Analog Devices' Digital Isolation Update
*i*Coupler® News

Welcome to another edition of the Analog Devices' Digital Isolation Update. Whether you are already using *i*Coupler technology or still designing with optocouplers, this Digital Isolation Update will keep you posted as we continue to introduce a wide array of new isolation products including gate drivers, transceivers, and multi-channel digital isolators with *iso*Power™ isolated, integrated DC/DC converters.

Each Digital Isolation Update includes a look at New Products, General News, a special application note we call "N***App***kin **Notes**," and it will also present insights and interesting facts in Inside *i*Coupler Technology.

We are always looking for feedback, so please feel free to e-mail us at: *i*Coupler_Isolation@analog.com.

New *i*Coupler Products

ADuM120xW/ADuM130xW/ADuM140xW for Automotive Applications

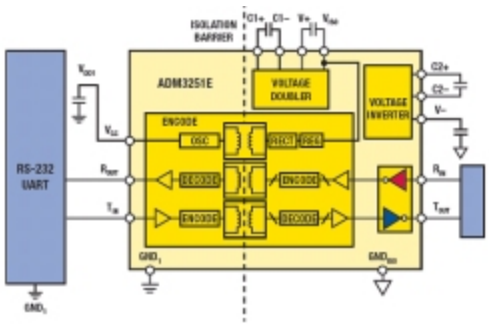
*i*Coupler products from the ADuM120x, ADuM130x and ADuM140x families are now available for automotive applications. Members are now AEC-Q100 compliant with operation up to 125°C. For more information on these products, please visit www.analog.com/icoupler_automotive.

ADuM5230

The ADuM5230 is an isolated half-bridge gate driver that provides independent and isolated high-side and low-side outputs. Supplying 150mW of power, the ADuM5230 contains an integrated DC/DC converter providing an isolated high-side supply; eliminating cost, space and performance difficulties usually associated with external supply configurations. For more information on the ADuM5230 family, please visit www.analog.com/adum5230.

ADuM5401/ADuM5402/ADuM5403/ADuM5404

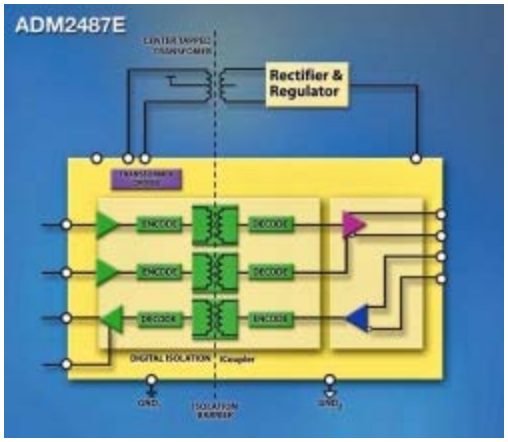
The ADuM540x are quad-channel digital isolators with *iso*Power integrated, isolated DC/DC converter. The DC/DC converter provides up to 500mW of regulated isolated power at either 5.0V or 3.3V. This eliminates the need for a separate isolated DC/DC converter: reducing size, cost and component count. The ADuM540x isolators provide four independent isolation channels in a variety of channel configurations and data rates. For more information on the ADuM540x family please visit www.analog.com/adum540x.



ADM3251E

The ADM3251E is a high speed single-channel 2.5kV isolated RS-232 transceiver that operates from a single power supply with 15kV ESD protection on the bus pins. This device is ideally suited to operate in electrically harsh environments or where RS-232 cables are frequently being plugged and unplugged. The ADM3251E incorporates dual-channel digital isolators with *iso*Power integrated isolated power, eliminating the need for a separate power supply. The result is a small form-factor, total isolation solution. The ADM3251E is available in a 20-lead Wide Body SOIC package. For more information on the ADM3251E, please visit www.analog.com/adm3251E.

ADM2482E/ADM2487E



The ADM2482E/ADM2487E are the industry's fastest integrated 2.5kV isolated RS-485/422 data transceivers with transformer driver functionality. The device combines into a single package a 3-channel 2.5kV UL and VDE certified isolator, a three-state differential line driver, and a differential input receiver. An on-chip oscillator outputs a pair of square waveforms that drive an external transformer to provide isolated power. The logic side of the device can be powered with either a 3.3V or a 5V supply, and the bus side is powered with an isolated 3.3V supply. The ADM2482E operates at data rates up to 16 Mbps, while the slew-rate limited ADM2487E operates at data rates up to 500 kbps. Both products have a number of features including external configurability for half-duplex or full-duplex communication, ±15kV ESD, current-limiting and thermal shutdown. The parts are fully specified over the industrial temperature range and are available in a 16-lead, wide-body SOIC package.

