



SPECIFICATIONS

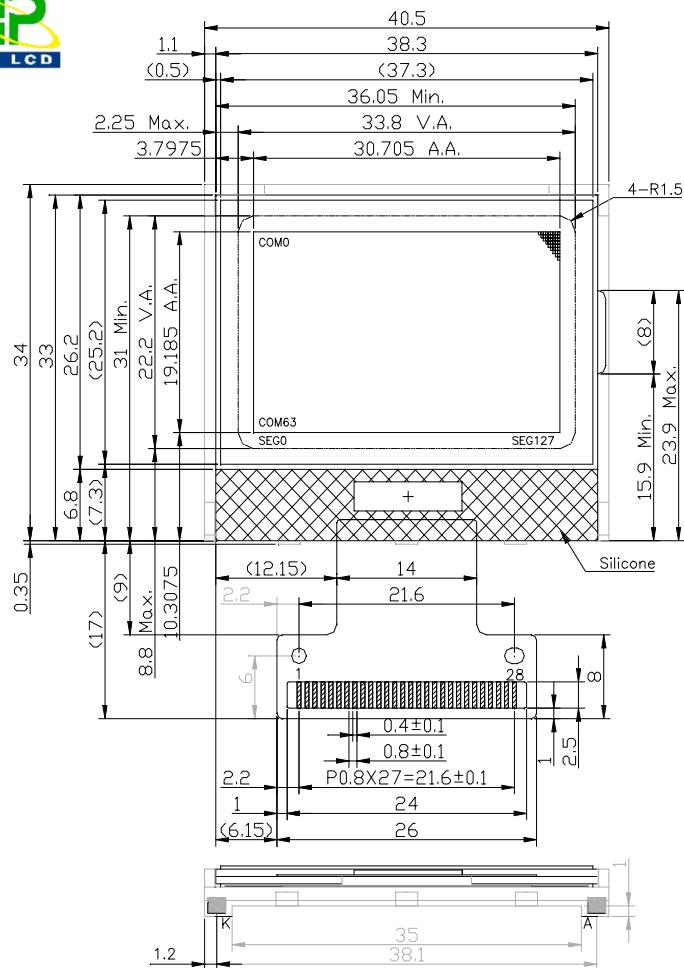
GG128X64-NFPCELYZ

(www.FindLCD.com)

G P O L C D

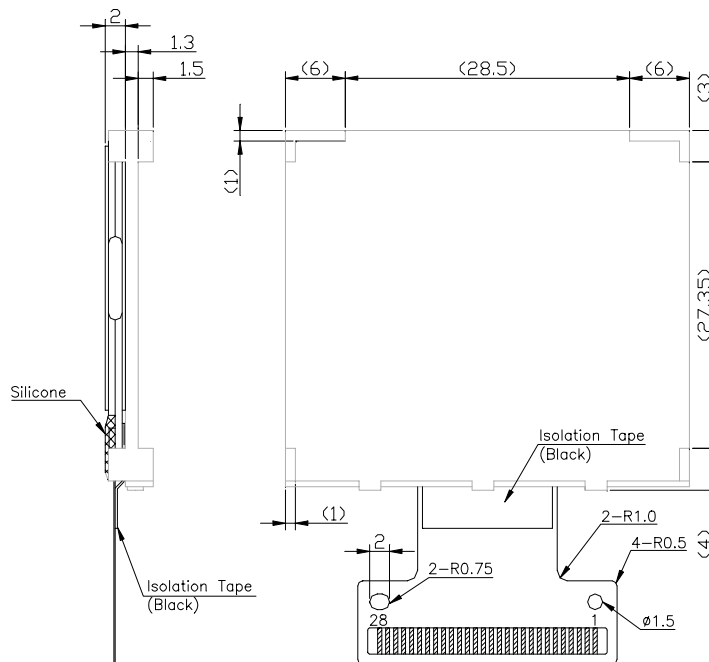
DESIGN DEP.		

REV.	Revision Item	Date
A	NEW	10/Jan/2001
B		
C		
D		
E		
F		
G		
H		
I		

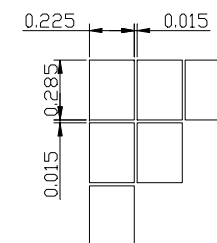


I/F Connector : FPC Cable

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VDD	Power Supply for Logic	16	D7	8-Bit Data Bus Lines
2	C86	H:6800 MPU ; L:8080 MPU	17	D6	
3	VSS	Power Supply (GND)	18	D5	
4	V5	Power Supply for LCD	19	D4	
5	V4		20	D3	
6	V3		21	D2	
7	V2		22	D1	
8	V1		23	D0	
9	CAP2+	DC/DC Voltage Converter Capacitor	24	RD	Read Signal for 8080 MPU
10	CAP2-			E	Enable Clock for 6800 MPU
11	CAP1-		25	WR	Write Signal for 8080 MPU
12	CAP1+			R/W	Read/Write Signal for 6800 MPU
13	CAP3-		26	A0	Data/Command Select
14	VOUT		27	RES	Reset Signal
15	VSS	Power Supply (GND)	28	CS	Chip Select (Active Low)



REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
-	A	First Issue	2000.11.02	H.M.Lin

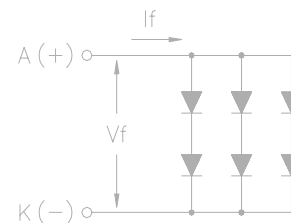


128X64 Dots
SCALE=40:1
DOTS DETAIL

NOTE :

LED Back-Light Spec.

1. $V_f=4.1V$
2. $I_f=30mA$
3. Color:Yellow Green



Grand Pacific Optoelectronics Corporation

MODEL GPG128X68-NFPCELYZ

DWG NAME Outline Drawing

DWG NO. G00270DA

SCALE	UNIT	TOL.	DATE	
2:1	mm	± 0.3	2000.11.02	
APPROVED	CHECKED	DESIGN	DRAWN	H.M.Lin

3. Basic Specifications

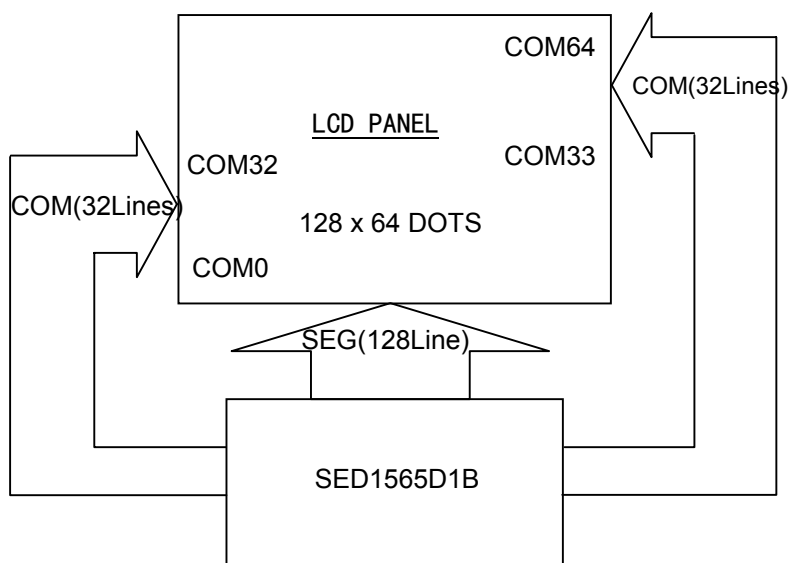
1.1. Display Specifications

- A) Display Mode: F-STN, Positive, Transflective
 - B) Display Color (*1): Display Data "1" = Black
Display Data "0" = White
 - C) Viewing Angle: 6 O'clock Direction
 - D) Duty: 1/65 Duty
 - E) Bias: 1/9 Bias
 - F) Driver IC: SED1565DBB
 - G) Display Surface: Glare
 - H) Back Light: LED, Yellow Green
- (*1) Color tone is slightly changed by temperature and driving voltage

1.2. Mechanical Specifications

- A) Outline Dimensions: Refer to attached outline Dimensions Figure G0027ODA
- B) Dot Format: 128 x 64 Dots
- C) Dot Size: 0.225 x 0.285 (mm)
- D) Dot Pitch: 0.24 x 0.30 (mm)
- E) Weight: Approx. 6.8 (g)

1.3. Block Diagram



1.4. Terminal Functions

Interface: 0.8 mm Pitch 28 pins FPC

No.	Symbol	I/O	Function
1	VDD	I	Power Supply For Logic
2	C86	I	H: 6800 MPU; L: 8080 MPU
3	VSS	I	Power Supply (GND)
4	V5	I	Power Supply for LCD
5	V4	I	
6	V3	I	
7	V2	I	
8	V1	I	
9	CAP2+	O	DC/DC voltage converter Capacitors I/O
10	CAP2-	O	
11	CAP1-	O	
12	CAP1+	O	
13	CAP3-	O	
14	VOUT	O	
15	VSS	I	Power Supply (GND)
16	D7	I/O	8-Bit Data Bus Lines
17	D6	I/O	
18	D5	I/O	
19	D4	I/O	
20	D3	I/O	
21	D2	I/O	
22	D1	I/O	
23	D0	I/O	
24	\overline{RD}	I	Read Signal for 8080 MPU
	E	I	Enable Clock for 6800 MPU
25	\overline{WR}	I	Write Signal for 8080 MPU
	R/W	I	Read/Write Signal for 6800 MPU
26	AO	I	Data/Command Select
27	\overline{RES}	I	Reset Signal
28	\overline{CS}	I	Chip Select (Active Low)

