TND308

Graphical Data Test Circuits for the NCP1651

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APPLICATION NOTE

The following circuits are the test configurations that were used to obtain the data for the graphical section of the NCP1651/D data sheet. Each graph has a schematic associated with it and in some cases a description of the procedure.

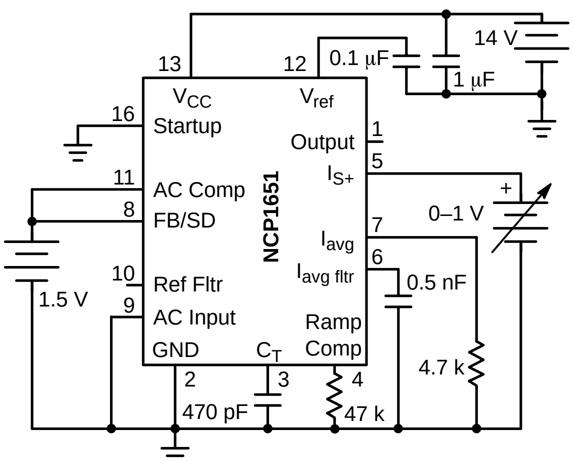

Figure 1. Current Sense Amplifier Gain
Re: NCP1651/D data sheet, Figure 4

Energize all three power sources, beginning with the 14 volt supply. Cycle the 14 volt supply down to 8 volts and back to 14 to start unit operating. Adjust power supply on pin 5 and read voltages on pins 6 and 7.

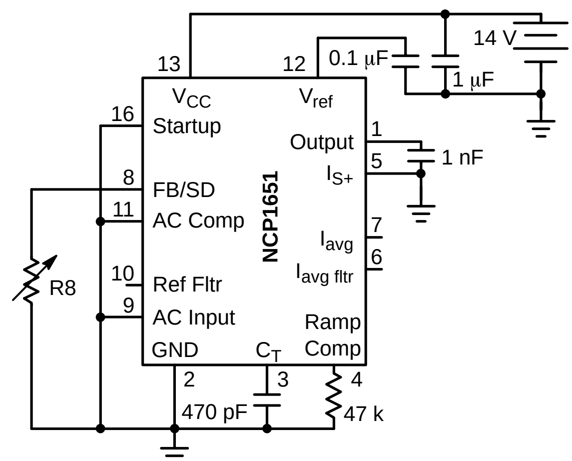

Figure 2. FB/SD V–I Characteristics
Re: NCP1651/D data sheet, Figure 5

Using a decade resistance box for R8, set it to 1 MΩ. Turn on the 14 volt source. Cycle it down to 8 volts and back up to 14 to turn the unit on. Read the voltage and pin 8 and note the resistance. Reduce R8 until the unit shuts down. Calculate the current for each reading.

