LTC2358-18
Isolated Industrial Data Acquisition Board

DESCRIPTION

Demonstration circuit 2542A is a reference design for robust industrial data acquisition applications based on the LTC2358-18. The LTC2358-18 is capable of high voltage measurements with a large input common range; however, the DC2542A implements input protection that allows up to 400V of continuous input protection. Combined with gas discharge tubes, which provide protection from surges, the DC2542A is capable of surviving extreme abuse.

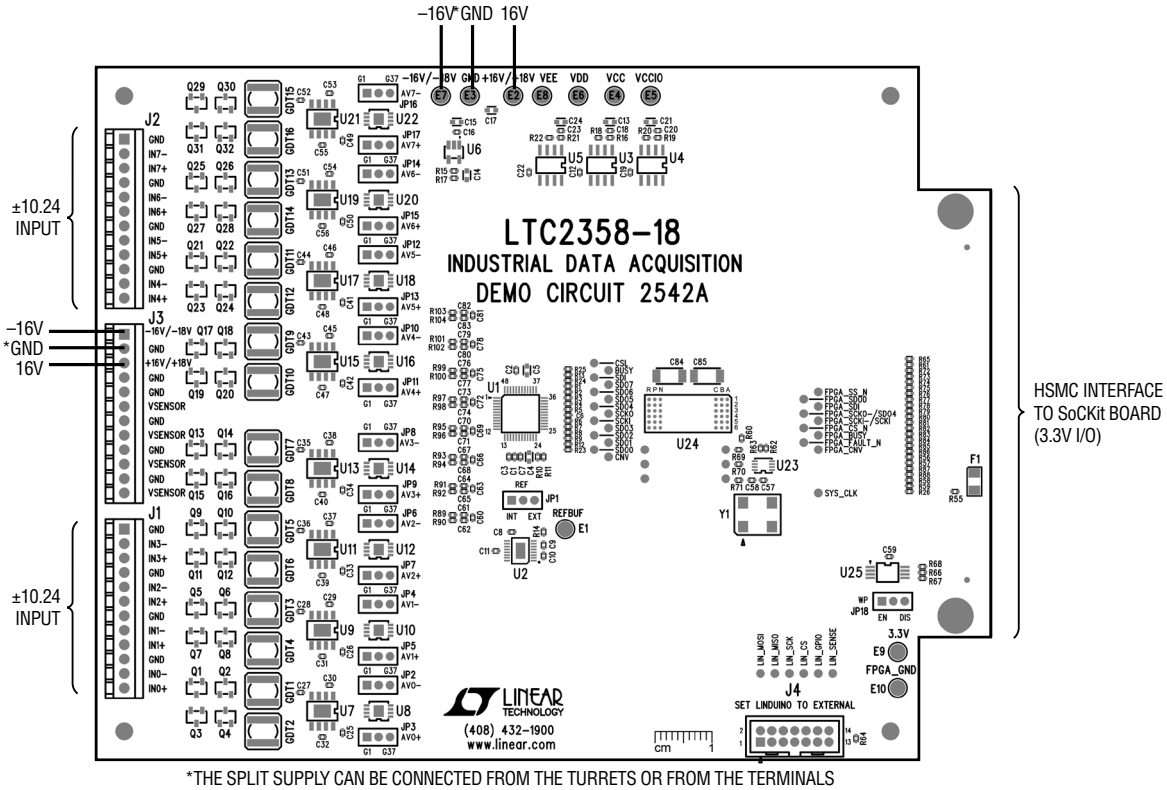
This reference design includes the LTC2358-18 SAR ADC, LTM2893-1 digital isolator, ADA4522-2 dual zero-drift operational amplifier, and an LT6658 dual-output, high current reference for sensor excitation.

The digital interface is an HSMC (high-speed mezzanine connector), which is compatible with Altera Cyclone V SoCkit and other Altera FPGA evaluation boards that support 3.3V CMOS I/O.

This demo manual covers the basic functionality of the DC2542A.

Refer to the design files for schematic and parts list/bill of materials.

Design files for this circuit board are available at http://www.linear.com/demo/DC2542A



*THE SPLIT SUPPLY CAN BE CONNECTED FROM THE TURRETS OR FROM THE TERMINALS

Figure 1. Connection Diagram

QUICK START PROCEDURE

1) Prepare the SoCkit board and SD card image as described here: http://www.linear.com/solutions/7704
2) Install the LinearLabTools software package from: http://www.linear.com/linearlabtools
3) Follow the procedure for Installing Python: http://www.linear.com/docs/52543
4) Carefully mount the DC2542A to the SoCkit board via the HSMC connector, using 5 mm standoffs between the boards and tighten the mounting screws.
5) Connect the SoCkit board to a network with a DHCP server, or connect directly to host computer's Ethernet jack or USB-Ethernet adapter.
6) Apply ±16V to the indicated terminals. Refer to Figure 1 for locations.
7) Apply a low noise, low distortion signal source to J1 and J2.
8) Power up the SoCkit board using the 12V adapter.
9) After approximately 30 seconds, the FPGA_CONF_D LED will illuminate, the board's IP address will show in the LCD display, and LED1 and LED2 will blink at different rates.
10) Open Spyder (the Anaconda Python Debugger)

    Click file -> open

    Navigate to the location where LinearLabTools is installed.

