I2C 接続 8 桁 2 行表示　バックライト付

マルツパーツ館
http://www.marutsu.co.jp/

小型 LCD ディスプレイ[AQM0802A-FL-YBH]

取扱説明書

第 1.1 版

この度は弊社製品をお買い上げいただき誠にありがとうございます。この液晶は電源電圧 DC3.3V で駆動する 8 桁 2 行のキャラクタ・ディスプレイです。幅 30㎜、高さ 19.5㎜ と小型で制御には標準的な ST7032I をコントローラとして搭載しています。マイコンとコントローラは I2C で接続しますので、配線も容易です。また引出線は 1.5㎜ ピッチのリード端子ですので、直接基板に取り付けが可能です。更に LED バックライトを標準装備していますので視認性も良く、小型携帯機器への組み込みに適しています。

◆ 外観 ◆

1.0 機械的仕様

1. Display Format	8*2 Character
2. Power Supply	3.3V
3. Overall Module Size	30.0mm(W) x 19.5mm(H) x max 5.5mm(D)
4. Viewing Aera(W*H)	27.0mm(W) x 10.5mm(H)
5. Dot Size (W*H)	0.45mm(W) x 0.50mm(H)
6. Dot Pitch (W*H)	0.50mm(W) x 0.55mm(H)
7. Character Size (W*H)	2.45mm(W) x 4.35mm(H)
8. Character Pitch (W*H)	2.95mm(W) x 4.90mm(H)
9. Viewing Direction	6:00 O'Clock
10. Driving Method	1/16Duty,1/5Bias
11. Controller IC	ST7032I OR EQUIV
12. LC Fluid Options	STN（Y-G） /Positive
13. Polarizer Options	Transflective
14. Backlight Options	LED-SIDE(Y-G)
15. Operating temperature	-20ºC ~ 70ºC
16. Storage temperature	-30ºC ~ 80ºC

2.0 最大定格

Item	Symbol	Min	Typ	Max	Unit
Operating temperature	Top	-20	-	70	ºC
Storage temperature	Tst	-30	-	80	ºC
Input voltage	Vin	Vss		Vdd	V
Supply voltage for logic	Vdd- Vss	2.7	-	5.5	V
Supply voltage for LCD drive	Vdd- Vo	3.0	-	7.0	V

3.0 電気特性

3.1 表示部　電気特性

Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply Voltage	Vdd	25ºC		3.3		V
Power Supply Current	Idd	Vdd=5.0V, fosc=270kHz		0.5		mA
Input voltage (high)	Vih	H level	0.8Vdd		Vdd	V
Input voltage (low)	Vil	L level	0		0.2Vdd	V
Recommended LC Driving Voltage	Vdd -Vo	-20ºC	-			V
		25ºC	4.3	4.5	4.7	
		70ºC	-			

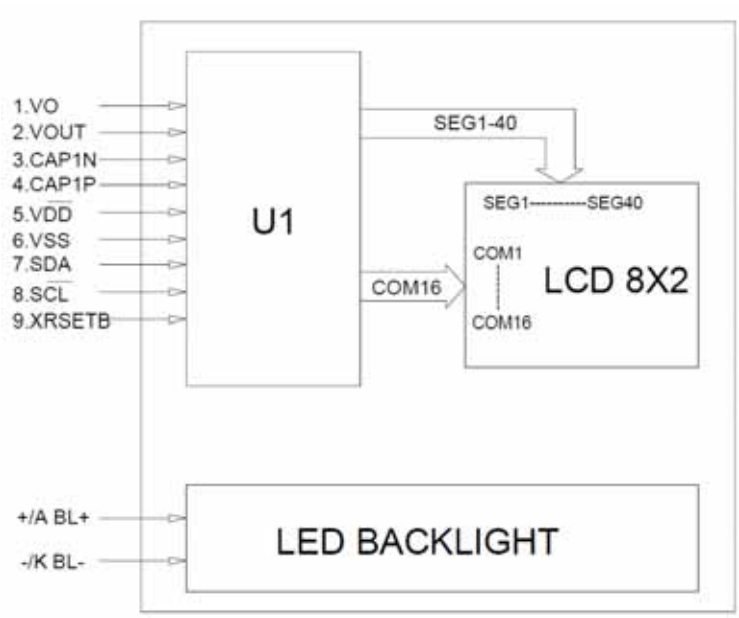
3.2 LEDバックライト部　電気特性

Item	Symbol	Condition	Min	Typ	Max	Unit
Operate Current	IF	VF=3.3±0.2V		40		mA
Luminance	Lv	IF= 40 mA	30			cd/m²
Peak wave length	λ p	IF= 40 mA	570		575	nm

