1. MECHANICAL DATA

(1) Product No.		AGM2412C
(2) Module Size		144.0 (W)mm x 104.0 (H)mm x MAX10.8 (D)mm (EL B.L., NO B.L.) 144.0 (W)mm x 104.0 (H)mm x MAX14.9 (D)mm (LED B.L.)
(3) Dot Size		0.42 (W)mm x 0.42 (H)mm
(4) Dot Pitch		0.45 (W)mm x 0.45 (H)mm
(5) Number of Dots		240 (W) x 128 (H)Dots
(6) Duty		1/128
(7) LCD Display Mode	STN:	☐ Gray Mode ☐ Yellow Mode
	FSTN:	☐ Black and White(Normal White/Positive Image)
	Rear Polarizer:	☐ Reflective ☐ Transflective ☐ Transmissive
(8) Viewing Direction		☐ 6 O'clock ☐ 12 O'clock ☐____O'clock
(9) Backlight		☐ W/O ☐ LED ☐ EL
(10) Weight		W/O B.L. : 137g EL B.L. : 142g LED B.L. : 175g

Revised: September 26, 2001

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

Vss=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	5.5	V	
Input Voltage	VI	−0.3	VDD	V	
Static Electricity	−	−	−	−	Note 1

Note 1 LCM should be grounded during handling

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP.			
	OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	−20	70	−30	80
Humidity (Without Condensation)	Note 4,5		Note 4,6	

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 < 48hrs, at 70°C will be < 120hrs

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

Note 5 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 6 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

3. ELECTRICAL CHARACTERISTICS

(VDD=5V±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 LCM Driving Voltage (Wide Temp. LCM)	VCC–VO	Duty= 1/128 Bias= 1/13	–20℃	19.9	20.3	20.7	V
			0℃	19.1	19.5	19.9	
			25℃	18.5	18.9	19.3	
			50℃	17.7	18.1	18.5	
			70℃	16.9	17.3	17.7	
Power Supply Current	IDD	VDD = 5.0V PATTERN: 		–	48.5	–	mA
LED Power Supply Current	I LED	V_{BL} = 5.0V DC (R_{BL} = 0Ω)		–	650	–	mA
EL Power Supply Current	I EL	V_{EL} = 72 V_{rms} 400Hz		–	6.5	–	mA

4. OPTICAL CHARACTERISTICS

4-1. WIDE TEMPERATURE MODE LCM

AT Vop

ITEM / MODE		Cr(Contrast Ratio)		θ(Viewing Angle)		φ(Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	J	–	14.5	–	94	–	82
S	J	–	9.5	–	76	–	80
NOTE		NOTE6		NOTE5			

AT ø=0° θ=0°

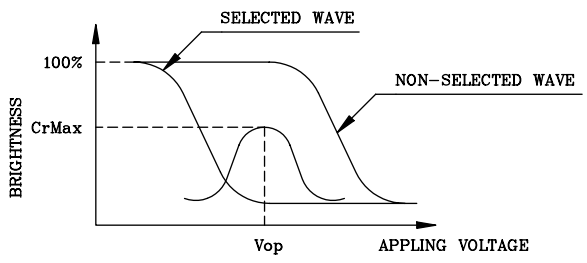
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	–	2750	4125	ms	NOTE 2
		0℃	–	520	780		
		25℃	–	250	375		
		50℃	–	130	195		
		70℃	–	120	180		
Response Time (fall)	Tf	-20℃	–	2650	3975	ms	NOTE 2
		0℃	–	410	615		
		25℃	–	150	225		
		50℃	–	100	150		
		70℃	–	60	90		

NOTE :

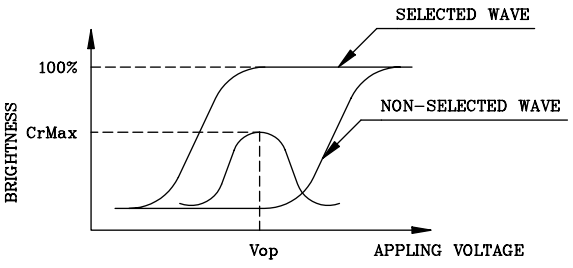
R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY
C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



