

# AZ DISPLAYS, INC.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM6448Y</b>
(2) Module Size	205.5 MAX(W)mm x 141.0 (H)mm x MAX 7.0 (D)mm
(3) Dot Size	0.053 (W)mm x 0.21 (H)mm
(4) Dot Pitch	0.078 (W)mm x 0.235 (H)mm
(5) Number of Dots	640 (W)xRGB x 480 (H)DOTS
(6) Duty	1/240
(7) LCD	F-STN: <input type="checkbox"/> Black and White(Normal Black/Negative Image) <input type="checkbox"/> Color STN module Rear Polarizer: Color Transmissive Type
(8) Viewing Direction	<input type="checkbox"/> 6 0'clock <input type="checkbox"/> 12 0'clock <input type="checkbox"/> __ 0'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Weight	310 g(approx.)

Revised: February 2, 2000

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Power Supply for LCD Drive	VEE-VSS	0	42.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration	Note 5			

Note 1 LCM should be grounded during handling

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 hrs, at  $70^\circ\text{C}$  will be < 120 hrs


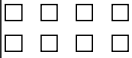
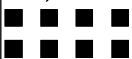
Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

Note 5

Frequency	5 Hz~13.95 Hz	13.95 Hz~33 Hz	33 Hz~51 Hz	51 Hz~500 Hz
Vibration Level	-	2X9.8 m/s <sup>2</sup>	-	5x9.8 m/s <sup>2</sup>
Vibration Width	0.2 inch	-	0.036 inch	-
Vibration Direction	X/Y/Z			
Vibration Time	20 min/cycle X 3 directions			

## 3. ELECTRICAL CHARACTERISTICS

### 3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply		VDD-VSS	T <sub>a</sub> = 25°C		4.5	5.0	5.5	V
Input Voltage		VIH	H level		0.8VDD	-	VDD	V
		VIL	L level		0	-	0.2VDD	V
Recommended LCD Driving Voltage		VEE-VSS (Vop)	Duty=1/240 Bias=1/13 VDD=5.0V	0°C	23.7	24.1	24.5	V
				25°C	22.6	23.0	23.4	
				50°C	21.5	21.9	22.3	
Supply Current for Logic		IDD	VDD-VSS=5.0V VEE-VSS=23.0V T <sub>a</sub> =25°C		-	30.0	45.0	mA
Supply Current for LCD		IEE	PATTERN : 		-	11.0	16.0	mA
LCM	Surface Luminance	L	VDD-VSS =5.0V VEE-VSS =23.0V T <sub>a</sub> =25°C I <sub>L</sub> =5mA	PATTERN: (Dots All On of White Color) 	-	65.0	-	cd/m <sup>2</sup>
				PATTERN: (Dots All Off) 	-	4.2	-	

## 3.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	$V_L$	–	388	–	Vrms	–
Lamp current	$I_L$	4	5	6	mArms	(*1)
Lamp power consumption	$P_L$	–	1.95	–	W	(*2)
Lamp frequency	$F_L$	–	50	–	KHz	
Starting voltage	$V_S$	–	–	600	Vrms	$T_a = 25^\circ\text{C}$
Color Degree	X	–	0.318	–	–	
	Y	–	0.299	–		
Lamp life time	$L_L$	10000	–	–	hrs	

(\*1) It is recommended that  $I_L$  be not more than 5.0 mArms so that heat radiation of CCFT backlight may least affect the display quality .

(\*2) Power consumption excluded inverter loss .

## 3.3 RECOMMENDED INVERTER : TDK TAD250

### 3.3.1 GENERAL SPECIFICATIONS

3.3.1.1 OPERATION TEMPERATURE : 0°C~50°C

3.3.1.2 STORAGE TEMPERATURE : -20°C~80°C

3.3.1.3 DIMENSION : 95.0(L)mm x 19.5(W)mm x MAX 8.8(H)mm

### 3.3.2 INPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Input Voltage	Vin	10	12	15	V	
Input Current	Iin	-	450	550	mA	RL = 100KΩ, Vin = 12V
Input Power	Pin	-	5.4	6.6	W	RL = 100KΩ, Vin = 12V
Standby Standby Input Current	Iin Standby	-	0.1	1.0	μA	OFF state
Control Terminal Input Voltage	Vrmt	3.5	5	10	V	ON state
		-0.5	0	0.4	V	OFF state
Control Terminal Input Current	Irmt	-	0.5	1.0	mA	Vrmt = 5V
		-	-	-0.3	μA	Vrmt = 0V

