APPENDIX II

Effective R_L and C in the Feedback Loop

Effective Load:

The output power range for this regulator is 24.5W to 60.0W. The reflected resistance in the auxiliary 12V primary-side supply is therefore:

$$R_{L(min)} = \frac{V_A^2}{P_{o(max)}} = \frac{144V^2}{60W} = 2.4\Omega$$

$$R_{L(max)} = \frac{144V^2}{24.5W} = 5.88\Omega$$

assuming that losses in the transformer and output filters are negligible.

Effective Filter Capacitor:

ESR considerations prevail in the choice of output filter capacitors. For a 50% maximum duty cycle, peak output ripple currents are calculated as follows:

$$I_o = \frac{i_{sp}}{2} D$$

where i_{sp} = peak secondary current

$$i_{sp} = \frac{2I_o}{D}$$

for the 5V output:

$$i_{sp5} = \frac{(2)\ (5A)}{.5} = 20A$$

for the 12V output:

$$i_{sp12} = \frac{(2)\ (2.9A)}{.5} = 11.6A$$

The ESR requirements are therefore:

for C_5:

$$ESR = \frac{\Delta V_o}{i_{sp5}} = \frac{50mV}{20A} = 2.5m\Omega$$

for C_{12}:

$$ESR = \frac{100mV}{11.6A} = 8.6m\Omega$$

Using low-cost aluminum electrolytic capacitors, these ESR requirements can be met with the following capacitance values:

$$C_5 = 10{,}000\mu F$$

$$C_{12} = 4700\mu F$$

The total effective capacitance in the auxiliary supply is given by:

$$C_E = \left(\frac{N_5}{N_A}\right)^2 C_5 + \left(\frac{N_{12}}{N_A}\right)^2 C_{12} + C_A$$

$$= \left(\frac{2}{6}\right)^2 10^4\mu F + \left(\frac{5}{6}\right)^2 4700\mu F + 100\mu F$$

$$= 4500\mu F$$

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Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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