

AZ DISPLAYS, INC.

1. MECHANICAL DATA

(1) Product No.	AGM1264E
(2) Module Size	77.5 (W)mm x 51.3 (H)mm x MAX2.8 (D)mm (W/O B.L.)
(3) Dot Size	0.48 (W)mm x 0.48 (H)mm
(4) Dot Pitch	0.52 (W)mm x 0.52 (H)mm
(5) Number of Dots	128 (W) x 64 (H)
(6) Duty	1/64
(9) 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)
(10) Viewing Direction	Rear Polarizer: <input type="checkbox"/> Reflective <input type="checkbox"/> Transflective <input type="checkbox"/> Transmissive <input type="checkbox"/> 6 O'clock <input type="checkbox"/> 12 O'clock
(11) Backlight	None
(12) Weight	23.0 g (approx)
(13) Controller (COG)	SED1565

Revised: May 30, 2000

2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

GND=0V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-GND	0	5.5	V	
Input Voltage	VI	GND	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 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.

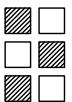

Note 5 Ta ≦ 70°C : 75%RH max.

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

3. ELECTRICAL CHARACTERISTICS

(VDD= 3V/5V ± 10%)

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Input Voltage	VIH	H level		0.8VDD	–	VDD	V
	VIL	L level		0	–	0.2VDD	
Recommended LCD Driving Voltage	VDD–V5 (VLCD)	DUTY= 1/64 Bias= 1/9	–20°C	10.6	11.0	11.4	V
			0°C	9.1	9.5	9.9	
			25°C	8.8	9.2	9.6	
			50°C	8.5	8.9	9.3	
			70°C	8.6	9.0	9.4	
Power Supply Current (VDD = 5V)	IDD	FLM = 70Hz VDD = 5.0V VDD–V5 = 9.2V 		–	0.7	1.1	mA
Power Supply Current (VDD = 3V)	IDD	FLM = 70Hz VDD = 3.0V VDD–V5 = 9.2V 		–	1.6	2.4	mA

4-1. OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT V_{op}

ITEM MODE		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	—	3.5	—	43	—	49
	C	—	6.0	—	67	—	66
	J	—	5.5	—	70	—	65
S	A	—	—	—	—	—	—
	C	—	—	—	—	—	—
	J	—	6.0	—	63	—	69
NOTE		NOTE 6		NOTE 5			

NOTE :

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

C/D: YELLOW
 E/F: BLUE
 G/H: NORMALLY BLACK
 J/K: NORMALLY WHITE

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	—	1400	2100	ms	NOTE 2
		25℃	—	350	550		
		50℃	—	160	240		
Response Time (fall)	Tf	0℃	—	700	1100	ms	NOTE 2
		25℃	—	180	270		
		50℃	—	80	120		

4-2. OPTICAL CHARACTERISTICS

(FOR WIDE TEMPERATURE MODE LCM)

AT Vop

MODE	ITEM	Cr(Contrast Ratio)										θ (Viewing Angle)		ϕ (Viewing Angle)	
		-20℃		0℃		25℃		50℃		70℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	J	-	3.7	-	4.0	-	5.7	-	5.8	-	4.7	-	70	-	65
S	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	J	-	3.6	-	5.2	-	6.1	-	4.9	-	3.7	-	63	-	69
T	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOTE		NOTE 6										NOTE 5			

NOTE :

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

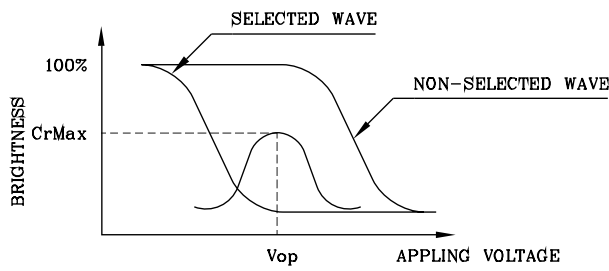
C/D: YELLOW
 E/F: BLUE
 G/H: NORMALLY BLACK
 J/K: NORMALLY WHITE

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

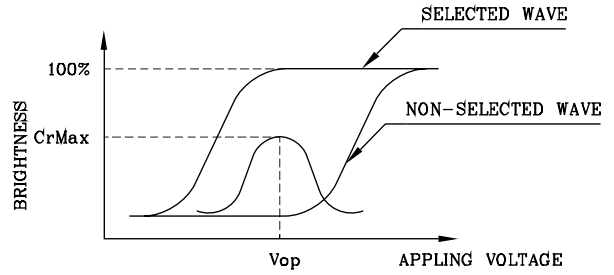
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	11240	-	ms	NOTE 2
		0℃	-	1450	-		
		25℃	-	350	-		
		50℃	-	145	-		
		70℃	-	75	-		
Response Time (fall)	Tf	-20℃	-	6200	-	ms	NOTE 2
		0℃	-	700	-		
		25℃	-	160	-		
		50℃	-	70	-		
		70℃	-	70	-		

