

# AZ Displays, Inc.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM3224G</b>
(2) Module Size	170.0(W)mm X 110.0(H)mm X MAX8.0(D)mm (CCFL B/L) (Excluded the mounting portions and connectors)
(3) Dot Size	0.33 (W)mm x 0.33 (H)mm
(4) Dot Pitch	0.36 (W)mm x 0.36 (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 FSTN: <input type="checkbox"/> Black and White(Normally White/Positive Image) <input type="checkbox"/> Black and White(Normally Black/Negative Image) Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive <input type="checkbox"/> Transflective(High Transmissive)
(8) Viewing Direction	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ___O'clock
(9) Backlight	CCFL B/L
(10) Weight	220g(approx.)
(11) Controller	Without
(12) DC/DC Converter	Without

# AZ Displays, Inc.

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	0	6.0	V	
Power Supply for LCM	VDD-VEE	0	30.0	V	
Input Voltage	VIN-VSS	0	VDD	V	
Supply Voltage for CCFL B/L	VL	0	1500	V	
Supply Current for CCFL B/L	IL	0	6.5	mA	
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
			Note 2,3				Note 3,5	
Humidity (Without Condensation)	Note 1				Note 4			

Note 1  $T_a \leq 50^\circ\text{C}$  : 85%RH max

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

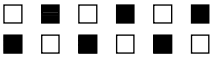
Note 2  $T_a$  at  $-20^\circ\text{C}$  will be < 48hrs, at  $70^\circ\text{C}$  will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature.  
This phenomenon is reversible.

Note 4  $T_a$  at  $-30^\circ\text{C}$  will be < 48hrs, at  $70^\circ\text{C}$  will be < 120hrs

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## 3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Supply Voltage for Logic	VDD-VSS	-	4.75	5.0	5.25	V	
Supply Voltage for LCD	VEE-VSS	-	-25.2	-24.0	-22.8	V	
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-V0	Duty= 1/240	0°C	-	22.1	22.9	V
			25°C	20.6	21.4	22.2	
		Bias= 1/12	50°C	19.7	20.5	-	
Input Signal Voltage	VIH	H level	0.8VDD	-	VDD	V	
	VIO	L level	0	-	0.2VDD	V	
Supply Current for Logic	IDD	VDD=5.0 V VDD-V0=21.4 V	-	6.5	-	mA	
Supply Current for LCD	IEE	PATTERN : 	-	4.8	-	mA	
CCFL LAMP	Supply Voltage	VFTL	FREQUENCY = 35 KHz	315	316.3	317	Vrms
	Supply Current	IFTL		4.9	5.0	5.1	Irms
	Brightness	B		34130	34360	34760	cd/m <sup>2</sup>
	Color Degree	X		0.3285	0.3293	0.3305	-
		Y		0.3316	0.3325	0.3340	

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## 4. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

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						
	C,D						
	J						
S	A,B						
	C,D						
	J						
T	E	4.0	6.0	35	65	20	30
	G	5.0	7.0	40	70	25	35
note		NOTE6		NOTE5			