4.0 視認性能 (Ta=25ºC, Vdd= 3.3V±0.25V)

Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing angle (horizontal)	θ	Cr ≥ 2.0	-35	-	35	deg
Viewing angle (vertical)	φ	Cr ≥ 2.0	-25	-	40	deg
Contrast Ratio	Cr	φ=0°, θ=0°	-	6	-	
Response time (rise)	Tr	φ=0°, θ=0°	-	180	300	ms
Response time (fall)	Tf	φ=0°, θ=0°	-	150	250	ms

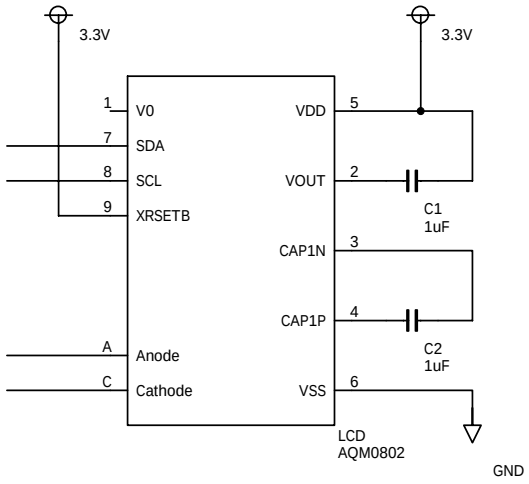
5.0 ブロック図



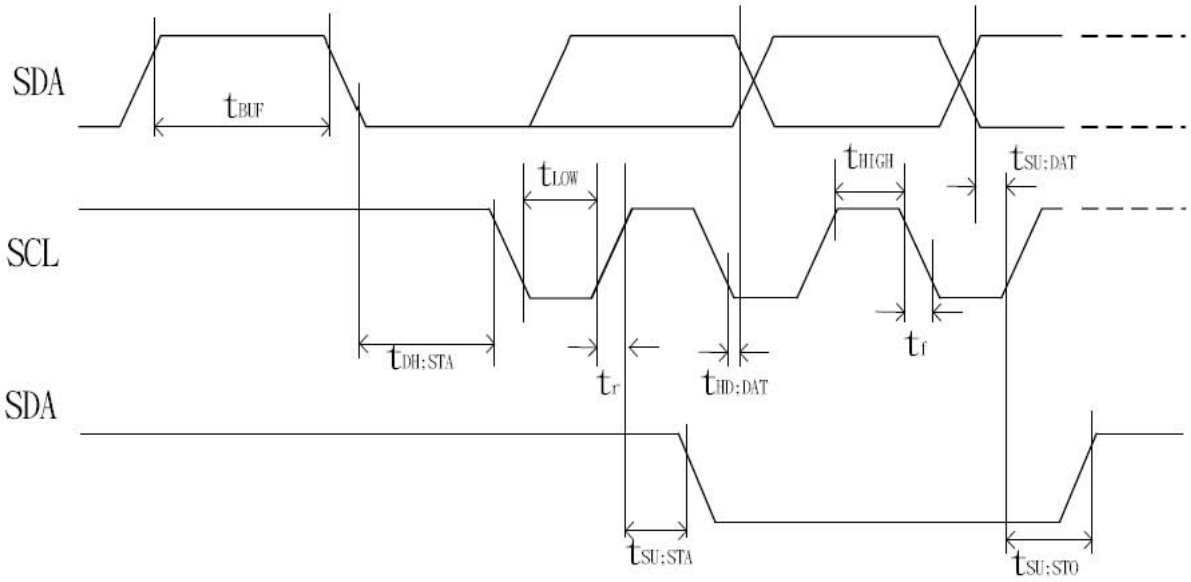
6.0 端子表

Pin No.	Symbol	Function
1	VO	Open
2	VOUT	DC/DC voltage converter output
3	CAPIN	Pins for DC/DC voltage converter
4	CAPIP	
5	VDD	+3.3V
6	VSS	Ground
7	SDA	Serial data input
8	SCL	Serial clock input
9	XRSETB	Chip reset signal. Active when low
A	BL+	Power Supply for BL+
K	BL-	Power Supply for BL-

