REVISION RECORD		REVISION NO.	MODEL NO.
		1.00	MK-AOB3202405x
		REVISION FIRST ISSUE DATE	
		SEPTEMBER 16, 2004	
ISSUE DATE	NEW REVISION NO.	COMMENTS	CHECKED & APPROVED BY

Contents

1. Amulet On-Board Module Information

MK-AOB	320240	5	B
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1 Product Type:	Amulet On-Board Module
2 Display Resolution:	320 x 240 Pixels
3 Display Type:	5.7” Graphic LCD
4 Display Modes:	**B**= STN Negative, Blue, Transmissive **N**= FSTN Negative, Transmissive **T**= FSTN Positive, Transflective

Backlight Type:	White LED
Backlight Control:	Digital Potentiometer
Contrast Control:	Digital Potentiometer
Viewing Angle:	6 o’clock
Operating Temp:	-20°C to 70°C
Temperature Comp:	Yes
Power Requirement:	5Vdc (±.25v) @ 250mA

Memory

µHTML Storage Capacity:	4 megabit

Communication Interface

Communication Type:	Amulet Protocol via UART
Data Rate (BAUD):	9,600 / 19,200 / 57,600 / 115,200 bps

2. Precautions in Use of Amulet On-Board Module

- Avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not make extra holes on the printed circuit board, modify its shape or change any components.
- Do not disassemble the module.
- Do not operate it above the absolute maximum ratings.
- Do not drop, bend or twist module.
- Storage: Store in anti-static electricity container and in a clean environment.

3. General Specification

ITEM	STANDARD VALUE	UNIT
Number of Pixels	320 x 240	dots
Outline Dimension	160.0(W) x 109.0(H) x 11.4max(T)	mm
View Area	122.0(W) x 92.0(H)	mm
Active Area	119.2(W) x 90.3(H)	mm
Dot Size	0.34(W) x 0.34(H)	mm
Dot Pitch	0.36(W) x 0.36(H)	mm
LCD Type	**B** = STN Negative, Blue, Transmissive **N** = FSTN Negative, Transmissive **T** = FSTN Positive, Transflective	
View Direction	6 o'clock	
Backlight	White LED	

4. Absolute Maximum Ratings & Electrical Characteristics

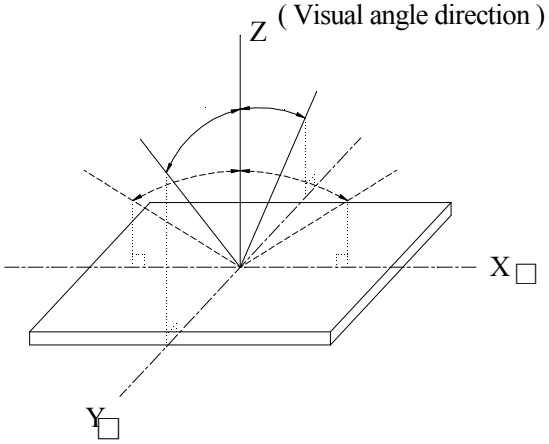
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	-20	-	+70	ºC
Storage Temperature	T_{ST}	-30	-	+80	ºC
Logic Voltage	V_{DD}	-	3.3	3.46	V
Supply Voltage For Module	V_{CC}	4.75	5.00	5.25	V
CMOS Input					
Input High Voltage	V_{IH}	$0.7V_{DD}$	-	-	V
Input Low Voltage	V_{IL}	-	-	$0.3V_{DD}$	V
Input Leakage Current	I_L	-10	-	10	μA
CMOS Output					
Output High Voltage	V_{OH}	$0.8V_{DD}$	-	-	V
Output Low Voltage	V_{OL}	-	-	$0.5V_{DD}$	V
I/O Pin Pull-up Resistor	R_{IO}	70K	108K	202K	Ω
Supply Current		240	250	270	mA

