

# AZ Displays, Inc.

## 1. MECHANICAL DATA

(1) Product No.	<b>AGM1532A</b>
(2) Module Size	116.50 (W)mm x 42.0 (H)mm x MAX15.0 (D)mm (LED B.L.) 116.50 (W)mm x 42.0 (H)mm x MAX9.5 (D)mm (W/O B.L.)
(3) Dot Size	0.50 (W)mm x 0.55 (H)mm
(4) Dot Pitch	0.55 (W)mm x 0.60 (H)mm
(5) Duty	1/32
(6) 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)
(7) 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 <input type="checkbox"/> ___O'clock
(8) Backlight	<input type="checkbox"/> W/O <input type="checkbox"/> LED <input type="checkbox"/> EL
(9) Weight	LED B/L: 70.0 g W/O B/L: 54.5 g

# AZ Displays, Inc.

## 2. ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

V<sub>SS</sub>=0V

	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Input Voltage	V <sub>I</sub>	-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
Input Voltage	V <sub>IH</sub>	H level	0.8VDD	–	VDD	V
	V <sub>IO</sub>	L level	0	–	0.2VDD	V
Recommended LC Driving Voltage (NORMAL TEMP. LCM)	VDD–V <sub>O</sub>	0℃	–	7.5	8.0	V
		25℃	6.3	6.8	7.3	
		50℃	5.6	6.1	–	
Recommended LC Driving Voltage (WIDE TEMP. LCM)	VDD–V <sub>O</sub>	–20℃	8.1	8.5	8.9	V
		0℃	7.9	8.3	8.7	
		25℃	7.6	8.0	8.4	
		50℃	7.3	7.7	8.1	
		70℃	6.7	7.1	7.5	
Power Supply Current	I <sub>DD</sub>	VDD = 5.0V	–	–	5.0	mA
LED Power Supply Current	I <sub>LED</sub>	V <sub>BL</sub> = 5.0V <sub>dc</sub> R <sub>LED</sub> = 5.0Ω	–	170	–	mA

# AZ Displays, Inc.

## 4.1 OPTICAL CHARACTERISTICS

(FOR NORMAL TEMPERATURE MODE LCM)

AT Vop

ITEM MODE		Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	2.5	3.4	30	40	20	30
	C	4.0	8.0	40	60	25	40
	J						
S	A						
	C	4.0	7.0	40	60	25	35
	J						
T	E						
	C	3.0	6.0	40	50	20	35
NOTE		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	–	470	940	ms	NOTE 2
		25℃	–	140	300		
		50℃	–	70	150		
Response Time (fall)	Tf	0℃	–	520	1000	ms	NOTE 2
		25℃	–	180	350		
		50℃	–	110	220		

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 NORMAL TEMPERATURE MODE LCM)

AT Vop

ITEM MODE		Cr(Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A						
	C						
	J						
S	A						
	C	—	6.5	—	60	—	90
	J						
T	E						
	C						
NOTE		NOTE6		NOTE5			

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

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	—	1800	2700	ms	NOTE 2
		0℃	—	400	600		
		25℃	—	150	230		
		50℃	—	70	110		
		70℃	—	70	110		
Response Time (fall)	Tf	-20℃	—	1060	1590	ms	NOTE 2
		0℃	—	250	380		
		25℃	—	105	160		
		50℃	—	65	100		
		70℃	—	60	90		

