

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 \leq 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.

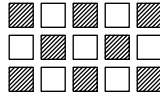
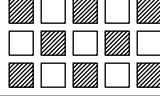
Note 5 Ta \leq 70°C : 75%RH max.

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

ITEM MODE	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

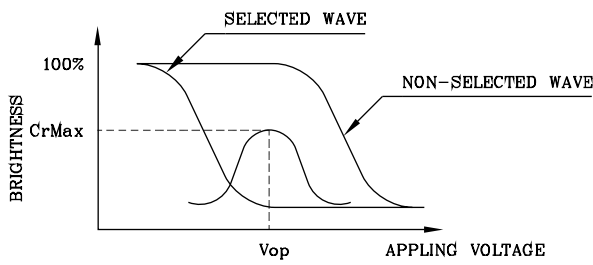
C/D: YELLOW
 E/F: BLUE
 G/H: NORMALLY BLACK
 J/K: NORMALLY WHITE

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

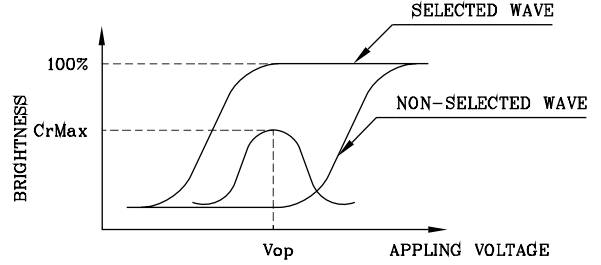
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	11240	-	ms	NOTE 2
		0℃	-	1450	-		
		25℃	-	350	-		
		50℃	-	145	-		
		70℃	-	75	-		
Response Time (fall)	Tf	-20℃	-	6200	-	ms	NOTE 2
		0℃	-	700	-		
		25℃	-	160	-		
		50℃	-	70	-		
		70℃	-	70	-		

(FIG 1)

Definition of Operation Voltage(Vop)



(positive type)



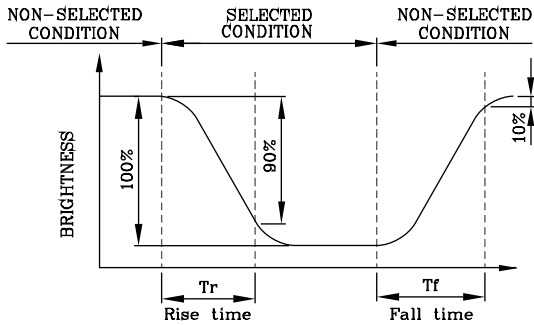
(negative type)

*Conditions

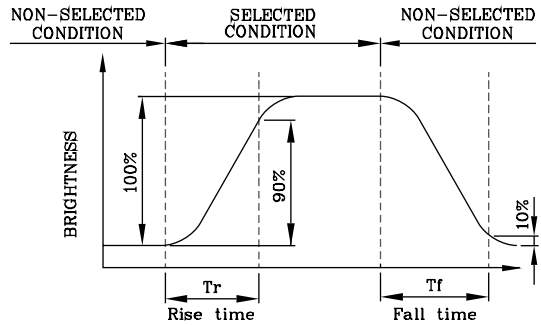
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : I/N duty 1/a bias

(FIG 2)

Definition of Response Time(Tr,Tf)



(positive type)



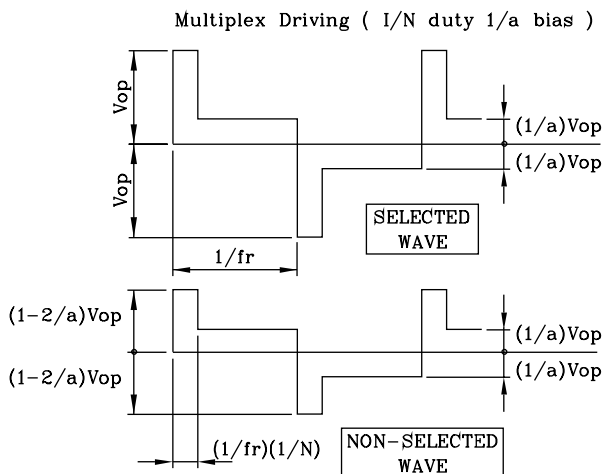
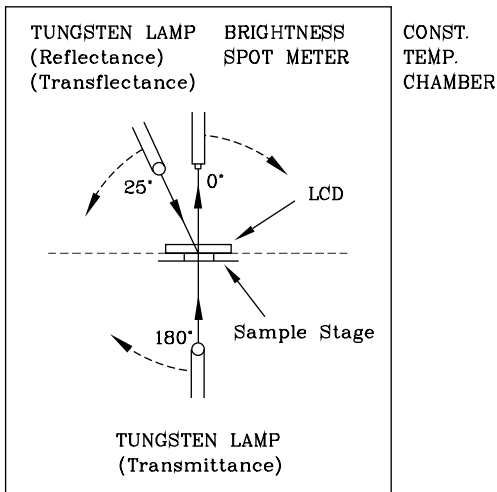
(negative type)