5. Optical Characteristics

ITEM	SYMB0L	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V)θ	CR ≥2	30	-	60	deg.
	(H)φ	CR≥2	-45	-	45	deg.
Contrast Ratio	CR	-	-	5	-	-
Response Time	T rise	-	-	200	300	ms
	T fall	-	-	150	200	ms

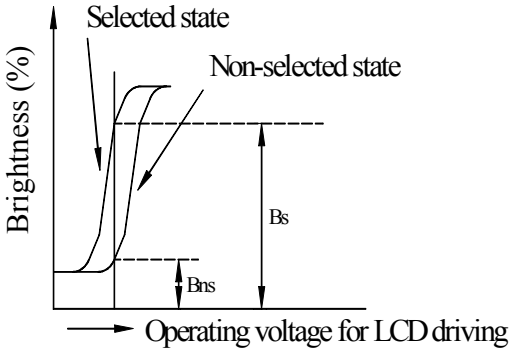
5.1 Definitions

■View Angles

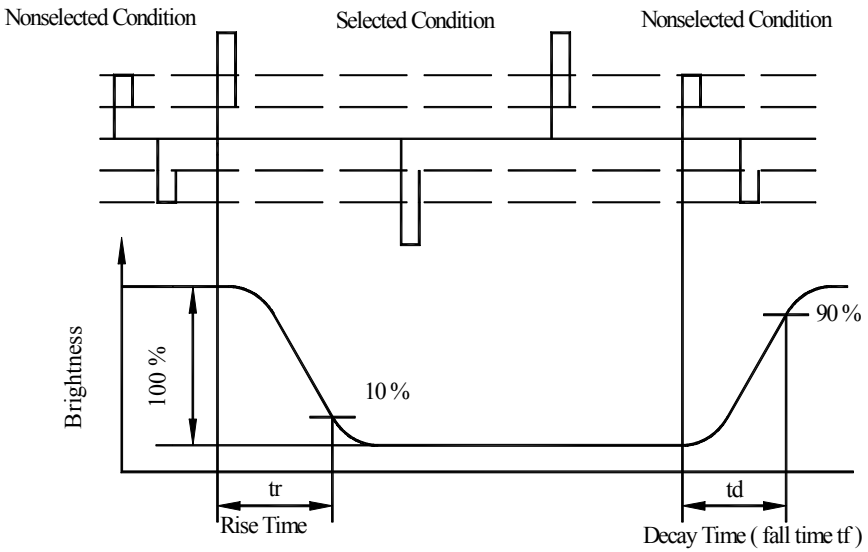


■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



■Response time



6. Interface Description

Pin Type

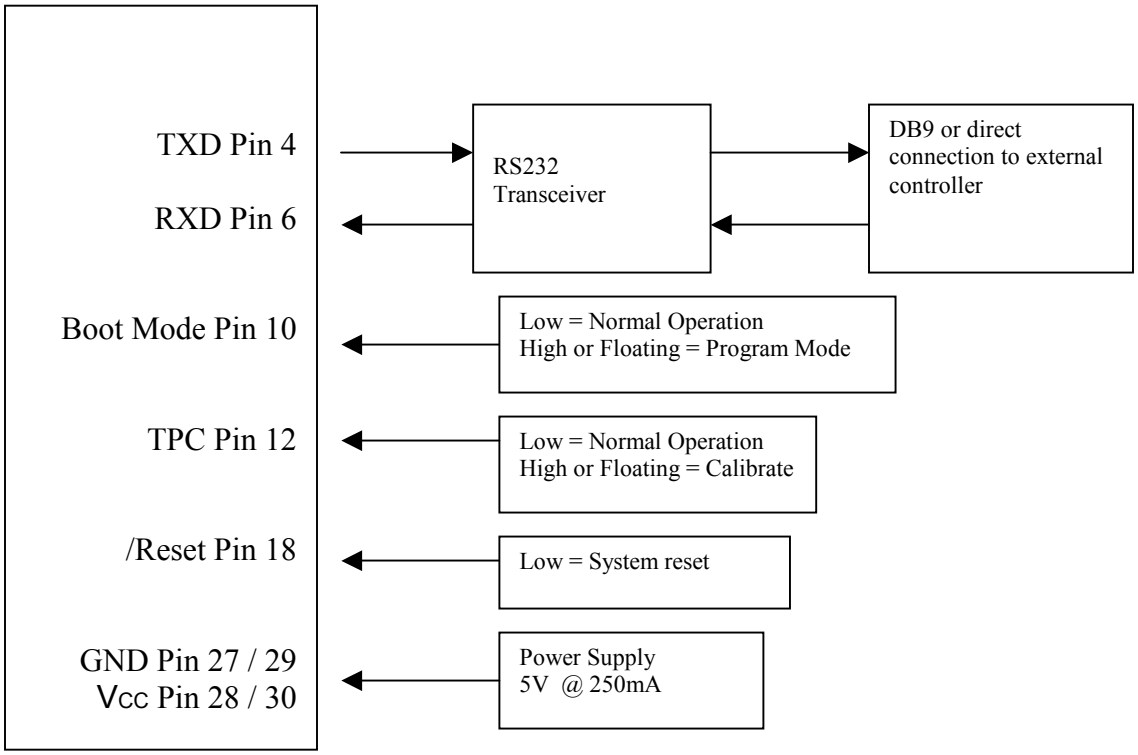
I = [1]CMOS Input
O = [1]CMOS Output
P = Power Supply

Pin #	Signal	Type	Description
1	GND	P	Ground.
2	GND	P	Ground.
3	/FSS	O	Flash slave select. This pin should be left unconnected.
4	TXD	O	Asynchronous data output (UART Transmit).
5	/TSS	O	Touch panel slave select. This pin should be left unconnected.
6	RXD	I	Asynchronous data input (UART Receive).
7	/SS2	O	Contrast control slave select. This pin should be left unconnected.
8	GND	P	Ground.
9	/SS3	O	Backlight control slave select. This pin should be left unconnected.
10	BOOT MODE	I	[2]System power up mode. Drive high or leave unconnected to enter program mode or drive low for normal operation.
11	/SS4	O	SPI slave select 4. This pin is for future use and should be left unconnected.
