

AZ DISPLAYS, INC.

1. MECHANICAL DATA

(1) Product No.	AGM1212E
(2) Module Size	92.0 (W)mm x 106.0 (H)mm x MAX12.0(D)mm (W/O, EL B.L.) 92.0 (W)mm x 106.0 (H)mm x MAX15.0(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: <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)
(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	<input type="checkbox"/> W/O <input type="checkbox"/> LED B/L <input type="checkbox"/> EL B/L
(10) LCD Controller	T6963C
(11) Weight	W/O B/L: 90.4g EL B/L: 96.5g LED B/L: 120.5g

Revised: May 24, 2000

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	5.5	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 2,4		Note 3,4		Note 4,5		Note 4,6	

Note 2 Ta ≤ 50°C : 85%RH max
 Ta > 50°C : Absolute humidity must be lower
 than the humidity of 85%RH at 50°C

Note 3 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

Note 4 Background color changes slightly depending on ambient temperature.
 This phenomenon is reversible.

Note 5 Ta ≤ 70°C : 75%RH max
 Ta > 70°C : Absolute humidity must be lower
 than the humidity of 75%RH at 70°C

Note 6 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	
Input Voltage	VIH	H level	0.8VDD	–	VDD	V	
	VIO	L level	0	–	0.2VDD	V	
Recommended LC Driving Voltage (NORMAL TEMP. LCM)	VDD–VO	DUTY= 1/128 Bias= 1/12	0°C	18.4	19.4	–	V
			25°C	17.2	18.2	19.2	
			50°C	15.4	16.7	–	
Recommended LC Driving Voltage (WIDE TEMP. LCM)	VDD–VO		–20°C	16.8	17.2	17.6	V
			0°C	15.7	16.1	16.5	
			25°C	15.6	16.0	16.4	
			50°C	15.3	15.7	16.1	
		70°C	15.1	15.5	15.9		
Power Supply Current for LCM	IDD	VDD = 5.0V	17	22	29	mA	
Power Supply Current for LED	ILED	VBL = 5.0V RBL = 0Ω	95	101	111	mA	
Power Supply Current for EL	IEL	VBL = 110Vac 400Hz RBL = 0Ω	–	–	10	mA	

4. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT Vop

MODE \ ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	—	—	—	—	—
	C	—	7	—	60	—	28
	J	—	8	—	60	—	35
S	A	—	—	—	—	—	—
	C	—	6	—	50	—	25
	J	—	—	—	—	—	—
T	E	—	—	—	—	—	—
	G	—	—	—	—	—	—
NOTE		FIG 6		FIG 5			

NOTE :

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

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

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

4-1.OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT Vop

MODE \ ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	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		FIG 6		FIG 5			

NOTE :

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

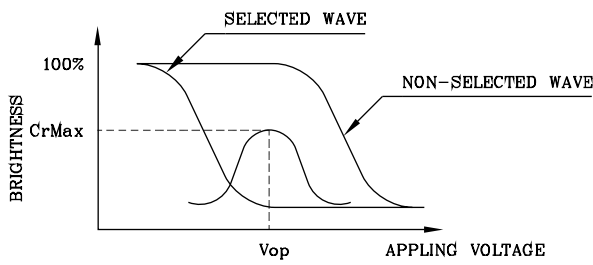
C: YELLOW
 E: BLUE
 G: NORMALLY BLACK
 J: NORMALLY WHITE

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

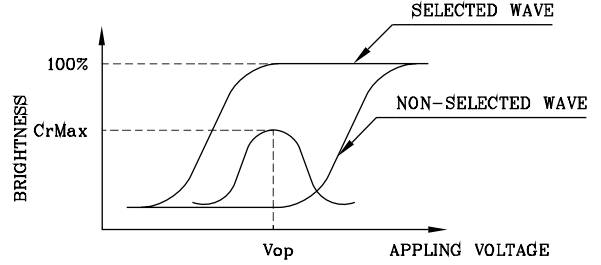
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	1620	2400	ms	FIG 2
		0℃	-	350	520		
		25℃	-	120	180		
		50℃	-	70	105		
		70℃	-	55	80		
Response Time (fall)	Tf	-20℃	-	1330	2000	ms	FIG 2
		0℃	-	640	900		
		25℃	-	200	300		
		50℃	-	80	120		
		70℃	-	35	50		

