Contents

Appendix A

MyriaNode

Figure A.1: MyriaNode v2.0

A.0.1 Features

- 2.4 GHz ISM band
- Nordic nRF24L01 Radio
- Integrated 1/4λ PCB antenna
- ATMega645 processor
- 64kB FLASH
- 4kB SRAM

- 2kB EEPROM
- 32kHz Crystal clock
- Size: 20 X 40 mm
- Single supply voltage: 1.9V - 3.6V

A.0.2 Description

This Wireless Sensor Node is the second generation product for the MyriaNed project. It integrates a Nordic radio module, antenna and embedded processor all on a PCB. The module is equipped with the software modules as they are being developed by one or more of the working groups of MyriaNed.

A.0.3 Architecture

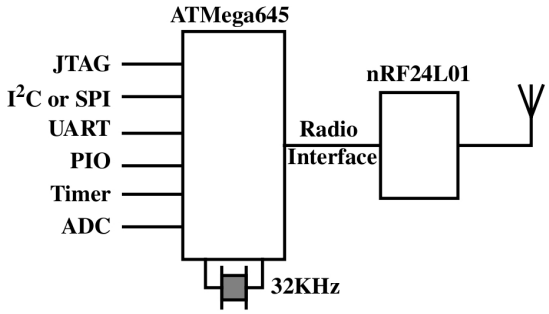

Figure A.2: MyriaNode Architecure

A.0.4 Radio Interface

SPI is used as interface between the processor and the radio, with the following interconnections:

ATMega		nRF24L01		Description
Signal	pin	Signal	pin	
SS	10	CS_N	2	SPI Slave Select
SCK	11	SCK	3	SPI SCK
MOSI	12	MOSI	4	SPI MOSI
MISO	13	MISO	5	SPI MISO
ICP1	25	CE	1	nRF24L01 Chip Sel.
INT0	26	IRQ	6	Interrupt from Radio

Figure A.3: fad

A.0.5 Mechanical and Mounting

Figure *A*.5 shows the top (component) view of the module. It can be mounted as a Surface Mount Device (SMD) directly onto a base PCB. The antenna area must be positioned in free air.

A.0.6 Energy Supply

Both the embedded processor and the radio are connected to the same supply rail. The supply voltage must therefore remain in a range that meet the supply voltage specifications of both devices, which is: 1.9V - 3.6V.

Inorder to reduce conversion noise of the ADC to a minimum, the power decoupling circuit is implemented following the guidelines in the datasheet of the ATMega645.

The energy consumption very much dependes on the network parameters and application software. Under average conditions of a network cycle time of 1s, and a frame size of 32 bytes, the node can last for at least 5 years on a Lithium Thionyl Chloride battery of 900mAh.

The voltage level of a new Lithium Thionyl Chloride battery is 3.67V, while the absolute maximum operating voltage of the nRF24L01 is 3.60V. This requires a voltage reduction circuit. The most simple one is to connect the node via a diode to the battery, as is shown in the following figure:

PCB Pin #	ATMega pin	Description
Z701	54	PF7, JTAG TDI
Z702	55	PF6, JTAG TDO
Z703	56	PF5, JTAG TMS
Z704	57	PF4, JTAG TCK
Z705	58	PF3, ADC3
Z706	61	PF0, ADC0
Z707	63	Analog Gnd
Z708	-	Supply (Z727)
Z709	2	PE0, UART RxD
Z710	3	PE1, UART TxD
Z711	4	PE2, AIN0
Z712	5	PE3, AIN1
Z713	6	PE4, SPI_SCK, I2C_SCL
Z714	7	PE5, SPI_DI, I2C_SDA
Z715	8	PE6, SPI_DO
Z716	9	PE7, CLKO
Z717	-	Gnd (Z726)
Z718	-	Gnd (Z726)
Z719	14	PB4, OC0A
Z720	15	PB5, OC1A
Z721	16	PB6, OC1B
Z722	17	PB7, OC2A
Z723	18	PG3, T1
Z724	19	PG4, T0
Z725	20	RESET_N
Z726	-	Power supply Gnd
Z727	-	Power supply input

Figure A.4: fdfa

A.0.7 Battery

The ER14250STU from EMB is a good Lithium Thionyl Chloride battery. It has a form factor of 1/2 AA size, and has a capacity of 1000mAh.

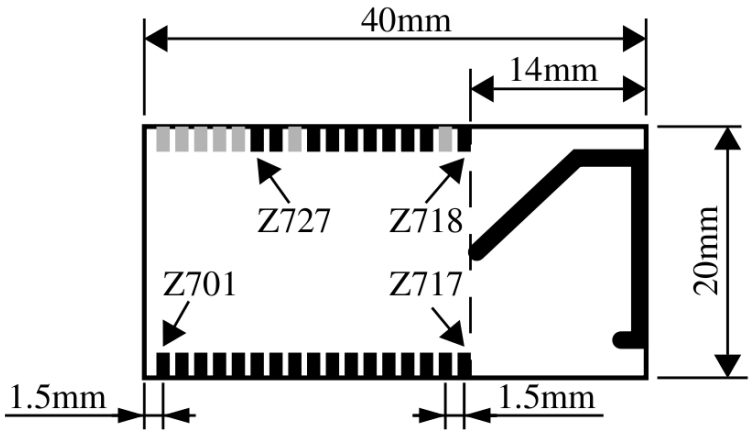

Figure A.5: MyriaNode dimentions

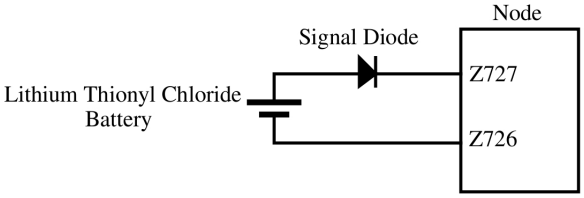

Figure A.6: Battery structure of a MyriaNode

A.0.8 Programming

The node can be programmed and debugged via the JTAG interface. Although there are many second source suppliers of JTAG development tools, it is advised to use the AVR JTAGICE mkII from Atmel, ordering code: ATJTAGICE2.

A.0.9 Software

The software is documented by the other working groups of MyriaNed.