AZ Displays, Inc.

1. MECHANICAL DATA

(1) Part Name	AGM2464D	
(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: ☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode	
	FSTN: ☐ Black and White(Normal White/Positive Image)	
	☐ Black and White(Normal Black/Negative Image)	
	Rear Polarizer: ☐ Reflective ☐ Transflective ☐ Transmissive	
(8) Viewing Direction	☐ 6 O'clock ☐ 12 O'clock ☐____ O'clock	
(9) Backlight	☐ W/O ☐ EL B/L ☐ LED B/L ☐ 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	

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 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

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

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage		VIH	H level		0.7VDD	–	VDD	V
		VIO	L level		0	–	0.3VDD	V
Recommended LC Driving Voltage (Normal Temp. LCM)		VDD−VEE	Duty= 1/64 Bias= 1/9	0°C	13.1	13.5	13.9	V
				25°C	11.9	12.5	13.1	
				50°C	10.8	11.4	11.8	
Recommended LC Driving Voltage (Wide Temp. LCM)		VDD−VEE	Duty= 1/64 Bias= 1/9	−20°C	11.7	12.1	12.5	V
				0°C	11.6	12.0	12.4	
				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 PATTERN : ■□■□■□ □■□■□■		6.5	7.2	10.6	mA
		IEE			1.6	1.8	2.4	
LED Power Supply Current		I_{LED}	V_{AK} = 5.0 V R_{18} = R_{19} =10Ω		–	220	–	mA
EL Power Supply Current		I_{EL}	V_{AK} = 110 V_{rms} 400HZ R_{18} = R_{19} =0Ω		–	–	10.0	mA rms
CCFL	Starting Voltage	V_{FLS}	–		–	900	–	V rms
	Driving Voltage	V_{FLD}	–		–	450	–	V rms
	Driving Current	I_{FLD}	V_{FLD} =450V_{rms} f_{FLD} =30KHZ		–	5.0	–	mA rms
	Driving Voltage	f_{FL}	–		15	30	50	KHZ

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4.OPTICAL CHARACTERISTICS

4-1 Optical Char. of Normal Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)		θ(Viewing Angle)		ø(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 ø=0° θ=0°

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

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4-2 Optical Char. of Wide Temp. Mode

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)		θ(Viewing Angle)		ø(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 ø=0° θ=0°

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		

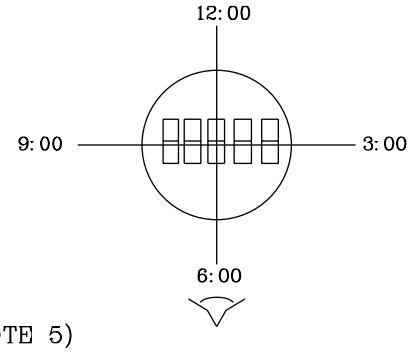
note:

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

AZ Displays, Inc.

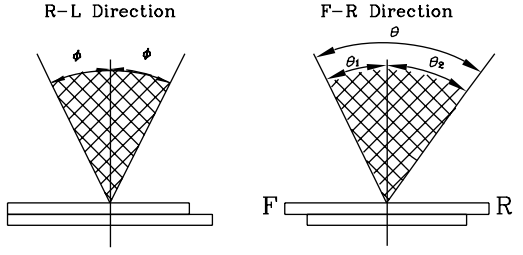
(NOTE 4)

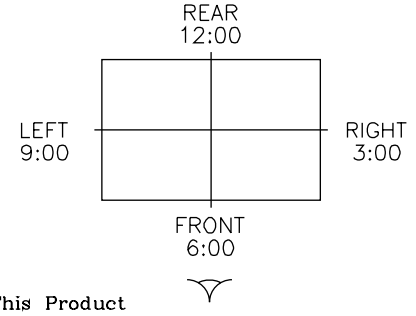
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