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



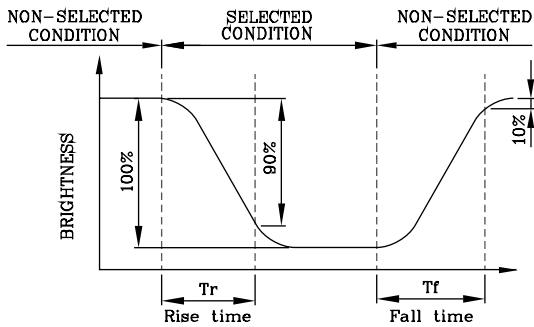
(negative type)

*Conditions

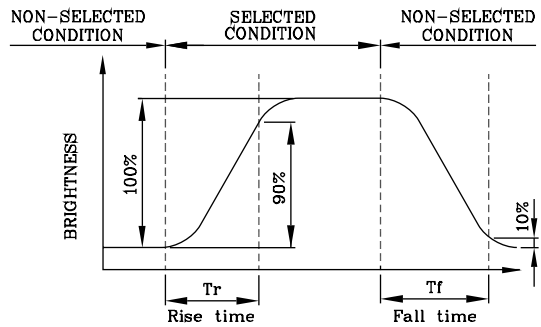
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



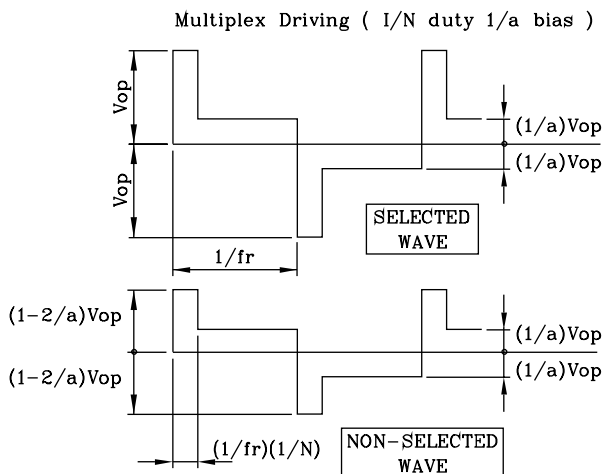
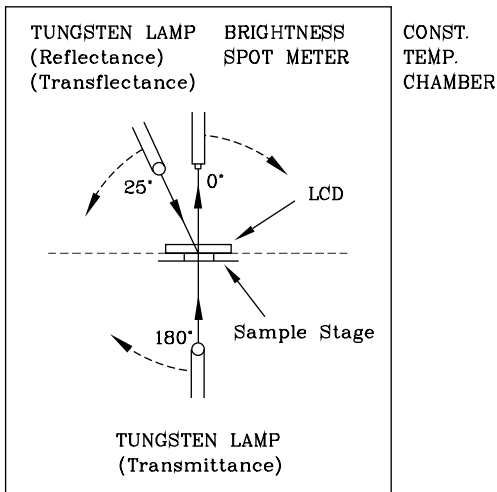
(negative type)

*Conditions

Operating Voltage : Vop
 Viewing Angle (θ,θ) : (0,0)
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

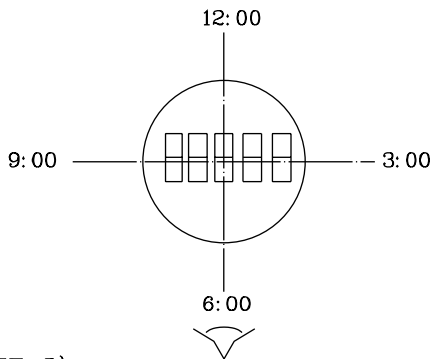
(FIG 3)