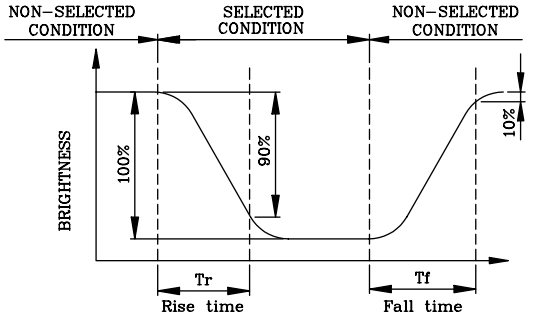
(negative type)

*Conditions

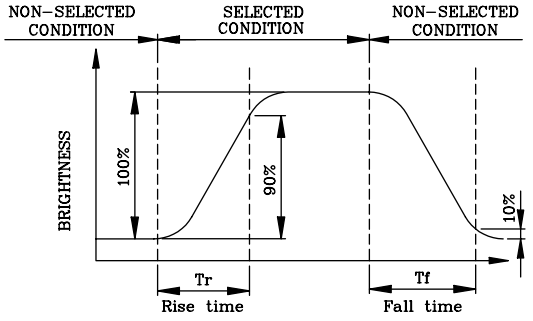
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



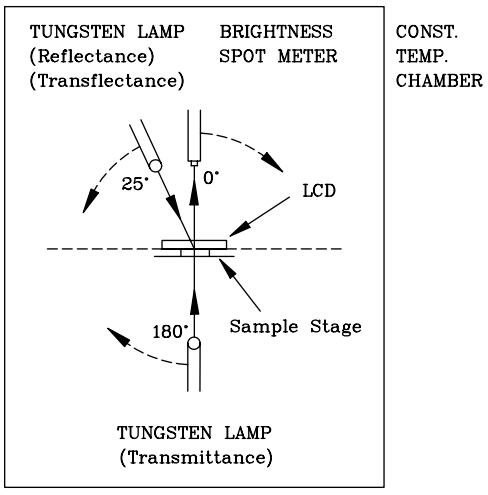
(negative type)

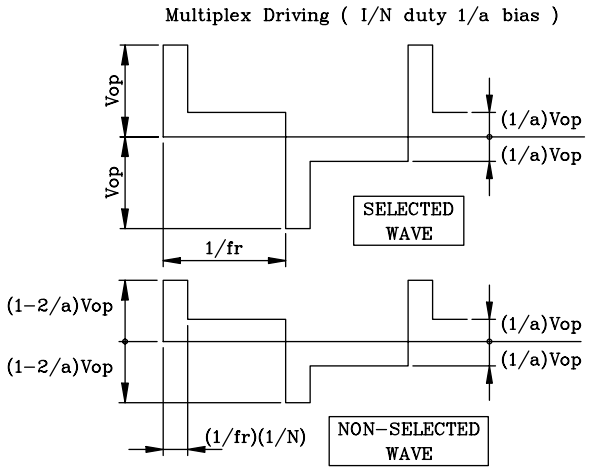
*Conditions

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

(NOTE 3)

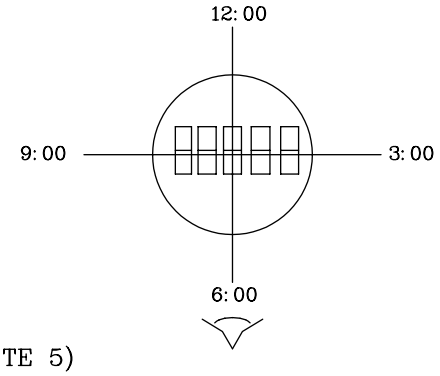
Description of Measuring Equipment and Driving Waveforms





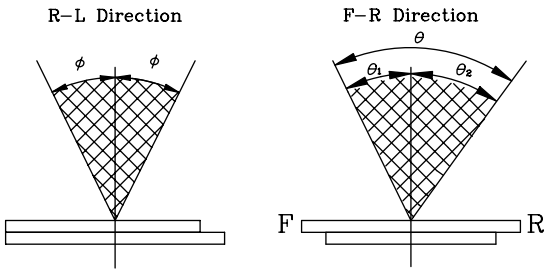
(NOTE 4)

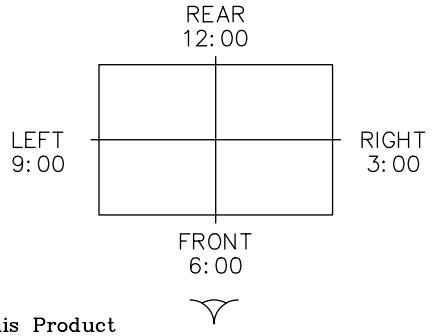
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock
So $\theta 1 > \theta 2$

