

AZ Displays, Inc.

1. MECHANICAL DATA

(1) Product No.	AGM1264D
(2) Module Size	78.0 (W)mm x 70.0 (H)mm x MAX9.5 (D)mm (W/O,EL B/L) 78.0 (W)mm x 70.0 (H)mm x MAX13.0 (D)mm (LED B/L)
(3) Dot Size	0.39 (W)mm x 0.55 (H)mm
(4) Dot Pitch	0.44 (W)mm x 0.60 (H)mm
(5) Number of Dots	128 (W) x 64 (H)Dots
(6) Duty	1/64
(7) LCD Display Mode	STN: <input type="checkbox"/> Gray Mode <input type="checkbox"/> Yellow Mode <input type="checkbox"/> Blue Mode FSTN: <input type="checkbox"/> Black and White(Normal White/Positive Image) <input type="checkbox"/> Black and White(Normal Black/Negative Image) Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive
(8) Viewing Direction	<input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock <input type="checkbox"/> ____O'clock
(9) Backlight	<input type="checkbox"/> W/O <input type="checkbox"/> LED <input type="checkbox"/> EL
(10) Weight	W/O : 56 g EL B/L : 59 g LED B/L : 72 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	VCC-VSS	-0.3	7.0	V	
Input Voltage	V _I	-0.3	VCC	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 2,4		Note 3,4		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

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3. ELECTRICAL CHARACTERISTICS

(VCC= 5V ± 10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT											
Input Voltage	V _{IH}	H level	0.7V _{CC}	—	V _{CC}	V											
	V _{IL}	L level	0	—	0.3V _{CC}	V											
Recommended LC Driving Voltage (Normal Temp. LCM)	V _{CC} -V _O	0℃	—	13.3	13.8	V											
		25℃	11.7	12.5	13.1												
		50℃	10.8	11.4	—												
Recommended LC Driving Voltage (Wide Temp. LCM)	V _{CC} -V _O	-20℃	11.7	12.1	12.5	V											
		0℃	11.6	12.0	12.4												
		25℃	11.5	11.9	12.3												
		50℃	11.4	11.8	12.2												
		70℃	11.3	11.7	12.1												
Power Supply Current	I _{CC}	V _{CC} = 5.0V V _{CC} -V _O =12.5V BIAS = 1/9 PATTERN :	—	1.0	2.5	mA											
	I _O	<table style="border: none; margin: 0; padding: 0;"> <tr> <td>□</td><td>■</td><td>□</td><td>■</td><td>□</td><td>■</td> </tr> <tr> <td>■</td><td>□</td><td>■</td><td>□</td><td>■</td><td>□</td> </tr> </table>	□	■	□	■	□	■	■	□	■	□	■	□	—	1.03	3.0
□	■	□	■	□	■												
■	□	■	□	■	□												
LED Power Supply Current	I _{LED}	V _{BL} = 5V _{Dc} (R _{BL} = 5Ω)	—	210	—	mA											
EL Power Supply Current	I _{EL}	V _{BL} = 110V _{Ac} 400Hz (R _{BL} = 0Ω)	—	—	5.0	mA											

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4-1. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT Vop

MODE \ ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3.5	4.5	50	75	20	30
	C	4.5	7.5	55	80	20	35
	J	6.0	8.0	60	85	20	35
S	A	3.0	4.2	50	70	20	30
	C	4.0	6.5	50	75	20	35
	J	5.0	7.5	55	80	20	35
note		FIG6		FIG5			

note:

R: REFLECTIVE
 S: TRANSFLECTIVE
 A: GRAY
 C: YELLOW
 J: NORMALLY WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	600	1200	ms	FIG2
		25℃	-	110	220		
		50℃	-	50	100		
Response Time (fall)	Tf	0℃	-	900	1500	ms	FIG2
		25℃	-	250	360		
		50℃	-	100	150		

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4-2.OPTICAL CHARACTERISTICS

(For Wide Temperature Mode LCM)

AT Vop

MODE \ ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	3.5	4.2	50	68	20	30
	C	5.0	7.0	50	60	30	35
	J	6.0	8.0	50	70	20	38
S	A	3.5	4.0	50	65	20	30
	C	5.0	7.0	50	60	25	35
	J	5.0	7.0	50	70	25	35
note		FIG6		FIG5			

note:

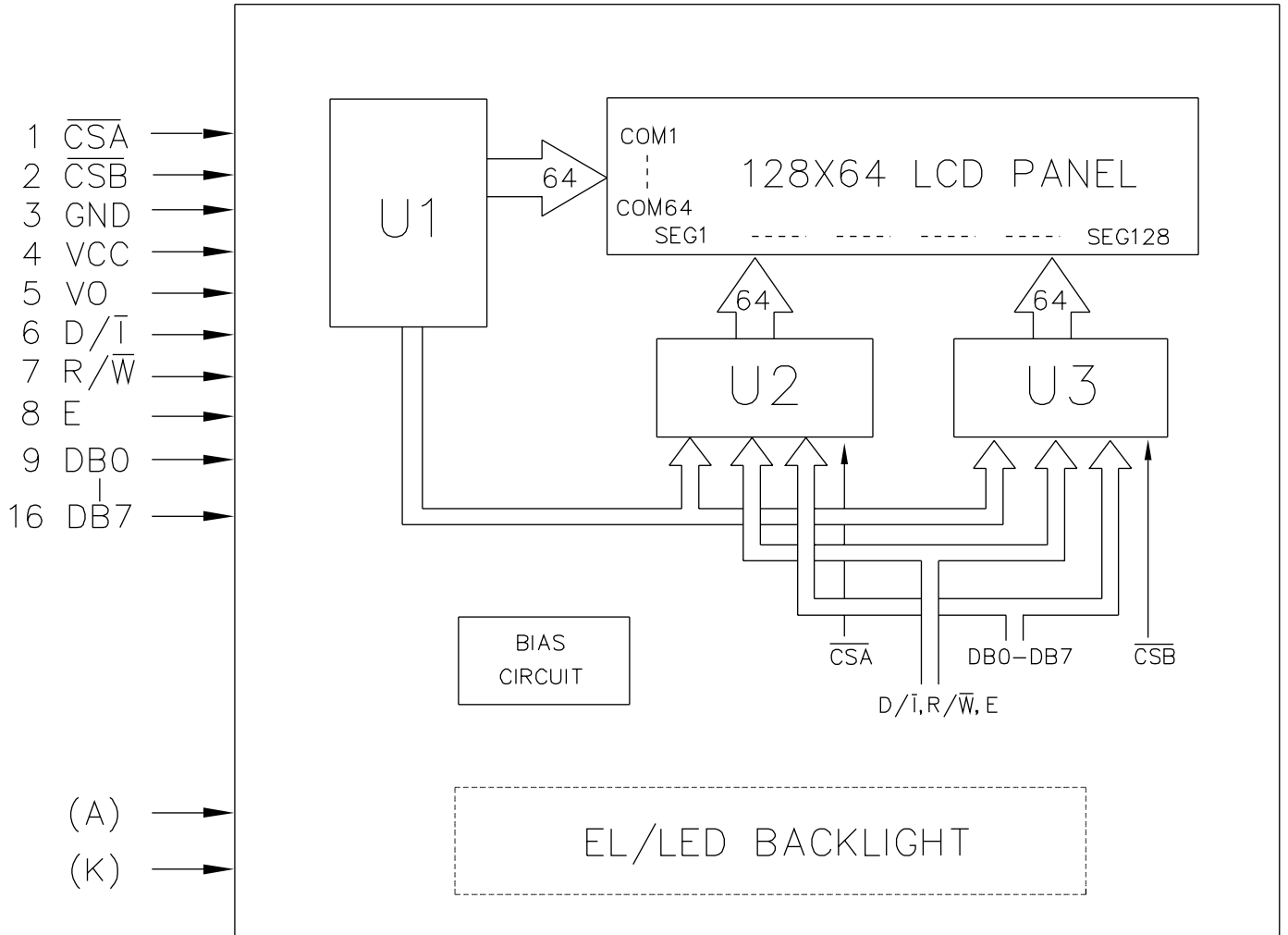
R: REFLECTIVE
 S: TRANSFLECTIVE
 A: GRAY
 C: YELLOW
 J: NORMALLY WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	2100	3200	ms	FIG 2
		0℃	-	450	680		
		25℃	-	150	250		
		50℃	-	110	170		
		70℃	-	70	90		
Response Time (fall)	Tf	-20℃	-	2100	3200	ms	FIG 2
		0℃	-	400	600		
		25℃	-	120	180		
		50℃	-	60	100		
		70℃	-	30	50		

