

欣瑞达液晶显示技术

X.R.D LCD TECHNOLOGY CO., LTD

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
MODEL	XRDZ-B00452ABDTKWNNN
CUSTOMER APPROVED	

APPROVED BY	CHECKED BY	ORGANIZED BY

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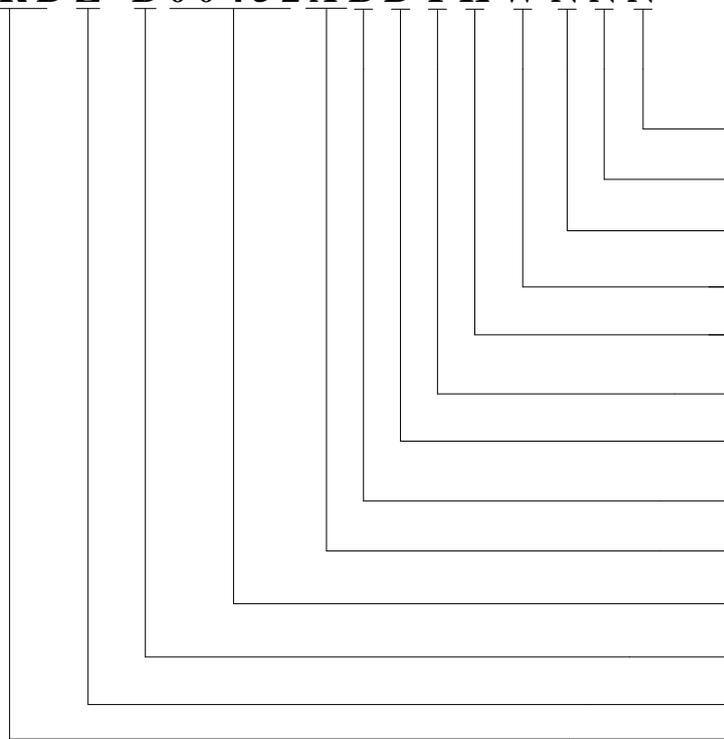
FAX: 0755—29519832

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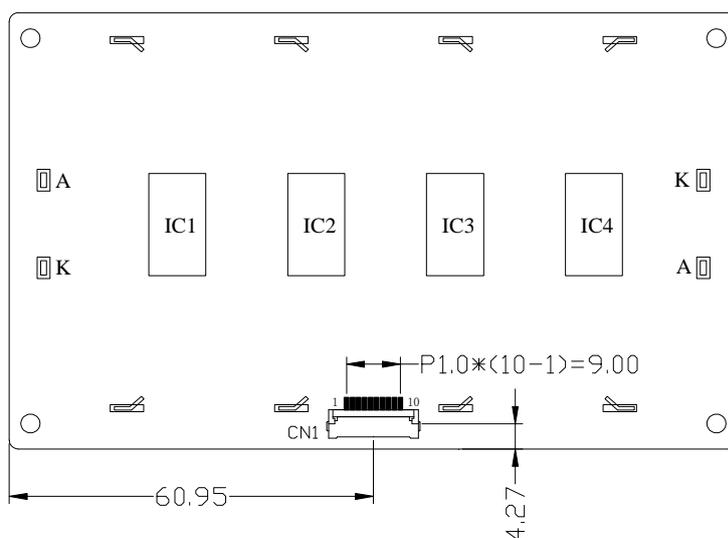
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■ MODULE CLASSIFICATION INFORMATION

X R D Z - B 0 0 4 5 2 A B D T K W N N N



SPECIAL NEEDS
N:NO SPECIAL NEEDS
CHARACTERS OR FONT MODE
N:WITHOUT
TEMP.GRADE
N: 0° TO +50°
BACKLIGHT MODE & COLOR
W:WHITE
POLARIZER COLOR
K:BLACK
POLARIZER MODE
T:Transmissive
VIEWING ANGLE
D: 6 O' CLOCK
LCD TYPE
B:BTN/VA
MODEL SERIES
A
DISPLAY FORMAT
00452
IC PACKING
B:COB
LCM TYPE
Z:OTHERS
STANDARD MODULE



PIN CONNECTION:

CN1	SYMBOL	1	2	3	4	5	6	7	8	9	10
	PIN NO.	5V	GND	LCD-CS1	LCD-CS2	LCD-CS3	LCD-CS4	LCD-WR	LCD-DATA	LEDA	LEDK

NOTES:

ALL UNMARKED TOLERANCES: ± 0.2 mm;

■ INTERFACE PIN CONNECTIONS

CN1:

NO	SYMBOL	LEVEL	FUNCTION
1	VDD	+5.0V	LCD Positive power supply
2	GND	0V	Ground
3	LCD-CS1	L	U1 Chip selection input with pull-high resistor
4	LCD-CS2	L	U2 Chip selection input with pull-high resistor
5	LCD-CS3	L	U3 Chip selection input with pull-high resistor
6	LCD-CS4	L	U4 Chip selection input with pull-high resistor
7	LCD-WR	H/L	WRITE clock input with pull-high resistor Data on the DATA line are latched into the HT1621 on the rising edge of the CLOCK signal.
8	LCD-DATA	H/L	Serial data input/output.
9	LEDA	+5.0V	Backlight Positive power supply
10	LC DK	H	Backlight Control

