

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM1232F</b>
(2) Module Size	65.4 (W)mm x 29.0 (H)mm x MAX 5.7 (D)mm
(3) Dot Size	0.36 (W)mm x 0.41 (H)mm
(4) Dot Pitch	0.40 (W)mm x 0.45 (H)mm
(5) Number of Dots	122 (W) x 32 (H)Dots
(6) Duty	1/32
(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(Normally White/Positive Image) <input type="checkbox"/> Black and White(Normally Black/Negative Image)
(8) Viewing direction	Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive <input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ____O'clock
(9) Backlight	LED
(10) Weight	12.5g

Revised: November 20, 2001

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	0	5.5	V	
Input Voltage	VI	0	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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage for Logic	VDD	25°C	2.7	3.0	4.5	V
Input Voltage	V <sub>IH</sub>	H level	0.8VDD	–	VDD	V
	V <sub>IO</sub>	L level	0	–	0.2VDD	
Recommended LC Driving Voltage (Normal TEMP. LCM)	VDD–VLCD	0°C	5.4	5.8	6.2	V
		25°C	5.2	5.6	6.0	
		50°C	4.8	5.2	5.6	
Recommended LC Driving Voltage (Wide TEMP. LCM)	VDD–VLCD	–20°C	7.2	7.7	8.2	V
		0°C	7.1	7.6	8.1	
		25°C	7.0	7.5	8.0	
		50°C	6.6	7.1	7.6	
		70°C	6.3	6.7	7.1	
Power Supply Current	I <sub>DD</sub>	VDD = 3.0V VLCD = –2.7V 25°C	–	–	0.6	mA
LED Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 100 mA	1.7	2.1	2.5	V
LED Forward Current	I <sub>F</sub>	V <sub>F</sub> = 2.1 V	–	100	200	mA

## 4. OPTICAL CHARACTERISTICS

### 4.1 Optical Char. of Normal Temp. Mode

At Vop

ITEM MODE		Cr (Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
S	A	2.5	3.5	25	35	15	20
	C	3.5	6.0	20	30	20	30
	J	—	—	—	—	—	—
NOTE		NOTE 6		NOTE 5			

 At  $\phi=0^\circ$   $\theta=0^\circ$ 

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	450	900	ms	NOTE 2
		25°C	—	110	220		
		50°C	—	60	120		
Response Time (fall)	Tf	0°C	—	550	1000	ms	NOTE 2
		25°C	—	190	300		
		50°C	—	100	160		

NOTE :

- R: REFLECTIVE
- S: TRANFLECTIVE
- A: GRAY
- C: YELLOW
- J: NORMALLY WHITE

## 4.2 Optical Char. of Wide Temp. Mode

At Vop

ITEM MODE		Cr (Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
S	A	3.0	4.0	25	40	15	25
	C	4.0	8.0	40	70	25	35
	J	—	—	—	—	—	—
NOTE		NOTE 6		NOTE 5			