Description of Measuring Equipment and Driving Waveforms



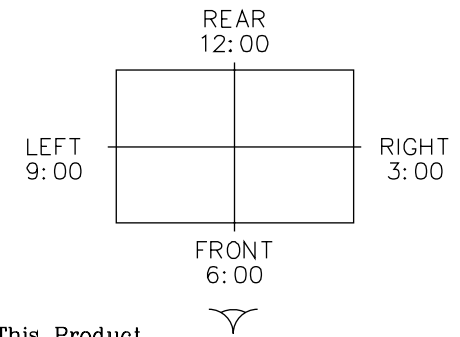
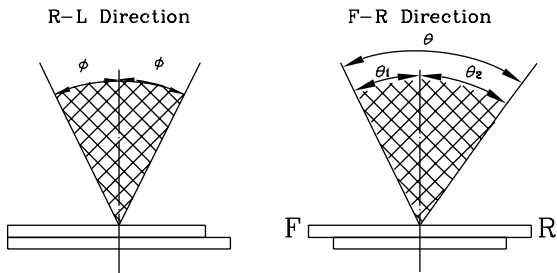
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

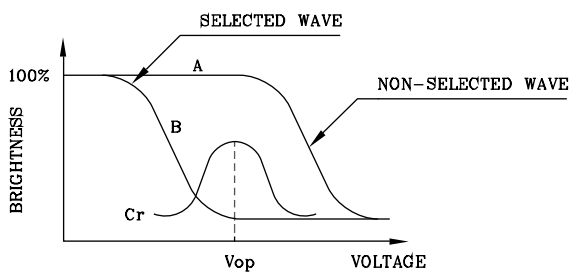
$$\theta = \theta_1 + \theta_2$$

*Conditions

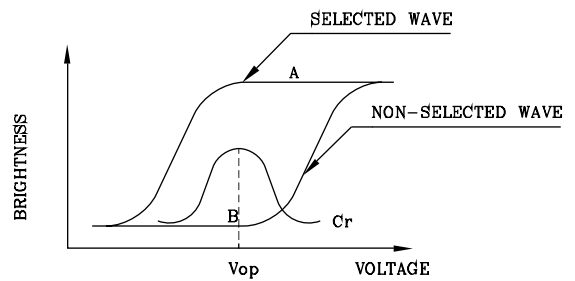
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



