



MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

MODULE NO.: MI12864J-G-7

Revision	V1.0
Engineering	
Date	
Our Reference	

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RECORD OF REVISION

NO	REASON	DESCRIPTION OF CHANGES	REMARKS	DATE
0.1		Original Version	Preliminary	20060901
1.0	Full Version			20061023

● GENERAL INFORMATION

1. SCOPE:

This specification covers the delivery requirements for the LCM delivered by Multi-Inno Technology Co.,Ltd. to Customer.

2. PRODUCT ELEMENT

LCD, IC,BACKLIGHT ,FPC

3. MODULE NAME

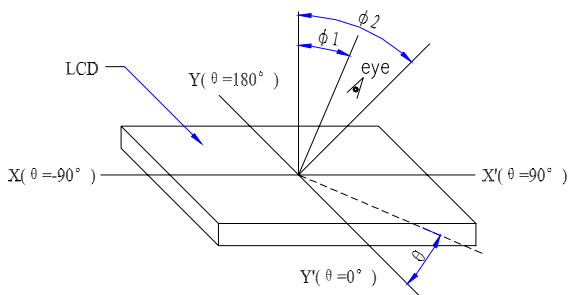
MI12864J-G-7

4. ENVIRONMENT DESCRIPTION.

RoHS COMPLIANT.

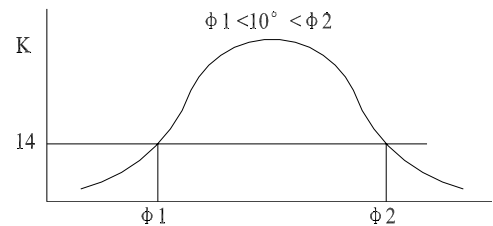
● OPTICAL DEFINITIONS

1. Definition of angle θ and ϕ



POSITIVE TYPE

2. Definition of viewing angle $\phi 1$ and $\phi 2$

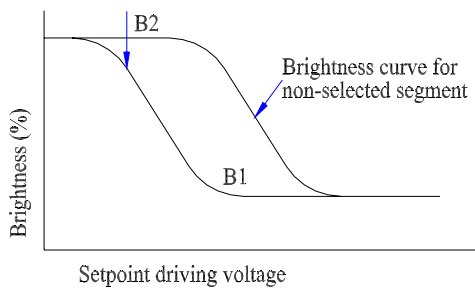


Contrast Ratio K
VS Viewing Angle ϕ

POSITIVE TYPE

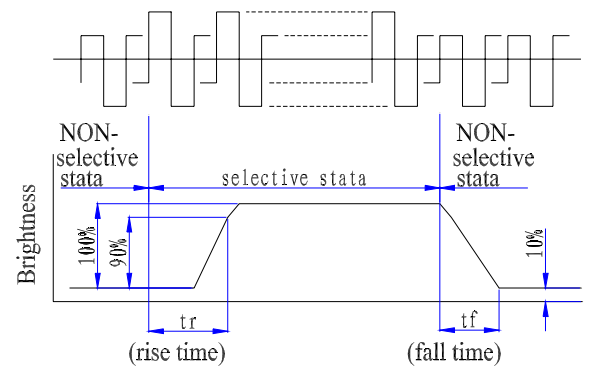
3. Definition of contrast “K”

$$K = \frac{\text{brightness of non-selected segment (B2)}}{\text{brightness of selected segment (B1)}}$$



