

AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

PART NUMBER:
DATE:

AGM2464A SERIES
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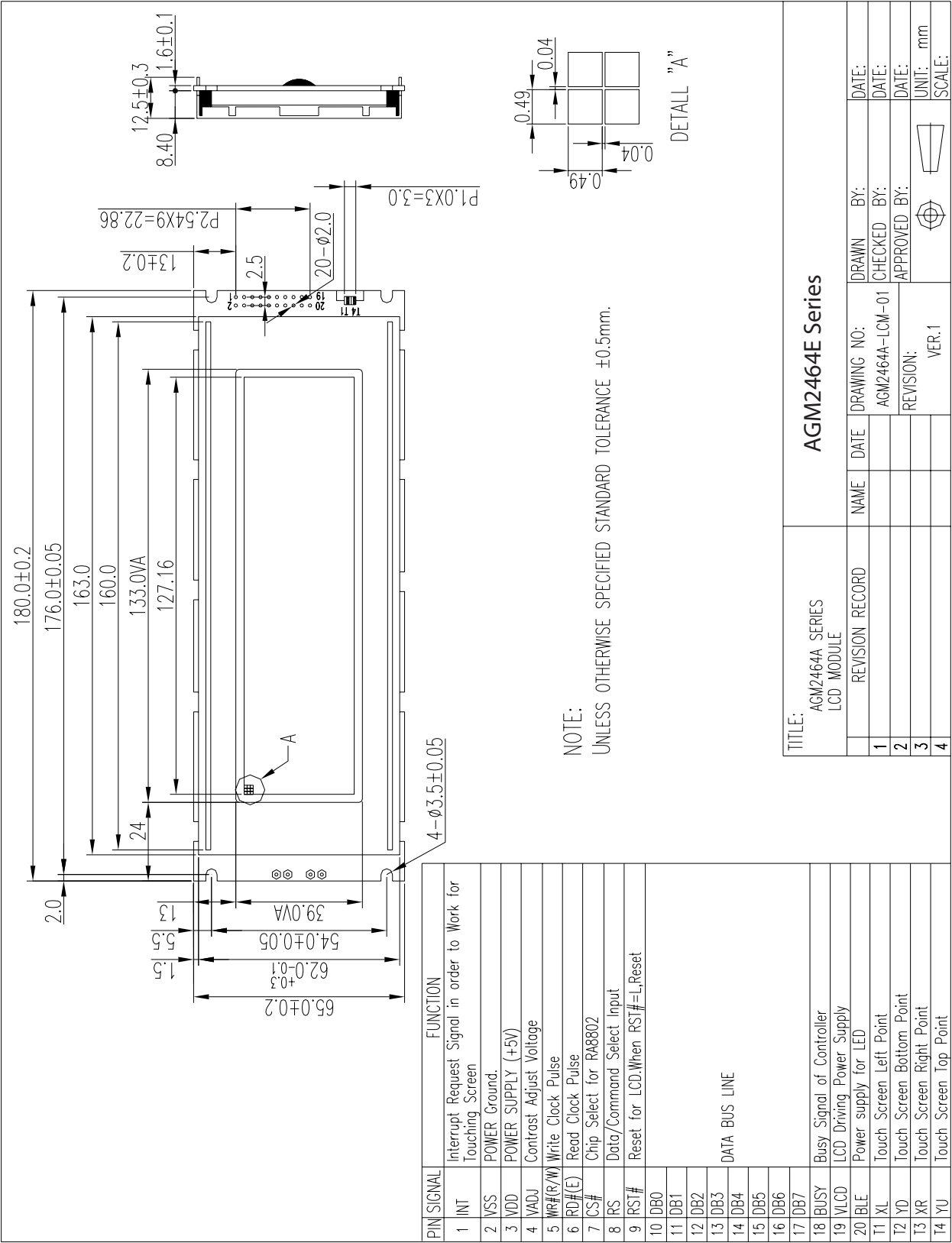
REVISION RECORD

