

EiceDRIVER™ 1EDI305xAS gate driver evaluation board

Z8F80536127

About this document

Scope and purpose

This document describes the EiceDRIVER™ gate driver 1EDI305xAS evaluation board. Refer to the corresponding data sheets [\[1\]](#) and [\[2\]](#).

Intended audience

This document is intended for application developers.

Important notice

Important notice

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Safety precautions

Safety precautions

Note: Please note the following warnings regarding the hazards associated with development systems.

Table 1 Safety precautions


	<p>Warning: ELECTRIC SHOCK HAZARD</p> <p>Contact can cause an electric shock. If a voltage above 60 V is applied to the evaluation board, then only persons trained in working with voltages above 60 V are allowed to handle the evaluation board. In addition, ensure that hazardous live parts are not accessible and that accessible live parts are not hazardous.</p>
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1 The board at a glance

1 The board at a glance

The EiceDRIVER™ gate driver 1EDI305xAS evaluation board is a versatile evaluation platform, which is compatible with both 1EDI3050AS and 1EDI3051AS variants. It features a two-half-bridge configuration in parallel.

See [Figure 1](#).

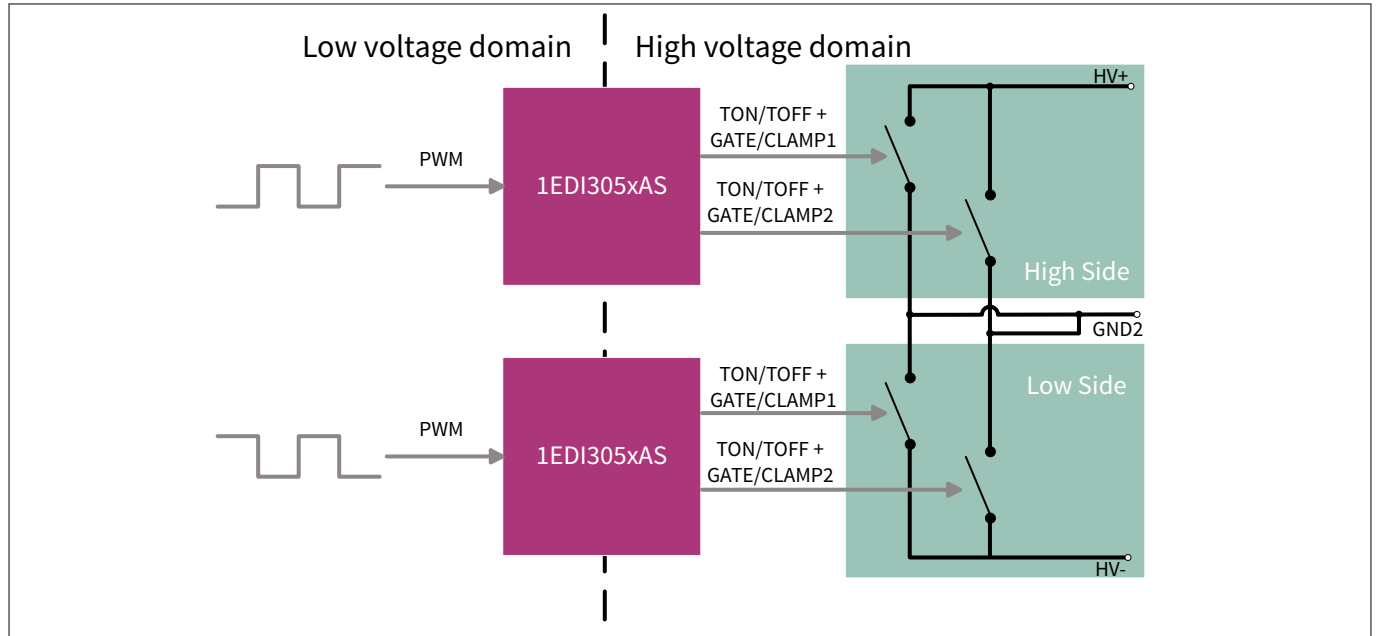


Figure 1 Board topology

1 The board at a glance

1.1 EiceDRIVER™ gate driver overview

The EiceDRIVER™ gate driver 1EDI305xAS is a high-voltage IGBT/SiC driver designed for automotive motor drives above 50 kW. The device is based on Infineon's Coreless Transformer (CT) technology, providing galvanic insulation between low voltage and high voltage domains. The device is designed to support 600 V, 750 V and 1200 V IGBT/SiC-MOSFET technologies. It is connected to a 5 V logic on the low voltage (primary) side. On the high voltage (secondary) side, the device is dimensioned to drive IGBTs/SiC-MOSFETs directly. Short propagation delays and controlled internal tolerances lead to a minimal distortion of the PWM signal. The device features an output stage of maximum 20 A peak current. In addition, there is a dual Miller clamping stage with typically 5 A integrated. It also supports an external clamp transistor drive. Safety functions are implemented in the device to support functional safety requirements at system level (according to ISO 26262). These integrated features ease the implementation of transition to safe-state. A flyback converter controller integrated to the primary side of the device supports the installation of the isolated supply domain.

Features

- Single-channel isolated IGBT/SiC driver using coreless transformer technology
- For IGBTs/SiC-MOSFETs up to 1200 V
- Integrated SPI
- CMTI up to 150 V/ns up to 1000 V
- 8 kV basic insulation according to DIN EN IEC 60747-17 (VDE 0884-17):2021-10
- Basic insulation according to UL 1577
- Integrated booster with up to 20 A peak current rail-to-rail split output
- Monitoring/clamping for power device driving
- Integrated flyback controller
- Safety inputs for primary ASC trigger and PWM control
- Optional secondary side ASC
- Propagation delay 60 ns typical
- Internal and external active Miller clamp supports unipolar switching
- Integrated dual ADC for temperature or DC-Link voltage measurement
- Integrated safety features to support ASIL D on system level:
 - Redundant DESAT and OCP protection
 - Differential over-current protection with matched impedance inputs
 - Gate and output stage monitoring
 - Shoot-through protection
 - LV/HV supply monitoring
 - Internal supervision
- ISO 26262 Safety Element out of Context for safety requirements up to ASIL B
- Green Product (RoHS compliant)

The key difference between the EiceDRIVER™ gate driver 1EDI3050AS and 1EDI3051AS is the number of the output channel "GATE/CLAMP x ($x = 1, 2$)", and corresponding functionality that rely on it, such as OCP, and AMCLP. 1EDI3050AS operates with disabled GATE/CLAMP2, while 1EDI3051AS operates with both GATE/CLAMP1 and GATE/CLAMP2. Another difference is that 1EDI3051AS does not have the ASCS functionality.

1 The board at a glance

1.2 Pin configuration

The pin assignment of both gate drivers is configured as shown in Figure 2. As depicted, the pins OCPP2, OCPN2, ASCS, AMCLP2, and GATE/CLAMP2 are all disabled in 1EDI3050AS.

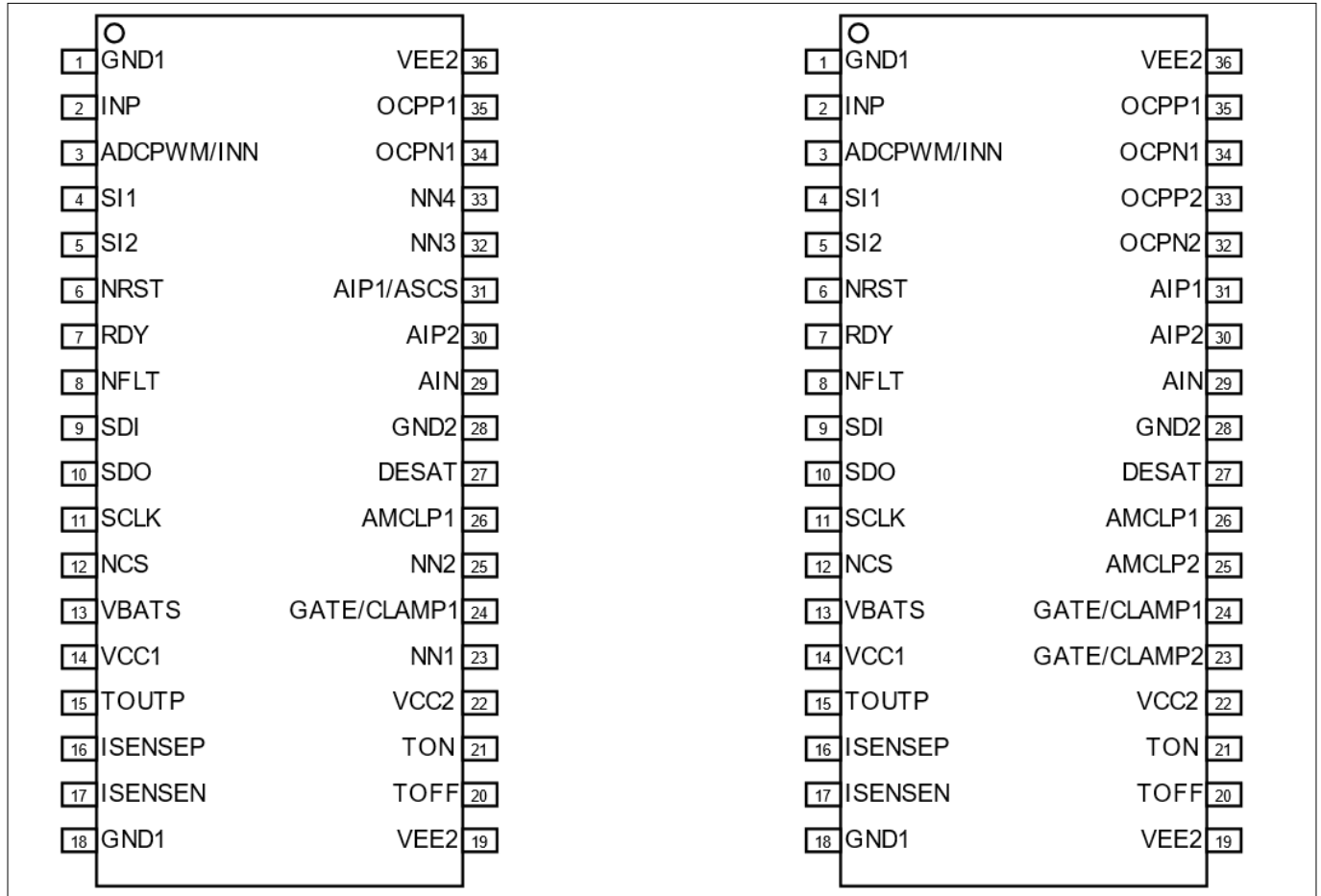


Figure 2 Pin assignment (left: 1EDI3050AS, right: 1ED3051AS)

1 The board at a glance

1.3 Block diagram

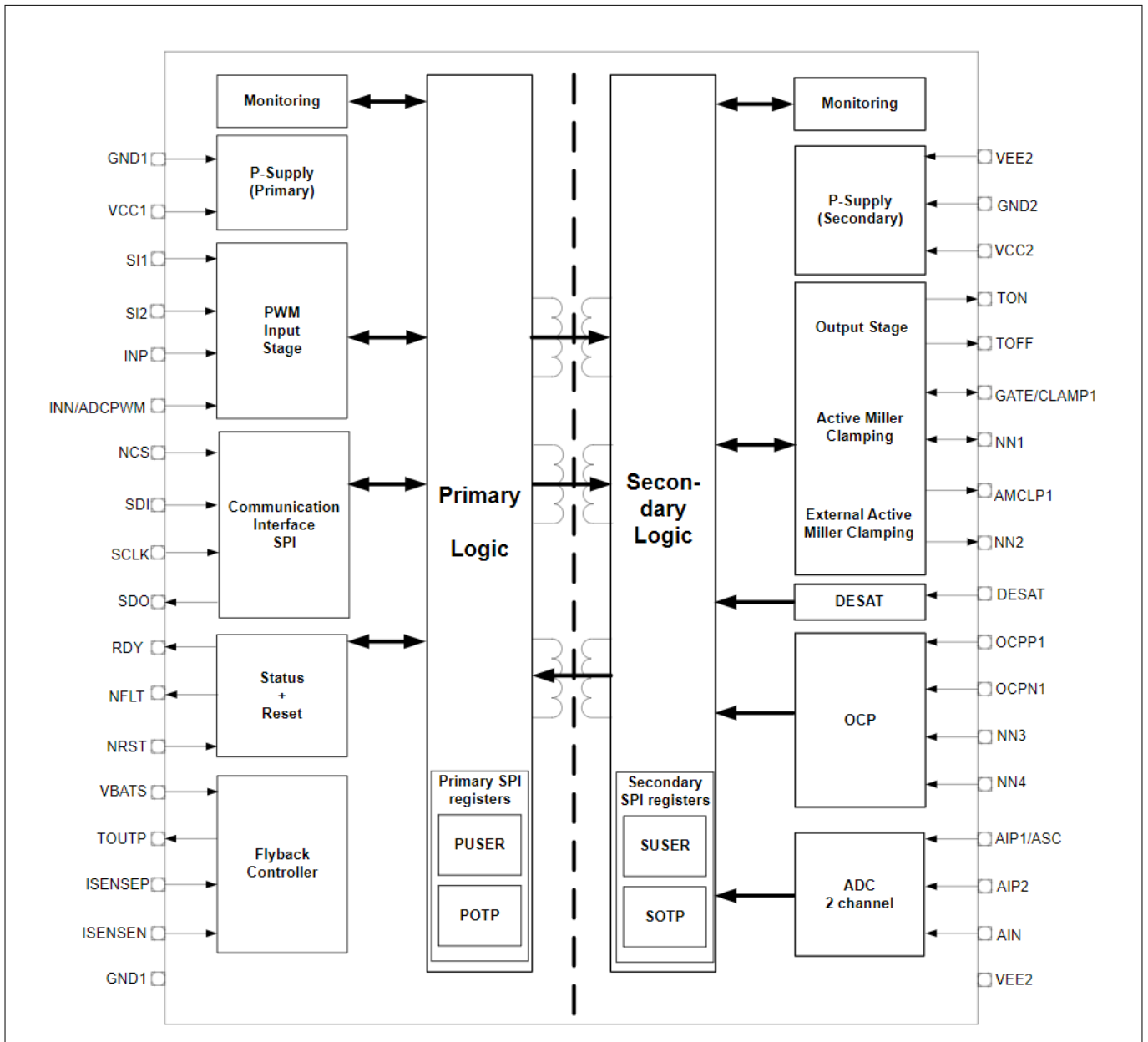


Figure 3 1EDI3050AS block diagram

The following external connections need to be done for correct operation of the device:

Table 2 Mandatory external measures for NNx (x = 1, 2, 3, 4) pins

Pin#	Pin name	External measure
23	NN1	Connect to pin GATE_CLAMP1
25	NN2	Open
32	NN3	Connect to NN4
33	NN4	Connect to GND2

1 The board at a glance

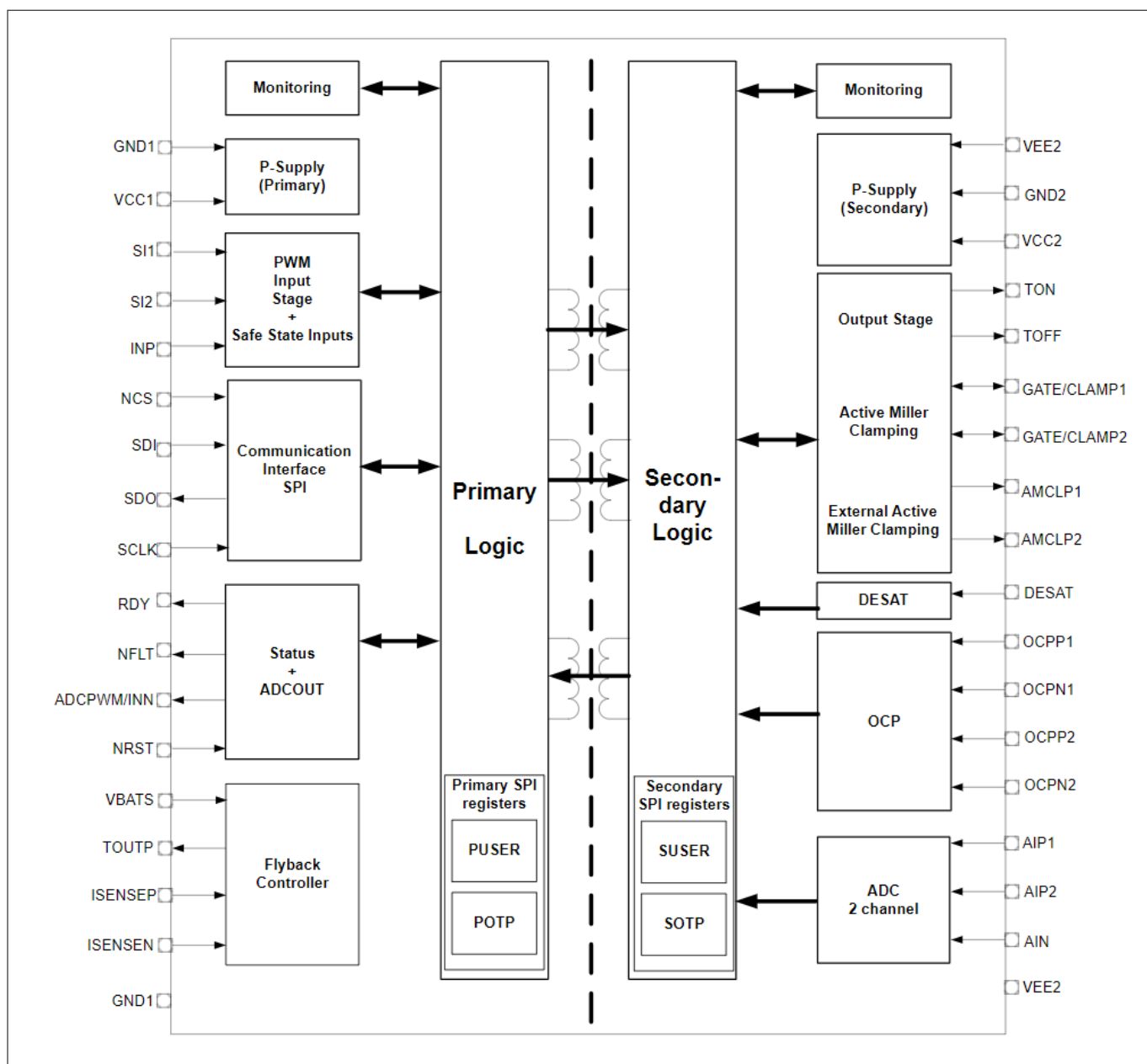


Figure 4 1EDI3051AS block diagram

1 The board at a glance

1.4 Operating modes

The EiceDRIVER™ gate driver 1EDI305xAS offers different operating modes, providing intrusive diagnostic features and the ability to enter a "safe-state" in case of a system failure. See Figure 5. For further details, refer to the data sheets [1] and [2].

