AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR

LIQUID CRYSTAL DISPLAY

PART NUMBER:	AGM3224K
REVISED:	NOVEMBER 11, 2002

Record of Revisions

DATE	REVISED NO.	REF. PAGE	SUMMARY
11/11/2002	1	5/16	The "Recommeded LCD Driving Voltage" values have decreased

1. MECHANICAL DATA

(1) Product No.		AGM3224K
(2) Module Size		88.3 (W)mm X 69.1 (H)mm X 2.2MAX (D)mm
(3) Dot Size		0.225 (W)mm X 0.225 (H)mm
(4) Dot Pitch		0.24 (W)mm X 0.24 (H)mm
(5) Number of Dots		320 (W) X 240 (H) Dots
(6) Duty		1/240
(7) LCD Display Mode	FSTN:	☐ Black and White(Normally White/Positive Image)
	Rear Polarizer:	☐ Transflective
(8) Viewing Direction		9 O'clock
(9) Backlight		W/O
(10) Weight		24.5 g(Approx)
(11) Controller		Excluded
(12) DC/DC Converter		Excluded

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

GND=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−GND	−0.3	7.0	V	
Power Supply for LC Drive	VLCD−GND	−0.3	36.0	V	
Input Voltage	VI	−0.3	VDD+0.3	V	
Static Electricity	−	−	−	−	Note 1

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	−20	70	−30	80
Humidity(Without Condensation	Note 2,3		Note 2,4	

Note 1 LCM should be grounded during handling

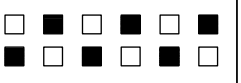
Note 2 Background color will change slightly depending on ambient temperature. This phenomenon is reversible.

Note 3 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 4 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

3. ELECTRICAL CHARACTERISTICS

(VDD = 3.0V ± 10%)

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage	VIH	H level		0.8VDD	–	VDD	V
	VIO	L level		0	–	0.2VDD	V
Recommended LC Driving Voltage (WIDE TEMP. LCM)	VLCD–GND (Vop)	1/240 Duty 1/12 Bias	–20°C	17.3	17.5	17.7	V
			0°C	15.7	15.9	16.1	
			25°C	15.2	15.4	15.6	
			50°C	14.4	14.6	14.8	
			70°C	13.5	13.7	13.9	
Power Supply Current	IDD	VDD=3.0V GND=0V VDD–GND=22.7V FLM=70Hz PATTERN : 		–	0.1	0.3	mA
	ILCD			–	0.55	1.0	

4.OPTICAL CHARACTERISTICS

AT Vop

ITEM / MODE		Cr(Contrast Ratio)										θ(Viewing Angle)		φ(Viewing Angle)	
		−20°C		−0°C		25°C		50°C		70°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
Z	T	2.5	3.0	3.5	4.0	5.0	5.5	3.0	3.5	2.0	2.5	−	F: 30 R: 25	−	±30
note		NOTE 6										NOTE 5			

NOTE :

Z: OTHER

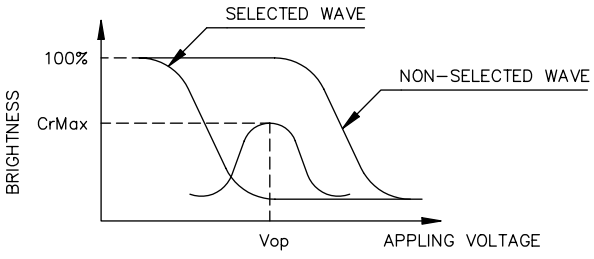
T: NORMALLY WHITE(9 O'clock)

AT φ=0° θ=0°

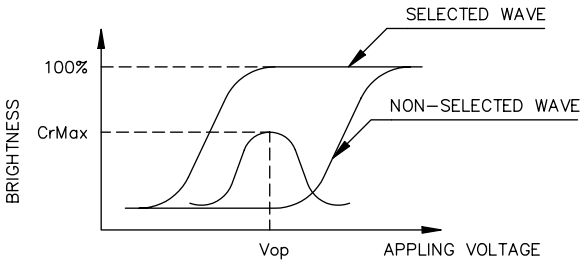
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	−20°C	5200	6700	10000	ms	NOTE 2
		0°C	950	1200	1800		
		25°C	280	350	500		
		50°C	130	160	250		
		70°C	80	100	150		
Response Time (fall)	Tf	−20°C	3400	4300	6500	ms	NOTE 2
		0°C	550	700	1000		
		25°C	200	250	350		
		50°C	70	90	140		
		70°C	50	70	110		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



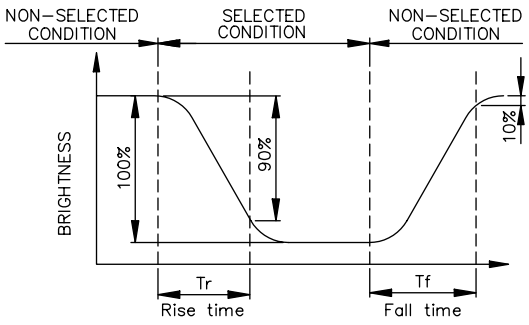
(negative type)