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CONTENTS

1.0 MECHANICAL DIAGRAM
2.0 GENERAL SPECIFICATION
3.0 ABSOLUTE MAXIMUM RATINGS
4.0 ELECTRICAL CHARACTERISTICS
5.0 OPTICAL CHARACTERISTICS
6.0 BLOCK DIAGRAM
7.0 PIN ASSIGNMENT
8.0 POWER SUPPLY
9.0 TIMING CHARACTERISTICS
10.0 RELIABILITY TEST
11.0 INSTRUCTION DESCRIPTION (RA8802)
12.0 DISPLAY WINDOW AND OPERATE WINDOW
13.0 PRECAUTION FOR USING LCM

1.0 MECHANICAL DIAGRAM



2.0 GENERAL SPECIFICATION

1. Overall Module Size	180.0mm(W) x 65.0mm(H) x max 15.5mm(D) for LED backlight version 180.0mm(W) x 65.0mm(H) x max 10.5mm(D) for reflective version
2. Dot Size	0.49 x 0.49mm
3. Dot Pitch	0.53 x 0.53mm
4. Duty	1/64 DUTY, 1/9 BIAS
5. Controller IC	RA8802(CGROM with 7612 chinese fonts16X16 dots matrix)
6. LC Fluid Options	STN /YELLOW-GREEN
7. Polarizer Options	Reflective, Transflective, Transmissive
8. Backlight Options	LED/YELLOW-GREEN
9. Temperature Range Options	Operating: -10°C ---- +60°C Storage: -20°C ---- +70°C
10. View Angle	6 Clock
11.Active Area	127.16 x 33.88mm
12. View Size	132.0 x 39.0mm

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	-10	-	60	°C
Storage temperature (Wide temperature)	Tst	-20	-	70	°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			25.0	V

4.0 ELECTRICAL CHARACTERISTICS

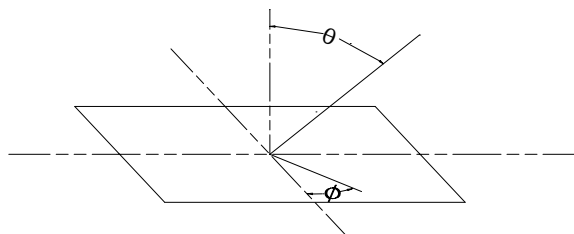
Item	Symbol	Condition	Min	Typ	Max	Unit
Input voltage (high)	V _{ih}	H level	0.8 V _{DD}	-	0.3+V _{DD}	V
Input voltage (low)	V _{il}	L level	0	-	0.2 V _{DD}	V
Recommended LC Driving Voltage (Standard Temp)	V _{dd} - V _o	0°C	12.5	12.8		V
		25°C	12.1	12.5	-	
		50°C			-	
Recommended LC Driving Voltage (Wide Temp)	V _{dd} - V _o	-20°C	12.8	13.2	-	V
		0°C	12.5	12.8	-	
		50°C			-	
		70°C	11.3	11.8	-	
Power Supply Current	I _{dd}	V _{dd} =5.0V	-		16.0	mA
LED Power Supply Voltage	V _{fled}	R=5.0Ω	-	5	5.25	V
LED Power Supply Current	I _{fled}	R=5.0Ω	-	510	850	mA

5.0 OPTICAL CHARACTERISTICS

Item Mode		Cr (Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C		25°C	
		MIN.	TYP.	MIN	TYP.	MIN	TYP.
R	A						
	B	7.10	7.70	80°	85°	-	35°
	C	-	-	-	-	-	-
S							
	B	7.05	7.55	80°	85°	-	35°
	C	-	-	-	-	-	-

Note:

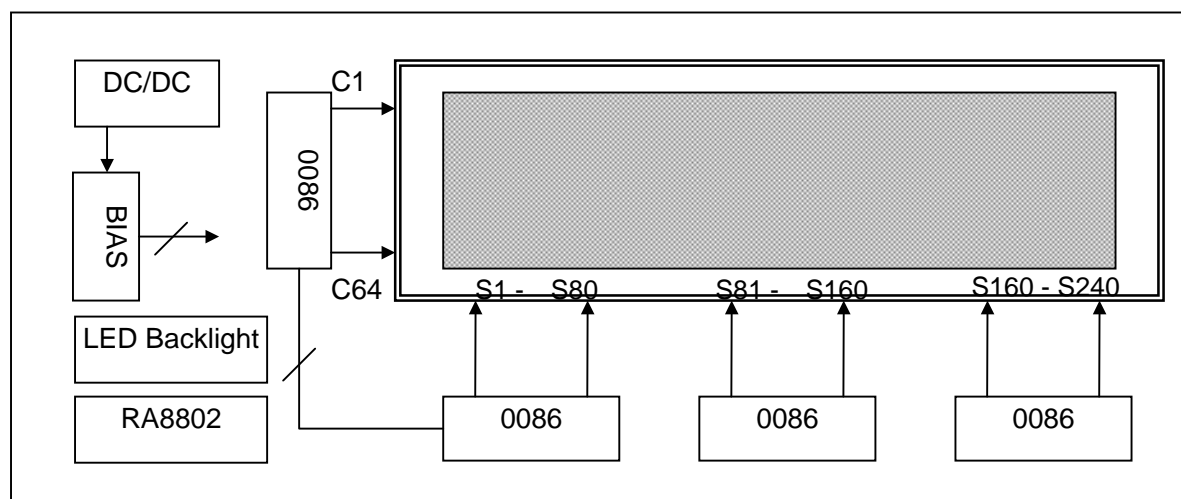
R: Reflective
S: Transflective
A: STN Gray
B: STN Yellow
C: FSTN



