DATA IMAGE CORPORATION

LCD Module Specification

ITEM NO.: **CM160200SFAYB-01**

Table of Contents

R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
James	Murphy.	Ken	helen
Version:	Issued Date:	Sheet Code:	Total Pages:
	2002/8/26		26

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
B	26/AUG/02	11.2.3, 11.3	21-22	1.Change: 11.2.3 Inspection Parameters. 2.Add:11.3 Sampling Condition.
	26/AUG/02	13	23	New model numbering system update from old P/N# CM1621S1LYH-J2

3. GENERAL SPECIFICATION

Display Format :	16characters (W)	×	2lines (H)		
Character Size :	4.84 (W)	×	8.06 (H)		mm
View Area :	99 (W)	×	24 (H)		mm
General Dimensions :	122 (W)	×	44 (H)	× 14.5 (T)	mm Max.
Weight :	76 g max.				

LCD Type : ☐ STN Gray ☑ STN Yellow ☐ FSTN

Polarizer mode : ☐ Reflective ☑ Transflective

☐ Transmissive ☐ Negative

View Angle : ☑ 6 O'clock ☐ 12 O'clock ☐ Others _____

Backlight : ☑ LED ☐ EL ☐ CCFL

Backlight Color : ☑ Yellow green ☐ Amber ☐ Blue Green

☐ White ☐ Others

Controller / Driver : KS0066

Temperature Range :

☐ Normal		☑ Wide Temperature	
Operating	0 to 50°C	Operating	-20 to 70°C
Storage	-20 to 70°C	Storage	-30 to 80°C

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

V_{SS}= 0V, Ta = 25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	V_{DD}-V_{SS}	0	7	V
Supply Voltage (LCD Driver)	V_{DD}-V_{EE}	1.5	13.5	V
Input Voltage	V_I	V_{SS}	V_{DD}	V
Operating Temperature	T_{OP}	-20	70	℃
Storage Temperature	T_{STG}	-30	80	℃

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Storage		Comment
	(Min.)	Max.)	(Min.)	(Max.)	
Ambient Temp	-20	70	-30	80	Note (1)
Humidity	Note (2)		Note(2)		Without Condensation
Vibration	--	4.9M/S^2	--	19.6M/S^2	XYZ Direction
Shock	--	29.4M/S^2	--	490M/S^2	XYZ Direction

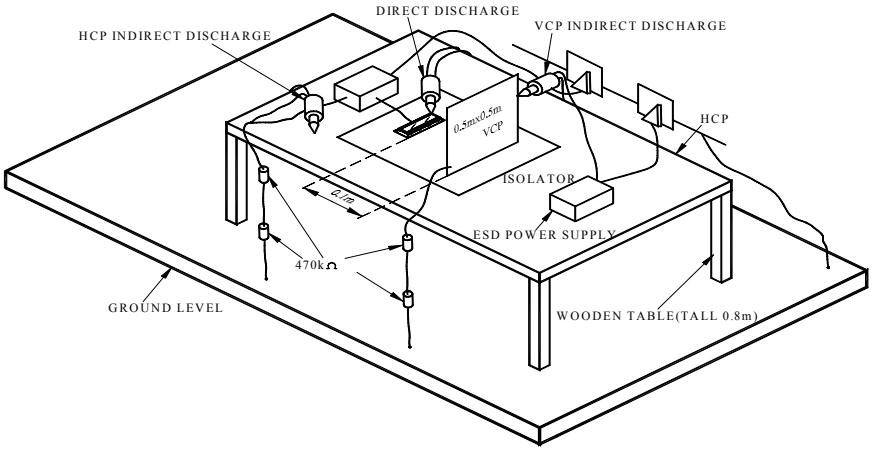
Note(1) Ta = 0°C : 50Hr Max.
Note(2) Ta ≤ 40°C : 90% RH Max.
Ta ≥ 40°C : Absolute humidity must be lower than the humidity of 90% RH at 40°C.

4.3 Electronic Static Discharge maximum rating

ESD test method : IEC1000-4-2

Item	Description	
Testing environment	Ambient temperature :15°C to 35 °C Humidity: 30% to 60 % LCM (E.U.T) : Power up	
Testing equipment	Manufacture: NoiseKen, Model No. ESD-100L	
Testing condition	See drawing 1	
Direct discharge	0 to ± 6 KV	Discharge point, see drawing 2
Indirect discharge	0 to ± 12KV	Discharge point, see drawing 1
Pass condition	No malfunction of unit. Temporary malfunction of unit which can be recovered by system reset	
Fail condition	Non. Recoverable malfunction of LCM or system	

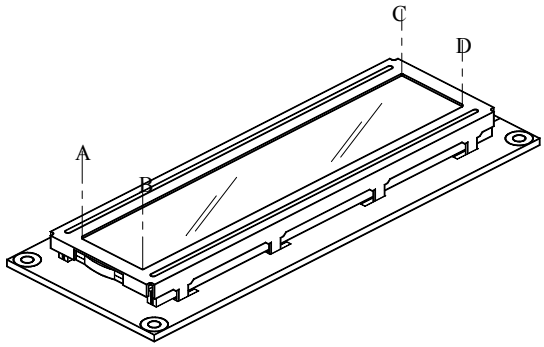
FIG 1 ESD TESTING EQUIPMENT



(1)

DIRECT CONTACT DISCHARGE

CONTACT POINT : A.B.C.D



(2)

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	V_{DD}-V_{SS}		2.7	5.0	5.5	V
Supply Voltage (LCD)	V_{DD}-V_{EE}	-20°C	4.4	4.8	5.0	V
		25°C	4.2	4.5	4.8	
		70°C	3.4	3.7	4.1	
Input Voltage	V_{IH}	--	0.7*V_{DD}	--	V_{DD}	V
	V_{IL}		V_{SS}	--	0.3*V_{DD}	
Logic Supply Current	I_{DD}	V_{DD}-V_{SS}=5V	--	2.0	--	mA

6. ELECTRO-OPTICAL CHARACTERISTICS

ITEM	Symbol	Condition	Min.	Typ.	Max.	Unit	Ref.
Rise Time	Tr	0°C	--	1100	1800	ms	Note (1)
		25°C		420	670		
Fall Time	Tf	0°C	--	210	340	ms	
		25°C		100	300		
Contrast	CR	25°C	--	6	--		Note (3)
View Angle	θ1~θ2	25°C & CR≧2	--	80	--		Note (2)
	∅1, ∅2		--	30	--		
Frame Frequency	Ff	25°C	--	64	--	Hz	

