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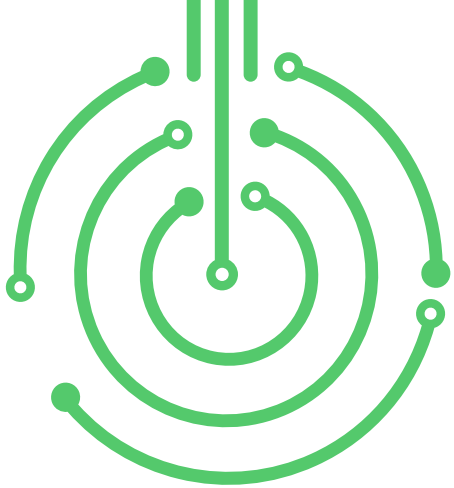


Two Channel Current Sensor for High Voltage Range

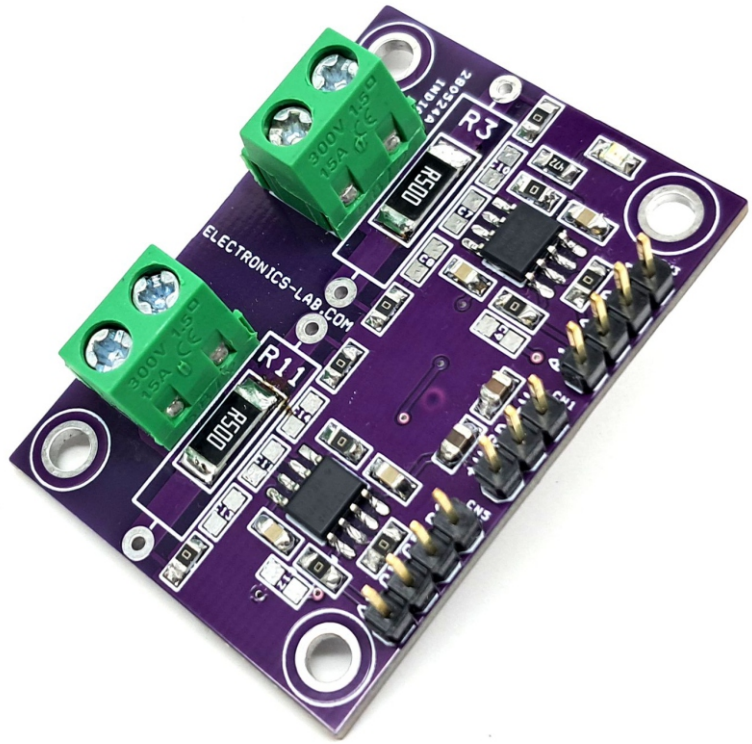
SKU: EL154082

Two Channel Current Sensor for High Voltage Range

This board is built using a 2 x INA149 precision unity-gain difference amplifier with a very high input common-mode voltage range. The project can be used as a current sensor for high-voltage applications, INA149 provides a common-mode voltage range of +/-275V. The project operates with a wide supply range from +/-5V to +/-15V. The circuit measures current by sensing the voltage drop across a series of resistors RS, R4, and R12. The application circuit shows the INA149 used to measure the supply currents of a device under test. The sense resistor imbalances the input resistor matching of the INA149, thus degrading its CMR. Also, the input impedance of the INA149 loads RS, causes a gain error in the voltage-to-current conversion. Both of these errors can be easily corrected.

FEATURES

- Power Supply +/-5V to +/-15V (Wide Supply Range: ±2.0 V to ±18 V)
- Output 500mV/1A
- Common-Mode Voltage Range: ±275 V
- Minimum CMRR: 90 dB from –40°C to +125°C
- DC Specifications: INA149
    - Maximum Offset Voltage: 1100 µV
    - Maximum Offset Voltage Drift: 15 µV/°C
    - Maximum Gain Error: 0.02%
    - Maximum Gain Error Drift: 10 ppm/°C
    - Maximum Gain Nonlinearity: 0.001% FSR



- AC Performance: INA149
  - Bandwidth: 500 kHz
- Input Protection: INA149
  - Common-Mode: ±500 V
  - Differential: ±500 V
- PCB Dimensions 46.36MMX33.34MM
- 4 X 3MM Mounting Holes

Note: The project can be used to measure current up to 2A, of DC Bus with +/-275V, this project has a few additional optional components R5, R6, C7, C8, C10 + R10, R13, C11, C13, C14, they can be used to overcome of CMR error. Refer to the datasheet of INA149 for more info. All these components are SMD size 0805.