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



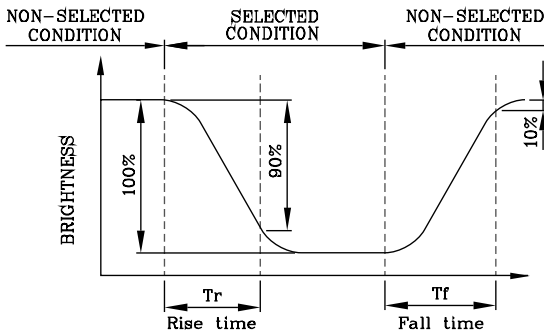
(negative type)

*Conditions

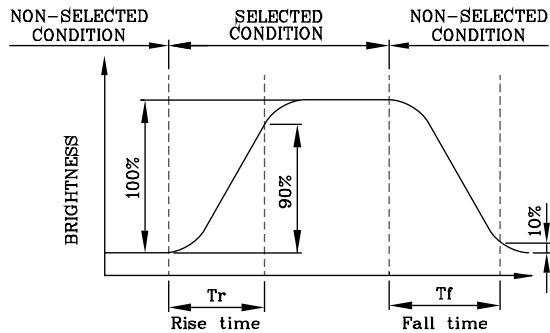
Viewing Angle : 0
 Frame Frequency : 70Hz
 Appling Waveform : 1/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



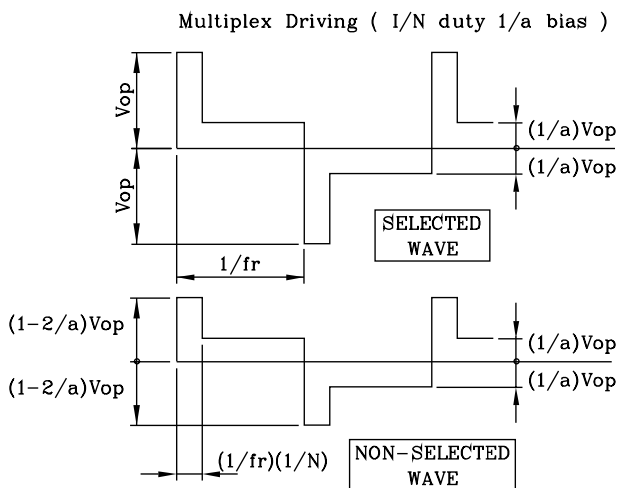
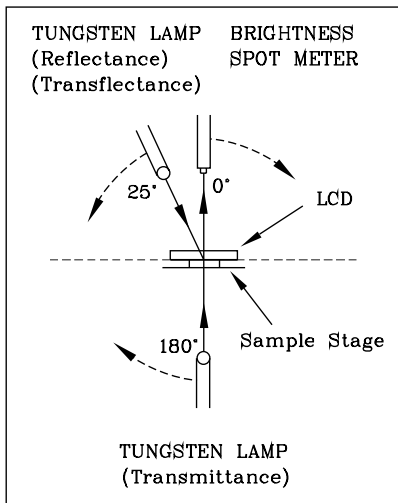
(negative type)

*Conditions

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

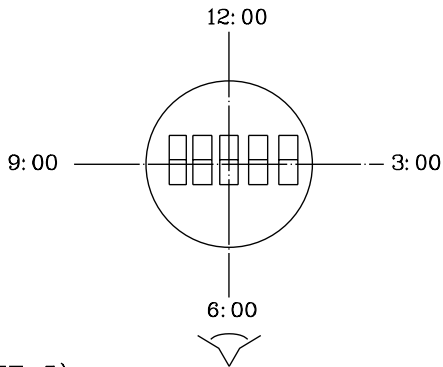
(FIG 3)

Description of Measuring Equipment and Driving Waveforms



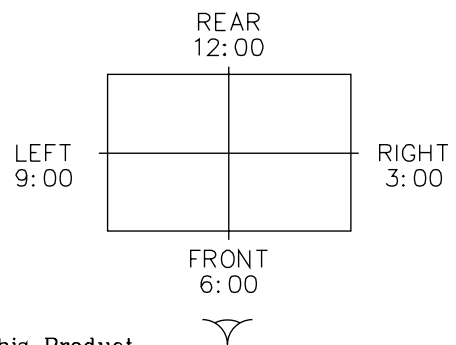
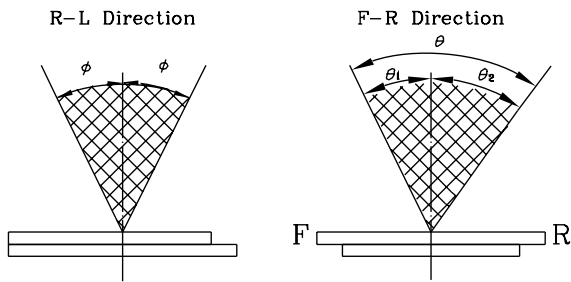
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

