1. MECHANICAL DATA

(1) Product No.	AGM6448G
(2) Module Size	260.0 (W)mm x 174.0 (H)mm x MAX8.0 (D)mm
(3) Dot Size	0.27 (W)mm x 0.27 (H)mm
(4) Dot Pitch	0.30 (W)mm x 0.30 (H)mm
(5) Number of Dots	640 (W) x 480 (H)Dots
(6) Duty	1/240
(7) LCD Display Mode	FSTN: Black and White(Normally Black/Negative Image) Rear Polarizer: Transmissive
(8) Viewing Direction	6 O'clock
(9) Backlight	CCFL
(10) Controller	Excluded
(11) DC/DC Converter	Excluded
(12) Weight	352.0 g(approx.)
(13) Recommended CFL Inverter	TDK CORP. CXA-L10L

Date: September 23, 2002

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	6.5	V	
Power Supply for LCM	VEE−VSS	0	27.0	V	
Input Voltage	VI	−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.			
	OPERATION		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note ※)	−		49m/s² (5G)	

Note 2 Ta ≦ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 3 Ta at −20°C will be < 48 hrs, at 70°C will be < 120 hrs

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

Note※

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	−		4.5	5.0	5.5	V
					2.7	3.0	3.3	
Recommended LC Driving Voltage		VEE−VSS	Duty=1/240 Bias=1/13	0°C	23.3	23.7	24.1	V
				25°C	22.1	22.5	22.9	
				50°C	20.7	21.1	21.5	
Input Voltage		VIH	H level		0.8VDD	−	VDD	V
		VIL	L level		0	−	0.2VDD	V
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VEE−VSS = 22.5 V		−	2.0	4.0	mA
		IEE	PATTERN : □ ■ □ ■ □ ■ / ■ □ ■ □ ■ □		−	10.0	20	mA
CCFL LAMP	Starting Voltage	Vs			−	600	−	Vrms
	Lamp Voltage	V_L			−	380	−	Vrms
	Lamp Current	I_L			4	5	6	mArms
	Lamp Consumption	P_L			−	1.9	−	W
	Lamp Frequency	F_L			−	40	−	KHz
	Lamp Life Time	L_L	NOTE 1		−	20000	−	hrs
LCM	Surface Luminance	L	ALL ON		−	70	−	cd/m²
			ALL OFF		−	8	−	
	Luminance Uniformity	Lu			−	85	−	%

NOTE 1: Lamp life is measured in half-life- the time it takes the brightness to reduce to 50% of its initial value.

4. OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		ø(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	–	6.0	–	10.0	–	3.0	–	45	–	40–20
Note		see page 6 (Note 6)						see page 6 (Note 5)			

NOTE :

T: TRANSMISSIVE

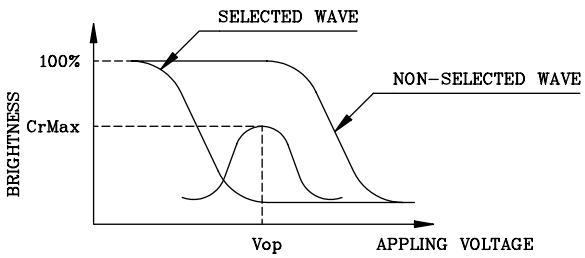
G: NORMALLY BLACK

AT ø=0° θ=0°

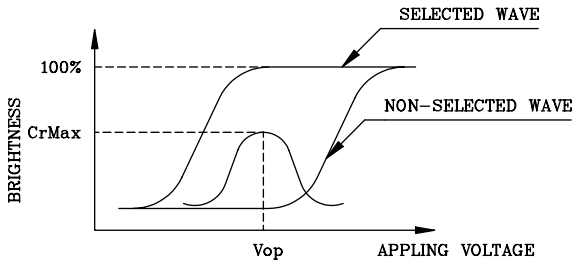
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	400	–	ms	see page 5 (Note 2)
		25℃	–	200	–		
		50℃	–	110	–		
Response Time (fall)	Tf	0℃	–	250	–	ms	see page 5 (Note 2)
		25℃	–	80	–		
		50℃	–	70	–		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



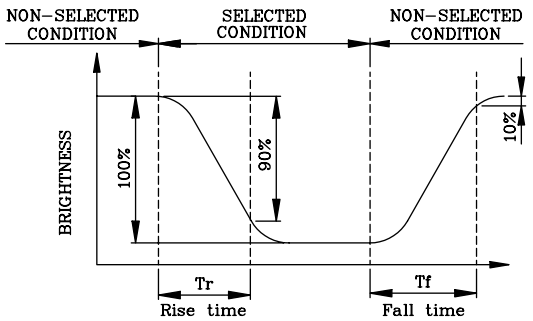
(negative type)

