

# TND307

## Graphical Data Test Circuits for the NCP1650

Prepared by  
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 ON Semiconductor Applications Engineering

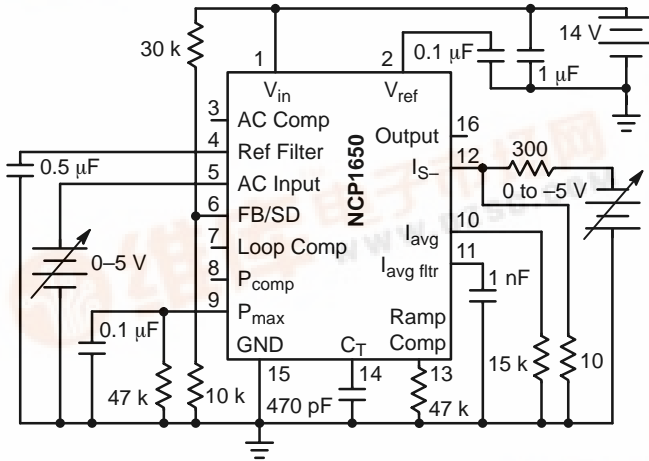


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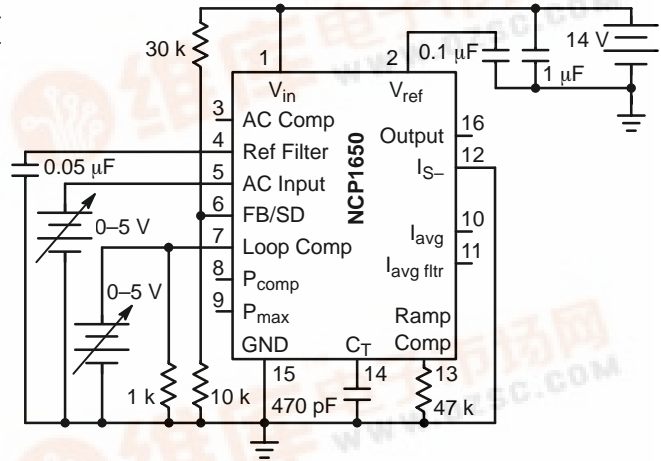
The following circuits are the test configurations that were used to obtain the data for the graphical section of the NCP1650/D data sheet. Each graph has a schematic associated with it and in some cases a description of the procedure.

### APPLICATION NOTE



**Figure 1. Power Multiplier Family of Curves**  
 Re: NCP1650/D data sheet, Figure 3

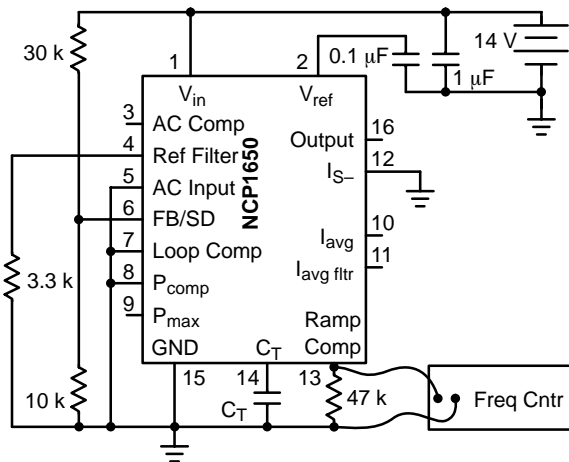
Power up chip. Set  $I_{S-}$  between 0 and  $-200$  mV in  $50$  mV increments. For each value of  $I_{S-}$  set the ac input (pin 5) to various values from 0 to 3.8 volts. Record output  $P_{max}$  (pin 9).