    Open this script: \python\llt\demo_board_examples\ltc23xx\ltc2358\

    Open ltc2358_dc2542a_a.py

11) Enter the IP address from the SoCkit LCD screen in the SOCKIT_IP argument. Click Run.
12) If the script reports an incorrect FPGA bitstream file, log into the SoCkit board using an SSH client such as Putty on Windows, or directly from a terminal in Mac or Linux. The user name is "sockit", and the password is "sockit".

    Run these commands:

    cd fpga_bitfiles

    rm default.rbf

    ln --symbolic DC2542A.rbf default.rbf

    sudo program_fpga.sh default.rbf

    (enter "sockit" for the password)

This only needs to be done once, the correct FPGA bitstream file will be loaded automatically the next time the board boots.

The script will capture data and display each channel in its own window. Figure 2 shows the captured data.

QUICK START PROCEDURE

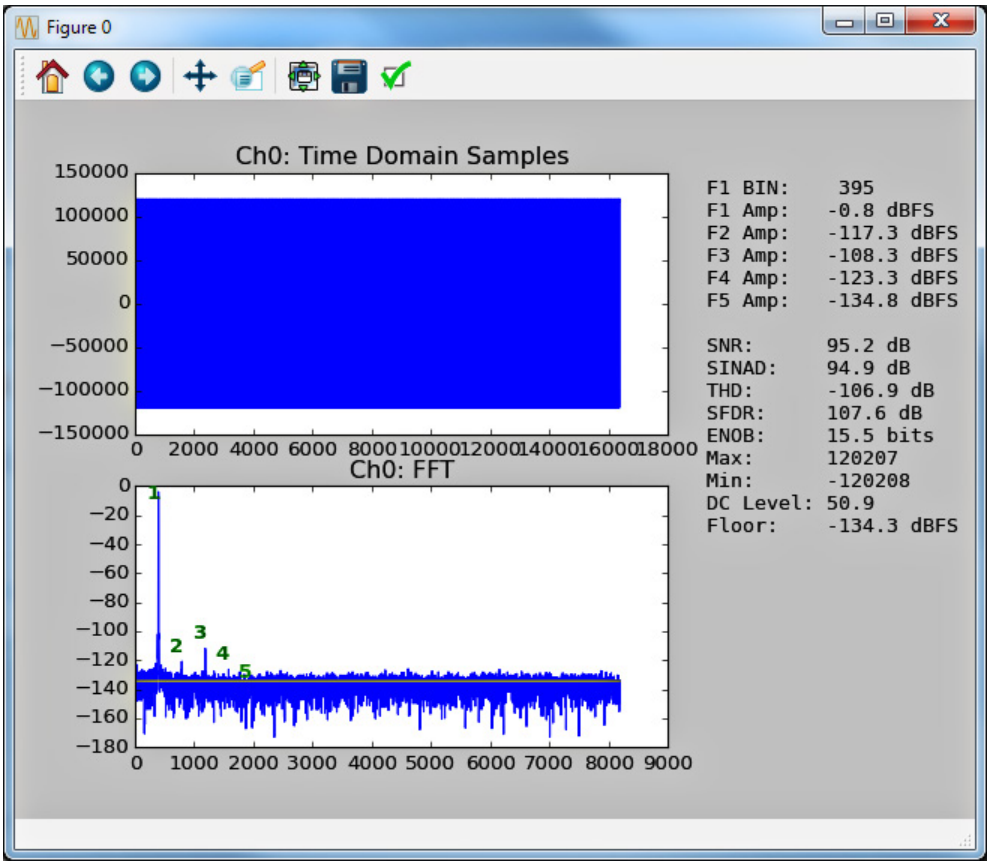


Figure 2. Screen Capture for Channel 0

CIRCUIT DESCRIPTION

Input Protection

The DC2542A features input protection circuits. The first line of defense is the use of a back to back depletion mode NMOS circuit. This circuit limits the input current to ±3mA up to a maximum of 400V. The second line of defense is the use of low voltage gas discharge tubes (GDT). This will protect downstream components from fast transients such as high voltage surges. Figure 3 shows the input protection circuit.

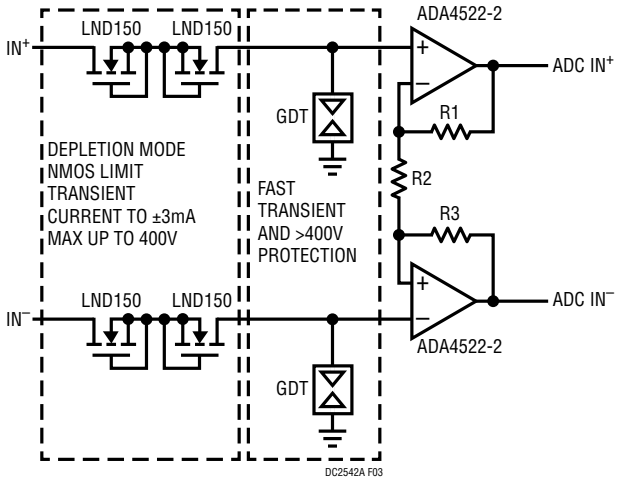


Figure 3. DC2542A Input Protection

CIRCUIT DESCRIPTION

Driving Sensors with LT6658

The DC2542A is fitted with an LT6658-5. The high output drive is exposed on J3 labeled VSENSOR. The LT6658 can drive up to 150mA and can be used to drive low impedance sensors such as Wheatstone bridges. Figure 4 shows how to connect the LT6658 to a number of Wheatstone bridge type sensors, but it can be used to drive other type of sensors.

