

AZ Displays, Inc.

1.MECHANICAL DATA

(1) Product No.	AGM1212C
(2) Module Size	72.4 (W)mm x 69.9 (H)mm x MAX13.5 (D)mm (LED B.L.) 72.4 (W)mm x 69.9 (H)mm x MAX9.5 (D)mm (W/O,EL B.L.)
(3) Dot Size	0.32 (W)mm x 0.32 (H)mm
(4) Dot Pitch	0.35 (W)mm x 0.35 (H)mm
(5) Number of Dots	128 (W) x 128 (H)Dots
(6) Duty	1/128
(7) LCD Display Mode	STN: ☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode FSTN: ☐ Black and White(Normal White/Positive Image) ☐ Black and White(Normal Black/Negative Image)
	Rear Polarizer: ☐ Reflective ☐ Transflective ☐ Transmissive ☐ Transflective(High Transmissive)
(8) Viewing Direction	☐ 6 O'clock ☐ 12 O'clock ☐ ____O'clock
(9) Backlight	☐ W/O ☐ EL ☐ LED ☐ CCFT
(10) LCD Controller	BUILT-IN LC7981 (SANYO)
(11) Weight	W/O B/L: about 53.9 g EL B/L: about 56.8 g LED B/L: about 68 g

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{ss}=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD–VSS	–0.3	7.0	V	
Power Supply for LC Drive	VDD–VEE	0	25.0	V	
Input Voltage	V _I	–0.3	VDD	V	
Static Electricity	–	–	–	–	Note 1

Note 1 LCM should be grounded during handling.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	–20	70	–20	70	–30	80
Humidity (Without Condensation)	Note 1,3		Note 2,3		Note 3,4		Note 3,5	

Note 1 Ta ≤ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower
than the humidity of 85%RH at 50°C

Note 2 Ta at –20°C will be < 48hrs, at 70°C will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

Note 4 Ta ≤ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower
than the humidity of 75%RH at 70°C

Note 5 Ta at –30°C will be < 48hrs, at 80°C will be < 120hrs

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3. ELECTRICAL CHARACTERISTICS

(VDD = 5V ± 10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply	VDD-VSS	—	4.75	5.0	5.25	V
Input Voltage	VIH	H level	0.8VDD	—	VDD	V
	VIL	L level	0	—	0.2VDD	V
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-VEE 1/12 Bias	0℃	—	19.0	20.0	V
		25℃	16.8	17.6	18.2	
		50℃	15.7	16.1	—	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-VEE 1/12 Bias	-20℃	—	16.9	17.4	V
		-10℃	15.2	16.1	16.7	
		0℃	15.2	16.1	16.5	
		25℃	15.2	16.1	16.4	
		50℃	15.2	15.9	16.4	
		70℃	14.3	14.9	—	
Supply Current (LCD) (Normal Temp. LCM)	IDD	VDD = 5.0V	—	—	9	mA
	IEE	VEE = 12.6V	—	—	4	mA
LED Power Supply Current	I LED	VBL = 5Vdc (RBL = 3.3Ω)	—	240	400	mA
LED Average Brightness	B(LED)		—	32.1	—	cd/m ²
EL Power Supply Current	I EL	VEL = 110VAc 400Hz	—	—	5	mA
EL Average Brightness	B(EL)		—	20.18	—	cd/m ²

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4-1.OPTICAL CHARACTERISTICS

(For Normal 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	A	3	4	40	60	25	30
	C	4	6	40	60	25	35
	J	4	6	40	60	25	35
S	A	3	4	40	60	20	30
	C	4	6	40	60	25	35
	J	3.5	6	40	55	20	30
T	E	3	4	35	65	20	40
	G	6	15	45	90	30	50
note		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	—	450	900	ms	NOTE 2
		25℃	—	110	220		
		50℃	—	65	130		
Response Time (fall)	Tf	0℃	—	650	1100	ms	NOTE 2
		25℃	—	135	250		
		50℃	—	80	150		

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

AZ Displays, Inc.