12	TPC	I	[2]Touch panel calibration mode. Drive high or leave unconnected to enter calibration mode or drive low for normal operation.
13	/SS5	O	SPI slave select 5. This pin is for future use and should be left unconnected.
14	FBS	I	[2]Flash programming baud rate. Drive high or leave unconnected to program flash at 115,200 bps or drive low to program at 19,200 bps.
15	/SS6	O	SPI slave select 6. This pin is for future use and should be left unconnected.
16	GND	P	Ground.
17	/SS7	O	SPI slave select 7. This pin is for future use and should be left unconnected.
18	/RESET	I	System reset input. An external source can initiate a system reset by driving this pin low.
19	GND	P	Ground.
20	/IRQ	I	Touch panel interrupt. This pin should be left unconnected.
21	SCLK	O	SPI clock. This pin should be left unconnected.
22	GND	P	Ground.
23	MISO	I	SPI data in. This pin should be left unconnected.
24	GND	P	Ground.
25	MOSI	O	SPI data out. This pin should be left unconnected.
26	GND	P	Ground.
27	GND	P	Ground.

28	Vcc	P	[3]Supply voltage for module. A regulated voltage between 4.75V and 5.25V should be applied to this pin.
29	GND	P	Ground.
30	Vcc	P	[3]Supply voltage for module. A regulated voltage between 4.75V and 5.25V should be applied to this pin.

