AZ DISPLAYS, INC.

1. MECHANICAL DATA

(1) Product No.   AGM6448Y

(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: ☐ Black and White(Normal Black/Negative Image)

                                 ☐ Color STN module

       Rear Polarizer: Color Transmissive Type

(8) Viewing Direction   ☐ 6 0'clock   ☐ 12 0'clock   ☐___ 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   Ta ≦ 50℃ : 85%RH max

 Ta > 50℃ : Absolute humidity must be lower
   than the humidity of 85%RH at 50℃

Note 3   Ta at −20℃ will be < 48 hrs, at 70℃ will be < 120 hrs
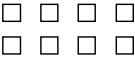
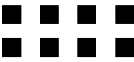Note 4   Background color will change slightly depending on ambient temperature.
   That phenomenon is reversible.

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/s²	−	5x9.8 m/s²
Vibration Width	0.2 inch	−	0.036 inch	−
Vibration Direction	X/Y/Z			
Vibration Time	20 min/cycle X 3 directions			

AZ DISPLAYS, INC.

3. ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCM

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply		VDD−VSS	Ta= 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 Ta=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 Ta=25°C IL=5mA	PATTERN: (Dots All On of White Color)	−	65.0	−	cd/m²
				PATTERN: (Dots All Off)	−	4.2	−	

AZ DISPLAYS, INC.

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	Ta =25°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 RECOMMANDED 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	mArms	
Working Frequency	f	35	45	55	kHz	

4. OPTICAL CHARACTERISTICS

4-1. Optical Char. of Normal Temp. Mode

AT V_{OP}

ITEM		Cr(Contrast Ratio)						θ(Viewing Angle)		ϕ(Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
MODE		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 $\phi=0°$ $\theta=0°$

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

Ta = 25°C

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

Note※ CIE chromaticity diagram   shown on Fig.1

Tolerance : ±0.05

Fig.1

AZ DISPLAYS, INC.

