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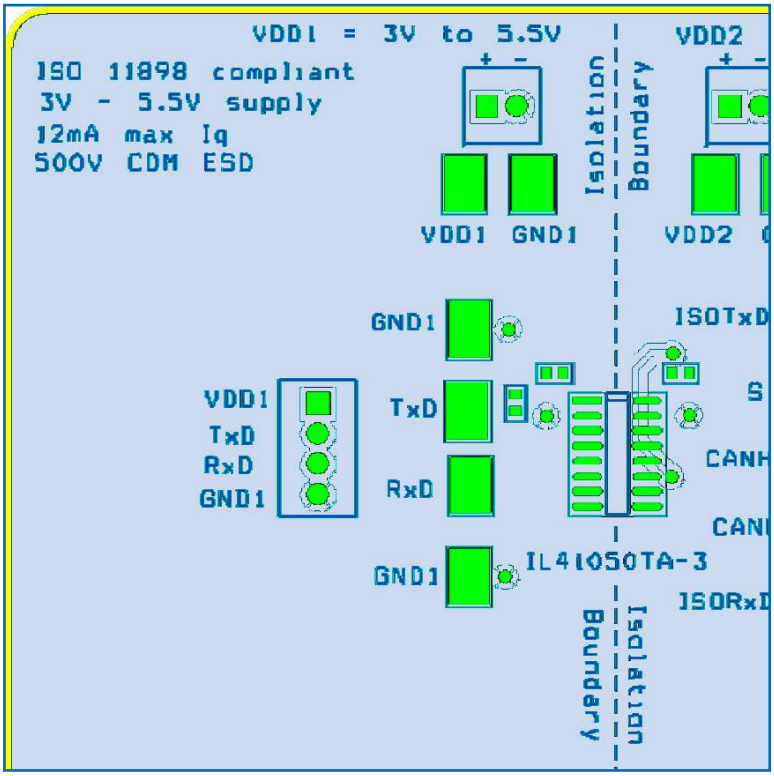
IsoLoop®
Isolated CAN Evaluation Board



Board No.: IL41050-01

About This Evaluation Board

This Evaluation Board provides a complete isolated CAN node using the revolutionary IL41050TA-3E isolated transceiver.

The IL41050TA is a galvanically isolated, CAN (Controller Area Network) transceiver, designed as the interface between the CAN protocol controller and the physical bus. Advanced features facilitate reliable bus operation. Unpowered nodes do not disturb the bus, and a unique non-volatile programmable power-up feature prevents unstable nodes. The devices also have a hardware-selectable silent mode that disables the transmitter.

Designed for harsh CAN and DeviceNet environments, IL41050TA transceivers have transmit data dominant time-out, bus pin transient protection, a rugged Charged Device Model ESD rating, thermal shutdown protection, and short-circuit protection. Unique edge-triggered inputs improve noise performance.

