EVAL-C101T-IM231 User manual

Motor Drive Evaluation Board Based On IMC101T-T038 and IM231-L6S1B

About this document

Scope and purpose

This user manual provides an overview of the evaluation board EVAL-C101T-IM231 including its main features, key data, pin assignments and mechanical dimensions.

EVAL-C101T-IM231 is an evaluation-board as part of the evaluation design platform for motor drive based on iMOTION™2.0 IMC100 Series. This board features and demonstrates Infineon's advanced Motion Control Engine (MCE) technology for permanent magnet motors drive over the full speed range. In the same time it features and demonstrates Infineon's CIPOS™ Micro IPM technology for motor drive.

The evaluation board EVAL-C101T-IM231 was developed to support customers during their first steps designing applications with running any permanent magnet motor via sensor-less sinusoidal control.

Intended audience

This user manual is intended for all technical specialists working with the EVAL-C101T-IM231 board under laboratory conditions.

Table of Contents

<Revision 1.0>

<2019-07-30>

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

⚠	*Caution: The ground potential of the EVAL-C101T-IM231 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 personal injury or death, and equipment damage. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
⚠	*Caution: EVAL-C101T-IM231 system contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait three minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
⚠	*Caution: 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.*
⚠	*Caution: The surfaces of the drive may become hot, which may cause injury.*
⚠	*Caution: The EVAL-C101T-IM231 board 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.*
⚠	*Caution: An incorrectly applied or installed drive can result in component damage or reduction in product lifetime. Wiring or application errors such as undersized motor, incorrect or inadequate DC supply, or excessive ambient temperatures may result in system malfunction.*
⚠	*Caution: Remove AC input cable or turn off AC power supply. 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.*
⚠	*Caution: The EVAL-C101T-IM231 board 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.*

2 Introduction

The EVAL-C101T-IM231 evaluation board is an evaluation design platform for complete inverter-controlled motor drive applications based on iMOTIONTM2.0 chipset. As a form factor board for motor drive it contains Controller (IMC101T-T038) and inverter (with CIPOS™ Micro IPM). The evaluation platform can easily be debugged through the MCEDesigner and MCEWizard during customer first designing applications with IMC101T-T038.

This evaluation board is designed to give comprehensible solutions of sensor-less control of permanent magnet motors over the full speed range. It provides a single-phase AC-connector, rectifier, DC-link, controller (with sensor less field oriented control), 3-phase output to motor. It is single shunt for current sensing and a voltage divider for DC-link voltage measurement.

The EVAL-C101T-IM231 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-C101T-IM231. 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-C101T-IM231. This evaluation board includes an EMI filter and IMC101T-T038 controller, Flyback power supply to provide 15V and 3.3V, and the CIPOS™ Micro IPM – IM231-L6S1B.
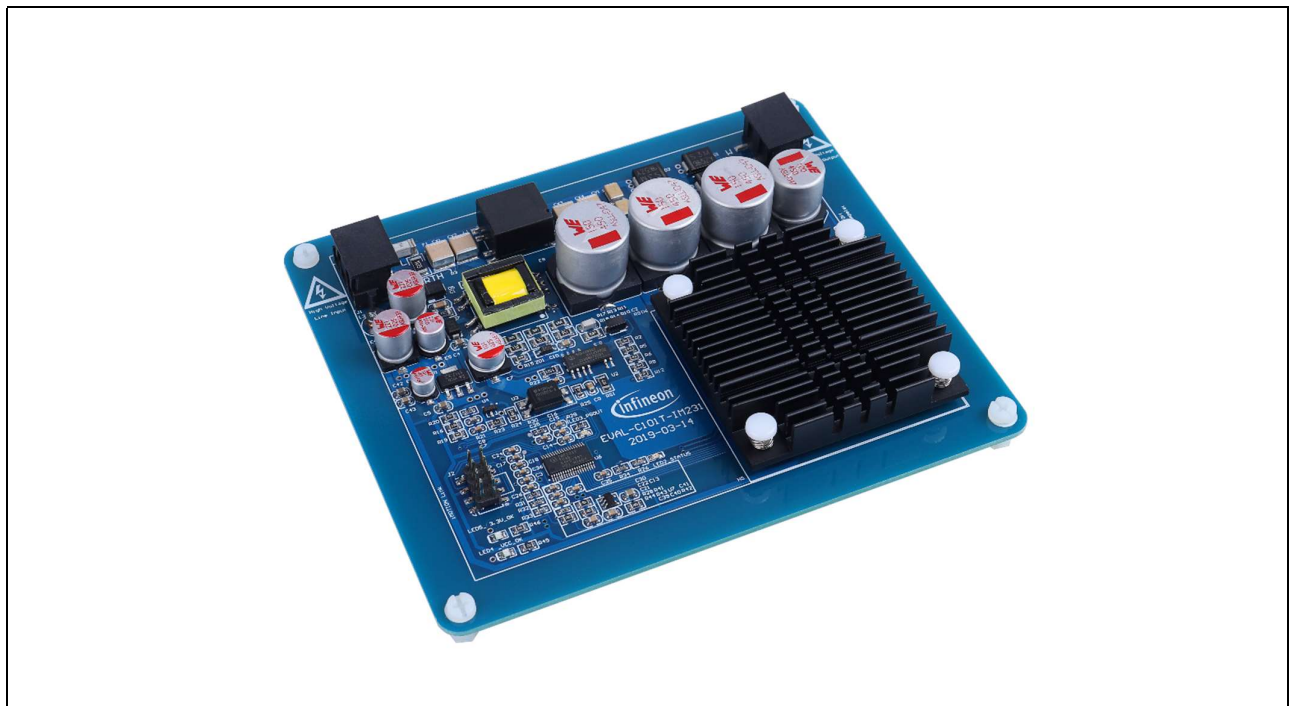

Figure 1   Evaluation board of the EVAL-C101T-IM231

3 Main features

EVAL-C101T-IM231 is a complete evaluation board including IMC101T-T038 controller and a 3 phase Micro IPM for motor control application. The kit demonstrates Infineon's motion control IC and IPM technology for motor drives.

The evaluation board characteristics are:

- Flat design
- All components are SMD and only placed on the top side
- Complete evaluation board for running any permanent magnet motor via sensor-less sinusoidal control
- Input voltage 160~265 VAC
- Maximum 180 W (with heatsink and F_{PWM}=6kHZ) motor power output
- On board EMI filter
- Current sensing with single shunt
- Flyback power supply with 15 V, 3.3 V
- Over current protection
- Sensing of DC-link voltage
- Fault diagnostic output
- PCB is 130×110mm and has two layers with 35µm copper each
- RoHS complaint

Applications:

- fridge compressor
- Small home appliances
- Pumps

Main features of Motion Control IC (IMC101T-T038) are:

- MCE (Motion Control Engine) as ready-to-use solution for variable speed drives
- Field oriented control (FOC) for permanent magnet synchronous motor (PMSM)
- Space vector PWM with sinusoidal commutation and integrated protection features
- Current sensing via single or leg shunt
- Sensorless operation
- Various serial communication interfaces (UART, I2C, SPI)
- Multiple motor parameter support
- 3.3 V (default) or 5 V VDD power supply
- Flexible host interface options for speed commands: UART, I2C, SPI, PWM or analog signal
- Support for IEC 60335 ('Class B')
- Scalable package options

Main features

Main features of CIPOSTM Micro IPM-IM231-L6S1B are:

- 600 V 3-phase inverter including gate drivers & bootstrap function
- Low VCE(sat) TRENCHSTOP™ IGBT6
- Temperature monitor
- Accurate overcurrent shutdown (±5%)
- Fault reporting and programmable fault clear
- Advanced input filter with shoot-through protection
- Optimized dv/dt for loss and EMI trade offs
- Open-emitter for single and leg-shunt current sensing
- 3.3 V logic compatible
- Isolation 2000 VRMS, 1min

3.1 Key data

Figure 2 provides a typical application Block Diagram using the IMC101T-T038 with single shunt current sensing. The IMC101T-T038 provides a built-in closed loop sensorless control algorithm using the unique flexible Motion Control Engine (MCE) for permanent magnet motors. The MCE™ consists of a collection of control elements, motion peripherals, a dedicated motion control sequencer and internal memory to map internal signal nodes. IMC101T-T038 also employs a unique single shunt current reconstruction circuit in addition to leg shunt current sensing circuit to eliminate additional analog/digital circuitry.
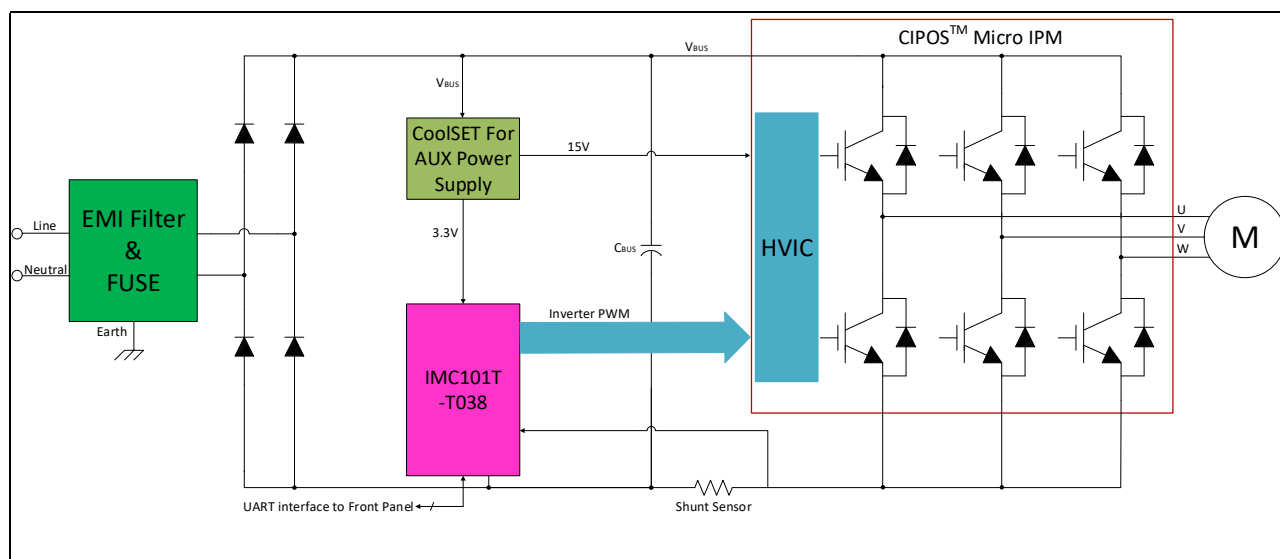

Figure 2   Typical Application Block Diagram of Evaluation Board with Single Shunt Current Sensing

Figure 3 provides pinout of the IMC101T-T038. The following drawings give the position of the functional pins for the available packages.

