AZ Displays, Inc.

1. MECHANICAL DATA

(1) Product No.		AGM1212D
(2) Module Size		92.0 (W)mm x 106.0 (H)mm x MAX 12.0 (D)mm (W/O , EL B.L.)
		92.0 (W)mm x 106.0 (H)mm x MAX 14.5 (D)mm (LED B.L.)
(3) Dot Size		0.50 (W)mm x 0.50 (H)mm
(4) Dot Pitch		0.55 (W)mm x 0.55 (H)mm
(5) Number of Dots		128 (W) x 128 (H)Dots
(6) Duty		1/128
(7) LCD Display Mode	STN:	☐ Gray ☐ Yellow ☐ Blue
	FSTN:	☐ Black and White(Normal White/Positive Image)
		☐ Black and White(Normal Black/Negative Image)
	Rear Polarizer:	☐ Reflective ☐ Transflective ☐ Transmissive
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐____O'clock
(9) LCD Controller		BUILT-IN T6963C (TOSHIBA)
(10) Backlight		☐ W/O ☐ EL ☐ LED
(11) Weight		W/O B/L : 90.4g
		EL B/L : 96.5g
		LED B/L : 120.5g

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

GND=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−GND	0	7.0	V	
Input Voltage	VI	GND	VDD	V	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	70	−20	70	−30	80
Humidity (Without Condensation)	Note 1,3		Note 2,3		Note 3,4		Note 3,5	

Note 1 Ta ≦ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 2 Ta at −20°C will be < 48hrs, at 70°C will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 4 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 5 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

3. ELECTRICAL CHARACTERISTICS

(VDD=5V ± 10%)

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD−GND	−		4.75	5.0	5.25	V
Input Voltage	VIH	H level		0.8VDD	−	VDD	V
	VIL	L level		GND	−	0.2VDD	V
Recommended LCD Driving Voltage (NORMAL TEMP. LCM)	VDD−V0 (Vop)	1/12 Bias	0°C	18.4	19.4	−	V
			25°C	17.2	18.2	19.2	V
			50°C	15.4	16.7	−	V
Recommended LCD Driving Voltage (WIDE TEMP. LCM)	VDD−V0 (Vop)	1/12 Bias	−20° C	−	17.2	−	V
			0° C	−	16.1	16.2	V
			25° C	−	16.0	16.2	V
			50° C	15.6	15.7	−	V
			70° C	−	−	−	V
Supply Current (LCD)	IDD	VDD = 5.0V V0 = −13.2V		17	21	29	mA
	I0			1.5	2.0	3.0	
LED POWER SUPPLY	ILED	VBL=5V RBL=5Ω		97	101	110	mA
EL POWER SUPPLY	IEL	VBL=110Vac 400Hz RBL=0Ω		−	−	10	mA

4. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)		θ(Viewing Angle)		ϕ(Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	3.5	7	40	60	20	28
	J	4	8	35	60	20	35
S	A	—	—	—	—	—	—
	C	3	6	35	50	20	25
	J	–	–	–	–	–	–
note		NOTE6		NOTE5			

AT ϕ=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	—	270	540	ms	NOTE 2
		25℃	—	140	280		
		50℃	—	50	120		
Response Time (fall)	Tf	0℃	—	760	1500	ms	NOTE 2
		25℃	—	210	420		
		50℃	—	120	240		

note:

S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

AZ Displays, Inc.

