

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM3224H</b>
(2) Module Size	142.6 (W)mm x 92.6 (H)mm x MAX 7.5 (D)mm (CCFT B.L.)
(3) Dot Size	0.285 (W)mm x 0.285 (H)mm
(4) Dot Pitch	0.30 (W)mm x 0.30 (H)mm
(5) Number of Dots	320 (W) x 240 (H)Dots
(6) Duty	1/240
(7) LCD Display Mode	STN: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode <input type="checkbox"/> Blue Mode <input type="checkbox"/> Other 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"/> Transflective(Normal) <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective(Medium Transparency) <input type="checkbox"/> Transflective(High Transparency)
(8) Viewing Direction	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ____O'clock
(9) Backlight	CCFT
(10) Recommended CCFT Inverter	TDK CORP. CXA-L10L
(11) Weight	CCFT : 120 g (approx.)

Revised: March 8, 2001

## 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	6.5	V	
Power Supply for LCM	VDD-VEE	0	27.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity(Without Condensation)	Note 2, 4		Note 3, 4	

Note 2 Ta ≤ 70°C : 75%RH max  
 Ta > 70°C : Absolute humidity must be lower  
 than the humidity of 75%RH at 70°C

Note 3 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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

## 3. ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Logic		VDD-VSS	-	4.5	5.0	5.5	V	
				2.7	3.0	3.3		
Recommended LC Driving Voltage		VDD-VEE	Duty=1/240 Bias=1/13	-20°C	24.3	24.7	25.1	V
				0°C	23.0	23.4	23.8	
				25°C	22.2	22.6	23.0	
				50°C	20.9	21.3	21.7	
				70°C	20.3	20.7	21.1	
Input Voltage		VIH	H level	0.8VDD	-	VDD	V	
		VIL	L level	0	-	0.2VDD	V	
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VDD-VEE = 22.6 V	-	6.4	9	mA	
		IEE	PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	6.0	9	mA	
CCFL LAMP	Starting Voltage	Vs		-	420	1000	Vrms	
	Lamp Voltage	VL		-	280	-	Vrms	
	Lamp Current	IL		4	5	6	mArms	
	Lamp Consumption	PL		-	1.4	-	W	
	Lamp Frequency	FL		-	35	-	KHz	
	Lamp Life Time	LL		-	20000	-	hrs	
LCM	Surface Luminance	L(ALL ON)	Transmissive/Black	-	191	-	cd/m <sup>2</sup>	
		L(ALL OFF)		-	8.3	-	cd/m	
		L(ALL ON)	Transflective/Normally white	-	23	-	cd/m	
		L(ALL OFF)		-	97	-	cd/m	
		L(ALL ON)	Transflective/BLUE	-	36	-	cd/m	
		L(ALL OFF)		-	195	-	cd/m	

## 4. OPTICAL CHARACTERISTICS

AT V<sub>OP</sub>

ITEM  MODE		Cr(Contrast Ratio)										$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G,H	-	15	-	18	-	20	-	10	-	5	-	X-60	-	54-33
S	J	-	7	-	8	-	8	-	6	-	4	-	36-36	-	33-36
T	E	-	4	-	4	-	4.5	-	3.5	-	2.5	-	X-37	-	37-27
note		NOTE6										NOTE5			

note:

S: TRANSFLECTIVE(NORMAL)  
 T: TRANSMISSIVE  
 P: TRANSFLECTIVE(MEDIUM TRANSPARENCY)  
 A: GRAY

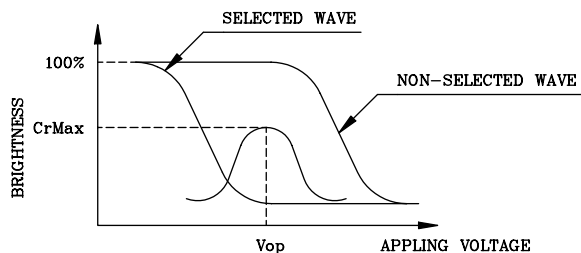
C: YELLOW  
 E,F: BLUE  
 G,H: NORMALLY BLACK  
 J: NORMALLY WHITE  
 Z: OTHER

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

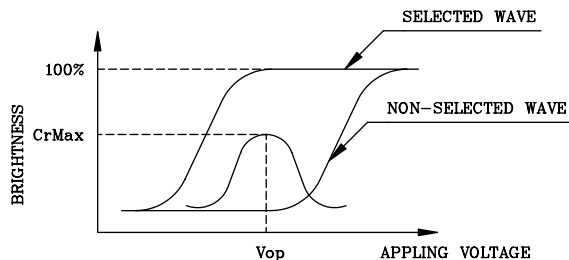
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	3000	-	ms	NOTE 2
		0℃	-	650	-		
		25℃	-	275	-		
		50℃	-	140	-		
		70℃	-	70	-		
Response Time (fall)	Tf	-20℃	-	2000	-	ms	NOTE 2
		0℃	-	400	-		
		25℃	-	100	-		
		50℃	-	60	-		
		70℃	-	55	-		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



