september 2018, february 2020

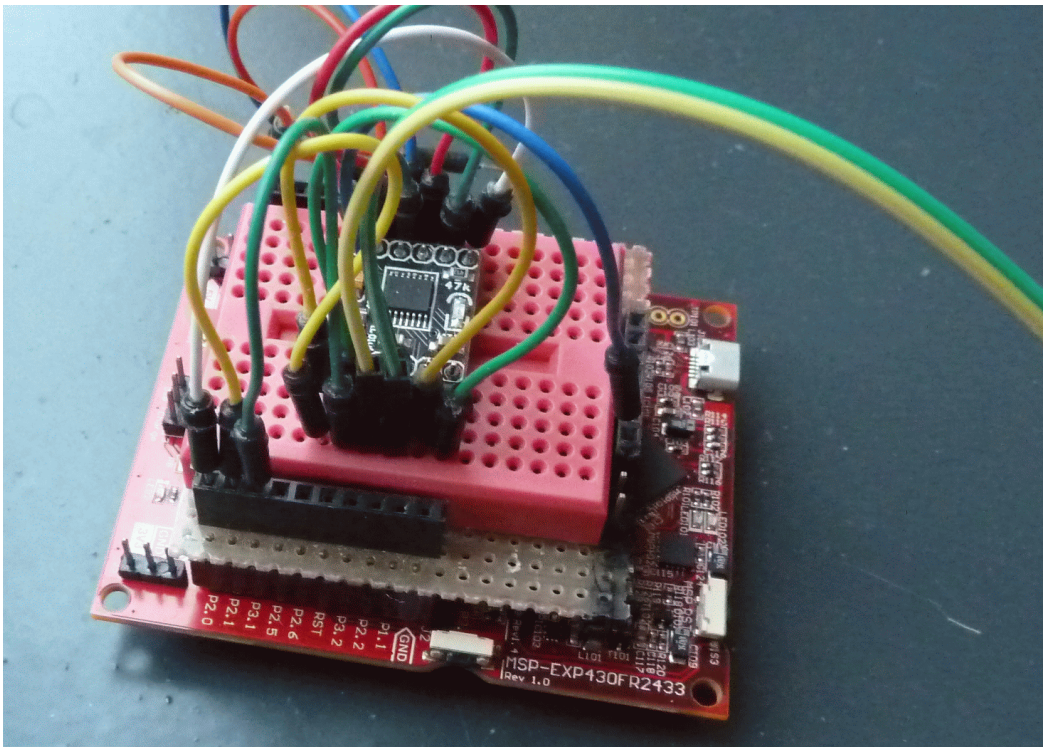
noForth website

MSP-EXP430FR2433 with noForth 2433

In this text we refer to these two documents:

- MSP430FR2433.PDF "MSP430FR2433 Mixed-Signal Microcontroller"
- SLAU445I.PDF "MSP430FR4xx and MSP430FR2xx Family User's Guide"

1. MSP-EXP430FR2433 with noForth 2433



MSP-EXP430FR2433 development kit
Core Sub-Architecture: MSP430X
No. of Bits: 16 bit
Kit Contents: LaunchPad Emulator, Mini USB-B Cable, Quick Start Guide

- Farnell - Ordercode: 2827472, TEXAS INSTRUMENTS - MSP-EXP430FR2433
- Texas Instruments - http://www.ti.com/tool/MSP-EXP430FR2433#buy

The Windows USB-driver for this board is: ezFET-Lite-Driver1.zip

i/o port connections on MSP-EXP430FR2433

Port 1		Port 2	
P1.0	- Led 1	P2.0	- Optional Xout
P1.1	- Led 2	P2.1	- Optional Xin
P1.2	- ...	P2.2	- ...
P1.3	- ...	P2.3	- S1
P1.4	- TX>>	P2.4	- ...
P1.5	- RX<<	P2.5	- ...
P1.6	- ...	P2.6	- ...
P1.7	- ...	P2.7	- S2

Port 3
P3.0 - ...
P3.1 - ...
P3.2 - ...

