

# EVAL-M1-183M User Manual

## iMOTION™ Modular Application Design Kit

### About this document

#### Scope and purpose

This application note provides an overview of the evaluation board EVAL-M1-183M including its main features, key data, pin assignments, mechanical dimensions and its application.

EVAL-M1-183M is an evaluation-board as part of the iMOTION™ Modular Application Design Kit (MADK). This board features and demonstrates Infineon's advanced Motion Control Engine (MCE) for permanent magnet motors drive over the full speed range.

The evaluation board EVAL-M1-183M was developed to support customers during their first steps designing applications with running any permanent magnet motor via sensorless sinusoidal control.

#### Intended audience

This application note is intended for all technical specialists working for motor control with the EVAL-M1-183M board under laboratory conditions.

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**Safety precautions**

# 1 Safety precautions

In addition to the precautions listed throughout this manual, please read and understand the following statements regarding hazards associated with development systems.

**Table 1**      **Precautions**

	<p><b>Attention:</b> <i>The ground potential of the EVAL-M1-183M system is biased to a negative DC bus voltage potential. When measuring voltage waveform by oscilloscope, the scope's ground needs to be isolated. Failure to do so may result in equipment damage or personal injury or death.</i></p>
	<p><b>Attention:</b> <i>Only personnel familiar with the drive and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.</i></p>
	<p><b>Attention:</b> <i>The surfaces of the drive may become hot, which may cause injury.</i></p>
	<p><b>Attention:</b> <i>EVAL-M1-183M system contains parts and assemblies sensitive to Electrostatic Discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to applicable ESD protection handbooks and guidelines.</i></p>
	<p><b>Attention:</b> <i>A control board, incorrectly applied or installed, can result in component damage or reduction in product lifetime. Wiring or application errors such as under sizing the motor, supplying an incorrect or inadequate DC supply or excessive ambient temperatures may result in system malfunction.</i></p>
	<p><b>Attention:</b> <i>Remove or connect this control board from or to the power drive. Wait three minutes after removing power from the power drive to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.</i></p>
	<p><b>Attention:</b> <i>EVAL-M1-183M system is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials which are unnecessary for system installation may result in overheating or abnormal operating condition.</i></p>

**Introduction**

## 2 Introduction

The EVAL-M1-183M evaluation board is a part of the iMOTION™ **Modular Application Design Kit** for drives (iMOTION™ MADK). It is single PM motor control solution.

The MADK platform is intended to use various power stages with different control boards. These boards can easily be interfaced through the 20 pins iMOTION™ MADK-M1 or the 30 pins iMOTION™ MADK-M3 interface connector. This board is equipped with 20 pins connector.

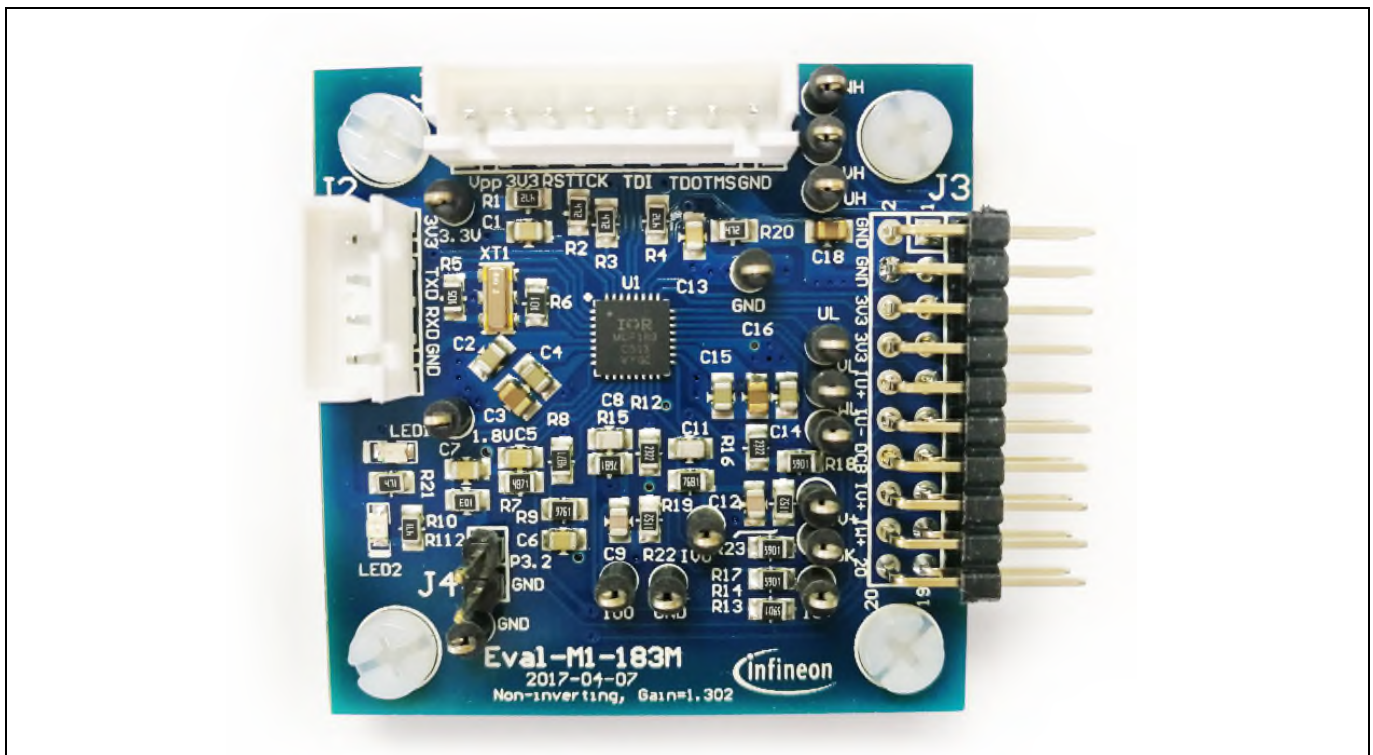
This evaluation board is designed to give comprehensible solutions of sensorless control of permanent magnet motors over the full speed range. It provides a capable of 3-phase and three types of 2-phase modulation, JTAG and UART interface, isolated via opto-isolation box (MCETOOLV2.0), 3.3V single supply. This evaluation board is used with Isolation box (MCETOOL V2). Details of isolation box please refer to its Application Note.

The EVAL-M1-183M evaluation board is available from Infineon. The features of this board are described in the design feature chapter of this document, whereas the remaining paragraphs provide information to enable the customers to copy, modify and qualify the design for production according to their own specific requirements.

Environmental conditions were considered in the design of the EVAL-M1-183M. The design was tested as described in this document but not qualified regarding safety requirements or manufacturing and operation over the whole operating temperature range or lifetime. The boards provided by Infineon are subject to functional testing only.

Evaluation boards are not subject to the same procedures as regular products regarding Returned Material Analysis (RMA), Process Change Notification (PCN) and Product Discontinuation (PD). Evaluation boards are intended to be used under laboratory conditions by specialists only.

Figure 1 shows the evaluation board EVAL-M1-183M. This document explains the features and details of this board as well as IRMCF183 control IC.



**Figure 1 Evaluation board EVAL-M1-183M**

**Main features**

### **3 Main features**

EVAL-M1-183M is a control evaluation board for motor control application. The kit demonstrates Infineon's motion control IC technology.

Main features of Motion Control IC are:

- MCE™ (Flexible Motion Control Engine) - Dedicated computation engine for high efficiency sinusoidal sensorless motor control
- Built-in hardware peripheral for single shunt or leg shunt current feedback reconstruction and analog circuits
- Embedded 8-bit high speed microcontroller (8051) for flexible I/O and man-machine control
- JTAG programming port for emulation/debugger
- Serial communication interface (UART)
- Watchdog timer with independent internal clock
- Internal 64Kbyte Flash
- 3.3V single supply

The evaluation board characteristics are:

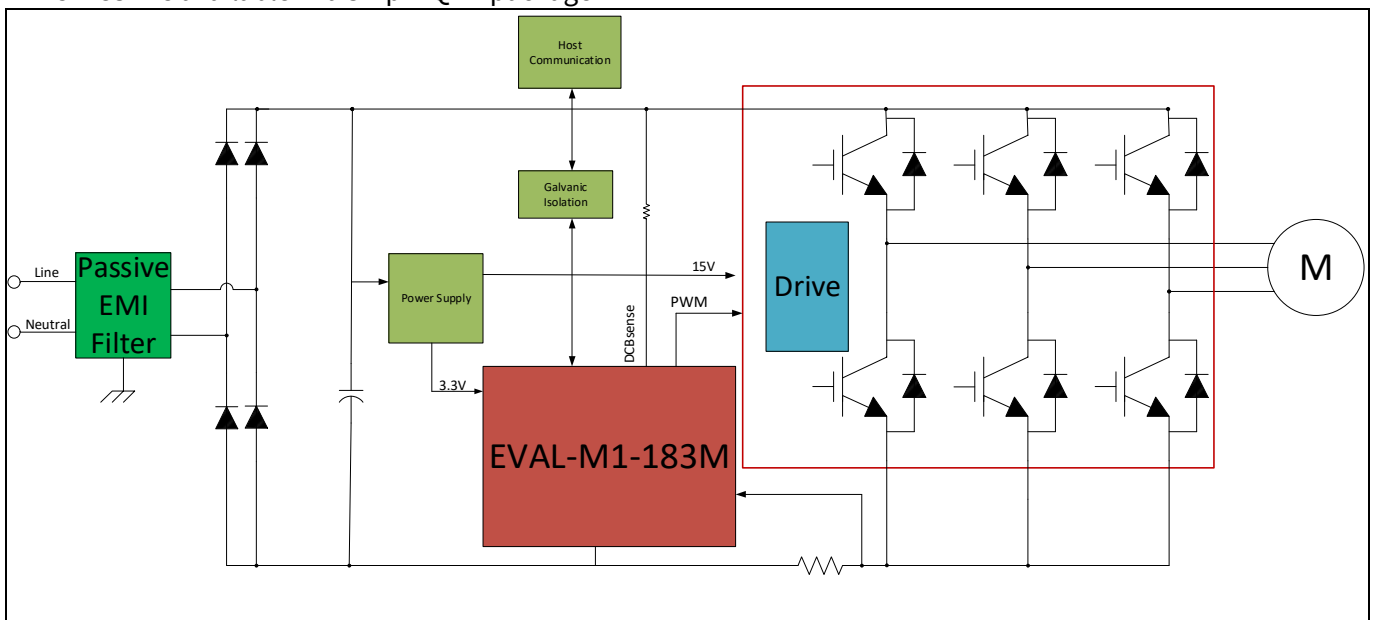
- Complete kit for running any permanent magnet motor via sensorless sinusoidal control
- 3.3V single power supply
- JTAG and UART interface, isolated via opto-isolation box
- 20 pins connector
- RoHS compliant
- PCB is 45x 45 mm and has two layers with 35 µm copper each

