AZ DISPLAYS, INC.

1. MECHANICAL DATA

(1) Product No.   AGM6448C

(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

Revised: March 7, 2000

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD	−0.3	6.5	V	
Power Supply for LCM	VDD−VEE	0	30	V	
Input Voltage	VI	−0.3	VDD+0.3	V	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling LCM.

(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 ※	−		49m/s² (5G)	

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.
　　　　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

AZ DISPLAYS, INC.

3. ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD−VSS	−		4.75	5.0	5.25	V
Recommended LC Driving Voltage		VDD−VEE	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 VDD−VEE=22.5V		−	17	30	mA
		IEE	PATTERN : □■□■□■ ■□■□■□		−	15	25	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		15000	−	−	hrs
LCM	Surface Luminance	L	ALL ON		−	56.3	−	cd/m²
			ALL OFF		−	6.3	−	

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

4. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT V$_{OP}$

| ITEM	Cr(Contrast Ratio)						θ(Viewing Angle)		$\emptyset$(Viewing Angle)	
	0°C		25°C		50°C		25°C		25°C	
MODE	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 $\emptyset=0°$ $\theta=0°$

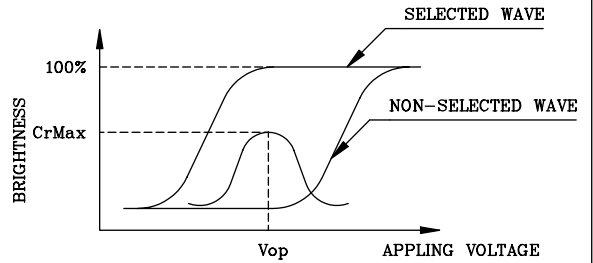| ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	−	400	−	ms	see page 5 (Note 2)
		25°C	−	200	−		
		50°C	−	110	−		
Response Time (fall)	Tf	0°C	−	250	−	ms	see page 5 (Note 2)
		25°C	−	80	−		
		50°C	−	70	−		

(NOTE 1)

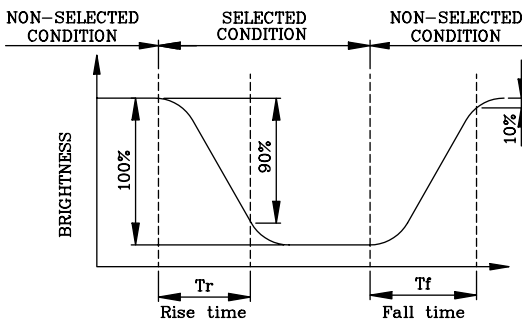Definition of Operation Voltage(Vop)
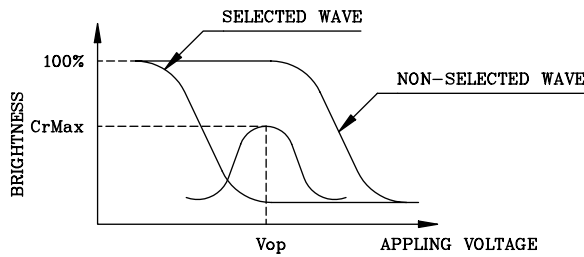
(positive type)

(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)
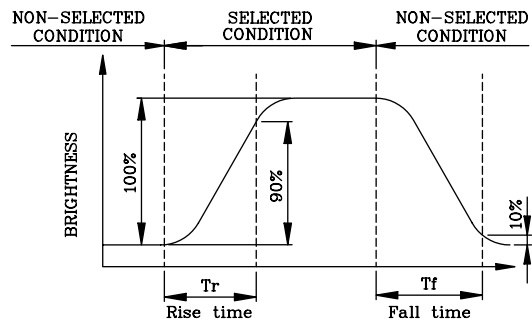
(negative type)

*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

TUNGSTEN LAMP   BRIGHTNESS   CONST.
(Reflectance)   SPOT METER   TEMP.
(Transflectance)   CHAMBER

25°   0°

LCD

180°

Sample Stage

TUNGSTEN LAMP
(Transmittance)

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

Vop

Vop

(1/a)Vop
(1/a)Vop

1/fr

SELECTED
WAVE

(1−2/a)Vop

(1−2/a)Vop

(1/a)Vop
(1/a)Vop

(1/fr)(1/N)

