Dalian Good Display Co.,Ltd

LCD Module User Manual
YM 0078

Tel: 86-411-84619565

Fax: 86-411-84619585

E-mail:sales @ good-lcd.com.cn

Website: http://www.good-lcd.com

REVISION RECORD		
REV. NO.	DATE	REVISION ITEMS
1.0	Jul.13, 2008	First Release Version

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1. Scope

This manual defines general provisions as well as inspection standards for standard LCD module. If the event of unforeseen problem or unspecified items may occur, please contact the nearest supplier or our company.

2. Warranty

If module is not stored or used as specified in this manual, it will be void the 12-month from the date of shopping from Dalian Good Display CO.,LTD. If Stored or used as specified under normal conditions within the contents of these sheets.

3. Features

3-1. Features

(1) Display mode: Transflective / Positive type
FSTN LCD

(2) Display color: Display dots: black
Background: Blue

(3)Input Data: Serial

(4)Driving method: Static

(5) Multiplex ratio: 1/16Duty, 1/5Bias

(6)Viewing direction: 6 O'clock

(7) Back light: LED Blue

(8) Controller: HT1626

3-2.Mechanical features

Item	Specifications	Unit
Outline dimensions	92.0(W)×92.0(H) ×5.6Max.(T)	mm
Viewing Area	65.0(W)×59.0(H)	mm
Weight	---	g

3-3.Absolute maximum ratings

Item	Symbol	Condition	Min	Max	Units
Power supply for logic	Vdd	25℃	-0.3	5.5	V
Operating voltage for LCD	Vdd-VSS	25℃	2.8	5.5	V
Input voltage	Vin	25℃	-0.3	Vdd+0.3	V
Operating temperature	Top	---	-20	70	℃
Storage temperature	Tstg	---	-30	80	℃

Note:

1) The modules may be destroyed if they are used beyond absolute maximum ratings.

In ordinary operation, it is desirable to use them within recommended operation conditions. Using the modules beyond these conditions may cause malfunction and poor reliability.

2) All voltage values are referenced to GND=0V.

3-4 Electrical characteristics (Ta = 25℃)

Item		Symbol	Condition		Min.	Typ.	Max	Unit
Operating Voltage		Vdd	-----		2.7	5.0	5.2	V
Operating Current		Idd1	3V	No load/LCD ON on-chip	---	150	300	uA
			5V	RC oscillator	---	300	600	
Operating Current		Idd2	3V	No load/LCD ON Crystal	---	60	120	
			5V	oscillator	---	120	240	
Operating Current		Idd3	3V	No load/LCD ON External	---	100	200	
			5V	clock source	---	200	400	
Input Voltage	"H" Level	Vih	3V	DATA,/WR,/CS,/RD	2.4	---	3.0	V
			5V		4.0		5.0	
	"L" Level	Vil	3V	DATA,/WR,/CS,/RD	0	---	0.6	
			5V		0		1.0	
Frame Frequency		Fosc	Vdd=3.0V on-chip RC oscillator		---	256	---	KHz
Power Consumption		Idd			---	1.0	---	mA

Note： All the dots are in the static state.