*Conditions

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

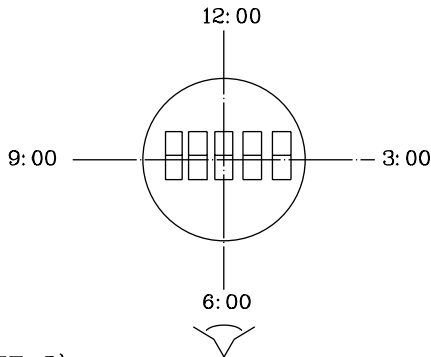
(FIG 3)

Description of Measuring Equipment and Driving Waveforms



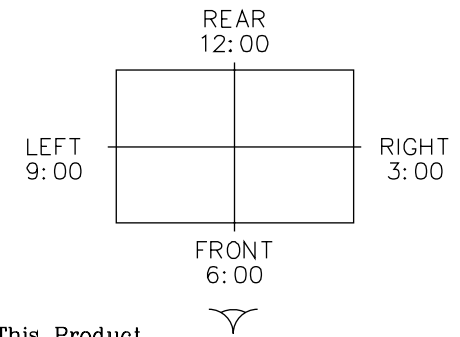
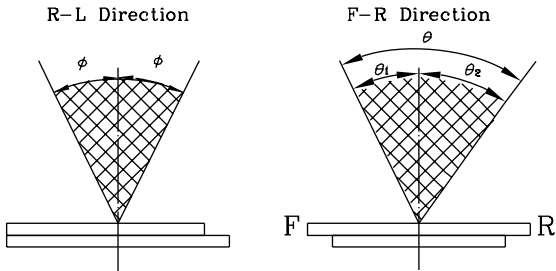
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



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

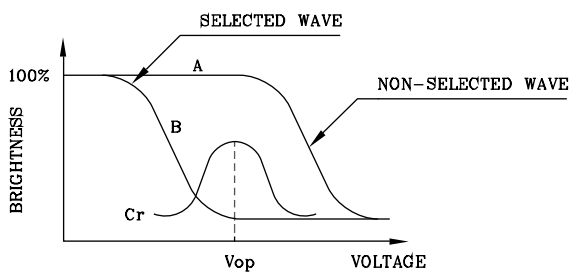
$$\theta = \theta_1 + \theta_2$$

*Conditions

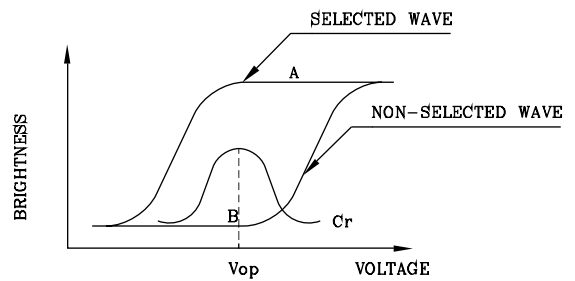
Operating Voltage : V_{op}
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



