

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

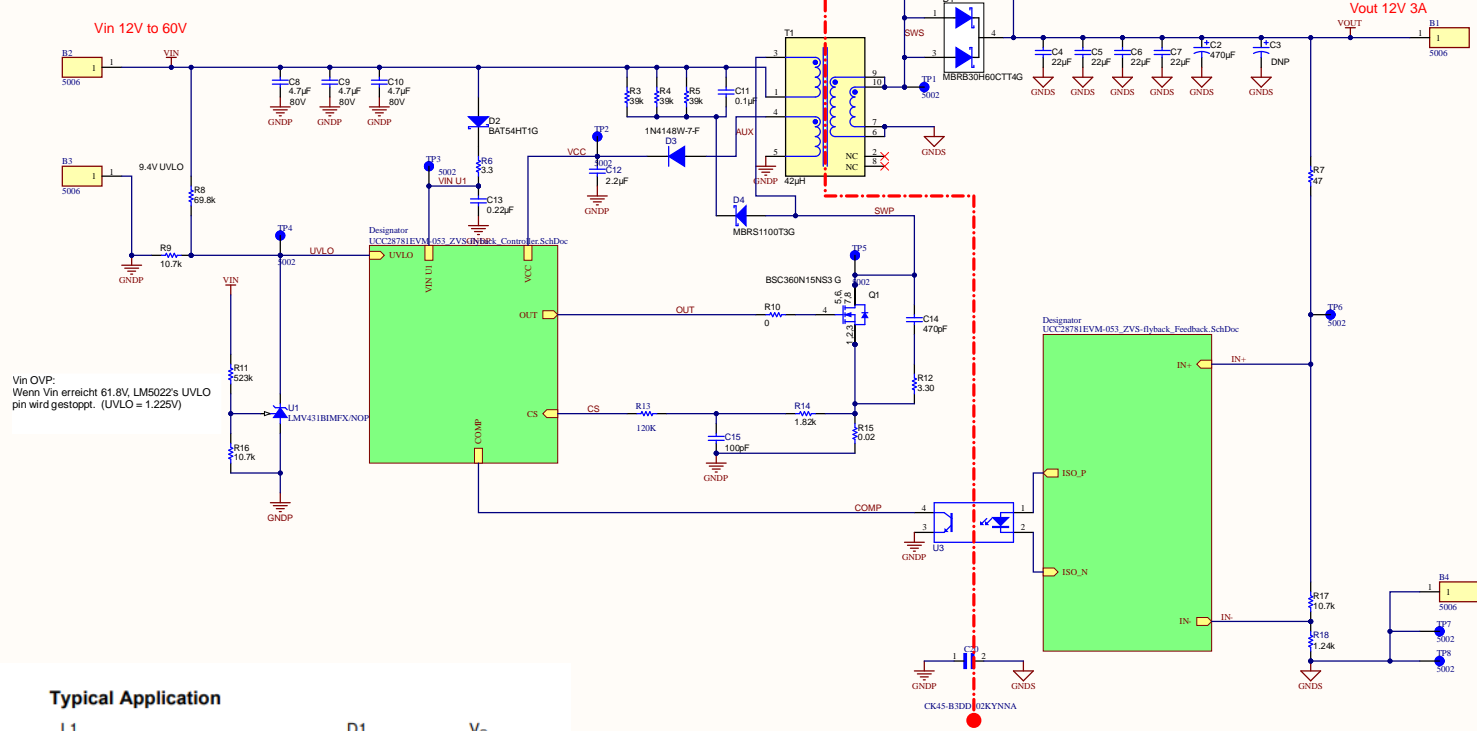
	MIN	MAX	UNIT
Supply voltage	6	60	V
External voltage at V _{CC}	7.5	14	V
Junction temperature	−40	125	°C

(1) Device thermal limitations may limit usable range

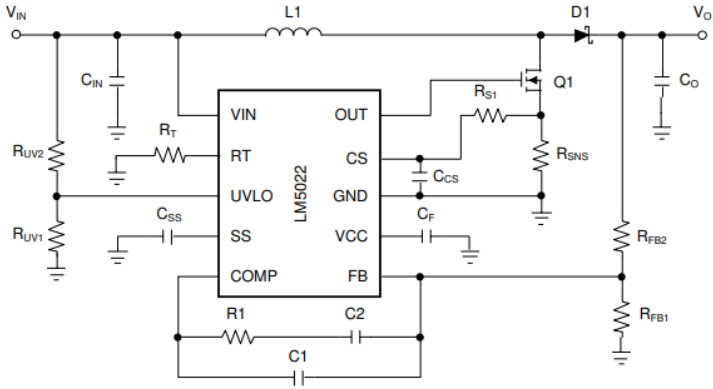
Typical Application:

Properties		Value	Unit
Version		Flyback	
Input Voltage	V _{IN}	12 - 60	V (DC)
Switching Frequency	f _{switch}	100	kHz
Output Voltage 1	V _{Out1}	12	V
Output Current 1	I _{Out1}	3	A
Auxiliary Voltage	V _{Aux}	12	V

Input: N1
Output 1: N2
Auxiliary: N3
Table shows a typical application. Values may vary by application.



Typical Application



For this example, a 0.1 Ω ±1%, thick-film chip resistor in a 1210 case size rated to 0.5 W is used.

With R_{SNS} selected, R_{S2} can be determined using Equation 40 and Equation 41.

$$R_{S2} = \frac{V_{CL} - I_{LIM} \times R_{SNS}}{45 \mu \times D} - 2000 - R_{S1}$$

8.2.2.9 R_{SNS}, R_{S2}, and Current Limit

The current sensing resistor, R_{SNS}, is used for steady-state regulation of the inductor current and to sense overcurrent conditions. The slope compensation resistor is used to ensure control loop stability, and both resistors affect the current limit threshold. The R_{SNS} value selected must be low enough to keep the power dissipation to a minimum, yet high enough to provide good signal-to-noise ratio for the current sensing circuitry. R_{SNS} and R_{S2} must be set so that the current limit comparator, with a threshold of 0.5 V, trips before the sensed current exceeds the peak current rating of the inductor, without limiting the output power in steady state.

