5.7 kV RMS/3.0 kV RMS Dual Digital Isolators

FEATURES

- High common-mode transient immunity: 180 kV/µs typical
- High robustness to radiated and conducted noise
- Low propagation delay
  - 6.2 ns typical (10 ns maximum) for 5 V operation
- Low dynamic power consumption, <1.65 mA/ch at 1 Mbps
- 2.25 V to 5.5 V level translation
- 150 Mbps maximum guaranteed data rate
- High temperature operation: 125°C
- Safety and regulatory approvals
  - DIN EN IEC 60747-17 (VDE 0884-17)
    - V_{IORM} = 636 V peak, SOIC_N (R-8)
    - V_{IORM} = 1173 V peak, SOIC_IC (RI-8-1)
  - UL 1577
    - V_{ISO} = 3000 V rms for 1 minute, SOIC_N (R-8)
    - V_{ISO} = 5700 V rms for 1 minute, SOIC_IC (RI-8-1)
  - IEC/EN/CSA 62368-1
  - IEC/CSA 61010-1
  - IEC/CSA 60601-1
  - CQC GB4943.1
- ±8 kV IEC 61000-4-2 ESD protection across isolation barrier
- ±4 kV HBM ESD protection on input/output pins
- Fail-safe high (N1) or low (N0) options
- SOIC_N Backward compatibility with
  - ADuM1200/ADuM1201/ADuM1210/ADuM1211
  - ADuM3200/ADuM3201/ADuM3210/ADuM3211
  - ADuM120N/ADuM121N
- AEC-Q100 qualified for automotive applications
- Operating temperature range: −40°C to +125°C

APPLICATIONS

- Inverters
- Power supplies
- Industrial field bus isolation
- PWM controller signal isolation
- General-purpose multichannel isolation

GENERAL DESCRIPTION

The ADuM320N/ADuM321N[1] are dual-channel digital isolators based on Analog Devices, Inc., *i*Coupler® technology. Combining high speed, complementary metal-oxide semiconductor (CMOS) and monolithic air core transformer technology, these isolation components provide outstanding performance characteristics and meet CISPR 32/EN 55032 Class B limits at 5 Mbps. The maximum propagation delay is 10 ns with a pulse width distortion of less than 3 ns at 5 V operation. Channel matching is hard at 3.0 ns maximum.

The ADuM320N/ADuM321N data channels are independent and are available in a variety of configurations with a withstand voltage rating of 5.7 kV RMS and 3.0 kV RMS (for more information, see the Ordering Guide section). The devices operate with the supply voltage on either side ranging from 2.25 V to 5.5 V, providing compatibility with lower voltage systems as well as enabling voltage translation functionality across the isolation barrier.

Two different fail-safe options are available, by which the outputs transition to a predetermined state when the input power supply is not applied.

FUNCTIONAL BLOCK DIAGRAMS

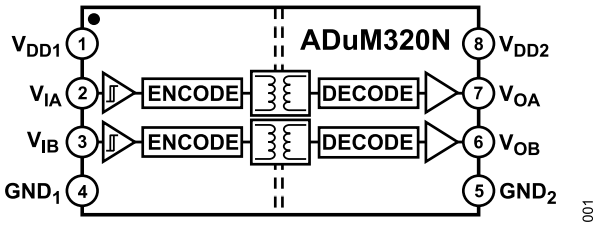

Figure 1. ADuM320N Functional Block Diagram

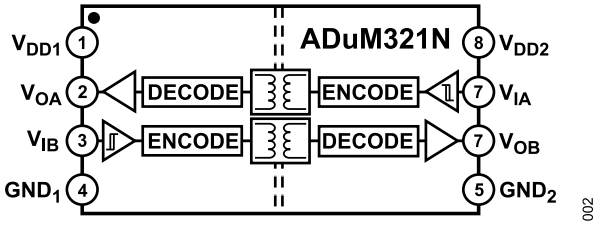

Figure 2. ADuM321N Functional Block Diagram

[1] Protected by U.S. Patents 5,952,849; 6,873,065; 6,903,578; and 7,075,329. Other patents are pending.

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REVISION HISTORY

12/2025—Rev. D to Rev. E

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Changes to Table 8 ... 11
Moved Figure 4 ... 12
Deleted Package Characteristics Section, Table 9, and Table 10; Renumbered Sequentially ... 12
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Deleted DIN EN IEC 60747-17 (VDE 0884-17) Insulation Characteristics (Pending) Section, Table 13, and Table 14 ... 13
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Added Thermal Characteristics Section and Table 14; Renumbered Sequentially ... 14
Added Thermal Analysis Section ... 19
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Deleted Surface Tracking Section, Insulation Wear Out Section, Calculation and Use of Parameters Example Section, and Figure 20; Renumbered Sequentially ... 20

9/2024—Rev. C to Rev. D

Changes to Features Section ... 1
Changes to Table 7 and Table 8 ... 10
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Changed DIN V VDE V 0884-11 (VDE V 0884-11) Insulation Characteristics (Pending) Section to DIN EN IEC 60747-17 (VDE 0884-17) Insulation Characteristics (Pending) Section ... 13
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2/2024—Rev. B to Rev. C

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12/2023—Rev. A to Rev. B

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9/2023—Rev. 0 to Rev. A

7/2023—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

5 V Operation

All typical specifications are at T_A = 25°C, V_{DD1} = V_{DD2} = 5 V. Minimum/maximum specifications apply over the entire recommended operation range of 4.5 V ≤ V_{DD1} ≤ 5.5 V, 4.5 V ≤ V_{DD2} ≤ 5.5 V, and −40°C ≤ T_A ≤ +125°C, unless otherwise noted. Switching specifications are tested with C_L = 15 pF and CMOS signal levels, unless otherwise noted. Supply currents are specified with 50% duty cycle signals.

Table 1. Electrical Characteristics (5 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
SWITCHING SPECIFICATIONS						
Pulse Width	PW	6.6			ns	Within pulse width distortion (PWD) limit
Data Rate		150			Mbps	Within PWD limit
Propagation Delay	t_{PHL}, t_{PLH}		6.2	10	ns	50% input to 50% output
Pulse Width Distortion	PWD		0.3	3	ns	$\lvert t_{PLH} - t_{PHL} \rvert$
Change vs. Temperature			1.5		ps/°C	
Propagation Delay Skew	t_{PSK}			6.1	ns	Between any two units at the same temperature, voltage, and load
Channel Matching						
Codirectional	t_{PSKCD}		0.3	3.0	ns	
Opposing Direction	t_{PSKOD}		0.3	3.0	ns	
Jitter[1]						For more information, see the Jitter Measurement section
Random Jitter, RMS (1σ)[2]	$t_{JIT(RJ)}$		4.6		ps	1 MHz clock input, all channels switching
Deterministic Jitter, Peak-to-Peak[3, 4]	$t_{JIT(DJ)}$		96		ps	100 Mbps, 2^{15} − 1 PRBS
Total Jitter, Peak-to-Peak, at Bit Error Rate (BER) 1 x 10^{-12}	$t_{JIT(TJ)}$					100 Mbps, 2^{15} − 1 PRBS input[5]
Without Crosstalk			149		ps	Single channel switching
With Crosstalk			238		ps	All channels switching
DC SPECIFICATIONS						
Input Threshold Voltage						V_{Ix}, V_{Ex}
Logic High	V_{IH}	0.7 × V_{DDx}			V	
Logic Low	V_{IL}			0.3 × V_{DDx}	V	
Input Hysteresis	V_{HYS}		0.85		V	V_{IH} − V_{IL}
Output Voltage						
Logic High	V_{OH}	V_{DDx} − 0.1	V_{DDx}		V	I_{Ox}[6] = −20 μA, V_{Ix} = V_{IxH}[7]
		V_{DDx} − 0.4	V_{DDx} − 0.2		V	I_{Ox}[6] = −4 mA, V_{Ix} = V_{IxH}[7]
Logic Low	V_{OL}		0.0	0.1	V	I_{Ox}[6] = 20 μA, V_{Ix} = V_{IxL}[8]
			0.2	0.4	V	I_{Ox}[6] = 4 mA, V_{Ix} = V_{IxL}[8]
Input Current per Channel	I_I	−10	+0.01	+10	μA	0 V ≤ V_{Ix} ≤ V_{DDx}, 0 V ≤ V_{Ex} ≤ V_{DDx}
Quiescent Supply Current						
ADuM320N						
	$I_{DD1 (Q)}$		0.41	0.6	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.84	1.4	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD1 (Q)}$		3.62	5.3	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		1.65	2.5	mA	V_I[9] = 1 (N0), 0 (N1)[10]
ADuM321N						
	$I_{DD1 (Q)}$		0.63	1.0	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.63	1.0	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD1 (Q)}$		2.66	3.8	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		2.68	3.8	mA	V_I[9] = 1 (N0), 0 (N1)[10]
Dynamic Supply Current						

