Demoboard BTS3011TE

User Manual

About this document

Scope and purpose

This document describes how to use the Demoboard BTS3011TE

Intended audience

Engineers, hobbyists and students who want to switch 12V loads in their Arduino UNO projects or evaluate the performances of the BTS3011TE with usual lab equipements (waveform generator, power supply, etc…)

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1 Getting Started

1.1 BTS3011TE Shield Overview

The 12V low-side switch demoboard with one BTS3011TE from Infineon Technologies is a flexible evaluation board dedicated to drive all kinds of loads up to 1kHz, especially motors and capacitive-like loads. This demoboard is compatible with Arduino UNO shield.

The demoboard can be controlled either with the general logic I/O-ports of a microcontroller or with a PWM signal from a waveform generator. It includes typical schematic to control the BTS3011TE.

This shield offers a quick evaluation of the product functions like the “Status” latch feedback, dedicated logic supply (logic is independent of Input) and all protections, e.g. “Current protection”, “Over temperature protection”.

WARNING: Please refer to BTS3011TE datasheet for details on functionalities and parameters values. This user manual does not replace the datasheet and user must be aware of limitations before turning on and supply.

The shield can be easily connected to any Arduino UNO board via headers. Code and GUI is available for Arduino UNO. No code/interface is available for XMC1100 but XMC1100 can be easily programmed through Arduino IDE: Please check the following link for detail: **https://github.com/Infineon/XMC-for-Arduino**

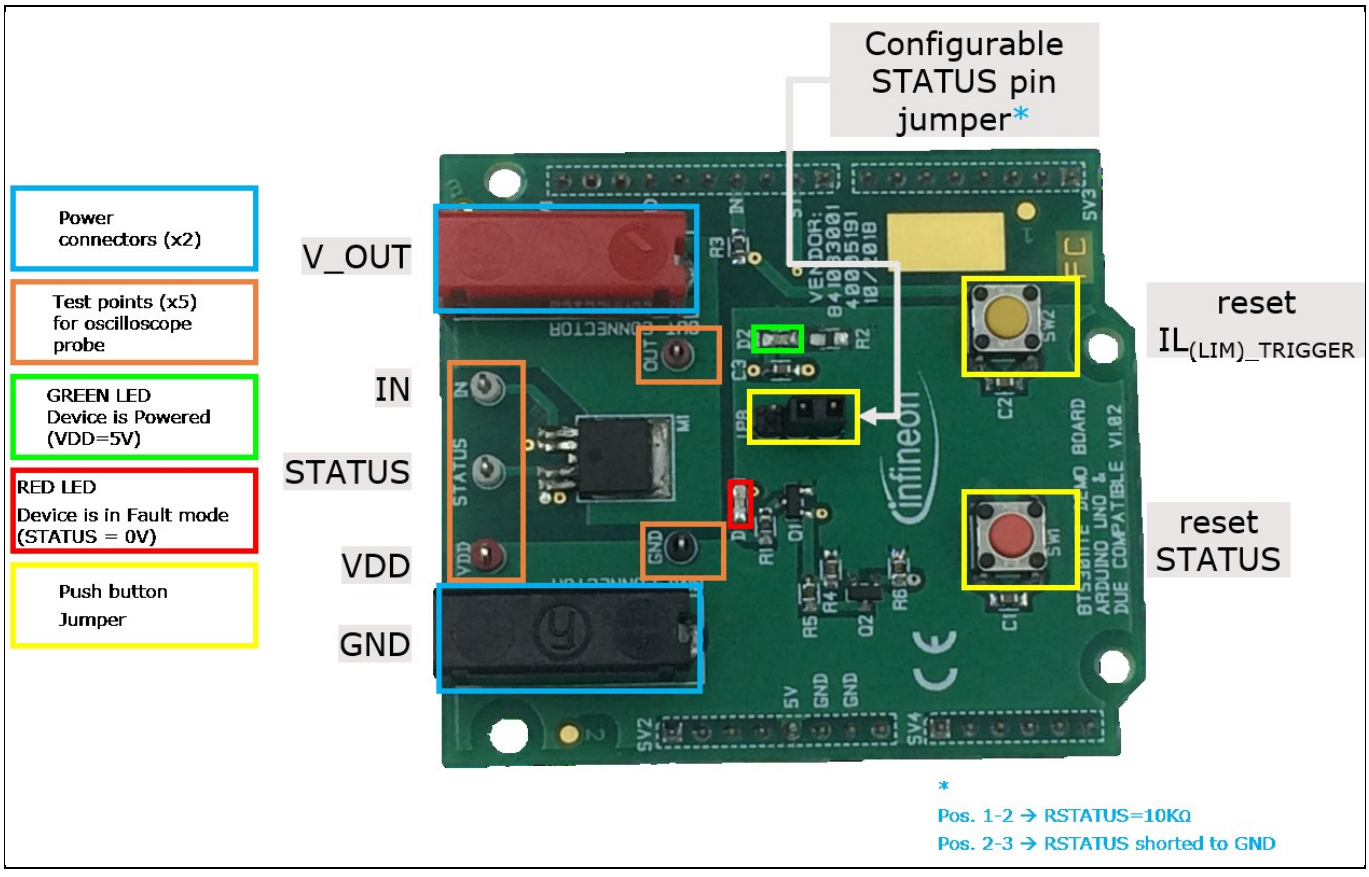

Figure 1 Example figure

1.3 Key Features

- Demoboard is able to provide continuous current load (20A in DC mode) between V_OUT and GND
- A green LED will light on when logic supply voltage is connected and ON
- Output voltage, Input logic, Status and VDD can be measured externaly with test points
- Input logic, Status and VDD can be monitored with Arduino interface

1.4 Demoboard Package Contents

In the zip package must be the following files:

- Demoboard_BTS3011TE_User_Manual_V1.0.pdf
- Demoboard_AIKO_Universal.exe
- Demoboard_AIKO_Universal.ino

