



DATA DISPLAY GROUP

Datasheet

OPTREX

T-55441GD050J-LW-A-AAN

OP-01-102

LCD Module Technical Specification

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Type No. **T-55441GD050J-LW-A-AAN**

Customer :

Customer's Product No :

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Date :

Please return this specification within two month with your signature.
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1. APPLICATION

This specification applies to color TFT-LCD module, T-55441GD050J-LW-A-AAN.

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OPTREX classifies the usage of the TFT-LCD module as follows. Please confirm the usage before using the product.

(1) Standard Usage

Computers, office equipment, factory automation equipment, test and measurement equipment, communications, transportation equipment(automobiles, ships, trains, etc.), provided, however, that operation is not influenced by TFT-LCD directly.

(2) Special Usage

Medical equipment, safety equipment, transportation equipment, provided, however, that TFT-LCD is necessary to its operation.

(3) Specific Usage

Cockpit Equipment, military systems, aerospace equipment, nuclear reactor control systems, life support systems and any other equipment. OPTREX should make a contract that stipulate apportionment of responsibilities between OPTREX and our customer.

The product specified in this document is designed for "Standard Usage" unless otherwise specified in this document. If customers intend to use the product for applications other than those specified for "Standard Usage", they should first contact OPTREX sales representative for it's intended use in writing.

OPTREX has been making continuous effort to improve the reliability of its products. Customers should implement sufficient reliability design of their application equipments such as redundant system design, fail-safe functions, anti-failure features.

OPTREX assumes no responsibility for any damage resulting from the use of the product that does not comply with the instructions and the precautions specified in this document.

Please contact and consult OPTREX sales representative for any questions regarding this product.

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2. OVERVIEW

T-55441GD050J-LW-A-AAN is 5.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight unit.

By applying 6 bit or 8 bit digital data, 640×640 , 262k-color or 16.7M-color images are displayed on the 5.0" diagonal screen. Input power voltage is 3.3 V for LCD driving.

The type of data and control signals are digital and transmitted via CMOS interface per Typ. 31.8 MHz clock cycle.

Driver circuit for LED backlight is not included in this module. General specifications are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	89.28(H) $\times$ 89.28(V) (5.0-inch diagonal)
Number of Dots	640×3 (H) $\times$ 640 (V)
Pixel Pitch (mm)	0.1395(H) $\times$ 0.1395 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white TN
Number of Color	262k(6 bit/color) 16.7M(8 bit/color)
Luminance (cd/m ²)	1000
Wide Viewing Angle Technology	Optical compensation film
Viewing Angle (CR $\geq$ 10)	-80~80° (H) -70~80° (V)
Surface Treatment	Anti-glare and hard-coating 3H
Electrical Interface	CMOS (6 bit/8 bit)
Optimum Viewing Angle (Contrast ratio)	6 o'clock
Module Size (mm)	103.8(W) $\times$ 105.8(H) $\times$ 11.9(D)
Module Mass (g)	155
Backlight Unit	Edge-light, LED

Characteristic value without any note is typical value.

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT
Power Supply Voltage for LCD	VCC	-0.3	4.0	V
Logic Input Voltage	VI	-0.3	6.0	V
Backlight (LED) Current	IF	--	200	mA
Operation Temperature (Panel) Note 1,2)	T _{op} (Panel)	-30	80	°C
Operation Temperature (Ambient) Note 2)	T _{op} (Ambient)	-30	80	°C
Storage Temperature Note 2)	T _{stg}	-30	80	°C

[Note]

1) Measured at the center of active area and at the center of panel back surface

2) Top, Tstg ≤ 40°C : 90%RH max. without condensation

Top, Tstg > 40°C : Absolute humidity shall be less than the value of 90%RH at 40°C without condensation.

4. ELECTRICAL CHARACTERISTICS

(1) TFT· LCD

Ambient temperature: Ta = 25°C

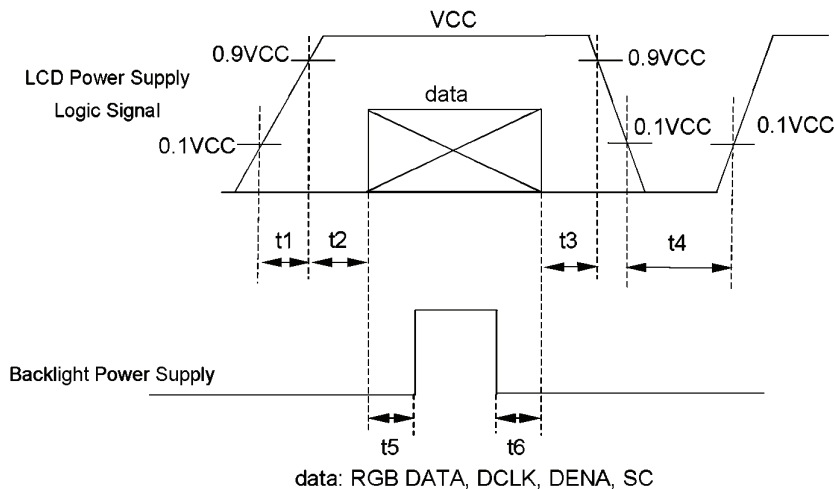
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Power Supply Voltage for LCD	VCC	3.0	3.3	3.6	V	*1)
Power Supply Current for LCD	ICC	--	330	530	mA	*2)
Permissible Input Ripple Voltage	VRP	--	--	100	mVp·p	VCC = +3.3V
Logic Input Voltage	High	VIH	2.0	--	5.5	V
	Low	VIL	0	--	0.8	V

*1) Power and signals sequence:

t1 ≤ 10 ms 200 ms ≤ t4

0 < t2 ≤ 50 ms 200 ms ≤ t5

0 < t3 ≤ 50 ms 0 ≤ t6



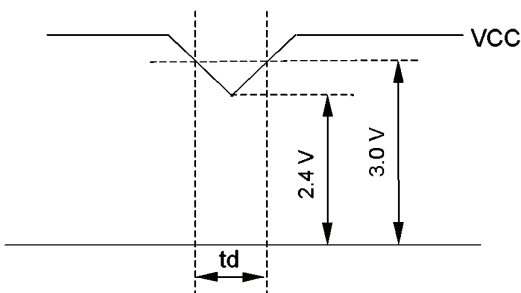
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VCC-dip conditions:

1) When $2.4\text{ V} \leq \text{VCC} < 3.0\text{ V}$, $t_d \leq 10\text{ ms}$

2) When $\text{VCC} < 2.4\text{ V}$

VCC-dip conditions should also follow the power and signals sequence.