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply voltage for logic	VCC	-0.3	5.5	V
Input voltage	VI	-0.3	VDD+0.3	V
Operating temperature	TOP	0	+50	°C
Storage temperature	TST	-10	+60	°C

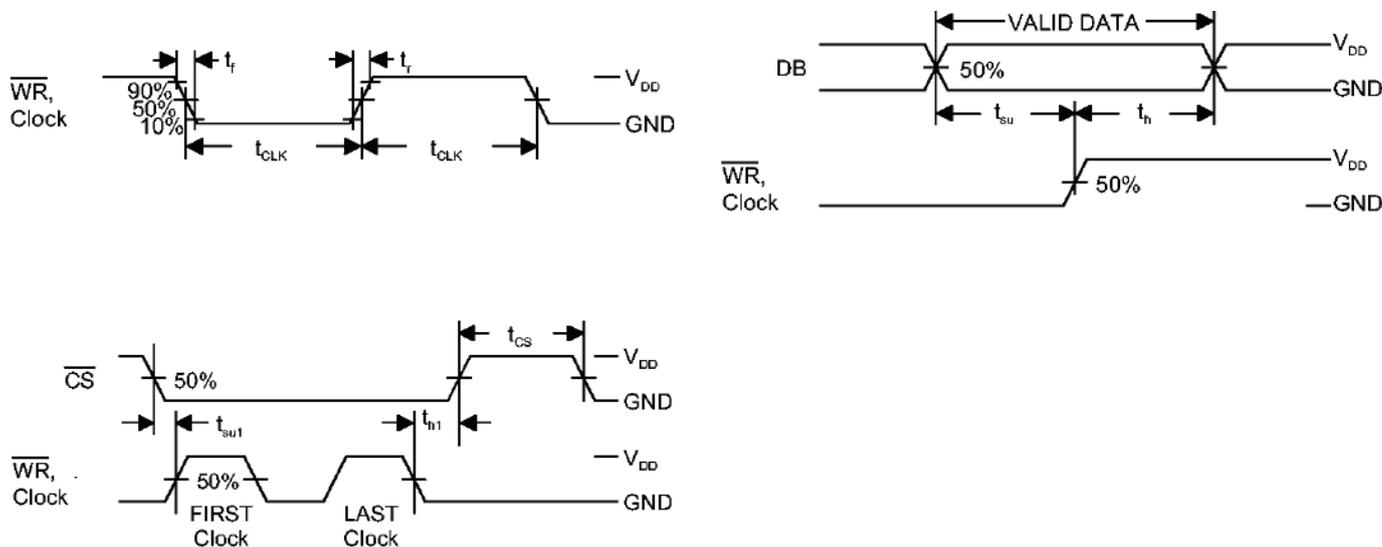
■ ELECTRICAL CHARACTERISTICS

▼ DC Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	VDD	---	4.5	5.0	5.2	V
Supply current for logic	IDD	---	---	300	600	μA
Input voltage 'H' level	VIH	---	4.0		5.0	V
Input voltage 'L' level	VIL	---	0	---	1.0	V

▼ AC Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
System Clock	fsys	On-chip RC oscillator	---	256	---	KHz
LCD Clock	fLCD	On-chip RC oscillator	---	256/768	---	KHz
LCD Common Period	tcom		---	4/ fLCD		s
Serial interface reset	tcs	VDD=5V, /CS	---	250	---	ns
/WR Input pulse wide	tclk	VDD=5V, Write mode	1.67	---	---	us
Rise/Fall time serial DATA clock width	tr,tf	VDD=5V	---	120	---	ns
Setup time for DATA to /WR clock width	tsu	VDD=5V	---	120	---	ns
Hold time for DATA to /WR clock width	th	VDD=5V	---	120	---	ns
Setup time for /CS to /WR clock width	tsu1	VDD=5V	---	100	---	ns
Hold time for /CS to /WR clock width	th1	VDD=5V	---	100	---	ns



■ BACKLIGHT

- ▼ Backlight Type: LED
- ▼ Backlight color: White
- ▼ Power Supply For Backlight (see SCHEMATIC DIAGRAM)

▼ Absolute Maximum Rating

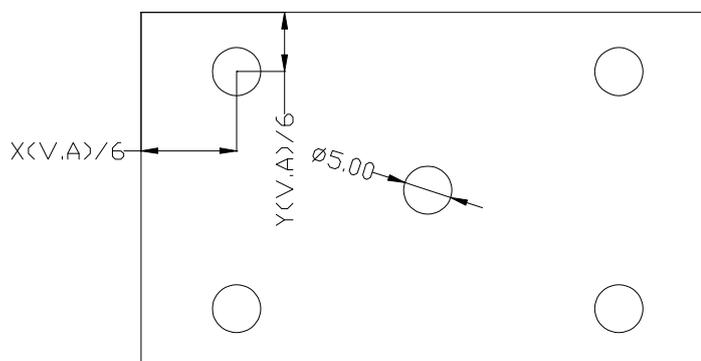
PARAMETER	SYMBOL	CONDITION	MAX	UNIT
Absolute maximum forward current	Ifm		240	mA
Peak forward current	Ifp	1 MSEC plus 10% Duty Cycle	480	mA
Reverse voltage	VR		7.0	V

Note: For operation above 25°C, Then Ifm Ifp must be decreased, the Current decreased is -1.08mA/°C for DC drive and -2.58mA/°C Pulse drive, the power dissipation is -4.5mW/°C. The product working current must not more than the 70% of the Ifm or Ifp according to the working temperature.

