DATA IMAGE CORPORATION

LCD Module Specification

ITEM NO.: **GM123210SFSYBG06**

Table of Contents

Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	Jack	*Eric*	*Ken*	*Huang*
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	A	2007/6/2		21

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
A	07/6/2			New Release

3. GENERAL SPECIFICATION

Display Format :   122dots (W) ×   32dots (H)

Dot Size :   0.4 (W) ×   0.45 (H) mm

Dot Pitch   0.44 (W) ×   0.49 (H) mm

View Area :   60.6 (W) ×   20.0 (H) mm

General Dimensions :   65.4 (W) ×   30 (H) ×   6 (T) mm Max.

Weight :   13 g max.

LCD Type &   ☐ STN   ☑ STN   ☐ FSTN
Background Color: Blue Gray   Yellow Green   Dark Gray

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 :   SBN1661G-M18

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

Pixel Color: Blue

Remark:

   Our components and processes are compliant to RoHS standard.

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

$V_{SS}= 0V, \quad Ta = 25°C$

Item	Symbol	Min.	Max.	Unit
Supply Voltage (Logic)	V_{DD}-V_{SS}	-0.3	7	V
Supply Voltage (LCD Driver)	V_{DD}-V_{O}		13	V
Input Voltage	V_I	-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{STG}	-30	80	°C

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　$\leq 40°C$:　90% RH Max.

　　　　Ta　$\geq 40°C$:　Absolute humidity must be lower than the humidity of 90% RH at 40°C.

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)	$V_{DD}-V_o$	-20°C	6.9	7.5	8.1	V
		25°C	5.8	6.4	6.9	
		70°C	4.8	5.3	5.8	
Input Voltage	V_{IH}	--	VDD-1.2	--	VDD	V
	V_{IL}		0	--	0.8	
Logic Supply Current	I_{DD}	$V_{DD}-V_{SS}$=5V	--	1.2	--	mA

6. ELECTRO-OPTICAL CHARACTERISTICS

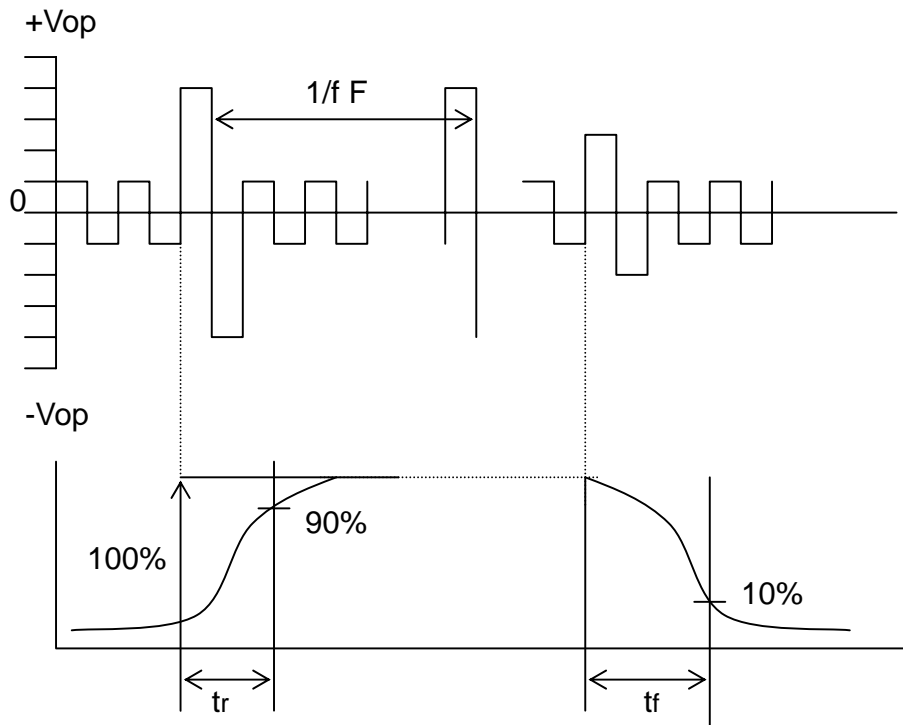| ITEM	Symbol	Condition	Min.	Typ.	Max.	Unit	Ref.
Rise Time	Tr	0°C	--	--	--	ms	Note (1)
		25°C		120	240		
Fall Time	Tf	0°C	--	--	--	ms	
		25°C		200	350		
Contrast	CR	25°C	3	4	--		Note (3)
View Angle	θ1~θ2 ∅1, ∅2	25°C & CR≥1.5	--	--	80		Note (2)
			-30	--	30		
Frame Frequency	Ff	25°C	--	64	--	Hz	