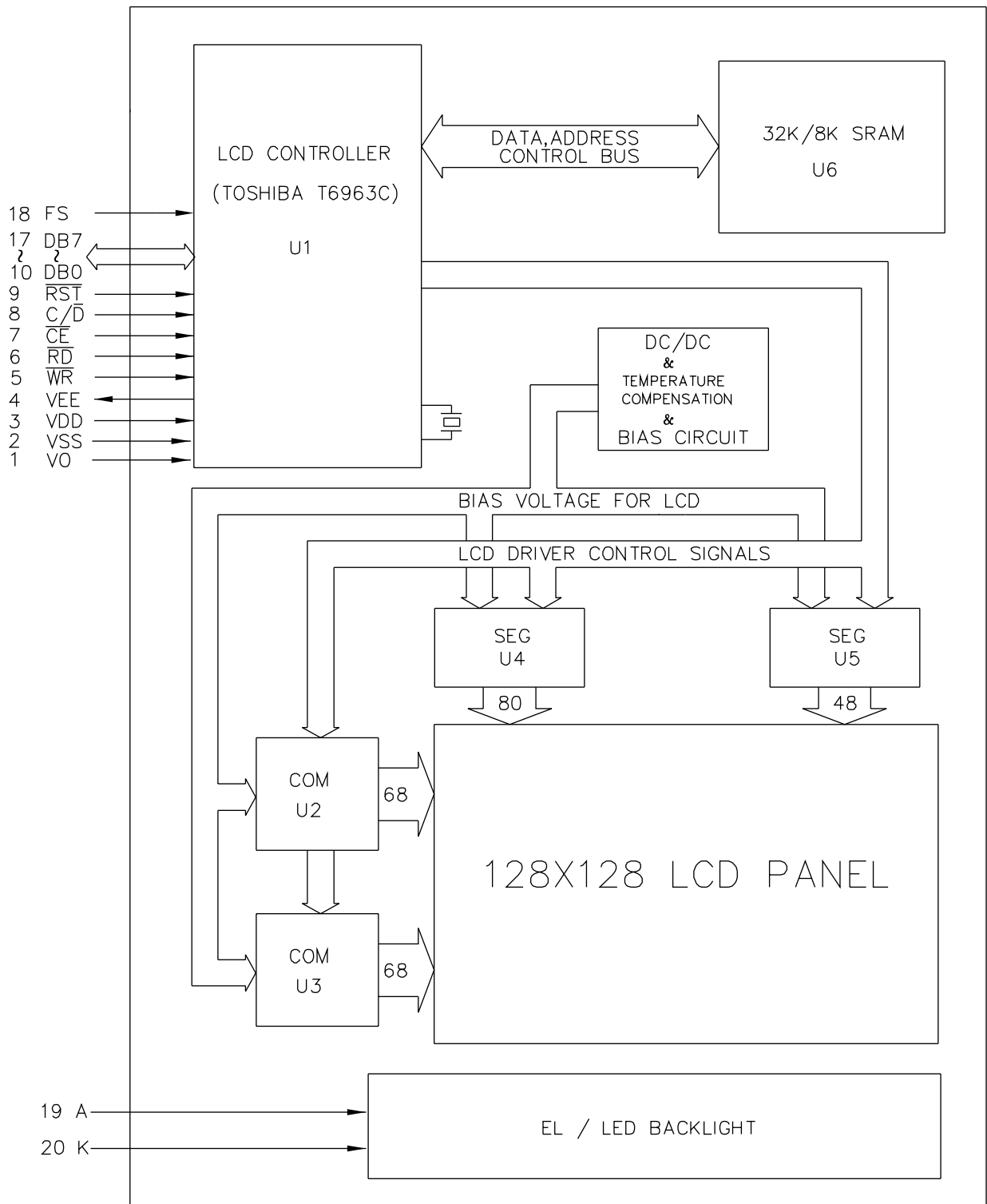
(negative type)

