Keywords: Component calculator, buck converter, buck regulator, boost converter, boost regulator, external component values, • compensation network, compensation network type II, compensation network type III, CIN, COUT, LOUT, design tool, power supply design,

APPLICATION NOTE 3665

External Component Calculator for Setting up a Buck or Boost Converter with the MAX5072/MAX5073

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Dec 08, 2005

Abstract: The External Component Calculator for the MAX5072/MAX5073 converters is a simple-to-use design tool to set up a buck or a boost converter. The tool calculates the principal external component values, the compensation network type (II or III), and its associated component values.

The External Component Calculator has two calculator worksheets used to set up a buck converter, and two similar worksheets for a boost converter. The first of each pair of worksheets calculates the principal external component values; the second worksheet calculates the compensation network type (II or III) and the associated component values.

The worksheets are presently configured to calculate component values for channel 1 of the MAX5072 and MAX5073. Because the two converter channels have different $R_{DS(ON)}$ values and internal switch current limits, it is important to update the $R_{DS(ON)}$ value if you are setting up channel 2. You should also double-check the peak currents and average currents to make sure that they are within the limits of channel 2. Consult the MAX5072 and MAX5073 data sheet EC tables and TOC plots for these values.

REMEMBER that once calculated cells are edited to fixed values, the automatic calculations will no longer be able to update these cells. It is a good idea to back up a copy of the spreadsheet before replacing calculated values with actual component values.

When you have set up the basic external component values (C_{IN}, C_{OUT}, L_{OUT}), you can unprotect the worksheets by using the password 'maxim.' Enter the *actual* capacitor ESR and capacitance values into the green cells for Max ESR_{OUT} and Min C_{OUT}, respectively. This will ensure accurate compensation values on the next worksheet. The capacitor values that are calculated are *limits*, not actual capacitor specifications.

Within the worksheets, the cells with a blue background are editable, and are for key power-supply design parameters. The green cells show the results that you need to implement your design. Some parameters are checked for validity: if a parameter goes out of specification, the cell value will turn red and the cell that needs adjustment will turn orange.

This tool will allow a user to quickly approximate or easily evaluate a variety of design options. This calculator is obviously not the definitive tool for switch-mode power-supply design. *Always* make a common-sense check, and verify all component values using standard switching power-supply design techniques.

Hints

- Start on the Configuration & Instructions page and set the desired switching frequency. Proceed then to the page for buck or boost supply. If you are setting up the MAX5072/MAX5073 as a dual buck or dual boost converter, save one copy of the spreadsheet for channel 1 and one copy for channel 2.
- In the compensation sheets, there is a value for VOSC. This value is 1V for the MAX5072/MAX5073, and is locked so it cannot be changed inadvertently.
- This tool is not guaranteed to be accurate. While good to the best of our knowledge, it is not officially certified nor thoroughly validated. All the calculations are taken directly from the MAX5072/MAX5073 data sheets.
- The inductor specifications are real; they are directly from the Pulse Engineering P0751 data sheet, and are selected by lookup functions from a hidden worksheet. There is another hidden worksheet containing values for the Pulse Engineering PG0063 inductors. The PG0063 inductors are slightly less expensive, but provide lower performance. The PG0063 inductors also sometimes work well for the lower current levels of channel 2. To reveal the hidden worksheets, use the Excel menus: Format, then Sheet, then Unhide. A knowledgeable spreadsheet user can then point the inductor lookup equations to this sheet, if desired.
- IMPORTANT: Not all limits and constraints are checked. There are simply too many interrelated constraints and conditions to program them all into the spreadsheet. Always check your results for validity, and verify the design parameters with standard switching power-supply design techniques.
- To design a dual-buck or dual-boost power supply, simply save a second copy of the spreadsheet and configure channel 2.

Related Parts		
MAX5072	2.2MHz, Dual-Output Buck or Boost Converter with POR and Power-Fail Output	Free Samples
MAX5072	2.2MHz, Dual-Output Buck or Boost Converter with POR and Power-Fail Output	Free Samples
MAX5072	2.2MHz, Dual-Output Buck or Boost Converter with POR and Power-Fail Output	Free Samples
MAX5073	2.2MHz, Dual-Output Buck or Boost Converter with Internal Power MOSFETs	Free Samples
MAX5073	2.2MHz, Dual-Output Buck or Boost Converter with Internal Power MOSFETs	Free Samples
MAX5073	2.2MHz, Dual-Output Buck or Boost Converter with Internal Power MOSFETs	Free Samples

More Information

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