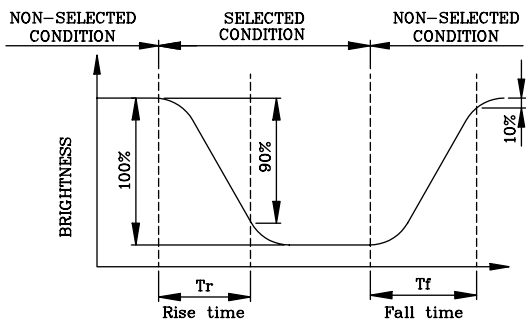
(negative type)

\*Conditions

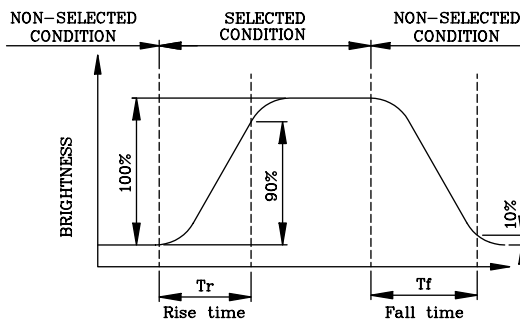
- Viewing Angle : 0
- Frame Frequency : 70Hz
- Applying Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



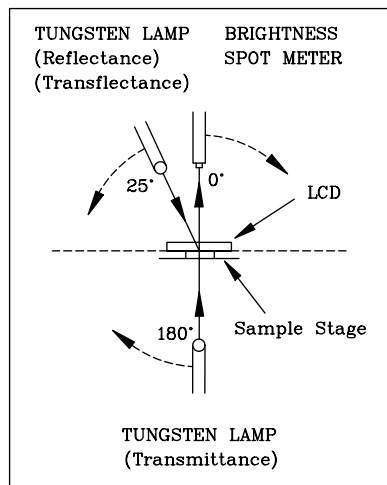
(negative type)

\*Conditions

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

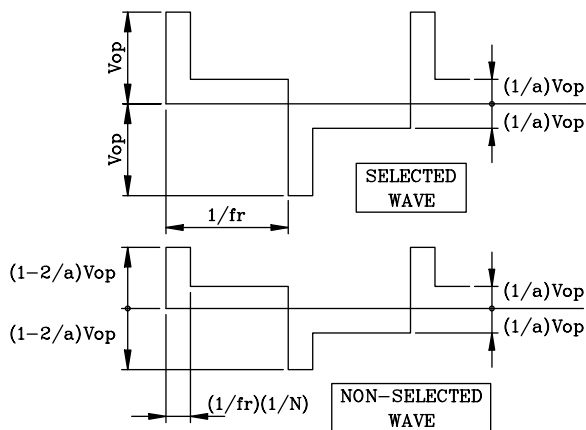
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



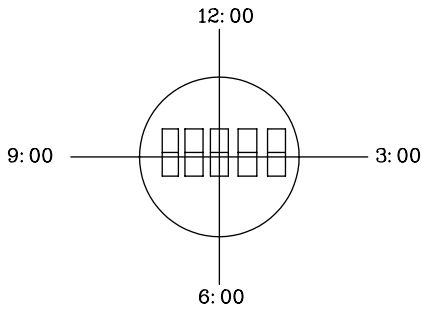
CONST.  
TEMP.  
CHAMBER

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



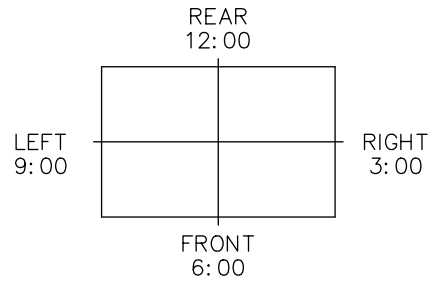
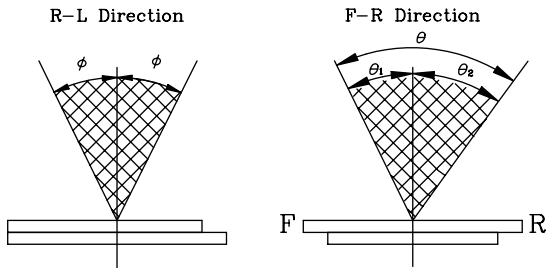
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

