

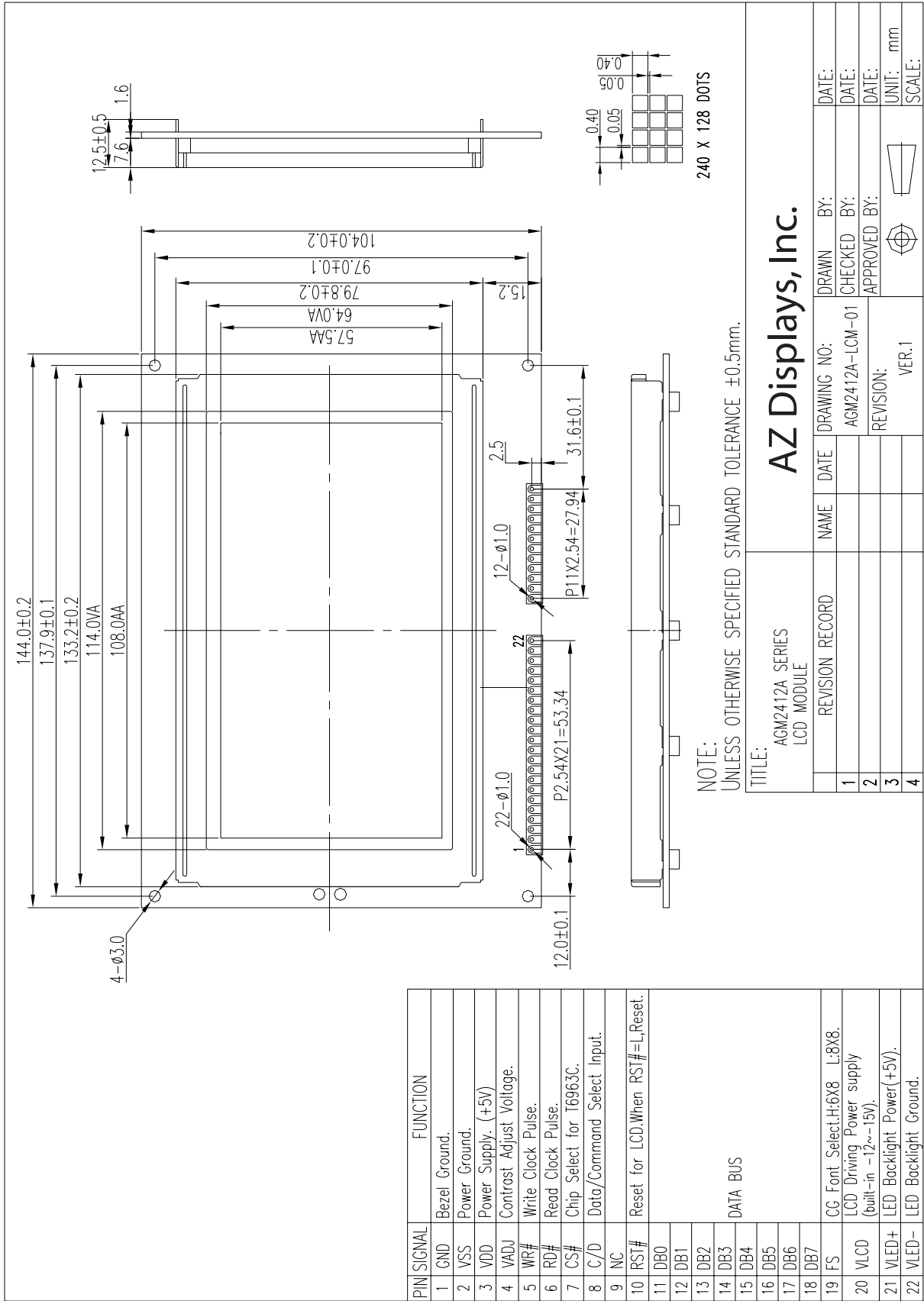
AZ Displays, Inc.

