



IMC301/302A MCU Getting Started Guide

About this document

Scope and purpose

The IMC300A motor controller series, namely IMC301A and IMC302A product line, contains two distinct cores, the Motion Control Engine (MCE) for control of a motor and/or power factor correction (PFC) and an additional microcontroller (MCU) based on an Arm[®] Cortex[®] -M0 processor.

This application note is a getting started guide to quickly get up and running with the IMC300A MCU. Detailed information on the functionality and configuration of the MCE, is beyond the scope of this document and can be found in the iMOTION[™]Motion Control Engine Software Reference Manual. For example code and explanation of example code please refer to document [3].

Intended audience

This document is intended for customers who would like to get started with the IMC300A MCU core.

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Brief Overview of MCU

1 Brief Overview of MCU



Figure 1 IMC300A application block diagram

iMOTION[™] IMC300A is a family of highly integrated ICs for the control of variable speed drives. It integrates the Motion Control Engine (MCE) for control of a motor and/or power factor correction (PFC) with an additional microcontroller (MCU) based on an Arm[®] Cortex[®] -M0 core.

The embedded microcontroller is using an Arm[®] Cortex[®] -M0 core along with Flash, SRAM and a comprehensive set of peripheral modules allows for the implementation of complex system functionality. For further details about this device please refer to the iMOTION[™] IMC300A Hardware Reference Manual along with the document IMC300A Peripheral Use Case Examples.



2 Getting Started

2.1 Requirements

2.1.1 Hardware Requirements

For evaluation of the IMC300A product line it is recommended to use the following hardware:

- (Optional) iMOTION[™] Link
 - o Isolated debug probe for the new generation iMOTION™ motor control ICs.
- EVAL-M1-301F/EVAL-M3-302F (MADK Control Board)
 - EVAL-M1-301F/EVAL-M3-302F evaluation board is a part of the iMOTION[™] Modular Application Design Kit for drives (iMOTION[™] MADK).
- MADK Power Board
 - Select one of the MADK Power Boards that is compatible with one of the MADK Control Boards.

Any of the hardware mentioned here can be found at https://www.infineon.com/cms/en/product/power/motor-control-ics/digital-motor-controller-imotion/.

2.1.2 Software Requirements

2.1.2.1 Arm Keil MDK

Keil[®] MDK is a comprehensive software development solution for Arm[®]-based microcontrollers and includes all components that you need to create, build, and debug embedded applications. It includes MDK-Core based on μ Vision (Windows only) with support for Cortex-M devices. MDK also includes Arm C/C++ Compiler with assembler, linker, and run-time libraries optimized for code size and performance.

Arm Keil[®] MDK can be downloaded at https://www2.keil.com/mdk5/.

2.1.2.2 μVision[®] IDE

μVision[®] IDE is an Integrated Development Environment and subset of the Arm Keil[®] MDK tools for Cortex M based microcontrollers. It combines project management, run-time environment, build facilities, source code editing, and program debugging in a single environment. It is also what is going to be used throughout this document for building and downloading source code to IMC300A MCU core.

µVision® IDE can be downloaded at https://www2.keil.com/mdk5/uvision/.

2.1.2.3 Infineon IMC300A DFP

Infineon IMC300A DFP is a Device Firmware Pack for the IMC300A product line. It contains low-level API library code for the IMC300A's comprehensive set of peripheral modules.

Infineon IMC300A DFP can be installed from within Keil using Pack Installer. The IMC300A DFP can be downloaded from the Keil website at https://www.keil.com/dd2/pack/ under the Infineon heading in the "Infineon IMC300A Series" drop down menu.



2.2 Installing IMC300A DFP onto Keil µVision[®] IDE

- 1) Download Keil µVision[®] IDE, and the Infineon IMC300A DFP.
- 2) Open Keil µVision[®] IDE and select the "Pack Installer" as shown in Figure 2.