▼ Electrical-Optical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Forward voltage	Vf		4.8	5.0	5.2	V
Forward current	If		----	100	150	mA
Reverse current	Ir	VR=7.0V	----	----	10	μA
Chromaticity		If(forward current) = 100mA	x=0.28 y=0.27	x=0.30 y=0.29	x=0.32 y=0.31	
Luminance	Lv		----	----	----	cd/m ²

Note: The Master Screen's luminance is the average value of 5 points, and The Lvmin./Lvmax. is not less than 75%. The measurement instrument is BM-7 luminance Colorimeter. The aperture is Φ5 mm.



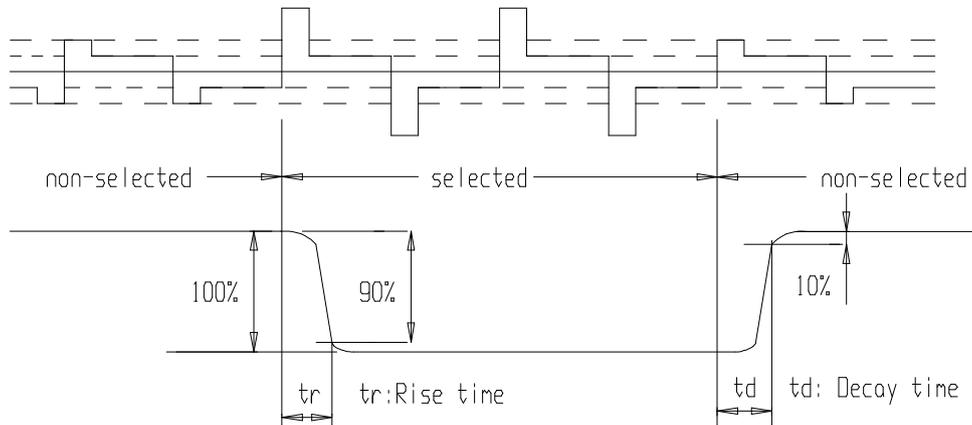
■ OPTICAL CHARACTERISTICS

Test instrument is LCD-5000,made in Japan

Item	Symbol	Condition	Min	Typ	Max	Unit	Remarks	Note
Operating voltage	Vop	25°C	4.3	4.5	4.7	V	---	---
Response time	Tr	----	----	150	230	ms	---	1
	Td	----	----	180	230	ms	---	1
Contrast ratio	Cr	----	3	5	----	---	---	2
Viewing angle range	θ	Cr≥3	----	35	----	deg	∅=0°	3
			----	20	----	deg	∅=180°	3

▼ Definition Of Viewing Angle

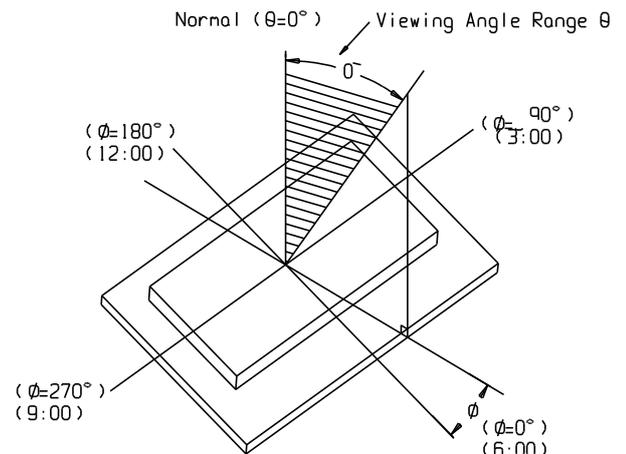
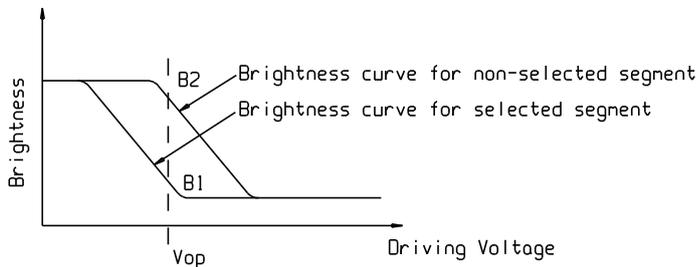
Note1: Definition of response time