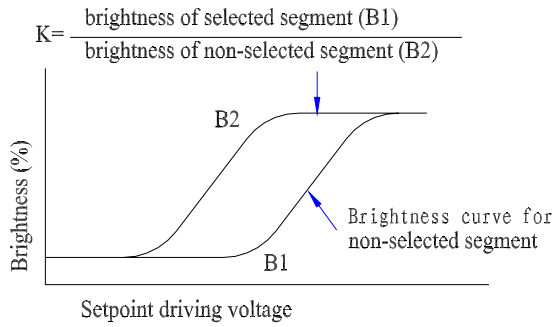
NEGATIVE TYPE

4. Definition of optical response

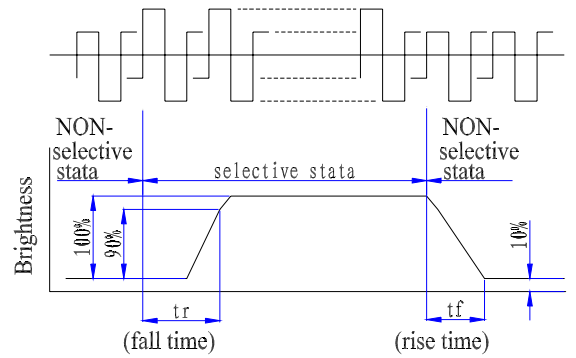


NEGATIVTYPE

5. Definition of contrast “K”

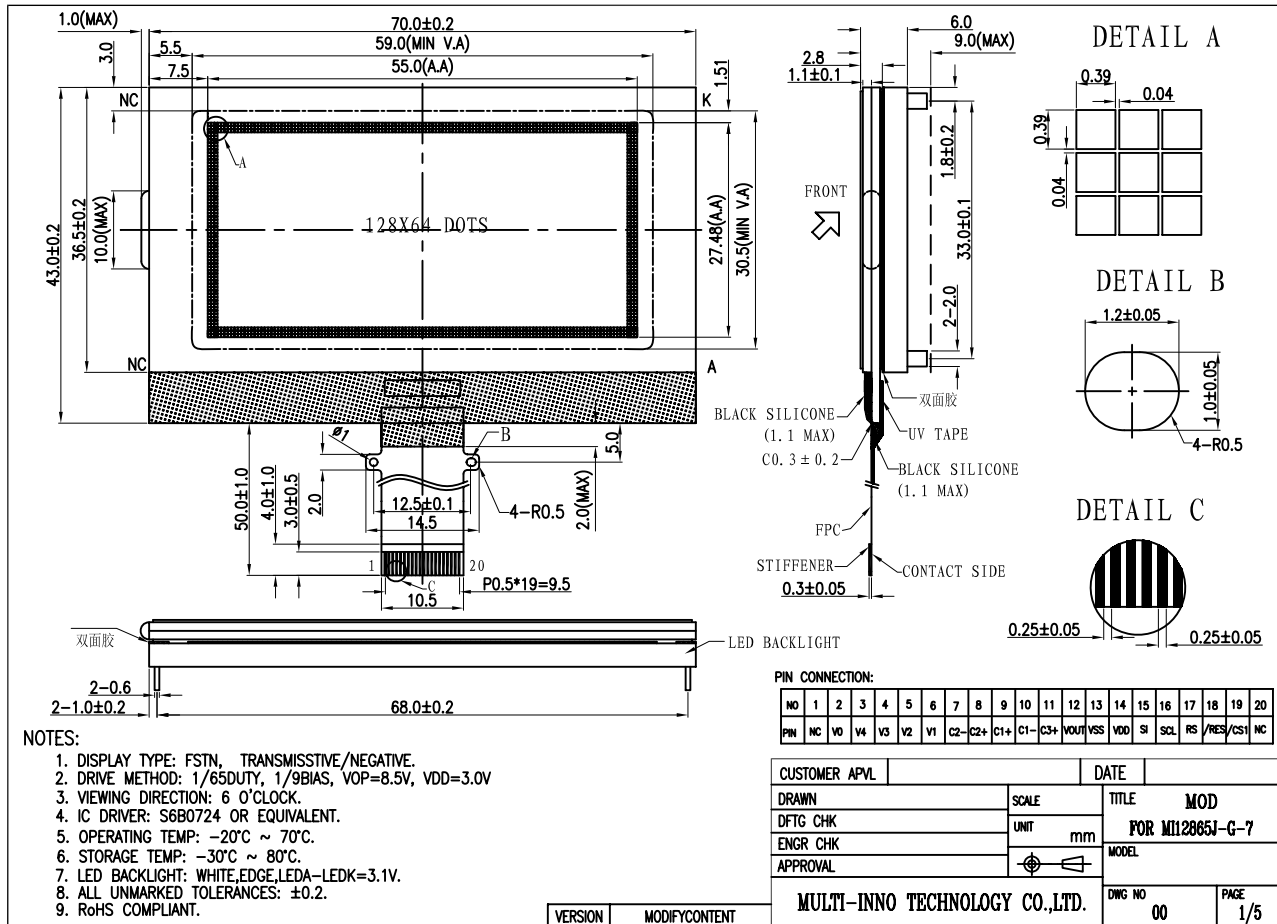


6. Definition of optical response



● OUTLINE AND MECHANICAL DESCRIPTION

1. OUTLINE



**PIN CONNECTION:**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NC	V0	V4	V3	V2	V1	C2-	C2+	C1+	C1-	C3+	VOU	VSS	VDD	S1	SCL	RS	/RES	/CS1	NC

2. MECHANICAL DESCRIPTION

Item.	Standard Value	Unit
Lcm Size	70L×93W×9.5H(MAX)	mm
Lcd Size	70L×36.5W ₁ /43W ₂ ×2.8H	mm
Dot Size	0.39×0.39	mm
Dot Number	128×64	dots
Dot Pitch	0.43×0.43	mm
Assy.Type	COG	--
Effective Display Area	59×30.5	mm
View Direction	<input type="checkbox"/> 3H <input checked="" type="checkbox"/> 6H <input type="checkbox"/> 9H <input type="checkbox"/> 12H <input type="checkbox"/> OTHER	--
Lcd Type	<input type="checkbox"/> TN <input type="checkbox"/> HTN <input type="checkbox"/> STN GRAY <input type="checkbox"/> STN BLUE <input type="checkbox"/> STN YELLOW-GREEN <input checked="" type="checkbox"/> FSTN B/W <input type="checkbox"/> OTHER	--
Display Mode	<input type="checkbox"/> Positive <input checked="" type="checkbox"/> Negative	--
Rear Polarizer	<input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input checked="" type="checkbox"/> Transmissive	--
Backlight Type	<input checked="" type="checkbox"/> LED <input type="checkbox"/> EL <input type="checkbox"/> CCFL <input type="checkbox"/> Bottom <input checked="" type="checkbox"/> Edge	--
	Led Voltage: 3.1V Lightness: 250CD/M ²	
Backlight Color	<input checked="" type="checkbox"/> White <input type="checkbox"/> Yellow-Green <input type="checkbox"/> Blue <input type="checkbox"/> Amber <input type="checkbox"/> Other	--
Temperature Range	OP:-20℃~70℃ ST:-30℃~80℃	--
Duty	1/65	--
Drive IC	S6B0724	--
Weight	27	g

