

# AZ Displays, Inc.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM1212B</b>
(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: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode <input type="checkbox"/> Blue Mode FSTN: <input type="checkbox"/> Black and White(Normal White/Positive Image) <input type="checkbox"/> Black and White(Normal Black/Negative Image) Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective(High Transmissive)
(8) Viewing Direction	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ____O'clock
(9) Backlight	<input type="checkbox"/> W/O <input type="checkbox"/> EL <input type="checkbox"/> LED <input type="checkbox"/> 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<sub>SS</sub>=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 <sub>I</sub>	-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	V <sub>BL</sub> = 5V <sub>dc</sub> (R <sub>BL</sub> = 3.3Ω)	-	240	400	mA
LED Average Brightness	B(LED)		-	32.1	-	cd/m <sup>2</sup>
EL Power Supply Current	I EL	V <sub>EL</sub> = 110V <sub>Ac</sub> 400Hz	-	-	5	mA
EL Average Brightness	B(EL)		-	20.18	-	cd/m <sup>2</sup>

# AZ Displays, Inc.

## 4-1. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT Vop

ITEM MODE		Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (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)		$\theta$ (Viewing Angle)		$\phi$ (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		

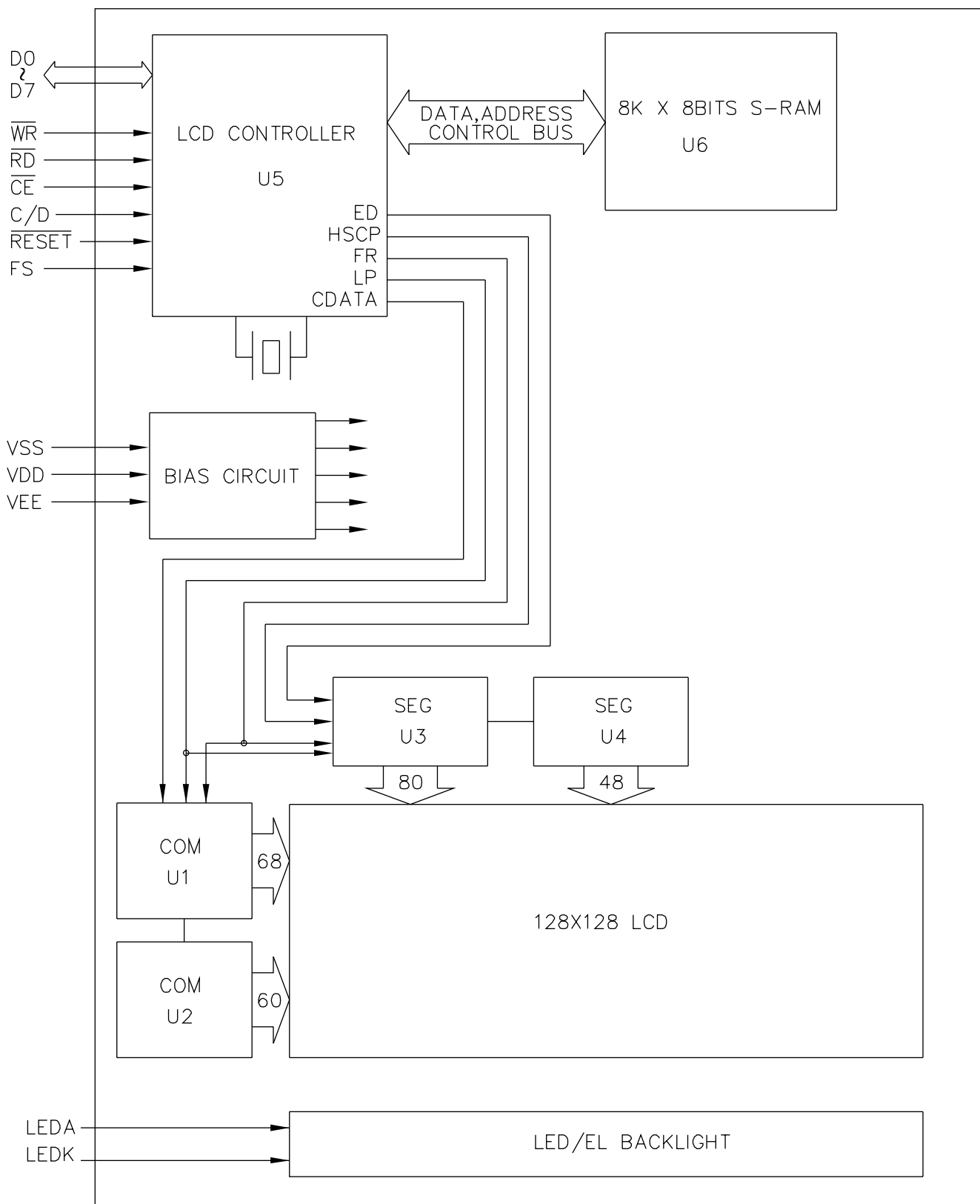
note:

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

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

# AZ Displays, Inc.

## 5. BLOCK DIAGRAM



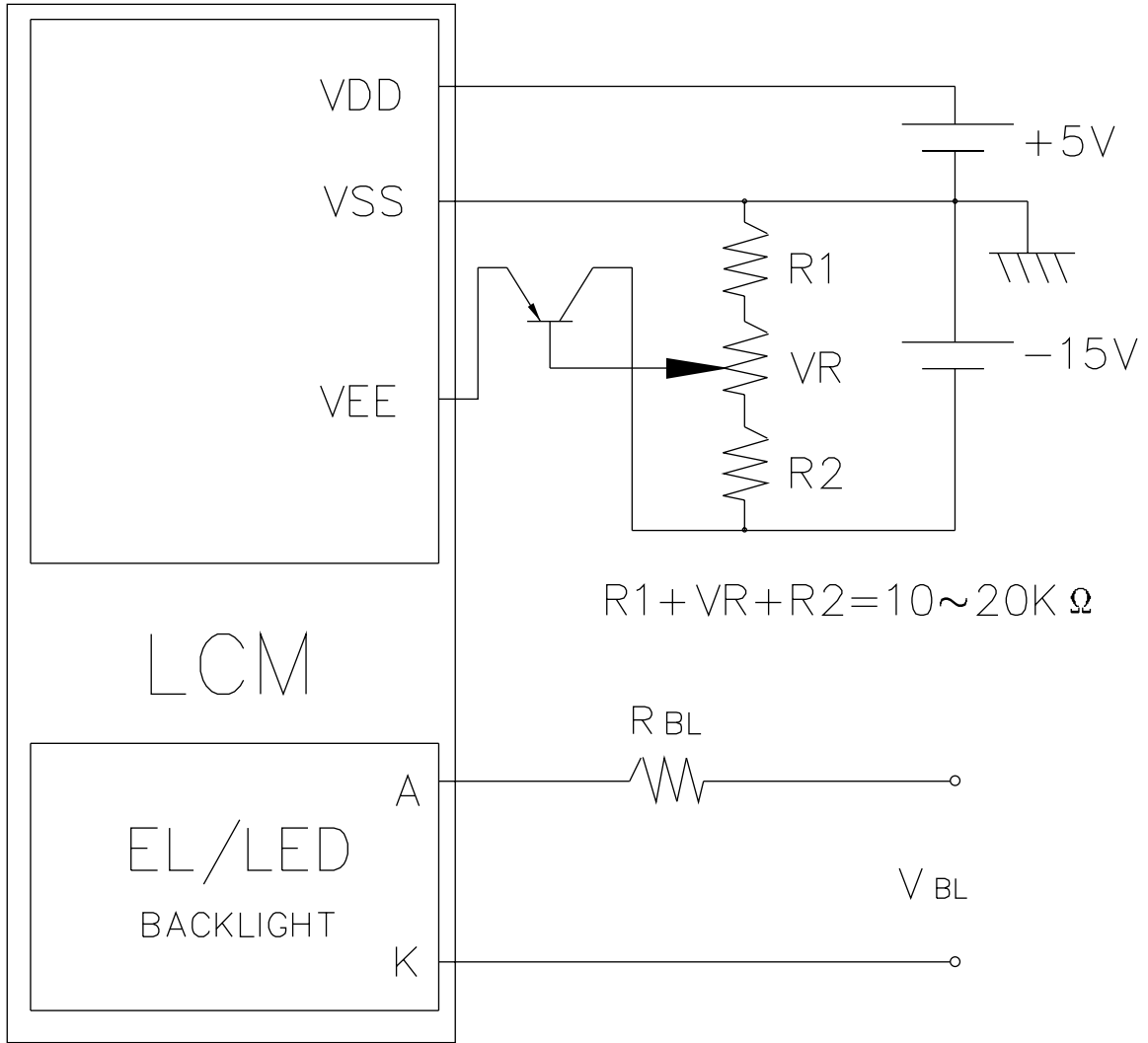
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## 6. INTERNAL PIN CONNECTION