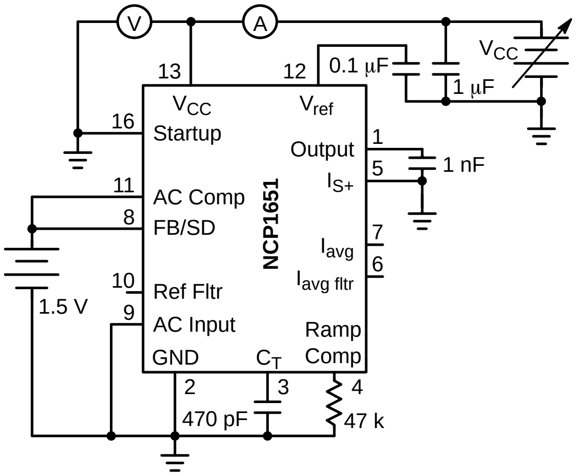

Figure 3. Bias Current versus V_{CC}
Re: NCP1651/D data sheet, Figures 6 and 7

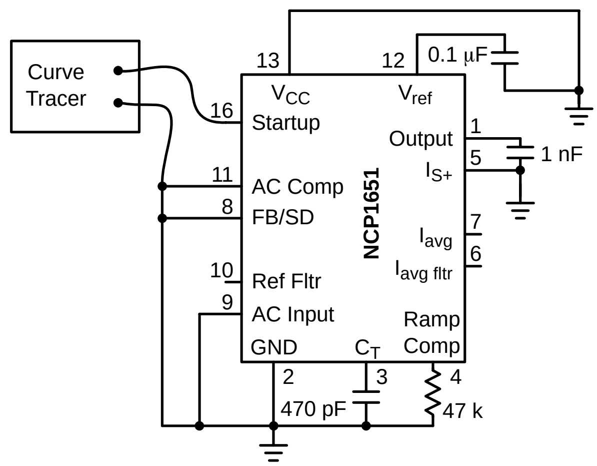

Figure 4. Startup Leakage
Re: NCP1651/D data sheet, Figure 8

Apply voltage from 1.5 volt source. Begin with V_{CC} at 0 volts and take current readings over a range of 0 to 11 volts. Reduce V_{CC} to 8 volts, and then increase to 12 volts, unit should begin operation. Reduce voltage to approximately 10 volts and take current readings up to 18 volts. If unit shuts down before 10 volts, note shutdown voltage. Recycle input power (V_{CC} to 12 volts, 8 volts and 12 again) and adjust V_{CC} to just above shutdown threshold and take readings.

Device needs to be non–operational for this test. Begin with curve tracer set to about 20 volts for low voltage readings. As unit heats up, currents will drop.

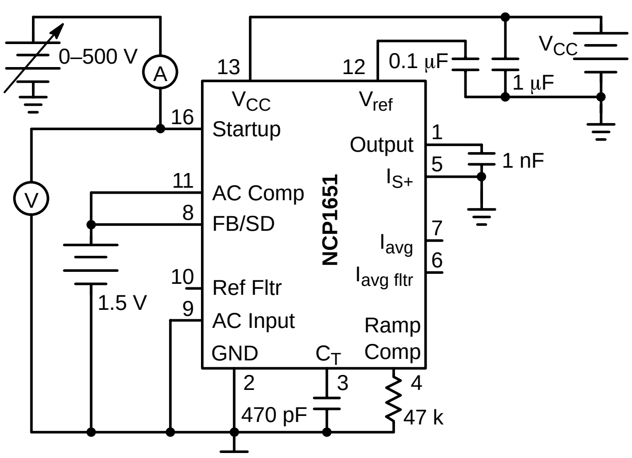

Figure 5. Startup Current and Leakage
Re: NCP1651/D data sheet, Figure 9

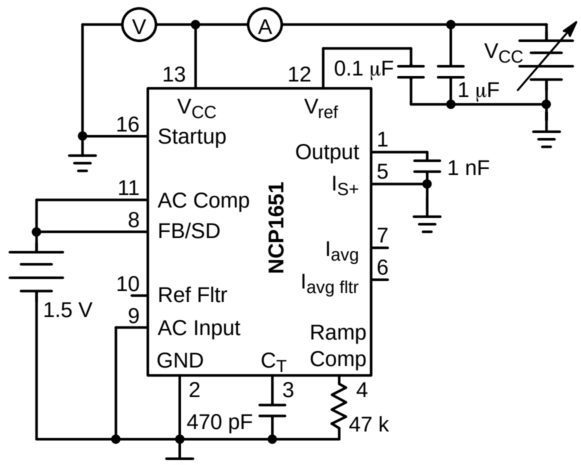

Figure 6. UVLO Thresholds
Re: NCP1651/D data sheet, Figure 10

Apply voltage from 1.5 volt source. Turn on V_{CC} and bring up to 12 volts. Reduce it to 8 volts and then increase it back to 12 volts. Adjust high voltage to 500 volts and take current measurement.

