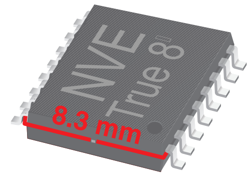
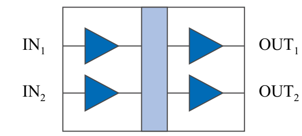
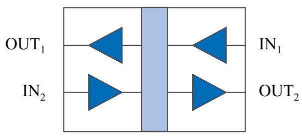
# High Isolation Voltage Digital Isolators



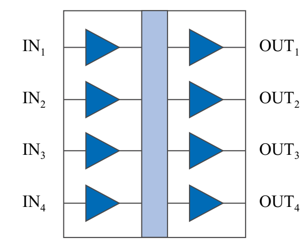

## Functional Diagrams



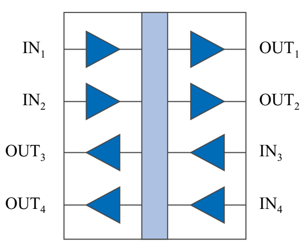

IL711V



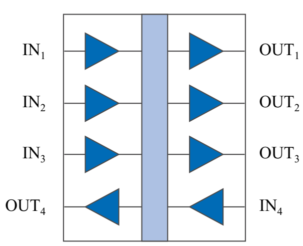

IL721V



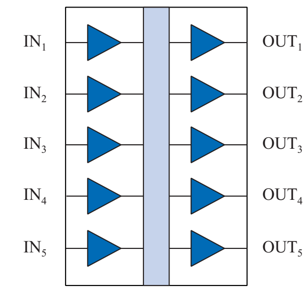

IL715V



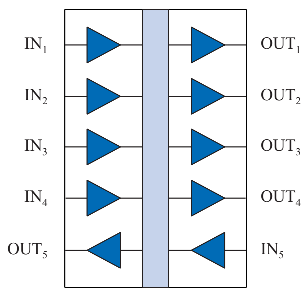

IL716V



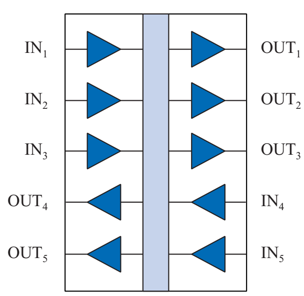

IL717V




IL260V




IL261V




IL262V

## Features

- 5000 $V_{RMS}$/7072 $V_{PK}$ isolation voltage (1 minute; per UL1577)
- 1000 $V_{RMS}$/1415$V_{PK}$ working voltage ($V_{IORM}$) under VDE 0884-10
- 10 $kV_{RMS}$ surge voltage under VDE 0884-10
- High temperature: −40°C to +125°C
- 50 kV/μs typ.; 30 kV/μs min. common mode transient immunity
- No carrier or clock for low EMI emissions and susceptibility
- 1.2 mA/channel typical quiescent current
- 100 ps max. pulse jitter
- 2 ns channel-to-channel skew
- 10 ns typical propagation delay
- 44000 year barrier life
- Excellent magnetic immunity
- UL 1577 recognized; VDE 0884-10 pending
- True 8 mm creepage package

## Applications

- Board-to-board communication
- CANbus
- Peripheral interfaces
- Logic level shifting
- Equipment covered under IEC 61010-1 Edition 3
- 5 $kV_{RMS}$ rated IEC 60601-1 medical applications

## Description

NVE's IL200V/IL700V family of high isolation voltage digital isolators are CMOS devices manufactured with NVE's patented* IsoLoop® spintronic Giant Magnetoresistive (GMR) technology.

IL200/IL700 isolators are inherently low in EMI emissions with no carrier or clocks.

A unique ceramic/polymer composite barrier provides excellent isolation and virtually unlimited barrier life.

The parts use NVE's unique JEDEC-compliant 16-pin package with True 8 mm creepage under IEC 60601.

IsoLoop is a registered trademark of NVE Corporation.
*U.S. Patent numbers 5,831,426; 6,300,617 and others.

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## Absolute Maximum Ratings

| Parameters | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Storage Temperature | $T_S$ | −55 | | 150 | °C | |
| Junction Temperature | $T_J$ | −55 | | 150 | °C | |
| Ambient Operating Temperature(1) | $T_A$ | −40 | | 125 | °C | |
| Supply Voltage | $V_{DD1}$, $V_{DD2}$ | −0.5 | | 7 | V | |
| Input Voltage | $V_I$ | −0.5 | | $V_{DD}$ + 0.5 | V | |
| Output Voltage | $V_O$ | −0.5 | | $V_{DD}$ + 0.5 | V | |
| Output Current Drive | $I_O$ | | | 10 | mA | |
| Lead Solder Temperature | | | | 260 | °C | 10 sec. |
| ESD | | | 2 | | kV | HBM |

## Recommended Operating Conditions

| Parameters | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Ambient Operating Temperature | $T_A$ | −40 | | 125 | °C | |
| Junction Temperature | $T_J$ | −40 | | 125 | °C | |
| Supply Voltage | $V_{DD1}$, $V_{DD2}$ | 3.0 | | 5.5 | V | |
| Logic High Input Voltage | $V_{IH}$ | 2.4 | | $V_{DD}$ | V | |
| Logic Low Input Voltage | $V_{IL}$ | 0 | | 0.8 | V | |
| Input Signal Rise and Fall Times | $t_{IR}$, $t_{IF}$ | | | 1 | μs | |

