PNP
Overvoltage

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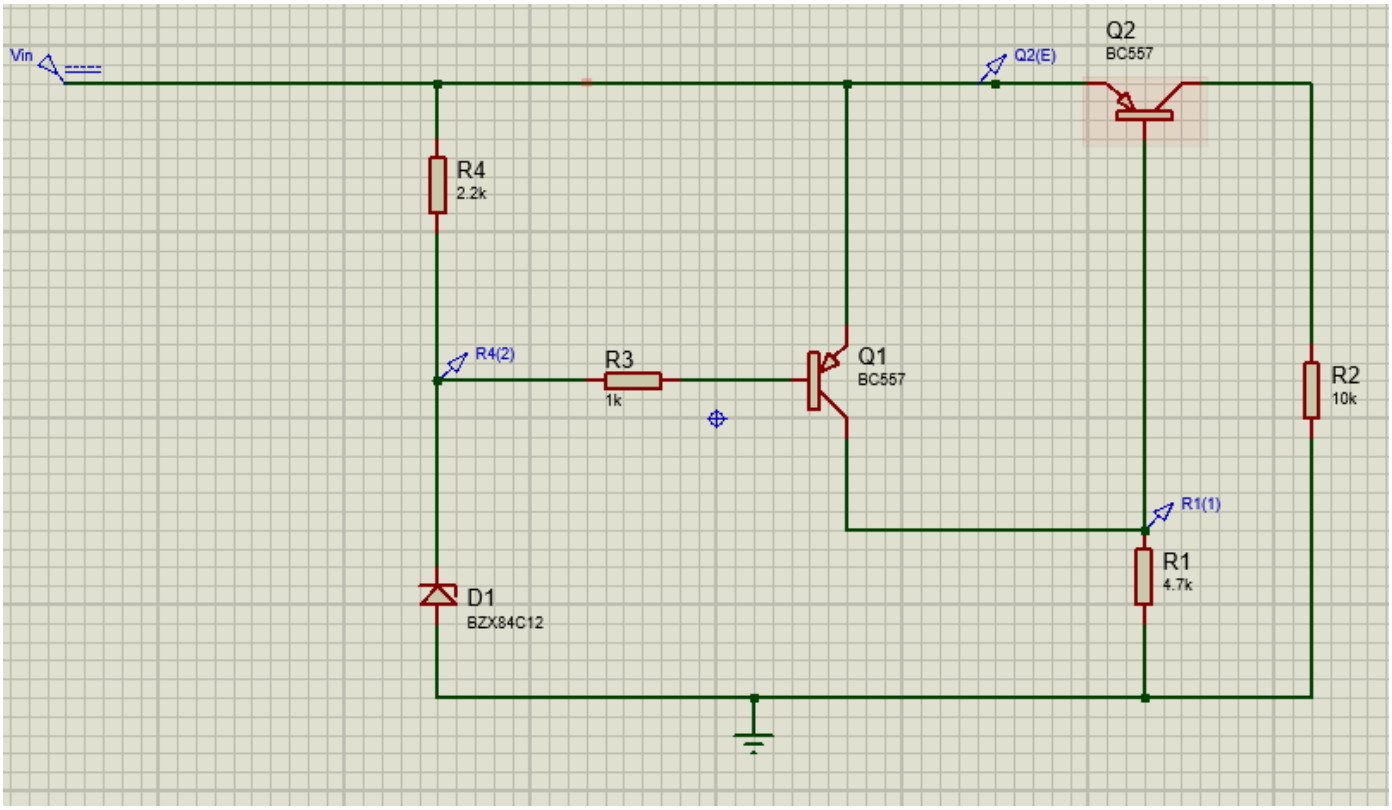

Figure 1 PNP Overvoltage Schematic

Circuit Operation Description

In the beginning, the voltage on the Zener diode will not be its breakdown voltage, so it will not connect any current through it, so the Q1 transistor will be turned off, the voltage on the base of Q2 will be zero, and the emitter will have the input value, so the collector (or the output) here will have the same voltage as the input voltage. But when the input voltage reaches the voltage of breakdown, the voltage on the base of Q1 will be the same as the Zener diode, and Q1 will be turned on. Now, the voltage on the Q2 base and emitter will be the same, so Q2 will turn off and the output voltage will be zero because the collector will be floating.