1.5 Typical Connection

1.5.1 With Arduino UNO Shield

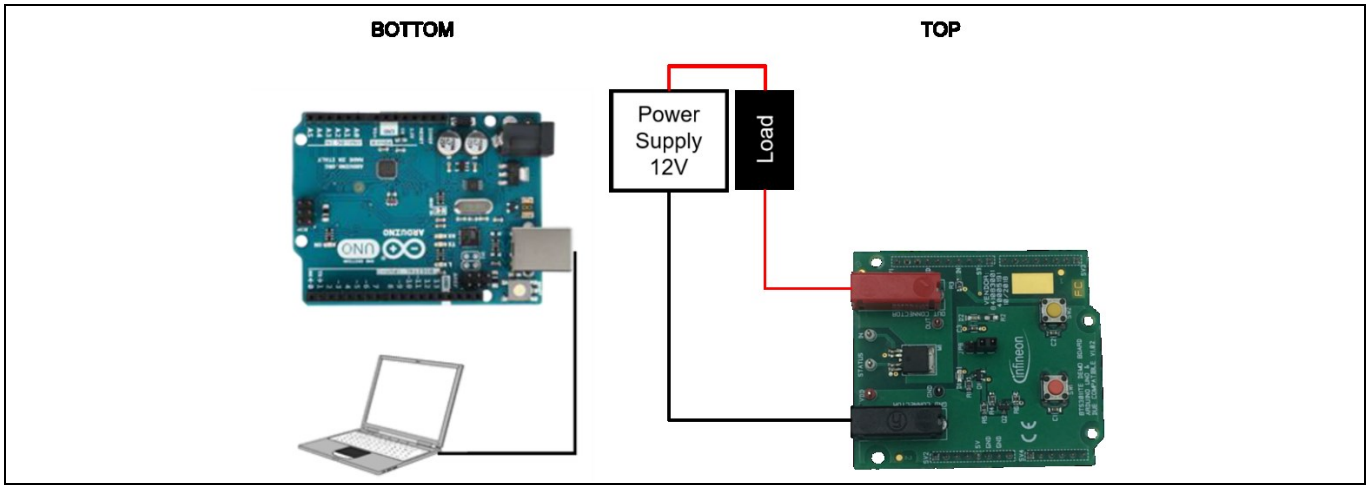

Figure 2 Example figure

1.5.2 Without Arduino UNO

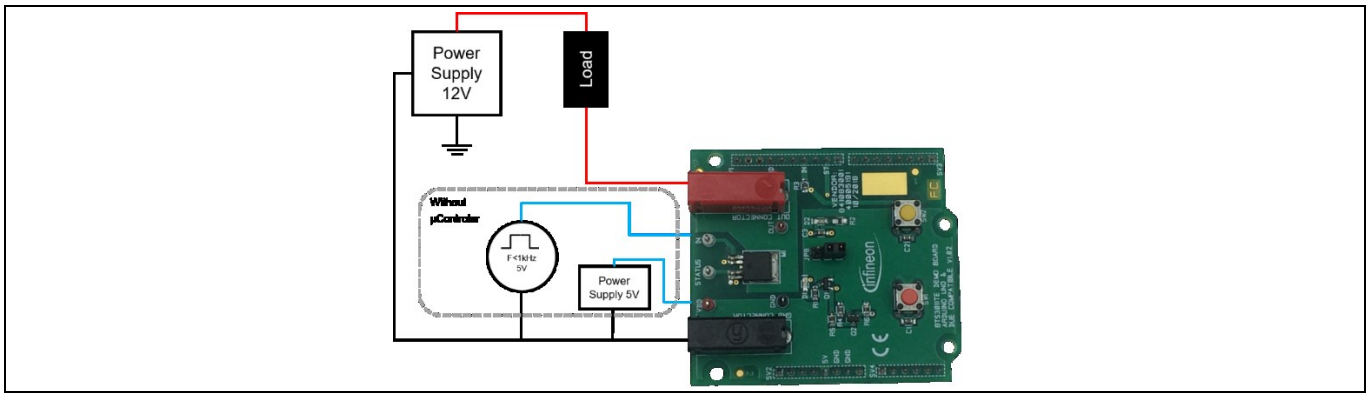

Figure 3 Example figure

2 Demoboard Configuration

If an Arduino is used, configuration needs to be set in the software. Please refer to **3.2.2** Control Panel.

2.1 STATUS Pin Connection

BTS3011TE can be controlled with STATUS pin pulled-up to VDD to allow fault monitoring, **Figure 4** shows the two possible settings of for STATUS pin