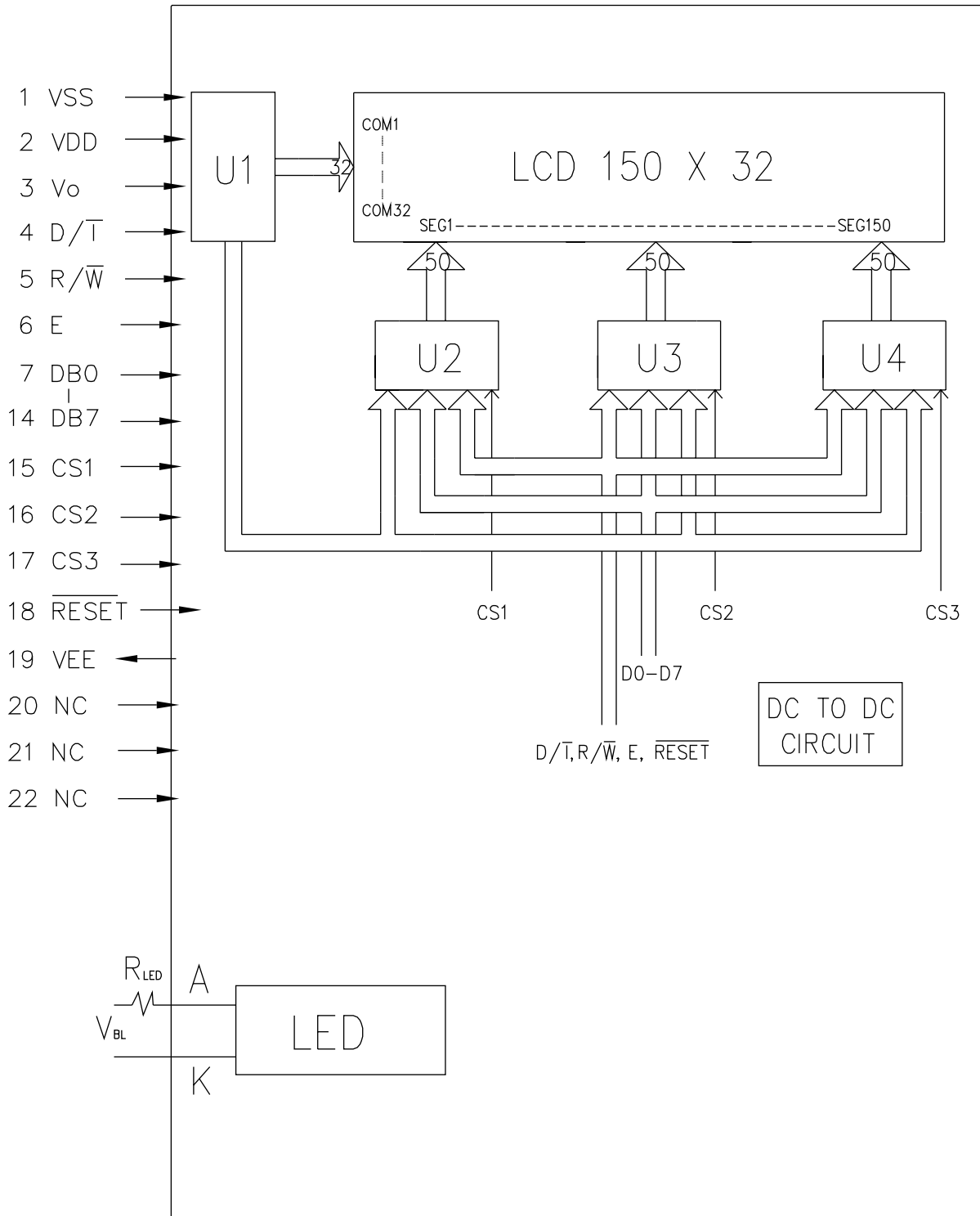
NOTE :

