

# AZ Displays, Inc.

## 1. MECHANICAL DATA

(1) Part Name	<b>AGM2464D</b>
(2) Module Size	180.0(W)mm X 65.0(H)mm X MAX10.5(D)mm (W/O,EL B/L) 180.0(W)mm X 65.0(H)mm X MAX15.5(D)mm (LED B/L) 190.0(W)mm X 65.0(H)mm X MAX13.8(D)mm (CCFL B/L)
(3) Dot Size	0.49 (W)mm x 0.49 (H)mm
(4) Dot Pitch	0.53 (W)mm x 0.53 (H)mm
(5) Number of Dots	240 (W) x 64 (H)Dots
(6) Duty	1/64
(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
(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 B/L <input type="checkbox"/> LED B/L <input type="checkbox"/> CCFL B/L
(10) Weight	W/O B/L: 128.5 g EL B/L: 135.5 g LED B/L: 164.0 g CCFL B/L: 173.0 g

# AZ Displays, Inc.

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	7.0	V	
Power Supply for LCM	VDD-VEE	0	20.0	V	
Input Voltage	VI	-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 3,5		Note 4,5		Note 4,6	

Note 2  $T_a \leq 50^\circ\text{C}$  : 85%RH max

$T_a > 50^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 85%RH at  $50^\circ\text{C}$

Note 3  $T_a$  at  $-20^\circ\text{C}$  will be  $< 48\text{hrs}$ , at  $70^\circ\text{C}$  will be  $< 120\text{hrs}$

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

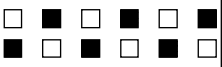
Note 5  $T_a \leq 70^\circ\text{C}$  : 75%RH max

$T_a > 70^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 75%RH at  $70^\circ\text{C}$

Note 6  $T_a$  at  $-30^\circ\text{C}$  will be  $< 48\text{hrs}$ , at  $80^\circ\text{C}$  will be  $< 120\text{hrs}$

# AZ Displays, Inc.

## 3. ELECTRICAL CHARACTERISTICS (VDD = 5V±10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT		
Input Voltage	V <sub>IH</sub>	H level	0.7VDD	–	VDD	V		
	V <sub>IO</sub>	L level	0	–	0.3VDD	V		
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD–VEE	Duty= 1/64	0°C	13.1	13.5	13.9	V	
			25°C	11.9	12.5	13.1		
		Bias= 1/9	50°C	10.8	11.4	11.8		
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD–VEE	Duty= 1/64	–20°C	11.7	12.1	12.5	V	
			0°C	11.6	12.0	12.4		
		Bias= 1/9	25°C	11.5	11.9	12.3		
			50°C	11.4	11.8	12.2		
			70°C	11.3	11.7	12.1		
Power Supply Current	IDD	FLM=72 Hz VDD=5.0 V VDD–VEE=11.6 V	6.5	7.2	10.6	mA		
	IEE	PATTERN : 	1.6	1.8	2.4			
LED Power Supply Current	I <sub>LED</sub>	V <sub>AK</sub> = 5.0 V R <sub>18</sub> = R <sub>19</sub> = 10Ω	–	220	–	mA		
EL Power Supply Current	I <sub>EL</sub>	V <sub>AK</sub> = 110 V <sub>rms</sub> 400HZ R <sub>18</sub> = R <sub>19</sub> = 0Ω	–	–	10.0	mA rms		
CCFL	Starting Voltage	V <sub>FLS</sub>	–	–	900	–	V <sub>rms</sub>	
	Driving Voltage	V <sub>FLD</sub>	–	–	450	–	V <sub>rms</sub>	
	Driving Current	I <sub>FLD</sub>	V <sub>FLD</sub> = 450V <sub>rms</sub> f <sub>FLD</sub> = 30KHZ	–	–	5.0	–	mA rms
	Driving Voltage	f <sub>FL</sub>	–	15	30	50	KHZ	

# AZ Displays, Inc.

## 4.OPTICAL CHARACTERISTICS

### 4-1 Optical Char. of Normal Temp. Mode

AT V<sub>OP</sub>

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, B	3.5	4.5	50	75	20	30
	C, D	6.0	9.0	60	85	20	35
	J	4.5	7.5	55	80	20	35
S	A, B	3.0	4.2	50	75	20	30
	C, D	5.0	8.0	55	85	20	35
	J	4.0	7.0	50	75	20	35
T	A	2.0	2.5	40	60	18	25
	E, F	3.0	4.0	50	70	20	35
	J, K	3.0	4.0	50	70	20	35
note		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	–	600	1200	ms	NOTE 2
		25°C	–	110	220		
		50°C	–	50	100		
Response Time (fall)	Tf	0°C	–	900	1500	ms	NOTE 2
		25°C	–	250	360		
		50°C	–	100	150		

note:

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

# AZ Displays, Inc.

## 4-2 Optical Char. of Wide Temp. Mode

AT V<sub>OP</sub>

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	3.5	4.2	50	68	20	30
	C	5.0	–	50	–	30	35
	J	6.0	8.0	50	70	20	38
S	A	3.5	4.0	50	65	20	30
	C	5.0	–	50	–	25	35
	J	5.0	7.0	50	–	25	35
T	E						
	G						
note		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20°C	–	2100	3200	ms	NOTE 2
		0°C	–	450	680		
		25°C	–	150	250		
		50°C	–	110	170		
		70°C	–	70	90		
Response Time (fall)	Tf	-20°C	–	2100	3200	ms	NOTE 2
		0°C	–	400	600		
		25°C	–	120	180		
		50°C	–	60	100		
		70°C	–	30	50		

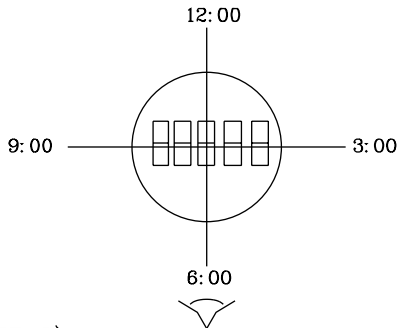
note:

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

# AZ Displays, Inc.

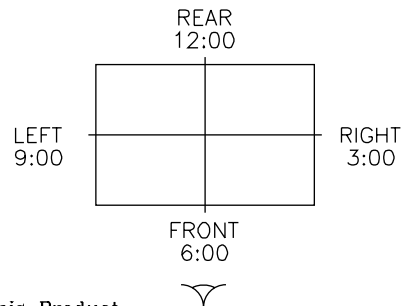
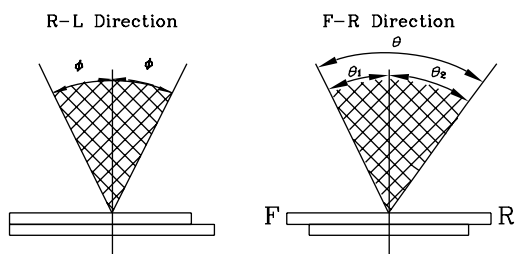
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



\*For This Product

The Viewing Direction Is 6 O'clock  
So  $\theta_1 > \theta_2$

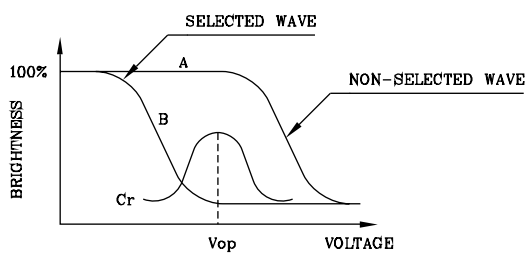
$$\theta = \theta_1 + \theta_2$$

\*Conditions

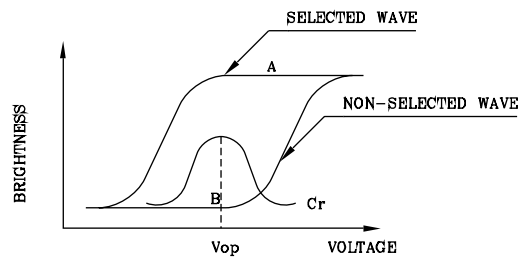
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