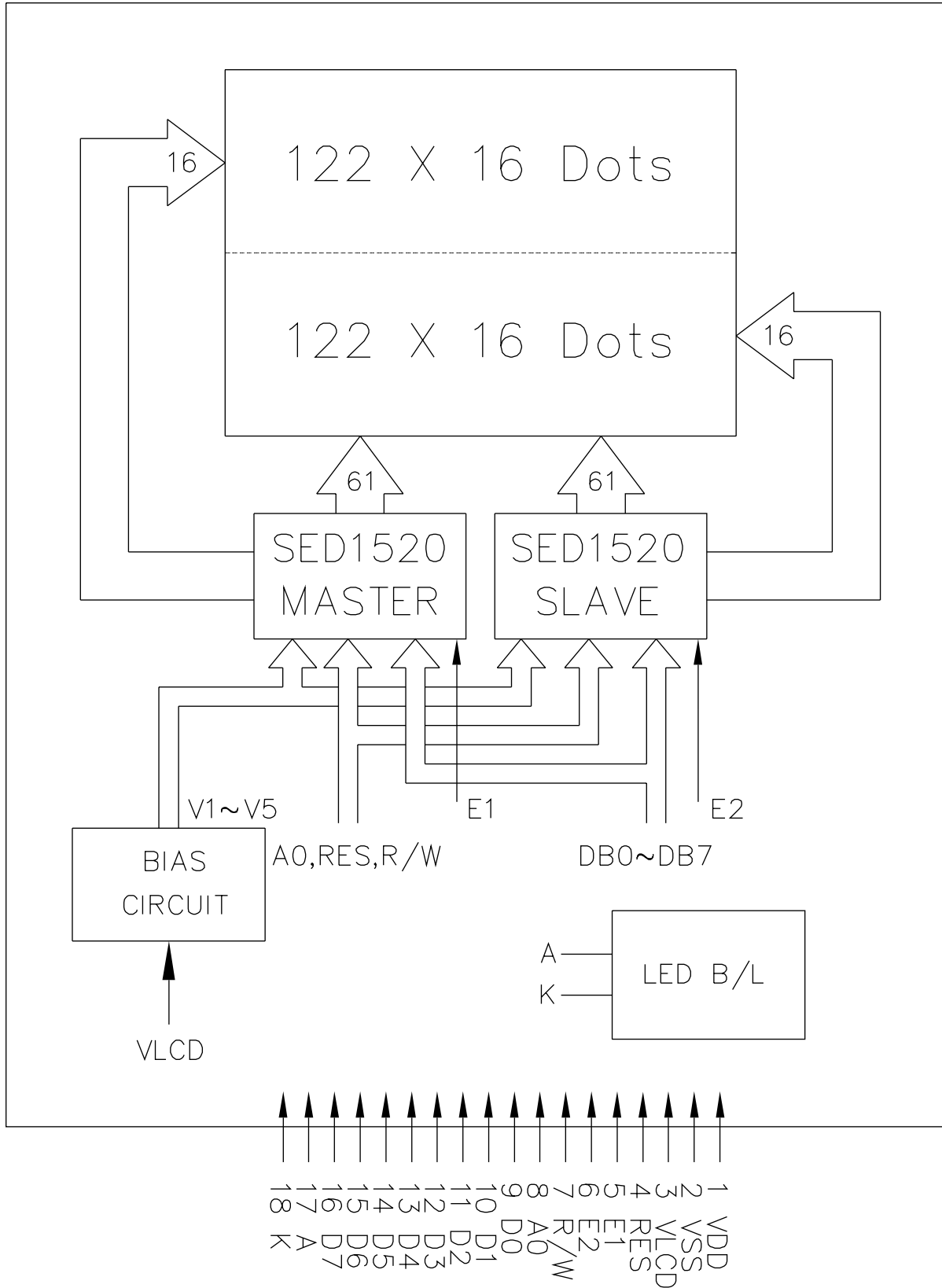
At  $\phi=0^\circ$   $\theta=0^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	1100	2200	ms	NOTE 2
		0°C	—	450	900		
		25°C	—	150	300		
		50°C	—	90	180		
		50°C	—	60	120		
Response Time (fall)	Tf	0°C	—	1800	2900	ms	NOTE 2
		0°C	—	280	730		
		25°C	—	100	250		
		50°C	—	70	160		
		50°C	—	60	120		

NOTE :