4-1.OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio) 25℃ MIN.	Cr(Contrast Ratio) 25℃ TYP.	θ(Viewing Angle) 25℃ MIN.	θ(Viewing Angle) 25℃ TYP.	φ(Viewing Angle) 25℃ MIN.	φ(Viewing Angle) 25℃ TYP.
R	A	–	3.8	–	–	–	–
	C	–	4.1	–	–	–	–
	J	–	6.5	–	26	–	33
S	A	–	4.0	–	46	–	25
	C						
	J						
T	A	–	2.5	–	–	–	–
note		NOTE6		NOTE5			

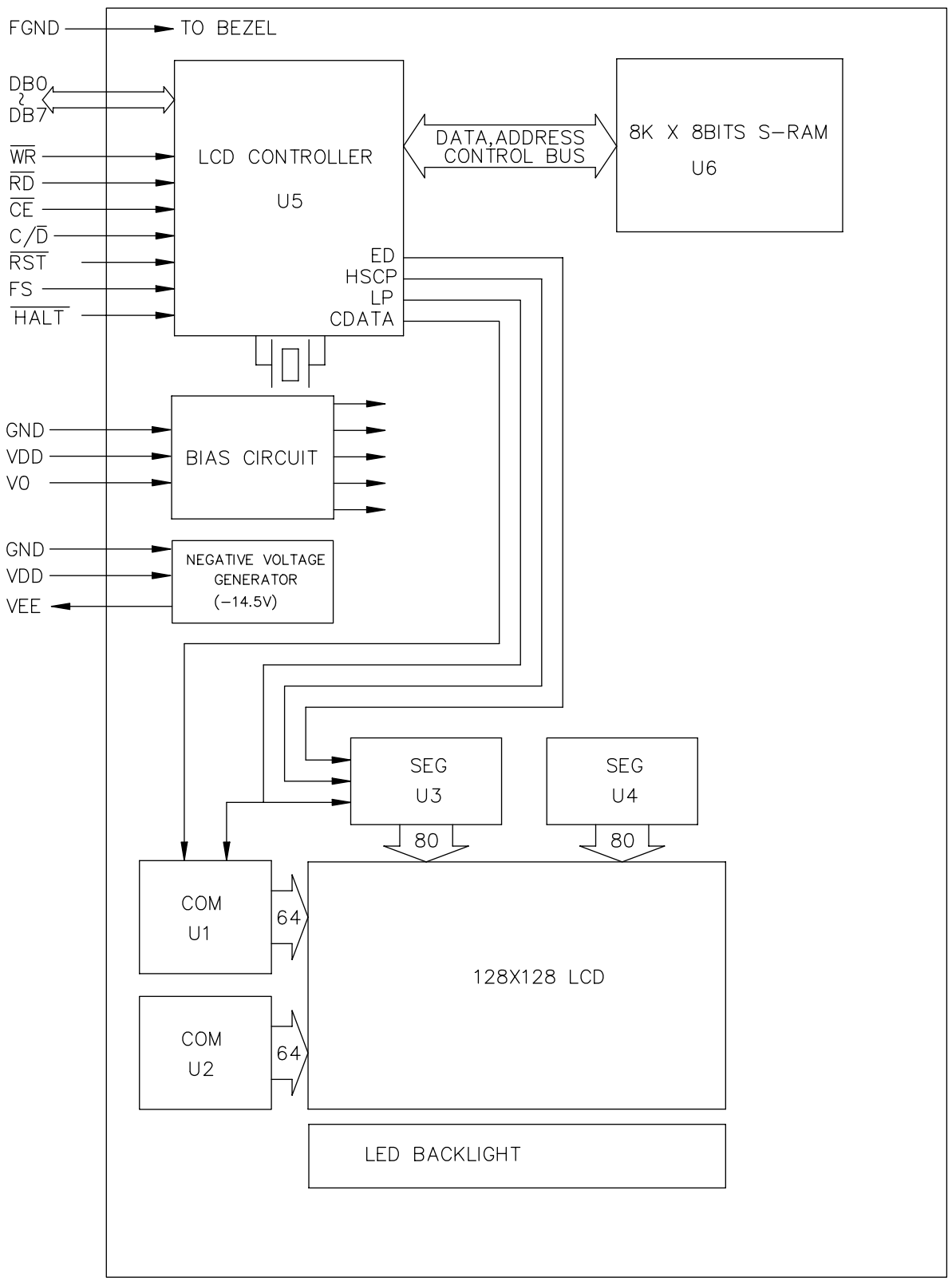
AT ø=0° θ=0°

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	–	–	–	ms	NOTE 2
		0℃	–	350	520		
		25℃	–	120	180		
		50℃	–	70	105		
		70℃	–	55	80		
Response Time (fall)	Tf	-20℃	–	–	–	ms	NOTE 2
		0℃	–	640	900		
		25℃	–	200	300		
		50℃	–	80	120		
		70℃	–	35	50		

note:

