

EXAMPLE NAME: PMSM_FOC_EXAMPLE_XMC13

OVERVIEW: This example demonstrates speed control of motor using V/f with smooth transition to FOC closed loop start up technique. Speed of the motor is changed by potentiometer input value.

DESCRIPTION:

- Potentiometer (P2.5) is used as analog input to change the speed of the motor.
- Motor will stop when input is less than 10% and motor will restart when input increases beyond 10%.

REQUIREMENTS:

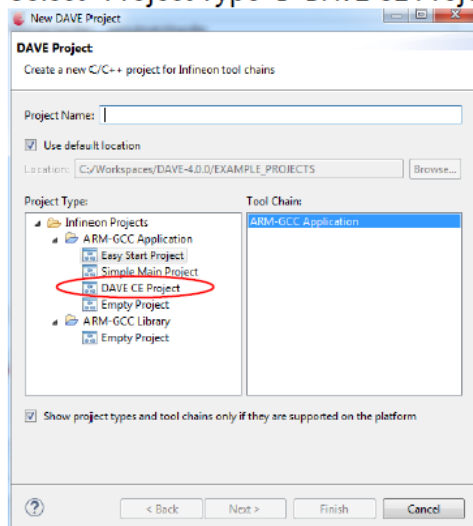
Boards Required: XMC1000 motor control application kit, Part Number: KIT_XMC1X_AK_MOTOR_001

HOW TO CREATE THE PROJECT:

1. Open the DAVE CE and use "Add IDE New Project Wizard" on the toolbar to add a new DAVE Project.

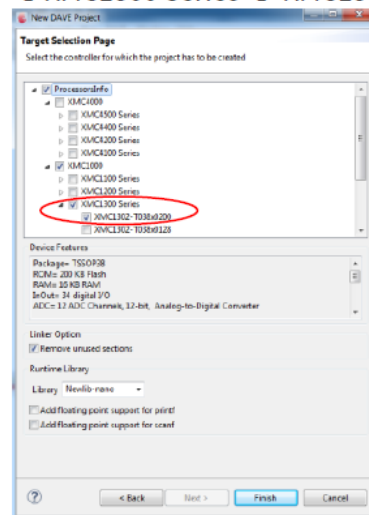
Enter Project Name

Select "Project Type → DAVE CE Project"



Select Processors Info

→ XMC1300 Series → XMC1302-T038X0200



2. Use the "Add New APP" in the toolbar to add PMSM_FOC APP. Configure the App instances with the following configurations.

PMSM_FOC APP configurations:

- In Control Algorithm tab, ensure below settings

Control Algorithm Configuration

Control technique: Field Oriented Control

Startup technique: V/f Startup with Transition to FOC

Feedback mechanism: Sensorless

Control scheme: Speed Control

☐ Vd-Vq decoupling

SVM Configuration

☒ Enable over modulation

SVM scheme: Standard SVM - 7 Segment Symmetric

PWM frequency [Hz]: 20000

CCU8 trap: Active Low

Fast Control Loop Configuration

Desired time [us]: 33

Actual time [us]: 50

Legend:

- mandatory
- depends on configuration

Note: APP contains precompiled library. It is required to manually add the library path in the linker settings of the project properties. For details please see Linker Settings Tab or the overview section in the help document.

- In ADC Measurements tab, select "Enable speed set value via analog input"

