

AZ Displays, Inc.

1. MECHANICAL DATA

(1) Product No.	AGM1212B
(2) Module Size	72.4 (W)mm x 69.9 (H)mm x MAX13.5 (D)mm (LED B.L.) 72.4 (W)mm x 69.9 (H)mm x MAX9.5 (D)mm (W/O,EL B.L.)
(3) Dot Size	0.32 (W)mm x 0.32 (H)mm
(4) Dot Pitch	0.35 (W)mm x 0.35 (H)mm
(5) Number of Dots	128 (W) x 128 (H)Dots
(6) Duty	1/128
(7) LCD Display Mode	STN: ☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode FSTN: ☐ Black and White(Normal White/Positive Image) ☐ Black and White(Normal Black/Negative Image) Rear Polarizer: ☐ Reflective ☐ Transflective ☐ Transmissive ☐ Transflective(High Transmissive)
(8) Viewing Direction	☐ 6 O'clock ☐ 12 O'clock ☐ ____O'clock
(9) Backlight	☐ W/O ☐ EL ☐ LED ☐ CCFT
(10) LCD Controller	BUILT-IN T6963C (TOSHIBA)
(11) Weight	W/O B/L: about 51.4 g EL B/L: about 54.3 g LED B/L: about 63 g

AZ Displays, Inc.

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{ss}=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD–VSS	–0.3	7.0	V	
Power Supply for LC Drive	VDD–VEE	0	25.0	V	
Input Voltage	V _I	–0.3	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

AZ Displays, Inc.

3. ELECTRICAL CHARACTERISTICS

(VDD = 5V ± 10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD-VSS	—	4.75	5.0	5.25	V
Input Voltage	VIH	H level	0.8VDD	—	VDD	V
	VIL	L level	0	—	0.2VDD	V
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-VEE 1/12 Bias	0℃	—	19.0	20.0	V
		25℃	16.8	17.6	18.2	
		50℃	15.7	16.1	—	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-VEE 1/12 Bias	-20℃	—	16.9	17.4	V
		-10℃	15.2	16.1	16.7	
		0℃	15.2	16.1	16.5	
		25℃	15.2	16.1	16.4	
		50℃	15.2	15.9	16.4	
		70℃	14.3	14.9	—	
Supply Current (LCD) (Normal Temp. LCM)	IDD	VDD = 5.0V	—	—	9	mA
	IEE	VEE = 12.6V	—	—	4	mA
LED Power Supply Current	I LED	VBL = 5Vdc (RBL = 3.3Ω)	—	240	400	mA
LED Average Brightness	B(LED)		—	32.1	—	cd/m ²
EL Power Supply Current	I EL	VEL = 110VAc 400Hz	—	—	5	mA
EL Average Brightness	B(EL)		—	20.18	—	cd/m ²

AZ Displays, Inc.

4-1.OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT Vop

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3	4	40	60	25	30
	C	4	6	40	60	25	35
	J	4	6	40	60	25	35
S	A	3	4	40	60	20	30
	C	4	6	40	60	25	35
	J	3.5	6	40	55	20	30
T	E	3	4	35	65	20	40
	G	6	15	45	90	30	50
note		NOTE6		NOTE5			

AT $\phi=0^{\circ}$ $\theta=0^{\circ}$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	—	450	900	ms	NOTE 2
		25℃	—	110	220		
		50℃	—	65	130		
Response Time (fall)	Tf	0℃	—	650	1100	ms	NOTE 2
		25℃	—	135	250		
		50℃	—	80	150		

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

AZ Displays, Inc.

4-2.OPTICAL CHARACTERISTICS

(For Wide Temperature Mode LCM)

AT Vop

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3.0	4.0	40	60	28	35
	C	—	—	—	—	—	—
	J	4.0	6.5	35	52	25	33
S	A	3.0	3.8	35	50	20	25
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
T	A	—	2.5	20	40	15	20
	G	5	10	50	86	35	50
note		NOTE6		NOTE5			

AT $\phi=0^{\circ}$ $\theta=0^{\circ}$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−20℃	—	2200	4400	ms	NOTE 2
		−10℃	—	940	1880		
		0℃	—	440	880		
		25℃	—	120	240		
		50℃	—	60	120		
		70℃	—	50	100		
Response Time (fall)	Tf	−20℃	—	3800	6000	ms	NOTE 2
		−10℃	—	1260	2400		
		0℃	—	620	1200		
		25℃	—	180	350		
		50℃	—	80	150		
		70℃	—	70	130		