## Insulation Specifications

| Parameters | | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|---|
| Creepage Distance (external) | | | 8.03 | 8.3 | | mm | Per IEC 60601 |
| Total Barrier Thickness (internal) | | | 0.013 | 0.014 | | mm | |
| Leakage Current(5) | | | | 0.2 | | μA | 240 $V_{RMS}$, 60 Hz |
| Barrier Resistance(5) | | $R_{IO}$ | | $>10^{14}$ | | Ω | 500 V |
| Barrier Capacitance(5) | | $C_{IO}$ | | 2 | | pF | f = 1 MHz |
| Comparative Tracking Index | | CTI | ≥175 | | | V | Per IEC 60112 |
| High Voltage Endurance (Maximum Barrier Voltage for Indefinite Life) | AC | $V_{IO}$ | 1000 | | | $V_{RMS}$ | At maximum operating temperature |
| | DC | | 1500 | | | $V_{DC}$ | |
| Barrier Life | | | | 44000 | | Years | 100°C, 1000 $V_{RMS}$, 60% CL activation energy |

## Thermal Characteristics (0.3" True 8 SOIC)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Junction–Ambient Thermal Resistance | $\theta_{JA}$ | | 60 | | °C/W | Soldered to double-sided board; free air |
| Junction–Case (Top) Thermal Resistance | $\Psi_{JT}$ | | 20 | | °C/W | |
| Power Dissipation | $P_D$ | | | 800 | mW | |



NVE Corporation 11409 Valley View Road, Eden Prairie, MN 55344-3617 Phone: (952) 829-9217 Fax: (952) 829-9189 www.IsoLoop.com 

## Safety and Approvals

***VDE 0884-10*** (File Number 5016933-4880-0001; currently certified 600 $V_{RMS}$ Working Voltage; 1000$V_{RMS}$ pending)

- Working Voltage ($V_{IORM}$) 1000 $V_{RMS}$ (1415 $V_{PK}$); basic insulation; pollution degree 2
- Transient overvoltage ($V_{IOTM}$) 6000 $V_{PK}$
- Surge voltage ($V_{IOSM}$) 10 $kV_{PK}$
- Each part tested at 2387 $V_{PK}$ for 1 second, 5 pC partial discharge limit
- Samples tested at 6000 $V_{PK}$ for 60 sec.; then 2122 $V_{PK}$ for 10 sec. with 5 pC partial discharge limit

***IEC 61010-1*** (Edition 2; TUV Certificate Numbers N1502812; N1502812-101)
Reinforced Insulation; Pollution Degree II; Material Group III

| Package | Working Voltage |
|---|---|
| Wide-body SOIC/True 8™ | 300 $V_{RMS}$ |

***UL 1577*** (Component Recognition Program File Number E207481)
5000 $V_{RMS}$/7072 $V_{PK}$ isolation voltage
Each part tested at 6000 $V_{RMS}$ (8486 $V_{PK}$) for 1 second; each lot sample tested at 5000 $V_{RMS}$ (7072 $V_{PK}$) for 1 minute

***IEC 60601-1***

IEC 60601 specifies isolator creepage for medical safety, and is also used for demanding non-medical applications. With 5000 V isolation and true 8 millimeter creepage, V-Series Isolators allow IEC 60601-1 compliance for 120V and 220/240V applications. Compliance is follows:

| | | Working Voltage ($V_{RMS}$) | |
|---|---|---|---|
| | Insulation | 125 | 250 |
| Creepage (mm) | Single | 3.0 | 4.0 |
| | Double | 6.0 | 8.0 |
| Dielectric strength | Single | 2000 | 2500 |
| | Double | 3000 | 4000 |

## Soldering Profile

Per JEDEC J-STD-020C, MSL 1



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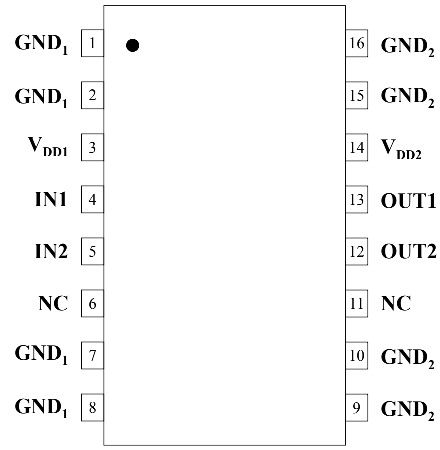
## IL711V Pin Connections

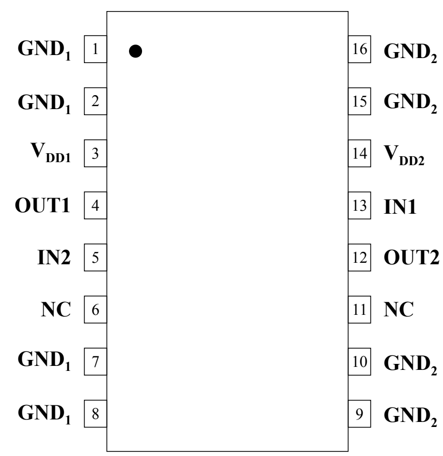
| | | |
|---|---|---|
| 1<br>2 | $GND_1$ | Ground return for $V_{DD1}$<br>(pins 1, 2, 7, and 8 internally connected) |
| 3 | $V_{DD1}$ | Supply voltage |
| 4 | $IN_1$ | Data in, channel 1 |
| 5 | $IN_2$ | Data in, channel 2 |
| 6 | NC | No connection |
| 7<br>8 | $GND_1$ | Ground return for $V_{DD1}$<br>(pins 1, 2, 7, and 8 internally connected) |
| 9<br>10 | $GND_2$ | Ground return for $V_{DD2}$<br>(pins 9, 10, 15, and 16 internally connected) |
| 11 | NC | No connection |
| 12 | $OUT_2$ | Data out, channel 2 |
| 13 | $OUT_1$ | Data out, channel 1 |
| 14 | $V_{DD2}$ | Supply voltage |
| 15<br>16 | $GND_2$ | Ground return for $V_{DD2}$<br>(pins 9, 10, 15, and 16 internally connected) |