NON−SELECTED
WAVE
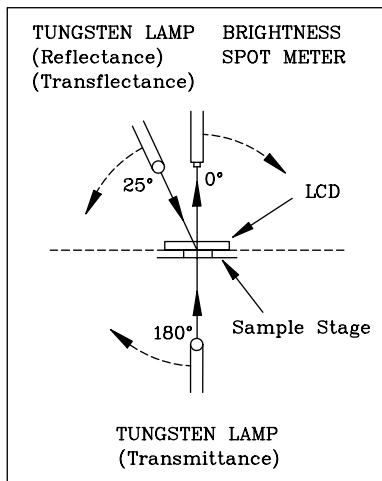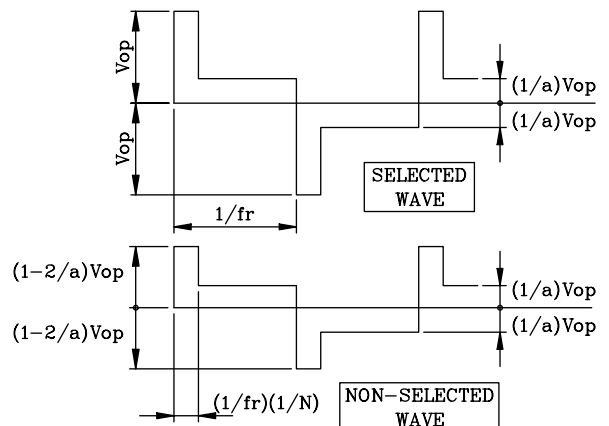
(NOTE 4)
Definition of Viewing Direction

12:00

9:00 ———————— 3:00

6:00
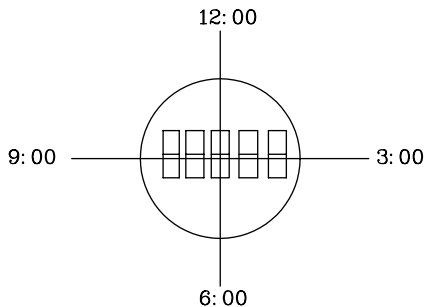
(NOTE 5)
Definition of Viewing Angle

R-L Direction

F-R Direction

REAR
12:00

LEFT
9:00

RIGHT
3:00

FRONT
6:00
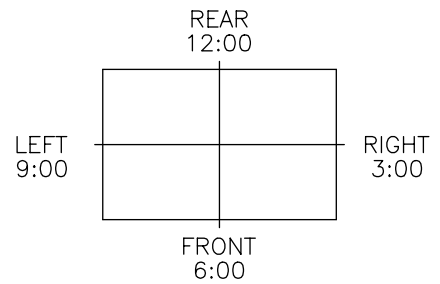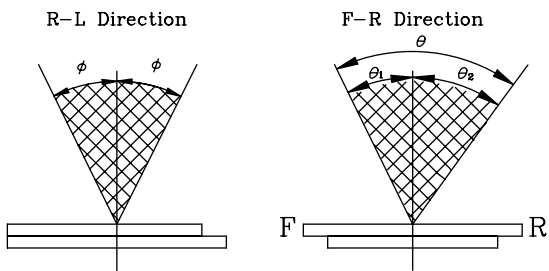
*For This Product
The Viewing Direction Is 6 O'clock
So $\theta 1 > \theta 2$

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

*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

BRIGHTNESS

B

NON-SELECTED WAVE

Cr

Vop   VOLTAGE

(positive type)

SELECTED WAVE

A

BRIGHTNESS

NON-SELECTED WAVE

B   Cr

Vop   VOLTAGE
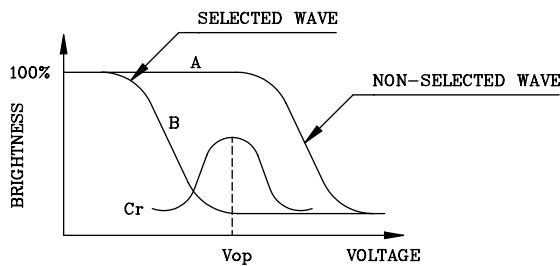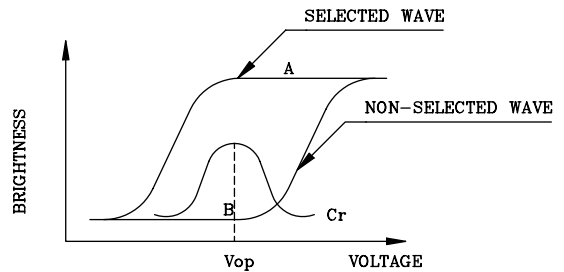
(negative type)

Contrast Ratio : Cr=A/B

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

5. BLOCK DIAGRAM

DU0~DU3

DL0~DL3

LOAD → | AC Signal Generator | → M

LOAD,CP,M,$\overline{\text{D.OFF}}$

1 FLM →
2 LOAD →
3 CP →
4 $\overline{\text{D.OFF}}$ →
5 VDD →
6 VSS →
7 VEE →
8 DU0 →
≀
11 DU3 →
12 DL0 →
≀
15 DL3 →
16 NC

FLM,LOAD,M,$\overline{\text{D.OFF}}$

SEG Drivers (Upper)

COM Drivers

640 X 480 LCD PANNEL

SEG Drivers (Lower)