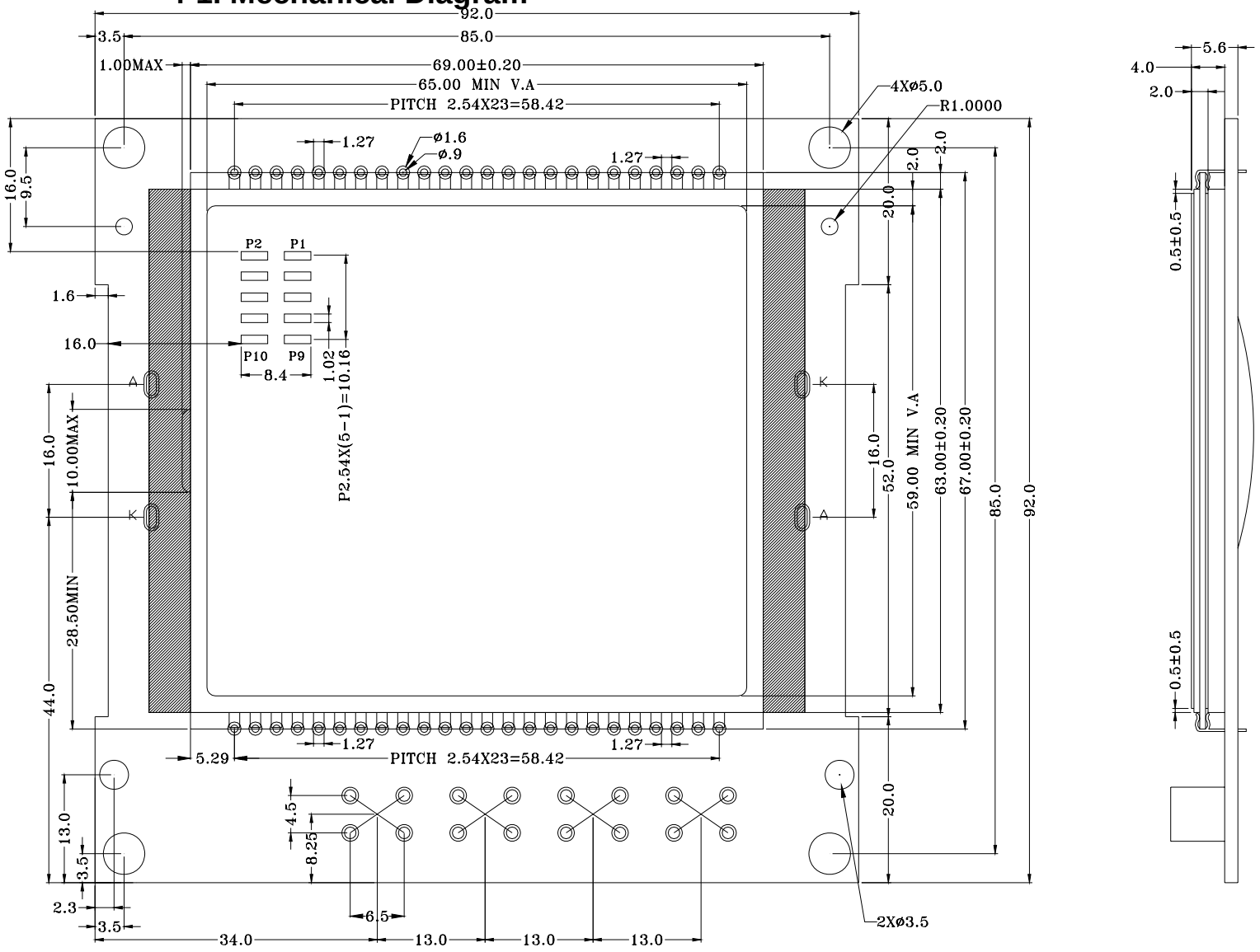
3-5.Electro-optical Characteristics

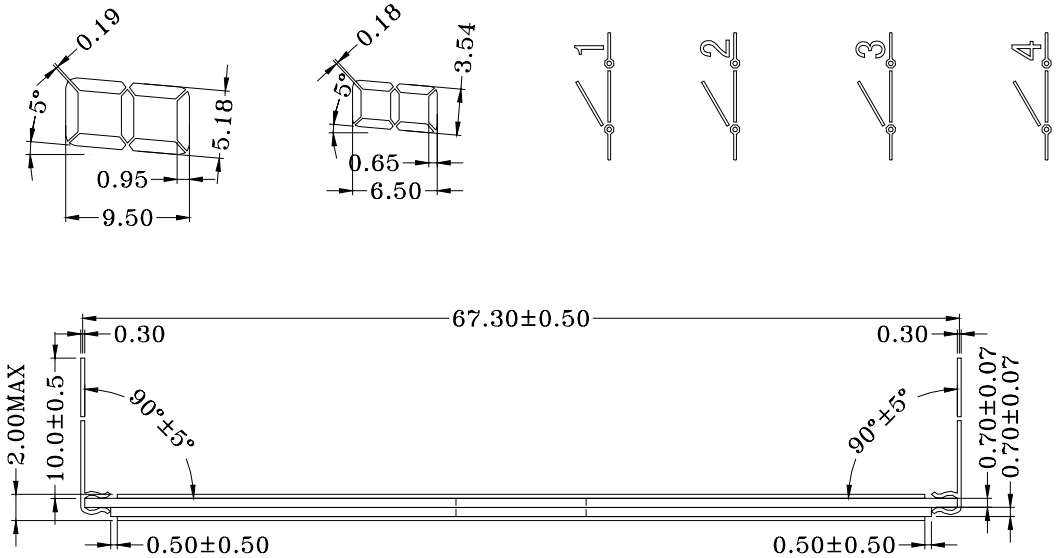
Item		Symbol	Temp	Conditions	Min.	Typ.	Max.	Unit
LCD Driving Voltage		Vop	25℃	Φ=0°， θ=0°		5.0		V
Response Time	Rise Time	tr	0℃	Φ=0°， θ=0°	----	1600	2000	ms
			25℃		----	160	200	
	Decay Time	td	0℃		----	3000	3500	
			25℃		----	200	260	
Viewing Angle		Δ Φ	25℃	Vertical	-35	---	35	deg
				Horizontal	-30	---	30	
Contrast Ratio		K	25℃	Φ=0°， θ=0°	6.0	18	----	**----**