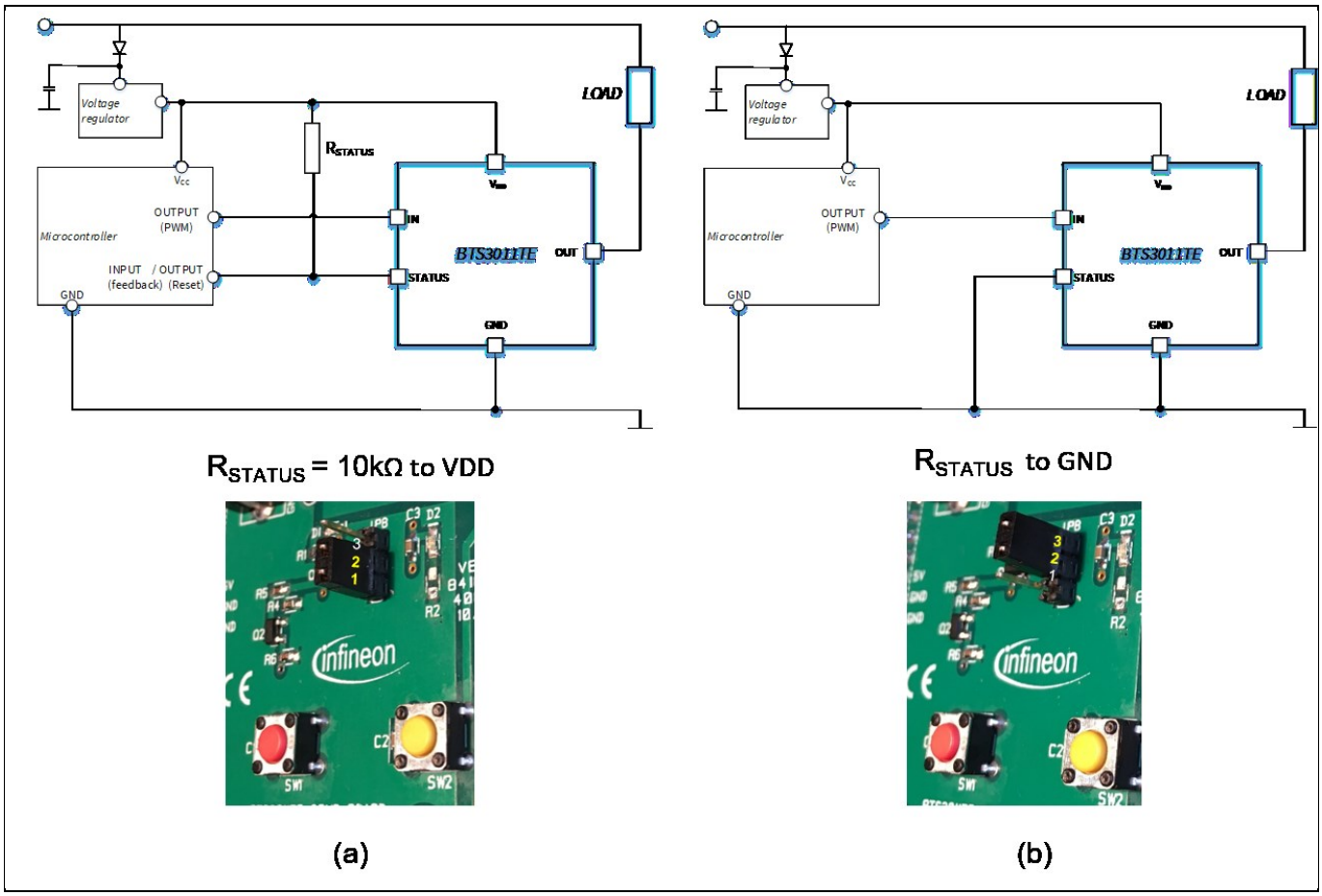

Figure 4 Example figure

- Jumper position **(a)**: STATUS pin is pull-up to VDD via a Resistor of 10kΩ when jumper connects therminal 1-2 together. This pin configuration allows to monitor the STATUS pin (reading STATUS voltage) and to reset the STATUS signal when latched (due to overtemperature event), STATUS and reset mechanism are described in detail in the product datasheet BTS3011TE
- Jumper position **(b)**: STATUS pin is not needed and is directly connected to GND. This pin configuration does not allow to monitor the STATUS pin and no reset is possible. Note that current limitation remains active once the device has been in fault mode. To reset the current limitation trigger and the STATUS pin, user have to turn-off the device and set VDD to low

Table 1 STATUS pin functionality

Pin	Symbol	I/O	Function
4	STATUS	Input	Reset of latches by microcontroller pull-up
		Output	“high”: Normal operation
			“low”: Overtemperature condition

2.1.1 Overcurrent limitation / Short circuit behavior

If the load current I_L reaches the current limitation trigger level $I_{L(LIM)TRIGGER}$ the device will self limit the current to $I_{L(LIM)}$, the device will start heating up and will self turn-off when junction temperature reaches $T_{J(SD)}$.

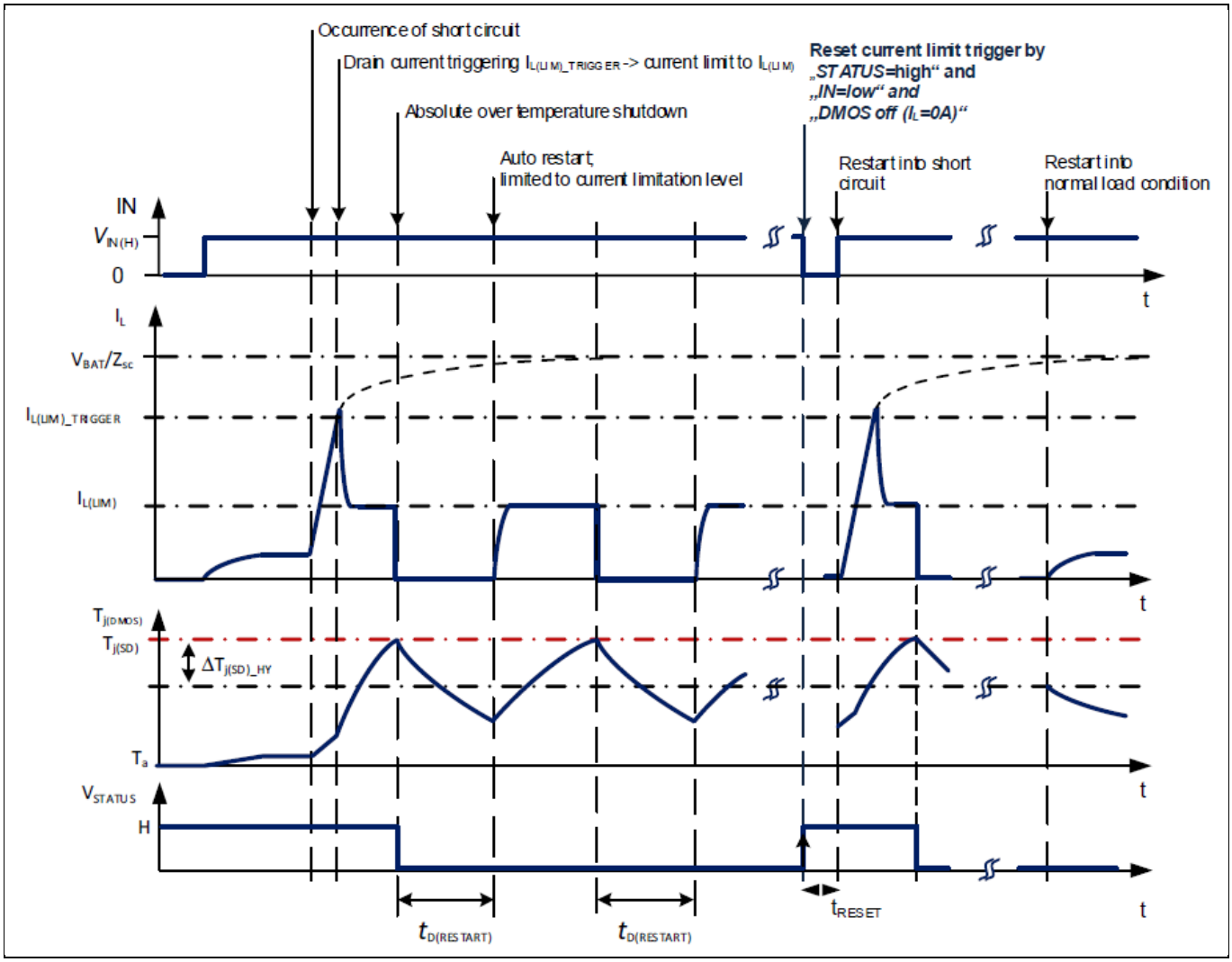

Figure 5 Short circuit protection via current limitation and thermal switch off, with latched fault signal on STATUS pin

2.1.3 Behavior with overload current below current limitation trigger level

The lower current limitation level $I_{L(LIM)}$ will be also triggered by a thermal shutdow. This could be the case in terms of overload with a current still beliw the current limitation trigger lever ($I_L < I_{L(LIM)TRIGGER}$)