Bias Circuit Generator

1 GND →
2 NC →
3 NC →
4 HV →

CCFL Back-Light
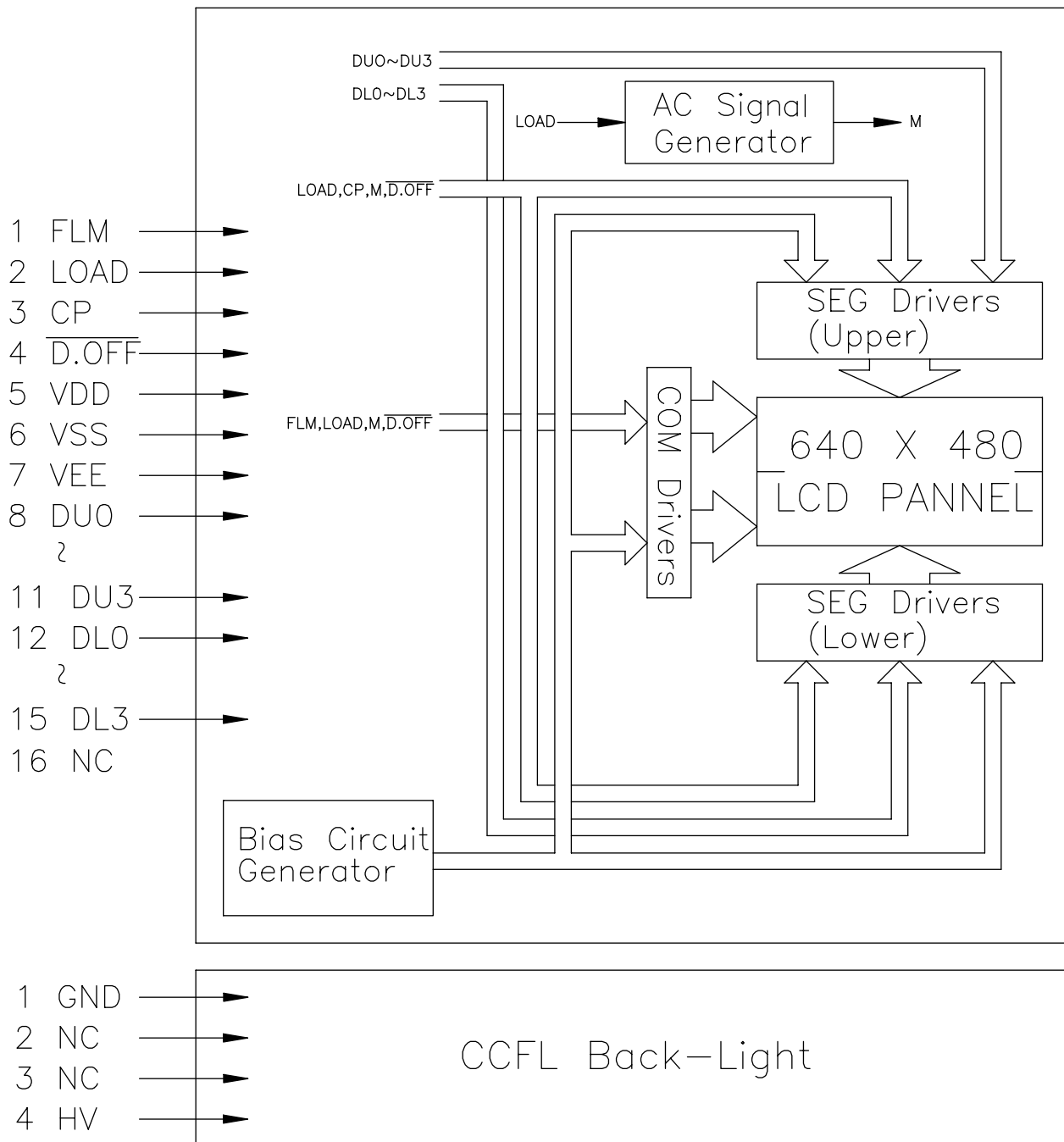
* AC Signal Setting

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

AZ DISPLAYS, INC.

AGM6448C

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		
9	DU1	H/L	DISPLAY DATA (UPPER HALF)
10	DU2		
11	DU3		
12	DL0		
13	DL1	H/L	DISPLAY DATA (LOWER HALF)
14	DL2		
15	DL3		

CCFT

Pin No.	Symbol	Level	Function
1	GND	−	GROUND LINE (INVERTER)
2	NC	−	NON CONNECTION
3	NC	−	NON 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