**Main features**

**3.1 Key data**

Figure 2 provides a typical application Block Diagram using the EVAL-M1-183M in which IRMCF183M controller is used. The IRMCF183M provides a built-in closed loop sensorless control algorithm using the unique flexible Motion Control Engine (MCE™) for permanent magnet motors as well as induction motors. The MCE™ consists of a collection of control elements, motion peripherals, a dedicated motion control sequencer and dual port RAM to map internal signal nodes. IRMCF183M also employs a unique single shunt current reconstruction circuit in addition to two leg shunt current sensing circuit to eliminate additional analog/digital circuitry and enables a direct shunt resistor interface to the IC. Motion control programming is achieved using a dedicated graphical compiler integrated into the MATLAB/Simulink™ development environment. Sequencing, user interface, host communication, and upper layer control tasks can be implemented in the 8051 high-speed 8-bit microcontroller. The 8051 microcontroller is equipped with a JTAG port to facilitate emulation and debugging tools.

IRMCF183M is available in a 32-pin QFN package.



**Figure 2 Typical Application Block Diagram Using EVAL-M1-183M**

**Main features**

Table 2 depicts the important specifications of the evaluation board EVAL-M1-183M.

**Table 2 EVAL-M1-183M board specifications**

<b>Parameters</b>	<b>Values</b>	<b>Conditions / comments</b>
<b>Host Interface (Non isolation)</b>		
UART(TXD RXD)	3.3V	Typical 5.76 kbps. single ended
TMS TDI TCK TDO	3.3V	Interface with FS2 or MCETOOL V2
8 Bit 2 Channel	0-3.3V output	GPIO Configurable to DAC
12 Bit	0-1.2V	
<b>Input</b>		
Voltage	3.3V	Power supply
<b>DC Bus</b>		
DC Bus Scaling	8.29 counts/v	Power board has 2MΩ resistor
DC Bus sensing range	494.0V max	
<b>Current feedback</b>		
Current sensing device	Single shunt resistor or Leg shunt resistor	Single shunt resistor Leg shunt resistor
Current Op-amp Configuration	Non-Inverting	
Current Op-amp Gain	1.302	
Resolution	12-bit	Power board may reduce the resolution
Latency	1 pwm cycle	
<b>Protections</b>		
Internal current trip level	1.2V Average	
<b>On board power supply</b>		
1.8V	1.8V+/-5%	From IC for ADC reference
<b>PCB characteristics</b>		
Material	FR4, 1.6MM thickness Copper thickness = 1oz (35um)	
Dimension	45mmx45mm	
<b>System environment</b>		
Ambient temperature	0-70°C	95%RH Max (Non-Condensing)

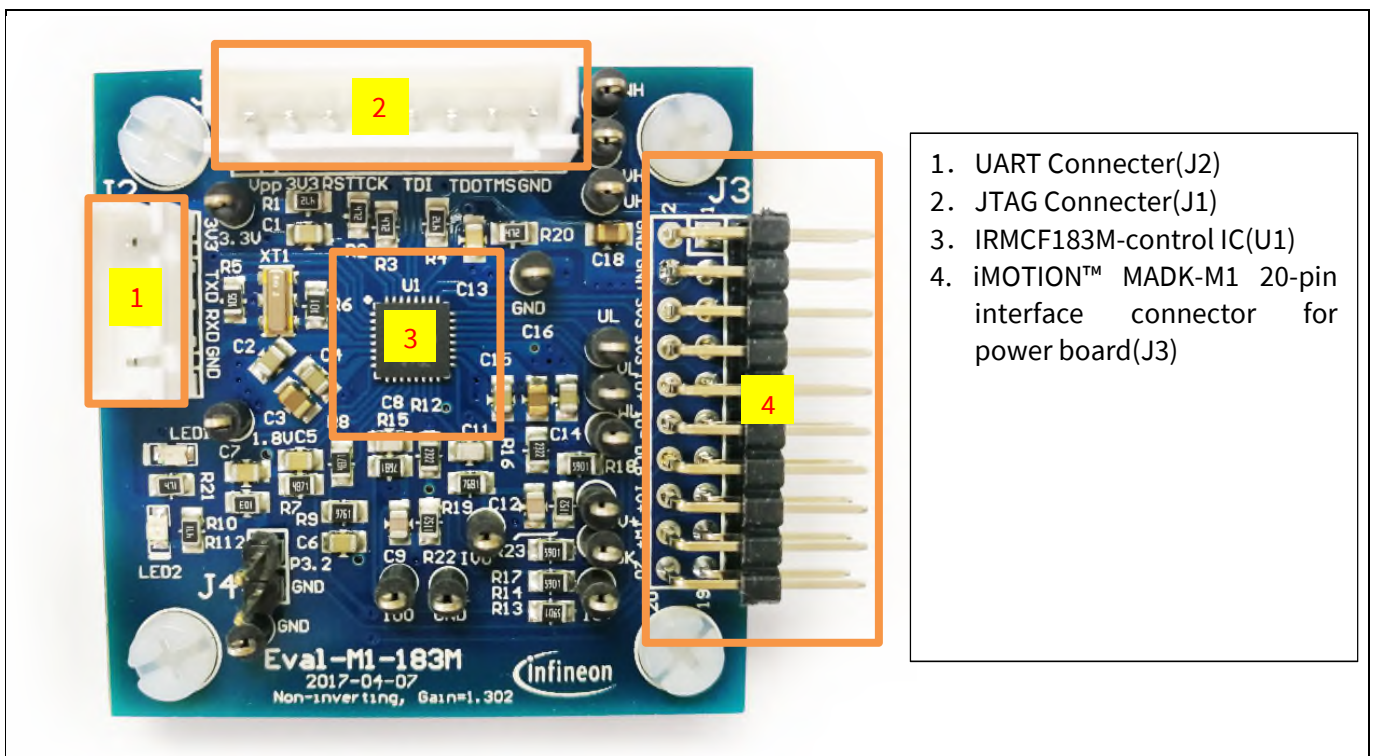
**Main features**

### 3.2 IRMCF183 installer

In order to run this evaluation board, the user has to download iMOTION™ installer from Infineon iMOTION™ Web, it contains information about all the iMOTION™ control IC including IRMCF183M development software at Infineon web.

<http://www.infineon.com/imotion-software> - for 100 series installer software and demo project downloading, please select “Software & Tools” on right column. And all the updated version software is there.

Figure 3 hints out the functional groups of the EVAL-M1-183M evaluation board.



**Figure 3 Top side of functional groups of the EVAL-M1-183M evaluation board**

## 4 Pin assignments

General information about the connectors of the EVAL-M1-183M evaluation board is reported.

Table 3 and Table 4 include the details of JTAG and UART connectors.

**Table 3 J2- UART Connector**

S. No.	Pin	Details
1	GND	Ground
2	RXD	Input, Receive data to IRMCF183M, can be configured to GPIO pins
3	TXD	Output, Transmit data from IRMCF183M, can be configured to GPIO pins
4	+3.3V	On board 3.3V supply

**Table 4 J1-JTAG Connector**

S. No.	Pin	Details
1	GND	Ground
2	TMS	TMS (test mode)
3	TDO	TDO (data output)
4	TDI	TDI (data input)
5	TCK	TCK (clock)
6	RST	IRMCF183M Reset
7	+3.3V	3.3V power supply(see Specification for max current)
8	VPP	Not Connected

Table 5 provides the pin assignments of the iMOTION™ MADK-M1 20 pins interface connector J3. This connector is the interface to the power board.