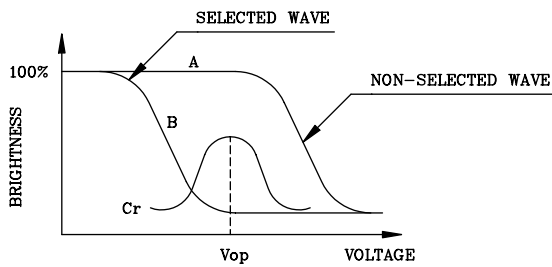
$$\theta = \theta_1 + \theta_2$$

\*Conditions

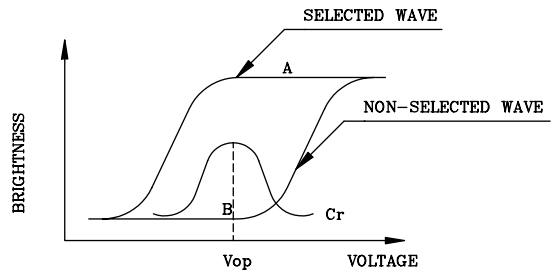
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



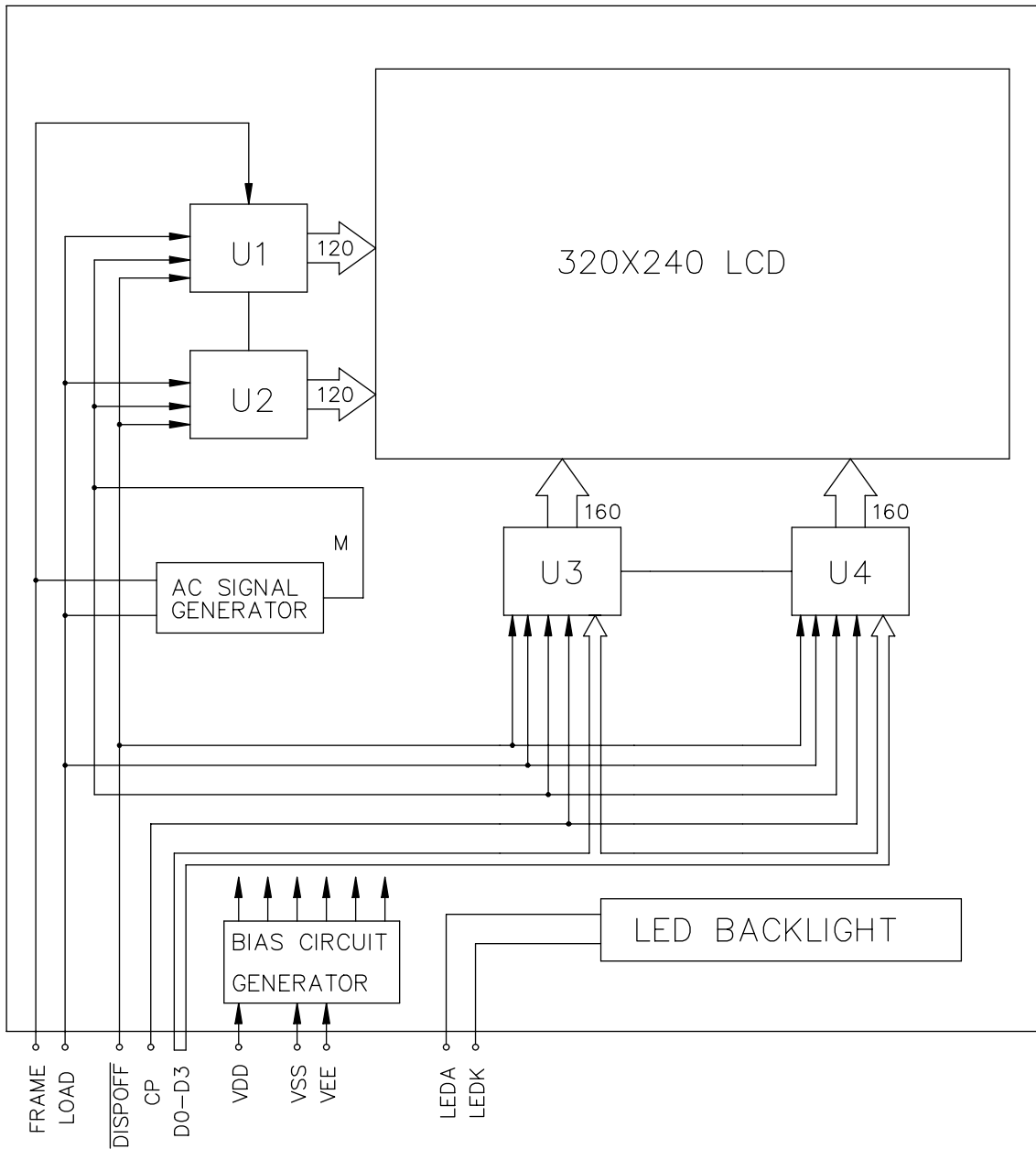
(negative type)