Measurement

Current measurement: 3 Phase Current Measurement

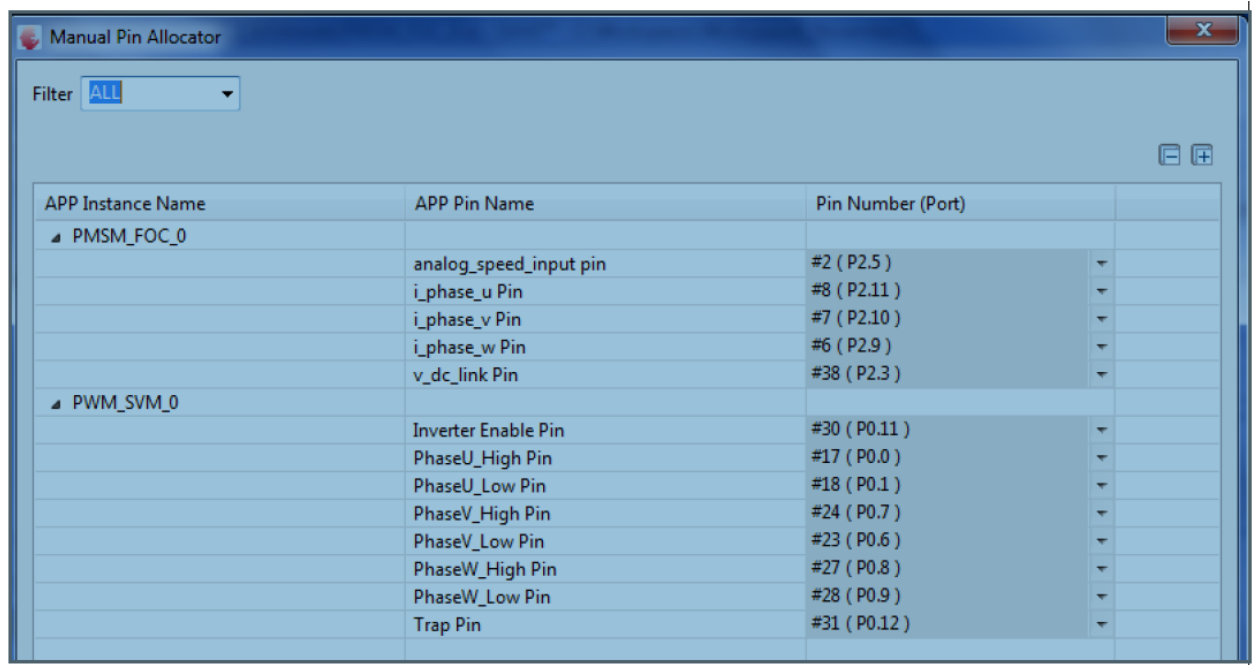
☐ Enable voltage compensation

☒ Enable speed set value via analog input

ADC Configuration

Enable measurement	Request source	Queue position	Refill	External trigger
<input checked="" type="checkbox"/> i_phase_u	Queue A	0	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable
<input checked="" type="checkbox"/> i_phase_v	Queue A	1	<input checked="" type="checkbox"/> Enable	<input type="checkbox"/> Enable
<input checked="" type="checkbox"/> i_phase_w	Queue A	2	<input checked="" type="checkbox"/> Enable	<input type="checkbox"/> Enable
<input checked="" type="checkbox"/> v_dc_link	Queue A	3	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable
<input checked="" type="checkbox"/> analog_speed_input	Queue A	4	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Enable
<input type="checkbox"/> user_defined	Queue A	5	<input type="checkbox"/> Enable	<input type="checkbox"/> Enable

