1-9-2014

Below are the equations for input capacitor and output capacitor RMS currents in a buck converter in CCM mode.

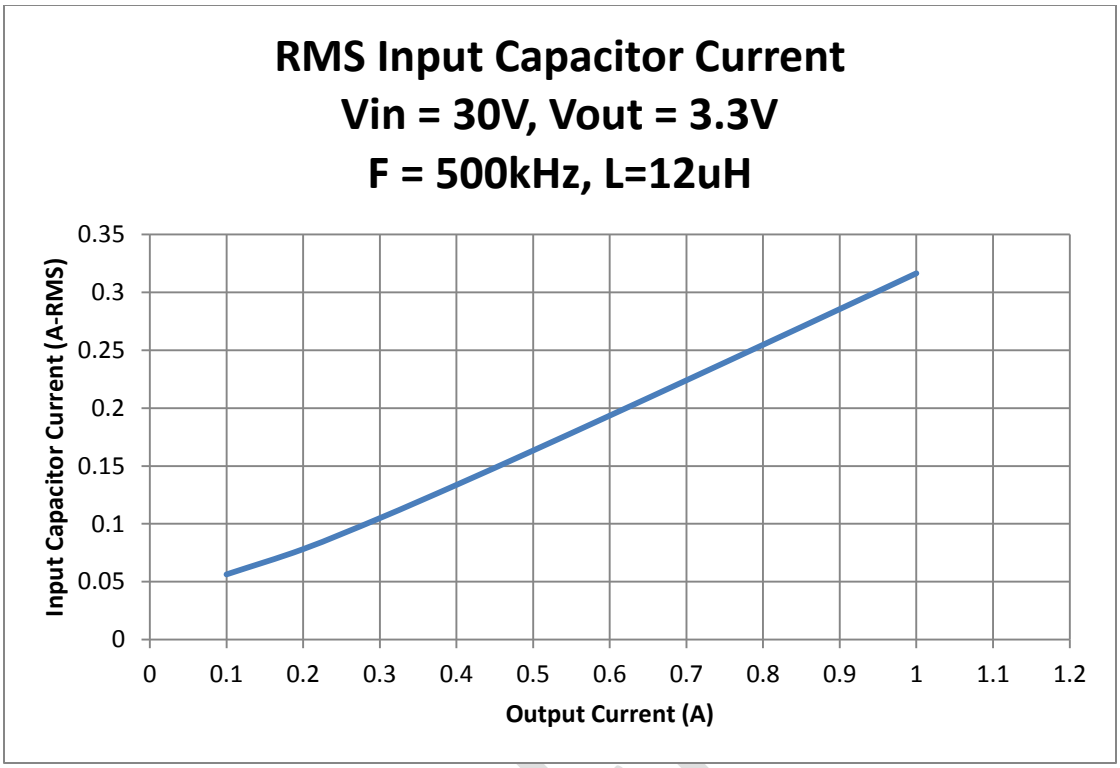
$$I_{cin}\big|_{rms} = I_o \cdot \sqrt{D \cdot D' + \frac{D}{12} \cdot \left(\frac{\Delta I}{I_o}\right)^2}$$

$$I_{co}\big|_{rms} = \frac{\Delta I}{2 \cdot \sqrt{3}}$$

$$\Delta I = \frac{(V_{in} - V_o)}{F_s \cdot L} \cdot D = \frac{(V_{in} - V_o)}{F_s \cdot L} \cdot \frac{V_o}{V_{in}}$$

$$D = \frac{V_o}{V_{in}}$$

The graph below shows the RMS current vs. output current for the conditions given by the customer.


RMS Input Capacitor Current
Vin = 30V, Vout = 3.3V
F = 500kHz, L=12uH
Input Capacitor Current (A-RMS)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
Output Current (A)

Important Notice

Please be reminded, that – as always – the application design and layout can have a substantial influence on the behavior of semiconductor devices. Also be reminded that the only applicable and binding specifications for our components are the TI released Datasheets, Technical Reference Manuals and Application Notes. TI trusts that the customer has fully checked, tested and validated their applications. Any comment or recommendation of TI in any form that we gave verbally or in writing, e-mail or any other document, during or as a result of any conversations, is a good faith statement only that is based on TI's limited knowledge and visibility of the customer's application and that reflects TI's knowledge at the time. The customer application and design is wholly owned by the customer and is their sole responsibility.