*Conditions

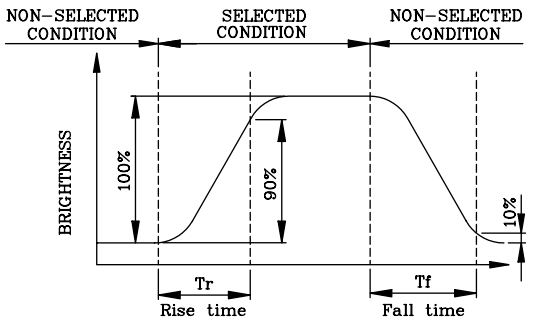
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



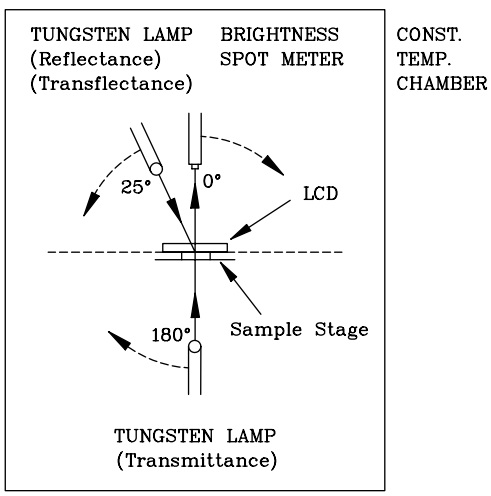
(negative type)

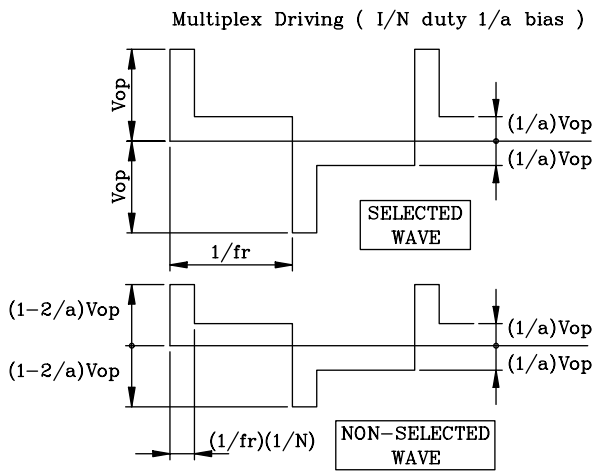
*Conditions

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

(NOTE 3)

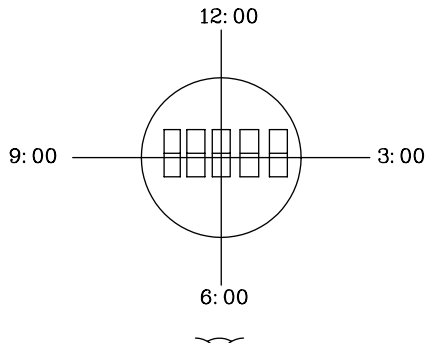
Description of Measuring Equipment and Driving Waveforms





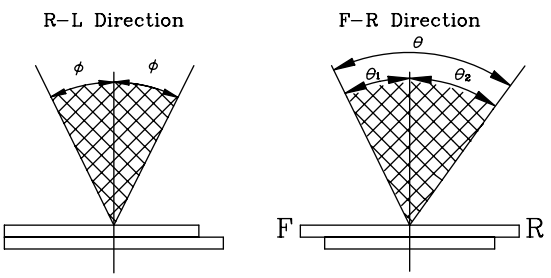
(NOTE 4)

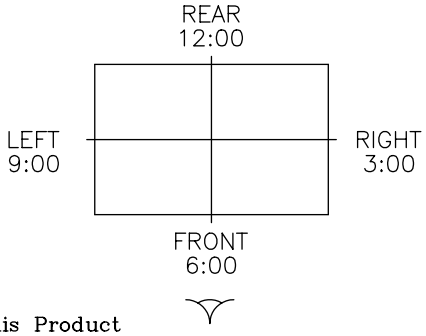
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

