NAppkin Note: Lowering the Power of the ADuM524x

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The ADuM524x was the first generation of *iCoupler*® products with *iso*Power® integrated, isolated power. One of the first uses of these products was to provide a small amount of isolated power to the secondary side of system in its start-up phase. Optimized for size and cost, a number of compromises were made, including a fairly high quiescent current. Combined with its efficiency, overall power consumption of the ADuM524x products may be too high for some applications. Even at low loads the ADuM524x can still consume up to 400 mW. Still, the size and cost benefits of the ADuM524x are hard to ignore, and so while designers have been using these products, they are looking for ways to curb power consumption.

A simple way to tame the power appetite of the ADuM524x devices is to take advantage of one of its features. . The integrated isolated dc-to-dc converter is designed to shut down when the input power supply is set below a given voltage. The ADuM524x has a fairly high value under voltage lockout (UVLO) monitor that turns on at about 4.25 V and turns off at about 4.05 V giving 220 mV of hysteresis. If a simple series resistance is added to the input power as shown in Figure 1, the UVLO will modulate the ADuM524x power oscillator to switch on and off as the voltage at V_{DD} rises and falls between the hysteresis limits. The frequency of the modulation is set by the R_{LIMIT} and C_{IN}, and the current is set by the value chosen for R_{LIMIT}.
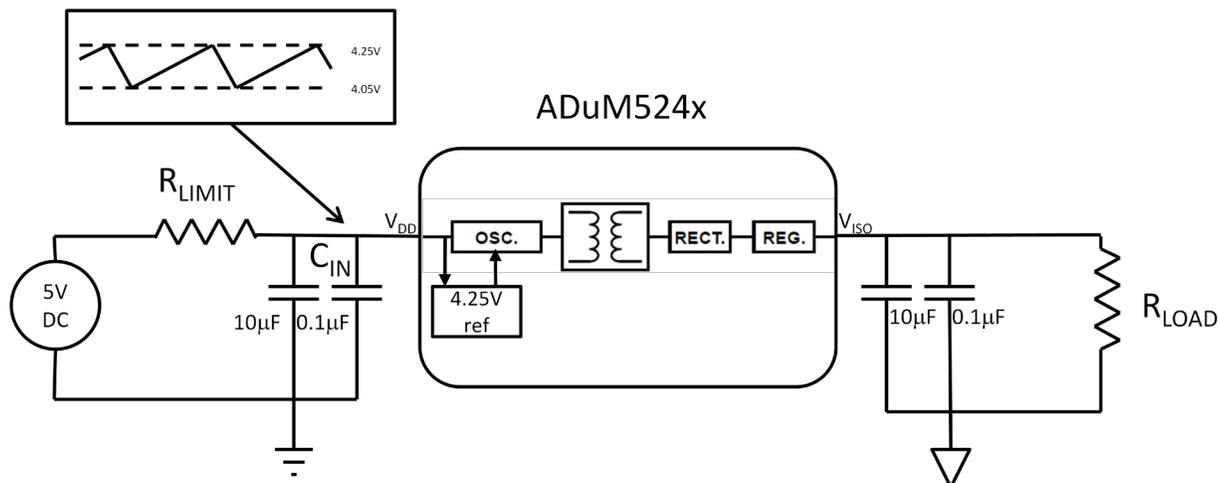