**SPECIFICATIONS FOR  
LIQUID CRYSTAL DISPLAY**

**PART NUMBER:**  
**DATE:**

**AGM 2412A SERIES**  
**APR.19, 2005**

1.0 MECHANICAL DIAGRAM



PIN SIGNAL	FUNCTION
1	GND Bezel Ground.
2	VSS Power Ground.
3	VDD Power Supply. (+5V)
4	VADJ Contrast Adjust Voltage.
5	WR# Write Clock Pulse.
6	RD# Read Clock Pulse.
7	CS# Chip Select for T6963C.
8	C/D Data/Command Select Input.
9	NC
10	RST# Reset for LCD. When RST# = L, Reset.
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7
19	FS CG Font Select. H: 6x8 L: 8x8.
20	VLCD LCD Driving Power supply (built-in -12~-15V).
21	VLED+ LED Backlight Power(+5V).
22	VLED- LED Backlight Ground.

**AZ Displays, Inc.**

REVISION RECORD	NAME	DATE	DRAWING NO:	BY:	DATE:
1			AGM2412A-LCM-01	CHECKED BY:	DATE:
2			REVISION:	APPROVED BY:	DATE:
3			VER.1		UNIT: mm
4					SCALE:

## 2.0 MECHANICAL SPECS

1. Overall Module Size	144.0mm(W) x 104.0mm(H) x max 12.5mm(D) for LED backlight version
2. Dot Size	0.40mm(W) x 0.40mm(H)
3. Dot Pitch	0.45mm(W) x 0.45mm(H)
4. Duty	1/128
5. Controller IC	T6963C
6. LC Fluid Options	STN, FSTN
7. Polarizer Options	Reflective, Transflective, Transmissive
8. Backlight Options	LED
9. Temperature Range Options	Standard (0°C ~ 50°C), Wide (-20°C ~ 70°C)

## 3.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature (Standard)	Top	0	-	50	°C
Storage temperature (Standard)	Tst	-10	-	60	°C
Operating temperature (Wide temperature)	Top	-20	-	70	°C
Storage temperature (Wide temperature)	Tst	-30	-	80	°C
Input voltage	Vin	-0.3	-	Vdd+0.3	V
Supply voltage for logic	Vdd- Vss	-0.3	-	7.0	V
Supply voltage for LCD drive	Vdd- Vo	6	16.2	28	V

## 4.0 ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Input voltage (high)	Vih	H level	3.5	-	Vdd	V
Input voltage (low)	Vil	L level	0	-	1.5	V
Recommended LC Driving Voltage (Standard Temp)	Vdd - Vo	0°C	16.0	16.5	-	V
		25°C	15.5	16.2	-	
		50°C	15.0	15.8	-	
Recommended LC Driving Voltage (Wide Temp)	Vdd -Vo	-20°C	16.5	16.8	-	V
		0°C	16.0	16.5	-	
		50°C	15.0	15.5	-	
		70°C	14.8	15.3	-	
Power Supply Current	Idd	Vdd=5.0V	-	10	16.0	mA
Power Supply voltage for White LED	(VLED+)-VLED-	RL=12Ω	4.4	5.0	6.8	V
LED Power Supply Current	Ifled	RL=12Ω	120	160	320	mA
Power Supply voltage For green LED	(VLED+)-VLED-	RL=4Ω	4.8	5.0	5.8	V
LED Power Supply Current	Ifled	RL=4Ω	150	200	400	mA

**5.0 OPTICAL CHARACTERISTICS**

Item		Cr (Contrast Ratio)		$\theta$ (Viewing Angle)		$\phi$ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN	TYP.	MIN	TYP.
R	A	2.8	3.05	80°	85°	-	35°
	B	7.10	7.70	80°	85°	-	35°
	C	-	-	-	-	-	-
S	A	2.49	2.99	80°	85°	-	35°
	B	7.05	7.55	80°	85°	-	35°
	C	-	-	-	-	-	-