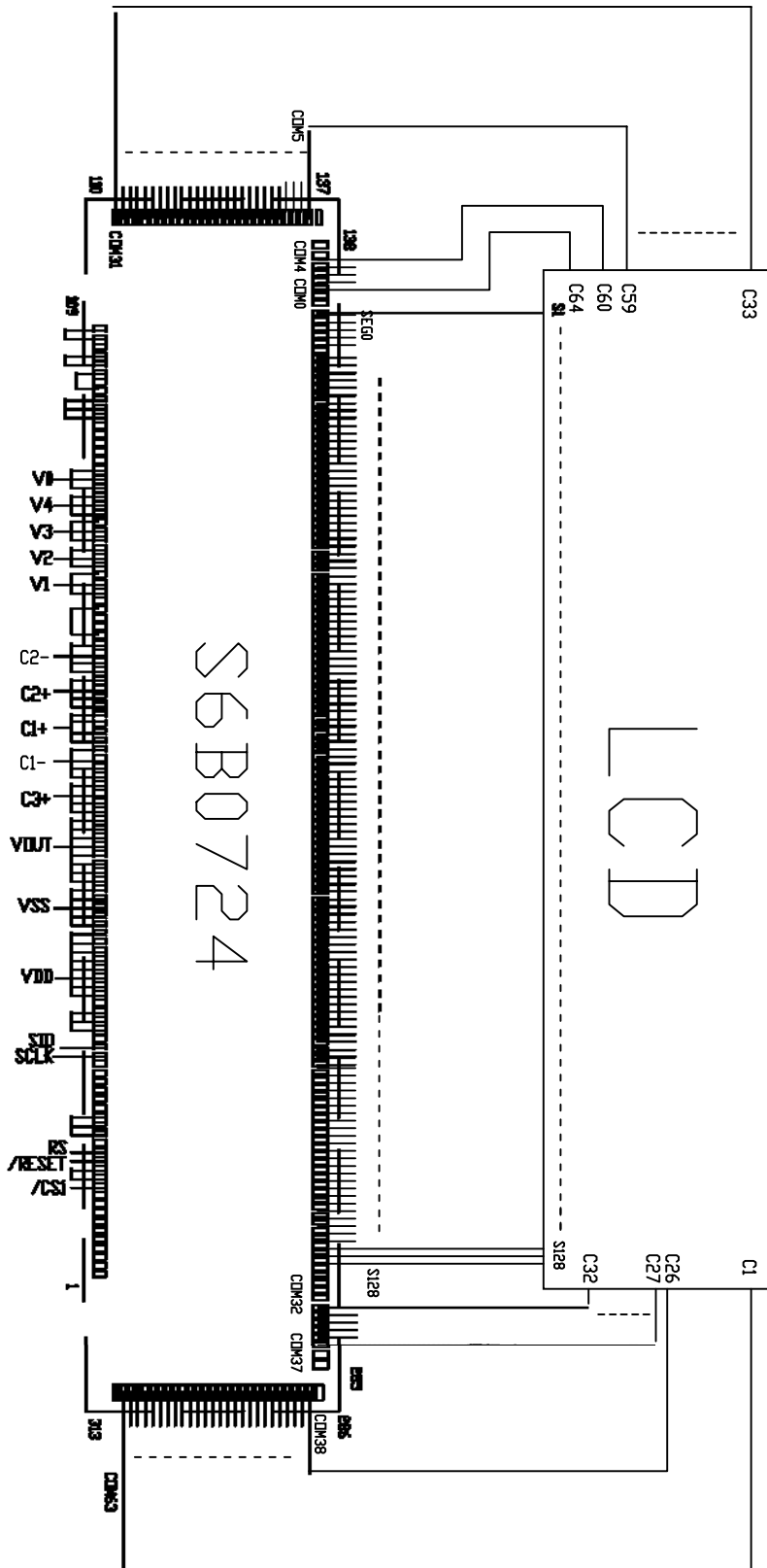
● ELECTRICAL DESCRIPTION

1. Input signal Function

Pin No.	Symbol	Level	Description
1	NC	-	No connection
2	V0	9.0V	Power supply voltage for LCD $V0 \geq V1 \geq V2 \geq V3 \geq V4 \geq VSS$
3	V4	-	
4	V3	-	
5	V2	-	
6	V1	-	
7	C2-	-	Capacitor pin for voltage converter
8	C2+	-	Capacitor pin for voltage converter
9	C1+	-	Capacitor pin for voltage converter
10	C1-	-	Capacitor pin for voltage converter
11	C3+	-	Capacitor pin for voltage converter
12	VOOUT	-	DC/DC voltage converter output
13	VSS	0V	Ground
14	VDD	2.7~3.3V	Power supply voltage for logic
15	SI	H/L	Serial data input pin
16	SCL	H/L	Serial clock input pin
17	RS	H/L	Register select input pin H: Data, L: control
18	/RES	H/L	Reset input pin (active at low)
19	/CS1	H/L	Chip select input pin (active at low)
20	NC	-	No connection