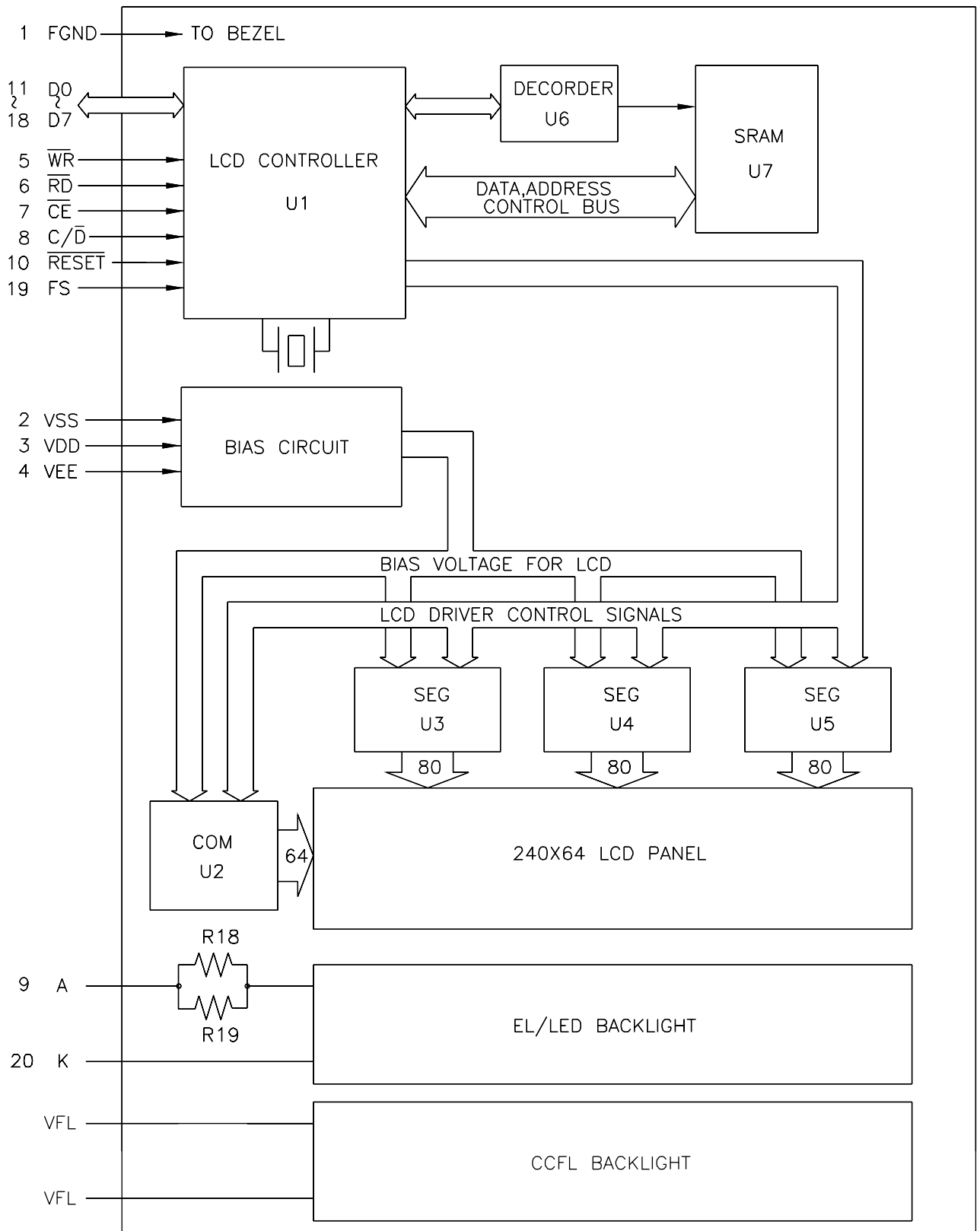
$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

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

# AZ Displays, Inc.

## 5. BLOCK DIAGRAM



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## 6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	VSS	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	VEE	POWER SUPPLY FOR LC DRIVING
5	$\overline{WR}$	DATA WRITE
6	$\overline{RD}$	DATA READ
7	$\overline{CE}$	CHIP ENABLE
8	C/ $\overline{D}$	$\overline{WR}$ ="L",C/ $\overline{D}$ ="H" :COMMAND WRITE $\overline{WR}$ ="L",C/ $\overline{D}$ ="L" :DATA WRITE $\overline{RD}$ ="L",C/ $\overline{D}$ ="H" :STATUS READ $\overline{RD}$ ="L".C/ $\overline{D}$ ="L" :DATA READ
9	A	Anode of LED B/L and EL B/L
10	$\overline{RESET}$	CONTROLLER RESET
11	D0	DATA INPUT/OUTPUT
12	D1	DATA INPUT/OUTPUT
13	D2	DATA INPUT/OUTPUT
14	D3	DATA INPUT/OUTPUT
15	D4	DATA INPUT/OUTPUT
16	D5	DATA INPUT/OUTPUT
17	D6	DATA INPUT/OUTPUT
18	D7	DATA INPUT/OUTPUT
19	FS	FONT SELECT        CONNECT TO VDD :6X8 PIXELS/CHARACTER CONNECT TO GND :8X8 PIXELS/CHARACTER
20	K	Cathode of LED B/L and EL B/L