### 3.3.3 OUTPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
NO Load Output Voltage	Vs	1400	-	-	Vrms	
Tube Current	IL	2.7	5	6.6	mA <sub>rms</sub>	
Working Frequency	f	35	45	55	kHz	

## 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)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	-	25	-	20	-	10	-	90	-	±60
T	M	-	20	-	30	-	8	-	95	-	60/40
note		NOTE 6						NOTE 5			

note:

T: TRANSMISSIVE

G: NORMALLY BLACK, 6 O'CLOCK

M: FOR 6 O'CLOCK COLOR STN MODULE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	640	950	ms	NOTE 2
		25℃	-	300	450		
		50℃	-	130	190		
Response Time (fall)	Tf	0℃	-	280	420	ms	NOTE 2
		25℃	-	100	150		
		50℃	-	60	90		

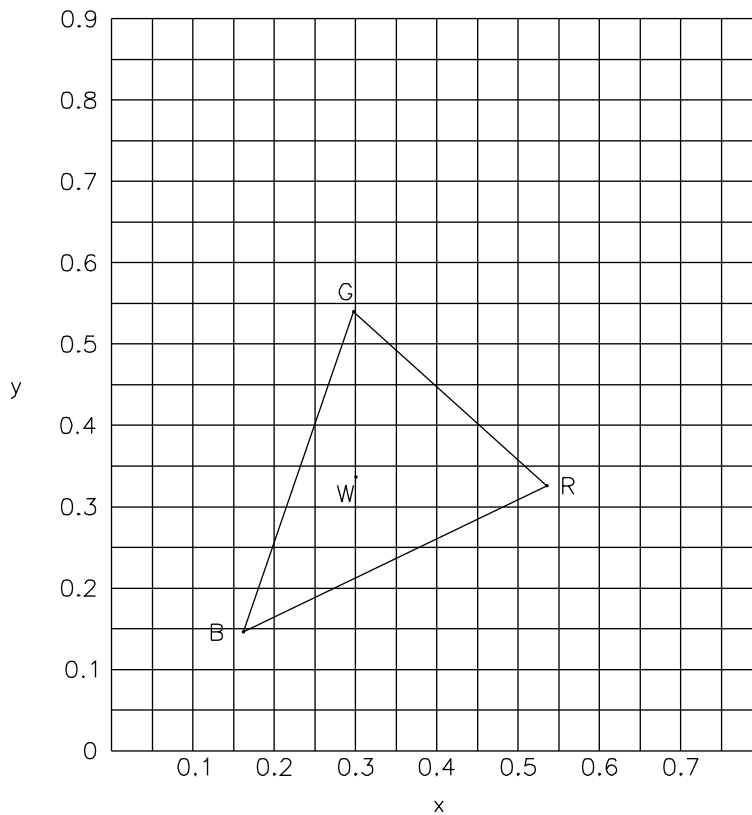
## 4-2. Color of CIE Coordinate

T<sub>a</sub> = 25°C

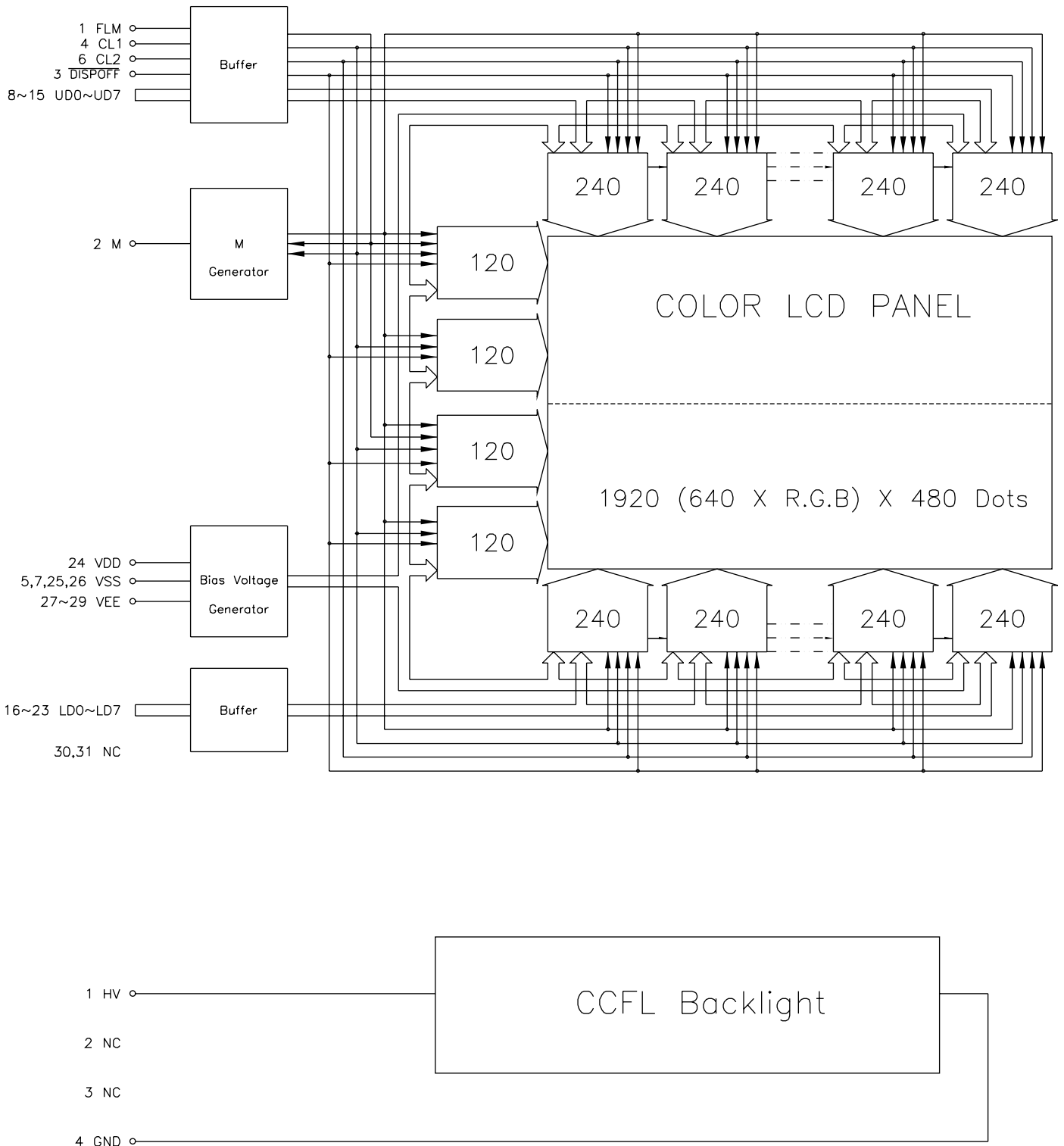
ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi = 0^\circ, \theta = 0^\circ$	0.529	Note*
		y		0.326	
	Green	X	$\phi = 0^\circ, \theta = 0^\circ$	0.299	
		y		0.541	
	Blue	X	$\phi = 0^\circ, \theta = 0^\circ$	0.162	
		y		0.148	
	White	X	$\phi = 0^\circ, \theta = 0^\circ$	0.304	
		y		0.338	

Note\* CIE chromaticity diagram shown on Fig.1 Tolerance : ±0.05

Fig.1



## 5. BLOCK DIAGRAM





## 6. INTERFACE PIN CONNECTION

USED LCD CONNECTOR :

CN1 : DF9-31P-1V (HIROSE)

CORRESPONDABLE LCD CONNECTOR : DF9-31S-1V (HIROSE)