HALL1/AIN4	1	38	HALL2/AIN3
VDC	2	37	IW/AHALL1-/AIN2
IV/AHALL2-	3	36	REFW/AHALL1+/AIN1
REFV/AHALL2+/AIN7	4	35	VSP/AIN0
REFU/AIN8	5	34	TX0
ISS/IU	6	33	RX0
NTC/AIN10	7	32	GPIO9
PARAM/HALL3/AIN11	8	31	DUTYFREQ
VSS	9	30	GPIO8
VDD	10	29	GPIO7
PWMUL	11	28	DIR/GPIO6
PWMUH	12	27	PAR3/GPIO6
PWMVL	13	26	VDD
PWMVH	14	25	VSS
PWMWL	15	24	PAR2/GPIO4
PWMWH	16	23	PAR1/GPIO3
LED	17	22	PAR0/GPIO2
GK	18	21	PGOUT
TX1	19	20	RX1

IMC101T T038 (Top View)

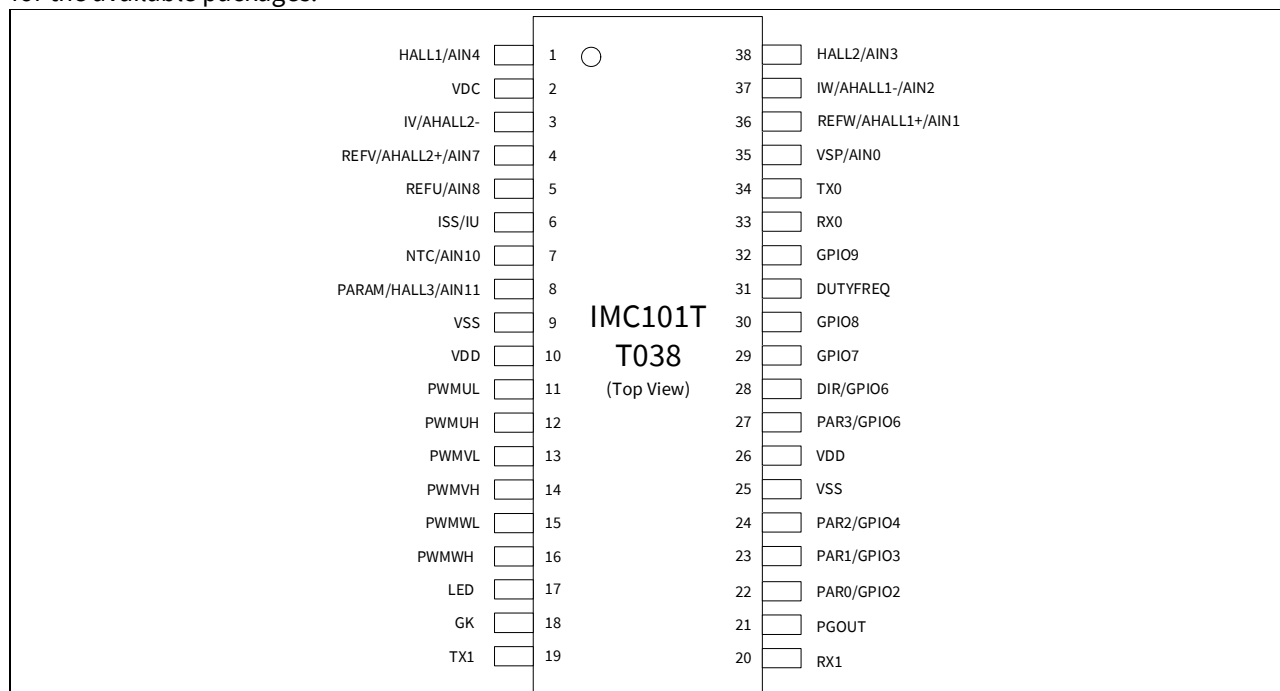**Figure 3   Pinout of IMC101T-T038**

Note: Refer to the datasheet for more detailed specifications of the pin type. Those pins with generic naming (GPIO) can be used via scripting.

Note: Figure 4 provides Internal Electrical Schematic of the IM231-L6S1B micro IPM. Refer to data sheet of the IM231-L6S1B for more detail information.
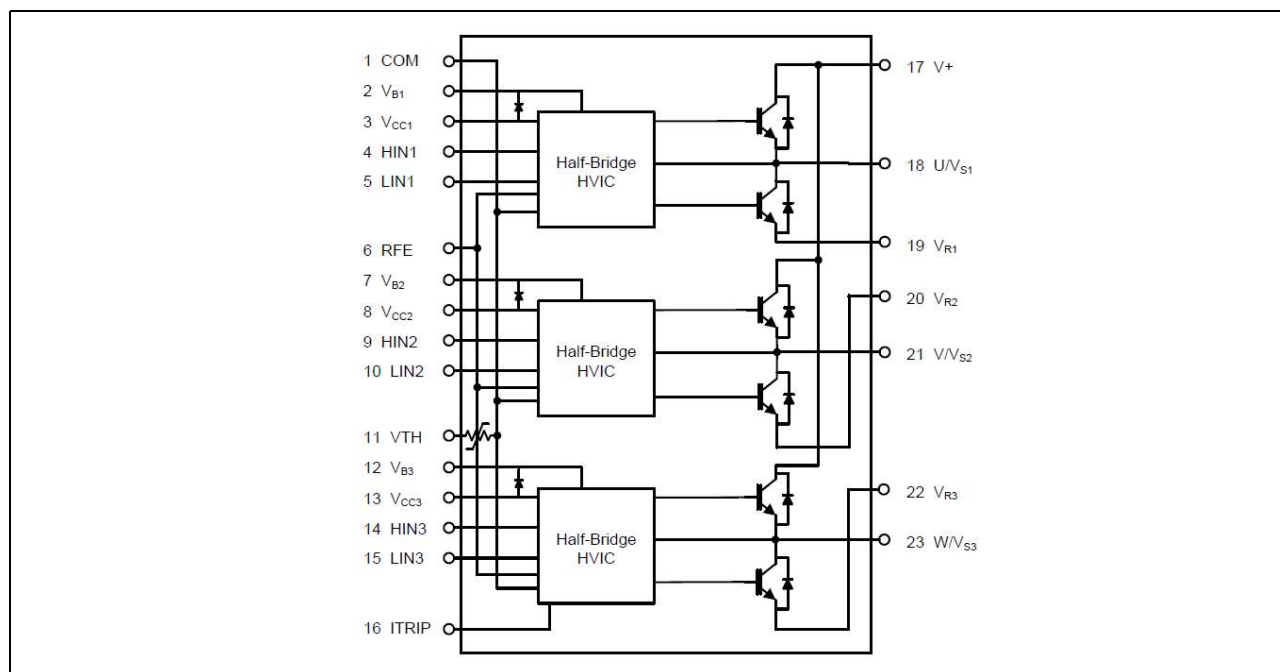

Figure 4   Internal electrical schematic

Main features

Table 2 depicts the important specifications of the evaluation board EVAL-C101T-IM231.

Table 2   **EVAL-C101T-IM231 board specifications**

Parameters	Values	Conditions / comments
Input		
Voltage	220V_{AC}	Lower AC input, less motor power output(with Heatsink)
Current	1.9A_{RM}	At 220 V_{AC} input, Ta=25°C, [1]T_{HS}=80°C,F_{PWM}=6kHz(with Heatsink)
Output		
Power(3 phases)	180W	At 220 V_{AC} input, Ta=25°C, T_{HS}=80°C，F_{PWM}=6 kHz(with Heatsink)
Phase Current	1.1A_{RMS}	At 220 V_{AC} input, Ta=25°C, T_{HS}=80°C, F_{PWM}=6 kHz(with Heatsink)
Thermal Resistance		
R_{thca}	10.7℃/W	Heatsink Thermal Resistance without Fan
DC Bus Voltage		
DC Bus voltage	310 V	Input 220V_{AC}
DC Bus voltage Ripple	30 V	C_{BUS}=55uF @output power=180W
DC Bus Scaling	8.29 counts/v	DC Bus sense Scaling
Current feedback		
Inverter Current sensing resistors RS1	100 mΩ	Single shunt
Inverter Current Op-amp Configuration	Inverting	
Inverter Current Op-amp Gain	2.65	
IMC101T-T038 Resolution	12-bit	
Latency	1 PWM cycle	
Protections		
3-phase output current trip level	[2]3.9 A_{peak}	Configured by the resistors R41
Temperature trip level	Tc=100 °C	Only valid for CIPOS™ with built in NTC
IMC101T-T038 internal current trip level	0.875V	Refer to MCEWizard Question 80
On board power supply		
15V	15V+/-2%	For CIPOS™ IPM driver

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[1] T_{HS} indicates the temperature of the heatsink's base.

[2]   For iMOTION™ IC IMC1xx, there are three types of Gatekill Input Source (Refer to section 5.5 or control board user manual for detail). Please note that, if select comparator for Gatakill Input Source, the external Gatakill signal will be not used. And the leg I_Shunt will be compared by the internal comparator with the "Gatekill Comparator Reference" value set in MCEWizard only.