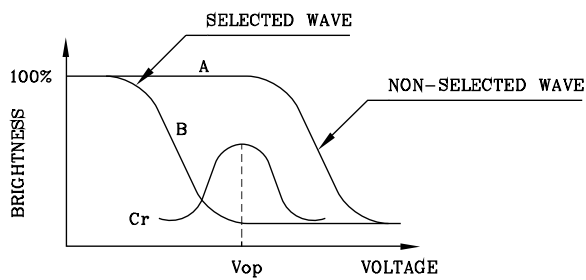
$$\theta = \theta_1 + \theta_2$$

*Conditions

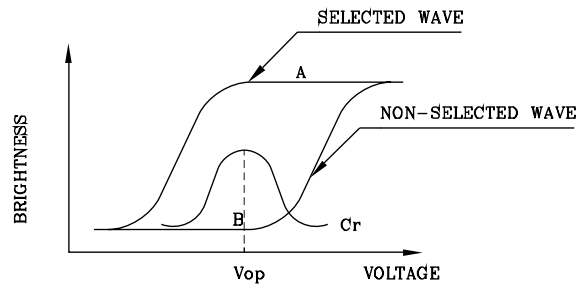
- Operating Voltage : V_{op}
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



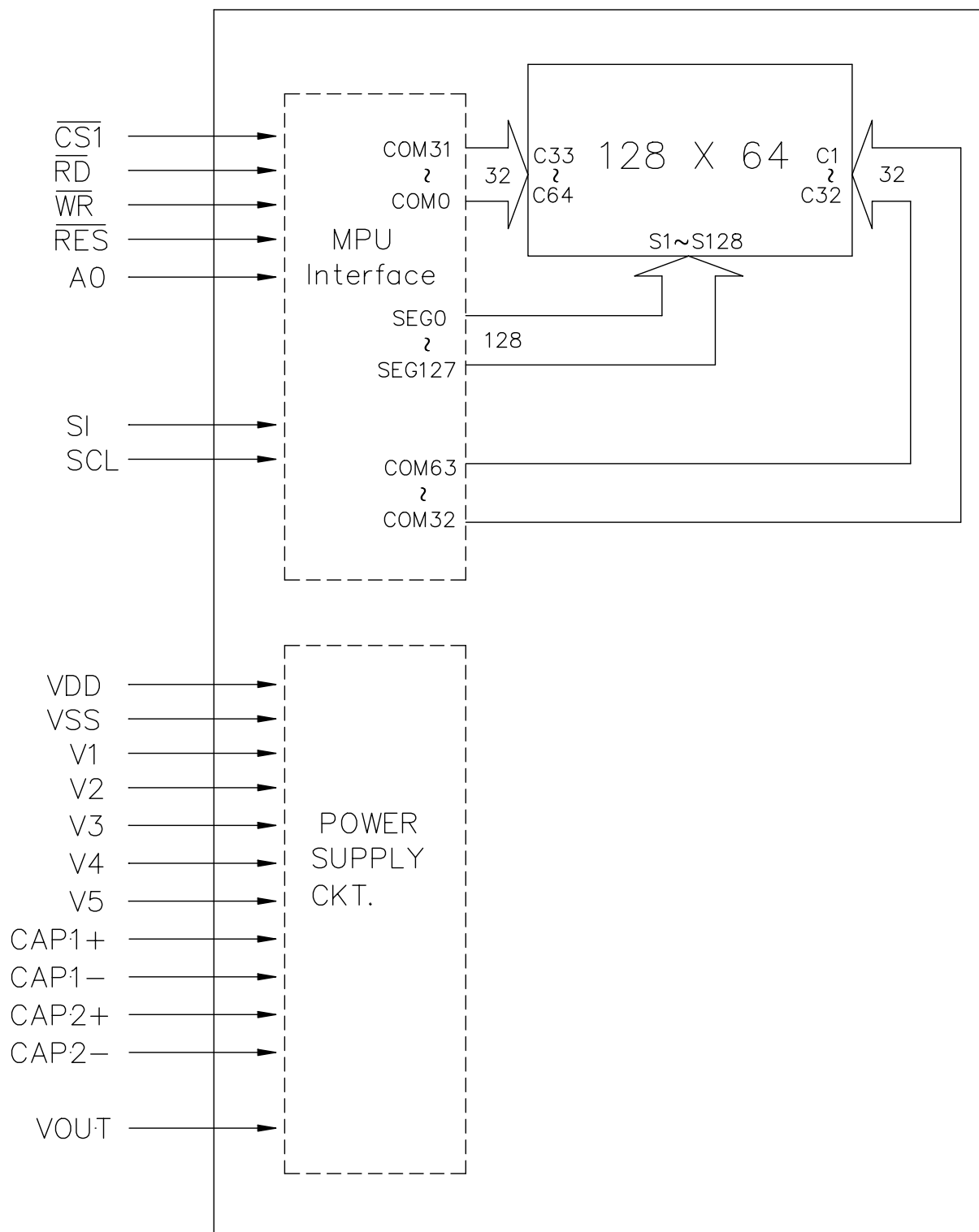
(negative type)

