



MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI0802A-G

Revision	
Engineering	
Date	
Our Reference	



REVISION RECORD

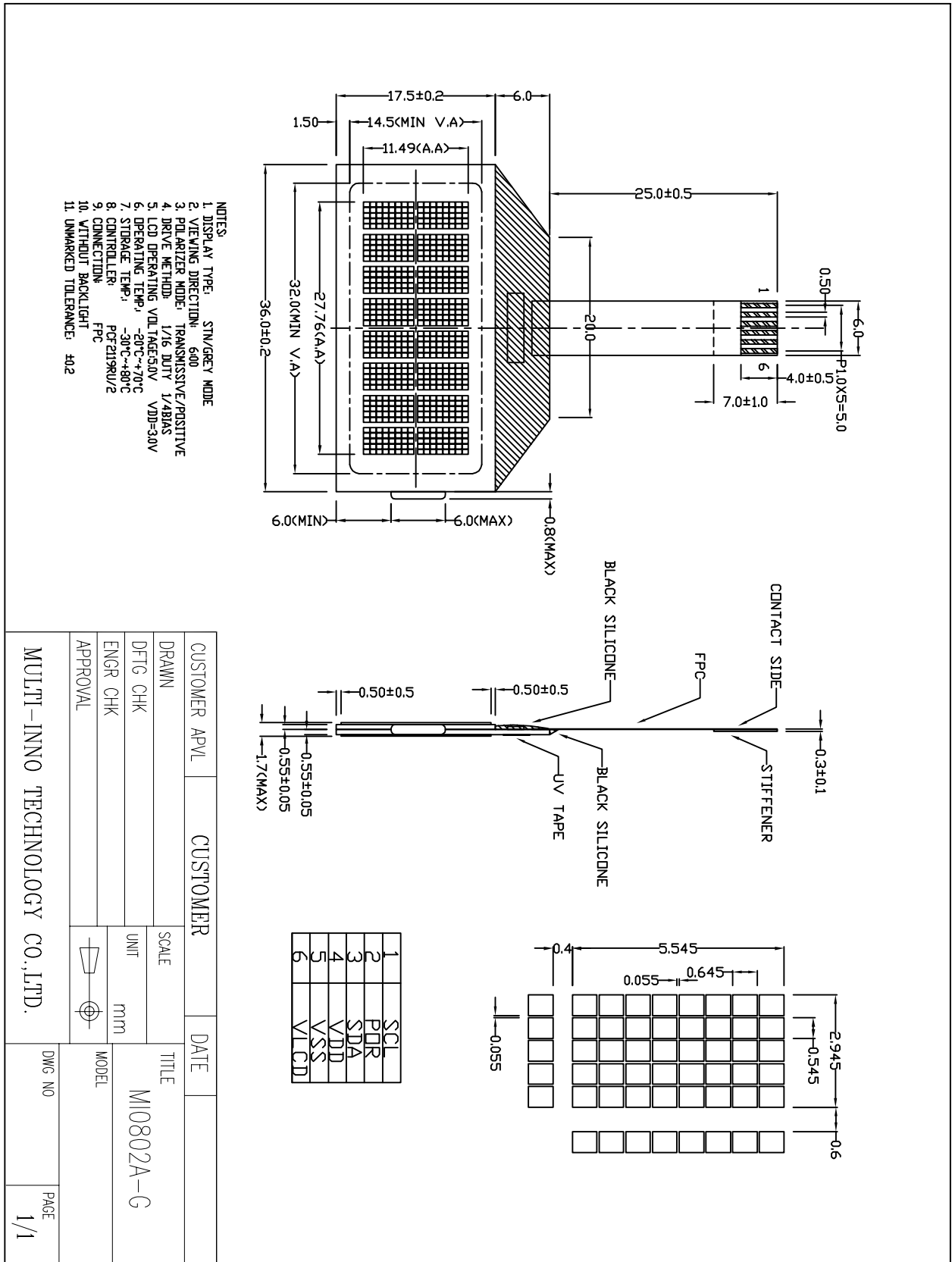
Date	Ref. Page	Revision No.	Revision Items	Check & Approval

