

# AZ DISPLAYS, INC.

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*COMPLETE LCD SOLUTIONS*

## SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:

AGM3224J Series

REVISED:

Spetember 25, 2006

## General Specifications

Item	<input checked="" type="checkbox"/> Standard Value	Unit
Display Pattern	<input checked="" type="checkbox"/> Graphic <input type="checkbox"/> Character <input type="checkbox"/> Segment <input type="checkbox"/> _____ <input type="checkbox"/> with ICON	
Color	<input checked="" type="checkbox"/> Mono. <input type="checkbox"/> Grayscale <input type="checkbox"/> _____	
Module Dimension (W x H x T)	166.0(W) X 109(H) X 8.0(T)	mm
Viewing Area (W x H)	121.0(W) X 91.6(H)	mm
Active Area (W x H)	115.17(W) x 86.37(H)	mm
Character Size (W x H)	\	mm
Character Pitch (W x H)	\	mm
DOT Size (W x H)	0.33(W) x 0.33(H)	mm
DOT Pitch (W x H)	0.36(W) x 0.36(H)	mm
LCD Type	<input type="checkbox"/> TN, Positive <input type="checkbox"/> TN, Negative <input type="checkbox"/> HTN, Positive <input type="checkbox"/> HTN, Negative	
	<input type="checkbox"/> STN, Yellow-Green <input type="checkbox"/> STN, Gray <input type="checkbox"/> STN, Blue <input checked="" type="checkbox"/> FSTN, Positive <input type="checkbox"/> FSTN, Negative	
	<input type="checkbox"/> _____ <input type="checkbox"/> FM LCD <input type="checkbox"/> Color STN	
Polarizer Type	<input type="checkbox"/> Transflective <input checked="" type="checkbox"/> Transmissive <input type="checkbox"/> Reflective <input type="checkbox"/> Anti-Glare	
View Direction	<input checked="" type="checkbox"/> 6H <input type="checkbox"/> 12H <input type="checkbox"/> _____	
LCD Controller	<b>S1D13700</b>	
LCD Driver	<b>NT7701 (Segment)+NT7702(Common)</b>	
LCD Driving Method	<b>1/240 duty, 1/15 bias</b>	
Interface Type	Serial <input type="checkbox"/> I <sup>2</sup> C <input type="checkbox"/> 4-line SPI <input type="checkbox"/> 3-line SPI <input type="checkbox"/> _____	
	Parallel <input type="checkbox"/> 6800 <input checked="" type="checkbox"/> 8080 <input type="checkbox"/> 4-bit <input type="checkbox"/> _____	
Backlight Type	<input type="checkbox"/> LED <input type="checkbox"/> Bottom <input type="checkbox"/> Single Side <input type="checkbox"/> Dual Side	
	<input type="checkbox"/> _____ <input type="checkbox"/> EL <input checked="" type="checkbox"/> CCFL	
Backlight Color	<input type="checkbox"/> Yellow-Green <input checked="" type="checkbox"/> White <input type="checkbox"/> Amber <input type="checkbox"/> Blue <input type="checkbox"/> Red <input type="checkbox"/> _____	
EL/CCFL Driver type	<input type="checkbox"/> Build-in <input checked="" type="checkbox"/> External	
DC-DC Converter	<input type="checkbox"/> Build-in <input checked="" type="checkbox"/> External	
Operation Temperature	T <sub>OPL</sub> = 0 T <sub>OPH</sub> = 45	°C
Storage Temperature	T <sub>STL</sub> = -25 T <sub>STH</sub> = 60	°C

# Electro-optical Specifications

## Absolute Maximum Ratings

No	Item	Symbol	Min.	Max.	Unit
1	Supply Voltage For Logic	$V_{DD}-V_{SS}$	-0.3	7.0	V
2	Supply Voltage For LCD Driver	$V_{LCD}$	-0.3	30.0	V
3	Input Voltage	$V_I$	$V_{SS}-0.3$	$V_{DD}+0.3$	V

Note: Operating Temperature and Storage Temperature can be found in 1.General Specifications.

