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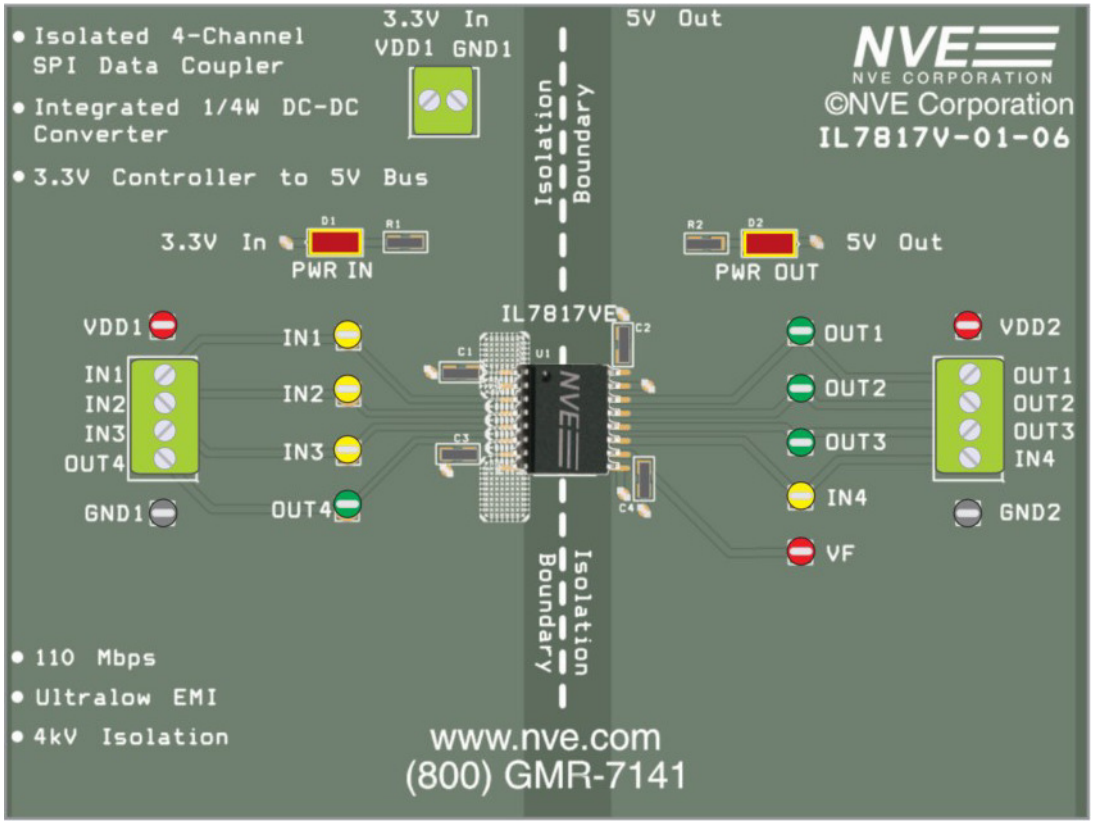
IL7817V-01
SPI Isolator with Integrated DC-DC Boost Convertor Evaluation Board



Board No.: IL7817V-01

About This Evaluation Board

This Evaluation Board provides a complete isolated four-channel SPI node, plus isolated power, using an IL7817VE.

The four- by three-inch (100 mm by 75 mm) board provides screw terminals for connections, plus test points for checking voltages and I/O. There are also LEDs to indicate DC-to-DC convertor input and output power. It uses a 2s2p board with thermal vias for optimal thermal performance.

The IL7817V is a high-speed, fully-isolated, data couplers with an integrated, one-quarter watt DC-to-DC convertor. This level of integration dramatically reduces chip count and board area.

The device uses NVE's proven spintronic Giant Magnetoresistance (GMR) isolation technology and IsoLoop® high-efficiency micro-scale isolation transformers.

A unique ceramic/polymer composite barrier provides full isolation and virtually unlimited barrier life. Frequency hopping and shielding minimize EMI.