4-2.OPTICAL CHARACTERISTICS

(For 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	A	3.0	4.0	40	60	28	35
	C	—	—	—	—	—	—
	J	4.0	6.5	35	52	25	33
S	A	3.0	3.8	35	50	20	25
	C	—	—	—	—	—	—
	J	—	—	—	—	—	—
T	A	—	2.5	20	40	15	20
	G	5	10	50	86	35	50
note		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	—	2200	4400	ms	NOTE 2
		-10℃	—	940	1880		
		0℃	—	440	880		
		25℃	—	120	240		
		50℃	—	60	120		
		70℃	—	50	100		
Response Time (fall)	Tf	-20℃	—	3800	6000	ms	NOTE 2
		-10℃	—	1260	2400		
		0℃	—	620	1200		
		25℃	—	180	350		
		50℃	—	80	150		
		70℃	—	70	130		

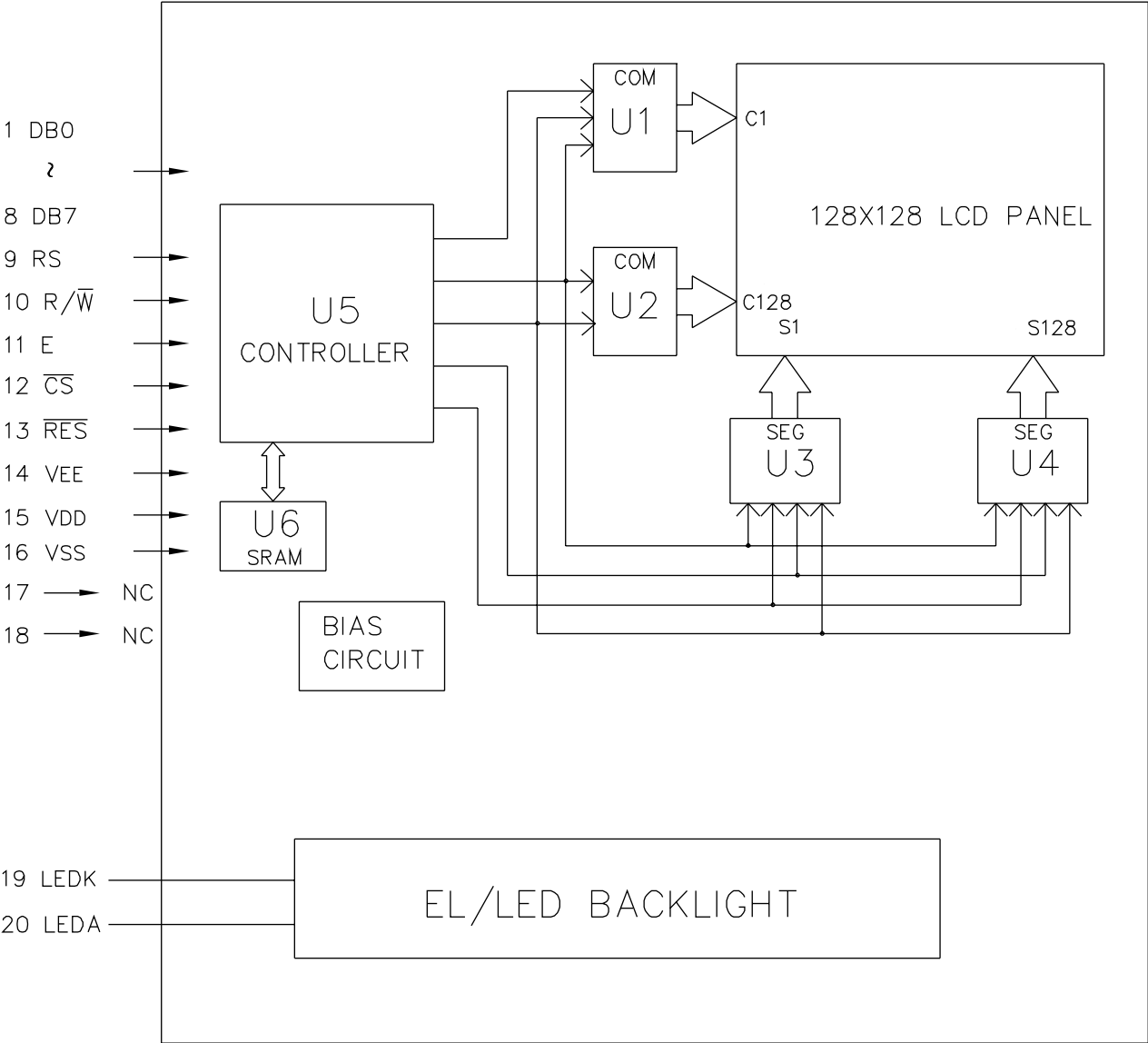
note:

R: REFLECTIVE
S: TRANSFLECTIVE
T: TRANSMISSIVE
A: GRAY

C: YELLOW
E: BLUE
G: NORMALLY BLACK
J: NORMALLY WHITE

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5. BLOCK DIAGRAM



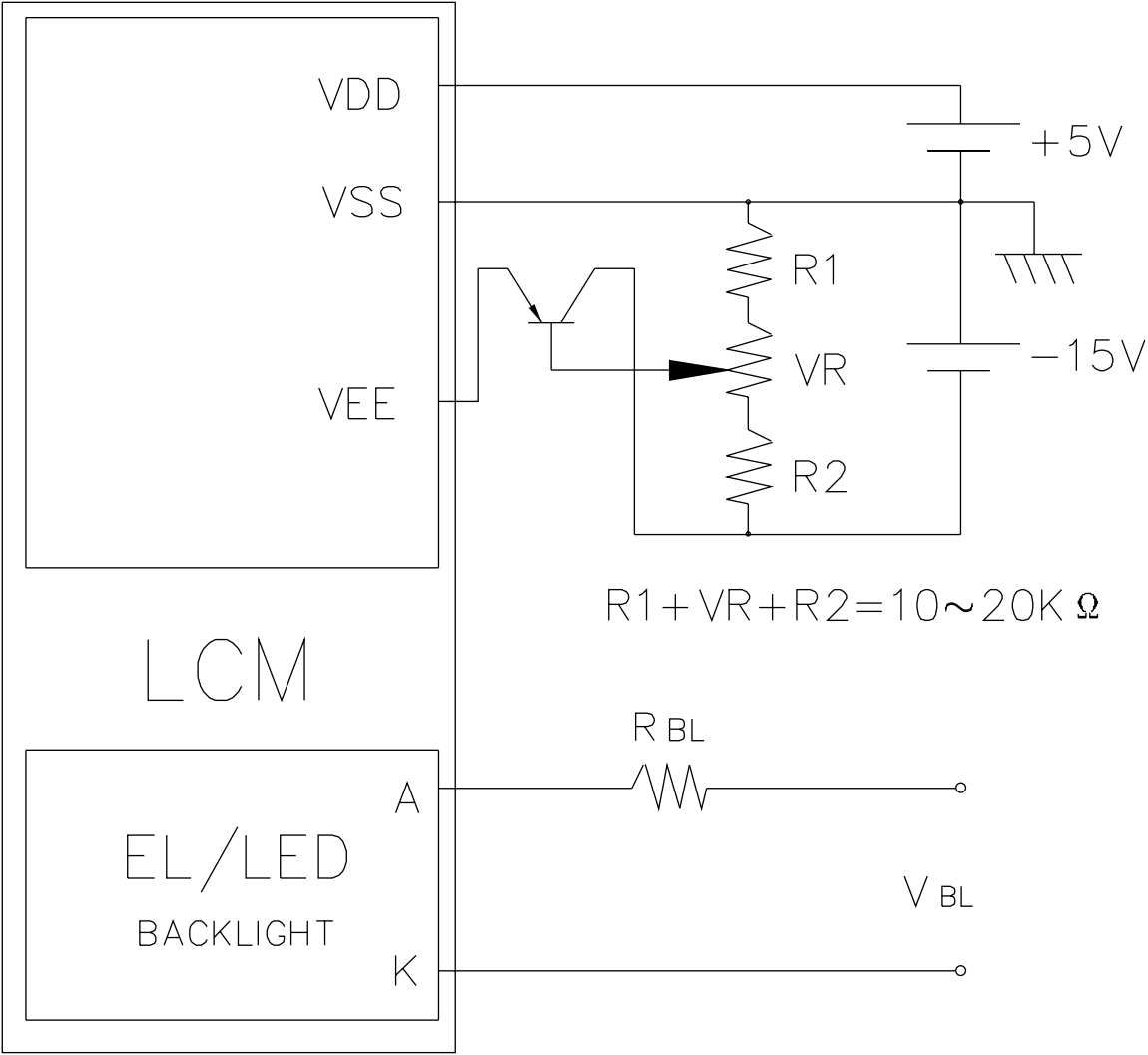
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6.INTERNAL PIN CONNECTION