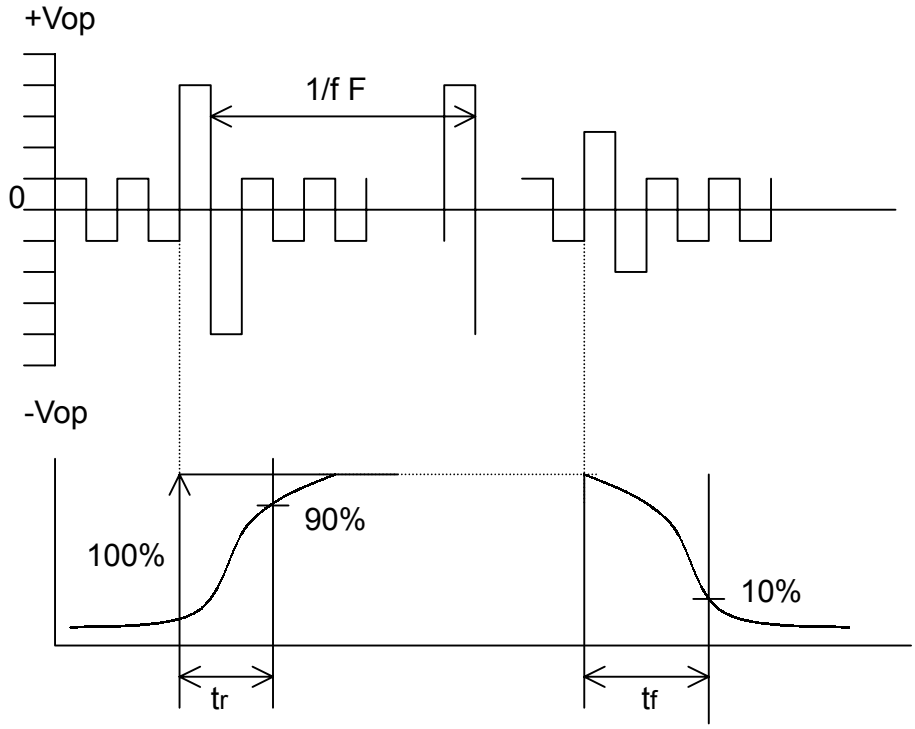
Note (1) & (2) : See next page

Note (3) : Contrast ration is defined under the following condition:

$$CR = \frac{\text{Brightness of non-selected condition}}{\text{Brightness of selected condition}}$$

(a). Temperature ---------- 25°C
(b). Frame frequency ---- 64Hz
(c). Viewing angle -------- θ= 0°, ∅ = 0°
(d). Operating voltage --- 4.5V

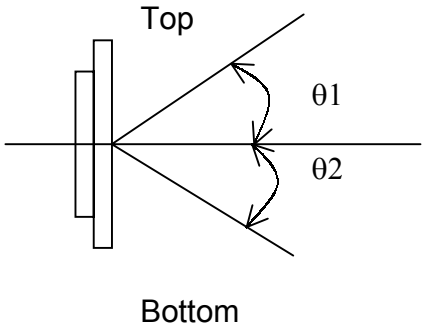
Note (1) Response time is measured as the shortest period of time possible between the change in state of an LCD segment as demonstrated below:



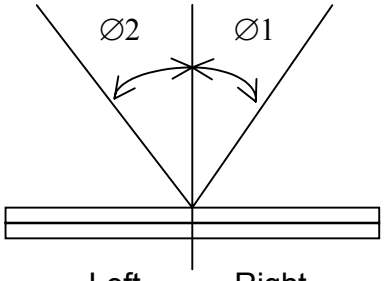
Condition:
(a) . Temperature ----------25°C
(b) . Frame frequency --------- 64Hz
(c) . View Angle ---------- θ = 0°, ∅=0°
(d) . Operating voltage -------- 4.5V

Note (2) Definition of View Angle

Top – Bottom direction



Right -- Left direction



6.1 LED ELECTRO-OPTICAL CHARACTERISTIC

Ta = 25°C

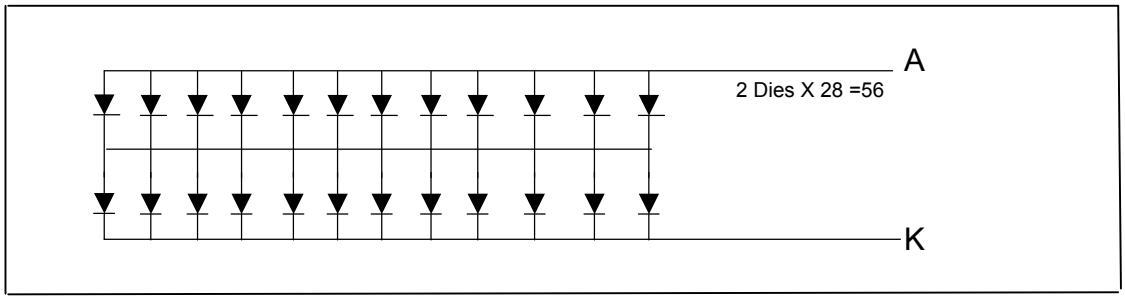
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	IF = 280mA Yellow Green	--	4.2	4.6	V
Luminous Intensity	I_V	IF = 280mA Yellow Green	70	140	--	cd/m^2
Peak Emission	λP	IF = 280mA Yellow Green	--	570	--	nm
Spectrum Radiation	$\Delta\lambda$	IF = 280mA Yellow Green	--	30	--	nm
Reverse Current	IR	VR = 8V Yellow Green	--	--	0.2	mA

Note : Measured at the bared LED backlight unit.

