

AZ DISPLAYS, INC.

1. MECHANICAL DATA

(1) Product No.	AGM2412C
(2) Module Size	144.0 (W)mm x 104.0 (H)mm x MAX10.8 (D)mm (EL B.L., NO B.L.) 144.0 (W)mm x 104.0 (H)mm x MAX14.9 (D)mm (LED B.L.)
(3) Dot Size	0.42 (W)mm x 0.42 (H)mm
(4) Dot Pitch	0.45 (W)mm x 0.45 (H)mm
(5) Number of Dots	240 (W) x 128 (H)Dots
(6) Duty	1/128
(7) LCD Display Mode	STN: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode FSTN: <input type="checkbox"/> Black and White(Normal White/Positive Image)
	Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> 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"/> LED <input type="checkbox"/> EL
(10) Weight	W/O B.L. : 137g EL B.L. : 142g LED B.L. : 175g

Revised: September 26, 2001

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	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	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity (Without Condensation)	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

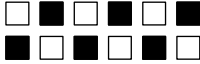
Note 4 Background color changes slightly depending on ambient temperature.
 This phenomenon is reversible.

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	V _{IH}	H level	0.8VDD	—	VDD	V	
	V _{IO}	L level	0	—	0.2VDD	V	
Recommended LCM Driving Voltage (Wide Temp. LCM)	VCC-V _O	Duty= 1/128	-20℃	19.9	20.3	20.7	V
			0℃	19.1	19.5	19.9	
		Bias= 1/13	25℃	18.5	18.9	19.3	
			50℃	17.7	18.1	18.5	
			70℃	16.9	17.3	17.7	
Power Supply Current	I _{DD}	VDD = 5.0V PATTERN: 	—	48.5	—	mA	
LED Power Supply Current	I _{LED}	V _{BL} = 5.0V _{DC} (R _{BL} = 0Ω)	—	650	—	mA	
EL Power Supply Current	I _{EL}	V _{EL} = 72 V _{rms} 400Hz	—	6.5	—	mA	

4. OPTICAL CHARACTERISTICS

4-1. 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	J	—	14.5	—	94	—	82
S	J	—	9.5	—	76	—	80
NOTE		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	—	2750	4125	ms	NOTE 2
		0℃	—	520	780		
		25℃	—	250	375		
		50℃	—	130	195		
		70℃	—	120	180		
Response Time (fall)	Tf	-20℃	—	2650	3975	ms	NOTE 2
		0℃	—	410	615		
		25℃	—	150	225		
		50℃	—	100	150		
		70℃	—	60	90		

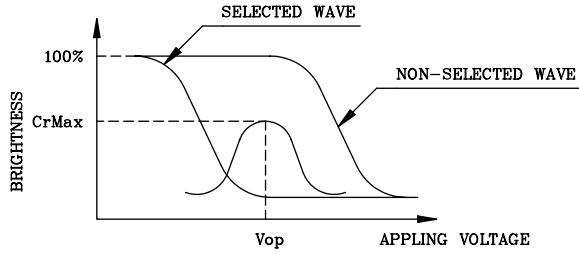
NOTE :

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

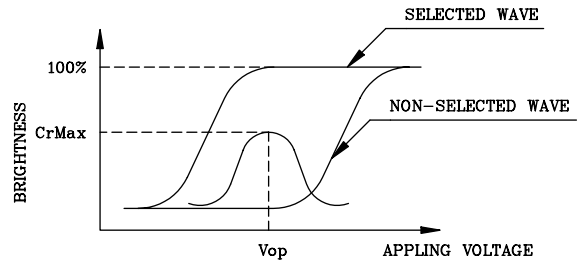
C: YELLOW
 E: BLUE
 G: NORMALLY BLACK
 J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(V_{op})



(positive type)



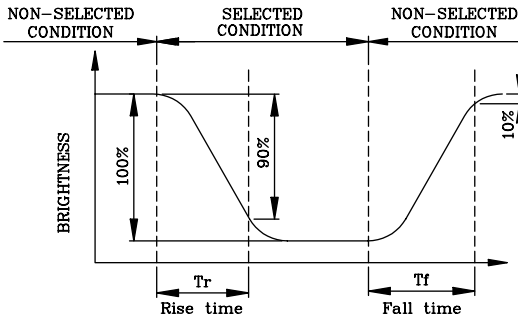
(negative type)

