LCD MODULE SPECIFICATION FOR APPROVAL	DATE	01/12/07
	VER.	1.0
JHD636	PAGE	1

CONTENTS

1. FEATURES

- •Display construction…… 128*64 DOTS
- •Display mode…… FSTN
- •Display type…… Positive Transflective
- •Backlight…… LED/3.3V
- •Viewing direction…… 6 o' clock
- •Operating temperature…… Indoor
- •Driving voltage…… Single power
- •Driving method…… 1/64 duty, 1/9 bias
- •Type…… COG (Chip On Glass)
- •Drive IC…… S6B0724
- •Number of data line…… 8080 8-bit parallel
- •Connector…… FPC

2. MECHANICAL DATA

ITEM		WIDTH	HEIGHT	THICKNESS	UNIT
Module Size (include component of FPC)		70.1	64.0	10.6(MAX)	mm
Resolution		128×64			dots
Viewing area		65.8	38.2	-	mm
Dot	Size	0.45	0.49	-	mm
	Pitch	0.475	0.515	-	mm
Diameter of mounting hole		Φ3.0			mm

3. ABSOLUTE MAXIMUM RATINGS

Cperation Votage	Symbol	Ratings
Operation Voltage	**VDD**	**-0.3V~7.0V**
Drive Supply Voltage	**VLCD**	**-0.3V~17.0V**
Input Voltage Range	**VIN**	**-0.3V~VDD+0.3V**
Operation Temperature	**TOPR**	**-0℃~60 ℃**
Storage Temperature	**TSTR**	**-20 ℃~70 ℃**
Humidity	**---**	**90%RH**

4. ELECTRICAL CHARACTERISTICS

(Vss = 0V, V_{DD} = 2.4 to 3.6V, Ta = -40 to 85°C)

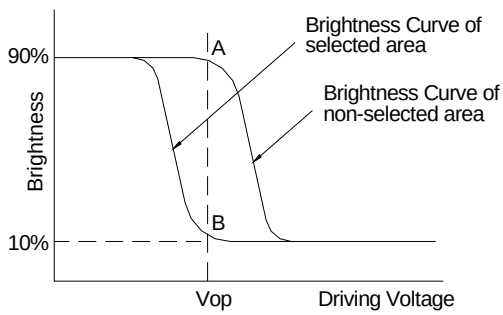
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Pin used
Operating voltage (1)		V_{DD}		2.4	-	3.6	V	VDD *1
Operating voltage (2)		V0		4.5	-	15.0	V	V0 *2
Input voltage	High	V_{IH}		0.8V_{DD}	-	V_{DD}	V	*3
	Low	V_{IL}		Vss	-	0.2V_{DD}		
Output voltage	High	V_{OH}	I_{OH} = -0.5mA	0.8V_{DD}	-	V_{DD}	V	*4
	Low	V_{OL}	I_{OL} = 0.5mA	Vss	-	0.2V_{DD}		
Input leakage current		I_{IL}	V_{IN} = V_{DD} or Vss	- 1.0	-	+ 1.0	μA	*5
Output leakage current		I_{OZ}	V_{IN} = V_{DD} or Vss	- 3.0	-	+ 3.0	μA	*6
LCD driver ON resistance		R_{ON}	Ta = 25°C, V0 = 8V	-	2.0	3.0	kΩ	SEGn COMn *7
Oscillator frequency	Internal	fosc	Ta = 25°C Duty ratio = 1/65	32.7	43.6	54.5	kHz	CL *8
	External	fCL		4.09	5.45	6.81		
Voltage converter input voltage		VCI	× 2	2.4	-	3.6	V	VCI
			× 3	2.4	-	3.6		
			× 4	2.4	-	3.6		
			× 5	2.4	-	3.2		
Voltage converter output voltage		VOUT	×2 / ×3 / ×4 / ×5 voltage conversion (no-load)	95	99	-	%	VOUT
Voltage regulator operating voltage		VOUT		6.0	-	16.0	V	VOUT
Voltage follower operating voltage		V0		4.5	-	15.0	V	V0 *9
Reference voltage		V_{REF}	Ta = 25°C - 0.05%/°C	2.04	2.1	2.16	V	*10

