

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM2412C</b>
(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)
(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 <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<sub>SS</sub>=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	5.5	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	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

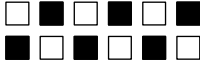
Note 4 Background color changes slightly depending on ambient temperature.  
 This phenomenon is reversible.

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 <sub>IH</sub>	H level	0.8VDD	—	VDD	V	
	V <sub>IO</sub>	L level	0	—	0.2VDD	V	
Recommended LCM Driving Voltage (Wide Temp. LCM)	VCC-V <sub>O</sub>	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 <sub>DD</sub>	VDD = 5.0V  PATTERN: 	—	48.5	—	mA	
LED Power Supply Current	I <sub>LED</sub>	V <sub>BL</sub> = 5.0V <sub>DC</sub> (R <sub>BL</sub> = 0Ω)	—	650	—	mA	
EL Power Supply Current	I <sub>EL</sub>	V <sub>EL</sub> = 72 V <sub>rms</sub> 400Hz	—	6.5	—	mA	

## 4. OPTICAL CHARACTERISTICS

### 4-1. 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	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		

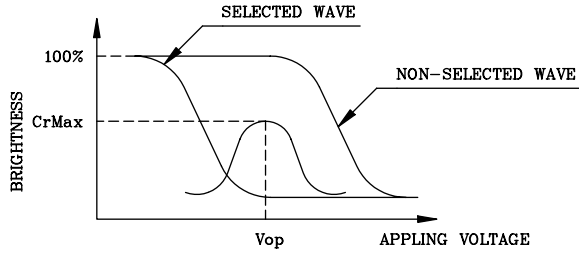
NOTE :

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

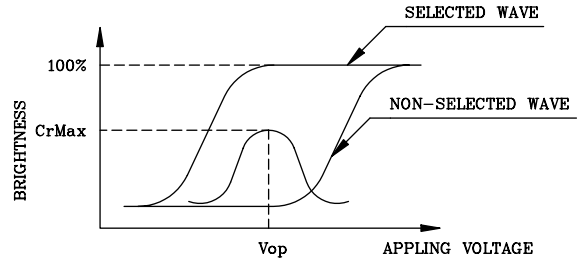
C: YELLOW  
 E: BLUE  
 G: NORMALLY BLACK  
 J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage( $V_{op}$ )



(positive type)



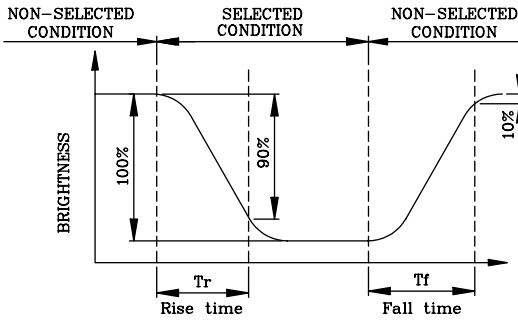
(negative type)

\*Conditions

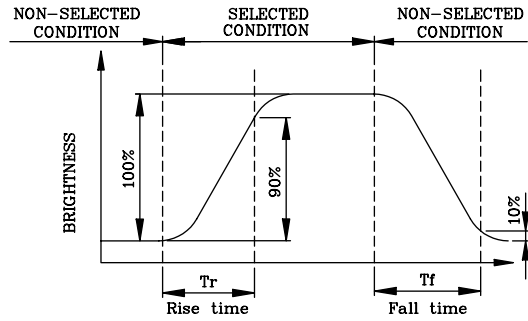
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applying Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time( $T_r, T_f$ )



(positive type)



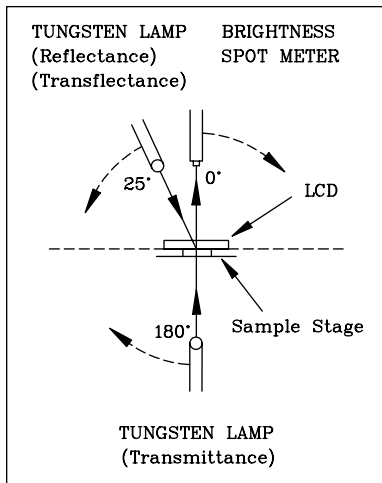
(negative type)