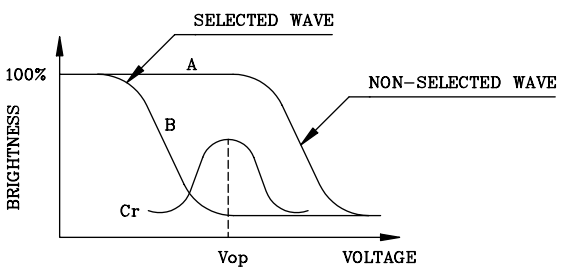
$\theta = \theta_1 + \theta_2$

*Conditions

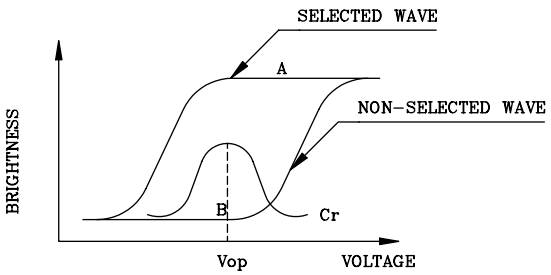
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



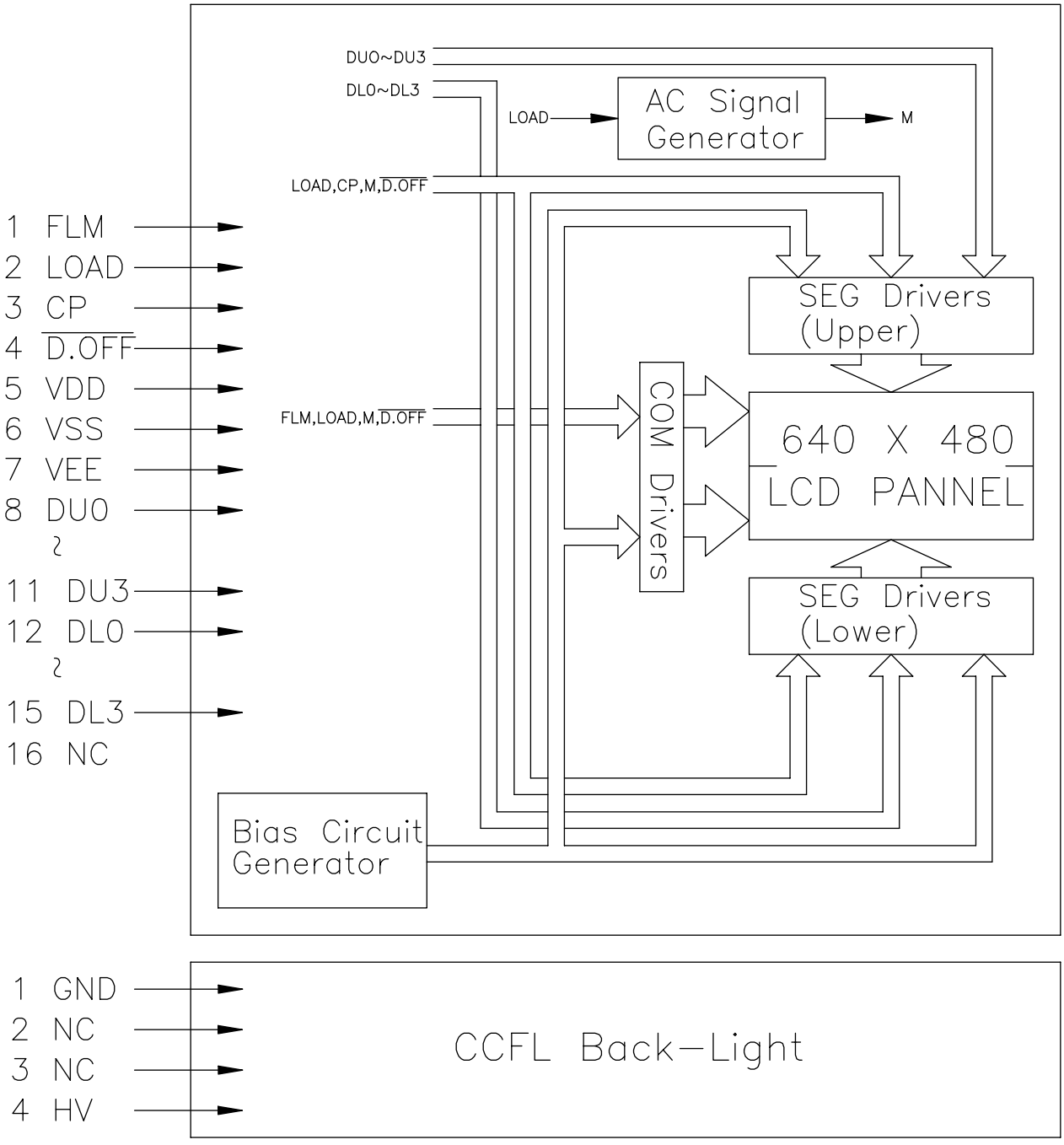
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

