AN2018-12 iMOTION[™] Link User Manual_V1.1_EN



iMOTION™ Link User Manual

iMOTION™ programming, debugging and tuning tool

Quality requirement category: Industry

Features

- Programming of firmware and parameters file for IMC10xT/IMM10xT/IMC30xA/IMD11xT devices
- Tuning of motor parameters via virtual UART
- Programming and debugging application code for programmable iMOTION[™] devices via standard SWD or Infineon's SPD interface
- All interfaces are galvanically isolated
- $3.3 V_{\text{DC}}$ output voltage to target board
- USB interface to PC for power and data
- Based on SEGGER J-Link Technology

Supported Devices

- iMOTION[™] IMC10xT
- iMOTION[™] IMM10xT
- iMOTION[™] IMC30xA
- iMOTION[™] IMD11xT

iMOTION[™] Link will support all future iMOTION[™] motor control ICs. For full list of supported devices, visit www.infineon.com/imotion-link

Description

iMOTION[™] Link is designed to program and debug IMC10xT/ IMM10xT / IMC30xA / IMD11xT series iMOTION[™] motor control ICs, and all future iMOTION[™] devices on user's target board (final application board) or on iMOTION[™] evaluation boards without on-board debugger.

The iMOTION[™] Link can also be used for motor and inverter board parameter tuning via the USB to UART interface.

Corresponding PC tool (MCEDesigner_v2.0.0.0 or above version) which is required to use iMOTION[™] link is available for download on the <u>http://www.infineon.com/imotion-software</u> web page.

Third party IDEs, for example Keil MDK-ARM and IAR Embedded Workbench are also supported by the iMOTION™ Link.



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1 Introduction

iMOTION[™] Link is an isolated debug probe for the new generation of iMOTION[™] motor control ICs which is used to program, configure and parametrize iMOTION[™] motor control ICs on the user's target board (final application board) or on corresponding Evaluation Kits. It is also used as a debug probe for programmable ARM[®] core integrated in some iMOTION[™] devices.

iMOTION[™] Link is having following functional characteristics:

- Power: 5V DC power supply (Powered through USB interface)
- PC interface: USB to virtual communication port and IMC device debug port
- Isolated 3.3V Output for target board (switchable)
- Isolated input/output interfaces



Figure 1 iMOTION[™] Link top view

Figure 1 is displaying main parts of iMOTION[™] Link debug probe:

- 1. Isolated 8-pin iMOTION [™] debug connector
- 2. PC to Micro USB cable port for debug and virtrual COM operation
- 3. Switch SW: Provides 3.3V to target board
- 4. Blue LED: Indicates vitual COM communication is initialized by PC software
- 5. Green LED: Indicates code debug function is initialized by PC IDE software
- 6. Red LED: Indicates if 3.3V output to target board is ON or OFF.





Figure 2 8-pin iMOTION [™] Debug Connector (2 x 4 pin, 0.1", 2.54mm) pinout

Figure 2 and Table 1. Provide more information about the 8-pin Debug Connector of iMOTION™ Link debug probe.

Pin	Function	Description
1	SWCLK	SerialWire Clock
2	SWIO	SerialWire Data
3	VDD	Power Supply VDDP 3.3 V
4	GND	Ground (VSS)
5	GND	Ground (VSS)
6	VDD	Power Supply VDDP 3.3 V
7	RXD1	Transmission line of PC/laptop, receive line of iMOTION ™ device
8	TXD1	Receive line of PC/laptop, transmission line of of iMOTION [™] device

Table 1. 8-pin iMOTION™ connector pin description

Switch SW enables iMOTION[™] Link to power target board with 3.3V DC voltage galvanically isolated from the 5V voltage supplied by the USB connector (and PC). This option covers the use case when the targed board does not have power stage (which typically provides 3.3V DC voltage to the controller) connected, or powered, and user wants to do some programming, or testing on the standalone controller, in the safe, low voltage environment.

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Introduction



Figure 3 iMOTION [™] Link "3.3V OUT" switch



iMOTION[™] Link technical information

2 iMOTION[™] Link technical information

This chapter describes the hardware details of the iMOTION[™] Link. iMOTION[™] Link is an isolated debug probe for all IMC[™] microcontrollers.

2.1 Hardware description

The hardware is depicted in Figure 4.