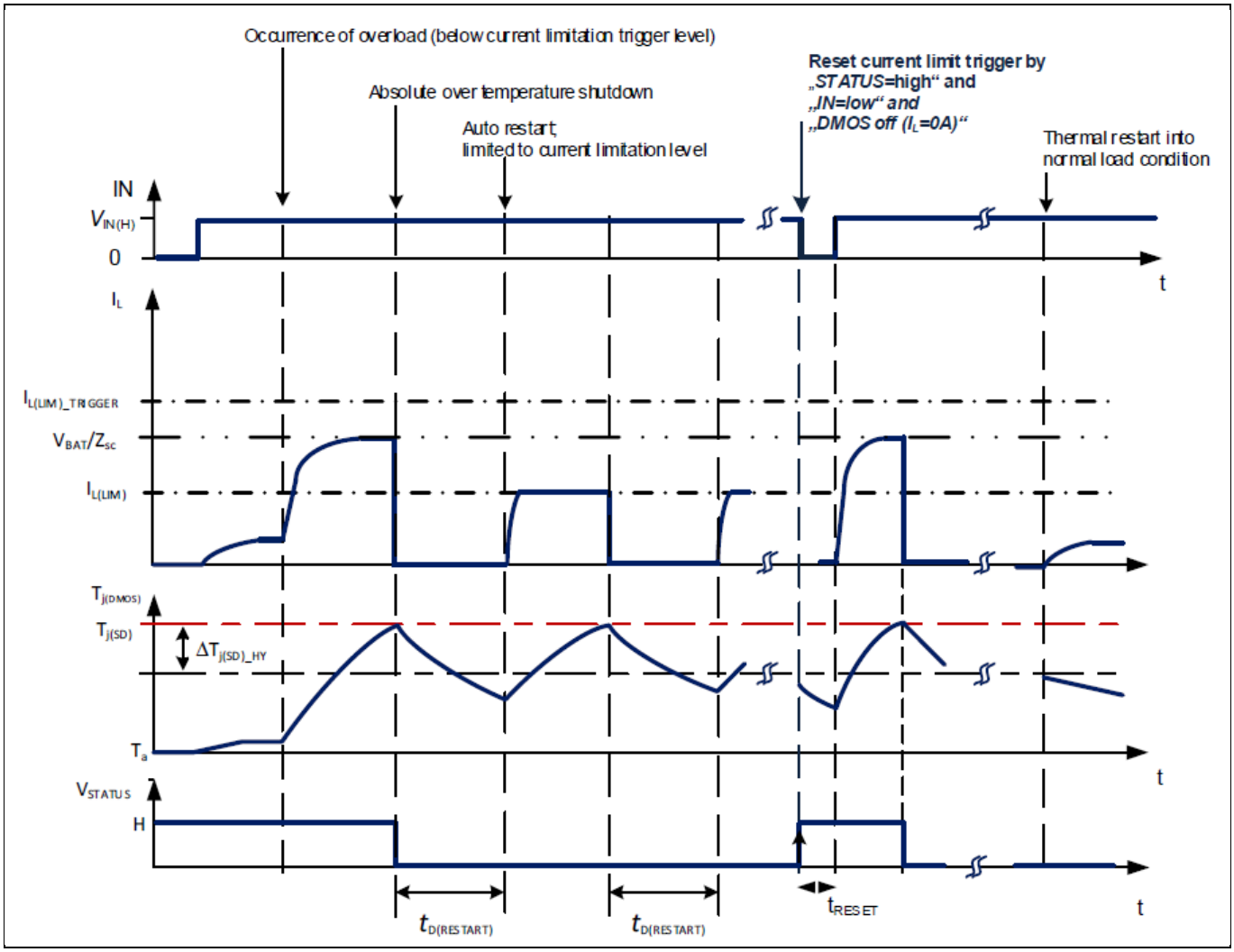

Figure 6 Example of overload behavior with thermal shutdown

3 Software Utilisation

- Software “Demoboard_Aiko_Universal.exe” is a GUI for Windows OS, used with Arduino UNO board with the dedicaded code “Demoboard_Aiko_Universal.ino”.

3.1 Installation

- User has to install the Arduino IDE software to allow communication between comuter and Arduino board
- Once the program is installed, connect the Arduino Shield. Double-click the “Demoboard_Aiko_Universal.ino” Arduino code and upload it.
- When the code is correctly uploaded / installed, the user can plug the demoboard on the Arduino shield. The green LED must turn-on, meaning that BTS3011TE logic is supplied
- Then, launch the “Demoboard_Aiko_Universal.exe”.
  - Click on “Ports” to select the right communication port on your Arduino board.
  - Click on “Start” to start the system.
    - If it’s not working, check your port name (usually called “COM X”, where X is a number).
  - If installation is done and operational, user can see text transmitted by Arduino board below the port selector.