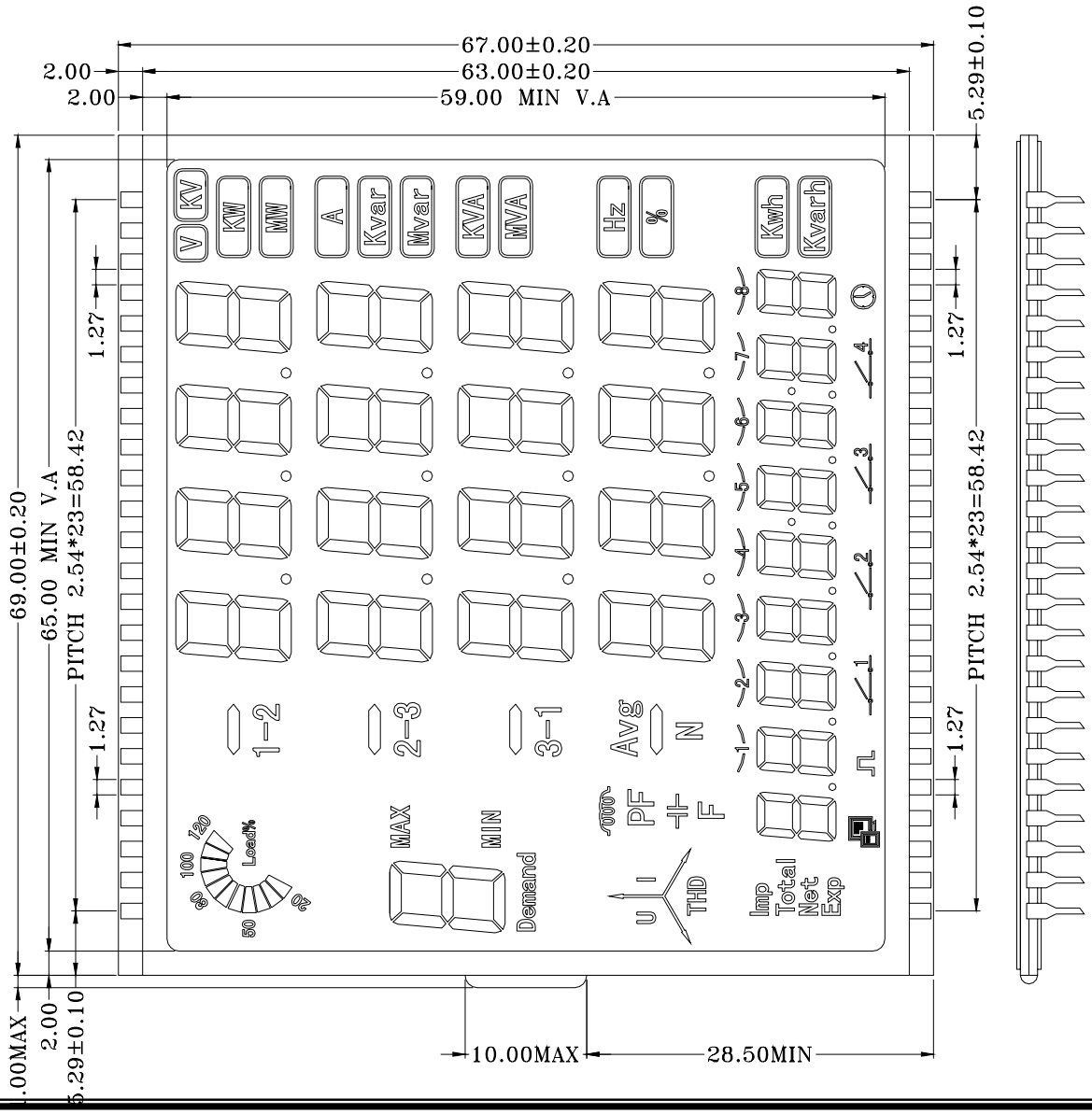
3-6. LED back light specifications

Item	Unit	Standard Values			Condition
		Min.	Typ.	Max.	
Supply Voltage	V	—	3.0	---	—
Current	mA	---	90		---
Lifetime	Hrs	10000			----
Luminous Color	—	Blue			----
Operating Temp.	℃	-20 ~ +70			—
Storage Temp.	℃	-30 ~ +80			—

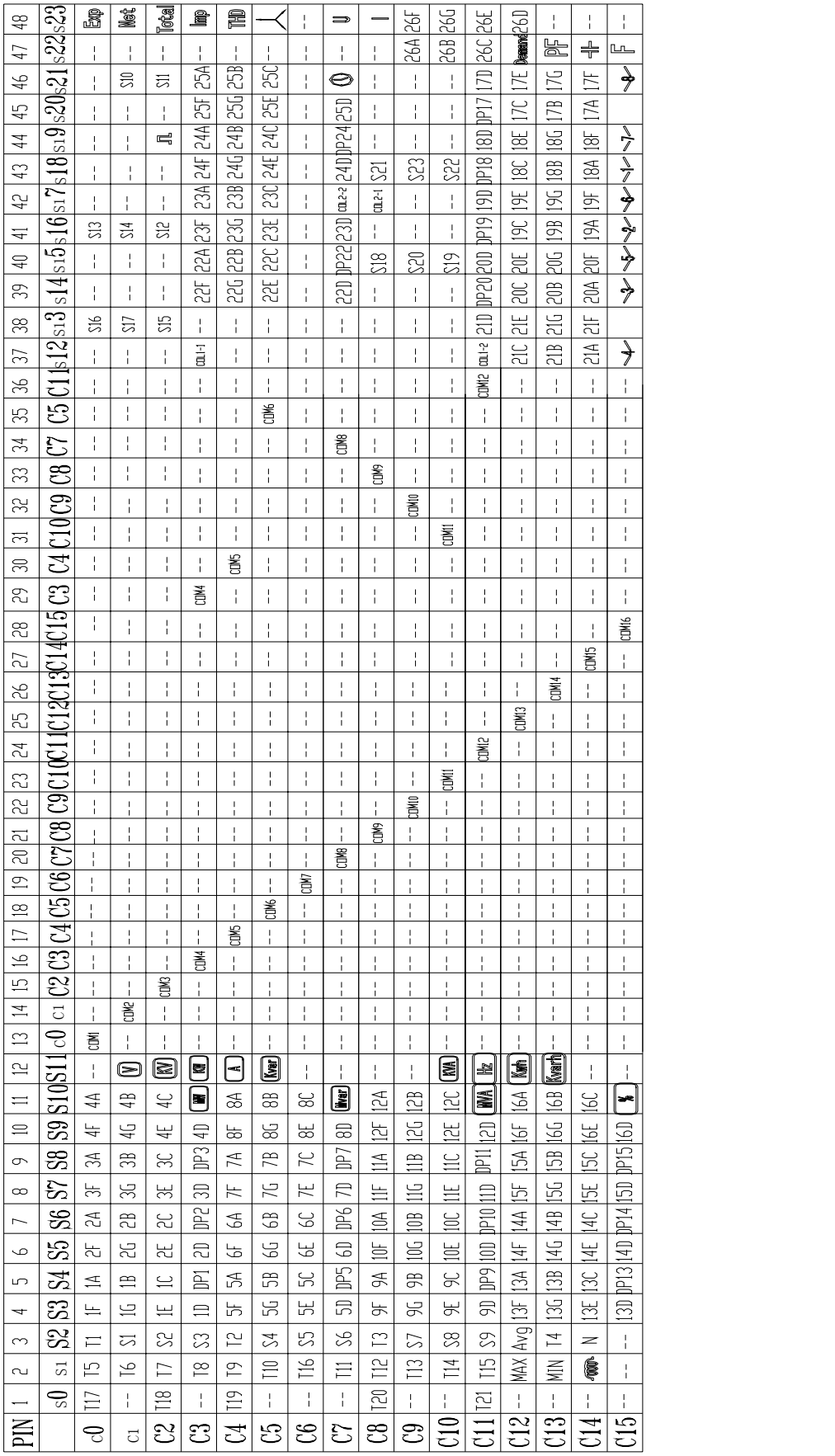
4-1. Mechanical Diagram




0.19
5°
5.18
0.95
9.50
0.18
5°
3.54
0.65
6.50
1
2
3
4
67.30±0.50
0.30
0.30
2.00MAX
10.0±0.5
90°±5°
90°±5°
0.70±0.07
0.70±0.07
0.50±0.50
0.50±0.50


67.00±0.20
63.00±0.20
59.00 MIN V.A
2.00
2.00
5.29±0.10
69.00±0.20
65.00 MIN V.A
PITCH 2.54*23=58.42
1.27
1.27
1.27
1.27
V
KV
KW
MW
A
Kvar
Mvar
KVA
MVA
Hz
%
Kwh
Kvarh
1-2
2-3
3-1
Avg
N
MAX
MIN
Demand
PF
F
THD
Imp
Total
Net
Exp
10.00MAX
28.50MIN
2.00
5.29±0.10

