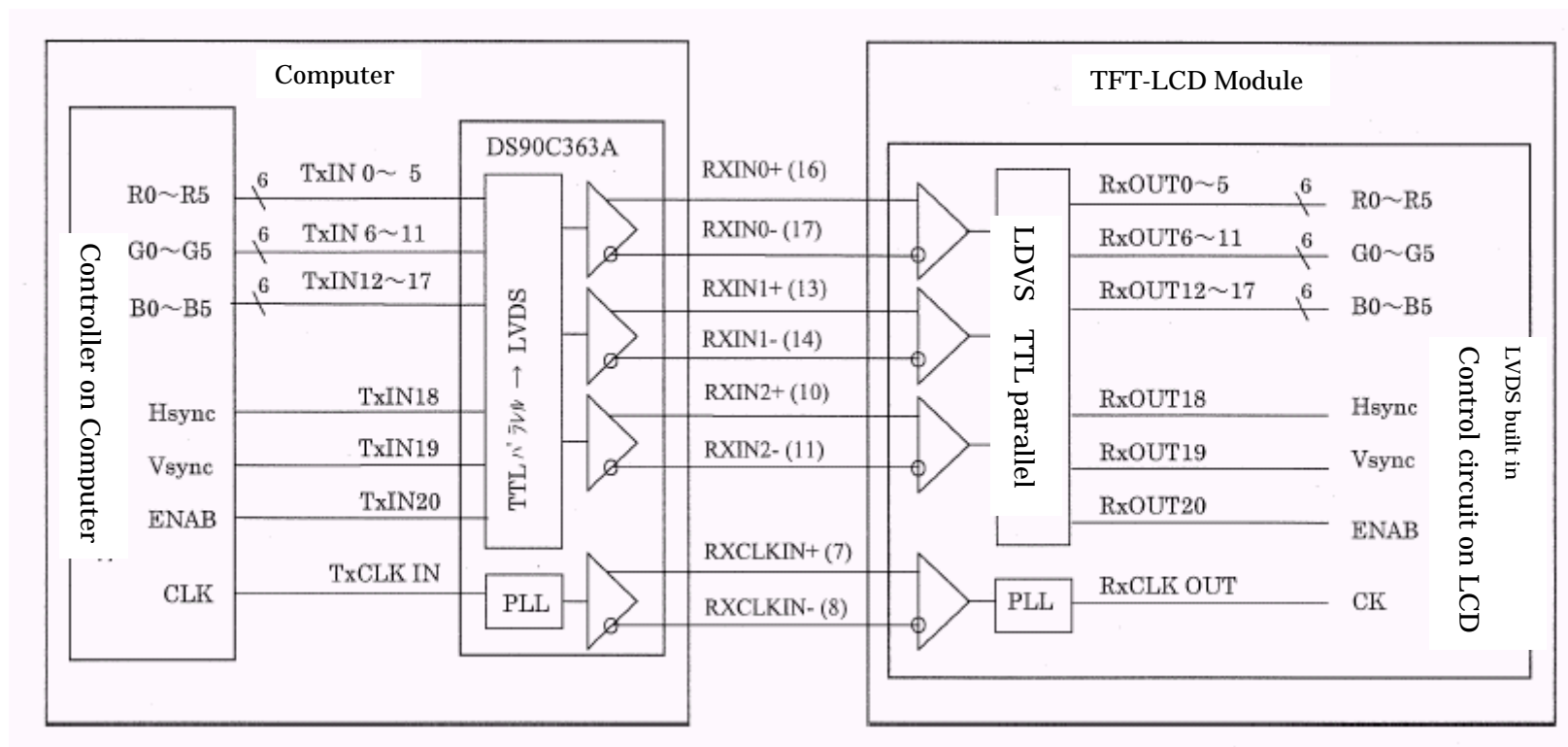
(It is pulled up internally, and when the pin is open, scans from TOP to BOTTOM.)