3.2 Features

3.2.1 Overview Panel

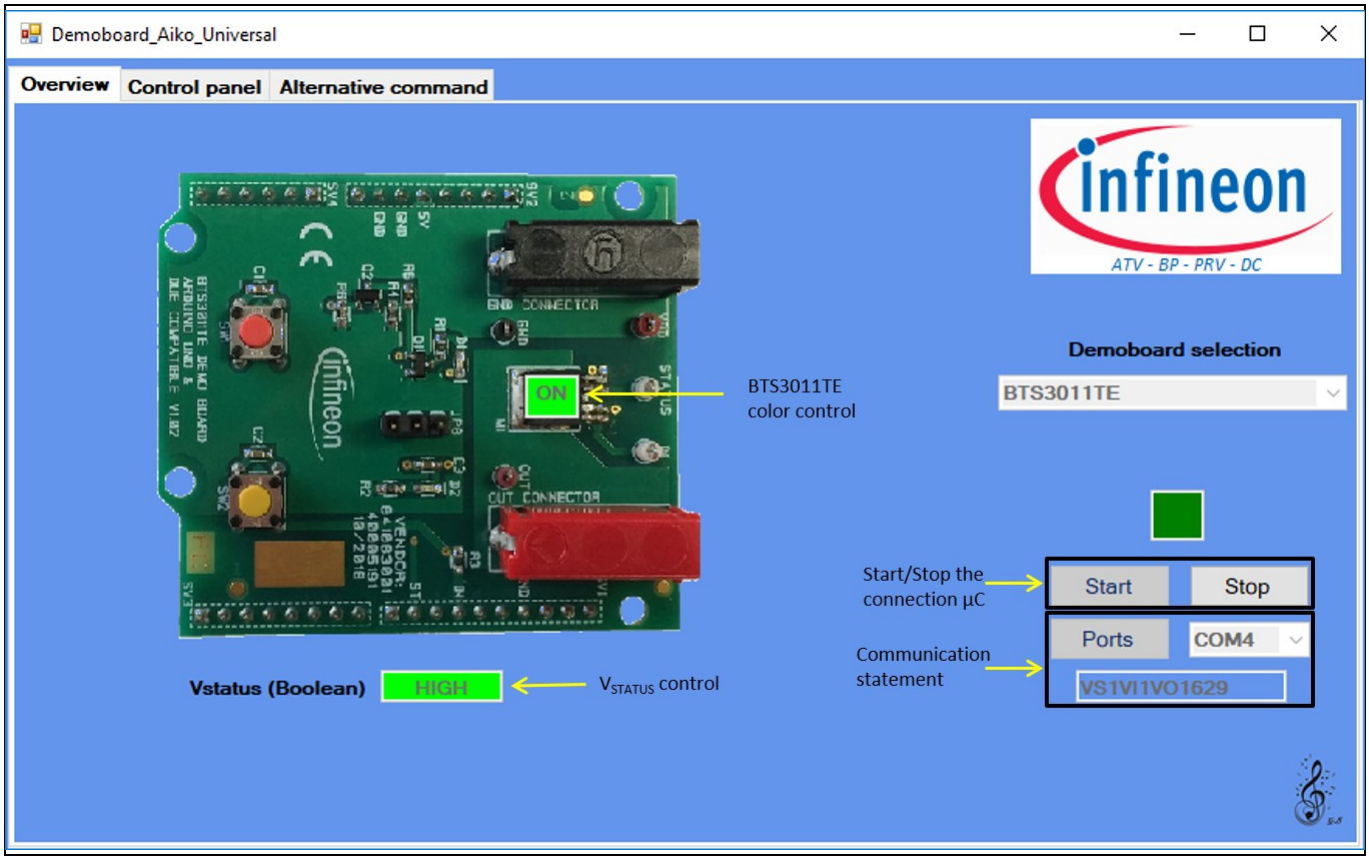

Figure 7 This panel can select the Port communication Start and Stop communication

- BTS3011TE color control has three possible states: ON OFF FA. If FA, You have to go on the “Alternative command” panel to restart the trigger or the status according the datasheet specifications.
  - If BTS3011TE operates normally, Vstatus should appear in green.
  - If BTS3011TE is latched, status appears in red.

3.2.2 Control Panel

- Button “ON/OFF” allows the user to switch ON and OFF the BTS3011TE in continuous mode.
- Button “Pulse” creates a manageable pulse for the BTS3011TE.
  - User can set upto 30 pulses with period control adjustable in the “PWM Mode”.
  - User can set an Ending action afer the end of the sequence.
- Button PWM allows user to manage dutycyle and frequency.

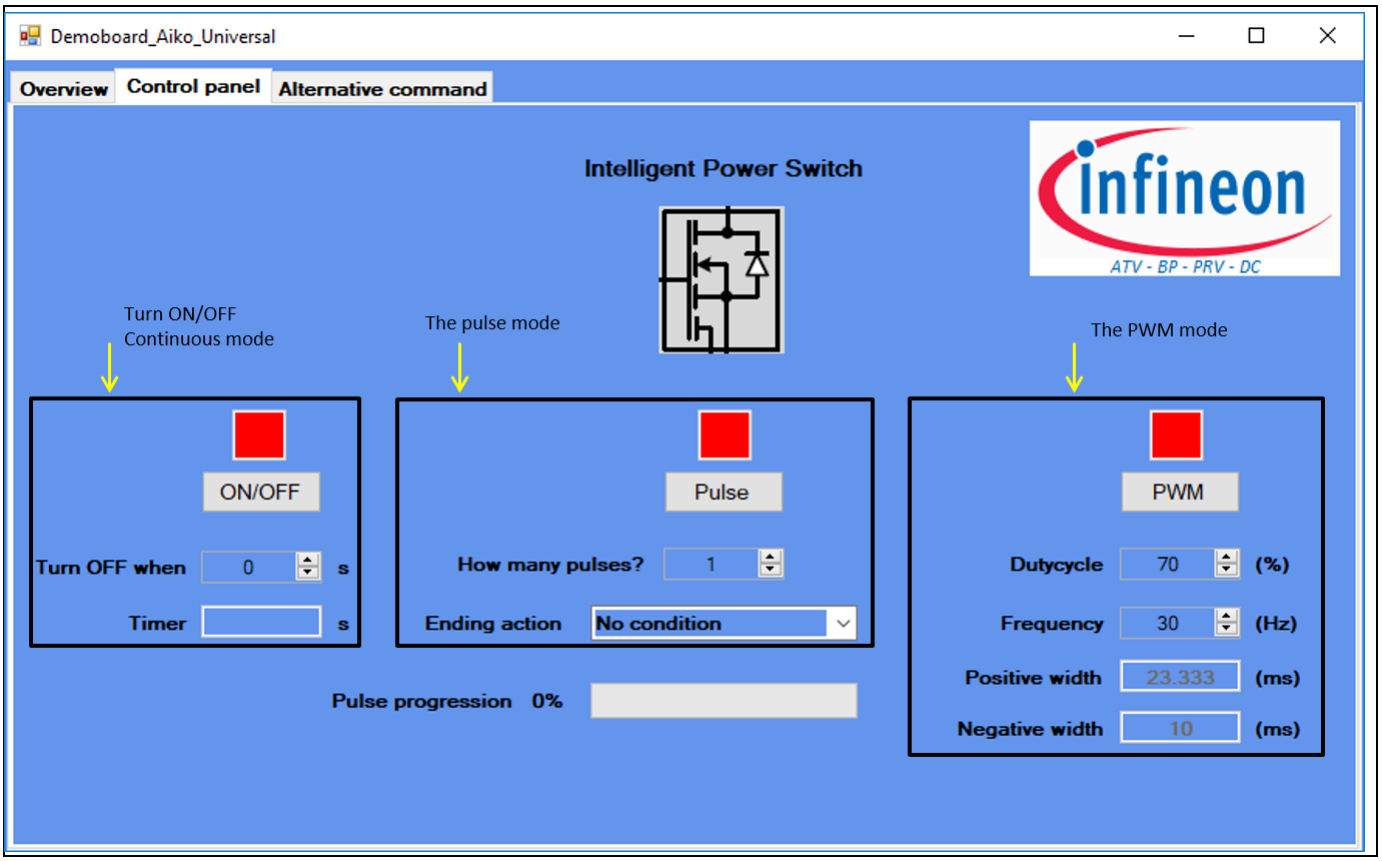

Figure 8 Control panel allows to set the Input signal (continuous or pulse)

3.2.4 Alternative Command Panel

- STATUS pin can be reseted (Low to High) when Reset Status button is pressed
- Current limitation threshold can be reset when Reset Trig buttion is pressed