*2) $\text{VCC} = +3.3\text{ V}$, $f_H=40.1\text{ kHz}$, $f_V=60\text{ Hz}$, $f_{\text{CLK}}=31.8\text{ MHz}$

Display image at typical power supply current value is 256-gray-bar pattern (8 bit), 640 line mode.

*3) Fuse

Parameter	Fuse Type Name	Supplier	Remark
VCC	FCC16162AB	Kamaya Electric Co., Ltd.	*)

*) The power supply capacity should be designed to be more than the fusing current.

(2) Backlight

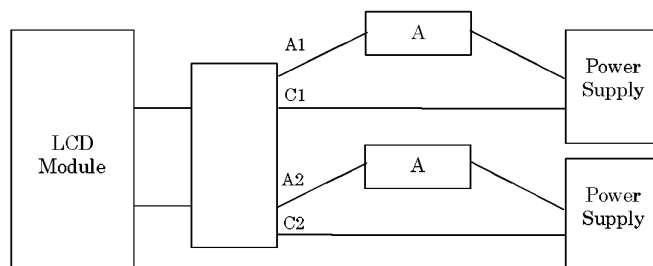
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
LED Voltage	VF	--	(16)	18	V	$I_F = 90\text{ mA}$, $T_a = 25^\circ\text{C}$
		--	--	18.7	V	$I_F = 90\text{ mA}$, $T_a = 0^\circ\text{C}$
		--	--	19.6	V	$I_F = 90\text{ mA}$, $T_a = -30^\circ\text{C}$
LED Current	IF	--	90	120	mA	*1), *3)
LED Life Time	LT	60,000	--	--	h	$I_F = 90\text{ mA}$, $T_a = 25^\circ\text{C}$ *4), *5), Continuous operation

[Note]

*1) Constant Current Drive

*2) The Voltage deviation between strings: $|V_{f1} - V_{f2}| \leq 2\text{ V}$

*3) LED Current measurement method



*4) LED life time is defined as the time when the brightness becomes 50% of the initial value.

*5) The life time of the backlight depends on the ambient temperature. The life time will decrease under high temperature.

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5. INTERFACE PIN CONNECTION

(1) CN 1(Interface Signal)

Used connector: 51296-4594 (Molex Japan)

Corresponding connector: FFC or FPC

Pin No.	Symbol	Function
1	GND	
2	DCLK	Clock signal for sampling catch data signal
3	GND	
4	HD	Horizontal sync signal *1)
5	VD	Vertical sync signal *1)
6	GND	
7	R0	Red data signal(LSB) *3)
8	R1	Red data signal *3)
9	R2	Red data signal
10	R3	Red data signal
11	R4	Red data signal
12	R5	Red data signal
13	R6	Red data signal
14	R7	Red data signal(MSB)
15	GND	
16	G0	Green data signal(LSB) *3)
17	G1	Green data signal *3)
18	G2	Green data signal
19	G3	Green data signal
20	G4	Green data signal
21	G5	Green data signal
22	G6	Green data signal
23	G7	Green data signal(MSB)
24	GND	
25	B0	Blue data signal(LSB) *3)
26	B1	Blue data signal *3)
27	B2	Blue data signal
28	B3	Blue data signal
29	B4	Blue data signal
30	B5	Blue data signal
31	B6	Blue data signal
32	B7	Blue data signal(MSB)
33	GND	
34	DENA	Data enable signal (to settle the viewing area)
35	NC	This pin should be open.
36	VCC	3.3 V Power Supply
37	VCC	3.3 V Power Supply
38	NC	This pin should be open.
39	NC	This pin should be open.
40	SC	Scan direction control (Low=Normal, High=Reverse)
41	NC	This pin should be open.
42	LED_C1	LED cathode1
43	LED_C2	LED cathode2
44	LED_A2	LED anode2
45	LED_A1	LED anode1

- *1) HD and VD are not being used for timing control.
- *2) Metal frame is connected to signal GND.
- *3) In case of 6 bit mode, Input signal should be low.

6. INTERFACE TIMING

(1) Timing Specifications

ITEM			SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK	Frequency		f _{CLK}	23.9	31.8	40	MHz
	Period		t _{CLK}	25.2	31.4	41.8	ns
	Low Width		tw _{CL}	10	--	--	ns
	High Width		tw _{CH}	10	--	--	ns
DATA(R,G,B), DENA	Set up time		t _{DS}	4	--	--	ns
	Hold time		t _{DH}	4	--	--	ns
DENA	Horizontal	Active Time	t _{HA}	640	640	640	t _{CLK}
		Blanking Time	t _{HB}	20	154	--	t _{CLK}
		Frequency	f _H	30.2	40.1	50.1	kHz
		Period	t _H	20.0	24.9	33.2	μs
	Vertical	Active Time	t _{VA}	640	640	640	t _H
		Blanking Time	t _{VB}	4	30	--	t _H
		Frequency	f _V	55	60	75	Hz
		Period	t _V	13.3	16.7	18.2	ms

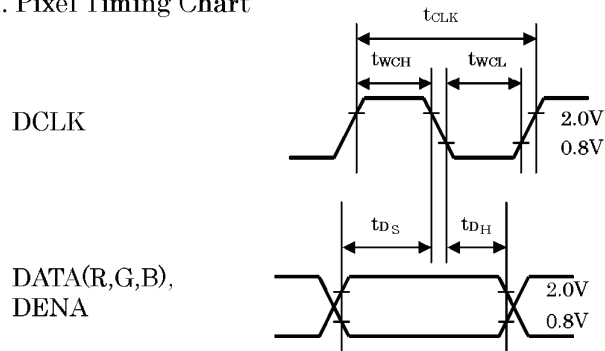
[Note]

- 1) DATA is latched at fall edge of DCLK in this specification.
- 2) DENA (Data Enable) should always be positive polarity as shown in the timing specification.
- 3) DCLK should appear during all invalid period.
- 4) In case of blanking time fluctuation, please satisfy following condition.