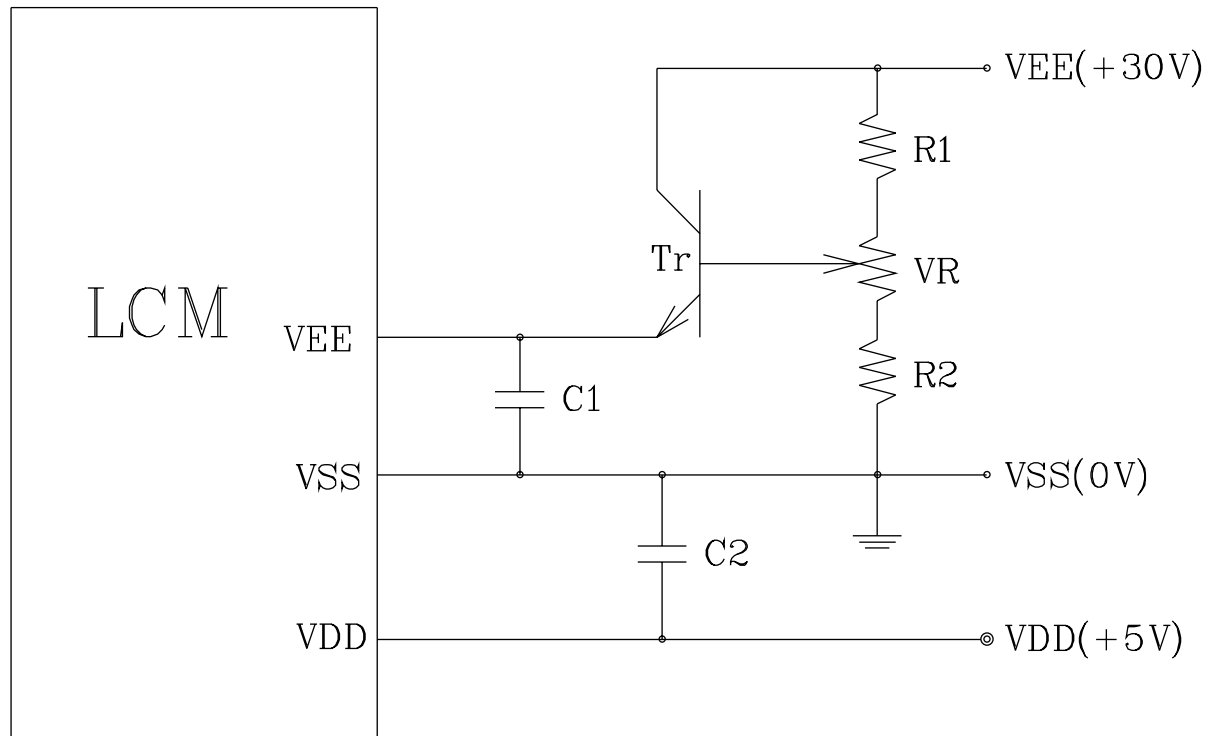
INTERFACE	PIN NO.	SYMBOL	FUNCTION	
LCM	CN1	1	FLM First Line Marker	
		2	M Alternate Signal for LCD Drive	
		3	$\overline{\text{DISPOFF}}$ Display Off ("H"=ON,"L"=OFF)	
		4	CL1 Data Latch Pulse	
		5	VSS Signal Ground (GND)	
		6	CL2 Data Shift Pulse	
		7	VSS Signal Ground (GND)	
		8	UD0	Display Upper Data
		9	UD1	
		10	UD2	
		11	UD3	
		12	UD4	
		13	UD5	
		14	UD6	
		15	UD7	Display Lower Data
		16	LD0	
		17	LD1	
		18	LD2	
		19	LD3	
		20	LD4	
		21	LD5	
		22	LD6	Power Supply for Logic
		23	LD7	
		24	VDD	
		25	VSS Signal Ground (GND)	
		26	VSS Signal Ground (GND)	
		27	VEE Power Supply for LCD (+V)	
		28	VEE Power Supply for LCD (+V)	
		29	VEE Power Supply for LCD (+V)	
		30	NC No Connection	
		31	NC No Connection	