2. Block diagram

Circuit Block Diagram



**Electrical Specifications and Instruction Code**

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		$V_{DD}-V_{SS}$	2.7	3.0	3.3	V
Supply Voltage		V_{LCD}	-	9.0	-	V
Input Signal Voltage	High	V_{IH}	$0.8V_{DD}$	-	V_{DD}	V
	Low	V_{IL}	0	-	$0.2V_{DD}$	V
Supply current (Logic) (Display character)		I_{DD}	-	200	-	uA
Supply current (LED)		I_{EE}	-	-	80	mA

Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	$V_{DD}-V_{SS}$	-0.3	6.0	V	
LCD Driving Voltage	V_{LCD}	-0.3	17.0		
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80		

4. Timing Characteristics

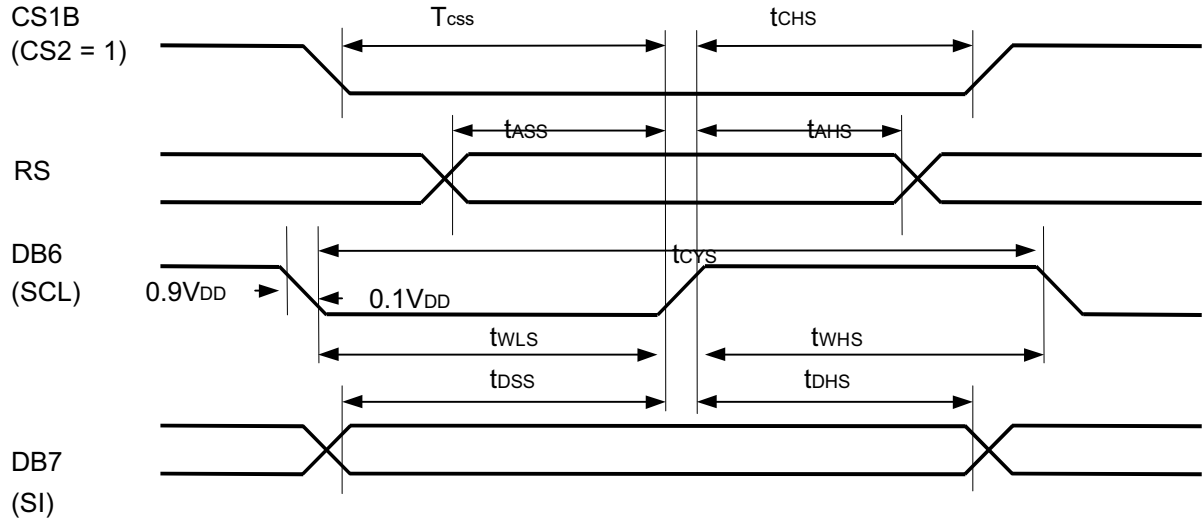


Figure . Serial Interface Characteristics

($V_{DD} = 2.4$ to $3.6V$, $T_a = -40$ to $+85^{\circ}C$)

	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Serial clock cycle SCLK high pulse	DB6 (SCL)	TCYS	250	-	-	ns	
		tWHS	100	-	-		
		tWLS	100	-	-		
Address setup time Address hold time	RS	tASS	150	-	-	ns	
		tAHS	150	-	-		
Data setup time Data hold time	DB7 (SI)	tDSS	100	-	-	ns	
		tDHS	100	-	-		
CS1B setup time CS1B hold time	CS1B	tCSS	150	-	-	ns	
		tCHS	150	-	-		

**INSTRUCTION DESCRIPTION****Table . Instruction Table**

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	0	0	0	0	0	1	Y7	Y6	Y5	Y4	Set column address MSB
Set column address	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
Entire display ON / OFF	0	0	1	0	1	0	0	1	0	EON	Select normal/entire display ON When EON = 0: normal display.
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
R	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
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Regulator resistor	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set reference voltage	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode
Set reference voltage	0	0	×	×	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set static indicator	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode
Set static indicator	0	0	×	×	×	×	×	×	S1	S0	Set static indicator register
Power save	-	-	-	-	-	-	-	-	-	-	Compound Instruction of display OFF and entire display ON

● QUALITY AND RELIABILITY

1. Test Condition

Test should be conducted under the following conditions:

Ambient Temperature: 25 ± 5 °C

Humidity : $60 \pm 20\%$ RH

2.Sampling Plan

Sampling method shall be in inspection level 2, normal inspection, and single sampling plan tables for normal tightened, and reduced inspection.