**1 General Specifications:**

- 1.1 Display type: STN/Grey mode
- 1.2 Display color*:
 - Display color: Blue
 - Background: Grey
- 1.3 Polarizer mode: Transmissive/Positive
- 1.4 Viewing Angle: 6:00
- 1.5 Driving Method: 1/16 Duty 1/4 Bias
- 1.6 LCD Operating Voltage: 5.0V VDD: 5.0V
- 1.7 Without Backlight
- 1.8 Controller: PCF2119AU/2
- 1.9 Data Transfer: Serial(I²C Bus) Interface
- 1.10 Operating Temperature: -20----+70°C
 - Storage Temperature: -30----+80°C
- 1.11 Outline Dimensions: Refer to outline drawing on next page
- 1.12 Dot Matrix: 8 Characters X 2 Lines
- 1.13 Dot Size: 0.645X0.545(mm)
- 1.14 Dot Pitch: 0.7X0.6 (mm)
- 1.15 Weight: Approx 5g

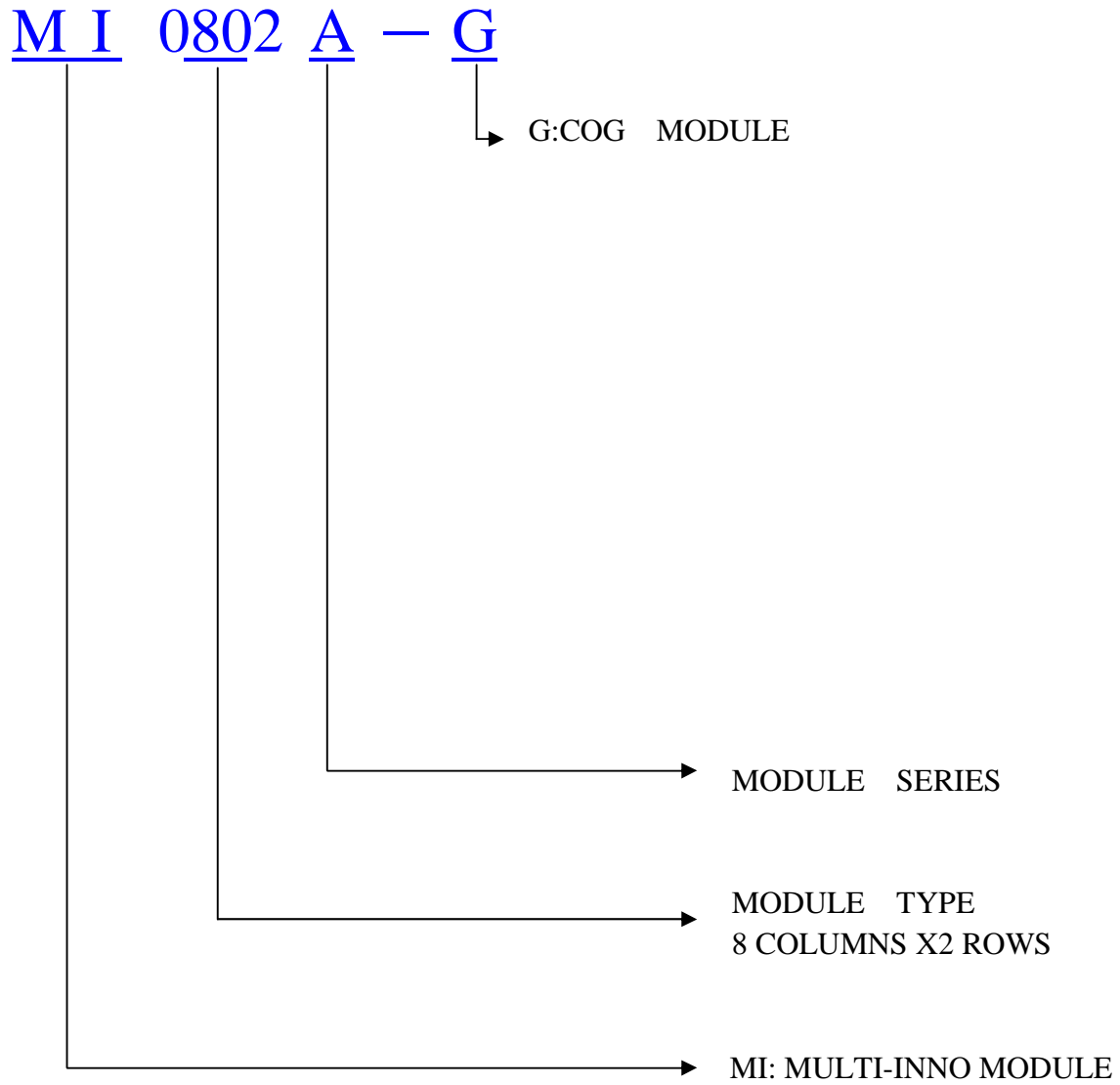
* Color tone is slightly changed by temperature and driving voltage.