5. BLOCK DIAGRAM

1 FLM
4 CL1
6 CL2
3 DISPOFF
8~15 UD0~UD7

Buffer

2 M

M
Generator

24 VDD
5,7,25,26 VSS
27~29 VEE

Bias Voltage
Generator

16~23 LD0~LD7

Buffer

30,31 NC

240   240   240   240

120

120

120

120

COLOR LCD PANEL

1920 (640 X R.G.B) X 480 Dots

240   240   240   240

1 HV

CCFL Backlight

2 NC

3 NC

4 GND

AZ DISPLAYS, INC.
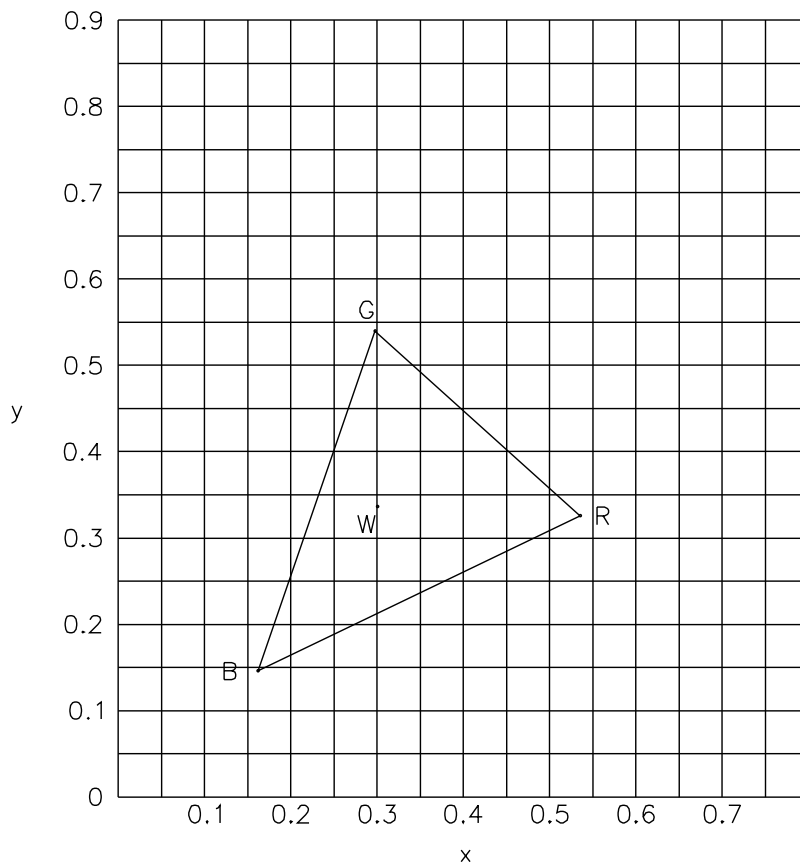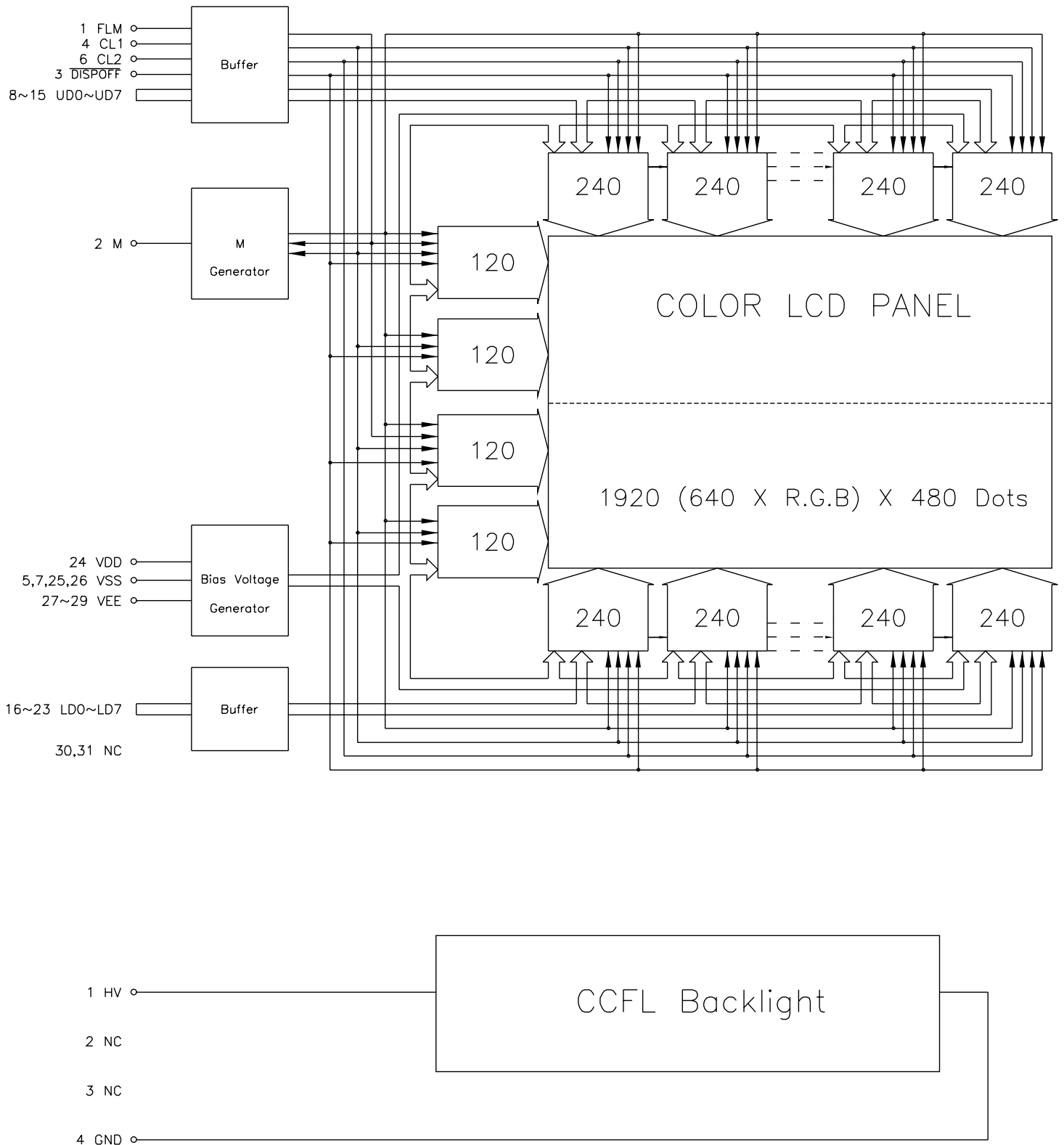
6.INTERFACE PIN CONNECTION

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	
		16	LD0	Display Lower Data
		17	LD1	
		18	LD2	
		19	LD3	
		20	LD4	
		21	LD5	
		22	LD6	
		23	LD7	
		24	VDD	Power Supply for Logic
		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
Corresponddable 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)

AZ DISPLAYS, INC.

