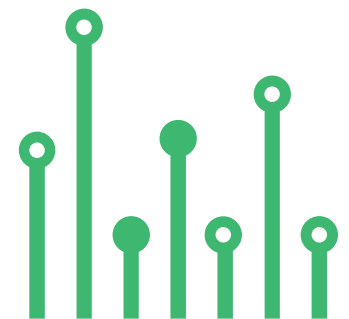


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PI Temperature Control Amplifier for Thermoelectric Cooler (TEC) Driver



SKU: EL148645

PI Temperature Control Amplifier for Thermoelectric Cooler (TEC) Driver



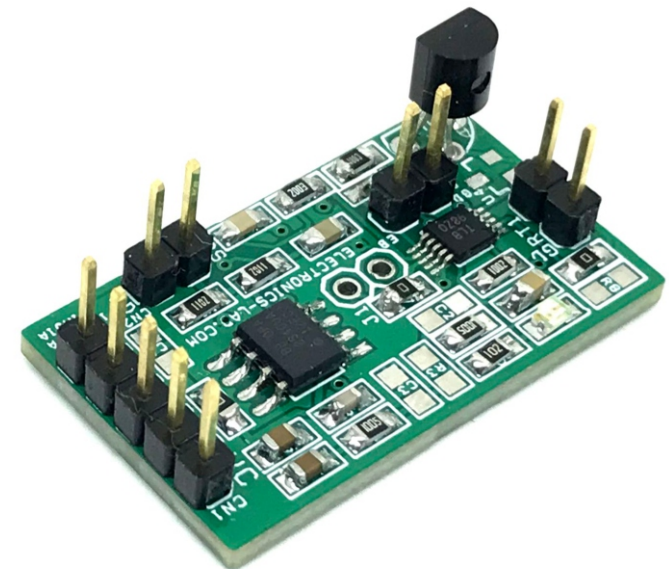
This is a simple Proportional, Integral (PI) temperature control amplifier. A complete thermoelectric cooler (TEC) controller can be created using this PI amplifier and OPA569 Power Op-Amp or other output amplifiers such as DRV591, DRV592 and DRV593. Proportional-integrator compensation is simpler to adjust and often provides an adequate thermal transient response to the TEC driver amplifiers. The project consists INA330 chip and OPA2340 OPAMP. The INA330 provides thermistor excitation and generates an output voltage proportional to the difference in resistances applied to the inputs. OPA2340 is used to create the PI closed Loop. U1 LM385-1.2V generates the reference voltage 1.23V, and REF3012 SOT23-2 U4 chip can be used as an alternative to U1. PI loop compensation can be optimized for loop stability and best response to thermal transients by adjusting R4, R11, C8, and C9. To facilitate the optimization of loop dynamics, the value of these components is important and will depend on the Thermal behavior of the TEC.



Info: If current regulation is not required, the ISEN pin should be directly connected to the PCB ground plane, thus shunt resistor R4 should be 0 Ohms. Refer data sheet of the chip for change the load current regulation.