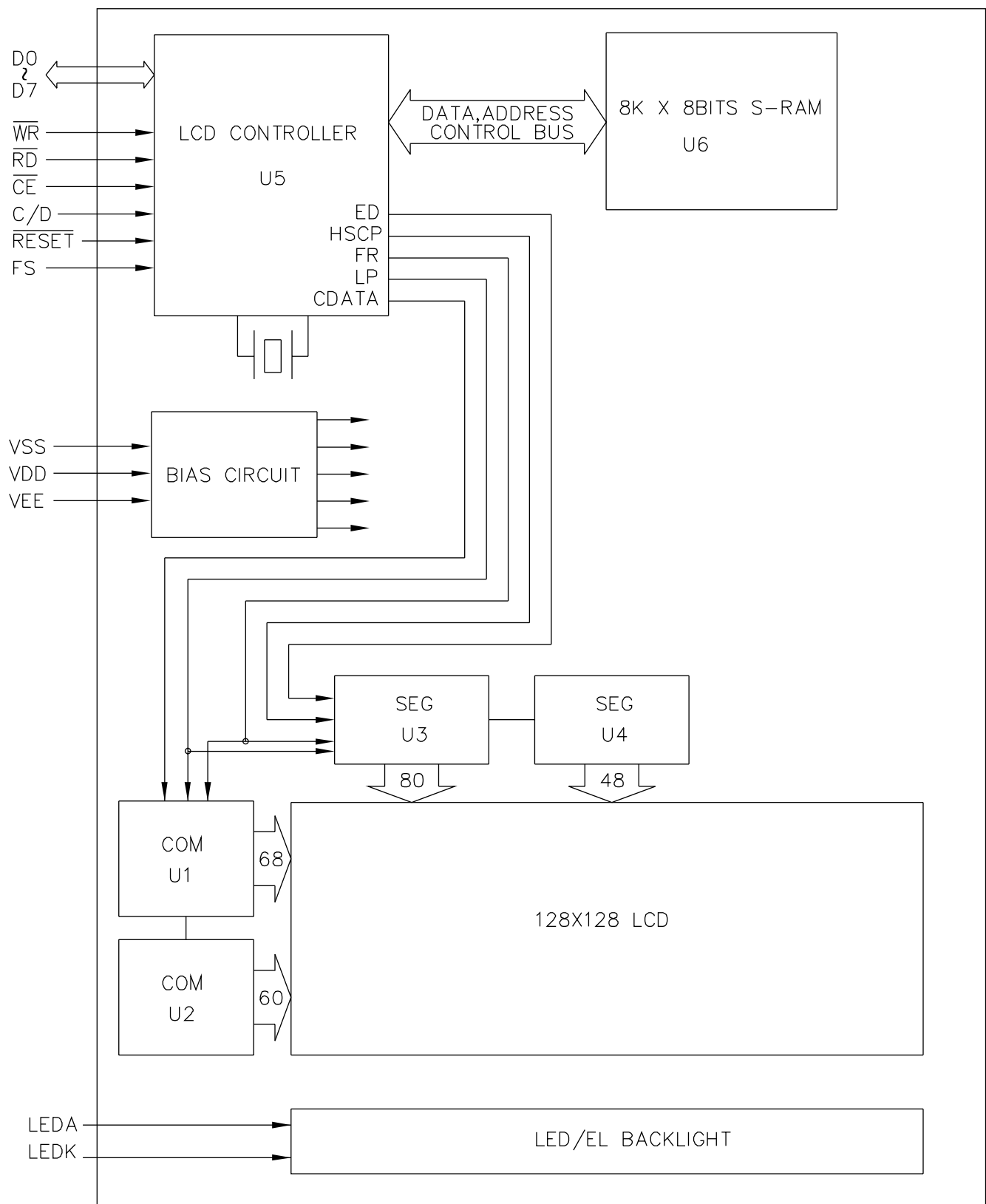
note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

AZ Displays, Inc.