Note (1) & (2) : See next page
Note (3) : Contrast ratio 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
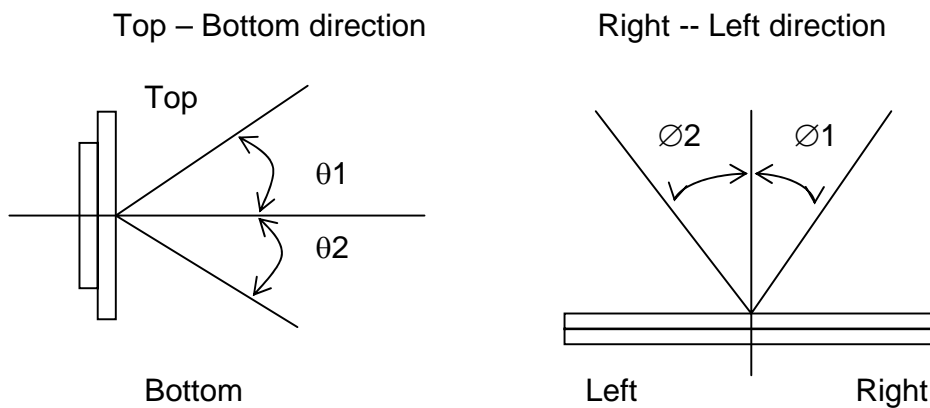(c). Viewing angle -------- θ= 0°, ∅ = 0°
(d). Operating voltage --- 6.4V

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:

+Vop

1/f F

0

-Vop

100%
90%
10%

tr

tf

Condition:
(a).   Temperature ---------------25°C
(b).   Frame frequency --------- 64Hz
(c).   View Angle ----------------- $\theta = 0°$, $\varnothing = 0°$
(d).   Operating voltage -------- 6.4V

Note (2)   Definition of View Angle

Top – Bottom direction

Top

$\theta 1$

$\theta 2$

Bottom

Right -- Left direction

$\varnothing 2$ $\varnothing 1$

Left   Right

6.1 LED ELECTRO-OPTICAL CHARACTERISTIC

Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF = 150mA Yellow Green	--	2.1	2.3	V
Luminous Intensity	Iv	IF = 150mA Yellow Green	12	15	--	cd/m²
Peak Emission	λP	IF = 150mA Yellow Green	567	572	577	nm
Spectrum Radiation	Δλ	IF = 150mA Yellow Green	--	--	--	nm
Reverse Current	IR	VR = 2.1V Yellow Green	--	--	--	mA

Note : Measured at the bared LED backlight unit.

6.2 LED MAXIMUM OPERATING RANGE

Item	Symbol	Yellow Green	Unit
Power Dissipation	PAD	0.46	W
Forward Current	IAF	200	mA
Reverse Voltage	VR	4	V