4. Absolute Maximum Ratings

Items	Symbols	Standard Value		Unit	Condition
		Min.	Max.		
Power Supply Voltage	VDD-VSS	-0.3	+4.5	V	Quad set-up
	VDD-V5	-0.3	+18.0	V	
Input Voltage	VIN	-0.3	VDD+0.3	V	
Output Voltage	V0	-0.3	VDD+0.3	V	
Peak Forward Current	IF	-	60	mA	LED B/L TA=25°C
Reverse Voltage	VR	-	8	V	LED B/L TA=25°C
Power Dissipation	PO	-	0.27	W	LED B/L TA=25°C
Operating Temperature	Top	-20	70	°C	
Storage temperature	Tst	-30	80	°C	

Insure that the voltage levels of V1, V2, V3 and V4 are always such that
 $VDD \geq V1 \geq V2 \geq V3 \geq V4 \geq V5$.

3. Electrical Characteristics

3.1. DC Characteristics

Item	Symbol	Standard Value			Unit	Terminal
		Min.	Typ.	Max.		
Power Supply Voltage	VDD-VSS	2.4	-	3.5	V	VDD
	V0-VSS	4.5	-	11.5	V	V0
	VA-VK	-	4.1	4.5	V	A
"0" Input Voltage	VIL	VSS	-	0.2VDD	V	A0,/RES,/CS
"1" Input Voltage	VIH	0.8VDD	-	VDD	V	D0~D7
Input Leak Current	ILI	-1.0	-	1.0	μA	A0,/RES,/CS
Output Leak Current	ILO	-3.0	-	3.0	μA	D0~D7
Power Supply Current (*1)	IDD	-	300	600	μA	VDD
Power Supply Current for LED B/L (*2)						

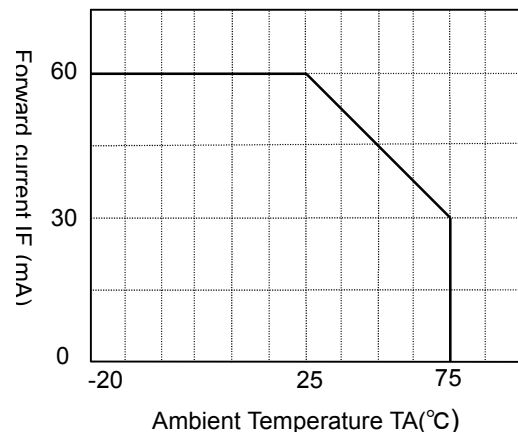
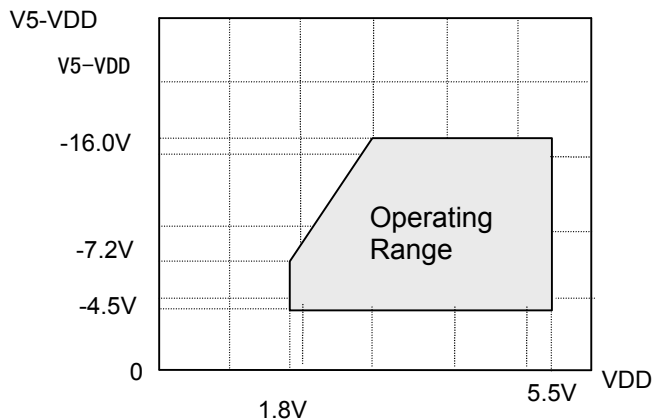
(*1) Measuring Conditions: T = 25°C

(Typ.) VDD = 3.0 V, Text Pattern

(Max.) VDD = 3.0 V, Checker Pattern

(*2) Measuring Conditions: T = 25°C

(Typ.) VA-VK = 4.1V



3.2. AC Characteristics

System Bus Read/Write Characteristics 1(For the 8080 Series MPU)

Ta = -20~70°C, VDD = 2.7~4.5V

Item	Signal	Symbol	Conditions	Rating		Units
				Min	Max	
Address hold time	A0	t _{AH8}		0	-	Ns
Address setup time		t _{AW8}		0	-	Ns
System cycle time		t _{CYC8}		300	-	Ns
Control L pulse width (WR)	WR	t _{CCLW}		60	-	Ns
Control L pulse width (RD)	RD	t _{CCLR}		120	-	Ns
Control H pulse width (WR)	WR	t _{CCHW}		60	-	Ns
Control H pulse width (RD)	RD	t _{CCHR}		60	-	Ns
Data setup time	D0 to D7	t _{DS8}		40	-	Ns
Data hold time		t _{DH8}		15	-	Ns
RD access time		t _{ACC8}	CL=100pF	-	140	Ns
Output disable time		t _{OH8}		10	100	Ns