\*Conditions

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

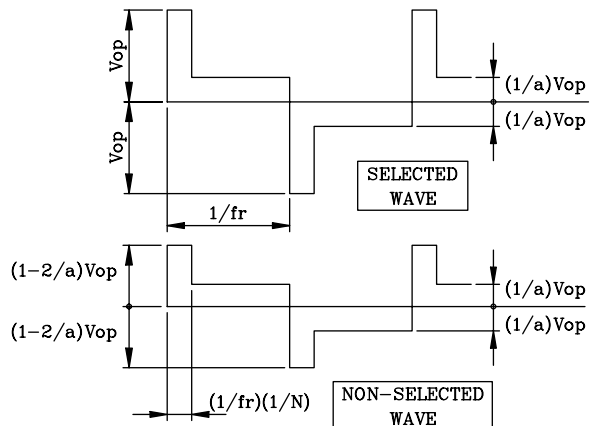
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



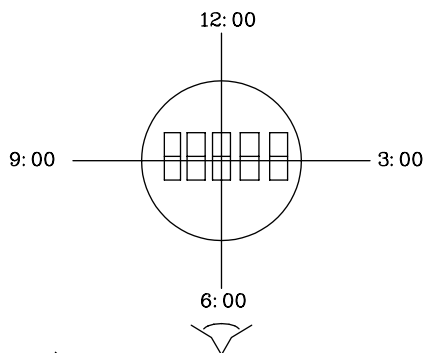
CONST.  
 TEMP.  
 CHAMBER

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



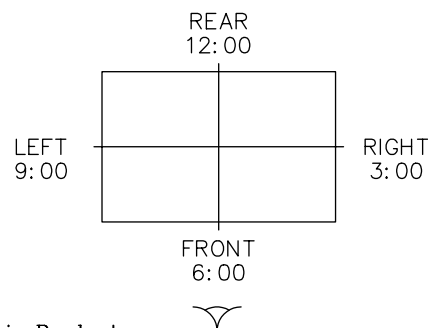
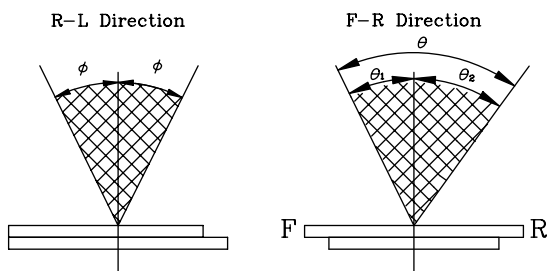
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

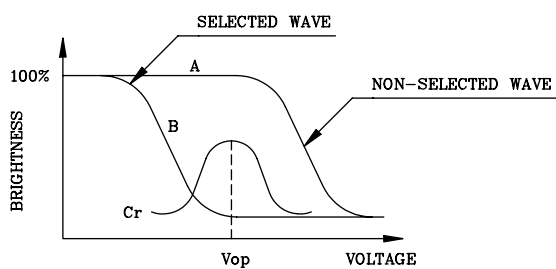
$$\theta = \theta_1 + \theta_2$$

\*Conditions

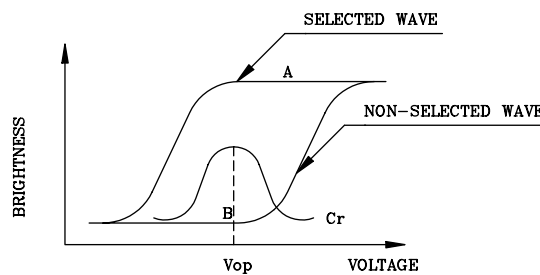
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