IL711V

## IL721V Pin Connections

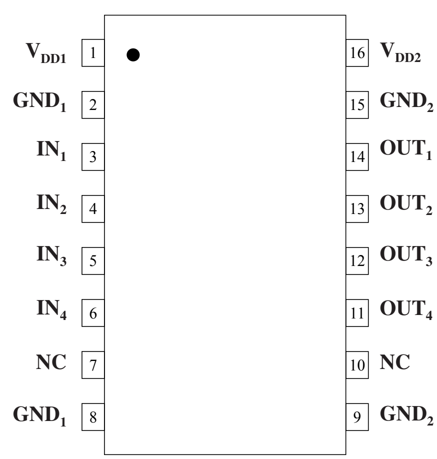
| | | |
|---|---|---|
| 1<br>2 | $GND_1$ | Ground return for $V_{DD1}$<br>(pins 1, 2, 7, and 8 internally connected) |
| 3 | $V_{DD1}$ | Supply voltage |
| 4 | $OUT_1$ | Data out, channel 1 |
| 5 | $IN_2$ | Data in, channel 2 |
| 6 | NC | No connection |
| 7<br>8 | $GND_1$ | Ground return for $V_{DD1}$<br>(pins 1, 2, 7, and 8 internally connected) |
| 9<br>10 | $GND_2$ | Ground return for $V_{DD2}$<br>(pins 9, 10, 15, and 16 internally connected) |
| 11 | NC | No connection |
| 12 | $OUT_2$ | Data out, channel 2 |
| 13 | $IN_1$ | Data in, channel 1 |
| 14 | $V_{DD2}$ | Supply voltage |
| 15<br>16 | $GND_2$ | Ground return for $V_{DD2}$<br>(pins 9, 10, 15, and 16 internally connected) |




IL721V

## IL715V Pin Connections

| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Supply voltage |
| 2 | $GND_1$ | Ground return for $V_{DD1}$* |
| 3 | $IN_1$ | Data in, channel 1 |
| 4 | $IN_2$ | Data in, channel 2 |
| 5 | $IN_3$ | Data in, channel 3 |
| 6 | $IN_4$ | Data in, channel 4 |
| 7 | NC | No connection |
| 8 | $GND_1$ | Ground return for $V_{DD1}$* |
| 9 | $GND_2$ | Ground return for $V_{DD2}$* |
| 10 | NC | No connection |
| 11 | $OUT_4$ | Data out, channel 4 |
| 12 | $OUT_3$ | Data out, channel 3 |
| 13 | $OUT_2$ | Data out, channel 2 |
| 14 | $OUT_1$ | Data out, channel 1 |
| 15 | $GND_2$ | Ground return for $V_{DD2}$* |
| 16 | $V_{DD2}$ | Supply voltage |




IL715V



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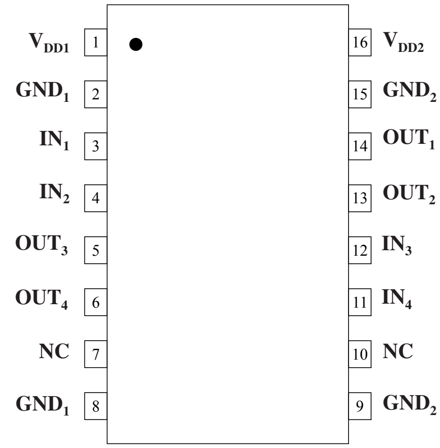
## IL716V Pin Connections

| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Supply voltage |
| 2 | $GND_1$ | Ground Return for $V_{DD1}$* |
| 3 | $IN_1$ | Data in, channel 1 |
| 4 | $IN_2$ | Data in, channel 2 |
| 5 | $OUT_3$ | Data out, channel 3 |
| 6 | $OUT_4$ | Data out, channel 4 |
| 7 | NC | No connection |
| 8 | $GND_1$ | Ground Return for $V_{DD1}$* |
| 9 | $GND_2$ | Ground Return for $V_{DD2}$* |
| 10 | NC | No connection |
| 11 | $IN_4$ | Data in, channel 4 |
| 12 | $IN_3$ | Data in, channel 3 |
| 13 | $OUT_2$ | Data out, channel 2 |
| 14 | $OUT_1$ | Data out, channel 1 |
| 15 | $GND_2$ | Ground Return for $V_{DD2}$* |
| 16 | $V_{DD2}$ | Supply voltage |

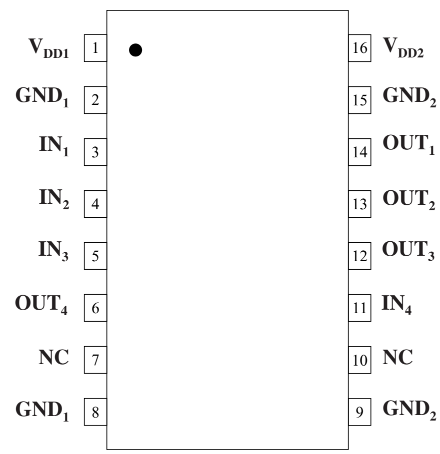



IL716V

***NOTE:** Pins 2 and 8 are internally connected, as are pins 9 and 15.

## IL717V Pin Connections

| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Supply voltage |
| 2 | $GND_1$ | Ground return for $V_{DD1}$* |
| 3 | $IN_1$ | Data in, channel 1 |
| 4 | $IN_2$ | Data in, channel 2 |
| 5 | $IN_3$ | Data in, channel 3 |
| 6 | $OUT_4$ | Data out, channel 4 |
| 7 | NC | No connection |
| 8 | $GND_1$ | Ground return for $V_{DD1}$* |
| 9 | $GND_2$ | Ground return for $V_{DD2}$* |
| 10 | NC | No connection |
| 11 | $IN_4$ | Data in, channel 4 |
| 12 | $OUT_3$ | Data out, channel 3 |
| 13 | $OUT_2$ | Data out, channel 2 |
| 14 | $OUT_1$ | Data out, channel 1 |
| 15 | $GND_2$ | Ground return for $V_{DD2}$* |
| 16 | $V_{DD2}$ | Supply voltage |