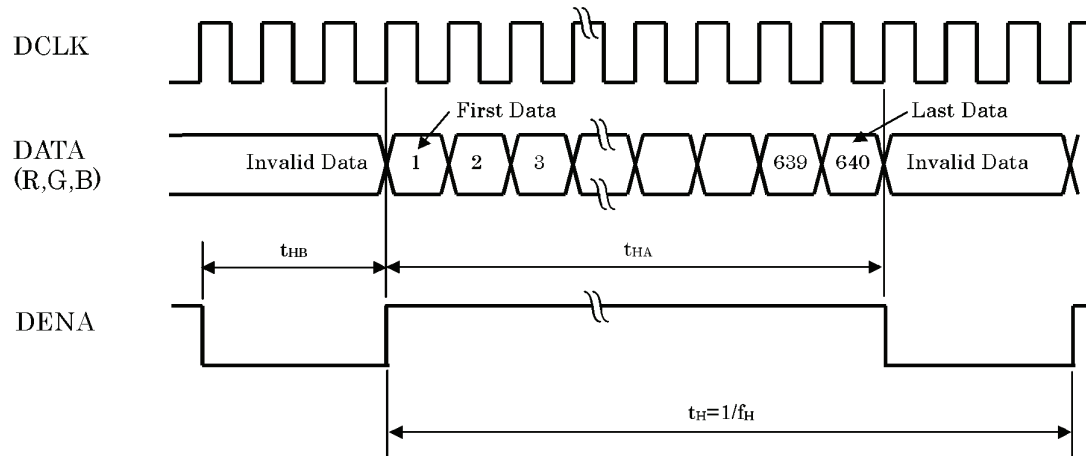
$$t_{VBn} > t_{VBn-1} - 3(t_H)$$

(2) Timing Chart

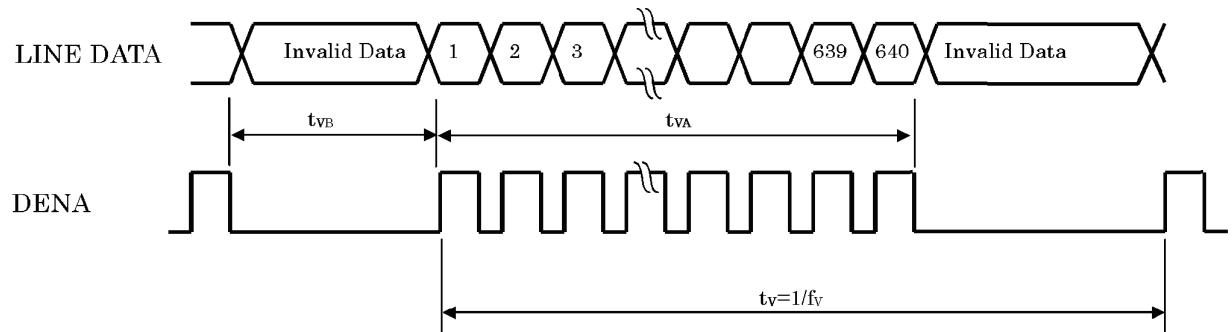
a. Pixel Timing Chart



b. Horizontal Timing Chart



c. Vertical Timing Chart



(3) Color Data Assignment

a. 6 bit input

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
MSB							LSB	MSB							LSB	MSB								LSB	
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	
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(63)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	
	YELLOW	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
	WHITE	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	
RED	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0		
	GREEN(62)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	
	GREEN(63)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	

[Note]

1) Definition of gray scale

Color (n) ---n indicates gray scale level.

Higher n means brighter level.

2) Data

1:High, 0: Low

b. 8 bit input

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
MSB							LSB	MSB							LSB	MSB								LSB	
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	
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	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	
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RED	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	

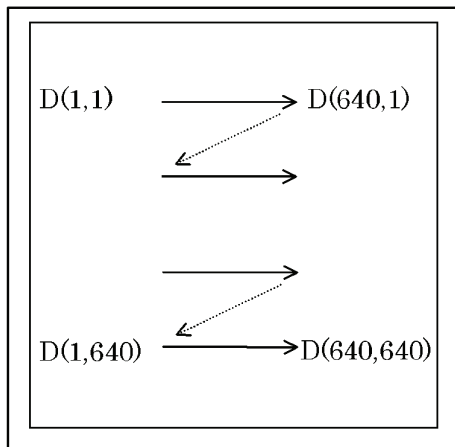
[Note]

- 1) Definition of gray scale
Color (n) ---n indicates gray scale level.
Higher n means brighter level.
- 2) Data
1:High, 0: Low

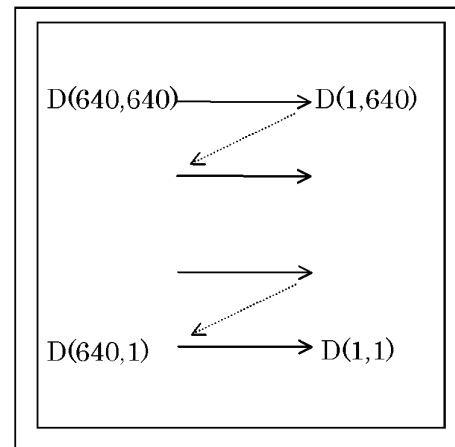
(4) Display Position and Scan Direction

D(X,Y) shows the data number of input signal for LCD panel signal processing PCB.