**Table 5 J3- iMOTION™ MADK-M1 20-pin interface connector for power board**

Pin	Name	Pin Name Connectors
1	PWMUH	3.3 V compatible logic output for high side gate driver-Phase U
2	GND	Ground
3	PWMUL	3.3 V compatible logic output for low side gate driver-Phase U
4	GND	Ground
5	PWMVH	3.3 V compatible logic output for high side gate driver-Phase V
6	+3.3V	3.3 V supply input
7	PWMVL	3.3 V compatible logic output for low side gate driver-Phase V
8	+3.3V	3.3 V supply input
9	PWMWH	3.3 V compatible logic output for high side gate driver-Phase W
10	IU+	Positive shunt voltage of phase U
11	PWMWL	3.3 V compatible logic output for low side gate driver-Phase W
12	IU-	Negative Shunt voltage of phase U or Ground if using single end current feedback
13	GK	Gate kill signal – active low when over current is detected



**Pin assignments**

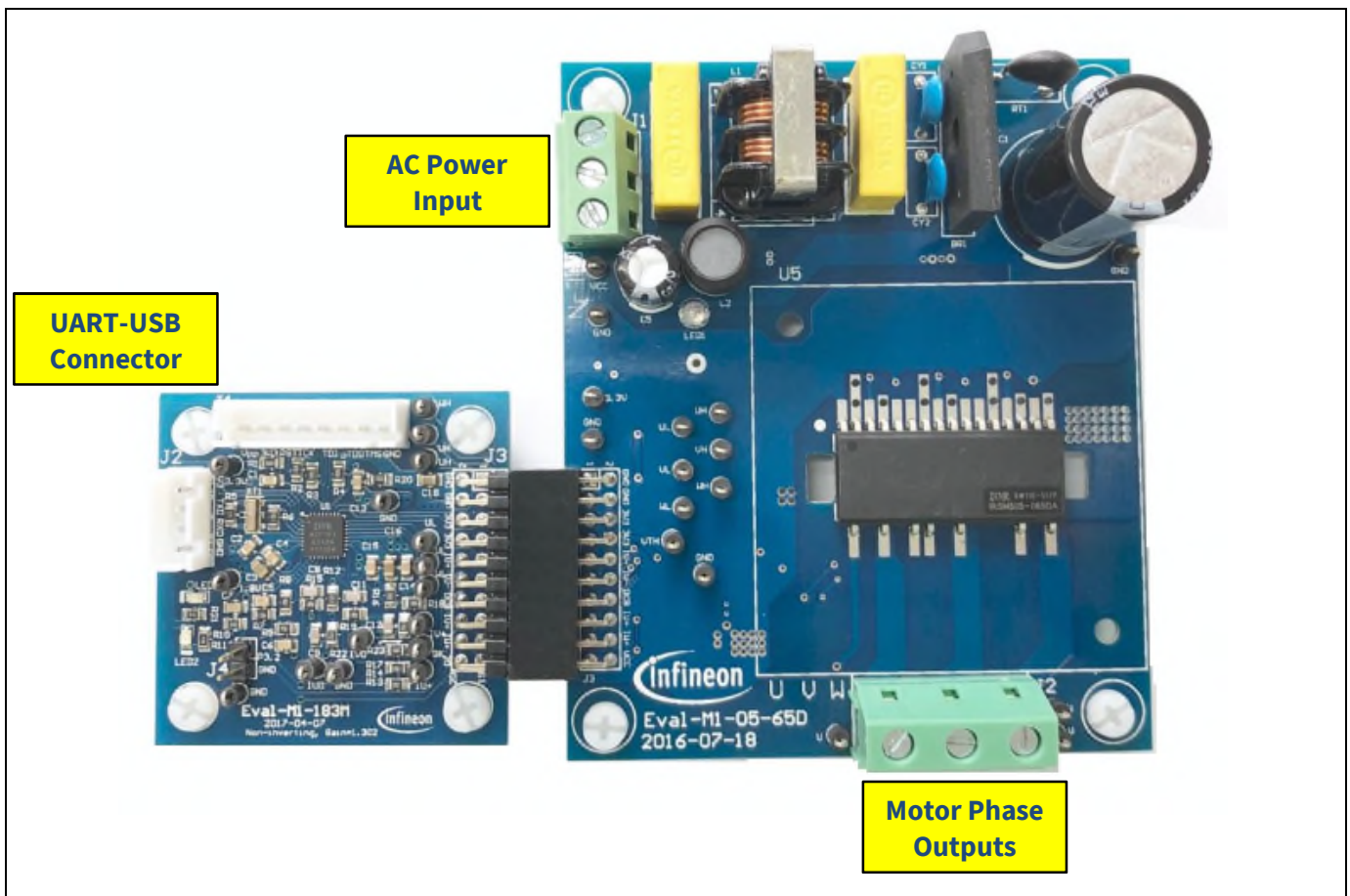
<b>Pin</b>	<b>Name</b>	<b>Pin Name Connectors</b>
14	DCBSENSE	DC bus positive voltage, scaled in 0-3.3 V range by a voltage divider
15	VTH	Thermistor input
16	IV+	Positive shunt voltage of phase V
17	IV-	Negative Shunt voltage of phase V or Ground if using single end current feedback
18	IW+	Positive shunt voltage of phase W
19	IW-	Negative Shunt voltage of phase W or Ground if using single end current feedback
20	VCC	Not used

## 5 Getting Started with EVAL-M1-183M

In order to run the motor system, a combination of the iMOTION™ MADK control board EVAL-M1-183M and the matching MADK power board (with M1 connector, EVAL-M1-05-65D for example in this chapter) is required. The 100 Series Installer for iMOTION™ PC Tools (MCEProgrammer, MCEWizard and MCEDesigner) are also required in order to initially setup the system, as well as to control and fine-tune the system performance to match users exact needs. This chapter provides more details on setting up the system and getting started with iMOTION™ MADK development platform.

### 5.1 Setting up the system

After downloading and installing the 100 Series Installer for iMOTION™ PC Tools (MCEProgrammer, MCEWizard and MCEDesigner, and the 100 Series Installer can be downloaded on the iMOTION™ Software web page [www.infineon.com/imotion-software](http://www.infineon.com/imotion-software)), following steps need to be executed in order to run the motor. Refer to the chapters 5.2.1, 5.2.2 and 5.2.3 as well as MCEProgrammer, MCEWizard and MCEDesigner documentation for more information.



**Figure 4 System connection example using EVAL-M1-183M and EVAL-M1-05-65D**

1. Connect USB-JTAG connector on the MCETOOLV2 to the PC via USB cable.
2. Connect JTAG connector on the MCETOOLV2 to the JTAG Connector J1 on the control board EVAL-M1-183M via JTAG cable.
3. Turn on the Power Switch button on the MCETOOLV2, and then open the installed PC tool MCEProgrammer to program firmware to the flash of iMOTION™ IC IRMCF183. Refer to Chapter 5.2.1 or MCEProgrammer User Guide for more details.

**Getting Started with EVAL-M1-183M**

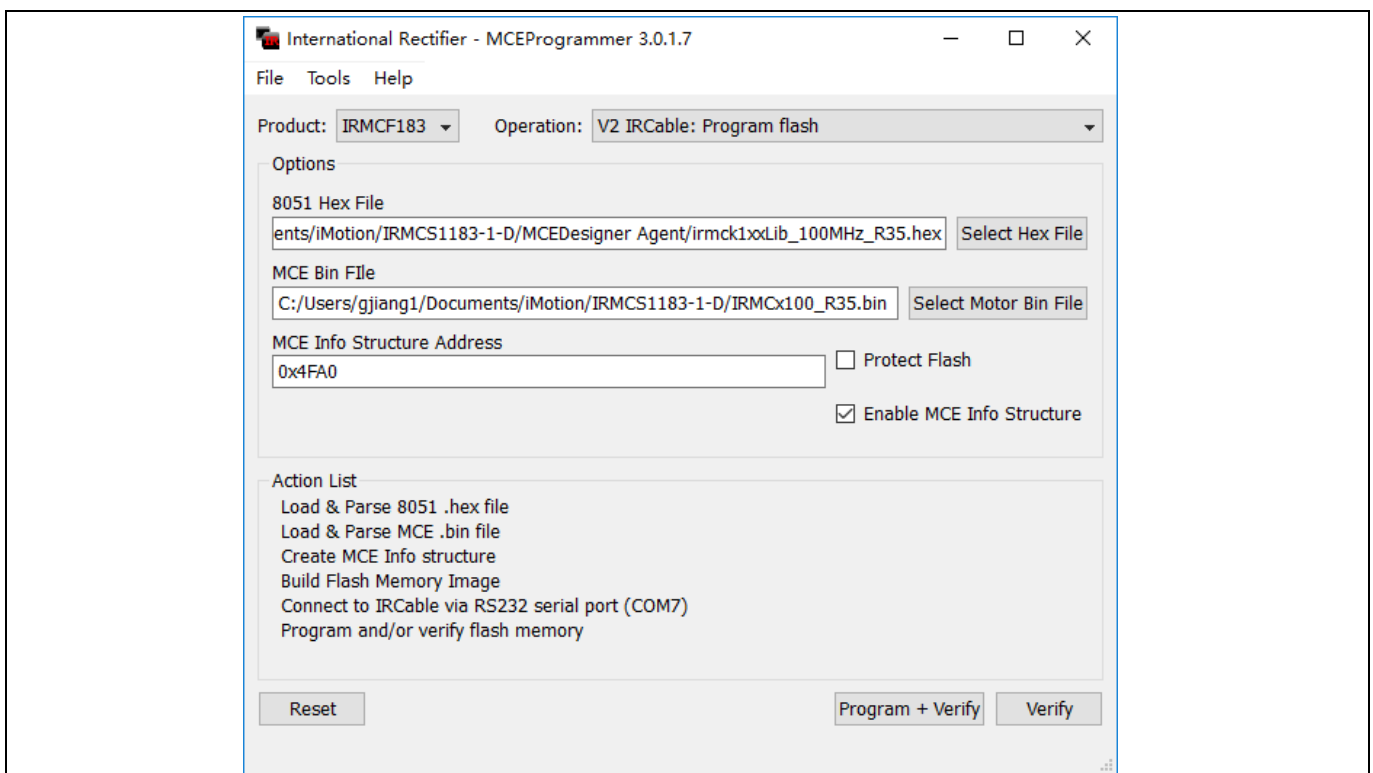
4. Connect EVAL-M1-183M's M1 20-pin interface connector (J3) to power board (For example EVAL-M1-05-65D, see Figure 4).
5. Connect USB-UART connector on the MCETOOLV2 to the PC via USB cable.
6. Connect UART connector on the MCETOOLV2 to the UART Connector J2 on the control board EVAL-M1-183M via UART cable.
7. Use MCEWizard to enter the target motor's system and operating parameters, as well as evaluation board's hardware parameters, which will then be used to calculate controller's digital parameter set representing complete motor drive system. First click "Calculate" button on the "Verify & Save Page" and then save the drive parameter set into your project directory by clicking "Export to Designer file (.txt)". Saved Drive System Parameter File will be later used by the MCEDesigner. Refer to Chapter 5.2.2 or MCEWizard User Guide for more details.
8. Connect motor phase outputs to the motor.
9. Connect AC power to power input connector and power on system.
10. Start MCEDesigner tool and open MCEDesigner default configuration file (.irc) for IRMCF183 controller (IRMCS1183-1-D\_R35.irc) by clicking "File" > "Open". IRMCS1183-1-D\_R35.irc is included in the iMotion default document folder "C:\Users\xxx\Documents\iMotion\IRMCS1183-1-D" after installed the 100 Series Installer.
11. MCEDesigner should automatically connect to the EVAL-M1-101T control board using default COM port (Indicated by green circle next to "COMx Up" status in the bottom frame of the MCEDesigner GUI). If it cannot establish the connection, change COM port by doing following steps: ("System" window active) > Preferences > Connection > Connect using (Chose one of the other available COM ports from the drop-down menu).
12. Use following steps to import the drive parameters into the internal SRAM of iMOTION™ IC: Click "File" and select "Import Drive Parameters". Browse and select the Drive Parameters .txt file created in step 7, and finally Click Configure Motor button to import drive parameters. See chapter MCEDesigner setup overview 5.2.3 for more details.
13. Start the motor by clicking the green traffic light button in the control bar.

