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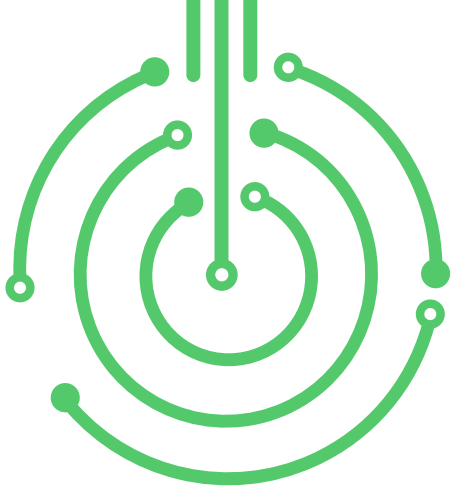


2 Channel Ultra-Precise Current Sensor

SKU: EL143438

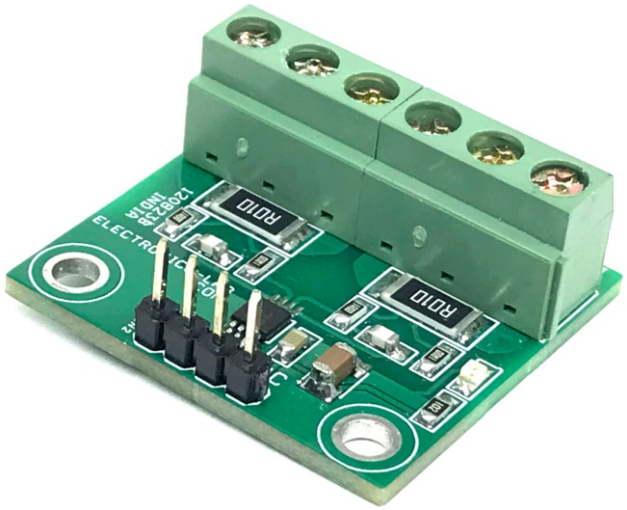
2 Channel Ultra-Precise Current Sensor

The project described here is a two-channel ultra-precise, current-sense amplifier that can measure voltage drops across shunt resistors over a wide common-mode range from 2.7 V to 120 V. The INA2290A1 chip is the heart of the project. The ultra-precise current measurement accuracy is achieved thanks to the combination of an ultra-low offset voltage of ±12 µV (maximum), a small gain error of ±0.1% (maximum), and a high DC CMRR of 160 dB (typical). The circuit is not only designed for DC measurement but also for high-speed applications (such as fast overcurrent protection, for example) with a high bandwidth of 1.1 MHz (at a gain of 20 V/V) and an 85dB AC CMRR (at 50 kHz). The project achieves ultra-precise current measurement by sensing the voltage drop across resistors R3 and R6.

Input Filter: Input filtering components R2, R4, R5, R7, C3 and C4 are optional, refer data sheet of the chip for guideline of input filter components. All resistors are SMD size 0805, capacitor ceramic SMD size 0805

Gain: Gain: the board is populated with an OPA2290A1 chip that has a gain of 20V/V, the user may choose the following chips with higher gain. Project provides 0.2V/A , 2V @ 10Amp Load.

- OPA2290A1 devices: 20 V/V
- Opa2290A2 devices: 50 V/V
- Opa2290A3 devices: 100 V/V
- Opa2290A4 devices: 200 V/V
- Opa2290A5 devices: 500 V/V