Parameters	Values	Conditions / comments
3.3V	3.3V+/-2%	For IMC101T-T038 power supply, Protection circuits
PCB characteristics		
Material	FR4, 1.6mm thickness Copper thickness = 1oz (35um)	
Dimension	130mmx110mm	PCB Size
System environment		
Ambient temperature	25℃	

3.2 The relationship between I_O and F_{PWM} for EVAL-C101T-IM231

Figure 5 the picture is showing the relationship between I_o (3 phase output current) and PWM Frequency, The curves can be used as a reference to output current capability of the evaluation board when you use it.
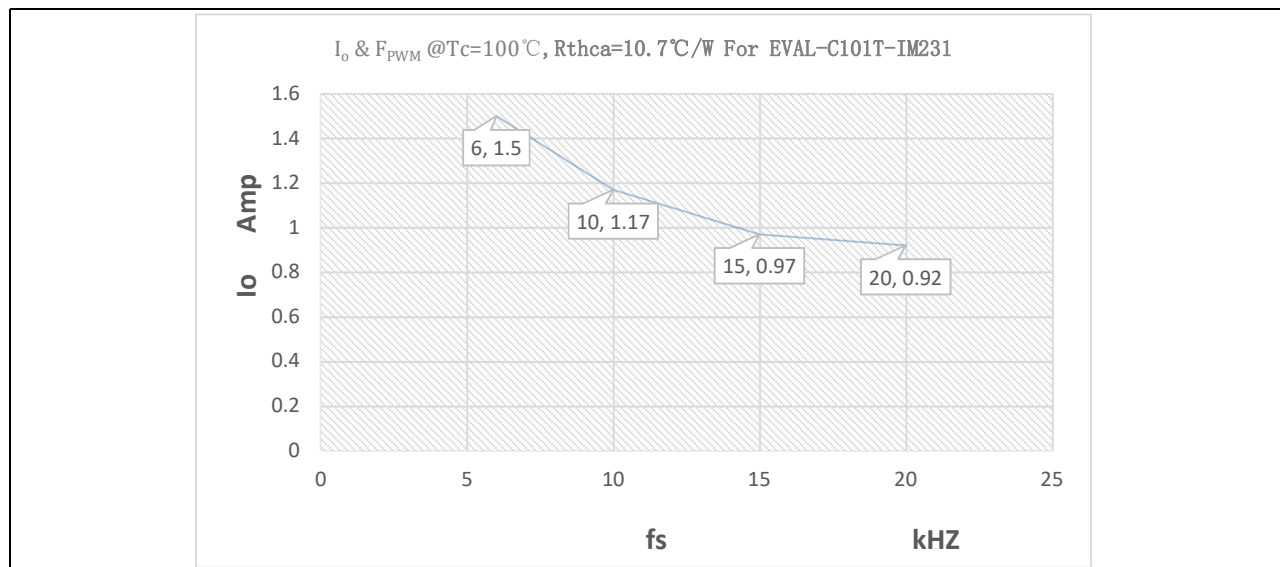

I_o & F_{PWM} @Tc=100℃, Rthca=10.7℃/W For EVAL-C101T-IM231

6, 1.5
10, 1.17
15, 0.97
20, 0.92

Figure 5   The relationship between Output Current and PWM Frequency

Note: Tc measurement point refer to datasheet (section 11.1) of the IM231-L6S1B

3.3 Setting up the system

In order to run this evaluation board, the iMOTION™ Software Tools MCEDesigner and MCEWizard are also required initially setup the system, as well as to control and fine-tune the system performance to match users exact needs. Refer to 3.4 as well as MCEWizard and MCEDesigner documentation for more information.

Figure 6 points out the functional groups on the top side of the EVAL-C101T-IM231 evaluation board.

1. J1 - AC Line connector
2. EMI filter
3. Rectifier
4. J3 - Motor phase connector
5. Fly back power supply
6. IMC101T-T038 controller
7. CIPOS™ Micro IPM IM231-L6S1B
8. J2 - iMOTION™ Link connector
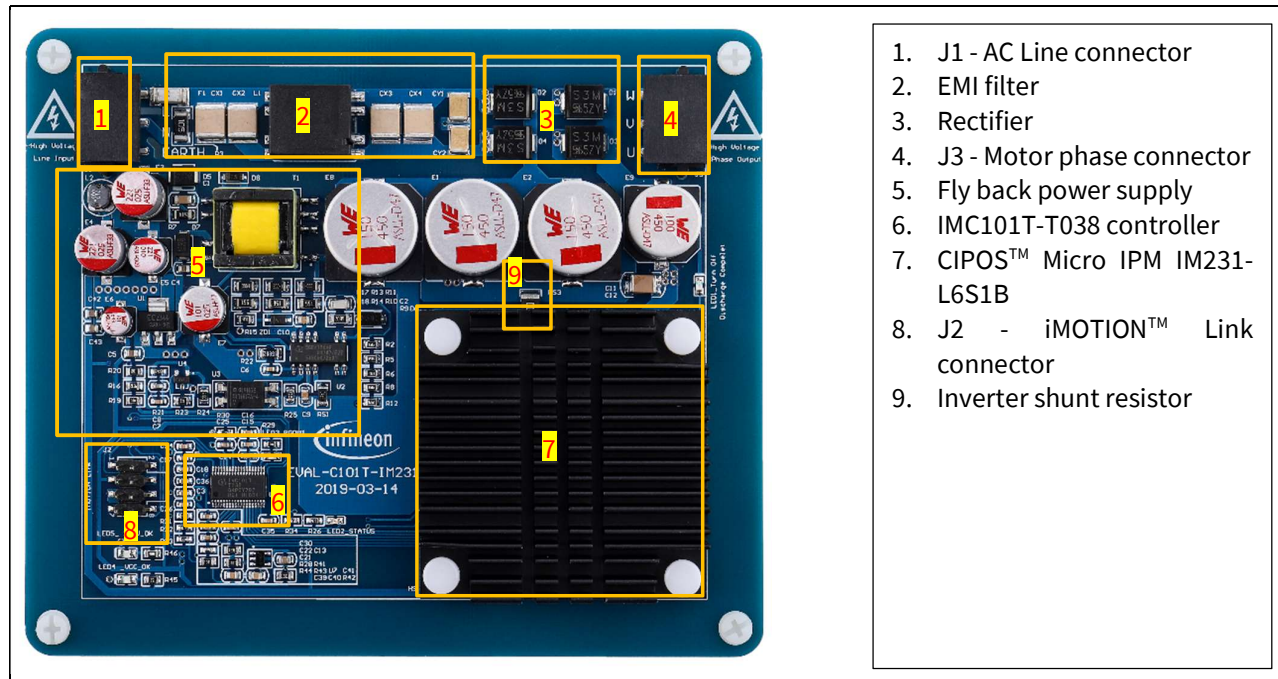9. Inverter shunt resistor

Figure 6   Functional groups of the EVAL-C101T-IM231 evaluation board's top side

3.4   System debug process

The user needs to assemble all the external hardware and ensures that all the connections are intact (includes AC-Line connector, iMOTIONTM Link Tool and motor 3-phase output connector) When users get this EVAL-C101T-IM231 evaluation board, then they can start trying to run the motor system. By default the user's evaluation board has been burned in the software to IMC101T, please execute the step2 directly. Otherwise, take the step1 and step2.

The iMOTION™ Development Tool installers for MCEDesigner and MCEWizard are available for download via Infineon iMOTIONTM website http://www.infineon.com/iMOTION. All supported tools and software variants are listed there. Please visit this page periodically to check for tool/software updates.

Figure 7 the picture is showing the application system connection.
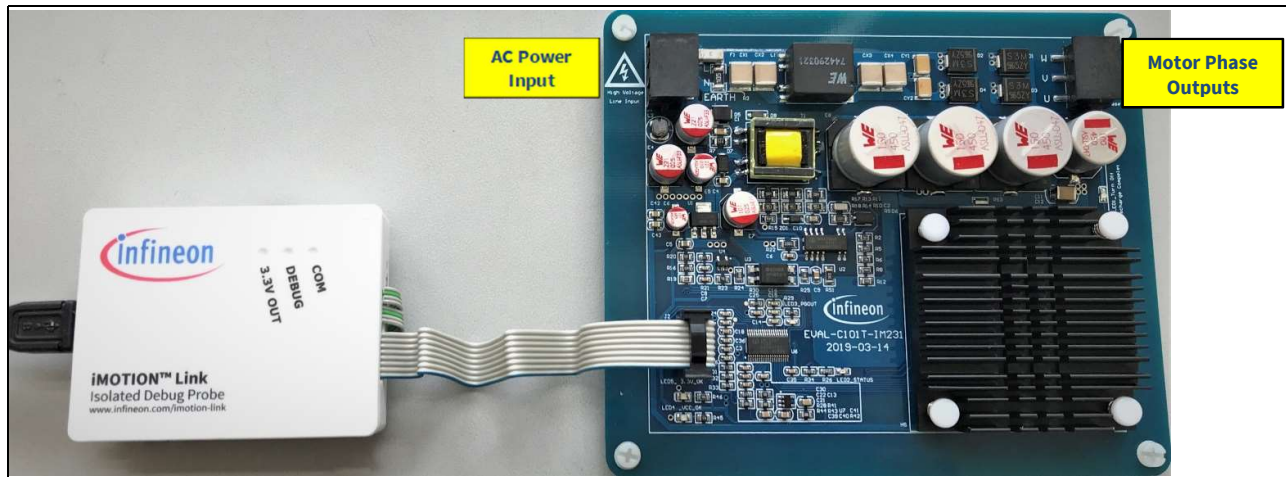

Figure 7   System connection indication

STEP1: Download Firmware to IMC101T

(1) Connect iMOTION™ Link to J2.

(2) Power on system.

(3) Use MCEDesigner program firmware to IMC101T's internal SRAM.

(4) Power off system.

Note: The firmware version for IMC101T is from the Infineon website. http://www.infineon.com/iMOTION

STEP2: Tuning Motor

(1) Keep the iMOTION™ Link Tool connect to J2.

(2) Use MCEWizard calculates motor hardware parameters and generate the parameters file (.txt).

(3) Power on system.

(4) Use MCEDesigner to program the parameters file (.txt) to the iMOTION™ controller.

(5) Start running motor system.

