



深圳市希恩凯电子有限公司
SHENZHEN CNK ELECTRONIC CO.,LTD.

Product Specification For LCD Module

Model NO.: CNKD0601-13001A2

CUSTOMERITEM NO.:

REVISION : 02

☐ APPROVAL FOR SPECIFICATIONS ONLY

☒ APPROVAL FOR SPECIFICATIONS AND SAMPLE

CUSTOMER :

APPROVED BY :

CNK LCM R&D CENTER

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DIRECTOR	MANAGER	Engineer

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Technical drawing of a mechanical part showing three views: front, top, and side. The front view shows a rectangular body with a total width of 65 mm, a height of 57.5 mm, and a base thickness of 8.5 mm. The top view shows a rectangular shape with dimensions 21.2 mm by 25.4 mm. The side view shows a profile with a total height of 56.5 mm, a base thickness of 4.0 mm, and a fillet radius of $R3 \pm 0.06$. Dimensions are given in millimeters.

REV: V01 DESCRIPTION BY DATE

71,3±0.2PCB
68,3
58.0FR
57,3
53,5V,A
6
5,3
1,3
4
27.0FR
34
42.0±0.2
7,5
11,5
15
21
15
4-φ4

14 两个座子向右平移7mm
1 13
7
10,6
1,6
5,6
13,1

特斯卡的针座
FWF25001-S04S22W1B
Wafer Pitch:2.50mm Straight Single row 4Pin DIP White
FWF25001-S09S22W1B
Wafer Pitch:2.50mm Straight Single row 9Pin DIP White

SPECIFICATIONS

DISPLAY MODE : TN,POSITIVE MODE
DRIVE CONDITION : 1/4 DUTY, 1/3 BIAS,VOP 4.5 V VDD 5.0V
VIEWING DIRECTION : 12 O'CLOCK
OPERATING TEMP : 0°C TO +60°C
STORAGE TEMP : -20°C TO +70°C
FRONT POLARIZER : TRANSMISSIVE, ADHESIVE
BACK POLARIZER : TRANSMISSIVE, ADHESIVE
CONNECTION TYPE : ZEBRA

NO.	SYMBOL
1	VDD
2	VSS
3	SW
4	BAT-V
5	SW
6	BAT-V
7	NC
8	VSS
9	DATA
10	WR
11	CS
12	VDD
13	LED

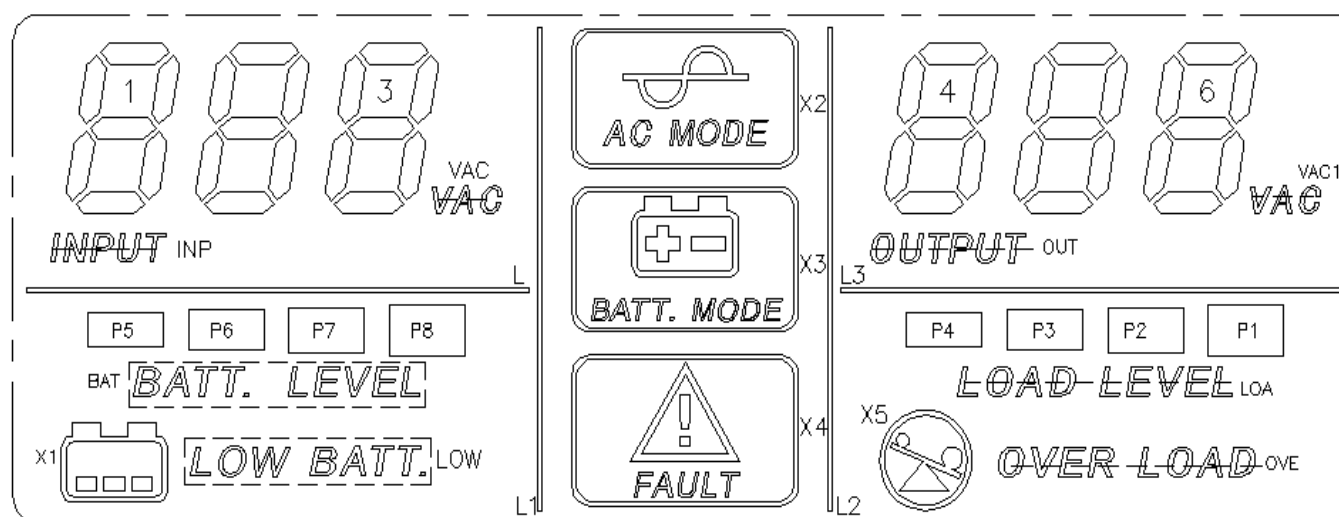
SHEET: 1 of 1
APPROVALS DATE
DWN LJH 2015-04-24
CHK
APP

深圳市希恩凯电子有限公司
SHENZHEN CNK ELECTRONIC CO.,LTD.

