

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM6448F</b>
(2) Module Size	167.7 (W)mm x 122.8 (H)mm x 5.3 (D)mm
(3) Dot Size	0.17 (W)mm x 0.17 (H)mm
(4) Dot Pitch	0.19 (W)mm x 0.19 (H)mm
(5) Number of Dots	640 (W) x 480 (H)Dots
(7) Duty	1/240
(8) LCD Display Mode	FSTN: Black and White(Normally White/Positive Image) Rear Polarizer: Transflective(High Transparency)
(9) Viewing Direction	6 O'clock
(10) Backlight	CCFL
(11) Controller	Excluded
(12) DC/DC Converter	Excluded
(13) Weight	150 g(approx.)

Revised: November 3, 2000

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Supply Voltage (Logic)	VDD-VSS	0	6.0	V	Ta = 25°C
Supply Voltage (LCD Drive)	VEE-VSS	0	30.0	V	Ta = 25°C
Input Voltage	VIN	0	VDD	V	Ta = 25°C
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling.

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP.			
	OPERATION		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	-20	70	-30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note 5)	-		49m/s <sup>2</sup> (5G)	

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 < 48 hrs, at 80°C will be < 120 hrs

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

Note 5

Frequency (Hz)	10~55~10/1 min
Vibration Width	1.5 m/m
Vibration Direction	X/Y/Z
Vibration Time	15 min/cycle X 3 directions

## 3. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Logic	VDD-VSS	T <sub>a</sub> = 25°C	3.0	3.3	5.5	V	
Input Voltage	VIL	L level	0	–	0.2VDD	V	
	VIH	H level	0.8VDD	–	VDD	V	
Recommand LCD Module Driving Voltage (Wide Temp.)	VEE-VSS	VDD=3.3V Bias=1/11.3	T <sub>a</sub> =-20°C	21.9	22.3	22.7	V
			T <sub>a</sub> =0°C	21.0	21.4	21.9	
			T <sub>a</sub> =25°C	20.1	20.5	20.9	
			T <sub>a</sub> =50°C	18.6	19.0	19.4	
			T <sub>a</sub> =65°C	17.3	17.7	18.1	
Power Supply Current for LCM	IDD	VDD=3.3V VDD-VEE=20.5V FLM=70Hz Pattern :	–	0.7	3.0	mA	
	IEE	<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <span>■</span><span>□</span><span>■</span><span>□</span> </div> <div style="display: flex; flex-wrap: wrap; gap: 5px;"> <span>□</span><span>■</span><span>□</span><span>■</span> </div> <div style="display: flex; flex-wrap: wrap; gap: 5px;"> <span>■</span><span>□</span><span>■</span><span>□</span> </div>	–	6.7	15.0		
CCFL LAMP	Open Voltage	V <sub>OPEN</sub>	Lamp Current = 5 mArms Frequency = 55 KHz	–	440	–	V <sub>rms</sub>
	Lamp Voltage	V <sub>L</sub>		–	330	–	V <sub>rms</sub>

## 4.OPTICAL CHARACTERISTICS

AT Vop

ITEM MODE		Cr(Contrast Ratio)						$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
H	J	-	6.5	-	6.0	-	5.0	-	37	-	46
NOTE		NOTE6						NOTE5			

NOTE :

H :TRANSFLECTIVE(HIGH TRANSPARENCY)

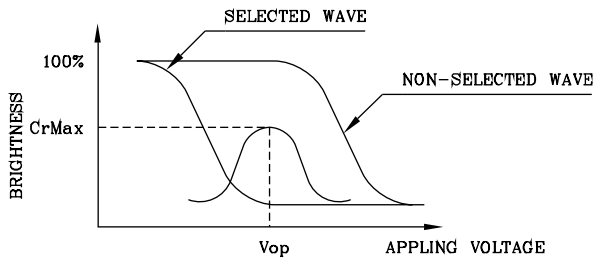
J: NORMALLY WHITE

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

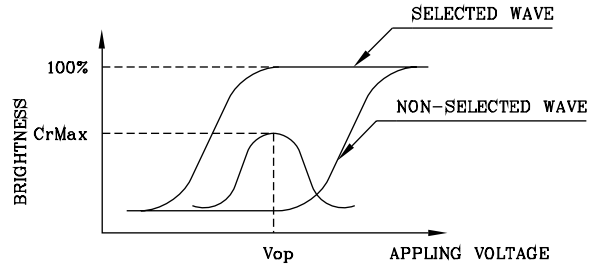
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	1700	2600	ms	Fig.2
		0℃	-	370	560		
		25℃	-	200	300		
		50℃	-	90	150		
		65℃	-	80	120		
Response Time (fall)	Tr	-20℃	-	900	1400	ms	Fig.2
		0℃	-	350	530		
		25℃	-	150	230		
		50℃	-	80	120		
		65℃	-	70	110		

