

# DISPLAYTRONIC

*XIAMEN ZETTLER ELECTRONICS CO., LTD.*

## SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

AQM1364A-MLB-FTW CHARACTER MODULE VER1.0

CUSTOMER APPROVAL	
1.POLARIZER OPTIONS: <input type="checkbox"/> R=REFLECTIVE <input type="checkbox"/> F=TRANSFLECTIVE <input type="checkbox"/> N=TRANSMISSIVE NEGATIVE <input checked="" type="checkbox"/> M=TRANSMISSIVE POSITIVE	
2.BACKLIGHT OPTIONS: <input checked="" type="checkbox"/> N=NONE <input type="checkbox"/> E=EL <input type="checkbox"/> L=LED <input type="checkbox"/> C=CCFL	
3. BACKLIGHT COLOR: <input type="checkbox"/> A= AMBER <input type="checkbox"/> B= BLUE <input type="checkbox"/> G= GREEN <input type="checkbox"/> W=WHITE <input type="checkbox"/> R= RED <input type="checkbox"/> RGB= RED+GREEN+BLUE	
4.FLUID OPTIONS: <input type="checkbox"/> T=TN <input checked="" type="checkbox"/> F=FSTN <input type="checkbox"/> Y=STN-YELLOW GREEN <input type="checkbox"/> G=STN-GRAY <input type="checkbox"/> B=STN-BLUE	
5. VIEWING DIRECTION: <input type="checkbox"/> B=BOTTOM VIEW(6 O'CLOCK) <input checked="" type="checkbox"/> T=TOP VIEW(12 O'CLOCK)	
6.TEMPERATURE RANGE: <input type="checkbox"/> S=STANDARD TEMPERATURE RANGE <input type="checkbox"/> H=DUAL POWER,WIDE TEMPERATURE RANGE <input checked="" type="checkbox"/> W=SINGLE POWER,WIDE TEMPERATURE RANGE	
7.OTHERS REQUIREMENT:	
※ PART NO. : <u>          AQM1364A-MLB-FTW          </u>	
APPROVAL	COMPANY CHOP
CUSTOMER COMMENTS	

DISPLAYTRONIC ENGINEERING APPROVAL		
DESIGN BY	CHECKED BY	APPROVED BY

**REVISION RECORD**

REVISION	REVISION DATE	PAGE	CONTENTS
VER1.0	16/11-2007		FIRST ISSUED

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## 1.0 MECHANICAL SPECS

1. Part NO	AQM1364A-MLB-FTW
2. Outline Dimensions	82.0mm(W) x 37.0mm(H) x max 28.0mm(D)
3. Viewing Area	79.0 mm(W) x 25.5mm(H)
4. Active Area	58.984 mm(W) x 20.972mm(H)
5. DISP.Construction	132x64Dots
6. Number of Dots	132x64
7. Dot Size	0.427mm(W) x 0.308mm(H)
8. Dot Pitch	0.447mm(W) x 0.328mm(H)
9. Driving Method	1/65 duty,1/9 bias
10. ASSY.Type	COG
11. Controller IC	SPLC501C
12. Display Type	FSTN,Positive
13. Polarizer Options	Transmissive
14. Viewing direction	12o'clock
15. Backlight Options	Blue backlight or not
16. Temperature Range Options	Wide(-10°C ~ 60°C)

## 2.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature (Wide temperature)	TOPR	-10	-	60	°C
Storage temperature (Wide temperature)	TSTG	-20	-	70	°C
Input voltage(Ta=25 °C)	VIN	-0.3	-	Vdd+0.3	V
Supply voltage for logic(Ta=25 °C)	VDD-VSS	-0.3	-	7.0	V
Supply voltage for LCD drive(Ta=25 °C)	V5	-12.0	-	0.3	V