6.2 LED MAXIMUM OPERATING RANGE

Item	Symbol	Yellow Green	Unit
Power Dissipation	P_{AD}	1.8	W
Forward Current	I_{AF}	420	mA
Reverse Voltage	VR	8	V

6.2.1 LED ARRAY BLOCK DIAGRAM



6.2.2 LED POWER SOURCE

	Option	Power source	Jumper setting
LED	A	VDD/VSS	J1,J3,R9
	B	15K/16A	J2,J5,J7
	C	A/K	NONE
	Nil	15A/16K	J2,J4,J6
GND	BZL GND		J8
	FRM GND		J9

7. TIMING CHARACTERISTICS

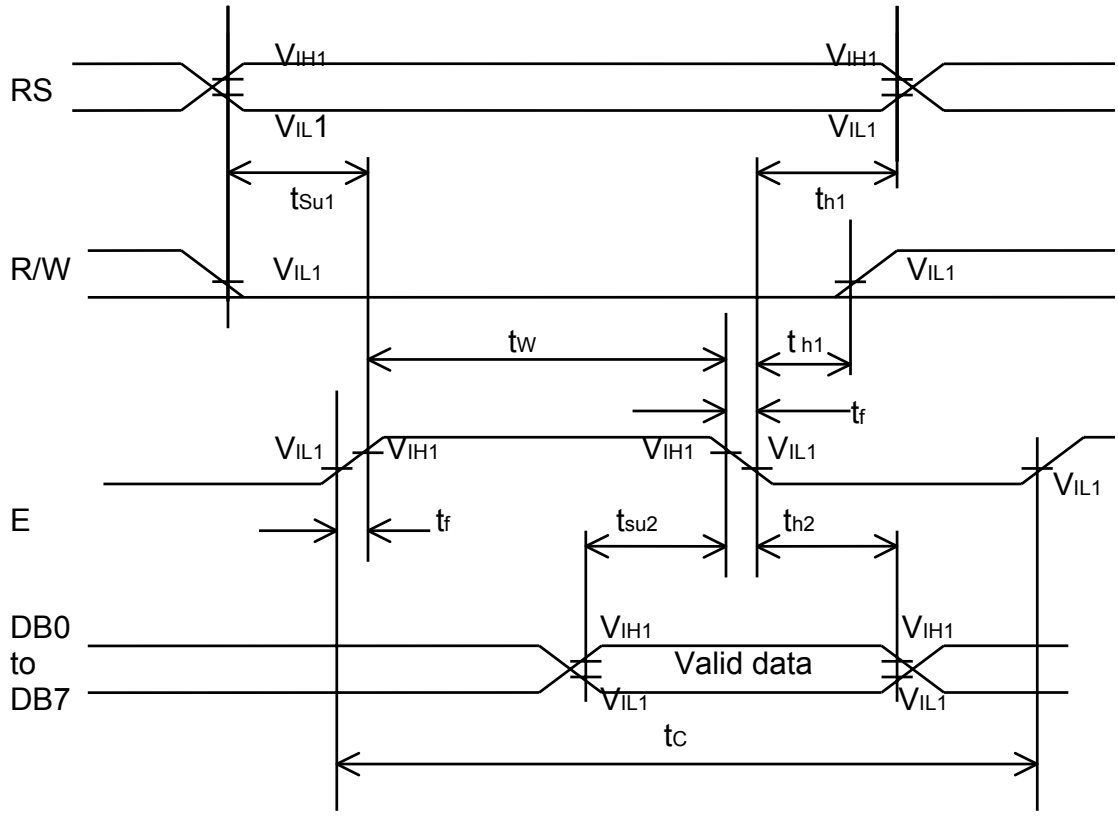
7.1 WRITE TIMING

AC characteristics (VDD=4.5v~5.5v,Ta=-30~85℃)

Item	Symbol	Condition	Min.	Max.	Unit
E cycle time	tc	VDD = 5V	500	--	ns
E pulse width (high level)	tw		230	--	
E rise/fall time	tR, tF		--	20	
R/W and RS Setup time	tsu1		40	--	
R/W and RS Hold time	tH1		10	--	
Data setup time	tsu2		80	--	
Data hold time	tH2		10	--	

AC characteristics (VDD=2.7v~4.5v,Ta=-30~85℃)

Item	Symbol	Condition	Min.	Max.	Unit
E cycle time	tc	VDD = 3V	1000	--	ns
E pulse width (high level)	tw		450	--	
E rise/fall time	tR, tF		--	25	
R/W and RS Setup time	tsu1		60	--	
R/W and RS Hold time	tH1		20	--	
Data setup time	tsu2		195	--	
Data hold time	tH2		10	--	



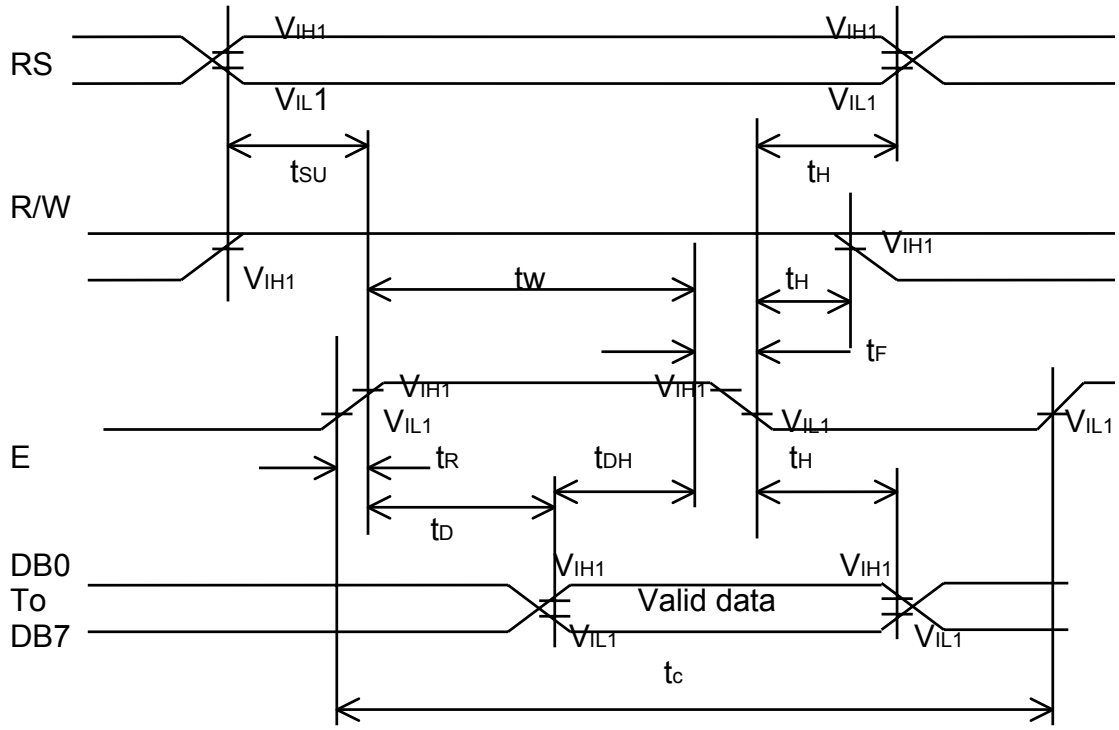
7.2 READ TIMING

AC characteristics (VDD=4.5v~5.5v,Ta=-30~85℃)