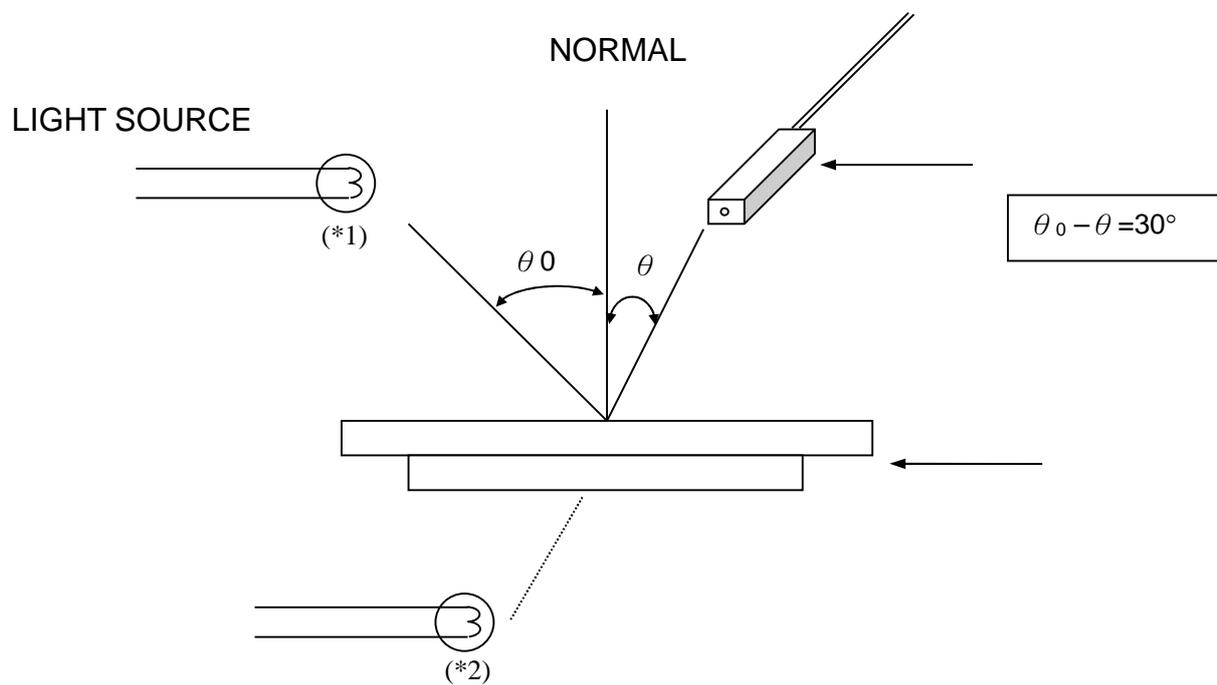
Note2: Definition of contrast ratio 'Cr'

Note3: Definition of viewing angle range 'θ'

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



Note4:Measuring Instruments For Electro-optical Characteristics



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transfective / transmissive types of LCD panel

■ OPERATING PRINCIPLES & METHODS

▼ Display memory-RAM

The static display memory (RAM) is organized into 32x4 bits and stores the displayed data. The contents of the RAM are directly mapped to the contents of the LCD driver. Data in the RAM can be accessed by the READ, WRITE, and READ-MODIFY-WRITE commands. The following is a mapping from the RAM to the LCD pattern:

	COM3	COM2	COM1	COM0	
SEG0					0
SEG1					1
SEG2					2
SEG3					3
⋮	⋮	⋮	⋮	⋮	⋮
SEG31					31
	D3	D2	D1	D0	addr Data

Address 6 bits
(A5,A4,.....,A0)

Data 4 bits addr
(D3,D2,D1,D0)

RAM mapping

▼ System oscillator

The LCD OFF command is used to turn the LCD bias generator off. After the LCD bias generator switches off by issuing the LCD OFF command, using the SYS DIS command reduces power consumption, serving as a system power down command. At the initial system power on, the CS1621 is at the SYS DIS state.

▼ Command format

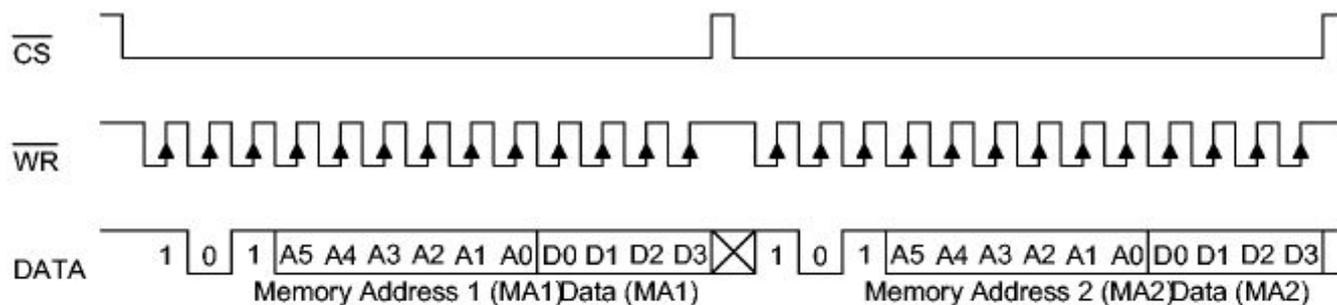
The CS1621 can be configured by the S/W setting. There are two mode commands to configure the CS1621 resources and to transfer the LCD display data. The configuration mode of the CS1621 is called command mode, and its command mode ID is 100. The command mode consists of a system configuration command, a system frequency selection command, a LCD configuration command, and an operating command. The data mode, on the other hand, includes WRITE operations. The following are the data mode IDs and the command mode ID:

