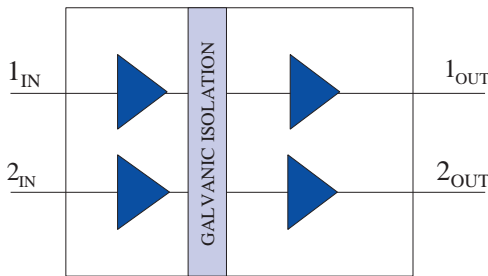
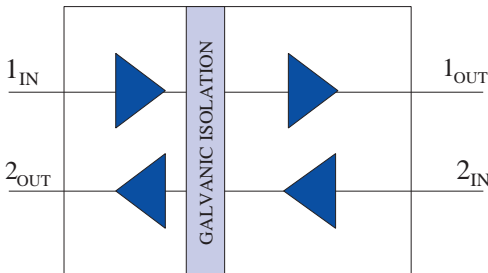


Dual Digital Isolator for Communications Applications

Functional Diagram



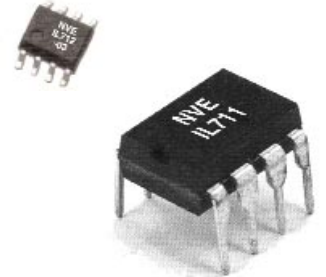
IL711



IL712

Features

- +5V and +3.3V CMOS Compatible
- 2500V_{RMS} Isolation
- 2 ns Typical Pulse Width Distortion
- 10 ns Typical Propagation Delay
- 30 kV/μs Typical Transient Immunity
- High Speed: 100 MBaud
- 8-pin PDIP and 8-pin SOIC Packages
- UL1577 Approved (File # E207481)



Applications

- Isolated Data Transmission
- Isolated ADCs and DACs
- Fieldbus Isolation
- High Speed Digital Systems
- Computer Peripheral Interfaces
- Logic Level Shifting

Description

The IL711 and IL712 offer the user a level of true logic integration in an isolation product not previously available. The high speed digital isolators are configured as dual unidirectional in the IL711, and as a bi-directional pair in the IL712. Both devices are integrated with patented* *IsoLoop*® technology giving them an excellent transient immunity specification. The symmetric magnetic coupling barrier gives these devices a propagation delay of only 10ns and a pulse width distortion of 2 ns.

Both the IL711 and the IL712 have 100Mbaud data rates at 30% PWD which are independent of direction, i.e. the IL712 operates in full duplex mode making it ideal for CAN bus applications. PROFIBUS / RS485 configurations are achieved by combinations of IL710 and the IL711 or IL712, either combination meeting the overall propagation delay requirements of the specification. Available in 8-pin PDIP and 8-pin SOIC packages, the IL711 and IL712 are specified over the temperature range of -40°C to +100°C without any derating in performance.

IsoLoop® is a registered trademark of NVE, Inc.
* US Patent number 5,831,426 and others

IL711/712 ^{IsoLoop®}

Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Units
Storage Temperature	T_S	-55	175	°C
Ambient Operating Temperature ⁽¹⁾	T_A	-55	125	°C
Supply Voltage	V_{DD1}, V_{DD2}	-0.5	7	Volts
Input Voltage	V_I	-0.5	$V_{DD1}+0.5$	Volts
Output Voltage	V_O	-0.5	$V_{DD2}+0.5$	Volts
Average Output Current	I_O		10	mAmps
Lead Solder Temperature (10s)			260	°C
ESD	2kV Human Body Model			

Insulation Specifications

Parameter	Condition	Min.	Typ.	Max.	Units
Rated Voltage, 1 minute	60Hz	2500			V_{RMS}
Partial Discharge, 100% Tested	1s, 5pC	2000			V_{RMS}
Creepage Distance (External)		7.036 (PDIP) 4.026 (SOIC)			mm
Leakage Current	240 V_{RMS} 60Hz		0.1		μ Amps

Recommended Operating Conditions

Parameters	Symbol	Min.	Max.	Units
Ambient Operating Temperature	T_A	-40	100	°C
Supply Voltage	V_{DD1}, V_{DD2}	3.0	5.5	Volts
Logic High Input Voltage	V_{IH}	$0.8V_{DD1}$	V_{DD1}	Volts
Logic Low Input Voltage	V_{IL}	0	0.8	Volts
Input Signal Rise and Fall Times	t_{IR}, t_{IF}		1	μ sec