MODEL NUMBER :
CNKD0601-13001A2-LCH

SCALE:
GENERAL TOL:± 0.2
DO NOT SCALE THIS DRAWING.

UNITS:
MM



PAD NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
COMO	COMO					P5	X2	X5	P1	6B	6A	5B	5A	4B	4A	3B	3A	2B	2A	1B	1A
COM1		COM1			X1	P6	X3	OVE	P2	6G	6F	5G	5F	4G	4F	3G	3F	2G	2F	1G	1F
COM2			COM2		LOW	P7	X4	LOA	P3	6C	6E	5C	5E	4C	4E	3C	3E	2C	2E	1C	1E
COM3				COM3	BAT	P8	L1	L2	P4	VAC1	6D	L3	5D	OUT	4D	VAC	3D	L	2D	INP	1D

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4. GENERAL SPECIFICATION

ITEM	CONTENTS
Module Size	71.3(W) ×42 (H) ×17.6 (T) mm
Display View Area	53.5(W) × 19(H) mm
LCD Type	TN/ POSITIVE/TRANSMISSIVE
View Angle	12 O'clock
Driver IC	HT1621
Backlight Driver type	Power/BLUE
DC to DC circuit	Build-In
Weight	TBD

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
LCD Module Driving Voltage	VDD	Ta=25℃	4.8	5.0	5.2	Volt
Operating Temperature	Top	--	0℃	-	+60℃	℃
Storage Temperature	Tst	--	-20℃	-	+70℃	℃
Humidity	%		--	--	90%	

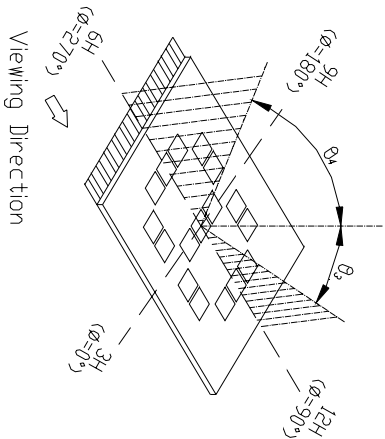
Note: See section 12 for backlight uniformity measurement

6. LCD OPTICAL CHARACTERISTICS

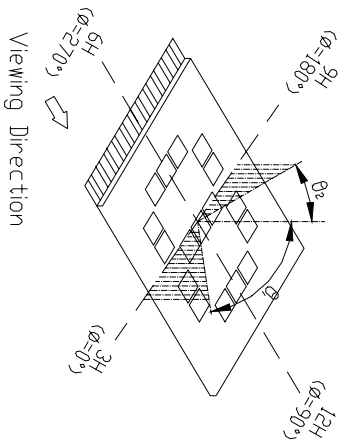
Item	Symbol	Temp(℃)	Rating			Unit	Reference
			Min	Typ	Max		
Recommended Driving Voltage	Vop	50				V	
		25	4.3	4.5	4.8		
		0					
Response Time	Rise Time	Tr	25		180	230	ms Note4
	Fall Time	Tf	25		180	230	
Frame Frequency	FR	25	70	75	80	Hz	
Viewing angle Cr≥2	∅=0°	θ ₁	25			30	Deg Note1 Note2
	∅=180°	θ ₂				30	
	∅=90°	θ ₃				30	
	∅=270°	θ ₄		15			
Viewing Direction		12 O'clock					
Contrast Ratio	Cr	25	6	8			Note3