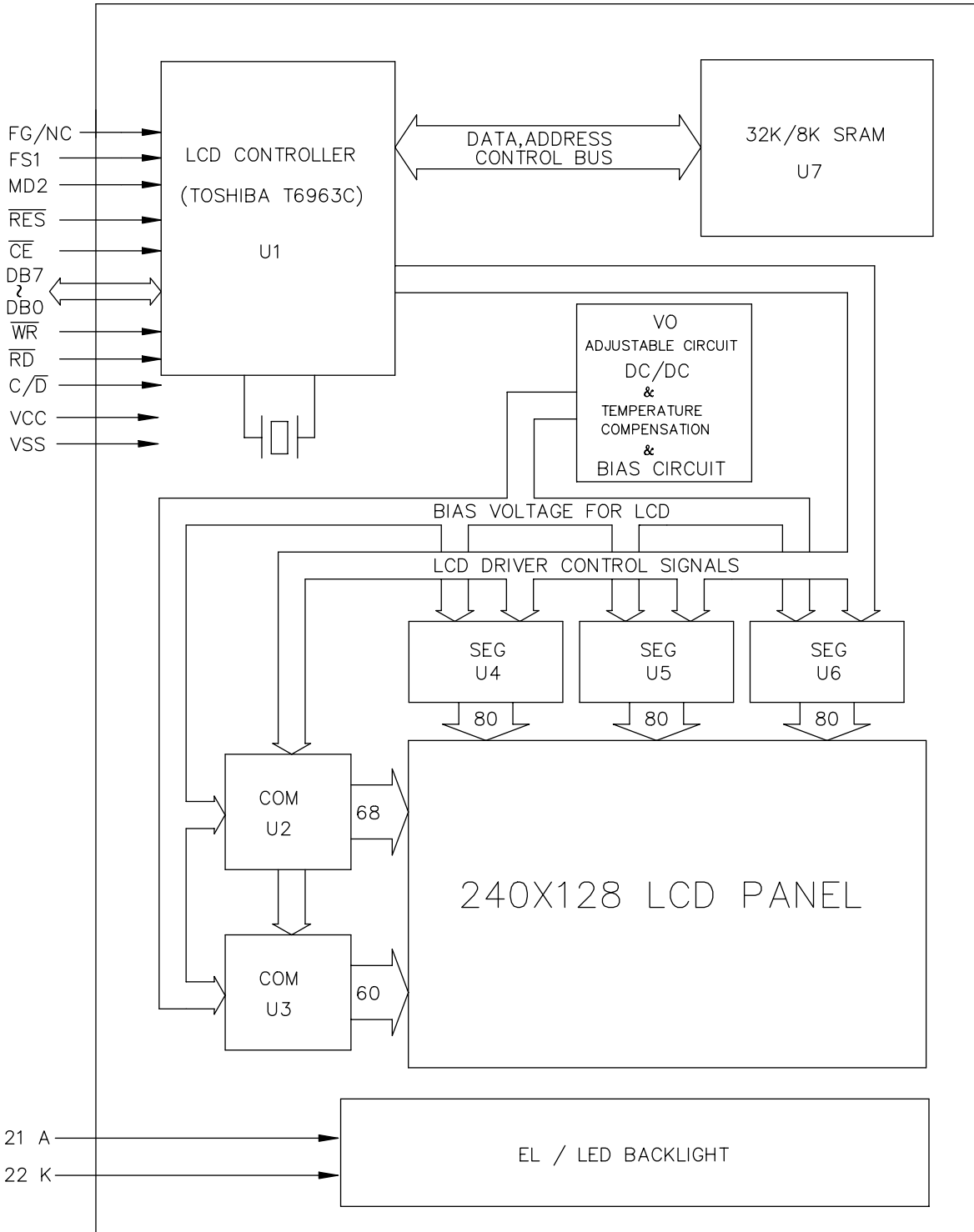
(negative type)