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

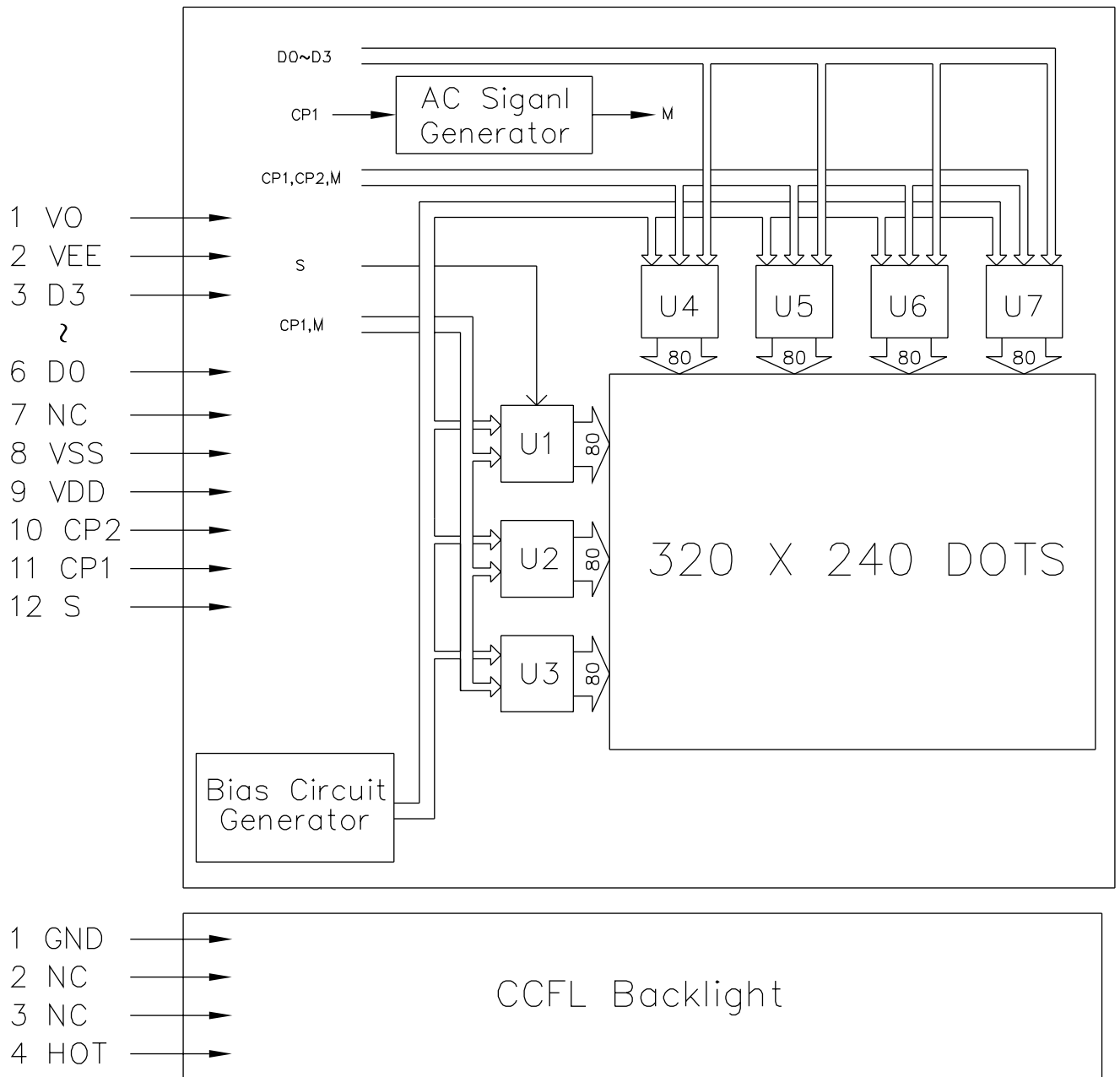
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	–	500	1000	ms	NOTE 2
		25°C	–	200	400		
		50°C	–	70	140		
Response Time (fall)	Tf	0°C	–	800	1300	ms	NOTE 2
		25°C	–	220	420		
		50°C	–	120	190		

note:

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

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## 5. BLOCK DIAGRAM



\* AC Signal Setting

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

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## 6. INTERNAL PIN CONNECTION

### CN1(LCD)

PinNo.	Symbol	Level	Function	
1	VO	—	LCD CONTRAST ADJUST VOLTAGE	
2	VEE	—	POWER SUPPLY FOR LCD DRIVE	
3	D3	H/L	DISPLAY DATA SIGNAL	
4	D2	H/L		
5	D1	H/L		
6	D0	H/L		
7	NC	—	NO CONNECTION	
8	VSS	—	0V	GROUND
9	VDD	—	5V	DC POWER SUPPLY
10	CP2	H/L	DATA INPUT CLOCK SIGNAL	
11	CP1	H/L	INPUT DATA LATCH SIGNAL	
12	S	H/L	SCAN START-UP SIGNAL	

### CN2(CCFL)

PinNo.	Symbol	Level	Function	
1	VFT1	—	POWER SUPPLY FOR CCFL(GND)	
2	NC	—	NO CONNECTION	
3	NC	—	NO CONNECTION	
4	VFT2	—	POWER SUPPLY FOR CCFL(HOT)	

Used connector :

CN1 : 12 PIN, FFC(PITCH 1.25mm)

CN2 : M63M83-04 (MITSUMI)