4-2. Display memory-RAM mapping



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	37	38	39	40	41	42	43	44	45	46	47	48
	S0	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C3	C4	C5	C10	C8	C7	C5	C11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
C0	T17	T5	T1	1F	1A	2F	2A	3F	3A	4F	4A	--	COM1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1	--	T6	S1	1G	1B	2G	2B	3G	3B	4G	4B	V	--	COM2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2	T18	T7	S2	1E	1C	2E	2C	3E	3C	4E	4C	KV	--	--	COM3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3	--	T8	S3	1D	DP1	2D	DP2	3D	DP3	4D	W	KW	--	--	--	COM4	--	--	--	--	--	--	--	--	COL1-1	--	--	COM4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4	T19	T9	T2	5F	5A	6F	6A	7F	7A	8F	8A	A	--	--	--	--	COM5	--	--	--	--	--	--	--	--	--	--	--	--	COM5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C5	--	T10	S4	5G	5B	6G	6B	7G	7B	8G	8B	Kvar	--	--	--	--	--	COM6	--	--	--	--	--	--	--	--	--	--	--	--	COM6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C6	--	T16	S5	5E	5C	6E	6C	7E	7C	8E	8C	--	--	--	--	--	--	--	COM7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C7	--	T11	S6	5D	DP5	6D	DP6	7D	DP7	8D	Wvar	--	--	--	--	--	--	--	--	COM8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM8	--	--	--	--	--	--	--	--	--	--	--	--	--
C8	T20	T12	T3	9F	9A	10F	10A	11F	11A	12F	12A	--	--	--	--	--	--	--	--	--	COM9	--	--	--	--	--	--	--	--	--	--	--	--	--	COM9	--	--	--	--	--	--	--	--	--	--	--	--	--
C9	--	T13	S7	9G	9B	10G	10B	11G	11B	12G	12B	--	--	--	--	--	--	--	--	--	--	COM10	--	--	--	--	--	--	--	--	--	--	--	--	--	COM10	--	--	--	--	--	--	--	--	--	--	--	--	--
C10	--	T14	S8	9E	9C	10E	10C	11E	11C	12E	12C	KVA	--	--	--	--	--	--	--	--	--	--	COM11	--	--	--	--	--	--	--	--	--	--	--	--	--	COM11	--	--	--	--	--	--	--	--	--	--	--	--	--
C11	T21	T15	S9	9D	DP9	10D	DP10	11D	DP11	12D	MVA	Hz	--	--	--	--	--	--	--	--	--	--	--	COM12	--	--	--	--	--	--	--	--	--	--	--	--	--	COM12	--	--	--	--	--	--	--	--	--	--	--	--	--
C12	--	MAX	Avg	13F	13A	14F	14A	15F	15A	16F	16A	Kvh	--	--	--	--	--	--	--	--	--	--	--	--	COM13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C13	--	MIN	T4	13G	13B	14G	14B	15G	15B	16G	16B	Kvarh	--	--	--	--	--	--	--	--	--	--	--	--	--	COM14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C14	--	N	T4	13E	13C	14E	14C	15E	15C	16E	16C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C15	--	--	--	13D	DP13	14D	DP14	15D	DP15	16D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

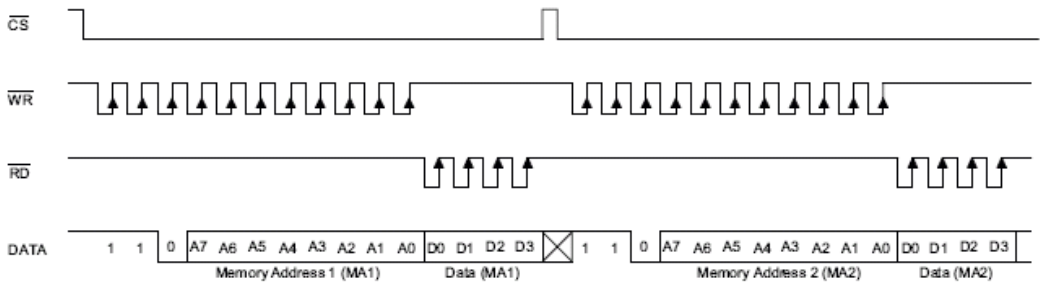
PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	S0	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C3	C4	C5	C10	C8	C7	C5	C11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
C0	T17	T5	T1	1F	1A	2F	2A	3F	3A	4F	4A	--	COM1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C1	--	T6	S1	1G	1B	2G	2B	3G	3B	4G	4B	V	--	COM2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C2	T18	T7	S2	1E	1C	2E	2C	3E	3C	4E	4C	KV	--	--	COM3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C3	--	T8	S3	1D	DP1	2D	DP2	3D	DP3	4D	W	KW	--	--	--	COM4	--	--	--	--	--	--	--	--	COL1-1	--	--	COM4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C4	T19	T9	T2	5F	5A	6F	6A	7F	7A	8F	8A	A	--	--	--	--	COM5	--	--	--	--	--	--	--	--	--	--	--	--	COM5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C5	--	T10	S4	5G	5B	6G	6B	7G	7B	8G	8B	Kvar	--	--	--	--	--	COM6	--	--	--	--	--	--	--	--	--	--	--	--	COM6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C6	--	T16	S5	5E	5C	6E	6C	7E	7C	8E	8C	--	--	--	--	--	--	--	COM7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C7	--	T11	S6	5D	DP5	6D	DP6	7D	DP7	8D	Wvar	--	--	--	--	--	--	--	--	COM8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM8	--	--	--	--	--	--	--	--	--	--	--	--	--
C8	T20	T12	T3	9F	9A	10F	10A	11F	11A	12F	12A	--	--	--	--	--	--	--	--	--	COM9	--	--	--	--	--	--	--	--	--	--	--	--	--	COM9	--	--	--	--	--	--	--	--	--	--	--	--	--
C9	--	T13	S7	9G	9B	10G	10B	11G	11B	12G	12B	--	--	--	--	--	--	--	--	--	--	COM10	--	--	--	--	--	--	--	--	--	--	--	--	--	COM10	--	--	--	--	--	--	--	--	--	--	--	--	--
C10	--	T14	S8	9E	9C	10E	10C	11E	11C	12E	12C	KVA	--	--	--	--	--	--	--	--	--	--	COM11	--	--	--	--	--	--	--	--	--	--	--	--	--	COM11	--	--	--	--	--	--	--	--	--	--	--	--	--
C11	T21	T15	S9	9D	DP9	10D	DP10	11D	DP11	12D	MVA	Hz	--	--	--	--	--	--	--	--	--	--	--	COM12	--	--	--	--	--	--	--	--	--	--	--	--	--	COM12	--	--	--	--	--	--	--	--	--	--	--	--	--
C12	--	MAX	Avg	13F	13A	14F	14A	15F	15A	16F	16A	Kvh	--	--	--	--	--	--	--	--	--	--	--	--	COM13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C13	--	MIN	T4	13G	13B	14G	14B	15G	15B	16G	16B	Kvarh	--	--	--	--	--	--	--	--	--	--	--	--	--	COM14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C14	--	N	T4	13E	13C	14E	14C	15E	15C	16E	16C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C15	--	--	--	13D	DP13	14D	DP14	15D	DP15	16D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	COM16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