2 Outline Drawing

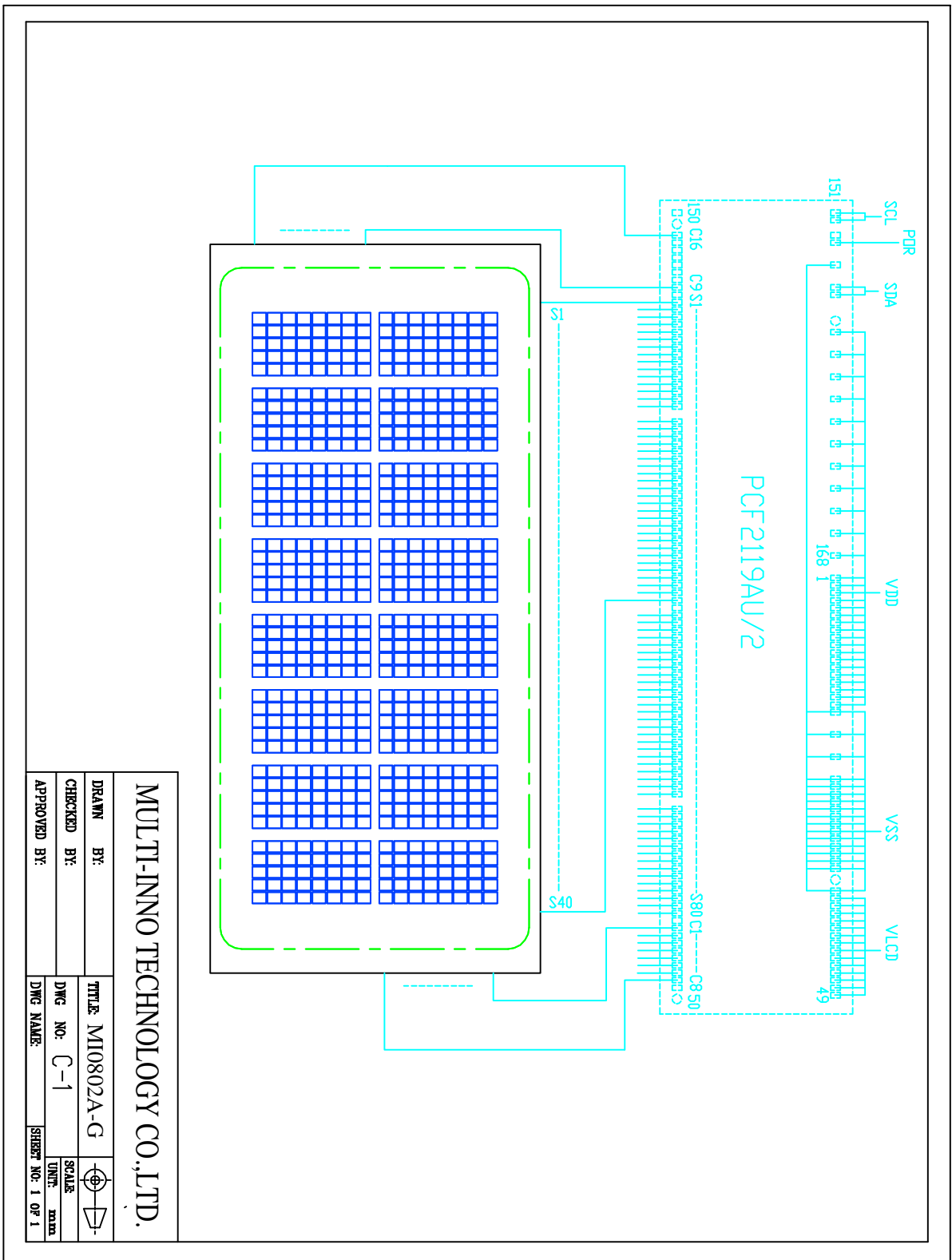




3 LCD Module Part Numbering System



4 Circuit Block Diagram



5 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	$V_{DD}-V_{SS}$	1.5	5.5	V	
LCD Driving Voltage	V_{LCD}	2.2	6.5		
Operating Temperature Range	T_{OP}	20	+70	°C	No Condensation
Storage Temperature Range	T_{ST}	-30	+80		