* All timing is specified using 20% and 80% of VDD as the standard

* The input signal rise time and fall time (t_r,t_f) are specified at 15 ns or less

System Bus Read/Write Characteristics 2 (For the 8080 Series MPU)

Ta = -20~70°C, VDD = 2.7~4.5V

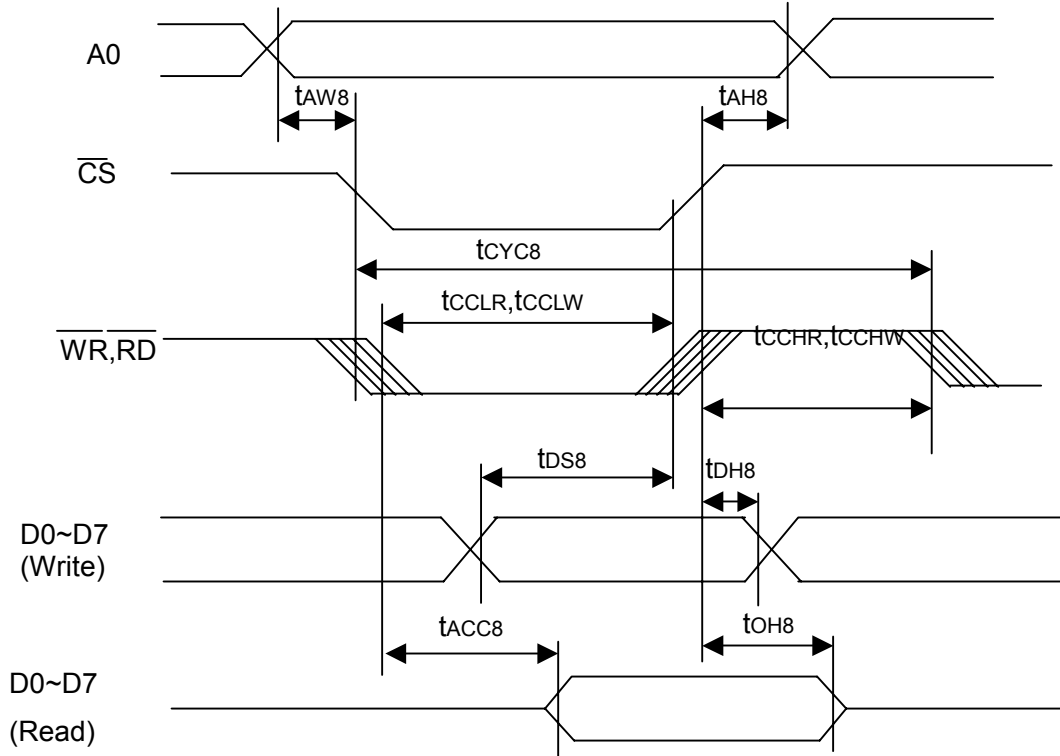
Item			Signal	Symbol	ConditionS	Rating		Units
						Min	Max	
Address hold time			A0	t _{AH6}		0	-	ns
Address setup time				t _{AW6}		0	-	ns
System cycle time				t _{CYC6}		300	-	ns
Data setup time			D0 to D7	t _{DS6}		40	-	ns
Address hold time				t _{DH6}		15	-	ns
Access time				t _{ACC6}	CL=100pF	-	140	ns
Output disable time			t _{OH6}	10		100	ns	
Enable H pulse Time	Read	E		t _{cclw}		120	-	ns
	Write			t _{CCLR}		60	-	ns
Enable L pulse Time	Read	E		t _{CCHW}		60	-	ns
	Write			t _{CCHR}		60	-	ns

* All timing is specified using 20% and 80% of VDD as standard.