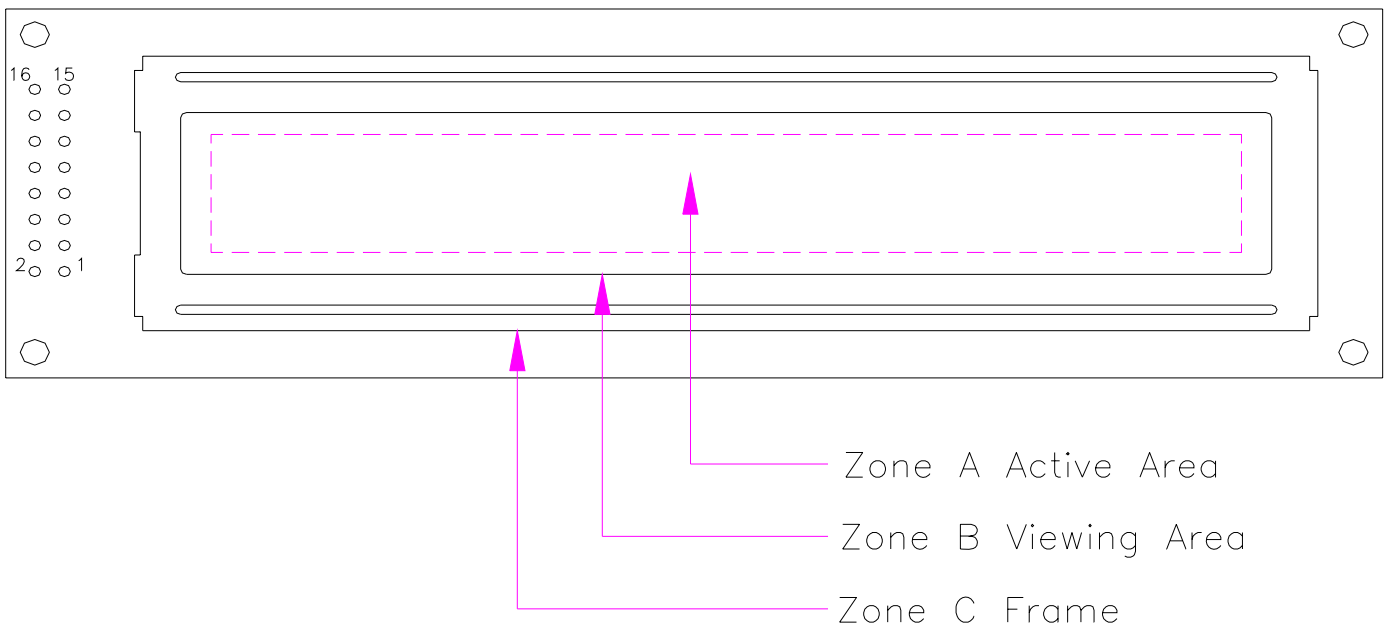
3.Acceptable Quality Level

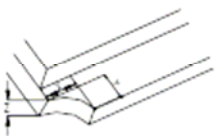
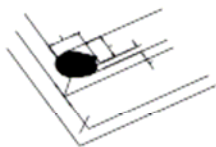
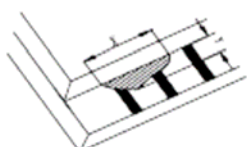
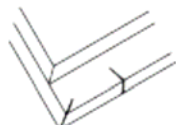
A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

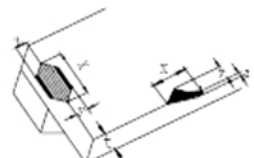
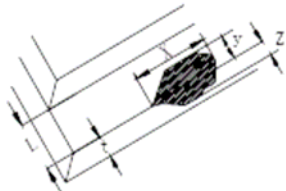

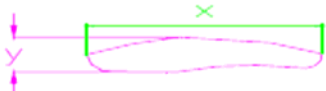
A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

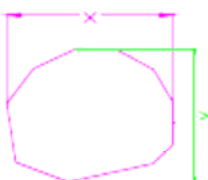
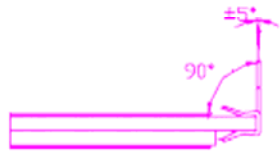
4. Appearance and Checking Standard

Appearance test is to be conducted by eyes at approximately 30cm distance from LCD module under the single fluorescent light.



Item 项目		Figure 示意图	Criteria 判断标准	MA MI
Glass Nonconform-ity 玻璃不良	Glass Corner Breakage 角破损		1、 $X \leq 3\text{mm}$ and don't touch pin $X \leq 3\text{mm}$ 和不到达 PIN 的引线 2、Y out of seal resin Y 不进入框线 3、Z ignore ACC Z 不计 接收	MI
			1、 $X \leq 1/8$ Length of LCD side $X \leq 1/8$ 边长 2、Y out of area A Y 不进入可视区 3、 $Z \leq t$ Z don't touch seal resin ACC $Z \leq t$ Z 不到达框线 接收	
	Extra Glass Ledge 突出		1、X ignore X 不计 2、 $Y \leq 1/3$ Length of conductor ACC $Y \leq 1/3$ PIN 长 接收	MI
Glass Nonconform-ity 玻璃破损	Crack 裂缝		Any crack any where 任何区域有裂痕	REJ 拒收 MA

Glass Nonconform-ity 玻璃不良	Glass Side Breakage 边破损		1、 $X \leq 1/4$ Length of LCD side $X \leq 1/4$ 边长 2、Y out of area A Y 不进入可视区 3、 $Z \leq t$ Z don't touch seal resin ACC $Z \leq t$ Z 不到达框线 接收	MI
			1、 $X \leq 1/4$ Length of LCD side $X \leq 1/4$ LCD 边长 2、 $Y \leq 1/3L$ (L: Length of conductor) $Y \leq 1/3$ PIN 宽 3、 $Z \leq t$ Z don't touch seal resin ACC $Z \leq t$ Z 不到达框线 接收	MI
Color Variation 彩虹			At most 2-color samples are acceptable but have no color difference in the brightest state. 无明显两色之分	ACC 接收 MI
Point Like flaw 点状不良			$\phi = (x+y) / 2$ $\phi \leq 0.25\text{mm}$ Distance between 2 spots $> 5\text{mm}$ $\phi = (x+y) / 2$ $\phi \leq 0.25\text{mm}$ 两点间距 $> 5\text{mm}$	ACC 接收 MI
Scratching Line 线状刮伤			$X \leq 6\text{mm}$ $Y \leq 0.08\text{mm}$ $X \leq 6\text{mm}$ $Y \leq 0.08\text{mm}$	ACC 接收 MI