Item	Symbol	Condition	Min.	Max.	Unit
E cycle time	tc	VDD = 5V	500	--	ns
E pulse width (high level)	tw		230	--	
E rise/fall time	tR, tF		--	20	
R/W and RS shetup time	tsu		40	--	
R/W and RS hold time	tH		10	--	
Data output delay time	tD		--	120	
Data hold time	tDH		5	--	

AC characteristics (VDD=2.7v~4.5v,Ta=-30~85℃)

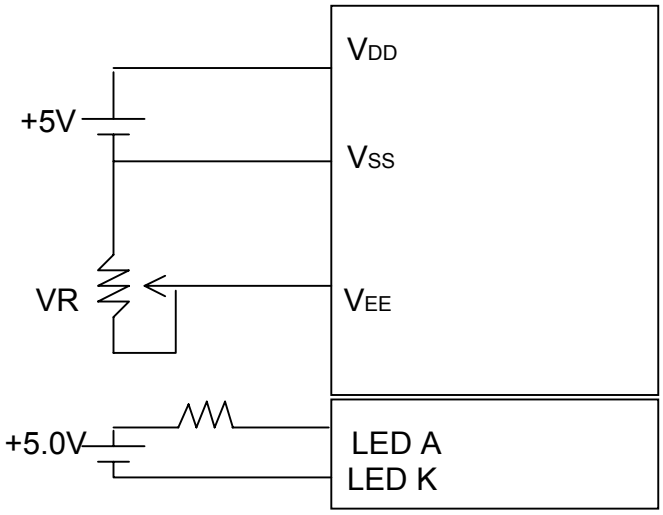
Item	Symbol	Condition	Min.	Max.	Unit
E cycle time	tc	VDD = 3V	1000	--	ns
E pulse width (high level)	tw		450	--	
E rise/fall time	tR, tF		--	25	
R/W and RS setup time	tsu		60	--	
R/W and RS hold time	tH		20	--	
Data output delay time	tD			--	
Data hold time	tDH		5	--	



8. PIN CONNECTIONS

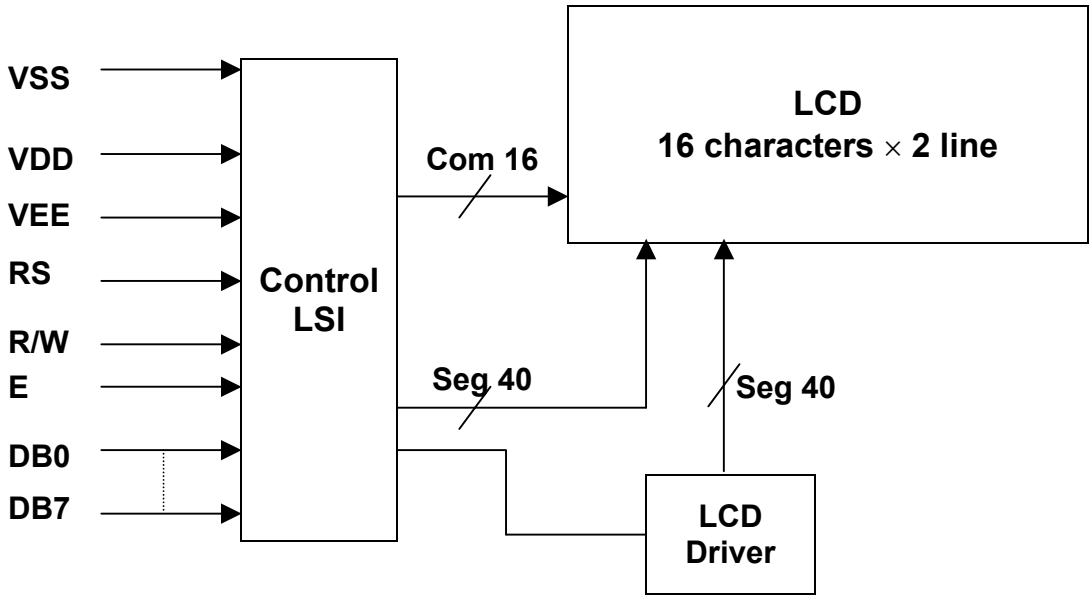
No.	Symbol	Function
1	VSS	Ground, 0V
2	VDD	Logic power supply, +5V
3	VEE	Voltage for LCD drive
4	RS	Data / Instruction register select
5	R/W	Read / Write
6	E	Enable signal, start data read/write
7	DB0	Data Bus Line
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	LED A	LED Anode, power supply +
16	LED K	LED Cathode, ground 0V

9. POWER SUPPLY



VR = 10K

10. BLOCK DIAGRAM



10.1 INSTRUCTIONS

Instruction	Instruction Code										DESCRIPTION	Executed Time(fosc =270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write “20H” to DDRAM and set DDRAM address to “00H ” from AC	1.53mS
Cursor At Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to “00H” from AC and return cursor to its original Position if shifted. The contents of DDRAM are not changed.	1.53mS
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39μS
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor(C), and Blinking of cursor(B) ON/OFF control bit.	39μS
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shifts cursor bit, and the direction, without changing of DDRAM data.	39μS
Function Set	0	0	0	0	1	DL	N	F	-	-	Sets interface data length (DL:8-BIT/4-BIT), number of display lines(N:2-line/1-line) and, display font type (F:5x11dots/5x8 dots).	39μS
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39μS
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39μS
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0μS
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM / CGRAM)	43μS
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Reads data from internal RAM (DDRAM / CGRAM).	43μS

*"-":don’t care

NOTE : When an MPU program with checking the Busy Flag(DB7) is made, it must be necessary 1/2Fosc is necessary for executing the next instruction by the falling edge of the ‘E’ signal after the Busy Flag(DB7)goes to “LOW” .