Apply voltage from 1.5 volt source. Turn on V_{CC} and bring up to 12 volts. Reduce it to 8 volts and then increase it slowly to the point when the unit begins operation. At that point the input current will jump from about 0.5 mA to roughly 5 mA. Decrease the V_{CC} voltage until the V_{CC} current drops back to 0.5 mA, this is the turn–off voltage.

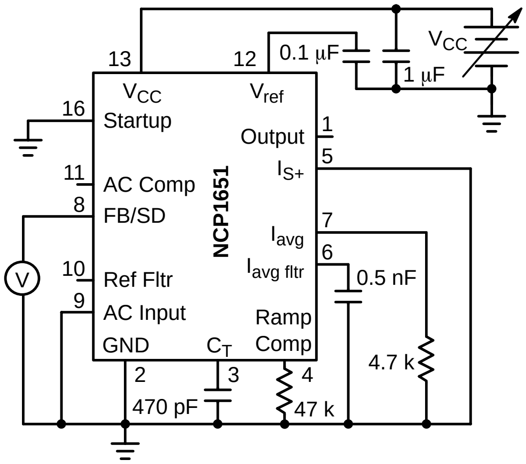

Figure 7. Clamp Voltage versus V_{CC}
Re: NCP1651/D data sheet, Figure 11

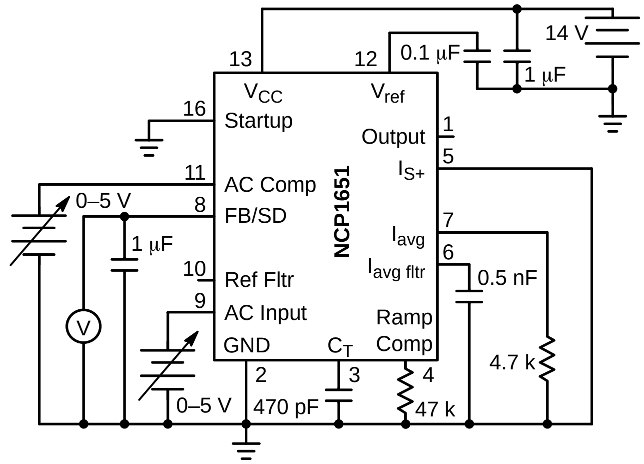

Figure 8. Reference Multiplier Family of Curves
Re: NCP1651/D data sheet, Figure 12

Begin with V_{CC} at 0 volts and increase to 11 volts taking measurements at frequent intervals. This will not allow the chip to go into the operational mode, as that would turn off the clamp.

Energize the 14 volt bias supply, and then the other two supplies on pins 8 and 9. Adjust pin 8 to about 1 volt, then reduce the 14 volt supply to 8 volts and back up to 14. This will start the chip operating. Adjust the supplies on pins 8 and 9, and measure the voltage on pin 10.