Polarizer Nonconformity 偏光片不良	Deflective Sticking 贴歪		According to the tolerance specified in engineering drawing. 符合工程图要求的公差	接收	MI					
	Faulty Sticking 贴错			REJ 拒收	MA					
	Air Bubble 气泡		$\Phi = (X+Y) / 2$ <table border="1" data-bbox="893 548 1300 750"> <tr> <th>Size (mm) 尺寸</th> <th>Qty allowed 允许个数</th> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>2</td> </tr> <tr> <td colspan="2">Distance between 2 spots > 5mm 两点间距 > 5mm</td> </tr> </table> <p>Ignore if out of viewing area. 可视区外忽略不计</p>	Size (mm) 尺寸	Qty allowed 允许个数	$0.2 < \Phi \leq 0.5$	2	Distance between 2 spots > 5mm 两点间距 > 5mm		
Size (mm) 尺寸	Qty allowed 允许个数									
$0.2 < \Phi \leq 0.5$	2									
Distance between 2 spots > 5mm 两点间距 > 5mm										
Electrode & pin Nonconformity 电极与PIN脚不良	Pin Length PIN长		Non-conformity with engineering drawing 与工程图不符	REJ 拒收	MA					
	Pin Deflection PIN歪斜		Deviation exceeds 5 degree 偏差 > 5°	REJ 拒收	MI					
	Pin body With resin PIN上有胶			REJ 拒收	MI					
	Deflection Frame Lines 切斜		Deviation between two ends exceeds 0.25mm 两端相差 0.25mm	REJ 拒收	MI					

Contact Pad Unclean 导电层不洁				REJ 拒收	MI
Silk Printing Nonconformity 表面丝印不良			1、 Unspecified tolerance of width of line $\leq 1/4$ width. 线宽均匀性 $\leq 1/4$ 线宽 ACC 接收 2、 Silk printing location: According to the Tolerance specified in engineering drawing 丝印位置依工程图要求的公差 3、 Diameter of broken pattern ≤ 0.25 mm. 缺失图案直径 ≤ 0.25 mm. ACC 接收		MI

5. Inspection Quality Criteria

ITME	DESCRIPTION OF DEFECTS			Class of defects	Acceptable level (%)
FUNCTION	Short circuit or Pattern cut			Major	0.65
DIMENSION	Refer to individual acceptance specification			Major	2.5
BLACK SPOTS	Ave. Dia. D	area A	area B	Minor	2.5
	$D \leq 0.2$	Disregard			
	$0.2 < D \leq 0.3$	2	3		
	$0.3 < D \leq 0.4$	0	1		
	$0.4 < D$	0	0		
BLACK LINES	Width W, Length L	A	B	Minor	2.5
	$W \leq 0.03$	Disregard			
	$0.03 < W \leq 0.05$	3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$	1	1		
BUBBLES IN POLARIZER	Average diameter D $0.2 < D < 0.5\text{mm}$ for N = 4 $0.5 < D < 0.7\text{mm}$ for N=1			Minor	2.5
COLOR UNIFORMITY	Rainbow color or Newton ring.			Minor	2.5
GLASS SCRATCHES	Obvious visible damage.			Minor	2.5
VIEWING ANGLE	Refer to individual acceptance specification			Minor	2.5
CONTRAST RATIO	Refer to individual acceptance specification			Minor	2.5
RESPONSE TIME	Refer to individual acceptance specification			Minor	2.5

6. Reliability

The LCD module should have no failure in the following reliability test.

TEST ITEM	TEST CONDITIONS
HIGH TEMPERATURE STORAGE	80 °C, 200hr.
LOW TEMPERATURE STORAGE	-30 °C, 200hr
HUMIDITY STORAGE	80 °C, 90%RH, 96hr.
HIGH TEMPERATURE OPERATION	70 °C, typical operating conditions, 200hr.
LOW TEMPERATURE OPERATION	-20 °C, typical operating conditions, 200hr.
TEMPERATURE CYCLING	-20 °C ~70 °C 10min, between each step temp. 50min, at each step temp. 5 cycles.
MECHANICAL VIBRATION	10 ~ 100 Hz sweep, 4G, amp1 = 10mm(max) XYZ for 60min, each.
MECHANICAL SHOCK	10 ~ 55Hz, 50G. XYZ for 1 time, each.

NOTE 1: The module should not have condensation of water on the module.