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	3.3 $\Omega$	0 $\Omega$	5V <sub>Dc</sub>	110 V <sub>Ac</sub> 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

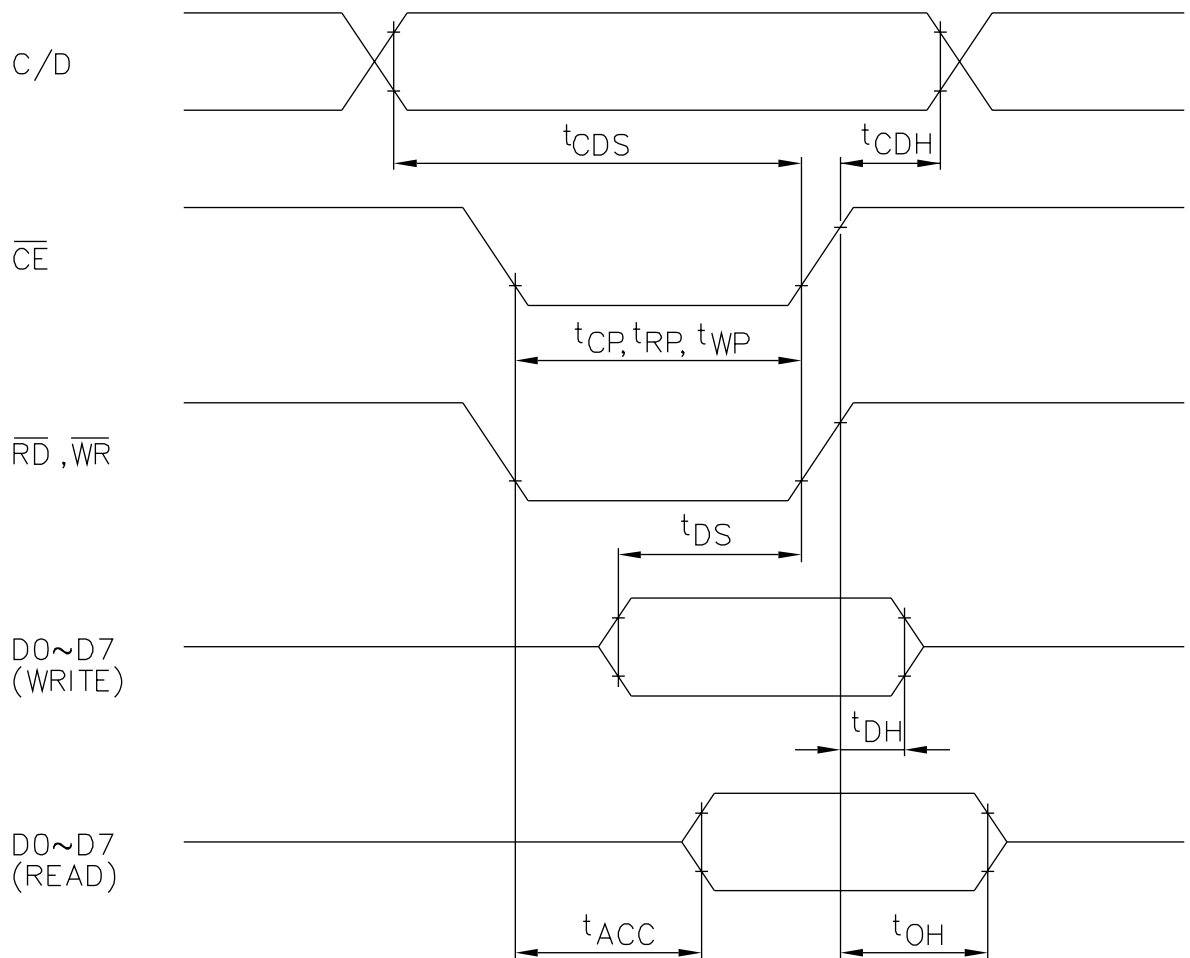
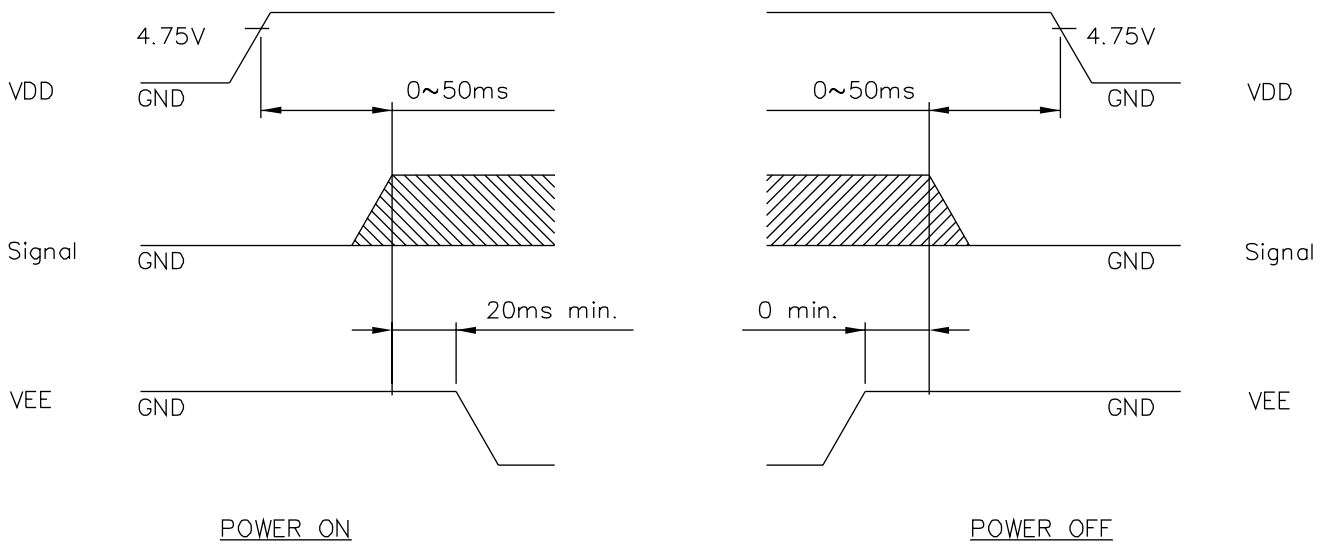