For more information on the ADM2482E/ADM2487E, please visit www.analog.com/rs485.

ADM2484E

The ADM2484E is the industry's highest isolation rated integrated RS-485/422 data transceiver. The device combines into a single package a 3-channel, 5kV UL and VDE certified isolator, a three-state differential line driver, and a differential input receiver. The logic side of the device can be powered with either a 3.3V or a 5V supply, and the bus side is powered with an isolated 3.3V supply.

The ADM2484E is slew-rate limited with a maximum data rate of 500kbps. It has enhanced ESD protection on the bus pins of ±15kV ESD and can be configured externally for half-duplex or full-duplex communication on multipoint transmission lines. For half-duplex operation the transmitter outputs and receiver inputs share the same transmission line.

The device has current-limiting and thermal shutdown features to protect against output short circuits and situations where bus contention might cause excessive power dissipation. The parts are fully specified over the industrial temperature range and are available in a 16-lead wide-body SOIC package.

For more information on the ADM2484E, please visit www.analog.com/rs485.

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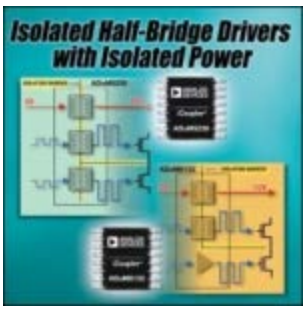
General News

Analog Devices Introduces Industry's First Isolated Gate Drivers with Integrated Isolated Power



The ADuM5230 and ADuM6132 are the industry's first isolated half-bridge gate drivers that incorporate isolated power and isolated gate drivers into one package. These *i*Coupler products integrate high-side and low-side outputs with an *iso*Power – integrated isolated power supply. *iso*Power leverages *i*Coupler technology's chip-scale micro-transformers along with high-voltage CMOS to create an isolated DC/DC converter to deliver half-bridge gate drivers that reduce the number of components and board space needed in applications such as motor drives, power supplies and solar power inverters. The ADuM5230 is now available to order, while the ADuM6132 will be released in July 2008 and is currently sampling. For more information on the ADuM5230 and the ADuM6132 please visit, www.analog.com/icoupler.

***i*Coupler Products Featured in Latest Motor Control Ad**

The ADuM5230, ADuM6132, ADM2491E, and AD7400 are among sixteen members of the *i*Coupler family referenced in Analog Devices' latest Motor Control ad. With unprecedented integration, these products not only improve overall performance, but they also significantly reduce the number of discrete components and improve system quality and reliability. To learn more about the use of Analog Devices components in motor control applications, please visit www.analog.com/motorcontrol-ad.

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*N**App**kin **Notes** – written expressly for the* Digital Isolation Update *– are ideas, hints, and tips for building with iCoupler technology.*

N***App***kin **Note: Integrating *i*Coupler RS-485 Transceivers**

By Michael Muller-Aulmann, Applications Engineer

One of the most common bus architectures is the RS-485 standard. Isolated implementations are used in a wide array of applications to prevent ground loops. In cases where bus topologies are complex, such as those requiring as many as 32 nodes, it is difficult to stay within the electrical limits of the RS-485-standard without the use of repeaters. This presents challenges in terms of size, space, and cost. With high levels of integration, there are a number of iCoupler solutions that include using: a multi-channel digital isolator, an isolated RS-485 transceiver, or a combination of these options with the new *i*Coupler digital isolators that incorporate *iso*Power.

The basic principal for building an isolated repeater is shown in Figure 1 with two ADMx48xE RS-485 transceivers, power-supplies for each side, and some circuitry to control the direction of the transceivers. To minimize the area required and power consumed, an *i*Coupler digital isolator (ADuM1301) is used. This common implementation allows flexibility in selecting the RS-485 transceiver best suited for the application, but there are more compact solutions.