LCM
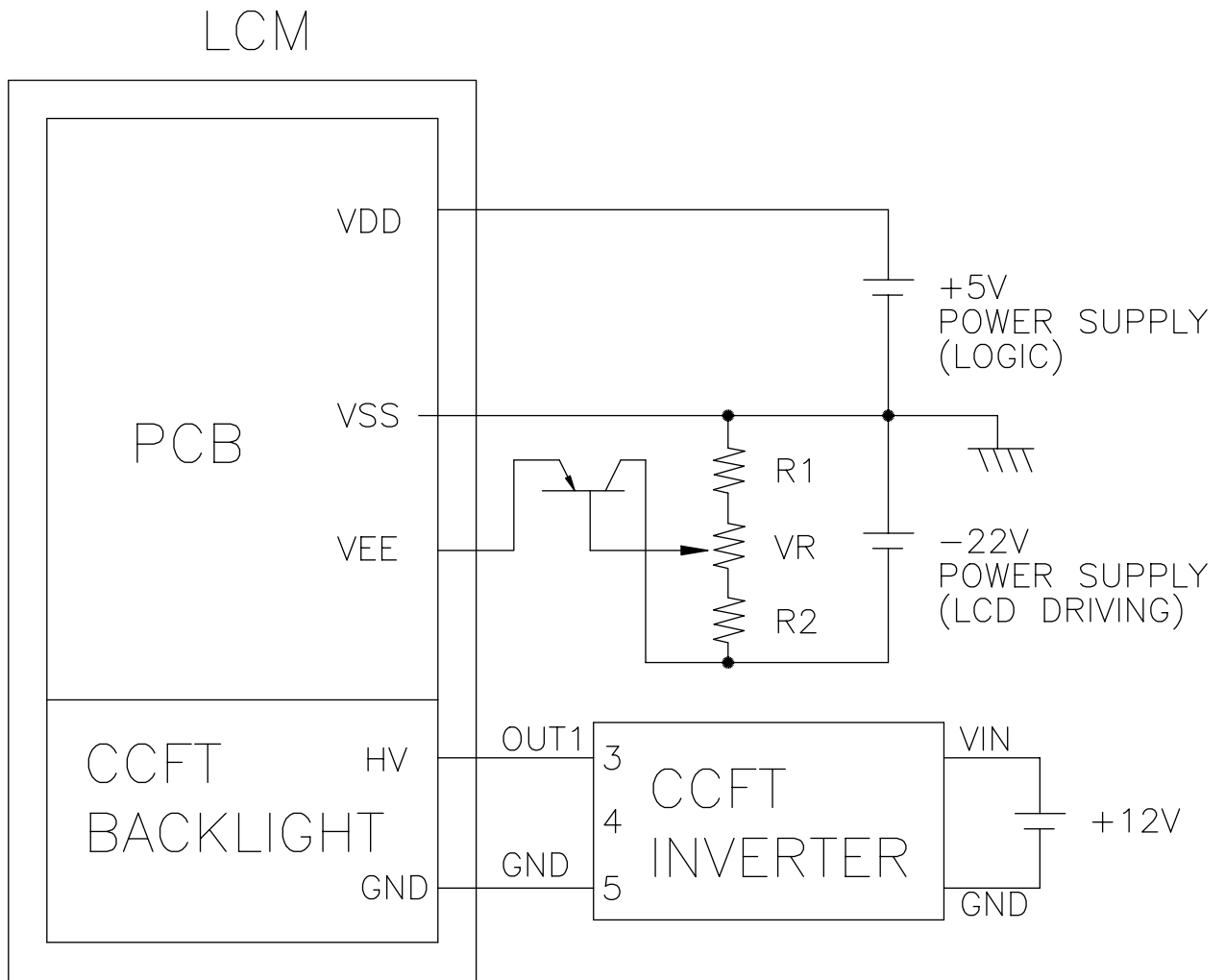
1. R1+VR+R2=10K~20KΩ

2. RECOMMENDED CCFT INVERTER : CXA−L10L(TDK)

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

@VDD=4.5~5.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Shift Clock Period	t_{cp}	153	—	—	ns
CLOCK PULSE WIDTH	t_w	56	—	—	ns
CLOCK RISE, FALL TIME	t_r, t_f	—	—	20	ns
DATA SETUP TIME	t_{DSU}	50	—	—	ns
DATA HOLD TIME	t_{DHD}	40	—	—	ns
"CP" → "LOAD" FALL TIME	t_{LSU}	65	—	—	ns
"LOAD" → "CP" FALL TIME	t_{LC}	65	—	—	ns
FLM SETUP TIME	t_{SETUP}	100	—	—	ns
FLM HOLD TIME	t_{HOLD}	100	—	—	ns
LOAD PULSE WIDTH	t_{WC}	70	—	—	ns

8-2.POWER ON/OFF TIMING

```
        0.8VDD ─┐                              ┌─ 0.8VDD
VDD            │                              │         VDD
        VSS  ──┘  │←── 0~50ms ──→│   │←── 0~50ms ──→│  └── VSS

Signal         ░░░░░░░░░░░░       ░░░░░░░░░░░░          Signal
        VSS                                     VSS

        VSS ───────────┐          ┌─────────── VSS
                       │          │                    VEE
VEE                    └──        └──

                   │←─ 20ms min. ─→│   │←─ 0 min. ─→│
                   │←── 20ms min. ──→│  │←─ 0 min. ─→│

              ┌──────           ──────┐
D.OFF  VSS ───┘                        └─── VSS        D.OFF
```