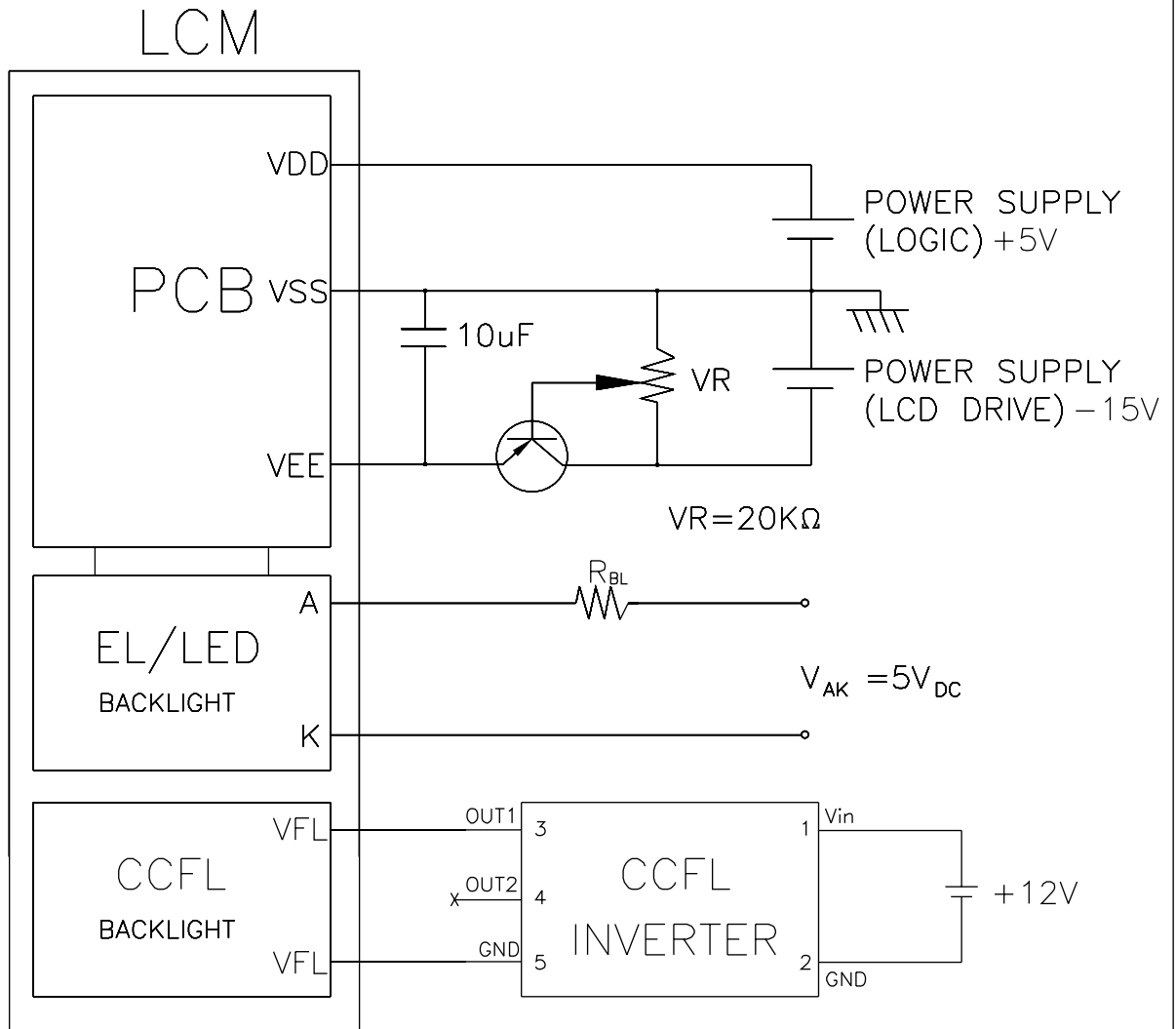
CCFL Connector : J.A.E/IL-G-4S-S3C2

PIN NO	SYMBOL	FUNCTION
1	VFL	POWER SUUPLY FOR CCFL DRIVE
2	NC	-
3	NC	-
4	VFL	POWER SUUPLY FOR CCFL DRIVE



# AZ Displays, Inc.

## 7. POWER SUPPLY



Recommended Inverter : CXA-L10L (TDK)