5. BLOCK DIAGRAM



* AC Signal Setting

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

6. INTERNAL PIN CONNECTION

LCD

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

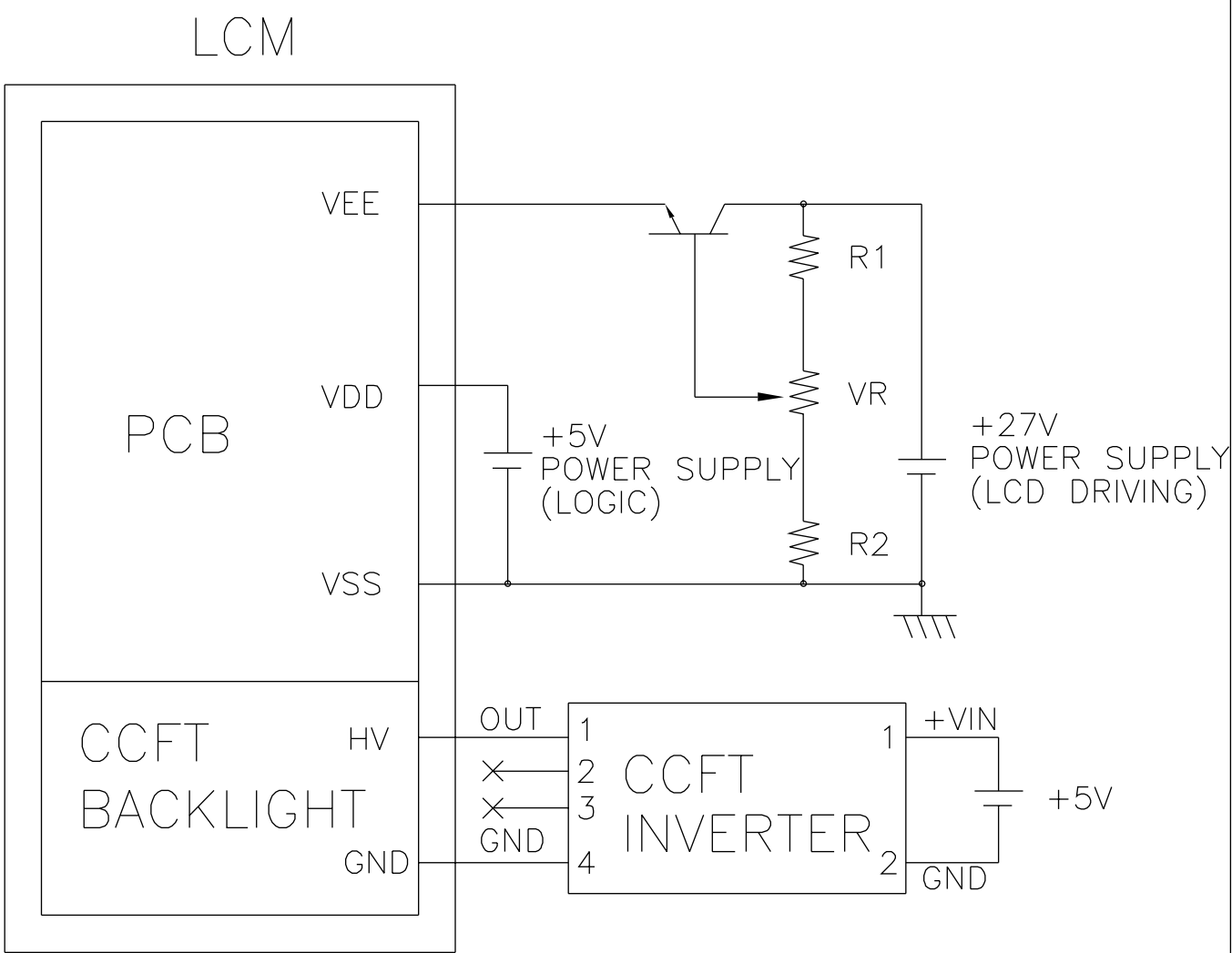
CCFT

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

LCD
Used connector : 53261-1590 (MOLEX)
Mating connector : 51021-1500 (MOLEX)

CCFT
Used connector : M63M83-04 (MITSUMI)
Mating connector : M60-04-30-114P (MITSUMI)
M60-04-30-134P (MITSUMI)
M61M73-04 (MITSUMI)