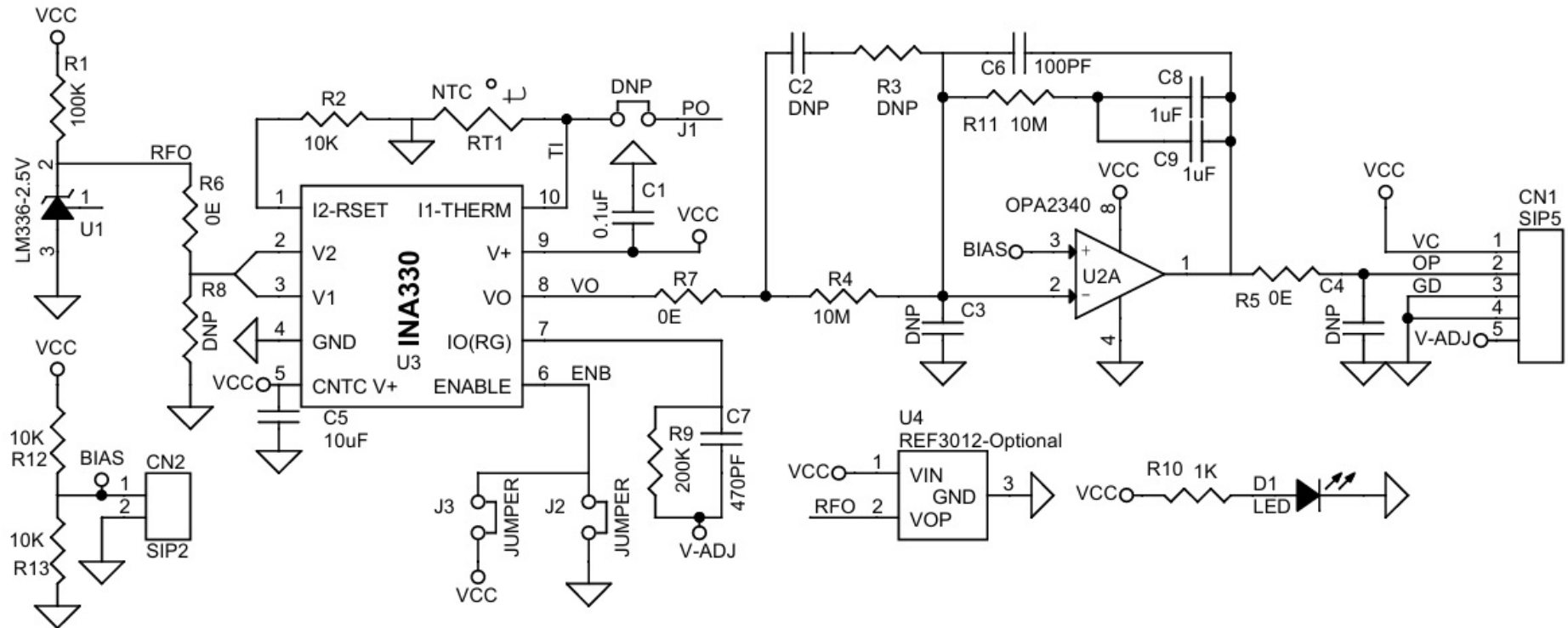
FEATURES

- Supply 5V DC
- NTC Temperature Sensor
- Compact Design
- Precision Temperature Sensor Amplifier
- On Board 1.23V Reference
- On Board Power LED
- PCB Dimensions 31.75X18.42MM

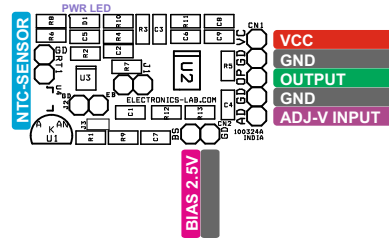


INA330 uses only one precision resistor R2 plus the thermistor RT1, thus providing an alternative to the traditional bridge circuit. The circuit maintains excellent accuracy for temperature control applications. An excitation voltage is applied to the thermistor (R THERM) RT1 and precision resistor (RSET) R2, creating currents I1 and I2. The current conveyor circuit produces an output current, I0, equal to I1 – I2, which flows through the external gain-setting resistor. A buffered voltage output proportional to I0 is also provided. The loop controls temperature to an adjustable set-point of 22.5°C to 27.5°C. The nominal 10kΩ at 25°C thermistor ranges from approximately 11.4kΩ to 8.7kΩ over this range. A 1.23V excitation voltage is applied to V1 and V2, producing a nominal 100μA current in the 10kΩ RSET resistor. The thermistor current is approximately 100μA at 25°C, but will vary above or below this value over the ±2.5°C set-point temperature range. The difference of these two currents flows in the gain-set resistor, RG. This produces a voltage output of approximately 0.9V/°C. The set-point temperature is adjusted with VADJ. Thus, the voltage at VO is the sum of (I0)(RG) + VADJ. VADJ can be manually adjusted or set with a Digital-to-Analog (D/A) converter. Optionally, Thus, the feedback loop will drive the heating or cooling of the TEC to force VO to equal VBIAS. VADJ = 2.5V will produce a set-point temperature of 25°C. VADJ = 2.5V + 0.9V will change the set-point by 1°C. A 0V to 5V D/A converter will provide approximately ±2.5°C adjustment range. A 12-bit D/A converter will allow for approximately 0.001°C resolution on the set-point temperature. For best temperature stability, the set-point temperature voltage should be derived ratiometrically from VBIAS. A D/A converter used to derive the set-point voltage should share the same reference voltage source as VBIAS. Likewise.

