USB Supply Demonstrator Board

Generation 2
October 14, 2016

USB Supply Demonstrator Board Introduction

- The following slides shall give You a brief introduction to the USB Supply Demonstrator Board
- Layout
- Schematic
- Quickstart
- Background

- The demonstrator board is equipped with a TLF51801 as 5 V regulator)
- Please refer to TLF51801 data sheet

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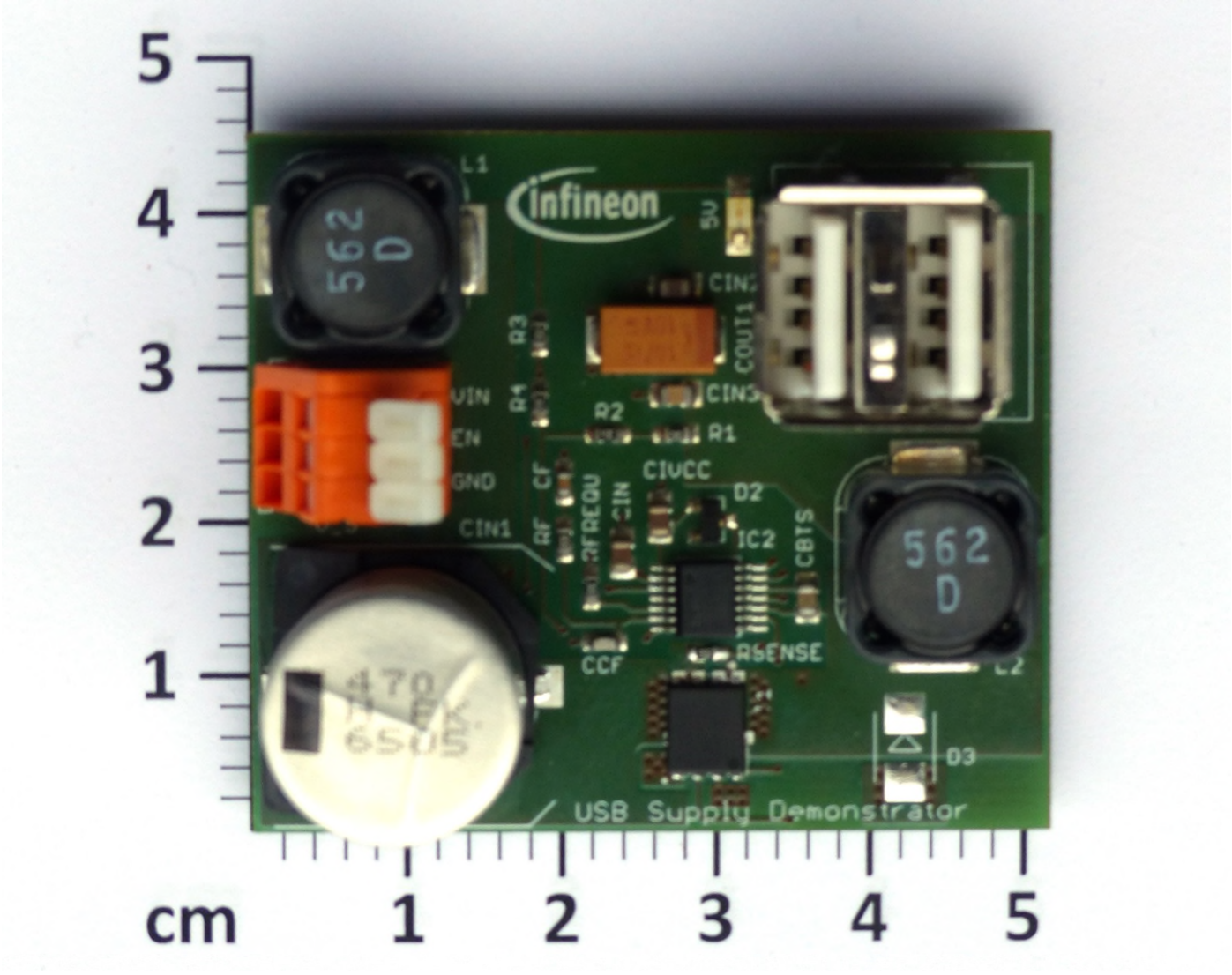
USB Supply Demonstrator Board
The Board (What You have in front of You, top view)