[Note 1: Refer to 4-2 for RXINi (i = 0,1,2) and actual displayed data]

## 4-2 LVDS Interface Block Chart

Receiver used : Control IC with function equivalent to THC63LVDF64A (Thine)

Transmitter mating: DS90C363, DS90C383, DS90C383A(National semi-conductor), THC63LVDF63A, THC63LVDM63A(Thine)



#### 4-3 Back-light Unit

CN2 Connector used : BHSR-02VS-1 (JST Mfg. Co., Ltd.)  
Connector Mating: SM02B-BHSS-1-TB (JST Mfg. Co., Ltd)

Pin No.	Symbol	Function
1	V <sub>HIGH</sub>	Lamp input terminal (high voltage side)
2	V <sub>LOW</sub>	Lamp input terminal (low voltage side)

#### 5. Absolute Maximum Rating

Item	Symbol	Condition	Standard	Unit	Remarks
Input Voltage	V <sub>I</sub>	Ta=25	- 0.3 ~ V <sub>CC</sub> + 0.3	V	[Note 1]
3.3V power source Voltage	V <sub>CC</sub>	Ta=25	0 ~ + 4.0	V	
Storage Temp.	T <sub>stg</sub>	--	- 25 ~ + 60		[Note 2]
Operating Temp. (environment)	T <sub>opa</sub>	--	0 ~ + 50		

[Note 1] All the LVDS input signals

[Note 2] Humidity: 95% RH Max. (when Ta 40 )  
Maximum wet-bulb temperature 39 (when Ta > 40 ).  
No condensation.

#### 6. Electrical Characteristics

##### 6-1 TFT LCD Module

Ta=25

Item		Sym.	Min.	STD.	Max.	Unit	Remarks
+ 3.3V Power Supply	Input Voltage	V <sub>CC</sub>	+ 3.0	+ 3.3	+ 3.6	V	[Note 5]
	Consumption Voltage	I <sub>CC</sub>	-	230	300	mA	[Note 6]
Allowable Input Ripple Volt.		V <sub>RP</sub>	-	-	100	mV <sub>P-P</sub>	V <sub>CC</sub> = + 3.3V
Differential Input Threshold Voltage (High)		V <sub>TH</sub>	-	-	+ 100	mV	V <sub>CM</sub> = + 1.2V [Note 1]
Differential Input Threshold Voltage (Low)		V <sub>TL</sub>	- 100	-	-	mV	
Input Threshold Voltage (High)		V <sub>THC</sub>	-	1.8	2.3	V	[Note 2]
Input Threshold Voltage (Low)		V <sub>TLC</sub>	0.5	0.9	-	V	[Note 2]
Input Leak Current (High)		I <sub>HC</sub>	-	-	± 10	μA	[Note 3]
Input Leak Current (Low)		I <sub>LC</sub>	- 22	- 66	- 160	μA	[Note 4]
Terminal resistance		R <sub>T</sub>	-	100	-		Inter-differential signals

[Note 1] V<sub>CM</sub> : common mode voltage of LVDS driver

[Note 2] Applicable to /RLINV, /USDW terminal. To be CMOS 3.3 V level input

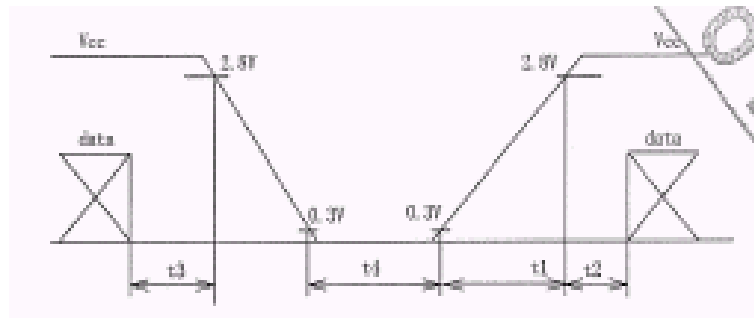
[Note 3] Applicable to /RLINV, /USDW terminal. V<sub>IN</sub> = V<sub>CC</sub>

[Note 4] Applicable to /RLINV, /USDW terminal. V<sub>IN</sub> = 0V

[Note 5]

Input voltage sequence

$$\begin{aligned}
 0 < t_1 &\leq 10 \text{ ms} \\
 0 < t_2 &\leq 50 \text{ ms} \\
 0 < t_3 &\leq 50 \text{ ms} \\
 t_4 &> 200 \text{ ms}
 \end{aligned}$$

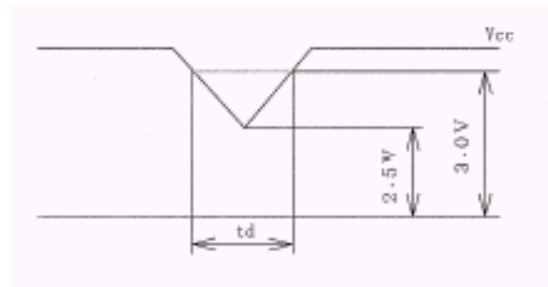


Display Time

Under the input condition stated above, time before LCD displays from power start-up ( $t_1$ ) is as follows: Display time ( $t$ ) < 250 ms