A

K

10 dice
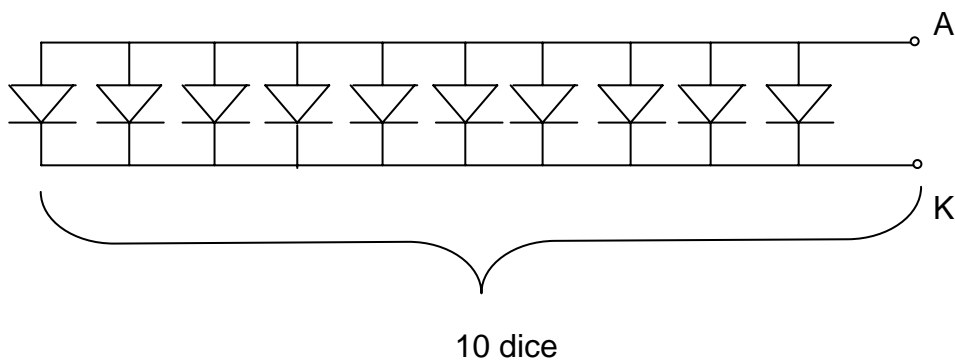
7. TIMING CHARACTERISTICS

7.1 AC timing for interface with an 80-type microcontroller.
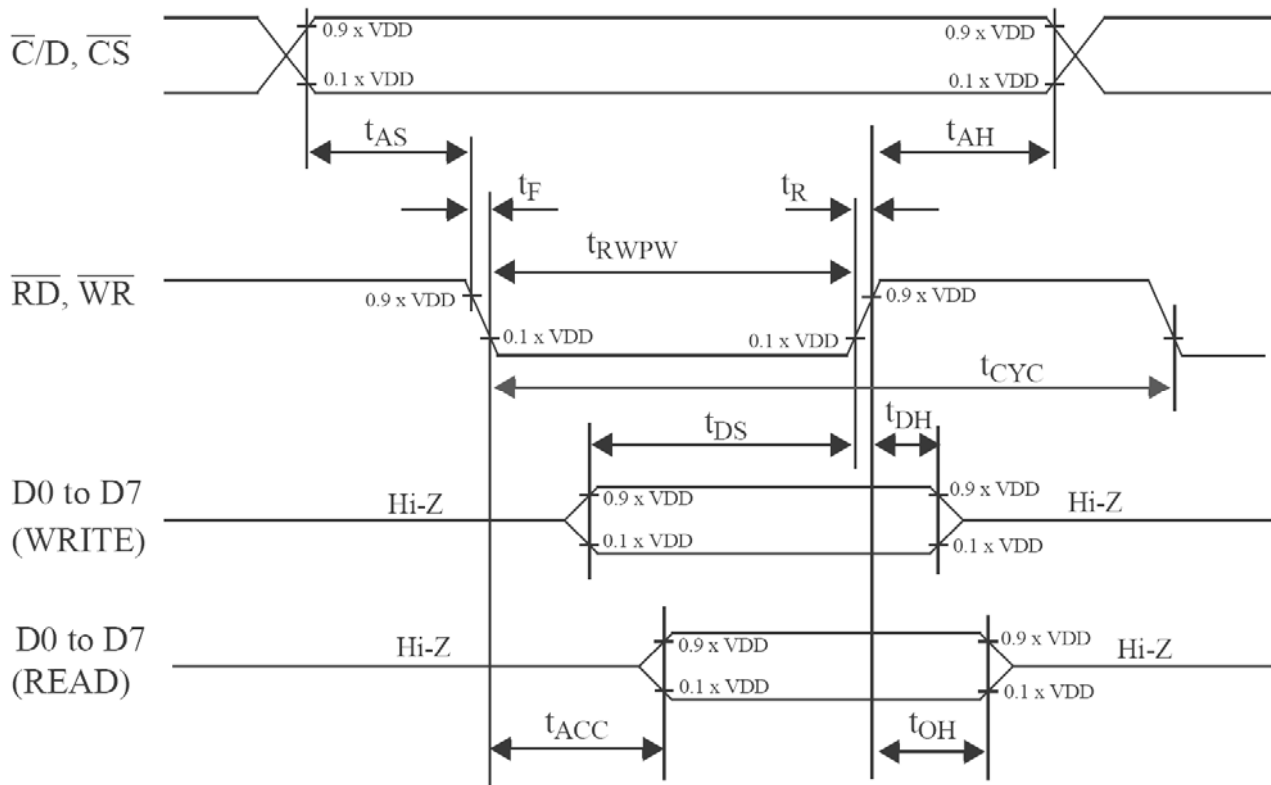
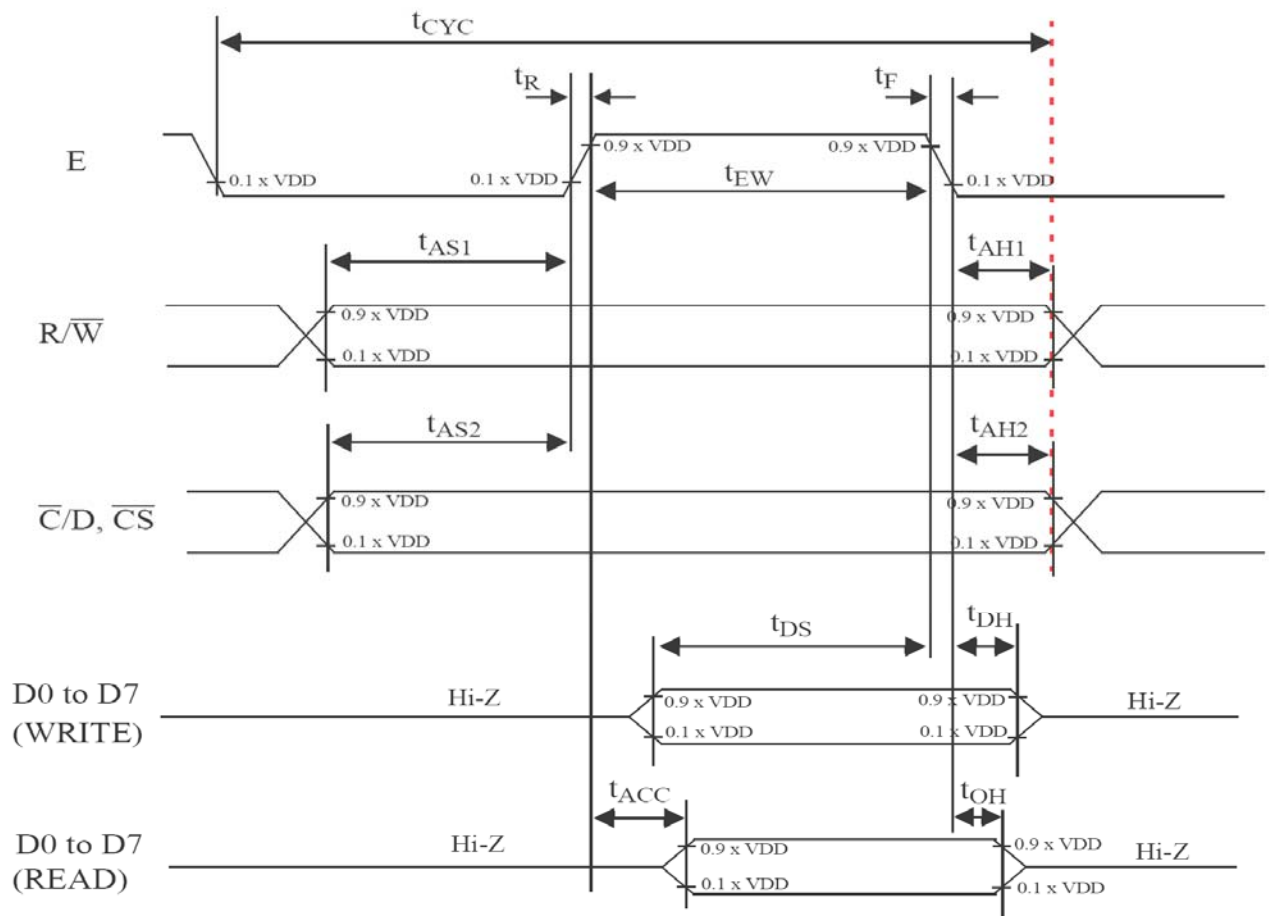AC timing for interface with a 80-type microcontroller at VDD=5volts.