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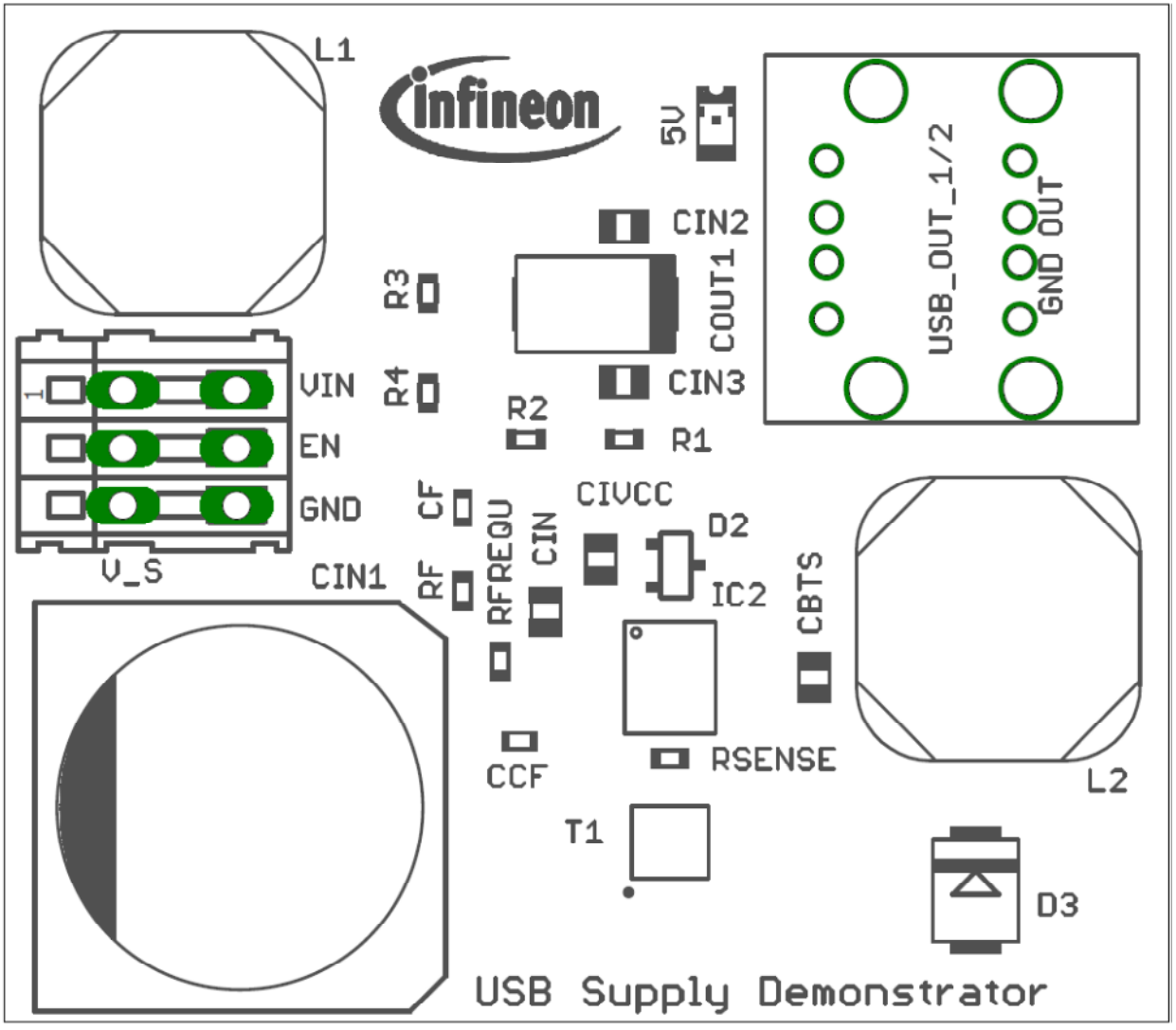
USB Supply Demonstrator Board
Mounting Plan