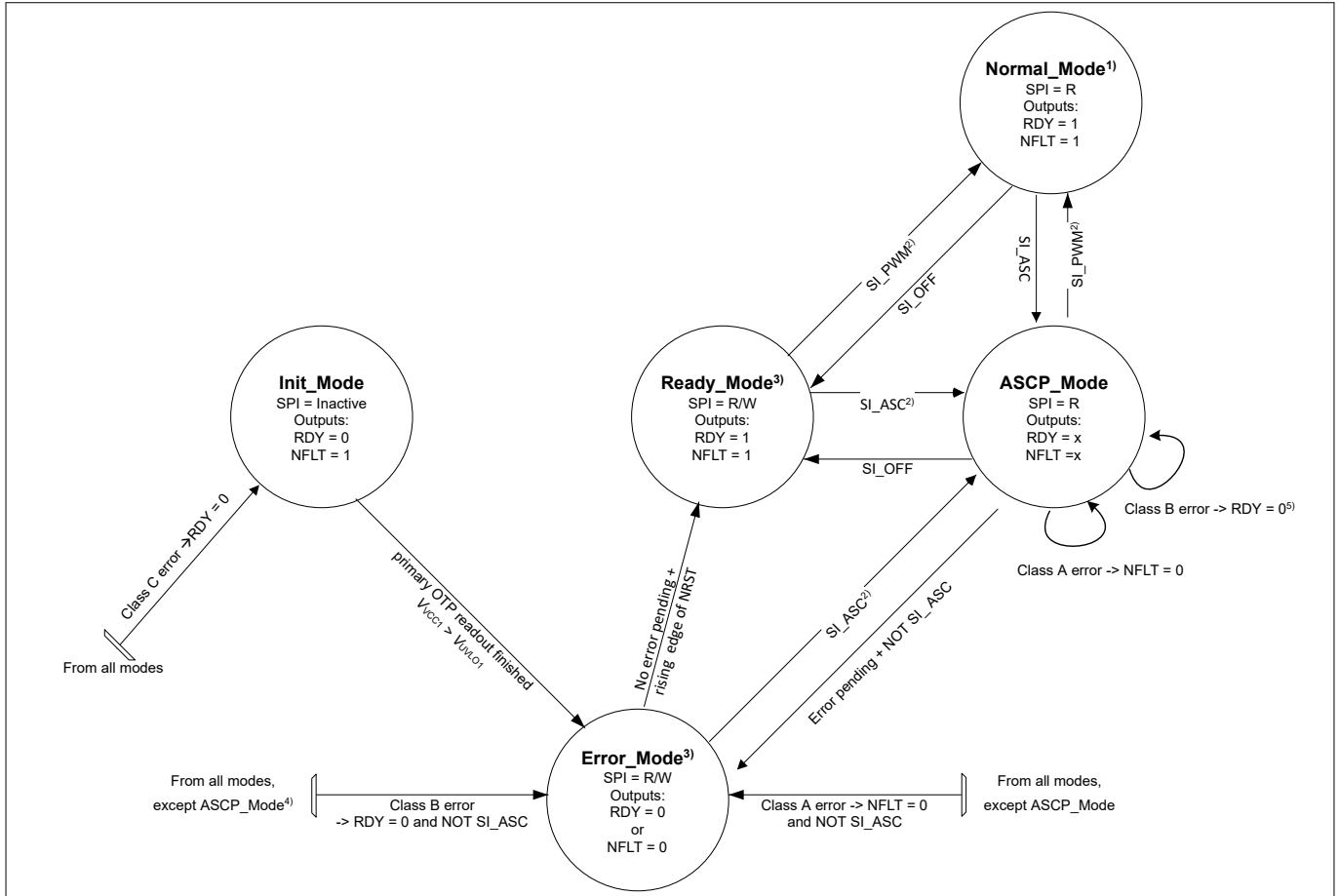


Figure 5 Operating modes diagram

2 Getting started

2 Getting started

The EiceDRIVER™ gate driver 1EDI305xAS evaluation board is recommended to be used with a PG-TO247-3 power device, such as AIMW120R080M1.

To toggle the gate driver output, perform the following steps:

1. Place the jumpers X7 and X18 to enable the hardware interlock and the shoot-through protection. See [Figure 6](#). For further details about jumpers, refer to [Chapter 3.5](#)

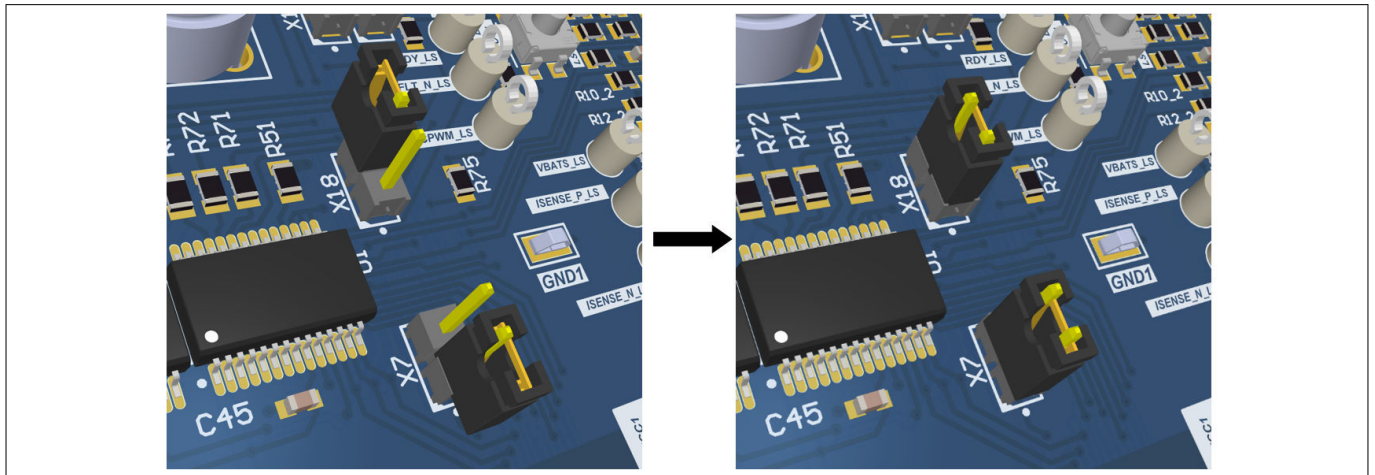


Figure 6 Jumper X7 and X18 connection

2. Short DESAT to GND with X13_1 and X13_2 on each channel to turn on TOUT when the power device is not connected. It leads to suppression of DESAT supervision. See [Figure 7](#). For further details about jumpers, refer to [Chapter 3.5](#)

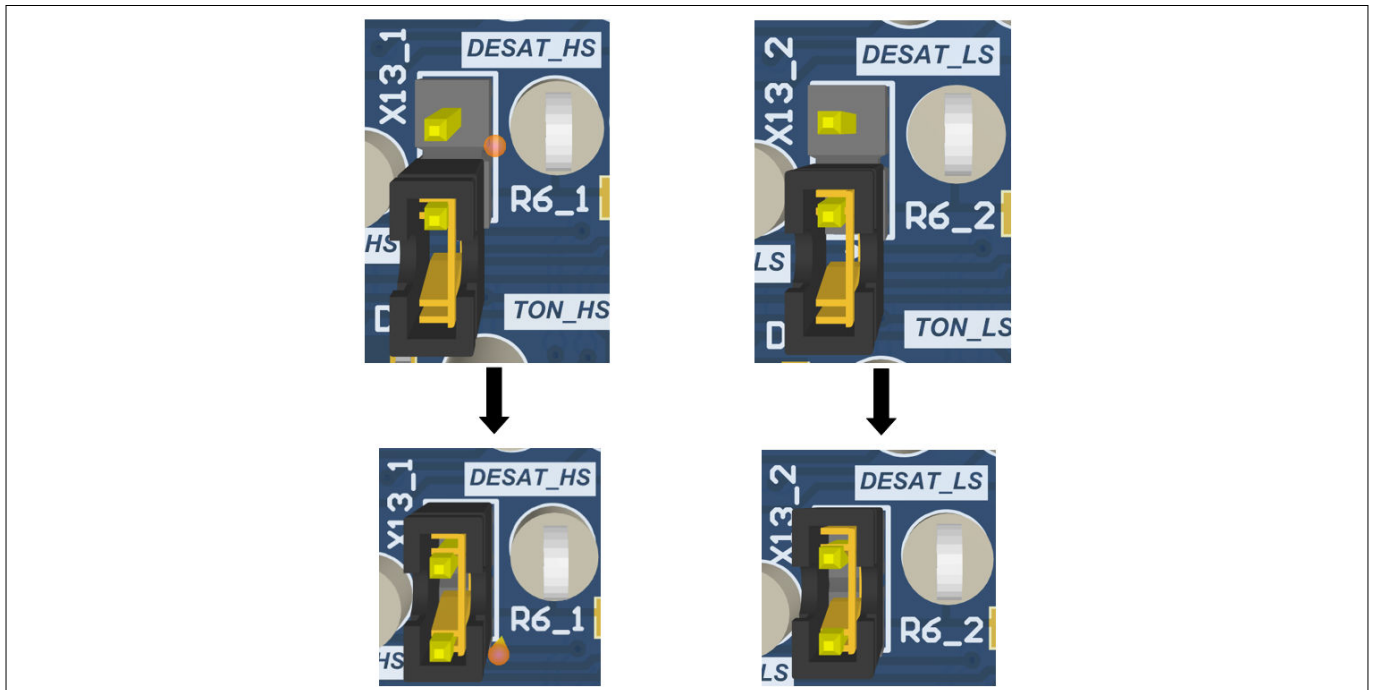


Figure 7 Jumper X13_1 and X13_2 connection

2 Getting started

3. Apply +12V to the banana sockets. See [Figure 8](#)



Figure 8 +12V banana sockets

4. Press HS and LS RESET buttons twice. See [Figure 9](#). After that, the NRST rising edge triggers the start-up of the fly-back. In addition, RDY goes high

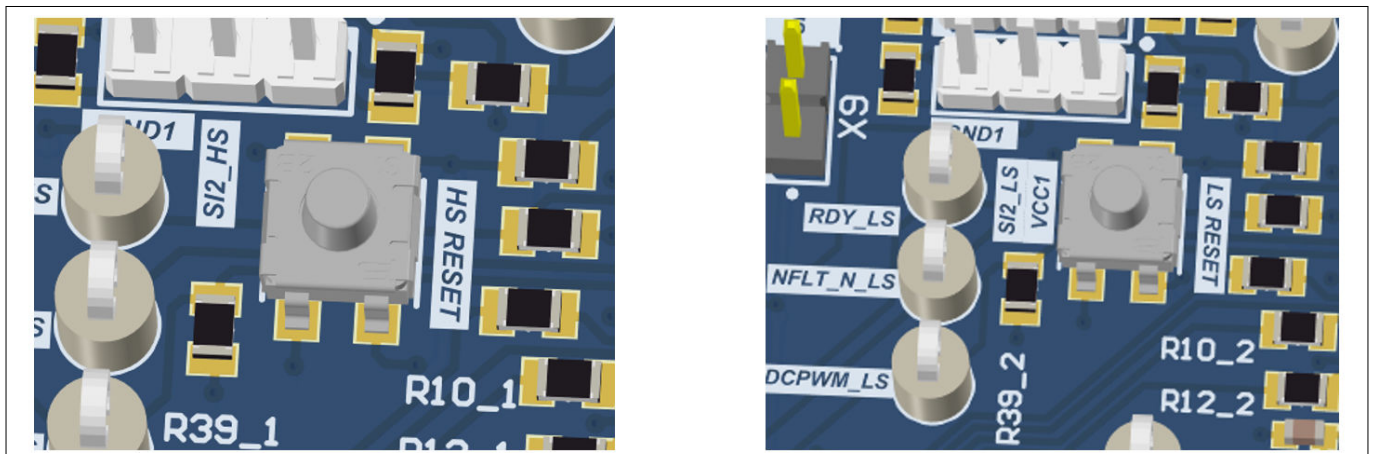


Figure 9 RESET button of HS and LS

5. Confirm the correct power-up procedure by checking the status LED. For further details, refer to [Chapter 3.3](#)

3 Evaluation board

3 Evaluation board

3.1 PCB overview

Figure 10 shows an overview of the EiceDRIVER™ gate driver 1EDI305xAS evaluation board. A vertical line on the PCB marks the split between the primary side and the secondary side. The horizontal line marks the split between the high side and the low side.