Package Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Input-Output Momentary ^(5,6) Withstand voltage	V_{ISO}	3750			V_{DC}	RH<50%, t= 1min., $T_A=25^\circ\text{C}$
Capacitance (Input-Output) ⁽⁵⁾	C_{I-O}		2		pF	f= 1MHz
Input IC Junction-to-Case (PDIP)	θ_{JCT}		150		°C/W	Thermocouple located at center underside of package
Thermal Resistance (SOIC)	θ_{JCT}		240		°C/W	
Package Power Dissipation	P_{PD}			150	mW	

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Electrical Specifications

Electrical Specifications are T_{min} to T_{max} unless otherwise stated.

Parameter	Symbol	Min.		Typ.		Max.		Units	Test Conditions
		3.3V	5V	3.3V	5V	3.3V	5V		
DC Specifications									
Input Quiescent Supply Current	IL711 IL712 I_{DD}			9 2.2	12 3	14 3.3	20 5	μ A mA	
Output Quiescent Supply Current	IL711 IL712 I_{DD2}			3.6 2.2	5.5 3	6.6 3.3	10 5	mA mA	
Logic Input Current	I_I		-10				10	μ A	
Logic High Output Voltage	V_{OH}		$V_{DD}-0.1$ $0.8*V_{DD}$		V_{DD} $V_{DD}-0.5$			V	$I_O = -20 \mu A, V_I = V_{IH}$ $I_O = -4 mA, V_I = V_{IH}$
Logic Low Output Voltage	V_{OL}				0 0.5		0.1 0.8	V	$I_O = 20 \mu A, V_I = V_{IL}$ $I_O = 4 mA, V_I = V_{IL}$
Switching Specifications									
Clock Frequency	f_{MAX}						50 50	MHz	$C_L = 15 pF$
Data Rate							100 100	MBd	$C_L = 15 pF$
Pulse Width ⁽²⁾	PW	10	10					ns	
Propagation Delay Input to Output (High to Low)	t_{PHL}				12 10		18 15	ns	$C_L = 15 pF$
Propagation Delay Input to Output (Low to High)	t_{PLH}				12 10		18 15	ns	$C_L = 15 pF$
Pulse Width Distortion ⁽²⁾ $t_{PHL} - t_{PLH}$	PWD				2 2		3 3	ns	$C_L = 15 pF$
Propagation Delay Skew ⁽³⁾	t_{PSK}				4 4		6 6	ns	$C_L = 15 pF$
Output Rise Time (10-90%)	t_R				2 1		5 3	ns	$C_L = 15 pF$
Output Fall Time (10-90%)	t_F				2 1		5 3	ns	$C_L = 15 pF$
Transient Immunity (Output Logic High or Logic Low) ⁽⁴⁾	CMH CML	20	20		30 30			kV/ μ s	$V_{cm} = 300V$
Channel to Channel Skew	T_{CSK}				2 2		3 3	ns	$C_L = 15 pF$

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.

IL711/712^{IsoLoop®}

Notes:

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 the PWD divided by the pulse width.
3. t_{PSK} is equal to the magnitude of the worst case difference in t_{PHL} and/or t_{PLH} that will be seen between units at 25°C.
4. CM_H is the maximum common mode voltage slew rate that can be sustained while maintaining $V_O > 0.8 V_{DD}$. 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. Input–Output Momentary Withstand Voltage is a dielectric voltage and should not be interpreted as an input–output continuous voltage.

Application Notes:

Power Consumption

The IL711 and IL712 achieve their low power consumption from the manner by which they transmits data across their isolation barriers. By detecting the edge transitions of the input logic signal and converting this to a narrow current pulse which drives the isolation barrier, the isolator then latches the input logic state in the output latch. Since the current pulses are narrow, about 2.5 ns wide, the power consumption is independent of mark-to-space ratio and solely dependent on frequency. This has obvious advantages over optocouplers whose power consumption is heavily dependent on its on state and frequency. The static power consumption for the IL711 and IL712 in either state approaches the CMOS quiescent value.