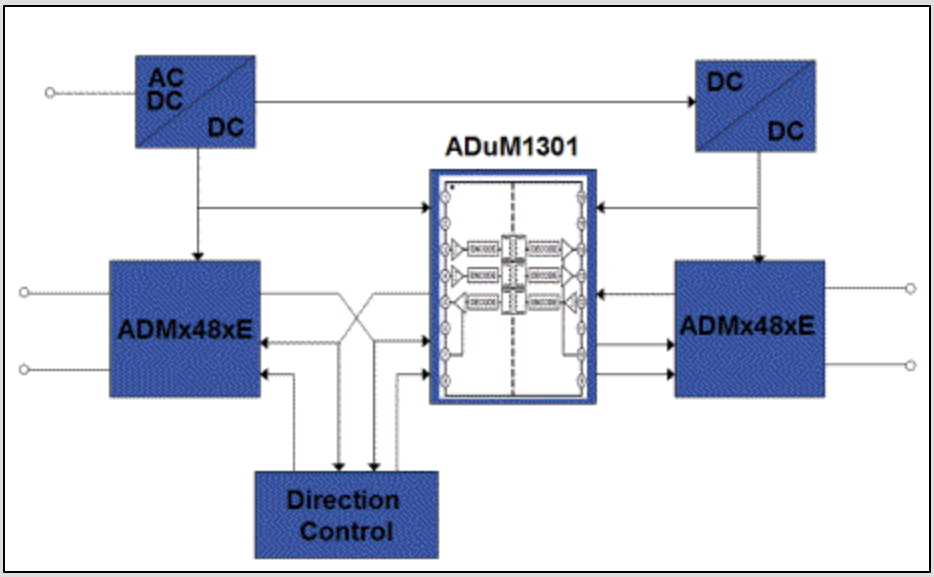

Figure 1

Figure 2 shows how the digital isolators and one RS-485 transceiver can be replaced by the ADM2485 which integrates not only the digital isolation and transceiver functions, but also

integrates a transformer driver to simplify the implementation of an isolated power supply.

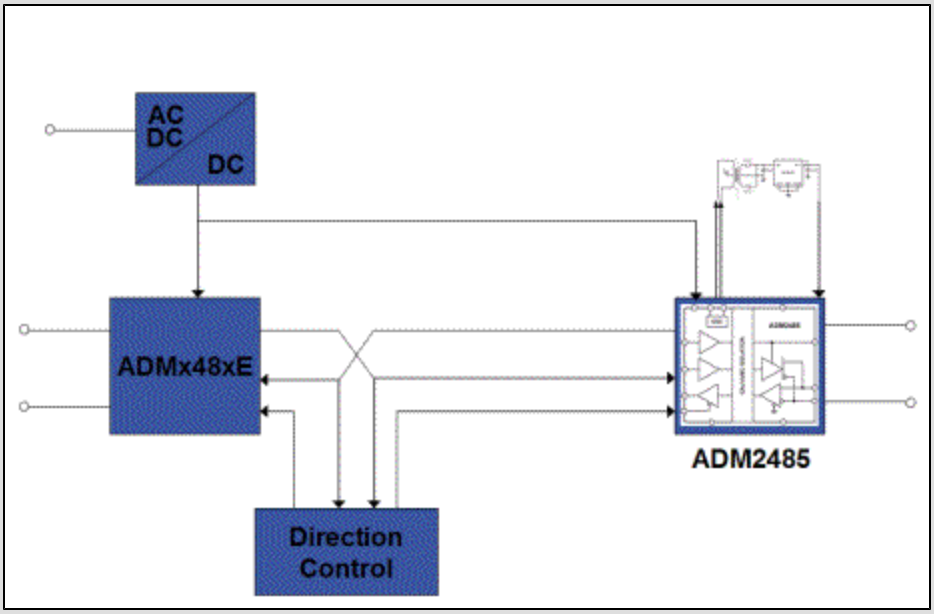

Figure 2

There is yet another solution that can be used to further reduce board space and simplify the interface, this time with newly introduced enhanced ADuM540x *iso*Power products. Figure 3 shows how the ADuM5402 replaces the separate components used for both signal and power isolation to implement a fully terminated RS-485 bus. The spare signal of the ADuM5402 could be used, for example, to switch on and off a possible bus termination resistor.