*Conditions

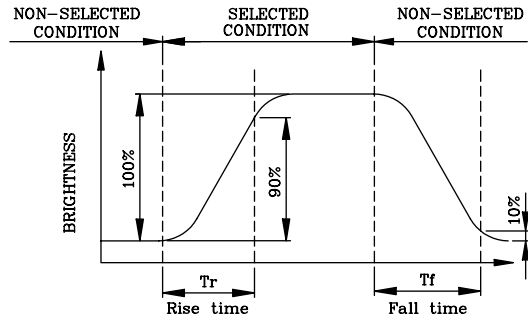
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(T_r, T_f)



(positive type)



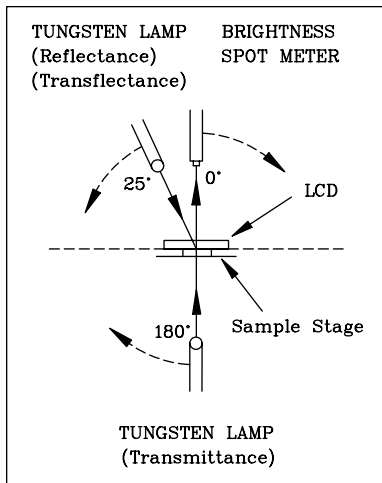
(negative type)

*Conditions

Operating Voltage : V_{op}
 Viewing Angle (θ, ϕ) : (0,0)
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

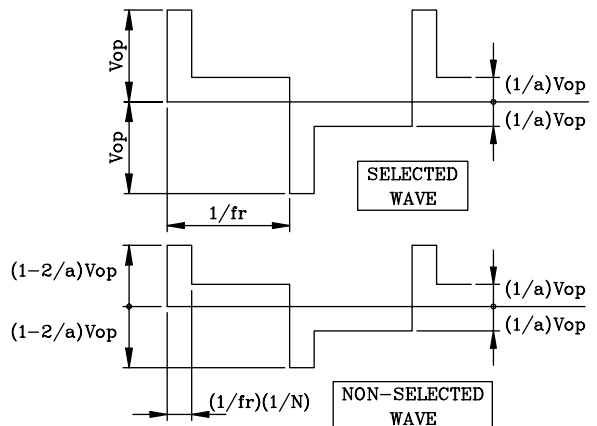
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



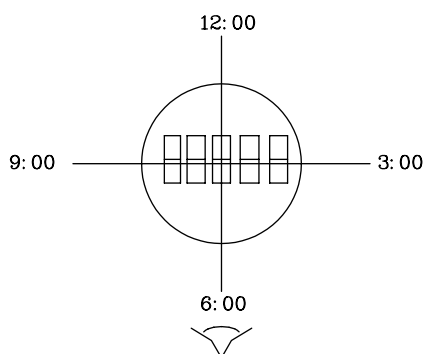
CONST.
TEMP.
CHAMBER

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



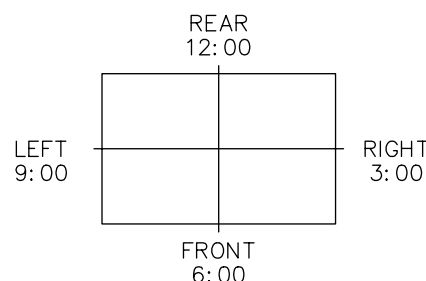
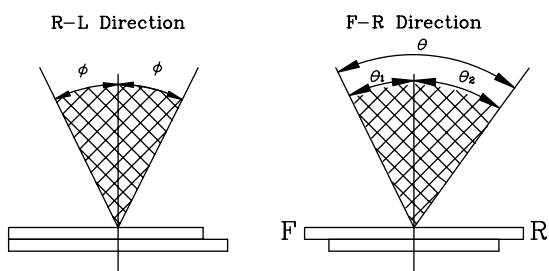
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