7.0 接続例



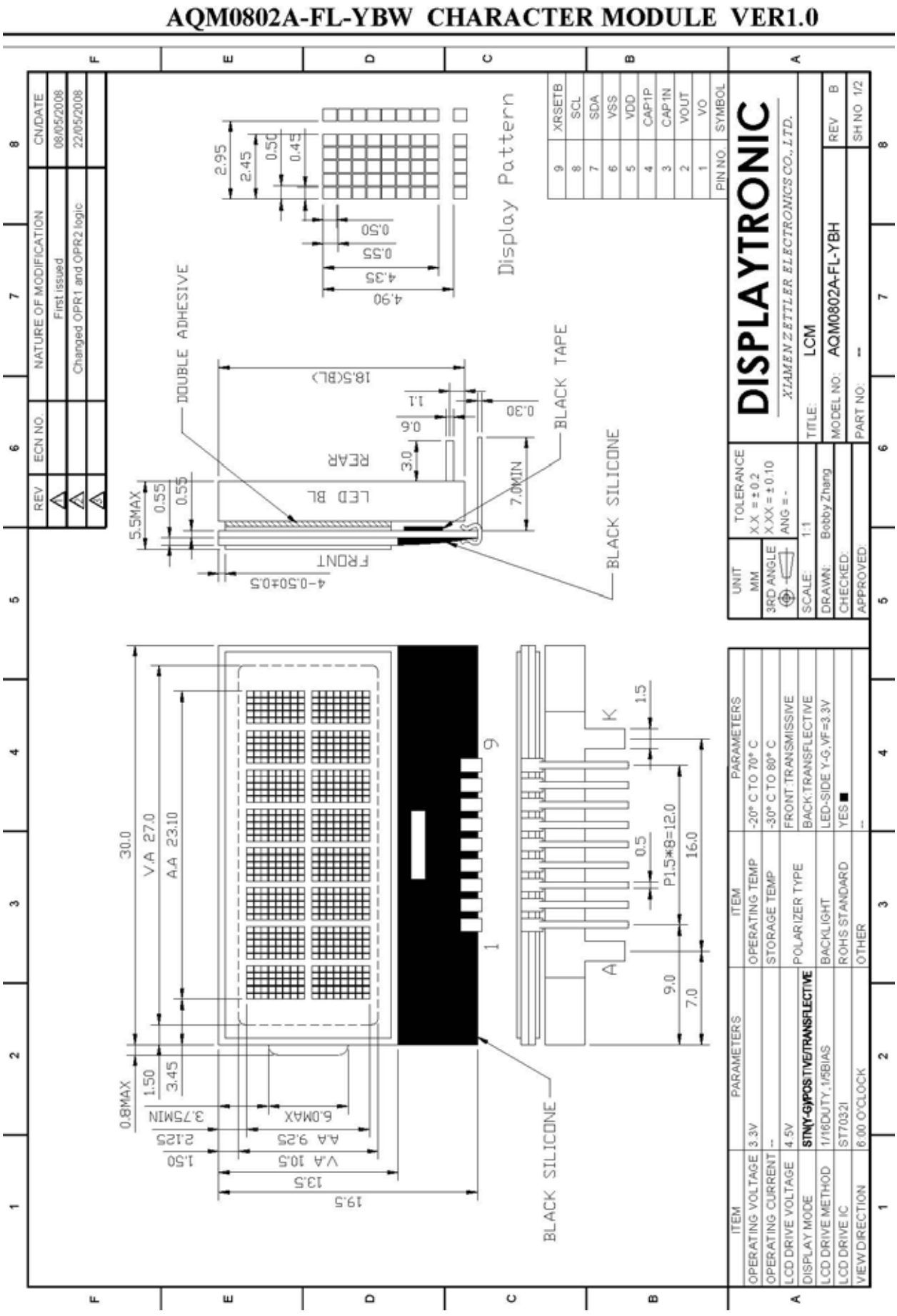
8.0 通信信号タイミング

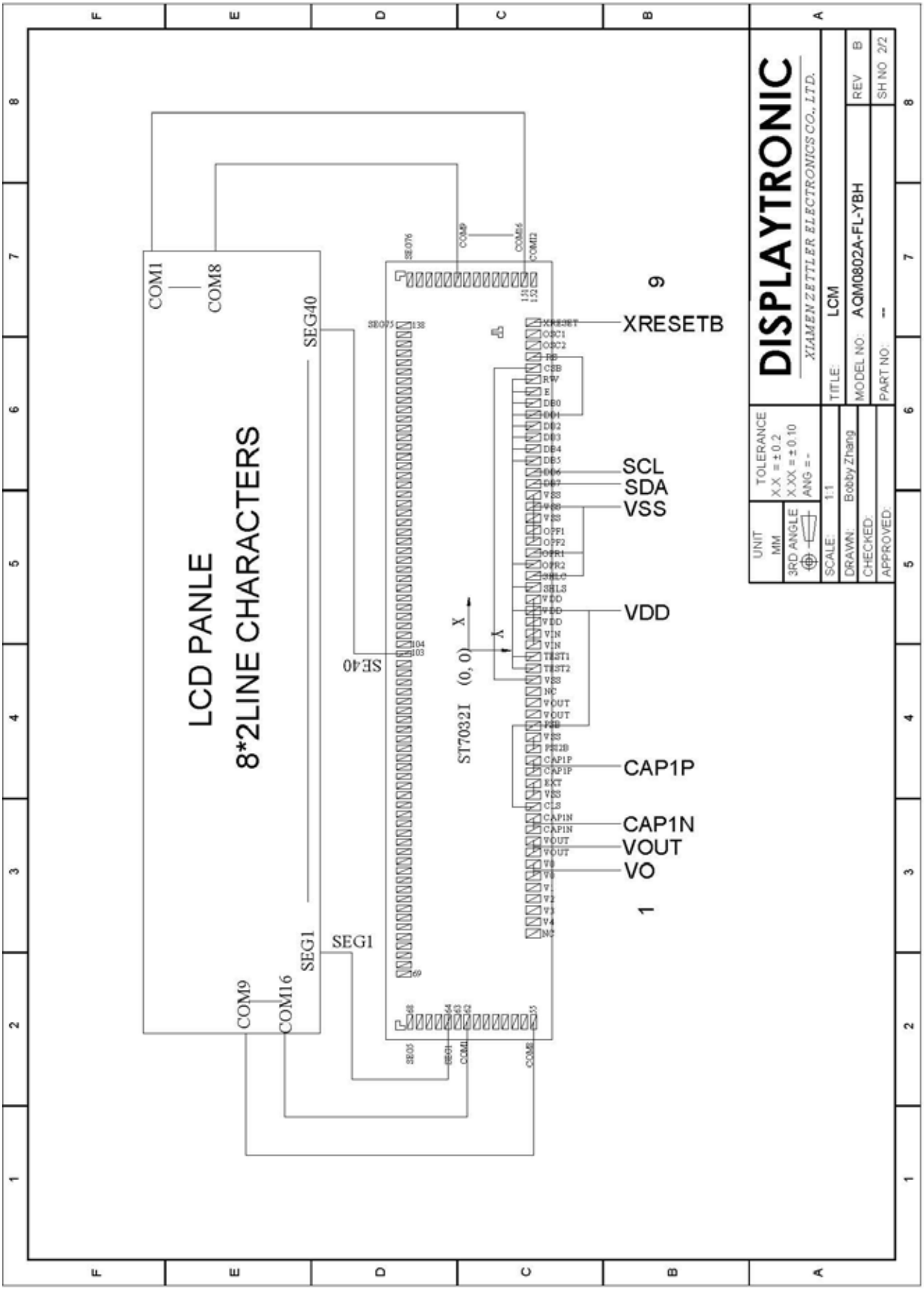


(Ta =-30°C to 85°C)

Item	Signal	Symbol	Condition	VDD=2.7 to 4.5V Rating		VDD=4.5 to 5.5V Rating		Units
				Min.	Max.	Min.	Max.	
SCL clock frequency	SCL	f_{SCLK}	—	DC	400	DC	400	KHz
SCL clock low period		t_{LOW}		1.3	—	1.3	—	us
SCL clock high period		t_{HIGH}		0.6	–	0.6	–	
Data set-up time	SI	$t_{SU;DAT}$	—	**180**	–	100	–	ns
Data hold time		$t_{HD;DAT}$		0	0.9	0	0.9	us
SCL,SDA rise time	SCL, SDA	t_r	—	20+0.1C_b	300	20+0.1C_b	300	ns
SCL,SDA fall time		t_f		20+0.1C_b	300	20+0.1C_b	300	
Capacitive load represent by each bus line		C_b	—	–	400	–	400	pf
Setup time for a repeated START condition	SI	$t_{SU;STA}$	—	0.6	–	0.6	–	us
Start condition hold time		$t_{HD;STA}$	—	0.6	–	0.6	–	us
Setup time for STOP condition		$t_{SU;STO}$	—	0.6	–	0.6	–	us
Bus free time between a Stop and START condition	SCL	t_{BUF}	—	1.3	–	1.3	–	us

