

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM6448Z</b>
(2) Module Size	197.0 (W)mm x 145.0 (H)mm x 10.26 (D)mm
(3) Bezel Opening Area	158.0 (W)mm x 118.0 (H)mm
(4) Dot Size	0.064 (W)mm x 0.222 (H)mm
(5) Dot Pitch	0.079 (W)mm x 0.237 (H)mm
(6) Number of Dots	640 (W)xR.G.B x 480 (H)DOTS
(7) Duty	1/480
(8) LCD	Glare/Color Transmissive Type
(9) Viewing Direction	6 O'clock
(10) Backlight	CCFL
(11) Controller	Excluded
(12) DC/DC Converter	Excluded
(13) Touch Panel	Nonglare (3H Min.)
(14) Weight	400 g(approx.)

Revised: September 15, 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	7.0	V	
Power Supply for LCD Drive	VEE-VSS	0	42.0	V	
Input Voltage	VI	VSS-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling.

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.			
	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 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 changes slightly depending on ambient temperature.

This 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- 1 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	Ta= 25°C		2.7	3.0	3.3	V
				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 Contrast Adjust Voltage	VEE-VSS	f <sub>FLM</sub> =120Hz Duty=1/484 Bias=1/14 VDD=3.3V	0°C	37.1	37.5	37.9	V
			25°C	36.1	36.5	36.9	
			50°C	35.2	35.6	36.0	
Supply Current for Logic	IDD	VDD-VSS = 3.3V VEE-VSS = 36.5V Ta= 25°C		–	16.0	24.0	mA
Supply Current for LCD	IEE			–	8.0	12.0	mA

## 3.1.1 CHARACTERISTICS OF TOUCH SCREEN

### 3.1.1.1 ELECTRICAL AND MECHANICAL TERMS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Applied Rating Voltage	$V_R$	—	—	—	5.0	V
Applied Rating Current	$I_R$	At Contact Point of Top Layer with Bottom Layer	—	—	1.0	mA
Operating Temperature	$T_{OPR}$	20%~85% R.H. Max. Avoid Dew Condensation at Any Time	-10	—	60	°C
Storage Temperature	$T_{STO}$		-20	—	70	
Resistance of Terminal Electrodes	$R_{ETD}$	X Electrode	260	580	1060	$\Omega$
		Y Electrode	155	350	640	
Linearity	L	—	—	—	1.5	%
Insulation Resistance	$R_{OFF}$	$V_{DC} = 25V$	20	—	—	M $\Omega$
Activation Force	$F_{ON}$	NOTE 1	10	—	80	g
Transparency	T	According to JIS-K7015	—	83	—	%
Surface Hardness	$S_H$	According to JIS-K5400	3	—	—	H

NOTE 1 : The force is given with R0.8 Polyacetal pen or R3, HS60 silicon rubber and the analog output could be detected stably.

### 3.1.1.2 RELIABILITY TERMS

ITEM	SPECIFICATION
Exposure to High Temperature	70°C, 120 Hours
Exposure to Low Temperature	-40°C, 120 Hours
Exposure to Constant Temperature and Humidity	60°C 90%RH, 120 Hours
Repetition of High and Low Temperatures	-10°C(60Minutes) — — -60°C(60Minutes) 20 Cycles   1 Cycle
Finger Touches Life	Polyacetal Tip Load 250±50 gf Silicone Rubber Load 300±100 gf Each One Million times
Writing Friction Life	Polyacetal Tip Load 250±50 gf 60mm/sec 20mm 100,000 times

Test condition : T/P is placed horizontally in a vessel and no power is supplied to T/P.  
Normal state is temperature : 25±10°C, relative humidity : 60±25%

## 3.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Used lamp : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Lamp Voltage	$V_L$	–	450	–	Vrms	
Lamp current	$I_L$	3	4	5	mArms	
Lamp power consumption	$P_L$	–	1.8	–	W	
Lamp frequency	$F_L$	35	40	45	kHz	
Starting voltage	$V_S$	–	800	1500	Vrms	$T_a = 25^\circ\text{C}$
Color Degree	X	0.32	0.33	0.34	–	
	Y	0.30	0.31	0.32		
Lamp life time	$L_L$	–	20000	–	hrs	

LCM : Rating

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Surface Luminance	L	–	82.6	–	$\text{cd}/\text{m}^2$	ALL ON( $I_L=4\text{mA}$ )
		–	2.6	–	$\text{cd}/\text{m}^2$	ALL OFF( $I_L=4\text{mA}$ )

## 3.3 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	V <sub>in</sub>	10	12	15	V	
Input Current	I <sub>in</sub>	-	450	550	mA	RL = 100KΩ, V <sub>in</sub> = 12V
Input Power	P <sub>in</sub>	-	5.4	6.6	W	RL = 100KΩ, V <sub>in</sub> = 12V
Standby Standby Input Current	I <sub>in</sub> Standby	-	0.1	1.0	μA	OFF state
Control Terminal Input Voltage	V <sub>rmt</sub>	3.5	5	10	V	ON state
		-0.5	0	0.4	V	OFF state
Control Terminal Input Current	I <sub>rmt</sub>	-	0.5	1.0	mA	V <sub>rmt</sub> = 5V
		-	-	-0.3	μA	V <sub>rmt</sub> = 0V

