



深圳市希恩凯电子有限公司

SHENZHEN CNK ELECTRONIC CO.,LTD.

Product Specification For LCD Module

Model NO. : CNKD0503-14001A

REVISION : A

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

CUSTOMER :

APPROVED BY :

LCM R&D CENTER

APPROVED BY


CHECKED BY

PREPARED BY

DIRECTOR

MANAGER

Engineer

 深圳市希恩凯电子有限公司 SHENZHEN CNK ELECTRONIC CO.,LTD.	MODEL NO.		PAGE
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4. GENERAL SPECIFICATION

ITEM	CONTENTS
Module Size	91(W) ×76 (H) × 9(T) mm
Display View Area	72(W) × 54(H) mm
LCD Type	TN/NEGATIVE/Transmissive
View Angle	12 O'clock
Driver IC	HT1621
Backlight Driver type	Power/White
DC to DC circuit	Build-In
Weight	TBD

5. LCD ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
LCD Module Driving Voltage	VDD	Ta=25°C	4.8	5.0	5.2	Volt
Operating Temperature	Top	--	0°C	-	+50°C	°C
Storage Temperature	Tst	--	-20°C	-	+70°C	°C
Humidity	%	--	--	90%		

Note: See section 12 for backlight uniformity measurement

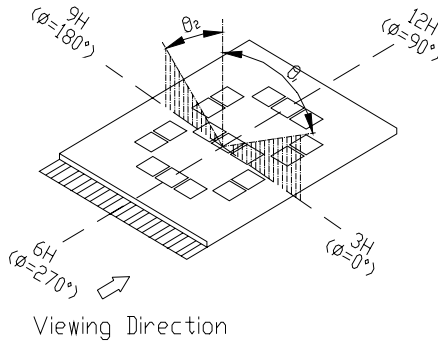
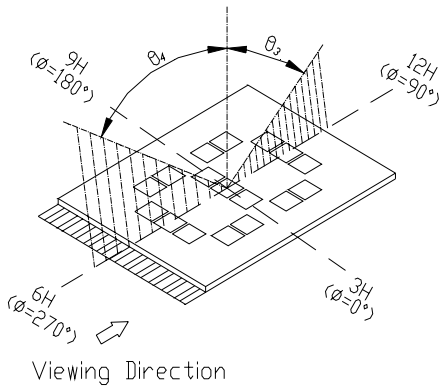
6. LCD OPTICAL CHARACTERISTICS

Item	Symbol	Temp(°C)	Rating			Unit	Reference	
			Min	Typ	Max			
Recommended Driving Voltage	Vop	50				V		
		25	4.8	5.0	5.2			
		0						
Response Time	Rise Time	Tr	25	180	230	ms	Note4	
	Fall Time	Tf	25	180	230			
Frame Frequency	FR	25	70	75	80	Hz		
Viewing angle Cr≥2	∅=0°	θ ₁	25	25		Deg	Note1 Note2	
	∅=180°	θ ₂		25				
	∅=90°	θ ₃		15				
	∅=270°	θ ₄		35				
Viewing Direction		12 O'clock						
Contrast Ratio	Cr	25	6	8			Note3	