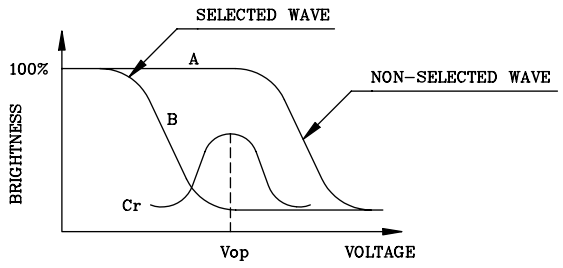
$$\theta = \theta_1 + \theta_2$$

*Conditions

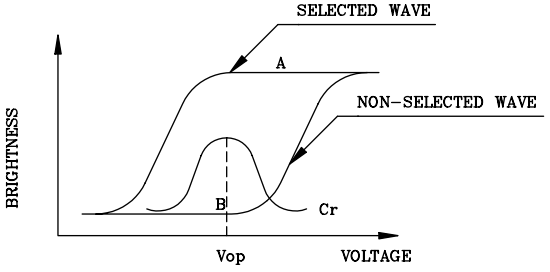
Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



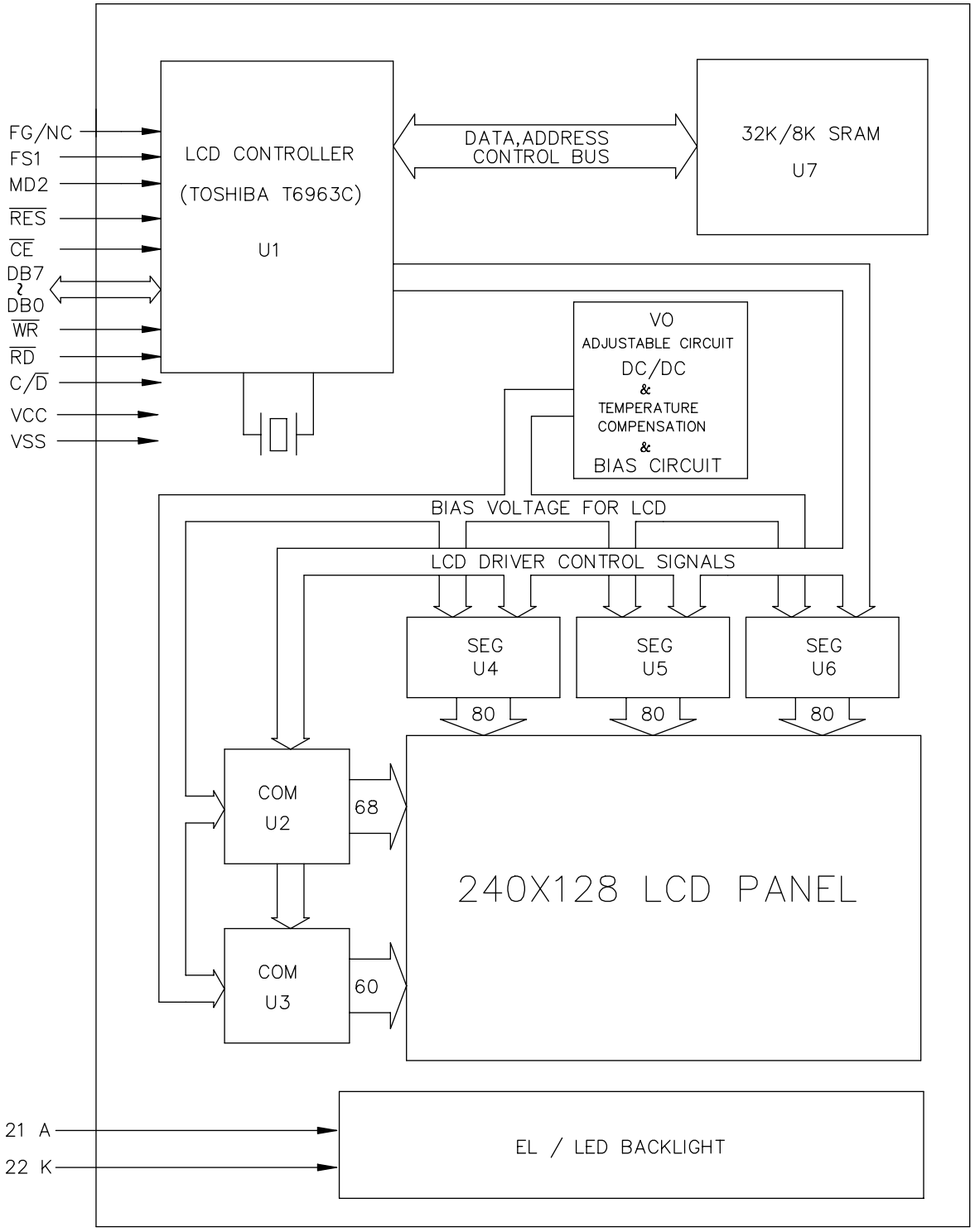
(negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