Connectors on MSP-EXP430FR2433

```
J1      = i/o P1, P2, and 3V3
J2      = i/o P1, P2, P3, Reset and GND
J3      = +5V and GND
J4      = Use/Charge of optional power cap.
J5      = (External) power (2,5V tot 3,6V)
J6      = (External) power (5V)
J10     = Led 1 connect
J11     = Led 2 connect
J101    = Programmer connection and USB RS232
J102    = Micro USB programming/RS232/Power supply
TP101/7= Seven test points
```

Hardware on MSP-EXP430FR2433

- Two leds on P1.0 and P1.1
- Switch S1 on P2.3
- Switch S2 on P2.7
- Optional super capacitor of 0.1 Farad
- Reset switch S3
- 32KHz xtal (Not Connected)

2. MSP430FR2433 i/o ports

Addresses

The MSP430FR2433 port registers are memory mapped. An overview:

Label	P1	P2	P3	Function
PxIN	200	201	220	Input
PxOUT	202	203	222	Output
PxDIR	204	205	224	Direction
PxREN	206	207	226	Resistor enable
PxSEL0	20A	20B	22A	Select 0
PxSEL1	20C	20D	22C	Select 1
PxIV	20E	21E	22E	Interrupt vector word
PxSELC	210	211	230	Complement selection
PxIES	218	219	238	Interrupt edge select
PxIE	21A	21B	23A	Interrupt on
PxIFG	21C	21D	23C	Interrupt flag

PxDir, PxREN and PxOUT

The three registers PxDIR, PxREN and PxOUT are used to configure an i/o pin:

PxDIR	PxREN	PxOUT	Pin configuration
0	0	x	Floating input
0	1	0	Input with resistor to GND
0	1	1	Input with resistor to VCC
1	x	x	Output

More info in SLAU445I.PDF page 313.
Texas Instruments recommends to configure unconnected i/o pins as Output.

PxSEL0 and PxSEL1

The registers PxSEL0 and PxSEL1 are used to assign a special function to an i/o pin. In this way, for example, the ADC of UART can be activated. More info:
MSP430FR2433.PDF from page 54, etc: P1-functions.

PxSEL1	PxSEL0	i/o-function
0	0	Normal i/o
0	1	Basic extra function
1	0	Controller specific!
1	1	Second extra function

UART

The eUSCI A0 is used as UART the default baudrate is 115200 baud. Pins P2.6 (TX>>) and P2.5 (RX<<) are used.

3. RAM and ROM

```
RAM 2000 - 2FFF,  ROM C400 - FFFF
```

4. Interrupt vectors MSP430FR2433

```
FF7E    - End of free flash
FF80    - 8 Bytes JTAG/BSL signature

FFDA    - P2
FFDC    - P1
FFDE    - ADC
FFE0    - eUSCI B0 tx/rx
FFE2    - eUSCI A1 tx/rx
FFE4    - eUSCI A0 tx/rx
FFE6    - WATCHDOG
FFE8    - RTC
FFEA    - TIMER3 A2 CCR1
FFEC    - TIMER3 A2 CCR0
FFEE    - TIMER2 A2 CCR1
FFF0    - TIMER2 A2 CCR0
FFF2    - TIMER1 A3 CCR1  CCR2
FFF4    - TIMER1 A3 CCR0
FFF6    - TIMER0 A3 CCR1  CCR2
FFF8    - TIMER0 A3 CCR0
FFFA    - NMI USER
FFFC    - NMI SYSTEM
FFFE    - RESET from many sources
```

See SLAS639E.PDF page 53 for details.

5. Processor registers in noForth

All processor registers (R0..R15) have their own name in noForth assembler:

`PC  RP` (=SP in TI texts!) `SR  CG`		MSP430 system registers
`SP  IP  TOS DOX  NXT`		noForth system registers
`W   DAY SUN MOON`		Registers, locally used by noForth
`XX  YY  ZZ`		Unused (free) registers