5. ELECTRO-OPTICAL CHARACTERISTICS

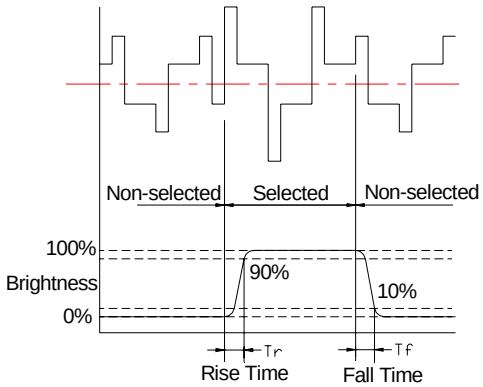
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast ratio	K	Φ=0	1.4	4	-	-	1
Response time (rise)	Tr	Φ=0	-	250	300	ms	2
Response time (fall)	Tf	Φ=0		250	350	ms	2
Viewing angle	Φ	K ⩾2.0	-40 -- +40			deg.	3
	θ		-30 -- +30				

Note 1: Definition of Contrast Ratio "K"

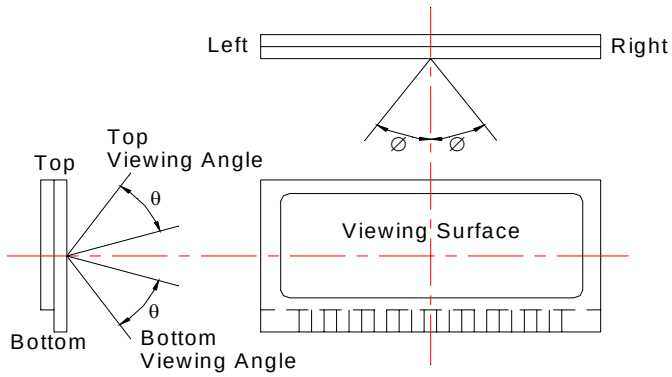
$$K = \frac{\text{Brightness of non-selected segment(A)}}{\text{Brightness of selected segment(B)}}$$