PinNo.	Symbol	Level	Function
1	DB0	H/L	DATA BUS LINE
2	DB1	H/L	
3	DB2	H/L	
4	DB3	H/L	
5	DB4	H/L	
6	DB5	H/L	
7	DB6	H/L	
8	DB7	H/L	
9	RS	H/L	H:INSTRUCTION CODE INPUT L:DATA INPUT
10	R/ $\overline{W}$	H/L	H:DATA READ (LCM TO MPU) L:DATA WRITE (MPU TO LCM)
11	E	H,H→L	ENABLE SIGNAL
12	$\overline{CS}$	L	CHIP ENABLE ACTIVE "L"
13	$\overline{RES}$	L	RESET ACTIVE "L"
14	VEE	—	POWER SUPPLY FOR LCD CIRCUIT
15	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
16	VSS	—	GROUND
17	N.C.	—	NO CONNECTION
18	N.C.	—	NO CONNECTION
19	LEDK	—	LED/EL BACKLIGHT
20	LEDA	—	LED/EL BACKLIGHT

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7. POWER SUPPLY



Recommended Value for RBL and VBL

ITEM Back Light Interface	R BL		V BL	
	LED	EL	LED	EL
A,K PIN	3.3Ω	0Ω	5V _{Dc}	110 V _{Ac} 400Hz

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8. TIMING CHARACTERISTICS

8-1 INTERFACE TIMING

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cyc}	Fig.a, Fig.b	1.0	—	—	us
Enable pulse width	PW_{EH}	Fig.a, Fig.b	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig.a, Fig.b	—	—	25	ns
RS,R/W set up time	t_{AS}	Fig.a, Fig.b	140	—	—	ns
Data delay time	t_{DDR}	Fig.b	—	—	225	ns
Data set up time	t_{DSW}	Fig.a	225	—	—	ns
Hold time	t_H	Fig.a, Fig.b	20	—	—	ns