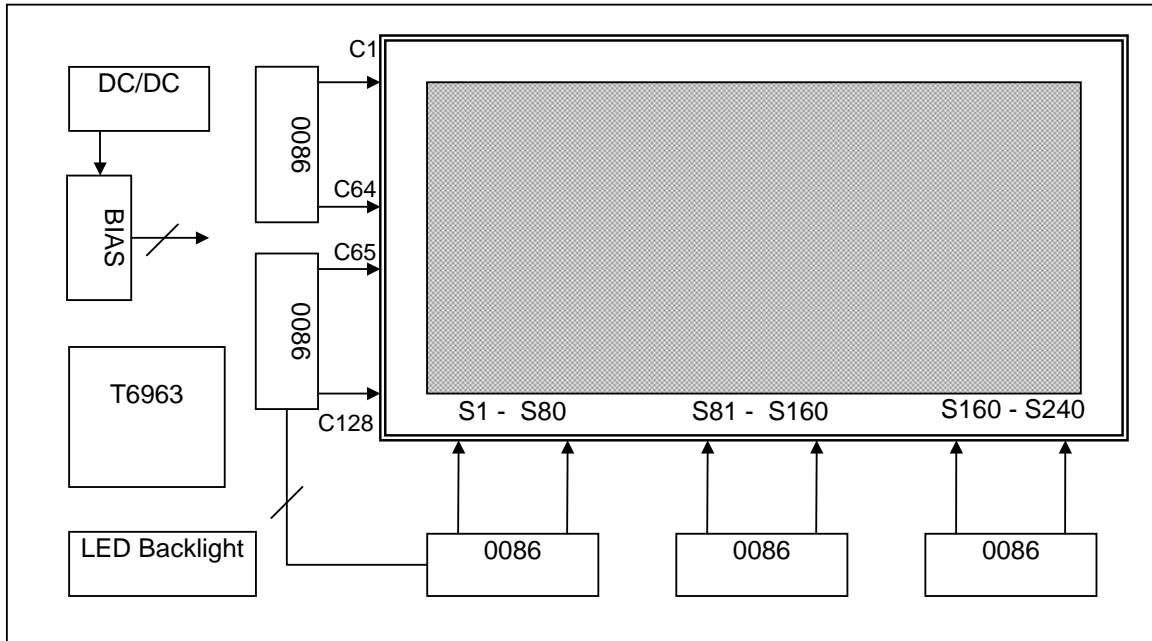
Note:

- R: Reflective S: Transflective
- A: STN Gray
- B: STN Yellow
- C: FSTN

At:  $\phi = 0^\circ, \theta = 0^\circ$

Item	Symbol	Condition	Min	Typ	Max	Unit
Response time (rise)	Tr	25 °C	-	150	250	ms
Response time (fall)	Tf	25°C	-	150	250	ms