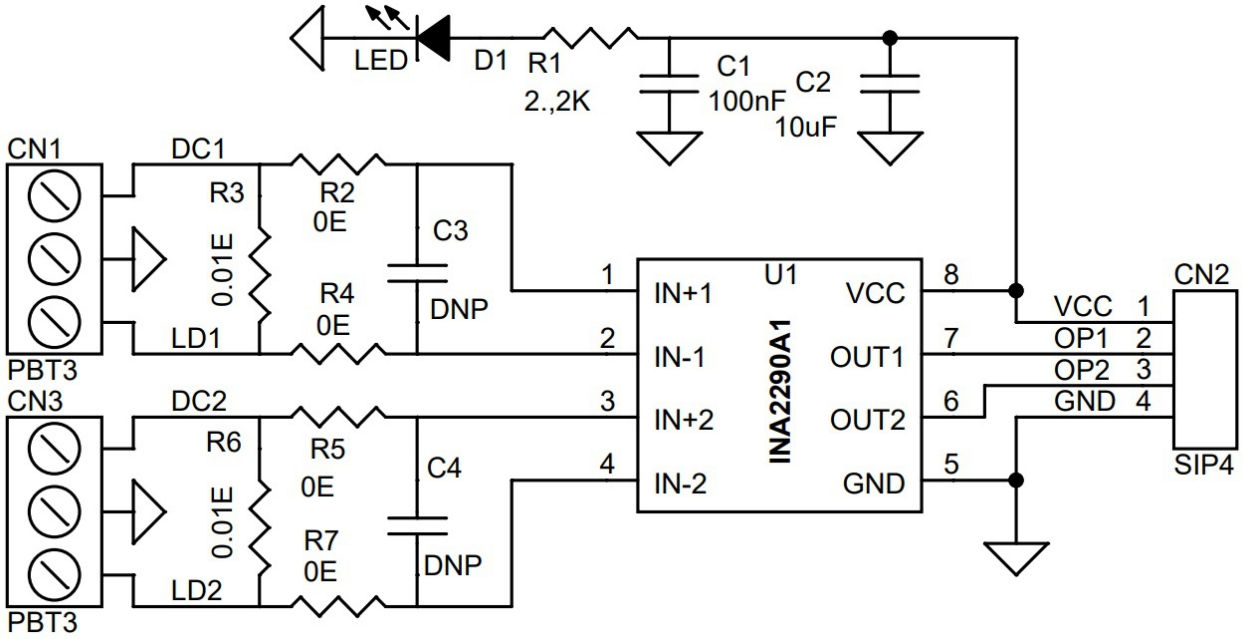


FEATURES

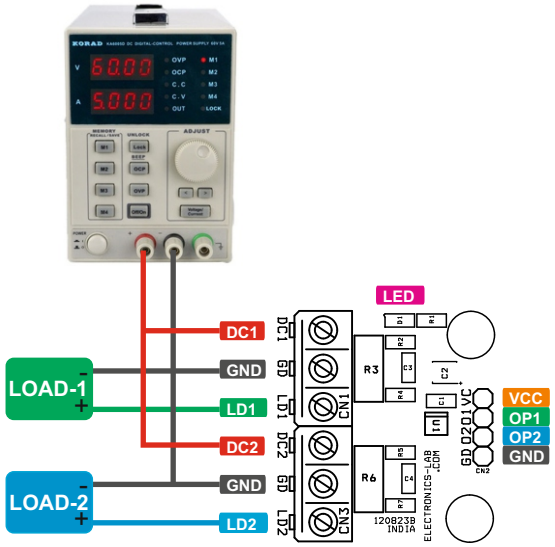
- Power Supply 2.7V to 20V DC
- Output 0.2V/A (2V @ 10Amps)
- Wide common-mode voltage: Operational voltage: 2.7 V to 120 V
- Survival voltage: −20 V to +122 V
- Excellent CMRR: 160-dB DC. 85-dB AC at 50 kHz
- Gain 20V/V
- Accuracy: Gain error: ±0.1% (maximum), Gain drift: ±5 ppm/°C (maximum),
- Offset voltage: ±12 µV (maximum),
- Offset drift: ±0.2 µV/°C (maximum)
- High bandwidth: 1.1 MHz (CLOAD = 5 pF, VSENSE = 200 mV)
- Slew rate: 2 V/µs
- Quiescent current: 370 µA (per channel)
- 2 x 3mm Mounting Holes
- PCB DIMENIONS 31.43 x 29.21mm

The circuit operates from a single 2.7V to 20V supply with the single channel device only drawing 370µA + LED supply current per channel (typical). The devices are available with five gain options: 20 V/V, 50 V/V, 100 V/V, 200 V/V, and 500 V/V. The low offset of the zero-drift architecture enables current sensing with low ohmic shunts as specified over the extended operating temperature range (−40°C to +125°C). Screw terminals are provided to connect the load, header connector is provided to power the circuit, and analog voltage output.