Figure 2 Keil µVision[®] IDE Pack Installer

3) The standalone pack installer should open in a separate window. Go to "File" →" Import…" and locate the Infineon IMC300A DFP on your local file system as shown in Figure 3.

Refresh		
Import		D J P
Import from Folder	Ð	Pack
Manage Local Repositories	Summary	
Exit	8063 Devices	Gene
		±
		±/
		÷…/
		±
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		+E

Figure 3 Keil µVision[®] IDE Pack Installer "Import"



4) Agree to the "Terms of Service" and click "Next" as shown in Figure 4.

Pack Unzip: Infineon IMC300A_DFP 2.0.0	×
License Agreement Please read the following license agreement carefully.	
To continue with SETUP, you must accept the terms of the License Agreement. To accept the agreement, click the check box below.	_
iMOTION(TM) SOFTWARE LICENSE AGREEMENT BY DOWNLOADING AND/OR USING THE SOFTWARE, LICENSEE AGREES TO BE BOUND BY THE TERMS AND CONDITIONS OF THIS AGREEMENT. IF LICENSEE DOES NOT AGREE TO ALL TERMS AND CONDITIONS OF THIS AGREEMENT, LICENSEE SHALL NOT DOWNLOAD, USE OR COPY THE SOFTWARE BUT IMMEDIATELY DELETE IT (TO THE EXTENT THAT IT WAS DOWNLOADED ALREADY). 1. DEFINITIONS	
I agree to all the terms of the preceding License Agreement	
<< Back Next >> Cance	el

Figure 4 iMOTION[™] Software License Agreement

5) To confirm IMC300A DFP has been installed look under "All Devices" → "Infineon" → "iMOTION" and one should see the IMC300 Series as shown in Figure 5.

File Packs Window Help			
Devices Boards			
Search:	3	<u>_</u>	Pack
Device 🖉	Summary		
Holtek	230 Devices	_	÷.
🚊 🖉 🖉 Infineon	190 Devices		⊟Ger
	2 Devices		
🖃 😤 IMC300 Series	1 Device		+
IMC300A_0128	ARM Cortex-M0, 48 MHz, 15 kB RAM, 128 kB ROM		.
	1 Device		.
🕀 🛧 TLE98xx Series	35 Devices		.
I	113 Devices	•	
Output			
Refresh Pack descriptions			
Ready			





2.3 Setting up Run-Time Environment according to the iMOTION FW version

Here, the FW 1.03.07 and the FW 5.X have different MCE software configurations. And even in the FW 5.X, there may have different definition in each version. Therefore, users must set the "iMOTION specific configuration" version according to the FW version in the "Manage Run-Time Environment". Please follow the procedure below to set up the Run-Time Environment.

1) Select the "Manage Run-Time Environment" as shown in Figure 6.



Figure 6 Keil µVision[®] IDE Manage Run-Time Environment

- 2) The standalone "Manage Run-Time Environment" should open in a separate window as shown in Figure 7.
- 3) Extract the "Device" in the "Software Component" index, and to confirm the "IMC300A PLIB" and "Startup" has been checked. If they are unchecked, please check them.
- 4) And also extract the "iMOTION" index, and select a appropriate Software Component according to the MCE FW version which user is going to use.
 - a. If you are using FW 1.03.07, then check the "MCE V1.x.y" and uncheck the "MCE V5.x.y".
 - b. If you are using the FW 5.X, then uncheck the "MCE V1.x.y" and check the "MCE V5.x.y", then choose the appropriate variant type of the configuration according to the sdpack version you are using. In the Figure 7, it is assumed that the FW 5.03.00.6.1395 is used as part of the SDpack V5.3.x, so, the "MCE V5.x.y" is checked with selecting the "V5.03.00.6.1395".