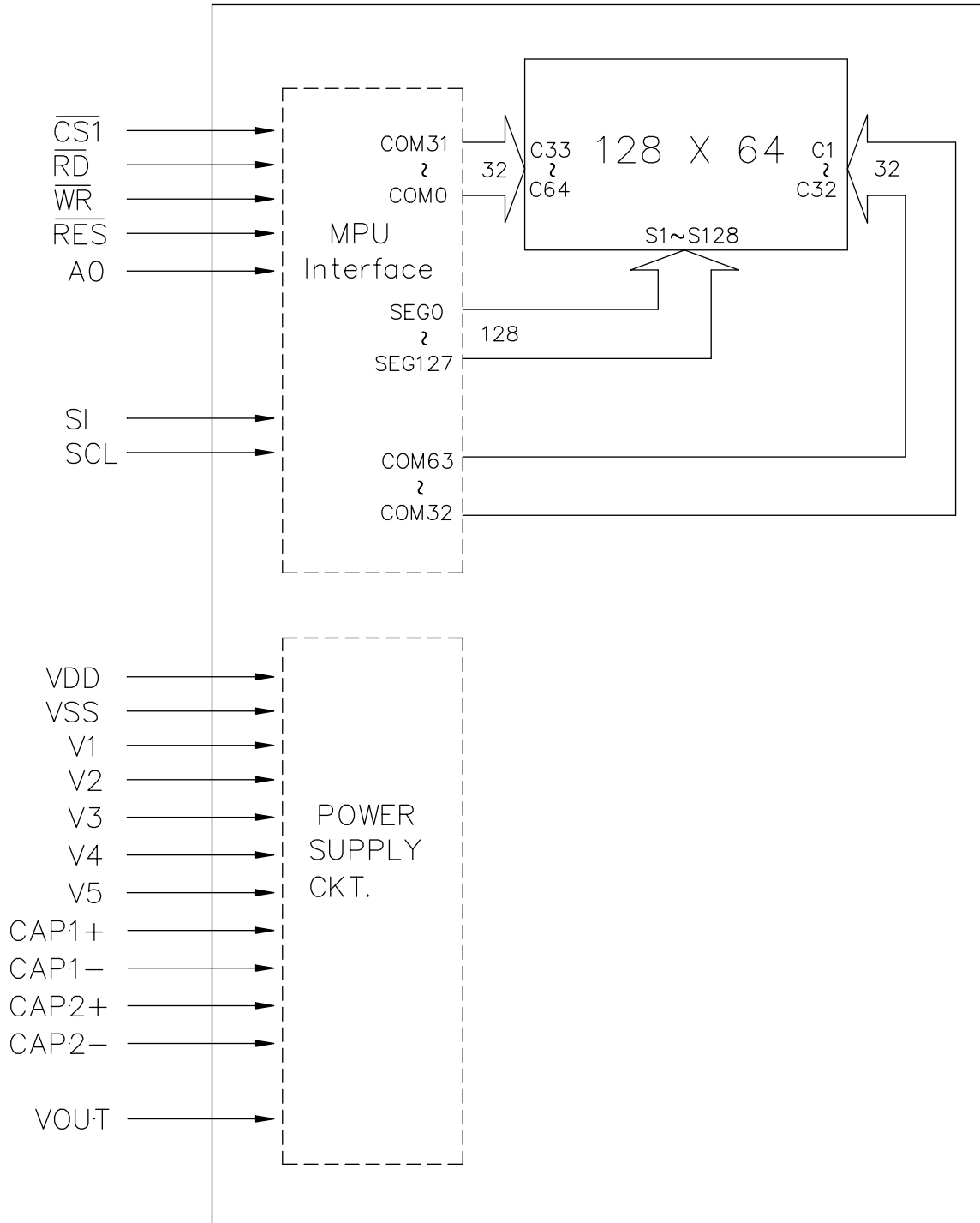
(negative type)