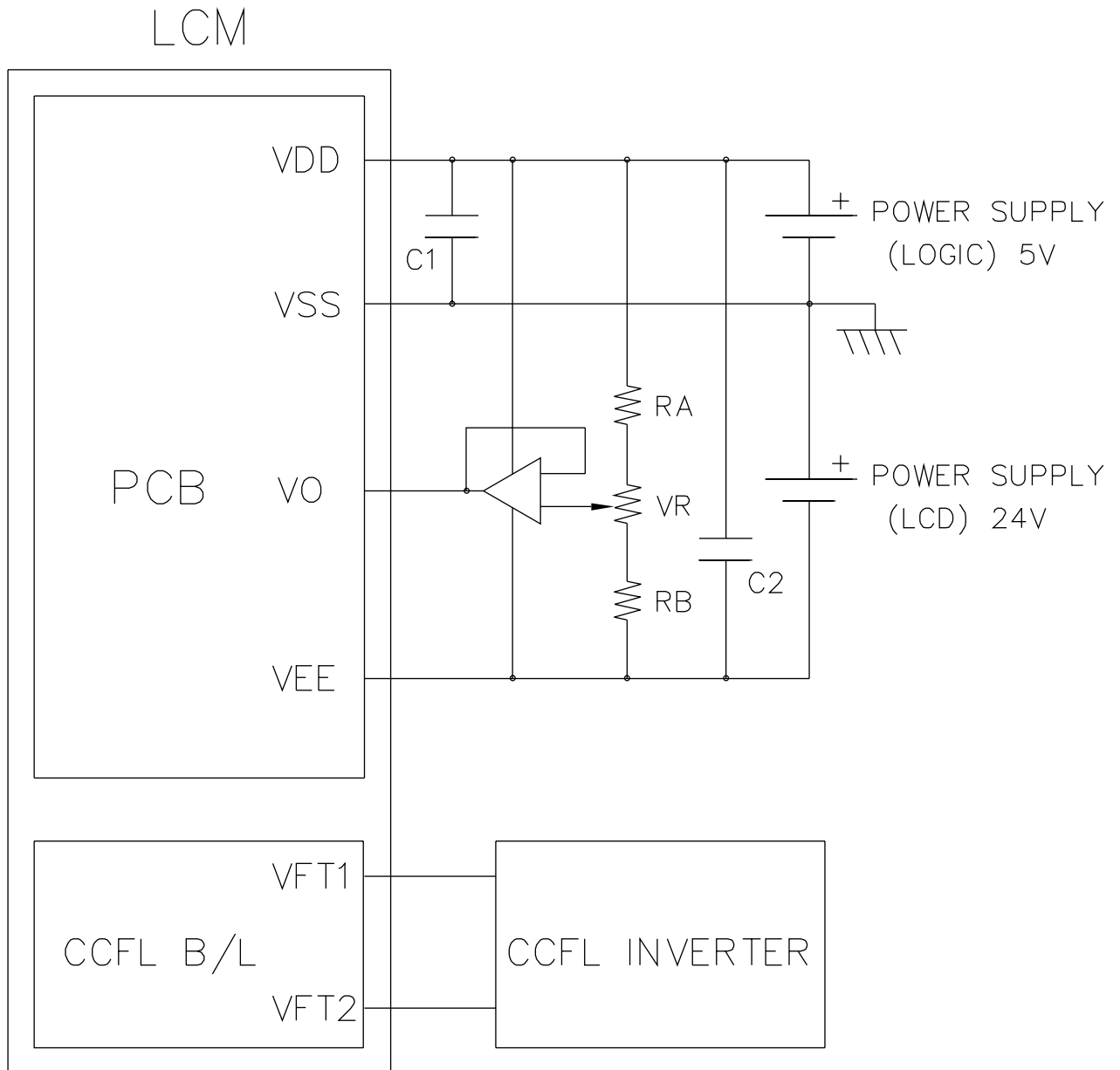
Mating connector :

CN1 : 5597-12APB.5597-12CPB(MOLEX)

CN2 : M60-04-30-134P (MITSUMI)