- R: REFLECTIVE
- S: TRANFLECTIVE
- A: GRAY
- C: YELLOW
- J: NORMALLY WHITE

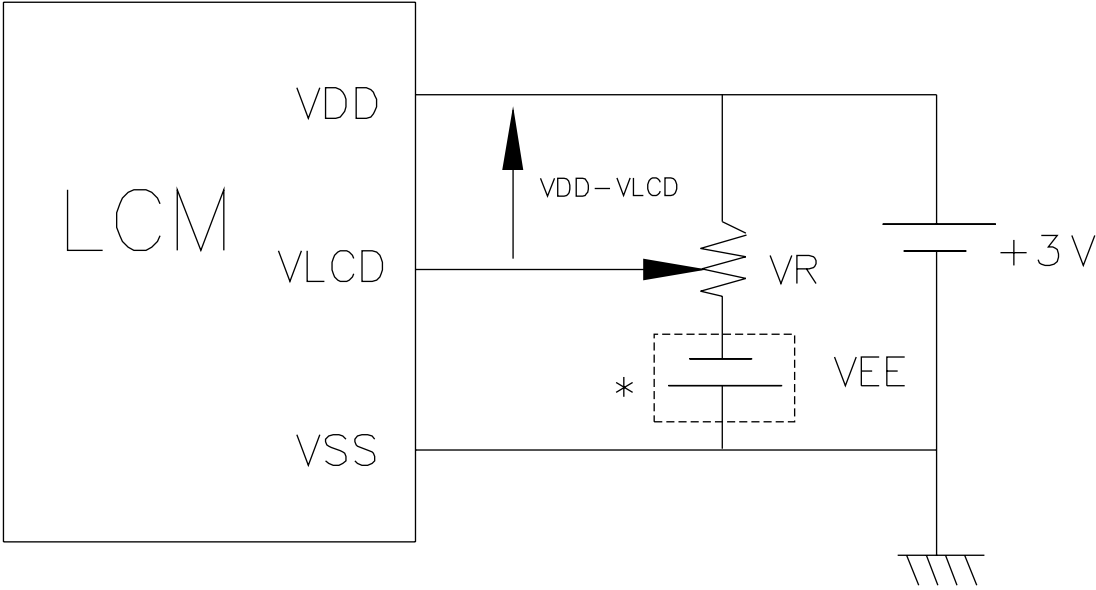
## 5. BLOCK DIAGRAM



## 6. INTERNAL PIN CONNECTION

PinNo.	Symbol	Level	Function
1	VDD	–	Power Supply (+3V)
2	VSS	–	Power Supply (0V)
3	VLCD	–	LCD Driving Voltage
4	RES	H/L	Resets The System
5	E1	H/L	Chip Enable for IC(Master)
6	E2	H/L	Chip Enable for IC(Slave)
7	R/W	H/L	Read/Write Select Signal
8	A0	H/L	Control/Data Selection
9	D0	H/L	Data Bus
10	D1	H/L	
11	D2	H/L	
12	D3	H/L	
13	D4	H/L	
14	D5	H/L	
15	D6	H/L	
16	D7	H/L	
17	A	–	Anode of LED B/L
18	K	–	Cathode of LED B/L

7. POWER SUPPLY



\* VEE = 6V



## 8. TIMING CHARACTERISTICS

### 8-1. INTERFACE TIMING

VDD=2.7~4.5V, Ta=-20~70°C

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
System cycle time (Note 1)	tCYC	Fig.a , Fig.b	2000	-	-	ns
Address setup time	tAW	Fig.a , Fig.b	40	-	-	ns
Address hold time	tAH	Fig.a , Fig.b	20	-	-	ns
Data setup time	tDS	Fig.b	160	-	-	ns
Data hold time	tDH	Fig.b	20	-	-	ns
Output disable time	tOH	Fig.a	20	-	120	ns
Access time	tACC	Fig.a	-	-	180	ns
Enable pulse width (Read)	tEWR	Fig.a	200	-	-	ns
Enable pulse width (Write)	tEWW	Fig.b	160	-	-	ns
Rise and fall time	tr,tf	Fig.a , Fig.b	-	-	15	ns

Note: 1.tCYC6 is the cycle time of  $\overline{CS} \cdot E = H$ , not the cycle time of E.