IL7817V Specification Highlights

- Four channels of isolated data
- Integrated 3.3-to-5 V DC-to-DC boost convertor
- DC-to-DC convertor Overcurrent and thermal shutdown protection
- 110 Mbps data transfer
- Ultralow output ripple
- -40 °C to 125 °C temperature range
- Low EMI
- 4 kV_{RMS} isolation
- UL 1577 approved
- 0.3" True 8™ mm 16-pin SOIC JEDEC-standard package

Applications

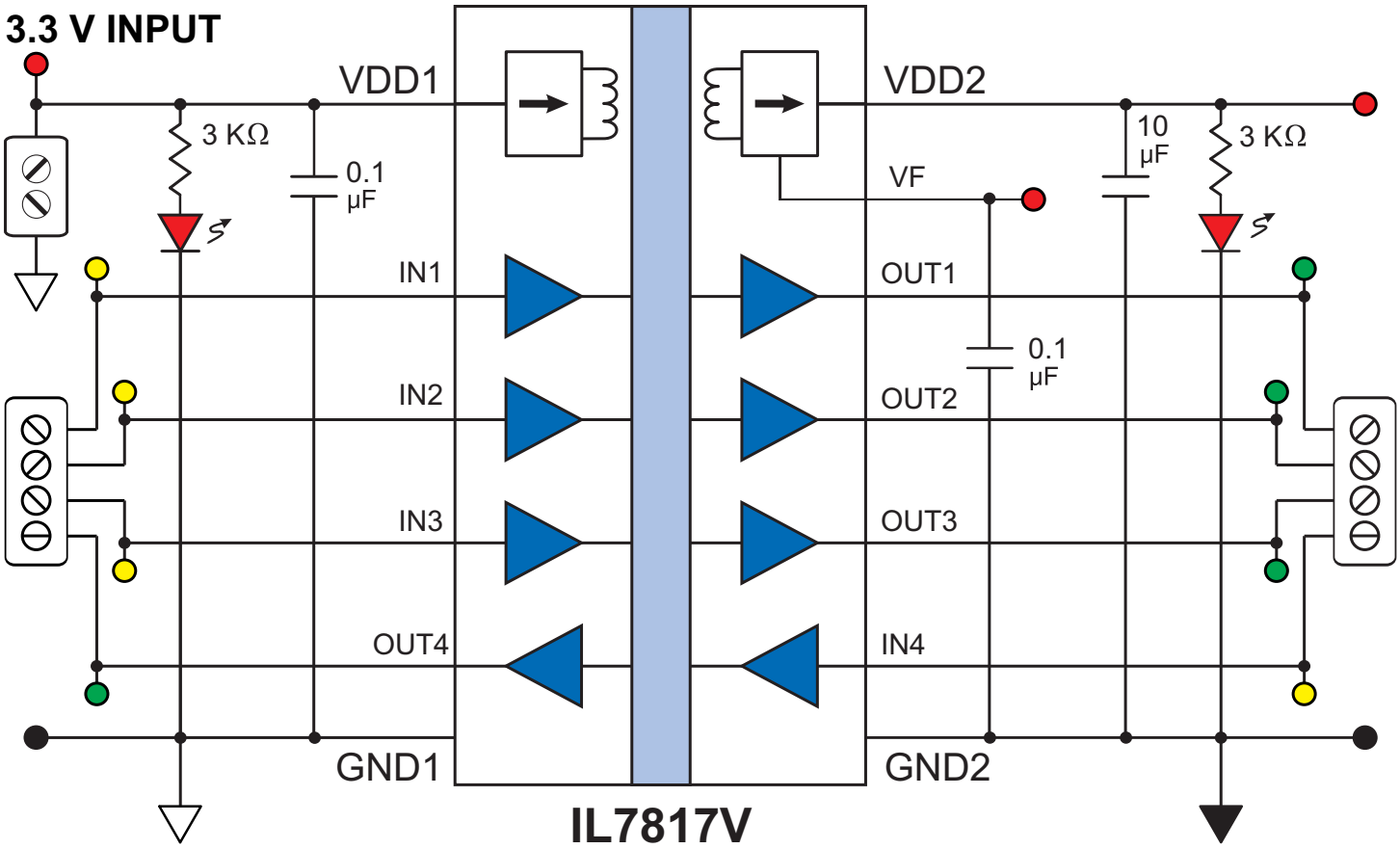
- Isolated SPI
- Isolated ADC and DAC interfaces
- "2x MOPP" medical instrumentation
- Grid infrastructure
- Test and measurement

Visit **www.nve.com** for datasheets and reference circuits.