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

\*Conditions

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

## 5. BLOCK DIAGRAM



\* AC SIGNAL SETTING

J1	J2	J3	J4	J5	J6	J7	J8
H	L	L	H	H	L	L	L

## 6. INTERNAL PIN CONNECTION

PIN CONNECTOR : ELCO 6224-12P-S-A OR EQUIVALENT

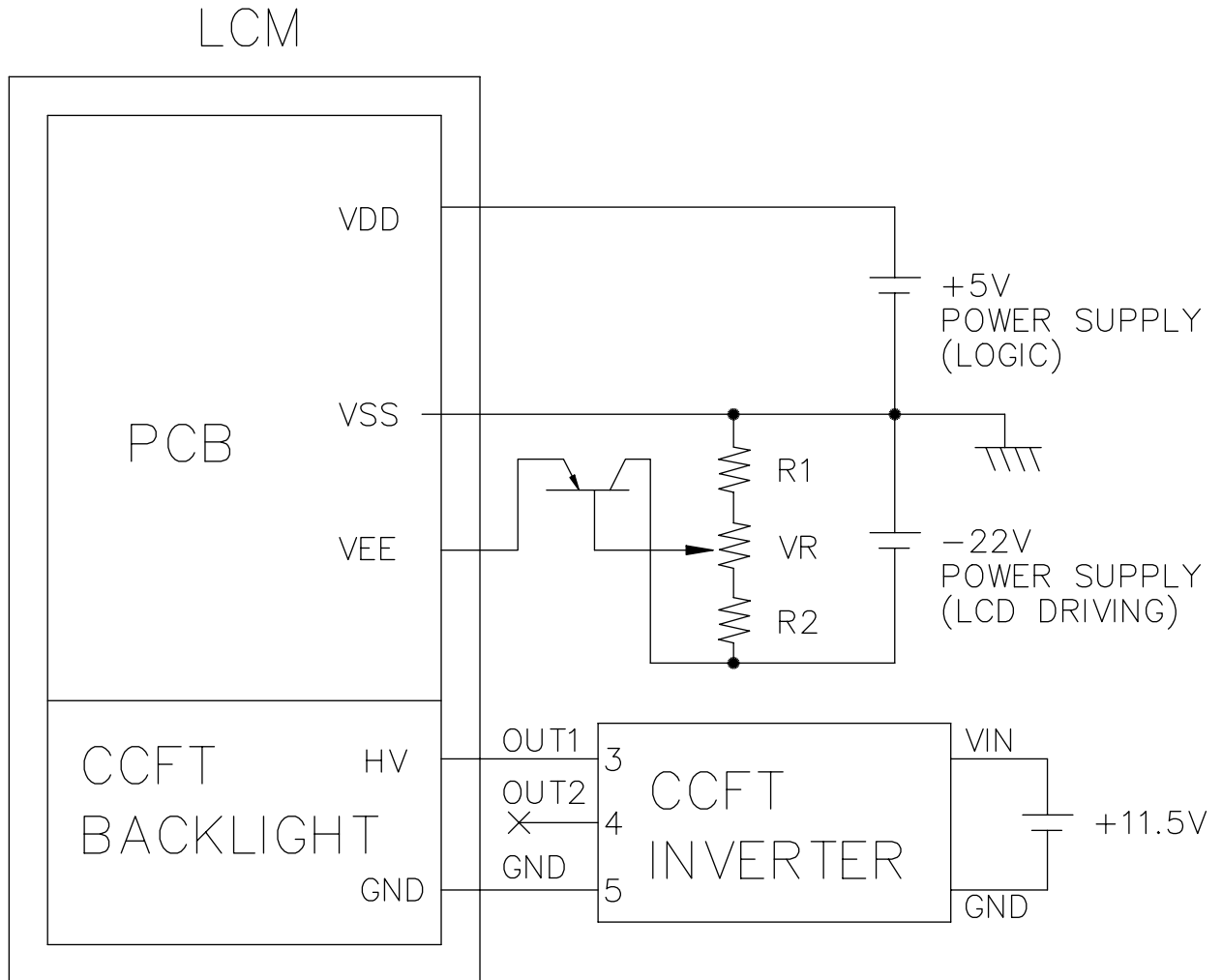
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	FRAME	H	FIRST LINE MARKER
2	LOAD	H→L	DATA LATCH
3	CP	H→L	DATA SHIFT
4	VDD	—	POWER SUPPLY FOR LOGIC
5	VSS	—	GND
6	VEE	—	POWER SUPPLY FOR LC
7	D0	H/L	DISPLAY DATA
8	D1		
9	D2		
10	D3		
11	$\overline{\text{DISPOFF}}$	H/L	H: ON/L: OFF
12	NC	—	—