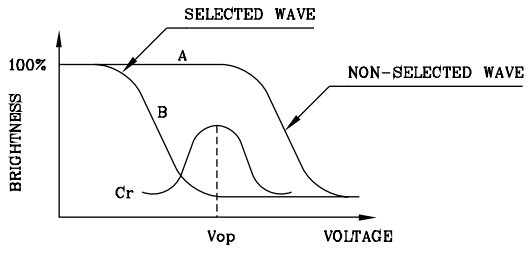
$\theta = \theta_1 + \theta_2$

*Conditions

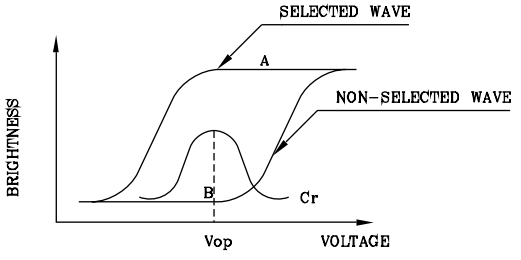
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

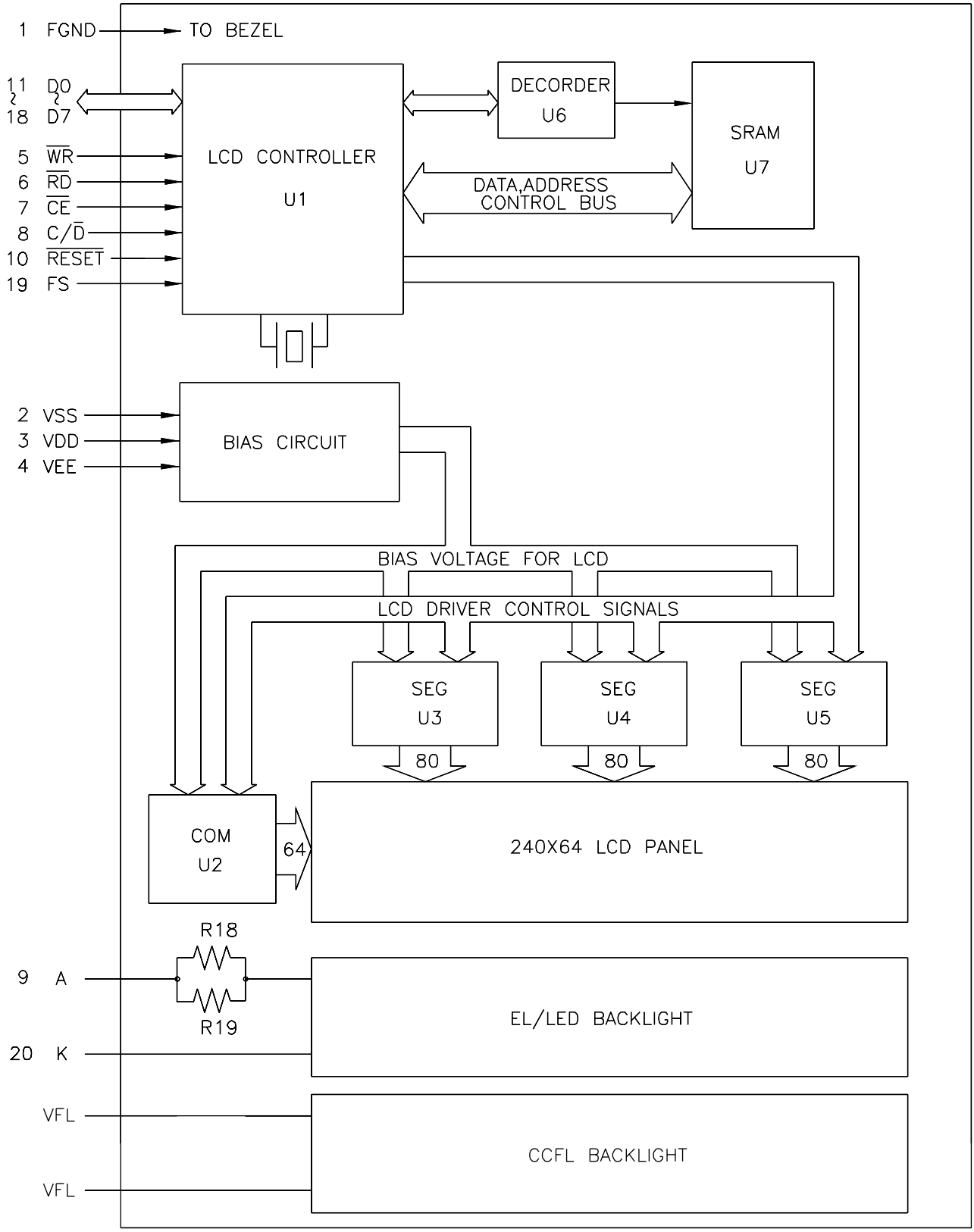
Contrast Ratio : Cr=A/B

*Conditions

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

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5. BLOCK DIAGRAM



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6. INTERNAL PIN CONNECTION