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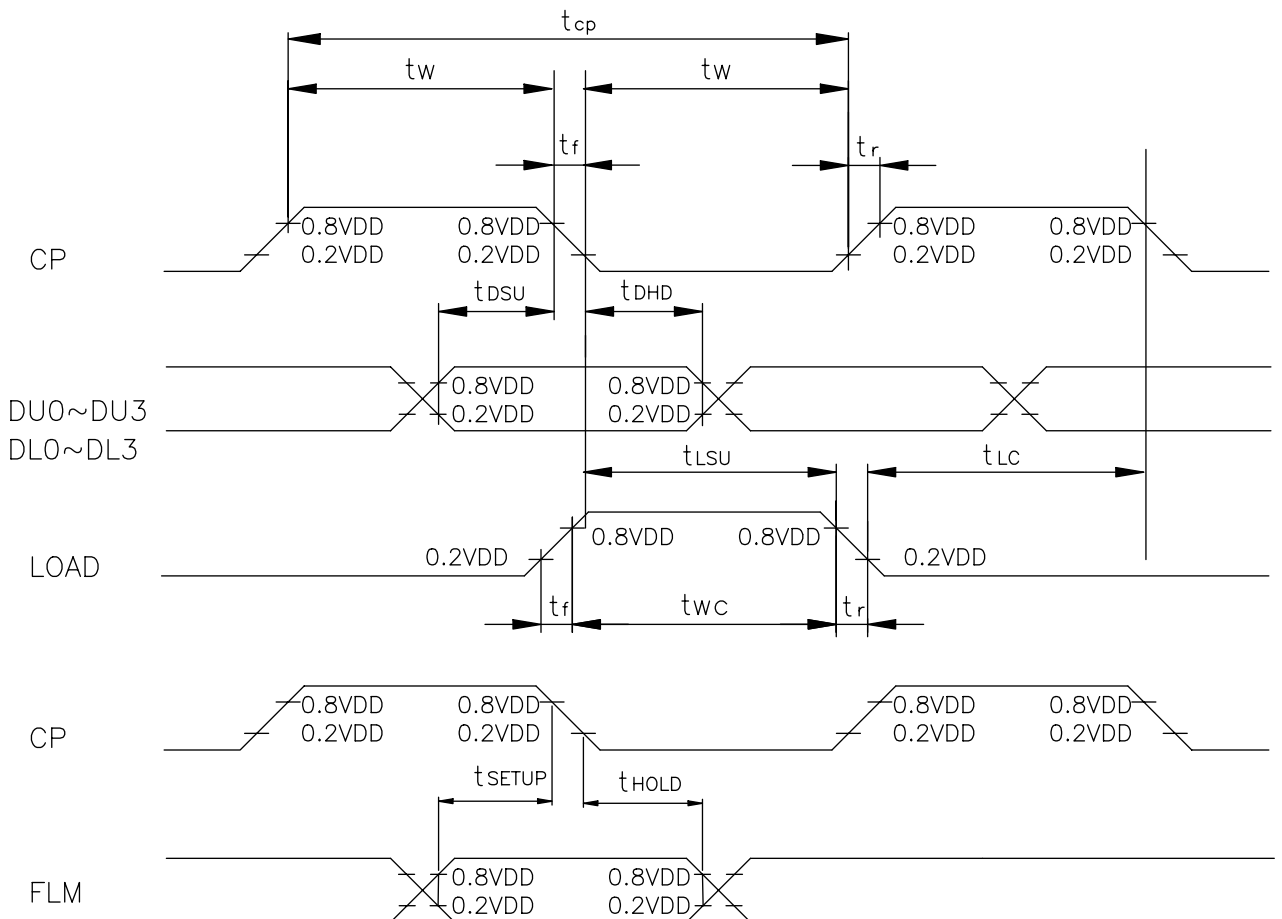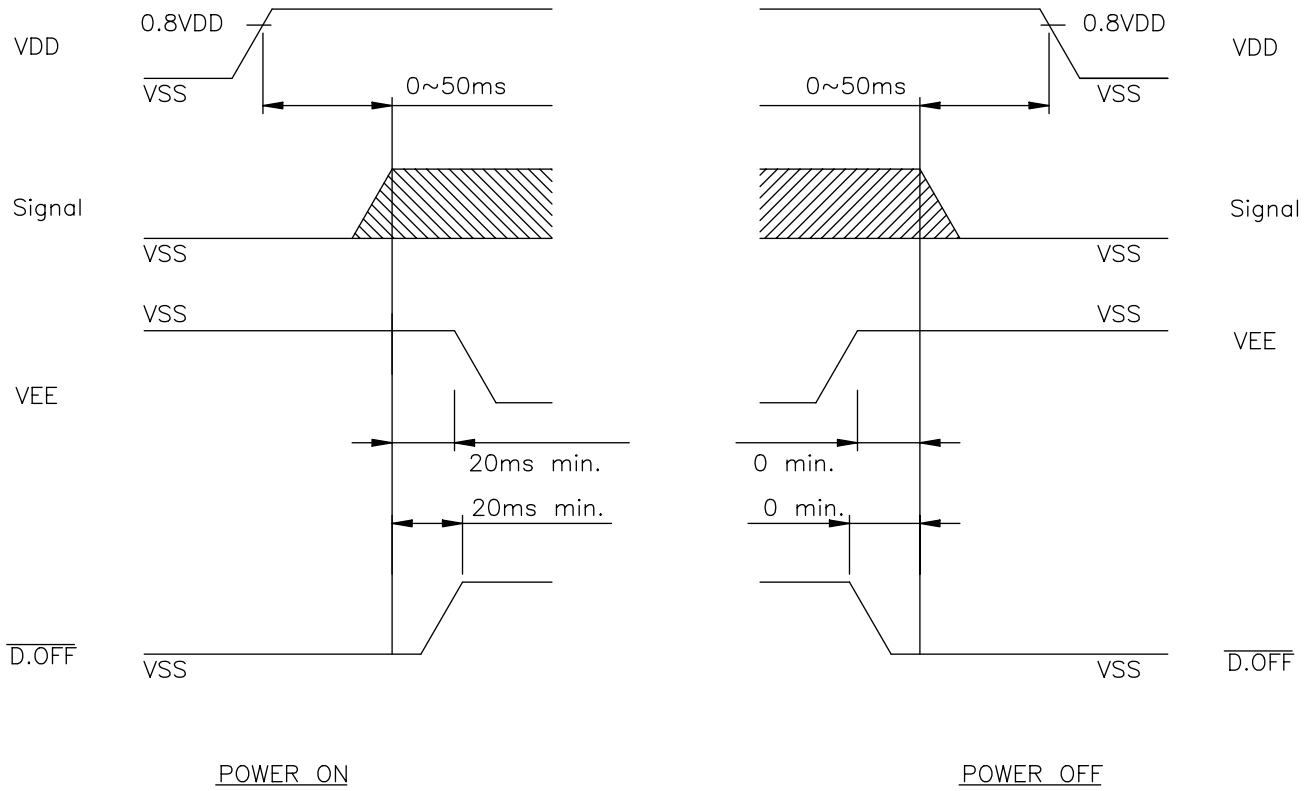
Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