Ta = -20 to 75 deg. VDD = 5.0V ± 10%;VSS=0V;

symbol	parameter	min.	max.	test conditons	unit
t_{AS}	Address set-up time	20			ns
t_{AH}	Address hold time	10			ns
t_F, t_R	Read/Write pulse falling/rising time		15		ns
t_{RWPW}	Read/Write pulse width	200			ns
t_{CYC}	System cycle time	1000			ns
t_{DS}	Data setup time	80			ns
t_{DH}	Data hold time	10			ns
t_{ACC}	Data READ access time		90	CL= 100 pF.	ns
t_{OH}	Data READ output hold time	10	60	Refer to Fig. 23.	ns

Note:

The measurement is with the load circuit connected. The load circuit is shown in Fig.23.

7.2 AC Timing interface   68 type microcontroller.

AC timing for interface with a 68ype microcontroller at VDD=5volts.

Ta = -20 to 75° C, VDD =5.0V ± 10% ;VSS=0V.

symbol	parameter	min.	max.	test conditons	unit
t_{AS1}	Address set-up time with respect to R/$\overline{W}$	20			ns
t_{AS2}	Address set-up time with respect to $\overline{C/D}$, $\overline{CS}$	20			ns
t_{AH1}	Address hold time with respect to R/$\overline{W}$	10			ns
t_{AH2}	Address hold time respect with to $\overline{C/D}$, $\overline{CS}$	10			ns
t_F, t_R	Enable (E) pulse falling/rising time		15		ns
t_{CYC}	System cycle time	1000		Note 1	ns
t_{EWR}	Enable pulse width for READ	100			ns
t_{EWW}	Enable pulse width for WRITE	80			ns
t_{DS}	Data setup time	80			ns
t_{DH}	Data hold time	10			ns
t_{ACC}	Data access time		90	CL= 100 pF.	ns
t_{OH}	Data output hold time	10	60	Refer to Fig. 23.	ns

Notes : The system cycle time(tcyc) IC the time duration from the time when Chip Enable is enabled to the time When Chip Select is released.

8. PIN CONNECTIONS

No.	Symbol	Function
1	VDD	Logic power supply (5V)
2	VSS	Power supply (0V, GND)
3	VO	Power supply for LCD drive
4	RES	Reset function (Active Low)
5	E1	Read/Write Enable Signal (Master)
6	E2	Read/Write Enable Signal (Salve)
7	R/W	Read/Write Select Signal
8	AO	Selects Display Data (H) or Instructions (L)
9-16	DB0-DB7	Data Bus Line
17	LED A	LED Anode (Power supply +)
18	LED K	LED Cathode (Power supply -)

9. POWER SUPPLY
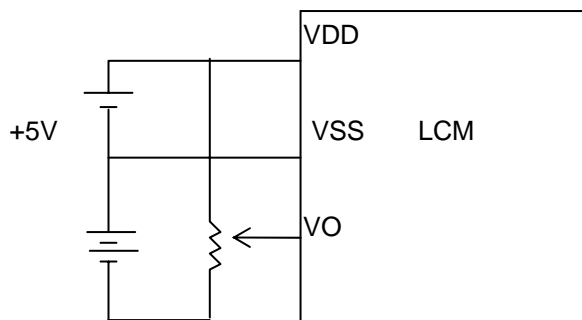
VR = 10K
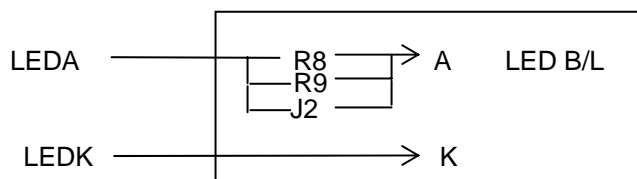
LED A	LEDK	J2	R8, R9
5V	GND	Open	51 ohm
2.1V	GND	Short	--