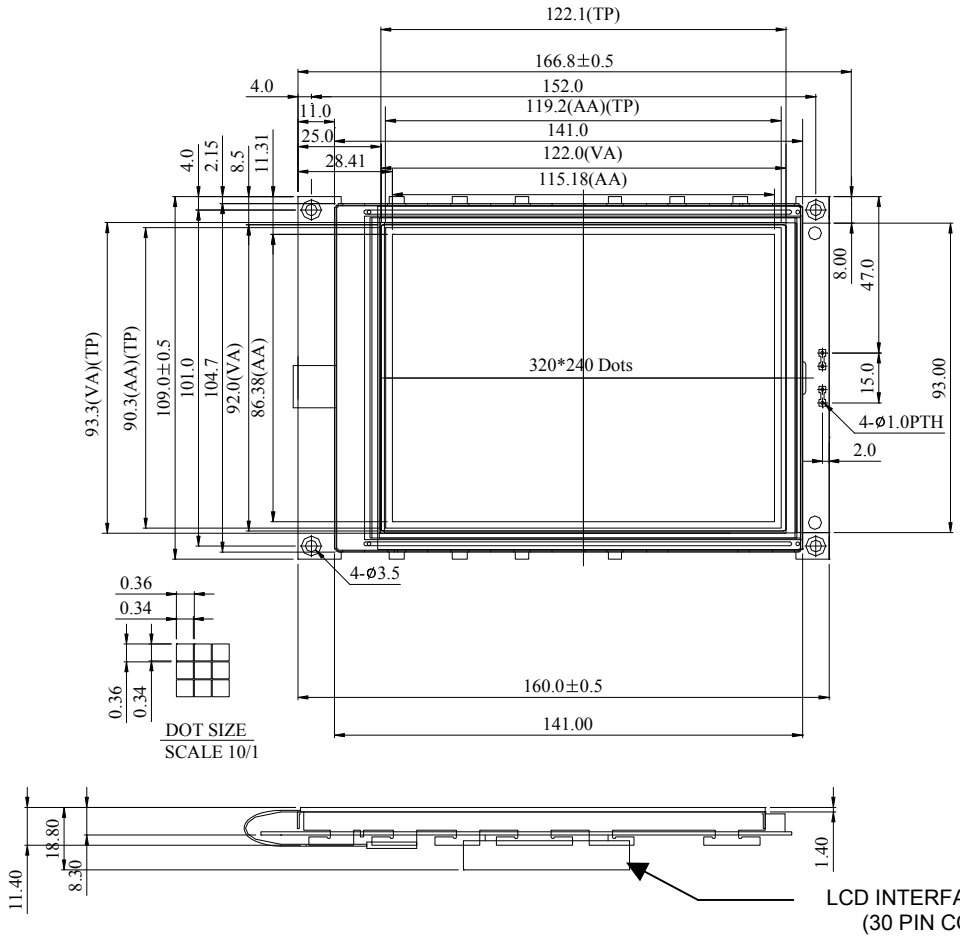
[1] The I/O pins must adhere to the voltage levels depicted in Section 4 (Absolute Maximum Ratings & Electrical Characteristics).
[2] Input pin is only read upon power up or a system reset.
[3] Supply voltage must provide 5V @ 250mA.

