Date: 2022/05/09

Specifications for Approval

Model name : 12864J-3 REV:A

ENG	QA	APPROVAL
Andy	Leo	Duke

Customer Approval	☐ **Accept** ☐ **Reject** **Comment:** **Approved by:**

REVISION RECORD

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Revision	Revision Date	Page	Contents
A	2022/05/09		Initial Release and Issue Full Specification

CONTENTS

1. FEATURES

The features of LCD are as follows

* Display mode : STN /BLUE, NEGATIVE, TRANSMISSIVE
* Color : Display dot :WHITE
  Background: BLUE
* Display Format : 128Dots × 64Dots graphic
* IC : NT7107 NT7108
* Interface Input Data : 8 位
* Driving Method : 1/65 Duty, 1/9 Bias
* Viewing Direction : 6 O'clock
* Backlight : LED(WHITE)

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	93.00(W) X70.00(H) X12.9(T)	mm
Viewing Area	70.7(W) X 28.8(H)	mm
Effective Display Area	66.52(W) X 33.24(H)	mm
Number of Dots	128 X 64 Dots	-
Dot Size	0.48(W) X 0.48(H)	mm
Dot Pitch	0.52(W) X 0.52(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1. Absolute Maximum Ratings (Vss=0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V_{DD}	-0.3	-	5.0	V
Supply Voltage For LCD Drive	V_0, V_{OUT}	-0.3	-	14.5	V
Operating Temp.	T_{OP}	-20	-	+70	°C
Storage Temp.	T_{ST}	-30	-	+80	°C
Static Electricity	Be sue that you are ground when handing LCM				

3. ELECTRICAL SPECIFICATIONS

3-2- 1.Electrical Characteristics

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic		$V_{DD} - V_{SS}$	Ta=25℃	4.8	5.0	5.2	V
Supply Voltage For LCD		$V_{DD} - V_0$	Ta=25℃	-	-	-	V
Input Voltage	"H" Level	V_{IH}	Ta=25℃	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{IL}		V_{SS}	-	0.2V_{DD}	V
Output Voltage	"H" Level	V_{OH}	I_{OUT}= -0.5mA	0.8V_{DD}	-	V_{DD}	V
	"L" Level	V_{OL}	I_{OUT}= 0.5mA	V_{SS}	-	0.2V_{DD}	V
Current Consumption		I_{DD}	V_{IN} = V_{DD}	-	-	1.0	mA