Schematic


LED
D1
R1
2.,2K
C1
100nF
C2
10uF
CN1
DC1
R3
0.01E
R2
0E
C3
R4
0E
DNP
LD1
PBT3
CN3
DC2
R6
0.01E
R5
0E
C4
R7
0E
DNP
LD2
PBT3
U1
IN+1
IN-1
IN+2
IN-2
INA2290A1
VCC
OUT1
OUT2
GND
1
2
3
4
8
7
6
5
CN2
VCC 1
OP1 2
OP2 3
GND 4
SIP4

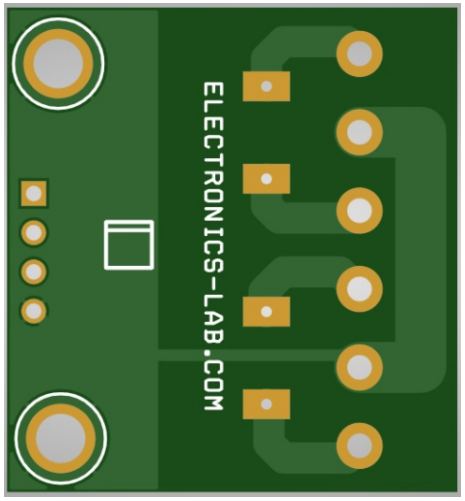
Connections

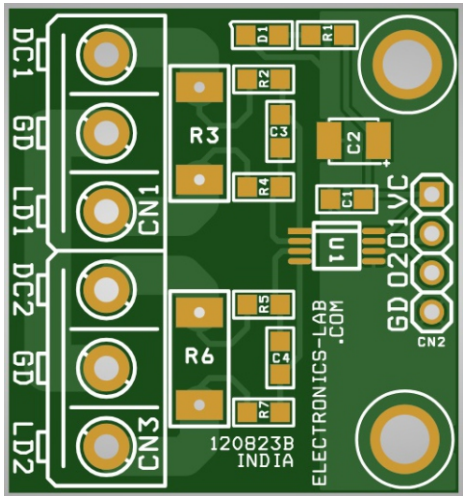


Connections

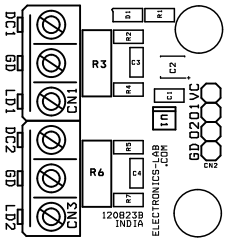
- CN1: Pin 1 = Load-1 DC Input, Pin 2 = GND, Pin 3 = +Load-1
- CN3: Pin 1 = Load-2 DC Input, Pin 2 = GND, Pin 3 = +Load-2
- CN2: Pin 1 = VCC 2.7V to 20V, Pin 2 = Output 1, Pin 3 = Output 2, Pin 4 = GND
- D1 Power LED
- Current Sense Resistor R3 and R6

PCB

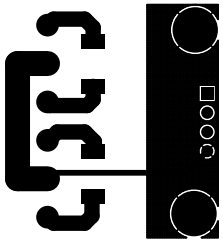




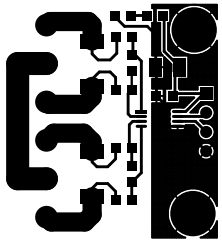
PCB GERBER FILES AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 31.43 X 29.21MM

Parts List

BOM						
NO	QNTY	REF	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	2	CN1,CN3	3 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1248-ND
2	1	CN2	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
3	1	C1	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
4	1	C2	10uF/25V CERAMIC SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
5	2	C3,C4	DNP			
6	1	D1	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
7	1	R1	2.2K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
8	4	R2,R4,R5,R7	0E	YAGEO/MURATA	DIGIKEY	
9	2	R3,R6	0.01E/3W 1% SMD SIZE 2512	BOURNS	DIGIKEY	CRA2512-FZ-R010ELFCT-ND
10	1	U1	INA2290A1	TI	DIGIKEY	296-INA2290A1IDGKRCT-ND

Notes

APP

Android App

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