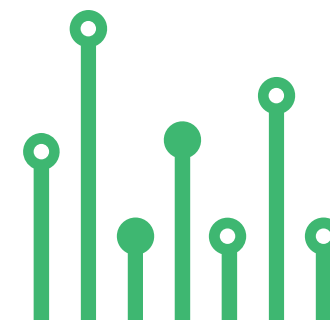


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**Reinforced Isolated
Current-Sense Amplifier
with Precision ± 250 -mV
Input, Differential
output & Integrated
DC/DC Converter**



SKU: EL130751

TEST - MEASUREMENTS

Reinforced Isolated Current-Sense Amplifier with Precision ± 250 -mV Input, Differential output & Integrated DC/DC Converter



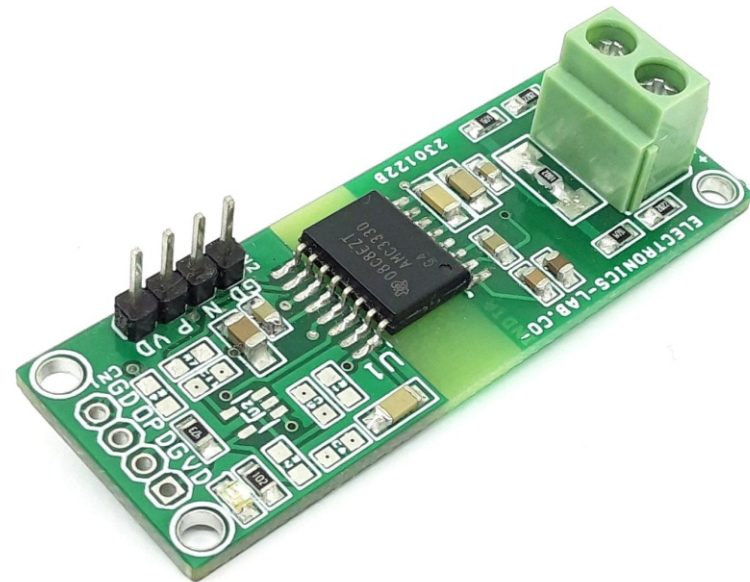
This isolated single-supply bidirectional current sensing project can accurately measure load currents from $-2A$ to $2A$. The linear range of the input is from $-250mV$ to $250mV$ with a differential output range of $-2.05V$ to $2.05V$. The gain of the circuit is fixed at $8.2V/V$. The project is based on AMC3301 chip which has a fully integrated, isolated DC/DC converter that allows single-supply operation from the low side of the device. The integrated DC-DC converter saves lots of board space. The reinforced capacitive isolation barrier is certified according to VDE V 0884-11 and UL1577 and supports a working voltage of up to $1.2 kVRMS$.



Note: The project is capable of measuring $\pm 2A$ current using an 0.1 Ohm shunt resistor. It can be optimized for external direct connection to a low-impedance shunt resistor or other or low-impedance voltage source with low signal levels.

Features

- Operating Supply 5V (Range 3.3V to 5V)
- Single Supply Operation
- Output Fully Isolated from Input
- Good for High Voltage Current Sense Applications
- Can Be used for AC or DC Current Sense
- Integrated Isolated DC/DC Converter (Chip)
- Current Measurement Range $-2A$ to $2A$
- Differential Output Range of $-2.05V$ to $2.05V$
- Output at Zero $1.44V$
- Amplifier Gain $8.2V$
- On-Board Power LED
- PCB Dimensions $57.94 \times 19.69mm$
- $2 \times 2.5mm$ Mounting Holes



The isolation barrier separates parts of the system that operate on different common-mode voltage levels and protects the low-voltage side from hazardous voltages and damage. Output is fully isolated from the input and optimized for high voltage interface. The project provides differential output for easy interface with ADC. Operating Power supply 5V DC.