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

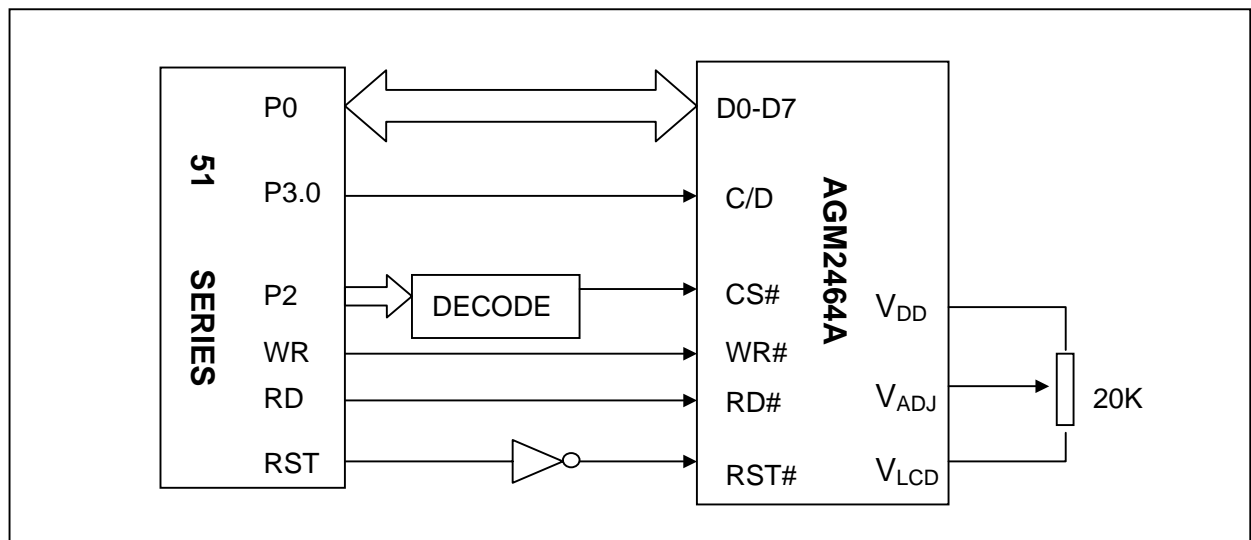


7.0 PIN ASSIGNMENT

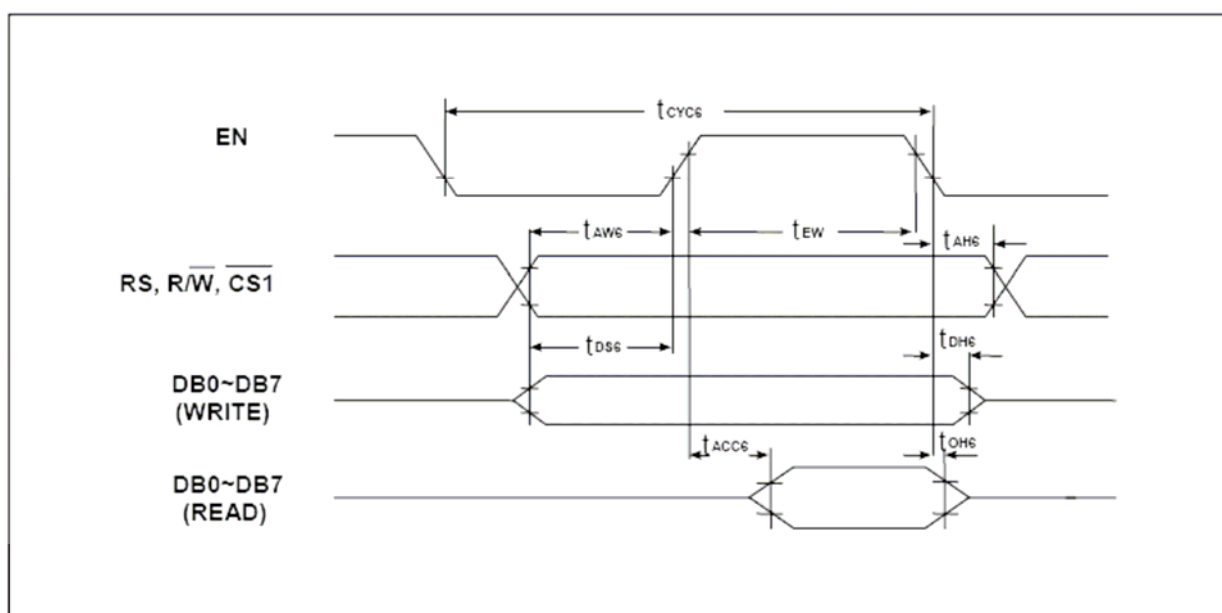
Pin No.	Symbol	Function	Level
1	INT	Controller INT signal To MCU	-
2	VSS	Ground	-
3	VDD	+5V	-
4	VADJ	Power supply for LCD driving	-
5	/WR	MCU write signal	
6	/RD	MCU Read signal	
7	/CS	Chip Enable	
8	RS	Command/Data Select	L/H
9	RST#	Reset for LCM. When RST#=L, Reset.	-
10	DB0	Data bit 0	H/L
11	DB1	Data bit 1	H/L
12	DB2	Data bit 2	H/L
13	DB3	Data bit 3	H/L
14	DB4	Data bit 4	H/L
15	DB5	Data bit 5	H/L
16	DB6	Data bit 6	H/L
17	DB7	Data bit 7	H/L
18	BUSY	'BUSY' signal	
19	VLCD	Power Supply for LCD	-
20	BLE	Power Supply for BL -	-

T1	XL	Left port of touch panel
T2	YD	bottom port of touch panel
T3	XR	right port of touch panel
T4	YU	upper port of touch panel