7. OPTICAL CHARACTERISTICS DEFINITION

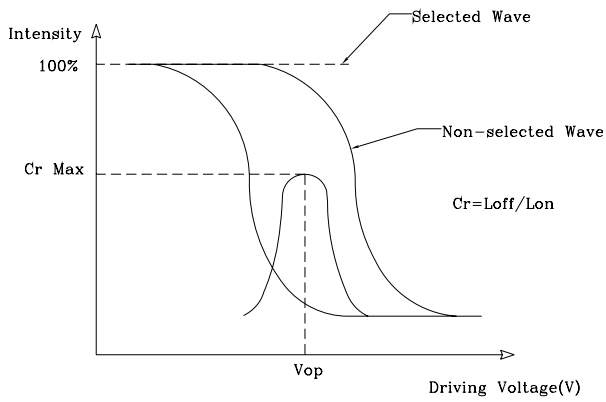
Note 1. Definition of angle θ_1 & θ_2

Note 2. Definition of angle θ_3 & θ_4

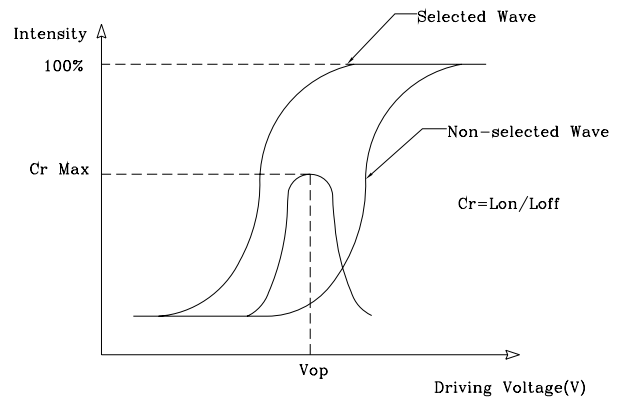


LCD Panel

Note 3. Definition of contrast ratio (Cr2)

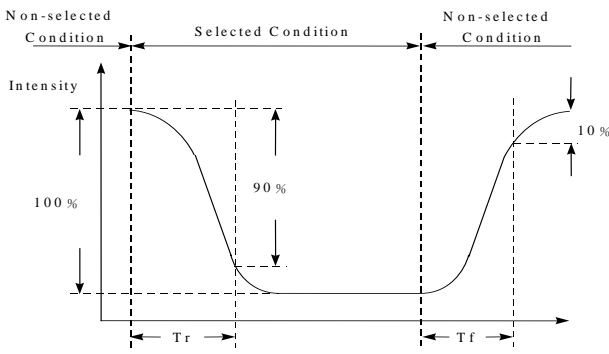


[Positive type]

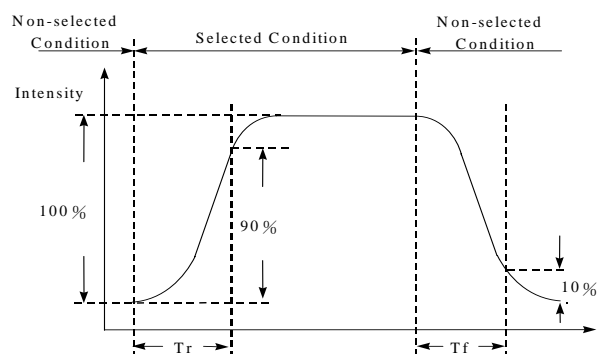


[Negative type]

Note 4. Definition of response time



[positive type]



[Negative type]

8. INTERFACE PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VSS	GND
2	VDD	Positive power supply
3	DATA	Serial Data Input/Output With a Pull-High Resistor
4	CS	Chip selection input with a pull-high resistor
5	WR	Write clock input with a pull-high resistor
6~7	A、K	LED Backlight

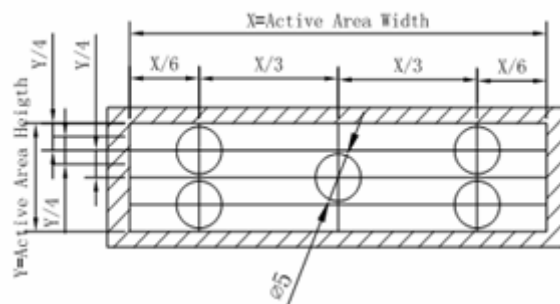
9. BACKLIGHT

BACKLIGHT ELECTRICAL-OPTICAL CHARACTERISTICS (Unless specified, Ambient temperature $T_a=25^{\circ}\text{C}$)

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Reference
Supply Current	I	--	60	80	mA	60mA	
WHITE LED	V	2.9	3.1	3.3	V	60mA	--
Backlight Luminous Intensity	L_v	--	--	--	Cd/m^2	60mA	Note1
Uniformity	--	70	--	--	%	60mA	Note1 Note2