Power Supplies

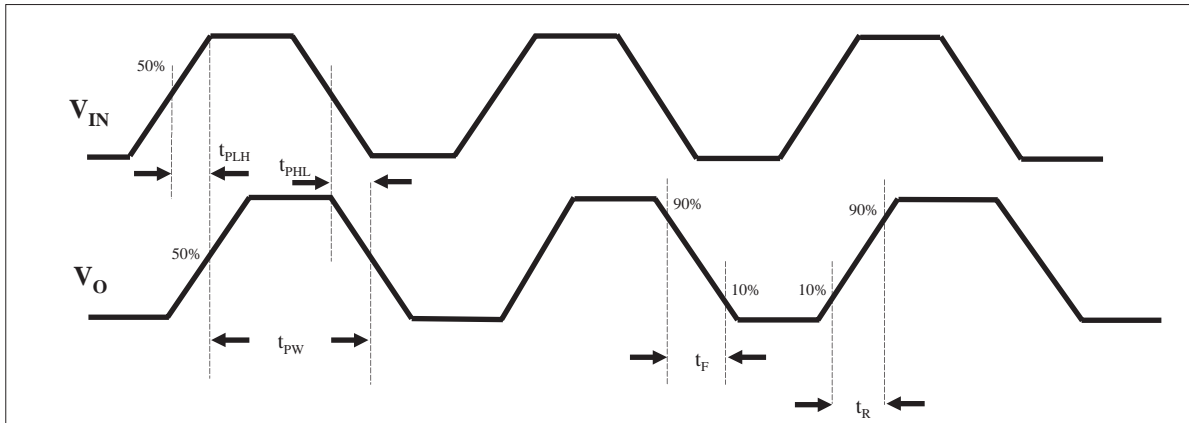
Because the IL711 and IL712 operate internally by using narrow current pulses, it is recommended that low ESR ceramic capacitors be used to decouple the supplies. 47nF capacitors should be placed as close to the device as possible between V_{DD1} and GND_1 as well as between V_{DD2} and GND_2 .

Signal Status on Start-up and Shut Down

To minimize power dissipation, the input signals to the IL711 and IL712 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. Therefore, the designer should consider the inclusion of an initialization signal in his start–up circuit.

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Timing Diagram

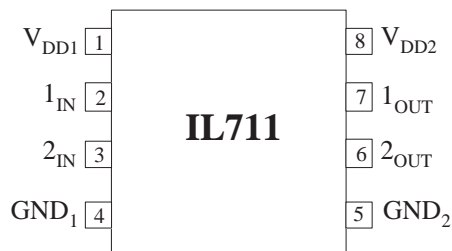


Legend

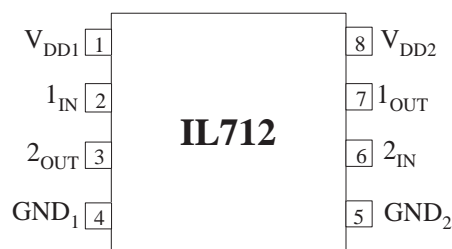
t_{PLH}	Propagation Delay, Low to High
t_{PHL}	Propagation Delay, High to Low
t_{PW}	Minimum Pulse Width
t_R	Rise Time
t_F	Fall Time

Pin Connections

1	V_{DD1}	Input Power Supply
2	1_{IN}	Channel 1 Logic Input Signal
3	2_{IN}	Channel 2 Logic Input Signal
4	GND_1	Input Power Supply Ground
5	GND_2	Output Power Supply Ground
6	2_{OUT}	Channel 2 Logic Output Signal
7	1_{OUT}	Channel 1 Logic Output Signal
8	V_{DD2}	Output Power Supply