## 3.0 ELECTRICAL CHARACTERISTICS

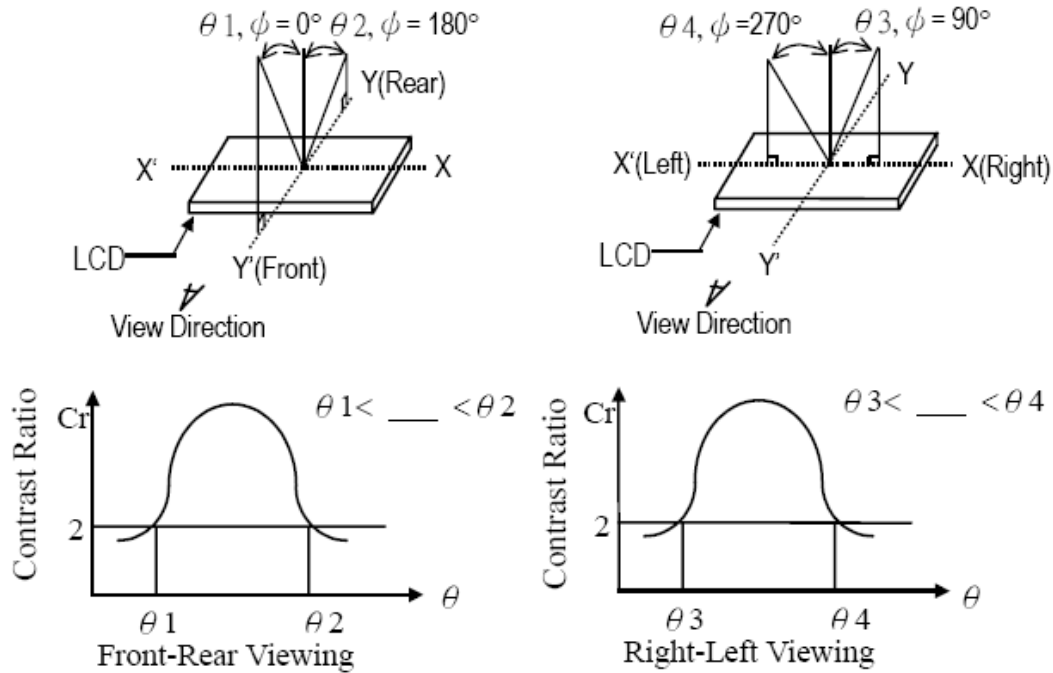
Item	Symbol	Condition	Min	Typ	Max	Unit
Power supply voltage	VDD-VSS	Ta=25 °C	-	5.0	-	V
Power supply for LCD driving	VDD-V5	Ta=25 °C	8.85	9.0	9.15	V
Input voltage "H" level	VIH	-	0.8VDD	-	VDD	V
Input voltage "L" level	VIL	-	VSS	-	0.2VDD	V
Output voltage "H" level	VOH	IOH=-0.5mA	0.8VDD	-	VDD	V
Output voltage "L" level	VOL	IOL=0.5mA	VSS	-	0.2VDD	V

**4.0 OPTICAL CHARACTERISTICS (Ta=25°C, Vdd= 5.0V±0.25V, FSTN LC fluid)**

for LCD 1/65 Duty, 1/9 Bias

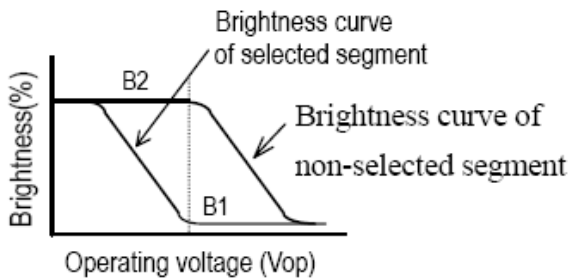
Item		Symbol	Temp.	Condition	Min.	Typ.	Max.	Unit.	Note
Response Time	Rise time	tr	-20°C	$\theta=0^\circ$ $\varphi=0^\circ$		-		mS	
			25°C			200			
	Decay time	td	-20°C			-			
			25°C			250			
Viewing Angle (06:00 H)		$\theta$	25°C K≥2	$\Phi=0^\circ$		35		deg.	
				$\Phi=90^\circ$		35			
				$\Phi=180^\circ$		50			
				$\Phi=270^\circ$		35			
Uniformity		$\Delta Bn$	25°C	$\theta=\varphi=0^\circ$	70%				
Contrast Ratio		K	25°C	$\theta=\varphi=0^\circ$		8			
Color of CIE(1931) coordinate	White	X	25°C	$\theta=\varphi=0^\circ$				-	
		Y						-	
	Red	X						-	
		Y						-	
	Green	X						-	
		Y						-	
	Blue	X						-	
		Y						-	
NTSC Ratio	S						-		