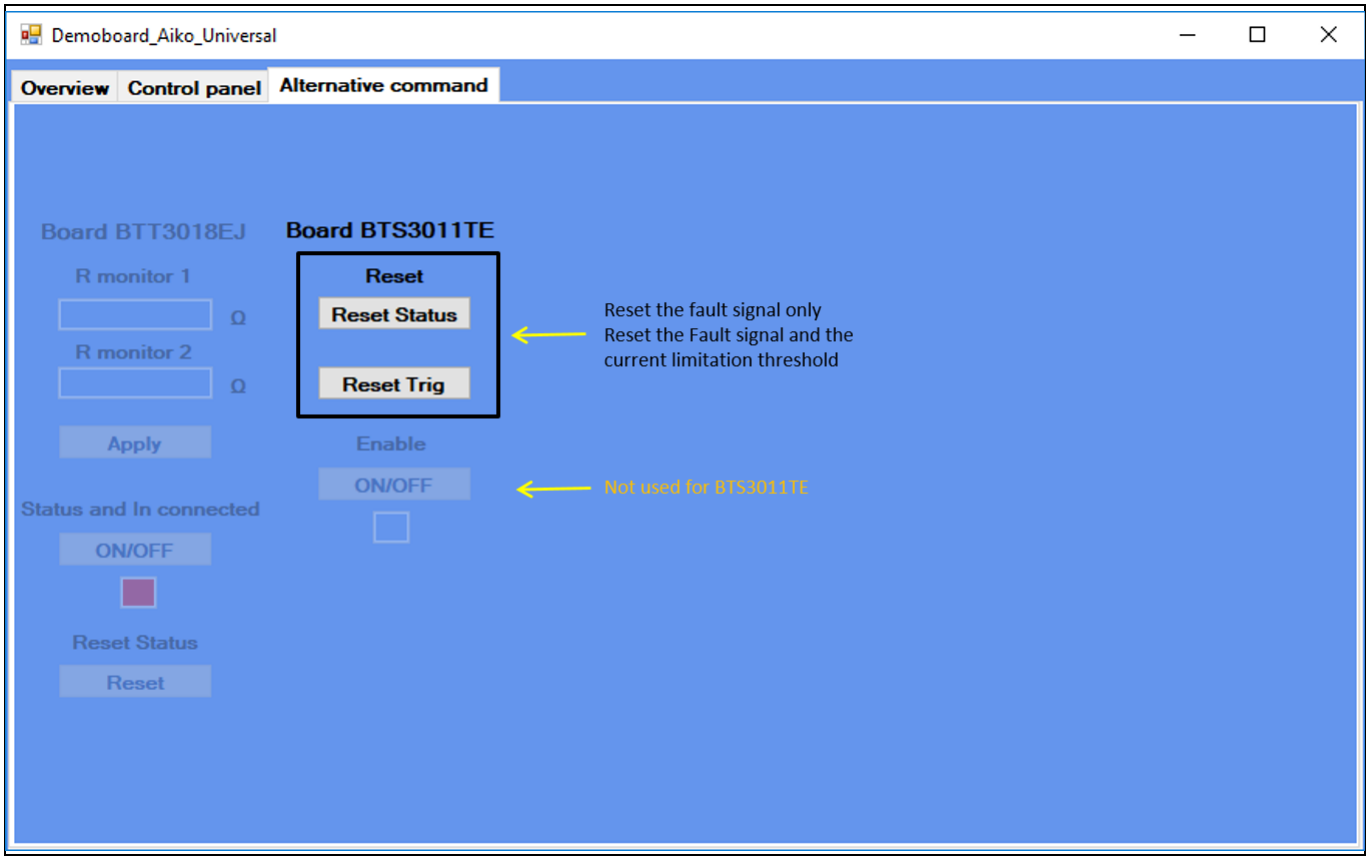

Figure 9 Alternative command panel

4 Board Connector Description

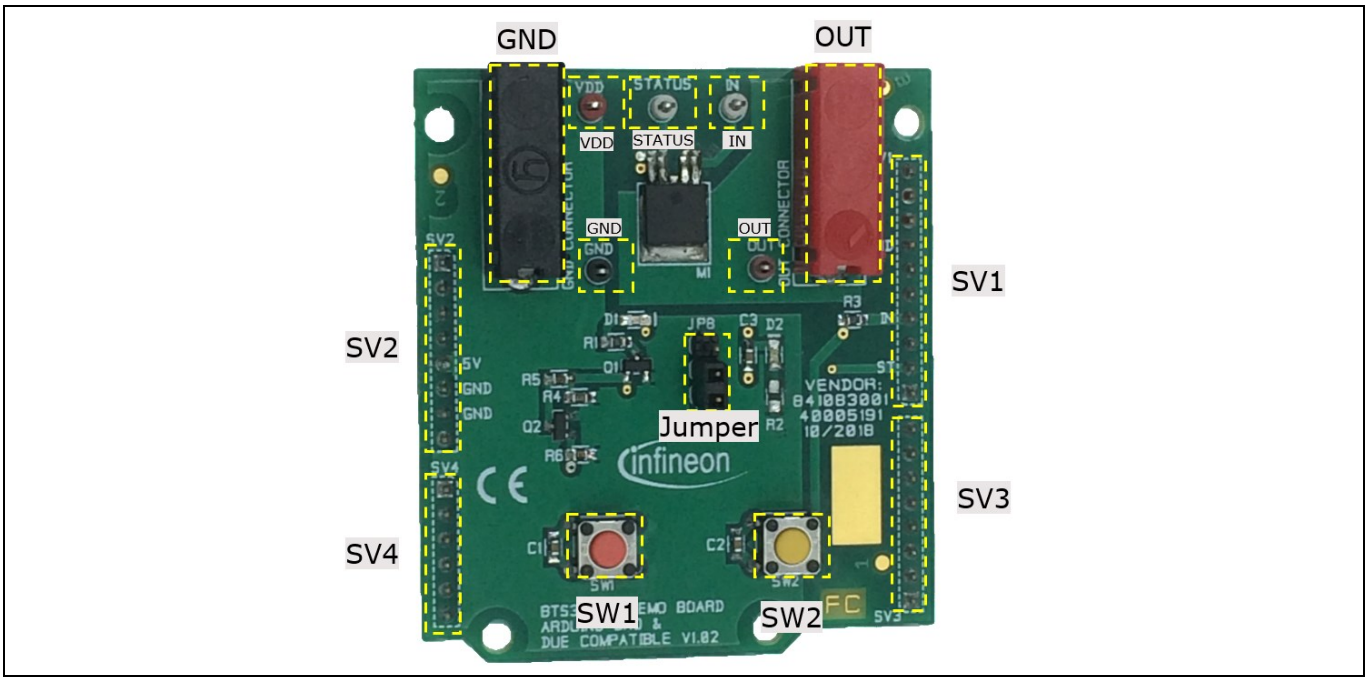

Figure 10 Connectors implantation

4.1 Power Connector

Table 2 Table A

Name	Connector	Type	Description
OUT	J1	Power supply	OUT Connector
GND	J2	Ground power	GND Connector