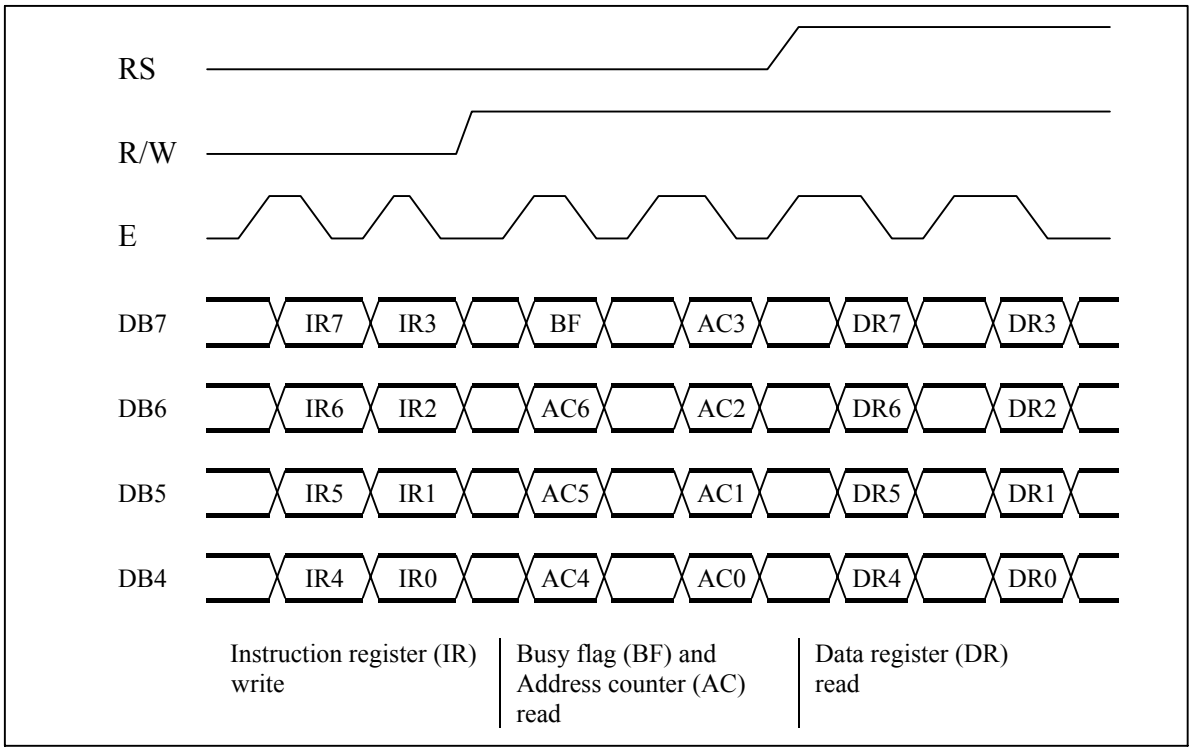
10.2 8-Bit Operation,8-Digit×2-Line Display Example

Step	Instruction											
No	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Display	Operation
1	Power supply on (the IC is initialized by the Internal reset circuit)											Initialized. No display.
2	Function set											Sets to 8-bit operation and selects 2-line display and 5×8 dot character font.
	0	0	0	0	1	1	1	0	*	*		
3	Display on/off control											Turns on display and cursor. All display is in space mode because of initialization.
	0	0	0	0	0	0	1	1	1	0		
4	Entry mode set											Sets mode to increment the address by one and to shift the cursor to the right at the time of write to the DD/CGRAM. Display is not shifted.
	0	0	0	0	0	0	0	1	1	0		
5	Write data to CGRAM/DDRAM										H_	Writes H. DDRAM has already been selected by initialization when the power was turned on. The cursor is incremented by one and shifted to the right
	1	0	0	1	0	0	1	0	0	0		
6	⋮										⋮	
7	Write data to CGRAM/DDRAM										HITACHI_	Writes I.
	1	0	0	1	0	0	1	0	0	1		
8	Set DDRAM address										HITACHI _	Sets DDRAM address so that t The cursor is positioned at the Head of the second lime.
	0	0	1	1	0	0	0	0	0	0		
9	Write data to CGRAM/DDRAM										HITACHI M_	Writes M.
	1	0	0	1	0	0	1	1	0	1		
10	⋮										⋮	
11	Write data to CGRAM/DDRAM										HITACHI MICROCO_	Writes O.
	1	0	0	1	0	0	1	1	1	1		
12	Entry mode set										HITACHI MICROCO_	Sets mode to shift display at the time of write.
	0	0	0	0	0	0	0	1	1	1		
13	Write data to CGRAM/DDRAM										ITACHI ICROCOM_	Writes M. Display is shifted to the left. The first and second lines both shift at the same time.
	1	0	0	1	0	0	1	1	0	1		
14	⋮										⋮	
15	Return home										HITACHI MICROCOM	Returns both display and cursor to the original position (address 0).
	0	0	0	0	0	0	0	0	1	0		

10.3 Interfacing to the MPU

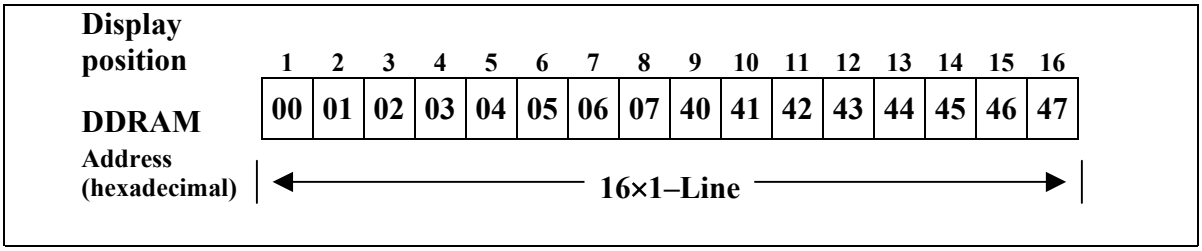
The IC can send data in either two 4-bit operations, thus allowing interfacing with 4- or 8-bit MPUs.

- For 4-bit interface data, only four bus lines (DB4 to DB7) are used for transfer. Bus lines DB0 to DB3 are disabled. The data transfer between the IC and the MPU is completed after the 4-bit data has been transferred twice. As for the order of data transfer, the four high order bits (for 8-bit operation,DB4 to DB7) are transferred before the four low order bits (for 8-bit operation, DB0 to DB3).
  The busy flag must be checked (one instruction) after the 4-bit data has been transferred twice. Two more 4-bit operations then transfer the busy flag and address counter data.