**Figure 2. Reference Multiplier Family of Curves**  
 Re: NCP1650/D data sheet, Figure 4

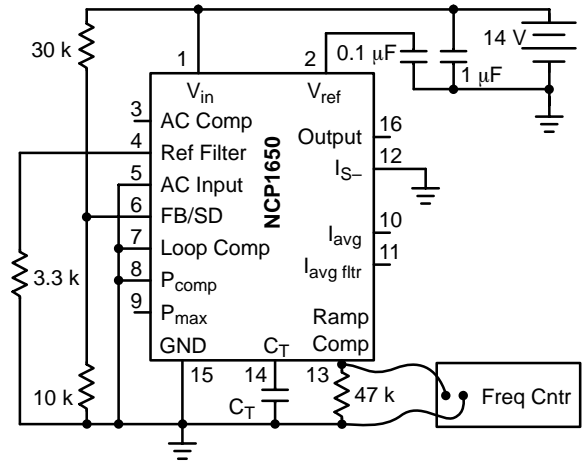


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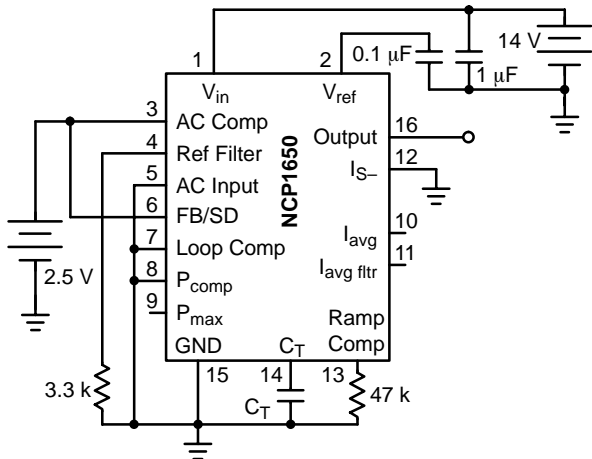
**Figure 3. Frequency versus  $C_T$**   
Re: NCP1650/D data sheet, Figure 5

Bias device per the above figure. Install various values of  $C_T$ , and measure the frequency at pin 13. Do not measure directly from pin 14, as the impedance of the measuring device will cause errors in the reading.



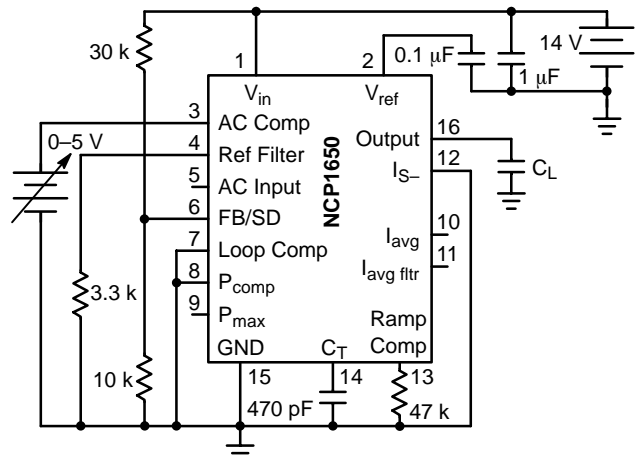
**Figure 4. Ramp Peak versus Frequency**  
Re: NCP1650/D data sheet, Figure 6

Bias device per the above figure. Install various values of  $C_T$ , and measure the frequency at pin 13. Measure amplitude at pin 14 with an oscilloscope.



**Figure 5. Max Duty Cycle versus Frequency**  
Re: NCP1650/D data sheet, Figure 7

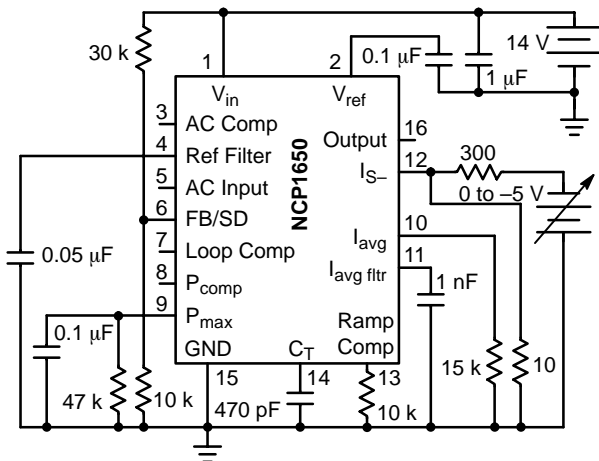
Measure frequency and duty cycle for various values of  $C_T$ .