Figure 4 PCB of the iMOTION [™] Link

2.2 Components placement and geometry

Figure 5Figure 4 shows the board dimensions and the placement of components on the PCB in hardware version1.01.



Figure 5 Components placement and geometry



2.3 Schematics

Figure 6 shows the schematics of iMOTION[™] Link in hardware version1.1.

Important Note:

Schematics and the BOM list on pages 8 and 9 correspond to the iMOTION[™] Link hardware revision 1.1. The difference between revisions 1.0 and 1.1 is that in revision 1.1 the resistor R1 is not mounted. This modification has eliminated some instabilities in the communication between the iMOTION[™] Link tool and iMOTION[™] ICs which were observed occasionally under certain power-up conditions.

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Figure 6 Schematic of the iMOTION [™] Link (Hardware Version1.01)

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iMOTION[™] Link technical information

Bill Of Material 2.4

The Bill Of Material (BOM) is valid for the iMOTION [™] Link in hardware version1.1.

Table 2 iMOTION Link BOM

Value	Device	Quantity	Reference Designator
OR 1% 0805	Resistor	1	JP1
1R 1% 0805	Resistor	1	R23
100R 1% 0402	Resistor	7	R10, R11, R15, R16, R17, R19, R22
100K 1% 0402	Resistor	3	R12, R20, R21
100nF 10V ±10% 0402	Capacitor X5R	13	C10, C17, C20, C21, C25, C26, C27, C28, C29, C30, C6, C7, C9
10K 1% 0402	Resistor	2	R5, R7
10nF 50V ±10% 0402	Capacitor X7R	2	C1, C18
10uF 6.3V ±20% 0603	Capacitor X5R	10	C11, C15, C16, C19, C2, C22, C23, C24, C3, C8
15pF 50V ±5% 0402	Capacitor NP0	2	C12, C13
16K9 1% 0402	Resistor	1	R6
1M 1% 0402	Resistor	1	R8
1uF 10V ±10% 0603	Capacitor X5R	2	C4, C5
22R 1% 0402	Resistor	2	R3, R4
2K94 1% 0402 SMD	Resistor	1	R18
4.7uF 10V -20%, +80% 0603	Capacitor Y5V	1	C14
470R 1% 0402	Resistor	1	R13
4K7 1% 0402	Resistor	1	R2
510R 1% 0402	Resistor	1	R14
2178713-8 2x4pin 0.1"	Ribbon Cable, DIP Header	1	J3
12MHz 3.2x2.5	Crystal 12Mhz 4Pad NX3225SA 12MHZ NDK	1	Y1
	DC/DC CONVERTER 1W 5VIN 5VOUT Recom		
R1SE-0505-R	Power	1	U1
16	Isolation IC Silicon Labs	1	U6
SI8652EC-B-IS1 NB-SOIC- 16	Isolation IC Silicon Labs	1	U4
60R 500mA 0603	Ferrite Bead BLM18PG600SN1D Murata	1	FB1
20021111-00010T4LF	Din Haadar Amphanal ICI	1	
	Non-Inverting Buffer with Open Drain Output	1	JZ
NL17SZ07DFT2G SOT353	ON Semiconductor	1	U7
SN74LVC1G126DCKR SC705	Single Bus Buffer Gate With 3-State Output Texas Instruments	1	U5
CA2108SA100 2x4pin 0.1"	IDC socket for flat cable 0.05" CviLux	1	N/A - Mounted on the cable
IFX54441LDV33XUMA1	Voltage Regulator 3.3 V Infineon	2	112 118
ISL_3528LIBW/ DLCC_2		1	
ISL-3528UGW/PLCC-2	LED Green	1	
ISL-3528URW/PLCC-2	LED Bed	1	
10118192-0001LF	Connector Micro LISB AB SMD Amphenol ECL	1	CN1
MMS22R	SLIDE SWITCH 300MA 30V Apen Inc	1	SW1
	TVS DIODE STMicroelectronics	1	D71
	TVS Diode Nevperia USA Inc	1	
XMC4200-048K256 OFN/48	Microcontroller XMC4200 Infineon	1	113



3

Driver software requirements for iMOTION[™] Link

There are 2 options for communicating between PC and iMOTION™ motor control ICs. First option is to use Infineon's MCEDesigner tool, for configuring and tuning of iMOTION[™] IC, as well as doing firmware updates. Second option (for iMOTION[™] devices which have integrated system controller based on ARM[®] Cortex[®] core) is to use industry standard ARM[®] Cortex[®] IDEs to program and debug the system controller. For both these options the installation of the J-Link Driver on the PC is required.

