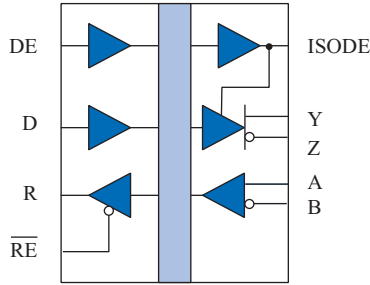# High Speed Isolated RS485/RS422 Transceiver

Functional Diagram

IL3522

IL3522 Receiver

RE	R	$V_{(A-B)}$
H	Z	X
L	H	≥ 200 mV
L	L	≤ -200 mV
L	H	Open

IL3522 Driver

DE	D	$V_{(Y-Z)}$
L	X	Z
H	H	≥ 2 V
H	L	≤ -2 V

H = High Level, L = Low Level
X = Irrelevant, Z = High Impedance

Features

- 40 Mbps data rate
- 20 ns propagation delay
- 1 ns pulse skew
- 6 kV$_{RMS}$ Reinforced Isolation / 12.8 kV surge / 1.2 kV$_{RMS}$ WV (IL3522VE)
- 50 kV/µs typ.; 30 kV/µs min. common mode transient immunity
- 3 V to 5 V power supplies
- 44000 year barrier life
- 15 kV bus ESD protection
- Low EMC footprint
- Thermal shutdown protection
- −40 °C to +85 °C temperature range
- IEC 60747-17 (VDE 0884-17):2021-10 certified; UL 1577 recognized
- 16-pin JEDEC-standard True 8™ mm SOIC packages

Applications

- Factory automation
- Industrial control networks
- Building environmental controls
- Equipment covered under IEC 61010-1 Edition 3
- 5 kV$_{RMS}$ rated IEC 60601-1 medical applications

Description

The IL3522 is a galvanically isolated, high-speed differential bus transceiver, designed for bidirectional data communication on balanced transmission lines. The device uses NVE's patented* spintronic Giant Magnetoresistance (GMR) technology.

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

The IL3522 delivers an exceptional 2.3 V differential output into a 54 Ω load over the supply range of 4.5 V to 5.5 V. This provides better data integrity over longer cable lengths, even at data rates as high as 40 Mbps. The device is also compatible with 3 V supplies, allowing interface to standard microcontrollers without additional level shifting.

Current limiting and thermal shutdown features protect against output short circuits and bus contention that may cause excessive power dissipation. Receiver inputs feature a "fail-safe if open" design, ensuring a logic high R-output if A/B are floating.

REV. U

Absolute Maximum Ratings[7]

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Storage Temperature	T_S	−55		150	°C	
Junction Temperature	T_J	−55		150	°C	
Voltage Range at any Bus Pin		−7		12	V	
Supply Voltage [1]	V_{DD1}, V_{DD2}	−0.5		7	V	
Digital Input Voltage		−0.5		$V_{DD} + 0.5$	V	
Digital Output Voltage		−0.5		$V_{DD} + 1$	V	
ESD (all bus nodes)		15			kV	HBM

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Supply Voltage	V_{DD1} V_{DD2}	3.0 4.5		5.5 5.5	V	
Ambient Operating Temperature	T_A	−40		85	°C	
Junction Temperature	T_J	−40		100	°C	
High-Level Digital Input Voltage	V_{IH}	2.4 3.0		V_{DD1}	V	$V_{DD1} = 3.3$ V $V_{DD1} = 5.0$ V
Low-Level Digital Input Voltage	V_{IL}	0		0.8	V	
Differential Input Voltage [2]	V_{ID}			+12/−7	V	
High-Level Output Current (Driver)	I_{OH}			60	mA	
High-Level Digital Output Current (Receiver)	I_{OH}			8	mA	
Low-Level Output Current (Driver)	I_{OL}	−60			mA	
Low-Level Digital Output Current (Receiver)	I_{OL}	−8			mA	
Digital Input Signal Rise and Fall Times	t_{IR}, t_{IF}	DC Stable				

Safety and Approvals

IEC 60747-17 (VDE 0884-17):2021-10:

IL3522VE version (Reinforced Isolation; VDE File Number 5016933-4880-0002)

- Working Voltage (V_{IORM}): 1200 V_{RMS} (1700 V_{PK}) with 20% Safety Factor; pollution degree 2
- Isolation voltage (V_{ISO}): 6000 V_{RMS}
- Surge immunity (V_{IOSM}): 12.8 kV_{PK}
- Surge rating: 8000 V
- Transient overvoltage (V_{IOTM}): 6000 V_{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

Standard IL3522E version (Basic Isolation; VDE File Number 5016933-4880-0001)

- Isolation voltage (V_{ISO}): 2500 V_{RMS}
- Transient overvoltage (V_{IOTM}): 4000 V_{PK}
- Surge rating: 4000 V
- Each part tested at 1590 V_{PK} for 1 second, 5 pC partial discharge limit.
- Samples tested at 4000 V_{PK} for 60 sec.; then 1358 V_{PK} for 10 sec. with 5 pC partial discharge limit.