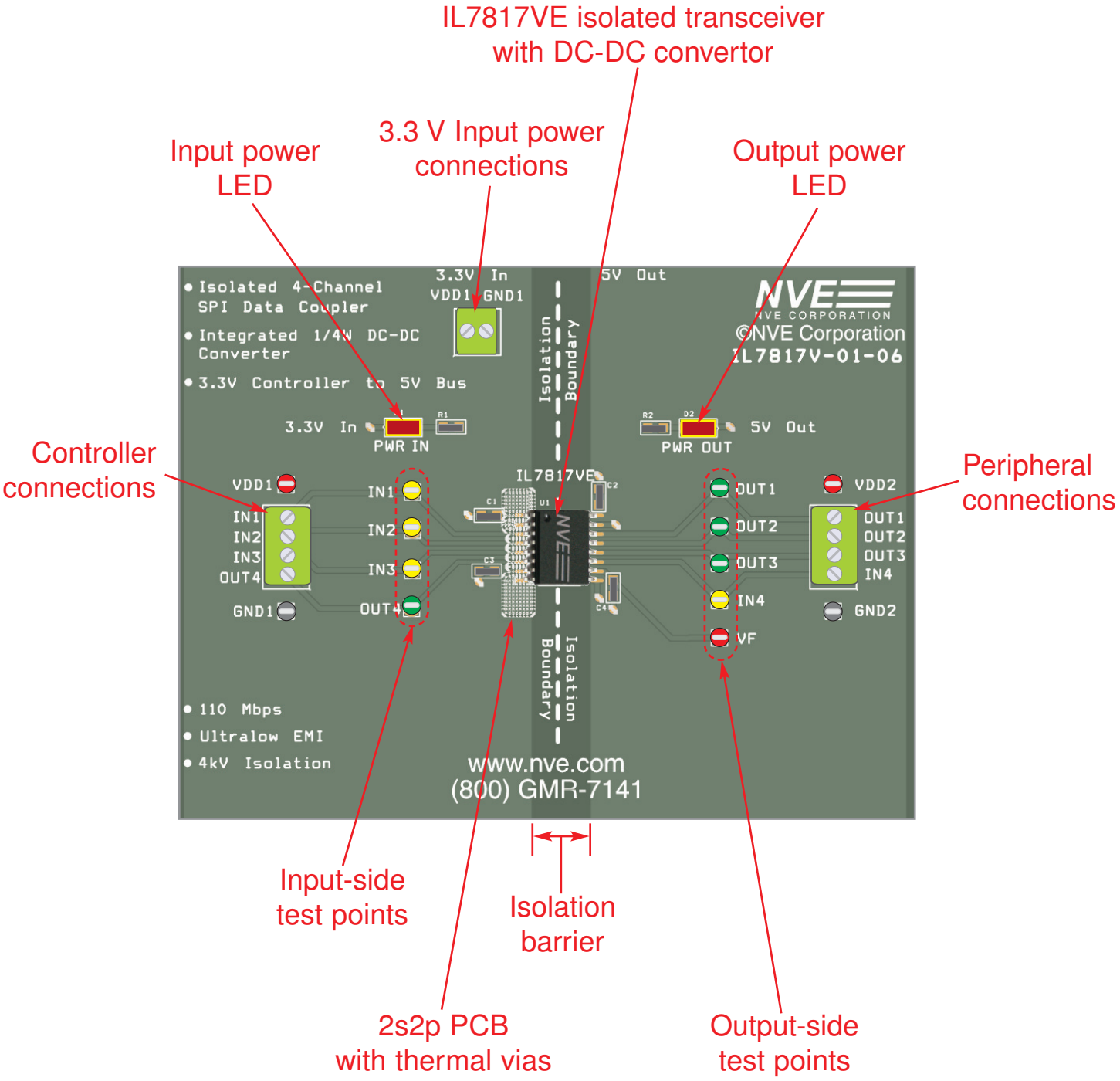
Quick Start

- Connect V_{DD1} to a 3.3 V power supply.
- The two LEDs should indicate input and output power.
- Connect signals to the inputs.
- Look for isolated signals outputs on the outputs.