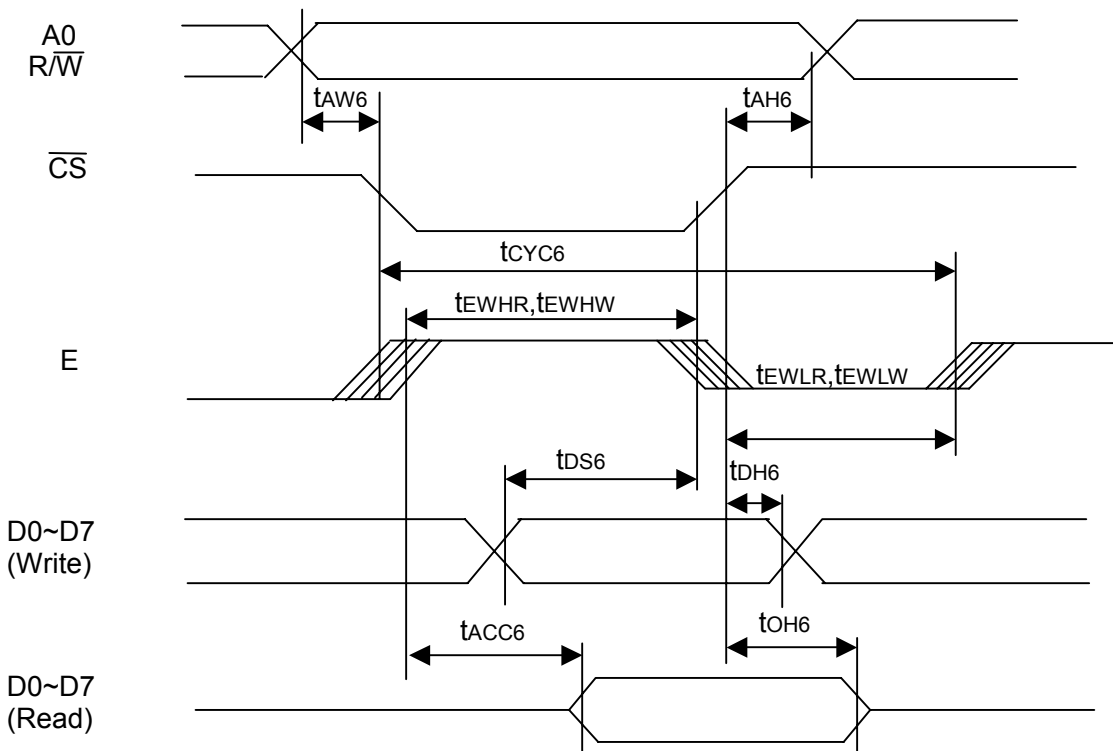
* The input signal rise time and fall time (t_r,t_f) are specified at 15 ns or less.

3.3. Timing Chart

System Bus Read/Write Characteristics 1(For the 8080 Series MPU)



System Bus Read/Write Characteristics 2(For the 6800 Series MPU)



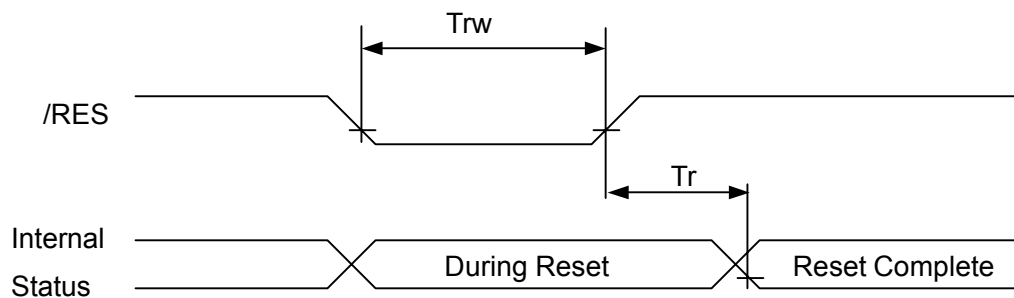
3.4. Parallel Interface Signal

Shared	6800 Series (C86=H)	8080 Series (C86=L)		Function
A0	R/W	RD	WR	
1	1	0	1	Read the display data
1	0	1	0	Write the display data
0	1	0	1	Status Read
0	0	1	0	Command Write

3.5. Reset timing

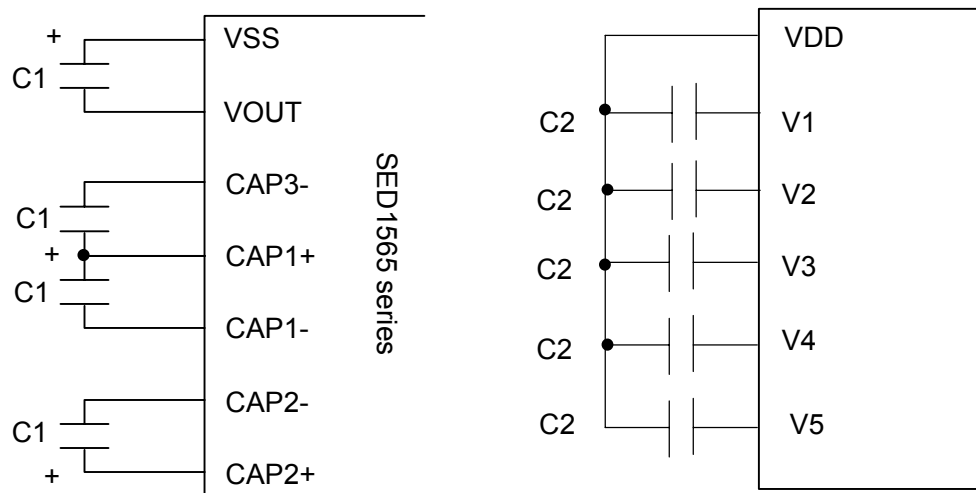
Ta=-20~70°C, VDD=2.7~4.5V

Item	Symbol	Standard Value		Unit	Conditions
		Min.	Max.		
Reset Time	Tr	-	1	μs	
Reset"L"Pulse width	Trw	1	-	μs	



3.6 The set-up voltage circuits

Connect capacitor C1 between CAP1+ and CAP1-, between CAP2+ and CAP2-, between CAP1+ and CAP3-, and between VSS and VOUT, to produce a voltage level in the negative direction at the VOUT terminal that is 4 times the voltage level between VDD and VSS.



