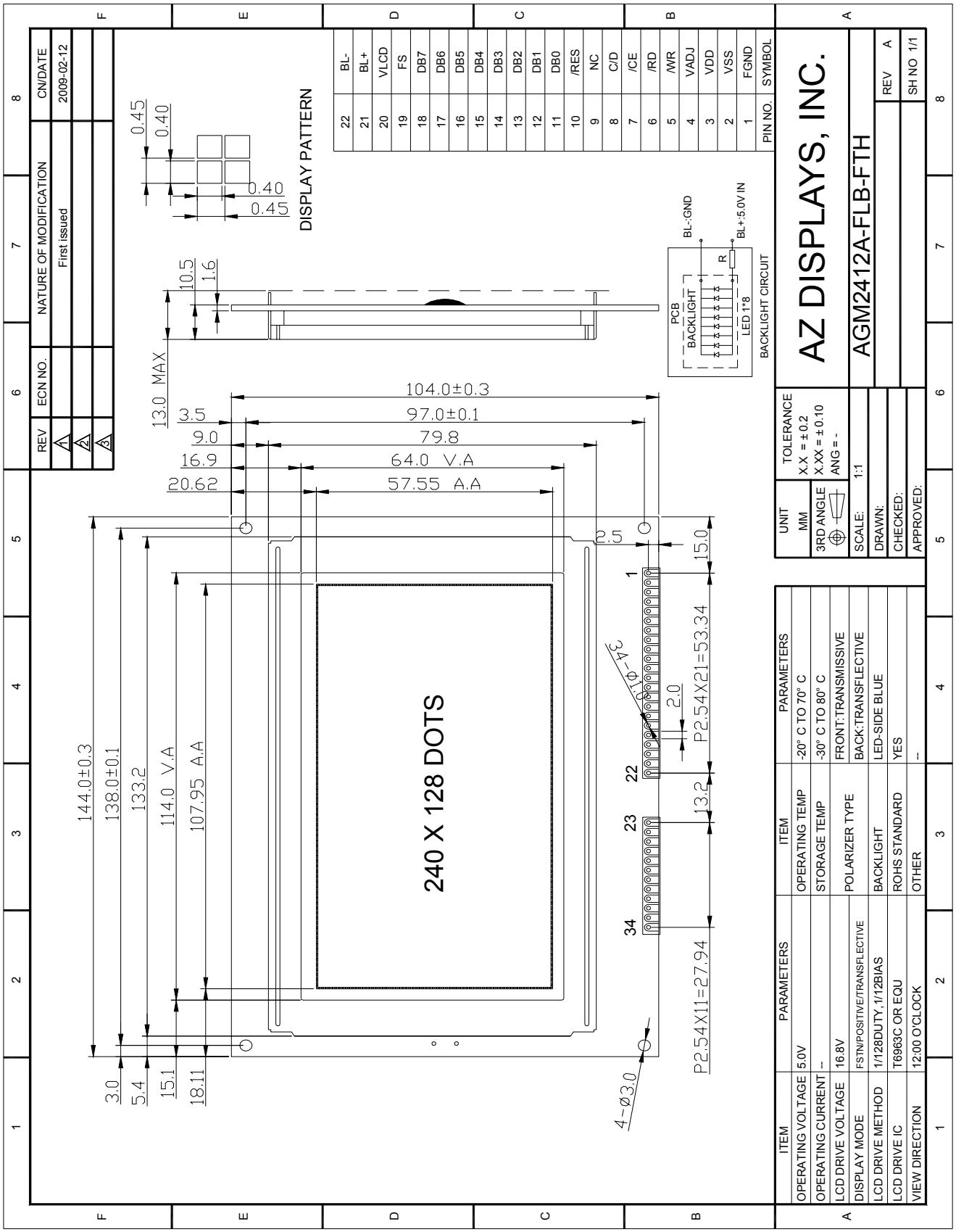
AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER: **AGM2412A-FLB-FTH**
DATE: **MAY 26, 2009**