Using iMOTION[™] Link with MCEDesigner 3.1

iMOTION[™] Link is needs J-Link virtual com port driver to connect with MCEDesigner. J-Link driver is automatically installed on user's PC during the installation procedure for MCEDesigner.

MCEDesigner installation package is available for download from the www.infineon.com/imotion-software website and contains all the necessary components for using iMOTION™ Link probe. Below is description of the steps that need to be executed in order to install MCEDesigner.

Following description is based on the use of the all-in-one installation package "MCEDesigner". The Note: installation procedure might differ slightly if individual installation files are used for the software tools above.

Step 1: Double click on the "MCEDesigner_v2.0.0.0.exe" (or later version) file. The installation process will check if the PC already has installed some version the software, and then it will go to the next step.



Figure 7 Welcome page for MCEDesigner software installation

Step 2: After verifying existing software installations, the installation process will start.

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Driver software requirements for iMOTION[™] Link

License Agreement	Powe red by iMotion**	Destination Folder Select folder where setup will install files.	Powered by IMotion
Please carefully read the license agreement below. You must accept agreement to continue with setup.	the license	Setup will install MCEDesigner_V2.0.0.0 iMOTIC	DN Series Support in the following
DESIGN TOOL SOFTWARE LICENSE AGRE	EMENT		
BY DOWNLOADING AND/OR USING (INCLUDING COPYING) SOFTWARE, LICENSEE AGREES TO BE BOUND BY THE TE CONDITIONS OF THIS AGREEMENT. IF LICENSEE DOES NO ALL TERMS AND CONDITIONS OF THIS AGREEMENT, LICEN (INCLUDING YOU) SHALL NOT DOWNLOAD AND/OR USE (IN	THE ERMS AND DT AGREE TO VSEE ICLUDING	Destination Folder Required Disk Space: Remaining Disk Space:	15,522 KB 4,450 MB
COPYING) THE SOFTWARE I have read, understand and <u>a</u> ccept the terms of the license agreement			

Figure 8 MCE Designer software installation

Press "Next" to select the install path, the default path is C:\Program Files\Infineon. Following dialog screens will appear.



Figure 9 MCE Designer softwarewith J-Link virtual driver installations

Step 3: After installation the confirmation massage "MCEDesigner_v2.0.0.0 iMOTION Series Support has been successfully installed" will appear. Press "Finish" to exit the installation wizard. After installation, the J-Link driver will be installed on users's PC.



Figure 10 Installation completed massage



Driver software requirements for iMOTION[™] Link

3.2 Using iMOTION[™] Link with standard ARM[®] IDEs

iMOTION[™] Link is supported by Keil MDK-ARM and IAR Embedded Workbench IDEs. The installation procedure for iMOTION[™] Link the installation of the J-Link Driver is as follows.

1. Download the latest version of "J-Link Software and Documentation pack for Windows" from <u>https://www.segger.com/downloads/jlink</u> and install it on your PC.

Note: The J-Link virtual UART driver is also part of the typical installation of MCEDesigner and 3rd party tools supporting SEGGER JLink.

2. Connect iMOTION[™] Link with your PC using the Micro USB cable.

3. A proper connection and installation of the J-Link driver is indicated by a constantly illuminated DEBUG LED.

4. Connect your iMOTION [™] target board with iMOTION [™] Link using one of the enclosed cables.

5. Select SEGGER J-Link as debugger in your preferred IDE e.g. ARM MADK

6. Start the programming and debugging session



4 iMOTION[™] Link Getting Started Guide

4.1 Getting Started with MCE Designer

4.1.1 Downloading MCE software for target device

Depending on the target iMOTION[™] device, corresponding MCE Software Package (e.g. "IMC101T-F064 MCE Software Package") file needs to be downloaded and saved to user's project directory. All software package files as well as iMOTION[™] software tools can be found on <u>www.infineon.com/imotion-software</u> website.