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5. BLOCK DIAGRAM



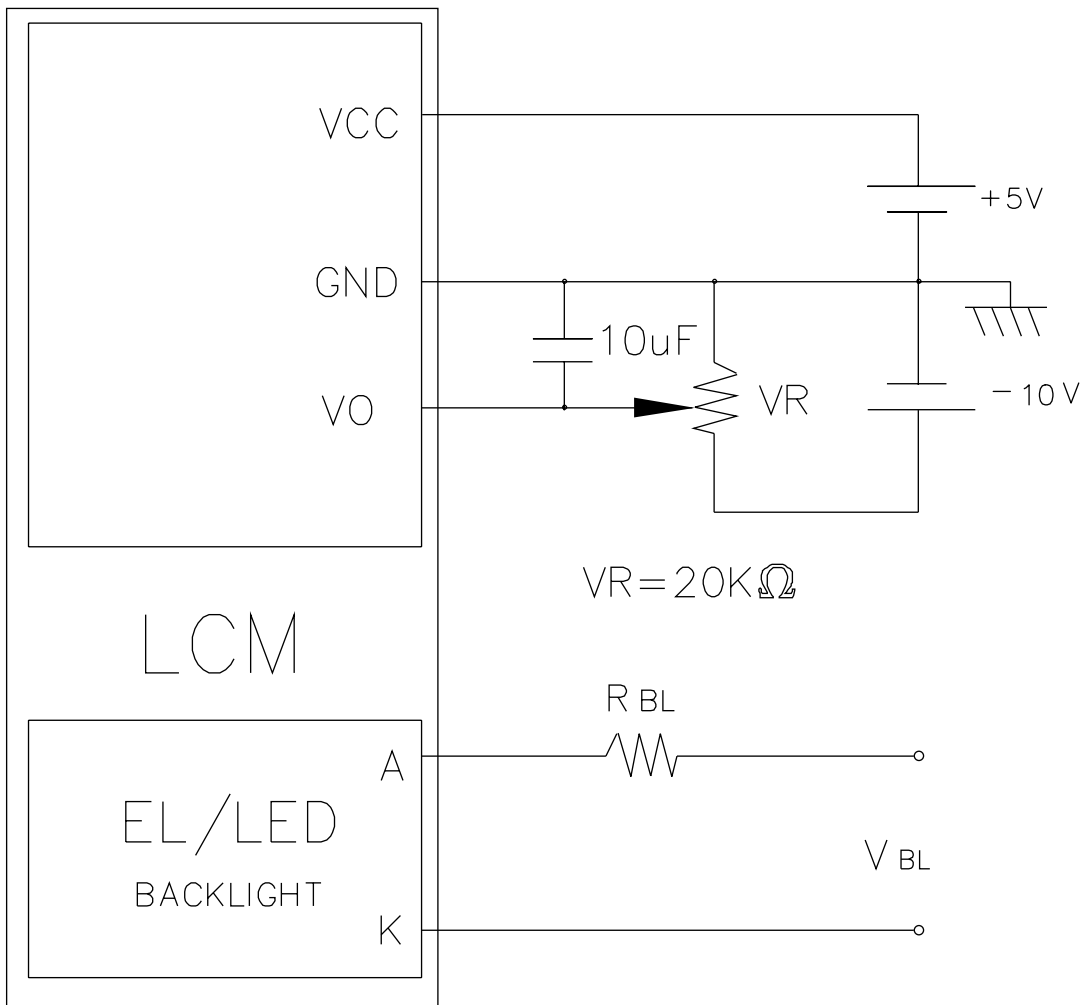
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6. INTERNAL PIN CONNECTION