7. POWER SUPPLY



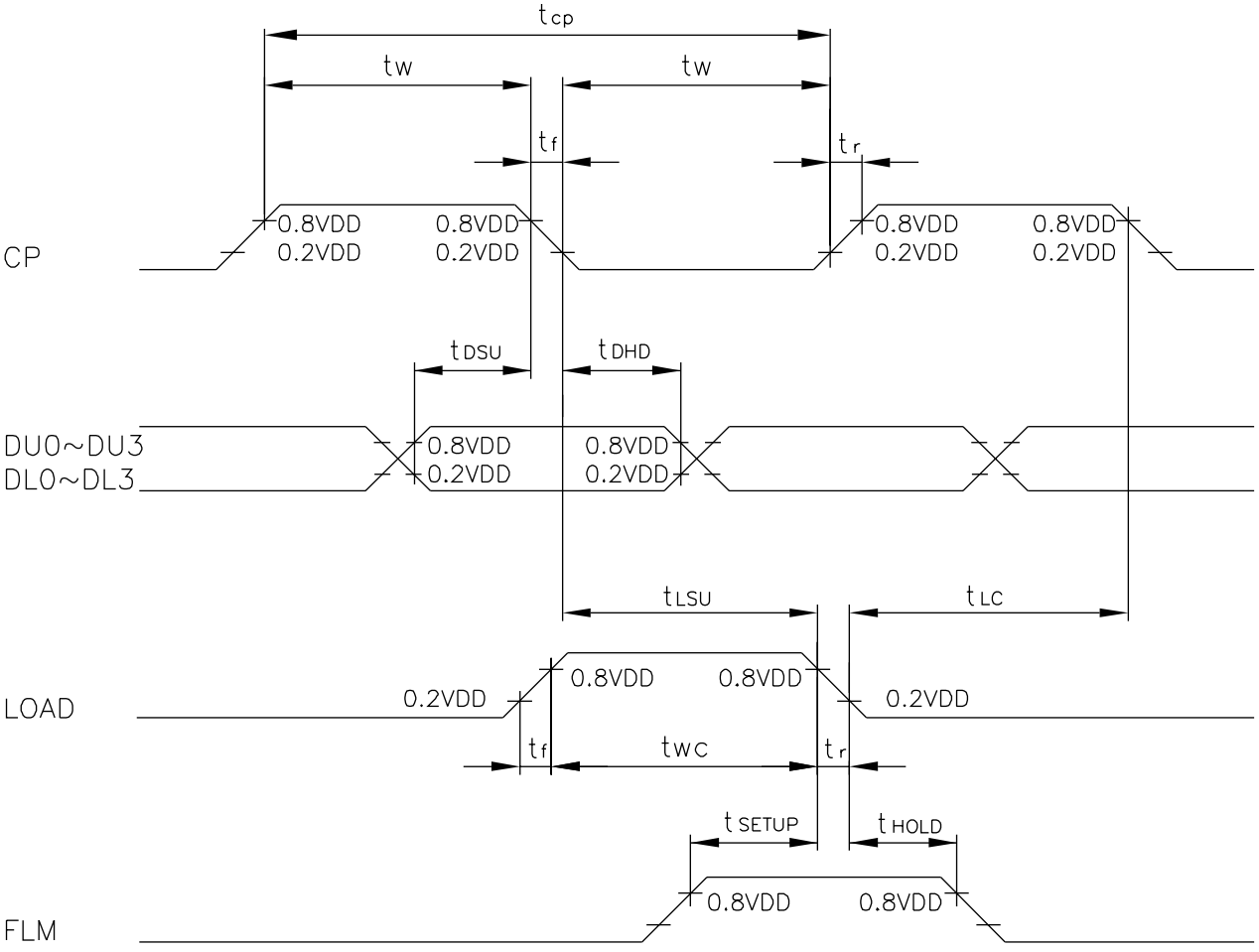
1. R1+VR+R2=10K~20KΩ
2. RECOMMENDED CCFT INVERTER : CXA-L10L(TDK)