## Optical Characteristics<sup>(1)</sup>

No	Item	Symbol	Condition	Min.	Typ.	Max.	Unit
1	Contrast Ratio	Cr	$T_a=23\pm 3^{\circ}\text{C}$ $V_{LCD} = \text{Typ.}^{(2)}$	-	3.0	3.5	-
2	Response time	$T_{ON}$	$T_a=23\pm 3^{\circ}\text{C}$	-	230	250	ms
3	Response time	$T_{OFF}$	$T_a=23\pm 3^{\circ}\text{C}$	-	320	350	ms
4	Viewing Angle	6H	$Cr = 2$ $T_a=23\pm 3^{\circ}\text{C}$	-	48	-	Deg.
5		12H			23	-	Deg.
6		3H			48	-	Deg.
7		9H			46	-	Deg.

Note:

(1) See Appendix Definition of Optical Characteristics for detail.

(2)  $V_{LCD}$  can be found in 4.2 Electrical Characteristics *Supply Voltage for LCD Driver*

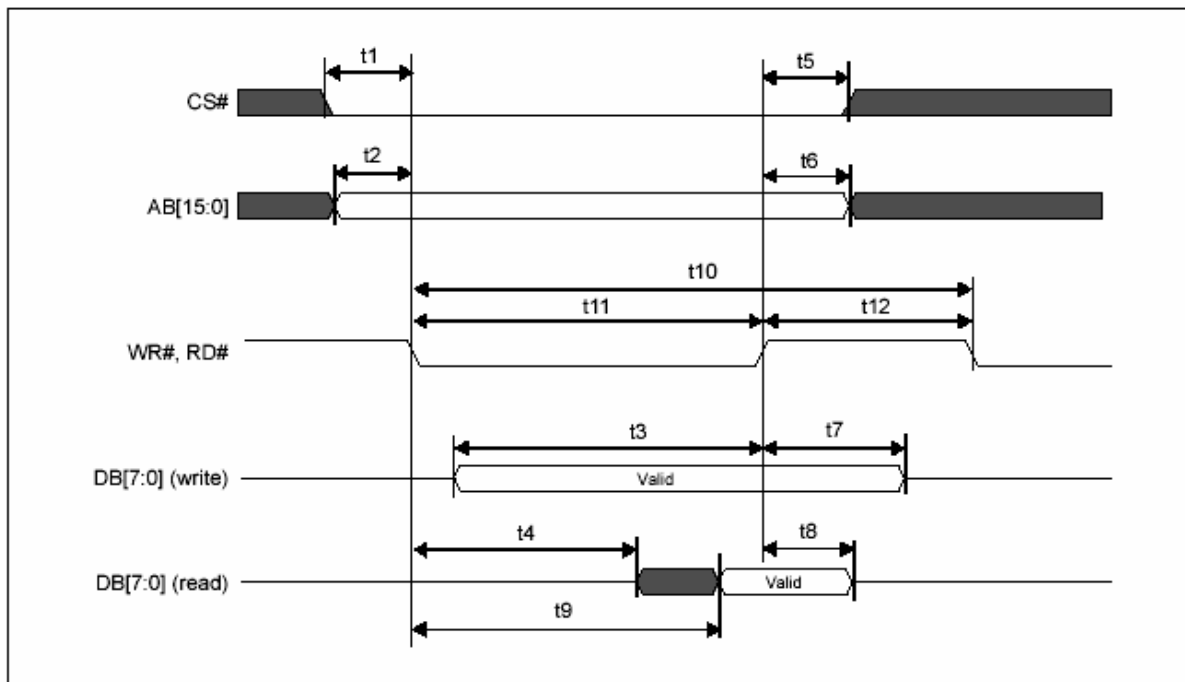
## Electrical Characteristics

No	Item	Symbol	Condition	Min.	Typ.	Max.	Unit
1	Supply Voltage for Logic	$V_{DD}-V_{SS}$	-	3.2	3.3	3.4	V
2	Supply Voltage for LCD Driver	$V_{LCD}$	$T_a=23\pm 3^{\circ}\text{C}$	21.8	22.0	22.2	V
3	Supply Current for Logic	$I_{DD}$	-....	-	-	3.0	mA
4	Frame Frequency	$f_M$	$T_a=23\pm 3^{\circ}\text{C}$	70	75	80	Hz