Simulation Discussion

Output and Input Graph

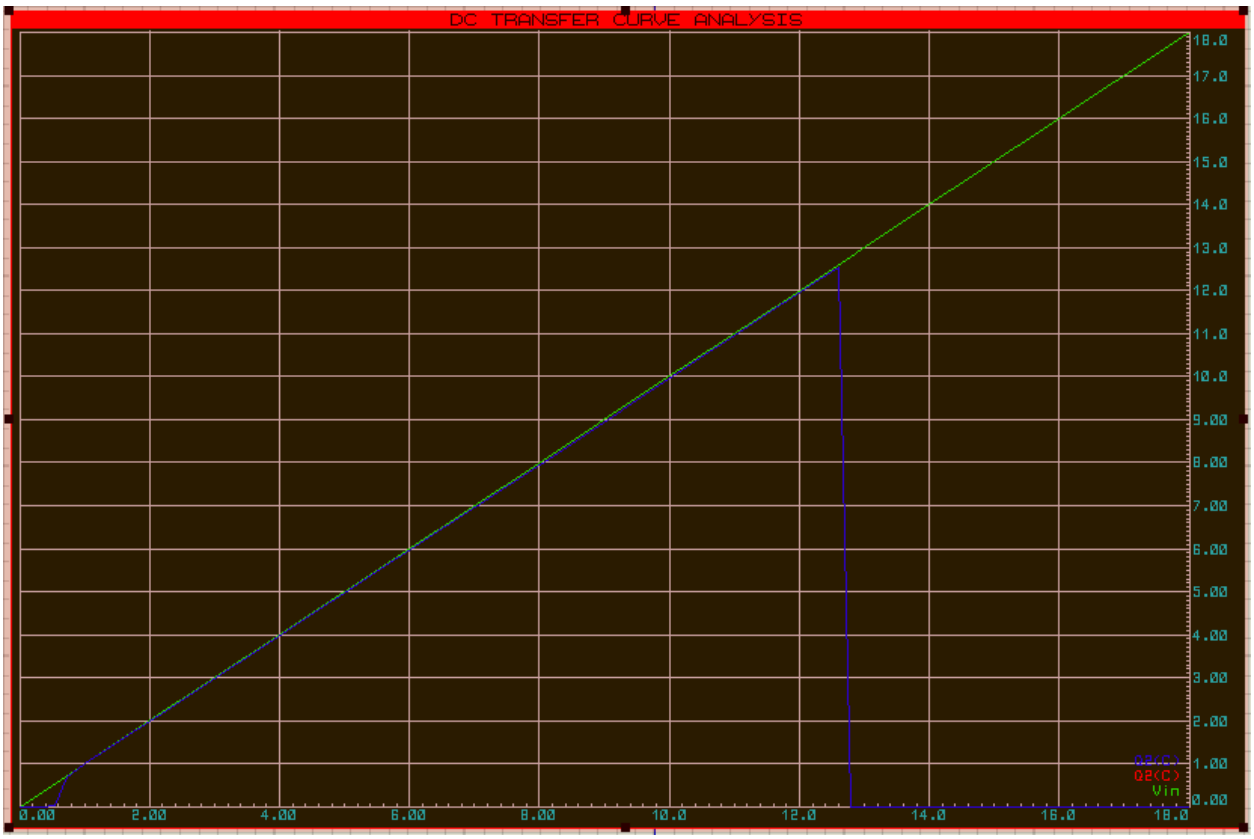

Figure 2 Output and Input Voltages Relation

First of all, the green line is the input, and this is obvious because it just keeps increasing, and the blue one is the collector of Q2 (the output in our case).

When the input reaches a certain value, maybe 12 or 13, I don't know. It is the value when the Zener diode starts connecting and the value when Q1 turns on and Q2 turns off, so when Q2 turns off, the output will be floating, and in this graph, you can see it reaches zero. We'll see the voltage variation on the bases of the transistors in the second graph.

Q1 and Q2 Bases

Figure 3 Bases voltages

The blue line represents the base of Q2, and the red line represents the base of Q1. As you can see, the voltage reaches a constant value of 12, and it's the Zener voltage. When it reaches this value, Q1 turns on, and the reason why Q2 turns off is that the voltage on its base is the same as the voltage on its emitter, as can be seen in this graph (the blue line is the base of Q1, and the green line is the input voltage).