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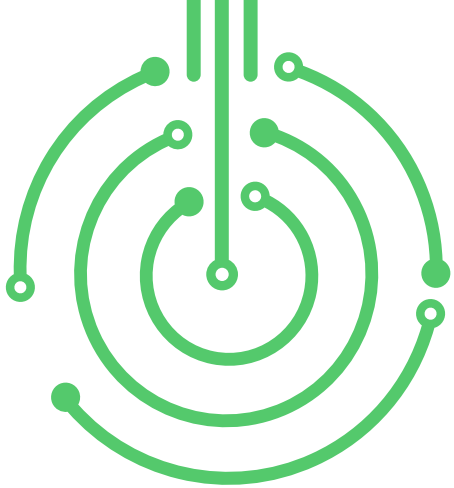


Dual Channel Voltage-to-Current (V-I) converter circuit with BJT

SKU: EL154054

Dual Channel Voltage-to-Current (V-I) converter circuit with BJT

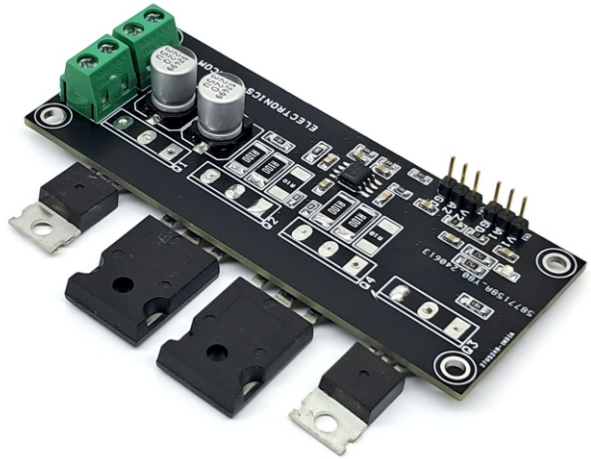
This low-side voltage-to-current (V-I) converter delivers a well-regulated current to a load. The circuit accepts an input voltage from 0V to 3V and converts it to a current from 0A to 6A (combined). The current is accurately regulated by feeding back the voltage drop across a low-side current-sense resistor (R8, R9 + R16, R17) to the OPAMP. Resistor divider (R4 and R5 + R12 and R13) is implemented to limit the maximum voltage at the non-inverting input, Vin, and sense resistor, (R8, R9 + R16, R17), at full-scale. Using a Darlington BJT reduces the output current requirement for the OPAMP. Feedback components R6+R13, R7+R15, and C5+C6 provide compensation to ensure stability. R6+R13 isolates the input capacitance of the bipolar junction transistor (BJT) R7+R15 provides a DC feedback path directly at the current setting resistor (R8, R9 + R16, R17), and C5+C6 provides a high-frequency feedback path that bypass the BJT.

The project is built using the OPA2170 dual OPAMP, which enables the creation of two separate channels. Each channel is capable of handling a current of up to 3A, and when combined, they provide a total current of 6A. Users have the flexibility to utilize only one channel if a lower current is required, in which case the components associated with the second channel can be omitted. To achieve a 6A load, simply tie inputs A1 and A2 together. For a 3A load, only one input is necessary.