4.2 Arduino/XMC1100 Connectors

4.2.1 Connector SV1

Table 3 Table A

Name	Connector	Type	Description
	1	Not connected	
ST	2	I/O	STATUS pin (Low active)
	3	Not connected	
IN	4	Digital input	To turn the device ON/OFF
	5, 6	Not connected	
GND	7	Digital Ground	Ground
	8 to 10	Not connected	

4.2.2 Connector SV2

Table 4 **Table A**

Name	Connector	Type	Description
	1 to 4	Not connected	
5V	5	VDD	Logic supply
GND	6	Digital Ground	Ground
GND	7	Digital Ground	Ground
	8	Not connected	

4.2.3 Connector SV3

Table 5 **Table A**

Name	Connector	Type	Description
	1 to 8	Not connected	

4.2.4 Connector SV4

Table 6 **Table A**

Name	Connector	Type	Description
	1 to 6	Not connected	

4.4 Push Buttons and Jumper

4.4.1 Push Button SW1 / SW2

Table 7 **Table A**

Name	Connector	Type	Description
SW1	1	Digital input	Button to reset STATUS pin
SW2	2	Digital input	Reset IL(LIM)_TRIGGER when both SW1 and SW2 are pressed together

4.4.2 Jumper JP8

Table 8 **Table A**

Name	Connector	Type	Description
JP8	1	---	Therminal connected to VDD
	2	---	Therminal connected to STATUS pin
	3	---	Therminal connected to GND

4.5 Test Points

Table 9 **Table A**

Name	Connector	Type	Description
IN	1	Digital input	Pin Activation for BTS3011TE
STATUS	2	Digital I/O	Pin to monitor the part status
VDD	3	Logic supply	Pin to provide supply to BTS3011TE Logic (5V recommended)
OUT	4	Analog output	Pin to monitor V_OUT
GND	5	Analog input	Pin to monitor the GND

5 Schematic

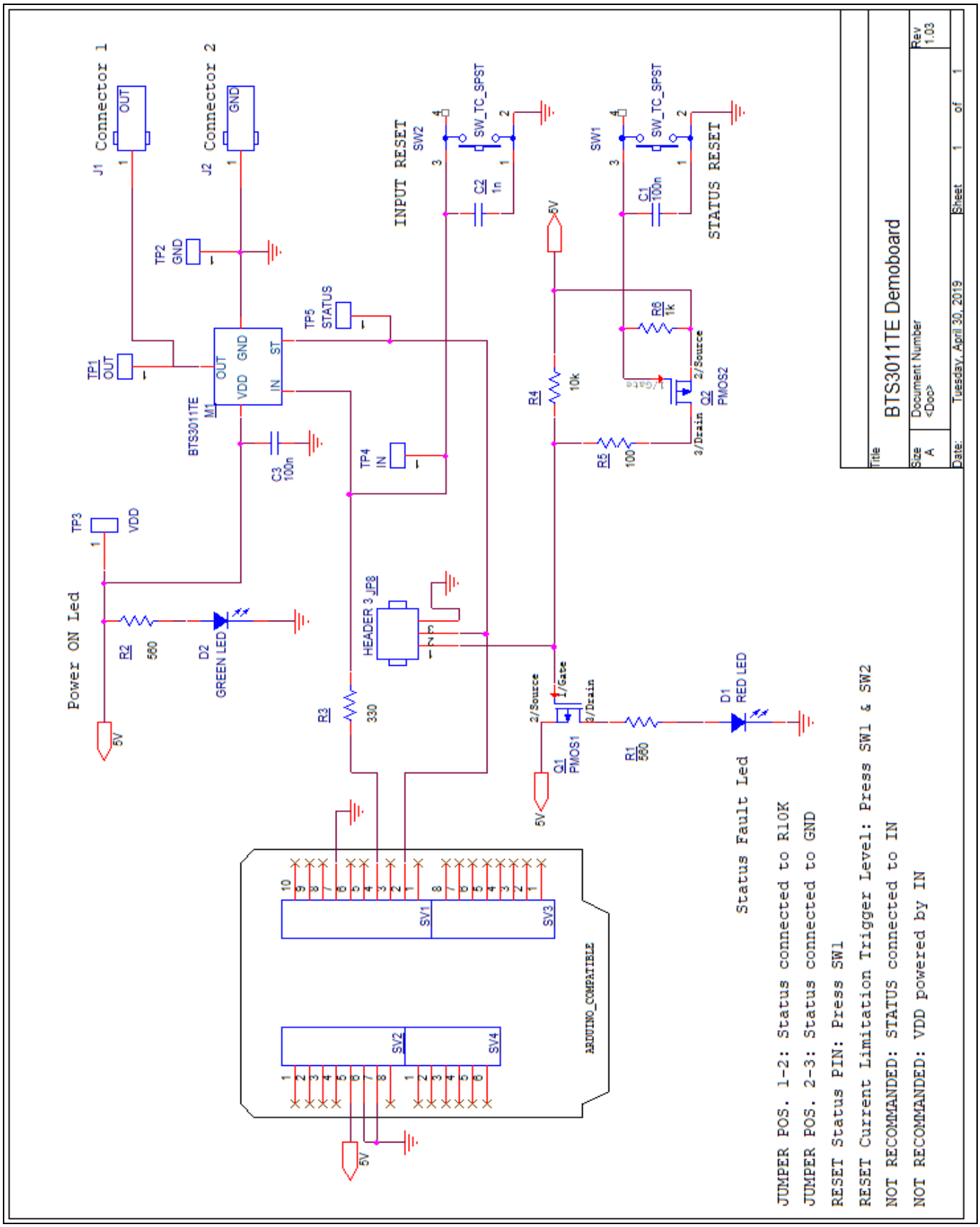

Figure 11 Example figure

6 B.O.M

Table 10 Table A

Item	Quantity	Reference	Part
1	2	"C1,C3"	100n
2	1	C2	1n
3	1	D1	RED LED
4	1	D2	GREEN LED
5	1	JP8	HEADER 3
6	2	"TP1,J1"	OUT
7	2	"TP2,J2"	GND
8	1	M1	BTS3011TE
9	1	Q1	PMOS1
10	1	Q2	PMOS2
11	2	"R1,R2"	560
12	1	R3	330
13	1	R4	10k
14	1	R5	100
15	1	R6	1k
16	4	"SV1,SV2,SV3,SV4"	CONNECTOR EDGE 10
17	2	"SW1,SW2"	SW_TC_SPST
18	1	TP3	VDD
19	1	TP4	IN
20	1	TP5	STATUS