5. BLOCK DIAGRAM



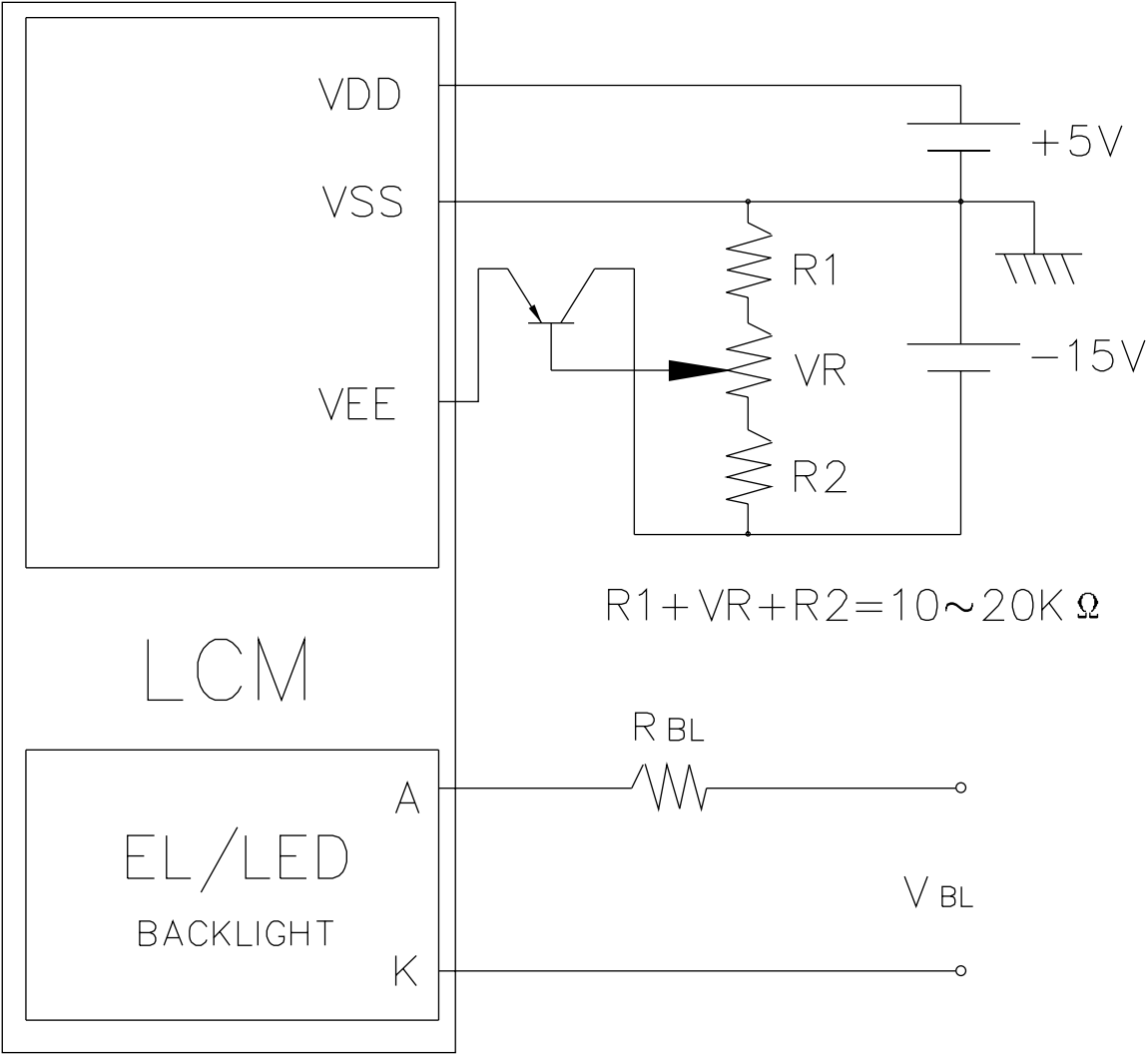
AZ Displays, Inc.

6.INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	VSS	GROUND
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT
3	VEE	POWER SUPPLY FOR LCD CIRCUIT
4	$\overline{WR}$	DATA WRITE
5	$\overline{RD}$	DATA READ
6	$\overline{CE}$	CHIP ENABLE
7	C/D	$\overline{WR}$ ="L",C/D="H" :COMMAND WRITE $\overline{WR}$ ="L",C/D="L" :DATA WRITE $\overline{RD}$ ="L",C/D="H" :STATUS READ $\overline{RD}$ ="L".C/D="L" :DATA READ
8	$\overline{RESET}$	CONTROLLER RESET
9	D0	DATA INPUT/OUTPUT
10	D1	DATA INPUT/OUTPUT
11	D2	DATA INPUT/OUTPUT
12	D3	DATA INPUT/OUTPUT
13	D4	DATA INPUT/OUTPUT
14	D5	DATA INPUT/OUTPUT
15	D6	DATA INPUT/OUTPUT
16	D7	DATA INPUT/OUTPUT
17	FS	FONT SELECT CONNECT TO VDD :6X8 PIXELS/CHARACTER CONNECT TO VSS :8X8 PIXELS/CHARACTER
18	NC	NO CONNECTION
19	LEDK	LED or EL BACKLIGHT
20	LEDA	LED or EL BACKLIGHT

AZ Displays, Inc.