3. Use the "Manual Pin Allocator" found in the toolbar, configure the output pin for the LED.

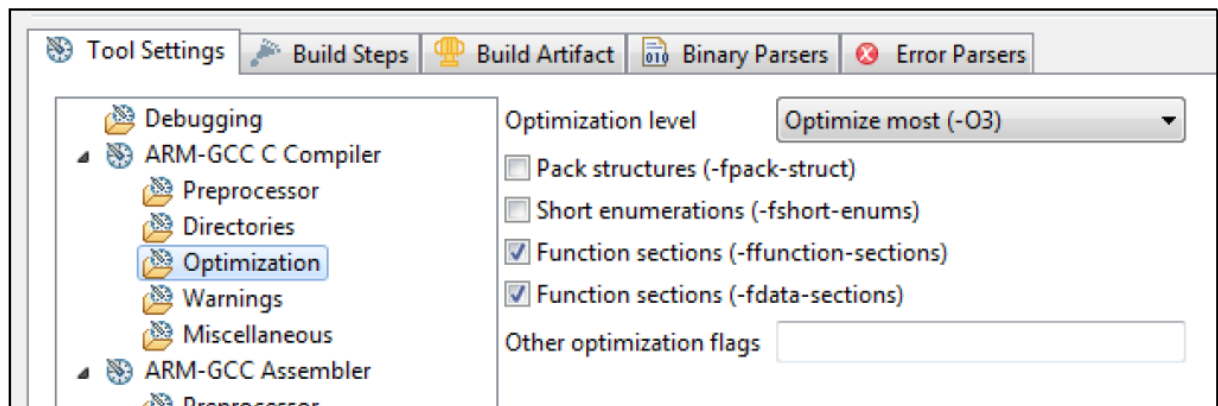


Manual Pin Allocator

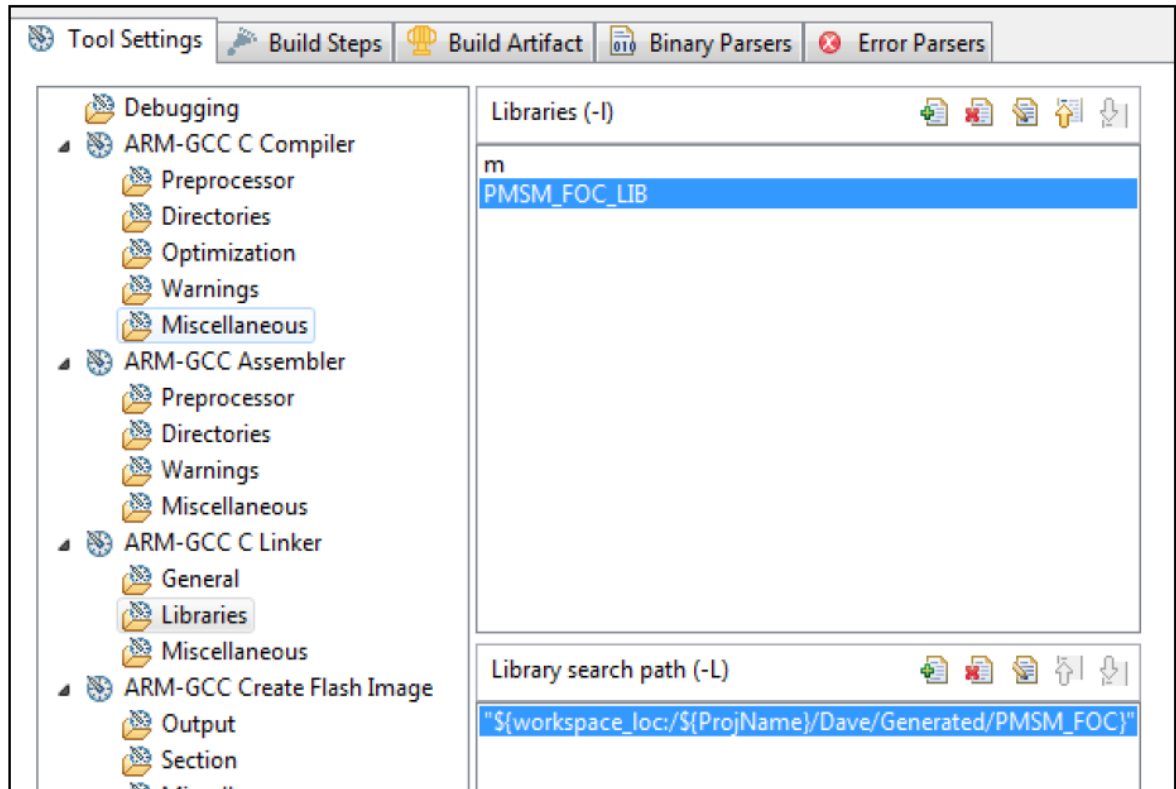
Filter: **ALL**

APP Instance Name	APP Pin Name	Pin Number (Port)
▲ PMSM_FOC_0		
	analog_speed_input pin	#2 (P2.5)
	i_phase_u Pin	#8 (P2.11)
	i_phase_v Pin	#7 (P2.10)
	i_phase_w Pin	#6 (P2.9)
	v_dc_link Pin	#38 (P2.3)
▲ PWM_SVM_0		
	Inverter Enable Pin	#30 (P0.11)
	PhaseU_High Pin	#17 (P0.0)
	PhaseU_Low Pin	#18 (P0.1)
	PhaseV_High Pin	#24 (P0.7)
	PhaseV_Low Pin	#23 (P0.6)
	PhaseW_High Pin	#27 (P0.8)
	PhaseW_Low Pin	#28 (P0.9)
	Trap Pin	#31 (P0.12)

4. Generate the code for configurations made by using in toolbar and call `PMSM_FOC_MotorStart(&PMSM_FOC_0);` in main.c
5. Use the “Active Project Properties” found in the toolbar to change the compiler and linker settings.
 - Compiler Settings to use optimization level 3



- Linker settings to add the library path
 - I as **PMSM_FOC_LIB**
 - L as **\${workspace_loc}/\${ProjName}/Dave/Generated/PMSM_FOC}**



6. Build and download to the microcontroller.

HOW TO TEST:

Download and run the demo in the uC.

OBSERVATIONS:

- Motor starts running in open loop and switches to closed loop at the threshold speed defined in the GUI.
- Speed of the motor changes as potentiometer value changes.
- Motor stops if the potentiometer input is less 10% and restarts as potentiometer increases beyond 10%.
- Motor runs at no load speed when potentiometer input is maximum.

HINTS WHEN MIGRATING EXAMPLE TO OTHER DEVICES IN THE SAME XMC FAMILY:

No additional information is required