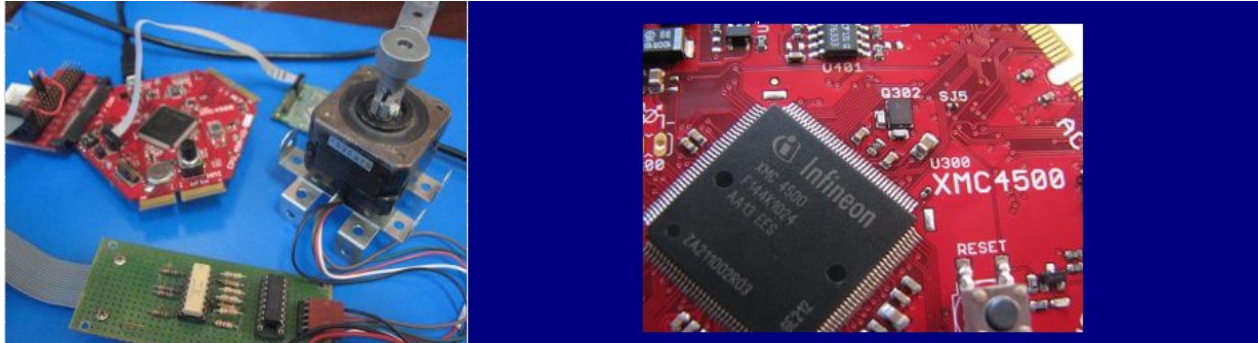




## ARM XMC - experiment No. 10



### E10.1 Name:

**Infineon XMC XMC4500 - Stepper Motor Interface**

### E10.2 Overview and purpose

The experiment aims to provide a solution for the development of IOT active nodes with unipolar stepper motors controlled by Infineon XMC4500 platforms. The experiment seeks acquiring basic knowledge about how to develop motor control structures isolated from the microcontroller.

At the end of the experiment you will have detailed information about the possibilities of controlling stepper motors using DAVE and XMC4500.

### E10.3 Resources

<i>Hardware</i>	XMC 4500 CPU board, extension for step by step motor, USB cable, oscilloscope
<i>Software</i>	DAVE4.1



## E10.4 Software example:

```
/*
 *Experiment no. 10
 *XMC4500 Stepper Moto control example
 */

#include <XMC4500.h> //SFR declarations of the selected device
#include "GPIO.h"

unsigned long timingdelay;
int s;

void Delay100US (unsigned long time);

int main(void)
{
    SysTick_Config(12000); // activate timer interrupt at 0.1 ms

    Control_P3_9(OUTPUT_PP_GP, STRONG); // LED
    Control_P0_13(OUTPUT_PP_GP, STRONG); // Step 1
    Control_P3_15(OUTPUT_PP_GP, STRONG); // Step 2
    Control_P0_12(OUTPUT_PP_GP, STRONG); // Step 3
    Control_P0_15(OUTPUT_PP_GP, STRONG); // Step 4
    Control_P3_3(OUTPUT_PP_GP, STRONG);

    s=300; // speed parameter
    SET_P0_15; SET_P0_12; SET_P3_15; SET_P0_13; RESET_P3_3;

    while (1)
    {
/*-----*/
        RESET_P0_13; // enable step 1 1
        Delay100US (s); // delay 1
        SET_P0_13;
/*-----*/
        RESET_P0_12; // enable step
        Delay100US (s); // delay 1 s
        SET_P0_12;
/*-----*/
        RESET_P3_15; // enable step 2
        Delay100US (s); // delay 1 s
        SET_P3_15;
/*-----*/
        RESET_P0_15; // activate step 4
        Delay100US (s); // delay 1 second
        SET_P0_15;
    }
    return 0;
}

void Delay100US (unsigned long time)
{
```

```

timingdelay = time;
while (timingdelay != 0);           // decrement time
}

void SysTick_Handler (void) // SysTick Handler interrupt method
{
    if (timingdelay != 0x00)
    {
        timingdelay--;
    }
}

```

### E10.5 Method of running experiment:

- Analyze the interconnection scheme of XMC4500 with a unipolar step by step motor