10. BLOCK DIAGRAM

```
VSS  ──────────►┌───────────────┐   61Seg    (seg 0 – 60 )
VDD  ──────────►│               │ ──────/──────────────┐
V0   ──────────►│  SBN1661G_    │                       ▼
                │    M18        │       ┌──────────────────────────┐
A0   ──────────►│               │ 16Com │                          │
E1   ──────────►│               │ ──/──►│                          │
R/W  ──────────►│               │       │    LCD   PANEL           │
RES  ──────────►│               │       │   122×32 DOTS            │
                ├───────────────┤       │                          │
E2   ──────────►│               │ 16Com │                          │
                │  SBN1661G_    │ ──/──►│                          │
                │    M18        │       └──────────────────────────┘
DB0  ──────────►│               │                          ▲
 │              │               │ 61Seg ( seg 0 – 60 )     │
DB7  ──────────►│               │ ──────/──────────────────┘
                └───────────────┘
```
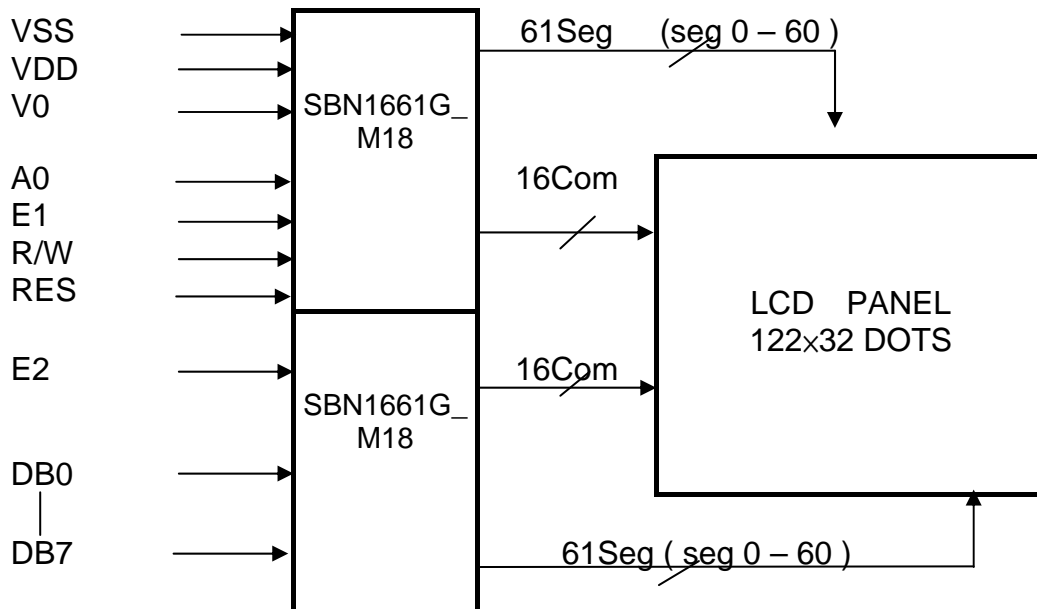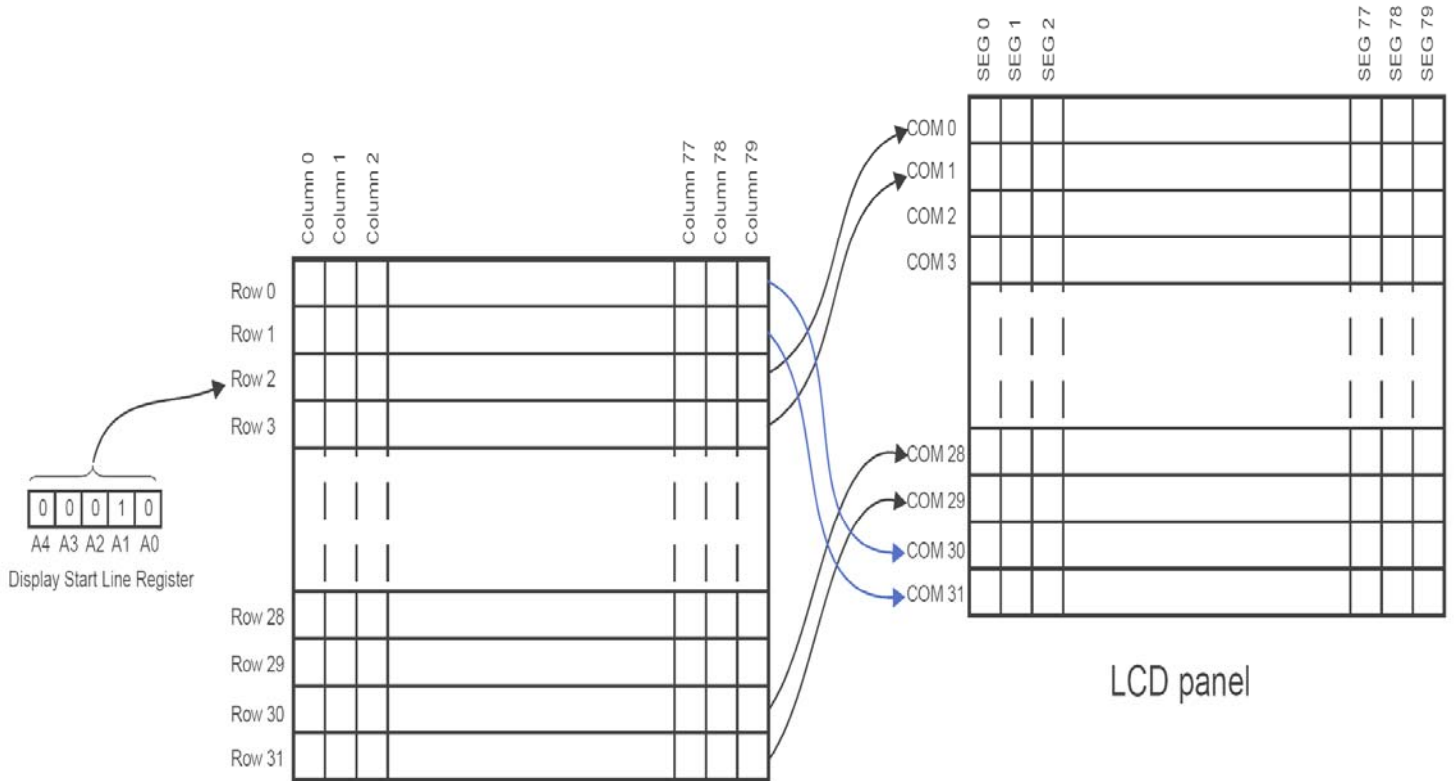
Display Data RAM Addressing