9.0 外形寸法図


AQM0802A-FL-YBW CHARACTER MODULE VER1.0
DISPLAYTRONIC
XIAMEN ZETTLER ELECTRONICS CO., LTD.
TITLE: LCM
MODEL NO: AQM0802A-FL-YBH
PART NO: --
REV B
SH NO 1/2
UNIT MM
3RD ANGLE
TOLERANCE XX = ±0.2 XXX = ±0.10 ANG = -
SCALE: 1:1
DRAWN: Bobby Zhang
CHECKED:
APPROVED:
REV ECN NO NATURE OF MODIFICATION CN/DATE
First issued 08/05/2008
Changed OPR1 and OPR2 logic 22/05/2008
PIN NO SYMBOL
1 VO
2 VOUT
3 CAP1N
4 CAP1P
5 VDD
6 VSS
7 SDA
8 SCL
9 XRSETB
Display Pattern
DOUBLE ADHESIVE
BLACK TAPE
BLACK SILICONE
LED BL
REAR
FRONT
18.5(BL)
7.0MIN
5.5MAX
4-0.50±0.5
30.0
V.A 27.0
A.A 23.10
0.8MAX
1.50
3.45
3.75MIN
6.0MAX
A.A 9.25
V.A 10.5
13.5
19.5
P1.5*8=12.0
16.0
9.0
7.0
1.5
0.5
ITEM PARAMETERS
OPERATING VOLTAGE 3.3V
OPERATING CURRENT --
LCD DRIVE VOLTAGE 4.5V
DISPLAY MODE STN(Y-G)POSITIVE/TRANSFLECTIVE
LCD DRIVE METHOD 1/16DUTY,1/5BIAS
LCD DRIVE IC ST7032I
VIEW DIRECTION 6:00 O'CLOCK
ITEM PARAMETERS
OPERATING TEMP -20° C TO 70° C
STORAGE TEMP -30° C TO 80° C
POLARIZER TYPE FRONT:TRANSMISSIVE BACK:TRANSFLECTIVE
BACKLIGHT LED-SIDE Y-G, VF=3.3V
ROHS STANDARD YES
OTHER --


LCD PANLE
8*2LINE CHARACTERS
COM1
COM8
SEG40
SEG1
COM9
COM16
SE40
ST7032I (0, 0)
XRESETB
SCL
SDA
VSS
VDD
CAP1P
CAP1N
VOUT
VO
9
1
DISPLAYTRONIC
XIAMEN ZETTLER ELECTRONICS CO., LTD.
TITLE: LCM
MODEL NO: AQM0802A-FL-YBH
PART NO: --
REV B
SH NO 2/2
UNIT MM
3RD ANGLE
TOLERANCE X.X = ±0.2 X.XX = ±0.10 ANG = -
SCALE: 1:1
DRAWN: Bobby Zhang
CHECKED:
APPROVED:

10.0 信賴性試驗

NO	Test Item		Description	Test Condition	Remark
1	Environmental Test	High temperature storage	Applying the high storage temperature Under normal humidity for a long time Check normal performance	80 ºC 96hrs	
2		Low temperature storage	Applying the low storage temperature Under normal humidity for a long time Check normal performance	-30ºC 96hrs	
3		High temperature Operation	Apply the electric stress(Volatge and current) Under high temperature for a long time	70 ºC 96hrs	Note1
4		Low temperature Operation	Apply the electric stress Under low temperature for a long time	-20ºC 96hrs	Note1 Note2
5		High temperature/High Humidity Storage	Apply high temperature and high humidity storage for a long time	90% RH 40ºC 96hrs	Note2
6		Temperature Cycle	Apply the low and high temperature cycle -30ºC＜＞25ºC＜＞80ºC ＜＞ 25ºC 30min 10min 30min 10min 1 cycle Check normal performance	-30ºC/80ºC 10 cycle	
7	Mechanical Test	Vibration test(Package state)	Applying vibration to product check normal performance	Freq:10-55Hz Max Acceleration 5G 1cycle time:1min time X.Y.Z direction for 15 mines	
8		Shock test(package state)	Applying shock to product check normal performance	Drop them through 70cm height to strike horizontal plane	
9	Other				

Remark

Note1:Normal operations condition (25ºC±5ºC).

