AOZ1375DI

20V 5A ECPower™ Bidirectional Load Switch Evaluation Board User Guide

General Description

The AOZ1375DI evaluation board was designed with the typical use case in mind. It is a 2-layer PCB with 1 oz copper. A large area of copper on the top layer is connected to the EXP pad to help dissipate heat. VINT and VBUS ceramic capacitors are placed close to the IC for the latter to have cleaner supply voltage. A Schottky diode and a TVS are placed between VBUS and GND to protect the IC from negative voltage and over-voltage spikes during a VBUS short-circuit transient. A second Schottky diode is placed between VINT and GND for the same reason.

The evaluation board can handle VINT and VBUS voltages between 3.4V and 23V. Current limit has been set to 3.4A but can be easily modified by changing the value of RLIM. The equation for RLIM selection is:

$$RLIM\ (k\Omega) = \frac{160}{Desired\ Current\ Limit\ (A)}$$

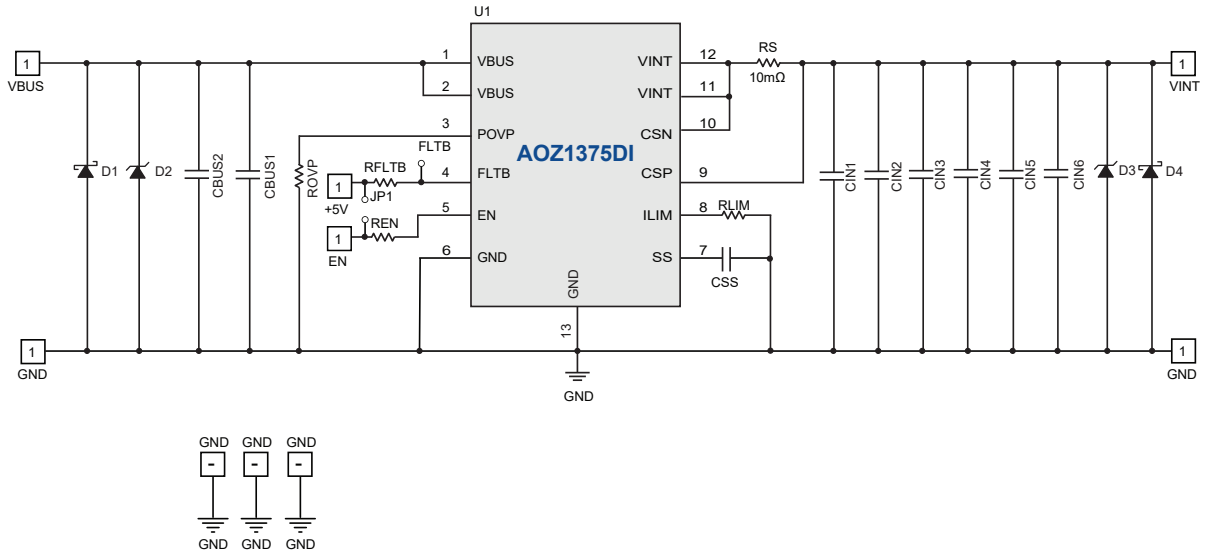
The over-voltage protection threshold has been set to 10.4V. To change that value, replace ROVP with an appropriate value. The AOZ1375DI allows four OVP thresholds to be set. Refer to the following table for ROVP values.

Table 1. ROVP Values

ROVP	Typical OVP Threshold
≤ 20k	24V
75.0k	17.4V
137k	10.4V
≥301k	6.4V

Soft-start ramping time is set to 400µs at 20V VINT. Refer to the data sheet in the case of a different timing requirement.