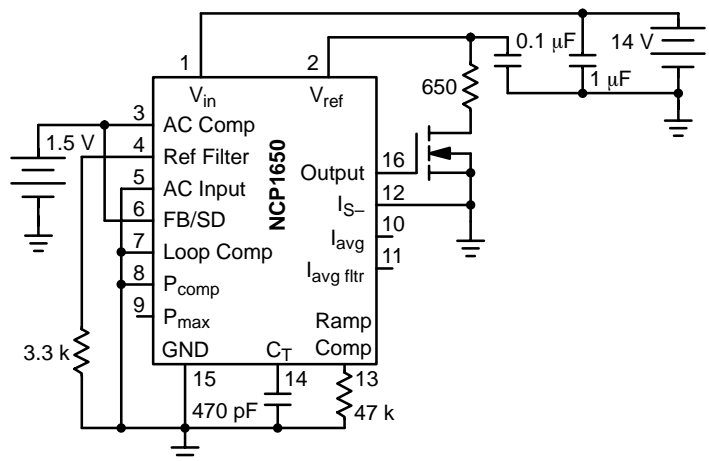
**Figure 6. Drive Rise and Fall Time versus Capacitance**  
Re: NCP1650/D data sheet, Figure 8

Adjust the voltage on pin 3 for approximately 50% duty cycle from the output driver. Measure the waveform on pin 16 with an oscilloscope and measure the rise and fall times at the 10% and 90% levels. Change  $C_L$  as required.

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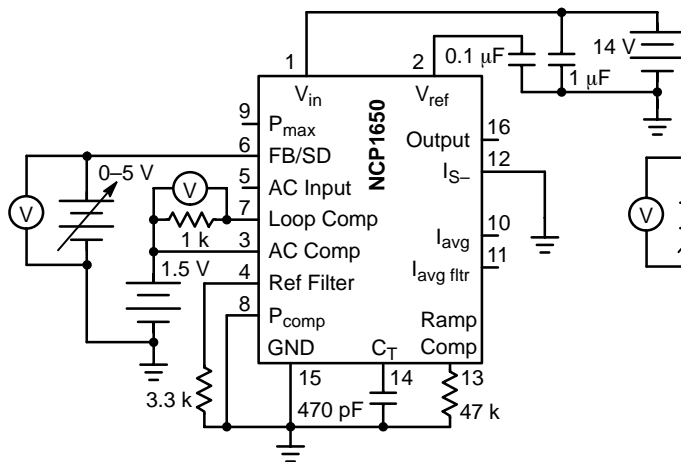