7. OPTICAL CHARACTERISTICS DEFINITION

Note 1. Definition of angle $\theta 1 \& \theta 2$

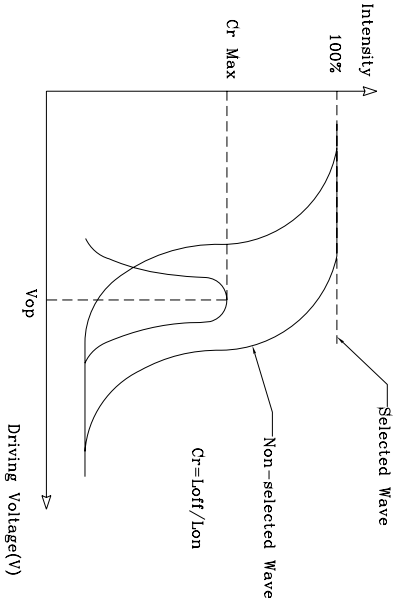


Note 2. Definition of angle $\theta 3 \& \theta 4$

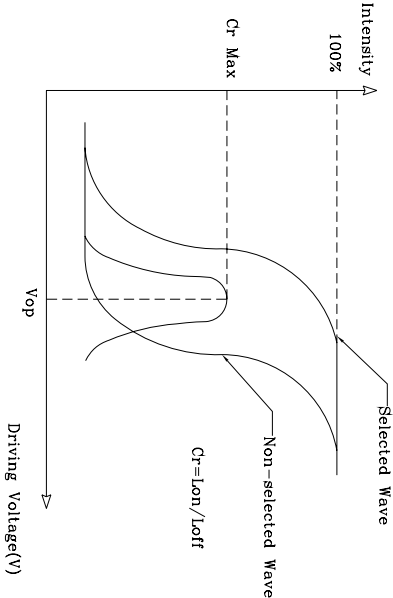


LCD Panel

Note 3. Definition of contrast ratio (Cr2)

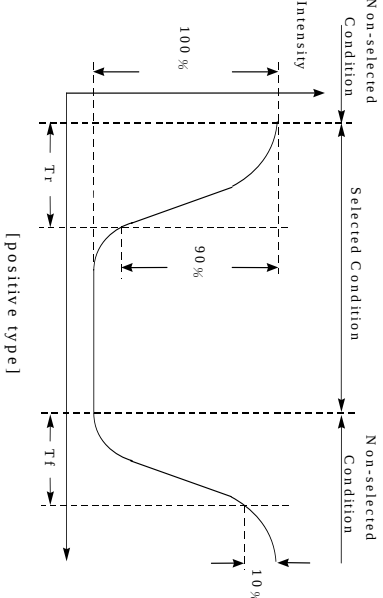


[Positive type]

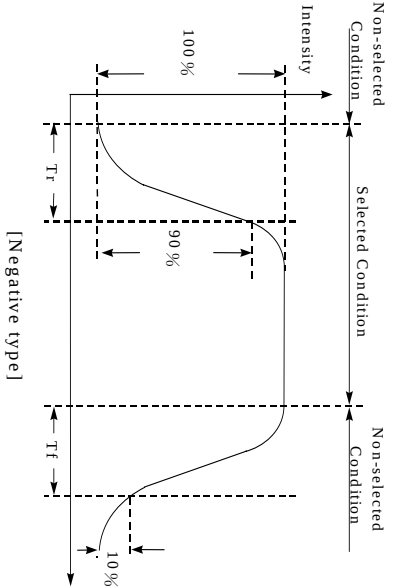


[Negative type]

Note 4. Definition of response time



[positive type]



[Negative type]

8. INTERFACE PIN ASSIGNMENT

1	VDD	Supply voltage for logic circuit +5v
2	VSS	Power Ground.
3	SW	SW
4	BAT-V	BAT-V
5	SW	SW
6	BAT-V	BAT-V
7	NC	NC
8	VSS	Power Ground.
9	DATA	Data bus line
10	WR	Read/write selection(H:Read,L:Write)
11	CS	Whe CS="L" then the chip select becomes active
12	VDD	Supply voltage for logic circuit +5v
13	LED	LED

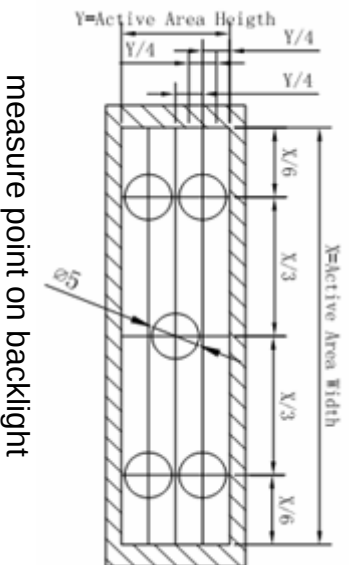
9. BACKLIGHT

BACKLIGHT ELECTRICAL-OPTICAL CHARACTERISTICS (Unless specified, Ambient temperature Ta=25°C)