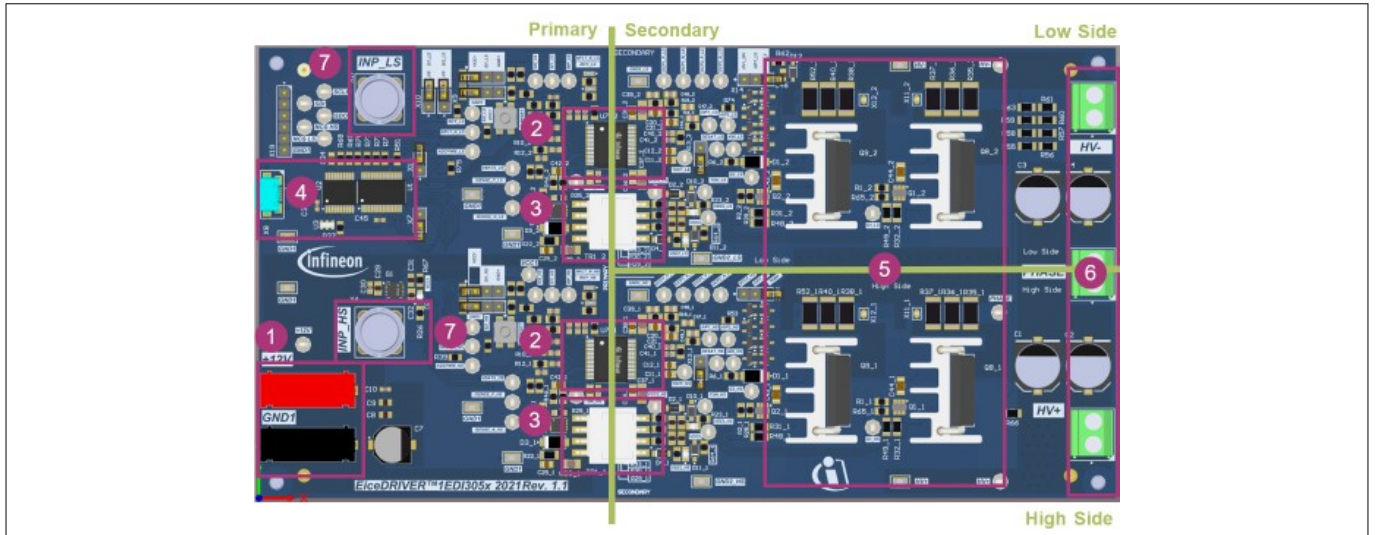


Figure 10 EiceDRIVER™ gate driver 1EDI305xAS evaluation board configuration overview

Pos.	Description
1	+12 V primary supply
2	1EDI305xAS gate driver
3	Flyback transformer
4	USB to SPI bridge
5	Half-bridge power devices
6	Power connectors
7	INP to BNC connectors

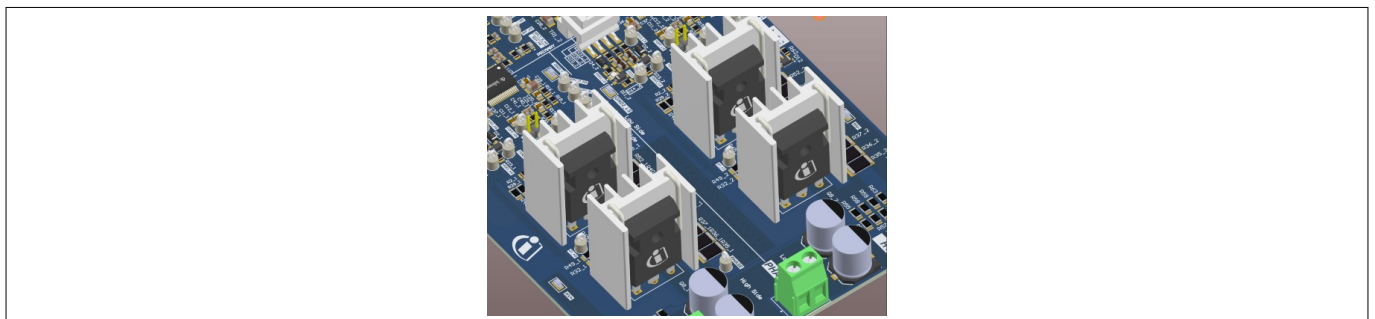


Figure 11 PG-T0247-3 power device mounted with heat sink

When using the PG-T0247-3 compatible power devices, an external heat sink option exists. The PCB footprint is prepared to mount the WA-T247-101E from Ohmite. The configuration is shown in Figure 11. The heat sink is not included by default and can be purchased separately.

3 Evaluation board

3.2 Connectors

There are connectors on the primary side and on the secondary side of the EiceDRIVER™ gate driver 1EDI305xAS evaluation board.

The board requires a supply voltage at the banana sockets on the primary side. See Table 2. The BNC connectors INP_HS and INP_LS accept the PWM signal for the input of each driver. The USB-C connector X8 must be connected to the PC. See Figure 12.

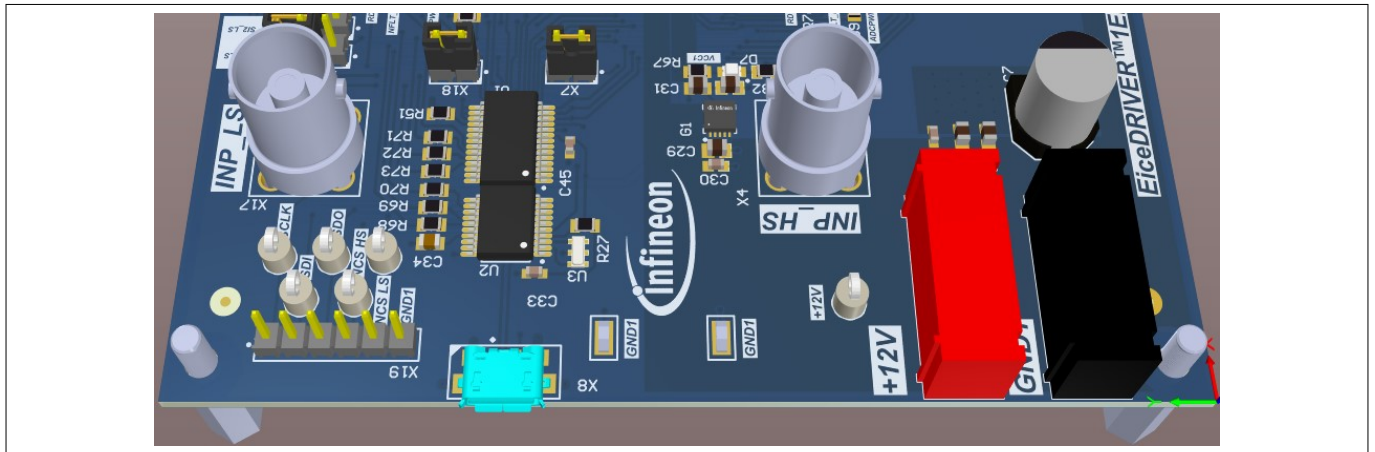


Figure 12 Primary side connectors

Figure 13 shows the secondary side screw terminals for the secondary supply voltage and the center tap of the half bridge.

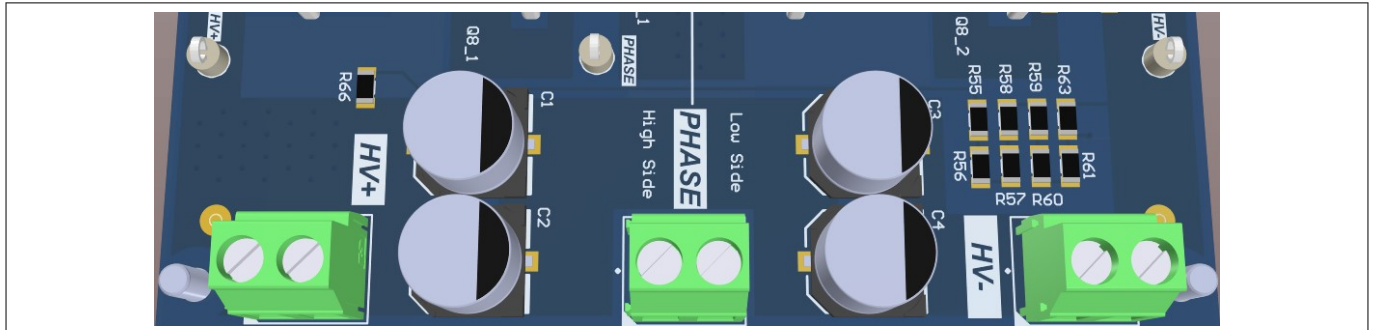


Figure 13 Secondary side connectors

3 Evaluation board

3.3 LED indicators

LEDs on the EiceDRIVER™ gate driver 1EDI305xAS evaluation board indicate the status of the board and the driver. See Figure 14:

1. Primary side supply indicator on VCC1
2. Secondary side supply indicator on VCC2/VEE2 for high side and low side drivers
3. Dedicated RDY indicator for high side and low side drivers
4. Dedicated NFLT_N indicator for high side and low side drivers

If the VCC1 and VCC2/VEE2 power supplies are appropriate, the indicators are green.

If the driver pulls the NFLT_N signal to "low", the NFLT-N LED is red, indicating a fault.

If the driver does not pull the RDY signal to "low", the RDY LED is blue, indicating that the device is ready.

The status indicated by the NFLT_N and RDY LEDs can be used to determine the current operating mode. For further details, refer to Chapter 1.4.

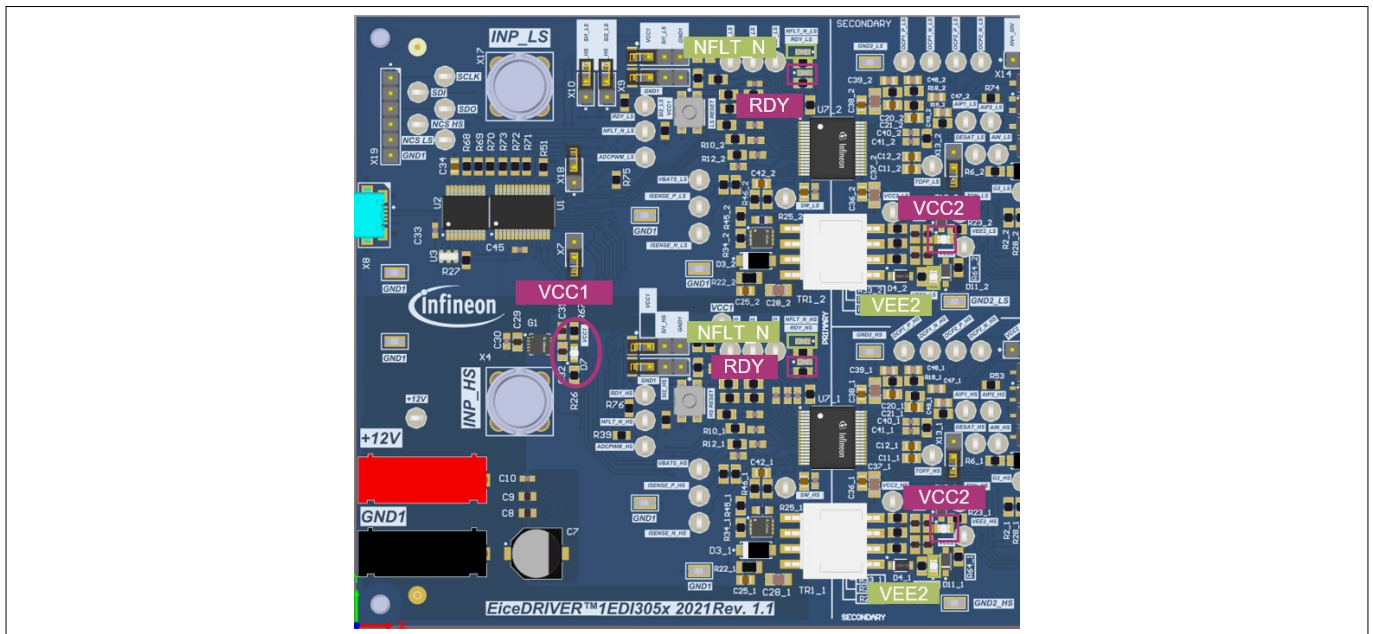


Figure 14 LEDs on board

3.4 Operating conditions

Make sure that the operating range defined in Table 3 is maintained to avoid electrical damage of the product.

Table 3 Operating conditions

Parameter	Pin	Values		Unit	Note
		Min.	Max.		
V _{supply}	Banana socket	6	26	V	Limited by the input voltage requirement from Flyback controller and linear voltage regulator [3].
V _{HV} to GND2	Screw terminal	0	800	V	Theoretical HV DC limit; not tested. Breakdown voltage given by DESAT diodes D1_1, D1_2 and capacitors C1, C2, C3, C4. Replace when higher voltages are required.
V _{BNC}	BNC connectors	-0.3	5	V	Limited by VCC1 voltage.

3 Evaluation board

3.5 Jumper configuration

The EiceDRIVER™ gate driver 1EDI305xAS evaluation board provides the following configuration options:

1. Enable shoot-through protection
2. Enable DESAT-protection on high- or low-side
3. Cross connection of SI1/SI2
4. Pullup/down configuration of SI1/SI2
5. DC-link and temperature measurement

Table 4 Jumper configuration options

Jumper ID	State	Signal name	Effect
X7	Placed	ADCPWM_HS/INP_LS	Shoot-through protection enabled
X18	Placed	ADCPWM_LS/INP_HS	Shoot-through protection enabled
X13_1	Placed	DESAT_HS/GND2_HS	DESAT supervision of HS suppressed
X13_2	Placed	DESAT_LS/GND2_LS	DESAT supervision of LS suppressed
X9	Placed	SI1_HS/SI2_LS	Cross connect SI1_HS and SI2_LS
X10	Placed	SI2_HS/SI1_LS	Cross connect SI1_LS and SI2_HS
X15_1	1-2 (2-3)	VCC1/SI1_HS/GND1	SI1_HS Pulled high (low)
X15_2	1-2 (2-3)	VCC1/SI1_LS/GND1	SI1_LS Pulled high (low)
X16_1	1-2 (2-3)	VCC1/SI2_HS/GND1	SI2_HS Pulled high (low)
X16_2	1-2 (2-3)	VCC1/SI2_LS/GND1	SI2_LS Pulled high (low)
X14	1-2 (2-3)	HV+/AIP1_LS/AIP1_2	HV+ measurement (temperature measurement)
X20	1-2 (2-3)	VCC2_HS/AIP1_HS/AIP1_1	VCC2_HS measurement (temperature measurement)

3.5.1 Shoot-through protection

Place the jumpers X7 on ADCPWM_HS and INP_LS, X18 on ADCPWM_LS and INP_HS to enable the shoot-through protection. See Figure 15.

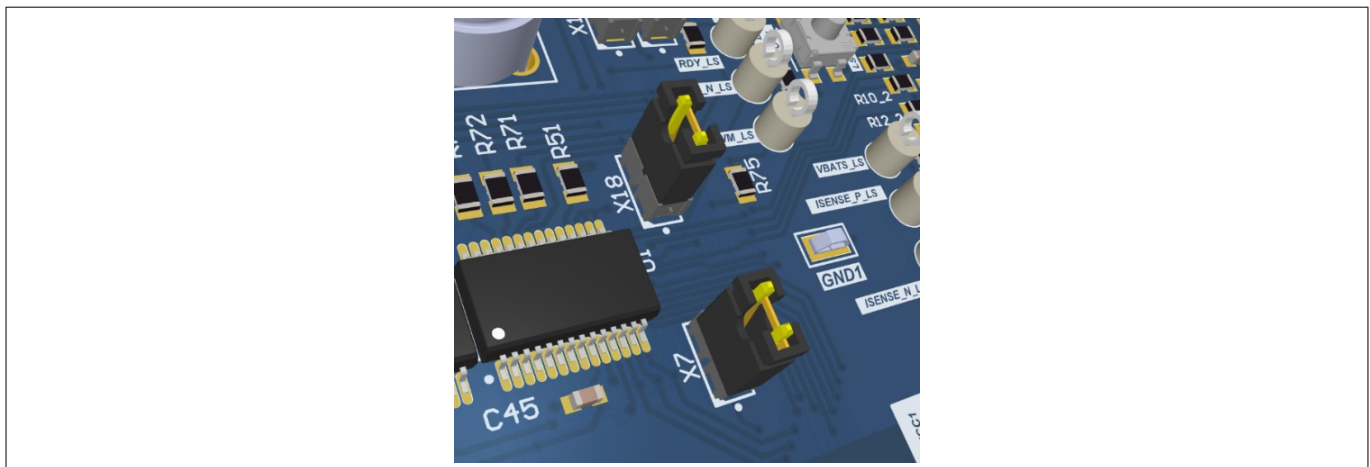


Figure 15 Shoot-through protection jumper placement

3 Evaluation board

3.5.2 DESAT protection

Place the jumpers X13_1 and X13_2 to enable the DESAT protection. See [Figure 16](#).



Figure 16 DESAT protection jumper placement

3.5.3 Cross-connect SI1 and SI2

SI1 and SI2 are two safety inputs that define different safe states. For testing without secondary side components (power devices, HV input), the jumper placement is not necessary. Otherwise, the SI1 and SI2 must be cross-connected for protecting against shoot-through. See [Figure 17](#). For further details, refer to [Chapter 1.4](#).



Figure 17 SI1, SI2 jumper cross-connect placement

3.5.4 SI1 and SI2 pull-up/low

For manual configuration of the SI1 and SI2 safety inputs to high or low, place the jumpers on SI1 and SI2 to VCC1 or GND1. [Figure 18](#) shows how to pull-up. It is worth noting that the jumpers should be placed on both SI1_HS and SI2_LS (SI2_LS and SI1_HS) to VCC1, if SI1_HS and SI2_LS (SI2_LS and SI1_HS) are cross connected. For more details, refer to [Chapter 5](#).