Current Sense Resistors

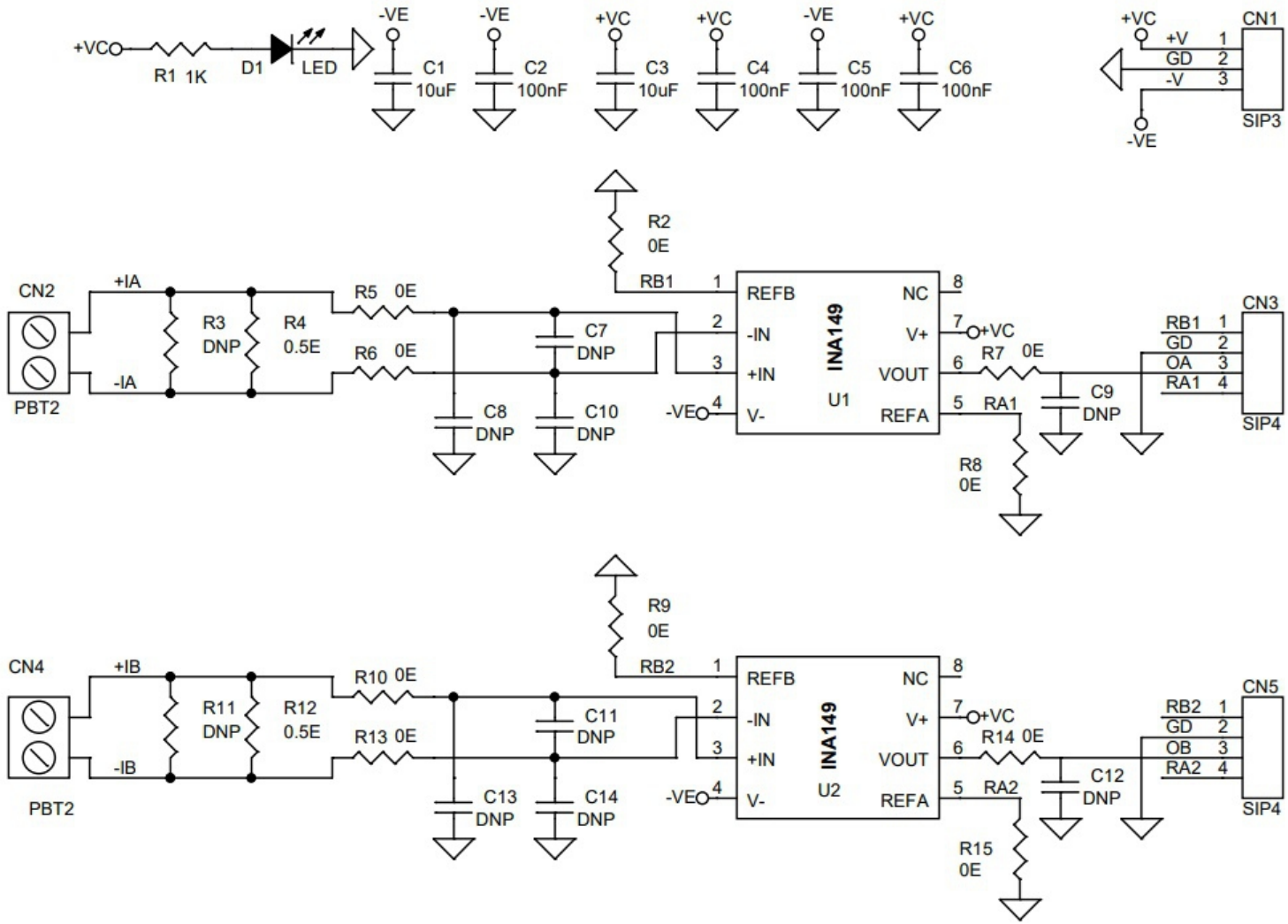
The board provides dual options for current sense resistors. Users may use THT resistors up to 3W R3, R11, or SMD 2512 R4 and R12 Up to 3W. The default circuit measures current up to 2A. Choose the appropriate current sense resistor for a higher or lower current sense range.