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Reference
Supply Current	I	--	12	---	mA	3V	
BLUE LED	V	--	3.0	---	V	12mA	--
Backlight Luminous Intensity	Lv	--	--	--	Cd/m ²	12mA	Note1
Uniformity	--	50	--	--	%	12mA	Note1 Note2

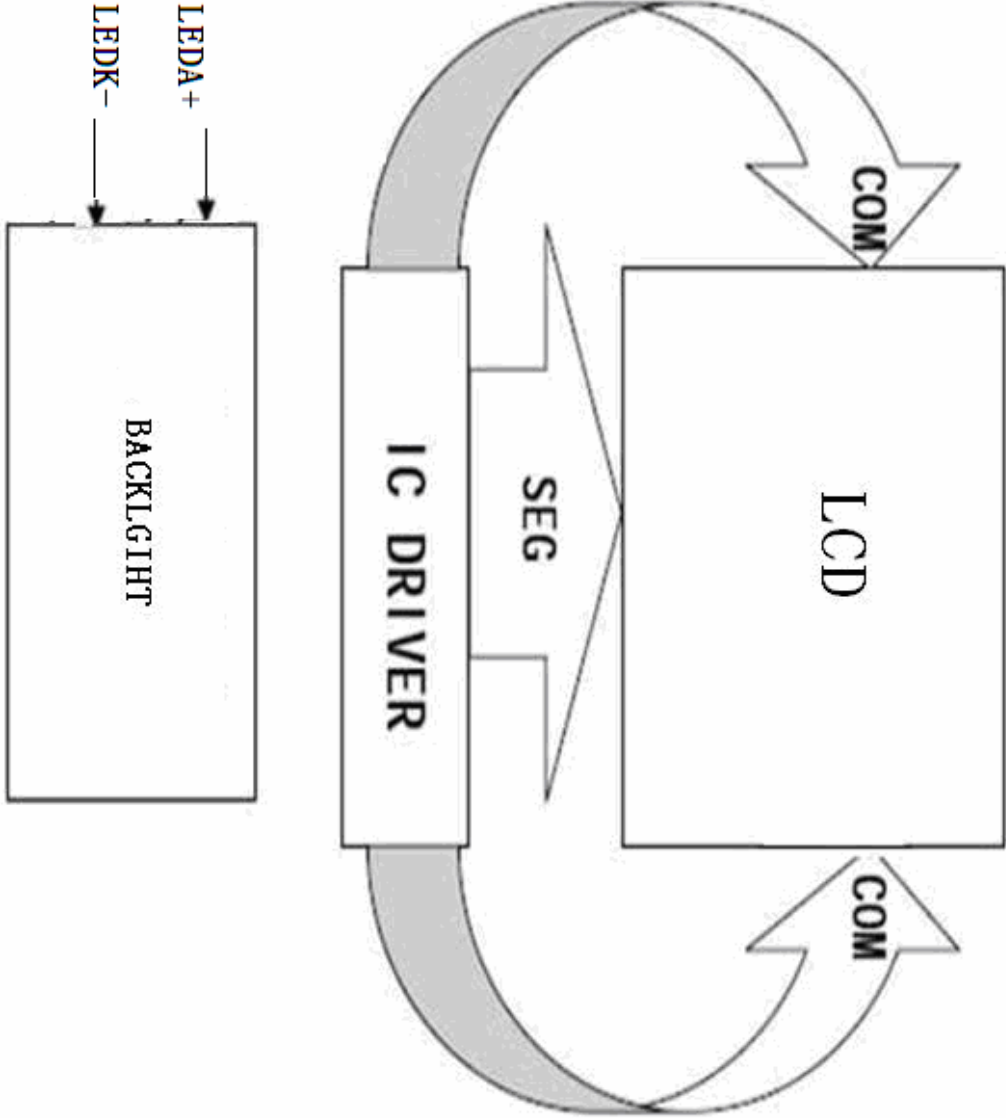
NOTE:

- Backlight luminance: The measurement instrument is BM-7 luminance colorimeter. The aperture of colorimeter is ø5mm 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.