PinNo.	Symbol	Level	Function
1	\overline{CSA}	L	CHIP SELECT FOR U1
2	\overline{CSB}	L	CHIP SELECT FOR U2
3	GND	—	GROUND
4	VCC	—	POWER SUPPLY FOR LOGIC(+5V)
5	VO	—	POWER SUPPLY FOR LCD DRIVING
6	D/ \overline{I}	H/L	H:DATA INPUT L:INSTRUCTION CODE INPUT
7	R/ \overline{W}	H/L	H:DATA READ (FROM LCM TO MPU) L:DATA WRITE (FROM MPU TO LCM)
8	E	H,H \rightarrow L	ENABLE SIGNAL
9	DB0	H/L	DATA BUS LINE
10	DB1	H/L	
11	DB2	H/L	
12	DB3	H/L	
13	DB4	H/L	
14	DB5	H/L	
15	DB6	H/L	
16	DB7	H/L	
(A)	A	—	ANODE OF BACKLIGHT
(K)	K	—	CATHODE OF BACKLIGHT

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7. POWER SUPPLY



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

Interface	ITEM		V _{BL}	
	Back Light			
	LED	EL	LED	EL
A,K PIN	5 Ω	0 Ω	5VDC	110 VAC 400Hz

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8-1. TIMING CHARACTERISTICS

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cyc}	Fig.a , Fig.b	1000	-	-	ns
E high level width	P_{WEH}	Fig.a , Fig.b	450	-	-	ns
E low level width	P_{WEL}	Fig.a , Fig.b	450	-	-	ns
E rise/fall time	t_r, t_f	Fig.a , Fig.b	-	-	25	ns
Address set up time	t_{AS}	Fig.a , Fig.b	140	-	-	ns
Address hold time	t_{AH}	Fig.a , Fig.b	10	-	-	ns
Data delay time	t_{DDR}	Fig.b	-	-	320	ns
Data set up time	t_{DSW}	Fig.a	200	-	-	ns
Data hold time (WR)	t_{DHW}	Fig.a	10	-	-	ns
Data hold time (RD)	t_{DHR}	Fig.b	20	-	-	ns

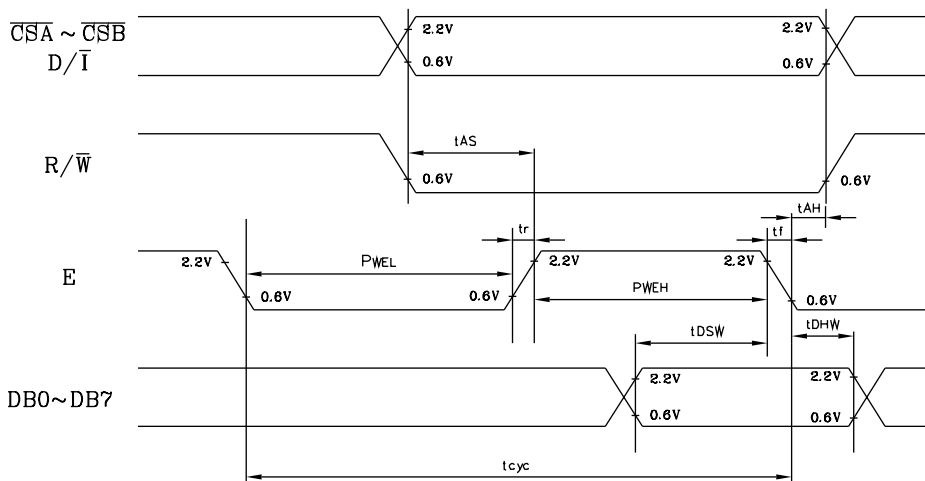


Fig . a Interface timing (data write)