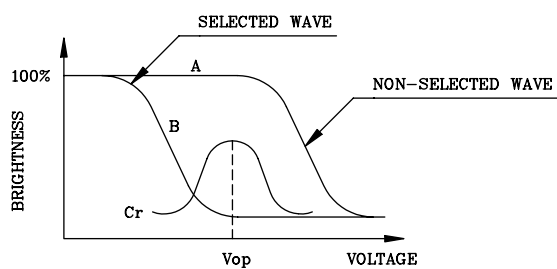
$$\theta = \theta_1 + \theta_2$$

*Conditions

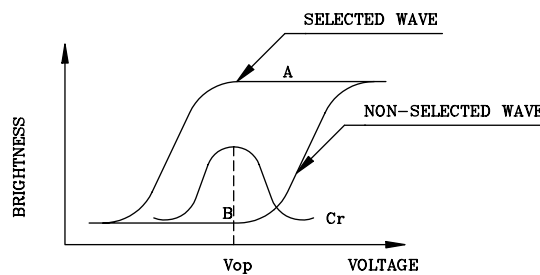
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



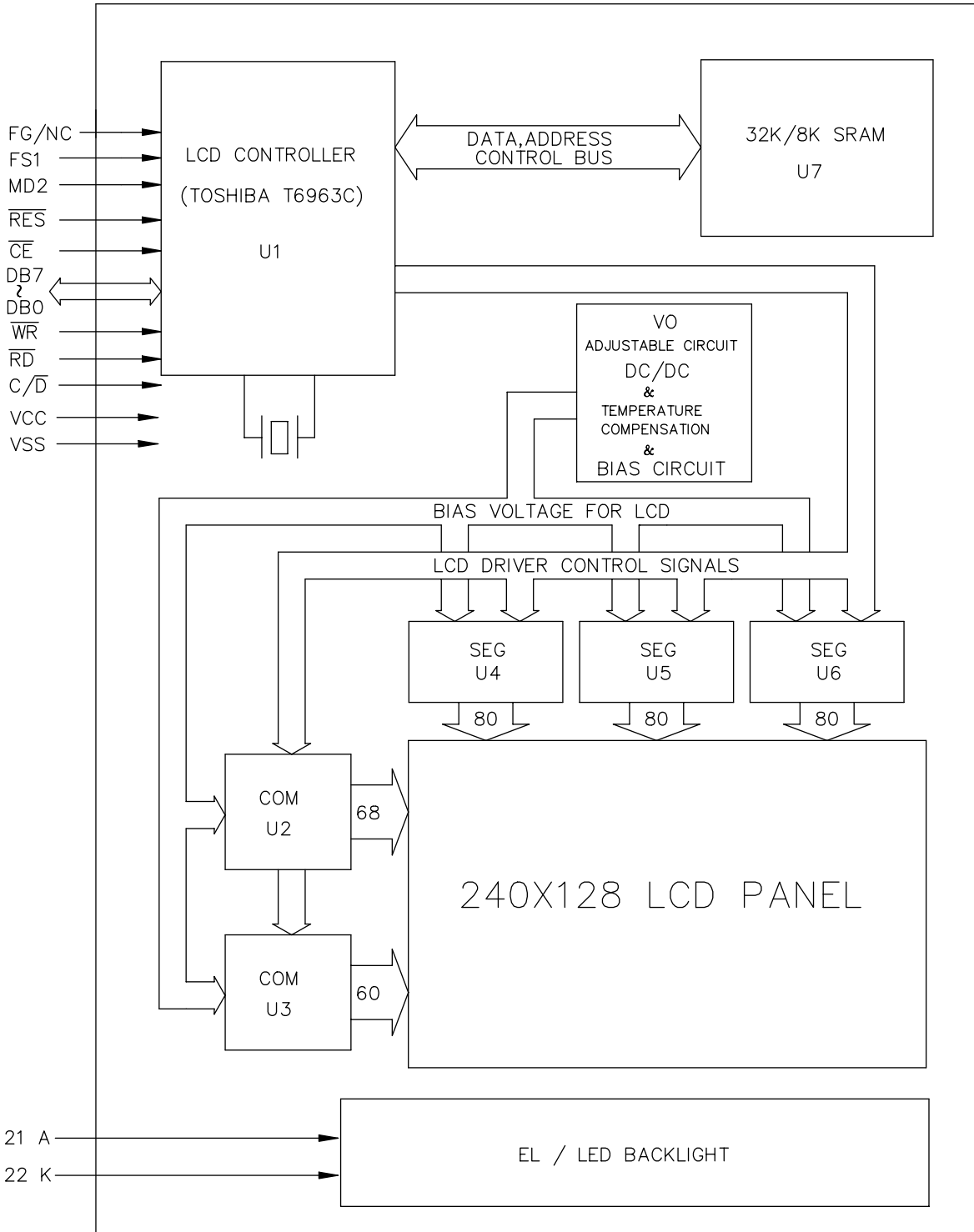
(negative type)