- Backlight Uniformity = (The Luminance min / The Luminance max) x 100%

10.BLOCK DIAGRAM



11.AC Characteristics

A.C. Characteristics

Symbol	Parameter	Test Conditions			Unit
		VDD	Conditions	Min. Typ. Max.	
f_{sys}	System Clock	3V 5V	On-chip RC oscillator	.. 256 256 ..	KHz KHz
f_{LCD}	LCD Clock	..	On-chip RC oscillator	.. $f_{sys}/1024$..	Hz
t_{COM}	LCD Common Period	..	n : Number of COM	.. n/f_{LCD} ..	s
t_{CLK1}	Serial Data Clock (/W/R pin)	3V 5V	Duty cycle 50%		150 KHz 300 KHz
t_{CLK2}	Serial Data Clock (/RD pin)	3V 5V	Duty cycle 50%		75 KHz 150 KHz
f_{TONE}	Tone Frequency	..	On-chip RC oscillator	.. 2.0/4.0 ..	KHz
t_{CS}	Serial Interface Reset Pulse Width (Figure 3)	..	/CS	.. 250 ..	ns
t_{CLK}	/W/R, /RD Input Pulse Width (Figure 1)	3V 5V	Write mode Read mode Write mode Read mode	3.34 6.67 1.67 3.34	 μs μs
t_{a}, t_{f}	Rise/Fall Time Serial Data Clock Width (Figure 1)	3V 5V	..	.. 120 ..	ns
t_{SU}	Setup Time for DATA to /W/R, /RD Clock Width (Figure 2)	3V 5V	..	.. 120 ..	ns
t_{h}	Hold Time for DATA to /W/R, /RD Clock Width (Figure 2)	3V 5V	..	.. 120 ..	ns
t_{SU1}	Setup Time for /CS to /W/R, /RD Clock Width (Figure 3)	3V 5V	..	.. 100 ..	ns
t_{h1}	Hold Time for /CS to /W/R, /RD Clock Width (Figure 3)	3V	..	.. 100 ..	ns

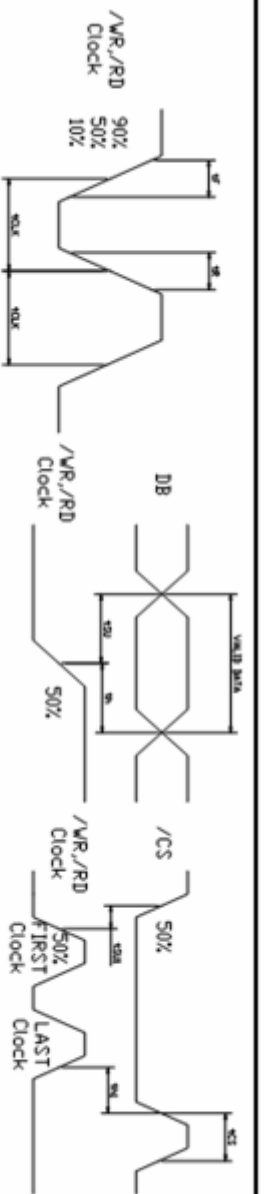


Figure 1

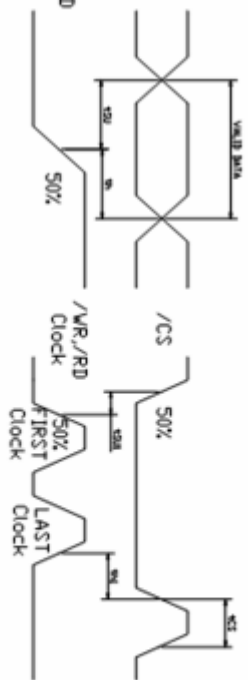


Figure 2

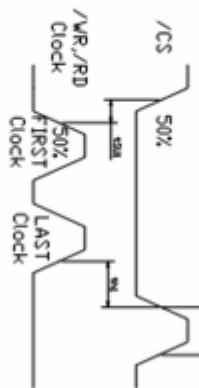
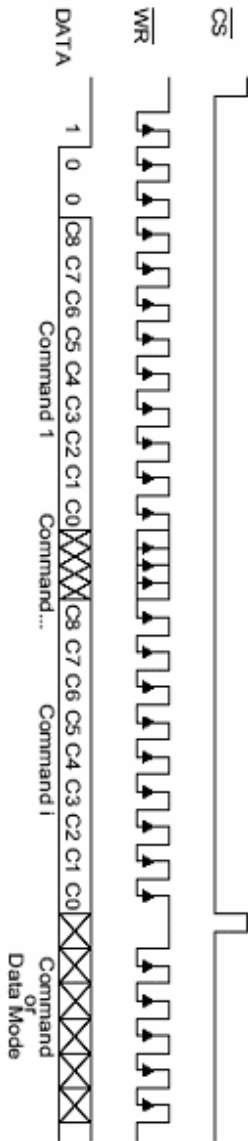