- Working Voltage (V_{IORM}; pollution degree 2):

Package	Part No. Suffix	Working Voltage
QSOP16	-1	600 V_{RMS}
Narrow-body SOIC16	-3	700 V_{RMS}
Wide-body SOIC16/True 8™	None	600 V_{RMS}

Safety-Limiting Values	Symbol	Value	Units
Safety rating ambient temperature	T_S	180	°C
Safety rating power (180 °C)	P_S	270	mW
Supply current safety rating (total of supplies)	I_S	54	mA

UL 1577 (Component Recognition Program File Number E207481)

Standard isolation grade

2500 V rating; each part tested at 3000 V_{RMS} (4243 V_{PK}) for 1 second; each lot sample tested at 2500 V_{RMS} (3536 V_{PK}) for 1 minute.
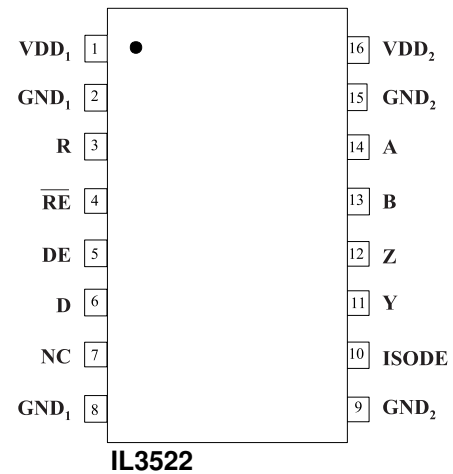
V-Series isolation grade

6 kV rating; each part tested at 7.2 kV_{RMS} (10.2 kV_{PK}) for 1 second; each lot sample tested at 6 kV_{RMS} (8485 V_{PK}) for 1 minute.

Soldering Profile

Per JEDEC J-STD-020C, MSL 1

IL3522

IL3522 Pin Connections

1	V_{DD1}	Input Power Supply
2	GND_1	Input Power Supply Ground Return (pin 2 is internally connected to pin 8)
3	R	Output Data from Bus
4	$\overline{RE}$	Read Data Enable (if $\overline{RE}$ is high, R = high impedance)
5	DE	Drive Enable
6	D	Data Input to Bus
7	NC	No Internal Connection
8	GND_1	Input Power Supply Ground Return (pin 8 is internally connected to pin 2)
9	GND_2	Output Power Supply Ground Return (pin 9 is internally connected to pin 15)
10	ISODE	Isolated DE Output for use in Profibus applications where the state of the isolated drive enable node needs to be monitored
11	Y	Y Bus (Drive – True)
12	Z	Z Bus (Drive – Inverse)
13	B	B Bus (Receive – Inverse)
14	A	A Bus (Receive – True)
15	GND_2	Output Power Supply Ground Return (pin 15 is internally connected to pin 9)
16	V_{DD2}	Output Power Supply

VDD_1 1	16 VDD_2
GND_1 2	15 GND_2
R 3	14 A
$\overline{RE}$ 4	13 B
DE 5	12 Z
D 6	11 Y
NC 7	10 ISODE
GND_1 8	9 GND_2

IL3522

Driver Section

Electrical Specifications are T_{min} to T_{max} and V_{DD} = 4.5 V to 5.5 V, unless otherwise stated.

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input Clamp Voltage	V_{IK}			−1.5	V	I_L = −18 mA
Output voltage	V_O			V_{DD}	V	I_O = 0
Differential Output Voltage[8]	$|V_{OD1}|$			V_{DD}	V	I_O = 0
Differential Output Voltage[8]	$|V_{OD2}|$	2.5	3	5	V	R_L = 54 Ω, V_{DD} = 5 V
Differential Output Voltage[8]	V_{OD3}	2.3		5	V	−7 V > V_{CM} < 12 V; R_L = 54 Ω, V_{DD} = 4.5 V
Change in Magnitude of Differential Output Voltage[4]	$\Delta|V_{OD}|$			±0.2	V	R_L = 54 Ω or 100 Ω
Common Mode Output Voltage	V_{OC}			3	V	R_L = 54 Ω or 100 Ω
Change in Magnitude of Common Mode Output Voltage[4]	$\Delta|V_{OC}|$			±0.2	V	R_L = 54 Ω or 100 Ω
Output Current	I_O			1 −0.8	mA	Output Disabled, V_O = 12 V_O = −7
High Level Input Current	I_{IH}			10	µA	V_I = 3.5 V
Low Level Input Current	I_{IL}			−10	µA	V_I = 0.4 V
Absolute |Short-circuit Output Current|	I_{OS}			250	mA	−7 V > V_O < 12 V