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

\*Conditions

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

## 5. BLOCK DIAGRAM

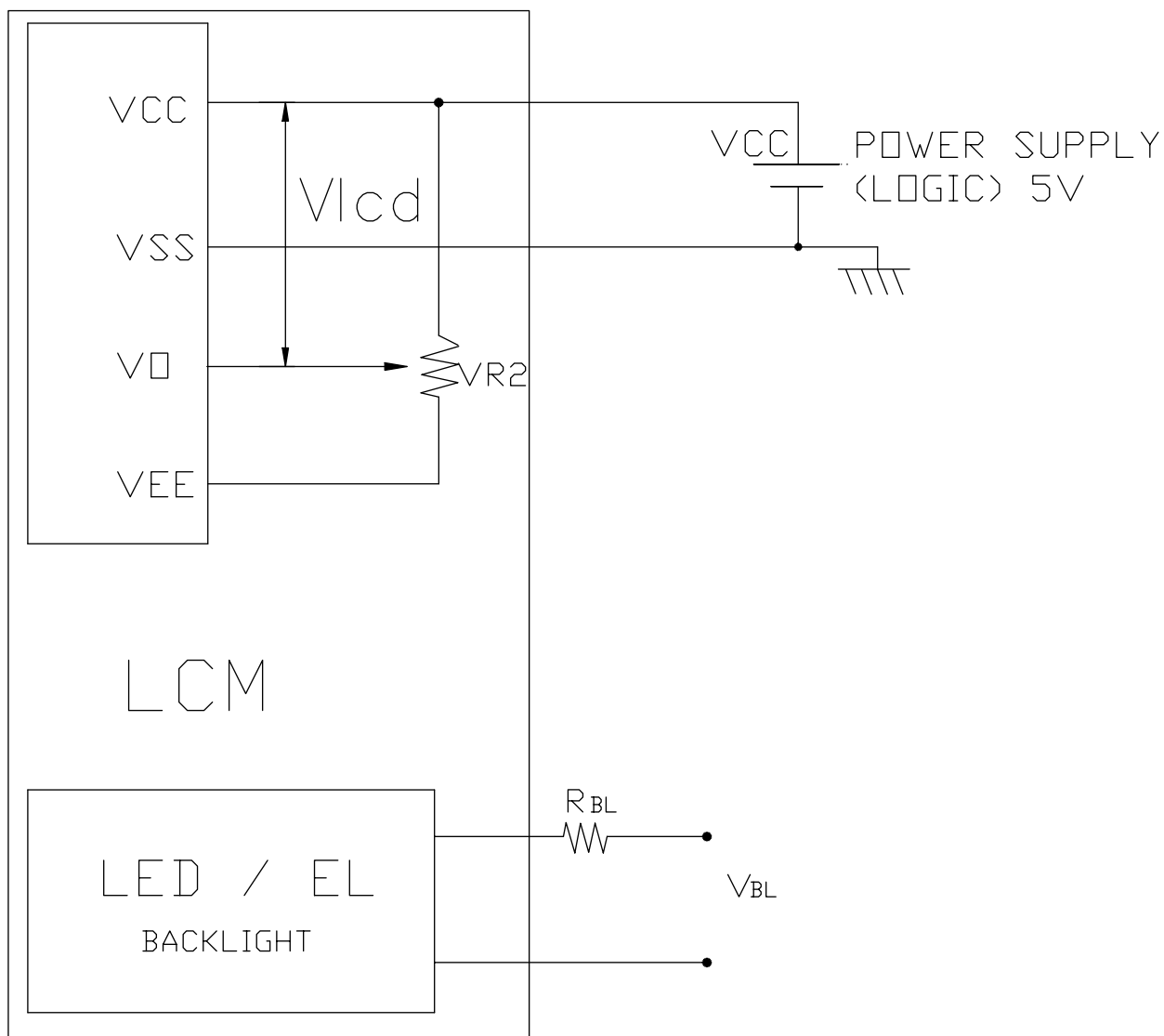


## 6. INTERNAL PIN CONNECTION

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<sub>BL</sub> and R<sub>BL</sub>