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

*Conditions

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

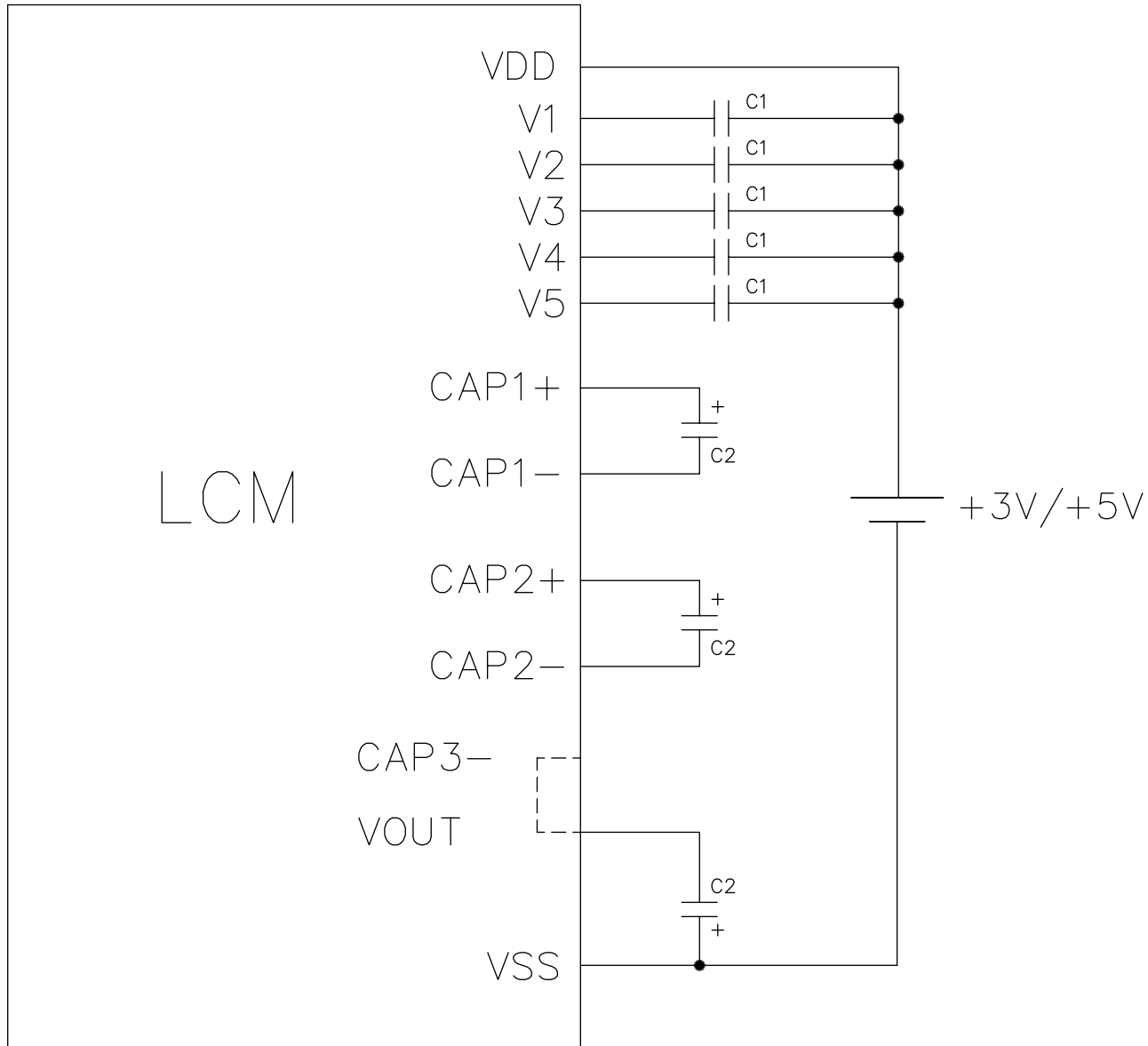
5. MPU INTERFACE/BLOCK DIAGRAM



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	RD	WR	D7	D6	D5	D4	D3	D2	D1		D0	
(1)Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF,1: ON
(2)Display start line set	0	1	0	0	1	Display start address						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	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	1	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	1	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	1	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	1	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	0	Column address increment At write: +1 At read: 0
(13)End	0	1	0	1	1	1	0	1	1	1	0	0	Clear read/modify/write
(14)Reset	0	1	0	1	1	1	0	0	0	1	0	0	Internal reset
(15)Common output mode select	0	1	0	1	1	0	0	0	*	*	*	1	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	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	1	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	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	0	Enter during the refresh sequence.