Receiver Section

Electrical Specifications (T_{min} to T_{max} and V_{DD} = 4.5 V to 5.5 V unless otherwise stated)						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Positive-going Input Threshold Voltage[2]	V_{IT+}			0.2	V	−7 V > V_{CM} < 12 V
Negative-going Input Threshold Voltage[2]	V_{IT-}	−0.2			V	−7 V > V_{CM} < 12 V
Hysteresis Voltage (V_{IT+} − V_{IT-})	V_{HYS}		40		mV	V_{CM} = 0 V, T = 25°C
High Level Digital Output Voltage	V_{OH}	V_{DD} − 0.2	V_{DD}		V	V_{ID} = 200 mV I_{OH} = −20 µA
Low Level Digital Output Voltage	V_{OL}			0.2	V	V_{ID} = −200 mV I_{OH} = 20 µA
High-impedance-state output current	I_{OZ}			±1	µA	V_O=0.4 to (V_{DD2}−0.5) V
Line Input Current	I_I			1	mA	V_I = 12 V
				−0.8	mA	V_I = −7 V
Input Resistance	R_I	20			kΩ	

Power Consumption

T_{min} to T_{max} and V_{DD2} = 5 V unless otherwise stated						
Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Controller-Side Quiescent Current V_{DD1} = 3.3 V V_{DD1} = 5 V	I_{DD1}		3 4	4 6	mA	f_{IN} = 0 Hz
Bus-Side Quiescent Supply Current	I_{DD2}		5	16	mA	Outputs Enabled; R_T = ∞; f_{IN} = 0 Hz
Controller-Side Dynamic Supply Current	I_{DD1}		0.22		mA/Mbps	V_{DD1} = 3.3 V
Bus-Side Dynamic Supply Current	$\Delta I_{DD2}/\Delta f_{IN}$		1			R_T = ∞
			0.8			R_T = 60 Ω

Switching Characteristics

V_{DD1} = 5 V, V_{DD2} = 5 V						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Data Rate		40			Mbps	R_L = 54 Ω, C_L = 50 pF
Propagation Delay[5]	t_{PD}		27	35	ns	V_O = −1.5 to 1.5 V, C_L = 15 pF
Pulse Skew[6]	$t_{SK}(P)$		1	6	ns	V_O = −1.5 to 1.5 V, C_L = 15 pF
Skew Limit[3]	$t_{SK}(LIM)$		2	12	ns	R_L = 54 Ω, C_L = 50 pF
Output Enable Time To High Level	t_{PZH}		15	25	ns	C_L = 15 pF
Output Enable Time To Low Level	t_{PZL}		15	25	ns	C_L = 15 pF
Output Disable Time From High Level	t_{PHZ}		15	25	ns	C_L = 15 pF
Output Disable Time From Low Level	t_{PLZ}		15	25	ns	C_L = 15 pF
Common Mode Transient Immunity (Output Logic High to Logic Low)	$|CM_H|,|CM_L|$	30	50		kV/µs	V_{CM} = 1500 V_{DC} $t_{TRANSIENT}$ = 25 ns
V_{DD1} = 3.3 V, V_{DD2} = 5 V						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Data Rate		40			Mbps	R_L = 54 Ω, C_L = 50 pF
Propagation Delay[5]	t_{PD}		30	38	ns	V_O = −1.5 to 1.5 V, C_L = 15 pF
Pulse Skew[6]	$t_{SK}(P)$		1	6	ns	V_O = −1.5 to 1.5 V, C_L = 15 pF
Skew Limit[3]	$t_{SK}(LIM)$		4	12	ns	R_L = 54 Ω, C_L = 50 pF
Output Enable Time To High Level	t_{PZH}		17	27	ns	C_L = 15 pF
Output Enable Time To Low Level	t_{PZL}		17	27	ns	C_L = 15 pF
Output Disable Time From High Level	t_{PHZ}		17	27	ns	C_L = 15 pF
Output Disable Time From Low Level	t_{PLZ}		17	27	ns	C_L = 15 pF
Common Mode Transient Immunity (Output Logic High to Logic Low)	$|CM_H|,|CM_L|$	30	50		kV/µs	V_{CM} = 1500 V_{DC} $t_{TRANSIENT}$ = 25 ns