7.POWER SUPPLY
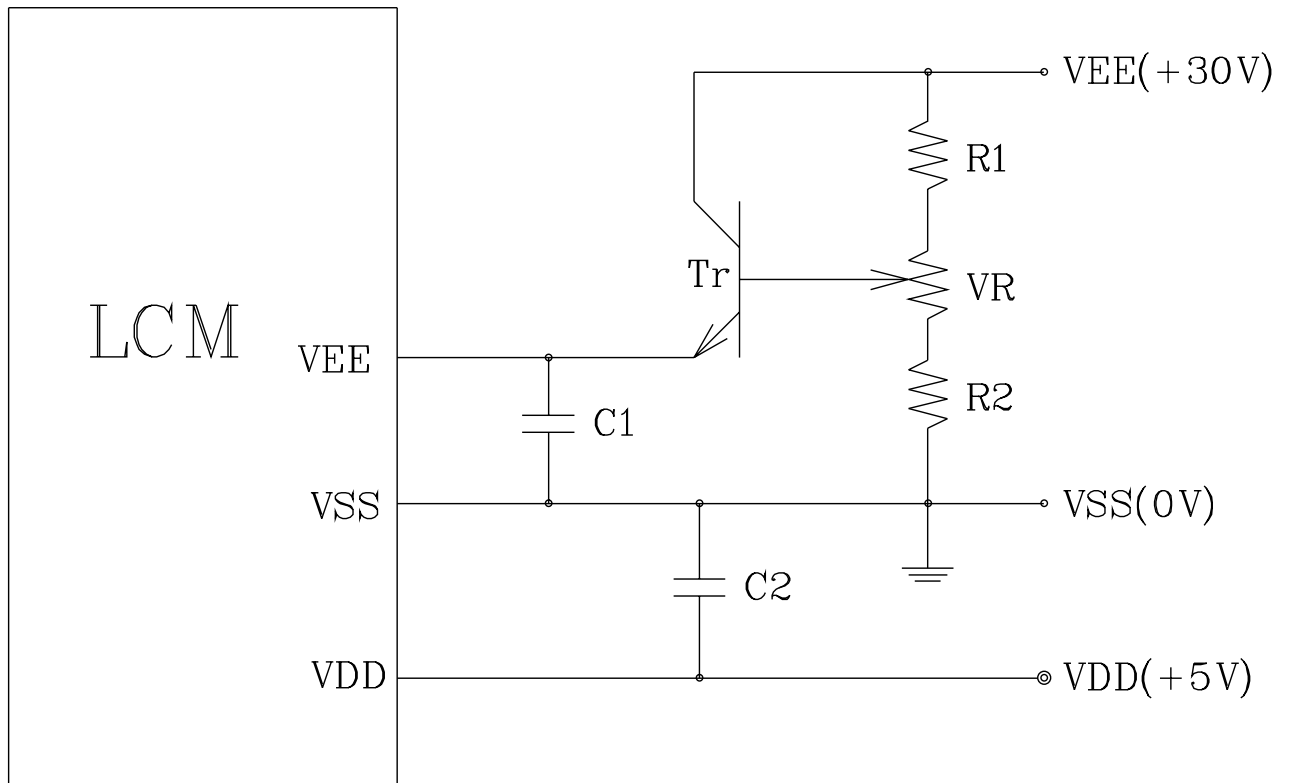
$$R1+R2+VR=10\sim20K\Omega$$
$$C1,C2=10\mu F$$

AZ DISPLAYS, INC.