6 Electrical Specifications and Instruction Code

6.1 Electrical characteristics

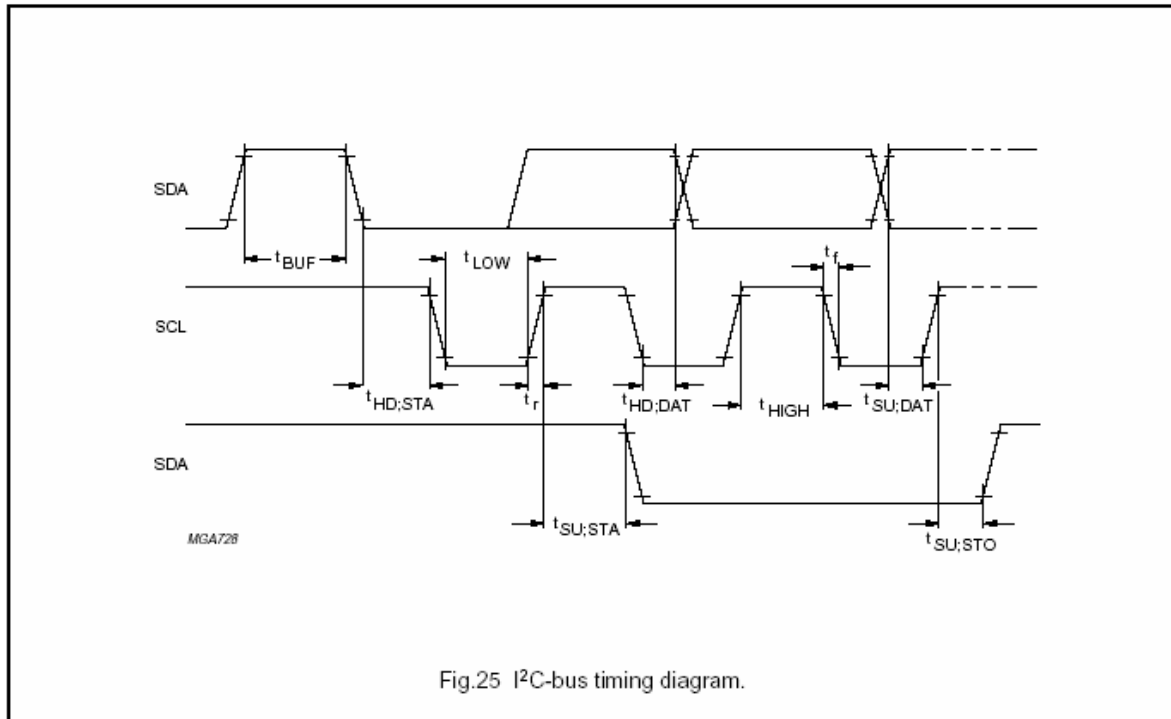
Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)		$V_{DD}-V_{SS}$	-	5.0	-	V
Supply Voltage (LCD Drive)		V_{LCD}	-	5.0	-	V
Input Signal Voltage	High	V_{IH} ($V_{DD}=5.0$)	$0.7V_{DD}$	-	$V_{DD}+0.3$	V
	Low	V_{IL} ($V_{DD}=5.0$)	-0.3	-	$0.2 V_{DD}$	V
Supply current (Logic) (Display Character)		I_{DD} ($V_{DD}-V_{SS}=5.0$)	-	-	1.5	mA



6.2 Interface Signals

Pin No.	Symbol	Level	Description
1	SCL	H/L	Serial clock line
2	POR	H/L	Power on reset
3	SDA	H/L	Serial data line
4	VDD	5.0V	Power supply voltage for logic
5	VSS	0V	Ground
6	VLCD	5.0V	Power supply voltage for LCD

6.3 Interface Timing Chart


 Fig.25 I²C-bus timing diagram.