Magnetic Field Immunity[13]

V_{DD1} = 5 V, V_{DD2} = 5 V						
Power Frequency Magnetic Immunity	H_{PF}		3500		A/m	50Hz/60Hz
Pulse Magnetic Field Immunity	H_{PM}		4500		A/m	t_p = 8µs
Damped Oscillatory Magnetic Field	H_{OSC}		4500		A/m	0.1Hz – 1MHz
Cross-axis Immunity Multiplier[14]	K_X		2.5			
V_{DD1} = 3.3 V, V_{DD2} = 5 V						
Power Frequency Magnetic Immunity	H_{PF}		1500		A/m	50Hz/60Hz
Pulse Magnetic Field Immunity	H_{PM}		2000		A/m	t_p = 8µs
Damped Oscillatory Magnetic Field	H_{OSC}		2000		A/m	0.1Hz – 1MHz
Cross-axis Immunity Multiplier[14]	K_X		2.5			

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	0.016		mm	
Barrier Resistance		R_{IO}		>10^{14}		Ω	500 V
Barrier Capacitance		C_{IO}		7		pF	f = 1 MHz
Leakage Current				0.2		µA$_{RMS}$	240 V_{RMS}, 60 Hz
Comparative Tracking Index		CTI	≥600			V_{RMS}	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}	
Surge Immunity ("V" Versions)		V_{IOSM}	12.8			kV$_{PK}$	Per IEC 61000-4-5
Barrier Life				44000		Years	100°C, 1000 V_{RMS}, 60% CL activation energy

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Junction–Ambient Thermal Resistance	θ_{JA}		67			Double-sided PCB in free air
Junction–Case (Top) Thermal Resistance	θ_{JC}		12		°C/W	
Junction–Ambient Thermal Resistance	θ_{JA}		46			2s2p PCB in free air per JESD51
Junction–Case (Top) Thermal Resistance	θ_{JC}		9			
Power Dissipation	P_D			1500	mW	

Notes:

1. All voltages are with respect to network ground except differential I/O bus voltages.

2. Differential input voltage is measured at the noninverting terminal A with respect to the inverting terminal B.

3. Skew limit is the maximum propagation delay difference between any two devices at 25°C.

4. $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from one logic state to the other.

5. Includes 10 ns read enable time. Maximum propagation delay is 25 ns after read assertion.

6. Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel.

7. Absolute Maximum specifications mean the device will not be damaged if operated under these conditions. It does not guarantee performance.

8. Differential output voltage is measured at terminal Y with respect to Z.

9. The relevant test and measurement methods are given in the Electromagnetic Compatibility section.

10. External magnetic field immunity is improved by this factor if the field direction is "end-to-end" rather than to "pin-to-pin."

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.

Power Supply Decoupling

V_{DD1} and V_{DD2} should be bypassed with 0.1 µF typical (0.047 µF minimum) capacitors as close as possible to 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. Package drawings and recommended pad layouts are included in this datasheet.

DC Correctness

The IL3522 incorporates a patented refresh circuit to maintain the correct output state with respect to data input. At power up, the bus outputs will follow the Function Table shown on Page 1. The DE input should be held low during power-up to eliminate false drive data pulses from the bus. An external power supply monitor to minimize glitches caused by slow power-up and power-down transients is not required.

Electromagnetic Compatibility

The IL3522 is fully compliant with IEC 61000-6-1 and IEC 61000-6-2 standards for immunity, and IEC 61000-6-3, IEC 61000-6-4, CISPR, and FCC Class A standards for emissions.

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:
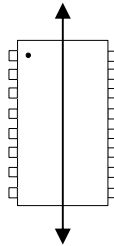
Application Information

The following figure shows typical connections to a microcontroller. The schematic includes typical termination and fail-safe resistors, and power supply decoupling capacitors:
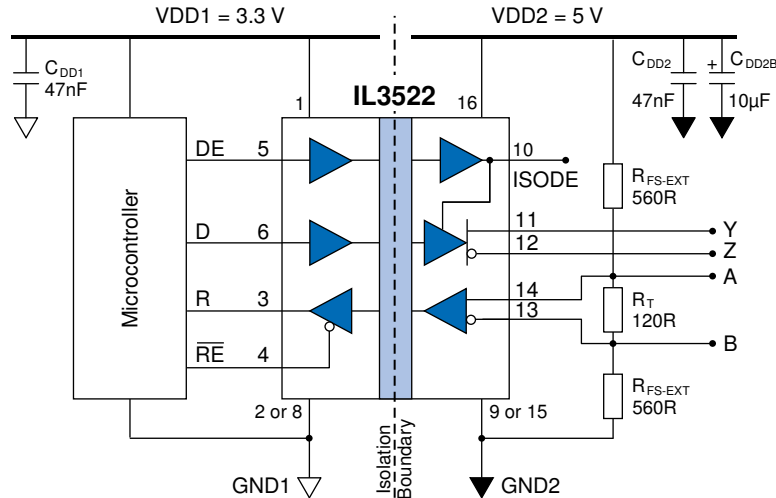
Typical IL3522 connections.