5. I/O Terminal

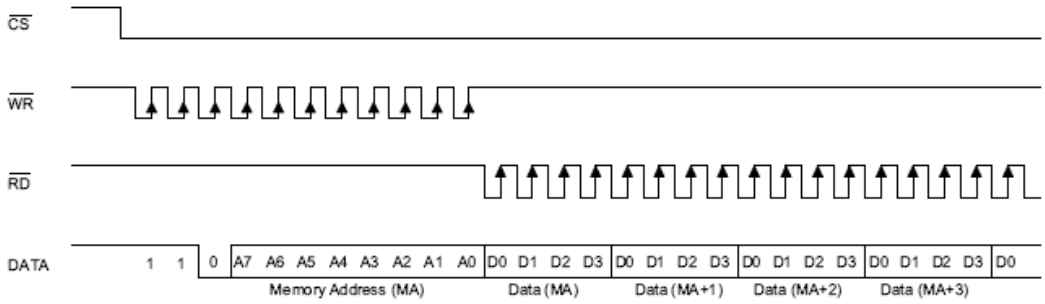
5-1 I/O Connection

Pin No.	Symbol	Function
1	VDD	Power supply (+)
2	KB1	KEY
3	KB2	
4	KB3	
5	KB4	
6	/CS	Chip selected terminal
7	DATA	Serial Data Input
8	/WR	Write single
9	BL+	Power supply for LED (+)
10	VSS	Power supply (GND)

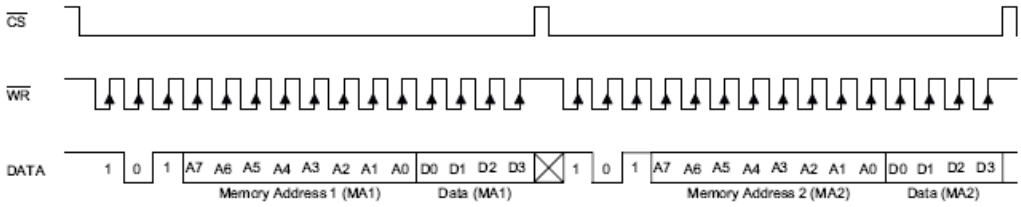
5-2 Signal timing diagram



READ mode (successive address reading)

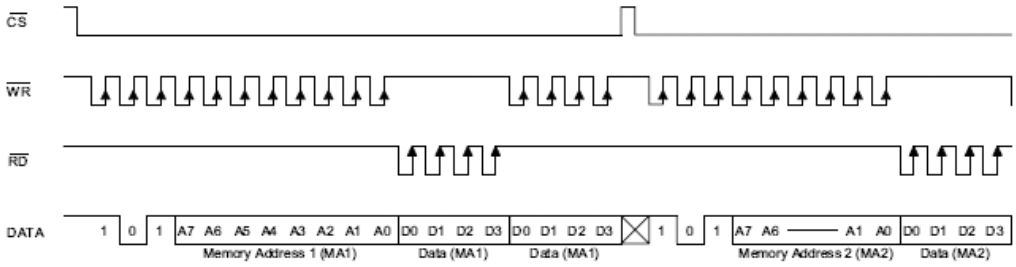


WRITE mode (command code : 1 0 1)

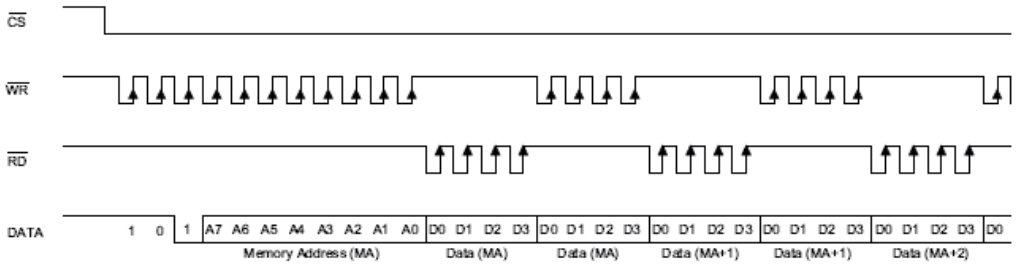


WRITE mode (successive address writing)

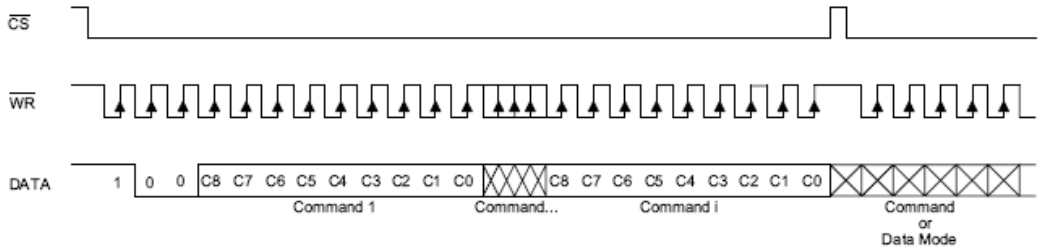
READ-MODIFY-WRITE mode (command code : 1 0 1)