*Conditions

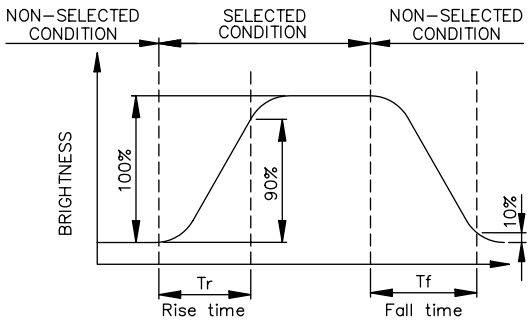
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



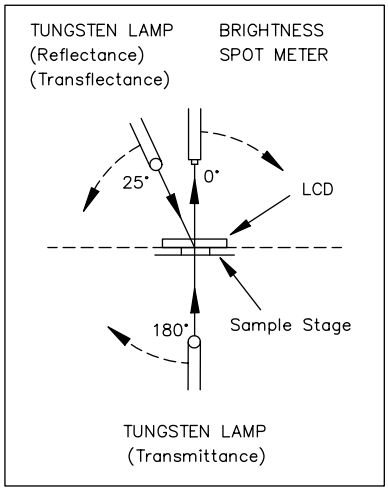
(negative type)

*Conditions

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

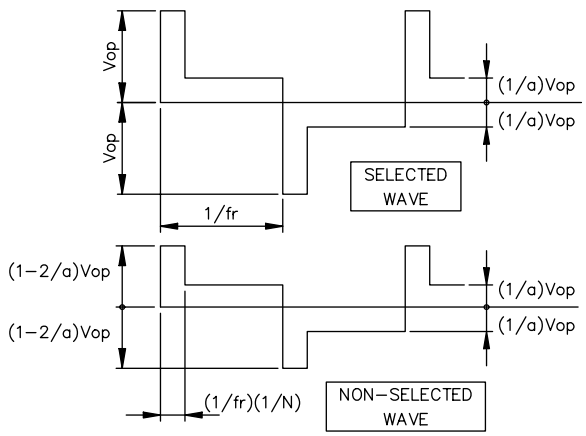
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



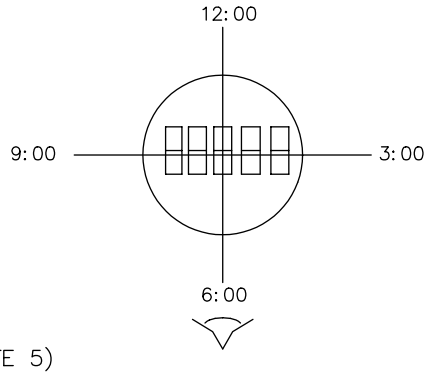
CONST.
TEMP.
CHAMBER

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



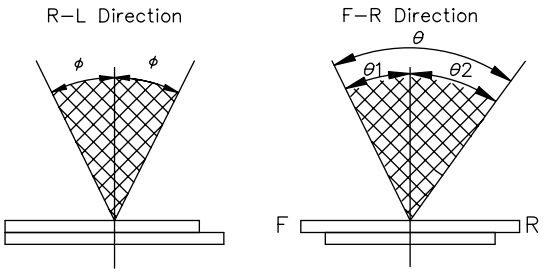
(NOTE 4)

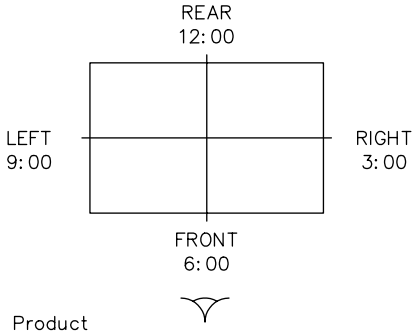
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta 1 > \theta 2$

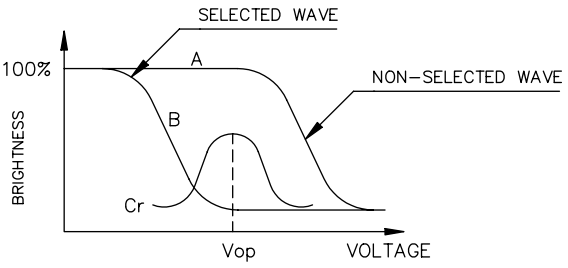
$\theta = \theta 1 + \theta 2$

*Conditions

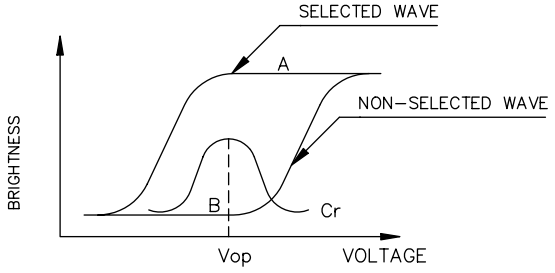
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