5	Input High Voltage	$V_{IH}$	-	$0.8 V_{DD}$	-	$V_{DD}$	V
6	Input Low Voltage	$V_{IL}$	-	$V_{SS}$	-	$0.2 V_{DD}$	V
7	Output High Voltage	$V_{OH}$	-	$0.8 V_{DD}$	-	$V_{DD}$	V
8	Output Low Voltage	$V_{OL}$	-	$V_{SS}$	-	$0.2 V_{DD}$	V

9	Supply Current for CCFL Backlight	$I_{CCFL}$	$V_{LED} = \text{Typ.}$ $T_a=23\pm 3^{\circ}\text{C}$	-	5.0	6.0	mA
10	Supply Voltage for CCFL Backlight	$V_{CCFL}$	$I_{LED} = \text{Typ.}$ $T_a=23\pm 3^{\circ}\text{C}$	-	500	-	V

## Timing Characteristics



Symbol	Parameter	3.3 Volt		5.0 Volt		Units
		Min	Max	Min	Max	
t1	CS# setup time	5	—	5	—	ns
t2	AB[15:0] setup time	5	—	5	—	ns
t3	DB[7:0] setup time to WR# rising edge (write cycle)	Note 2	—	Note 2	—	ns
t4	RD# falling edge to DB[7:0] driven (read cycle)	3	—	3	—	ns
t5	CS# hold time	7	—	7	—	ns
t6	AB[15:0] hold time	7	—	7	—	ns
t7	DB[7:0] hold time from WR# rising edge (write cycle)	5	—	5	—	ns
t8	DB[7:0] hold time from RD# rising edge (read cycle)	3	14	3	14	ns
t9	RD# falling edge to valid Data (read cycle)	—	Note 3	—	Note 3	ns
t10	RD#, WR# cycle time	Note 4	—	Note 4	—	ns
t11	RD#, WR# pulse active time	5	—	5	—	Ts
t12	RD#, WR# pulse inactive time	Note 5	—	Note 5	—	ns

1.  $T_s$  = System clock period
2.  $t_{3min}$  =  $2T_s + 5$
3.  $t_{9max}$  =  $4T_s + 18$  (for 3.3V)  
=  $4T_s + 20$  (for 5.0V)
4.  $t_{10min}$  =  $6T_s$  (for a read cycle followed by a read or write cycle)  
=  $7T_s + 2$  (for a write cycle followed by a write cycle)  
=  $10T_s + 2$  (for a write cycle followed by a read cycle)
5.  $t_{12min}$  =  $1T_s$  (for a read cycle followed by a read or write cycle)  
=  $2T_s + 2$  (for a write cycle followed by a write cycle)  
=  $5T_s + 2$  (for a write cycle followed by a read cycle)