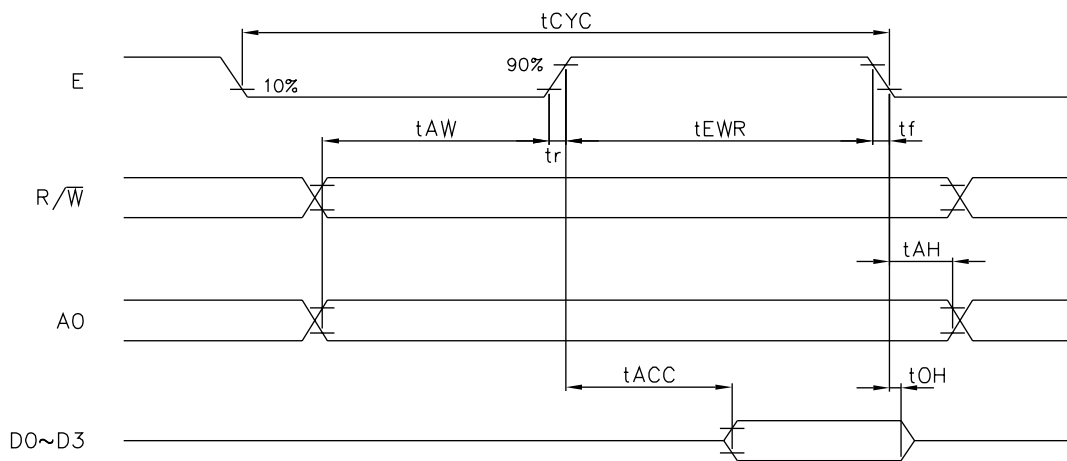


Fig . a Interface timing (Read)

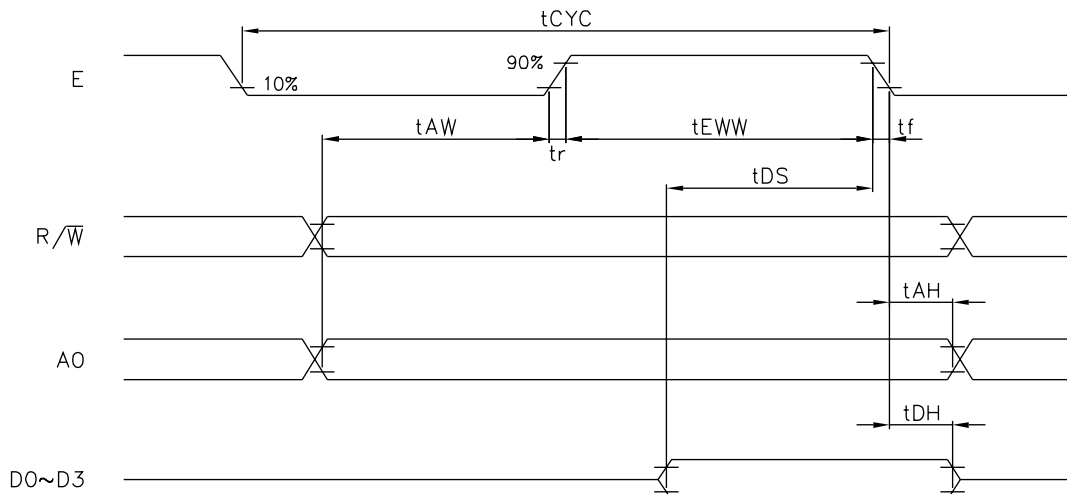
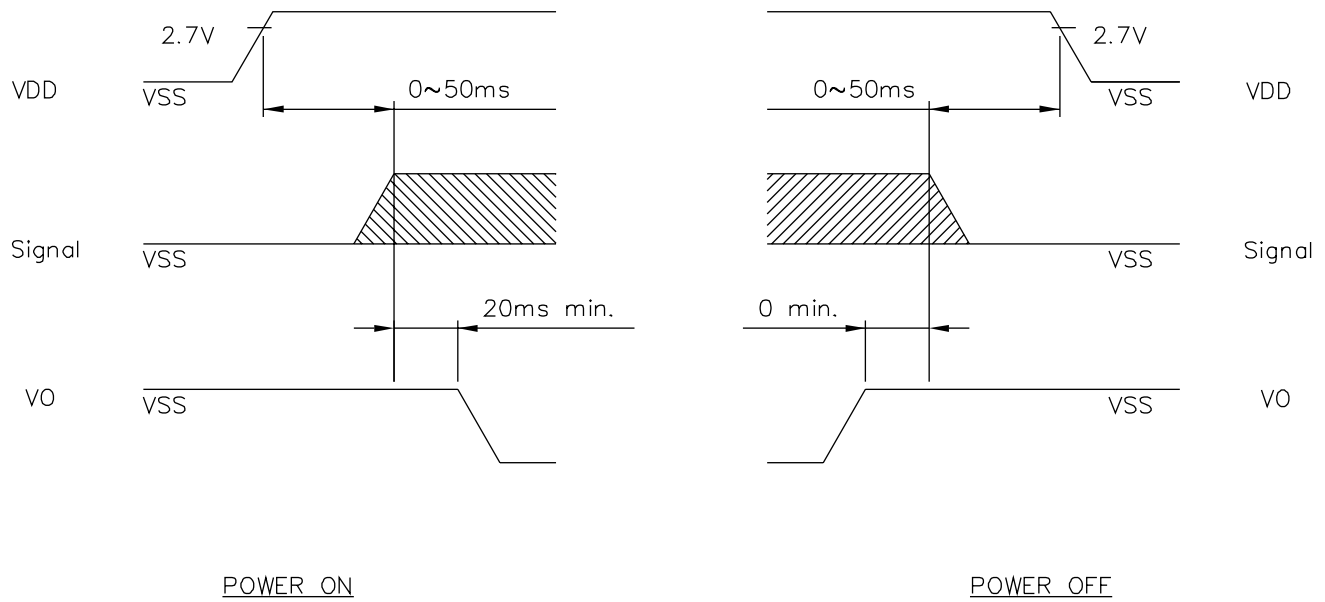