(Reference C1=1.0~4.7 μ F, C2=0.47~1.0 μ F)

3.6. Explanation of Command

For details of command explanation, please refer to the data sheet of driver IC SED1565.

4. Optical Characteristics

4.1. Optical Characteristics

(Reflective mode)

Item	Symbol	Temp °C	Standard Value			Unit	Conditions	
			Min	Typ	Max			
Vop	VDD-VS	-20	10.0	10.3	10.6	V		
		25	8.8	9.1	9.4	V		
		70	7.7	8.0	8.3	V		
Response Time	Tr	25	-	170	255	ms		
		-20	-	5570	8355	ms		
	Tf	25	-	80	120	ms		
		-20	-	2660	3990	ms		
Contrast Ratio	K	25	4	8	-			
Viewing angle	Φ	25	-	35	-	deg.	θ = 0°	CR≥2.0
			-	29	-	deg.	θ = 90°	
			-	57	-	deg.	θ =180°	
			-	34	-	deg.	θ = 270°	
Initial Brightness	B	25	-	2	-	cd/m²	(*1)	

- Panel only characteristics
- 1/65 duty, 1/9 bias

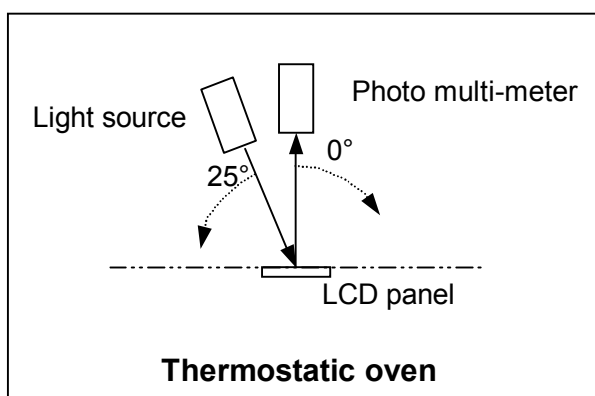
(*1) Measuring Conditions:

Test point: Φ 15.0mm, Tester: TOPCON BM-7

VA-VK=4.1V, Display pattern: all display data="0"

4.2. Definition of Optical Characteristics

4.2.1. Optical Measuring Equipment

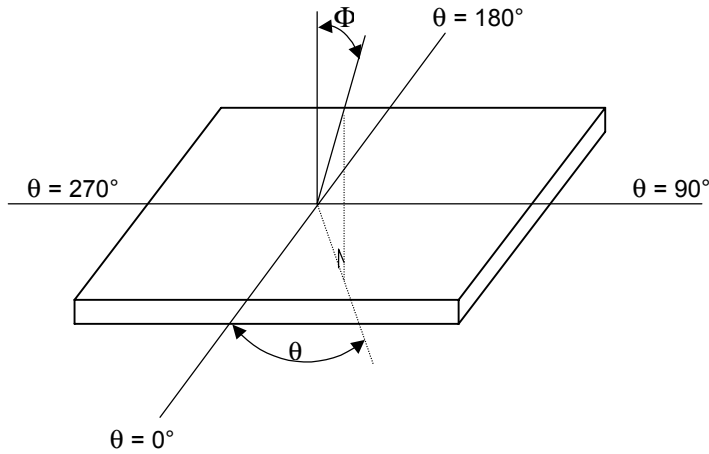


Specification of Measuring Conditions:

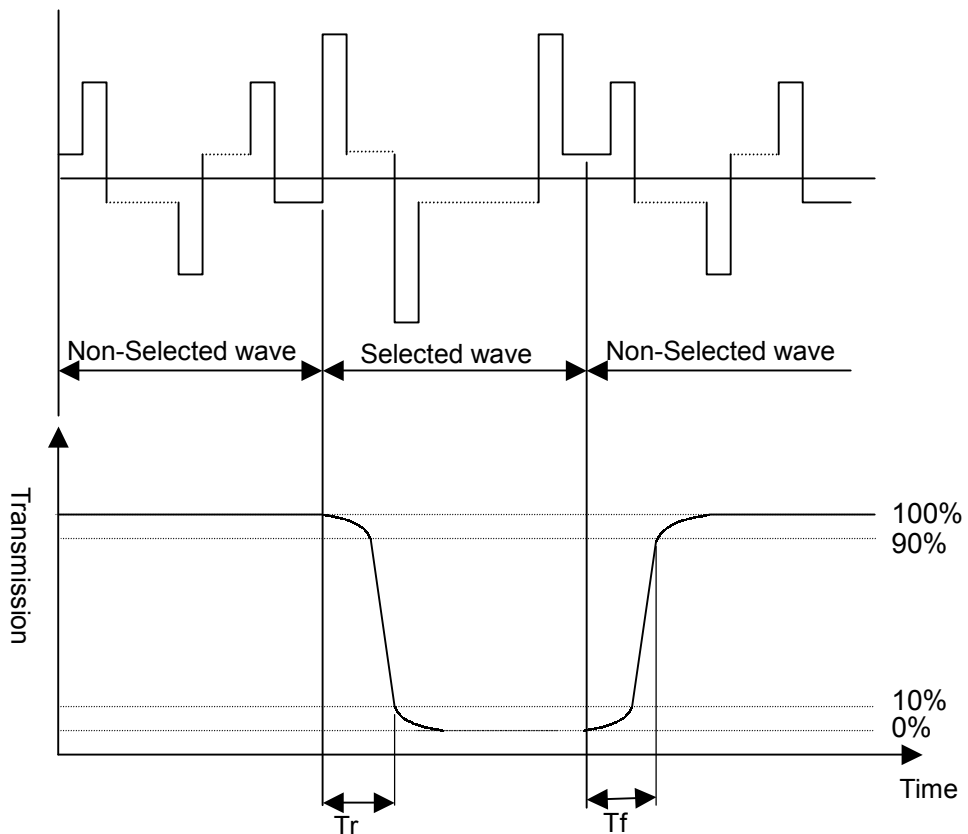
Luxmeter: LCD-5100 (OTSUKA ELECTRONICS)

Brightness of Measuring Spot Diameter: \varnothing 3.0mm

4.2.2. Definition of Viewing Angle



4.2.3. Definition of Response Time

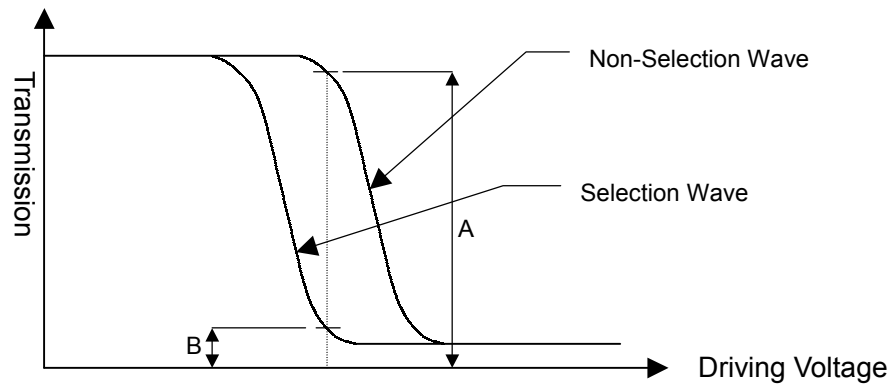


[Measuring Conditions]

VLCD-VSS = Operating Voltage

$\theta_X = \theta_Y = 0^\circ$

4.2.4. Definition of Contrast Ratio



$$\text{Contrast Ratio} = \frac{\text{Transmission A of Non Selection DOT}}{\text{Transmission B of Selection DOT}}$$

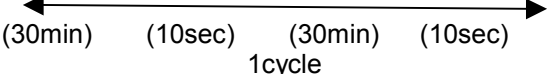
[Measuring Conditions]

V0-VSS = Operating Voltage

$\theta X = \theta Y = 0^\circ$

5. Reliability Test

5.1. Content of Reliability Test

No	Test Item	Content of test	Condition
Environmental test			
1	High Temperature Storage	Endurance test applying high temperature for a long time.	80°C 200H
2	Low Temperature Storage	Endurance test applying low temperature for a long time.	-30°C 200H
3	High Temperature/ Humidity Storage	Endurance test applying high temperature and high humidity for a long time.	50°C - 90%RH 200H
4	Thermal Shock	Endurance test applying low and high temperature cycles. <div style="text-align: center;"> $-30^{\circ}\text{C} \rightleftharpoons 25^{\circ}\text{C} \rightleftharpoons 80^{\circ}\text{C} \rightleftharpoons 25^{\circ}\text{C}$  </div>	-30/80°C 10 Cycles

1) Driving condition for operating test

Power supply voltage for logic (VDD) = 3.2 V

Power supply voltage for LCD (V_{LCD}) = Voltage getting maximum contrast

Power supply voltage for EL (VEL) = 4.2 V

5.2. Failure judgment criteria

After the above-mentioned test:

A) There should be no conspicuous failure of display quality and appearance.