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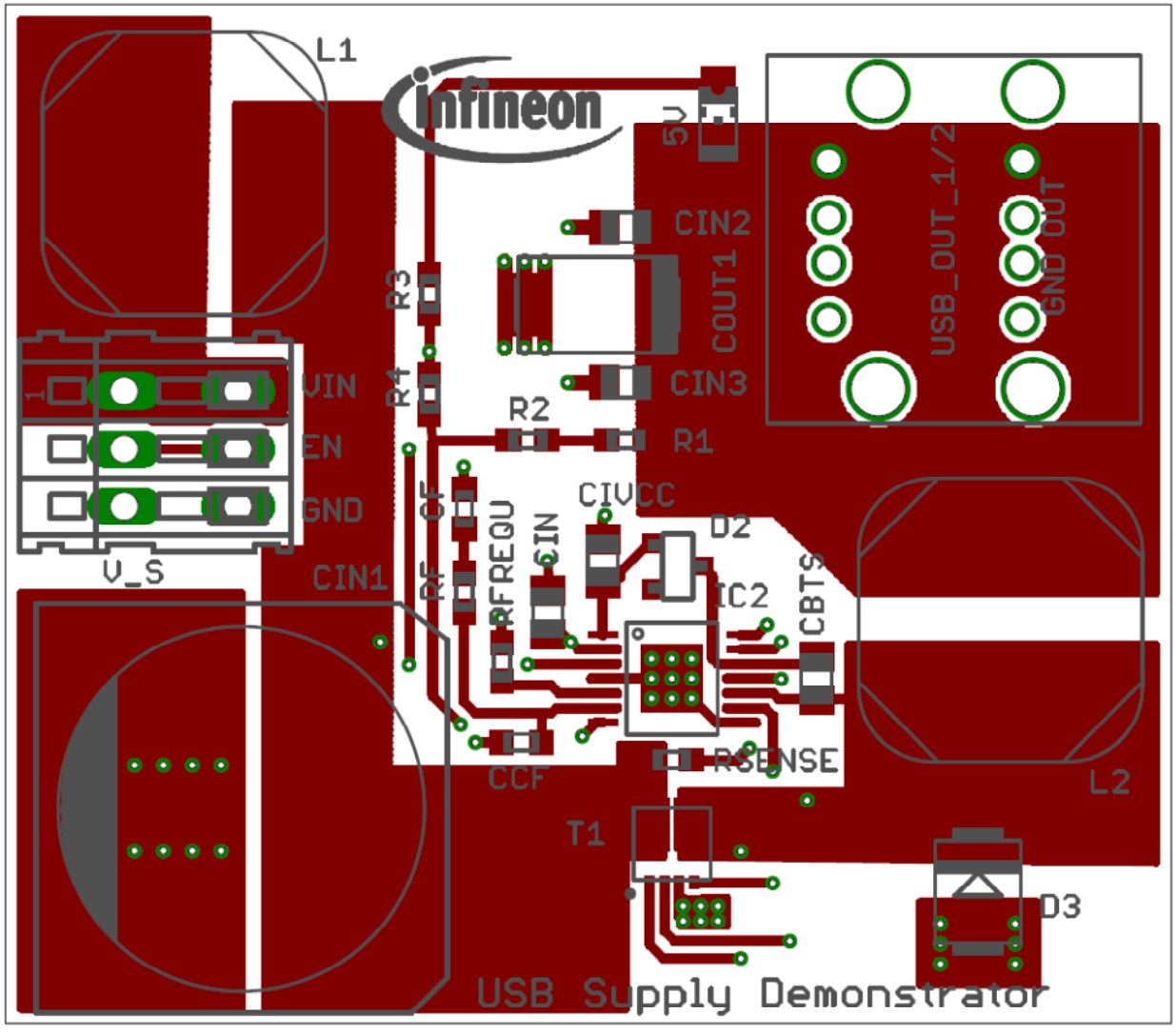
USB Supply Demonstrator Board
Layout Top Layer