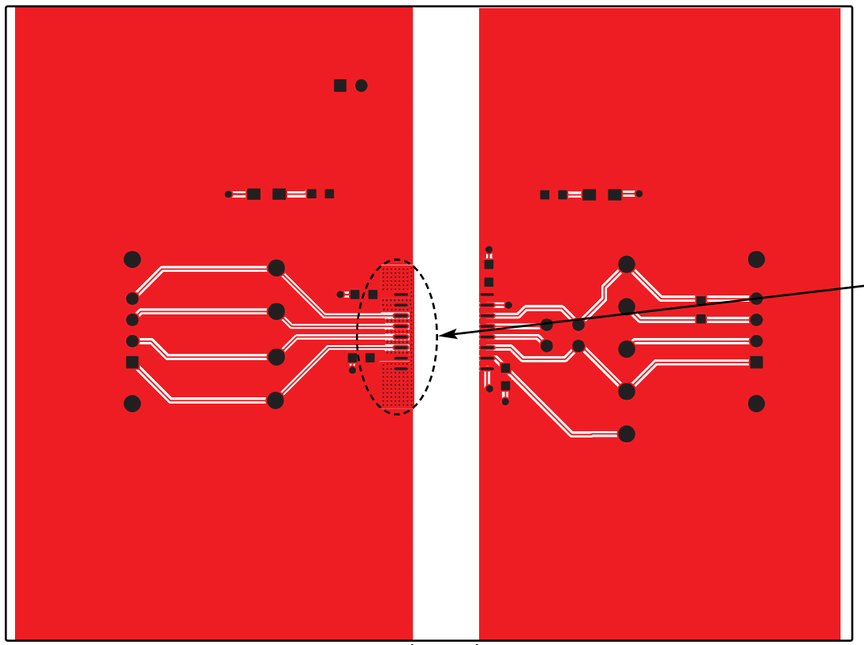
Circuit Diagram



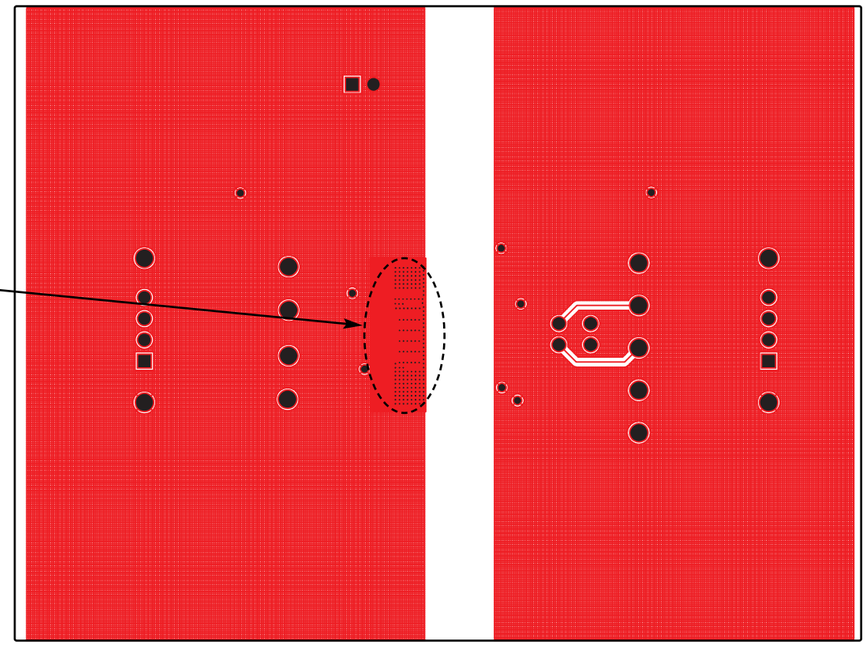
Evaluation Board Layout



Evaluation Board Layers



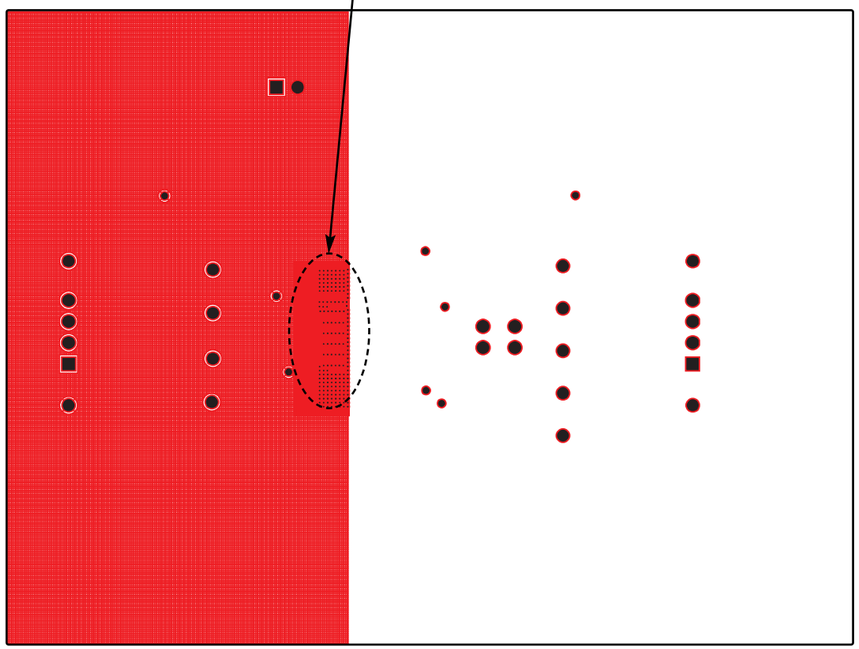
Top layer



Bottom layer

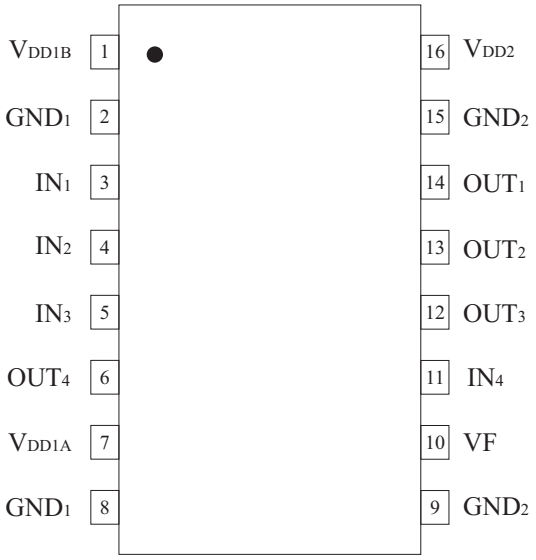
Thermal vias

8 mm creepage



Inner layers
(two inner layers)

IL7817VE Pinout



IL7817VE pin	Symbol	Description
1	VDD1B	Coupler controller-side power supply input (3.3 V nominal).
2	GND1	Ground return for VDD1 (pins 2 and 8 internally connected).
3	IN1	Data in, channel 1
4	IN2	Data in, channel 2
5	IN3	Data in, channel 3
6	OUT4	Data out, channel 4
7	VDD1A	DC-DC convertor input voltage (3.3 V nominal); bypass with 0.1 µF.
8	GND1	Ground return for VDD1 (pins 2 and 8 internally connected).
9	GND2	Ground return for VDD2 (pins 9 and 15 internally connected).
10	VF	Output-side rectifier output / regulator input; connect to a 0.1 µF/16 V external filter capacitor.
11	IN4	Data in, channel 4
12	OUT3	Data out, channel 3
13	OUT2	Data out, channel 2
14	OUT1	Data out, channel 1
15	GND2	Ground return for VDD2 (pins 9 and 15 internally connected).
16	VDD2	Isolated supply voltage (bypass with 10 µF)

Thermal and Current Management

Thermal Management
With a board full of functionality in a single IC, the IL7817V has a high power density.