7 Board Layout

7.1 TOP

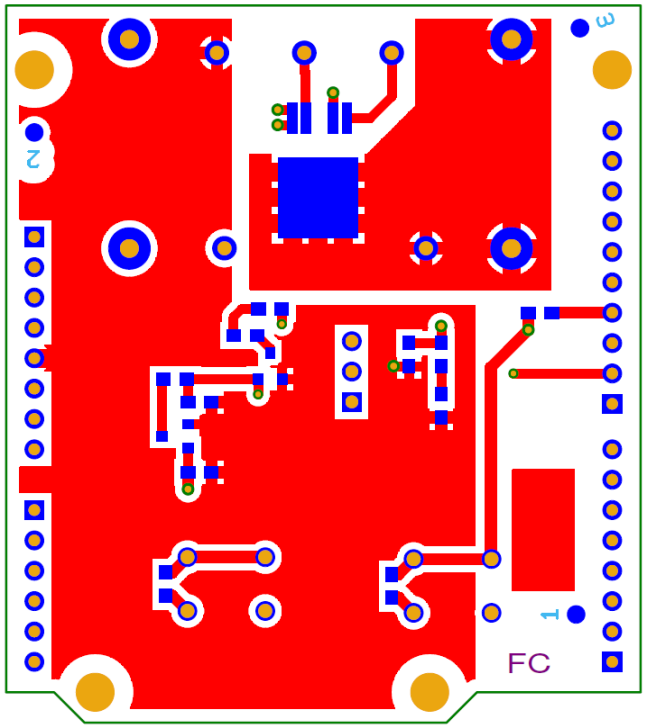

Figure 12 Example figure

Body text.

7.2 BOTTOM

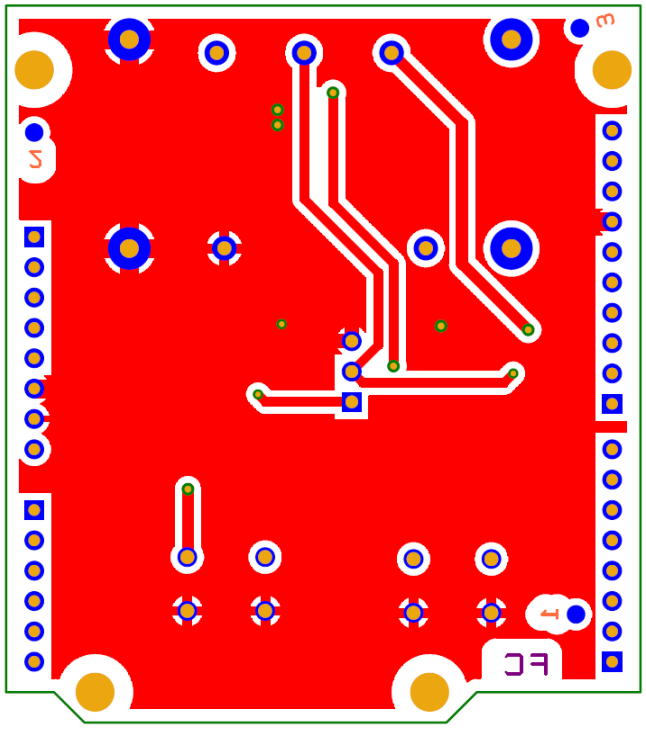

Figure 13 xample figure

7.3 MECHANICAL VIEW

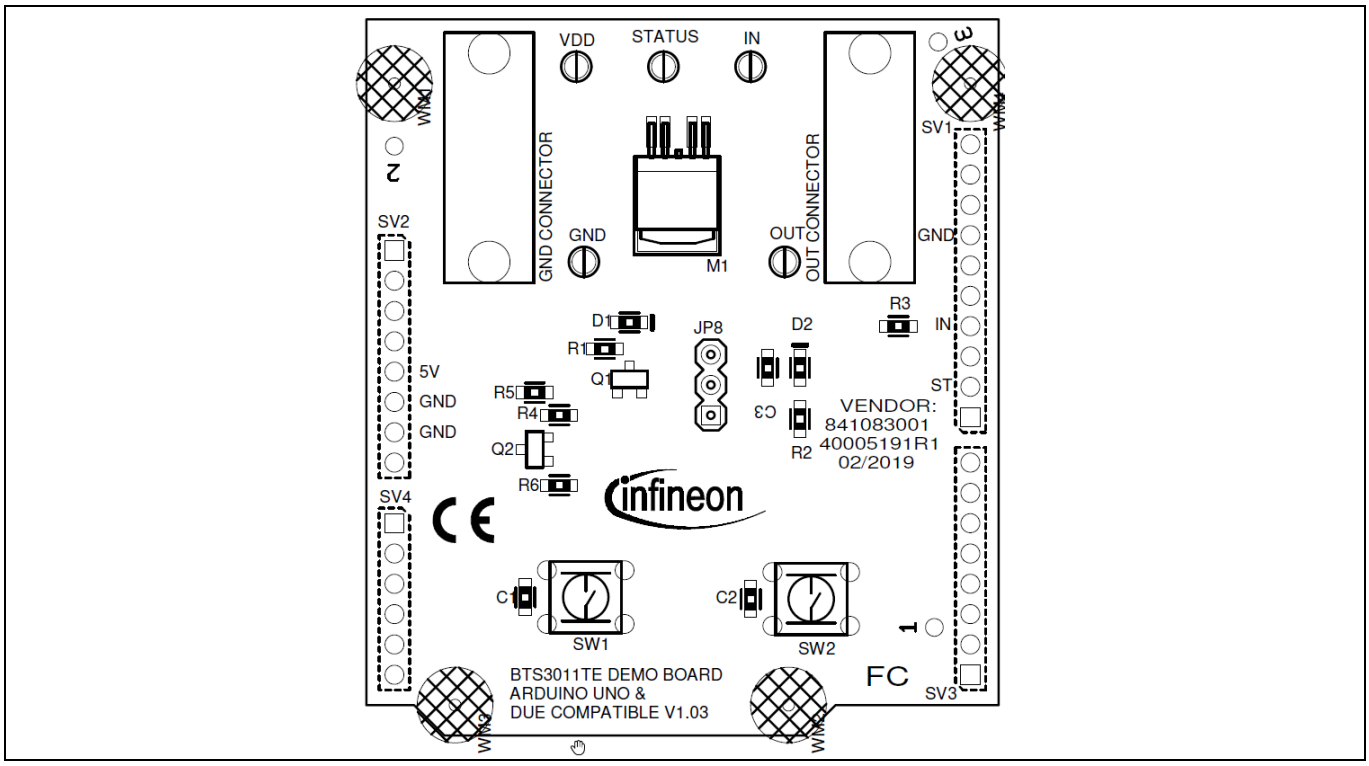

Figure 14 Example figure

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Revision history

Document version	Date of release	Description of changes
1.0	May 7, 2019	First release

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User Manual

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