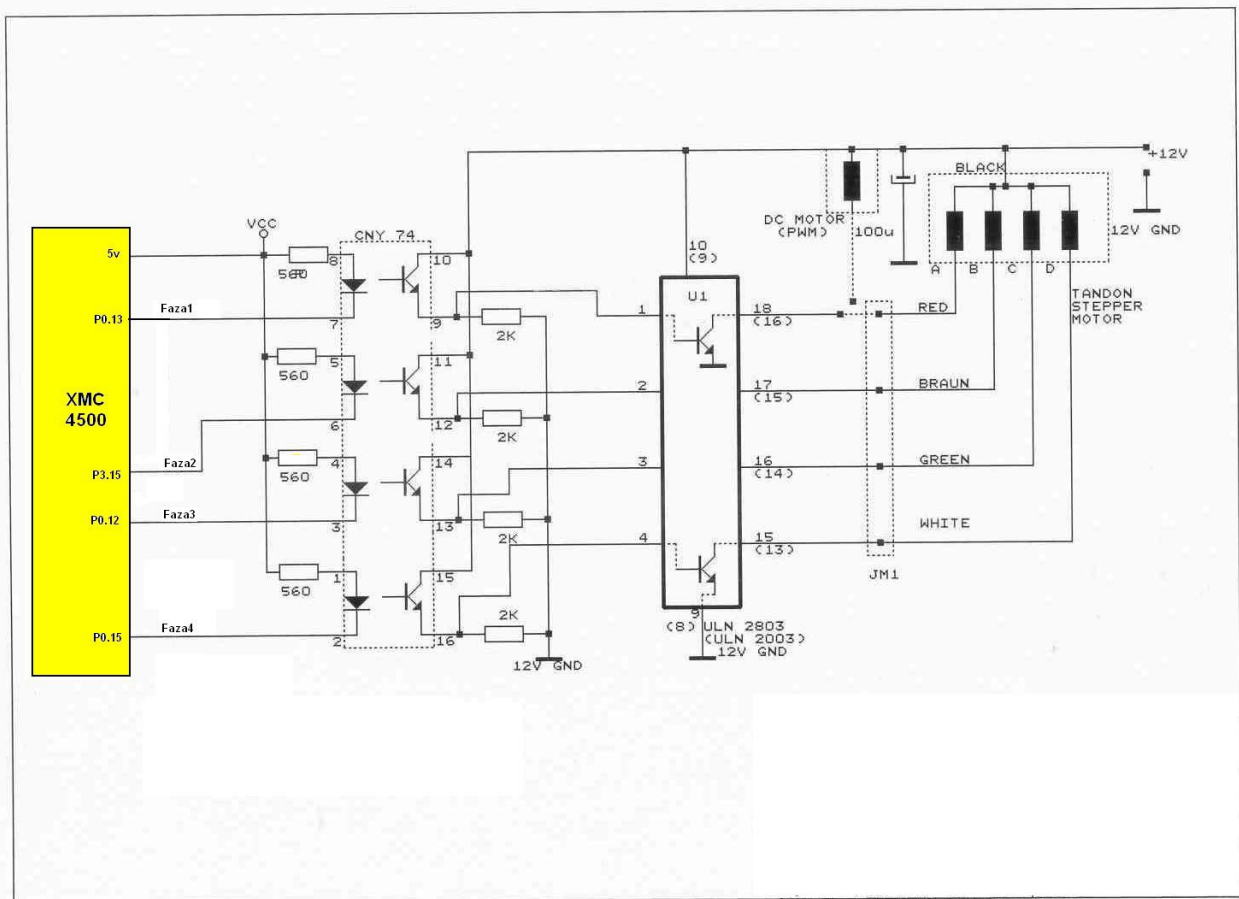


Figure 10.1 The interconnection scheme

- Create a DAVE project using the prototype code;
- Test and execute your code on XMC 4500;
- Solve the proposed problems.

### E10.6 Problems proposed:

1. Take a sequence program that allows motor rotation counterclockwise;
2. Make a program that allows rotation of the spindle motor speed;
3. Make a program that allows stepper motor shaft rotation interwoven;
4. Take a sequence program that will determine the number of steps for a full rotation.
5. Make a program that will rotate the motor shaft at an angle of 45 degrees.

### E10.7 The experiment can be extended to be used for:

- Making active nodes with stepper motors for Universal Internet of Things;
- Achieving precise positioning systems;
- Making throttle control systems for vehicles;
- Making industrial equipment to control movement;
- Achievement active elements for 3D printers;



Figure 10.2 XMC 4500 hexagon platform

### E10.8 More helpful information:

1. **Infineon Motor Control Kits -**  
(<http://www.infineon.com/cms/en/product/microcontroller/32-bit-industrial->



microcontroller-based-on-arm-registered-cortex-registered-m/xmc-development-tools-kits-and-boards/xmc-motor-control-application-kits/channel.html?channel=db3a304342371bb001424797a480738b)

2. **Infineon Motor Control and Drivers** - (<http://www.infineon.com/cms/en/applications/motor-control-drives/>)
3. **Infineon Servo and Stepper** - (<http://www.infineon.com/cms/en/product/power/motor-control-and-gate-driver-ics/intelligent-motor-control-ics/servo-and-stepper-motor-driver/channel.html?channel=db3a3043437e2e96014390bfad196162>)
4. **Internet of Things – trends** - ([http://www.internet-of-things-research.eu/pdf/IoT\\_Cluster\\_Strategic\\_Research\\_Agenda\\_2009.pdf](http://www.internet-of-things-research.eu/pdf/IoT_Cluster_Strategic_Research_Agenda_2009.pdf))
5. **Unipolar Stepper Motor** - (<http://www.doc.ic.ac.uk/~ih/doc/stepper/>)
6. **Infineon Multi-copter** - (<http://www.infineon.com/cms/en/applications/consumer/home-entertainment/multicopters/>)
7. **German Volo-copter** - (<http://phys.org/news/2013-11-electric-two-seater-volocopter-germany-video.html>)
8. **Step by Step Motor Tutorial** - (<http://www.cs.uiowa.edu/~jones/step/>)