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XMC1000 / XMC4000 Motor Control Application Kit

Getting Started 01 v1.0

Induction Motor V/F Control App (ACIM_FREQ_CTRL)





Induction Motor V/F Control App





Induction Motor V/F Control App





Kit composition – XMC 1300 Boot Kit





Kit composition – PMSM LV 15W Card





Kit composition – connection XMC1300





Kit composition – XMC4400 Enterprise Kit



2015-08-28

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Kit composition – General Purpose Motor Drive



ACT connector to CPU Card (e.g. CPU_44A)



Kit composition – connection XMC4400





Induction Motor V/F Control App





Development Tool: DAVE[™] version 4

- > DAVE[™] is a free development platform for code generation by Infineon
- The Software package: DAVE[™], Examples, Videos, Apps, XMCLib... can be downloaded from
- http://www.infineon.com/DAVE
- > This Getting started is based on DAVETM v. 4.1.2





Induction Motor V/F Control App





Getting started limitations

- > The following example shows the default usage of the App.
- This Getting Started shows how to create an example with the default settings.
 Only the used App configurations are described. More information about the spectrum of the App can be found in the Help or an Application Note.
- The creation is described in steps. If a step is specific to XMC1300 or XMC4400 it is mentioned in the title and a sub-step e.g. 2.a, 2.b. Variation of the example (e.g. with adjustable speed) based on the main example.
- The following examples based on ACIM_FREQ_CTRL/ACIM_FREQ_CTRL APP v.
 4.0.5 beta

Step 1: create new project

- **Open Dave** >
- Select a workspace or use the default workspace >
- Click "OK" >

New

Close Close All

Save

Open File...

File \rightarrow New \rightarrow DAVE Project... >

DAVE IDE - DAVE™ - C:\Workspaces\DAVE-4.1\Motor

File Edit Source Refactor Navigate Project Search Run D.

Alt+Shift+N ► 💣

Ctrl+W

Ctrl+S

Ctrl+Shift+W

Se Workspace	Launcher	
Select a wo	r kspace es vour projects in a folder called a workspace.	
Choose a w	prkspace folder to use for this session.	
Workspace:	C:\Workspaces\DAVE-4.1\Motor	Browse
► Copy Settin	ıgs	
	dow b	OK Cancel
I KUN DAVE WIN		
DAVE Project		
Project		
Example		



Ctrl+N

Example...

Cther...



Step 1: create new project

- Enter project name: e.g. GT_ACIM_XMC44_Example1_v1_0 >
- Select "DAVE CE Project" for Project Type >
- Click "Next >" >
- Select your microcontro >
 - **XMC1300**: XMC130 _

- XMC4400: XMC440
- Click "Finish" >

	DAVE Project	
ntroller:	Create a new C/C++ project for Infin	eon tool chains
.302-TO38X0200	Project Name: GT_ACIM_XMC44_Exa	mple1_v1_0
400-F100x512	Location: C:/Workspaces/DAVE-4.1/	Motor Browse
New DAVE Project	Project Type:	Tool Chain:
Microcontroller Selection Page Select the microcontroller for which the project has to be created	 Infineon Projects RM-GCC Application 	ARM-GCC Application
	Easy Start Project Simple Main Project DAVE CE Project Empty Project ARM-GCC Library Empty Project	
ROM = 512 KB Flash RAM = 80 KB RAM InOut = 55 digital I/O Linker Option I Remove unused sections Runtime Library	Show project types and tool chair	ns only if they are supported on the platform
Library Newlib-nano Add floating point support for printf Add floating point support for scanf	? < Back	Next > Finish Cancel
? Back Next >	Cancel	

New DAVE Project

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Step 2: add APP

> Click "Add New App"



- Deactivate "Hide beta versions"
- > Enter in search filter "Motor Control"
- Select "ACIM_FREQ_CTRL"
- > Click "Add"
- Read the warning regarding beta versions and Click "OK" to confirm.
- Add in a new APP takes a few seconds
- Click "Close" to hide the "Add new APP" window







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Step 3: APP configuration

- Open "ACIM_FREQ_CTRL" by double click or right click → "Configure App instance"
- Open "Basic Control Scheme" tab
- Select "FB_RAMP_0"
- This will add the AUTOMATION APP. This can take a few seconds.