Note2:Pay attention to keep dewdrops from the module during this test.

11.0 命令コード表

- **instruction table at "Normal mode"**

(When "EXT" option pin connect to VDD, the instruction set follow below table)

Instruction	Instruction Code										Description	Instruction Execution Time		
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		OSC= 380KHz	OSC= 540kHz	OSC= 700KHz
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	**1.08 ms**	**0.76 ms**	**0.59 ms**
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	**1.08 ms**	**0.76 ms**	**0.59 ms**
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	**26.3 us**	**18.5 us**	**14.3 us**
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	**26.3 us**	**18.5 us**	**14.3 us**
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	S/C and R/L: Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	**26.3 us**	**18.5 us**	**14.3 us**
Function Set	0	0	0	0	1	DL	N	x	x	x	DL: interface data is 8/4 bits N: number of line is 2/1	**26.3 us**	**18.5 us**	**14.3 us**
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	**26.3 us**	**18.5 us**	**14.3 us**
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	**26.3 us**	**18.5 us**	**14.3 us**
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	**0**	**0**	**0**
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	**26.3 us**	**18.5 us**	**14.3 us**
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	**26.3 us**	**18.5 us**	**14.3 us**

Note:
Be sure the ST7032 is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7032. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

➢ instruction table at "Extension mode"

(when "EXT" option pin connect to Vss, the instruction set follow below table)

Instruction	Instruction Code										Description	Instruction Execution Time		
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		OSC= 380KHz	OSC= 540kHz	OSC= 700KHz
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.08 ms	0.76 ms	0.59 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.08 ms	0.76 ms	0.59 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	26.3 us	18.5 us	14.3 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	26.3 us	18.5 us	14.3 us
Function Set	0	0	0	0	1	DL	N	DH	*0	IS	DL: interface data is 8/4 bits N: number of line is 2/1 DH: double height font IS: instruction table select	26.3 us	18.5 us	14.3 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	26.3 us	18.5 us	14.3 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0	0	0
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 us	18.5 us	14.3 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM/ICONRAM)	26.3 us	18.5 us	14.3 us

Note * : this bit is for test command , and must always set to "0"

Instruction table 0(IS=0)														
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	S/C and R/L: Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	26.3 us	18.5 us	14.3 us
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	26.3 us	18.5 us	14.3 us

Instruction table 1(IS=1)														
Internal OSC frequency	0	0	0	0	0	1	BS	F2	F1	F0	BS=1:1/4 bias BS=0:1/5 bias F2~0: adjust internal OSC frequency for FR frequency.	26.3 us	18.5 us	14.3 us
Set ICON address	0	0	0	1	0	0	AC3	AC2	AC1	AC0	Set ICON address in address counter.	26.3 us	18.5 us	14.3 us
Power/ICON control/Contrast set	0	0	0	1	0	1	Ion	Bon	C5	C4	Ion: ICON display on/off Bon: set booster circuit on/off C5,C4: Contrast set for internal follower mode.	26.3 us	18.5 us	14.3 us
Follower control	0	0	0	1	1	0	Fon	Rab 2	Rab 1	Rab 0	Fon: set follower circuit on/off Rab2~0: select follower amplified ratio.	26.3 us	18.5 us	14.3 us
Contrast set	0	0	0	1	1	1	C3	C2	C1	C0	Contrast set for internal follower mode.	26.3 us	18.5 us	14.3 us

12.0 標準文字コード表

13.0 使用上の注意事項

1. LCDパネルはガラス基板で作られていますので、落としたりぶつけたりしますと、破損する可能性があります。取扱いには、ご注意ください。
2. LCDモジュールの表面には、特殊コーティングが施されていますので、表面に傷をつけないように注意してください。製品化の際、プラスチック・カバーなどの保護材を使用することをお勧めします。
3. LCDモジュールを規定温度外で保管しないでください。品質が劣化します。

また、以下の内容についてご注意ください。

a) 電極以外の部分が回路と接触しないように使用してください。

b) パネルに穴を空けたり、その他加工は行わないでください。搭載する電子回路にも加工を加えないください。

c) 電極は、弱い力で変形したり、内部での断線を引き起こします。決して無理な力は加えないでください。

◆ 注意事項 ◆

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