(Fig.1)

Definition of Operation Voltage(Vop)



(positive type)



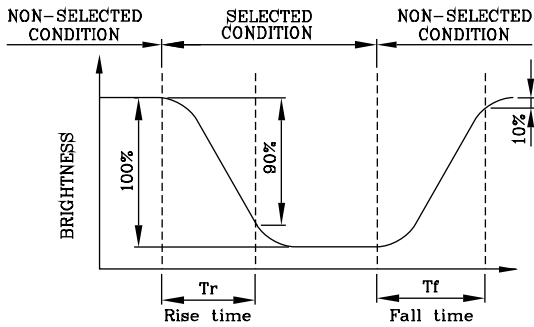
(negative type)

\*Conditions

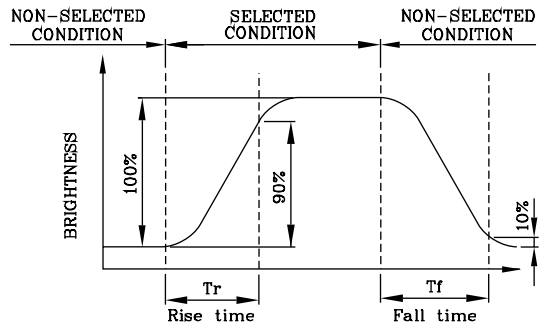
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Applying Waveform : I/N duty 1/a bias

(Fig.2)

Definition of Response Time(Tr,Tf)



(positive type)



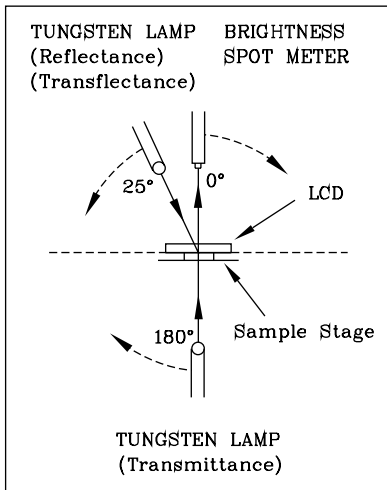
(negative type)

\*Conditions

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

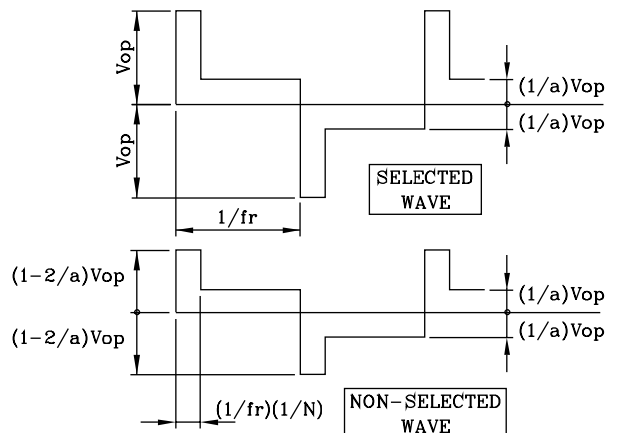
(Fig.3)

Description of Measuring Equipment and Driving Waveforms



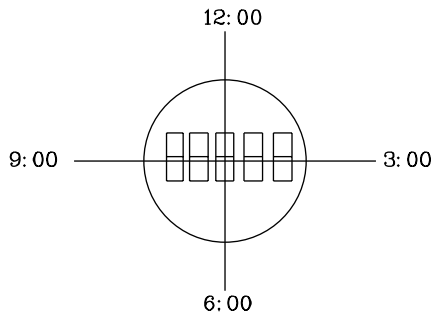
CONST.  
TEMP.  
CHAMBER

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



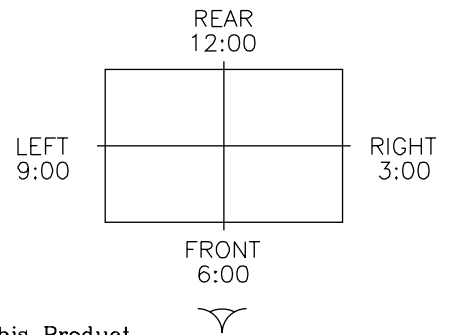
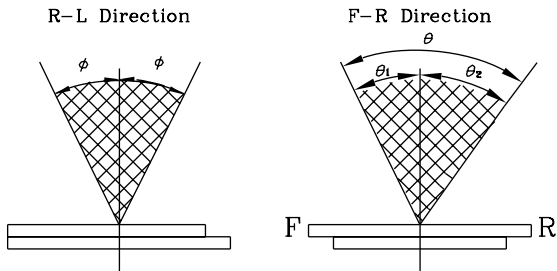
(Fig.4)