Receiver Features
The receiver includes a "fail-safe if open" function that guarantees a high level output if the receiver inputs are unconnected (floating). The receiver output "R" has tri-state capability via the active low $\overline{RE}$ input.

Driver Features
The RS-422 driver is differential output and delivers at least 1.5 V across a 54 Ω load. Drivers feature low propagation delay skew to maximize bit width and minimize EMI. Drivers have tri-state capability via the active-high DE input.

Receiver Data Rate, Cables and Terminations
The IL3522 is intended for networks up to 4,000 feet (1,200 m), but the maximum data rate decreases as cable length increases. Twisted pair cable should be used in all networks since they tend to pick up noise and other electromagnetically induced voltages as common mode signals, which are effectively rejected by the differential receivers.
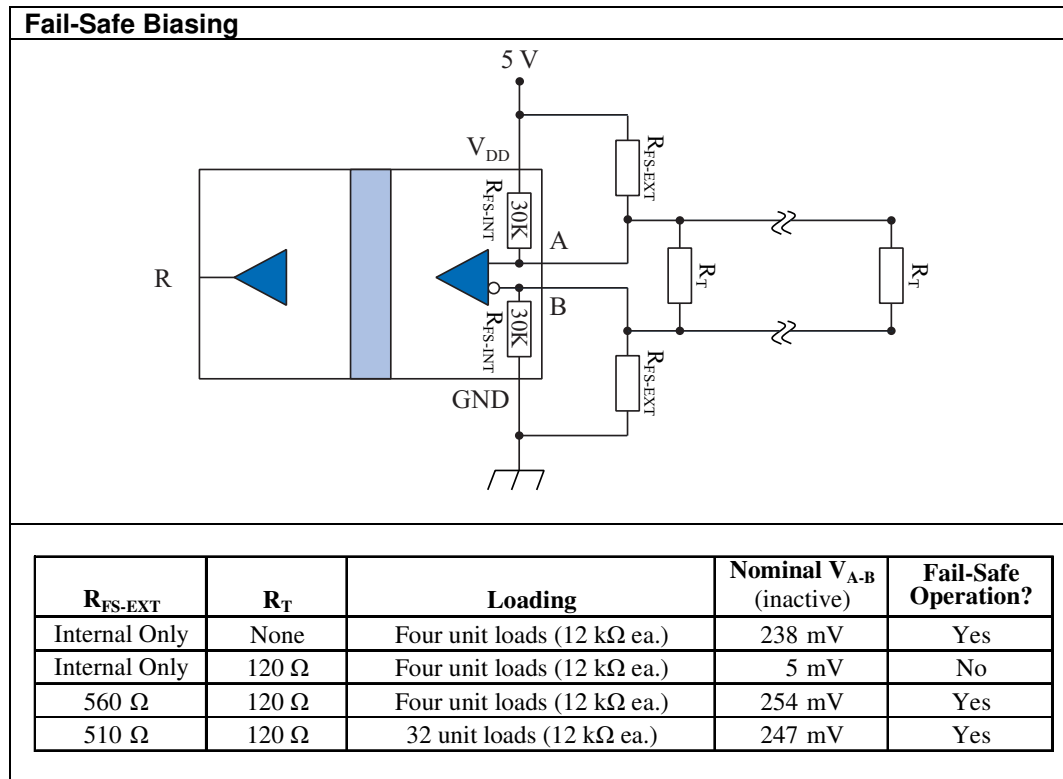
Fail-Safe Operation

"Fail-safe operation" is defined here as the forcing of a logic high state on the "R" output in response to an open-circuit condition between the "A" and "B" lines of the bus, or when no drivers are active on the bus.