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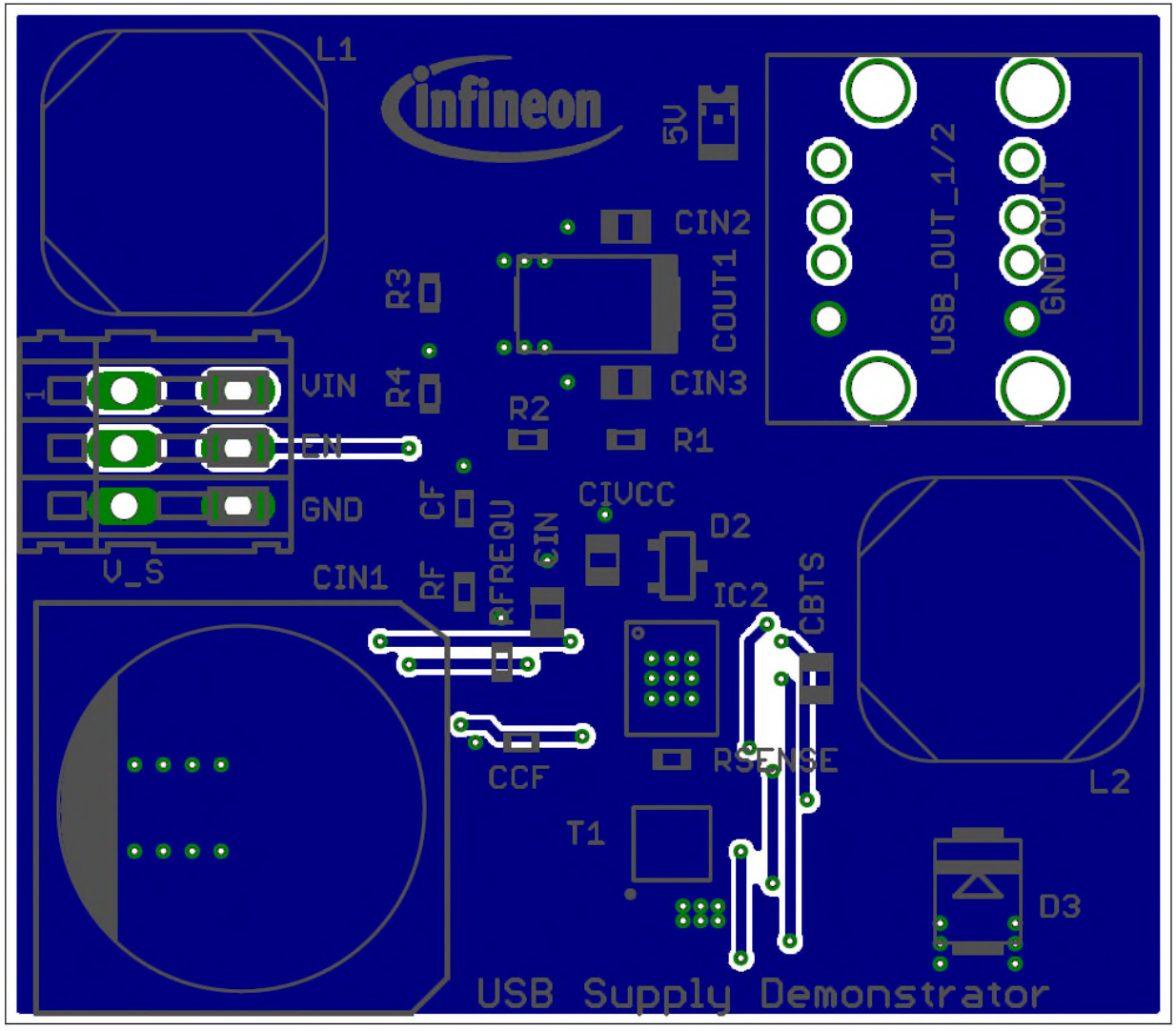
USB Supply Demonstrator Board
Layout Bottom Layer