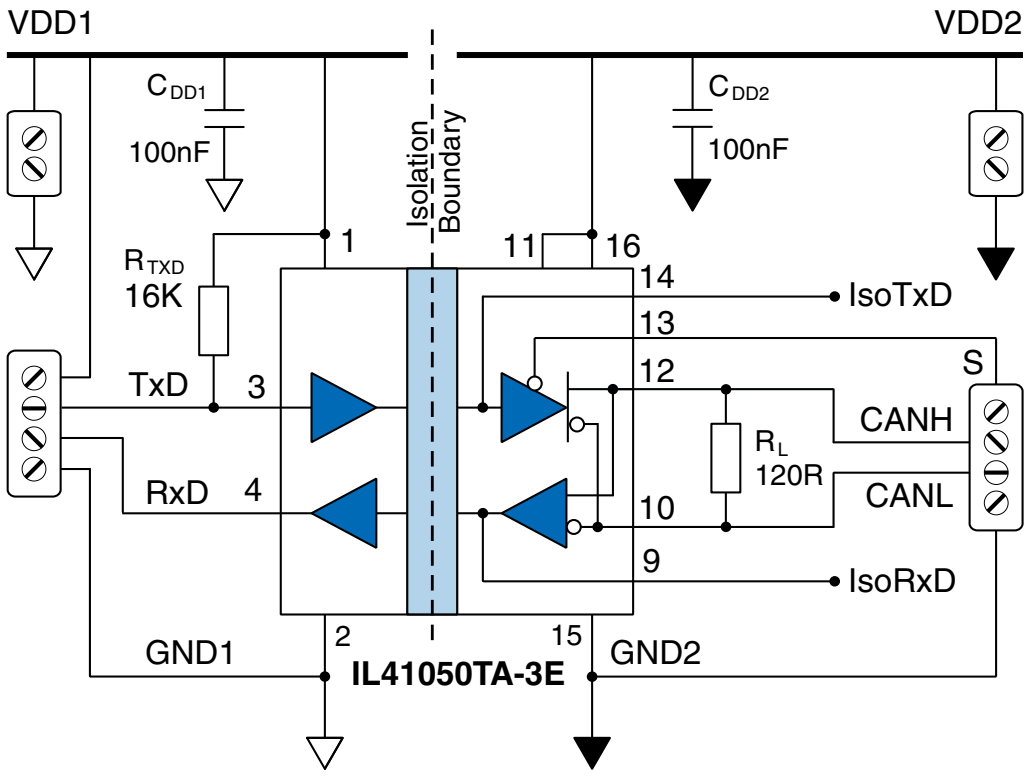
Unlike optocouplers or other isolation technologies, IsoLoop isolators have virtually indefinite barrier life.

The Isolation Advantage

Battery fire caused by over or under charging of individual lithium ion cells is a major concern in multi-cell high voltage electric and hybrid vehicle batteries. To combat this, each cell is monitored for current flow, cell voltage, and in some advanced batteries, magnetic susceptibility. The IL41050 allows seamless connection of the monitoring electronics of every cell to a common CAN bus by electrically isolating inputs from outputs, effectively isolating each cell from all other cells. Cell status is then monitored via the CAN controller in the Battery Management System (BMS).

Another major advantage of isolation is the tremendous increase in noise immunity it affords the CAN node, even if the power source is a battery. Inductive drives and inverters can produce large transients. Traditional, non-isolated CAN nodes provide some protection due to differential signaling and symmetrical driver/receiver pairs, but the IL41050 typically provides several times more transient immunity than traditional CAN nodes.

Circuit Diagram



IL41050 TA-3E pin	Symbol	Description
1	V_{DD1}	V_{DD1} power supply
2	GND_1	V_{DD1} power supply ground return
3	TxD	Transmit Data input
4	RxD	Receive Data output
5	NC	No internal connection
6	NC	No internal connection
7	NC	No internal connection
8	NC	No internal connection
9	IsoRxD	Isolated RxD output (for test purposes only)
10	CANL	Low level CANbus line
11	V_{DD2}	V_{DD2} CAN I/O bus circuitry power supply input*
12	CANH	High level CANbus line
13	S	Mode select input (open or low for normal operation; high for silent mode)
14	IsoTxD	Isolated TxD output (for test purposes only)
15	GND_2	V_{DD2} power supply ground return
16	V_{DD2}	V_{DD2} isolation power supply input*

*Pin 11 is not internally connected to pin 16; both are connected to V_{DD2} in the PCA.

Application Information

Bus-Side Power Supply Pins
Both V_{DD2} power supply inputs (pins 11 and 16) must be connected to the bus-side power supply. Pin 11 powers the bus side of the CAN I/O circuitry, while pin 16 powers the bus-side isolation circuitry. For testing purposes, they are not internally connected, but the part will not operate without both pins powered, and operation without both pins powered can cause damage.