### 3.3.3 OUTPUT CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
NO Load Output Voltage	V <sub>s</sub>	1400	-	-	V <sub>rms</sub>	
Tube Current	I <sub>L</sub>	2.7	3	3.3	mA <sub>rms</sub>	V <sub>ctrl</sub> = 3V Min. Brightness
		5.4	6	6.6	mA <sub>rms</sub>	V <sub>ctrl</sub> = 0V Max. Brightness
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	M	-	25	-	35	-	20	-	±30	-	±42
note		NOTE6						NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	800	-	ms	NOTE 2
		25℃	-	260	-		
		50℃	-	130	-		
Response Time (fall)	Tf	0℃	-	450	-	ms	NOTE 2
		25℃	-	120	-		
		50℃	-	80	-		

note:

T : TRANSMISSIVE  
M : NORMALLY BLACK(COLOR)

## 4-2. Color of CIE Coordinate

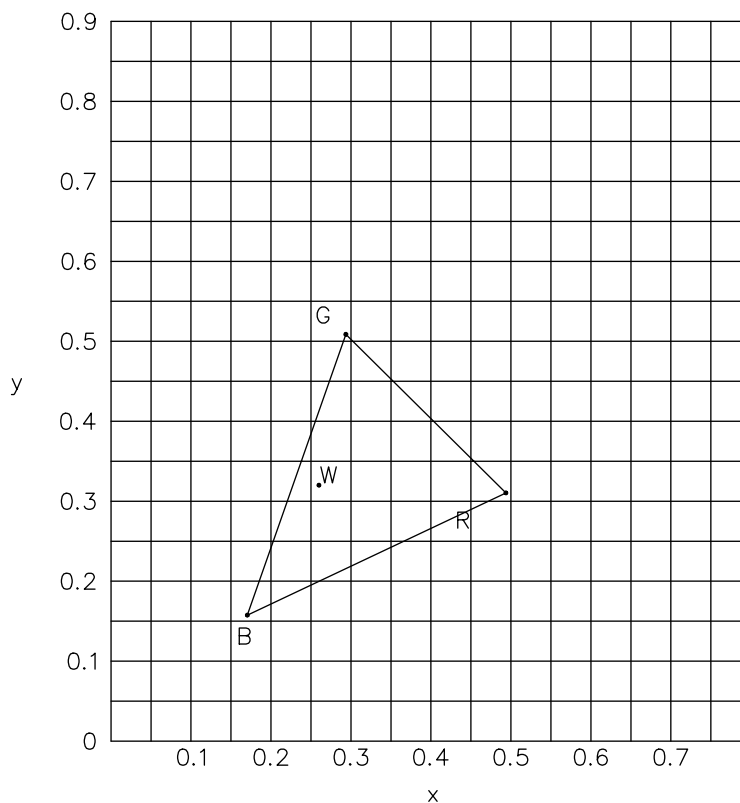
Ta = 25°C

ITEM		SYMBOL	CONDITION	VALUE	NOTE
Color of CIE Coordinate	Red	X	$\phi=0^\circ$ , $\theta=0^\circ$ CCFL BACKLIGHT COLOR DEGREE X=0.33 Y=0.31	0.4850	Note*
		y		0.3234	
	Green	X		0.2924	
		y		0.5113	
	Blue	X		0.1734	
		y		0.1552	
	White	X		0.2635	
		y		0.3119	

Note\* Measuring at position 3 on Fig.1  
CIE chromaticity diagram

Tolerance :  $\pm 0.05$

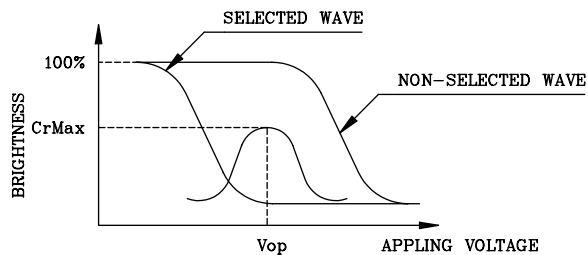
Fig.1



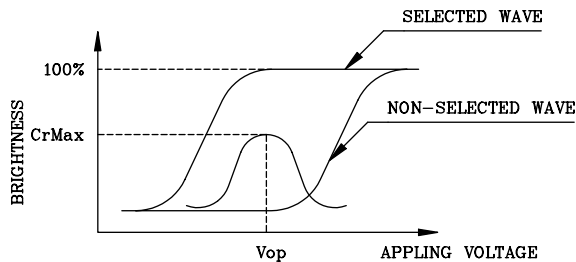


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



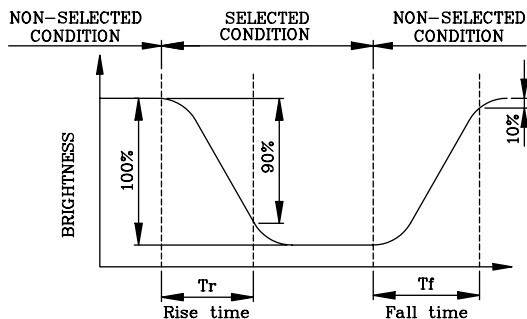
(negative type)

\*Conditions

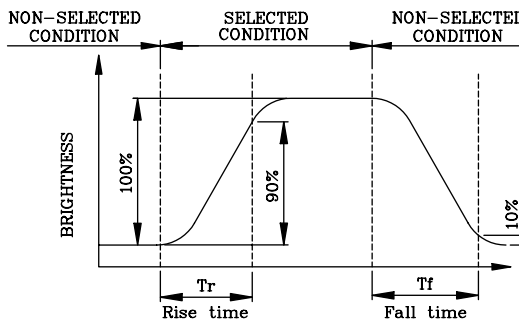
Viewing Angle : 0  
 Frame Frequency : 70Hz  
 Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