SPECIFICATIONS

Table 1. Electrical Characteristics (5 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
Dynamic Input	$I_{DDI (D)}$		0.011		mA/Mbps	Inputs switching, 50% duty cycle
Dynamic Output	$I_{DDO (D)}$		0.029		mA/Mbps	Inputs switching, 50% duty cycle
Undervoltage Lockout	UVLO					
Positive V_{DDx} Threshold	V_{DDxUV+}		2.0	2.2	V	Rising supply voltage enable threshold
Negative V_{DDx} Threshold	V_{DDxUV-}	1.7	1.8		V	Falling supply voltage lockout threshold
V_{DDx} Hysteresis	V_{DDxUVH}		0.2		V	UVLO hysteresis
UVLO Recovery Time[11]	t_{UVLO}			60	µs	UVLO release delay after V_{UVLO+} threshold
AC SPECIFICATIONS						
Output Rise/Fall Time	t_R/t_F		2.5		ns	10% to 90%
Common-Mode Transient Immunity[12]	$\|CM_H\|$	100	180		kV/µs	$V_{Ix} = V_{DDx}$, V_{CM} = 1000 V, transient magnitude = 800 V
	$\|CM_L\|$	100	180		kV/µs	V_{Ix} = 0 V, V_{CM} = 1000 V, transient magnitude = 800 V

1 Jitter parameters are guaranteed by design and characterization. Values do not include stimulus jitter.

2 This specification is measured over a population of ~100,000 edges.

3 Peak-to-peak jitter specifications include jitter due to PWD.

4 This specification is measured over a population of ~300,000 edges.

5 Using the following formula: $t_{JIT(TJ)} = 14 \times t_{JIT(RJ)} + t_{JIT(DJ)}$.

6 I_{Ox} is the channel x output current, where x = A, or B.

7 V_{IxH} is the input side logic high.

8 V_{IxL} is the input side logic low.

9 V_I is the voltage input.

10 N0 is the ADuM320N0/ADuM321N0 models, and N1 is the ADuM320N1/ADuM321N1 models. For more information, see the Ordering Guide section.

11 Guaranteed by design and not subject to production test.

12 $|CM_H|$ is the maximum common-mode voltage slew rate that can be sustained while maintaining the voltage-output (V_O) > 0.8 V_{DDx}. $|CM_L|$ is the maximum common-mode voltage slew rate 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.

Table 2. Total Supply Current vs. Data Throughput (5 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
SUPPLY CURRENT						
ADuM320N						
1 Mbps						
Supply Current Side 1	I_{DD1}		2.0	2.9	mA	
Supply Current Side 2	I_{DD2}		1.3	1.9	mA	C_L = 0 nF
25 Mbps						
Supply Current Side 1	I_{DD1}		2.2	3.2	mA	
Supply Current Side 2	I_{DD2}		2.0	3.0	mA	C_L = 0 nF
100 Mbps						
Supply Current Side 1	I_{DD1}		3.1	4.2	mA	
Supply Current Side 2	I_{DD2}		4.2	6.7	mA	C_L = 0 nF
ADuM321N						
1 Mbps						
Supply Current Side 1	I_{DD1}		1.6	2.3	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		1.6	2.3	mA	C_L = 0 nF
25 Mbps						
Supply Current Side 1	I_{DD1}		2.1	3.0	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		2.1	3.0	mA	C_L = 0 nF
100 Mbps						

SPECIFICATIONS

Table 2. Total Supply Current vs. Data Throughput (5 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Current Side 1	I_{DD1}		3.7	5.5	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		3.7	5.5	mA	C_L = 0 nF

3.3 V Operation

All typical specifications are at T_A = 25°C, V_{DD1} = V_{DD2} = 3.3 V. Minimum/maximum specifications apply over the entire recommended operation range of 3.0 V ≤ V_{DD1} ≤ 3.6 V, 3.0 V ≤ V_{DD2} ≤ 3.6 V, and −40°C ≤ T_A ≤ +125°C, unless otherwise noted. Switching specifications are tested with C_L = 15 pF and CMOS signal levels, unless otherwise noted. Supply currents are specified with 50% duty cycle signals.

Table 3. Electrical Characteristics (3.3 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
SWITCHING SPECIFICATIONS						
Pulse Width	PW	10			ns	Within PWD limit
Data Rate		100			Mbps	Within PWD limit
Propagation Delay	t_{PHL}, t_{PLH}		6.6	10	ns	50% input to 50% output
Pulse Width Distortion	PWD		0.5	3	ns	$\lvert t_{PLH} - t_{PHL} \rvert$
Change vs. Temperature			1.5		ps/°C	
Propagation Delay Skew	t_{PSK}			7.5	ns	Between any two units at the same temperature, voltage, and load
Channel Matching						
Codirectional	t_{PSKCD}		0.5	3.0	ns	
Opposing Direction	t_{PSKOD}		0.5	3.0	ns	
Jitter[1]						For more information, see the Jitter Measurement section
Random Jitter, RMS (1σ)[2]	$t_{JIT(RJ)}$		5		ps	1 MHz clock input, All channels switching
Deterministic Jitter, Peak-to-Peak[3, 4]	$t_{JIT(DJ)}$		93		ps	100 Mbps, 2^{15} − 1 PRBS input
Total Jitter, Peak-to-Peak, at Bit Error Rate (BER) 1 x 10^{-12}	$t_{JIT(TJ)}$					100 Mbps, 2^{15} − 1 PRBS input[5]
Without Crosstalk			149			Single channel switching
With Crosstalk			229			All channels switching
DC SPECIFICATIONS						
Input Threshold Voltage						V_{Ix}, V_{Ex}
Logic High	V_{IH}	0.7 × V_{DDx}			V	
Logic Low	V_{IL}			0.3 × V_{DDx}	V	
Input Hysteresis	V_{HYS}		0.7		V	V_{IH} − V_{IL}
Output Voltage						
Logic High	V_{OH}	V_{DDx} − 0.1	V_{DDx}		V	I_{Ox}[6] = −20 μA, V_{Ix} = V_{IxH}[7]
		V_{DDx} − 0.4	V_{DDx} − 0.2		V	I_{Ox}[6] = −2 mA, V_{Ix} = V_{IxH}[7]
Logic Low	V_{OL}		0.0	0.1	V	I_{Ox}[6] = 20 μA, V_{Ix} = V_{IxL}[8]
			0.2	0.4	V	I_{Ox}[6] = 2 mA, V_{Ix} = V_{IxL}[8]
Input Current per Channel	I_I	−10	+0.01	+10	μA	0 V ≤ V_{Ix} ≤ V_{DDx}, 0 V ≤ V_{Ex} ≤ V_{DDx}
Quiescent Supply Current						
ADuM320N						
	$I_{DD1 (Q)}$		0.4	0.6	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.8	1.3	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD1 (Q)}$		3.6	5.2	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		1.6	2.3	mA	V_I[9] = 1 (N0), 0 (N1)[10]
ADuM321N						
	$I_{DD1 (Q)}$		0.61	0.9	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.61	0.9	mA	V_I[9] = 0 (N0), 1 (N1)[10]