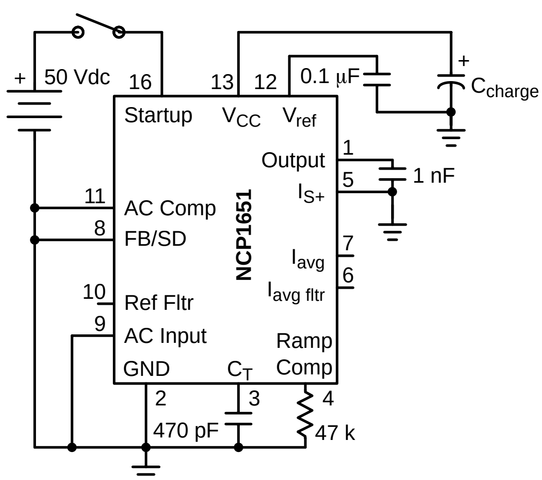

Figure 9. Turn–on Time
Re: NCP1651/D data sheet, Figure 13

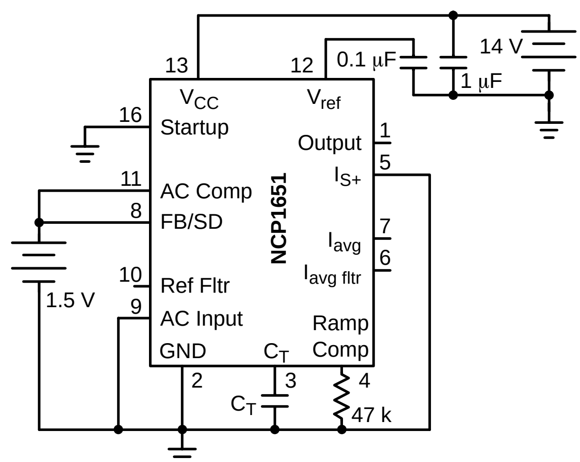

Figure 10. Frequency versus C_T
Re: NCP1651/D data sheet, Figure 14

Using a series of capacitors from 1 μF to 1000 μF, apply the 50 volt supply with a rise time of less than 100 μs. Measure time required for the V_{CC} cap to charge to its peak. This is the point at which the chip will start operating if possible. Since this is not an operable configuration, V_{CC} will then decay to the turn off threshold.

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Measure frequency. Repeat for various values of C_T, and measure the frequency at pin 4. Do not measure directly from pin 3, as the impedance of the measuring device will cause errors in the reading.

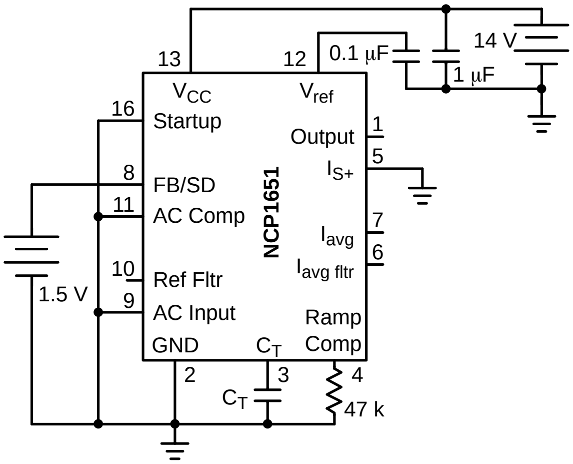

Figure 11. Ramp Peak versus Frequency
Re: NCP1651/D data sheet, Figure 15

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Measure ramp peak at pin 3 with an oscilloscope for various values of C_T.

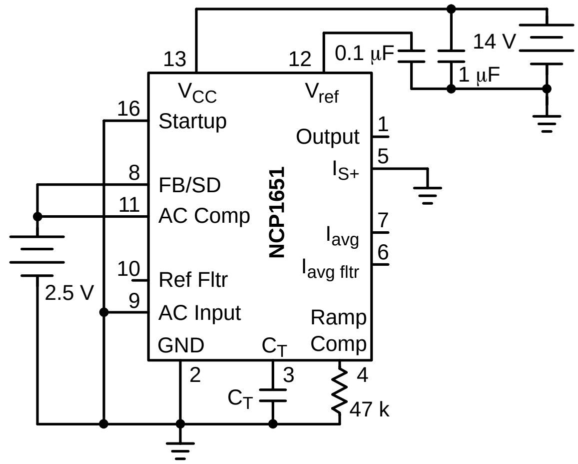

Figure 12. Maximum Duty Cycle versus Frequency
Re: NCP1651/D data sheet, Figure 16

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Measure frequency and duty cycle, using an oscilloscope on pin 1, for various values of C_T.

