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#### APPLICATION NOTE 3090

# Range/Resolution Considerations with External Resistors Using the DS1870

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*Abstract: The DS1870 is used for biasing RF power amplifiers. Without using external resistors, the bias range is 3 to 5V with a 5V reference. This application note shows how external resistors can be used to tailor the range and resolution. A link to a spreadsheet is given; the spreadsheet computes the new effective temp co, once external resistors are added.*

## Range Resolution Calculations

**Figure 1** shows three external resistors R1, R2, R3. This is the most flexible topology. Of course R1 can be omitted in many cases if the reference voltage is just right for the application. Furthermore because there are 2 channels, if both channels are used then R1 needs to be sized up as the parallel combination of the individual corresponding values found for each channel. Because there are 256 positions in the 8-bit potentiometer the range is equal to the resolution multiplied by 256. For instance a range of 256mV from HCOM to L1 guarantees a resolution of 1mV.



[Click here for an overview of the wireless components used in a typical radio transceiver.](#)

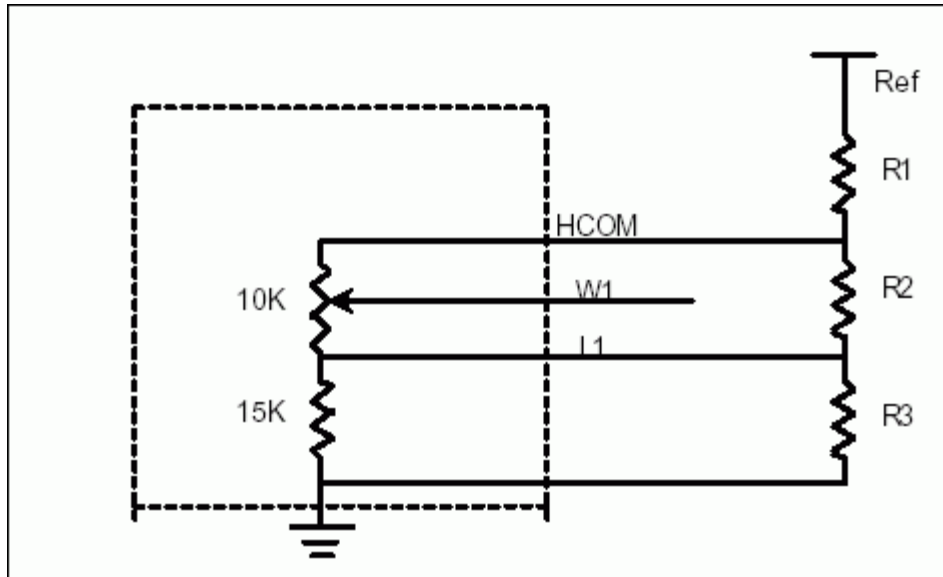


Figure 1.

## Temperature Coefficients

Without the use of external resistors (R1 replaced by a short), if the reference is applied to HCOM and given a fixed wiper position then the voltage at W1 varies as a function of the temperature dependence of the internal resistors. This variation is called ratiometric temperature coefficient and is expressed in ppm/°C. The same concept applies when external resistors are used.

The spreadsheet located at the following link (<http://pdfserv.maximintegrated.com/en/an/AN3090Calc.xls>) computes the effective temp co when using external resistors. Once you input the values and temp cos for each of R1, R2, and R3 the effective ratiometric temp co is calculated. This number is computed in a RSS like fashion and is a representation of the process sigmas for the numbers entered as inputs. For example if the temp cos for R1, R2, R3 are 3 sigma numbers then the answer you will obtain is a 3 sigma number. Furthermore the temp co of the internal resistors are accounted for.

To use the spreadsheet, enter your inputs in the area colored in lavender. Read the answer in the orange cell.

### Related Parts

[DS1870](#)

LDMOS RF Power-Amplifier Bias Controller

[Free Samples](#)

### More Information

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