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

*Conditions

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

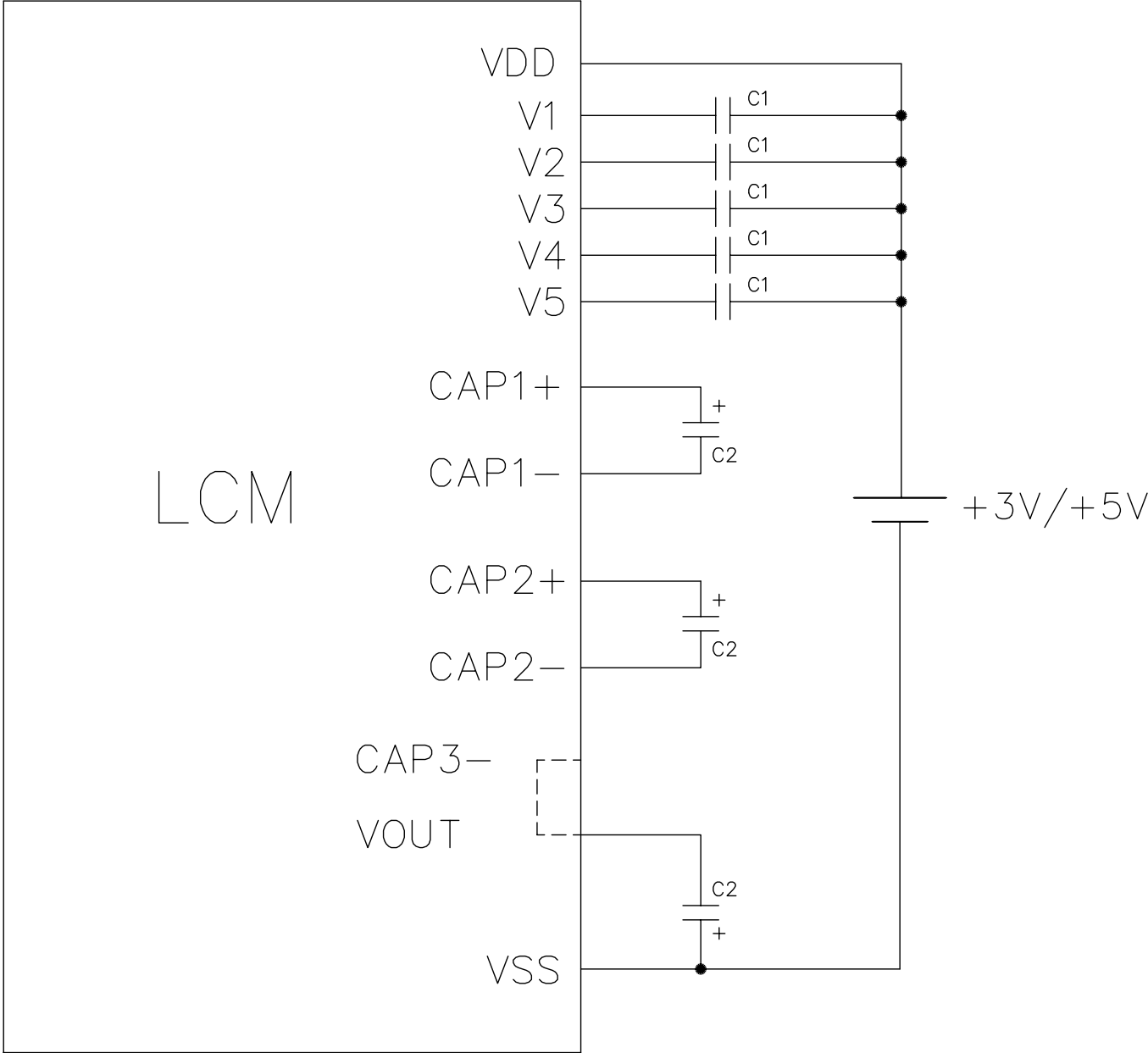
5. MPU INTERFACE/BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Function
1	V5	This is a multi-level power supply for the liquid crystal drive. $VDD(=V0) \geq V1 \geq V2 \geq V3 \geq V4 \geq V5$
2	V4	
3	V3	
4	V2	
5	V1	
6	N.C	N.C
7	CAP2+	Connect a capacitor between this terminal and the CAP2- terminal.
8	CAP2-	Connect a capacitor between this terminal and the CAP2+ terminal.
9	CAP1-	Connect a capacitor between this terminal and the CAP1+ terminal.
10	CAP1+	Connect a capacitor between this terminal and the CAP1- terminal.
11	VOUT	Connect a capacitor between this terminal and the VSS
12	VSS	0V(GND)
13	VDD	+3V/+5.0V(Logic voltage)
14	D7(SI)	Serial data input
15	D6(SCL)	Serial clock input
16	\overline{RD}	Fixed to either "H" or to "L"
17	\overline{WR}	Fixed to either "H" or to "L"
18	A0	"H"=Display data , "L"=Control data
19	\overline{RES}	Reset signal
20	$\overline{CS1}$	Chip select signal