Note 2: Definition of Optical Response Time

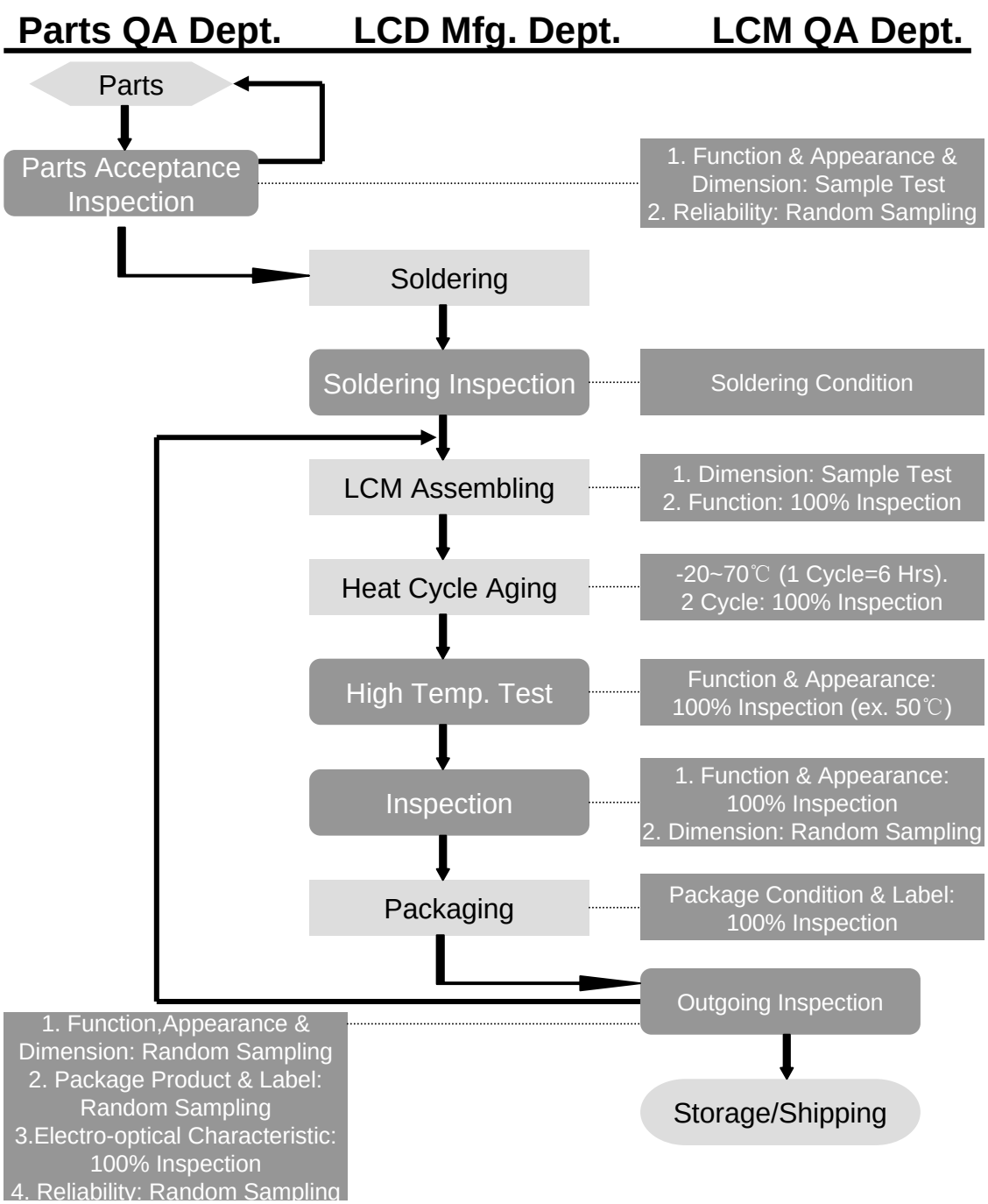


Note 3: Definition of Viewing Angle



Please select either top or bottom viewing angle

6. QC/QA PROCEDURE



7. RELIABILITY

•Operating life time:

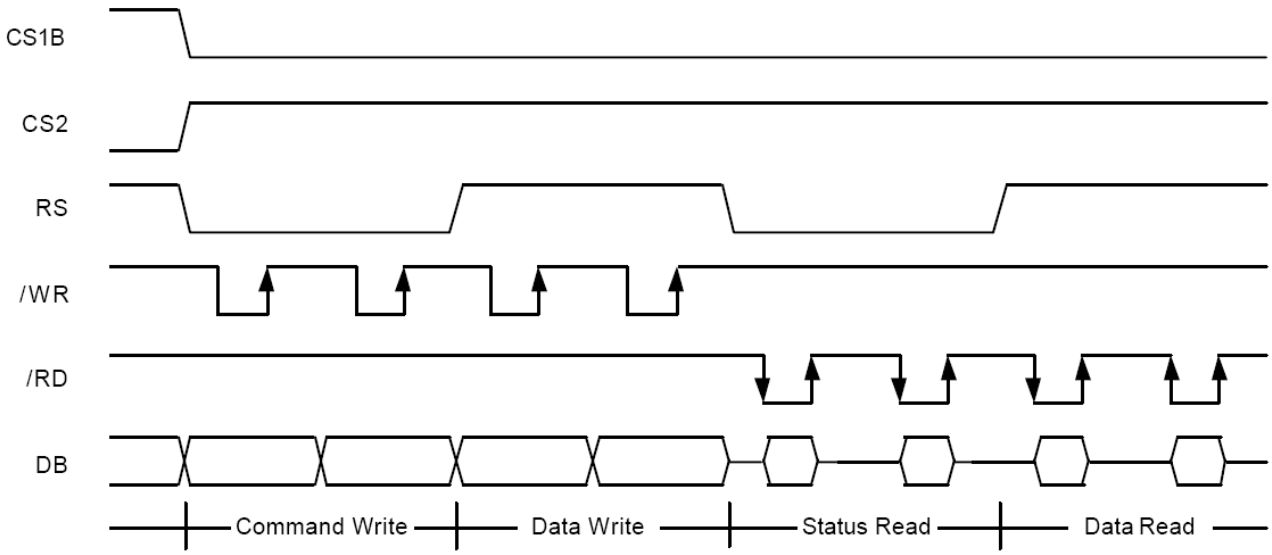
Longer than 50000 hours (at room temperature without direct irradiation of sunlight)

•Reliability Characteristics:

Item	Test	Criterion
High temp	60℃ / 200 Hrs	■Total current consumption should be below double of initial value ■Contrast ratio should be within initial value±50% ■No defect in cosmetic and operational function is allowable
Low temp.	-10℃ / 200 Hrs	
High humidity	40℃ * 90%RH / 200 Hrs	
Thermal shock	-10℃→25℃→60℃→25℃ /5 Cycles (30min) (5min) (30min) (5min)	
Vibration	1.Operating time: Thirty minutes exposure in each direction (x, y, z) 2.Sweep Frequency (1min):10Hz→ 55Hz →10Hz 3.Amplitude: 0.75mm double amplitude	

8. TIMING DIAGRAM

8080-Series MPU Interface Protocol (PS="H", CS86="L")



9. INSTRUCTION SET

×: Don't care

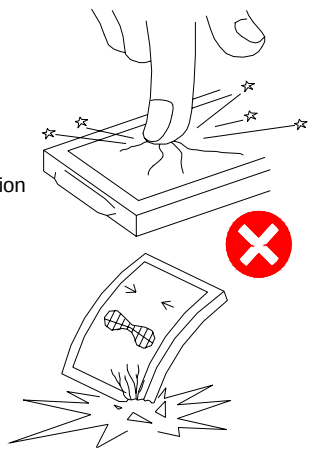
Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Display ON / OFF	0	0	1	0	1	0	1	1	1	DON	Turn on/off LCD panel When DON = 0: display OFF When DON = 1: display ON
Initial display line	0	0	0	1	ST5	ST4	ST3	ST2	ST1	ST0	Specify DDRAM line for COM0
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	Y7	Y6	Y5	Y4	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y3	Y2	Y1	Y0	Set column address LSB
Read status	0	1	BUSY	ADC	ONOFF	RESETB	0	0	0	0	Read the internal status
Write display data	1	0	Write data								Write data into DDRAM
Read display data	1	1	Read data								Read data from DDRAM
ADC select	0	0	1	0	1	0	0	0	0	ADC	Select SEG output direction When ADC = 0: normal direction (SEG0→SEG131) When ADC = 1: reverse direction (SEG131→SEG0)
Reverse display ON / OFF	0	0	1	0	1	0	0	1	1	REV	Select normal / reverse display When REV = 0: normal display When REV = 1: reverse display
Entire display ON / OFF	0	0	1	0	1	0	0	1	0	EON	Select normal/entire display ON When EON = 0: normal display. When EON = 1: entire display ON
LCD bias select	0	0	1	0	1	0	0	0	1	BIAS	Select LCD bias
Set modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode
Reset modify-read	0	0	1	1	1	0	1	1	1	0	release modify-read mode
Reset	0	0	1	1	1	0	0	0	1	0	Initialize the internal functions
SHL select	0	0	1	1	0	0	SHL	×	×	×	Select COM output direction When SHL = 0: normal direction (COM0→COM63) When SHL = 1: reverse direction (COM63→COM0)
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Regulator resistor select	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set reference voltage mode	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode
Set reference voltage register	0	0	×	×	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set static indicator mode	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode
Set static indicator register	0	0	×	×	×	×	×	×	S1	S0	Set static indicator register
Power save	-	-	-	-	-	-	-	-	-	-	Compound Instruction of display OFF and entire display ON
NOP	0	0	1	1	1	0	0	0	1	1	*Non-Operation command*
Test Instruction_1	0	0	1	1	1	1	×	×	×	×	*Don't use this instruction*
Test Instruction_2	0	0	1	0	0	1	×	×	×	×	*Don't use this instruction*

10. Handling Precautions

1. Limitation of Application:
Optrex products are designed for use in ordinary electronic devices such as business machines, telecommunications equipment,measurement devices and etc. Please handle the products with care. (see below)
Optrex products are not designed,intended ,or authorized for use in any application which the failure of the product could result in a situation where personal injury or death may occur . these applications include, but are not limited to . life-sustaining equipment,nuclear control devices , aerospace equipment , devices related to hazardous or flammable materials , etc.[If Buyer intends to purchase or use the Optrex Products for such unintended or unauthorized applications , Buyer must secure prior written consent to such use by a responsible officer of Optrex Corporation.]Should Buyer purchase or use Optrex Products for any such unintended or unauthorized application [without such consent].Buyer shall indemnify and hold Optrex and its officers. employees. subsidiaries, affiliates and distributors harmless against all claims, costs, damages and expenses , and reasonable attorney's fees,arising out of , directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Optrex was negligent regarding the design or manufacture of the part.
2.Industrial Rights and Patents
Optrex shall not be responsible for any infringement of industrial property rights of third parties in any country arising out of the application or use of Optrex products, except which directly concern the structure or production of such products.