(Note)*: disabled data

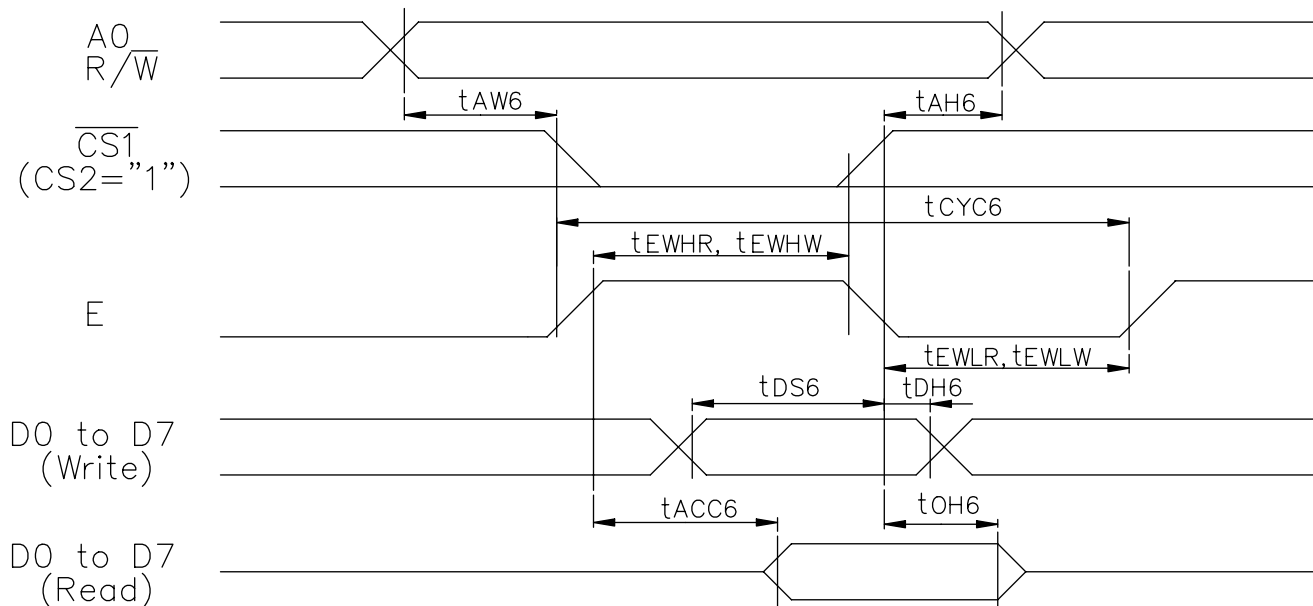
8-2. DISPLAY DATA RAM and ADDRESSES

Page Address D3D2D1D0	Data	Line address	COM output
0,0,0,0	D0	Page 0	COM0
	D1		COM1
	D2		COM2
	D3		COM3
	D4		COM4
	D5		COM5
	D6		COM6
	D7		COM7
0,0,0,1	D0	Page 1	COM8
	D1		COM9
	D2		COM10
	D3		COM11
	D4		COM12
	D5		COM13
	D6		COM14
	D7		COM15
0,0,1,0	D0 ~ D7	Page 2	COM16 ~ COM23
0,0,1,1	D0 ~ D7	Page 3	COM24 ~ COM31
0,1,0,0	D0 ~ D7	Page 4	COM32 ~ COM39
0,1,0,1	D0 ~ D7	Page 5	COM40 ~ COM47
0,1,1,0	D0	Page 6	COM48
	D1		COM49
	D2		COM50
	D3		COM51
	D4		COM52
	D5		COM53
	D6		COM54
	D7		COM55
0,1,1,1	D0	Page 7	COM56
	D1		COM57
	D2		COM58
	D3		COM59
	D4		COM60
	D5		COM61
	D6		COM62
	D7		COM63
1,0,0,0	D0	Page 8	COMS
Column address	ADC		
	D0 = 0	83 00	---
	D0 = 1	82 01	---
		81 02	---
		80 03	---
		7F 04	---
		7E 05	---
		7D 06	---
		7C 07	---
			82
			83
	LC		---
	CD		---
	UT		---
		SEG0	SEG130
		SEG1	SEG131
		SEG2	
		SEG3	
		SEG4	
		SEG5	
		SEG6	
		SEG7	

when the common output mode is normal

9-1. TIMING CHARACTERISTICS

(For 6800 Series MPU)