Used CCFT Connector : MITSUMI/M63M83-04

Correspondable CCFT Connector : MITSUMI/M60-04-30-134P or M60-04-30-114P  
or M61M73-04

INTERFACE	PIN NO.	SYMBOL	FUNCTION
CCFT	1	HV	High Voltage Line (Inverter)
	2	N.C	No Connection
	3	N.C	No Connection
	4	GND	Ground Line (Inverter)

## 7. POWER SUPPLY



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

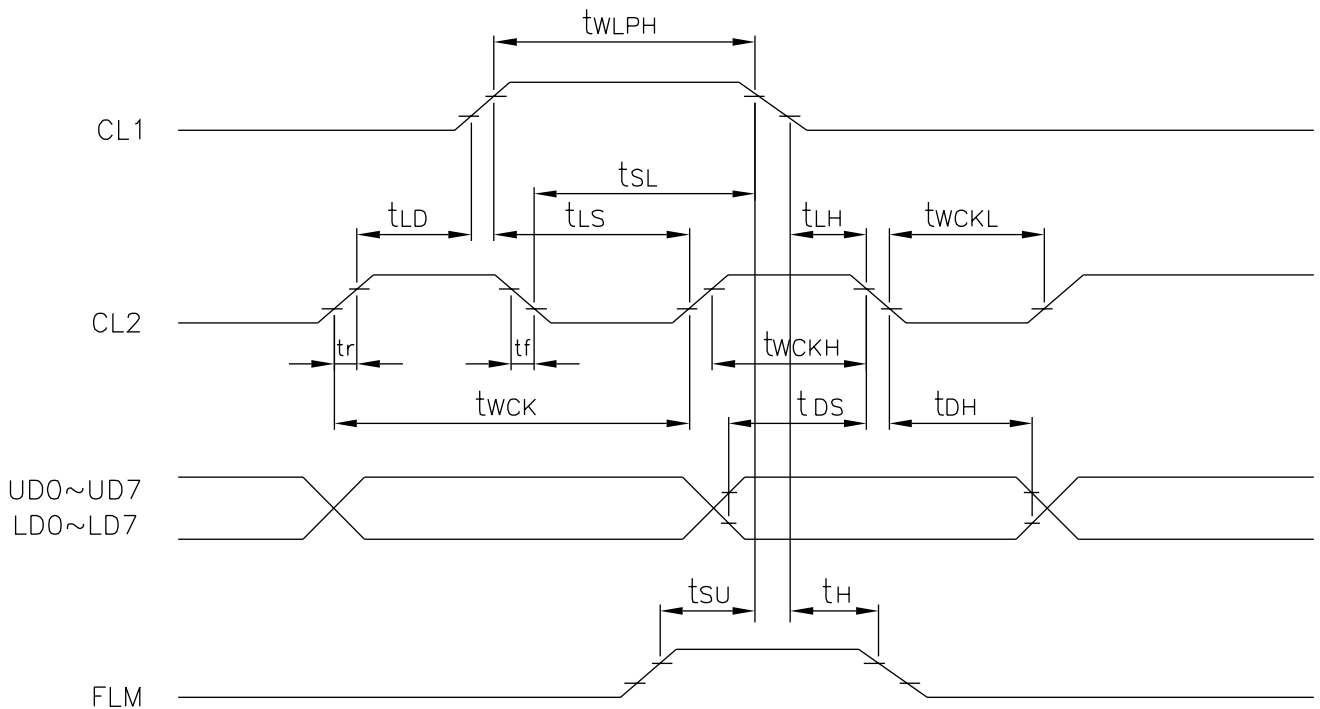
$$C1, C2 = 10 \mu F$$

## 8. TIMING CHARACTERISTICS

### 8-1. INTERFACE TIMING

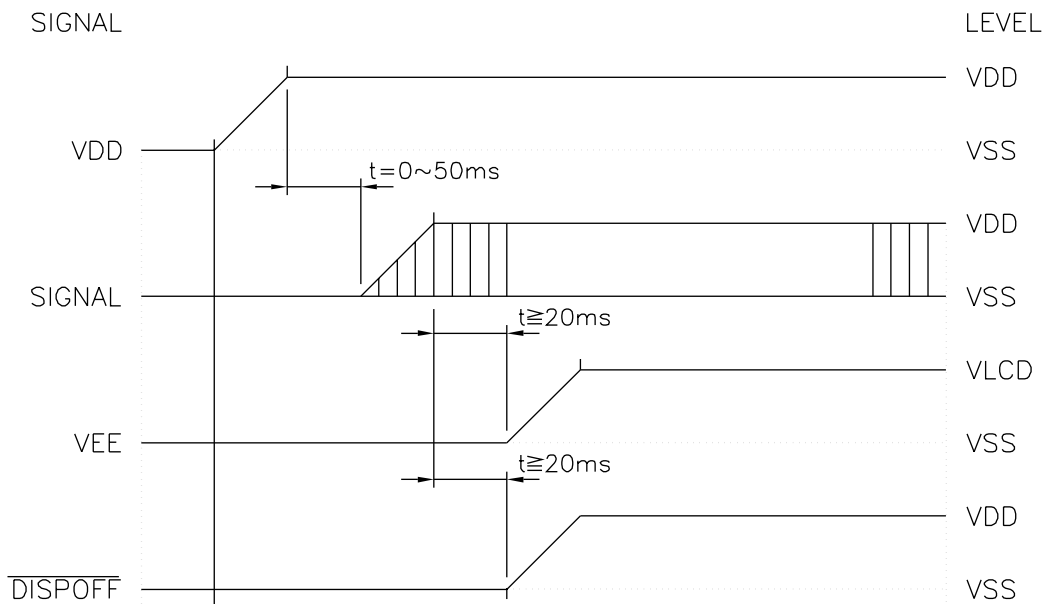
VDD=5.0V ± 10%

Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	$t_{wck}$	50	—	ns
CLOCK PULSE HIGH LEVEL WIDTH	$t_{wckH}$	15	—	ns
CLOCK PULSE LOW LEVEL WIDTH	$t_{wckL}$	15	—	ns
LATCH PULSE HIGH LEVEL WIDTH	$t_{wLPH}$	20	—	ns
CL2→CL1 RISE TIME	$t_{LD}$	0	—	ns
CL2→CL1 FALL TIME	$t_{SL}$	25	—	ns
CL1→CL2 RISE TIME	$t_{LS}$	25	—	ns
CL1→CL2 FALL TIME	$t_{LH}$	25	—	ns
CLOCK PULSE RISE/FALL TIME	$t_r, t_f$	—	30	ns
DATA SETUP TIME	$t_{DS}$	10	—	ns
DATA HOLD TIME	$t_{DH}$	10	—	ns
FLM SETUP TIME	$t_{SU}$	100	—	ns
FLM HOLD TIME	$t_H$	30	—	ns