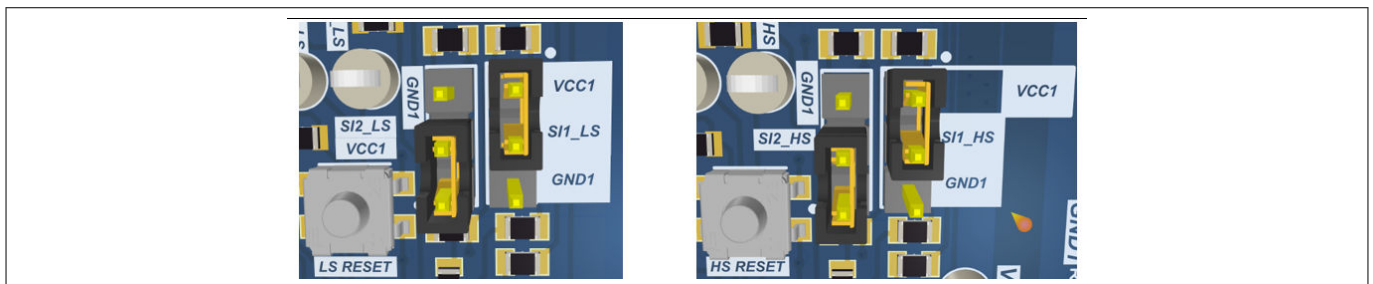


Figure 18 SI1, SI2 pull-up (left: low side, right: high side)

3 Evaluation board

3.5.5 AIP_1 signal selection

The X14 and X20 selection jumpers are both capable of voltage and temperature measurement. They can be placed in two configurations by selecting the specific external circuit. See Figure 19.

Take the X20 jumper as an example. Placing the jumper between pin 1 and 2 connects a voltage divider to VCC2. The internal ADC current source on these devices has to be deactivated through SPI. For further details, refer to the data sheets [1] and [2].

Placing the jumper between pin 2 and 3 connects several bipolar transistors in diode configuration to emulate temperature measurement on the 1EDI305xAS. The EiceDRIVER™ 1EDI305xAS gate driver has an internal current source combined with the ADC.

The same applies to the X14 jumper.

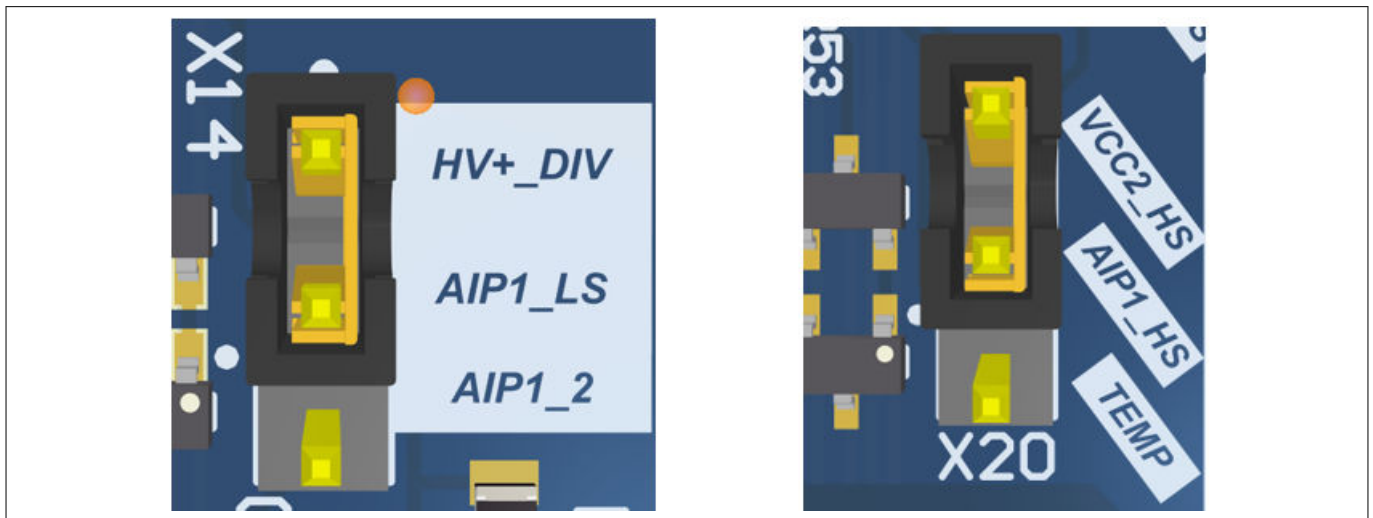


Figure 19 AIP signal selection jumper (left: low side, right: high side)

4 GUI

4 GUI

The GUI tool allows the interaction with the EiceDRIVER™ gate driver 1EDI305xAS evaluation board.

4.1 GUI installation

1. The GUI requires at least .NET Framework 4.7.2. The .NET Framework 4.8 can be installed from [here](#). Download this version and follow the instructions. See [Figure 20](#)

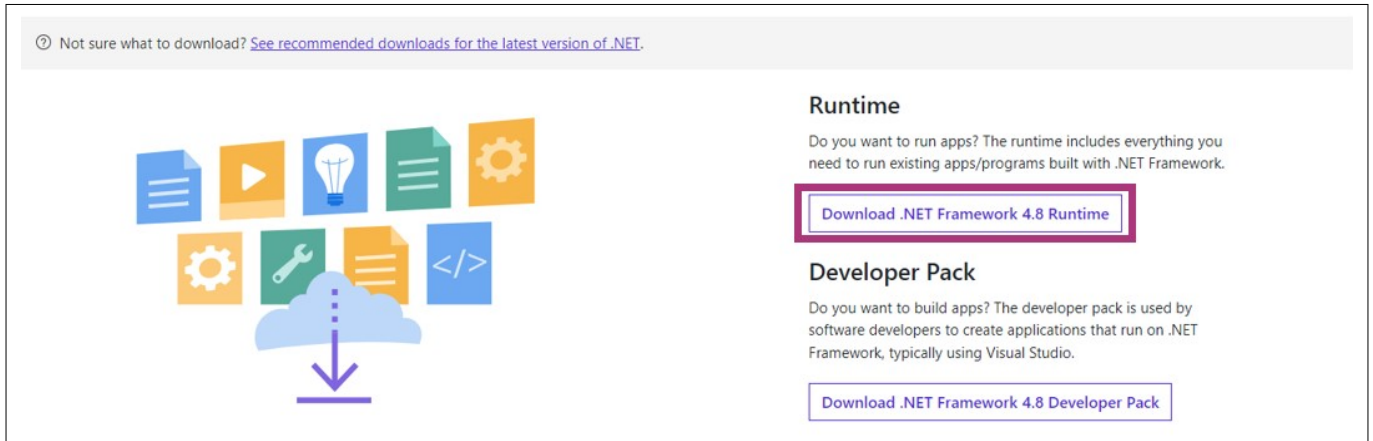


Figure 20 .NET Framework 4.8 download instruction – download portal

2. Download and unzip the entire content
3. Run the “setup.exe”. See [Figure 21](#)

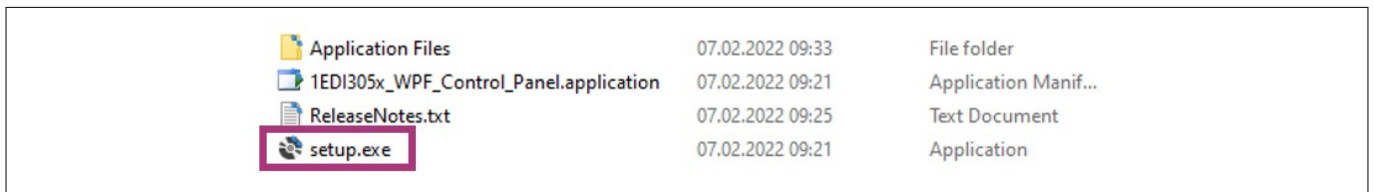


Figure 21 .NET Framework 4.8 download instruction – application file

4. Click “Install”. See [Figure 22](#)

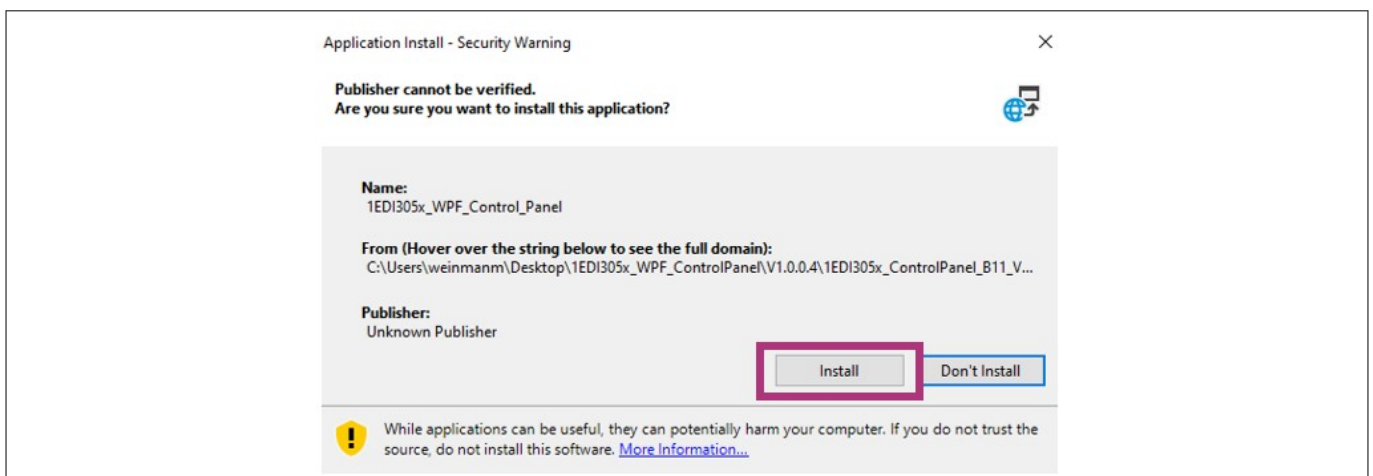


Figure 22 .NET Framework 4.8 download instruction – application installation

4 GUI

- Start the application from the Windows start menu. See Figure 23

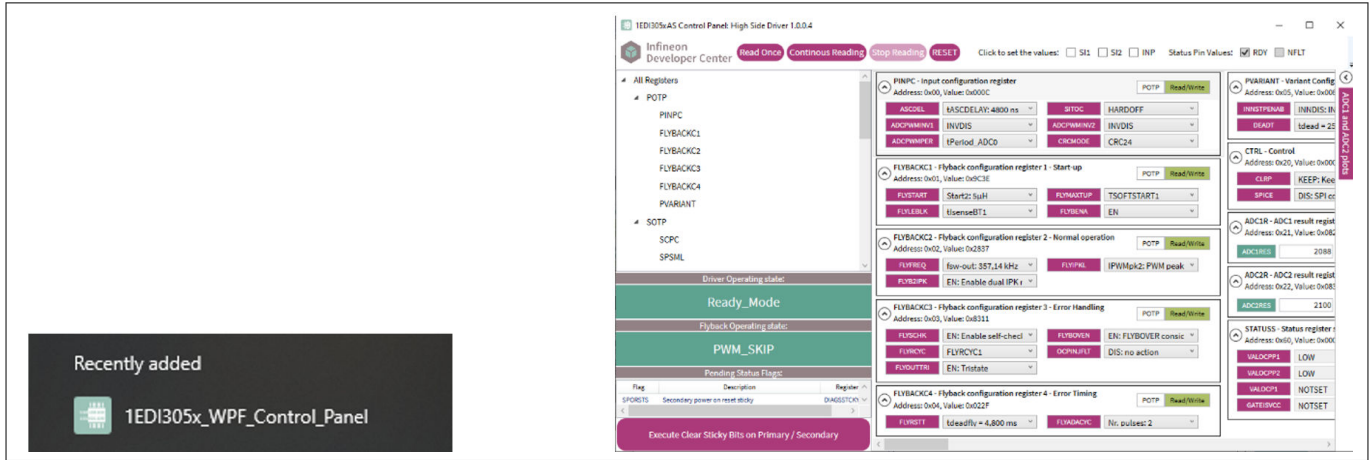


Figure 23 .NET Framework 4.8 download instruction – start GUI

4.2 Getting started with the GUI

- Supply the board with +12 V and connect it to your PC with a micro-USB cable. The board registers as a “HID USB device” and installs the driver automatically
- Start the GUI by executing “1EDI305x_WPF_Control_Panel” from your start menu. See Figure 24

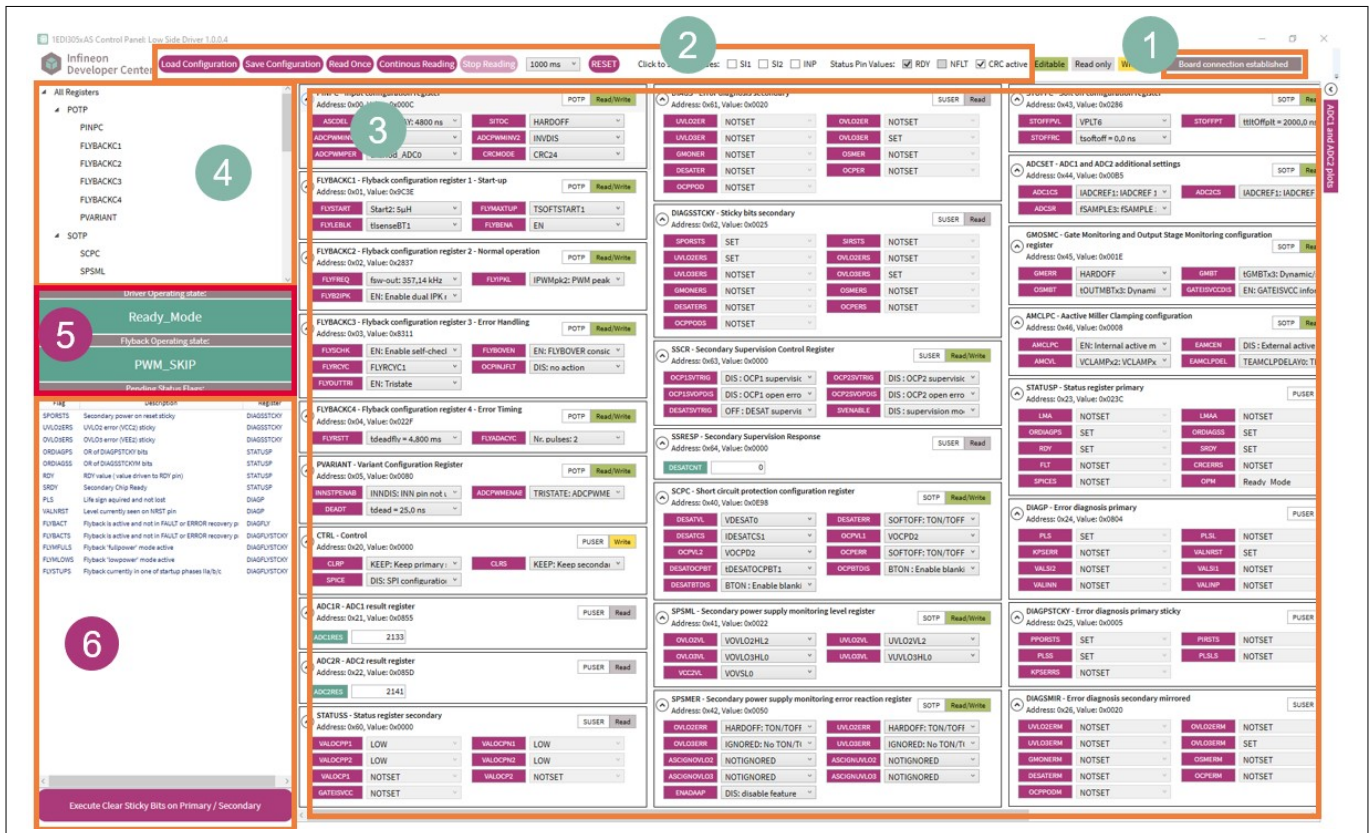


Figure 24 GUI start menu

Pos.	Explanation	Description
1	Board connection indicator	Flashing green when the board is connected, red when the connection is not established
2	Dashboard	Multiple functions, described in the following sections

4 GUI

Pos.	Explanation	Description
3	Register panel	Shows register content and manipulate settings
4	Register tree	Click to show individual registers or groups of register
5	Operating mode indicator	Shows the current operating mode of the driver and the flyback controller
6	Active status flags	

4.3 GUI use cases

In this section, four use cases are introduced, including the basic operations of the evaluation board.