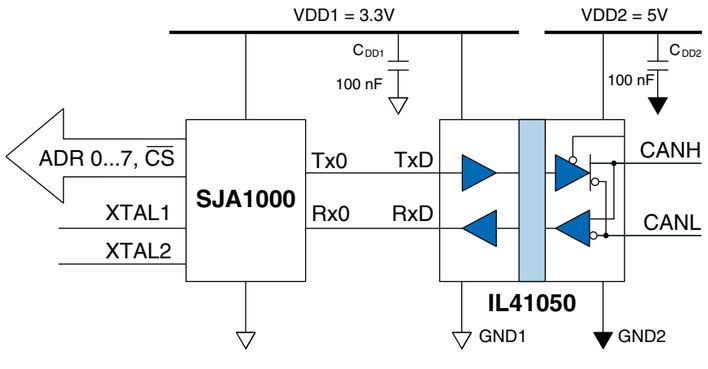
Power Supply Decoupling
Both V_{DD1} and V_{DD2} must be bypassed with 100 nF ceramic capacitors. These supply the dynamic current required for the isolator switching and should be placed as close as possible to V_{DD} and their respective ground return pins.

Input Configurations
The TxD input should not be left open as the state will be indeterminate. If connected to an open-drain or open collector output, a pull-up resistor (typically 16 kΩ) should be connected from the input to V_{DD1}. This kit has a 16 kΩ pull-up resistor.

The Mode Select ("S") input has a 150 kΩ nominal internal pull-down resistor. It can be left open or set low for normal operation.

Bus Termination
Because of their relatively low speed, CAN networks can sometimes be unterminated, but reflections are minimized by terminating both ends of the bus (but not every node). Two 120 Ω termination resistors are generally used to match a 60 Ω cable impedance. This kit comes with a 120 Ω termination resistor. The resistor can be removed for multi-node configurations.

Level Shifting
As shown in the figure at right, the IL41050 can provide isolation and level shifting between a 5 volt CAN bus and a 3 volt microcontroller such as an SJA1000 MCU.



IsoRxD / IsoTxD Outputs
The IsoRxD and IsoTxD outputs are isolated versions of the RxD and TxD signals. These outputs are provided on the IL41050 narrow-body version for troubleshooting, and are brought to test points in this kit. Normally no connections are made to the pins.

Dominant Mode Time-out and Failsafe Receiver Functions
CAN bus latch up is prevented by an integrated Dominant mode timeout function. If the TxD pin is forced permanently low by hardware or software application failure, the time-out returns the RxD output to the high state no more than 765 µs after TxD is asserted dominant. The timer is triggered by a negative edge on TxD. If the duration of the low is longer than the internal timer value, the transmitter is disabled, driving the bus to the recessive state. The timer is reset by a positive edge on pin TxD.

If V_{DD2} power is lost, the IL41050 asserts the RxD output high when the supply voltage falls below 3.8 V. RxD will return to normal operation when V_{DD2} rises above approximately 4.2 V.

Programmable Power-Up
A unique non-volatile programmable power-up feature prevents unstable nodes. A state that needs to be present at node power up can be programmed at the last power down. For example if a CAN node is required to "pulse" dominant at power up, TxD can be sent low by the controller immediately prior to power down. When power is resumed, the node will immediately go dominant allowing self-check code in the microcontroller to verify node operation. If desired, the node can also power up silently by presetting the TxD line high at power down. At the next power on, the IL41050 will remain silent, awaiting a dominant state from the bus.

The microcontroller can check that the CAN node powered down correctly before applying power at the next "power on" request. If the node powered down as intended, RxD will be set high and stored in the IL41050's non-volatile memory. The level stored in the RxD bit can be read before isolated node power is enabled, avoiding possible CAN bus disruption due to an unstable node.