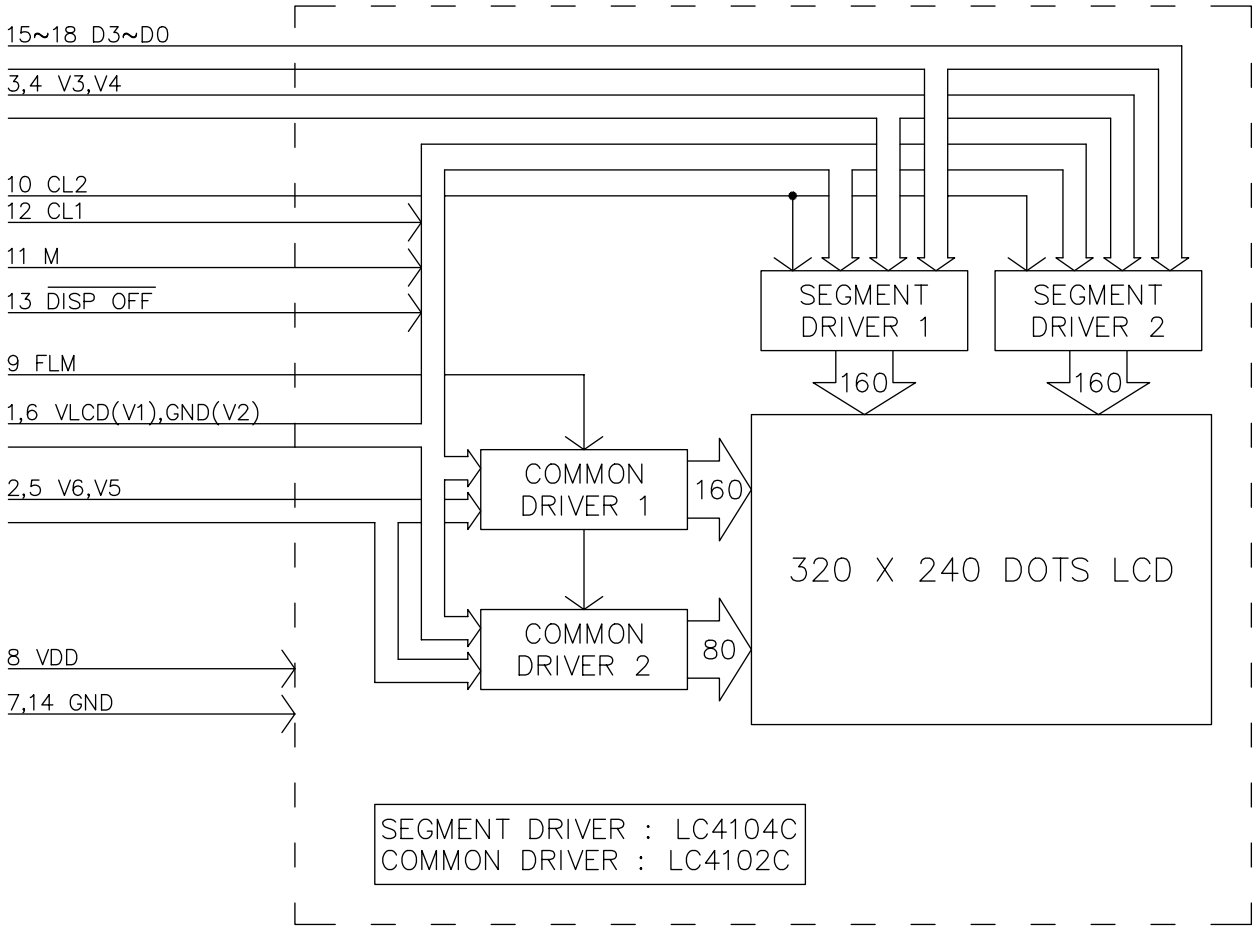
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

5. BLOCK DIAGRAM



Note :