VDD=4.5~5.5V, Ta=-40~85°C

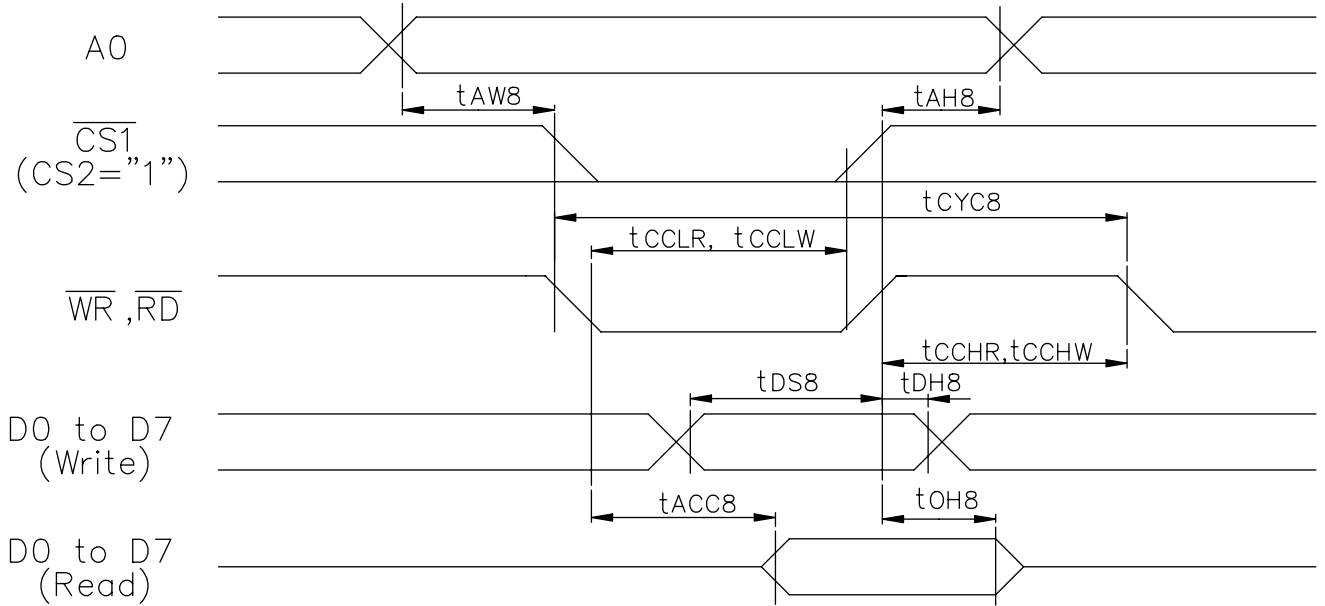
Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	tAH6		0	-	ns
Address setup time	A0	tAW6		0	-	ns
System cycle time	A0	tCYC6		166	-	ns
Data setup time	D0 to D7	tDS6		30	-	ns
Data hold time		tDH6		10	-	ns
Access time	D0 to D7	tACC6	CL=100pF	-	70	ns
Output disable time		tOH6		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)



