Emant Pte Ltd Low Cost Bluetooth Data Acquisition Module

EMANT380

FEATURES

- Low cost and portable data acquisition system
- up to 6 channels of differential multiplexed ADC
    - single channel 22 bit @ 10 samples/sec
    - single channel 16 bit waveform @ 2500 samples/sec (max)
    - Programmable Gain 1-128
- 1 channel of 8-bit D/A conversion (current output)
- 8 digital IO channels
- One 16-bit general-purpose counter OR 16-bit PWM
- Bluetooth connectivity to desktop PC, notebook, mobile phone, PDA
- Low cost and easily available 25 pin D-Sub connects to the physical world.
- Application adaptors with instructional guides for fuss free learning.

APPLICATIONS

The **EMANT380** is a low-cost and compact data acquisition system developed for learning purposes. It can be used readily with a desktop personal computer for data acquisition and control. When connected to a notebook, mobile phone or PDA, portability and isolation is achieved.

Together with the communication capabilities inherent in the computer or mobile phone, it allows learners to experiment and design solutions that **capture, compute, control and connect** to the world.

The high resolution ADC, Differential Inputs & Programmable Gain Amplifier simplifies sensor connection. Learners can connect thermocouples and strain gauges directly to read temperature and strain without needing expensive and sophisticated signal conditioning.

The current output DAC allows users to measure resistance directly. Thus, resistive sensors like thermistors can be connected directly to measure temperature.

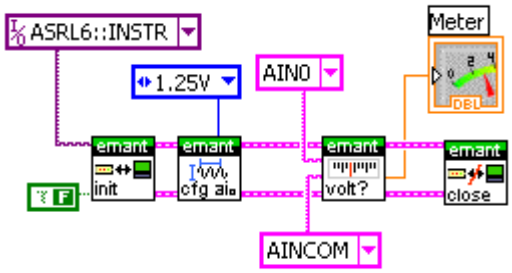
The counter can be used to measure flow rate or RPM. When the counter is not used, its clock can be used for PWM output for heating or motor control experiments.

Bluetooth allows for wireless connection.

SOFTWARE SUPPORT AVAILABLE

4 icons (LabVIEW) or 7 lines of code (C# on .NET) later, the learner has created a voltage meter.

LabVIEW driver (ver7.0 or later)



.NET driver for use with C#, VB and C++ (.NET Framework 2.0 or later)

```
double volt;
EMANT300 DAQ = new EMANT300();
DAQ.Open(false,"COM6");
DAQ..ConfigAnalog(1.5, Emant300.POLARITY.Unipolar, 100, Emant300.VREF.V1_25, false);
volt = DAQ.ReadAnalog(Emant300.AIN.AIN0, Emant300.AIN.COM);
Console.WriteLine(volt);
DAQ.Close();
```

Using the Internet connectivity, the same voltage can now be read across the world using email, browser or messenger.

Connected to a mobile phone (running Windows Mobile 6.0 or later and using Compact .NET Framework 2.0), this voltage reading is now available on the mobile phone.

Simple examples are provided with instructional guide to allow the learner to explore and build on the knowledge.

SPECIFICATIONS

Typical at 25 °C unless otherwise noted. **VDD = 3.3V**

Parameter	Condition	Specification	Unit
ANALOG INPUT (AIN0-AIN5, AINCOM)			
Number of analog input channels		6 single ended / 3 differential	
Resolution		24	Bits
Sampling Rate Resolution	10 samples/s	22	Bits
Single Channel[1]	2500 samples/s	16	Bits
Max Sampling Rate[1]		2500	Hz
Input gains (PGA)		1, 2, 4, 8, 16, 32, 64 or 128	
Full-Scale Input Voltage Range	Unipolar	0 to VREF/PGA	V
	Bipolar	±VREF/PGA	V
Analog Input Range	Buffer OFF	GND to VDD	V
	Buffer ON	GND + 50mV to VDD - 1.5	V
Differential Input Impedance Buffer	Buffer OFF	7/PGA	MΩ
Input Current	Buffer ON	0.5	nA
ON-CHIP VOLTAGE REFERENCE			
Output Voltage	VREFH = 1	2.5 (VDD from 3.3V to 3.6V)	V
	VREFH = 0	1.25	V
Current Source		2.5	mA
Current Sink		60	UA
TEMPERATURE SENSOR			
Temperature Sensor Voltage	T = +25°C	115	mV
Temperature Sensor Coefficient		375	µV/°C
IDAC OUTPUT CHARACTERISTICS			
Full-Scale Output Current		1	mA
Compliance Voltage		VDD – 1.5	V
Resolution		8	Bits