4.1.2 PC port configuration

In order to establish the communication between MCEDesigner and target board through iMOTION™ Link, following steps need to be executed:

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	G v IMC101_Firmware_V0.0.26 + MCEDesigner	- 4 Search MCEDesigner	9
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	Computer	select a file to preview.	
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	👿 Recycle Bin		
	Eval-M1-ELB		
	MC101_Firm		
		•	
	File name:	Configuration Files (*.irc)	_
		Open Car	cel
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For Help, press F1	eon Technologies - MCEDesigner Ver 2. 0. 0. 0		
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For Help, press F1		PFC - IMC102T_R01_V0.00.26.irc C(Users/wyang1)Desktop1MC10' G Register Structure Definitions G Function Definition C Subfunction Library Definition on", uncl	
For Help, press F1	neon Technologies - MCEDesigner Ver 2. 0. 0. 0	PFC - IMC102T_R01_V0.00.26.irc C(Users/wyang1)Desktop1MC10' B Register Structure Definitions F Function Definition Subfunction Library Definition on", ncel	
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Figure 11 Configuration file selection

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1. Launch MCE Designer and open one of the available configuration files (with extension .irc). Configuration file comes as a part of "IMCxxx MCE Software Package" downloaded earlier. This is the default configuration file for the particular device. The actual system configuration of any particular system will differ from the defauls configuration file to the certain extent, and it is recommended that user saves the actual .irc file for further use. System will promt user to save the .irc file at several points in the process, and the user can save it any time by choosing "File" > "Save As..." option.

2. It is possible that the default COM port does not match with the configured COM port number on the PC, and the message "MCEDesigner cannot connect to target device" will appear (as in Figure 11). In that case, press Cancel, Highlight or click "System – XXX.irc" sub-window and select "Preferences —> Connection". Then select proper COM port from drop down list and press "OK" button.



Figure 12 COM port selection



4.1.3 Programming target device

In order to operate "T" versions of iMOTION[™] motor control ICs (without programmable system controller), 2 different files need to be programmed into iMOTION[™] controller: Firmware file (.ldf) and parameter file (.txt or .ldf extension). Following steps are required to program these files into iMOTION[™] controller:

1. Highlight or click "System – XXX.irc" sub-window and select "Tools —> Programmer".

2. Select desired firmware file (with .ldf extension) or parameters file (with .txt or .ldf extension) using "Browse.." button, press "Open" button in file selection dialog and then "Start" button in "IMC Programmer" dialog.

File View Preferences Tools Window F	felp
D 🖻 <u>8</u> 🐴	
System - IMC102T_R01_V0.00.26.irc	B Motor1 - IMC102T_R01_V0.00.26.irc B PFC - IMC102T_R01_V0.00.26.irc
C:\Users\wyang1\Desktop\IMC10:	C:\Users\wyang1\Desktop\IMC10: G: C:\Users\wyang1\Desktop\IMC
	Program IMC controller
	Information DLL Version: V1.00.00 Release Time: 2018-01-31 Connection Port: CDM61
	Operation Options Program Parameters Program Firmware and Parameter: Read Parameter
	File Program Parameter File ktop/UMC101_Firmware_V0.0.26/Parameter/UMC102T-F064_param.txt Browse
	Program Firmware File ware_V0.0.26\MCC_Firmware_V0.0.26\MC102T-F064_A_V0.00.26\ldf Browse

Figure 13 Firmware file selection

Programming of these files will take several seconds (see Figure 14)

System - IMC102T_R01_V0.00.26.irc System - IMC102T_R01_V0.00.26.irc C\Users\wyang1\Desktop\UMC10: Register Structure Definitions Portion Definitions Program firmware and parameters into device Programming firmware to device Programming firmware to device	The view Preferences Tools window The	eip	
System - IMC102T_R01_V0.00.26.irc Imotor 1 - IMC102T_R01_V0.00.26.irc Image: C:\Users\wyangl\Desktop\UMC10: Image: C:\Users\wyangl\Desktop\UMC10: Image: C:\Users\wyang	D 🚅 🔊 🛔 🛢		
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	C:Users/wyang1\DesktopUMC10: Monitor Definitions	C:\UserS\wyang1\Desktop\IMC10: G:\Comparison Structure Definitions G:\Comparison Structure Definitions G:\Comparison Structure Definition Program firmware and parameters into device Programming firmware to device Programming firmware to device Programming firmware to device	C\Users\wyang1\Dexktop\UMC10: G\Users\wyang1\Dexktop\UMC10: G\Users\uncerktop\UMC10: G\Users\uncerktop\Umc10: G\Users\uncerktop\Umc10: G\Users\uncerktop\Umc10: G\Users\underktop\Umc10: G\Users\underktop\Umc10: Subfunction Library Definition

Figure 14 Programming in progress





Figure 15 Programming complete

Upon successful programming process, the tool will prompt user to save the system configuration to the .irc file.