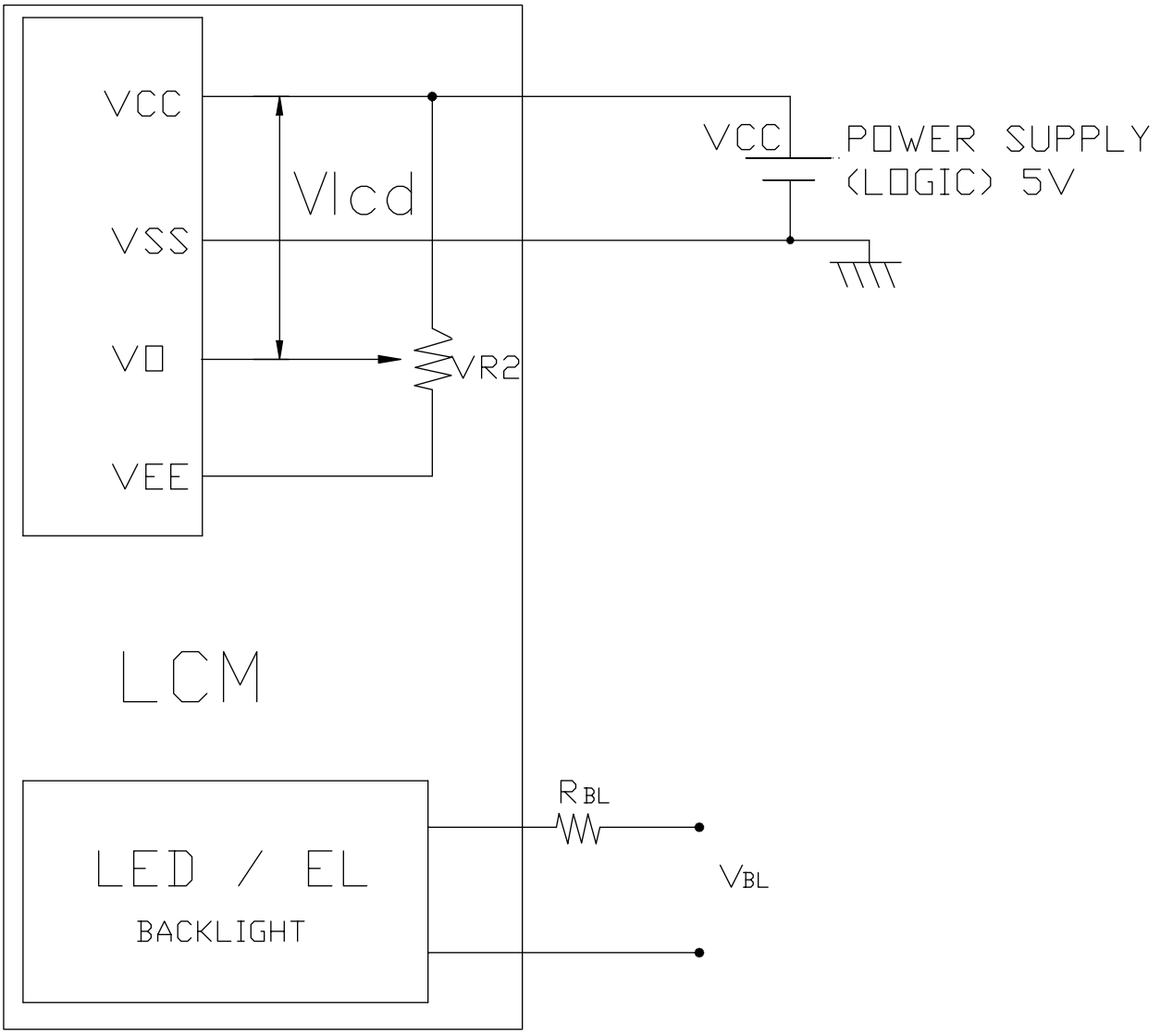
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
1	VSS	GROUND (0V)
2	VCC	Logic Supply Voltage (+5V)
3	NC	–
4	C/$\overline{D}$	"H" : Command "L" : DATA
5	$\overline{RD}$	DATA READ
6	$\overline{WR}$	DATA WRITE
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	$\overline{CE}$	Chip Enable
16	$\overline{RES}$	Reset
17	N.C.	–
18	MD2	Font Size Selection
19	FS1	Font Size Selection
20	FG/NC	Frame Ground or NC
21	A+	Power Supply for LED / EL B.L.
22	K–	