COMMANDS

Summary

Command	Code											Function	
	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0		
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off. 1 : ON, 0 : OFF	
Display start line	0	1	0	1	1	0	Display start address (0 to 31)					Specifies RAM line corresponding to top line of display.	
Set page address	0	1	0	1	0	1	1	1	0	Page (0 to 3)		Sets display RAM page in page address register.	
Set column (segment) address	0	1	0	0	Column address (0 to 72)							Sets display RAM column address in column address register.	
Read status	0	0	1	Busy	ADC	ON/OFF	Reset	0	0	0	0	Reads the following status:	
												BUSY	1 : Busy 0 : Ready
												ADC	1 : CW output 0 : CCW output
												ON/OFF	1 : Display off 0 : Display on
												RESET	1 : Being reset 0 : Normal
Write display data	1	1	0	Write data								Writes data from data bus into display RAM.	
Read display data	1	0	1	Read data								Reads data from display RAM onto data bus.	
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0 : CW output 1 : CCW output	
Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selets static driving operation. 1 : Static drive 0 : Normal driving	
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selets LCD duty cycle 1 : 1/32 0 : 1/16	
Read – Modify - Write	0	1	0	1	1	1	0	0	0	0	0	Read – modify – write ON	
End	0	1	0	1	1	1	0	1	1	1	0	Read – modify – write OFF	
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset	

11. QUALITY ASSURANCE

11.1 Test Condition

11.1.1 Temperature and Humidity(Ambient Temperature)
Temperature   : $20 \pm 5°C$
Humidity   : $65 \pm 5\%$

11.1.2 Operation
Unless specified otherwise, test will be conducted with LCM in operation.

11.1.3 Container
Unless specified otherwise, vibration test will be conducted on module only.

11.1.4 Test Frequency
Single cycle.

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)	$40°C \pm 2°C$, 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