Figure 1. Low power connection of the ADuM524x

The power savings can be very significant, as shown in Figure 2; however, the trade-off is that the power delivered to the output is now insufficient for driving a full 10 mA load. Once the load current reaches the point where it the secondary side LDO voltage regulator does not have enough voltage to properly regulate, the output voltage will start to fall off. The curves in Figure 3 show the range in which the output will regulate as a function of load, and how the voltage will roll off.
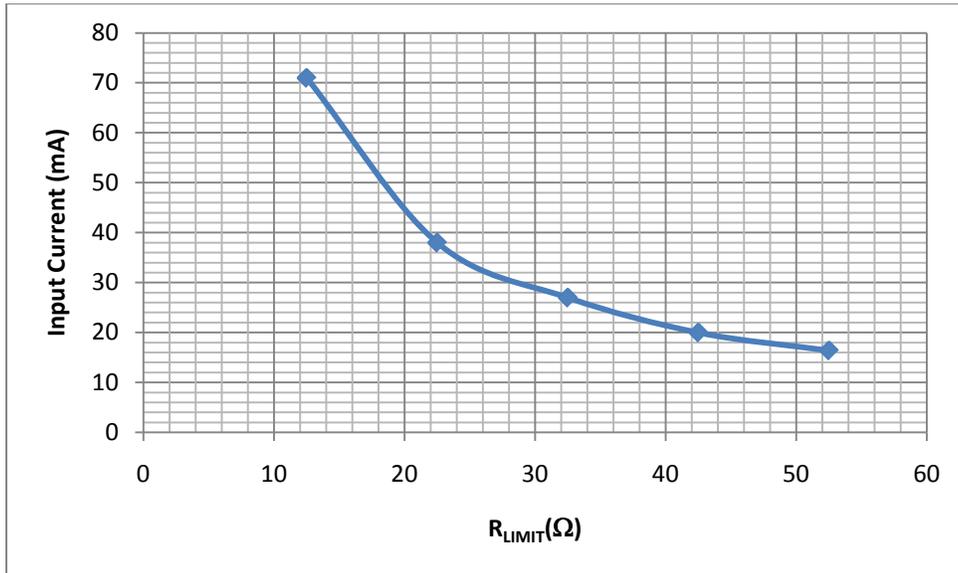
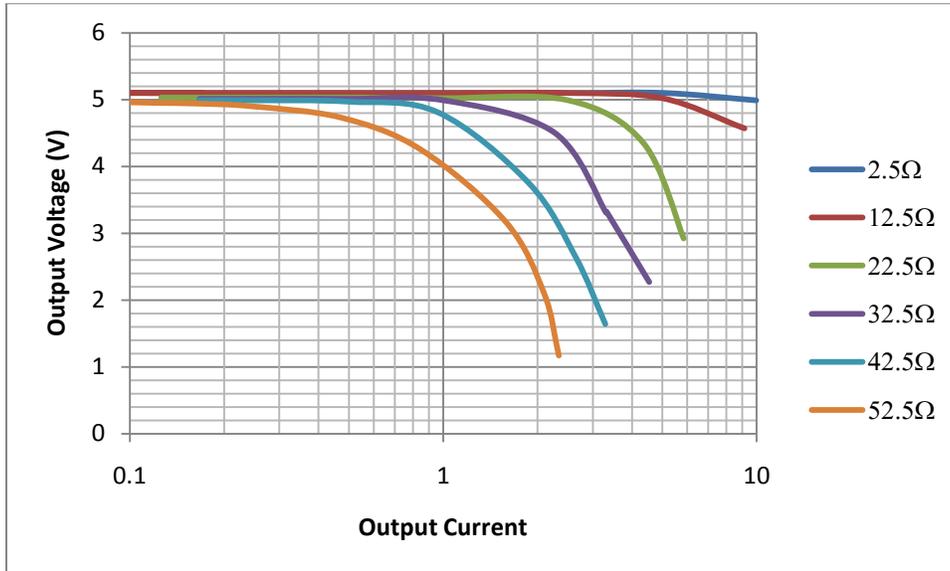Figure 2. Average V_{DD} current for different limiting resistors.

Figure 3. V_{ISO} for different loads and limit resistors.

If your application only requires a small amount of current for proper operation, or you can tolerate some voltage droop, then this method can save significant power in your design. For example a 30 Ω limit resistor in a 1 mA load application will drop the I_{DD} current from about 80 mA to about 30 mA. Since the power oscillator is now being switched off much of the time, the high frequency emissions levels drop proportionately. One final note concerning the data inputs on the primary side, it is advisable to add a series current limit resistor of about 500 Ω to these inputs since the inputs can provide parasitic power path that could circumvent the limit resistor effect.