ITEM B.L. VALUE	V <sub>BL</sub>	R <sub>BL</sub>
LED	5V	0 Ω
EL	110V <sub>AC</sub> 400HZ	0 Ω

## 8-1. INTERFACE TIMING CHARACTERISTICS

(VCC=5.0V±10%, VSS=0V, T<sub>a</sub>=-20 To 70°C)

ITEM	SYMBOL	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t <sub>CDS</sub>	Fig.	100	—	ns
C/D HOLD TIME	t <sub>CDH</sub>	Fig.	10	—	ns
$\overline{CE}, \overline{RD}, \overline{WR}$ CLOCK WIDTH	t <sub>CE</sub> , t <sub>RD</sub> , t <sub>WR</sub>	Fig.	80	—	ns
DATA SET UP TIME	t <sub>DS</sub>	Fig.	80	—	ns
DATA HOLD TIME	t <sub>DH</sub>	Fig.	40	—	ns
ACCESS TIME	t <sub>ACC</sub>	Fig.	—	150	ns
DATA OUTPUT HOLD TIME	t <sub>OH</sub>	Fig.	10	50	ns

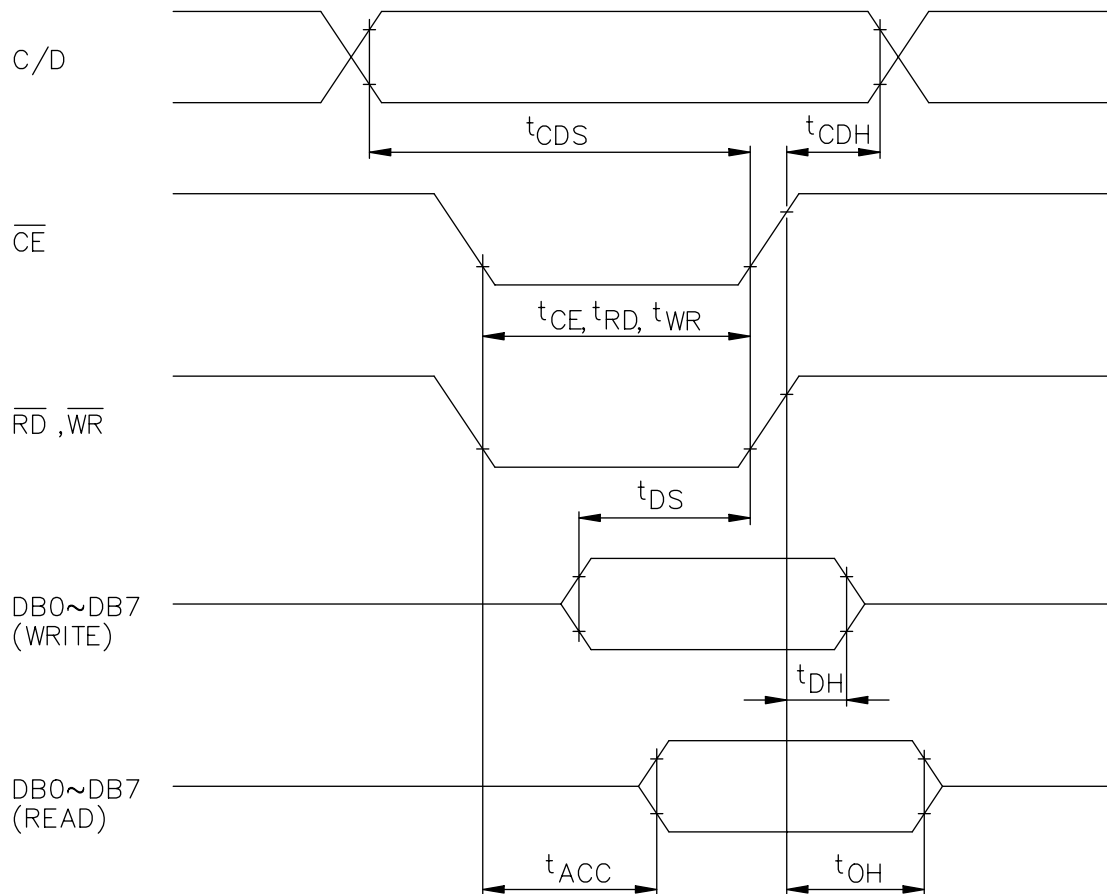
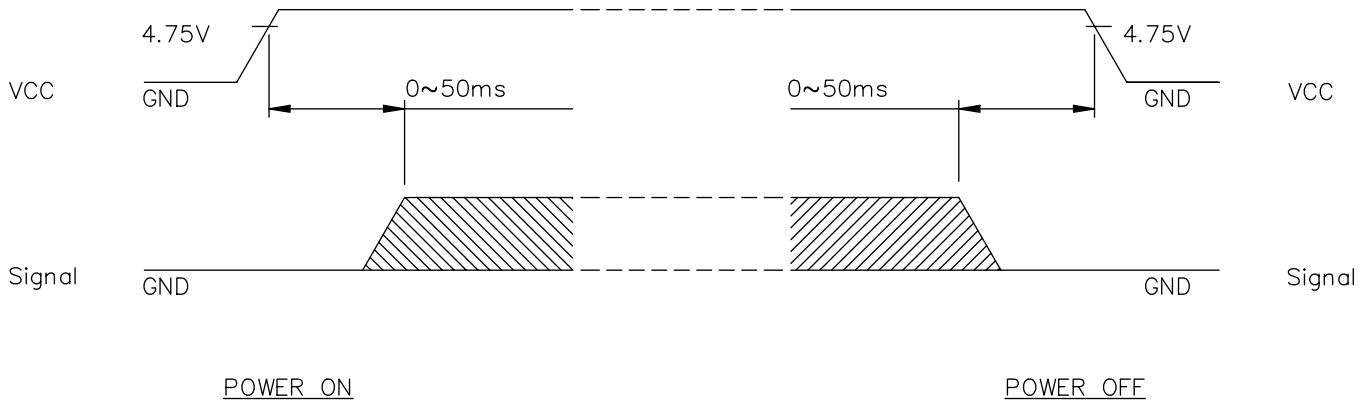