6.1 Typical Interface

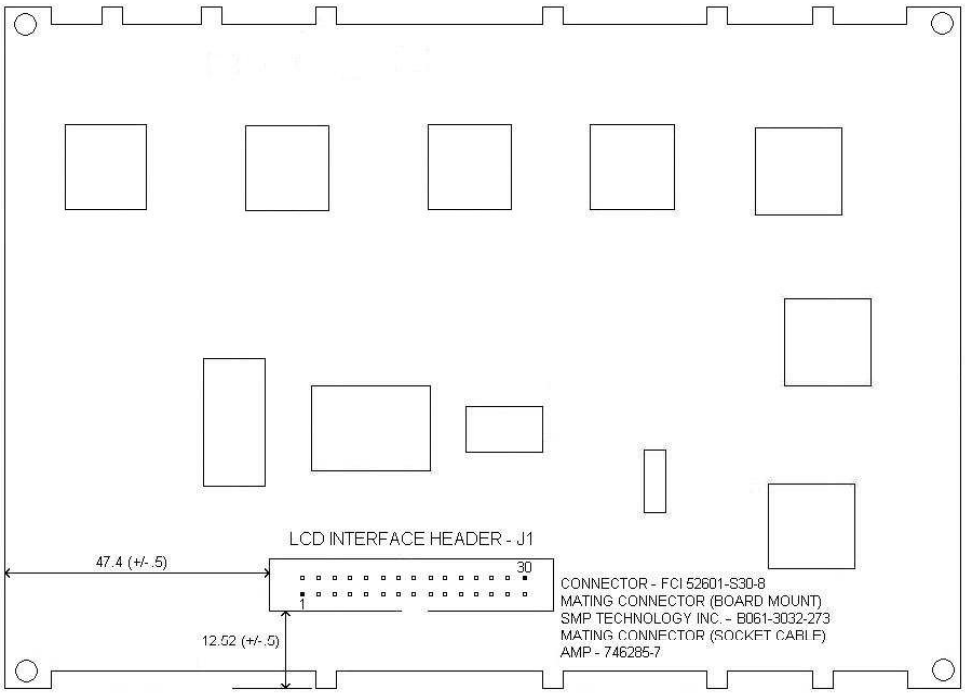


MK-AOB3202405 **External Hardware**

7. Contour Drawing



Pin No.	Symbol	Pin No.	Symbol
1	GND	2	GND
3	/FSS	4	TXD
5	/TSS	6	RXD
7	/SS2	8	GND
9	/SS3	10	BOOT MODE
11	/SS4	12	TPC
13	/SS5	14	FBS
15	/SS6	16	GND
17	/SS7	18	/RESET
19	GND	20	/IRQ
21	SCLK	22	GND
23	MISO	24	GND
25	MOSI	26	GND
27	GND	28	VCC
29	GND	30	VCC



8. Quality Assurance

Screen Cosmetic Criteria

NO.	DEFECT	JUDGMENT CRITERION	PARTITION
1	Spots	A) Clear Size: d mm / Acceptable Qty in active area d≤0.1 Disregard 0.1<d≤0.2 6 0.2<d≤0.3 2 0.3<d 0 Note: Including pinholes and defective dots, which must be within one pixel size. B) Unclear Size: d mm / Acceptable Qty in active area d≤0.2 Disregard 0.2<d≤0.5 6 0.5<d≤0.7 2 0.7<d 0	Minor
2	Bubbles in polarizer	Size: d mm / Acceptable Qty in active area d≤0.3 Disregard 0.3<d≤1.0 3 1.0<d≤1.5 1 1.5<d 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable density	Above defects should be separated by more than 30mm from each other.	Minor
5	Coloration	Not to be noticeable in the viewing area of the LCD panels. Backlight type should be judged with the backlight in the on state only.	Minor