4.2 Using iMOTION[™] Link with standard ARM[®] IDEs

4.2.1 PC port configuration

When iMOTION[™] Link is used for the first time, the user needs to configure the connection. If there is no connection or the configuration has problem, IDE will prompt warning information. Here using Keil uVision5 for example.

Launch KEIL-MDK and select one project. Open "Options for Target...", press Debug tap.

Options for Target 'Target 1'	×
Device Target Output Listing User C/C++ Asm	Linker Debug Utilities
C Use Simulator <u>with restrictions</u> Settings	Use: J-LINK / J-TRACE Cortex Settings
✓ Load Application at Startup ✓ Run to main() Initialization File:	✓ Load Application at Startup ✓ Run to main() Initialization File:
Edit	Edit
Restore Debug Session Settings	Restore Debug Session Settings
I Breakpoints I Toolbox	Preakpoints I Toolbox
✓ Watch Windows & Performance Analyzer	✓ Watch Windows
Memory Display Viswer	Memory Display System Viewer
CPU DLL: Parameter:	Driver DLL: Parameter:
SARMCM3.DLL -REMAP	SARMCM3.DLL
Dialog DLL: Parameter:	Dialog DLL: Parameter:
DARMCM1.DLL PCM0	TARMCM1.DLL pCM0
,	,
Manage Component Vi	ewer Description Files
OK Ca	ncel Defaults Help

Figure 16 Configuring the Project

Note: If there is no iMOTION[™] Link connection to the PC or the configuration is mismatched, the following error messages will appear. Please reconfigure the port settings.

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C Use Simulator with restrictions Setting □ Limit Speed to Real-Time □ Load Application at Startup □ Run to main() Initialization File: □ Limit Settings □ Restore Debug Session Settings □ Limit Restore Debug Session Settings □ Restore Debug Settings □ Restore Debug Session Settings □ Restore D	s	Settings main()	Image: Shire (J-Trace Adgeter) SN Device More SN: SSI: SSI: SSI: Device: Junk Lite:XMC4200 Rev.1 More Up Port Junk Lite:XMC4200 Rev.1 SVD Port Junk Lite:XMC4200 Rev.1 Common Stress Port Mac Ock Connect: SW 3MH: Addo Cik Connect: Floate: Connect: Connect: Floate: Connect: Preset: Normal Reset: Visition: Cache Options: Connect: Preset: Normal Post Addoes Preset: Normal Post Addoes Iterace: Scahe Connect: Preset: Normal Post Addoes State:: Scane JLink Info JLink Info JLink Info JLink Krol JLink Krol
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Figure 17 Configuring the J-Link /J-Trace Target Driver Setup

	Cortex JLink/JTrace Target Driver Setup
Cortex JLink/JTrace Target Driver Setup Debug Trace J-Link / J-Trace Adapter SN: 591115344 Device: J-Link Lite-XMC4200 Rev.1 HW: V1.00 HW: V1.00 FW: J-Link Lite-XMC4200 Rev.1 or Port: Max Clock: SW 3 MHz JTAG Auto Clk	Cortex Link/Trace Target Driver Setup Debug Trace J-Link / J-Trace Adapter SW Device SN: 591115344 Device: J-Link Lite-XMC4200 Rev.1 HW: V1.00 HW: V1.00 Pot: Max Clock: FW: J-Link Lite-XMC4200 Rev.1 Pot: Max Clock: SW SW Device Pot: Max Clock: SW 3 MHz 25 MHz 20 MHz 25 MHz Connect: Normal 2 MHz Connect: NHz 20 MHz Vormal Connect: NHz Connect: NHz Connect: NHz State: ready

Figure 18 Select desired option.

Note: For now, iMOTION™ device only supports "SW" port option, the Max Clock value is depending on target device environment. If the board noise and ouside disturbance are small, the maximum clock can be used.



Revision history

Major changes since the last revision

Version number	Revision date	Revision description
1.0	2018-06-11	First Release
1.1	2020-01-23	Updated schematics on page 8 by removing resistor R1

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