## 5.2 iMOTION™ development tools and software

The 100 Series Installer for iMOTION™ Development Tools MCEProgrammer, MCEDesigner and MCEWizard are available for download via Infineon iMOTION™ website (<http://www.infineon.com/imotion-software>). All supported tools and software variants are listed there. Please visit this page periodically to check for tool/software updates.

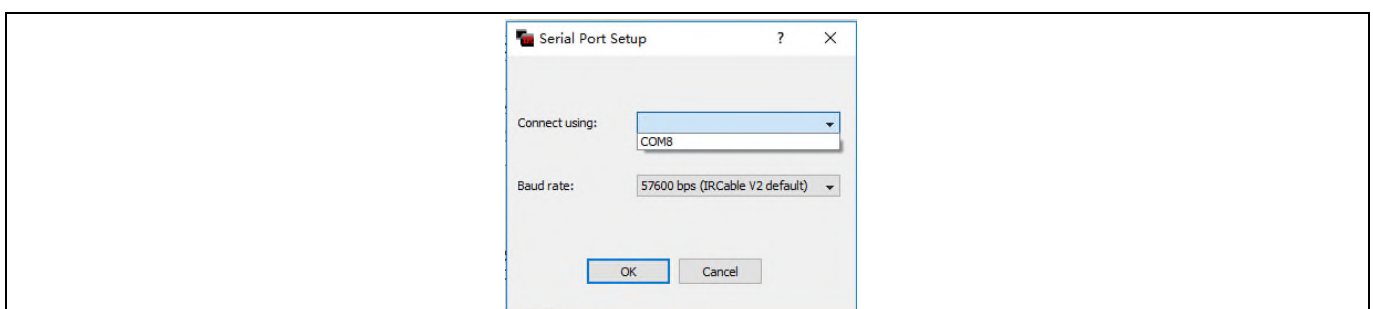
### 5.2.1 MCEProgrammer setup overview

After installing the 100 Series Installer for iMOTION™ Development Tools, the shortcut for MCEProgrammer appears on the Windows desktop. Double click the shortcut to open the MCEProgrammer and configure the parameters to program firmware to the flash of iMOTION™ IC IRMCF183. Figure 5 shows the main window for MCEProgrammer, where the type of iMOTION™ IC IRMCF183 can be selected through the Product pull-down list.



**Figure 5 MCEProgrammer Main Window**

The serial port can be set by clicking the Tools menu and select IRCable V2 Serial Port Setup in the pull-down list. And select the using connect serial port by clicking the pull down list in the pop-up serial port setup window as shown in the Figure 6.

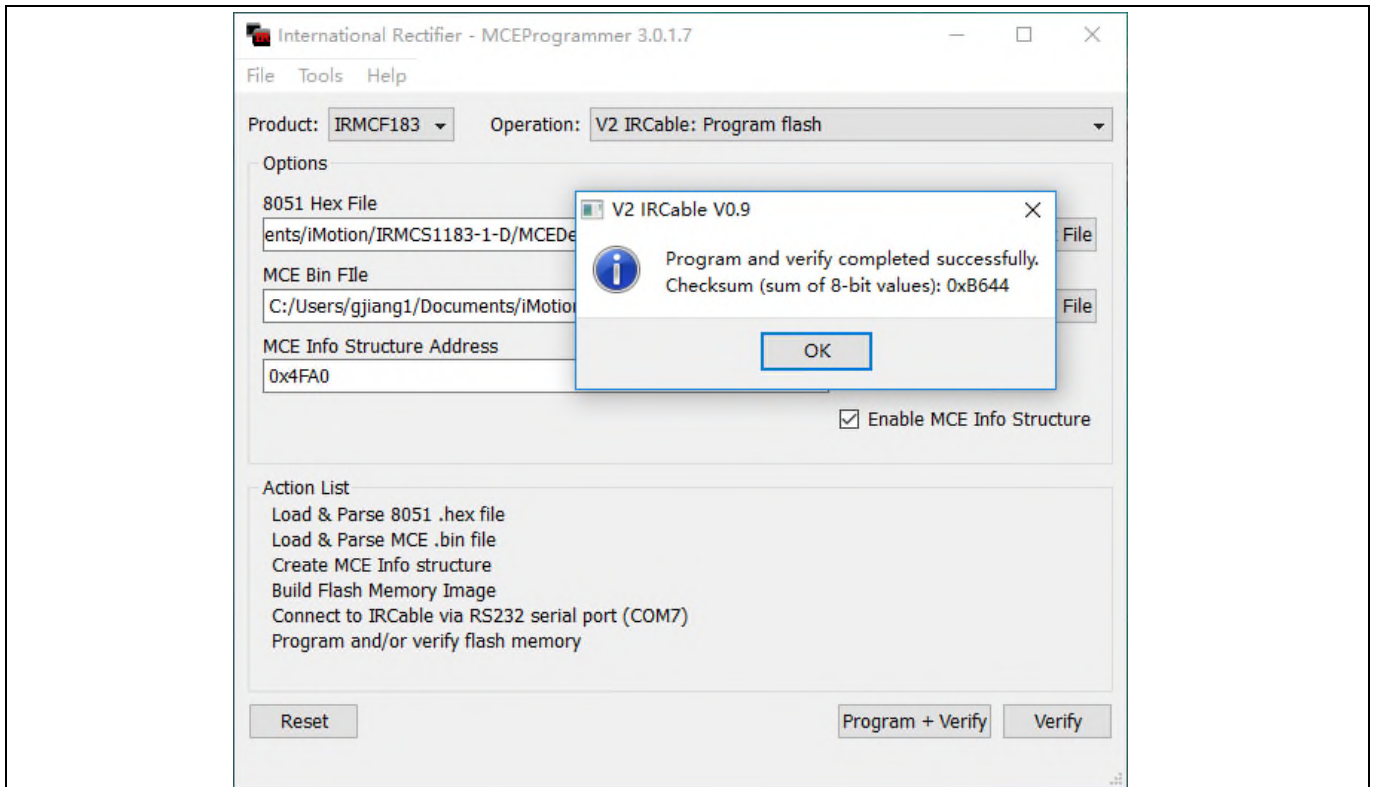


**Figure 6 Serial Port Setup pop-up window for MCEProgrammer**

**Getting Started with EVAL-M1-183M**

After selecting the 8051 Hex File and the MCE Bin File, start the Program setup procedure by clicking the “Program + Verify” button in the right bottom corner as shown in Figure 5. IRMCx100\_R35.bin is included in the iMotion default document folder “C:\Users\xxx\Documents\iMotion\IRMCS1183-1-D” after installed the 100 Series Installer. While the 8051 Hex File irmck1xxLib\_100MHz\_R35.hex is in the subfolder MCEDesigner Agent.

After Program and verify successfully the success information window will be popped up as shown in the Figure 7.