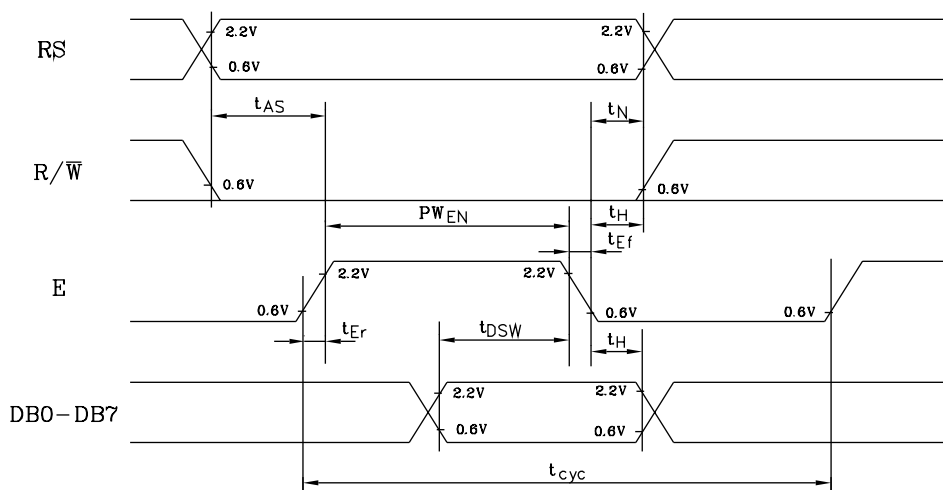


Fig. a Interface timing (data write)

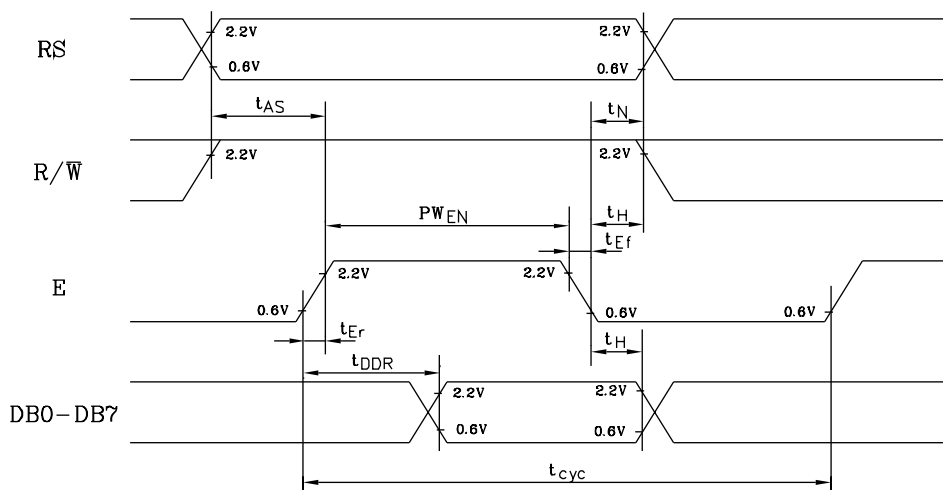
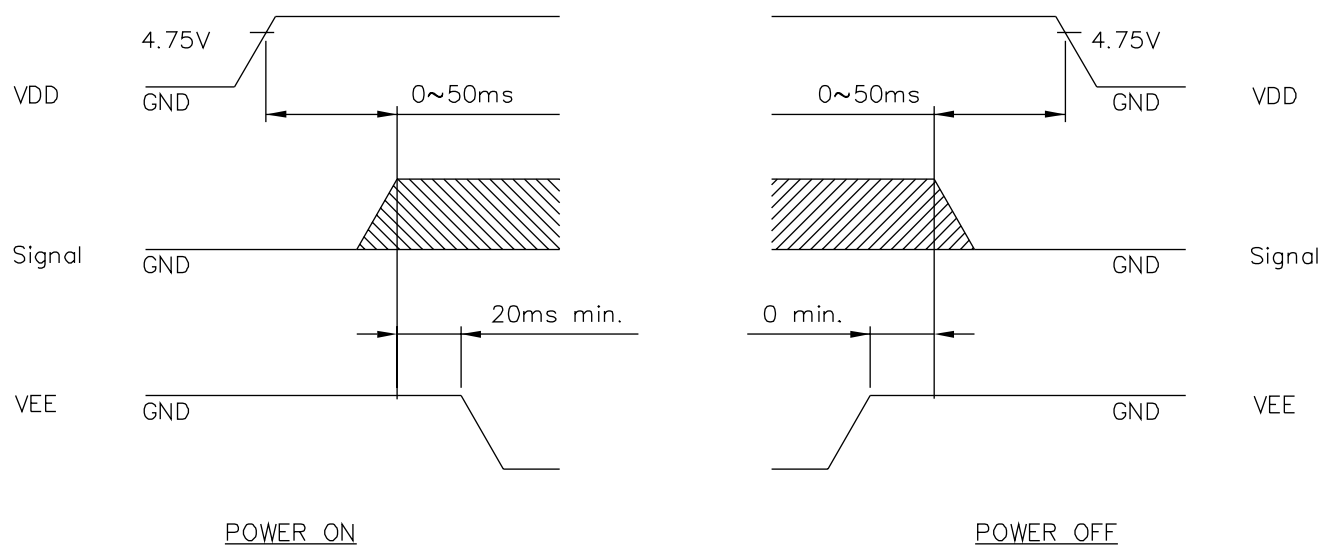