**Figure 7. Current Sense Amplifier Gain**  
Re: NCP1650/D data sheet, Figure 9

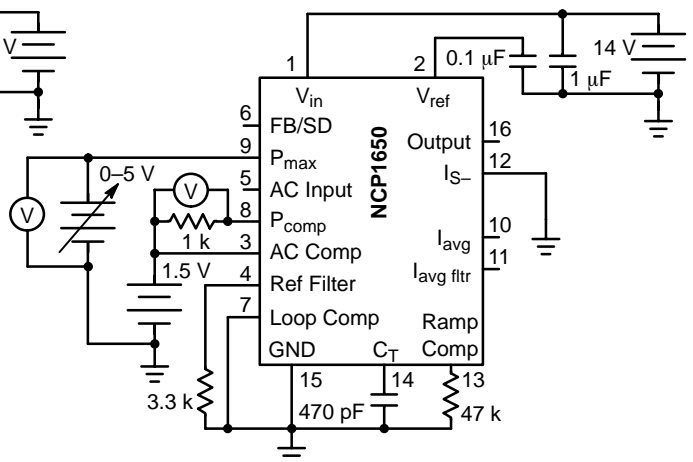


**Figure 8.  $V_{ref}$ , Transient Response**  
Re: NCP1650/D data sheet, Figure 11

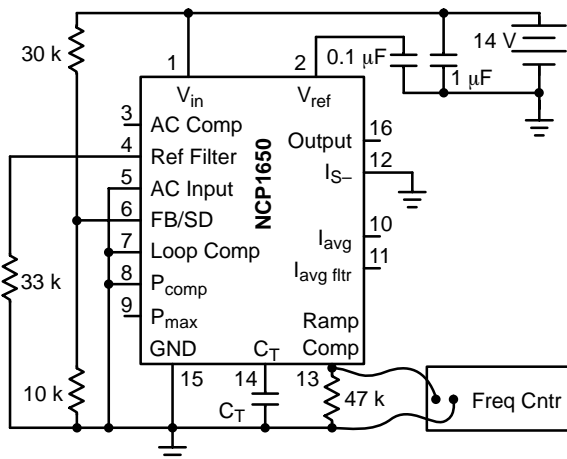
Adjust voltage at pin 12, and read values at pins 10 & 11.



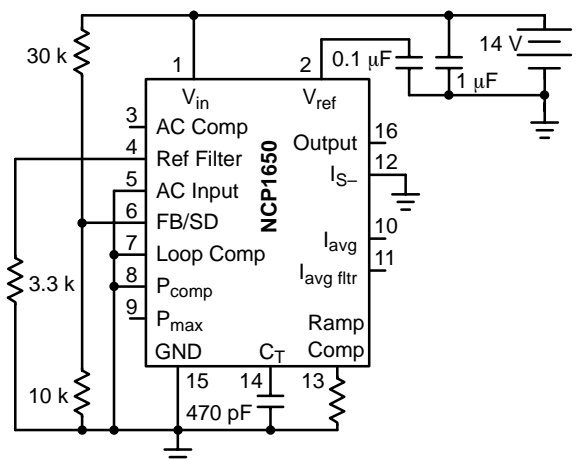
**Figure 9. Voltage Error Amplifier Gain**  
Re: NCP1650/D data sheet, Figures 12 & 13



**Figure 10. Power Error Amplifier Gain**  
Re: NCP1650/D data sheet, Figures 14 & 15



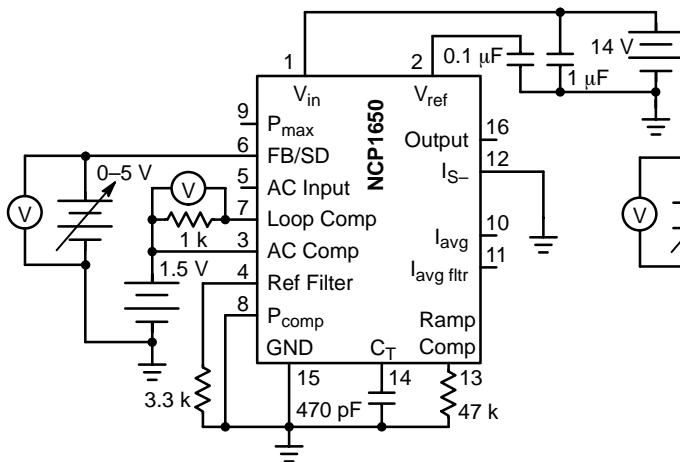
**Figure 11. Frequency versus  $C_T$**   
Re: NCP1650/D data sheet, Figure 16



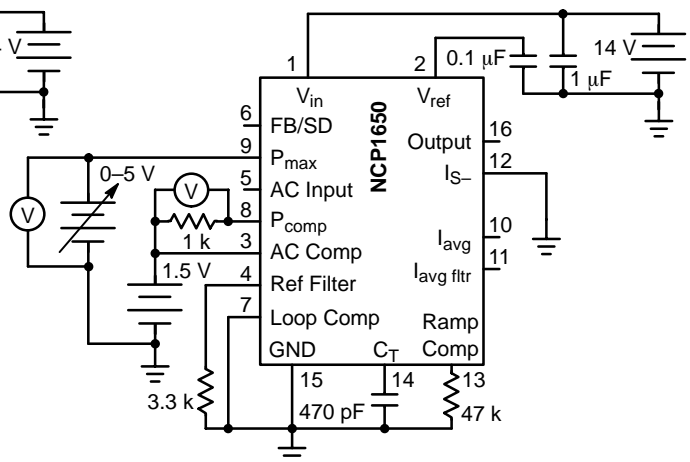
**Figure 12. Ramp Peak versus Temperature**  
Re: NCP1650/D data sheet, Figure 17