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
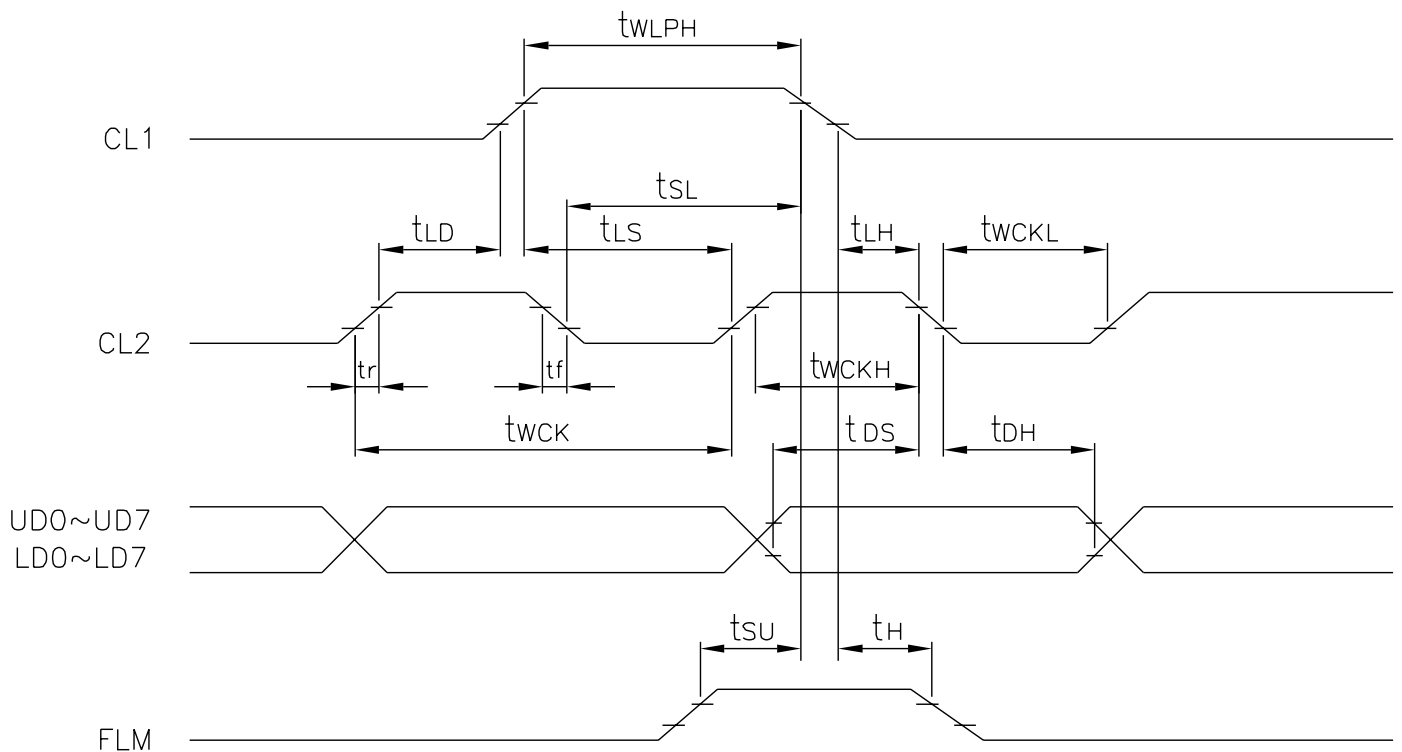
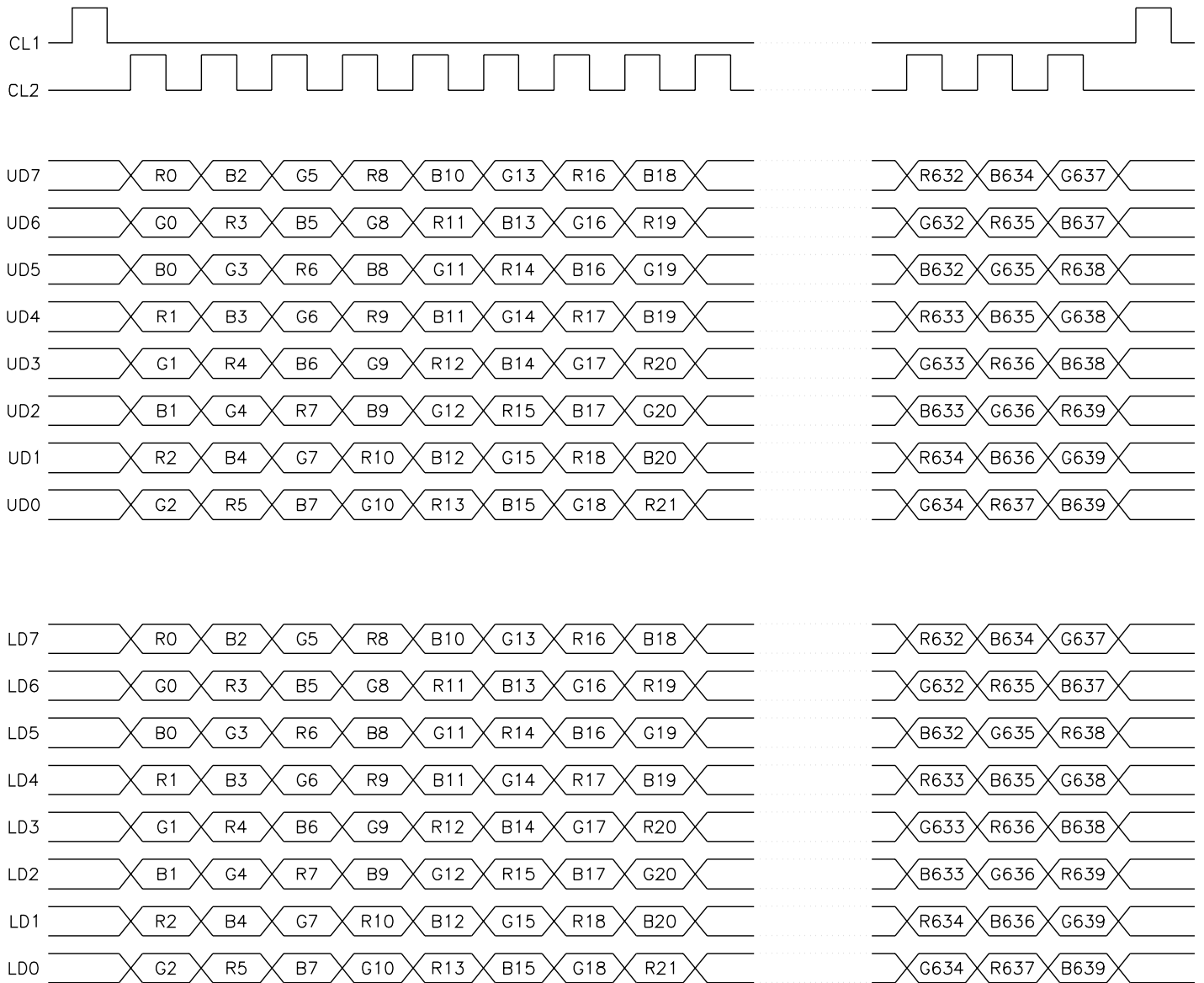## 8-2. POWER ON/OFF TIMING