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

item Back Light interface	$R_{BL}$		$V_{BL}$	
	EL	LED	EL	LED
A,K PIN	0 $\Omega$	5 $\Omega$	110V <sub>AC</sub> 400HZ	5V <sub>DC</sub>

# AZ Displays, Inc.

## 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
$\bar{C}\bar{E}$ , $\bar{R}\bar{D}$ , $\bar{W}\bar{R}$ 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

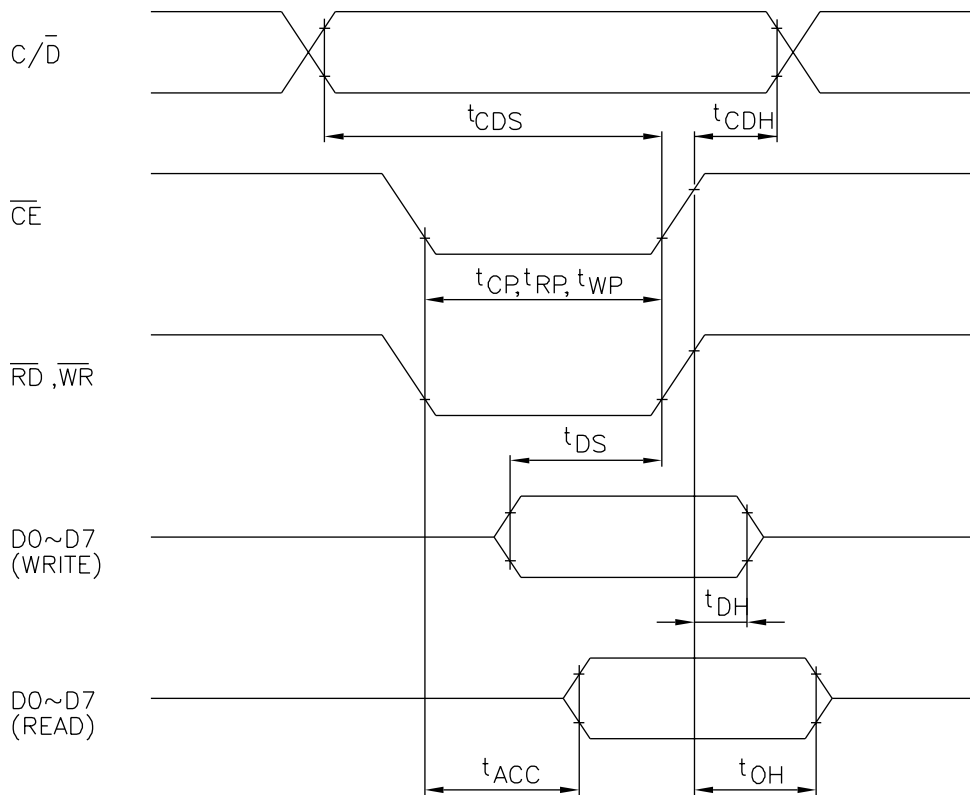
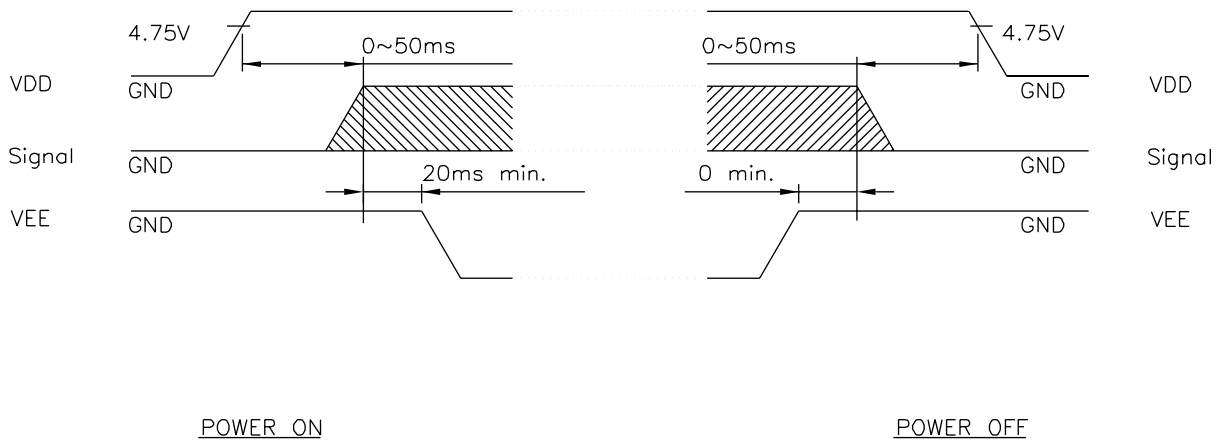