SPECIFICATIONS

Table 3. Electrical Characteristics (3.3 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
	$I_{DD1 (Q)}$		2.6	3.7	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		2.6	3.7	mA	V_I[9] = 1 (N0), 0 (N1)[10]
Dynamic Supply Current						
Dynamic Input	$I_{DDI (D)}$		0.009		mA/Mbps	Inputs switching, 50% duty cycle
Dynamic Output	$I_{DDO (D)}$		0.019		mA/Mbps	Inputs switching, 50% duty cycle
Undervoltage Lockout	UVLO					
Positive V_{DDx} Threshold	V_{UVLO+}		2.0	2.2	V	Rising supply voltage enable threshold
Negative V_{DDx} Threshold	V_{UVLO-}	1.7	1.8		V	Falling supply voltage lockout threshold
V_{DDx} Hysteresis	V_{UVLO_HYS}		0.2		V	UVLO hysteresis
UVLO Release Time[11]	t_{UVLO}			60	µs	UVLO release delay after V_{UVLO+} threshold
AC SPECIFICATIONS						
Output Rise/Fall Time	t_R/t_F		2.5		ns	10% to 90%
Common-Mode Transient Immunity[12]	$\|CM_H\|$	100	180		kV/µs	$V_{Ix} = V_{DDx}$, V_{CM} = 1000 V, transient magnitude = 800 V
	$\|CM_L\|$	100	180		kV/µs	V_{Ix} = 0 V, V_{CM} = 1000 V, transient magnitude = 800 V

[1] Jitter parameters are guaranteed by design and characterization. Values do not include stimulus jitter.

[2] This specification is measured over a population of ~100,000 edges.

[3] Peak-to-peak jitter specifications include jitter due to PWD.

[4] This specification is measured over a population of ~300,000 edges.

[5] Using the following formula: $t_{JIT(TJ)} = 14 \times t_{JIT(RJ)} + t_{JIT(DJ)}$.

[6] I_{Ox} is the Channel x output current, where x = A or B.

[7] V_{IxH} is the input side logic high.

[8] V_{IxL} is the input side logic low.

[9] V_I is the voltage input.

[10] N0 refers to ADuM320N0/ADuM321N0 models, and N1 refers to ADuM320N1/ADuM321N1 models. For more information, see the Ordering Guide section.

[11] Guaranteed by design and not subject to production test.

[12] $|CM_H|$ is the maximum common-mode voltage slew rate that can be sustained while maintaining the voltage-output (V_O) > 0.8 V_{DDx}. $|CM_L|$ is the maximum common-mode voltage slew rate 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.

Table 4. Total Supply Current vs. Data Throughput (3.3 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
SUPPLY CURRENT						
ADuM320N						
1 Mbps						
Supply Current Side 1	I_{DD1}		2.0	2.9	mA	
Supply Current Side 2	I_{DD2}		1.3	1.8	mA	C_L = 0 nF
25 Mbps						
Supply Current Side 1	I_{DD1}		2.2	3.0	mA	
Supply Current Side 2	I_{DD2}		1.73	2.5	mA	C_L = 0 nF
100 Mbps						
Supply Current Side 1	I_{DD1}		2.9	3.8	mA	
Supply Current Side 2	I_{DD2}		3.2	4.9	mA	C_L = 0 nF
ADuM321N						
1 Mbps						
Supply Current Side 1	I_{DD1}		1.62	2.3	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		1.62	2.3	mA	C_L = 0 nF
25 Mbps						

SPECIFICATIONS

Table 4. Total Supply Current vs. Data Throughput (3.3 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Current Side 1	I_{DD1}		2.0	2.7	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		2.0	2.7	mA	C_L = 0 nF
100 Mbps						
Supply Current Side 1	I_{DD1}		3.1	4.4	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		3.1	4.4	mA	C_L = 0 nF

2.5 V Operation

All typical specifications are at T_A = 25°C, V_{DD1} = V_{DD2} = 2.5 V. Minimum/maximum specifications apply over the entire recommended operation range of 2.25 V ≤ V_{DD1} ≤ 2.75 V, 2.25 V ≤ V_{DD2} ≤ 2.75 V, −40°C ≤ T_A ≤ +125°C, unless otherwise noted. Switching specifications are tested with C_L = 15 pF and CMOS signal levels, unless otherwise noted. Supply currents are specified with 50% duty cycle signals.

Table 5. Electrical Characteristics (2.5 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
SWITCHING SPECIFICATIONS						
Pulse Width	PW	10			ns	Within PWD limit
Data Rate		100			Mbps	Within PWD limit
Propagation Delay	t_{PHL}, t_{PLH}		7.2	14	ns	50% input to 50% output
Pulse Width Distortion	PWD		0.3	4.5	ns	$\lvert t_{PLH} - t_{PHL} \rvert$
Change vs. Temperature			1.5		ps/°C	
Propagation Delay Skew	t_{PSK}			8.9	ns	Between any two units at the same temperature, voltage, and load
Channel Matching						
Codirectional	t_{PSKCD}		0.4	5.0	ns	
Opposing Direction	t_{PSKOD}		0.4	5.0	ns	
Jitter[1]						For more information, see the Jitter Measurement section
Random Jitter, RMS (1σ)[2]	$t_{JIT(RJ)}$		5.2		ps	1 MHz clock input, All channels switching
Deterministic Jitter, Peak-to-Peak[3, 4]	$t_{JIT(DJ)}$		120		ps	100 Mbps, 2^{15} − 1 PRBS input
Total Jitter, Peak-to-Peak, at Bit Error Rate (BER) 1 x 10^{-12}	$t_{JIT(TJ)}$					100 Mbps, 2^{15} − 1 PRBS input[5]
Without Crosstalk			181		ps	Single channel switching
With Crosstalk			247		ps	All channels switching
DC SPECIFICATIONS						
Input Threshold Voltage						
Logic High	V_{IH}	0.7 × V_{DDx}			V	
Logic Low	V_{IL}			0.3 × V_{DDx}	V	
Input Hysteresis	V_{HYS}		0.65		V	$V_{IH} - V_{IL}$
Output Voltage						
Logic High	V_{OH}	V_{DDx} − 0.1	V_{DDx}		V	I_{Ox}[6] = −20 μA, V_{Ix} = V_{IxH}[7]
		V_{DDx} − 0.4	V_{DDx} − 0.2		V	I_{Ox}[6] = −2 mA, V_{Ix} = V_{IxH}[7]
Logic Low	V_{OL}		0.0	0.1	V	I_{Ox}[6] = 20 μA, V_{Ix} = V_{IxL}[8]
			0.2	0.4	V	I_{Ox}[6] = 2 mA, V_{Ix} = V_{IxL}[8]
Input Current per Channel	I_I	−10	+0.01	+10	μA	0 V ≤ V_{Ix} ≤ V_{DDx}
Quiescent Supply Current						
ADuM320N						
	$I_{DD1 (Q)}$		0.4	0.6	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.8	1.3	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD1 (Q)}$		3.6	5.2	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		1.6	2.3	mA	V_I[9] = 1 (N0), 0 (N1)[10]

SPECIFICATIONS

Table 5. Electrical Characteristics (2.5 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions/Comments
ADuM321N						
	$I_{DD1 (Q)}$		0.6	0.9	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD2 (Q)}$		0.6	0.9	mA	V_I[9] = 0 (N0), 1 (N1)[10]
	$I_{DD1 (Q)}$		2.6	3.7	mA	V_I[9] = 1 (N0), 0 (N1)[10]
	$I_{DD2 (Q)}$		2.6	3.7	mA	V_I[9] = 1 (N0), 0 (N1)[10]
Dynamic Supply Current						
Dynamic Input	$I_{DDI (D)}$		0.008		mA/Mbps	Inputs switching, 50% duty cycle
Dynamic Output	$I_{DDO (D)}$		0.0015		mA/Mbps	Inputs switching, 50% duty cycle
Undervoltage Lockout						
Positive V_{DDx} Threshold	V_{DDxUV+}		2.0	2.2	V	
Negative V_{DDx} Threshold	V_{DDxUV-}	1.7	1.8		V	
V_{DDx} Hysteresis	V_{DDxUVH}		0.2		V	
UVLO Release Time[11]				60	µs	
AC SPECIFICATIONS						
Output Rise/Fall Time	t_R/t_F		2.5		ns	10% to 90%
Common-Mode Transient Immunity[12]	$\|CM_H\|$	100	180		kV/µs	$V_{Ix} = V_{DDx}$, V_{CM} = 1000 V, transient magnitude = 800 V
	$\|CM_L\|$	100	180		kV/µs	V_{Ix} = 0 V, V_{CM} = 1000 V, transient magnitude = 800 V