Analog Output

The analog outputs are fully differential signals centered at a common-mode output voltage of 1.44 V. The outputs are available on the header connector CN2 and swing from 0.5 V to 2.5 V when a negative to positive full-scale linear input signal is applied to the input. OUTN swings from 2.5 V to 0.5 V when a negative to positive full-scale linear input signal is applied to the input.

Various Current Range Can be Achieved with Different Shunt Resistors

- For +/-2A Measurement Shunt Resistor $R5 = 0.1\Omega$ 2W-3W = Differential Output Range of $-2.05V$ to $2.05V$
- For +/-10A Measurement Shunt Resistor $R5 = 0.025\Omega$ 3W-5W = Differential Output Range of $-2.05V$ to $2.05V$
- For +/-50A Measurement Shunt Resistor $R5 = 0.005\Omega$ 12.5W External Shunt = Differential Output Range of $-2.05V$ to $2.05V$

Use the Following Formulas to Calculate the Shunt Resistor

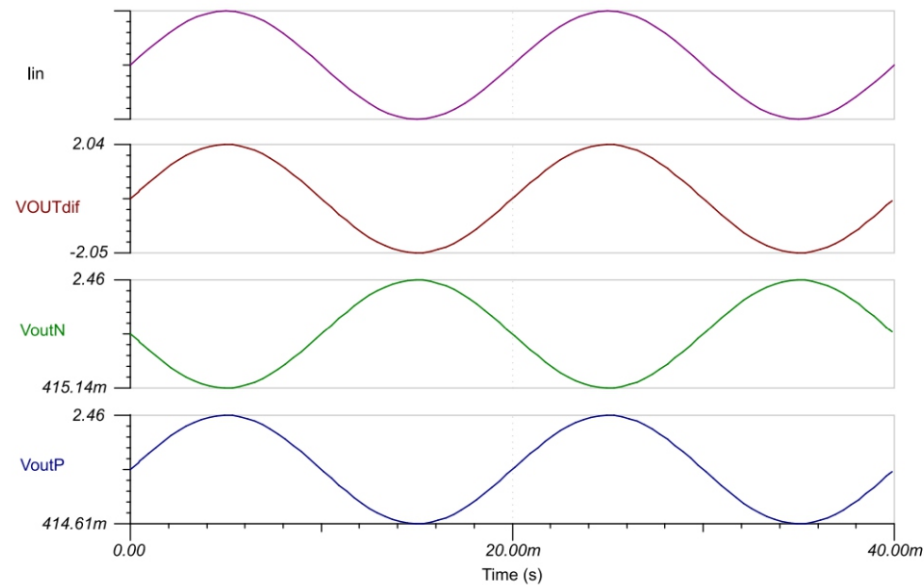
- $V_{out} = I_{in} \times R_{shunt} \times 8.2V$
- $R_{shunt} = V_{shunt} / I_{inMax} = 250mV / 2A = 100\text{ m}\Omega$