NOTE:

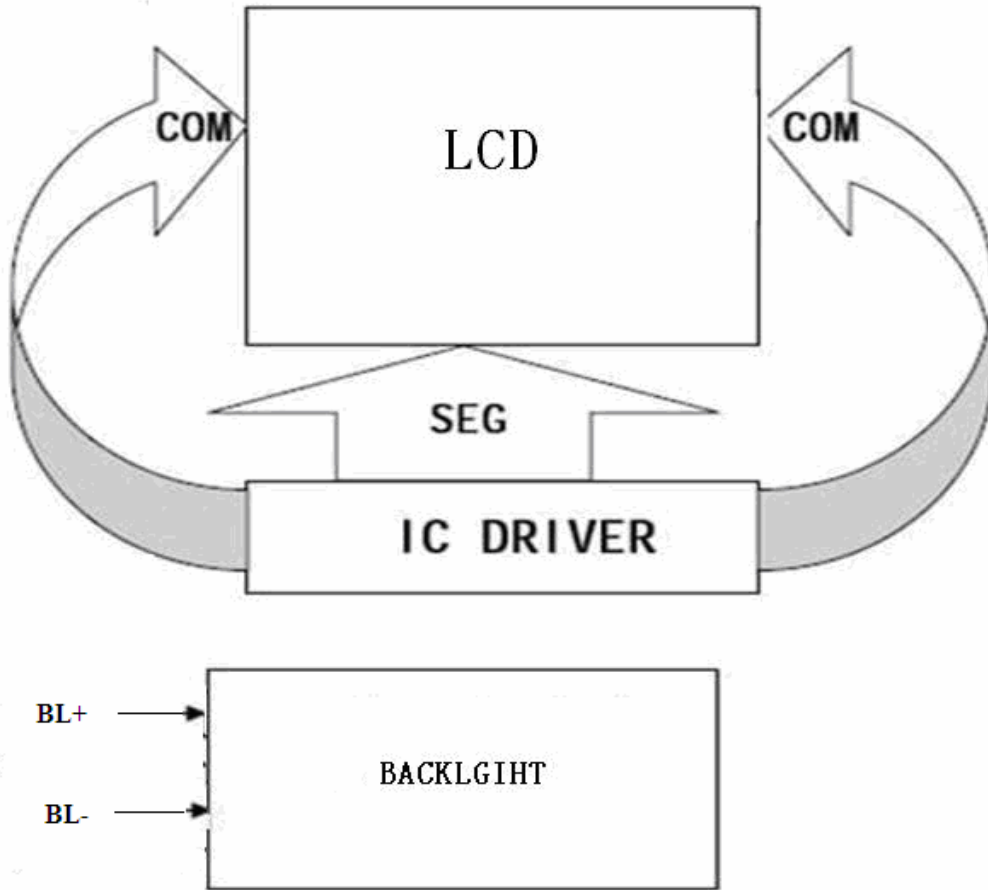
1. Backlight luminance: The measurement instrument is BM-7 luminance colorimeter. The aperture of colorimeter is $\varnothing 5\text{mm}$ and the distance between lens and backlight is 50cm. 5 points will be measured and the luminance of backlight is the average value of 5 points.



measure point on backlight

2. Backlight Uniformity = $(\text{The Luminance min} / \text{The Luminance max}) \times 100\%$

10.BLOCK DIAGRAM



11.AC Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
		VDD=5V				
f _{SYS1}	System Clock	On-chip RC oscillator	----	256	----	KHZ
f _{SYS2}	System Clock	Crystal oscillator	----	32.768	----	KHZ
f _{SYS3}	System Clock	External clock source	----	256	----	KHZ
f _{LCD}	LCD Clock	On-chip RC oscillator	----	FSYS1/1024	----	HZ
		Crystal oscillator	----	FSYS2/128	----	HZ
		External clock source	----	FSYS3/1024	----	HZ