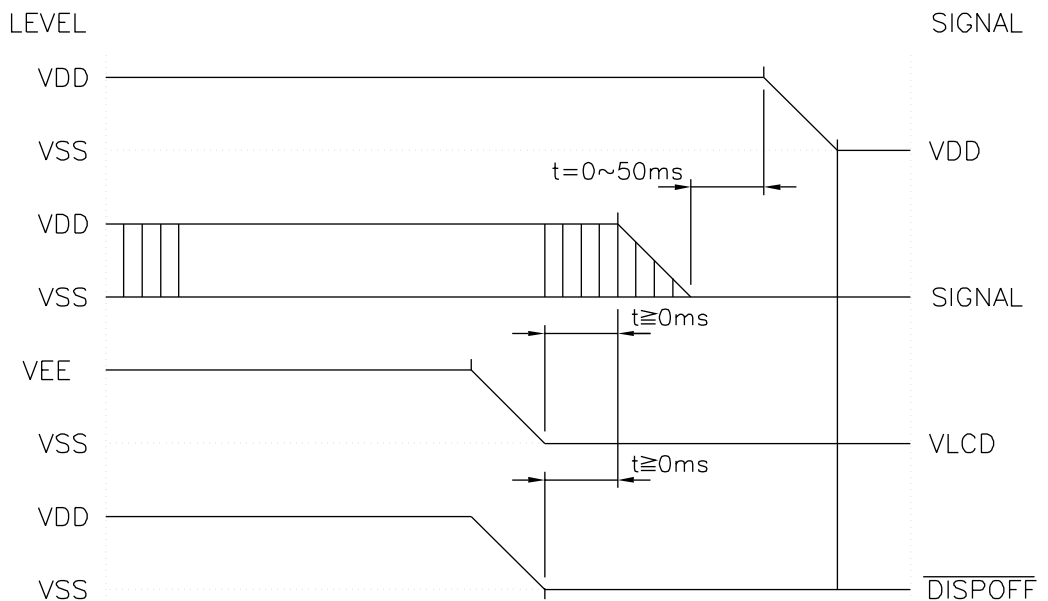


## 8-2. POWER ON/OFF TIMING

### ON SEQUENCE

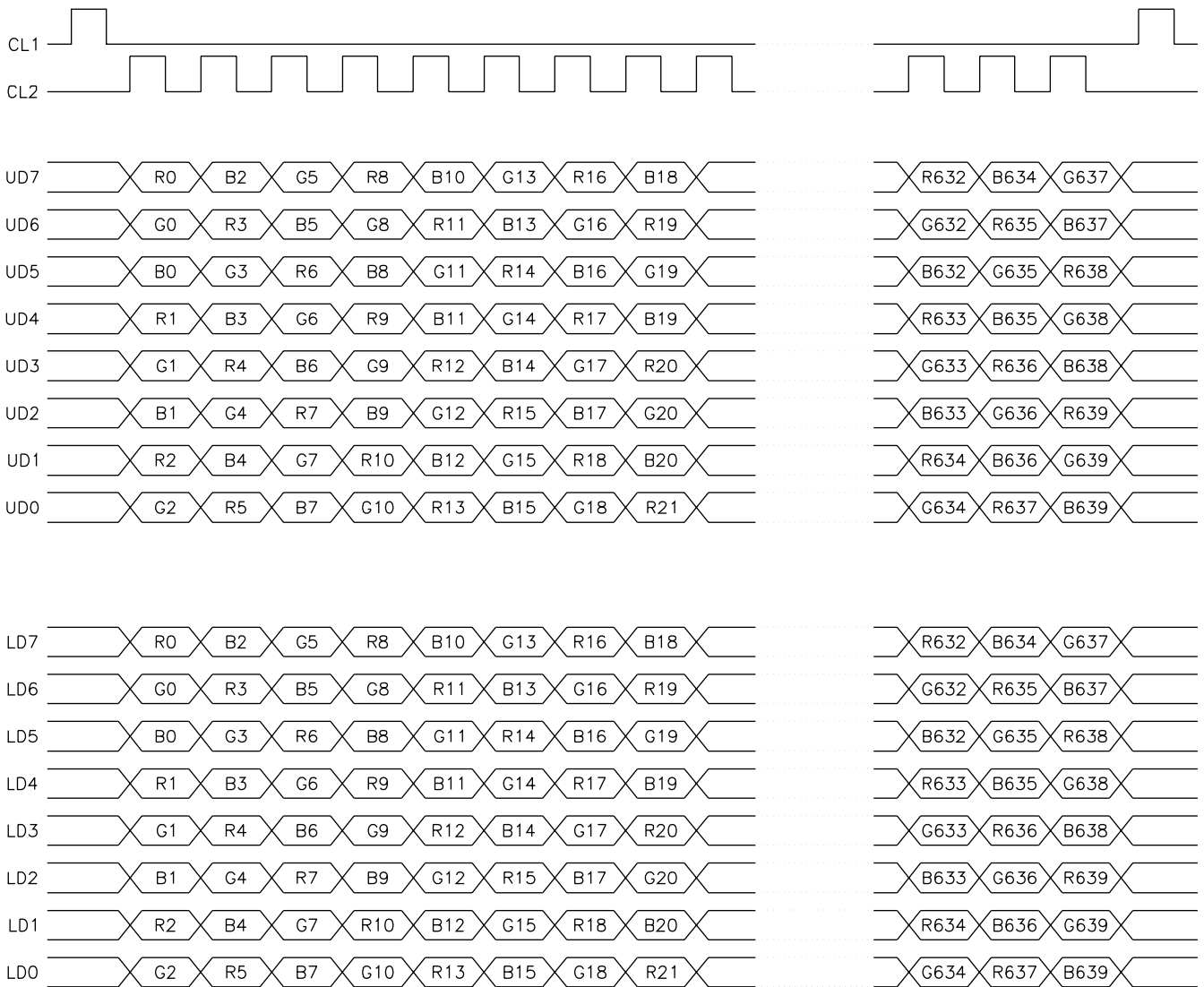


### OFF SEQUENCE



Please maintain the above sequence when turning on and off the power supply of the module. If  $\overline{\text{DISPOFF}}$  is supplied to the module while internal alternate signal for LCD driving(M) is unstable, DC component will be supplied to the LCD panel. This may cause damage to the LCD module.

## 8-3. TIMING CHART



# AZ DISPLAYS, INC.

AGM6448Y

## 8-4. DISPLAY PATTERN

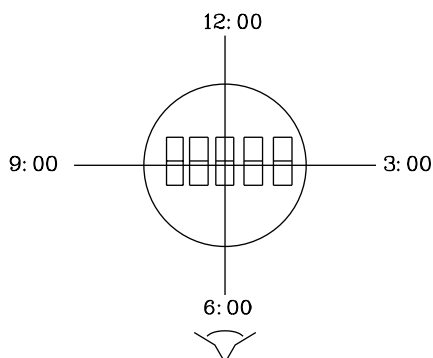
	1	2	3	4	5	6	7	8			1913	1914	1915	1916	1917	1918	1919	1920
1	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
2	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0

239	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