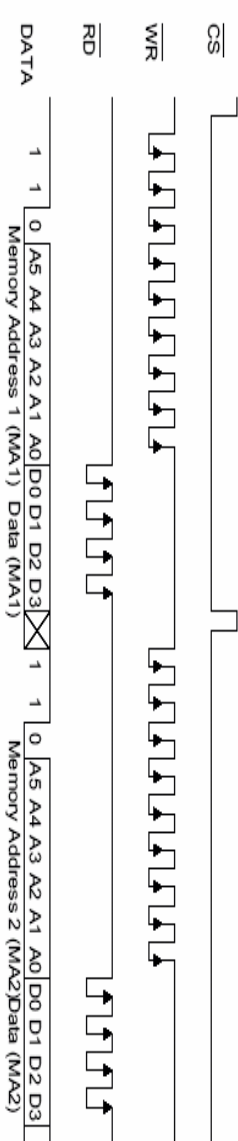
Figure 3

Command mode (command code : 1 0 0)

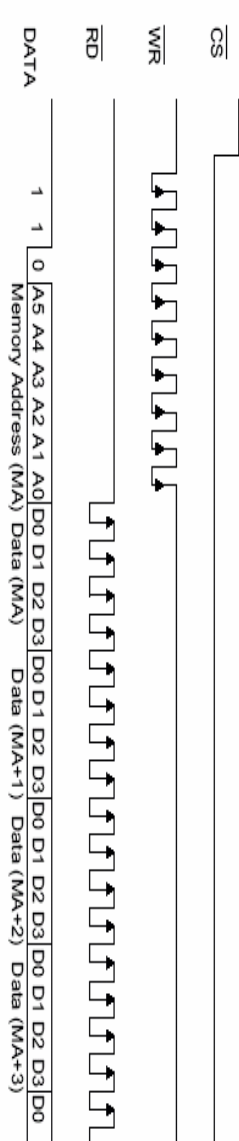


Timing Diagrams

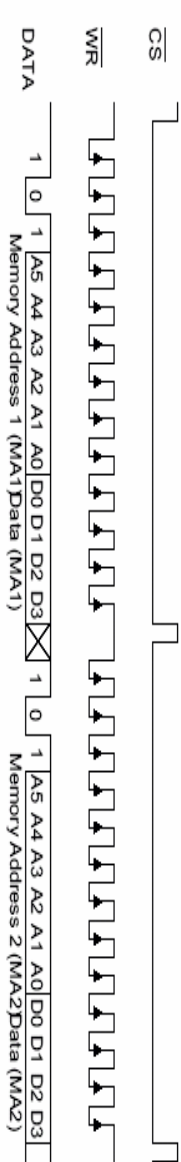
READ mode (command code : 1 1 0)



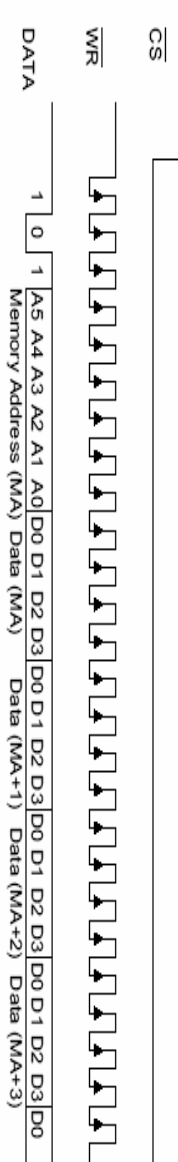
READ mode (successive address reading)



WRITE mode (command code : 1 0 1)



WRITE mode (successive address writing)