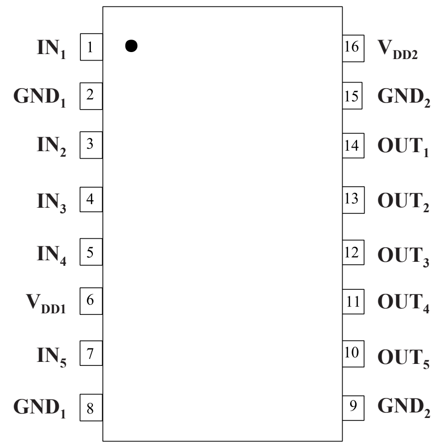



IL717V

***NOTE:** Pins 2 and 8 are internally connected, as are pins 9 and 15.

### IL260V Pin Connections

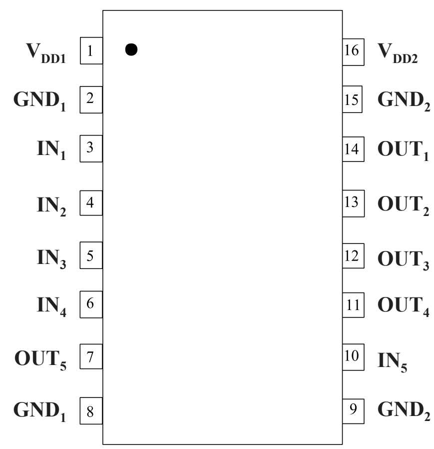
| | | |
|---|---|---|
| 1 | $IN_1$ | Input 1 |
| 2 | $GND_1$ | Ground* |
| 3 | $IN_2$ | Input 2 |
| 4 | $IN_3$ | Input 3 |
| 5 | $IN_4$ | Input 4 |
| 6 | $V_{DD1}$ | Supply Voltage 1 |
| 7 | $IN_5$ | Input 5 |
| 8 | $GND_1$ | Ground* |
| 9 | $GND_2$ | Ground* |
| 10 | $OUT_5$ | Output 5 |
| 11 | $OUT_4$ | Output 4 |
| 12 | $OUT_3$ | Output 3 |
| 13 | $OUT_2$ | Output 2 |
| 14 | $OUT_1$ | Output 1 |
| 15 | $GND_2$ | Ground* |
| 16 | $V_{DD2}$ | Supply Voltage 2 |




IL260V

### IL261V Pin Connections

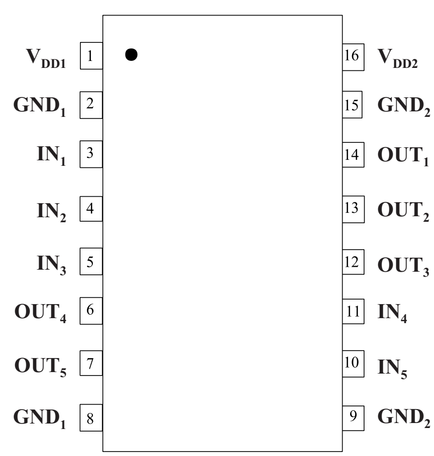
| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Supply Voltage 1 |
| 2 | $GND_1$ | Ground* |
| 3 | $IN_1$ | Input 1 |
| 4 | $IN_2$ | Input 2 |
| 5 | $IN_3$ | Input 3 |
| 6 | $IN_4$ | Input 4 |
| 7 | $OUT_5$ | Output 5 |
| 8 | $GND_1$ | Ground* |
| 9 | $GND_2$ | Ground* |
| 10 | $IN_5$ | Input 5 |
| 11 | $OUT_4$ | Output 4 |
| 12 | $OUT_3$ | Output 3 |
| 13 | $OUT_2$ | Output 2 |
| 14 | $OUT_1$ | Output 1 |
| 15 | $GND_2$ | Ground* |
| 16 | $V_{DD2}$ | Supply Voltage 2 |




IL261V

### IL262V Pin Connections

| | | |
|---|---|---|
| 1 | $V_{DD1}$ | Supply Voltage 1 |
| 2 | $GND_1$ | Ground* |
| 3 | $IN_1$ | Input 1 |
| 4 | $IN_2$ | Input 2 |
| 5 | $IN_3$ | Input 3 |
| 6 | $OUT_4$ | Output 4 |
| 7 | $OUT_5$ | Output 5 |
| 8 | $GND_1$ | Ground* |
| 9 | $GND_2$ | Ground* |
| 10 | $IN_5$ | Input 5 |
| 11 | $IN_4$ | Input 4 |
| 12 | $OUT_3$ | Output 3 |
| 13 | $OUT_2$ | Output 2 |
| 14 | $OUT_1$ | Output 1 |
| 15 | $GND_2$ | Ground* |
| 16 | $V_{DD2}$ | Supply Voltage 2 |