3.5   MCEWizard setup overview

After installing the MCEWizard, 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 MADK control board or power board can be selected through the pull-down list. 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 User Manual 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 are very limited numbers of parameters which are specific to the control board or power board hardware. Table 3 provides the MCEWizard setup overview for hardware related parameters. Similar tables will be available in each power board's User Manual. 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 3   MCEWizard setup overview table

Page	Parameter	Value	Comment
Welcome Page	Power Board selecting	MADK power board name	If no, select EVAL-M1-05-65D to modify
Options Page	Motor 1 Shunt Configuration	100mΩ	Single shunt
	Hall Sense Configuration	Refer to the Motor Parameters	None Hall by default
	Script Function Options	Enable or Disable	Disable by default
Question 3	Controller Supply Voltage	3.3V	
Question 19	Max DC Bus Voltage	420V	
Question 23	DC Bus Sensing High Resistor	2MΩ	
Question 24	DC Bus Sensing Low Resistor	Refer to control board user manual	13.3kΩ by default
Question 63	GateSense Low-Side Devices	High is true	High is true by default
Question 64	GateSense High-Side Devices	High is true	High is true by default
Script Edit Page	Script Configuration	ADC pin and GPIO pin Configuration	Refer to the "Script For MCE 2.0 User Guide"

Page	Parameter	Value	Comment
	Script Coding	Script File Operation and Script Text Edit	Refer to the "Reference Manual" and the "Application Guide"

Note: Please refer to the following link for more detailed information about Edit Script File.

1. *Reference Manual: Page 44-58:2.5 Script Engine*
   -Infineon MCESW RM UM v01_01 EN.pdf
2. *Application Guide*
   -Infineon AN2018 27_How_to_Use_iMOTION_Script_Language AN

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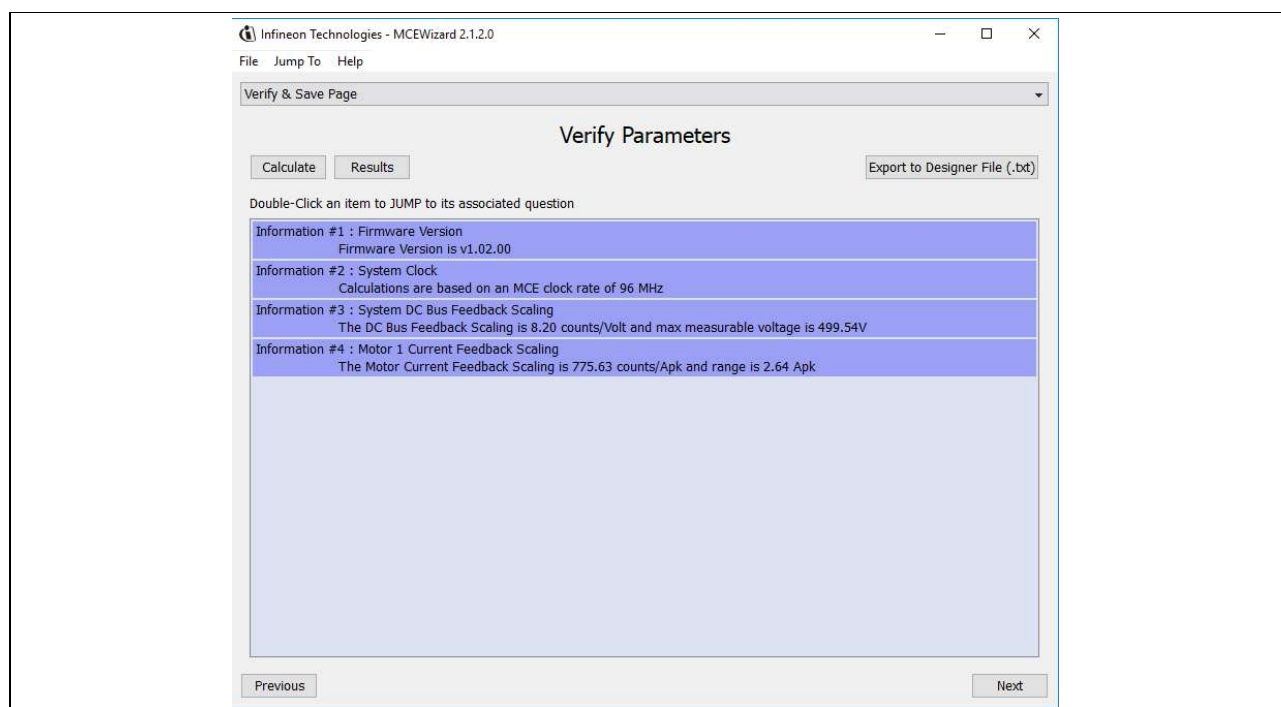

Figure 9   Verify and Save page for MCEWizard

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.

3.6   MCEDesigner setup overview

After installing MCEDesigner installer, there is a shortcut for MCEDesigner on Windows desktop. Double click the shortcut to open MCEDesigner and then open "IMC101T_xx.irc" file.
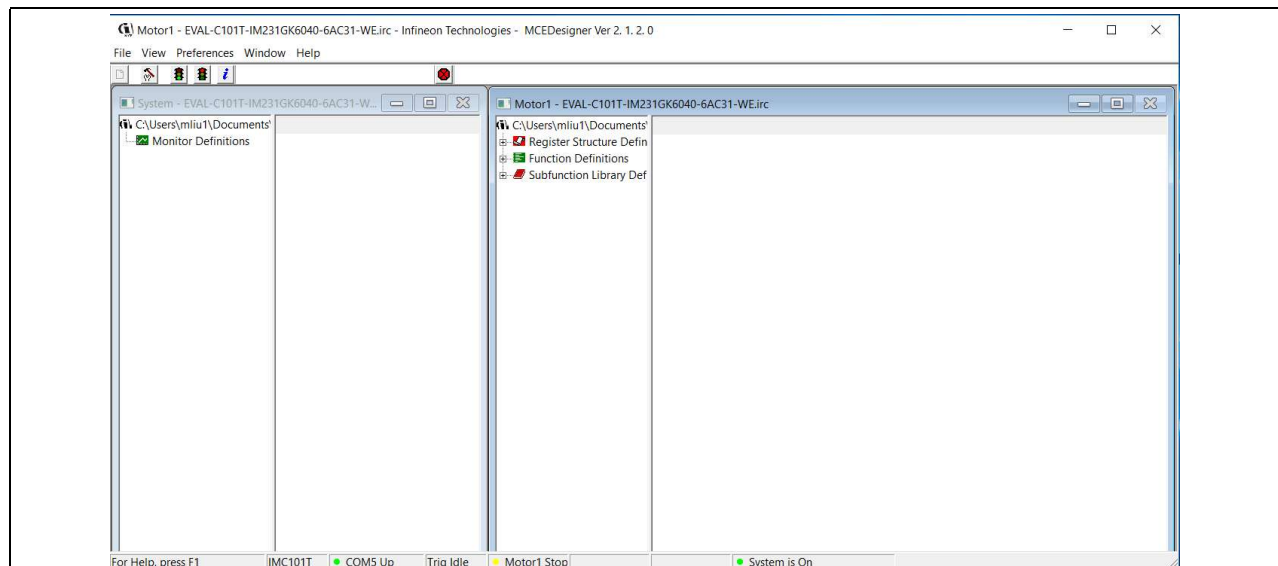

Figure 10   MCEDesigner's Main Display for EVAL-M1-101T

To program system drive parameters into IMC101T-T038, please click "Tools" menu and select "Programmer" in the pull down list. The pop-up window "Program IMC controller" will show up as in Figure 11. Click on the "Program Parameters" radio button (this is the default option), and then select the Drive System Parameter file created using MCEWizard by clicking on "Browse". Finally, click on the "Start" button to program the parameter file into the IMC101T-T038 IC.
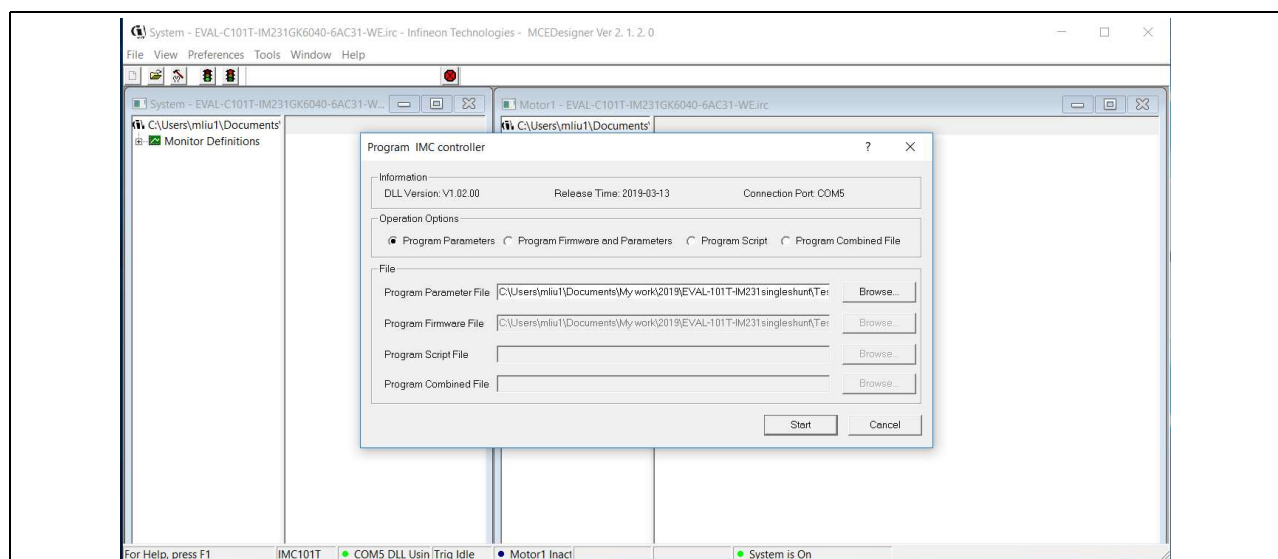

Figure 11   "Program IMC Controller" pop-up window

After Drive System Parameter file has been programmed into IMC101T 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

speeds, modify drive parameters and many other functions. Please refer to the MCEDesigner documentation for more details.