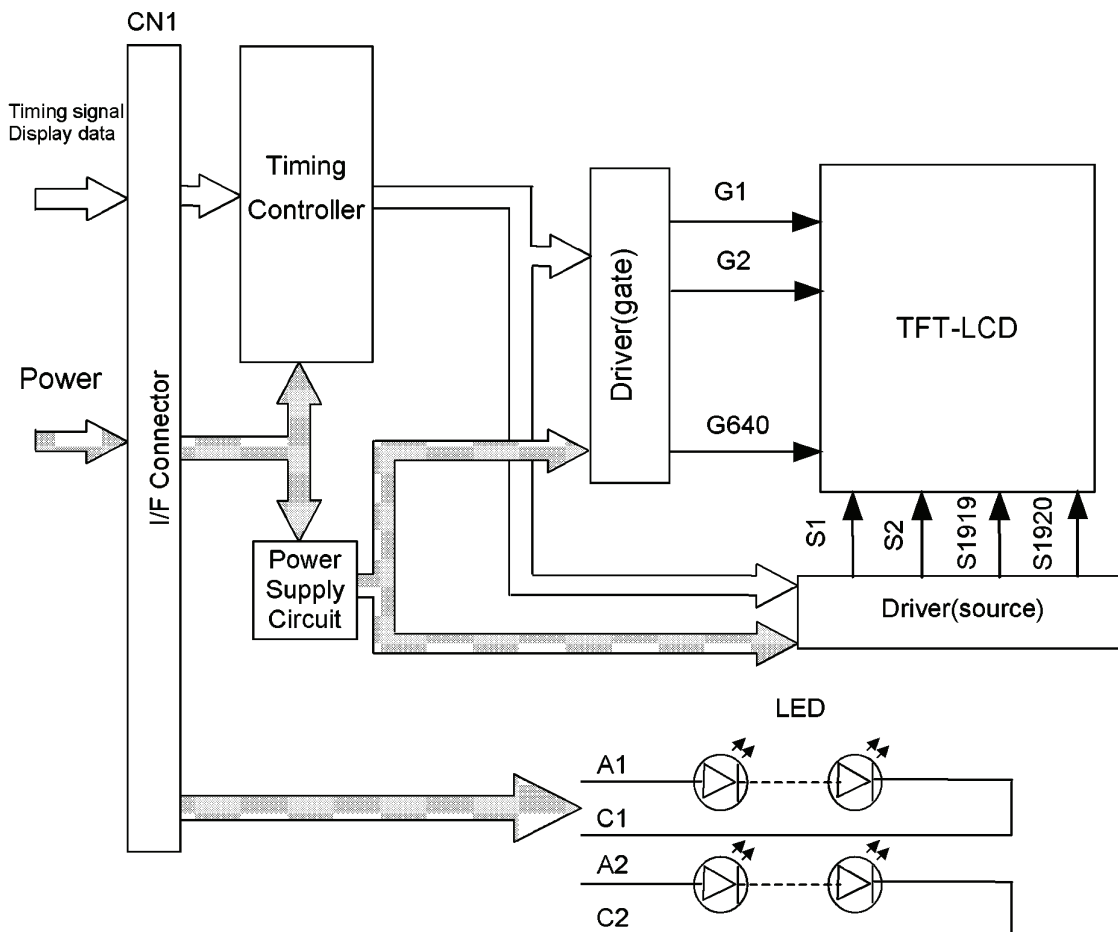
SC: Low



SC: High

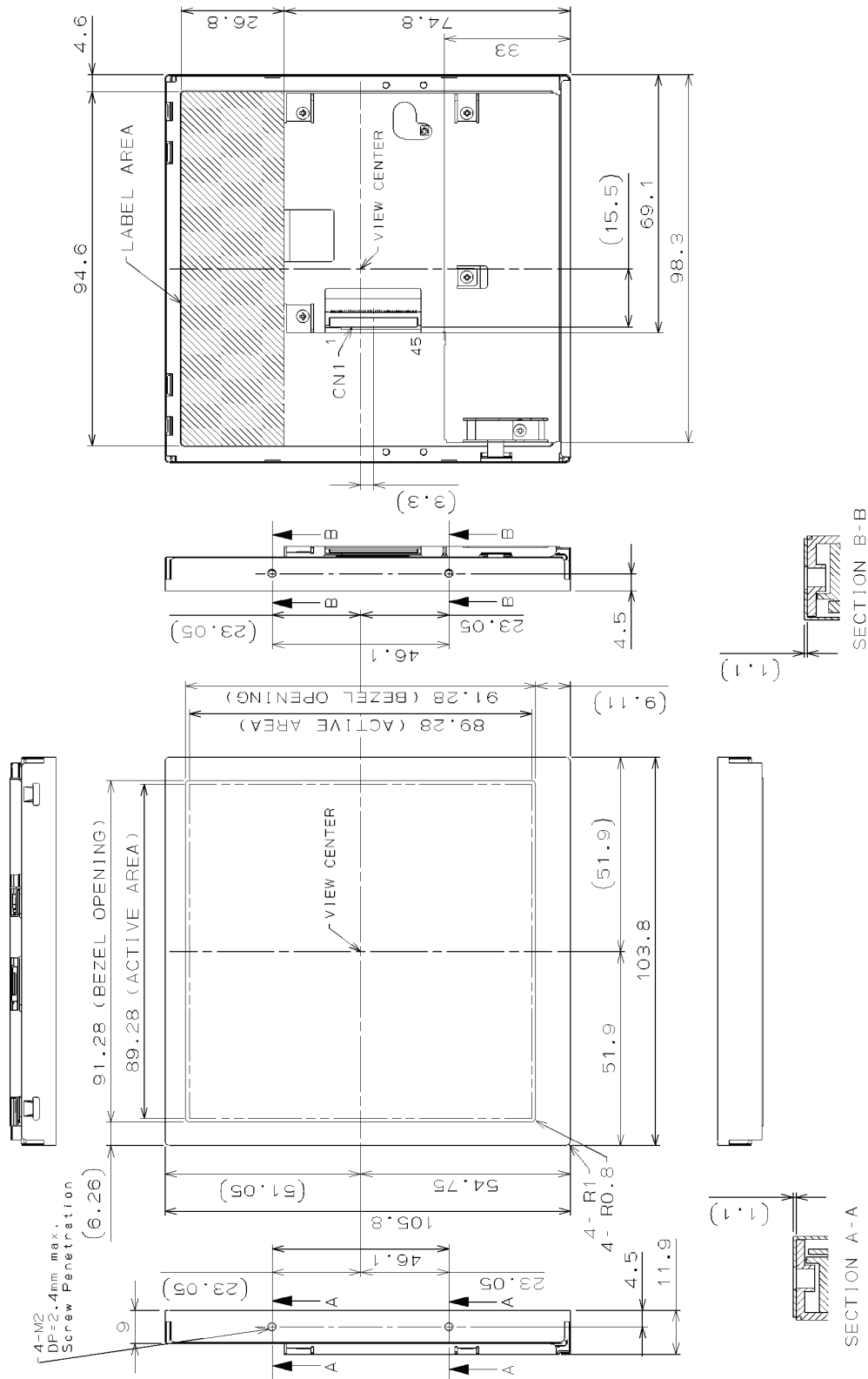


7. BLOCK DIAGRAM



8. MECHANICAL SPECIFICATIONS

(1) Outline Dimensions



1)Tolerance is ±0.5mm unless noted.
2)Third angle projection

CN1:51296-4594(mol ex)

(Unit:mm)