Definition of Viewing Direction



(Fig.5)

Definition of Viewing Angle



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

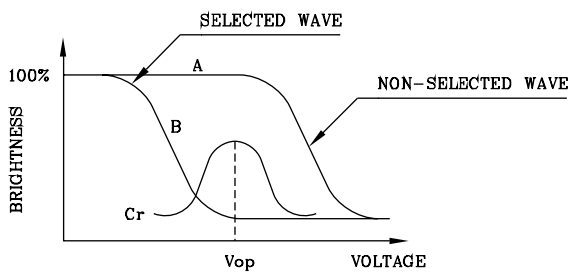
$$\theta = \theta_1 + \theta_2$$

\*Conditions

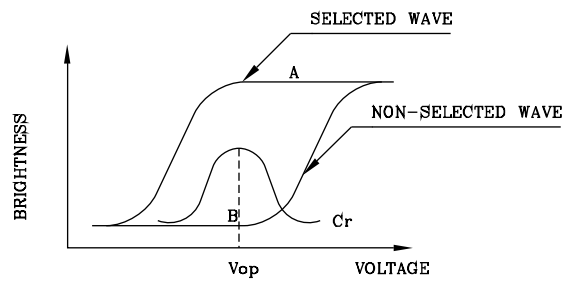
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(Fig.6)

Definition of Contrast Ratio (Cr)



(positive type)



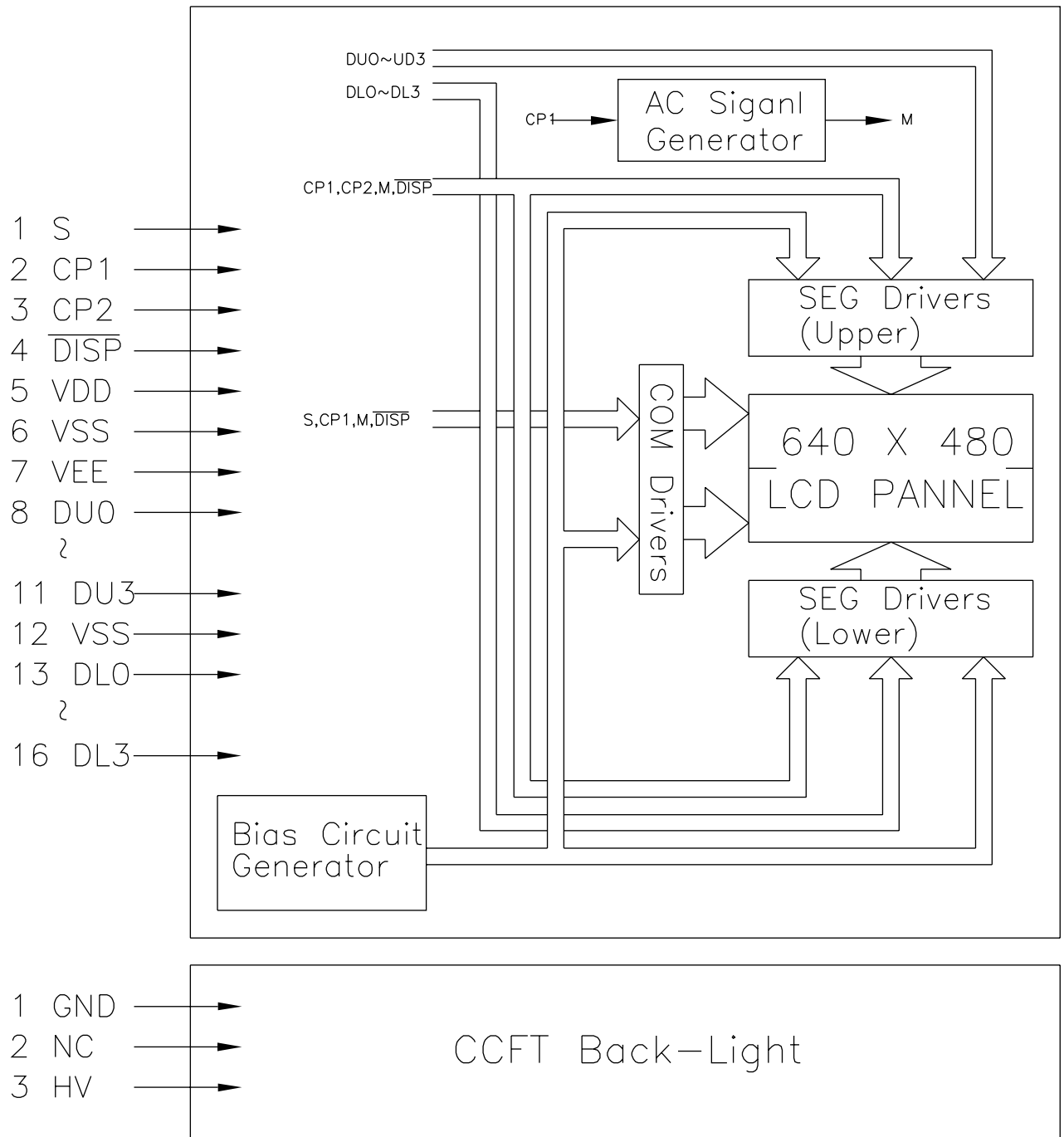
(negative type)