To program new firmware and Drive System Parameter into IMC101T-T038, please click "Tools" menu and select "Programmer" in the pull down list. The pop-up window "Program IMC controller" will show up as in Figure 12. Click on the "Program Firmware and Parameter" radio button, and select the Drive System Parameter file created using MCEWizard by clicking on the "Browse" button on the row of "Program Parameter File", and then select the firmware file by clicking on the "Browse" button on the row of "Program Firmware File". Finally, click on the "Start" button to program the parameter file into the IMC101T-T038 IC.
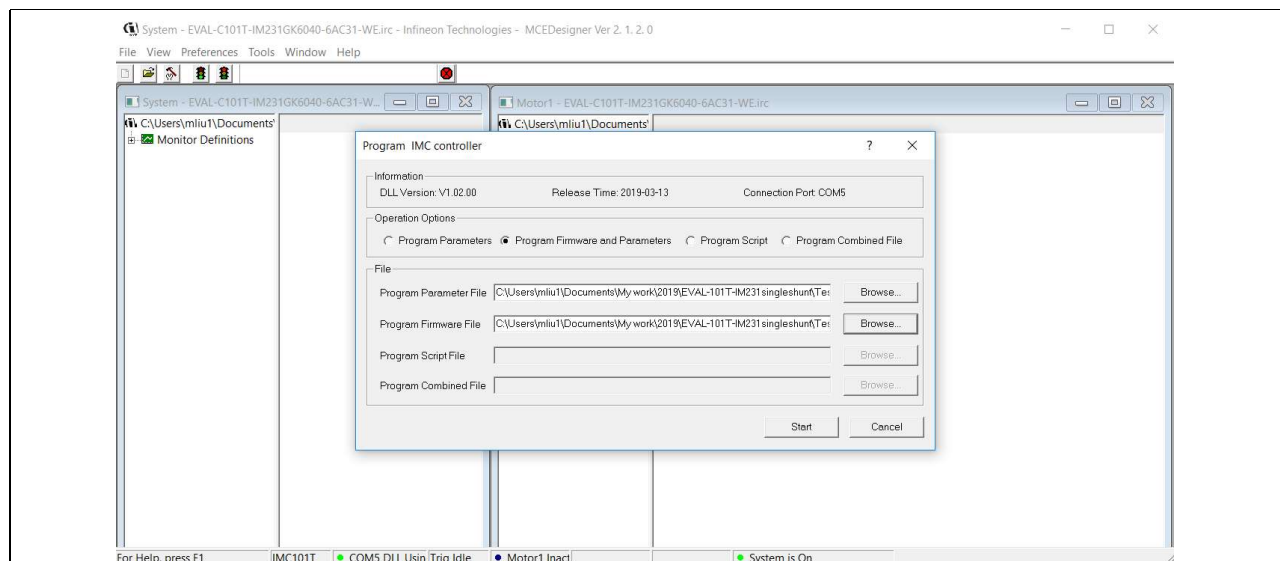

Figure 12   Program Firmware and Parameter in "Program IMC Controller" pop-up window

Note: All latest firmware file for different type of iMOTION^{TM} control ICs are available for download via Infineon iMOTION^{TM} website http://www.infineon.com/iMOTION.

4 Pin assignments

General information about the connectors of the EVAL-C101T-IM231 evaluation board is described below.

Table 4 provides the pin assignments of the J2.

Table 4   J2-iMOTION Link interface

S. No.	Pin	Details
1	TXD0	Output, Transmit data from IMC101T
2	RXD0	Input, Receive data to IRMCF188
3	+3.3V	On board 3.3 V supply
4	GND	Ground
5	GND	Ground
6	+3.3V	On board 3.3 V supply
7	RXD1	Input, Receive data to IMC101T
8	TXD1	Output, Transmit data from IMC101T

Table 5 provides the pin assignments of the AC line connector J1.

Table 5   J1- AC Line connector

S. No.	Pin	Details
1	L	AC line input(160 V~265 V)
2	N	AC neutral input
3	EARTH	Earth ground

Table 6 denotes the details of the motor side connector J3.

Table 6   J3-Motor side connector

S. No.	Pin	Details
1	U	Connected to motor phase U
2	V	Connected to motor phase V
3	W	Connected to motor phase W

5   Schematics and Layout

To meet individual customer requirements and make the EVAL-C101T-IM231 evaluation board a basis for development or modification, all necessary technical data like schematics, layout and components are included in this chapter.

5.1   EMI filter circuit

Figure 13 depicts the schematic from the AC line input connector J1 to the rectified DC bus voltage. This circuitry includes a passive EMI filter consisting of elements CX1, CX2, L1, CX3, CX4, CY1 and CY2. D1, D2, D3, D4 rectifier block, and reducing conduct loss in steady state.
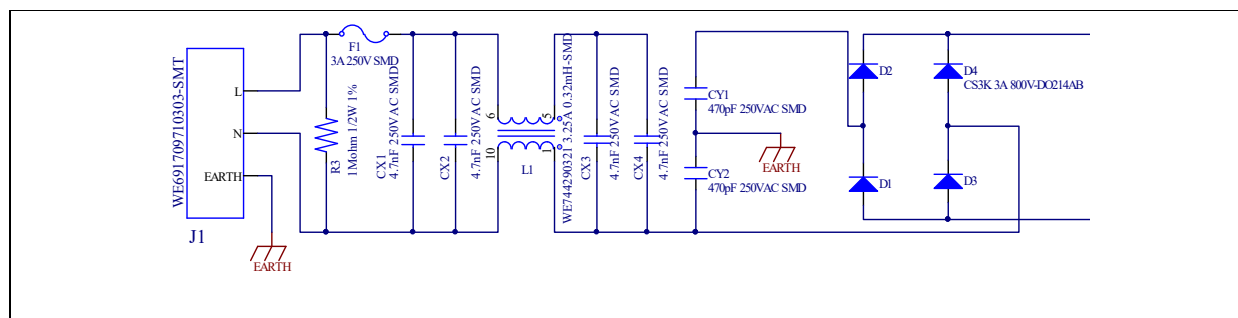

Figure 13   The schematic for AC/DC section and EMI of the EVAL-C101T-IM231 evaluation board

5.2 Inverter section using CIPOS^{TM} Micro IPM

Inverter section are implemented using the CIPOS^{TM} Micro IPM as sketched in Figure 14. The CIPOS^{TM} module includes 600 V 3-phase inverter including gate drivers & bootstrap function, and low VECTRENCHSTOP^{TM} IGBT6.

The three capacitors C20, C27 and C32 are used as bootstrap capacitors to provide the necessary floating supply voltages V$_{BS1}$, V$_{BS2}$ and V$_{BS3}$ respectively.
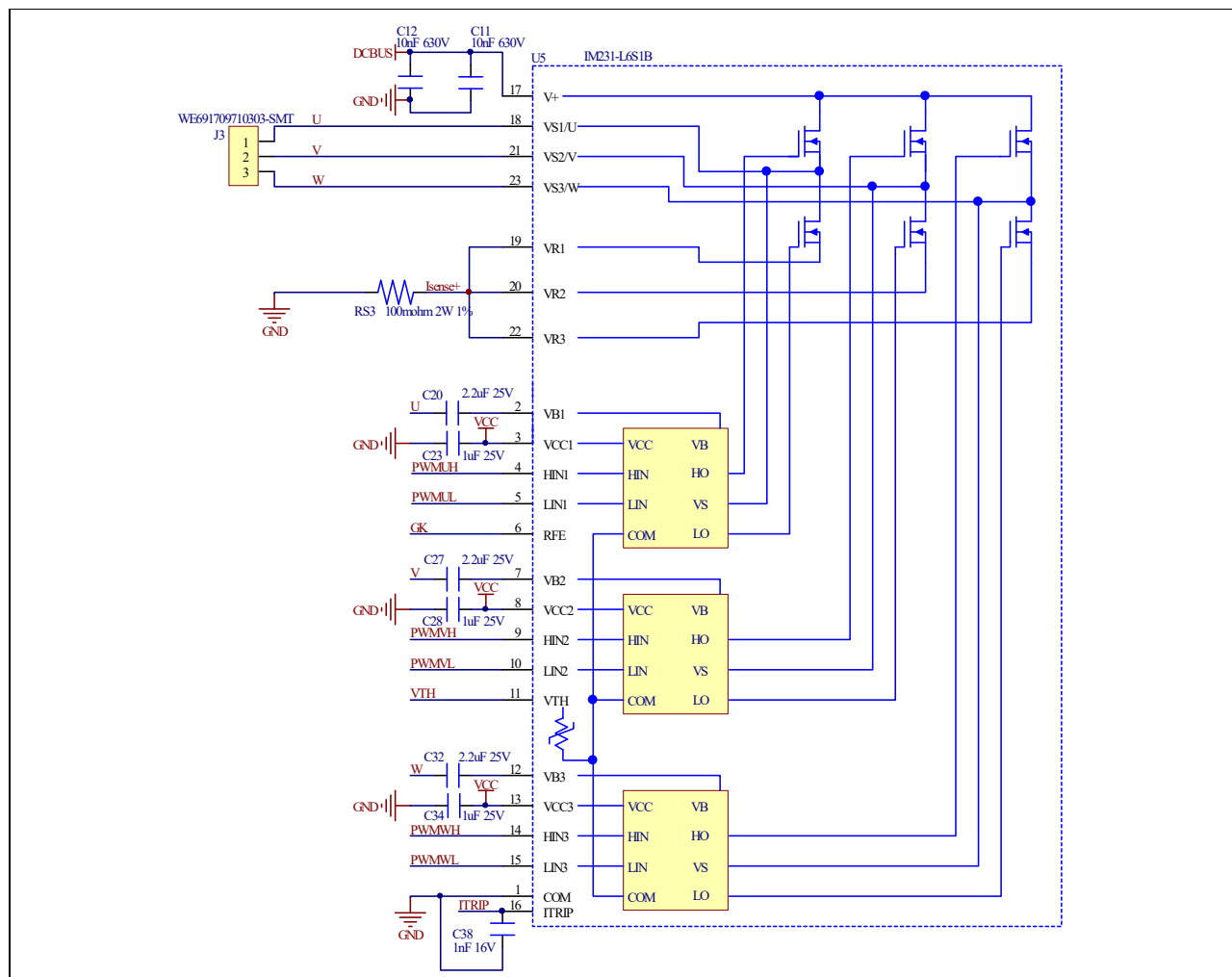

Figure 14   The schematic of 3-phase inverter section using CIPOS^{TM} Micro IPM on the EVAL-C101T-IM231 evaluation board