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9. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3 V, Input Signals: Typ. Values shown in Section 6

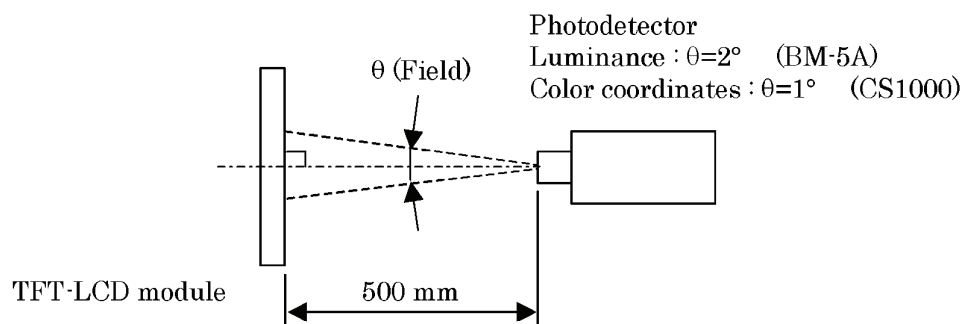
ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remarks
Contrast Ratio		CR	$\theta_V=0^\circ, \theta_H=0^\circ$	500	700	--	--	*1)*2)*5)
Luminance		Lw	$\theta_V=0^\circ, \theta_H=0^\circ$	800	1000	--	cd/m ²	*1)*5)
Luminance Uniformity		ΔLw	$\theta_V=0^\circ, \theta_H=0^\circ$	--	--	30	%	*1)*3)*5)
Response Time		tr	$\theta_V=0^\circ, \theta_H=0^\circ$	--	4	--	ms	*1)*4)*5)
		tf	$\theta_V=0^\circ, \theta_H=0^\circ$	--	12	--	ms	*1)*4)*5)
Viewing Angle	Horizontal	θ_H	CR ≥ 10	-70~70	-80~80	--	°	*1)*5)
	Vertical	θ_V		-60~70	-70~80	--	°	*1)*5)
Image Sticking		tis	2 h	--	--	2	s	*6)
Color Coordinates	Red	Rx	$\theta_V=0^\circ, \theta_H=0^\circ$	0.509	0.549	0.589	--	*1)*5)
		Ry		0.316	0.356	0.396		
	Green	Gx		0.299	0.339	0.379		
		Gy		0.499	0.539	0.579		
	Blue	Bx		0.114	0.154	0.194		
		By		0.090	0.130	0.170		
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		

[Note]

These items are measured using CS1000(MINOLTA) for color coordinates, EZContrast(ELDIM) for viewing angle and CS1000 or BM-5A(TOPCON) for others under the dark room condition (no ambient light) after more than 30 minutes from turning on the backlight unless noted.

Condition: IF=90 mA

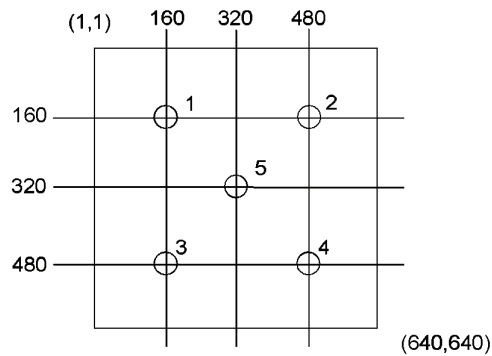
Measurement method for luminance and color coordinates is as follows.



The luminance is measured according to FLAT PANEL DISPLAY MEASUREMENTS STANDARD (VESA Standard).

***1) Measurement Point**

Contrast Ratio, Luminance, Response Time, Viewing Angle, Color Coordinates: Display Center
Luminance Uniformity: point 1~5 shown in a figure below



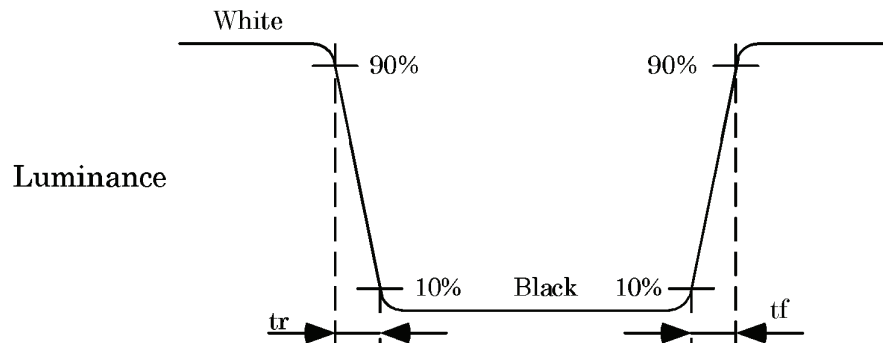
***2) Definition of Contrast Ratio**

$CR = \text{Luminance with all white pixels} / \text{Luminance with all black pixels}$

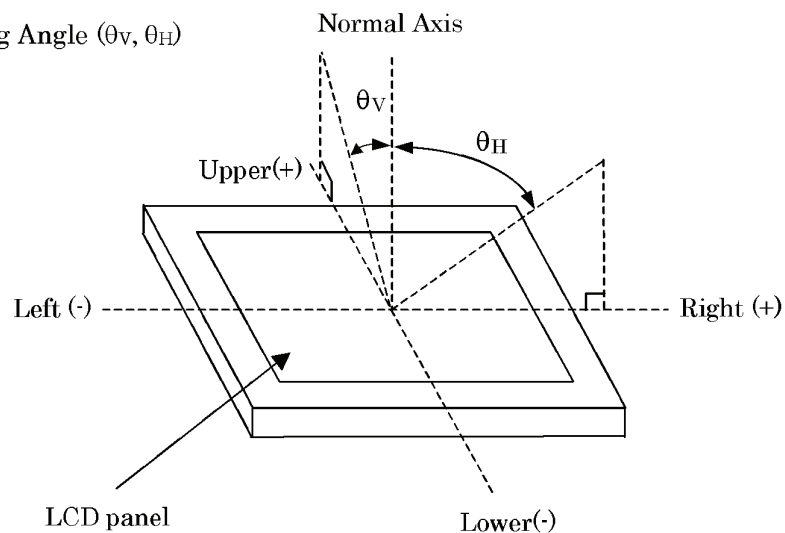
***3) Definition of Luminance Uniformity**