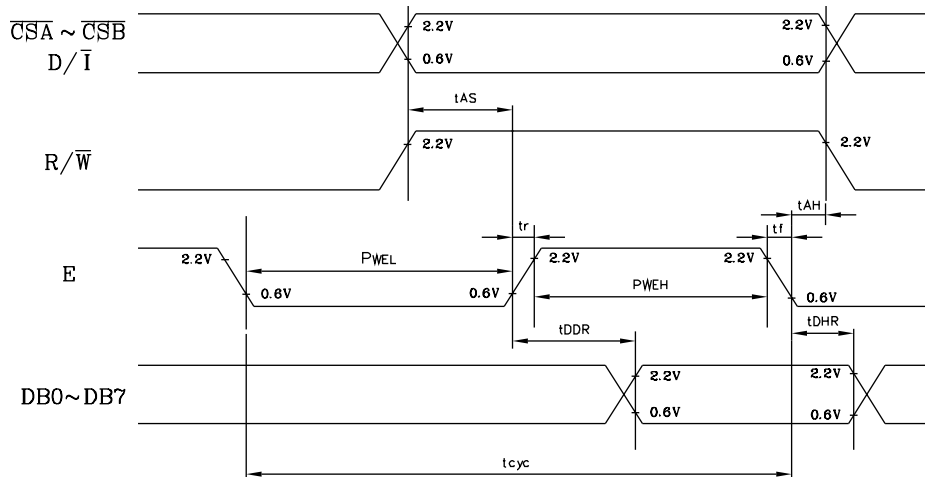
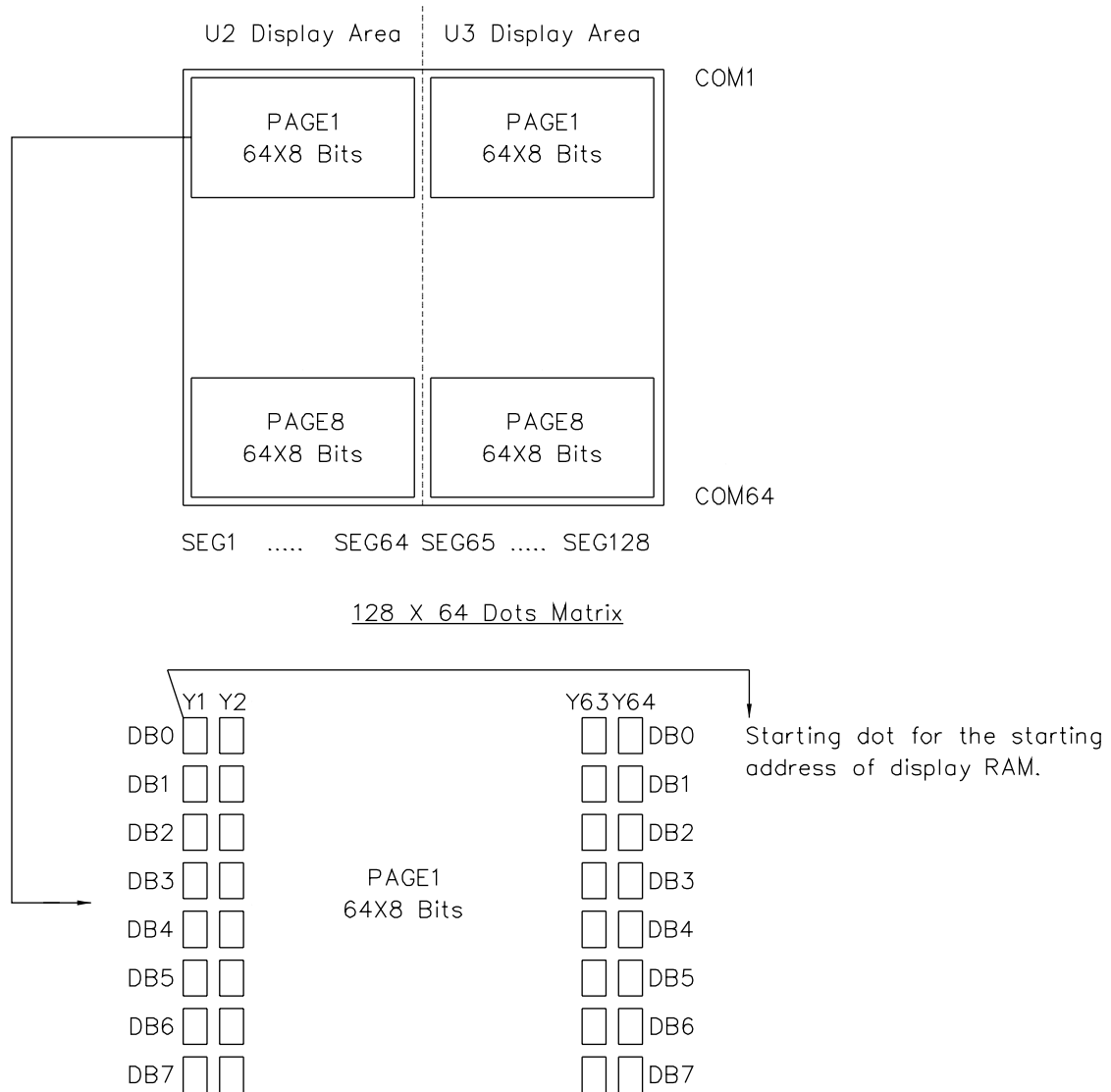