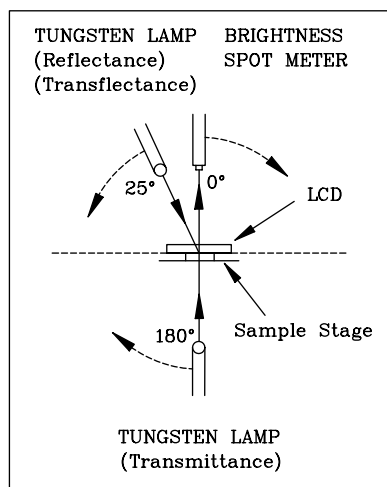
(negative type)

\*Conditions

Operating Voltage : Vop  
 Viewing Angle ( $\theta, \phi$ ) : (0,0)  
 Frame Frequency : 70Hz  
 Appling Waveform : I/N duty 1/a bias

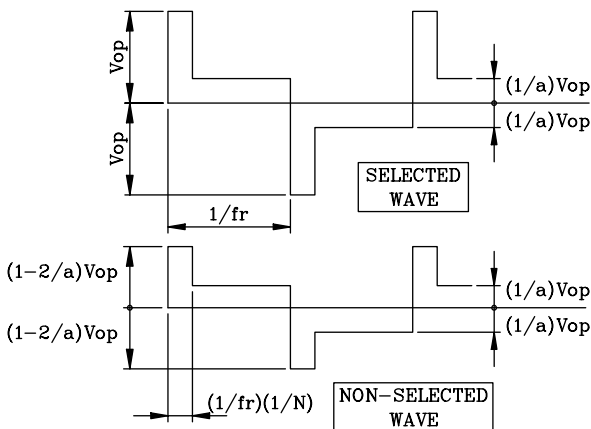
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



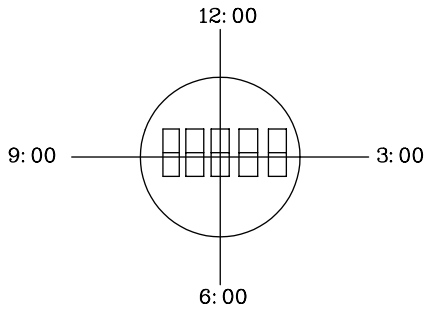
CONST.  
TEMP.  
CHAMBER

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



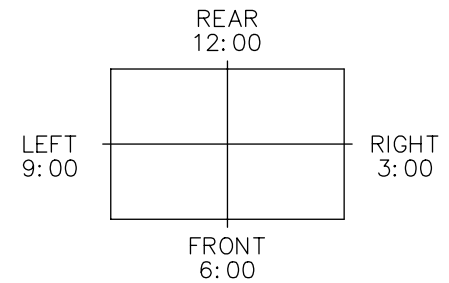
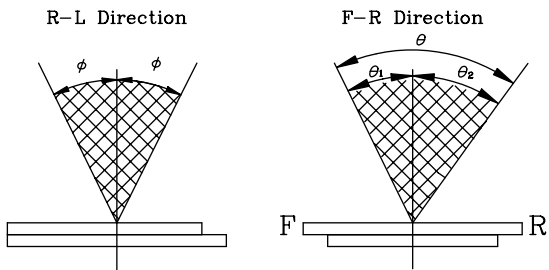
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



\*For This Product

The Viewing Direction Is 6 O'clock  
So  $\theta_1 > \theta_2$

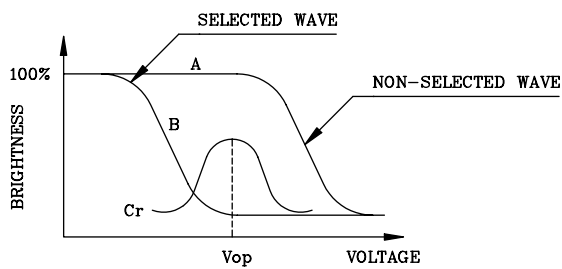
$$\theta = \theta_1 + \theta_2$$

\*Conditions

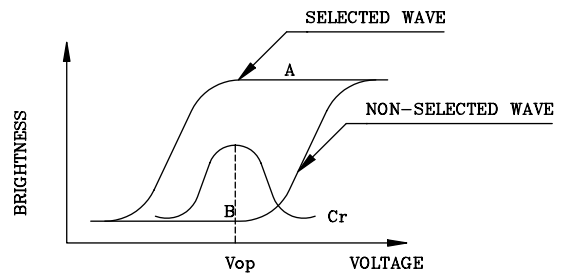
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