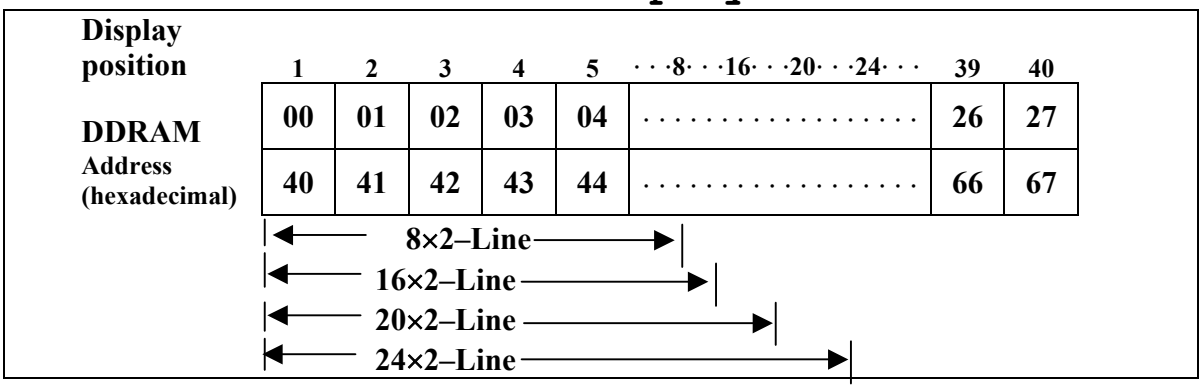


4-Bit Transfer Example

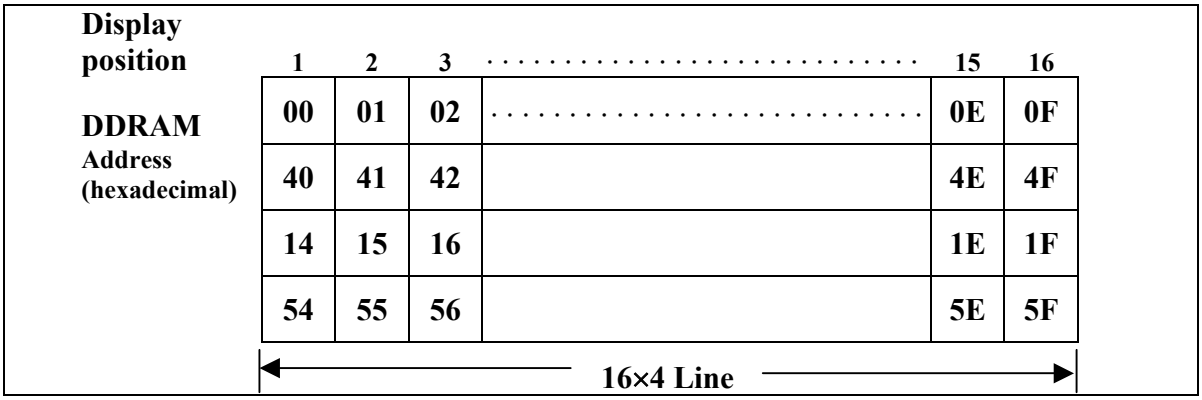
10.4 1-Line Display

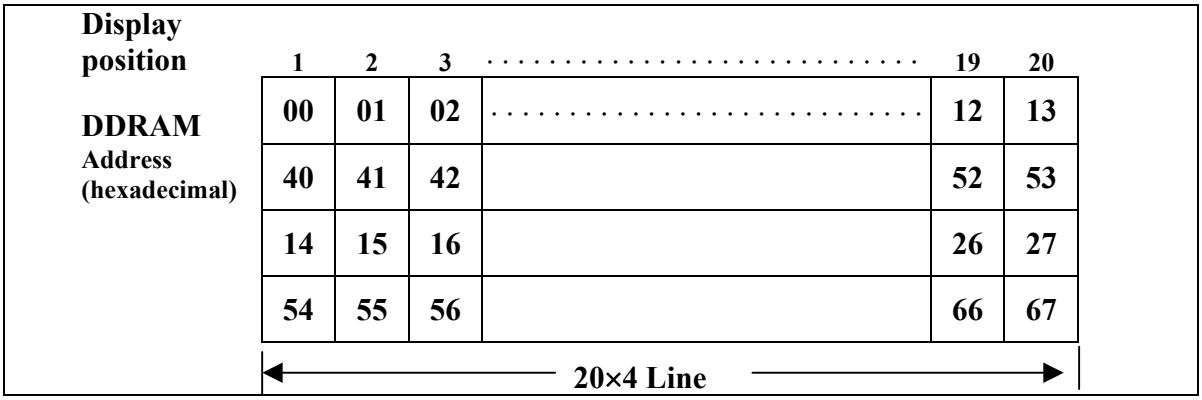


2-Line Display



4-Line Display





10.5 CGRAM

Relationship between CGRAM Addresses, Character Codes (DDRAM) and Patterns (CGRAM Data)

For 5×8 dot character patterns

Character Codes (DDRAM data)	CGRAM Address	Character Patterns (CGRAM data)	
7 6 5 4 3 2 1 0 High Low	5 4 3 2 1 0 High Low	7 6 5 4 3 2 1 0 High Low	
0 0 0 0 ∗ 0 0 0	0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 1 0 1 1 1 0 1 1 1	∗ ∗ ∗ 1 1 1 1 0 1 0 0 0 1 1 0 0 0 1 1 1 1 1 0 1 0 1 0 0 1 0 0 1 0 1 0 0 0 1 ∗ ∗ ∗ 0 0 0 0 0	Character Pattern (1) } Cursor position
0 0 0 0 ∗ 0 0 1	0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 1 0 1 1 1 0 1 1 1	∗ ∗ ∗ 1 0 0 0 1 0 1 0 1 0 1 1 1 1 1 0 0 1 0 0 1 1 1 1 1 0 0 1 0 0 0 0 1 0 0 ∗ ∗ ∗ 0 0 0 0 0	Character Pattern (2) } Cursor position
	0 0 0 0 0 1	∗ ∗ ∗	
0 0 0 0 ∗ 1 1 1	1 1 1 1 0 0 1 0 1 1 1 0 1 1 1	∗ ∗ ∗	

Notes :

1. **Character code bits 0 to 2 correspond to CGRAM address bits 3 to 5 (3 bits: 8 types).**
2. **CGRAM address bits 0 to 2 designate the character pattern line position. The 8th line is the cursor position and its display is formed by a logical OR with the cursor. Maintain the 8th line data, corresponding to the cursor display position, at 0 as the cursor display.**
   If the 8th line data is 1, 1 bits will light up the 8th line regardless of the cursor presence.
3. **Character pattern row positions correspond to CGRAM data bits 0 to 4 (bit 4 being at the left).**
4. **As shown Table 5, CGRAM character patterns are selected when character code bits 4 to 7 are all 0. However, since character code bit 3 has no effect, the R display example above can be selected by either character code 00H or 08H.**
5. **1 for CGRAM data corresponds to display selection and 0 to non-selection.**

∗ **Indicates no effect.**

10.6 Correspondence between Character Codes and Character Patterns (ROM Code:A00)

Note: The user can specify any pattern for character-generator RAM.