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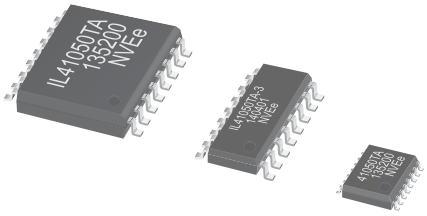
Specification Highlights and Quickstart

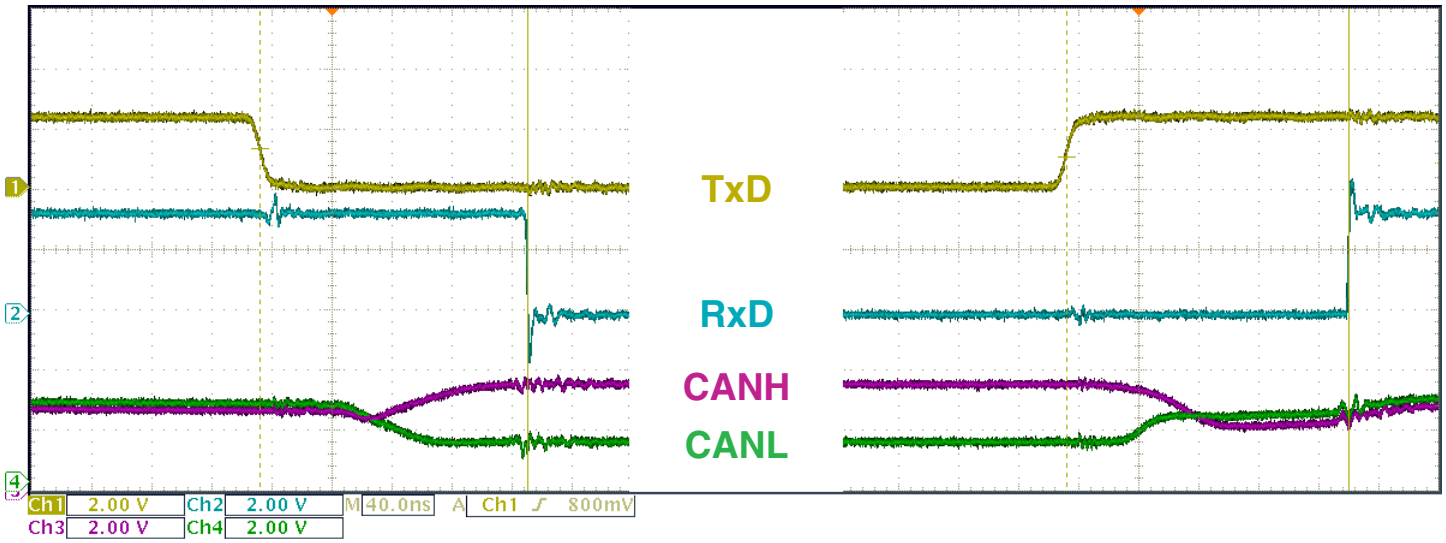


IL41050TA Specification Highlights:

- Fully compliant with the ISO 11898 CAN standard
- 3.0 V to 5.5 V input power supplies
- 12 mA maximum quiescent recessive supply current
- 70 mA maximum bus-side dynamic supply current
- 1200 V_{RMS} 1 minute isolation (QSOP); 2500 V_{RMS} for narrow and wide SOIC versions
- ±500 V CDM ESD
- 1 Mbps
- 50 kV/µs transient immunity
- Silent mode to disable transmitter
- Unpowered nodes do not disturb the bus
- Edge triggered, non-volatile input improves noise performance
- Thermal shutdown protection
- Short-circuit protection for ground and bus power
- –55°C to +125°C operating temperature
- QSOP, 0.15" SOIC, or 0.3" True 8™ mm 16-pin packages
- UL 1577 recognized; IEC 60747-5-5 (VDE 0884) certified