S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

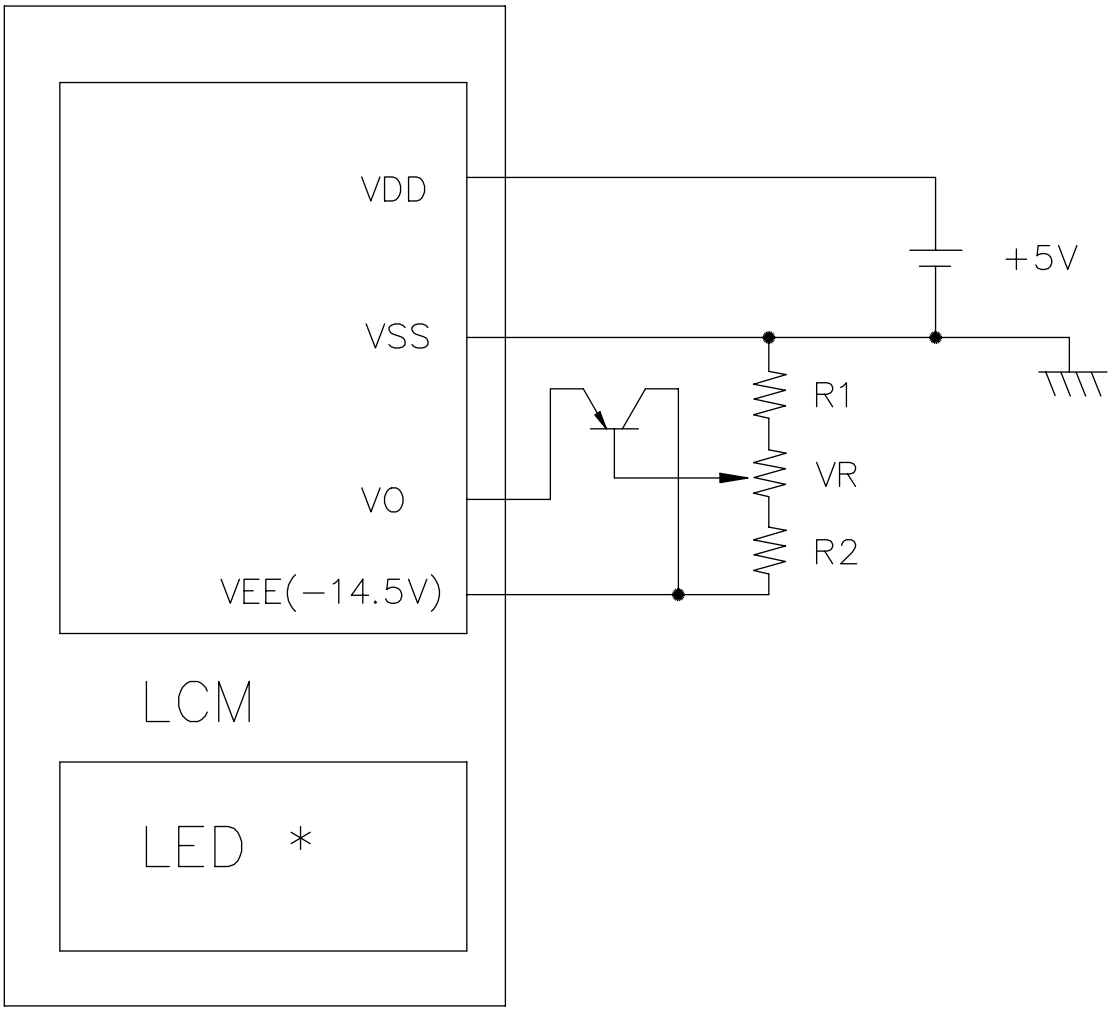
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	Vss	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	V0	POWER SUPPLY FOR LC DRIVING
5	$\overline{WR}$	DATA WRITE
6	$\overline{RD}$	DATA READ
7	$\overline{CE}$	$\overline{CE}$="L", CHIP ENABLE
8	C/$\overline{D}$	$\overline{WR}$="L",C/$\overline{D}$="H" :COMMAND WRITE $\overline{WR}$="L",C/$\overline{D}$="L" :DATA WRITE $\overline{RD}$="L",C/$\overline{D}$="H" :STATUS READ $\overline{RD}$="L".C/$\overline{D}$="L" :DATA READ
9	$\overline{RST}$	CONTROLLER RESET
10	D0	DATA INPUT/OUTPUT
11	D1	DATA INPUT/OUTPUT
12	D2	DATA INPUT/OUTPUT
13	D3	DATA INPUT/OUTPUT
14	D4	DATA INPUT/OUTPUT
15	D5	DATA INPUT/OUTPUT
16	D6	DATA INPUT/OUTPUT
17	D7	DATA INPUT/OUTPUT
18	FS	FONT SELECT CONNECT TO VDD : 6X8 PIXELS/CHARACTER CONNECT TO GND : 8X8 PIXELS/CHARACTER
19	VEE	−14.5 V NEGATIVE VOLTAGE GENERATOR
20	$\overline{HALT}$	$\overline{HALT}$="L", CONTROLLER HALT