7. POWER SUPPLY



Recommended Value for V_{BL} and R_{BL}

ITEM / B.L. / VALUE	V_{BL}	R_{BL}
LED	5V	0Ω
EL	110VAC 400HZ	0Ω

8-1. INTERFACE TIMING CHARACTERISTICS

(VCC=5.0V±10%, VSS=0V, Ta=-20 To 70°C)

ITEM	SYMBOL	CONDITION	MIN.	MAX.	UNIT
C/D SET UP TIME	t_{CDS}	Fig.	100	–	ns
C/D HOLD TIME	t_{CDH}	Fig.	10	–	ns
$\overline{CE}$, $\overline{RD}$, $\overline{WR}$ CLOCK WIDTH	t_{CE}, t_{RD}, t_{WR}	Fig.	80	–	ns
DATA SET UP TIME	t_{DS}	Fig.	80	–	ns
DATA HOLD TIME	t_{DH}	Fig.	40	–	ns
ACCESS TIME	t_{ACC}	Fig.	–	150	ns
DATA OUTPUT HOLD TIME	t_{OH}	Fig.	10	50	ns

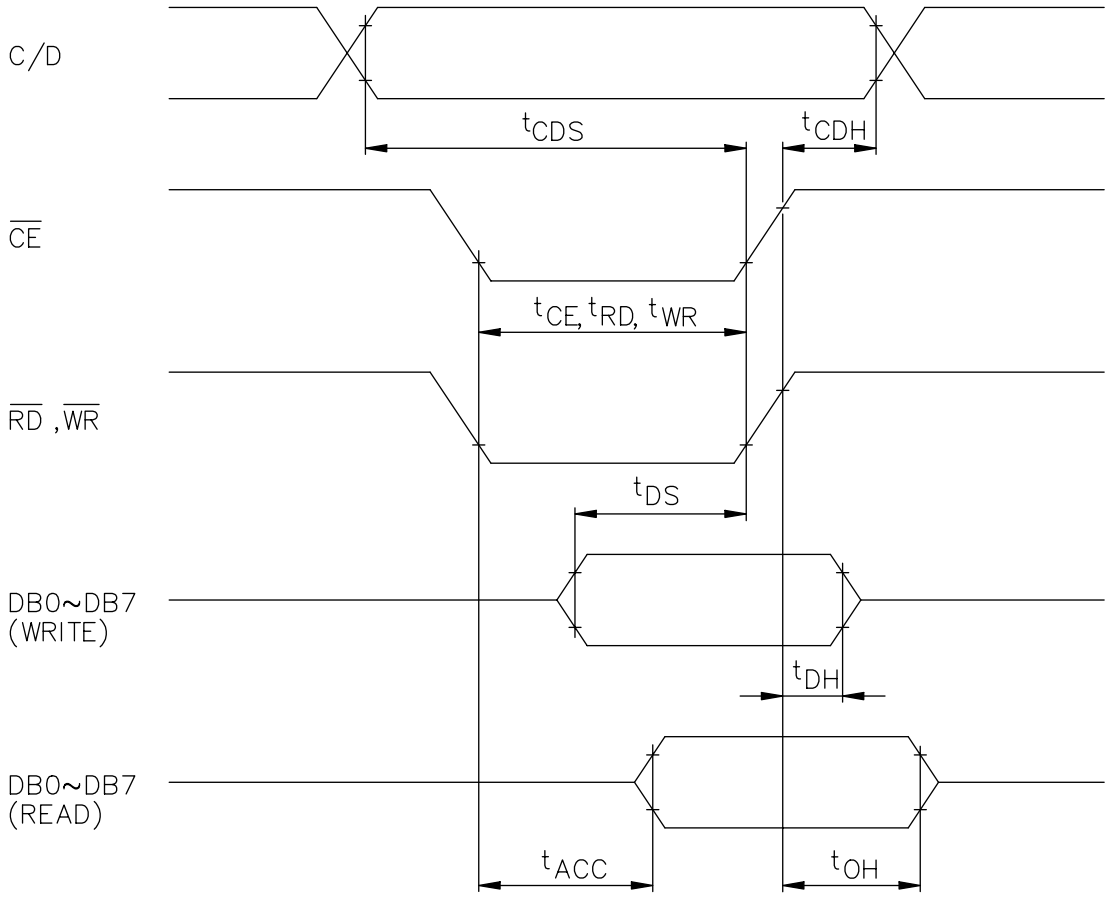
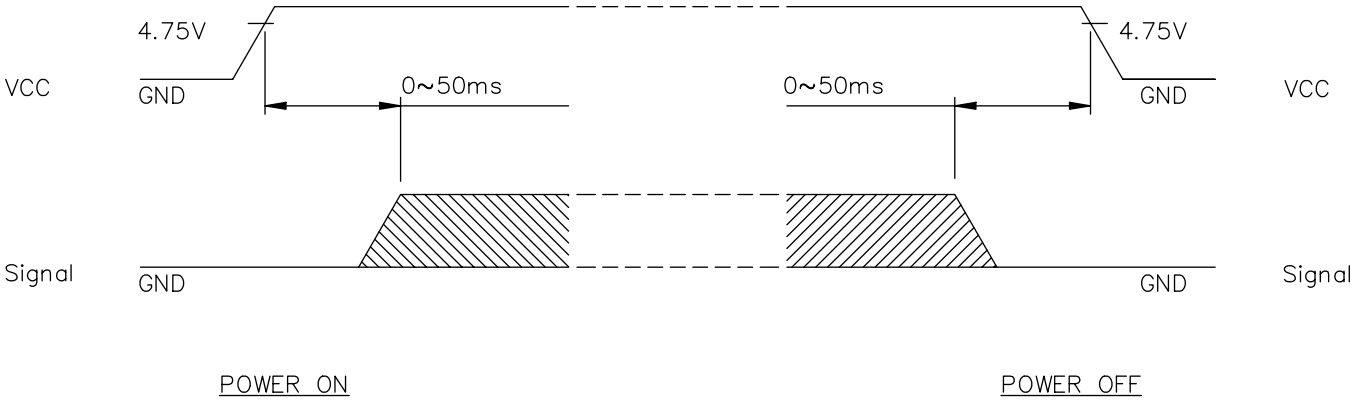