Operation	Mode	ID
WRITE	Data	101
COMMAND	Command	100

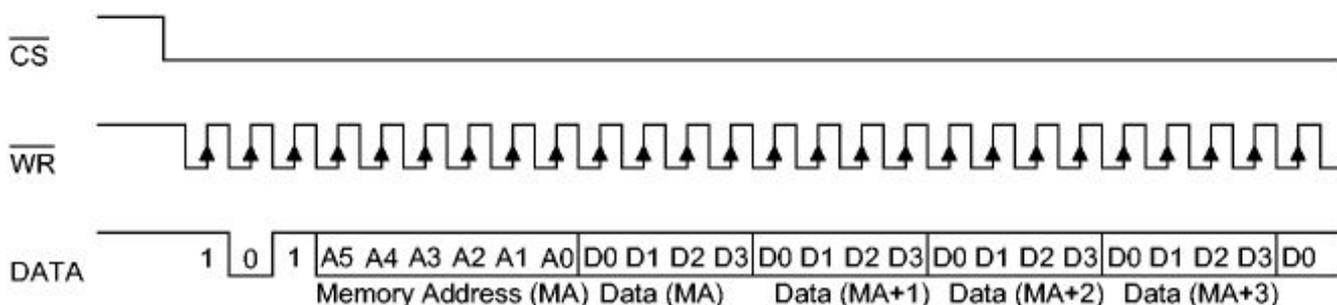
The mode command should be issued before the data or command is transferred. If successive commands have been issued, the command mode ID, namely 100, can be omitted. While the system is operating in the non-successive command or the non-successive address data mode, the CS pin should be set to "1" and the previous operation mode will be reset also. Once the CS pin returns to "0" a new operation mode ID should be issued first.

▼ **Timing Diagrams**

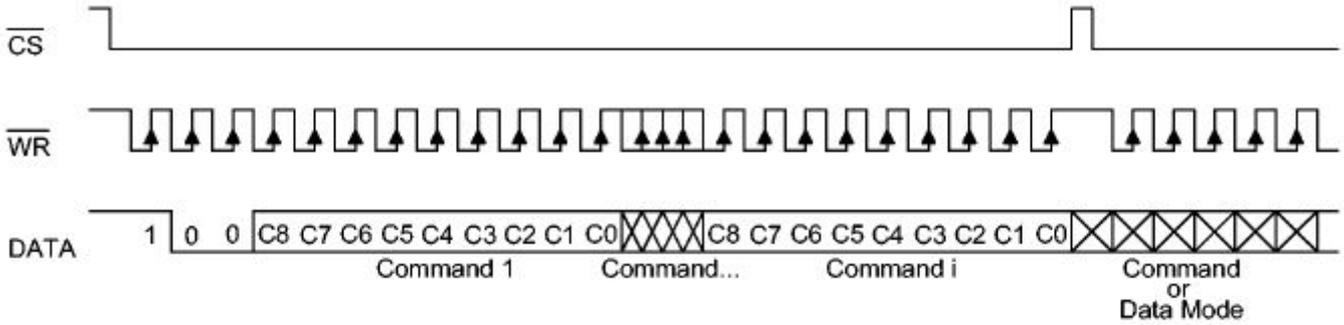
WRITE mode (command code : 1 0 1)



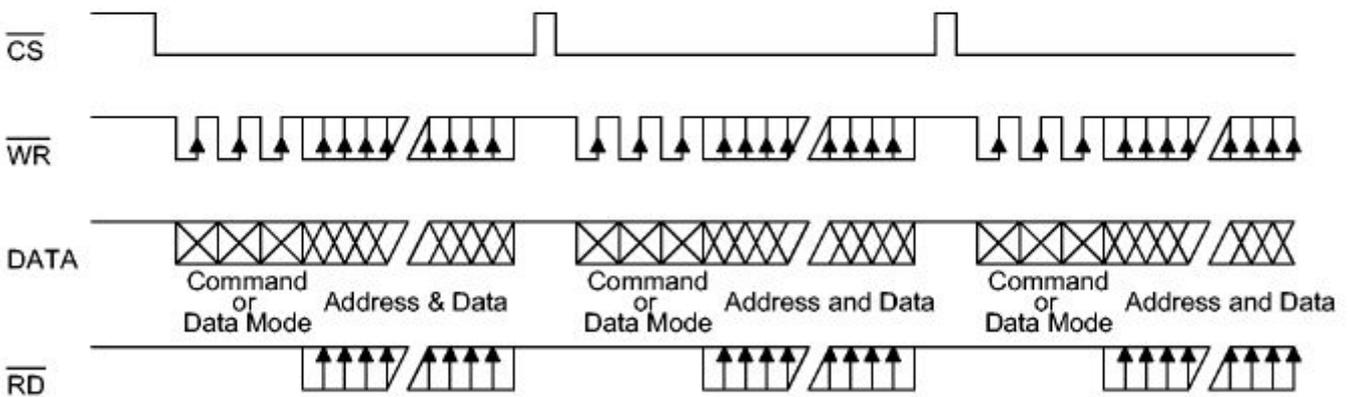
WRITE mode (successive address writing)



Command mode (command code : 1 0 0)



Mode (data and command mode)



Note: It is recommended that the host controller should read in the data from the DATA line between the rising edge of the RD line and the falling edge of the next RD line.

▼ **Command Summary**

Name	ID	Command Code	D/C	Function	Def.
WRITE	101	A5A4A3A2A1A0D0D1D2D3	D	Write data to the RAM	
SYS DIS	100	0000-0000-X	C	Turn off both system oscillator and LCD bias generator	Yes
SYS EN	100	0000-0001-X	C	Turn on system oscillator	
LCD OFF	100	0000-0010-X	C	Turn off LCD bias generator	Yes
LCD ON	100	0000-0011-X	C	Turn on LCD bias generator	
TIMER DIS	100	0000-0100-X	C	Disable time base output	
TIMER EN	100	0000-0110-X	C	Enable time base output	
CLR TIMER	100	0000-11XX-X	C	Clear the contents of time base generator	
RC 256K	100	0001-10XX-X	C	System clock source, on-chip RC oscillator	Yes
BIAS 1/2	100	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	100	0010-abX1-X	C	LCD 1/3 bias option ab=00:2 commons option ab=01:3 commons option ab=10:4 commons option	
NORMAL	100	1110-0011-X	C	Normal mode	Yes