Note 1: Single Channel. There is a 3 cycle delay betw een samples of multiplexed inputs

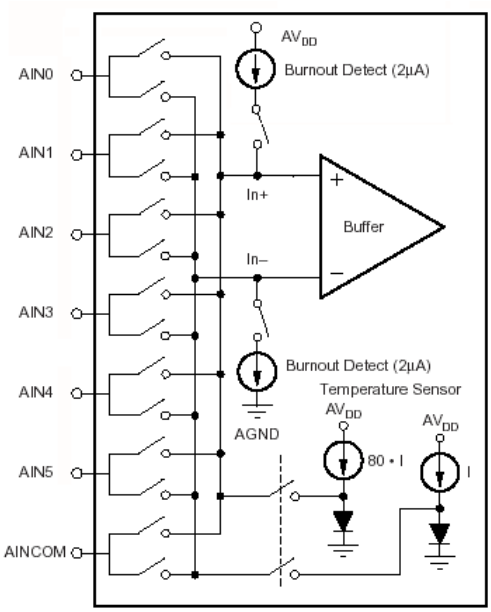


Fig 1: Analog Input Schematic

Typical at 25 °C unless otherwise noted. **VDD = 3.3V**

Parameter	Condition	Specification	Unit
DIGITAL IO			
Number of channels		8	
Direction control		Each channel configurable as input or output	
Absolute maximum voltage range		-0.3 to VDD+0.3	V
Input Low Voltage (Max)		0.2 VDD	V
Input High Voltage (Min)		0.6 VDD	V
Output low voltage (Max)	I_{OL} =1mA	0.4	V
	I_{OL} =20mA	1.5	V
Pull-Up Resistors		13	kΩ
COUNTER[2]			
Number of counters		1	
Resolution		16	Bits
Counter measurements		Edge counting (falling edge)	
Maximum input frequency		5	MHz
Input Low Voltage (Max)		0.2 VDD	V
Input High Voltage (Min)		0.6 VDD	V
PWM[2] (Pulse Width Modulation Output)			
Number of channels		1	
Resolution		16	Bits
Period		0.05 – 35	ms
Duty cycle		0 to 100	%
Deadtime		8	usec
Output low voltage (Max)	I_{OL} =20mA	1.5	V
Output high voltage (Min)	I_{OH} =20mA	VDD – 1.5	V
POWER SUPPLY			
VDD	Typical	3.3	V
	Max	3.6	V
	Min	3.0	V
PHYSICAL CHARACTERISTICS			
Dimensions		5.7 by 9.5 by 2.4	cm
Weight		60	g
I/O Connectors		25 pin D-Sub connector (Plug)	

Note 2: Both the Counter and PWM shares the same clock. Therefore only one function is available at any one time.

BLUETOOTH CHARACTERISTICS

Fully Qualified Bluetooth 2.0/1.2/1.1
Class 1 radio, 100m distance
Low power modes 50mA TX, 40mA RX (connected)
Default Pairing code: 1234
Module Approval: FCC ID: T9J-RN41, ICS: 6514A-RN41, CE: 0681
Bluetooth SIG Qualified: B013180

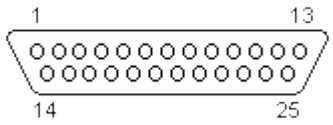


Fig 2: DB25 pin out connection to the real world

DB25 Pin	Signal Name	Description
1	IDAC	Analog Current Output
2	AGND	Analog Ground
3	REFOUT	Reference Voltage +ve
4	REFIN-	Reference Voltage -ve
5	AINCOM	Analog Input Common
6	AIN5	Analog Input
7	AIN4	Analog Input
8	AIN3	Analog Input
9	AIN2	Analog Input
10	AIN1	Analog Input
11	AIN0	Analog Input
12	NC	Not Connected
13	NC	Not Connected