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
		VDD=5V				
t _{COM}	LCD Common Period	n: Number of COM	----	n/f _{LCD}	----	s
f _{CLK1}	Serial Data Clock (WR pin)	Duty cycle 50%	----	----	300	KHZ
f _{CLK2}	Serial data clock (RD pin)	Duty cycle 50%	----	----	150	KHZ
f _{TONE}	Tone Frequency	On-chip RC oscillator	----	2.0 or 4.0	----	KHZ
t _{CS}	Serial interface reset pulse width	CS	----	250	----	ns
T _w	Pulse width serial data clock (figure 1)	Write mode	1.67	----	----	us
		Read mode	3.34			
t _{RI}	Rise/fall time serial data clock (figure 1)	-----	----	120	----	ns
t _{SU}	Setup time DATA to serial data clock (figure 2)	-----	----	120	----	ns
t _H	Hold time DATA to serial data clock (figure 3)	-----	----	120	----	ns
t _n	Low to CS high serial data clock (figure 3)	-----	----	100	----	ns
t _{rec}	CS high to serial data clock high (figure 3)	-----	----	100	----	ns
t _w	Serial interface reset high (figure 3)	-----	----	250	----	ns
t _{SU}	CS low to serial pulse width serial data clock high (figure 3)	-----	----	100	----	ns

12. RELIABILITY

No	Test Item	Content of Test	Test Condition	
Environment Test	1	High Temperature Storage	Endurance test of high temperature for a long time. 80℃ 96H	
	2	Low Temperature Storage	Endurance test of low temperature for a long time. -20±2℃ 96H	
	3	High Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element. 70℃ 96H	
	4	High Temperature /Humidity Storage	Endurance Test of high temperature and high humidity for a long time. 45±2℃ 90±2%RH 96H	
	5	Thermal shock	Endurance test of low and high temperature cycles.(air to air) -20±2℃ ←————→ 70±2℃ (60min) ←————→ (60min) 1 cycle	-10±2℃/70±2℃ 10 cycle
	6	vibration	Maximum vibration is 2.45m/s ² (0.25 G) during operation and 11.75 m/s ² (1.2 G) during storage. Tested 10-100KHz XYZ directions 1 hour each.	Ambient temperature Ta=25℃
7	shock	Maximum shock is 29.4 m/s ² (3 G) during operation and 490.0 m/s ² (50 G) during storage. Tested 10 milliseconds in XYZ directions 1 time each.	Ambient temperature Ta=25℃	

Note:

- 1) Condensation is not allowed during low temperature testing.
- 2) Driving condition for operation test:

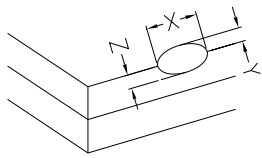
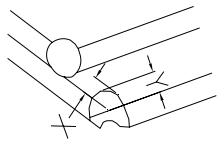
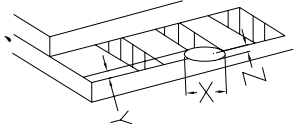
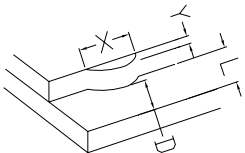
Power Supply Current for Backlight =15mA

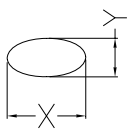
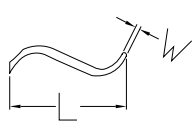
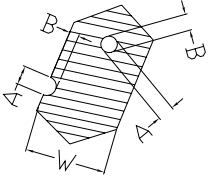
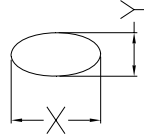
Failure Judgment Criterion

After the above mentioned test (For Environmental Test, after 2 hours in room temperature):

- 1) There should not be conspicuous failure of display quality and appearance.
- 2) Contrast ratio should be greater than or equal to 50% of the initial contrast ratio.
- 3) Abnormal function is a failure.