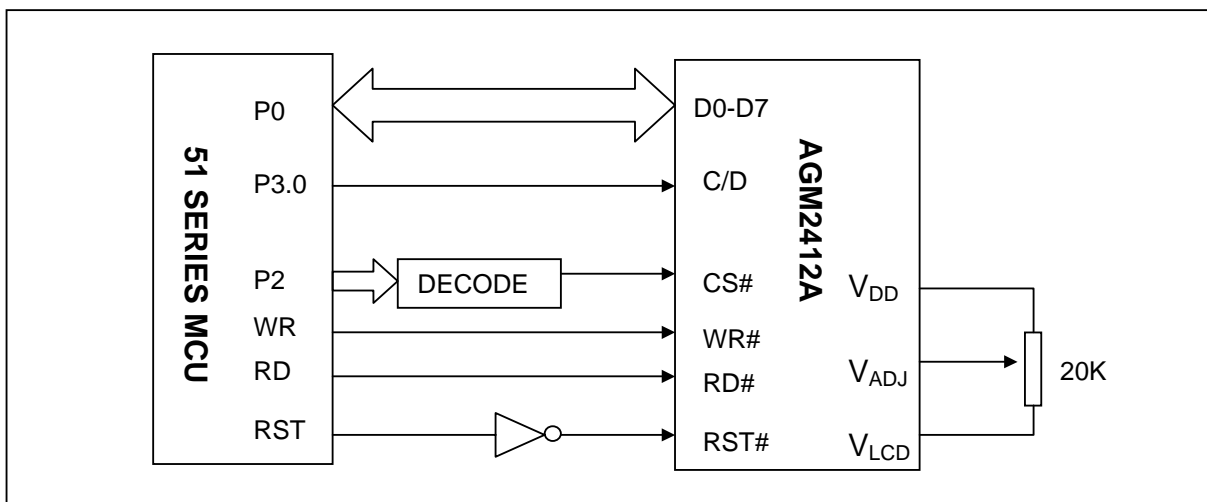
**6.0 BLOCK DIAGRAM**



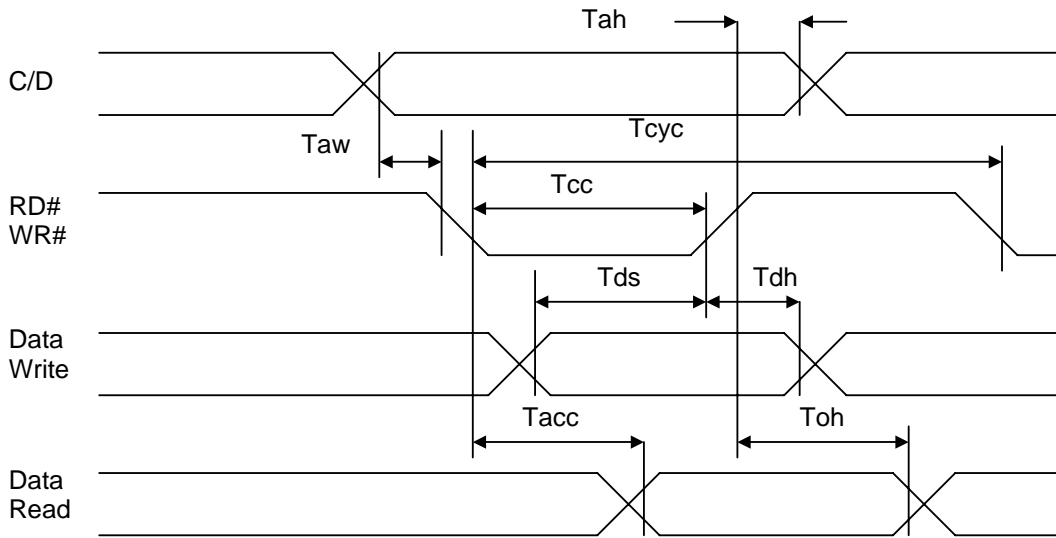
### 7.0 PIN ASSIGNMENT

Pin No.	Symbol	Function	Level
1	FGND	Frame Ground	-
2	V <sub>SS</sub>	Ground	-
3	V <sub>DD</sub>	+5V	-
4	V <sub>ADJ</sub>	Contrast Adjust Voltage	-
5	/WR	H: Data read L: Data write	L
6	/RD	Enable signal	L
7	/CE	Chip Enable	L
8	C/D	Command/Data	L/H
9	NC	-	-
10	/RES	Reset	H/L
11	DB0	Data bit 0	H/L
12	DB1	Data bit 1	H/L
13	DB2	Data bit 2	H/L
14	DB3	Data bit 3	H/L
15	DB4	Data bit 4	H/L
16	DB5	Data bit 5	H/L
17	DB6	Data bit 6	H/L
18	DB7	Data bit 7	H/L
19	FS	Font Select	H/L
20	VLCD	Power supply for LCD driving	-15.0V
21	VLED+	Power supply for LED+	5.0V
22	VLED-	Power supply for LED-	0V