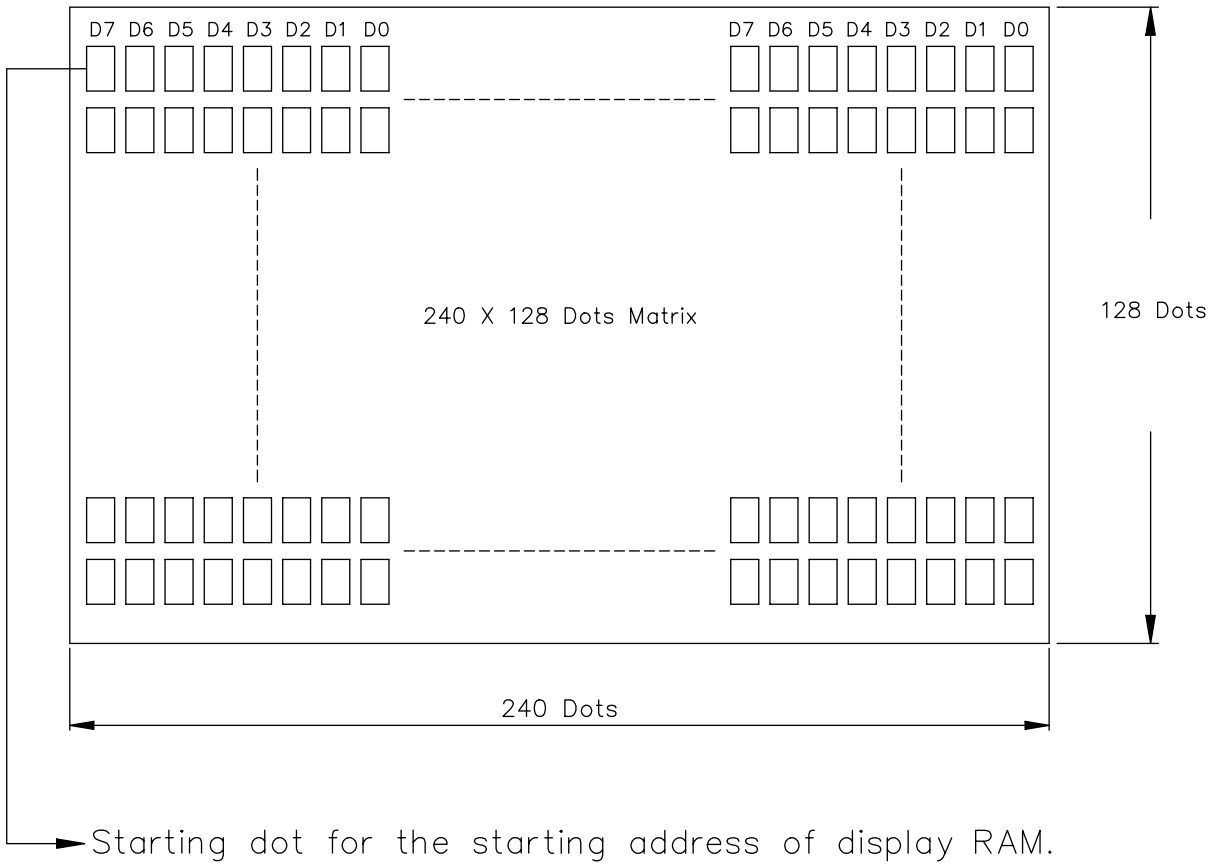
Fig. INTERFACE TIMING CHART

8-2. POWER ON/OFF TIMING CHARACTERISTICS

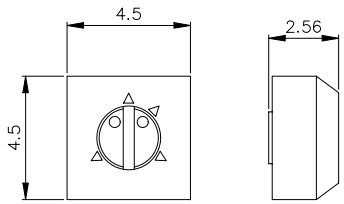


Missing pixels may occur when the LCM is driven beyond the above power interface timing sequence.