oftware Component	Sel.	Variant		Version	Description	
🕬 🚸 CMSIS					Cortex Microcontroller Software Interface Components	
🛛 💠 CMSIS Driver					Unified Device Drivers compliant to CMSIS-Driver Specifications	
🗉 🚸 Compiler		ARM Compiler		1.6.0	Compiler Extensions for ARM Compiler 5 and ARM Compiler 6	
🗐 💠 Device					Startup, System Setup	
MC300A PLIB	v			1.0.0	Peripheral Library Infineon iMOTION IMC300A series	
Startup	•			1.0.0	System Startup for Infineon iMOTION IMC300A series	
🗄 💠 File System		MDK-Plus	\sim	6.14.1	File Access on various storage devices	
🗄 💠 Graphics		MDK-Plus	\sim	6.16.3	User Interface on graphical LCD displays	
🗄 💠 Network		MDK-Plus	\sim	7.15.0	IPv4 Networking using Ethernet or Serial protocols	
🗄 🚸 USB		MDK-Plus	\sim	6.15.0	USB Communication with various device classes	
imotion		iMOTION		2.0	iMOTION specific configuration	
MCE V1.x.y		V1.03.07		1.3.7	Support for T core firmware V1.03.07	
MCE V5.x.y	V	V5.03.00.6.1395	-	5.2.0	Support for T core firmware V5.03.00.6.1395 as part of SDpack V5.3.x	
		V5.01.01.5.1269				
		V5.02.00.5.1338				

Figure 7 Keil µVision[®] IDE Manage Run-Time Environment Window



2.4 Setting up J-LINK/J-TRACE Cortex as debugger

- 1) Connect iMOTION[™] Link to EVAL-M1-301F/EVAL-M3-302F or use the on-board debugger using USB connection.
 - a. Please refer to the User Manual of the correlated board to connect iMOTION™ Link to MCU.
- In μVision[®] IDE open a use case code example from https://www.infineon.com/cms/en/product/power/motor-control-ics/digital-motor-controllerimotion/ or start a new blank project.
- 3) Select "options for target" next to the "Select Target" dropdown menu as shown in Figure 8.



Figure 8 Keil µVision[®] IDE Options for Target

4) Go to the "Debug" tab and select "J-LINK/J-TRACE Cortex" from the drop-down menu on the right side of the page as shown in Figure 9.

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Device Target Output Listing User C/C++ Asm	Linker Debug Utilities
○ Use Simulator with restrictions Settings □ Limit Speed to Real-Time Imit Speed to Real-Time Imit Speed to Real-Time Imit Speed to Real-Time Restore Debug Session Settings Imit Speed to Real-Time Imit Speed to Real-Time Imit Speed to R	 ✓ Use: J-LINK / J-TRACE Cortex ✓ Settings ULINK Pro Cortex Debugger ULINK/JUNK Debugger CMSIS-DAP Debugger J-LINK / J-TRACE Cortex Initializatic Models Cortex-M Debugger ST-Link Debugger NULink Debugger NULink Debugger Restore Restore Restore Bre Altera Blaster Cortex Debugger ✓ Watch Windows ✓ Irracepoints ✓ Memory Display ✓ System Viewer
CPU DLL: Parameter: SARMCM3.DLL -REMAP	Driver DLL: Parameter: SARMCM3.DLL
Dialog DLL: Parameter: DARMCM1.DLL -pCM0	Dialog DLL: Parameter: TARMCM1.DLL -pCM0
Warn if outdated Executable is loaded Manage Component Vie	Wam if outdated Executable is loaded

Figure 9 Keil µVision[®] IDE Options for Target Window

5) Then click the "Settings" button and under the "Debug" tab click "Scan" in the interface section for USB. A software device should be seen if the iMOTION[™] Link is connected properly as shown in Figure 10. Make sure the port used for the device is a "SW" port.