f_{SCL}	SCL clock frequency		-	-	400	kHz
t_{LOW}	SCL clock low period		1.3	-	-	μ s
t_{HIGH}	SCL clock high period		0.6	-	-	μ s
$t_{SU:DAT}$	data set-up time		100	-	-	ns
$t_{HD:DAT}$	data hold time		0	-	-	ns
t_r	SCL, SDA rise time	note 2, 3	$15 + 0.1 C_B$	-	300	ns
t_f	SCL, SDA fall time	note 2, 3	$15 + 0.1 C_B$	-	300	ns
C_B	capacitive bus line load		-	-	400	pF
$t_{SU:STA}$	set-up time for a repeated START condition		0.6	-	-	μ s
$t_{HD:STA}$	START condition hold time		0.6	-	-	μ s
$t_{SU:STO}$	set-up time for STOP condition		0.6	-	-	μ s
t_{SW}	tolerable spike width on bus		-	-	50	ns
t_{BUF}	Bus free time between STOP and START condition		1.3			μ s

6.4 Instruction Code

Table 5 Instruction set for I²C-bus commands

CONTROL BYTE								COMMAND BYTE								I ² C-BUS COMMANDS
Co	RS	0	0	0	0	0	0	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	note 1

Note

1. $\overline{R/W}$ is set together with the slave address.

INSTRUCTION	RS	$\overline{R/W}$	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	DESCRIPTION	REQUIRED CLOCK CYCLES		
H = 0 or 1														
NOP	0	0	0	0	0	0	0	0	0	0	no operation	3		
Function set	0	0	0	0	1	DL	0	M	SL	H	sets interface Data Length (DL) and number of display lines (M); single line/MUX 1 : 9 (SL), extended instruction set control (H)	3		
Read busy flag and address counter	0	1	BF	A_C								reads the Busy Flag (BF) indicating internal operating is being performed and reads address counter contents	0	
Read data	1	1	read data									reads data from CGRAM or DDRAM	3	
Write data	1	0	write data									writes data from CGRAM or DDRAM	3	
H = 0														
Clear display	0	0	0	0	0	0	0	0	0	1	clears entire display and sets DDRAM address 0 in address counter	165		
Return home	0	0	0	0	0	0	0	0	1	0	sets DDRAM address 0 in address counter; also returns shifted display to original position; DDRAM contents remain unchanged	3		
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	sets cursor move direction and specifies shift of display; these operations are performed during data write and read	3		
Display control	0	0	0	0	0	0	1	D	C	B	sets entire display on/off (D), cursor on/off (C) and blink of cursor position character (B); D = 0 (display off) puts chip into the power-down mode	3		
Cursor/display shift	0	0	0	0	0	1	S/C	R/L	0	0	moves cursor and shifts display without changing DDRAM contents	3		
Set CGRAM address	0	0	0	1	A_{CG}								sets CGRAM address; bit 6 is to be set by the command 'set DDRAM address'; look at the description of the commands	3
Set DDRAM address	0	0	1	A_{DD}								sets DDRAM address	3	