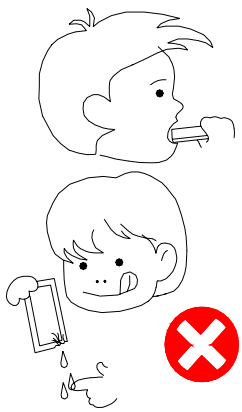
No Press and Shock!

If pressure to LCD, orientation may be disturbed.
LCD will broken by shock!



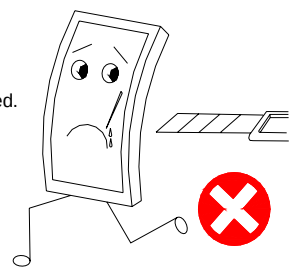
Don't Swallow or Touch Liquid Crystal!

Liquid Crystal may be leaked when display is broked.
If it accidentally gets your hands, wash then with water!



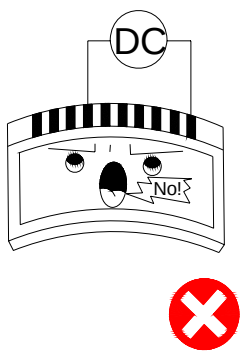
Don't not Scratch!

Polarizer is a soft material and can easily be scratched.



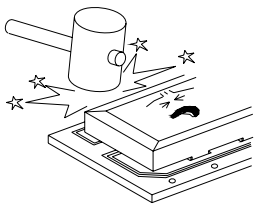
No DC Voltage to LCD!

DC volrage or driveing higher than the specified voltage will reduce the lifetime of the LCD.

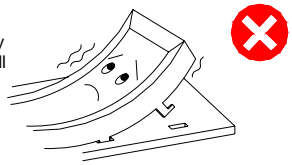


Don't Press the Metallic Frame and Disassemble the LCM

Pressure on the metallic frame and PCB may deform the conductive rubber or break the liquid crystal cell and back light, which will cause defects.

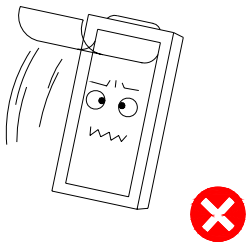


LCD may be shifted or conductive rubber may be reshaped, which will cause defects.



Slowly Peel Off Protective Film!

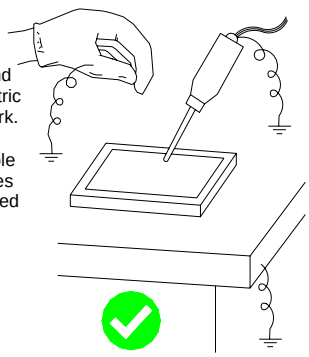
Avoid static electricity.



Avoid Static Electricity!

Please be sure to ground human body and electric apploances during work.

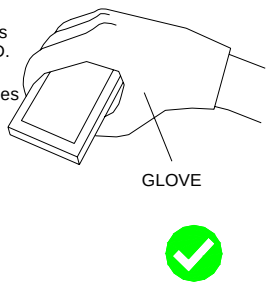
It is preferable to use conductive mat on table and wear cotton clothes or conduction processed fiber. Synthetic fiber is not recommended.



Wear Gloves While Handing!

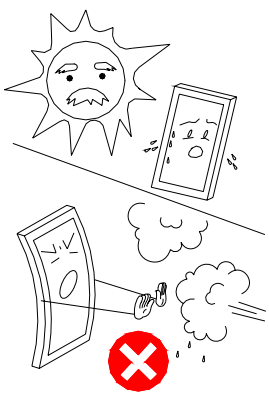
It is preferable to wear gloves to avoid damaging the LCD.

Please do not touch electrodes with bare hands or make them dirty.



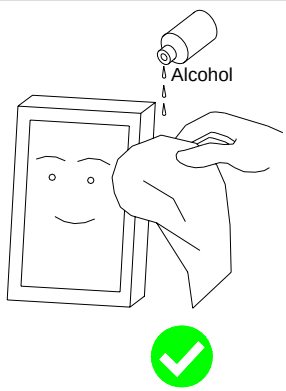
Keep Away From Extreme Heat and Humidity!