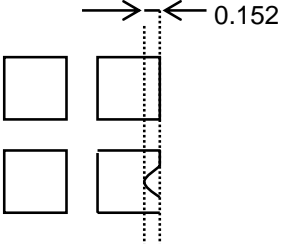The LCD shall be inspected under 40W white fluorescent light.
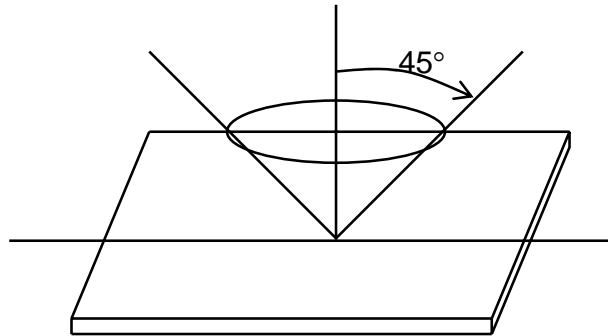
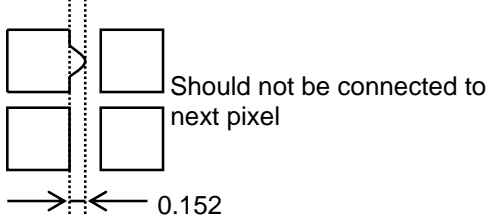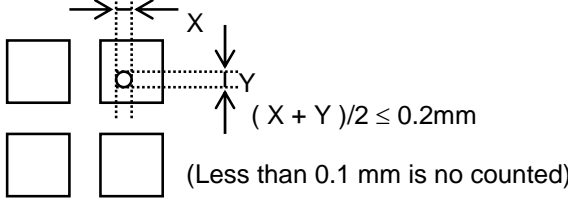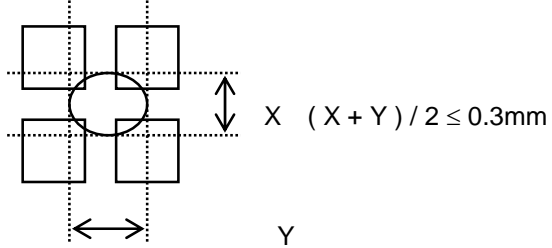### 11.2.2 Definition of applicable Zones
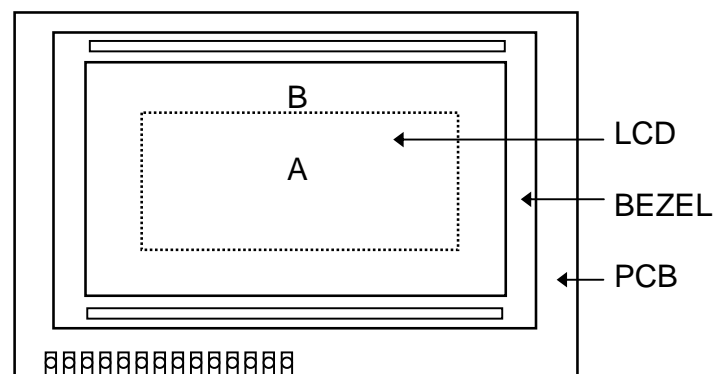
A : Display Area
B : Non-Display Area

11.2.3 Inspection Parameters

No.	Parameter	Criteria
1	Black or White spots	

Zone \ Dimension	Acceptable number A	Acceptable number B	Class Of Defects	AQL Level
D < 0.15	∗	∗		
0.15≤ D< 0.2	4	4		
0.2 ≤ D ≤ 0.25	2	2	Minor	2.5
D ≤ 0.3	0	1		

D = (Long + Short) / 2   ∗ : Disregard

No.	Parameter	Criteria
2	Scratch, Substances	

X (mm)	Y(mm)	Acceptable number A	Acceptable number B	Class Of Defects	AQL Level
∗	0.04 ≥ W	∗	∗		
3.0 ≥ L	0.06 ≥ W	4	4		
2.0 ≥ L	0.08 ≥ W	2	3	Minor	2.5
—	0.1 < W	0	1		

X : Length   Y : Width   ∗ : Disregard
Total defects should not exceed 4/module

No.	Parameter	Criteria
3	Air Bubbles (between glass & polarizer)	

Zone \ Dimension	Acceptable number A	Acceptable number B	Class of Defects	AQL Level
D ≤ 0.15	∗	∗		
0.15 < D ≤ 0.25	2	∗	Minor	2.5
0.25 < D	0	1		

∗ : Disregard
Total defects shall not excess 3/module.

No.	Parameter	Criteria
4	Uniformity of Pixel	(1) Pixel shape (with Dent)

← 0.152

4	Uniformity of Pixel	(2) Pixel shape (with Projection) Should not be connected to next pixel 0.152 (3) Pin hole X Y (X + Y)/2 ≤ 0.2mm (Less than 0.1 mm is no counted) (4) Deformation X (X + Y) / 2 ≤ 0.3mm Y Total acceptable number : 1/pixel, 5/cell		
Class of defects	**Major**	AQL 0.65	**Definition**	
			It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.	
		AQL 1.00	It is a defect that is likely to assembly size and not result in functioning problem.	
	Minor	AQL 2.5	It is a defect that will not result in functioning problem with deviation classified.	

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
Sampling table: MIL-STD-105E
Inspection level: Level II

12.　LOT NUMBERING SYSTEM

| 9 | 7 | 4 | 2 |

Production week number

Production year

13.　LCM NUMBERING SYSTEM

GM 123210 S F S Y B G 06

VERSION:06

RoHS

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
A –Amber
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
G –STN Gray
S – STN Yellow
N – TN