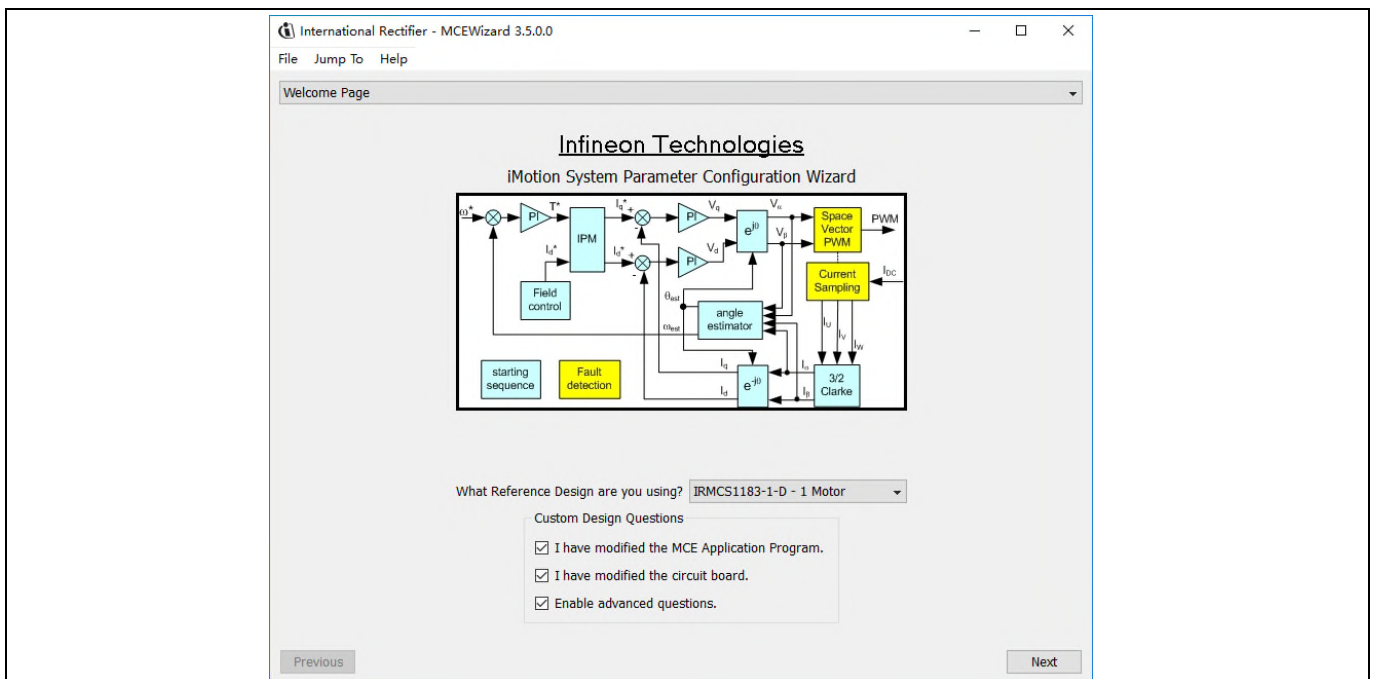


**Figure 7 Successfully programmed pop-up window for MCEProgrammer**

## 5.2.2 MCEWizard setup overview

After installing the 100 Series Installer, the shortcut for MCEWizard appears on the Windows desktop. Double click the shortcut to open the MCEWizard and configure the parameters for evaluation boards or motor. Figure 8 shows the “Welcome Page” for MCEWizard, where the Reference Design board IRMCS1183-1-D should be selected through the pull-down list for the MADK control board EVAL-M1-183M and the matching power board. Infineon keeps releasing new MADK controller and power boards. Therefore, it could happen that some of the newest power boards are not pre-configured in the MCEWizard tool and cannot be selected through the pull-down menu. In that case, the user should select any other power board (as similar as possible) and follow the MCEWizard setup steps by entering the parameter values which are specific to the chosen board. Make sure both “I have modified the circuit board” and “Enable advanced question” checkmarks are selected. Please refer to the Application Note of the corresponding power board for additional information.

After selecting the MADK control and the power board, start the MCEWizard system setup procedure by clicking the “Next” button in the right bottom corner as shown in Figure 8.



**Figure 8 Welcome Page of MCEWizard**

iMOTION™ MADK system enables users to easily test different combination of control and power board with their motors. User should be familiar with the system level parameters which are related to the motor used. There is a very limited number of parameters which are specific to the control board or power board hardware.

Table 6 provides the MCEWizard setup overview for hardware related parameters. Similar tables will be available in each power board’s Application Note. Combination of this table and the corresponding table of the power board provides enough information to setup the MADK-based motor drive system in shortest time.

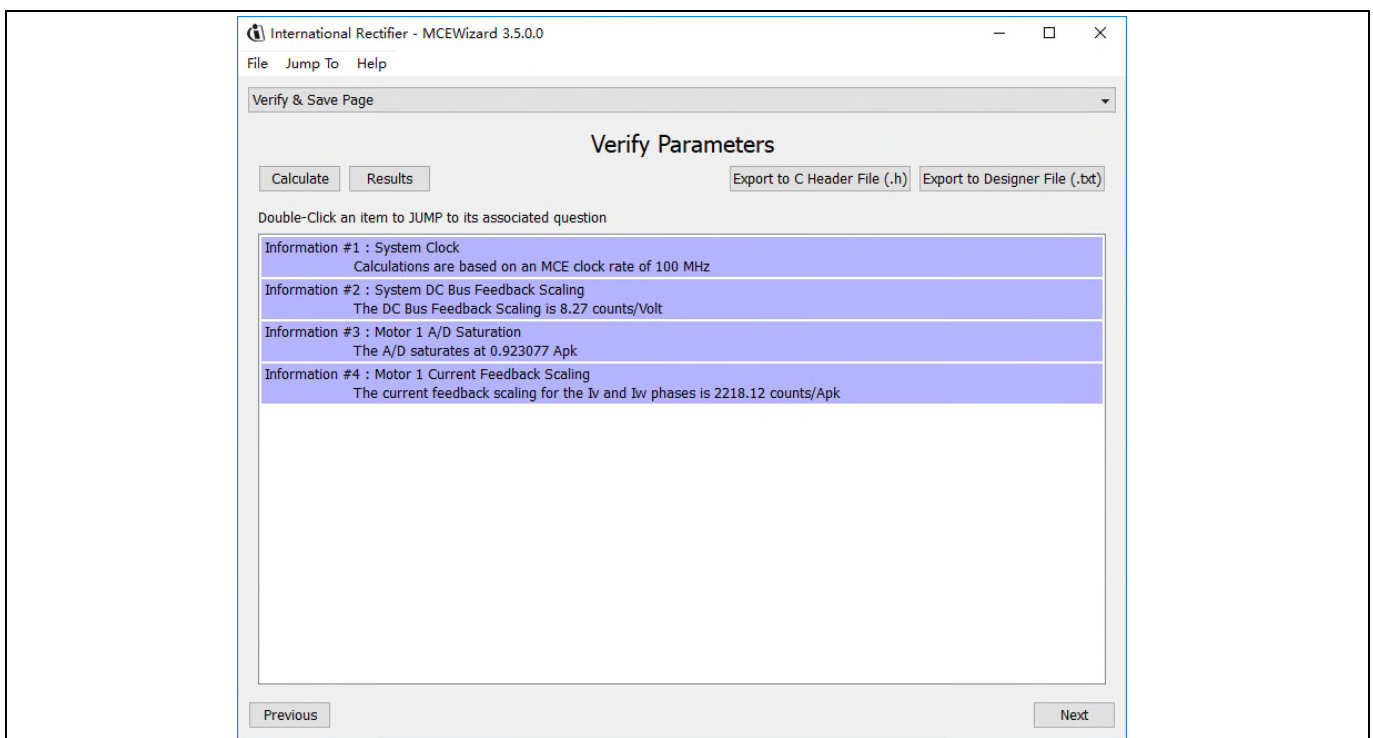
**Table 6 MCEWizard setup overview table**

Page	Parameter	Value	Comment
Welcome Page	Reference Design selecting	IRMCS1183-1-D	For EVAL-M1-183M only
Options Page	Motor 1 Shunt Configuration	Refer to the power board user manual	Leg Shunt for power board EVAL-M1-05-65D

**Getting Started with EVAL-M1-183M**

Page	Parameter	Value	Comment
Question 3	Controller Supply Voltage	Refer to the power board user manual	VDD is 3.3V by default
Question 8	Max DC Bus Voltage	Refer to the power board user manual	
Question 9	DC Bus Sensing High Resistor	Refer to the power board user manual	2000 kΩ for power board EVAL-M1-05-65D
Question 10	DC Bus Sensing Low Resistor	4.87 kΩ	
Question 111	GateSense Low-Side Devices	Refer to the power board user manual	High is true for power board EVAL-M1-05-65D
Question 112	GateSense High-Side Devices	Refer to the power board user manual	High is true for power board EVAL-M1-05-65D
Question 117	Current Feedback Shunt	Refer to the power board user manual	250mΩ for power board EVAL-M1-05-65D only

After all the MCEWizard questions are answered, the “Verify & Save Page” will be shown as in Figure 9.

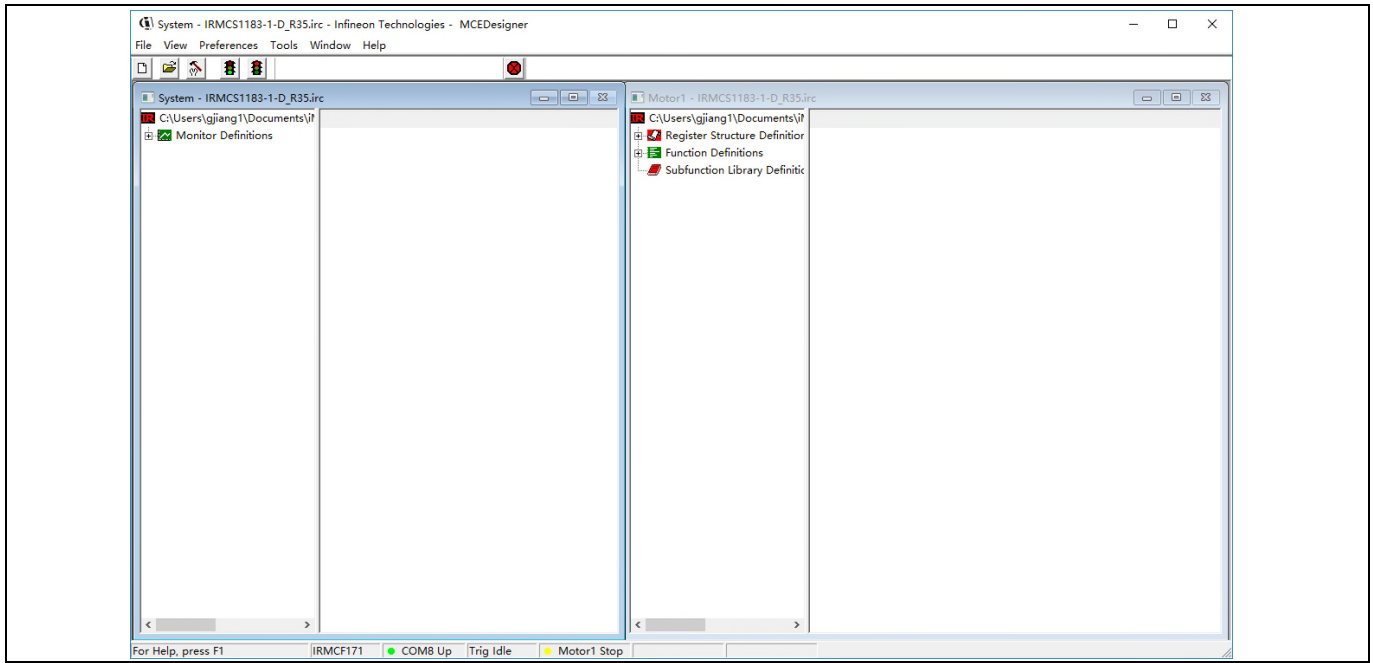


**Figure 9 Verify and Save page for MCEWizard**

Click “Calculate” button and “Export to Designer File (.txt)” button to save the parameter file which will be used by the MCEDesigner in the next steps.