Proper biasing can ensure fail-safe operation, that is a known state when there are no active drivers on the bus. IL3000-Series Isolated Transceivers include internal pull-up and pull-down resistors of approximately 30 kΩ in the receiver section ($R_{FS\text{-}INT}$; see figure below). These internal resistors are designed to ensure failsafe operation but only if there are no termination resistors. The entire V_{DD} will appear between inputs "A" and "B" if there is no loading and no termination resistors, and there will be more than the required 200 mV with up to four RS-422 worst-case Unit Loads of 12 kΩ. Many designs operating below 1 Mbps or less than 1,000 feet are unterminated. Termination resistors may not be necessary for very low data rates and very short cable runs because reflections have time to settle before data sampling, which occurs at the middle of the bit interval.

In busses with low-impedance termination resistors, however, the differential voltage across the conductor pair will be close to zero with no active drivers. In this case the state of the bus is indeterminate, and the idle bus will be susceptible to noise. For example, with 120 Ω termination resistors (R_T) on each end of the cable, and four Unit Loads (12 kΩ each), without external fail-safe biasing resistors the internal pull-up and pull-down resistors will produce a voltage between inputs "A" and "B" of only about 5 mV. This is not nearly enough to ensure a known state. External fail-safe biasing resistors ($R_{FS\text{-}EXT}$) at one end of the bus can ensure fail-safe operation with a terminated bus. Resistors should be selected so that under worst-case power supply and resistor tolerances there is at least 200 mV across the conductor pair with no active drivers to meet the input sensitivity specification of the RS-422 standard.

Using the same value for pull-up and pull-down biasing resistors maintains balance for positive- and negative going transitions. Lower-value resistors increase inactive noise immunity at the expense of quiescent power consumption. Note that each Unit Load on the bus adds a worst-case loading of 12 kΩ across the conductor pair, and 32 Unit Loads add 375 Ω worst-case loading. The more loads on the bus, the lower the required values of the biasing resistors.

In the example with two 120 Ω termination resistors and four Unit Loads, 560 Ω external biasing resistors provide more than 200 mV between "A" and "B" with adequate margin for power supply variations and resistor tolerances. This ensures a known state when there are no active drivers. Other illustrative examples are shown in the table below:

Fail-Safe Biasing

$R_{FS\text{-}EXT}$	R_T	Loading	Nominal $V_{A\text{-}B}$ (inactive)	Fail-Safe Operation?
Internal Only	None	Four unit loads (12 kΩ ea.)	238 mV	Yes
Internal Only	120 Ω	Four unit loads (12 kΩ ea.)	5 mV	No
560 Ω	120 Ω	Four unit loads (12 kΩ ea.)	254 mV	Yes
510 Ω	120 Ω	32 unit loads (12 kΩ ea.)	247 mV	Yes

Package Drawing

0.3" 16-pin SOIC Package

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

0.013 (0.3)
0.020 (0.5)

0.397 (10.08)
0.413 (10.49)

0.017 (0.43)*
0.022 (0.56)

Pin 1 identified by
either an indent
or a marked dot

0.292 (7.42)*
0.299 (7.59)

0.394 (10.00)
0.419 (10.64)
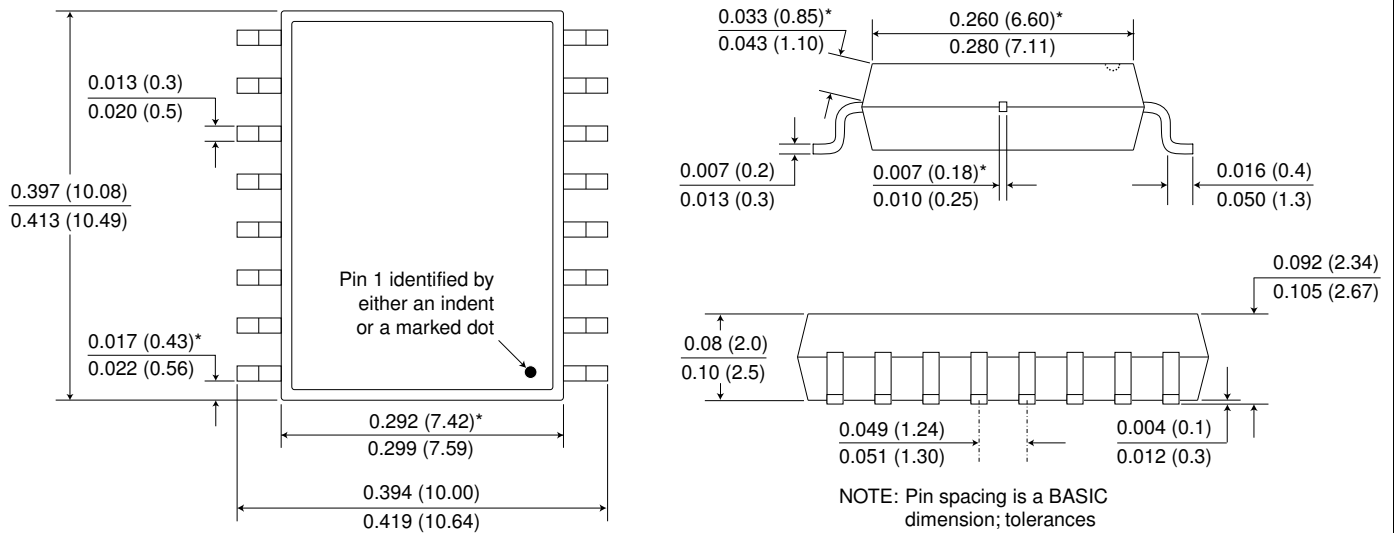
*Specified for True 8™ package to guarantee 8 mm creepage per IEC 60601.