Fig. INTERFACE TIMING CHART

# AZ Displays, Inc.

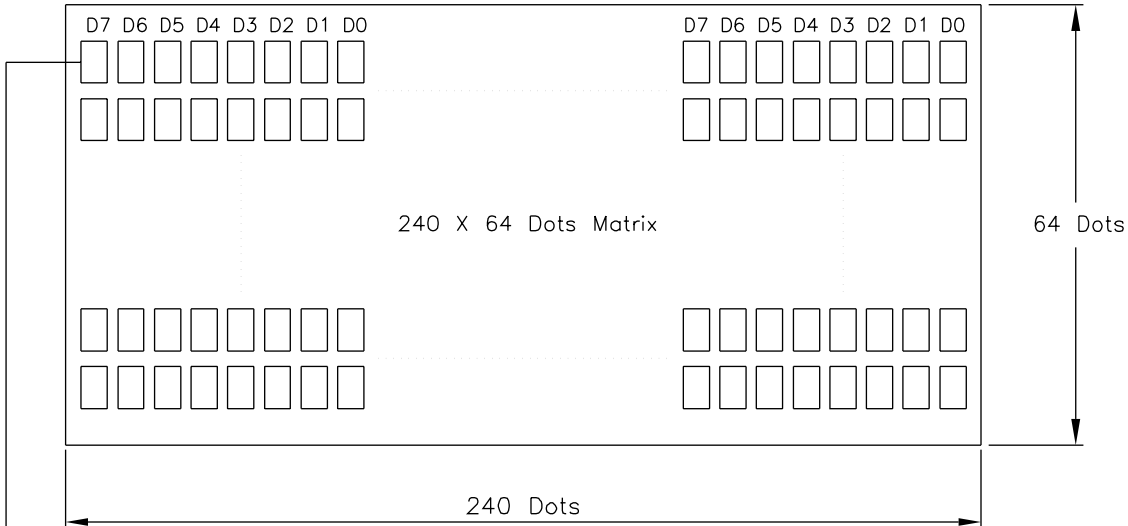
## 8-2 POWER ON/OFF TIMING



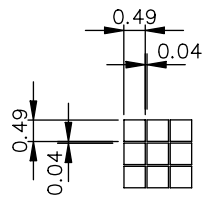
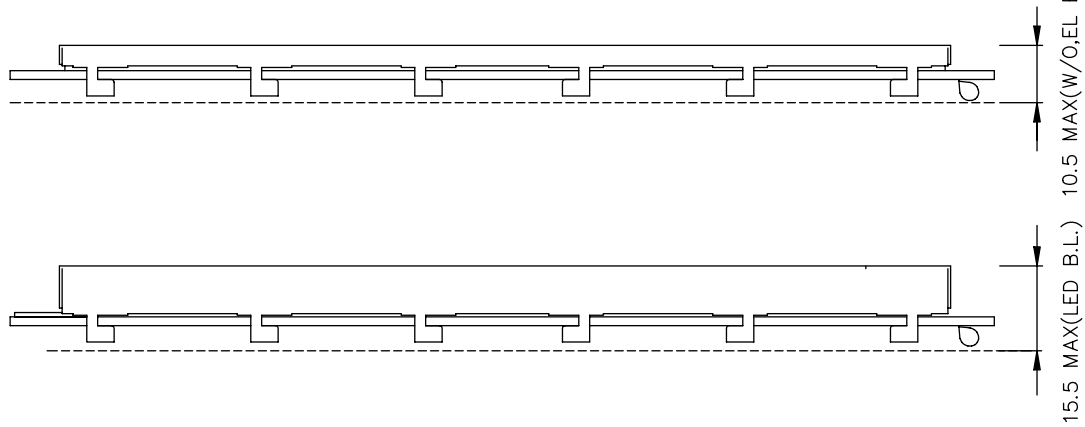
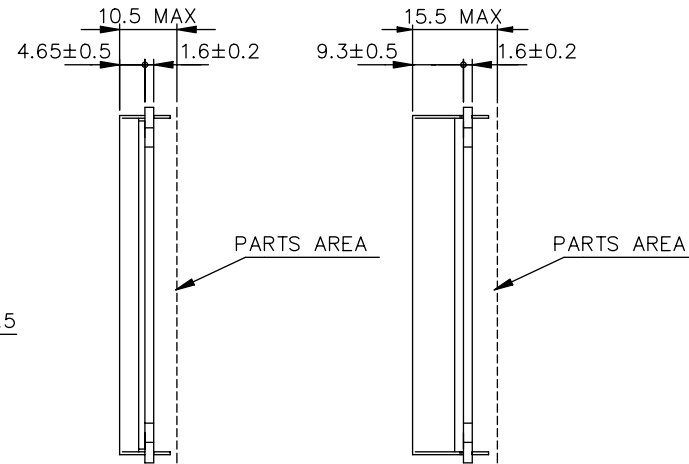