(1) DEFINITION OF VIEWING ANGLE

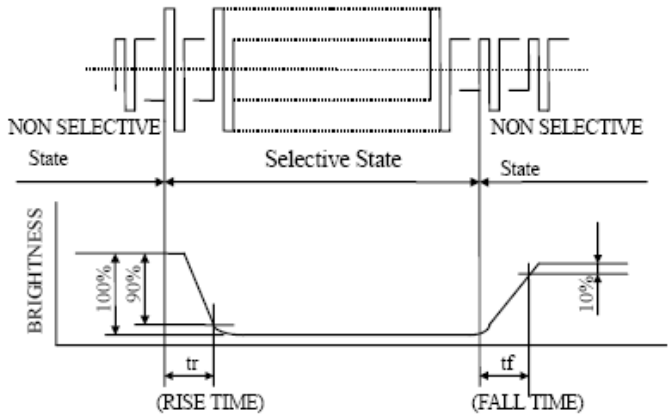


(2) DEFINITION OF CONTRAST

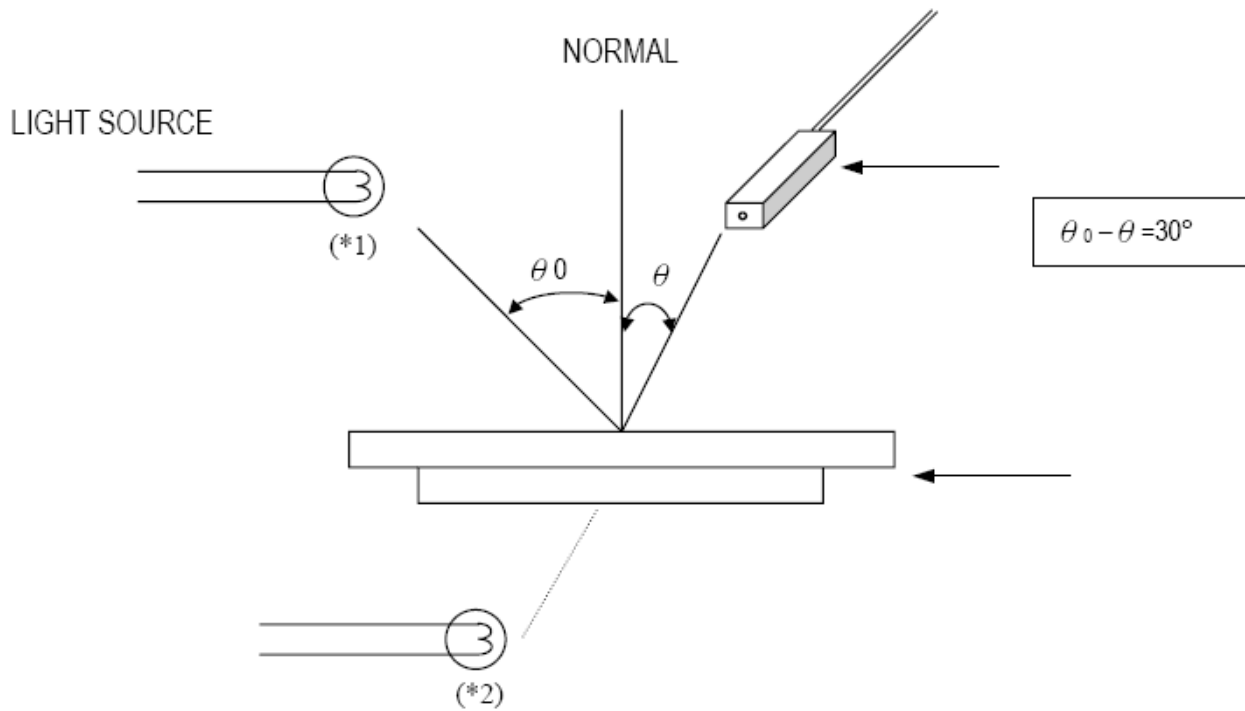
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE



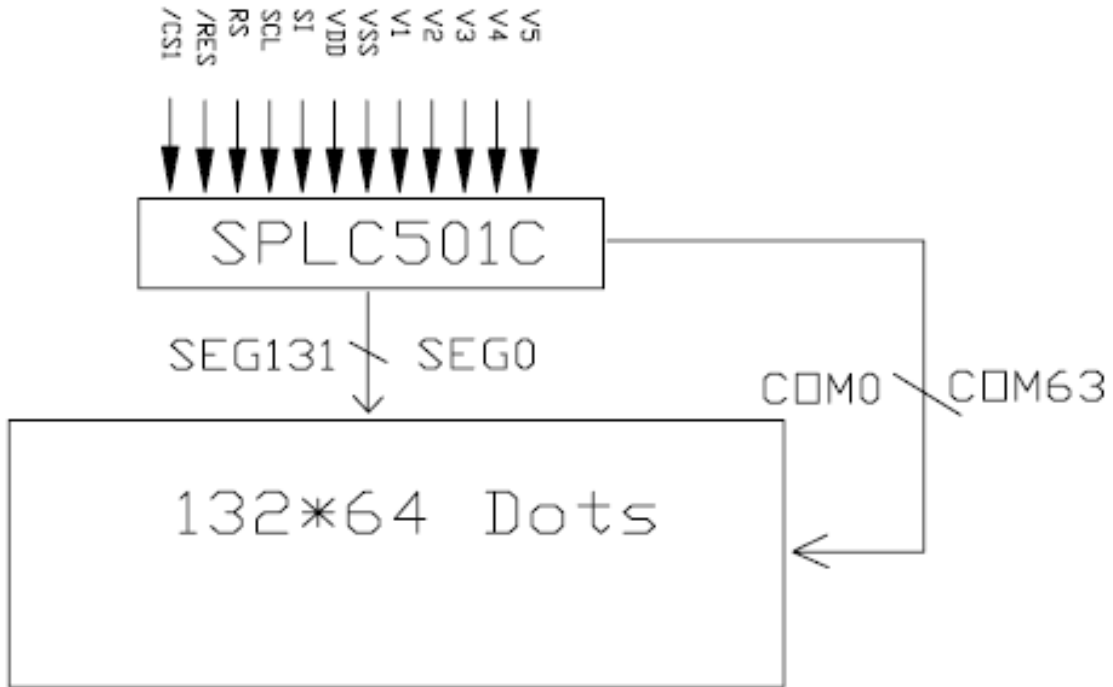
(4) Measuring Instruments For Electro-optical Characteristics