8. TIMING CHARACTERISTICS

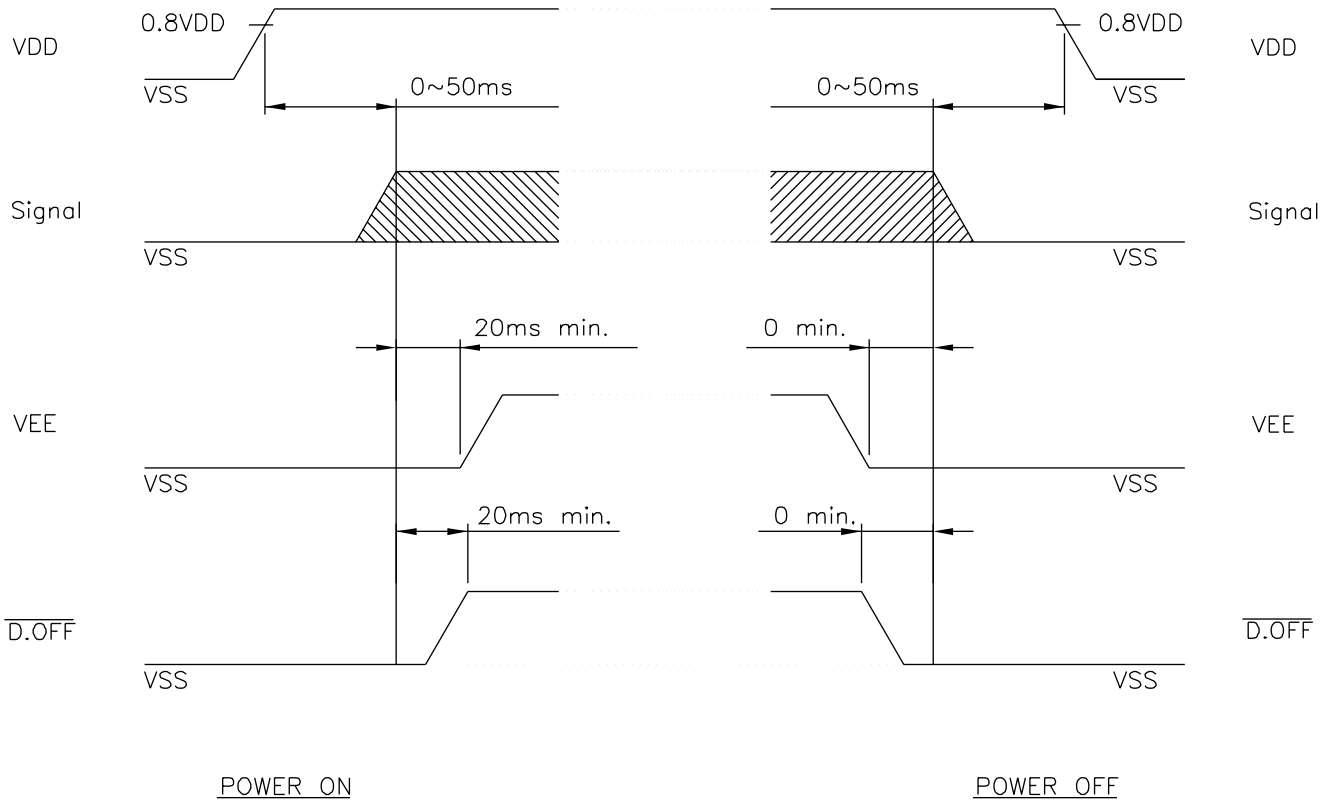
8-1. INTERFACE TIMING

@VDD=2.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	125	–	–	ns
"CP" PULSE WIDTH	t_W	51	–	–	ns
CLOCK RISE, FALL TIME	t_r , t_f	–	–	20	ns
DATA SETUP TIME	t_{DSU}	40	–	–	ns
DATA HOLD TIME	t_{DHD}	30	–	–	ns
"CP" → "LOAD" FALL TIME	t_{LSU}	51	–	–	ns
"LOAD" → "CP" FALL TIME	t_{LC}	51	–	–	ns
"FLM" SETUP TIME	t_{SETUP}	30	–	–	ns
"FLM" HOLD TIME	t_{HOLD}	50	–	–	ns
"LOAD" PULSE WIDTH	t_{WC}	51	–	–	ns