instant-voltage-drop

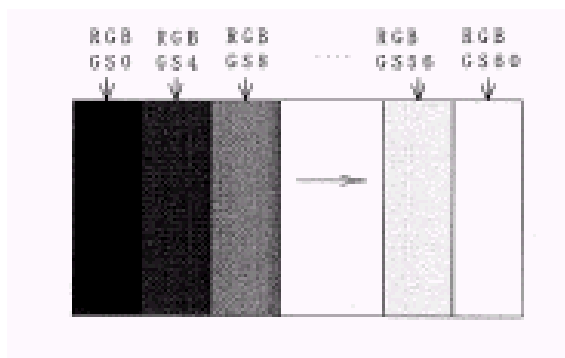
- 1) When  $2.5\text{V} < V_{cc} < 3.0\text{V}$ ,  $t_d = 10 \text{ ms}$
- 2) When  $V_{cc} < 2.5\text{V}$ , conditions for instant-voltage-drop is in accordance with Input Voltage Sequence.



[Note 6] Consumption Current

Standard Value : 16-gray-bar patterns

( $V_{cc} = +3.3\text{V}$ , Gray scale: (4n) where "n" = 0 ~ 15; see Chapt. 8 for RGB scale)





## 6-2 Back-light Unit

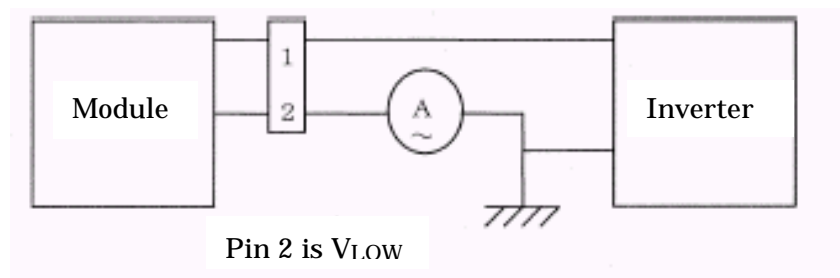
The back-light system is an edge-lighting type with 1 CCFT (Cold Cathode Fluorescent Tube).  
The characteristics of the lamp are shown below.

Item	Symbol	Min.	STD.	Max.	Unit	Remarks
Discharge Tube Current	$I_L$	2.0	6.0	6.5	mArms	[Note 1]
Discharge Tube Voltage	$V_L$	-	390	-	Vrms	
Power Consumption	$P_L$	-	2.3	-	W	[Note 2]
Lighting Frequency	$F_L$	37	49	6.0	kHz	[Note 3]
Kick-Off Voltage	$V_s$	-	910	1100	Vrms	$T_a=25$
		-	1010	1220		$T_a = 0$ [Note 4]
Tube Life	$L_L$	10000	-	-	h	[Note 5]

[Note 1] Current range for lighting a tube is shown below.

Rating for tube current is measured by a high frequency current measurement equipment connected to  $V_{LOW}$  at circuit shown below. (Keep enough kick-off voltage and steady voltage.) · Lighting frequency : 37 ~ 60 kHz

Ambient temperature : 0 ~ 50



Before using in low-current area, please confirm the kick-off voltage and stability by actually mounting the module and inverter.

[Note 2] Referential value by calculation is  $I_L \times V_L$ .

[Note 3] Lamp frequency may produce interference with horizontal synchronous frequency to cause beating on the display; to prevent this interference, keep lamp frequency as far as possible from the horizontal synchronous frequency and high harmonic frequency.

[Note 4] Ballast condenser of DC/AC inverter when 22pF is used.

Lighting voltage must be kept steady for at least 1 second; otherwise it may fail to light.

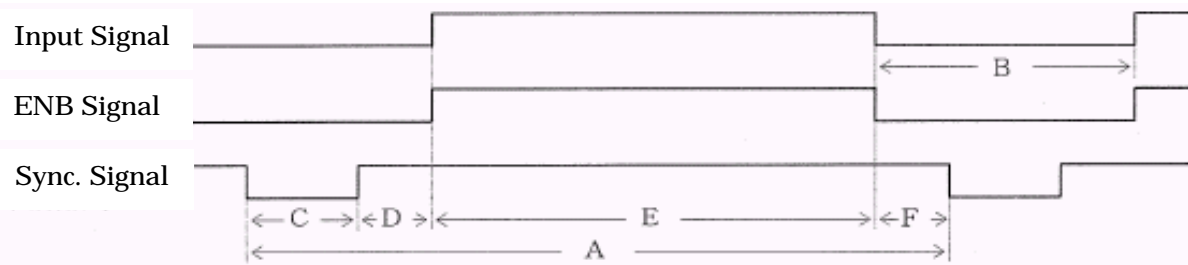
[Note 5] When the tube is lit at  $T_a = 25$  ,  $I_L = 6.0\text{mArms}$ , tube life is defined as:  
when surface luminance becomes 50% of its original value  
when kick-off voltage is 1220 Vrms at  $T_a = 0$  .