Using External References for the LTC2358

The DC2542 can be configured to accept external references for the LTC2358. Move JP1 from internal (INT) to external (EXT) position and connect the external reference to the turret labeled REFBUF. To use the LT6658 as the reference, stuff R14 with a 0Ω 0402 resistor.

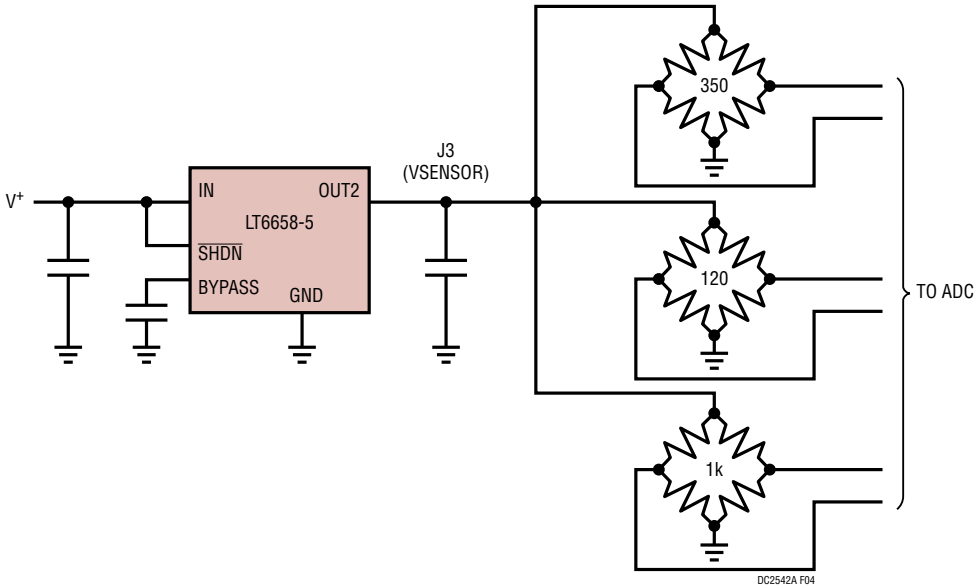


Figure 4. Driving Low Impedance Sensors with the LT6658

EXTERNAL CONNECTIONS

Connections:

P1: (Reverse side of the board) - HSMC digital interface. 3.3V CMOS digital signals to and from the ADC, as well as auxiliary signals. It provides 3.3V power from the FPGA board to the non-isolated side of the DC2542A.

J1, J2: 12-pin terminal block. $IN0^+/IN0^-$ through $IN3^+/IN3^-$ on J1, $IN4^+/IN4^-$ through $IN7^+/IN7^-$ on J2 - provide analog input voltages to AIN0-AIN7 via the ADA4522-2.

J3: 12-pin terminal block. LT6658 OUT2 is connected in common to four VSENSOR terminals for sensor excitation. +16V, GND, –16V terminals for analog isolated supply.

J4: 14-pin connector with 3.3V logic levels. This connector is intended for advanced features which allows the FPGA to connect to demo boards with a SPI interface. Contact the factory for support.

JP1: REF - selects internal (INT) or external (EXT) reference for the ADC. The default setting is INT.

JP2-JP17: GAIN - set the gain of the ADA4522-2 to either unity gain (G1) or a gain of 37 (G37). The default position is G1. Both jumpers for a given ADA4522-2 must be set to the same gain position.

JP18: EEPROM is for factory use only. The default position is WP.

Turrets:

E1: REFBUF - LTC2358 reference pin.

E2: +16V/+18V - Positive input for isolated analog supply. A maximum of 20V can be applied.

E3: GND - Grounded input for isolated analog supply.

E4: V_{CC} - LTC2358-18 positive high voltage power supply, nominally 15.25V set by U3.

E5: VCCIO - LTC2358-18 digital supply, nominally 3.28V set by U4.

E6: V_{DD} - LTC2358-18 V_{DD} power supply, nominally 5V.

E7: -16V/-18V: Negative input for isolated analog supply. A maximum of –20V can be applied.

E8: V_{EE} - LTC2358-18 negative high voltage power supply, nominally –15.25V set by U6.

E9: 3.3V - Supply for onboard clock and LTM2893-1 logic side. Normally supplied from the FPGA board via P1. May be powered externally by removing F1.

E10: FPGA_GND - FPGA ground.

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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