Fig. b Interface timing (data read)

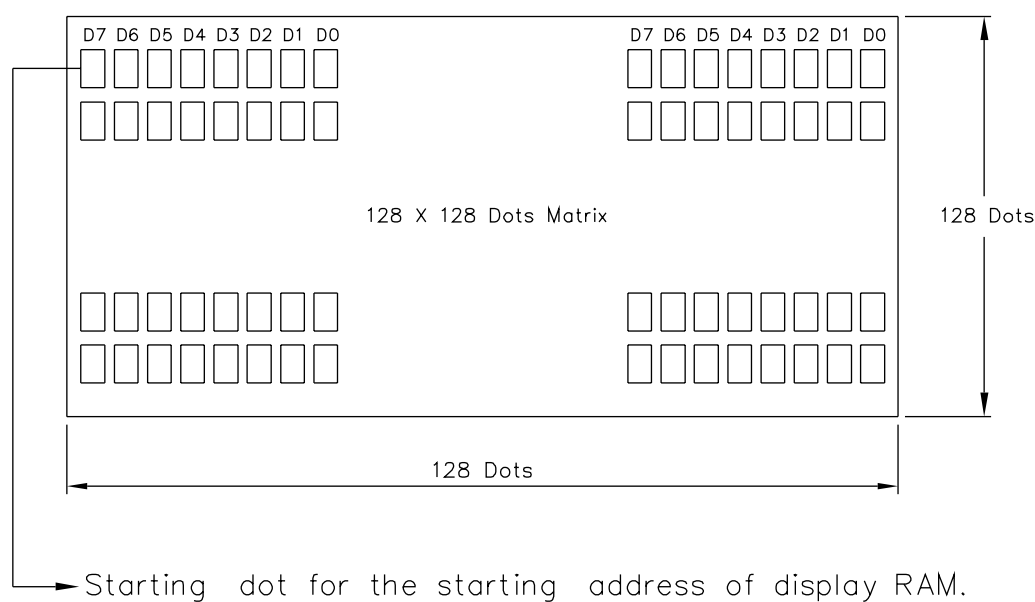
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8-2. POWER ON/OFF TIMING



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

9. DISPLAY PATTERN

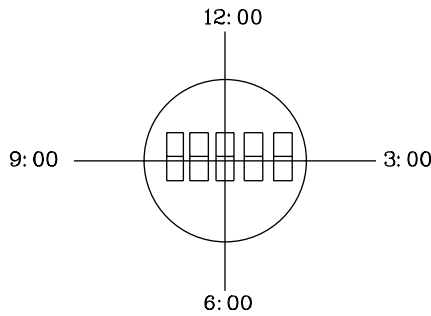


D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

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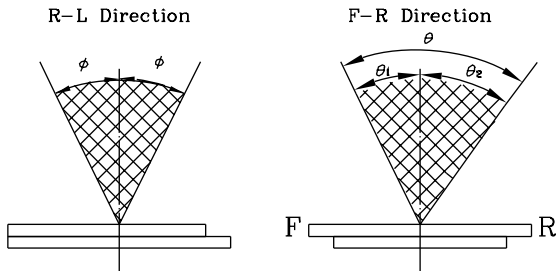
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