7. POWER SUPPLY



R1+VR+R2=10K~20K

*: Power is internally supplied to LEDs.

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/$\overline{D}$ SET UP TIME	t_{CDS}	Fig.	100	–	ns
C/$\overline{D}$ HOLD TIME	t_{CDH}	Fig.	10	–	ns
$\overline{CE}$,$\overline{RD}$,$\overline{WR}$ CLOCK WIDTH	t_{CP}, t_{RP}, t_{WP}	Fig.	80	–	ns
DATA SET UP TIME	t_{DS}	Fig.	80	–	ns
DATA HOLD TIME	t_{DH}	Fig.	40	–	ns
ACCESS TIME	t_{ACC}	Fig.	–	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

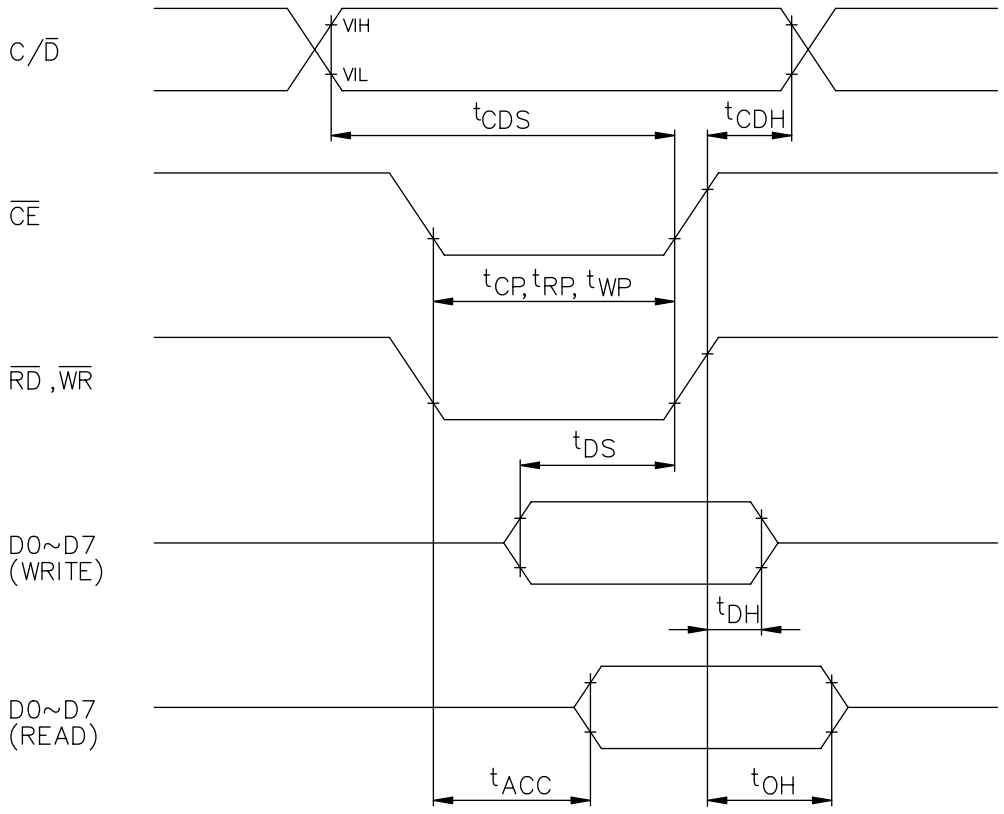
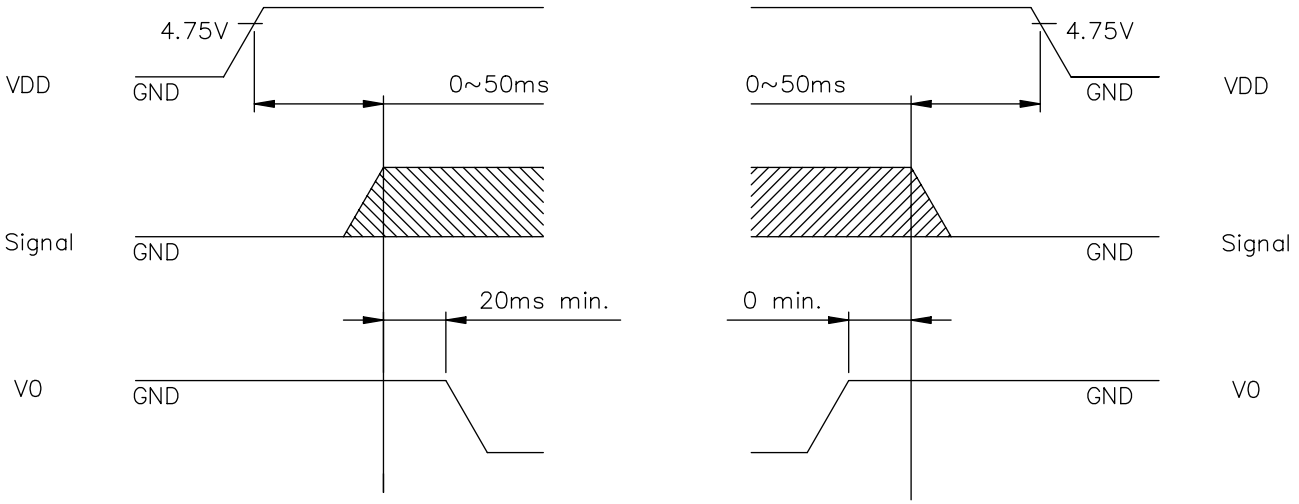