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## 7. POWER SUPPLY



$$RA = 20 \text{ K}\Omega$$

$$RB = 0.1 \text{ K}\Omega$$

$$VR = 10 \text{ K}\Omega(\text{VARIABLE})$$

$$C1, C2 = 10 \text{ }\mu\text{F}$$

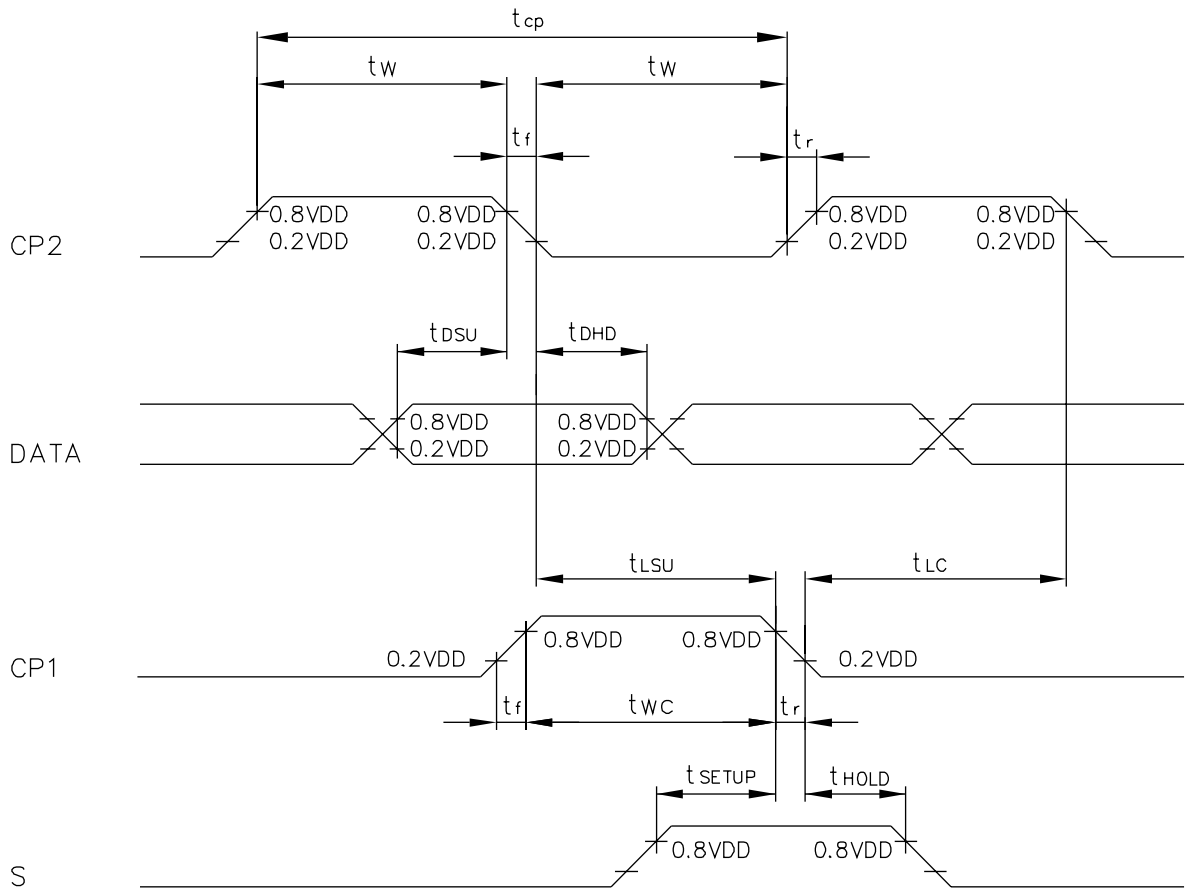
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## 8. TIMING CHARACTERISTICS