Schematic



Bill of Materials

Ref Designation	Part Number	Description	Manufacturer
CIN1	GRM188R61A105MA61D	Capacitor, 1µF, 0603, 10V, X5R	muRata
CIN2, CIN3, CBUS1, CBUS2	GRM32ER61H106KA12L	Capacitor, 10µF, 50V, 1210, X5R, ±10%	muRata
CSS	GRM188R61H102KA01D	Capacitor, 1nF, 50V, 0603, X5R, ±10%	muRata
CIN4, CIN5, CIN6	OPEN		
D1, D4	B340A-13-F	Schottky Diode, SMA, 40V, 3A	Diodes
D2	SMAJ22A	TVS Diode, SMA, 24.4V Breakdown	Littelfuse
D3	OPEN		
RS	WSL1206R0100FEA18	Res, 0.01Ω, 1206, ±1%	Vishay
ROVP	RC0603FR-07121KL	Res,137K, 0603, ±1%	Yageo
RFLTB, REN	CRG0805F100K	Res, 100K, 0805, ±1%	CRG, Neohm
RLIM	RC0603FR-0782K5L	Res, 47K, 0603, ±1%	Yageo
U1	AOZ1375DI-01	IC, MAX 5A, DFN3x3	AOS
Terminal	1514-1	Term Turret Single	Keystone