11. QUALITY ASSURANCE

11.1 Test Condition

11.1.1 Temperature and Humidity(Ambient Temperature)
Temperature : 20 ± 5°C
Humidity : 65 ± 5%

11.1.2 Operation
Unless specified otherwise, test will be conducted under function state.

11.1.3 Container
Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

11.1.4 Test Frequency
In case of related to deterioration such as shock test. It will be conducted only once.

11.1.5 Test Method

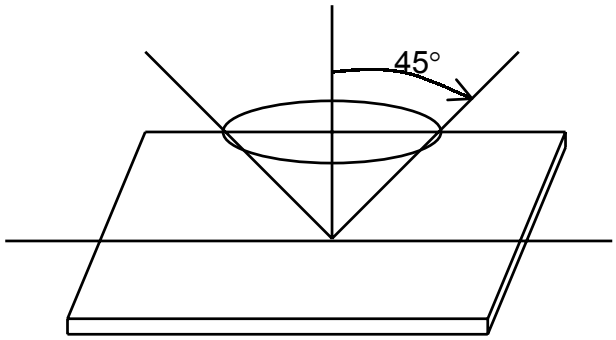
No.	Parameter	Conditions	Regulations
1	High Temperature Operating	70 ± 2 °C	Note 3
2	Low Temperature Operating	-20 ± 2 °C	Note 3
3	High Temperature Storage	80 ± 2 °C	Note 3
4	Low Temperature Storage	-30 ± 2 °C	Note 3
5	Vibration Test (Non-operation state)	Total fixed amplitude : 1.5mm Vibration Frequency : 10 ~ 55Hz One cycle 60 seconds to 3 directions of X.Y.Z. for each 15 minutes	Note 3
6	Damp Proof Test (Non-operation state)	40°C ± 2°C, 90~95%RH, 96h	Note 1,2
7	Shock Test (Non-operation state)	To be measured after dropping from 60cm high once concrete surface in packing state	Note 3

Note 1: Returned under normal temperature and humidity for 4 hrs.
Note 2: No dew condensation to be observed.
Note 3: No change on display and in operation under the test condition

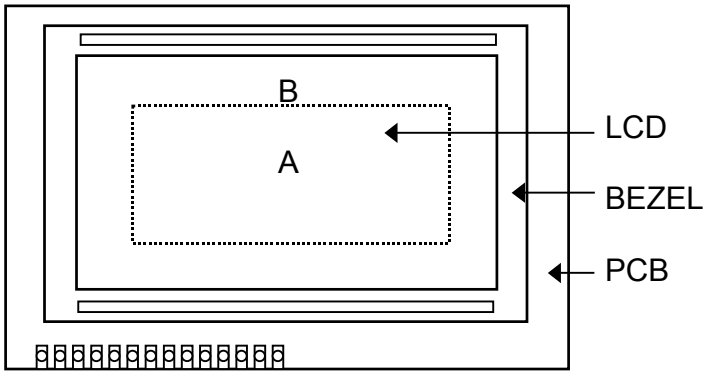
11.2 Inspection condition

11.2.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

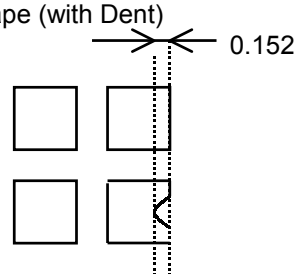


11.2.2 Definition of applicable Zones

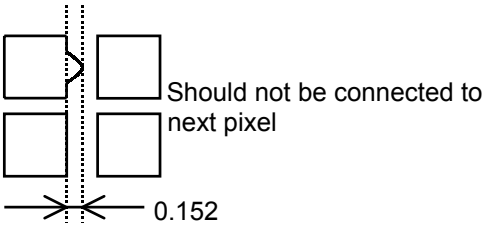


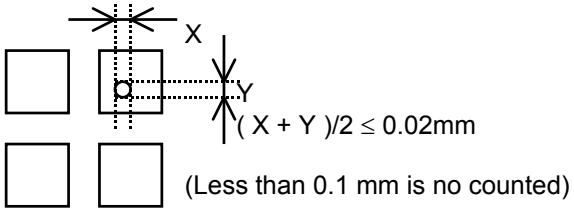
A : Display Area
B : Non-Display Area

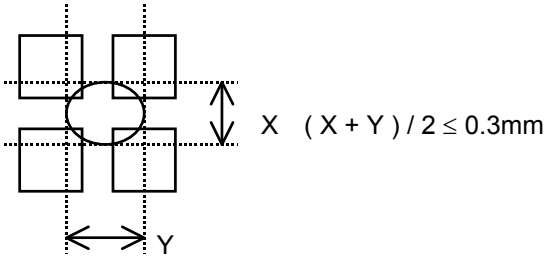
11.2.3 Inspection Parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension</th><th colspan="2">Acceptable number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D < 0.15</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.15≤ D< 0.2</td><td>4</td><td>4</td></tr>
<tr><td>0.2 ≤ D ≤ 0.25</td><td>2</td><td>2</td></tr>
<tr><td>D ≤ 0.3</td><td>0</td><td>1</td></tr>
</table>
D = (Long + Short) / 2 * : Disregard
</td></tr>
<tr><td>2</td><td>Scratch, Substances</td><td>
<table>
<tr><th rowspan="2">Zone
X (mm) Y(mm)</th><th colspan="2">Acceptable number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>*</td><td>0.04 ≥ W</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>3.0 ≥ L</td><td>0.06 ≥ W</td><td>4</td><td>4</td></tr>
<tr><td>2.0 ≥ L</td><td>0.08 ≥ W</td><td>2</td><td>3</td></tr>
<tr><td>—</td><td>0.1 < W</td><td>0</td><td>1</td></tr>
</table>
X : Length Y : Width * : Disregard
Total defects should not exceed 4/module
</td></tr>
<tr><td>3</td><td>Air Bubbles
(between glass & polarizer)</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension</th><th colspan="2">Acceptable number</th><th rowspan="2">Class of Defects</th><th rowspan="2">AQL Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D ≤ 0.15</td><td>*</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>0.15 < D ≤ 0.25</td><td>2</td><td>*</td></tr>
<tr><td>0.25 < D</td><td>0</td><td>1</td></tr>
</table>
* : Disregard
Total defects shall not excess 3/module.
</td></tr>
<tr><td>4</td><td>Uniformity of Pixel</td><td>(1) Pixel shape (with Dent)
 