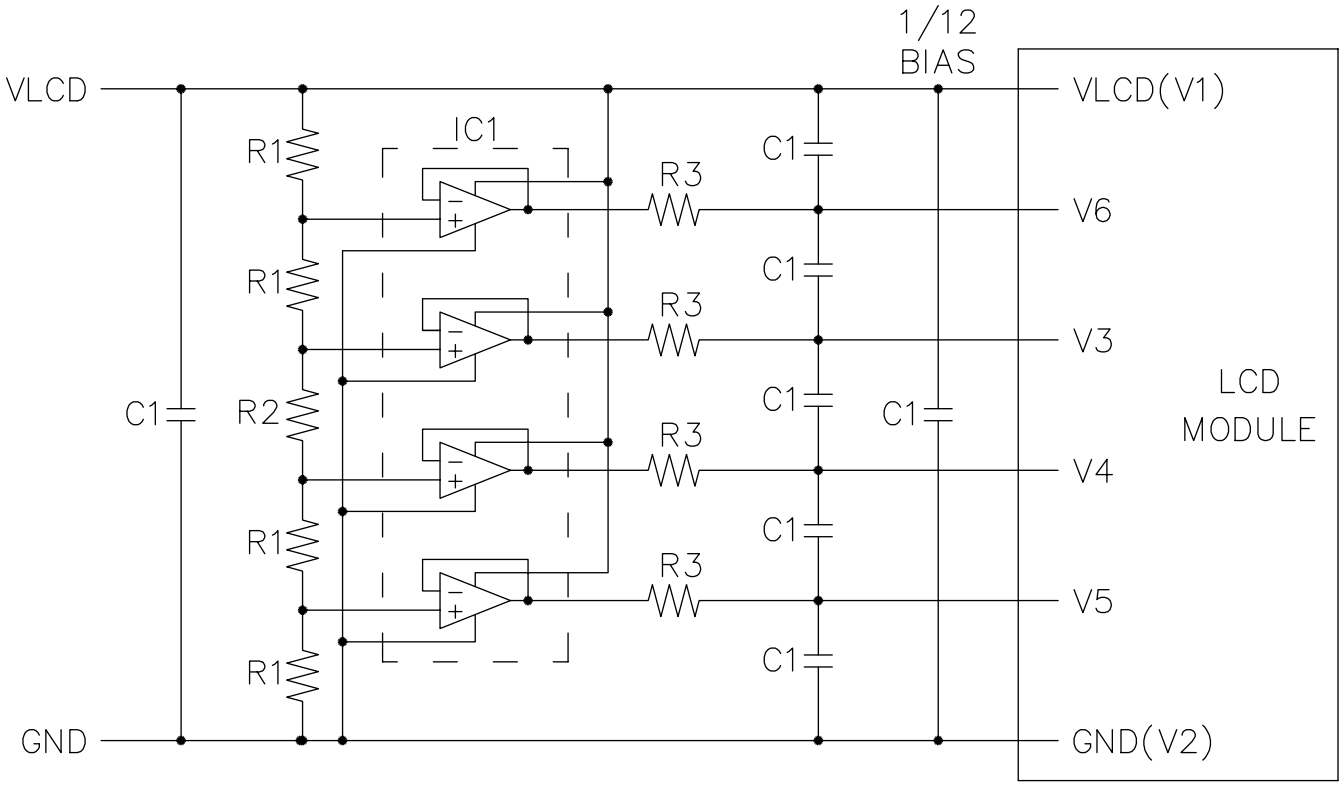
1)Controller and bias voltage supply circuit are not included.

2)VLCD(V1),GND(V2),V6,V3,V4 and V5 are power supply voltage for LCD. (V1>V6>V3>V4>V5>V2)

6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	VLCD(V1)	Bias voltage(Liquid crystal drive voltage)
2	V6	Bias voltage(V1>V6>V3>V4>V5>V2)
3	V3	
4	V4	
5	V5	
6	GND(V2)	(GND: 0V)
7	GND	0V
8	VDD	Power supply voltage: +3.0V typ
9	FLM	Frame signal
10	CL2	Display data shift clock
11	M	LCD drive signal(AC signal)
12	CL1	Display data latch signal
13	$\overline{\text{DISP OFF}}$	Display ON/OFF control signal("H": Display ON,"L": Display OFF)
14	GND	0V
15	D3	Display data
16	D2	
17	D1	
18	D0	

7. POWER SUPPLY



IC1 :LP324M(NATIONAL SEMICONDUCTOR)
R1 :22(KOHM)±0.5%, R2 :180(KOHM)±2%, R3 :4.7(OHM)±5%
C1 : 2.2−4.7(uF)

8. TIMING CHARACTERISTICS

8-1. INTERFACE TIMING

@ VDD=3.0V±10%, Ta=-20~70 ℃

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CL2 Cycle Time	tC	Fig.a	82	–	–	ns
CL2 Pulse Width	tSWH,tSWL	Fig.a	28	–	–	ns
CL2 Rise/Fall Time	tCR,tCF	Fig.a	–	–	50	ns
Data Set Up Time	tDSU	Fig.a , Fig.b	100	–	–	ns
Data Hold Time	tDHD	Fig.a , Fig.b	30	–	–	ns
CL1 Cycle Time	tL	Fig.b	250	–	–	ns
CL1 "H" Pulse Width	tLWH	Fig.a , Fig.b	100	–	–	ns
CL1 Rise/Fall Time	tLR,tLF	Fig.b	–	–	30	ns
CL2 To CL1 Delay Time	tCL	Fig.a	30	–	–	ns
CL1 To CL2 Delay Time	tLC	Fig.a	–	–	200	ns
FLM TO CL1 SETUP TIME	tFLS	Fig.b	30	–	–	ns
FLM TO CL1 HOLD TIME	tFLH	Fig.b	50	–	–	ns