4.3.1 Use case example A – “How to turn on the output of the driver”

- Click **Read Once** to read all registers once. See Figure 25. All registers update with content read from the board. Field descriptions turn red if their value changes. This makes “flips in registers” easy to spot



Figure 25 Menu bar operation – read all registers

- Confirm: **RDY** = SET (device is ready), **NFLT** = NOTSET (no fault occurred), **OPM** = Ready_Mode. See Figure 26. If not, press **RESET** button in Figure 25 or push buttons on PCB

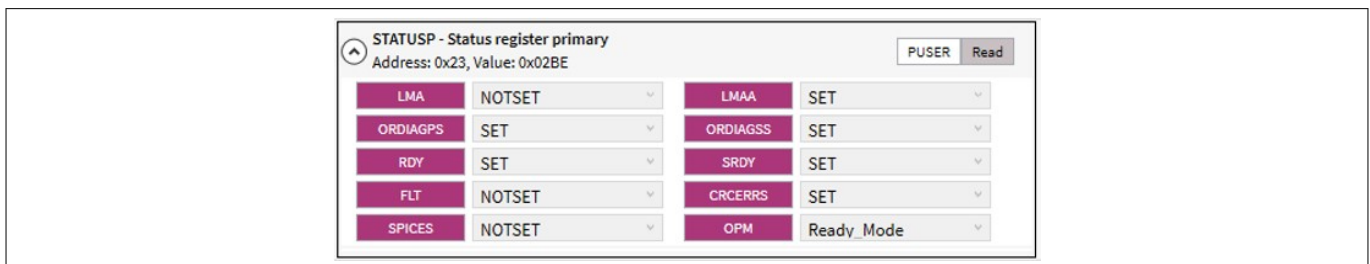


Figure 26 STATUSP panel confirmation – RDY, NFLT, OPM

- Transfer the device to Normal_Mode by setting **SI1** and **SI2** = high (click the check boxes). Then set **INP** = high to turn on the output stage. See Figure 27



Figure 27 Menu bar operation – set Normal_Mode

- Check field **GATEISVCC** in **STATUSS** register is set. This field shows the output of the gate monitor and can be used to check the TOUT state. See Figure 28

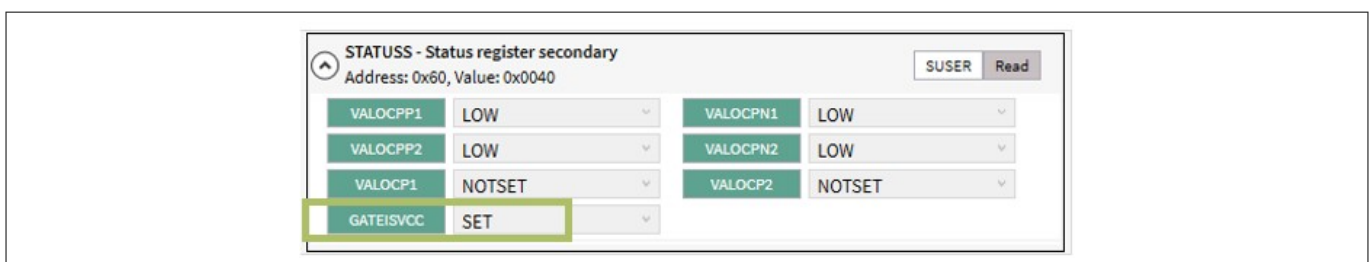


Figure 28 STATUSS panel confirmation - GATEISVCC

4 GUI

4.3.2 Use case example B – “How to write to the driver through SPI”

Follow the first part of example A to confirm the device is in Ready_Mode and **SI1=SI2=low** are set. SPI write access is only possible in Error_Mode or in Ready_Mode, as shown in Chapter 1.4.

Find the **CTRL** register in the control panel, then in the **CTRL** register, select **SPICE: EN** to enable SPI write access. After reading once from the device in **STATUSP** register, the **SPICES** flag should now be set. See Figure 29.

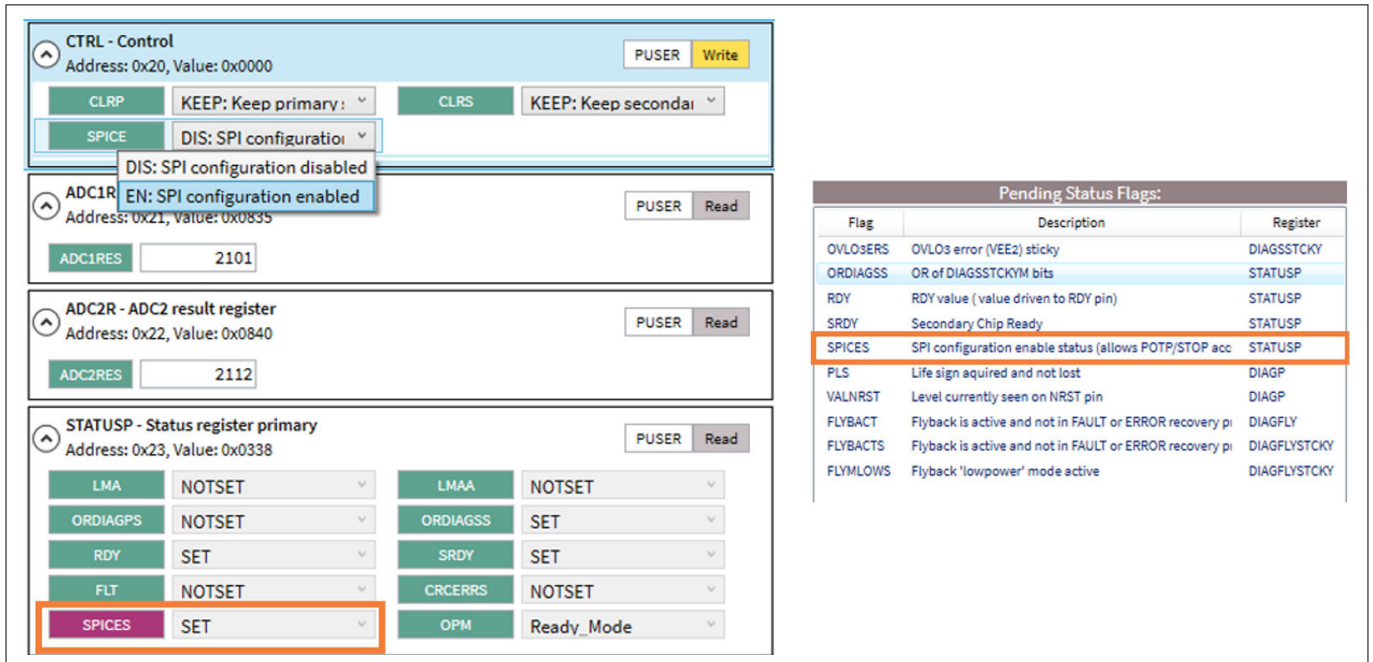


Figure 29 CTRL register panel operation and corresponding pending status flags

All other registers that are marked green with Editable can now be modified from the GUI.

4 GUI

4.3.3 Use case example C – “How to periodically read from the driver”

During switching operation or when injecting errors, it is essential to monitor the gate driver for status changes. For this use-case, the GUI allows for polling the register values within a given time interval. See Figure 30.

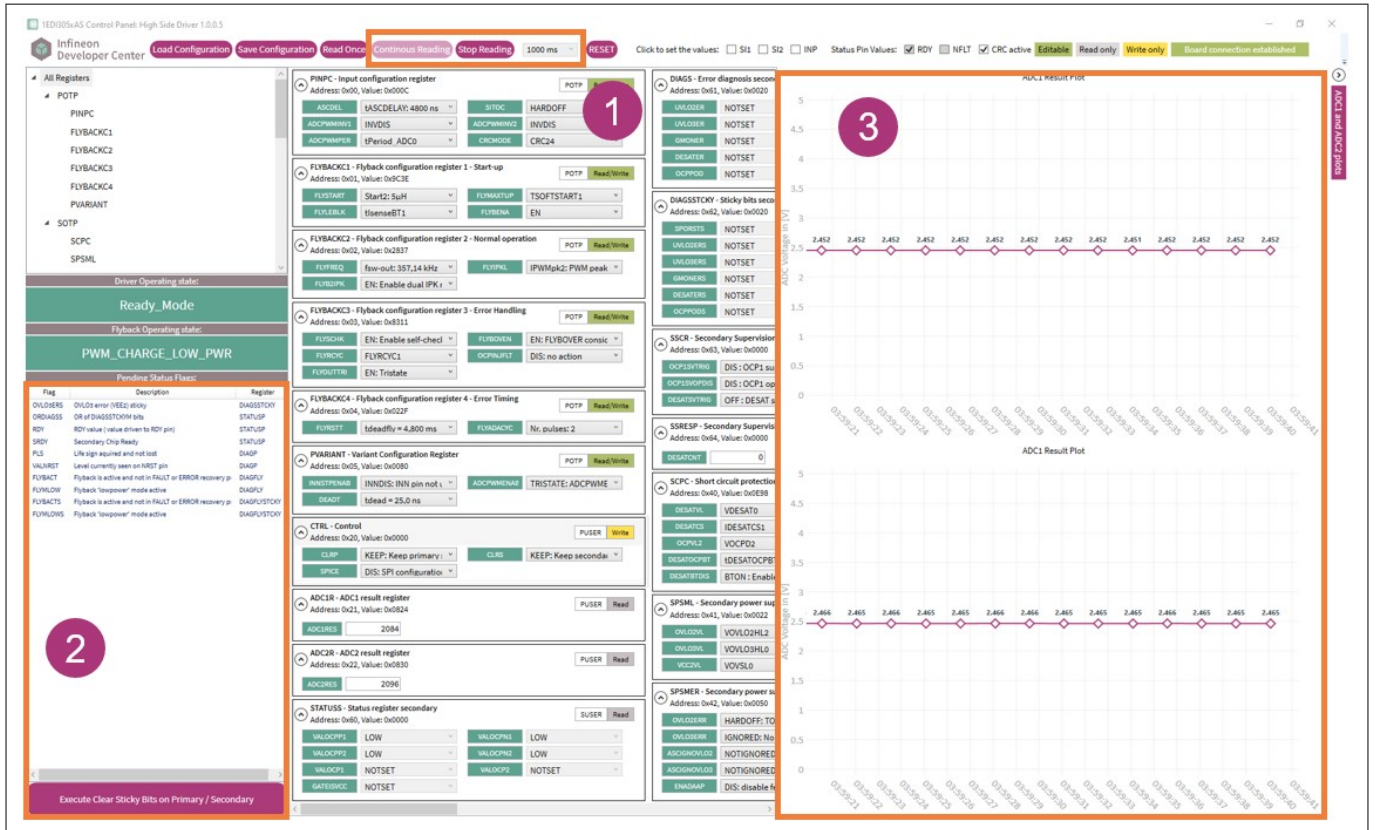


Figure 30 Control panel demonstration

1. Set the reading interval through the drop-down list and start reading by clicking **Continuous Reading**
2. All sticky and non-sticky status flags are displayed
3. ADC1 and ADC2 ideal input voltage plots

4 GUI

4.3.4 Use case example D – “How to save the driver configuration”

Buttons on the top of the control panel **Load Configuration** and **Save Configuration** can be used to recall or save all writable register states from and to the driver. See [Figure 31](#).

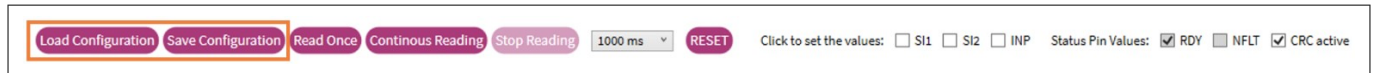


Figure 31 Menu bar operation – save configuration

The register dump is created in a human readable XML format and can be edited with the notepad, where address and content are saved as decimal values. See [Figure 32](#).

```
<ArrayOfXmlRegister xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <xmlRegister>
    <name>PINPC</name>
    <address>0</address>
    <content>12</content>
  </xmlRegister>
  <xmlRegister>
    <name>FLYBACKC1</name>
    <address>1</address>
    <content>39998</content>
  </xmlRegister>
  <xmlRegister>
    <name>FLYBACKC2</name>
    <address>2</address>
    <content>10295</content>
  </xmlRegister>
  <xmlRegister>
    <name>FLYBACKC3</name>
    <address>3</address>
    <content>33553</content>
  </xmlRegister>
</ArrayOfXmlRegister>
```

Figure 32 .xml format register dump

5 Schematic and layout

5 Schematic and layout

Figure 33, Figure 34, Figure 35, Figure 36, Figure 37, Figure 38, Figure 39, Figure 40 show the EiceDRIVER™ gate driver 1EDI305xAS evaluation board schematics. The driver schematic depends on the variant of the EiceDRIVER™ gate driver 1EDI305xAS. The variants only differ regarding the mounted driver. All other components are identical. See Chapter 6.

Note: The red cross marks represent the unfitted components.