DIAG PIN

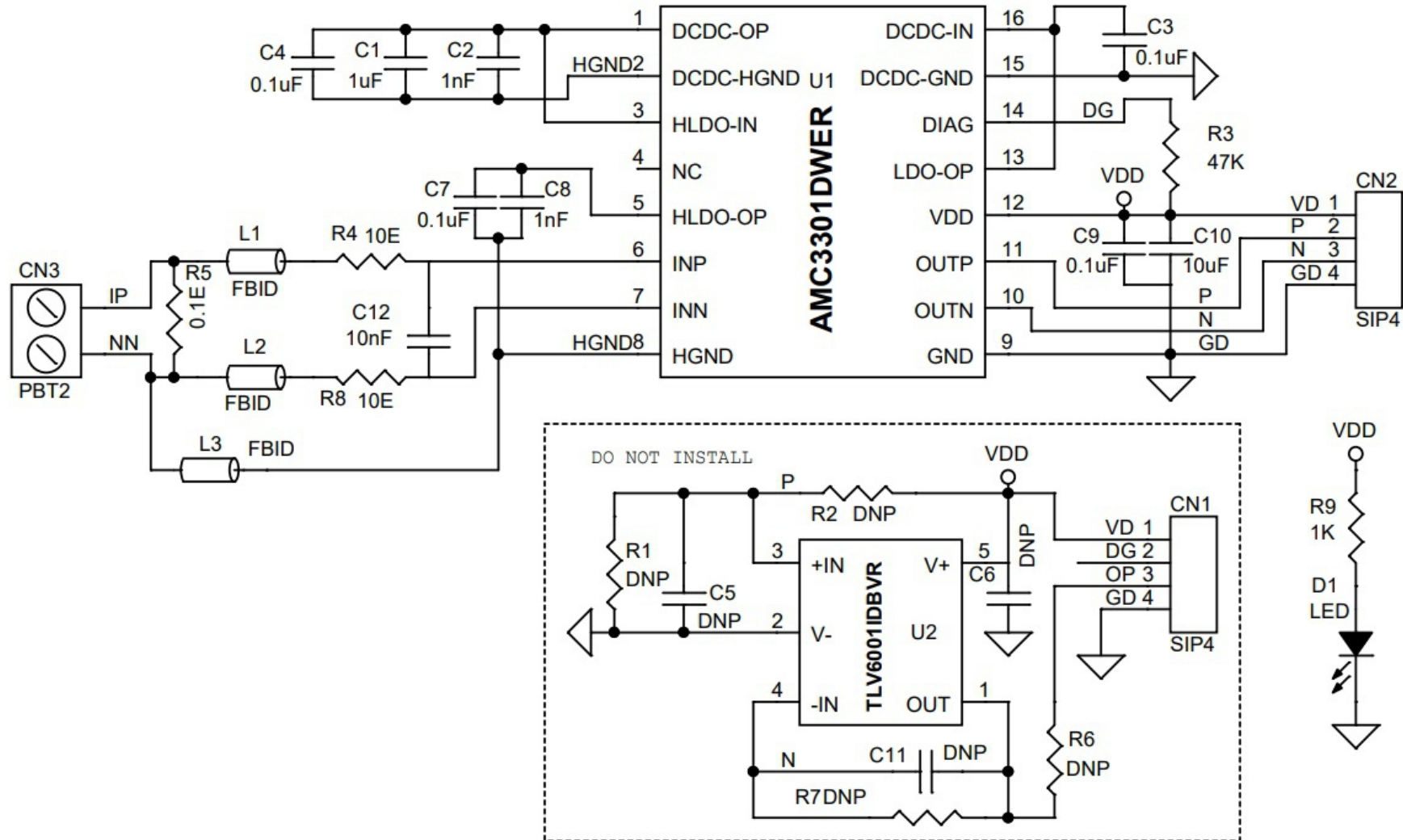
The open-drain DIAG pin can be monitored to confirm the device is operational and the output voltage is valid. The DIAG pin is actively held low until the high-side supply is in regulation and the device operates properly. During normal operation, the DIAG pin is in high-impedance (Hi-Z) state and is pulled high through an external pullup resistor. The DIAG pin is actively pulled low if:

- The low-side does not receive data from the high-side (for example, because of a loss of power on the high side). In this case, the amplifier outputs are driven to the VFAILSAFE value.
- The high-side DC/DC output voltage (DCDC_OUT) or the high-side LDO output voltage (HLDO_OUT) drop below their respective undervoltage detection thresholds (brown-out). In this case, the low-side may still receive data from the high-side but the data may not be valid. The amplifier outputs are driven to the VFAILSAFE value