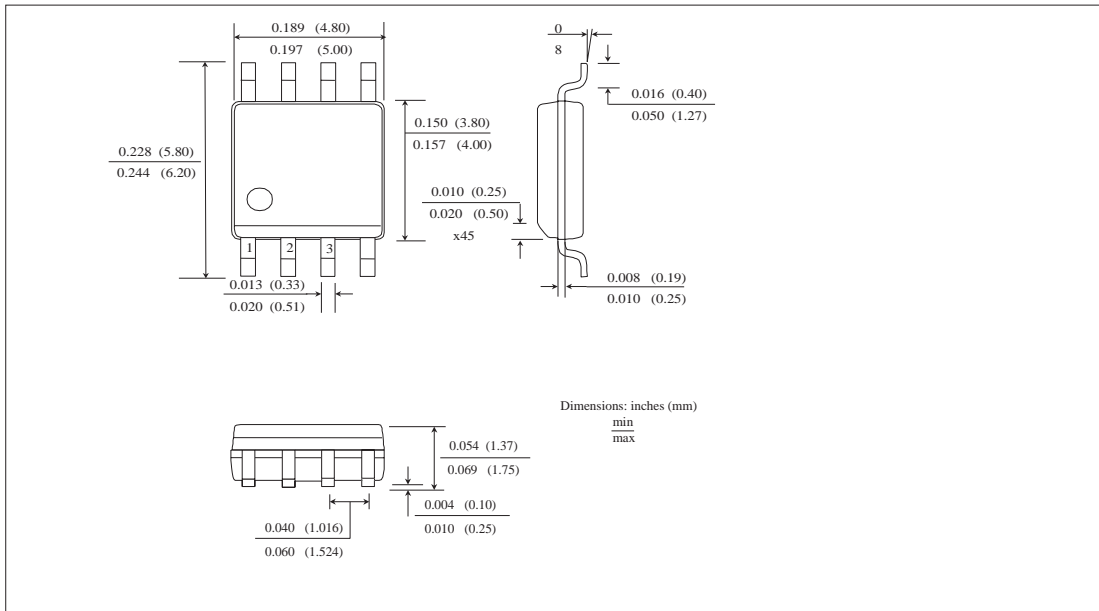


1	V_{DD1}	Input Power Supply
2	1_{IN}	Channel 1 Logic Input Signal
3	2_{OUT}	Channel 2 Logic Output Signal
4	GND_1	Input Power Supply Ground
5	GND_2	Output Power Supply Ground
6	2_{IN}	Channel 2 Logic Input Signal
7	1_{OUT}	Channel 1 Logic Output Signal
8	V_{DD2}	Output Power Supply