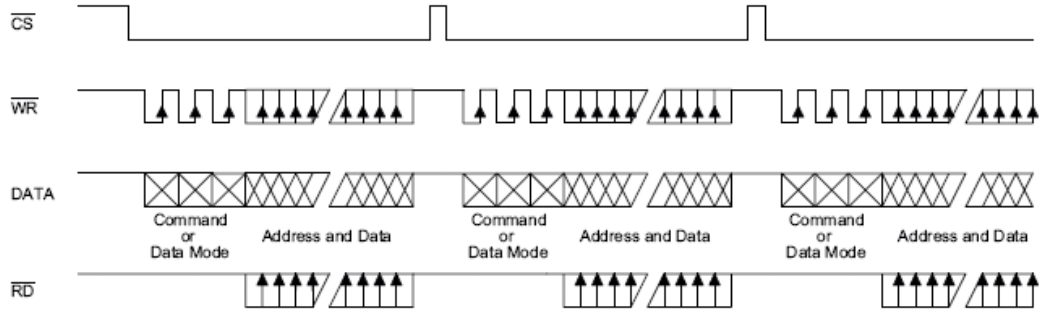
READ-MODIFY-WRITE mode (successive address accessing)



Command mode (command code : 1 0 0)



Mode (data and command mode)



5-3. Instruction Table

Name	ID	Command Code	D/C	Function	Def.
READ	1 1 0	A7A6A5A4A3A2A1A0D0D1D2D3	D	Read data from the RAM	
WRITE	1 0 1	A7A6A5A4A3A2A1A0D0D1D2D3	D	Write data to the RAM	
READ-MODIFY-WRITE	1 0 1	A7A6A5A4A3A2A1A0D0D1D2D3	D	Read and Write data 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 display	Yes
LCD ON	1 0 0	0000-0011-X	C	Turn on LCD display	
TIMER DIS	1 0 0	0000-0100-X	C	Disable time base output	Yes
WDT DIS	1 0 0	0000-0101-X	C	Disable WDT time-out flag output	Yes
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
CLR TIMER	1 0 0	0000-1101-X	C	Clear the contents of the time base generator	
CLR WDT	1 0 0	0000-1111-X	C	Clear the contents of the WDT stage	
RC 32K	1 0 0	0001-10XX-X	C	System clock source, on-chip RC oscillator	Yes
EXT (XTAL) 32K	1 0 0	0001-11XX-X	C	System clock source, external 32kHz clock source or crystal oscillator 32.768kHz	
TONE 4K	1 0 0	010X-XXXX-X	C	Tone frequency output: 4kHz	
TONE 2K	1 0 0	0110-XXXX-X	C	Tone frequency output: 2kHz	
$\overline{\text{IRQ}}$ DIS	1 0 0	100X-0XXX-X	C	Disable $\overline{\text{IRQ}}$ output	Yes
$\overline{\text{IRQ}}$ EN	1 0 0	100X-1XXX-X	C	Enable $\overline{\text{IRQ}}$ output	
F1	1 0 0	101X-0000-X	C	Time base clock output: 1Hz The WDT time-out flag after: 4s	
F2	1 0 0	101X-0001-X	C	Time base clock output: 2Hz The WDT time-out flag after: 2s	
F4	1 0 0	101X-0010-X	C	Time base clock output: 4Hz The WDT time-out flag after: 1s	

Name	ID	Command Code	D/C	Function	Def.
F8	**1 0 0**	101X-0011-X	C	Time base clock output: 8Hz The WDT time-out flag after: 1/2 s	
F16	**1 0 0**	101X-0100-X	C	Time base clock output: 16Hz The WDT time-out flag after: 1/4 s	
F32	**1 0 0**	101X-0101-X	C	Time base clock output: 32Hz The WDT time-out flag after: 1/8 s	
F64	**1 0 0**	101X-0110-X	C	Time base clock output: 64Hz The WDT time-out flag after: 1/16 s	
F128	**1 0 0**	101X-0111-X	C	Time base 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

Note: X : Don't care

A7~A0 : RAM address

D3~D0 : RAM data

D/C : Data/Command mode

Def. : Power on reset denault

All the bold forms, namely **1 1 0**, **1 0 1**, and **1 0 0**, are mode commands. Of these, **1 0 0** indicates the command mode ID. If successive commands have been issued, the command mode ID except for the first command will be omitted. The source of the tone frequency and of the time base/WDT clock frequency can be derived from an on-chip 32kHz RC oscillator, a 32.768kHz crystal oscillator, or an external 32kHz clock. Calculation of the frequency is based on the system frequency sources as stated above. It is recommended that the host controller should initialize the HT1626 after power on reset, for power on reset may fail, which in turn leads to the malfunctioning of the HT1626.

6. Quality Level

6-1 Inspection conditions

6-1-1The environmental conditions for inspection shall be as follows:

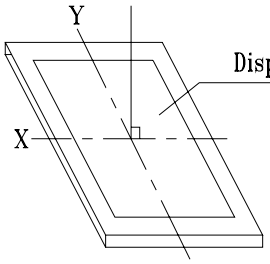
Room temperature: 20±3℃

Humidity: 65±20% RH

6-1-2 The external visual inspection:

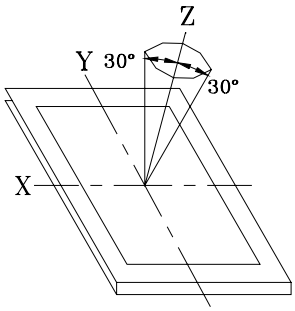
The inspection shall be performed by using a 20W fluorescent lamp for illumination and the distance between LCD and the eyes of the inspector should be at least 30cm.

6-1-3 (1) Light method



Fluorescent lamp set the perpendicular to the display surface

(2) Inspection distance and angle



Inspection should be performed within ø (ø=30°) from Z axis to each X and Y axis.

Inspection distance of any direction within ø must be kept 30±50cm to the display surface.