CCFL CONNECTOR : MITSUMI/M63M83-04 OR EQUIVALENT

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	GND	—	GND FOR CCFT BACKLIGHT
2	NC	—	—
3	NC	—	—
4	HV	—	POWER SUPPLY FOR CCFT BACKLIGHT



## 7. POWER SUPPLY



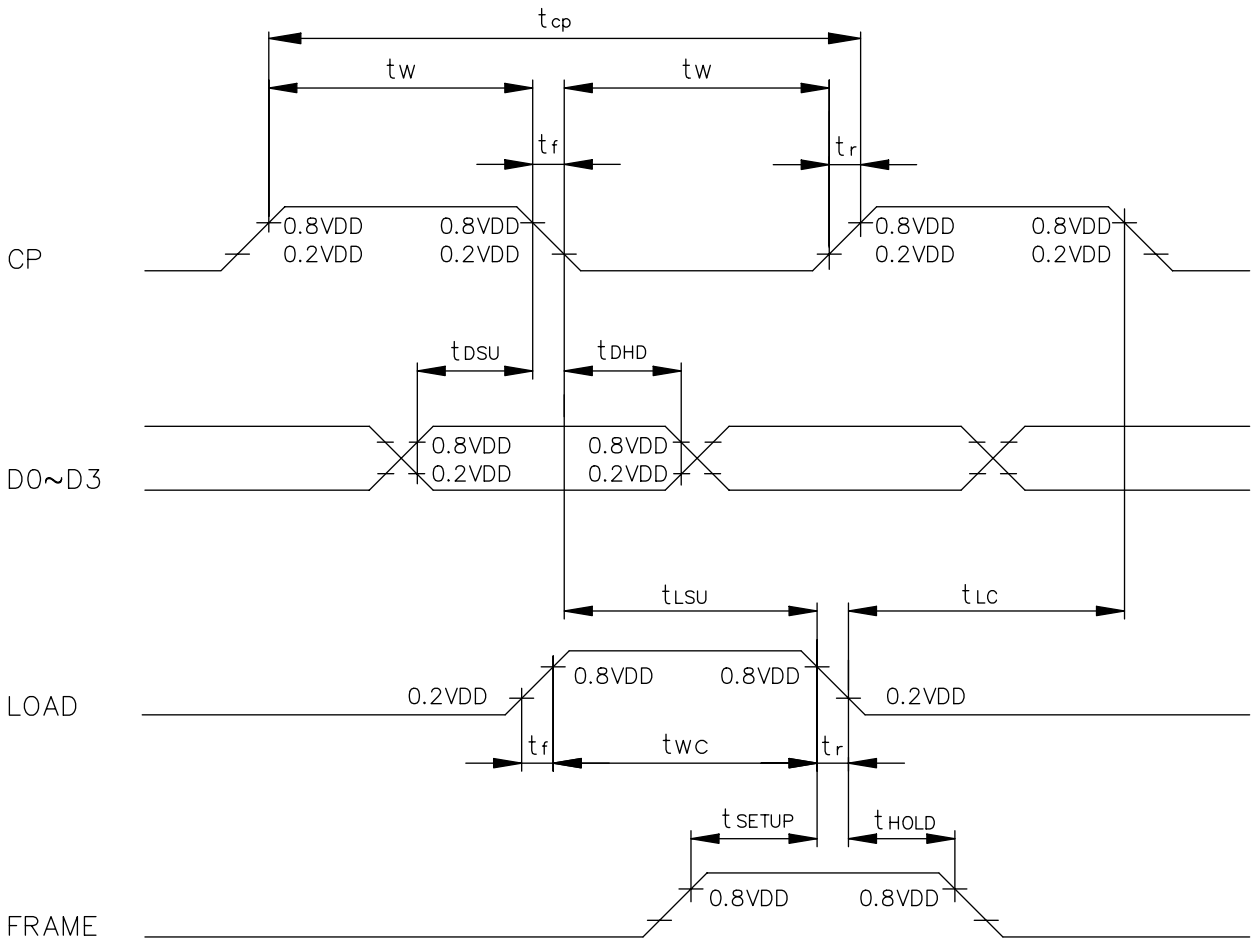
1.  $R1 + VR + R2 = 10K \sim 20K \Omega$