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

\*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
L	H	L	L	H	L	L	L

## 6. INTERNAL PIN CONNECTION

### LCD

Pin No.	Symbol	Level	Function
1	S	H/L	SCAN START-UP SIGNAL
2	CP1	H→L	INPUT DATA LATCH SIGNAL
3	CP2	H→L	DATA INPUT CLOCK SIGNAL
4	$\overline{\text{DISP}}$	H/L	DISPLAY OFF ("H"=ON,"L"=OFF)
5	VDD	-	POWER SUPPLY FOR LOGIC (+)
6	VSS	-	SIGNAL GROUND (GND)
7	VEE	-	POWER SUPPLY FOR LCD (+)
8	DU0	H/L	DISPLAY DATA (UPPER HALF)
9	DU1		
10	DU2		
11	DU3		
12	VSS	-	SIGNAL GROUND (GND)
13	DL0	H/L	DISPLAY DATA (LOWER HALF)
14	DL1		
15	DL2		
16	DL3		

### CCFT

Pin No.	Symbol	Level	Function
1	GND	-	GROUND LINE (INVERTER)
2	NC	-	NO CONNECTION
3	HV	-	HIGH VOLTAGE LINE (INVERTER)

### LCD

Used connector : FH12A-16S-0.5SH (HIROSE)

Mating cable : FFC or FPC (Pitch 0.5mm,16 pins,Conact Partion  
Thickness 0.3mm)