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

E: BLUE  
 G: NORMALLY BLACK  
 J: NORMALLY WHITE

# AZ Displays, Inc.

## 5. BLOCK DIAGRAM



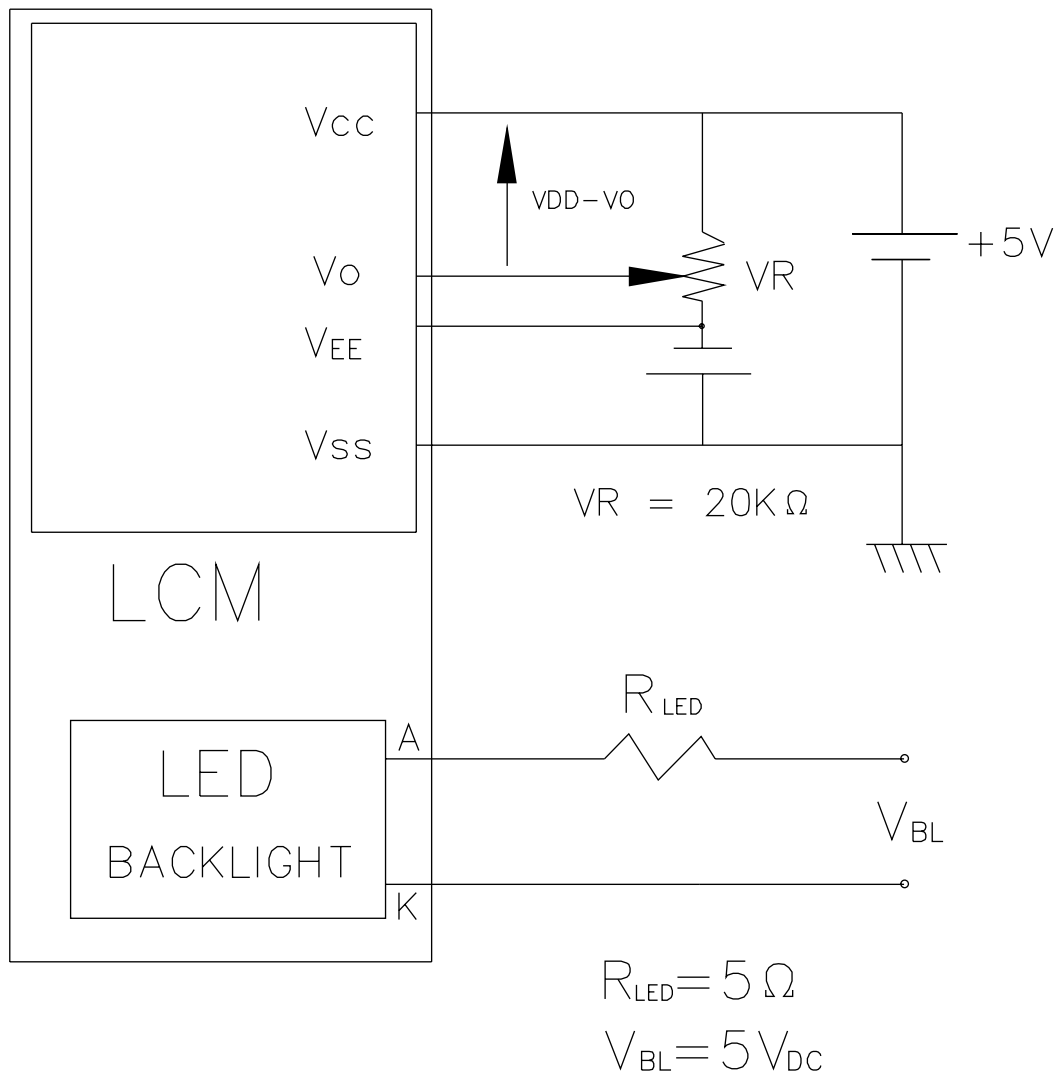
# AZ Displays, Inc.

## 6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V <sub>SS</sub>	—	0V	POWER SUPPLY
2	V <sub>DD</sub>	—	+5V	
3	V <sub>0</sub>	—	OPERATING VOLTAGE FOR LCD DRIVING	
4	D/ $\bar{T}$	H/L	H: DATA INPUT L: INSTRUCTION CODE INPUT	
5	R/ $\bar{W}$	H/L	H: DATA READ (FROM LCM TO MPU) L: DATA WRITE (FROM MPU TO LCM)	
6	E	H, H→L	ENABLE SIGNAL	
7	DB0	H/L	DATA BUS LINE	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		
15	CS1	H	CHIP SELECT FOR IC1	
16	CS2	H	CHIP SELECT FOR IC2	
17	CS3	H	CHIP SELECT FOR IC3	
18	$\overline{\text{RESET}}$	L	" L " ACTIVE	
19	VEE	—	POWER SUPPLY FOR LCD DRIVING	
20	NC	—	NONE CONNECTION	
21	NC	—	NONE CONNECTION	
22	NC	—	NONE CONNECTION	

# AZ Displays, Inc.

## 7. POWER SUPPLY





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## 8. TIMING CHARACTERISTICS

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	$t_{cyc}$	Fig a, Fig. b	500	—	—	ns
E high level width	$P_{WEH}$	Fig a, Fig. b	220	—	—	ns
E low level width	$P_{WEL}$	Fig a, Fig. b	220	—	—	ns
E rise/fall time	$t_r, t_f$	Fig a, Fig. b	—	—	20	ns
Address set up time	$t_{AS}$	Fig a, Fig. b	40	—	—	ns
Address hold time	$t_{AH}$	Fig a, Fig. b	10	—	—	ns
Data delay time	$t_{DDR}$	Fig. b	—	—	140	ns
Data set up time	$t_{DSW}$	Fig. a	60	—	—	ns
Data hold time (WR)	$t_{DHW}$	Fig. a	10	—	—	ns
Data hold time (RD)	$t_{DHR}$	Fig. b	20	—	—	ns