Self-heating generated by the quiescent current of the DC-to-DC convertor generally limits the ambient operating temperature to less than 125 °C to avoid exceeding the 150 °C Absolute Maximum junction temperature.

The isolator section will operate at 125 °C, however, if the DC-to-DC convertor is not used or is duty cycled.

A double sided, double buried power plane (“2s2p”) board like the one in this kit maximizes thermal performance. Thermal vias should be used between the power plane and the board surfaces. All of the IC ground pins should be connected, with wide traces to help cool the leadframe.

Current Management
IL761xV / IL781xV parts typically operate well within the current limits of the DC-DC convertor unless the coupler is operating at high speed or there are external loads on the DC-DC convertor. Internal thermal management circuitry gradually limits the output voltage and power output as the junction temperature increases to avoid thermal overload. The coupler section is guaranteed to operate at the 2.7 volt minimum DC-DC convertor output voltage with 250 mW output power.

Application Information

Simple Capacitive Decoupling
The only external parts required are a 0.1 µF ceramic capacitor placed as close as possible to the VDD1B supply pin, a 10 µF ceramic capacitor for the VDD2B pin, and a 0.1 µF filter capacitor. This low external parts count reduces board area and cost.

Inherently Low EMI
IL761xV / IL781xVC parts designed for compliance with IEC 61000-6-3, IEC 61000-6-4, CISPR, and FCC Class A standards for emissions. The DC-to-DC convertor oscillator operates above 88 MHz, where emission limits are higher since there is less risk of interference with common commercial radio and television broadcasting.

Frequency-hopping technology dramatically reduces peak EMI, and synchronous rectification and PWM control are avoided, resulting in inherently low EMI. Ferrite beads are generally not required for EMI mitigation.

High Magnetic Immunity
These parts are fully compliant with IEC 61000-6-1 and IEC 61000-6-2 magnetic immunity standards. The coupler's Wheatstone bridge configuration and differential magnetic field signaling ensure excellent EM immunity. Immunity to external magnetic fields is even higher if the field direction is "end-to-end" (rather than to "pin-to-pin").

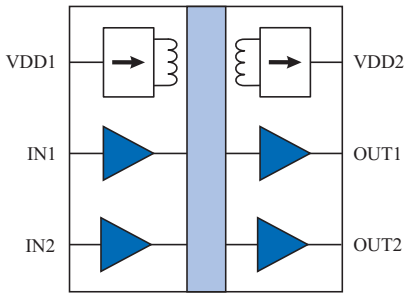
Short-Circuit Protection
The DC-to-DC convertor output current is internally limited to approximately 125 mA. This provides short-circuit protection and eliminates the need for external protection circuitry.

Optional External Regulation
An external regulator can be used in place of the parts' internal low drop-out regulator for voltages up to approximately 8 volts. The maximum output current decreases at higher regulator output voltages, but the output power capacity remains approximately 250 milliwatts.

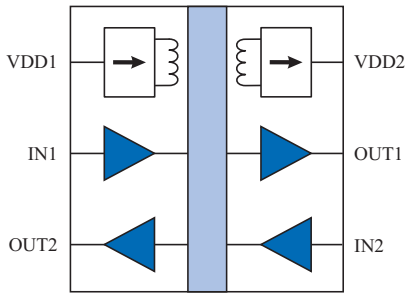
Ideal for Medical Systems
Patient-applied parts electrically connected to the patient in body-floating medical systems generally require two means of patient protection (2 x MOPP). IL761xV / IL781xV parts meet the 2 x MOPP requirements of 4 kV_{RMS} isolation and true 8 mm creepage. 2 x MOPP AC/DC power supplies are difficult to find and expensive. An inexpensive 2 x MOOP power supply can supply the operator interface, while a 2 x MOPP compliant IL761xV / IL781xV DC-to-DC converter can power the patient-applied electronics. The power requirements of the patient-applied electronics are generally low and can be satisfied with the internal DC-to-DC converter.

