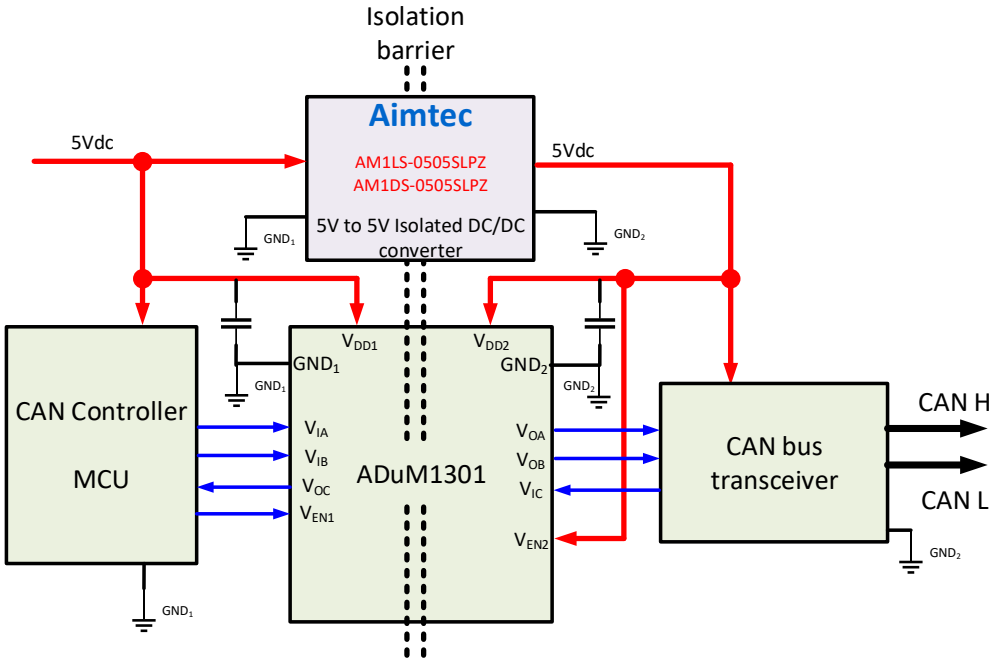
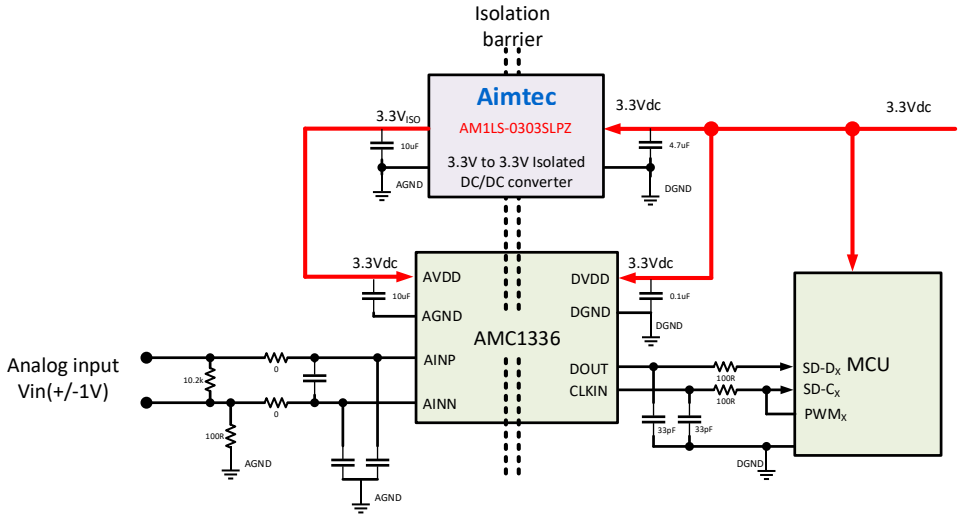
DC-DC for Power Isolation in Communication Protocols

For today's industrial applications, CAN bus communication for signal transfer is the preferred choice for many engineers. Controller area network (CAN) communication is generally robust, but sources of failures due to a ground potential difference between subsystems, noise, and spikes on the power bus can be avoided by ensuring well-designed isolation of the power bus.