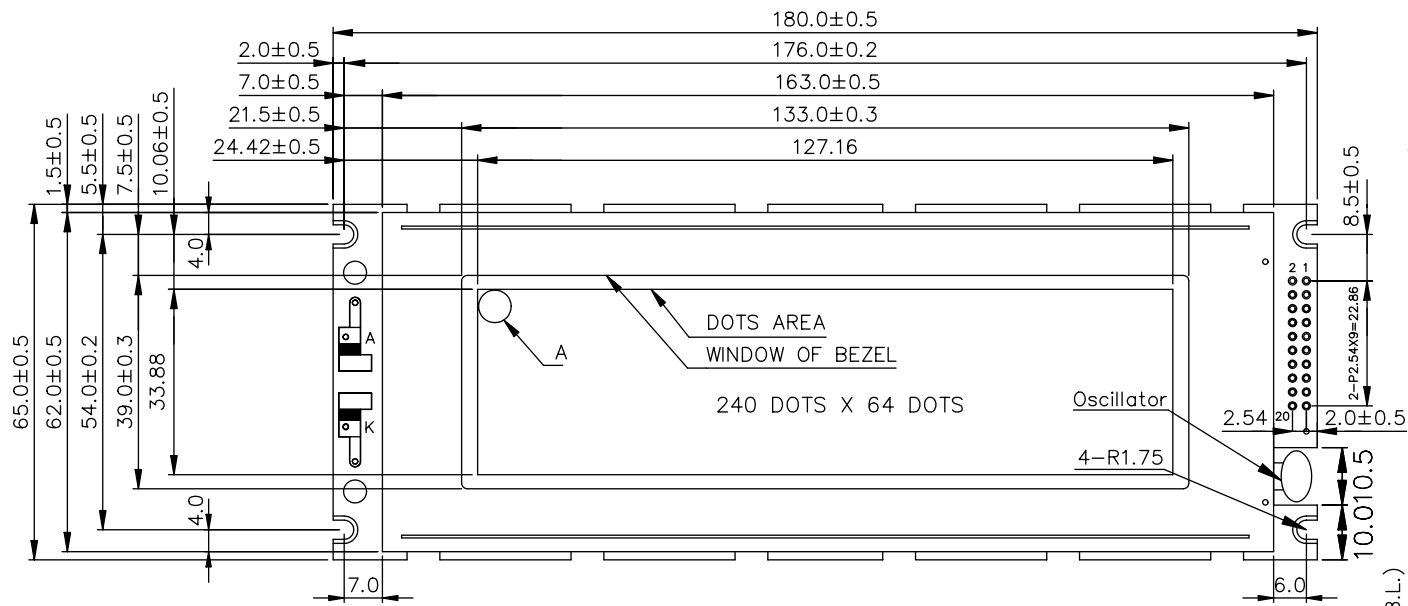
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

# AZ Displays, Inc.

## 8-3 DISPLAY PATTERN



Starting dot for the starting address of display RAM D0~D7,  
where D0 is LSB and D7 is MSB.