7. POWER SUPPLY/BOOSTER CAPACITANCE



C1: 2.2~4.7 μ F
C2: 2.2~4.7 μ F

8-1. SED1565 Series Commands

Command	Command Code										Function	
	A0	\overline{RD}	\overline{WR}	D7	D6	D5	D4	D3	D2	D1		D0
(1)Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD display ON/OFF 0: OFF,1: ON
(2)Display start line set	0	1	0	0	1	Display start address					1	Sets the display RAM display start line address
(3)Page address set	0	1	0	1	0	1	Page address					Sets the display RAM page address
(4)Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5)Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6)Display data write	1	1	0	Write data								Writes to the display RAM
(7)Display data read	1	0	1	Read data								Reads from the display RAM
(8)ADC select	0	1	0	1	0	1	0	0	0	0	0	Sets the display RAM address SEG output correspondence 0: normal,1: reverse
(9)Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	Sets the LCD display normal/reverse 0: normal,1: reverse
(10)Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	Display all points 0: normal display 1: all point ON
(11)LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD drive voltage bias ratio SED1565***...0: 1/9,1: 1/7 SED1566***...0: 1/8,1: 1/6 SED1567***...0: 1/6,1: 1/5
(12)Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13)End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14)Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15)Common output mode select	0	1	0	1	1	0	0	0	*	*	*	Select COM output scan direction 0: normal direction, 1: reverse direction
(16)Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17)V5 voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio (Rb/Ra) mode
(18)Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V5 output voltage electronic volume register
Electronic volume register set	0	1	0	*	*	Electronic volume value						
(19)Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	0: OFF,1: ON
Static indicator register set	0	1	0	*	*	*	*	*	*	*	mode	Set the flashing mode
(20)Power saver												Display OFF and display all points ON compound command
(21)NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(22)Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command
(23)Test mode reset	0	1	0	1	1	1	1	0	0	0	0	Enter during the refresh sequence.