The INA149 is a precision unity-gain difference amplifier with a very high input common-mode voltage range. It is a single, monolithic device that consists of a precision op amp and an integrated thin-film resistor network. The INA149 can accurately measure small differential voltages in the presence of common-mode signals up to ±275 V. The INA149 inputs are protected from momentary common-mode or differential overloads of up to 500 V.

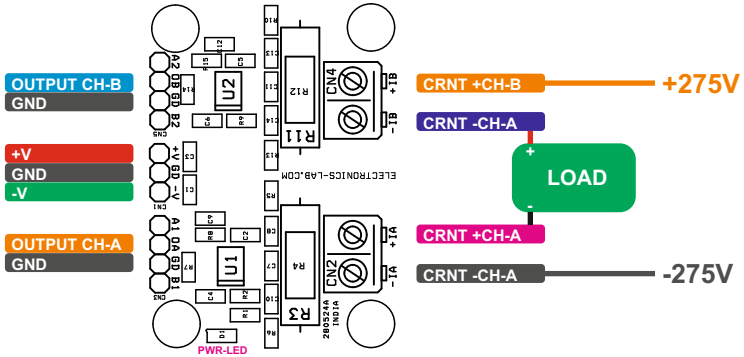
Applications

- High-Voltage Current Sensing
- Battery Cell Current or Voltage Monitoring
- Power-Supply Current Monitoring
- Motor Controls

Schematic


+VC
R1 1K
D1
LED
-VE
C1
10uF
-VE
C2
100nF
+VC
C3
10uF
+VC
C4
100nF
-VE
C5
100nF
+VC
C6
100nF
+VC
+V
GD
-V
-VE
CN1
SIP3
R2
0E
CN2
+IA
-IA
PBT2
R3
DNP
R4
0.5E
R5 0E
R6 0E
C7
DNP
C8
DNP
C10
DNP
RB1
REFB
-IN
+IN
V-
-VE
INA149
U1
NC
V+
VOUT
REFA
+VC
R7 0E
RA1
C9
DNP
R8
0E
CN3
SIP4
R9
0E
CN4
+IB
-IB
PBT2
R11
DNP
R12
0.5E
R10 0E
R13 0E
C11
DNP
C13
DNP
C14
DNP
RB2
INA149
U2
R14 0E
RA2
C12
DNP
R15
0E
CN5
SIP4