Fig . b Interface timing (Write)

## 8-2. POWER ON/OFF TIMING



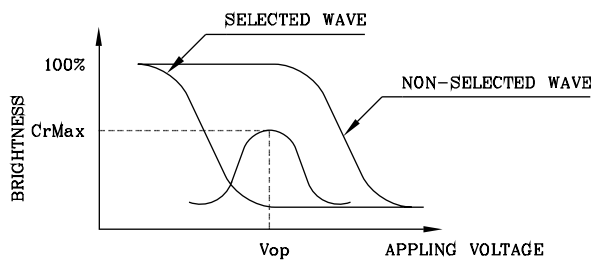
Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

## 9. DISPLAY PATTERN

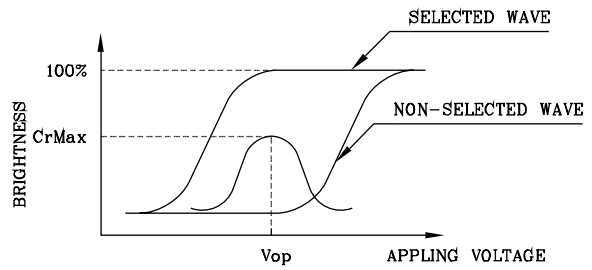
Page	DATA		Com NO.	Driver
0	D0 ⋮ D7	122 x 16 Pixels	1	Master
1	D0 ⋮ D7		↓ 16	
2	D0 ⋮ D7	122 x 16 Pixels	17	Slave
3	D0 ⋮ D7		↓ 32	
Column Addr.	ADC=0	00H → 3C	00H → 3C	
	Seg NO.	1 → 61	62 → 122	
	Driver	Master	Slave	