PCB Layout

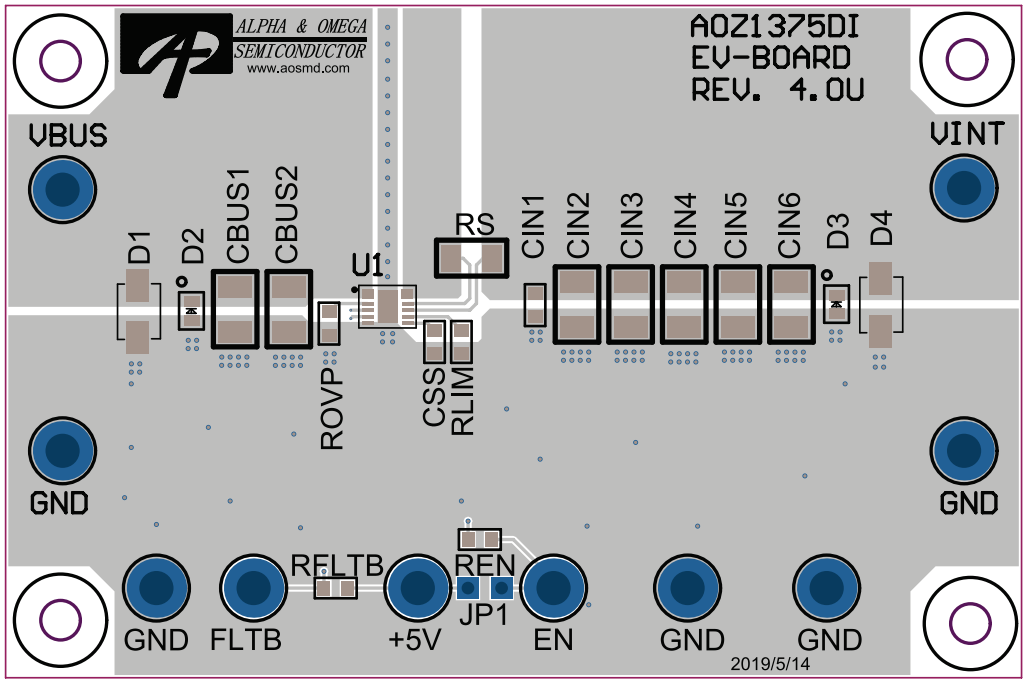


Figure 1. Top Layer

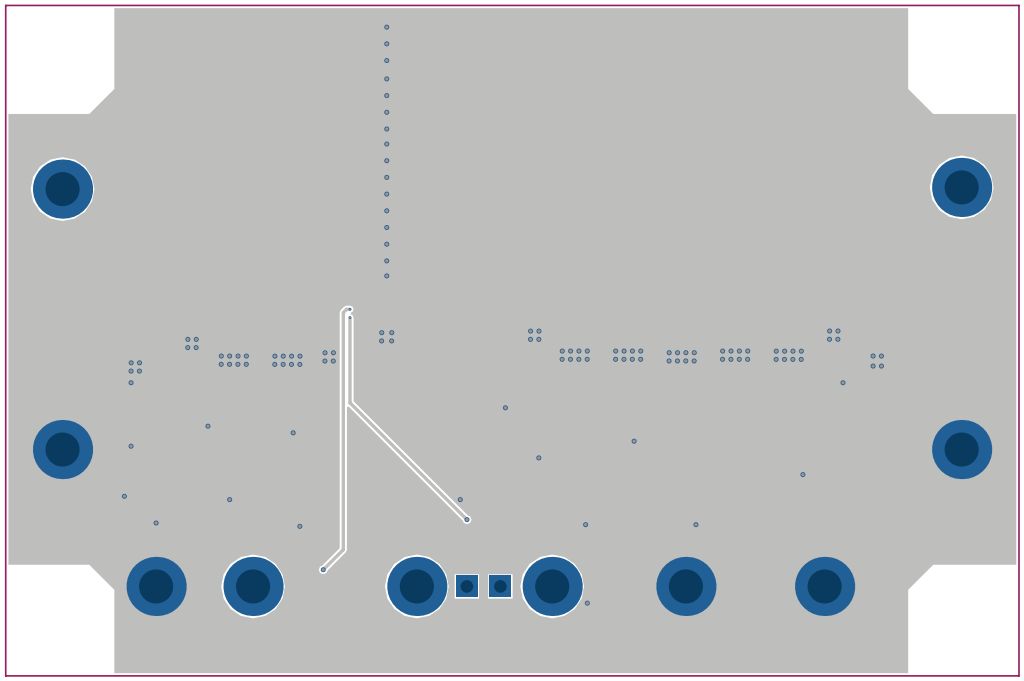


Figure 2. Bottom Layer

Quick Start Guide

1. Connect the EN terminal to a 5V DC source or to a 5V logic control signal.
2. Connect a DC power supply between VINT and GND terminals and set the voltage to 9V.
3. Connect a 5V DC source to +5V and GND terminals.
4. Measure the voltage between VBUS and GND. Measure the load current.
5. Monitor the FLTB voltage on a scope.
6. Connect an electronic load to VBUS and GND terminals.

Application Considerations for Fault Conditions

As a bidirectional current limited load switch, the AOZ1375DI is designed with flexibility in mind and provides protection against many kinds of fault, such as over-voltage, thermal overload and short-circuit. In reality, there is a limit on voltage level, both positive and negative, that the part can handle as well as on response time before the part reacts to over-voltage or over-current events. The board designer should consider the operating range, and board level and parasitic inductance, capacitance and resistance when selecting external components for the switch.

In the case of an output short, the AOZ1375DI responds after approximately 2.5µs. When the switch does open there can be an inductive kick that will depend on input inductance. This may cause the input voltage to go below ground or above the abs max voltage of the device. In these cases Schottky and TVS diodes should be used to prevent the input and/or output from going outside the device's absolute maximum boundaries.

In the case of a hard short which is very close to the output pins of the device, due to very low Rdson of the AOZ1375DI, the input will be pulled close to ground. As such enough input capacitance must be present to hold the VINT voltage above UVLO threshold of the device for at least 2.5µs (response time of AOZ1375DI). The amount of capacitance needed depends on how close the short is to the output pins (inductance and resistance) and the starting input voltage.

LEGAL DISCLAIMER

Applications or uses as critical components in life support devices or systems are not authorized. Alpha and Omega Semiconductor does not assume any liability arising out of such applications or uses of its products. AOS reserves the right to make changes to product specifications without notice. It is the responsibility of the customer to evaluate suitability of the product for their intended application. Customer shall comply with applicable legal requirements, including all applicable export control rules, regulations and limitations.

AOS's products are provided subject to AOS's terms and conditions of sale which are set forth at:
http://www.aosmd.com/terms_and_conditions_of_sale

LIFE SUPPORT POLICY

ALPHA AND OMEGA SEMICONDUCTOR PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.