13. INSPECTION CRITERIA

NO	Item	Criteria	AQL																		
1	Electrical Testing	(1) non-display (2) segment missing (3) segment short	0.65																		
2	Dimension state	Dimension out of the specification	1.00																		
3	Glass crack	<p>Substrate check symbol Definition: X: Length direction Y: Short side direction Z: Thickness direction T: Glass thickness K:LCD length L: Single connector width</p> <p>(1) General crack</p>  <table border="1" data-bbox="813 996 1348 1160"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$1/8K \geq$</td> <td>Not over viewing area</td> <td>$T \geq$</td> </tr> </table> <p>(2) Corner</p>  <table border="1" data-bbox="813 1209 1348 1373"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$1/8K \geq$</td> <td>Not over viewing area</td> <td>No check</td> </tr> </table> <p>(3) Contact pad crack</p>  <table border="1" data-bbox="901 1489 1353 1653"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$1/8K \geq$</td> <td>$1/3L \geq$</td> <td>No check</td> </tr> </table> <p>1. Cracks on the contact area cannot exceed 1/2 of the glass thickness. 2. Y not to exceed 1/3 seal width</p> <p>(4) Substrate protuberance and internal crack</p>  <p style="text-align: right;">$D < 2/3L$,Reject</p> <p>(5) No progressive glass cracks allowed</p>	X	Y	Z	$1/8K \geq$	Not over viewing area	$T \geq$	X	Y	Z	$1/8K \geq$	Not over viewing area	No check	X	Y	Z	$1/8K \geq$	$1/3L \geq$	No check	2.50
X	Y	Z																			
$1/8K \geq$	Not over viewing area	$T \geq$																			
X	Y	Z																			
$1/8K \geq$	Not over viewing area	No check																			
X	Y	Z																			
$1/8K \geq$	$1/3L \geq$	No check																			