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

*Conditions

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

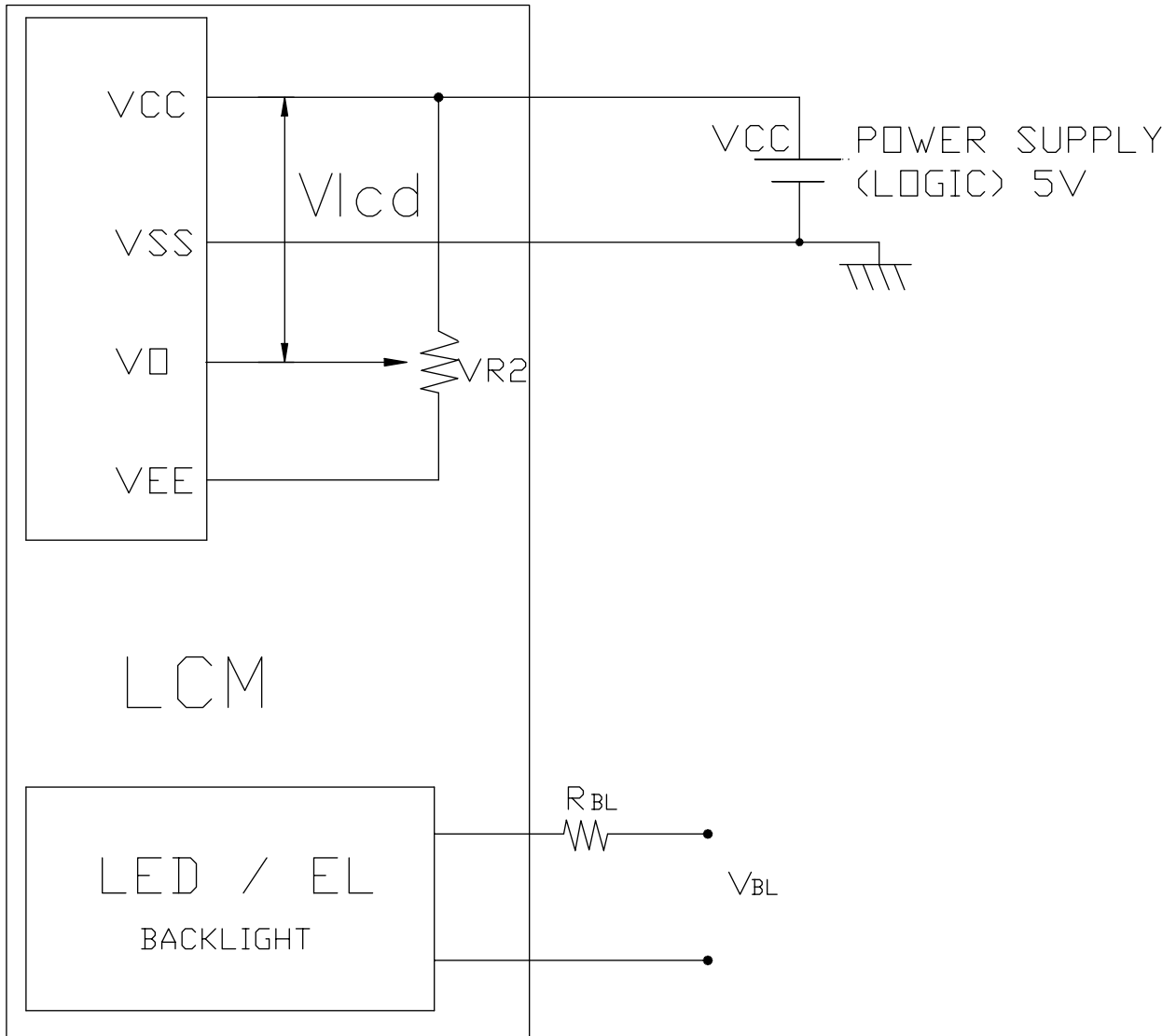
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	VSS	GROUND (0V)
2	VCC	Logic Supply Voltage (+5V)
3	NC	—
4	C/ \bar{D}	"H" : Command "L" : DATA
5	\overline{RD}	DATA READ
6	\overline{WR}	DATA WRITE
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	\overline{CE}	Chip Enable
16	\overline{RES}	Reset
17	N.C.	—
18	MD2	Font Size Selection
19	FS1	Font Size Selection
20	FG/NC	Frame Ground or NC
21	A+	Power Supply for LED / EL B.L.
22	K-	