7. POWER SUPPLY



Recommended Value for R_{BL} and V_{BL}

ITEM Back Light Interface	R BL		V BL	
	LED	EL	LED	EL
A,K PIN	3.3Ω	0Ω	5V _{Dc}	110 V _{Ac} 400Hz

AZ Displays, Inc.

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	—	ns
C/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

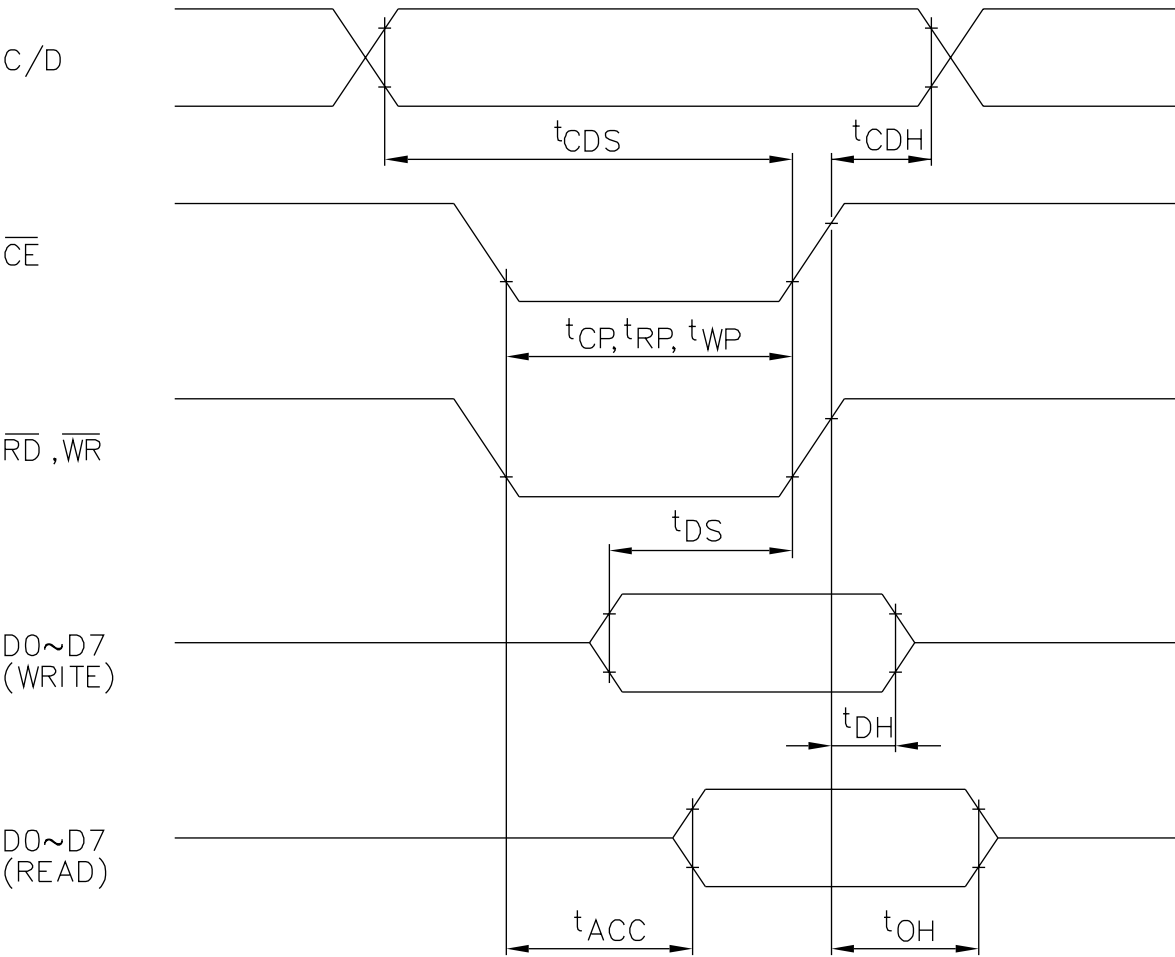
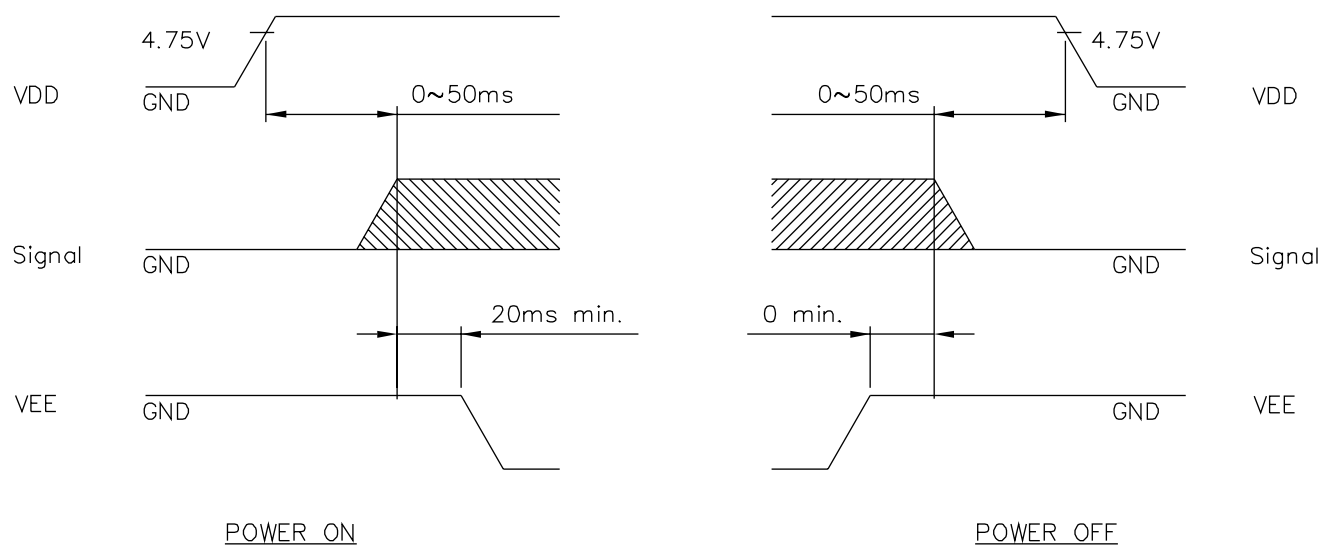