### 8-1 INTERFACE TIMING

@VDD=2.5~5.5V

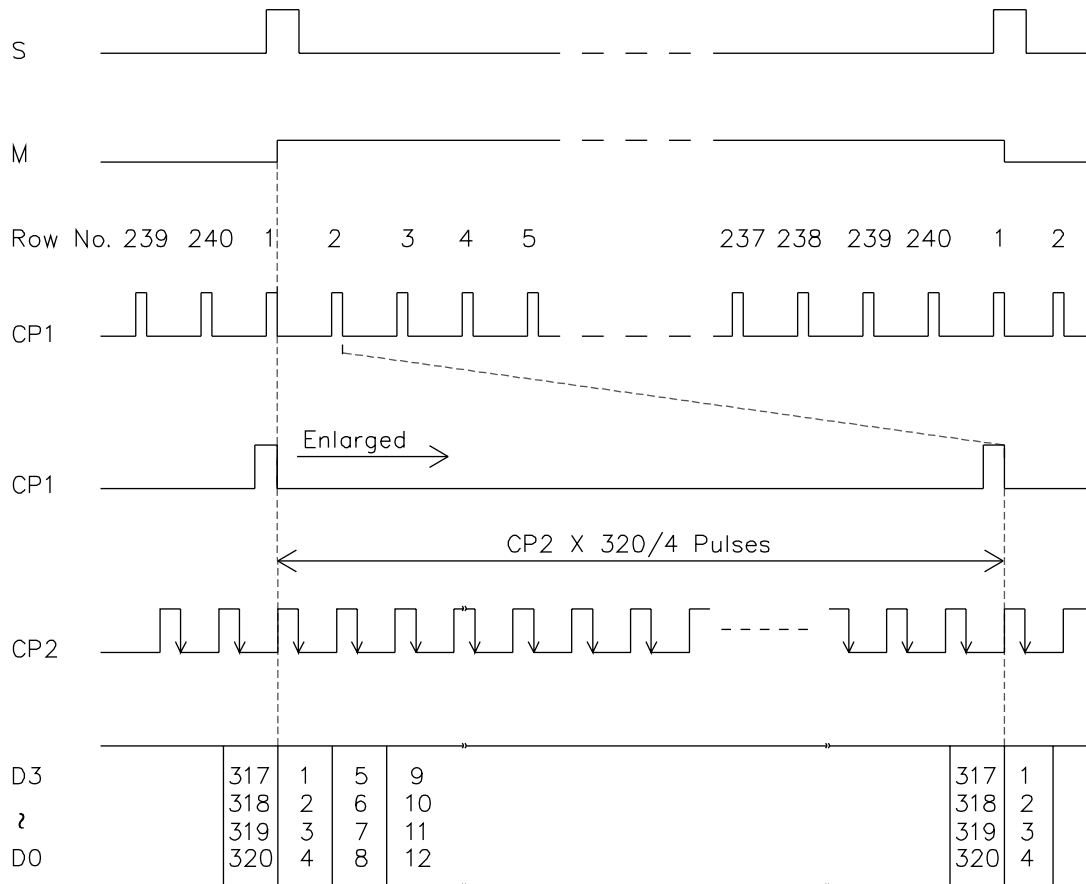
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
"CP2" CLOCK CYCLE	$t_{CP}$	152	-	-	ns
"CP2" PULSE WIDTH	$t_w$	65	-	-	ns
CLOCK RISE, FALL TIME	$t_r, t_f$	-	-	50	ns
DATA SETUP TIME	$t_{DSU}$	50	-	-	ns
DATA HOLD TIME	$t_{DHD}$	40	-	-	ns
"CP2" → "CP1" FALL TIME	$t_{LSU}$	65	-	-	ns
"CP1" → "CP2" FALL TIME	$t_{LC}$	65	-	-	ns
"S" SETUP TIME	$t_{SETUP}$	100	-	-	ns
"S" HOLD TIME	$t_{HOLD}$	100	-	-	ns
"CP1" PULSE WIDTH	$t_{WC}$	65	-	-	ns





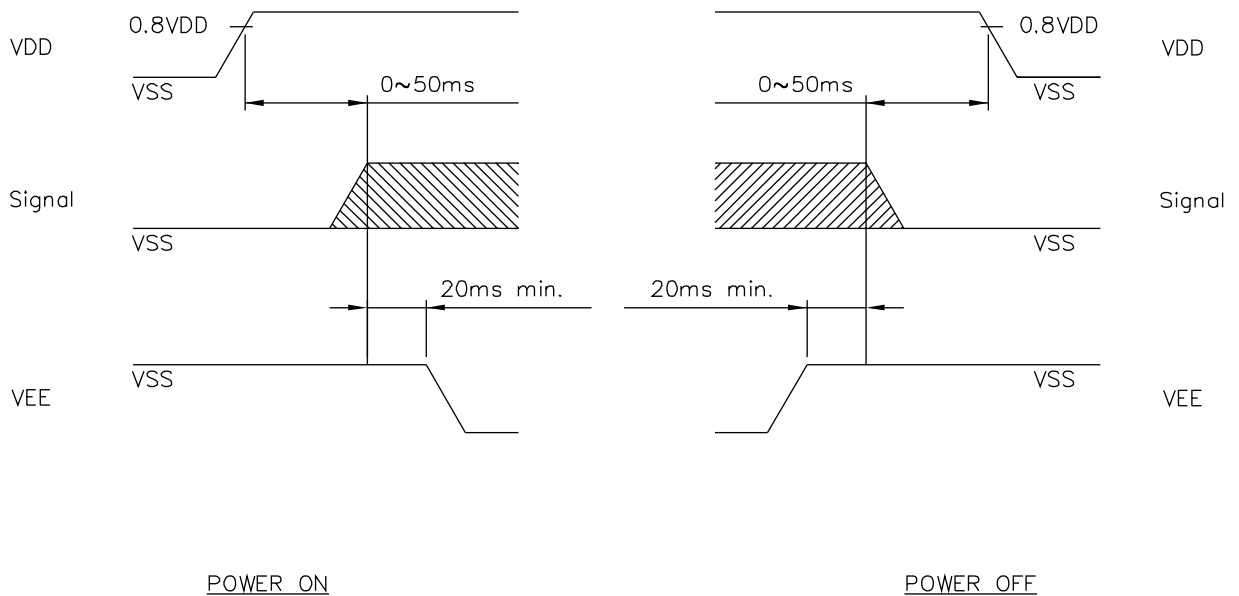
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## 8-2 TIMING CHART OF INPUT SIGNALS