NOTE: 1) Duty ratio=1/65, Bias=1/9

2) Measured in Dots ON-state

3-3- BACKLIGHT

3-3-1. Absolute Maximum Ratings

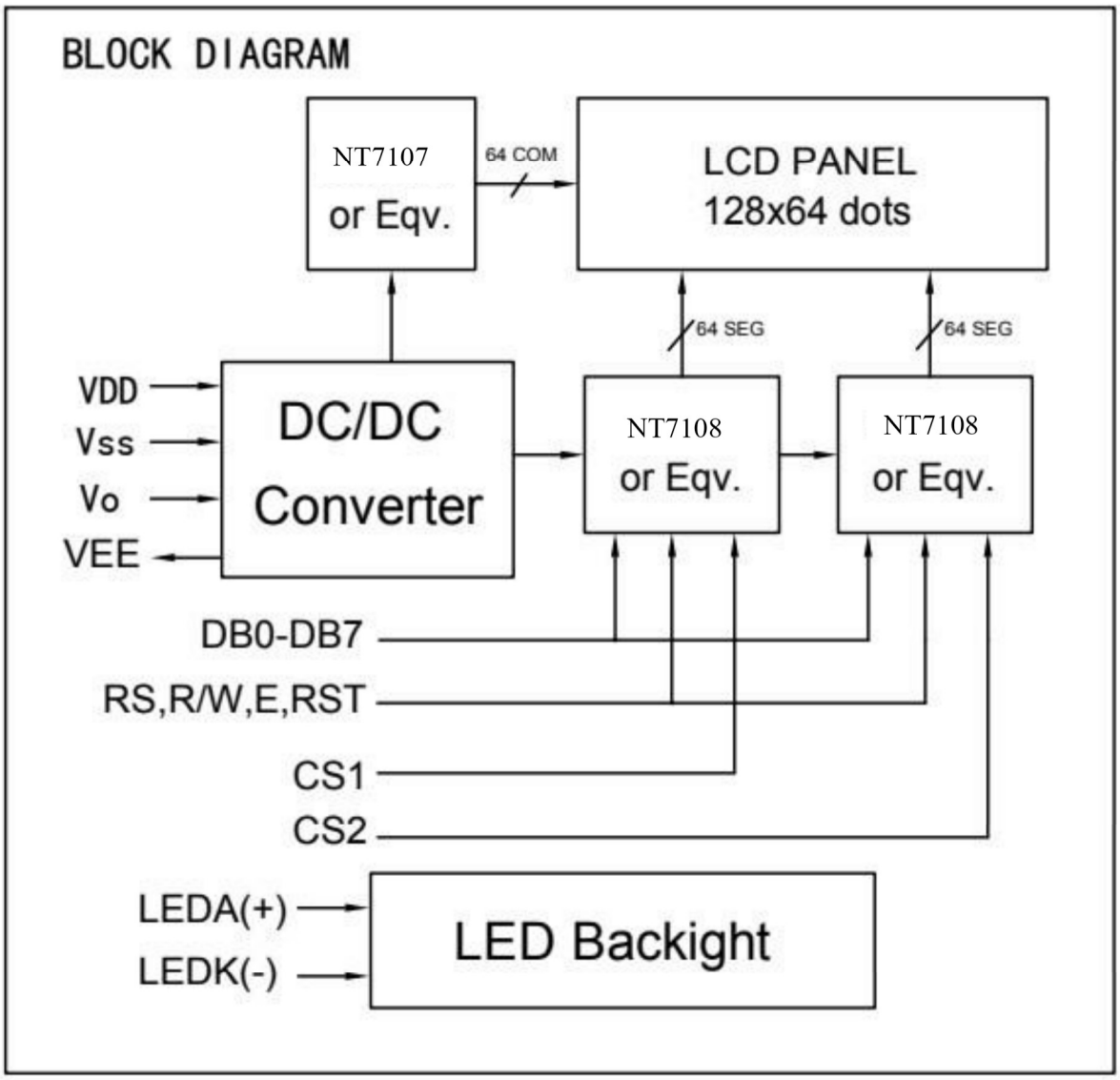
Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Current	IF	Ta= 25℃	-	-	20	mA
Reverse Voltage	VR		-	-	5	V
Power Dissipation	PD	Ta= 25℃	-	-	100	mW

3-3-2. Opto-electronic Characteristics

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Voltage	VF	Ta= 25℃ IF= 32mA	2.8	3.0	3.2	V
Luminous	-		100	150	-	cd/m²

* The brightness is measured without LCD panel

4. schematic diagram



5. Interface Pin Function

Pin	Symbol	Level	Function
1	Vss	- -	GND (0V)
2	VDD	- -	Supply Voltage for Logic (+5v)
3	Vo	- -	Power supply for LCD
4	RS	H/L	H:Data L:Instruction code
5	R/W	H/L	H:Read L:Write
6	E	H	Enadle Signal
7	DB0	H/L	
8	DB1	H/L	
9	DB2	H/L	Data Bus Line
10	DB3	H/L	
11	DB4	H/L	
12	DB5	H/L	
13	DB6	H/L	
14	DB7	H/L	
15	CS1	H/L	H:Chip Selection For IC1
16	CS2	H/L	H:Chip Selection For IC2
17	RESET	H/L	Reset Signal
18	VEE	- -	Negative Votage(-10)to LCD
19	LED+	- -	LED Backight Power Supply
20	LED-	- -	

6. COMMAND LIST

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.
Status read	L	H	Busy	L	On/ Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write display data	H	L	Write data								Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data								Reads data (DB0:7) from display data RAM to the data bus.

7.TIMING CHARACTERISTICS (Continued)

MPU Interface

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t_C	1000	–	–	ns
E high level width	t_{WH}	450	–	–	ns
E low level width	t_{WL}	450	–	–	ns
E rise time	t_R	–	–	25	ns
E fall time	t_F	–	–	25	ns
Address set-up time	t_{ASU}	140	–	–	ns
Address hold time	t_{AH}	10	–	–	ns
Data set-up time	t_{DSU}	200	–	–	ns
Data delay time	t_D	–	–	320	ns
Data hold time (write)	t_{DHW}	10	–	–	ns
Data hold time (read)	t_{DHR}	20	–	–	ns