1 Jitter parameters are guaranteed by design and characterization. Values do not include stimulus jitter.

2 This specification is measured over a population of ~100,000 edges.

3 Peak-to-peak jitter specifications include jitter due to PWD.

4 This specification is measured over a population of ~300,000 edges.

5 Using the following formula: $t_{JIT(TJ)} = 14 \times t_{JIT(RJ)} + t_{JIT(DJ)}$.

6 I_{Ox} is the Channel x output current, where x = A or B.

7 V_{IxH} is the input side logic high.

8 V_{IxL} is the input side logic low.

9 V_I is the voltage input.

10 N0 refers to ADuM320N0/ADuM321N0 models, and N1 refers to ADuM320N1/ADuM321N1 models. For more information, see the Ordering Guide section.

11 Guaranteed by design and not subject to production test.

12 $|CM_H|$ is the maximum common-mode voltage slew rate that can be sustained while maintaining the voltage-output (V_O) < 0.8 V_{DDx}. $|CM_L|$ is the maximum common-mode voltage slew rate 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.

Table 6. Total Supply Current vs. Data Throughput (2.5 V Operation)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
SUPPLY CURRENT						
ADuM320N						
1 Mbps						
Supply Current Side 1	I_{DD1}		2.0	2.9	mA	
Supply Current Side 2	I_{DD2}		1.3	1.8	mA	C_L = 0 nF
25 Mbps						
Supply Current Side 1	I_{DD1}		2.2	3.0	mA	
Supply Current Side 2	I_{DD2}		1.6	2.3	mA	C_L = 0 nF
100 Mbps						
Supply Current Side 1	I_{DD1}		2.8	3.7	mA	
Supply Current Side 2	I_{DD2}		2.8	4.2	mA	C_L = 0 nF
ADuM321N						
1 Mbps						

SPECIFICATIONS

Table 6. Total Supply Current vs. Data Throughput (2.5 V Operation) (Continued)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Supply Current Side 1	I_{DD1}		1.6	2.3	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		1.6	2.3	mA	C_L = 0 nF
25 Mbps						
Supply Current Side 1	I_{DD1}		1.9	2.6	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		1.9	2.6	mA	C_L = 0 nF
100 Mbps						
Supply Current Side 1	I_{DD1}		2.8	3.9	mA	C_L = 0 nF
Supply Current Side 2	I_{DD2}		2.8	3.9	mA	C_L = 0 nF

INSULATION SPECIFICATIONS

The ADuM320N/ADuM321N are suitable for "safe electrical insulation" only within the safety limiting ratings. Compliance with the safety limiting ratings shall be ensured by means of suitable protective circuits.

Table 7. R-8 Narrow-Body [SOIC_N] Package Insulation Characteristics

Parameter	Symbol	Value	Unit	Test Conditions/Comments
GENERAL				
Minimum External Clearance Distance	CLR	3.5	mm	Measured from input terminals to output terminals, shortest distance through air per IEC 60664-1
Minimum External Creepage Distance	CRP	3.5	mm	Measured from input terminals to output terminals, shortest distance along body per IEC 60664-1
Distance Through Insulation	DTI	36	µm	Minimum internal
Comparative Tracking Index	CTI	>600	V	Per IEC 60112
Material Group		I		Per IEC 60664-1
Overvoltage Category per IEC 60664-1		I to IV		Rated mains voltage ≤ 150V rms
		I to III		Rated mains voltage ≤ 300V rms
		I to II		Rated mains voltage ≤ 600V rms
SAFETY LIMITING VALUES				
Maximum Ambient Safety Temperature	T_S	150	°C	
Maximum Junction Temperature, Safety	$T_{JMAX,S}$	150	°C	Maximum junction temperature for isolation barrier safety
Maximum Total Power Dissipation	P_{TOT}	1.34	W	T_A ≤ 25°C, P_{TOT} = P_{SI} = P_{SO}
Derating Above Ambient		9.92	mW/°C	T_A > 25°C, see Figure 3
Junction-to-Air Thermal Impedance	θ_{JA}	93	°C/W	See Thermal Characteristics
IEC 60747-17 (REINFORCED INSULATION)				
Maximum Repetitive Peak Isolation Voltage	V_{IORM}	636	V peak	
Maximum Isolation Working Voltage	V_{IOWM}	450	V rms	AC voltage, end of life test, f = 60 Hz
		636	V peak	DC voltage
Maximum Transient Isolation Voltage	V_{IOTM}	4242	V peak	V_{TEST} = 1.2 × V_{IOTM}, t = 1 s (100% production)
Maximum Impulse Voltage	V_{IMP}	4000	V peak	Surge voltage in air, waveform per IEC 61000-4-5
Maximum Surge Isolation Voltage	V_{IOSM}	10000	V peak	V_{TEST} ≥ 1.3 × V_{IMP} minimum 10 kV (type test), tested in oil, waveform per IEC 61000-4-5
Apparent Charge	q_{pd}	≤5	pC	Method a (sample test), V_{ini} = V_{IOTM}, t_{ini} = 60 s, $V_{pd(m)}$ = 1.6 × V_{IORM}, t_m = 10 s
				Method b1 (100% production), V_{ini} = 1.2 × V_{IOTM}, t_{ini} = 1 s, $V_{pd(m)}$ = 1.875 × V_{IORM}, t_m = 1 s
Resistance (Input to Output)[1]	R_{IO}	$>10^{11}$	Ω	T_A = 25°C, V_{TEST} = 500 V dc, t = 60 s
	R_{IO_S}	$>10^{9}$	Ω	T_A = T_S, V_{TEST} = 500 V dc, t = 60 s
Capacitance (Input to Output)[1]	C_{IO}	0.5	pF	f_{TEST} = 1 MHz
Climate Category		40/125/21		
Pollution Degree		2		Per IEC 60664-1

SPECIFICATIONS

Table 7. R-8 Narrow-Body [SOIC_N] Package Insulation Characteristics (Continued)

Parameter	Symbol	Value	Unit	Test Conditions/Comments
UL 1577				
Maximum Withstanding Isolation Voltage	V_{ISO}	3000	V rms	$V_{TEST} = 1.2 \times V_{ISO}$, t = 1 s (100% production)

[1] Device measured as a 2-terminal device with Pin 1 to Pin 4 connected and Pin 5 to Pin 8 connected.