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

*Conditions

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

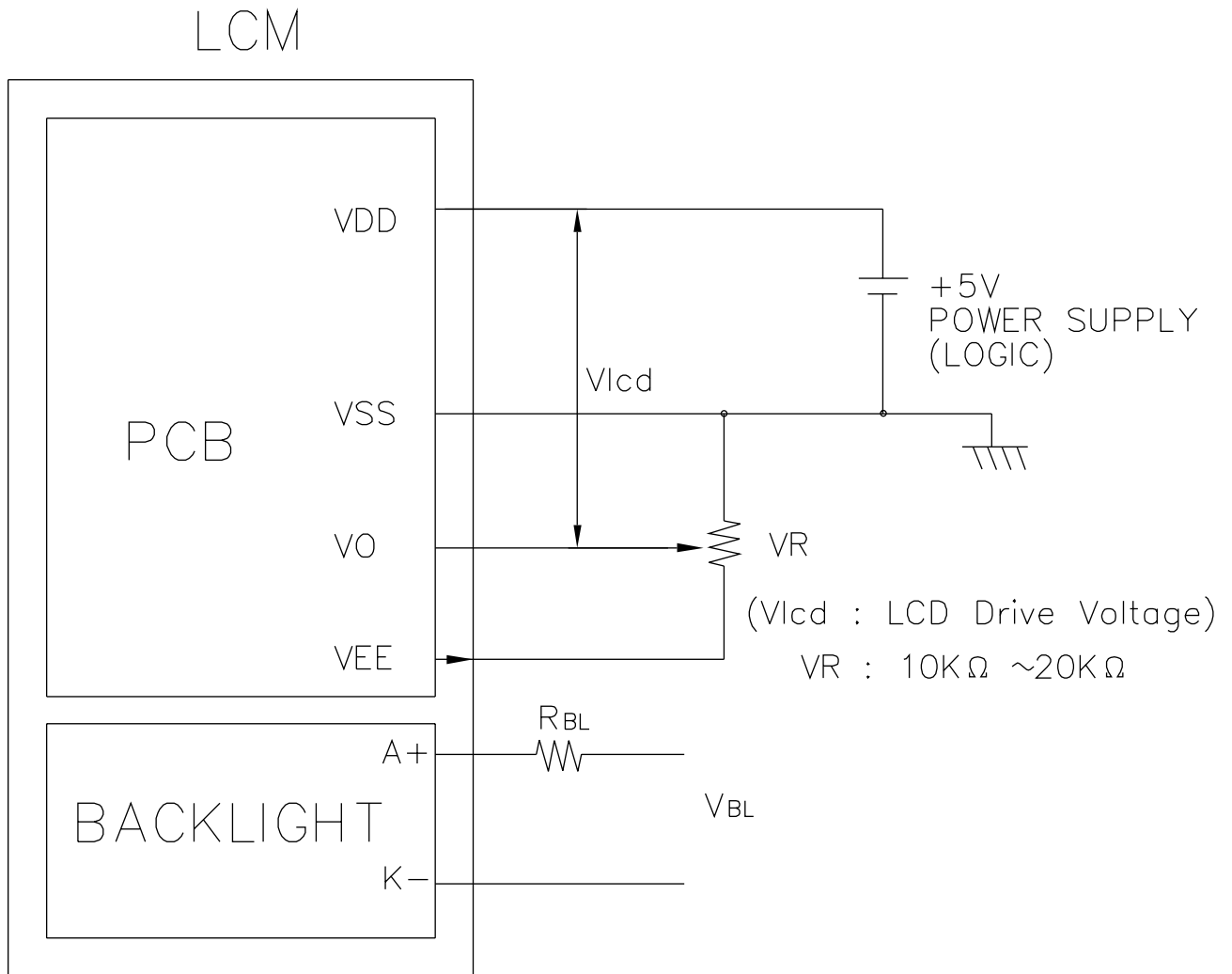
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

No	Symbol	Function	
1	Vo	Adjust LCD Contrast	
2	VSS	0V	Ground
3	VDD	+5V	Power Supply for Logic
4	VEE	LCD Contrast Voltage Output	
5	\overline{WR}	L	Data Write
6	\overline{RD}	L	Data Read
7	\overline{CE}	L	Chip Enable
8	C/ \overline{D}	H/L	H=Command ; L=Data
9	\overline{RST}	L	Reset
10	DB0	H/L	Data Bus (LSB)
11	DB1	H/L	
12	DB2	H/L	
13	DB3	H/L	
14	DB4	H/L	
15	DB5	H/L	
16	DB6	H/L	
17	DB7	H/L	
18	FS	H/L	Font Select
19	A(+)	Power Supply for LED/EL	
20	K(-)	Power Supply for LED/EL	

7. POWER SUPPLY



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

ITEM B.L. VALUE	V_{BL}	R_{BL}
LED	5V	0Ω
EL	110VAC 400HZ	0Ω

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

ITEM	ITEM	CONDITION	MIN.	MAX.	UNIT
C/ \bar{D} SET UP TIME	t_{CDS}	Fig.	100	—	ns
C/ \bar{D} HOLD TIME	t_{CDH}	Fig.	10	—	ns
$\bar{C\bar{E}}, \bar{RD}, \bar{WR}$ 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