7. POWER SUPPLY



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

ITEM B.L. VALUE	V _{BL}	R _{BL}
LED	5V	0 Ω
EL	110V _{AC} 400HZ	0 Ω

8-1. INTERFACE TIMING CHARACTERISTICS

(VCC=5.0V±10%, VSS=0V, T_a=-20 To 70°C)

ITEM	SYMBOL	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 _{CE} , t _{RD} , t _{WR}	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

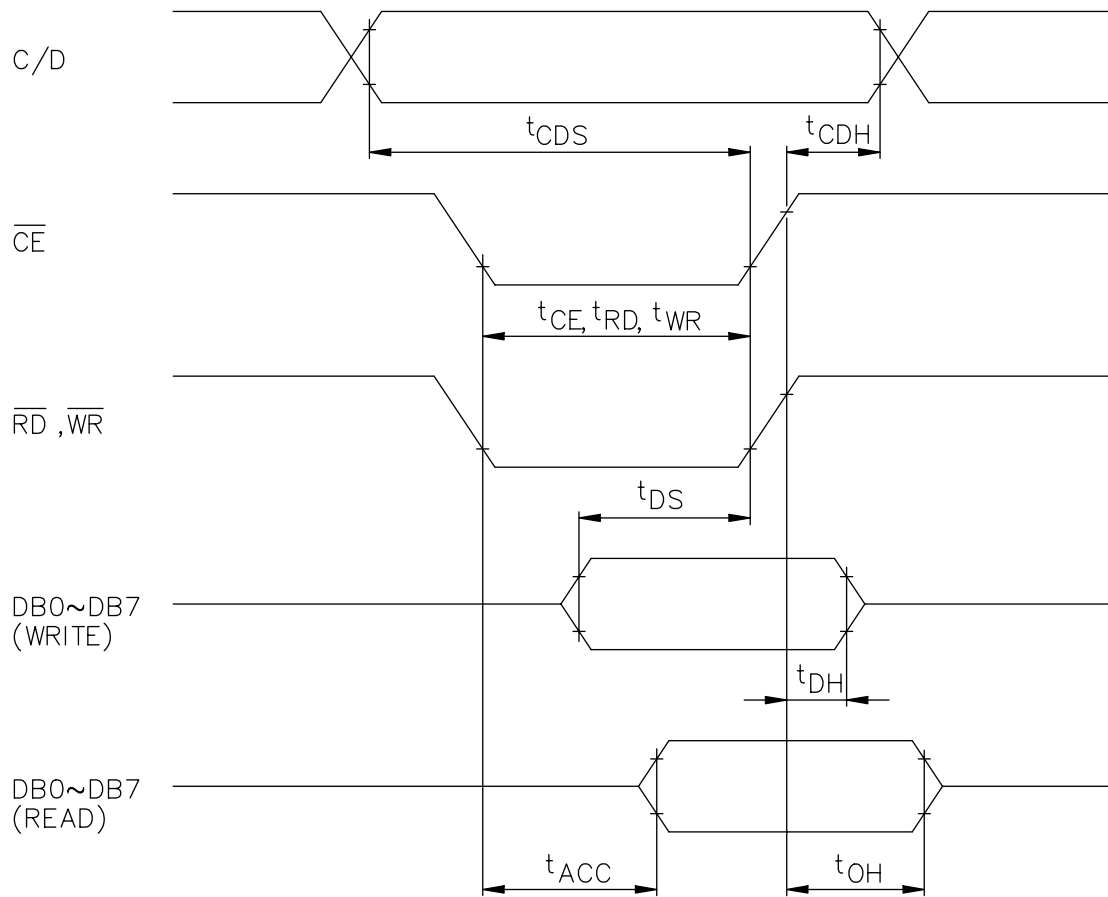
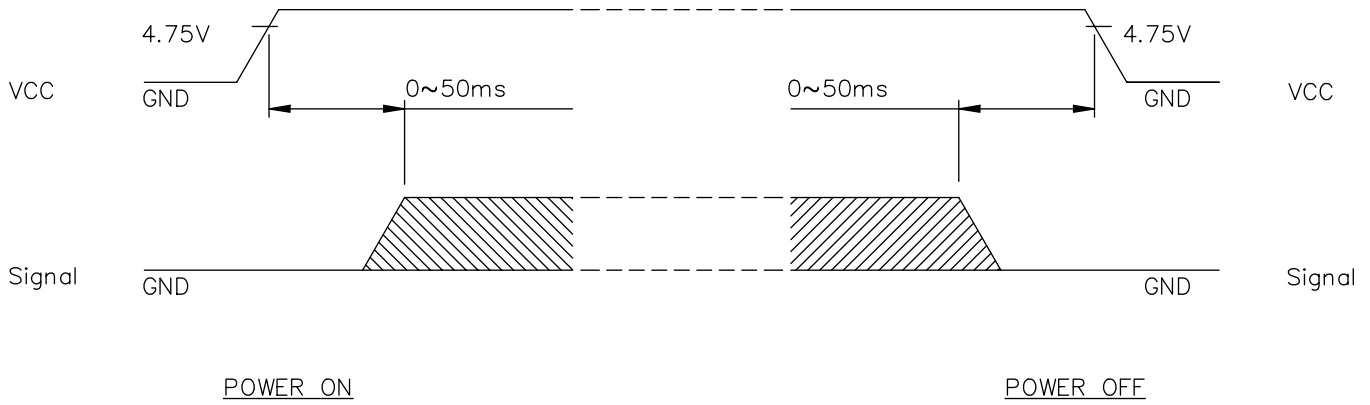