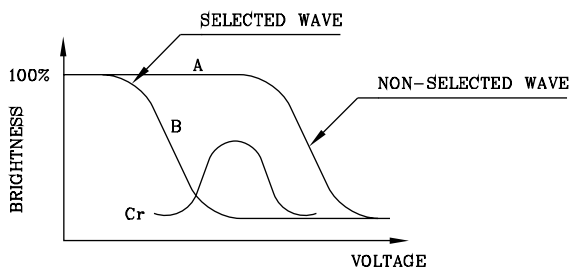
$$\theta = \theta_1 + \theta_2$$

*Conditions

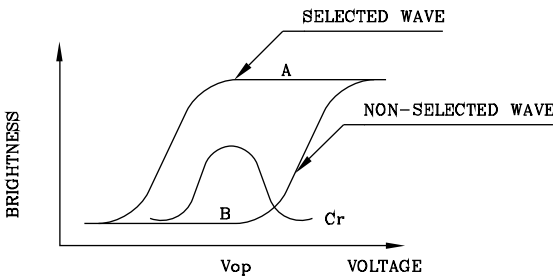
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

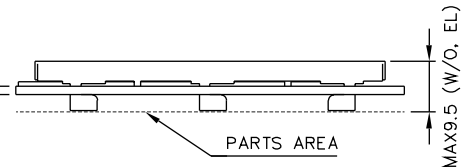
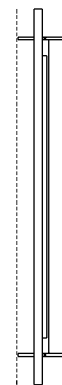


(negative type)

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

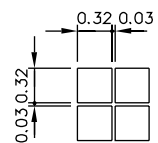
*Conditions

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



- 1.RESOLUTION: 128X128 DOTS
- 2.CONTROLLER: LC7981(SANYO)
- 3.DC/DC: WITHOUT
- 4.BACKLIGHT: LED(YELLOW GREEN)
EL(WHITE)
- 5.CONNECTOR: FPC2-T-020-20