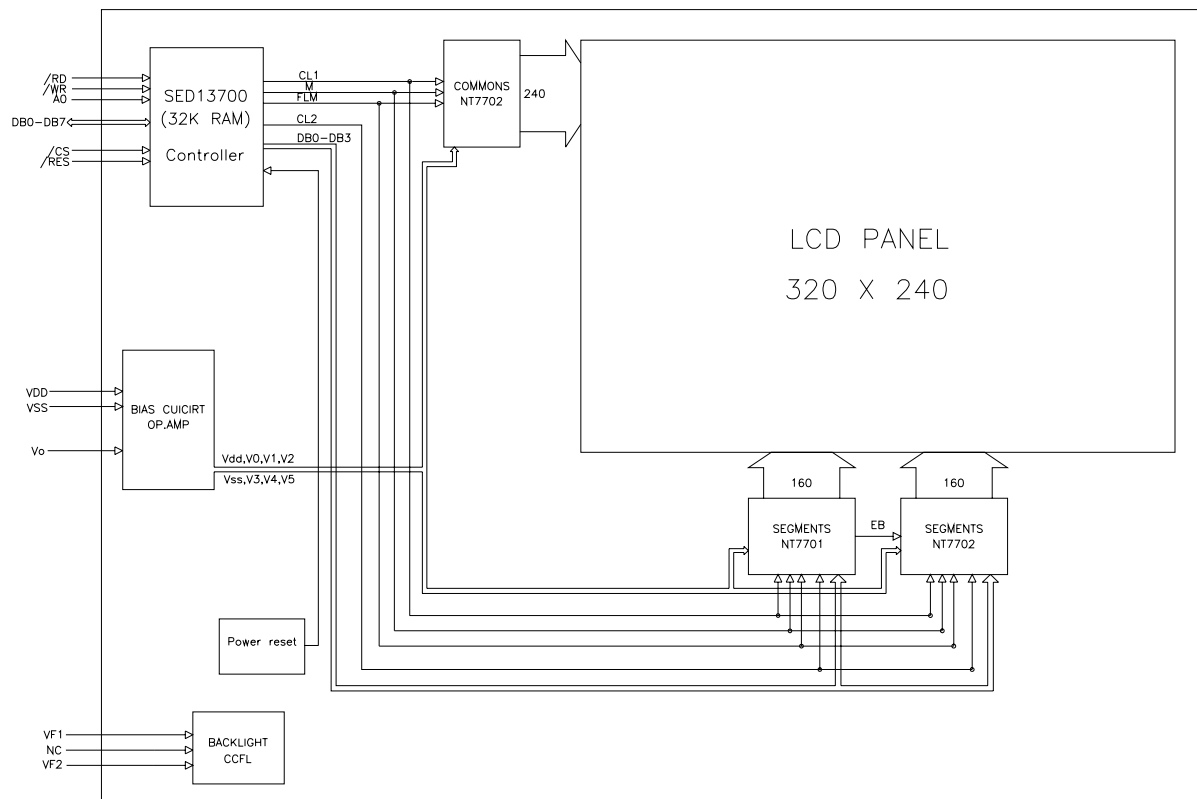
**Note:** See Data sheet of S1D13700 for detail.

# I/O Terminal

## Pin Description

Pin NO.	Symbol	Function Description
1	V0	Power Supply for LCD Driver. (22V)
2	VDD	Power Supply for Logic Cuicuit
3	VSS	Ground
4	/CS	Chip select input. Data input is enable when CS is LOW.
5	/RES	When RES is caused to go LOW, initialization is executed.
6	A0	It identifies the data from MPU as display data or command. HIGH: identified as display data or a command parameter. LOW: identified as a command
7	/RD	P/S=LOW : High impedance P/S=HIGH : Parallel interface read signa
8	/WR	P/S=LOW : High impedance P/S=HIGH : Parallel interface write signal
9-16	D0-D7	8-bit bi-directional data bus.

## Block Diagram



\*IC SED13700 has 32K bit RAM inside

# Programming

## Instruction Table<sup>(1)</sup>

Class	Register Address	Command	Register Description	Control Byte Value	No. of Bytes
System Control	8000h - 8007h	SYSTEM SET	Initializes device and display	40h	8
	8008h	POWER SAVE	Enters standby mode	53h	0
Display Control	8009h - 800A	DISP ON/OFF	Enables/disables display and display attributes	58h 59h	1
	800Bh - 8014h	SCROLL	Sets screen block start addresses and sizes	44h	10
	8015h - 8016h	CSRFORM	Sets cursor type	5Dh	2
	8017h	CSRDIR	Sets direction of cursor movement	4Ch - 4Fh	0
	8018h	OVLAY	Sets display overlay format	5Bh	1
	8019h - 801Ah	CGRAM ADR	Sets start address of character generator RAM	5Ch	2
Drawing Control	801Bh	HDOT SCR	Sets horizontal scroll position	5A	1
	801Ch - 801Dh	CSRW	Sets cursor address	46h	2
	801Eh - 801Fh	CSRR	Reads cursor address	47h	2
	8020h	GRAYSCALE	Sets the Grayscale depth (bpp)	60h	1
Memory Control		MEMWRITE	Writes to memory	42h	n/a
		MEMREAD	Reads from memory	43h	

(1) Note: See Data sheet of S1D13700 for detail.