Note : X : Don't care

A5~A0 : RAM addresses

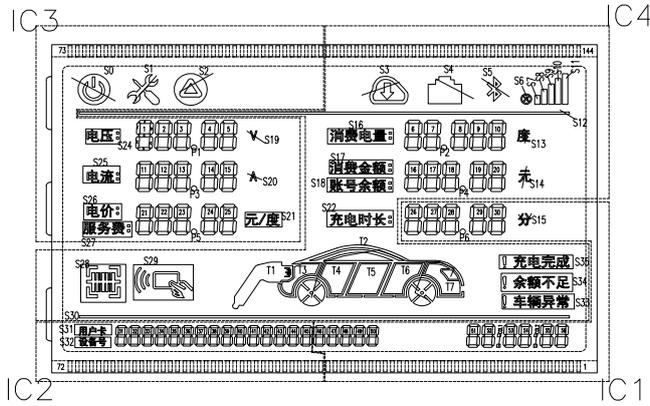
D3~D0 : RAM data

D/C : Data/command mode

Def. : Power on reset default

All the bold forms, namely 101, and 100, are mode commands. Of these, 100 indicates the Command mode ID. If successive commands have been issued, the command mode ID except for the first command will be omitted.

■ DISPLAY DATA RAM ADDRESS MAP



LCD成品效果图

ABOUT 7 CROSS POINTS IN V.A 0.05*0.05MM

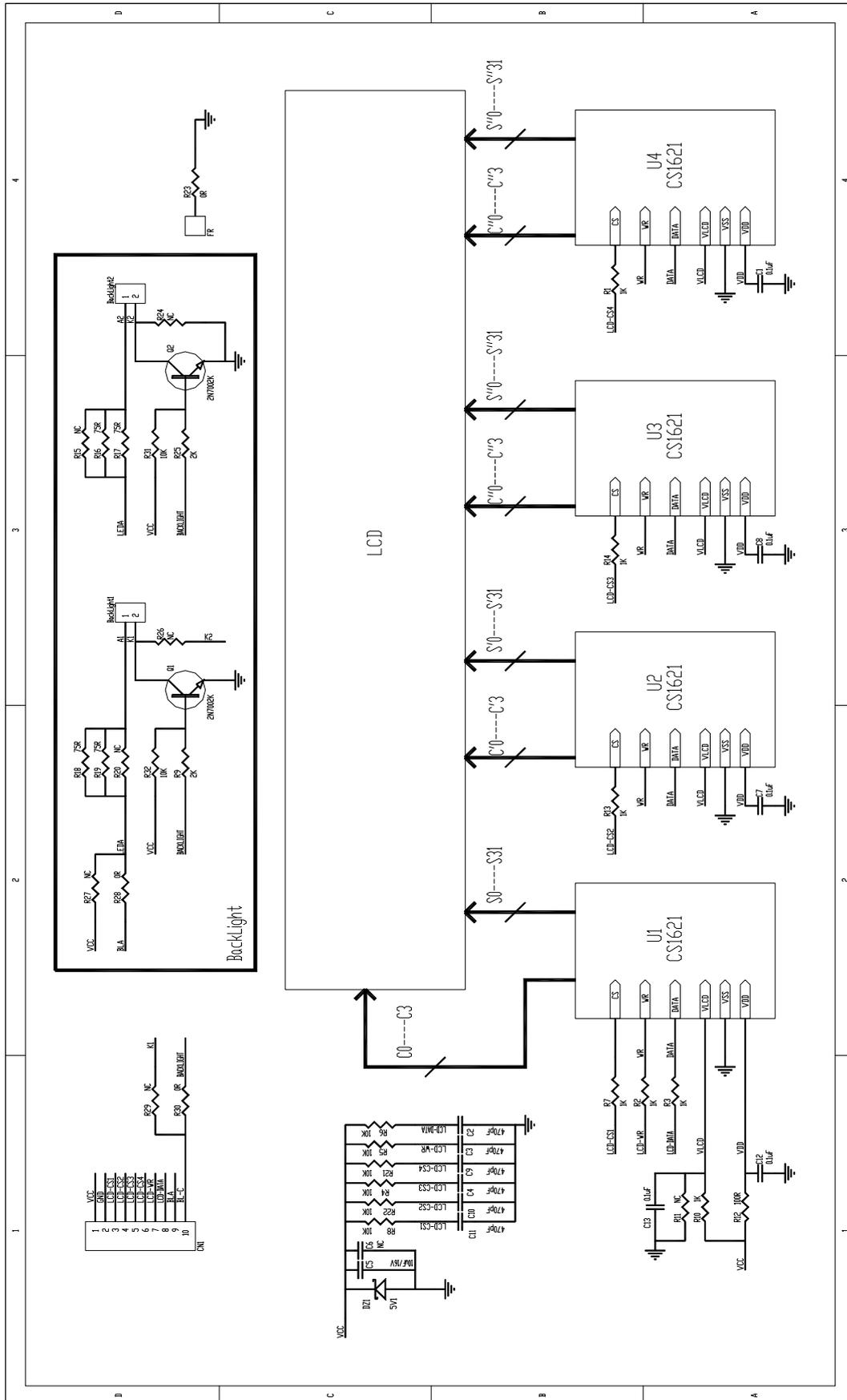
		SE00	SE01	SE02	SE03	SE04	SE05	SE06	SE07	SE08	SE09	SE10	SE11	SE12	SE13	SE14	SE15	SE16	SE17	SE18	SE19	SE20	SE21	SE22	SE23	SE24	SE25	SE26	SE27	SE28	SE29	SE30	SE31				
IC1	PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	COM1	--	--	--	COM1	30D	30E	29D	29C	28D	28E	27D	27C	26D	26E	56D	56E	55D	55E	54D	54E	53D	53E	52D	52E	51D	51E	50D	50E	49D	49E	48D	48E	47D	47E	46D	46E
	COM2	--	--	COM2	--	30C	30G	29C	29G	28C	28G	27C	27G	26C	26G	56C	56G	55C	55G	54C	54G	53C	53G	52C	52G	51C	51G	50C	50G	49C	49G	48C	48G	47C	47G	46C	46G
	COM3	--	--	COM3	--	30B	30F	29B	29F	28B	28F	27B	27F	26B	26F	56B	56F	55B	55F	54B	54F	53B	53F	52B	52F	51B	51F	50B	50F	49B	49F	48B	48F	47B	47F	46B	46F
COM4	COM4	--	--	--	30A	S15	29A	P6	28A	--	27A	--	26A	--	56A	--	55A	COL2	54A	--	53A	COL1	52A	--	51A	--	50A	--	49A	--	48A	--	47A	--	46A	--	