### 5.2.3 MCEDesigner setup overview

After installing the 100 Series Installer, there is a shortcut for MCEDesigner on Windows desktop. Double click the shortcut to open MCEDesigner and then open “IRMCS1183-1-D\_R35” file in the iMotion default document folder “C:\Users\xxx\Documents\iMotion\IRMCS1183-1-D” after installed the 100 Series Installer as shown in Figure 10.



**Figure 10 MCEDesigner’s Main Display for EVAL-M1-183M**

MCEDesigner should automatically connect to the EVAL-M1-183M control board using default COM port (Indicated by green circle next to “COMx Up” status in the bottom frame of the MCEDesigner GUI). If it cannot establish the connection, change COM port by doing following steps: (“System” window active) > Preferences > Connection > Connect using (Chose one of the other available COM ports from the drop-down menu)

To Import Drive System Parameter file into internal SRAM of iMOTION™ IC IRMC183, please Click “File” and select “Import Drive Parameters”. Browse and select the Drive Parameters .txt file created in 5.1 step 7, and finally click configure Motor button to import drive parameters.

After Drive System Parameter file has been programmed into IRMC183 controller, and the motor drive system is powered, the MCEDesigner can be used to start/stop the motor, display motor current traces, change the motor speed, modify drive parameters and many other functions. Please refer to the MCEDesigner documentation for more details.

*Note: The MCETOOLV2 is galvanically isolated from the controller portion and the attached power board. In order to program the parameters or firmware to the IRMC183 controller, the 3.3V DC voltage needs to be supplied to the controller portion of the EVAL-M1-183M. This voltage can either be supplied by the power board (MADK power boards are designed to supply the 3.3V to the control board through M1 or M3 connector) or by feeding the 3.3V DC voltage to the control board through some of the available 3.3V access/test points if the power board is not attached to the EVAL-M1-183M control board.*

All the latest firmware files for different types of iMOTION™ motor control ICs are available for download via Infineon iMOTION™ website (<http://www.infineon.com/imotion-software>).

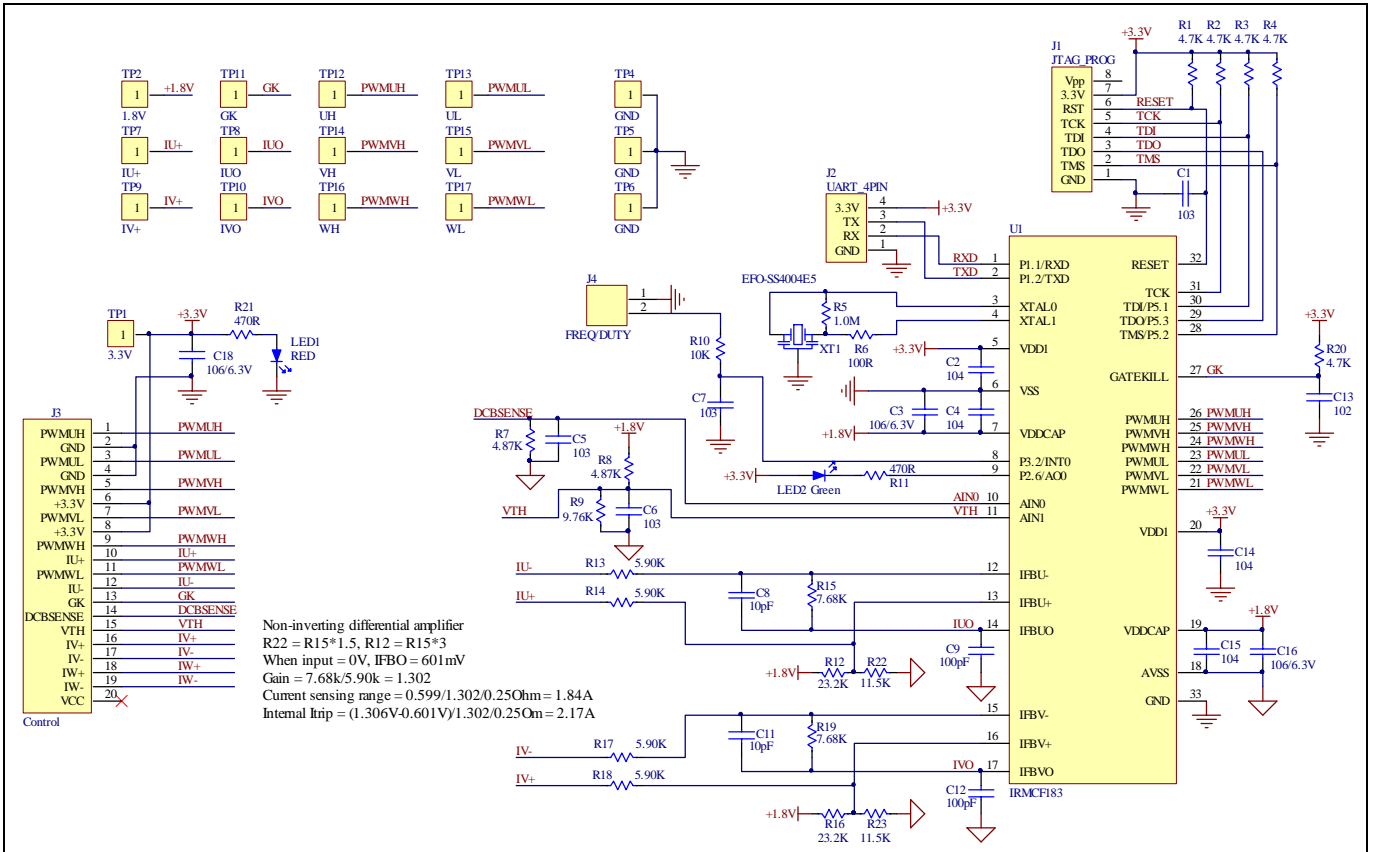


## 6 Schematics and Layout

To meet individual customer requirements and make the EVAL-M1-183M evaluation board a basis for development or modification, all necessary technical data like schematics, layout and components are included in this chapter.

### 6.1 IRMCF183M Schematic Overview

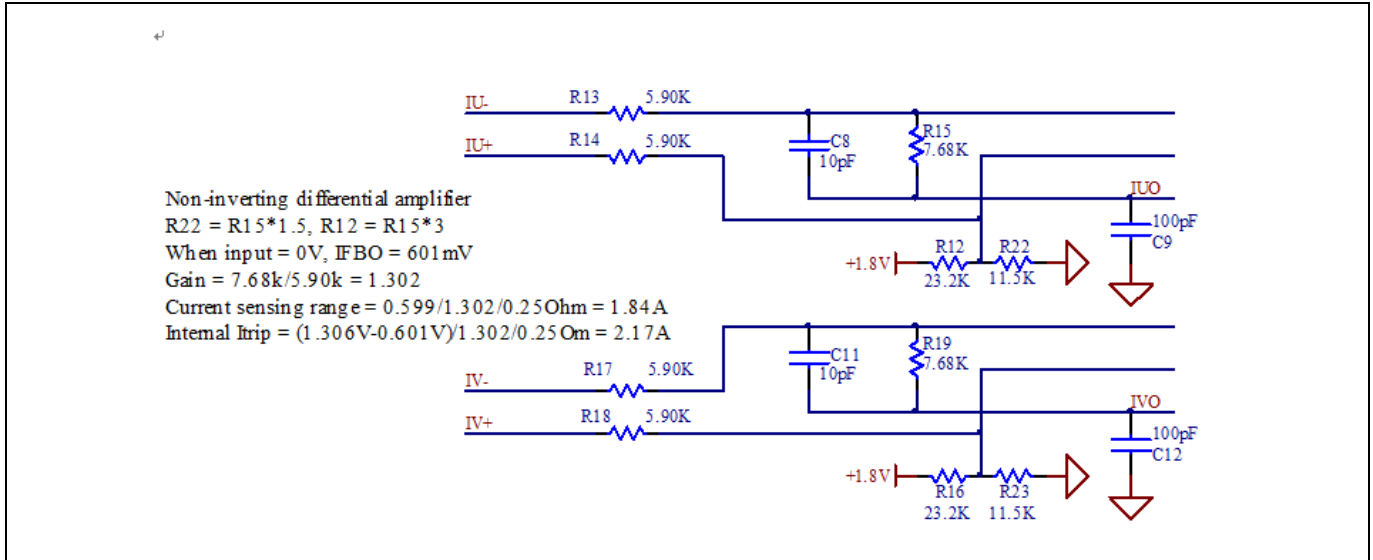
Figure 11 shows the schematic of EVAL-M1-183M evaluation board with IRMCF183M controller.