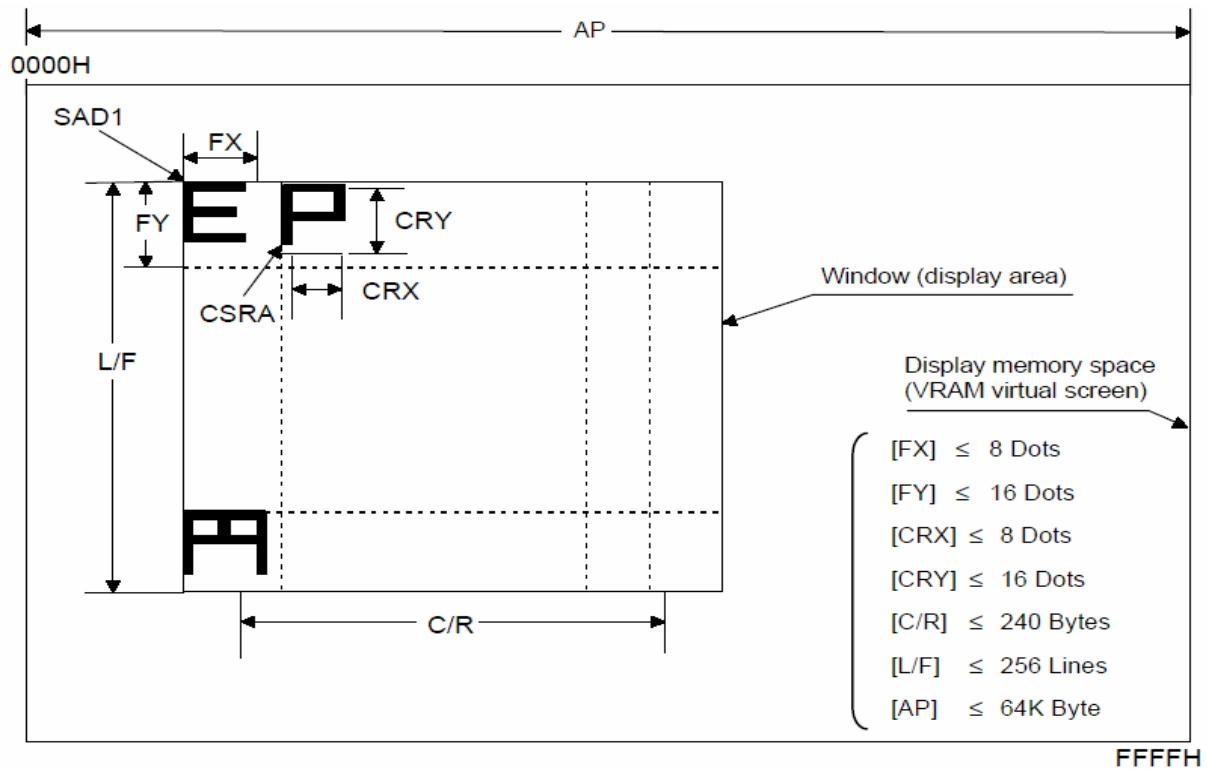
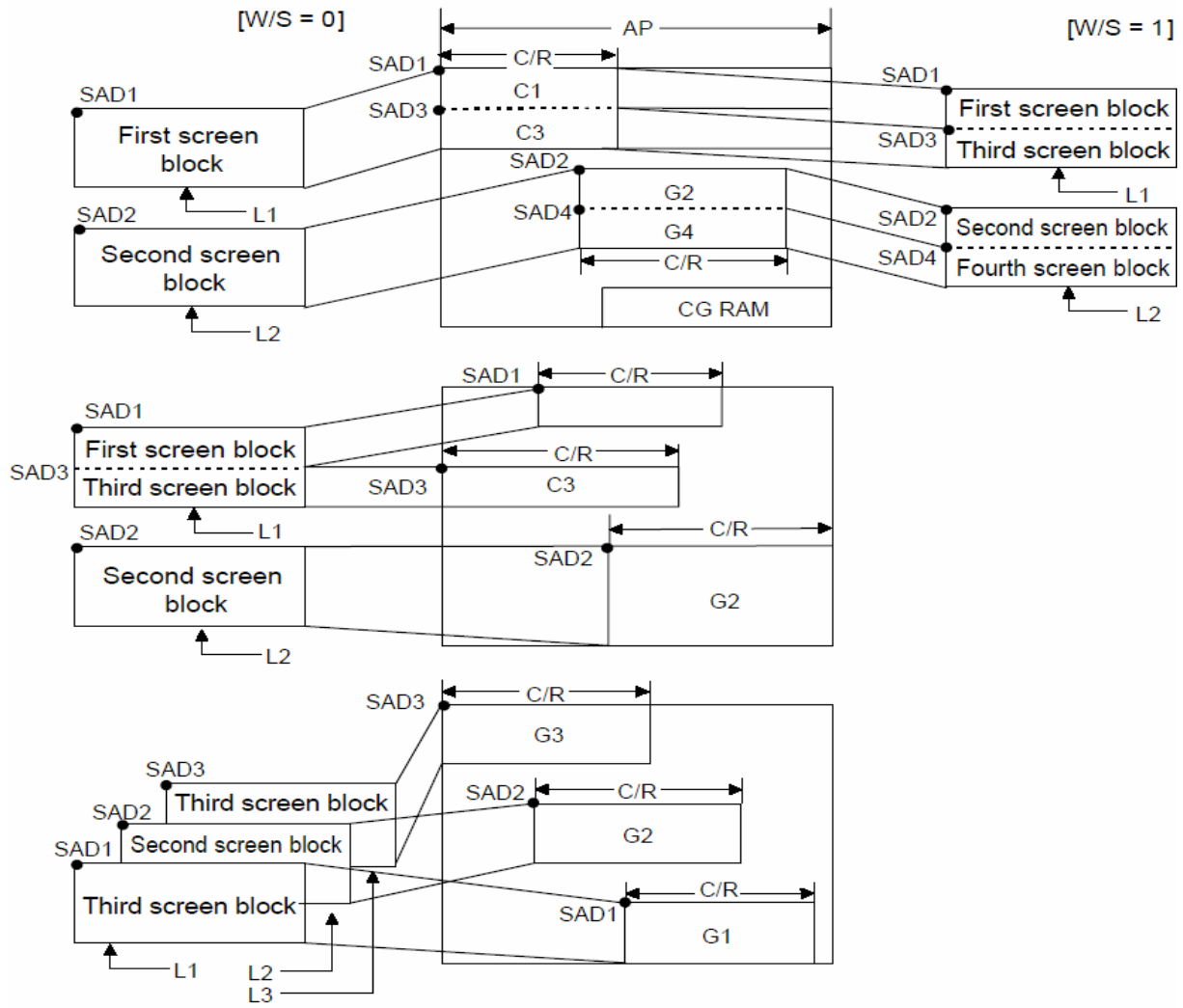
## Display Data RAM