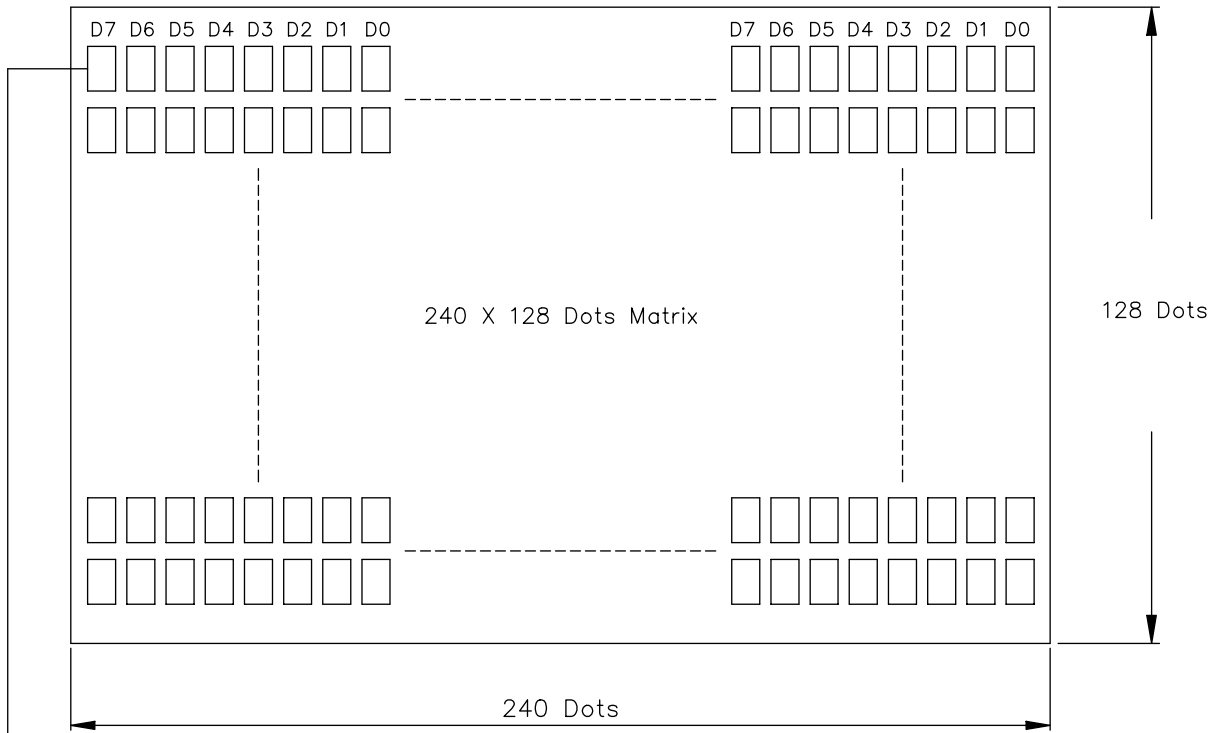
Fig. INTERFACE TIMING CHART

8-2. POWER ON/OFF TIMING CHARACTERISTICS



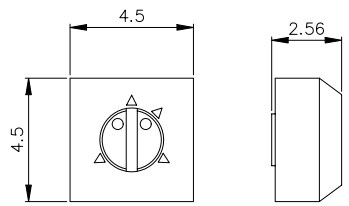
Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