</td></tr>
</table>

<table>
<tr><td>4</td><td colspan="2">Uniformity of Pixel</td><td>(2) Pixel shape (with Projection)
 

(3) Pin hole
 

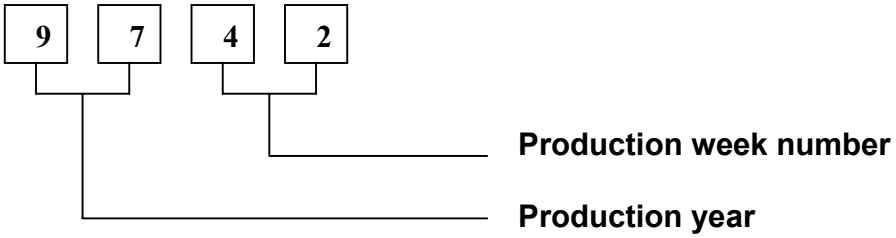
(4) Deformation
 

Total acceptable number : 1/pixel, 5/cell</td></tr>
<tr><td rowspan="4">Class of defects</td><td rowspan="2">Major</td><td>AQL 0.65%</td><td>Definition</td></tr>
<tr><td>AQL 1.00%</td><td>It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
It is a defect that is likely to assembly size and not result in functioning problem.</td></tr>
<tr><td>Minor</td><td>AQL 2.5%</td><td>It is a defect that will not result in functioning problem with deviation classified.</td></tr>
</table>

11.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Inspection level: Level II
Sampling table: MIL-STD-105E

12. LOT NUMBERING SYSTEM



13. LCM NUMBERING SYSTEM

CM 160200 S F A Y B – 01

VERSION :01

View direction & Temp. Range
A–Bottom view 6H & Normal temp.
B–Bottom view 6H & Wide temp.
C–Top View & Normal temp.
D–Top View & Wide temp.

Backlight Color
B –Blue
W –White
Y – Yellow

Backlight
S –edge light LED B/L
E –EL
A –Array LED B/L

MODE
M – transmissive R – Reflective
F – transflective N - Negative

LCD type
P – FSTN Paper white
F – FSTN
S – STN Yellow
G –STN Gray

Series code
160**00**–16 characters X 2 lines; **0** LCD Type, **0**PCB Type

Model type
CM – Character Module
GM – Graphic Module
TG –Single TAB Graphic Module
TX–Custom Single TAB Graphic Module

14. PRECAUTION FOR USING LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degredation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting . Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.

(2). The modules should be kept in antistatic bags or other containers resistant to static for storage.

(3). Only properly grounded soldering irons should be used.

(4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

(5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

(6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3 Soldering

(1). Solder only to the I/O terminals.

(2). Use only soldering irons with proper grounding and no leakage.

(3). Soldering temperature : 280°C ± 10°C

(4). Soldering time: 3 to 4 sec.

(5). Use eutectic solder with resin flux fill.

(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4 Operation

(1). The viewing angle can be adjusted by varying the LCD driving voltage V0.

(2). Driving voltage should be kept within specified range; excess voltage shortens display life.

(3). Response time increases with decrease in temperature.

(4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

(5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

2.5 Storage

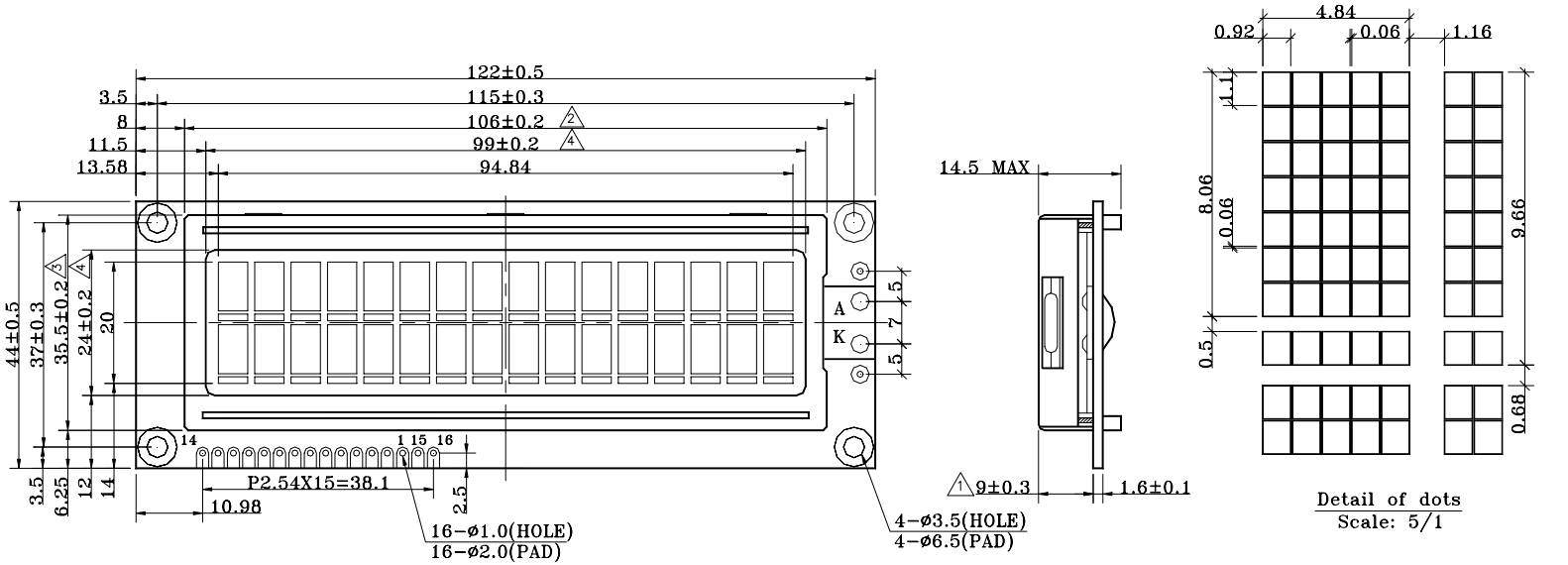
If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

2.6 Limited Warranty

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

15. OUTLINE DRAWING

UNITS MM



PIN FUNCTIONS	
1. VSS	9. DB2
2. VDD	10. DB3
3. VEE	11. DB4
4. RS	12. DB5
5. R/W	13. DB6
6. E	14. DB7
7. DB0	15. LEDA
8. DB1	16. LEDK

Note: tolerance is ±0.3 unless otherwise noted.

16. PACKAGE INFORMATION