8.0 POWER SUPPLY

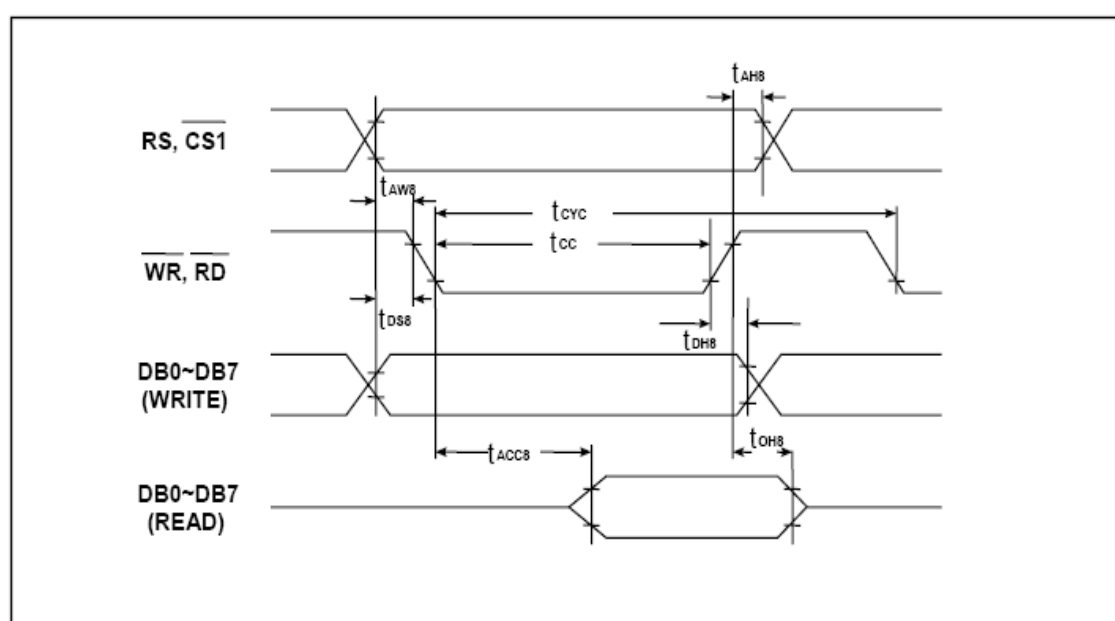


9.0 TIMING CHARACTERISTICS



interface with 6800series mcu

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
A0, R/W#, CS1#	t_{AH8}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{AW8}	Address setup time	63	--	ns	
	t_{CYC8}	System cycle time	800	--	ns	
DB0 to DB7	t_{DS8}	Data setup time	63	--	ns	
	t_{DH8}	Data hold time	10	--	ns	
	t_{ACC8}	Access time	--	330	ns	
	t_{OH8}	Output disable time	10	--	ns	
EN	t_{EW}	Enable pulse width	400	--	ns	



interface with 8080series mcu

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
RS, CS1#	t_{AH8}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{AW8}	Address setup time	63	--	ns	
WR#, RD#	t_{CYC}	System cycle time	800	--	ns	
	t_{CC}	Strobe pulse width	400	--	ns	
DB0 to DB7	t_{DS8}	Data setup time	63	--	ns	
	t_{DH8}	Data hold time	10	--	ns	
	t_{ACC8}	RD access time	--	330	ns	
	t_{OH8}	Output disable time	10	--	ns	

10.0 RELIABILITY TEST

Content	Conditions	Evaluations and Assessment*			
		Current Consumption	Oozing	Contrast	Other Appearances
Operation at low temperature	-10°C 240hrs	Twice initial value or less		More than 80% of initial value	No abnormality
Operation at high temperature and humidity	60°C,90% RH,240hrs	Twice initial value or less	none	More than 80% of initial value	No abnormality
High temperature storage	70°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 conde