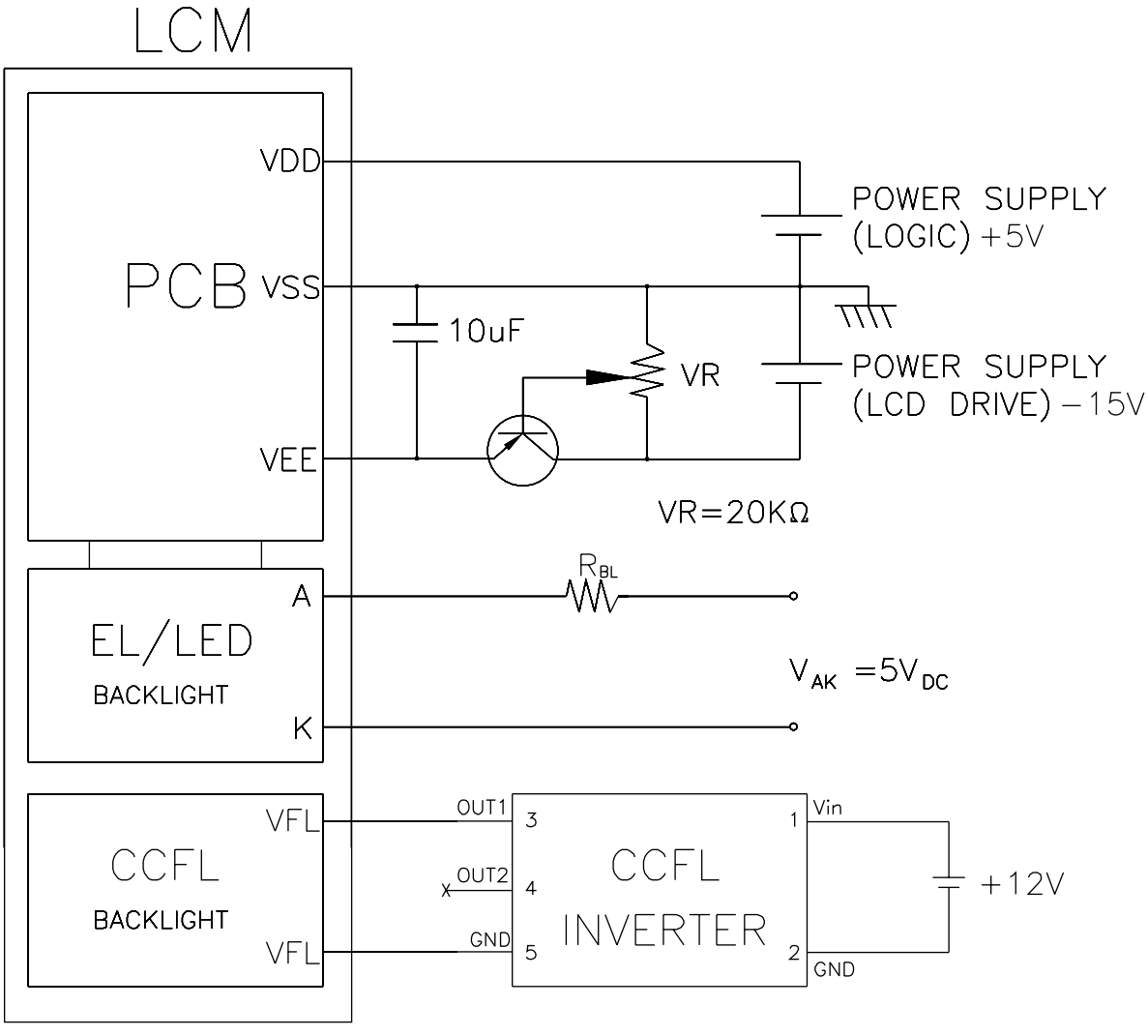
PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	VSS	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	VEE	POWER SUPPLY FOR LC DRIVING
5	$\overline{WR}$	DATA WRITE
6	$\overline{RD}$	DATA READ
7	$\overline{CE}$	CHIP ENABLE
8	C/$\overline{D}$	$\overline{WR}$="L",C/$\overline{D}$="H" :COMMAND WRITE $\overline{WR}$="L",C/$\overline{D}$="L" :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