(NOTE) Characteristics of DC/AC inverter affects the lighting performance and life of back-light. Please make sure to avoid poor lighting, such as flickering and miss-lighting, caused by mismatch of back-light and the inverter. When you confirm, the module should be operated on the same condition as it is actually installed in your instrument.

Strong impact to LCD module may cause micro crack in CCFT; a device to detect excessive voltage/current must be mounted on the inverter circuit to avoid overheating of electrode.

## 7. Input Signal Timing Characteristic

### 7-1 Timing Characteristics (Rated by LVDS-IC output digital signal)



(Vertical)

Item (symbols)	Min.	STD.	Max.	Unit	Remarks
Vsync Cycle ( $T_{VA}$ )		16.667	-	ms	negative
	803	806	-	line	( - )
Blanking Period ( $T_{VB}$ )	35	38	-	line	
Sync. Range ( $T_{VC}$ )	4	6	-	line	
Back Porch ( $T_{VD}$ )	0	29		line	
Sync. Range + Back Porch	35	35	35	line	
Effective Display Range ( $T_{VE}$ )	768	768	768	line	
Front Porch ( $T_{VF}$ )	0	3	-	line	

(Horizontal)

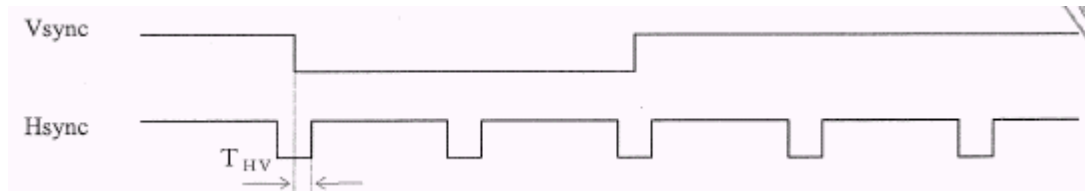
Item (symbols)	Min.	STD.	Max.	Unit	Remarks
Hsync Cycle ( $T_{HA}$ )	19.4	20.667	-	$\mu s$	negative
	1260	1344	1408	clock	( - )
Blanking Period ( $T_{HB}$ )	236	320	-	clock	
Sync. Range ( $T_{HC}$ )	8	136	-	clock	
Back Porch ( $T_{HP}$ )	0	160	312	clock	
Sync. Range + Back Porch	$1500 - T_{HA}$	296	$T_{HA} - 1024$	clock	
Effective Display Range ( $T_{HE}$ )	1024	1024	1024	clock	
Front Porch ( $T_{HF}$ )	0	24	-	clock	

(Clock)

Item (symbol)	Min.	STD.	Max.	Unit	Remarks
Clock Frequency	59.5	65.0	65.0	MHz	[Note]

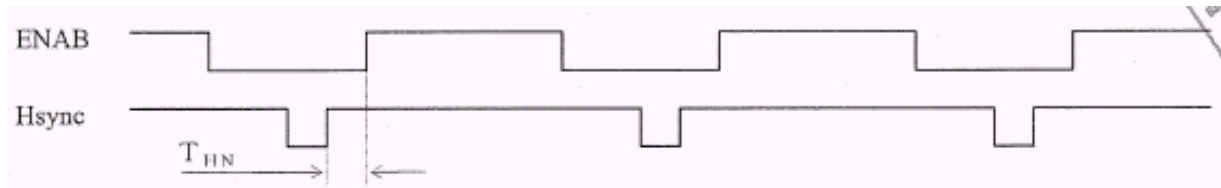
[Note] Low frequency may cause deterioration of display such as flickering.

( Horizontal-Vertical Synchronizing Signal Phase Difference)



Item (symbol)	Min.	STD.	Max.	Unit	Remark
Horizontal-Vertical Sync. Signal Phase Difference ( $T_{HV}$ )	1	-	$T_{HA} - T_{HC}$	clock	

( Horizontal-ENAB Signal Phase Difference)



Item (symbol)	Min.	STD.	Max.	Unit	Remark
Horizontal-ENAB Signal Phase Difference ( $T_{HN}$ )	0	-	312	clock	

## 7-2 Display Positioning

Item	Standard Position	Starting Position	Ending Position	Unit	Remark
Horizontal	ENAB start-up	0	1024	clock	
	Hsync start-up	296	1320	clock	Set ENAB to LOW
Vertical	Vsync start-up	35	803	line	

[Note]

(Horizontal display position)

When ENAB is set at Low level, it counts 296 clock after Hsync start-up and displays one after that. If any other timing is desired, use ENAB signal.