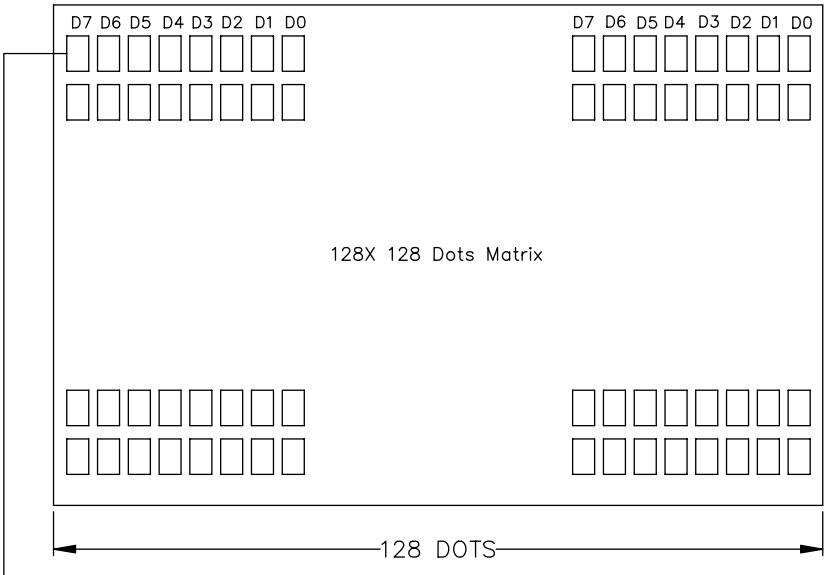
Fig. INTERFACE TIMING CHART

8-2 POWER ON/OFF TIMING



THE RECOMMENDED POWER & INTERFACE TIMING SEQUENCE

9. DISPLAY PATTERN

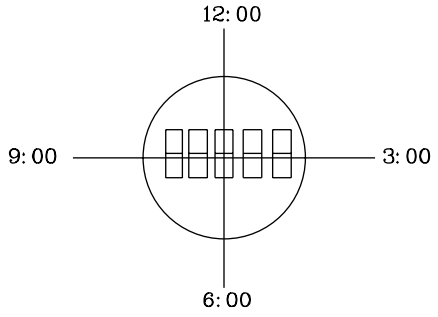


Starting dot for the starting address of display RAM.

D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

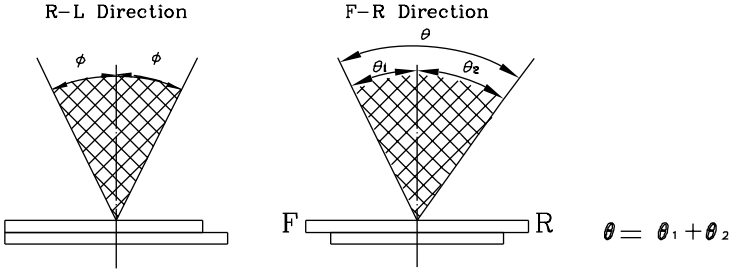
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



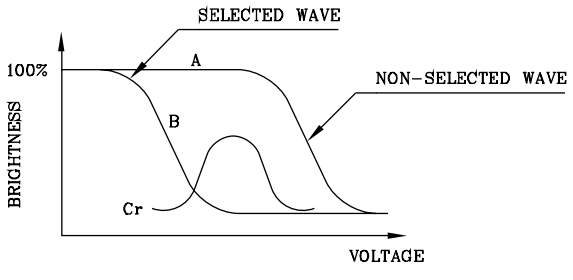
$\theta = \theta_1 + \theta_2$

*Conditions

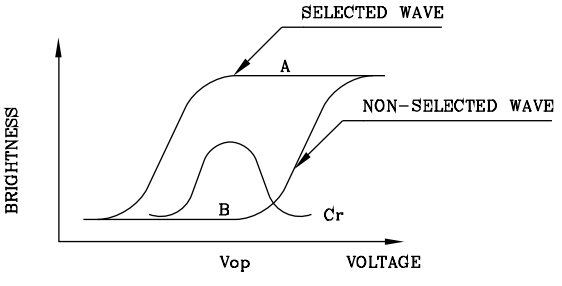
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