6-2 Sampling procedures for each item's acceptance level table

Defect type	Sampling procedure	AQL
Major defect	MIL-STD-105D Inspection Level I Normal inspection Single sample inspection	QC/07-2006(1)
Minor defect	MIL-STD-105D Inspection Level I Normal inspection Single sample inspection	QC/07-2006(1)

6-3 Classification of defects

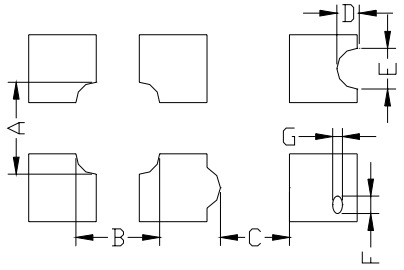
6-3-1 Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

6-3-2 Minor defect

A minor defect refers to a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

6-4 Inspection standards

<table>
<tr><th>Item</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>1) Display on inspection</td><td>(1) Non display (2) Vertical line is deficient
(3) Horizontal line is deficient (4) Cross line is deficient</td><td>Major</td></tr>
<tr><td>2) Black / White spot</td><td><table><tr><th>Size Φ(mm)</th><th>Acceptable number</th></tr><tr><td>Φ≤0.3</td><td>Ignore (note)</td></tr><tr><td>0.3<Φ≤0.45</td><td>3</td></tr><tr><td>0.45<Φ≤0.6</td><td>1</td></tr><tr><td>0.3<Φ</td><td>0</td></tr></table>(Note) Not allowed if four more spots crowd together</td><td>Minor</td></tr>
<tr><td>3) Black / White line</td><td><table><tr><th>Length (mm)</th><th>Width (mm)</th><th>Acceptable number</th></tr><tr><td>L≤10</td><td>W≤0.03</td><td>Ignore</td></tr><tr><td>5.0≤L≤10</td><td>0.03<W≤0.04</td><td>3</td></tr><tr><td>5.0≤L≤10</td><td>0.04<W≤0.05</td><td>2</td></tr><tr><td>1.0≤L≤10</td><td>0.05<W≤0.06</td><td>2</td></tr><tr><td>1.0≤L≤10</td><td>0.06<W≤0.08</td><td>1</td></tr><tr><td>L≤10</td><td>0.08<W</td><td>follows 2) point defect</td></tr></table>Defects separate with each other at an interval of more than 20mm.</td><td>Minor</td></tr>
<tr><td>4) Display pattern</td><td> 

[Unit: mm]
<table><tr><td>A+B≤0.45
2</td><td>0<C</td><td>D+E≤0.35
2</td><td>F+G≤0.35
2</td></tr></table>Note: 1) Up to 3 damages acceptable
2) Not allowed if there are two or more pinholes every 3 of fourths inch.</td><td>Minor</td></tr>
<tr><td>5) Spot-like contrast irregularity</td><td><table><tr><th>Size Φ(mm)</th><th>Acceptable Number</th></tr><tr><td>Φ≤0.7</td><td>Ignore (note)</td></tr><tr><td>0.7<Φ≤1.0</td><td>3</td></tr><tr><td>1.0<Φ≤1.5</td><td>1</td></tr><tr><td>1.5<Φ</td><td>0</td></tr></table>Note: 1) Conformed to limit samples.
2)Intervals of defects are more than 30mm.</td><td>Minor</td></tr>
</table>

<table>
<tr><th>Item</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>6) Bubbles in polarizer</td><td><table><tr><th>Size Φ(mm)</th><th>Acceptable Number</th></tr><tr><td>Φ≤0.4</td><td>Ignore (note)</td></tr><tr><td>0.4<Φ≤0.65</td><td>2</td></tr><tr><td>0.65<Φ≤1.2</td><td>1</td></tr><tr><td>1.2<Φ</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>7) Scratches and dent on the polarizer</td><td>Scratches and dent on the polarizer shall be in the accordance with “2) Black/white spot”, and “3) Black/White line”.</td><td>Minor</td></tr>
<tr><td>8) Stains on the surface of LCD panel</td><td>Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.</td><td>Minor</td></tr>
<tr><td>9) Rainbow color</td><td>No rainbow color is allowed in the optimum contrast on state within the active area.</td><td>Minor</td></tr>
<tr><td>10) Viewing area encroachment</td><td>Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.</td><td>Minor</td></tr>
<tr><td>11) Bezel appearance</td><td>Rust and deep damages that are visible in the bezel are rejected.</td><td>Minor</td></tr>
<tr><td>12) Defect of land surface contact</td><td>Evident crevices that are visible are rejected.</td><td>Minor</td></tr>
<tr><td>13) Parts mounting</td><td>(1) Failure to mount parts
(2) Parts not in the specifications are mounted
(3) For example: Polarity is reversed, HSC or TCP falls off.</td><td>Major</td></tr>
<tr><td>14) Part alignment</td><td>(1) LSI, IC lead width is more than 50% beyond pad outline.
(2) More than 50% of LSI, IC leads is off the pad outline.</td><td>Minor</td></tr>
<tr><td>15) Conductive foreign matter (solder ball, solder hips)</td><td>(1) 0.45<Φ, N≥1
(2) 0.3<Φ≤0.45, N≥1
Φ: Average diameter of solder ball (unit: mm)
(3) 0.5<L, N≥1
L: Average length of solder chip (unit: mm)</td><td>Major
Minor

Minor</td></tr>
<tr><td>16) PCB pattern damage</td><td>(1) Deep damage is found on copper foil and the pattern is nearly broken.
(2) Damage on copper foil other than 1) above</td><td>Major
Minor</td></tr>
<tr><td>17) Faulty PCB correction</td><td>(1) Due to PCB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair;2 or more places are corrected per PCB.
(2) Short-circuited part is cut, and no resist coating has been performed.</td><td>Minor</td></tr>
<tr><td>18) Bezel flaw</td><td>Bezel claw missing or not bent</td><td>Minor</td></tr>
<tr><td>19) Indication on name plate (sampling indication label)</td><td>(1) Failure to stamp or label error, or not legible.(all acceptable if legible)
(2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.</td><td>Minor</td></tr>
</table>

7. Reliability

7-1 Lifetime

50,000 hours (25℃ in the room without ray of sun)

7-2 Items of reliability

Item	Condition	Criterion
1) High Temperature Operating	60℃ 96hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value ± 10%. Total current consumption should be below double of initial value.
2) Low Temperature Operation	-20℃ 96hrs	
3) Humidity	40℃, 90%RH, 96hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value ± 20%. Total current consumption should be below double of initial value.
4) High Temperature	70℃ 96hrs	
5) Low Temperature	-30℃ 96hrs	
6) Thermal shock	25℃→30℃→25℃→70℃ 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	
7) Vibration	10~55~10hz amplitude: 1.5mm 2hrs for each direction (X,Y,Z)	No defects in cosmetic and operational function are allowable. Total current consumption should be below double of initial value.