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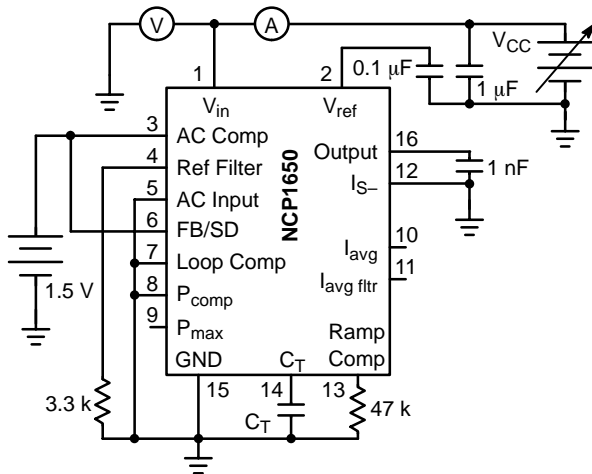
**Figure 15. Voltage Error Amplifier Gain**  
Re: NCP1650/D data sheet, Figure 21



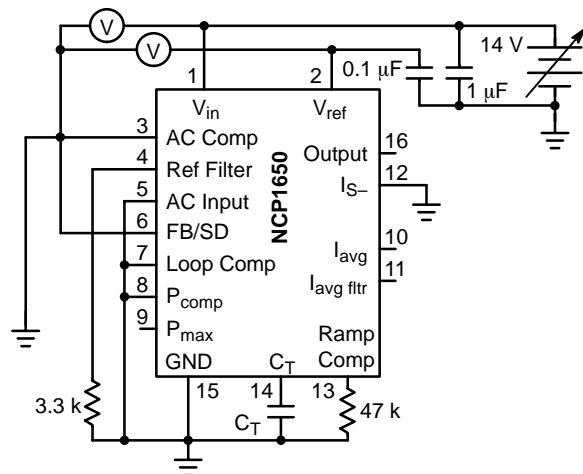
**Figure 16. Power Error Amplifier Gain**  
Re: NCP1650/D data sheet, Figure 22

Energize unit by applying 14 volt supply. Using a precision supply with resolution of 1 mV or less, adjust the voltage at pin 6 for zero current out of pin 7. The voltage at pin 6 will be the effective 4.0 V reference voltage.

Energize unit by applying 14 volt supply. Using a precision supply with resolution of 1 mV or less, adjust the voltage at pin 9 for zero current out of pin 8. The voltage at pin 9 will be the effective 2.5 V reference voltage.

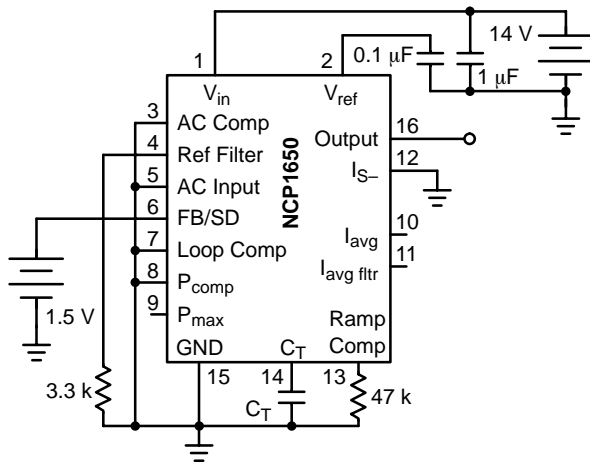


**Figure 17. Bias Current versus V<sub>CC</sub>**  
Re: NCP1650/D data sheet, Figure 23



**Figure 18. V<sub>ref</sub> versus V<sub>CC</sub> in Shutdown Mode**  
Re: NCP1650/D data sheet, Figure 24

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**Figure 19. Minimum Duty Cycle versus Frequency**  
Re: NCP1650/D data sheet, Figure 25

Apply power to 14 V supply and then to 1.5 V supply. Measure on time, and period at pin 16 using an oscilloscope. Vary capacitor value from 2000 pF to 100 pF for frequency range of 25 kHz to 300 kHz.

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**Notes**

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