### *Relationship between Display Memory and Screens*

The display memory of the S1D13700 may be used as a virtual screen of greater width than the physical size of the LCD panel address range (C/R). One layer of the S1D13700 may be considered a window through which to look at the part of display memory that comprises a virtual screen. This window can be divided into two blocks that may correspond to independent areas on the virtual screen. Therefore, it is possible to use one block as a dynamically scrollable data area and the other as a stationary message area. (See Figures 4-7 and 4-8.)

Screen

Screen



FFFFH

Figure 4-8 Window and display memory settings

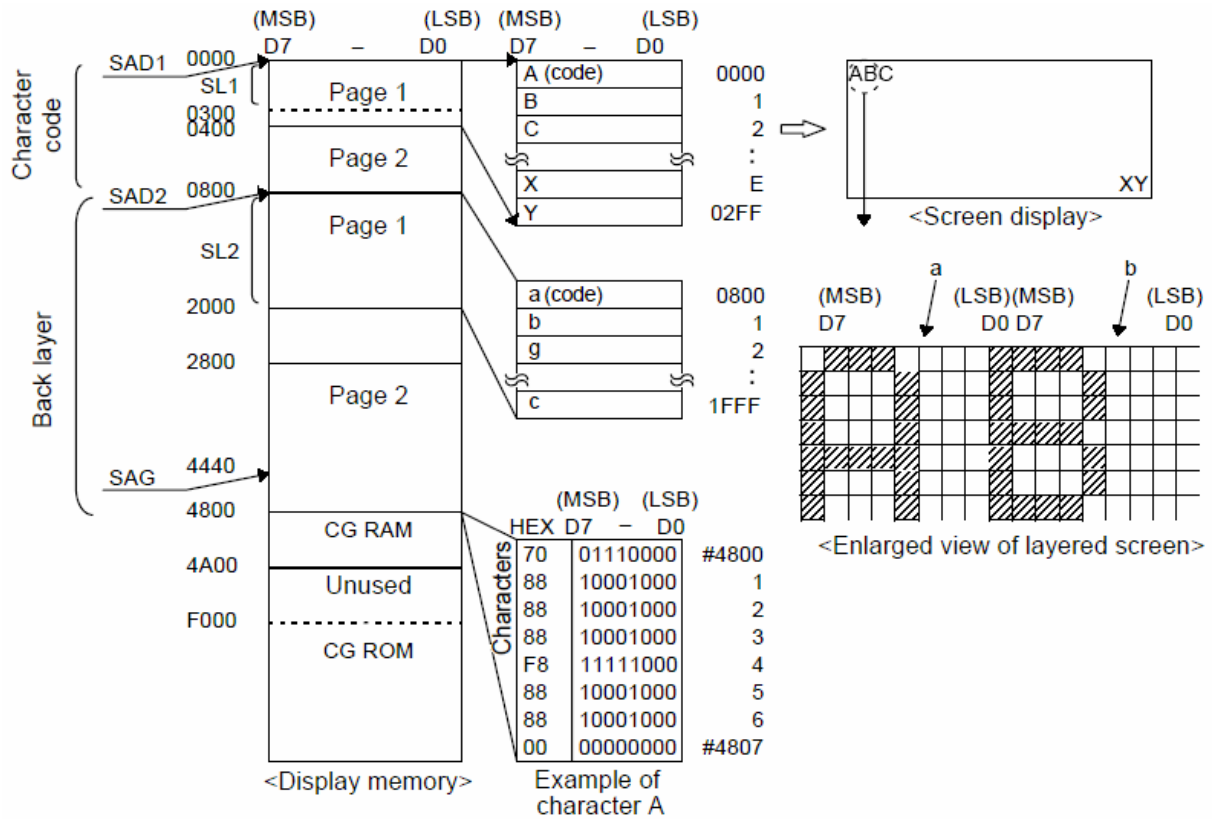
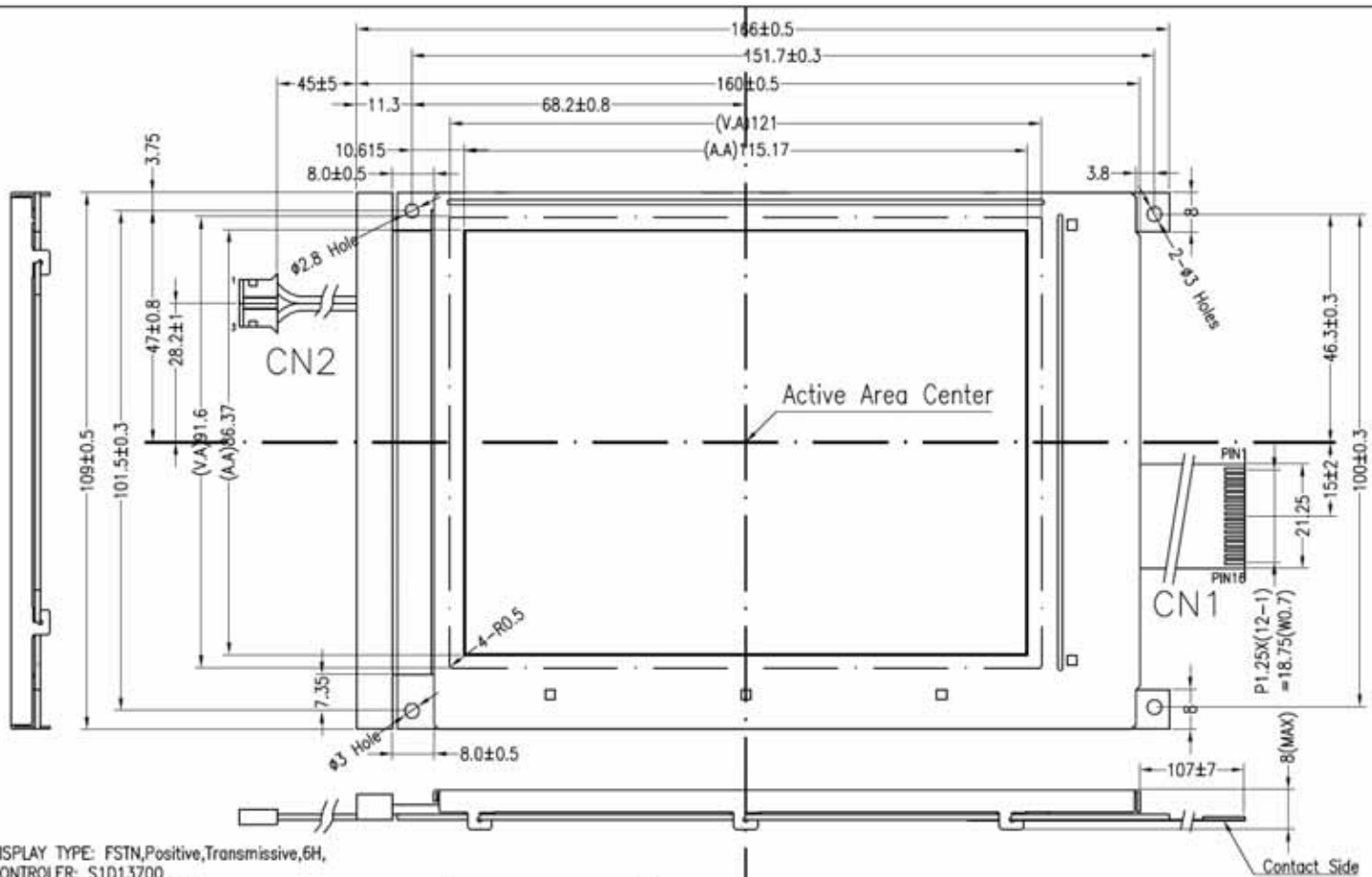