● Command Index

Name	ID	Command Code	D/C	Function	Def.
READ	1 1 0	A5A4A3A2A1A0D0D1D2D3	D	Read data from the RAM	
WRITE	1 0 1	A5A4A3A2A1A0D0D1D2D3	D	Write data to the RAM	
READ-MODIFY-WRITE	1 0 1	A5A4A3A2A1A0D0D1D2D3	D	READ and WRITE to the RAM	
SYS DIS	1 0 0	0000-0000-X	C	Turn off both system oscillator and LCD bias generator	Yes
SYS EN	1 0 0	0000-0001-X	C	Turn on system oscillator	
LCD OFF	1 0 0	0000-0010-X	C	Turn off LCD bias generator	Yes
LCD ON	1 0 0	0000-0011-X	C	Turn on LCD bias generator	
TIMER DIS	1 0 0	0000-0100-X	C	Disable time base output	
WDT DIS	1 0 0	0000-0101-X	C	Disable WDT time-out flag output	
TIMER EN	1 0 0	0000-0110-X	C	Enable time base output	
WDT EN	1 0 0	0000-0111-X	C	Enable WDT time-out flag output	
TONE OFF	1 0 0	0000-1000-X	C	Turn off tone outputs	Yes
TONE ON	1 0 0	0000-1001-X	C	Turn on tone outputs	
CLR TIMER	1 0 0	0000-1101-X	C	Clear the contents of time base generator	
CLR WDT	1 0 0	0000-1111-X	C	Clear the contents of WDT stage	
XTAL 32K	1 0 0	0001-01XX-X	C	System clock source, crystal oscillator	
RC 256K	1 0 0	0001-10XX-X	C	System clock source, on chip RC oscillator	Yes
EXT 256K	1 0 0	0001-11XX-X	C	System clock source, external clock source	
BIAS 1/2	1 0 0	0010-abX0-X	C	LCD 1/2 bias option ab=00: 2 commons option ab=01: 3 commons option ab=10: 4 commons option	
BIAS 1/3	1 0 0	0010-abX1-X	C	LCD 1/3 bias option ab=00: 2 commons option ab=01: 3 commons option ab=10: 4 commons option	
TONE 4K	1 0 0	010X-XXXX-X	C	Tone frequency, 4KHz	
TONE 2K	1 0 0	011X-XXXX-X	C	Tone frequency, 2KHz	
IRQ DIS	1 0 0	100X-0XXX-X	C	Disable IRQ output	Yes
IRQ EN	1 0 0	100X-1XXX-X	C	Enable IRQ output	
F1	1 0 0	101X-X000-X	C	Time base/WDT clock output:1Hz The WDT time-out flag after: 4s	
F2	1 0 0	101X-X001-X	C	Time base/WDT clock output:2Hz The WDT time-out flag after: 2s	
F4	1 0 0	101X-X010-X	C	Time base/WDT clock output:4Hz The WDT time-out flag after: 1s	
F8	1 0 0	101X-X011-X	C	Time base/WDT clock Output: 8Hz The WDT time-out flag after: 1/2 s	
F16	1 0 0	101X-X100-X	C	Time base/WDT clock output: 16Hz The WDT time-out flag after: 1/4 s	
F32	1 0 0	101X-X101-X	C	Time base/WDT clock output: 32Hz The WDT time-out flag after: 1/8 s	
F64	1 0 0	101X-X110-X	C	Time base/WDT clock output:64Hz The WDT time-out flag after: 1/16 s	
F128	1 0 0	101X-X111-X	C	Time base/WDT clock output:128Hz The WDT time-out flag after: 1/32 s	Yes
TEST	1 0 0	1110-0000-X	C	Test mode, user don't use.	
NORMAL	1 0 0	1110-0011-X	C	Normal mode	Yes

12. RELIABILITY

No	Test Item	Content of Test	Test Condition
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/s2 (0.25 G) during operation and 11.75 m/s2 (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/s2 (3 G) during operation and 490.0 m/s2 (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(ImA)=15mA

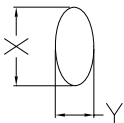
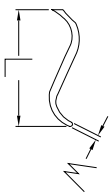
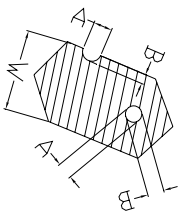
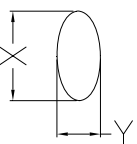
Failure Judgment Criterion

