

Keywords: Inverter, Compensation, Inverting DC-DC

APPLICATION NOTE 3591

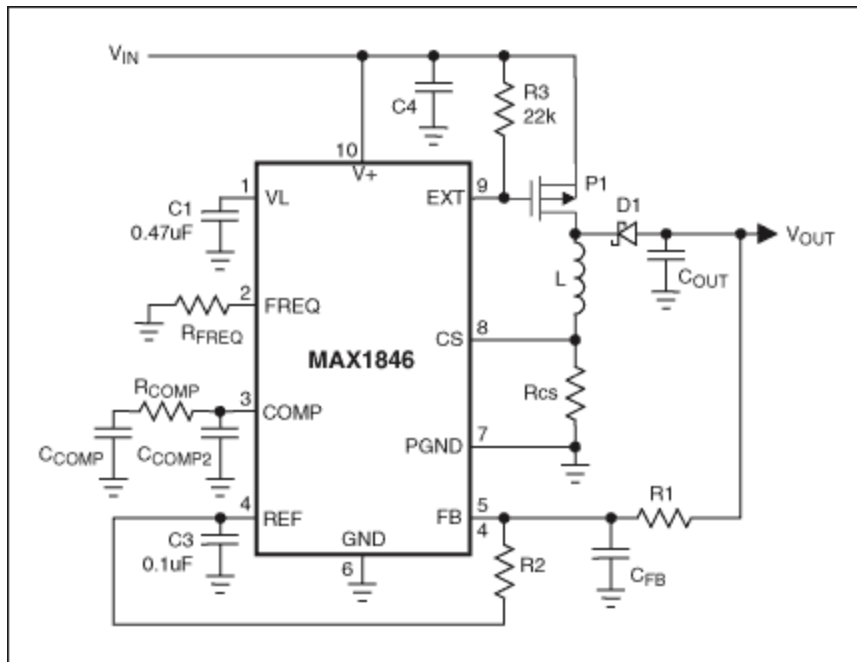
# Compensation Calculator for the MAX1846/MAX1847 Inverting DC-DC Converters

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*Abstract: An Excel spreadsheet calculates MAX1846/MAX1847 compensation components based on the application requirements and components' specifications.*

The [Compensation Calculator spreadsheet](#) calculates MAX1846/MAX1847 compensation components based on the application requirements and components' specifications. User inputs are entered in column B, highlighted in blue. Calculated values are noted in red.

## Inverting Regulator



The Compensation Calculator spreadsheet is easy to use. The list below explains what unit information is required for, or calculated in, each cell. Just enter the required information into column B. The spreadsheet will do the rest.

B2: Chosen  $R_{FREQ}$  (frequency setting resistor).

D2: Calculated switching frequency ( $F_{OSC}$ ).  
 B3: Enter the maximum input voltage.  
 B4: Enter the minimum input voltage.  
 B5: Enter the output voltage,  $V_{OUT}$  (must be negative).  
 B6: Enter the maximum output current.  
 D6: Calculated equivalent resistive load.  
 B7: Estimate  $V_{DS}$ , of PFET, P1, at maximum peak current (0.1V).  
 B8: Estimate current-sense voltage (0.1V).  
 D8: Calculated minimum duty cycle.  
 B9: Estimate voltage drop across output diode, D1 (0.5V).  
 D9: Calculated maximum duty cycle.  
 G9: Calculated RMS input-ripple current, assuming 80% efficiency.  
 D10: Calculated inductor-ripple current ( $I_{RIPPLE}$ ), assuming  $LIR = 0.4$  at  $V_{IN, max}$ .  
 D11: Calculated inductor,  $L$  .  
 G10: Calculated RMS output-ripple current.  
 F11: Calculated minimum inductor (for duty cycles greater than 50%).  
 B12: Enter the inductor (next lower standard value, but greater than  $L_{MIN}$ ).  
 D12: Calculated DC current in inductor ( $I_{LDC}$ ).  
 D13: Calculated ripple current in the inductor ( $I_{LPEAK}$ ).  
 F13: Calculated peak current in the inductor.  
 H13: Calculated current-sense resistor ( $R_{CS}$ ).  
 B14: Bottom feedback resistor, R2.  
 D14: Calculated top feedback resistor, R1.  
 B15: Enter the top feedback resistor (next higher standard value).  
 D15: Calculated  $C_{OUT}$  for 1% peak-to-peak ripple voltage (Excludes ESR).  
 B16: Enter the current-sense resistor (next lower standard value).  
 B17: Enter the output capacitor,  $C_{OUT}$  (next higher standard value).  
 D17: Calculated output pole frequency ( $P_{OUT1}$ ).  
 B18: Enter the ESR of output capacitor ( $R_{ESR}$ ).  
 D19: Calculated DC open-loop gain ( $A_{DC}$ ).  
 B20: Enter a compensation frequency ( $Z_{ESR}$ ) less than  $F_{OSC}$  (G20) and  $F_{ESR}$  (H20).  
 D21: Calculated compensation capacitor,  $C_{FB}$ .  
 G22: Calculate right half-plane zero ( $Z_{RHP}$ ) frequency .  
 H22: Calculated Nyquist limit ( $P_{OUT2}$ ).  
 I22: Calculated output filter cut off frequency ( $OUT_{FIL}$ ).  
 B22: Enter the loop crossover frequency ( $F_{CROSS}$ ) less than  $Z_{RHP}$  (G22) and  $P_{OUT2}$  (H22).  
 B23: Enter next lower standard for  $C_{FB}$ .  
 D23: Calculated compensation resistor,  $R_{COMP}$ .  
 B24: Enter the compensation resistor,  $R_{COMP}$  (next lower standard value).  
 D24: Calculated compensation capacitor,  $C_{COMP}$ .  
 B25: Enter compensation capacitor,  $C_{COMP}$  (next higher standard value).  
 D25: Recalculated  $P_{OUT1}$  frequency based on compensation components.  
 D26: Calculated optional roll-off capacitor,  $C_{COMP2}$ .

## Related Parts

<a href="#">MAX1846</a>	High-Efficiency, Current-Mode, Inverting PWM Controller	<a href="#">Free Samples</a>
<a href="#">MAX1847</a>	High-Efficiency, Current-Mode, Inverting PWM Controller	<a href="#">Free Samples</a>

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Application Note 3591: <http://www.maximintegrated.com/an3591>

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