		SE30	SE31	SE32	SE33	SE34	SE35	SE36	SE37	SE38	SE39	SE40	SE41	SE42	SE43	SE44	SE45	SE46	SE47	SE48	SE49	SE50	SE51	SE52	SE53	SE54	SE55	SE56	SE57	SE58	SE59	SE60	SE61				
IC2	PIN	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
	COM1	--	45D	45E	44D	44E	43D	43E	42D	42E	41D	41E	40D	40E	39D	39E	38D	38E	37D	37E	36D	36E	35D	35E	34D	34E	33D	33E	32D	32E	31D	31E	S32	COM1	--	--	
	COM2	--	45C	45G	44C	44G	43C	43G	42C	42G	41C	41G	40C	40G	39C	39G	38C	38G	37C	37G	36C	36G	35C	35G	34C	34G	33C	33G	32C	32G	31C	31G	S31	--	COM2	--	--
	COM3	--	45B	45F	44B	44F	43B	43F	42B	42F	41B	41F	40B	40F	39B	39F	38B	38F	37B	37F	36B	36F	35B	35F	34B	34F	33B	33F	32B	32F	31B	31F	--	--	COM3	--	--
COM4	--	45A	--	44A	--	43A	--	42A	--	41A	--	40A	--	39A	--	38A	--	37A	--	36A	--	35A	--	34A	--	33A	--	32A	--	31A	--	--	--	COM4	--	--	

		SE60	SE61	SE62	SE63	SE64	SE65	SE66	SE67	SE68	SE69	SE70	SE71	SE72	SE73	SE74	SE75	SE76	SE77	SE78	SE79	SE80	SE81	SE82	SE83	SE84	SE85	SE86	SE87	SE88	SE89	SE90	SE91	SE92	SE93	SE94	SE95	SE96	SE97
IC3	PIN	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108		
	COM1	--	25A	S21	24A	P5	23A	--	22A	S26	21A	S27	15A	S20	14A	P3	13A	--	12A	--	11A	S25	5A	S19	4A	P1	3A	--	2A	--	1A	--	S24	--	--	COM1	--	--	
	COM2	--	25B	25F	24B	24F	23B	23F	22B	22F	21B	21F	15B	15F	14B	14F	13B	13F	12B	12F	11B	11F	5B	5F	4B	4F	3B	3F	2B	2F	1B	1F	S0	--	--	COM2	--	--	
	COM3	--	25C	25G	24C	24G	23C	23G	22C	22G	21C	21G	15C	15G	14C	14G	13C	13G	12C	12G	11C	11G	5C	5G	4C	4G	3C	3G	2C	2G	1C	1G	S1	--	--	COM3	--	--	
COM4	--	25D	25E	24D	24E	23D	23E	22D	22E	21D	21E	15D	15E	14D	14E	13D	13E	12D	12E	11D	11E	5D	5E	4D	4E	3D	3E	2D	2E	1D	1E	S2	COM4	--	--	--			

		SE90	SE91	SE92	SE93	SE94	SE95	SE96	SE97	SE98	SE99	SE100	SE101	SE102	SE103	SE104	SE105	SE106	SE107																					
IC4	PIN	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144			
	COM1	COM1	--	--	--	S12	--	--	10A	S13	9A	--	8A	P2	7A	--	6A	--	5A	S14	19A	P4	18A	--	17A	--	16A	--	--	--	S30	--	--	--	COM1	--	--			
	COM2	--	COM2	--	--	S5	S6	S11	10B	10F	9B	9F	8B	8F	7B	7F	6B	6F	5B	5F	4B	4F	3B	3F	2B	2F	1B	1F	16B	16F	S17	T5	T4	T6	S33	--	--	COM2	--	--
	COM3	--	--	COM3	--	S4	S7	S10	10C	10G	9C	9G	8C	8G	7C	7G	6C	6G	5C	5G	4C	4G	3C	3G	2C	2G	1C	1G	17B	17G	S18	S28	T3	T2	S34	--	--	COM3	--	--
COM4	--	--	--	COM4	S3	S8	S9	10D	10E	9D	9E	8D	8E	7D	7E	6D	6E	5D	5E	4D	4E	3D	3E	2D	2E	1D	1E	S22	S29	T1	T7	S35	COM4	--	--	--	--			