11.0 INSTRUCTION DESCRIPTION (RA8802)

Reg code	name	model	Function code							
			D7	D6	D5	D4	D3	D2	D1	D0
00H	LCR	W/R	PW		SR	RTM	CG	DP	DK	DV
08H	MIR	W/R	-	CKN	DISP	PLR	-	-	CKB	
10H	CCR	W/R	ARI	ALG	WDI	WBC	AIX	CP	CK	CSD
18H	CSCR	W/R	CR				DY			
20H	AWRR	W/R	-	-	X					
28H	DWRR	W/R	-	-	A					
30H	AWBR	W/R	Y							
38H	AWBR	W/R	B							
40H	AWLR	W/R	-	-	SS					
48H	DWLR	W/R	-	-	C					
50H	AWTR	W/R	SC							
58H	DWTR	W/R	D							
60H	CPXR	W/R	-	-	RS					
70H	CPYR	W/R	RC							
80H	BTR	W/R	BT							
90H	SCCR	W/R	CK							
A0H	INTR	W/R	BSY	INA	INX	INY	MSZ	MSA	MSX	MSY
B0H	INTX	W/R			IX					
B8H	INTY	W/R	IY							
C0H	TPCR	W/R	AZEN	AZOE	-	ADET	AS			
C8H	TPDR	W/R	TP							
D0H	LCCR	W/R	DZEN	DZWE	DRST	ADC				
E0H	PDR	W/R	FD							
F0H	FCR	W/R	TNS	BNK	RM		FDA	ASC	ABS	

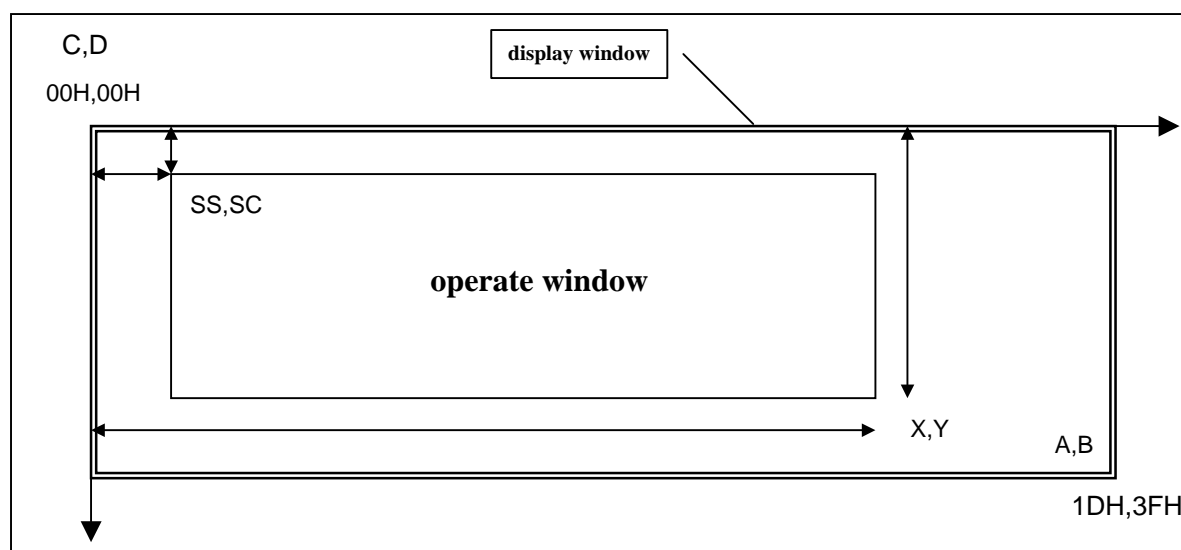
FUNCTION CODE DETAILS:

Fun code	default	set	description
PW mode	11	11	Normal,all function on
		10	Standby mode。
		01	Sleep mode,only can write to or read from registor,the else function be inhibitive
		00	Closed mode。 All function be inhibitive, wait for'WAKE-UP'trigge。
SR	0	0/1	1:All registor value set to default; 0: disable
RTM	0	0/1	Auto reset, 0: disable
CG	1	0/1	text/graphic select 1: text; 0: graphic。
DP	1	0/1	Display on/off. 1: on, 0: off。
DK	0	0/1	Blink mode 0: normal, 1: blink
DV	1	0/1	Reverse display mode:1(normal)
CKN	1	0/1	'CLK_OUT' enable ,0(disable)
DISP	0	0/1	Windows mode: 0(display windows), 1(operating windows)
PLR	0	0/1	Set effective voltage of INT and BUSY。
CKB Clock frequency	00	00	1M _{HZ}
		01	2M _{HZ}
		10	4M _{HZ}
		11	8M _{HZ}
ARI	1	0/1	Set cursor automatically shifted at read mode。 1:enable
ALG	1	0/1	Text mode : 1(chinese –english word is automatically level)
WDI	1	0/1	current data stored mode: 1(normal) 0(reserve)。
WBC	1	0/1	Text mode:1(bold-faced) 0(normal)。
AIX	0	0/1	Set cursor automatically shifted at write mode。 1:enable
CP	0	0/1	Cursor display on/off 1(cursor on) 0(cursor off)
CK	0	0/1	1(cursor blink) 0(cursor not blink)
CSD	0	0/1	Cursor width : 0(8PIX) 1(changed with input text)
CR	02H		Text mode :cursor highness。
DY	02H		Text mode : set line distance
X		Ref 11	Set right position of operating windows
A	00H	1DH	Set right position of display windows=(numbers of displaycolumns/8)-1
Y		Ref 11	Set bottom position of operating windows
B		3FH	Set bottom position of display windows=(numbers of display lines-1)
SS	00H	Ref 11	Set left position of operating windows
C	00H	00H	Set left position of display windows general: 00H
SC	00H	Ref 11	Set top position of operating windows
D	00H	00H	Set top position of display windows general: 00H

Table lasted

Fun code	default	set	description
RS	00H		Set cursor column address
RC	00H		Set cursor line address
BT	23H		Set cursor blink time。
CK			Set operating cycle $T = F_{OSC} * 4 / (N * M * F_{RAM})$
BSY	0		Busy flag 1(busy,not accept command from MCU)
INA	0		Touch panel detective 1: touch panel ation
INX	0		Cursor line status 1(cursor position=INTX)
INY	0		Cursor column status 1(cursor position=INTY)
MSZ	0		Shield busy-int 1(enable) 0(disable)
MSA	0		Shield touch panel-int 1(enable) 0(disable)
MSX	0		Set registor INTX interrupt 1(enable) 0(disable)
MSY	0		Set registor INTY interrupt 1(enable) 0(disable)
IX	27H		Set line address interrupt when*CPXR=INTX interrupt occur
IY	EFH		Set column address interrupt when*CPXR=INTX interrupt occur
AZEN	1		Touch panel function on/off : 1(on) 0(off)
AZOE	1		Touch panel data output 1(enable) 0(disable)
ADET	1		Touch panel action status 1(no action) 0(action)。
AS			Touch panel control
TP	00H		Touch panel position data
DZEN	1		Lcd contrast control 1(enable) 0(disable)
DZWE	1		DAC write enable 0(allow MCU write)
DRST	1		Reset Lcd contrast control 1(normal) 0(reset DAC)
DAC	0H	0-1FH	Set lout value of Lcd contrast control 0uA-→1ma
FD	00H		Set data write to DDRAM
TNS	1		Fonts conversion 1(enable) 0(disable)
BNK	0		interior/exterior CGROM select 1(exterior CGROM)
RM	00		Punjabi select 01(numerous) 10(simple)
FDA	0		Write fd data to DDRAM repeatly 0(allow)
ASC	0		Kind of text select 1: ASCII 0: data>=A0H GB/BIG5
ABS	00		ASCII code area selection 00, 01, 10, 11。

12.0 display window and operate window



note:

1. display window is lcd physical display area, lcd dot matrix decide the size of display area, generally it can not be changed.
2. operate window is customer defined active window, it can be set by parameter of register(20H,30H,40H,50H),thereinto (ss,sc) is coordinate top-left, (x,y) is coordinate bottom-right