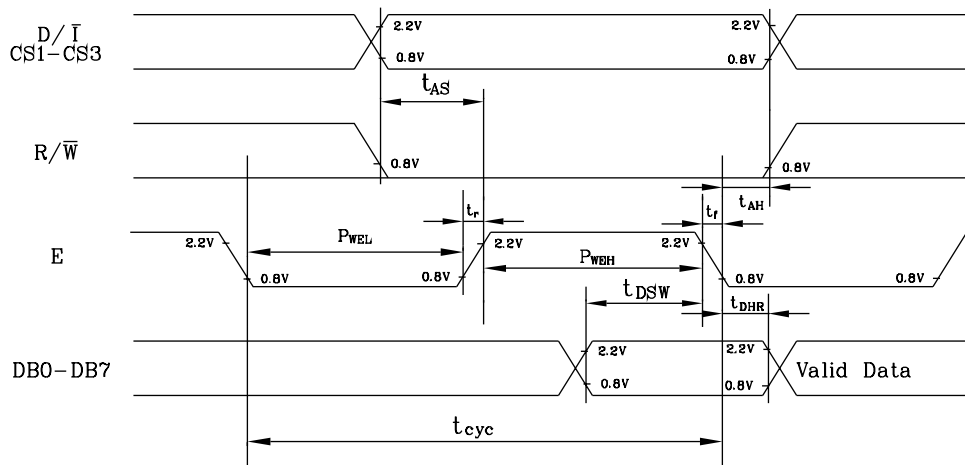


Fig. a Interface timing (data write)

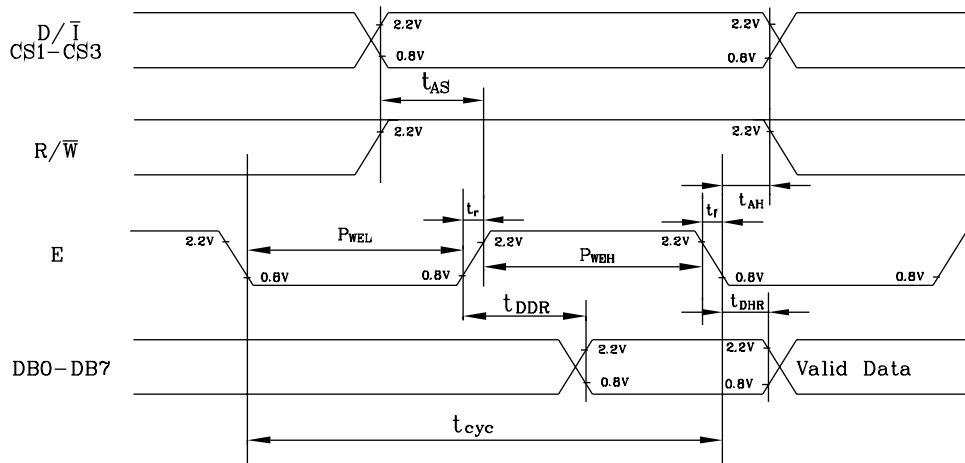
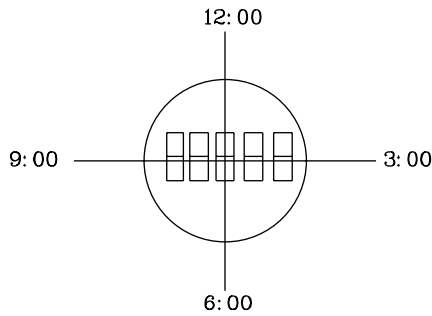


Fig. b Interface timing (data read)

# AZ Displays, Inc.

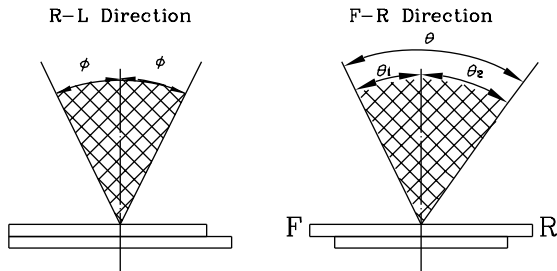
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



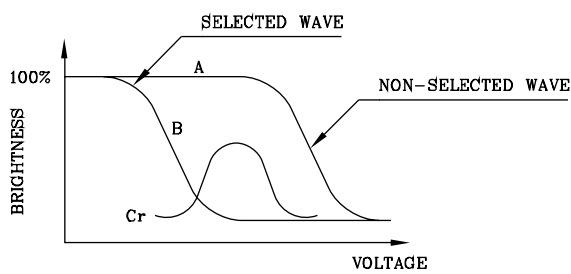
$$\theta = \theta_1 + \theta_2$$

\*Conditions

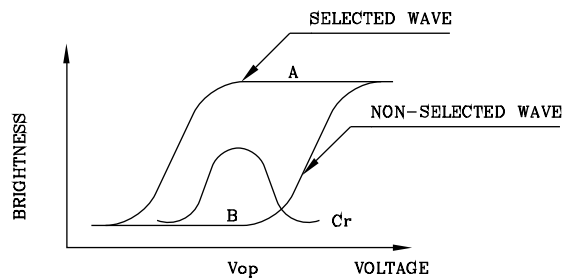
- Operating Voltage :  $V_{op}$
- Frame Frequency : 70Hz
- Applying Waveform : 1/N duty 1/a bias
- Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