7 Optical Characteristics

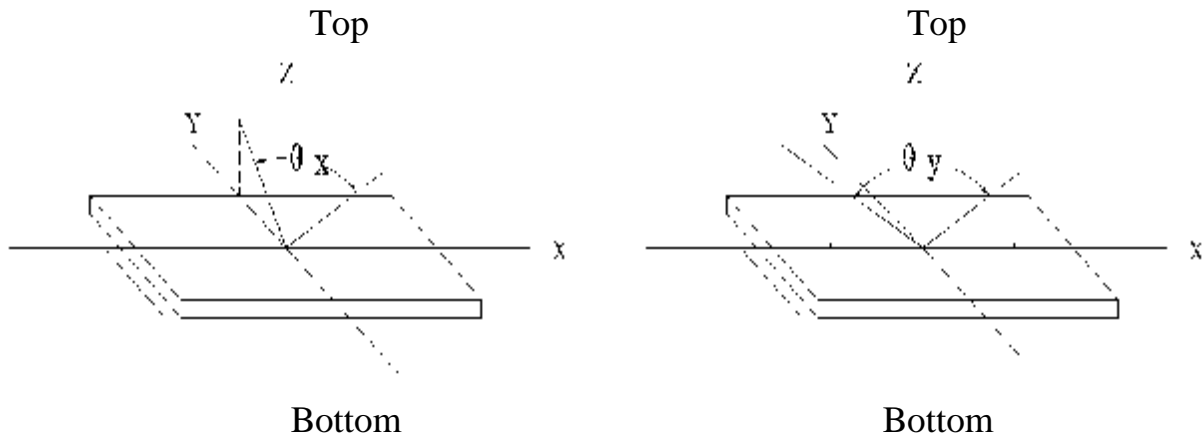
7.1 Optical Characteristics

Ta=25°C

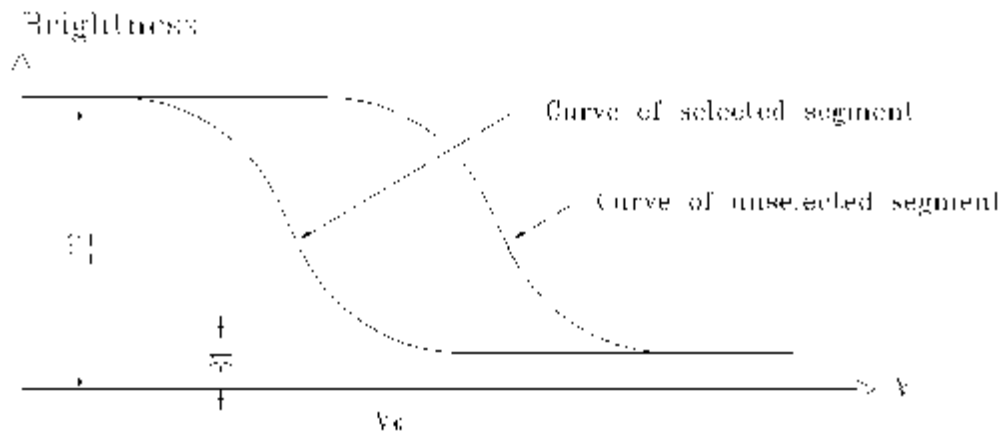
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle	θ_x	$C_r \geq 2$				Deg
	θ_y					
		$\theta_x = 0^\circ$				
Contrast Ratio	C_r	$\theta_x = 0^\circ$ $\theta_y = 0^\circ$	4.0	-	-	
Response Time	Turn on	T_{on}	$\theta_x = 0^\circ$ $\theta_y = 0^\circ$			ms
	Turn off	T_{off}				

7.2 Definition of Optical Characteristics

7.2.1 Definition of Viewing Angle



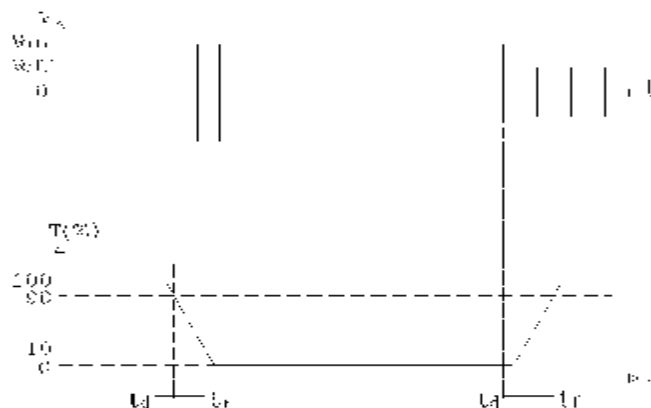
7.2.2 Definition of Contrast Ratio



$$\text{Contrast Ratio} = B2/B1 = \frac{\text{unselected state brightness}}{\text{selected state brightness}}$$

Measuring Conditions:

- 1) Ambient Temperature: 25°C
- 2) Frame frequency: 84.3Hz



7.2.3 Definition of Response time

Turn on time: $t_{on} = t_d + t_r$

Turn off time: $t_{off} = t_d + t_f$

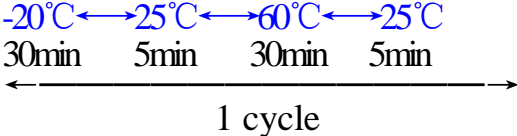
Measuring Condition:

- 1) Operating Voltage: 4.4V
- 2) Frame frequency: 84.3Hz

8 Reliability

8.1 Content of Reliability Test

Ta=25°C

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 96H Restore 4H at 25°C
2	Low Temperature Storage	Endurance test applying the low storage temperature for a long time	-20°C 96H Restore 4H at 25°C
3	High Temperature /Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time	40°C 90%RH 96H Restore 4H at 25°C
4	Temperature Cycle	Endurance test applying the low and high temperature cycle 	-20°C/60°C 10 cycles Restore 4H at 25°C
5	Vibration Test (package state)	Endurance test applying the vibration during transportation	10Hz~150Hz, 50m/s ² , 40min
6	Shock Test (package state)	Endurance test applying the shock during transportation	Half- sine wave, 100m/s ² , 11ms
7	Atmospheric Pressure Test	Endurance test applying the atmospheric pressure during transportation by air	40kPa 16H Restore 2H