1.0 MECHANICAL DIAGRAM



PIN NO.	SYMBOL
22	BL-
21	BL+
20	VLCD
19	FS
18	DB7
17	DB6
16	DB5
15	DB4
14	DB3
13	DB2
12	DB1
11	DB0
10	/RES
9	NC
8	C/D
7	/CE
6	/RD
5	/WR
4	VADJ
3	VDD
2	VSS
1	FGND

REV	ECN NO.	NATURE OF MODIFICATION	CN/DATE
A		First issued	2009-02-12
B			
C			

ITEM	PARAMETERS
OPERATING VOLTAGE	5.0V
OPERATING CURRENT	--
LCD DRIVE VOLTAGE	16.8V
DISPLAY MODE	FSTN/POSITIVE/TRANSFLECTIVE
LCD DRIVE METHOD	1/128DUTY,1/12BIAS
LCD DRIVE IC	T6963C OR EQU
VIEW DIRECTION	12:00 O'CLOCK

ITEM	PARAMETERS
OPERATING TEMP	-20° C TO 70° C
STORAGE TEMP	-30° C TO 80° C
POLARIZER TYPE	FRONT:TRANSMISSIVE BACK:TRANSFLECTIVE
BACKLIGHT	LED-SIDE BLUE
ROHS STANDARD	YES
OTHER	--

2.0 MECHANICAL SPECS

1. Display Format	240*128 DOTS
2. Power Supply	5.0V
3. Overall Module Size	144.0mm(W) x 104.0mm(H) x max 13.0mm(D)
4. Viewing Aera(W*H)	114.0mm(W) x 64.0mm(H)
5. Dot Size (W*H)	0.40mm(W) x 0.40mm(H)
6. Dot Pitch (W*H)	0.45mm(W) x 0.45mm(H)
7. Viewing Direction	12:00 O'Clock
8. Driving Method	1/128 Duty,1/12 Bias
9. Controller IC	T6963C OR EQUIV
10. LC Fluid Options	FSTN /Positive
11. Polarizer Options	Transflective
12. Backlight Options	LED-SIDE(Blue)
13. Operating temperature	-20ºC ~70ºC
14. Storage temperature	-30ºC ~ 80ºC
15. ROHS	ROHS compliant

3.0 ABSOLUTE MAXIMUM RATINGS

Item Symbol		Min	Typ	Max	Unit
Operating temperature	Top	-20	-	70	ºC
Storage temperature	Tst	-30	-	80	ºC
Input voltage	Vin	-0.3	-	Vdd+0.3	V
Supply voltage for logic	Vdd- Vss	-0.3	-	7.0	V
Supply voltage for LCD drive	Vdd- V0	6		28	V

4.0 ELECTRICAL CHARACTERISTICS

4.1 Electrical Characteristic Of LCM（VDD=5.0V，Ta=25ºC）

Item Symbol		Condition	Min	Typ	Max	Unit
Power Supply Voltage	VDD	Ta=25ºC		5.0		V
Power Supply Current	Idd	Vdd=5.0V	--	15	25	mA
Input voltage (high)	Vih	H level	VDD-2.2	--	VDD	V
Input voltage (low)	Vil	L level	0	--	0.8	V
Recommended LC Driving Voltage	Vdd -Vo	-20ºC	--	--	--	V
		25ºC	16 .4	16.8	17.2	
		70ºC	--	--	--	

4.2 The Characteristic Of Backlight

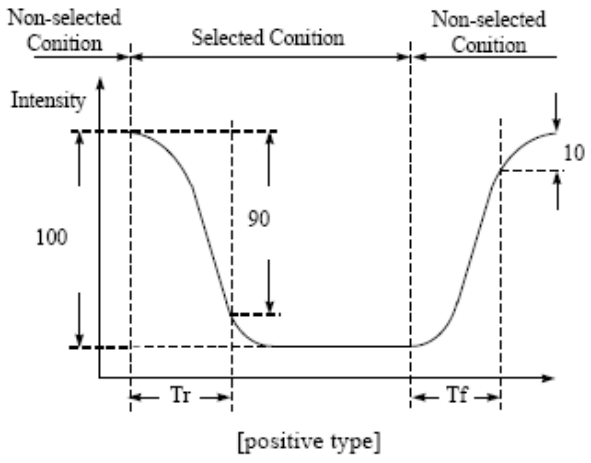
Item Sy	mbol	Condition	Min	Typ	Max	Unit
Operate Current	IF	Vbl=5.0V，R=16.5Ω	--	120	--	mA
Luminance	Lv	IF= 120 mA	--	23 0	--	cd/m
Peak wave length	λ p	IF= 120 mA	465	4 70	475	nm
Coordinate range	--	IF= -- mA	x= --- , y= ---			