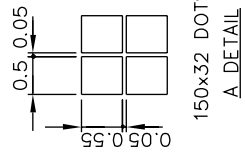
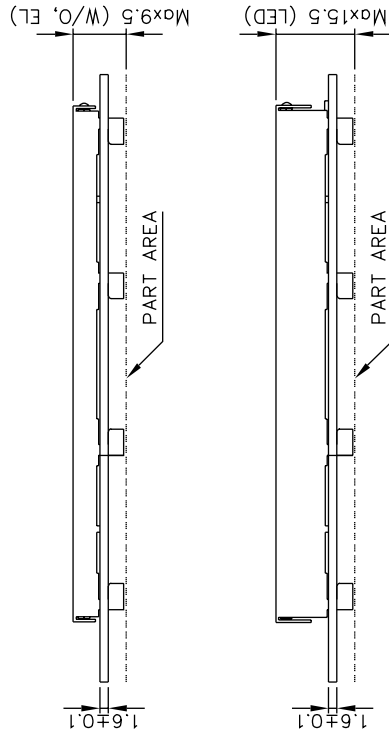
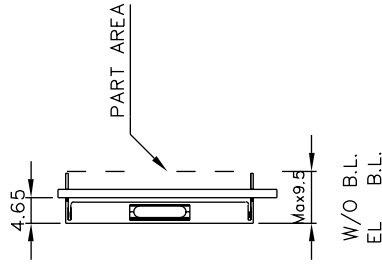
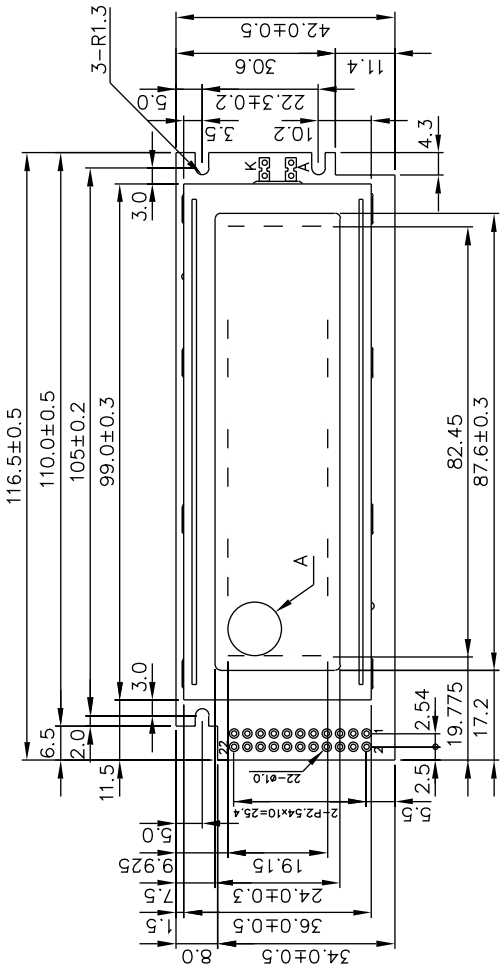


(negative type)

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

\*Conditions

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



Note :  
 1. Resolution : 150X32 Dots  
 2. General Tolerance : ±0.5mm

PinNo.	Symbol	Level	Function	
1	VSS	-	0V	Power supply
2	VDD	-	+5V	supply
3	V <sub>O</sub>	-		OPERATING VOLTAGE FOR LED DRIVING
4	D/I	H/L		INSTRUCTION CODE INPUT
5	R/W	H/L		INSTRUCTION CODE INPUT
6	E	H, H → L		ENABLE SIGNAL
7	DB0	H/L		DATA BUS LINE
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		
15	CS1	H		CHIP SELECT FOR IC1
16	CS2	H		CHIP SELECT FOR IC2
17	CS3	H		CHIP SELECT FOR IC3
18	RES	L		RESET
19	VEE	-		POWER SUPPLY FOR LED DRIVING
20	NC	-		NO CONNECTION
21	NC	-		NONE CONNECTION
22	NC	-		NONE CONNECTION

AGM1532A		AZ DISPLAYS, INC.	
APPROVE	NAME	DATE	TITLE
CHECK			DWG-NO
DESIGN			MXBX031X
DRAW	MAY PING	87.03.02	Rev.A
			UNIT : mm
			SCALE : 2/3