\*1.Light source position for measuring the reflective type of LCD panel

\*2.Light source position for measuring the transfective / transmissive types of LCD panel

## 5.0 BLOCK DIAGRAM



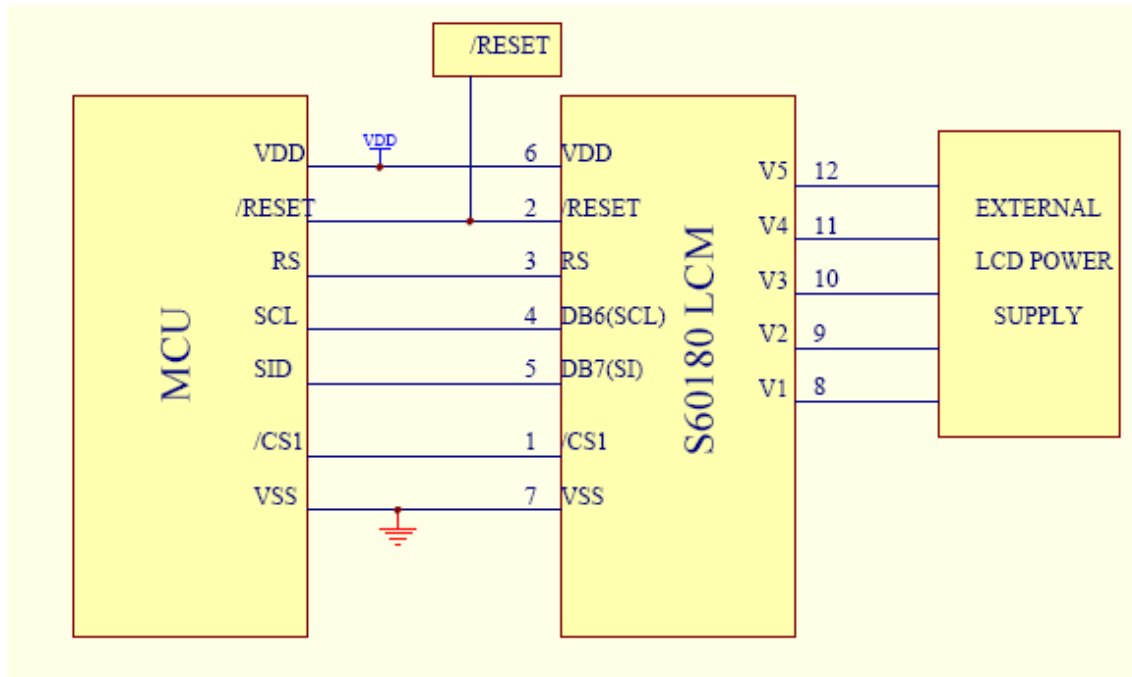
## 6.0 PIN ASSIGNMENT

Pin No.	Symbol	Function
1	/CS1	Chip select signal,active at low.
2	/RESET	Reset signal input
3	RS	Register select.H:Data code input; L:instruction code input.
4	DB6(SCL)	Serial clock input terminal
5	DB7(SI)	Serial data input terminal
6	VDD	Power supply
7	VSS	Ground
8	V1	Power supply for the liquid crystal drive
9	V2	Power supply for the liquid crystal drive
10	V3	Power supply for the liquid crystal drive
11	V4	Power supply for the liquid crystal drive
12	V5	Power supply for the liquid crystal drive