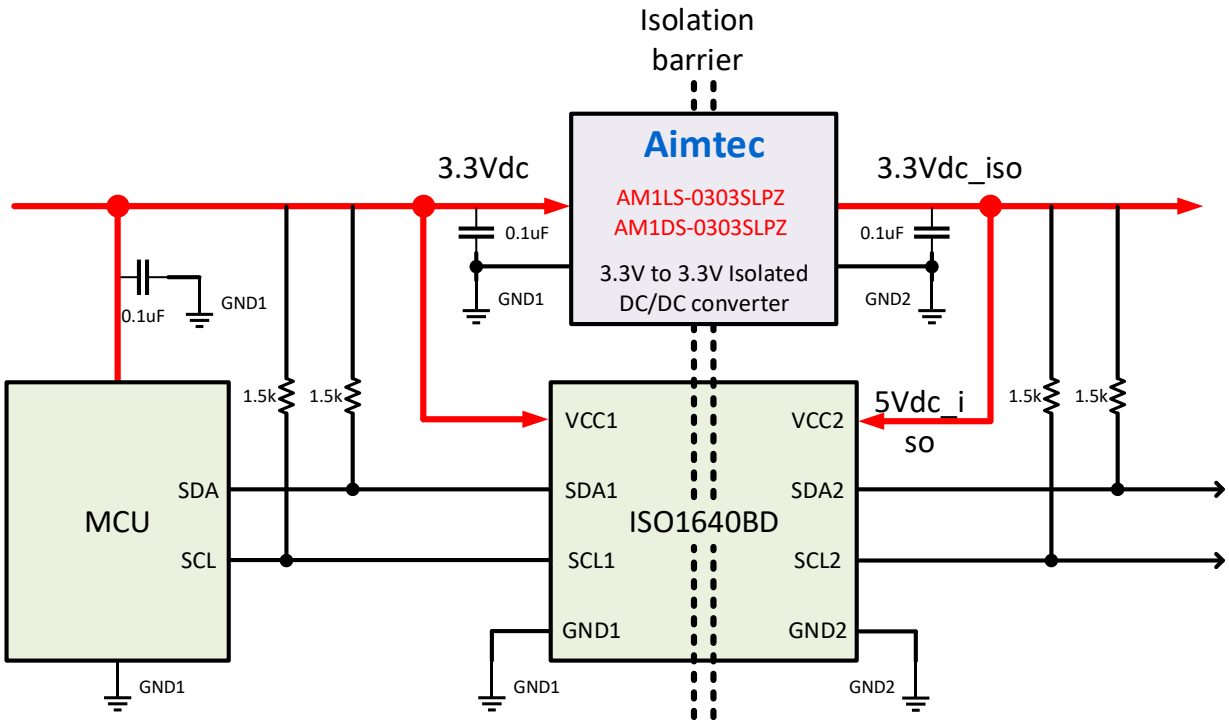
Aimtec's 1W/2W DC-DC converters are an ideal solution to help meet these galvanic isolation requirements. Below are some common examples of realizing the power bus isolation with Aimtec.
For typical CAN bus controllers powered by 5VDC, similar to the ADuM1301, the AM1LS-050SLPZ and AM1DS-0505SLPZ provide 1500VDC i/p - o/p isolation and can operate from -40°C to +105°C. These products have efficiencies of 85% and 86% respectively and are available in industry standard SMD and SIP7 packages. The AM1LS-050SLPZ and AM1DS-0505SLPZ are typically used to power the CAN bus transceiver and the Vdd2 on the controller, thus isolating the power bus.



For controllers that operate with 3.3VDC, similar to the TI AMC1336 isolated ADC modulator, the compact AM1LS-0303SLPZ can help provide a modular product that can help reduce time to market by providing a tested EMC solution that meets the IEC/CE/UL 62368-1 requirements.