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## 8-3 POWER ON/OFF TIMING



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

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## 8-4 DISPLAY PATTERN

#001	D3	D2	D1	D0	D3						D0	D3	D2	D1	D0
#002	D3	D2	D1	D0	D3						D0	D3	D2	D1	D0
<p>Data Input: Terminal : Dots (Row) on Display</p> <p>D3 : dot 1, dot 5 ..... dot 313, dot 317</p> <p>D2 : dot 2, dot 6 ..... dot 314, dot 318</p> <p>D1 : dot 3, dot 7 ..... dot 315, dot 319</p> <p>D0 : dot 4, dot 8 ..... dot 316, dot 320</p>															
#239	D3	D2	D1	D0	D3						D0	D3	D2	D1	D0
#240	D3	D2	D1	D0	D3						D0	D3	D2	D1	D0
#001	#002	#003	#004	#005							#316	#317	#318	#319	#320

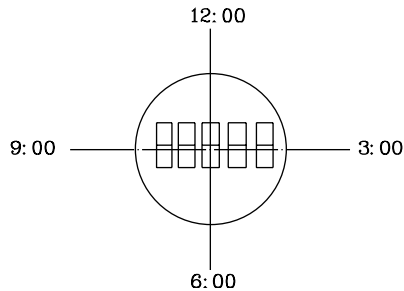
240 DOTS

320 DOTS

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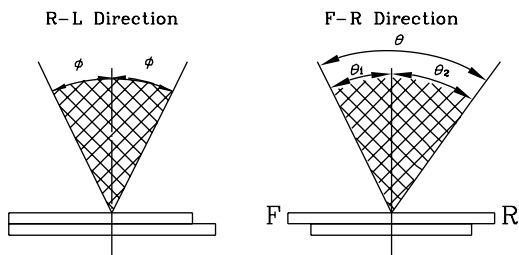
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



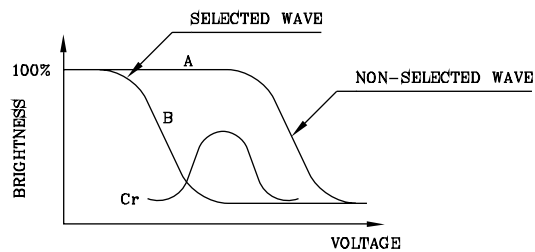
$$\theta = \theta_1 + \theta_2$$

\*Conditions

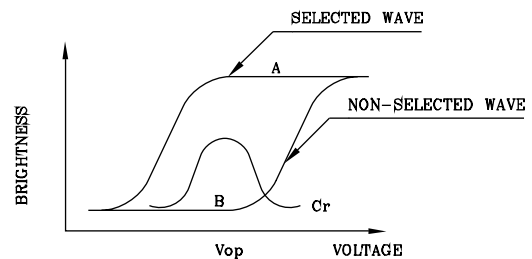
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(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