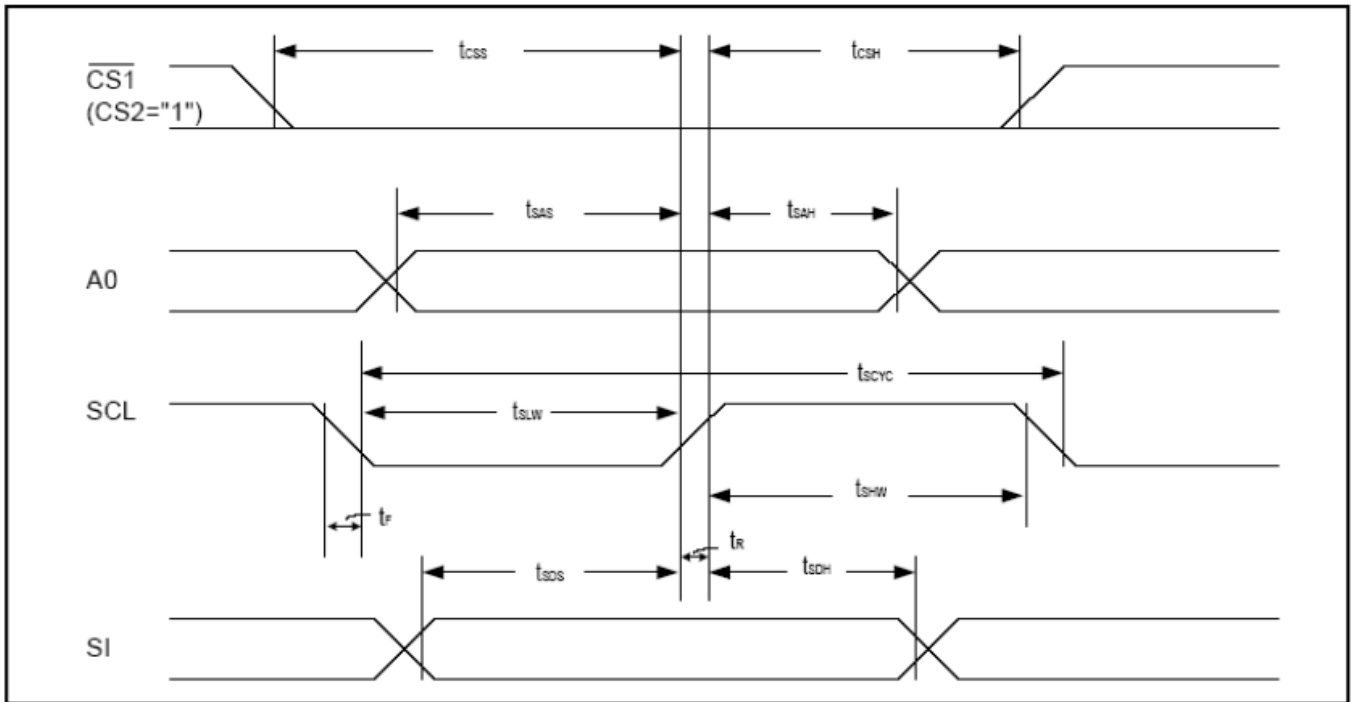


## 7.0 APPLICATION CIRCUIT

4-lines SPI:



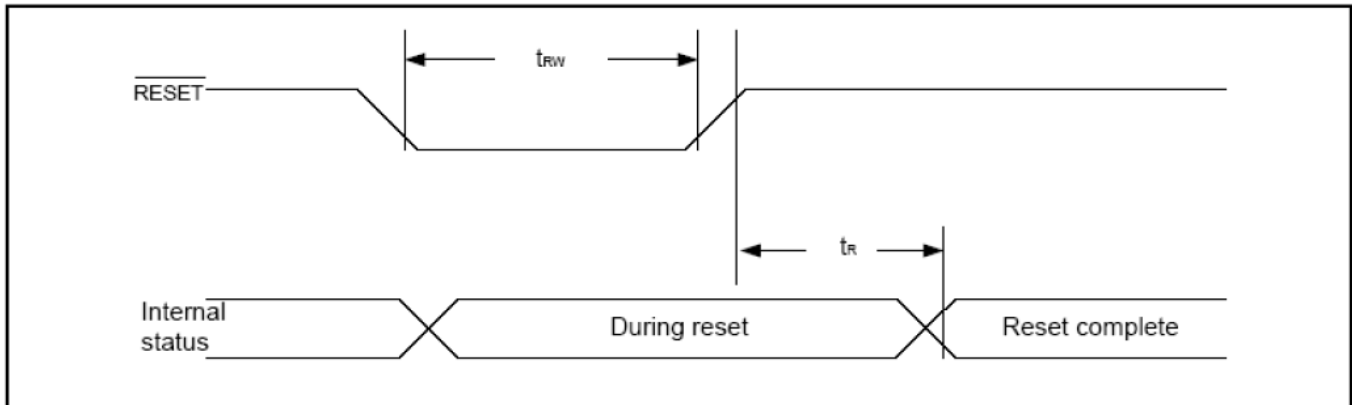
## 8.0 TIMING CHARACTERISTICS



(VDD = 4.5V to 5.5V, T<sub>A</sub> = 25°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period		$t_{SCYC}$	-	200	-	ns
SCL 'H' pulse width	SCL	$t_{SHW}$	-	75	-	ns
SCL 'L' pulse width		$t_{SLW}$	-	75	-	ns
Address setup time	A0P	$t_{SAS}$	-	50	-	ns
Address hold time		$t_{SAH}$	-	100	-	ns
Data setup time	SI	$t_{SDS}$	-	50	-	ns
Data hold time		$t_{SDH}$	-	50	-	ns
CS-SCL time	CS	$t_{CSS}$	-	100	-	ns
		$t_{CSH}$	-	100	-	ns

## 9.0 RESET TIMING CHARACTERISTICS

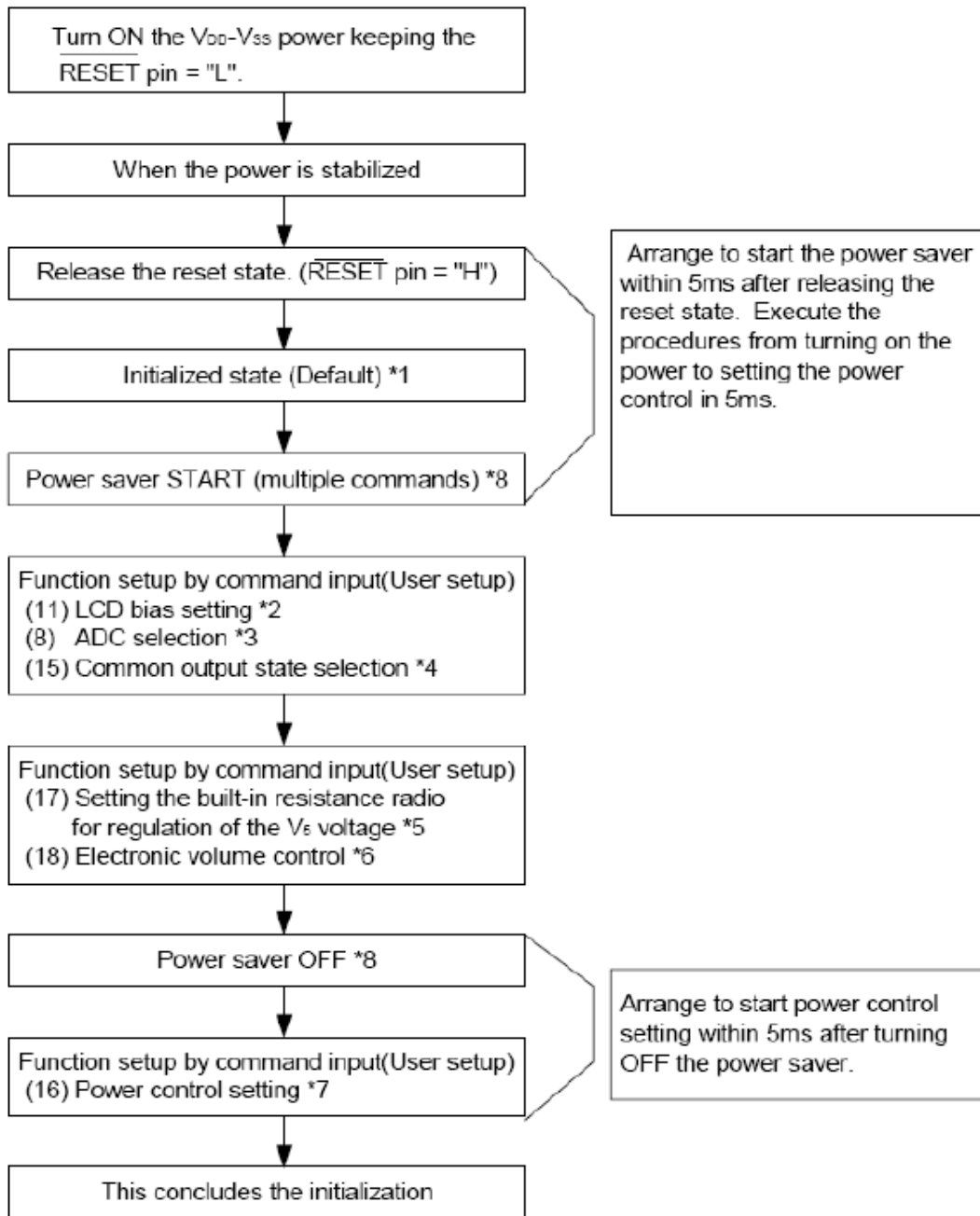


(VDD = 4.5V to 5.5V, T<sub>A</sub> = 25°C)