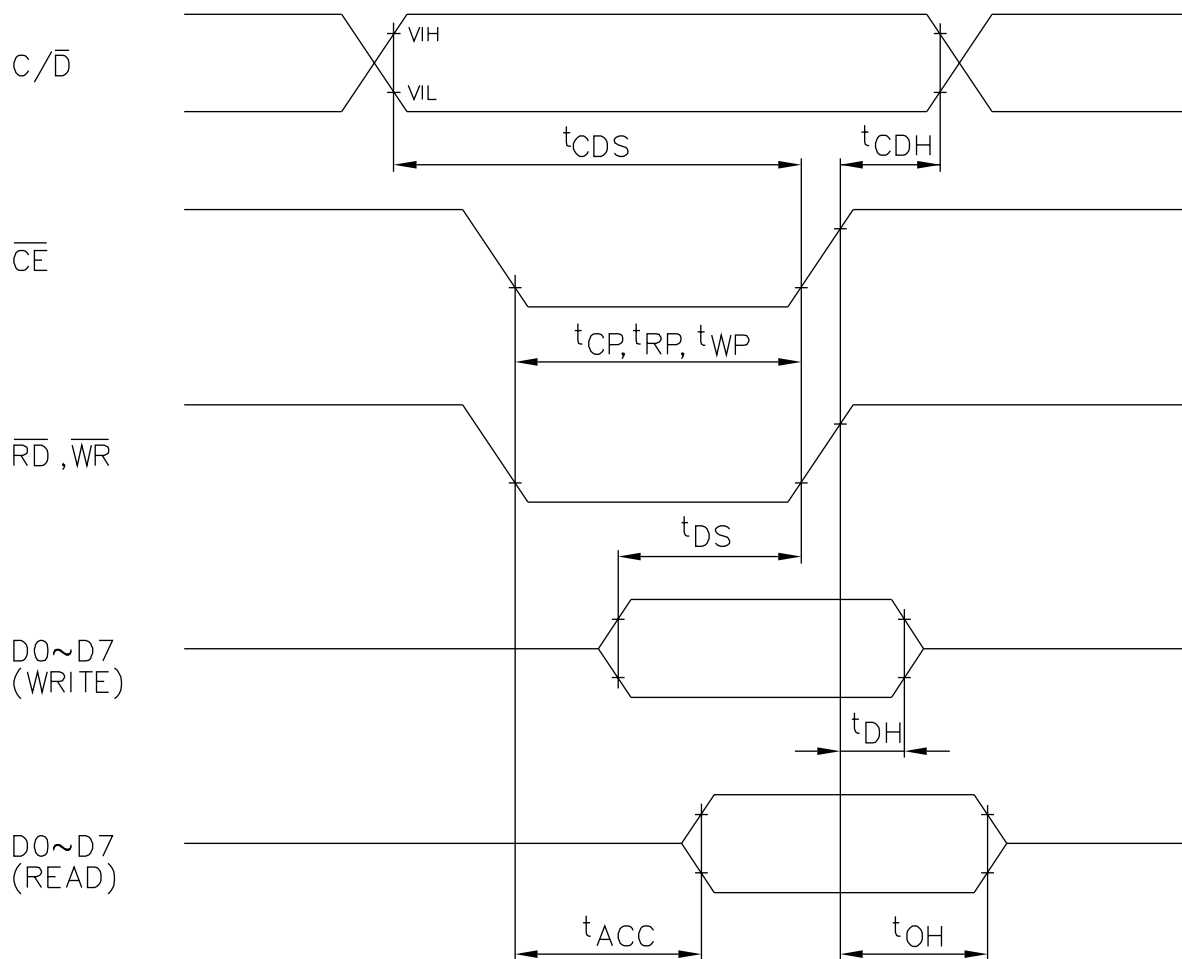
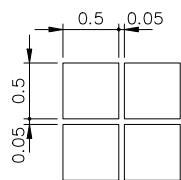
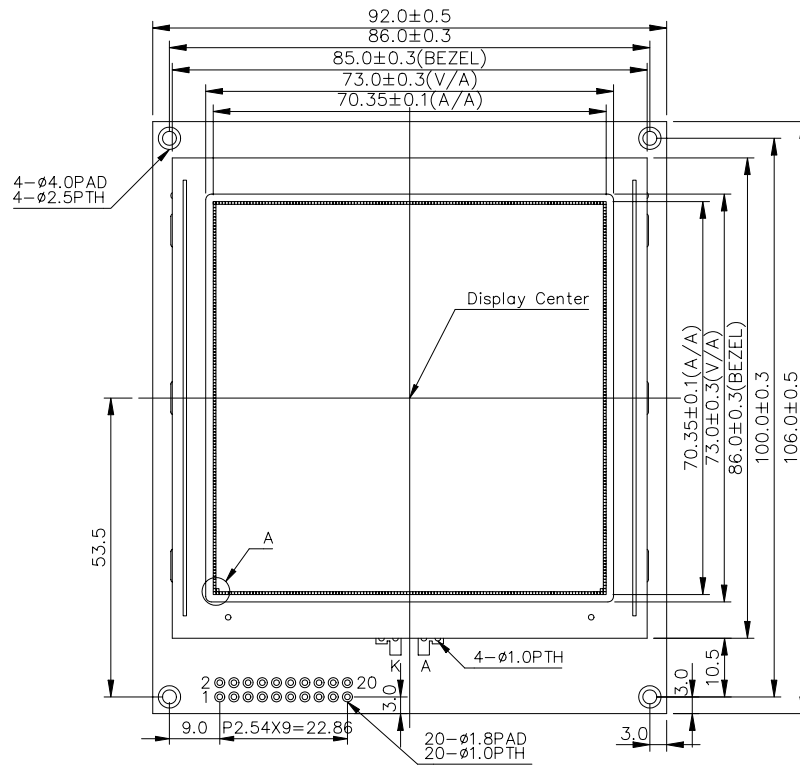
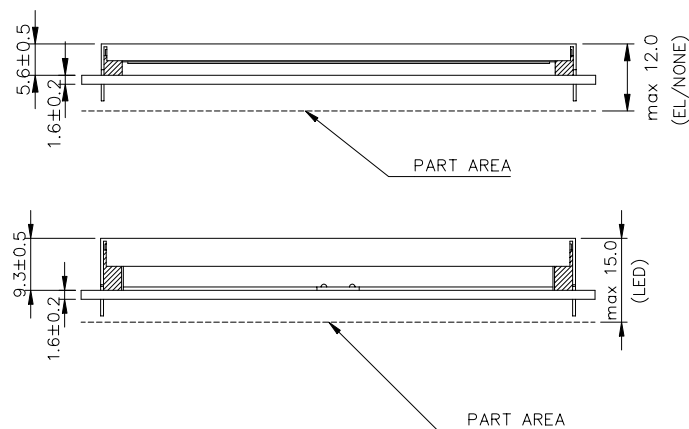