Isolators with DC-to-DC Convertors

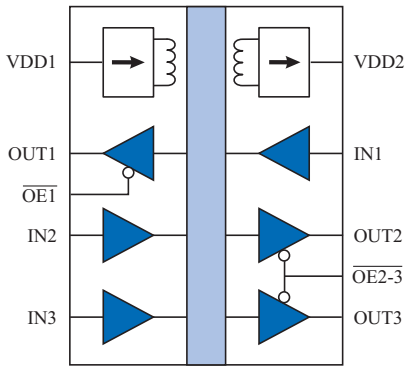
NVE offers a wide variety isolators with integrated DC-to-DC convertors in addition to the IL7817V used in this board. Versions are available with either 3.3-to-3.3 volt integrated DC-to-DC convertors (IL46xx and IL761xVE) or 3.3-to-5 volt integrated boost convertors (IL48xx and IL781xVE):



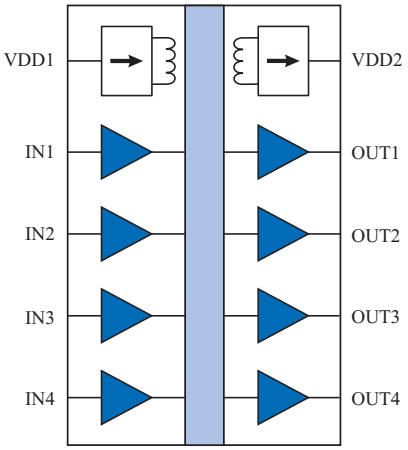
IL7611V / IL7811V



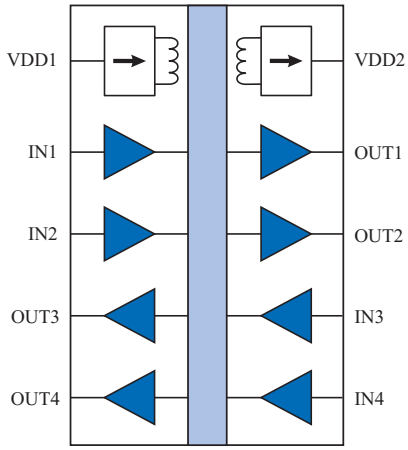
IL7612V / IL7812V



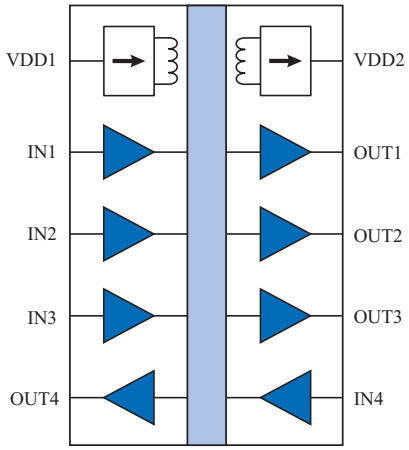
IL7614V / IL7814V



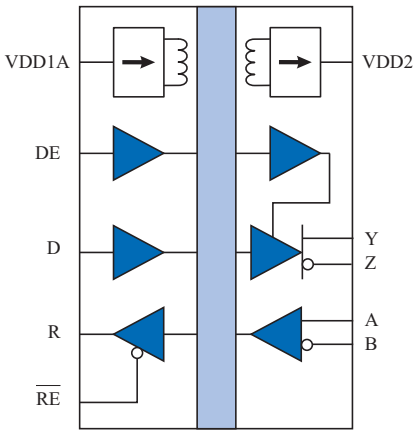
IL7615V / IL7815V



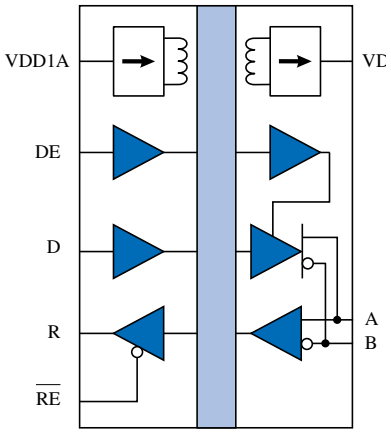
IL7616V / IL7816V



IL7617V / IL7817V



IL4622 / IL4822



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