Series code
1232**10** –122 Dots X 32Dot, **1** LCD type,**0** PCB type

Model type
CM – Character Module
GM – Graphic Module
CX – Custom Character Module
GX – Custom 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".
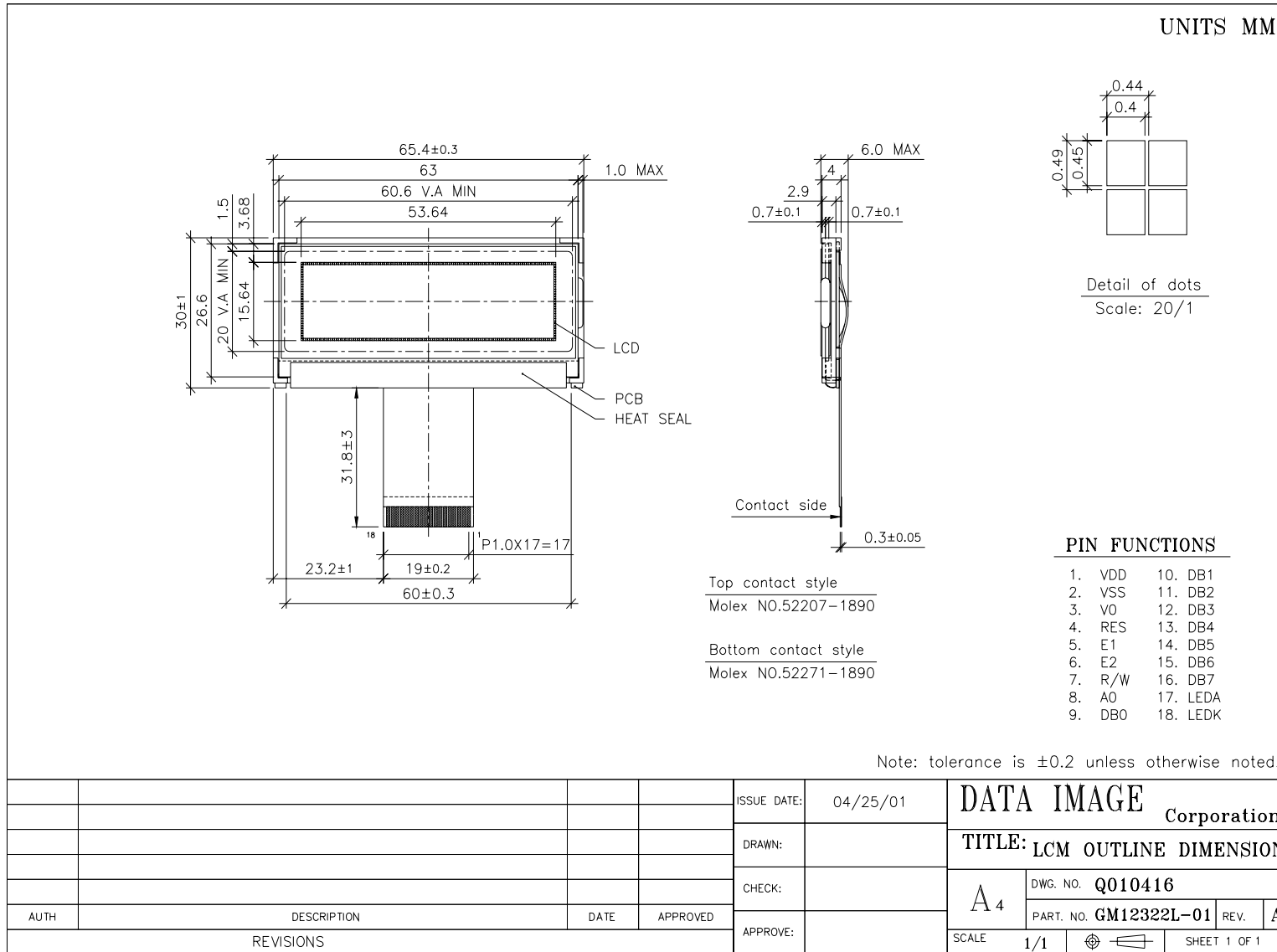
2.5 Storage

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

Detail of dots
Scale: 20/1

0.44
0.4
0.49
0.45

65.4±0.3
63
60.6 V.A MIN
53.64
1.0 MAX
1.5
3.68
30±1
26.6
20 V.A MIN
15.64
LCD
PCB
HEAT SEAL

31.8±3
18
P1.0X17=17
23.2±1
19±0.2
60±0.3

6.0 MAX
4
2.9
0.7±0.1
0.7±0.1

Contact side
0.3±0.05

Top contact style
Molex NO.52207-1890

Bottom contact style
Molex NO.52271-1890

PIN FUNCTIONS

1.	VDD	10. DB1
2.	VSS	11. DB2
3.	V0	12. DB3
4.	RES	13. DB4
5.	E1	14. DB5
6.	E2	15. DB6
7.	R/W	16. DB7
8.	A0	17. LEDA
9.	DB0	18. LEDK

Note: tolerance is ±0.2 unless otherwise noted.

AUTH	DESCRIPTION	DATE	APPROVED	ISSUE DATE:	04/25/01	DATA IMAGE Corporation
				DRAWN:		TITLE: LCM OUTLINE DIMENSION
				CHECK:		A4 DWG. NO. Q010416
	REVISIONS			APPROVE:		PART. NO. GM12322L-01 REV. A
						SCALE 1/1 SHEET 1 OF 1

16. PACKAGE INFORMATION

Anti-static bag

LCM

(2)

Carton

(1)

Item	Size(L*W*H)		Quantity	Note
1.Master Carton	482*282*279		1	
2.Inner Carton	267*224*115		4	
Quantity Per Inner Carton	60	Quantity Per Master Carton		240
N . W	3.12 (kg)	G . W		4.12 (kg)