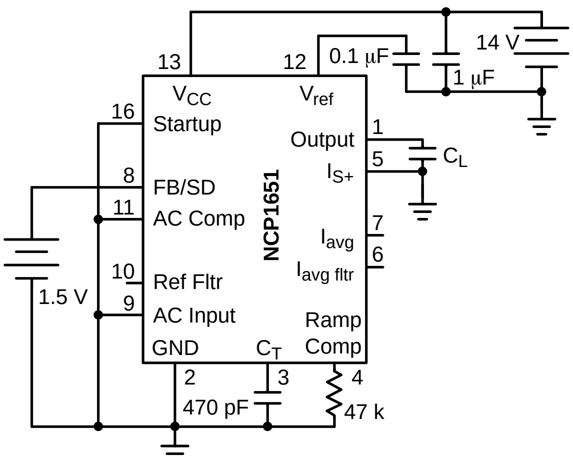

Figure 13. Driver Rise and Fall Times versus Capacitance
Re: NCP1651/D data sheet, Figure 17

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Adjust the voltage of the 1.5 volt source for approximately 50% duty cycle on the output driver pin. Measure the waveform on pin 1 with an oscilloscope for the 10% and 90% rise and fall time. Change C_L as required.

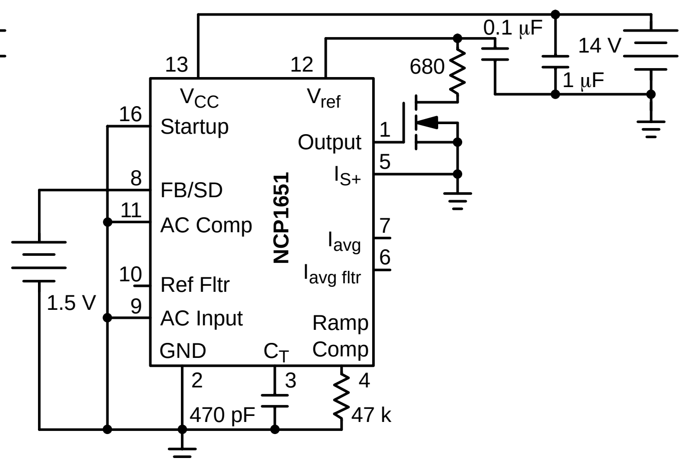

Figure 14. V_{ref} Transient Response
Re: NCP1651/D data sheet, Figure 18

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Adjust the voltage of the 1.5 volt source for approximately 50% duty cycle on the output driver pin. Measure the waveform on pin 12 with an oscilloscope.

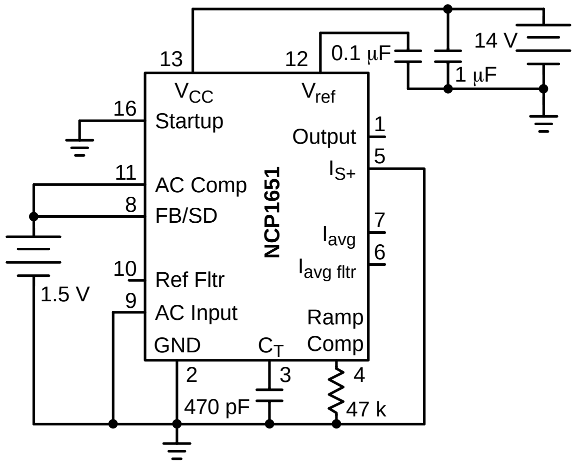

Figure 15. Frequency versus Temperature
Re: NCP1651/D data sheet, Figures 19 and 20

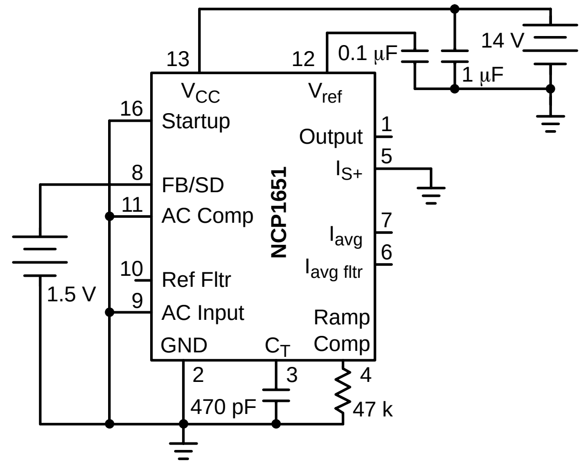

Figure 16. Ramp Peak versus Temperature
Re: NCP1651/D data sheet, Figure 21

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Measure the frequency at pin 1 using an oscilloscope or frequency counter.