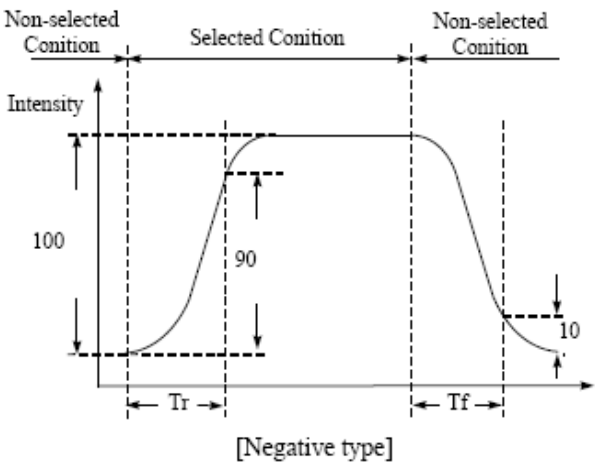
Note:Luminance means the backlight brightness without glass

5.0 OPTICAL CHARACTERISTICS

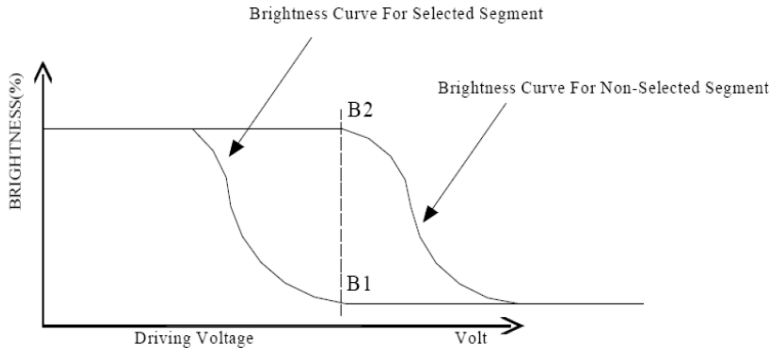
Item Symbol		Condition	Min	Typ	Max	Unit
Viewing angle (horizontal)	Cr	2.0	-35	-	35	deg
Viewing angle (vertical)	Cr	2.0	-25	-	45	deg
Contrast Ratio	Cr	=0 , =0	5.0		-	
Response time (rise)	Tr	=0 , =0	-	150	250	ms
Response time (fall)	Tf	=0 , =0	-	160	280	ms