8.2 Failure Judgment Criterion

Criterion Item	Test Item No.							Failure Judgement Criterion
	1	2	3	4	5	6	7	
Basic Specification	√	√	√	√	√	√	√	Out of the basic Specification
Electrical specification	√	√	√					Out of the electrical specification
Mechanical Specification					√	√		Out of the mechanical specification
Optical Characteristic	√	√	√	√			√	Out of the optical specification
Note	For test item refer to 8.1							
Remark	Basic specification = Optical specification + Mechanical specification							

9 QUALITY LEVEL

Examination or Test	At $T_{amb}=25^{\circ}\text{C}$ (unless otherwise stated)	Inspection				
		Min.	Max.	Unit	IL	AQL
External Visual Inspection	Under normal illumination and eyesight condition, the distance between eyes and LCD is 25cm.	See annex A			II	Major 1.0 Minor 2.5
Display Defects	Under normal illumination and eyesight condition, display on inspection.	See annex B			II	Major 1.0 Minor 2.5
Note: Major defects: Open segment or common, Short, Serious damages, Leakage Miner defects: Others Sampling standard conforms to GB2828						

10 Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- a. Be sure to ground the body when handling the LCD Modules.
- b. Tools required for assembly, such as soldering irons, must be properly ground.
- c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range.

If the LCD modules will be stored for a long time, the recommend condition is:

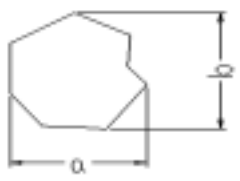

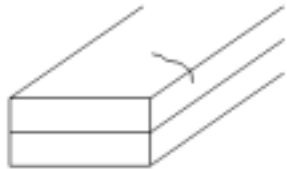
Temperature : $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$

Relatively humidity: $\leq 80\%$

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

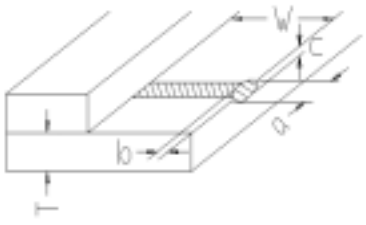
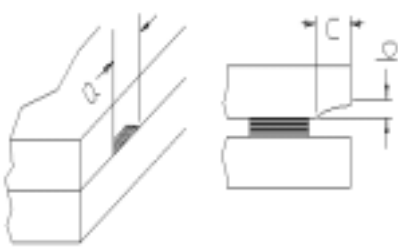
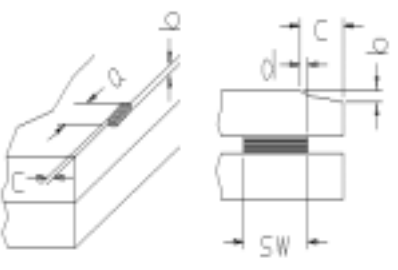
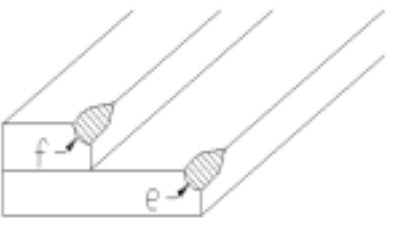
10.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

Inspection items and criteria for appearance defects

Items	Contents	Criteria		
Leakage		Not permitted		
Rainbow		According to the limit specimen		
Polarizer	Wrong polarizer attachment	Not permitted		
	Bubble between polarizer and glass	Not counted	Max. 3 defects allowed	
		$\phi < 0.3\text{mm}$	0.3mm ϕ 0.5mm	
	Scratches of polarizer	According to the limit specimen		
Black spot (in viewing area)		Not counted	Max. 3 spots allowed	
		$X < 0.2\text{mm}$	0.2mm X 0.5mm	
		$X = (a+b)/2$		
Black line (in viewing area)		Not counted	Max. 3 lines allowed	
		$a < 0.02\text{mm}$	0.02mm a 0.05mm b 2.0mm	
Progressive cracks		Not permitted		