9. Reliability

Content of Reliability Test

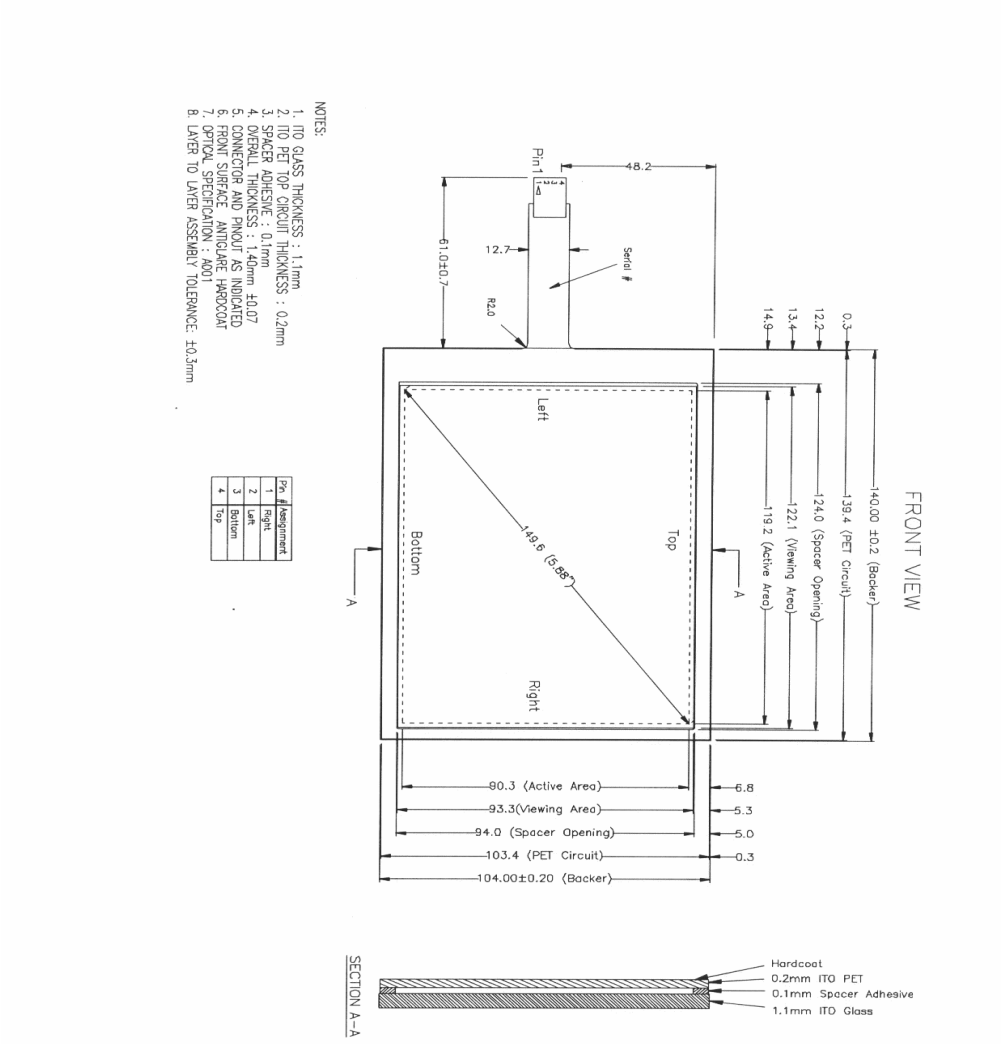
Environmental Test				
NO.	TEST ITEM	CONTENT OF TEST	TEST CONDITION	APPLICABLE STANDARD
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	80ºC 200hrs	——
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30ºC 200hrs	——
3	High temperature operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	——
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	——
5	High temperature/ humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	80°C,90%RH 96hrs	——
6	High temperature/ humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	70°C,90%RH 96hrs	——
7	Temperature cycle	Endurance test applying the low and high temperature cycle. -30°C 25°C 80°C 30min 5min 30min 1 cycle	-30°C /80°C 10 cycles	——
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and use.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	——
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msedc 3 times of each direction	——
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during air transportation.	115mbar 40hrs	——
Others				
11	Static electricity test	Endurance test applying the electrical stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

10. Backlight Information

(Ta=25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Luminous intensity	IV	150	200	--	CD/M^2	ILED=107mA
Wave length	X		0.280			ILED=107mA
	Y		0.290			
Life time	--	--	50K	100K	Hr.	V≦ 5Vdc
Color	White					

11. Touch Panel Information



11.1 Machine Specifications

ITEM	SPECIFICATION	CONDITION
Operating force	Less than 80g	R8.0 HS 40 ° Silicon rubber or R0.8 Polyacetal pen
Surface hardness	More than 2H	Pencil test
Light transmission	More than 80%	@550nm Hitachi U3300
Durability for pen selections	More than 1,200,000 times	Force:250g Speed:2cm/sec