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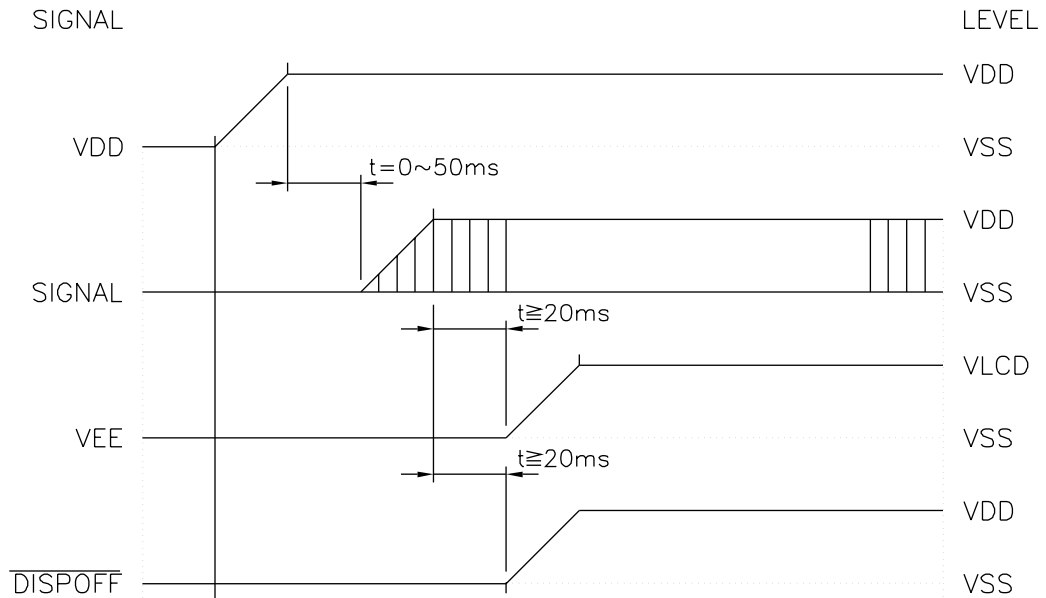
OFF SEQUENCE
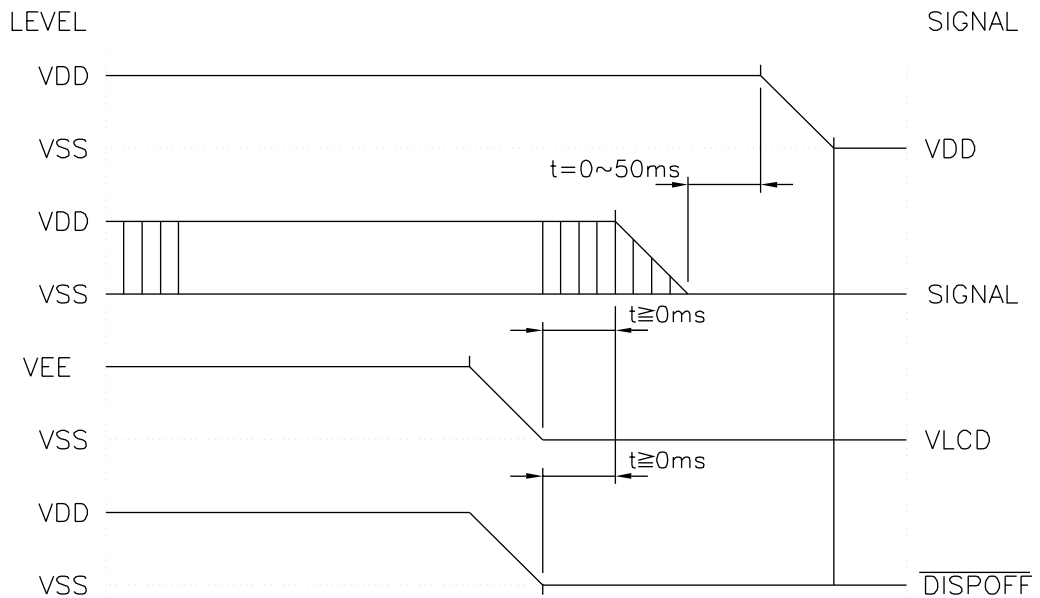
Please maintain the above sequence when turning on and off the power supply of the module. If $\overline{\text{DISPOFF}}$ is supplied to the module while internal alternate signal for LCD driving(M) is unstable, DC component will be supplied to the LCD panel. This may cause damage to the LCD module.
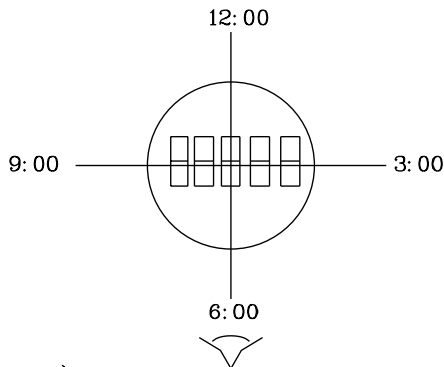
AZ DISPLAYS, INC.