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. Measure ramp peak at pin 3 with an oscilloscope.

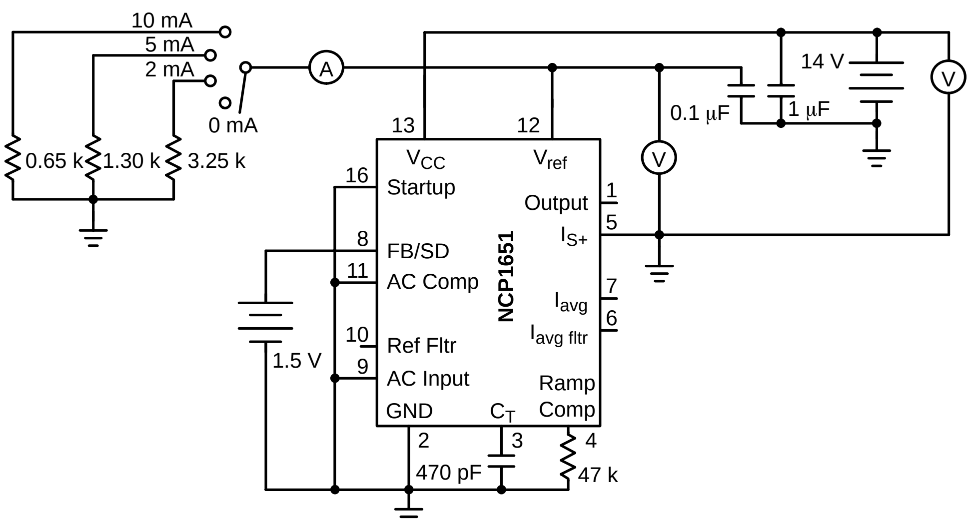

Figure 17. V_{ref} Line/Load Regulation
Re: NCP1650/D data sheet, Figures 22 and 23

Apply both voltage sources, reduce the 14 volt source to 8 volts and then increase to 14 volts. To measure load regulation, hold the V_{CC} voltage constant and vary the load, measuring V_{ref} a load current at various loads between 0 and 10 mA. To measure line regulation, hold the load constant and measure V_{ref} and V_{CC} at various V_{CC} levels between 10 and 18 volts.

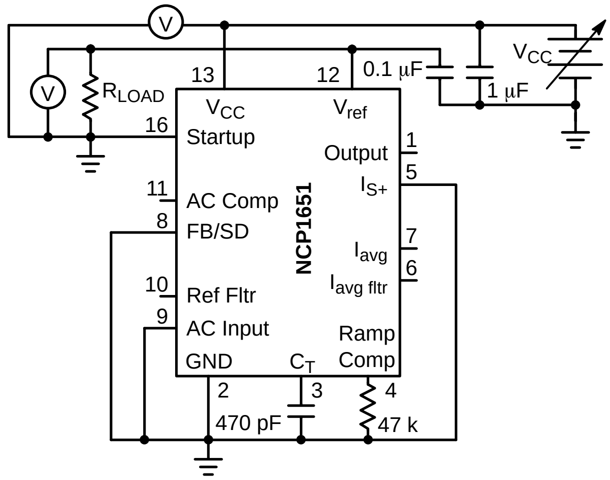

Figure 18. V_{ref} versus V_{CC} in Shutdown Mode
Re: NCP1651/D data sheet, Figure 24

Connect desired load to pin 12. Apply 14 volts to V_{CC} pin, unit will be in shutdown mode. Measure V_{ref} voltage.

Notes

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