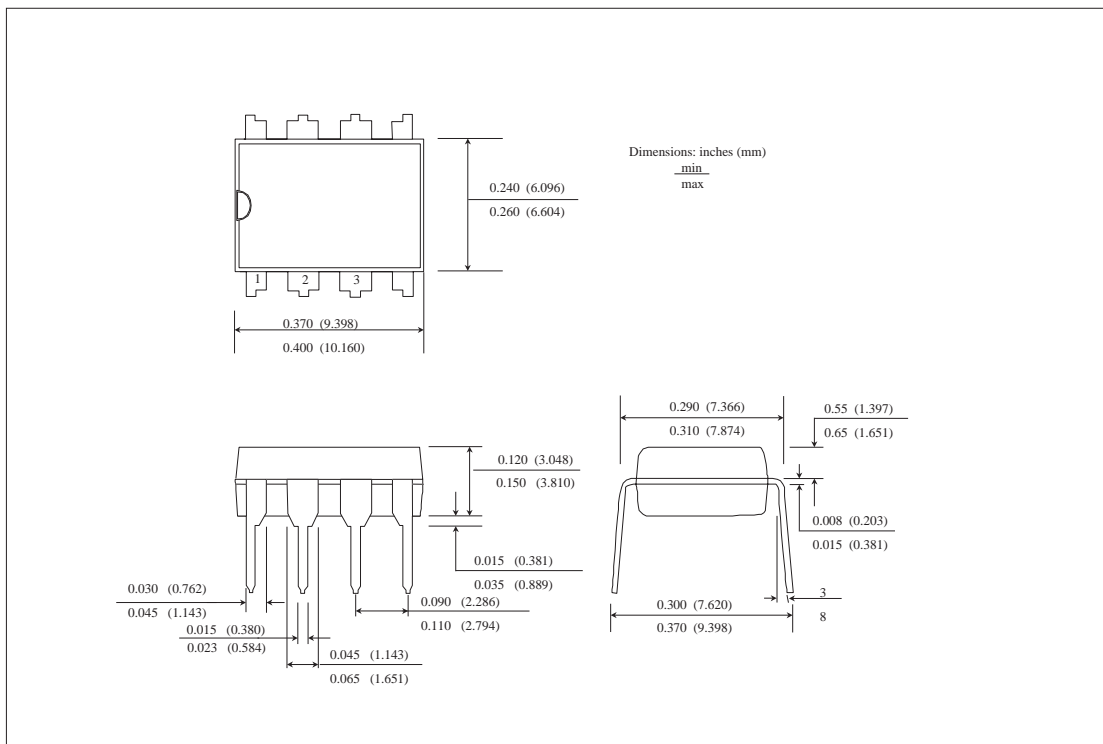


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IL711-3 and IL712-3 (Small Outline SOIC-8 package)



IL711-2 and IL712-2 (8-Pin PDIP Package)

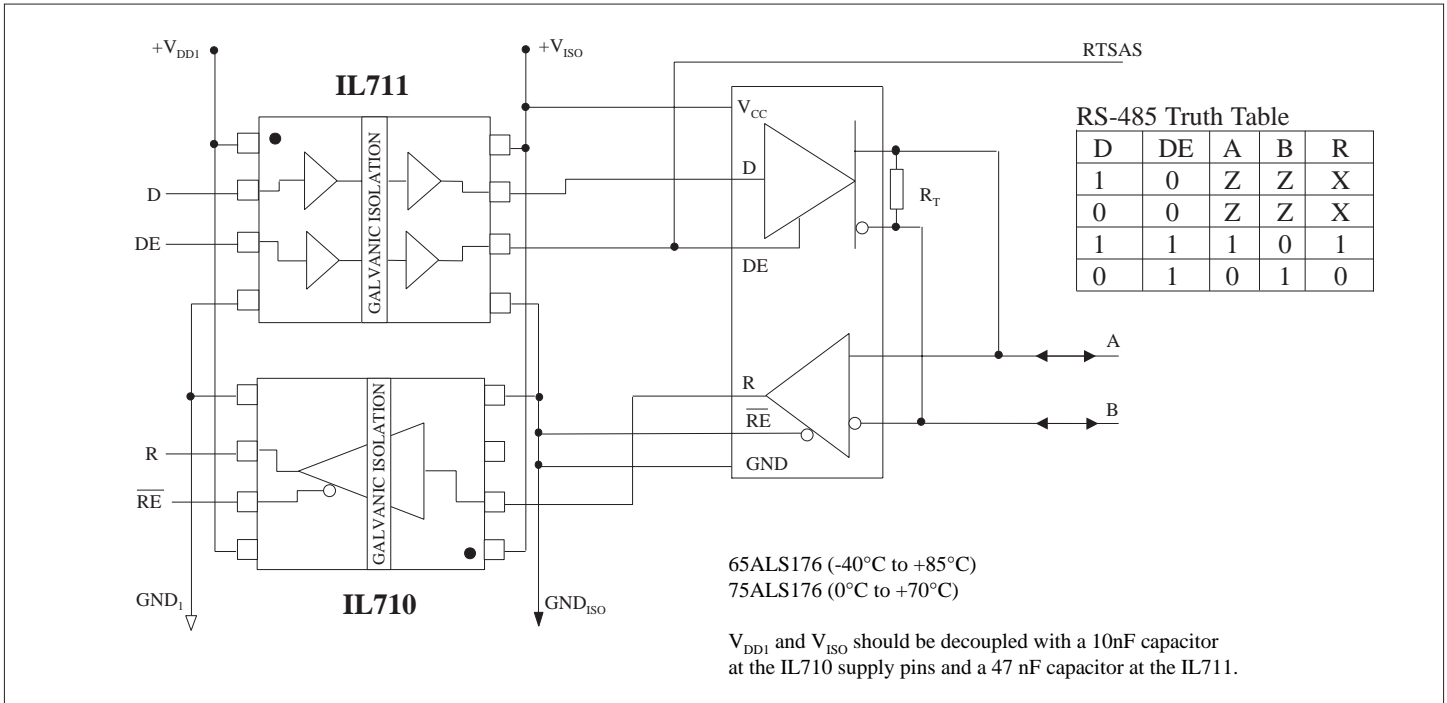


Ordering Information: Order parts per the above numbers.