LCD deteriorates.



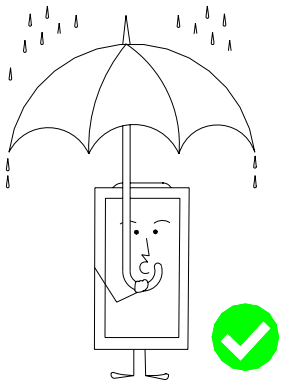
Use Alcohol to Clean Terminals!

When attaching with the heat seal or anisontropically conductive film, wipe off with alcohol before use.



Don't Drop Water on LCD!

Note that the presence of waterdrops or dew in the LCD panel may deteriorate the polarizer or corrade electrode.



Precaution in Soldering LCD Module

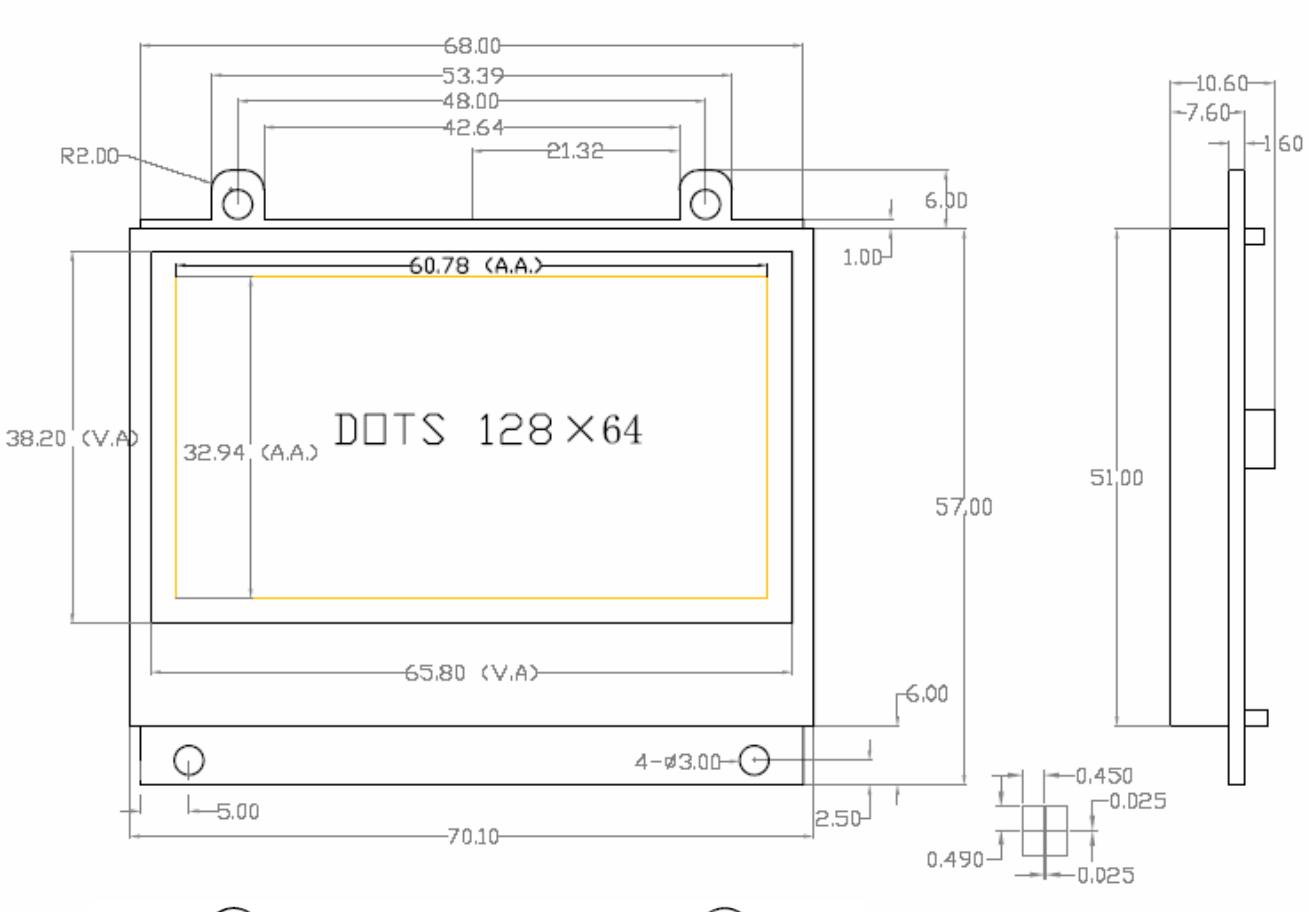
Basic instructions: Solder I/O terminals only.
Use soldering iron without leakage.
(1)Soldering condition to I/O terminals
Temperature at tip of the iron: 280±10℃
Soldering time: 3~4 sec.
Type of solder: Eutectic solder (containing colophony-flux)
*Please do not use flux because it may soak into LCD Module or contaminate it.
*It is preferable to peel off protective film on display surface after soldering I/O terminals is finished.
(2)Remove connector or cable
*When you remove connector or cable soldered to I/O terminals, please confirm that solder is fully melted. If you remove by force, electrodes at I/O terminals may be damaged(or stripped off).
*It is recommended to use solder suction machine.