240	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0			UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0
241	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0
242	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0

479	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0
480	RO	G0	B0	R1	G1	B1	R2	G2			G637	B637	R638	G638	B638	R639	G639	B639
	LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0			LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0

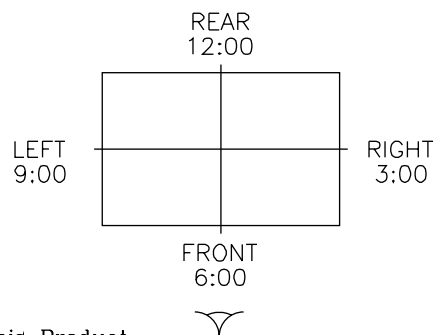
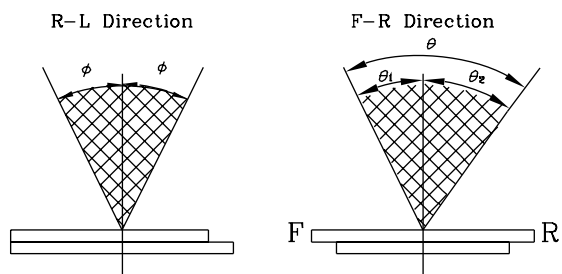
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

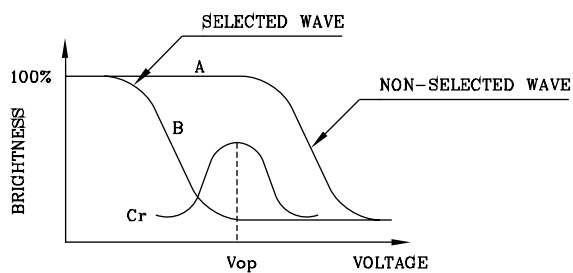
$$\theta = \theta_1 + \theta_2$$

\*Conditions

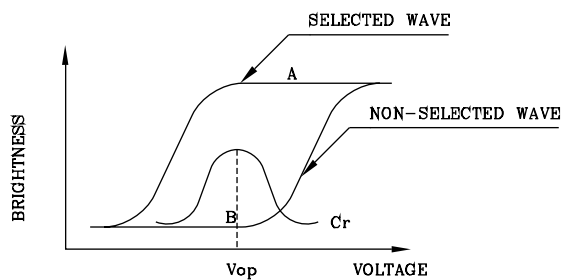
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(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