Fig. INTERFACE TIMING CHART

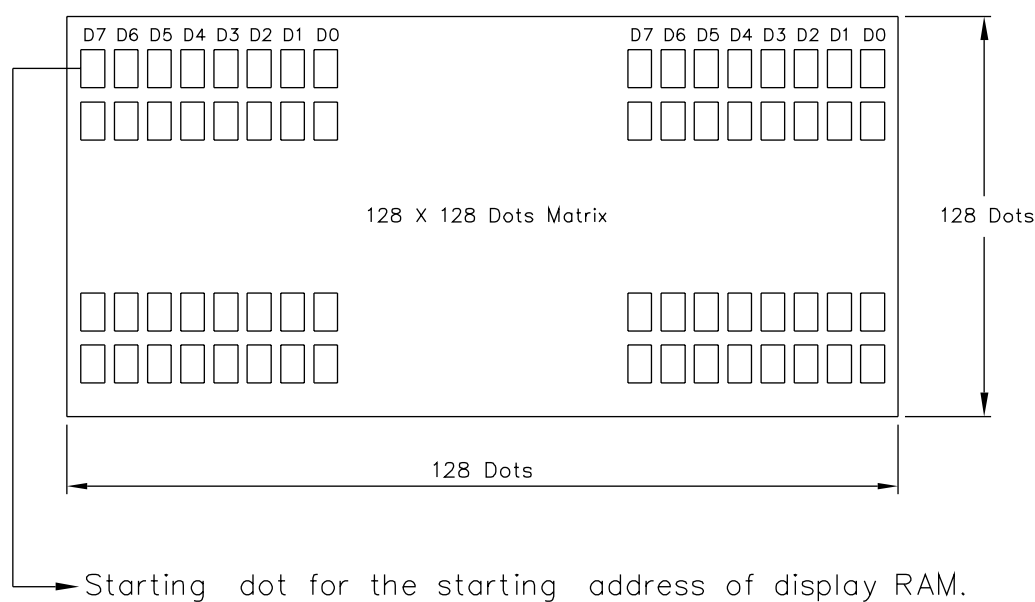
AZ Displays, Inc.