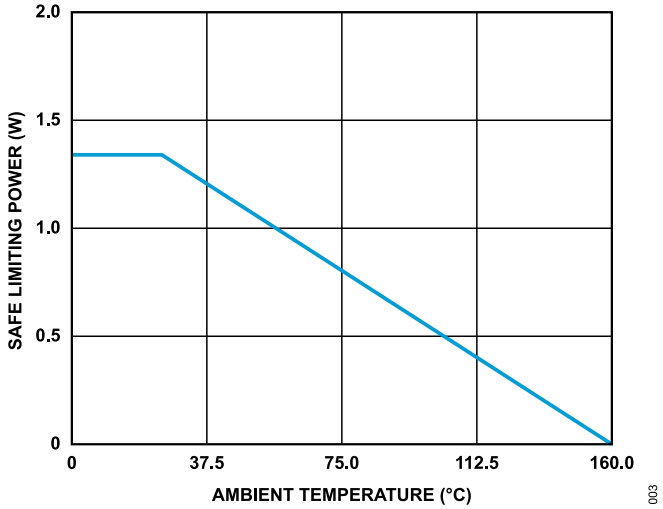

Figure 3. Thermal Derating Curve for 8-Lead Narrow SOIC [SOIC_N] (R-8), Dependence of Safety Limiting Power with Ambient Temperature per IEC 60747-17

Table 8. RI-8-1 Wide Body, with Increased Creepage [SOIC_IC] Package Insulation Characteristics

Parameter	Symbol	Value	Unit	Test Conditions/Comments
GENERAL				
Minimum External Clearance Distance	CLR	8.3	mm	Measured from input terminals to output terminals, shortest distance through air per IEC 60664-1
Minimum External Creepage Distance	CRP	8.3	mm	Measured from input terminals to output terminals, shortest distance along body per IEC 60664-1
Distance Through Insulation	DTI	36	µm	Minimum internal
Comparative Tracking Index	CTI	>600	V	Per IEC 60112
Material Group		I		Per IEC 60664-1
Overvoltage Category per IEC 60664-1		I to IV		Rated mains voltage ≤ 150V rms
		I to IV		Rated mains voltage ≤ 300V rms
		I to III		Rated mains voltage ≤ 600V rms
SAFETY LIMITING VALUES				
Maximum Ambient Safety Temperature	T_S	150	°C	
Maximum Junction Temperature, Safety	$T_{JMAX,S}$	150	°C	Maximum junction temperature for isolation barrier safety
Maximum Total Power Dissipation	P_{TOT}	1.40	W	$T_A \leq 25°C$, $P_{TOT} = P_{SI} = P_{SO}$
Derating Above Ambient		11.2	mW/°C	$T_A > 25°C$, see Figure 4
Junction-to-Air Thermal Impedance	θ_{JA}	89	°C/W	See Thermal Characteristics
IEC 60747-17 (REINFORCED INSULATION)				
Maximum Repetitive Peak Isolation Voltage	V_{IORM}	1173	V peak	
Maximum Isolation Working Voltage	V_{IOWM}	829	V rms	AC voltage, end of life test, f = 60 Hz
		1173	V peak	DC voltage
Maximum Transient Isolation Voltage	V_{IOTM}	8000	V peak	$V_{TEST} = 1.2 \times V_{IOTM}$, t = 1 s (100% production)
Maximum Impulse Voltage	V_{IMP}	8000	V peak	Surge voltage in air, waveform per IEC 61000-4-5

SPECIFICATIONS

Table 8. RI-8-1 Wide Body, with Increased Creepage [SOIC_IC] Package Insulation Characteristics (Continued)

Parameter	Symbol	Value	Unit	Test Conditions/Comments
Maximum Surge Isolation Voltage	V_{IOSM}	16000	V peak	$V_{TEST} \geq 1.3 \times V_{IMP}$ minimum 10 kV (type test), tested in oil, waveform per IEC 61000-4-5
Apparent Charge	q_{pd}	≤5	pC	Method a (sample test), $V_{ini} = V_{IOTM}$, $t_{ini} = 60$ s, $V_{pd(m)} = 1.6 \times V_{IORM}$, $t_m = 10$ s
				Method b1 (100% production), $V_{ini} = 1.2 \times V_{IOTM}$, $t_{ini} = 1$ s, $V_{pd(m)} = 1.875 \times V_{IORM}$, $t_m = 1$ s
Resistance (Input to Output)[1]	R_{IO}	$>10^{11}$	Ω	$T_A = 25°C$, $V_{TEST} = 500$ V dc, t = 60 s
	R_{IO_S}	$>10^{9}$	Ω	$T_A = T_S$, $V_{TEST} = 500$ V dc, t = 60 s
Capacitance (Input to Output)[1]	C_{IO}	0.5	pF	$f_{TEST} = 1$ MHz
Climate Category		40/125/21		
Pollution Degree		2		Per IEC 60664-1
UL 1577				
Maximum Withstanding Isolation Voltage	V_{ISO}	5700	V rms	$V_{TEST} = 1.2 \times V_{ISO}$, t = 1 s (100% production)

[1] Device measured as a 2-terminal device with Pin 1 to Pin 4 connected and Pin 5 to Pin 8 connected.

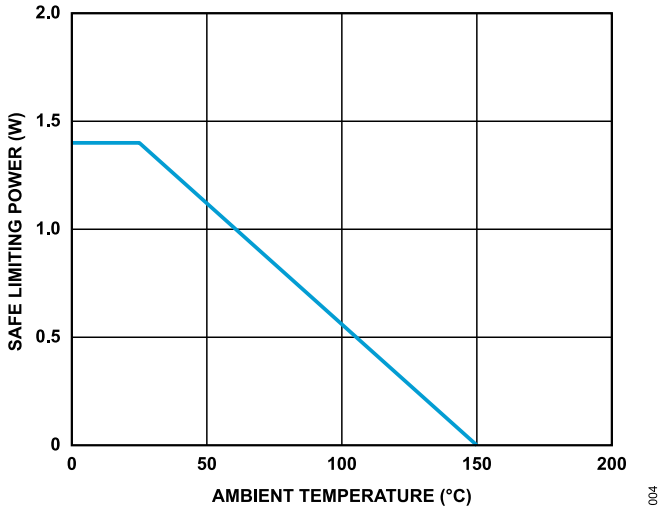

Figure 4. Thermal Derating Curve for 8-Lead Increased Creepage SOIC [SOIC_IC] (RI-8-1), Dependence of Safety Limiting Power with Ambient Temperature per IEC 60747-17

REGULATORY INFORMATION

The ADuM320N/ADuM321N R-8 and RI-8-1 have been approved by the organizations listed in Table 9 and Table 10. Copies of the relevant certifications are available at Safety and Regulatory Certification for Digital Isolators.

Table 9. R-8 Narrow-Body [SOIC_N] Package

Regulatory Agency	Standard Certification / Approval	File or Certificate
UL	UL 1577 component recognition program Single protection, 3000 V rms isolation voltage	File E214100
TÜV Süd	DIN EN IEC 60747-17 (VDE 0884-17) Reinforced insulation at 636 V peak IEC / EN 62368-1 Basic Insulation at 350 V rms Reinforced Insulation at 175 V rms	Certificate B 056232 0029
CSA[1]	IEC / EN / CSA 62368-1	File 205078

SPECIFICATIONS

Table 9. R-8 Narrow-Body [SOIC_N] Package (Continued)

Regulatory Agency	Standard Certification / Approval	File or Certificate
	Basic insulation at 350 V rms Reinforced insulation at 175 V rms IEC / CSA 60601-1 1 MOPP at 187 V rms IEC / CSA 61010-1 Basic insulation at 300 V rms Reinforced insulation at 150 V rms	
CQC	CQC GB4943.1 Basic insulation at 300 V rms Reinforced insulation at 150 Vrms	Certificate CQC25001466832

[1] Working voltages are quoted for Pollution Degree 2, Material Group III and Overvoltage Category II except where otherwise specified. The ADuM320N/ADuM321N case material has been evaluated by CSA as Material Group I.

Table 10. RI-8-1 Wide-Body, with Increased Creepage [SOIC_IC] Package

Regulatory Agency	Standard Certification / Approval	File or Certificate
UL	1577 Single protection, 5700 V rms isolation voltage	File E214100
TÜV Süd (Pending)	DIN EN IEC 60747-17 (VDE 0884-17) Reinforced insulation at 1173 Vpeak IEC / EN 62368-1 Basic Insulation at 830 V rms Reinforced Insulation at 415 V rms	Certificate B 056232 0029
CSA[1]	IEC / EN / CSA 62368-1 Basic insulation at 830 V rms Reinforced insulation at 415 V rms IEC / CSA 60601-1 1 MOPP at 519 V rms (pending) 2 MOPP at 261 V rms IEC / CSA 61010-1 Basic insulation at 600 V rms Reinforced insulation at 300 V rms	File 205078
CQC	CQC GB4943.1 Basic insulation at 830 V rms Reinforced insulation at 415 V rms	Certificate CQC25001466406

[1] Working voltages are quoted for Pollution Degree 2, Material Group III and Overvoltage Category II except where otherwise specified. The ADuM320N/ADuM321N case material has been evaluated by CSA as Material Group I.