(Note)*: disabled data

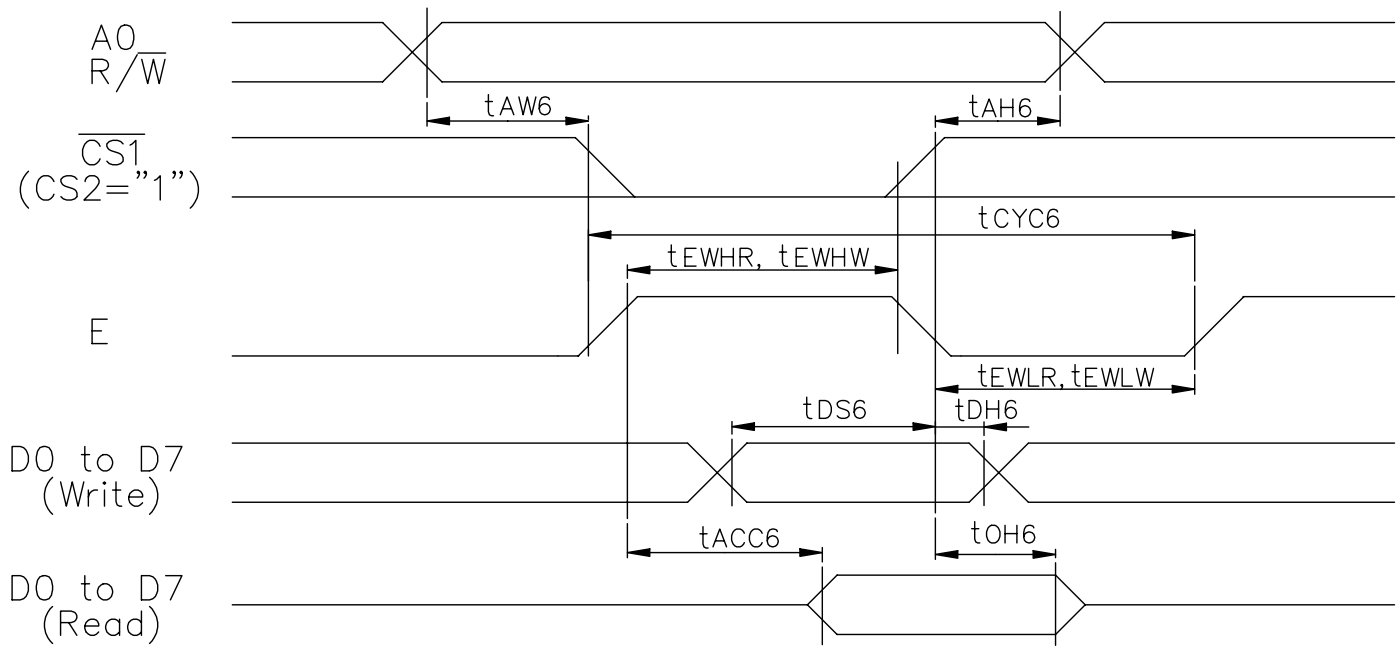
8-2. DISPLAY DATA RAM and ADDRESSES

Page Address D3D2D1D0	Data										Line address	COM output
0,0,0,0	D0										00H	COM0
	D1										01H	COM1
	D2										02H	COM2
	D3										03H	COM3
	D4										04H	COM4
	D5										05H	COM5
	D6										06H	COM6
	D7										07H	COM7
0,0,0,1	D0										08H	COM8
	D1										09H	COM9
	D2										0AH	COM10
	D3										0BH	COM11
	D4										0CH	COM12
	D5										0DH	COM13
	D6										0EH	COM14
	D7										0FH	COM15
0,0,1,0	D0 ? D7										10H ? 17H	COM16 ? COM23
0,0,1,1	D0 ? D7									18 ? 1FH	COM24 ? COM31	
0,1,0,0	D0 ? D7									20H ? 27H	COM32 ? COM39	
0,1,0,1	D0 ? D7									28H ? 2FH	COM40 ? COM47	
0,1,1,0	D0										30H	COM48
	D1										31H	COM49
	D2										32H	COM50
	D3										33H	COM51
	D4										34H	COM52
	D5										35H	COM53
	D6										36H	COM54
	D7										37H	COM55
0,1,1,1	D0										38H	COM56
	D1										39H	COM57
	D2										3AH	COM58
	D3										3BH	COM59
	D4										3CH	COM60
	D5										3DH	COM61
	D6										3EH	COM62
	D7										3FH	COM63
1,0,0,0	D0											COMS
Column address	ADC											
	D0 D0 = 0	83 00	82 01	81 02	80 03	7F 04	7E 05	7D 06	7C 07	- - -	82	83
	D0 D0 = 1									- - -	01	00
	LCD	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	- - -	SEG130	SEG131
	OUT											

when the common output mode is normal

9-1. TIMING CHARACTERISTICS

(For 6800 Series MPU)



VDD=4.5~5.5V, Ta=-40~85°C

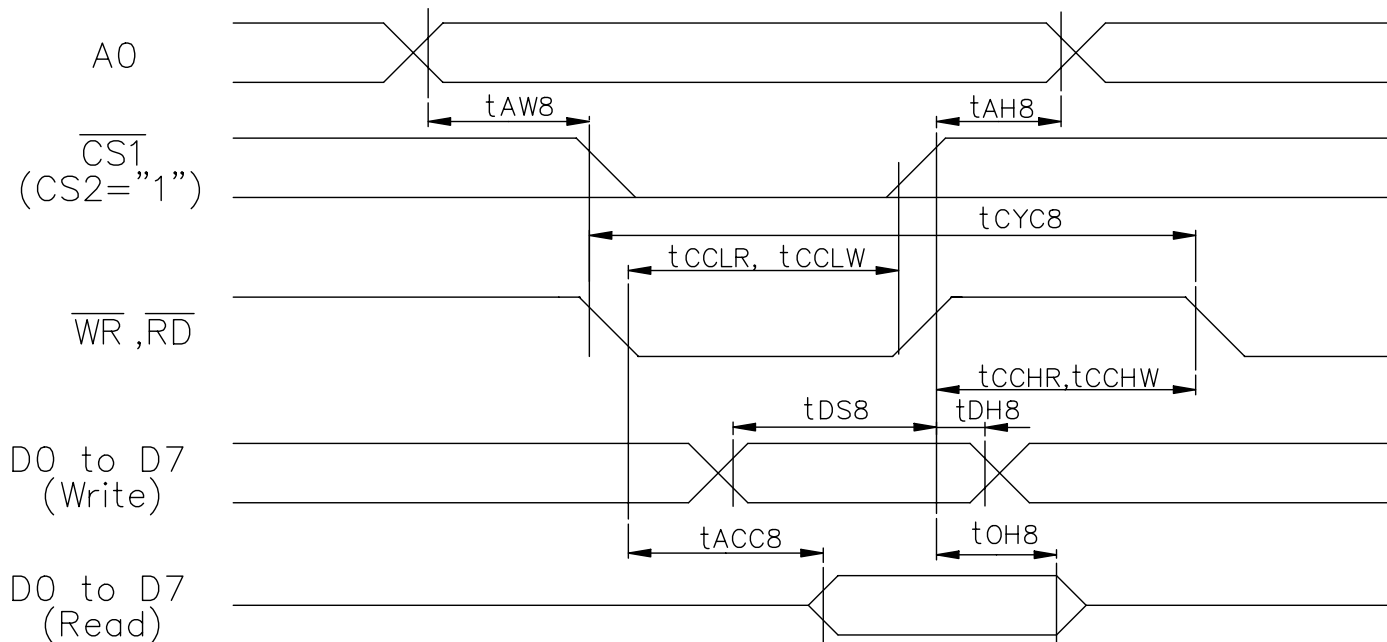
Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	tAH6		0	-	ns
Address setup time	A0	tAW6		0	-	ns
System cycle time	A0	tCYC6		166	-	ns
Data setup time	D0 to D7	tDS6		30	-	ns
Data hold time		tDH6		10	-	ns
Access time	D0 to D7	tACC6	CL=100pF	-	70	ns
Output disable time		tOH6		10	50	ns
Enable H pulse time	Read Write	E	tEWHR tEHW	70	-	ns
				30	-	ns
Enable L pulse time	Read Write	E	tEWLR tEWLW	30	-	ns
				30	-	ns

VDD=2.7~4.5V, Ta=-40~85°C

Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	tAH6		0	-	ns
Address setup time	A0	tAW6		0	-	ns
System cycle time	A0	tCYC6		300	-	ns
Data setup time	D0 to D7	tDS6		40	-	ns
Data hold time		tDH6		15	-	ns
Access time	D0 to D7	tACC6	CL=100pF	-	140	ns
Output disable time		tOH6		10	100	ns
Enable H pulse time	Read Write	E	tEWHR tEHW	120	-	ns
				60	-	ns
Enable L pulse time	Read Write	E	tEWLR tEWLW	60	-	ns
				60	-	ns