8-2. POWER ON/OFF TIMING



The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

9. DISPLAY PATTERN

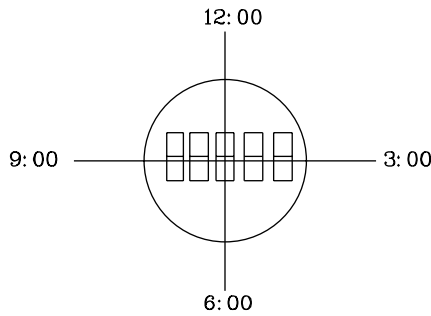


D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

AZ Displays, Inc.

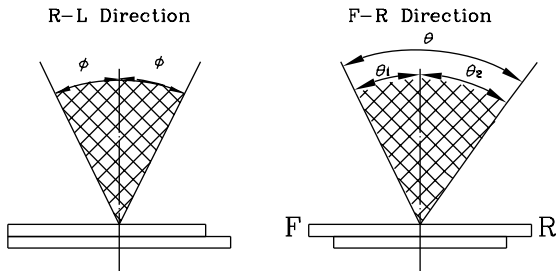
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



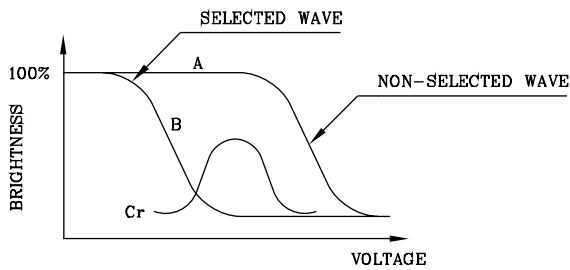
$$\theta = \theta_1 + \theta_2$$

*Conditions

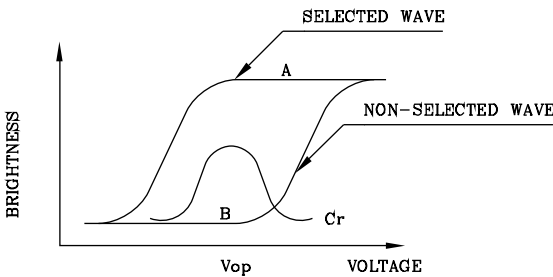
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

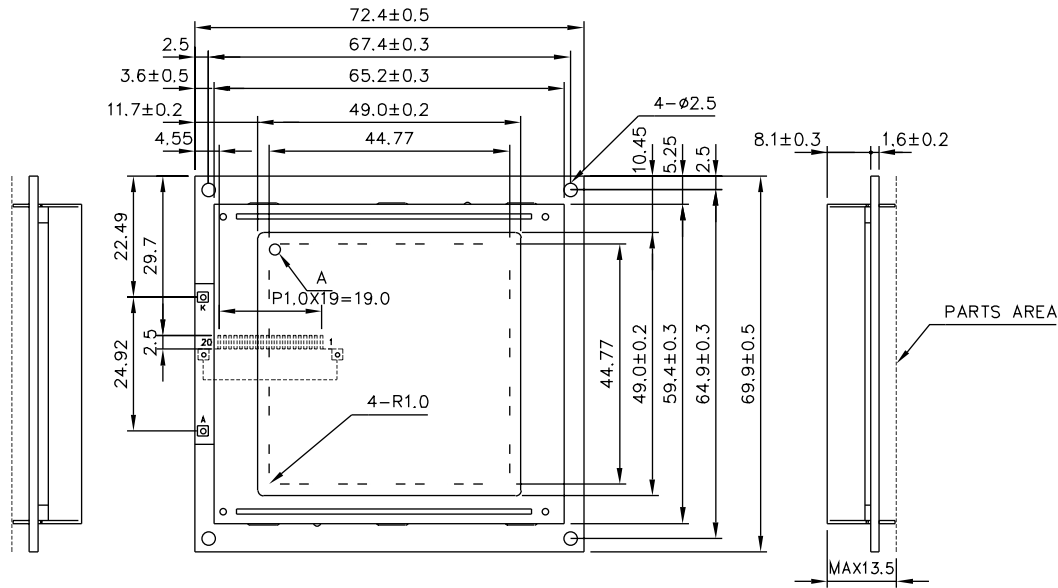


(negative type)