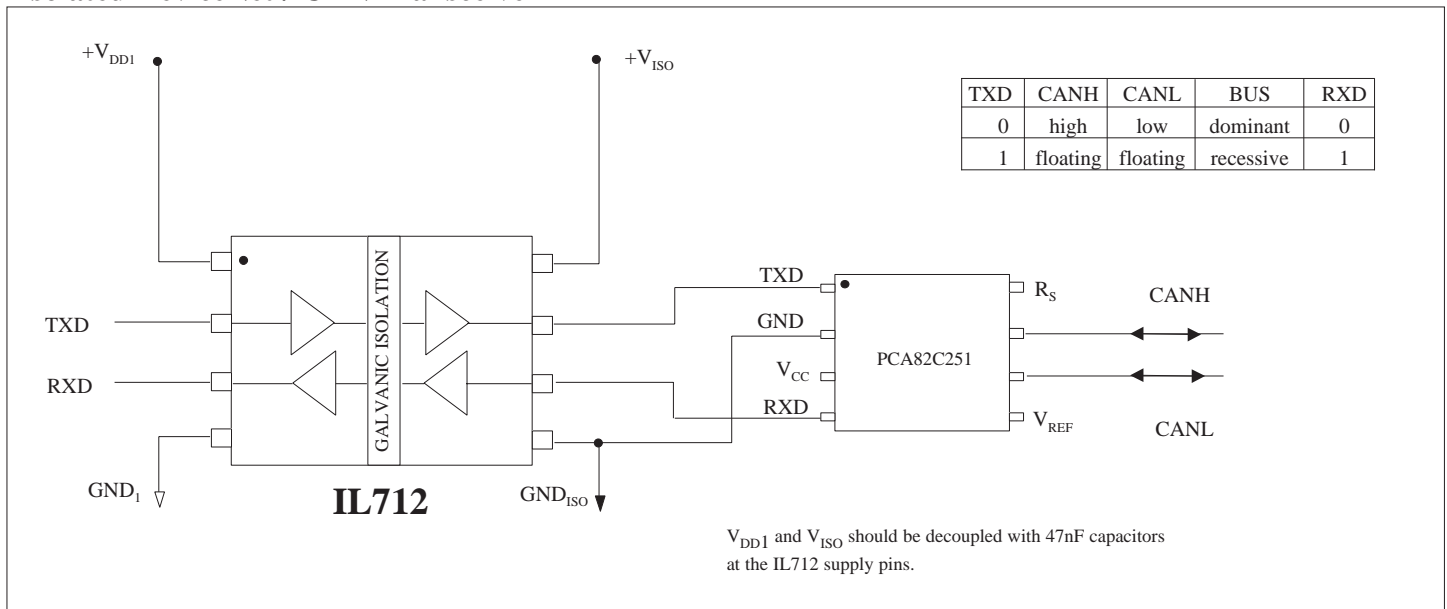
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Applications

Isolated PROFIBUS / RS-485



Isolated DeviceNet / CAN Transceiver





About NVE Corporation

An ISO 9001 Certified Company

NVE is a high technology components manufacturer having the unique capability to combine leading edge Giant Magnetoresistive (GMR) materials with integrated circuits to make novel electronic components. Products include Magnetic Field Sensors, Magnetic Field Gradient Sensors (Gradiometer), Digital Magnetic Field Sensors, Digital Signal Isolators and Isolated Bus Transceivers.

NVE is a leader in GMR research and in 1994 introduced the world's first products using GMR material, a line of GMR magnetic field sensors that can be used for position, magnetic media, wheel speed and current sensing.

NVE is located in Eden Prairie, Minnesota, a suburb of Minneapolis. Please visit our Web site at www.nve.com or call 952-829-9217 for information on products, sales or distribution.

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Specifications shown are subject to change without notice.

ISB-DS-001-IL711/2-B