I-Link / I-Trace Adapter		
		Move
21/1: 233003632		
Device: J-Link Lite-XMC4200 Rev	.1 OXUBBI14// ARM CoreSight SW-DP	Up
HW : V1.00 dll : V6.86	<u>}</u>	Down
FW : J-Link Lite-XMC4200 Rev.		
Port: Max Clock:	Automatic Detection ID CODE:	
SW 🗾 5 MHz	C Manual Configuration Device Name:	
Auto C	Ik Add Delete Update IR len:	
Connect: Normal Reset Options Reset	:: Normal Cache Options Download Options	ns Download 9 Flash
USB © TCP/IP Scan	Autodetect Autodetect Fr. 0 . 0 . 1 : 0	Link Info

Figure 10 Keil µVision[®] IDE JLink/JTrace Setup Window

6) Go to the "Flash Download" tab and select settings that are appropriate for your application as shown in Figure 11.



Download Function C Erase Full Chip C Erase Sectors C Do not Erase	 ✓ Program ✓ Verify ✓ Reset and F 	RAM for J Start:	Algorithm Dx20000000 Size: Dx1000	
Description	Device Size	Device Type	Address Range	_
		Start:	Size:	
	Add	Remove		

Figure 11 Keil µVision[®] IDE JLink/JTrace Flash Download Tab

7) Finally, press "OK" twice to exit out of "options for target".

2.5 Building A Project and Downloading to Flash Memory

- 8) Connect iMOTION[™] Link to EVAL-M1-301F/EVAL-M3-302F or use the on-board debugger using USB connection.
 - a. Please refer to the User Manual of the correlated board to connect iMOTION[™] Link to MCU.
- 2) Open one of our use case example codes in μ Vision[®] IDE as shown in Figure 12.



<u>F</u> ile <u>E</u> dit <u>V</u> iew	Project Flash Debug Peripherals Tools SVCS Window Help						
i 🗋 💕 📓 🥔	New µ <u>V</u> ision Project						
	New Multi-Project <u>W</u> orkspace						
	Open Project						
	Close Project						
	Import	+					
	Export	•					
	<u>M</u> anage	•					
	Select Device for Target						
	Remove Item						
	🔊 Options for Target 'Target 1'	Alt+F7					
	Clean Targets						
	Build Target	F7					
	😬 <u>R</u> ebuild all target files						
	👹 Batch Buil <u>d</u>						
	🥔 Batc <u>h</u> Setup						
	Translate	Ctrl+F7					
	🔜 Stop b <u>u</u> ild						

Figure 12 Keil µVision[®] IDE Open Project

3) Press F7 or click the "Build" button in the top left corner as shown in Figure 13. This should build the source code and compile into an object file.



Figure 13 Keil µVision[®] IDE Build Project

4) Press F8 or click the "Load" button in the top left corner to download the object file into the MCU's flash memory as shown in Figure 14.



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🗇 🕮 🕮 🖌 - 🔛 🔤 Target 1 🔤 🐔	📥 🗟 🗇 🎯
Project Download (F8) Download code to flash memory Imc300A CCU Capture Imc300A CCU Capture Imc Imc CCU4_capture.c CMSIS Imc Device	<pre>imain. imain. imai</pre>





Troubleshooting FAQ

3 Troubleshooting FAQ

Q Why can't I find the iMOTION Link when I scan?

A In order to scan for the iMOTION Link port must be set to "SW" (Serial Wire) interface.

Q Why do I get "No J-Link found" pop up when I try to "Load" firmware?

A Debugger settings may be incorrect for the target. Please refer to section 2.3 on how to setup the debugger.



Reference

4 Reference

- [1] See the code examples at <u>www.infineon.com/iMOTION</u>
- [2] iMOTION[™]Motion Control Engine Software Reference Manual
- [3] AN2020-10 IMC300A Peripheral Use Case Examples
- [4] iMOTION[™] IMC300A Hardware Reference Manual



Revision history

Revision history

Document version	Date of release	Description of changes
1.0	2021-04-13	Initial Release
1.1	2021-07-14	Updated link for IMC300A DFP
1.2	2021-07-22	Revised section 2.1.2.3
1.3	2023-11-22	Added section 2.3 for setting up the Run Time Environment with support the IMC300A DFP pack version 2.0.0

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Email: erratum@infineon.com

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