5.3 IMC101T-T038 Schematic Overview

Figure 15 shows the schematic of EVAL-C101T-IM231 evaluation board with IMC101T-T038 controller.
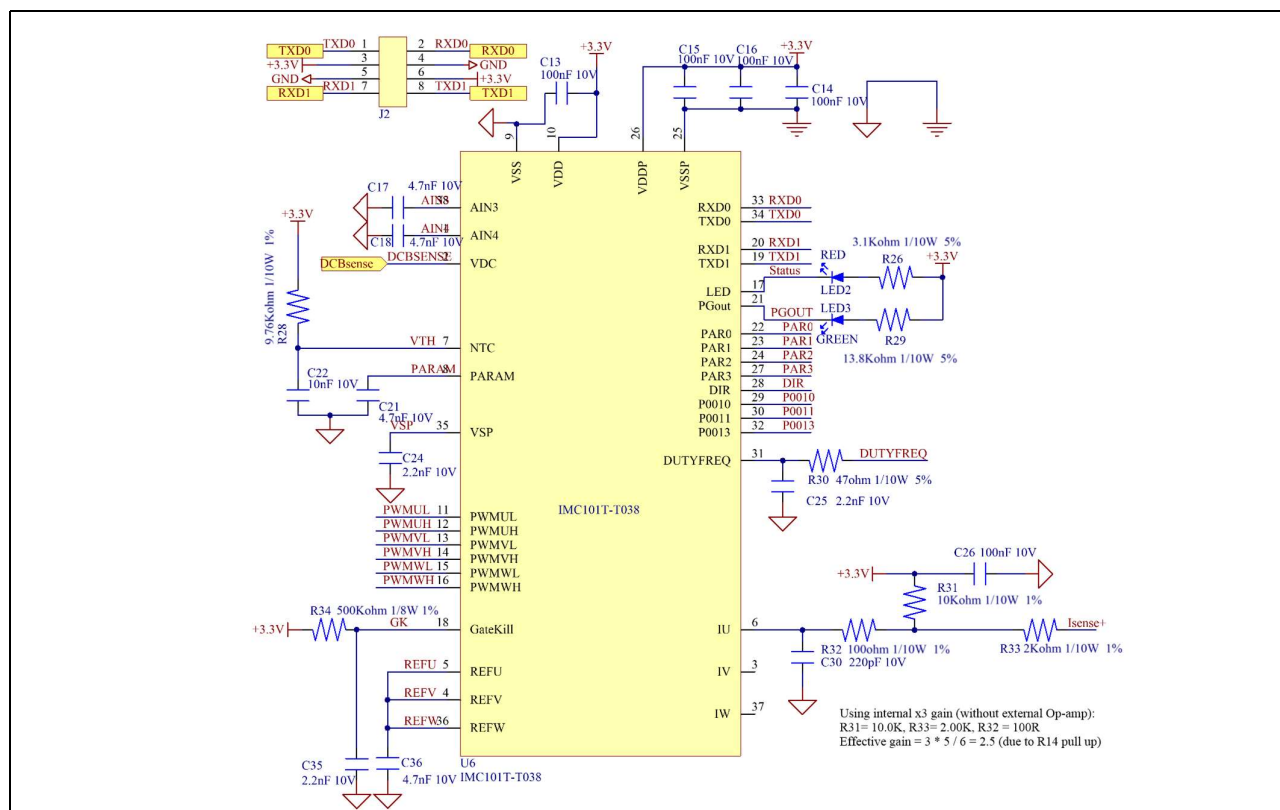

Figure 15   The schematics for the EVAL-C101T-IM231 evaluation board

5.4　　　Auxiliary power supply

Figure 16　depicts the schematic of the auxiliary power supply available on the EVAL-C101T-IM231 board. The circuit includes the latest CoolSET 5 of Infineon and fly back topology, directly output 15V and 3.3V. V_{CC} is connected to the gate drivers inside the CIPOS™ IPM.
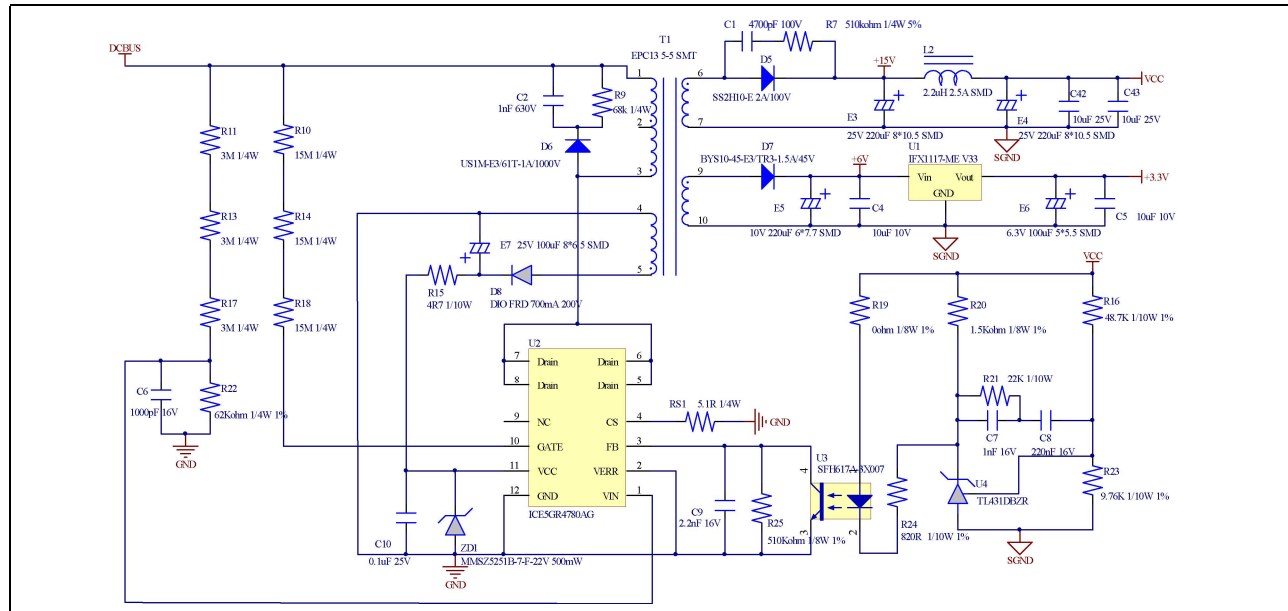

Figure 16　Power supply section of the EVAL-C101T-IM231 evaluation board

5.5　　　Inverter over current protection circuit

Figure 17 shows the Inverter over current protection circuitry. The open collector output of comparator U7 is pulled up to 3.3V by resistor R42.
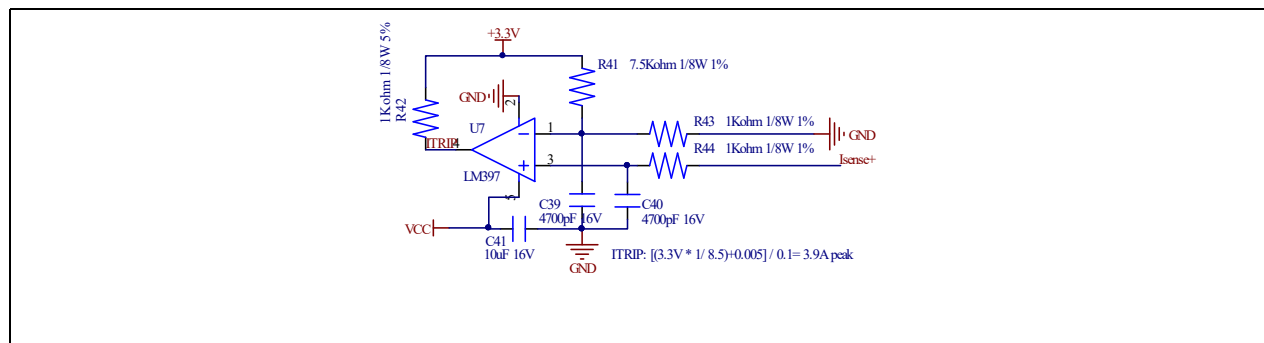

Figure 17　Inverter section over current protection circuit of the EVAL-C101T-IM231 evaluation board

The comparator threshold can be set through the voltage divider provided by resistors R41 and R43. By default for single shunt application, R41 is 7.5kΩ and R43 is 1KΩ.

$$\text{Itrip}_{\_Inverter}=\frac{5.1V*\frac{1k\Omega}{7.5k\Omega+1k\Omega}}{100\ m\Omega}=3.9A$$

5.6 PCB Layout

The layout of this board can be used for different voltage or power classes of power board. The PCB has two electrical layers with 35µm copper by default and its size is 130 mm × 110 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 18 illustrates the top assembly print of the evaluation board.
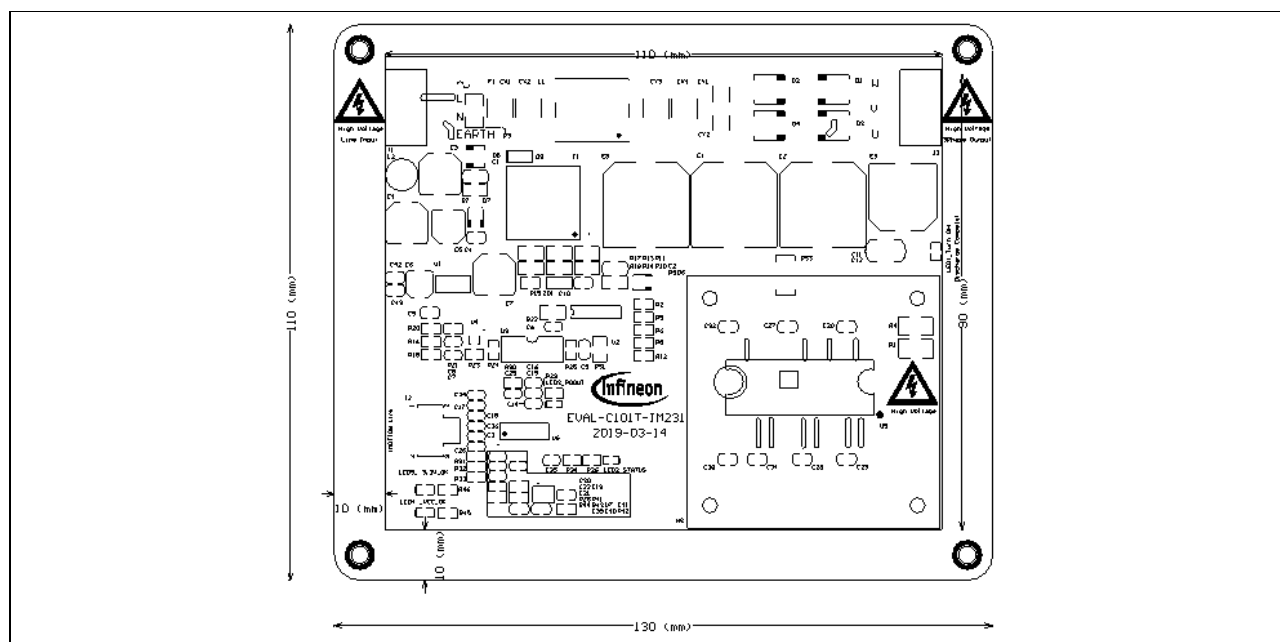