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Step 3



Step 3: APP configuration

- > Open "Power Board" tab
- Set "Dead time rising edge[ns]" to 1100
- > Set "Dead time falling edge[ns]" to 885

Control Algorithm	Basic Cont	rol Scheme	Control Parameters	Task Scheduler	Power Board	Mea
Power Board Con	figuration –					
DC link voltage [V]:	24				11
Dead time rising e	edge [ns]:	1100		PWM Tim Compare		~
Dead time falling	edge [ns]:	885		value	/	
Switch delay [ns]:		500		High Side		Ц
Inverter enable pir	n:	Active Hig	h 👻	PWM		
Bootstrap time [m	ns]:	0		Low Side PWM	•	H
Output polarity				Phase	:	
High side switch	nes:	Active Low	-	Voltage	: →	! !
Low side switch	es:	Active Low	-		:	
Current Amplifier	Configurati	on				
VADC reference [[V]:	3.3			Amplifier Bia	5
Rshunt [mOhms]]:	10		₽↓	Y	
Amplifier gain:		21			<pre>{</pre>	
		4.5.74.4005			I	

Step 4: Pin assignment

- > The pin allocation can be done in two ways:
 - 1) table view 🚺

Filter PWM_SVM_0 ·			
APP Instance Name	APP Pin Name	Pin Number (Port)	
# PWM_SVM_0			
	PhaseU_High Pin	Not Selected	*
	PhaseV High Pin	Not Selected	
	PhaseW High Pin	Not Selected	*
	PhaseU Low Pin	Not Selected	*
	PhaseV Low Pin	Not Selected	
	PhaseW Low Pin	Not Selected	-
	Trap Pin	Not Selected	-
	Inverter Enable Pin	Not Selected	
		Not Selected	-
		#17 (P0.0)	
		#18 (P0.1)	
		#19 (P0.2)	
		#20 (P0.3)	
		#21 (P0.4)	-
		#22 (P0.5)	
		#23 (P0.6)	
		#24 (P0.7)	
		#27 (P0.8)	
		#28 (P0.9)	
		#29 (P0.10)	
		W30 (P0.11)	
		#31 (P0.12)	
		#32 (P0.13)	
		#33 (P0.14)	
		#34 (P0.15)	
-		#16(PL0)	*











Step 4: Pin assignment- table view

The Pin Allocation can be done in two ways:

- Table view: >
 - Click "Manual Pin Allocator"



- Table: select the corresponding pin for each pin
- Click "Save" _

File	Edit	Navigate	Search	Project	Run	DAVE	Window	He
	b é	28%	6 %	1 2 5	0	9 1	2 🌒 🔅	₹ į
10 C	/C++	Projects 🖾	🔁 Proje	ect Explor	er 🚺	1anual P	in Allocato	or R

ter PWM_SVM_0 ▼			
			E
APP Instance Name	APP Pin Name	Pin Number (Port)	
PWM_SVM_0			
	PhaseU_High Pin	Not Selected	*
	PhaseV_High Pin	Not Selected	*
	PhaseW_High Pin	Not Selected	-
	PhaseU_Low Pin	Not Selected	*
	PhaseV Low Pin	Not Selected	÷
	PhaseW Low Pin	Not Selected	+
	Trap Pin	Not Selected	-
	Inverter Enable Pin	Not Selected	-
		Not Selected	*
		#1/(P0.0)	
		#18 (PO.1)	
		#19 (P0.2)	
		#20 (P0.3)	-
		#21 (P0.4)	=
		#22 (P0.5)	
		#23 (P0.6)	
		#24 (P0.7)	
		#27 (P0.8)	
		#28 (P0.9)	
		#29 (P0.10)	
		#30 (P0.11)	
		#31 (P0.12)	
		#32 (P0.13)	
		#33 (P0.14)	
		#34 (P0.15)	
		#16 (P1.0)	*



Step 4: Pin assignment- graphical view

- Graphical view:
 - Click "Pin Mapping Perspective"
 - Select pin in the left table
 - Right click on a colored pin
 - Click "Assign"