(1). Definition of Optical Response Time



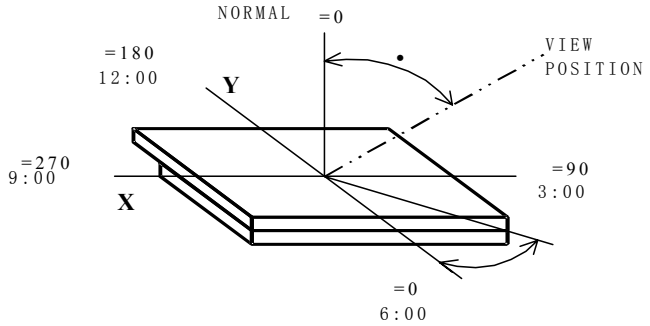


(2). Definition of Contrast Ratio

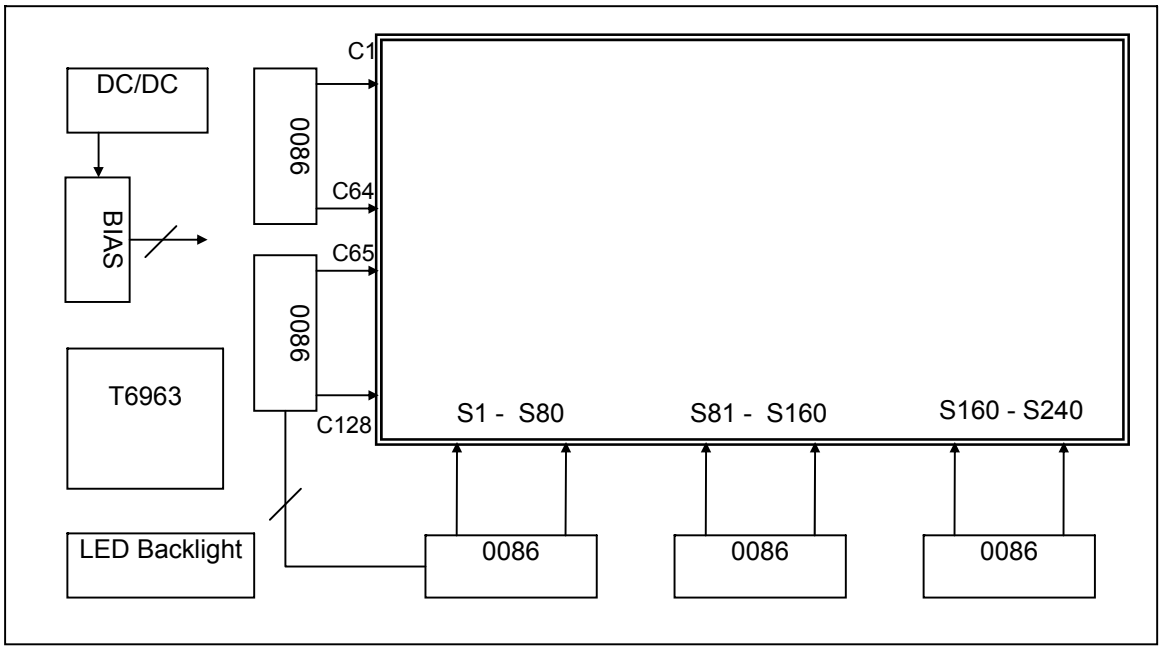


$$Cr = \frac{\text{Brightness of Non-selected Segment(B2)}}{\text{Brightness of selected Segment(B1)}}$$