8. Handling Precautions

8-1 Mounting method

A panel of LCD module consists of two thin glass plates with polarizer that easily gets damaged.

And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board (PCB).

Extreme care should be used when handling the LCD modules.

8-2 Cautions of LCD handling and cleaning

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

- □ Isopropyl alcohol
- □ Ethyl alcohol
- □ Trichlorotriflorothane

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

Do not use the following solvent:

- □ Water
- □ Ketone
- □ Aromatics

8-3 Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:

Connect any unused input terminal to V_{dd} or V_{ss}. Do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

8-4 Packaging

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

8-5 Caution for operation

- It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module.
  An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD module may show dark color in them. However those phenomena do not mean malfunction or out of order of LCD module, which will come back in the specified operating temperature.

8-6 Storage

In the case of storing for a long period of time, the following ways are recommended:

- Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.
- Storing with no touch on polarizer surface by any thing else.

8-7 Safety

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

9. Precautions for Use

9-1 Both parties should provide a limit sample on an occasion when both parties agree its necessity.
The judgment by a limit sample shall take effect after the limit sample has been established and confirmed by both parties

9-2 On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of the both parties.

-When a question is arisen in this manual.

-When a new problem is arisen this is not specified in this manual.

-Some problem is arisen due to the change of inspection and operating conditions in users.

-When a new problem is arisen at the customer’s operating set for sample evaluation in the customer site.

附录：部分程序代码，显示数据零

初始化程序

```
ST:     nop
        nop
        nop
        setb cs
        nop
        nop
        nop
        nop
        clr cs
        setb dat   ;100
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        nop       ;TNORMAL
        setb dat   ;1/1
        clr w_r
        setb w_r
        setb dat   ;2/1
        clr w_r
        setb w_r
        setb dat   ;3/1
        clr w_r
        setb w_r
        clr dat  ;4/0
        clr w_r
        setb w_r
        clr dat  ;5 /0
        clr w_r
        setb w_r
        clr dat   ;6 /0
        clr w_r
        setb w_r
        setb dat ;7/1
        clr w_r
        setb w_r
        setb dat ;8/1
        clr w_r
        setb w_r
        clr dat  ;9/0
        clr w_r
        setb w_r
        nop     ;RC32K
        clr dat   ;1/0
        clr w_r
        setb w_r
        clr dat   ;2/0
        clr w_r
        setb w_r
        clr dat   ;3/0
        clr w_r
        setb w_r
        setb dat      ;4/1
        clr w_r
        setb w_r
        setb dat      ;5/1
        clr w_r
        setb w_r
        clr dat ;6/0
        clr w_r
        setb w_r
        setb dat ;7/1
        clr w_r
        setb w_r
        clr dat  ;8/0
        clr w_r
        setb w_r
        clr dat  ;9/0
        clr w_r
        setb w_r
        nop;SYS   EN   turn   on
systemm oscillator
        clr dat   ;1/0
        clr w_r
        setb w_r
        clr dat   ;2 /0
        clr w_r
        setb w_r
        clr dat   ;3/0
        clr w_r
        setb w_r
        clr dat  ;4/0
        clr w_r
        setb w_r
        clr dat  ;5/0
        clr w_r
        setb w_r
        clr dat   ;6/0
        clr w_r
        setb w_r
        clr dat  ;7/0
        clr w_r
```

```
        setb w_r
        setb dat ;8/1
        clr w_r
        setb w_r
        clr dat   ;9/0
        clr w_r
        setb w_r
        nop
        clr dat   ;1/0;开显示
        clr w_r
        setb w_r
        clr dat   ;2/0
        clr w_r
        setb w_r
        clr dat   ;3/0
        clr w_r
        setb w_r
        clr dat   ;4/0
        clr w_r
        setb w_r
        clr dat   ;5/0
        clr w_r
        setb w_r
        clr dat   ;6/0
        clr w_r
        setb w_r
        setb dat   ;7/1
        clr w_r
        setb w_r
        setb dat   ;8/1
        clr w_r
        setb w_r
        clr dat   ;9/0
        clr w_r
        setb w_r
        nop
        setb cs
aa1:    nop      ;全显
        setb cs
        nop
        nop
        nop
        nop
        clr cs
        setb dat   ;写数据指令 101
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        setb dat
        clr w_r
        setb w_r
        nop
        clr dat
        clr w_r      ;送地址 00
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        nop
clear:nop       ;clear display
        setb cs
        nop
        nop
        nop
        nop
        clr cs
        setb dat   ;101data
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        setb dat
        clr w_r
        setb w_r
        nop
        clr dat
        clr w_r   ;write address00
```

```
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        nop
        mov r0,#0BCH
clear1:clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        djnz r0,clear1
        setb cs
        ret

onedata:nop     ;
        nop     ;
        setb cs
        nop
        nop
        nop
        nop
        clr cs
        setb dat   ;101data
        clr w_r
        setb w_r
        clr dat
        clr w_r
        setb w_r
        setb dat
        clr w_r
        setb w_r
        nop
        mov a,r0   ;send a address
        rlc a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        rlc   a
        mov dat,c
        clr w_r
        setb w_r
        nop//送一个数据
        mov a,r1    ;
        rrc a
        mov dat,c
        clr w_r
        setb w_r
        rrc a
```

```
        mov dat,c
        clr w_r
        setb w_r
        rrc a
        mov dat,c
        clr w_r
        setb w_r
        rrc a
        mov dat,c
        clr w_r
        setb w_r
        nop
        setb cs
        ret

delay:  MOV R7,#00H
  L1:   MOV R6,#00H
  L0:   DJNZ R6,L0
        DJNZ R7,L1

        RET

        END
```