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	Substrate check symbol Definition: X: Length direction Y: Short side direction Z: Thickness direction T: Glass thickness K:LCD length L: Single connector width								
		(1) General crack	<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>$1/8K \geq$</td><td>Not over viewing area</td><td>$T \geq$</td></tr></table>	X	Y	Z	$1/8K \geq$	Not over viewing area	$T \geq$	
		X	Y	Z						
		$1/8K \geq$	Not over viewing area	$T \geq$						
		(2) Corner	<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>$1/8K \geq$</td><td>Not over viewing area</td><td>No check</td></tr></table>	X	Y	Z	$1/8K \geq$	Not over viewing area	No check	
X	Y	Z								
$1/8K \geq$	Not over viewing area	No check								
(3) Contact pad crack	<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>$1/8K \geq$</td><td>$1/3L \geq$</td><td>No check</td></tr></table> 1. Cracks on the contact area cannot exceed 1/2 of the glass thickness. 2. Y not to exceed 1/3 seal width	X	Y	Z	$1/8K \geq$	$1/3L \geq$	No check			
X	Y	Z								
$1/8K \geq$	$1/3L \geq$	No check								
(4) Substrate protuberance and internal crack	$D < 2/3L$, Reject									
	(5) No progressive glass cracks allowed									

NO	Item	Criterion	AQL												
4.	Black spot , white spot (including polarizer) Ø=(X+Y) /2 unit:mm	(1) Round type  <table><tr><th>Size</th><th>Acceptable QTY</th></tr><tr><td>Ø≤0.10</td><td>Accept</td></tr><tr><td>0.10<Ø≤0.20</td><td>2</td></tr><tr><td>0.20<Ø≤0.25</td><td>1</td></tr><tr><td>0.25<Ø</td><td>0</td></tr></table>	Size	Acceptable QTY	Ø≤0.10	Accept	0.10<Ø≤0.20	2	0.20<Ø≤0.25	1	0.25<Ø	0	1.50		
		Size	Acceptable QTY												
		Ø≤0.10	Accept												
		0.10<Ø≤0.20	2												
0.20<Ø≤0.25	1														
0.25<Ø	0														
(2) Line type  <table><tr><th>Length L</th><th>Width W</th><th>Acceptable QTY</th></tr><tr><td>accept</td><td>0.015≥W</td><td>No check</td></tr><tr><td>3.0≥L</td><td>0.050≥W</td><td rowspan="2">2</td></tr><tr><td>2.5≥L</td><td>0.080≥W</td></tr><tr><td></td><td>0.100<W</td><td>As round type</td></tr></table>	Length L	Width W	Acceptable QTY	accept	0.015≥W	No check	3.0≥L	0.050≥W	2	2.5≥L	0.080≥W		0.100<W	As round type	
Length L	Width W	Acceptable QTY													
accept	0.015≥W	No check													
3.0≥L	0.050≥W	2													
2.5≥L	0.080≥W														
	0.100<W	As round type													
(3) No more than 2 spots and lines within 3 mm. Maximum combined total of round and line defects is 4.															
(4) Scratches criterion is same as that of Round type.															
5.	Pixel deformation	Symbols: W: segment width Ø: average of diameter =(A+B) / 2 (1)Pin hole and deformation  <table><tr><th>Width</th><th>Acceptable</th><th>Defect</th></tr><tr><td>W<0.4</td><td>Ø≤0.20 and Ø≤1/2W</td><td></td></tr><tr><td>W≥0.4</td><td>Ø≤0.25 and Ø≤1/3W</td><td></td></tr></table> Ø under 0.10mm ,acceptable	Width	Acceptable	Defect	W<0.4	Ø≤0.20 and Ø≤1/2W		W≥0.4	Ø≤0.25 and Ø≤1/3W		2.5			
		Width	Acceptable	Defect											
		W<0.4	Ø≤0.20 and Ø≤1/2W												
W≥0.4	Ø≤0.25 and Ø≤1/3W														
(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.															
6.	Polarizer bubble Ø=(X+Y)/2	 <table><tr><th>size Ø</th><th>Acceptable QTY</th></tr><tr><td>Ø≤0.20</td><td>No check</td></tr><tr><td>0.20<Ø≤0.50</td><td>3</td></tr><tr><td>0.50<Ø≤1.00</td><td>2</td></tr><tr><td>1.00<Ø</td><td>0</td></tr><tr><td>Total QTY</td><td>3</td></tr></table>	size Ø	Acceptable QTY	Ø≤0.20	No check	0.20<Ø≤0.50	3	0.50<Ø≤1.00	2	1.00<Ø	0	Total QTY	3	1.5
size Ø	Acceptable QTY														
Ø≤0.20	No check														
0.20<Ø≤0.50	3														
0.50<Ø≤1.00	2														
1.00<Ø	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												

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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 alcohol
 Solvents 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.