For this example, the peak current at V_{IN(MIN)} is 2.5 A, while the inductor itself is rated to 3.2 A. The threshold for current limit, I_{LIM}, is set slightly between these two values to account for tolerance of the circuit components, at a level of 3 A. The required resistor calculation must take both the switch current through R_{SNS} and the compensation ramp current flowing through the internal 2-kΩ R_{O1} and R_{O2} resistors into account. R_{O2} must be selected first because it is a power resistor with more limited selection. Equation 36 and Equation 37 must be evaluated at V_{IN(MIN)} when duty cycle is highest.

$$R_{SNS} = \frac{L \times f_{SW} \times V_{CL}}{(V_O - V_{IN}) \times 3 \times D + L \times f_{SW} \times I_{LIM}} \quad (36)$$

$$R_{SNS} = \frac{33 \times 0.5 \times 0.5}{(40 - 9) \times 3 \times 0.78 + 33 \times 0.5 \times 3}$$

where

- L is in μH
- f_{SW} in MHz

(37)

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7.4 Device Functional Modes

7.4.1 Oscillator, Shutdown, and SYNC

A single external resistor, R_T , connected between the RT/SYNC and GND pins sets the LM5022 oscillator frequency. To set the switching frequency (f_{SW}), R_T can be calculated with Equation 1.

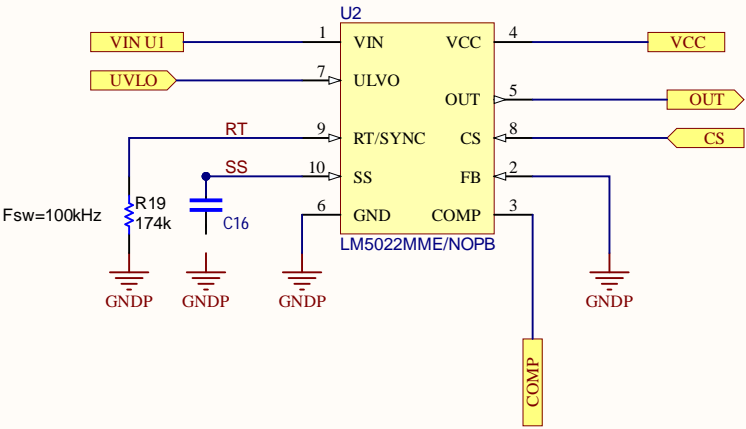
$$R_T = \frac{(1 - 8 \times 10^{-8} \times f_{SW})}{f_{SW} \times 5.77 \times 10^{-11}}$$

where

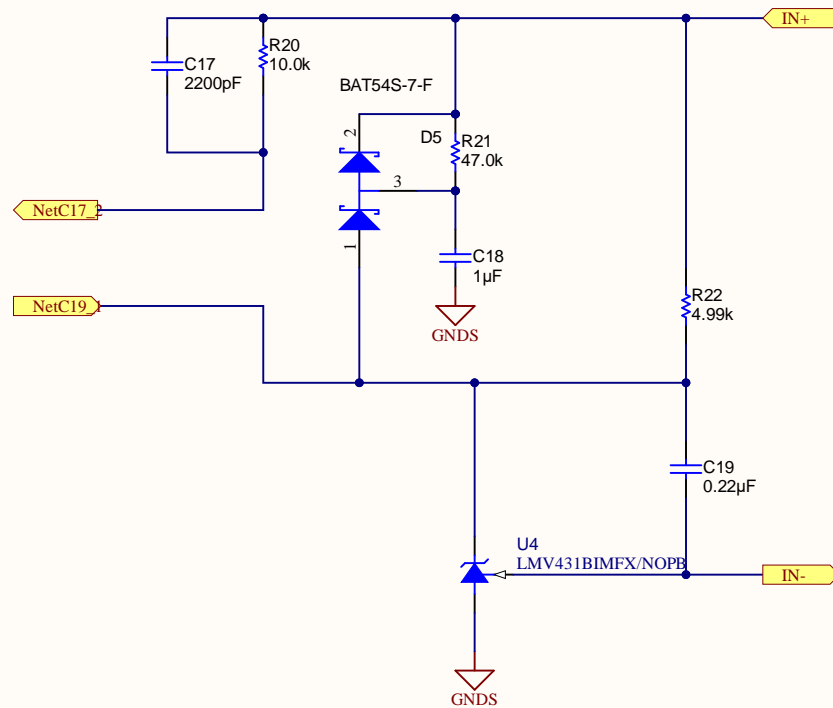
- f_{SW} is in Hz
- R_T is in Ω

(1)

The LM5022 can also be synchronized to an external clock. The external clock must have a higher frequency than the free-running oscillator frequency set by the R_T resistor. The clock signal must be capacitively coupled into the RT/SYNC pin with a 100-pF capacitor as shown in Figure 13. A peak voltage level greater than 3.8 V at the RT/SYNC pin is required for detection of the sync pulse. The sync pulse width must be set between 15 ns to 150 ns by the external components. The R_T resistor is always required, whether the oscillator is free-running or externally synchronized. The voltage at the RT/SYNC pin is internally regulated to 2 V, and the typical delay from a logic high at the RT/SYNC pin to the rise of the OUT pin voltage is 120 ns. R_T must be placed very close to the device and connected directly to the pins of the controller (RT/SYNC and GND).



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