Fig. INTERFACE TIMING CHART



A DETAIL



NOTE :

- 1.RESOLUTION : 128 X 128 Dots
- 2.GENERAL TOLERANCE : ±0.5mm
- 3.LOGIC VOLTAGE : 5V
- 4.CONTROLLER : T6963C
- 5.BACKLIGHT : LED AND EL/NONE
- 6.DC TO DC : Built-in
- 7.Temp. Comp. CKT : Built-in

No	Symbol	Function
1	Vo	Adjust LCD Contrast
2	VSS	0V Ground
3	VDD	+5V Power Supply for Logic
4	VEE	LCD Contrast Voltage Output
5	WR	L Data Write
6	RD	L Data Read
7	CE	L Chip Enable
8	C/D	H/L H=Command ; L=Data
9	RST	L Reset
10	DB0	H/L (LSB)
11	DB1	H/L
12	DB2	H/L
13	DB3	H/L
14	DB4	H/L
15	DB5	H/L
16	DB6	H/L
17	DB7	H/L (MSB)
18	FS	H/L Font Select
19	A(+)	Power Supply for LED/EL
20	K(-)	Power Supply for LED/EL

AGM1212E		AZ DISPLAYS, INC.		
	NAME	DATE	TITLE	
APPROVE		5-23-00		
CHECK			DWG-NO	MX-X193X Rev.A
DESIGN			UNIT : mm SCALE :	
DRAW				