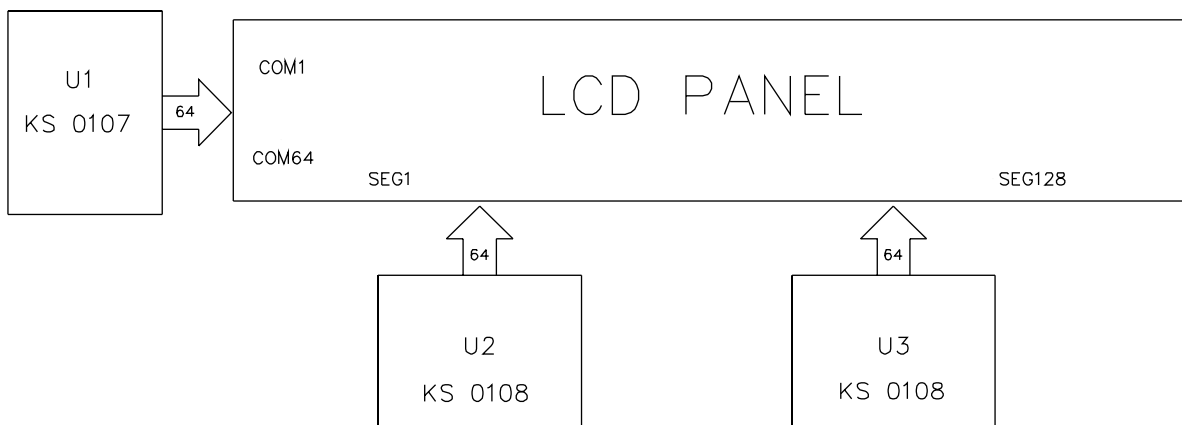
Fig . b Interface timing (data read)

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8-2. RELATION BETWEEN DISPLAY PATTERN AND DRIVERS



Each segment driver has 8 pages RAM , and each page has 64 x 8 bits RAM .
DB0~DB7 are 8 bits transmitted data , where DB0 is LSB and DB7 is MSB .



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8-3. DISPLAY CONTROL INSTRUCTION

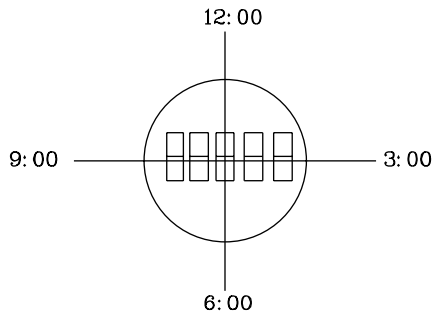
The display control instructions control the internal state of the KS0108B. Instructions is received from MPU to KS0108B for the display control.

Instruction	D/I	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	FUNCTION	
Display ON/OFF	0	0	0	0	1	1	1	1	1	0/1	Controls the display on or off. Internal status and display RAM data is not affected. 0: OFF , 1: ON	
Set Address	0	0	0	1	Y address(0~63)						Sets the Y address in the Y address counter.	
Set Page (X address)	0	0	1	0	1	1	1	Page(0~7)			Sets the X address at the X address register.	
Display Start Line	0	0	1	1	Display start line(0~63)						Indicates the display data RAM displayed at the top of the the screen.	
Status Read	0	1	BUSY	0	ON/OFF	RESET	0	0	0	0	Read status. BUSY 0: Ready 1: In operation ON/OFF 0: Display ON 1: Display OFF RESET 0: Normal 1: Reset	
Write Display Data	1	0	Write Data									Writes data(DB0: 7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read Display Data	1	1	Read Data									Reads data(DB0: 7) from display data RAM to the data bus.