2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

## 8. TIMING CHARACTERISTICS

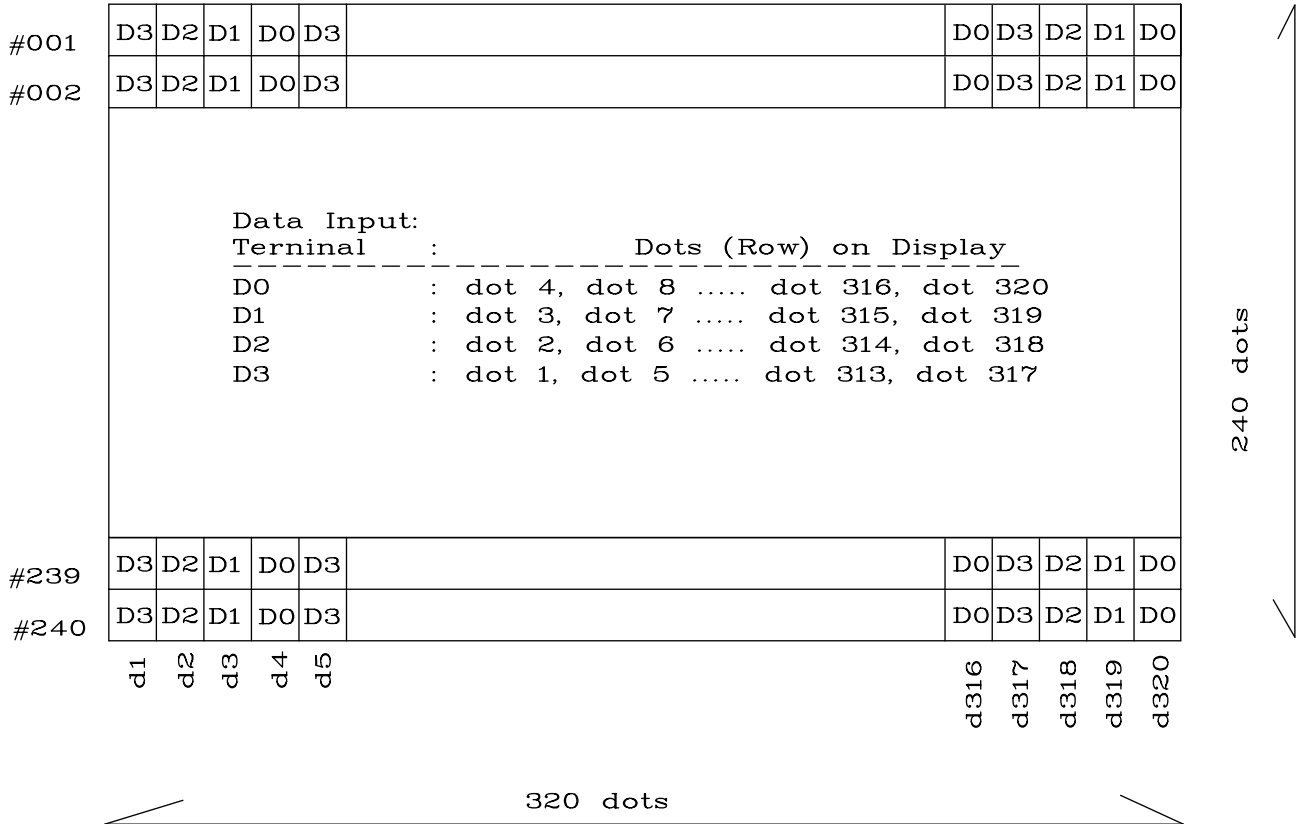
@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	$t_{cp}$	220	—	—	ns
"CP" PULSE WIDTH	$t_w$	90	—	—	ns
CLOCK RISE, FALL TIME	$t_r, t_f$	—	—	20	ns
DATA SETUP TIME	$t_{dsu}$	80	—	—	ns
DATA HOLD TIME	$t_{dhd}$	65	—	—	ns
"CP" → "LOAD" FALL TIME	$t_{lsu}$	100	—	—	ns
"LOAD" → "CP" FALL TIME	$t_{lc}$	100	—	—	ns
"FRAME" SETUP TIME	$t_{setup}$	100	—	—	ns
"FRAME" HOLD TIME	$t_{hold}$	100	—	—	ns
"LOAD" PULSE WIDTH	$t_{wc}$	110	—	—	ns