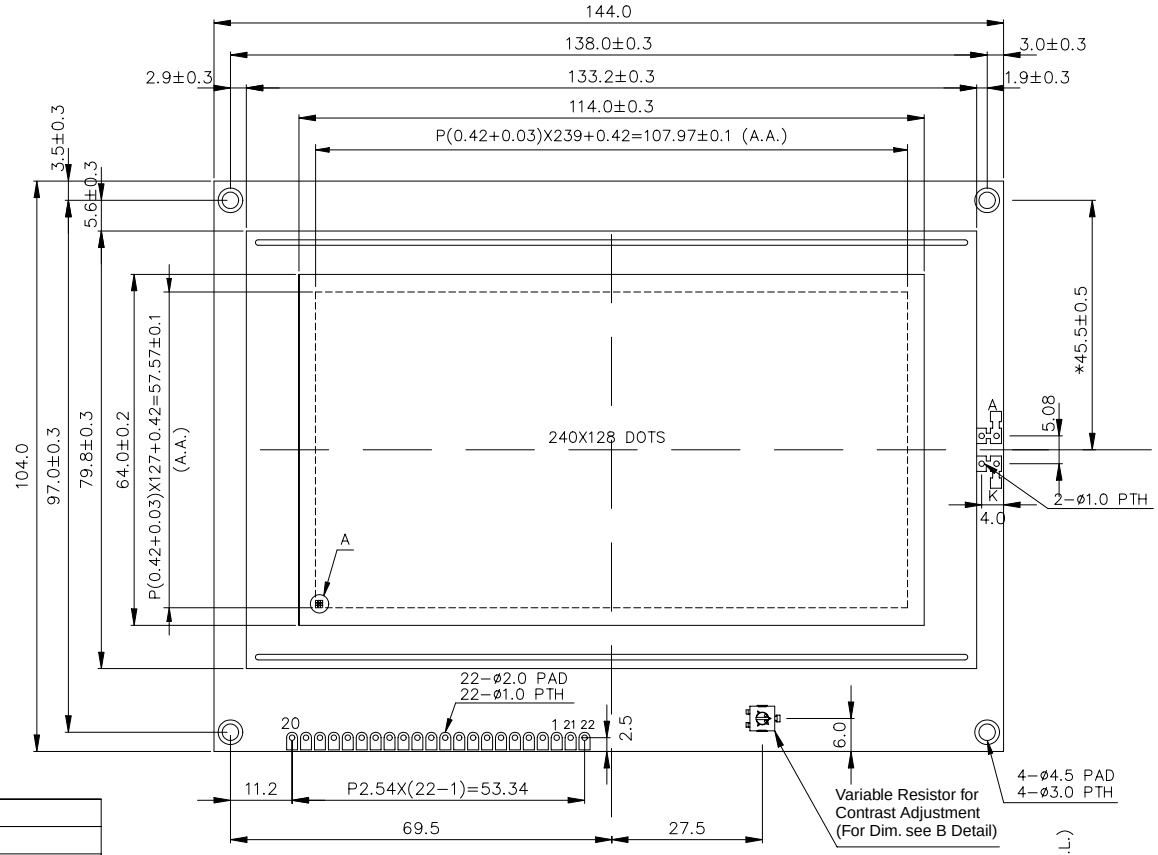
8-3. DISPLAY PATTERN

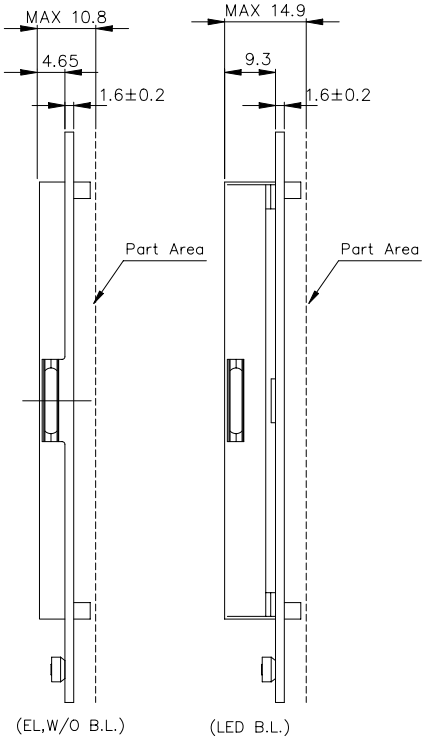


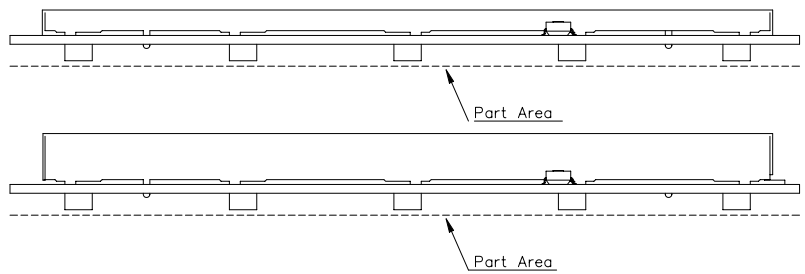
DB0~DB7 are 8 bits transmitted data ,where DB0 is LSB and DB7 is MSB.



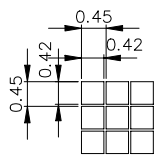
B DETAIL







Pin No.	Symbol	Description
1	VSS	GROUND (0V)
2	VDD	Logic Supply Voltage (+5V)
3	N.C.	–
4	C/$\overline{D}$	"H" : Command "L" : DATA
5	$\overline{RD}$	DATA READ
6	$\overline{WR}$	DATA WRITE
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	$\overline{CE}$	Chip Enable
16	$\overline{RES}$	Reset
17	N.C.	–
18	MD2	Font Size Selection
19	FS1	Font Size Selection
20	FG/NC	Frame Ground or NC
21	A+	Power Supply for LED/EL B.L.
22	K–	



A DETAIL

NOTE :
1. RESOLUTION : 240X128 Dots
2. GENERAL TOLEARANCE : ±0.5mm
3. Controller : T6963C
4. Logic Voltage : 5V.

	LM_EA_184_1_	
	NAME	DATE
APPROVE	TONY CHOU	87.10.02
CHECK	J.S.SHEU	87.10.02
DESIGN	JACK LEE	87.10.02
DRAW	MAY PING	87.10.02

AZ DISPLAYS, INC.

TITLE	AGM2412C	
DWG-NO	MXAX184X1	Rev.A
THIRD ANGLE PROJECT	UNIT : mm	
	SCALE : 1/1	