october 2015, .. march 2016

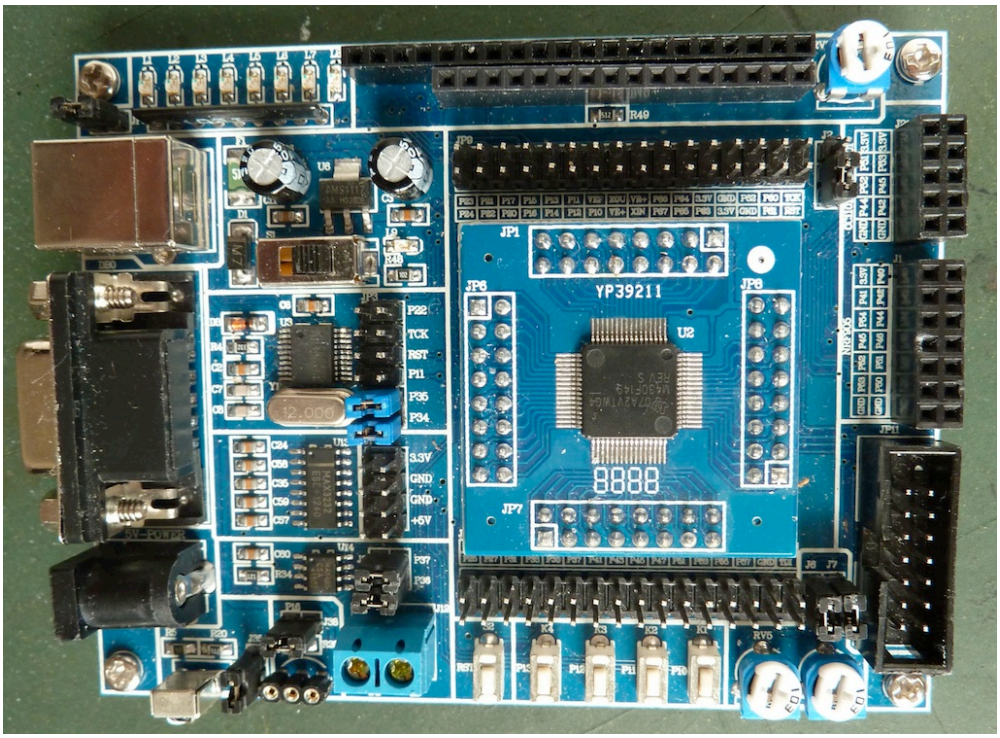
noForth website

MSP430F149 Dupont board with noForth 149

In this text we refer to these two documents:

- SLAS272F.PDF "MSP430x13x, MSP430x14x, MSP430x14x1 mixed signal microcontroller"
- SLAU049F.PDF "MSP430x1xx Family User's Guide"

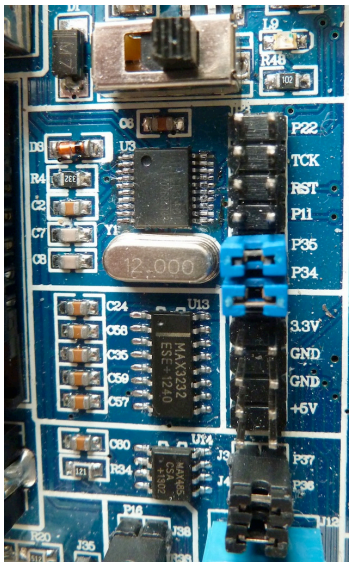
1. MSP430F149 Dupont board with noForth 149



Dimensions: 4.21 in x 3.07 in x 0.55 in (10.7 cm x 7.8 cm x 1.4 cm)
Weight: 2.65 oz (75 g) - Price: ca. $20
Shenzhen JieSheng Electronics Limited - China (Mainland) (Guangdong)

- Aliexpress - Product ID: 1261022611
  Msp430 development board msp430f149 usb line core board dupont line pcb
- DX - Model: 7026
  DIY MSP430F149 STM Minimum System Development Board w/ BSL Download / Remote Control - Blue + Black

RS232/USB driver



The USB chip (CH341) on the dupont board needs a specific driver under Windows. Download and execute this file.
No jumpers are needed for the RS232 connection DB0.
For the RS232/USB connection 2 jumpers are needed on JP3 at the left side, see foto.

i/o port connections on Dupont board

Port 1
Digital i/o and TimerA i/o

P1.0	SW K1
P1.1	SW K2/Bootloader TX
P1.2	SW K3
P1.3	SW K4
P1.4	...
P1.5	IR receiver
P1.6	DS18B20
P1.7	...