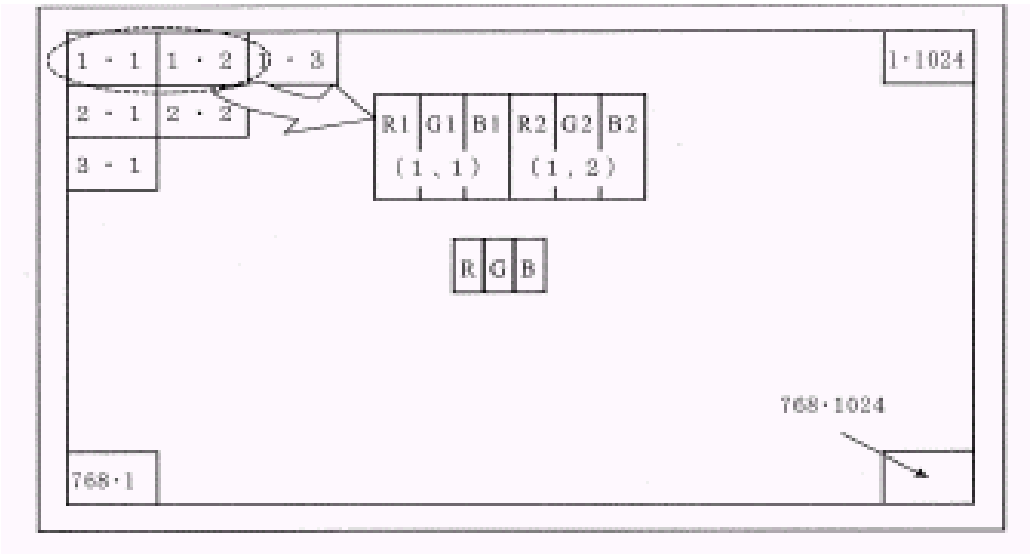
(Vertical display position)

It counts 35 lines after Vsync start-up and displays one after that. Any other timing will cause displacement.

(Remarks)

ENAB cannot be used for vertical position adjustment.

7-3 Input Signals and Display Position



Data Display Position (V·H)

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

	Color & luminance	Input Data																			
		Scale	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	0	1	1	1	1	1	1	0	0	0	0	0	
	Cyan		0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
	Red		1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
	Magenta		1	1	1	1	1	1	1	0	0	0	0	0	0	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	
	Dark	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	↑																				
	↓																				
	Bright	GS61	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
	↓	GS62	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
	Red	GS63	1	1	1	1	1	1	1	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	0	1	0	0	0	0	0	0	0	0	0	0	
	Dark	GS2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	↑																				
	↓																				
	Bright	GS61	0	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	0	1	1	1	1	1	0	0	0	0	0	
	Green	GS63	0	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	
	Dark	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
	↑																				
	↓																				
	Bright	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

By inputting data signal 6 bit for each color display, 64 gray scale(gradation) for each color is displayed. 262,144 colors display is possible by having combination of total 18 bit data.

## 9. Optical Characteristics

### 9-1 Back-light ON

Item	Symbol	Condition	Min.	STD.	Max.	Unit	Remarks
Range of Visual Angle	Horizontal	21 22	30	40	-	°	[Note 1,4]
	Vertical	11	40	45	-	°	
		12	20	30	-	°	
Contrast Ratio	CRn	=0 °	100	150	-		[Note 2,4]
Response Time	Rising	r	-	30	45	ms	[Note 3,4]
	Falling	d	-	50	75	ms	
White Chromaticity	x	=0 °	0.282	0.322	0.362		[Note 4]
	y		0.292	0.332	0.372		
Luminance of White	Y <sub>L</sub>		140	180	-	cd/m <sup>2</sup>	I <sub>L</sub> =6.0mArms, F <sub>L</sub> =49kHz [Note 5]
Luminance Distribution	w		-	-	1.45		[Note 6]

\* Measuring will be done 30 minutes after lighting the lamp rating.