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



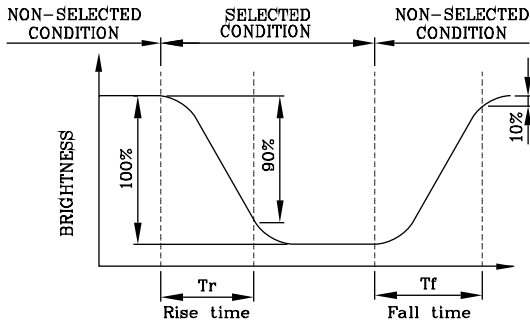
(negative type)

\*Conditions

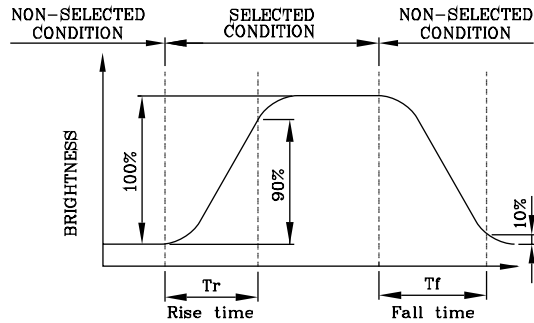
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



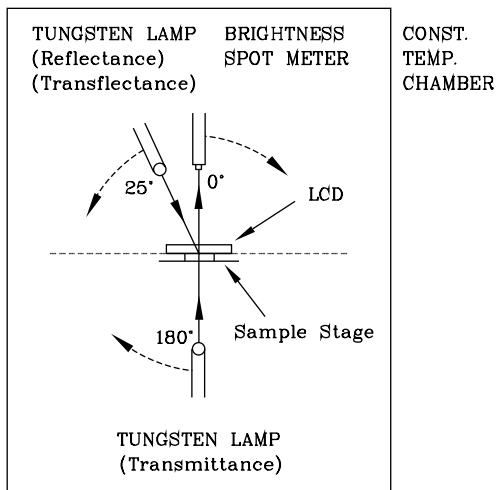
(negative type)

\*Conditions

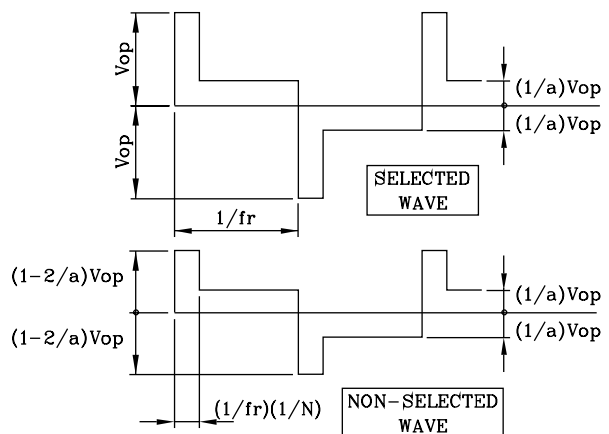
- Operating Voltage : Vop
- Viewing Angle ( $\theta, \phi$ ) : (0,0)
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms

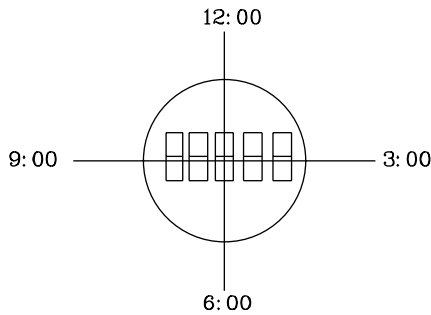


Multiplex Driving ( 1/N duty 1/a bias )



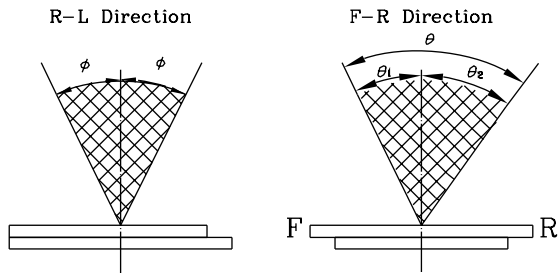
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