IL262V

***NOTE:** Pins 2 and 8 are internally connected, as are pins 9 and 15.



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| **3.3 Volt Electrical Specifications** ($T_{min}$ to $T_{max}$ unless otherwise stated) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameters** | **Symbol** | **Min.** | **Typ.** | **Max.** | **Units** | **Test Conditions** |
| Input Quiescent Supply Current | | | | | | |
| IL260V | $I_{DD1}$ | | 300 | 400 | µA | |
| IL261V | | | 1.2 | 1.75 | mA | |
| IL262V | | | 2.4 | 3.5 | mA | |
| IL711V | | | 8 | 10 | µA | |
| IL721V | | | 1.2 | 1.75 | mA | |
| IL715V | | | 16 | 20 | µA | |
| IL716V | | | 2.4 | 3.5 | mA | |
| IL717V | | | 1.2 | 1.75 | mA | |
| Output Quiescent Supply Current | | | | | | |
| IL260V | $I_{DD2}$ | | 6 | 8.75 | mA | |
| IL261V | | | 4.8 | 7 | mA | |
| IL262V | | | 4.8 | 7 | mA | |
| IL711V | | | 2.4 | 3.5 | mA | |
| IL721V | | | 1.2 | 1.75 | mA | |
| IL715V | | | 4.8 | 7 | mA | |
| IL716V | | | 2.4 | 3.5 | mA | |
| IL717V | | | 3.6 | 5.25 | mA | |
| Logic Input Current | $I_I$ | −10 | | 10 | µA | |
| Logic High Output Voltage | $V_{OH}$ | $V_{DD}$ – 0.1 | $V_{DD}$ | | V | $I_O$ = −20 µA, $V_I = V_{IH}$ |
| | | 0.8 x $V_{DD}$ | 0.9 x $V_{DD}$ | | | $I_O$ = −4 mA, $V_I = V_{IH}$ |
| Logic Low Output Voltage | $V_{OL}$ | | 0 | 0.1 | V | $I_O$ = 20 µA, $V_I = V_{IL}$ |
| | | | 0.5 | 0.8 | | $I_O$ = 4 mA, $V_I = V_{IL}$ |

| **Switching Specifications** ($V_{DD}$ = 3.3 V) | | | | | | |
|---|---|---|---|---|---|---|
| Maximum Data Rate | | 100 | 110 | | Mbps | $C_L$ = 15 pF |
| Pulse Width(7) | PW | 10 | 7.5 | | ns | 50% Points, $V_O$ |
| Propagation Delay Input to Output (High to Low) | $t_{PHL}$ | | 12 | 18 | ns | $C_L$ = 15 pF |
| Propagation Delay Input to Output (Low to High) | $t_{PLH}$ | | 12 | 18 | ns | $C_L$ = 15 pF |
| Pulse Width Distortion(2) | PWD | | 2 | 3 | ns | $C_L$ = 15 pF |
| Propagation Delay Skew(3) | $t_{PSK}$ | | 4 | 6 | ns | $C_L$ = 15 pF |
| Output Rise Time (10%–90%) | $t_R$ | | 2 | 4 | ns | $C_L$ = 15 pF |
| Output Fall Time (10%–90%) | $t_F$ | | 2 | 4 | ns | $C_L$ = 15 pF |
| Common Mode Transient Immunity (Output Logic High or Logic Low)(4) | $\|CM_H\|,\|CM_L\|$ | 30 | 50 | | kV/µs | $V_{CM}$ = 1500 $V_{DC}$<br>$t_{TRANSIENT}$ = 25 ns |
| Channel-to-Channel Skew | $t_{CSK}$ | | 2 | 3 | ns | $C_L$ = 15 pF |
| Dynamic Power Consumption(6) | | | 140 | 240 | µA/Mbps | per channel |

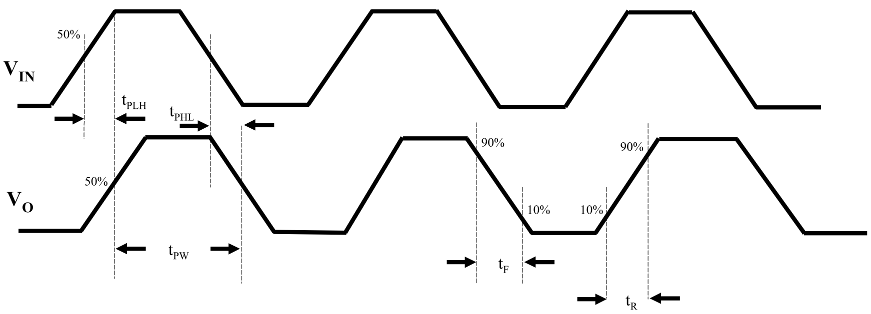
| **Magnetic Field Immunity**(8) ($V_{DD2}$= 3V, 3V<$V_{DD1}$<5.5V) | | | | | | |
|---|---|---|---|---|---|---|
| Power Frequency Magnetic Immunity | $H_{PF}$ | 1000 | 1500 | | A/m | 50Hz/60Hz |
| Pulse Magnetic Field Immunity | $H_{PM}$ | 1800 | 2000 | | A/m | $t_p$ = 8µs |
| Damped Oscillatory Magnetic Field | $H_{OSC}$ | 1800 | 2000 | | A/m | 0.1Hz – 1MHz |
| Cross-axis Immunity Multiplier(9) | $K_X$ | | 2.5 | | | |