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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	0Ω	5Ω	110V_{AC} 400HZ	5V_{DC}

8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

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

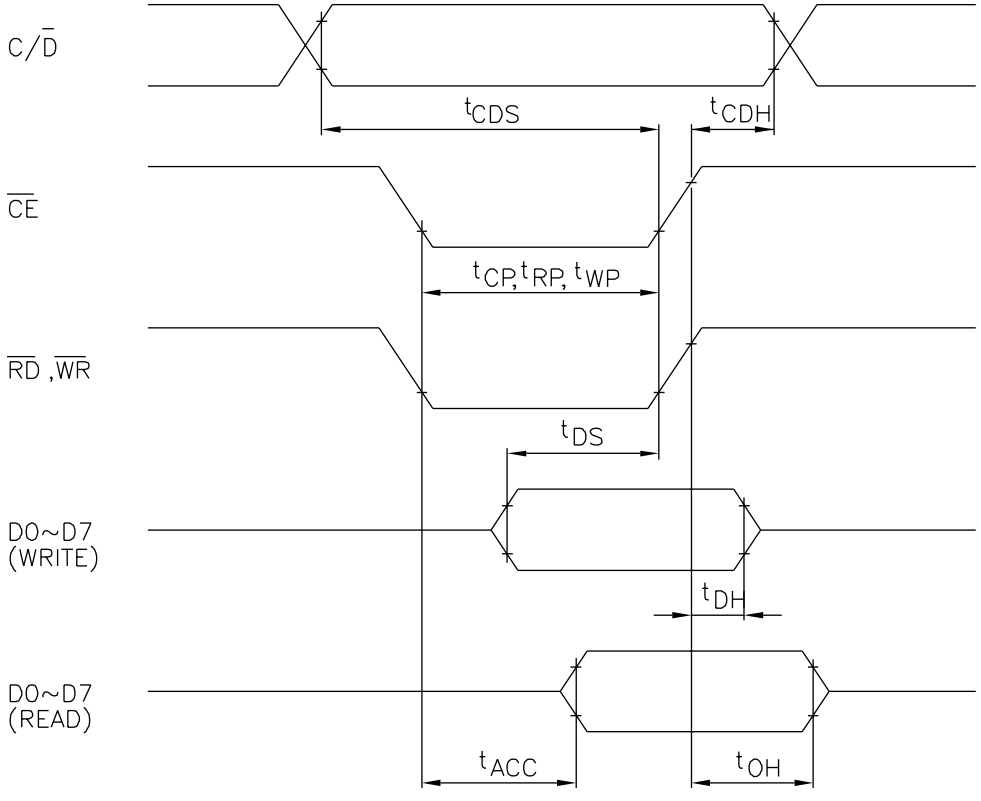
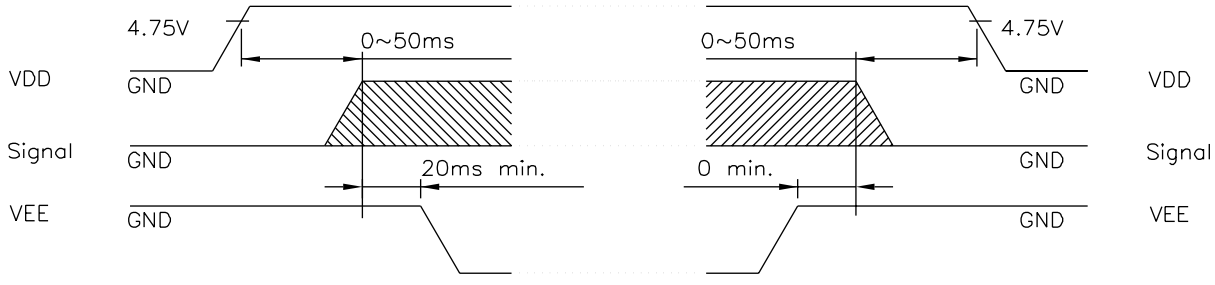