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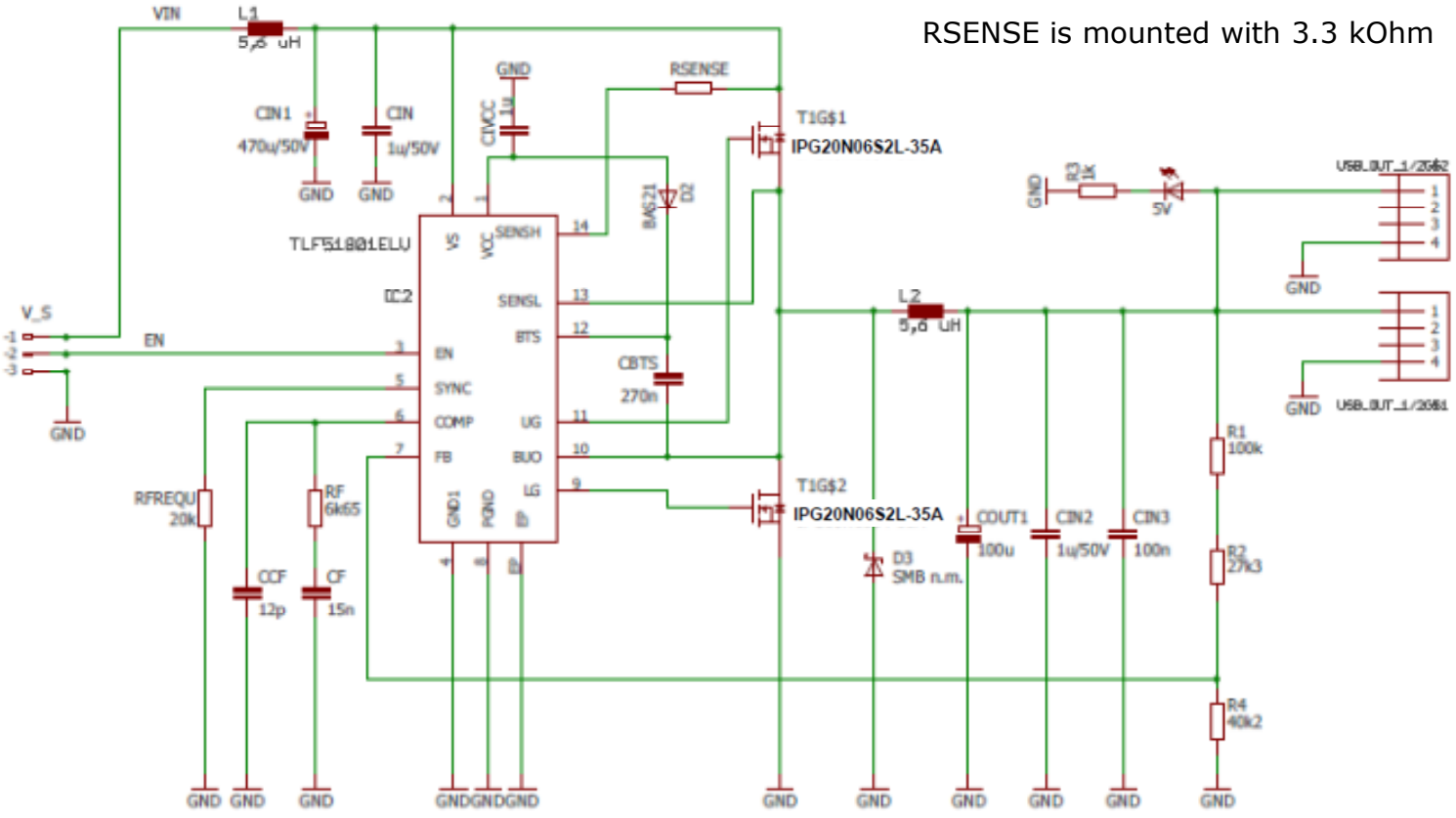
USB Supply Demonstrator Board Schematic