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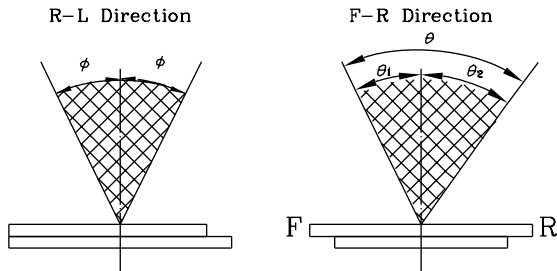
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



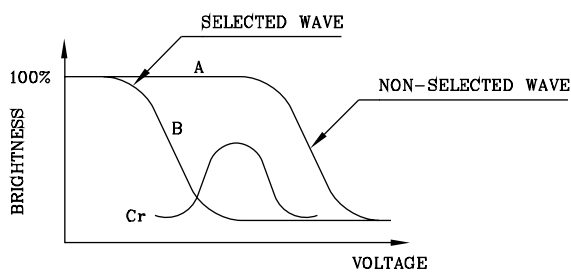
$$\theta = \theta_1 + \theta_2$$

*Conditions

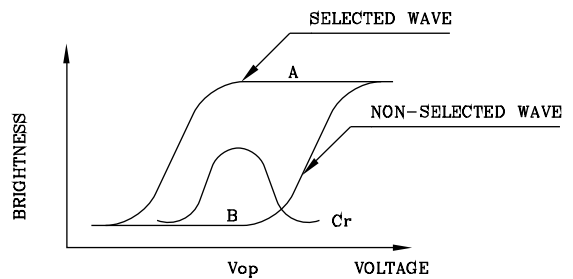
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

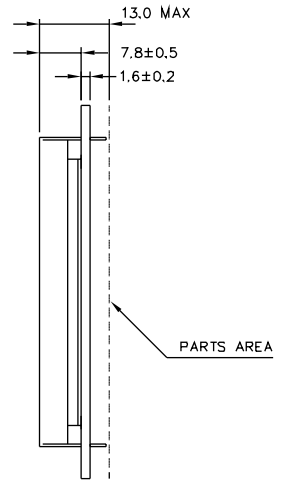
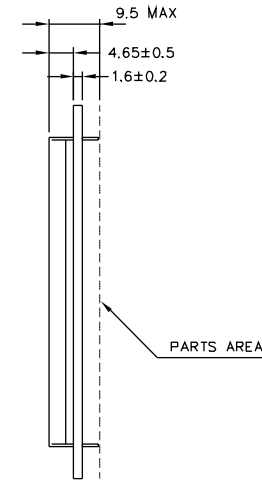
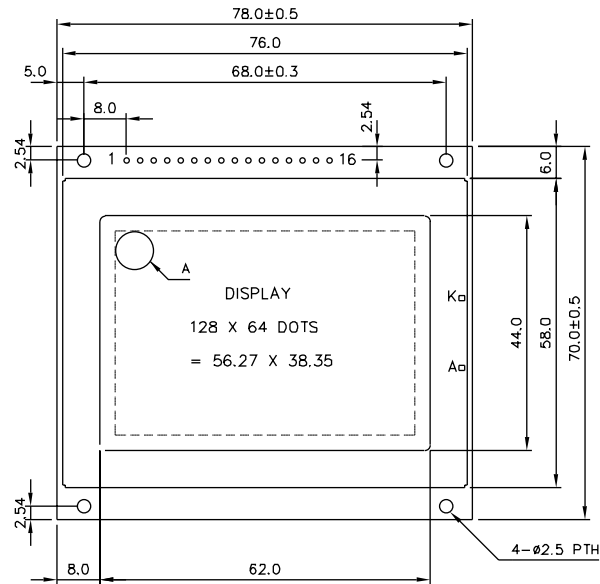


(negative type)

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

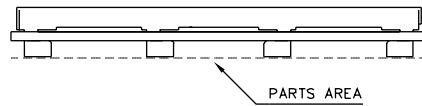
*Conditions

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

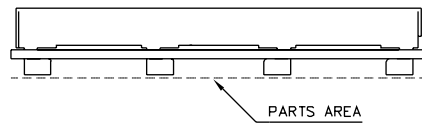


(W/O,EL B/L)

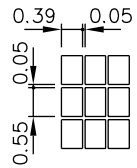
(LED B/L)



(W/O,EL B/L)



(LED B/L)



A DETAIL

Resolution: 128X64 Dots

AGM1264D		AZ DISPLAYS, INC.		
APPROVE	NAME	DATE	TITLE	
CHECK			DWG-NO	Mx-x077x Rev.A
DESIGN			UNIT	mm
DRAW	MAY PING	87.08.18	SCALE	1/1



Pin No.	Symbol
1	CSA
2	CSB
3	GND
4	VCC
5	VO
6	D/T
7	R/W
8	E
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7