RECOMMENDED OPERATING CONDITIONS

Table 11. Recommended Operating Conditions

Parameter	Symbol	Rating
Operating Temperature	T_A	−40°C to +125°C
Supply Voltages		
V_{DD1}		2.25 V to 5.5 V
V_{DD2}		2.25 V to 5.5 V
Input Signal Rise and Fall Times		1.0 ms

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 12. Absolute Maximum Ratings

Parameter	Rating
Supply Voltages	
V_{DD1} to GND_1	−0.5 V to +7.0 V
V_{DD2} to GND_2	−0.5 V to +7.0 V
Input Voltages (V_{IA}, V_{IB})	−0.5 V to V_{DDI}[1] + 0.5 V
Output Voltages (V_{OA}, V_{OB})	−0.5 V to V_{DDO}[2] + 0.5 V
Average Output Current per Pin	
Side 1 Output Current (I_{O1})	−10 mA to +10 mA
Side 2 Output Current (I_{O2})	−10 mA to +10 mA
Common-Mode Transients[3]	−300 kV/µs to +300 kV/µs
Temperature	
Storage Range (T_{ST})	−65°C to +150°C
Ambient Operating Range (T_A)	−40°C to +125°C
Moisture Sensitivity Level	MSL3

1 V_{DDI} is the input side supply voltage.

2 V_{DDO} is the output side supply voltage.

3 Refers to the common-mode transients across the insulation barrier. Common-mode transients exceeding the absolute maximum ratings may cause latchup or permanent damage.

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

ELECTROSTATIC DISCHARGE (ESD) RATINGS

The following ESD information is provided for handling of ESD sensitive devices in an ESD protected area only.

Human body model (HBM) per ANSI/ESDA/JEDEC JS-001.

Field induced charged device model (FICDM) and charged device model (CDM) per ANSI/ESDA/JEDEC JS-002.

International Electrotechnical Commission (IEC) electromagnetic compatibility: Part 4-2 (IEC) per IEC 61000-4-2.

ESD Ratings for ADuM320N/ADuM321N

Table 13. ADuM320N/ADuM321N, 8-Lead SOIC_N and SOIC_IC

ESD Model	Withstand Threshold (V)	Class
HBM[1]	±5500 (ADuM320N) ±4500 (ADuM321N)	3A
CDM[1]	±1500	C3
IEC[2]	±8kV (across isolation barrier with respect to GNDx)	Level 4

1 With respect to local VDDx and GNDx pins.

2 Across the isolation barrier between GND_1 and GND_2.

THERMAL CHARACTERISTICS

Thermal performance is directly linked to printed circuit board (PCB) design and operating environment. Careful attention to PCB thermal design is required.

Thermal resistance and characterization parameter values specified in Table 14 are defined and calculated based on the JEDEC JESD51standards. For more details on their definition and usage, see JEDEC JESD51-12 and the Thermal Analysis section.

Table 14. Package Thermal Data

Package Type[1]	θ_{JA}	θ_{JB}	Ψ_{JB}	Ψ_{JT}	Unit
SOIC_N (R-8)	92.96	177.75	62.66	7.07	°C/W
SOIC_IC (RI-8-1)	88.11	89.19	61.61	9.86	°C/W

1 Thermal impedance simulated values are based on JEDEC 2S2P thermal test board with no vias and still air.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS

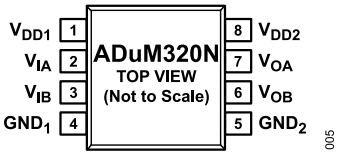

Figure 5. ADuM320N Pin Configuration

Table 15. ADuM320N Pin Function Descriptions

Pin Number	Mnemonic	Description
1	V_{DD1}	Supply Voltage for Isolator Side 1. This pin requires a 0.1 µF bypass capacitor.
2	V_{IA}	Logic Input A.
3	V_{IB}	Logic Input B.
4	GND_1	Ground Reference for Isolator Side 1.
5	GND_2	Ground Reference for Isolator Side 2.
6	V_{OB}	Logic Output B.
7	V_{OA}	Logic Output A.
8	V_{DD2}	Supply Voltage for Isolator Side 2. This pin requires a 0.1 µF bypass capacitor.

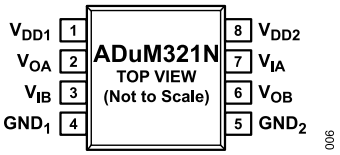

Figure 6. ADuM321N Pin Configuration

Table 16. ADuM321N Pin Function Descriptions

Pin Number	Mnemonic	Description
1	V_{DD1}	Supply Voltage for Isolator Side 1. This pin requires a 0.1 µF bypass capacitor.
2	V_{OA}	Logic Output A.
3	V_{IB}	Logic Input B.
4	GND_1	Ground Reference for Isolator Side 1.
5	GND_2	Ground Reference for Isolator Side 2.
6	V_{OB}	Logic Output B.
7	V_{IA}	Logic Input A.
8	V_{DD2}	Supply Voltage for Isolator Side 2. This pin requires a 0.1 µF bypass capacitor.

TYPICAL PERFORMANCE CHARACTERISTICS

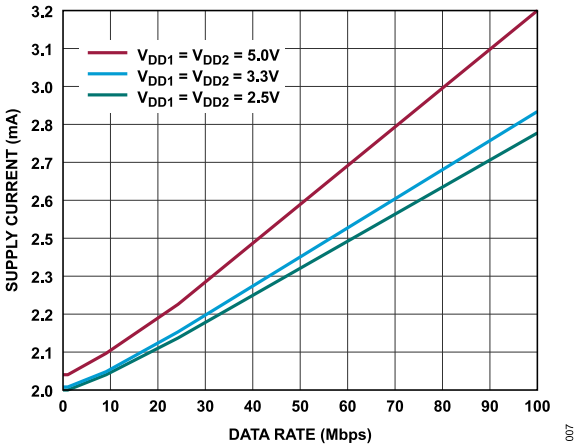

Figure 7. I_{DD1} Supply Current vs. Data Rate at Various Voltages

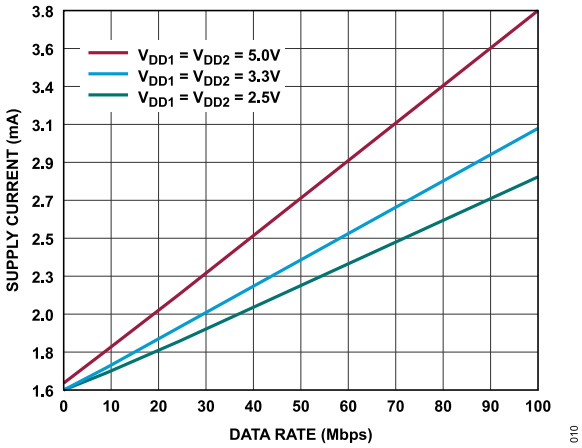

Figure 10. I_{DD2} Supply Current vs. Data Rate at Various Voltages

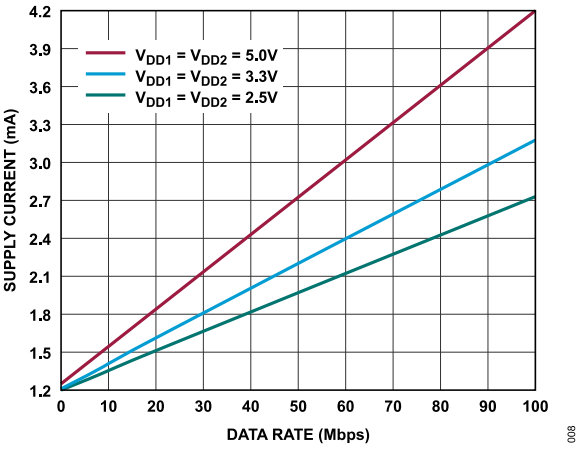

Figure 8. I_{DD2} Supply Current vs. Data Rate at Various Voltages

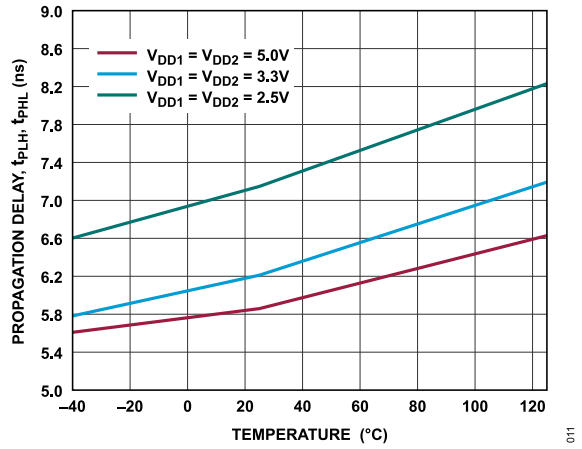

Figure 11. Propagation Delay, t_{PLH}, t_{PHL} vs. Temperature at Various Voltages