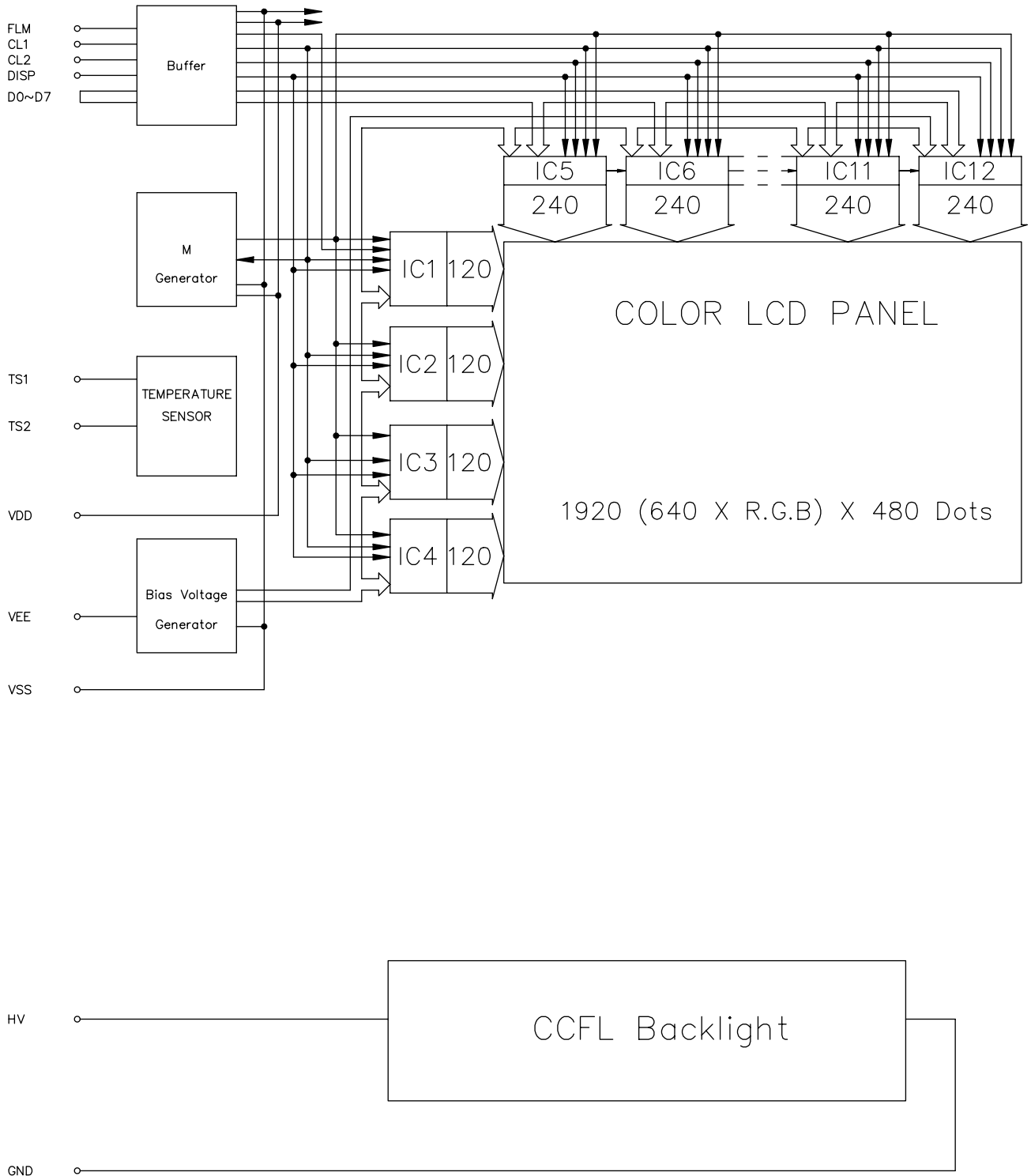
(negative type)

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

\*Conditions

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

## 5. BLOCK DIAGRAM



## 6. INTERFACE PIN CONNECTION

FFC: PITCH 1.0mm / Suitable Connector : IL-402-22S-S1L-SA(JAE)

INTERFACE	PIN NO.	SYMBOL	FUNCTION
LCM	FFC	1	FLM Scan start-up signal
		2	VSS GND
		3	CL1 Input data latch signal
		4	VSS GND
		5	CL2 Data input clock
		6	VSS GND
		7	D0 Display data
		8	D1 Display data
		9	D2 Display data
		10	D3 Display data
		11	D4 Display data
		12	D5 Display data
		13	D6 Display data
		14	D7 Display data
		15	DISP Display control signal H: ON , L: OFF
		16	VDD Power supply voltage for logic
		17	VDD Power supply voltage for logic
		18	VSS GND
		19	VEE Power supply voltage for LCD(+)
		20	VSS GND
		21	TS1 Temperature sensor pin1
		22	TS2 Temperature sensor pin2