8-3. DISPLAY PATTERN

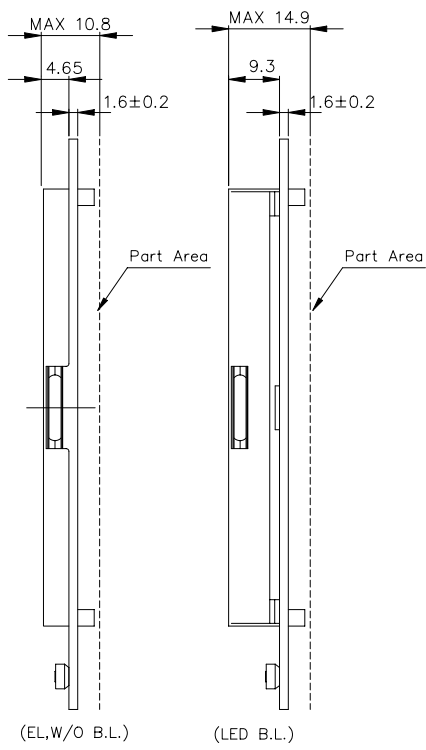
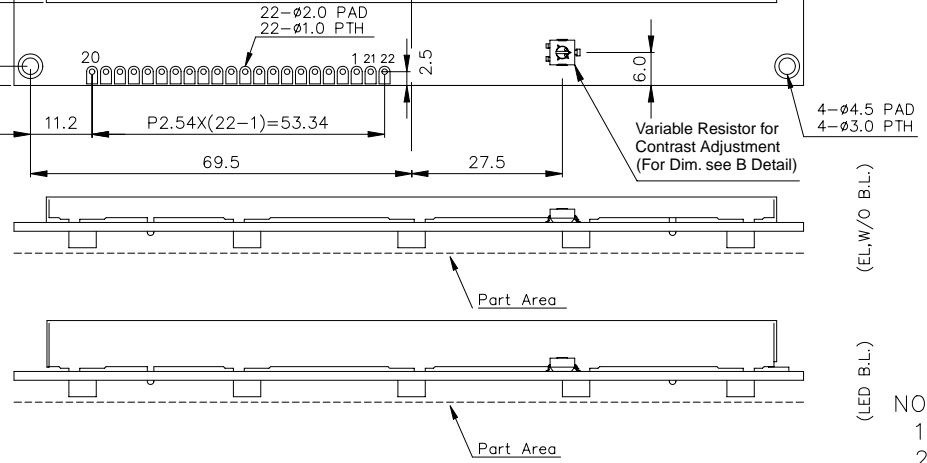
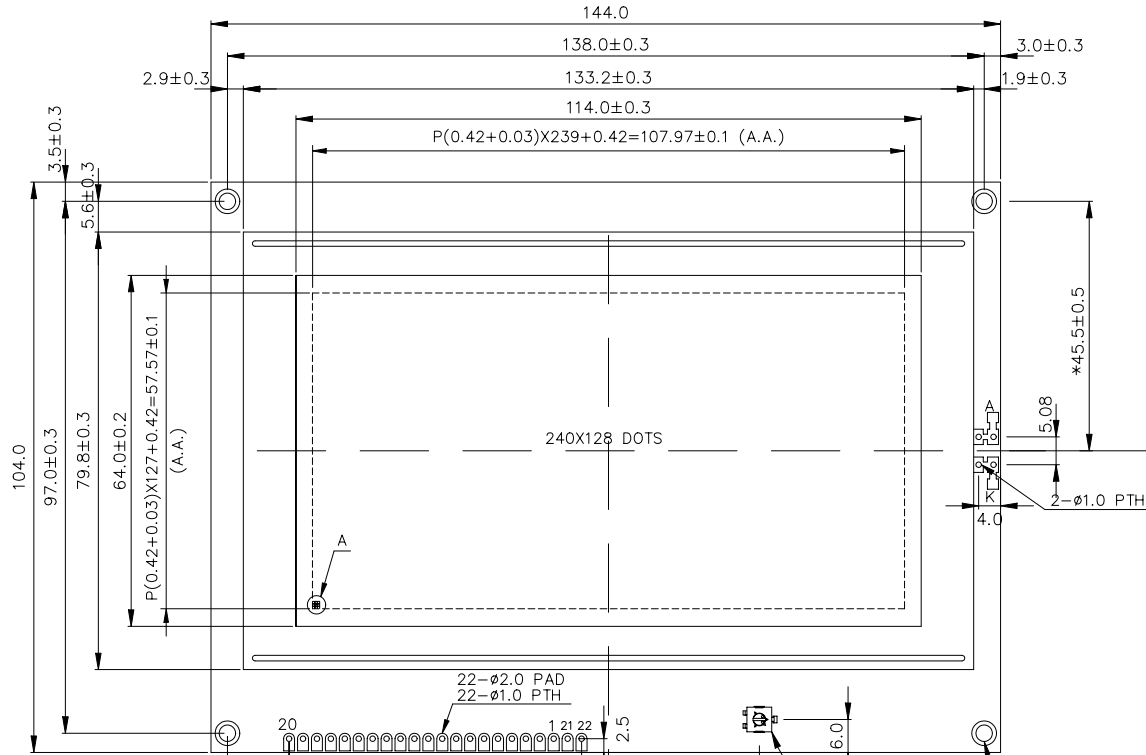


Starting dot for the starting address of display RAM.

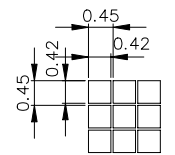
DB0~DB7 are 8 bits transmitted data ,where DB0 is LSB and DB7 is MSB.



B DETAIL



Pin No.	Symbol	Description
1	VSS	GROUND (0V)
2	VDD	Logic Supply Voltage (+5V)
3	N.C.	-
4	C/D	"H" : Command "L" : DATA
5	RD	DATA READ
6	WR	DATA WRITE
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	CE	Chip Enable
16	RES	Reset
17	N.C.	-
18	MD2	Font Size Selection
19	FS1	Font Size Selection
20	FG/NC	Frame Ground or NC
21	A+	Power Supply for LED/EL B.L.
22	K-	



A DETAIL

- NOTE :
1. RESOLUTION : 240X128 Dots
 2. GENERAL TOLERANCE : ±0.5mm
 3. Controller : T6963C
 4. Logic Voltage : 5V.

	LM_EA_184_1_	AZ DISPLAYS, INC.		
	NAME	DATE	TITLE	
APPROVE	TONY CHOU	87.10.02	AGM2412C	
CHECK	J.S.SHEU	87.10.02	DWG-NO	MXAX184X1 Rev.A
DESIGN	JACK LEE	87.10.02	UNIT : mm	
DRAW	MAY PING	87.10.02	SCALE : 1/1	