RSENSE is mounted with 3.3 kOhm



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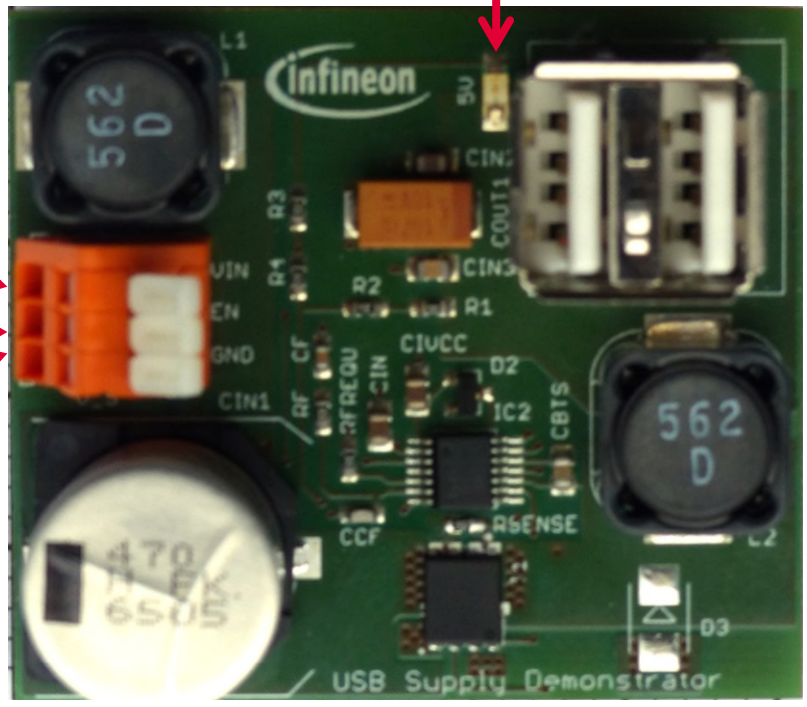
USB Supply Demonstrator Board
Quick Start

LED indicates output voltage



V_{IN}

EN

GND

USB Ports 1&2

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USB Supply Demonstrator Board Quick Start

- Connect GND to Ground
- Connect V_{IN} to battery voltage (12 V)
- To start the board connect Enable to V_{IN}
- Green LED indicates output voltage

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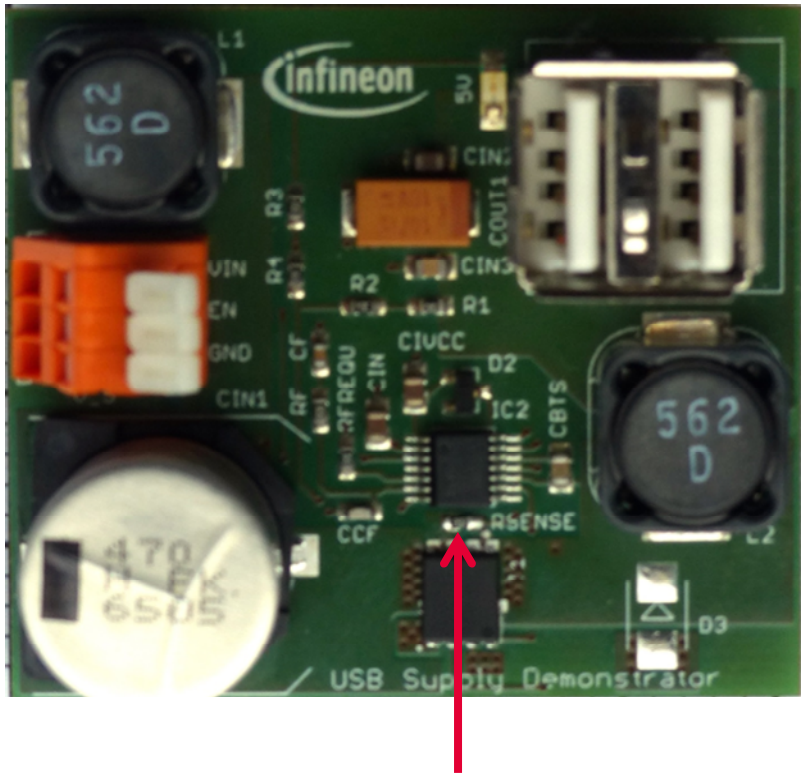
USB Supply Demonstrator Board Adjustments