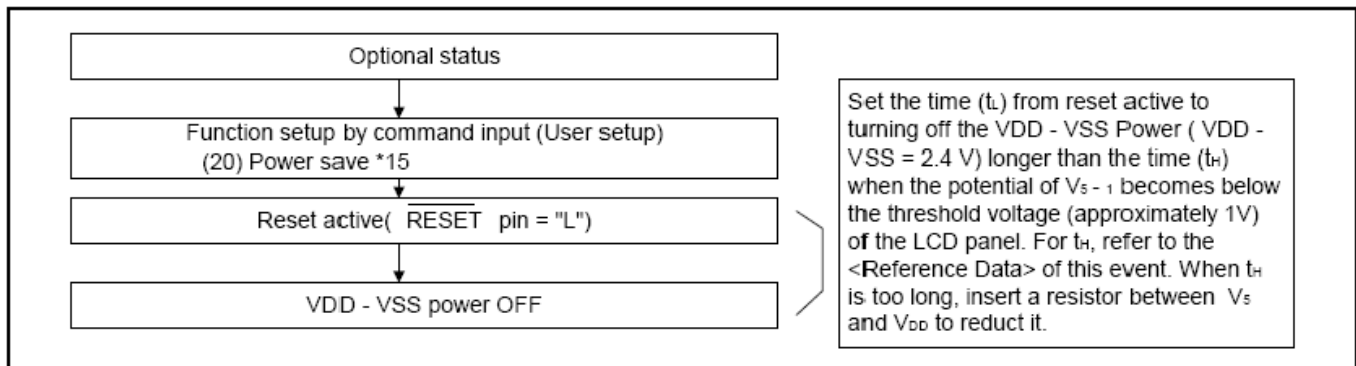
Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		t <sub>R</sub>	-	-	0.5	μs	
Reset 'L' pulse width	RES	t <sub>rw</sub>	-	0.5	-	μs	

## 10.0 POWER ON/OFF SEQUENCE

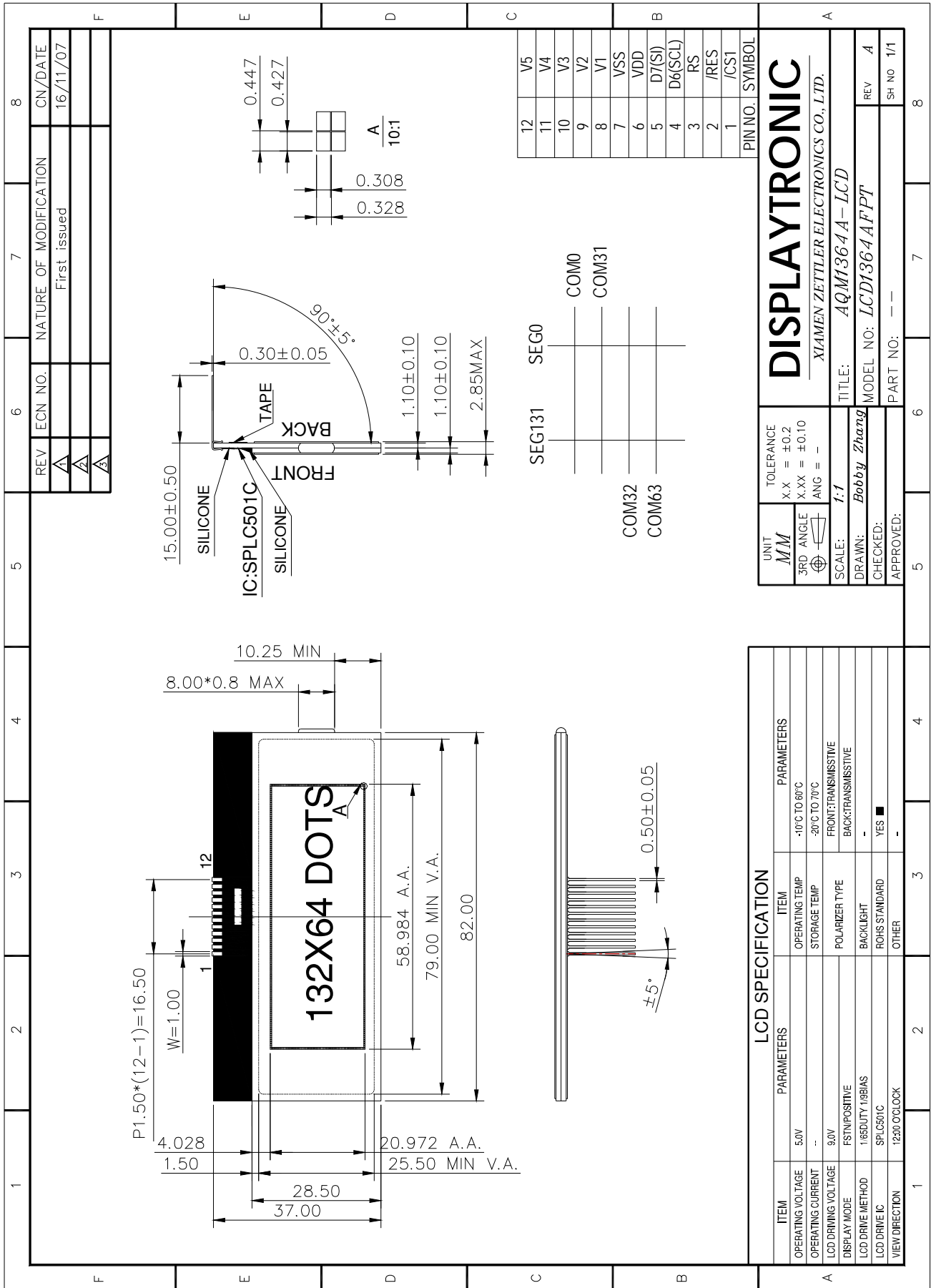
Power on:



Power off:



11.0 MECHANICAL DIAGRAM



## 12.0 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-10°C ~ +60°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-20°C ~ +70°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—	See Note	WITHOUT CONDENSATION

## 13.0 RELIABILITY TEST

ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERATURE +60°C 24HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 10°C 12HRS	
STORAGE TEMPERATURE	HIGH TEMPERATURE +70°C 96HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 20°C 16HRS	
HUMIDITY	40°C 90%RH 96HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	<ul style="list-style-type: none"> <li>• Operating Time: thirty minutes exposure for each direction (X,Y,Z)</li> <li>• Sweep Frequency: 10~55Hz (1 min)</li> <li>• Amplitude: 1.5mm</li> </ul>	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
THERMAL SHOCK	-10°C (30mins) ←→+60°C (30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

\*NOTE: TEST CONDITION

(1)TEMPERATURE AND HUMIDITY: IF NO SPECIFICATION, TEMP. SET AT 25±2°C, HUMIDITY SET AT 60±5%RH

(2) OPERATING STATE: SAMPLES SUBJECT TO THE TESTS SHALL BE IN " OPERATING" CONDITION

14.0 DISPLAY INSTRUCTION TABLE

Command	Command Code										Function	
	A0P	RD	WR	DB7	DB6	DB5	DB4	DB3	DB2	DB1		DB0
1). Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	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	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				Set 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	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	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	Display all points 0: normal display 1: all points ON
11). LCD bias set	0	1	0	1	0	1	0	0	0	1	0	Sets the LCD driver voltage bias ratio SPLC501C.....0:1/9, 1:1/7
12). Read/modify/write	0	1	0	1	1	1	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	Clear read/modify/write
14). Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
15). Common output mode select	0	1	0	1	1	0	0	0	*	*	*	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). V <sub>s</sub> 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	1	Set the V <sub>s</sub> output voltage electronic volume register
Electronic volume register set	0	1	0	*	*	Electronic volume value						

## AQM1364A-MLB-FTW CHARACTER MODULE VER1.0

Command	Command Code										Function	
	A0P	$\overline{RD}$	$\overline{WR}$	DB7	DB6	DB5	DB4	DB3	DB2	DB1		DB0
19). Static indicator ON/OFF Static indicator Register set				1	0	1	0	1	1	0	0	0: OFF, 1: ON  1  Set the flashing mode
20). Page Blink Page selection	0	1	0	1	1	0	1	0	1	0	1	P7 - 0: 1 - blinking page  0 - no blinking, normal display
21). Driving Mode Set Mode selection	0	1	0	1	1	0	1	0	0	1	0	Set the driving mode register  Driving capability (D1, D0): (1,1)>(0,0)>(0,1)>(1,0)
22). Power saver												Display OFF and display all points ON compound command
23). NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
24). Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

Note: The character generator RAM is the RAM with which the user can rewrite character patterns by program.