Fig. INTERFACE TIMING CHART

8-2 POWER ON/OFF TIMING

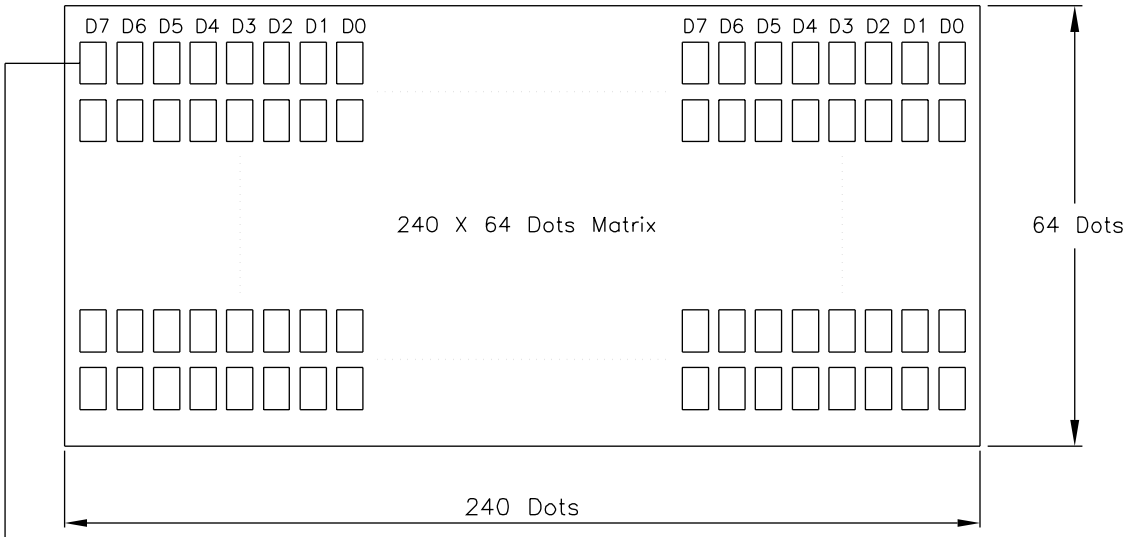


POWER ON

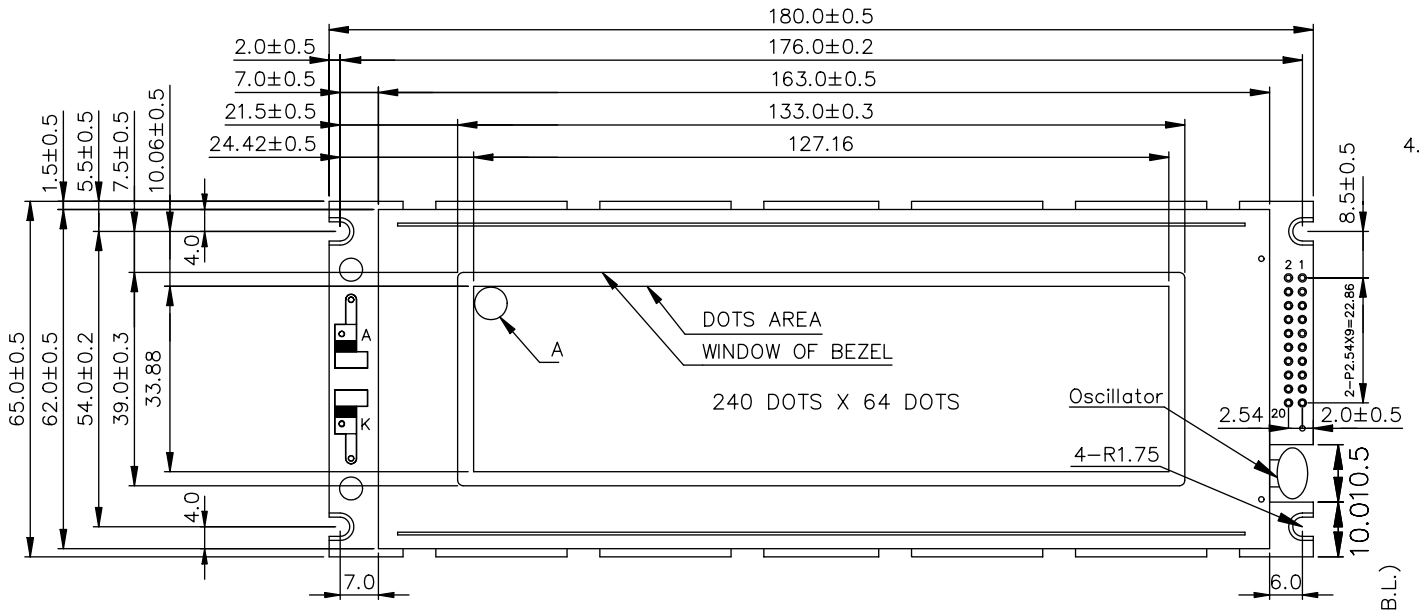
POWER OFF

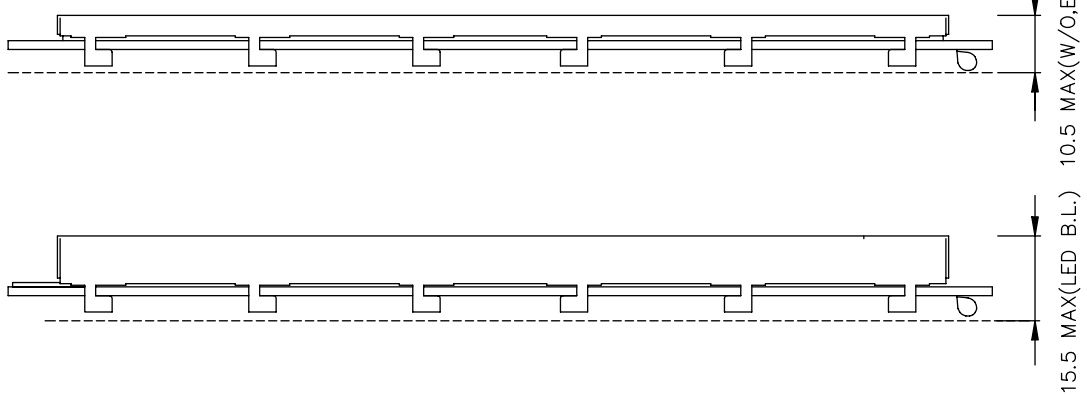
The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

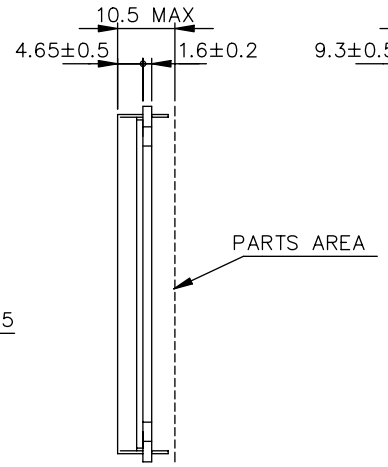
8-3 DISPLAY PATTERN



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





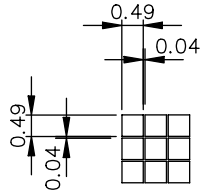


W/O, EL B/L

LED B/L

NOTES:

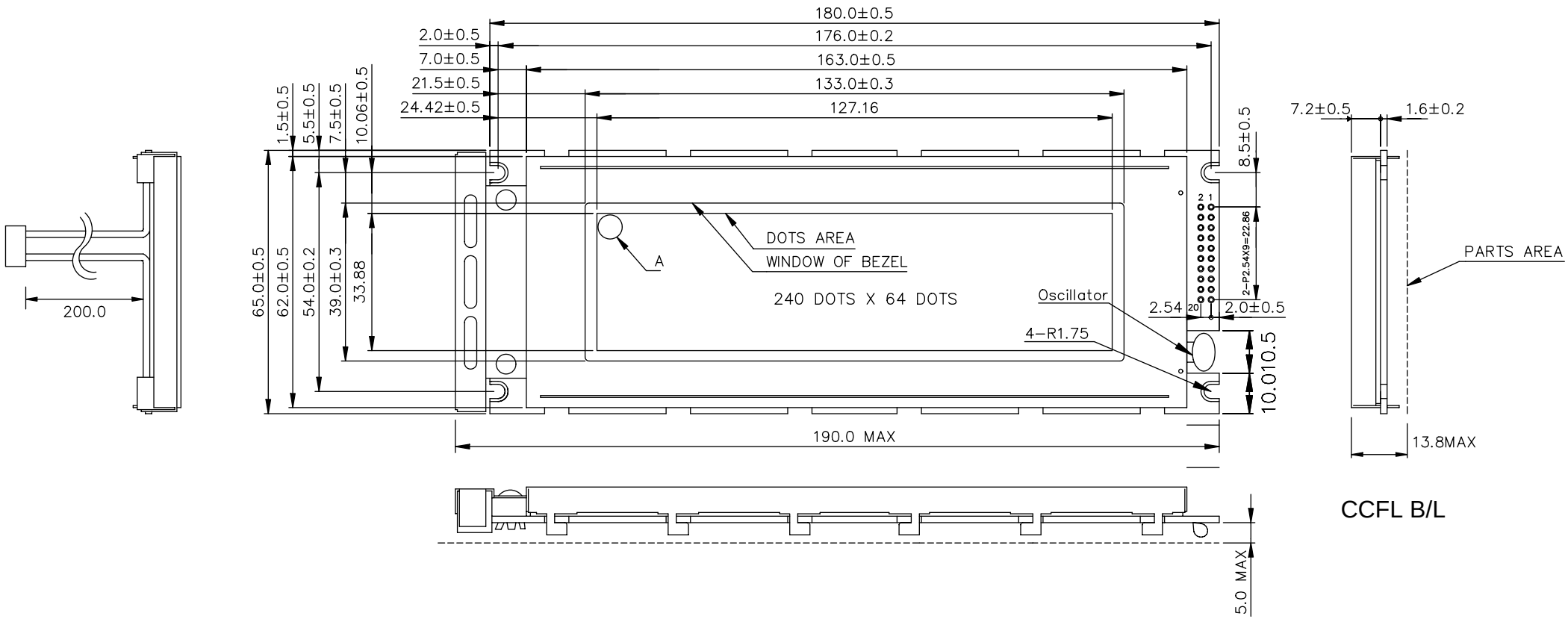
1. Resolution : 240 x 64 Dots
2. Controller : T6963C
3. DC/DC Converter : Without
4. General Tolerance : ±0.5 mm



A DETAIL

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

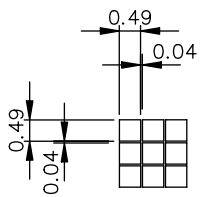
	AGM2464D		AZ DISPLAYS, INC.		
	NAME	DATE			
APPROVE			TITLE		
CHECK			DWG-NO	MX-X003XP	Rev.B
DESIGN	M.Y. Lin	88.10.8			
DRAW	MAY PING	88.10.8	THIRD ANGLE PROJECT	UNIT : mm	
				SCALE : NTS	



CCFL B/L

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	$\overline{WR}$	$\overline{RD}$	$\overline{CE}$	C/$\overline{D}$	A	$\overline{RESET}$
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.		
	NAME	DATE			
APPROVE			TITLE		
CHECK			DWG-NO	MB-X003X1P	Rev.B
DESIGN	M.Y. Lin	88.10.8	THIRD ANGLE PROJECT	UNIT : mm	
DRAW	MAY PING	88.10.8		SCALE : NTS	