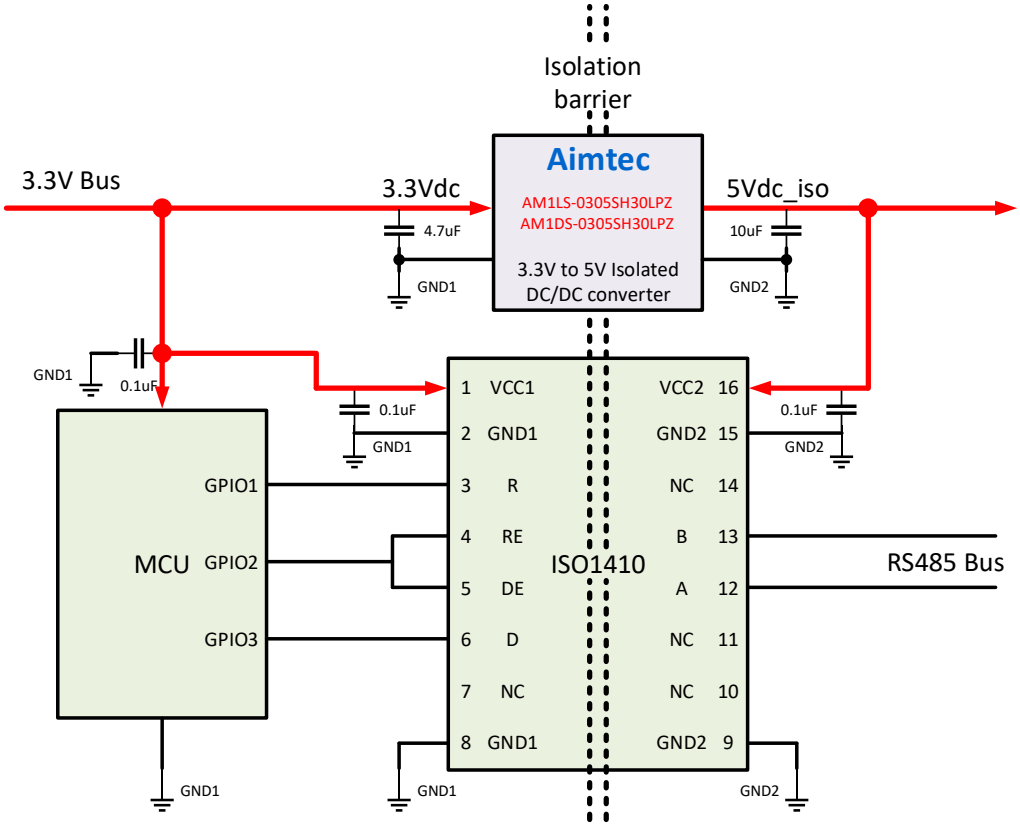
Inter-Integrated circuit or I2C is a synchronous, multi-controller/multi-target (controller/target), packet-switched, single-ended, serial communication bus that is used in many microcontroller-based applications. Engineers need to consider both the signal and Power isolation for a successful design. Aimtec's 1W low power win series of products can help power the secondary side of the digital isolator or isolated I2C buffer, preventing unintentional ground loops which can deteriorate the data signals. The below example shows an AM1LS-0303SLPZ and the AM1DS-0303SLPZ providing power isolation between the primary and secondary sections.