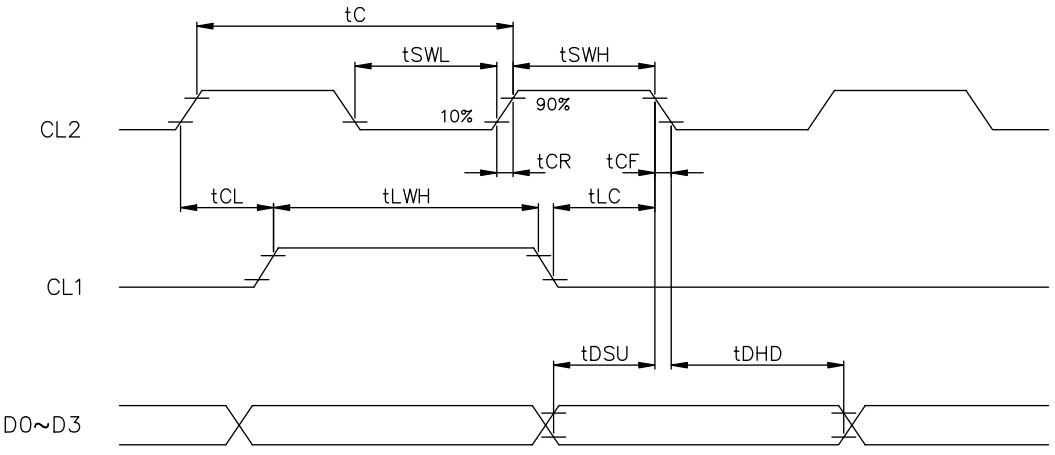


Fig . a Interface timing (SEGMENT)