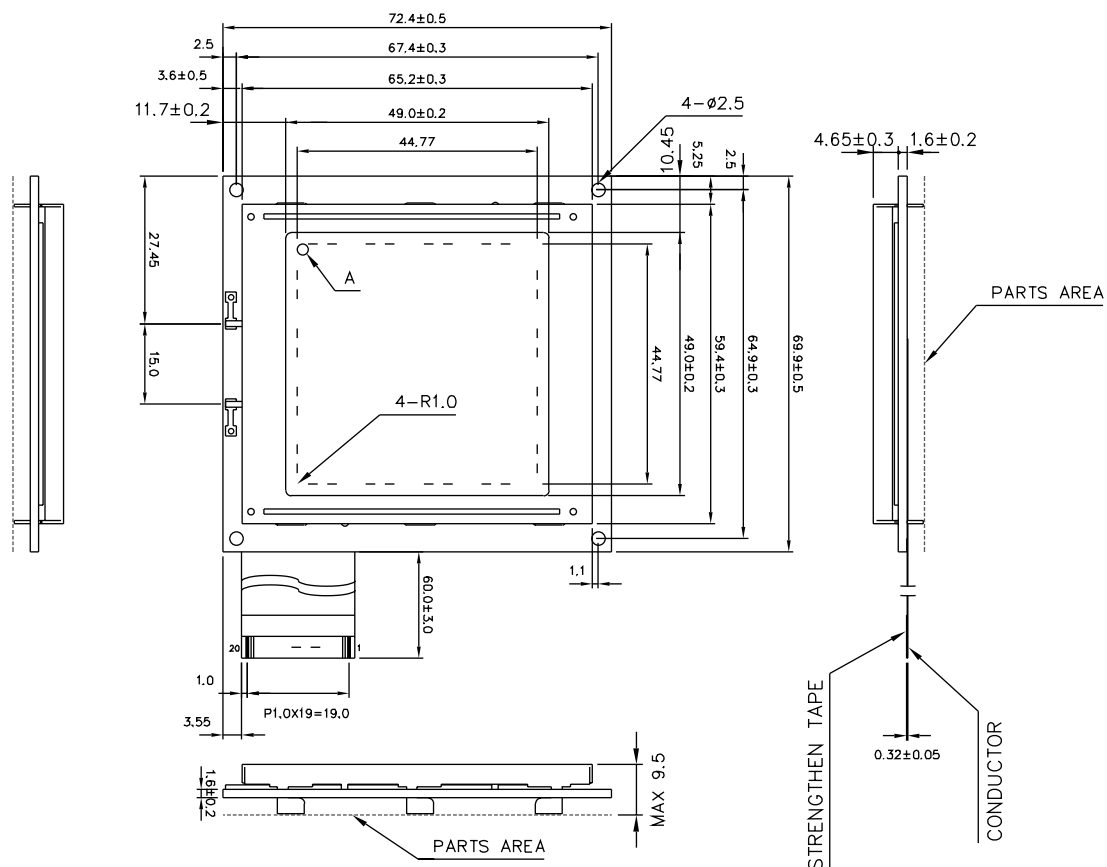
Pin No.	Symbol	Level	Function
1—8	DB0—DB7	H/L	Data Bus Line
9	RS	H/L	H—Instruction L—Data
10	R/ $\bar{W}$	H/L	H: MPU—LC7981 L: MPU—LC7981
11	E	H/L	Enable
12	$\bar{CS}$	L	Chip Enable Active "L"
13	$\bar{RES}$	L	Reset Active "L"
14	VEE	—	Power Supply for LCD Circuit
15	VDD	—	Power Supply for Logic Circuit
16	VSS	—	Ground
17—18	NC		No Connection
19	LEDK		LED or EL Backlight
20	LEDA		LED or EL Backlight



128X128

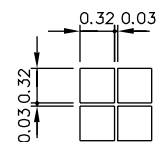
A DETAIL

		AGM1212C	AZ DISPLAYS, INC.		
	NAME	DATE	TITLE		
APPROVE					
CHECK			DWG-NO	MXA026XXPX	Rev.A
DESIGN			 UNIT : mm SCALE : 2/3		
DRAW	MAY PING	85.05.07			



NOTES :

- 1.RESOLUTION: 128X128 DOTS
- 2.CONTROLLER: LC7981(SANYO)
- 3.DC/DC: WITHOUT
- 4.BACKLIGHT: EL(WHITE)



A DETAIL

Pin No.	Symbol	Level	Function
1-8	DB0-DB7	H/L	Data Bus Line
9	RS	H/L	H—Instruction L—Data
10	R/W	H/L	H: MPU—LC7981 L: MPU—LC7981
11	E	H/L	Enable
12	CS	L	Chip Enable Active "L"
13	RES	L	Reset Active "L"
14	VEE	-	Power Supply for LCD Circuit
15	VDD	-	Power Supply for Logic Circuit
16	Vss	-	Gound
17-18	NC		No Connection
19	LEDK		LED or EL Backlight
20	LEDA		LED or EL Backlight

AGM1212C		AZ DISPLAYS, INC.		
APPROVE	NAME	DATE	TITLE	
CHECK			DWG-NO	MDAX026X5P
DESIGN			Rev.	A
DRAW	MAY PING	86.12.13	UNIT : mm	SCALE : 2/3