5.1 Schematic

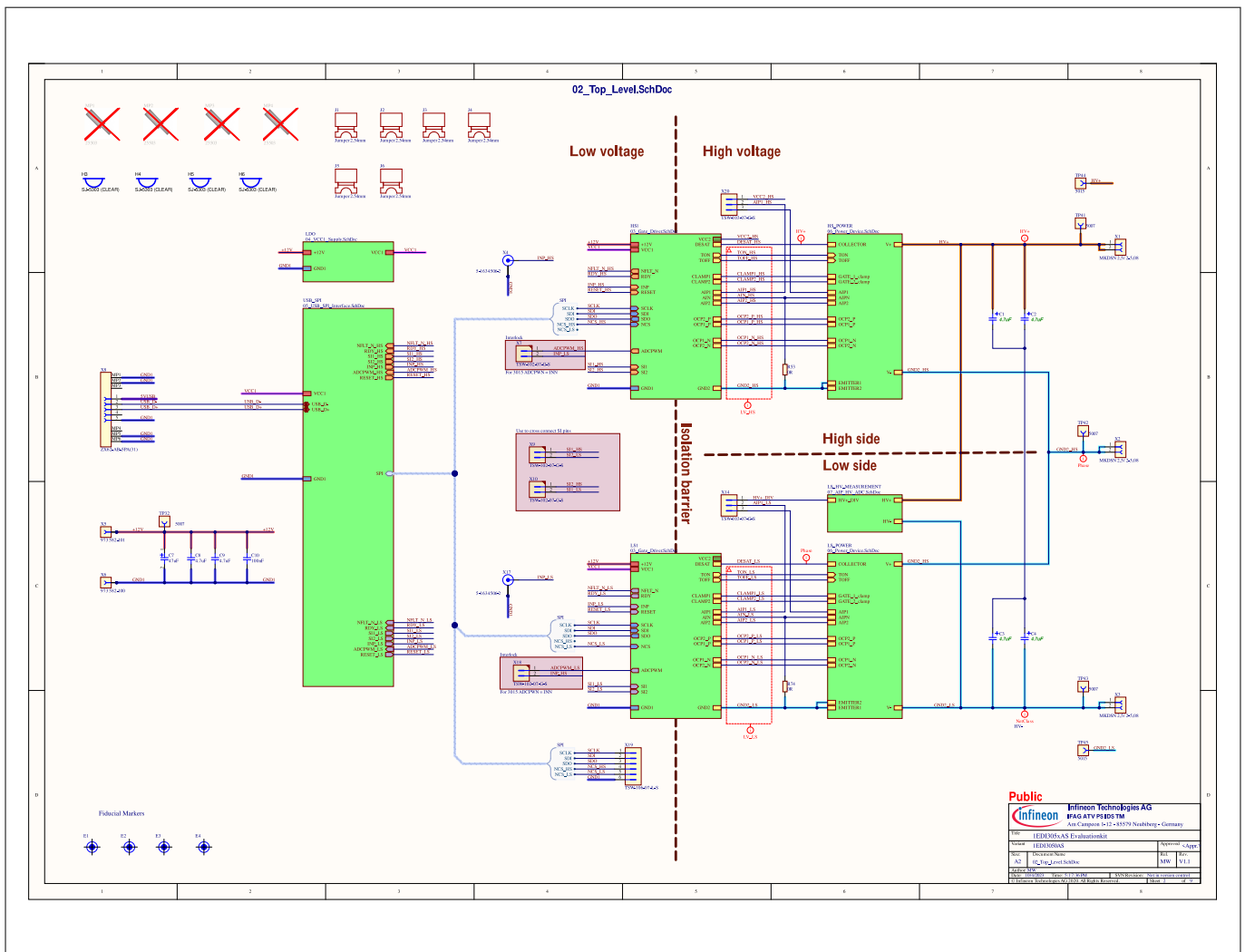


Figure 33 Schematic of top-level overview

5 Schematic and layout

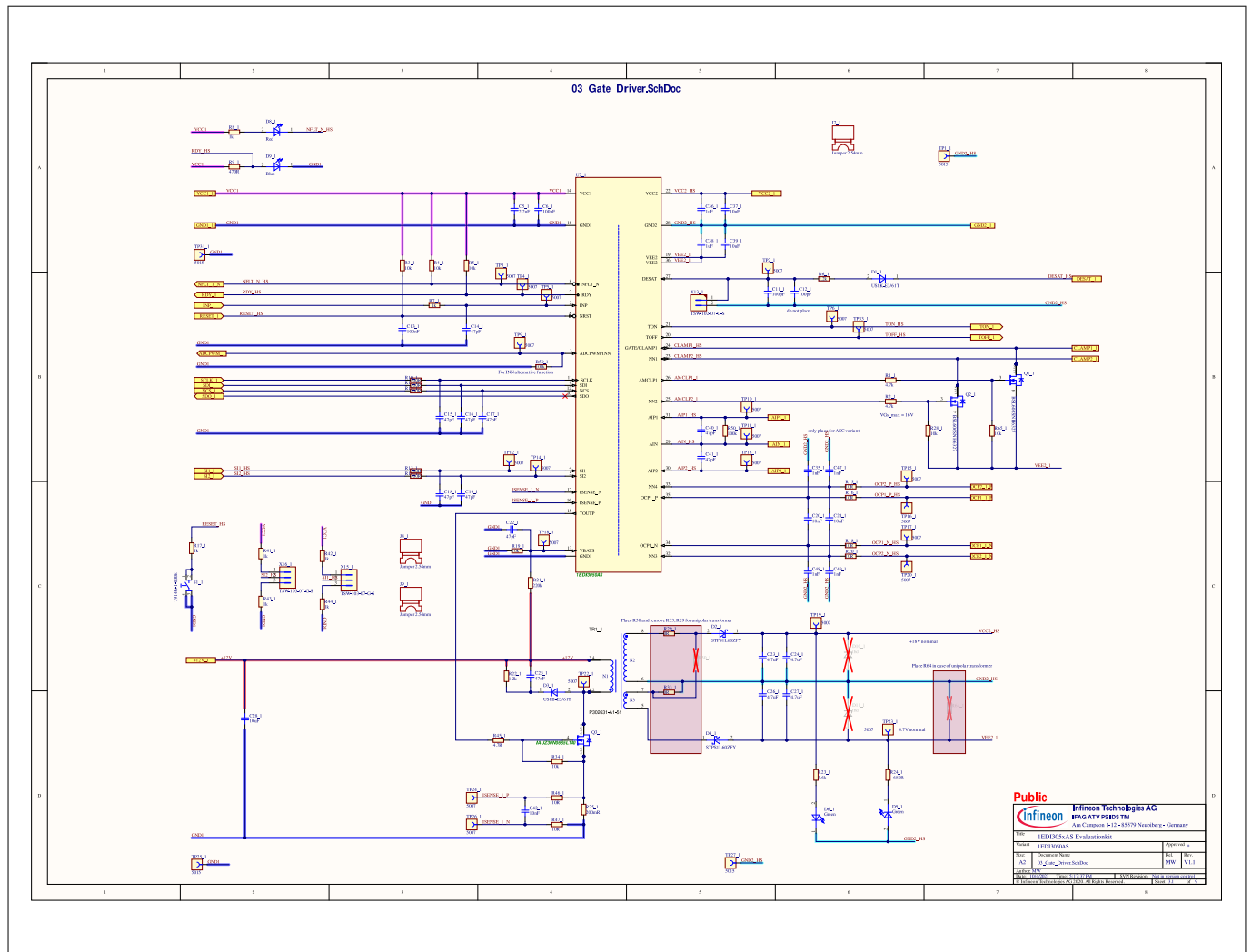


Figure 34 Schematic of high-side gate- driver configuration

5 Schematic and layout

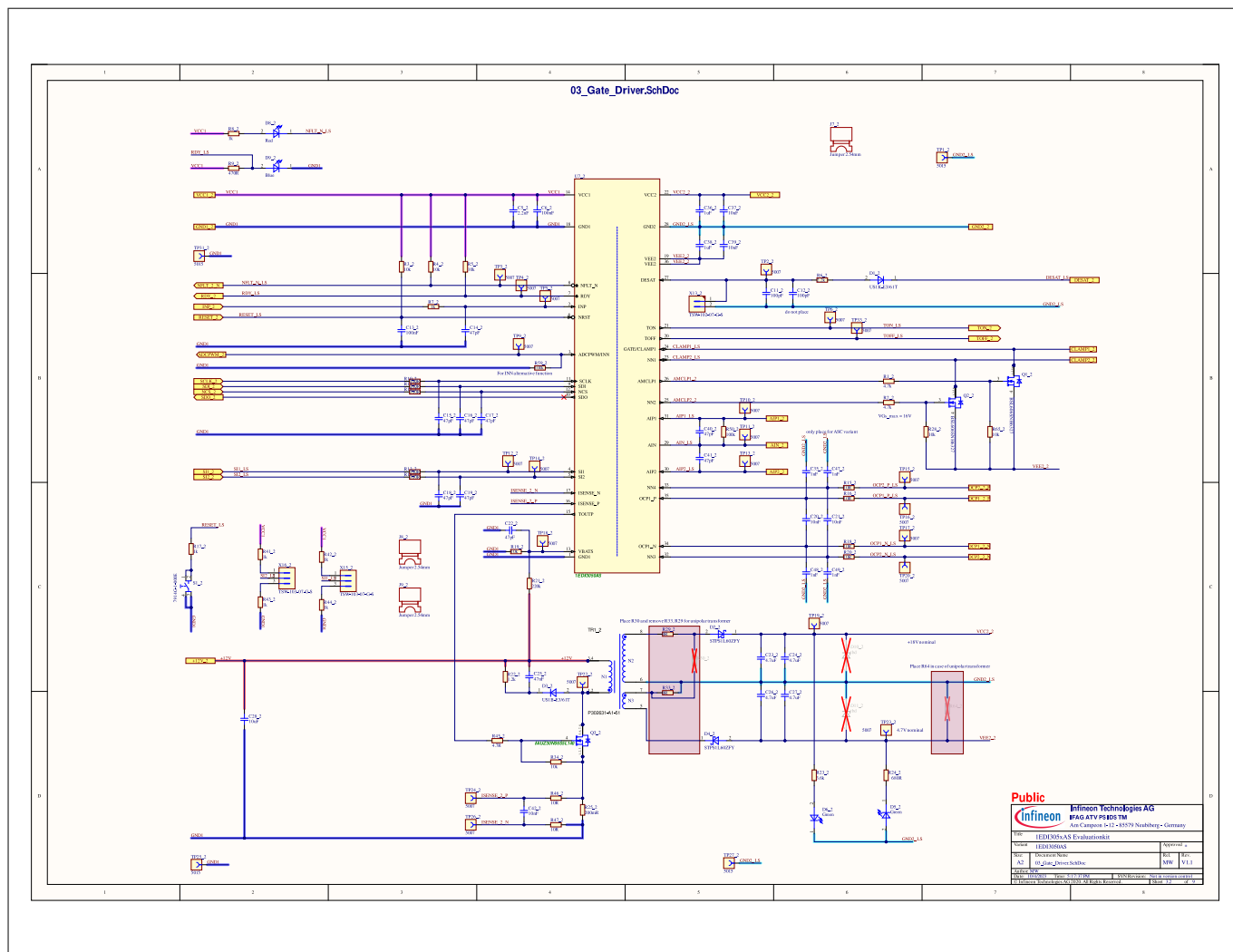


Figure 35 Schematic of low-side gate-driver configuration

5 Schematic and layout

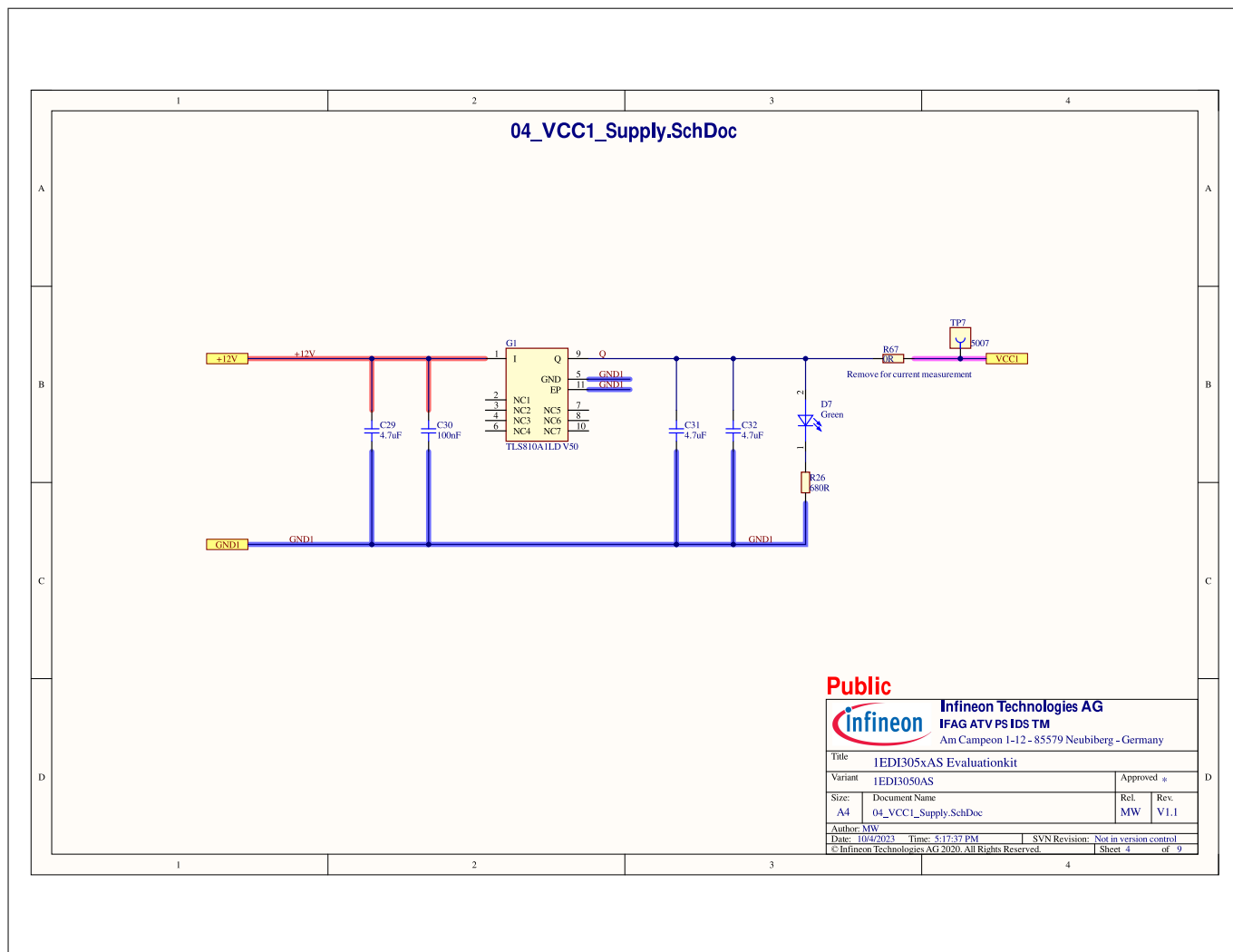


Figure 36 Schematic of VCC1 supply

5 Schematic and layout

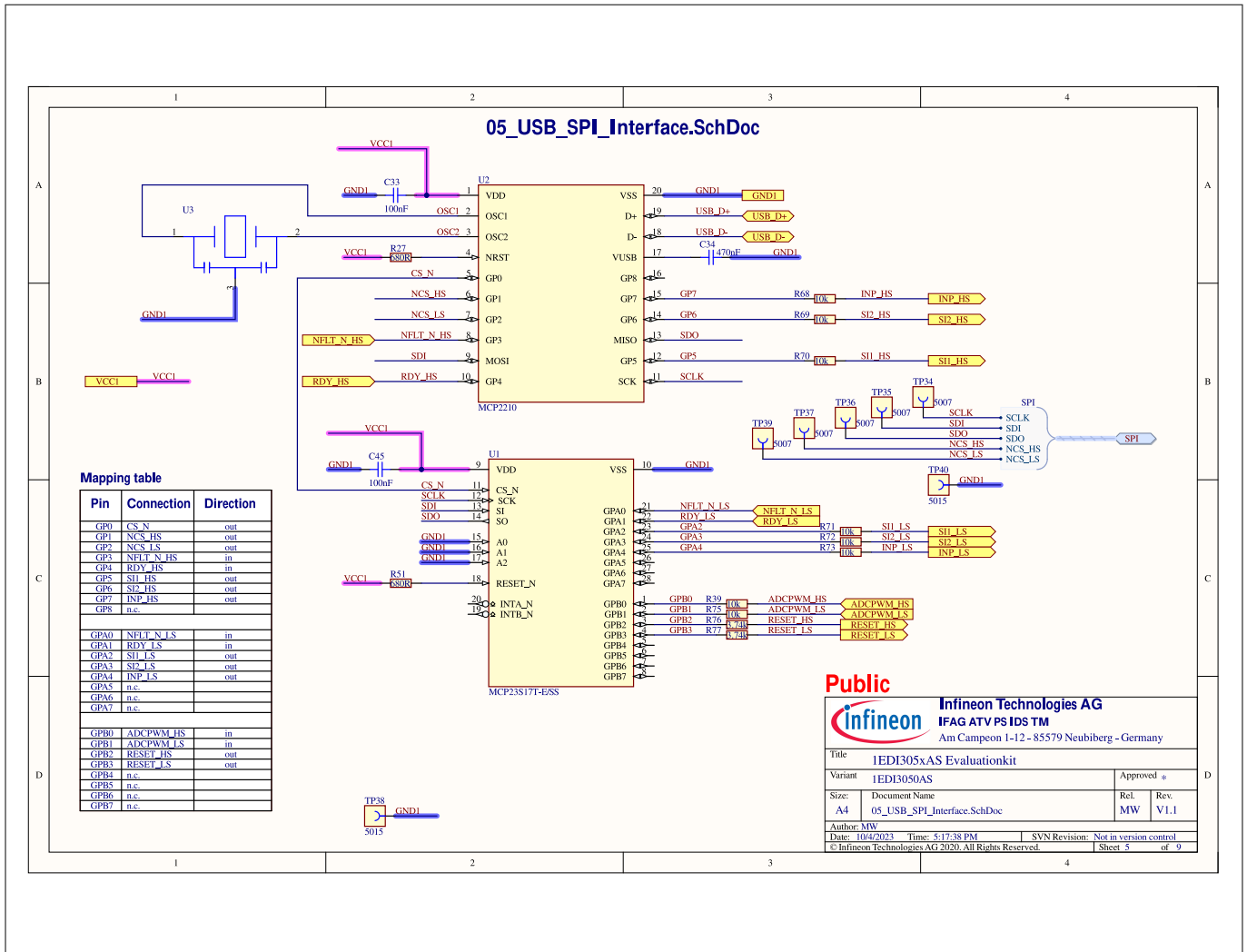


Figure 37 Schematic of USB to SPI interface

5 Schematic and layout

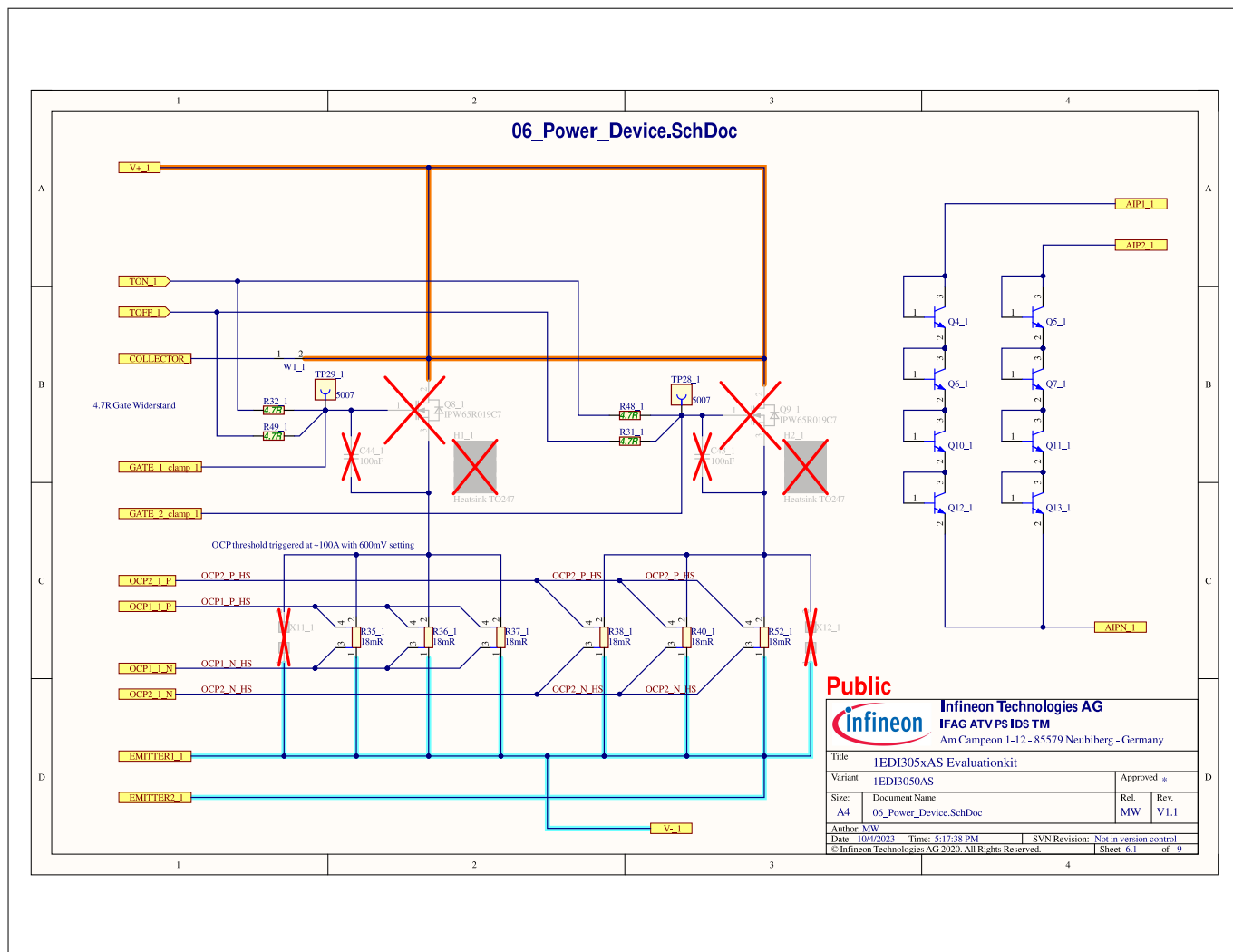