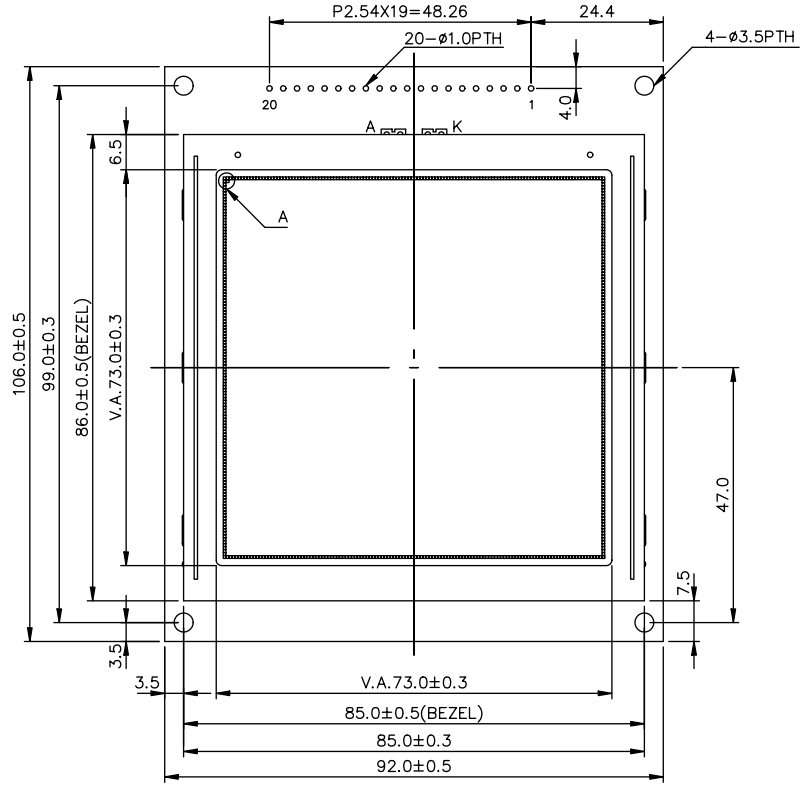


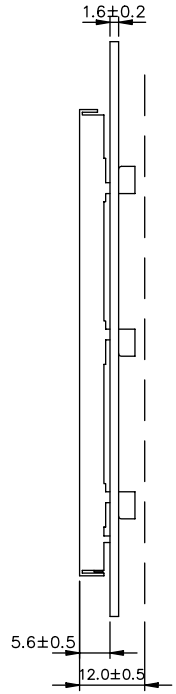
(negative type)

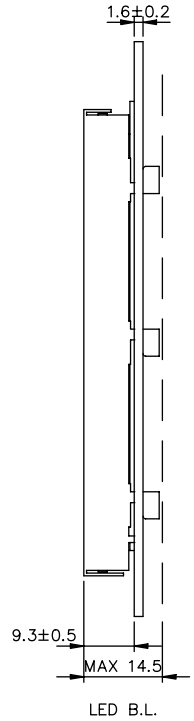
Contrast Ratio : Cr=A/B

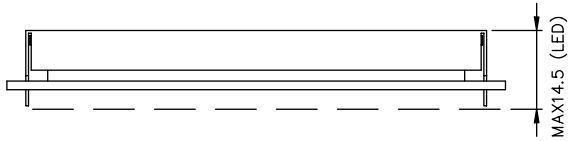
*Conditions

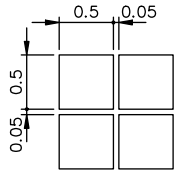
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias











128x128 DOTS

A DETAIL

No.	Symbol
1	FGND
2	GND
3	VDD
4	V0
5	$\overline{WR}$
6	$\overline{RD}$
7	$\overline{CE}$
8	C/$\overline{D}$
9	$\overline{RST}$
10	DB0
11	DB1
12	DB2
13	DB3
14	DB4
15	DB5
16	DB6
17	DB7
18	FS
19	VEE
20	$\overline{HALT}$

Note :

1.RESOLUTION : 128 X128

2.GENERAL TOLERANCE : ±0.5mm

	AGM1212D		AZ DISPLAYS, INC.		
	NAME	DATE			
APPROVE			TITLE		
CHECK			DWG-NO	MX-X082X	Rev.A
DESIGN			THIRD ANGLE PROJECT	UNIT : mm	
DRAW	MAY PING	86.11.07		SCALE : 2/3	