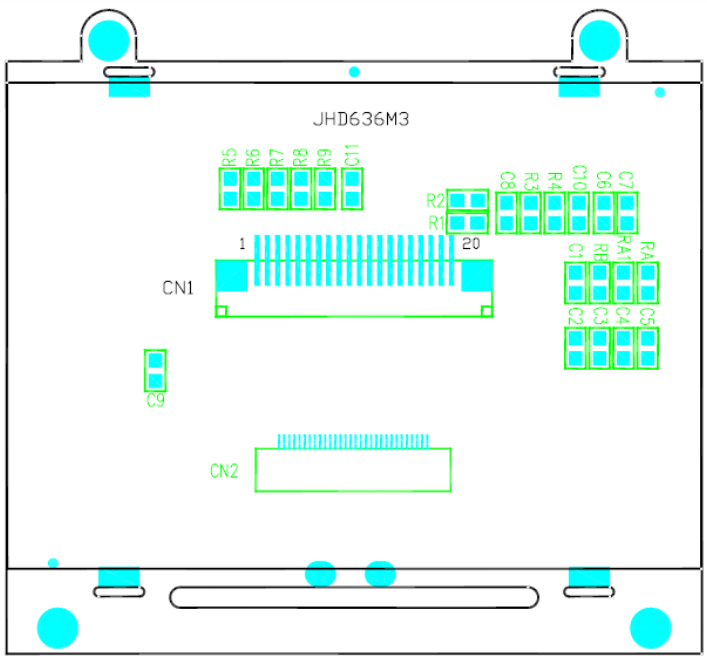
Long-term Storage

If it is necessary to store LCD modules for a long time, please comply with the following procedures.
If storage condition is not satisfactory, display(especially polarizer) may be deteriorated or soldering I/O terminals may become difficult(some oxide is generated at I/O terminals plating).
1.Store as delivered by Optrex
2.If you store as unpacked,put in anti-static bag,seal its opening and store where it is not subjected to direct sunshine nor fluorescent lamp.
3.Store at temperature 0 to +35℃ and at low humidity.Please refer to our specification sheets for storage temperature range and humidity condition.

Long-term Storage

Please use power supply with built-in surge protection circuit.


68.00
53.39
48.00
42.64
21.32
R2.00
6.00
1.00
60.78 (A.A.)
38.20 (V.A)
32.94 (A.A.)
DOTS 128×64
57.00
65.80 (V.A)
6.00
4-ø3.00
5.00
70.10
2.50
10.60
7.60
1.60
51.00
0.450
0.025
0.490
0.025


JHD636M3
R5
R6
R7
R8
R9
C11
R2
R1
C8
R3
R4
C10
C6
C7
1
20
CN1
C1
R16
R14
R15
C2
C3
C4
C5
C9
CN2

12.INTERFACE(CN1)

PIN	SYMBOL		PIN	SYMBOL
1	/CS1		11	DB5
2	/RST		12	DB6
3	RS		13	DB7
4	/WR		14	VDD
5	/RD		15	VDD
6	DB0		16	VSS
7	DB1		17	VSS
8	DB2		18	VSS
9	DB3		19	LED_A
10	DB4		20	LED_K