Figure 38 Schematic of high-side power-devices configuration

5 Schematic and layout

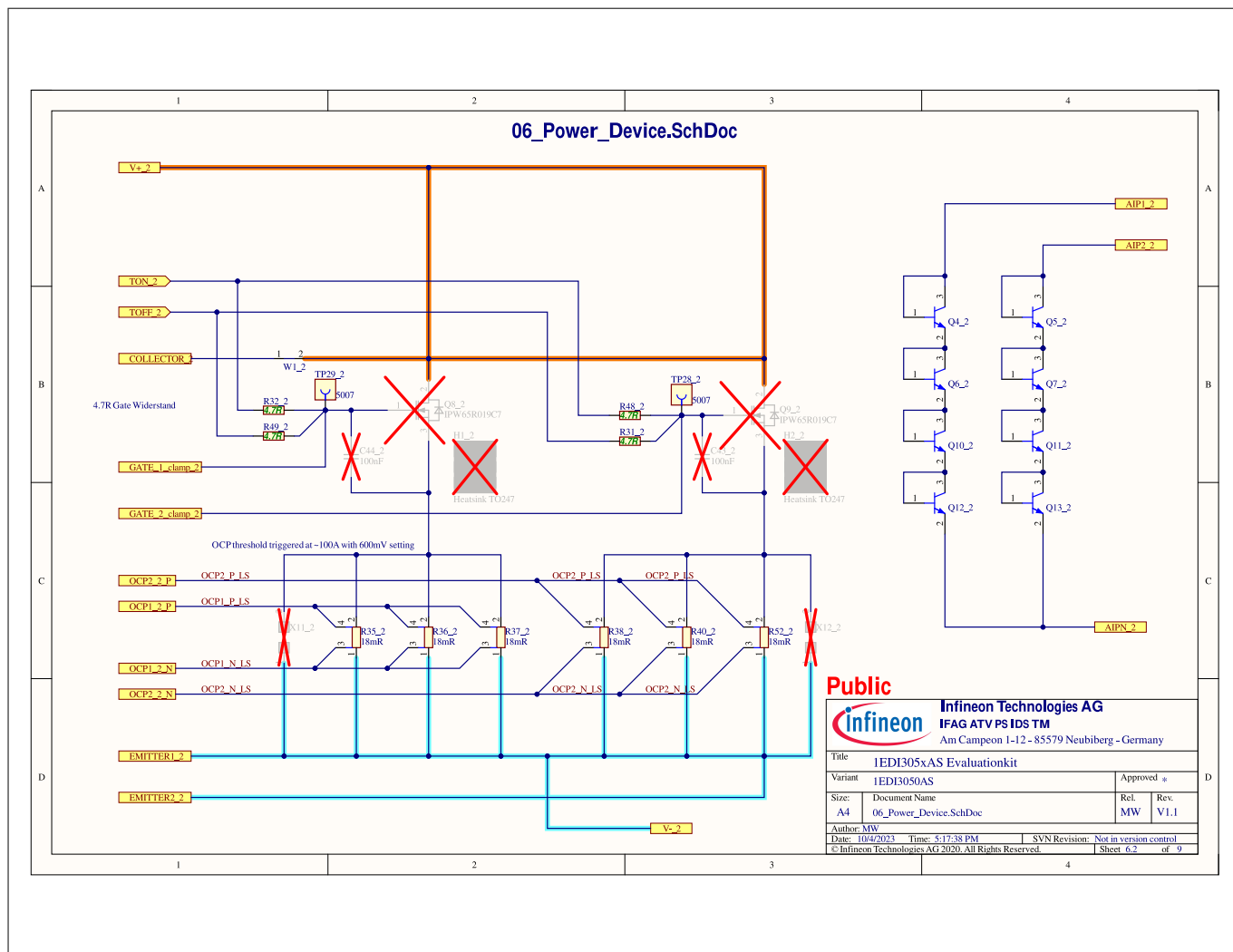


Figure 39 Schematic of low-side power-devices configuration

5 Schematic and layout

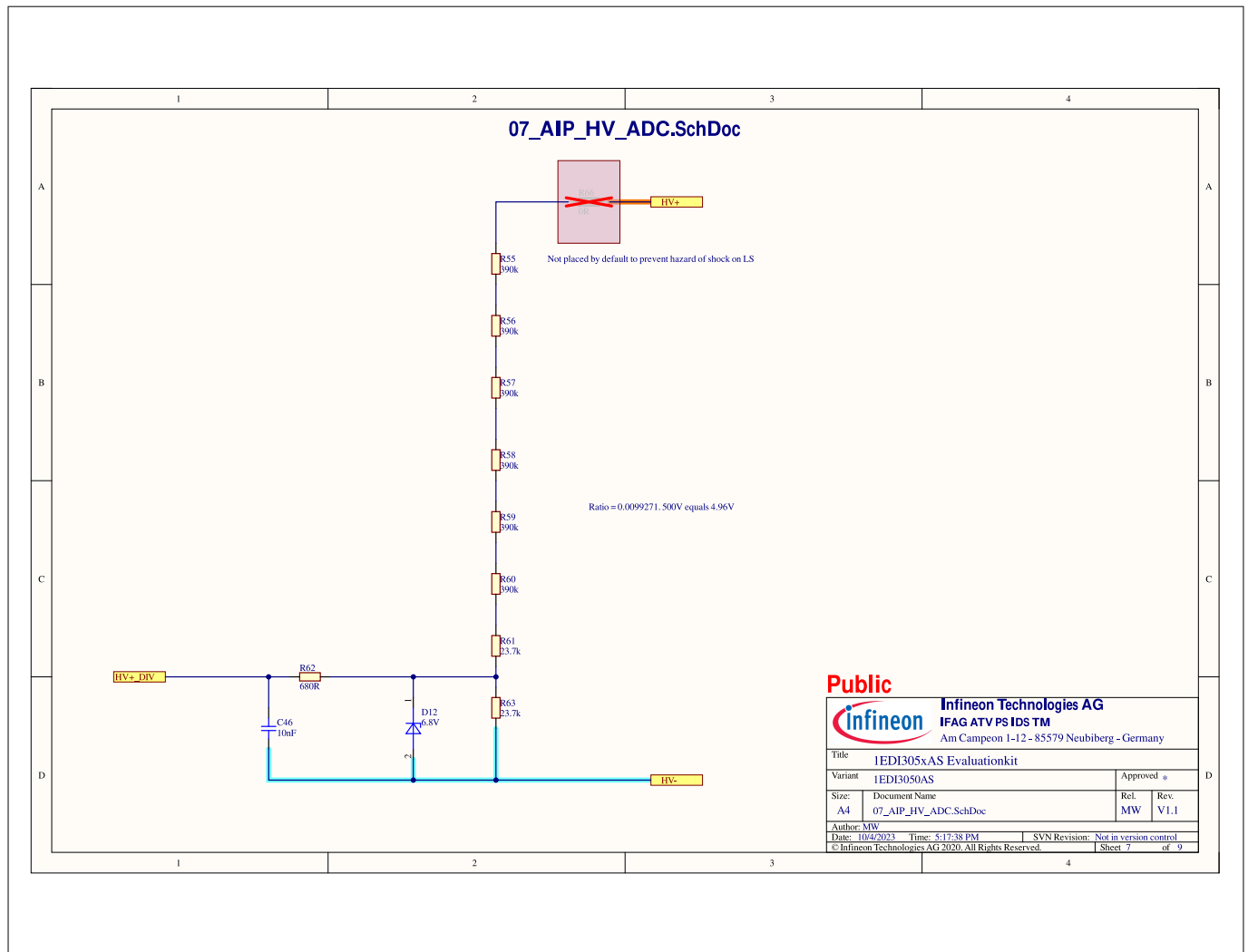


Figure 40 Schematic of voltage divider for HV+ measurement

5 Schematic and layout

5.2 Layout

The EiceDRIVER™ gate driver 1EDI305xAS evaluation board PCB consists of two layers: top and bottom. Components are not placed on the bottom side. [Figure 41](#) shows the assembly overview. [Figure 42](#) and [Figure 43](#) show the top and bottom layout respectively.