FLCN: MITSUMI/M63M83-04

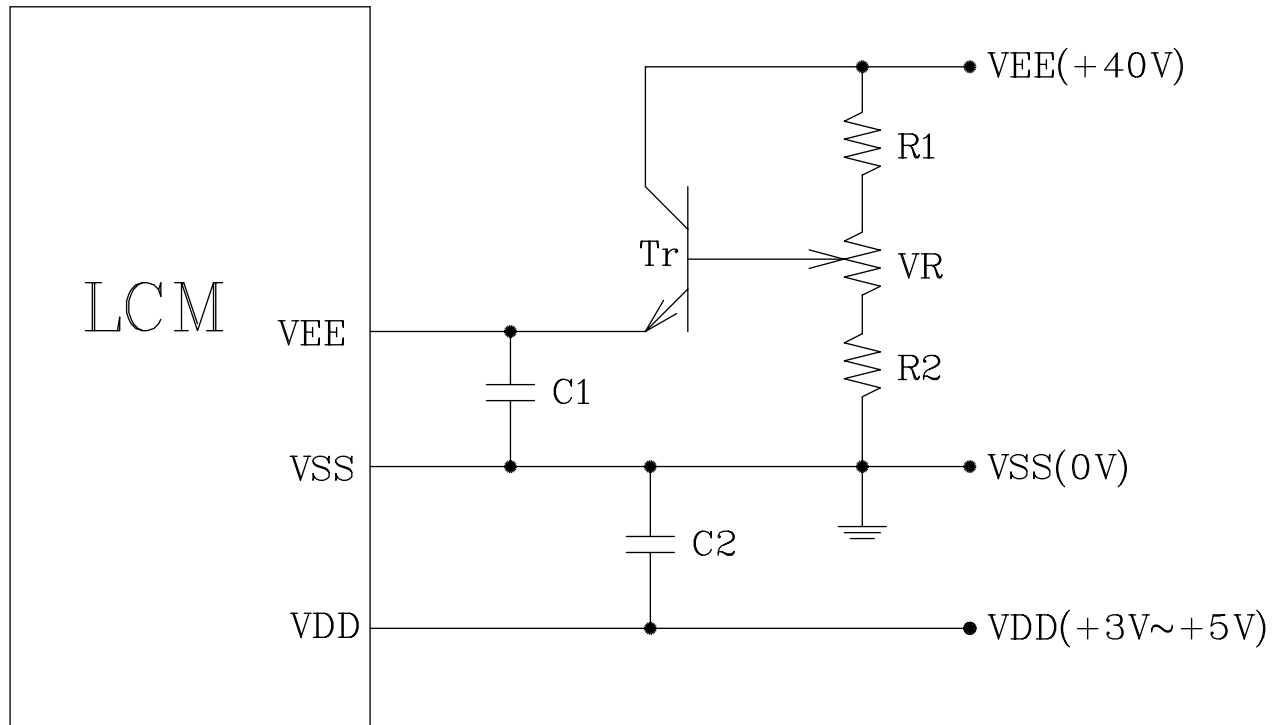
(Suitable Connector: MITSUMI/M60-04-30-134P or M60-04-30-114P or M61M73-04)

INTERFACE	PIN NO.	SYMBOL	FUNCTION
FLCN	1	GND	CFL GND
	2	N.C	-
	3	N.C	-
	4	HV	Power supply voltage for CFL