8-3. DISPLAY PATTERN

SEGMENT

```
            1      2      3                                              640
         ┌──────────────────────────────────────────────────────────────┐
    1    │ 1.1 │ 1.2 │ 1.3 │                                      │1.640│ │
    2    │ 2.1 │ 2.2 │                                                    │
    3    │ 3.1 │                                                          │
         │                                                                │
         │                          UPPER                                 │
  240    │240.1│                                                  │240.640│
  241    │241.1│                                                  │241.640│
         │                                                                │
         │                          LOWER                                 │
  480    │480.1│                                                  │480.640│
         └──────────────────────────────────────────────────────────────┘
```
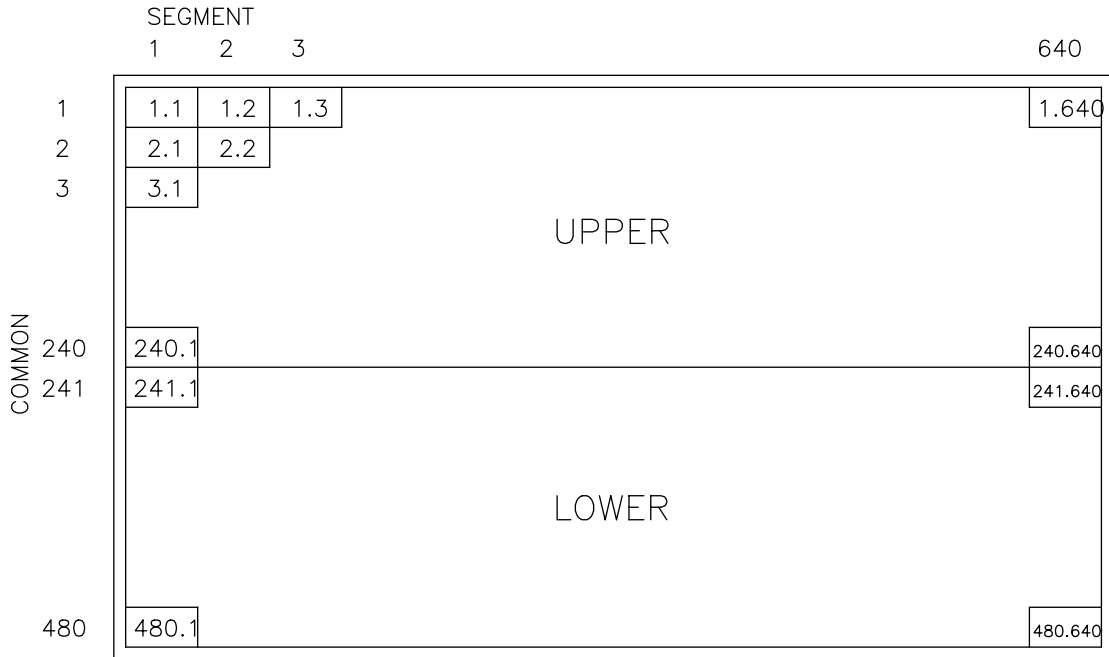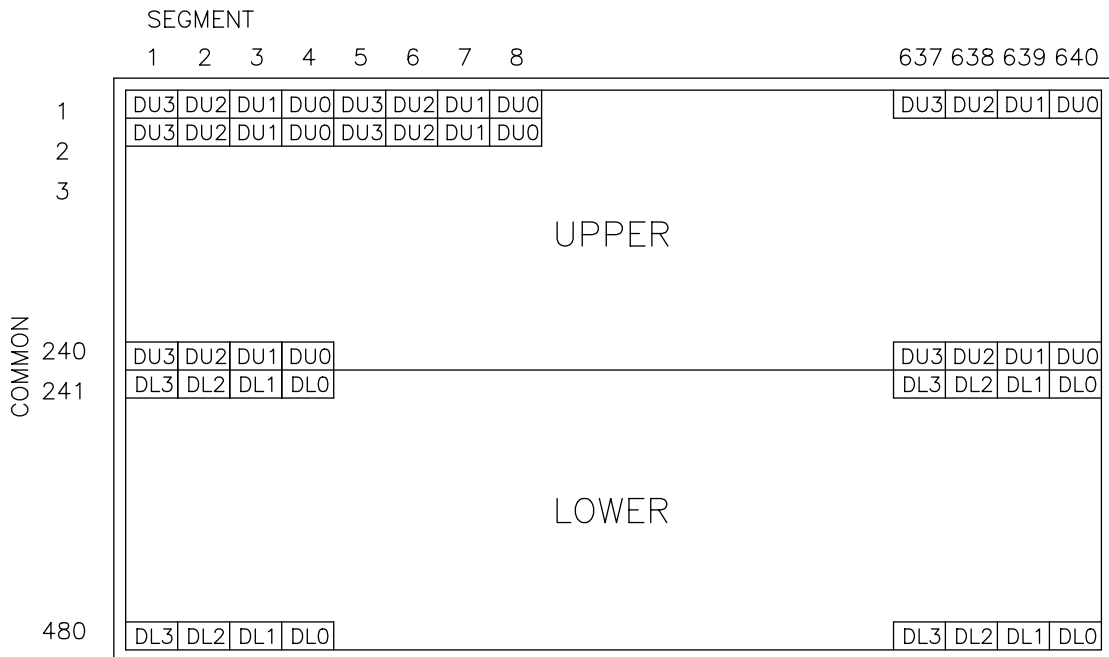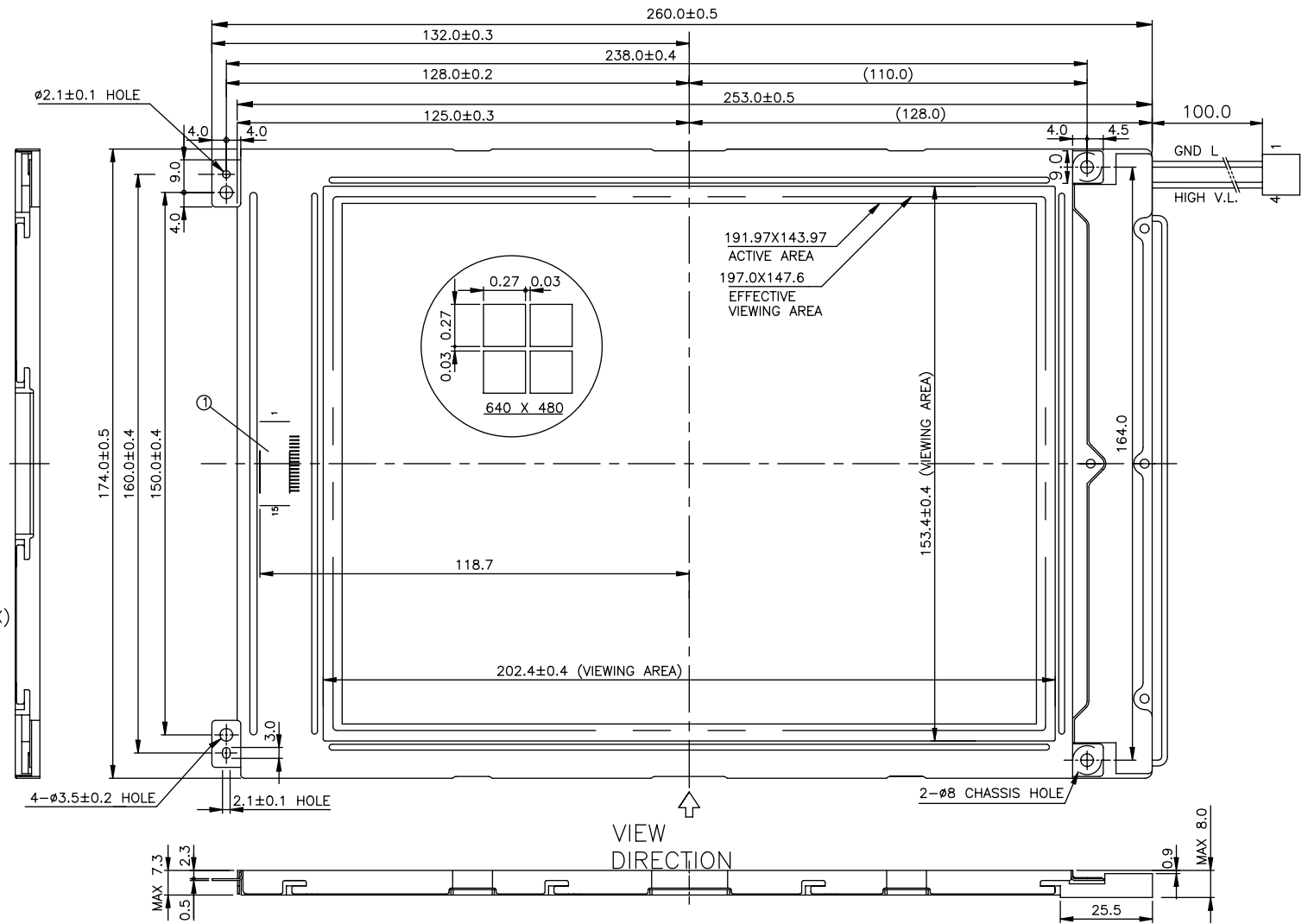
COMMON (vertical label on left)