0.033 (0.85)*
0.043 (1.10)

0.260 (6.60)*
0.280 (7.11)

0.007 (0.2)
0.013 (0.3)

0.007 (0.18)*
0.010 (0.25)

0.016 (0.4)
0.050 (1.3)

0.092 (2.34)
0.105 (2.67)

0.08 (2.0)
0.10 (2.5)

0.049 (1.24)
0.051 (1.30)

0.004 (0.1)
0.012 (0.3)

NOTE: Pin spacing is a BASIC
dimension; tolerances
do not accumulate

Recommended Pad Layout

0.15" 16-pin SOIC Pad Layout

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

0.317 (8.05)

0.050 (1.27)

0.020 (0.51)
16 PLCS

0.449 (11.40)
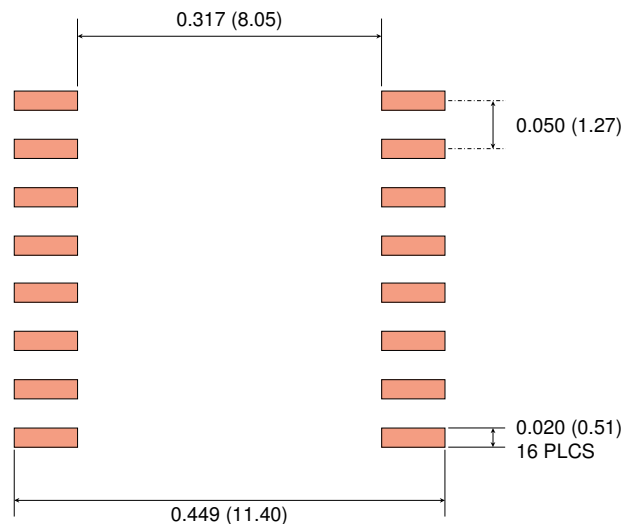
Ordering Information and Valid Part Numbers

IL 35 22 V E TR13

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

Package
Blank = 80/20 Sn/Pb Plating
E = RoHS Compliant

Isolation Grade
Blank = 2.5 kV Isolation
V = 6 kV Isolation

Channel Configuration
22 = RS-422

Base Part Number
35 = Digital-In, 40 Mbps Transceiver

Product Family
IL = Isolators
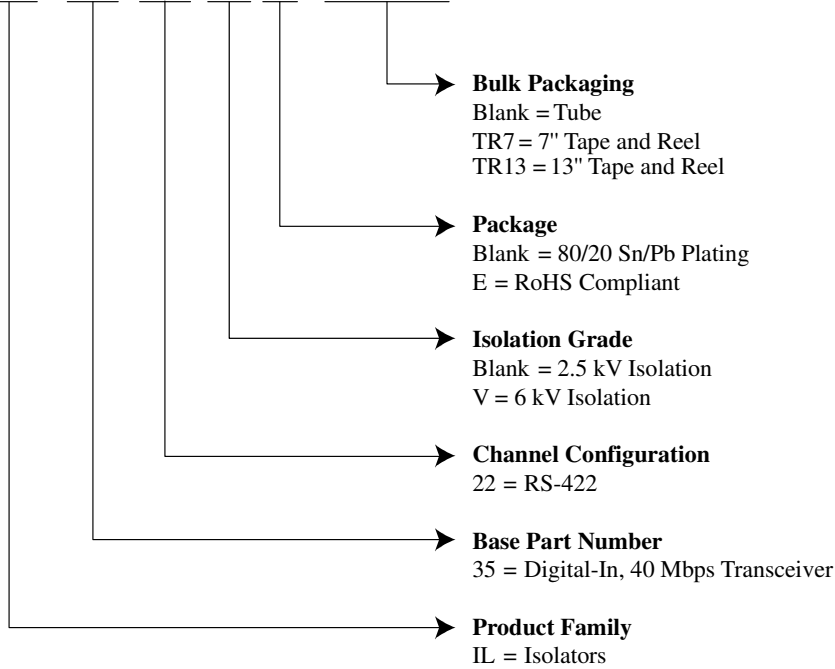
Valid Part Numbers
IL3522
IL3522E
IL3522TR7
IL3522ETR7
IL3522TR13
IL3522ETR13