| 5 Volt Electrical Specifications ($T_{min}$ to $T_{max}$ unless otherwise stated) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameters** | **Symbol** | **Min.** | **Typ.** | **Max.** | **Units** | **Test Conditions** |
| Input Quiescent Supply Current | | | | | | |
| IL260V | $I_{DD1}$ | | 350 | 500 | µA | |
| IL261V | | | 1.8 | 2.5 | mA | |
| IL262V | | | 3.6 | 5 | mA | |
| IL711V | | | 10 | 15 | µA | |
| IL721V | | | 1.8 | 2.5 | mA | |
| IL715V | | | 20 | 15 | µA | |
| IL716V | | | 3.6 | 5 | mA | |
| IL717V | | | 1.8 | 2.5 | mA | |
| Output Quiescent Supply Current | | | | | | |
| IL260V | $I_{DD2}$ | | 9 | 12.5 | mA | |
| IL261V | | | 7.2 | 10 | mA | |
| IL262V | | | 7.2 | 10 | mA | |
| IL711V | | | 3.6 | 5 | mA | |
| IL721V | | | 1.8 | 2.5 | mA | |
| IL715V | | | 3.6 | 5 | mA | |
| IL716V | | | 3.6 | 5 | mA | |
| IL717V | | | 5.4 | 7.5 | mA | |
| Logic Input Current | $I_I$ | −10 | | 10 | µA | |
| Logic High Output Voltage | $V_{OH}$ | $V_{DD}$ − 0.1 | $V_{DD}$ | | V | $I_O$ = −20 µA, $V_I = V_{IH}$ |
| | | 0.8 x $V_{DD}$ | 0.9 x $V_{DD}$ | | | $I_O$ = −4 mA, $V_I = V_{IH}$ |
| Logic Low Output Voltage | $V_{OL}$ | | 0 | 0.1 | V | $I_O$ = 20 µA, $V_I = V_{IL}$ |
| | | | 0.5 | 0.8 | | $I_O$ = 4 mA, $V_I = V_{IL}$ |

| Switching Specifications ($V_{DD}$ = 5 V) | | | | | | |
|---|---|---|---|---|---|---|
| Maximum Data Rate | | 100 | 110 | | Mbps | $C_L$ = 15 pF |
| Pulse Width(7) | PW | 10 | 7.5 | | ns | 50% Points, $V_O$ |
| Propagation Delay Input to Output (High to Low) | $t_{PHL}$ | | 10 | 15 | ns | $C_L$ = 15 pF |
| Propagation Delay Input to Output (Low to High) | $t_{PLH}$ | | 10 | 15 | ns | $C_L$ = 15 pF |
| Pulse Width Distortion(2) | PWD | | 2 | 3 | ns | $C_L$ = 15 pF |
| Pulse Jitter(10) | $t_J$ | | 100 | | ps | $C_L$ = 15 pF |
| Propagation Delay Skew(3) | $t_{PSK}$ | | 4 | 6 | ns | $C_L$ = 15 pF |
| Output Rise Time (10%–90%) | $t_R$ | | 1 | 3 | ns | $C_L$ = 15 pF |
| Output Fall Time (10%–90%) | $t_F$ | | 1 | 3 | ns | $C_L$ = 15 pF |
| Common Mode Transient Immunity (Output Logic High or Logic Low)(4) | $\|CM_H\|,\|CM_L\|$ | 30 | 50 | | kV/µs | $V_{CM}$ = 1500 $V_{DC}$<br>$t_{TRANSIENT}$ = 25 ns |
| Channel to Channel Skew | $t_{CSK}$ | | 2 | 3 | ns | $C_L$ = 15 pF |
| Dynamic Power Consumption(6) | | | 200 | 340 | µA/Mbps | per channel |

| **Magnetic Field Immunity**[8] ($V_{DD2}$= 5V, 3V<$V_{DD1}$<5.5V) | | | | | | |
|---|---|---|---|---|---|---|
| Power Frequency Magnetic Immunity | $H_{PF}$ | 2800 | 3500 | | A/m | 50Hz/60Hz |
| Pulse Magnetic Field Immunity | $H_{PM}$ | 4000 | 4500 | | A/m | $t_p$ = 8µs |
| Damped Oscillatory Magnetic Field | $H_{OSC}$ | 4000 | 4500 | | A/m | 0.1Hz – 1MHz |
| Cross-axis Immunity Multiplier[9] | $K_X$ | | 2.5 | | | |

## Timing Diagram




**Legend**

| | |
|---|---|
| $t_{PLH}$ | Propagation Delay, Low to High |
| $t_{PHL}$ | Propagation Delay, High to Low |
| $t_{PW}$ | Minimum Pulse Width |
| $t_R$ | Rise Time |
| $t_F$ | Fall Time |

## **Notes** (apply to both 3.3 V and 5 V specifications):

1. Absolute maximum ambient operating temperature means the device will not be damaged if operated under these conditions. It does not guarantee performance.
2. PWD is defined as $|t_{PHL} - t_{PLH}|$. %PWD is equal to PWD divided by pulse width.
3. $t_{PSK}$ is the magnitude of the worst-case difference in $t_{PHL}$ and/or $t_{PLH}$ between devices at 25°C.
4. $CM_H$ is the maximum common mode voltage slew rate that can be sustained while maintaining $V_O$ > 0.8 $V_{DD2}$. $CM_L$ is the maximum common mode input voltage that can be sustained while maintaining $V_O$ < 0.8 V. The common mode voltage slew rates apply to both rising and falling common mode voltage edges.
5. Device is considered a two terminal device: pins 1–4 shorted and pins 5–8 shorted.
6. Dynamic power consumption is calculated per channel and is supplied by the channel's input side power supply.
7. Minimum pulse width is the minimum value at which specified PWD is guaranteed.
8. The relevant test and measurement methods are given in the Electromagnetic Compatibility section on p. 6.
9. External magnetic field immunity is improved by this factor if the field direction is "end-to-end" rather than to "pin-to-pin" (see diagram on p. 6).
10. 64k-bit pseudo-random binary signal (PRBS) NRZ bit pattern with no more than five consecutive 1s or 0s; 800 ps transition time.



NVE Corporation 11409 Valley View Road, Eden Prairie, MN 55344-3617 Phone: (952) 829-9217 Fax: (952) 829-9189 www.IsoLoop.com 

## Application Information

### Electrostatic Discharge Sensitivity

This product has been tested for electrostatic sensitivity to the limits stated in the specifications. However, NVE recommends that all integrated circuits be handled with appropriate care to avoid damage. Damage caused by inappropriate handling or storage could range from performance degradation to complete failure.