Figure 18   Top overlay print of the EVAL-C101T-IM231 evaluation board

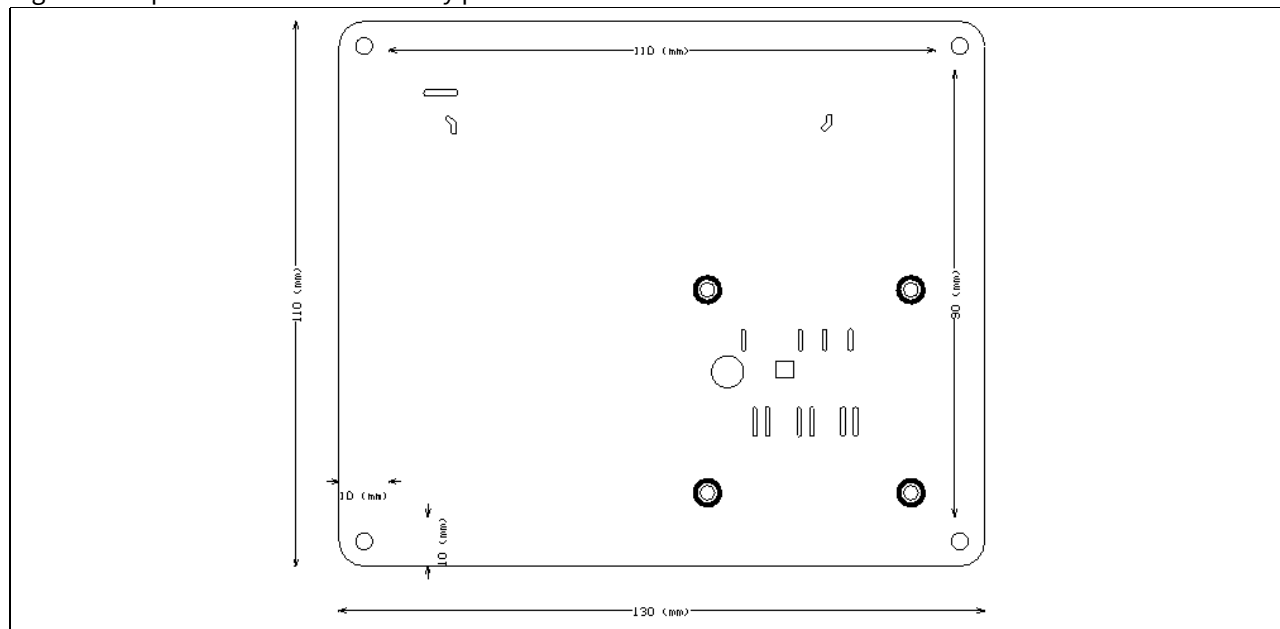Figure 19 depicts the bottom assembly print of the evaluation board.

Figure 19   Bottom overlay print of the EVAL-C101T-IM231 evaluation board

The top layer routing of the PCB is provided in Figure 20.
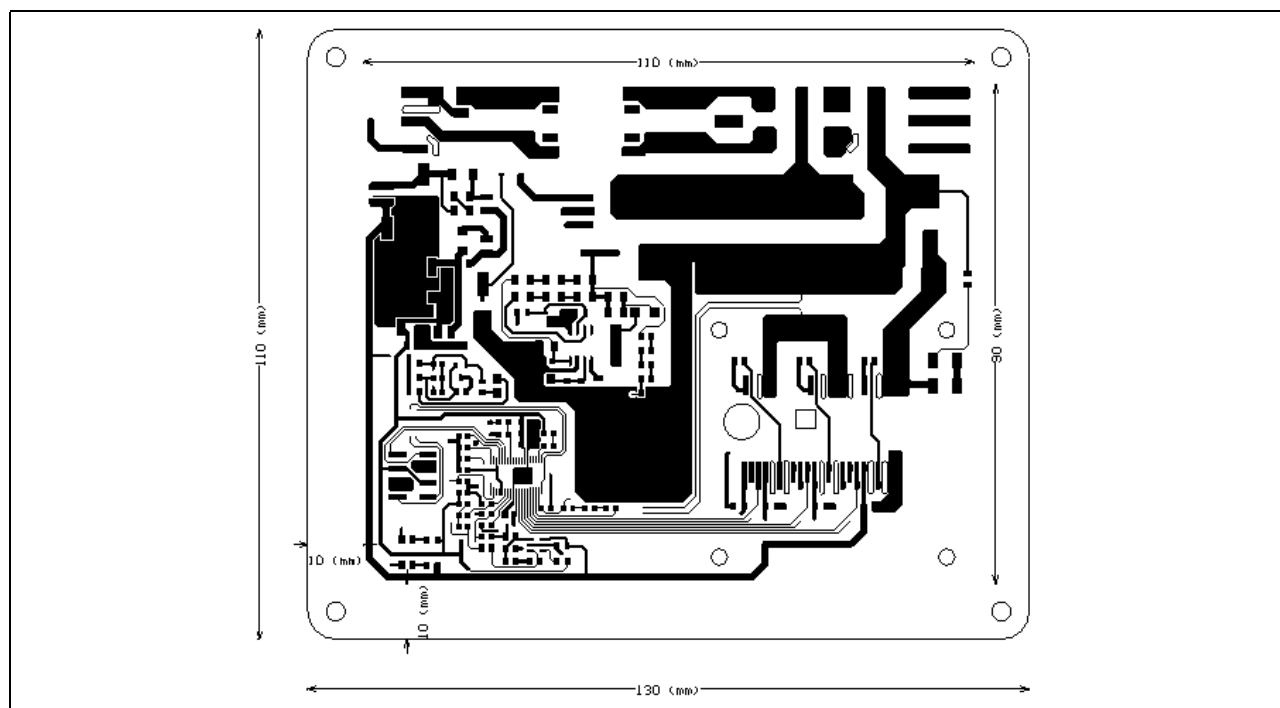

Figure 20   Top layer routing of the EVAL-C101T-IM231

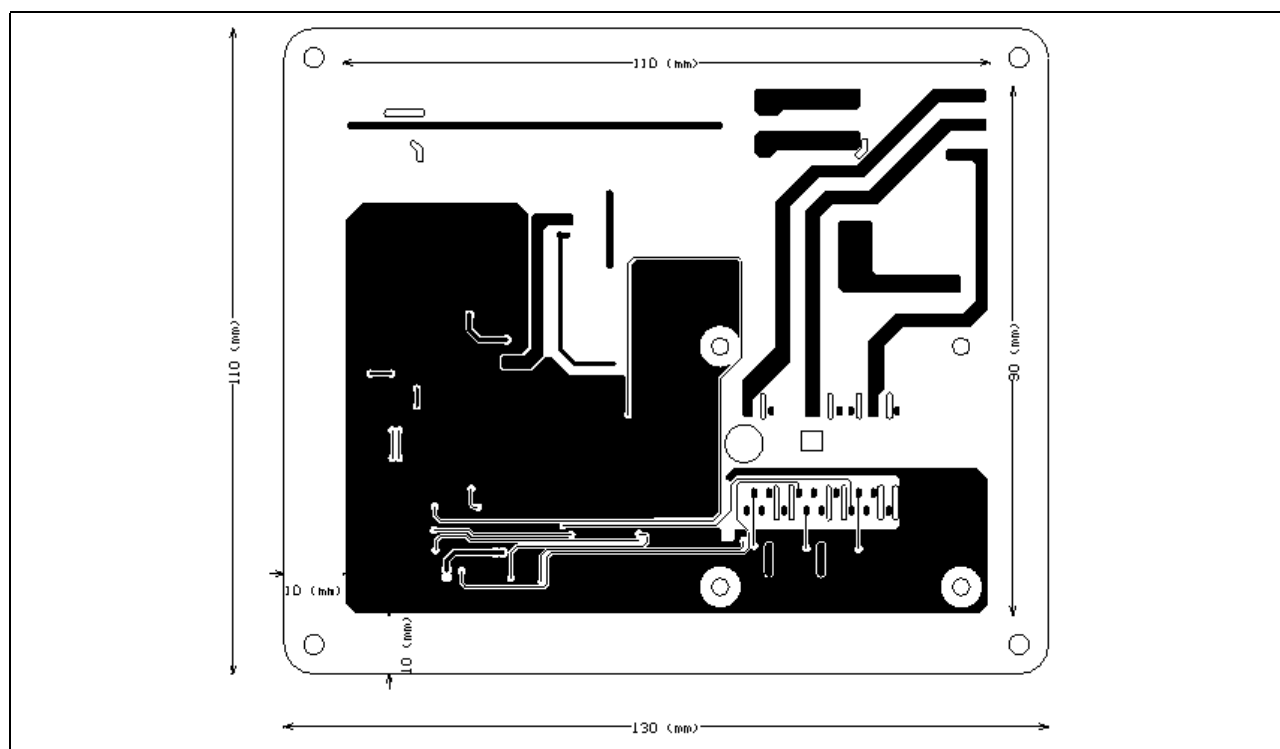Figure 21 illustrates the bottom layer routing of the PCB.

Figure 21   Bottom layer routing of the EVAL-C101T-IM231

6 Bill of Materials of EVAL-C101T-IM231

Table 7 provides the complete bill of materials for the EVAL-C101T-IM231 board.