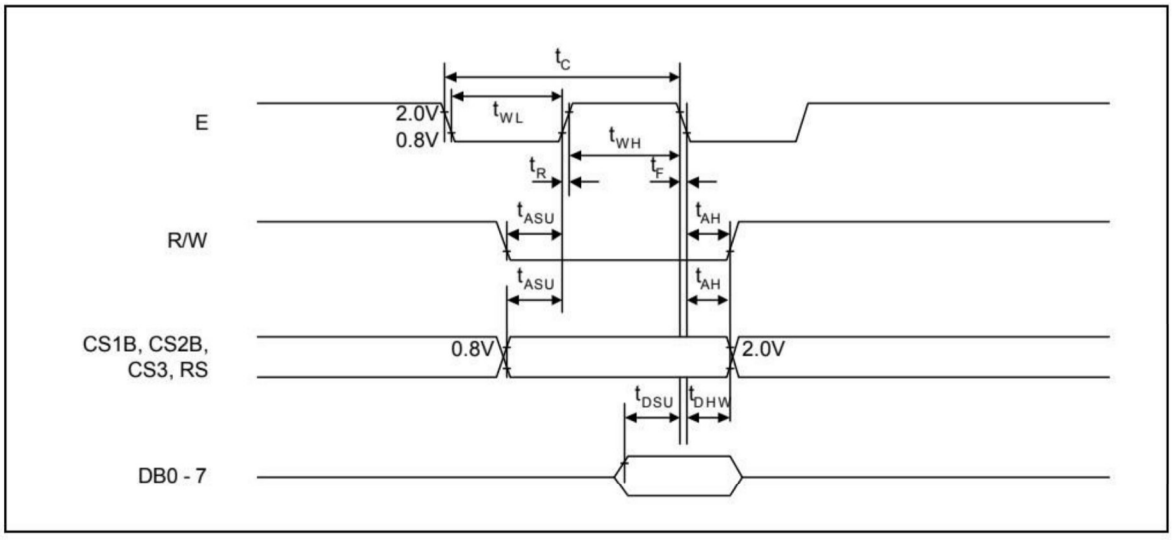


Figure 3. MPU Write Timing

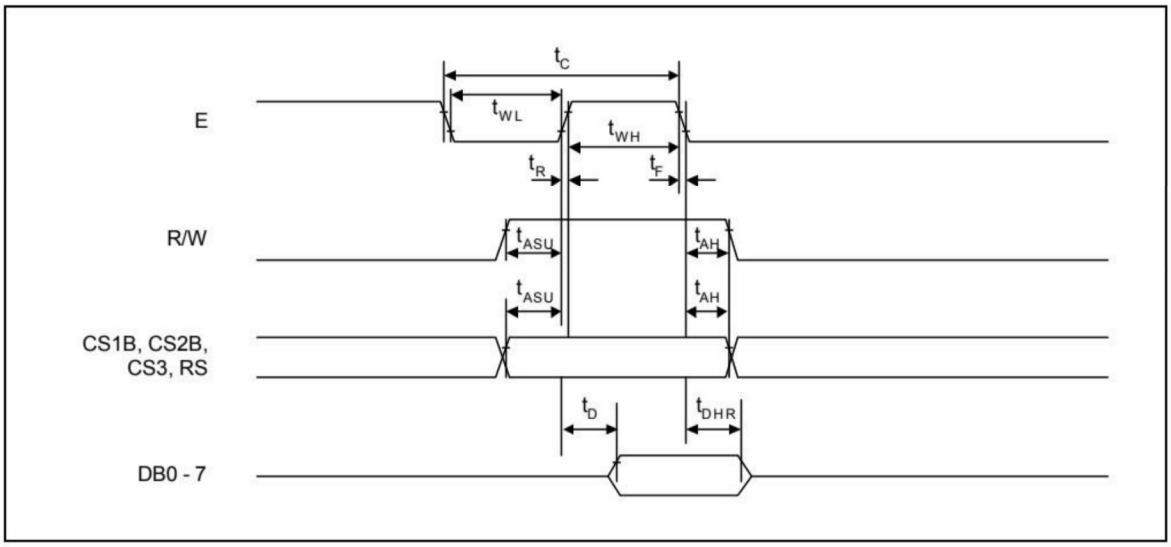


Figure 4. MPU Read Timing

8. QUALITY SPECIFICATION (Continued)

8-3. Sampling Plan and Acceptance

1.Sampling Plan

MIL - STD - 105E (||) ordinary single inspection is used.