$$\Delta L_w = [L_w(\text{MAX}) / L_w(\text{MIN}) - 1] \times 100$$

***4) Definition of Response Time**

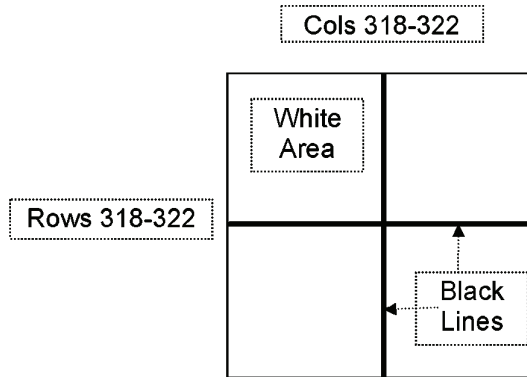


***5) Definition of Viewing Angle (θ_V , θ_H)**



***6) Image Sticking**

Continuously display the test pattern shown in the figure below for two-hours. Then display a completely white screen. The previous image shall not persist more than two seconds at 25°C.



TEST PATTERN FOR IMAGE STICKING TEST

10. RELIABILITY TEST CONDITION

(1) Temperature and Humidity

ITEM	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40°C, 90%RH, 240 h (No condensation)
HIGH TEMPERATURE OPERATION	80°C, 240 h
LOW TEMPERATURE OPERATION	-30°C, 240 h
HIGH TEMPERATURE STORAGE	80°C, 240 h
LOW TEMPERATURE STORAGE	-30°C, 240 h
THERMAL SHOCK (NON-OPERATION)	BETWEEN -30°C (1h) and 80°C(1h), 100 CYCLES

(2) Shock & Vibration

ITEM	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: 1470m/s ² (150G) Waveform: half sinusoidal wave, 2ms Number of shocks: one shock input in each direction of three mutually perpendicular axis for a total of six shock inputs
VIBRATION (NON-OPERATION)	Vibration level: 9.8m/s ² (1.0G) Waveform: sinusoidal Frequency range: 5 to 500Hz Frequency sweep rate: 0.5 octave /min Duration: one sweep from 5 to 500 Hz in each of three mutually perpendicular axis(total 3 hours)

(3) Judgment standard

The judgment of the above tests should be made as follow:

Pass: Normal display image, no damage of the display function. (ex. no line defect)

Partial transformation of the module parts should be ignored.

Fail: No display image, damage of the display function. (ex. line defect)

11. INSPECTION STANDARDS

Inspection condition is as follows:

- Inspection Area: active area
- Viewing distance: approximately 35 cm.
- Viewing angle: normal to the LCD panel $\pm 10^\circ$ horizontal and vertical.
- Ambient temperature: approximately 25°C.
- Ambient light: 300 - 500 lx.

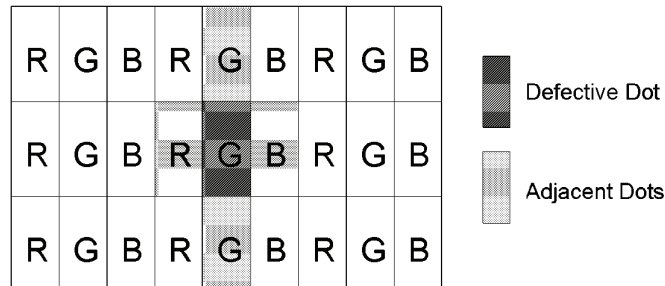
Bright Dot is defined as follows:

Visible through 5% transmission ND filter under the condition that black image (color 0) is on the display.

DEFECT TYPE		LIMIT	
VISUAL DEFECT	SCRATCH	$0.01 \text{ mm} < W \leq 0.05 \text{ mm}$ $L \leq 10 \text{ mm}$	$N \leq 4$
		$0.01 \text{ mm} < W$ $10 \text{ mm} < L$	$N = 0$
		$0.05 \text{ mm} < W$	$N = 0$
	DENT	$0.2 \text{ mm} < \phi \leq 0.4 \text{ mm}$	$N \leq 4$
		$0.4 \text{ mm} < \phi$	$N = 0$
	BLACK SPOT BUBBLE	$0.2 \text{ mm} < \phi \leq 0.4 \text{ mm}$	$N \leq 5$
		$0.4 \text{ mm} < \phi$	$N = 0$
	LINT	$L \leq 3 \text{ mm}$ $W \leq 0.1 \text{ mm}$	$N \leq 4$
		$3 \text{ mm} < L$ $W \leq 0.1 \text{ mm}$	$N = 0$
		$0.1 \text{ mm} < W$	ACCORDING TO BLACK SPOT
ELECTRICAL DEFECT	BRIGHT DOT	$N \leq 5$	
	DARK DOT	$N \leq 5$	
	TOTAL DOT	$N \leq 8$	
	TWO ADJACENT DOT		
	BRIGHT DOT	$\leq 2 \text{ PAIRS}$	
	DARK DOT	$\leq 2 \text{ PAIRS}$	
	THREE OR MORE ADJACENT DOT	NOT ALLOWED	
	LINE DEFECT	NOT ALLOWED	

*1) W: width, L: length, ϕ : diameter, N: number

*2) DEFINITION OF ADJACENT



The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

12. OTHER FEATURE

This LCD module complies with RoHS*) directive.

*) RoHS: Restriction of the use of certain hazardous substances in electrical and electronic equipment

13. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

Please pay attention to the followings in handling TFT-LCD products:

(1) ASSEMBLY PRECAUTION

- a. Please mount the LCD module by using mounting hole with a screw clamping torque less than 0.2 Nm. Please do not bend or wrench the LCD module in assembling. Please do not drop, bend or twist the LCD module in handling.
- b. Please design display housing in accordance with the following guide lines.
 - (a) Housing case must be designed carefully so as not to put stresses on LCD and not to wrench module.
 - (b) Under high temperature environment, performance and life time of LED may heavily shorten. When you design with our LCD product, please consider radiating heat and ventilation for good heat management.
 - (c) Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. Approximately 1.0mm of the clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
 - (d) When some parts, such as, FPC cable and ferrite plate, are installed underneath the LCD module, still sufficient clearance is required, such as 0.5mm. This clearance is, especially, to be reconsidered when the additional parts are implemented for EMI countermeasure.
 - (e) Design the LED driver location and connector position carefully so as not to give stress to LED backlight cable.
 - (f) Keep sufficient clearance between LCD module and the others parts, such as inverter and speaker so as not to interfere the LCD module. Approximately 1.0 mm of the clearance in the design is recommended.
 - (g) To avoid local elevation/decrease of temperature, considering location of heating element, heat release, thermal design should be done.
- c. Please do not push or scratch LCD panel surface with anything hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)
- d. Please wipe off LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
- e. Please wipe off drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
- f. Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- g. Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
- h. Please handle metal frame carefully because edge of metal frame is very sharp.
- i. Please connect the metal frame of LCD module to GND in order to minimize the effect of external noise and EMI.
- j. Be sure to connect the cables and the connectors correctly.