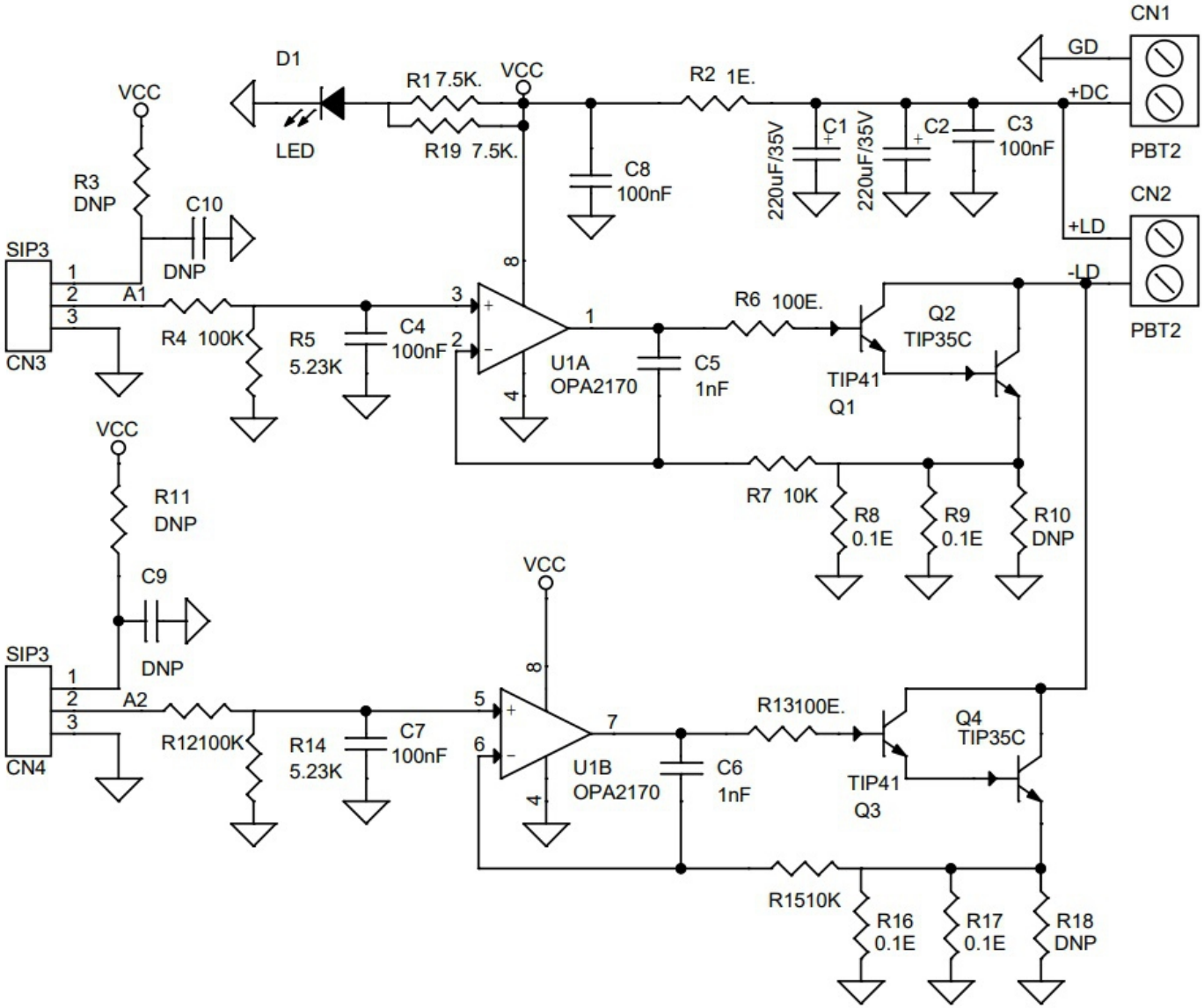
Note: To effectively manage the excessive heat generated by the BJT, it is recommended to utilize a large-sized heat sink. Additionally, it is advisable to employ a fan to facilitate efficient power dissipation. Mount Q2 and Q4 on big heatsink, Q1 and Q3 can be mounted on a small heatsink.

FEATURES

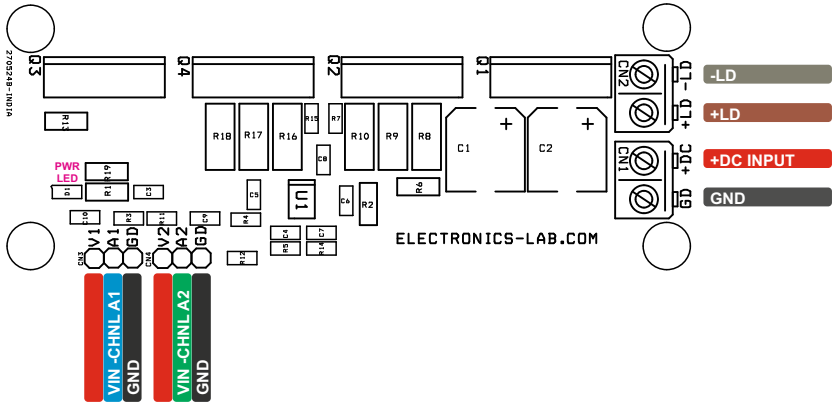
- Input Power Supply Range 12V to 30V DC
- Load 5Amps (3A + 3A)
- Input Voltage 0 to 3V
- 4X4MM Mounting Holes
- On Board Power LED
- PCB Dimensions 91.44X36.20MM



Schematic


CN1
GD
+DC
PBT2
CN2
+LD
-LD
PBT2
D1
LED
R1 7.5K.
R19 7.5K.
VCC
R2 1E.
C1
220uF/35V
C2
220uF/35V
C3
100nF
C8
100nF
R3
DNP
C10
DNP
SIP3
CN3
A1
R4 100K
R5
5.23K
C4
100nF
U1A
OPA2170
C5
1nF
R6 100E.
Q2
TIP35C
TIP41
Q1
R7 10K
R8
0.1E
R9
0.1E
R10
DNP
R11
DNP
C9
DNP
SIP3
CN4
A2
R12100K
R14
5.23K
C7
100nF
U1B
OPA2170
C6
1nF
R13100E.
Q4
TIP35C
TIP41
Q3
R1510K
R16
0.1E
R17
0.1E
R18
DNP