Fig. INTERFACE TIMING CHART

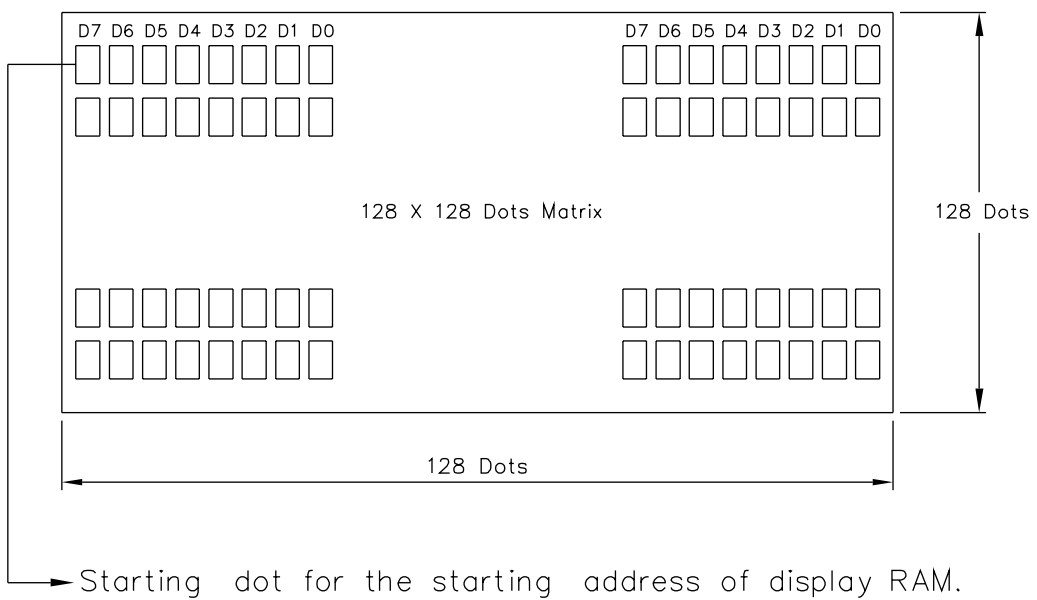
# AZ Displays, Inc.

## 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

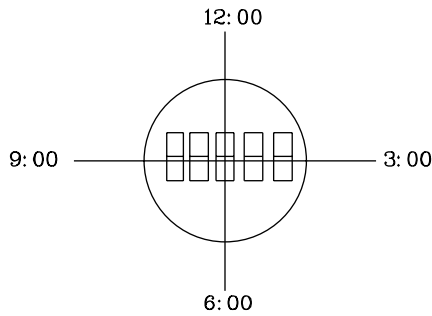


D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

# AZ Displays, Inc.

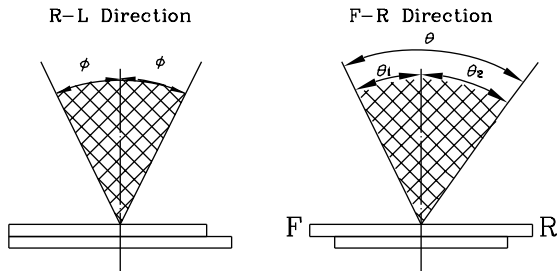
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



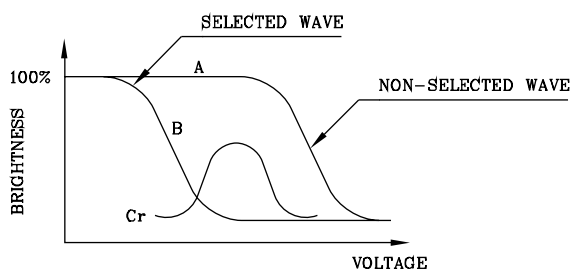
$$\theta = \theta_1 + \theta_2$$

\*Conditions

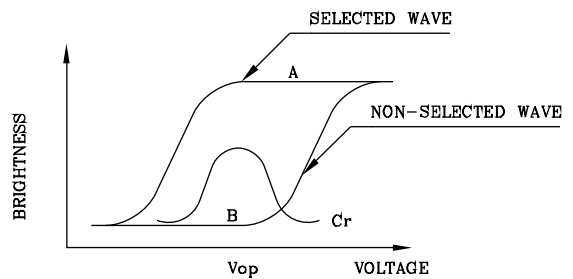
- Operating Voltage : Vop
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