8-3. TIMING CHART

CL1														
CL2														

UD7	R0	B2	G5	R8	B10	G13	R16	B18		R632	B634	G637		
UD6	G0	R3	B5	G8	R11	B13	G16	R19		G632	R635	B637		
UD5	B0	G3	R6	B8	G11	R14	B16	G19		B632	G635	R638		
UD4	R1	B3	G6	R9	B11	G14	R17	B19		R633	B635	G638		
UD3	G1	R4	B6	G9	R12	B14	G17	R20		G633	R636	B638		
UD2	B1	G4	R7	B9	G12	R15	B17	G20		B633	G636	R639		
UD1	R2	B4	G7	R10	B12	G15	R18	B20		R634	B636	G639		
UD0	G2	R5	B7	G10	R13	B15	G18	R21		G634	R637	B639		

LD7	R0	B2	G5	R8	B10	G13	R16	B18		R632	B634	G637		
LD6	G0	R3	B5	G8	R11	B13	G16	R19		G632	R635	B637		
LD5	B0	G3	R6	B8	G11	R14	B16	G19		B632	G635	R638		
LD4	R1	B3	G6	R9	B11	G14	R17	B19		R633	B635	G638		
LD3	G1	R4	B6	G9	R12	B14	G17	R20		G633	R636	B638		
LD2	B1	G4	R7	B9	G12	R15	B17	G20		B633	G636	R639		
LD1	R2	B4	G7	R10	B12	G15	R18	B20		R634	B636	G639		
LD0	G2	R5	B7	G10	R13	B15	G18	R21		G634	R637	B639		

8-4. DISPLAY PATTERN

	1	2	3	4	5	6	7	8		1913	1914	1915	1916	1917	1918	1919	1920
1	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0		G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
2	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0		G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
239	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0		G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
240	R0 UD7	G0 UD6	B0 UD5	R1 UD4	G1 UD3	B1 UD2	R2 UD1	G2 UD0		G637 UD7	B637 UD6	R638 UD5	G638 UD4	B638 UD3	R639 UD2	G639 UD1	B639 UD0
241	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0		G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0
242	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0		G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0
479	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0		G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0
480	R0 LD7	G0 LD6	B0 LD5	R1 LD4	G1 LD3	B1 LD2	R2 LD1	G2 LD0		G637 LD7	B637 LD6	R638 LD5	G638 LD4	B638 LD3	R639 LD2	G639 LD1	B639 LD0

