

APPLICATION NOTE 821

# Compensation Calculator for the MAX1864/MAX1865 xDSL Cable-Modem Power Supplies

Oct 09, 2001

*Abstract: A spreadsheet calculates compensation components for a linear regulator and a buck regulator. The MAX1864 and MAX1865 xDSL cable modem power supplies are featured.*

The linked [Excel® spreadsheet](#) (ZIP, 4kB) calculates compensation components based on the application requirements and components specifications. User inputs are highlighted in blue.

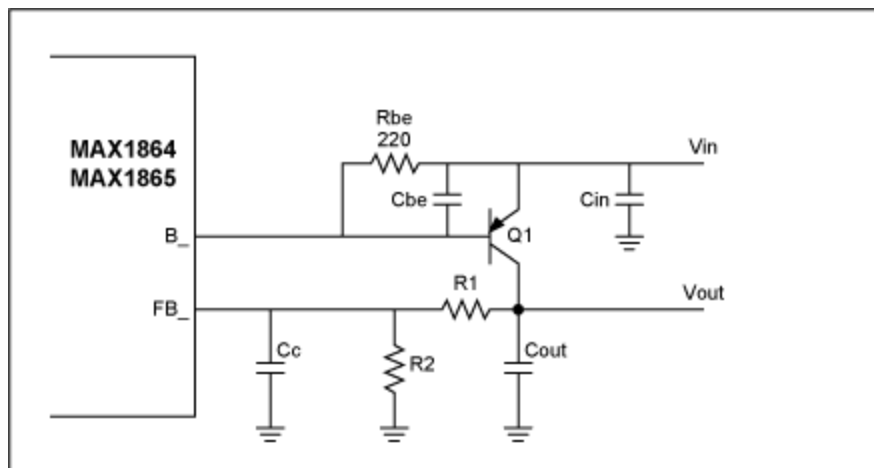


Figure 1. Linear regulator.

- B2: Output voltage,  $V_{out}$
- B3: Maximum output current
- B4: Output capacitor,  $C_{out}$
- B5: ESR of output capacitor
- B6: Bottom feedback resistor,  $R_2$
- D6: Calculated top feedback resistor,  $R_1$  (does not apply to negative regulator)
- B7: Chosen top feedback resistor (next higher standard value)
- B8: Current gain of pass transistor,  $Q_1$  (use maximum specification)
- B9: Calculated dominant pole frequency
- D9: Calculated  $C_{be}$  to place second pole above unity-gain crossover frequency
- B10: Calculated ESR zero frequency

- D10: Calculated compensation capacitor ( $C_c$ ) to cancel ESR zero.  $C_c < 50\text{pF}$  not necessary.
- B11: Calculated crossover frequency
- B12: Chosen  $C_{be}$  (subtract transistor  $C_{be}$ , choose next lower standard value)
- B13: Calculated second pole frequency

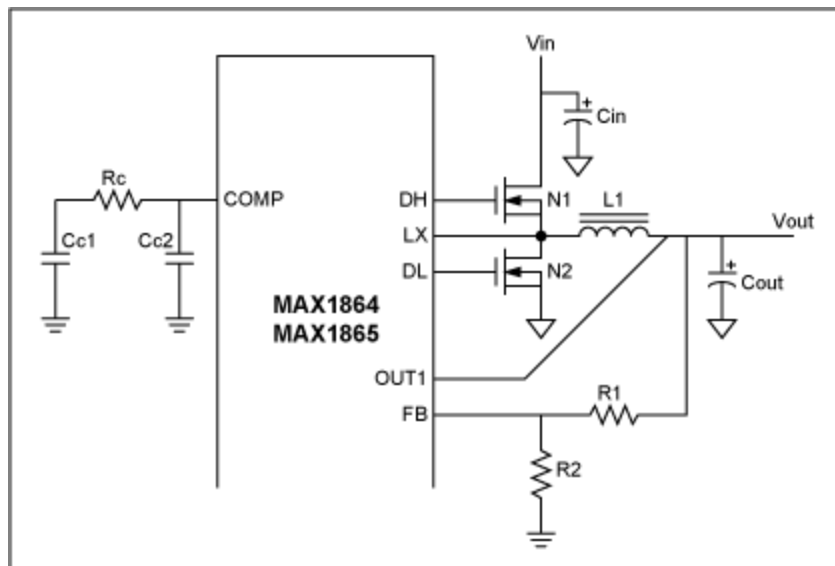


Figure 2. Buck regulator.

- B16: Output voltage,  $V_{out}$
- B17: Maximum output current
- D17: Calculated inductance assuming  $LIR = 0.3$ .
- B18: Output capacitor,  $C_{out}$
- B19: ESR of output capacitor
- D19: Calculated ESR zero frequency
- B20: Maximum on-resistance of control FET,  $N1$
- B21: Chosen unity-gain crossover frequency (choose  $< 40\text{kHz}$ )
- D21: Calculated compensation capacitor ( $C_{c1}$ ) to set dominant pole
- B22: Chosen compensation capacitor (standard value  $> D21$ )
- B23: Calculated dominant pole frequency
- D23: Calculated resistor ( $R_c$ ) to cancel output pole
- B24: Chosen resistor (next higher standard value)
- D24: Calculated compensation capacitor ( $C_{c2}$ ) to cancel ESR zero. Not necessary if  $f_c < Z_{esr}$ .
- B25: Bottom feedback resistor,  $R2$  (if necessary)
- D25: Calculated top feedback resistor,  $R1$

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#### Related Parts

<a href="#">MAX1864</a>	xDSL/Cable Modem Triple/Quintuple Output Power Supplies	<a href="#">Free Samples</a>
<a href="#">MAX1865</a>	xDSL/Cable Modem Triple/Quintuple Output Power Supplies	<a href="#">Free Samples</a>

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