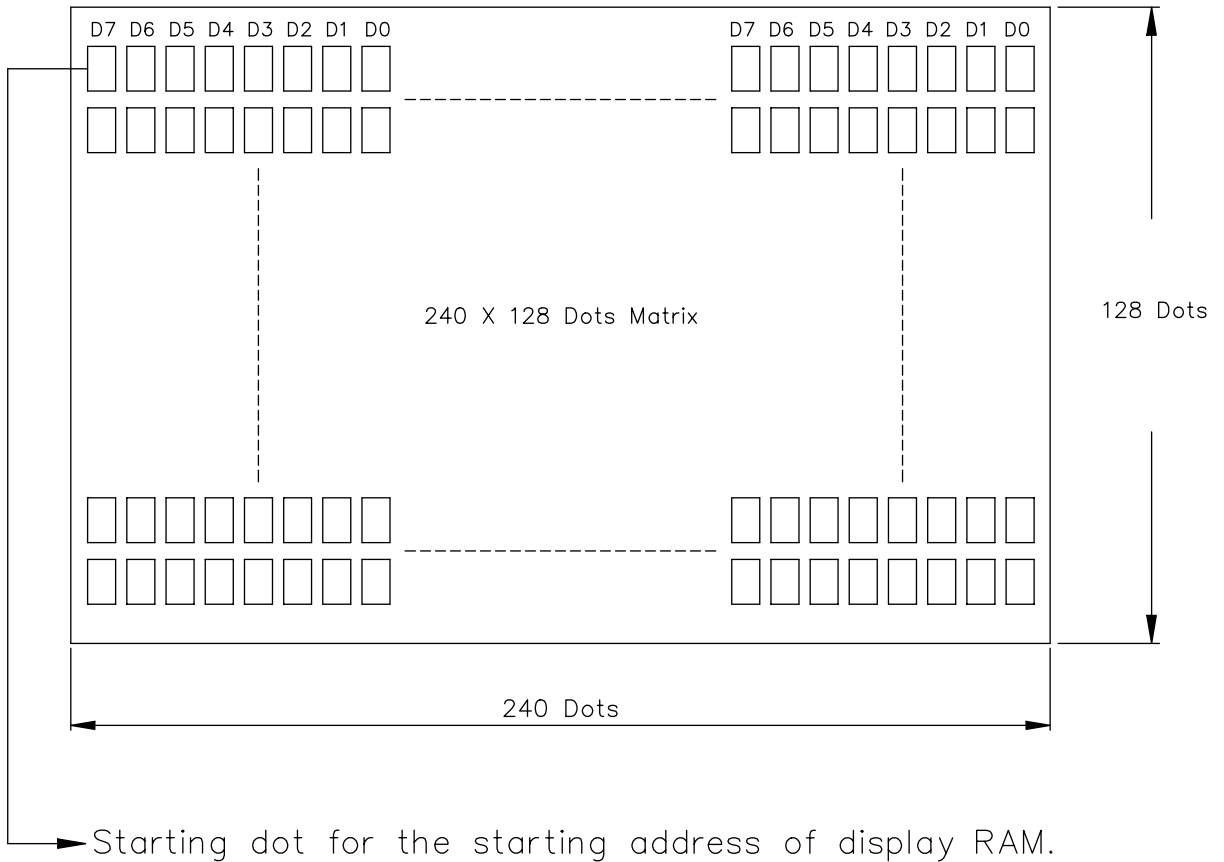
Fig. INTERFACE TIMING CHART

## 8-2. POWER ON/OFF TIMING CHARACTERISTICS

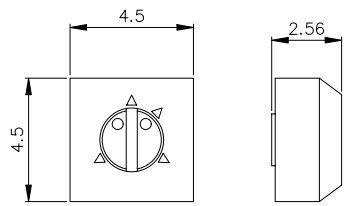


Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

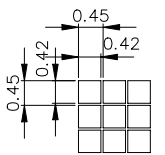
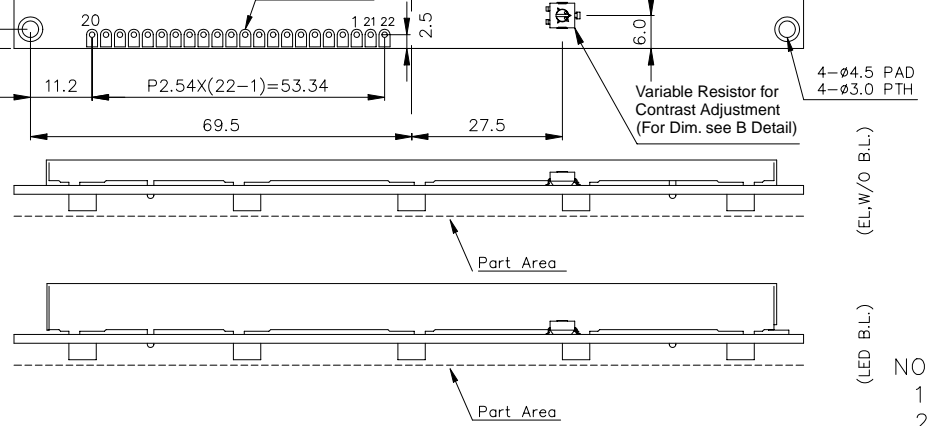
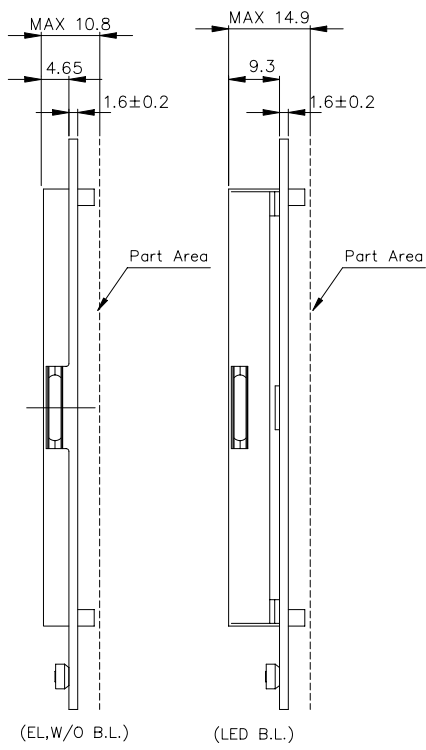