(NOTE 4)
Definition of Viewing Direction

12:00

9:00 — 3:00

6:00

(NOTE 5)
Definition of Viewing Angle

R-L Direction

ϕ ϕ

F-R Direction

θ

θ_1 θ_2

F   R

REAR
12:00

LEFT
9:00

RIGHT
3:00

FRONT
6:00
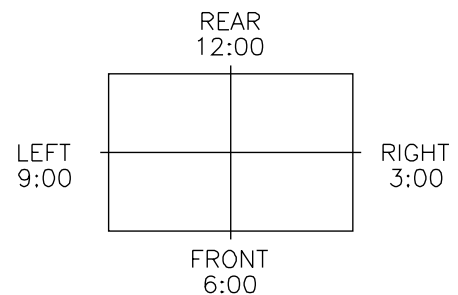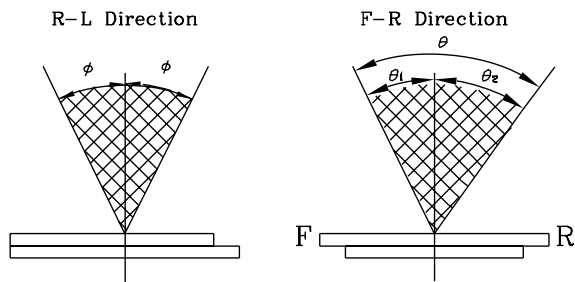
*For This Product
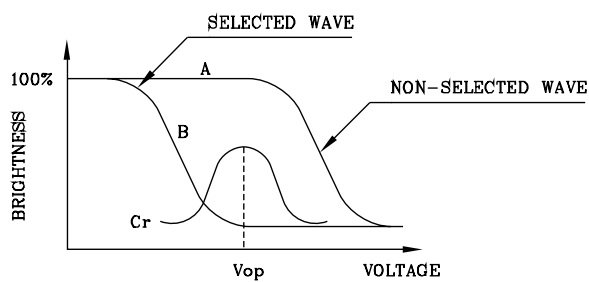The Viewing Direction Is 6 O'clock
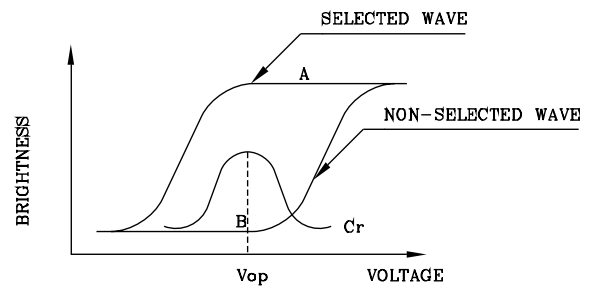So $\theta_1 > \theta_2$

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

*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)

SELECTED WAVE

100%   A

NON-SELECTED WAVE

BRIGHTNESS

B

Cr

Vop   VOLTAGE

(positive type)

SELECTED WAVE

A

NON-SELECTED WAVE

BRIGHTNESS

B   Cr

Vop   VOLTAGE
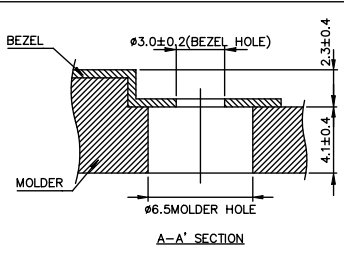
(negative type)

Contrast Ratio : Cr=A/B

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

BEZEL

ø3.0±0.2(BEZEL HOLE)

2.3±0.4

4.1±0.4

MOLDER

ø6.5MOLDER HOLE

A–A' SECTION

Note :
① used LCD connector : DF9-31P-1V(HIROSE)
   correspondable LCD connector : DF9-31S-1V(HIROSE)