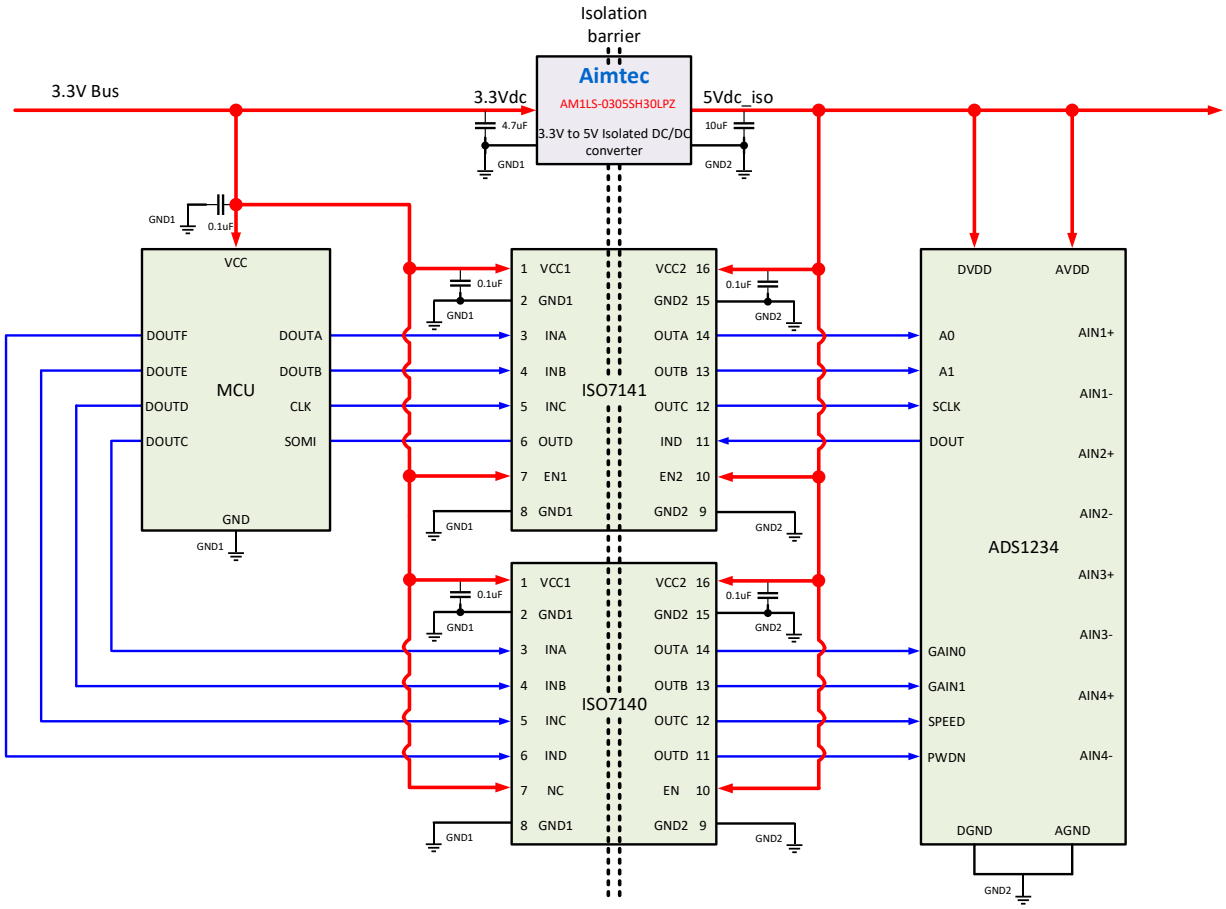
RS-485 is a well-known and preferred standard for long-distance wired communication. This protocol typically uses a two-wire system to communicate between multiple commanding devices and multiple listening devices. RS-422 is a very similar protocol to the RS-485 and can be used for long-distance communication. This protocol replaces the older RS-232 and is used for applications that require one commander and multiple listeners. Programming the RS-485 is more complex than the RS-422 as timing is critical to ensure the correct listing device receives the intended message without being missed or truncated.

The Profibus is a digital communications system that can be used for manufacturing and process automation applications.

Regardless of the type of protocol used, the power isolation of the primary and the secondary side can help provide a robust and reliable communication network. In the RS-485 block diagram shown below Aimtec's AM1LS-0305SH30LPZ and AM1DS-0305SH30LPZ can provide a DC-DC boost converter that can offer 3000VDC I/P – O/P isolation that can help the system prevent ground loops that can cause noise, that preventing interferes with the RS-485 bus communication.



For Many Test and Measurement applications, ground loops and common-mode voltage overloads can lead to inaccurate measurements. Electrically isolating the circuit can help mitigate these issues and also provide protection to human operators. In the below example, we have a typical isolated Data Acquisition System where the AM1LS-0305SH30LPZ provides 3000VDC isolation; this 1W SMD DC/DC converter can operate from -40 to 105°C with full power up to 85°C. With a 3,500,000h MTBF and a low profile case height of just 6.05mm, the AM1LS-0305SH30LPZ can help engineers properly isolate their power sources and provide accurate measurements.


Isolation barrier
3.3V Bus
3.3Vdc
4.7uF
GND1
Aimtec
AM1LS-0305SH30LPZ
3.3V to 5V Isolated DC/DC converter
5Vdc_iso
10uF
GND2
0.1uF
VCC
DOUTF
DOUTE
DOUTD
DOUTC
MCU
DOUTA
DOUTB
CLK
SOMI
GND
1 VCC1
2 GND1
3 INA
4 INB
5 INC
6 OUTD
7 EN1
8 GND1
ISO7141
VCC2 16
GND2 15
OUTA 14
OUTB 13
OUTC 12
IND 11
EN2 10
GND2 9
1 VCC1
2 GND1
3 INA
4 INB
5 INC
6 IND
7 NC
8 GND1
ISO7140
VCC2 16
GND2 15
OUTA 14
OUTB 13
OUTC 12
OUTD 11
EN 10
GND2 9
DVDD
AVDD
A0
A1
SCLK
DOUT
GAIN0
GAIN1
SPEED
PWDN
DGND
AGND
AIN1+
AIN1-
AIN2+
AIN2-
AIN3+
AIN3-
AIN4+
AIN4-
ADS1234