2.Acceptance

Major defect: AQL = 0.25%

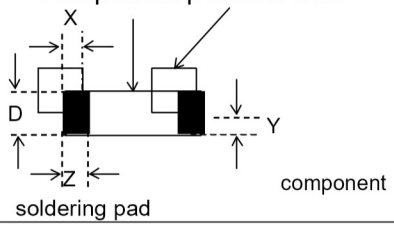
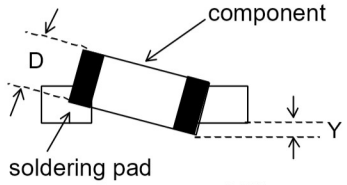
Minor defect: AQL = 0.65%

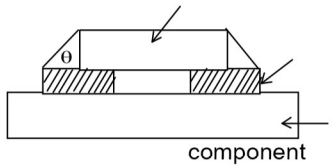
8-4. Criteria

1.COB

Defect	Inspection Item	Inspection Standards	
Major	PCB copper flakes peeling off	Any copper flake in viewing Area should be greater than 1.0mm^2	Reject
Major	Height of coating epoxy	Exceed the dimension of drawing	Reject
Major	Void or hole of coating epoxy	Expose bonding wire or IC	Reject
Major	PCB cutting defect	Exceed the dimension of drawing	Reject

2.SMT

Defect	Inspection Item	Inspection Standards	
Minor	Component marking not readable		Reject
Minor	Component height	Exceed the dimension Of drawing	Reject
Major	Component solder defect (missing , extra, wrong component or wrong orientation		Reject
Minor	Component position shift 	X < 3/4Z Y > 1/3D	Reject Reject
Minor	 Component tilt	Y > 1/3D	Reject
Minor	Insufficient solder	$\theta \leq 20°$	Reject



PAD
PCB

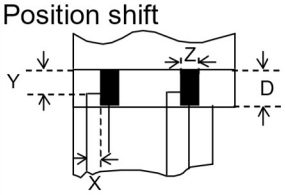
8. QUALITY SECIFICATION (Continued)

8-4. Criteria (Continued)

3. Metal (Plastic) Frame

Defect	Inspection Item	Inspection Standards		
Major	Crack / breakage	Anywhere		Reject
Minor	Frame Scratch	W	L	Acceptable of Scratch
		w<0.03mm	Any	Ignore
		0.03mm≤w<0.05mm	L≤5.0mm	2
		0.05mm≤w<0.1mm	L≤3.0mm	1
		w≥0.1mm	Any	0
		Note: 1. Above criteria applicable to scratch lines with distance greater than 5mm. 2. Scratch on the back side of frame (not visible) can be ignored.		
Minor	Frame Dent, Prick $\Phi = \frac{L + W}{2}$			Acceptable of Dents / Pricks
		Φ≤1.0mm		2
		1.0<Φ≤1.5mm		1
		1.5mm>Φ		0
		Note: 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm 2. Dent / prick on the back side of frame (not visible) can be ignored		
Minor	Frame Deformation	Exceed the dimension of drawing		
Minor	Metal Frame Oxidation	Any rust		

4. Flexible Film Connector (FFC)

Defect	Inspection Item		Inspection Standards	
Minor	Tilted soldering		Within the angle ±3°	Acceptable
Minor	Uneven solder joint /bump			Reject
Minor	Hole	$\Phi = \frac{L + W}{2}$	Expose the conductive line	Reject
			Φ > 1.0mm	Reject
Minor	Position shift 		Y > 1/3D	Reject
			X > 1/2Z	Reject

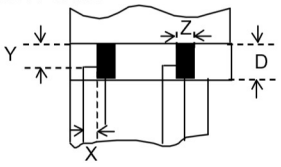
8. QUALITY SPECIFICATION (Continued)

8-4. Criteria (Continued)

5. Screw

Defect	Inspection Item	Inspection Standards	
Major	Screw missing/loosen		Reject
Minor	Screw oxidation	Any rust	Reject
Minor	Screw deformation	Difficult to accept screw driver	Reject

6. Heat seal 、TCP 、FPC

Defect	Inspection Item	Inspection Standards	
Major	Scratch expose conductive layer		Reject
Minor	HS Hole $\Phi=\frac{L+W}{2}$	Φ> 0.2mm	Reject
Major	Adhesion strength	Less than the specification	Reject
Minor	Position shift 	Y > 1/3D	Reject
		X > 1/2Z	Reject
Major	Conductive line break		Reject