RSENSE

› The current limitation of TLF51801 is set to ~ 5.5A and may be adjusted by modifying R_{SENSE}

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USB Supply Demonstrator Board
Adjustment of TLF51801 current limitation

IPG20N06S2L-35A

OptiMOS® Power-Transistor

AEC Qualified RoHS

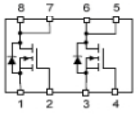
Product Summary

V_{DS}	55	V
$R_{DS(on),max}$ [4]	35	mΩ
I_D	20	A

Features

- Dual N-channel Logic Level - Enhancement mode
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested
- Feasible for automatic optical inspection (AOI)

PG-TDSON-8-10



Type	Package	Marking
IPG20N06S2L-35A	PG-TDSON-8-10	2N06L35

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current one channel active[2]	I_D	T_C=25 °C, V_{GS}=10 V[1]	20	A
		T_C=100 °C, V_{GS}=10 V	20	
Pulsed drain current[2] one channel active	$I_{D,pulse}$	-	80	
Avalanche energy, single pulse[2, 4]	E_{AS}	I_D=10A	100	mJ
Avalanche current, single pulse[4]	I_{AS}	-	15	A
Gate source voltage	V_{GS}	-	±20	V
Power dissipation one channel active	P_{tot}	T_C=25 °C	65	W
Operating and storage temperature	T_j, T_{stg}	-	-55 ... +175	°C
IEC climatic category; DIN IEC 68-1	-	-	55/175/56	

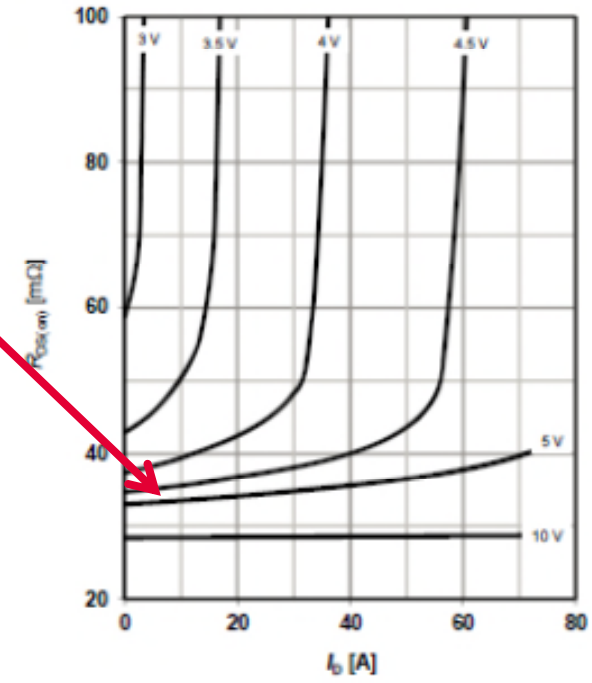
Rev. 1.0 page 1 2013-02-28

RDSON

6 Typ. drain-source on-state resistance[4]

$R_{DS(on)} = f(I_D)$; T_j = 25 °C

parameter: V_{GS}



› Please refer to Infineon IPG20N06S2L-35A data sheet

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USB Supply Demonstrator Board
Adjustment of TLF51801 current limitation

- The TLF51801current limitation is done in RDSON-configuration, which is less accurate than Shunt-configuration, of course depending on application needs both configurations are possible (Rdson-configuration saves the expensive Shunt resistor)
- Equation taken from TLF51801 data sheet (naming different than USB Supply Demonstrator board!)
- $I_{\text{limit}} = I_{OC_lim,ref} \times \frac{R_SENSE}{R_DSON}$
- Desired current limitation value is 5.2 A
- With
  - RDSON = 35 mΩ (value taken from datasheet of MosFET)
  - IOC_lim,ref = 95 µA
- RSENSE = 1.915 kΩ
- Due to spread of RDSON of the MosFET the current limitation was found far below 5.2 A
- A new value for setting the current limitation was found by testing, now set to 5.8 A:
- RSENSE = 3.300 kΩ
- The current limitation in RDSON-configuration is a protection of the regulator, if a more accurate value is necessary, Shunt-configuration is recommended.

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