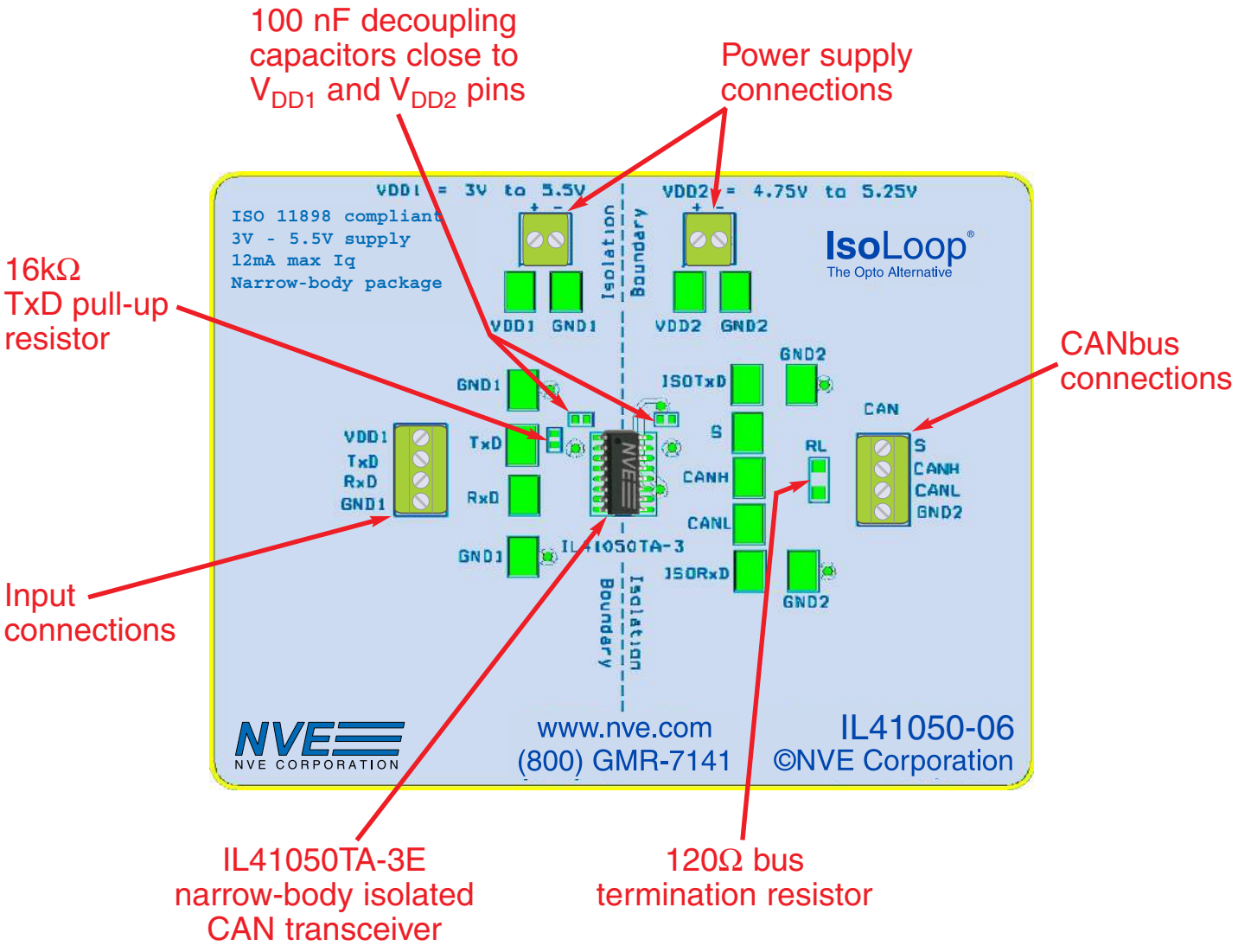
Quick Start:

- Connect V_{DD1} to a 3.3 V power supply and V_{DD2} to 5 V.
- Connect a 500 kHz signal generator to the “TxD” input.
- Verify the “RxD” and CAN outputs on an oscilloscope:



Visit **www.IsoLoop.com** for datasheets.

Evaluation Board Layout



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