### TOUCH PANEL PIN CONNECTION

INTERFACE	PIN NO.	FUNCTION
FPC	1	RIGHT
	2	BOTTOM
	3	LEFT
	4	TOP

## 7. POWER SUPPLY



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

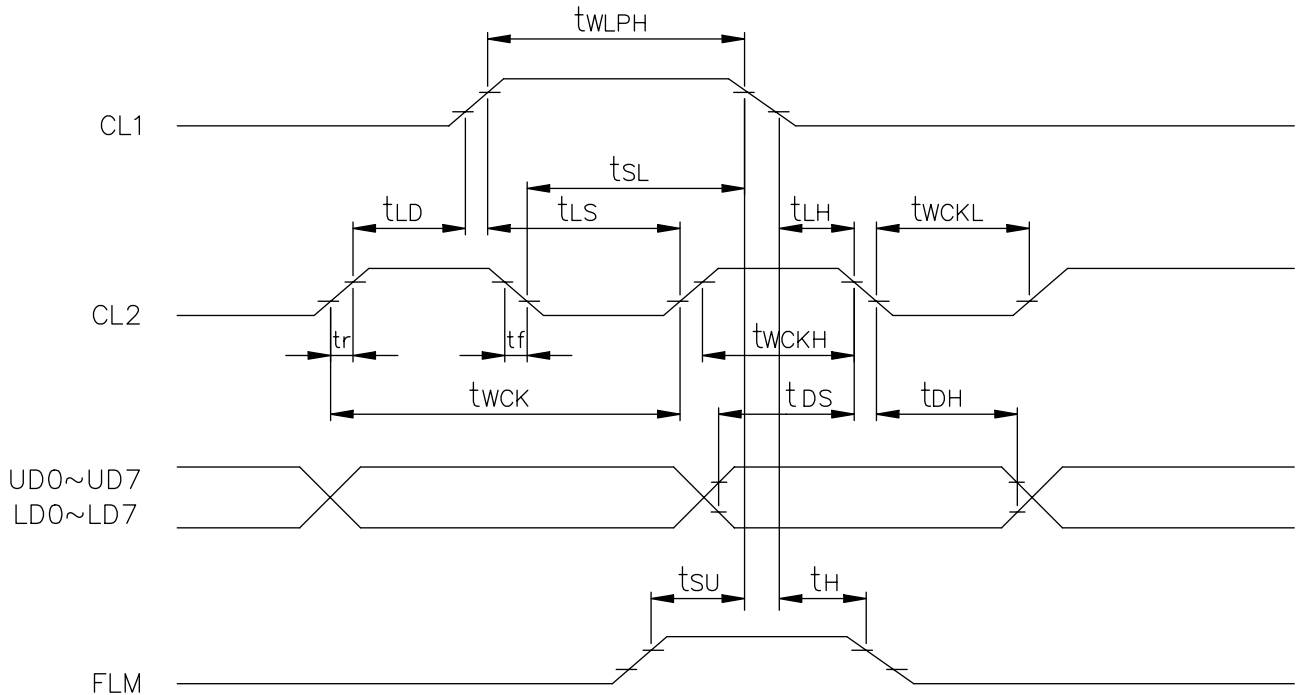
$$C1, C2 = 10 \mu F$$

## 8. TIMING CHARACTERISTICS

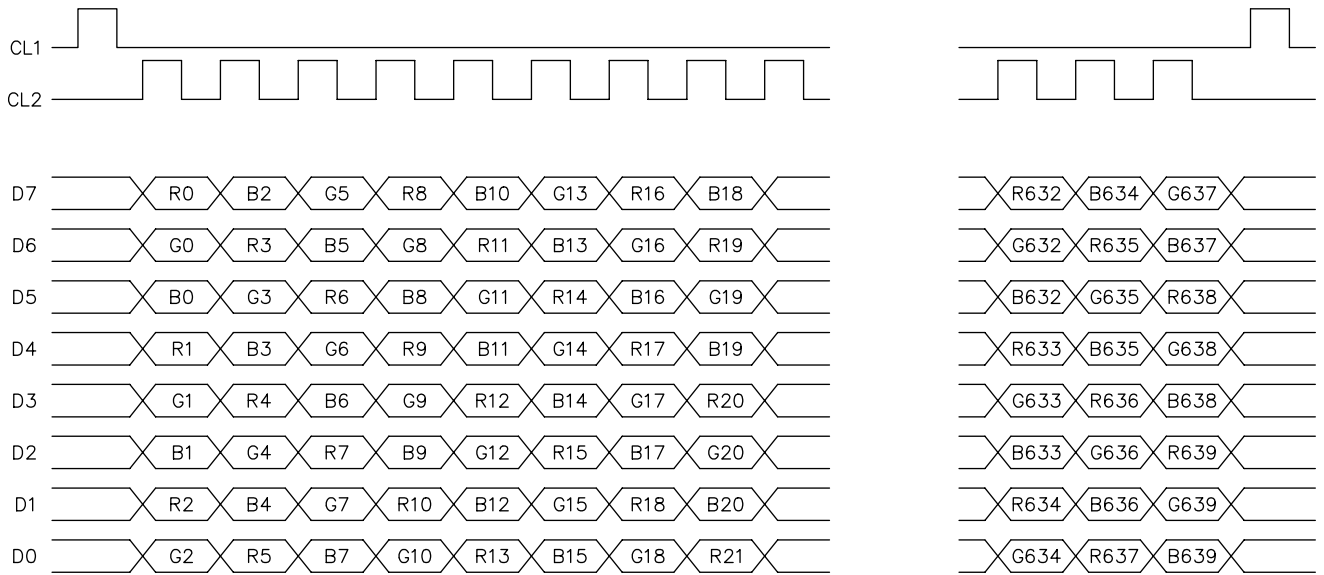
### 8-1. INTERFACE TIMING

VDD=3V~4.5V

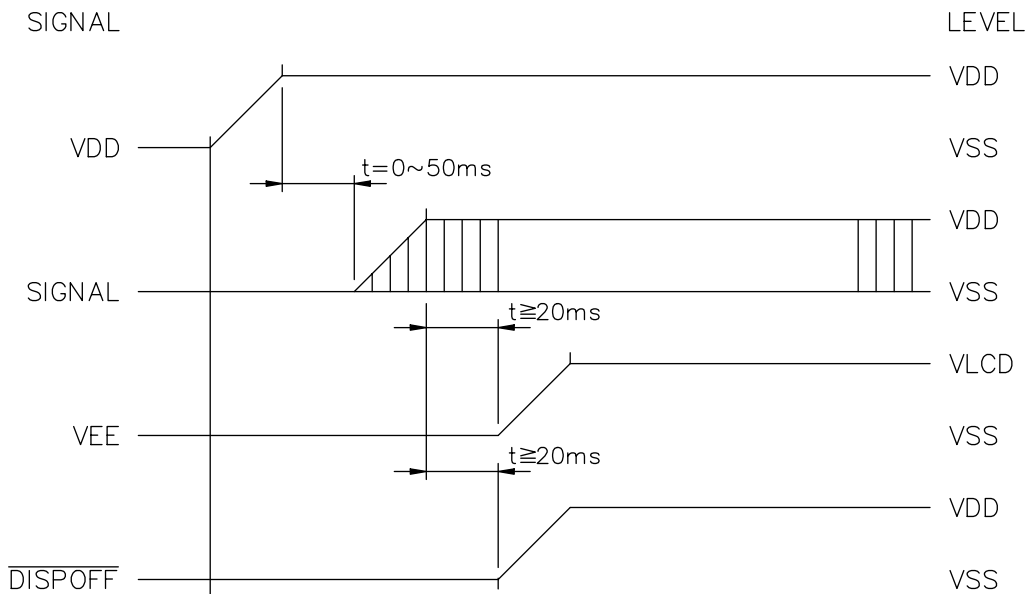
Parameter	SYMBOL	MIN.	MAX.	UNIT
CLOCK PULSE CYCLE TIME	$t_{wck}$	66	—	ns
CLOCK PULSE HIGH LEVEL WIDTH	$t_{wckH}$	23	—	ns
CLOCK PULSE LOW LEVEL WIDTH	$t_{wckL}$	23	—	ns
LATCH PULSE HIGH LEVEL WIDTH	$t_{wLPH}$	30	—	ns
CP→LP RISE TIME	$t_{LD}$	10	—	ns
CP→LP FALL TIME	$t_{SL}$	30	—	ns
LP→CP RISE TIME	$t_{LS}$	30	—	ns
LP→CP FALL TIME	$t_{LH}$	30	—	ns
CLOCK PULSE RISE/FALL TIME	$t_r, t_f$	—	50	ns
DATA SETUP TIME	$t_{DS}$	10	—	ns
DATA HOLD TIME	$t_{DH}$	25	—	ns
FLM SETUP TIME	$t_{SU}$	30	—	ns
FLM HOLD TIME	$t_H$	50	—	ns