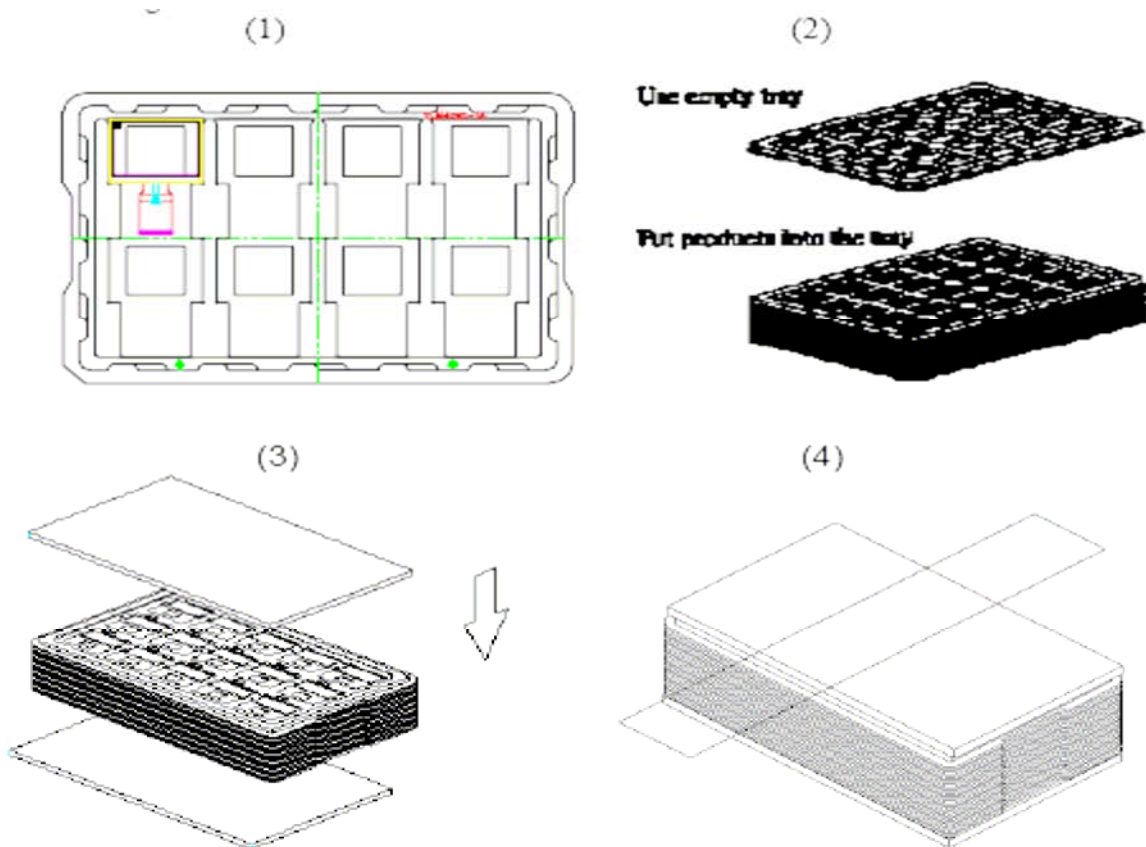
NOTE 2: The module should be inspected after 1 hour storage in normal conditions (15~35°C, 45~65%RH).

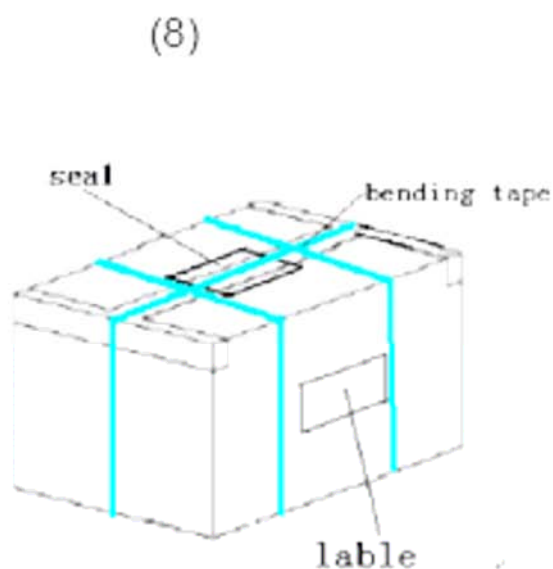
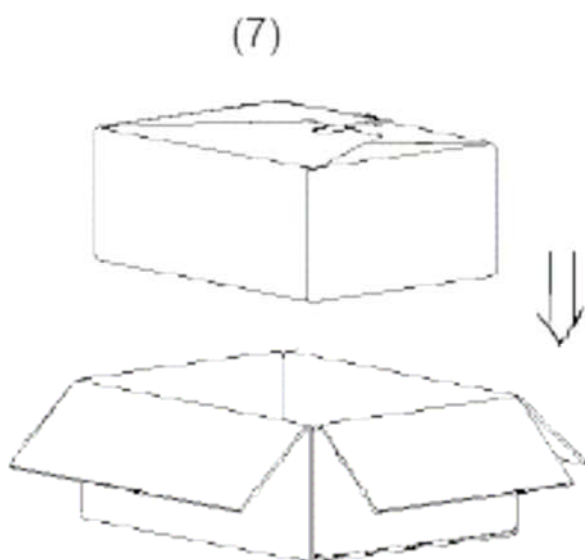
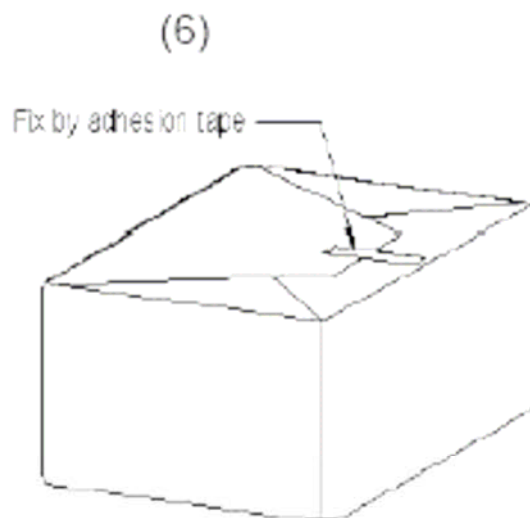
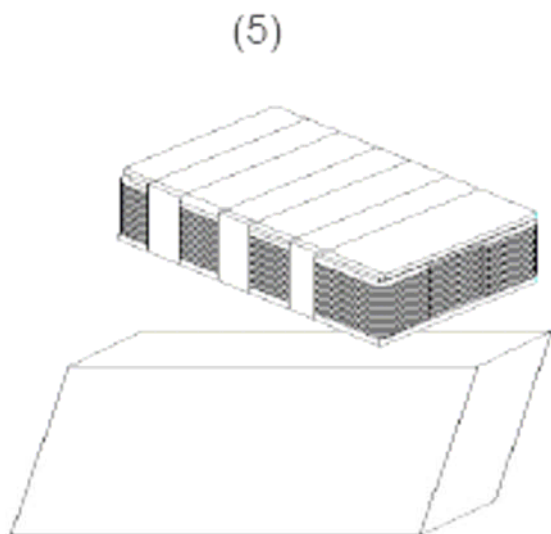
● PACKING