DB25 Pin	Signal Name	Description
14	D0	Digital IO
15	D1	Digital IO
16	D2	Digital IO
17	D3	Digital IO
18	D4	Digital IO
19	D5	Digital IO
20	D6	Digital IO
21	COUNTER	Counter Input
22	PWM	PWM Output
23	D7	Digital IO
24	Gnd	Supply Gnd
25	VDD	3.3V Supply

TYPICAL APPLICATION SCHEMATICS

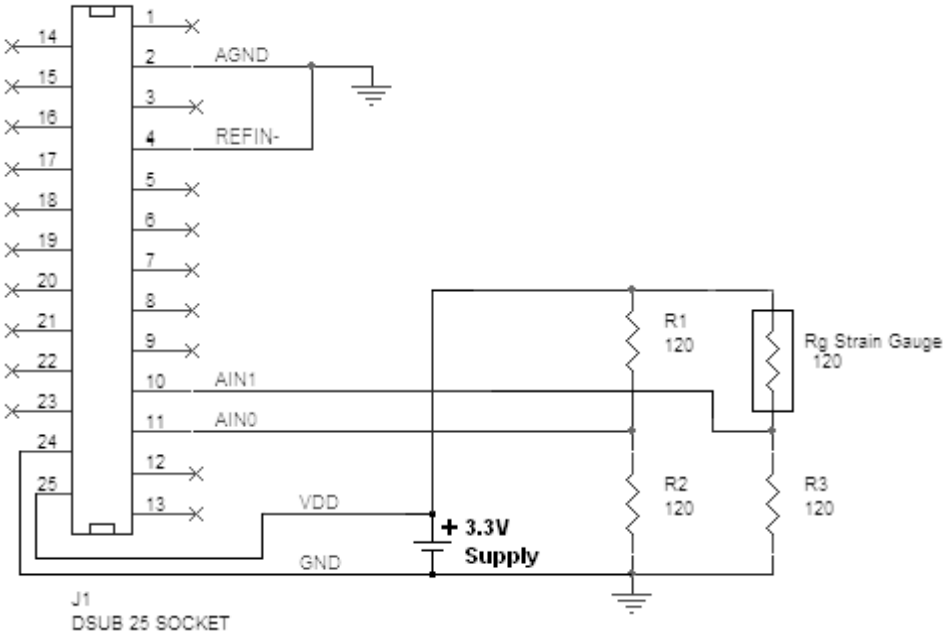


Fig 3: Quarter Bridge Strain Gauge Measurement

(REFIN- connected to AGND to use the internal reference)

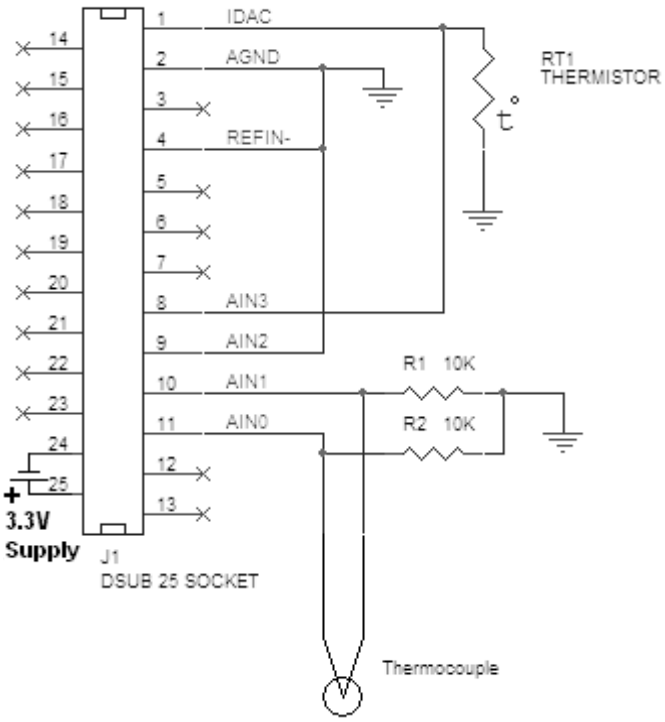


Fig 4: Temperature Measurement using Thermocouple with Thermistor for Cold Junction Compensation

(REFIN- connected to AGND to use the internal reference)