IL3522VE
IL3522VETR7
IL3522VETR13

RoHS
COMPLIANT

Revision History

ISB-DS-001-IL3522-U **August 2023**	• Added 7-inch reel option (IL3522E-TR7; p.12).
ISB-DS-001-IL3522-T **August 2022**	• Upgraded to IEC 60747-17 (VDE 0884-17):2021-10 certification (p. 3). • Increased Working Voltage ratings based on latest VDE testing (p. 3). • Separate power consumption specifications section; added dynamic power consumption (p. 5). • Updated EMC standards. • Deleted minimum magnetic field immunity specifications (p. 6) since it is not 100% tested. • Added thermal characteristics (p. 7).
ISB-DS-001-IL3522-S	• Updated VDE Reinforced Isolation file number and description.
ISB-DS-001-IL3522-R	• Updated VDE certification standard to VDE V 0884-10. • Upgraded "V" Version Surge Immunity specification to 12.8 kV. • Upgraded "V" Version VDE 0884-10 rating to reinforced insulation.
ISB-DS-001-IL3522-Q	• Increased V-Series isolation voltage to 6 kV$_{RMS}$. • Increased typ. Total Barrier Thickness specification to 0.016 mm. • Increased CTI min. specification to ≥600 V$_{RMS}$.
ISB-DS-001-IL3522-P	• 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-IL3522-O	• Added V-Series versions (5 kVrms isolation / 1000 Vrms working voltage).
ISB-DS-001-IL3522-N	• IEC 60747-5-5 (VDE 0884) certification. • Upgraded from MSL 2 to MSL 1.
ISB-DS-001-IL3522-M	• Increased transient immunity specifications based on additional data. • Added VDE 0884 pending. • Added transient immunity specifications. • Added high voltage endurance specification. • Increased magnetic immunity specifications. • Updated package drawings. • Added recommended solder pad layouts.
ISB-DS-001-IL3522-L	• Changed title to "Very High Speed Isolated RS485/RS422 Transceiver." • Detailed isolation and barrier specifications. • Cosmetic changes.

Datasheet Limitations

The information and data provided in datasheets shall define the specification of the product as agreed between NVE and its customer, unless NVE and customer have explicitly agreed otherwise in writing. All specifications are based on NVE test protocols. In no event however, shall an agreement be valid in which the NVE product is deemed to offer functions and qualities beyond those described in the datasheet.

Limited Warranty and Liability

Information in this document is believed to be accurate and reliable. However, NVE does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NVE be liable for any indirect, incidental, punitive, special or consequential damages (including, without limitation, lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Right to Make Changes

NVE reserves the right to make changes to information published in this document including, without limitation, specifications and product descriptions at any time and without notice. This document supersedes and replaces all information supplied prior to its publication.

Use in Life-Critical or Safety-Critical Applications

Unless NVE and a customer explicitly agree otherwise in writing, NVE products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical devices or equipment. NVE accepts no liability for inclusion or use of NVE products in such applications and such inclusion or use is at the customer's own risk. Should the customer use NVE products for such application whether authorized by NVE or not, the customer shall indemnify and hold NVE harmless against all claims and damages.

Applications

Applications described in this datasheet are illustrative only. NVE makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NVE products, and NVE accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NVE product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customers. Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NVE does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customers. The customer is responsible for all necessary testing for the customer's applications and products using NVE products in order to avoid a default of the applications and the products or of the application or use by customer's third party customers. NVE accepts no liability in this respect.

Limiting Values

Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the recommended operating conditions of the datasheet is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and Conditions of Sale

In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NVE hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NVE products by customer.

No Offer to Sell or License

Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export Control

This document as well as the items described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Automotive Qualified Products

Unless the datasheet expressly states that a specific NVE product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NVE accepts no liability for inclusion or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NVE's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NVE's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NVE for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NVE's standard warranty and NVE's product specifications.

An ISO 9001 Certified Company

NVE Corporation
11409 Valley View Road
Eden Prairie, MN 55344-3617 USA
Telephone: (952) 829-9217

www.nve.com
e-mail: iso-info@nve.com

ISB-DS-001-IL3522-U

August 2023