**Figure 11 The schematics for the EVAL-M1-183M evaluation board**

## 6.2 Current feedback

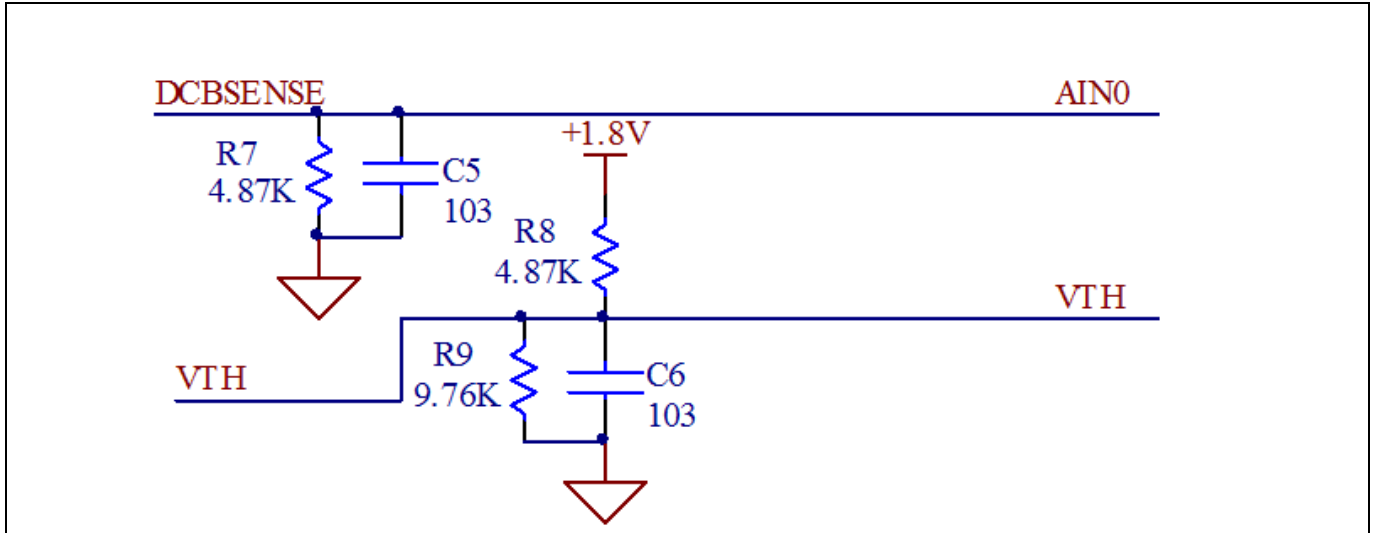
Figure 12 depicts the EVAL-M1-183M evaluation board is suitable for single shunt and leg shunt for current feedback.



**Figure 12 The part of Current feedback on the EVAL-M1-183M evaluation board**

### 6.3 AD port Input

Figure 13 depicts AD input for IRMCF183M. Temperature input should fit to the design recommendation in the IRMCF183M application note.

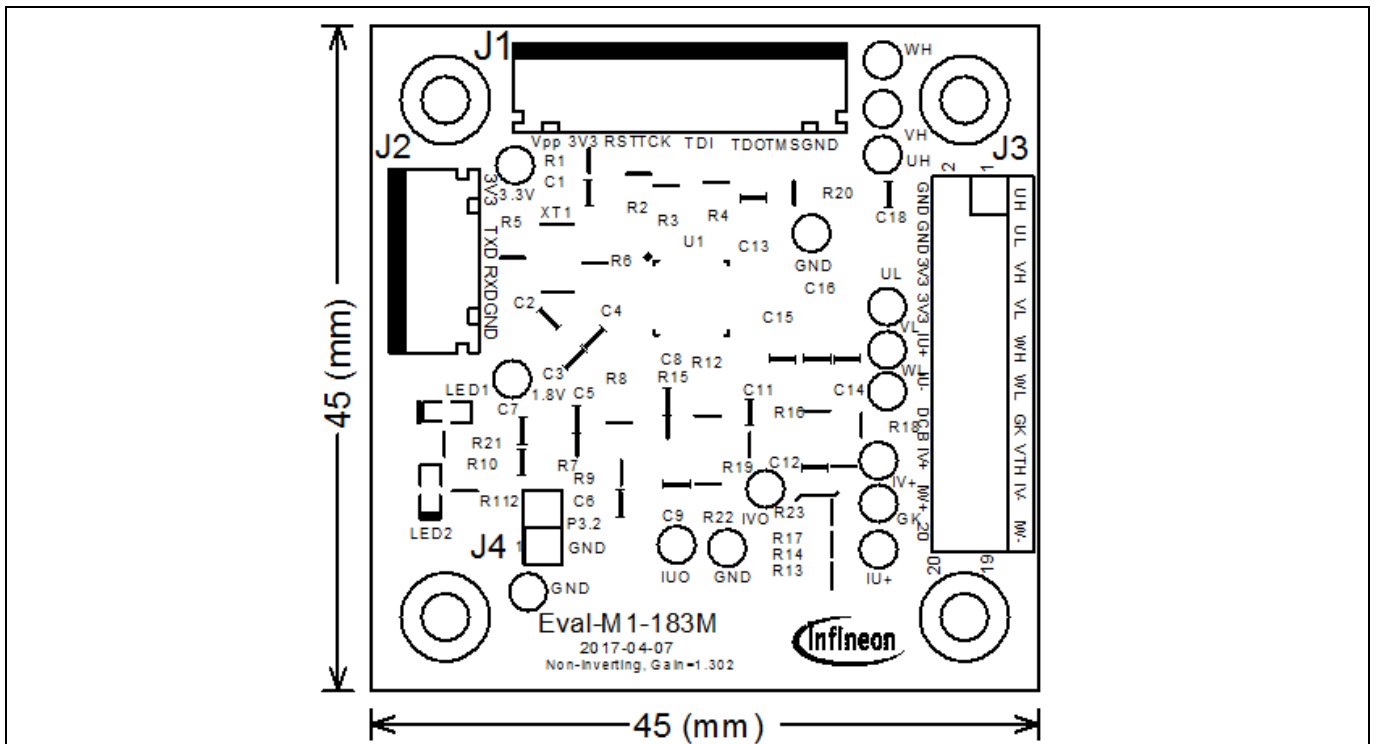


**Figure 13 AD input on the EVAL-M1-183M evaluation board**

## 6.4 PCB Layout

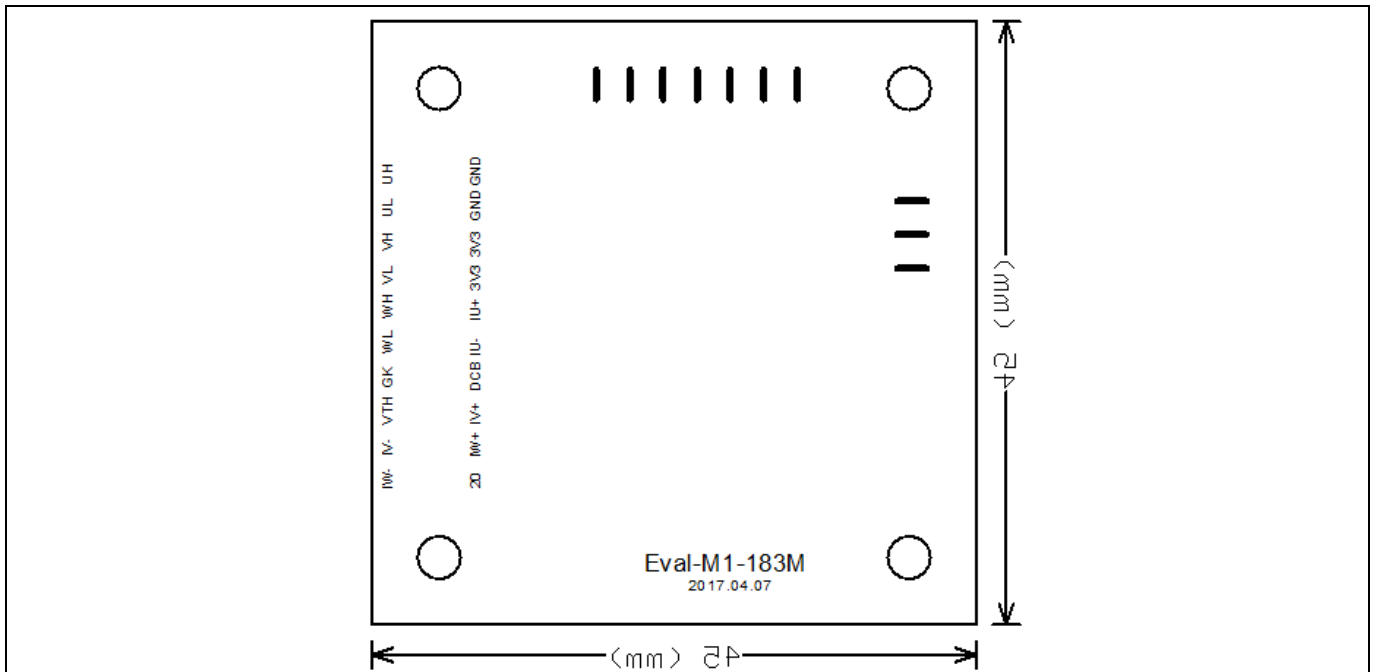
The layout of this board can be used for different voltage or power classes. The PCB has two electrical layers with 35µm copper by default and its size is 45 mm × 45 mm. The PCB board thickness is 1.6mm. Get in contact with our technical support team to get more detailed information and the latest Gerber-files.

Figure 14 illustrates the top assembly print of the EVAL-M1-183M evaluation board.