NOTE : 1.1 MEANS 1ST COMMON 1ST SEGMENT DOT

SEGMENT

```
       1   2   3   4   5   6   7   8              637 638 639 640
     ┌──────────────────────────────────────────────────────────────┐
 1   │DU3│DU2│DU1│DU0│DU3│DU2│DU1│DU0│      │DU3│DU2│DU1│DU0│          │
 2   │DU3│DU2│DU1│DU0│DU3│DU2│DU1│DU0│                                 │
 3   │                                                                │
     │                         UPPER                                  │
240  │DU3│DU2│DU1│DU0│                      │DU3│DU2│DU1│DU0│          │
241  │DL3│DL2│DL1│DL0│                      │DL3│DL2│DL1│DL0│          │
     │                                                                │
     │                         LOWER                                  │
480  │DL3│DL2│DL1│DL0│                      │DL3│DL2│DL1│DL0│          │
     └──────────────────────────────────────────────────────────────┘
```

COMMON (vertical label on left)

NOTE:

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

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

Labels on drawing:
- 260.0±0.5
- 132.0±0.3
- 238.0±0.4
- 128.0±0.2
- (110.0)
- 253.0±0.5
- 125.0±0.3
- (128.0)
- 100.0
- φ2.1±0.1 HOLE
- 4.0
- 4.0
- 4.0
- 4.5
- GND L
- HIGH V.L.
- 9.0
- 9.0
- 4.0
- 191.97X143.97 ACTIVE AREA
- 197.0X147.6 EFFECTIVE VIEWING AREA
- 0.27 0.03
- 0.27
- 0.03 0.27
- 640 X 480
- 174.0±0.5
- 160.0±0.4
- 150.0±0.4
- 153.4±0.4 (VIEWING AREA)
- 164.0
- 1
- 15
- 118.7
- 202.4±0.4 (VIEWING AREA)
- 3.0
- 4-φ3.5±0.2 HOLE
- 2.1±0.1 HOLE
- 2-φ8 CHASSIS HOLE
- VIEW DIRECTION
- MAX 7.3
- 2.3
- 0.5
- MAX 8.0
- 0.9
- 25.5

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	D.OFF	H/L	DISPLAY OFF ("H"=ON,"L"=OFF)
5	VDD	—	POWER SUPPLY FOR LCD (+5V)
6	VSS	—	SIGNAL GROUND (GND)
7	VEE	—	POWER SUPPLY FOR LCD (−V)
8	DU0		
9	DU1	H/L	DISPLAY DATA
10	DU2		(UPPER HALF)
11	DU3		
12	DL0		
13	DL1	H/L	DISPLAY DATA
14	DL2		(LOWER HALF)
15	DL3		

AZ DISPLAYS, INC.

DIMENSION	TOLERANCE		NAME	DATE	THIRD ANGLE P.
L ≦ 6	±0.25 (mm)	APPROVE			
6 < L ≦ 18	±0.3 (mm)	CHECK			
18 < L ≦ 50	±0.4 (mm)	DESIGN	SEAN HU	881222	SCALE UNIT
50 < L ≦ 125	±0.5 (mm)	DRAWN	J.S HUANG	88.11.19	1/0.75 mm
125 < L	±0.6 (mm)	DWG NO.	AGM6448C		
ANGLE	±1° (DEG)				