Measurement of optical characteristics will be done in the following method in the dark room or equivalent. (standard: I<sub>L</sub> = 6.0 mArms)

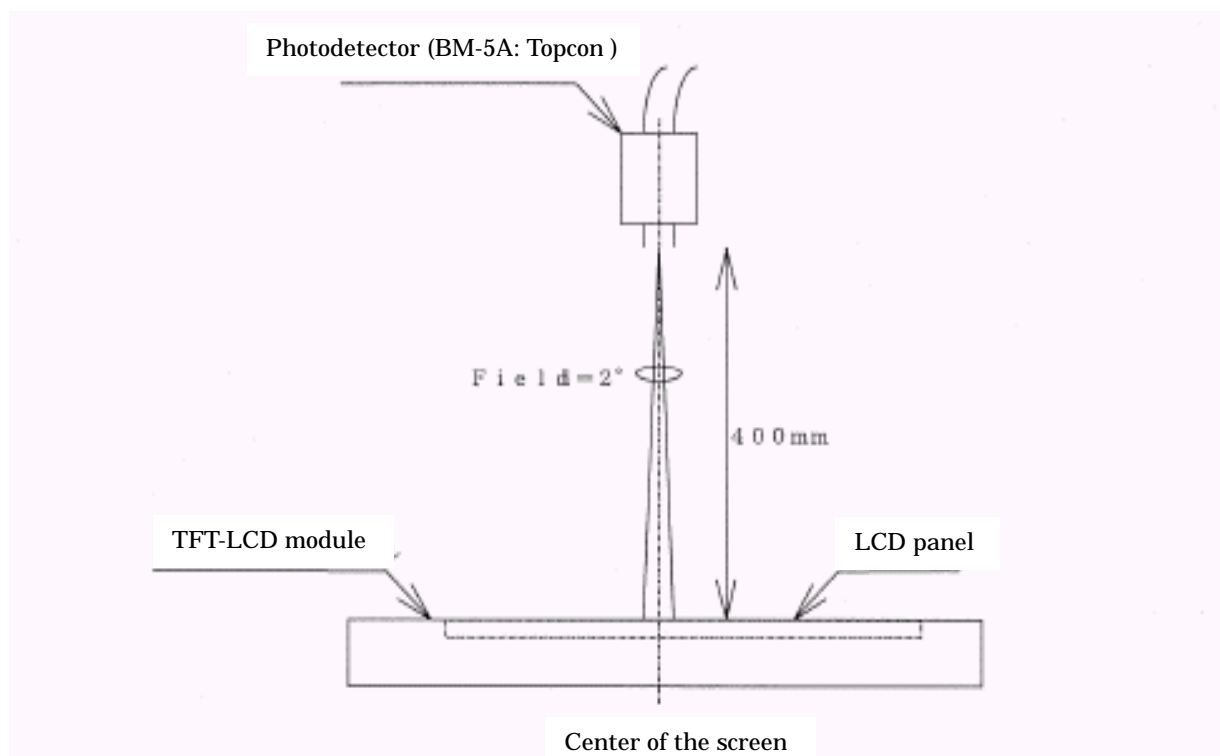


Fig. Setup for Measuring Optical Characteristics

## 9-2 Back-light OFF

Ta = 25 , Vcc = + 3.3V

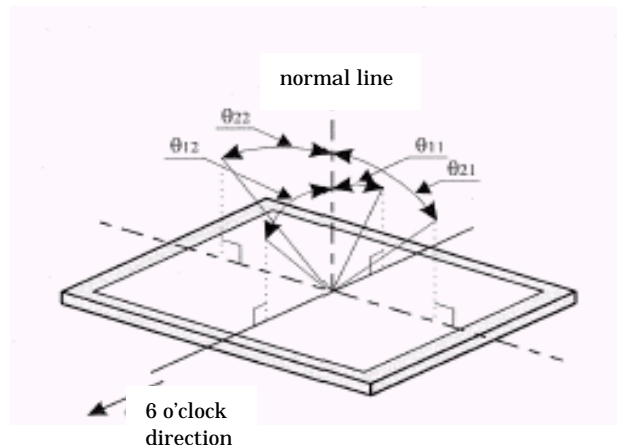
Item	Symbol	Condition	Min.	STD.	Max.	Unit	Remarks
Contrast Ratio	CR	=0 °	3	3.5	-		[Note 2, 4]
Reflectance	R		2	2.6	-	%	[Note 4]

Measuring device : CM-2002 (dispersion colorimeter by Minolta)

Definition of reflectance = 
$$\frac{\text{Reflected light intensity of the panel when voltage is added}}{\text{Reflection intensity of white panel}}$$