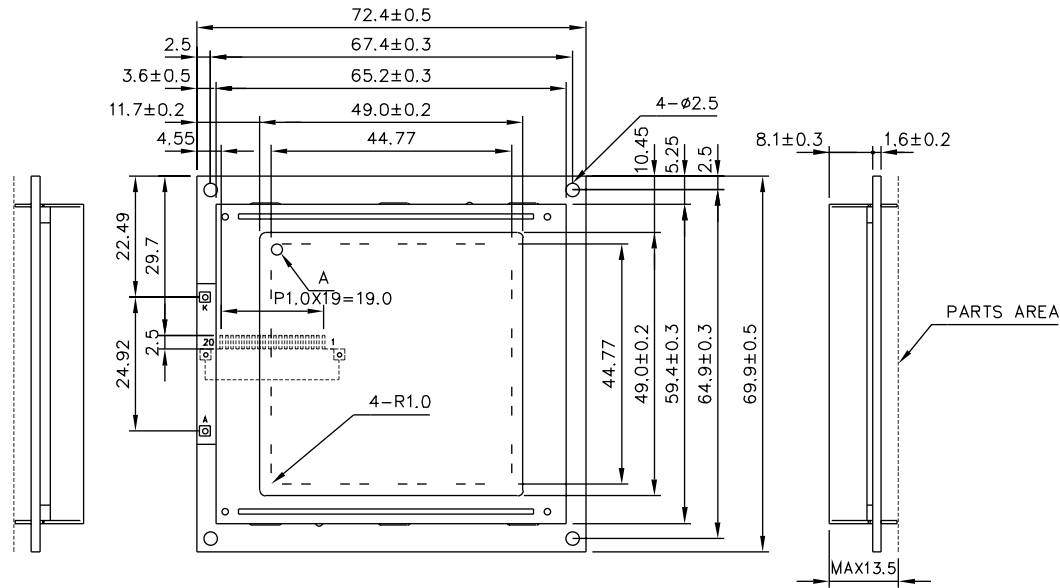


(negative type)

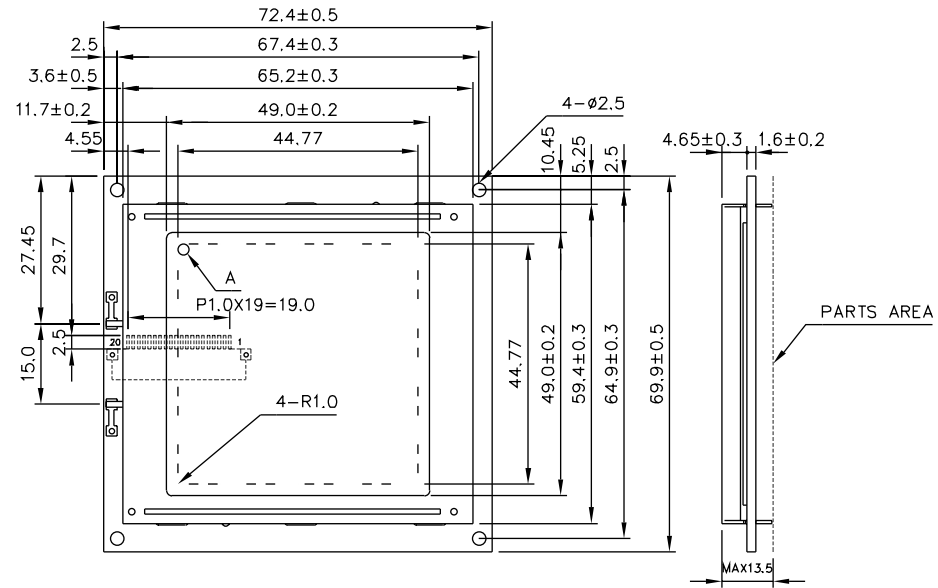
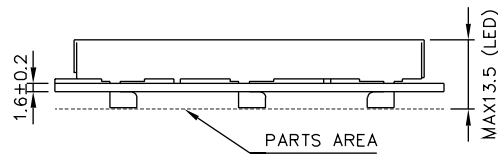
$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

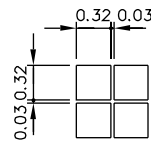
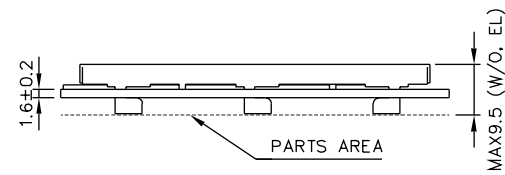
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias



LED B.L.