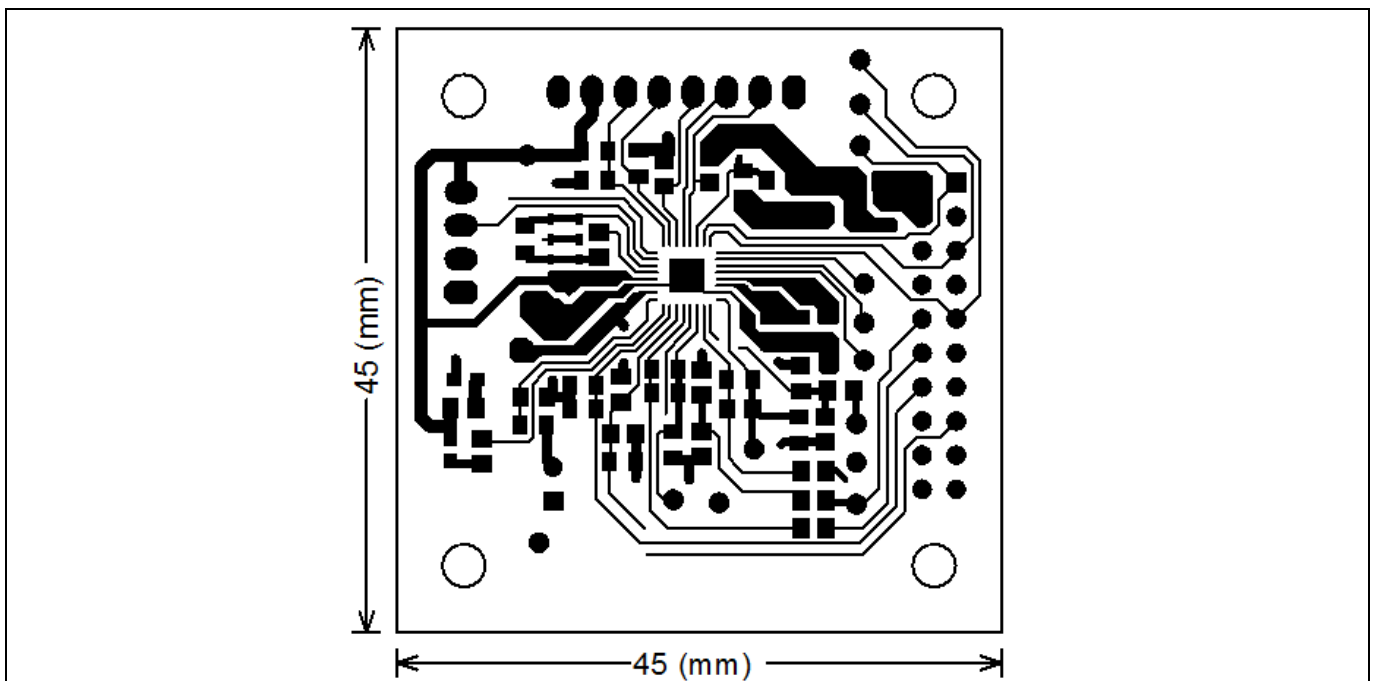
**Figure 14 Top overlay print of the EVAL-M1-183M evaluation board**

Figure 15 depicts the bottom assembly print of the evaluation board.



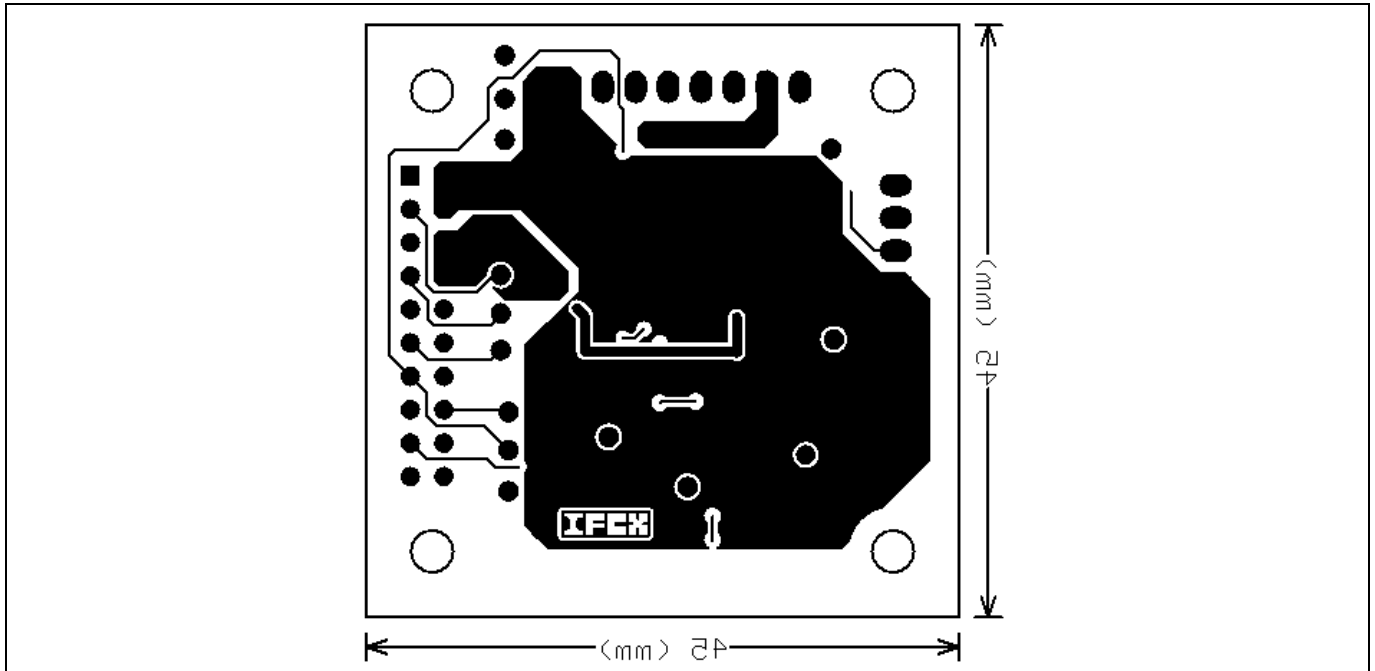
**Figure 15 Bottom overlay print of the EVAL-M1-183M evaluation board**

The top layer routing of the PCB is provided in the following Figure 16.



**Figure 16 Top layer routing of the EVAL-M1-183M**

Figure 17 illustrates the bottom layer routing of the PCB.



**Figure 17 Bottom layer routing of the EVAL-M1-183M**

## 7 Bill of Materials of EVAL-M1-183M

Table 7 provides the complete bill of materials for the EVAL-M1-183M board.

**Table 7 Bill of materials**

No.	Qty.	Part description	Designator	Part Number	Manufacturer
1	4	CAP CER 10000pF 50V X7R 0805	C1, C5, C6, C7	885012207092	Würth Electronics Inc.
2	4	CAP CER 0.1µF 25V Y5V 0805	C2, C4, C14, C15	885012207072	Würth Electronics Inc.
3	3	CAP CER 10µF 6.3V X5R 0805	C3, C16, C18	885012107004	Würth Electronics Inc.
4	2	CAP CER 10pF 16V C0G/NP0 0805	C8, C11	885012007010	Würth Electronics Inc.
5	2	CAP CER 100pF 50V C0G/NP0 0805	C9, C12	885012007057	Würth Electronics Inc.
6	1	CAP CER 1000pF 50V X7R 0805	C13	885012007063	Würth Electronics Inc.
7	1	CONN HEADER XH TOP	J1	B8B-XH-A(LF)(SN)	JST Sales America Inc.
8	1	CONN HEADER XH TOP 4POS 2.5MM	J2	B4B-XH-A(LF)(SN)	JST Sales America Inc.
9	1	HEADER 20POS SCKT R/A DL 2.54 MM	J3	613020243121	Würth Electronics Inc.
10	1	CONN HEADER 2 POS 2.54	J4	61300211121	Würth Electronics Inc.
11	1	LED RED CLEAR 0603 R/A SMD	LED1	150060RS75000	Würth Electronics Inc.
12	1	LED GREEN CLEAR 0603 R/A SMD	LED2	150060GS75000	Würth Electronics Inc.
13	4	RES SMD 4.7 kΩ 5% 1/8W 0805	R1, R2, R3, R4, R20	RC0805FR-074K7L	Yageo
14	1	RES SMD 1 MΩ 5% 1/8W 0805	R5	RT0805BRD071ML	Yageo
15	1	RES SMD 100 Ω 5% 1/8W 0805	R6	RC0805JR-07100RL	Yageo
16	2	RES SMD 4.87 kΩ 0.5% 1/4W 0805	R7, R8	RC0805FR-074K87L	Yageo
17	1	RES SMD 9.76 kΩ 1% 1/8W 0805	R9	RC0805FR-079K76L	Yageo
18	1	RES SMD 10 kΩ 1% 1/8W 0805	R10	RC0805FR-0710KL	Yageo
19	2	RES SMD 470 Ω 5% 1/8W 0805	R11, R21	RC0805FR-07470RL	Yageo
20	2	RES SMD 23.2 kΩ 1% 1/8W 0805	R12, R16	RT0805BRD0723K2L	Yageo
21	4	RES SMD 5.9 kΩ 1% 1/8W 0805	R13, R14, R17, R18	RT0805BRD075K9L	Yageo
22	2	RES SMD 7.68 kΩ 1% 1/8W 0805	R15, R19	RC0805FR-077K68L	Yageo
23	2	RES SMD 11.5 kΩ 1% 1/8W 0805	R22, R23	RT0805BRD0711K5L	Yageo
24	16	TEST POINT PC MINI .040"D WHITE	TP1, TP2,TP4, TP5, TP6,TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14 TP15, TP16, TP17	5002	Keystone Electronics
25	1	IC MOTOR CTRLR	U1	IRMCF183M	Infineon Technologies

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**Bill of Materials of EVAL-M1-183M**

<b>No.</b>	<b>Qty.</b>	<b>Part description</b>	<b>Designator</b>	<b>Part Number</b>	<b>Manufacturer</b>
26	1	CER RES 4.0000MHZ 15PF SMD	XT1	CSTCR4M00G53-R0	Murata Electronics North America



## **8 Reference**

[1] Datasheet of Infineon IRMCF183M

[2] Application Note of 2017-03\_AN2017-08\_EVAL-M1-099M\_V1.0\_EN

[3] IRMCx100 Reference Manual

[4] IRMCx100 Software Developer's Guide

[5] IRMCx100 System Overview

*Note:* All listed reference materials are available for download on Infineon's website [www.infineon.com/](http://www.infineon.com/). All the iMOTION MADK evaluation board's User Manuals are available at [www.infineon.com/MADK](http://www.infineon.com/MADK)

## Revision History

### Major changes since the last revision

Version number	Revision Date	Revision description
1.0	2017-06-01	First release
1.1	2017-07-25	1. Remove MCETOOL v2 description 2. Software download link updated
1.2	2018-07-10	Update BOM. Add WE Part Number, and add Getting Started with EVAL-M1-183M