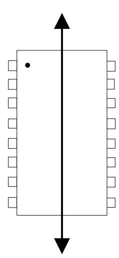
### Electromagnetic Compatibility

IsoLoop Isolators have the lowest EMC footprint of any isolation technology. IsoLoop Isolators' Wheatstone bridge configuration and differential magnetic field signaling ensure excellent EMC performance against all relevant standards.

These isolators are fully compliant with generic EMC standards EN50081, EN50082-1 and the umbrella line-voltage standard for Information Technology Equipment (ITE) EN61000. NVE has completed compliance tests in the categories below:

EN50081-1
  Residential, Commercial & Light Industrial
  Methods EN55022, EN55014
EN50082-2: Industrial Environment
  Methods EN61000-4-2 (ESD), EN61000-4-3 (Electromagnetic Field Immunity), EN61000-4-4 (Electrical Transient Immunity), EN61000-4-6 (RFI Immunity), EN61000-4-8 (Power Frequency Magnetic Field Immunity), EN61000-4-9 (Pulsed Magnetic Field), EN61000-4-10 (Damped Oscillatory Magnetic Field)
ENV50204
  Radiated Field from Digital Telephones (Immunity Test)

Immunity to external magnetic fields is even higher if the field direction is "end-to-end" rather than to "pin-to-pin" as shown in the diagram below:



Cross-axis Field Direction

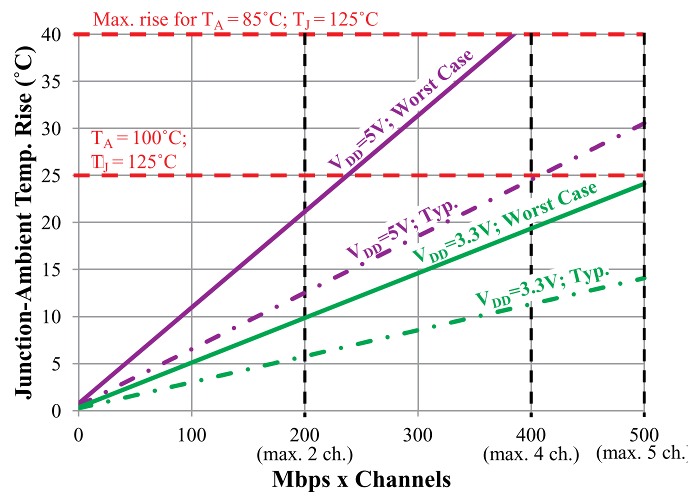
### Dynamic Power Consumption

IsoLoop Isolators achieve their low power consumption from the way they transmit data across the isolation barrier. By detecting the edge transitions of the input logic signal and converting these to narrow current pulses, a magnetic field is created around the GMR Wheatstone bridge. Depending on the direction of the magnetic field, the bridge causes the output comparator to switch following the input logic signal. Since the current pulses are narrow, about 2.5 ns, the power consumption is independent of mark-to-space ratio and solely dependent on frequency. This has obvious advantages over optocouplers, which have power consumption heavily dependent on mark-to-space ratio.

### Thermal Management

IsoLoop Isolators are designed for low power dissipation and thermal performance, providing unmatched channel density for high-performance isolators. Nevertheless, package temperature rise should be considered when running multiple channels at high speed. Power consumption is higher at 5 volt operation than at 3.3 volts, and dynamic supply current is higher on the input side of the isolators than the output side, so thermal management is more important with five-volt input-side power supplies.

Based on the specifications contained in this datasheet, the derating curve at typical operating conditions is as follows:




### Power Supply Decoupling

Both power supplies to these devices should be decoupled with low-ESR 47 nF ceramic capacitors. Ground planes for both $GND_1$ and $GND_2$ are highly recommended for data rates above 10 Mbps. Capacitors must be located as close as possible to the $V_{DD}$ pins.

### Maintaining Creepage

Creepage distances are often critical in isolated circuits. In addition to meeting JEDEC standards, NVE isolator packages have unique creepage specifications. Standard pad libraries often extend under the package, compromising creepage and clearance. Similarly, ground planes, if used, should be spaced to avoid compromising clearance. The package drawing and recommended pad layout are included in this datasheet.

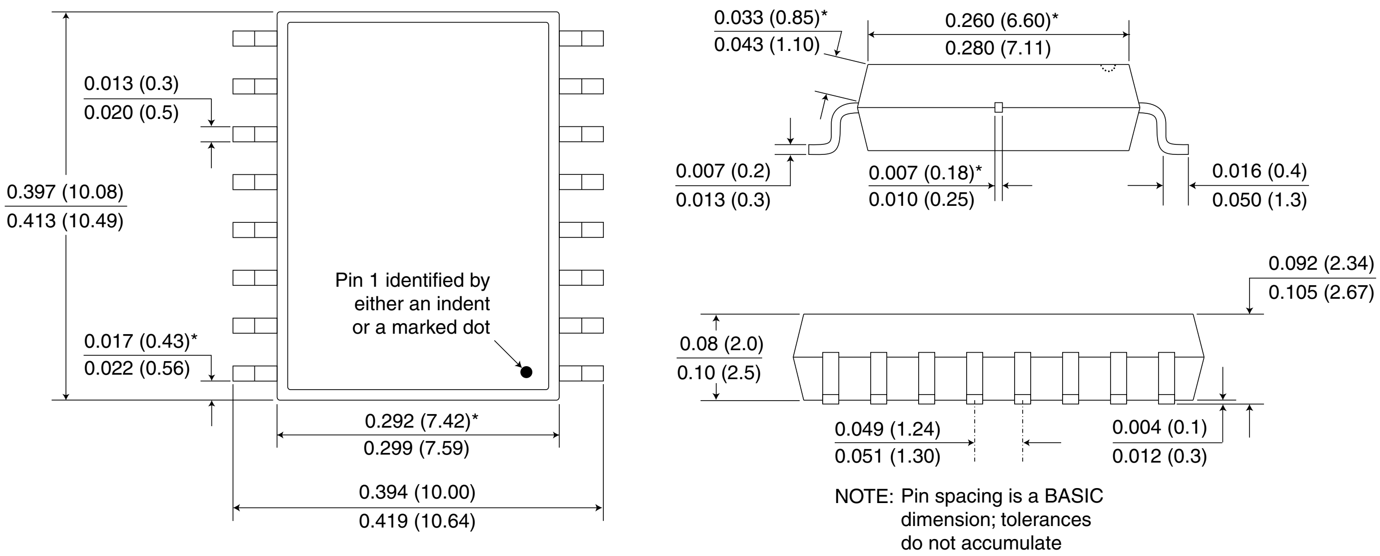
### Signal Status on Start-up and Shut Down