13.0 PRECAUTION FOR USING LCM

1. When design the product with this LCD Module, make sure the viewing angle matches to its purpose of usage.
2. As LCD panel is made of glass substrate, Dropping the LCD module or banging it against hard objects may cause cracking or fragmentation. Especially at corners and edges.
3. Although the polarizer of this LCD Module has the anti-glare coating, always be careful not to scratch its surface. Use of a plastic cover is recommended to protect the surface of polarizer.
4. If the LCD module is stored at below specified temperature, the LC material may freeze and be deteriorated. If it is stored at above specified temperature, the molecular orientation of the LC material may change to Liquid state and it may not revert to its original state. Excessive temperature and humidity could cause polarizer peel off or bubble. Therefore, the LCD module should always be stored within specified temperature range.
5. Saliva or water droplets must be wiped off immediately as those may leave stains or cause color changes if remained for a long time. Water vapor will cause corrosion of ITO electrodes.
6. If the surface of LCD panel needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If it is not still clean enough, blow a breath on the surface and wipe again.
7. The module should be driven according to the specified ratings to avoid malfunction and permanent damage. Applying DC voltage cause a rapid deterioration of LC material. Make sure to apply alternating waveform by continuous application of the M signal. Especially the power ON/OFF sequence should be kept to avoid latch-up of driver LSIs and DC charge up to LCD panel.
8. Mechanical Considerations
 - a) LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.
 - b) Do not tamper in any way with the tabs on the metal frame.
 - c) Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
 - d) Do not touch the elastomer connector; especially insert a backlight panel (for example, EL).
 - e) When mounting a LCM makes sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
 - f) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.
9. Static Electricity
 - a) Operator

Wear the electrostatics shielded clothes because human body may be statically charged if not wear shielded clothes. Never touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

b) Equipment

There is a possibility that the static electricity is charged to the equipment, which has a function of peeling or friction action (ex: conveyer, soldering iron, working table). Earth the equipment through proper resistance (electrostatic earth: 1×10^8 ohm).

Only properly grounded soldering irons should be used.

If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

c) Floor

Floor is the important part to drain static electricity, which is generated by operators or equipment.

There is a possibility that charged static electricity is not properly drained in case of insulating floor. Set the electrostatic earth (electrostatic earth: 1×10^8 ohm).

d) Humidity

Proper humidity helps in reducing the chance of generating electrostatic charges. Humidity should be kept over 50%RH.

e) Transportation/storage

The storage materials also need to be anti-static treated because there is a possibility that the human body or storage materials such as containers may be statically charged by friction or peeling.

The modules should be kept in antistatic bags or other containers resistant to static for storage.

f) Soldering

Solder only to the I/O terminals. Use only soldering irons with proper grounding and no leakage.

Soldering temperature : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$

Soldering time: 3 to 4 sec.

Use eutectic solder with resin flux fill.

If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

g) Others

The laminator (protective film) is attached on the surface of LCD panel to prevent it from scratches or stains. It should be peeled off slowly using static eliminator.

Static eliminator should also be installed to the workbench to prevent LCD module from static charge.

10. Operation

- a) Driving voltage should be kept within specified range; excess voltage shortens display life.
 - b) Response time increases with decrease in temperature.
 - c) Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
 - d) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".
11. If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. The toxicity is extremely low but caution should be exercised at all the time.
 12. Disassembling the LCD module can cause permanent damage and it should be strictly avoided.
 13. LCD retains the display pattern when it is applied for long time (Image retention). To prevent image retention, do not apply the fixed pattern for a long time. Image retention is not a deterioration of LCD. It will be removed after display pattern is changed.
 14. Do not use any materials, which emit gas from epoxy resin (hardener for amine) and silicone adhesive agent (dealcohol or deoxym) to prevent discoloration of polarizer due to gas.
 15. Avoid the exposure of the module to the direct sunlight or strong ultraviolet light for a long time.
- The brightness of LCD module may be affected by the routing of CCFL cables due to leakage to the chassis through coupling effect. The inverter circuit needs to be designed taking the level of leakage current into consideration. Thorough evaluation is needed for LCD module and inverter built into its host equipment to