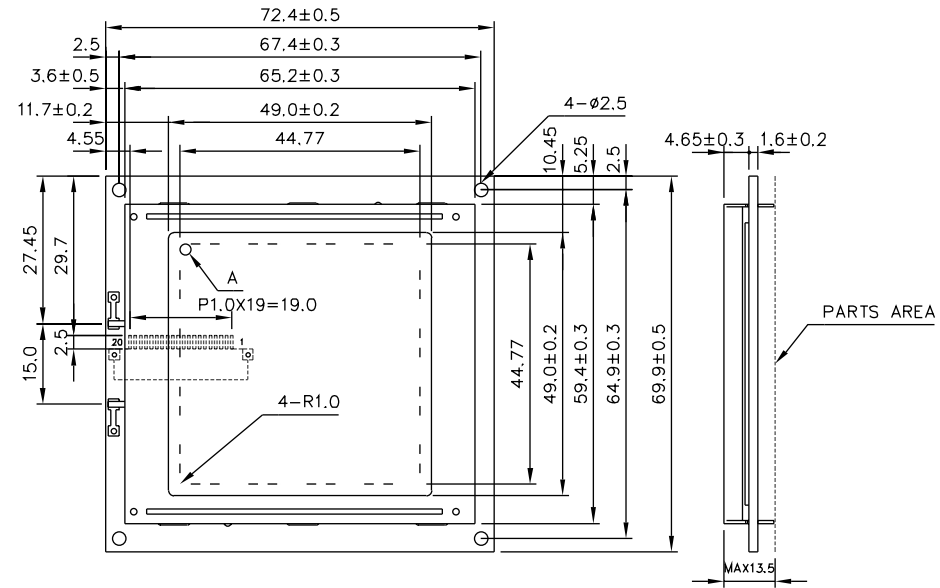
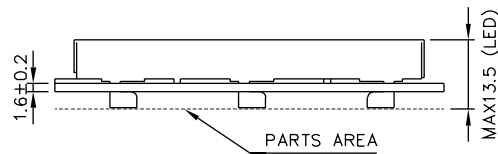
$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

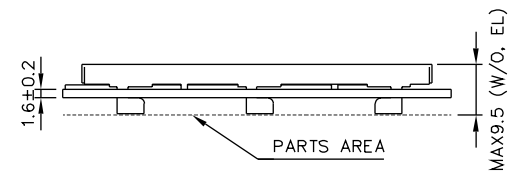
Viewing Angle : 0
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias



LED B.L.

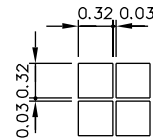


W/O B.L.
EL B.L.



NOTES:

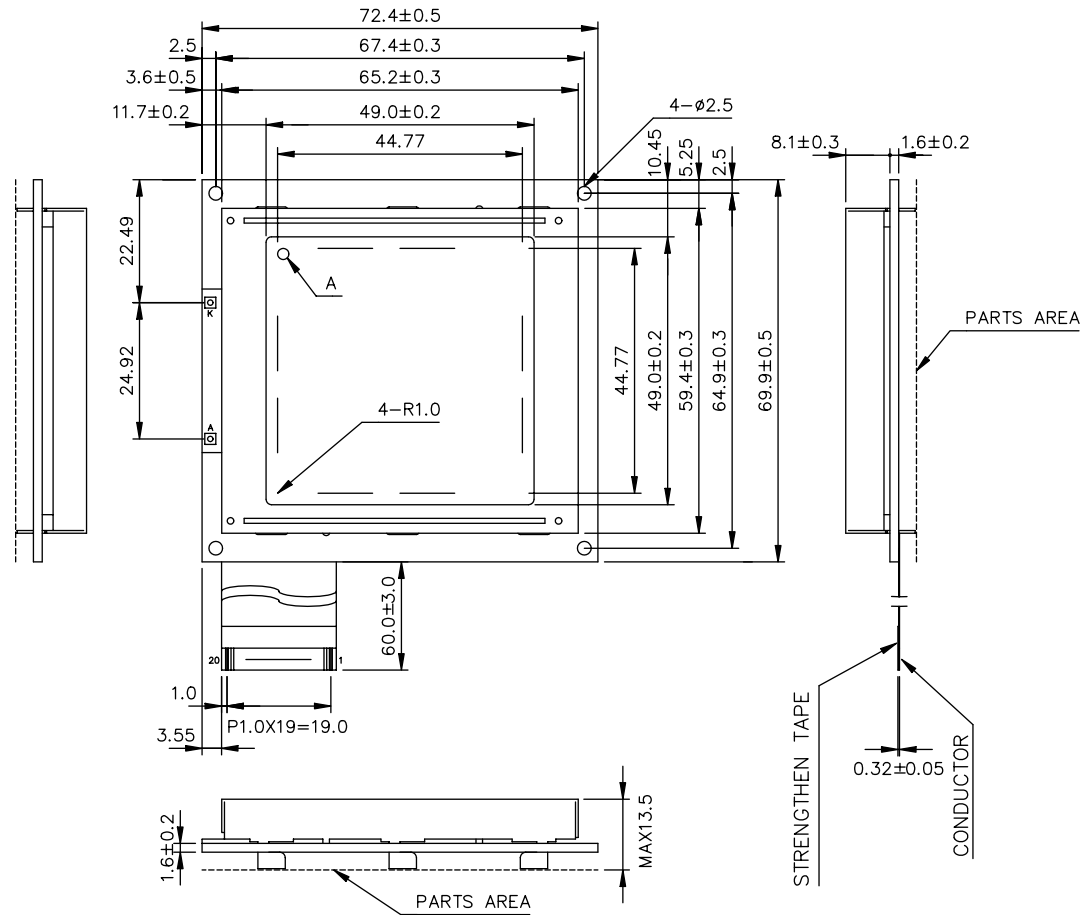
- 1.RESOLUTION:128X128 DOTS
- 2.CONTROLLER: T6963C(TOSHIBA)
- 3.DC/DC: WITHOUT
- 4.BACKLIGHT: LED(YELLOW GREEN)
EL(WHITE)



A DETAIL

Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power Supply for Logic Circuit
3	VEE	Power Supply for LCD Circuit
4	WR	Data Write
5	RD	Data Read
6	CE	Chip Enable
7	C/D	WR="L",C/D="H" : Command Write WR="L",C/D="L" : Data Write RD="L",C/D="H" : Status Read RD="L",C/D="L" : Data Read
8	RESET	Controller Reset
9-16	D0-D7	Data Bus Line
17	FS	Font Select Connect to VDD : 6x8 Pixels/Character Connect to VSS : 8x8 Pixels/Character
18	NC	No Connection
19	LEDK	LED or EL Backlight
20	LEDA	LED or EL Backlight

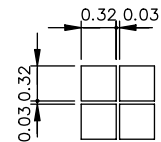
AGM1212B		AZ DISPLAYS, INC.		
NAME	DATE	TITLE		
APPROVE			DWG-NO	MX-X026X Rev.A
CHECK			DESIGN	
DRAW	MAY PING	85.05.07	THIRD ANGLE PROJECT	UNIT : mm SCALE : 2/3



NOTES:

- 1.RESOLUTION:128X128 DOTS
- 2.CONTROLLER: T6963C(TOSHIBA)
- 3.DC/DC: WITHOUT
- 4.BACKLIGHT: LED(YELLOW GREEN)

Pin No.	Symbol	Function
1	VSS	Ground
2	VDD	Power Supply for Logic Circuit
3	VEE	Power Supply for LCD Circuit
4	WR	Data Write
5	RD	Data Read
6	CE	Chip Enable
7	C/D	WR="L",C/D="H" : Command Write WR="L",C/D="L" : Data Write RD="L",C/D="H" : Status Read RD="L",C/D="L" : Data Read
8	RESET	Controller Reset
9-16	D0-D7	Data Bus Line
17	FS	Font Select Connect to VDD : 6x8 Pixels/Character Connect to VSS : 8x8 Pixels/Character
18	NC	No Connection
19	LEDK	LED or EL Backlight
20	LEDA	LED or EL Backlight



A DETAIL

AGM1212B			AZ DISPLAYS, INC.		
	NAME	DATE	TITLE		
APPROVE			DWG-NO	MCDX026X1D	Rev.A
CHECK			DESIGN		
DRAW	MAY PING	87.06.29	THIRD ANGLE PROJECT	UNIT : mm	SCALE : 2/3