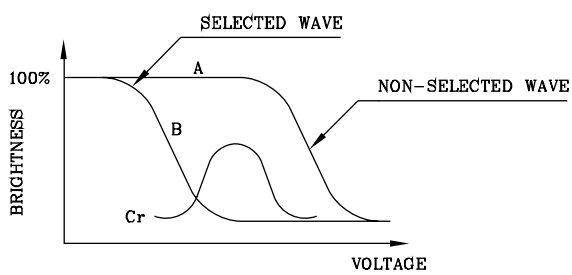
$$\theta = \theta_1 + \theta_2$$

\*Conditions

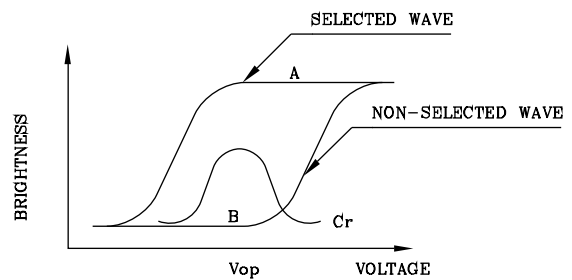
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

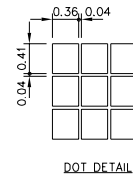
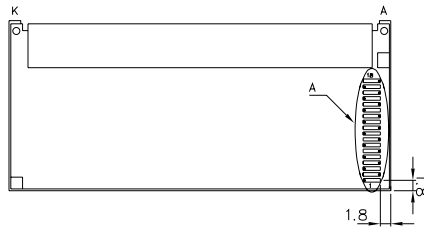
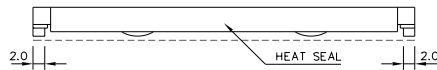
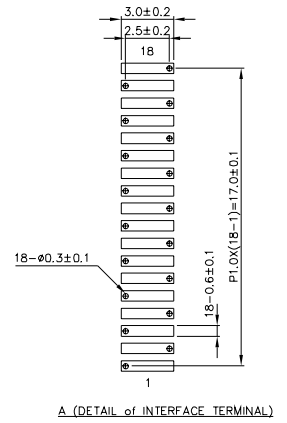
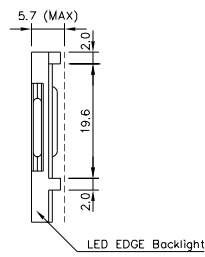
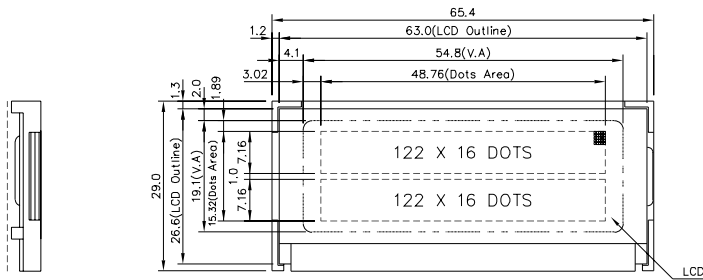


(negative type)

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

\*Conditions

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



NO.	SIGNAL
1	VDD
2	VSS
3	VLCD
4	RES
5	E1
6	E2
7	R/W
8	A0
9	D0
10	D1
11	D2
12	D3
13	D4
14	D5
15	D6
16	D7
17	A
18	K

NOTES :

1. RESOLUTION: 122 X 32
2. TOLERANCE NOT SPECIFIED: ±0.5mm

		LMC62X095XM	AZ DISPLAYS, INC.	
APPROVE	NAME	DATE	TITLE	AGM1232F
CHECK			DWG-NO	MCAx095xM Rev.A
DESIGN				
DRAW	MAY PING	86.12.26	THIRD ANGLE PROJECT	UNIT : mm SCALE :