Figure 4-9 Example of display memory mapping

(1) Note: See Relationship between Display Memory and Screens of S1D13700 for detail.

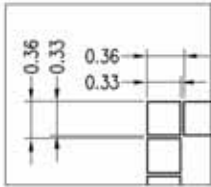




CN1	
Pin NO	Symbol
1	V0
2	VDD
3	VSS
4	CS
5	RES
6	A0
7	RD
8	WR
9-16	DB0:7

CN2	
Pin NO	Symbol
1	VFT1
2	NC
3	VFT2

DISPLAY TYPE: FSTN,Positive,Transmissive,6H,  
 CONTROLLER: S1D13700  
 DRIVER IC: NT7701&NT7702  
 LOGIC VOLTAGE: 3.3±0.3V  
 LCD DRIVE VOLTAGE(V<sub>lcd</sub>): 22±2V  
 DRIVING METHOD: 1/240 DUTY, 1/15 BIAS  
 BACKLIGHT: CCFL  
 OPERATING TEMPERATURE: 0° ~ +45°C  
 STORAGE TEMPERATURE: -25° ~ +60°C  
 INTERFACE CONNECTOR: FFC  
 ALL UNMARKED TOLERANCES: ±0.2mm



AZ Displays, Inc.

AGM3224J

UNITS: mm

DWG NO: ED-4729-LCM/C01

SHEET 1 OF 1