$V_{DD}=4.5\sim 5.5V, T_a=-40\sim 85^\circ C$

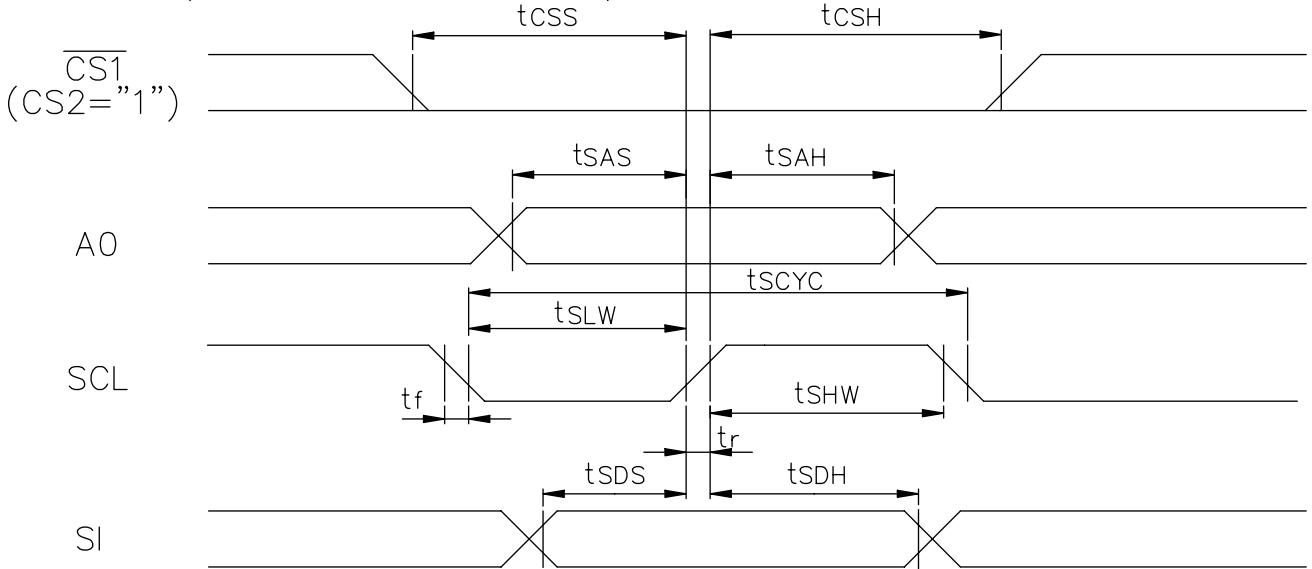
Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	t_{AH8}		0	—	ns
Address setup time	A0	t_{AW8}		0	—	ns
System cycle time	A0	t_{CYC8}		166	—	ns
Control L pulse width	\overline{WR}	t_{CCLW}		30	—	ns
Control L pulse width	\overline{RD}	t_{CCLR}		70	—	ns
Control H pulse width	\overline{WR}	t_{CCHW}		30	—	ns
Control H pulse width	\overline{RD}	t_{CCHR}		30	—	ns
Data setup time	D0 to D7	t_{DS8}		30	—	ns
Data hold time		t_{DH8}		10	—	ns
\overline{RD} access time	D0 to D7	t_{ACC8}	CL=100pF	—	70	ns
Output disable time		t_{OH8}		5	50	ns

$V_{DD}=2.7\sim 4.5V, T_a=-40\sim 85^\circ C$

Item	Signal	Symbol	Condition	Rating		Unites
				Min	Max	
Address hold time	A0	t_{AH8}		0	—	ns
Address setup time	A0	t_{AW8}		0	—	ns
System cycle time	A0	t_{CYC8}		300	—	ns
Control L pulse width	\overline{WR}	t_{CCLW}		60	—	ns
Control L pulse width	\overline{RD}	t_{CCLR}		120	—	ns
Control H pulse width	\overline{WR}	t_{CCHW}		60	—	ns
Control H pulse width	\overline{RD}	t_{CCHR}		60	—	ns
Data setup time	D0 to D7	t_{DS8}		40	—	ns
Data hold time		t_{DH8}		15	—	ns
\overline{RD} access time	D0 to D7	t_{ACC8}	CL=100pF	—	140	ns
Output disable time		t_{OH8}		10	100	ns

9-3. TIMING CHARACTERISTICS

(For Series Interface)