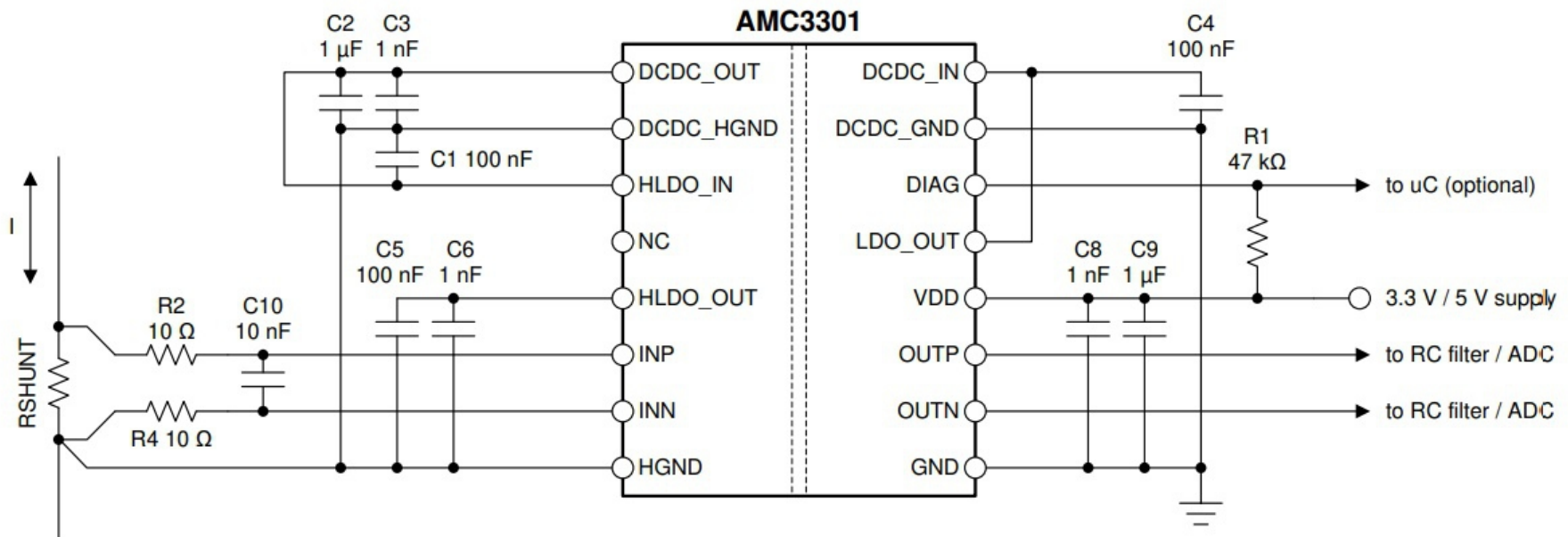
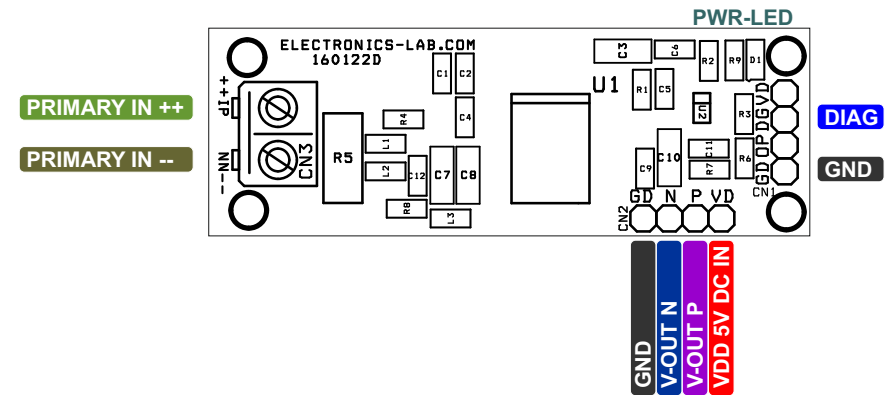
Transient Simulation Results