9-2. TIMING CHARACTERISTICS

(For 8080 Series MPU)



VDD=4.5~5.5V, Ta=-40~85°C

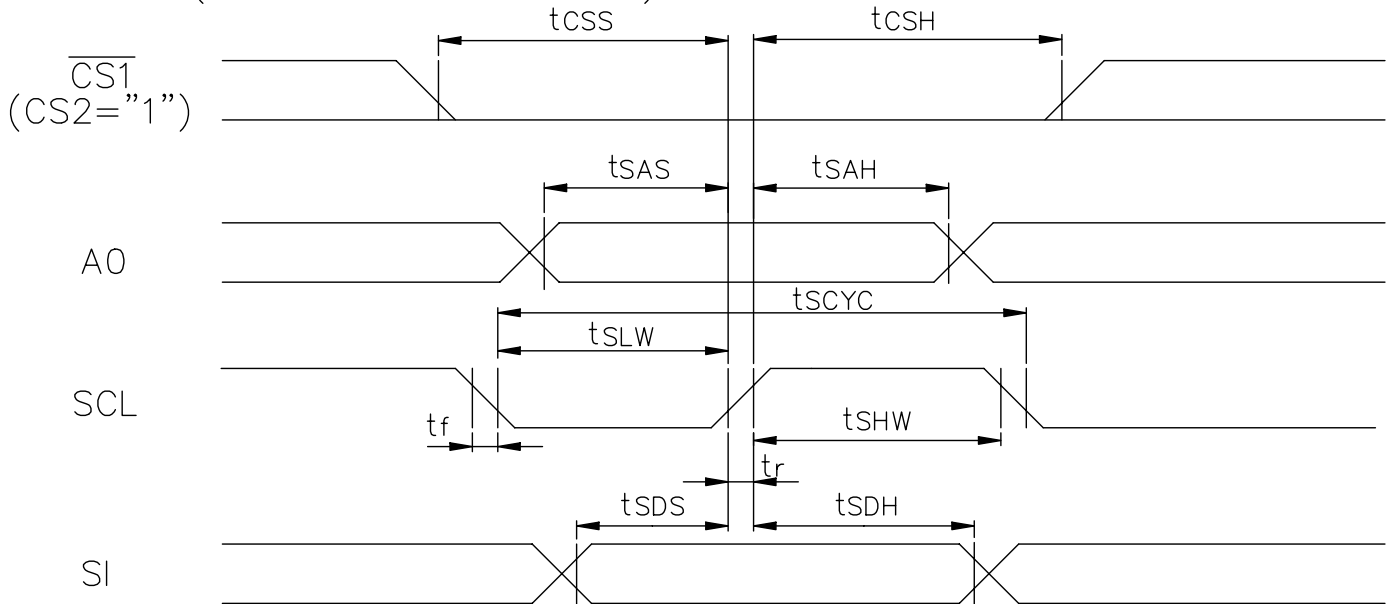
Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	tAH8		0	-	ns
Address setup time	A0	tAW8		0	-	ns
System cycle time	A0	tCYC8		166	-	ns
Control L pulse width	\overline{WR}	tCCLW		30	-	ns
Control L pulse width	\overline{RD}	tCCLR		70	-	ns
Control H pulse width	\overline{WR}	tCCHW		30	-	ns
Control H pulse width	\overline{RD}	tCCHR		30	-	ns
Data setup time	D0 to D7	tDS8		30	-	ns
Data hold time		tDH8		10	-	ns
\overline{RD} access time	D0 to D7	tACC8	CL=100pF	-	70	ns
Output disable time		tOH8		5	50	ns

VDD=2.7~4.5V, Ta=-40~85°C

Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	tAH8		0	-	ns
Address setup time	A0	tAW8		0	-	ns
System cycle time	A0	tCYC8		300	-	ns
Control L pulse width	\overline{WR}	tCCLW		60	-	ns
Control L pulse width	\overline{RD}	tCCLR		120	-	ns
Control H pulse width	\overline{WR}	tCCHW		60	-	ns
Control H pulse width	\overline{RD}	tCCHR		60	-	ns
Data setup time	D0 to D7	tDS8		40	-	ns
Data hold time		tDH8		15	-	ns
\overline{RD} access time	D0 to D7	tACC8	CL=100pF	-	140	ns
Output disable time		tOH8		10	100	ns

9-3. TIMING CHARACTERISTICS

(For Series Interface)