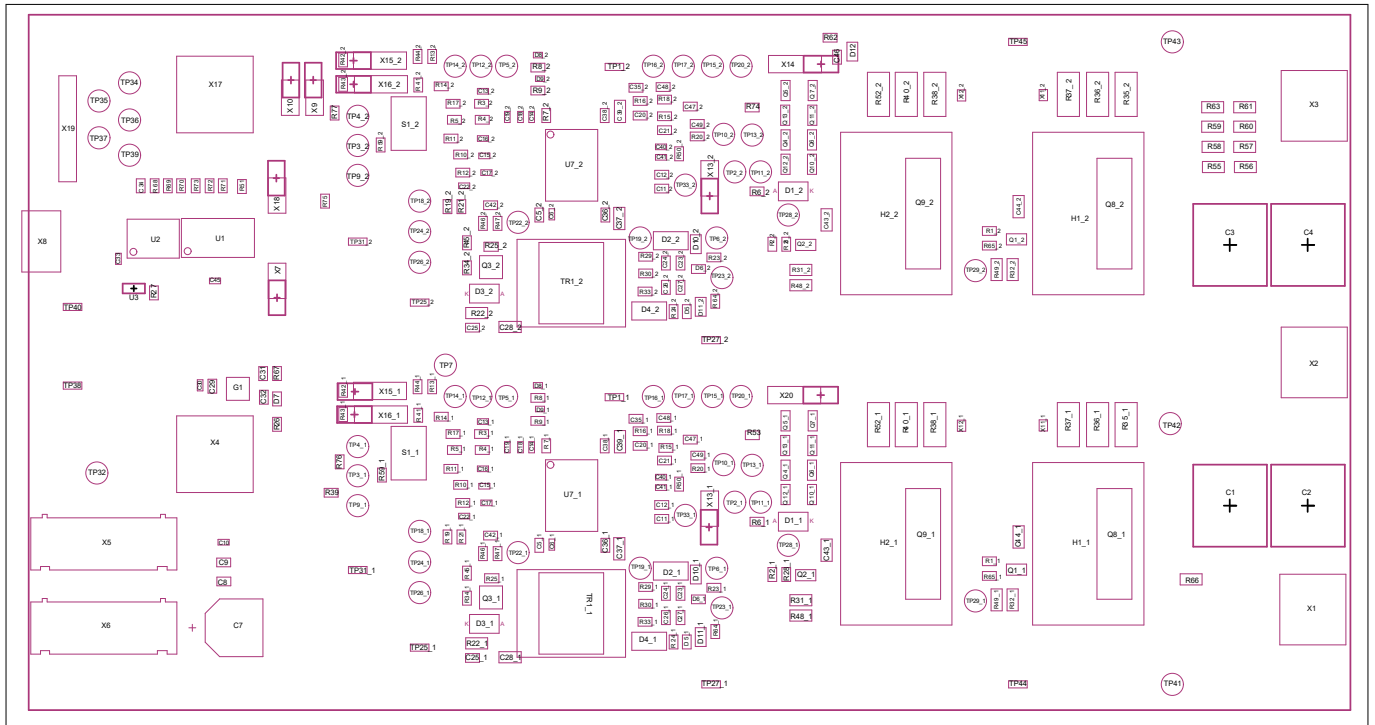


Figure 41 Assembly top view

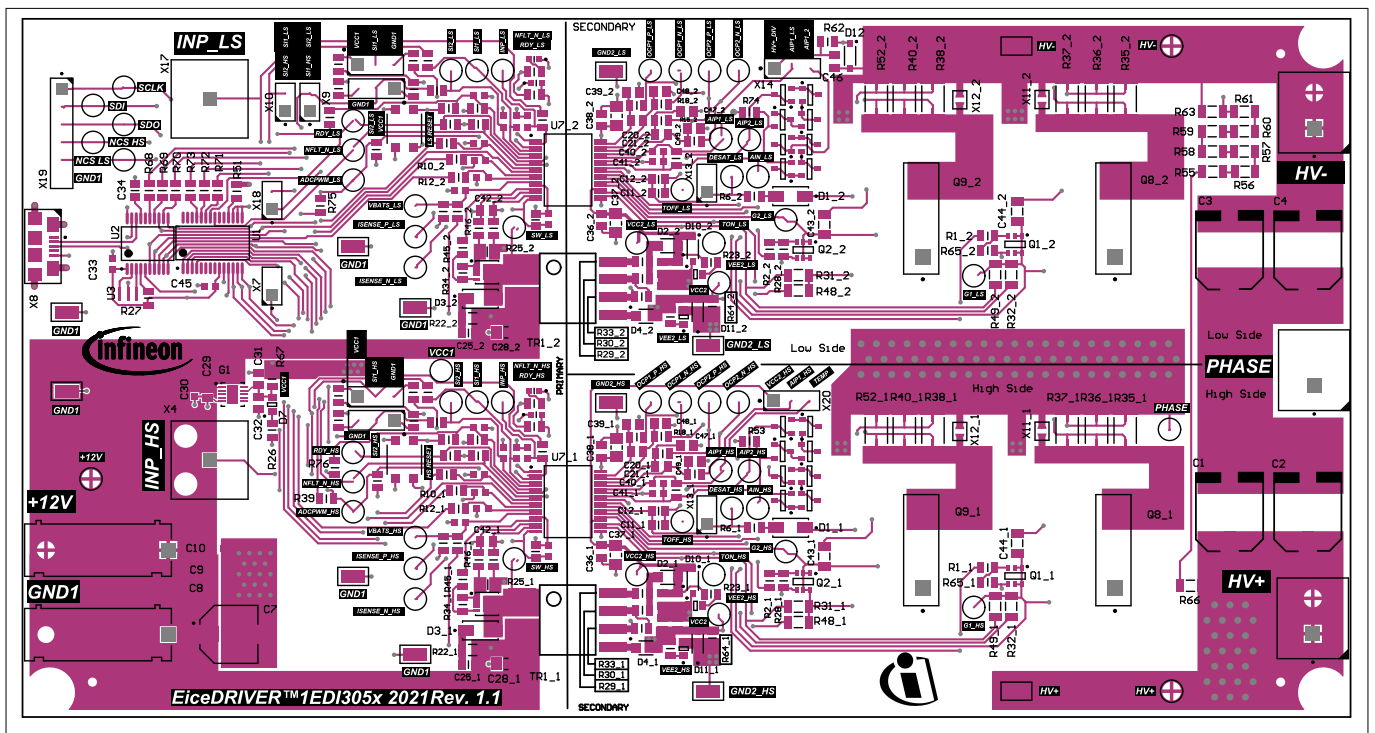


Figure 42 Top layer

5 Schematic and layout

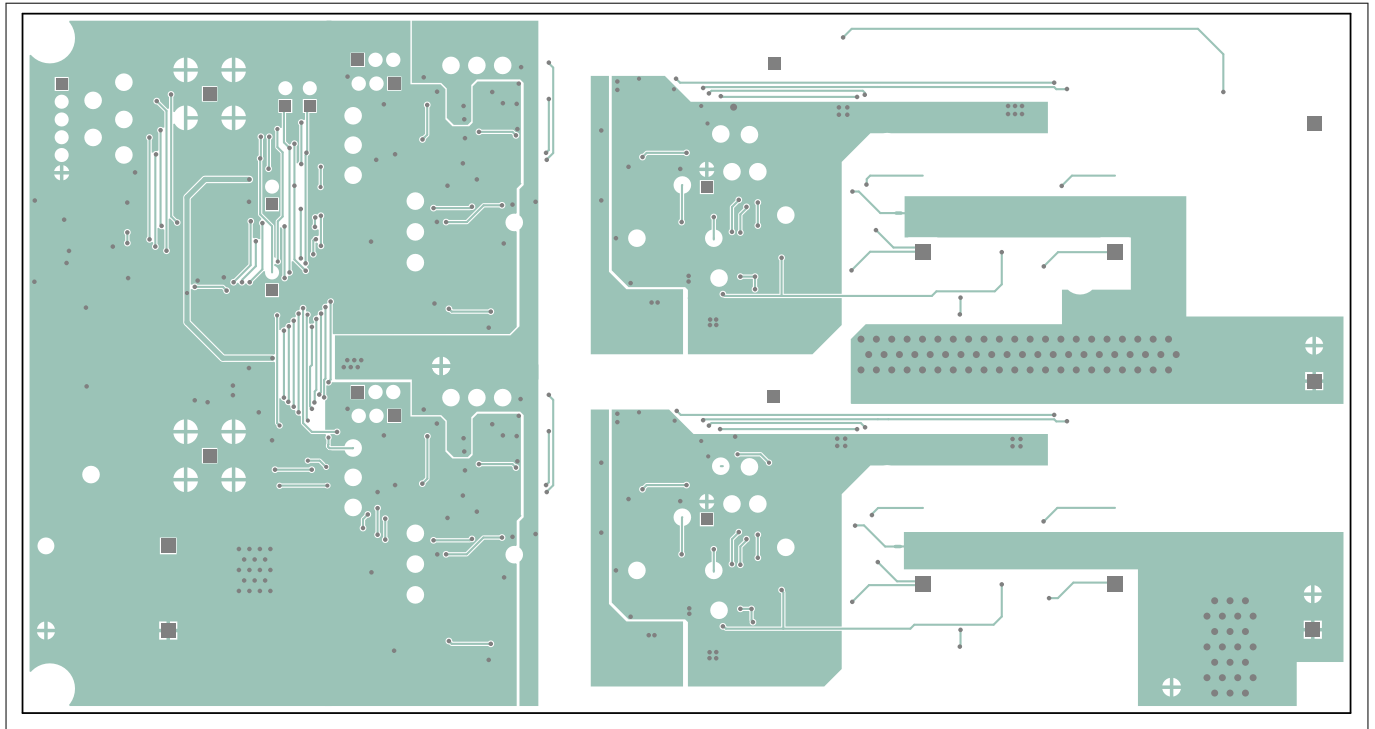


Figure 43 Bottom layer

6 Bill of material

6 Bill of material

Table 4 shows the bill of materials for all EiceDRIVER™ gate driver 1EDI305xAS evaluation board variants. The driver ICs mounted depend on the variant. The power switches are not included.

Table 5 Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
4	C1, C2, C3, C4	CAP / ALU/ 4.7uF / 400V / 20% / electrolyte / -40°C to 105°C	Nichicon	UUX2G4R7MNL1GS
2	C5_1, C5_2	CAP / CERA / 2.2uF / 16V / 10% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GRM21BR71C225KA12
8	C6_1, C6_2, C10, C13_1, C13_2, C30, C33, C45	CAP / CERA / 100nF / 16V / 10% / X7R (EIA) / -55°C to 125°C / 0603(1608) / SMD / -	MuRata	GCM188R71C104KA37
1	C7	CAP / ELCO / 47uF / 25V / 20% / Aluminium electrolytic / -55°C to 125°C / 8.30mm L X 8.30mm W X 12.00mm H / SMD / -	Panasonic	25SVPD47M
13	C8, C9, C23_1, C23_2, C24_1, C24_2, C26_1, C26_2, C27_1, C27_2, C29, C31, C32	CAP / CERA / 4.7uF / 25V / 10% / X7R (EIA) / -55°C to 125°C / 0805 / SMD / -	Taiyo Yuden	TMK212AB7475KG-T
4	C11_1, C11_2, C12_1, C12_2	CAP / CERA / 100pF / 50V / 2% / C0G (EIA) / NP0 / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GRM2165C1H101GA01
18	C14_1, C14_2, C15_1, C15_2, C16_1, C16_2, C17_1, C17_2, C18_1, C18_2, C19_1, C19_2, C22_1, C22_2, C40_1, C40_2, C41_1, C41_2	CAP / CERA / 47pF / 50V / 2% / C0G (EIA) / NP0 / -55°C to 125°C / 0603(1608) / SMD / -	MuRata	GRM1885C1H470GA01
7	C20_1, C20_2, C21_1, C21_2, C42_1, C42_2, C46	CAP / CERA / 10nF / 50V / 20% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GCM219R71H103MA37
2	C25_1, C25_2	CAP / CERA / 47nF / 50V / 20% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GRM21BR71H473MA01

(table continues...)

6 Bill of material

Table 5 (continued) Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
6	C28_1, C28_2, C37_1, C37_2, C39_1, C39_2	CAP / CERA / 10uF / 25V / 10% / X7R (EIA) / -55°C to 125°C / 1206(3216) / SMD / -	TDK Corporation	C3216X7R1E106K160AB
1	C34	CAP / CERA / 470nF / 25V / 5% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GRM219R71E474JA88
8	C35_1, C35_2, C47_1, C47_2, C48_1, C48_2, C49_1, C49_2	CAP / CERA / 1nF / 50V / 10% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	Kemet	C0805C102K5RACTU
4	C36_1, C36_2, C38_1, C38_2	CAP / CERA / 1uF / 25V / 10% / X7R (EIA) / -55°C to 125°C / 0805(2012) / SMD / -	MuRata	GCM21BR71E105KA56
4	C43_1, C43_2, C44_1, C44_2	CAP / CERA / 100nF / 25V / 10% / X7R (EIA) / -55°C to 125°C / 1206(3216) / SMD / -	MuRata	GRM319R71E104KA01
2	D1_1, D1_2	Surface Mount Ultrafast Rectifier 1.0A/800V	Vishay	US1K-E3/61T
4	D2_1, D2_2, D4_1, D4_2	Schottky Rectifier, 1A/60V	ST	STPS1L60ZFY
2	D3_1, D3_2	Surface Mount Ultrafast Rectifier 1.0A/100V	Vishay	US1B-E3/61T
5	D5_1, D5_2, D6_1, D6_2, D7	CHIPLED, Green Colour, 570nm	OSRAM Opto Semiconductors	LG R971-KN-1
2	D8_1, D8_2	Surface Mount LED, Super Red, 630nm	OSRAM Opto Semiconductors	LS L29K-H1J2-1
2	D9_1, D9_2	Surface Mount LED, Blue, 470nm	OSRAM Opto Semiconductors	LB L293-L2N1-25-1-Z
5	D10_1, D10_2, D11_1, D11_2, D12	Small Signal Zener Diode, Temp Range (-55°C to 150°C)	Vishay	BZT52C6V8-HE3-18
1	G1	Ultra Low Quiescent Current Linear Voltage Regulator, 5µA, 5V Voltage Output	Infineon Technologies	TLS810A1LD V50
4	H1_1, H1_2, H2_1, H2_2	TO247_heatsink	OHMITE	WA-T247-101E
4	H3, H4, H5, H6	Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)

(table continues...)

6 Bill of material

Table 5 (continued) Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
12	J1, J2, J3, J4, J5, J6, J7_1, J7_2, J8_1, J8_2, J9_1, J9_2	Jumper	Harwin Inc.	M7581-05
4	MP1, MP2, MP3, MP4	5mm M/F Hex Standoff, Nylon 6/6 material	Keystone Electronics Corp.	25503
4	Q1_1, Q1_2, Q2_1, Q2_2	OptiMOS-3 Small Signal N-Channel Enhancement Transistor	Infineon Technologies	BSL606SN H6327
2	Q3_1, Q3_2	OptiMOS-5 N-Channel Enhancement Mode Power-Transistor, VDS 40V	Infineon Technologies	IPZ40N04S5L-7R4
16	Q4_1, Q4_2, Q5_1, Q5_2, Q6_1, Q6_2, Q7_1, Q7_2, Q10_1, Q10_2, Q11_1, Q11_2, Q12_1, Q12_2, Q13_1, Q13_2	NPN Switching Transistor	Nexperia	MMBT3904,215
4	Q8_1, Q8_2, Q9_1, Q9_2	CoolMos C7 700V Power Transistor	Infineon Technologies	IPW65R019C7
4	R1_1, R1_2, R2_1, R2_2	RES / STD / 4.7k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08054K70FK
22	R3_1, R3_2, R4_1, R4_2, R5_1, R5_2, R19_1, R19_2, R28_1, R28_2, R34_1, R34_2, R39, R65_1, R65_2, R68, R69, R70, R71, R72, R73, R75	RES / STD / 10k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW080510K0FK
2	R6_1, R6_2	RES / STD / 2.2k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08052K20FK
14	R7_1, R7_2, R8_1, R8_2, R17_1, R17_2, R41_1, R41_2, R42_1, R42_2, R43_1, R43_2, R44_1, R44_2	RES / STD / 1k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08051K00FK
2	R9_1, R9_2	RES / STD / 470R / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW0805470RFK

(table continues...)

6 Bill of material

Table 5 (continued) Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
10	R10_1, R10_2, R11_1, R11_2, R12_1, R12_2, R13_1, R13_2, R14_1, R14_2	RES / STD / 100R / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW0805100RFK
12	R15_1, R15_2, R16_1, R16_2, R18_1, R18_2, R20_1, R20_2, R46_1, R46_2, R47_1, R47_2	RES / STD / 10R / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW080510R0FK
2	R21_1, R21_2	RES / STD / 220k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW0805220KFK
2	R22_1, R22_2	RES / STD / 1.2k / 250mW / 1% / 100ppm/K / -55°C to 155°C / 1206 / SMD / -	Vishay	CRCW12061K20FK
2	R23_1, R23_2	RES / STD / 3.6k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08053K60FK
6	R24_1, R24_2, R26, R27, R51, R62	RES / STD / 680R / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW0805680RFK
2	R25_1, R25_2	RES / STD / 200mR / 250mW / 1% / 100ppm/K / -55°C to 155°C / 0805(2012) / SMD / -	Vishay	RCWE0805R200FKEA
11	R29_1, R29_2, R30_1, R30_2, R33_1, R33_2, R53, R64_1, R64_2, R67, R74	RES / STD / 0R / - / 0R / - / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08050000Z0
8	R31_1, R31_2, R32_1, R32_2, R48_1, R48_2, R49_1, R49_2	RES / STD / 2.2R / 250mW / 1% / 100ppm/K / -55°C to 155°C / 1206 / SMD / -	Vishay	CRCW12062R20FK
12	R35_1, R35_2, R36_1, R36_2, R37_1, R37_2, R38_1, R38_2, R40_1, R40_2, R52_1, R52_2	RES / STD / 100mR / 1W / 1% / 75ppm/K / - / 2512 / SMD / -	Vishay	WSL2512R0180FEA18
2	R45_1, R45_2	RES / STD / 4.7R / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08054R70FK
4	R50_1, R50_2, R59_1, R59_2	RES / STD / 100k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW0805100KFK

(table continues...)

6 Bill of material

Table 5 (continued) Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
6	R55, R56, R57, R58, R59, R60	RES / STD / 390k / 250mW / 1% / 100ppm/K / -55°C to 155°C / 1206 / SMD / -	Vishay	CRCW1206390KFK
2	R61, R63	RES / STD / 23.7k / 250mW / 1% / 100ppm/K / -55°C to 155°C / 1206 / SMD / -	Vishay	CRCW120623K7FK
1	R66	RES / STD / 0R / - / 0R / - / -55°C to 155°C / 1206 / SMD / -	Vishay	CRCW12060000Z0
2	R76, R77	RES / STD / 3.74k / 125mW / 1% / 100ppm/K / -55°C to 155°C / 0805 / SMD / -	Vishay	CRCW08053K74FK
2	S1_1, S1_2	Micro Miniature Pushbutton Switch	Bourns	7914G-1-000E
12	TP1_1, TP1_2, TP25_1, TP25_2, TP27_1, TP27_2, TP31_1, TP31_2, TP38, TP40, TP44, TP45	Test Point, Miniature, Surface Mount, Finish- Silver Plate	Keystone Electronics Corp.	5015
58	TP2_1, TP2_2, TP3_1, TP3_2, TP4_1, TP4_2, TP5_1, TP5_2, TP6_1, TP6_2, TP7, TP9_1, TP9_2, TP10_1, TP10_2, TP11_1, TP11_2, TP12_1, TP12_2, TP13_1, TP13_2, TP14_1, TP14_2, TP15_1, TP15_2, TP16_1, TP16_2, TP17_1, TP17_2, TP18_1, TP18_2, TP19_1, TP19_2, TP20_1, TP20_2, TP22_1, TP22_2, TP23_1, TP23_2, TP24_1, TP24_2, TP26_1, TP26_2, TP28_1, TP28_2, TP29_1, TP29_2, TP32, TP33_1, TP33_2, TP34, TP35, TP36, TP37, TP39, TP41, TP42, TP43	PC Test Point-Compact THT, White	Keystone Electronics Corp.	5007

(table continues...)

6 Bill of material
Table 5 (continued) Bill of material

Quantity	Ref Designator	Description	Manufacturer	Part number
2	TR1_1, TR1_2	TDK Transformer with E13 core for bipolar output	TDK	B78308A2464A003
1	U1	16-Bit I/O Expander with Serial Interface	Microchip Technology	MCP23S17T-E/SS
1	U2	USB to SPI translator with GPIOs	Microchip	MCP2210-I/SS
1	U3	12 MHz quarz	Murata	CSTNE12M0G55A000R0
2	U7_1, U7_2	Single channel dual output isolated IGBT/SiC driver	Infineon Technologies	1EDI3051AS
3	X1, X2, X3	PCB Terminal Block, Nominal Current 16A, Nominal Voltage 400V ,5.08mm pitch	Phoenix Contact	MKDSN 2,5/ 2-5,08
2	X4, X17	BNC Straight PCB Socket	TE Connectivity	5-1634506-2
1	X5	Banana Socket, Red, 17.5mm Pitch	Hirschmann Test & Measurement	973 582-101
1	X6	Banana Socket, black, 17.5mm Pitch	Hirschmann Test & Measurement	973 582-100
6	X7, X9, X10, X13_1, X13_2, X18	Through hole .025 SQ Post Header, 2.54mm pitch, 2 pin, vertical, single row	Samtec	TSW-102-07-G-S
1	X8	Micro-USB 2.0 Standard, Type AB, Bottom Mount, Shell SMT	Hirose Connectors	ZX62-AB-5PA(31)
4	X11_1, X11_2, X12_1, X12_2	Solder Jumper 2 Pins	Infineon Technologies	Solder Jumper 2 Pins
6	X14, X15_1, X15_2, X16_1, X16_2, X20	2.54mm Pitch KK Header, Breakaway, Vertical, 3 Circuits, 0.38µm Gold Selective Plating, Mating Pin Length 6.09mm	Samtec	TSW-103-07-G-S
1	X19	Through hole .025 SQ Post Header, 2.54mm pitch, 6 pin, vertical, single row	Samtec	TSW-106-07-L-S

7 Restrictions

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References

References

- [1] Infineon Technologies AG. Data sheet (2023): *EiceDRIVER™ gate driver 1EDI3050AS: Single channel isolated IGBT/SiC-MOSFET driver. IFX-Z8F69662782*
- [2] Infineon Technologies AG. Data sheet (2023): *EiceDRIVER™ gate driver 1EDI3051AS: Single channel isolated IGBT/SiC-MOSFET driver. IFX-Z8F69199023*
- [3] Infineon Technologies AG. Data sheet (2015): *Ultra Low Quiescent Current Linear Voltage Regulator TLS810D1LDV50.*
- [4] Infineon Technologies AG. Data sheet (2015): *OptiMOS™-5 Power-Transistor IPZ40N04S5L-7R4.*

Revision history

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2023-11-17	Initial release

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[0301-000](#) [ROA1286023/1](#)