Table 7   Bill of materials

No.	Qty.	Part description	Designator	Part Number	Manufacturer
1	1	CAP CER 4700PF 100V X7R 1206	C1	885012208110	Wurth Electronics Inc.
2	1	CAP CER 1000PF 630V C0G/NP0 1206	C2	885342008005	Wurth Electronics Inc.
3	5	CAP CER 4700PF 10V X7R 0603	C3, C17, C18, C21, C36	885012206012	Wurth Electronics Inc.
4	2	CAP CER 10UF 10V X5R 0805	C4, C5	885012107010	Wurth Electronics Inc.
5	1	CAP CER 1000PF 16V C0G/NP0 0603	C6	885012006029	Wurth Electronics Inc.
6	1	CAP CER 1000PF 16V C0G/NP0 0603	C7	885012006029	Wurth Electronics Inc.
7	1	CAP CER 0.22UF 16V X7R 0603	C8	885012206048	Wurth Electronics Inc.
8	1	CAP CER 2200PF 16V NP0 0805	C9	885012007023	Wurth Electronics Inc.
9	1	CAP CER 0.1UF 25V X7R 0805	C10	885012207072	Wurth Electronics Inc.
10	2	CAP CER 10000PF 630V C0G 1812	C11, C12	C4532C0G2J103J160KA	TDK Corporation
11	5	CAP CER 0.1UF 10V X7R 0603	C13, C14, C15, C16, C26	885012206020	Wurth Electronics Inc.
12	3	CAP CER 2.2UF 25V X5R 0805	C20, C27, C32	885012107016	Wurth Electronics Inc.
13	1	CAP CER 10000PF 10V X7R 0603	C22	885012206014	Wurth Electronics Inc.
14	3	CAP CER 1UF 25V X5R 0805	C23, C28, C34	885012107015	Wurth Electronics Inc.
15	3	CAP CER 2200PF 10V NP0 0603	C24, C25, C35	885012006015	Wurth Electronics Inc.
16	1	CAP CER 220PF 10V X7R 0603	C30	885012206004	Wurth Electronics Inc.
17	1	CAP CER 1000PF 16V NP0 0805	C38	885012007021	Wurth Electronics Inc.
18	2	CAP CER 4700PF 16V X7R 0805	C39, C40	885012207037	Wurth Electronics Inc.
19	1	CAP CER 10UF 16V X5R 0805	C41	885012107014	Wurth Electronics Inc.
20	2	CAP CER 10UF 25V X5R 0805	C42, C43	C2012X5R1E106K085AC	TDK Corporation
21	4	CX 4.7nF 250VAC-SMD	CX1, CX2, CX3, CX4	885352214001	Wurth Electronics Inc.
22	2	CY 470pF 250VAC SMD	CY1, CY2	885352211001	Wurth Electronics Inc.
23	2	DIODE GEN PURP 800V 3A DO214AB	D1, D2, D3, D4	S3K-E3/9AT	Vishay Semiconductor Diodes Division
24	2	DIODE SCHOTTKY 100V 2A DO220AA	D5	SS2PH10-M3/84A	Vishay Semiconductor Diodes Division

No.	Qty.	Part description	Designator	Part Number	Manufacturer
25	2	DIODE GEN PURP 1KV 1A DO214AC	D6	US1M-E3/61T	Vishay Semiconductor Diodes Division
26	2	DIODE SCHOTTKY 45V 1.5A DO214AC	D7	BYS10-45-E3/TR3	Vishay Semiconductor Diodes Division
27	2	DIO FRD 700mA 200V SOD-123-2P 25nS SMD ROHM	D8	RF071MM2STR	Rohm Semiconductor
28	1	CAP AL 15uF 450V 16*17 SMD	E1, E2, E8	865061463005	Wurth Electronics Inc.
29	1	CAP AL LD 25V 220uF M 8*10.5 SMD	E3, E4	865080453013	Wurth Electronics Inc.
30	1	CAP AL LD 10V 220uF M 6.3*7.7 SMD	E5	865080245009	Wurth Electronics Inc.
31	1	CAP AL LD 6.3V 100uF M 5*5.5 SMD	E6	865080142007	Wurth Electronics Inc.
32	2	CAP AL LD 25V 100uF M 8*6.5	E7	865080449011	Wurth Electronics Inc.
33	2	CAP AL 15uF 450V 12.5*14 SMD	E9	865061462004	Wurth Electronics Inc.
34	3	FUSE BOARD MOUNT 250V 3.0A	F1	F6632DKR-ND	Littelfuse Inc.
35	1	WE WR-TBL Serie 7097-5.0mm-3P SMT	J1, J3	691709710303	Wurth Electronics Inc.
36	7	CONN HEADER SMD 8POS 2.54MM	J2	61000821121	Wurth Electronics Inc.
37	1	CMC 320UH 3.25A 2LN SMD	L1	744290321	Wurth Electronics Inc.
38	1	FIXED IND 2.2UH 2.5A 71 MOHM SMD	L2	744773022	Wurth Electronics Inc.
39	5	LED RED CLEAR 0805 SMD	LED1	150080RS75000	Wurth Electronics Inc.
40	1	LED RED CLEAR 0603 SMD	LED2	150060RS75000	Wurth Electronics Inc.
41	2	LED GREEN CLEAR 0603 SMD	LED3	150060GS75000	Wurth Electronics Inc.
42	2	LED GREEN CLEAR 0805 SMD	LED4, LED5	150080GS75000	Wurth Electronics Inc.
43	3	RES SMD 100Kohm 1/2W 2010	R1, R4	RMCF2010JT300R	Yageo
44	2	RES SMD 500Kohm 1/8W 0805	R2, R5, R6, R8	RNCF0805BTE500K	Stackpole Electronics Inc
45	2	RES SMD 1Mohm 1/2W 2010	R3	RT2010DKE071ML	Yageo
46	2	RES SMD 510Kohm 1/4W 1206	R7	RC0603JR-077K68L	Yageo
47	6	RES SMD 1/4W 68kohm F 1206	R9	HVCB0805FKC1M00	Stackpole Electronics Inc.
48	4	RES SMD 1/4W 15M 1206	R10, R14, R18	RC0603FR-074K87L	Yageo
49	1	RES SMD 1/4W 3M F 1206	R11, R13, R17	RC0805FR-074K99L	Yageo
50	1	RES SMD 13.3K OHM 0.1% 1/8W 0805	R12	RT0805BRD0713K3L	Yageo
51	1	RES SMD 1/10W4.7ohm F 0603	R15	RC0603JR-074R7L	Yageo

No.	Qty.	Part description	Designator	Part Number	Manufacturer
52	1	RES SMD 1/10W 48.7Kohm F 0805	R16, R34	RC0805FR-074K87L	Yageo
53	1	RES SMD 0ohm 1/8W 0805	R19	RC0805JR-070RL	Yageo
54	2	RES SMD 1.5Kohm 1/8W 0805	R20	RC0805JR-071K5L	Yageo
55	4	RES SMD 1/10W 22Kohm F 0603	R21	RC0603FR-0722KL	Yageo
56	2	RES SMD 58.3Kohm 1/4W 1206	R22	TNPW120658K3BEEA	Vishay Dale
57	1	RES SMD 1/10W 9.76Kohm F 0603	R23	RC0603FR-079K76L	Yageo
58	1	RES SMD 1/10W 820ohm F 0603	R24	RC0603JR-07820RL	Yageo
59	1	RES SMD 510Kohm 1/8W 0805	R25	RC0805JR-07510KL	Yageo
60	1	RES SMD 3.1Kohm 1/10W 0603 5%	R26	M55342K12B3E10RWSV	Vishay Dale
61	1	RES SMD 4.87Kohm 1/10W 0603 1%	R28	RT0603BRD074K87L	Yageo
62	1	RES SMD 13.8Kohm 1/10W 0603 5%	R29	RT0603BRD0713K8L	Yageo
63	1	RES SMD 47ohm 1/10W 0603 5%	R30	RT0603BRD0747RL	Yageo
64	1	RES SMD 10Kohm 1/10W 0603 1%	R31	RT0603DRD0710KL	Yageo
65	1	RES SMD 100ohm 1/10W 0603 1%	R32	RT0603DRD07100RL	Yageo
66	2	RES SMD 2Kohm 1/10W 0603 1%	R33	RC0603FR-072KL	Yageo
68	2	RES SMD 7.5Kohm 1/8W 0805	R41	RT0805BRD077K5L	Yageo
70	1	RES SMD 1Kohm 1/8W 0805	R43, R44, R42	RT0805BRD071KL	Yageo
71	1	RES SMD 15Kohm 1/8W 0805	R45	RT0805BRD0715KL	Yageo
72	1	RES SMD 9.1Kohm 1/8W 0805	R46	RC0805JR-079K1L	Yageo
73	1	RES SMD 1/4W 3ohm F 1206	RS1	RC1206FR-073RL	Yageo
74	1	RES 0.1 OHM 1% 1W 2512	RS3	RL2512FK-070R1L	Yageo
75	2	EPC13 5-5 SMT	T1		
76	1	IC REG LINEAR 3.3V 1A SOT223-4	U1	IFX1117MEV33HTMA1	Infineon Technologies
77	1	125KHZ OFFLINE 800V 4.7 DSO12	U2	ICE5GR4780AGXUMA1	Infineon Technologies
78	1	OPTOISOLATOR 5.3KV TRANS 4SMD	U3	SFH617A-3X007T	Vishay Semiconductor Opto Division
79	1	IC VREF SHUNT ADJ SOT23-3	U4	TL431IDBZR	Texas Instruments
80	2	CIPOS MICRO IPM	U5	IM231L6S1BALMA1-ND	Infineon Technologies
81	1	IC MOTOR CONTROLLER 3V-5.5V TSSOP-38	U6	IMC101TT038XUMA1	Infineon Technologies
82	1	IC COMPARATOR VOLT SGL SOT23-5	U7	LM397MF/NOPB	Texas Instruments
83	1	DIODE ZENER 22V 500MW SOD123	ZD1	MMSZ5251B-7-F	Diodes Incorporated

7   Reference

[1] Datasheet of Infineon-IMC100-DS-v01_03-EN

[2] Datasheet of Infineon-IM231-L6S1B_T2B-DS-v02_00-EN

[3] 2018-11_AN2018-36_EVAL-M1-IM231-A User Manual_V1.0_EN

Note: Above all reference materials are available for download on Infineon's website
http://www.infineon.com/iMOTION

Revision History

Major changes since the last revision

Version number	Revision Date	Revision description
1.0	2019-07-30	First release

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