Contrast ratio should be 50% of the initial contrast ratio.

B) There should be no abnormal function.

6. Precautions for use of LCD Modules

6.1. Handling procedures

- A) The display panel is made of glass. Do not subject it to a mechanical shock.
- B) If the display panel is damaged, the liquid crystal substance inside may leak out. Avoid contact with the mouth. If the substance comes into contact with the your skin or clothes, promptly wash the area thoroughly using soap and water.
- C) Do not touch or apply excessive force on the surface of the display or the adjoining area of the LCD module since this may cause the color tone/contrast ratio to vary.
- D) Under the protective film the polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully and keep in a dust free environment.
- E) If the display surface of the LCD module becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of following solvents, either Isopropyl or Ethyl Alcohol
Solvents other than those mentioned above may damage the polarizer.
Do not use water, acetone, and aromatic solvents.
- F) When positioning the LCD module, ensure that it is free of twisting, warping, and tension. Strain has a great influence upon display quality. Also, ensure that enough room is left for possible shifting of the outer case/housing.
- G) When installing the LCD module, do not forcibly pull or bend the I/O cable.
- H) Do not touch the IC of the LCD module, as this may cause abnormal readings that cannot be corrected.
- I) Do not attempt to disassemble or modify the LCD module.
- J) No Connection terminals should be left open. Do not connect anything.
- K) If the logic circuit power is off, do not try to apply input signals.
- L) To prevent damage to the various components of the display from static electricity, normal anti static techniques must be used.
Tools required for assembly, such as soldering irons, must be properly earthed to minimize the amount of static electricity generated. Try to avoid assembly and other work under very dry conditions.
The LCD module is coated with a film to protect the display surface. (See D) Exercise care when peeling off this protective film since static electricity may be generated.
- M) Avoid handling the LCD glass, as the edges are sharp.

6.2. *Storage precautions*

- A) Exercise care to minimize possible corrosion or contamination of the electrical contacts. Moisture condensation or a current flow in a high humidity environment accelerates corrosion of the contacts.
- B) When storing the LCD module, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the LCD module in bags designed to prevent static electricity build up under low ambient temperature/normal humidity conditions.
Avoid high temperature /high humidity and low temperatures, below 0 °C.
Whenever possible, the LCD module should be stored in the same packaging in which they were shipped from our company.

6.3. *Design precautions*

- A) The absolute maximum ratings represent the rated value beyond which the LCD module must not be used. If the LCD module is used in excess of the rated values, their operation characteristics may be adversely affected permanently.
- B) To prevent the occurrence of erroneous or poor operation caused by electromagnetic noise, attention must be paid to the VIL, VIH specification values, including taking the precaution of using short signal cables whenever possible.
- C) The liquid crystal display characteristics are temperature dependent. Viewing clarity of the display becomes poorer when the LCD is used outside its designated operating temperature range. It is therefore recommended that the LCD be used within this range.
- D) We recommend that power supply lines (Vcc) have over-current protection precautions. (Fuse etc.)
- E) To minimize Electro Magnetic Interference, designs using LCD Modules should recognize the effect of components elsewhere, especially from adjacent peripheral devices.
- F) To cope with EMI, take measures basically on outputting side.
- G) The Tape Carrier Package fixes the LCD module, consisting of a glass panel, inside the housing. If the PCB is fixed, it could be disconnected when subjected to stress.

7. Other considerations

- A) Liquid crystal material solidifies at low temperatures (below the storage temperature range) leading to defective orientation of the liquid crystal or the generation of air bubbles. Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
- B) If the LCD module has been operating for a long time showing the same display patterns, there may be retention of the display pattern on the screen as ghost images and a slight contrast irregularity may also appear. Normal operating status can be regained by suspending use for some time to rest the display if possible. It should be noted that this phenomenon does not adversely affect the performance reliability.
- C) To minimize performance reduction of the LCD modules resulting from the adverse effects of static electricity, avoid touching the following areas when handling the modules:
 - Terminal connections
 - Parts of pattern wiring on PCB, etc.

8. COG Precautions

- A) Although these modules have a built-in protection terminal against static electricity for all pins, this may not be sufficient if higher levels of static electricity are encountered, possibly leading to a short circuit. Therefore, care in anti static handling is very important, including using earthen straps for the operators
- B) Generally, irradiating it with a strong light will change the characteristics of a semiconductor device. This may adversely affect the operational characteristics of the IC in the modules. We recommend whenever possible that:

Handling, preparation, assembly, and testing involving LCD are carried out in the lowest possible lighting conditions, consistent with Operator comfort.