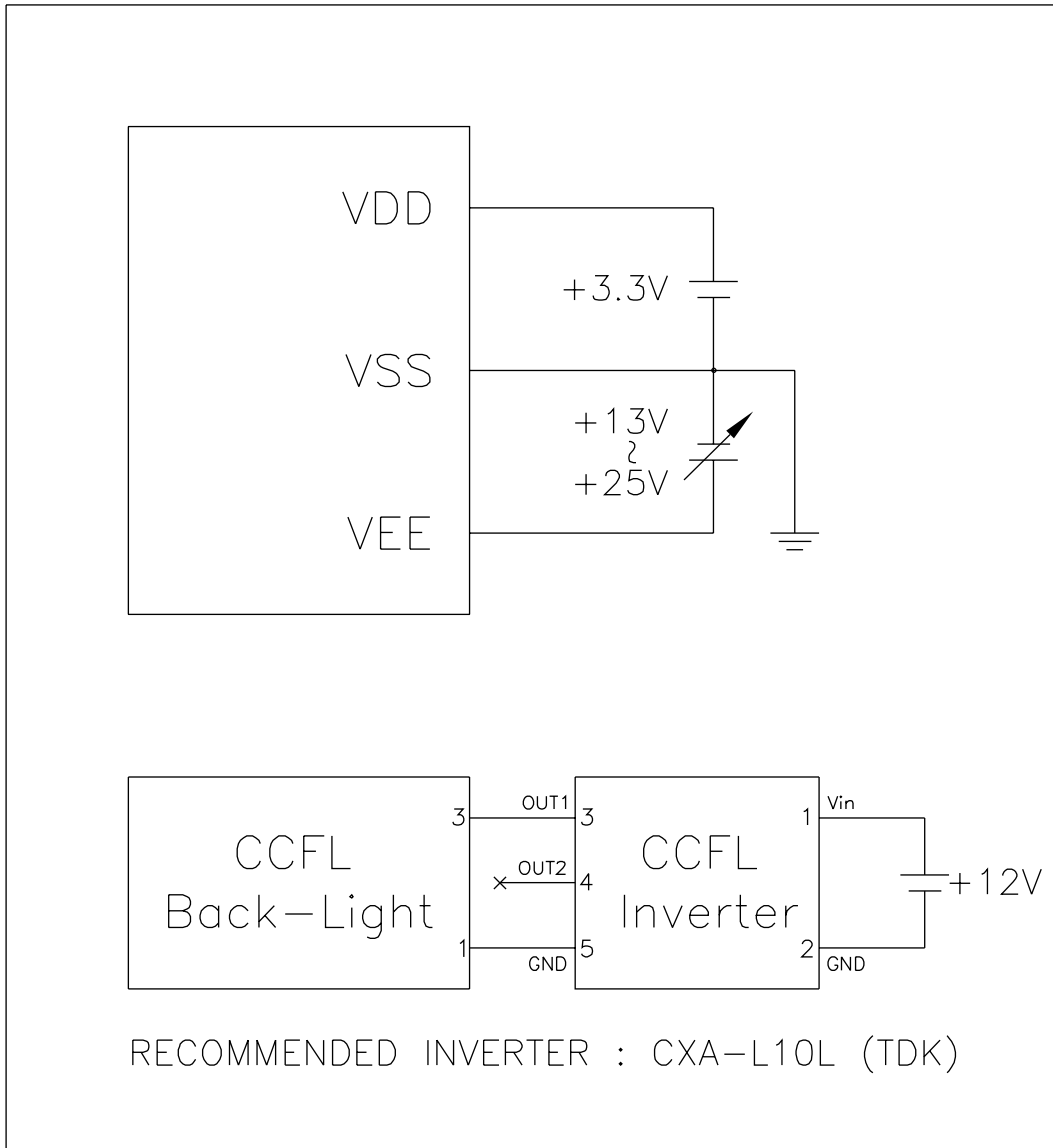
### CCFT

Used connector : BHR-03VS-1 (JST)