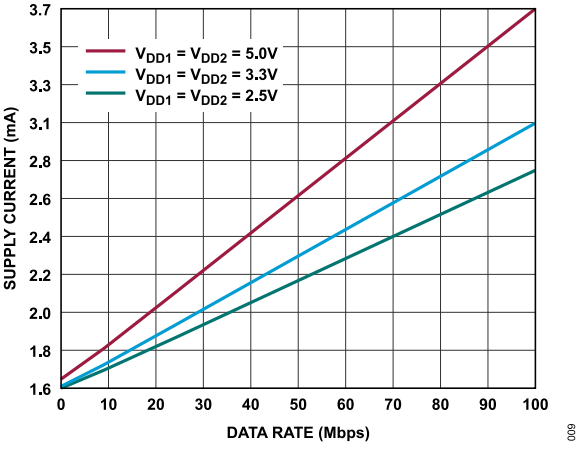

Figure 9. I_{DD1} Supply Current vs. Data Rate at Various Voltages

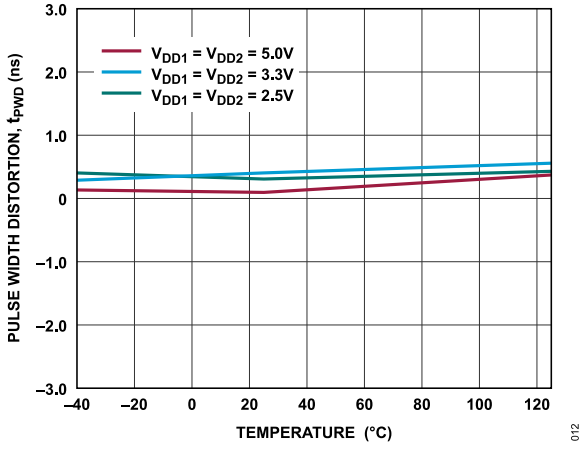

Figure 12. Pulse Width Distortion, t_{PWD} vs. Temperature at Various Voltages

THEORY OF OPERATION

The ADuM320N/ADuM321N use a high-frequency carrier to transmit data across the isolation barrier using *i*Coupler chip-scale transformer coils separated by layers of polyimide isolation. Using an on/off keying (OOK) technique and the differential architecture shown in Figure 13 and Figure 14, the ADuM320N/ADuM321N have very low propagation delay and high speed.

There is no interdependency between V_{DD1} and V_{DD2} supplies. They can simultaneously operate at any voltage within their specified operating ranges and may sequence in any order. This enables the isolator to perform voltage translation of 2.5 V, 3.3 V, and 5 V logic. The architecture is designed for high common-mode transient (CMTI) immunity and high immunity to electrical noise and magnetic interference. Radiated emissions are minimized with a spread spectrum OOK carrier and other techniques.

Figure 13 shows the waveforms for models of the ADuM320N/ADuM321N that have the condition of the fail-safe output state equal to low, where the carrier waveform is off when the input state is low. If the input side is off or not operating, the low fail-safe output state (ADuM320N0/ADuM321N0) sets the output to low. For the ADuM320N/ADuM321N that have a high fail-safe output state, Figure 14 shows the conditions where the carrier waveform is off when the input state is high. When the input side is off or not operating, the high fail-safe output state (ADuM320N1/ADuM321N1) sets the output to high. For the model numbers that have the fail-safe output state of low or the fail-safe output state of high, see the Ordering Guide section.

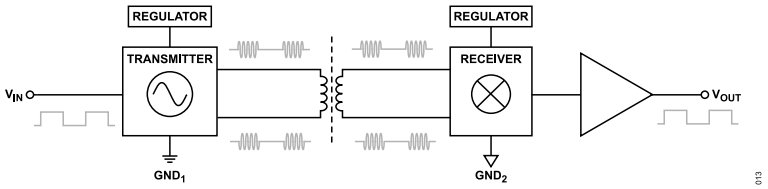

Figure 13. Operational Block Diagram of a Single Channel with a Low Fail-Safe Output State

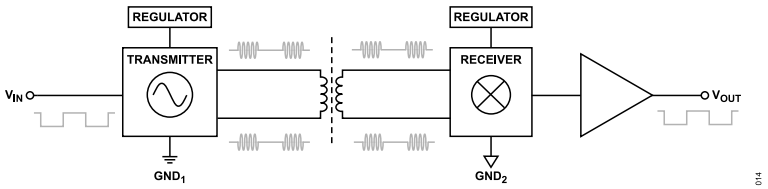

Figure 14. Operational Block Diagram of a Single Channel with a High Fail-Safe Output State

THEORY OF OPERATION

TRUTH TABLE

Table 17. ADuM320N/ADuM321N Truth Table (Positive Logic)

V_{Ix} Input[1, 2]	V_{DDI} State[3]	V_{DDO} State[4]	Default Low (N0), V_{Ox} Output[1, 5, 6]	Default High (N1), V_{Ox} Output[1, 5, 7]	Test Conditions/ Comments
L	Powered	Powered	L	L	Normal operation
H	Powered	Powered	H	H	Normal operation
L	Undervoltage	Powered	L	H	Fail-safe output
X[8]	Undervoltage	Powered	Z	Z	Outputs disabled
X	Powered	Undervoltage	Indeterminate	Indeterminate	

[1] L means low, H means high, X means don't care, NC means not connected, and Z means high impedance within one diode drop of GNDx.

[2] V_{Ix} refers to the input signals of a given channel (A or B).

[3] V_{DDI} refers to the supply voltages on the input sides of the given channel.

[4] V_{DDO} refers to the supply voltages on the output sides of the given channel.

[5] V_{Ox} refers to the output signals of a given channel (A or B).

[6] N0 refers to the ADuM320N0/ADuM321N0 models. For more information, see the Ordering Guide section.

[7] N1 refers to the ADuM320N1/ADuM321N1 models. For more information, see the Ordering Guide section.

[8] Input pins (V_{Ix} and V_{Ex}) on the same side as an unpowered supply must be in a low state to avoid powering the device through its ESD protection circuitry.

INPUT/OUTPUT SCHEMATICS

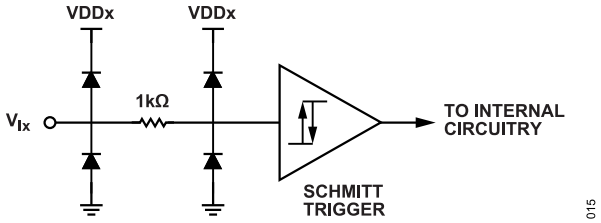

Figure 15. V_{IA} and V_{IB} Input Schematics

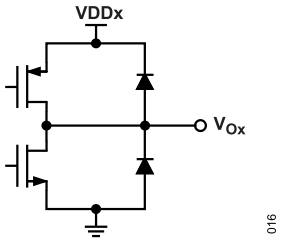

Figure 16. V_{OA} and V_{OB} Output Schematics

APPLICATIONS INFORMATION

PCB LAYOUT

The ADuM320N/ADuM321N digital isolators require no external interface circuitry for the logic interfaces. Power supply bypassing is required at the input and output supply pins (see Figure 17). Bypass capacitors are to be connected between Pin 1 and Pin 4 for V_{DD1} and between Pin 8 and Pin 5 for V_{DD2}. The required bypass capacitor value is between 0.01 µF and 0.1 µF. The total lead length between both ends of the capacitor and the input power supply pin must not exceed 10 mm.