SCHEMATIC DIAGRAM



■ RELIABILITY

▼ Content of Reliability Test

Environmental Test			
No.	Test Item	Content of Test	Test Condition
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	+60 °C 96hrs
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-10 °C 96hrs
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	+50 °C 96hrs
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	0 °C 96hrs
5	High temperature / Humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	+45 °C , 90 %RH 96 hrs
6	High temperature / Humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	+40 °C 90 %RH 96 hrs
7	Temperature cycle	Endurance test applying the low and high temperature cycle. $ \begin{array}{c} 0^{\circ}\text{C} \quad \rightleftharpoons \quad 25^{\circ}\text{C} \quad \rightleftharpoons \quad 50^{\circ}\text{C} \\ 30\text{min.} \quad \leftarrow \quad 5\text{min.} \quad \leftarrow \quad 30\text{min.} \\ \hline \text{1 cycle} \end{array} $	0°C / 50°C 10 cycles

*** Supply voltage for logic system = 5V. Supply voltage for LCD system = Operating voltage at 25°C.

▼ Failure Judgement Criterion

Criterion Item	Test Item No.											Failure Judgment Criterion	
	1	2	3	4	5	6	7	8	9	10	11		
Basic specification													Out of the Basic Specification
Electrical characteristic													Out of the DC and AC Characteristic
Mechanical characteristic													Out of the Mechanical Specification Color change : Out of Limit Apperance Specification
Optical characteristic													Out of the Apperance Standard

■ INSPECTION CRITERIA

see :Q/XRD0002-05

■ PRECAUTIONS FOR USING LCD MODULES

▼ Handling Precautions

- (1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- (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 becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents :
 - Isopropyl alcohol
 - Ethyl alcohol
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

■ USING LCD MODULES

▼ Liquid Crystal Display Modules

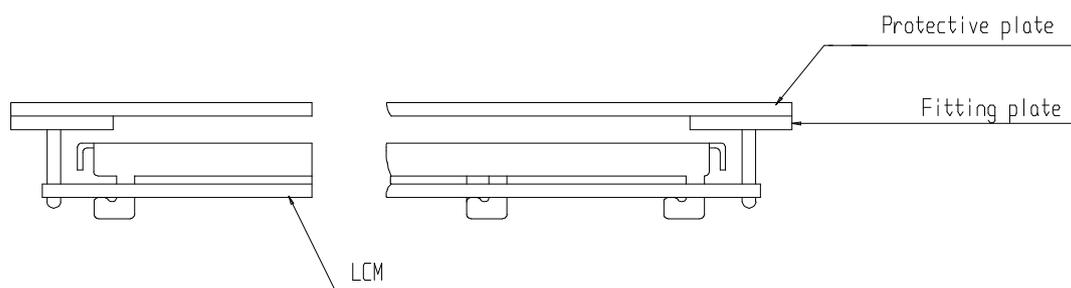
LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
- (10) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

▼ Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$.

▼ Precaution for Handing LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- (1) Do not alter, modify or change the shape of the tab on the metal frame.
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- (3) Do not damage or modify the pattern writing on the printed circuit board.
- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM.

▼ Electro-Static Discharge Control

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handling LCM.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

▼ Precaution for soldering to the LCM

- (1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.
 - Soldering iron temperature : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
 - Soldering time : 3-4 sec.
 - Solder : eutectic solder.

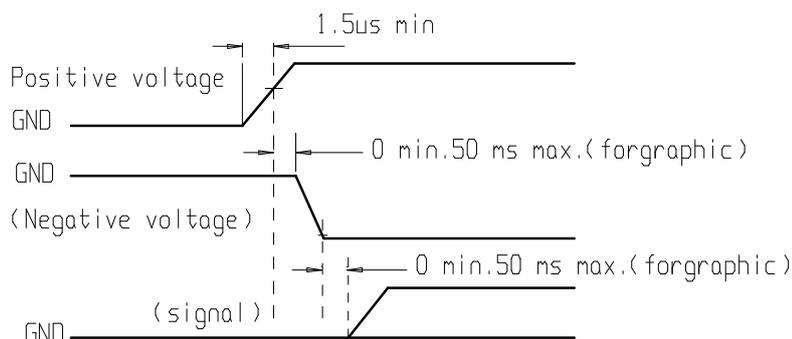
If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

- (2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- (3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

▼ Precautions for Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- (5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
- (6) When turning the power on, input each signal after the positive/negative voltage becomes

stable.



▼ Storage

When storing LCD's as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)
- (4) Environmental conditions :
 - Do not leave them for more than 168hrs. at 65°C.
 - Should not be left for more than 48hrs. at -20°C.

▼ Safety

- (1) It is recommended to crush damaged or unnecessary LCD's into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

▼ Limited Warranty

Unless agreed between X.R.D and customer, X.R.D will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with X.R.D LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to X.R.D within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of X.R.D limited to repair and/or replacement on the terms set forth above. X.R.D will not be responsible for any subsequent or consequential events.

▼ Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet's damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's, conductors and terminals.