Mating connector : SM02(80)B-BHS-1



## 7. POWER SUPPLY

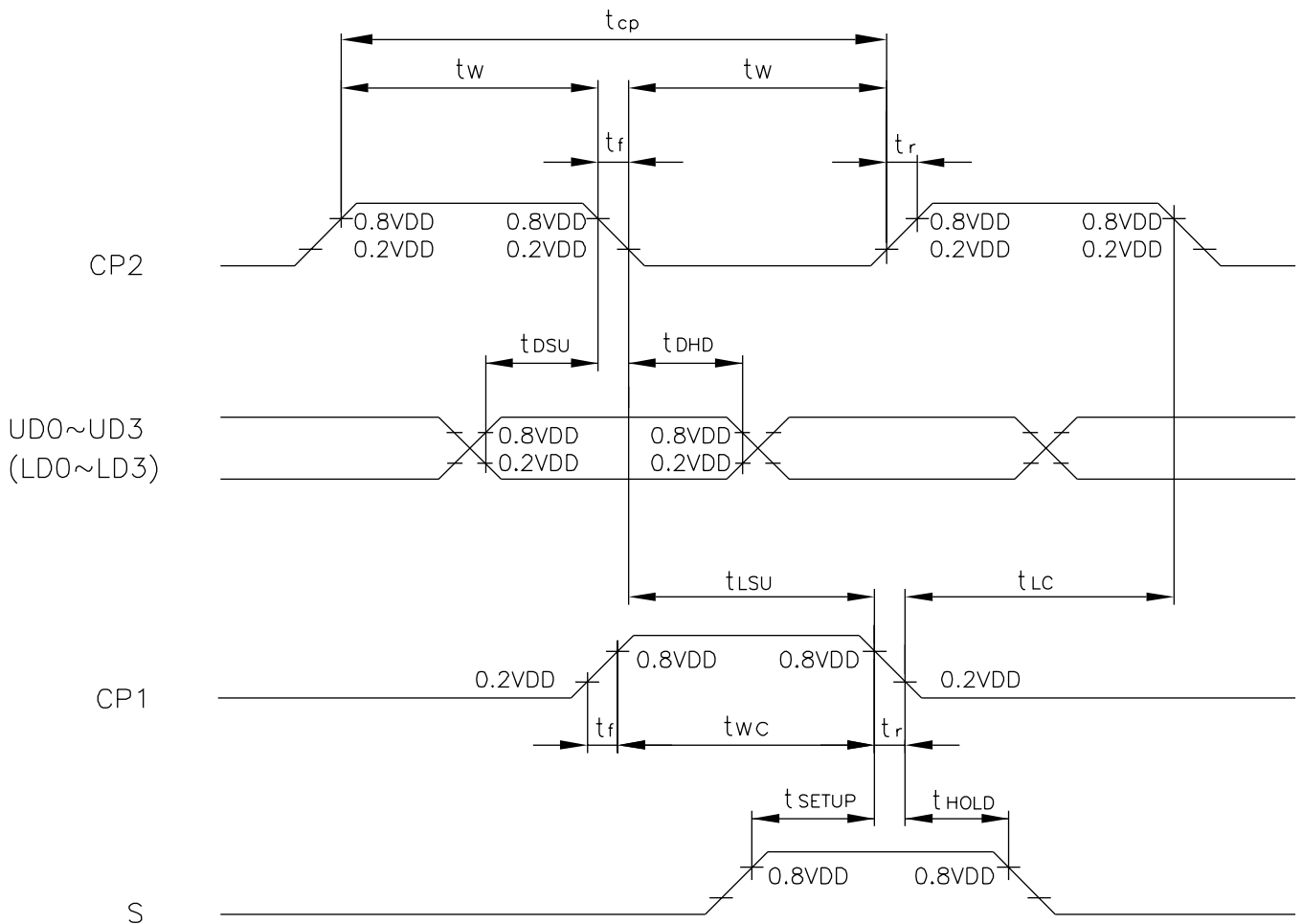


## 8. TIMING CHARACTERISTICS

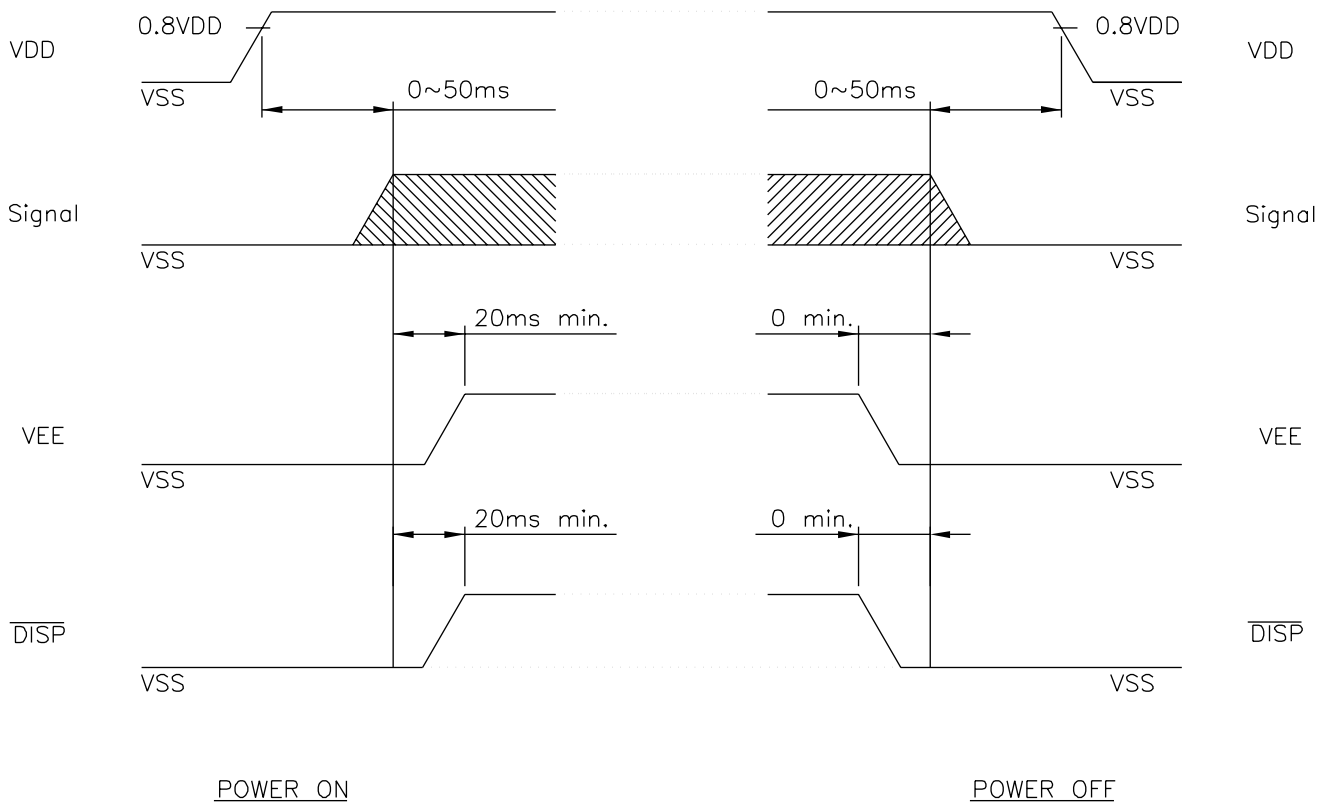
### 8-1. INTERFACE TIMING

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	$t_{cp}$	125	-	-	ns
"CP2" PULSE WIDTH	$t_w$	51	-	-	ns
CLOCK RISE, FALL TIME	$t_r, t_f$	-	-	50	ns
DATA SETUP TIME	$t_{dsu}$	30	-	-	ns
DATA HOLD TIME	$t_{dhd}$	50	-	-	ns
"CP2" → "CP1" FALL TIME	$t_{lsu}$	51	-	-	ns
"CP1" → "CP2" FALL TIME	$t_{lc}$	51	-	-	ns
"S" SETUP TIME	$t_{setup}$	100	-	-	ns
"S" HOLD TIME	$t_{hold}$	100	-	-	ns
"CP1" PULSE WIDTH	$t_{wc}$	65	-	-	ns