1. Packing Materials

No.	ITEM	DIMENSION(L*W*H)
1		
2		

2. Packing Method





- (1). Put module into tray cavity :
- (2). Tray stacking
- (3). Put 1 cardboard under the tray stack and 1 cardboard above:
- (4). Fix the cardboard to the tray stack with adhesive tape:
- (5). Put the tray stack and 4 pcs desiccant into the LDPE bag
- (6). Fix the LDPE bag with adhesive tape:
- (7). Put LDPE bag with tray stack into carton.:
- (8). Carton sealing with adhesive tape.



● CAUTION FOR USING LCM

1. Precautions in handling LCD Modules

Lcms have been assembled and accurately calibrated before delivery.

Please observe the following criteria when handling.

- A. Do not subject the module to excessive shock.
- B. Do not modify the tab on the metal holder.
- C. Do not tamper with the printed circuit board.
- D. Limit the soldering of the printed circuit board to I/O terminals only.

Do not touch the zebra strip nor modify its location.

2. Static electricity warning

LCM uses CMOS LSI technology. Therefore, strict measures to avoid static electricity discharge are followed through all processes from manufacturing to shipping. When handling a LCM, take sufficient care to prevent static electricity discharge as you would any CMOS IC.

- A. Do not take the LCM from its anti-static bag until it's to be assembled.

LCMs are individually packaged in bags specially treated to resist static electricity. When storing, keep the LCM packed in the original bags, or store them in a container processed to be resistant to static electricity, or in an electric conductive container.

- B. Always use a ground strap when handling a LCM.

Always use a ground strap while working with the module, from the time it is taken out of the anti-static bag until it is assembled. If it is necessary to transfer the LCM, once it has been taken out of the bag, always place it in an electric conductive container. Avoid wearing clothes made of chemical fibers, the use of cotton or conductive treated fiber clothing is recommended.

- C. Use a no-leak iron for soldering the LCM.

The soldering iron to be used for soldering the I/O terminals to the LCM are to be insulated or grounded at the iron tip.



D. Always ground electrical apparatuses required for assembly.

Electrical apparatuses required to assemble the LCM into a product, i.e. electrical screw drivers, are to be first grounded to avoid transmitting spike noises from the motor.

E. Assure that the work bench is properly grounded.

F: Peel off the LCM protective film slowly.

The module is attached with a film to protect the display surface from contamination, damage, adhesion of flux, etc. Peeling off this film abruptly could cause static electricity to be generated, so peel the tape slowly.

G: Pay attention to the humidity in the work area. 50~60% RH is recommended.

3. Storage

If the correct method of storage is not followed, deterioration of the display material (polarizer) and oxidation of the I/O terminal plating may make the process of soldering difficult. Please comply with the following procedure.

A. Store in the shipping container.

B. If the shipping container is not available, place in anti-static bags and seal the opening.

C. Store the modules where they are not subjected to direct sunlight or a fluorescent lamp.

D. Store in a temperature range of 0°C - 35°C with low relative humidity.

4. Caution

A. Do not give any external shock.

B. Do not wipe the surface with hard materials.

C. Do not apply excessive force on the surface.

D. Do not expose to direct sunlight or fluorescent light for a long time.

E. Avoid storage in high temperature and high humidity.

F. When storage for a long time at 40°C or higher is required, R/H should be less than 60%.

Liquid in LCD is hazardous substance. Do not lick, swallow when the liquid is attached to your hands, skin, clothes etc. Wash it out thoroughly.