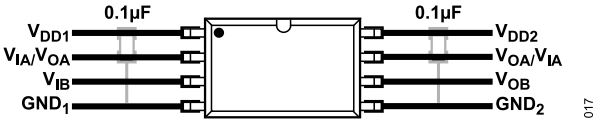

Figure 17. Recommended PCB Layout

In applications involving high common-mode transients, ensure that board coupling across the isolation barrier is minimized. Furthermore, design the board layout such that any coupling that does occur equally affects all pins on a given component side. Failure to ensure this can cause voltage differentials between pins exceeding the Absolute Maximum Ratings of the device, so leading to latchup or permanent damage.

For board layout guidelines, refer to the AN-1109 Application Note, *Recommendations for Control of Radiated Emissions with iCoupler Devices*.

PROPAGATION DELAY RELATED PARAMETERS

Propagation delay is a parameter that describes the time required for a logic signal to propagate through a component. The propagation delay to a Logic 0 output can differ from the propagation delay to a Logic 1 output.

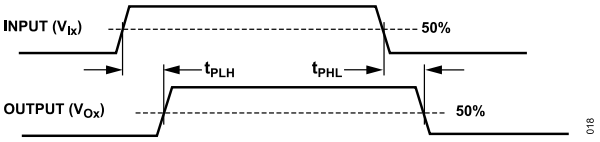

Figure 18. Propagation Delay Parameters

Pulse width distortion is the maximum difference between these two propagation delay values and is an indication of how accurately the timing of the input signal is preserved.

Channel matching is the maximum amount that the propagation delay differs between channels within a single ADuM320N/ADuM321N component.

Propagation delay skew is the maximum amount that the propagation delay differs between multiple ADuM320N/ADuM321N components operating under the same conditions.

JITTER MEASUREMENT

Figure 19 shows the resulting eye diagram for the ADuM321N. The measurement is taken using a Keysight 81160A pulse pattern generator at 100 Mbps with pseudorandom bit sequences (PRBS15) 2^{15}-1 input. Jitter is measured using the Tektronix 6 Series B mixed-signal oscilloscope, with a TAP1500 probe and using the Tektronix jitter and analysis software. The 10% to 90% rise and fall times of the input signal from the generator approximately equals 1.2 ns. The result shows a typical output eye diagram measured on the ADuM321N. Figure 19 shows random and deterministic jitter characteristics for a PRBS input.

Total Jitter is evaluated at a BER of $1x10^{-12}$ and calculated for a PRBS input with and without the effects of crosstalk. The total jitter measurement without crosstalk consists of examining one channels input, while the adjacent channels inputs are grounded. The jitter measurement with crosstalk consists of all channels switching simultaneously at the same rate.

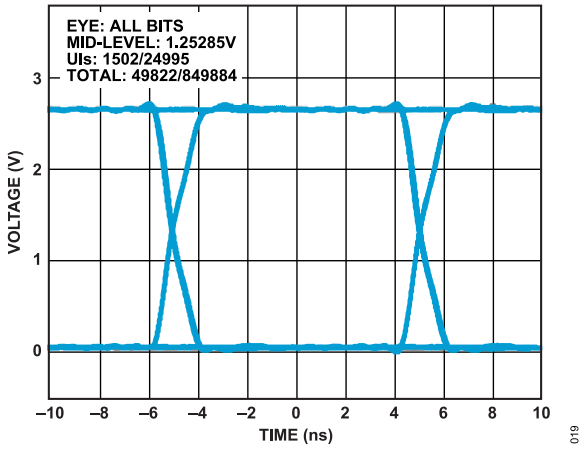

Figure 19. ADuM321N Eye Diagram

THERMAL ANALYSIS

The ADuM320N/ADuM321N consists of two internal die attached to a split lead frame with two die attach pads. For the purposes of thermal analysis, the die are treated as a single thermal unit, with the highest junction temperature reflected in the thermal parameter values from Table 14. The thermal parameter values are based on thermal simulations with the devices mounted on a JEDEC standard, 4-layer board with fine width traces and still air. Under normal operating conditions, the ADuM320N/ADuM321N can operate at full load across the full temperature range without derating the output current.

θ_{JA} and θ_{JB} are mainly used to compare the thermal performance of the package of the device with other semiconductor packages when all test conditions listed are similar. θ_{JA} and θ_{JB} can be used for first order approximation of the junction temperature in the system environment.

APPLICATIONS INFORMATION

If an accurate thermal measurement of the board temperature near the device under test or directly on the package top surface operating in the system environment is available along with the corresponding device power dissipation, then using Ψ_{JB} or Ψ_{JT} is a more appropriate way to estimate the junction temperature in the system environment. Use Ψ_{JB} when the temperature measurement point is on the board or Ψ_{JT} when it is on the package top. The junction temperature is estimated using the following equation:

$$T_J = \psi_{Jx} \times P_d + T_x \quad (1)$$

where
P_d is the dissipated power.
T_x is the measured temperature at location *x* and *x* is either *B* for the PCB or *T* for the package top.

The temperature measurement point for θ_{JB} and Ψ_{JB} is between Pin 6 and Pin 7 on the outer edge of the pin footprint. The temperature measurement point for Ψ_{JT} is at the center of the topside of the package.

INSULATION LIFETIME

All insulation structures eventually break down when subjected to voltage stress over a sufficiently long period. The rate of insulation degradation is dependent on the characteristics of the voltage waveform applied across the insulation as well as on the materials and material interfaces. Analog Devices conducts an extensive set of evaluations to determine the lifetime of the insulation structure within the ADuM320N/ADuM321N as per IEC 60747-17.

OUTLINE DIMENSIONS

Package Drawing (Option)	Package Type	Package Description
R-8	SOIC_N	8-Lead Standard Small Outline Package
RI-8-1	SOIC_IC	8-Lead Standard Small Outline Package, with Increased Creepage

For the latest package outline information and land patterns (footprints), go to Package Index.

ORDERING GUIDE

Model[1, 2]	Temperature Range	Package Description	Packing Quantity	Package Option
ADUM320N0BRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM320N0BRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM320N0BRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM320N0BRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM320N0WBRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM320N0WBRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM320N0WBRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM320N0WBRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM320N1BRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM320N1BRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM320N1BRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM320N1BRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM320N1WBRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM320N1WBRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM320N1WBRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM320N1WBRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM321N0BRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM321N0BRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM321N0BRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM321N0BRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM321N0WBRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM321N0WBRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM321N0WBRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM321N0WBRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM321N1BRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM321N1BRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM321N1BRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM321N1BRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8
ADUM321N1WBRIZ	-40°C to +125°C	8-Lead SOIC (Increased Creepage)		RI-8-1
ADUM321N1WBRIZ-RL	-40°C to +125°C	8-Lead SOIC (Increased Creepage)	Reel, 1500	RI-8-1
ADUM321N1WBRZ	-40°C to +125°C	8-Lead SOIC		R-8
ADUM321N1WBRZ-RL7	-40°C to +125°C	8-Lead SOIC	Reel, 1000	R-8

[1] Z = RoHS Compliant Part.

[2] W = Qualified for Automotive Applications.

Updated: November 22, 2023

OUTLINE DIMENSIONS

EVALUATION BOARDS

Model[1]	Description
EVAL-ADuM32XNEBZ	Evaluation Board

[1] Z = RoHS Compliant Part.

AUTOMOTIVE PRODUCTS

The ADuM320NW/ADuM321NW models are available with controlled manufacturing to support the quality and reliability requirements of automotive applications. Note that this automotive model may have specifications that differ from the commercial model, therefore, designers must review the Specifications section of this data sheet carefully. Only the automotive grade product shown is available for use in automotive applications. Contact the local Analog Devices, Inc., account representative for specific product ordering information and to obtain the specific Automotive Reliability reports for this model.