Port 2
Digital i/o and TimerA i/o

P2.0	Led/LCD0
P2.1	Led/LCD1
P2.2	Led/LCD2/Bootloader RX
P2.3	Led/LCD3
P2.4	Led/LCD4
P2.5	Led/LCD5
P2.6	Led/LCD6
P2.7	Led/LCD7

Port 3
Digital i/o and UART0 and UART1

P3.0	...
P3.1	...
P3.2	...
P3.3	...
P3.4	TX0/RS232/USB
P3.5	RX0/RS232/USB
P3.6	TX1/RS485
P3.7	RX1/RS485

Port 4
Digital i/o and TimerB i/o

P4.0	NRF905
P4.1	NRF905
P4.2	NRF24L01/NRF905
P4.3	...
P4.4	NRF24L01
P4.5	NRF24L01/NRF905
P4.6	NRF905
P4.7	...

Port 5
Digital i/o and UART1 SPI mode

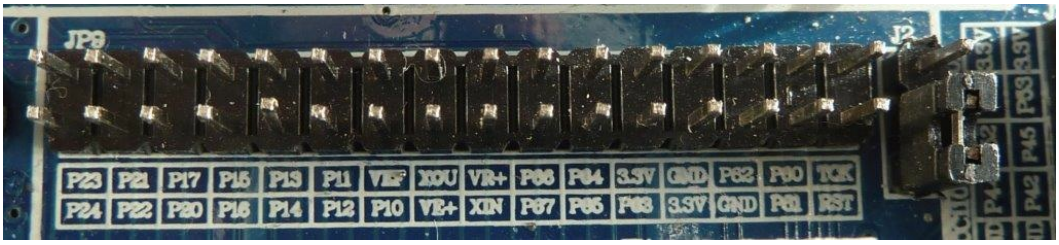
P5.0	NRF905
P5.1	NRF24L01/NRF905
P5.2	NRF24L01/NRF905
P5.3	NRF24L01/NRF905
P5.4	...
P5.5	...
P5.6	...
P5.7	...

Port 6
Digital i/o and analog inputs

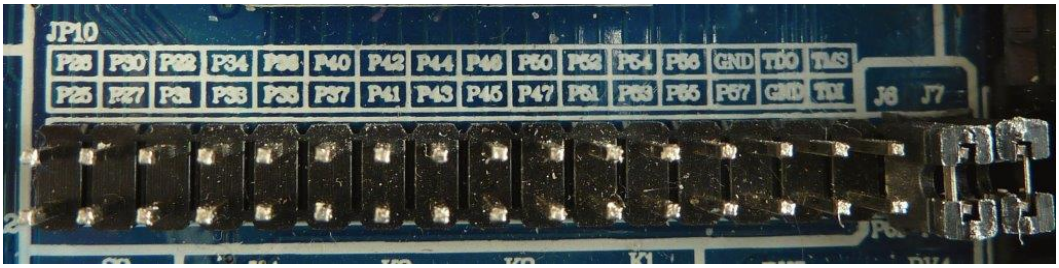
P6.0	ADC0/Potm RV4
P6.1	ADC1/Potm RV5
P6.2	...
P6.3	LCDrs
P6.4	LCDrw
P6.5	LCDen
P6.6	LCDbl
P6.7	...