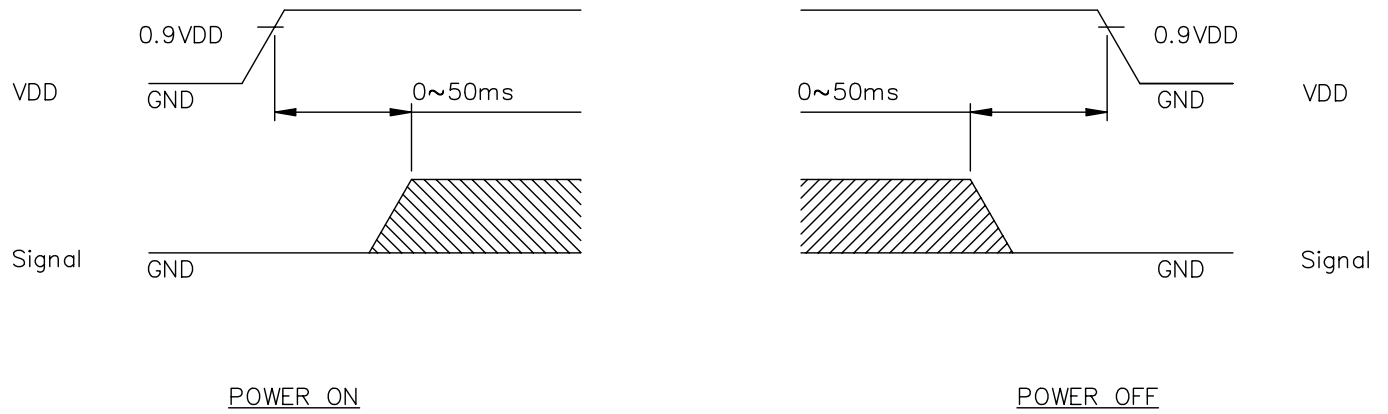
VDD=4.5~5.5V, Ta=-40~85°C

Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Serial Clock Period		tSCYC		200	—	ns
SCL "H" pulse width	SCL	tSHW		75	—	ns
SCL "L" pulse width	SCL	tSLW		75	—	ns
Address setup time	A0	tSAS		50	—	ns
Address hold time	A0	tSAH		100	—	ns
Data setup time	SI	tSDS		50	—	ns
Data hold time	SI	tSDH		50	—	ns
CS-SCL time	CS	tCSS		100	—	ns
		tCSH		100	—	ns

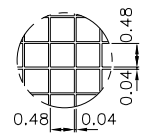
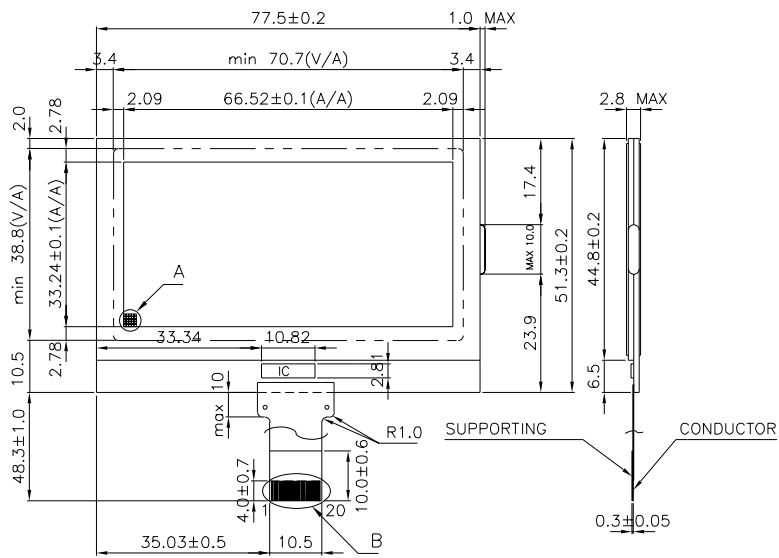
VDD=2.7~4.5V, Ta=-40~85°C

Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Serial Clock Period		tSCYC		250	—	ns
SCL "H" pulse width	SCL	tSHW		100	—	ns
SCL "L" pulse width	SCL	tSLW		100	—	ns
Address setup time	A0	tSAS		150	—	ns
Address hold time	A0	tSAH		150	—	ns
Data setup time	SI	tSDS		100	—	ns
Data hold time	SI	tSDH		100	—	ns
CS-SCL time	CS	tCSS		150	—	ns
		tCSH		150	—	ns

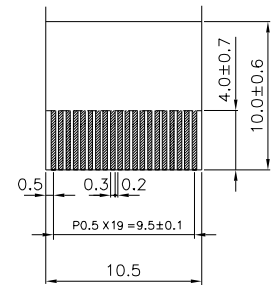
9-4. POWER ON/OFF TIMING



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



A DETAIL
1:10



B DETAIL
1:3

- Note:
- 1.RESOLUTION : 128X64
 - 2.COG IC : SED1565
 - 3.GLASS THICKNESS : 1.1 mm
 - 4.GENERAL TOLERANCE: ±0.2mm

NO	SYMBOL
1	V5
2	V4
3	V3
4	V2
5	V1
6	N.C
7	CAP2+
8	CAP2-
9	CAP1-
10	CAP1+
11	VOUT
12	VSS
13	VDD
14	D7(SI)
15	D6(SCL)
16	RD
17	WR
18	A0
19	RES
20	CS1

AGM1264E			AZ DISPLAYS, INC.	
APPROVE	NAME	DATE	TITLE	
CHECK			DWG-NO	Rev.0
DESIGN				UNIT : mm
DRAW	KIKI	88.03.23		SCALE : 0.85/1