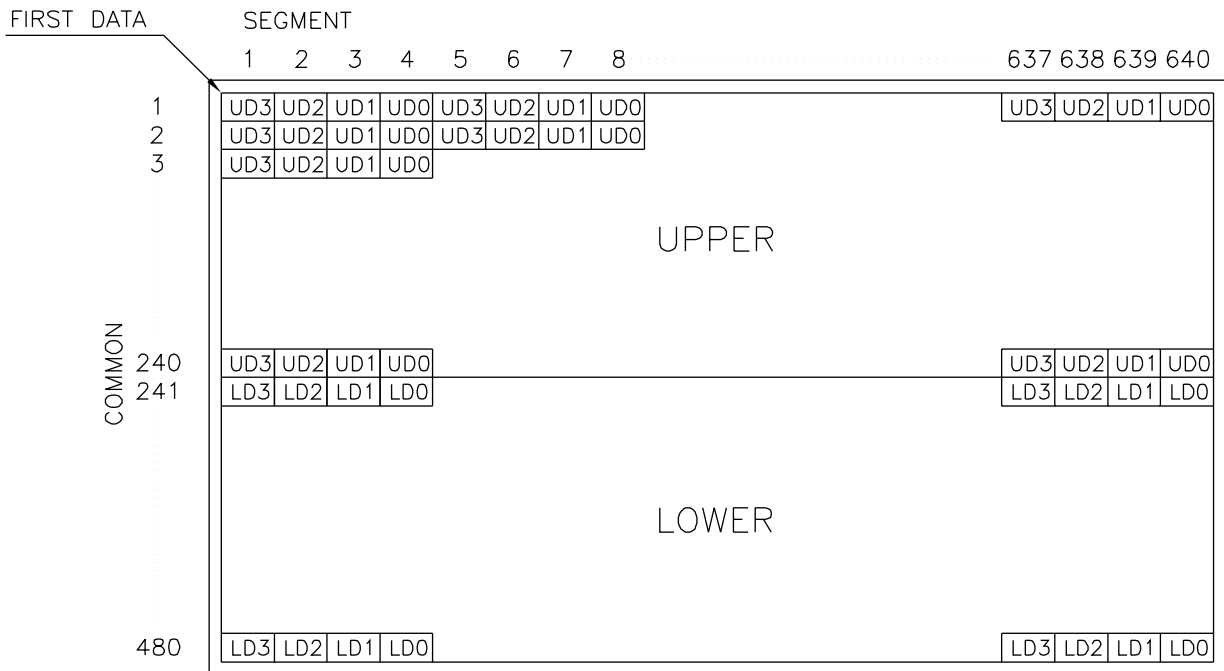


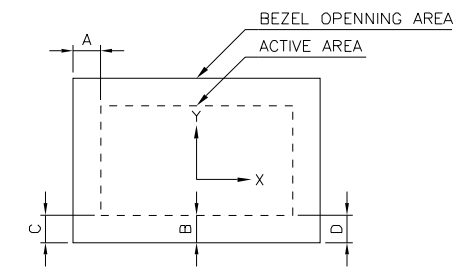
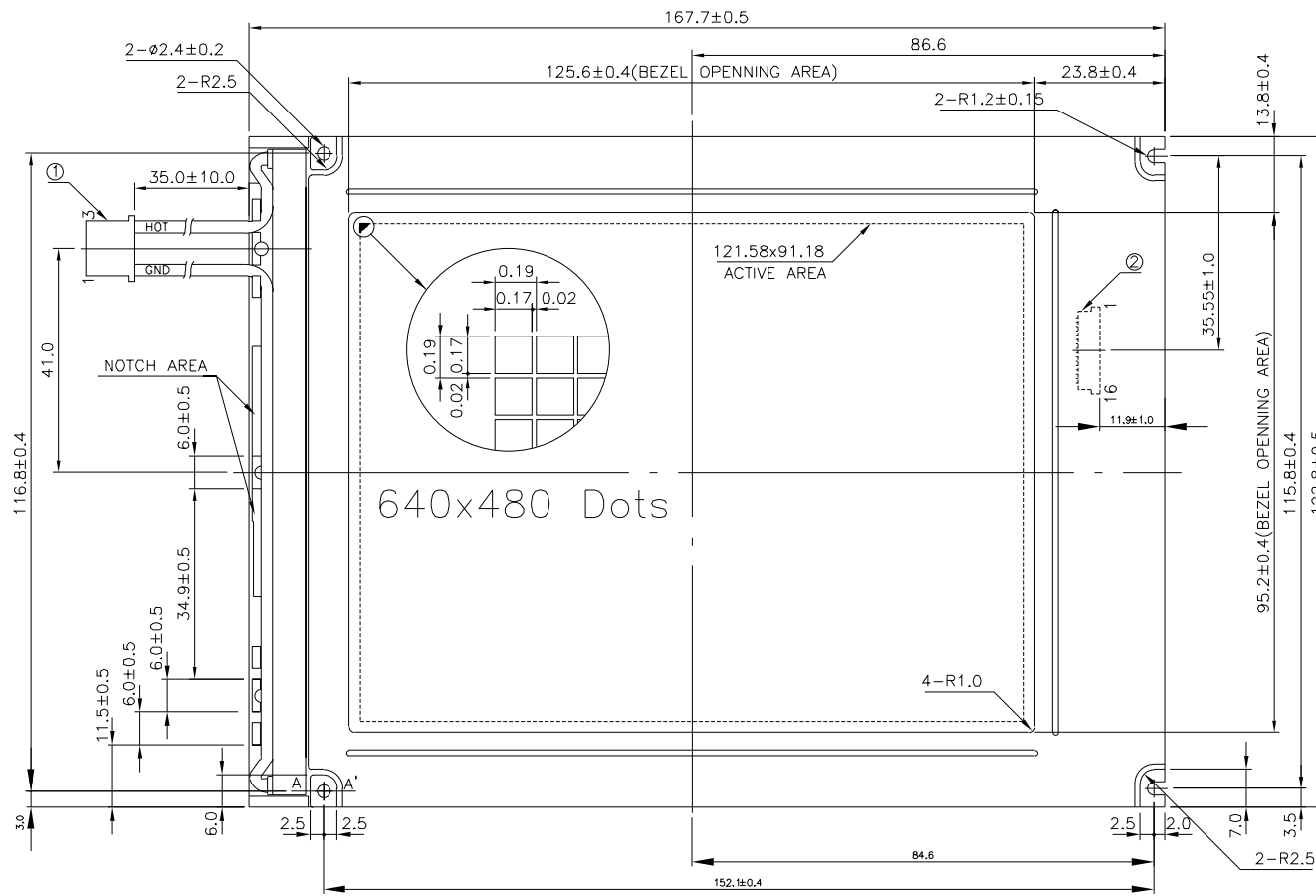
## 8-2. POWER ON/OFF TIMING



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

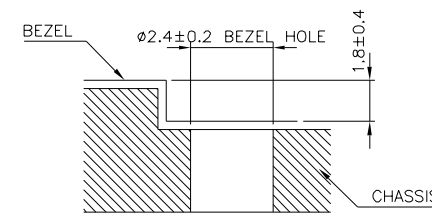
## 8-3.DISPLAY PATTERN





- 1) TOLERANCE X-direction A : 2.01±0.8
- 2) TOLERANCE Y-direction B : 2.01±0.8
- 3) OBLIQUITY of DISPLAY AREA (C-D) < 0.8

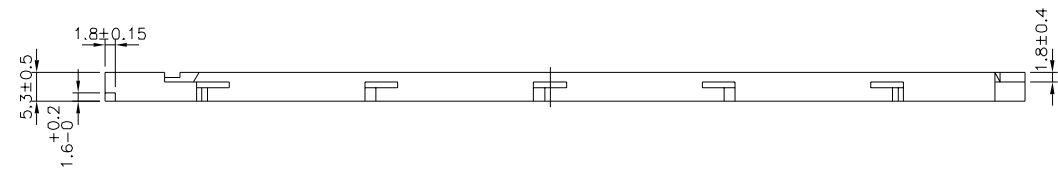
BEZEL/DISPLAY POSITION



A-A' SECTION

INTERFACE PIN LAYOUT

Pin No.	Symbol
1	S
2	CP1
3	CP2
4	DISPOFF
5	VDD
6	VSS
7	VEE
8	DU0
9	DU1
10	DU2
11	DU3
12	VSS
13	DL0
14	DL1
15	DL2
16	DL3



NOTES :

- 1. RESOLUTION : 640 X 480 DOTS
- 2. TOLERANCE NO SPECIFIED: ±0.5mm
- 3. ① CCFT CONNECTOR : BHR-03VS-1 (JST)
- ② INTERFACE CONNECTOR : FH12A-16S-0.5SH (HIROSE)

		<b>AZ DISPLAYS, INC.</b>		
	NAME	DATE	TITLE	
APPROVE			<b>AGM6448F</b>	
CHECK			DWG-NO	TB-H191J REV.A
DESIGN			UNIT : mm	
DRAW	MAY PING	87.09.21	SCALE : 1/1	
			 THIRD ANGLE PROJECT	