(3). Definition of Viewing Angle and



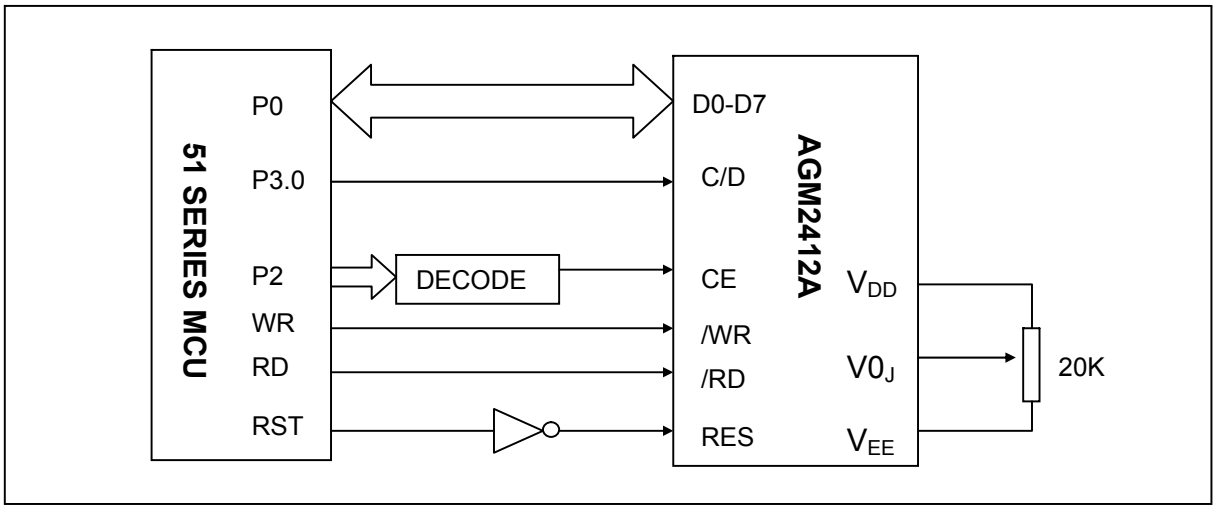
6.0 BLOCK DIAGRAM



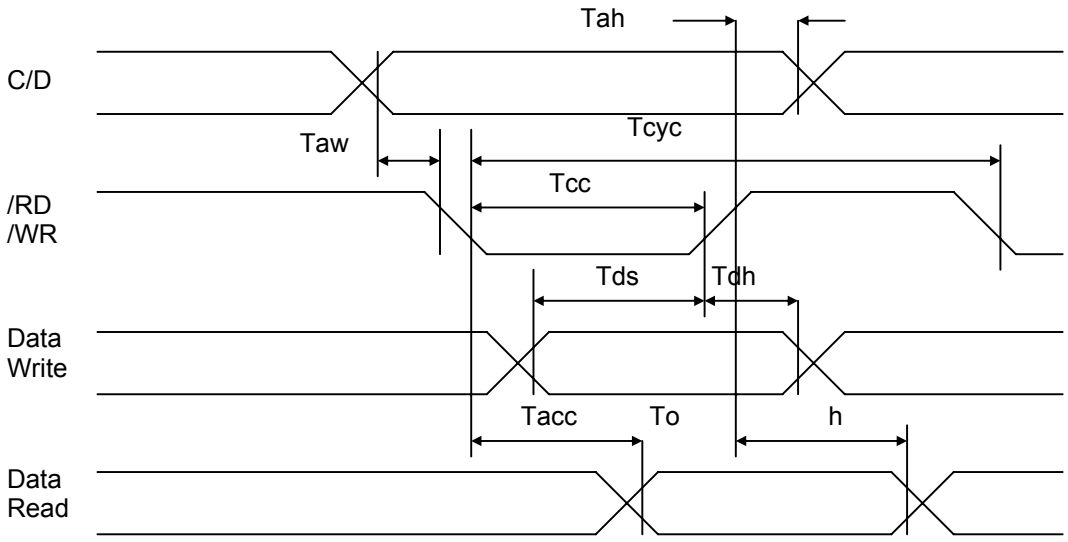
7.0 PIN ASSIGNMENT

Pin No.	Symbol	Function	Level
1	FGND	BEZEL Ground	-
2	VSS	Ground	
3	VDD	+5V -	
4 V	adj	Contrast Adjust Voltage	-
5 /W	R	Data write	L
6 /	RD	Data read	L
7 /	CE	Chip Enable	H, H→ L
8 C	/D	Command/Data	L/H
9 N	C		
10 /	RES	Reset	L
11	DB0	Data bit 0	H/L
12	DB1	Data bit 1	H/L
13	DB2	Data bit 2	H/L
14	DB3	Data bit 3	H/L
15	DB4	Data bit 4	H/L
16	DB5	Data bit 5	H/L
17	DB6	Data bit 6	H/L
18	DB7	Data bit 7	H/L
19	FS	Font Select	H=6*8dots matrix, L=8*8 dot matrix
20	VLCD	Power supply for LCD driving	-14.0V
21	BL+	Power supply for LED+	5.0V
22	BL-	Power supply for LED-	0V

8.0 APPLICATION



9.0 TIMING CHARACTERISTICS



ITEM SYMBLE		MIN	MAX	UNIT
Address Setup Time	Taw	10		ns
Address Hold Time	Tah	10		ns
RD#,WR# Cycle	Tcyc	200		ns
RD#,WR# Pulse Width	Tcc	80		ns
Data Setup Time	Tds	80		ns
Data Hold Time (Write)	Tdh	40		ns
Data Access Time	Tacc		150	ns
Data Hold Time (Read)	Toh	10	50	ns