DAVE CE - DAVE™ - C:\We	orkspaces\DAVE-4.1\Motor
File Edit Navigate Searc	h Project Run DAVE Window Help
u n 🗠 i 🔁 🖉 🤌 🖒 🕴	k t ≥ S • B • B • B • • • S
🖥 C/C++ Projects 🖾 🏠 Pro	oject Explorer 🔅 🗢 🖗 Pin Mapping Perspective
D GT_ACIM_XMC44_Ex	ample1_v1_0 [Active - Debug]
FinMapping - DAVE™ - C:\W	orkspaces\DAVE-4.1\Motor
File Edit Navigate Search	Project Run DAVE Window Help
📬 🕶 📼 👘 👛 🗎 🏊 🔯	🌽 💀 👩 🎋 👈 🚍 🖨 🗃 🕢 🗟 🔹 🌣 👻 🚳 💆
👯 Virtual Pin View 🛛 🗖 🗖	· Package View
Virtual Pin List	
PWM_SVM_0	
Inverter Enable Din	P2.4 1
PhaseU_High Pin	P2 5 2
PhaseV_High Pin	P2 6 - 3
PhaseV_Low Pin	P2 7 - 4
PhaseW_High Pin	P2 8 - 5
PhaseW_Low Pin	P2 9 🖂 6
Trap Pin	P2.10
	P2.11 Assign
	VSS, VSSP = 9 TSSOP
	VDD, VD 10

Note: See legend color code for additional information



Step 4a: Pin assignment - XMC1300

			ĒĒ
APP Instance Name	APP Pin Name	Pin Number (Port)	
PWM_SVM_0			
	PhaseU_High Pin	#17 (P0.0)	Ψ.
	PhaseV_High Pin	#24 (P0.7)	Ψ.
	PhaseW_High Pin	#27 (P0.8)	Ψ.
	PhaseU_Low Pin	#18 (PO.1)	Ψ.
	PhaseV_Low Pin	#23 (P0.6)	Ψ.
	PhaseW_Low Pin	#28 (P0.9)	Ψ.
	Trap Pin	#31 (P0.12)	Ψ.
	Inverter Enable Pin	#30 (P0.11)	-





Step 4b: Pin assignment- XMC4400

PP Instance Name	APP Pin Name	Pin Number (Port)		10	
PWM_SVM_0					
	PhaseU_High Pin	#97 (P0.5)	*		
	PhaseV_High Pin	#98 (P0.4)	*		
	PhaseW_High Pin	#99 (P0.3)	▼		
	PhaseU_Low Pin	#100 (P0.2)			
	PhaseV_Low Pin	#1 (PO.1)	*		
	PhaseW_Low Pin	#2 (P0.0)	*		
	Trap Pin	#89 (P0.7)	*		
	Inverter Enable Pin	#68 (P1.15)	*		
		n	01		۵.0
				000 P02 8 8 P02 8 8 P02 8 8 P02 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	007 007 0000 0400 0400 0400 0400 0400 0
D	S	ave Reset	Close	P0.1 2 P0.10 2 P0.10 3	
				P0.9 4 P3.2 5 P3.1 6	
				USB_DM 8 USB_DP 9	
				VDDP 11 XM	IC4400

Step 5: Generate code

- > Click "Generate Code"
- Code Generation can take a few seconds.





Step 6: Add function



 Edit main.c by adding the following function call: ACIM_FREQ_CTRL_MotorStart(&ACIM_FREQ_CTRL_0);

```
23 int main(void)
24 {
25
     DAVE STATUS t status;
26
627
     status = DAVE Init();
                                     /* Initialization of DAVE APPs */
28
29
     if(status == DAVE_STATUS_FAILURE)
30
     {
31
       /* Placeholder for error handler code. The while loop below can be replaced with an user error handler. */
32
       XMC_DEBUG("DAVE APPs initialization failed\n");
33
34
       while(10)
35
       {
36
37
        }
38
     }
39
40
     ACIM_FREQ_CTRL_MotorStart(&ACIM_FREQ_CTRL_0);
41
     /* Placeholder for user application code. The while loop below can be replaced with user application code. */
42
     while(10)
43
     {
44
45
     }
46 }
47
```