NO	Item	Criterion	AQL																								
4.	<p>Black spot , white spot (including polarizer) $\emptyset = (X+Y) / 2$</p> <p>unit:mm</p>	<p>(1) Round type</p>  <table border="1"> <thead> <tr> <th>Size</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>$\emptyset \leq 0.10$</td> <td>Accept</td> </tr> <tr> <td>$0.10 < \emptyset \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \emptyset \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \emptyset$</td> <td>0</td> </tr> </tbody> </table> <p>(2) Line type</p>  <table border="1"> <thead> <tr> <th>Length L</th> <th>Width W</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>accept</td> <td>$0.015 \geq W$</td> <td>No check</td> </tr> <tr> <td>$3.0 \geq L$</td> <td>$0.050 \geq W$</td> <td rowspan="2">2</td> </tr> <tr> <td>$2.5 \geq L$</td> <td>$0.080 \geq W$</td> </tr> <tr> <td></td> <td>$0.100 < W$</td> <td>As round type</td> </tr> </tbody> </table> <p>(3) No more than 2 spots and lines within 3 mm. Maximum combined total of round and line defects is 4.</p> <p>(4) Scratches criterion is same as that of Round type.</p>	Size	Acceptable QTY	$\emptyset \leq 0.10$	Accept	$0.10 < \emptyset \leq 0.20$	2	$0.20 < \emptyset \leq 0.25$	1	$0.25 < \emptyset$	0	Length L	Width W	Acceptable QTY	accept	$0.015 \geq W$	No check	$3.0 \geq L$	$0.050 \geq W$	2	$2.5 \geq L$	$0.080 \geq W$		$0.100 < W$	As round type	1.50
Size	Acceptable QTY																										
$\emptyset \leq 0.10$	Accept																										
$0.10 < \emptyset \leq 0.20$	2																										
$0.20 < \emptyset \leq 0.25$	1																										
$0.25 < \emptyset$	0																										
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accept	$0.015 \geq W$	No check																									
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$2.5 \geq L$	$0.080 \geq W$																										
	$0.100 < W$	As round type																									
5.	Pixel deformation	<p>Symbols: W: segment width \emptyset: average of diameter $= (A+B) / 2$</p> <p>(1) Pin hole and deformation</p>  <table border="1"> <thead> <tr> <th>Width</th> <th>Acceptable Defect</th> </tr> </thead> <tbody> <tr> <td>$W < 0.4$</td> <td>$\emptyset \leq 0.20$ and $\emptyset \leq 1/2W$</td> </tr> <tr> <td>$W \geq 0.4$</td> <td>$\emptyset \leq 0.25$ and $\emptyset \leq 1/3W$</td> </tr> </tbody> </table> <p>\emptyset under 0.10mm ,acceptable</p> <p>(2) Pixel size should be in the range of 95% to 100% of the normal dimension and the gap between pixels should be less than 150% of normal dimension.</p>	Width	Acceptable Defect	$W < 0.4$	$\emptyset \leq 0.20$ and $\emptyset \leq 1/2W$	$W \geq 0.4$	$\emptyset \leq 0.25$ and $\emptyset \leq 1/3W$	2.5																		
Width	Acceptable Defect																										
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$W \geq 0.4$	$\emptyset \leq 0.25$ and $\emptyset \leq 1/3W$																										
6.	<p>Polarizer bubble $\emptyset = (X+Y) / 2$</p>	 <table border="1"> <thead> <tr> <th>size \emptyset</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>$\emptyset \leq 0.20$</td> <td>No check</td> </tr> <tr> <td>$0.20 < \emptyset \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \emptyset \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \emptyset$</td> <td>0</td> </tr> <tr> <td>Total QTY</td> <td>3</td> </tr> </tbody> </table>	size \emptyset	Acceptable QTY	$\emptyset \leq 0.20$	No check	$0.20 < \emptyset \leq 0.50$	3	$0.50 < \emptyset \leq 1.00$	2	$1.00 < \emptyset$	0	Total QTY	3	1.5												
size \emptyset	Acceptable QTY																										
$\emptyset \leq 0.20$	No check																										
$0.20 < \emptyset \leq 0.50$	3																										
$0.50 < \emptyset \leq 1.00$	2																										
$1.00 < \emptyset$	0																										
Total QTY	3																										
7.	Contrast	Under normal power supply, uneven contrast is unacceptable.	2.5																								
8.	Rainbow	Obvious uneven color in LCD viewing area is not allowed.	2.5																								


14. PRECAUTION FOR USE OF LCD MODULE

1. Handling Precautions

- 1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 2) If the display panel is damaged, the liquid crystal substance leaks out ,do not ingest. If the substance contacts skin or clothes, promptly wash off using soap and water.
- 3) Do not apply excessive force to the display surface or adjoining areas since this may affect the LCD color
- 4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcoholSolvents other than those mentioned above may damage the polarizer.
Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 6) Do not attempt to disassemble or process the LCD module.

2. Assembling Precautions

- 1) When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also, use an adequately stiff outer case.
- 2) Please handle the LCD module by its side.
- 3) NC terminal should be open. Do not connect anything.
- 4) If the logic circuit power is OFF, do not apply the input signals.
- 5) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- 6) Be careful handling the glass panel because it has a very sharp edge.

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3. Storage Precautions

- 1) When storing the LCD module, avoid exposure to direct sunlight, to the light of fluorescent lamps, to high temperature or to high humidity. Whenever possible, LCD modules should be stored in the same packaging they were shipped in.
- 2) Exercise care to minimize corrosion of the electrodes. Corrosion of the electrodes is accelerated by water droplets or by current flow in a high-humidity environment.