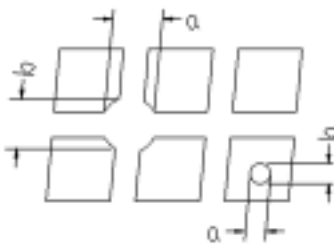
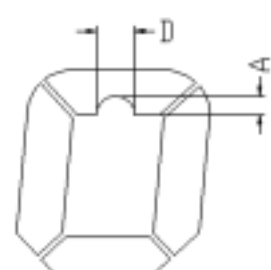
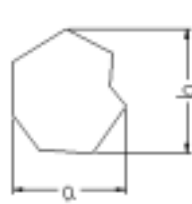

Appendix A

Inspection item and criteria for appearance defects (continued)

Items	Contents	Criteria					
Glass Cracks	Cracks on pads 	a	b	c	Max. 2 Cracks allowed	Max. 5 cracks allowed	
	$\leq 3\text{mm}$	$\leq W/5$	$\leq T/2$				
	$\leq 2\text{mm}$	$\leq W/5$	$T/2 < C < T$				
	Cracks on contact side 	a	b		Max. 2 cracks allowed		
	$\leq 3\text{mm}$	$\leq T/2$					
	$\leq 2\text{mm}$	$T/2 < b < T$					
	C shall be not reach the seal area						
	Cracks on non-contact side 	a			b		Max. 2 cracks allowed
	$\leq 3\text{mm}$	$\leq T/2$					
	$\leq 2\text{mm}$	$T/2 < b < T$					
$C \leq 0.5\text{mm}$							
$d \leq SW/3$							
Corner cracks 	$e < 2.0\text{mm}^2$ $f < 2.0\text{mm}^2$				Max. 3 cracks allowed		

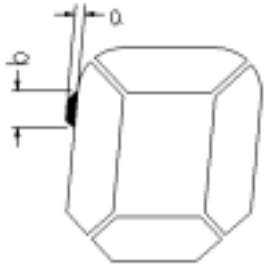
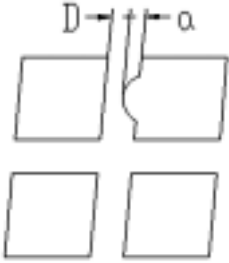
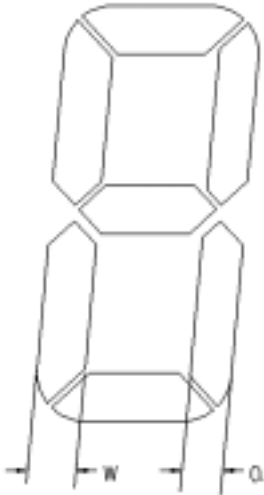
Appendix B

Inspection items and criteria for display defects

Items	Contents	Criteria		
Open segment or open common		Not permitted		
Short		Not permitted		
Wrong viewing angle		Not permitted		
Contrast ratio uneven		According to the limit specimen		
Crosstalk		According to the limit specimen		
Pin holes and cracks in segment (DOT)		Not counted	Max.3 dots allowed	Max.3 dots allowed
		$X < 0.1\text{mm}$	$0.1\text{mm} \leq X \leq 0.2\text{mm}$	
		$X = (a+b)/2$		
		Not counted	Max.2 dots allowed	
$A < 0.1\text{mm}$		$0.1\text{mm} \leq A \leq 0.2\text{mm}$ $D < 0.25\text{mm}$		
Black spot (in viewing area)		Not counted	Max.3 spots allowed	Max.3 spots (lines) allowed
		$X < 0.1\text{mm}$	$0.1\text{mm} \leq X \leq 0.2\text{mm}$	
		$X = (a+b)/2$		
Black line (in viewing area)		Not counted	Max.3 lines allowed	
		$a < 0.02\text{mm}$	$0.02\text{mm} \leq a \leq 0.05\text{mm}$ $b \leq 0.5\text{mm}$	

Appendix B

Inspection items and criteria for display defects (continued)

Items	Content	Criteria		
Transformation of segment		Not counted	Max. 2 defects allowed	Max.3 defects allowed
		$x < 0.1\text{mm}$	$0.1\text{mm} \leq x \leq 0.2\text{mm}$	
		$x = (a+b)/2$		
		Not counted	Max. 1 defects allowed	
		$a < 0.1\text{mm}$	$0.1\text{mm} \leq a \leq 0.2\text{mm}$ $D > 0$	
	Max.2 defects allowed $0.8W \leq a \leq 1.2W$ a=measured value of width W=nominal value of width			