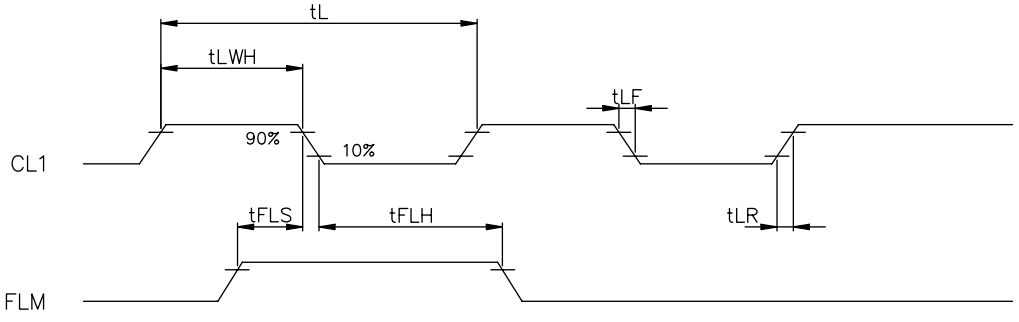
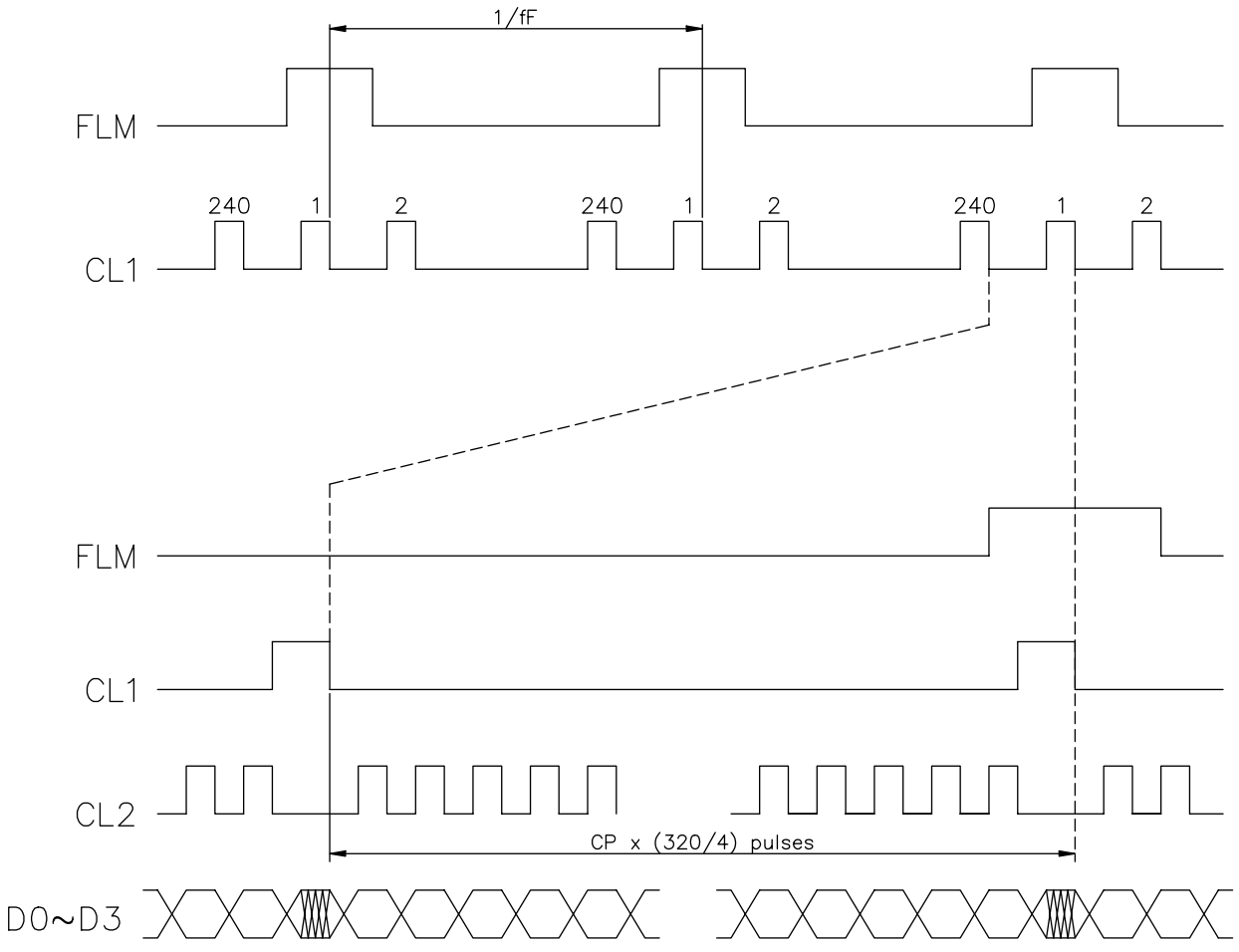
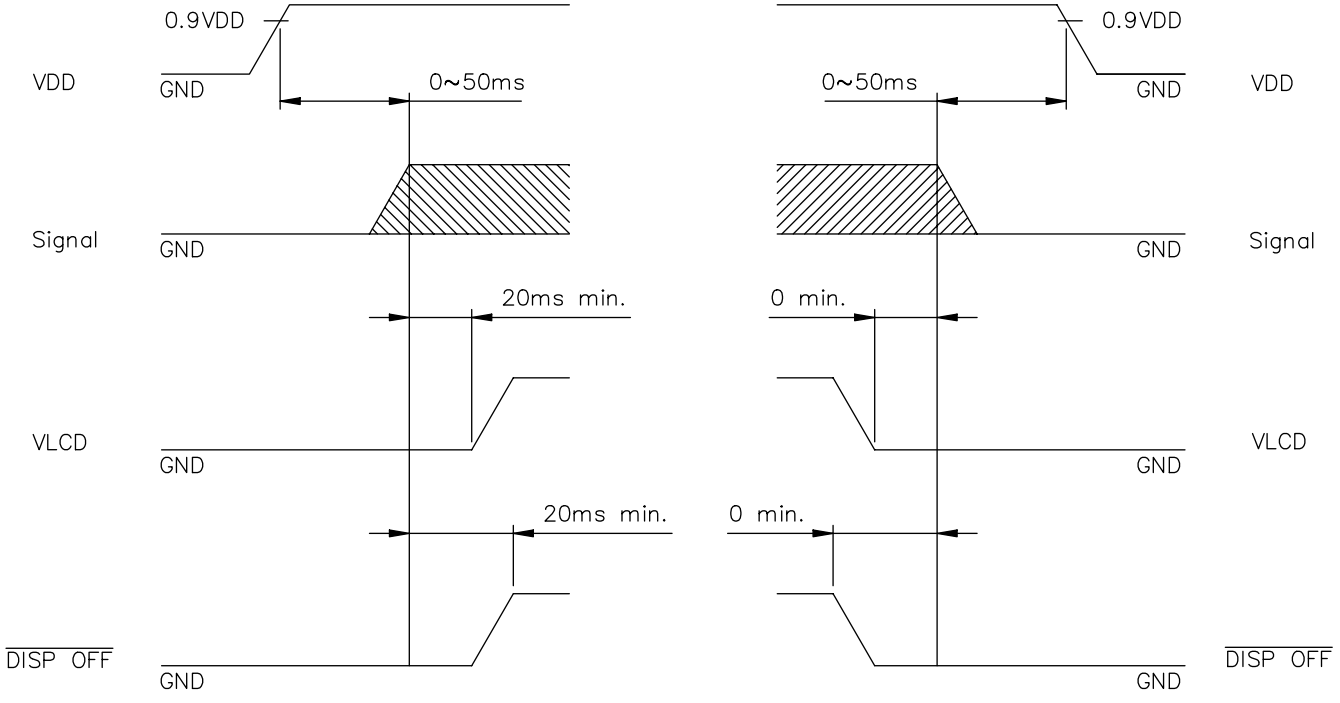


Fig . b Interface timing (COMMON)