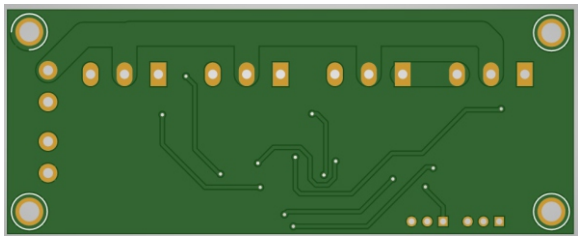
Connections

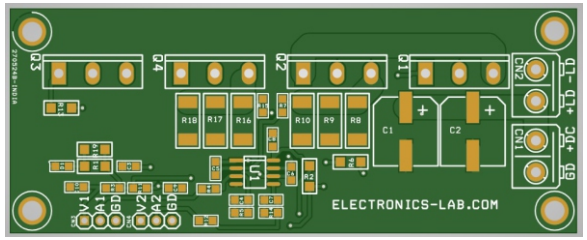


Connections

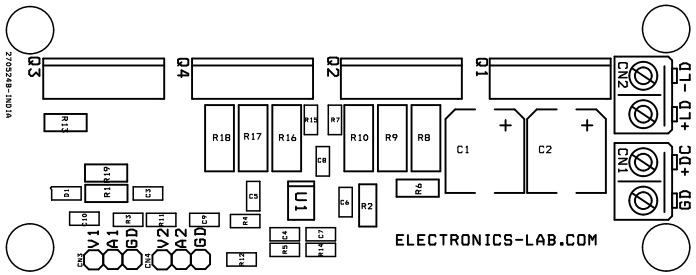
- CN1: Pin 1 = Power Supply Input 12V TO 30V , Pin 2 = GND
- CN2: Pin 1 = +Load, Pin 2 = -Load
- CN3: Pin 1 = No Use, Pin 2 = Analog Voltage In for Channel A1, Pin 3 = GND
- CN4: Pin 1 = No Use, Pin 2 = Analog Voltage In for Channel A2, Pin 3 = GND
- D1: Power LED

PCB

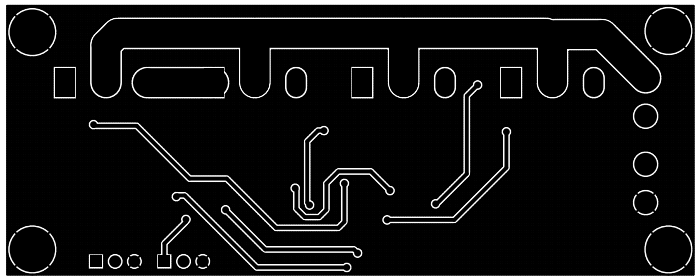




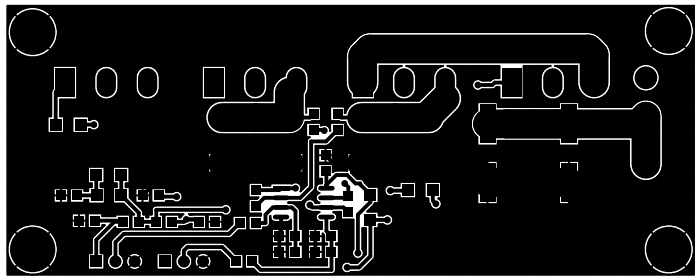
PCB GERBER FILES AVAILABLE



SILK SCREEN TOP



BOTTOM LAYER



PCB DIMENSIONS 91.44X36.20MM

Parts List

BOM						
NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	2	CN1,CN2	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
2	2	CN3,CN4	3 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5316-ND
3	2	C1,C2	220uF/35V	RUBYCON	DIGIKEY	1189-35SGV220M10X10.5CT-ND
4	4	C3,C4,C7,C8	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
5	2	C5,C6	1nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	6	R3,C9,R10,C10,R11,R18	DNP			
7	1	D1	LED RED SMD SIZE 0805	LITE ON INC	DIGIKEY	160-1427-1-ND
8	2	Q1,Q3	TIP41 TO220	ST	DIGIKEY	497-2622-5-ND
9	2	Q2,Q4	TIP35C TO247	ST	DIGIKEY	497-2609-5-ND
10	2	R1,R19	7.5K 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
11	1	R2	1E 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
12	2	R4,R12	100K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
13	2	R5,R14	5.23K 1% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
14	2	R6,R13	100E 5% SMD SIZE 1206	YAGEO/MURATA	DIGIKEY	
15	2	R7,R15	10K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
16	4	R8,R9,R16,R17	0.1E 1% 3W SMD SIZE 2512	BOURNS	DIGIKEY	CRA2512-FZ-R100ELFCT-ND
17	1	U1	OPA2170 SOIC	TI	DIGIKEY	296-39108-5-ND

Notes

APP

Android App

DOWNLOAD

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