To minimize power dissipation, input signals are differentiated and then latched on the output side of the isolation barrier to reconstruct the signal. This could result in an ambiguous output state depending on power up, shutdown and power loss sequencing. Unless the circuit connected to the isolator performs its own power- on reset (POR), a start-up initialization circuit should be considered. Initialization consists of toggling the input either high then low, or low then high.

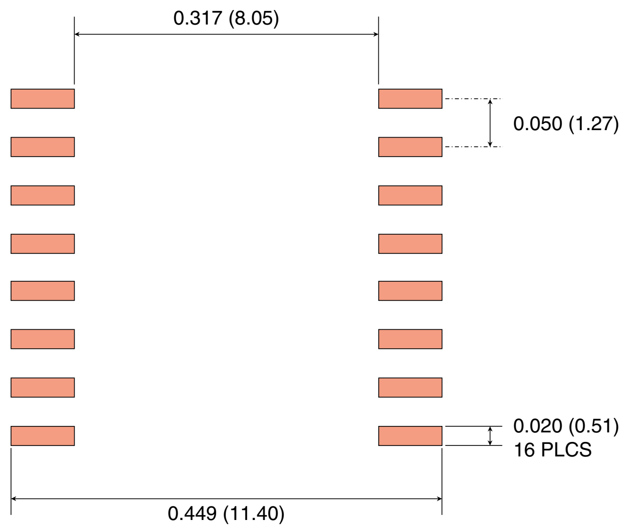
In CAN applications, the IL721V should be used with CAN transceivers with Dominant Timeout functions for seamless POR. Most CAN transceivers have Dominant Timeout options. Examples include NXP's TJA 1050 and TJA 1040 transceivers

## True 8™ (8 mm creepage) 16-pin SOIC Package

Dimensions in inches (mm); scale = approx. 5X




Dimensions in inches (mm); scale = approx. 5X



## Ordering Information

# IL 711 V E TR13

**Bulk Packaging**
Blank = Tube
TR7 = 7" Tape and Reel
TR13 = 13" Tape and Reel

**Package**
E = RoHS Compliant

**Grade**
V = High Isolation Voltage and High Temperature

**Base Part Number**
260 = 5 Drive Channels

261 = 4 Drive Channels,
1 Receive Channel

262 = 3 Drive Channels,
2 Receive Channel

711 = 2 Transmit Channels

721 = 1 Transmit Channel
1 Receive Channel

715 = 4 Transmit Channels

716 = 2 Transmit Channels
2 Receive Channels

717 = 3 Transmit Channels
1 Receive Channel

**Product Family**
IL = Isolators

RoHS
COMPLIANT



NVE Corporation 11409 Valley View Road, Eden Prairie, MN 55344-3617 Phone: (952) 829-9217 Fax: (952) 829-9189 www.IsoLoop.com 

**ISB-DS-001-IL700V-F**
**August 2014**

**Changes**
- Increase V-Series surge voltage specification to 10 kV.
- Upgraded V-Series safety and approval from IEC 60747-5-5 (VDE 0884) to VDE 0884-10.

**ISB-DS-001-IL700V-E**
**July 2014**

**Changes**
- Increased working voltage to 1000 V and isolation voltage to 5000 V.

**ISB-DS-001-IL700V-D**
**March 2014**

**Changes**
- Removed Preliminary status.
- Revised and added details to thermal characteristic specifications (p. 2).
- Moved IEC 60601-1 compliance from "Applications" to "Safety and Approvals."
- Added "Thermal Management" paragraph in Applications section.

**ISB-DS-001-IL700V-C**
**November 2013**

**Changes**
- IEC 60747-5-5 (VDE 0884) certification.
- Added IEC 60601 compliance table.
- Upgraded from MSL 2 to MSL 1.

**ISB-DS-001-IL700V-B**
**September 2013**

**Changes**
- Added five-channel part types (IL260V/IL261V/IL262V).
- UL 1577 recognized.

**ISB-DS-001-IL700V-A**
**August 2013**

**Changes**
- Added four-channel part types (IL715V/IL716V/IL717V)
- Tightened quiescent current specifications.

**ISB-DS-001-IL711/21V-PRELIM**
**June 2013**

**Changes**
- Increased transient immunity specifications based on additional data.

**ISB-DS-001-IL711/21V-PRELIM**
**May 2013**

**Changes**
- Increased transient immunity specifications based on additional data.
- Defined IL711V and IL721V (V-Series high isolation voltage).
- Updated package drawings.
- Added recommended solder pad layouts.

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NVE Corporation 11409 Valley View Road, Eden Prairie, MN 55344-3617 Phone: (952) 829-9217 Fax: (952) 829-9189 www.IsoLoop.com 

An ISO 9001 Certified Company

NVE Corporation
11409 Valley View Road
Eden Prairie, MN 55344-3617 USA
Telephone: (952) 829-9217
Fax: (952) 829-9189
www.nve.com
e-mail: iso-info@nve.com



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*August 2014*