7. LED Backing Protective Film and Others

Defect	Inspection Item	Inspection Standards	
Minor	LED dirty, prick	Acceptable number of units	
		$\Phi \leq 0.10$mm	Ignore
		$0.10 < \Phi \leq 0.15$mm	2
		$0.15 < \Phi \leq 0.2$mm	1
		$\Phi > 0.2$mm	0
		The distance between any two spots should be ≥10mm Any spot/dot/void outside of viewing area is acceptable	
Minor	Protective film tilt	Not fully cover LCD	Reject
Major	COG coating	Not fully cover ITO circuit	Reject

8. Electric Inspection

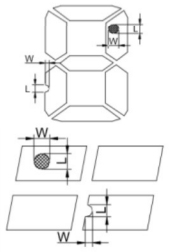
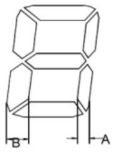
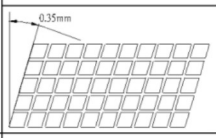
Defect	Inspection Item	Inspection Standards	
Major	Short		Reject

Major	Open		Reject

8. QUALITY SPECIFICATION (Continued)

8-4. Criteria (Continued)

9. Inspection Specification of LCD

Defect	Inspect Item		Inspection Standards				
Minor	Linear Defect	∗ Glass Scratch ∗ Polarizer Scratch ∗ Fiber and Linear material	W	W≤0.03		0.03<W≤0.05	W>0.05
			L	L<5		L<3	Any
			ACC. NO.	1		1	Reject
			Note	L is the length and W is the width of the defect			
Minor	Black Spot and Polarizer Pricked	∗ Foreign material between glass and polarizer or glass and glass ∗ Polarizer hole or protuberance by external force	Φ	Φ≤0.1	0.1<Φ≤0.15	0.15<Φ≤0.2	Φ>0.2
			ACC. NO.	3EA /1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			
Minor	White Spot and Bubble in polarizer	∗ Unobvious transparant foreign material between glass and glass or glass and polarizer ∗ Air protuberance between polarizer and glass	Φ	Φ≤0.1	0.1<Φ≤0.15	0.15<Φ≤0.2	Φ>0.2
			ACC. NO.	3EA / 1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			
Minor	Segment Defect		Φ	Φ≤0.10	0.10<Φ≤0.20	Φ>0.2	
			ACC. NO.	3EA /1PC	2	0	
			Note	W is more than 1/2 segment width		Reject	
				$\Phi = \frac{L + W}{2}$ Distance between two defect is 10mm			
Minor	Protuberant Segment	 Φ = (L + W) / 2	Φ	Φ≤0.10	0.10<Φ≤0.20	Φ>0.2	
			W	Glue	W≤1/2 Seg , W≤0.2	Ignore	
			ACC. NO.	3EA /1PC	2	0	
Minor	Assembly Mis-alignment		1. Segment				
			B	B≤0.4mm	0.4<B≤1.0mm	B>1.0mm	
			B-A	B-A<1/2B	B-A<0.2	B-A<0.25	
			Judge	Acceptable	Acceptable	Acceptable	
			2. Dot Matrix				
			Deformation>0.35mm			Reject	
Minor	Stain on LCD Panel Surface		Accept when stains can be wiped lightly with a soft cloth or a similar one. Otherwise, judged according to the above items: “Black spot” and “White Spot”				

9. RELIABILITY

NO.	Item	Condition	Criterion
1	High Temperature Operating	70℃, 96Hrs	No defect in cosmetic and operational function allowable. Total current Consumption should be below double of initial value.
2	Low Temperature Operating	-20℃, 96Hrs	
3	High Humidity	40℃, 90%RH, 96Hrs	
4	High Temperature Storage	80℃, 96Hrs	
5	Low Temperature Storage	-30℃, 96Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2g 2 Hrs per direction(X,Y,Z)	
7	Thermal Shock	-10℃ to 25℃ to 60℃ (60Min) (5Min) (60Min) 16Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 5kV and –1 ~ –5kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.
		Air Discharge Voltage: +1 ~ 8kV and –1 ~ -8kV	

Note: 1) Above conditions are suitable for XIN NUO YA standard products.

2) For restrict products, the test conditions listed as above must be revised.

10. HANDLING PRECAUTION

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

10. HANDLING PRECAUTION (Continued)

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 60□C, 90%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance ,for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol. Which should be burned up later.
- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

11. OUTLINE DIMENTION