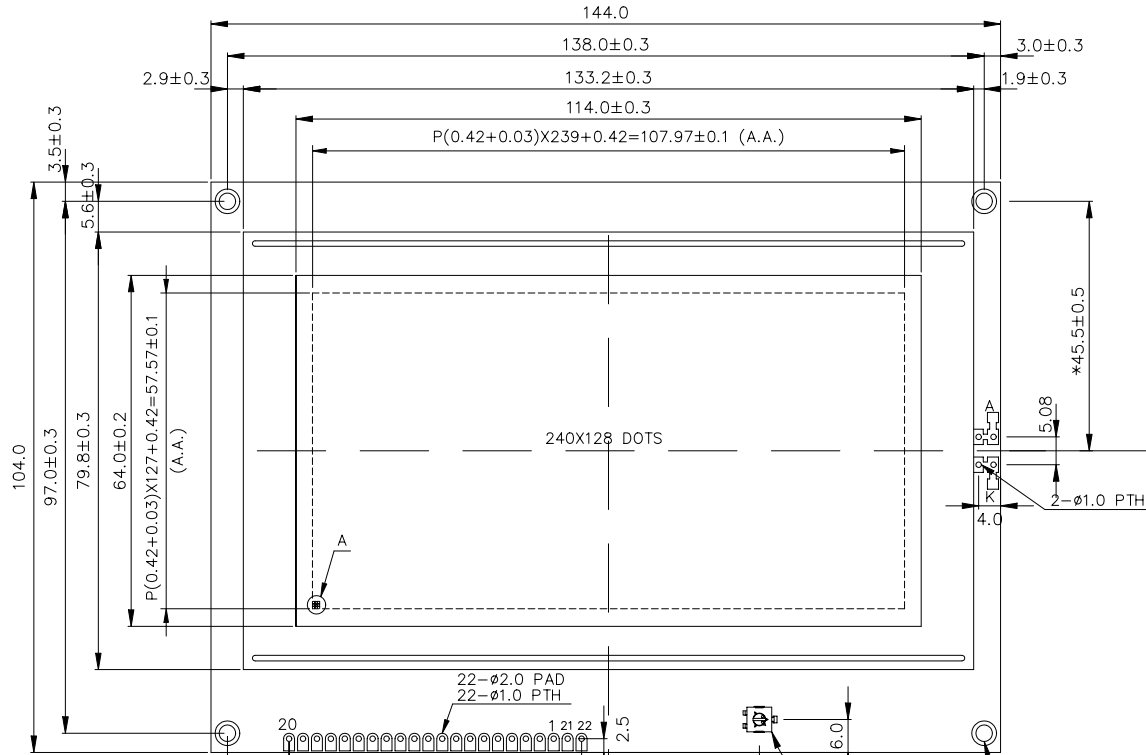
## 8-3. DISPLAY PATTERN



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



B DETAIL



A 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
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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-	

- 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	