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(2) OPERATING PRECAUTIONS

- a. Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- b. Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification.
- c. The interface signal speed is very high. Please pay attention to transmission line design and other high speed signal precautions to satisfy signal specification.
- d. A condensation might happen on the surface and inside of LCD module in case of sudden change of ambient temperature. Please take care so as not to cause any damage mentioned on (1)-d.
- e. Please pay attention not to display the same pattern for very long time. Image might stick on LCD. Even if image sticking happens, it may disappear as the operation time proceeds.
- f. Please obey the same safe instructions as ones being prepared for ordinary electronic products.

(3) PRECAUTIONS WITH ELECTROSTATICS

- a. This LCD module use CMOS-IC on circuit board and TFT-LCD panel, and so it is easy to be affected by electrostatics. Please be careful with electrostatics by the way of your body connecting to the ground and so on.
- b. Please remove protection film very slowly from the surface of LCD module to prevent from electrostatics occurrence.

(4) STORAGE PRECAUTIONS

LCD should be stored in the room temperature environment with normal humidity. The LCD inventory should be processed by first-in first-out method.

(5) SAFETY PRECAUTIONS

- a. When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- b. If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.
- c. Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- d. LED driver should be designed carefully to limit or stop its function when over current is detected on the LED.

(6) OTHERS

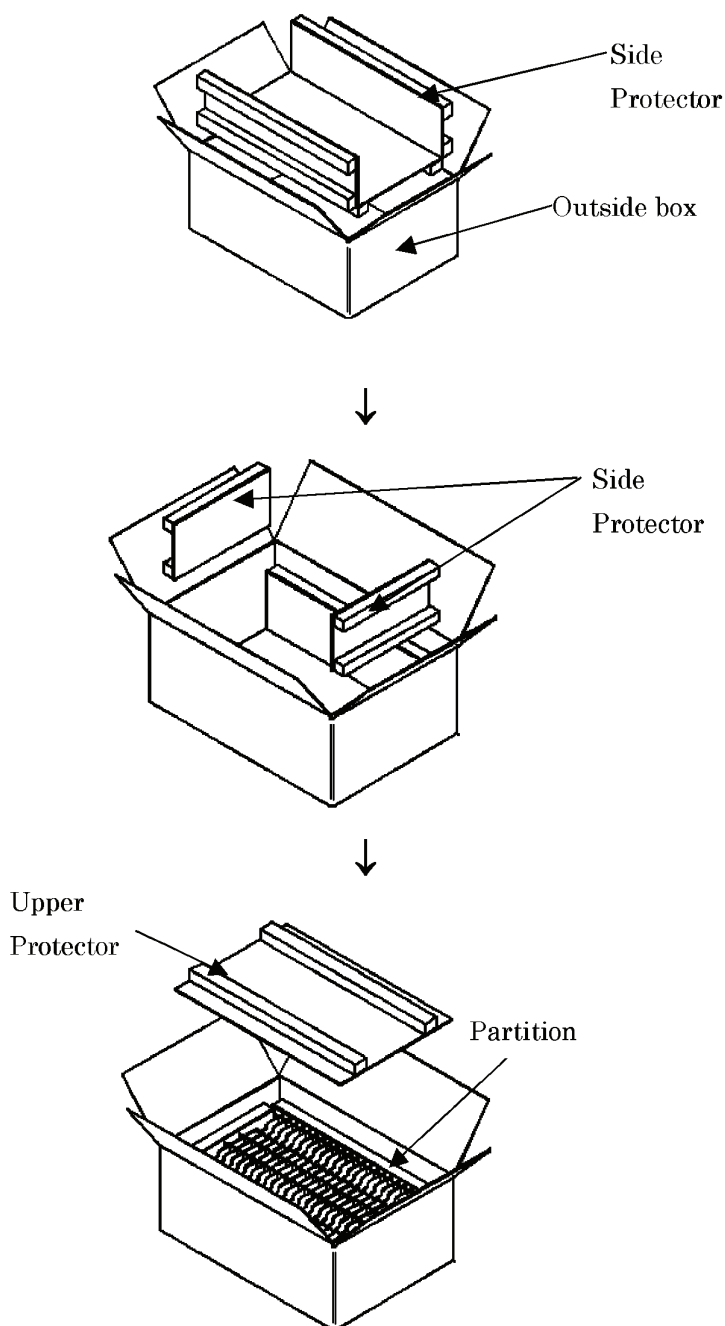
- a. A strong incident light into LCD panel may cause deterioration to polarizer film, color filter, and other materials, which will degrade the quality of display characteristics. Please do not expose LCD module under strong Ultraviolet rays for a long time.
- b. Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- c. For the packaging box handling, please see and obey with the packaging specification datasheet.

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PACKAGING SPECIFICATION

PACKAGING BOX

material:	cardboard
construction:	See Fig.1
max. packaging number:	40 pcs.
dimension:	582(W) × 401(D) × 271(H) [mm] (Tolerance is ±15mm)
mass(including 40 modules):	10.5 kg
label:	Labels are put on the box.(See Fig.2, 3)



[Fig.1](#) Illustration of packaging box structure

	Box No.
	Mass
PKG ID Bar-code	
Special Bar-code	
Quantity Bar-code	
Trans ID Bar-code	
Special Bar-code	

Fig.2. Label 1

Consignee
Product name of consignee
Product name
Order No.
Box No.
Place of production
Bar-code
Shipping date

Fig.3. Label 2

OPTREX	
TFT-LCD:T-55441GD050J-LW-A-AAN	
AA050AA01	
P / O NO.	123456789
C / S	001 OF 005
MADE IN JAPAN	
	001 JA1BK4144
2001/11/15	