Connectors on Dupont board

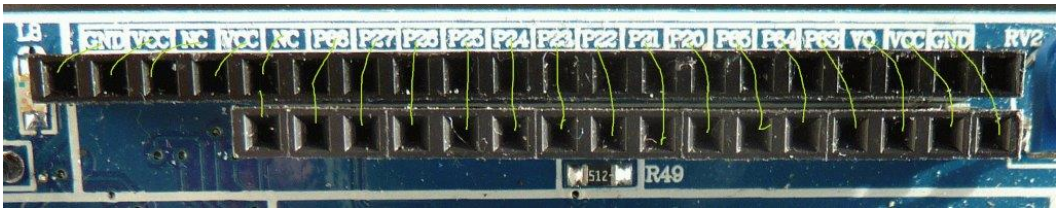
```
P1    = power 8V to 12V
USB1  = USB power annex pseudo RS232
S1    = 5 Volt via USB or P1/7805
J2    = Vref
J3    = RS485
J4    = RS485
J5    = Leds on/off
J6    = Potm RV4
J7    = Potm RV5
J8    = char LCD
J12   = Screw terminal with RS485 interface
J33   = Graphical LCD
J35   = IR receiver
J38   = DS18B20
JP1   = P1.0 to P1.4 and P6.3 to P6.7
JP2   = Power select
JP3   = Bootloader P1.1 and P2.2
JP6   = P1.5 to P1.6, P2 and P3.0 to P3.4
JP7   = P3.5 to P3.7, P4 and P5.0 to P5.4
JP8   = P5.5 to P5.7, P6.0 to P6.2, XT, JTAG, 3V3
JP9   = P1, P6 and part of P2, XT, Vref, 3V3
JP10  = Remaining P2, P3, P4, P5, JTAG
JP11  = JTAG
```



Connector JP9: All JP9 connections are clearly visible.
P23 = P2 pin 3; 3.3V = 3,3 Volt pulse power connection; RST = reset pin.



Connector JP10: All JP10 connections are clearly visible. TD0 = JTAG data out pin.



LCD connectors:
The upper connector is for graphical LCD screens, the lower one for character LCD screens.

Hardware on Dupont board

- 8 leds on P2
- 4 switches on P1.0 .. P1.3
- Reset switch S2
- Two potentiometers on P6.0 and P6.1
- RS485 driver on P3.6 and P3.7 op
- IR receiver on P1.5
- Connection for DS18B20 on P1.6
- Connection for character LCD on P2 and P6.3 .. P6.6 & contrast potm. RV2
- Connection for graphical LCD on P2 and P6.3 .. P6.6 & contrast potm. RV2
- Connection for NRF24L01 P4.2, P4.4 and P4.5, P5.1, P5.2 and P5.3
- Connection for NRF905 on P4 and P5

2. MSP430F149 i/o ports

Addresses

The MSP430F149 port registers are memory mapped. An overview:

	P1	P2	P3	P4	P5	P6	Function
PxIN	20	28	18	1C	30	34	In
PxOUT	21	29	19	1D	31	35	Out
PxDIR	22	2A	1A	1E	32	36	Direction
PxIFG	23	2B	-	-	-	-	Interrupt flag
PxIES	24	2C	-	-	-	-	Interrupt edge on
PxIE	25	2D	-	-	-	-	Interrupt on
PxSEL	26	2E	1B	1F	33	37	Select

See: SLAS272F.PDF under "peripheral file map", page 20-23.

PxDir

```
PxDIR = 0          Floating input
PxDIR = 1          Output
```

The port register functions are documented in SLAU049F.PDF 9.2.3.
Texas Instruments recommends to configure unconnected i/o pins as Output.

PxSEL

The PxSEL register is used to assign a special function to an i/o pin, ADC for example.
More info in SLAU272F.PDF from page 40: the P1 functions.

```
PxSEL = 0          Normal i/o
PxSEL = 1          Special function
```

UART

Registers ME1 and ME2 are used to link the UART's to the fysical i/o bits, see SLAU049F.PDF page "13-27".

3. MSP430F149 RAM & ROM

```
RAM         0200 - 09FF
FlashROM    1100 - FFFF
```

4. MSP430F149 interrupt vectors

```
FFDE    End of free Flash

FFE0    ...
FFE2    P2
FFE4    USART1 TX
FFE6    USART1 RX
FFE8    P1
FFEA    TIMER A3 CCR1 CCR2
FFEC    TIMER A3 CCR0
FFEE    ADC12

FFF0    USART0 TX
FFF2    USART0 RX
FFF4    WATCHDOG
FFF6    COMPARATOR
FFF8    TIMER B7 CCR1 CCR2 CCR3 ...
FFFA    TIMER B7 CCR0
FFFC    NMI
FFFE    RESET
```

See SLAS272F.PDF page 13 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