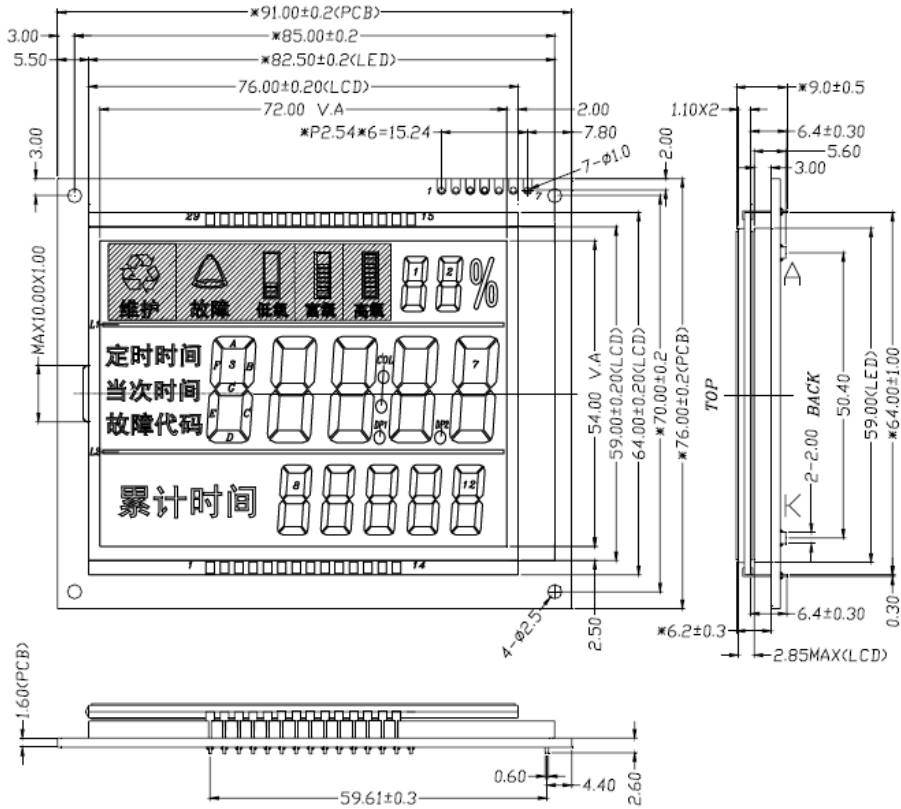
4. Design Precautions

- 1) The absolute maximum ratings represent the rated value beyond which LCD module can not exceed. When the LCD modules are used in excess of this rated value, their operation characteristics may be adversely affected.
- 2) To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy V_{IL} , V_{IH} specification values including taking the precaution of using signal cables that are short.
- 3) The LCD exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also keep in mind that the LCD driving voltage levels necessary for clear displays will vary according to temperature.
- 4) We recommended that power supply lines (VDD) have over-current protection line. (Fuse etc. Recommend Value:0.5A)
- 5) Sufficiently reduce electrical noise from peripheral devices.
- 6) To cope with EMI, take measures basically on outputting side.
- 7) Assemble LCD module tightly with the application case or PCB.

5. Other considerations

- 1) Liquid crystal solidifies under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
- 2) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- 3) To minimize the performance degradation of the LCD module's resulting from destruction caused by static electricity, etc., exercise care to avoid touching the LCD's electrical connections.
- 4) LCD voltage adjustment may be necessary to obtain the best contrast on each LCD.
- 5) Precaution for disposal of LCD module. When disposal of LCD module, ask specialization company of industrial waste which is permitted by the government. When burn up LCD module, obey the law of environmental hygienic.

15.LCM DRAWING



1	VSS
2	VDD
3	DATA
4	CS
5	WR
6	A
7	K

1	Operating Voltage:	5.0V
2	Drive method:	1/4Duty,1/3Bias
3	Viewing Direction:	12:00
4	Operating Temp:	0°C~50°C
5	Storage Temp:	-20°C~70°C
6	Display type:	TN,Negative,T/H
7	Unspecified tolerance:	±0.2
8	LCD controller/driver:	HT1621
9	Backlight:	LED/WHITE
10	Customer No.:	
11	Dimensions with mark "*" are important	
12	RoHS compliant	

CUSTOMER NO:



TOLERANCES:±0.2
ANGLES:±0.1°
APPROVED

UNIT:MM

MODEL NO: CNKD0503-14001A

CHECKED DESIGNED REV:00