Fig.4. Sample of Label 2

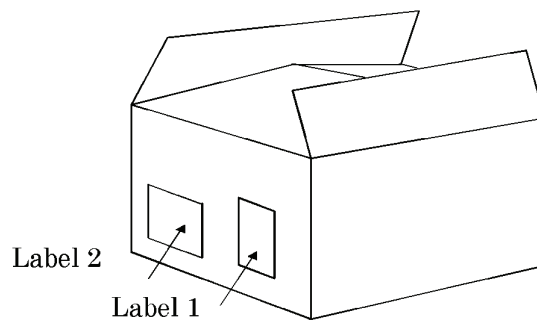


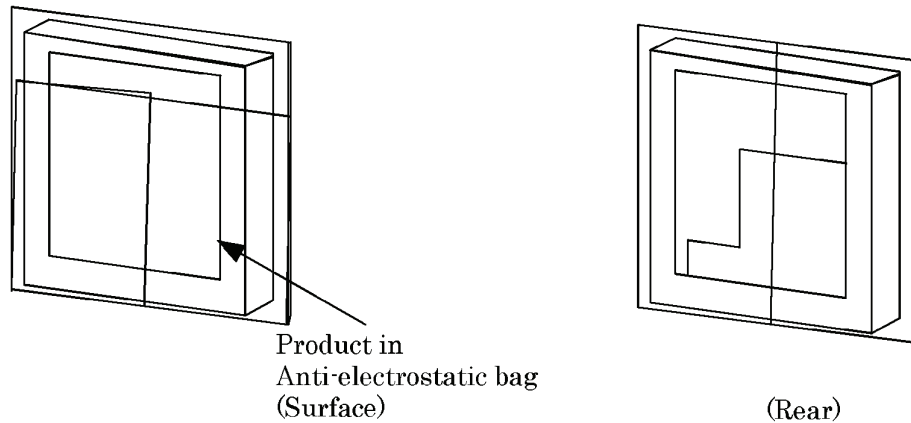
Fig.5. Location of labels

LOCATION OF LABEL ON THE PACKAGING BOX

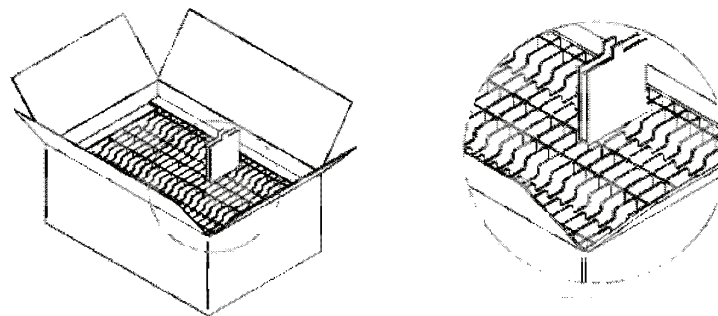
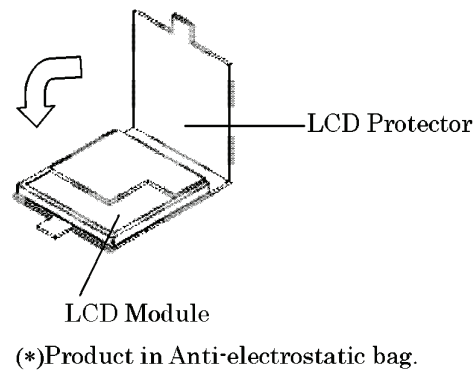
Labels are put on the box.(See. [Fig.5](#))

PACKAGING FORM OF PRODUCT

- (1) Each of LCD modules is packed in anti-electrostatic bag (See [Fig.6](#)).
- (2) LCD module is covered with LCD protector.
Packed LCD module is put in the packaging box.
1 piece in each space, total 40 pieces(max). (See [Fig.7](#))
- (3) Upper protector is put on the products, and shut the box.



[Fig.6](#)



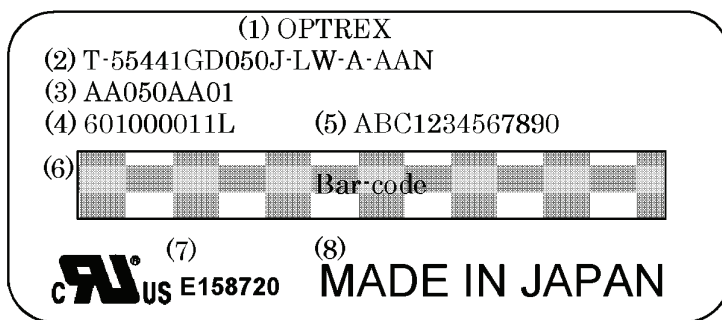
[Fig.7](#)

CAUTIONS OF SHIPPING & STORAGE

- (1) Do not turn the packaging upside down while storage and transportation. The boxes should not be piled up more than 8.
- (2) Packaging box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)
- (3) Keep off from direct sunlight exposure. Please store under room temperature & low humidity in original packaging condition when they were shipped.
- (4) Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
- (5) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- (6) Keep other cautions described in handling manual.

PRODUCTS NUMBER LABELING FORMS

Products number label is constructed as below;



Example of Products Number Label

(1) Brand Name

(2) Products Name of Optrex

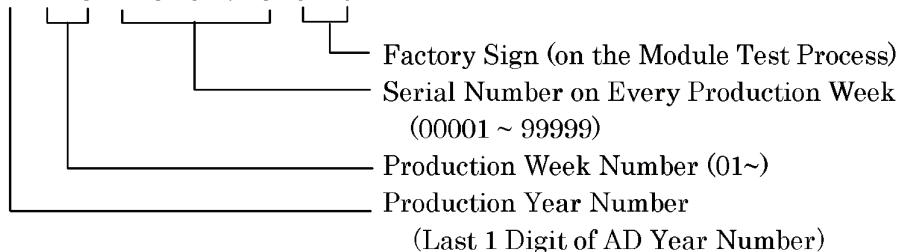
(3) Products Name

ex.1: AA050AA01

ex.2: AA050AA01 B

(4) Date Code (Serial Number, Factory Sign)

□ □ □ □ □ □ □ □ □ □
1 2 3 4 5 6 7 8 9 10



(5) Production Key Number (13 Digits)

(ID Number for Production Control)

(6) Bar-code(Date Code)

Bar-code Line for computer reading Date Code mentioned as above.

(7) UL File No.

(8) Production Country

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