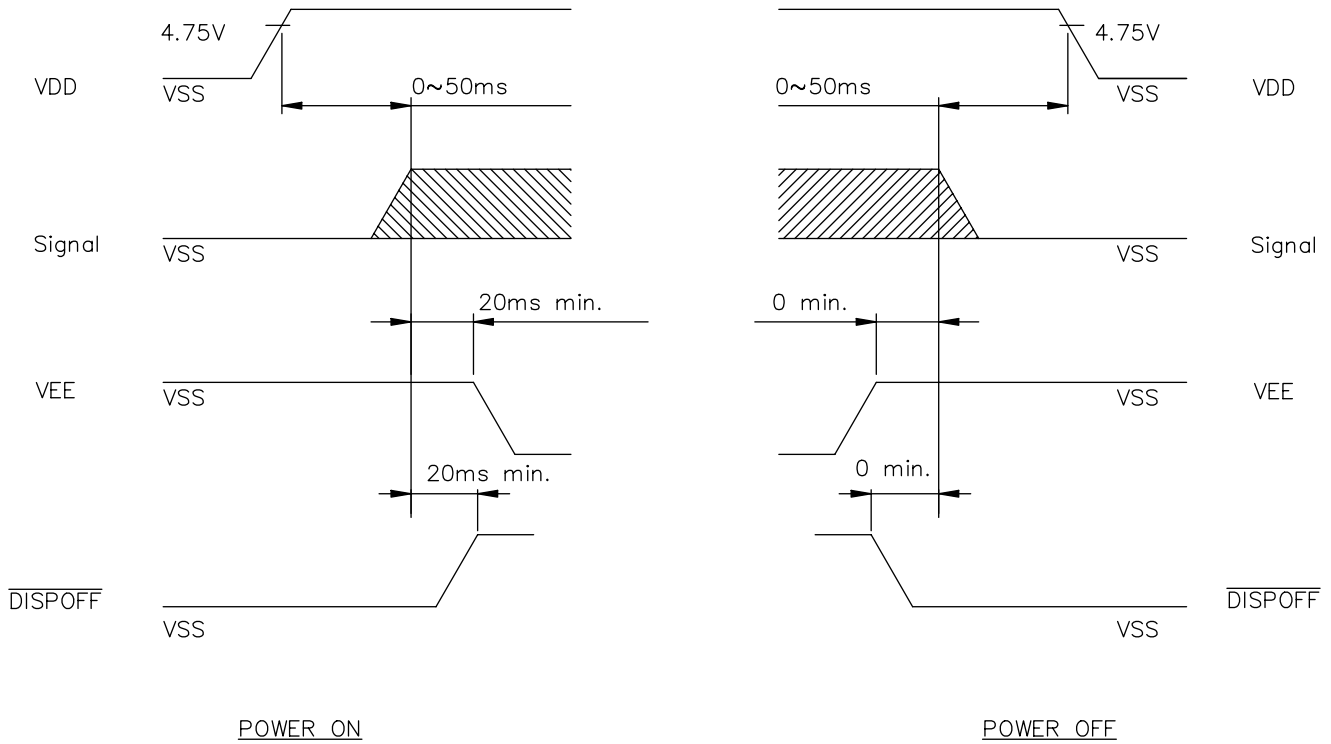




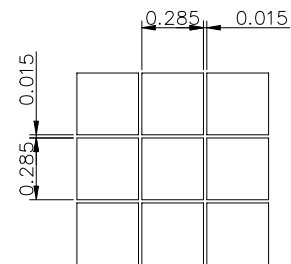
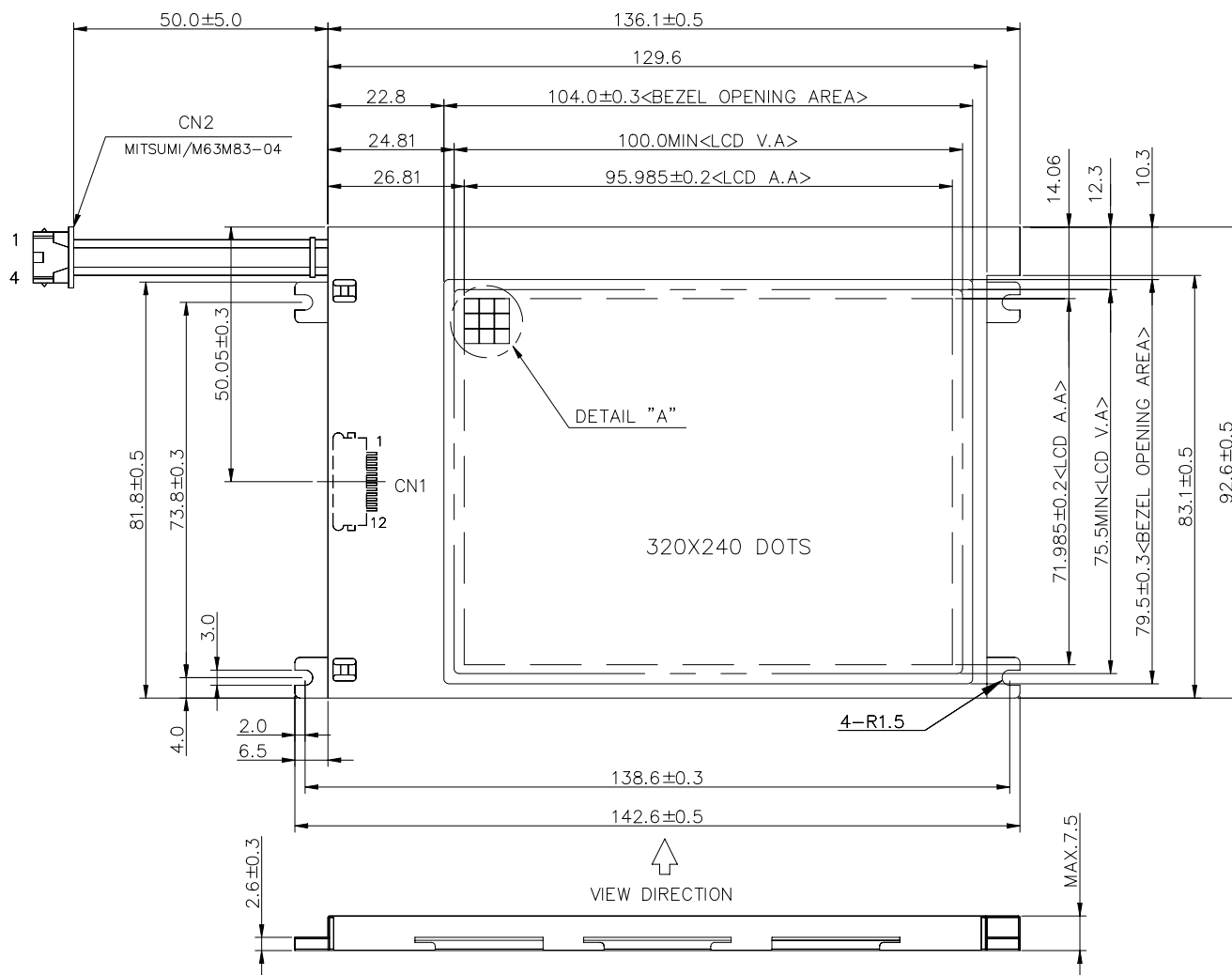
## 8.3 DISPLAY PATTERN



## 8.4 POWER ON/OFF TIMING



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



DETAIL "A"  
(SCALE 40:1)

NOTES :

- 1.RESOLUTION : 320 X 240 DOTS
- 2.DRIVER IC : "OKI" MSM 6778 (COM)  
MSM 6779 (SEG)
- 3.BACKLIGHT : CCFT (WHITE)
- 4.FRAME : SUS 430
- 5.TOLERANCE NO SPECIFIED : ±0.5mm

CN1:ELCO/6224-12P-S-A OR EQUIVALENT

Pin NO.	SYMBOL	LEVEL	FUNCTION
1	FRAME	H	FIRST LINE MARKER
2	LOAD	H-L	DATA LATCH
3	CP	H-L	DATA SHIFT
4	VDD	-	POWER SUPPLY FOR LOGIC
5	VSS	-	GND
6	VEE	-	POWER SUPPLY FOR LC
7	DO	H/L	DISPLAY DATA
8	D1		
9	D2		
10	D3		
11	DISPOFF	H/L	H: ON/L: OFF
12	NC	-	-

CN2(CCFT CONNECTOR):MITSUMI/M63M83-04 OR EQUIVALENT

Pin NO.	SYMBOL	FUNCTION
1	GND	GROUND LINE(INVERTER)
2	NC	NO CONNECTION
3	NC	NO CONNECTION
4	HV	HIGH VOLTAGE LINE (INVERTER)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
⑤					
④					
③					
②					
①					

AZ DISPLAYS, INC.

AGM3224H

APPROVE	DESIGN	DATE	SCALE	UNIT	THIRD ANGLE P.
CHECK	J.S HUANG	89.02.19	1/1	mm	
DESIGN	J.S HUANG	89.02.19			
DWG NO.	M372AD0A ①				