[Note 1] Definition of Viewing Angle

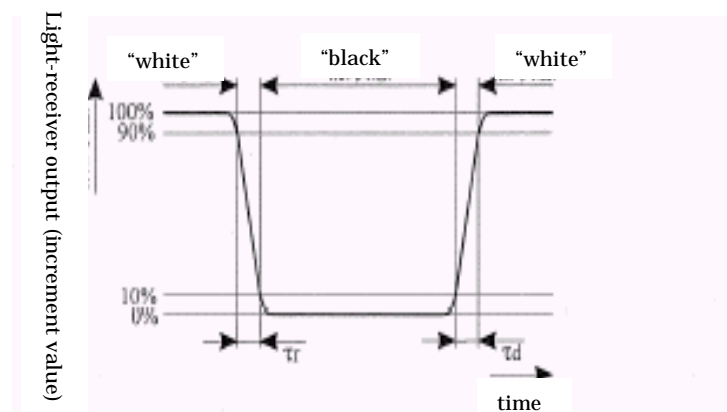


[Note 2] Contrast Ratio is defined as below:

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

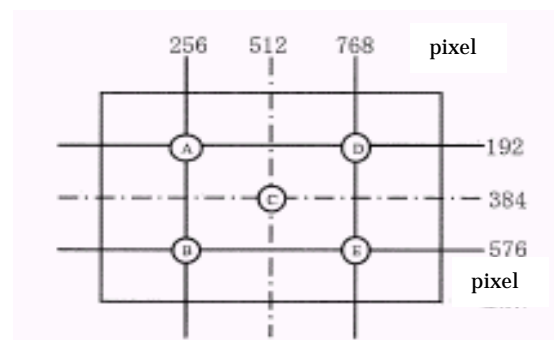
[Note 3] Definition of Response Speed

Sum of  $r$  and  $d$



[Note 4] Measurement is taken at the center of the panel.

[Note 5] Luminance is defined as  
the average value of 5 points (A~E)  
shown on the right.



[Note 6] Luminance Distribution is defined  
by using the measured value of 5 points  
(A~E) in the formula below.

$$w = \frac{\text{Max.luminance of points A~E}}{\text{Min. luminance of points A~E}}$$

## 10. Visual Quality

Please refer to the attachment "Delivery Inspection Manual".

## 11. Handling Instruction

- a) Turn power OFF before connecting or disconnecting a cable to the module.
- b) Assemble the module firmly with the mounting holes on the same face; do not cause any stress such as twist or warp.
- c) Handle the polarized face of the panel surface with extreme care.
- d) Contact with water droplet for over 10 minutes may cause discoloration or stain. Wipe off promptly.
- e) When the surface of the panel is soiled, clean it with a cotton wool or a soft cloth.
- f) Handle the device with care as the surface is made of glass. It may crack or chip off if dropped or bumped on hard surface.
- g) Connecting / disconnecting must be done parallel to LCD module and be kept horizontal.
- h) LCD module is mounted with CMOS-LSI; take special measures toward static electricity.
- i) Handle other electronic parts with care.
- j) The circuit board is located on the back of the module; excessive stress during assembly may cause damage to the circuit.
- k) In handling or mounting of module, storing it in an environment where oxidizing gas or reducing medium may be present, or use of chemicals, solution, or resin that may cause the gases mentioned above, may cause corrosion or discoloration.
- l) LCD panel is composed of fluorescent tube, please comply with the local regulations in disposition.

## 12. Packing Form

- a) Maximum stack in a pile: 10
- b) Maximum packing quantity: 20 units.
- c) Carton size: 337 mm (W) x 313 mm (D) x 218 mm (H)
- d) Total mass with 20 units: 3300g

Fig. 2 shows the packing form.