W/O, EL B/L

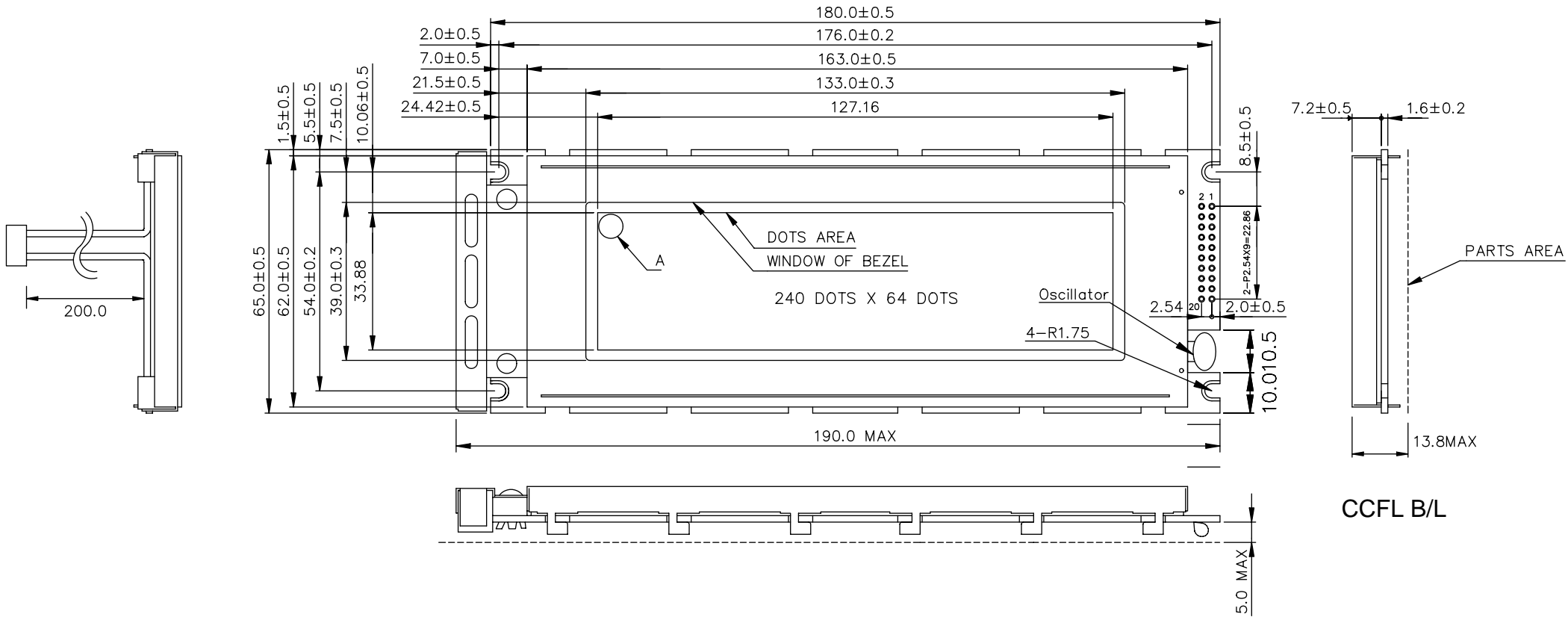
LED B/L

NOTES:

1. Resolution : 240 x 64 Dots
2. Controller : T6963C
3. DC/DC Converter : Without
4. General Tolerance : ±0.5 mm

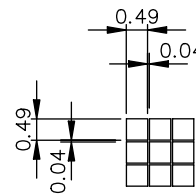
PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	WR	RD	CE	C/D	A	RESET
PIN NO.	11	12	13	14	15	16	17	18	19	20
SYMBOL	D0	D1	D2	D3	D4	D5	D6	D7	FS	K

		AGM2464D		AZ DISPLAYS, INC.		
APPROVE	NAME	DATE	TITLE			
CHECK			DWG-NO	MX-X003XP	Rev.B	
DESIGN	M.Y. Lin	88.10.8				
DRAW	MAY PING	88.10.8				
			THIRD ANGLE PROJECT		UNIT : mm	
					SCALE : NTS	



NOTES:

1. Resolution : 240 x 64 Dots
2. Controller : T6963C
3. DC/DC Converter : Without
4. General Tolerance : ±0.5 mm



A DETAIL

PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	WR	RD	CE	C/D	A	RESET
PIN NO.	11	12	13	14	15	16	17	18	19	20
SYMBOL	D0	D1	D2	D3	D4	D5	D6	D7	FS	K

	AGM2464D		AZ DISPLAYS, INC.		
APPROVE	NAME	DATE	TITLE		
CHECK			DWG-NO	MB-X003X1P	Rev.B
DESIGN	M.Y. Lin	88.10.8	UNIT : mm SCALE : NTS		
DRAW	MAY PING	88.10.8			