10.0 RELIABILITY TEST

NO	Test Item		D escription	Test Condition	Remark
1	Environmental Test	High temperature storage	Applying the high storage temperature Under normal humidity for a long time Check normal performance	80 ºC 96hrs	
2		Low temperature storage	Applying the low storage temperature Under normal humidity for a long time Check normal performance	-30ºC 96hrs	
3		High temperature Operation	Apply the electric stress(Volatge and current) Under high temperature for a long time	70 ºC 96hrs	Note1
4		Low temperature Operation	Apply the electric stress Under low temperature for a long time	-20ºC 96hrs	Note1 Note2
5		High temperature/High Humidity Storage	Apply high temperature and high humidity storage for a long time	90% RH 40ºC 96hrs	Note2
6		Temperature Cycle	Apply the low and high temperature cycle -30ºC＜＞25ºC＜＞80ºC ＜＞25ºC 30min 10min 30min 10min ←——— 1 cycle ———→ Check normal performance	-30ºC/80ºC 10 cycle	
7	Mechanical Test	Vibration test(Package state)	Applying vibration to product check normal performance	Freq:10-55Hz Max Acceleration 5G 1cycle time:1min time X.Y.Z direction for 15 mines	
8		Shock test(package state)	Applying shock to product check normal performance	Drop them through 70cm height to strike horizontal plane	
9	Ot her				

Remark

Note1:Normal operations condition (25ºC±5ºC).

Note2:Pay attention to keep dewdrops from the module during this test.

11.0 DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the T6963c.

COMMAND	Control State			Code								DESCRIPTION
	CD	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	
REGISTERS SETTIBG	1	1	0	0	0	1	0	0	N2	N1	N0	N2 N1 N0 0 0 1 Set Cursor Pointer 0 1 0 Set Offset Register 1 0 0 Set address Pointer
SET CONTROL WORD	1	1	0	0	1	0	0	0	0	N1	N0	N1 N0 0 0 Set Text Home Address 1 1 Set Text Area 2 0 Set Graphic Home Address 1 1 Set Graphic Area
MODE SET	1	1	0	1	0	0	0	C G	N2	N1	N0	CG=0: Internal CG ROM Mode CG=1: Internal CG ROM Mode N2 N1 N0 Graphic & Text 0 0 0 OR Mode 0 0 1 Exor Mode 0 1 1 And Mode 1 0 0 Text Attribute Mode
DISPLAY MODE	1	1	0	1	0	0	1	N3	N2	N1	N0	N3=0: Display Off N3=1: Display On N2=0:Text Off N2=1: Text On N1=0: Cursor Off N1=1: Cursor On N0=0: Blink Off N0=1: Blink On
CURSOR PATTERN SELECT	1	1	0	1	0	1	0	0	N2	N1	N0	N2,N1,N0 Line Number of Cursor N2 N1 N0 0 0 0 1-Line Cursor (Bottom Line) 1 1 1 8-Line Cursor (8x8Dots)
DATA AUTO READ/WRITE	1	1	0	1	0	1	1	0	0	N1	N0	N1 N0 0 0 Data Auto Write 0 1 Data Auto Read 1 * Auto Reset
DATA READ/WRITE	1	1	0	1	1	0	0	0	N2	N1	N0	N2=0: ADP Variable N2=1: ADP Nonvariable N1=0: Increment ADP N1 =1: Decrement ADP N0=0: Data Write N0=1: Data Read
SCREEN PEEK	1	1	0	1	1	1	0	0	0	0	0	Screan Peek
SCREEN COPY	1	1	0	1	1	1	0	1	0	0	0	Screen Copy
BIT SET/RESET	1	1	0	1	1	1	1	N3	N2	N1	N0	N3=0: Bit Reset N3=1: Bit Set N2, N1, N0 Bit Address 000-D0, 111-D7
DATA WRITE	0	1	0	Write Data								Writes data DB0~DB7 into display data RAM. After writing instruction
DATA READ	0	0	1	Read Data								Reads data DB0~DB7 from display data RAM to the data bus.