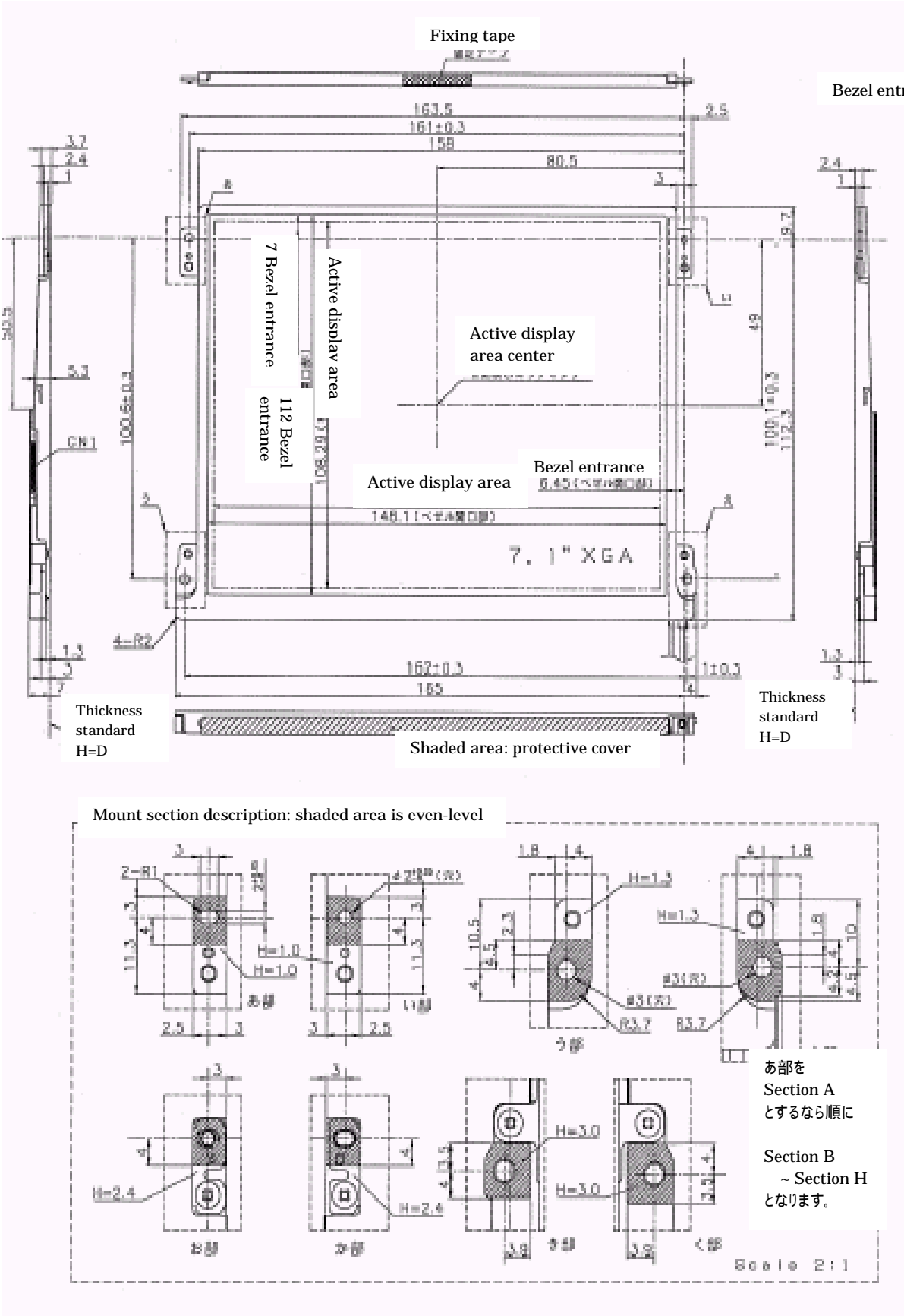
### 13. Reliability Items

No.	Test item	Description
1	High temperature storage test	Ta = 60 ; 240 hr
2	Low temperature storage test	Ta = - 25 ; 240 hr
3	High temperature operation	Ta = 50 ; 240 hr (panel temperature <60 )
4	Low temperature operation	Ta = 0 ; 240 hr
5	High temp./high humidity operation test	Ta = 40 , 95% RH; 240 hr (no condensation)
6	Vibration test (non-operating)	Frequency: 5~57Hz/0.075mm 58~500Hz/9.8 m/s <sup>2</sup> Sweep time: 10Hz~500Hz~10Hz/11.0min Test period: 6 hr (2 hr each for X,Y,Z direct.)
7	Shock test (non-operating)	by the term A of JIS-C-0041 Acceleration: 490 m/s <sup>2</sup> , pulse width: 11ms Direction: ± X, ± Y, ± Z

[Evaluation Criteria] There should be no change in operation when actually operated in normal condition in accordance with "Delivery Inspection Manual".

150 ± 1.5 (CN1 Tip)

左半分



右半分



1	High V side
2	GND side

- 1) Tolerance  $\pm 0.5$
- 2) Width to be the one pressed with 2N
- 3) Avoid any stress on protective shield to prevent damage to electronic parts
- 4) There may be some units with flaw or foam outside the active display area; please consider in assembly.

LCP-03020600

Upper tray

LCP-03029-21

VOID

Outer tray

lead wire  
fixing tape

Module  
LS071x7LA01

tray

Outer tray

Master carton  
(Main box)

图 2 包装形态图

Fig. 2 Packing Form