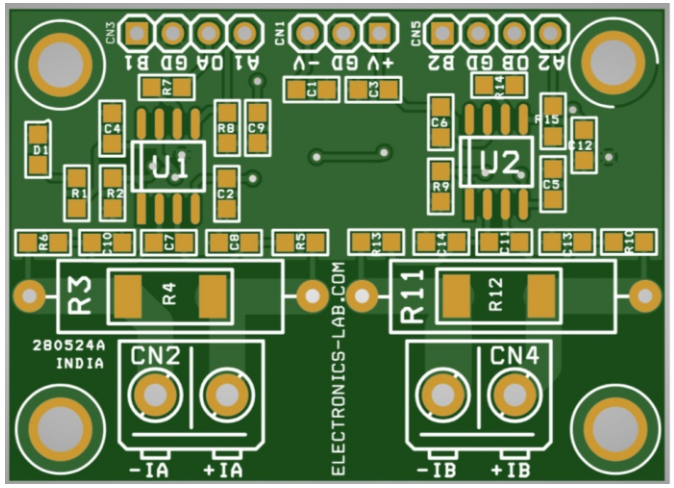
Connections

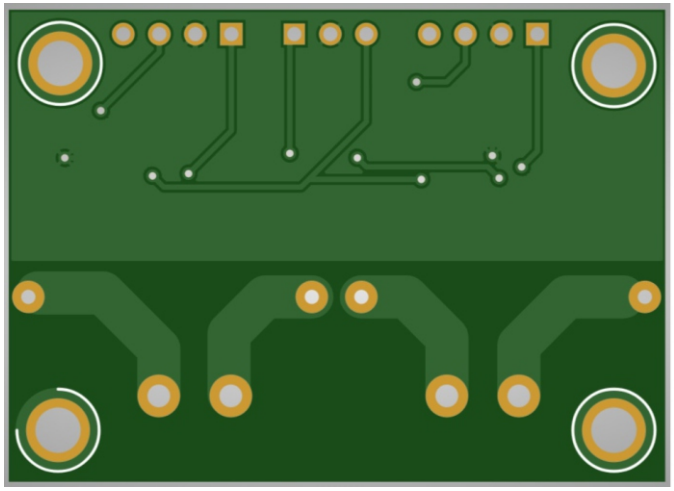


Connections

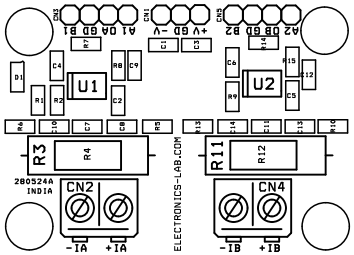
- CN1: Pin 1 = +5V to 15V DC, Pin 2 = GND, Pin 3 = -5V to 15V
- CN2: Pin1 = Current Sense +I Channel A, Pin 2 Current Sense -I Channel A
- CN3: Pin 1 REFB=1 CH-A (No Use), Pin 2 GND, Pin 3 = Channel A Output, Pin 4 = REFA-1 CH-A (No Use)
- CN4: Pin1 = Current Sense +I Channel B, Pin 2 Current Sense -I Channel B
- CN3: Pin 1 REFB=2 CH-B (No Use), Pin 2 GND, Pin 3 = Channel B Output, Pin 4 = REFA=2 CH-B (No Use)
- D1: Power LED

PCB

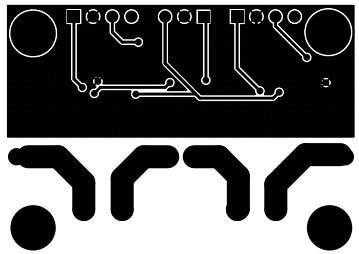




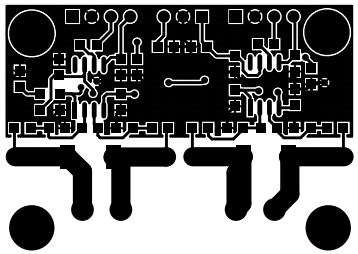
PCB GERBER FILES AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 46.36MMX33.34MM

Parts List

BOM						
NO.	QNTY.	REF.	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	3 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5316-ND
2	2	CN2,CN4	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	2	CN3,CN5	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
4	2	C1,C3	10uF/25V CERAM IC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
5	4	C2,C4,C5,C6	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	10	R3,C7,C8,C9,C10,R11,C11,C12,C13,C14	DNP			
7	1	D1	LED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
8	1	R1	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
9	10	R2,R5,R6,R7,R8,R9,R10,R13,R14,R15	0E SMD DSIZE 0805	YAGEO/MURATA	DIGIKEY	
10	2	R4,R12	0.5E/2W-3W 1% SMD SIZE 2512	VISHAY/DALE	DIGIKEY	541-10290-1-ND
11	2	U1,U2	INA149 SOIC8	TI	DIGIKEY	296-30028-1-ND

Notes

APP

Android App

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