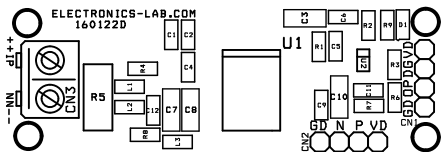
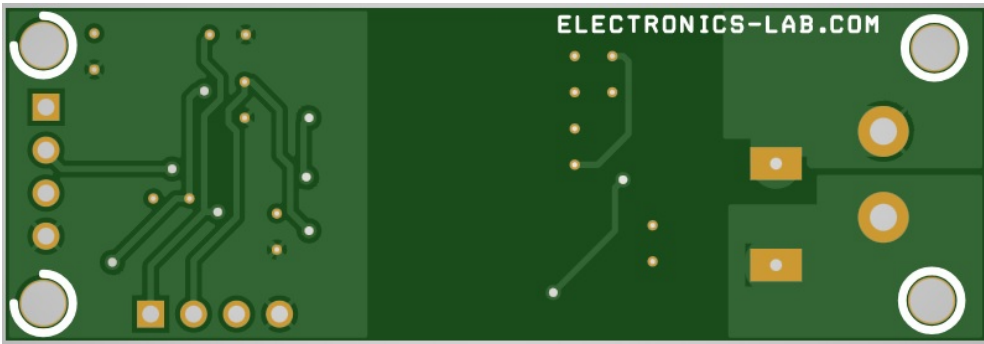
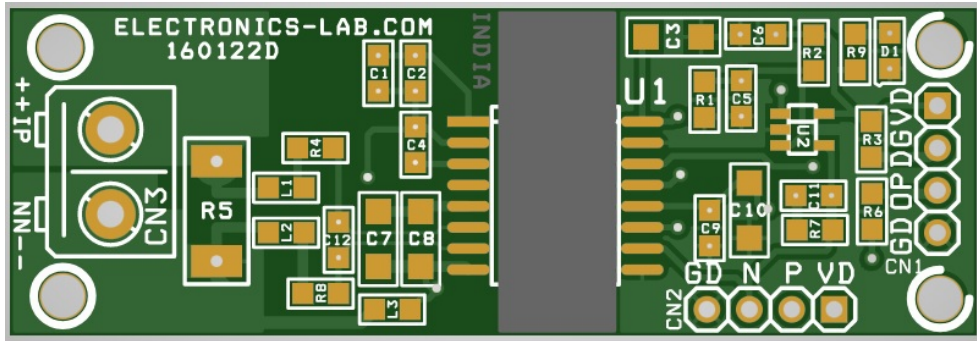
Schematic



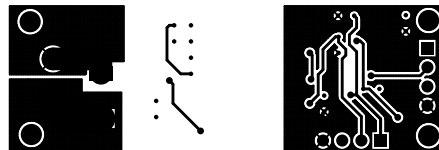
Connections



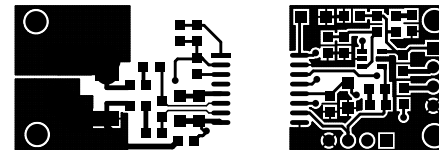
PCB



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 57.94MM X 19.69MM



Parts List

BOM						
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	2	CN1,CN2	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
2	1	CN3	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	1	C1	1uF/25V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
4	1	C2	1nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
5	3	C3,C4,C9	0.1uF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	7	R1,R2,C5,R6,C6,R7,C11	DNP			DO NOT INSTALL
7	1	C10	10uF/10V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
8	1	C12	10nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
9	1	D1	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
10	3	L1,L2,L3	FERRITE BEADS	LAIRD	DIGIKEY	HI0805N600R-10-ND
11	1	R3	47K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
12	2	R4,R8	10E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	1	R5	0.1E/2W SMD SIZE 2512	YAGEO/MURATA	DIGIKEY	
14	1	R9	1K % SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
15	1	U1	AMC3301DWER	TI	DIGIKEY	296-AMC3301DWERCT-ND
16	1	U2	TLV6001IDBVR	TI	DIGIKEY	DO NOT INSTALL
17	1	C7	0.1uF/50V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
18	1	C8	1nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	

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