Loyola Marymount University

Department of Electrical Engineering and Computer Science

Constant Current Source

Objectives:

1. To **design** and study the characteristics of constant current sources.

Required Equipment and parts.

Hardware:

1. CA3046 or CA3083 npn transistor array chip
2. DC power supply
3. Signal generator
4. Standard resistors and capacitors

PRELAB

(1) **Design** a constant current source (Widlar current source) to supply 1mA current.

(2) Simulate the current source in MultiSim for different values of load resistances and show that the current remains constant. Calculate the range of load resistance for which your current source will work.

(3) Perform a parametric analysis of Load current Vs Load resistor, for load resistance varying from 0 to 3 times the value of the maximum load resistance for which the constant current source works. In MultiSim parametric analysis can be done by:

a. Select ***Simulate->Analyses->Parameter Sweep*** in the main menu.
b. In the **Device type** drop down list select ***Resistor***. In the **Name list**, select the name of your load resistor. In the **Sweep variation type** drop down list, select ***Linear***. In the value list select appropriate **start**, **stop**, and **#of points** or **increment values**.
c. In the **Analysis to sweep** drop down list select ***DC Operating Point***.
d. Click on the ***Output*** tab at the top. In the left side list select your output current and click on the ***Add*** button.
e. Click on the ***Simulate*** button.

You must show your complete design process and calculations, design check calculations, a circuit diagram, the simulation results showing output current of 1mA and a Parametric sweep showing relatively constant output current for load resistance of 0 to 3 times the total calculated value of maximum resistance for which the current source works.

EXPERIMENT

(1) Build the current source and verify its proper operation. Measure the load current for the limiting load resistances calculated in pre-lab part 1. **(The substrate, pin 13, of CA3046 or Pin 5 of CA3083 chip must be connected to the most negative potential of your circuit!).**

(2) Measure the output resistance of the current source.

(3) Obtain the signature of the instructor when finished.

REPORT

(1) Submit the report according to the lab-report guidelines.

(2) Include your final circuit diagram in the system-description section of your report.

(3) Compare the calculated and measured value of load resistances (tabular form) for which your current source worked properly. Explain any differences. Give your answers in the results and discussion-of-results sections of your report.

(4) Compare measured and calculated values of output resistance (tabular form). Give your answers in the results and discussion-of-results sections of your report.