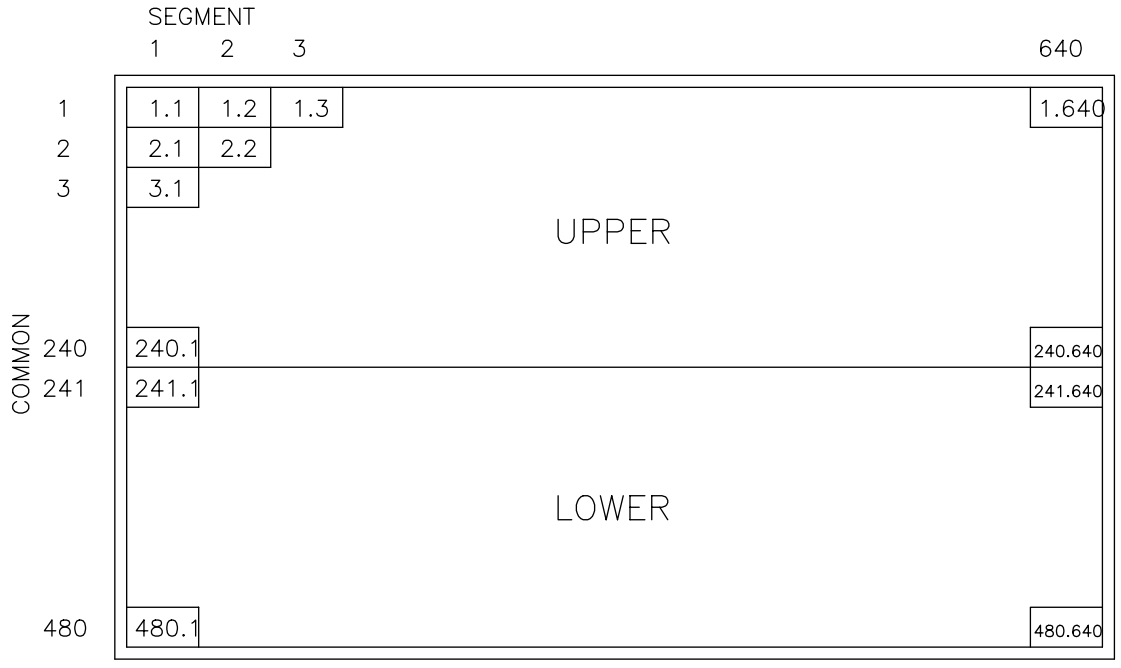


8-2.POWER ON/OFF TIMING

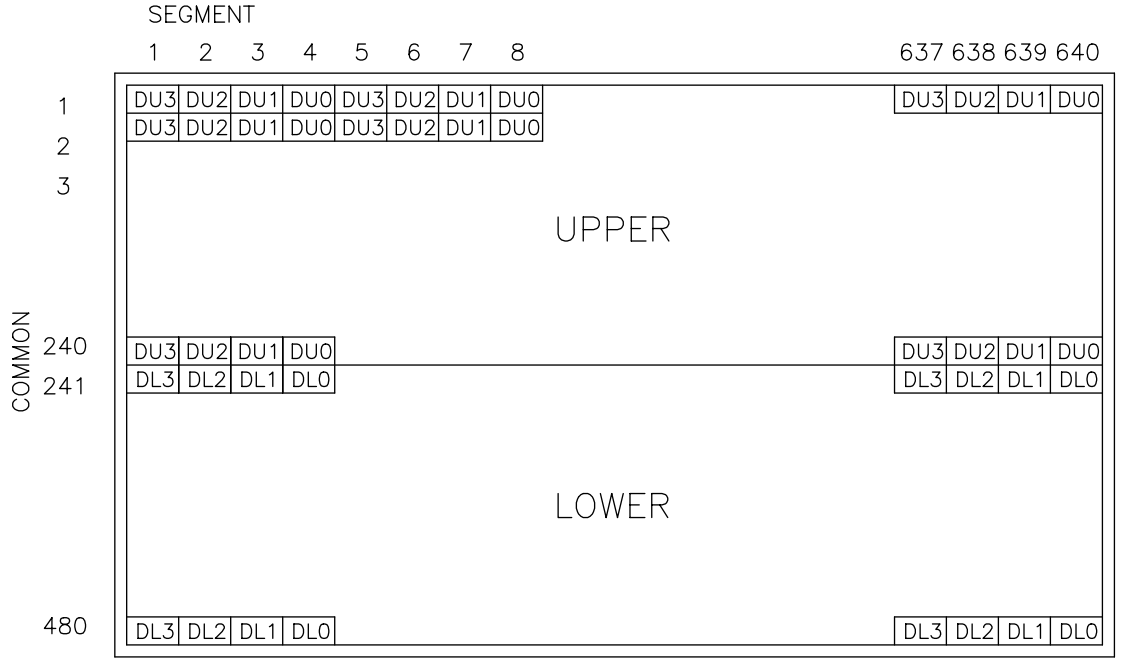


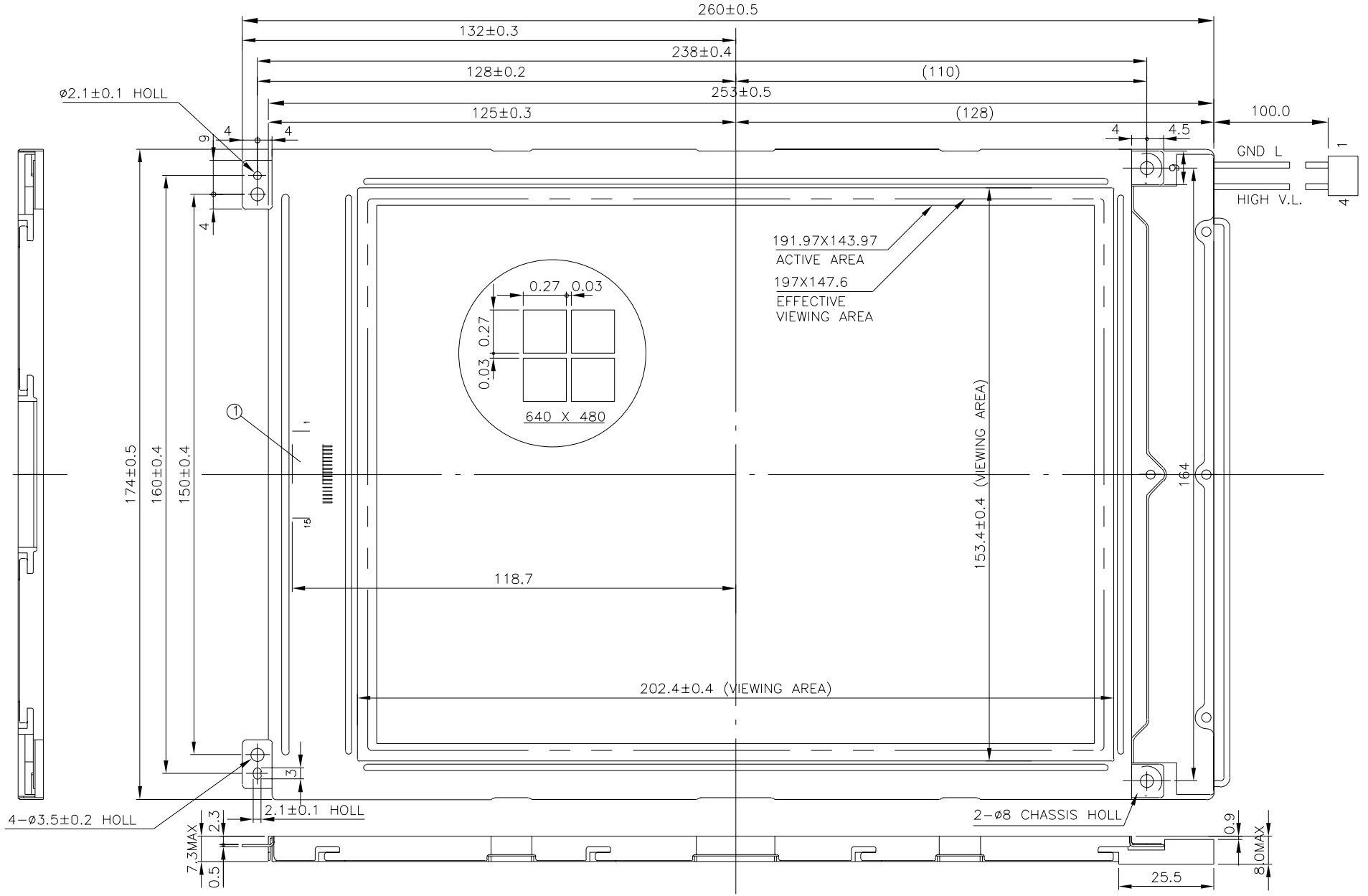
Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

8-3. DISPLAY PATTERN



NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT





PIN#	1	2	3	4	5	6	7	8
SYMBOL	FLM	LOAD	CP	$\overline{D.OFF}$	VDD	VSS	VEE	DU0
PIN#	9	10	11	12	13	14	15	–
SYMBOL	DU1	DU2	DU3	DL0	DL1	DL2	DL3	–

① INTERFACE CONNECTOR(15 PINS) :53261-1590(MOLEX)

② CCFL CONNECTOR : M63M83-04(MITSUMI)
(FOR CCFL B.L. ONLY)

LTBSHT157G7C			AZ DISPLAYS, INC.	
	NAME	DATE		
APPROVE			TITLE	AGM6448G
CHECK			DWG-NO	TBAT157G7C Rve.A
DESIGN				
DRAW	MAY PING	88.05.24	THIRD ANGLE PROJECT	UNIT : mm
				SCALE : 2/3