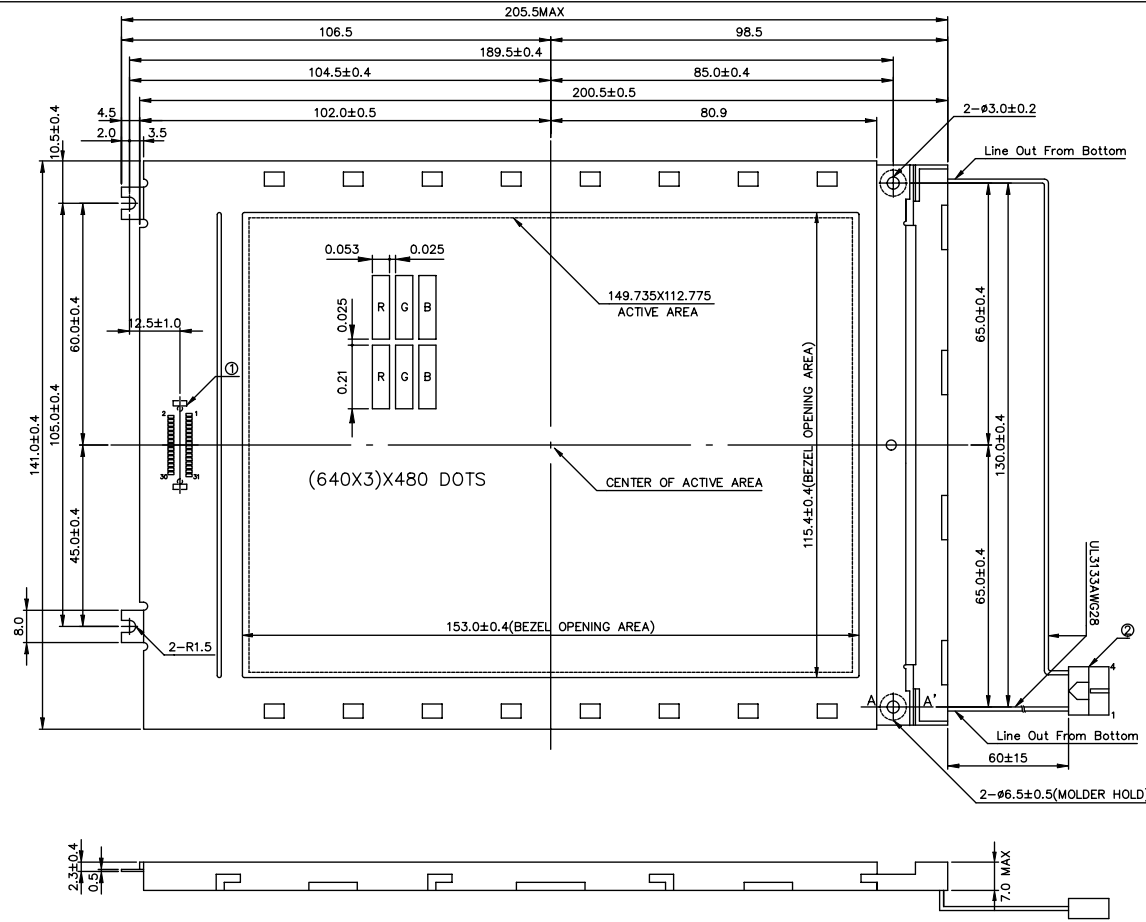② used CCFT connector : M63M83-04 (MITSUMI)
   correspondable CCFT connector : M60-04-30-114P (MITSUMI)
                                    M60-04-30-134P (MITSUMI)
                                    M61M73-04 (MITSUMI)

I/O connection ①

Pin No.	Symbol	Signal Level	Function
1	FLM	H/L	First Line Marker
2	M	H/L	Alternate Signal for LCD Drive
3	DISP	H/L	Display Off ("H"=ON,"L"=OFF)
4	CL1	H→L	Data Latch Pulse
5	VSS	–	Signal Ground (GND)
6	CL2	H→L	Data Shift Pulse
7	VSS	–	Signal Ground (GND)
8	UD0	H/L	
9	UD1	H/L	
10	UD2	H/L	
11	UD3	H/L	
12	UD4	H/L	Display Upper Data
13	UD5	H/L	
14	UD6	H/L	
15	UD7	H/L	
16	LD0	H/L	
17	LD1	H/L	
18	LD2	H/L	
19	LD3	H/L	Display Lower Data
20	LD4	H/L	
21	LD5	H/L	
22	LD6	H/L	
23	LD7	H/L	
24	VDD	–	Power Supply for Logic
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

CCFT ②

Pin No.	Symbol	Signal Level	Function
1	HV	–	High Voltage Line (Inverter)
2	NC	–	No Connection
3	NC	–	No Connection
4	GND	–	Ground Line (Inverter)

205.5MAX
106.5
98.5
189.5±0.4
104.5±0.4
85.0±0.4
200.5±0.5
102.0±0.5
80.9
4.5
2.0
3.5
10.5±0.4
60.0±0.4
105.0±0.4
141.0±0.4
45.0±0.4
12.5±1.0
8.0
2-R1.5

0.053   0.025
0.025
R G B
0.21
R G B

(640X3)X480 DOTS

149.735X112.775
ACTIVE AREA

CENTER OF ACTIVE AREA

115.4±0.4(BEZEL OPENING AREA)

153.0±0.4(BEZEL OPENING AREA)

2-ø3.0±0.2
Line Out From Bottom
65.0±0.4
130.0±0.4
65.0±0.4
UL3133AWG28
Line Out From Bottom
60±15
2-ø6.5±0.5(MOLDER HOLD)
A A'

2.3±0.4
0.5
7.0 MAX

	AGM6448Y	AZ DISPLAYS, INC.
	NAME	DATE	TITLE	
APPROVE				
CHECK			DWG-NO	CB-T163x	Rev.A
DESIGN				
DRAWN	MAY PING	87.09.01	THIRD ANGLE PROJECT	UNIT : mm SCALE : 0.68/1