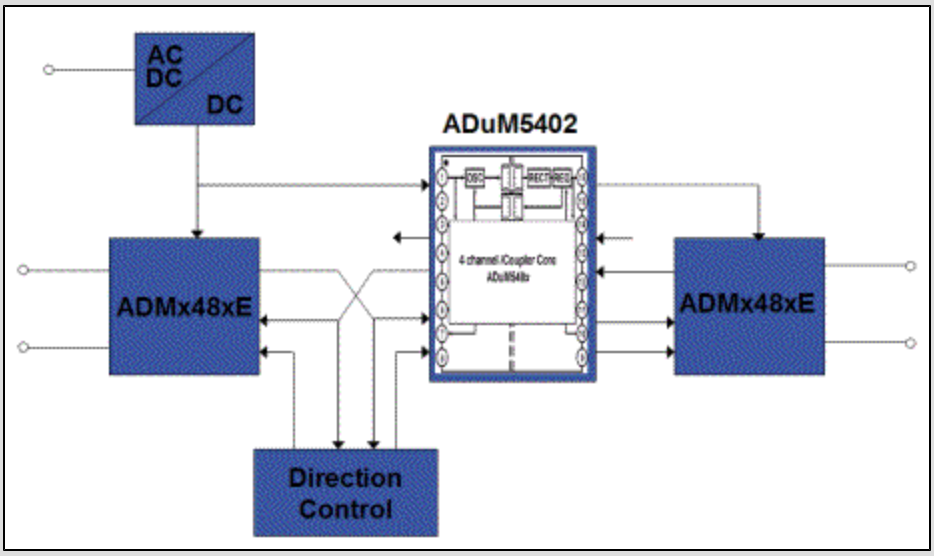

Figure 3

While these figures show different options to realize a common application, future *i*Coupler RS-485 transceivers will achieve even greater integration to produce solutions with greater functionality in less space.

For more information on *i*Coupler products with please visit www.analog.com/*i*coupler or send an email to *i*Coupler_Isolation@analog.com.

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Inside *i*Coupler Technology

by Baoxing Chen, Design Engineer

Signal and power isolation in the same package had been a dream for many system designers

until we released our first generation *iso*Power products, the ADuM524x family. *iso*Power solves the common problem of providing an isolated power supply, and it also reduces size and cost dramatically versus traditional solutions. The ADuM524x is useful for many low power applications requiring digital isolation, such as data acquisition modules and industry automation systems. However, there are some limitations to the ADuM524x that prevent it from being widely adopted. First, the isolated power output is only 50mW. Second, the quiescent current is high and the efficiency drops quickly if the load is small.

To eliminate these limitations, we developed a family of second generation *iso*Power products, ADuM540x, ADuM520x and ADuM5000 that not only increases isolated power output by 10x to 500mW, but also reduces quiescent current by more than 5x to less than 20mA. In addition, the power conversion efficiency drops very slowly from 33% at full load (100mA) to 31% at 20% of the load (20mA).

The fully integrated converter architecture, shown in figure 4, uses two 0.6µm high voltage CMOS switches in a cross-coupled configuration together with the on-chip transformer, this forms a sustained oscillation. The transformer, with its center tap connected to VDD, is switched resonantly at 170 MHz to achieve efficient energy transfer. The integrated Schottky diodes are used as rectification devices. These diodes turn on and recover fast enough for 170 MHz rectification. A 500 KHz feedback PWM signal turns on and off the resonant transformer switching action instead of controlling the two CMOS switches directly. This approach separates the energy regulation from energy conversion allowing optimized power transfer and maintaining regulation.

The feedback PWM signal is generated by a controller integrated on the secondary chip. A modified Proportional plus Integral (PI) controller is used to achieve high output accuracy and some immunity to high frequency noise. All the compensation elements were implemented on chip. The PWM is created by comparing the output from the error amplifier to the output from a constant frequency ramp waveform generator. The differential inputs for the error amplifier are the 4:1 divided output voltage and a 1.25V reference voltage generated through on chip bandgap reference generator. The PWM signal is transferred from the secondary to the primary using a separate *i*Coupler signal transformer.

With these improvements, *i*Coupler products with *iso*Power integrated isolated power now have expanded application for solving the challenge of powering isolated systems, with the added benefit of reducing total system, size and cost.

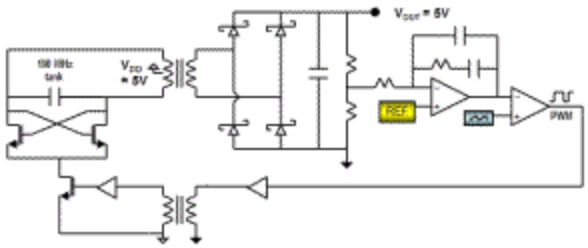

Figure 4

Power Transfer Block Diagram

Visit our website, www.analog.com/*i*coupler to learn more about our latest, award winning *i*Coupler technology, download data sheets and order free samples, or email us directly at *i*Coupler_Isolation@analog.com.

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