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



A DETAIL

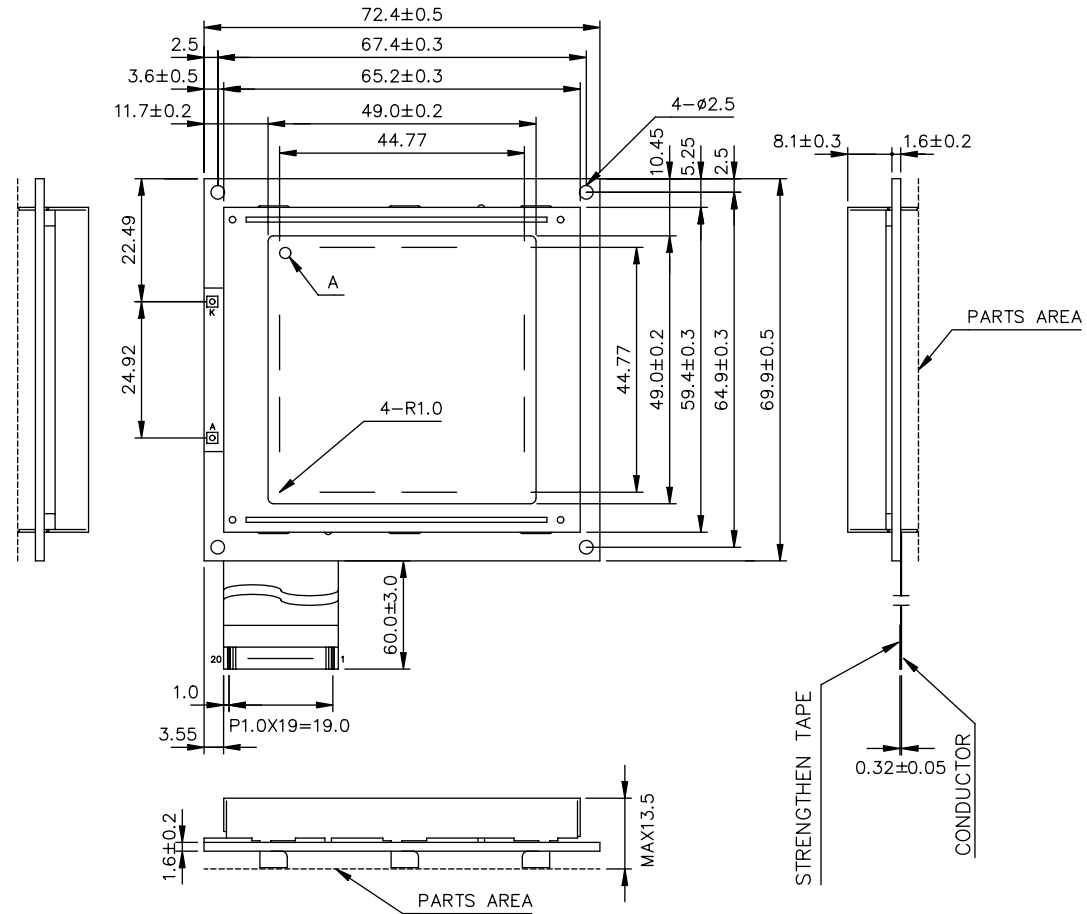
NOTES:

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

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	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.	
APPROVE	NAME	DATE	TITLE
CHECK			DWG-NO    MX-X026X    Rev.A
DESIGN			UNIT : mm
DRAW	MAY PING	85.05.07	SCALE : 2/3

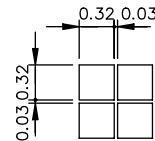




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A DETAIL

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