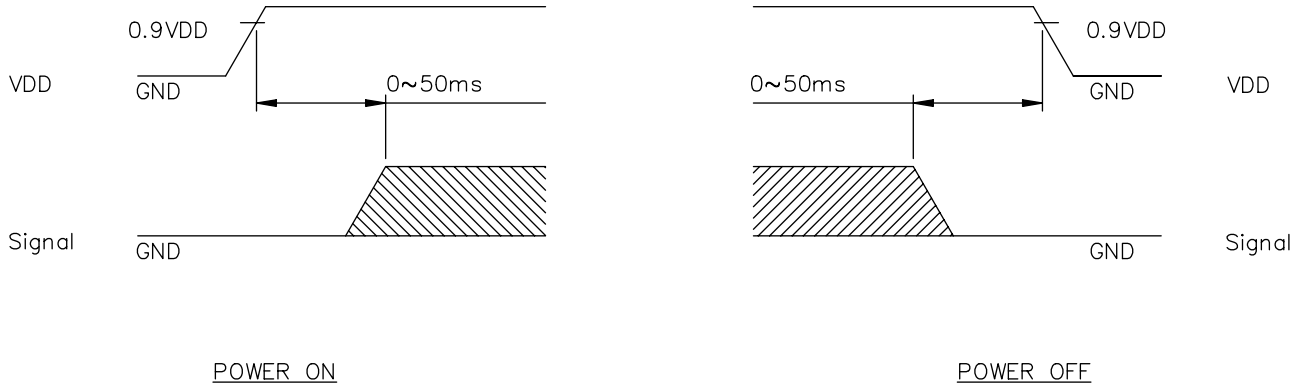
VDD=4.5~5.5V, Ta=-40~85°C

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

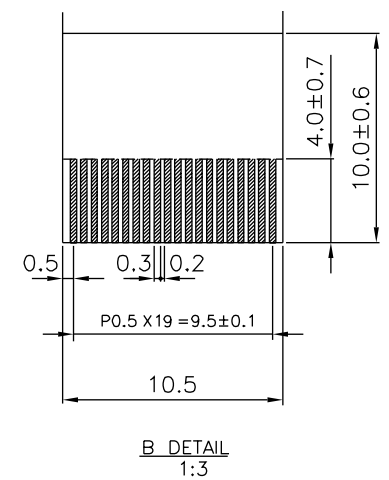
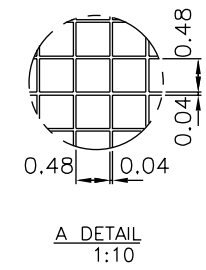
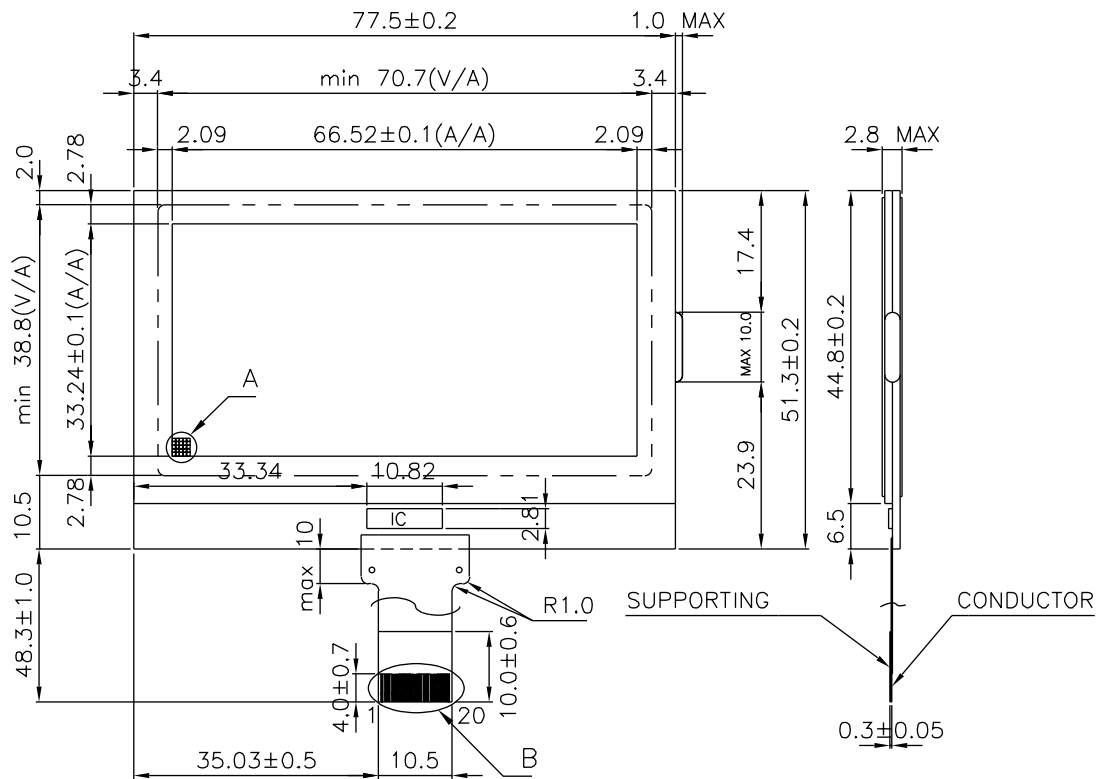
VDD=2.7~4.5V, Ta=-40~85°C

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.



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	AO
19	RES
20	CS1

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