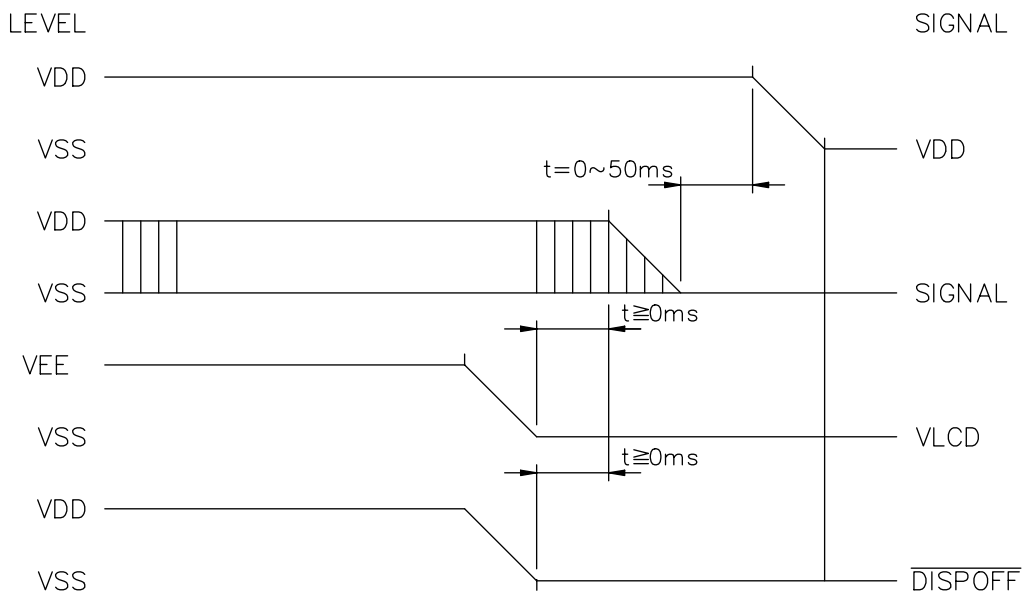
## 8-2. TIMING CHART



## 8-3. 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.



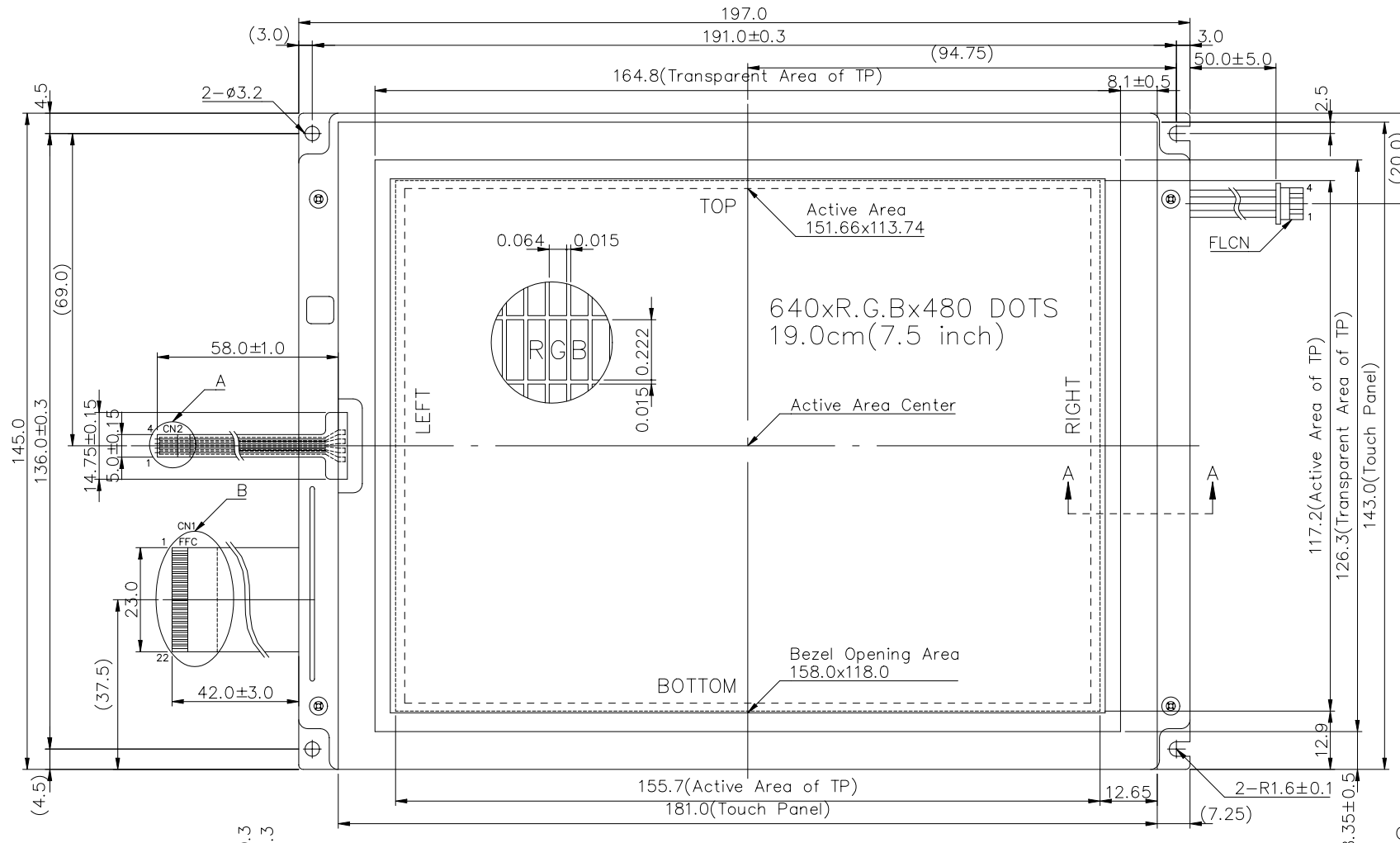
## 9. DISPLAY

	1	2	3	4	5	6	7	8	
1	R0	G0	B0	R1	G1	B1	R2	G2	
	D7	D6	D5	D4	D3	D2	D1	D0	
2	R0	G0	B0	R1	G1	B1	R2	G2	
	D7	D6	D5	D4	D3	D2	D1	D0	

	1913	1914	1915	1916	1917	1918	1919	1920
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0

479	R0	G0	B0	R1	G1	B1	R2	G2	
	D7	D6	D5	D4	D3	D2	D1	D0	
480	R0	G0	B0	R1	G1	B1	R2	G2	
	D7	D6	D5	D4	D3	D2	D1	D0	

	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0
	G637	B637	R638	G638	B638	R639	G639	B639
	D7	D6	D5	D4	D3	D2	D1	D0



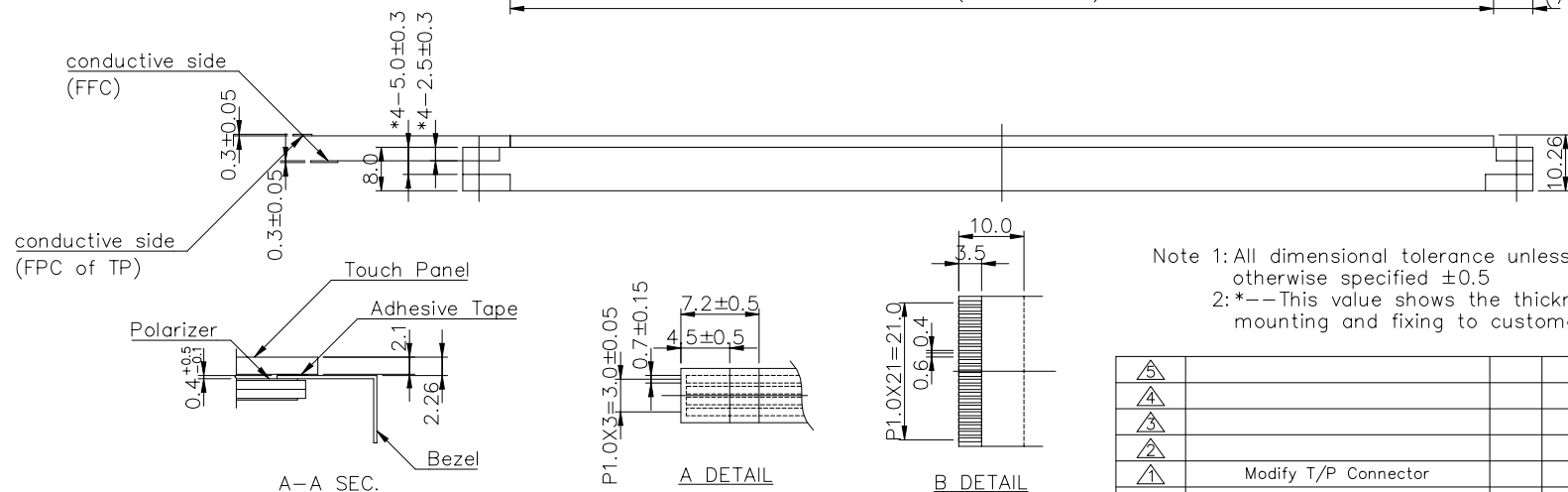
CN1 for LCM

Pin No.	Pin Name
1	FLM
2	VSS
3	CL1
4	VSS
5	CL2
6	VSS
7~14	D0~D7
15	DISP
16	VDD
17	VDD
18	VSS
19	VEE
20	VSS
21	TS1
22	TS2

CN2 for Touch Panel

Pin No.	Pin Name
1	RIGHT
2	BOTTOM
3	LEFT
4	TOP

CN1 : Flat Cable Pitch 1.0mm  
Suitable Connector  
IL-402-22S-S1L-SA(J.A.E)  
FLCN : M63-M83-04(MITSUMI)  
PIN-1 :HOT  
PIN-4 :GND



Note 1: All dimensional tolerance unless otherwise specified ±0.5  
2: \*-- This value shows the thickness after mounting and fixing to customer's cabinet.

**AZ DISPLAYS, INC.**

**AGM6448Z**

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
△					
△					
△					
△					
△	Modify T/P Connector				

APPROVE	NAME	DATE	THIRD ANGLE P.	
	Tony Chou	88.04.15		
	Louis Lee	88.04.15		
DESIGN	NAME	DATE	SCALE	UNIT
	K.Y.Chen	88.04.15	1/1	mm
DRAWN	NAME	DATE	SCALE	UNIT
	May Ping	88.04.15	1/1	mm
DWG NO.		M302-D1A		