8-2. TIMING CHART OF INPUT SIGNAL



8-3.POWER ON/OFF TIMING

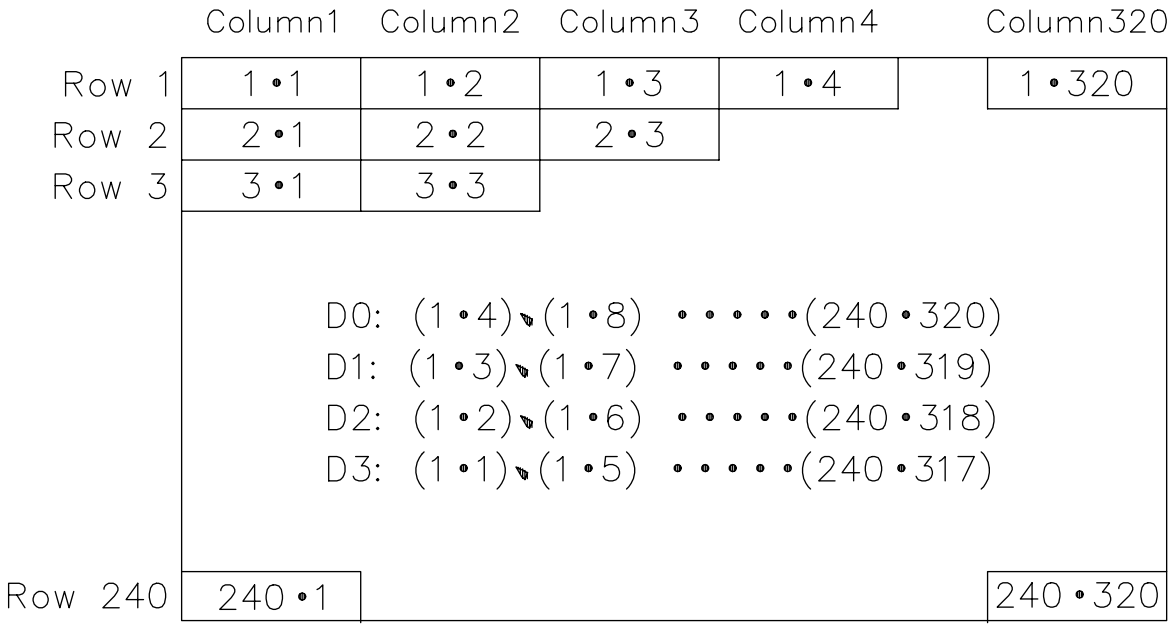


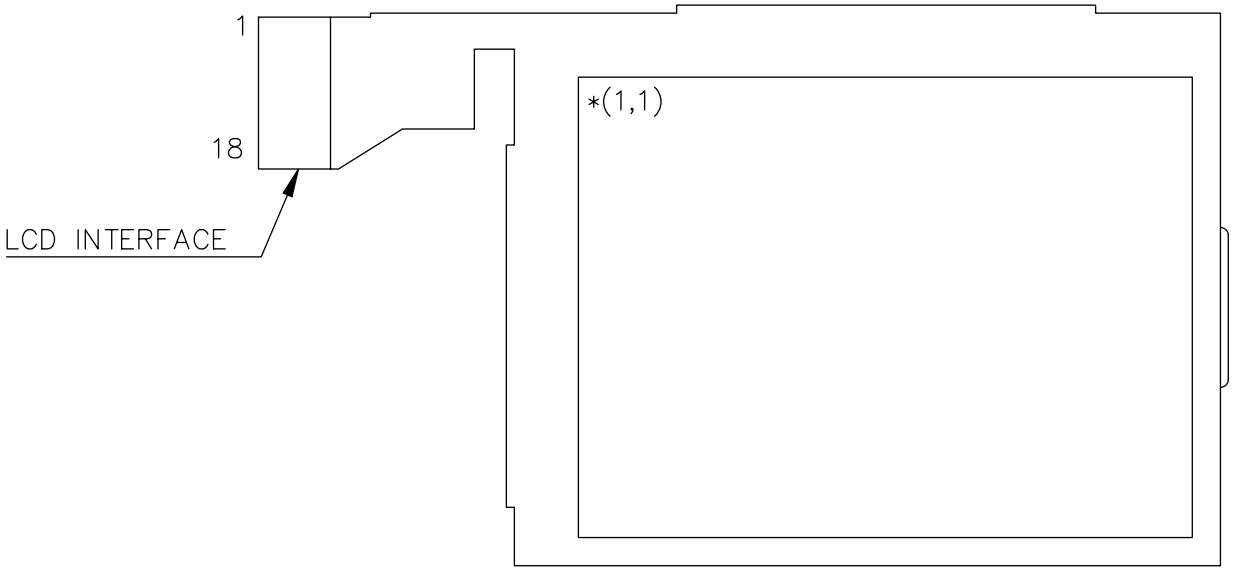
POWER ON

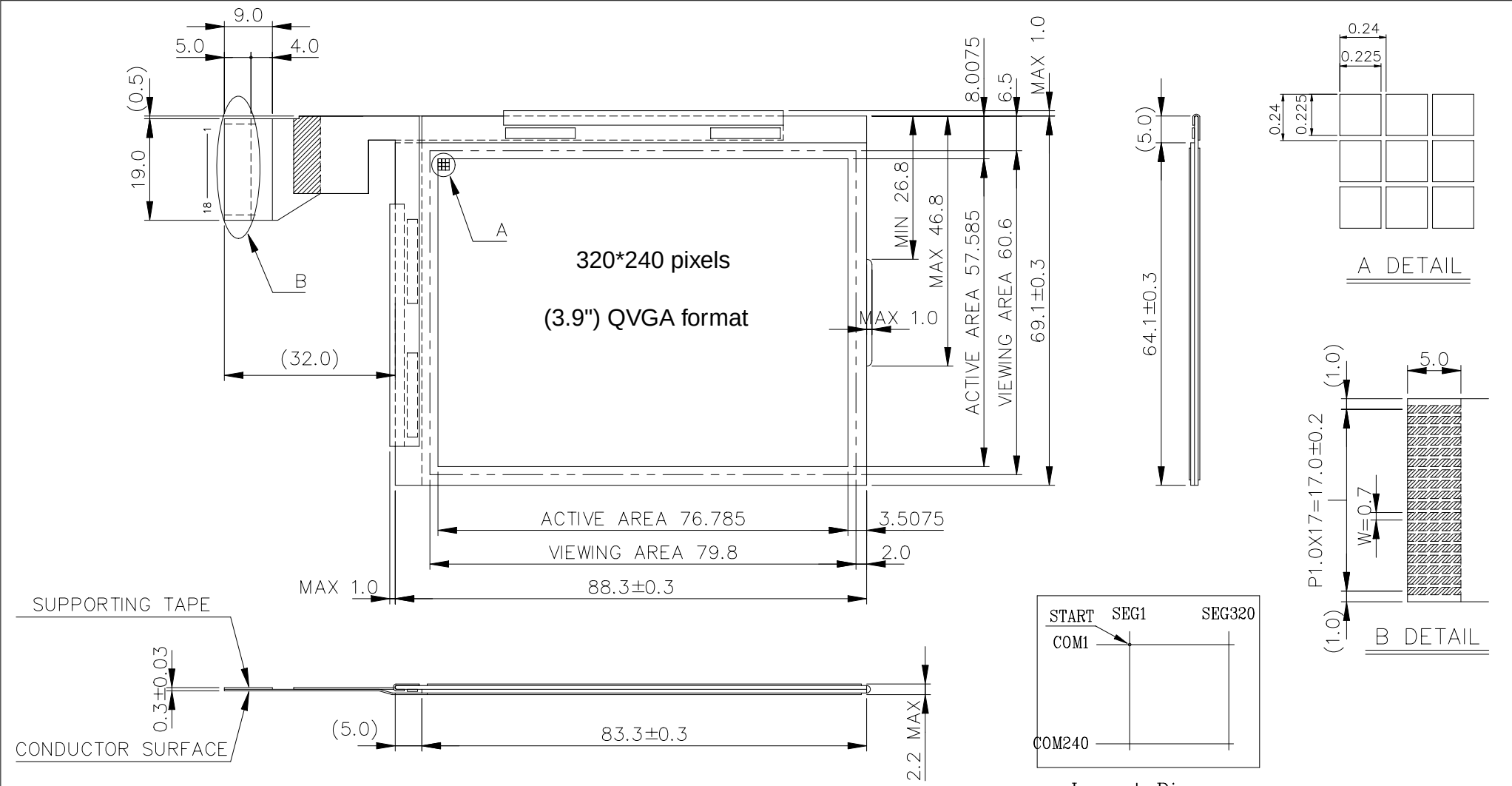
POWER OFF

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

8-4.DISPLAY PATTERN







Layout Diagram

PIN NO	SYMBOL	FUNCTION
1	VLCD(V1)	Bias voltage(Liquid crystal drive voltage)
2	V6	Bias voltage(V1>V6>V3>V4>V5>V2)
3	V3	
4	V4	
5	V5	
6	GND(V2)	(GND: 0V)
7	GND	0V
8	VDD	Power supply voltage: +3.0V typ
9	FLM	Frame signal(sync. Of display)
10	CL2	Display data shift clock
11	M	LCD drive signal(AC signal)
12	CL1	Display data latch signal
13	$\overline{\text{DISP OFF}}$	Display ON/OFF control signal("H": Display ON,"L": Display OFF)
14	GND	0V
15	D3	Display data
16	D2	
17	D1	
18	D0	

Note:
1. RESOLUTION : 320x240 DOTS。
2. COG IC : COM LC4102C
SEG LC4104C

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)
ANGLE	±1° (DEG)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

AZ DISPLAYS, INC.

AGM3224K

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	J.Y.Lin	89.05.16	SCALE: –
DRAWN	Ping Ping	89.05.16	UNIT: mm

DWG NO. M359-D0A 1/1 0