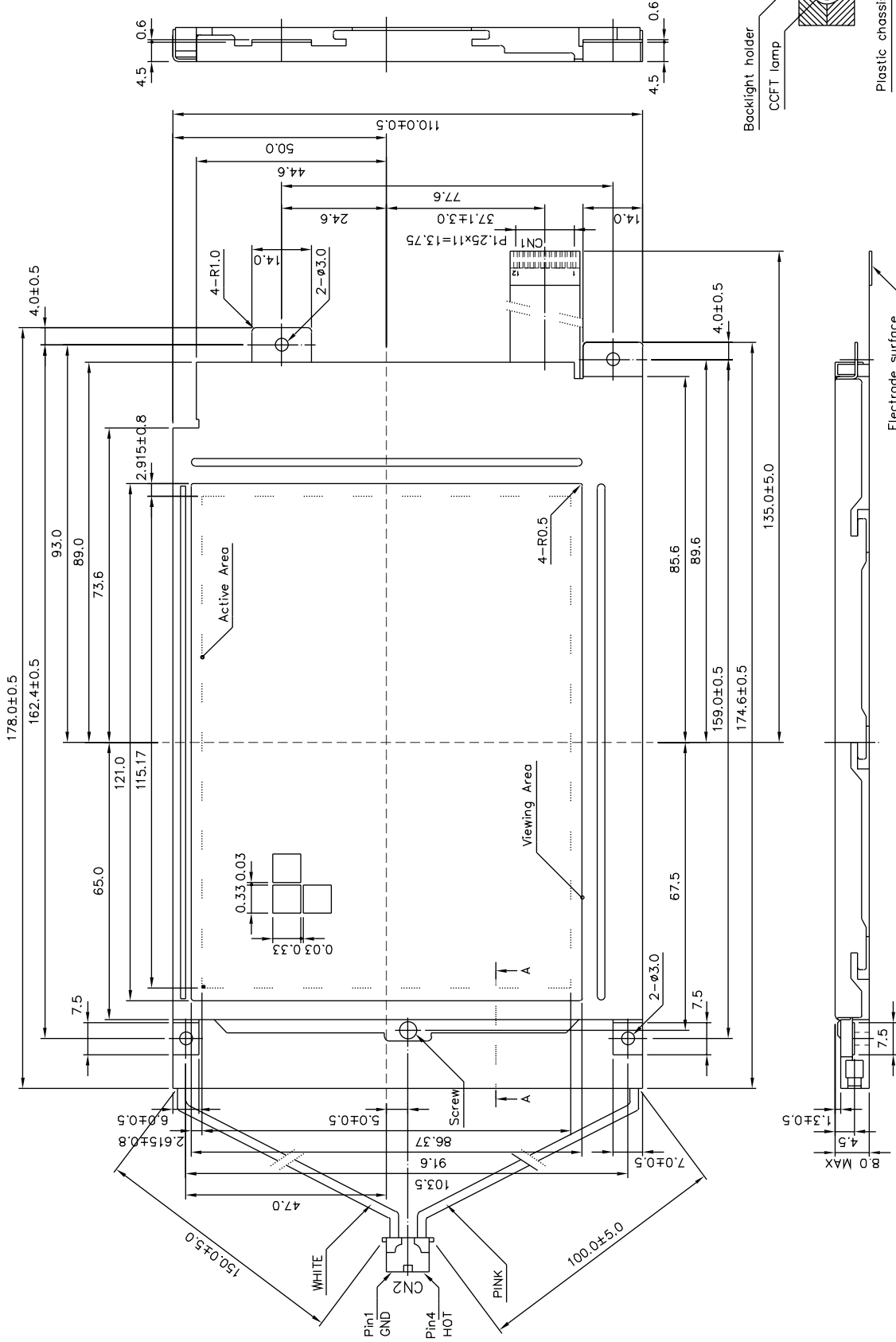
INTERFACE SYMBOL

CN1

Pin No.	SYMBOL	Pin No.	SYMBOL
1	V <sub>0</sub>	7	NC
2	V <sub>EE</sub>	8	V <sub>SS</sub>
3	D <sub>3</sub>	9	V <sub>DD</sub>
4	D <sub>2</sub>	10	CP <sub>2</sub>
5	D <sub>1</sub>	11	CP <sub>1</sub>
6	D <sub>0</sub>	12	S

CN2

Pin No.	SYMBOL
1	GND(white)
2	NC
3	NC
4	HOT(pink)



A-A' Section(Scale : 2/1)

Note :

1. RESOLUTION : 320 X 240 DOTS
2. CONTROLLER : WITHOUT
3. DC/DC CONVERTER : WITHOUT

AGM3224G	AZ DISPLAYS, INC.	
NAME	DATE	TITLE
APPROVE		DWG-NO TB-x134x
CHECK		Rev.A
DESIGN		UNIT : mm
DRAW	MAY. PING 86.09.13	SCALE : 1/1