### 8.0 APPLICATION



**9.0 TIMING CHARACTERISTICS**



ITEM	SYMBLE	MIN	MAX	UNIT
Address Setup Time	Taw	10		ns
Address Hold Time	Tah	10		ns
RD#,WR# Cycle	Tcyc	200		ns
RD#,WR# Pulse Width	Tcc	80		ns
Data Setup Time	Tds	80		ns
Data Hold Time (Write)	Tdh	40		ns
Data Access Time	Tacc		150	ns
Data Hold Time (Read)	Toh	10	50	ns

**10.0 RELIABILITY TEST**

Storage Condition	Content	Evaluations and Assessment*			
		Current Consumption	Oozing	Contrast	Other Appearances
Operation at high temperature and humidity	40°C,90% RH,240hrs	Twice initial value or less	none	More than 80% of initial value	No abnormality
High temperature storage	60°C, 240hrs	Twice initial value or less	none	More than 80% of initial value	No abnormality
Low temperature storage	-20°C, 240hrs	Twice initial value or less		More than 80% of initial value	No abnormality

\*Evaluations and assessment to be made two hours after returning to room temperature (25°C±5°C).

\*The LCDs subjected to the test must not have dew condensation.

## 11.0 DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the T6963c.

COMMAND	Control State			Code								DESCRIPTION
	CD	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	
REGISTERS SETTIBG	1	1	0	0	0	1	0	0	N2	N1	N0	N2 N1 N0 0 0 1 Set Cursor Pointer 0 1 0 Set Offset Register 1 0 0 Set address Pointer
SET CONTROL WORD	1	1	0	0	1	0	0	0	0	N1	N0	N1 N0 0 0 Set Text Home Address 1 1 Set Text Area 2 0 Set Graphic Home Address 1 1 Set Graphic Area
MODE SET	1	1	0	1	0	0	0	CG	N2	N1	N0	CG=0: Internal CG ROM Mode CG=1: Internal CG ROM Mode N2 N1 N0 Graphic & Text 0 0 0 OR Mode 0 0 1 Exor Mode 0 1 1 And Mode 1 0 0 Text Attribute Mode
DISPLAY MODE	1	1	0	1	0	0	1	N3	N2	N1	N0	N3=0: Display Off N3=1: Display On N2=0:Text Off N2=1: Text On N1=0: Cursor Off N1=1: Cursor On N0=0: Blink Off N0=1: Blink On
CURSOR PATTERN SELECT	1	1	0	1	0	1	0	0	N2	N1	N0	N2,N1,N0 Line Number of Cursor N2 N1 N0 0 0 0 1-Line Cursor (Bottom Line) 1 1 1 8-Line Cursor (8x8Dots)
DATA AUTO READ/WRITE	1	1	0	1	0	1	1	0	0	N1	N0	N1 N0 0 0 Data Auto Write 0 1 Data Auto Read 1 * Auto Reset
DATA READ/WRITE	1	1	0	1	1	0	0	0	N2	N1	N0	N2=0: ADP Variable N2=1: ADP Nonvariable N1=0: Increment ADP N1 =1: Decrement ADP N0=0: Data Write N0=1: Data Read
SCREEN PEEK	1	1	0	1	1	1	0	0	0	0	0	Screen Peek
SCREEN COPY	1	1	0	1	1	1	0	1	0	0	0	Screen Copy
BIT SET/RESET	1	1	0	1	1	1	1	N3	N2	N1	N0	N3=0: Bit Reset N3=1: Bit Set N2, N1, N0 Bit Address 000-D0, 111-D7
DATA WRITE	0	1	0	Write Data								Writes data DB0~DB7 into display data RAM. After writing instruction
DATA READ	0	0	1	Read Data								Reads data DB0~DB7 from display data RAM to the data bus.