Schematic



Connections

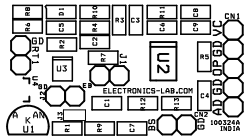
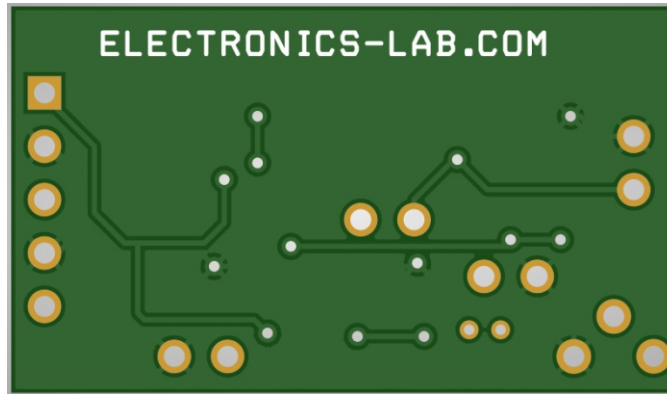
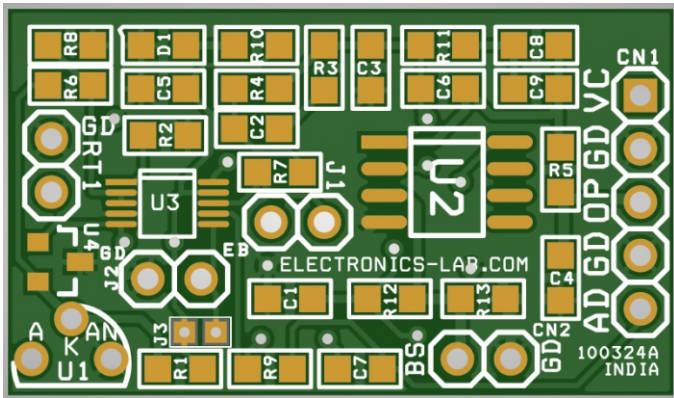


NTC TEMP SENSOR FEEDBACK

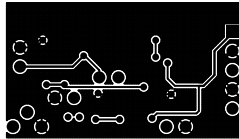
Connections and Other Information

- CN1: Pin 1 = 5V DC, Pin 2 = Output, Pin 3 = GND, Pin 4 = GND, Pin 5 = V-ADJ 0 to 5V from DA Converter
- CN2: For High Accuracy Omit R12 and R13 and Feed 2.5V External Reference Voltage to Pin 1, Pin = GND
- J1: No Use
- J2: Disable
- J3: Enable (Solder Jumper)
- U1: Reference Voltage Generator, Use Alternate U4 REF3012 SOT23-3
- D1: Power LED
- R2: 10K 0.1% SMD Resistor Size 0805
- RT1: NTC 10K 1%

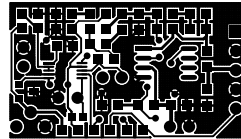
PCB



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 31.75X18.42MM

Parts List

BOM						
NO	QNTY.	REF	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	5 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5318-ND
2	1	CN2	2 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5315-ND
3	1	C1	0.1uF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
4	6	J1,J2C2,R3,C3,C4,R8	DNP			
5	1	C5	10uF/16V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	1	C6	100PF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
7	1	C7	470PF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
8	2	C8,C9	1uF/16V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
9	1	D1	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
10	1	J3	SOLDER JUMPER			
11	1	RT1	NTC 10K 1%, NXRT15XH103FA1B030	MURATA	DIGIKEY	490-8601-ND
12	1	R1	100K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	3	R2,R12,R13	10K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
14	2	R4,R11	10M 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
15	3	R5,R6,R7	0E SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
16	1	R9	200K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
17	1	R10	1K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
18	1	U1	LM336-2.5V TO 92 DO NOT INSTALL	TI	DIGIKEY	LM385BXZ-1.2/NOPB-ND
19	1	U2	OPA2340 SOIC8	TI	DIGIKEY	296-26254-1-ND
20	1	U3	INA330 VSSOP10	TI	DIGIKEY	296-13861-1-ND
21	1	U4	REF3012AIDBZR SOT23-3	TI	DIGIKEY	296-32213-1-ND

Notes



APP

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Android App

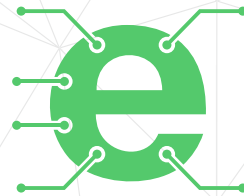
DOWNLOAD



Android App launched in 2017 and has 100k+ downloads - rated with 4.5 stars.

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